SYQWEST INCORPORATED

High Resolution Echo Sounders and Acoustic Systems for Precision Seafloor Exploration

BATHY-500DF

DUAL FREQUENCY HYDROGRAPHIC ECHO SOUNDER

INTERLEAVED DUAL FREQUENCY

- **INSTALLATION**
- **OPERATION**
- **MAINTENANCE**

Ver 4309

SyQwest

222 Metro Center Blvd. * Warwick, Rhode Island 02886

Tel: (401) 921-5170 * FAX: (401) 921-5159

Website http://www.syqwestinc.com/ **Email:** mailto:tech-support@syqwestinc.com

TABLE OF CONTENTS

1.0 INTRODUCTION

1.1 GENERAL INFORMATION

The Bathy-500DF Survey Echo Sounder provides a high-contrast thermal chart record complete with alphanumeric annotation of important parameters such as geographic position, depth, speed of sound and offset for draft/tide. Real-time viewing of all parameters is provided to the user via front panel liquid-crystal display. Position input can be from either a standard C/A GPS receiver or differential GPS system. Depth data is available to external devices in digital form, via a versatile interface, whose format is selectable by the user using the front panel keypad. The user may obtain digital depth data output, in various industry standard RS-232/422 formats or NMEA-0183. The ability to accept external annotation input from various PC-based hydrographic software is standard in the Bathy-500DF.

Unit set-up and parameter changes are accomplished via the keypad. Important parameter values are retained by the unit in non-volatile memory when power is removed. A real-time internal clock provides time and date stamping of the chart record.

The Bathy-500DF is equally well suited for both applications which involve rapid depth of channel determination by viewing the chart record and for detailed hydrographic surveys whereby automatic operation and unattended logging of digital depth data is desired. The use of embedded parallel microprocessor architecture allows for operation of the chart recording function simultaneously with digital display and data outputs, while further having the real-time capability to implement a proven weighted bottom detection technique, adaptive bottom tracking gate and other advanced signal processing.

Entirely portable, the Bathy-500DF can be operated on any vessel of opportunity since a wide range of A.C. and D.C. input voltages can be used. Your Bathy-500DF is capable of operation on various frequencies as selected by the user; See Section 3.3.1 for frequency selection procedure. Space is provided in the rear of the unit to store the various transducer types. Since scale annotation is printed on the chart along with bottom features, only one type of chart paper is required; The user need not change paper type when changing measurement units from feet to meters or vice-versa.

1.2 ECHO SOUNDING OVERVIEW

Echo sounding measures water depth by measuring the time interval required for ultrasonic sound waves to travel, at a known velocity, from a known point (a vessel) to a reflecting surface (water bottom) and return. If the time is measured between the transmission of a sound wave and the reception of its echo, the depth may be determined by multiplying one-half of this time interval by the velocity of sound in the water column.

For accurate surveying, sound velocity (more correctly referred to as speed of sound since it is really a scalar value) must be determined and entered into the echo sounder. Sound speed in water is dependent upon the salinity, temperature and depth. For instruments that operate in shallow depths, as is the case for the Bathy-500DF, depth is not a major factor effecting sound speed, so such is not considered in this manual. Complete details regarding the various methods available to the user to measure or estimate sound speed is included in the chapter which describes unit operation (Section 3.0).

Under optimal desired survey conditions, only a single trace will be shown in the water column; That, of course, representing the water bottom. Various conditions do however exist which result in other marks between the zero line and obvious water bottom. Physical conditions such as a rapid temperature gradient (thermocline) or density variation (pycnocline) can form an acoustically reflective layer between the zero mark and true bottom. Further, dense biological material (plankton) may have the same effect. While the user may, in many cases, easily recognize these layers (as represented on the paper chart), automatic digital depth tracking, display and output may be effected. In such cases, a blanking feature (manual gate feature on the Bathy-500DF) is required for robust, reliable unattended surveying.

1.3 SPECIFICATIONS

Depth Ranges:	Units of 0-15, 0-30, 0-60, 0-120, 0-240, 0-480, 0-960, 0-1920 Feet or 0-5, 0-10, 0-20, 0-40, 0-80, 0-160, 0-320, 0-640 Meters
Phasing:	0-120, 60-180, 120-240, 180-300, 240-360, 300-420, 360-480 through 1800-1920 Feet, Auto or 0-40, 20-60, 40-80, 60-100, 80-120, 100-140, 120-160 through 600-640 Meters, Auto
Chart Record:	8.5 inch X 90 Feet (21.59cm x 27.43mt) High-Contrast Thermal Paper
Digital Display:	LCD (4 lines X 16 characters) 0.25 inch (6.35mm) characters (Depth Display 0.75 inch (19.05mm) characters) (Backlighting: Electro-luminescent)
Resolution:	0.01 units for depths less than 100 meters; 0.1 for depths greater than 100 meters; 0.1 feet on all ranges
Accuracy:	+ / - 0.5%
Depth alarms:	Shallow & Deep (selected by keypad)
Speed of Sound:	4600 - 5250 feet/second (1401 - 1600 meters/second) (user selected via keypad or default to 4800 feet/second)
Offset:	0 to +30 feet or 0 to +10 meters (allows the user, via keypad, to adjust for net sum of transducer depth and tide)
Geographic Position:	NMEA-0183 Format GGA or GLL Format from GPS/DGPS
Data I/O Compatibility:	COM 1 provides bi-directional interface to PC or other peripheral device; This port accepts external annotation from external sources such as hydrographic software. This port also allows remote control of all echo sounder functions using SyQwest Inc.'s Windows 95/98/NT based software.
Data Output:	COM 2 accepts GPS/DGPS inputs and provides additional (from COM1) data outputs. A) NMEA-0183 Format (GGA or GLL) B) RS-232/422 Data Output to the following formats: - ODEC PMC dt (true depth & status) - ODEC dpt (proprietary format; time & position [when available], true depth) - Atlas DESO 25 - ODOM Digitrace - ODOM Echotrac - NMEA dbt - NMEA dbs
Acoustic Output:	Single and Dual (interleaved) frequencies (user selectable & changeable via keypad) from these: 33kHz,40kHz,50kHz,200kHz, 210kHz, 33/210Khz, 50/210kHz (@600watts maximum)
Input Power:	11-30 volts D.C. (1.5 amps @ 12 v. 0.5 amp @ 30 v.) or 115/230 volts A.C. 50/60 hertz (20 watts)
Dimensions (Recorder):	Height (including handle) 19 inches (48.26cm) Width 17.5 inches (44.45 cm) Depth 9 inches (22.86 cm)
Weight:	36 lbs.(15.87 kg) (plus transducer)

2.0 INSTALLATION

2.1 OVERVIEW

Presented in this section are Bathy-500DF physical and electrical details needed to utilize the product in either portable or fixed (installed aboard a vessel) mode. The equipment group shown below must be supplemented with an optional SYQWEST transducer as listed in Section 2.4 or a SYQWEST approved equal.

2.2 EQUIPMENT SUPPLIED

SYQWEST Part Number	Description	Qty.
P01800	Bathy-500DF Dual Frequency Unit	1
P01182	D.C. Power Cable	1
P01183	A.C. Power Cable	1
P01044	Data I/O Plug Kit	1
P01184	D.C. Fuse (spare) 5 amp, 250 V., 3AG	3
P01185	A.C. Fuse (spare) 0.5 amp, 250v.	3
P01200	Chart Paper Roll Kit (with take up roll)	2
P01818	Manual, Operators Bathy-500DF	1

(See Section 2.4 for optional transducers)

2.3 ACCESSORIES & OPTIONS

SYQWEST Part Number	Description
P01799	Integral DGPS Option
P01170	Handheld Remote Fix Mark Switch (with cable)

2.4 TRANSDUCERS (DIMENSIONS & MOUNTING)

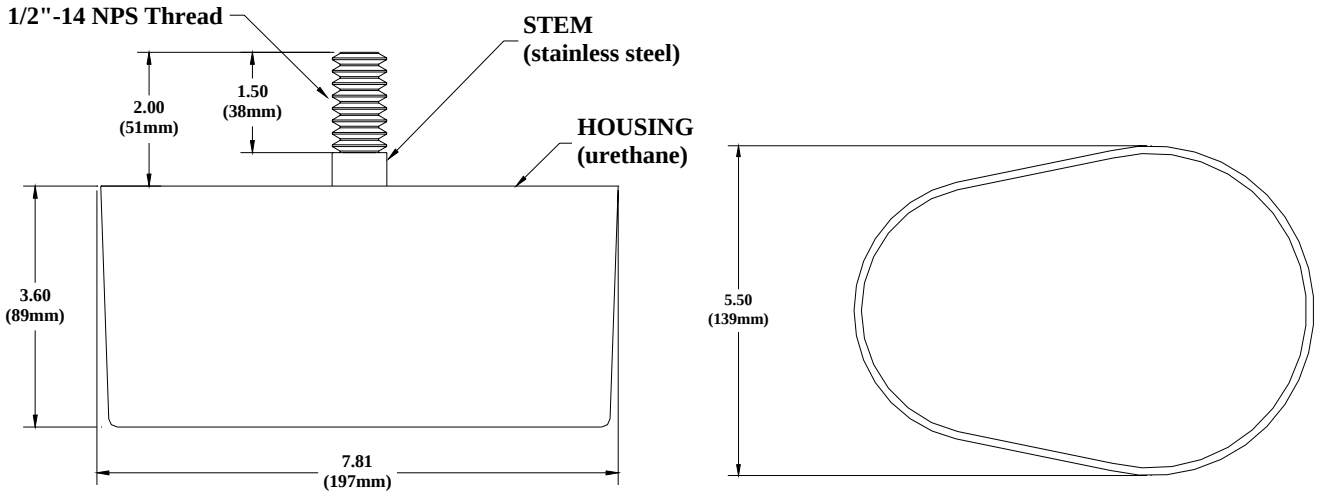
(Transducer drawings and specifications are for reference only and are subject to change; please contact SYQWEST for current transducer information.) For installation suggestions, please visit our website http://www.oceandata.com/

2.4.1 P/N P01740 TRANSDUCER 33/210Khz

Resonant Frequency:	33/210 KHz.
Nominal Impedance:	60/60 ohms
Beamwidth (@ 3 dB point):	33khz 23 degrees 210khz 8 degrees
Cable:	30 feet C44 (with plug to mate with recorder)
Housing Material:	Urethane with Stainless Steel Stem, ½-14NPS Thread
Weight:	11 lbs (5 kg)

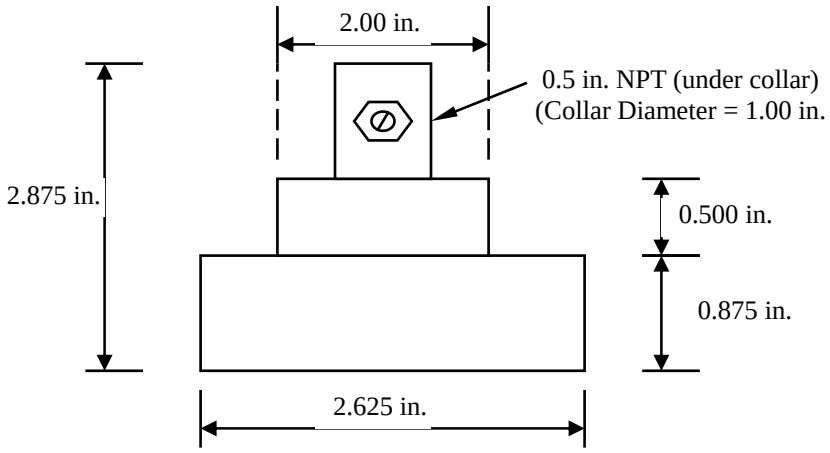
2.4.2 P/N P01745 TRANSDUCER 50/210Khz

Resonant Frequency:	50/210 KHz.
Nominal Impedance:	60/60 ohms
Beamwidth (@ 3 dB point):	50khz 210khz
Cable:	30 feet C44 (with plug to mate with recorder)
Housing Material:	Urethane with Stainless Steel Stem, ½-14NPS Thread
Weight:	11 lbs (5 kg)

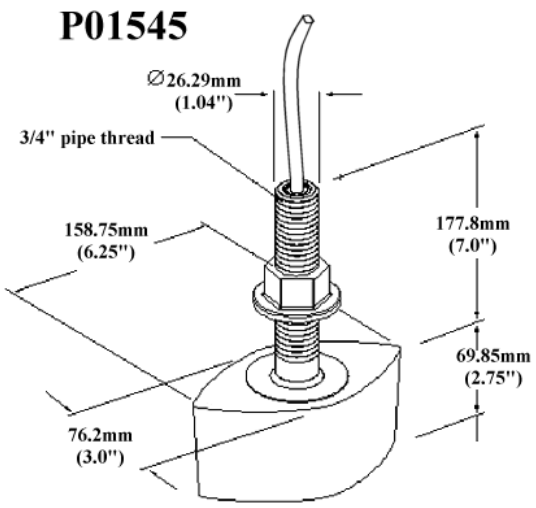


2.4.3 P/N P01540 TRANSDUCER 210Khz 8 deg

Resonant Frequency:	200 KHz. (nominal)
Nominal Impedance:	50 ohms
Beamwidth (@ 3 dB point):	8 degrees
Cable:	30 feet (with plug to mate with recorder)
Housing Material:	Stainless Steel: (or may be brass) (with urethane acoustic window)
Piezo Material:	Barium Titanate



2.4.4 P/N P01545 TRANSDUCER 40Khz 36 deg



Resonant Frequency: 40 KHz.

Nominal Impedance: 150 ohms

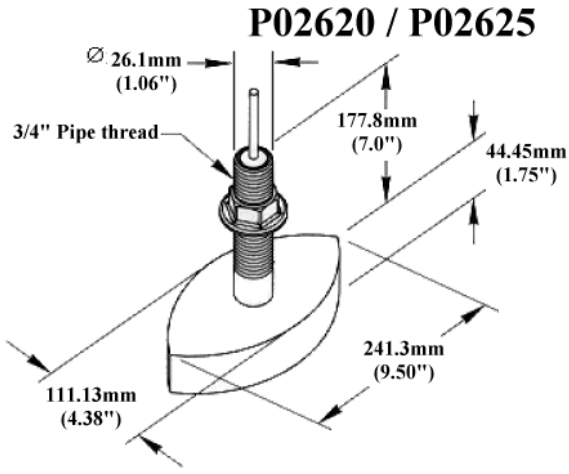
Beamwidth (@ 3 dB point): 36 degrees

Cable: 30 feet (with plug to mate with recorder)

Housing Material: Brass (with urethane acoustic window)

Piezo Material: Barium Titanate

2.4.5 P/N P02620 TRANSDUCER 50Khz 18 deg



Resonant Frequency: 50 KHz.

