SERIES 3000 SONAR SYSTEM

Operations and Maintenance Manual

P/N 11210066, Rev. 7.0

L3 communications
Klein Associates, Inc.

11 Klein Drive
Salem, NH 03079-1249
U.S.A.
Tel: (603) 893-6131
Fax: (603) 893-8807

www.L-3Klein.com

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WARNING

Klein Associates recommends all troubleshooting be done by a trained technician. Some circuits in the Sonar Transceiver and Processing Unit have voltages as high as 240 volts, and some circuits in the sonar towfish have 1500 volts. You should familiarize yourself with the location of these voltages before you attempt any troubleshooting. Failure to observe these warnings could result in injuries to personnel.

CAUTION

Serious damage to the sonar electronics may occur if the sonar towfish is operated out of the water for periods longer than 15 minutes. Let the sonar cool 15 minutes or longer between operations. Protect the sonar towfish from direct exposure to the sun prior to and during operation in high temperature climates.

CAUTION

The depth rating on the transducers is 200 meters (656 feet). Operations at depths greater than 200 meters may damage the transducers.

STANDARDS

SAFETY: EN 60950

EMC: EN 60945

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Series 3000 Sonar System Warranty

What Is Covered

Subject to the conditions set forth below, equipment sold by Klein Associates, Inc., ("we", "us", or "our") is warranted against defects in materials and workmanship for one year from the date of original purchase with the following exceptions: (a) all video products are warranted for 6 months from the date of original purchase, and (b) this warranty does not apply to tow cables. During the warranty period we will repair or, at our option, replace any equipment that proves to be defective. Such repair or replacement is your exclusive right and remedy, and our only obligation, with respect to any defective equipment.

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a) This limited warranty is transferable from the original buyer upon approval by Klein.

b) Warranty does not cover equipment that has been repaired or modified other than by us, nor equipment that has been subjected to misuse or to negligent or accidental mishandling.

c) Buyer is responsible for the prepayment of all freight charges, insurance, customs, imposts, duties, etc., to return defective equipment to us and for the charges for us to return the repaired or replaced equipment to buyer.

d) Equipment returned for warranty service must be packed to best commercial standards to prevent shipping damage.

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Preface

The Series 3000 Sonar System is a towed single beam sonar comprising a towed underwater platform and a topside system.

What's in This Manual

This operations and maintenance manual provides information pertaining to the setup and deployment, operation, general maintenance, and troubleshooting of the Series 3000 Sonar System. The manual is divided into the following seven main chapters and five appendices:

Chapter 1: Overview. Presents an overview of the Series 3000 Sonar System components, including both functional and physical descriptions of the system.

Chapter 2: Specifications. Provides detailed physical and performance specifications for the main components of the system, including the acoustic transducers, the environmental and navigation sensors, and the available tow cables.

Chapter 3: Preparation for Use. Provides instructions for unpacking and setting up the Series 3000 Sonar System components. It also includes a pre-survey checkout procedure.

Chapter 4: SonarPro Ver. 11.0 Operating Instructions. Contains detailed instructions for operating SonarPro Ver. 11.0.

Chapter 5: Equipment Maintenance. Provides checklists for daily, weekly, and long term inspection and service.

Chapter 6: Splashproof TPU. Provides a functional description and setup and operating instructions for the optional Splashproof TPU.

Chapter 7: S3000SBP Chirp Sub Bottom Profiler. Provides instructions on how to install the optional S3000SBP Chirp Sub Bottom Profiler.

Appendix A: Notes on Handling Tow Cables. Contains information on tow cable handling.

Appendix B: TPU Software Interface and Control. Describes the various control and initialization procedures for the system.

Appendix C: General Setup, Configuration and Troubleshooting. Includes basic setup and configuration information and information that is useful for system troubleshooting.

Appendix D: Setting up the System for a Magnetometer. Provides instructions on how to set up the Series 3000 for use with a magnetometer.

Appendix E: Drawings and Parts Lists. Provides drawings and parts lists for reference and troubleshooting purposes.

Note, Warning, Caution, and Shock Hazard Notices

Where applicable, note, warning, caution, and shock hazard notices are included throughout this manual as follows:

NOTE *Recommendations or general information that is particular to the material being presented or a referral to another part of this manual or to another manual.*

WARNING *Identifies a potential hazard that could cause personal injury or death to yourself or to others.*

CAUTION *Identifies a potential hazard that could be damaging to equipment or could result in the loss of data.*

SHOCK HAZARD *Identifies a potential electrical shock hazard that could cause personal injury or death to yourself or to others.*

Customer Service

L-3 Klein technical support can be contacted using any of the following means:

Mail

L-3 Communications Klein Associates, Inc.
11 Klein Drive
Salem, NH 03079

Email

Klein.mail@L-3com.com

Telephone

(603) 893-6131

Facsimile

(603) 893-8807

For more information about L-3 Klein and our products, please go to our Web site at **www.l-3klein.com**.

CHAPTER 1: OVERVIEW

The Series 3000 Sonar System displays sonar data on a high resolution monitor and will store data on both the hard disk drive and a CD for high capacity storage. Many optional accessories may be added to the basic system for special situations or applications. This sonar equipment provides the capability for precision swath imaging of the sea floor.

1.1 Equipment

The Series 3000 Sonar System equipment consists of a single beam sonar instrumented towfish, a Transceiver and Processing Unit (TPU), and a Windows Computer Display and Control Unit (computer), along with a tow cable and various interconnect cables.

1.1.1 Single Beam Sonar Instrumented Towfish

The towfish electronics perform all the sonar data processing prior to digital transmission to the sonar TPU. This minimizes the system's susceptibility to externally induced electronic noise. Processing includes transmit/receive functions, time varied gain (TVG) amplification, digitalization, and multiplexing of the sonar uplink data. Timing and sonar data are bidirectionally multiplexed on a single conductor coaxial cable. Use of a low noise preamplifier design ensures maximum range performance. The ability to operate with a fiber-optic cable is available as an option for very long cable (deep tow) operations or installations requiring electrical isolation in severe noise environments.

An electro-mechanical termination is provided on the towfish end of the tow cable for connection to the towfish. A tow shackle provides a strong, reliable, mechanical termination to the towfish tow bracket. An underwater connector on a pigtail connects the tow cable electrically to an underwater jumper cable on the towfish.

1.1.2 Transceiver and Processing Unit (TPU)

The TPU contains the electronics for sonar data demultiplexing and data processing.

1.1.3 Computer Display and Control Unit

The Computer Display and Control Unit (computer) supports the PC based Windows operating system as the display and control interface. This provides for an easy to use familiar graphical user interface and simple expansion capabilities to a wide assortment of equipment. The software is set up in a client-server format, allowing for flexible and expandable system configurations with multiple computers connected over a TCP/IP fast Ethernet network, all sharing the sonar data.

1.1.4 Tow Cable

Coaxial or optional fiber-optic, double armored, steel tow cable is used to transmit data bidirectionally from the towfish to the TPU.

1.2 Features

The Series 3000 Sonar System has the following capabilities:

- Advanced electronics and transducers that produce superior high resolution imagery
- 12-bit digital multiplexer for transmission of sonar and control data over a single coaxial cable
- Ranges of up to 150 meters at 500 kHz and 450 meters at 100 kHz
- Simultaneous dual frequency operation with independent controls
- Integrated attitude and ancillary sensors
- PC based operation using SonarPro
- Small, lightweight and simple to operate and maintain
- Interfaces to third party processors and LAN networks
- Standard operating depth of 1500 meters with deeper units available
- Compatible with all L-3 Klein towing accessories and cables
- Flexible configurations for ROV, AUV and special applications
- Low cost

1.3 Physical Description

The Series 3000 Sonar System consists of two major subsystems: the surface equipment and the subsurface equipment.

1.3.1 Surface Equipment

The surface subsystem comprises the TPU, the Computer Display and Control Unit (computer), and the Ethernet Hub.

Transceiver and Processing Unit (TPU). The front panel of the TPU is shown in Figure 1-1. The main power switch is located on the lower right corner of the front panel. The TPU is rack mountable in a standard 48.26 cm (19 inch) rack and contains electronics for receiving sonar data, downlink multiplexing of control signals to the towfish, and uplink demultiplexing of sonar and auxiliary sensor signals.

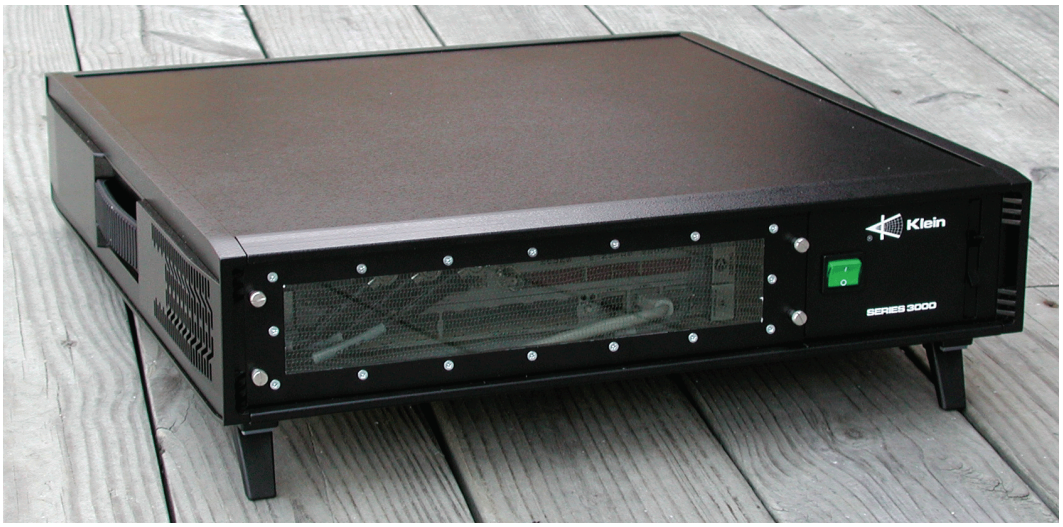


Figure 1-1: *TPU Front Panel*

Computer Display and Control Unit (computer). Most operator functions are accomplished through the use of the computer which supports the PC based Windows operating system as the display and control interface for the sonar signals. For a physical description of the computer, refer to the manufacturer's manual.

Ethernet Hub. The Ethernet Hub is used to connect the computer and the TPU. For a physical description of the Ethernet Hub, refer to the manufacturer's manual.

1.3.2 Subsurface Equipment

The subsurface equipment comprises the towfish, as shown in Figure 1-2, and a tow cable.

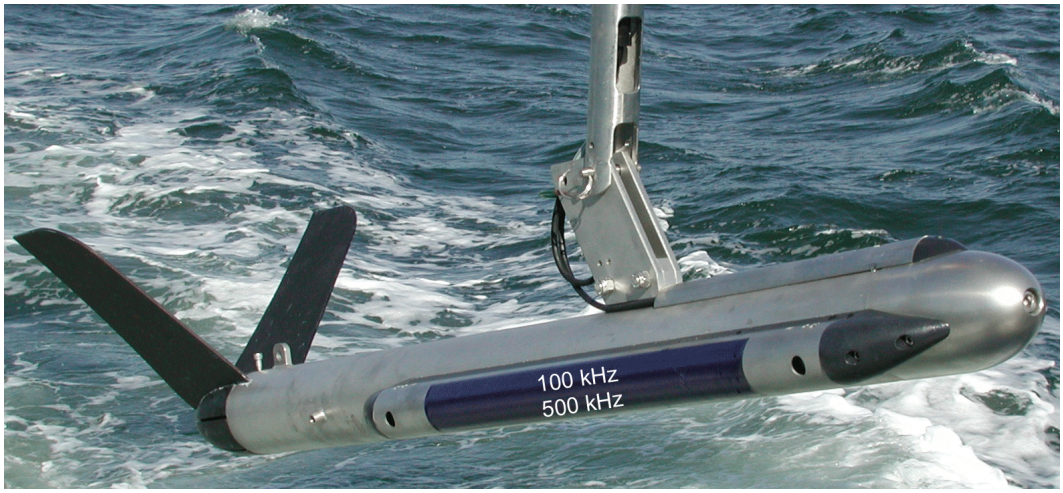


Figure 1-2: *Towfish*

Towfish. The Towfish consists of a negatively buoyant tow body containing port and starboard sonar transducers, processing and control electronics for sonar operation, a downlink demultiplexer for control signals, and an uplink multiplexer for sonar and auxiliary sensor data.

Tow Cable. The tow cable is a complete assembly consisting of a coaxial tow cable with a copper conductor, an electro-mechanical termination on the towfish end, and an electrical underwater connector. The tow cable is available in either a lightweight polyurethane jacketed Kevlar reinforced design or a double armored steel design. Optional fiber-optic double armored cable is also available. The lightweight design is used for operations with cable lengths of 300 meters and under. The double armored design is used for cable lengths longer than 300 meters.

1.4 Theory of Operation

This section provides a detailed functional description of the Series 3000 Sonar System operation.

1.4.1 Introduction

The Series 3000 Sonar System is a single beam side-looking sonar intended for high resolution survey use.

The Series 3000 departs from previous single beam systems in that the swath forming process is implemented digitally using digital signal processing (DSP), rather than analog delay lines, phase shifters, or multipliers and adders. The primary advantage of this technique is a reduction in the size and weight of the towfish. This affords a concomitant reduction in the size of the required survey vessel and ancillary equipment, such as a winch and crane. Other advantages include more flexibility in the swath processing, allowing software control of operating parameters. Previously this would have required hardware changes.

The Series 3000 architecture is composed of the towfish, the tow cable, the computer, and the TPU. The towfish contains the transducer arrays and electronic subsystems for transmission, reception and data acquisition, and telemetry. The towfish also includes standard and optional sensors for the monitoring of towfish position and motion dynamics, pressure, depth and altitude (acoustically measured), magnetometer, and other pertinent information.

The tow cable is simply a coaxial cable that provides power transfer and duplex communications between the towfish and the TPU.

The TPU processes the data from the towfish and outputs this data via the local area network (LAN). Sonar processor control of the TPU is also done via the LAN.

1.4.2 Towfish

The towfish is composed of the towfish housing, which has external brackets for cable attachment, the transducer arrays (one for each side), the nose cone, the tail section, and a pressure housing containing optional sensors and electronics. In a typical operation the towfish is towed behind the survey vessel by means of the tow cable. The depth at which the towfish runs below the surface of the water is a function of both the length of the deployed cable and the tow speed.

NOTE *The transducers are side specific and are not interchangeable.*

The two transducer arrays are each composed of piezoelectric ceramic sub-arrays that operate as both transmit and receive elements. Each set of sub-arrays is arranged into a continuous line array spanning an overall aperture of 48 centimeters.

The towfish electronics is divided into four individual boards: a 100 kHz Transceiver board, a 500 kHz Transceiver board, a Power Supply board, and a Multiplexer board. A block diagram of the towfish is shown in Figure 1-3.

100 kHz and 500 kHz Transceiver boards. The 100 kHz and 500 kHz Transceiver boards each include a transmitter which produces a transmit pulse, at the start of a swath, that illuminates the sea floor over a defined footprint. The pulse length is adjustable from 50 µs to 400 µs for the 100 kHz Transceiver board and from 25 µs to 100 µs for the 500 kHz Transceiver board. The transmitters are connected to both the port and starboard transducer sub-arrays, and they operate at a center frequency of 445 kHz. The transmitters are Class-D switching types coupled through a double tuned transformer to the transducer sub-arrays.

The 100 kHz and 500 kHz Transceiver boards each include a receiver which processes the backscatter information by applying fixed gain, time varied gain (TVG) and frequency filtering to the input voltage signals received from the individual sub-arrays in the transducer arrays.

The receivers first process the transducer data by isolating the input preamplifier electronics from the high voltage transmit signal via a transmit/receive (T/R) switch. The T/R switch is automatic and requires no intelligent control. After the transmit waveform has decayed, the switch closes to allow the receive signals to enter a fixed gain low noise preamplifier stage. The output of the preamplifier is input to a voltage controlled amplifier (VCA) which performs the TVG function. The gain versus time relationship, TVG, that is applied identically to all channels is digitally synthesized from a predefined curve stored in a PROM on the Multiplexer board. Provision has been made for the storage of alternate TVG curves but in practice it has been found that the use of these has been limited to test procedures.

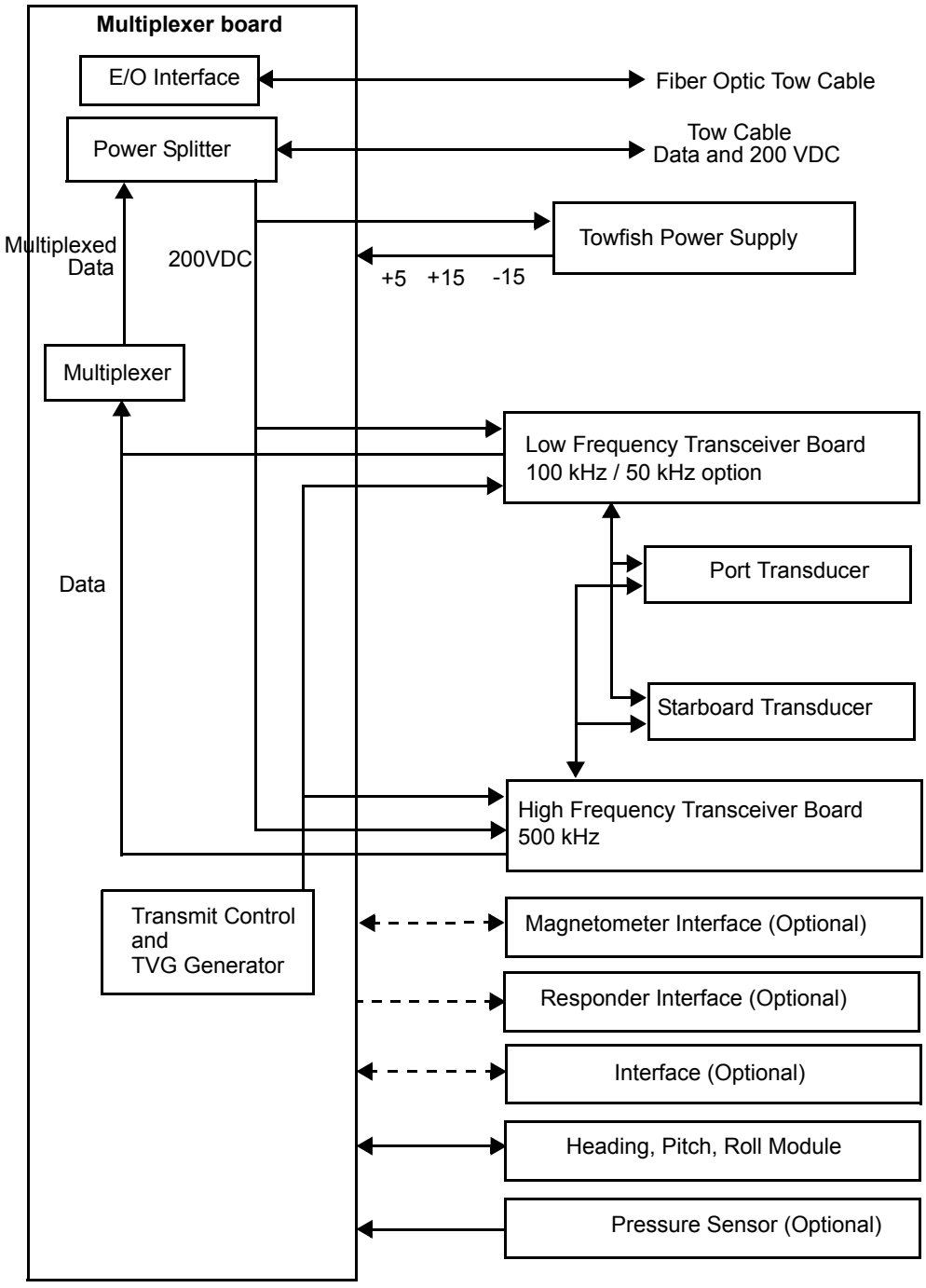


Figure 1-3: *Towfish Block Diagram*

Multiplexer board. The Multiplexer board digitizes the signals from each of the transducer sub-array channels along with the signals from the sensors, encodes the data, and transmits a high baud rate digital data stream to the TPU via the tow cable. The Multiplexer board also receives the trigger signal and command messages which instruct the Transmitter board to fire the arrays and configure aspects of towfish operation. The Multiplexer board also acts as a motherboard for the other boards providing the connections and distributing power.

A full duplex hybrid allows data transmission up the cable while simultaneously receiving the FSK trigger signals and power. The downlink signals are input to FSK demodulators, and the baseband outputs are routed to the Transmitter board, indicating when to fire the main array, and to a micro controller that handles towfish configuration.

Towfish connector. The towfish connector pinouts are shown in Table 1-1, and the connector is shown in Figure 1-4. Only two pins are used.

Table 1-1: *Towfish Connector—at Towfish*

PIN NO.	LABEL	FUNCTION
1	Power/Data	+200 VDC power and multiplexed data
2	Shield	Power and data return

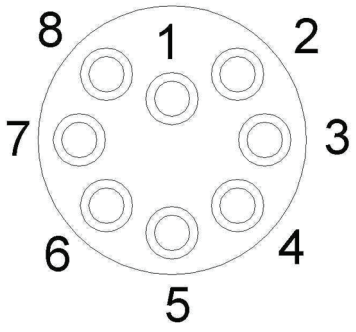


Figure 1-4: *Towfish Connector—at Towfish*

1.4.3 Transceiver and Processing Unit

The TPU provides signal processing along with the system control and data telemetry functions. The TPU is composed of two circuit boards: an embedded CPU board and a Demultiplexer board. The TPU also contains a 200-volt towfish power supply and a TPU power supply. A block diagram of the TPU is shown in Figure 1-5.

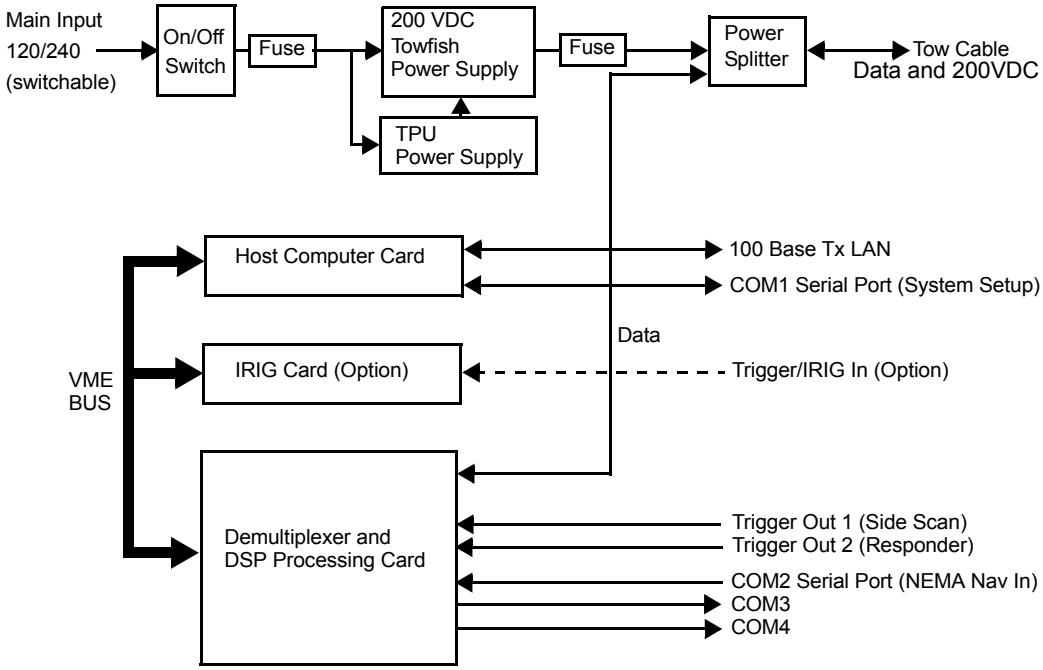


Figure 1-5: *TPU Block Diagram*

CPU board. The CPU board is an embedded MVME-6100-based processor board that enables external control of the TPU by a PC connected via an Ethernet 100BaseT local area network (LAN), providing control over system functions. All functions, including communicating the operating parameters to the DSP and extracting sensor data from the Demultiplexer board, are communicated over the LAN.

Demultiplexer board. The Demultiplexer board receives the encoded digital data telemetered from the towfish, recovers the clock and data, and then decodes the data and routes it to the DSP for processing. The Demultiplexer board also contains an FSK modulator for transmitting trigger signals and towfish commands to the towfish. This modulator is under control of the CPU board.

The data from the towfish arrives in serial NRZ format and is conditioned and input to the clock recovery circuit. The recovered clock is used to strobe the serial data into a line decoder. The decoded data is converted to parallel format and output the front panel connector.

The downlink modulator is used to indicate to the towfish when to fire the main array and to send commands to the towfish. The modulator uses FSK modulation and is frequency multiplexed before being amplified and combined with 200-volt power which is then transmitted down the tow cable. The CPU board controls the modulator.

Front panel. The power switch is located on the front panel as shown in Figure 1-1 on page 1-3. All control of the TPU is done remotely via the LAN.

Power supply. The power supply provides 200 VDC to energize the towfish via the tow cable and to generate ±12 VDC and +5 VDC power to energize the sonar transceiver electronics.

Rear connector panel. The rear connector panel provides the following I/O connectors as shown in Figure 1-6:

- TOWFISH (See also Table 1-2.)
- AC (See also Table 1-3.)
- COM 1, COM 2, COM 3, and COM 2 (See also Table 1-4.)
- TRIG IN/IRIG (optional)
- TRIG 1 OUT
- TRIG 2 OUT
- LAN

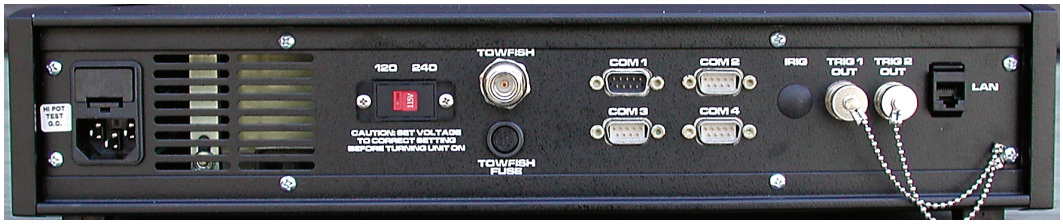


Figure 1-6: *TPU Rear Panel*

Table 1-2: *TOWFISH Connector Pinouts*

PIN NO.	LABEL	FUNCTION
1	Center pin	+200 VDC power and multiplexed data
2	Shell	Shield power and data return

Table 1-3: *AC Connector Pinouts*

PIN NO.	LABEL	FUNCTION
1	L	AC line
2	N	AC neutral
3	G	Ground

Table 1-4: *COM1, COM 2, COM3, and COM4 Connector Pinouts*

PIN NO.	LABEL	FUNCTION
1	NC	No connection
2	RXD	Data input
3	TXD	Data output
4	NC	No connection
5	GND	Ground
6	NC	No connection
7		
8		
9		

Fuses. The fuses are listed in Table 1-5.

CAUTION *Do not replace a fuse with one with a higher current rating. Do not bypass the fuse. Failure to observe this caution may cause damage to the equipment and void the warranty. If fuses blow repeatedly, there is a problem that must be corrected before attempting further operation.*

Table 1-5: *System Fuses*

FUSE	TPU LOCATION	AMP/VOLT	MANUFACTURER TYPE	SIZE
Main AC power	Rear panel, above AC connector	2 A, Slow-Blow 250 V	BUSS GMA	5 x 20 mm (two)
Towfish	Rear panel below TOWFISH connector	630 mA Slow-Blow 250 V	BUSS GMA	5 X 20 mm

CHAPTER 2: SPECIFICATIONS

This chapter includes the physical and performance specifications for the main components of the Series 3000 Sonar System.

NOTE *Specifications are typical and subject to change without notice.*

2.1 Sonar System

Sonar channels:	4
Sonar frequencies:	100 kHz nominal (132 kHz, ±1% actual) 500 kHz nominal (445 kHz, ±1% actual)
Transmission pulse:	Toneburst, operator selectable from 25 to 400 µs; independent pulse controls for each frequency
Maximum range:	Up to 450 meters per side at 100 kHz and 150 meters per side at 500 kHz (actual range varies with environmental conditions and operating frequency)
Horizontal beam width:	1° at 100 kHz; 0.2° at 500 kHz
Vertical beam width:	40°
Tilt angles:	-5° to -25°; -15° is the default
Swath width:	900 m maximum at 100 kHz; 300 m maximum at 500 kHz
Depth limit:	1500 m standard; 3000 m and 6000 m optional
Operating temperature:	-10–25°C (14–77°F)

2.2 Sonar Transceiver and Processing Unit (TPU)

2.2.1 TPU Operation

The only operator control on the TPU is the main power switch.

2.2.2 Towfish Input/Output

Quantity: 1

Connector: Type N

2.2.3 Trigger/IRIG Input (Optional)

The trigger/IRIG input, which is optional, is used to trigger the system externally.

Quantity: 1

Input level: TTL compatible, positive edge triggered

Rise time: 1 µs maximum

Pulse width: 100 µs minimum

Impedance: 10 Kohm

Connector: Type N

2.2.4 Trigger Outputs

The trigger outputs are used to slave external processors or other equipment such as locators. The main trigger output runs at the trigger rate determined by the RANGE setting. The auxiliary trigger occurs at a sub-multiple of this, determined by the AUX TRIG DIVISOR setting.

Quantity: 2

Output level: CMOS/TTL compatible

Pulse width: 100 µs nominal

Connector: BNC

2.2.5 RS-232 COM 1, COM3 and COM4 Ports

Quantity: 3

Baud rate: 9600 baud

Connector: 9-pin DSUB for receiving sensor data and sending control commands to the TPU

2.2.6 RS-232 COM 2 Port

Quantity: 1

Baud rate: 4800 baud

Connector: 9-pin DSUB for receiving navigation data

2.2.7 LAN Input/Output Port

Quantity: 1

Output: 100BaseT

Connector: RJ-45

2.2.8 Power Input

Power consumption: 250 VA (nominal)

Input voltage: 115 VAC, 50–60 Hz or 230 VAC, 50–60 Hz, manually selected

2.2.9 Physical Characteristics

Size: 48.3 cm (19 in.) wide
8.75 cm (3.5 in.) high
54.6 cm (21.5 in.) deep

Weight: 10.4 kg (23 lb)

2.3 Computer Display and Control Unit

For specifications on the Computer Display and Control Unit, please refer to the manufacturer's manual.

2.4 Ethernet Hub

For specifications on the Ethernet Hub, please refer to the manufacturer's manual.

2.5 Towfish

2.5.1 General

Electronics boards: Modular plug-in

2.5.2 Transducers

Type: Proprietary line array

Vertical beam angle: 40°

Depth limit: 1500 m standard; 3000 m and 6000 m optional

2.5.3 Transmitter

Type: Toneburst

Pulse width: 50 µs, 100 µs, 200 µs

Driver: Class-D MOSFET

2.5.4 Receiver

Type: High gain, tuned preamplifier with TVG

Noise figure: 1 dB nominal

TVG range: 80 dB

2.5.5 A/D Converter

Type: Pipeline

Resolution: 12 bits

Quantization: Linear

Sample rate: Proprietary

2.5.6 Multiplexer

Modulation format: Pulse code modulation (PCM)

Multiplexing format: Time division multiplexing (TDM)

Number of channels: 4

Data rate: 1.544 Mb/s

Data format: B8ZS

Bit error rate: Better than $1x10^{-8}$ (before correction)

2.5.7 Power

Input power: Powered from the TPU; no additional power required

2.5.8 Physical Characteristics

Body material: Type 316 stainless steel

Tail fin material: Hard-coat anodized 6061 aluminum

Size: 127.8 cm (50.3 in.) long
8.9 cm (3.5 in.) diameter

Weight in air: 28.2 kg (62 lb)

Weight in water: 12.7 kg (28 lb)

2.5.9 Heading Sensor

Accuracy level: ±0.5° RMS

Accuracy tilted: ±1.0° RMS

Resolution: 0.1°

Repeatability: ±0.1°

2.5.10 Pitch and Roll Sensor

Accuracy: ±0.2° RMS

Resolution: 0.1°

Repeatability: ±0.2°

2.5.11 Pressure Sensor (Optional)

Pressure range: Selectable

Accuracy: ±0.10%

2.6 Tow Cables

2.6.1 Lightweight Tow Cable

Type:	Polyurethane jacketed coaxial, Kevlar reinforced
Conductors:	Coaxial copper
Diameter (OD):	1.156 cm (0.455 in.)
Breaking strength:	2270 kg (5000 lb)
Working load:	454 kg (1000 lb)
Operational length:	3000 m maximum
Voltage rating:	600 VDC
Termination:	Stainless steel shackle at towfish end

2.6.2 Steel Tow Cable

Type:	Double layer, counter helical, galvanized improved plow steel (GIPS)
Conductors:	Coaxial copper
Diameter (OD):	10.2 mm (0.40 in.)
Breaking strength:	4990 kg (11,000 lb)
Working load:	1247 kg (2750 lb)
Operational length:	3000 m nominal
Voltage rating:	1200 VDC
Termination:	Stainless steel shackle at towfish end

2.7 Options

The Series 3000 Sonar System design provides the configuration flexibility to meet your specific needs. The highly modular design of the equipment makes this possible. This section provides information on the available optional capabilities of the System.

2.7.1 Towfish Options

The towfish can be equipped with the following options:

- Pressure sensor
- Responder
- Magnetometer

2.7.2 Tow Cable Options

Three types of tow cables are available:

- Lightweight coaxial
- Armored coaxial
- Armored fiber-optic

CHAPTER 3: PREPARATION FOR USE

This chapter provides instructions for unpacking and preparing your equipment for use in the field, including detailed instructions on the following:

TPU setup. Guidelines for installing the TPU to optimize performance and equipment lifetime.

Computer setup. Guidelines for installing the Computer Display and Control Unit (computer) to optimize performance and equipment lifetime.

Power connection. Power requirements and connection procedures and the importance of proper grounding techniques.

Towfish assembly. How to assemble the towfish.

Tow cable hookup. Proper techniques for attaching the tow cable to the TPU, the computer, and the towfish to ensure noise free, safe towing.

3.1 Unpacking and Inspection

3.1.1 Unpacking the TPU

Remove the TPU from the shipping container and set it on a sturdy, flat surface. Inspect the TPU for signs of damage. If there is any damage or if any items are missing, immediately contact L-3 Communications Klein Associates, Inc. or your L-3 Klein sales representative. Record the serial number of the TPU; it can be found on a sticker on the rear of the unit.

3.1.2 Unpacking the Computer Display and Control Unit (Computer)

Remove the computer from the shipping container, and set it on a sturdy, flat surface. Inspect the computer for signs of damage. If there is any damage or if any items are missing, immediately contact L-3 Communications Klein Associates, Inc. or your L-3 Klein sales representative. Record the serial numbers of the computer modules.

3.1.3 Unpacking the Towfish

The towfish is shipped in a reusable wooden crate. Open the crate and inspect the towfish for damage. If there is any damage or if any items are missing, immediately contact L-3 Communications Klein Associates, Inc. or your L-3 Klein sales representative. Record the serial number of the towfish. The serial number can be found on the towfish tow bracket. Save the crate for use when reshipping the towfish.

3.1.4 Unpacking the Tow Cable

The tow cable is shipped on a cable palette or reel. Inspect the cable for damage. If there is any damage or if any items are missing, immediately contact L-3 Communications Klein Associates, Inc. or your L-3 Klein sales representative. The TPU end of the cable has a Type N connector. The towfish end has a stainless steel tow shackle and a molded waterproof connector. After removing and inspecting the tow cable, save the cable reel or palette for future use when reshipping the tow cable.

3.2 Mechanical Installation of the TPU and Computer

3.2.1 Location

The TPU is partially sealed against spray and inclement weather. However, for equipment longevity, it is best to locate the TPU in a sheltered area. The computer should be located near the TPU, and it should be protected against spray and inclement weather and located in a sheltered area. For operational convenience and safety, this area should be close to or in ready communication with the bridge and the winch operator. The sonar operator must have the ability to alert the helmsman or winch operator if hazardous operational conditions develop. Make sure that the location of the TPU and the computer provides adequate clearance for personnel access.

3.2.2 Mounting

The TPU may be mounted on a table or mounted in a 48.3 cm (19 in.) rack (not provided). You should also secure the computer modules in a way that will protect them as much as possible.

3.2.3 Isolating from Shock and Vibration

The TPU and the computer should not be subjected to excessive or unnecessary pounding, shock or vibration. If the TPU is rack mounted, and the vessel is riding heavily in the seas or engine vibration is excessive, a thick layer of foam rubber or other resilient material may be used to isolate the TPU from the rack.

3.3 Power Connection

The Series 3000 requires AC power to operate. The power source requirements are 115 VAC, 50–60 Hz, single phase or 230 VAC, 50–60 Hz. The system is designed to protect against over and under voltage and transient spikes. However, it is always best to check the power source carefully before operating the equipment. Ensure that the power source is within the required operational tolerances, with minimal noise and voltage spikes. As the quality of onboard AC power varies from vessel to vessel, it is best to actually check the AC power source with a voltmeter or an oscilloscope.

CAUTION *Application of improper AC power may damage the Series 3000 Sonar System. Do not turn the equipment on until you have checked the supply voltage and frequency.*

3.3.1 Connecting Cables and Power Cords

The hardware must be fully interconnected for real time data collection. The computer may be used standalone when desired for display of stored data. Connect the cables as described below to set up the system for normal operation.

Tow cable. Refer to “Towfish Setup” on page 3-5 for instructions on connecting the tow cable.

NMEA navigation data line. Connect the data line from your NMEA navigation equipment to the TPU COM2 connector.

LAN cables. One end of a LAN cable connects to the LAN connector on the rear panel of the TPU, and the other end connects to the Ethernet Hub. A second LAN cable connects from the Ethernet Hub to the computer.

Computer cables. Connect the computer display, keyboard and mouse cables to the computer.

Power Cords. Connect the power cords to the Ethernet Hub, the TPU, the display, and the computer.

Confirm that the TPU and the computer are set to the local voltage (115 VAC or 230 VAC) and that the proper transformer (115 or 230 VAC to 12 VDC is used for the Ethernet Hub).

Since a variety of power connectors are in use throughout the world, it may be necessary to use an adapter or to cut off the US-type plug and re-terminate it with a new plug. In the event that the power cord for the TPU must be re-terminated, the wires should be connected in accordance with Table 3-1.

Table 3-1: *TPU Power Cord Wiring*

COLOR	FUNCTION
Yellow/green	Ground (earth)
Blue	Neutral
Brown	Hot

After checking the power source, and modifying the power cord if required, connect the TPU to AC power.

3.3.2 Power Line Fuse

The main AC power input line is protected by two 2-A, 5 x 20-mm slow-blow fuses rated for 250 volts (P/N 13000045). These fuses are located on the rear connector panel above the power cord receptacle. Before changing the fuse, be sure that the TPU is disconnected from its power source. To remove the fuse, lift the tab and pull out the fuse insert. A spare fuse should also be located there.

CAUTION *Do not replace a fuse with one with a higher current rating. Do not bypass the fuse. Failure to observe this caution may cause damage to the equipment and void the warranty. If fuses blow repeatedly, there is a problem that must be corrected before attempting further operation.*

3.3.3 Towfish Fuse

The towfish is protected by a 630-mA, 5 x 20-mm slow blow fuse rated for 250 volts (P/N 13000043). It is located on the back panel of the TPU and is below the TOWFISH connector. Before changing the fuse, be sure that the TPU is disconnected from its power source. To remove the fuse, use a flat bladed screwdriver to push in and then turn the fuse receptacle counterclockwise. The fuse will pop out. Remove the fuse from the holder to check or change it. When replacing it, there are two tabs that line up in the insert. When the tabs are aligned, push in on it and turn it clockwise to lock it into position.

3.3.4 Grounding

It is important that the TPU be well grounded to minimize potential hazards to the operator and electrical interference from other equipment. A good ground for the system is a low impedance, well conducted path to the sea water. Always check the quality of the electrical ground. Check that the AC power source ground has no voltage potential with respect to the vessel hull.

3.4 Towfish Setup

3.4.1 General Rigging Notes and Cautions

Grease the waterproof connectors when attaching the connectors at the towfish. Avoid putting excessive grease on the male pins. The silicone grease serves an important lubricating and corrosion protection function. Use a high quality, nonconducting grease such as Dow Corning DC-4.

CAUTION *Always avoid putting excessive silicon grease on the Subcon male pins. Apply a light coat of grease, and never put grease into the female connectors.*

When connecting the tow cable, make a general inspection of the towfish. Check that the retaining screws securing the towfish nose cone and tail section assemblies are tight. Check the tail fins and tow bracket assembly to be sure the retaining screws and bolts are secure. Tail fin tether cables should be tight to the end of the tail cone. It is important to make sure tail fins are straight and true.

Attach the shackle end of the safety cable to the bail grip on the tow cable near the tow cable shackle and clevis pin end to the safety cable tab on the top of the towfish near the tail. The safety cable must be taut enough so that drag, or the likelihood of snagging, is not increased, but loose enough so that it does not interfere with the functioning of the tow shackle.

NOTE *The tow cable and <u>not</u> the safety cable must take up the strain of the tow load*

CAUTION *Serious damage to the towfish electronics may occur if the towfish is operated on deck for periods longer than fifteen minutes. Between periods of operation, let the sonar cool for fifteen minutes. In high temperature climates, protect the towfish from direct exposure to the sun prior to and during operation.*

3.4.2 Tow Cable Electrical Connection

It is essential to exercise care when making and breaking the tow cable connections at both the TPU and the towfish ends. The electrical connection procedures are provided below.

WARNING *In all of the procedures which follow, be sure that the power is turned off. Disconnect the TPU power cable from the power source. Failure to follow this practice may result in personal injury or damage to the towfish or the TPU electronics, or to both.*

SHOCK HAZARD *Do not connect or disconnect the tow cable from the towfish or the TPU when power is on. Failure to follow this practice may result in personal injury and will damage the towfish or the TPU electronics, or both.*

The male Type N connector on the TPU end of the tow cable connects to the TOWFISH connector on the TPU rear connector panel. The shackle on the tow cable connects mechanically to the towfish tow bracket using a tow pin. The waterproof connector on the towfish end of the tow cable connects to the waterproof connector on the tow cable as shown in Figure 3-1.

Figure 3-1: *Towfish Connection*

The tow cable jumper is secured with cable ties to the top of the towfish. The towfish mechanical and electrical connection procedure is as follows:

1. Remove the retaining ring from the beveled end of the tow pin and withdraw the pin from the tow bracket. Align the tow shackle mounting hole with the upper mounting hole of the tow bracket, with the shackle pigtail connector facing the tail of the towfish. Insert the beveled end of the tow pin through the holes in the tow cable shackle and the bracket and secure the pin with the retaining ring.
2. Remove the dummy plug from the connector on the end of the tow cable jumper. Apply a thin film of silicone grease to the pins of the connector. Do not over grease. Align the male and female connectors and press the connectors together firmly. If necessary, use a slight side to side rocking motion while pressing on the connector, but do not bend the pins. When properly inserted there should be no gap between the surfaces of the two connectors.
3. If using a safety cable, attach the shackle end of the safety cable to the bail grip loop on the tow cable near the tow cable shackle. Attach the strap fork with clevis pin end to the safety cable tab on the top of the towfish near the tail.
4. If using a safety cable, and if it is not already secured, use cable ties (7.5 x 0.185 in.), which are included in the towfish spares kit, to fasten the safety cable to the cable hold-down clips on the top of the towfish housing. Place a cable tie through the shackle pin hole and wrap around the shackle pin to prevent the shackle from loosening. Use electrical tape every 30 cm (12 in.) to secure the safety cable to the tow cable starting at the top of the tow shackle and up the bail grip loop. Move the tow shackle forward and back to check for smooth operation.

NOTE *Apply silicone grease to the pins of the towfish connector before every connection.*

CAUTION *When connecting or disconnecting the electrical connection, do not bend it back and forth. Use straight up action. Pull on the connector, not the cable.*

3.4.3 Towfish and Optional Depressor Connection

The shackle on the tow cable connects mechanically to the towfish K-Wing depressor tow bracket using a tow pin. The depressor connects mechanically to the towfish. The waterproof connector on the towfish jumper cable connects to the waterproof connector on the tow cable, and the tow cable jumper is secured with cable ties to the top of the towfish. The towfish mechanical and electrical connection procedure is as follows:

1. Remove the retaining ring from the beveled end of the tow pin, withdraw the pin from the tow bracket and set it aside. Remove the two bolts and tow brackets from the welded-on six-hole towing flange. Take note of the location of the tow brackets for future reference.
2. Position the K-Wing depressor over the towing flange in the same location as where the tow brackets were previously connected. Secure the depressor to the towing flange with the fasteners provided.
3. Align the tow shackle mounting hole with the mounting hole of the K-Wing® depressor tow bracket, with the shackle pigtail connector facing the tail of the towfish. Insert the beveled end of the tow pin through the holes in the tow cable shackle and the bracket, and secure the tow pin with the retaining ring.
4. If the towfish was previously configured for towing without a depressor, it will be necessary to extend the free length of the tow cable jumper in order to reach the shackle pigtail connector. Do not extend more than is needed to make the connection and to provide free rotation of the tow shackle. Remove the dummy plug from the connector on the end of the tow cable. Apply a thin film of silicone grease to the pins of the connector. Do not over grease. Align the male and female connectors, and press the connectors together firmly. If necessary, use a slight side-to-side rocking motion while pressing on the connector, but do not bend the pins. When properly inserted there should be no gap between the surfaces of the two connectors.
5. If using a safety cable, attach the shackle end of the safety cable to the bail grip loop on the tow cable near the tow cable shackle. Attach the strap fork with clevis pin end to the safety cable tab on the top of the towfish near the tail.
6. If using a safety cable, and if it is not already secured, use cable ties (7.5 x 0.185 in.), which are included in the towfish spares kit, to fasten the safety cable to the cable hold-down clips on the top of the towfish housing. Place a cable tie through the shackle pin hole and wrap around the shackle pin to prevent the shackle from loosening. Use electrical tape every 30 cm (12 in.) to secure the safety cable to the tow cable starting at the top of the tow shackle and up the bail grip loop. Move the tow shackle forward and back to check for smooth operation.

3.4.4 Tow Cable Disconnection

If possible, it is best to keep the tow cable connected to the towfish while on deck. If the tow cable is disconnected, however, it is very important that all connectors be properly maintained. Connectors must be kept clean and must remain out of the way of traffic while on deck. L-3 Klein supplies dummy connectors which can be used to protect the underwater connectors on the towfish and cable when they are not mated to each other. The procedure for disconnecting the tow cable from the towfish is as follows:

WARNING *Power to the sonar system must be turned off prior to connection or disconnection of the tow cable to either the towfish or the TPU, as serious damage may occur to the sonar system electronics or injury may occur to the operator as a result of this action.*

Review "General Rigging Notes and Cautions" on page 3-5 before performing the following procedures.

1. Turn the system power off.
2. If using a safety cable, disconnect the safety cable from the bail grip loop. Remove the electrical tape securing the safety cable to the tow cable. Cable ties fastening the safety cable to the cable hold-down clips on the towfish housing may remain in place.
3. Double check that the TPU is off and grasp the body of each connector and gently pull them apart. Do not pull on the wires to separate the connectors. Always hold the body of the connectors. After separating the connectors, put a thin coating of silicone grease on the rubber section of the connector pins.
4. Remove the retaining ring from the tow pin and withdraw the pin. Disengage the tow cable shackle from the towfish or tow bracket. Replace the tow pin in the hole in the tow bracket, and secure it with the retaining ring.

Refer to "CHAPTER 4: SonarPro Ver. 11.0 Operating Instructions," before powering up.

3.5 Quick Start Installation and Operating Guide

3.5.1 Hardware Installation

Refer to Figure C-1 on page C-3 and to Figure C-2 on page C-4 in APPENDIX C: "General Setup, Configuration and Troubleshooting."

To install the hardware:

1. Install the TPU, the Ethernet Hub and the Computer Display and Control Unit (computer) in the deck house of the towing vessel.
2. Verify the ship power voltage with a voltmeter.
3. Check that the TPU, the Ethernet Hub and the computer are set to the proper voltage. The hub must have the proper transformer (115 or 230 VAC to 12 VDC).
4. Connect the Ethernet Hub to the power source and check that the power light is lit.

5. Connect the computer and the TPU to the power source.
6. Turn the computer on and check that it boots up to the Windows desktop.
7. Connect the TPU to the power source and turn it on. Make sure the power light is lit.
8. Turn the TPU off.
9. Install and connect the customer supplied GPS receiver to the COM2 connector of the TPU. Make sure the GPS is outputting the NEMA 0183 format data string. It should contain GGA&VTG, GLL&VTG or RMC at 4800 baud. If 4800 baud is not available, contact L-3 Klein technical support for assistance.
10. Run the LAN cables from the TPU to the Ethernet Hub and from the Ethernet Hub to the computer.

CAUTION *Verify that the TPU is off.*

11. Connect the tow cable to the TPU.

This completes the hardware installation. For SonarPro installation instructions, refer to "CHAPTER 4: SonarPro Ver. 11.0 Operating Instructions."

3.5.2 Deck Test

To perform the deck test:

1. Turn on the GPS receiver (customer supplied), and let it acquire its location.
2. Verify that the tow cable is connected to the TPU and the towfish.
3. Turn on the computer. After the booting process is complete and the Windows desktop is visible, turn on the TPU.
4. Open the front door of the TPU and verify that the LOCK LOSS and ERROR lights come on, and that they both turn off after approximately 45 seconds.
5. Check the Ethernet Hub port status for two ports lit, if only the computer and the TPU are connected to the hub.
6. On the computer, start SonarPro and observe that the towfish is transmitting by viewing the output pulse in the Sonar Viewer window. Also check that GPS data are being displayed in the Information window in SonarPro.
7. Select the 150-range, open a second Sonar Viewer window and select the low frequency operation. Allow the TVG to normalize; it will take about two minutes.

8. Perform a rub test on the port and starboard transducers to confirm that the receiver mode is operating properly. Vigorously rub each transducer, one at a time, while observing the Sonar Viewer window in SonarPro for returns.
9. Exit SonarPro and turn off the computer and the TPU.

This completes the deck test.

3.5.3 At-Sea Test

To perform the at-sea test:

1. With the computer running and at the Windows desktop, turn on the TPU. After the TPU boots (as in Step 3 above), start SonarPro. Again, check for the output pulse, and then carefully deploy the towfish.
2. Adjust the towfish within the water column so that it is at a comfortable altitude off the bottom and under the boat wake (about 15 percent of range). A good starting vessel speed is around 4 or 5 knots. Check for the following:
   - The image is satisfactory for both the high and low frequency channels.
   - Pitch, roll, depth, and altitude are being displayed.
   - Speed and heading are being displayed from the GPS.

This completes the at-sea test.

CHAPTER 4: SONARPRO VER. 11.0 OPERATING INSTRUCTIONS

SonarPro Ver. 11.0 is a comprehensive Windows based software program that provides multiple displays of real-time or saved sonar and sensor data and towfish status. SonarPro also allows you to record all acquired sonar and sensor data.

NOTE *Both the Series 3000 and Series 5000 Sonar Systems currently use SonarPro version 11.0 software. Therefore wherever the operating instructions refer to the Series 5000, the information also applies to the Series 3000. One exception is the section "Series 5000 Sonar System Towfish Setup" on page 4-12, where Series 3000 users are referred to the section "Series 3000 Sonar System Towfish Setup" on page 4-80.*

4.1 Installing SonarPro

Insert the SonarPro Ver. 11.0 CD into your CD-ROM drive, and then locate the Sonarpro Installation.pdf file in the Documentation folder. Double-click this file to open it.

NOTE *It is very important that you follow the instructions in the Sonarpro Installation.pdf file. You should also print this file.*

To install SonarPro double-click the setup.exe file in the SonarPro Disk1 folder and follow the directions carefully.

For an upgrade, double-click the setup.exe file in the SonarPro Disk1 folder and follow the directions carefully. Multiple versions of SonarPro can reside on the same computer.

When installation is complete, verify that your startup and vxWorks files are located in the klein directory.

4.2 SonarPro Quick Start

1. Open the SonarPro 11.0 folder and double-click the SonarPro.exe file. You can create a shortcut and place it on the desktop. This will start SonarPro.

2. Click .

   This button will run SonarPro in real time. The Sonar Viewer window will open.

3. Click .

   This button will start the presentation of real time data. The data will start scrolling down in the Sonar Viewer window.

4. Click .

   This button will open the Sub Bottom Viewer window. In this window click to start the presentation of real time chirp sub bottom profiler data if the optional chirp sub bottom profiling system is installed. The data will start scrolling down in the Sub Bottom Viewer window.

5. Click .

   This button will allow you to adjust the time varied gain (TVG) on the data. For normal operation leave the **Auto TVG is On** check box selected and adjust the **Intensity** slider. For manual control clear this check box and tune the port and starboard sides manually.

6. Click .

   This button allows you to change the color of the data being displayed. You have control over the hue and the saturation. There is also an **Inverse Video** check box.

7. Click .

   This button will open the Navigation window where sonar coverage and target locations are plotted.

8. Click .

   This button will open the Sensor window which displays the sensor data. Right-click in the Sensor window to select the sensor data to be displayed.

9. Right-click in any open window for more options.

10. Double-click on a target to open the Target window.

4.3 SonarPro Windows

SonarPro includes the following primary windows:

- Main
- Sonar Viewer
- Sub Bottom Viewer
- Information
- Target
- Navigation
- 3D Terrain
- Sensor
- Raw Channel Data

The Main window, which is shown in Figure 4-1, is the first window to open after launching SonarPro. This is where you select the data source option.

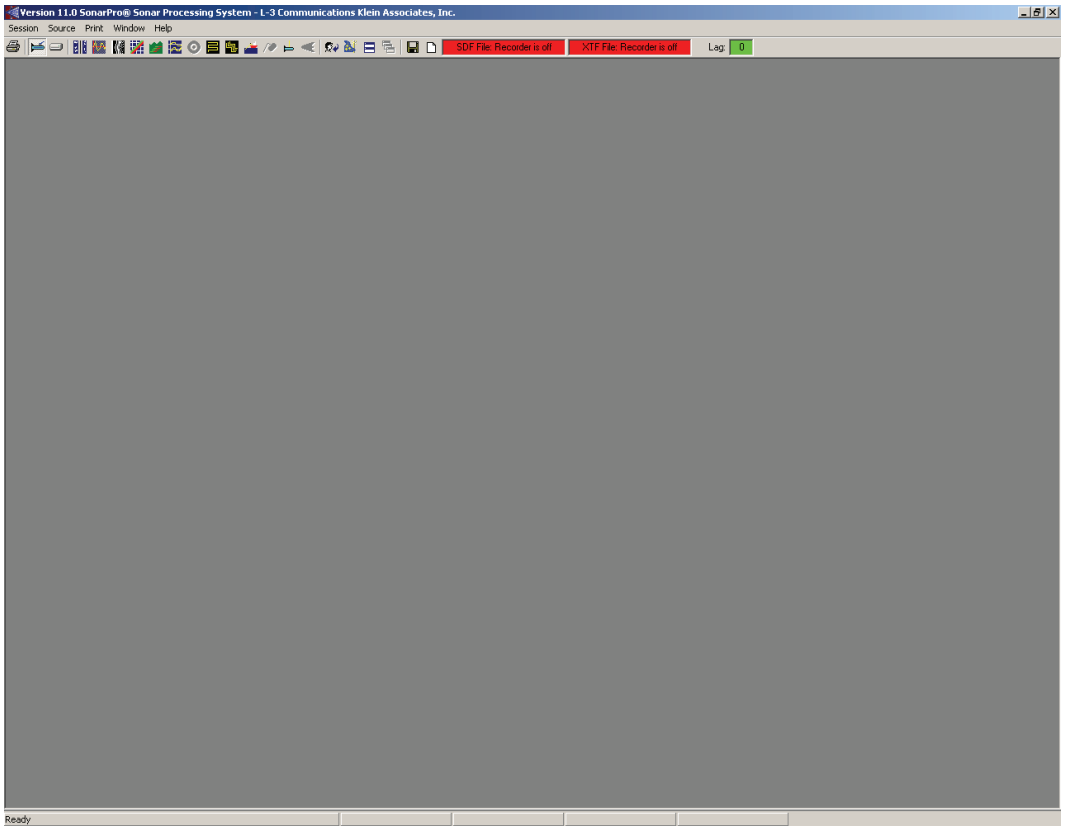


Figure 4-1: *The Main Window*

4.4 Selecting the Connection Type

Towfish Source

Click this button to set up the connection type. The *TPU Connection* dialog box will open as shown in Figure 4-2.

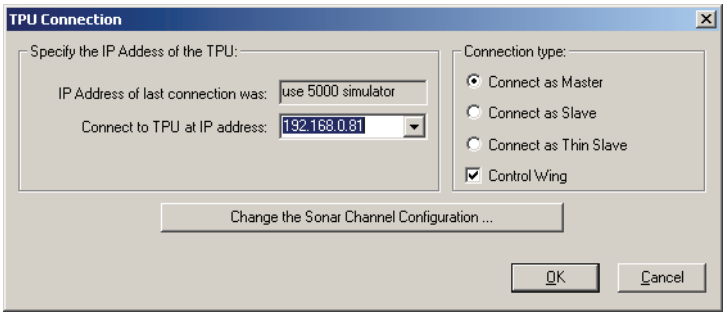


Figure 4-2: *The TPU Connection Dialog Box*

The **Specify the IP Address of the TPU** section of the *TPU Connection* dialog box displays the IP address of the last TPU connection. You can change the IP address here if you have a second TPU with a different address or if you are using the system on a network that has different IP addresses.

There are three connection types:

Connect as Master. Select this option when the computer you are using will be running the sonar system and controlling the towfish. This setting is used most of the time. There can only be one master.

Connect as Slave. Select this option when there is already a master computer on the network running the sonar system. You may want to put one or more additional computers on the network to work with the data in real time or for post processing. The slave computer cannot control the sonar.

Connect as Thin Slave. Select this option to transfer only navigation data to another computer running SonarPro. This option is useful in certain instances where you want to conserve bandwidth; for example, when you are running on a wireless network.

Control Wing. Select this check box to initialize and enable control of the wing actuator on a Series 5000 MK IIB towfish—for the **Connect as Master** or the **Connect as Slave** option. With this check box selected, the **Show/Hide Wing Control** button on the Main tool bar and the *Show/Hide Wing Control* item on the *Window* menu are available.

The **Change the Sonar Channel Configuration** button is used if you have a special sonar system or special configurations. To minimize file size, set up the *Channels and Sensors* dialog box shown in Figure 4-3.

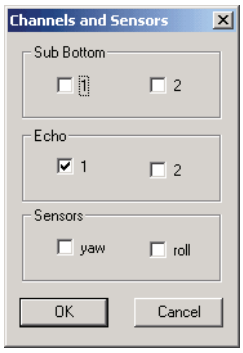


Figure 4-3: *The Channels and Sensors Dialog Box*

When the settings in the TPU Connection dialog box have been made or verified, click **OK**. The *Run Survey Wizard* dialog box shown in Figure 4-4 will open where you are asked if you want to run the Survey Wizard. The Survey Wizard guides you through setting up parameters for maintaining an orderly survey data file structure. For instructions on how to use the Survey Wizard, refer to "Survey Wizard" on page 4-7. Click **Yes** to run the Survey Wizard, or if you do not want to run the Survey Wizard at this time, click **No**.

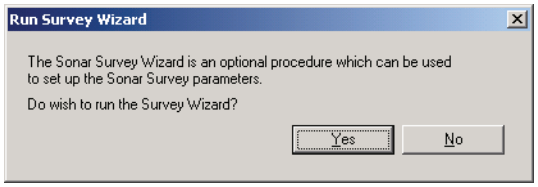


Figure 4-4: *The Run Survey Wizard Dialog Box*

The Sonar Viewer window will open, along with the Scan and Information windows in the Main window as shown in Figure 4-6. When operating in real time, the Sonar Viewer window includes the Real-Time tool bar as shown in Figure 4-27.

Figure 4-5: *The Real-Time Tool Bar*

At the top of the Main window is the Scan window where you can monitor signal strength. Below this window is the Sonar Viewer window. At the bottom of the Main window, you have the Information window. Here you can monitor the towfish and its position along the bottom and in the water column. On the right is an area where you can open other windows, including the Navigation window shown. If these windows do not open, you can open them from the *Window* menu.

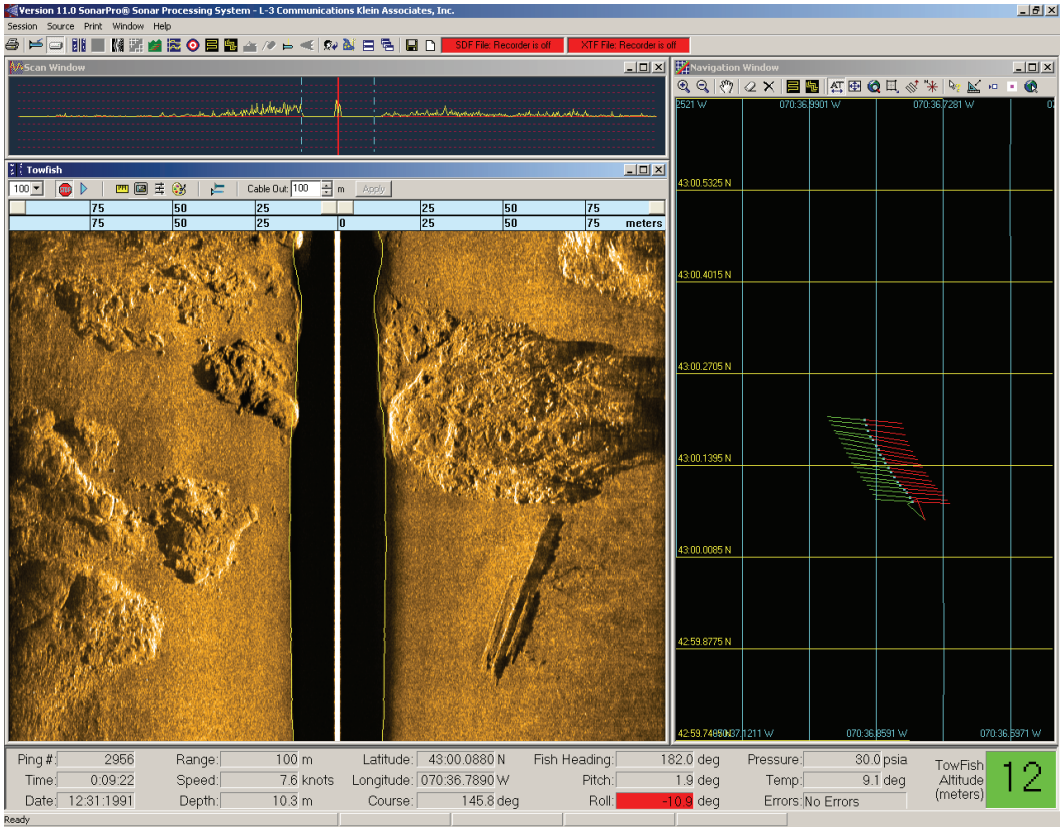


Figure 4-6: *Real Time Sonar Viewer, Scan and Information Windows*

4.5 Operating in Real Time

Play

Click this button on the Real-Time tool bar in the Sonar Viewer window to start the sonar and operate SonarPro in real time. The sonar data will start scrolling down the Sonar Viewer window, and the TVG will start to automatically adjust the gain on the data.

Click 100.

The drop-down list box displays the sonar range scale setting.

Click STOP.

This will stop sonar data collection.

Many of the features in SonarPro are available when operating in either real time or in playback. Refer to “Operating in Playback” on page 4-20 for information on the operating features of SonarPro.

4.6 Survey Wizard

Survey Wizard

Click this button to start the Survey Wizard. The *Survey Wizard* dialog box will open to the *Start* page as shown in Figure 4-7.

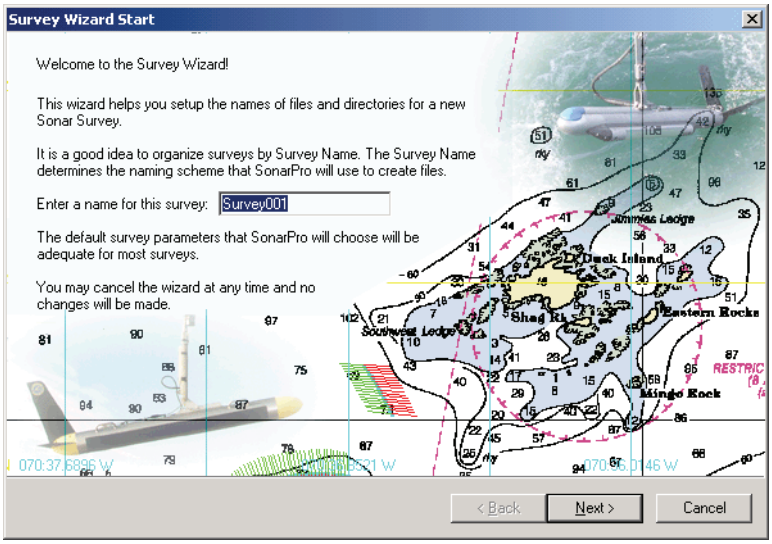


Figure 4-7: *The Survey Wizard Dialog Box—Start Page*

The Survey Wizard will guide you through the following parameters:

- First enter a name for the current survey.
- Select a data directory.
- Specify a target catalog.
- Specify target parameters.
- Specify a survey grid waypoint file.
- Specify a session state file.
- Specify the sensor scale of the towfish being used.

Once the above has been checked or set up, click **Finish**. You will then have an opportunity to print a summary of the setup information using the Snagit print utility (check print preview).

On the *Start* page of the Survey Wizard, you are asked to enter a name for the survey. This action gives the main folder a name in which to store the sonar data files and sub folders, in this case Survey002, the default, as shown in Figure 4-8.

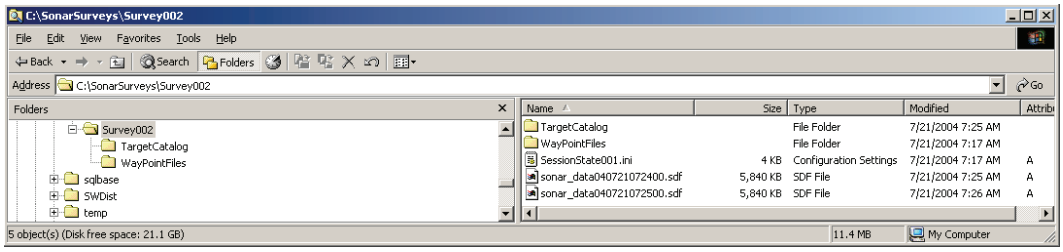


Figure 4-8: *The Survey002 File*

On the *Data Storage Location* page shown in Figure 4-9, you are asked for the directory name.

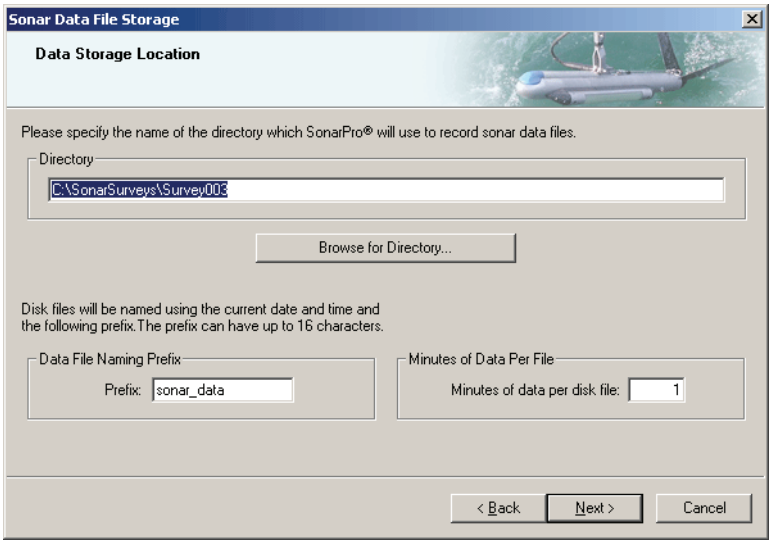


Figure 4-9: *The Survey Wizard—Data Storage Location Page*

You can enter the name in the **Directory** text box, or you can browse for one. In most cases you will want to use the default. You can also change the data file prefix in this box by entering it in the **Prefix** text box. In the following example the prefix is sonar_data.

sonar_data040721072400.sdf

The final text box is **Minutes of data per disk file**. This sets the length of time that the current data file will collect sonar data. The default is one minute. You should usually keep this file time short to protect the data should a problem occur. You will only lose one minute of data. There are times, however, when you may want to increase the time interval. For example, if you are running a survey and want to have one file for each survey line, you would enter a file time that is longer than the time it would take for you to survey the line, and then at the end of the line, you would click . This will end the file and start the next file.

