FS-DW / FS-AU

FULL SPECTRUM SYSTEMS

TECHNICAL & USER'S MANUAL

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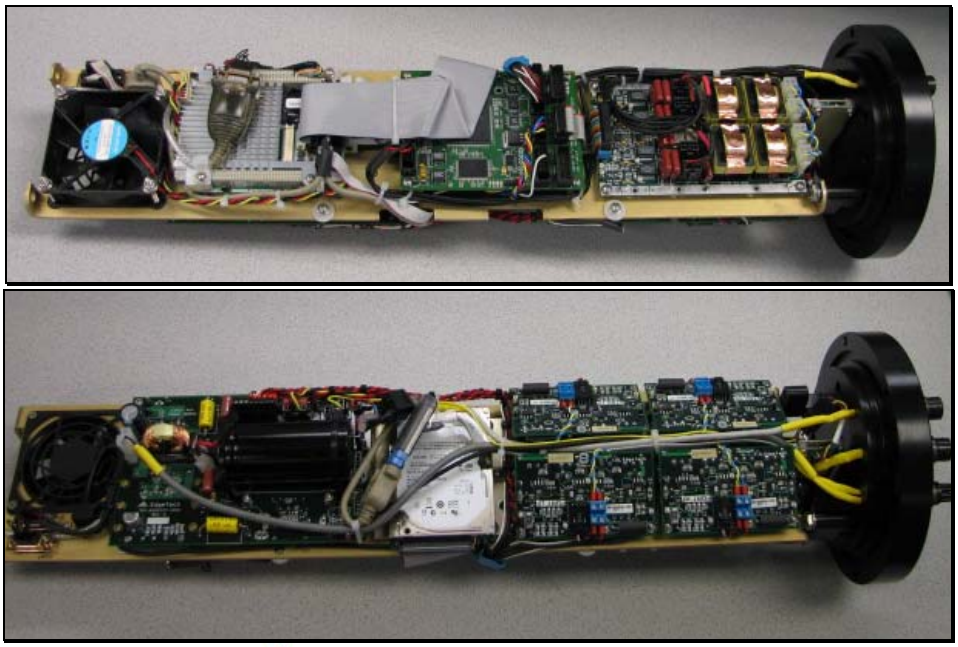

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Forward

This manual is intended to provide the user with an understanding of the operation and care of the EdgeTech Model FS-DW and FS-AU systems. General sub-bottom profiling information may be found in papers published in the Journal of the Acoustical Society of America, Offshore Technology Conference, IEEE Journal of Oceanic Engineering by L.R. LeBlanc and S.G. Schock. General information on Side Scan sonar data generation and interpretation may be found in the book title Sound Underwater Images by John Perry Fish and H. Arnold Carr.

The information, figures and specifications in this manual are proprietary. Materials in this manual are issued in strict confidence on condition that it not be copied, reprinted or disclosed to a third party either wholly or in part without the prior written consent of EdgeTech.

Although this manual has been revised to cover the latest operational features of FS-DW / FS-AU systems, some features may be periodically upgraded. Portions of this manual such as parts lists, schematics, and test features are subject to change and should be used for reference only.

EdgeTech has made every effort to document this product accurately and completely. However, EdgeTech assumes no liability for errors or for any damages that result from use of this manual or the equipment it accompanies. EdgeTech reserves the right to upgrade features of this equipment and to make changes to this manual without notice at any time.

Since clear and concise documentation is important for successful operation and understanding of the equipment, we invite you to contact us with any questions or comments, so that we may enhance this manual.

Warranty

All equipment manufactured by EdgeTech is warranted against defective components and workmanship for a period of one year after shipment. Warranty repairs will be done by EdgeTech, free of charge, however shipping costs are to be borne by the customer. Malfunctions due to improper use are not covered in the warranty and EdgeTech disclaims any liability for consequential damage resulting from defects in the performance of the equipment. No product is warranted as being fit for a particular purpose and there is no warranty of merchantability. This warranty applies only if:

The items are used solely under the operating conditions and in the manner recommended in Seller's instruction manual, specifications, or other literature.

The items have not been misused or abused in any manner or repairs attempted thereon.

Written notice of the failure within the warranty period is forwarded to Seller and the directions received for properly identifying items returned under warranty are followed.

The return notice authorizes Seller to examine and disassemble returned products to the extent Seller deems necessary to ascertain the cause for failure.

The warranties expressed herein are exclusive. There are no other warranties, either expressed or implied, beyond those set forth herein, and seller does not assume any other obligation or liability in connection with the sale or use of said products. Any product or service repaired under this warranty shall be warranted for the remaining portion of the original warranty period only.

Equipment not manufactured by EdgeTech is supported only to the extent of the original manufacturer's warranties

Warning

This equipment maintains High DC Voltages at currents that are LETHAL! to the human body. The user must exercise extreme caution during system hookup and operation. If for any reason a system powered by STAR-MUX must be serviced, the STAR-MUX unit must be unplugged from the 110/230VAC receptacle. After the STAR-MUX system has been powered down, due to high residual voltages, a waiting period of ten (10) minutes must be allowed prior to servicing.

This equipment contains static sensitive devices that are extremely sensitive to static electrical charges, which may be developed on the body and the clothing. Extreme care should be taken when handling these devices both in and out of the circuit board. Normal handling precautions involve the use of anti-static protection materials and grounding straps for personnel.

This equipment generates, uses and can radiate radio frequency energy, and if not installed properly may cause interference to radio communications. It has not been tested to compliance with the appropriate FCC rules designed to provide reasonable protection against such interference when operated in a commercial environment. Operation of this equipment in a residential area may cause interference, in which case the user, at his own expense, will be required to take whatever measures needed to correct the interference. It is the user's responsibility to verify that the system complies with the applicable FCC emission limits.

High Voltage may be present in the vehicle, power amplifier and the topside processor. Use caution when the electronics are removed from their containers for servicing.

Operation with improper line voltage could cause serious damage to the equipment.

Quality

To our customers:

Thank you for purchasing one of our products. At EdgeTech, it is our policy to provide high quality, cost-effective products and support services that meet or exceed your requirements, to deliver them on time and to continuously look for ways to improve. We all take pride in the products we manufacture.

We want you to be entirely satisfied with your equipment. The information in this manual will get you started. It tells you what you need to get your equipment up and running, and introduces its many features.

We always enjoy hearing from people who use our products. Your experience with our products is an invaluable source of information that we can use to continuously improve what we manufacture. We encourage you to contact or visit us to discuss any issues whatsoever that relates to our products or your application.

The Employees of EdgeTech

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1 INTRODUCTION

This manual is intended to be a reference for the electronics for the following systems:

- 2000-CSS
- 2200-S
- 2200-M
- 2200-MP
- 2400-DSS

These systems are provided as a complete package including sensors and pressure vessel. Alternatively, they can be integrated into the AUV pressure housing. The modular systems can operate independent of the AUV by setting parameters before deployment, or a processor on the AUV can control it. The hardware is meant to drive a side scan, sub-bottom or both of these sensors combined.

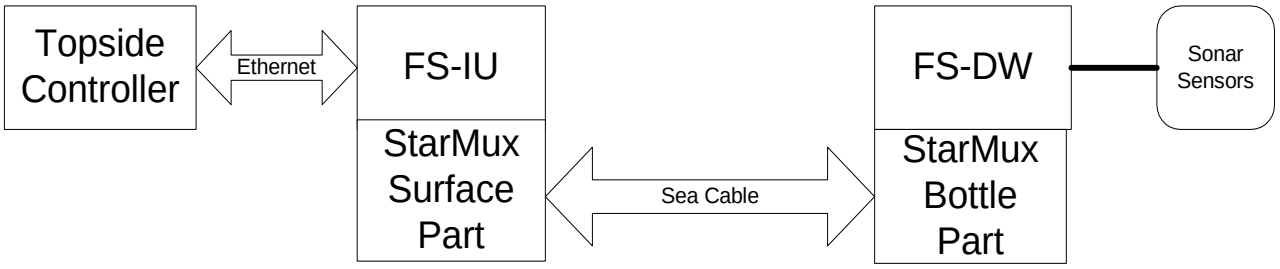
The 2200-S is a compact, lightweight, low power, combined side scan sonar and sub-bottom profiler. The electronic chassis is referred to as an FS-AU. It is designed for installation on a limited payload AUV and has a maximum depth rating of **6000** meters.

The 2000-CSS, 2200-M, 2200-MP and 2400-DSS are deep water Hydrographic Survey Systems. These systems consist of a side scan sonar, sub-bottom profiler, digital link, surface interface, and a surface data display processor. A number of additional options may be integrated on to the system as needed. The 2200-M Modular Sonar System is designed for installation on a medium to large AUV, ROV, ROTV and USVs. It gathers side scan and/or sub-bottom data in water depths up to **6000** meters.

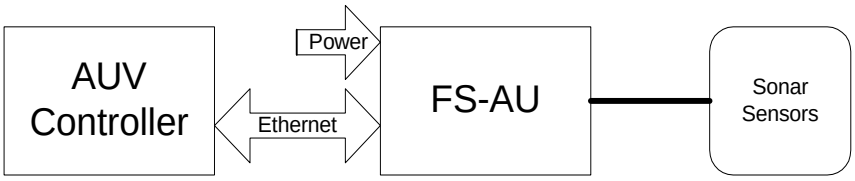
2 OVERVIEW AND BLOCK DIAGRAM

The Edgetech FS-DW / FS-AU system is a combined Sub-bottom and sidescan sonar sensor package. The Edgetech FS-IU system provides a diagnostic capability and interfaces to 3rd party topside controllers for the FS-D. All systems are supplied with JSTAR, a topside software package which provides a diagnostic and basic user interface (See the separate JSTAR users manual for details). The Edgetech StarMux Telemetry system uses advanced modem technology to provide power and transfer sonar data between the FS-DW and FS-IU

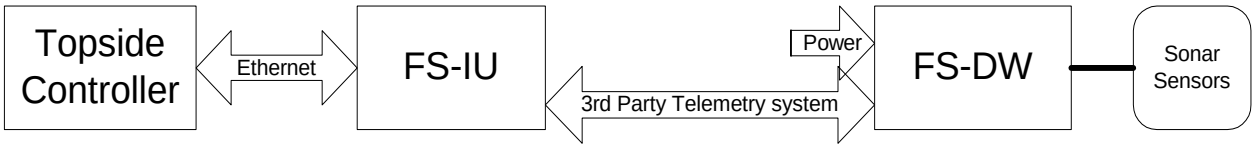
using standard copper cable. Shown below are three typical configurations for these components:



Deep Tow Configuration

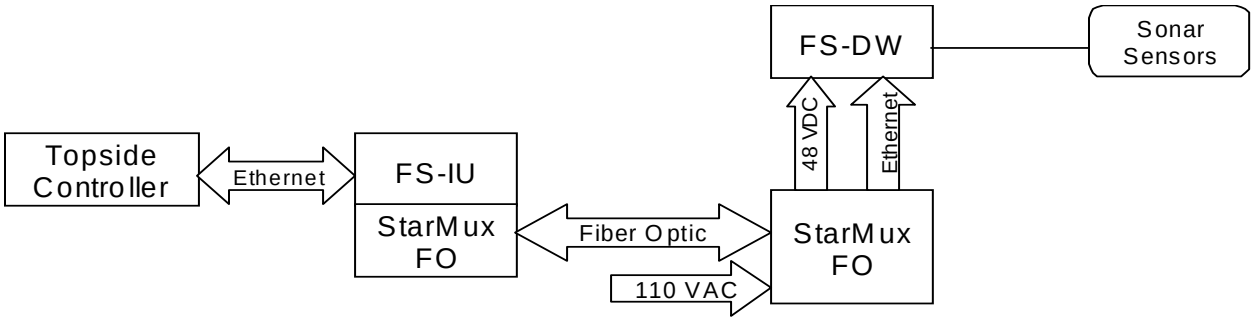


AUV Configuration

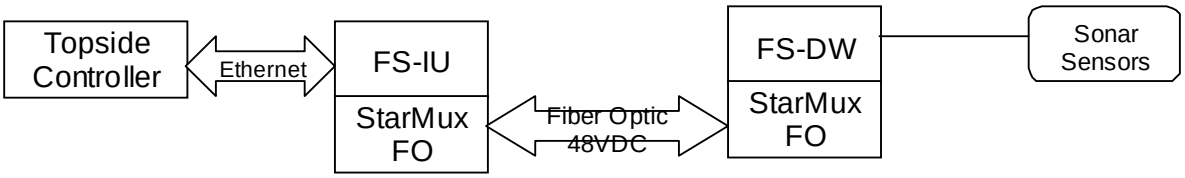


ROV Configuration

EdgeTech also offers a Fiber Optic link called StarMux FO to transfer sonar data between the FS-DW and FS-IU. Shown below is a typical configuration:



Option1: Fiber Optics Configuration for ROV



Option2: Fiber Optics Configuration for Deep Tow

The definition of these configurations is loosely described as:

- Deep Tow: System with StarMux modem and FS-IU topside connection, FS-DW installed on tow vehicle.
- AUV: System without StarMux modem and without FS-IU topside controller.
- ROV: System without StarMux modem but with FS-IU topside connection (telemetry via 3rd party)
- This document describes the underwater electronics components of the Full Spectrum products *common* to the AUV, ROV and the Deep Tow (i.e. with StarMux Telemetry) configurations of the system.
- The components of these configurations, described in this section, are housed entirely within the deep water, pressure proof, FS-DW/FS-AU cylindrical housing. This housing may be a "long" or "short" version of the housing depending on the telemetry options chosen.

- The common electronics of this system perform the following functions:
- Generate high frequency chirp (HF) transmit signals for the Sidescan arrays, (Port and Starboard)
- Generate low frequency chirp (LF) transmit signals for the Sidescan arrays, (Port and Starboard)
- Generate chirp transmit signals for the Sub-bottom transmitter
- Provide receive amplification and digitizing of Sidescan echo data (4 channels)
- Provide receive amplification and digitizing of Sub-bottom echo data (1 channel used)
- Perform Matched Filter processing (pulse compression) on all receive channels
- Provide inter-channel synchronizing, gating and triggering functions
- Provide overall control of data acquisition and processing functions of the FS-DW/AU
- Provide Ethernet Communications link for data and control
- Provide optional 4 X RS232 communications channels
- Provide optional User voltage sources
- Provide optional Mass Storage for Sonar and Sensor data

The electronics described herein requires 48Vdc power, and Ethernet based command and control. These interfaces may be supplied via an integral and optional STARMUX component in a Deep tow configuration, (See StarMux Manual) or may be supplied direct as in ROV and AUV configurations.

2.1 System Description

The primary components of the chirp processor system are:

Pressure Housing: Normally an 8" ID – 9" [22.9cm] OD or 10" OD [25.4] (depending on the depth rating), tubular aluminum cylinder which is designed to hold its electronics payload. For smaller AUVs there is an Aluminum 7" [17.8cm] OD option.

CPU Processor Board (PC/104): This is the main processor for the enclosure. It is normally a PC compatible, Pentium computer equipped with integrated Flash drive for operating system and Sonar Applications. A large capacity hard drive for data storage is optional.

Tiger Board Set: The set consists of three boards; a Sonar Interface Board, a Side Scan Board and a Sub-Bottom Board. They provide the real time data acquisition and sonar control electronics.

Power Amplifiers: These are ultra-compact linear amplifiers designed to drive side-scan or sub-bottom transducers.

TR Switch: This is the transmit / receive switch electronics for the side scan arrays. It accepts transducer drive signals from the power amps and receives sensor data from the side scan arrays.

Power Distribution Board (200W): This is responsible for receiving and distributing electronic power to each component. It includes voltage regulators, which are nominally driven from 48 Volts.

Electronics Chassis: This is the mounting structure for the electronics. It includes a mounting frame for all parts, and electronics backplane / bus for electronics interconnect.

Mass Storage: This is used in the AUV version to store data for an entire mission. The data is uploaded for post processing when the mission ends (option).

End Cap: with wet mate underwater connectors

STARMUX Cable Telemetry: module (option).

STARMUX Fiber Optic Telemetry: module (option).

Four Port Rs-232 I/O: For bringing serial sensor data from the tow fish to the topside. (option)

External Sensor Support: An auxiliary power output option, which is intended to supply DC power for the optional peripheral sensors. It also comes equipped with a high voltage option coming from the StarMux in the bottle with a high power output.

Specifications:

- **12V**

Max Power Out = 8 Watts
I_{12} max = 0.667Amps

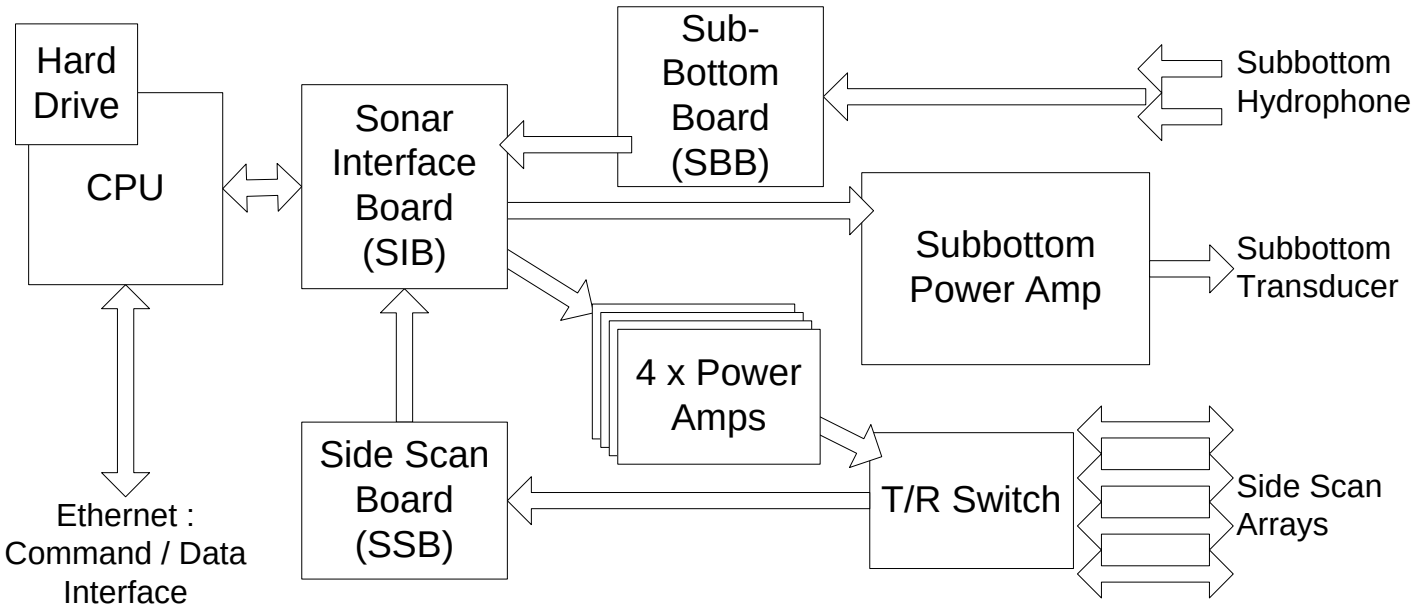
- **24V**

Max Power Out = 16 Watts
I_{24} max = 0.667Amps

- **24V High Output (From the StarMux)**

Max Power Out = 250 Watts
$I_{24\,H}$ max = 10.42Amps

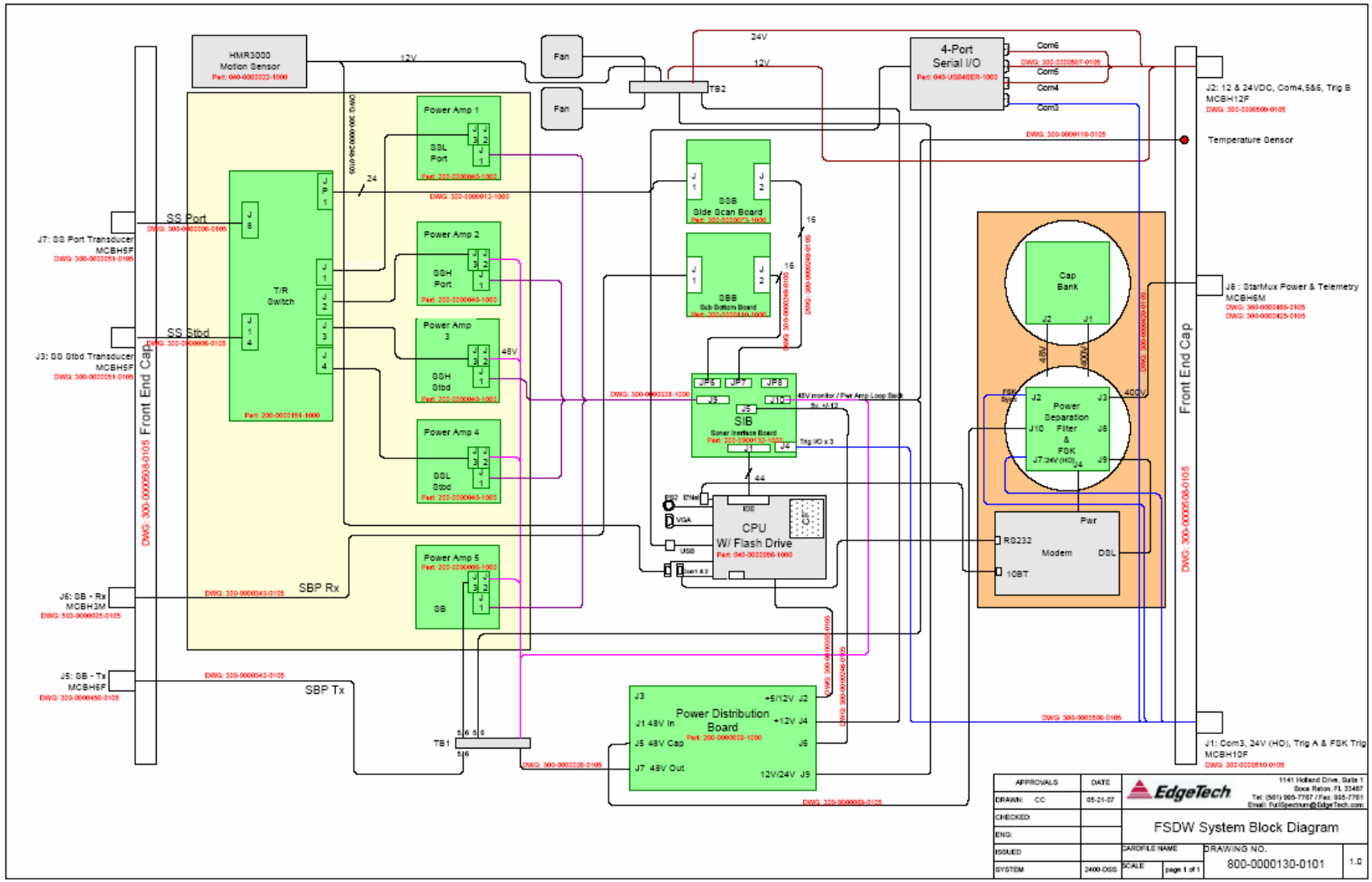
The overall connection between the key components is illustrated below.



The CPU board provides the external data and control interfaces. It also manages and controls the Tiger board set. The Sonar Interface board generates low signal level, Full Spectrum, amplitude and phase modulated chirp transmit pulses for the SSS and SBP functions, and performs the receive amplification and digitizing of the received signal data. The linear Power Amplifiers provide the high level power amplification of the chirp transmit signals to drive the SSS arrays and SBP transducer. The T/R Switch provides the automatic switching operation to couple the SSS arrays to the power Amplifiers on transmit only, and then switch them to the receive function of the Side Scan board during receive. The SBP receive hydrophones are permanently coupled to the Sub-Bottom board receive function. The various operating voltages of the system are provided by the DC-DC power module which operates off a nominal, unregulated 48VDC. The power amplifiers also operate directly off this same 48Vdc source. System cooling is via forced air conduction, and is assisted by two fans which circulate the air within the pressure housing.

Refer to the FS-DW/AU Generic Block Diagram for the description that follows.

Note: The exact block diagram of your specific system is contained in an Addendum.


HMR3000
Motion Sensor
Fan
Fan
TB2
4-Port
Serial I/O
Com6
Com5
Com4
Com3
J2: 12 & 24VDC, Com4,5&6, Trig B
MCBH12F
Temperature Sensor
Power Amp 1
SSL
Port
Power Amp 2
SSH
Port
Power Amp
3
SSH
Stbd
Power Amp 4
SSL
Stbd
Power Amp 5
SB
SS Port
SS Stbd
T/R
Switch
J7: SS Port Transducer
MCBH5F
J3: SS Stbd Transducer
MCBH5F
SBP Rx
SBP Tx
J6: SB - Rx
MCBH3M
J5: SB - Tx
MCBH6F
Front End Cap
SSB
Side Scan Board
SBB
Sub Bottom Board
SIB
Sonar Interface Board
CPU
W/ Flash Drive
Cap
Bank
Power
Separation
Filter
&
FSK
Pwr
RS232
Modem
DSL
10BT
J8 : StarMux Power & Telemetry
MCBH8M
Front End Cap
Power Distribution
Board
J1 48V In
J5 48V Cap
J7 48V Out
+5/12V J2
+12V J4
12V/24V J9
TB1
J1: Com3, 24V (HO), Trig A & FSK Trig
MCBH10F
APPROVALS
DATE
DRAWN: CC
05-21-07
CHECKED:
ENG:
ISSUED:
SYSTEM:
2400-DSS
EdgeTech
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Boca Raton, FL 33487
Tel: (561) 995-7767 / Fax: 995-7761
Email: FullSpectrum@EdgeTech.com
FSDW System Block Diagram
CARDFILE NAME
DRAWING NO.
800-0000130-0101
SCALE
page 1 of 1
1.0

2.2 Component Descriptions

PC Compatible CPU

The overall control and digital signal processing of the FS-DW/AU processor is provided by a PC compatible, Pentium processor (CPU) with compact flash module. The processor operating system is Microsoft Windows XP. The processor card used is a self contained processor on a card, with the following on board functions:

Ethernet 10/100BaseT port

IDE interface port

Dual Serial ports

System RAM

VGA display port (for special diagnostics only)

PS2 Keyboard Interface (for diagnostics only)

PS2 Mouse Port (for diagnostics only)

All system software resides in the compact flash card on the CPU.

The IDE port on the CPU is connected to the sonar interface board.

There is an Ethernet connection on the CPU, it is either connected to the StarMux Modem (deep tow configuration) or the Power/Telemetry user connector on the end cap in the ROV/AUV configuration. The software connection via the Ethernet port is made through a single TCP/IP address.

The serial port (Com 1) on the CPU is reserved for the Honeywell Motion sensor. One of the 2 serial ports of the CPU is, in Deep tow configurations, used to control the StarMux modem function.

Tiger Board Set

This board set provides analog amplification and A/D conversion resources for the acquisition and buffering of the received echo data for each of the sidescan and sub-bottom channels. The low voltage, transmit, chirp signal generation for each channel is also provided by this board set.

The **Sonar Interface Board** (SIB) is a data concentrator that interfaces between the CPU Processor and multiple data acquisition cards. It has six digital to analog converter channels that provide the pilot waveforms for the transmitted acoustic pulses. It is also the trigger and timing manager. The SIB has its operating software loaded off the PC-CPU hard disk at boot time, and is stored in onboard RAM for execution. It is powered by a 5V and +/-12V connection from J5 to J4 on the Power Distribution Board. It connects to the five Power Amplifiers via J9, the SSB via J7, the SBB via J6 and the Input/Output trigger functions come out on J4.

The **Side Scan Board** (SSB) is a four channel analog to digital converter card optimized for Side Scan applications. A single SSB card can support dual frequencies. J2 on the SSB is connected to J7 of the SIB. J1 on the SSB connects to JP1 of the T/R Switch for the sidescan receive.

The **Sub-Bottom Board** (SBB) is an analog to digital converter card optimized for Sub-Bottom applications. It connects through J2 to JP6 of the SIB and to the sub-bottom receiver arrays via J2.
The received echo data is buffered and delivered to the PC-CPU card via the SIB during the receive portion of the transmit/receive cycle.
Timing of the Tx/Rx cycles is performed by the Sonar Interface Board, with regard to user options related to external triggering choices.
A set of 3 LEDs on the Sonar Interface Board provides an indication of the state of this board set (Idle, Tx/Rx, and Error), and can be viewed with the cover plate removed. (See Section 6.3 for a description of the LED states).

Power Amplifiers

There are 5 individual linear power amplifiers in a fully configured FS-DW/AU system, one each for the Port/Starboard, High/Low sidescan channels, and one for the Sub-bottom function. These power amplifiers are also mounted on mechanical heat sinks attached to the Power Amplifiers sub-assembly, which also houses the T-R Switch. These amplifiers appear identical, but are NOT fully interchangeable. There a 5 distinct variants of these Power Amplifiers; one each for Sidescan High Frequency (600 or 410Khz) , Low Frequency (300, 120, or 75Khz) and Sub-bottom channels. Port/Starboard units of the same type may be interchanged.

Each power amplifier accepts raw, unregulated 48Vdc power at J2, and low level transmit signals, together with On/Off control signals at J1. The amplified power outputs are delivered at J3 on each board.

The sidescan power outputs are connected direct to the T/R Switch, and the Sub-bottom power output is connected directly to the SB transmit transducer via TB1 (terminal block) located on the Power Amplifiers Sub Assembly.

T/R Switch

This board provides the transmit to receive mode switching functions for the sidescan arrays. Each sidescan array component performs both as a transmitter and receiver, and as such has to be switched between the transmitters and the receiver electronics with negligible delay. The T-R Switch also provides some low-level pre-amplification on receive, to help minimize noise. The sidescan receive data is coupled to the FSIC board via a 24 way ribbon cable at JP1. The input power signals are connected at the screw terminals labeled J6 though J4. The sidescan arrays are connected to the T-R Switch via J8 and J14 (including J5 and J13 for the 2200-MP Multi Pulse system) and the end cap wet mateable connectors.

4 Port Serial I/O Card

The USB 4-Port Serial Adapter is an optional component, it allows 4 RS-232 serial devices to be connected to a single USB acceptance port on the CPU Processor board. It is powered by 5V from Power Distribution Board. The adapter has 4 DB-9 Male connectors with standard serial interfaces, these serial interfaces are cabled to external underwater connectors on the Endcap. Typically only 2 signals, TxD (Transmitted Data) an RxD (Received Data), for each serial port and 1 RS-23 GND are connected to Endcap connectors.

Power Distribution Board (PDB)

The Power Distribution Board converts the system input power into different voltages as required by sonar processor. Typically 48V or 24V input and converted to 12V,-12V, and 5V to power components such as processor board, hard drives, fans and various EdgeTech board assemblies. It also provides a noise filtered 48V to power amplifiers. In the case of systems with less than 48V input; a secondary DC to DC converter is added to the system.

The PDB also provides low power out options for external devices, this is achieved by adding a separate DC to DC to the system.

Optional output voltages are: 12V, 15V, 24V, and 27V.

2.3 System Specifics

The differences between the delivered system and this generic system description are typically:

- FS-DW System with Starmux components: Power/Telemetry Connection option provided. Refer to the StarMux Manual (Doc. 990-0000002-1000) for a description of these components
- FS-AU System: 48V Power/Ethernet connector used
- User specific combinations of Serial I/O, Trigger options and Output Power voltages. In this case the additions are limited to an additional connector and suitable internal wiring to provide the required signals
- System specific (Connector pin outs, Connector positions, installed components etc.) technical documentation is available in your Addendum

2.4 Side Scan Transducers Installation

The next page shows a typical individual transducer beam patterns in the vertical plane.

The beam patterns are plotted about the longitudinal transducer axis, with the cable entry/exit towards the viewer.