Nominal Impedance: 150 ohms

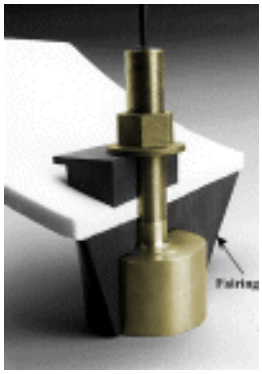
Beamwidth (@ 3 dB point): 18 degrees

Cable: 30 feet (with plug to mate with recorder)

Housing Material: Brass (with urethane acoustic window)

Piezo Material: Barium Titanate

2.4.6 P/N P02565 TRANSDUCER 200Khz 6 deg



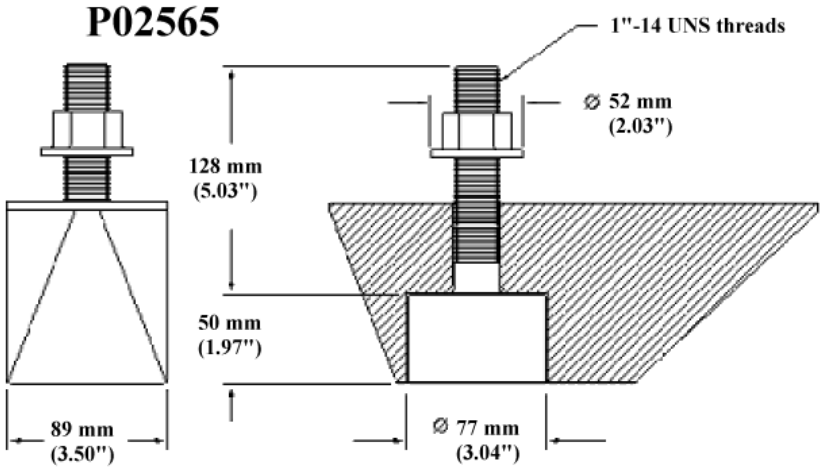
Resonant Frequency: 200 KHz

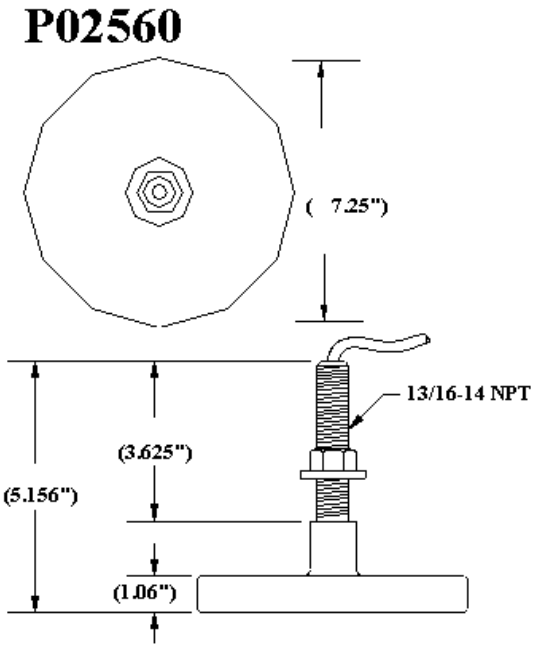
Nominal Impedance: 100 ohms

Beamwidth (@ 3 dB point): 6 degree

Cable: 30 feet (with plug to mate with recorder)

Housing Material: Brass (with urethane acoustic window)





2.4.7 P/N P02560 TRANSDUCER 210Khz 3 deg

Resonant Frequency: 200 KHz (nominal)

Nominal Impedance: 60 ohms

Beamwidth (@ 3 dB point): 3 degree

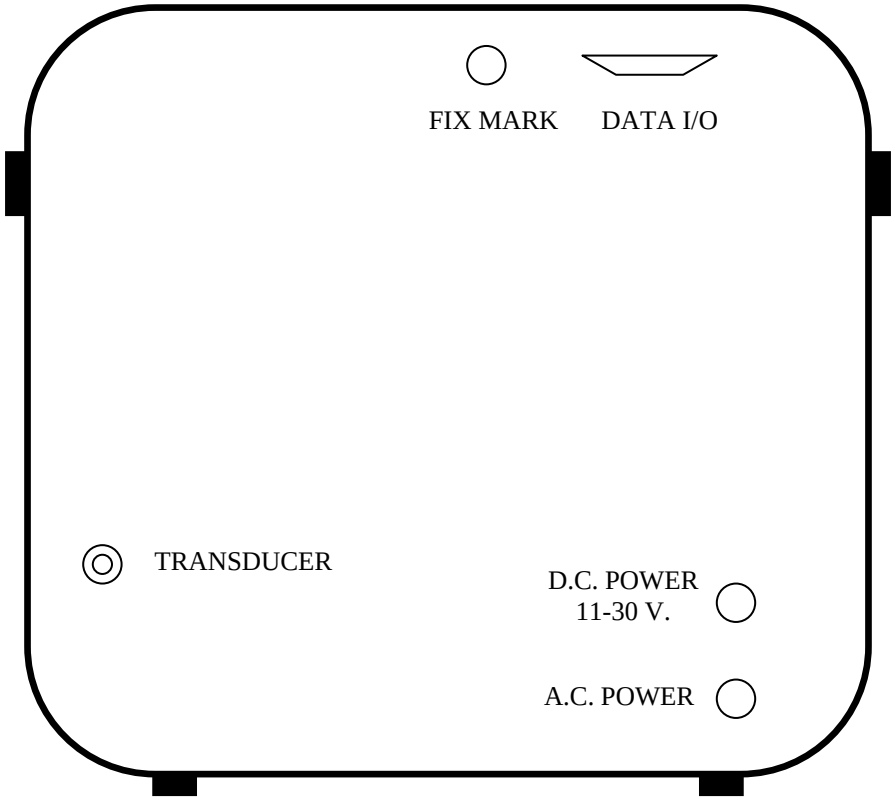
Cable: 30 feet (with plug to mate with recorder)

Housing Material: Brass (with urethane acoustic window)

Piezo Material: Barium Titanate

2.5 Basic Connections

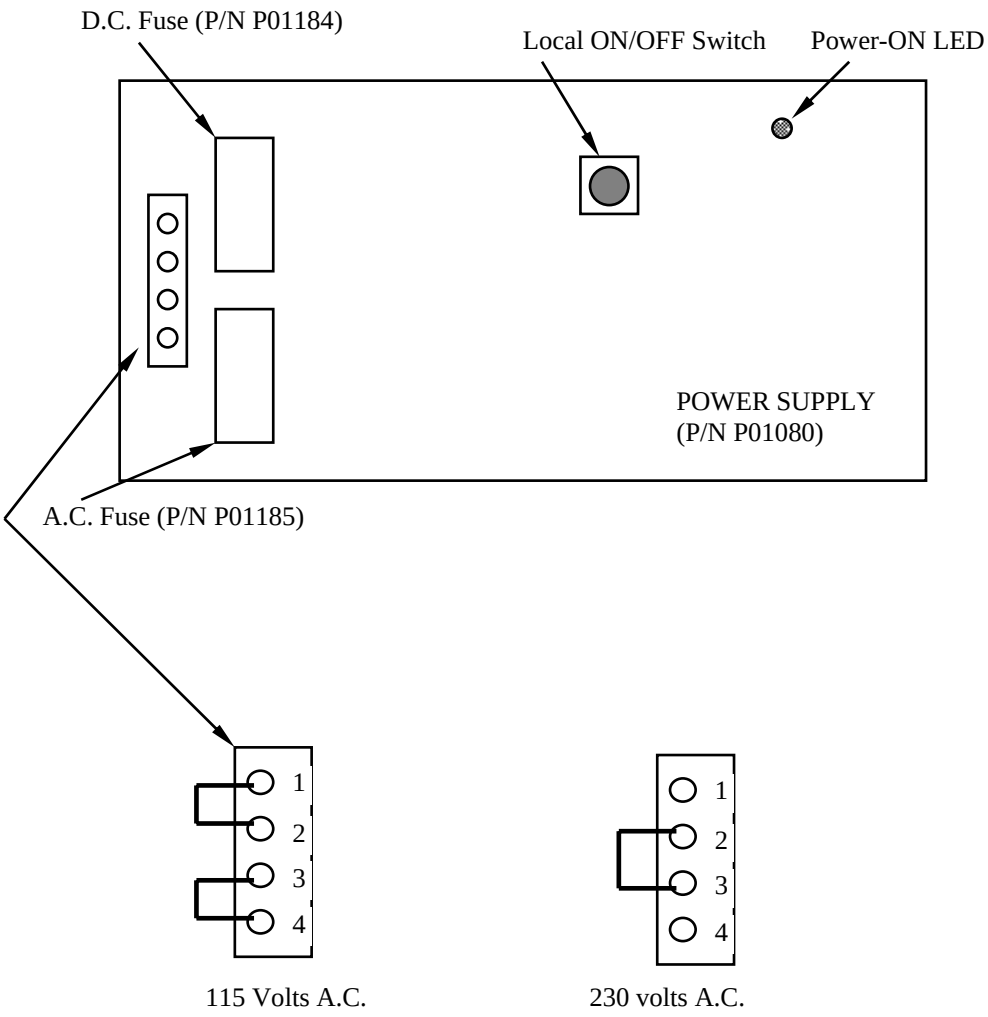
All electrical connections to the Bathy-500DF are via quick-disconnect plugs, which attach to the rear of the center plate of the unit as shown below. Plugs are factory installed thus the user need not be concerned with details of the connector pin-outs unless field repair of cables or plugs is required; To aid in such cases, pin-out data is given in the following sections Information related to using the Data I/O connector port is given in section 2.6.



2.5.1 A.C. Power Input and Voltage Selection)

Before applying A.C. power to the unit, the user must insure that the Bathy-500DF recorder has been properly configured with regard to A.C. voltage (115 or 230). Jumpers on the left side of the P/N P01080 Power Supply PCB must be reconfigured as shown below. *For safety reasons the A.C. Power cable must not be placed into the center plate connector when jumpers are removed or installed. At all* times that *the protective plastic cover is removed from the unit the power cable should be unplugged*.

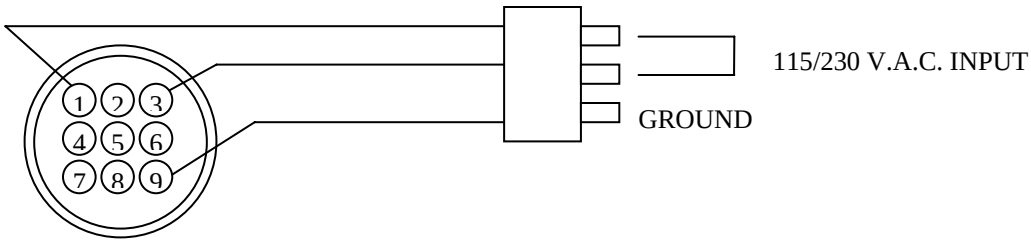
NOTE: Unless otherwise noted, Bathy-500DF units are shipped from the factory configured for 115 volts A.C.



JUMPER FORMAT FOR A.C. VOLTAGES

Shown above, in addition to voltage setting information is the local ON/OFF switch and power ON LED. Details on these items are described in Section 4.0 (Maintenance).

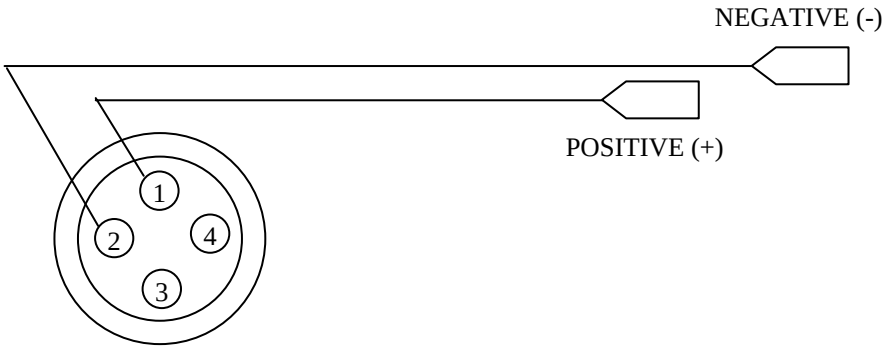
Should it become necessary to add additional cable or to repair the P/N P01183 A.C. Power Cable, the user should refer to the plug diagram below.



VIEW SHOWN IS PLUG FROM REAR (WIRE SIDE)

2.5.2 D.C. Power Input

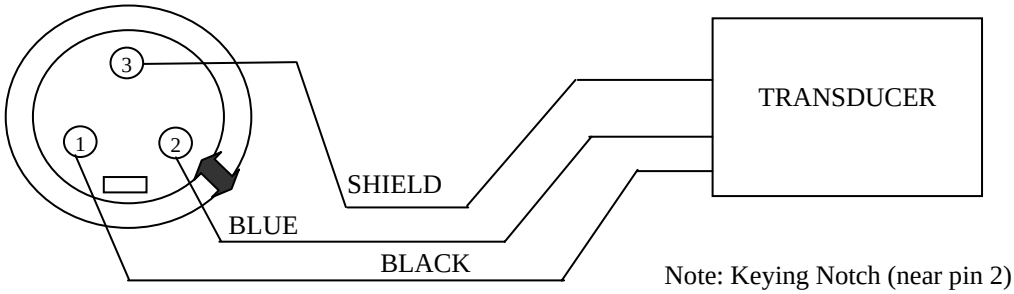
If the user desires to operate the Bathy-500DF from a D.C. source, any battery supply in the range of 11 to 30 volts may be used. No selection of the input voltage is necessary as the power supply or the unit will regulate automatically over the stated voltage range. The user need only connect the P/N P01182 D.C. Power Cable. Color-coded battery clips (red = positive +) are factory installed on this cable assembly. If cable replacement is required refer to the diagram below.



VIEW SHOWN IS PLUG FROM REAR (WIRE SIDE)

2.5.3 Transducer Plug

The transducer plug for the Bathy-500DF, as pre-wired from the factory, is shown below.



Note: Keying Notch (near pin 2)

VIEW SHOWN IS PLUG FROM REAR (WIRE SIDE)

2.5.4 Fix Mark (remote)

N.O. (Close to mark chart)

VIEW SHOWN IS PLUG FROM REAR (WIRE SIDE)

2.6 DATA I/O INTERFACING

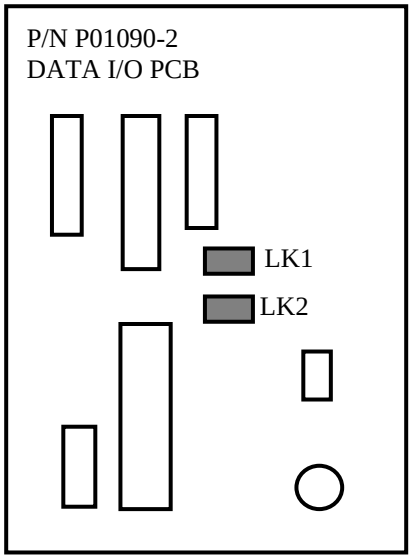
Data input (geographic position or external annotation) and parameter outputs interface thru the Data I/O connector on the rear of the center plate. For this purpose, the P/N P01044 Data I/O Plug Kit is supplied as part of the basic equipment delivery. The following sub-sections provide the systems integrator with all data required to utilize the Bathy-500DF as an integral building block of this hydrographic survey system.

2.6.1 Connector Pin-out & Data I/O Set-up

The Data I/O port is accessed using an industry standard DB-25 plug which is provided as part of the basic Bathy-500DF delivery. Pin designations are shown below.
See Serial Interface Wiring Diagrams on page 2-16 for connection examples.

PIN NUMBER	FUNCTION
1	Chassis Ground
2	RS-232 TXD
3	RS-222 RXD
4	RS-232 RTS
5	RS-232 CTS
6	RS-232 DSR
7	Signal Ground
8	(unused)
9	RS-422 TXD +
10	RS-422 TXD -
11	RS-422 RXD+
12	RS-422 RXD
13	RS-422 RTS+
14	RS-422 RTS
15	RS-422 CTS+
16	RS-422 CTS
17	RS-422 DSR+
18	RS-422 DSR-
19	(unused)
20	RS-232 DTR
21	(unused)
22	(unused)
23	RS-422 DTR+
24	RS-422 DTR-
25	(unused)

Shown on the following page is an outline of the P/N P01090-2 Data I/O PCB. Jumper locations are shown for LK1 and LK2. If the user desires RS-232 output format, place a jumper block on LK-1. If RS-422 is desired, place the jumper block on LK-2 ***Note: Bathy-500DF units are shipped from the factory preset for RS-232. (Only one jumper block is to be*** installed ***at any time).***



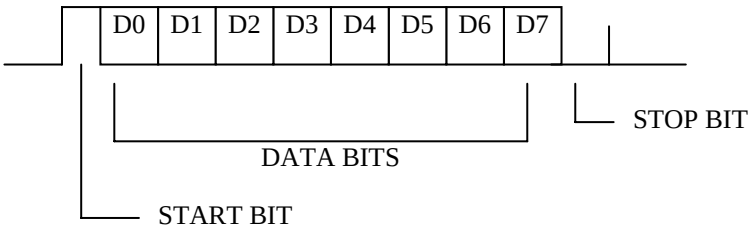
RS-232/422 JUMPER LOCATIONS

2.6.2 Data Input

2.6.2.1 GPS Input

Your Bathy-500DF will accept NMEA 0183 input sentences containing GPS position in either GGA or GLL format. The unit auto detects when GGA is present in a sentence and accepts such as its first choice of position. Both Input position and unit time/date can be annotated on the chart record. The unit will accept input data in either RS-232 or RS-422 input formats as denoted in 2.6.1

The standard NMEA 0183 data transmission format is as follows; Data is transmitted in serial asynchronous form in accordance with ANSI standards. The first bit is a start bit and is followed by data bits, least-significant-bit first as illustrated below. The following parameters are used: Baud rate = 4800/9600, Data bits = 8 (d7 = 0), Parity = None, Stop bits = One.