On the *Target Catalog Location* page shown in Figure 4-10, you are asked to specify information for the target catalog. In most cases the default should be used. You can also specify a reference catalog to be used to place historical targets on the page for comparison. You must browse for a previous catalog.

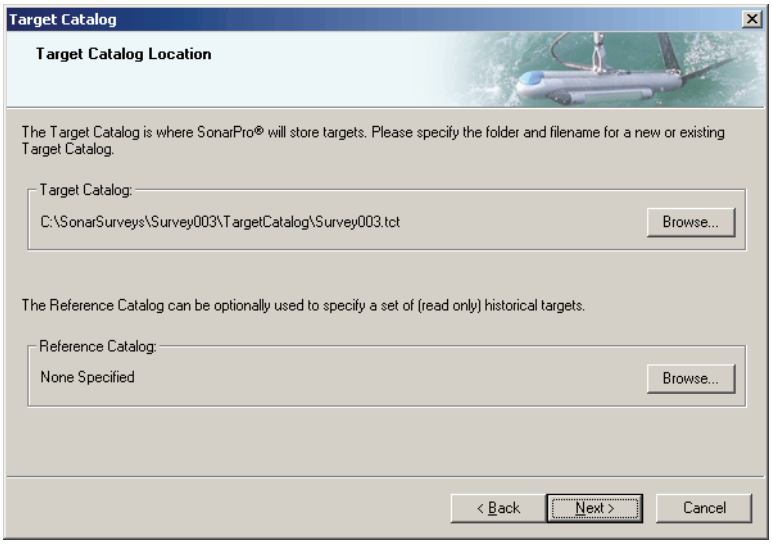


Figure 4-10: *The Survey Wizard—Target Catalog Page*

On the *Target Parameters* page shown in Figure 4-11, you are asked to set a target name prefix. This is the prefix that will appear for the target in the target window when a new target is generated. Again, in most cases you should use the default. You may want to change the prefix if you have a unique requirement. You also have the option of selecting a new layer. If you will be using the targets in conjunction with a reference target catalog you might want to set the new targets on a different layer. In this case they will have a different color and will be easily identified.

On the *Survey File Location* page shown in Figure 4-12, you are asked to either create a new survey grid or route file or load a previously created survey route or grid. The **Create a new survey grid or route file** selection is the default. It will generate a default survey grid and put it in the default file location shown. You can edit this if needed, but it is suggested that you use the default. If you already have a survey route or grid for the survey area, the **Load an existing survey grid or route file** selection gives you the opportunity to browse to the file and have it loaded on startup.

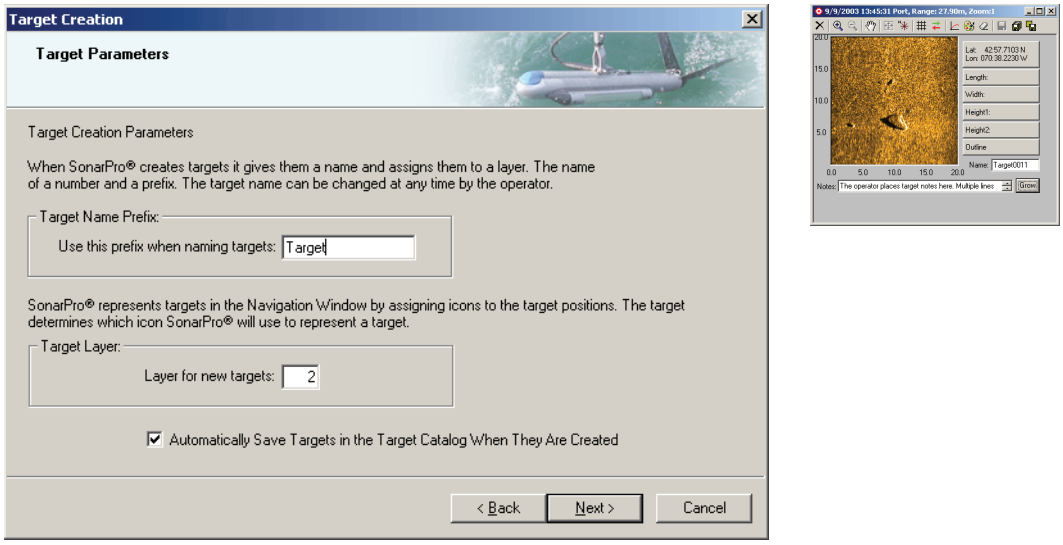


Figure 4-11: *The Survey Wizard—Target Creation Page*

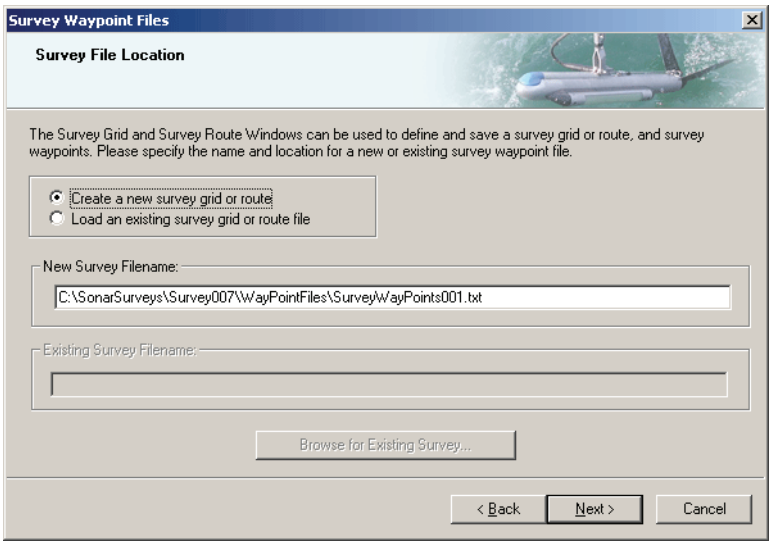


Figure 4-12: *The Survey Wizard—Survey File Location Page*

On the *Session State Files* page shown in Figure 4-13, you can change the name of the default Session State file. This is a file that stores all of SonarPro's parameters, such as the number of open windows and their locations, file prefixes, and so on. It is suggested that the default settings be used.

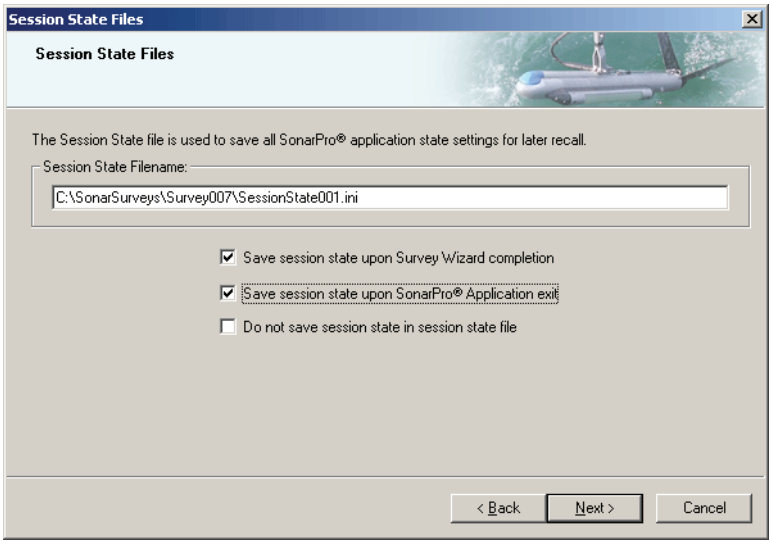


Figure 4-13: *The Survey Wizard—Session State Files Page*

On the *Depth Sensor Scale* page shown in Figure 4-14, you can specify a pressure range for your pressure sensor. At the present time the Series 5000 towfish uses a 300 psi sensor, which is selected by default. This should not be changed unless there is a custom sensor installed in the towfish. It is important that this setting be correct, since it affects the depth reading. The Series 3000 towfish currently has a default sensor of 1500 psi, and a optional 300 psi sensor. Select the appropriate one. If the incorrect sensor is selected here, the operator can change the setting within SonarPro once the program is launched and running by opening the Sensor window and then doing a right-click, which will open the *Sensor* dialog box.

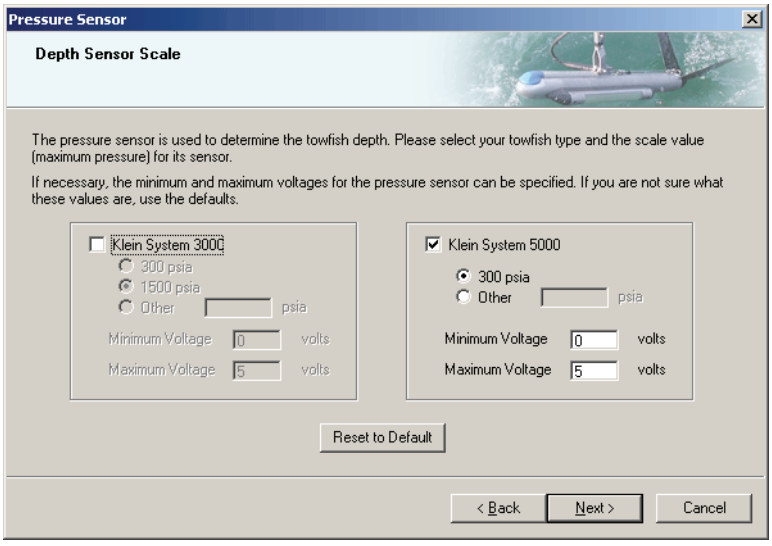


Figure 4-14: *The Survey Wizard—Depth Sensor Scale Page*

4.7 Series 5000 Sonar System Towfish Setup

Towfish Setup

Click this button on the Real-Time tool bar to configure the towfish setup parameters. The *Sonar Interface* dialog box will open to the *System 5000 Control* tab as shown in Figure 4-15.

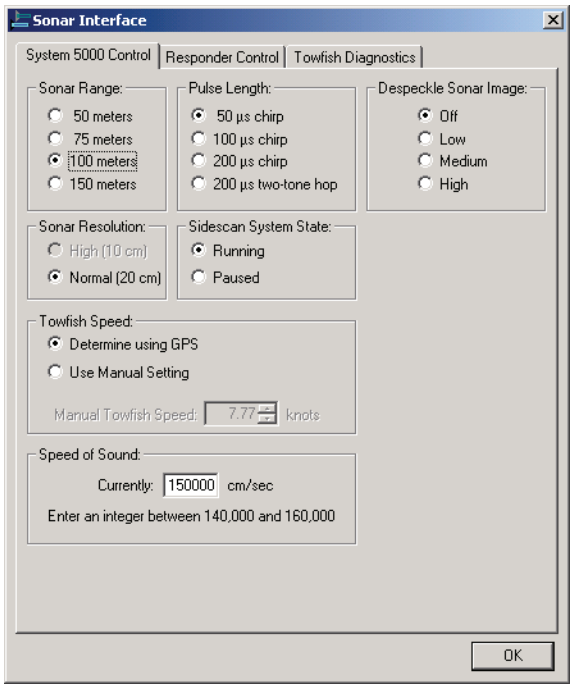


Figure 4-15: *The Sonar Interface Dialog Box, Series 5000 Sonar System—System 5000 Control Tab*

NOTE *Much of the information provided in this section applies to both the Series 3000 and Series 5000 Sonar Systems. However, for users of a Series 3000, refer also to "Series 3000 Sonar System Towfish Setup" on page 4-80.*

The *System 5000 Control* tab is the main control interface for the Series 5000 Sonar System. It is used to configure following towfish setup parameters:

Sonar Range. The distance you want the sound to travel away from the towfish.

Pulse Length. Gives you a few default waveform settings for the output sound waveforms. The optimum setting for the Series 5000 is **100 µsec chirp**.

Despeckle Sonar Image. Filter settings to smooth sonar images. For the highest resolution, select **Off**.

Sonar Resolution. Select **Normal (20 cm)** or **High (10 cm)** for the 50 and 75-meter ranges.

Sidescan System State. Select **Running** or **Paused**. These options function the same as the **Play** and **Stop** buttons on the Sonar Viewer window tool bar.

Towfish Speed. Accurate speed input is necessary for the sonar system to work properly. The Series 5000 should always be used with a speed input device such as a GPS receiver. A manual setting is available should a failure occur.

Speed of Sound. The speed of sound in water. This setting may be adjusted for special conditions.

The *Responder Control* tab shown in Figure 4-16 is used when the towfish is equipped with an optional responder. Set the responder ping rate and the responder frequency here.

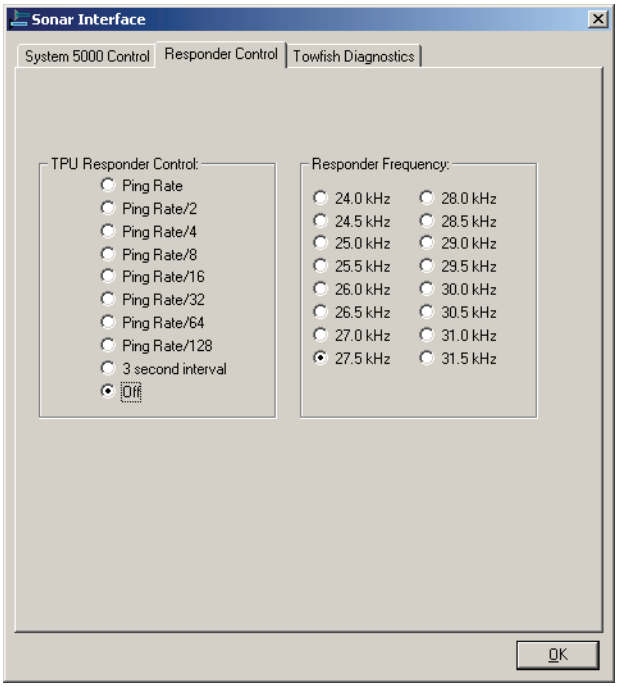


Figure 4-16: *The Sonar Interface Dialog Box, Series 5000 Sonar System—Responder Control Tab*

The *Towfish Diagnostics* tab shown in Figure 4-17 is used for testing the system. The **Operator Command** area of the dialog box allows you to send specialized commands to the towfish. Refer to APPENDIX C: "General Setup, Configuration and Troubleshooting," for more information on using this dialog box.

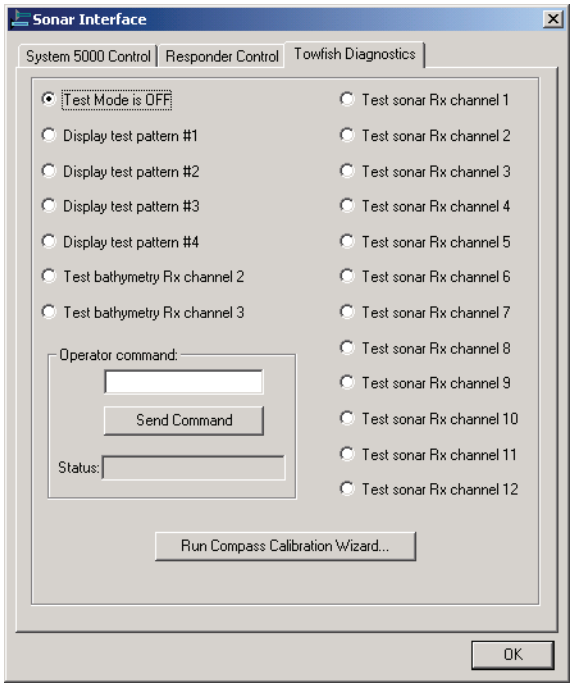


Figure 4-17: *The Sonar Interface Dialog Box, Series 5000 Sonar System—Towfish Diagnostics Tab*

Click **Run Compass Calibration Wizard** to open the *Compass Calibration Wizard* dialog box which is shown in Figure 4-18. This provides a fairly quick and accurate method for calibrating the towfish compass.

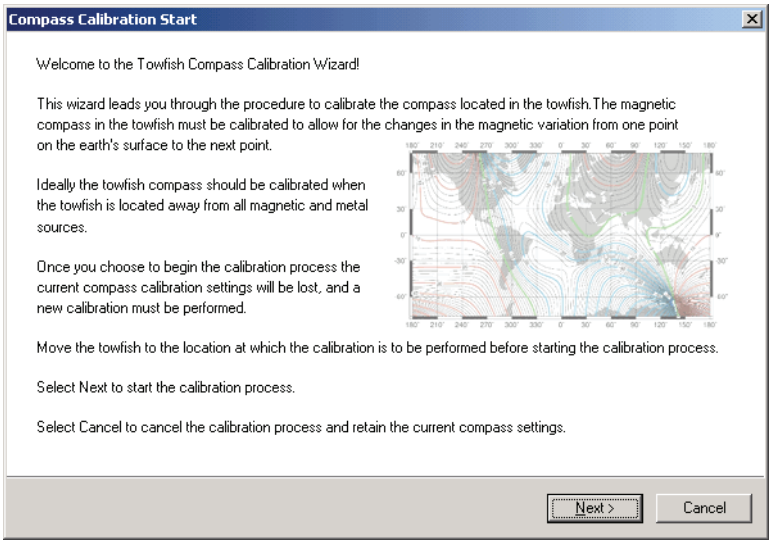


Figure 4-18: *The Compass Calibration Wizard*

Follow the directions in the wizard and play the animation to gain an understanding for the procedure. The animation is shown in Figure 4-19. Once started, the Compass Calibration Wizard must be completed. There will be a slight time delay between pages within the wizard, as commands are sent to the towfish.

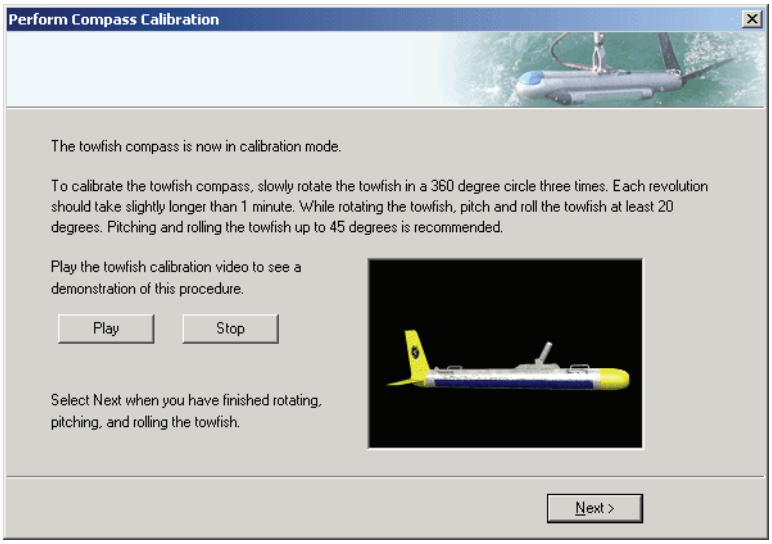


Figure 4-19: *The Compass Calibration Wizard Animation*

4.8 Monitoring and Setting the Information Alarms

4.8.1 Altitude Alarm

The **Towfish Altitude** display is located on the far right side of the Information Window as shown in Figure 4-20. Here you can monitor the current distance above the bottom that the towfish is flying.

Figure 4-20: *The Information Window*

To set a minimum towfish altitude alarm, left click the **Towfish Altitude** Display area. The *Towfish Altitude Display* dialog box shown in Figure 4-21 will open. Set the altitude threshold by entering a value in the **Altitude Threshold** text box and enable the alarm (beep).

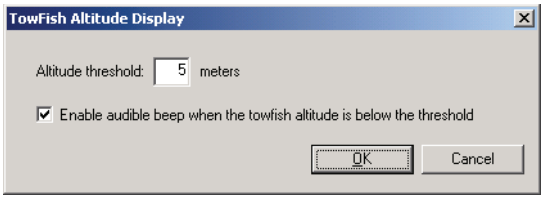


Figure 4-21: *The Towfish Altitude Display Dialog Box*

When the towfish drops below the set threshold figure, the alarm will beep and the **Towfish Altitude** display will change from a green background to a red background.

4.8.2 Roll Alarm

The towfish roll has a roll threshold that can be set. Click in the **Roll** display and the *Towfish Roll* dialog box shown in Figure 4-22 will open. You can set the roll threshold and turn an audible beep on when the threshold is exceeded. When this happens the roll status window will turn red. If you are viewing the roll data in the Sensor window, the roll graph will also change from yellow to red.

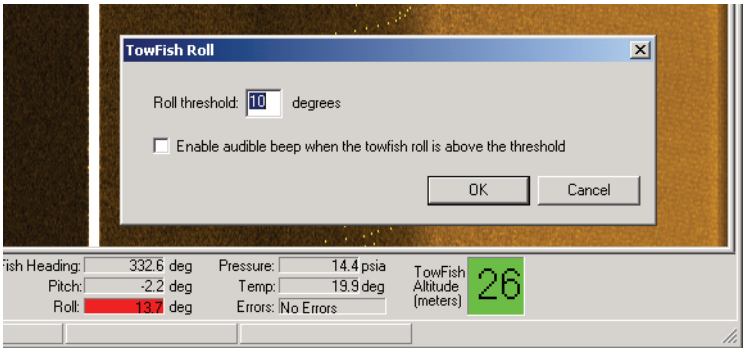


Figure 4-22: *Towfish Roll Dialog Box*

4.8.3 Error Field

The **Error** display in the Information window will turn red if an error from the TPU is detected. An occasional error is acceptable. However, if errors become excessive, there may be a problem developing.

4.8.4 Lag

On the right side of the Main tool bar is the **Lag** display as shown in Figure 4-23. Here you monitor the performance of SonarPro, and it provides a level of confidence that no sonar data are being lost. If at any time SonarPro is overloaded, such as having too many tasks to perform, the status box will begin to increment. When the incrementing number reaches the set threshold, the background will turn red. In general, the count can increment to a number above 200 before you begin to near the data loss point. If the count begins to increase and does not decrement back to zero, by closing a window or two the count should go back to zero.

Figure 4-23: *The Main Tool Bar*

Left-click in the **Lag** display to open the *Ping Lag* dialog box shown in Figure 4-24. Here you can set a ping lag threshold and a time interval for SonarPro to check the ping status. An audible beep may also be enabled.

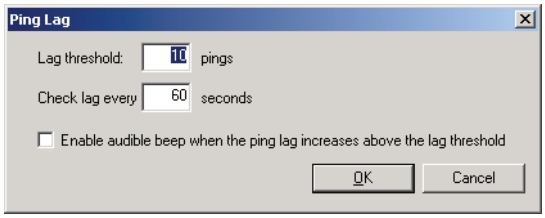


Figure 4-24: *The Ping Lag Dialog Box*

NOTE *For troubleshooting purposes a Check Lag of 5 seconds is recommended; for slower computers you may have to use 15 to 20 seconds.*

4.9 Recording Sonar Data

Data Recorder

Click this button to record data. The *Sonar Data Recorder* dialog box will open as shown in Figure 4-25.

The *Sonar Data Recorder* dialog box allows you to specify the recorder parameters for saving the survey data. When operating SonarPro with the Series 5000, only the **Record to SDF disk file** area will be active. When operating SonarPro with the Series 3000, both the **Record to SDF disk file** and **Record to XTF disk file** areas will be active. You can record in either or both file formats at the same time. SonarPro will only play back XTF data that have been recorded by SonarPro.

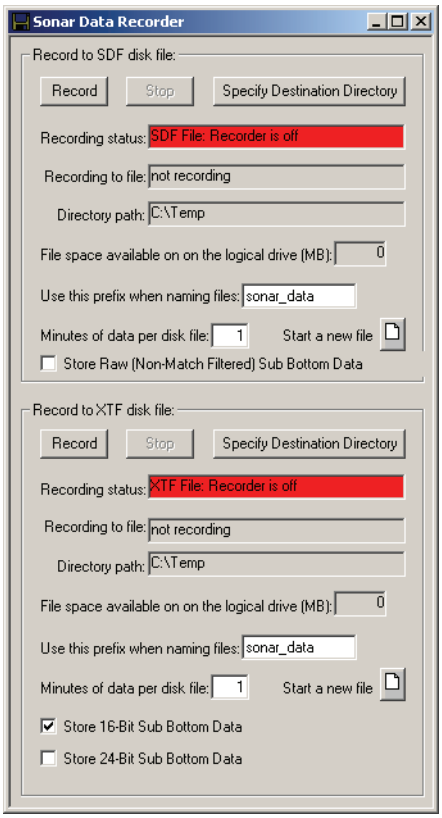


Figure 4-25: *The Sonar Data Recorder Dialog Box*

Use the **Record to SDF disk file** and **Record to XTF disk file** areas to specify where the data are to be saved. Click **Specify Destination Directory** to open the *Save* dialog box. Set the data file location as you would normally. We suggest using a disc letter that is different from the one used for the operating system disc. Next inspect the **Use this prefix when naming files** text box. This sets a default prefix for the data file naming scheme. This information is set up when you use the Survey Wizard. Then inspect the **Minutes of data per disk file** text box. Click to change the size of the default data file based on the time the file records.

If the optional chirp sub bottom profiling system is installed and you want to record raw, non-matched filtered sub bottom profile data, select the **Store Raw (Non-Match Filtered) Sub Bottom Data** check box. With this check box selected, raw sub bottom profile data are recorded. These data can only be played back in SonarPro, as it will perform the required match-filter processing on the data before displaying the data. Generally you should leave this check box cleared. Leaving it cleared will store processed sub bottom profile data which can be read and properly displayed by other programs as well as SonarPro.

Select the **Store 16-Bit Sub Bottom Data** check box to store only the 16 most significant bits of each 24-bit sample of sub bottom profile data. The 8 least significant bits are discarded. Similarly, select the **Store 24-Bit Sub Bottom Data** check box to store all 24 bits of each sample of data. Select both these check boxes to separately store 16-bit and 24-bit records. Most users will require 16-bit records as most XTF readers handle only 16 bits. Clearing both check boxes will cause the sub bottom profile data to not be stored.

To start recording sonar data, click **Record**.

After the recording parameters are set up, close the *Sonar Data Recorder* dialog box. You can start or stop the recording by clicking the **SDF File Recording Status** or **XTF File Recording Status** displays on the Main tool bar as shown in Figure 4-26.

Figure 4-26: *The SDF File and XTF File Recording Status Displays on the Main Tool Bar*

When recording is on, the background is green.

When recording is off, the background is red.

4.9.1 Editing Pre-Recorded Data

Sonar data can be edited and new data file sets can be created.

- Specify a new location for the new data set.
- Open a data file and click **Record**.
- Start the data playing. Simply click **Stop** and **Record** at the appropriate times for editing.

4.9.2 Selecting a New File

Located on the Main tool bar, as well as in the *Sonar Data Recorder* dialog box, is the **New Data File** button.

New Data File

Click this button to force the start of a new data file. For example, if you want to have a survey line all in one file, when setting up a survey you would set the file length to be longer than the time it will take to gather the data (but not more than 6000 minutes) on the survey line. When you reach the end of the line and are ready to start a new line, click the New Data File button to force a new file to begin.

4.10 Operating in Playback

Hard Disk

Click this button to open the Sonar Viewer window and operate SonarPro in playback. The data could be on a hard drive or CD on the local computer or on a mass storage device that is on a network. Many of the features in SonarPro are available when operating in either real time or in playback. When operating in playback, the Sonar Viewer window includes the Playback tool bar as shown in Figure 4-27.

To operate SonarPro in real time, refer to “Operating in Real Time” on page 4-6.

Figure 4-27: *The Playback Tool Bar*

To display sonar data you must select the data file you want to view.

Open File

Click this button to open the *Open* dialog box where you can browse for the files of your choice.

Search

Click this button to open the *Go To Time* dialog box shown in Figure 4-28. You can use this dialog box to locate data.

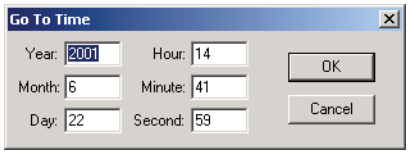
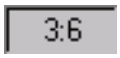


Figure 4-28: *The Go To Time Dialog Box*



File Counter

This display is located on the left side of the Playback tool bar. It displays two sets of numbers. The first number indicates the file number you are viewing in the data set. The second number indicates the total number of files in the data set. The data set is usually the total number of files in a folder.

After selecting the data file, use the following set of buttons to control the data being presented.

Back

Click this button to move back one file in the file sequence.

Ruler

Click this button to show or hide the ruler in the Sonar Viewer window. The ruler is displayed in cyan below the tool bar and has two scales. The top scale is a fixed reference based on the range setting and is either in meters or in time, depending on whether the **Distance** or **Time** option is selected on the *Plan View Configuration* tab of the *Sub Bottom Profiler Viewer Properties* dialog box as described below. The lower scale is variable. By adjusting the sliders on the top scale, you can zoom in or out of any swath segment of the displayed sonar data, both port and starboard simultaneously. Effectively, the right slider for the port channel selects the distance or time from the start of each scan to where or when the display of data starts. The left slider for the port channel selects the distance or time in each scan over which data are displayed. The reverse is true for the starboard channel. When adjusting the sliders, the scaling of the lower scale adjusts automatically, and double clicking any slider returns the lower scale to the range setting.

Stop

Click this button to stop playback.

Play

Click this button to start playback.

Forward

Click this button to move forward one file in the file sequence.

Display

Click this button to open the *Sonar Viewer Properties* dialog box to the *Plan View Configuration* tab as shown in Figure 4-29. You can set the properties of the Sonar Viewer window here. You can select both sonar channels (port and starboard) or display only one channel of data.

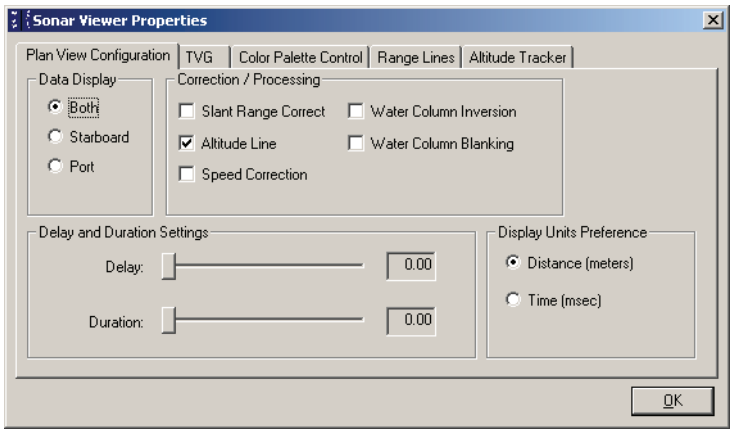


Figure 4-29: *The Sonar Viewer Properties Dialog Box—Plan View Configuration Tab*

On the *Plan View Configuration* tab you can make the following selections:

- Select the **Slant Range Correct** check box to display slant range corrected data.
- Select the **Water Column Inversion** check box to change the water column from black to white.
- Select the **Water Column Blanking** check box to blank the surface noise in the water column.
- Select the **Altitude Line** check box to display the yellow altitude line.
- Select the **Speed Correction** check box to turn on speed correction. For the Series 3000 only, there is an 8-ping delay when selecting this check box.
- Select the **Distance** option to scale the ruler in meters; select the **Time** option to scale the ruler in milliseconds.

- Adjust the **Delay** and **Duration** settings to zoom in or out of any swath segment of the displayed sonar data. The **Delay** adjustment postpones the display of data in distance or time from the start of each scan, depending on whether the **Distance** or **Time** option is selected. Effectively it selects where or when in each scan the display of data starts. The **Duration** adjustment selects the distance or time in each scan over which data are displayed. Effectively it selects where or when in each scan the display of data ends. The ruler scale and its units are automatically adjusted accordingly.

TVG

Click this button to open the *Sonar Viewer Properties* Dialog box to the *TVG* tab as shown in Figure 4-30. You can adjust the overall TVG intensity of the displayed sonar data using the **Automatic TVG** slider. Clear the **Auto TVG On** check box to have manual control over each channel. By adjusting the sliders you can control the initial, end and overall intensity of the displayed sonar data.

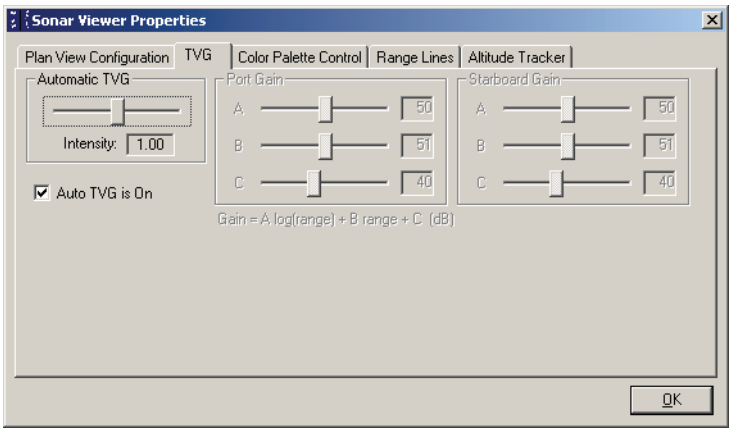


Figure 4-30: *The Sonar Viewer Properties Dialog Box—TVG Tab*

Palette

Click this button to open the *Sonar Viewer Properties* dialog box to the *Color Palette Control* tab as shown in Figure 4-31. You can adjust the color of the data being displayed. Select **Inverse Video** to display shadows as light and the contacts as dark. To return to the default color palette after making any adjustments, click **Use Default Palette**.

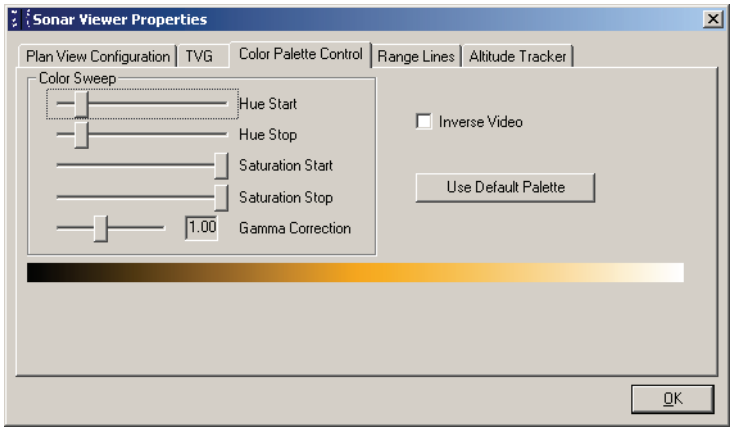


Figure 4-31: *The Sonar Viewer Properties Dialog Box—Color Palette Control Tab*

The *Range Lines* tab is shown in Figure 4-32. To open this tab right-click anywhere in the Sonar Viewer window to open the *Sonar Viewer Properties* dialog box, and then click the tab. On this tab you can turn the range lines on or off in the Sonar Viewer window. The distance between the range lines and the color of the lines can also be set here. Click **Specify Range Line Color** to open a color selection box. Range lines are disabled when slant range is selected.

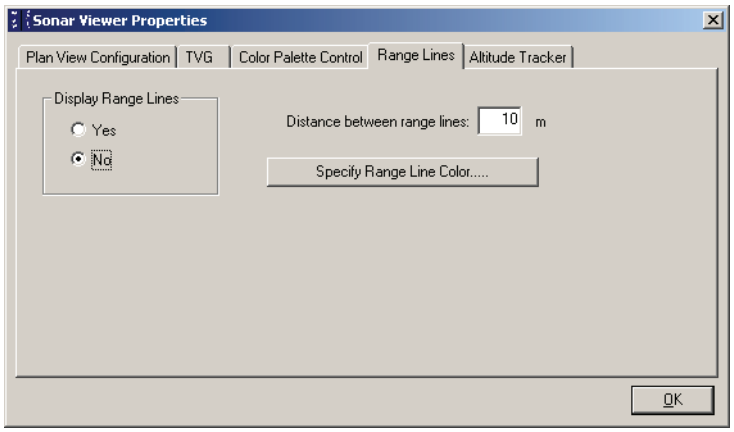


Figure 4-32: *The Sonar Viewer Properties Dialog Box—Range Lines Tab*

The *Altitude Tracker* tab is shown in Figure 4-33. To open this tab right-click anywhere in the Sonar Viewer window to open the *Sonar Viewer Properties* dialog box, and then click the tab. On this tab you can override the auto tracker setting in an attempt to track the bottom in adverse operating conditions. The altitude determines the start of TVG when auto TVG is on which affects the display of the sonar data. The altitude has no effect on the TVG or the display when the TVG is set manually.

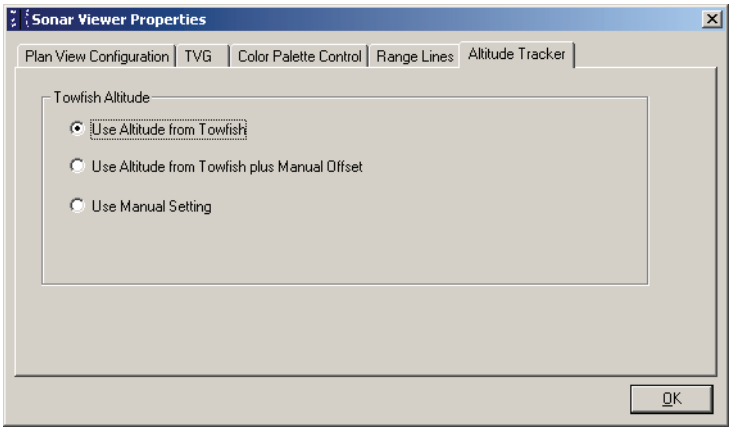


Figure 4-33: *The Sub Bottom Profiler Viewer Properties Dialog Box—Altitude Tracker Tab*

Select **Use Altitude from Towfish** to run with auto tracking on. This is the default setting when starting SonarPro and should be used almost all of the time. However, if conditions warrant, select **Use Manual Setting** to enable manual altitude tracking or select **Use Altitude from Towfish plus Manual Offset** to enable the sum of both auto and manual tracking. Once either of these two options is selected, the **Manual Towfish Altitude Offset** scroll box becomes available where you can enter an estimated altitude.

The altitude tracking lines in the Sonar Viewer window will change to the color cyan; the **Towfish Altitude** display in the Information Window will also change to cyan; and a display with a cyan background will appear in the Sonar Viewer window tool bar indicating either "Manual Altitude" followed by the altitude for the **Use Manual Setting** option or "Offset Altitude" followed by the altitude for the **Use Altitude from Towfish plus Manual Offset** option:

An example of the Sonar Viewer window with the manual altitude tracking enabled is shown in Figure 4-34.

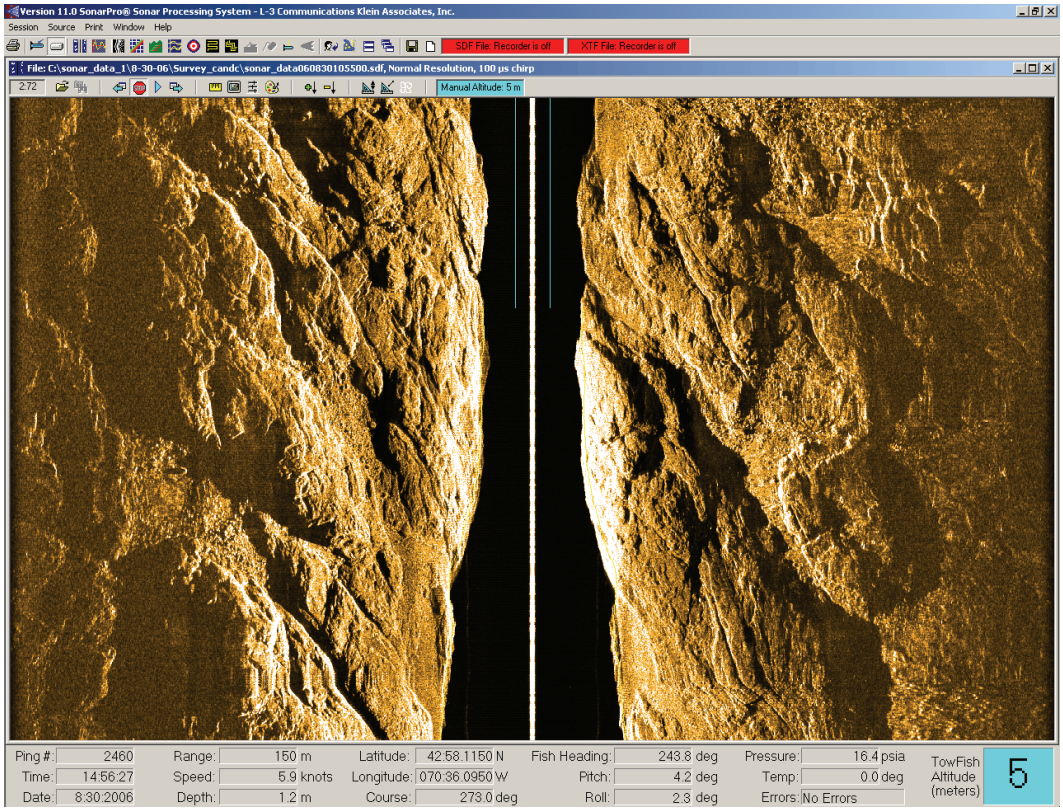


Figure 4-34: *Sonar Viewer Window with Manual Altitude Tracking Enabled*

Speed Up

Click this button to speed up the playback rate.

Slow Down

Click this button to slow down the playback rate.

Outline

Click this button to stop the display and use your mouse to outline a target of interest when playing back sonar data. The outline also appears in the Navigation window. Cursor information will be displayed on the bottom of the Main window in the Status bar as shown in Figure 4-35. By placing the cursor in the sonar display and holding the left mouse button down, the sonar range, latitude, and longitude will also be displayed in the Status Bar.

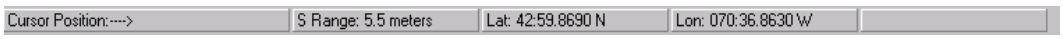


Figure 4-35: *The Status Bar*

Height

Click this button to measure height. The result is displayed in the Status bar.

Length

Click this button to measure length. The result is displayed in the Status bar.

A-Scan

Click this button to open the A-Scan window which is shown in Figure 4-36. You can also open this window by choosing *Sonar Scan* from the *Window* menu. The A-Scan window is above the Sonar Viewer window. This window displays the signal intensities of the data similar to how they would be seen on an oscilloscope.

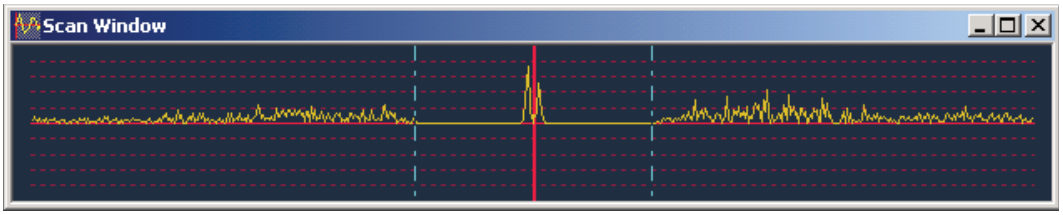


Figure 4-36: *The A-Scan Window*

Right-clicking in the A-Scan window opens the *A-Scan Display Configuration* dialog box shown in Figure 4-37.

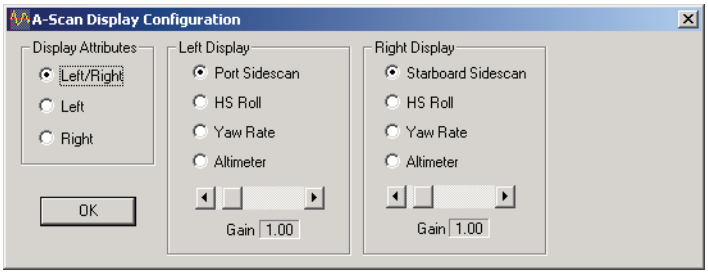


Figure 4-37: *The A-Scan Display Configuration Dialog Box*

In the **Display Attributes** area you can select the data you want to display across the display area. Select **Left/Right** to display both left and right channel data; select **Left** to display only left channel data; or select **Right** to display only right channel data. In the **Left Display** area, and when **Left/Right** or **Left** is selected, you can select the port side scan sonar data, the optional HS roll sensor data, the optional yaw rate sensor data, or the altimeter data to display. The gain of the signal being displayed can also be adjusted using the **Gain** slider. Similarly, in the **Right Display** area, and when **Left/Right** or **Right** is selected, you can make the same selections and adjustments.

4.11 Opening Additional Sonar Viewer Windows

New Viewer

Click this button on the Main tool bar to open additional Sonar Viewer windows. It can be used to display sonar data differently in separate windows. For example, the data can be slant range corrected or displayed with a different color palette.

4.12 Session Menu

The *Session* menu allows you to set up individual work spaces with individual operator preferences and to open and save cable out and depth output devices that have been set up in the *Cable Out* and *Depth Output* dialog boxes. (See “Choosing or Setting up an External Cable Out Source” on page 4-60 and “Towfish Depth” on page 4-62.) You can also exit from SonarPro from the *Session* menu. The following items are on the *Session* menu:

- Choose *New State* when you want to set SonarPro to its default settings.
- Choose *Open State File* to open a previously saved session. A search box will open. Look for yourfile.ini. This will read the session file and restore SonarPro to the state it was in when the session file was created. If you want to have SonarPro in a state with resized window sizes, you must click on and under the general tab set window sizes to manual.
- Choose *Save State, to Registry* to save the current session state to the Windows registry. The next time SonarPro is started, it will open in this state.
- Choose *Save State, to File* to save a separate work space session. For example, each operator may prefer to have the windows in SonarPro sized differently. This can be saved in a yourfile.ini file.
- Choose *Open Devices File* to open a previously saved cable out or depth output device file.
- Choose *Save Devices, to File* to save the current cable out or depth output device settings to a file.
- Choose *Exit* to exit from SonarPro. You can also exit from SonarPro by clicking the X button in the Main window. Then SonarPro is closed down this way, the current session is saved. The next time you start SonarPro, it will be set up the way you exited.

4.13 Navigation Window

Navigation

Click this button to plot the track of the boat and the sonar data collection coverage. The Navigation window will open as shown in Figure 4-38.

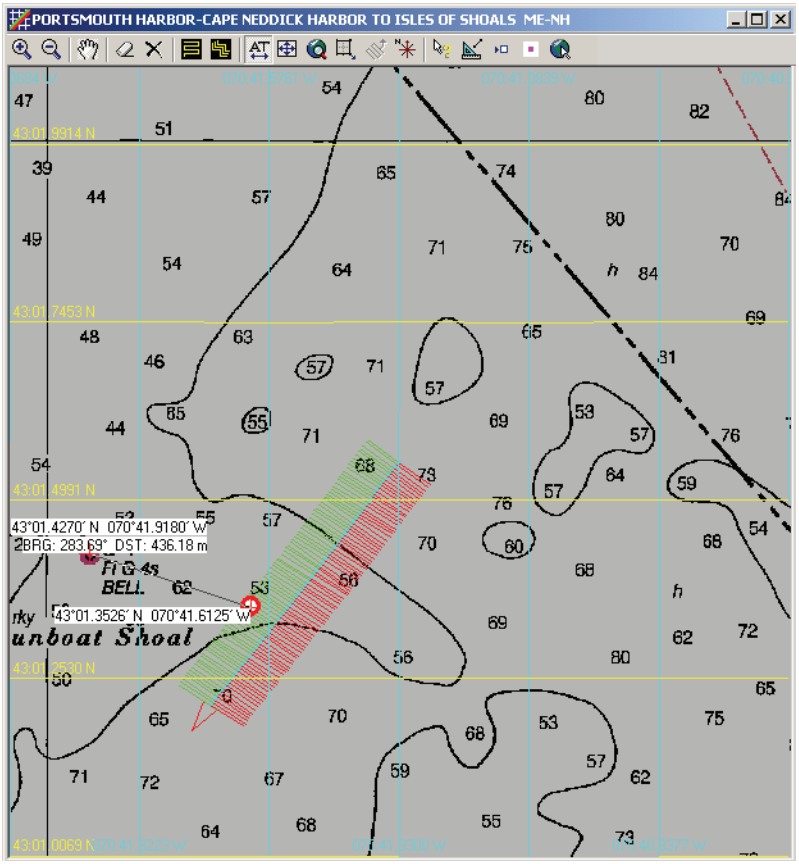


Figure 4-38: *The Navigation Window*

The Navigation window also displays the location of the targets that are selected or outlined. This window has the option of displaying the data collection track over a chart of the area. SonarPro is compatible with the MAPTECH digital charts (www.maptech.com)*.bsb file format, and C-MAP Global Electronic Chart Service (http://www.c-map.no). If you are using a demo CD, there is a folder on the CD labeled MAPTECH, which has charting information for the sample data.

4.13.1 Setting up the Navigation Window Properties

Right-click in the Navigation Window to open the *Navigation Properties* dialog box to the *General* tab as shown in Figure 4-39.

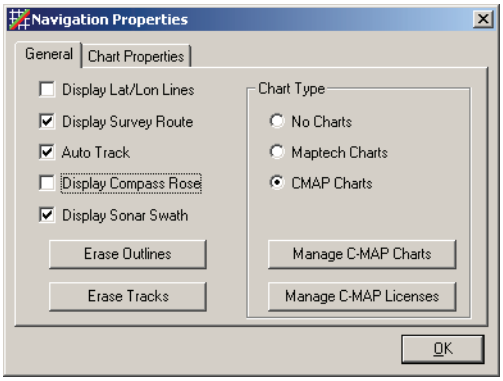


Figure 4-39: *The Navigation Properties Dialog Box—General Tab*

On the *General* tab you can make the following selections:

- Select **Display Lat/Lon Lines** to display the latitude and longitude lines.
- Select **Display Survey Route** to display the survey route.
- Select **Auto Track** to have the Navigation window re-center on the sonar coverage track automatically when it goes off the edge of the window. You can also use the **Drag Tool** button at the top of the window to re-center it manually.
- Select **Display Compass Rose** to place a compass rose icon in the upper right corner of the Navigation window for orientation. The compass rose is used with the C-MAP charts.

- Select **Display Sonar Swath** to display sonar swath lines. When not selected, the survey route is displayed as a dotted line.
- Click **Erase Outlines** to erase any outlined targets.
- Click **Erase Tracks** to erase the sonar collection track.
- Select **No Charts** to not display a chart.
- Select **Maptech Charts** to display Maptech charts.
- Select **CMAP Charts** to display C-MAP charts. When this option is selected, the **Manage C-MAP Charts** and **Manage C-MAP Licenses** buttons become available.

4.13.2 Using the Navigation Window Tool Bar

The Navigation window tool bar is shown in Figure 4-40.

Figure 4-40: *The Navigation Window Tool Bar*

Zoom In

Click this button to zoom in on the Navigation window.

Zoom Out

Click this button to zoom out of the Navigation window.

Drag Tool

Click this button to pan the chart in any direction. It makes for easy browsing of the chart in the Navigation window. The button is on by default.

Erase Outlines

Click this button to erase the outlines that have been drawn around targets.

Erase Tracks

Click this button to erase the data collection track.

Survey Grid

Click this button to open the *Survey Grid* dialog box which allows you to set up a survey grid as described in “Setting up a Survey Grid” on page 4-53.

Survey Route

Click this button to open the *Survey Route* dialog box which allows you to set up a survey route as described in “Setting up a Survey Route” on page 4-55.

Auto Track

Click this button to automatically center the data collection track in the Navigation window when the track reaches the edge of the window.

Center

Click this button to center the data collection track in the Navigation window.

Mag All

Click this button to quickly zoom out to display all of the data collection tracks, targets and the survey route.

Zoom Window

Click this button to select an area in the Navigation window to zoom in on.

Align Survey Route

This button is only active with the C-MAP charts or no charts. Click the button once to rotate the view so the survey grid is oriented up and down. The current ship heading, if following the survey grid, will be up. This is a good function for use by the person steering the boat on a survey grid. Click the button a second time to rotate the chart 180 degrees. Right-click in the Navigation window to open the *Navigation Properties* dialog box to the *General* tab and select the **Display Survey Route** and **Display Compass Rose** check boxes to display the survey grid and the compass rose for orientation.

Align North

This button is only active with the C-MAP charts or no charts. Click the button to align north up.

Location

Click this button to move the cursor over to a location of interest in the Navigation window. The location of the cursor will be displayed in the Status bar in the Main window.

Distance

Click this button to locate the bearing and distance to a previous target. Click the button, move the cursor to a start point, hold the left mouse button down and drag to the target or end location. The position, bearing and distance information will be displayed as shown in the example in Figure 4-41.

ID Target

Click this button to identify the targets that you have selected or marked in the Navigation window. Click the button, place the cursor over the target and hold the mouse button down to view the target. Releasing the mouse button will erase the target image. The data image of the target will appear in the Navigation Window.

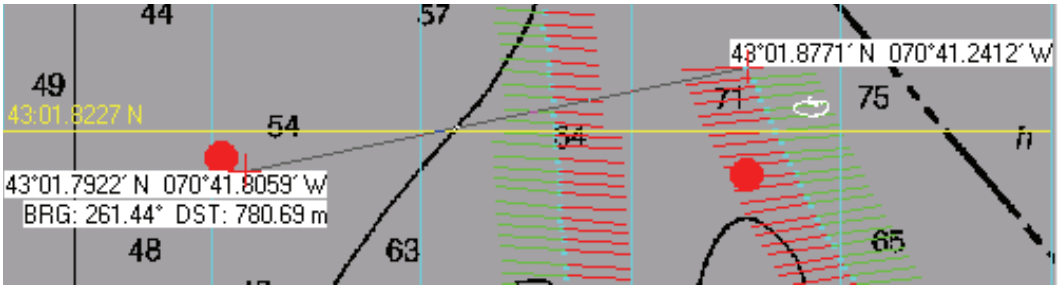


Figure 4-41: *Position, Bearing and Distance Display Example in the Navigation Window*

Zoom Target

Click this button to zoom in close to a target that has been logged. Click the button and then a target along the data collection track. The Navigation window will zoom in on the selected target.

Move Location

Click this button to open a window that allows you to enter a location.

4.13.3 Managing C-MAP Charts

Click **Manage C-MAP Charts** on the *General* tab of the *Navigation Properties* dialog box. The *C-Map Management* dialog box shown in Figure 4-42 opens to the *Display Options* tab.

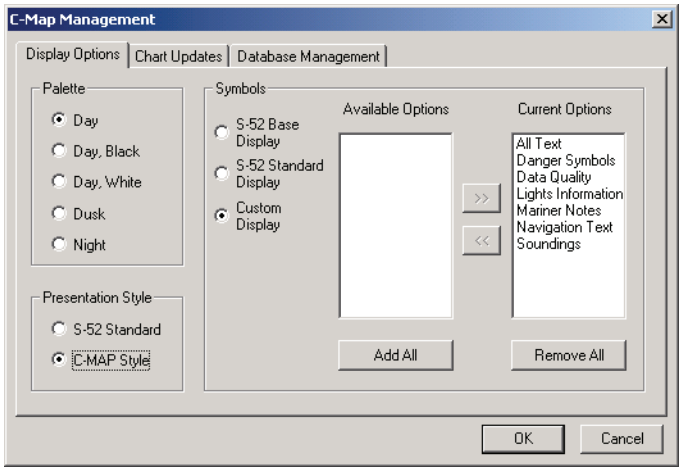


Figure 4-42: *The C-MAP Management Dialog Box—Display Options Tab*

This dialog box allows you to choose from five different palettes and two presentation styles for map and symbols displayed on the C-MAP charts. The symbols can be customized by selecting **Custom Display** and moving items from the **Available Options** list into the **Current Options** list.

Changing the presentation style can take several seconds before the image is updated. S-52 is an international standard for navigation. S-52 Base and S-52 Standard Display are defined in the S-52 Standard.

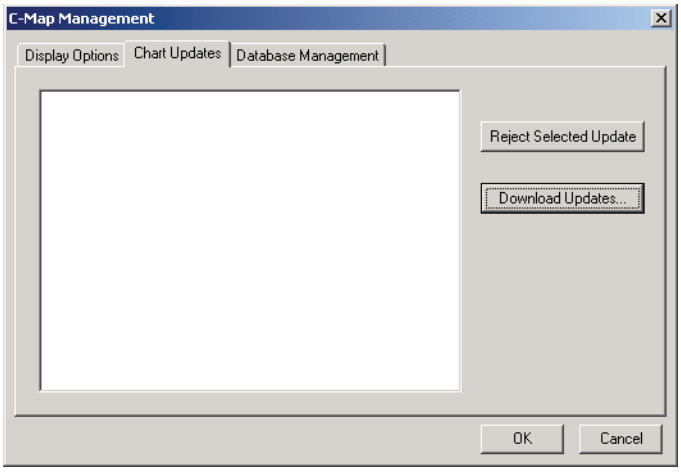


Figure 4-43: *The C-MAP Management Dialog Box—Chart Updates Tab*

The *Chart Updates* tab shown in Figure 4-43 allows you to download and update your chart profile directly from C-MAP. C-MAP issues updates to charts on a regular basis and makes them available though their Web site. An internet connection is required.

To update a chart profile, select the profile of interest, and then click **Reject Selected Update**. To get the latest updates, click **Download Updates**. The *Download C-MAP Chart Updates* dialog box shown in Figure 4-44 opens. Downloads can be quite large, so you can check the size of the data file by clicking **Check Download Size**. When satisfied click **Download All Updates**.

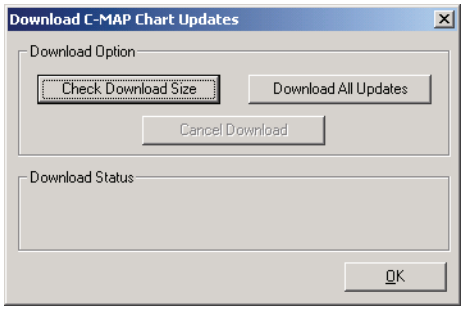


Figure 4-44: *The Download C-MAP Chart Updates Dialog Box*

You can cancel the download at any time by clicking **Cancel Download**.

The *Database Management* tab shown in Figure 4-45 allows you to manage multiple C-MAP databases. (Normally, SonarPro will come with the database already loaded and registered, and there will be only one database.) You can use this tab to load your C-MAP database from the distribution CD. We recommend that you copy the database to your hard drive. Put the CD in the drive, click **Copy Database to HD** and follow the instructions. Then register the database and set it as the default. To delete a database from the hard drive, click **Unregistered Database**. Disregard the **Check Signature** buttons.

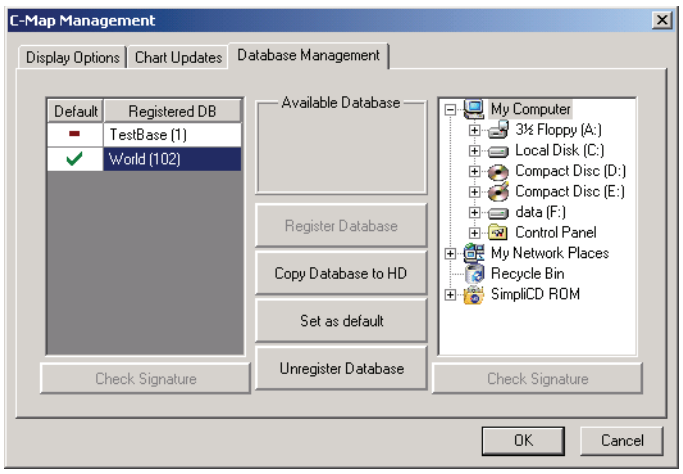


Figure 4-45: *The C-MAP Management Dialog Box—Database Management Tab*

4.13.4 Managing C-MAP Licenses

Click the **Manage C-MAP Licenses** button on the *General* tab of the *Navigation Properties* dialog box. The *C-MAP License Registration* Dialog Box shown in Figure 4-46 opens. This dialog box allows you to manage C-MAP licenses. For more information read the SENC Distribution End User Info PDF file located in the manual folder under your SonarPro folder and the SonarPro installation section.

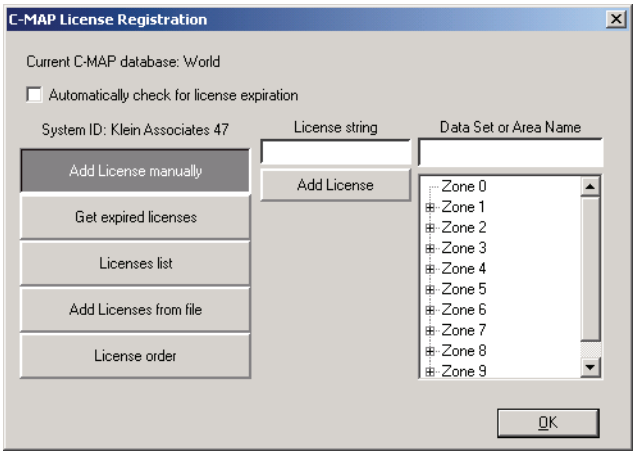


Figure 4-46: *The C-MAP License Registration Dialog Box—Add License Manually*

If you have the C-MAP charts loaded on a PC unlicensed, SonarPro will display the charts, but they will be displayed at a low resolution. If you are seeing this happen we suggest checking your license validation.

To add a license manually, select the region on the right, enter the license number obtained from C-MAP, and then click **Add License manually**.

To get an expired license, enter the date in the **Expiry Date** text box, and then click **Get expired licenses**. You can enter the current date or a date in the future. Or click the **Automatically check for license expiration** check box.

Click the **Licenses list** button to list all the current licenses, the expiration date, the zone, and the license string.

Click the **Add Licenses from file** to browse for the file. To add the license click **OK**.

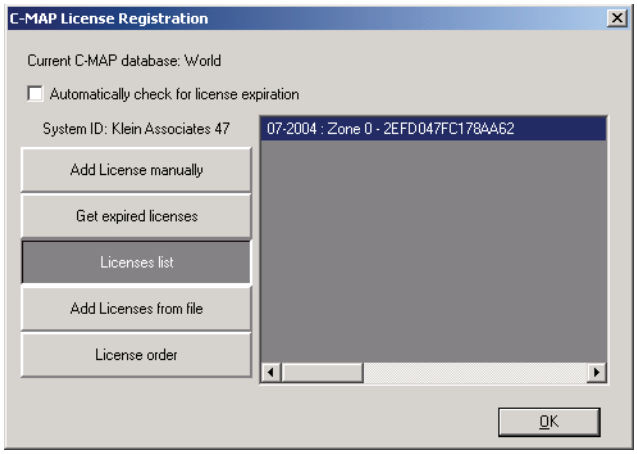


Figure 4-47: *The C-MAP License Registration Dialog Box—License List*

4.13.5 Managing Maptech Charts

When the **Maptech charts** option is selected on the *General* tab of the *Navigation Properties* dialog box, SonarPro will search for the proper chart. If it cannot be located, a Windows file search dialog will open. Browse for the chart folder. SonarPro will then extract the proper chart. The chart of the area that the sonar is working in will then be displayed in the Navigation window as long as the zoom is set at a reasonable level. If the zoom level is too far out, the chart will not display. Check that the **Auto Track** check box is selected.

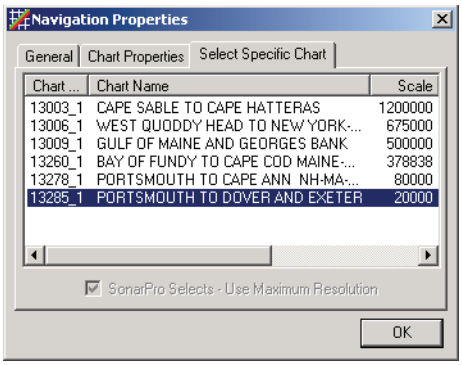


Figure 4-48: *The Navigation Properties Dialog Box—Select Specific Chart Tab*

The *Specific Chart* tab is available in the *Navigation Properties* dialog box with Maptech charts as shown in Figure 4-48. Here you can select a different chart if you do not like the chart coverage that was selected by default; for example, you can use a more detailed chart. The charts may be sorted by chart number, chart name or scale. Click the appropriate button above the charts.

4.13.6 Configuring the Chart Properties

The *Chart Properties* tab of the *Navigation Properties* dialog box is shown in Figure 4-49. This tab allows you to vary the chart's background intensity by using the **Palette Intensity** slider.

The **Use Original Palette Intensity** button resets the intensity of the background chart to the default setting.

The **Specify Chart Folder** button allows you to select the location of the charts.

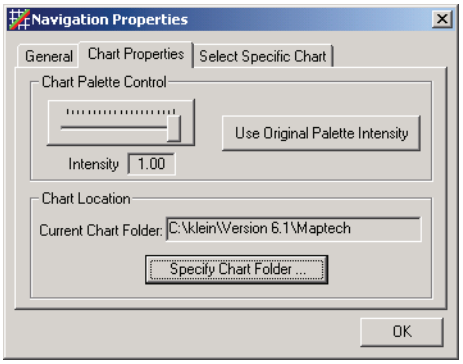


Figure 4-49: *The Navigation Properties Dialog Box—Chart Properties Tab*

4.13.7 Displaying Outlines

Outline

By selecting this button in the Sonar Viewer window and outlining an area, the area outlined will be marked both in the Sonar Viewer Window and in the Navigation window as shown in Figure 4-50.
Right-click in the Navigation window, select the *Chart Properties* tab in the *Navigation Properties* dialog box, and lower the **Chart Palette Control** to see the outline. To erase outlines, right-click in the Navigation window, select the *General* tab and click **Erase Outlines**.

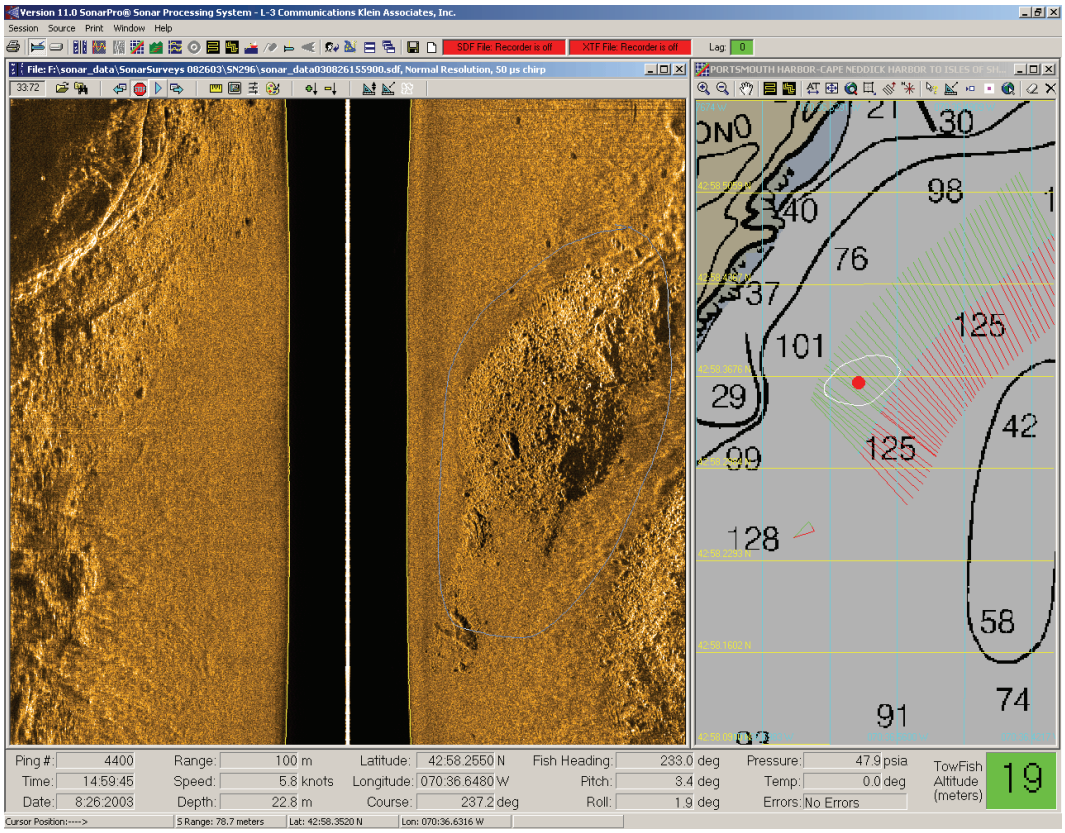


Figure 4-50: *Outlines in the Sonar Viewer and Navigation Windows*

4.14 3D Terrain Window

3D Terrain

Click this button on the Main tool bar to view a 3D terrain of the data. The 3D Terrain window will open as shown in Figure 4-51. This window is only available when the C-MAP navigation charts are loaded. The 3D Terrain window tool bar is shown in Figure 4-52.