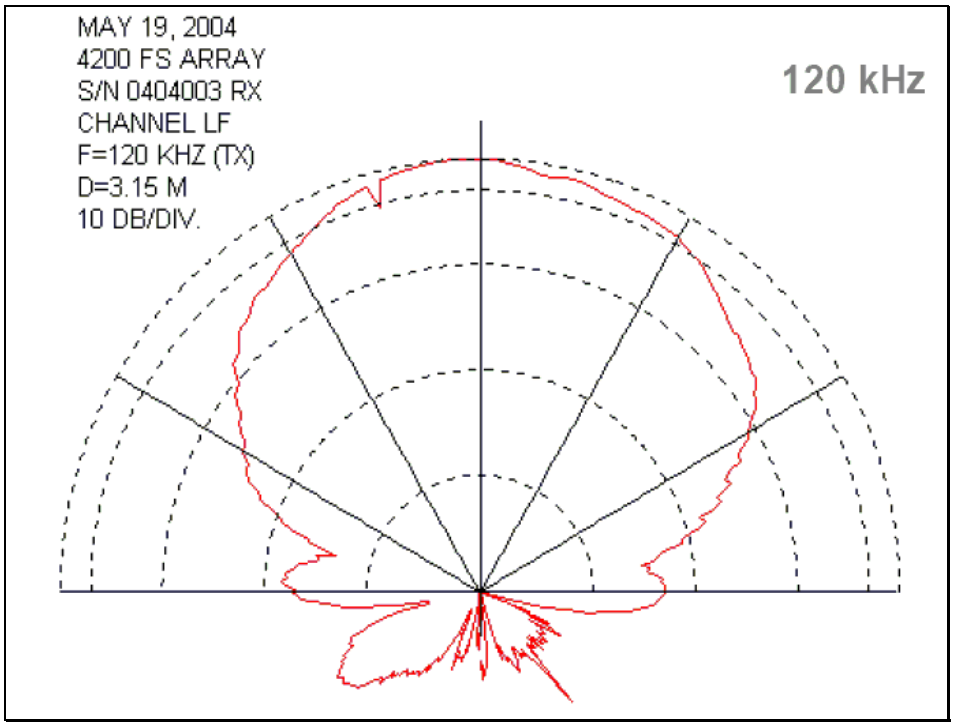
To minimize side lobe interference in the sidescan records, the transducers are mounted as follows:

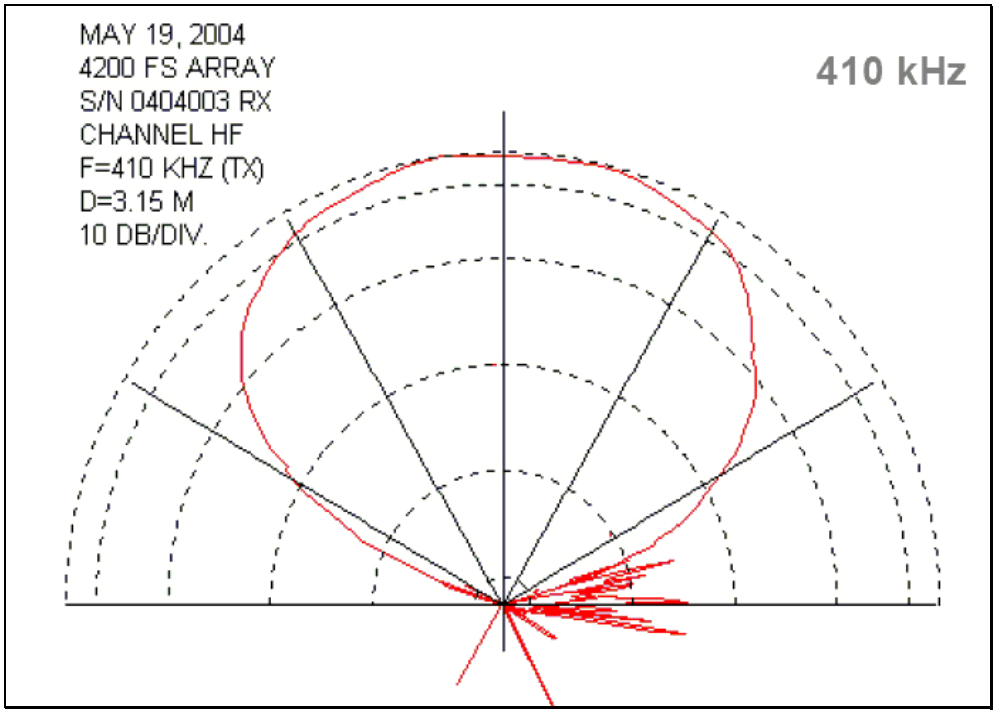
Both transducers are depressed approximately 20 degrees down from horizontal.

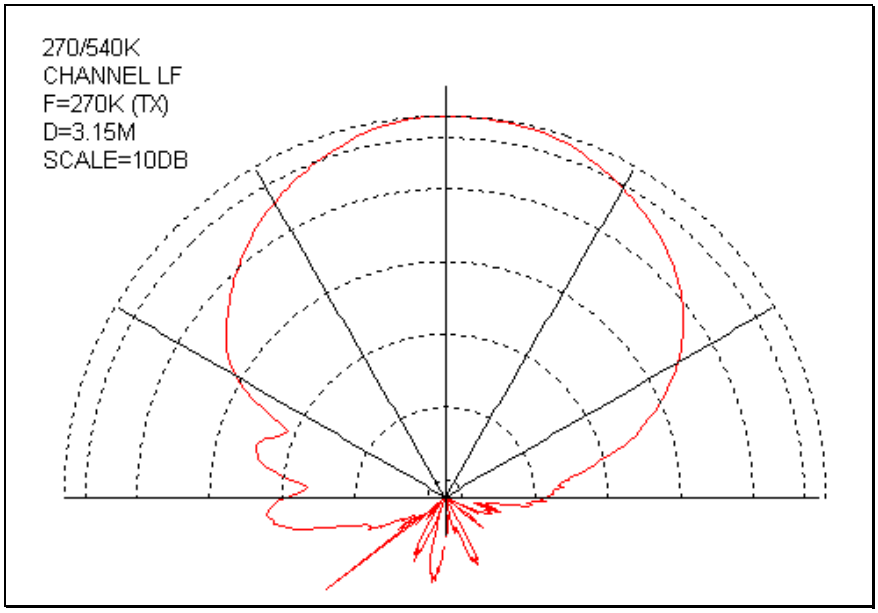
Note: The port and starboard sidescan transducer are identical and can be interchanged as long as the above mounting considerations are followed.

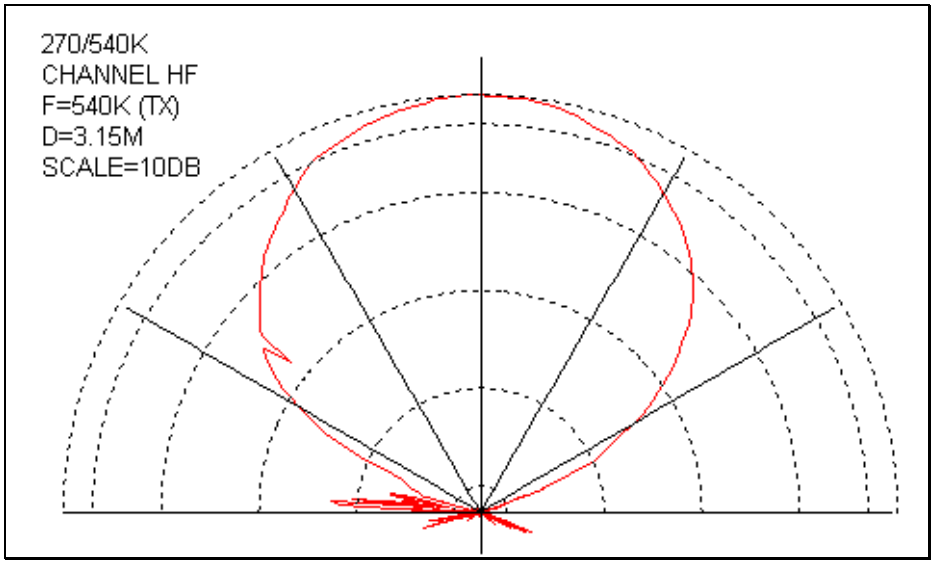
The second drawing shows the beam patterns referenced to the deep tow DT-1 vehicle frame, taking account of these installation details.

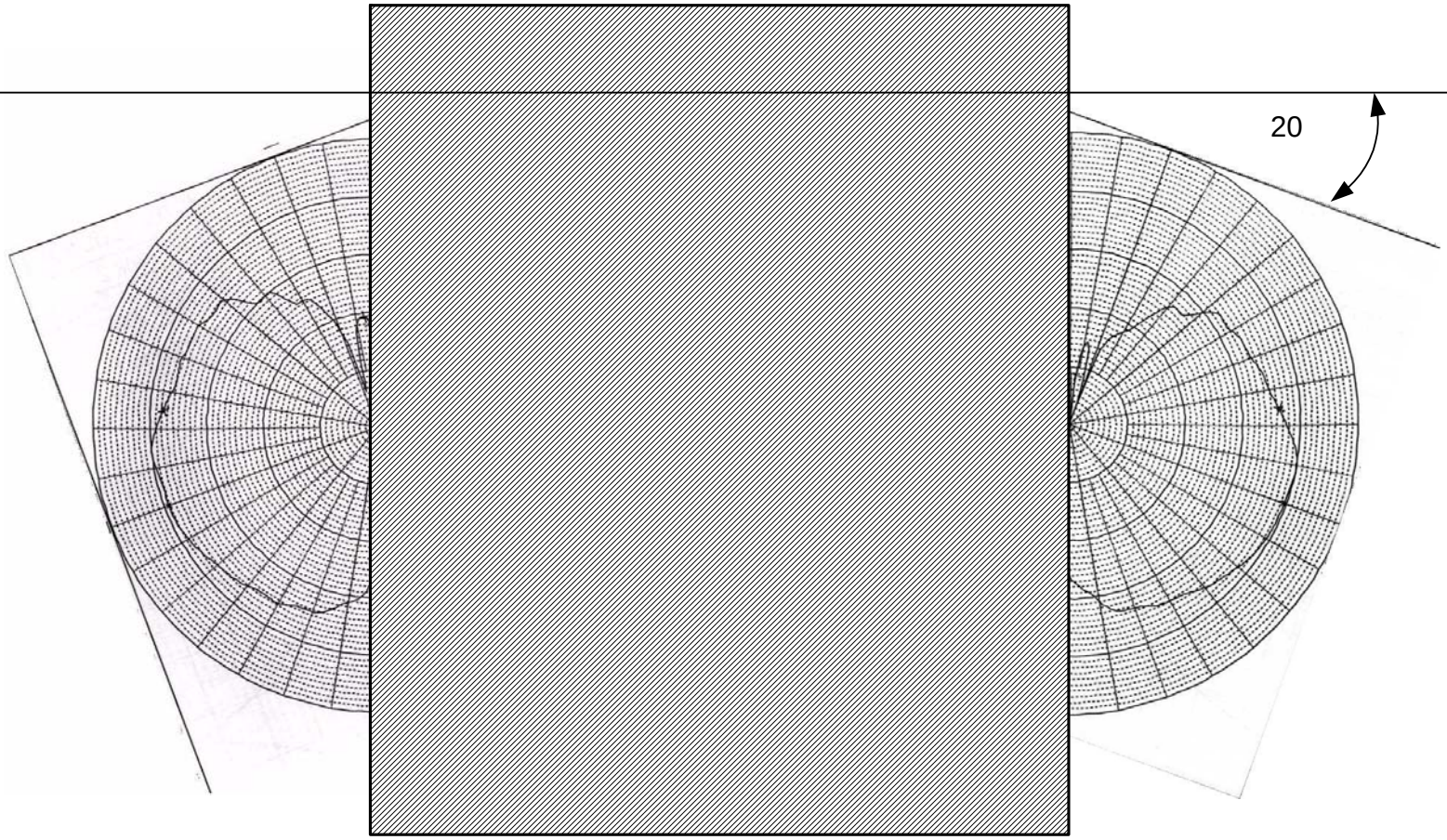
Sample transducer beam patterns in the vertical plane






270/540K
CHANNEL LF
F=270K (TX)
D=3.15M
SCALE=10DB


270/540K
CHANNEL HF
F=540K (TX)
D=3.15M
SCALE=10DB



Sample beam pattern referenced to the DT-1 vehicle frame

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3 SPECIFICATIONS

3.1 Power Requirements and Options

Power Requirements	
Average idle power	65 watts
Maximum idle power	75 watts
Active side scan	Add 3 to 25 watts depending on ping rates and pulse power
Active sub-bottom	Add 1 to 8 watts depending on ping rates and pulse power
Telemetry option	Add 8 watts
Telemetry 400 V option	Add approximately 20 percent to the total
Power options	* 200 to 400 VDC (for use with StarMux telemetry option) * 44 to 56 VDC (nominal 48V) at 8 Amps peak (user provided local power)

3.2 Sensors and Interfaces (Optional):

Temperature:

Internal ambient temperature sensor

Accuracy = 1 degree C

RS-232 interface:

Up to 4 ports available for user options.

Recommended speed is 9,600 bits per second.

Maximum speed is 38,800 bits per second depending on configuration.

Honeywell Motion Sensor:

The optional Honeywell Digital Compass Module (HMR3000) uses magnetic and two-axis tilt sensor to bring pitch, roll and heading information. It communicates with the FS-DW host via an RS-232 link connected to Com 1. A digital copy of the manual and PC demo interface software has been installed in the C drive of the FS-DW/AU. To access, login to PC anywhere and click on the Navigation short cut on the desktop.

***Note**: This magnetic sensor has to be calibrated in order to compensate for Magnetic fields other than earth's field component to get accurate heading. Compass calibration is performed by following the procedure specified by the manufacturer in the manual.*

3.3 Sidescan Specifications:

Modulation: Full Spectrum Chirp FM pulse with amplitude and phase weighting.

The port side sweeps up and the starboard side sweeps down for improved cross talk reduction.

Side Scan Sonar Specifications				
Frequencies	**75/120 kHz**	**75/410 kHz**	**120/410 kHz**	**230/540 kHz**
Maximum Swath Range	**1000/800 m**	**1000/300 m**	**800/300 m**	**500/220 m**
Beam Width two way	**0.8°**	**0.8°/0.5°**	**0.8°/0.5°**	**0.54°/0.34°**
Array Size **Length** **Width** **Depth**	**99 cm (39")** **7 cm (2.75")** **7.6 cm (3")**	**99 cm (39")** **7 cm (2.75")** **7.6 cm (3")**	**78 cm (31")** **7.6 cm (3")** **3.8 cm (1.5")**	**56 cm (22.08")** **3.8 cm (1.5")** **3.12 cm (1.23")**
Array Weight in Air	**16.5 kg (36.5 lbs.)**	**16.5 kg (36.5 lbs.)**	**7.3 kg (16 lbs.)**	**2.6 kg (5.8 lbs.)**
Array Weight in Seawater	**11.6 kg (25.6 lbs.)**	**11.6 kg (25.6 lbs.)**	**5 kg (11 lbs.)**	**1.8 kg (4 lbs**
Array Depth Ratting	**6000 meters**			
Array Depression Angle	**10° to 20° from horizontal, adjustable**			
Power	**48 to 24 VDC**			

Transmit channel electronics:

Number of channels: 4

D/A converter: 10 bit, 3.75 MHz

Receive channel electronics:

Number of channels: 4

A/D converter: 16 bit converter, 938 kHz max. sample rate

TVG amplifier: Custom gain ramp with a 48 dB range.

Total dynamic range: 125 dB.

3.4 Sub-Bottom Specifications:

Modulation: Full Spectrum Chirp FM pulse with amplitude and phase weighting

Source Power: 200 Watts

Source Level: 202 dB re 1 µPa at 1 meter (type)

Receive Sensitivity: -204 dB re 1 Volt/µPa

Receiver Variable Gain: 27 - 75 dB, automatic or manual control

Total Dynamic Range: 125 dB

Ping Rate : 10 Hz maximum

Sub-Bottom Profiler Specifications			
Sensor Model	**DW-106**	**DW-216**	**DW-424**
Frequency Band	**1-6 kHz**	**2-16 kHz**	**4-24 kHz**
Pulse Selections*	**1-6, 2-6, 1.5-4.5 kHz**	**2-16, 2-12, 2-10 kHz**	**4-24, 4-20, 4-16 kHz**
Resolution	**15 –25 cm**	**6 – 10 cm**	**4 – 8 cm**
Beam Width	**28° - 36°**	**15° - 25°**	**15° - 25°**
Transmitter Size (approximate) **Height cm** **Diameter cm**	 **31.8** **26**	 **28** **19**	 **19** **12.7**
Hydrophone Size (each) **Length cm** **Width cm** **Depth cm**	 **82.8** **7.6** **6**	 **54.6** **7.6** **3.8**	 **33.6** **2.5** **2.5**
Transmitter Weight **in Air (with plate)** **in Air (without plate)** **in Salt Water (with plate)** **in Salt Water (without plate)**	 **40 kg** **33.9 kg** **21.8 kg** **14.4 kg**	 **20 kg** **14.1 kg** **8.8 kg** **7 kg**	 **10 kg** **7 kg** **4.3 kg** **4 kg**
Hydrophone Weight **Array in Air (with plate)** **Each in Air (without plate)** **Array in Saltwater (with plate)** **Each in Saltwater (without plate)**	 **12.8 kg** **4.5 kg** **7.4 kg** **0.4 kg**	 **8.6 kg** **1.4 kg** **5.2 kg** **0.3 kg**	 **6 kg** **0.9 kg** **3.2 kg** **0.2 kg**
Sensor Depth Ratting	**6000 meters**		
Power	**48 to 24 VDC**		

Note: Custom pulses with different bandwidths and lengths can be ordered for special applications.

4 MECHANICAL DESCRIPTION AND MAINTENANCE

4.1 Pressure Vessel

All the data acquisition and processing components for the system are mounted within a mechanical chassis housed inside an aluminum pressure vessel. The general design concept for the mechanical chassis is to have the principle electronics mounted within an enclosure, then apply a steady stream of airflow across the components. The heat generated by the electronics is carried away in the airflow and then dissipated to the seawater by channeling the airflow between the outer surface of the chassis and the inner bottle wall. The heat dissipation through the wall thickness of the pressure vessel is relatively significant and thus allows the system to run reasonably cool even when not operating in water.

In FS-AU systems, the system hard drive is located behind the DC/DC converters on the underside of the chassis. Special care has been taken to shock mount this device in order to avoid excessive vibration. If the dual mass storage option is chosen these additional drives will consist of two small laptop drives which will be mounted on a standard circuit board in the same area as the other electrical boards. The FS-DW variant of the system has the hard drive mounted on the chassis extension, underneath the StarMux modem components. These provide a bi-directional telemetry link to the topside. It is also a means of communicating with the pressure vessel for debug and diagnostic purposes.

In FS-DW systems, mounted to the rear of the chassis assembly, is a large capacitor bank and a round circuit board with two 400-48v DC/DC converters. This subassembly is used to regulate the voltage being sent from the topside to the electronics in the pressure vessel, and is part of the Starmux Telemetry option. In some older systems these components may be mounted on the rear end cap of the pressure housing.

For a description of the functioning of the system, refer to Section 2.1

4.1.1 Dimensions and weight

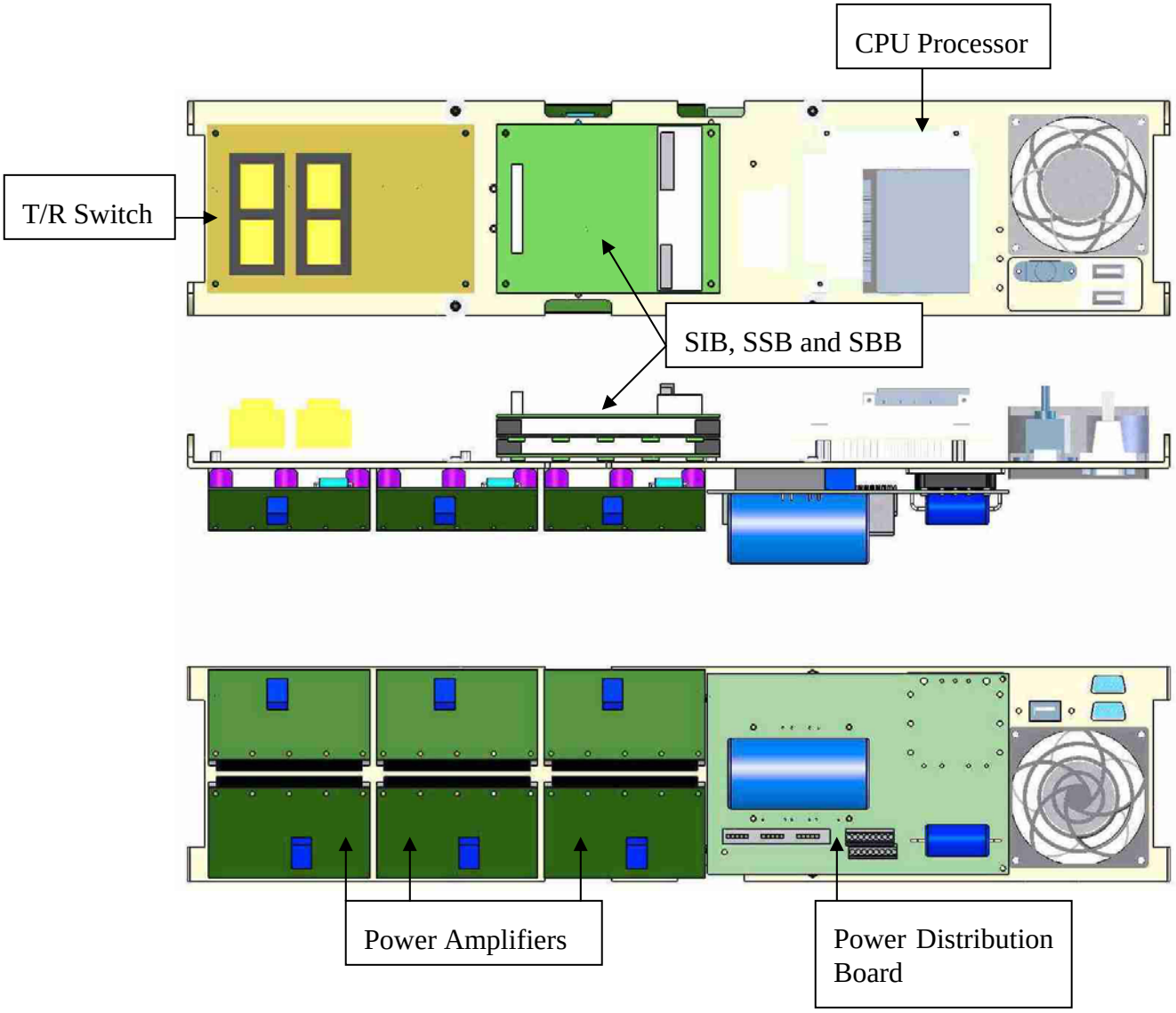
FS-DW & FS-AU Specifications	
Time Sync In – Hardware	**TTL level, minimum 5 µs pulse, triggers on negative edge, normally 1 PPS**
Time Sync In – Software	**Via Ethernet port, 10 ms accuracy**
Trigger In - Software	**Via Ethernet port, 10 ms accuracy**
Triggers Hardware	**3 Programmable in/out TTL levels**
Trigger Types	**Internal, External, Coupled, Gated**
Attitude Sensor Option	**Heading Accuracy: < 1.5° RMS Heading Resolution: 0.1° Roll, Pitch Angle Accuracy: ± 0.4° Roll, Pitch Angle Repeatability: 0.2° Roll, Pitch Resolution: 0.1°**
Options	**USBL Acoustic Tracking System RS-232 Ports (4 or 6) bi-directional 19.2K Baud Power Out 12, 24, 48 or 400 VDC 400 watts Local Mass Storage Most Customer Specified Sensors**
FS-DW 3000 meter Housing	

Size OD, ID, L(cm)	**25.4, 20.32, 101**
Weight In Air (Kg)	**66.22**
Material	**6061-T6 aluminum housing (Titanium optional)**
FS-AU 3000 meter Housing	
Size OD, ID, L(cm)	**25.4, 20.32, 66.1**
Weight In Air (Kg)	**58**
Material	**6061-T6 aluminum housing**

4.2 Chasse Options

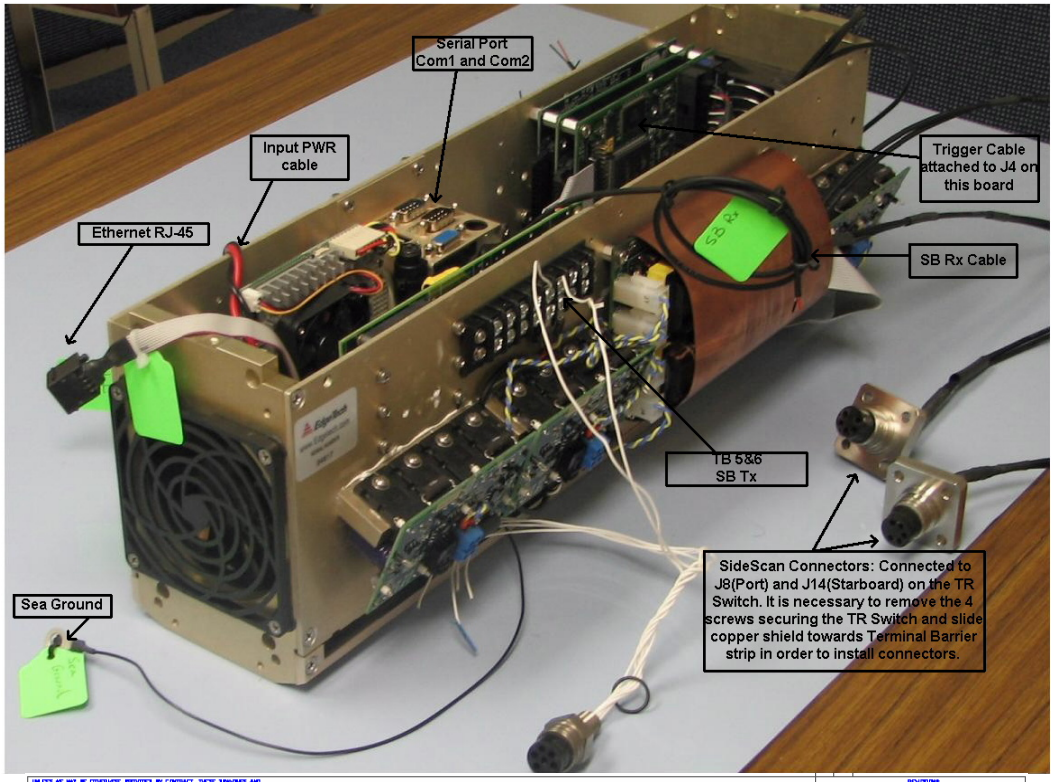
4.2.1 5" Chassis

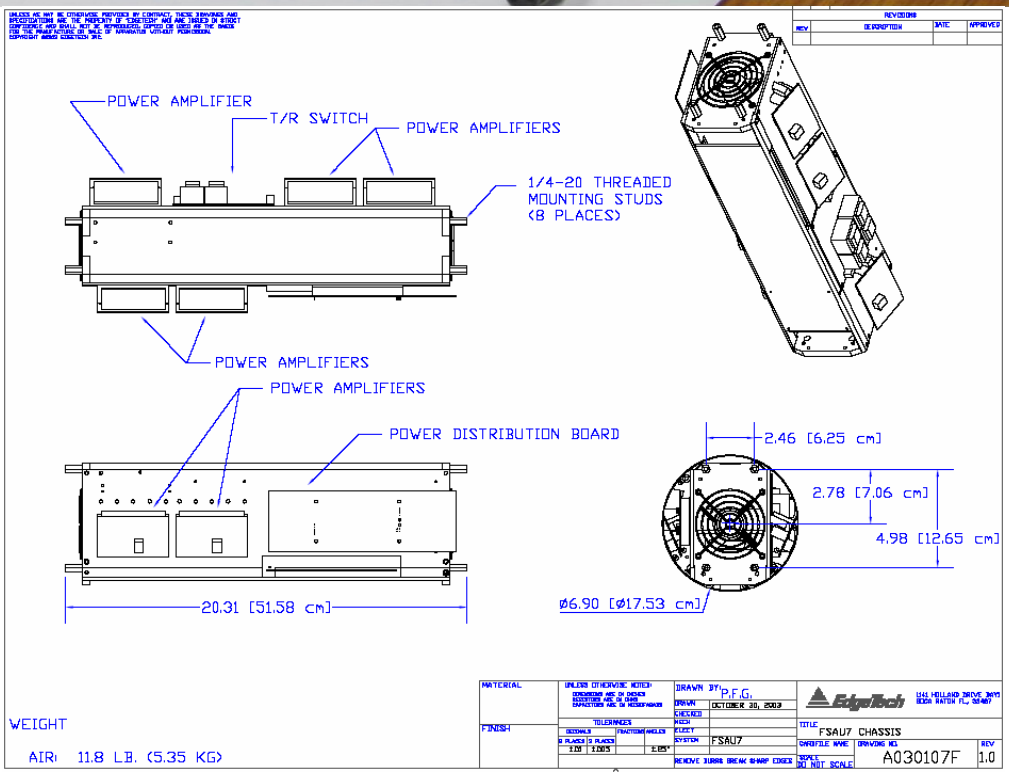
EdgeTech supplies all the components of a 2200-S system mounted on a chassis 22" long that can fit within a 5" ID (inside Diameter) housing.



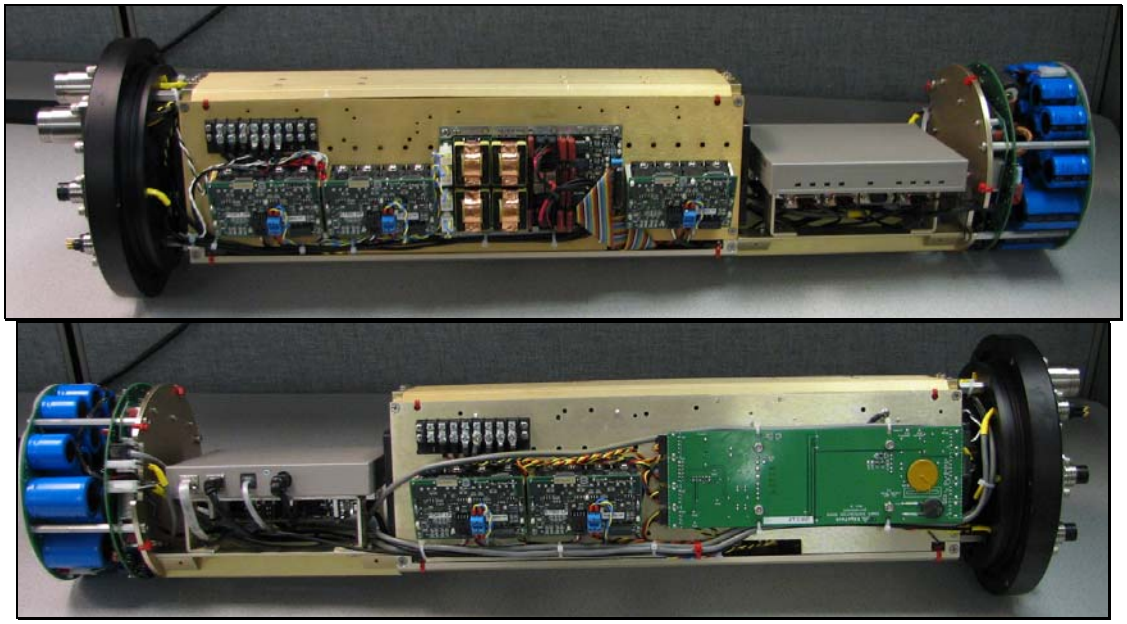
4.2.2 7" Chassis

Alternatively, EdgeTech can offer a chassis that fits inside a housing 7" in diameter.