2.6.2.2 External Annotation Input

In lieu of GPS position, your Bathy-500DF will accept external annotation from various PC-based hydrographic software; Up to forty-four characters (Alphanumeric-uppercase) may be printed vertically. Serial input is made to the same hardware pins as is used for GPS input; See 2.6.1.

To start an annotation string, "CONTROL F" then "CONTROL A" is inputted; This is followed by up to forty-four characters, then "CONTROL D" to end the string. Simply put, the sequence is shown below.

(CNTRL F) (CNTRL A) (ANNOTATION) (CNTRL D)

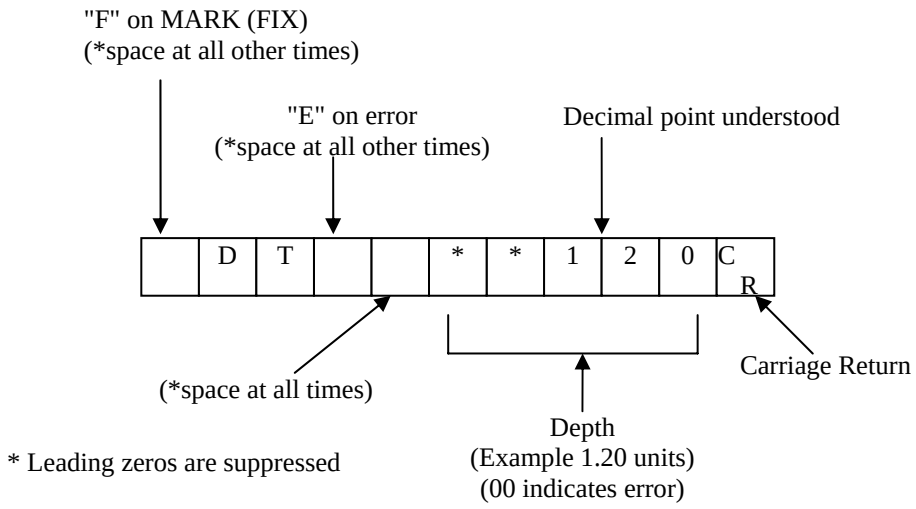
Should the user not desire vertical annotation but instead desire a vertical fix mark line, only a (CNTRL F) need be sent from the PC.

2.6.3 Data Outputs

Section 2.6.3 lists the various data output formats available from the Data I/O at the Bathy-500DF. This section provides more detailed, information for each format (sentence) to allow the user to interface with external peripheral devices Hardware pin-out connections are listed in 2.6.1.

2.6.3.1 ODOM dt Format

Your Bathy-500DF emulates the digital depth output of the ODOM Digitrace depth digitizer unit. To receive ODOM dt format data, the user will connect his external receiving device to PIN 2 *(RS-232* signal output) and PIN 7 (signal ground) on the Data I/O connector (DB-25 connector). The ODOM standard output data string contains 11 characters as shown below; No parity is used and the sentence has 8 data bits and 1 stop bit.



Byte 1:

An ASCII "F" (hex 46) appears as the first byte in the string whenever the operator depresses the recorder MARK key. The depth value in the output string reflects the depth at the point which the key is pressed. At all other times the ASCII "space" (hex 20) appears at this location.

Byte 2 & 3:

Characters 2 and 3 contain the unit identifiers. These are set to "D" and "T" (hex 44, 54).

Byte 4:
Position 4 is reserved as an error indicator in the form of an ASCII "E" (hex 45) and coincides with all zeros in the depth field. An ASCII "space" is present at all other times.

Byte 5:
This location will always contain the ASCII "space".

Byte 6 thru 10
True depth is given in these five positions with the decimal point understood to be fixed between bytes 8 and 9. Leading zero suppression is applied to the first two digits of depth. For example, for a depth of 8.5 feet, the five digits would appear as: space/space/8/5/0.

Depth in the output sentence will be corrected for Offset and Speed of Sound. In the event of an error due to loss of bottom tracking two zeros will appear in the depth field and the "E" character will occur in byte 4.

Byte 11:
A carriage return <CR> delimiter (hex 0D) is always placed at the end at the string.

2.6.3.2 ODOM et Format

This output emulates the ODOM Echotrac output sentence as shown in the example below:

Single Frequency Operation	**Dual Frequency Operation**
_E T_ _ x x x x x <CR>	_E T_ f_ x x x x x <CR>

During normal operation the "space" in front of the "E" will be blank; When a Fix Mark is initiated, this space will contain the character "F". During proper equipment operation, the character immediately after the "T" is blank also. Should the bottom be lost in Single Frequency mode, an error condition is indicated by the character "E" being placed in this space. In Dual Frequency mode, this error condition will be displayed as an “E” indicating a High frequency error, or an “O” indicating a Low frequency error. In addition, the Dual Frequency output string has an extra character, represented in the above example by an **f**. This character indicates which frequency return the depth value applies to. “H” indicates a High frequency depth, and “L” indicates a Low frequency depth.

Output in "FEET" units is denoted as "ET" while output in "METERS" is denoted as "et".

The example above would indicate four digits in front of the decimal point and thus one digit after due to the uppercase “ET” representing English mode (i.e. "12345" equals 1234.5 feet). If in Metric mode, there would be two places after the decimal, thus "12345" would equal 123.45 meters. Note that zeroes are suppressed.

2.6.3.3 PMC dt Format

The structure for this industry standard output is shown below.

Single Frequency Operation	**Dual Frequency Operation**	
_D T_ _ x x x x . x _FT <CR><LF>	_D T_f _ x x x x . x _FT <CR><LF>	(English mode)
_D T_ _ x x x . x x _MT <CR><LF>	_D T_f _ x x x . x x _MT <CR><LF>	(Metric mode)

During normal operation the "space" in front of the "D" will be blank; An "E" in this space indicates an error such as lost bottom while an "F" indicates a Fix Mark. The second character after the “T”, represented above by an **f**, indicates which frequency return the depth value applies to. “H” indicates a High frequency depth, and “L” indicates a Low frequency depth.

2.6.3.4 NMEA dbt

Data output will be NMEA 0183 depth below transducer sentence format as shown below.

$ S D D B T , x x x x . x , f , x x x . x x, M , x x x . x , F <CR><LF>

Where x x x x . x = feet (f) x x x . x x = meters (M) x x x . x = fathoms (F)

2.6.3.5 NMEA dbs Format

Data Output will be NMEA 0183 depth below surface sentence format as shown below.

$ S D D B S , x x x x . x , f , x x x . x x , M , x x x . x , F <CR><LF>

Where x x x x . x = feet (f) x x x . x x = meters (M) x x x . x = fathoms (F)

2.6.3.6 DESO-25 Format

This data output emulates the output sentence of the Atlas DESO-25.

D A x x x x x . x x Ft * (English mode)

D A x x x x x . x x _m * (Metric mode)

Note that an asterisk is always used as a terminator at the end of the sentence. Also note that in the Metric mode, a blank space will always appear in front of the "m" character. In addition, the character after the leading “D”, which in the example above is an “A”, represents which frequency the digital depth value applies to. “A” for High Frequency and “B” for Low Frequency.

2.6.3.7 ODEC dpt Format

This data output string is ODEC’s comma delimited proprietary format containing Time and Position (from a GPS device), true depth, and depth status. This format is depicted below:

$ S D O D C , h h : m m : s s , a y y . y y . y y y y , o x x . x x . x x x x , f , x x x x . x , u , v <CR><LF>

Where h h = UTC Hours m m = UTC Minutes s s = UTC Seconds

a = N / S Latitude y y . y y . y y y y = Latitude Degrees, Minutes, Decimal Minutes

o = W / E Longitude x x . x x . x x x x = Longitude Degrees, Minutes, Decimal Minutes

f = Depth Frequency (A = Low Frequency or Only Frequency, B = High Frequency)

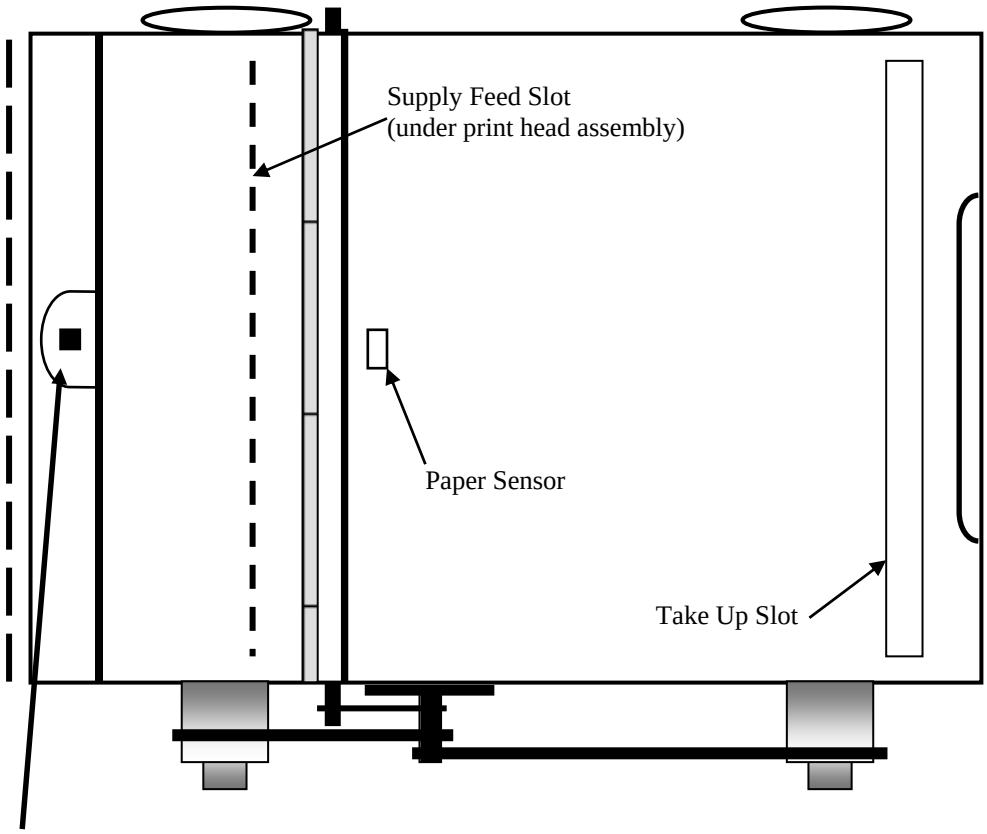
x x x x . x = True Depth u = Units (M = Meters, f = Feet) v = Depth Status (A = Valid, V = Invalid)

2.7 CHART PAPER INSTALLATION

With your Bathy-500DF, two P/N P01200 Chart Paper Roll Kits are supplied. Additional kits are available from SyQwest Incorporated. *Do not use other paper types in your Bathy-500DF. Attempted use of other media will result in improper contrast shading and potential damage to the thin-film printhead. Do not attempt to substitute paper take up rolls as the roll furnished with the kit is designed (size and tolerance) to precisely fit the paper shaft.* ***Use of any paper kit other than that type specified herein will void the thin-film thermal printhead warranty***.

Before beginning installation of a new paper roll, perform the following:

1) Remove the empty supply roll liner and full take up roll.
2) Clean debris from both paper shafts (under no circumstances add lubricants to shafts).
3) Place your print head lift arm in the UP position (as shown in the diagram below).
4) Use a dry cloth to clean any debris from the surface of the paper sensor (see below).

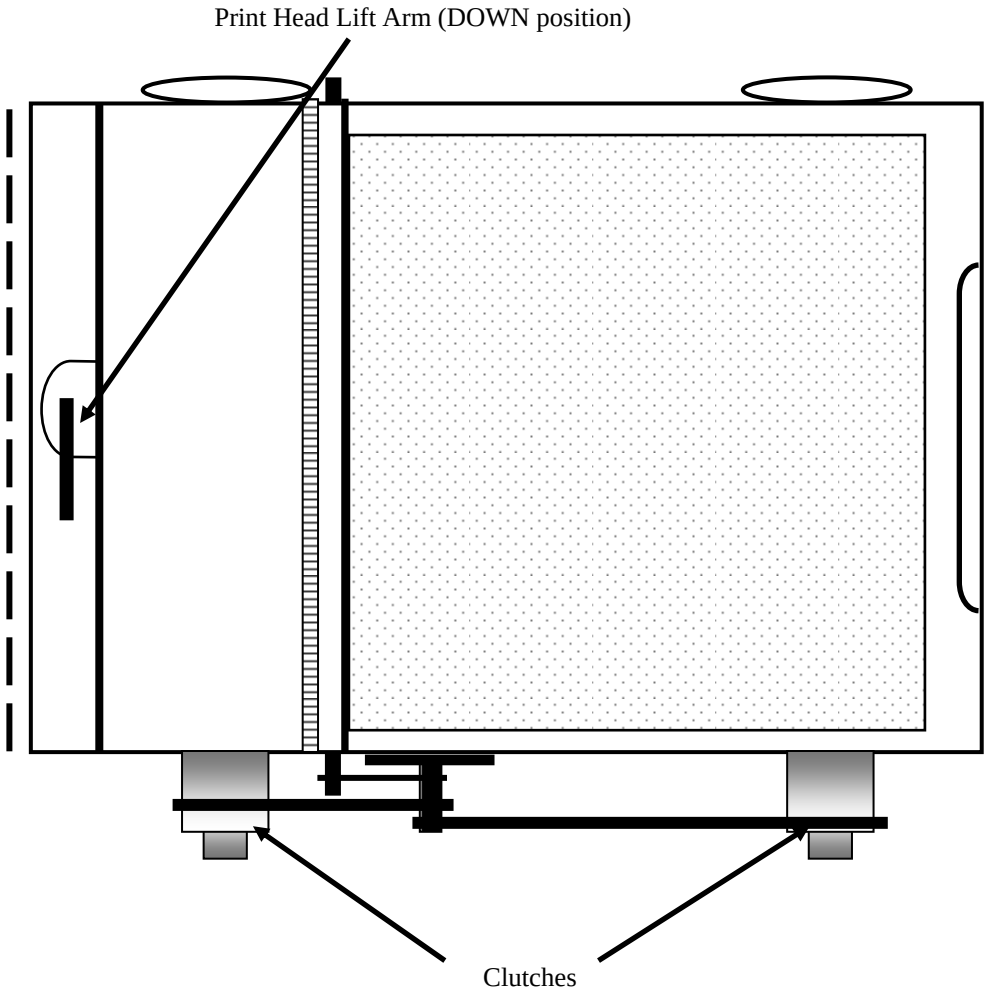


Print Head Lift Arm (UP position)

(continuing the paper installation process)

5) Install the new paper take up roll onto the take up paper shaft as shown below.
6) Install the new supply roll onto the supply paper shaft and feed the leading edge of the paper over the printhead roller, under the printhead assembly, across the chart module and down to the return slot and to the take up roll.
7) Use the take up clutch spool to adequate paper (for holding) onto the take up roll and to pull the paper taut across the chart module face.
8) Return the printhead lift arm to the down (closed) position (shown below).
Insure that the paper is aligned with the platen bottom

***SPECIAL NOTES*:**



Your Bathy-500DF contains an optical sensor (located in the platen just in front of the print-head) to halt printing should the paper supply become exhausted or if the paper is incorrectly aligned (buckled); Should the unit stop printing, power down, correct the problem then reapply power. Your Bathy-500DF will not power-up without proper paper supply alignment. Your Bathy-500DF also contains as automatic shutdown in the event of over-temperature; the unit will again function normally upon return to normal operating temperature range and reapplication of power.

Refer to Section 4.4.1 for the proper procedure to clean the printhead.