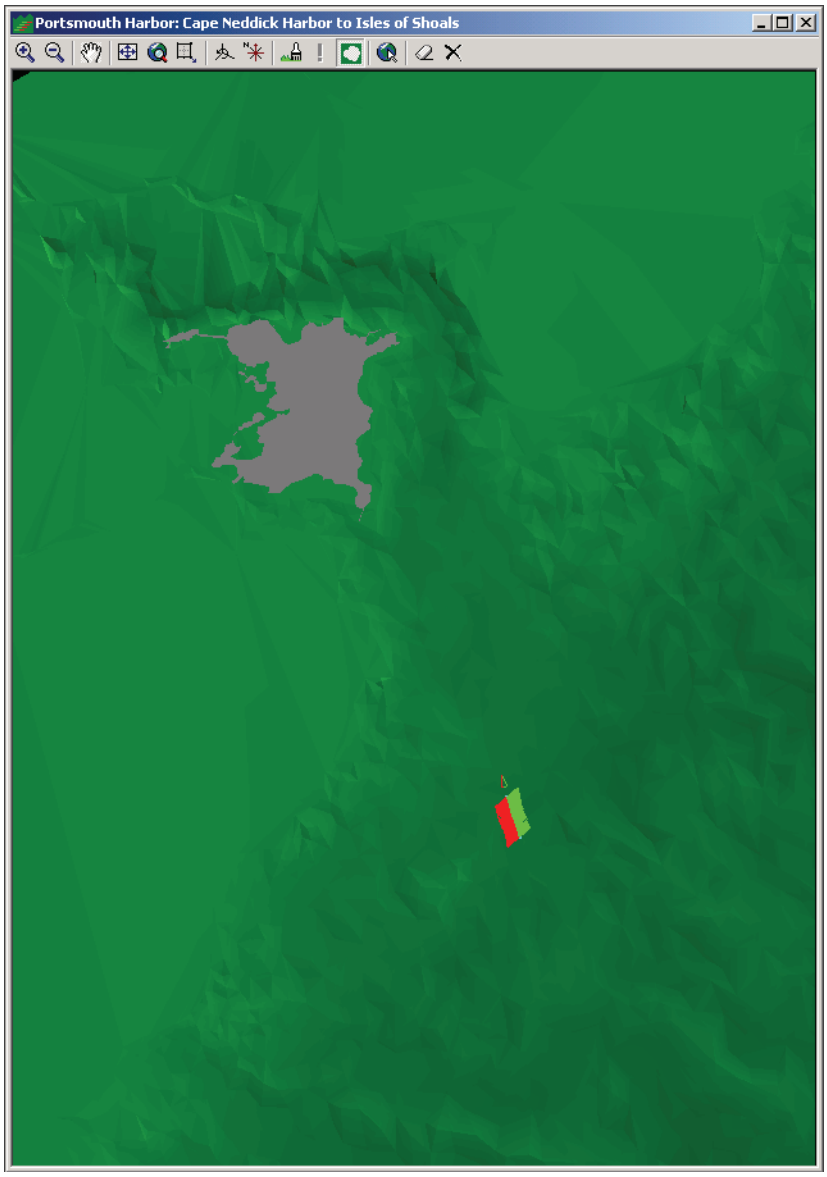


Figure 4-51: *The 3D Terrain Window*

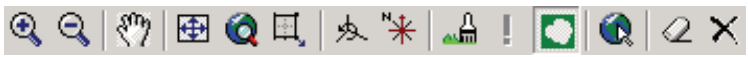


Figure 4-52: *The 3D Terrain Window Tool Bar*

Zoom In

Click this button to zoom in on the 3D Terrain window.

Zoom Out

Click this button to zoom out of the 3D Terrain window.

Drag Tool

Click this button to pan the chart in any direction. It makes for easy browsing of the chart in the 3D Terrain window. The button is on by default.

Center

Click this button to center the data in the 3D Terrain window.

Mag All

Click this button to quickly zoom out to display all of the data collection tracks and targets.

Zoom Window

Click this button to select an area in the 3D Terrain window to zoom in on.

Rotate Window

Click this button to rotate the scene with respect to the camera in 3D as shown in Figure 4-53.

Align North

Click this button to align north up and position the camera directly over the view.

Regenerate Mesh

Click this button to regenerate mesh data.

Mesh Data

This display changes from gray to black when there is no mesh data available for display at the survey area.

Land Boundaries

Click this button to turn on or off the land boundaries on the 3D mesh information.

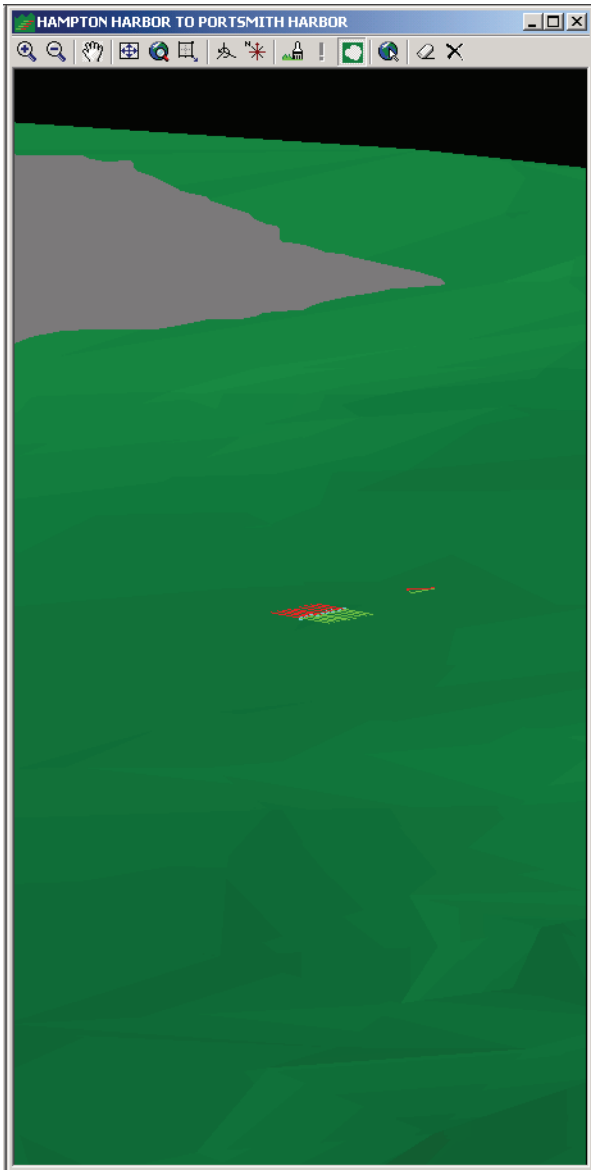


Figure 4-53: *The 3D Terrain Window Rotated*

Move Location

Click this button to open a window that allows you to enter a location.

Erase Outlines

Click this button to erase the outlines that have been drawn around targets.

Erase Tracks

Click this button to erase the data collection track.

4.15 Targets And Target Management

By placing the pointer over a target in the Sonar Viewer window and double-clicking, you can log a target into a target catalog, open a Target window for the target as shown in Figure 4-54, and place a target mark in the Navigation Window. You can use the Target window to zoom, pan, save, get the exact location, and adjust the TVG gain and color palette of the target. You can also select a target classification, such as a cable, rock, pipe, or wreck. Coordinates around the edge of the target window are measured in meters or feet. For target catalog setup information, refer to “Setting up the User Preferences” on page 4-48.

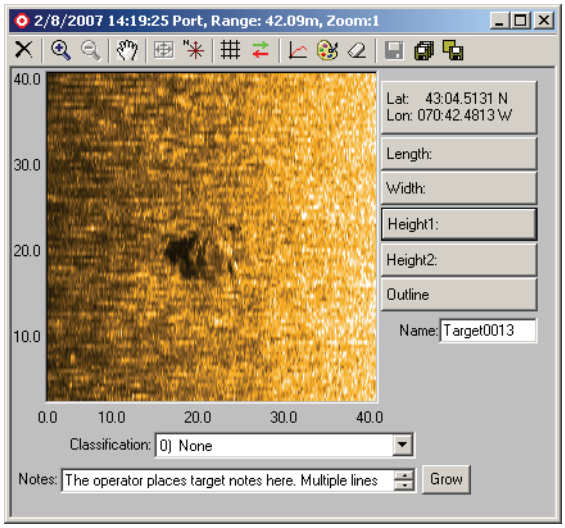


Figure 4-54: *The Target Window*

4.15.1 Setting up the Target Window Properties

Right click on the Target window to open the *Target Properties* dialog box to the *Target Gain* tab as shown in Figure 4-55. On this tab use the **Intensity** slider to adjust the gain of the target data being displayed. Click **Use Original Gain Value** to select the default gain.

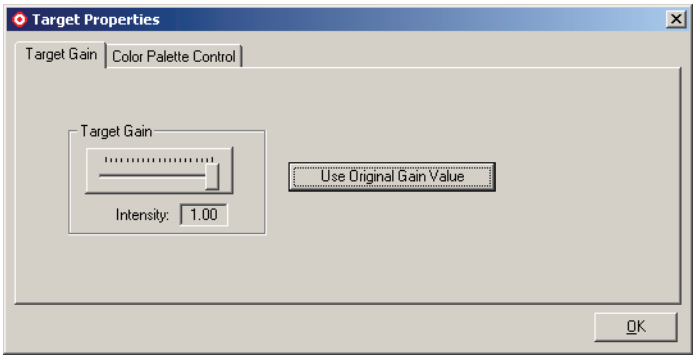


Figure 4-55: *The Target Properties Dialog Box—Target Gain Tab*

The *Color Palette Control* tab shown in Figure 4-56 allows you to adjust the color of the target data being displayed. Select **Inverse Video** to display shadows as light and the contacts as dark. Return to the default color palette by clicking **Use Default Palette**.

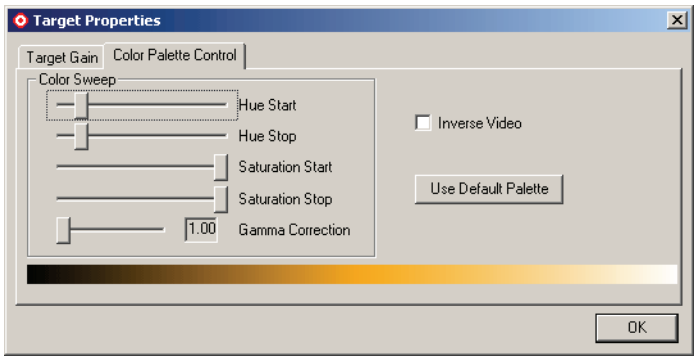


Figure 4-56: *The Target Properties Dialog Box—Color Palette Control Tab*

4.15.2 Using the Target Window Tool Bar

The Target window tool bar is shown in Figure 4-57.

Figure 4-57: *The Target Window Tool Bar*

Delete

Click this button to delete a selected Target window from the target catalog.

Zoom In

Click this button to zoom in on the Target window.

Zoom Out

Click this button to zoom out of the Target window.

Drag Tool

Click this button to pan the target data in any direction. The button is on by default.

Center

Click this button to center the target data in the Target window.

Align North

Click this button to align north up and position the camera directly over the view.

Toggle Grid

Click this button to place a grid over the target data for estimating target parameters.

Toggle Shadow

Click this button to place an arrow in the target window that indicates the sound direction. The arrow is red when the direction is to port; green if to starboard.

Gain

Click this button to open the *Target Properties* dialog box to the *Target Gain* tab shown in Figure 4-55 on page 4-41 where you can adjust the gain of the target data being displayed.

Palette

Click this button to open the *Target Properties* dialog box to the *Color Palette Control* tab shown in Figure 4-56 on page 4-42 where you adjust the color of the target data being displayed.

Erase

Click this button to erase any measurement marks in the Target window.

Save

Click this button to save a target.

Save All

Click this button to save all targets. (See “Setting up the Target Preferences” on page 4-51 for instructions on how to automatically save targets.)

Save Image

Click this button to save the target image in a GEOTIFF Image (.tif) or Windows Bitmap (.bmp) file.

4.15.3 Managing Targets

Target Management

Click this button on the Main tool bar to view a list of the targets you are working with. *The Detailed Target Window Management* dialog box will open as shown in Figure 4-58. The targets have a color code for the different layers, and specific data on each target are listed. The main purpose of this window is for selecting, displaying and editing targets in the Main window.

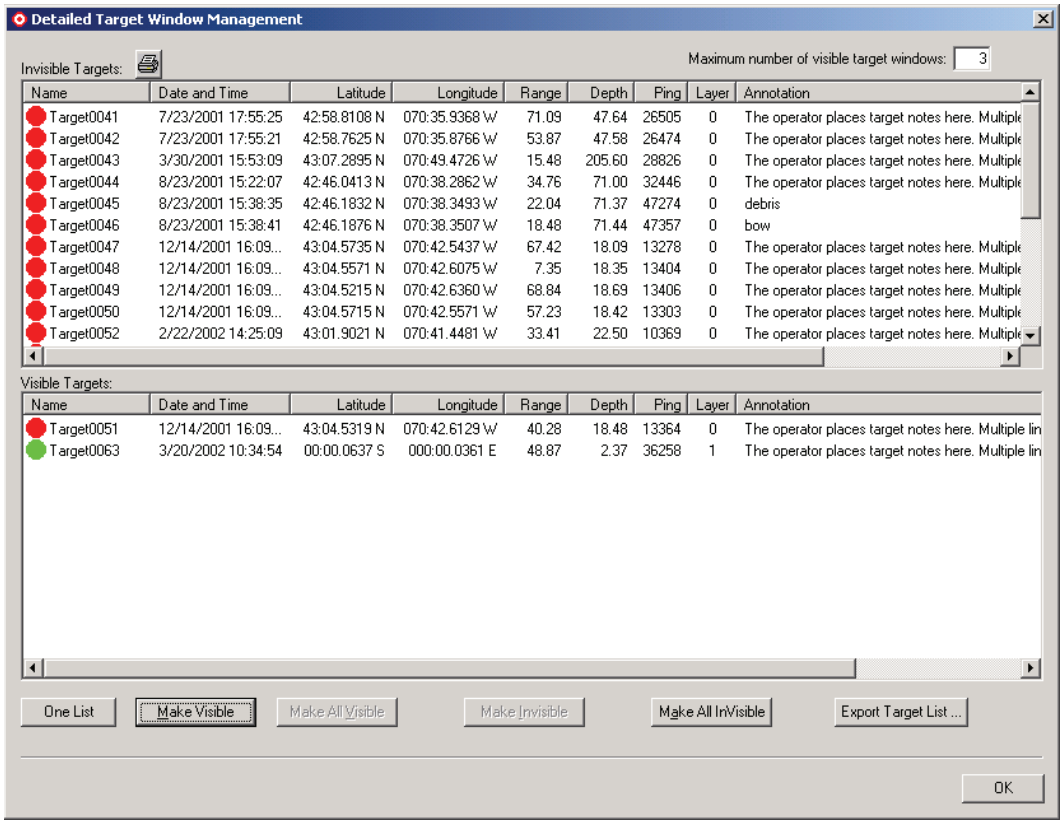


Figure 4-58: *The Detailed Target Window Management Dialog Box*

Two lists of targets are shown by default: the **Invisible Targets** list, which are the targets that are stored in the target catalog but are not visible in the Main Window, and the **Visible Targets** list, which are separate, visible Target windows displayed in the Main Window. The maximum number of visible windows can be set by entering a value in the **Maximum number of visible target windows** text box in the upper right corner. Targets in the lists may be sorted by name, date and time, latitude, longitude, range, depth, ping number, view layer, and annotation by clicking the corresponding column title.

The following buttons in the *Detailed Target Window Management* dialog box are used to manage the target lists.

One List/Two List. Click **One List** to change the display to only one list called the **All Targets** list. In this mode you will not know which targets are being displayed, but the list is more suitable for printing. The **One List** button will change to **Two List**. Click **Two List** to revert to two lists.

Make Visible. By selecting a target from the **Invisible Targets** list, this button will become available. Click the button to move the selected target into the **Visible Targets** list and display its Target window in the Main Window.

Make All Visible. Click this button to move all of the targets in the **Invisible Targets** list into the **Visible Targets** list and display their Target windows in the Main Window. The maximum number of visible targets is 12.

Make Invisible. By selecting a target from the **Visible Targets** list, this button will become available. Click the button to move the selected target into the **Invisible Targets** list and close its Target window.

Make All Invisible. Click this button to move all the targets in the **Visible Targets** list into the **Invisible Targets** list and close all the Target windows.

Export Target List. Click this button to output the target list to a text file, a file of extension *.txt*, for viewing and printing in word processors.

When a target is selected and made visible, it will be identified in the Navigation window as a red target with a white center as shown in Figure 4-59.

To edit a target, select the target and click **Make Visible**. Then go to its Target window, make the changes and resave the target. To delete a target from the target catalog, select the target and click **Make Visible**. Then go to its target window and delete the target.

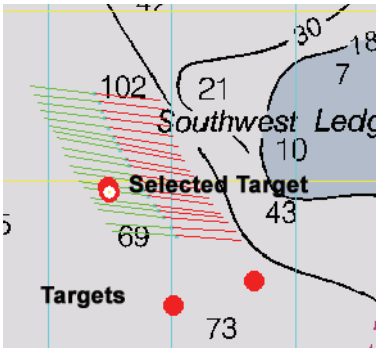


Figure 4-59: *Visible Target in Navigation Window*

4.15.4 Target Measurement

In the Target window on the right side is a list of measurement parameters as shown in Figure 4-54 on page 4-41: Lat/Lon, Length, Width, Height1, and Height2. These are all active tools. Click a parameter to activate it, move the cursor to the target, and then click and drag to make the desired measurement.

The **Outline** button operates the same as the one in the Sonar Viewer window. Click the button, and with your mouse, outline a target. The outline will be placed in the Target window as well as in the Navigation window. Right-click in the Navigation window, select the *Chart Properties* tab in the *Navigation Properties* dialog box, and lower the **Chart Palette Control** to see the outline. To erase outlines, right-click in the Navigation window, select the *General* tab and click **Erase Outlines**.

At the bottom of the Target window there is a text box for entering notes about the target. The target can also be renamed from its default name by entering the name in the **Name** text box.

4.16 Towfish Sensor Information

Sensor

Click this button to display towfish sensor information. The Sensor window will open as shown in Figure 4-60.

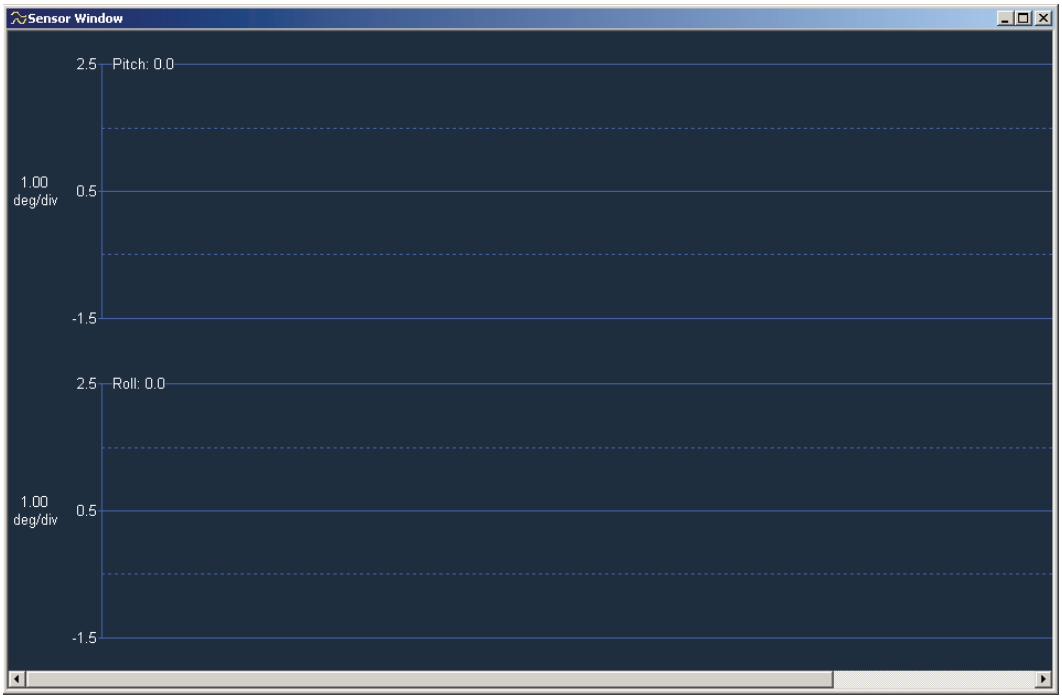


Figure 4-60: *The Sensor Window*

The towfish sensor information is also displayed in the Information Window at the bottom of the Main window.

Right-click in the Sensor Window to open the *Sensor Configuration* dialog box shown in Figure 4-61. This dialog box allows you to select which sensors you want to monitor.

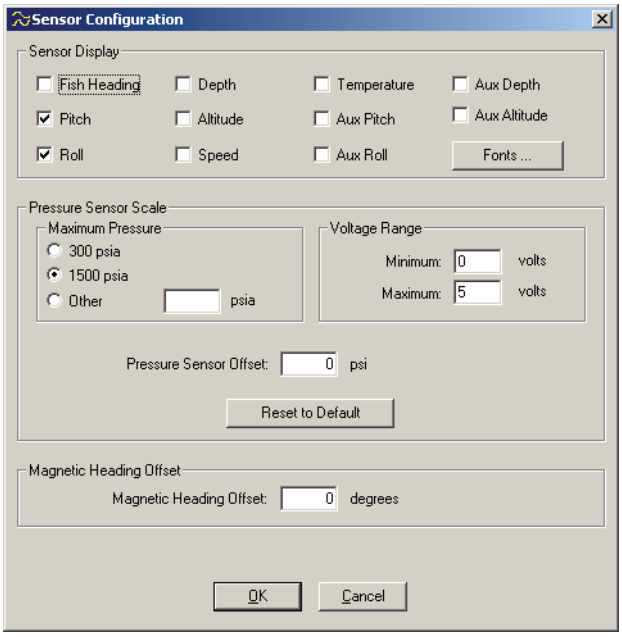


Figure 4-61: *The Sensor Configuration Dialog Box*

If a custom pressure sensor is installed in your towfish, select the pressure sensor scale here. If the pressure sensor's maximum pressure reading value is not in the standard list, enter the value in the **Other** text box. The default voltage range is 0 to 5 millivolts. If the pressure sensor's voltage range is different than this, the values can be entered in the **Minimum** and **Maximum** text boxes. To manually add an offset in psi, plus or minus, to the pressure sensor output, enter the offset in the **Pressure Sensor Offset** text box. To manually add an offset in degrees, plus or minus, to the magnetic heading output, enter the offset in the **Magnetic Heading Offset** text box. If you are unsure what the values should be, click **Reset to Default** to set them to the default for the current towfish type.

NOTE *Note that any changes to these values should be done with care, as they are used to calculate the towfish depth, and incorrect parameters will cause incorrect readings.*

Fonts that are displayed in the Sensor window may also be changed by clicking **Fonts** and making the selections.

Shown in Figure 4-62 is an example *Sensor Configuration* dialog box setup with the corresponding results in the Sensor window.

NOTE *The Sensor window is graphic intensive and should therefore be used sparingly during real-time operation. Leaving this window open for long periods may result in the system running in a data lag condition. The Sensor window should be used mostly in playback.*

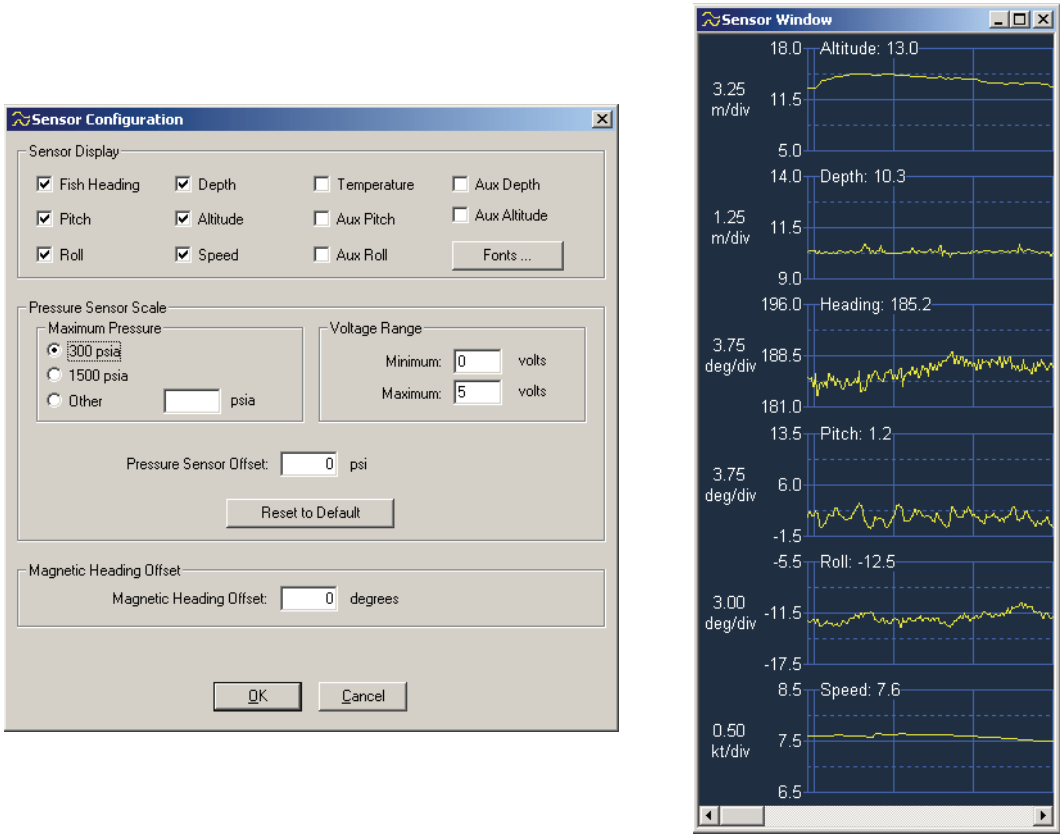


Figure 4-62: *Example of Sensor Configuration Dialog Box Setup with the Corresponding Results in the Sensor Window*

4.17 Setting up the User Preferences

Preferences

Click this button to set up the user preferences. The *SonarPro User Preferences* dialog box will open to the *General Preferences* tab as shown in Figure 4-63.

4.17.1 Setting up the General User Preferences

On the *General Preferences* tab you can set up the way SonarPro places and sizes the windows in the Main window. You can choose to manually set the position and sizes of the windows, or you can have SonarPro perform this function automatically. You can also select the units for SonarPro to use when displaying the towfish altitude and depth and when performing target mensuration. In addition, you can select the format to use when displaying latitude and longitude, select either English or Japanese for displayed text, and select whether to output User Data Protocol (UDP) messages containing sonar and target information. When this option is selected, SonarPro will broadcast the UDP messages. In most cases this option is not selected.

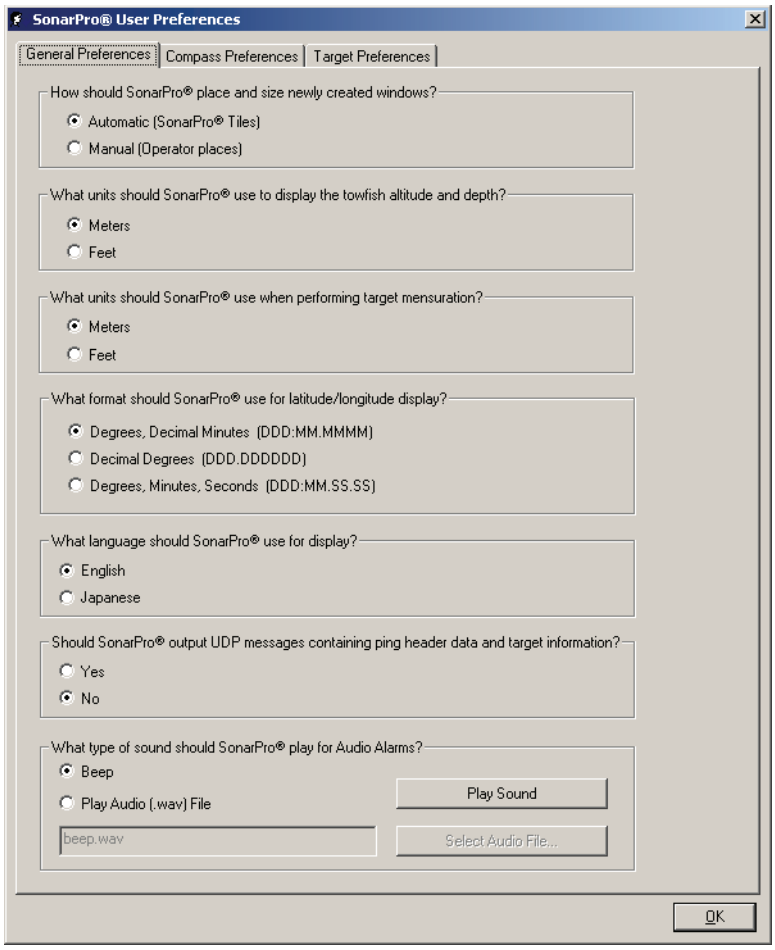


Figure 4-63: *The SonarPro User Preferences Dialog Box—General Preferences Tab*

SonarPro will beep when sounding an alarm. However, you can choose to have SonarPro play an audio (.wav) file instead. Click **Select Audio File** to choose the file. Click **Play Sound** to hear it.

4.17.2 Setting up the Compass Preferences

On the *Compass Preferences* tab shown in Figure 4-64 you can select whether to display within SonarPro the raw compass heading from the towfish, which includes a compass that provides a rough magnetic heading, or a deviation corrected towfish heading which derives true heading. You can also select the source used for positioning calculations within SonarPro, either the towfish heading or the ship heading.

In addition, you can choose to have SonarPro automatically select which positioning method to use or you can select a specific one. When choosing automatic, SonarPro will use the ultra short baseline (USBL) system, if installed, which uses a towfish mounted responder and a shipboard transceiver. If not installed or if not operating, layback will be automatically selected if valid layback parameters have been entered. If not, ship position will be automatically selected. When choosing a specific positioning method, first choose either the USBL or the layback option, depending on the system configuration.

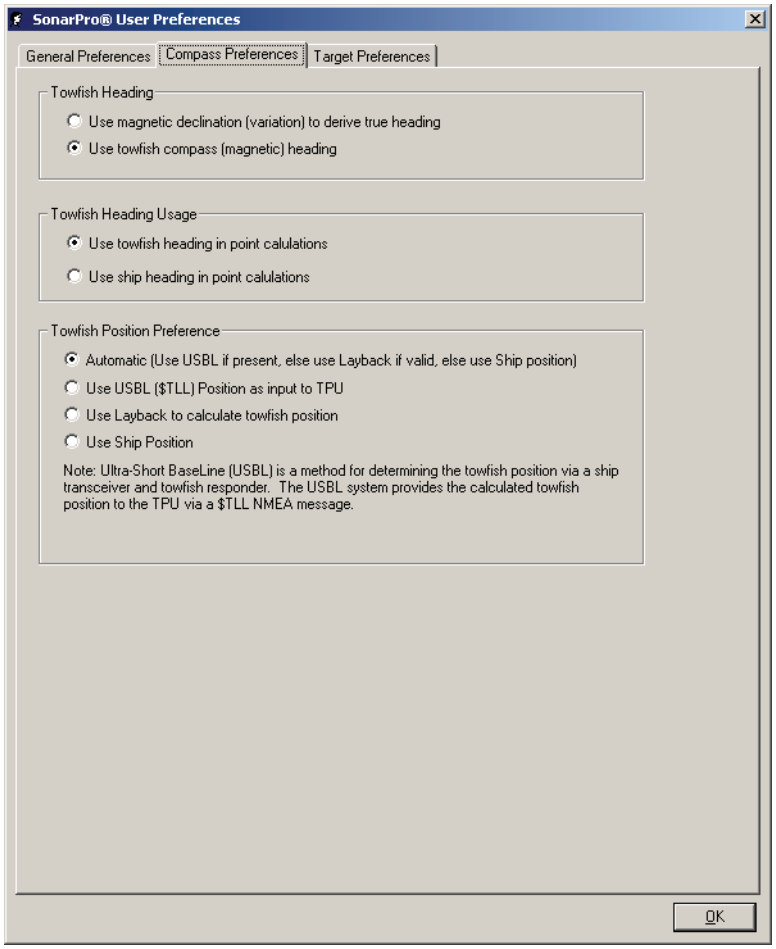


Figure 4-64: *The SonarPro User Preferences Dialog Box—Compass Preferences Tab*

4.17.3 Setting up the Target Preferences

On the *Target Preferences* tab shown in Figure 4-65 you can set up the way SonarPro handles the targets when they are displayed in the Target window and how target information is handled and saved.

In the **Target Catalog** area of the *Target Preferences* tab, select the location for saving the target catalogs that are generated. This can be a new catalog or a previously generated catalog. The catalog must be located on a hard drive. If the Survey Wizard was used when starting the survey, the location was selected at that time. Click **Browse** to select or create the directory from the *Save* box.

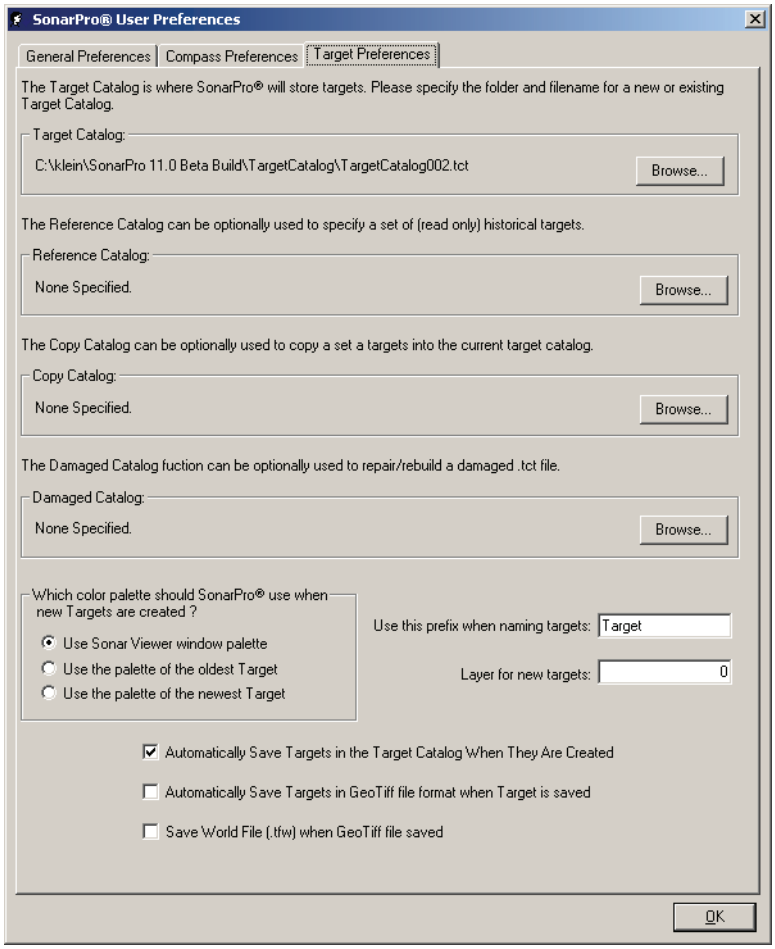


Figure 4-65: *The SonarPro User Preferences Dialog Box—Target Preferences Tab*

In the **Reference Catalog** area you can optionally browse for historical targets located on the computer hard drive. These targets can be used in the Navigation window as a reference if you are resurveying an area. If the Survey Wizard was used when starting the survey, the targets were selected at that time.

In the **Copy Catalog** area you can optionally browse for and copy a set of targets into the current target catalog.

In the Damaged Catalog area you can repair or rebuild a damaged target catalog.

In the **Which color palette should SonarPro use when new targets are created?** area, you can select the color palette to use for the target. When you create a target, SonarPro generates the target in a color palette. The default color palette is the same color palette as that used in the Sonar Viewer window. There may be instances when you may want the target in a different color palette to highlight different characteristics. You can choose to use the Sonar Viewer window palette or the palette of the oldest or newest target.

You can change the prefix for the target names by entering it in the **Use this prefix when naming targets** text box. If the Survey Wizard was used when starting the survey, the prefix was entered at that time.

Targets can be stored on 4 different layers. These layers are displayed as different colored targets in the Navigation window. This feature is useful if you have previously surveyed an area and want to compare the targets from this survey with the current survey. The most recent surveyed targets are placed on a separate layer for easy comparison. If the Survey Wizard was used when starting the survey, the layer was selected at that time.

You can save targets in the target catalog manually from the Target window, or you can have SonarPro automatically save targets when they are generated. To save them automatically, select the **Automatically Save Targets in the Target Catalog When They Are Created** check box. In addition, when saving targets, you can also select the **Automatically Save Targets in GeoTiff file format when Target is saved** check box to save the targets to GeoTiff files—one file for each target—with embedded georeferenced information. And you can select the **Save World File (.tfw) when GeoTiff file saved** to automatically save an associated World File (.tfw) with the GeoTiff file.

4.17.4 Arranging Windows

SonarPro Tile

Click this button to position the open windows in the Main window in a tile arrangement.

Cascade Window

Click this button to position the open windows in the Main window in a cascade arrangement.

4.18 Survey Routes

There are two types of survey routes: a survey grid and a survey route. A survey grid is a rectangular array of back-and-forth lines at equal spacing. A survey route is a more free form tool which is made up of lines with multiple waypoints. The lines can have different numbers of waypoints and be at different spacings. An example survey grid in the Navigation window is shown in Figure 4-66, and an example survey route is shown in Figure 4-70 on page 4-56.

Survey routes and survey grids can be turned on or off in the Navigation window by right-clicking in the window to open the *Navigation Properties* dialog box to the *General* tab and selecting or clearing the **Display Survey Route** check box.

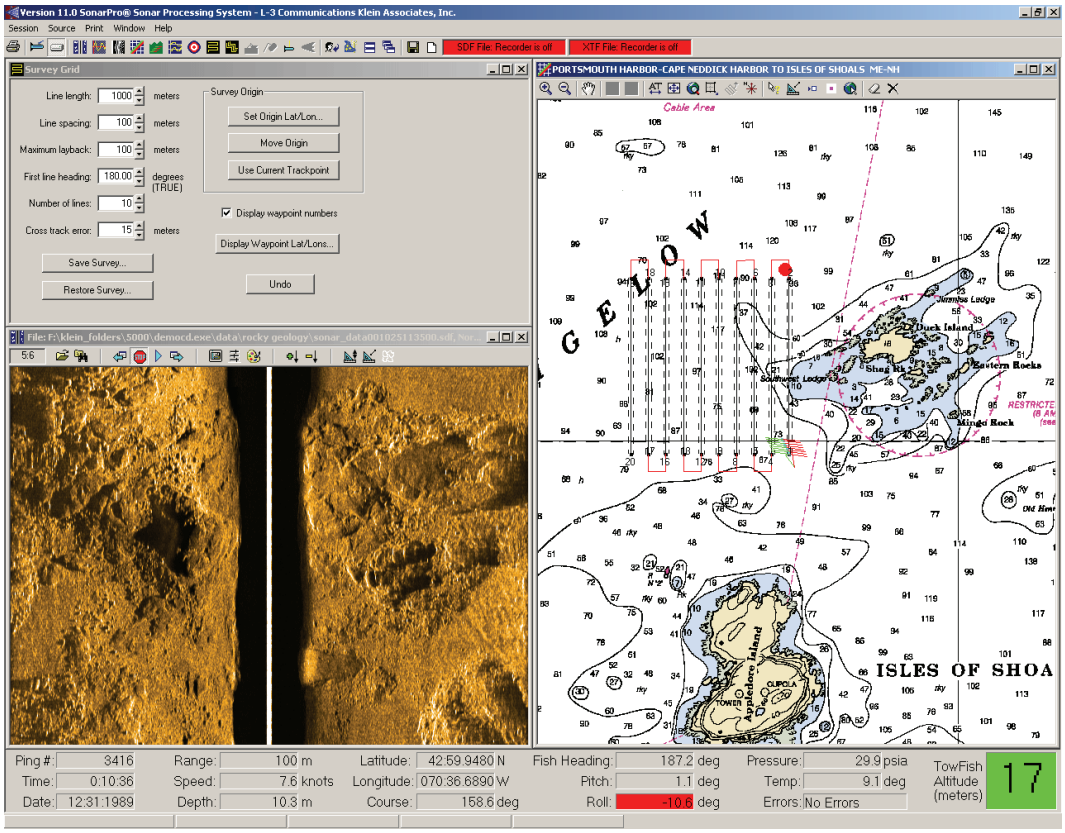


Figure 4-66: *Example Survey Grid in the Navigation Window*

4.18.1 Setting up a Survey Grid

Survey Grid

Click this button, either on the Main tool bar or on the Navigation window tool bar, to set up and place a survey grid over a charted area in the Navigation Window. The *Survey Grid* dialog box will open as shown in Figure 4-67.

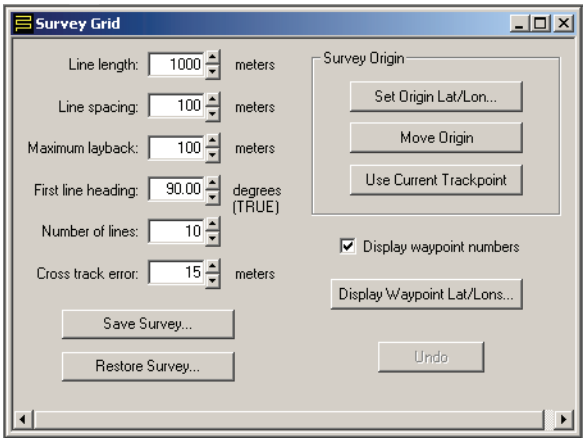


Figure 4-67: *The Survey Grid Dialog Box*

Use the following scroll boxes to set up the survey grid:

- **Line length**
- **Line spacing**
- **Maximum layback**
- **First line heading**
- **Number of lines**
- **Cross track error**

The cross track error is the course error margin that the ship needs to hold when running a line and is shown as dashed lines on the survey grid.

The following buttons in the *Survey Grid* dialog box are used to set up, save and restore the survey grid:

Save Survey. Click this button to save the survey grid.

Restore Survey. Click this button to restore the survey grid.

Set Origin Lat/Lon. Click this button to open the *Origin Location* dialog box which allows you to enter the latitude and longitude manually.

Use Current Trackpoint. Click this button to start the survey grid at the current navigation trackpoint location.

Move Origin. Click this button to quickly move the placed survey grid on the chart in the Navigation window. Click the button, and then move the cursor over the Navigation window. The cursor will change to a . Click in the window to move the grid to the new starting point.

Undo. Click this button to undo a moved survey origin.

Display Waypoint Lat/Lons. Click this button to open the Text window shown in Figure 4-68 with the waypoint information listed. This is the information that is saved when clicking **Save Survey** and can be printed and used as a reference at a later date if the survey needs to be repeated.

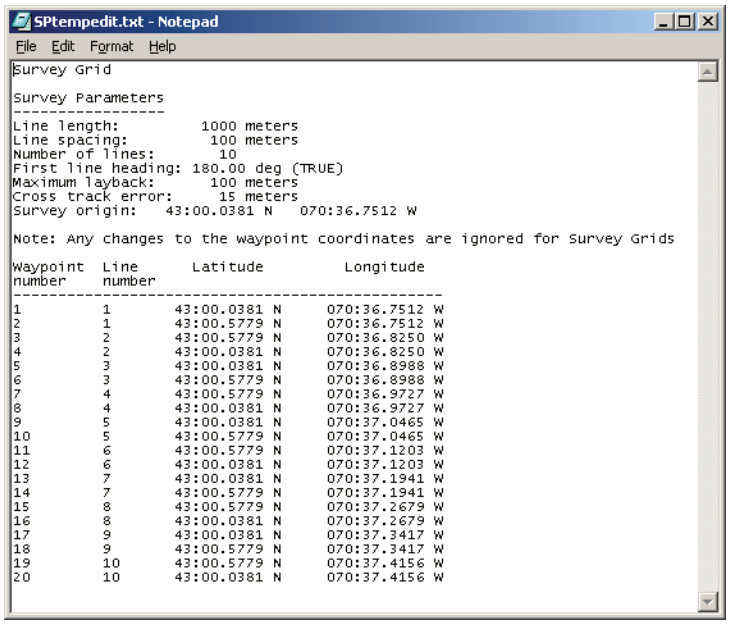


Figure 4-68: *Text Window with Waypoint Information Listed*

4.18.2 Setting up a Survey Route

Survey Route

Click this button, either on the Main tool bar or on the Navigation window tool bar, to set up and place a survey route over a charted area in the Navigation Window. The *Survey Route* dialog box will open as shown in Figure 4-69. The survey route is used to set up surveys where a survey grid is not the best pattern. A survey route is intended for rivers or coastlines where a free form survey is better.

Use the following scroll boxes to set up the survey route:

- **First line heading**
- **Maximum layback**
- **Cross track error**

The cross track error is the course error margin that the ship needs to hold when running a line and is shown as dashed lines on the survey route.

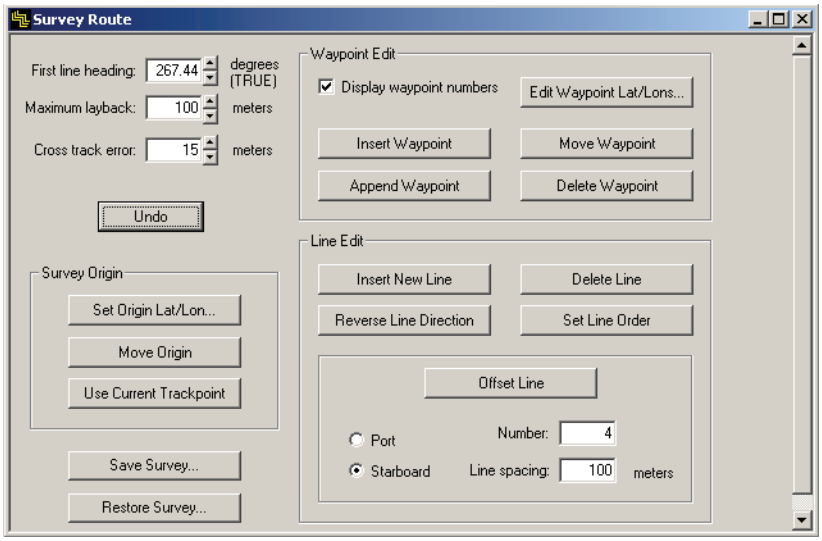


Figure 4-69: *The Survey Route Dialog Box*

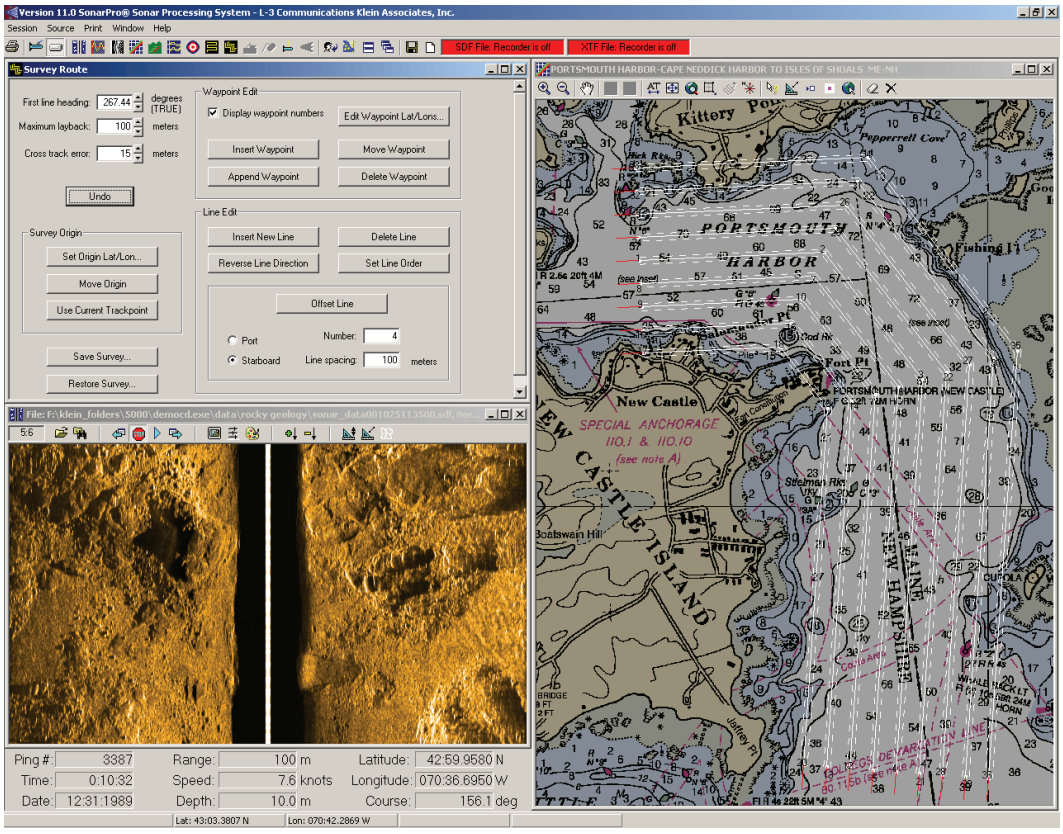


Figure 4-70: *Example Survey Route in the Navigation Window*

The following buttons in the *Survey Route* dialog box are used to set up, save and restore the survey route:

Save Survey. Click this button to save the survey route.

Restore Survey. Click this button to restore the survey route.

Set Origin Lat/Lon. Click this button to open the *Origin Location* dialog box which allows you to enter the latitude and longitude manually.

Use Current Trackpoint. Click this button to start the survey route at the current navigation trackpoint location.

Move Origin. Click this button to quickly move the placed survey route on the chart in the Navigation window. Click the button, and then move the cursor over the Navigation window. The cursor will change to a . Click in the window to move the route to the new starting point.

Undo. Click this button to undo an operation.

Edit Waypoint Lat/Lons. Click this button to open the Text window shown in Figure 4-68 on page 4-55 with the waypoint information listed. This is the information that is saved when clicking **Save Survey** and can be printed and used as a reference at a later date if the survey needs to be repeated. You can edit this file in the Text window if you want, and when you save the file, the changes will be reflected in the Navigation window when you click **Restore Survey** and open the file from the *Open* dialog box.

Insert New Line. Click this button to insert a line. Click the button, and then click in the Navigation window to insert the first waypoint, which is the beginning of the line. Click again in the window to insert the second waypoint, which is the end of the line. Continue clicking to add additional lines. When you are finished, click **End Line Insertion**, which was previously the **Insert New Line** button. You can also end the line insertion by clicking any other button or by right-clicking in the Navigation window.

Insert Waypoint. Click this button to insert a waypoint into an existing line. Click the button, and then click in the line where you want to insert the waypoint. The waypoint is inserted. The line will turn red when it is directly under the pointer. If you hold the mouse button down when inserting the waypoint, you can drag the newly inserted waypoint to a different location. You can continue to click in the Navigation window to insert additional waypoints, on the same or on a different line.

Append Waypoint. Click this button to append a waypoint to the end of a line. Click the button, and then click the line near the end that you want to append the waypoint to. Click again in the Navigation window where you want to insert the new waypoint. Continue clicking to append additional waypoints. When you are finished, click **End Append**, which was previously the **Append**

Waypoint button. You can also end the waypoint insertion by clicking any other button or by right-clicking in the Navigation window.

Move Waypoint. Click this button to move an existing waypoint to a new location. Click the button, and then click and drag the waypoint to the new location. The waypoint turns red when it is directly under the pointer. The survey route is updated immediately. You can continue to select and move other waypoints.

Delete Waypoint. Click this button to delete a waypoint. Click the button, and then click the waypoint you want to delete. You can continue to delete additional waypoints. If a line will have less than two points after deletion, the entire line is deleted. A warning message appears first, however, asking for your confirmation. To restore a deleted waypoint, click **Undo**.

Delete Line. Click this button to delete an entire line. Click the button, and then click the line you want to delete. You can continue to delete additional lines. To restore a deleted line, click **Undo**.

Reverse Line Direction. Although the cross-track error lines are not shown for routes, the lines are ordered and have a direction as shown by the waypoint numbers. Click this button to reverse the ordering of the waypoint numbers for a line. Click the button, and then click the line whose direction you want to reverse.

Set Line Order. Click this button to set the line order for the entire survey. Click the button, and then click the lines in the order desired. The order is updated immediately as each line is clicked. You can stop at any time by clicking **End Line Order**, which was previously the **Set Line Order** button. When the next to the last line is selected, the last line is ordered automatically.

Offset Line. Click this button to generate lines that are parallel to a selected line. Enter the number of parallel lines in the **Number** text box, enter the line spacing in meters in the **Line spacing** text box, and select the **Port** or the **Starboard** option to place the lines to the port or starboard of the selected line. After entering this information, click the button and then the line.

When creating a survey route, it is easiest to first insert a master line in the Navigation window and then generate parallel lines using the **Offset Line** function. For example, if you were surveying a river, insert the first line, the master line, down the middle of the river, and then insert the required number of offset lines on the port and starboard sides of the master line. If working along the coast, place the master line along the coast and then generate the required number of lines on the seaward side of the master line.

4.19 Layback

Layback

Click this button to enter the cable layback parameters. The *Layback* dialog box will open shown in Figure 4-71.

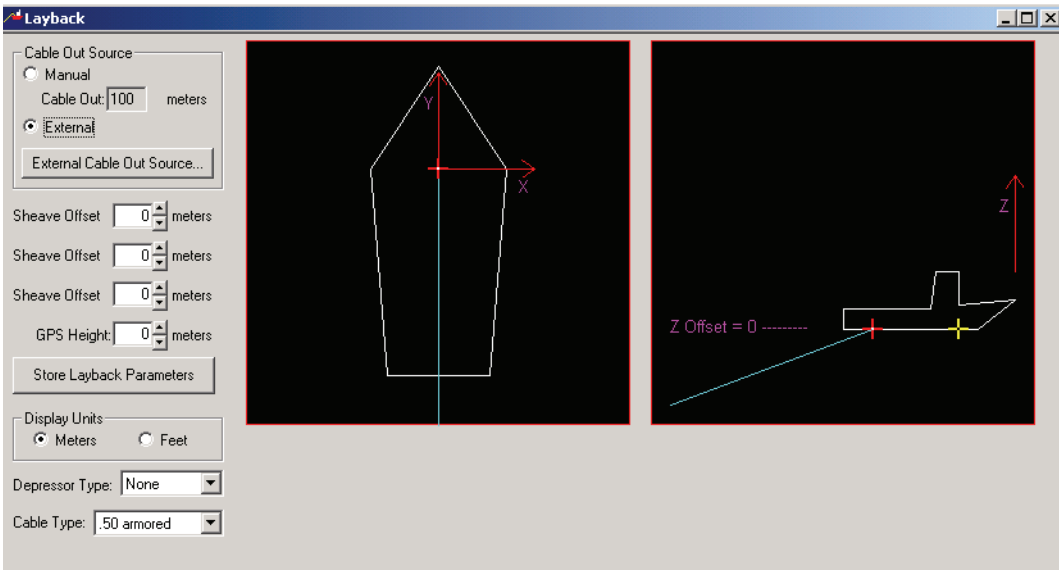


Figure 4-71: *The Layback Dialog Box*

Navigation position information is obtained by the location of the GPS antenna. The parameters in the *Layback* dialog box are used to increase the accuracy of the towfish and target positions that are calculated by SonarPro. These parameters become part of the sonar data record and are stored during data collection. The layback calculation is always active on the target and towfish positions. The more accurate the information entered here is, the more accurate the positioning information will be.

4.19.1 Entering the Layback Parameters

The layback parameters are entered in the *Layback* dialog box as follows:

Cable Out Source. Select the **Manual** option if you want to manually enter the length of cable out; select the **External** option to obtain the length from a winch status input. If you select the **Manual** option, enter the length of cable out in the **Cable Out** scroll box in the units shown. This scroll box is available only if you selected this option.

Display Units. Select the **Meters** option to enter and display the layback parameters in meters; select the **Feet** option to enter and display the parameters in feet.

Sheave Offset X. Enter the distance the sheave is from the GPS antenna on the X axis. Enter a positive number if it is to starboard of the antenna; enter a negative number if it is to port of the antenna.

Sheave Offset Y. Enter the distance the sheave is from the GPS antenna on the Y axis. Enter a positive number if it is forward of the antenna; enter a negative number if it is aft of the antenna.

Sheave Offset Z. Enter the distance the sheave is from the GPS antenna on the Z axis. Enter a positive number if it is above the antenna; enter a negative number if it is below of the antenna.

GPS Height. Enter the distance above the water the GPS antenna is located.

Store Layback Parameters. Click this button to transmit the layback parameters to the TPU for the position correction calculations. Changed parameters will not take effect until this button is clicked.

Depressor Type. Select the type of depressor being towed with the towfish from the drop-down list box. If a depressor is not being used, select *None*.

Cable Type. Select the cable type being used from the drop-down list box.

For convenience a **Cable out** scroll box is included on the tool bar of the Sonar Viewer window when operating in real time as shown in Figure 4-5 on page 4-5. Enter the amount of cable out, and then click **Apply** next to the scroll box. You *must* click **Apply** for the new value to be used.

4.19.2 Choosing or Setting up an External Cable Out Source

SonarPro accepts winch status input on an RS-232 serial port from the following cable read-out devices.

- 3PS Inc. SD41
- BJ Design T count Counter System
- Brooke Ocean Technology Metering Sheave
- Delph format from Coastal0
- TOTOCO Cable Counter
- Dynapar Cable Counter
- NEMA 0183 format template

The winch status is generally input to COM2 of the computer running SonarPro. The **External Cable Out Source** button is available when the **External** option is selected. Clicking this button opens the *Cable Out* dialog box shown in Figure 4-72.

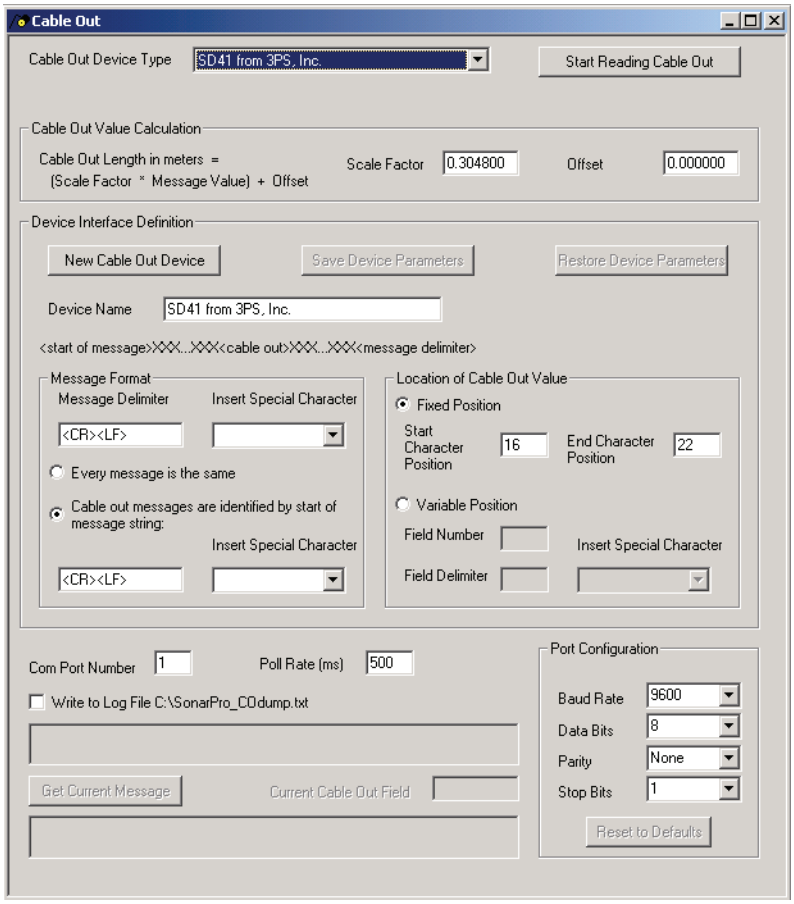


Figure 4-72: *The Cable Out Dialog Box*

The *Cable Out* dialog box allows you to select the specific cable counter to use and to set up any new cable counters. To use a cable counter that is already on the list, select it from the **Cable Out Device Type** drop-down list box, and then click **Start Reading Cable Out**. The cable out value will be displayed in the **Cable out** display on the tool bar of the Sonar Viewer window when operating in real time.

To set up a new cable counter, click **New Cable Out Device** in the **Device Interface Definition** area. Here you specify the new device name, which COM port the computer will use to receive the data, the message format, the location of the cable out value in the data string, and whether you want the data stored in a log file. A template is provided for devices that uses a NMEA format message.

SonarPro requires that the cable out value from the device be in meters. You make this adjustment in the **Cable Out Value Calculation** area by entering a value in the **Scale Factor** text box. For example if the device outputs a value in feet, you would enter the conversion factor .304800. To zero the value, for example, when the cable is all the way in and you have a reading of 4 meters, you could enter into the **Offset** text box a correction of -4.

Enter how often to poll the device in the **Poll Rate** text box and configure the port using the drop-down list boxes in the **Port Configuration** area.

To save the new device, click **Save Device Parameters**. The new device will be added to the **Cable Out Device Type** drop-down list box.

To save the cable out device settings to a file, choose *Save Devices, to File* from the *Session* menu. To read the cable out device settings from a file, choose *Open Devices File* from the *Session* menu.

4.20 Towfish Depth

Towfish Depth

Click this button to enter the depth output parameters. The *Depth Output* dialog box will open as shown in Figure 4-73.

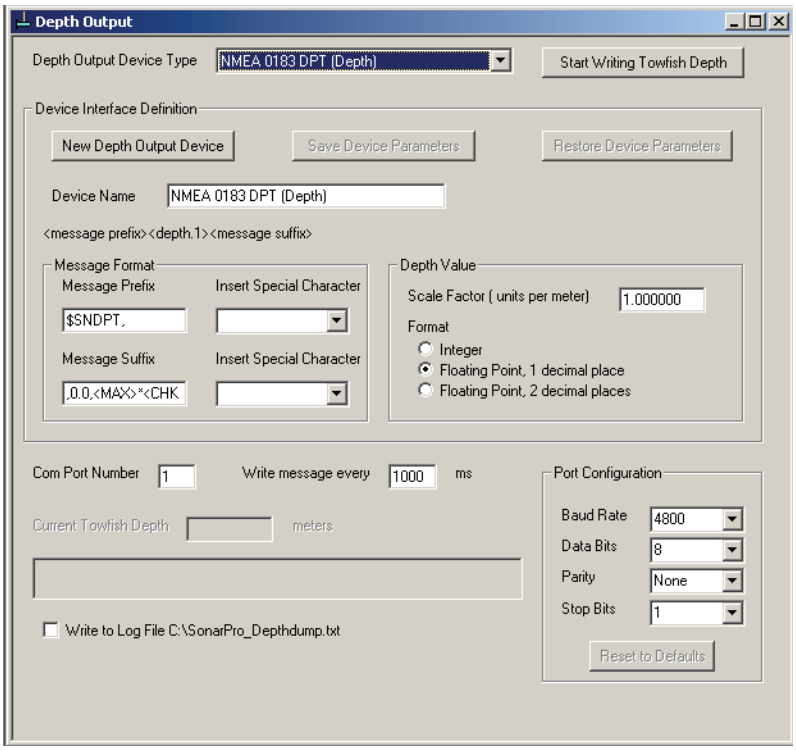


Figure 4-73: *The Depth Output Dialog Box*

The current towfish depth can be output to a hardware device using an RS-232 serial port. Two predefined data formats are available: the ORE Trackpoint format, and a standard NMEA DPT message format. Custom messages can also be defined using the **Depth Output** dialog box.

To use an existing format, select it from the **Depth Output Device Type** drop-down list box. Enter the COM port to which the device is connected in the **Com Port Number** text box, and then click **Start Writing Towfish Depth** to output the depth data. The data being transmitted are also displayed at the bottom of the window. To help troubleshoot problems, the data can also be written to a file by selecting the **Write to Log File** check box. To stop the output of data, click **Stop Writing Towfish Depth**, which was previously the **Start Writing Towfish Depth** button.

To define a new device interface, click **New Depth Output Device**. Enter a name for the device in the **Device Name** text box. Messages are split into three parts: a prefix, the actual depth value and a suffix. The prefix and suffix are any characters that come before and after the depth value, respectively. Enter the message prefix and suffix in the **Message Prefix** and **Message Suffix** text boxes. Use the **Insert Special Character** drop-down list boxes to insert special character codes such as carriage return, line feed and spaces.

NOTE *The ORE and NMEA messages contain codes that are not in this list. These codes cannot be used in custom messages. There may be messages that do not fit into this format. You can contact L-3 Communications Klein Associates, Inc. to request that we add new predefined formats.*

For the depth value, enter the scale factor to convert from meters to the units required by the message in the **Scale Factor** text box. If the message value is in meters, the scale factor equals one. If the message value is in feet, the scale factor should be set to the number of feet per meter, or 3.281, and so on. Then select the format option as follows:

- **Integer** for no decimal places
- **Floating Point, 1 decimal point** for one decimal place.
- **Floating Point, 2 decimal places** for two decimal places.

Enter how often to output the data in the **Write message every** text box and configure the port using the drop-down list boxes in the **Port Configuration** area.

To save the new device, click **Save Device Parameters**. The new device will be added to the **Depth Output Device Type** drop-down list box.

To save the depth output device settings to a file, choose *Save Devices, to File* from the *Session* menu. To read the depth output device settings from a file, choose *Open Devices File* from the *Session* menu.

4.21 Printing with SonarPro

SonarPro provides two methods for printing a hard copy of the data. One method allows you to use the utility program SnagIt to obtain a screen capture and save it as a .bmp, .pcx, .tif, .jpg, .gif, or .png file. You can then import the image into any image editing program or image catalog program and print a high resolution image to a printer. The supplied Snagit Studio is a limited editing, print and catalog utility. Choose *SnagIt Capture* from the *Print* menu to start SnagIt.

The second method uses the *EPC Model 1086 Printer Properties* dialog box shown in Figure 4-74. To open this dialog box, choose *EPC 1086* from the *Print* menu. The dialog box opens to the *Control* tab.

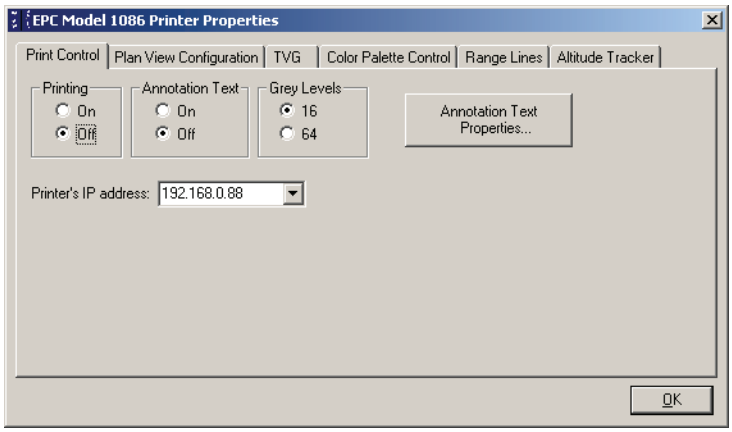


Figure 4-74: *The EPC Model 1086 Printer Properties Dialog Box*

On the *Control* tab enter the printer's IP address in the **Printer's IP address** drop-down list box. The IP address 192.168.0.88 is the default, which must be changed when using a different network. Select additional print options as follows:

Printing. Select **On** to turn the printer on; select **Off** to turn the printer off.

Annotation text. Select **On** to print the annotated text; select **Off** to not print the text.

Grey Levels. Select the **16** or the **64** option to choose the levels of gray.