Chassis With Out StarMux

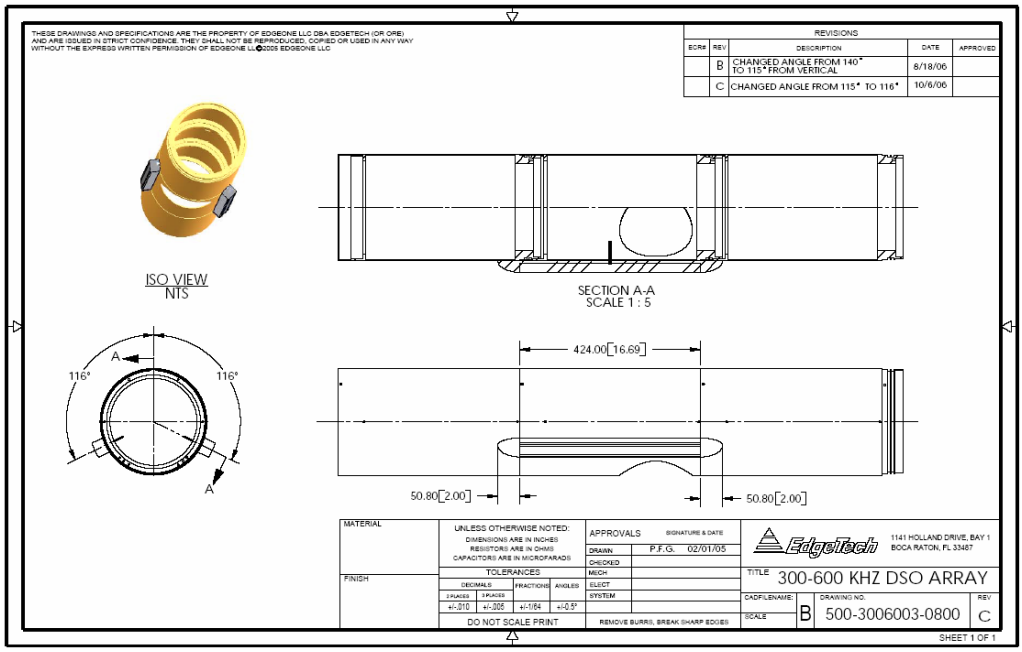


Chassis With StarMux

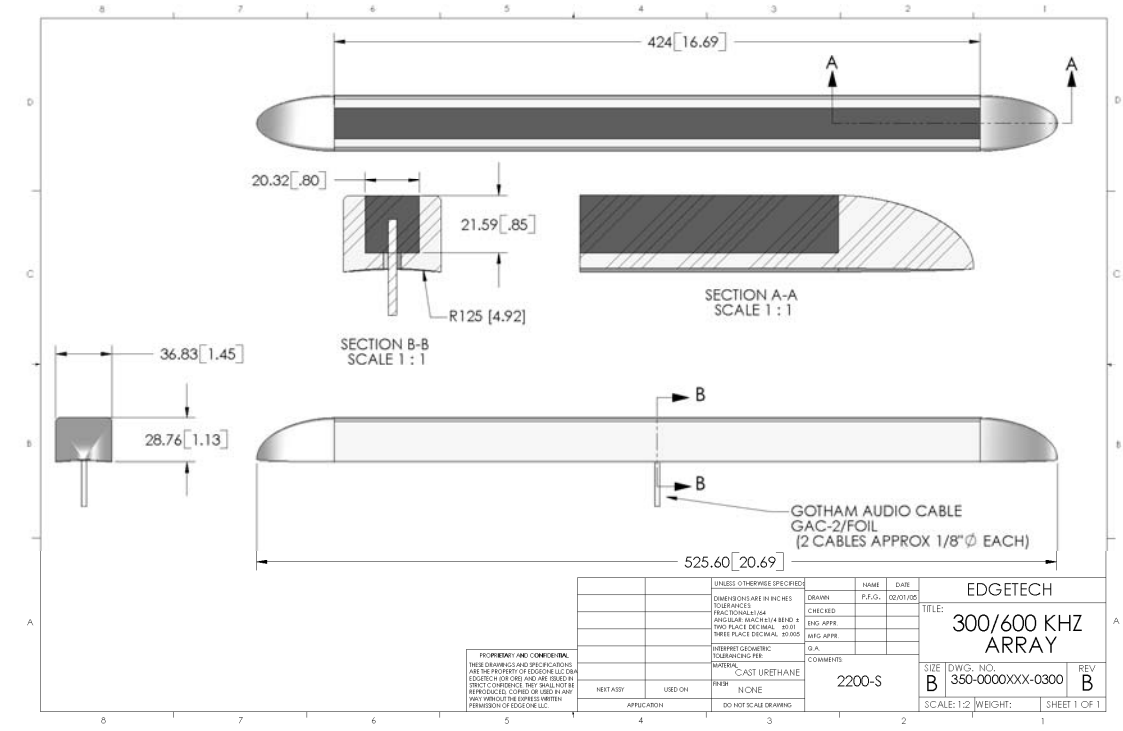
4.3 Side Scan Array Mounting

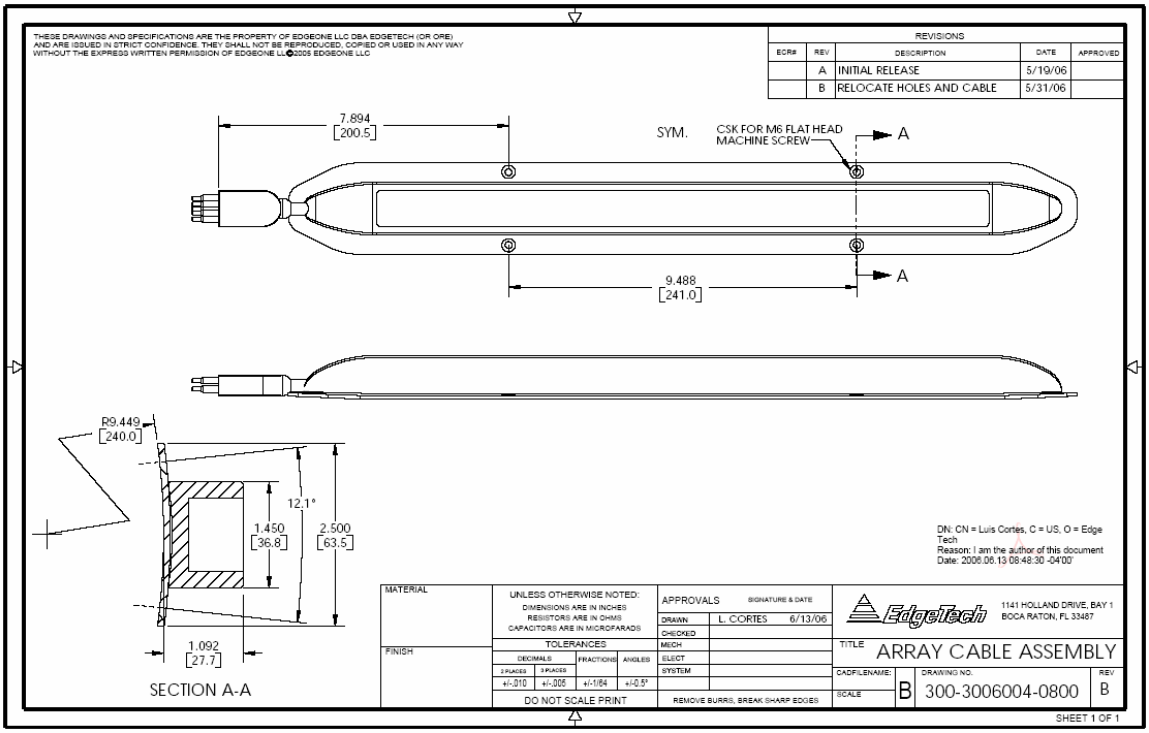
In most cases the side scan arrays will be glued to the side of the AUV (permanent installation). A fairing is provided to add buoyancy, to smooth flow of the water over the array and for some protection to the array. When the side scan array is glued to the side of the AUV a pig tail from the back of the array penetrates the AUV for a direct connection to the electronics. No underwater connectors are needed.

Alternatively, the client might use the typical way of underwater bulkhead connectors going through and end cap and the arrays are bolted to the AUV. The side scan arrays supplied with the system are identical and interchangeable between port and starboard sides.



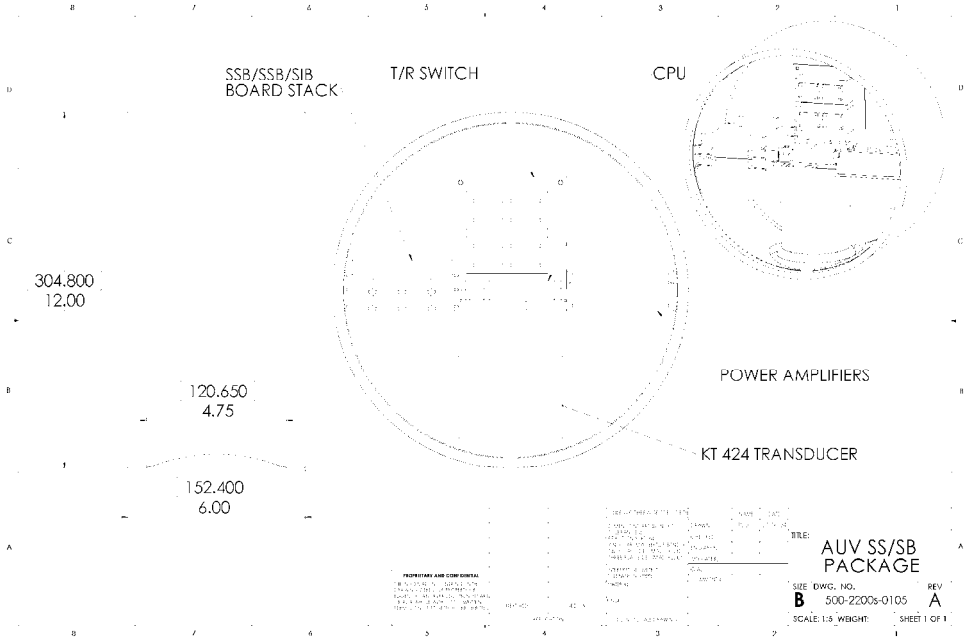
CAUTION: When mounting the arrays on an ROV or AUV the serial numbers should be up, this means the cable gland should be pointing port side forward, and starboard side aft.

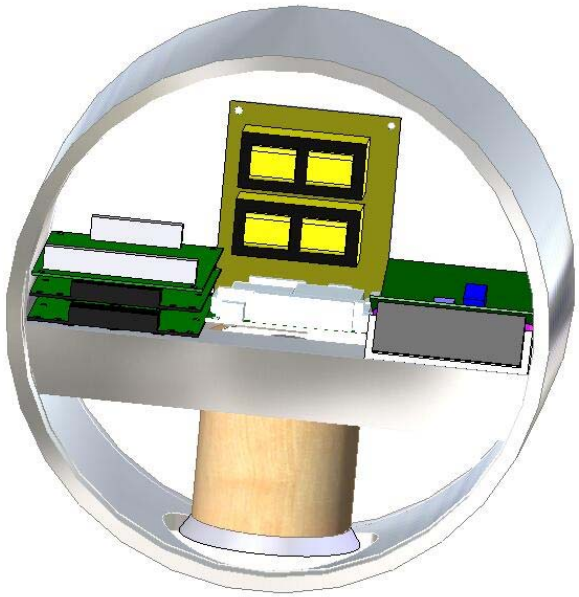


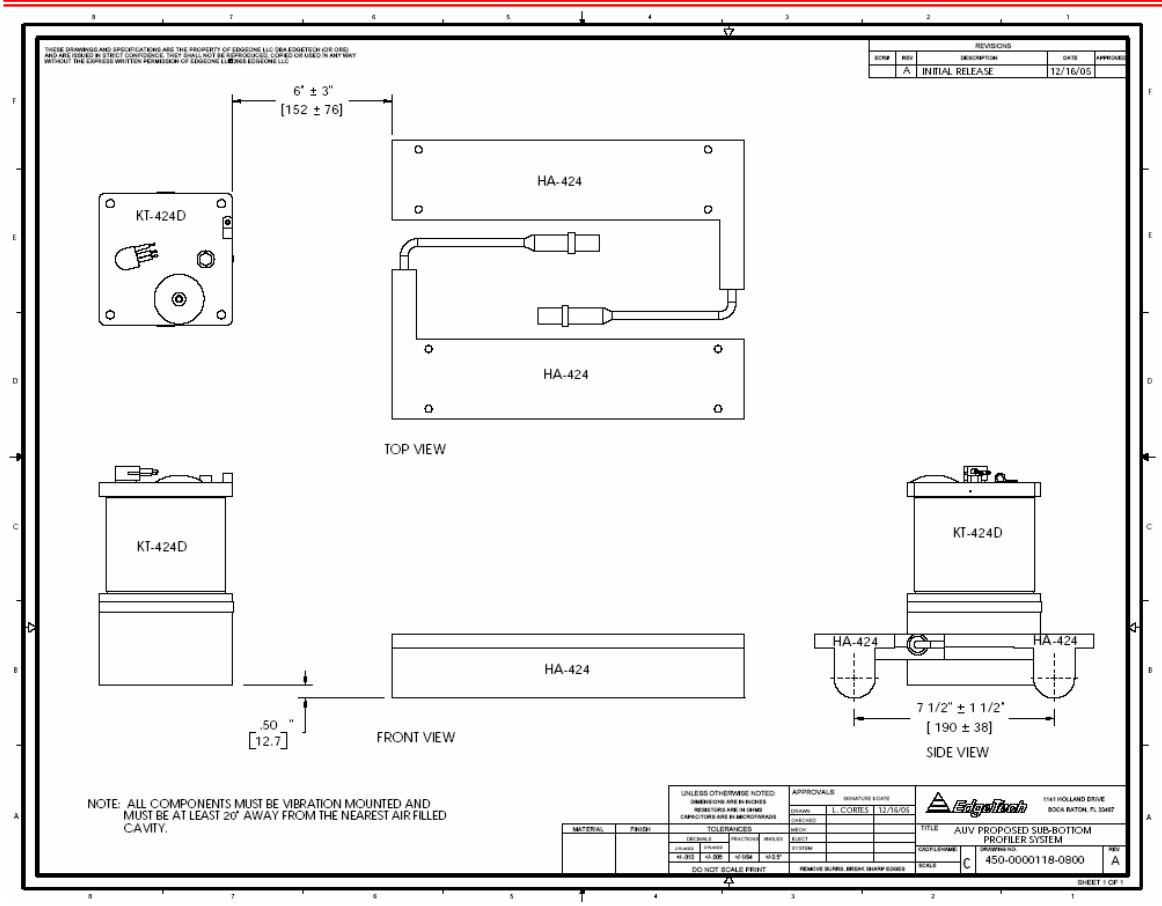


4.4 Sub-Bottom Transducer Mounting

For configurations where the host AUV is providing the different voltages and there is no room to mount the Sub-bottom hydrophones, the sub-bottom transducer could be housed in a 4-5 inch long payload section and act as receiver and transmitter via a T/R switch. In most application a transmitter and 2 receivers are used.







4.4.1 4-24 Sub-Bottom Sensors

Frequency : 4-24 kHz
Range : > 200 m
Beam Width @-3dB: < 25°
Receiver sensitivity: -187 dB re 1Volt/Micro Pa
Max. Update : 10 pings/sec.
Depth Resolution : 4 cm
Maximum operating depth : 300 m

4.5 Towing Considerations

In order to generate good imagery, the pitch of the vehicle (nose up or nose down) must be less than 1/2 the -6 dB beam width of the acoustic pulse, at its highest frequency. The rule of thumb is for a 0.5-meter long receiver; the -6 dB beam width at 10 kHz is 20 degrees. For example, if you are transmitting a 2 to 15 kHz FM pulse using a 0.5 meter long receiving array (DW-216), you must keep the vehicle from pitching more than 6 degrees in either direction (1/2x20°x10kHz/15kHz). The same applies to vehicle rolling.

Rough sea conditions will tend to move the vehicle up and down vertically causing oscillations in the images. A heave sensor may be mounted inside the vehicle and connected directly to the pressure vessel (optional) to remove the vehicle motion from the Sub-bottom sonar data.

4.6 Maintenance Recommendations

4.6.1 Sensors & Cable

After each deployment rinse the sensors and all cables with fresh water. Before each mission clean the transducers' radiating surface with mild detergent. This will ensure wetting of this surface, which will improve acoustic coupling to the water.

4.6.2 Underwater connectors

To extend the life and increase the reliability of the connectors, apply a thin film of silicone dielectric grease to the entire surface of each male pin. Grease should also be applied at the entrance of each female socket. Re-lubrication is recommended every three to five mating cycles. The use of Novagard G624 silicone compound or equivalent is recommended for lubrication.

Inspection should be performed regularly to check for corrosion on the contacts. Any corrosive build up may be removed from the male contacts by using no less than #800 wet/dry emery paper cut in strips slightly less than or equal to the width of the contact and rubbing lightly. A pencil eraser can also be used with similar results. Female sockets may be cleaned using a cotton swab and rubbing alcohol. A .22 caliber bore brush with only nylon bristles may be used to remove light corrosion. Remember to always install the dummy connectors on all unused connectors.

4.6.3 Subconn Connectors Handling Procedure

The following handling procedure should be adopted to get the best out of your connectors:

- The connector should not be exposed to long term heat or sunshine
- If this occurs, and the connector is very dry, soak in fresh water before use.
- Ensure the connectors are lubricated, use a high quality silicone grease - but use sparingly. Half a match head dose per contact is adequate.
- Any accumulation of sand or mud in the female contact should be removed with fresh water. Failure to do so could result in the splaying of the female contact and damage to the O-ring seals.
- Do not over tighten the bulkhead nuts.
- Do not disconnect by pulling on the cable and avoid sharp bends at cable entry.
- When using bulkhead connectors see that there are no angular loads as this destroys the connector.
- When disconnecting, pull straight, not at an angle.

4.7 Pressure Vessel Maintenance

General maintenance on the pressure vessel can be achieved by carefully inspecting the outer surfaces for damage and cleaning the bulkhead connectors according to the procedure described above. Also rinse off the pressure vessel and other sensors with fresh water after each mission. The bolts for the connectors and the pressure relief port should be checked after each mission to ensure they are secure.

It is VERY important to wait at least 3 minutes after powering the system down before disconnecting the power / telemetry cable. The capacitor bank in the bottle will take approximately 2.5 minutes to drain down from the 400V it stores. Failure to wait the required 3 minutes could result in a potentially serious electrical shock.

Just prior to opening the end-cap remove the pressure relief port in the front end-cap using a 7/16 (11mm) wrench. This will allow the pressure in the housing to equalize with the atmospheric pressure.

To open the pressure vessel first:

1. Use the same socket head bolts holding the end-cap on, to push the end-cap off. To do this remove the bolts from their original holes and rotate them 60 degrees to the adjacent holes.
2. Screw the bolts into the threaded holes in the end-cap until they encounter the bottle.
3. Turn the bolts evenly and slowly, in an alternating fashion, until the end-cap can be removed. It is very important the end-cap is removed evenly to prevent the plug, portion from galling against the o-ring surface of the housing.
4. Once the end-cap is free from the bottle slowly pull the electronics chassis, bolted to the end cap, out of the bottle approximately 3 inches.
5. Section 5 & 6: Older FS-DW Systems only (Note these steps are only applicable to older systems shipped prior to May 2001)
6. Disconnect the two cables, which provide power from the capacitor bank to the chassis. These cables are tucked up between the front end cap and the chassis. One connection is via a 6 way cable connector and the other via a 9 way connector.
7. Once the cables are disconnected the electronics chassis can be fully removed from the housing. The rear end cap can be removed in the same manner. The cables may be freely withdrawn.

Having the electronics chassis removed from the housing provides opportunity to perform a general inspection of the connections, cables and cards within the enclosure. With the electronics chassis resting on a stable platform take off the top cover by removing the 4 8-32 x 3/8" Philips head screws located at either end of the top plate. Then carefully look over the connections and cable routing to ensure their integrity was maintained during the mission. The more susceptible connectors have zip ties securing them in place. Pay special attention to these connections. Then in general inspect the cables external to the chassis for any signs of wear and check that all the cards are well seated.

When the inspection of the electronics has been completed, reinstall the top cover, then perform a careful inspection and cleaning of the seal areas. When cleaning these areas ensure any salt deposits or other small debris, as well as the o-ring lubricant is completely removed. In addition to the seal areas it is important to clean the inside surfaces of the mounting holes around the perimeter of the end cap. This is necessary to prevent salt deposits and other debris from falling onto the face seal area during assembly. To clean these areas use a small nylon bristle brush or a cotton swab.

After cleaning allow the surface to dry completely then reapply a thin film of high quality, high pressure o-ring lubricant to the new o-rings as well as the seal areas on the housing. It

may be easier to first slide the new o-rings over the electronics chassis, and capacitor bank for the front and rear end caps respectively then apply the o-ring lubricant. This will help keep any debris from adhering to the lubricant during the installation process.

When all inspection, cleaning, re-lubrication, o-ring replacement and installation has been completed the pressure vessel is ready to assemble.

This next section only applicable to older FS-DW Systems shipped prior to May 2001, requiring re-assembly of the rear end cap.

When installing the rear end cap notice there is a small "l" on the outer diameter of the end cap and a matching "l" on the outer diameter of the housing. Ensure these marks are lined up then gently press the end-cap into the housing up to the base of the bore seal. Next insert the socket head bolts into the clearance holes in the end-cap and thread them into the housing. Then gently pull the end cap on by slowly and evenly tightening down on these bolts, again in an alternating pattern. Periodically check the end cap is going on straight. There could be a reasonable amount of resistance since the new o-rings will be more resilient to compression that the old ones. Tighten the bolts to xx lbs. torque, when the bolts are tight there should be no sign of daylight at the interface of the end cap and housing. Reach inside the housing and route the two cables coming from the rear end cap up along the right side of the housing.

Next replace the desiccant on the rear of the chassis with one of the spare desiccants provided. This step should be done just prior to installing the chassis into the housing as to minimize its exposure to the elements. Now line up the "T" stamped on the front end-cap with the "T" stamped on the housing. Then gently slide the electronics chassis into the housing while carefully routing the two cables from the end cap on the right underside of the chassis. Insert the chassis until there is approximately 3 inches remaining. Then connect the two cables from the end cap and return them to their original position, tucked up between the front end-cap and the chassis. Next push the assembly into the housing up to the base of the bore seal. Then close according to the procedure outlined for the rear end-cap.

Next replace the desiccant on the rear of the chassis with one of the spare desiccants provided. This step should be done just prior to installing the chassis into the housing as to minimize its exposure to the elements. Then gently slide the electronics chassis into the housing. gently press the end-cap into the housing up to the base of the bore seal. Next insert the socket head bolts into the clearance holes in the end-cap and thread them into the housing. Then gently pull the end cap on by slowly and evenly tightening down on these bolts, again in an alternating pattern. Periodically check the end cap is going on straight. There could be a reasonable amount of resistance since the new o-rings will be more resilient to compression that the old ones. Tighten the bolts to xx lbs. torque, when the bolts are tight there should be no sign of daylight at the interface of the end cap and housing..

The final step in the assembly procedure is to replace the pressure relief port.

As there is only one sealing surface for this port BE SURE TO INSPECT "O" RING AND MATING SURFACE. These should be free of any nicks, cuts or other signs of damage. Replace and lubricate O ring if in doubt.

The system is now ready for use.

5 ELECTRONICS

The main components of the FS-DW chassis are described in greater detail below.

5.1 CPU

PC-104 processor

This is a high performance single board computer complete with the following:

- Ethernet (10/100) interface for input / output
- Diagnostic Support via Keyboard / Mouse / VGA connectors
- 2 RS-232 connections
- 2 USB 1.0
- IDE interface
- Compact Flash

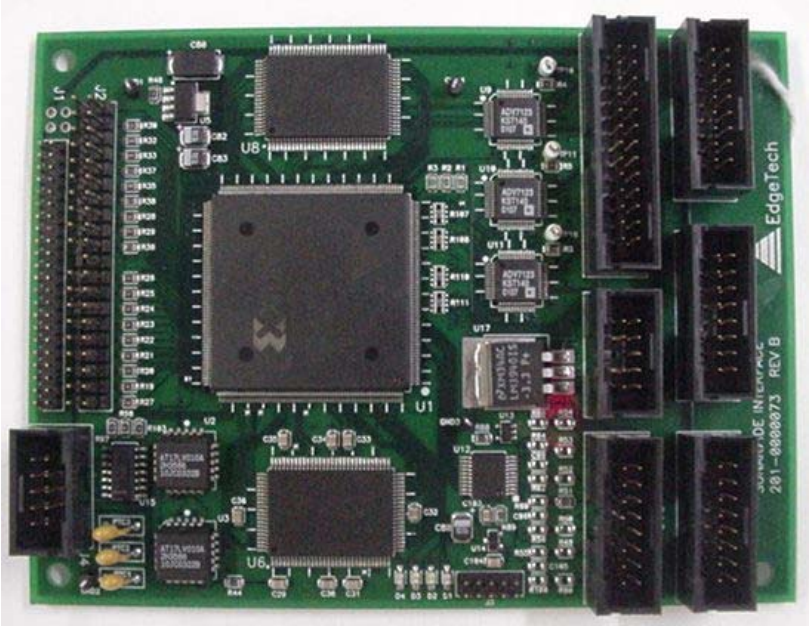
Connection of VGA monitor, Keyboard and Mouse are only required for detailed diagnostics. The only normal connections made to the CPU are IDE, Com1, and Ethernet.

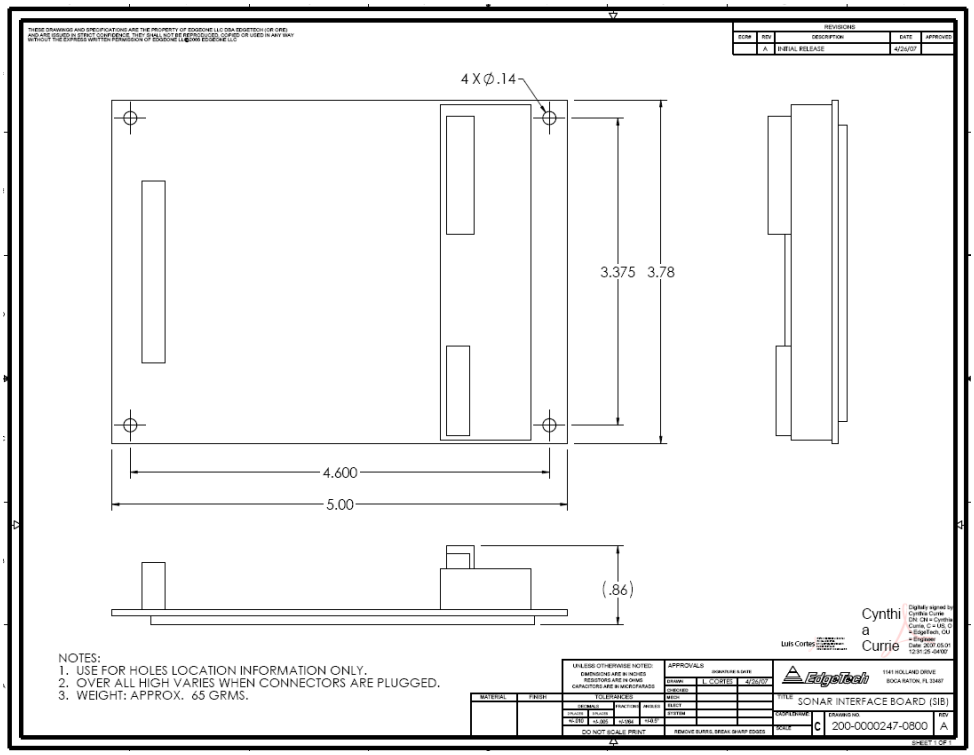
5.2 Tiger Board Set

The Tiger board set consists of a Sonar Interface Board, a Side Scan Board and a Sub-Bottom Board. The main components on the Card are:

5.2.1 Sonar Interface Board (SIB)

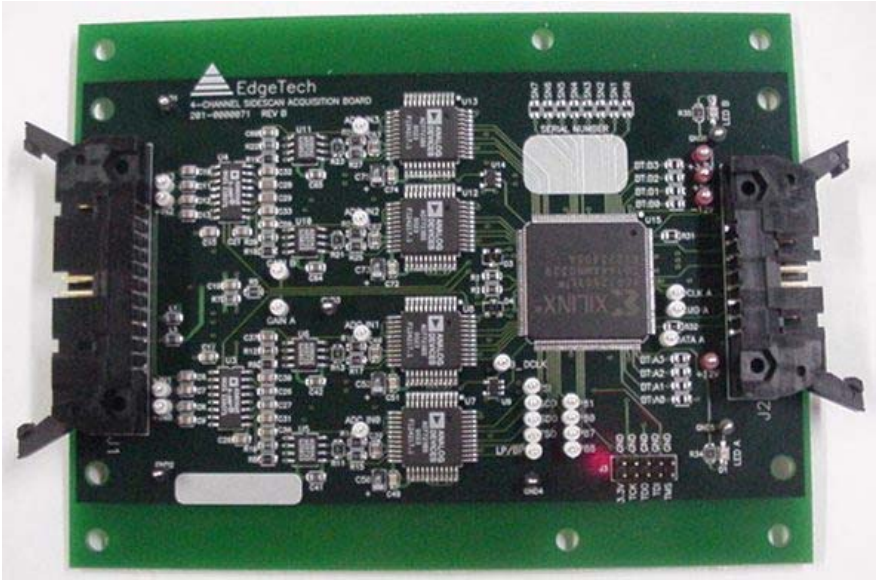
The SIB is a High Speed Digital to Analog converter with up to 6 channels of data (2 Sub-bottom, 2 Side Scan High, 2 Side Scan Low). It is programmable with variable gain pre-amp stage for all channels for ultra wide dynamic range. The SIB includes three external trigger inputs and outputs.





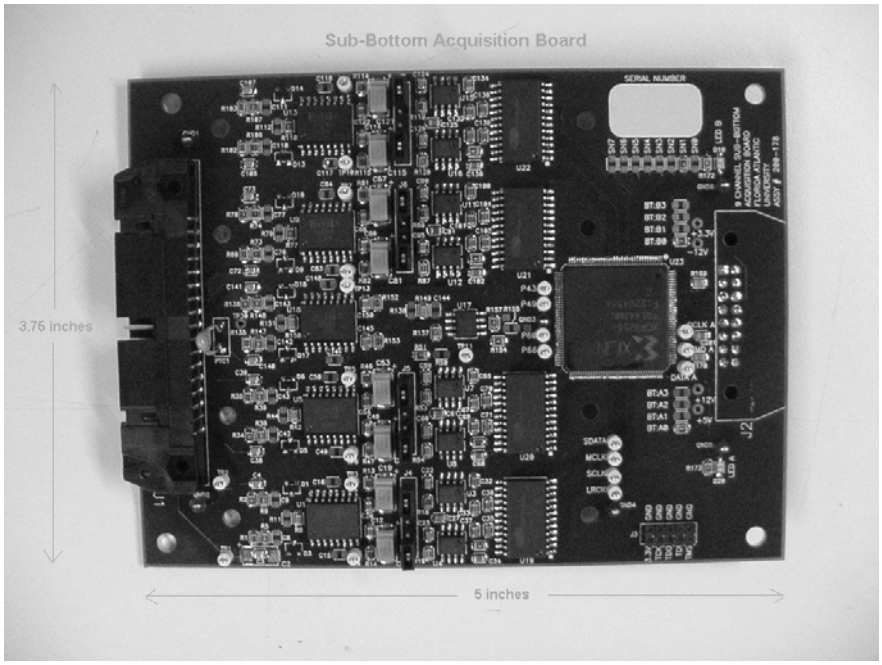
5.2.2 Side Scan Board (SSB)

The SSB performs the analog to digital signal processing for the receive signal from the Side Scan hydrophones.