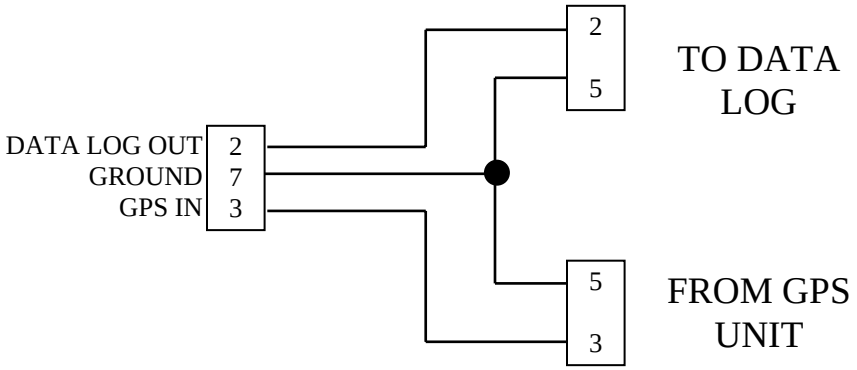


Figure 2-1 RS-232 CONNECTION DB25 TO DE9 PIN

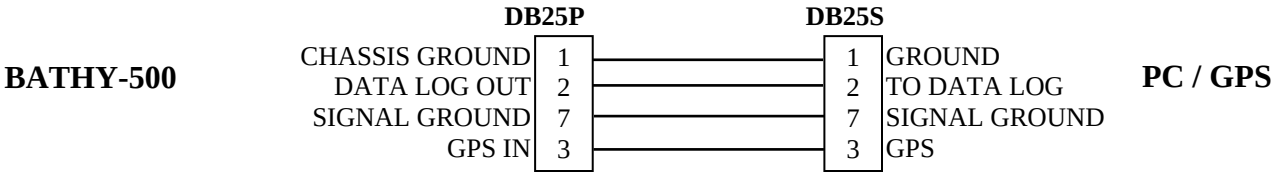


Figure 2-2 RS-232 CONNECTION DB25 TO DB25 PIN

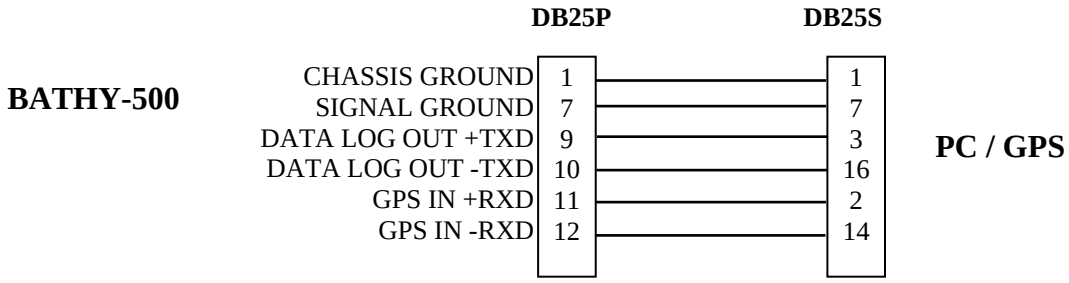
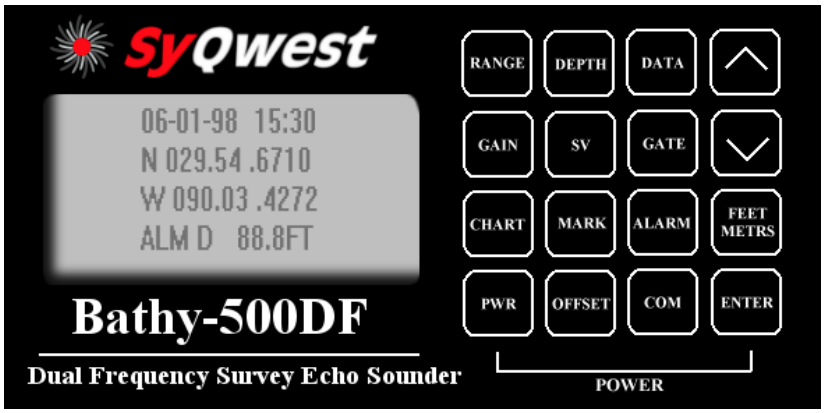


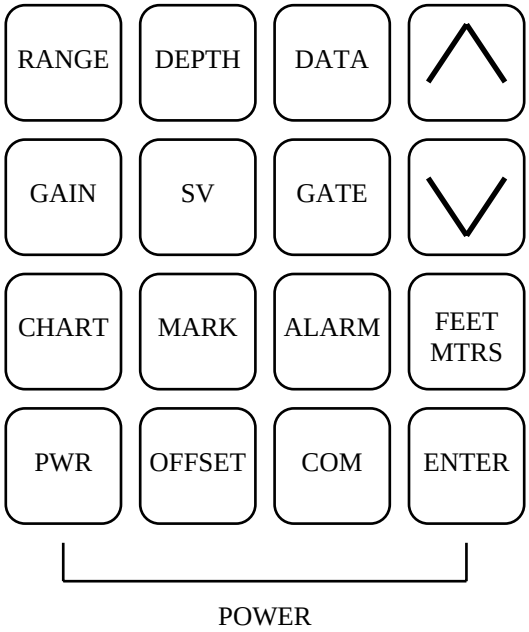
Figure 2-3 RS-422 CONNECTION DB25 TO DB25 PIN

3.0 OPERATION

3.1 THE KEYPAD

Your Bathy-500DF is entirely controlled using the 16 keys which comprise the keypad as shown below.





3.2 ON/OFF

Depressing the PWR and ENTER keys at the same time will turn on your Bathy-500DF: The same procedure is used to turn off the unit

Note: Upon powering-down your Bathy-500DF, allow at least five seconds to elapse before powering-up the unit again; This allows time for orderly resetting of the system processors.

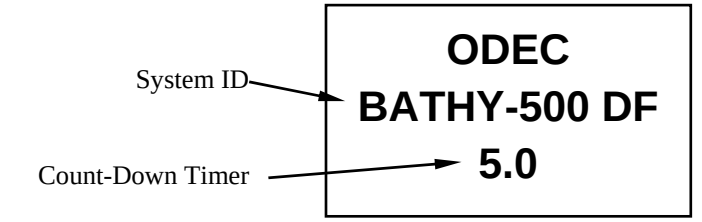
3.3 KEY FUNCTIONS

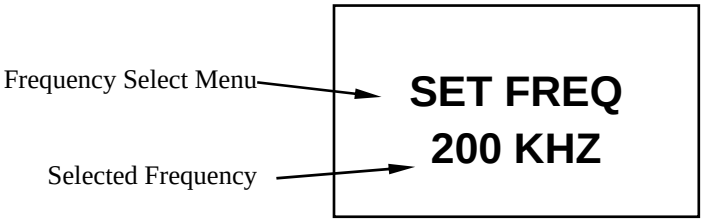
The following sections denote the detailed function of each key and show the associated display pages for each. No separate descriptive sections are *given* for the ON, ENTER or INCREMENT (up arrow) and DECREMENT (down arrow) keys; Their Functions are denoted in other sections.

3.3.1 Frequency Selection

Upon powering up your Bathy-500DF, the LCD display will initially show the self-test page (See APPENDIX B); Once this sequence is completed, the below shown page will appear for five seconds. A digital timer (line 3 of the below first page contains the timer status) counts down from 5.0 seconds to 0.0 seconds at which time the "DATA" (status) page is displayed. If, however, during the five second count-down, the "COM" key is depressed, the "SET FREQ" menu will appear.

The second example below indicates that your Bathy-500DF has been user programmed for 200Khz single frequency operation. If you desire this frequency, simply depress "ENTER". If not, use the "UP" and "DOWN" arrows to toggle between the other available frequencies (i.e. 33, 40, 50, 33/210, 50/210, etc); When the desired frequency is shown, depress "ENTER".

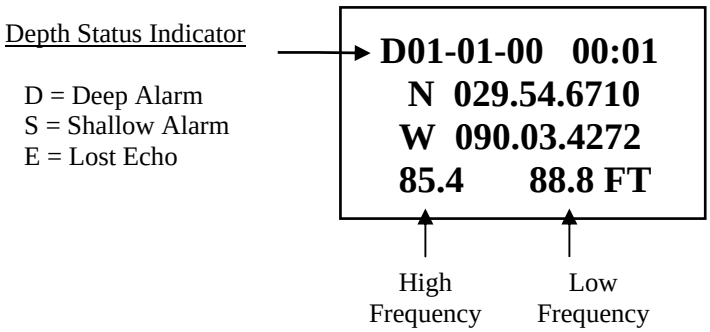




WARNING: BEFORE CHANGING FREQUENCY, INSURE THAT YOU HAVE CHANGED THE TRANSDUCER AND T/R POWER LINKS (I.E. LK1, LK2, and LK3) TO PROPERLY OPERATE WITH THE NEW SELECTED FREQUENCY.

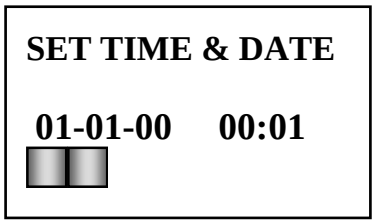
3.3.2 DATA Key

Depressing the DATA key causes the status display page. as shown below, to be displayed.



This display page, denoted status display, provides the user with a summary of the important parameters; Date, Time, Position, (if GPS data is present), Depth Alarm (if active), Low and High Frequency Depth (when in Dual Frequency Mode).

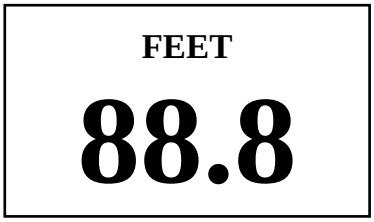
Depressing the DATA key a second Time calls up the second page for this key; This page allows the user to set the Time and Date. The second page (to the DATA key) is shown below.

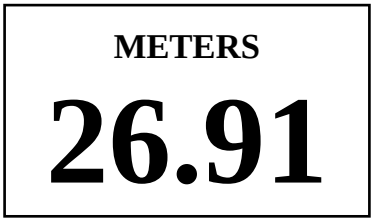


To set the month (if the double cursor is below the month designation), use the INCREMT and DECREMENT keys to change the month. To move from month to day (and then year), depress the DATA key as required; Each time using the INCREMENT and DECREMENT keys to change the value. Time is set in the same manner using the DATA key to move the cursor. To accept all values either depress the ENTER key or wait until the unit reverts to the status display page (this will occur after about ten seconds).

3.3.3 DEPTH Key

Depressing the DEPTH key will call up the large format depth screen page as shown below. This display, while being limited to the depth parameter only, provides for readability at extended distance from the unit. When the unit is in Dual Frequency mode, only one frequency can be shown at a time. To toggle between frequencies, use the DEPTH key. (examples of English and Metric below)



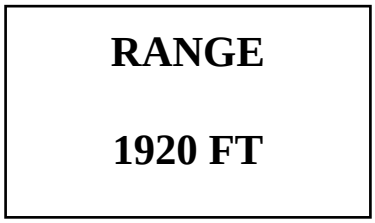


3.3.4 FEET/MTRS Key

Depressing this key toggles the chart presentation, digital display and data output between feet and meters.

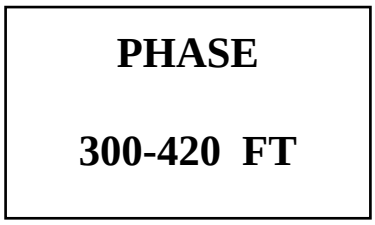
3.3.5 RANGE Key

The user depresses the RANGE key once to view the range to which the unit is presently set. If the user desires to change the range, INCREMENT and DECREMENT keys are used to step thru the available depth ranges. Shown below is the range display for the maximum range (in feet).



To accept new (after changing using the INCREMENT and DECREMENT keys), either depress ENTER or wait until the unit reverts to the previous screen.

Depressing the RANGE key a second time calls up the second menu of this key, which is Phase as shown below.



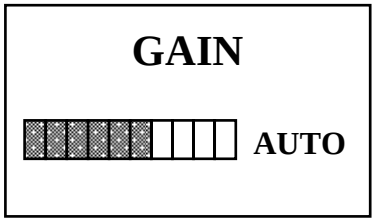
INCREMENT and DECREMENT keys are used to step thru the various phases; Selection of a new phase is either by depressing the ENTER key or waiting for the unit to revert to the previous page. A listing of the available ranges and phases are shown below.

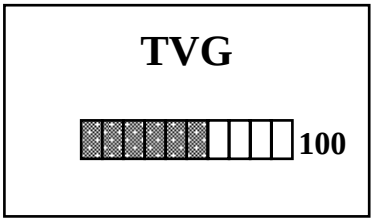
Range Library:		Phase Library:	
0 - 30 FT	0 - 10 METERS	0 - 120 FT	0 - 40 METERS
0 - 60	0 - 20	60 - 180	20 - 80
0 - 120	0 - 40	120 - 240	40 - 80
0 - 240	0 - 80	180 - 300	60 - 100
0 - 480	0 - 160	240 - 360	80 - 120
0 - 960	0 - 320	300 - 420	100 - 140
0 - 1920	0 - 640	360 - 480	120 - 160
		thru	thru
		1800 - 1920	560 - 640
		AUTO	AUTO

For helpful hints when using your Bathy-500DF in extremely shallow water, refer to APPENDIX D- Operation in Extremely Shallow Water Depths

3.3.6 GAIN Key

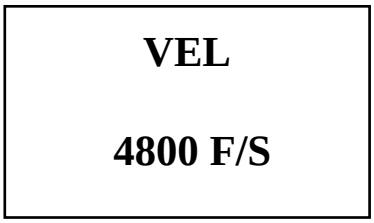
Using the GAIN key, the user will be able to view and modify the Bathy-500DF gain menus, including fixed gain and TVG. In dual frequency mode, the user has access to separate High and Low frequency gain and TVG controls. The user can scroll through each gain setting by depressing the GAIN key. Using the INCREMENT and DECREMENT keys, the user may then change a gain setting as desired and then accept such by depressing the ENTER key. The INCREMENT and DECREMENT keys vary the gain in steps of 6 dB while the display (examples shown below) is in a linear bar-graph form. The numerical value shown to the right of the bar-graph represents the percentage of total gain in use. Incrementing the GAIN setting past one-hundred percent sets the unit into auto gain mode. In dual frequency operation, AUTO gain applies to BOTH frequency settings. This "Auto All" mode can be activated by selecting AUTO in either the High or Low frequency GAIN setting.





3.3.7 SV Key (Speed of Sound)

Depressing the SV key will call up the screen page as shown below. This display announces the currently used sound velocity (speed of sound); Display will be in either feet or meters depending upon which scale has been selected by the FEET/MTRS key.



Once the above page is displayed, the user may change the sound velocity using the INCREMENT and DECREMENT keys; This value may be adjusted from 4600 to 5250 feet per second (1401 to 1600 meters per second). Once the desired value is displayed the user depresses ENTER or waits for the unit to revert to the previously viewed page.

The user may determine the sound velocity applicable to a specific survey using three methods:

A) Obtaining the measured sound velocity value from an external sound velocimeter.

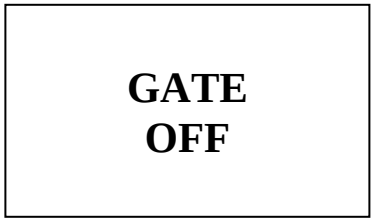
B) Performing a "BAR-CHECK" using the Bathy-500DF. To accomplish such, a plate (bar) is placed at a known depth below the transducer face The user then varies the speed of sound value until that exact depth is displayed on the DEPTH display page (and, of course, the chart). At that point of agreement the entered sound velocity value will be correct for the specific survey area and time. In effect, the Bathy-500DF contains an integral sound velocimeter.

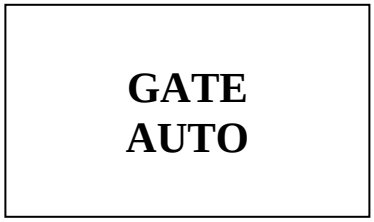
C) By estimating the sound velocity considering the salinity and temperature of the given survey area and time APPENDIX A provides a matrix of speed of sound values for various combinations of salinity and temperature.

Note: When the Bathy-500DF is in Dual Frequency mode, the Sound Velocity setting applies to both frequency depths.

3.3.8 GATE Key

Depressing the GATE key once allows the user to view whether the gate function is disabled (Off), designated to be automatic (Auto) or Manual Screen pages denoting the first two settings are shown below.

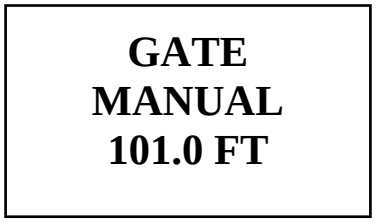




When the gate function is off, the first acoustic return (bottom or other) will be digitized and displayed as depth. In the automatic mode, a self-adaptive gate, based upon real-time mathematical modeling will be established. When the unit is operating in Dual Frequency mode, both acoustic returns have their own individual gate. Auto Gates mode provides the most robust digital bottom tracking. The user toggles between Off, Auto and Manual screens by pressing the GATE key.