Click **Annotation Text Properties** to open the *Annotation Text Properties* dialog box shown in Figure 4-75. In this dialog box, select the data to be printed, and then click the appropriate arrow button to place it in the **Selected Fields** window. The information in this area will be printed. Select additional print options as follows:

Text Size. Select the text size.

Text Background. Select the text background. The **Overlay** option prints text over the data; the **Window** option prints the text in a white window.

Text Margin. Select the text margin from this drop-down list box.

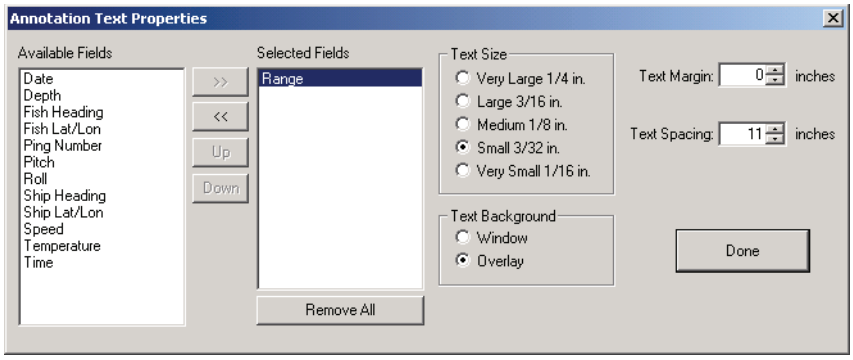


Figure 4-75: *The Annotation Text Properties Dialog Box*

Text Spacing. Select the spacing between lines of text from this drop-down list box.

Done. Click this button when you are finished with the setup.

The *Plan View Configuration*, *TVG*, *Color Palette Control*, *Range Lines,* and *Altitude Tracker* tabs all work as described in "Operating in Playback" on page 4-20, with the exception that the color information is given a gray scale equivalent for printing on the gray scale EPC 1086 printer.

4.22 Operating SonarPro With Dual Displays

For a dazzling sonar display presentation, SonarPro can be used with two displays. This allows you to run the sonar on one display and do navigation and target management on the other, or run the port sonar data on the left display and the starboard sonar data on the right display.

4.22.1 Recommendations When Using Dual Displays

Below are some recommendations if you plan to use two displays.

- If you change from a single to dual displays, or vice versa, on the fly, you must close and restart SonarPro.
- If you change the display resolution, color depth, refresh frequency, or desktop area, you must restart SonarPro.
- SonarPro should be run with the small fonts selected in the Windows display settings.
- If you plug a second display into a booted computer, you must reboot the computer before the second display will be detected by that computer.

4.22.2 Setting up the Displays and Switching between Them

When using dual displays, they can be set up horizontally or vertically using the functions in the Windows display settings. With two displays active, either vertically or horizontally, the Sonar Viewer window occupies one display—the bottom display for a vertical arrangement and the left display for a horizontal arrangement—and all the other windows occupy the other display. If multiple Sonar Viewer windows are open, they will all occupy the same display. You can rearrange the open windows, however, any way you want and in either of the two displays.

To enable instant swapping of the displays, SonarPro provides a Rapid Window Switch (RWS) button in the Status bar of the Main window as shown in Figure 4-76. This button is only visible when two displays are connected and the Main window in each display fills the entire display area. Click RWS to move the Sonar Viewer window to the other display and all the open windows in that display to the one originally occupied by the Sonar Viewer window. If more than one Sonar Viewer window is open, they will all move together.

Figure 4-76: *The RWS Button in the Status Bar*

An example of a windows arrangement for two displays is shown in Figure 4-77, where the Sonar Viewer window in the bottom display and the Target window is in the top display. The top display also includes the *Control Towfish Wing* dialog box. For information on this dialog box, refer to “Operating the Wing” on page 4-69. Clicking RWS will instantly swap the displays.

NOTE *The Main window title bar and tool bar remain in the top display when a vertical arrangement is set up and begins in the left display when a horizontal arrangement is set up.*

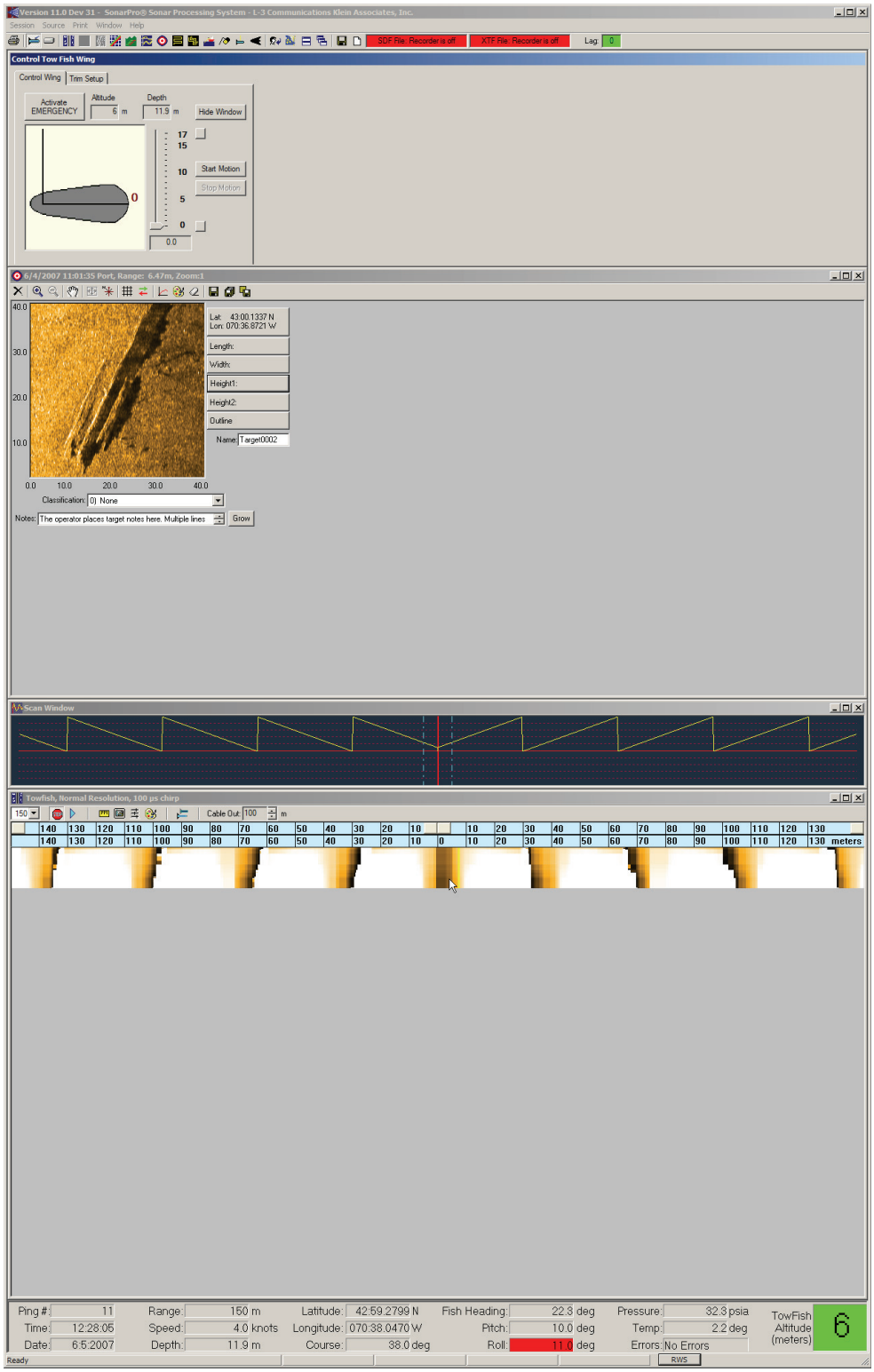


Figure 4-77: *Dual Displays with Open Control Towfish Wing Dialog Box and Target Window (Top) and Sonar Viewer, Information and Scan Windows (Bottom)*

4.23 Raw Channel Data

You can monitor the raw data output from the towfish by choosing *Raw Channel Data* from the *Window* menu. The Raw Channel Data window will open as shown in Figure 4.23.

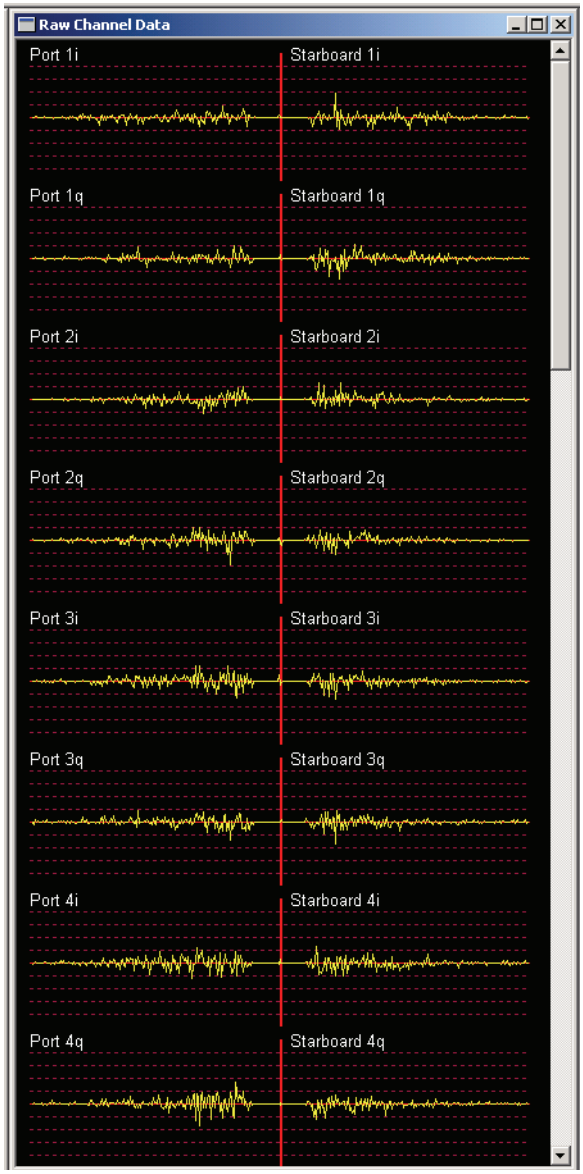


Figure 4-78: *The Raw Channel Data Window*

4.24 Operating the Wing

Show/Hide Wing Control

Click this button to show or hide the *Control Towfish Wing* dialog box where you can operate the Series 5000 MK IIB towfish wing. You can also open this dialog box by choosing *Show/Hide Wing Control* from the *Window* menu. The *Control Towfish Wing* dialog box is shown opened to the *Control Wing* tab in Figure 4-79. A wing graphic on the tab indicates the current angle of the wing.

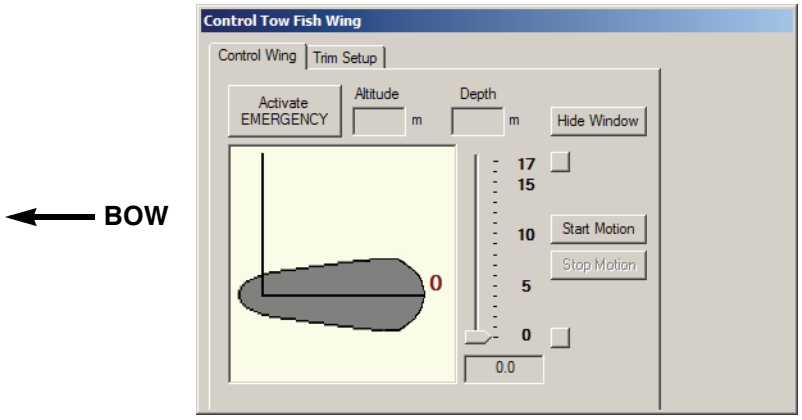


Figure 4-79: *The Control Towfish Wing Dialog Box—Control Wing Tab*

The wing is activated by an actuator which raises or lowers the aft section of the wing, pivoting on the forward section. This changes the wing angle relative to the horizontal and hence the depressive or downward force on the towfish when it is being towed. In addition to adjusting the wing angle, an emergency feature is included which when activated, immediately lowers the wing to within three degrees of its horizontal position. The emergency activation can be initiated from SonarPro or by sending a command to a COM port of the computer running SonarPro. The COM port is selected in SonarPro, and the command is sent from an interface board when a switch, which is connected to the board, is closed. The interface board is provided.

NOTE *To be able to operate the wing, the* ***Control Wing*** *check box and the* ***Connect as Master*** *option in the TPU Connection dialog box must be selected. (See "Selecting the Connection Type" on page 4-4.)*

To hide the *Control Towfish Wing* dialog box, click **Hide Window** in the dialog box, choose *Hide Wing Control* from the *Window* menu or click the **Show/Hide Wing Control** button. The same applies to show the hidden dialog box.

4.24.1 Selecting the Emergency Activation COM Port

You can select any available COM port on the computer running SonarPro for the emergency activation connection. The computer must also be connected as a master or a slave. To select the COM port, click the *Trim Setup* tab in the *Control Towfish Wing* dialog box. The *Trim Setup* tab shown in Figure 4-80 opens. Select the COM port from the **Emergency Switch Port** drop-down list box, and then restart the computer. Connect the interface board to the COM port and to a switch.

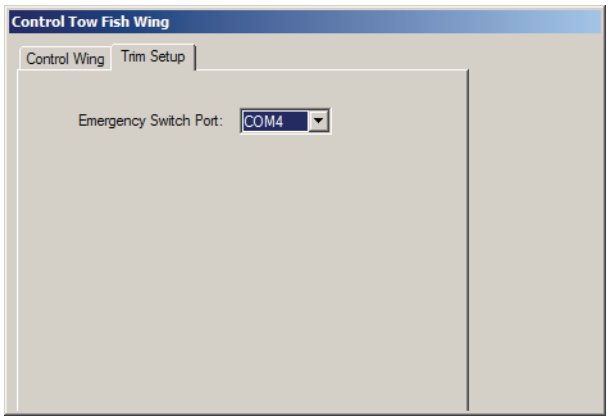


Figure 4-80: *The Control Towfish Wing Dialog Box—Trim Setup Tab*

4.24.2 Initiating Emergency Activation

To initiate emergency activation of the wing, click **Activate EMERGENCY** on the *Control Wing* tab of the *Control Towfish Wing* dialog box or activate the switch closure to the interface board. The emergency condition is indicated by a red border around the wing graphic as shown in Figure 4-81, and the wing moves to its horizontal, zero-degree position as shown in Figure 4-82. The interface board must be connected to the selected COM port for the emergency activation to function. (See "Selecting the Emergency Activation COM Port" above.)

To terminate the emergency, open the switch closure to the interface board or click **Clear Emergency**.

NOTE *You must terminate the emergency using the same device that was used to initiate it, the switch or the* ***Clear Emergency*** *button.*

4.24.3 Setting the Wing Angle

The wing angle is set from the *Control Wing* tab of the *Control Towfish Wing* dialog box. To set the angle of the wing, first choose the angle by dragging the slider up or down to position it at the desired angle, from 0 to 17 degrees. The

angle is displayed in degrees in one-degree increments in the display below the slider as shown in Figure 4-81. Then click **Start Motion**. The wing moves to the desired angle as indicated both by the wing graphic and the display in the graphic as shown in Figure 4-82. Movement of the wing can be stopped at any time by clicking **Stop Motion**.

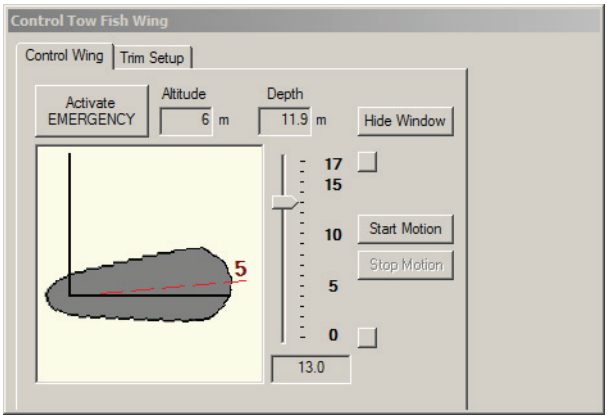


Figure 4-81: *Choosing the Wing Angle*

To immediately move the wing to its horizontal position in just one operation, click the button to the right of "0" on the slider; to immediately move the wing to its maximum angle, click the button to the right of "17." Again, movement of the wing can be stopped at any time by clicking **Stop Motion**.

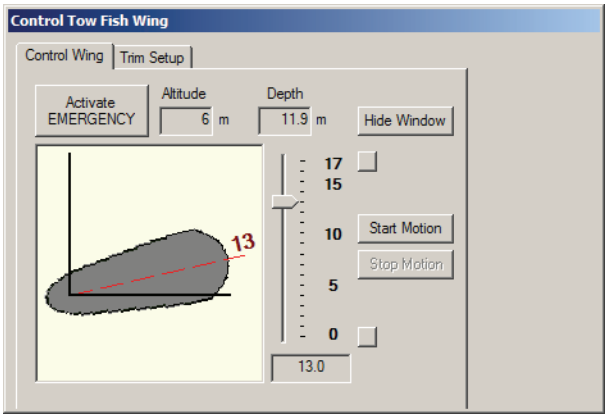


Figure 4-82: *Wing Angle Set*

If maneuvering of the mouse or pointing device is awkward or difficult, you can use an alternate method of setting the wing angle. To set the angle of the wing using this method, use the up or the down arrow key on the keyboard to move the slider. Each click of an arrow key moves the slider one degree. Then click Enter. The wing moves to the desired angle. Movement of the wing can be stopped at any time by clicking Enter again.

4.24.4 Depth and Altitude Displays

For convenience depth and altitude is displayed on the *Control Wing* tab of the *Control Towfish Setup* dialog box. The displayed information is the same as that displayed in the Information window as shown in Figure 4-20 on page 4-15.

4.25 Operating SonarPro with a Series 3000 Sonar System

SonarPro operates with either the Series 3000 or Series 5000 Sonar System. However, each system has a different vxWorks and Startup.ini file. If you own both systems, make sure you have the proper file set loaded into the Klein directory before booting up the system. SonarPro will automatically detect and configure to the system that it is connected to.

The Series 3000 includes a dual frequency towfish and an optional chirp sub bottom profiler. You can operate both the low and high frequency sonars simultaneously as shown in Figure 4-83, or you can operate either the low or the high frequency sonar and the chirp sub bottom profiler simultaneously as shown in Figure 4-84. To operate both the low and high frequency sonars, open a second Sonar Viewer window, right click in this window to open the *Sonar Viewer Properties* dialog box to the *Plan View Configuration* tab, and then select the sonar frequency option, usually **Low**. To view sub bottom profile data, choose *Sub Bottom Viewer* from the *Window* menu or click the **New Sub Bottom Viewer** button.

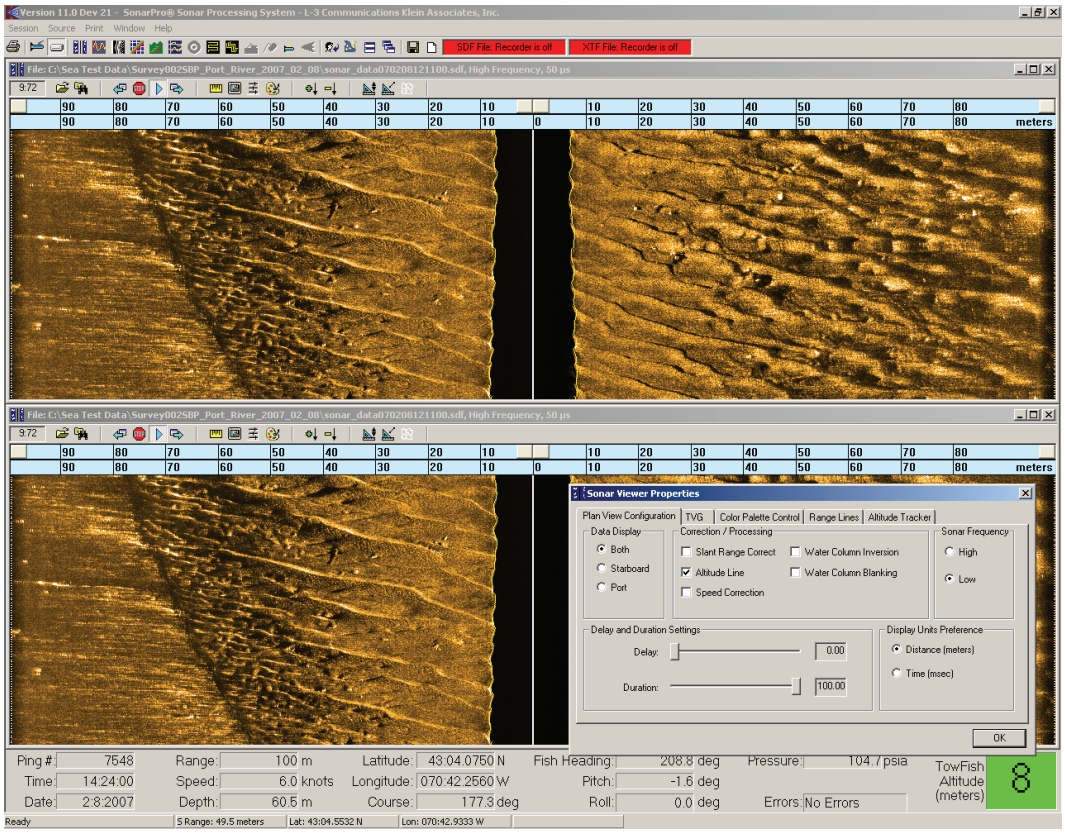


Figure 4-83: *Sonar Viewer Window—Dual Frequency Operation with the Series 3000 Sonar System*

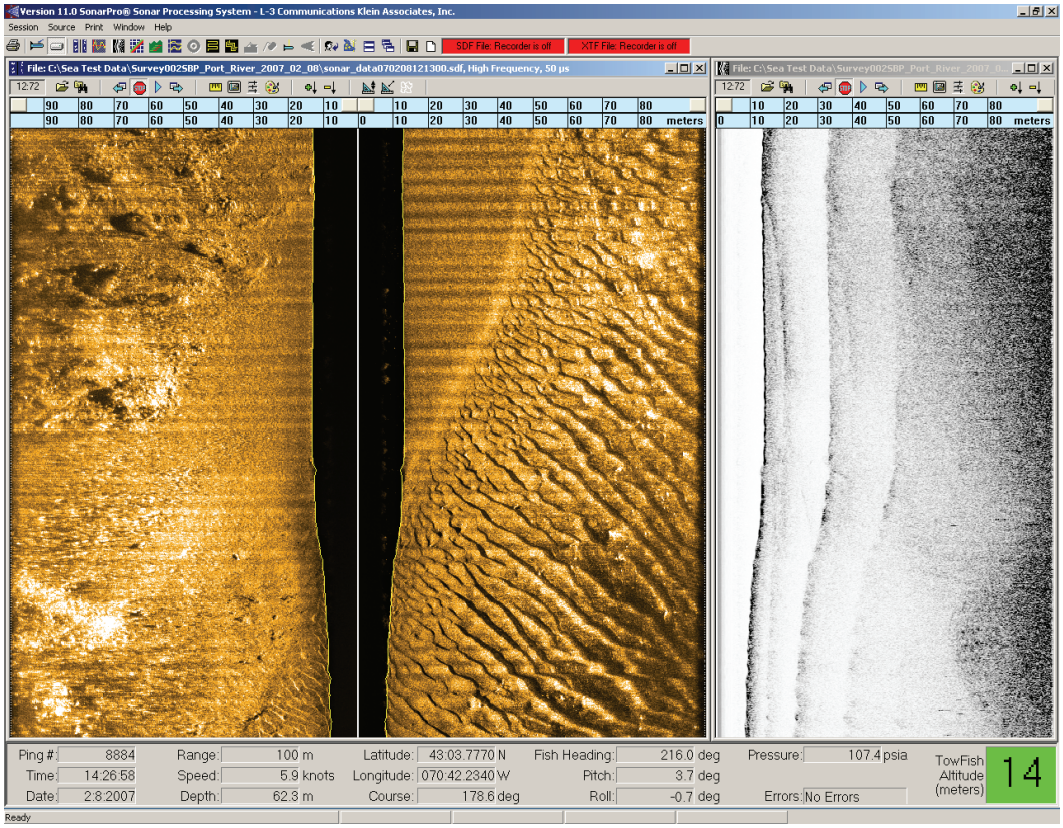


Figure 4-84: *Sonar and Sub Bottom Viewer Windows—Simultaneous High Frequency Sonar and Chirp Sub Bottom Operation with the Series 3000 Sonar System*

To operate SonarPro in real time, refer to "Operating in Real Time" on page 4-6. When operating in real time, the Sub Bottom Viewer window includes the real-time tool bar shown in Figure 4-85. Most of the buttons on this tool bar function the same as those on the corresponding tool bar in the Sonar Viewer window. However the **Ruler**, **Display**, **TVG** and **Palette** buttons each open the *Sub Bottom Profiler Viewer Properties* dialog box where you can adjust the display settings in the Sub Bottom Viewer window.

Figure 4-85: *The Real-Time Tool Bar—Sub Bottom*

To operate SonarPro in playback, refer to "Operating in Playback" on page 4-20. When operating in playback, the Sub Bottom Viewer window includes the playback tool bar shown in Figure 4-86. Again, except for the **Ruler**, **Display**, **TVG** and **Palette** buttons, the buttons on this tool bar also function the same as those on the corresponding tool bar in the Sonar Viewer window.

Figure 4-86: *The Playback Tool Bar—Sub Bottom*

To record sonar data, refer to “Recording Sonar Data” on page 4-17.

Ruler

Click this button to show or hide the ruler in the Sub Bottom Viewer window. The ruler is displayed in cyan below the tool bar and has two scales. The top scale is a fixed reference based on the range setting and is either in meters or in time, depending on whether the **Distance** or **Time** option is selected on the *Plan View Configuration* tab of the *Sub Bottom Profiler Viewer Properties* dialog box as described below. The lower scale is variable. By adjusting the sliders on the top scale, you can zoom in or out of any water column segment of the displayed sub bottom profile data. Effectively, the left slider selects the distance or time from the start of each scan to where or when the display of data starts. The right slider selects the distance or time in each scan over which data are displayed. When adjusting the sliders, the scaling of the lower scale adjusts automatically, and double clicking either slider returns the lower scale to the range setting.

Display

Click this button to open the *Sub Bottom Profiler Viewer Properties* dialog box to the *Plan View Configuration* tab as shown in Figure 4-87. You can set the properties of the Sub Bottom Viewer window here.

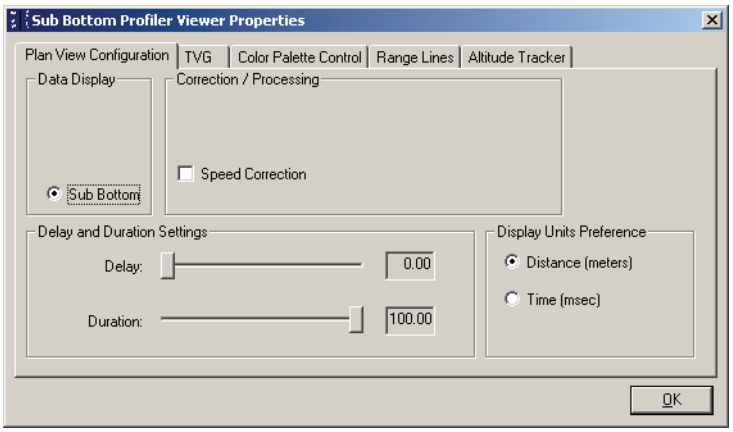


Figure 4-87: *The Sub Bottom Profiler Viewer Properties Dialog Box—Plan View Configuration Tab*

On the *Plan View Configuration* tab you can make the following selections and adjustments:

- The **Sub Bottom** option is only an indicator. It is there to notify you that adjustments made in this dialog box apply to the Sub Bottom Viewer window only.
- Select the **Speed Correction** check box to turn on speed correction. There is an 8-ping delay when selecting this check box.
- Select the **Distance** option to scale the ruler in meters; select the **Time** option to scale the ruler in milliseconds.
- Adjust the **Delay** and **Duration** settings to zoom in or out of any water column segment of the displayed sub bottom profile data. The **Delay** adjustment postpones the display of data in distance or time from the start of each scan, depending on whether the **Distance** or **Time** option is selected. Effectively it selects where or when in each scan the display of data starts. The **Duration** adjustment selects the distance or time in each scan over which data are displayed. Effectively it selects where or when in each scan the display of data ends. The ruler scale and its units are automatically adjusted accordingly.

TVG

Click this button to open the *Sub Bottom Profiler Viewer Properties* Dialog box to the *TVG* tab as shown in Figure 4-88. By adjusting the sliders you can control the initial, end and overall intensity of the displayed sub bottom profile data. The TVG starts when the bottom is automatically detected or in accordance with a manual entry for altitude, the selection of which is made on the *Altitude Tracker* tab of the *Sub Bottom Profiler Viewer Properties* dialog box.

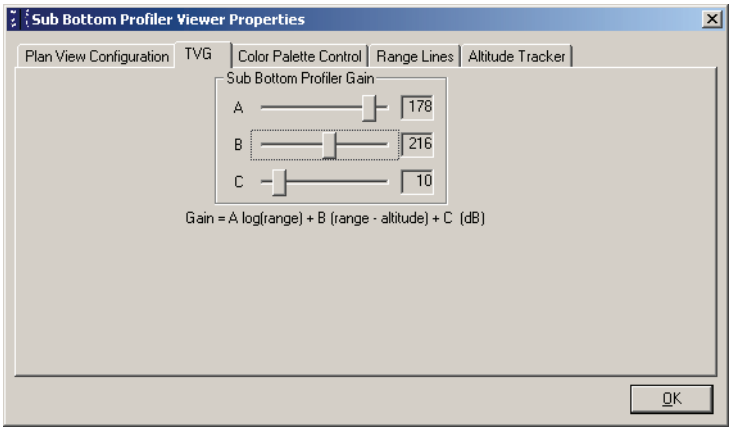


Figure 4-88: *The Sub Bottom Profiler Viewer Properties Dialog Box—TVG Tab*

Palette

Click this button to open the *Sub Bottom Profiler Viewer Properties* dialog box to the *Color Palette Control* tab as shown in Figure 4-89. You can adjust the color of the data being displayed. Select **Inverse Video** to display stronger returns as dark and weaker ones as light. It is the default selection and is usually preferred. To return to the default color palette at any time, click **Use Default Palette**.

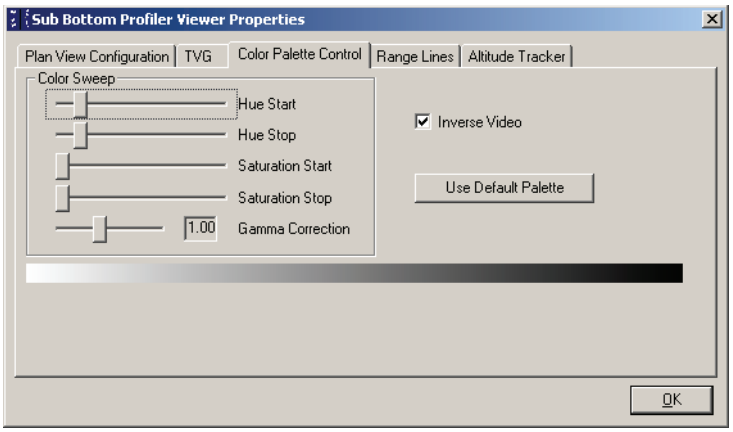


Figure 4-89: *The Sub Bottom Profiler Viewer Properties Dialog Box—Color Palette Control Tab*

The *Range Lines* tab is shown in Figure 4-90. To open this tab right-click anywhere in the Sub Bottom Viewer window to open the *Sub Bottom Profiler Viewer Properties* dialog box, and then click the tab. On this tab you can turn the range lines on or off in the Sub Bottom Viewer window. The distance between the range lines and the color of the lines can also be set here. Click **Specify Range Line Color** to open a color selection box.

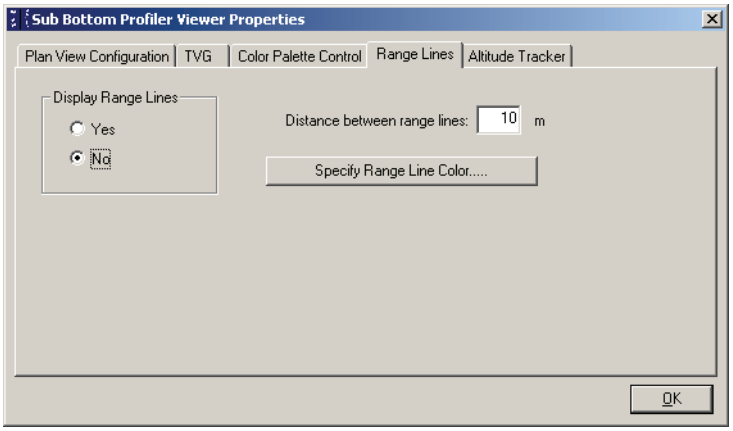


Figure 4-90: *The Sub Bottom Profiler Viewer Properties Dialog Box—Range Lines Tab*

The *Altitude Tracker* tab is shown in Figure 4-91. To open this tab right-click anywhere in the Sub Bottom Viewer window to open the *Sub Bottom Profiler Viewer Properties* dialog box, and then click the tab. On this tab you can override the auto tracker setting in an attempt to track the bottom in adverse operating conditions. The altitude determines the start of TVG which affects the display of the sub bottom profile data.

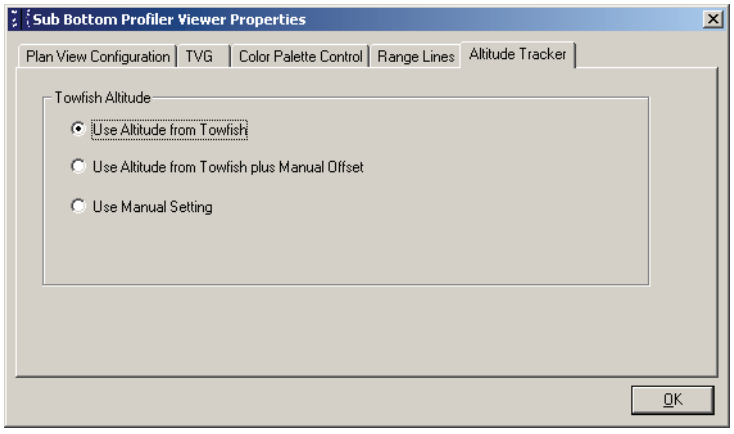


Figure 4-91: *The Sub Bottom Profiler Viewer Properties Dialog Box—Altitude Tracker Tab*

Select **Use Altitude from Towfish** to run with auto tracking on. This is the default setting and should be used almost all of the time. However, if conditions warrant, select **Use Manual Setting** to enable manual altitude tracking or select **Use Altitude from Towfish plus Manual Offset** to enable the sum of both auto and manual tracking. Once either of these two options is selected, the **Manual Towfish Altitude Offset** scroll box becomes available where you can enter an estimated altitude. In addition, a display with a cyan background will appear in the Sub Bottom Viewer window tool bar indicating either "Manual Altitude" followed by the altitude for the **Use Manual Setting** option or "Offset Altitude" followed by the altitude for the **Use Altitude from Towfish plus Manual Offset** option:

The Sub Bottom Profiler Scan window, which is shown in Figure 4-92, displays the signal intensities of the sub bottom profile data similar to how they would be seen on an oscilloscope. To open the Sub Bottom Profiler Scan window, choose *Sub Bottom Scan* from the *Window* menu.

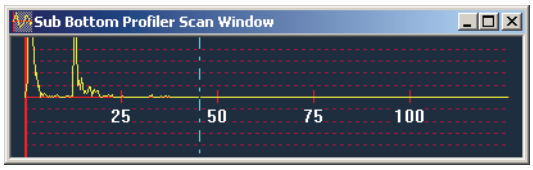


Figure 4-92: *The Sub Bottom Profiler Scan Window*

Right-clicking in the Sub Bottom Scan window opens the *SBP A-Scan Display Configuration* dialog box shown in Figure 4-37. In this dialog box you can use the Gain slider to adjust the gain of the signal being displayed.

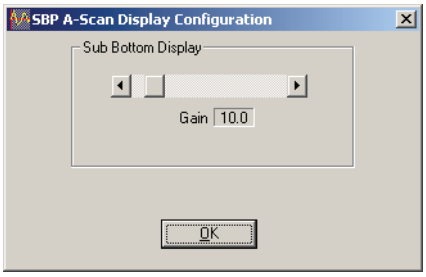


Figure 4-93: *The SBP A-Scan Display Configuration Dialog Box*

New Sub Bottom Viewer

Click this button on the Main tool bar to open additional Sub Bottom Viewer windows.

4.26 Series 3000 Sonar System Towfish Setup

Towfish Setup

Click this button to configure the towfish setup parameters. The *Sonar Interface* dialog box will open to the *System 3000 Control* tab as shown in Figure 4-15.

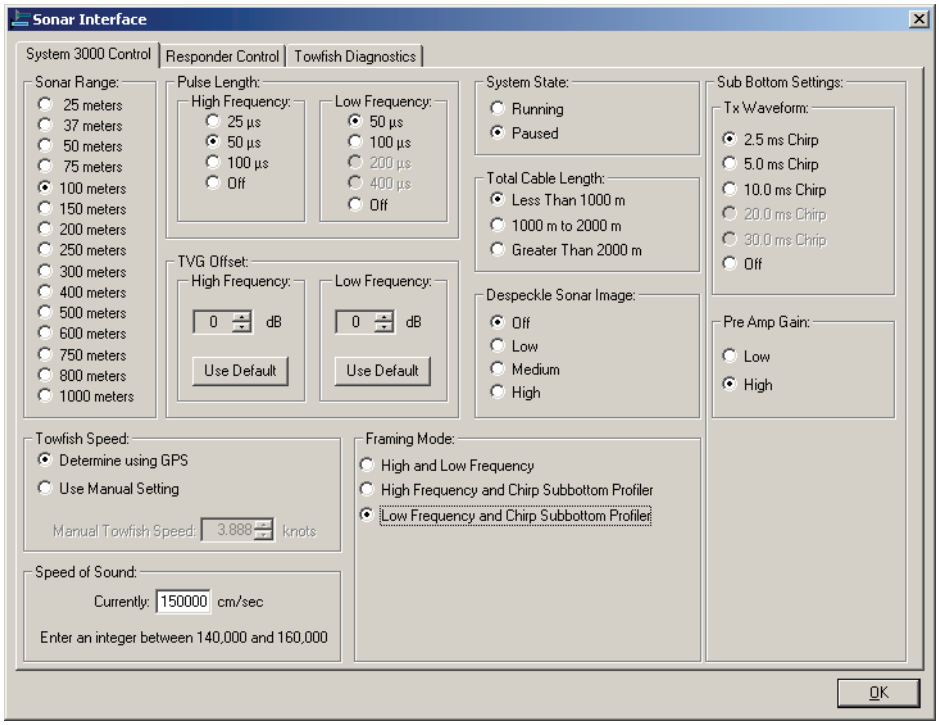


Figure 4-94: *The Sonar Interface Dialog Box, Series 3000 Sonar System—System 3000 Control Tab*

NOTE *For users of a Series 5000 Sonar System, refer to "Series 5000 Sonar System Towfish Setup" on page 4-12 for the towfish setup.*

The *System 3000 Control* tab is the main control interface for the Series 3000 Sonar System. It is used to configure following towfish setup parameters:

Sonar Range. There are 15 range scale settings from 25 meters to 1000 meters. Remember, however, that when operating at ranges longer than 150 meters, the high frequency will fall off at the longer range settings.

Pulse Length. When applicable, you can have different pulse length selections for the high and low frequencies. When you select a range scale, the optimum pulse length will be selected. Keep in mind that longer pulse lengths put more power into the water but lower the resolution. You can select **Off** to turn the unused transmitter off if you are only using one frequency.

System State. Select **Running** or **Paused**. These options function the same as the **Play** and **Stop** buttons on the Sonar Viewer and Sub Bottom Viewer tool bars.

TVG Offset. This setting should only be changed if you are having unsatisfactory results with the tuning or if you are working in unusual conditions, such as extremely soft mud. There is a setting for each the low and the high frequency with 0 dB as the default.

Total Cable Length. Determines the gain setting of the telemetry system in the towfish. This setting should only be changed with instructions from the factory.

Despeckle Sonar Image. Filter settings to smooth sonar images. For the highest resolution, select **Off**.

Towfish Speed. Accurate speed input is necessary for the sonar system to work properly. The system should always be used with a speed input device such as a GPS receiver. A manual setting is available should a failure occur.

Speed of Sound. The speed of sound in water. This setting may be adjusted for special conditions.

Framing Mode. Selects whether to acquire sonar or sub bottom data or both.

Sub Bottom Settings. Selects the chirp pulse length for the sub bottom sonar if installed. The available settings are dependent on the range setting. To turn off the chirp transmitter, select **Off**.

NOTE *The sub bottom sonar acquires data to a maximum range of 250 meters. In addition, the available chirp pulse length selections are dependent on the range setting.*

Pre Amp Gain. Selects either low or high gain for the sub bottom preamplifier.

The *Responder Control* tab shown in Figure 4-95 is used when the towfish is equipped with an optional responder. Set the responder ping rate and the responder frequency here.

The *Towfish Diagnostics* tab shown in Figure 4-96 is used for testing the system. The **Operator Command** area of the dialog box allows you to send specialized commands to the towfish. Refer to APPENDIX C: “General Setup, Configuration and Troubleshooting,” for more information on using this dialog box.

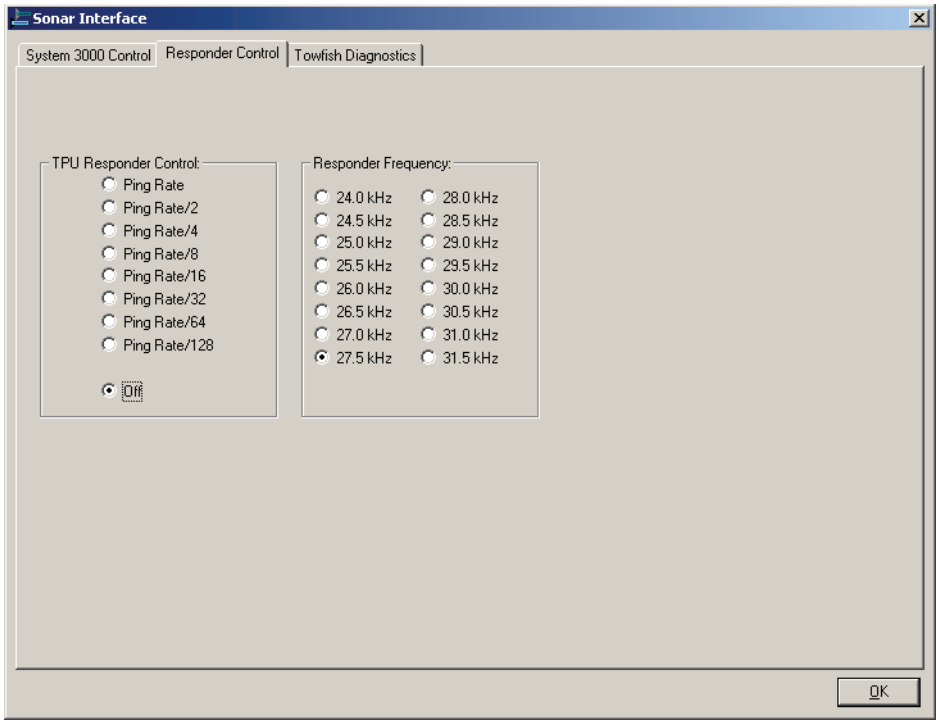


Figure 4-95: *The Sonar Interface Dialog Box, Series 3000 Sonar System—Responder Control Tab*

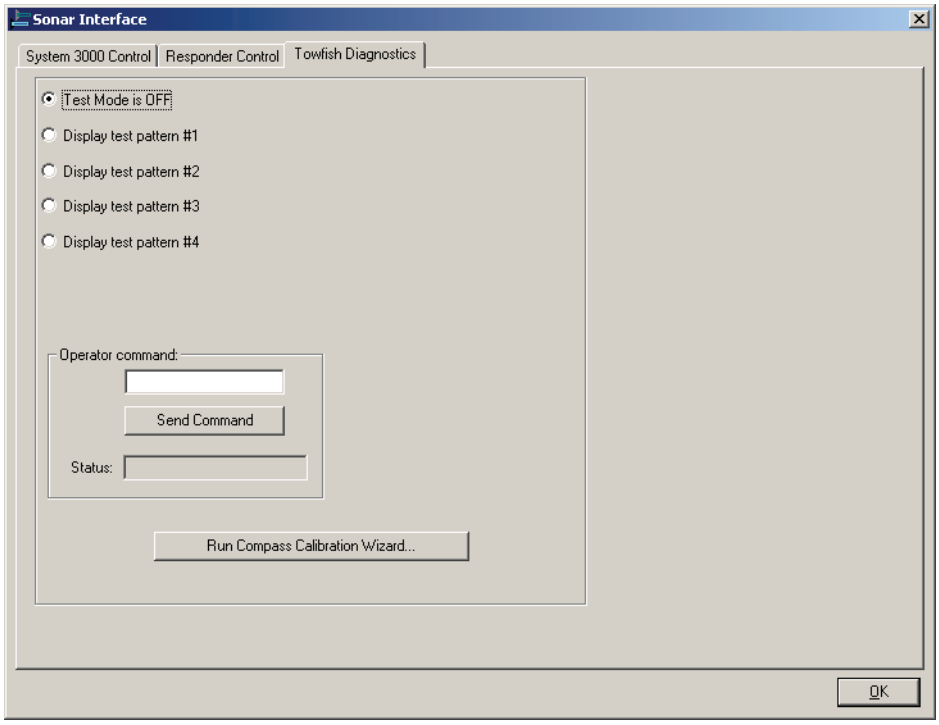


Figure 4-96: *The Sonar Interface Dialog Box, Series 3000 Sonar System—Towfish Diagnostics Tab*

Click **Run Compass Calibration Wizard** to open the *Compass Calibration Wizard* dialog box which is shown in Figure 4-18 on page 4-14. This provides a fairly quick and accurate method for calibrating the towfish compass. (See page 4-14 for instructions on how to use the Compass Calibration Wizard.)

The Series 3000 towfish uses a different pressure sensor than the Series 5000 towfish. If your towfish is equipped with a pressure sensor for towfish depth readings, choose *Sensor* from the *Window* menu to open the Sensor window, and then right-click in the window to open the *Sensor Configuration* dialog box shown in Figure 4-61 on page 4-47. Select the correct pressure sensor scale option. For the Series 3000, **1500 psia** is the default selection, and **300 psia** is the optional selection.

4.27 Notes on Time Usage

4.27.1 TPU Time in SonarPro

When using SonarPro, a date and time is displayed in the Information window. This time is also in the header in the .sdf data that comes from the TPU. The time is set when SonarPro is started on the master computer.

When the system is successfully booted, SonarPro can be started from the master computer. The master computer controls the range, pulse width, etc. of the sonar, and only one master computer can be running at a time with one sonar. Any other computers connected to the Ethernet Hub and running SonarPro, would be considered slaves. The slave computers running SonarPro have no control of the sonar or the TPU.

When SonarPro starts on the master computer, a message is sent to the TPU to set the TPU clock. The TPU in turn looks at the GPS navigation input on COM2. If it sees an RMC sentence on COM2 in the GPS message, the TPU clock is set to the GPS time which is Zulu time. If an RMC message is not seen on COM2, the TPU sets its clock to the master computer's clock.

The TPU clock is set whenever SonarPro is started from the master computer. Thereafter it keeps its own time, either GPS or master computer time. Therefore if the navigation input is not present when SonarPro is started on the master computer, and the navigation input is connected after SonarPro is started, the TPU will not follow GPS time. SonarPro will have to be restarted, or a new state will have to be initialized to sync the TPU to the GPS time with the RMC sentence present.

If another operating system other than SonarPro is used, it most likely will not set the TPU clock. SonarPro should be started before the other operating system to sync the TPU to GPS time if desired. Once the TPU has been synced, SonarPro can be shut off and the TPU will continue to keep time with its own clock. Another solution would be to set the master computer to GPS (Zulu) time.

In the header information for .sds files, there are two times. The first time is that described above, and again, it is set when SonarPro is started. The second time or fix time hour, minutes and seconds is the time read from the GPS input on COM2 if a sentence with time is input. This time is not viewable in SonarPro.

4.27.2 IRIG

Some users choose to use an IRIG board to ensure accurate time. The IRIG board is installed in the TPU as an option. The IRIG board is triggered by an external IRIG time generator which is synced to a time source, such as a GPS or other extremely accurate time source. The IRIG board in turn sends a time message to the TPU on each ping of the sonar, updating the TPU clock time.

4.27.3 Data File Time

When data are stored on a computer running SonarPro, the date and time stamp of the data files is stamped to the computer that is being used to store the data. The computer can be either the master or a slave.

For researching data files after surveys, searches, etc., it is recommended to set all computers used to record data files to the local date and time or to Zulu date and time.

CHAPTER 5: EQUIPMENT MAINTENANCE

This chapter provides instructions for equipment maintenance and includes guides for taking care of the equipment on a daily, weekly, and long term basis. In addition, instructions are provided for replacing the fixed tail cone assembly.

5.1 Maintenance General Comments

Equipment used at sea is subjected to severe environmental and handling conditions. While the Series 3000 Sonar System is designed to operate in such conditions, a certain amount of routine maintenance is necessary to ensure trouble free, long term operation.

Keep a maintenance log. This provides assistance in tracking what has or has not been done with the system. A log is useful when tracking problems, if they do occur, and is especially important if more than one TPU, Computer Control and Display Unit (computer), or towfish is used in a large survey operation. Inventory the system, related spares and accessories carefully. Record the serial numbers of the major components, such as the TPU, the computer, and the towfish. Store the shipping boxes in a safe place so they can be reused when needed. A small amount of regular maintenance and care makes the critical difference in a successful field operation. The following pages contain the recommended routine checking and maintenance schedules for a daily, weekly, and long term basis.

5.2 Maintenance Checklists

5.2.1 Daily Maintenance Checklist

Perform the following maintenance steps at the end of each day's operation:

1. Turn off the power to the TPU and to the computer.
2. Verify that all cables and connectors are secure and tightened.
3. If fresh water is available, wash down the towfish and towing apparatus. Cover them while not in use to protect against salt water spray and to minimize corrosion.

4. Keep the tow cable plugged into the towfish, or use dummy plugs on the tow cable and towfish to keep the connectors from exposure to the salt atmosphere. Remember to put a thin film of silicone grease, such as Dow-Corning 4, on the rubber portion of the underwater connector every time the towfish is disconnected. Avoid getting too much grease on the metal pins of the connector; a very light coating is sufficient.
5. Check that all of the screws on the towfish are tight.

5.2.2 Weekly Maintenance Checklist

Perform the following maintenance steps at the end of each week's operation:

1. Turn off the power to the TPU and to the computer.
2. Check all cables for abrasion and damage. If any wear spots are noticed, clean them with fresh water, dry them, and wrap them carefully with electrical tape, such as Scotch #88 or #33. If there is wear or fraying in any of the cables in an area subject to high tension, repair or replace the cable.
3. Inspect and clean the system plugs and jacks.
4. Inspect the towfish for signs of corrosion or other damage.
5. Check the underwater connectors on the towfish. The contacts should be clean and shiny. Contacts may be cleaned with a rubber pencil eraser or very fine emery paper.

5.2.3 Long Term Maintenance Checklist

Perform the following maintenance steps at six month intervals, or more frequently when continued long term usage is occurring.

1. Turn off the power to the TPU and to the computer.
2. Thoroughly clean the TPU, cables and towing equipment. Clean the top and outside surfaces of the TPU using a cloth dampened with fresh water. Use a small amount of detergent if necessary. Do not let dirt and salt deposits accumulate on the TPU cabinet.
3. Replace the AC fuses in the TPU as preventive maintenance. Fuses will sometimes fatigue after long term use or operation.
4. Remove the screws securing the nose cone of the towfish and check that the connectors are firmly seated. Use a thin film of silicone grease on all external connectors. Make sure the transducer leads are free from cuts or abrasion.
5. Follow the instructions in the manufacturer's manual for any necessary cleaning and maintenance of the computer.

CHAPTER 6: SPLASHPROOF TPU

For use in open boat operations where exposure to rain and spray is likely, a lightweight, rugged, splashproof configuration of the Transceiver and Processor Unit (TPU) is available. The Splashproof TPU is similar to the rack mount configuration but is housed in a watertight, corrosion proof, high impact resistant Pelican Protector Case. Like the rack mount version, this TPU connects to the towfish and to the Ethernet port of an optional or user supplied ruggedized laptop computer running SonarPro.

6.1 General Description

The Splashproof TPU is shown in Figure 6-1. It provides the same functions and most of the same external connections as the rack mount TPU, plus optional GPS and wireless router connections. All of the connectors, indicators and switches are splashproof and are located on a connector panel on the side of the case. In addition, two view ports on the connector panel allow viewing of additional indicators inside the TPU.

The Splashproof TPU is powered from 115 or 230 VAC, internally switch selectable, or from 12 VDC. A switch on the connector panel allows selection of the AC or DC power source.

Figure 6-1: *Splashproof TPU*

CAUTION *Do not submerge the Splashproof TPU in water as it is not designed for continuous immersion. (See "Specifications" on page 6-14.)*

6.1.1 Optional Wireless Router

The optional wireless router provides a wireless network connection to a computer running SonarPro with a wireless Ethernet device. This wireless router is capable of providing sufficient data bandwidth to support the data throughput of the system. However, these wireless devices share a radio-frequency band with many other RF devices. As a result, it is possible that RF interference from other equipment could limit the data bandwidth of the wireless network connection and reduce the data throughput to the computer such that it lags the rate of data acquisition. Should this occur, you should connect the computer directly to the Splashproof TPU using the waterproof LAN cable provided.

6.1.2 Venting the Splashproof TPU

The Splashproof TPU includes a vent which can be easily opened or closed. The TPU is shipped with the vent closed as shown in Figure 6-2.

Figure 6-2: *Splashproof TPU Vent Closed*

CAUTION *The vent on the TPU must be opened when the outside air temperature exceeds 30 °C. Failure to do so may damage the TPU.*

To open the vent, loosen each of the screws by hand or by using a flat bladed screw driver, keeping them captive to the TPU, until the vent pops open approximately one-half inch as shown in Figure 6-3.

To close the vent, tighten each of the screws until the vent is completely closed. Hand tightening is sufficient.

Figure 6-3: *Splashproof TPU Vent Open*

6.1.3 External Connections

The external connections to the Splashproof TPU are made on the connector panel which is shown in Figure 6-4. The connector panel is also shown inside the case cover in Figure 6-5. Most of the connectors on this panel are wired to internal connectors which connect to the Demultiplexer and CPU boards as shown in Figure 6-6 on page 6-6. The external connections are the following:

TOWFISH: 8-pin bulkhead connector that connects to the towfish using the towfish cable.

This connector is internally wired to a BNC connector that connects to the 200 VDC power supply. The power supply's data output connector connects to the CABLE connector of the Demultiplexer board using a BNC cable.

LAN: RJ-45 connector that connects to the Ethernet port of a computer.

This connector is internally wired to an RJ-45 connector that connects directly to the LAN connector of the CPU board or to the optional wireless router if installed. This router is shown in Figure 6-5.

TRIG: 3-pin bulkhead connector that provides a trigger output for keying external equipment.

This connector is internally wired to a BNC connector that connects to the TRIG 1 connector of the Demultiplexer board.

MAG OUT: 6-pin bulkhead connector that connects to a magnetometer.

This connector is internally wired to a 9-pin DSUB connector that connects to the COM2 connector of the Demultiplexer board.

DEBUG: 3-pin bulkhead connector that connects to the serial port of a computer and can be used to view and save the boot sequence data using HyperTerminal.

This connector is internally wired to an RJ-45 connector that connects to the DBUG connector of the CPU board.

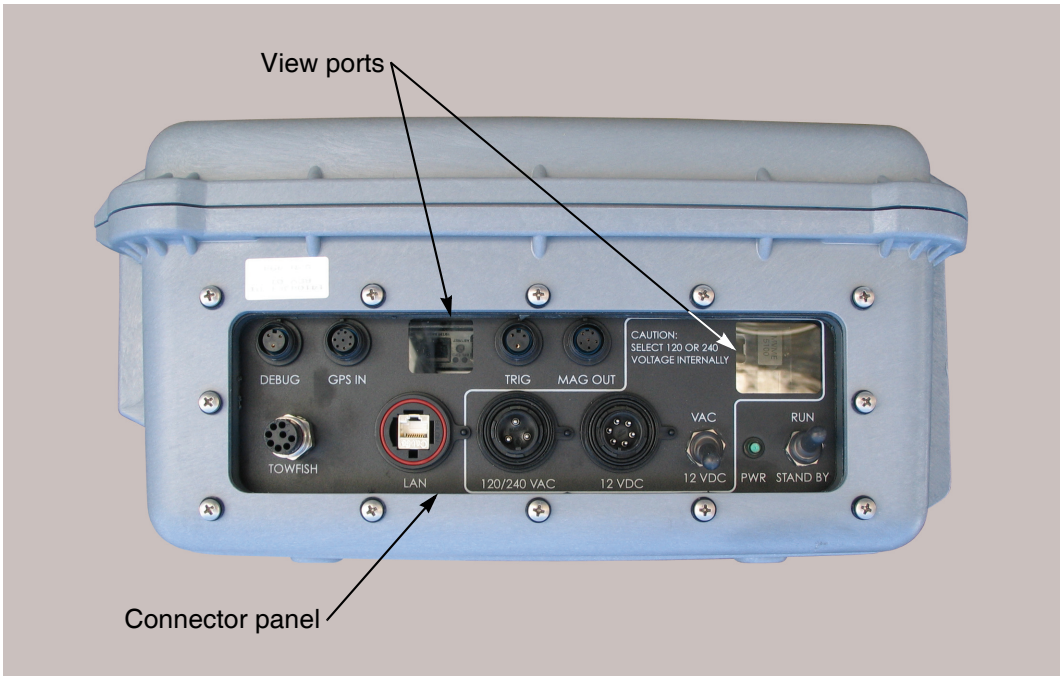


Figure 6-4: *Splashproof TPU Connector Panel*

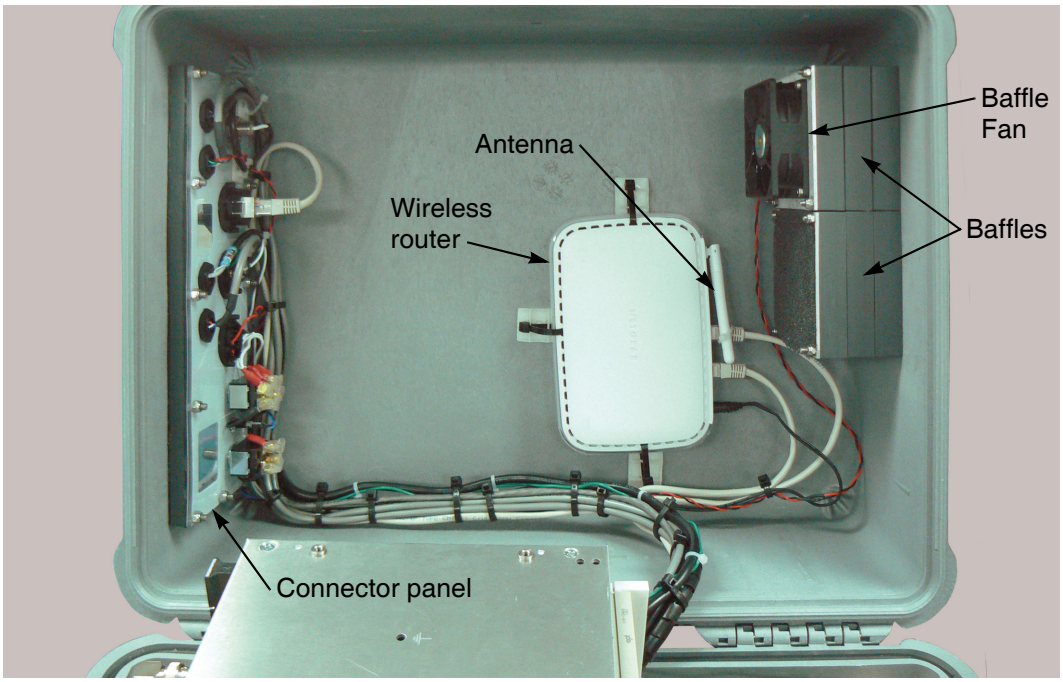


Figure 6-5: *Inside the Cover of the Splashproof TPU Case*

GPS IN: 8-pin bulkhead connector for receiving navigation data.

This connector is internally wired to a 9-pin DSUB connector that connects to the COM1 connector of the Demultiplexer board and to the output of the 12 VDC power supply.

120/240 VAC: 3-pin bulkhead connector that connects to either a 115 or 230 VAC, 50–60 Hz power source.

12 VDC: 6-pin bulkhead connector that connects to a 12 VDC, 1.5 A power source

6.1.4 Operator Controls and Indicators

Most of operator controls and one indicator are located on the connector panel of the Splashproof TPU as shown in Figure 6-4 on page 6-4. They are the following:

PWR: Green indicator that is illuminated when either AC or DC power is on.

VAC/12 VDC: 3-position switch that when switched to VAC, selects AC power to power the TPU, and when switched to 12 VDC, selects DC power to power the TPU. Power is applied in accordance with the RUN/STAND BY switch position. With the switch in the center position, the power is off.

RUN/STAND BY: 2-position switch that when switched to STAND BY, powers the wireless router so it can establish communications with the computer after switching the VAC/12 VDC switch from off to VAC or 12 VDC. When switched to RUN, after communications have been established, applies power to the rest of the components in the TPU. This switch should be in the STAND BY position when the VAC/12 VDC switch is switched from off to VAC or 12 VDC.

VOLTAGE SELECT: Slide switch which selects 115 or 230 VAC operation. This switch is located inside the TPU and is shown in Figure 6-6. (See CAUTIONS on page 6-10 regarding the use of this switch.) The switch positions are 115V and 230V for 115 VAC and 230 VAC operation. The displayed number is the selected voltage.

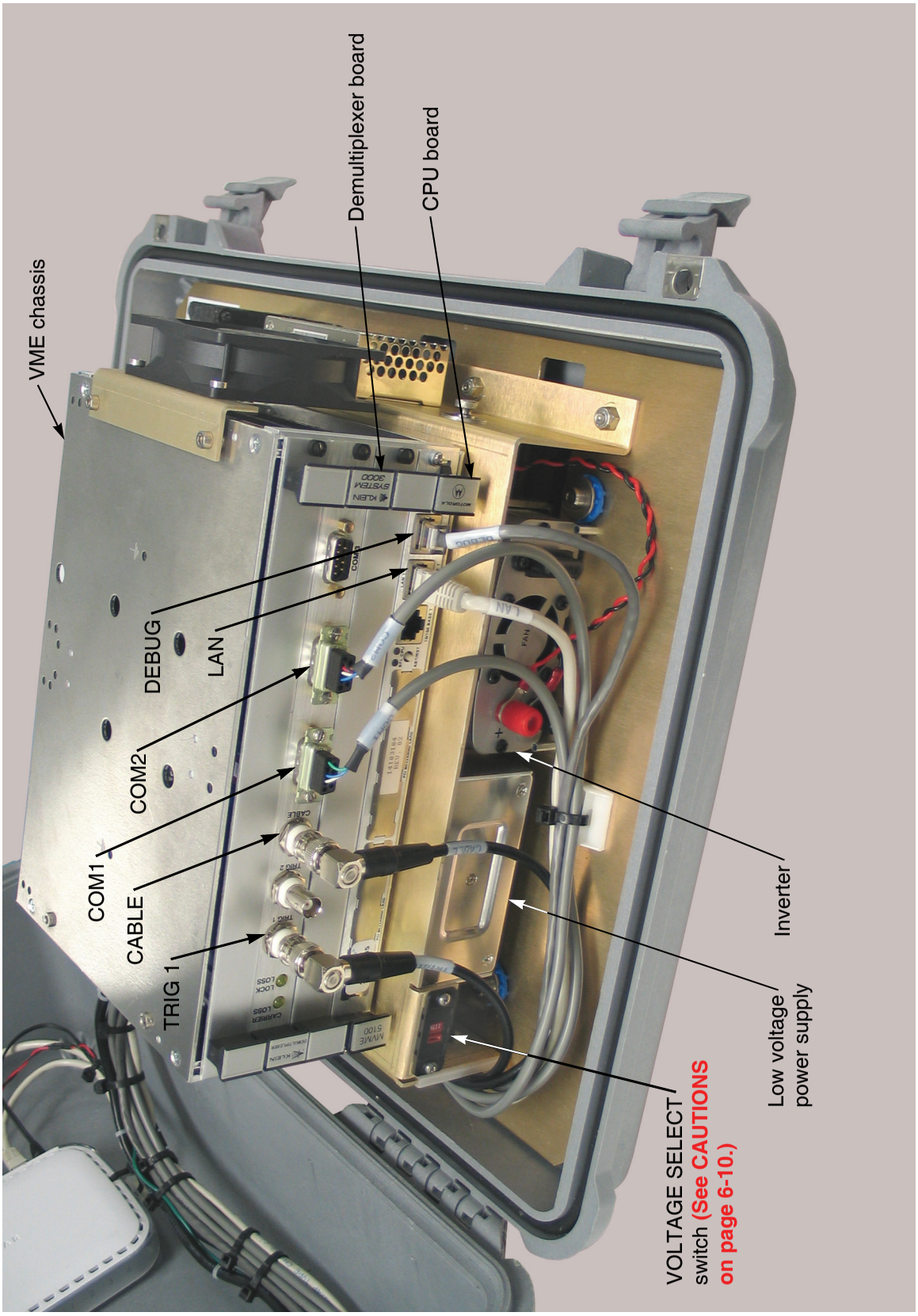


Figure 6-6: *Front Panel of VME Chassis inside Splashproof TPU*

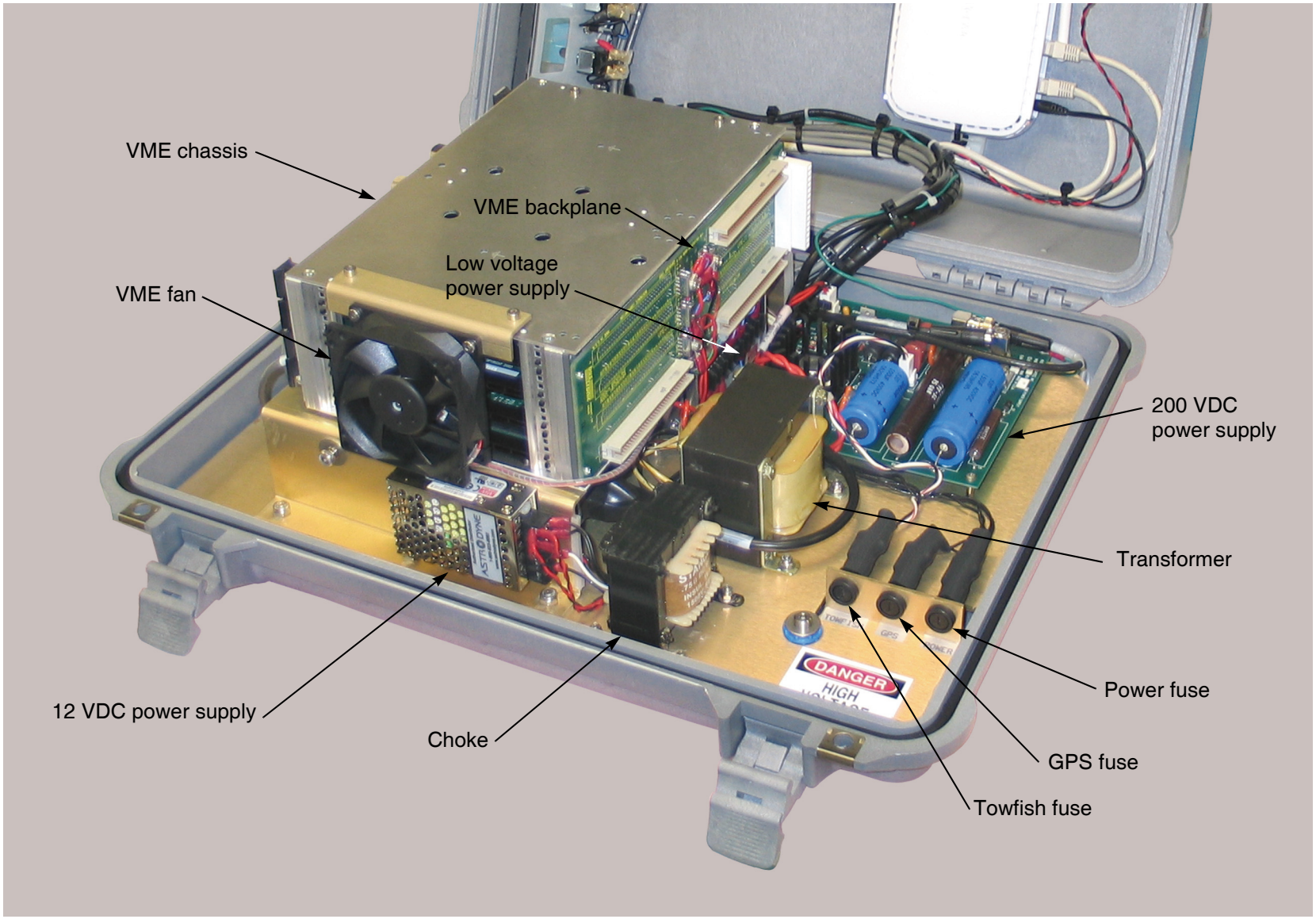


Figure 6-7: *VME Backplane and Power Supply Connections inside Splashproof TPU*

The connector panel also includes two view ports, as shown in Figure 6-4 on page 6-4, which allow you to view the setting of the VOLTAGE SELECT switch and the indicators on the Demultiplexer and CPU boards. For information about the indicators, refer to APPENDIX C: “General Setup, Configuration and Troubleshooting.”