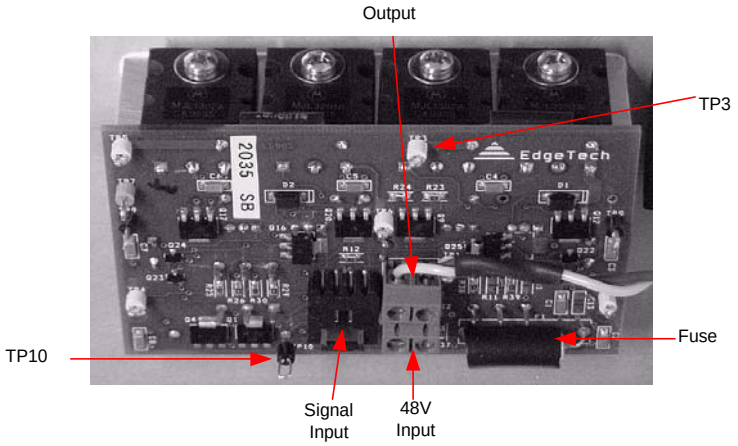
5.2.3 Sub-Bottom Board (SBB)

The SBB performs the analog to digital signal processing for the receive signal from the Sub-Bottom hydrophones. This board also tests the power loop back of the transmit signal from the power amplifier.



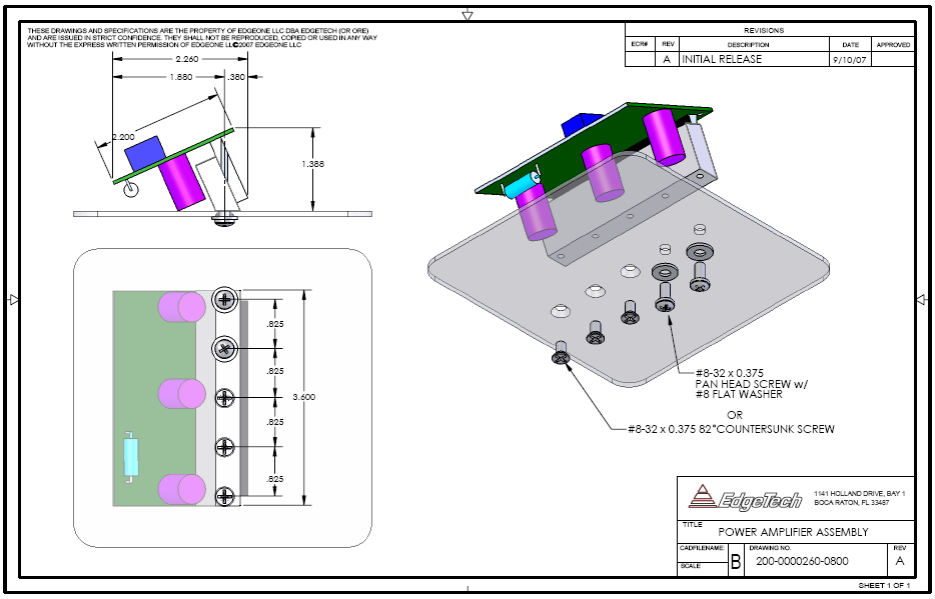
5.3 Power Amp

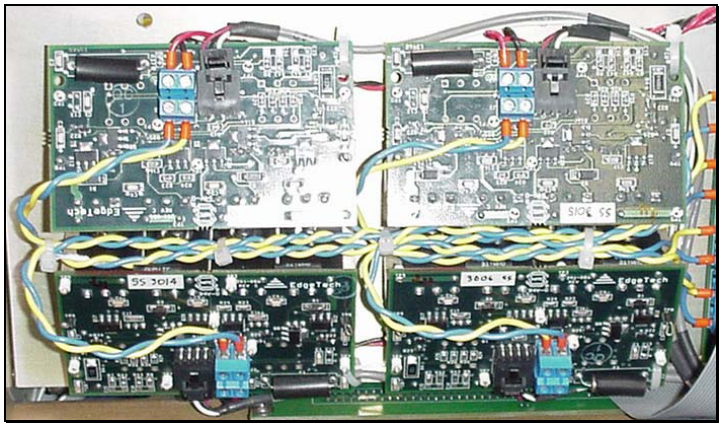
Each power amp is housed on a separated circuit card of approximately 2 inches by 3.5 inches. There are slight variations in the internal electronics depending on the frequency band being driven (SB, SSL, SSH). Each power amplifier is marked either SSL, SSH or SB.



A power amplifier card is illustrated below:

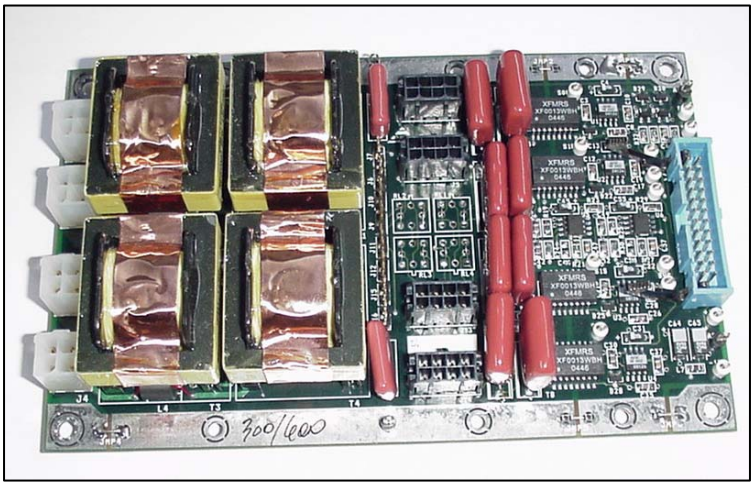
The fuse is a 5 amp slow blow. This can be tested, by checking for 48Vdc on the right hand side of the fuse, when viewed as above.

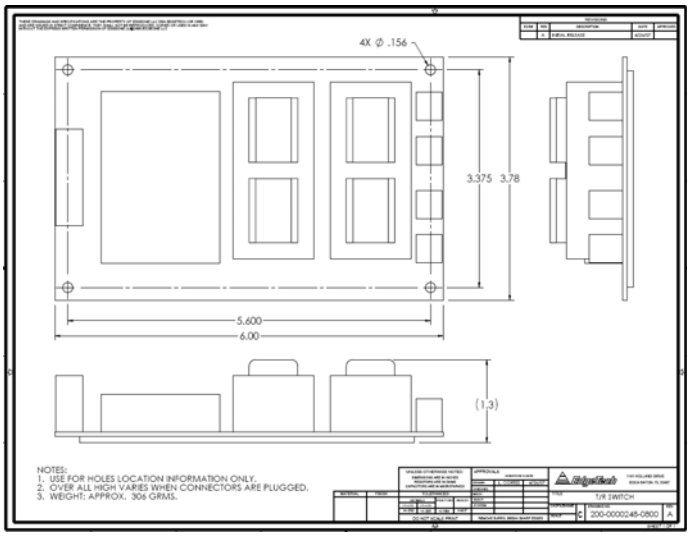




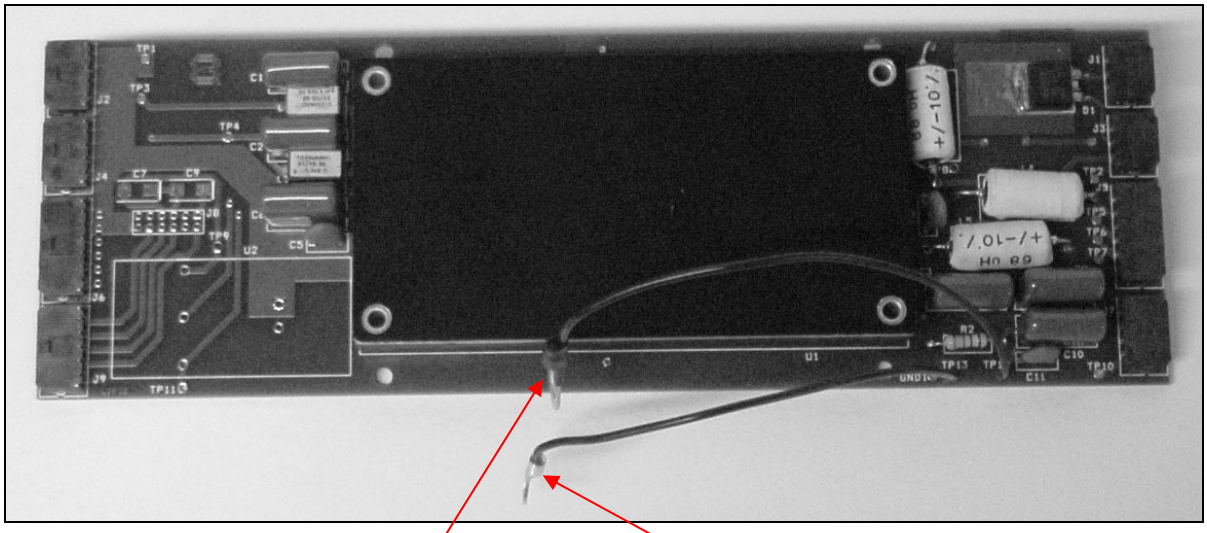
5.4 T/R Switch

The T/R Switch is mounted on a plate common to the 5 power amplifiers. The Power Amplifier inputs are on the left, and the 2 connections to the sidescan array connectors (J1 &2) are as shown. The amplified signals are sent to the Side Scan Board via JP1.



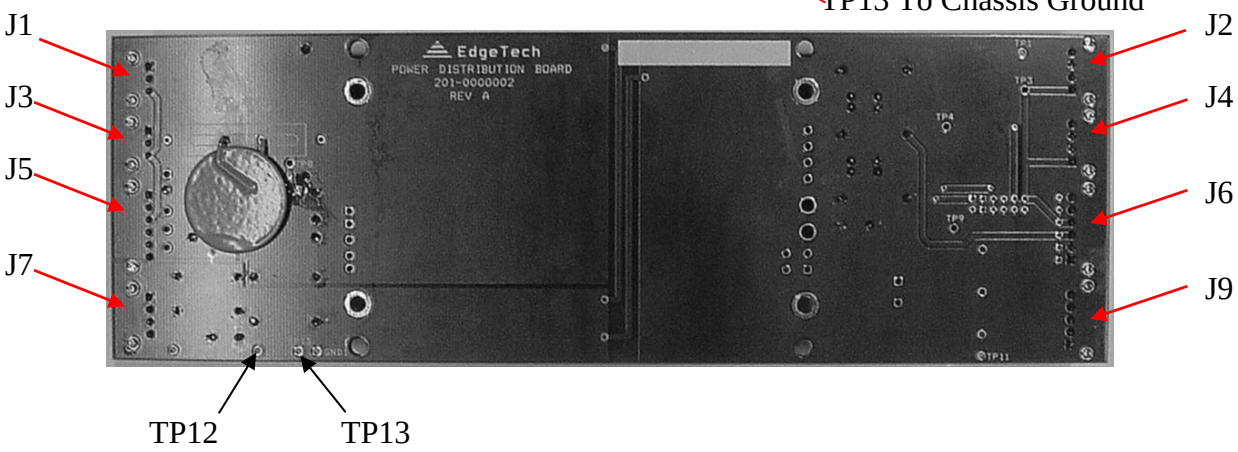


5.5 Power Distribution Board



TP12 To Pressure Housing Ground

TP13 To Chassis Ground



7" Chassis Power Distribution Board

The Power Distribution Board provides most filtering, noise isolation, fusing, surge limiting, and connection points for +48 volt power distribution within the sonar system. The board also provides +5V, +12V, and –12V for the various circuit boards and disk drives, etc. It can optionally be configured to provide various positive and negative voltages to low power subsystems at 5 to 10 watts by special order.

J1 and J3 are for applications where the user supplies regulated 48V to power the sonar. Each of these inputs has steering diodes to isolate the power sources and provide polarity protection as well as a 20 amp reset-able fuse. J5 connects to the Edgetech 48V power source if applicable and the 48V energy storage capacitor bank. J7 provides low noise 48-volt power to sensitive components that may degrade sonar performance if noise is high. J7 must not be used by non-EdgeTech devices.

J2 and J4 are connected in parallel and provide +5V and +12V to disk drives and similar devices. J6 provides +5V, +12V, and –12V to the passive back plane and other electronics. J9 is the connection to the optionally configured voltages and has about 5 to 10 watts available depending on the voltages required.

TP12 must be connected to the pressure housing and TP13 must be connected to the internal chassis. These connections provide noise control for the sonar and the telemetry subsystem if installed and connects the pressure housing through an RC network.

6 SOFTWARE

This system comes with a Sonar Application, Discover Side Scan and Sub-bottom Software, our diagnostic software J-Star, and Sonar Simulator. The software manuals for both Discover Side Scan and J-Star are included with both of these software applications.

6.1 Discover

EdgeTech's Discover Sonar Software is a processing software package for combined side scan and sub-bottom profiler sonars. It is part of a family of sonar control, image processing, display, storage and printer control for the EdgeTech family of Sub-Bottom Profilers and Side Scan Sonars. Please refer to Discover manual for more in depth user directions.

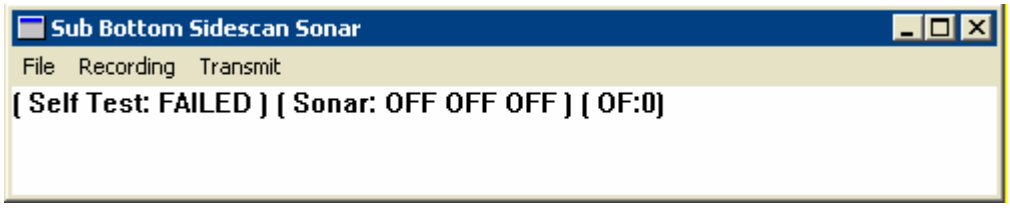
For a FS-DW (ROV and Deep Towed Systems) – Discover is completely set up and licensed, it runs on the EdgeTech topside provided. Data is piped up the telemetry link and stored in the top side processor.

For a FS-AU (AUV) - Discover runs on any PC running Microsoft's Windows Operating System. Sonar data is stored on a high capacity hard drive on the AUV and are offloaded from the drive via an external Ethernet connection. Data is stored in EdgeTech's native ".jsf" format. Discover has the facility to convert this data to industry standard formats such as XTF for the side scan data and SEG-Y for the sub-bottom data.

Discover can replay the sonar data and process the data with a number of features including: video gains, speed correction, channel balancing, printer control, different color schemes, altitude correction, file conversion, and zoom.

The J-Star software can be used for real time diagnostics and trouble shooting. Sonar Simulator is used as a tool for developers in writing an interface to the EdgeTech Sonar. There is also a remote desktop utility, used for interfacing with the sonar.

When the FS-DW/AU computer is powered on it performs it power on self-tests and then begins running the Sonar Application (Sonar.exe). If a monitor is attached to the system then the following screen will appear:



This display indicates which subsystems (Sub-bottom, Side Scan Low, Side Scan High) are currently enabled and the overall status of the system. An equivalent but more detailed set of information is also presented on the FS-IU computer (if present) for operator display.

The sonar application performs the following functions:

Drives all transducers with transmission pulses.

Receives and digitizes sonar data.

Match filtering and other post processing.

Storage of data (AUV Version)

Transmission of data to FS-IU or AUV Controller

Command and control interface.

Power On Self Test (POST)

Serial Device IO (E.g.: Pitch / Roll / Heave / Pressure / Magnetometer / CTD)

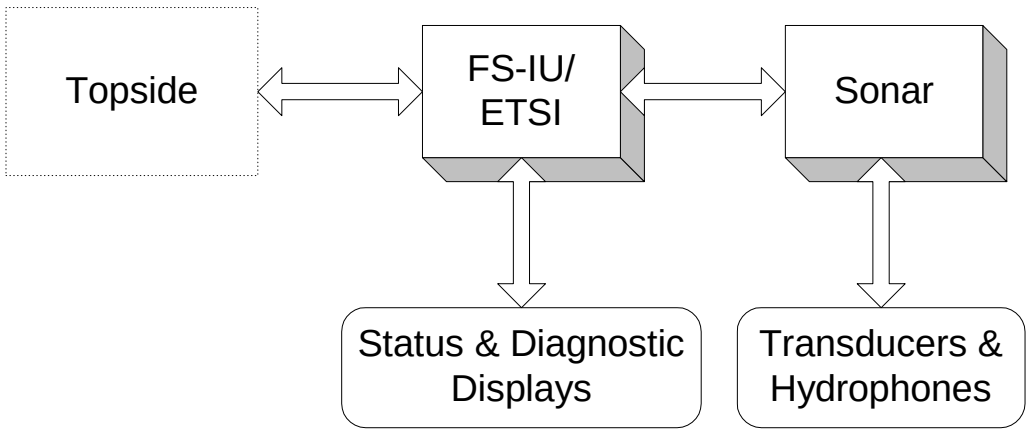
Time tagging of data and time synchronization

The application includes several menus and dialog boxes, which are capable of displaying the current system status and providing low-level diagnostics. Under normal operation these low-level diagnostics are not used and the sonar is designed to operate without operator assistance.

This is one of two applications that are normally required for the Edgetech Full-Spectrum Sonars, namely:

Sonar.exe: This Sub-Bottom / Side Scan sonar is the primary application for sonar data collection.

ETSI.exe: This drives the user interface (e.g. dedicated status LEDs), diagnostic display, and provides for multiple topside interfaces. This executable runs on the FS-IU computer system.



Main Sonar Applications

The FS-IU computer is not normally present in the AUV version. In this case the AUV controller connects directly with the Sonar/FSDW, however the ETSI program does provide a diagnostic which can be run before mission launch. The topside computer connects to the FS-IU (or sonar) via an Ethernet interface.

A separate software program, "J-STAR" is provided with all systems, for full system diagnostics. Refer to the J-STAR users manual.

Both the ETSI and Sonar programs are customizable to support a variety of mission scenarios. The contents of the initialization files are described in subsequent sections.

The Sonar accepts commands and transfers data via TCP/IP standard sockets. An AUV controller or the FS-IU connects to the sonar via two logical sockets, namely:

Command Socket (1700): Used to send commands to the sonar and query for sonar status. Example commands are:

Turn pinging on or off.

Set the trigger mode (e.g. external or internal trigger).

Specify the ping rate.

- Specify the amount of data to be returned per ping.

Select pulse.

Data Socket (1701): Used to send processed sonar data to a topside or AUV controller.

The detailed specification of the messages that are sent on these interfaces is provided upon request. A sonar simulator is also available to ease software integration and testing which accepts and emulates all commands.

To ease the testing of the system the J-Star, diagnostic topside, is provided with every system. J-Star allows an operator to set these parameters and view sonar data. See the separate J-Star manual for details.

Some of the concepts / terminology of the Sonar are described below.

6.2 Network Addresses And Sockets Numbers

The computers in a Full Spectrum system communicate via TCP/IP. For this to work properly, each computer must have a UNIQUE network address on the same SUB-NET.

A TCP/IP address consists of 4 groups of digits separated by the "dot" (.) character. Each digit is between 0 and 255. For the type of addresses typically used by Edgetech, addresses are on the same SUB-NET if their first three digit groups match. Summarized below are the commonly assigned / recommended addresses.

Node	Address	Subnet Mask
FS-DW/SONAR	192.9.0.101	255.255.255.0
FS-IU/ETSI	192.9.0.100	255.255.255.0

An FS-IU normally has two network cards. One is used to connect to the bottle and the second is used to connect to topsides. Therefore, there is a second sub-net for the topside interfaces.

Node (Topside)	Address	Subnet Mask
FS-IU/ETSI	192.10.0.100	255.255.255.0
User's Topside	192.10.0.99	255.255.255.0

It is recommended that the TCP/IP addresses, for the Edgetech supplied nodes, not be changed. Note that although changing the address is relatively easy, when an address is changed multiple files must be modified. For example, if the FS-DW address is changed the ETSI initialization file must be changed to reflect the new address as well.

NOTE: These TCP/IP addresses are only valid and active if a proper hardware connection is made to the Ethernet RJ45 connector. This is a quirk of the Windows 2000 operating system. If there is no valid connection the TCP/IP address 127.0.0.1 is the only active address for the Ethernet adapter.

The sonar uses two logical TCP/IP sockets to communicate with the ETSI and the ETSI uses two logical sockets per topside to communicate. These typical values are summarized below.

Socket	Socket Number
FS-DW Data	1701
FS-DW Commands	1700
FS-IU Topside 1 Data	1601
FS-IU Topside 1 Commands	1600
FS-IU Topside 2 Data	1603
FS-IU Topside 2 Commands	1602
FS-IU Topside 3 Data	1605
FS-IU Topside 3 Commands	1604
FS-IU JSTAR Commands	1800
FS-IU JSTAR data	1801

As part of the normal software setup, each topside (such as TEI Delph, TEI Isis) must be provided with the TCP/IP address of the ETSI and its two socket numbers for connections.

6.3 Subsystems and Channels

The Sub-Bottom, Side Scan low frequency (75 or 120 kHz), and Side Scan high frequency (400 kHz) data streams are treated as independent subsystems. Thus it is possible to enable / disable and independently ping any or all of these.

A Sub-bottom system normally returns only a single channel of data, whereas each side scan frequency supports 2 channels (both port and starboard).

6.4 Understanding Transmission Pulses

The sonar uses FM Chirp technology to produce noise free high quality imagery. This FM Chirp technology is described in greater detail in the enclosed "Theory of Operation Manual".

Each subsystem includes Full Spectrum (wide bandwidth) transducer technology for enhanced resolution. The wide bandwidth provides flexibility in pulse bandwidth, center acoustic frequency, and pulse duration.

In a complex system with multiple acoustic sources it is often possible to work around acoustic interference by using pulses which vary these parameters. For a Sub-bottom system, enhanced penetration or enhanced resolution pulses can be selected to support a wide range of survey requirements.

The following standard pulses are provided for the system.

Sub-bottom	Pulse	Maximum Ping Rate
DW-106	1 kHz to 2.5 kHz 66 ms	1.42
	1 kHz to 4.5 kHz 33 ms	2.8
	1 kHz to 6 kHz 20 ms	4.7
	1.5 kHz to 10 kHz 12 ms	8.0
DW-216	2 kHz to 10 kHz 20 ms	6.0
	2 kHz to 12 kHz 20 ms	6.0
	2 kHz to 15 kHz 20 ms	6.0
	2 kHz to 15 kHz 10 ms	6.0
	2 kHz to 15 kHz 5 ms	6.0
DW-424	4 kHz to 16 kHz 10 ms	TBD
	4 kHz to 20 kHz 10 ms	TBD
	4 kHz to 24 kHz 10 ms	TBD
SS-75	7.5 kHz BW 14 ms	6.7
	2 kHz BW 50 ms	2.0
SS-120	12 kHz BW 8.3 ms	24.0
	6 kHz BW 22 ms	4.5
SS-410	40 kHz Bandwidth 2.4 ms	20.0

6.5 Understanding the Ping Rate

The following sonar parameters effect the ping rate:

Trigger Mode: EdgeTech Full Spectrum® chirp sonar systems support 4 trigger modes, as defined below:

Internal Trigger: An internal timer is used to trigger the sonar. The ping rate (in Hz) or ping range (in Meters) determines the frequency of the timer.

External Trigger: An external trigger line triggers the next ping. When the hardware trigger is asserted (programmable as active low or high) a new ping occurs.

Coupled: This mode only applies to a combined sub-bottom and side scan system. In coupled mode, the subsystem is triggered when the master subsystem triggers. For example, if sub-bottom is coupled to side scan low then when side scan low is triggered the sub-bottom is also triggered.

Gated: Gated and internal trigger modes are similar in that an internal timer determines the trigger rate. However, in gated mode a hardwired trigger input line is monitored. Whenever the trigger line is asserted (transition to active low), the trigger event (ping) is inhibited for the trigger delay period (as described below). If the time to the next ping is longer than the specified trigger delay, then the asserted trigger input has no effect.

Trigger Delay: Delays the trigger event. In coupled or external trigger modes, a positive trigger delay will cause the outgoing ping to be delayed by the Trigger Delay amount. In gated mode, the trigger delay determines the period of time to delay the ping after the trigger in is received.

Trigger System: Master subsystem for coupled trigger modes.

Ping Rate or Range: Specifies the ping rate in hertz or ping range in meters. This parameter will only effect the true ping rate in internal or gated trigger modes. In coupled mode, this parameter is ignored and the ping rate is determined by the master subsystem. This value is also used to determine the expected amount of data to return per ping. In external trigger mode, the ping rate must be less than the actual trigger rate or data will be lost. Partial data records are not sent to the topside host for display. If a range is specified the actual ping rate must accommodate the full echo duration.

Maximum Ping Rate: This is a pulse dependent item. Each pulse has a maximum ping rate, which cannot be exceeded. Attempting to use faster ping rates causes the maximum ping rate to be used.

Data Window Size: The data window determines how many samples are returned per ping. The special value of 0 returns the maximum amount of data per ping. If the amount of data requested is greater then the ping rate or range setting will allow then the ping rate is reduced to accommodate the requested amount of data. In coupled mode however, the window size is reduced instead if it is too large for the master subsystems ping rate.

Example:

If a subsystem (SSL) is coupled to another (SB) then the ping rate / range is determined from the master subsystem, and if a non-zero data window is specified then the window will be reduced if the amount of data required exceeds the amount that can be collected as determined by the masters rate/range.

6.6 External Trigger Input and Output Lines

EdgeTech Full Spectrum® chirp sonar systems supports 3 external trigger lines:

Trigger A

Trigger B

Trigger C

Any of these can be programmed to be either an external trigger input or trigger output for any subsystem. The sonar program has an initialization file, 'Sonar.ini' which determines how they are used. If programmed as a trigger output, the trigger out line can also be specified as either active low or active high, by a 'Sonar.ini' parameter. (See Section 6.7.3.2)

As a trigger input, a trigger event is detected on the High to Low transition of the line. A trigger input must be inactive (high) for a minimum of one millisecond. When asserted (active low), must be held low for a minimum of one microsecond.

6.7 Sonar Default Values and Configuration

The combined Side Scan / Sub-bottom Sonar (Sonar.Exe) application serves as the main controller for sonar data processing. There is an extensive list of customization parameters, which can be used to specify its default settings and configuration. While modification of this file is not recommended, sometimes it will be necessary properly configure the system.

Every system includes on line documentation of the configuration settings in the file **Sonar.txt**. If in doubt on the meaning of a parameter please consult Edgetech.

These parameters are specified in the file **Sonar.ini**, which is a standard windows .ini file. This section describes some of the key parameters, which may need to be modified.

This is a text file, which can be modified by Notepad. If using a different editor, please make sure to save the file as a text only file. The file is divided into major sections.

6.7.1 Section [SUBn]

The [SUBn] sections define parameters for a subsystem, where n is the internal subsystem number (e.g. 0, 1, or 2). The normal values for n are: 0: Sub-bottom, 1: SSL, 2: SSH.

6.7.1.1 PING_SELECT=Ping.Dat

Defines the default pulse. If the topside does not set the pulse the last set or default pulse will be applied.

6.7.1.2 PING_TRIGGER=0

Defines the default trigger mode. If the topside does not set the trigger mode then the default will be used. The following values are useful:

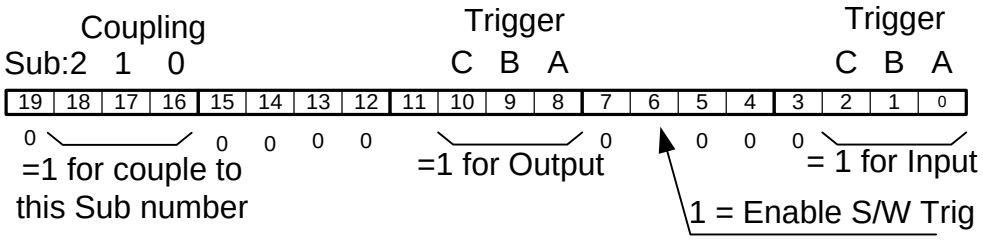
Value	Meaning
0	Internal Trigger
1	External Trigger
2	Coupled Mode
3	Gated Mode

6.7.1.3 TriggerMask=201

Trigger in and out mask in HEXADECIMAL for an FSIC system. There are 3 digital lines (A, B, & C) which can be used as either external trigger in or external trigger out. Each of

these lines is normally active low (low to assert). The default value of 201 allocates Trigger A (bit 0 set) for trigger in, and the second line (Trigger B) (bit 200 set) for external trigger out.

Bits	Meaning
0-2	Trigger in input digital IO line(s) to monitor.
6	Enable software (Ethernet) trigger in.
8-10	Trigger out digital IO line(s) to assert.
16	Couple this system with SubSys # 0 (SB)
17	Couple this system with SubSys # 20 (SSL)
18	Couple this system with SubSys # 21 (SSH)
19	Reserved = 0



6.7.1.4 TriggerOutLength=0

Length of the trigger out pulse in us for an FSIC system. This value is rounded to a 250 us multiple (FSIC card) and has a minimum value of 250. The maximum is about 30000 (that is, 30 ms).

6.7.2 Section [SUBnIOm]

The [SUBnIOm] sections define parameters for an individual channel of a subsystem, where n is the internal subsystem number and m is the channel number (eg 0, 1). The normal values for m are: 0: Port, 1: Starboard

6.7.2.1 CompressNet=0

Set to 0 for no compression. Set to 1 for about 35% compression. A non-zero value will cause data to be sent in a compressed format over the Ethernet interface. This can be useful in reducing network bandwidth requirements. A standard deep tow Edgetech system consists of both a surface computer and a data collection pressure housing. In this configuration, data is compressed in the pressure housing and decompressed on the surface. For other configurations, a non-zero value for CompressNet may require special support from the topside interface computer.

6.7.3 Section [DSPc]

The [DSPc] sections define parameters for a data acquisition card. Normally a system has a single card, and c would be replaced with 0 (e.g. [DSP0]).

6.7.3.1 TimeSyncMask=0

The sonar accepts a one pulse-per-second time sync input via any of the three external trigger lines. This parameter defines which if any to use for time sync:

Value	1 PPS Mask Trigger In Line
0	Disabled
1	First (Trig A)
2	Second (Trig B)
4	Third (Trig C)

6.7.3.2 TriggerOutInversion=0

This consists of one bit for each trigger out line. If set then the a trigger out will be active high (high when asserted) instead of active low (low when asserted). The value should be the sum of any of the following:

Value	Meaning
1	Invert first external trigger out line. (A)
2	Invert second external trigger out line. (B)
4	Invert third external trigger out line. (C)
Value	Meaning

6.7.4 Section [SERIALp]

The [SERIALp] sections define parameters for a serial port, where p is the unit number (0 through 7).

6.7.4.1 Baud=9600

Baud rate of the port.

7 DIAGNOSTICS

Prior to each deployment, it is recommended that the system be checked for proper operation. At a minimum, the following are recommended tests:

Sub-Bottom, and Side Scan low Heartbeats

Rub test of each transducer

Heartbeat:

As part of the normal power on self-test, the sonar will chirp the Sub-bottom transducer, side scan low port transducer and finally the side scan low starboard transducer.

The heartbeat on the Sub-bottom transducer is loud and can easily be heard. The side scan transducers produce a very soft, high pitched tone. You may need to be very close to the side-scan array to hear this, especially in a noisy environment.

The ETSI.exe application allows you to repeat these tests as well as several others to verify the power on self-test. Please refer to the FS-IU manual for details. These tests include:

Heartbeat on Sub-Bottom and Side Scan transducers

Power amp feedback

Digital logic integrity test

Rub Test:

The J-Star diagnostic topside or your own topside can be used to perform the rub test. To perform the test, you enable display of data for each channel on your topside and then rub the respective sensor array. You should see increased signal return level when the sensor is being rubbed. Each of the 5 sensors (Sub-bottom hydrophone, side scan low port / starboard, and side scan high port / starboard) should be tested in this way.

Please refer to the J-Star diagnostic manual for more details on this procedure as well as other checkout diagnostics.

7.1 FS-DW Remote Control / Software Maintenance

Since the FS-DW computer is contained in a pressure housing access to the computer inside is limited. To ease maintenance and diagnostics, the internal data files are made available on the network interface. It is also possible to operate the computer remotely as described below.

7.1.1 File Sharing

The FS-DW internal files are shared on the network and accessible from another Windows PC.

These files may need to be accessed for maintenance purposes. To access these files, it is recommended that you setup a login on your maintenance PC with user name EdgeTech and no password. The FS-IU computer is normally shipped with this user account already set up, and the FS-IU is intended to serve as a maintenance computer. It is also recommended that

the maintenance PC be placed in the "Boca-Domain" workgroup. This can be done in the Control Panel / Network Settings icon. The maintenance computer should also be on the same TCP/IP subnet, which is normally 192.9.0.xxx. That is, the maintenance computer should have a TCP/IP address in which the "xxx" is replaced with a number between 1 and 254. The value 101 should NOT be used since the FS-DW is normally set to 192.9.0.101.