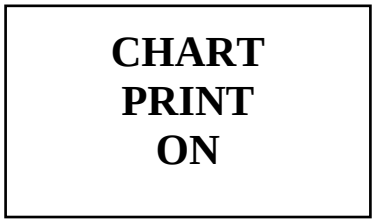
The Manual mode is used when physical or biological conditions cause a "false bottom' in the water column. In such cases, the user may direct the Bathy-500DF to digitize acoustic returns only below that depth.

Once in the Manual mode, the user may change the false bottom blanking depth via the INCREMENT and DECREMENT keys. Depressing ENTER will then accept that value. An example of the Manual mode page is shown below.

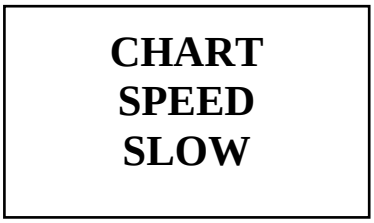


3.3.9 CHART Key

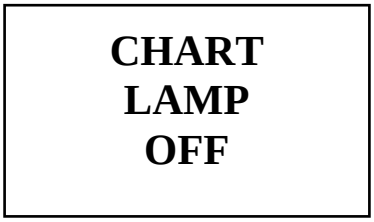
Depressing CHART key once win call up the first page of the chart key screens; This page, as shown below, denotes whether the Chart recorder (printing) is enabled or disabled. The user turns the chart printing on or off using the INCREMENT or DECREMENT keys.



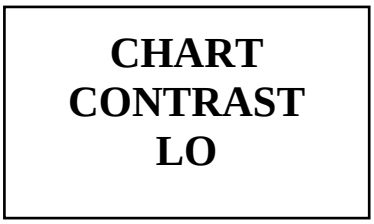
Depressing the CHART key twice moves to the second screen page of the chart key which denotes whether the chart speed is set to slow or fast. INCREMENT and DECREMENT keys toggle between these two speeds. The screen for slow speed is shown below.



Depressing the CHART key again moves the display to the third screen as shown below; The user can toggle between chart lamp Off, Lo or Hi via the INCREMENT and DECREMENT keys. Lamp status OFF is shown below.

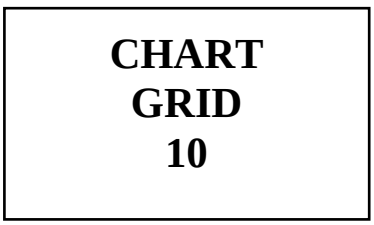


The fourth CHART key page is obtained by again depressing the CHART key. This allows the user to vary the print contrast of the thermal printer. A typical screen page denoting Lo contrast is shown below: Other settings are Med and Hi.



The fifth CHART key page is used to reset the paper gauge (% of paper remaining) when the user replaces the chart paper roll. To reset the gauge, the user depresses the INCREMENT or DECREMENT key to remove "No" from the CHART RESET page and replace such with "YES"; Then the ENTER key is pressed.

The sixth and final CHART key page controls the number of grid lines to be printed on the chart paper. The user can choose between 10, 20, and 40 grid lines which will divide the chart paper in order to make it more readable. The higher the value, the closer the lines will be to each other. The default value of 10 grid lines is shown below.



3.3.10 ALARM Key

Your Bathy-500DF allows the user to set an alarm for both shallow depth and deep depth limits. Upon either alarm condition, the audible alarm will sound and the character **S** or **D** will be shown in the status page *(see* DATA key display).

Note: When the unit is in Dual Frequency mode, the shallow and deep alarms will be triggered by the Low frequency depth only.

The user depresses the ALARM key once to view the first screen associated with this key. OFF is shown (as below), all alarms are disabled. To enable, the user presses the ALARM key again and moves on to set to shallow and deep alarm values as shown in further sections on this page.

ALARM
ON

The user depresses the ALARM key twice to view the previously selected value for shallow depth. As with other parameters, INCREMENT and DECREMENT keys are used to change this value. A typical display for this screen page is shown below.

ALARM
SHALLOW
15.0 FT

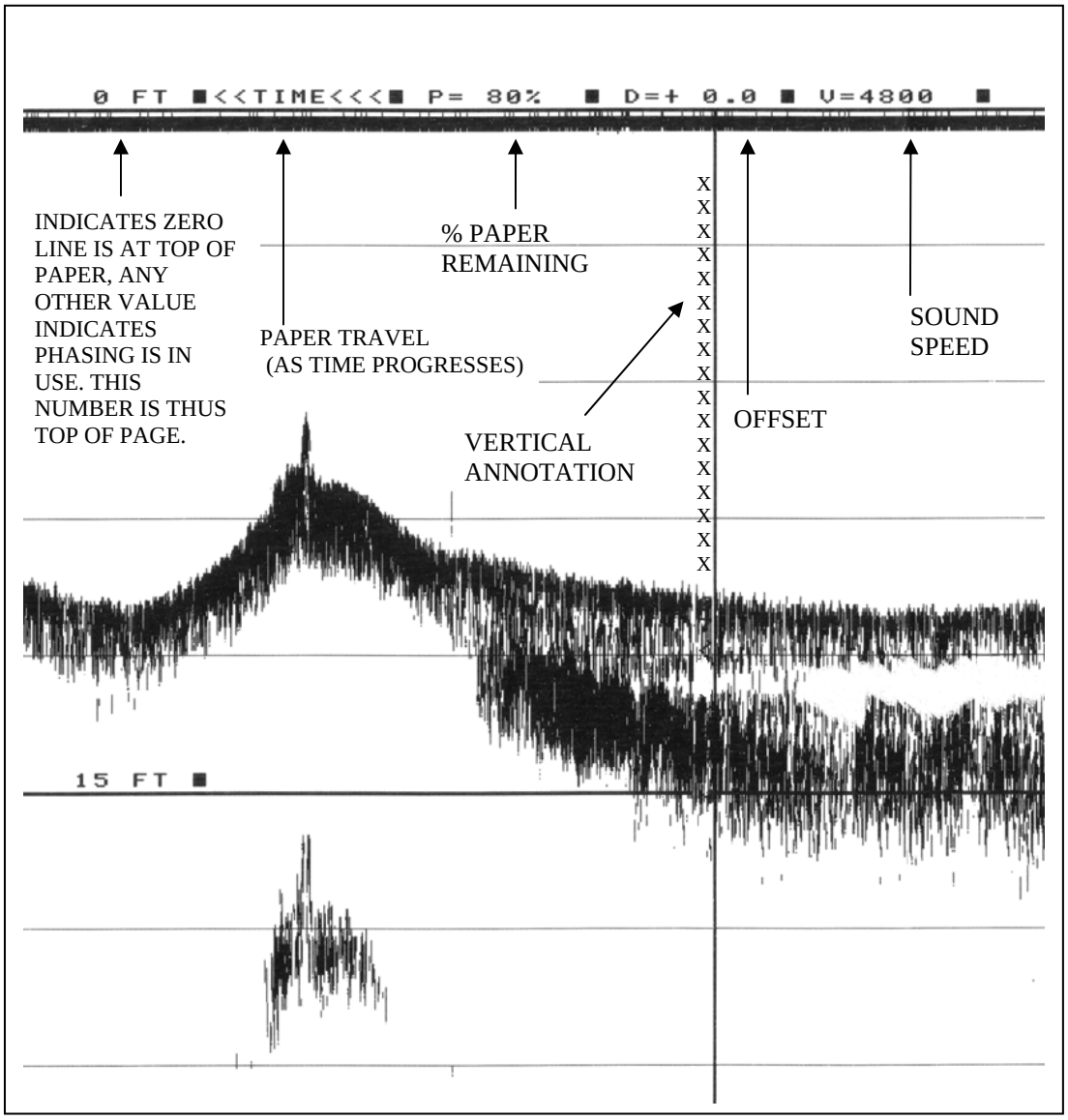
Upon depressing the ALARM key a third time, the deep alarm limit is shown and can be changed in the same manner as the shallow alarm limit. A typical deep alarm page is shown below. Press ENTER to accept all values.

ALARM
DEEP
225.0 FT

3.3.11 MARK Key

Depressing the MARK key causes a vertical fix (event) line to be printed vertically across the chart. Holding this key down for 3 seconds or greater will result in the printing of depth (both High and Low frequency depths in Dual Frequency mode), position and other important parameters along the vertical line. The following page contains a sample chart record with such annotation; This vertical annotation is in addition to other annotation routinely printed on the chart record.

Chart Record Example



Note: In automatic gate mode, the actual bottom is shadowed (reduced line intensity) above and below to indicate the gate position and to verify bottom tracking was not lost.

3.3.12 OFFSET Key

This function allows the user to compensate for vessel draft tide etc or for difference in transducer depth and a historical waterline reference. The Offset value shall be the algebraic sum of all components that the user desires to include into a specific survey. This offset will be applied to both High and Low frequency depths when operating the Bathy-500DF in Dual Frequency mode. A value, from 0 to +30 in tenths of feet may be entered via the INCREMENT and DECREMENT keys and then accepting such by depressing ENTER. Upon the user first depressing the OFFSET key, a screen page of the format shown below will be displayed

OFFSET

12.0 FT

3.3.13 COM Key

Functions associated with the COM key (communications) allow the user to select various format digital outputs. Upon depressing the COM key, one of the below shown data output formats will be displayed; To change format, use the INCREMENT and DECREMENT keys to toggle between the five types shown; Then press ENTER to accept the output format desired. Refer to 2.6 for details about the formats below.

COM FORMAT ODOM et

Data output will be the **ODOM et** (Echotrac) format.

COM FORMAT ODOM dt

Data output will be the **ODOM dt** (Digitrace) format.

COM FORMAT ODEC dpt

Data output will be the **ODEC dpt** format. (ODEC Proprietary string containing time, position, and depth)

COM FORMAT PMC dt	Data output will be the **PMC dt** format
COM FORMAT NMEA dbs	Data output will be **NMEA dbs** (Depth Below Surface) format.
COM FORMAT NMEA dbt	Data output will be **NMEA dbt** (NMEA 0183 Depth Below Transducer) format.
COM FORMAT DESO 25	Data output will be **DESO 25** (Atlas) format.

Depressing the COM key a second time will result in the I/O BAUD menu page as shown below. The user may select either 4800 or 9600 via the INCREMENT and DECREMENT keys and then depressing the ENTER key. (Note that the baud rate of input data, if any, must match the baud rate of the output data selected).

COM
I/O BAUD
9600

THIS PAGE INTENTIONALLY LEFT BLANK

4.0 MAINTENANCE

4.1 GENERAL

Your Bathy-500DF consists of individual functional modules as to provide for highest probability of field repair thus reducing survey downtime. No internal adjustments or calibration of the functional modules are required thus the recorder is serviceable by users without extensive knowledge of electronics or special test equipment. 4.7 provides a listing of all functional modules, hardware items, and cables which may be needed should your recorder ever fail.

4.2 FUNCTIONAL OVERVIEW

Eight printed circuit board assemblies (functional modules), along with the thermal printhead assembly and step motor, comprise the key sections of your Bathy-500DF recorder unit. A general technical overview of each printed circuit board containing active electronics follows:

4.2.1 Power Supply P/N: P01080

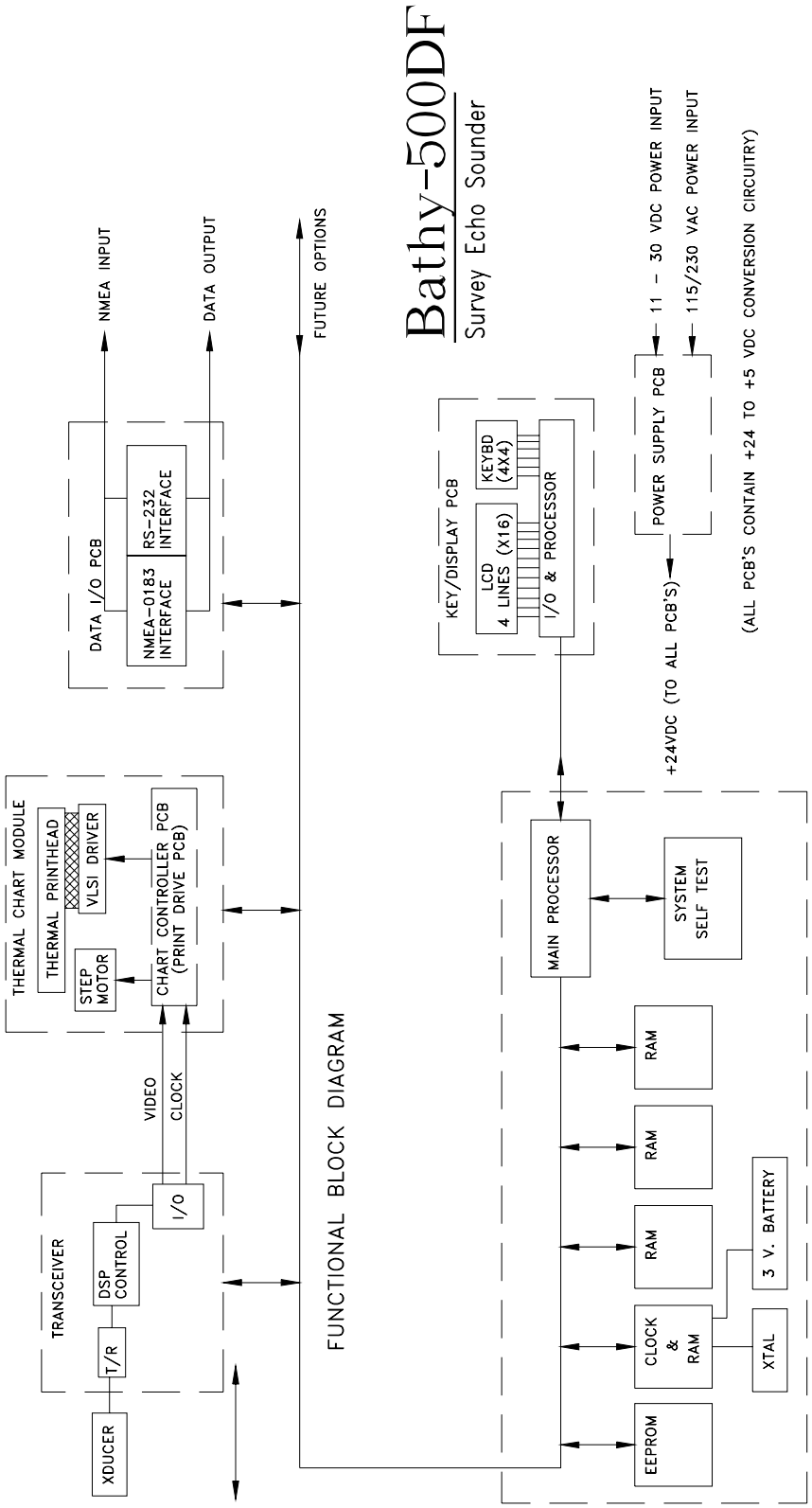
The Bathy-500DF power supply module functions to convert AC line voltage or low-voltage DC, power to regulated 24 volts DC to service all other functional modules. Other voltages (i.e. +5v DC) required by other modules is generated locally on each such assembly. The B.I.T.E. indicator (green LED) located on the power supply PCB verifies proper operation or this assembly, thus 24 volts DC is available to other modules.

4.2.2 Key/Display PCB P/N: P01050

The key/display printed circuit board serves to interface the CPU PCB to the liquid-crystal display and keypad. Keystrokes are converted to digital messages to be implemented by the CPU PCB, which collates bi-directional data from the other functional modules and communicates with the user thru the front panel display.

4.2.3 CPU PCB P/N:P01600-2

The central processor printed circuit board (CPU) provides the buss architecture for communication with other PCB's. This assembly houses software routines associated with the users operator interface. It contains both the real-time system clock which references all data to international time and date and it houses electrically erasable memory (EEPROM) which stores important parameters when the unit is turned off. A long-life Lithium battery is included to maintain the real-time clock function.