6.1.5 Functional Components

The Splashproof TPU incorporates many of the same functional components as the rack mount configuration, in particular, the same VME chassis. And the VME chassis includes the same Demultiplexer and CPU boards. These components, along with the additional components provided with the Splashproof TPU, are described below and shown in Figure 6-5 on page 6-4, Figure 6-6 on page 6-6 and Figure 6-7 on page 6-7. This information, along with the information provided in APPENDIX C: “General Setup, Configuration and Troubleshooting,” can be useful when performing any system troubleshooting. In addition, refer to “Splashproof TPU Drawings” on page 6-14 for wiring diagrams and connector information.

VME chassis. The VME chassis contains the Demultiplexer and CPU boards.

VME backplane. The VME backplane provides the interconnections between the Demultiplexer and CPU boards in the VME chassis and the +5 VDC, +12 VDC and -12 VDC connections to the boards from the low voltage power supply.

Demultiplexer board. For a functional description of the Demultiplexer board, refer to CHAPTER 1: “Overview.”

CPU board. For a functional description of the CPU board, refer to CHAPTER 1: “Overview.”

200 VDC power supply. The 200 VDC power supply inputs 200 VAC from the transformer and provides 200 VDC to power the towfish. In addition, this power supply provides data coupling to and from the towfish on the 200 VDC power.

Low voltage power supply. The low voltage power supply provides +5 VDC, +12 VDC and -12 VDC to power the VME chassis. The +5 VDC also powers the PWR indicator and the VME fan. This power supply runs automatically on 115 or 230 VAC.

12 VDC power supply. The 12 VDC power supply provides +12 VDC to power the wireless router, the optional GPS and the baffle fan. This power supply runs automatically on 115 or 230 VAC.

Choke. The choke is connected in series with the 200 VDC power to the towfish and the towfish fuse. It is used for power conditioning the 200 VDC.

Power fuse. The power fuse is in series with the main AC power input, the transformer input and the input to the low voltage power supply. It is a 2-A, 5 x 20-mm slow-blow fuse rated for 250 volts (P/N 13000045).

Towfish fuse. The towfish fuse is in series with the 200 VDC output of the 200 VDC power supply. It is a 630-mA, 5 x 20-mm slow-blow fuse rated for 250 volts (P/N 13000043).

GPS fuse. The GPS fuse is in series with the main AC power input and the input to the 12 VDC power supply. It is a 1-A, 5 x 20-mm fast-acting fuse rated for 250 volts (P/N 13000161).

Transformer. The transformer inputs either 115 or 230 VAC, depending on the setting of the VOLTAGE SELECT switch. The transformer output voltage is 200 VAC which is input to the 200 VDC power supply. (See CAUTIONS on page 6-10 regarding the use of the VOLTAGE SELECT switch.)

Inverter. The inverter inputs +12 VDC when the VAC/12 VDC switch is switched to 12 VDC and a 12 VDC supply is connected to the 12 VDC connector on the connector panel. The inverter output is 115 VAC which provides the main AC input power for the TPU. When using +12 VDC to power the TPU, the VOLTAGE SELECT switch must be switched to 115V.

Baffle fan. The baffle fan provides cooling for the inside of the case.

VME fan. The VME fan provides cooling for the VME chassis.

Baffles. The baffles allow air to flow out of the case to cool the inside without allowing rain or spray inside the case.

Wireless router. The wireless router is optional and is used for wireless communications with the computer.

Antenna. The antenna is attached to the optional wireless router and should be left in the position shown in Figure 6-5 on page 6-4.

6.2 Setting up and Connecting the Splashproof TPU

Setting up and connecting the Splashproof TPU is similar to that of the rack mount TPU as described in APPENDIX C: “General Setup, Configuration and Troubleshooting.” However, the power connections are different. In addition, if the optional wireless router is installed, and you will be using this option, you do not require a Ethernet Hub and you must change the IP address settings both in your computer and in the TPU.

6.2.1 Included Accessories

The following accessories are included with the Splashproof TPU:

- AC power cord
- DC power cord
- Towfish jumper cable
- GPS connector
- TRIG connector
- Waterproof LAN cable

6.2.2 Connecting Power

The TPU can be powered from a 115 VAC, 230 VAC or 12 VDC power source. However, before making any power connections, refer to the CAUTIONS below. To open the TPU, lay it on a flat surface with the connector panel to your left. The connector labels will be upside down. Then release the two latches and carefully open the cover.

CAUTION *When powering the TPU from a 12 VDC power source, be sure the VOLTAGE SELECT switch inside the TPU is switched to 115V. Failure to do so will not provide the required 200 VDC to power the towfish. The VOLTAGE SELECT switch is shown in Figure 6-6 on page 6-6.*

CAUTION *Do not power the TPU from a 230 VAC power source if the VOLTAGE SELECT switch inside the TPU is switched to 115V. This switch must be switched to 230V before powering the TPU from a 230 VAC power source. Failure to do so may damage both the TPU and the towfish. The VOLTAGE SELECT switch is shown in Figure 6-6 on page 6-6.*

To connect power to the TPU:

1. If you will be connecting a 115 VAC *or* 12 VDC power source to the TPU, set the VOLTAGE SELECT switch inside the TPU to 115V. Refer to the CAUTIONS stated above. Close and latch the TPU cover.

   If you will be connecting a 230 VAC power source to the TPU, set the VOLTAGE SELECT switch inside the TPU to 230V. Refer to the CAUTIONS stated above. Close and latch the TPU cover.
2. Connect the AC power to the 120/230 VAC connector on the TPU.
3. Connect the DC power source to the 12 VDC connector.

6.2.3 Configuring the Wireless Network Connection for Windows 2000

To configure the wireless network connection for Windows 2000:

1. Refer to “Windows 2000 LAN Configuration Setup” on page C-11 and perform the first two steps to open the *Network and Dial up Connection* dialog box. Then in Step 3, right click *Wireless Network Connection*.

   The *Local Area Connection Properties* dialog box opens.

2. Continue with Step 4, and then in Step 5 change the IP address from 192.168.0.82 to 192.168.0.83.

3. Click **OK**.

NOTE *Once you have entered the IP address for the wireless network connection, your computer will automatically select the local area network (LAN) connection when connecting a LAN and the wireless connection when removing the LAN connection.*

---

4. Continue with Step 1 through Step 3 to begin setting up the FTP service. Then in Step 4, change the IP address from 192.168.0.82 to 192.168.0.83.

5. Click **OK**.

6. Refer to “TPU LAN Configuration Setup” on page C-24 and connect a Terminal PC running HyperTerminal to the DEBUG connector.

7. Verify that the VAC/12 VDC switch is in its center position which is off.

8. Switch the RUN/STANDBY switch on the TPU to RUN.

9. Switch the VAC/12 VDC switch to VAC to apply AC power to the TPU and turn in on; switch to 12 VDC to apply DC power and turn it on. Refer to the CAUTIONS on page 6-10.

NOTE *It is normal for a spark to occur when connecting the DC power cable to a battery, as the inverter is being powered up.*

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10. When the TPU begins to boot up, press any key.

11. Enter "c."

12. Change the IP address from 192.168.0.82 to 192.168.0.83 for "host inet (h)."

13. Turn the TPU off.

6.2.4 Configuring the Wireless Network Connection for Windows XP

To configure the wireless network connection for Windows XP:

1. Refer to “Windows XP LAN Configuration Setup” on page C-16 and perform the first two steps to open the *Network Connection* dialog box. Then in Step 3, right click *Wireless Network Connection*.

   The *Local Area Connection* dialog box opens.

2. Continue with Step 4, and then in Step 5 change the IP address from 192.168.0.82 to 192.168.0.83.

3. Click **OK**.

NOTE *Once you have entered the IP address for the wireless network connection, your computer will automatically select the local area network (LAN) connection when connecting a LAN and the wireless connection when removing the LAN connection.*

---

4. Continue with Step 1 through Step 3 to begin setting up the FTP service. Then in Step 4, change the IP address from 192.168.0.82 to 192.168.0.83.

5. Click **OK**.

6. Refer to “TPU LAN Configuration Setup” on page C-24 and connect a Terminal PC running HyperTerminal to the DEBUG connector.

7. Verify that the VAC/12 VDC switch is in its center position which is off.

8. Switch the RUN/STANDBY switch to RUN.

9. Switch the VAC/12 VDC switch to VAC to apply AC power to the TPU and turn in on; switch to 12 VDC to apply DC power and turn it on. Refer to the CAUTIONS on page 6-10.

NOTE *It is normal for a spark to occur when connecting the DC power cable to a battery, as the inverter is being powered up.*

---

10. When the TPU begins to boot up, press any key.

11. Enter "c."

12. Change the IP address from 192.168.0.82 to 192.168.0.83 for "host inet (h)."

13. Turn the TPU off.

6.3 Activating the Splashproof TPU

Activating the Splashproof TPU is similar to that of the rack mount TPU.

SHOCK HAZARD *Do not connect or disconnect the tow cable from the towfish or the TPU when power is on. Failure to follow this practice may result in personal injury and will damage the towfish or the TPU electronics, or both.*

CAUTION *Serious damage to the towfish electronics may occur if the towfish is operated on deck for periods longer than fifteen minutes. Between periods of operation, let the sonar cool for fifteen minutes. In high temperature climates, protect the towfish from direct exposure to the sun prior to and during operation.*

To activate the Splashproof TPU:

1. Connect the towfish cable to the TOWFISH connector of the TPU.
2. Turn on the computer and wait for it to fully boot up.
3. Switch the RUN/STAND BY switch to STAND BY.
4. Switch the VAC/12 VDC switch to VAC to apply AC power to the TPU and power the wireless router; switch to 12 VDC to apply DC power. Refer to the CAUTIONS on page 6-10.

NOTE *It is normal for a spark to occur when connecting the DC power cable to a battery, as the inverter is being powered up.*

5. Wait for the wireless network connection to establish communications with the computer.
6. Switch the RUN/STAND BY switch to RUN.
7. The boot sequence will begin, and when completed, the CARRIER LOSS and LOCK LOSS indicators on the Demultiplexer board will turn off. These indicators can be viewed through the view ports on the connector panel of the TPU.

6.4 Specifications

The specifications for the Splashproof TPU, except for those listed below, are the same as the rack mount TPU. Refer to CHAPTER 2: "Specifications," for those specifications.

NOTE *Specifications are typical and subject to change without notice.*

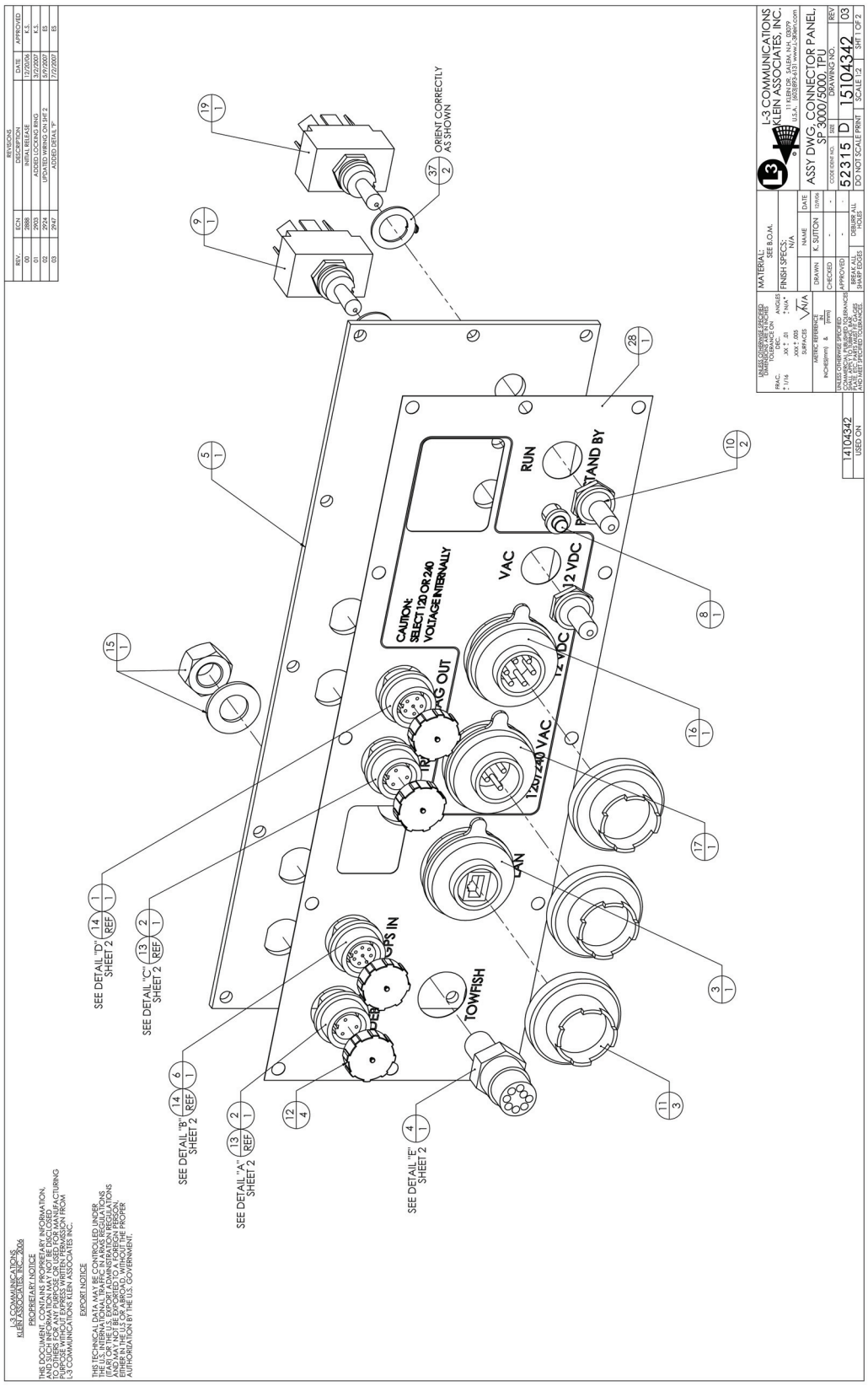
Power consumption:	250 VA (nominal)
Input voltages:	115 or 230 VAC, 50–60 Hz, manually selected; or +12 VDC at 12 A
Optional wireless router:	IEEE 802.11b or 802.11g
Size:	52.5 cm (20.7 in.) wide 21.7 cm (8.5 in.) high 43.6 cm (17.2 in.) deep
Weight:	16.4 kg (36 lb)
Operating temperature:	0–40° C with vent open; 0–30° C with vent closed
Ingress protection:	Designed to IP-66 with vent closed; IP-56 with vent open

6.5 Splashproof TPU Drawings

Listed in Table 6-1 are the drawings for the Splashproof TPU. They are provided for reference and troubleshooting purposes.

Table 6-1: *List of Drawings*

DRAWING NO.	TITLE
15104342	Assembly Drawing, Connector Panel, SP 3000/5000, TPU (Sheets 1 and 2)
14314343	Wiring Diagram, SP 3000/5000 Base Unit
14314344	Wiring Diagram, Splashproof System 3000
15104403	Assembly Drawing, Connector, accessory Kit, SP TPU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REV: ECN DESCRIPTION DATE APPROVED
00 2888 INITIAL RELEASE 12/20/06 K.S.
01 2905 ADDED LOCKING RING 3/2/2007 K.S.
02 2934 UPDATED PANEL PER SHT 2 3/12/2007 BS
03 2942 ADDED DETAIL "F" 7/2/2007 BS
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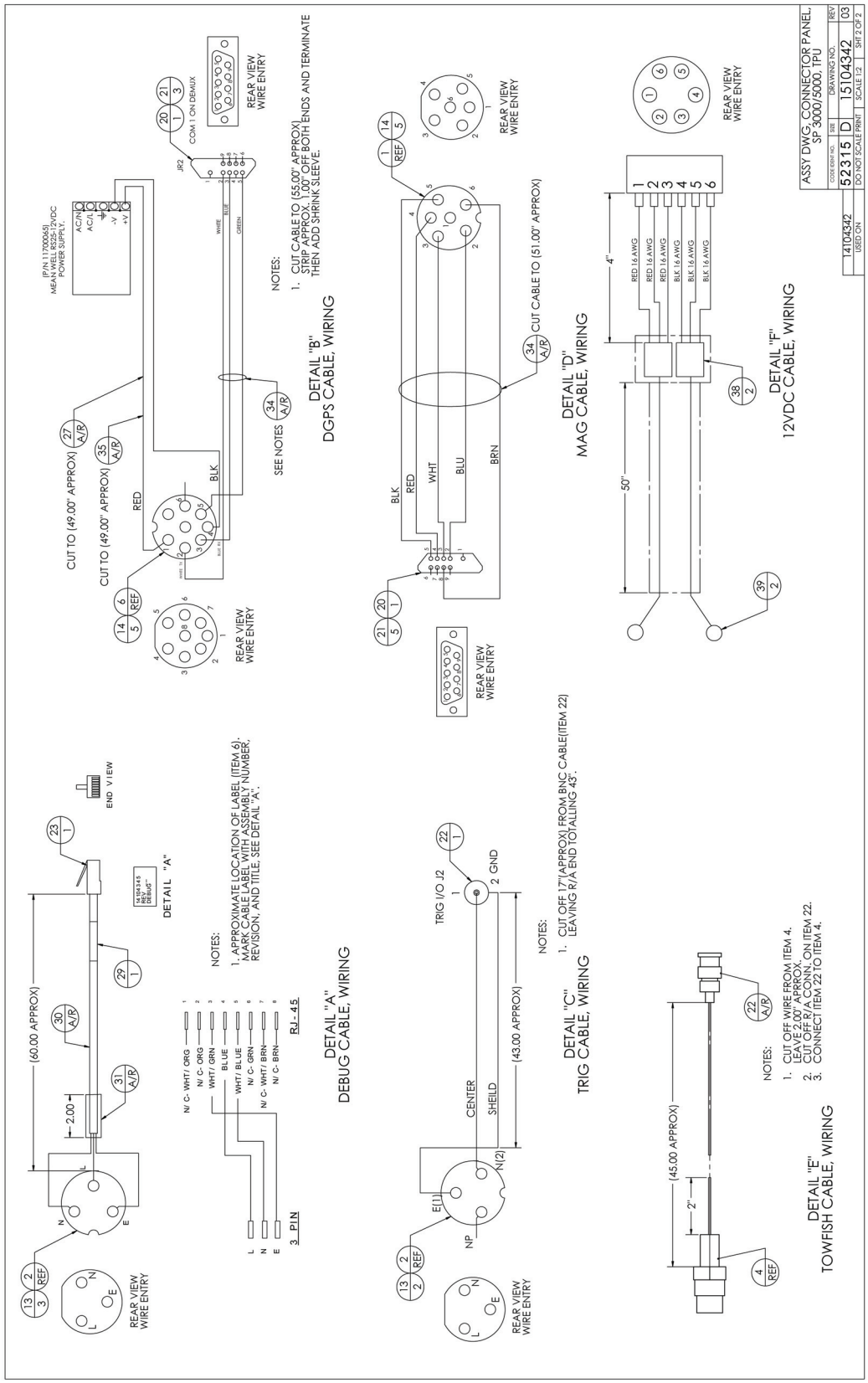
SEE DETAIL "D" SHEET 2
SEE DETAIL "C" SHEET 2
SEE DETAIL "B" SHEET 2
SEE DETAIL "A" SHEET 2
SEE DETAIL "E" SHEET 2
ORIENT CORRECTLY AS SHOWN
CAUTION: SELECT 120 OR 240 VOLTAGE INTERNALLY
RUN
STAND BY
VAC
12 VDC
12 VDC
120/240 VAC
TRIG OUT
LAN
GPS IN
TOWFISH
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCE ON: DEC. ANGLES .X ± .1 ± .5° .XX ± .03 .XXX ± .005 SURFACES √N/A
METRIC REFERENCE (mm) & [mm]
MATERIAL: SEE B.O.M.
FINISH SPECS: N/A
NAME DATE
DRAWN K. SUTTON 12/19/06
CHECKED - -
APPROVED - -
DEBURR ALL HOLES
BREAK ALL SHARP EDGES
L3 COMMUNICATIONS KLEIN ASSOCIATES, INC.
ASSY DWG, CONNECTOR PANEL, SP 3000/5000 TPU
CODE IDENT NO. 88235 DRAWING NO. 15104342 REV 03
DO NOT SCALE PRINT SCALE 1:2 SHT 1 OF 2
14104342 USED ON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SIZE D
DRAWING NO. 15104342
REV 03
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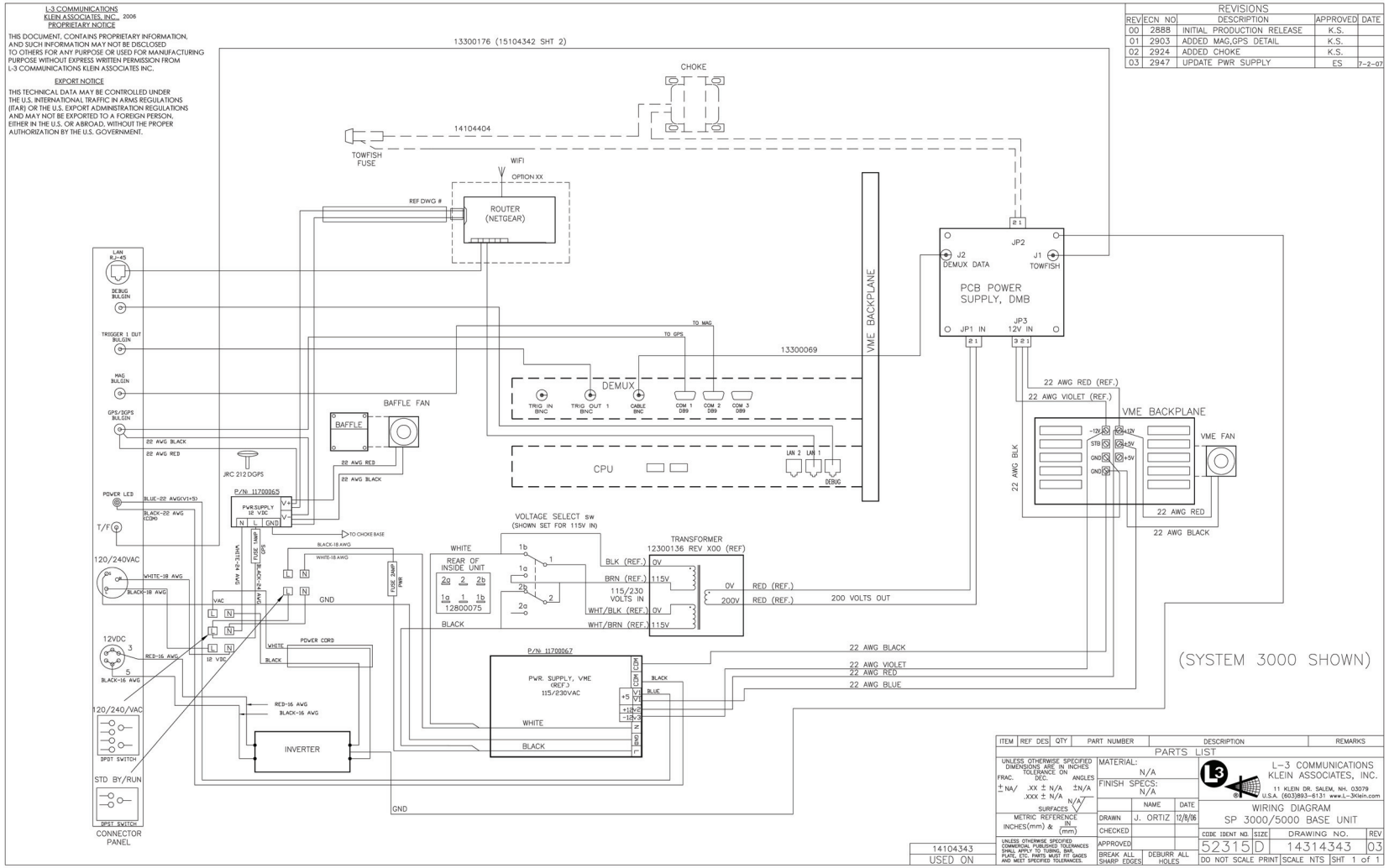
SCALE 1/2
SHT 2 OF 2
DETAIL "A" DEBUG CABLE, WIRING
DETAIL "B" DGPS CABLE, WIRING
DETAIL "C" TRIG CABLE, WIRING
DETAIL "D" MAG CABLE, WIRING
DETAIL "E" TOWFISH CABLE, WIRING
DETAIL "F" 12VDC CABLE, WIRING
REAR VIEW WIRE ENTRY
END VIEW
3 PIN
RJ-45
COM 1 ON DEMUX
TRIG I/O J2
CENTER
SHEILD
GND
RED 16 AWG
BLK 16 AWG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01 2903 ADDED MAG,GPS DETAIL K.S.
02 2924 ADDED CHOKE K.S.
03 2947 UPDATE PWR SUPPLY ES 7-2-07
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CHOKE
14104404
TOWFISH FUSE
WIFI
OPTION XX
REF DWG #
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LAN RJ-45
DEBUG BULGIN
TRIGGER 1 OUT BULGIN
MAG BULGIN
GPS/DGPS BULGIN
22 AWG BLACK
22 AWG RED
BAFFLE FAN
BAFFLE
JRC 212 DGPS
P/N 11700065
PWR SUPPLY 12 VDC
POWER LED
BLUE-22 AWG(V1+S)
BLACK-22 AWG (COM)
T/F
120/240VAC
WHITE-18 AWG
BLACK-18 AWG
TO CHOKE BASE
VOLTAGE SELECT sw (SHOWN SET FOR 115V IN)
WHITE
REAR OF INSIDE UNIT
12800075
BLACK
TRANSFORMER 12300136 REV X00 (REF)
BLK (REF.) 0V
BRN (REF.) 115V
115/230 VOLTS IN
WHT/BLK (REF.) 0V
WHT/BRN (REF.) 115V
0V RED (REF.)
200V RED (REF.)
200 VOLTS OUT
VAC
GND
FUSE 2AMP
12VDC
RED-16 AWG
BLACK-16 AWG
12 VDC
POWER CORD
WHITE
BLACK
120/240/VAC
SPDT SWITCH
STD BY/RUN
DPST SWITCH
CONNECTOR PANEL
INVERTER
P/N 11700067
PWR. SUPPLY, VME (REF.) 115/230VAC
+5V
+12V
-12V
COM
22 AWG BLACK
22 AWG VIOLET
22 AWG RED
22 AWG BLUE
WHITE
BLACK
GND
13300069
VME BACKPLANE
PCB POWER SUPPLY, DMB
JP2
J2 DEMUX DATA
J1 TOWFISH
JP1 IN
JP3 12V IN
TO MAG
TO GPS
DEMUX
TRIG IN BNC
TRIG OUT 1 BNC
CABLE BNC
COM 1 DB9
COM 2 DB9
COM 3 DB9
CPU
LAN 2
LAN 1
DEBUG
22 AWG RED (REF.)
22 AWG VIOLET (REF.)
VME BACKPLANE
-12V
+12V
STB
+5V
GND
VME FAN
22 AWG BLK
22 AWG RED
22 AWG BLACK
(SYSTEM 3000 SHOWN)
ITEM REF DES QTY PART NUMBER DESCRIPTION REMARKS
PARTS LIST
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METRIC REFERENCE INCHES(mm) & IN (mm)
UNLESS OTHERWISE SPECIFIED COMMERCIAL PUBLISHED TOLERANCES SHALL APPLY TO TUBING, BAR PLATE, ETC. PARTS MUST FIT GAGES AND MEET SPECIFIED TOLERANCES.
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FINISH SPECS: N/A
NAME DATE
DRAWN J. ORTIZ 12/8/06
CHECKED
APPROVED
BREAK ALL SHARP EDGES DEBURR ALL HOLES
L-3 COMMUNICATIONS KLEIN ASSOCIATES, INC.
11 KLEIN DR. SALEM, NH. 03079 U.S.A. (603)893-6131 www.L-3klein.com
WIRING DIAGRAM SP 3000/5000 BASE UNIT
CODE IDENT NO. 52315 SIZE D DRAWING NO. 14314343 REV 03
DO NOT SCALE PRINT SCALE NTS SHT 1 of 1
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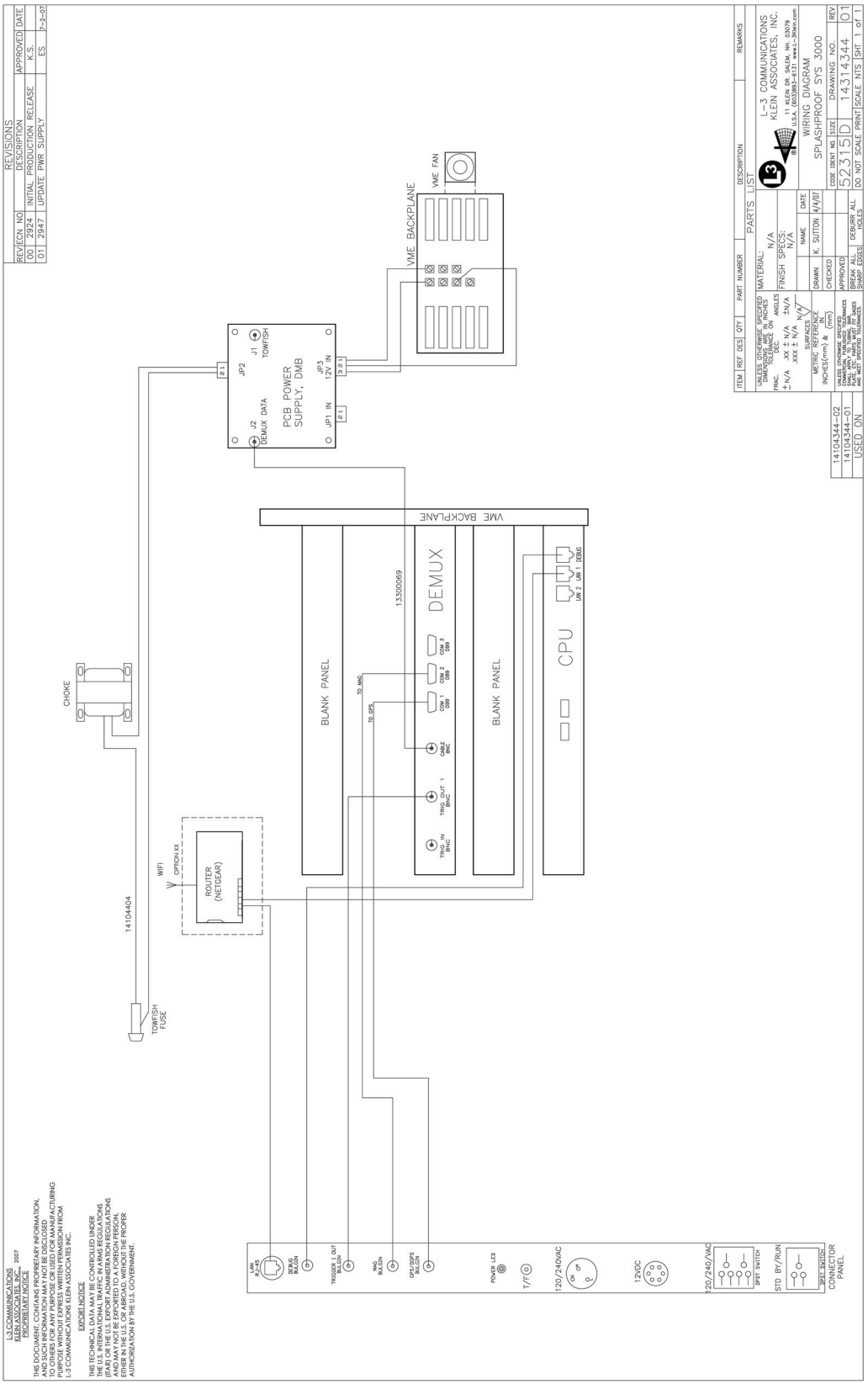
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REV/ECN NO DESCRIPTION APPROVED DATE
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01 2947 UPDATE PWR SUPPLY ES 7-2-07
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PARTS LIST
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METRIC REFERENCE INCHES[mm] Δ [mm]
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FINISH SPECS: N/A
DRAWN K. SUTTON 4/4/07
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WIRING DIAGRAM
SPLASHPROOF SYS 3000
CODE IDENT NO. SIZE DRAWING NO. REV
52315 D 14314344 01
DO NOT SCALE PRINT SCALE NTS SHT 1 of 1
VME FAN
VME BACKPLANE
JP2
J1 TOWFISH
J2 DEMUX DATA
PCB POWER SUPPLY, DMB
JP3 +24V IN
JP1 IN
CHOKE
14104404
TOWFISH FUSE
WIFI
OPTION XX
ROUTER (NETGEAR)
BLANK PANEL
13300069
DEMUX
TRIG IN BNC
TRIG OUT 1 BNC
CABLE BNC
COM 1 DB9
COM 2 DB9
COM 3 DB9
TO MAG
TO GPS
BLANK PANEL
CPU
LAN 2 LAN 1 DEBUG
LAN BEAM BULGIN
TRIGGER 1 OUT BULGIN
MAG BULGIN
GPS/1PPS BULGIN
POWER LED
T/F
120/240VAC
12VDC
120/240/VAC
SPST SWITCH
STD BY/RUN
SPST SWITCH
CONNECTOR PANEL

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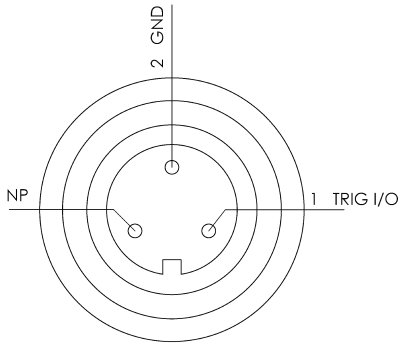
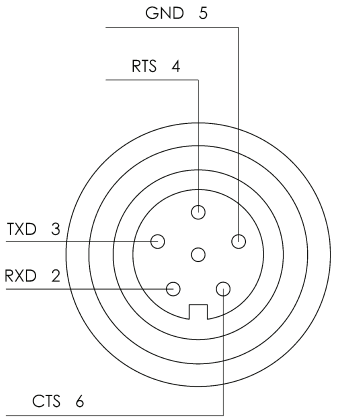


TRIG 1

ITEM 2
WIRE ENTRY VIEW



MAG

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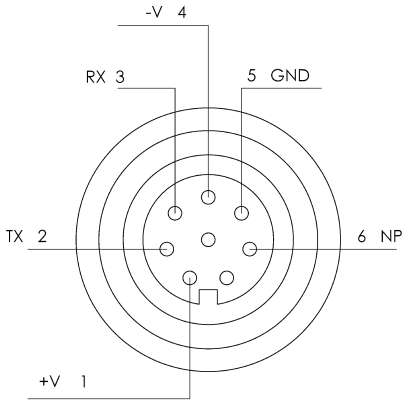
WIRE ENTRY VIEW



GPS/DGPS

ITEM 6
WIRE ENTRY VIEW

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SURFACES N/A
METRIC REFERENCE
INCHES (mm) & IN (mm)

UNLESS OTHERWISE SPECIFIED COMMERCIAL PUBLISHED TOLERANCES SHALL APPLY TO TUBING, BAR, PLATE, ETC. PARTS MUST FIT GAGES AND MEET SPECIFIED TOLERANCES.

MATERIAL: N/A

FINISH SPECS: N/A

	NAME	DATE
DRAWN	K. SUTTON	12/19/06
CHECKED	-	-
APPROVED	-	-

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ASSY DWG, CONNECTOR ACCESSORY KIT, SP TPU

CODE IDENT NO.	SIZE	DRAWING NO.	REV
52315	B	15104403	00

DO NOT SCALE PRINT | SCALE 2:1 | SHT 1 OF 1

14104403
USED ON

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CHAPTER 7: S3000SBP CHIRP SUB BOTTOM PROFILER

For combined side scan sonar and chirp sub bottom profiling, the S3000SPB Chirp Sub Bottom Profiler is available as an upgrade to the Series 3000 Towfish. The sub bottom profiler mounts directly to the towfish and connects to the towfish with supplied jumper cables. Power is provided from the towfish and setup and operation is performed using SonarPro. For instructions on how to set up and operate the sub bottom profiler using SonarPro, refer to "Operating SonarPro with a Series 3000 Sonar System" on page 4-73. This chapter provides a general description and specifications for the S3000SBP Chirp Sub Bottom Profiler along with an illustrated procedure on how to install it onto the towfish.

7.1 General Description

The S3000DBP Chirp Sub Bottom Profiler is shown mounted to the towfish in Figure 7-1. The sub bottom profiler includes two low frequency transducers and a pressure housing containing the sub bottom profiler electronics within a two-piece

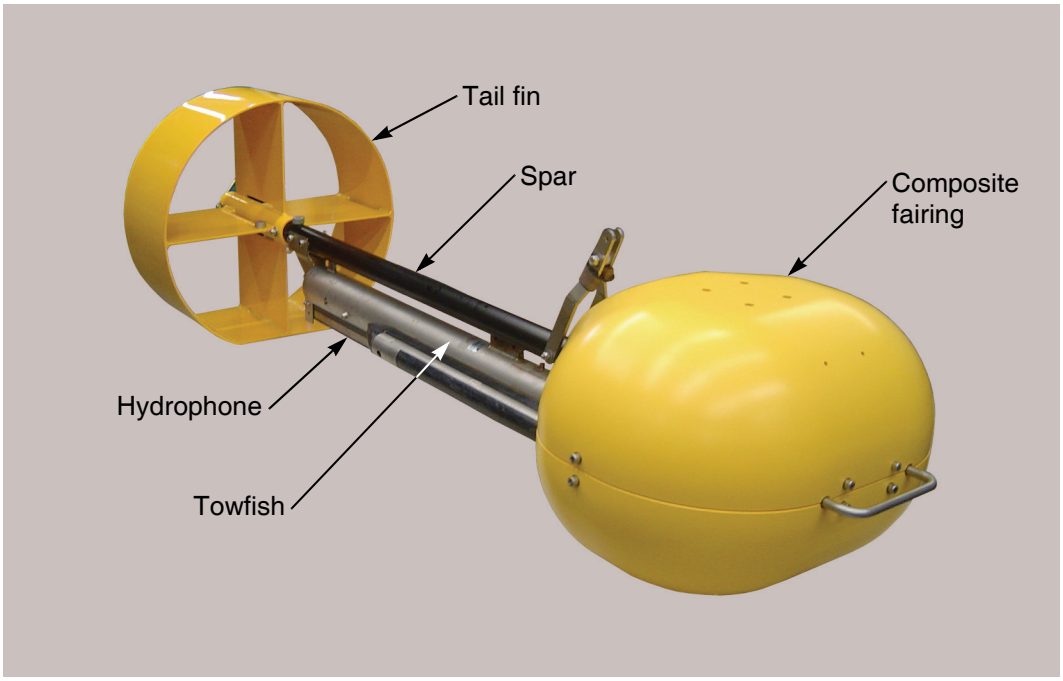


Figure 7-1: *S3000SBP Chirp Sub Bottom Profiler with Series 3000 Towfish*

composite fairing. This assembly is mounted at the end of a spar which attaches to the towfish with the fairing located at the bow. Mounted to the opposite end of the spar is a tail fin. In addition, a receiver hydrophone is mounted under the towfish and secured in two places.

7.2 Specifications

The general specifications for the S3000SBP Chirp Sub Bottom Profiler are listed below.

NOTE *Specifications are typical and subject to change without notice.*

Frequency range:	2–8 kHz
Repetition range:	Selectable to 30/s; synchronized with side scan sonar
Pulse length:	2.5, 5, 10, 20, and 30 ms, selectable
Resolution:	12.5 cm
Power:	1 kW
Source Level:	204 dB re 1 µPa @ 1 m
Depth limit:	600 m
Weight in air:	91 kg (200 lb), approximate
Software:	SonarPro 11.0
Data format:	SDF

7.3 Installing the Sub Bottom Profiler

The Chirp Sub Bottom Profiler mounts directly to the Series 3000 towfish. There are two main components to install, the hydrophone and the transducer/electronics assembly. In addition, the required mounting brackets, cables and hardware are provided.

To mount the sub bottom profiler, the towfish must be partially disassembled. The tools and materials required are 4, 6 and 8-mm hex keys, a 5/16 hex key, a 3/4-inch adjustable wrench, a socket wrench with a 17-mm socket, a Phillips screw driver, and silicone grease.

To mount the sub bottom profiler to the towfish:

1. Raise the towfish off the floor on wooded blocks and orient it such that the middle tail fin is pointing straight up.
2. Using the 8-mm hex key, loosen the M10 socket head cap screw on the tail cone far enough to be able to separate the retaining cup from the tail cone, and then remove both tail fins.

   Store these components away. They will not be needed with the sub bottom profiler installed.

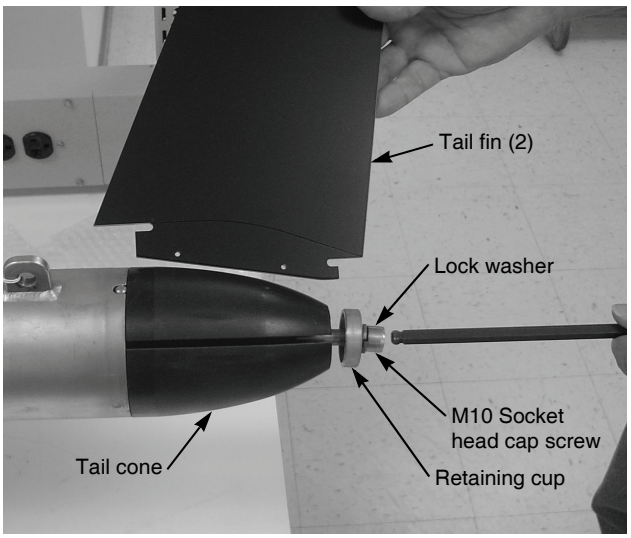


Figure 7-2: *Removing the Tail Fins*

3. Remove the socket head cap screw, lock washer and retaining cup as an assembly, and then remove the tail cone.

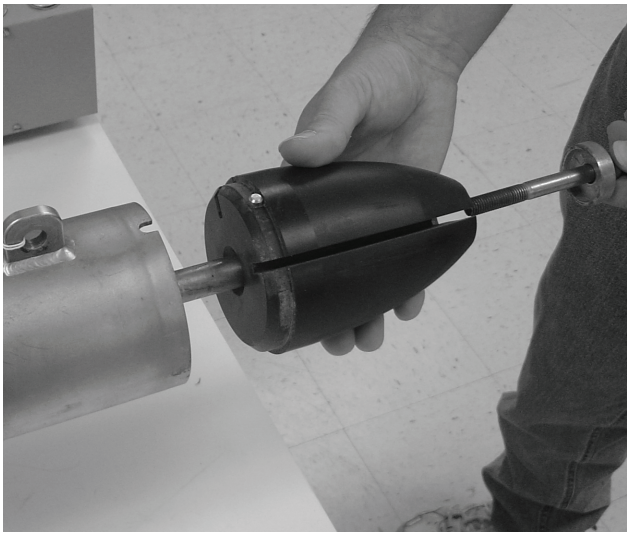


Figure 7-3: *Removing the Tail Cone*

4. Using the 8-mm hex key, loosen the M10 socket head cap screw on the nose cone, and then remove the nose cone. The screw remains captive to the nose.

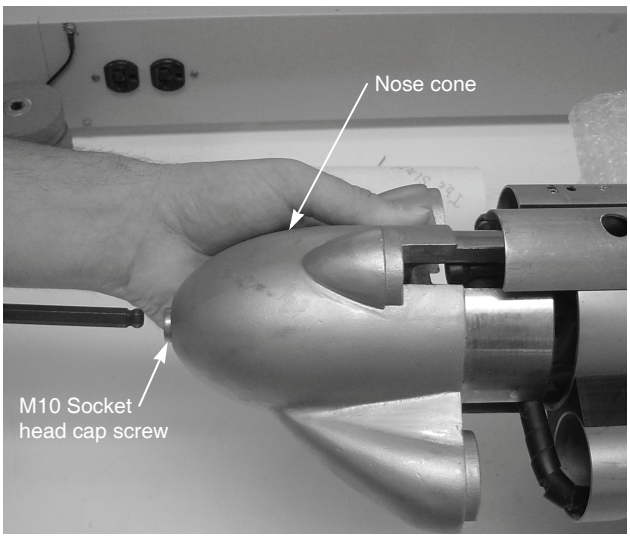


Figure 7-4: *Removing the Nose Cone*

5. Using the Phillips screw driver, remove the two Phillips head screws that secure the cable cover, and then remove the cover.

   Store these components away. They will not be needed with the sub bottom profiler installed.

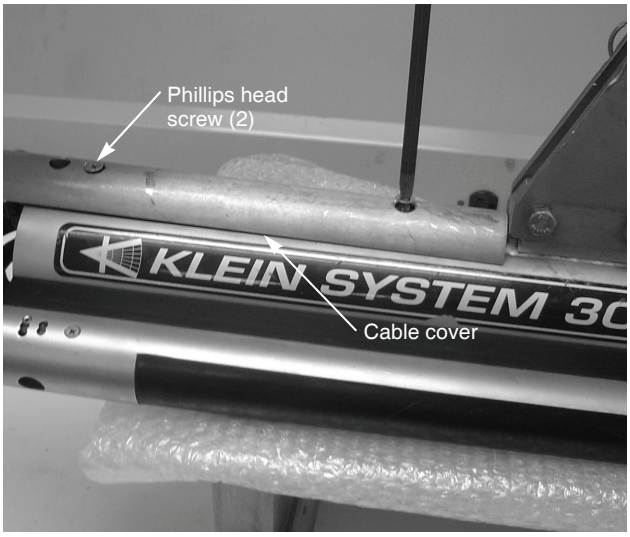


Figure 7-5: *Removing the Cable Cover*

6. Cut the cable ties securing the tow cable jumper cable (not shown) to the tow bar. Do not disconnect the tow cable jumper cable from the towfish.
7. Remove the cotter ring from the clevis pin on the tow bracket, and then remove the pin and the tow bar.

   Store these components away. They will not be needed with the sub bottom profiler installed.

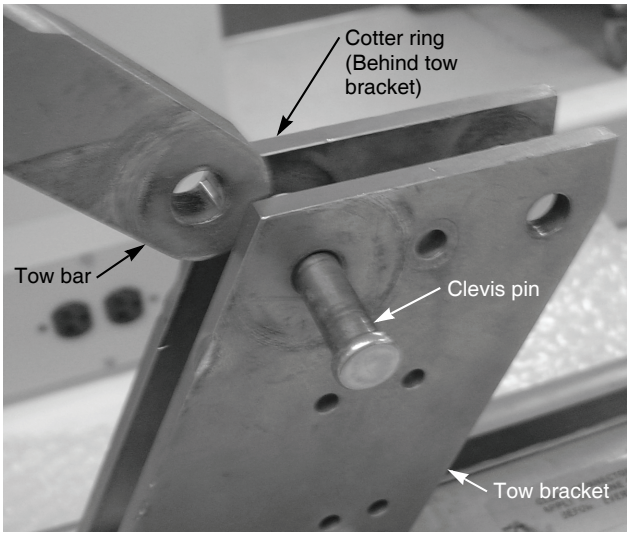


Figure 7-6: *Removing the Tow Bar*

8. Using the 3/4-inch adjustable wrench, remove the two nylon lock nuts securing the cable retaining plate to the tow bracket, and then remove the plate.

   Store these components away. They will not be needed with the sub bottom profiler installed.
9. Lay the tow cable jumper cable aside. Do not disconnect it from the towfish.

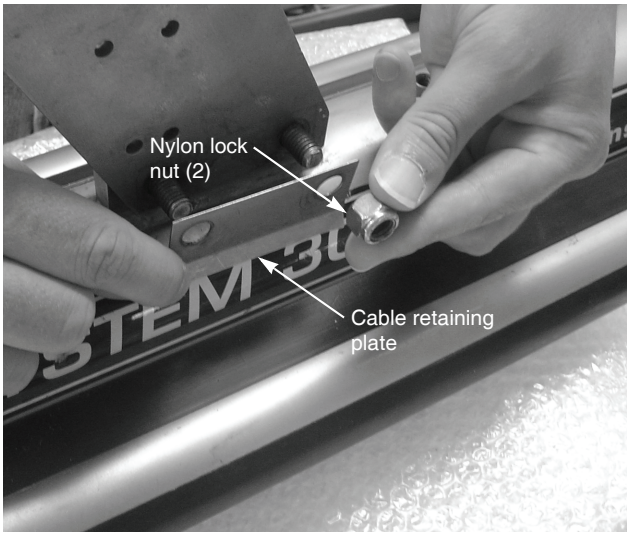


Figure 7-7: *Removing the Cable Retaining Plate*

10. Remove the two tow brackets and the two hex head bolts that secure them.

Store these components away. They will not be needed with the sub bottom profiler installed.

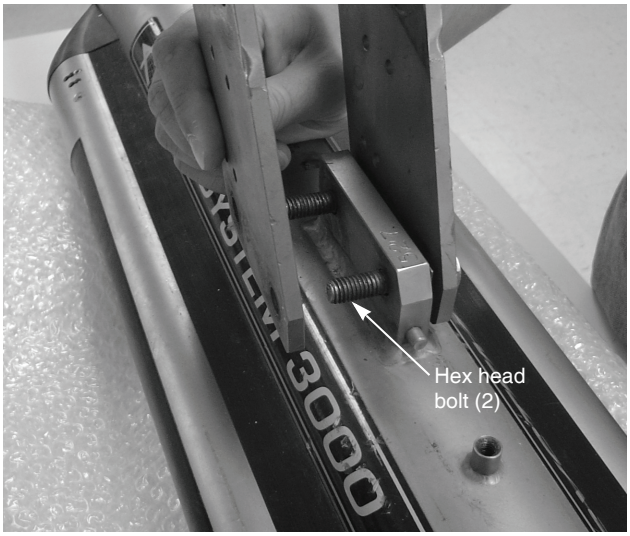


Figure 7-8: *Removing the Tow Brackets*

11. Slide the supplied aft sub bottom towfish mounting bracket over the stud weldment at the aft end of the towfish. The stud weldment inserts into the hole in the bracket, and the tab in the bracket inserts into the tab slot in the towfish.

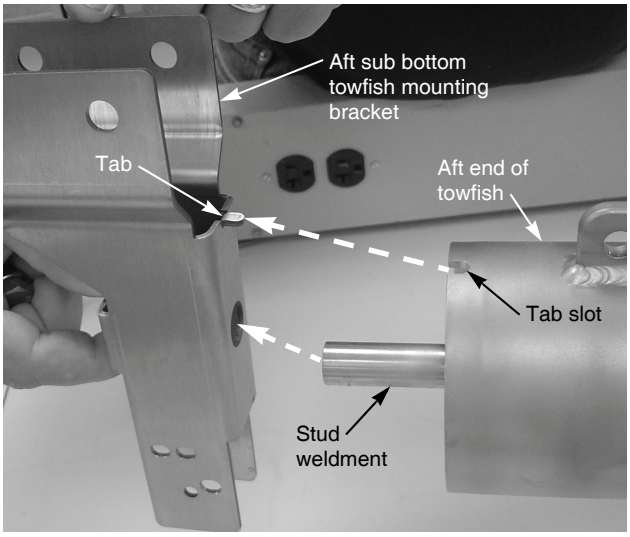


Figure 7-9: *Sliding the Aft Sub Bottom Towfish Mounting Bracket onto the Towfish*

12. Insert a supplied 30-mm, M10 hex head bolt and lock washer through the bracket and into the stud weldment on the towfish.

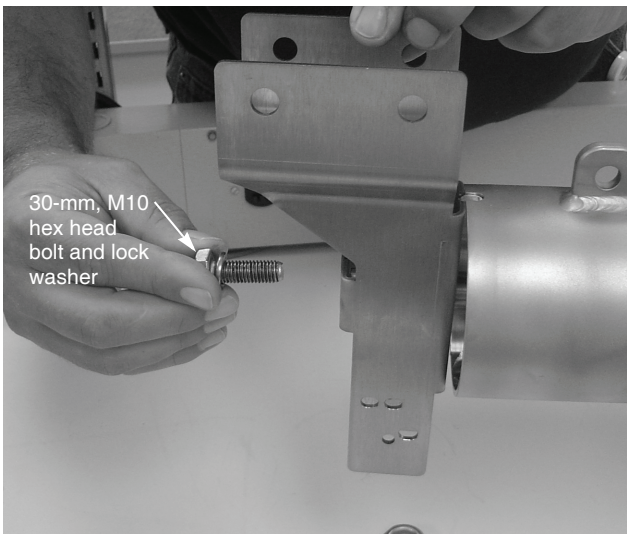


Figure 7-10: *Inserting an M10 Hex Head Bolt and Lock Washer into the Aft Sub Bottom Towfish Mounting Bracket*

13. Using the 3/4-inch adjustable wrench, securely tighten the M10 hex bolt.

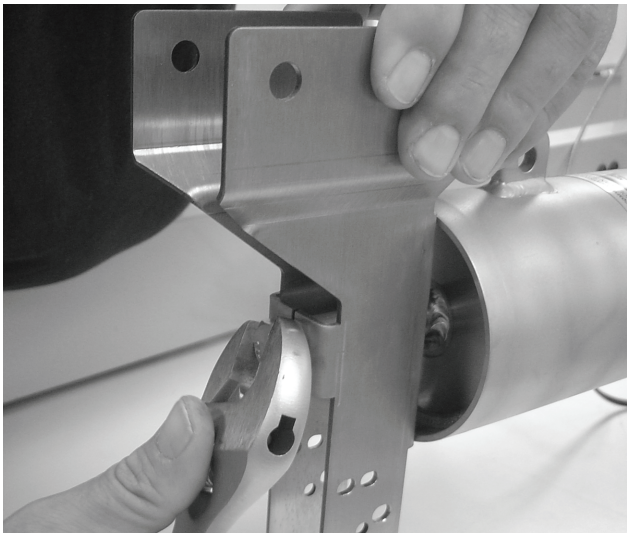


Figure 7-11: *Tightening the M10 Hex Head Bolt*

14. Using the 6-mm hex key, screw the two cross bar retaining screws—one on the top and one on the bottom of the towfish at the bow—*into* the cross bar until they bottom out.

15. Grasp the cross bar, which is mounted to the pressure housing end cap at the forward end of the towfish, and then pull the pressure housing out far enough to be able to access the bulkhead connectors on the end cap.

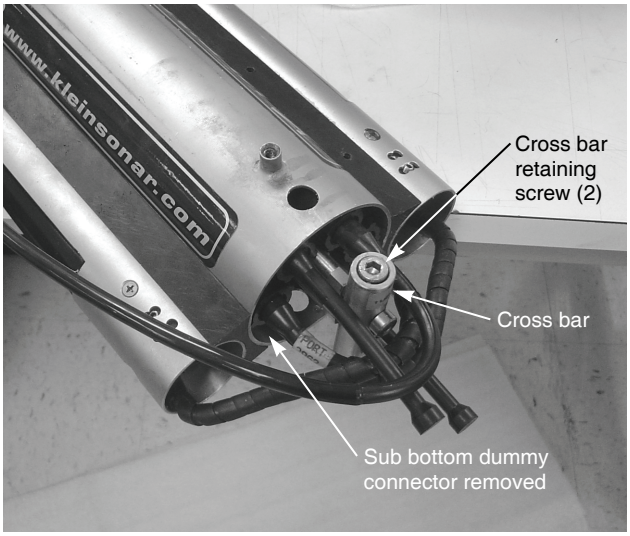


Figure 7-12: *Pressure Housing Partially Extracted and the Sub Bottom Dummy Connector Removed*

16. Disconnect the sub bottom dummy connector (not shown) from the sub bottom bulkhead connector which is immediately under the starboard transducer bulkhead connector.

17. Apply a thin film of silicone grease to the base (rubber part) of the pins of the supplied sub bottom jumper cable connector, and then connect the cable to the sub bottom bulkhead connector. Do not over grease.

18. Secure the locking collar, which is not shown for clarity, to the sub bottom bulkhead connector.

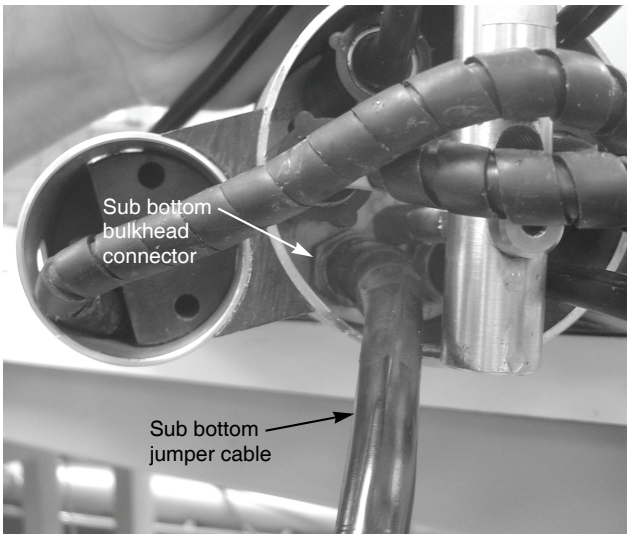


Figure 7-13: *Sub Bottom Jumper Cable Connected*

19. Push the pressure housing back into the towfish, aligning the two cross bar retaining screws with the holes in the housing, and then unscrew the retaining screws until they are flush with the housing.

20. While laying the starboard transducer cable into the slots in the forward sub bottom towfish mounting bracket, one slot on each side of the bracket, insert a supplied 30-mm, M10 hex head bolt and lock washer through the bracket and into the stud on the cross bar. The tab at the top of the bracket inserts into the towfish housing against the cross bar. The sub bottom jumper cable is not shown for clarity.

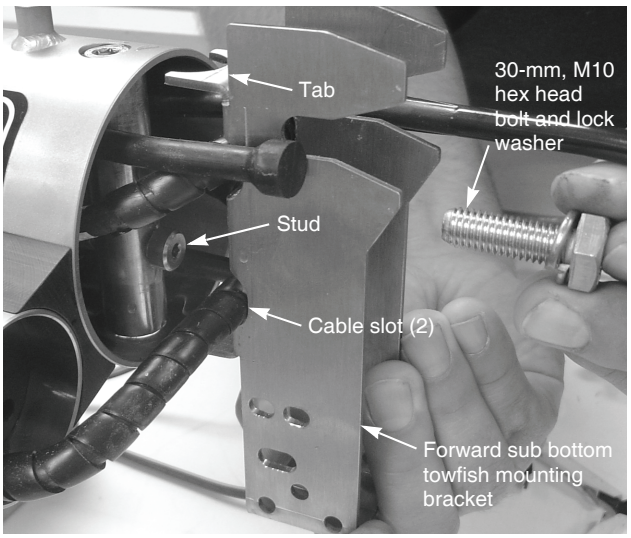


Figure 7-14: *Attaching the Forward Sub Bottom Towfish Bracket*

21. Using the socket wrench and 17-mm socket, securely tighten the M10 hex bolt.

22. Turn the towfish over and position the connector end of the hydrophone near the forward sub bottom towfish mounting bracket, and then insert the connector of the supplied hydrophone jumper cable (blue cable) through the bracket as shown.

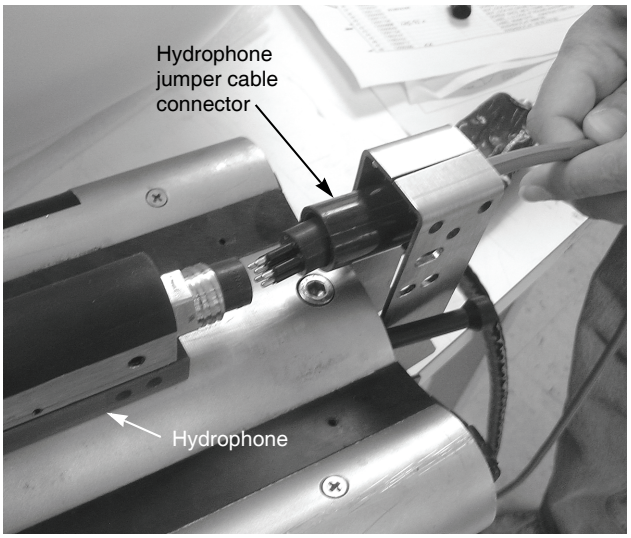


Figure 7-15: *Positioning the Hydrophone and Inserting the Hydrophone Jumper Cable Through the Forward Sub Bottom Towfish Mounting Bracket*

23. Apply a thin film of silicone grease to the base (rubber part) of the pins of the hydrophone jumper cable, and then connect the cable to the hydrophone. Do not over grease.
24. Secure the locking collar to the hydrophone.

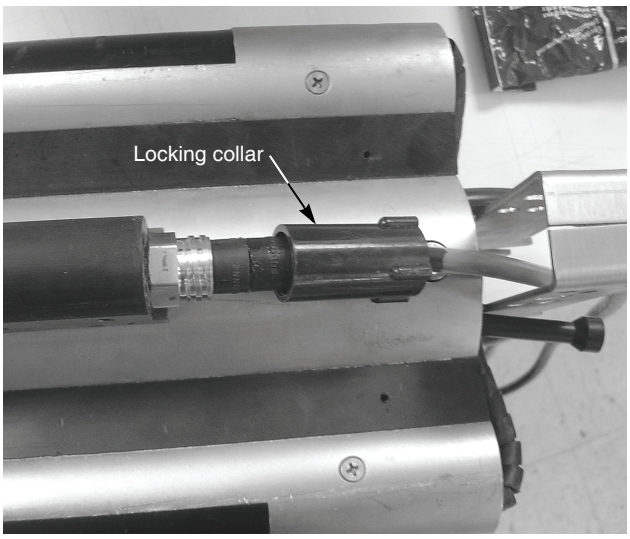


Figure 7-16: *Hydrophone Jumper Cable Connected to the Hydrophone*

25. Insert two of the supplied M5 socket head cap screws through the slots on either side of the aft sub bottom towfish mounting bracket, through the hydrophone and through the slots on the opposite side of the bracket.
26. Using the 4-mm hex key and 3/4-inch adjustable wrench, secure the bolts with two of the supplied M5 nylon locking nuts (not shown).

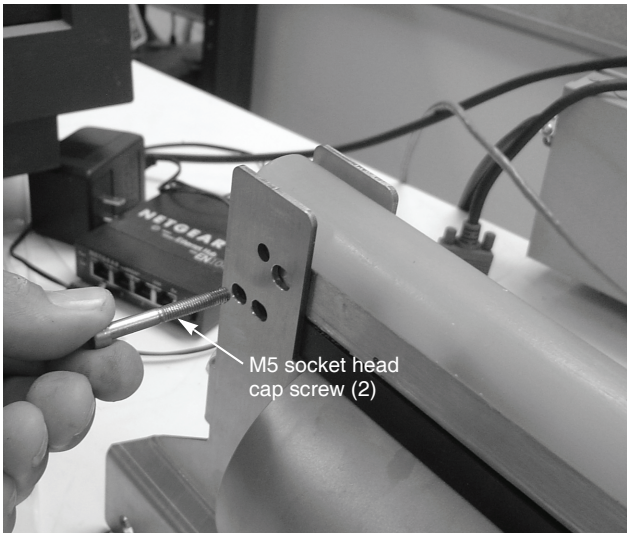


Figure 7-17: *Securing the Hydrophone—Aft End*

27. Insert two of the supplied M5 socket head cap screws through the slots on either side of the forward sub bottom towfish mounting bracket, through the hydrophone and through the slots on the opposite side of the bracket.

28. Using the 4-mm hex key and 3/4-inch adjustable wrench, secure the bolts with two of the supplied M5 nylon locking nuts (not shown).

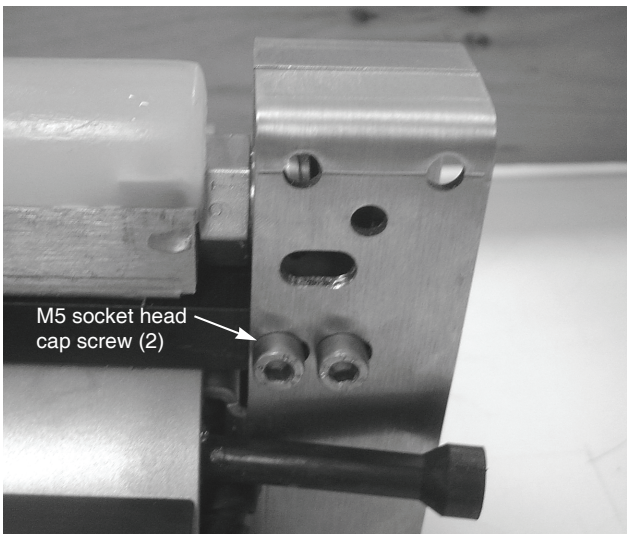


Figure 7-18: *Hydrophone Secured—Forward End*

29. Lay out the jumper cables, identifying each to ensure all three are connected and available.

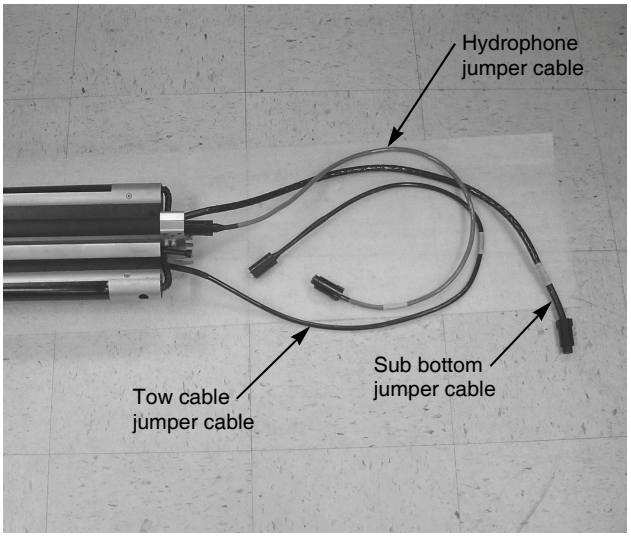


Figure 7-19: *Three Jumper Cables, Connected and Available*

30. Using the 6-mm hex key, remove the eight M8 socket head cap screws and washers that secure the top shell of the sub bottom transducer/electronics assembly.

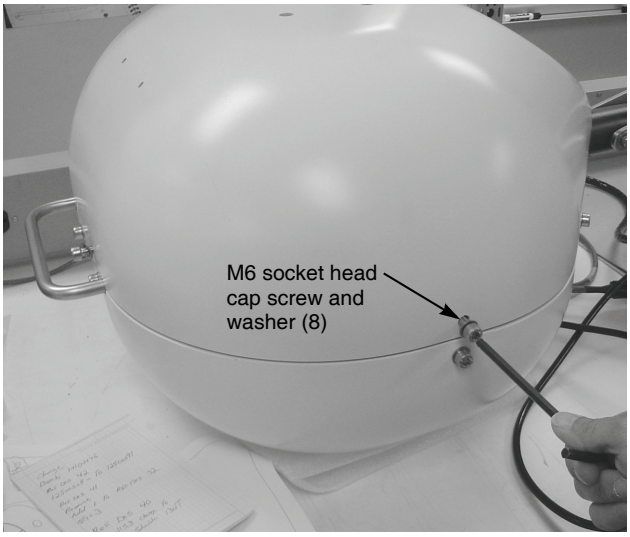


Figure 7-20: *Removing the Top Shell of the Sub Bottom Transducer/Electronics Assembly*

31. Turn the towfish over such that it is in its upright position again. Set the towfish bow next to the sub bottom transducer/ electronics assembly as shown. Ensure all three jumper cables are accessible.