Use the Windows Explorer / Network Neighborhood to access the hard disk. For an FS-DW system, the main files of interest are located in the \Edgetech\SSSSonar folder.

Within this folder are subfolders for:

Folder	Use
Sonar	Run time program and Sonar.ini configuration file
SBPulse	Current Sub-bottom pulses
SLPulse	Current Side Scan low pulses
SHPulse	Current Side Scan high pulses

7.1.2 Running PC Anywhere

FS-DW systems are shipped with PC Anywhere installed and enabled for remote control. If the system includes an FS-IU computer then the FS-IU already has PC Anywhere installed. Otherwise, you are licensed to install the "Express" version on a second computer for maintenance purposes. To install:

Access PC Anywhere install via Windows Explorer. It is located in the FS-DW in the C:\Drivers folder. Copy this folder to your local hard disk.

Install the express version.

Copy the PC Anywhere HTML data file to your local hard disk. It is located in the FS-DW in the C:\Edgetech\Win2k folder.

Run this HTML file from your local hard disk. Press the button to connect to the Sonar. You now can remotely control the FS-DW computer for maintenance purposes.

7.2 FS-DW Diagnostics and Checkout

If you have a problem with the system after carefully checking the cables and power supply, you may wish to call Edgetech to assist in the diagnostics BEFORE PROCEEDING.

Listed below is some background information and some things to check.

7.2.1 Startup Problems

To diagnose startup problems, the Startup Sequence should be understood. When power is applied:

Low level (BIOS) diagnostics are run on the main processor

Operating system boots

Ethernet starts up

Sonar Application Starts (Within 4 minutes of power on)

Sub-bottom transducer is chirped. This audible signal indicates that the sonar is operational and ready for commands.

Two methods can be used to detect that the system has booted, namely:

Audible Heartbeat heard on Sub-bottom Transducer (within 4 minutes of power on)

Communications Established via Ethernet Remote Control Cable

If no heartbeat is heard then either:

Power has not been applied.

Sub-bottom transducer is not connected or is faulty.

System did not completely boot.

If communications is not established with the FS-DW then either:

Power has not been applied.

Faulty Network Cable

Improper Network Settings

System did not completely boot.

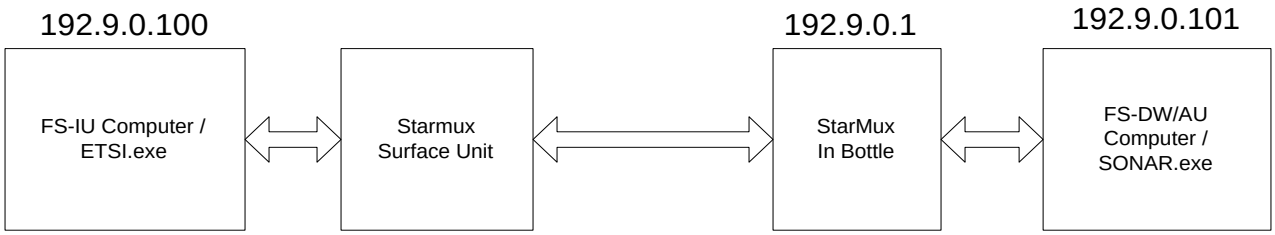
Incomplete boot up problems can only be diagnosed with the pressure housing open. Therefore it is highly desirable to pursue other sources first.

7.2.2 Check Ethernet Cable

There are two common configurations of the FS-DW computer. With a StarMux, and with an Ethernet output. Some systems are furnished with both capabilities. In this case, it is usually necessary to open the pressure housing to switch between these two options (as described in a separate document). The Ethernet cable check will depend on the option selected / enabled.

7.2.2.1 Ethernet With StarMux Cable Check

When the StarMux is present, data transmission is via the StarMux as illustrated below:



Network Configuration With StarMux

The StarMux includes several status LEDs, which are not normally visible, but which can be viewed if the top panel is removed. The first LED indicates power OK and should be on. The second LED indicates modem link established and should be blinking. The third LED indicates an error condition and should NOT be lit. Please refer to the StarMux manual for more details.

As an option, Edgetech provides a diagnostic cable for the StarMux ⇔ StarMux interface. If a problem is suspected then you should test with this cable. The link is probably OK, if the third LED (link established) is blinking about once per second.

The crossover Ethernet cable between the topside StarMux unit and the FS-IU should also be checked. Most network interface cards have an LED to indicate that the cable is connected. If this light is not on then there will likely also be a communications problem.

If communications is established, then you should be able to ping the StarMux modem in the pressure housing. In a DOS command prompt window, type "ping 192.9.0.1" to verify link established.

7.2.2.2 Ethernet Without StarMux Cable Check

One of the easiest initial checks to perform if there is no communications with the bottle is the LED on you network interface cards. Most network interface cards have an LED to indicate that the cable is connected to another network source. Check this light. If this light is not on then the cable may not be working properly.

Note that there are two possible wiring combinations for an RJ45 Ethernet cable – straight through and crossover.

A straight through cable is used to connect a computer to a hub. A crossover cable is used to connect two computers directly. The two methods of wiring a 10/100 Based T RJ45 are shown below:

Connector 1	Connector 2: Crossover	Connector 2: Straight Thru
Pin 1	Pin 3	Pin 1
Pin 2	Pin 6	Pin 2
Pin 3	Pin 1	Pin 3
Pin 4	Don't Care	Don't Care
Pin 5	Don't Care	Don't Care
Pin 6	Pin 2	Pin 6
Pin 7	Don't Care	Don't Care
Pin 8	Don't Care	Don't Care
Connector 1	Connector 2: Crossover	Connector 2: Straight Thru

As an option, Edgetech provides a diagnostic network cable for check out purposes. This cable should be plugged into another computers network card and not into a hub (wired as a

crossover). If available test with the diagnostic cable to distinguish between cable problems and other cabling or power supply problems.

7.2.3 Check Network Settings

Improper network settings can also cause a failure of communications.

Use the TCP/IP ping command to verify that the network settings are correct between your host computer and the FS-DW. For a Microsoft Windows machine (e.g. Win95 / Win98 / WinME / NT / Win2k) use the following procedure:

Open a "Command Prompt" window.

Type: ping 192.9.0.101

Where 192.9.0.101 is the default as shipped TCP/IP address of the FS-DW. Note that if you are running from an Edgetech supplied FS-IU computer, we normally place a shortcut on the desktop to perform this command.

If you get the response: "Host Unreachable", then the network settings on your test computer are not correct and you are not on a compatible subnet. To correct this problem go to the network settings and assign a compatible address (192.9.0.X, where X is between 1 and 255 (excluding 101)) and subnet mask (255.255.255.0).

If the ping times out then the FS-DW computer is not running or there is a network cabling or hardware problem.

Note that there are two common configurations of the FS-DW, namely:

Ethernet 10/100 provided on endcap connector.

StarMux modem and Ethernet output of StarMux on deck (FS-IU unit).

For the first case above, note that the link is 10/100 auto switching by default. Setting the other end to 10 MB only may improve signal integrity. The ping command should be repeated at 10 MB mode in this case.

For the second case above, the StarMux modem in the bottle should be pinged as well (ping 192.9.0.1). If you cannot ping the StarMux, then refer to the StarMux users manual for aid in diagnosing the problem. If you can ping the StarMux BUT NOT the FS-DW then the FS-DW computer probably has a startup problem. See the section "Diagnosing System Incomplete Boot" for more details.

7.2.4 Check Source Power

Naturally there will be no communications with the FS-DW if no power is supplied. There are two common power sources: 48 volts DC (no StarMux) and 300 – 400 volts DC (with StarMux).

The polarity and level of the power supply should be verified on the endcap pins for your system. Refer to your endcap wiring diagrams to locate the appropriate connector and pins.

7.2.5 Diagnosing System Incomplete Boot

Important Note: Remember to turn power off before opening the bottle or removing or inserting any electronic device (e.g. circuit cards / hard disks).

To diagnose problems related to incomplete startup of the FS-DW, it is necessary to open the pressure housing. It is highly recommended that you check some common problems first, namely:

Verity, that correct power is being provided.

Verify that no startup heartbeat is heard on the SB transducer within 4 minutes of system power on.

Please review the section 4.5 on pressure housing maintenance before opening the housing.

After the housing has been opened, check for any loose cables or improperly seated boards before continuing.

Check the power supply voltages on the passive backplane. You should see stable +12 and +5 volts on the screw terminal panels if measured with a voltmeter. (See J10 in Drawing 800-0000005-0101 in Section 2.1 for terminal assignments). Also check the 4 LEDs on the backplane to verify power present.

D1	D2	D3	D4
-12V	+5V	+3.3V	+12V

After removing the top plate, the three LEDs on the FSIC card set should be visible. These LEDs will remain off until the system completely boots, at which time the two Green LEDs should alternate on, indicating that the system is booted, idle and ready to accept commands. In this case you should double check the network cables before proceeding.

To continue diagnostics, attach a VGA compatible monitor, keyboard, and mouse to controller card. The mouse connector is the Topmost PS2 port, while the lower one is the Keyboard.

Cycle power and you should see the main computer initiate its BIOS power on self test. If you get an error at this point you may wish to inspect the CMOS settings to possibly correct the problem (consult Edgetech for assistance).

After passing BIOS POST, the hard disk should be recognized. If no hard disk is seen, inspect the cabling to the hard disk before proceeding. If necessary you may need to replace the hard disk.

If the hard disk is recognized but the system does not completely boot, mark the slot positions of all cards, remove all cards (except the main processor) from the system. If the system still does not boot, the problem could be either in the main processor / passive backplane / or hard disk.

FS-DW systems are normally shipped with an image of the as shipped hard disk on a CD-ROM. If you have a spare hard disk, try restoring the as shipped configuration to the spare

(see Disk Restore Procedure). If the behavior is similar with the spare disk, the problem is probably in the main processor card.

If the system correctly boots, turn off the power and add each card removed previously one at a time until the system fails. Swap out any cards that seem to cause a problem (if you have a spare).

7.2.6 Disk Restore Procedure

You system is shipped with an image of the hard disk on CD. To build a second hard disk, you must have a second PC computer, which contains a CD-ROM drive.

With the power off, remove ALL hard disks from this second computer. Insert the new hard disk and make sure that both the disk and CD-ROM drive are cabled to the main computer.

Turn on the power and insert the supplied CD. Go to the BIOS setup and select the option to boot from the CD-ROM drive.

After saving settings and rebooting you should be presented with a menu of options.

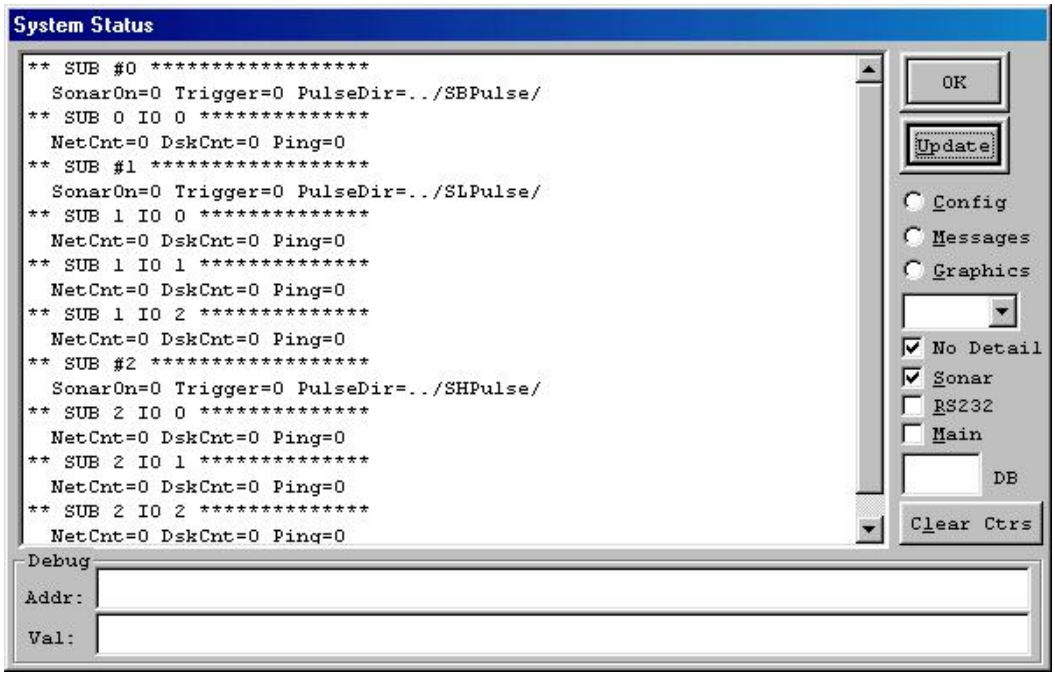
You must choose options (1) Partition Hard Disk, (2) Format Hard Disk, and then (3) Restore hard disk.

- After the disk is restored, if this is a Win2K or WinNT system, you must restore the Win2K / WinNT boot sector.
- Select option 7 if you answered "No" to the first question when the disk was partitioned (via Fdisk), as you created a Fat16 partition. Otherwise select option 8,
- Now Select the (1) Recovery Option, followed by (2) Recovery Console. Logon to the default section,by typing '1' , with Password = <CR> (empty).Now type Fixboot C: at the prompt. i.e> Fixboot C:

Note that we have detected a problem with some small hard disks (under 2 GB) with the above procedure.

Also note that the above procedure will restore the disk to its "as shipped" configuration. If any changes were made after this point, you must make them to the new disk as well.

7.2.7 Sonar Diagnostics



The Sonar application has numerous internal diagnostics, which can be accessed via PC Anywhere. After you have established remote control, locate the Sonar application on the task bar. Click once to open the application. A menu should appear. Select the menu item "File" / "Show Status" and the current runtime status details will be displayed.

A set of radio buttons and check boxes can be used to select which set of options to display. These include:

Sonar: This shows the status for each subsystem and channel of data. Includes information such as current configuration settings, ping number.

RS232: Shows data traffic on each enabled RS232 port.

Main: Shows error codes, network connection status diagnostic sensor values.

Messages: Show a log of messages sent between a topside controller and the sonar.

Graphics: Graphs a single channel of data in an X-Y plot.

When the "Update" button is pressed a new snapshot of the system status is taken.

This can be used to verify connectivity and communications between the topside and the FS-DW. It also has numerous diagnostics such as time sync, indications of network bottlenecks, displays of serial port traffic, etc.

While the list of items present is not described here, you may wish to consult Edgetech for specific items to check if you are experiencing any problems or are attempting to verity current operation.

7.2.8 J-Star Diagnostics

The J-Star diagnostic topside is installed inside the FS-DW and FS-IU computers in the \Edgetech\Topside folder. The J-Star manual provides full details on how to operate this program.

Some of these diagnostics are repeated below:

7.2.8.1 Transmit Diagnostics

The transmit pulses for the Side Scan low and high pass through a transmit / receive switch. It is therefore possible to see the transmit pulse on the receive data when the sonar is placed in a special raw data diagnostic mode. Please see the J-Star diagnostic manual for details.

7.2.8.2 Receive Diagnostics

Using the J-Star diagnostic program, the sonar data can be displayed in real time. Please refer to the J-Star manual on the procedure to use for doing a rub test to test receive sensitivity.

In addition, the Sub-bottom has a programmable gain stage, which can be adjusted via J-Star. As the gain changes, the signal meter intensity should also change.

The side scan has a variable gain stage. For Side Scan low, this gain stage will ramp up to a maximum value within about 1 second and begins at about the 0.3 second point. This characteristic profile can be seen even if the transducer is not in the water, as the gain will amplify the low internal electronic noise. This can also be displayed with J-Star and verifies that the gain ramp is working properly.

7.2.8.3 Acoustic Frequency Analysis

If there are additional acoustic sources in your system, there may be interference between the Sub-bottom / Side Scan and these other sources. The J-Star can be used to perform frequency analysis of the data to detect this interference. Again see the J-Star manual for details.

7.3 FSIC Card Diagnostics

The FS-IU topside reports the status of the Sonar Power On Self Test (POST) which diagnoses some features of the FSIC Card. In addition, if the FSIC card is visible (and not sealed in a pressure housing), three LEDs indicate the status of the sonar. The first LED is Red and the second and third are green. The lights have the following states:

LED State	Meaning
All 3 off	System not yet initialized.
All 3 Light Sequentially (Red -> Grn1 -> Grn2)	Sonar application not running or handshake failed.
Red out, Green lights alternate on / off	Sonar is idle and ok.
Red out	Green1 blinking indicates that the SB is enabled to

Green1 / Green2 blinking together	ping or pinging. Green2 blinking indicates that SSL OR SSH is enabled to ping or pinging.
Red on solid, Green1 / Green2 blinking together	Same as above, but the red light indicates that in internal data error has been detected.

7.3.1 External Trigger Lines

The FSIC card includes three external trigger lines. The external trigger lines can be configured as either inputs or outputs. See the Sonar.Ini configuration section for details on how to configure the trigger lines.

External Trigger Input Test

To verify that each external trigger line is working correctly as an input, enable the line (or lines) under test as external trigger inputs. Start the J-Star diagnostic program. Set the trigger mode to Internal. Turn pinging on. You should see sonar data. Set the trigger mode to Gated with a delay of 0. You should still see sonar data being received. Short the trigger input to ground. Sonar data should stop.

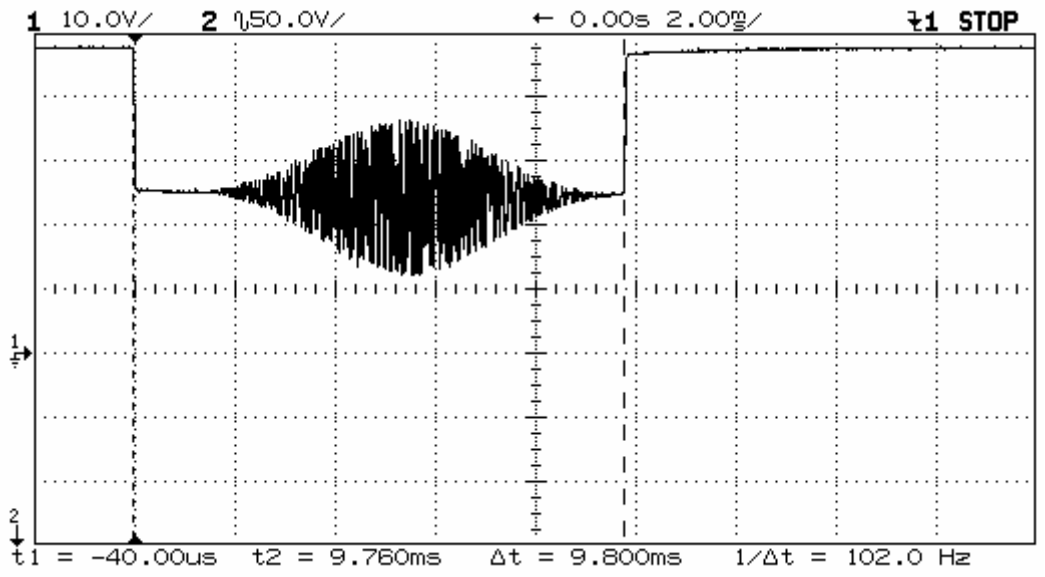
External Trigger Output Test

To verify that an external trigger line is working correctly as an output, enable the line (or lines) under test as external trigger outputs. Start the J-Star diagnostic program. Set the trigger mode to Internal. Turn pinging on. You should see sonar data. Use a scope to verify that the external trigger line is pulsing. As an alternative, you can loop back the trigger line under test to another line and externally trigger a second subsystem from the first.

7.4 Power Amp Diagnostics

Note that each power amplifier has a fuse to protect the amplifier from excessive loads. If this fuse should blow, then the amplifier will be disabled. The fuse can be tested with an Ohmmeter if the pressure housing is open.

To check transmit power output, attach an oscilloscope probe to TP3 on the power amp (See Power amp photo….) and the ground lead to TP10 (black test point). Activate the appropriate subsystem, with power set to 100%. When idle, the scope trace should show +48Vdc (nominal). For the duration of the transmit pulse, the mean value of the trace should drop to approximately 24Vdc, with the transmit AC signal visible as a smoothly tapered AC waveform. See figure below.



Example of the Transmit Waveform for Side Scan Low.

7.5 T/R Switch Diagnostics

There are no diagnostic tests to be run on the T/R Switch. If the sidescan transmit signals are present on the appropriate power amplifier output, but are not visible at the underwater housing output connector, then the T/R switch cabling should be checked. (See Block diagram in Section **Error! Reference source not found.**). Failing this the T/R Switch should be replaced.

7.6 Utilities

Several utility programs are provided for maintenance and general system checkout. Some of these are described here.

7.6.1 Pulse Installation and PickFish : Select Active Pulses

Each subsystem has a set of active pulses. However, your system is normally selected with a broader range of pulses. For and FSIC system, the directory structure is as follows:

C:\Edgetech\SSSSonar\SBPulse: Currently active Sub-Bottom pulses

C:\Edgetech\SSSSonar\SLPulse: Currently active Side Scan low pulses

C:\Edgetech\SSSSonar\SHPulse: Currently active Side Scan high pulses

If a special pulse is required, the supplied pulse files can be copied into the appropriate directory. They will then be available for use the next time that the FS-DW is restarted.

Standard pulses are also cached in the following location:

C:\Edgetech\SSSSonar\Pulses

There are sub-folders for each fish type with pulses for those fish. The PickFish.Exe application, also located in the above directory can be run to select / modify the active set.

Note that this will completely ERASE the active pulse directories. Thus, if a custom pulse has been installed, it must also be present in a sub-folder of C:\Edgetech\SSSSonar\Pulses as well to allow PickFish to restore them.

7.6.2 ADCRun : Low Level Diagnostics

The system includes a low-level diagnostic, ADCRun.Exe. DO NOT RUN THIS APPLICATION WITHOUT THE GUIDANCE OF EDGETECH PERSONNEL, AS SOME COMMANDS HAVE THE POTENTIAL TO DAMAGE YOUR HARDWARE. For example, it is possible to blow power amp fuses with some extreme settings in this program.

This diagnostic is safe to run if all cables to the FSIC card are removed. In this safe mode, it provides several useful diagnostics such as:

Pulse Memory Integrity Test

Data Transfer Integrity Test

Edgetech will guide you through the use of this diagnostic, if you are experiencing a problem, which requires these low-level diagnostics.

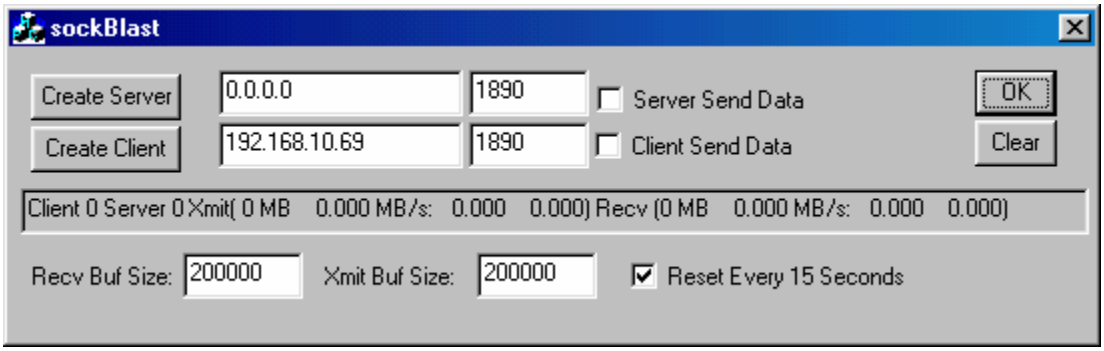
7.6.3 SockBlast : Network Performance Testing

The SockBlast application is used to test network throughput between the FS-DW or FS-IU and a third party computer. Network performance can vary significantly from computer to computer. If the topside displays are sluggish or seem to drop data, it is recommended that you run this application to verify throughput. This application is normally kept in C:\EdgeTech\Utilities folder.

Two copies must be run one on each computer. One serves as the client and the other as the server. Since the client connects to the server, the client address must be the TCP/IP address of the server machine. The server address should be the same value, and must be a local TCP/IP address. For example, to use the FS-IU as the server, the server address would normally be 192.10.0.100. The client address on the topside would be this same value.

After pressing the buttons to start the server and clients on their respective machines. Check either the Client send data on the client, or Server send data box on the server. A performance in MB/second will be displayed. For a combined Sub-bottom and side scan system, the actual throughput must exceed 0.6 MB/second. The value received from SockBlast should be much higher.

If the two applications hook up, then the Client count on the host should increment to 1 (from 0) and the Server count in the bottle should increment to 1 as well. This indicates that there is one connection between the two applications.



7.6.4 ComTestLoopMaster and ComTestLoopBack: Serial Port testing

These utilities are used to test serial port IO. Run a separate copy for each port. Select matching baud rates for each application and select the appropriate Com ports. Enable the ComTestLoopBack to monitor the port and echo data back to the sender. Run the ComTestLoopMaster. It will send diagnostic data to the loop back application and wait for replies

7.7 Hardware Troubleshooting

7.7.1 Sub-bottom Hydrophones and Spider Assembly Tests

Note: Refer to DWG 300-0000050-0105 for the wiring of J4 connector (SBP) on the FS-DW. Pins 4 & 5 are used for the receive pair.

To check proper functionality of the Sub-bottom hydrophones, the following tests are suggested.

- Measure 5 – 6 nano Farad per hydrophone connected on pin 4 and 5 for the HA-216D and 8 – 9 nano Farad per hydrophone connected for the HA-106D array.
- Measure > 10 Mega ohms on pin 4 and 5 with both hydrophone connected
- Squeeze each array and measure > 0.5 – 1Volt.

8 SERIAL PORT OPTION

This section describes the serial port option for the FS-AU (AUV version of sonar) and FS-DW/FS-IU (Deep tow & ROV version of sonar) systems. In addition to high-resolution sonar data, a complete system may often require other sensor data from RS232 serial ports. The primary features of the serial port option are:

High Speed Serial Ports: Four high speed, bi-directional serial ports. The serial ports have extra hardware buffering to accommodate higher data rates if necessary.

Built In Support For Industry Standard Devices: Built in support is provided for several industry standard devices such as pitch / roll and pressure.

Flexible Configuration Options for Customer Provided Devices: A wide set of configuration options is available to allow end users to configure and manage their own custom serial port devices.

Time Tagging of Serial Port Data: All serial port data is time-tagged at the point of acquisition. This allows for high accuracy data merging with other end user devices.

Integrated Storage for AUV Applications: Serial port data can be stored on the (optional) storage media.

Transparent Topside Interface: In a deep-tow configuration, a duplicate set of 4 ports is provided on the surface. The serial port on the surface can then be used to control the serial device in the vehicle.

Network Interface: As an alternative to the transparent topside interface, serial port data can be received via EdgeTech's standard message protocol via the Ethernet.

8.1 Serial Data Flow

In the DS-DW/FS-AU Bottle, all data contains a time stamp. For sonar data, the time stamp is the time of the ping. For serial port data, the time stamp is the time of receipt of the character string (which must be somewhat later then when the sensor measurement was taken.

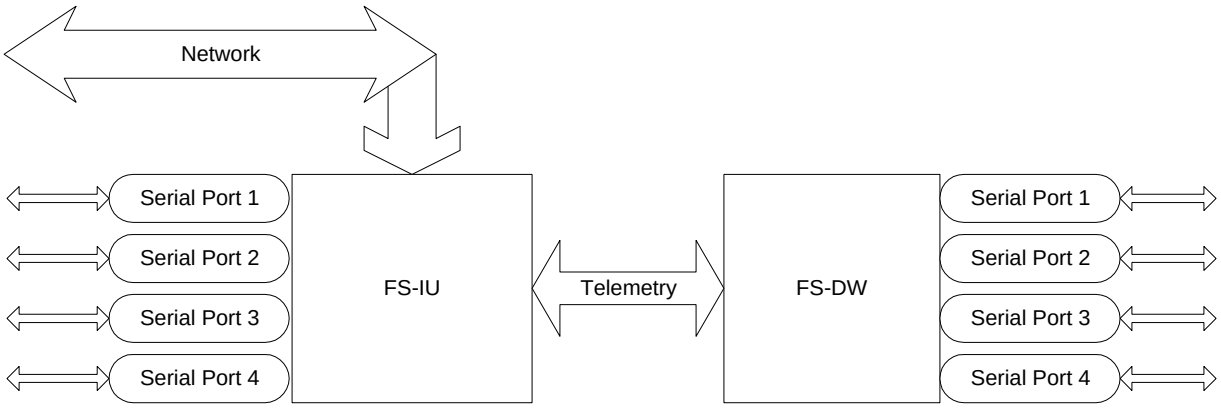
Sonar data is processed (e.g. match filtered, windowed). This processing causes additional latency (before it is queued for transmission), which will vary with the ping rate. Serial port data is queued immediately. As a configuration option, either raw serial port data AND / OR parsed data records specific to each sensor are queued. Queued data is sent up the Ethernet (via the StarMux) to the FSIU topside unit.

In the FSIU, some serial port data (eg pitch / roll) is stuffed into sonar header fields. All data is associated with a "subsystem" number. Example subsystems are subbottom data, SSL data, SSH data, raw serial port data, parsed serial port data. All data also has a channel (e.g. port vs. starboard OR serial port number). Multiple topside controllers or data observers can connect to the FSIU. Each is responsible for specifying what types of data (in terms of subsystem and channel) they want. When the FSIU receives a message from the bottle, that data is replicated and queued to each topside connection that desires that type of data. If raw serial port data is received, that data is also written to a serial port in the FSIU unit.

The FSIU also receives data from serial ports and sends messages to the bottle to write that data to the respective serial port in the bottle. This is implemented via multiple queues - one in the FSIU used to send data down via Ethernet - one in the bottle used to receive data from the Ethernet and a final buffer serves to hold the RS232 data until it can be written to the port.

Commands from a topside controller - in most cases - are queued and then send via Ethernet to the bottle for execution. If the command requires a reply, that reply is queued for transmission back to the FSIU, which subsequently queues and sends that reply to the appropriate topside. A session ID field is used to determine which topside receives the reply.

The serial port option is illustrated below:



Serial Port Option

8.2 Configuration and Setup

Behavior of each serial port is determined by configuration settings in the Sonar.Ini file and messages and commands sent by the AUV controller over the network. Each serial port has a section associated with it, [SerialN] where N is the logical channel number. Below is a sample section:

```
[Serial3]
Create=1        ; Use 1 for standard serial port.  2 for Crossbow DMU-6 only
Port=3
Baud=9600
```

If your sonar has an FS-IU system, an equivalent section will be present in the ETSI.ini file which determines the companion parameters for the surface RS232 interface. Below is a sample section.

```
[COM3]
Active=1
Baud=9600
Parity=2
DataBits=8
Stop=1
```

```
SerialEnable=0
Interval=10
```

The above sections define a generic port, which sends data between the surface and pressure housing unit. An end user can then connect an RS232 cable between the surface and bottle systems to control and receive data from a device that is attached to the bottle.

There are other keywords in the '.ini' file that can be used to tailor the serial port options. These are documented in the file Sonar.txt, which is included with every system.

You may wish to review the Sonar.Txt file or contact EdgeTech on these or other setup options. The file is located in the same folder as the executable file (e.g. C:\Edgetech\SSSSonar\Sonar or C:\Edgetech\FSDW\Sonar depending on your system configuration).

8.3 Standard Configurations

Built in support is provided for several industry standard devices. The Sonar.ini keyword "Parser" in the [SerialN] sections is used to choose a built-in parser. When EdgeTech provides a built-in parser, some additional data validation is usually implemented. For example, if the RS232 device message includes a check sum then the data records will be validated and error statistics maintained.

When the Parser keyword is used, a special recognized device message is transmitted in the standard network data stream. For example, for a pressure sensor, the message DEV_DEVICE_PRESSURE_DATA is sent with a validated reading.

The Sonar.Txt file includes up-to-date documentation on devices supported and how to set them up.