Bathy-500DF
Survey Echo Sounder
FUNCTIONAL BLOCK DIAGRAM
NMEA INPUT
DATA OUTPUT
FUTURE OPTIONS
DATA I/O PCB
NMEA-0183 INTERFACE
RS-232 INTERFACE
KEY/DISPLAY PCB
LCD 4 LINES (X16)
KEYBD (4X4)
I/O & PROCESSOR
POWER SUPPLY PCB
11 - 30 VDC POWER INPUT
115/230 VAC POWER INPUT
+24VDC (TO ALL PCB'S)
(ALL PCB'S CONTAIN +24 TO +5 VDC CONVERSION CIRCUITRY)
THERMAL CHART MODULE
THERMAL PRINTHEAD
VLSI DRIVER
STEP MOTOR
CHART CONTROLLER PCB (PRINT DRIVE PCB)
VIDEO
CLOCK
TRANSCEIVER
DSP CONTROL
I/O
T/R
XDUCER
MAIN PROCESSOR
SYSTEM SELF TEST
RAM
RAM
RAM
CLOCK & RAM
3 V. BATTERY
XTAL
EEPROM

4.2.4 Print/Drive PCB P/N: P01060-2

The print/drive PCB coordinates timing of the step motor which, in turn, controls the synchronous movement of the printhead roller and both paper shafts. At the same time water bottom data in digital form from the Broadband T/R PCB is converted into driver signals compatible with the thermal printhead. Further, in conjunction with a sub-assembly, the paper sensor, the print/drive PCB serves as a monitor of paper presence, stopping printing if the recorder is out of paper; Otherwise operation of the printhead without paper would damage the printhead.

4.2.5 T/R PCB (Transceiver) P/N: P01100-2

Incorporating state-of-the-art digital signal processing the T/R PCB employs a trio of microprocessors, operating in parallel, to provide broad dynamic range and low noise operation. Both conventional gain and time-varied gain (TVG) capability is built into the T/R design; Each functional gain type is controlled via the keypad by the user (manually) or automatically (as enabled by the user). Digital control of transmit pulse form and frequency control provides for a robust acoustic source well suited for the operating depths of the Bathy-500DF.

4.2.6 Data I/O PCB P/N: P01090-2

The Data I/O has two prime functions: 1) To accept geographical position data from a GPS receiver and; 2) To provide RS-232 or RS-422 digital depth data in industry standard format. The Data I/O contains a separate microprocessor (with local firmware) to format output data; Such architecture allows for future updates should data standards be revised.

4.3 DIAGNOSTIC CHART

(SEE APPENDIX B FOR SELF-TEST FEATURES)

SYMPTOM	CHECK & ACTION
Unit does not power-up:	1) Check fuses; replace if defective. 2) Use Local On/Off switch on power supply PCB in attempt to power-up unit; If depressing this switch turns unit on, replace the key/display PCB***;*** If not, replace the power supply PCB.
LCD functions; Chart does not:	1) If the chart moves (but does not print) replace the printhead. 2) No chart movement Check to insure paper is covering paper sensor (without wrinkles); If so, and still no movement, go to step 3. 3) If the chart does not move, replace the print/drive PCB paper sensor PCB or step motor as applicable
No display or record of depth (other functions are normal):	1) Check transducer connections 2) Replace T/R PCB.
No GPS data or depth data output:	1) Verify proper operation of external devices. 2) Replace Data I/O PCB

4.4 CLEANING

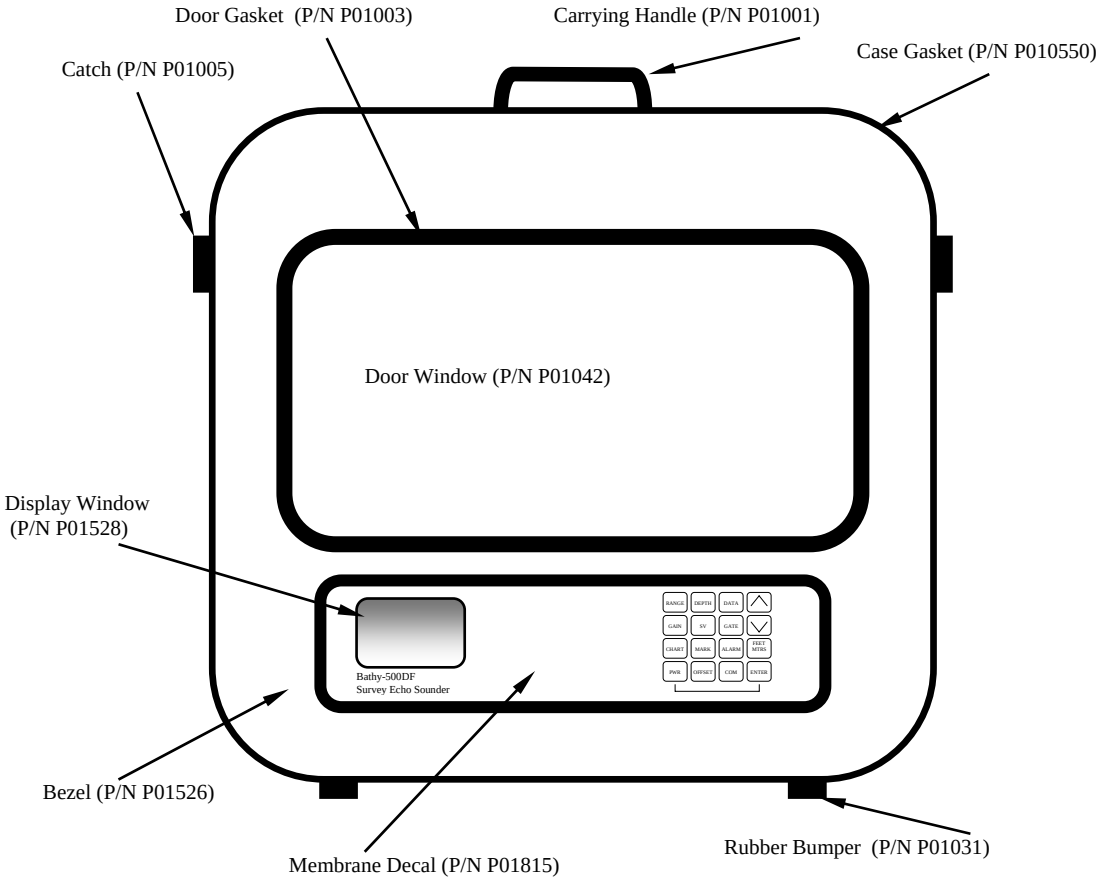
4.4.1 Printhead Care

Your Bathy-500DF utilizes a long-life thin-film thermal printhead. While robust, care must be taken as to not allow sand and other such matter to come in contact with the printhead face. Should the interior of the case become contaminated with any such matter, stop operation at once; Raise the printhead assembly by using the lift arm, remove the paper and use dry air to remove all such particles from around the printhead and chart module paper travel surface. *Never clean the printhead surface with anything except a cotton swab, which has been moistened with Isopropyl alcohol.* **DO NOT USE ANY OTHER SOLVENT.**

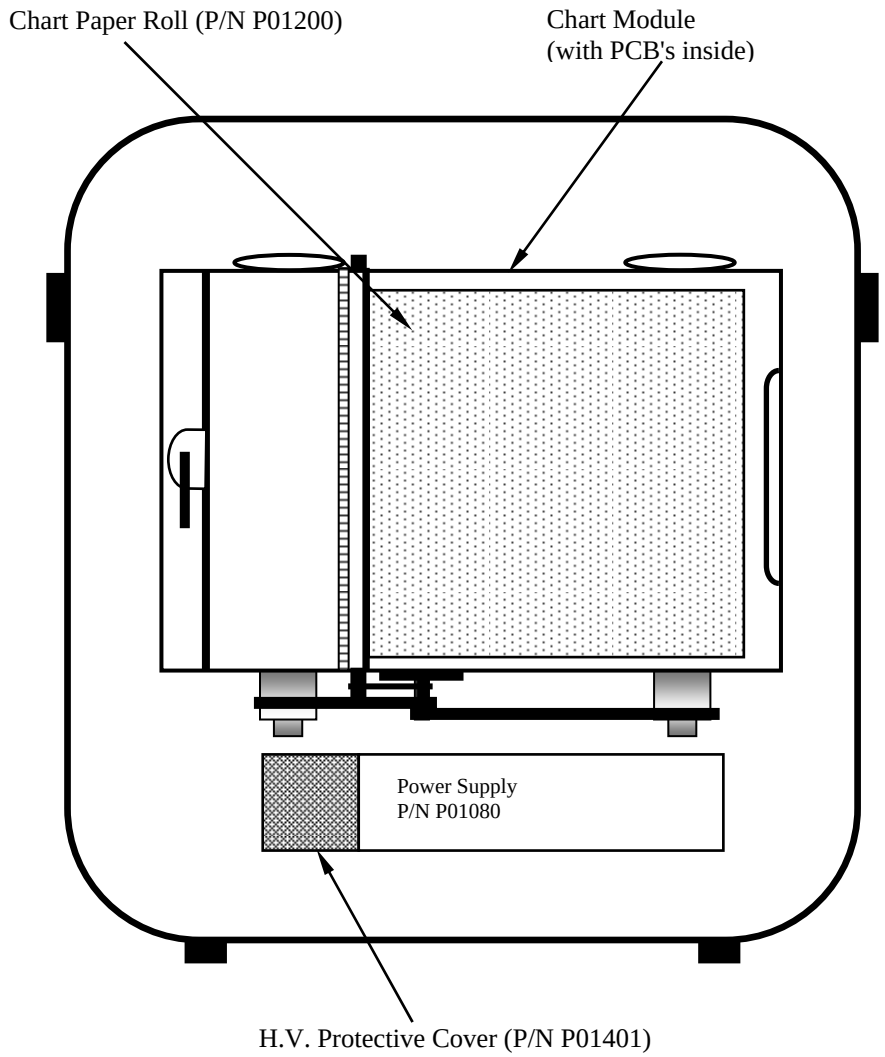
4.4.2 Printhead Roller

It is important to maintain a clean printhead roller to prevent slippage during printing. *Before cleaning the printhead roller, always raise the printhead using the lift arm.* Use a cotton swab to clean the roller. If a solvent is needed, use only isopropyl alcohol. *Do not use any other solvent; the roller is synthetic rubber and will be damaged.*