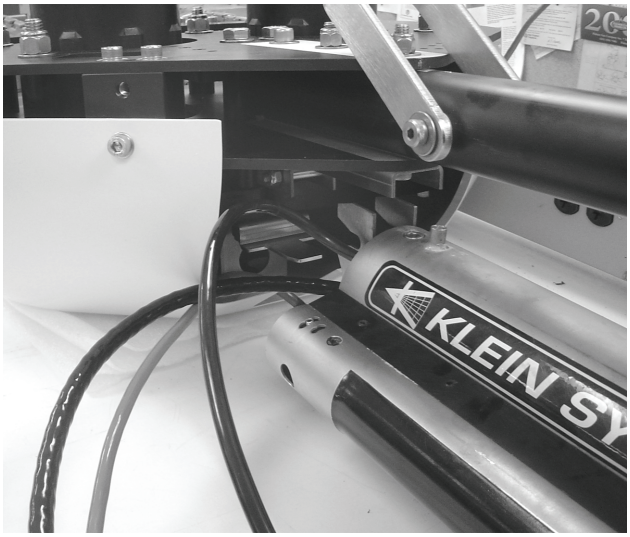


Figure 7-21: *Towfish Positioned Next to the Sub Bottom Transducer/Electronics Assembly*

32. Route the sub bottom and hydrophone jumper cables through the hole in the sub bottom transducer/ electronics assembly top plate next to the port sub bottom transducer as shown. Route the tow cable jumper cable through the bottom plate and back towards the aft end of the towfish.

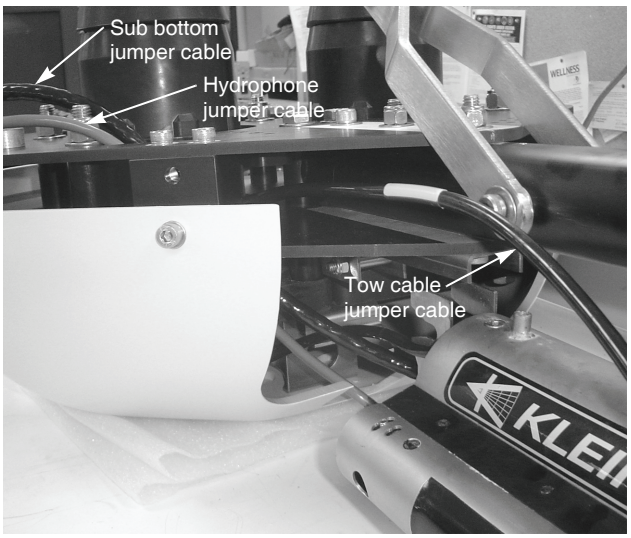


Figure 7-22: *Routing the Sub Bottom, Hydrophone and Tow Cable Jumper Cables*

33. Slide both slots of the forward sub bottom towfish bracket over the shoulder bolt on the sub bottom transducer/ electronics assembly as shown.

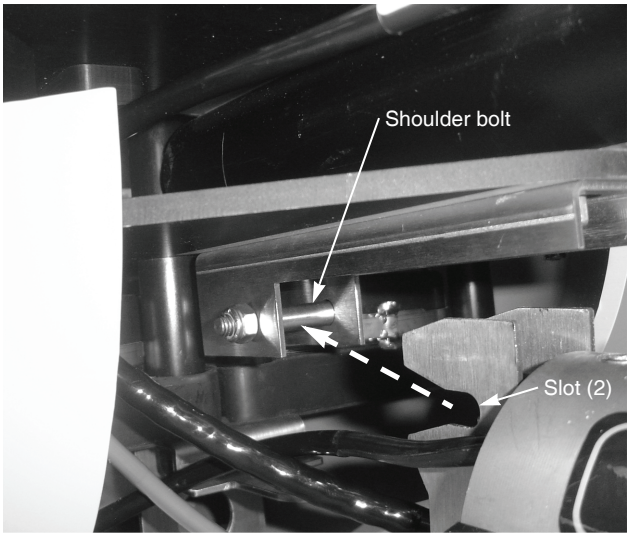


Figure 7-23: *Attaching the Towfish to the Sub Bottom Transducer/Electronics Assembly*

34. Connect the sub bottom and hydrophone jumper cables to the sub bottom electronics pressure case as shown. The dummy plug and remaining cable are factory connected.

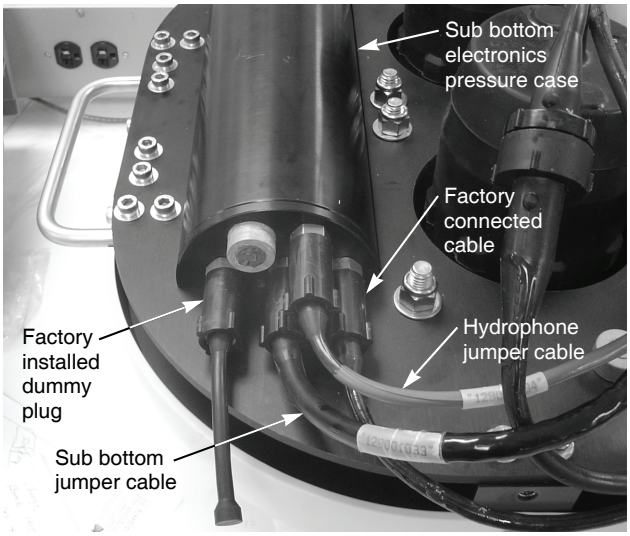


Figure 7-24: *Sub Bottom and Hydrophone Jumper Cables Connected to the Sub Bottom Electronics Pressure Case*

35. Align the spar of the sub bottom transducer/ electronics assembly with the towfish as shown.

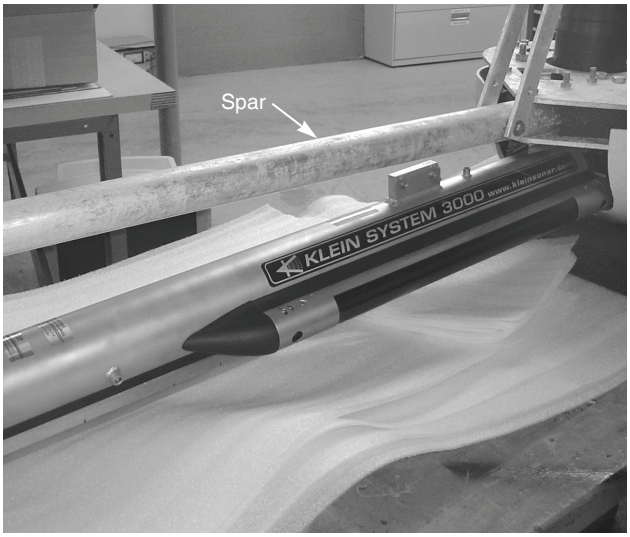


Figure 7-25: *Sub Bottom Transducer/ Electronics assembly Aligned with Towfish*

36. Lift the stern of the towfish and align the holes in the aft sub bottom towfish bracket with the holes in the spar.

NOTE *The tow point on the towfish should also slide into a slot under the spar.*

Figure 7-26: *Aligning the Holes in the Spar with the Holes in the Aft Sub Bottom Towfish Bracket*

37. Insert the two supplied 3.25-inch, 3/8-16 socket head cap screws through the holes in the bracket and the spar.

38. Using the 5/16 hex hey along with the 3/4-inch adjustable wrench, secure the bolts with the two supplied 3/8-16 nylon locking nuts.

39. Install the top shell of the sub bottom transducer/ electronics assembly using the eight M8 socket head cap screws and washers.

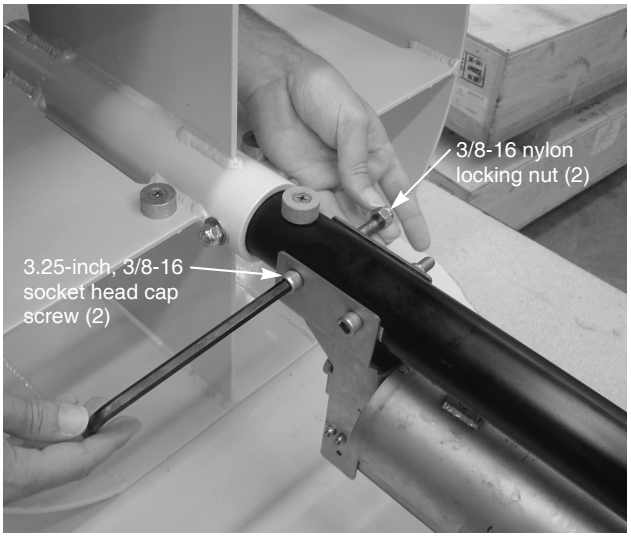


Figure 7-27: *Securing the Spar to the Aft Sub Bottom Towfish Bracket*

40. Route the tow cable jumper cable (not shown) along the tow bar and use cable ties to secure the cable.

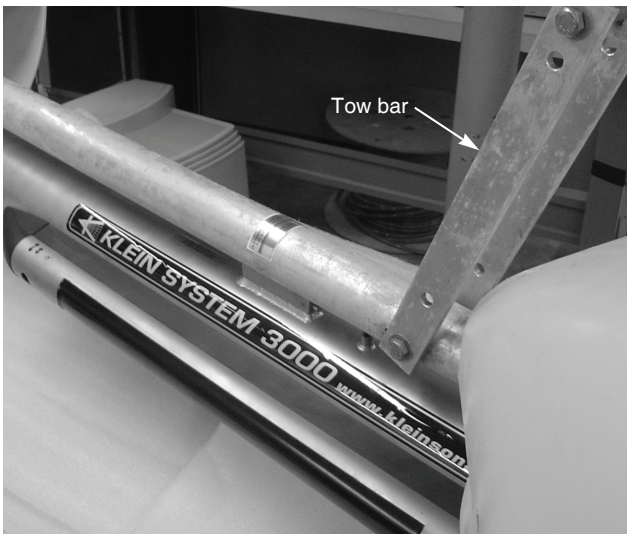


Figure 7-28: *Tow Bar for Routing the Tow Cable Jumper Cable*

41. The final assembly of the sub bottom profiler to the towfish should be as shown.

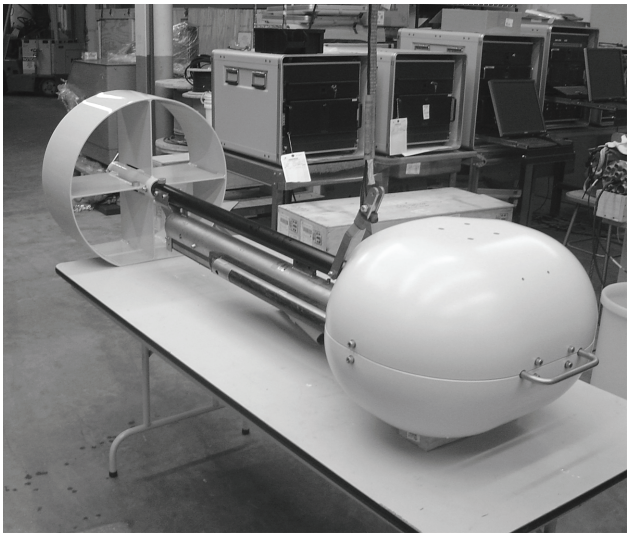


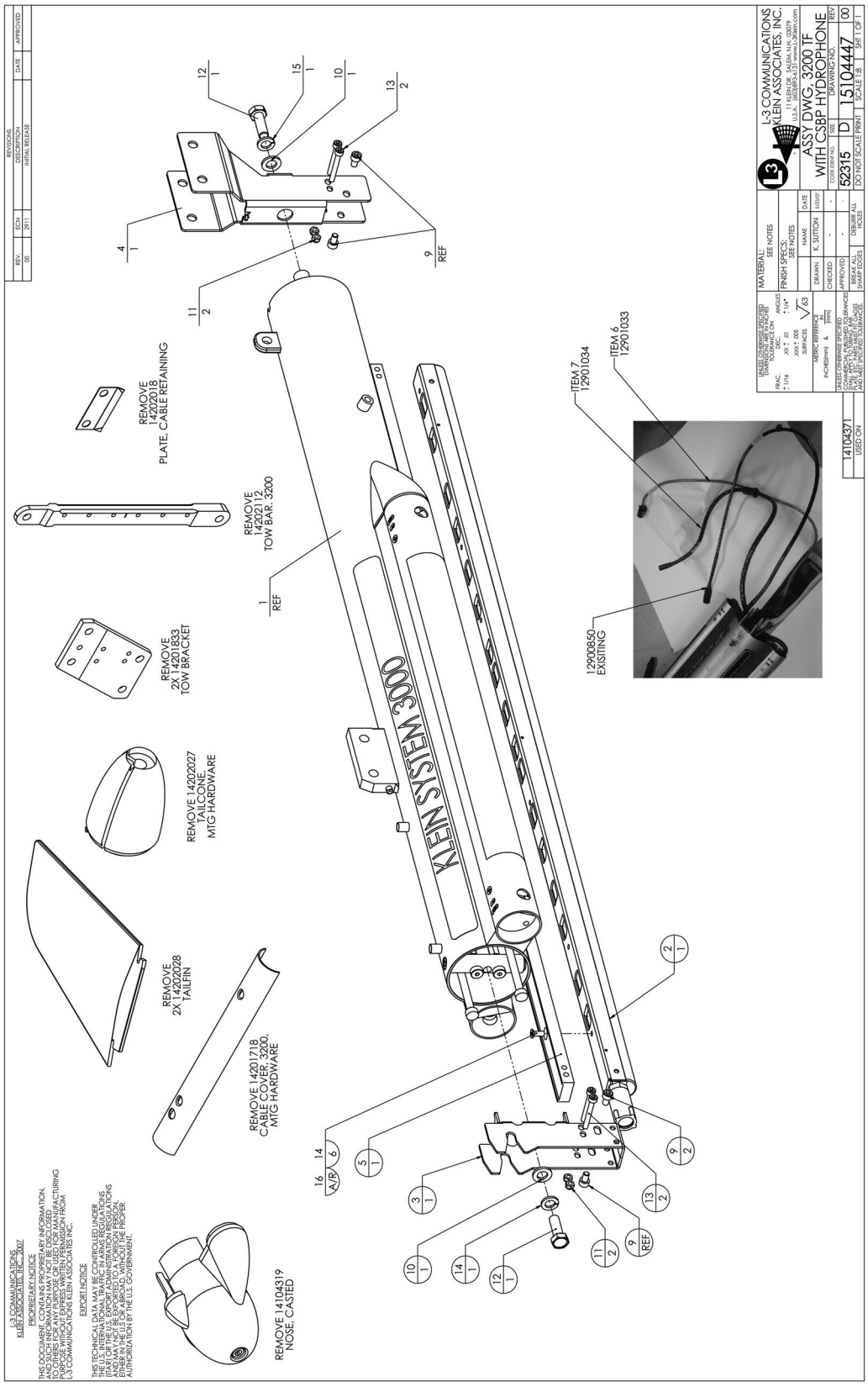
Figure 7-29: *Final Assembly of the Sub Bottom Profiler to the Towfish*

7.4 S3000SBP Chirp Sub Bottom Profiler Drawings

Listed in Table 7-1 are the assembly drawings and parts lists for the S3000SBP Chirp Sub Bottom Profiler. They are provided for reference and troubleshooting purposes. Each assembly drawing is followed by its corresponding parts list.

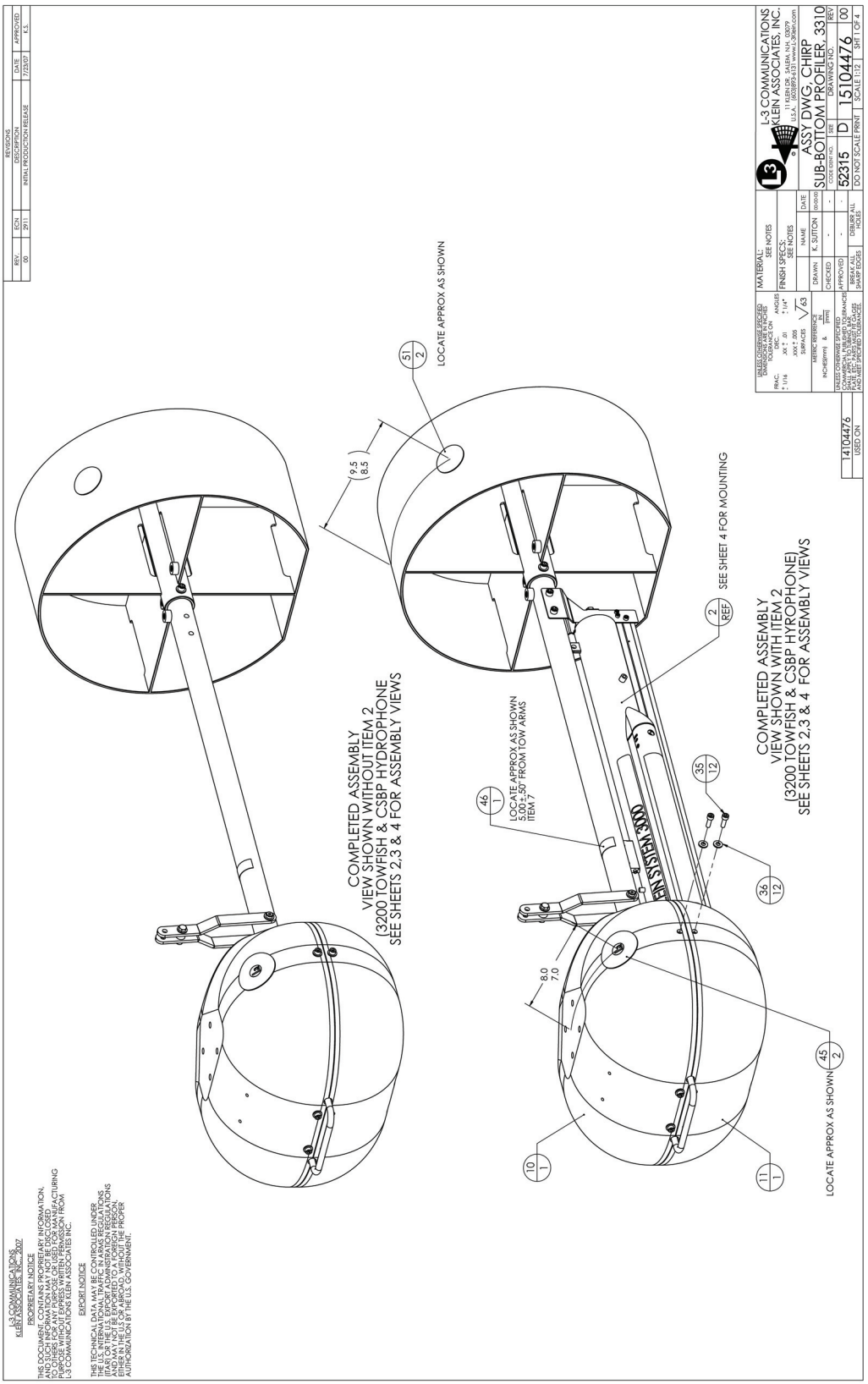
Table 7-1: *List of Drawings and Parts Lists*

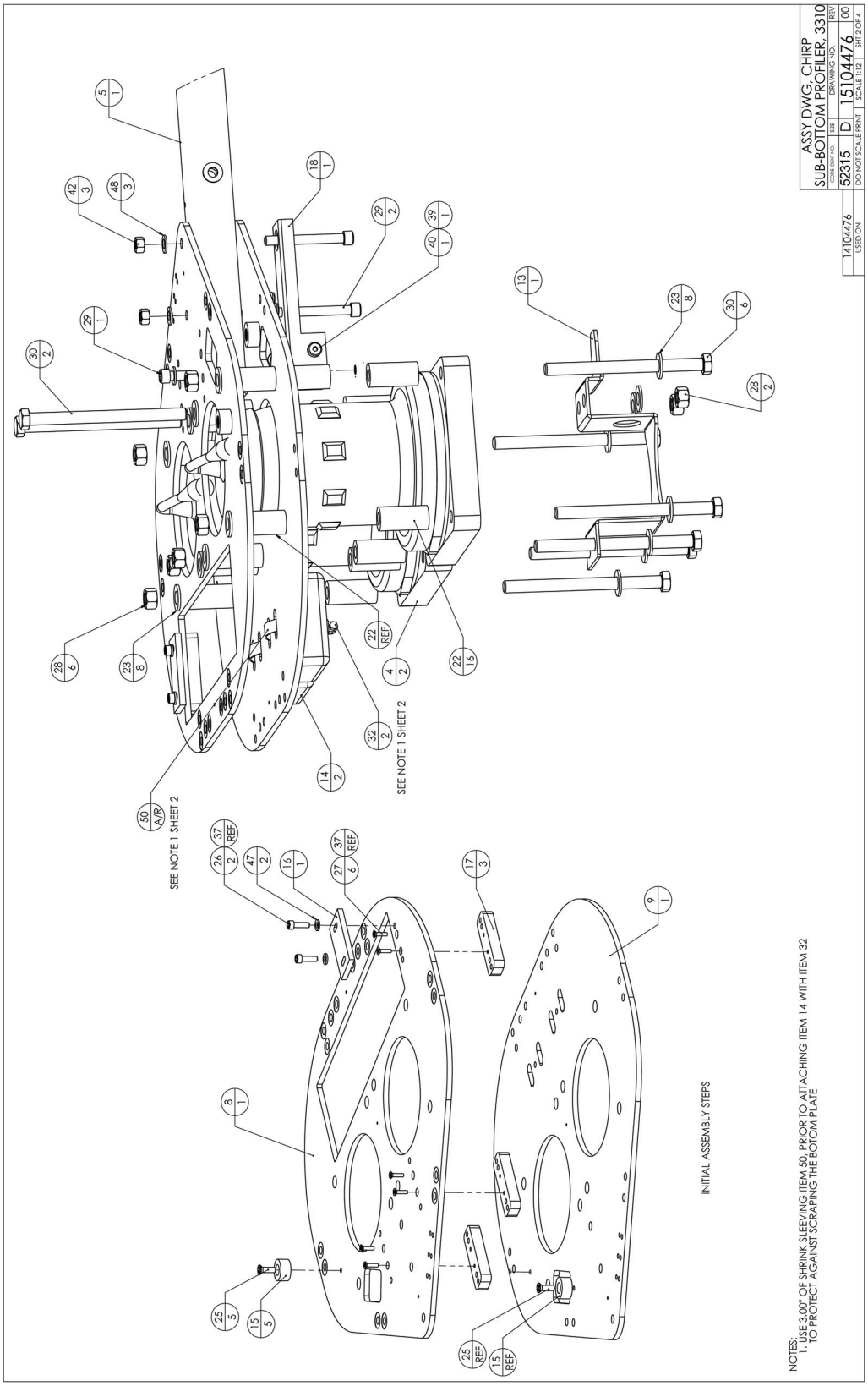
DRAWING NO.	PARTS LIST NO.	TITLE
15104447	14104447	Assembly Drawing, 3200 TF with CSBP Hydrophone
15104476	14104476	Assembly Drawing, Chirp Sub Bottom Profiler, 3310

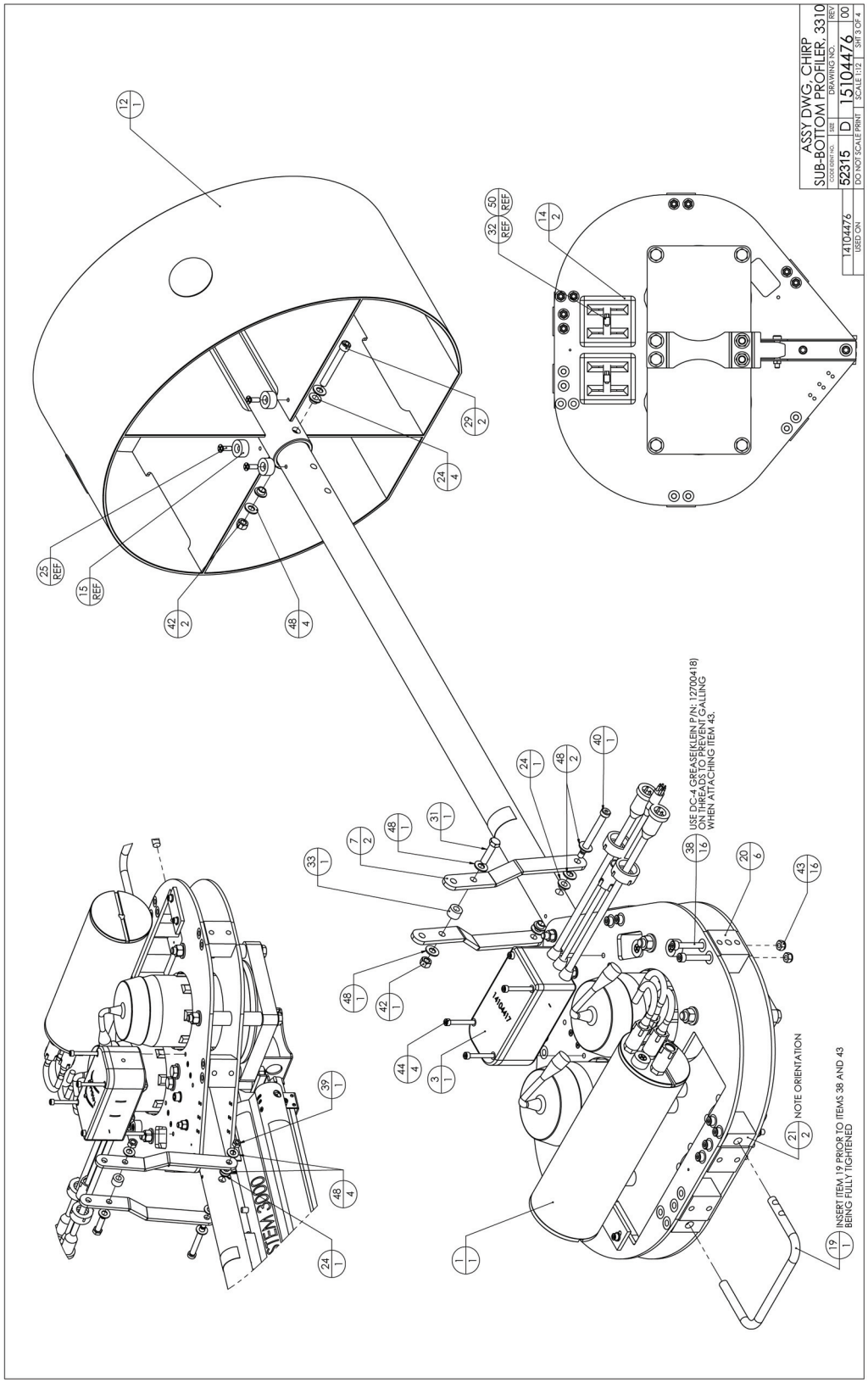

REMOVE 14202018 PLATE, CABLE RETAINING
REMOVE 14202112 TOW BAR, 3200
REMOVE 2X 14201833 TOW BRACKET
REMOVE 14202027 TAILCONE, MTG HARDWARE
REMOVE 2X 14202028 TAILFIN
REMOVE 14201718 CABLE COVER, 3200, MTG HARDWARE
REMOVE 14104319 NOSE, CASTED
KLEIN SYSTEM 3000
ITEM 7 12901034
ITEM 6 12901033
12900850 EXISTING
L3 COMMUNICATIONS KLEIN ASSOCIATES, INC.
ASSY DWG, 3200 TF WITH C5BP HYDROPHONE
52315 D 15104447 00
SCALE 1:8 SHT 1 OF 1
DO NOT SCALE PRINT

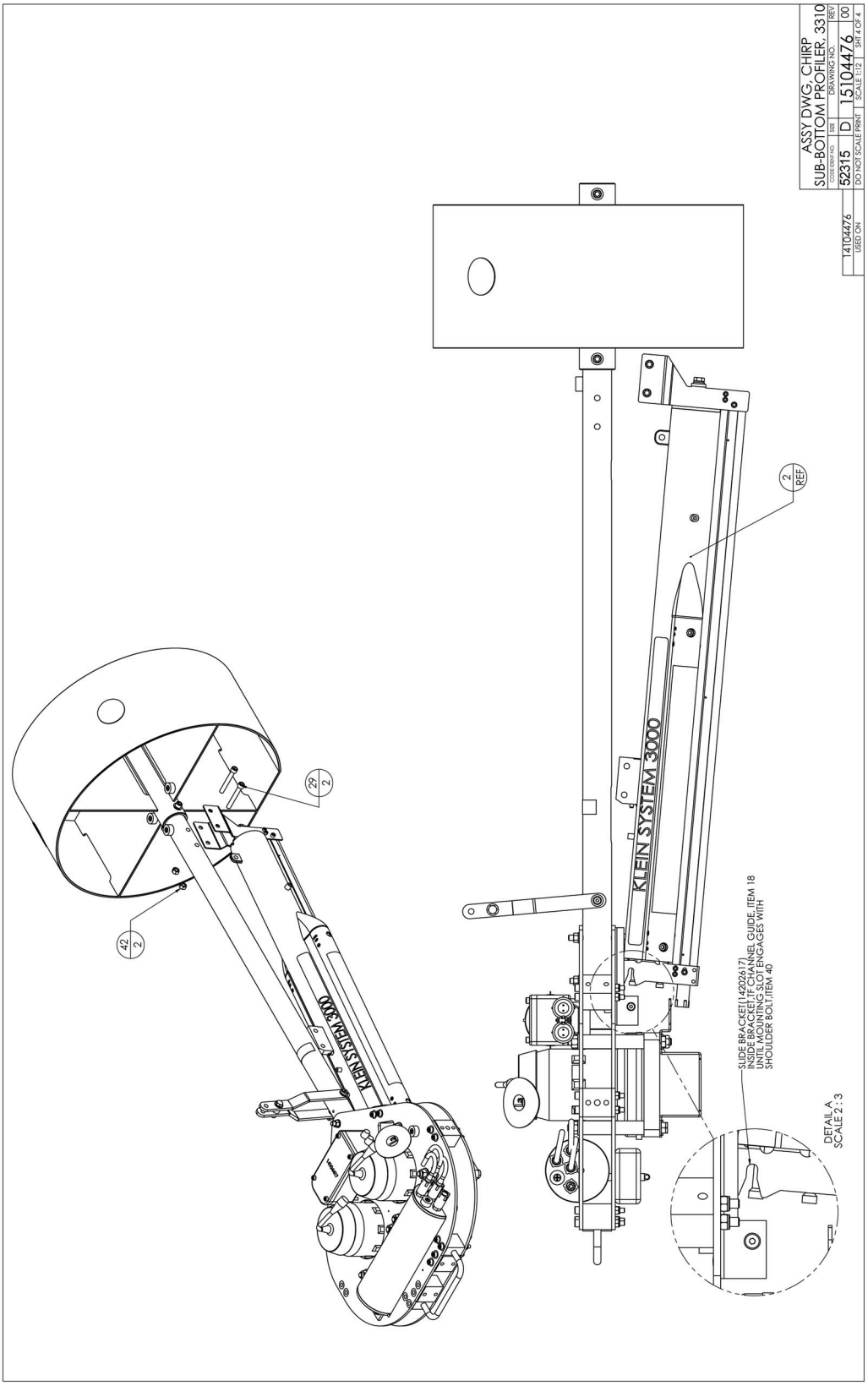
14104447 - ASSY, TF AND HYDROPHONE

Item	Part Number	Description	Qty
1	14103010-01	ASSY, FINAL, TOWFISH, 3210, SBP READY	REF
2	14104431	ASSY, XDCR, HYDROPHONE,CSBP	1
3	14202617	BRACKET, 3200 TF TO CSBP, FWD	1
4	14202618	BRACKET, 3200 TF TO CSBP, AFT	1
5	14202629	BRACKET,HYDROPHONE MOUNTING,CSBP	1
6	12901033	CONN,JUMPER,8P MIC M TO F,4 STP+OS, 36"	1
7	12901034	CONN,JUMPER,6P MIC M TO F, 1 STP, 36"	1
9	12501157	SCREW,SHSC,M6X8MMLG,SST,316	4
10	12500836	WASHER, FLAT, M10, 316SS	2
11	12501004	NUT,LOCK,M5 NYLON INSERT, 18-8 SS	4
12	12500977	BOLT,HH,M10 X 30MM,316SST	2
13	12501073	SCREW, SHCS, M5 X 40MM, 316SST	4
14	12500962	SCREW,FHMS,M5X12MM,PHLPS,316	6
15	12500835	WASHER,LOCK, M10, 316 SST	2
16	12700021	ADHESIVE,LOCTITE #242, BLUE	1
900	15104447	ASSY DWG, 3200 TF & CSBP HYDROPHONE	REF


COMPLETED ASSEMBLY
VIEW SHOWN WITHOUT ITEM 2
(3200 TOWFISH & CSBP HYDROPHONE
SEE SHEETS 2,3 & 4 FOR ASSEMBLY VIEWS
LOCATE APPROX AS SHOWN
9.5
8.5
COMPLETED ASSEMBLY
VIEW SHOWN WITH ITEM 2
(3200 TOWFISH & CSBP HYROPHONE)
SEE SHEETS 2,3 & 4 FOR ASSEMBLY VIEWS
SEE SHEET 4 FOR MOUNTING
LOCATE APPROX AS SHOWN
5.00 ±.50" FROM TOW ARMS
ITEM 7
LOCATE APPROX AS SHOWN
8.0
7.0
L-3 COMMUNICATIONS
KLEIN ASSOCIATES, INC.
ASSY DWG, CHIRP
SUB-BOTTOM PROFILER, 3310
52315
D
15104476
00
SCALE 1:12
SHT 1 OF 4
DO NOT SCALE PRINT
PROPRIETARY NOTICE
EXPORT NOTICE
14104476
USED ON


ASSY DWG, CHIRP
SUB-BOTTOM PROFILER, 3310
CODE IDENT NO. 52315
SIZE D
DRAWING NO. 15104476
REV 00
14104476
USED ON
DO NOT SCALE PRINT
SCALE 1:12
SHT 2 OF 4
SEE NOTE 1 SHEET 2
SEE NOTE 1 SHEET 2
INITIAL ASSEMBLY STEPS
NOTES:
1. USE 3.00" OF SHRINK SLEEVING ITEM 50, PRIOR TO ATTACHING ITEM 14 WITH ITEM 32
TO PROTECT AGAINST SCRAPING THE BOTOM PLATE


ASSY DWG, CHIRP
SUB-BOTTOM PROFILER, 3310
CODE IDENT NO. 52315
SIZE D
DRAWING NO. 15104476
REV 00
DO NOT SCALE PRINT
SCALE 1:12
SHT 3 OF 4
14104476
USED ON
USE DC-4 GREASE(KLEIN P/N: 12700418) ON THREADS TO PREVENT GALLING WHEN ATTACHING ITEM 43.
NOTE ORIENTATION
INSERT ITEM 19 PRIOR TO ITEMS 38 AND 43 BEING FULLY TIGHTENED
S3000


ASSY DWG, CHIRP
SUB-BOTTOM PROFILER, 3310
CODE IDENT NO. 52315
SIZE D
DRAWING NO. 15104476
REV 00
SCALE 1:12
SHT 4 OF 4
DO NOT SCALE PRINT
14104476
USED ON
KLEIN SYSTEM 3000
2 REF
29 2
42 2
SLIDE BRACKET(14202617) INSIDE BRACKET,TF CHANNEL GUIDE, ITEM 18 UNTIL MOUNTING SLOT ENGAGES WITH SHOULDER BOLT,ITEM 40
DETAIL A
SCALE 2 : 3

14104476 ASSY, CHIRP SPB, 3310

Item	Part Number	Description	Qty
1	14104416	ASSY, PRESSURE HOUSING, CSBP	1
2	14104447	ASSY, 3200 TF & CSBP HYDROPHONE	1
3	14104417	ASSY, TRANSFORMER, CSBP	1
4	16400386	XDCR, TR-1075, MASSA, CSBP	2
5	14202623	SPAR, 2"OD, ALUM, CSBP	1
7	14202624	TOWARM, CSBP	2
8	14202520-01	PLATE, XDCR MOUNT, UPPER, CSBP	1
9	14202520-02	PLATE, XDCR MOUNT, LOWER, CSBP	1
10	14202515-01	SHELL, UPPER, CSBP	1
11	14202515-02	SHELL, LOWER, CSBP	1
12	14202610	TAIL, CIRCULAR, CSBP	1
13	14202611	BRACKET, LOWER SUPPORT, CSBP	1
14	16400396	BALLAST, LEAD, COATED,5LBS,3.5X3.8X1.6	2
15	14202154	ANODE, ZINC, 1" OD X .50 THK	5
16	14202594	PLATE, LOCKING, CSBP	1
17	14202626	PLATE, BASE, LOCKING BAR, PH,CSBP	3
18	14202621	BRACKET,TF GUIDE CHANNEL, CSBP	1
19	14202522	HANDLE, FORWARD, CSBP	1
20	14202523	BLOCK, PLATE CONNECTION, CSBP	6
21	14202531	BLOCK, HANDLE CONNECTION, CSBP	2
22	12501140	SPACER,3/4" OD,1/2" ID,2" LONG,PE,BLACK	16
23	12500400	WASHER,FLAT 1/2 X 1 IN 316 SS	16
24	12501161	WASHER,SHOULDER,.38 IDX.50 OD,NYL,WHT	10
25	12500955	SCREW,FHMS,1/4-20 X 7/8,PHLPS,82 DEG,316	5
26	12501021	SCREW, SHCS, M6 X 25MM, 316SST	2
27	12500829	SCREW,FHMS, M4 X 16MM	6
28	12500899	NUT,NYLON INSERT,1/2-13,316SST	8
29	12501156	SCREW, SHCS,3/8-16X3 1/4,SST	7
30	12500900	SCREW,CAP,1/2-13 X 6.5",316SST	8
31	12500021	BOLT,HH 3/8-16X1-1/2 316 SS	1
32	14000267	CLAMP,HOSE,1/2" X 1.31 TO 2.25 DIA,SS	2
33	12501159	SPACER, TOW BRACKETS,CSBP	1
35	12501042	SCREW, SHCS, M8 X 25MM, 316SST	12
36	12500832	WASHER,FLAT,M8,SST	12
37	12700021	ADHESIVE,LOCTITE #242, BLUE	A/R
38	12501160	SCREW,SHCS,M8X80MM,SST 18-8	16
39	12500093	NUT,LOCK NYLON INSERT 5/16-18	1
40	12501163	SCREW,SHOULDER,375 X 3.00 L X5/16-18,SS	1
42	12500091	NUT,LOCK NYLON INSERT 3/8-16,SS,9/16HEX	6
43	12500849	NUT,LOCK NYLON,M8,18-8 SS	16
44	12501154	SCREW, SHCS, M6 X 110MM, 18-8 SST	4
45	11603150	LABEL, L-3 LOGO, 3.5" ROUND, WATERPROOF	2
46	11603151	LABEL, MODEL,CSBP,3310	1
47	12500717	WASHER,FLAT 6MM SS	2
48	12500395	WASHER,FLAT 3/8 IN 316 SS	10
49	12700064	SLEEVING,SHRINK 3/8 IN BLACK	A/R
50	11600125	LABEL,LOGO	1
900	15104476	ASSY DWG, CHIRP SPB, 3310	REF

APPENDIX A: NOTES ON HANDLING TOW CABLES

A few methods on how to safely unreel tow cables are provided in this appendix. In addition, how cable kinking can occur is identified along with what can result from this condition.

A.1 Unreeling Tow Cable

The reel should be revolved and the rope taken off the way it was put on the reel as shown in Figure A-1 for two effective methods. Place a shaft through the reel center and jack it up so that the reel revolves freely. Pull the cable straight ahead, keeping it taut, to prevent the cable from becoming loose on the reel. A board held against a flange may be used as a brake to prevent the reel from revolving too fast.

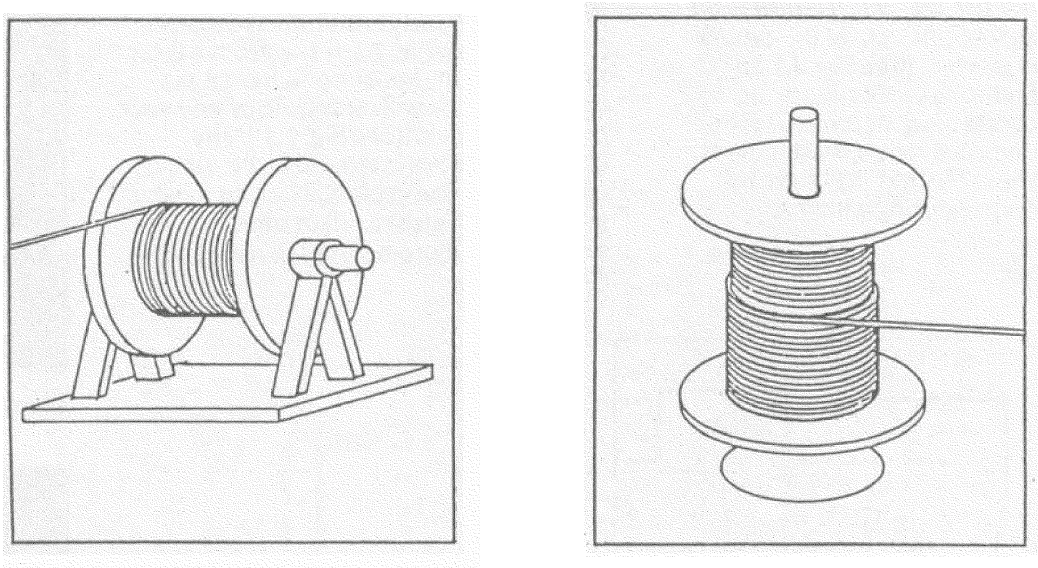


Figure A-1: *Correct Methods to Unreel Tow Cable*

A.2 Uncoiling Tow Cable

Remove ties and roll the coil along the ground so the rope lies straight. There will be no twist or kink in the cable if these instructions are followed.

CAUTION *If the reel and coil do not revolve freely, it will cause the cable to twist as each turn is taken off. Kinking will result if the twist is not removed and the cable straightened out before being placed under tension.*

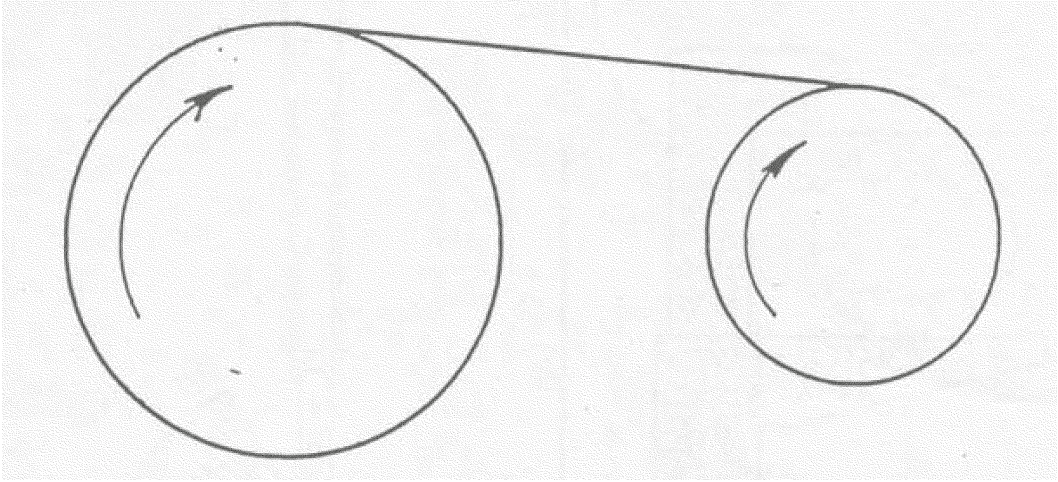


Figure A-2: *Spooling Real to Drum*

A.3 Cable Kinking

Cable kinking can be prevented if the cable is properly handled and installed. The cause, the effect and the result of cable kinking are discussed below.

A.3.1 Cause of Cable Kinking

Kinking is caused when the cable takes a spiral shape as the result of an unnatural twist. One of the most common causes of twisting is improper unreeling and uncoiling. A cable loop and a cable kink are shown in Figure A-3. At the loop stage no damage will occur if the loop is immediately straightened out before it causes a kink.

Figure A-3: *Cable Loop and Kink*

A.3.2 Effect of Cable Kinking

The effect of kinking is shown in Figure A-4. The cable is permanently damaged

Figure A-4: *Damaged Cable*

A.3.3 Result of Cable Kinking

The result of cable kinking is that strands and wires are displaced, creating uneven tension which causes excessive wear at the point of the kink. The kink can be straightened out so that the damage appears slight; however, since the relative adjustment between strands has been disturbed, the cable cannot give maximum service.

APPENDIX B: TPU SOFTWARE INTERFACE AND CONTROL

This appendix describes the various control and initialization procedures for the 3000, 5000 and 5900 Sonar System TPUs. The information in this document applies to TPU software version 5.3 and later.

B.1 Control Methods

Aside from control of the TPU via the Ethernet interface, the 3000/5000/5900 System may be controlled via NMEA messages or via a startup script file. This document outlines these latter two control methods.

B.2 Startup Script

The TPU defaults to various values for its adjustable parameters. If these default values are unsatisfactory then a startup script may be included to override the default values. This script is executed at boot up if the path to the file is included in the startup script field of the boot parameters. (See “TPU LAN Configuration Setup” on page C-24.) The syntax is "set <VARIABLE> <VALUE>" where <VARIABLE> is one of the variables from the list below and the values are as defined for the associated commands. If a variable is not included in the file, then the default value is used. The following variables are available:

3.1 RANGE {d = 0,1,2,3; or 25 - 1500}. Set range scale, where d = 0 is 50 m, d = 1 is 75 m, d = 2 is 100 m and d = 3 is 150 m. Default = 100 m. For the 5000 System the above enumerated ranges are available. For both the 3000 System and 5000 System the range scale may be set by simply specifying the range in meters, i.e. set RANGE 150, which would set the range scale to 150 meters. For the System 5900 the range scale may be set to any value between 150 and 1500 meters.

TXWAVEFORM {d = 0,1,2,3; X}. For the System 5900 set transmit waveform, where d = 1 is STD, d = 2 is DTRE and d = 0 is OFF. Default = STD.

For the 5000 System set transmit waveform, where d = 0 is 50 µs, d = 1 is 100 µs and d = 2 is 200 µs. Default = 50 µs.

The 3000 System does not support waveform initialization via the startup script. Either the default waveform must be used or the Ethernet interface used to control the waveform.

RESPDIV {d = 0 - 15}. Sets the responder divisor to 2^d, where d = 0 – 15. A value of 15 turns the responder off. Default is 15 (off).

RESPFREQ {d = 0 - 15}. Sets the responder frequency to 24 kHz + d * 500 Hz, where d = 0 – 15. Default is 7 (27.5 kHz).

DESPECKLESWITCH {d = 0,1,2,3}. Set despeckle mode, where d = 0 is off, d = 1 is low, d = 2 is medium and d = 3 is high. Default is off.

SPEEDFILTERSWITCH {d = 0,1}. Turn velocity filter on|off, where d = 0 is off and d = 1 is on. Default is on.

TVGPAGE {d = 0 - 15}. Set TVG page, where d = 0 – 15. Default is 7. Decreasing d decreases the gain by 3dB whereas increasing d increases gain by 3dB. A setting of 15 selects a "flat" TVG curve where the gain is constant.

HEARTBEAT {d = 0 - 256}. Sets the heartbeat message divisor. Heartbeat messages are output once every ‘d’ pings where d is a value from 0 to 256. Note that a value of 0 shuts off messages. Default is 0 (off).

SPEEDSOUND {d = 140000 – 150000}. Sets the speed of sound in cm/s. Default is 150000 cm/s. Accepted range is from 140000 to 160000

RESMODE {d = 0,1} (5000 System only). Set resolution mode where d = 0 is normal and d = 1 is high resolution. Note ranges of 100 m and 150 m are not available in high-resolution mode. Default is normal.

BAUDRATE {d = 300, 600, 1200, 2400, 4800, 9600, 19200, 38400}. Set the baud rate for the NMEA port (COM2). Default is 4800 (NMEA standard).

ALTIMETER {d = 0,1} (5000 System only). Turn altimeter transmitter on or off. Setting d = 1 turns altimeter on, d = 0 turns altimeter off. Default is on.

BATHY {d = 0,1,2} (5000 System only). If the towfish is a 5400 Bathymetry model then d must be set to 1. This instructs the software to process the data as four beams plus bathymetry data. If the towfish is a model 5500 with bathy then this must be set to 2. This instructs the TPU to process five beams plus bathymetry data.

OLDHEADERTYPE {d = 0,1}. Setting d = 1 selects the older header format for the data. This allows compatibility with older versions of software. If you are using an older version of ss.exe along with K-View or an older version of ISIS set this to one, otherwise set to zero or don’t include. Default is zero.

RAWTERMINAL {d = 0,1}. Setting d = 1 tells the TPU to treat COM1 as a raw terminal. This is useful if COM1 is to be used for controlling the towfish in certain integrated applications.

PINGSPERFILE {d = 500 – 50000}. When using local hard-disk storage this tells the TPU how many pings to record before starting a new file.

TRIGOUTTYPE {d = 0,1}. Sets the Trig 1 Out trigger type. For normal installations the type is ‘0’ and a pulse is generated simultaneous with the towfish trigger. For the BlueFin AUV project the type should be set to ‘1’ which programs the port to output a pulse 31 milliseconds prior to the end of the range and at a rate such that the rate is maximum without exceeding 4 Hz. Default is ‘0’.

DVLDELAYDELTA {d = 0 – 50}. Sets the DVL delay delta where d is the time in milliseconds before the end of the range at which the DVL trigger is pulsed. For example, a value of 31 (default) would set the DVL trigger pulse to occur 31 milliseconds before the end of the current range scale. For 100 m this would be 102 ms after the sonar trigger. Valid values are between 0 and 50.

DIAGLEVEL {d = 0 – 255}. This activates diagnostics monitoring in the TPU software. Each bit of the value controls a diagnostic according to the following:

bit 0: Setting this bit echoes towfish commands on COM1.

bit 1: Reserved.

bit 2: Setting this bit monitors hard-disk activity.

bit 3: Setting this bit monitors the data quality analysis thread.

bit 4: Setting this bit echoes the towfish sensor packet on COM1.

bit 5: Setting this bit echoes the towfish trigger character (CTRL-Q) on COM1.

bits 6,7: Reserved.

Example: to monitor the towfish sensor packet add the following to the startup.ini file:

set DIAGLEVEL 16

STANDBYMODE {d = 0,1,2}. Setting this to ‘1’ instructs the sonar to enter standby mode immediately on power-up. Setting this to ‘0’ instructs the sonar to starting "pinging" as soon as boot-up is completed. Setting this to ‘2’ tells the system to enter standby on power-up but shut off towfish power. This mode is only supported for AUV installations equipped with the appropriate components. Default is ‘0’.

OLDMUX {d = 0,1} (5000 System only). If the sonar contains a Version 1 multiplexer (discontinued) then this must be set to ‘1’. This instructs the TPU to use the old style trigger signal. Most 5000 Systems and all 3000 Systems use the newer CTRL-Q triggering technique. A handful of early 5000 Systems contain the older multiplexer boards and require this to be set when using the

latest software. If you have an older board it is recommended that you send your system back for upgrade as this older board is no longer supported. Default is ‘0’.

LASER {d = 0,1} (5000 System only). If the sonar contains a fiber-optic capable telemetry link set this to ‘1’ to enable the on-board laser and deactivate the copper telemetry link. DO NOT set this unless there is a fiber hooked up to the towfish and the fiber is properly terminated into the Klein FOI-01 Fiber Optic interface module. Setting this to ‘0’ deactivates the laser and activates the standard coaxial uplink. Default is ‘0’.

ENABLESENSORMESSAGE {d = 0,1}. Setting this to ‘1’ instructs the TPU to output a sensor message on COM2. This message contains the data from the onboard sensors and the current time. The format of this message is:

$PKLA,SI,HddMddSddTdddCddd.dPdd.dRdd.dDd.ddd*hh<CR><LF>

where the fields are hours, minutes, seconds, thousandths of seconds, heading, pitch, roll and depth. The depth field is in volts. A full scale reading of 5.0 volts corresponds to full scale from the pressure sensor. The full scale of the sensor must be used to convert this value to depth. The sensor measures absolute pressure so the atmospheric pressure must also be taken into account (14.7 psi). An example of the calculation is:

depth = ((Volts * Full_Scale / 5.0) – 14.7) / 1.458 meters

where Volts is the value in the depth field of the sensor message and Full_Scale is the full scale output of sensor in psi.

ENABLELEAKSENSOR {d = 0,1} (5000 System only). Setting this to ‘1’ enables leak monitoring. This should only be set if the towfish has the optional leak sensor installed. If the sensor is not installed setting this to ‘1’ can result in a false leak warning being generated. Default is ‘0’.

PREEMPHASIS {d = 0 – 7}. This controls the amount of high-frequency pre-emphasis applied to the uplink telemetry signal. In conjunction with the LBOGAIN variable this allows the sonar to drive cables of varying lengths. For short cables this should be set to ‘0’. For longer cables this number is increased to offset the cable dispersion. The optimum setting is achieved when the telemetry link exhibits zero errors. This can be found by varying the pre-emphasis with the sonar running until the error rate is a minimum. This is achieved using the $MLx fish command. When the optimum setting is found the value can then be entered in to the startup script to apply this value every time the system is started. NOTE: This is only supported on towfish equipped with the 14102066 Multiplexer PCB.

LBOGAIN {d = 0 – 3}. Along with the PREEMPHAIS variable (see above) this allows longer cables to be driven. The default value of '1' provides for optimum performance on short to medium length cables. A value of '0' decreases the uplink signal level by 6 dB. This is useful when operating the sonar on an extremely short cable such as when testing using only the deck cable as the level in to the TPU would normally be too high and may cause telemetry errors. For longer cables setting the value to '2' increases the level by 6 dB, a value of '3' increases the level by another 6 dB. Using the $MGx fish command along with the $MLx fish command the optimum combination of gain and pre-emphasis can be found. These values can then be applied on turn-on by entering the appropriate values into the startup script. NOTE: This is only supported on towfish equipped with the 14102066 Multiplexer PCB.

GETRAWDATA {d = 0,1}. Setting this to '1' instructs the TPU that the raw data acquisition modification has been performed. This modification allows the TPU to acquire and save raw stave data. Contact the factory for more details.

INCLUDE_IPMC761 {d = 0,1}. If the TPU host CPU is an MVME51xx series CPU board and has been outfitted with an IPMC761 PCI Mezzanine Card this should be set to '1'. This instructs the TPU to use the features of the IPMC761. The IPMC761 is factory installed when the system is modified for raw data acquisition.

DEFAULTUPLINK {d = 0,1} (3000 System only). The default operation of the 3000 System telemetry subsystem utilizes a party-line topology where the various serial data sources are routed to the uplink auxiliary serial channel depending upon the downlink message destination (the main uplink serial channel is dedicated to sensor data packets). For example, if the downlink message were a compass command the uplink serial channel would be routed to the TX output of the compass and all compass output data would appear at the TPU auxiliary serial port (COM3). However, this can be over-ridden by setting DEFAULTUPLINK to '1'. This tells the towfish to reset the uplink auxiliary serial channel to the towfish auxiliary RS-232 input after each downlink message. This is useful when, for example, a magnetometer or other free-running sensor is connected to the towfish auxiliary RS-232 input. This allows that sensor data to be constantly output from the TPU auxiliary serial port regardless of any downlink commands. Default is '0'.

BEAMBALANCE {d = 0 – 1000} (5000 System only). Version 5.3 and later of the TPU software has an improved beam balancing algorithm. The time constant of the balancing filter is variable and is set with this command. Lower values allow the filter to compensate for beam imbalance faster but may reduce data quality somewhat as the filter may respond to geographic features. Higher values slow the adaptation rate but may not allow the filter to adapt to

towfish-motion-induced imbalance as well. A value between 50 and 200 is recommended. The default value of ‘0’ deactivates the new algorithm and uses the previous algorithm.

MAXSAMPLES {d = 4096 – 65536} (System 5900 only). This limits the maximum number of samples generated per ping per beam. If the number of samples that normally would be generated for the range scale exceeds this value then the TPU decimates the data to this value. For example, at a 750 m range scale the TPU would normally produce about 22000 samples per beam. If MAXSAMPLES is set to 4096 then the TPU would decimate the data by about 5 to generate 4096 samples.

DOWNLINKSOURCE {d = 0,1} (System 5900 only). Setting d = 0 selects the metallic (coax) downlink driver. Setting d = 1 selects fiber downlink.

UPLINKSOURCE {d = 0,1} (System 5900 only). Setting d = 0 selects the metallic (coax) uplink. Setting d = 1 selects fiber uplink.

RAWDATACONFIG. Sets the raw data channels to populate in the data page. The argument is a hexadecimal value where the lower 16 bits set the port mask, and the upper 16 bits set the starboard mask. A value of one in each bit position configures the system to acquire the corresponding channel. For example, set RAWDATACONFIG 0007000f would select the first 3 channels on the starboard side and the first four channels on the port side. To acquire all the available raw data channels, set the configuration word to 3fff3fff. To acquire just the sidescan channels (and not the bathymetry channels) set the word to 0fff0fff.

NFSFILESYS (AUV only). Sets the NFS File system directory. This mode is only supported for AUV installations equipped with the appropriate components.

RECORDDEV {d = 0,1} (AUV only). Setting d = '0' disables NFS recording support. Setting d = '1' enables NFS recording. This mode is only supported for AUV installations equipped with the appropriate components.

TVGCHAN_1_32_PAGE {d = 0 - 7} (5900 only). Set the TVG channel gain for the side scan sonar and down looker to d. $MAd command.

TVGCHAN_33_64_PAGE {d = 0 - 7} (5900 only). Set the TVG channel gain for the side scan sonar and down looker to d. $MBd command.

TVGCHAN_65_96_PAGE {d = 0 - 7} (5900 only). Set the TVG channel gain for the NAS, up looker, and 38kHz to d. $MCd command.

TVGCHAN_97_128_PAGE {d = 0 - 7} (5900 only). Set the TVG channel gain for the side scan sonar and down looker to d. $MDd command.

BLOVERRIDE {d = 0,1} (System 5000 only). Setting d = '1' limits the number of beams to 4. Setting d = '0' uses 5 beams. Note: If Bathy is enabled, number of beams is also limited to 4. Default is '0'.

DECIMATIONMODE (System 5900 only). This is a debug setting and should not be used in normal operation. Current software ignores this parameter.

TRANSMITMASK {d = 0 - 0xFFFF}. Sets the towfish transmit mask to 'd'. Equivalent to the $XMd and $YMd commands.

MBSSXTRANSMITMASK {d = 0 - 0xFFFF} (System 5900 only). Sets the towfish side scan transmit X mask to 'd'. Equivalent to the $XMd command.

MBSSYTRANSMITMASK {d = 0 - 0xFFFF} (System 5900 only). Sets the towfish side scan transmit Y mask to 'd'. Equivalent to the $YMd command.

MBESXTRANSMITMASK {d = 0 - 0xFFFF} (System 7180/5900 only). Sets the towfish echo sounder transmit X mask to 'd'. Equivalent to the $XMd command.

MBSSYTRANSMITMASK {d = 0 - 0xFFFF} (System 7180/5900 only). Sets the towfish echo sounder transmit Y mask to 'd'. Equivalent to the $YMd command.

NAVECHO {d = 0,1}. For the System 3000, 5000, and 5900: Setting d = '1' causes each GPS string that the TPU detects on COM1 to be output to the debug COM2 port. Setting d = '0' turns off the debug navigation output. Default is '0'.

For the System 7180/5900: Setting d = '1' causes any string from the SVP, Transmissometer, Actuator, Depth Sensor, and GPS to be output to the debug port. Setting d = '0' turns off the debug output. Default is '0'.

ENGINEVERSION {d = 0,1,2} (System 7XXX/5900 only). Sets the sample rate depending on which 5900 engine is in the towfish. Set d = '0' for the 5900 Engine (sample rate of 22372.2 K samples/s). Set d = '1' for the 7200 Engine (sample rate of 12500 Ksamples/s). Set d = '2' for the 7180/5900 Engine (sample rate of 24000 Ksamples/s). Default is '0'

TOWFISHECHO {d = 0,1}. Setting d = '1' enables all commands sent to the towfish to be echoed out the TPU debug port COM2. Setting d = '0' disables the debug output. Default is '0'.

LBO {d = 0 - 7}). Sends the fish command $MZd.

SYS7KCONFIG1_32 {d = 0 - 0xFFFFFFF} (System 7XXX/5900 Only). Sets the channel configuration mask for channels 1 thru 32 to 'd'. Each bit in the mask enables a channel. For example 0x10000001 would enable channels 1 and 29 and disable all other channels.

SYS7KCONFIG33_64 {d = 0 - 0xFFFFFFF} (System 7XXX/5900 Only). Sets the channel configuration mask for channels 33 thru 64 to 'd'. Each bit in the mask enables a channel. For example 0x10000001 would enable channels 33 and 61 and disable all other channels.

SYS7KCONFIG65_96 {d = 0 - 0xFFFFFFF} (System 7XXX/5900 Only). Sets the channel configuration mask for channels 65 thru 96 to 'd'. Each bit in the mask enables a channel. For example 0x10000001 would enable channels 65 and 93 and disable all other channels.

SYS7KCONFIG97_128 {d = 0 - 0xFFFFFFF} (System 7XXX/5900 Only). Sets the channel configuration mask for channels 97 thru 128 to 'd'. Each bit in the mask enables a channel. For example 0x10000001 would enable channels 97 and 128 and disable all other channels.

MASTERCONTROLBOARD {d = 0,1} (System 7XXX/5900 Only). Debug only command. Indicates whether there is a master control board present in the system or not. Setting d = '0' indicates the fish is being operated in a debug mode without a master control board. Setting d = '1' indicates a master control board is present (normal operation). Default is '1'.

DSPLOWPASSFILTERCUTOFF {d = 0 - 9} (System 7XXX/5900 Only). Sets the DSP low pass filter cutoff to 'd'. Equivalent to the $DCd command. Default is '4'.

DECIMATIONFACTOR {d = 0 - 9} (System 7XXX/5900 Only). Causes the TPU to decimate the side scan sonar data by factor 'd'. Thus, the equivalent sample frequency becomes "Default Sample Freq / 'd'". Default is '2'.

OCTANSLATITUDEINIT {Lat =llll.ll H = a} (System 7180/5900 Only). Causes the TPU to send a $--GGA message to the octans to initialize its latitude to 'llll.ll' degrees and hemisphere 'a' where a may be 'N' for North or 'S' for South.

ALTOFFSET {d} (System 5000 Only). Sets the floating point altitude offset 'd' in meters. The altitude offset is subtracted from the System 5000 calculated altitude before it is placed in the data page header. Default is '0.04' meters.

SLAVEMODE {d = 0,1} (Systems 3000/5000 Only). Setting d = '1' puts the TPU system in slave standby mode. Standby mode disables the trigger timer interrupt and enables the external demux interrupt. In standby mode, the fish my be triggered by an external device. Default is '0'.

WINGACTUATOR {d = 0,1} (System 5000/5900 Only). Setting d = '1' indicates the Towfish has a motorized actuated wing. Setting this value to '0' when there is an actuated wing present will disable the wing motion control. Default is '0'.

SUBBOTTOM {d = 0,1} (System 3000 Only). Setting d = '1' indicates the Towfish has the sub bottom profiler option. Enabling this option will cause the TPU to allow the sub bottom profiler to be enabled and sub bottom data collected. When using the sub bottom profiler option, the System 3000 data page output format changes to support the 24-bit sub bottom data. Default is '0'.

SBPTXVERSION {d = 0} (System 3000 Only). Sets the version of the sub bottom profiler Tx waveforms programmed into the towfish. This command is provided for possible future updates to the SBP Tx waveforms. The Tx waveform version in the startup.ini file must match the SBP Tx waveform version programmed into the towfish SBP transmitter. Default is '0'.

HEADERVERSION {d = 3,4}. Setting d = 4 selects the version 4 header format for the data. This value must be set to 4 for sub bottom. Setting this value to 4 expands the functionality of the system. This allows expanded functionality and should be used with all new Sonar systems. If you are using an older version of SonarPro or other TPU interfacing software, set this value to 3 or don't include. Default is 3.

When this value is set, the page version is as follows for the various systems:

d <= 3: 3000 towfish, page version 3000

d = 4: 3000 towfish, page version 3001

d <= 3: 5000 towfish, page version 5000

d = 4: 5000 towfish, page version 5001

PRESSURESENSOROFFSET {d} (System 3000 and 5000 Only). Sets the floating point pressure sensor offset 'd' in pounds per square inch (psi). This setting is only valid when HEADERVERSION is greater than or equal to 4. This value is placed in the SDF Extended header pressureSensorOffset field. It may then be used by client software to provide an offset to the pressure sensor reading derived from the depth sensor. Default is 0.

FISHHEADINGOFFSET {d} (System 3000 and 5000 Only). Sets the floating point towfish heading offset 'd' in degrees. This setting is only valid when HEADERVERSION is greater than or equal to 4. This value is placed in the SDF Extended header fishHeadingOffset field. It may then be used by client software to provide an offset to the magnetic heading read from the compass. Default is 0.

An example script is as follows:

```
set RANGE 2
set TXWAVEFORM 0
set RESPDIV 3
set RESPFREQ 7
set DESPECKLESWITCH 0
set SPEEDFILTERSWITCH 1
set TVGPAGE 7
set HEARTBEAT 0
set SPEEDSOUND 150000
set RESMODE 0
set BAUDRATE 9600
set ALTIMETER 1
set BEAMBALANCE 100
```

The file is typically given the name "startup.ini"and is located in the same directory as the VxWorks file. The full path to startup script file must be entered into the "startup script" parameter field in the boot configuration. (See “TPU LAN Configuration Setup” on page C-24 for details on boot parameters.) For example: if the file is located in /klein, then the "startup script" parameter must be set to /klein/startup.ini.

B.3 Remote Control

COM2 is a NMEA 0183 serial port used for inputting navigation data to the TPU. In addition to the standard messages that are accepted (i.e. RMC, GGA, refer to manual for details) the TPU also accepts proprietary messages of the form:

$PKLA,aaddd*hh<CR><LF>

where aa is two-letter command code, ddd is a variable length hexadecimal data field and hh is the checksum computed for the characters between the ‘$’ and the ‘*’. Note that the checksum need not be included, it is only required by the NMEA standard but the TPU does not reject a message if the checksum is not present. Therefore one may simply issue a command as: $PKLA,aaddd<CR><LF>. This, however, technically violates the NMEA standard although the TPU will still interpret the message and act accordingly. Refer to the NMEA 0183 specification for more information on proprietary messages. These messages may also be used to control the sonar. Note that if a master client is already controlling the sonar (i.e.

SonarPro connected as master) then many of the commands will have no effect as there can only be one master and the software request to change a parameter will be rejected because there is an existing master. Many commands will echo the current setting if the data field is replaced with "?". For example "PKLA,RS?<CR><LF>" will respond with the current range scale.

The following command codes are recognized:

ATd: Turn altimeter transmitter on or off. Setting d = 1 turns altimeter on, d = 0 turns altimeter off. Default is off.

BRdddd: Sets the baud rate of COM2 where dddd is the baud rate. Default is 4800. To change the baud rate issue this command and then change the terminal to match the new rate.

DDdd: Set the DVL delay delta where dd is the time in milliseconds before the end of the range at which the DVL trigger is pulsed. For example, a value of 31 (default) would set the DVL trigger pulse to occur 31 milliseconds before the end of the current range scale. For 100 m this would be 102 ms after the sonar trigger. Valid values are between 0 and 50.

DF: Set all parameters to their default values.