8.4 Connections

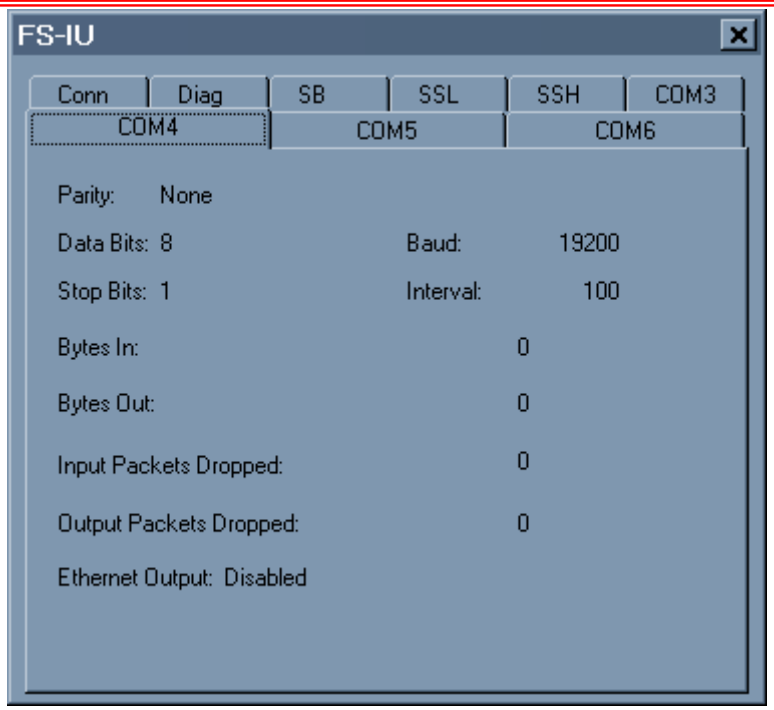
Only three wires are required for each serial port – transmit, receive and ground. The default connector for a bottle system with the serial port option exposes all 4 ports (12 pins total) on a single bottle penetrator. Refer to your system specific documentation for actual pin outs.

On the surface (for a deep-tow system), a standard 9-Pin connector is provided for each port.

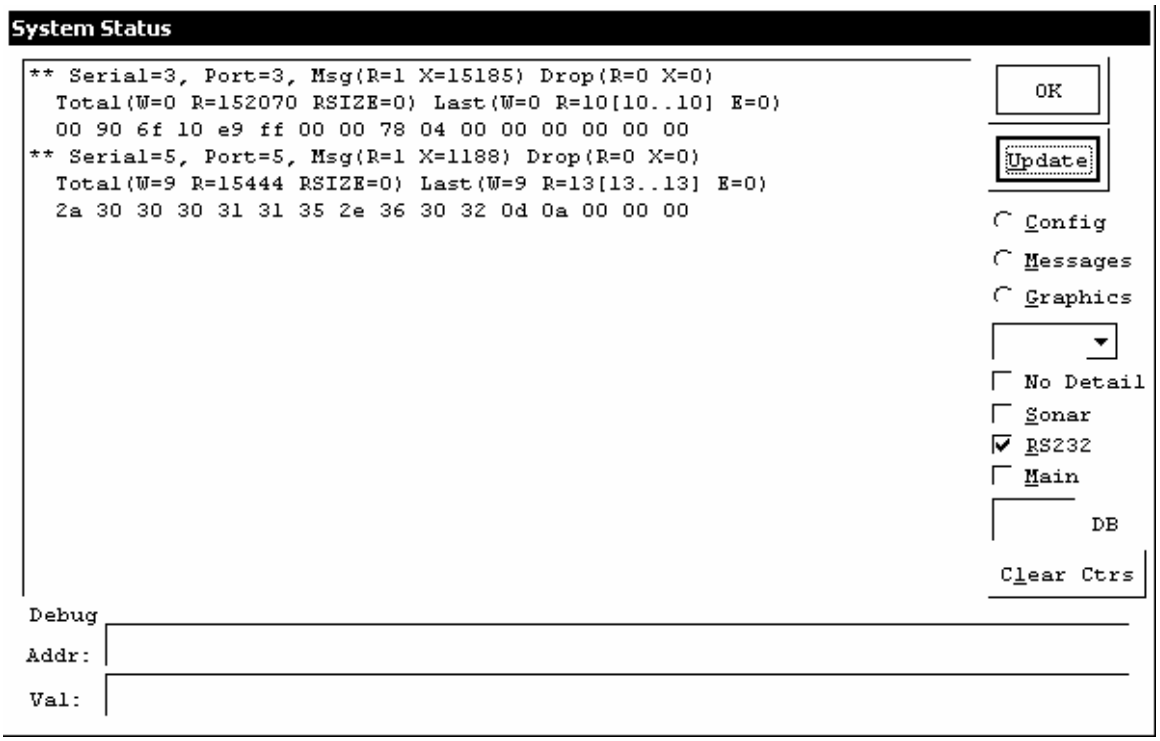
To conserve on bottle connector pins, the handshake wires are not used. In the software, serial ports are configured with hardware and software handshaking disabled.

8.5 Trouble Shooting

Diagnostic displays are available on both the FS-IU and inside the pressure housing to check out the serial ports. If a monitor and keyboard are attached to the FS-IU, a display is available for each topside serial port, which shows the settings, bytes in, bytes out and other statistics. A sample display is shown below:



In the pressure housing, the "File / Show Status" menu option of the sonar can be used to show similar statistics. A sample display is shown below:



In this display, two serial ports are active. Serial three has received a total of 152070 bytes of data from its RS232 port and no data has been written from the network to the port (W=0). The last read was for 10 bytes (R=10). And since the "Clear Ctrs" button was pressed all records

read were exactly 10 bytes long (as indicated by the min and max byte count range in square brackets). These are typical statistics for a pitch roll sensor sending data in the EM1000 format. The E=0 indicates that no errors were detected in parsing the data. The most recent data record received is show as a series of hex bytes.

Using the statistics above, it is usually possible to verify proper operation of each device.

EdgeTech also provides loop back diagnostic programs for serial port checkout. See your main manuals for description of these "Utilities". Note that to use these applications, you must attach a loop back connector between serial ports.

Each system is also shipped with the standard, windows terminal emulation program, HyperTerminal.

Note that since the Sonar and ETSI normally control the serial ports when they are running, you must exit these applications before running HyperTerminal or the loop back diagnostics

8.6 Programming Interface

Specification files suitable for use in sending messages to the Sonar for an AUV controller are provided upon request. There is also an extensive set of options in the Sonar.Ini file.

Listed below is the current set of parameters and messages, as of the publication date of this manual. As both of these may be enhanced in the future, please refer to the actual data files for up-to-date information.

```
Summary of Sonar.Ini File Settings (Pressure Housing Setup):
;------------------------------------------------------------------------
;------------------------------------------------------------------------
; [SerialN] : RS232 configuration options (Starts with Serial0..Serial7)
;------------------------------------------------------------------------
; CREATE=0
; Use 1 for standard serial port.  2 for DMU6.
; NETWORK=1
; 1 to enable data on ethernet
; DISK=0
; 1 to enable data on the disk
; DATA=
; Default string to write to port on init
; Port=N
; Specifies the actual hardware serial port number for the channel.  Default
; is the channel number.
; Baud=9600
; Baud rate of connection.
; Parity=2
; Parity of port (0=>even, 1=>odd, 2=>none, 3=>mark, 4=>space
; StopBits=1
; Stop bits for port.  Minimum of 1
; WetPortCheckInterval=100
; Data polling interval in ms.
; ExtendedParsingInfo=0
; Extended parsing info, reserved for future applications.
; DataBits=8
; Data bits per character (maximum of 8).
; Priority=0
; Set the thread priority for serial io.  A value of 0 is NORMAL, 1 is
```

```
; above normal, and 2 is highest (real time).
; Parser=0
; Parsing algorithm.  Choose from:
; 0: None - read and send up any data.
; 1: Pitch/Roll in Simrad EM1000 format - This consists of 5 16-bit words
with values
;  (Header)(Roll)(Pitch)(Heave)(Heading)
; 2: Paroscientific Pressure Meter
; DiagnosticIOPort=0
; Set to a VALID parallel port IO address IN HEX to enable latency testing.
Parallel
; port data bits will then be asserted as soon as a serial record is
received.  A
; scope can then be attached to the port to detect latency between serial io
and
; time tag events.
; ReadIntervalTimeout=0
; Read interval timeout in ms.  After the first character, if the next one
does not
; arrive within the interval then the read is aborted (end of packet).  A
value of
; 0 disables.
; ReadTotalTimeout=0
; Read total timeout in ms.  Waits this long for the first character (or all
chars if
; the interval timeout is 0).  A value of 0 results in a default of 1 ms.
; WriteTotalTimeout=0
; Suspend up to this long in ms waiting for a write.  A value of 0 uses 1.5
times the
; WetPortCheckInterval.
; TimeStampFirstChar=0
; Set to 1 or 2 to timestamp the first character read in a buffer.  This will reduce
; jitter in the timestamp read, which can be as high as 20 ms otherwise.
Setting this
; flag makes the code less efficient.
; A value of 1 will read the port twice per loop: Once for the first
character and then
; for what is remaining in the buffer.
; A value of 2 will read the port three times per loop: Once for the first
character
; and then once for what is remaining in the buffer and then once more.
; Choose between a value of 1 or 2 by the size of the read fifo buffer and
the size of
; each expected record.  If the fifo buffer size is less than the amount of
data per
; record then the value 2 should be selected.  Otherwise the value 1 should
be elected.
; TimestampBias=0
; Bias of timestamp of each record in ms.  A negative value moves back in
time.  Since
; the data is buffered by the hardware, there is a fixed latency in receipt
of data.
; This parameter allows the timestamp to be biased (usually back in time) to
compensate
; for these latencies as well as internal device sampling latency.  A scope
connected
```

```
; to the parallel port with the DiagnosticIOPort option can be used to
determine this
; value.  For a receive buffer size of N and a baud rate M, the approximate value
for
; time stamp at first character receipt would be (assuming that
TimestampFirstChar=1):
; - (1000 * 10.0 / M) * (N + 2)
; Value must be between +-500 or it is ignored.
; InitString=
; Init string to send to unit on startup or other failure condition.  To
insert
; non-printable characters use \n (newline), \r (return) or \XX where XX
;  represents the value to insert in 2 hex digits.
; InitTimeout=10000
; Timeout for init string in ms.  The init string is sent after this period
of
; inactivity or upon startup.  A value of <= 0 disables the init string
processing.

Summary of ETSI.Ini File Settings (Topside Serial Port Setup):
;--------------------------------------
; Serial Port Configuration
;--------------------------------------
; active = 1 - active, 0 - inactive
; baud rate = 1200, 2400, 4800, 9600, 19200
; parity  = 0 - even, 1 - odd, 2 - none, 3 - mark, 4 - space
; dataBits = 5, 6, 7, 8, number of data bits
; stop = 0, 1, 2, number of stop bits
; serialEnable = 0, 1 enable serial port output
; interval = val aproximate poling interval in ms - max 1000

Summary of Serial Messages (Device Messages):
/* ---------------------------------------------------------------------- */
/* sonarMessage field indicates the type of data to follow.     */
/* ---------------------------------------------------------------------- */

typedef enum
{
  /* Note: Use SONAR_MESSAGE_DATA_NETWORK, SONAR_MESSAGE_DATA_DISK to   */
  /* enable / disable data output on a device.          */

  /* ---------------------------------------------------------------------- */
  /* A Serial Port allows the reading and writing of data to a port.  */
  /* ---------------------------------------------------------------------- */

  /* Read or write bytes of data to the port (DEVDataType)      */
  DEV_SERIAL_DATA = MESSAGE_OFFSET_DEV,

  /* Receives baud rate, etc - eg (DEVSerialParametersType)     */
  DEV_SERIAL_PARAMETERS,

  /* ---------------------------------------------------------------------- */
  /* Generic device control - reserved for future expansion.      */
  /* ---------------------------------------------------------------------- */

  /* Read or write bytes of data to the port (DEVDeviceDataType)    */
```

```
  DEV_DEVICE_DATA = MESSAGE_OFFSET_DEV_GENERIC,

  /* Receives device parameters.  Size is specific to device subsystem. */
  DEV_DEVICE_PARAMETERS,

  /* Send a special command to the device (SonarMessageLongType)    */
  DEV_DEVICE_COMMAND,

  /* ---------------------------------------------------------------- */
  /* Special device messages                */
  /* ---------------------------------------------------------------- */
  /* A DMU-6 Provides 3 axis accelerometers, 3 axis rate gyros, and   */
  /* Temperature, Pitch, Roll.  It is a serial device.        */
  /* ---------------------------------------------------------------- */

  /* Sends data of type (DEVDataType + DMU_6DataType)       */
  DEV_DEVICE_DMU6_DATA = MESSAGE_OFFSET_DEV_DMU6,

  /* Calibrate DMU6 Rate Gyros                */
  DEV_DEVICE_DMU6_CALIBRATE,

  /* Receives baud rate, etc - eg (DeviceDMU6ParametersType)      */
  DEV_DEVICE_DMU6_PARAMETERS,

  /* ---------------------------------------------------------------- */
  /* Low rate analog io messages              */
  /* ---------------------------------------------------------------- */

  /* Sends data of type (AnalogIOItemType) on a get         */
  DEV_DEVICE_ANALOGIO_DATA = MESSAGE_OFFSET_DEV_ANALOGIO,

  /* Set parameters for analog io data (DeviceAnalogIOParametersType)   */
  DEV_DEVICE_ANALOGIO_PARAMETERS,

  /* ---------------------------------------------------------------- */
  /* A Pressure sensor reads pressure and optionally temp / salinity.   */
  /* ---------------------------------------------------------------- */

  /* Sends data of type (DEVDataType + DEVPressureType)       */
  DEV_DEVICE_PRESSURE_DATA = MESSAGE_OFFSET_DEV_PRESSURE,

  /* ---------------------------------------------------------------- */
  /* Add more device messages here              */
  /* ---------------------------------------------------------------- */

} DeviceMessagesType;
```

9 DATA STORAGE OPTION

This section describes the optional data storage option for the FS-AU. In an AUV configuration, it is usually not possible to send sonar data to the surface in real-time. This data can be either be stored on the sonar's dedicated data storage hard disks or sent to a third-party or

end user provided controller for data management. The primary features of the storage system are:

Data Stream Replication To Storage Device : Each sonar data source supports two sets of parameters. One set determines how data is sent via the network interface to the topside / AUV controller. A second set determines how much data is stored on disk. These parameters include:

First sample and totals samples to return. This allows for reduced data requirements by removing the water column or other areas not of interest from the data.

Ping and Sample Decimation. These parameters would normally only be used on the network interface to reduce data rates. Reduced sample rate / ping rate data could then be transferred to the surface via modem for quality control monitoring.

In addition, serial port data (eg: Pitch Roll, etc) is also optionally sent to either or both the internal store and network interfaces.

Data Compression : Multiple levels of data compression are supported. The compression algorithms are designed to preserve dynamic range and reduce post mission upload times. These algorithms are also easy to use and implement and an optional compression library is available.

High Capacity Storage for Long Missions : A minimum of 30 GB of storage is provided. When collecting data at maximum rates for a combined sub-bottom / dual frequency side scan system, this will provide at least 36 hours of continuous data collection. Typical record times are much higher and depend primarily on the amount of high frequency (410 kHz) side scan data desired.

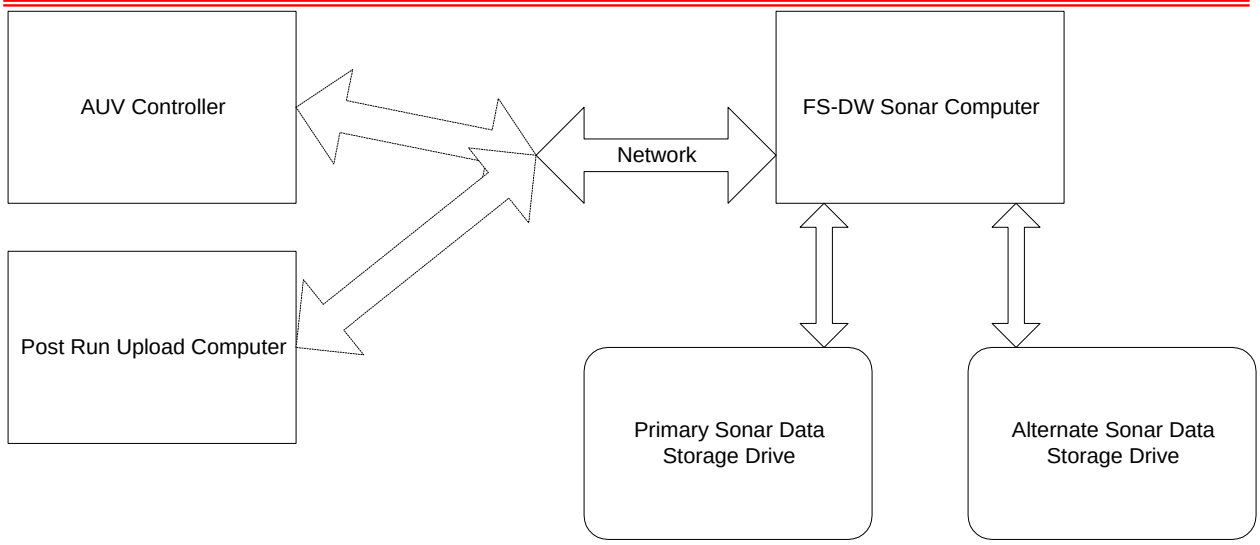
Time Stamp : All data is time stamped at the time of collection. Several time sync protocols are supported, including a standard 1 PPS.

Redundant Storage : Redundant storage drives are provided for enhanced reliability.

Ease of Post Run Data Access : Data can be accessed as standard files post run, and are shared for ease of network access from any Microsoft Windows compatible computer.

Diagnostic Topside Support: Data files are recorded in Edgetech's standard network protocol format. The JStar diagnostic topside, which is shipped with every system can be used to playback the data files post run.

The overall sonar system with storage is illustrated below:



Storage Option

9.1 Configuration and Setup

Behavior of the storage system is determined by configuration settings in the Sonar.Ini file and messages / commands sent by the AUV controller over the network. The [File] section in the Sonar.Ini file specifies most of the parameters. Below is a sample section:

[File]

PrimaryDrive=D:

BackupDrive=E:

BaseName=\DATA\DATA

MaxFileSize=50

MaxFileTime=600

In the above example, data is stored on the D: drive in the folder D:\Data\ each file has a name of the format DATA???????.jsf where the 7 question marks are replaced by a sequence number. For example, after a mission this folder might contain:

DATA0000000.jsf

DATA0000001.jsf

…

DATA0000999.jsf

A new file is created:

Upon command from the AUV controller OR

After the current file reaches 50 mb of data OR

After the current file has been open for over 600 seconds (10 minutes).

There are other keywords in the Sonar.Ini file that can be used to tailor the data collection options. These are documented in the file Sonar.Txt, which is included with every shipped system.

In addition, the sonar.ini file contains sections for each channel of data. A default set of storage parameters can be defined for each channel to specify which channels of data are sent to the storage subsystem when storage is enabled. The Sonar.Txt file also includes these parameters.

While not recommended, it is possible to store data and control the system with no interaction with an external controller computer by choosing default settings. For example, the system can be set up with "Auto Store" enabled, so that data by default is stored to disk when it arrives. The external trigger lines can then be used to determine when and how often to ping. An "Auto Run" option is also available to begin pinging and data collection (via internal trigger) upon power on.

You may wish to review the Sonar.Txt file or contact Edgetech on these or other setup options.

For dynamic control of the system via an AUV controller, a message interface over the network is provided. A sample set of commands might be:

STORAGE_MESSAGE_MASTER_RECORD : Sent to start recording at the beginning of a line.

STORAGE_MESSAGE_MASTER_RECORD : Sent to stop recording at the end of a line.

Other messages are also possible to tailor the system. See the programming section for more details.

9.2 Normal Operation

Pre-Mission Check Out:

Prior to each mission, any old data recorded should be deleted to make room for new data. This can be done by hooking up a support computer (Windows compatible) to the network interface of the FS-DW. The folder for recorded data is shared on the network.

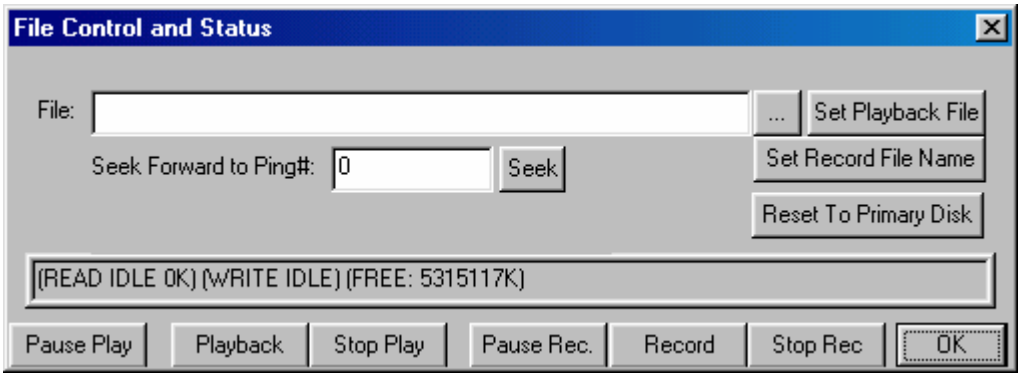
The sonar status should be checked at this time for any errors relating to disk storage. The status is available to an AUV controller via the SONAR_MESSAGE_SYSTEM_STATUS message (see programming section).

As an alternative, PC Anywhere can be used to directly access the computer in the FS-DW housing. In the Sonar application, which should be running, select the menu option "Recording / File Control and Status …" A dialog box will appear which includes a continuously updated status line as shown below:

If the status does not appear similar to the above, for example if the the phrase ** BACKUP DRIVE ** is shown in the WRITE section of the text, then an error has been detected on the primary drive. Please refer to the trouble shooting section.

You can also test the recording. Press the "Record" button and a new file should be created. Note that this file will ONLY be created when there is new data to be saved, so you may need to turn on pinging via the "Transmit" option on the main menu. Note also that the Sonar.Ini

parameters must be set up to record data to disk. F example, make sure that the keyword DATA_FILE=1 is present in the [SUB0IO0] section of the Sonar.Ini file to collect data for subsystem 0, channel 0 (the subbottom) to disk.



Post Mission Upload:

Post Mission, hook up your Windows compatible support computer to upload data. Then delete the files from the FS-DW to make room for the next mission.

9.3 Trouble Shooting

As described and illustrated above, a diagnostic control panel, "File Control And Status" for the storage is provided in the Sonar application inside the FS-DW. This can be accessed via PC Anywhere. Refer to your main documentation for installation details.

Via this control panel, you can turn recording on and off and verify that data is being recorded in the primary storage drive. This display also shows the real time status of the storage and can therefore be used to test any AUV controller interface to the sonar. For example, enabling the master record should change the write state from IDLE to OPEN and the currently open file should be displayed.

If an error is ever detected, the message ** BACKUP DRIVE ** will appear in the status line to indicate that recording is now on the backup drive. The button "Reset To Primary Disk" will switch back to the primary in this case (after correcting the problem).

If a problem is detected, you should check both the primary and backup disks for errors. To do this, use PC Anywhere to access the FS-DW system. Start Explorer and select the drive to test. Select the "Properties" option from the Explorer menu. Then select the tools options and do a through test of the disk.

9.4 Programming Interface

Specification files suitable for use in sending messages to the Sonar for an AUV controller are provided upon request. There is also an extensive set of options in the Sonar.Ini file.

Listed below is the current set of parameters and messages, as of the publication date of this manual. As both of these may be enhanced in the future, please refer to the actual data files for up-to-date information.

```
Summary of Sonar.Ini File Settings:
;--------------------------------------------------------------------------
```

```
[File] - Store and Forward
;--------------------------------------------------------------------------
; PrimaryDrive=D:
; BackupDrive=
; Sets the primary and backup hard disks for data storage.  If the
BackupDrive
; is specified and is not blank, then if a disk error occurs then storage
will be
; switched from the primary to the backup drive.  See the keyword
"OnBackupDrive".
; BaseName=\DATA\DATA
; Base directory and file name for data storage.  Note that this is preceeded
by the
; PrimaryDrive or BackupDrive string when creating files.
; MaxFileSize=50
; Maximum size of each file in mb.  Once a file exceeds this size it is
closed
; and a new file is created.  Must be between 1mb and 2 gb.
; MaxFileTime=600
; Maximum time a file can remain open for writing in seconds.  Onces a file
; is open for this time it is closed and a new file is created.  This
determines
; the maximum amount of data that can be lost on power failure.
; AutoRecord=0
; Set to 1 to enable recording of data to disk on startup.
; AutoPlayback=0
; Set to 1 to enable playback of store and forward data on startup.
; FileQueueSize=100
; Size of the data queue in elements destined to be written to a data file.
; PlaybackRate=100
; Sets the playback rate in messages per second.
; AllowNoHeaderRead=0
; Set to 1 to enable compatibility mode with old format JStar files.  This
; reduces the amount of error checking done.
; MaxBackupSize=0
; Set to the maximum size of the backup data files in mb.  Once data is
; played back, it is deleted if this value is 0.  Otherwise, only the oldest
; data is deleted until the total size of the backup files are below this
value.
; MaxDiskUsage=0
; Set to the maximum space allowed for data files waiting to be played back
; and backup data.  Set to 0 to disable this check.
; MinDiskFree=0
; Set to the mimimum amount of disk free space in mb.  A new recording file
will
; not be created (Disk Full Error) if there is not at least this much
; free disk space.  A value of 0 will set the minimum disk free space to
; twice the MaxFileSize.  A value less than 10 mb will otherwise set the
minimum disk
; free space to 10 mb.  Use -1 to disable this check (not recommended).
; DesiredBufferSize=65536
; Data is buffered into disk-sector sized units before writing to the disk.
This sets
; the buffer size.  It must be at least the sector size (typically 512 bytes)
and at
```

```
; most 2000000 bytes.  The actual value used will be rounded to the current
sector size.
; OnBackupDrive=0
; When set to 1, data is recorded on the secondary (backup drive).  Recording
will be
; AUTOMATICALLY switched from primary to secondary drive when a disk error
occurs if
; the BackupDrive is specified and is not blank.

Summary of Storage Messages:
/* ---------------------------------------------------------------------- */
/* sonarMessage field indicates the type of data to follow.     */
/* ---------------------------------------------------------------------- */

typedef enum
{

  /* ---------------------------------------------------------------------- */
  /* Management of disk files               */
  /* Subsystem should be set to 0 and channel set to 0.       */
  /* ---------------------------------------------------------------------- */

  /* Enables recording to storage if 1, disables on 0.        */
  /* (SonarMessageLongType)                 */
  STORAGE_MESSAGE_MASTER_RECORD = MESSAGE_OFFSET_STORAGE_FILE,

  /* Enables playback of stored data if 1, disables on 0.       */
  /* (SonarMessageLongType)                 */
  /* Note: playback data is received by a topside as        */
  /* SONAR_COMMAND_PLAYBACK type messages.            */
  STORAGE_MESSAGE_PLAYBACK,

  /* Deletes either (1) All Data, (2) Already Transmitted Data, (3) Data  */
  /* Not Yet transmitted (FIFO flush).            */
  /* (SonarMessageLongType)                 */
  STORAGE_MESSAGE_PURGE,

  /* Resets the playback point to the specified time.       */
  /* (TimestampType).                   */
  STORAGE_MESSAGE_ROLLBACK,

  /* Returns the amount of free space in mb on a SONAR_COMMAND_GET.  This */
  /* includes undeleted but transmitted data.           */
  /* (SonarMessageLongType)                 */
  STORAGE_MESSAGE_FREE_SIZE,

  /* Returns the amount of data to be transmitted in mb (FIFO depth)  */
  /* (SonarMessageLongType)                 */
  STORAGE_MESSAGE_PLAYBACK_SIZE,

  /* This is a SONAR_COMMAND_PLAYBACK message that is only generated in */
  /* playback of data for store and forward.  At the start of every new */
  /* file, a timestamp message is inserted.  These timestamps are included*/
  /* in the playback data.  (TimestampType)           */
  STORAGE_MESSAGE_TIMESTAMP,
```

```
  /* On a set, sets the base file name for future storage.  Recording   */
  /* must be disabled when this function is called.  Note that both   */
  /* recording and playback use the same base file name.  This message  */
  /* is primarily intended for use without the playback option.  That is  */
  /* data recorded is manually picked up after the run and manually   */
  /* deleted from the disk.  Takes a parameter of (SonarMessageStringType)*/
  /* Only alph numberic characters and the '.' are accepted in file names.*/
  STORAGE_MESSAGE_FILE_NAME,

  /* Each file is padded to a multiple of the sector size (512 normally)  */
  /* by inserting one of these messages at the end of the file.     */
  STORAGE_MESSAGE_END_OF_FILE_PADDING,

  /* ------------------------------------------------------------------- */
  /* Sonar Return Data                  */
  /* ------------------------------------------------------------------- */

  /* Disable(0), Enable (1) storage of data.  Applies to any subsystem  */
  /* and channel.                    */
  /* (SonarMessageLongType)                  */
  STORAGE_MESSAGE_DATA_ENABLE = MESSAGE_OFFSET_STORAGE_RETURN,

  /* Window for sonar data storage (SonarMessageWindowType).  This only */
  /* applies to sonar data type subsystems.           */
  STORAGE_MESSAGE_DATA_FILE_WINDOW,

  /* Returns the name of the file for which playback is starting    */
  /* (SonarMessageStringType).  This message is automatically generated */
  /* at the start of every new file.              */
  STORAGE_MESSAGE_PLAYBACK_BEGIN,

  /* Returns the name of the file for which playback is stoping     */
  /* (SonarMessageStringType).  This message is automatically generated */
  /* at the ned of each file.                */
  STORAGE_MESSAGE_PLAYBACK_END,

} StorageMessageType;
```