4.5 MECHANICAL REPLACEMENT PARTS



CENTER PLATE



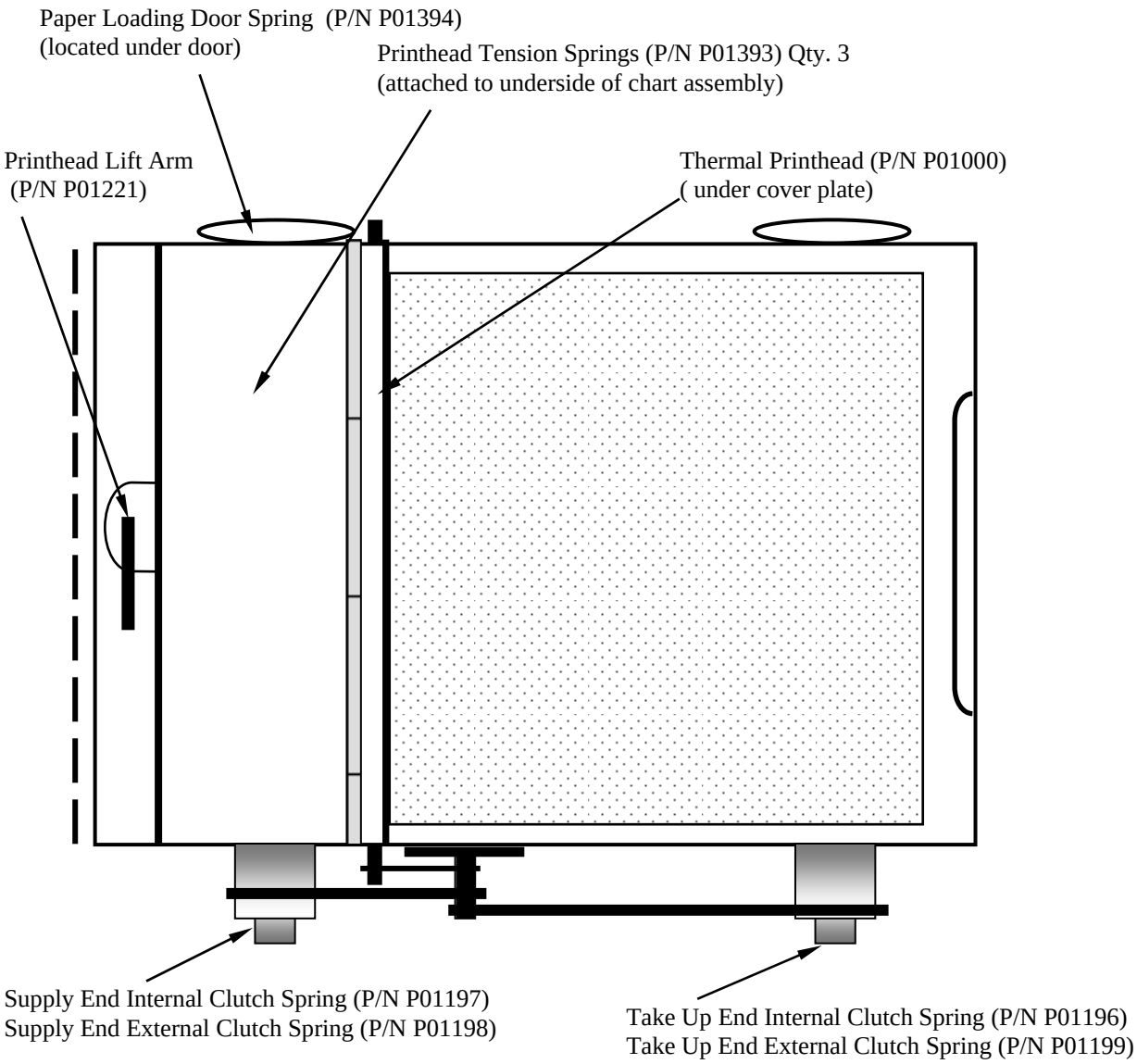


CHART MODULE - EXTERIOR FRONT VIEW

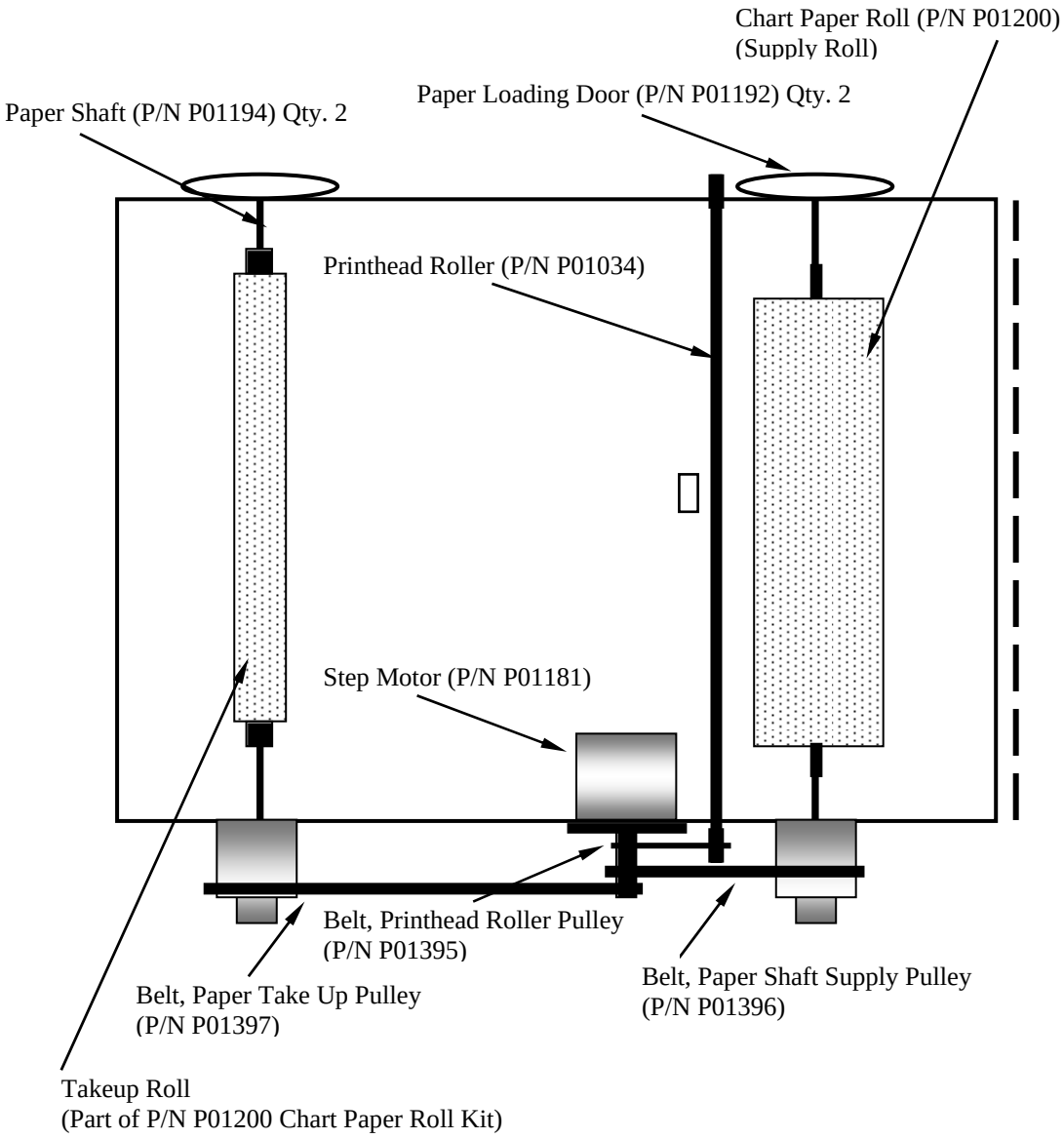
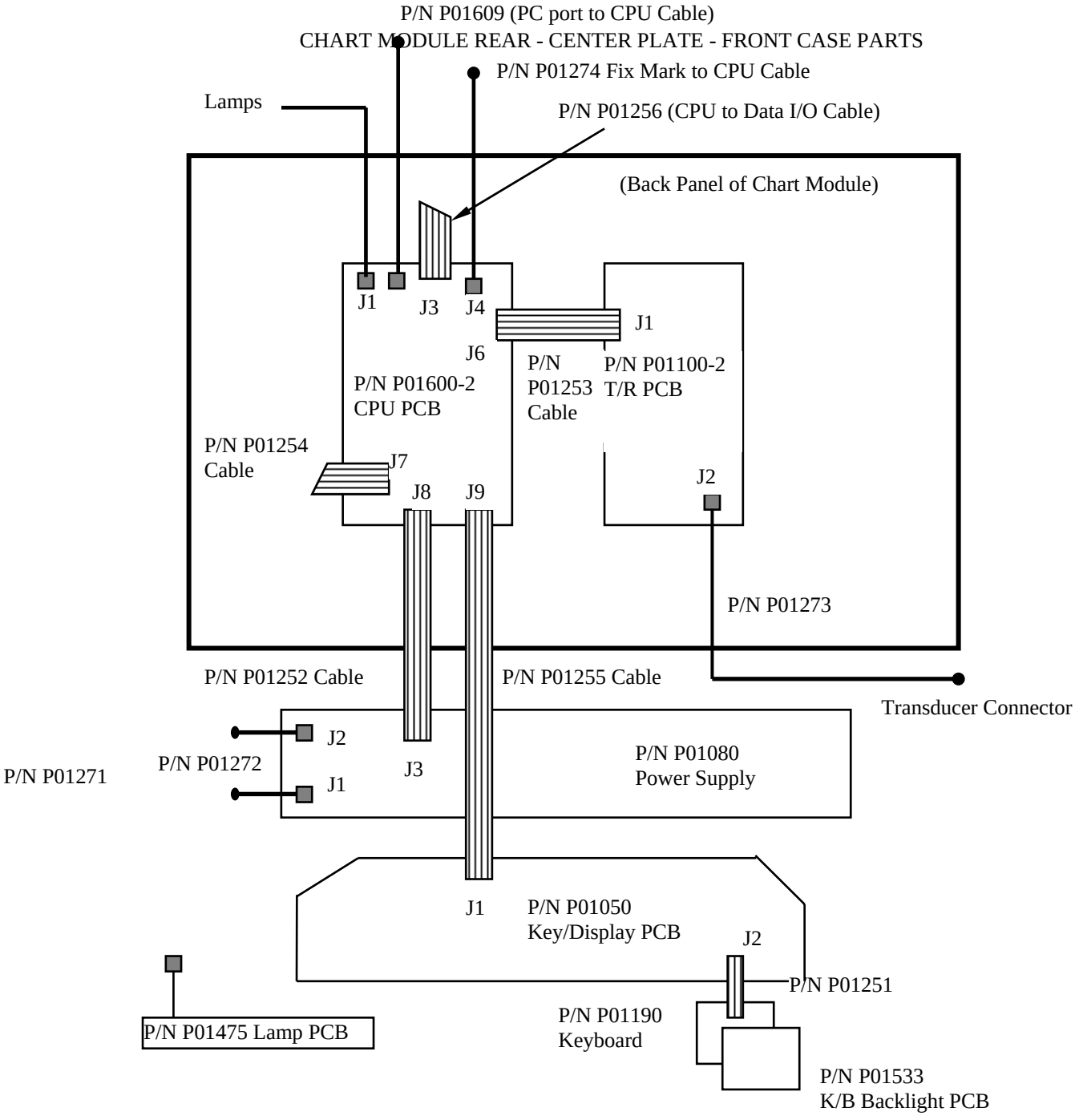


CHART MODULE - UNDERSIDE VIEW

4.6 ELECTRICAL REPLACEMENT PARTS



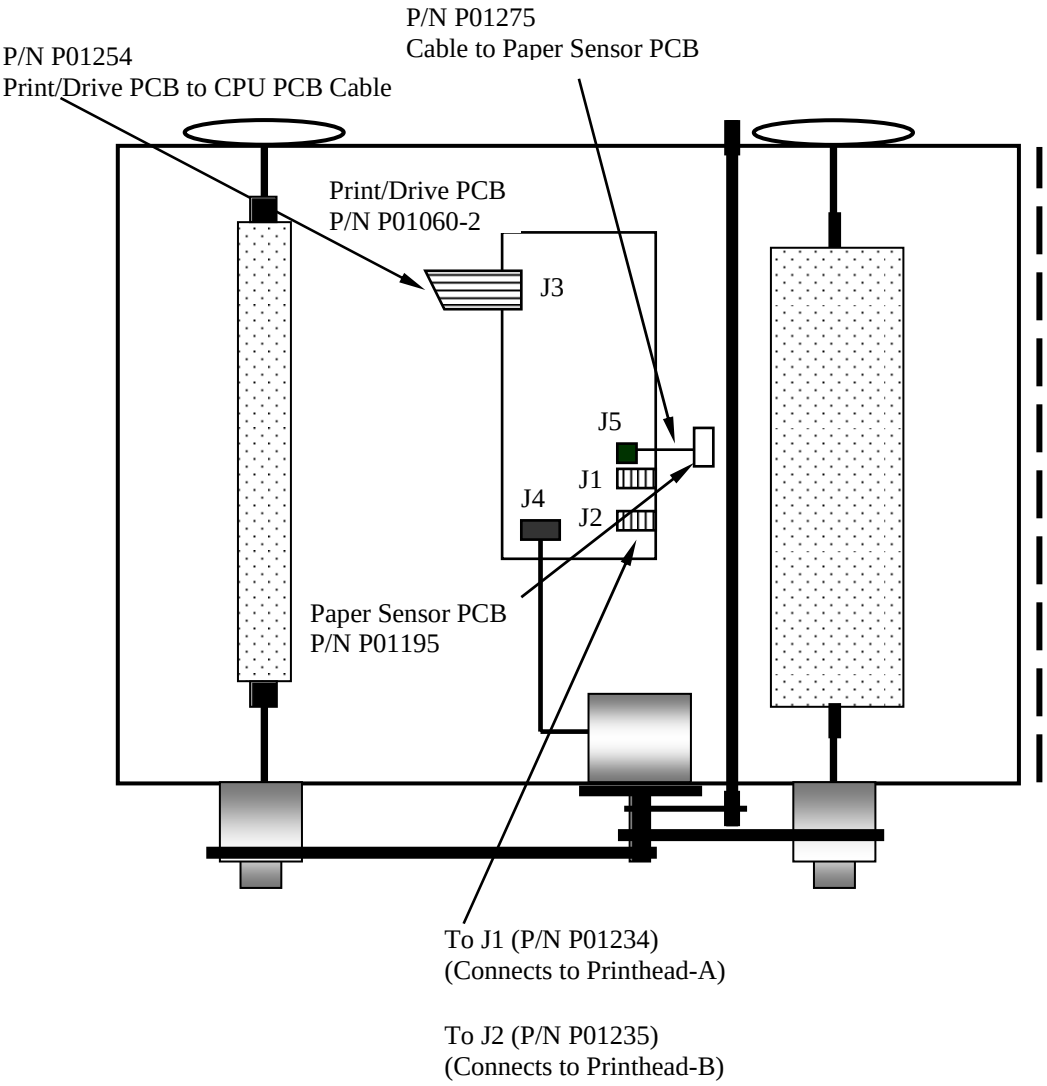


CHART MODULE - UNDERSIDE VIEW

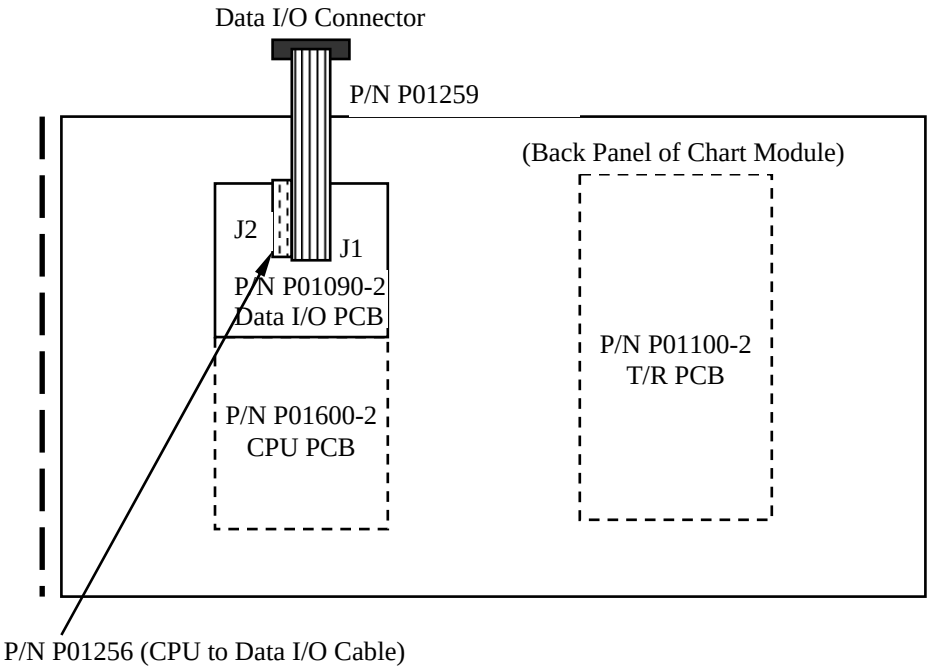
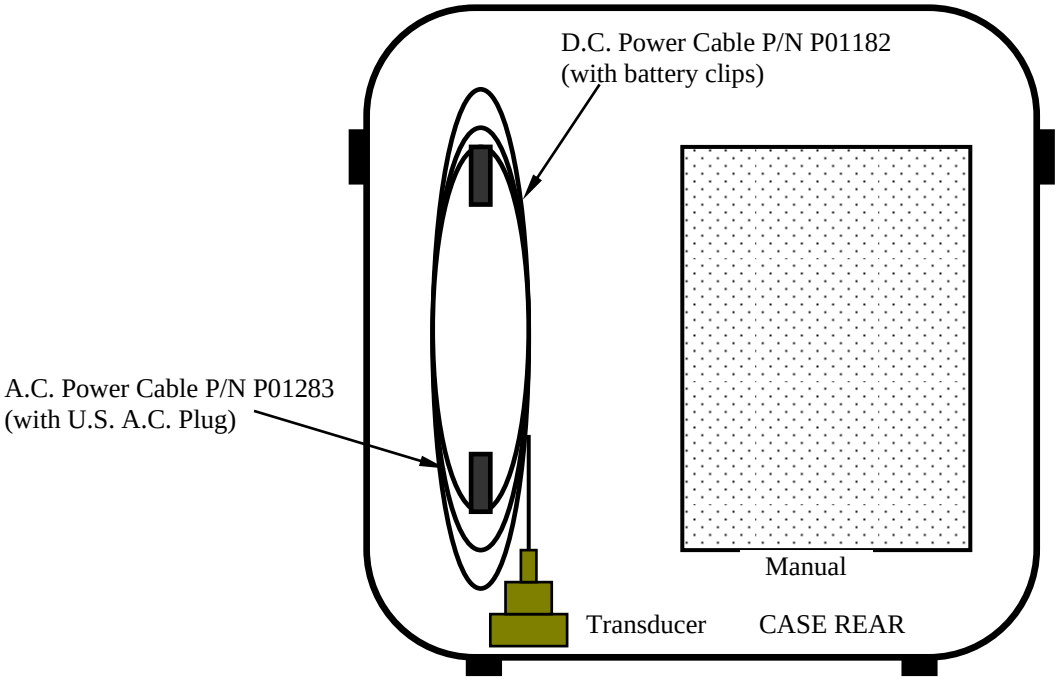


CHART MODULE REAR (LOCATION OF DATA I/O PCB)



4.7 SPARE PARTS

SYQWEST Part Number	Description
P01000	Thermal Printhead
P01001	Handle (carrying)
P01003	Gasket, Door
P01005	Catch
P01550	Gasket, Case
P01031	Rubber Bumper
P01034	Printhead Roller
P01042	Door Window
P01044	Data I/O Plug (complete kit)
P01050	Key/Display PCB
P01060-2	**Print/Drive PCB Bathy-500DF**
P01600-2	**CPU PCB Bathy-500DF**
P01080	Power Supply
P01090-2	**Data I/O PCB Bathy-500DF**
P01100-2	**T/R PCB Bathy-500DF**
P01181	Step Motor
P01182	D.C. Power Cable Assy. (with battery dips)
P01183	A.C. Power Cable Assy (with U.S. plug)
P01184	D.C. Fuse
P01185	A.C. Fuse
P01815	Membrane Decal (for keypad)
P01190	Keypad
P01192	Paper Loading Door
P01528	Window for LCD display
P01194	Paper Shaft
P01195	Paper Sensor PCB
P01196	Take-up End Internal Clutch
P01197	Supply End Internal Clutch
P01198	Supply End External Clutch
P01199	Take-up End Internal Clutch
P01200	Chart Paper Poll Kit (with take-up roll)
P01221	Print Head Lift Arm
P01234	P. Head-A Cable to Print/Drive PCB
P01235	P. Head-B Cable to Print/Drive PCB
P01251	Flex-Cable (Keypad to Key/Display PCB)
P01252	Ribbon Cable, P.S. PCB to CPU PCB
P01253	Ribbon Cable, T/R PCB to CPU PCB
P01254	Ribbon Cable, Print/Drive PCB to CPU PCB
P01255	Ribbon Cable, Key/Display PCB to CPU PCB
P01256	Ribbon Cable, Data I/O to CPU PCB
P01259	Ribbon Cable, Data I/O Chassis to Data I/0 PCB
P01271	A.C. Power Chassis Harness Assy
P01272	D.C. Power Chassis Harness Assy
P01273	Transducer Chassis Harness Assy
P01274	FIX Mark Chassis Harness Assy
P01275	Paper Sensor Harness Assy
P01393	Print Head Tension Spring
P01394	Paper Loading Door Spring
P01395	Belt, Print Head Roller Pulley
P01396	Bert, Paper Supply Shaft Pulley

P01397	Belt, Paper Take-up Pulley
P01401	H.V. Protective Cover
P01475	Lamp PCB
P01477	Lamp
P01609	PC Port Chassis Harness Assy.
P01526	Bezel for Decal/Keypad
P01533	Backlight Keypad PCB

Note: See APPENDIX E for a listing of part numbers and descriptions of memory modules (software housed or microchips).