DLd: Sets diagnostics verbosity. Each bit in d turns on or off specific diagnostic features. Setting bit 0 turns on fish command echoing. This echoes any commands sent to the towfish out COM1. Setting bit 1 enables program flow monitoring. This enables messages that indicate changes in program state. Setting bit 2 enables hard-drive monitoring messages including disk statistics and file creation information. Setting bit 3 enables output of statistical data analysis. Setting bit 4 echoes the uplink data from the towfish. Default is 0x7. Note that the startup banner, revision number, and peripherals seek information (IRIG, SCSI, etc.) are always displayed on startup.

DMd: Set despeckle mode, where d = 0 is off, d = 1 is low, d = 2 is medium and d = 3 is high. Default is off.

DS: Dump (transfer) the snapshot. See below for details.

ESd: Enable sensor data message. A value of zero disables the message and a value of one enables the message.

FC<string>: Send a towfish command. The string is sent to the towfish via the downlink. See below for details on fish commands.

FD: Format the hard-drive. WARNING: this will erase all data. Only use if a new disk has been installed. Note: only supported if local disk-drive option installed.

FLdddd: Set the length of the recorded files where d is the number of pings per file. Default is 5000. Range is from 500 to 50000.

HBd: Sets the heartbeat message divisor. Heartbeat messages are output once every ‘d’ pings where d is a value from 0 to 256. Note that a value of 0 shuts off messages. Default is 0 (off).

LL<data>: Inputs the fish position. The format of the data is aaa.aa,N,bbb.bb,E where aaa.aa is the latitude, N is N/S, bbb.bb is longitude and E is E/W.

MVd.d: Sets the minimum velocity in m/s. Default is 1.0 m/s.

NF: Opens a new data file regardless of the number of pings written to the existing file. This can be used to synchronize recording to another event such as the beginning of a track. The current file is closed and the new file is opened on the subsequent ping following this command. If record mode is "0" the command will not take effect until record mode is switched to "1".

RB: Reboot the TPU. In the event that the TPU watchdog reports an error the TPU should be rebooted using this command. Prior to issuing the reboot command recording must be stopped and all files closed. Refer to status messages for more information.

RCd: Start or stop recording data, where d = 0 stops and d = 1 starts recording. Not affected by the set defaults command. Default (startup condition) is off. Note: only supported if local disk-drive option installed.

RDd: Sets the responder divisor to 2^d, where d = 0 – 15. A value of 15 turns the responder off. Default is 15 (off).

RFd: Sets the responder frequency to 24 kHz + d * 500 Hz, where d = 0 – 15. Default is 7 (27.5 kHz).

Red: Set resolution mode where d = 0 is normal and d = 1 is high resolution. Note ranges of 100 m and 150 m are not available in high-resolution mode. Default is normal.

RSd: Set range scale, where d = 0 is 50 m, d = 1 is 75 m, d = 2 is 100 m and d = 3 is 150 m. Default = 100 m.

SC<data>: Synchronize the internal clock. The <data> field is defined as follows: mm,dd,yyyy,hh,mm,ss,mmm which is month, day, year (4 digit), hours, minutes, seconds, and milliseconds.

SD: Prepare the system for shutdown. This puts the system in standby, stops any recording, and closes all files. When shutdown preparations are complete a status message is issued and the SD value is set to one.

SId: Take a snapshot image and save for subsequent transfer. Setting d = 0 sets the image size to 16x1, d = 1 sets the snapshot size to 32x32, d = 2 is 64x64, d = 3 is 128x128 and d = 4 is 256x256.

SMd: Set standby mode, where d = 0 is normal and d = 1 puts the system into standby (no trigger). Setting d = 2 puts the system into low-power mode by shutting off the power to the towfish (only supported in AUV configuration option, see above). Default is normal (0).

SSdddddd: Sets the speed of sound in cm/s. The data field is expected to be of length six. Default is 150000 cm/s. Accepted range is from 140000 to 160000.

ST: Dump a status message. See below.

TMd: Set test mode where d = 0 is normal. Reserved for factory test, do not access.

TPd: Set TVG page, where d = 0 – 15. Default is 7. Decreasing d decreases the gain by 3dB whereas increasing d increases gain by 3dB.

TS: Triggers the system. This can be used as an alternate triggering method. If the internal triggering is not desired then the user can issue this command to trigger the system. To use this command, place the system in standby (SM1) first and then issue the command at the desired rate.

TTd: Sets the Trig 1 Out trigger type. For normal installations the type is ‘0’ and a pulse is generated simultaneous with the towfish trigger. For the BlueFin AUV project the type should be set to ‘1’ which programs the port to output a pulse 31 milliseconds prior to the end of the range and at a rate such that the rate is maximum without exceeding 4 Hz. Default is ‘0’.

VFd: Turn velocity filter on|off, where d = 0 is off and d = 1 is on. Default is on.

WFd: Set transmit waveform, where d = 0 is 50 µs, d = 1 is 100 µs and d = 2 is 200 µs. Default = 50 µs

An example command:

$PKLA,DM2*5E<CR><LF>

would select the medium despeckler kernel.

For AUV applications the system accepts a custom navigation data message that combines all the pertinent data into a single string for convenience. This data is merged with the sonar data on a per ping basis. The data is input to the system using a $PAUV message. The format of the message is as follows:

$PAUV,hhmmss.ss,S,llll.ll,a,yyyy.yy,a,v.vv,h.h,pp.p,rr.r,dd.d,aa.a,ddmmyyyy*hh<CR>LF>

where the fields are, in order:

time, status, latitude, N/S, longitude, E/W, speed in m/s, course, pitch in degrees, roll in degrees, depth in meters, altitude in meters, and date.

B.4 Snapshots

The system is capable of outputting image snapshots for use in equipment health monitoring. These snapshots are decimated images of the current imagery data. Five different sizes are supported so as to meet the limitations of varying acoustic or RF telemetry links between the AUV and the mother ship. The data is output in a simple raster format. After issuing the DS command a sequence of NMEA messages are output. Each message has the form

$PKLA,SIxxxxxx…..xxx*hh<CR><LF>

where the xxxxx.xxx represents the data. The data is 8 bits, and each 8-bit value is represented by a two character hexadecimal ASCII representation. A new SI command overwrites any previous data. Be sure to issue a DS command before issuing a new SI command unless the data from the previous SI command can be discarded.

NOTE *The heartbeat message is turned off on during the output of the snapshot data. It is restored to its previous value upon completion of the data dump. This is done to prevent the output of a heartbeat message during the output of the snapshot data.*

B.5 Messages

B.5.1 Status Message

Upon query of the system by the ST (status) command the system outputs a status message of the form:

$PKLA,ST,RSdWFdRMdSMdDMdTPdVFdRCdSDdHDddERdd*hh<CR><LF>

where the fields are as described above and HD is the percentage of hard drive space used and ER is an error/health monitoring byte (in ASCII hex representation) where zero indicates normal operation and a non-zero value indicates an error state defined as:

0: Over-speed, the vehicle is above the maximum speed for the given range scale/resolution mode.

1: Navigation Data Error, the navigation data is incorrect either in format or checksum.

2: Telemetry Error, the telemetry link between the TPU and the towfish is malfunctioning. Note: this feature is currently unsupported. Future hardware revisions plan support for link monitoring and this is a place holder for those revisions.

3: Sensor Checksum Error, the checksum in the sensor data packet does not equal the computed checksum. Occasional errors are no cause for alarm as sometimes a sensor packet is corrupted by the strong electromagnetic field generated when the towfish “fires”. Repeated errors, however, may indicate a telemetry or other fault and should be investigated.

4: Leak, there is a leak in the electronics bottle. This is only supported if the towfish is equipped with a leak sensor and the appropriate initializer is present in the startup script.

5: Statistical analysis indicates data may be compromised. The TPU monitors the data quality by performing power spectrum measurements on the data. If the results of these measurements indicate that the data is static (indicating a software or DSP crash) or has little energy (indicating a hardware failure) then this flag is raised. Note that if the towfish is operated out of water then it is quite common for this flag to be set as there is little energy in the return echo and the TPU will assume that the hardware has failed.

6: TPU watchdog. If this bit is set then a task may be locked. The TPU uses multi-threaded OS technology where multiple tasks are performed simultaneously. These tasks include acquiring the data, formatting it, parsing the sensor messages, handling navigation input, etc. A software error can cause a thread to cease execution although this is extremely rare. Whilst the sonar can continue operating if a non-critical thread is stopped certain critical threads will render the sonar inoperable if they are stopped. If this flag is raised then one or more threads has ceased. It is recommended to shutdown the system and reboot.

7: Reserved.

An example status message:

$PKLA,ST,RS2WF1RM0SM0DM0TP7VF0RC1SD0HD57ER24*hh<CR><LF>

B.5.2 Heartbeat Message

Once per ping (or less, see HB command) a heartbeat message is output. This message contains the current ping number, time, altitude and the current error status as follows:

$PKLA,HB,PxxxxHddMddSddTdddAdd.dEyy*hh<CR><LF>

Following the "HB" the fields are ping number, hours, minutes, seconds, thousandths of seconds, altitude in meters and error state.

B.5.3 Sensor Message

Roughly once per second (if enabled, see Startup Script and Remote Control above) a sensor message is output. This message contains the data from the onboard sensors and the current time. The format of this message is:

$PKLA,SI,HddMddSddTdddCddd.dPdd.dRdd.dDd.ddd*hh<CR><LF>

where the fields are hours, minutes, seconds, thousandths of seconds, heading, pitch, roll and depth. The depth field is in volts. A full scale reading of 5.0 volts corresponds to full scale from the pressure sensor. The full scale of the sensor must be used to convert this value to depth. The sensor measures absolute pressure so the atmospheric pressure must also be taken into account (14.7 psi). An example of the calculation is:

depth = ((Volts * Full_Scale / 5.0) – 14.7) / 1.458 meters

where Volts is the value in the depth field of the sensor message and Full_Scale is the full scale output of sensor in psi.

NOTE *The systems are available with a range of pressure sensors. This is the reason that absolute depth is not calculated by the TPU.*

B.6 Towfish Commands

Although sonar control is normally performed using the Ethernet or NMEA interfaces, direct control of the towfish is possible. Various parameters of sonar operation are performed in the towfish, such as waveform selection, TVG page, etc. These parameters are set by transmitting control messages to the towfish via the downlink telemetry. The control messages take the form:

$XYd <CR><LF>

where X is the destination, Y is the command and dd is the data for the command. The destination of the command instructs the downlink processor where to route the command as there are multiple possible destinations for a command. For example, one can send commands to the on-board compass, the Transmitter PCB, the MUX PCB, etc. For the 5000 System the possible destinations are M for the MUX PCB, T for the Transmitter PCB and C for the Compass module. For the 3000 System the possible destinations are M for the MUX PCB, S for the SBP, C for the Compass module and A for the auxiliary RS-232 port. For the System 5900 the possible destinations are M for the MUX board, D for the DSP board, X for Transmitter board #1 and Y for Transmitter board #2.

Issuing commands to the towfish can be done in a number of ways. The most straightforward technique is to use the towfish command interface in the SonarPro software. The desired command is simply entered and then sent to the towfish. Another technique is to use the $PKLA,FC command via the NMEA interface (COM2). The desired command is simply typed after the ‘FC’. For example, $PKLA,FC$MT9<CR><LF>. The final technique is to use the towfish diagnostics connectors located inside the TPU. On the 5000 System a special cable is needed to break out a header on the DEMUX board to a DB-25 connector. This connector can then be hooked to a terminal and direct control of the towfish achieved. This is normally reserved for factory use. For the 3000 System a terminal can be connected to COM3 on the DEMUX board. Once again, this is normally reserved for factory use.

B.6.1 5000 System MUX Commands

The following commands are available to control the 5000 System Multiplexer:

$MTd: Sets the TVG page where d = 0 – F in hexadecimal format. The default page is 7. Increasing the value increases the gain by 3 dB for each increment. Conversely decreasing this value decreases the gain by 3 dB.

$MLd: Sets the uplink pre-emphasis amount where d = 0 – 7. See the 'PREEMPHASIS' description in the startup script above for more information. This command can be used to fine tune the uplink for various cables. When the performance is optimized then this value can be incorporated into the startup script to initialize the pre-emphasis on boot-up. Note: this command is only supported on towfish equipped with a 14102066 Multiplexer board.

$MGd: Sets the uplink gain where d = 0 – 4. See the 'LBOGAIN' description in the startup script above for more information. This command can be used to fine tune the uplink for various cables. When the performance is optimized then this value can be incorporated into the startup script to initialize the pre-emphasis on boot-up. Note: this command is only supported on towfish equipped with a 14102066 Multiplexer board.

$MSd: Sets the uplink source where d = 0 selects the normal coaxial drive. Setting this to '1' selects the laser as the source and deactivates the metallic uplink. See the 'LASER' description in the startup script above for more information. Note: this command is only supported on towfish equipped with a 14102066 Multiplexer board.

B.6.2 5000 System Transmitter Commands

The following commands are available to control the 5000 System Transmitter:

$TWd: Sets the transmit waveform. This command should not be accessed by the user as an incorrect setting can cause serious data quality degradation.

$TRd: Selects the responder frequency page where d = 0 –F hexadecimal. The default is '7' which selects a frequency of 27.5 kHz. Increasing or decreasing this value changes the responder frequency by 500 Hz.

$TDd: Sets the responder divisor to 2^d, where d = 0 – 15. A value of 15 turns the responder off.

$TAd: Turns the altimeter transmitter on or off. Setting d = 1 turns altimeter on, d = 0 turns the altimeter off.

B.6.3 System 5000 Actuator Commands

For System 5000s equipped with an actuated wing, the wing actuator may be controlled using towfish commands. This is not recommended. The syntax is $MA<command><CR><LF> where <command> is a actuator control command. Refer to the appropriate actuator motor controller user's manual for more information on actuator commands.

B.6.4 3000 System Multiplexer Commands

$MMd: Selects the towfish acquisition mode. This command should not be issued by the user as the format of the data is changed without the TPU being informed. This command is inherently sent when the framing mode is changed via the SonarPro interface.

$MLd: Selects the low-frequency TVG page where d = 0 – F hexadecimal. The default page is 7. Increasing the value increases the gain by 3 dB for each increment. Conversely decreasing this value decreases the gain by 3 dB.

$MHd: Selects the high-frequency TVG page where d = 0 – F hexadecimal. The default page is 7. Increasing the value increases the gain by 3 dB for each increment. Conversely decreasing this value decreases the gain by 3 dB.

$MDd: Sets the responder divisor to 2^d, where d = 0 – 15. A value of 15 turns the responder off.

$MAd: Sets the low-frequency waveform. This command should not be issued by the user as damage to the transmit electronics could result if an inappropriate waveform is selected.

$MBd: Sets the high-frequency waveform. This command should not be issued by the user as damage to the transmit electronics could result if an inappropriate waveform is selected.

B.6.5 Auxiliary and Compass Commands

For the both the 3000 and 5000 Systems the compass module may be controlled using towfish commands. This is not recommended unless manual reconfiguration of the compass is necessary. The syntax is $C<command><CR><LF> where <command> is a TCM2 compass command. Refer to the TCM2 user's manual for more information on compass commands. For example, to stop the compass the halt command would be issued by sending the fish command Ch<CR><LF>.

Likewise for the 3000 System commands may be sent to an auxiliary sensor connected to the towfish auxiliary RS-232 port. The format of the commands is obviously specific to the sensor used. To issue a command to an auxiliary sensor the format would be $A<command><CR><LF>.

B.6.6 System 5900 MUX Commands

The following commands are available to control the System 5900 Multiplexer:

$MTd: Sets the TVG page where d = 0 – F in hexadecimal format. The default page is 7. Increasing the value increases the gain by 3 dB for each increment. Conversely decreasing this value decreases the gain by 3 dB.

$MLd: Sets the uplink pre-emphasis amount where d = 0 – 7. See the 'PREEMPHASIS' description in the startup script above for more information. This command can be used to fine tune the uplink for various cables. When the performance is optimized then this value can be incorporated into the startup script to initialize the pre-emphasis on boot-up.

$MGd: Sets the uplink gain where d = 0 – 3. See the 'LBOGAIN' description in the startup script above for more information. This command can be used to fine tune the uplink for various cables. When the performance is optimized then this value can be incorporated into the startup script to initialize the pre-emphasis on boot-up.

$MSd: Sets the uplink source where d = 0 selects the normal coaxial drive. Setting this to '1' selects the laser as the source and deactivates the metallic uplink. See the 'UPLINKSOURCE' description in the startup script above for more information.

$MXd: Sets the trigger mask register where d is the bit mask in hex. The bits are defined as: bit0: transmit trigger, bit1: aux trigger 1, bit2: aux trigger2. For normal operation it is sufficient to simply send $MXF.

B.6.7 System 5900 DSP Commands

The following commands are available to control the System 5900 DSP board:

$DR: Resets the DSP. This command resets the DSP card to its initial default state.

$DTd: Selects the DSP test mode where d = 0 – 5. Test mode ‘0’ is off. Test mode ‘1’ puts a fixed word into each channel such that channel0i = 0, channel0q = 1, channel1i = 0x100, channel1q = 0x101, channel2 = 0x200, etc. Test mode ‘2’ sets channel0i and channel0q to 0x7fff and all other channels to 0. Test mode ‘3’ puts a sliding ramp test pattern into the channels. Test mode ‘4’ slowly increases all channels. Test mode ‘5’ puts the value 0x4321 into all channels.

$DCd: Sets the DSP lowpass filter cutoff frequency where d = 0 – 9. The cutoff frequency is then given by Fc = d + 1 kHz.

$DAd: Turns on|off the magnitude function. When d = 1 the DSP finds the magnitude by performing x = sqrt(I^2 + Q^2). The resultant magnitude information for each channel is then passed to the TPU as a 32-bit value. If d = 0 the DSP passes the I and Q data up as two 16-bit words for each channel.

$DHyd: System 7180/5900 only. Sets the saturation detect headroom threshold d for receiver card y where d is a 16-bit hexadecimal number (0x0000 thru 0xFFFF) and y is A, B, C, or D. The headroom threshold is used by the DSP to compare each A/D value on every channel to determine if any raw samples exceed the threshold. When the threshold is exceeded, a threshold count for that channel is incremented. The threshold count for each channel is then placed in the first Q sample word for that channel in every ping. Each ping resets all the threshold counters.

B.6.8 System 5900 Transmitter Commands

The following commands are available to control the System 5900 Transmitters. There are two transmitter boards. The board that controls the lower 64 channels is ‘X’. The other board is referred to as ‘Y’. The commands shown use ‘X’. To control the other board change the ‘X’ to ‘Y’.

$XWd: Selects the transmit waveform where d = 0 – 3. The waveforms are 0 = 50 µs, 1 = 100 µs, 2 = 150 µs and 3 = 200 µs. Setting d = 0xf selects a null waveform (no transmit).

$XMdddd: Selects the transmitter mask. Each transmitter board is comprised of 16 transmitters. Each transmitter can be individually masked. Each bit in the hex value dddd corresponds to a transmitter. For example $XM0001 would enable only the first transmitter. Likewise $XMF00F would enable the upper four and lower four transmitters. The default is $XMFFFF (all on).

B.6.9 System x000 Sub-Bottom Profiler (SBP) Commands.

System x000 Sub-bottom Profiler (SBP) Commands.

$SGd: Selects the Sub Bottom Preamp Gain where d = 0 is low and d = 1 is high. Default is 1.

$SEd: Enables (d=1) or disabled (d=0) the Sub Bottom Tx. Default is 1.

$SWd: Selects the Sub Bottom Tx waveform where d = 0 - 15. Default is 0.

$STd: Selects the Sub Bottom test mode where d = 0 - 6. The test modes are as follows:

d = 0: Normal mode: RX data is sent.

d = 1: Reserved.

d = 2: Reserved.

d = 3: Generate a sawtooth waveform by holding the low 12 bits at 0xFFF, and incrementing a 12-bit counter every sample time to drive the high 12 bits.

d = 4: Reserved.

d = 5: Send the static data pattern 1-2-3-A-B-E for every 24-bit sample.

d = 6: Redirect selected TX waveform to uplink. Decimate the sample rate as required (8:1) and assign to MS 8 bits of each 24-bit sample. (Low 16 bits 0x0000).

B.6.10 Datalogger On/Off commands

The 4 acceptable commands will be:

$PKLA,PC1: Will turn power off to the sonar only.

$PKLA,PC2: Will turn power off to the TPU only.

$PKLA,PC3: Will turn power on to both the TPU and sonar.

$PKLA,PC0: Will turn power off to both the TPU and sonar.

$PKLA,PL2: Will shut down data logger in the proper Linux sequence.

APPENDIX C: GENERAL SETUP, CONFIGURATION AND TROUBLESHOOTING

Included in this appendix are basic setup and configuration instructions along with other information useful for setting up and maintaining the Series 3000 Sonar System. In addition, information is provided which can be helpful for system troubleshooting should problems occur, including instructions on how to verify operation of hardware components and transducers.

WARNING *Klein Associates recommends all troubleshooting be done by a trained technician. Some circuits in the Sonar Transceiver and Processing Unit have voltages as high as 240 volts, and some circuits in the sonar towfish have 1500 volts. You should familiarize yourself with the location of these voltages before you attempt any troubleshooting. Failure to observe these warnings could result in injuries to personnel.*

CAUTION *Serious damage to the sonar electronics may occur if the sonar towfish is operated out of the water for periods longer than 15 minutes. Let the sonar cool 15 minutes or longer between operations. Protect the sonar towfish from direct exposure to the sun prior to and during operation in high temperature climates.*

CAUTION *The depth rating on the transducers is 200 meters (656 feet). Operations at depths greater than 200 meters may damage the transducers.*

C.1 Basic System Requirements

Although we suggest that you get the fastest available computer at the time of purchase, it is recommended that you use the following *minimum* PC system.

- 400 MHz Pentium II
- 512 megabytes of RAM
- 10 GB hard drive
- 8 MB video card
- 100BaseT Ethernet card, such as a 3Com 3C905
- Windows NT 4.0, 2000 or XP
- Windows NT disk defragmenter.
- Power backup module.

When running the PC system it is important to make sure that you leave at least 500 MB of free disk space for temporary system disk swap files.

You will need to connect the Transceiver and Processing Unit (TPU) to the host PC computer using a fast Ethernet hub, such as a 3Com 8 port, product number 3C16722.

C.2 Basic System Setup

Refer to Figure C-1 for the basic system setup information and to Figure C-2 for a system with an acoustic positioning system.

It is important that you check the operating voltage of the ship. Inspect and reset the input voltage on the TPU and Host PC computer before connecting to ship board power.

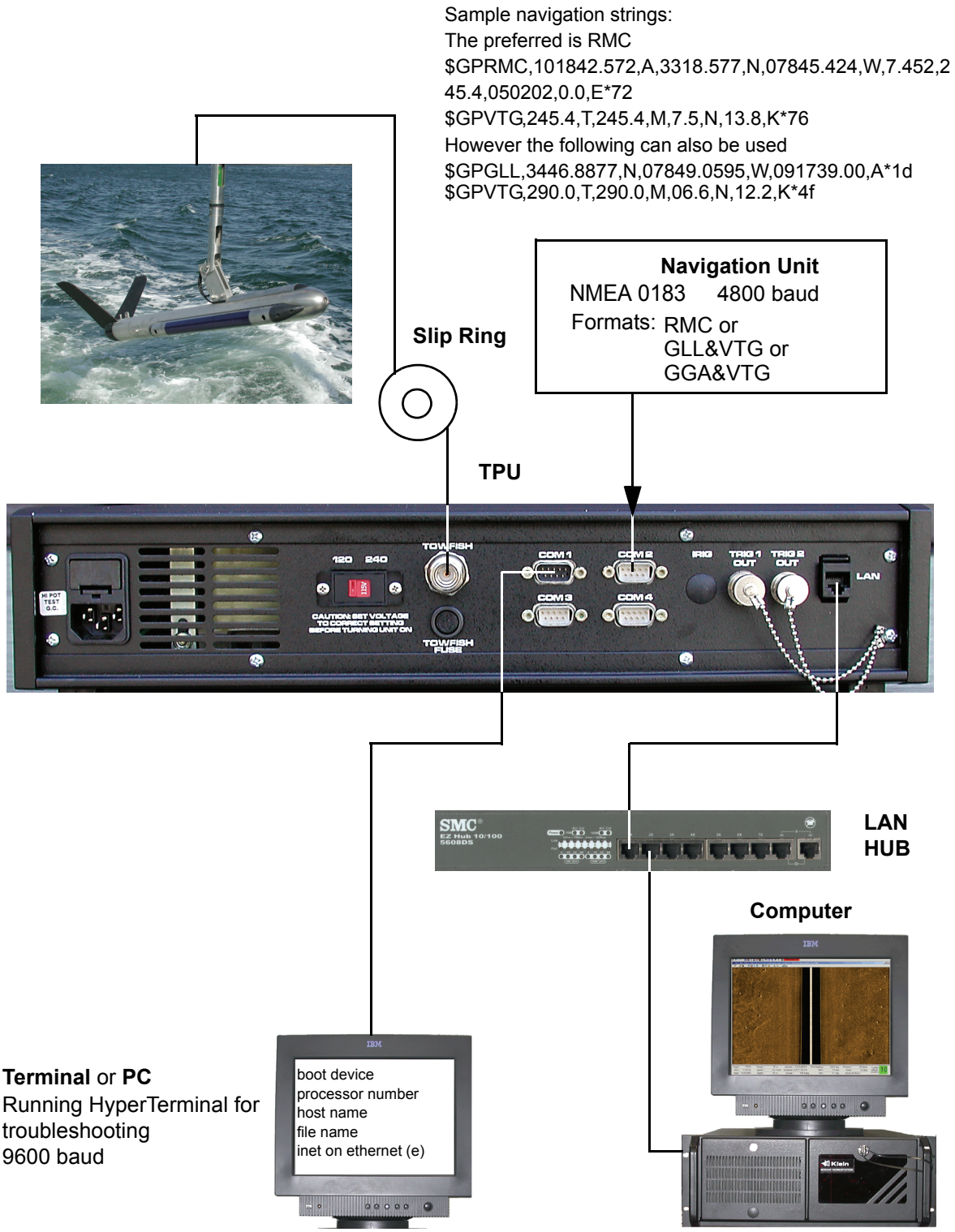


Figure C-1: *Basic System Setup Diagram*

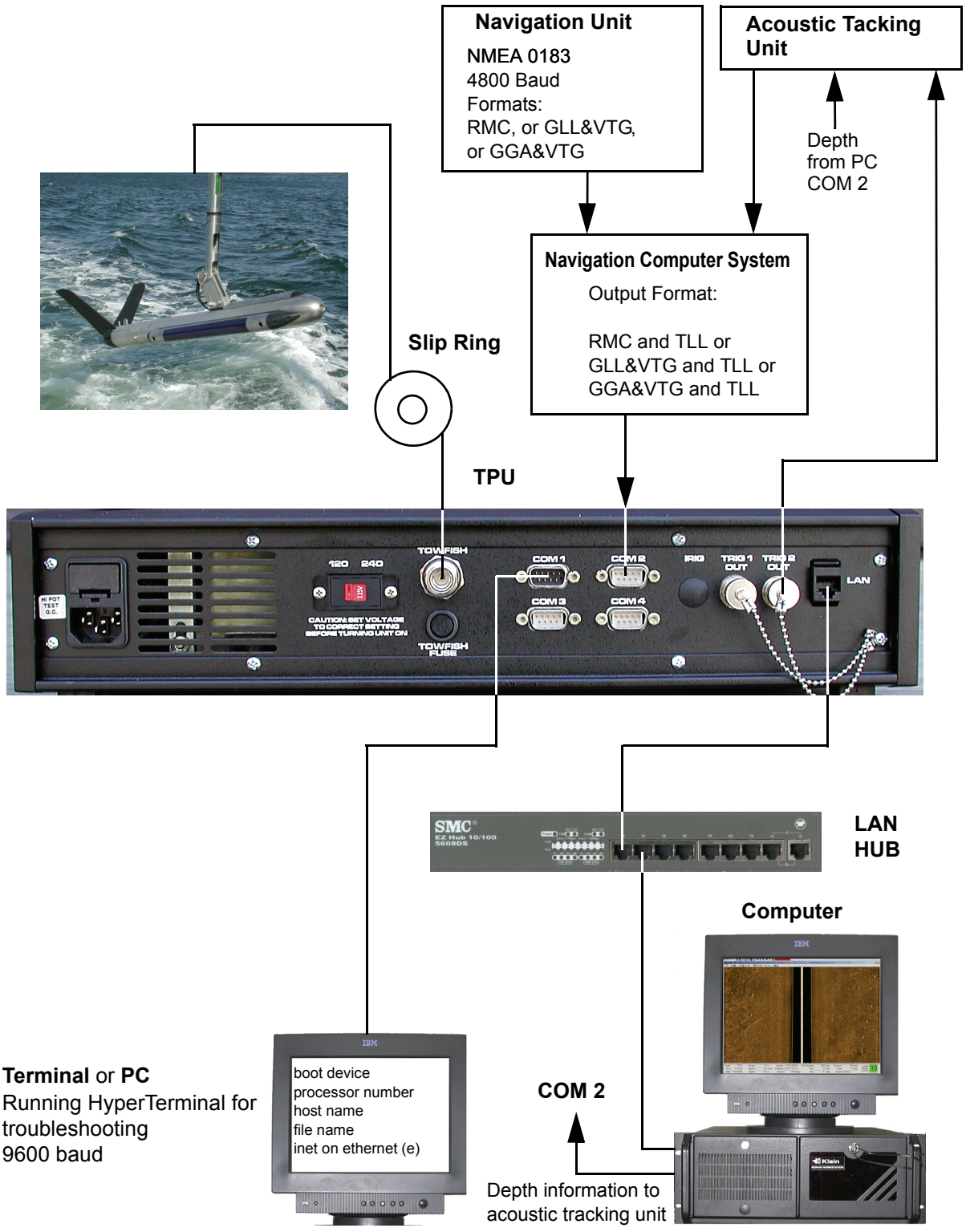


Figure C-2: *System Setup Diagram with Acoustic Positioning System*

C.3 Installing SonarPro

Insert the SonarPro Version 10.0 CD into your CD-ROM drive, and then locate the SonarPro Installation.pdf file in the Documentation folder. Double-click this file to open it.

NOTE *It is very important that you follow the instructions in the Sonarpro Installation.pdf file. You should also print this file.*

To install SonarPro double-click the setup.exe file in the SonarPro Disk1 folder and follow the directions carefully.

For an upgrade, double-click the setup.exe file in the SonarPro Disk1 folder and follow the directions carefully. Multiple versions of SonarPro can reside on the same computer.

When installation is complete, verify that your startup.ini file or your vxWorks files are located directly in the klein directory.

C.4 Configuring the LAN Connection

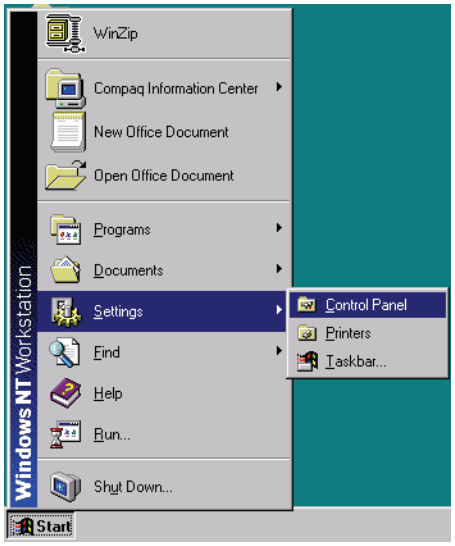
Three LAN configuration setup procedures are provided, one for each of three Windows operating systems: NT, 2000 and XP. In addition, the TPU must be configured for the LAN.

C.4.1 Windows NT LAN Configuration Setup

First, check the TCP/IP protocol:

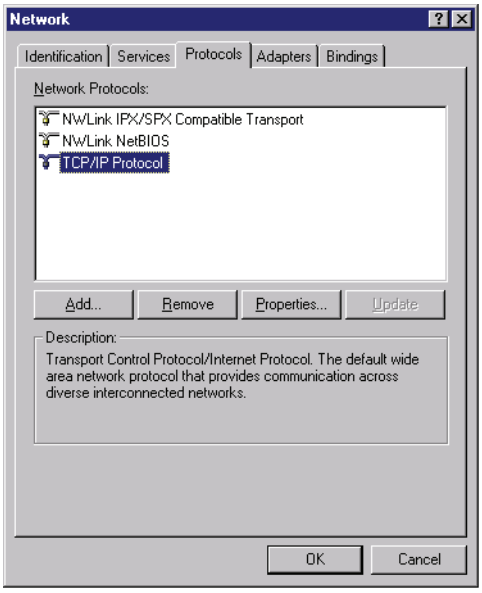
1. On the desktop choose *Start/Settings/ Control Panel*.
2. Double-click the **Network** icon

.



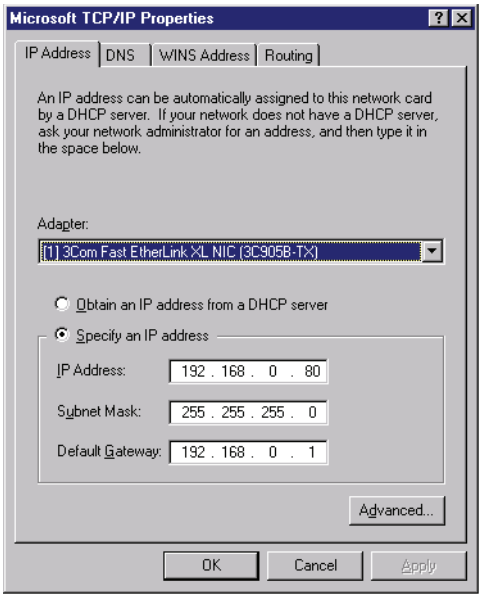
3. Note your computer name.

4. Select the *Protocols* tab.



5. Select *TCP/IP Protocol*, click **Properties**, and then verify or set your IP address and subnet mask.

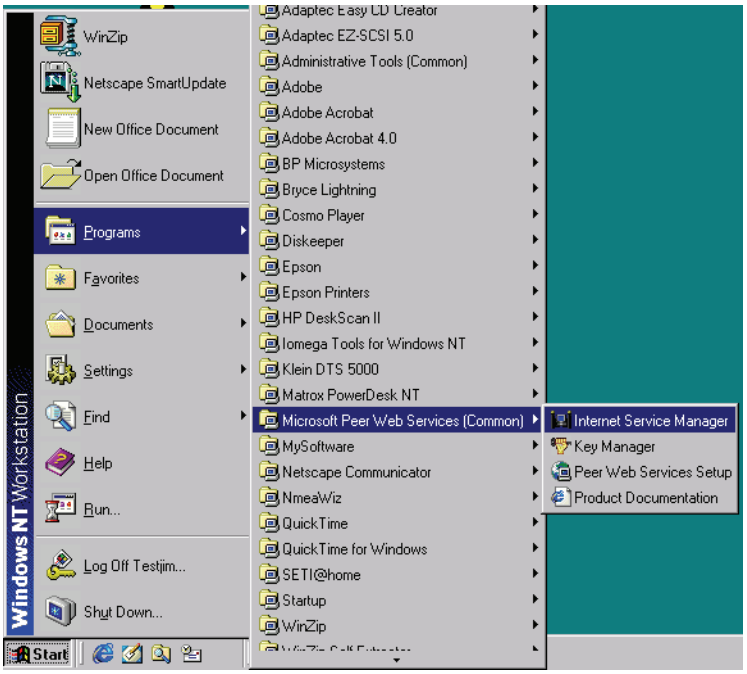
   These settings will be used later to direct the TPU to the location of the boot program vxWorks.



Next, see if you have Internet Service Manager and FTP Service installed and set up on your computer:

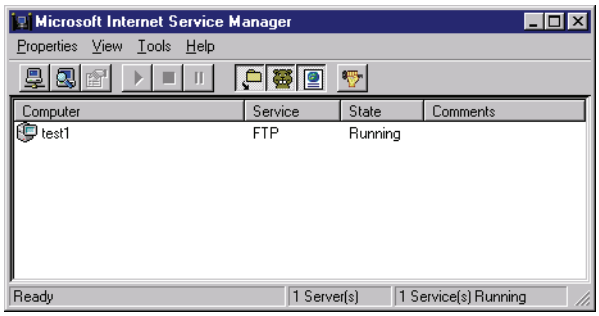
1. On the desktop choose *Start/ Programs/ Microsoft Peer Web Services (Common)*.

   If you do not find *Microsoft Peer Web Services (Common)* under your *Start* menu, you will have to install it. You will need your Windows NT 4.0 CD ROM. Insert the NT CD ROM into your CD ROM drive. Go to NT File Explorer and locate the Windows NT directory and look for d:\I386\inetsev\inetstp.exe. This program will ask you for the files to be added. Install the Internet Service Manager and the FTP Service only, and use the defaults when prompted.



NOTE *A new empty directory C:\InetPub\ftroot will be created on your C: drive. Do not delete it.*

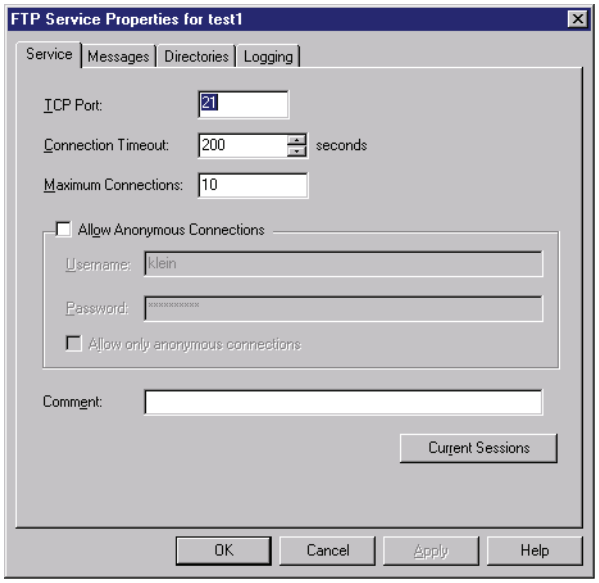
2. On the desktop choose *Start/ Programs/Microsoft Peer Web Services (Common)/ Internet Service Manager.*



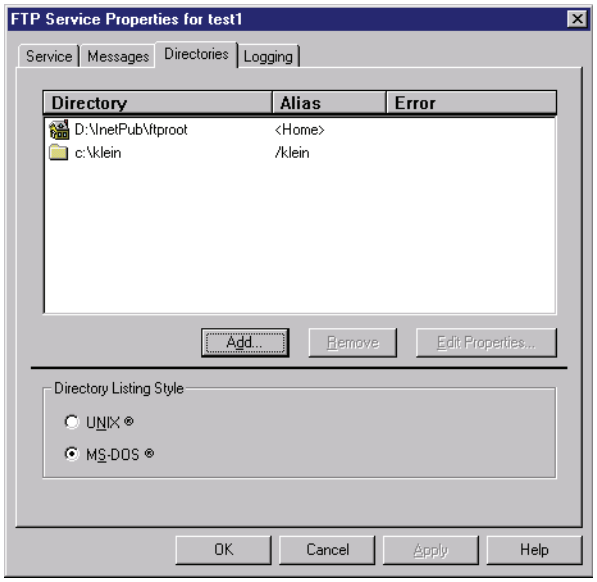
3. Right-click the computer running the FTP service and choose *Service Properties*. The computer name should be the one noted earlier.

   The *FTP Service Properties* dialog box for your computer will open to the *Service* tab.

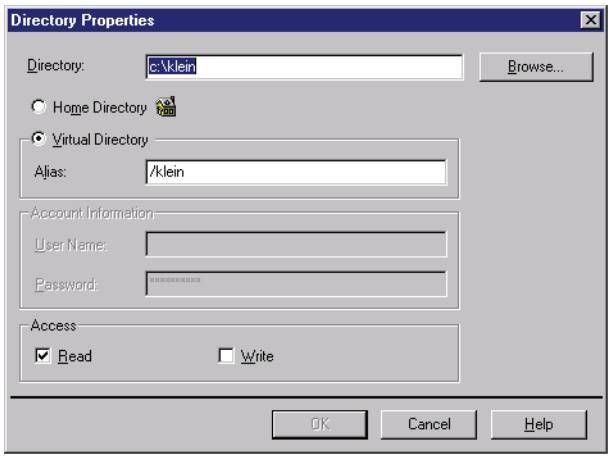
4. Enter the parameters shown. Make sure the dialog boxes match.



5. Click the *Directories* tab and check for the c:\klein directory.

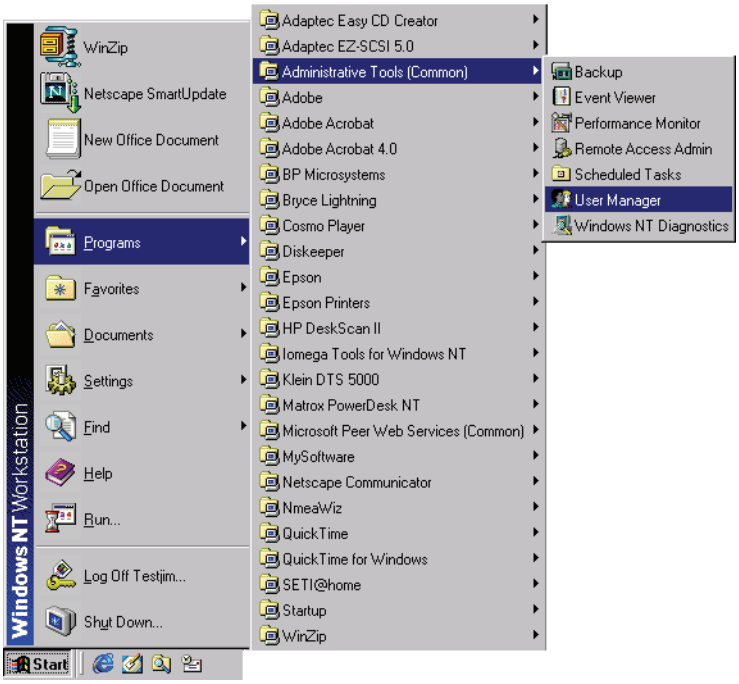


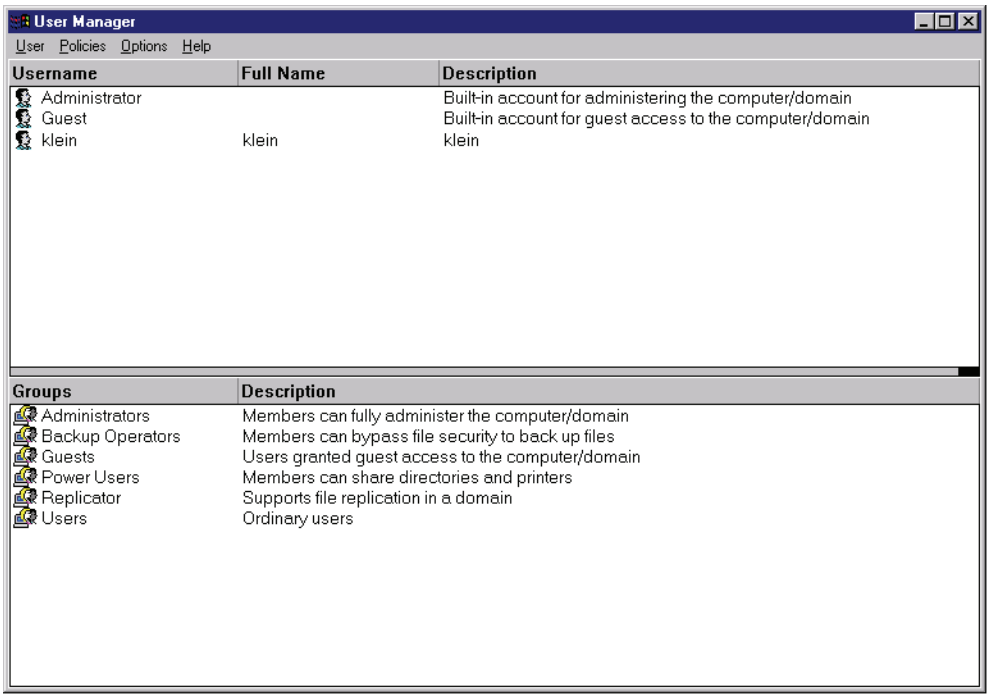
If it is not present click **Add** and set up the dialog box as shown. Make sure the dialog boxes match.



Finally, set up the user profile:

1. On the desktop choose *Start/ Programs/ Administrative Tools/(Common)/ User Manager.*





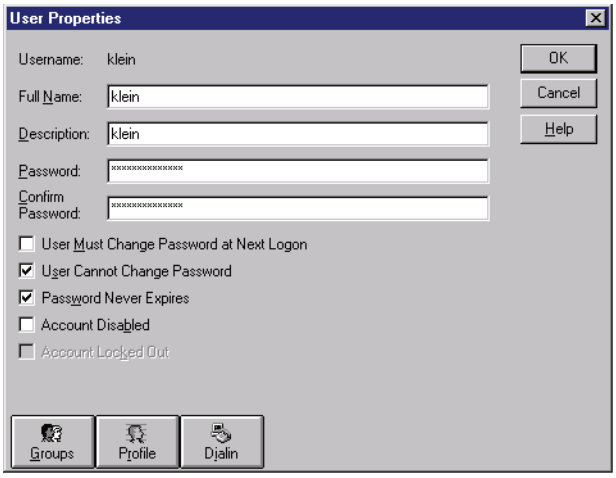
2. Check or add new user klein.

   If adding a new user, choose *User/New User*, enter klein in all the text boxes and set up the check boxes as shown.

   If checking the user *klein* setup, click *klein* and check the dialog box. The password is klein.

3. Click **OK**.

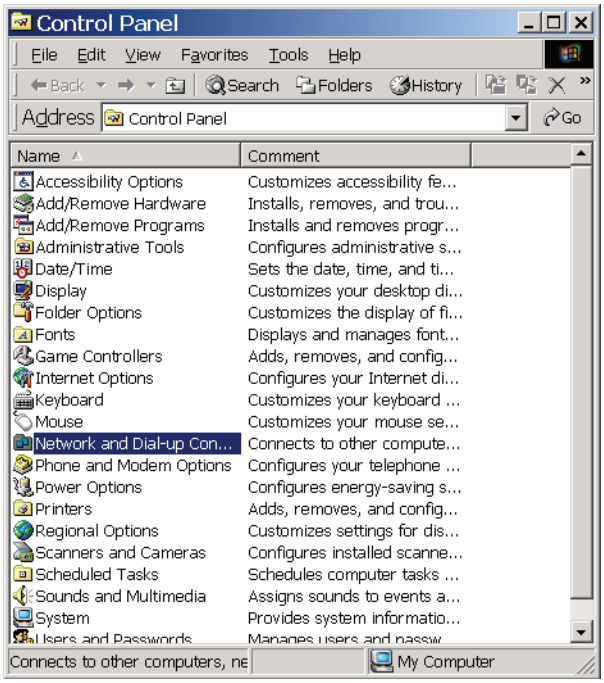
4. Verify that your vxWorks file is located in the klein directory.



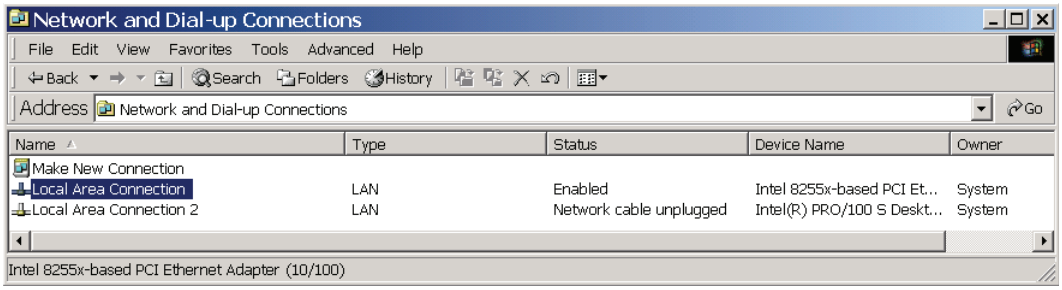
C.4.2 Windows 2000 LAN Configuration Setup

First, check the TCP/IP protocol:

1. On the desktop choose *Start/ Settings/Control Panel*.



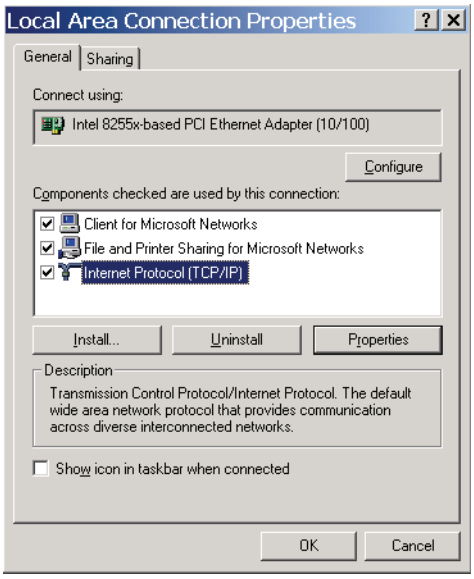
2. Right-click *Network and Dial-up Connection*.



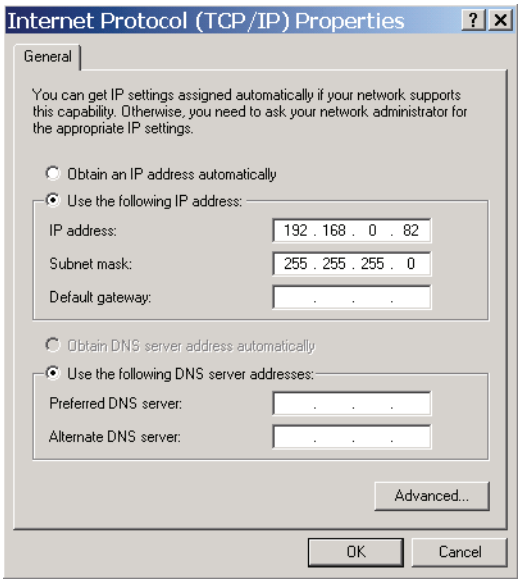
3. Right-click *Local Area Connection*.

   The *Local Area Connection Properties* dialog box opens.

4. Select *Internet Protocol (TCP/IP)*, and then click **Properties**.

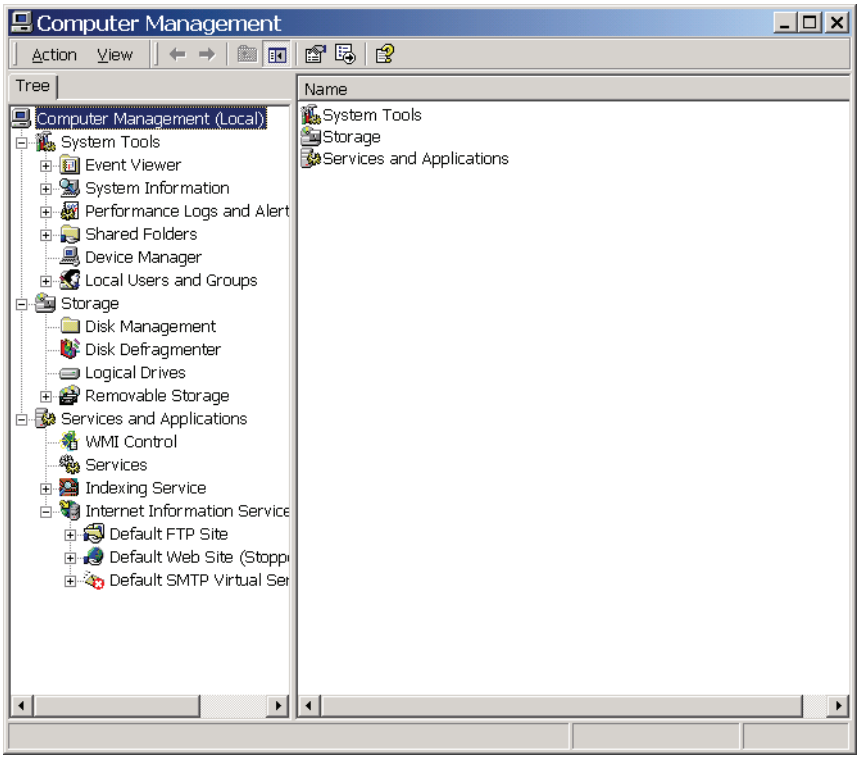


5. Enter the IP address and the subnet mask for your computer, and then click **OK**.



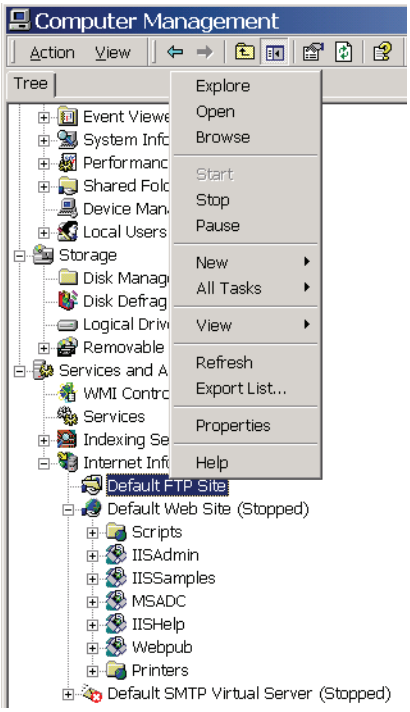
Next, set up the FTP service:

1. On the desktop choose *Start/Settings/Control Panel/Administrative Tools/ Computer Management*.



NOTE *If the Internet Information Services item is not in the Computer Management (Local) menu above, it will need to be installed. Locate your Windows CD, select Install Add-on Components, and then select Internet Information Services.*

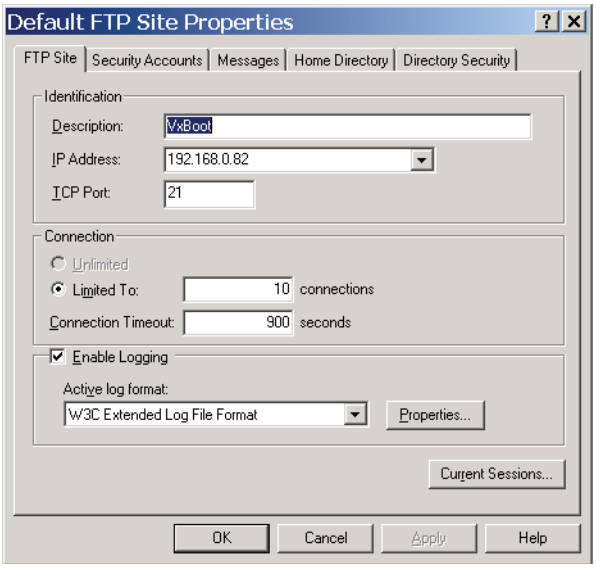
2. Select *Internet Information Services*.



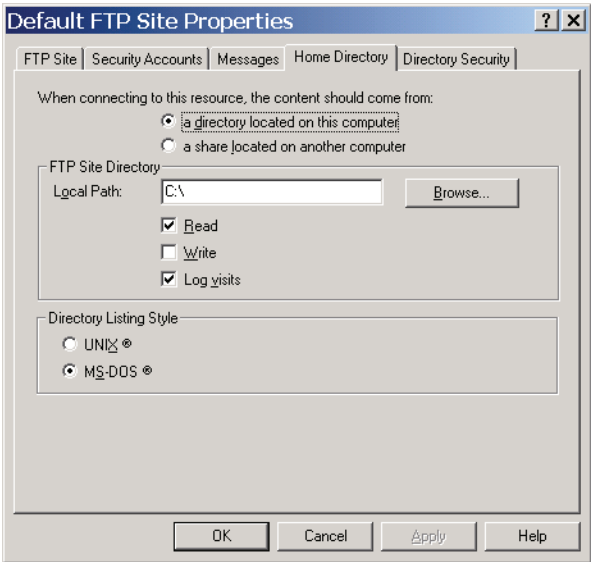
3. Right-click *Default FTP Site* and choose *Properties*.

   The *Default FTP Site Properties* dialog box will open to the *FTP Site* tab.

4. Enter the parameters as shown. The IP address is the address that was set up earlier.

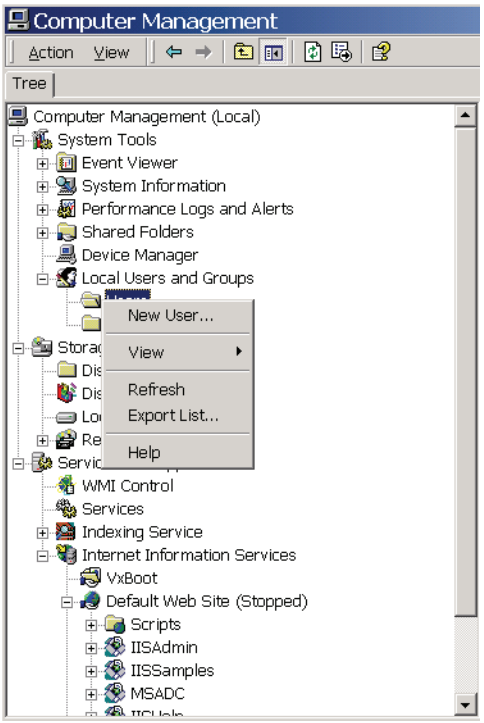


5. Click the *Home Directory* tab.
6. Set up the dialog box as shown, including entering C:\ in the **Local Path** text box.



Finally, set up the user profile:

1. On the desktop choose *Start/Settings/ Control Panel/Administrative Tools/ Computer Management*.
2. Select *Local Users and Groups*.



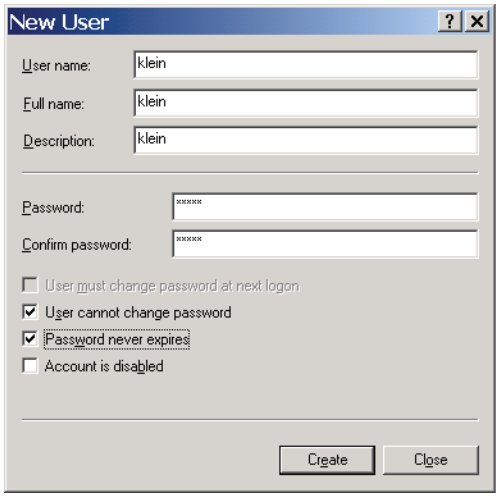
3. Right-click *Users*, and then choose *New User*.

   The *New User* dialog box will open.

4. Enter klein in all the text boxes and set up the check boxes as shown.

5. Click **Create**.

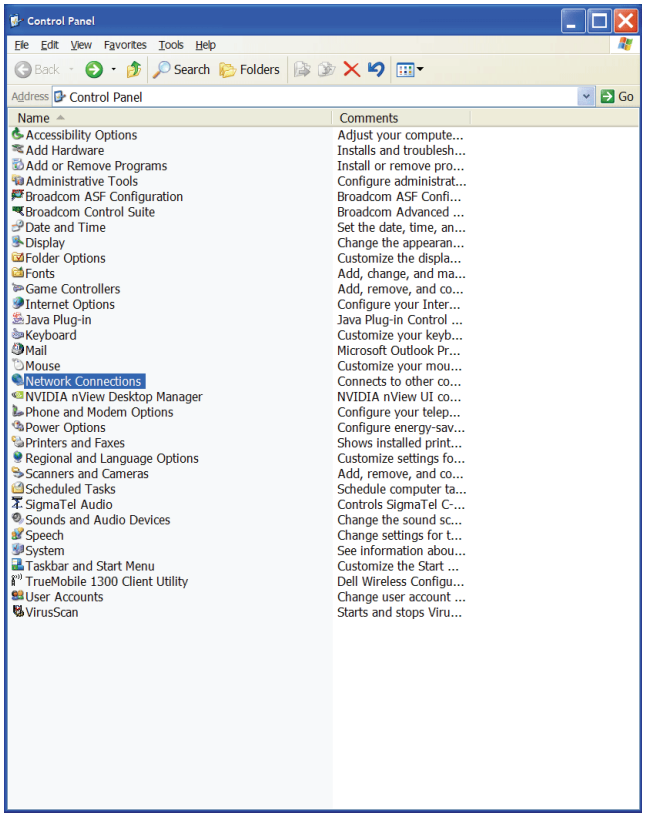
6. Verify that your vxWorks file is located in the klein directory.



C.4.3 Windows XP LAN Configuration Setup

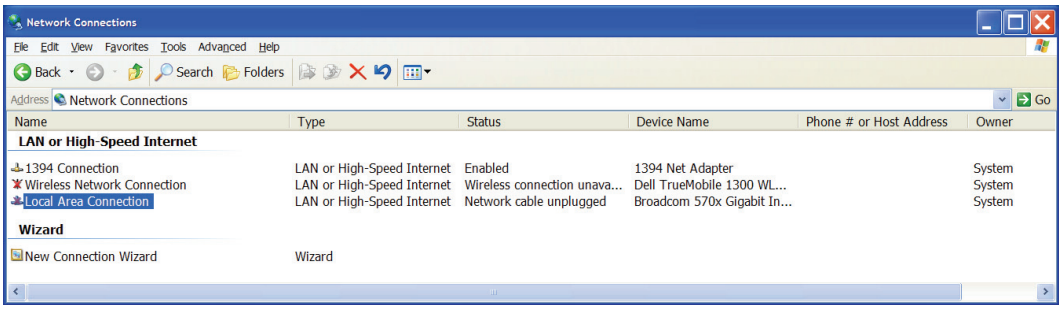
First, check the TCP/IP protocol:

1. On the desktop choose *Start/Control Panel*.



2. Right-click *Network Connections*.

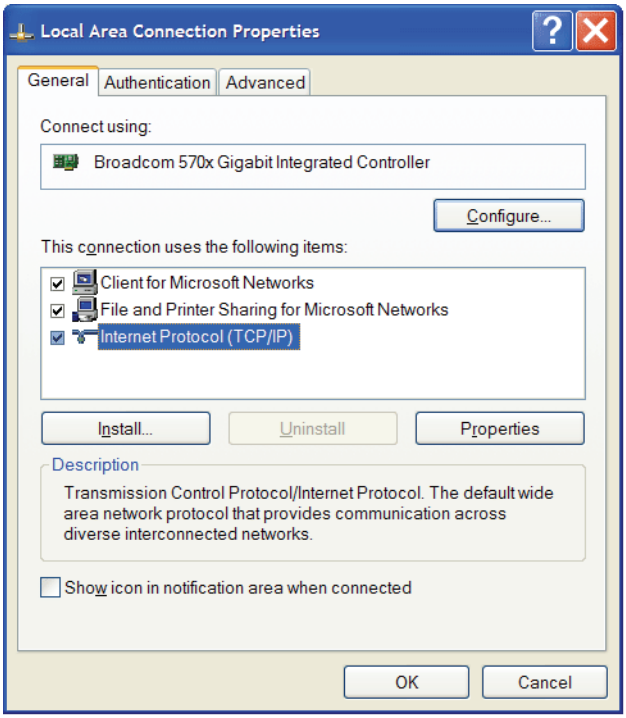
   The *Network Connection* dialog box opens.



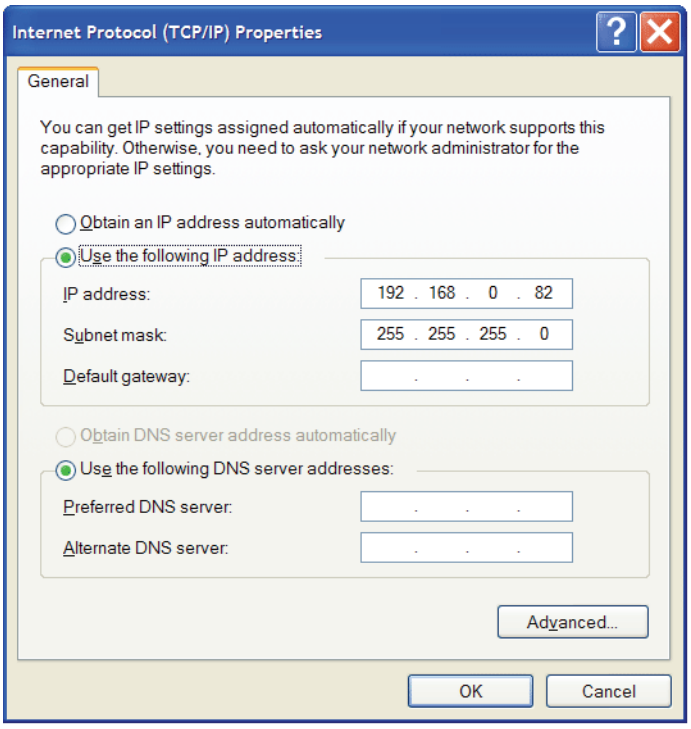
3. Right-click *Local Area Connection*.

   The *Local Area Connection* dialog box opens.

4. Select *Internet Protocol (TCP/IP)*, and then click **Properties**.

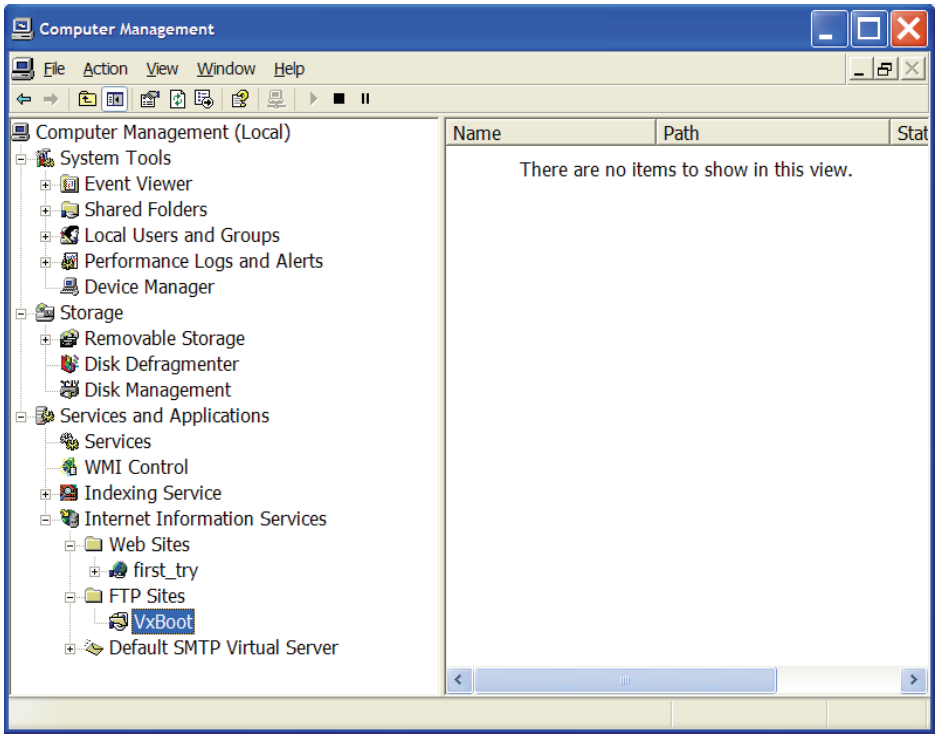


5. Enter the IP address and the subnet mask for your computer, and then click **OK.**



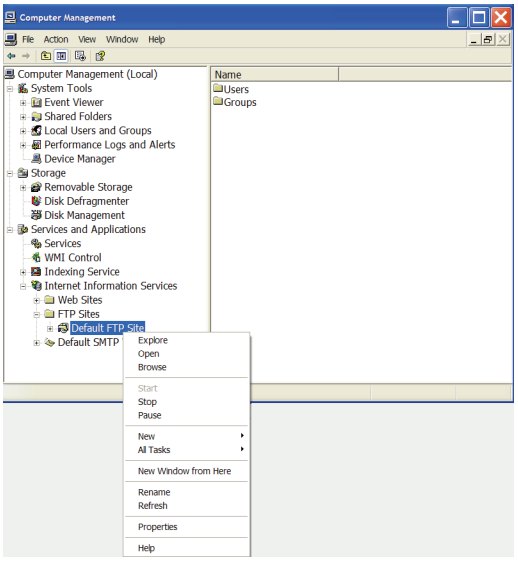
Next, set up the FTP service:

1. On the desktop choose *Start/Control Panel/Administrative Tools/Computer Management*.



NOTE *If the Internet Information Services item is not in the Computer Management (Local) menu above, it will need to be installed. Locate your Windows XP Professional CD, select Install Optional Windows Components, and then select Internet Information Service (IIS) and add it to the list of other checked components. Select Details and make sure File Transfer Protocol (FTP) Service is checked.*

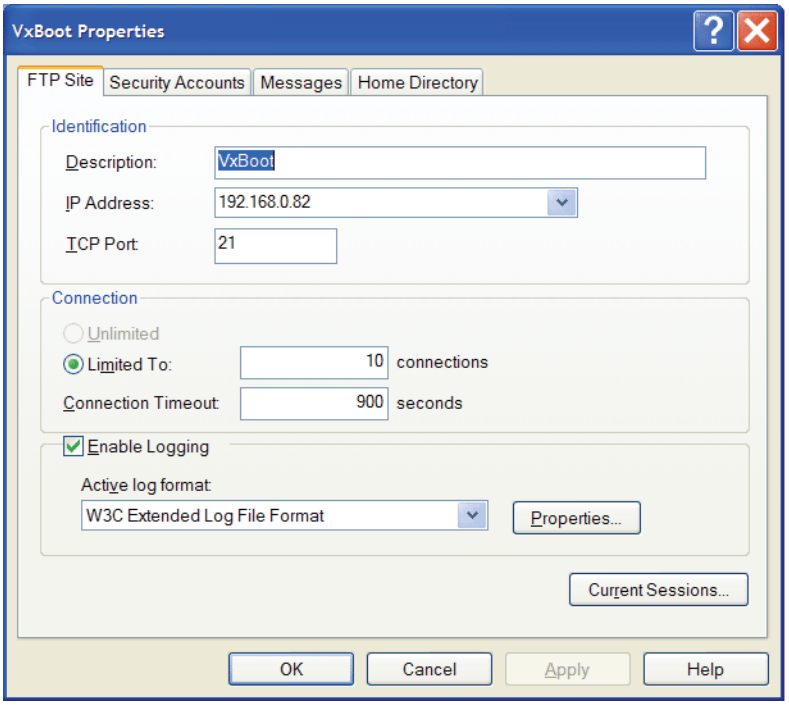
2. Select *Internet Information Services*.