10 APPENDIX 1: SONAR.TXT

```
Parameters for Sonar.Ini

;------------------------------------------------------------------------
; [MAIN] : Overall configuration options:
;------------------------------------------------------------------------
; Priority=1
;   Sets the run time priority of the app (0:Normal, 1:High , 2:Real-Time)
;   Note that priority of 2 causes problems with PC-Anywhere
; AutoStart=0
;   Set to 1 to start pinging on startup
; AutoEther=1
;   Set to 1 to enable transmission of all channels of sonar data over
ethernet
; DspSimulator=0
;   Set not-zero to run without a DSP Card.
```

```
;   Set to 3 to process step wedge through filters.
;   Set to 2 to enable simulator mode and input a random delay of the
;   outgoing pulse.  This is the required mode for MPX simulation.
;   Set to 1 to enable a stepwedge directly out.
; DspSimulatorTickInterval=5
;   Tick marks at top of display in simulator if greater than 0.
; TAPE_LINE1=Your Company
;   Annotation for segy data.
; TAPE_LINE2=Your Area
;   Annotation for segy file second line.
; NCARD=1
;   Number of ADC64 cards installed (1-3).  Config for each card is in [DSPN]
sections.
; NSUB=1
;   Number of Subsystems installed.  Config for each subsystem is in [SUBN]
sections.
; NETWORK_QUEUE_SIZE=1000
;   Size of the data queue in kbytes.
; PlaybackQueueSize=500
;   Size of playback data queue in kbytes.
; DSP_QUEUE_SIZE=64
;   Size of the data queue in elements between the dsp and the data thread.
;   A queue of this size is allocated for each card.
; COMMAND_PORT=1700
;   Socket number for command socket
; DATA_PORT=1701
;   Socket number for data socket
; NetDataIF=1
;   1 to enable command and data sockets.  0 to disable.
; DisplayOptions=2
;   Set to 0 to minimize on startup.
;   Set to 1 to keep display minimized at all times.
;   Set to 2 to show always.
;   Set to 3 to let the operator choose
; PostProcessing=1
;   Set to 0 to enable DSP based post processing (original analog card only)
;   Set to 2 to pick up DATA_ALL format data from the dsp.  Required for
performance
;     in multiping systems.
; DspSyncInterval=60000
;   Set to the number of milliseconds between time syncs of each DSP card.
; PciPollInterval=20
;   Set to the number of milliseconds to sleep when there is no data on the
;   shared memory between DSP and PC.  Can be increased when bigbuf is used.
; IgnoreMFOverlap=0
;   Set to 1 to ignore the size of the matched filter (SaveSize).  This will
;   deliver some data at the end of a pulse that is not good.
; SoundSpeed=1500
;   Sound speed in meters per second.
; CmdXmitSize=60000
; CmdRecvSize=60000
; DataXmitSize=150000
; DataRecvSize=60000
;   Size of transmit and receive buffers for data on sockets.
; DualNetwork=0
;   Set to 0 to get 1 network socket for both command and data and storage.
```

```
;   Set to 1 to get 2 simultaneous network connections.  In this case the
;   second connection replaces record for the storage window interface.
;   Set to 2 to get 2 command sockets but only a single data socket.
;   with storage support (on the second window).
;   When a second network soocket / socket pair are enabled, they will
;   default to sockets 1702 and 1703.  This can be modified by creating
;   a [Net1] section with appropriate COMMAND_PORT and DATA_PORT keywords.
; TimeSyncInterval=1
;   Time sync interval for hardware time sync in seconds.
; TimeSyncNetwork=0
;   Set to a time interval in seconds to enable sonar as a master timesync
;   for the SIU and this computer.
;   When this number is positive the bottle computer (Sonar.Exe) is the
;   time sync master.  Time sync is done periodically.  When this parameter
;   is set to 1 it will timesync every 30 seconds.  For custom timesync
;   interval set to 2 or greater (eg 2 for every 2 seconds).
; TimeSyncMaxLatency=100
;   Maximum latency between a query for time and a response from the SIU.
;   If the latency is exceeded the response from the SIU is ignored and
;   no timesync is performed.
; TimeSyncMaxDelta=20
;   Maximum time delta in ms to apply per time sync query (to the SIU).
;   If this value is too small, the SIU time may never converge, but
;   smaller values can help to filter out latency noise in the algorithm.
; XmitRate=500000
;   Rate of data socket (maximum sustainable) in bytes per second.
; XmitBufSize=0
;   Buffer size in bytes  of network buffers to avoid overflow.  If set to
zero
;   then rate limiting of data transmission is disabled.  A good number is
about
;   32000
; DisableUnsolicitedMsgs=0
;   Set to 1 to disable unsolicited messages on the command / data socket (eg
status msgs)
; CompatibilityOptions=0
;   Bit 0: Use old pulse file formats (per channel) and window based on
samples
; TimerSource=-1
;   Set the internal timer source if >= 0.  Standard (0), HP (1), Hardware
(2)
; PostCodes=00001 01001 10001 11001
;   Power on self test codes to run on startup. This consists of up to 8 hex
numbers.
;   Each value has the following: (S)(C)(P)(F) where,
;   (S) : One Hex digits of the subsystem index (0..f)
;   (C) : One Hex digits of the channel number (0..f)
;   (P) : Two Hex digits of the post code as defined in
DiagnosticSelectionType (SonarMessages)
;   (F) : Function to perform (1 => Execute but dont check status, 2 =>
Execute and include in status)
;         Other values (ie 0) cause the POST test to be ignored.
;    The DiagnosticSelections are summarized below:
;      0 : Heartbeat
;      1 : SB Poweramp feedback
;      2 : Check Interface card digital logic
```

```
;      3 : Check 48 Volt Power
;      4 : Check ambient temperature sensor
;    To run digital diag use code 00022.  To run SB power amp feedback use
code 00012
;    eg: PostCodes=00001 01001 10001 11001 00022 00012
;   RECOMMENDED POSTCODES:
;     FSIC:  00001 10001 11001 00012 00022 00032 00042
;     FSSB:  00001 00012 00022
; IgnorePostError=1
;   When set to 0, NO SONAR DATA will be transmitted if there is a POST
error.
;   When set to 1, post errors are ignored.  SONAR_MESSAGE_OVERRIDE message
can
;   be sent to set the flag to 1.
; StepWedgeSamples=0
;   Set to a positive value to fill the first N samples of each returned
message
;   packet with a step wedge for testing.
; StepWedgeGainDB=0
;   Overall scale factor for intensity level of step wedge in DB.
; Message_Dll=
;   Name of message dll for advanced / extended processing.
; SystemType=-1
;   System type as returned by the SONAR_MESSAGE_SYSTEM_TYPE message.
;   If -1 is used, the configuration will be estimated from other parameters.
;   The -1 values should only be used for backward compatibility.
;   /*    0 - No Acquisition
*/
;   /*    1 - MPX sidescan
*/
;   /*    2 - single frequency sidescan
*/
;   /*    3 - simultaneous dual frequency sidescan - DF1000
*/
;   /*    4 - simultaneous dual frequency sidescan - FSDW
*/
;   /*    5 - sub-bottom sonar
*/
;   /*    6 - combined sub-bottom and dual frequency sidescan
*/
; Device=1
;   Low level hardware model for system.  The currently defined devices are
;   1: ADC64
;   2: ATAPI
; Config=0
;   Standard configuration settings.  If non-zero, the default values for
;   keywords are modified consistent with the types described below.  This
;   simplifies the ini file.  This string is case sensitive and must be in
;   all uppercase letters.  The supported configurations are:
;   0: None
;   ATAPI_SBSS: ATAPI Based SB, SSL and SSH system.
;   FSIC_SBSS : FSIC Based SB, SSL and SSH system.
;   FSIC_2200M
;   FSIC_2000C
;   FSIC_2400DT
;   FSIC_MPX  : FSIC Based MPX with SB system.
```

```
;   ATAPI_MPX : ATAPI Based MPX with SB system.
;   SIB_4300MP-X
;   ADC64_FSSB: AIC Based SB Only System
;   ATAPI_SAS : ATAPI Based SAS (12 Channel) system.
;   SIB_4400SAS
;   ATAPI_FSSB: ATAPI Based FSSB system (1 channel subbottom).
;   ATAPI_SC  : ATAPI Based Sed Class system (8 channel subbottom)
;   ADC64_SC  : ADC64 Based Sed Class system (8 channel subbottom)
;   ADC64_3200XS
;   ADC64_3300HM
;   ATAPI_4200: ATAPI Based 4200 Dual Freq SS
;   SIB_4200FS: ..
;   ATAPI_DIAG: Special internal diagnostic configuration
;   SIB_512W  : WHOI Fisheries Special Dual Sub-bottom subsystems
;   SIB_4500DF: Dynamically Focussed Side Scan
;   SIB_3200XS: ATAPI Based XStar System
;   SIB_3100  : Geostar Portable
;   SIB_SS    : ATAPI Based Dual Frequency Side Scan with no Subbottom
;   SIB_4200_A: 4200 With Dual Simultaneous Multi-ping.
; QCCompressMethod=0
;   Compression method for QC Data.  See CompressNet keyword for description.
; QCDestinationQueue=1
;   Destination queue for QC Data.  Use 1 for standard network or 2 for
;   alternate network like (or disk link).
; PingOffIfNoActiveDestination=0
;   Set to one to keep pinging on even if there is not valid destination for
;   data.  If set to 0, pinging and data collection will stop if there is
;   nothing to send data to (network link or file destination).
; CompressNet= -1
; CompressDisk= -1
;   Default compression method for sonar data.  See discussion in [SubMION]
;   for details.
; EnableSounds=0
;   This is a bit mask for enabling playing of sounds on the PCs speaker.
;   Bit 0: If there is a post error, play the sound file SoundPostError.txt
;   Bit 1: If there is not data sink (eg no net connect) play the file
SoundNoConnect.txt
;   Bit 2: If a connection is established play the file SoundConnect.txt
;   If a file does not exist then not sound will be heard even if enabled.
; MaxMessageSize=262144
;   Approximate maximum message size on the command socket.  The default is
normally
;   much larger than is needed.  However, some video capture options will
require
;   a larger size.
; RawDataOutput=0
;   Options to save true raw data.  Bit 0 enables low level raw data out on
the
;   network interface.  Bit 1 enables low level raw data out on the disk
interface.
;   Since this can result in a substantial data rate, these options should
only be
;   enabled for special diagnostic purposes.
; TimeSyncSource=0
;   Select the source used for time sync.  The allowed values are:
;   0 : Network based only
```

```
;   1 : ZDA string only time sync.
;   2 : Network or ZDA string (on a parsed NMEA serial port).  When set to 2
;       a topside should not send time setting type messages when the ZDA
;       string is active.
;   3 : Time sync disabled
; ContainerDestination=3
;  Selects the destination queues for container messages.  If bit 0 is set
then
;  messages are sent to the network queue.  If bit 1 is set then messages are
;  sent to the disk queue.
; BackgroundMonitor=0
;  Set to 1 to enable the background monitor function.  This can (and is
intended)
;  to use cpu resources and should not be enabled unless required.

;--------------------------------------------------------------------------
[File] - Store and Forward
;--------------------------------------------------------------------------
; PrimaryDrive=
;   Sets the hard disk partition for data storage.  If no drive is specified
then file
;   recording is disabled.  The recommended value is : PrimaryDrive=E:
; BaseName=\DATA\DATA
;   Base directory and file name for data storage.  Note that this is
preceeded by the
;   PrimaryDrive or BackupDrive string when creating files.
; MaxFileSize=50
;   Maximum size of each file in mb.  Once a file exceeds this size it is
closed
;   and a new file is created.  Must be between 1mb and 2 gb.
; MaxFileTime=600
;   Maximum time a file can remain open for writing in seconds.  Onces a file
;   is open for this time it is closed and a new file is created.  This
determines
;   the maximum amount of data that can be lost on power failure.
; AutoRecord=0
;   Set to 1 to enable recording of data to disk on startup.
; FileQueueSize=100
;   Size of the data queue in kbytes destined to be written to a data file.
;   If file storage is used this number should be set to about 1000.
;   As a special case, if this value is less than 100 and larger than 0
;   then data destined for file storage is redirected into the network output
queue.
;   A value of 0 will default to 1000 (1 mb) if the storage option is
enabled.  The default
;   value of 100 will automatically be increased to 2000 if a primary drive
is specified.
; PlaybackRate=500
;   Sets the playback rate in kbytes per second.
; AllowNoHeaderRead=0
;   Set to 1 to enable compatibility mode with old format JStar files.  This
;   reduces the amount of error checking done.
; MaxBackupSize=0
;   Set to the maximum size of the backup data files in mb.  Once data is
;   played back, it is deleted if this value is 0.  Otherwise, only the
oldest
```

```
;   data is deleted until the total size of the backup files are below this
value.
; MaxDiskUsage=0
;   Set to the maximum space allowed for data files waiting to be played back
;   and backup data.  Set to 0 to disable this check.
; MinDiskFree=0
;   Set to the mimimum amount of disk free space in mb.  A new recording file
will
;   not be created (Disk Full Error) if there is not at least this much
;   free disk space.  A value of 0 will set the minimum disk free space to
;   twice the MaxFileSize.  A value less than 10 mb will otherwise set the
minimum disk
;   free space to 10 mb.  Use -1 to disable this check (not recommended).
; DesiredBufferSize=65536
;   Data is buffered into disk-sector sized units before writing to the disk.
This sets
;   the buffer size.  It must be at least the sector size (typically 512
bytes) and at
;   most 2000000 bytes.  The actual value used will be rounded to the current
sector size.

;------------------------------------------------------------------------
; [SUBNIOM] : IO Channel configuration options (Starts with IO0 .. IO<NCHAN-
1>)
;------------------------------------------------------------------------
; SystemDescription=Sonar System
;   Information (segy) written to disk
; ChannelDescription=Channel Info
;   Information (segy) written to disk
; PulseDescription=Pulse Info
;   Information (segy) written to disk
; DATA_TYPE=1
;   Format of data to be returned for this channel.
;   0 => Envelope (match filtered - 1 word per sample),
;   1 => Analytic (match filtered - complex 2 words per sample),
;   2 => raw,
;   4 => RESERVED for All data (all 8 channels of raw data)
;   5 => RESERVED for All low rate IO data.
;   Other values will return incorrect results.
; DATA_NETWORK=1
;   Send data for this channel over the ethernet interface.
;   Note that the AutoEther keyword in the main section, if set to 1 (the
default)
;   superceeds this keyword, so set AutoEther=0 if you wish to disable
specific channels.
; DATA_FILE=1
;   Write data for this channel to local storage.  Note that the master
;   record for the file must also be enabled (with a valid file name) before
;   data is written.
; DATA_NETWORK_WINDOW=1 1 0 0 200000
;   Set the points to return to the ethernet  (Frame decimation, decimation,
first
;   sample, total samples, block size in samples)
; DATA_FILE_WINDOW=1 1 0 0 200000
;   Set the points to return and write to the disk
; PROCESSING_CALCONST=1000
```

```
;   1000 * the calibration constant.
; PROCESSING_PAKDELAY=0
;   Spherical correction factor for the first ADC sample.  Set to -1 to
disable always.
;   Set to -2 to disable only for multiping side-scan pulses.
;   Only applies to match filtered data
; PROCESSING_DIRECT_PATH = -1
;   Sets optimization window for agc processing in samples.
;   Special Values:
;     -1 : Use the size of the outgoing pulse + 20%.
;     -N : Delay by abs(N) milliseconds.
; PING_GAIN=1000
;   1000 * the gain factor for the outgoing pulse.  Should be between 0 and
1000.
;   Note that when the outgoing pulse is 0 (value of 0 here) the power amp is
;   kept off.
; ADC_GAIN=1
;   For a subbottom:
;   Log 2 of gain factor for ADC.  0..3 without analog card.  0..8 with card.
;   for a sidescan:
;   The gain in DB * 100 (eg 2000 is 20 db gain).
; ADC_AGC=0
;   Set to 1 to enable AGC algorithm
; DACChan=-1
;   Default actual DAC channel.  If set to -1, the logical and actual channel
number
;   are the same.  If -2 then this channel is disabled.
; ADCChan=-1
;   Default actual ADC channel.  If set to -1, the logical and actual channel
number
;   are the same.  If -2 then this channel is disabled.
; SlaveChannel=-1
;   Set to the channel on the card where gain is controlled from.  Only used
if a slave
;   card is present.  The gain setting is sent both to the primary and slave
channels.
; ADC_ANALOGCARDGAIN=1
;   Set to 0 to use only the on card 4 level gain stage.
;   Set to 1 to use the preamp gain on the analog card only for gains.
;   Set to 2 to use both a preamp gain and the on card 4 level gain stage.
;   Set to 3 to use a 16-bit number as the gain (0..32767) (For Side Scan).
;   Set to 4 to use DB * 10 for basic gain units (applies to FSIC SS
Subsystems)
;     The internal channel must be 2 (SSL) or 4 (SSH) for valid data.
;   Set to 5 if no gain stage is present.
;
; ------------------------------------------------------------------------
-------
; The Current pulse file overrides the following settings.  These are
included
; for internal testing purposes only.
; ------------------------------------------------------------------------
-------
; PING_DAC_RATE=200000
;   Set the rate for data acquistion and DAC output.  Note that when a pulse
is loaded
```

```
;   the pulse values will override this temporary setting.  Currently the IO0
rate is
;   used for all channels of a subsystem.
; ADC_DECIMATE=3
;   Set the ADC decimation factor.  Note that when a pulse is loaded the
pulse values will
;   override this temporary setting.  Currently the IO0 decimation is used
for all channels
;   of a subsystem.
; FFTSize=4096
;   Initial value of forward FFT size.  This value is overridden when the
first
;   pulse is loaded.
; IFFTSize=4096
;   Initial value of inverse FFT size.  This value is overridden when the
first
;   pulse is loaded.
; FFTDecimation=1
;   Initial forward FFT decimation factor.  This value is overridden when the
first
;   pulse is loaded.
; MatchFirst=0
;   Initial value of first value in matched filter.  This value is overridden
when the
;   first pulse is loaded.
; MinSaveSize=0
;   Minimum save size per matched filter.  Must be less than IFFTSize.  When
set to
;   0 the save size as specified in the pulse file is used.
; CompressNet=DEFAULTVALUE
; CompressDisk=DEFAULTVALUE
;   Set to 0 for no compression.
;   Set to 1 for about 33% compression.
;   Set to 2 for about 50% compression
;   Set to 3 for about 70% compression
;   The default value is based on the keyword of the same name in the section
[Main].
;   A value of -1 will use the value from section IO0 (or NONE if IO0 is -1)
; RawDataItemID=-1
;   Used to enable special diagnostic data collection.  Set to 256 *
subsystem + channel
;   to send raw data to the specified subsystem / channel pair for special
diagnostic
;   processing.  The subsystem / channel routed to should have ACTADCChan and
ACTDacChan
;   set to -1 to ignore true io.
; MFDataSource=-1
;   Set to the channel to inherit the match filter from if not present in the
pulse file.

;-------------------------------------------------------------------------
; [DSPN] : ADC64 card options (Starts with DSP0 .. DSP<NCARD-1>)
;-------------------------------------------------------------------------
; DspExecutable=.\SONAR.OUT
;   File name of ADC64 executable file image
; BigBuf=1
```

```
;   When zero it uses the standard buffer size for shared memory between the
;   DSP and the PC (PCI Bus) of 128 K.  Larger values are needed for some
high
;   data rate applications.
; TimeSyncMask=0
;   Mask of trigger in bits to use for the time sync function or 0 to disable
; ReferenceADCValue=195
;   Reference ADC Value for SSL and SSH VGA gain profiles (0..255)
; VersionNumber=0
;   Version number of attached analog card.
; TriggerOutInversion=0
;   This is a hex value.
;   Bit map to invert the trigger out line polarity.  Bit 0 is for the first
trigger line.
;   Bit 1 for the second and bit 2 for the third.  There are two sets of
values, namely:
;   Bits 0-7 : Invert when any subsystem is pinging if set to 1.
;   Bits 8-15: Invert when all subsystems are NOT pinging if set to 1.
; TriggerInInversion=0
;   This is a hex value.
;   Bit map to invert the trigger in line polarity.  Bit 0 is for the first
trigger line.
;   Bit 1 for the second and bit 2 for the third.  The misc digital input
trigger invers
;   follow.  Note that the invert is done before the debounce logic.
; ConfigFlags=0
;   Special configuration flags.
;    FSIC System:
;      Bit 0: Merge SSL and SSH into a 4 channel system
;      Bit 1: Random pci xfer updates for noise reduction
;      Bit 2: Small pci xfer buffers for uniform noise reduction
;    FSDW System:
;      Bit 2: Small pci xfer buffers for uniform noise reduction
; ConfigValues=0 0 0 0
;   Overall config values.  Not currently used.
; FPGAFile=
;   File name of FPGA data file to download
; LOWRATEIO_NETWORK=0
;   Set to 1 to send low rate analog data up the network interface
; LOWRATEIO_DISK=0
;   Set to 1 to write low rate analog data to the disk
; LowRateIOAlgorithm=0
;   Defines the algorithm for low rate io data collection.  Values:
;   0 : Disabled
;   1 : Use ADC64 channels or FSIC Serial ADC - collect 8 values
;   2 : Retrieve data from ADC64 channels 4, 5, 6, 7
;   3 : Mux ADC64 channels
;   4 : Use FSIC Serial ADC - collect 8 values
;   5 : ATAPI Card Algorithm
; TemperatureAlerts=-20.0 -10.0 60.0 65.0 100.0
;   Ambient temperature Thresholds in degrees C
;   If the ambient temperature in below the first or greater than the last
then
;   the sensor has an invalid reading.
;   If between the first and second thresholds then the bottle is below spec
temp
```

```
;   If between the second and third then the bottle is in normal spec temp
range
;   If between the third and fourth then it is too hot.
;   If between the fourth and fifth then the bottle is way to hot and THIS
WILL
;     CAUSE THE SONAR TO TURN OFF ALL PINGING
; TemperatureAlertsEnable=0
;   Set to 1 to enable monitoring of temperature alerts.
; LOWRATEIO_DECIMATION=10
;   Decimation factor for low rate io data (minimum of 1).
; AmbientScale=-17.777 0.00694
;   Offset and gain conversion factors for ambient sensor (counts to degrees
C).
;   Note that 32767 counts -> 4.096 volts.
;   Note that for ATAPI configurations the default values are: 67.8400 0.0050
; BottleScale=-17.777 0.00694
;   Offset and gain conversion factors for bottle temp sensor (counts to
degrees C)
;   For older system, these values whould be -17.777 and 55.55
;   Note that 32767 counts -> 4.096 volts
; HumidityScale=-0.2403e4 0.9748e4 -1.2897e4 0.5724e4
;   Conversion factors (A B C D) from counts (32767 max) for humidity sensor.
;   A + B * X + C * X ^ 2 + D * X ^ 3
;   Note that 32767 counts -> 4.096 volts
; PowerScale=0.0 0.00308
;   Offset and gain conversion factors for 48 volt sensor (volts sensed to
power Volts)
;   Once converted the 48 volt sensor should read at about 48 volts.
; Card=i
;   Remap of logical to physical card number.
; DIAGNOSTIC_PARAMETERS=1 50 100 2250 0 0 0 0 0 0
;   Sets thresholds and checks for running diagnostics.  These are currently:
;   FSSB:
;     0: Hardware Analog Card Version Number (1)
;     1: Power Amp Feedback with 0 VDC : Max Mean Voltage * 1000 (100 => 0.1
Volts)
;     2: Power Amp Feedback with 0 VDC : Max Variance in Volts**2 * 1000000
;     3: Power Amp Feedback Minimum Signal Level
;     4: Unused
;     5: Unused
;     6: Unused
;     7: Unused
;     8: Unused
;     9: Unused
;     Recommended: DIAGNOSTIC_PARAMETERS=1 50 100 2250 0 0 0 0 0 0
;   FSIC:
;     0: Must be 2 to enable feedback diagnostic, otherwise disabled.
;     1: Power Amp Feedback with signl Amp On  : Min Std Dev in Micro-Volts
;     2: Power Amp Feedback with 0 VDC Amp Off : Range about 48 Volt mean in
mv
;     3: Power Amp Feedback with 0 VDC Amp On  : Range about 24 Volt mean in
mv
;     4: Minimum reading of 48 volts * 1000
;     5: Maximum reading of 48 volts * 1000
;     6: Minimum reading of ambient sensor * 1000
;     7: Maximum reading of ambient sensor * 1000
```

```
;     8: Unused
;     9: Unused
;     Recommended Vals: DIAGNOSTIC_PARAMETERS=2 4000 2000 2000 40000 64000 -
20000 100000 0 0
;   SIB:
;     0: Must be 2 to enable feedback diagnostic, otherwise disabled.
;     1: Power Amp Feedback with signl Amp On  : Min Std Dev in counts
;     2: Power Amp Feedback with 0 VDC         : Max Std Dev in counts
;     3: Power Amp Feedback with 0 VDC         : Max Mean value in counts
;     4: Minimum reading of 48 volts * 1000
;     5: Maximum reading of 48 volts * 1000
;     6: Minimum reading of ambient sensor * 1000
;     7: Maximum reading of ambient sensor * 1000
;     8: Unused
;     9: Unused
;     Recommended Vals: DIAGNOSTIC_PARAMETERS=2 50000 4000 4000 40000 64000 -
20000 100000 0 0
; PulseMemoryMB=1
;   Pulse memory minimum size in MB.  This only applies to the ATAPI Card.
;   A value of 0 causes the diagnostic to be ignored.
; ADCMemoryMB=2
;   ADC Memory minimum size in MB.  This only applies to the ATAPI Card.
;   A value of 0 causes the diagnostic to be ignored.
; SerialAdcconfigN=0
;   Where N is 0 through 7.
;   Board type installed for each ATAPI serial data stream.  A value
;   of 0 causes the diagnostic to be ignored.  A value of -1 will check the
diagnostic
;   mode feedback but not verify the board type.
; PressureSensorType=0
;   Set to the full scale range in PSI if you have an analog (non-serial)
pressure sensor attached.
;   When enabled, the sonar will generate DEV_PRESSURE_SENSOR messages for
each reading of
;   the sensor.
;   Value 0: No Pressure Sensor Attached.
;ADCType0=4
;ADCType1=4
;ADCType2=4
;  ADC Input Type for each subsystem.  Only applies to SIB systems.
;  The default is modified when a standard configuration is used (Config=xxx
in [Main]) so
;  this keyword is not normally present.
;  Otherwise the values are:
;  0 : Side Scan Card (4 channel)
;  1 : Subbottom Card (8 channel)
;  2 : DDC
;  3 : Double rate sidescan card
;ADCClock=66666666.66667
;  Clock rate for adc subsystem.  Only applies to SIB systems.
;DDCRemix=1
;  For a DDC Based system - choose between 0 (no remixing and no phase
coherence)
;  1 (remix), 2 (no remix but ping to ping phase coherence).

;------------------------------------------------------------------------
```

```
; [SUBN] : Subsystems installed (Starts with SUB0 .. SUB<NSUB-1>)
;--------------------------------------------------------------------------
; NChan=1
;   Number of IO channels installed (1-8). Config for each channel is in
[SUBNIOM]
;   sections, where N is the current subsystem and M is the current channel
(0-7).
; PulseDirectory=
;   Set to the directory name where pulse files are located
; SystemNumber=0
;   End user subsystem number for this channel (as defined in Subsystem.h)
; SystemType=8
;   Type of processing for this subsystem:
;   8 => ADC64 Subbottom,
;   0 => FSIC_SB, 1 => FSIC_SSL, 2 => FSIC_SSH, 3 => 4 Channel Bathy or
Multiping
; Card=0
;   Primary ADC64 card for this subsystem.
; SlaveCard=-1
;   Slave ADC64 card for this subsystem for special applications.  When a
slave
;   card is present and ADC or DAC is located on the slave card by adding 8
to
;   the actual channel number.  Thus DAC 8 is the first on the slave card.
; PING_SELECT=Ping.Dat
;   File name of outgoing pulse/matched filter pair
; PING_BLOCKS=3
;   Minimum number of sample blocks per ping.  This effectively sets the ping
rate
;   The size of a sample block is nominally 512 but this is a compilation
option.
; PING_RATE=2000
;   Approximate ping rate * 1000.0 in Hz.  If non-zero, this overrides
PING_BLOCKS
; PING_RANGE=0
;   Approximate ping range in 1/1000 meter units (mm).  NOTE that the
PING_RATE has higher
;   priority than a ping_range, so if a default range is desired the
PING_RATE=-1 keyword
;   should be included in the same section.
; PING_TRIGGER=0
;   Set to 0 for internal trigger, 1 for external trigger, 2 for coupled
mode, 3 for
;   gated mode.
;   Set to -1 for synchronous EXTERNAL TRIGGER (trigger now).  NOTE that
synchronous
;   mode ASSUMES that the trigger happens when the ADC is not being
triggered.
; PING=0
;   Set to 1 to enable pinging.  Set to 2 to ping once.
; ADC_USETIMER5CLOCK=0
;   Set to 1 to set the clock out on the 100-pin connectur to the ADC
conversion rate
;   NOTE that you must externally trigger the ADCs when set to 1.  When set
to 0
;   ADCs are internally triggered.
```

```
; TriggerMask=201
;   Trigger in and out mask in HEXADECIMAL.
;   This parameter only applies to FSIC card systems.  For the AAC card, the
;   middle BNC is always trigger in and BNCC is trigger out.
;   Bits  0-5: Trigger in input digital io line(s) to monitor.
;   Bit     6: Enable software (ethernet) trigger in.
;   Bit  8-13: Trigger out digital IO line(s) to assert.
; TriggerOutLength=0
;   Length of the trigger out pulse in us.  This value is rounded to a 250 us
;   multiple (FSIC card) and has a minimum value of 250.  The maximum is
about
;   30000 (that is, 30 ms).
; LEDBlinkTriggerLine= -1
;   Set this to 0, 1 or 2 to blink the associated LED.
; DIGITAL_OUT=0
;   Set to the default values for the Digital IO bits on the 100-pin
connector
; PING_DAC_CHANNELS=1
;   Bitmap (unused currently) to enable either or both DAC channels
; ADC_CHANNELS=1
;   Bitmap used to enable up to 32 ADC channels.  This is used to set the
analog mux.
;   Each set of 4 bits selects one of 4 possible mux channels (Only the first
bit set
;   is used).  For example, so select ADC0 to look at IN2-IN3 and ADC1 to
look at IN8-IN9
;   use the value 18 [(2 * 1) + (1 * 16)].  To enable automuxing select
either the
;   values 0x33333333 (first 2 channels on each mux) or 0x77777777 (first 3
channels on
;   each mux) or 0xFFFFFFFF (all channels on all muxes).  When automuxing,
only data
;   format 4 (see IO section) is valid.
; USE_ANALOG_CARD=1
;   NOTE: This value is specifed in hex format.
;   For the standard SB subsystem systems:
;     Set to 1 to use the "Alan" analog card logic.  Set to 0 to drive the
100-pin DIO lines
;     directly.  This effects trigger out, power amp on/off, and external
interrupt handlers.
;     Bit 0: Enable use of analog card.
;     Bit 1: If 1 => keep power amp on between pings
;     Bit 2: If 1 => keep power amp on when sonar is off
;   For the FSIC subsystems:
;      Bit 1 (0x2)          : Keep amp on when pinging
;      Bit 2 (0x4)          : Keep amp off when pinging
;      Bit 3 (0x8)          : Bandpass mode on adcs
;   For the SIB subsystems:
;      Bit 1 (0x2)          : Keep amp on when pinging
;      Bit 2 (0x4)          : Keep amp off when pinging
; FindFile=*.*
;   File qualifier for pulse files for this subsystem used in
FindFirst/FindNext.
; TelemetryFormat=0
;   Reporting format for data.  Choose from:
;   0: Segy
```

```
;   1: SideScan
;   2: Private - Compressed for Telemetry Bandwidth Reduction
;   3: Compressed Header : Decompression Library unpacks to Segy
;   4: Compressed Header : Decompression Library unpacks to SideScan
; DiskFormat=-1
;   Same meaning as telemetry format.  Compressed header format IS NOT
;   recommended since it lacks a full time stamp.  A value of -1 will
;   base the format on the TelemetryFormat, but disabling the compressed
header option.
; EnableData=1
;   1 to enable data output for this subsystem.  0 to disable.
; TriggerDivisor=1
;   Trigger divisor in external and coupled modes.
; TriggerSystem=0
;   Subsystem index to trigger off of and not a logical subsystem number.
The indices are
;   typically 0: SB, 1: SSL, 2: SSH
; TriggerDelay=0
;   Trigger delay in external and coupled modes in us.
; EnablePingSorting=-1
;   Set to 1 to enable ping sorting.  Set to 0 to disable.  -1: Sort if
;   sidescan channel.
; HysterisisBits=0
;   Bits of hysterisis on "WeightingFactor" of returned data.  A value of 0
;   means no hysterisis.  A value of one requires a change of 2 bits.
; TriggerOverride=0
;   Set non-zero to IGNORE SONAR_MESSAGE_PING_TRIGGER messages from the
topside
;   and use the Sonar.ini file default only
; MultiPingAlgorithm=0
;   Multiping algorith option.  Choose from
;   0 : Multiping is not supported.
;   1 : Multiple pings in the watercolumn supported.  Window determines
spherical correction
;       factor and ping depth.
;   2 : Use algorithm 3 for a subbottom and algorithm 4 for a sidescan
;   3 : Multiping data ends at the next pulse (of any pulse phase).
;   4 : Multiping data continues UNTIL the next pulse of the same pulse
phase.
; QCSource=0
;   Source for QC Post processing.  Choose from 0 for disabled, 1 for network
window,
;   2 for disk window.
; QCSubsampleMethod=0
;   Decimation method for qc data.  Choose from 0 for max, 1 for avg, and 2
for none.
; QCLongTrackSubSampling=1
;   Decimation factor along track (ping decimation)
; QCCrossTrackSubSampling=1
;   Decimation factor across track (sample decimation)
; QCBlendingMask=255
;   Blending mask for QC Data.  For SAS and MPX systems, this determines
which respective
;   channels are summed.  This is a bit mask.  If no bits are set no QC data
will be
```

```
;   returned.  The LSB corresponds to the first channel on each side.  On a
SAS system,
;   a value of 63 will sum all 6 channels in the returned value.
; DCRemoval=-2
;   DC (Direct path) removal method.  -1 : Use pulse length, -2 : Let sonar
choose best,
;   0: disabled, positive value: remove specified number of ms.  -3 : Same as
-2 but stop
;   dynamic estimation after a short period of time.
; OneWindowForEntireSubsystem=0
;   If set non-zero, the channel 0 window is used for all additional
channels.  If other channels
;   have a different data type the window parameters are interpolated to
yield the same amount of
;   data for the new data type.  This was done to support the 512W fish.
; PowerAmpFeedbackADCChannel= -1
;   ADC Channel to use for poweramp feedback for a SIB SB card solution.
;-------------------------------------------------------------------------
------
; AGC Parameters are specified at the subsystem level.  For a side scan
subsystem,
; the AGC algorithm is ignored if there is a VGA gain ramp for the current
pulse.
; Otherwise the gain ramp is set to a constant gain value based on the
maximum
; signal meter readings.  For a SB subsystem, only the AGCHigh and AGCLow
values
; are used, whereas all keywords apply for a sidescan subsystem.
; It should be noted that for an MPX subsystem, there is a duplicate set of
keywords
; in the [Multiping] section.  The Multiping section parameters are used in
this case
; IF multiping post processing is enabled AND the subsystem level parameters
are used
; otherwise.  For a sidescan subsystem, if there is more than one channel of
data
; (eg port and stbd => 2 channels) then the AGC gain is based on the max
value from
; all channels that are sending data OUT OF THE NETWORK interface socket.
;-------------------------------------------------------------------------
------
; AGCHigh=32000
;   High threshold for AGC algorithm.
; AGCLow=7500
;   Low threshold for AGC algorithm.
; AGCUpDelta=2
;    Amount to increase gain by in 10 * DB units when too low or too high.
;    A value of 0 will disable the agc.  The maximum value is 100.
; AGCDownDelta=2
;    Amount to reduce gain by in 10 * DB units when too low or too high.
;    A value of 0 will disable the agc.  The maximum value is 100.
; AGCUpCount=4
;    Number of consecutive pings that must be below threshold before gain is
increased.
; AGCDownCount=1
```

```
;    Number of consecutive pings that must be above threshold before gain is
reduced.
; AGCGainMin = 0
;   Minimum gain to apply while AGC algorithm is active in DB * 10.
; AGCGainMax = 460
;   Maximum gain to apply while AGC algorithm is active in DB * 10.
; AutoPulseMode = 0
;   Auto pulse selection mode.  Set to 0 to disable.  Set to 1 to 4 to limit
;   pulse selection to the specified number of pulses in the water (for
multiping
;   systems).  When non-zero, pulses are selected based on operating range
or
;   ping rate, and cannot be specifically selected from the topside.
; NotchCenterFrequency=0
; NotchWidth=200
;   Notch (frequency removal) of a specific frequency in hz with a specified
removal
;   width in hearts.  If the center frequency is 0 this feature is disabled.
This
;   is not effected by frequency shifts, and if the notch out frequency is
outside of
;   the match filter bandwidths then it has no effect.
; NoAliasing=0
;   Set to 1 to (sometimes) double the match filtered sample rate. If the
match filter
;   sample rate is not at least twice the max frequency then the sample rate
is doubled
;   if possible.  This makes it possible to discard the imaginary part of the
data for
;   a subbottom system and still not alias.  All pulses will not alias, even
when this
;   option is not set if complex data is maintained by post processing.
;   Set to 2 to use the bandwidth and not the max freq as the criteria for no
aliasing.  A value of
;   2 would be more appropriated for a side scan system.
; CompensateMatchFilteredDataForPulsePowerLevel=1
;   Set non-zero to apply the recriprical of the the pulse power level to
returned
;   match filtered data.  This is recommended for subbottom data, especially
if
;   the reflection coefficient is used, and is not normally applied for side
scan data.
; PostProcessor=0
;   Set to the following non-zero values to enable the specified type of post
processor:
;   (1) : Multiping : The [MultipingN] sections apply, and MPX type post
processing
;         (for a 4300 or 4200 system are applied).
;   (2) : 4500DF : The 4500 Dynamic Focus algorithms are applied.
;   (3) : MX and DF : Both the multiping and dynamic focus algorithms are
applied.  The
;         [MPX_And_DFN] section apply.

;-------------------------------------------------------------
; [MPX_AND_DFN] : Multiping with Dynamic Focus superset options
;-------------------------------------------------------------
```

```
; FocusTable=4700FocusTable.txt
;   The focus table contains the hydrophone geometry information and which
channels to include
;   at which range.  See comments in a sample focus table for details.  This
file is requried for
;   the post processor to work correctly.
; CalDir=..\\MPCal
;   Location where MPX type calibration files are to be stored.
; BlendingMode=3
;   Default blending mode.  Choose from:
;   0: Disabled - bypasses post processor
;   1: Use the fore arrays only
;   2: Use the aft arrays only
;   3: Blend the data
;   -1:Use the fore arrays only (same as 1)
;  -2: Use the second channel only
;  -3: ... etc, use the nth channel only
;   Note that using a specific channel will only process that channel through
the blending
;   algorithm, with the weights specified by the blending table, so this will
be different than
;   the channel passed through when blending is disabled.
; CalMaxPulseAttenuation=100
;    Maximum pulse attenuation in DB * 10
; DynamicGainBalancing=1
;    Set to 0 to disable multiping gain balancing, 1 to enable, or -1 to
;    always disable (override topside messages).
; CompressMethod=0
;    Select a compression algorithm.
;    A value of 1 is about 30 % compression.
;    A value of 2 is about 50 % compression.
;    If no keyword is present, the [Main] CompressNet keyword value is used
so this keyword need
;    not be present to compress data.
;======================
; PULSECAL.PCF Keywords: In the same section name:
;======================
; CalPulsePowerStart=600
; CalPulsePowerEnd=800
;   Calibration range in tenths of a ms units for calculating the calibration
statistic



;-----------------------------------------
; [MultipingN] : Multiping algorithm options
;-----------------------------------------
; Subsystem=-1
;   Set to 1 to enable the multiping post processor for this subsystem.  Use
-1 for
;   disabled.
; CompressMethod=0
;    Select a compression algorithm.
;    A value of 1 is about 30 % compression.
;    A value of 2 is about 50 % compression.
```

```
;    If no keyword is present, the [Main] CompressNet keyword value is used
so this keyword need
;    not be present to compress data.
; CalRange=2000
;    Recommended operating range for calibration in MS * 10
; The ADC Related values below are presently obsolete:
;   CalMaxADCGain=200
;      Default maximum gain to apply per ADC in DB * 10
;   CalADCStart0=200
;   CalADCEnd0=400
;   CalADCStart1=500
;   CalADCEnd1=700
;   CalADCStart2=900
;   CalADCEnd2=1100
;   CalADCStart3=0
;   CalADCEnd=0
;      Calibration bins for ADCs in MS * 10
; CalMaxPulseAttenuation=100
;    Maximum pulse attenuation in DB * 10
; CalDir=..\MPCal
;    Directory to save calibration files in.
; BlendingMode=3
;    Default blending mode where:
;    0: None
;    1: Fore Array
;    2: Aft Array
;    3: Blended
; ADCConfig=0
;    ADC Channel config to use for multiping playback.  Choose from
;    0 : Standard (4 chan : 0=Port Fore, 1=Stbd Fore, 2=Port Aft, 3=Stbd Aft)
;    1 : Standard (2 chan : 0=Port Fore, 1=Stbd Fore)
;    2 : Old Data (2 chan : 0=Port Fore, 1=Port Aft)
; DynamicGainBalancing=1
;    Set to 0 to disable multiping gain balancing, 1 to enable, or -1 to
;    always disable (override topside messages).

;-----------------------------------------
; [VideoCap] : Video Camera Option
;-----------------------------------------
; VideoOptions=0
; If a video camera is included, setting this value to 1 will enable
collection of data.
; Note that the default sends data over the network interface.  To save data
to the
; disk queue instead use the value 5.  To save data to both queues use the
value 7.
; VidMode=0
; Select the video mode.  A value of 0 uses the default mode.
; DeviceNumber=0
; Select the device for video capture.

;-----------------------------------------
; [Atapi] : Atapi Card Options
;-----------------------------------------
;ADCMode0=0
;ADCMode1=0
```

```
;ADCMode2=0
;  Serial out command mode lines for each subsystem.
;  The default is modified when a standard configuration is used (Config=xxx
in [Main]) so
;  this keyword is not normally present.

;----------------------------------------
;[NAV] : Navigation configuration options
;----------------------------------------
; Options = 0
; Set the following bits if these options are desired:
; Bit 0: GXY as GGU (special work around)
; Bit 1: Accept time nmea strigs with no month day year items
; Bit 2: XY (not lat long) desired
;
; For each field items to be stuffed several tuning parameters can be
; specified.  The items are the N values as detailed below:
;   0 : Lat lon
;   1 : Course
;   2 : Speed
;   3 : Heading
;   4 : Pressure
;   5 : Pitch / Roll
;   6 : Altitude
;   7 : Heave
;   8 : Water temperature
;   9 : Depth
;  10 : Annotation
;  11 : Cable Counter
;  12 : Time
; The item parameters are the keywords below
; SourceN=0
; (Example Source0=0 for lat lon).  The source field determines
; the source for the field.  The special value 0 indicates auto detection,
; based on the software's best guess of the best active string.  The value 0
is
; for disabled, 2 for manual entry (ManV0 and or Manv1 fields).  Additional
values
; can be used to specify a specific nmea string : consult Edgetech for their
codes.
; ChanN=0
; The channel (eg serial port) used for the receipt if the source is not
automatic.
; TimeoutN=0
; The timeout in seconds used to invalidate the item.  The special value 0 is
; interpreted as a timeout of 10 seconds.
; ManV0_N=0
; ManV1_N=0
; Manual entry values.  Most fields only require ManV0_N.
```