APPENDIX A. - SPEED OF SOUND

(as a function of salinity & temperature)

SV Table

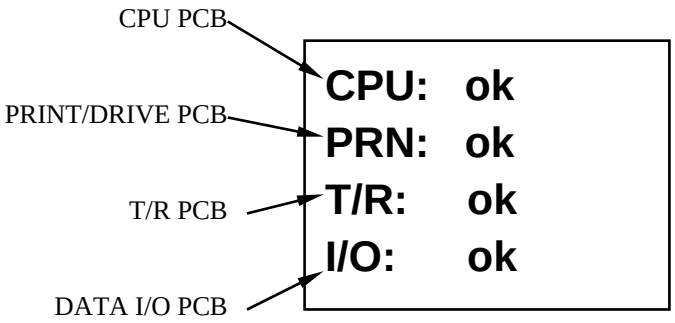
SAL / TEMP	0 ppt.	5 ppt.	10 ppt.	15 ppt.	20 ppt.	25 ppt.	30 ppt.	35 ppt.	40 ppt.
0 deg. C	1400	1407	1414	1421	1481	1435	1442	1449	1445
5 deg. C	1424	1431	1437	1444	1451	1457	1464	1470	1447
10 deg. C	1445	1452	1458	1464	1471	1477	1483	1490	1496
15 deg. C	1464	1470	1476	1482	1488	1495	1501	1507	1513
20 deg. C	1481	1487	1493	1498	1504	1510	1516	1521	1527
25 deg. C	1496	1502	1507	1513	1518	1523	1529	1534	11540
30 deg. C	1510	1515	1520	1525	1530	1535	1540	1546	1551
35 deg. C	1522	1526	1531	1536	1541	1546	1551	1555	1560
40 deg. C	1532	1537	1541	1546	1551	1555	1560	1564	1569

(Speed of Sound values are in meters per second)

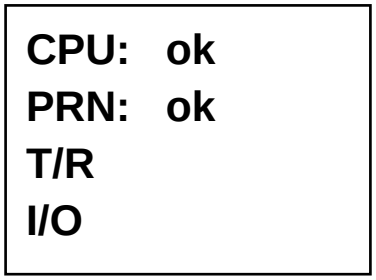
THIS PAGE INTENTIONALLY LEFT BLANK

APPENDIX B. - SELF TEST FEATURE

Your Bathy-500DF contains an automatic self-test, which is initiated each time the unit is turned on. The display shown below generally indicates a properly functioning Bathy-500DF. Upon normal self-test (no errors found), this display screen will automatically clear itself.



As shown above, the designation "ok" next to the PCB designation indicates normal (proper) functioning of that specific PCB. Should the self-test routine detect an error, the self test will halt after the last operational PCB is tested; The procedure will not continue until the first PCB found to have a problem is replaced. Then upon power-up again, the procedure will continue. For example, the display shown below indicates proper operation of the CPU and Print/Drive PCB's but a failure with the T/R PCB. The Data I/O PCB cannot thus be tested until the T/R PCB is replaced.



THIS PAGE INTENTIONALLY LEFT BLANK

APPENDIX C. - LIST OF STORED PARAMETERS

When power is turned off to your Bathy-500DF, the following parameter values will be stored in memory; Upon re-application of power, these values will reappear and thus be used unless changed by the user.

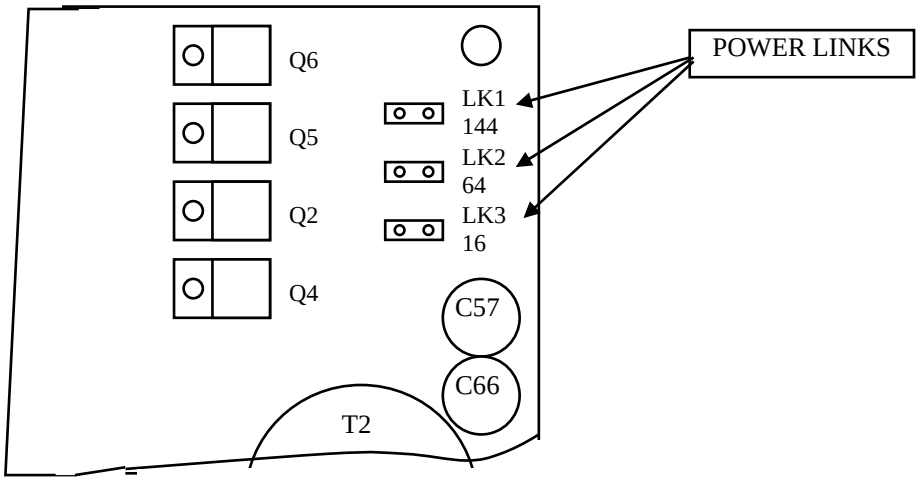
- Gain Mode, Gain, and TVG Values (Including Dual Frequency settings)
- Units (Feet or Meters)
- Range and Phase Mode
- SV (Sound Velocity)
- Paper Remaining (% of roll unused)
- Chart Print Contrast
- Chart Print Status (On or Off)
- COM Format (Output Type)
- COM Baud Rate
- Display Mode (Status Display Page or Depth Readout Page)
- Last Operating Frequency or Dual Frequencies

THIS PAGE INTENTIONALLY LEFT BLANK

APPENDIX D. - Operation in Extremely Shallow Water Depths

When operating in extremely shallow depths (less than one meter below the transducer), the minimum depth performance of your Bathy-500DF is primarily determined by the transmit pulse "ringing" of your specific transducer. For those users who primarily operate in minimum depths, it may be desirable to reduce the acoustic power of the instrument; This will reduce the "ringing" and thus result in a shallower minimum operating depth. It will also help reduce multiple bottom echoes typical of higher power units operating in very shallow water.

In the figure below, a portion of the T/R PCB (P/N P01100-2) is shown. Note that there are three jumper (link) positions; See arrows. Your Bathy-500DF is delivered with the jumper in link position "LK2"; This provides the maximum rated acoustic power output. Moving this jumper to "LK3" will reduce the output power, thus reducing transducer ringing, yet still providing adequate power for most depth applications.



With regard to keypad setup, the user should turn the GATE off and first try very shallow water operation with AUTO GAIN enabled; If needed, the user may switch to manual gain and adjust the GAIN and TVG for optimum shallow water operation. Refer to 3.3.6 for more information on setting gain levels.

THIS PAGE INTENTIONALLY LEFT BLANK

APPENDIX E. - Software

Bathy-500DF Serial No. _____

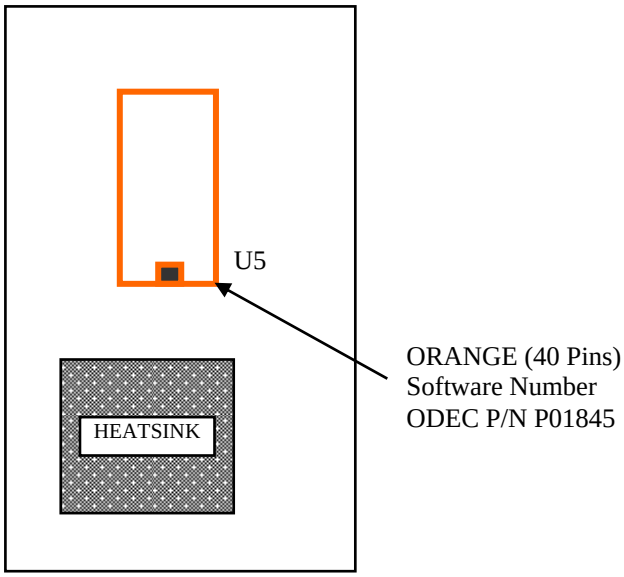
Your Bathy-500DF contains a neural network of six RISC-based microprocessors, operating in parallel. The operating software is distributed throughout the network (on various PCB's) as each microprocessor contains internal memory (ROM). These six memory sites are located on the below listed PCB's.'

- P/N P01060-2 Print/Drive PCB Bathy-500DF
- P/N P01600-2 CPU PCB Bathy-500DF
- PIN P01100-2 T/R PCB Bathy-500DF
- P/N P01090-2 Data I/O PCB Bathy-500DF

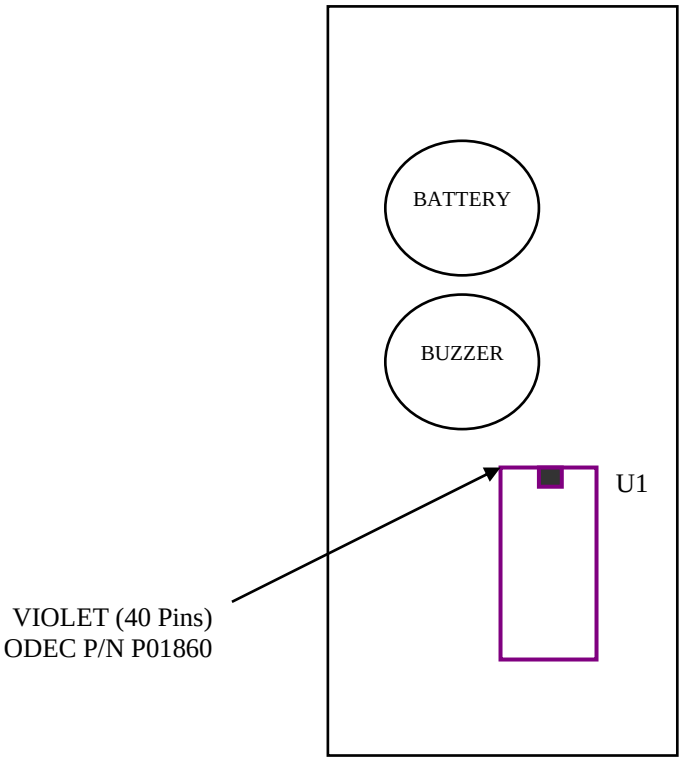
All Bathy-500DF units have identical printed circuit board hardware; Only the microchips containing memory may differ between various version (upgrades) Bathy-500DF units. Accordingly, the above shown numbers for hardware (PCB's) apply to *all* Bathy-500DF units.

Data contained in the following pages provides the user with specifics of the software (firmware) configuration for your particular Bathy-500DF. Such information serves to allow the user or service station to verify the proper combination of firmware modules in a specified equipment serial number. SYQWEST part numbers needed to order particular firmware modules (microchips) are given in the attached pages, adjacent to the map of each PCB showing the memory site.

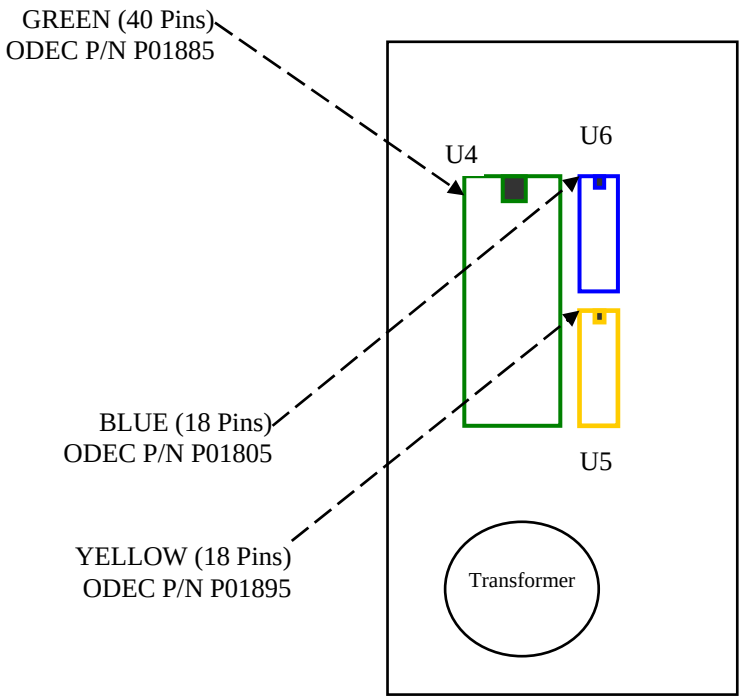
All firmware is contained on sockets as to provide for easy removal and/or installation on the PCB's. Firmware memory microchips are coded via firmware number; i.e. P0XXXX and by color code near pin one of the microchip. When installing firmware, particular care must be exercised as to insure that the microchip is properly oriented ("plugged-into") in the socket.



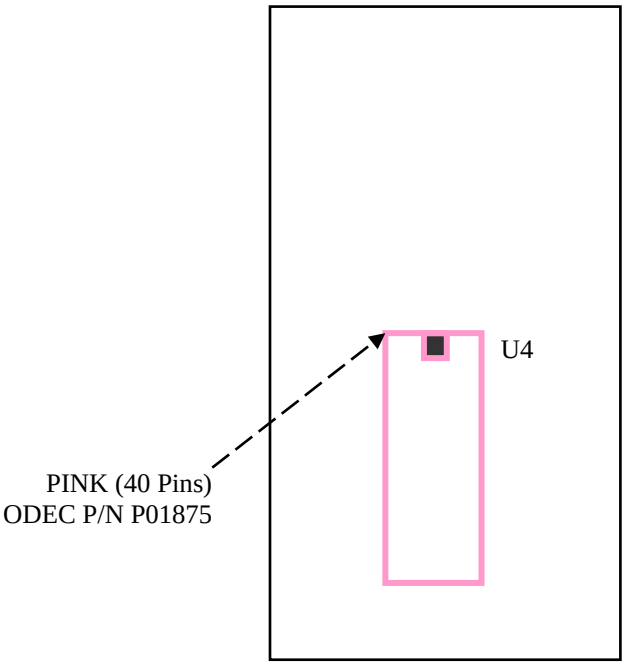
Part Number P01060-2 PRINT/DRIVE PCB



Part Number P01600-2 CPU PCB



Part Number P01100-2 BROAD BAND T/R



Part Number P01090-2 DATA I/O PCB

APPENDIX F. – Heave Compensation

The B500DF product is capable of compensating the chart record and depth value for Heave of the vessel if a Heave Sensor serial output is connected via the 9 pin D Connector labeled “PC PORT” on the B500DF rear panel.

Heave Sensor Setup and Data Format

The B500DF requires that the Serial interface for the Heave Sensor be setup as a standard RS-232 connection operating in Asynchronous mode with the following port parameter settings:

- Baud Rate – 9600
- Data Bits – 8
- Parity – None
- Stop Bits – 1

The Heave Sensor update rate should be set in the range of 5-20 updates per second for optimum operation. The protocol for the serial data output is the industry standard TSS1 format and is listed below:

TSS1 HEAVE FORMAT -

:XXAAAASMHHHHQMRRRRSMPPPP<CR><LF>

: – Start Character

XX – Horizontal Acceleration

AAAA – Vertical Acceleration

S – Space Character

M – Heave Sign Value, Space if Positive, Minus(-) if Negative Heave

HHHH – Heave Value in CM

Q – Status Flag, U,G,H or F when Valid Heave, u,g,h, or f when Invalid Heave

M – Roll Sign Value, Space if Positive, Minus(-) if Negative Heave

RRRR – Roll Value in Degrees

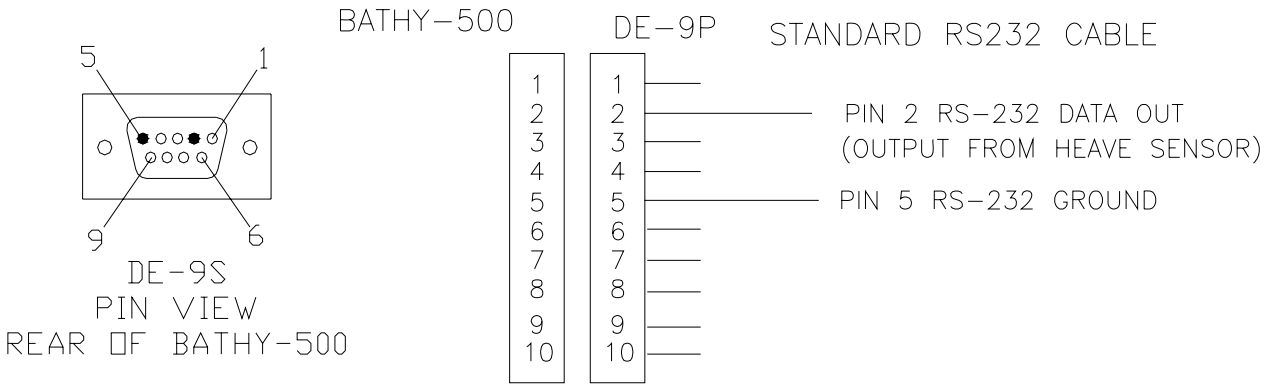
S - Space Character

M – Pitch Sign Value, Space if Positive, Minus(-) if Negative Heave

PPPP – Pitch Value in Degrees

B500DF/Heave Sensor Wiring

The B500DF communicates with the Heave Sensor via an asynchronous serial interface and only requires that the RS-232, Transmit Output and Ground be connected to the 9 Pin D connector on the Rear Panel of the B500DF unit. The figure below shows the appropriate connections when viewing the B500DF unit at the Rear Panel. Note that the viewing orientation will affect the wiring so the user should verify that the signals are corrected properly.



Wiring required per above diagram.
PIN 2 RS-232 DATA OUT (OUTPUT FROM HEAVE SENSOR)
PIN 5 RS-232 GROUND

~End of Manual~