11 APPENDIX 2: SONARSERIAL.TXT

```
This file contains parameters for Sonar.Ini relating to Serial Port
Devices.

;------------------------------------------------------------------------
; [SerialN] : RS232 configuration options (Starts with Serial0..Serial7)
;------------------------------------------------------------------------
; CREATE=0
;   Use 1 for standard serial port.  2 for DMU6.
; Network=1
;   1 to enable data on ethernet
; NetworkRaw=0
;   1 to enable unparsed (raw) data on ethernet
; Disk=0
;   1 to enable data on the disk
; DiskRaw=0
;   1 to enable unparsed (raw) data on disk
; DATA=
;   Default string to write to port on init
; Port=N
;   Specifies the actual hardware serial port number for the channel.
Default
;   is the channel number.
; Baud=9600
;   Baud rate of connection.
; Parity=2
;   Parity of port (0=>even, 1=>odd, 2=>none, 3=>mark, 4=>space
; StopBits=1
;   Stop bits for port.  Minimum of 1
; WetPortCheckInterval=100
;   Data polling interval in ms.
; ExtendedParsingInfo=0
;   Extended parsing info, reserved for future applications.
; DataBits=8
;   Data bits per character (maximum of 8).
; Priority=0
;   Set the thread priority for serial io.  A value of 0 is NORMAL, 1 is
;   above normal, and 2 is highest (real time).
; Parser=0
;   Parsing algorithm.  Choose from:
;   0: None - read and send up any data.
;   1: Pitch/Roll in Simrad EM1000 format - This consists of 5 16-bit words
with values
;      (Header)(Roll)(Pitch)(Heave)(Heading) - Parser for MRU (records with
gaps)
;   2: Paroscientific Pressure Meter
;   3: Pitch/Roll in Simrad EM1000 format - Parser for TSS unit (continuous
xmission).
;   4: Parse NMEA and send specific messages.  Messages parsed are:
;     $SDDBT : Altitude from Simrad Mesotech 1007 or compatible
;     $PTNTHPR,x.x,a,x.x,a,x.x,a : Heading, Pitch, Roll from Honeywell
HMR3000
```

```
;       Note the x.x in above must be setup in units of degrees
;   5: Parse and send generic NMEA Strings
;   6: RD Instruments Dopler Velocity Log (DVL) parsing (Model WH-N-nnnKHZ) .
;   7: Octans Motion Sensor
;   8: Applied Microsystems Smart CTD
;   9: Valeport MiniSVS
;  10: Seabird SBE50
;  11: Seabird SBE49
;  12: Falmouth Pressure Sensor
; ParserParameters=
;   Special parameters for specific parsers.  See comments on each parser for
;   these optional parameters.
; VerifyChecksum=2
;   Effects how NMEA strings are validated.  0 returns any line of data.  1
Validates
;   that a string begins with a $ and has a * or *<CheckSum>.  2 also
validates the
;   checksum.  If non-zero only valid strings are processed further.
; DiagnosticIOPort=0
;   Set to a VALID parallel port IO address IN HEX to enable latency testing.
The parallel
;   port data bits will then be asserted as soon as a serial record is
received.  A
;   scope can then be attached to the port to detect latency between serial
io and
;   time tag events.
; ReadIntervalTimeout=0
;   Read interval timeout in ms.  After the first character, if the next one
does not
;   arrive within the interval then the read is aborted (end of packet).  A
value of
;   0 disables.
; ReadTotalTimeout=0
;   Read total timeout in ms.  Waits this long for the first character (or
all chars if
;   the interval timeout is 0).  A value of 0 results in a default of 1 ms.
; WriteTotalTimeout=0
;   Suspend up to this long in ms waiting for a write.  A value of 0 uses 1.5
times the
;   WetPortCheckInterval.
; TimeStampFirstChar=0
;   Set to 1 or 2 to timestamp the first character read in a buffer.  This
will reduce the
;   jitter in the timestamp read, which can be as high as 20 ms otherwise.
Setting this
;   flag makes the code less efficient.
;   A value of 1 will read the port twice per loop: Once for the first
character and then
;   for what is remaining in the buffer.
;   A value of 2 will read the port three times per loop: Once for the first
character and
;   then once for what is remaining in the buffer and then once more.
;   Choose between a value of 1 or 2 by the size of the read fifo buffer and
the size of each
```

```
;   expected record.  If the fifo buffer size is less than the amount of data
per record then
;   the value 2 should be selected.  Otherwise the value 1 should be
selected.
; TimestampBias=0
;   Bias of timestamp of each record in ms.  A negative value moves back in
time.  Since
;   the data is buffered by the hardware, there is a fixed latency in receipt
of data.
;   This parameter allows the timestamp to be biased (usually back in time)
to compensate
;   for these latencies as well as internal device sampling latency.  A scope
connected
;   to the parallel port with the DiagnosticIOPort option can be used to
determine this
;   value.  For a receive buffer size of N and a baud rate M, the approximate
value for
;   time stamp at first character receipt would be (assuming that
TimestampFirstChar=1):
;   - (1000 * 10.0 / M) * (N + 2)
;   Value must be between +-500 or it is ignored.
; InitString=
;   Init string to send to unit on startup or other failure condition.  To
insert non-printable
;   characters use \n (newline), \r (return) or \XX where XX represents the
value to insert in
;   2 hex digits.  The value \b causes a break to be asserted.  The value \0
will mark the end
;   of the init string - this makes it possible to send no init string at
all.  Note that some
;   parsers will insert a default init string if the init string is
completely blank.  The value
;   \p will insert a 100 ms pause.  The value \P will insert a 1 second
pause.
; InitTimeout=10000
;   Timeout for init string in ms.  The init string is sent after this period
of inactivity
;   or upon startup.  A value of <= 0 disables the init string processing.
; BreakMilliseconds=300
;   Number of milliseconds to wait when a break is asserted (DEV_SERIAL_BREAK
received)
; BreakPause=50
;   Number of milliseconds to wait AFTER a break is deasserted to allow the
serial device
;   to recover before sending more characters.
;------------------------------------------------------------------------
; [SerialN] : Built in support options.
;------------------------------------------------------------------------
; In addition to generic devices, the sonar supports some industry standard
; devices.  This section describes the setup procedure and recommended
; configuration options for these devices.

;------------------------------------------------------------------------
; Seatex MRU4
```

```
;---------------------------------------------------------------------------
; Setup: Using the Seatex provided configuration utility, set the following:
;   Baud:              9600
;   Data Format:       EM1000
;   Transmission Rate: 20 Hz
;   When properly set up, the device will transmit a fixed record of 10 char
;   at a 20 Hz rate.
;---------------------------------------------------------------------------
; Ini File Section: The [SerialN] section should have the following
; Create=1
; Parser=1
; ReadIntervalTimeout=5
; ReadTotalTimeout=1000
;---------------------------------------------------------------------------

;---------------------------------------------------------------------------
; TSS Pitch Roll
;---------------------------------------------------------------------------
; Setup: Using the TSS provided configuration utility, set the following:
;   Baud:              2400
;   Data Format:       EM1000
;   Transmission Rate: 23 Hz (Implied)
;   When properly set up, the device will transmit a fixed record of 10 char
;   at a 23 Hz rate.  Note that the update rate is determined by the
;   baud rate, so too high a baud rate will result in excessive data.
;---------------------------------------------------------------------------
; Ini File Section: The [SerialN] section should have the following
; Create=1
; Parser=3
; Baud=2400
;---------------------------------------------------------------------------

;---------------------------------------------------------------------------
; Paroscientific Pressure Meter
;---------------------------------------------------------------------------
; Setup: Using the vendor provided configuration utility, set the following:
;   Baud:              9600
;   Transmission Rate: 1 Hz
;   Reporting Units: PSI
;   Unit Number: 1
;   When properly set up, the device will transmit a fixed record of 12 char
;   at a 1 Hz rate.
; Notes:
;   The default init string is \r\n*9900P4\r\n
;   This causes the instrument to start sending pressure readings.  Please
;   refer to the paroscientific manuals for details.
;   The unit number of the sensor must be set to 01.  Other values will
;   result in a parsing error.
;   The default engineering units should be PSI.  The engineering units
;   are set with the command *0100EW*0100UN=n where n is 1-8.  The value
;   of n for PSI is 1.  If you wish to read in a non-standard scale, you
;   can specify the conversion to PSI with the ParserParameters keyword
;   which takes the format:
;   ParserParameters=N M
```

```
;     WHERE N is the floating point gain and M is the floating point offset
;     in this case, the conversion from paroscientific reading (READING) to
;     PSI would be:
;       PSI = READING * N + M
;-------------------------------------------------------------------------
; Setup For FSSB:
;   In addition to the above setup:
;
;   Attach a serial port to the unit and start hyperterm at 9600 baud
;   Set the device to mode 2 using the command:
;     *0100EW*0100MD=2
;   Set the pressure integration time constant (100 is about 2 hz)
;     *0100EW*0100PR=100
;   Important NOTE: In above, terminate each line with the CONTROL-J
character
;     if in hyperterminal.
;-------------------------------------------------------------------------
; Ini File Section: The [SerialN] section should have the following
; Create=1
; Parser=2
; ReadIntervalTimeout=20
; ReadTotalTimeout=2000
;-------------------------------------------------------------------------

;-------------------------------------------------------------------------
; Sea-Bird SBE50 Pressure Meter
;-------------------------------------------------------------------------
; Setup: Using the vendor provided configuration utility, set the following:
;   Baud:              9600
;   Transmission Rate: 1 Hz
;   Reporting Units: PSI
;   Unit Number: 1
;   When properly set up, the device will transmit a fixed record of 12 char
;   at a 1 Hz rate.
; Notes:
;   The default init string is \rstop\routputformat=1\rnavg=1\rstart\r
;   This causes the instrument to start sending pressure readings in
;   absolute PSI at the highest possible update rate.  Please
;   refer to the SBE-50 manuals for details.
;   The default units should be PSI absolute (outputformat=1).
;   If you wish to read in a non-standard scale, you
;   can specify the conversion to PSI with the ParserParameters keyword
;   which takes the format:
;   ParserParameters=N M
;     WHERE N is the floating point gain and M is the floating point offset
;     in this case, the conversion from paroscientific reading (READING) to
;     PSI would be:
;       PSI = READING * N + M
;-------------------------------------------------------------------------
; Setup For FSSB:
;   In addition to the above setup:
;
;   Attach a serial port to the unit and start hyperterm at 9600 baud
;   Set the device to autorun using the command:
```

```
;     autorun=y
;   Set the pressure integration amount to the desired update rate : for
example
;     navg=1
;   Important NOTE: In above, terminate each line with the enter key
(carriage return)
;     if in hyperterminal.
;-------------------------------------------------------------------------
; Ini File Section: The [SerialN] section should have the following
; Create=1
; Parser=10
; ReadIntervalTimeout=20
; ReadTotalTimeout=2000
;-------------------------------------------------------------------------

;-------------------------------------------------------------------------
; Applied Micro Smart CTD
;-------------------------------------------------------------------------
; Notes:
;   The default init string is \r\P\r\p\r\pr\pe\pa\pl\p\r\ps\pe\pt\p \ps\p
\pc\po\pn\pt\pi\pn\pu\po\pu\ps\p\r\pm\p\r
;     The pauses are essential in the above.  If not present the instrument
;     may freeze up or not receive the commands !!!.
;   This causes the instrument to start sending pressure readings.  Please
;   refer to the Applied Micro manuals for details.
;   The parser adds 14696 to the pressure reading because the unit is
;   normally calibrated to read 0 at sea level.
;   If you wish to read in a non-standard scale, you
;   can specify the conversion to PSI with the ParserParameters keyword
;   which takes the format:
;   ParserParameters=N M
;     WHERE N is the floating point gain and M is the floating point offset
;     in this case, the conversion from paroscientific reading (READING) to
;     PSI would be:
;       PSI = READING * N + M
;-------------------------------------------------------------------------
; Ini File Section: The [SerialN] section should have the following
; Create=1
; Parser=8
; Baud=9600
;-------------------------------------------------------------------------

;-------------------------------------------------------------------------
; Simrad Mesotech 1007 or compatible
;-------------------------------------------------------------------------
; Setup: Use the vendors default configuration (9600 baud)
;-------------------------------------------------------------------------
; Ini File Section: The [SerialN] section should have the following
; Create=1
; Parser=4
;-------------------------------------------------------------------------

;-------------------------------------------------------------------------
; Honeywell HMR3000 Pitch Roll Heading
```

```
;-------------------------------------------------------------------------
; Setup: Use the vendors default configuration (19200 baud).  Specify
;   an update rate for the PTNTHPR.  Disable (0 for time period) all others
; Notes:
;   If the sensor is not mounted so that the heading reads 0 when the fish
;   is pointing due north, you can use the ParserParameters keyword to modify
;   the message data.  Only 0, 90, 180 and 270 degree rotations are
supported.
;   the value should be of the form ANGLE N where N is the mounting angle.
;   A value of N of 180 will add 180 to the heading and negate both pitch and
roll.
;   (eg ParserParameters=ANGLE 180 )
;-------------------------------------------------------------------------
; Ini File Section: The [SerialN] section should have the following
; Create=1
; Parser=4
; Baud=19200
;-------------------------------------------------------------------------

;-------------------------------------------------------------------------
; RD Instruments Dopler Velocity Log WH-N-nnnKHZ
;-------------------------------------------------------------------------
; Setup: Using the vendor provided configuration utility, set the following:
;   Baud:              9600
;   Triggering: Send command CX1 for external trigger, CX0 for internal trig
;   Review manual for other desired settings.  Use CK command to save
settings.
;
; Notes:
;   If no init string is specified, then the instrument will be initialized
;   as follows: \bCF11110\rPD3\rCS\r
;   This string sets the output format to PD3 binary mode.  However, PD0 and
;   PD4 and PD5 binary modes are also support with appropriate init strings
;   Ascii modes are NOT supported.
;-------------------------------------------------------------------------
; Ini File Section: The [SerialN] section should have the following
; Create=1
; Parser=6
; ReadIntervalTimeout=20
; ReadTotalTimeout=2000
;-------------------------------------------------------------------------

;-------------------------------------------------------------------------
; Octans Motion Sensor
;-------------------------------------------------------------------------
; Setup: Using the vendor provided configuration utility, set the following:
;   Baud:              57600
;   Sample Period:     100 MS
;   Output Format:     Motion Sensor 2 (Output NMEA 0183 Compatible)
; Notes:
;-------------------------------------------------------------------------
; Ini File Section: The [SerialN] section should have the following
; Create=1
; Parser=7
```

```
; Baud=57600
; ReadIntervalTimeout=10
; ReadTotalTimeout=2000
;------------------------------------------------------------------------

;------------------------------------------------------------------------
; Crossbow DMU6
;------------------------------------------------------------------------
; Setup: The unit should be shipped from the factory set to 9600 baud
;------------------------------------------------------------------------
; Ini File Section: The [SerialN] section should have the following
; Create=2
; DMUVersion=0
; Command_calibrate=1
;------------------------------------------------------------------------
; Special ini file options for the Crossbow.
;------------------------------------------------------------------------
;[SerialN]
; CREATE=0
;   Use 2 for DMU6.
; NETWORK=0
;   1 to enable data on ethernet
; DISK=0
;   1 to enable data on ethernet
; CALCONSTANT=200
;   Calibration constant for DMU6
; TIMECONSTANT=100
;   Time constant for DMU6
; HeaveTC=-1
;   Heave time constant.  Set to a value between 0 and 255 to send
;   this message on init.  0 => no heave, 1 => max roll off, 255=>lowest
;   roll off.
; SAMPLERATE=100
;   Sample rate for polled operation in ms.  Use -1 for continous mode
;   at maximum rate, and -N for decimated by N in continuous mode.
; COMMAND_CALIBRATE=0
;   Set to 1 to calibrate the device on init
; DMUVersion=1
;   DMU Version.  This is a bitmap with the following bits:
;   Bit 0: Heave estimation present if 1
;   Bit 1: New Temperature Sensor if 1
;   Bit 2: 4 G Range on Accelerometers if 1
;   Bit 3: DMU-VG has no temperature sensor - temp set to -32768 if 1
; HeaveScale=1000
;   Scale factor * 1000 for heave sensor input.  Used to convert
;   to Meters.
; Port=N
;   Actual serial port that supplies data.

;------------------------------------------------------------------------
; Valeport MiniSVS
;------------------------------------------------------------------------
; Setup: Using the vendor provided configuration utility, set the following:
;   Baud:              9600
```

```
; Notes:
;   The default init string is ##\\P\r#082;csv\rM1\r
;-------------------------------------------------------------------------
; Ini File Section: The [SerialN] section should have the following
; Create=1
; Parser=9
; Baud=9600
;-------------------------------------------------------------------------

;-------------------------------------------------------------------------
; Seabird SBE49 CTD
;-------------------------------------------------------------------------
; Setup: Using the vendor provided configuration utility, set the following:
;   Baud:              9600
; Notes:
;   The default init string is \rSTOP\rOUTPUTFORMAT=3\rSTART\r
;   This causes the instrument to start sending readings in engineering
units.
;   Please refer to the SBE49 manuals for details.
;   If you wish to read in raw data mode (format 0) you
;   can use the init string \rSTOP\rOUTPUTFORMAT=0\r\PDCAL\rSTART\r
;   The \P is MANDATORY in the above string as the instrument does not
;   buffer enough data to read the entire string at once.  The DCAL is also
;   mandatory as the cal values must be read from the instrument to apply
them.
;   This cal equation is complex and may be subject to change in future
instruments.
;   Use of raw data format is NOT RECOMMENDED.
;   You can also do a coarse conversion from counts to PSI
;   with the ParserParameters keyword (without the DCAL option)
;   which takes the format below.  This may not yield very accurate results
and
;   only format 3 is recommended.  All other readings (other than pressure)
will
;   be invalid in format 0 if no DCAL is issued.
;   ParserParameters=N M
;     WHERE N is the floating point gain and M is the floating point offset
;     in this case, the conversion from raw reading (READING) to
;     PSI would be:
;       PSI = READING * N + M
;-------------------------------------------------------------------------
; Ini File Section: The [SerialN] section should have the following
; Create=1
; Parser=11
; Baud=9600
; OPTIONAL and NOT RECOMMENDED:
InitString=\rSTOP\rOUTPUTFORMAT=0\r\PDCAL\rSTART\r
;-------------------------------------------------------------------------

;-------------------------------------------------------------------------
; Falmouth Pressure Meter Model# EOPM
;-------------------------------------------------------------------------
; Setup: Using the vendor provided configuration utility, set the following:
;   Baud:              9600
```

```
;   Transmission Rate: 1 Hz
;   Reporting Units: DBAR
;   Output: Continuous.  Include date/time in message.  Include pressure in
message.
;     If viewed on hyperterm, the output should be of the format:
;     date,time,reading in decibars
; Notes:
;   If you wish to read in a non-standard scale, you
;   can specify the conversion to PSI with the ParserParameters keyword
;   which takes the format:
;   ParserParameters=N M;
;   ParserParameters=1.0210 0.3087
;     WHERE N is the floating point gain and M is the floating point offset
;     in this case, the conversion from reading (READING) to
;     PSI would be:
;       PSI = CONVERTED_READING * N + M
;       where the CONVERTED_READING is the sensor reading converted based on
;         an assumed input unit of DBAR to absolute PSI (14.7 is sea level)
;-------------------------------------------------------------------------
; Ini File Section: The [SerialN] section should have the following
; Create=1
; Parser=12
; Baud=9600
;-------------------------------------------------------------------------

;-------------------------------------------------------------------------
; NMEA Strings
;-------------------------------------------------------------------------
; Setup: There are two possible parsers for NMEA strings, type 4 and type 5
;   Type 4 includes support for some non-standard NMEA strings produced by
;   certain devices, most notably a Honeywell pitch roll heading sensr.
;   When the parser type is set to 4, in addition to adding NMEA strings to
;   the sonar message stream, it will parse and interpret certain strings.
;   Pitch / roll $PTNTHPR messges will generate additional pitch roll
messages
;   as detailed on DeviceMessages.h, and if enabled the sonar's internal
;   clock can be time synched to a NMEA ZDA string (see the TimeSyncSource
keyword
;   in Sonar.txt file).
;   Type 5 will just generate NMEA messages in the sonar data stream.
;-------------------------------------------------------------------------
; Ini File Section: The [SerialN] section should have the following
; Create=1
; Parser=4 (or 5)
; Baud=9600
; Disk=1   (If you want these messages recorded in the disk stream of the
local disk)
;-------------------------------------------------------------------------
```

12 APPENDIX 3: SPARE PARTS

Part Number	Description
200-0000056-1000	CPU Processor Board
200-0000009-1000	Power Distribution Board (48VDC)
200-0000132-1000	Sonar Interface Board (SIB)
200-0000073-1000	Side Scan Board (SSB)
200-0000110-1000	Sub-Bottom Board (SBB)
200-0000040-1000	Sub-Bottom Power Amplifier Board
200-0000006-1000	Side Scan Power Amplifier Board
200-0000151-1000	Transmit & Receive Switch Board (120/410Khz)
040-USB4SER-1000	4 Port Serial I/O
040-1000	High Capacity Mass Storage

13 APPENDIX 4: CONSUMABLE PARTS

Part Number	Description
067-F006D00-1000	Dummy plug, 6 pin female (SBP)
067-M006D00-1000	Dummy plug, 6 pin male (SBP)
067-M005D00-1000	Dummy plug, 5 pin male (SSS)
067-F005D00-1000	Dummy plug, 5 pin female (SSS)
067-F010P02-1000	Connector, Wetmate, 2' pigtail, 10 pin female pigtail (J1)
067-M010D00-1000	Dummy plug, 10 pin male
067-F010D00-1000	Dummy plug, 10 pin female
067-N000L00-1020	Locking Sleeve, 20 Shell Size
N/A	End cap bore O-ring
N/A	End cap face O-ring
N/A	O-Rings Lubricant
N/A	Dielectric grease
350-0000022-1000	Zinc Sacrificial Anode
350-0000021-1000	Pressure Release Port
N/A	Dessicant Pad
990-0000003-1000	FS-DW/AU Manual
N/A	Secure/Removal bolts, 1/4 – 20 X 2.5" Hex Head Bolts
N/A	3/16 Allen Key
067-F012P02-1000	Connector, Wetmate, 2' pigtail, 12 pin female pigtail (J6)
067-M012D00-1000	Dummy plug, 12 pin male
067-F012D00-1000	Dummy plug, 12 pin female