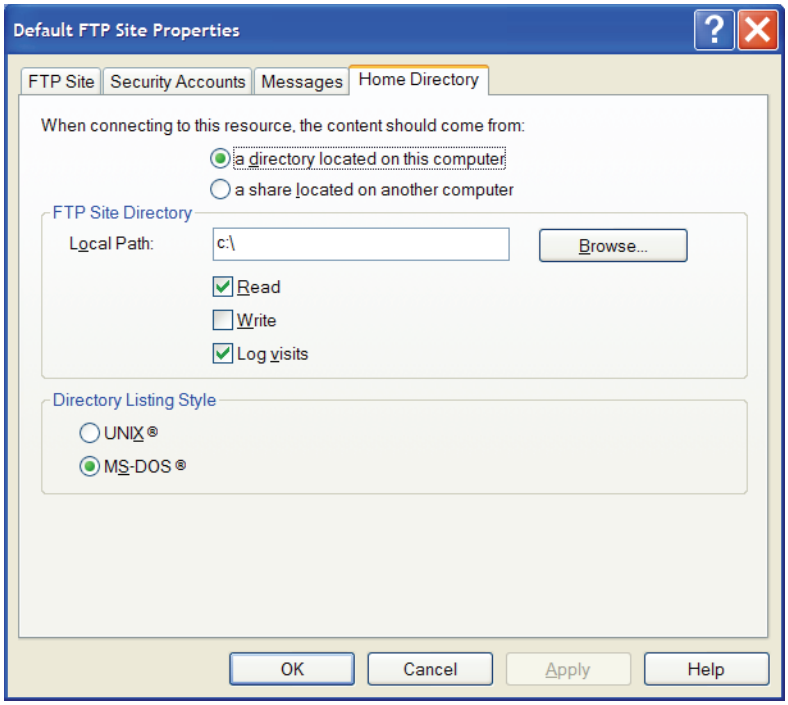
3. Right-click *Default FTP Site,* and then choose *Properties*.

   The *Default FTP Site Properties* dialog box will open to the *FTP Site* tab.

4. Enter the parameters as shown. The IP address is the address that was set up earlier.

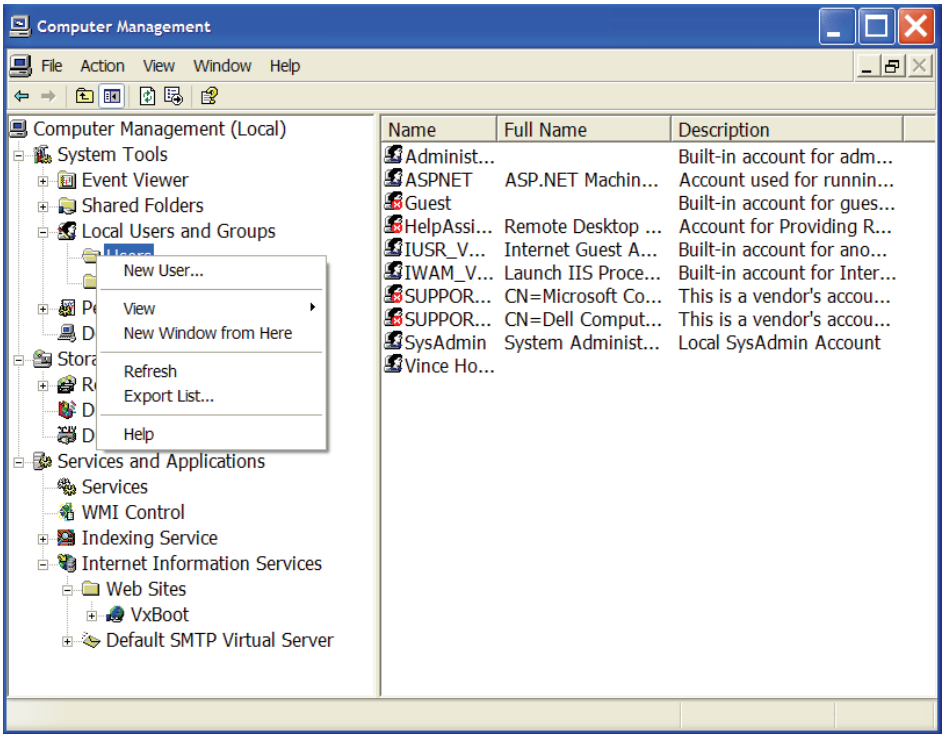


5. Click the *Home Directory* tab.
6. Set up the dialog box as shown, including entering C:\ in the **Local Path** text box.



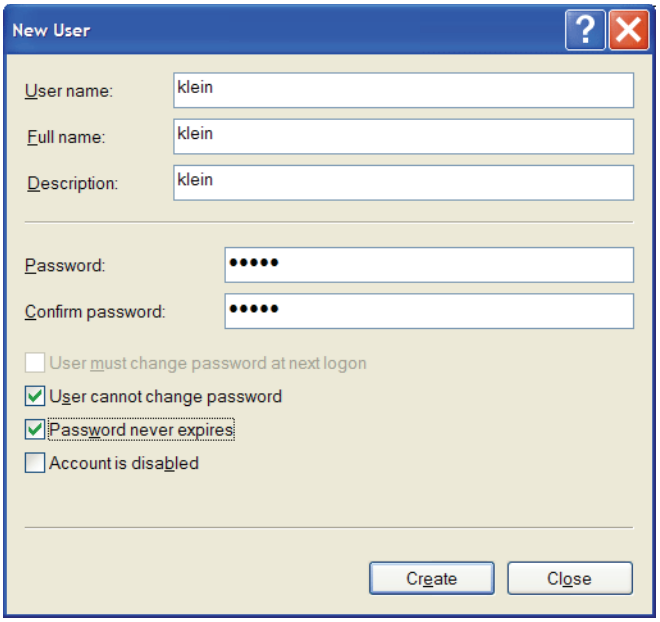
Finally, set up the user profile.

1. On the desktop choose *Start/Control Panel/Administrative Tools/Computer Management*.



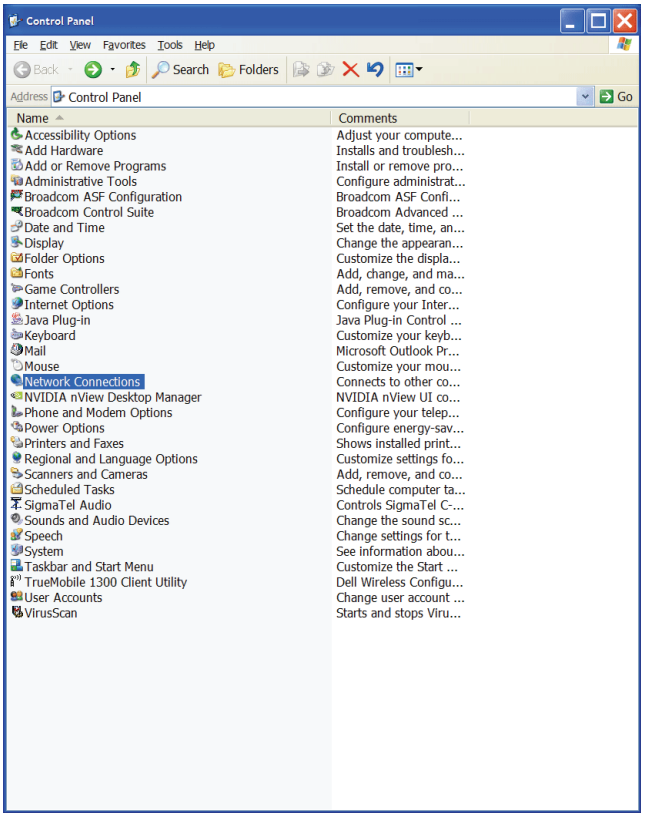
2. Select *Local Users and Groups*.
3. Right-click *Users*, and then choose *New User*.

   The *New User* dialog box opens.
4. Enter klein in all the text boxes and set up the check boxes as shown.



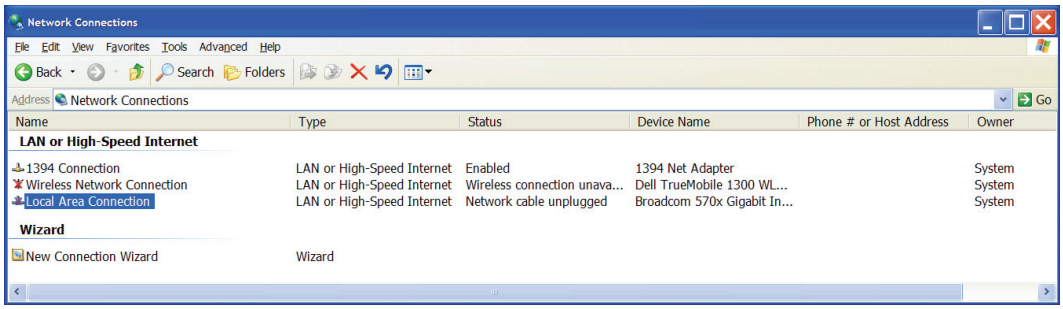
With the addition of XP Service Pack 2, Microsoft has added a firewall. This firewall prevents the system from downloading the vxWorks program and will cause the system to not boot up properly and usually produce an error message. If you are using XP with Service Pack 2, you must also check the following:

1. On the desktop choose *Start/Control Panel*.



2. Right-click *Network Connections*.

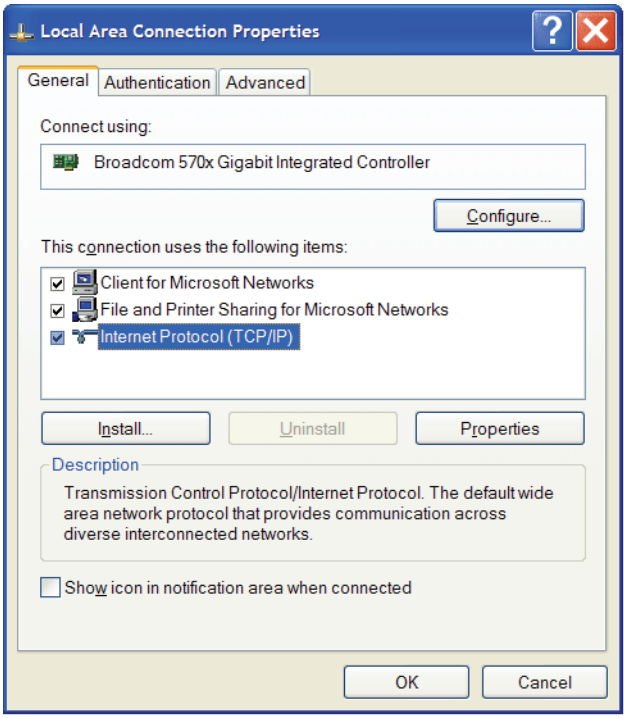
   The *Network Connection* dialog box opens.



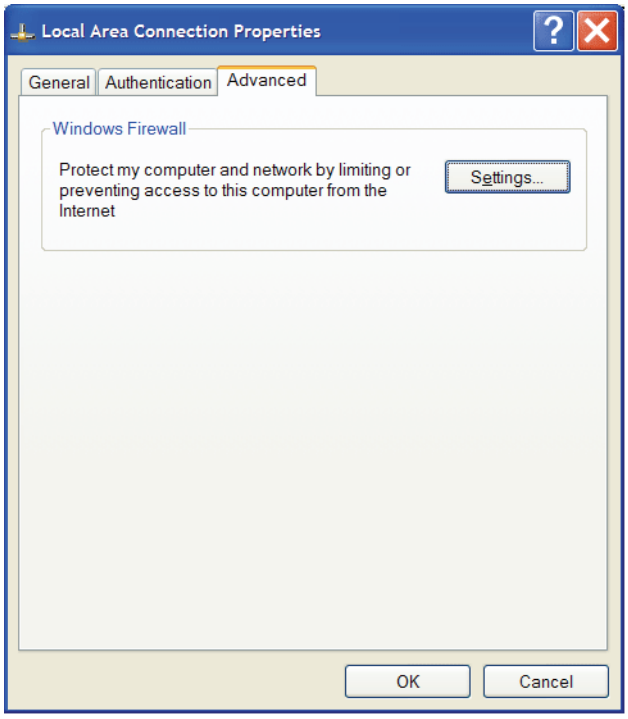
3. Right-click *Local Area Connection*., and then choose *Properties*.

   The *Local Area Connection* dialog box opens.

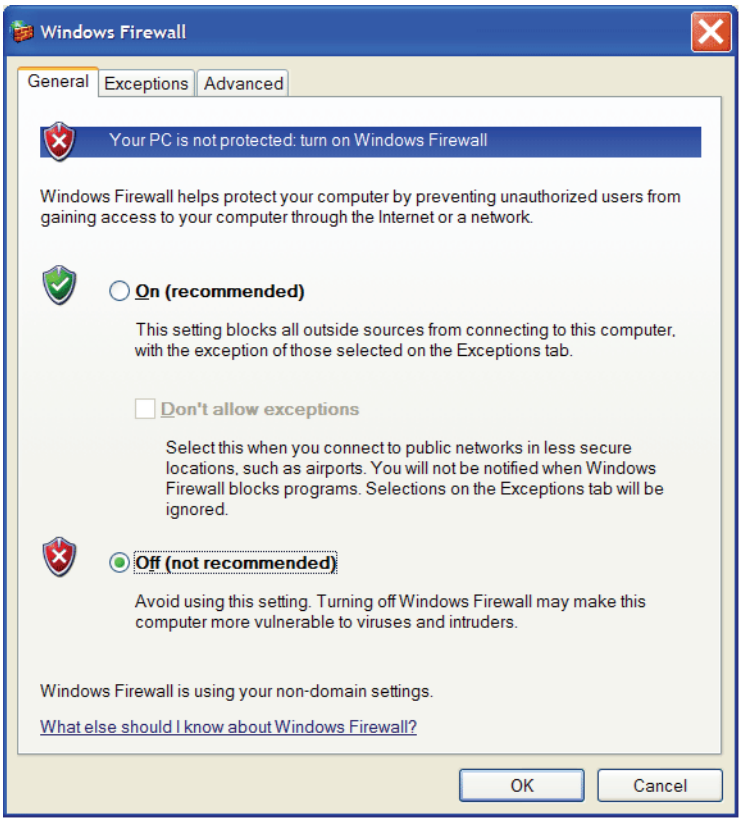
4. Select *Internet Protocol (TCP/IP)*, and then click **Properties**.



5. Select the *Advanced* tab.



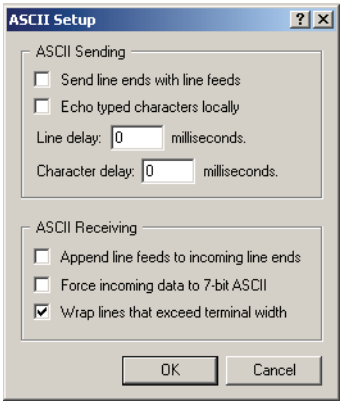
6. Click **Settings**, select the **Off** option, and then click **OK**.
7. Verify that your vxWorks file is located in the klein directory.



C.5 TPU LAN Configuration Setup

Connect a Terminal or PC running HyperTerminal to COM1 on the back of the TPU.

Configure the device as follows:



- 9600 baud
- 8 bit
- 1 stop bit
- none flow control
- TTY emulation

Configure the ASCII setup in the *ASCII Setup* dialog box, and then connect the TPU to the host PC computer using the Ethernet Hub.

Turn on the TPU. The CPU in the TPU will look for the host computer and load the file vxWorks:

```
VxWorks System Boot


Copyright 1984-2001  Wind River Systems, Inc.


CPU: Motorola MVME5110-2161 - MPC 7410
Version: VxWorks5.4.2
BSP version: 1.2/2
Creation date: Aug 29 2006, 10:17:52


Press any key to stop auto-boot...
 0
auto-booting...


boot device          : fei
unit number          : 0
processor number     : 0
host name            : sonarclient
file name            : \klein\vxWorks
inet on ethernet (e) : 192.168.0.81
host inet (h)        : 192.168.0.82
user (u)             : klein
ftp password (pw)    : klein
```

```
flags (f)          : 0x0
target name (tn)     : VxTarget
startup script (s)   : \klein\startup.ini

Attached TCP/IP interface to fei0.
Attaching network interface lo0... done.
Loading New... 1310608
Starting at 0x100000...

sysScsiInit() Failed, SCSI system not initialized
0x1ffffde8 (tRootTask): SCSI controller not found
Attached TCP/IP interface to fei unit 0
Attaching interface lo0...done
-> System SCSI controller not found.

-----------------------------------------------------

Determining Sonar Type from sonarclient:\klein\startup.ini...

+------------------------------------------------------------+
|\ _____________________________________________________________ /|
| |                                    | |
| |  #####  #   #  #####  ######### ####### #    # | |
| | #   # # # # #   #   #   #    ## ## | |
| | #      #   #      #   #    # ### # | |
| |  #     #    #     #   #####  # # # | |
| |   #    #     #    #   #    #    # | |
| |    #   #      #   #   #    #    # | |
| | #   #   #   #   #   #   #    #    # | |
| |  #####   #   #####    #   ######## #    # | |
| |                                    | |
| |      3333333333  000000000  000000000  00000000  | |
| |          3 0     0  0     0 0     0  | |
| |          3 0     0  0     0 0     0  | |
| |          3 0     0  0     0 0     0  | |
| |   3333333333  0     0  0     0 0     0    | |
| |        3  0     0  0     0 0     0     | |
| |        3  0     0  0     0 0     0     | |
| |        3  0     0  0     0 0     0     | |
| |        3  0     0  0     0 0     0     | |
| | 333333333   000000000   000000000  000000000        | |
| |                                    | |
| |   ----------------------------------------------     | |
| |   Copyright (C) 2002 Klein Associates, Incorporated     | |
| |_____________________________________________________________| |
|/                                                \|
+------------------------------------------------------------+
```

Version 5.40.2089 08/29/2006

Installed DEMUX COM port driver.
Created COM1 device on DEMUX
Created COM2 device on DEMUX
Auto-detecting attached devices....

IRIG-B Decoder Board not detected, IRIG support not available.

$MO
$ML7
$ML7
$ML7
$MH0
$MH0
$MH0
$MA0
$MA0
$MA0
$MB0
$MB0
$MB0
$MDF
$MDF
$MDF
$MF7
$MF7
$MF7
Opening script file on sonarclient:\klein\startup.ini
Processing startup script:
$MDF
$MDF
$MDF
$MF7
$MF7
$MF7
$ML1
$ML1
$ML1
$MH0
$MH0
$MH0
$PS1
$PS1
System Ready.
NOTE: GPS set to com1 at 4800 baud.

An improper boot will hang the system and you may have to configure the TPU. After a time out period, you will be put into the edit mode for the TPU. You will now be able to edit the boot parameters. Enter c to change parameters.

Type the new parameter after the current parameter. If there are any other parameters not noted below, leave them as they are. Entering “?” will give you a help menu and entering "any key" before the boot sequence will put you in the edit mode.

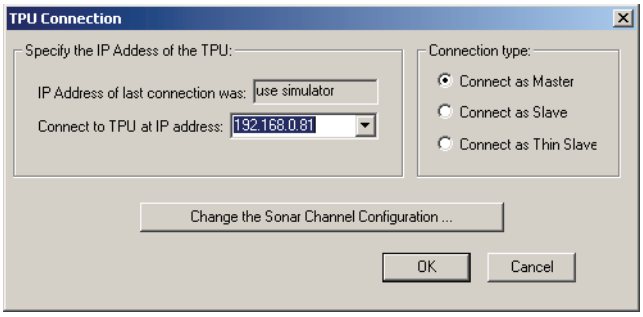
```
boot device          : fei...Leave as is
unit number          : 0...Leave as is
processor number:    : 0...Leave as is
host name            : sonarclient...Name of your host PC as noted earlier
file name            : \klein\vxWorks...Path to vxWorks on your computer
inet on ethernet (e) : 192.168.0.81...Address you give the TPU
host inet (h)        : 192.168.0.82
user (u)             : klein..User name as set up earlier
ftp password (pw)    : klein..User password as set up earlier
flags (f)            : 0x0...Sets boot delay to 10
target name (tn)     : VxTarget...Set as is
startup script (s)   : \klein\startup.ini...Location of startup.ini file
```

Turn the TPU off and then back on and watch the boot sequence again.

The Klein startup.ini file is used to set boot parameters. The following is a typical .ini file.

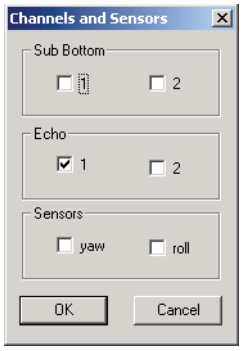
```
set SONARTYPE 3000
set RANGE 2
set RESPDIV 15
set RESPFREQ 7
set DESPECKLESWITCH 0
set SPEEDFILTERSWITCH 1
set TVGPAGE 7
set SPEEDSOUND 150000
set BAUDRATE 4800
set STANDBYMODE 0
set DEFAULTUPLINK 0
set TOWFISHECHO 0
set DIAGLEVEL 1
```

SonarPro needs to know the IP address of the TPU. Start SonarPro, and then click to connect to the towfish in real time. The *TPU Connection* dialog box will open. Enter the TPU IP address into the dialog box if different.



The LAN configuration should now be complete.

While you have the *TPU Connection* dialog box open, click **Change the Sonar Channel Configuration** and verify the settings in the *Channels and Sensors* dialog box as shown.



C.6 Tow Cable Considerations

For lightweight tow cables, we recommend that you use tow cables with the following characteristics:

Type:	Polyurethane jacketed, coaxial Kevlar reinforced
Conductors:	Coaxial copper
Diameter (OD):	1.03 cm (0.405 in.)
Breaking strength:	2270 kg (5000 lb)
Working load:	454 kg (1000 lb)
Operational length:	3000 m maximum
Voltage rating:	600 VDC
Termination:	Stainless steel shackle at towfish end

For armored tow cables, we recommend that you use tow cables with the following characteristics:

Type:	Double layer, counter helical, galvanized improved plow steel (GIPS) Stainless steel can be a special order
Conductors:	Coaxial copper
Diameter (OD):	10.2 mm (0.40 in.)
Breaking strength:	4990 kg (11, 000 lb)
Working load:	1247 kg (2750 lb)
Operational length:	3000 m maximum
Voltage rating:	1200 VDC
Termination:	Stainless steel shackle at towfish end

Other important characteristics to consider are that, electrically, the cable must be 50 ohms. The whole cable assembly, deck cable, slip ring, winch, cable and connectors must be coax all the way from the TPU to the towfish.

NOTE *The whole cable assembly must not exceed an attenuation of greater than 24 dB of insertion loss at 15 MHz. We suggest a working loss of 24 dB at 15 MHz.*

C.6.1 Measuring Cable Insertion Loss

To get an accurate assessment of your tow cable assembly, we suggest that you use a Hewlett Packard 4194A Impedance/Gain-Phase Analyzer or similar.

A sample plot is shown in Figure C-3.

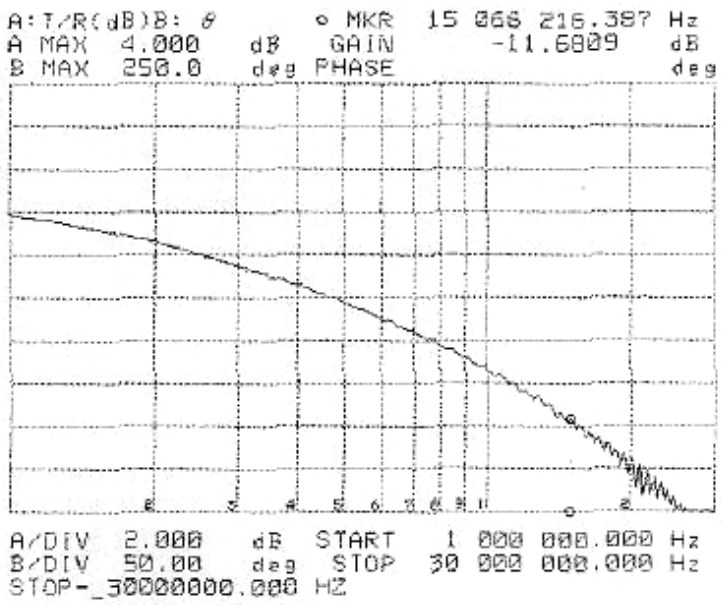
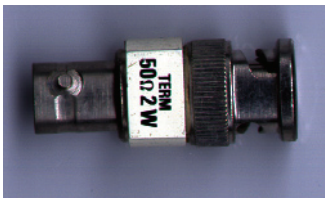


Figure C-3: *Sample Plot of Tow Cable Characteristics*

If you do not have access to a Hewlett Packard 4194A Impedance/Gain-Phase Analyzer, you can get a close reading by using a function generator, a 50-ohm terminator and an oscilloscope as shown in Figure C-4.



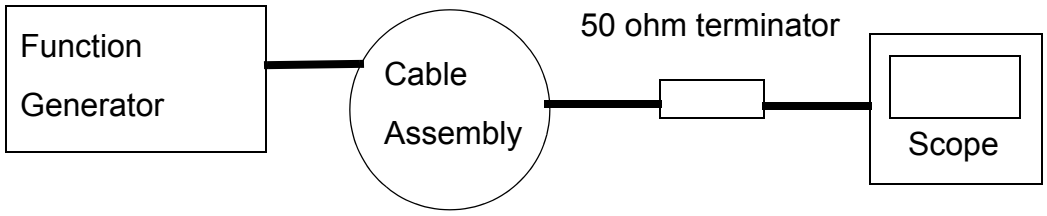


Figure C-4: *Setup for Measuring Tow Cable Characteristics using a Function Generator, Terminator and Oscilloscope*

With the function generator and the oscilloscope connected to the cable, monitor input on the oscilloscope and input a 1 volt peak (2 volt peak-to-peak) sine wave of the specific frequency of interest. Measure the peak output at the other end of the cable on the scope through the 50-ohm termination.

Use the formula

dB = 20 log (Vout /Vin)

For example, if at 15 MHz, you get a reading of 160 mv, then

dB = 20 log (0.16/1.0) = -15.9 dB (loss).

C.6.2 Spare Tow Cable

Given the nature of high speed towing, cable problems can occur. For troubleshooting purposes we suggest that you have on hand a lightweight Kevlar reinforced 150-meter (minimum length) tow cable. This extra cable will allow you to bypass your primary tow cable assembly and speed up fault isolation.

C.7 Transceiver and Processing Unit

The Transceiver and Processing Unit (TPU) is shown in Figure C-5.

Figure C-5: *The Transceiver and Processing Unit (TPU)*

The rear panel of the TPU is shown in Figure C-6.

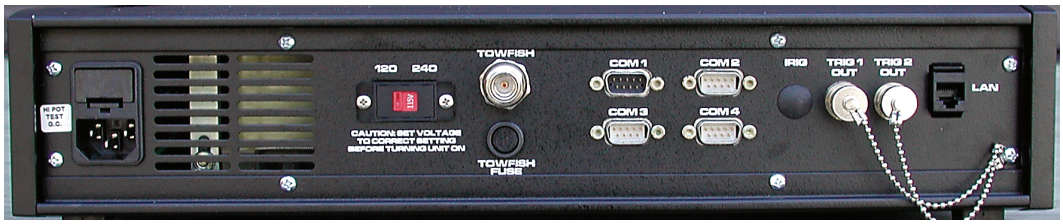


Figure C-6: *TPU Rear Panel*

C.7.1 Input Power

Check the rear panel of the TPU for the proper AC input voltage setting, 120 VAC or 240 VAC. Power is connected to the back of the unit on the left side, when viewed from the back.

The AC input fuses (both high and low sides) are located above the AC power connector. To check or replace an AC fuse, lift the tab and pull out the fuse insert. A spare fuse should also be located there. The fuse will be a 2-A, 5 x 20-mm slow-blow fuse rated for 250 volts (P/N 13000045).

C.7.2 Towfish Fuse

The towfish fuse is on the 200 VDC line to the towfish. Access to this fuse is located on the back of the TPU just below the towfish connector. The towfish fuse is a 630-mA, 5 x 20-mm slow-blow fuse rated for 250 volts (P/N 13000043).

C.7.3 TPU Block Diagram

The TPU block diagram is shown in Figure C-7.

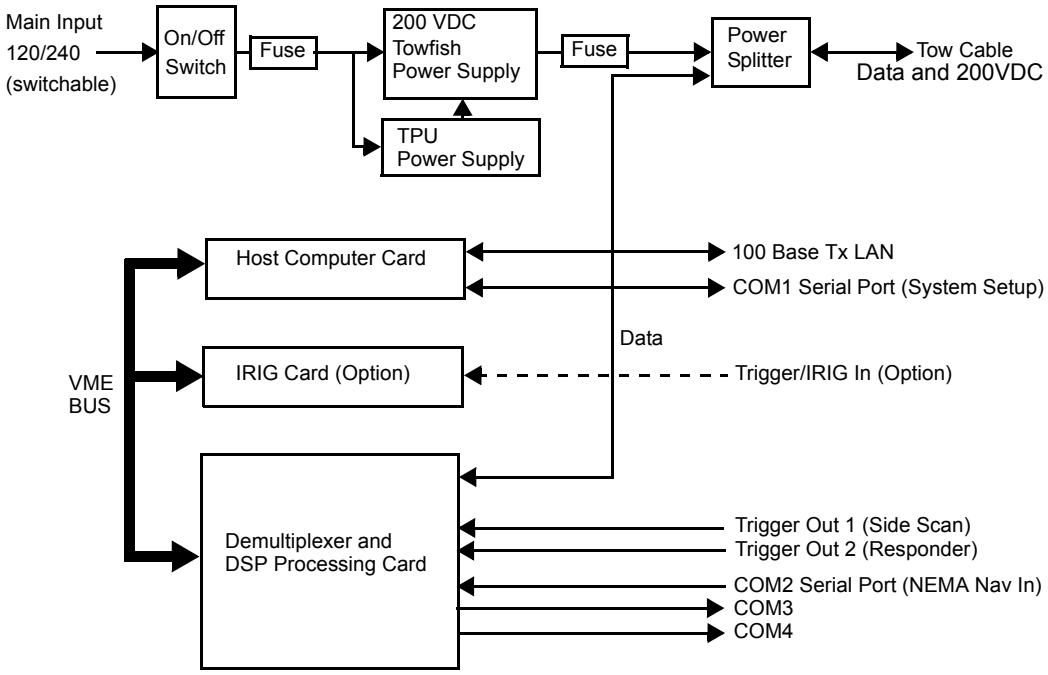


Figure C-7: *TPU Block Diagram*

C.7.4 TPU Internal Access

To access the inside of the TPU, you must first remove the two screws on the upper rear of the unit. Slide the back locking frame off to one side, and then slide the TPU top towards the back of the unit.

SHOCK HAZARD *AC Voltages and high level DC voltages are present inside the TPU. Therefore only qualified individuals should access the unit to this level.*

C.7.5 Power Supplies

The TPU includes a low voltage and a high voltage power supply as shown in Figure C-8.

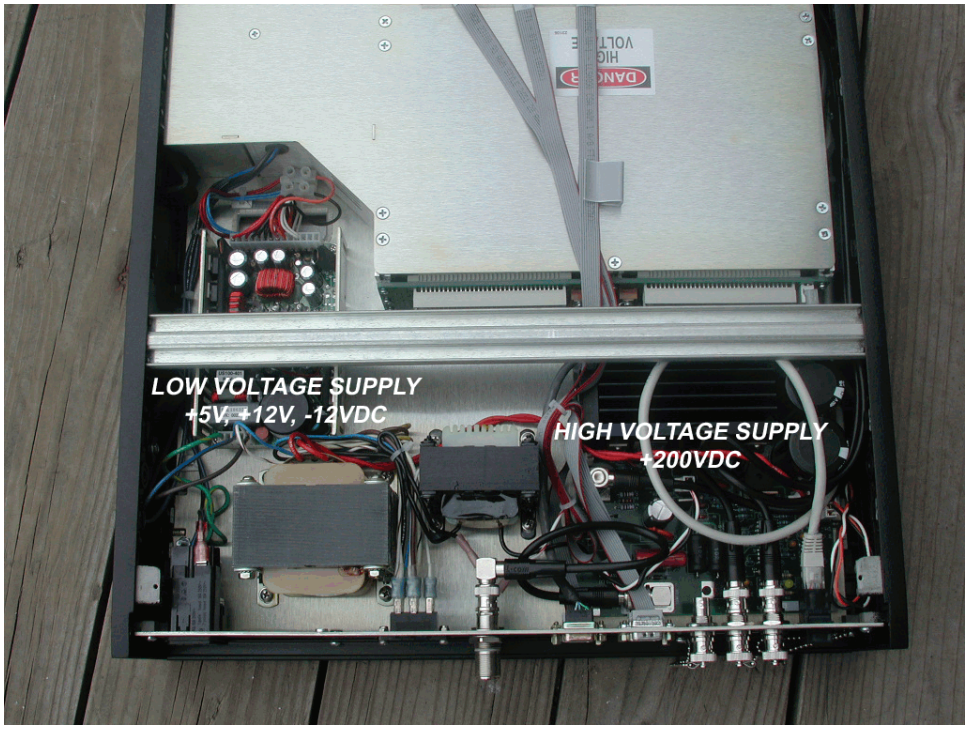


Figure C-8: *Low Voltage and High Voltage Power Supplies*

The high voltage power supply supplies 200 VDC power to the towfish and is fused on the back of the TPU. 200 VAC enters the power supply board from the transformer at JP1 HV, and 200 VDC is generated which can be measured between the base of the fuse holder and the BNC cable as shown in Figure C-9. LED D9 lights if there is excessive current draw, such as in a cable short.

The low voltage power supply provides +5 VDC, +12 VDC and -12 VDC. This is also used to supply the VME chassis. 200 VAC is the input power at JP1 as shown in Figure C-10. The +12 VDC and -12 VDC can be measured at connector JP4. And the +5 VDC can be measured on the power supply across the red and black wires.

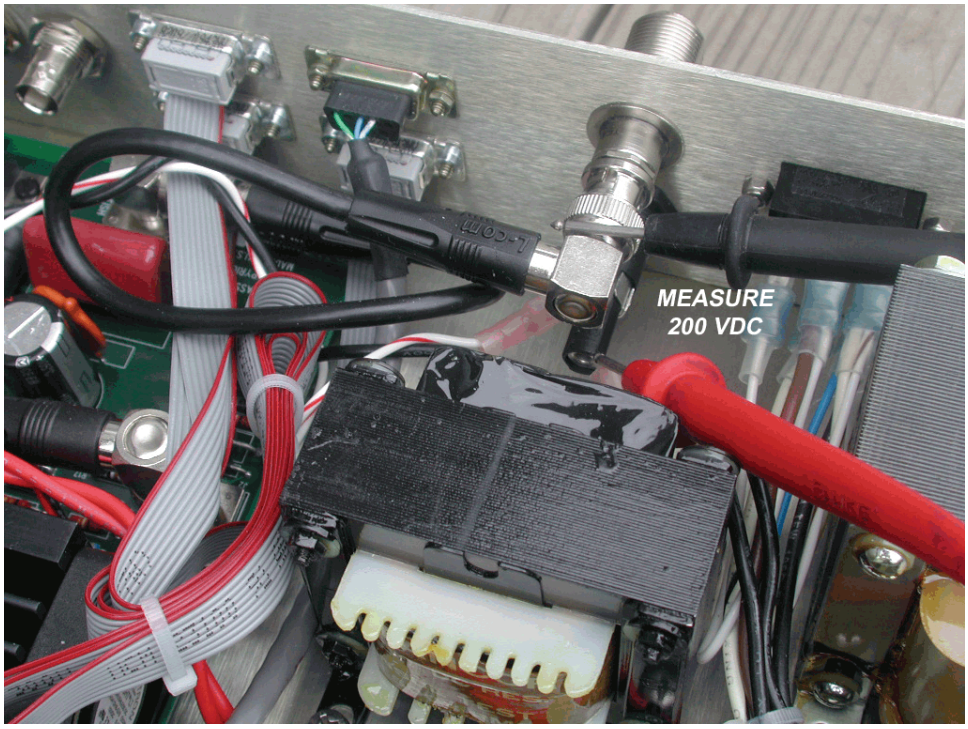


Figure C-9: *Measuring the 200 VDC Output to the Towfish*

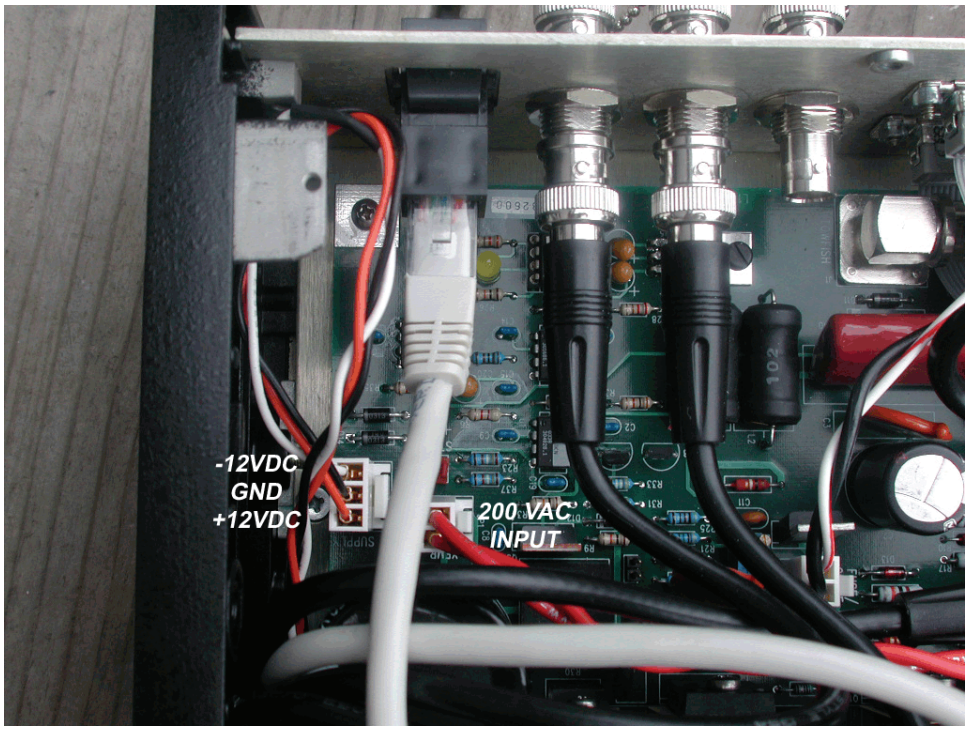


Figure C-10: *Test Points for +5 VDC, +12 VDC and -12 VDC Outputs*

C.7.6 Board Locations

The location of the Demultiplexer, optional IRIG and CPU boards in the TPU is shown in Figure C-11.

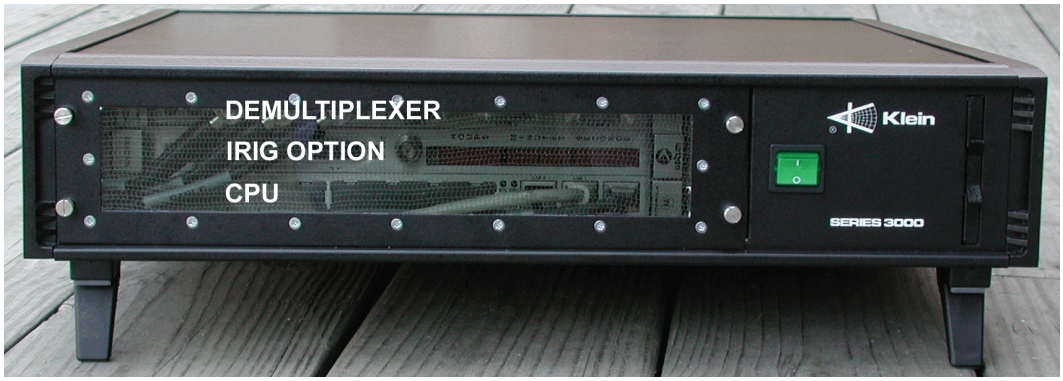


Figure C-11: *Location of the Demultiplexer, optional IRIG and CPU Boards in the TPU*

C.7.7 Access Panel

To access the boards in the TPU, loosen the four captive screws on the access panel, two each on the left and right sides. The two left screws are shown in Figure C-12. These two screws should be loosened until the threads are seen. Lift the right side out first, and then slide the panel to the right slightly, freeing the panel. To install the panel, insert the tabs on the left side and reverse the process.

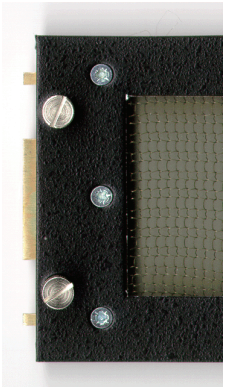


Figure C-12: *Left Two Captive Screws on the TPU Access Panel*

With the access panel removed, the TPU appears as shown in Figure C-13.

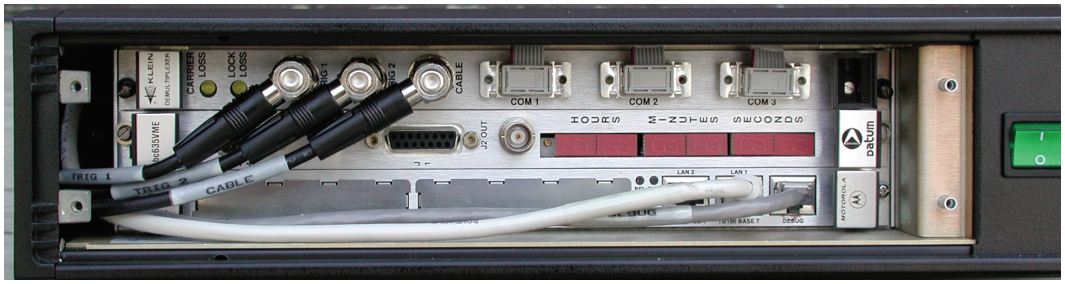


Figure C-13: *TPU with Access Panel Removed*

C.7.8 COM Port Wiring

The COM port wiring on the TPU, from the front panel of the Demultiplexer and CPU boards to the rear panel of the TPU, is shown in Table C-1.

Table C-1: *TPU COM Port Wiring, Front Panel to Rear Panel*

FRONT PANEL	BACK PANEL	TO
DEBUG	COM1	Computer and HyperTerminal
COM1	COM2	Navigation
COM2	COM3	Magnetometer
COM3	COM4	Magnetometer and diagnostics

C.7.9 TPU Power up and Test Sequence

SHOCK HAZARD *Do not connect or disconnect the tow cable from the towfish or the TPU when power is on. Failure to follow this practice may result in personal injury and will damage the towfish or the TPU electronics, or both.*

CAUTION *Serious damage to the towfish electronics may occur if the towfish is operated on deck for periods longer than fifteen minutes. Between periods of operation, let the sonar cool for fifteen minutes. In high temperature climates, protect the towfish from direct exposure to the sun prior to and during operation.*

To power up the TPU and verify proper operation of the TPU and LAN:

1. With the towfish and LAN cables removed from the TPU, turn the power on, listen for the cooling fan to come on, and then measure the voltage at the TOWFISH connector which should be 200 VDC. This will test the basic TPU.
2. Turn the TPU off.
3. Connect the LAN cable through the hub to the computer. You will see the computer port on the hub lit.
4. Turn the TPU on. The TPU port on the hub will light. This will add the LAN side to the TPU test.
5. Turn the TPU off.
6. Connect the towfish cable to the TPU.
7. Turn the TPU on.

   There will then be light activity on the CPU board as the system looks for the boot program on the host computer and then initializes. The CARRIER LOSS and LOCK LOSS lights, which are shown in Figure C-13 on page C-37, will be on until the TPU finishes its boot cycle with the host computer (about 45 seconds). Once the boot sequence is complete, the lights will go out.

The boot process sequence may be monitored with an external terminal or with Windows default terminal Hyperterminal. (See “TPU LAN Configuration Setup” on page C-24.)

If the CARRIER LOSS and LOCK LOSS lights do not go off on the first try, turn the TPU off and back on. If the CARRIER LOSS and LOCK LOSS lights are still on, check for a towfish fuse failure or cable assembly problems; for example: miswire, open, using too long a cable, using wrong type of cable, or a failure in the towfish. Re-check to see if you have a proper system boot sequence.

C.7.10 TPU Cooling

For proper unit cooling, any unused board slots should be closed with a blank panel.

The TPU also has an air filter which is accessible from the right side of the front panel as shown in Figure C-14. This filter should be cleaned once a month. To remove the filter, pull it straight out from the front panel using the two tabs. Use compressed air to clean the filter or wash it in clean, fresh water. To replace the air filter, slide it back into the slot.

Figure C-14: *Removing the Air Filter from the TPU*

C.8 Towfish

The towfish is shown in Figure C-15.

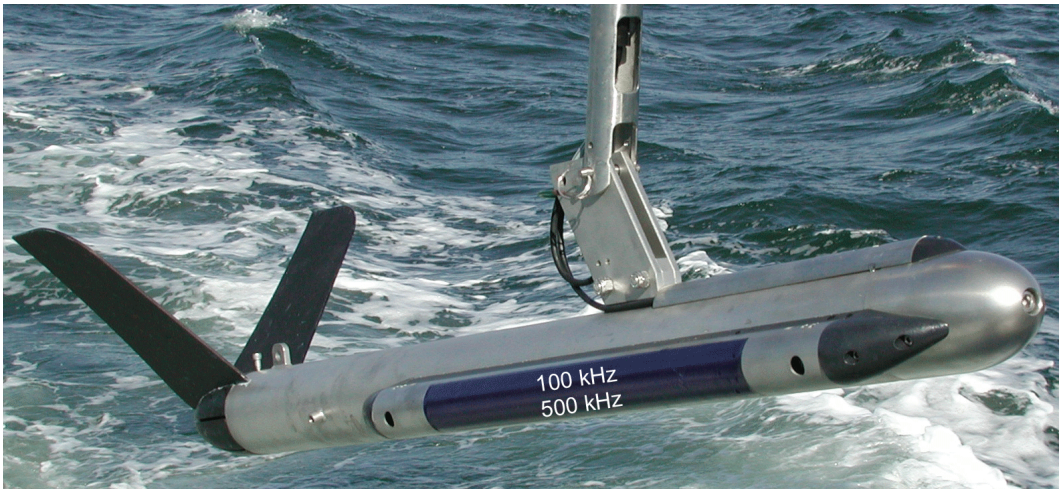


Figure C-15: *Towfish*

C.8.1 Towfish Block Diagram

The towfish block diagram is shown in Figure C-16.

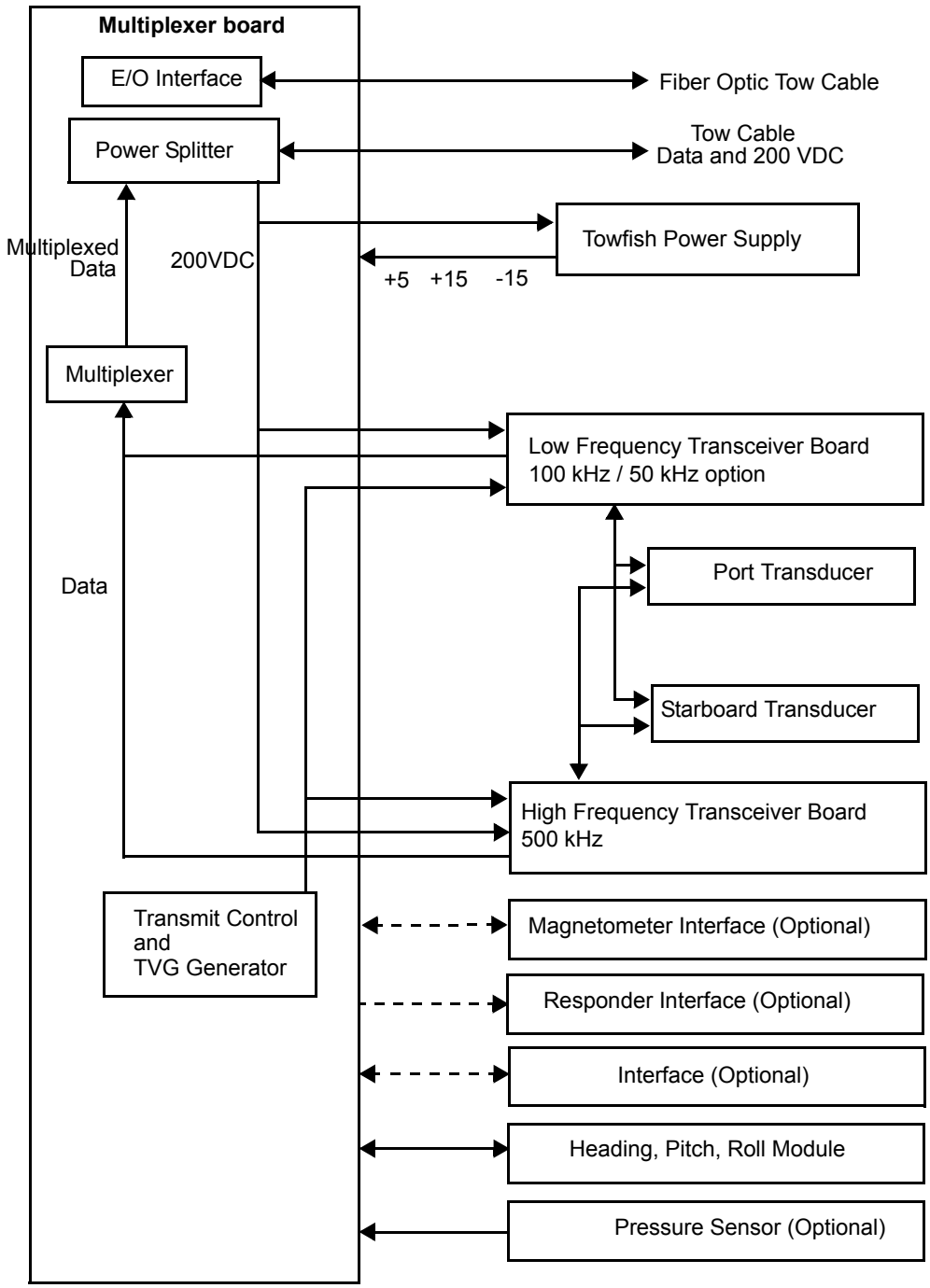


Figure C-16: *Towfish Block Diagram*

C.8.2 Checking the Telemetry Link to the Towfish

Turn the TPU on and check the CARRIER LOSS and LOCK LOSS lights. The lights should be off. If they are on or flickering, there is a problem. Again, a telemetry link problem could be one or more of the following: towfish fuse failure, cable assembly problems, miswire, open, using too long a cable, using wrong type of cable, or a failure in the towfish.

C.8.3 Checking the Transmitters before Deployment

There are two transmitters, 100 kHz and 500 kHz. To check that the transmitters are working, turn the system on and wait for the system to boot up. Start SonarPro and set the range to 100 meters. You can place an oscilloscope probe with the scope tip along the transducer to see the transmit waveform as shown in Figure C-17. The transmitters fire in a staggered mode with about a 500-µs delay. The first pulse will be the 500-kHz transmitter followed by the 100-kHz transmitter. If there is a problem with a transmitter, it will show up as a very weak transmit waveform or none at all.

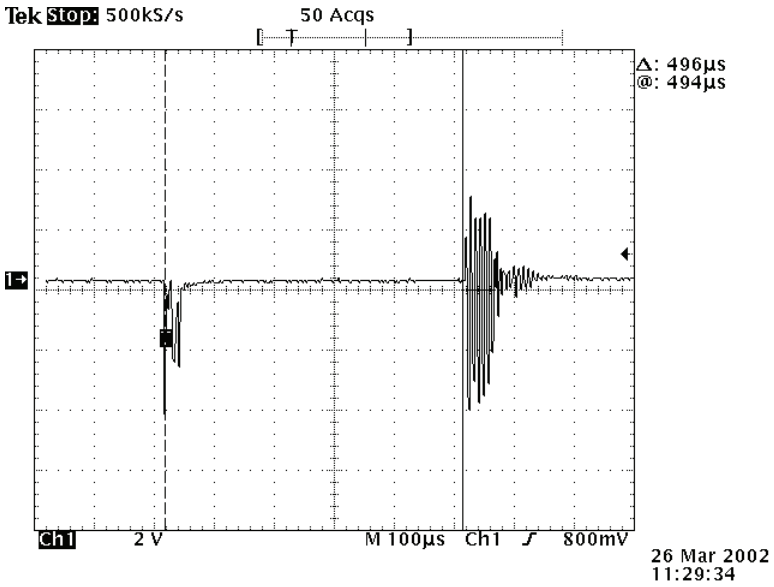


Figure C-17: *Transmit Waveform*

C.8.4 Checking the Receivers before Deployment

With the towfish running on deck, start SonarPro and open the Sonar Viewer window for each the high and the low frequency. Set the range to 150 meters and allow the TVG gain to adjust. Rub the transducers firmly, one transducer at a time. This is the rub test. The image in the Sonar Viewer window should look something like that shown in Figure C-18.

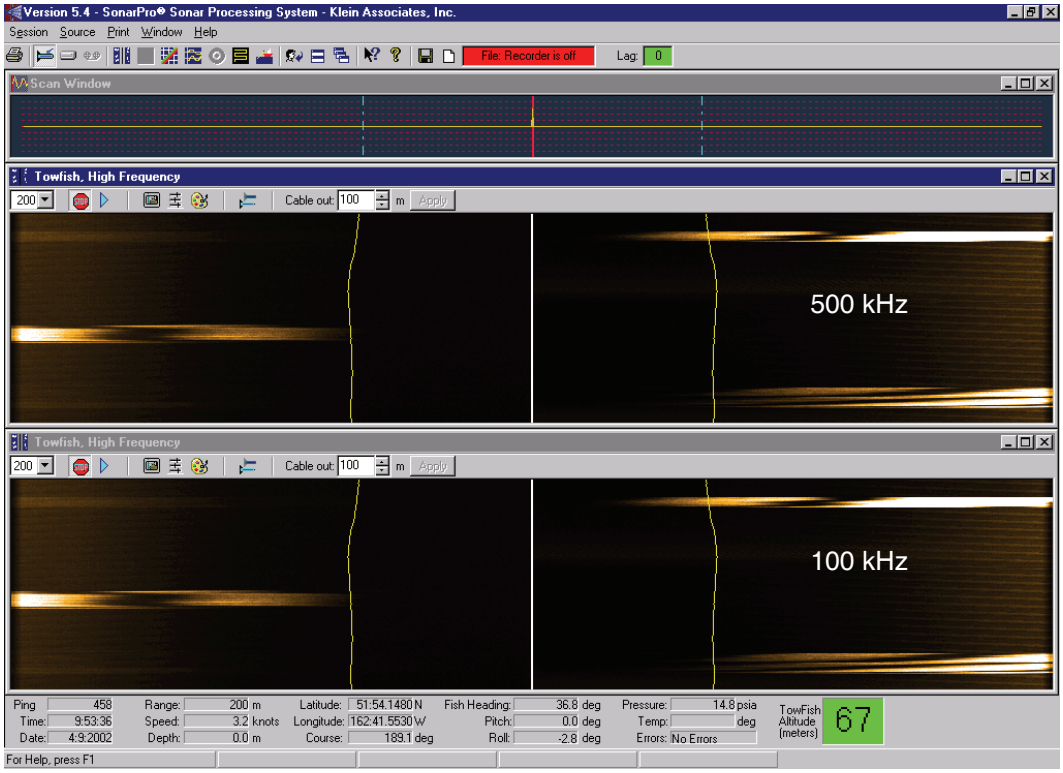


Figure C-18: *Image in Sonar Viewer Windows During a Rub Test*

C.8.5 Removing the Towfish Electronics

To remove the towfish electronics:

1. Remove the towfish nose cone by unscrewing the socket head cap screw in the center with a 8-mm hex key or driver. Once you have the nose cone off you will find the electronics extraction handle as shown in Figure C-19.
2. Unplug all the cables at the feed-thrus, which are shown in Figure C-19, and inspect this area for dirt and debris and flush clean.
3. On the top and bottom of the extraction handle is a 6-mm hex set screw. One of these screws is shown in Figure C-20. Screw them into the handle to release the feed-thru.
4. Pull firmly on the extraction handle to extract the electronics assembly which may pop out quickly. Avoid over stressing the transducer leads.
5. Carefully slide the electronics assembly out of the housing while keeping the electronics assembly level.

To reassemble the electronics into the pressure housing:

1. Inspect and clean the O-ring and the O-ring surface in the pressure housing. Apply a light coat of silicone grease to both the O-ring and the O-ring surface.

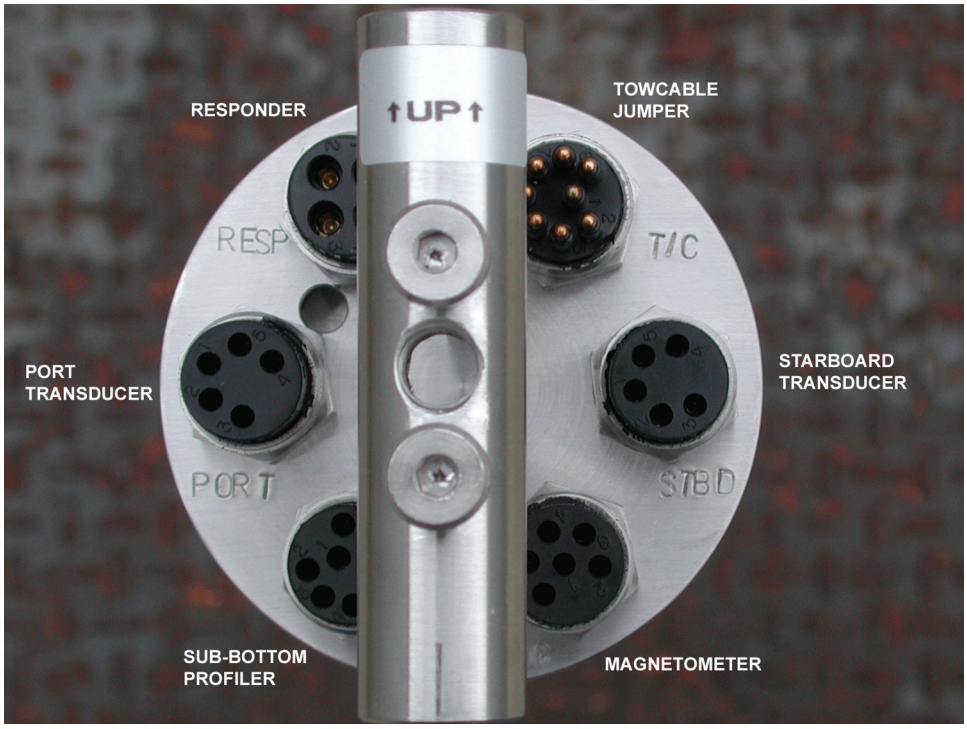


Figure C-19: *Towfish Electronics Extraction Handle and Feed-Thrus*

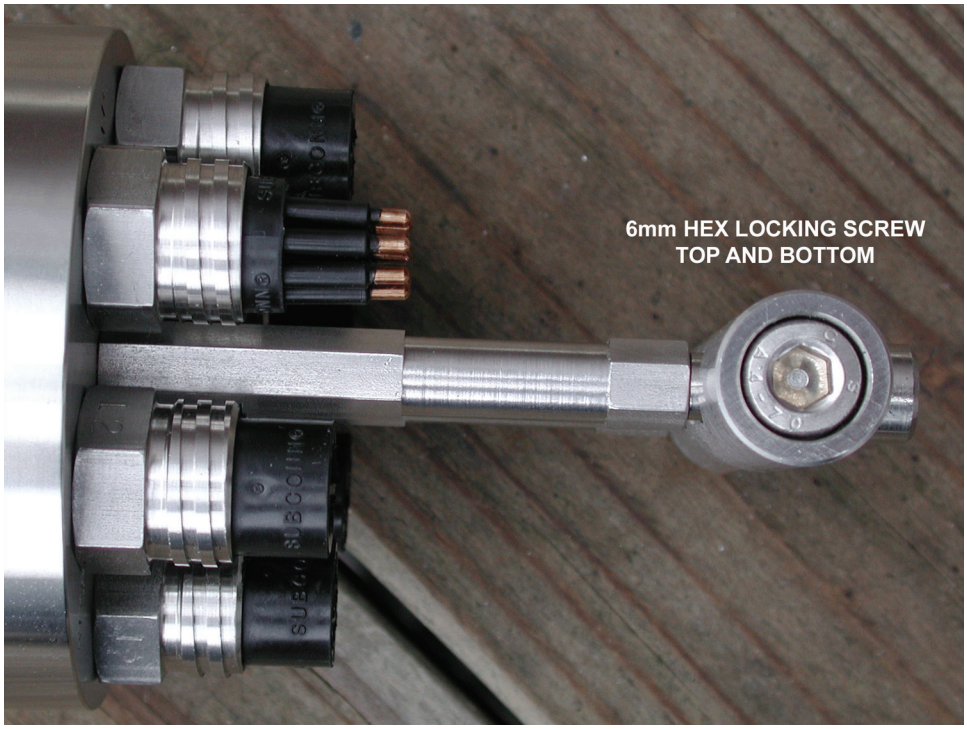


Figure C-20: *One of Two 6-mm Hex Locking Screws in the Towfish Electronics Extraction Handle*

2. Slide the electronics assembly gently and carefully into the housing, positioning the extraction handle such that the “UP” label is at the top as shown in Figure C-19 on page C-43.
3. Once properly seated unscrew the 6-mm set screws in the top and bottom of the extraction handle to lock the feed-thru in the housing.
4. Replace the nose cone.

With the towfish electronics out of the pressure housing, you can identify some of the components as shown in Figure C-21.

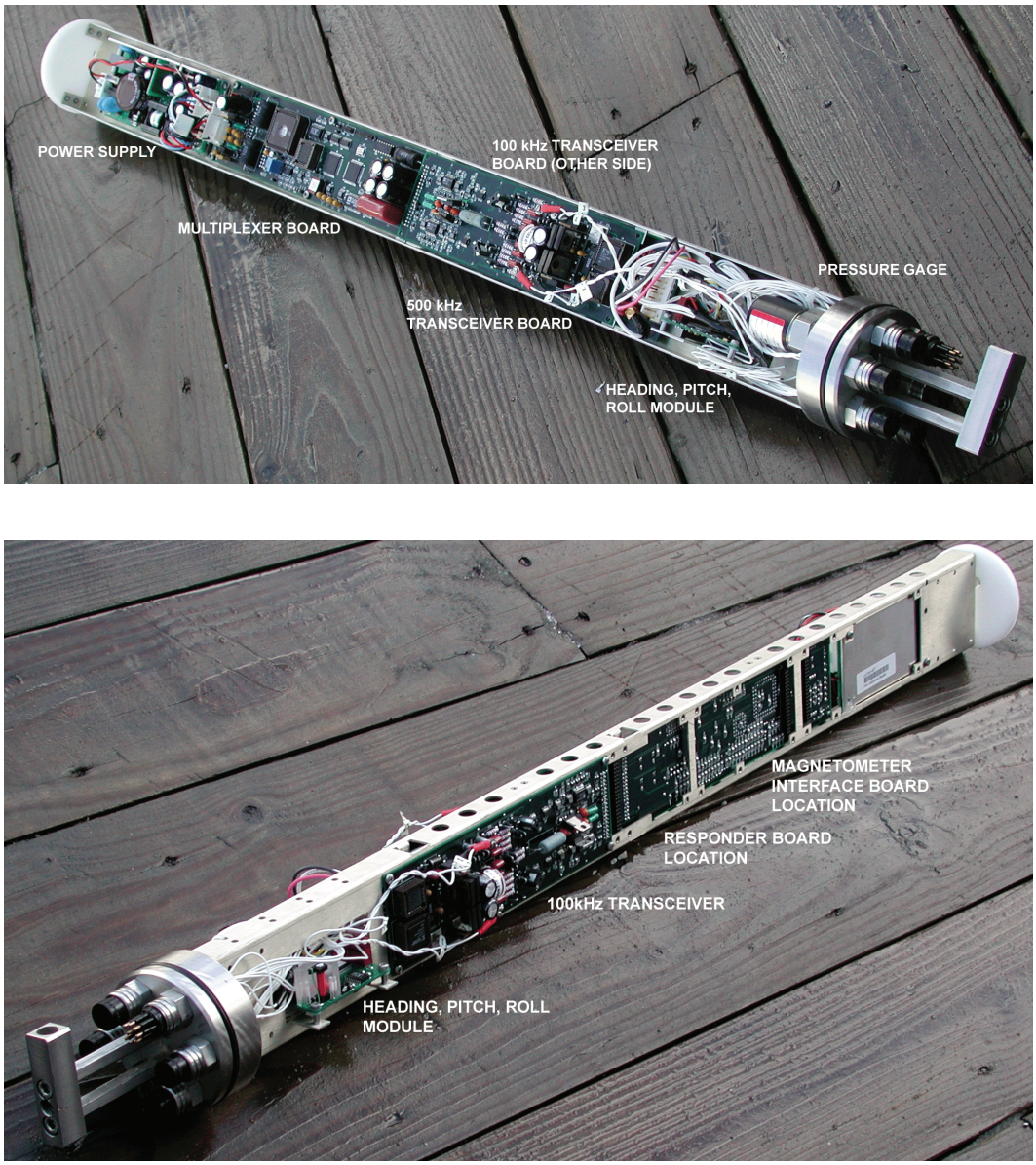
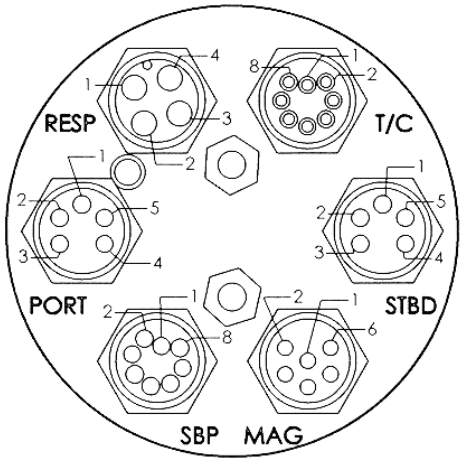


Figure C-21: *Towfish Electronics*

C.8.6 Feed-Thru Connector Pin Orientations and Pinouts

The feed-thru connector pin orientations and pinouts are shown in Figure C-22.



TOWCABLE JUMPER (T/C)
8 PIN SUBCONN M TO 7 PIN MOLEX & SMA PLUG

SUBCONN PIN #	WIRE LENGTH	MOLEX PIN #	NOTES
1		NA	T/C (SMA CENTER)
2		NA	T/C (SMA SHIELD)
3		1	VCC
4		2	DATA +
5		3	DATA -
6		4	TRIG
7		5	COM
8		6	GND

STARBOARD TRANSDUCER (STBD)
5 PIN SUBCONN TO SPADE CONNECTORS

SUBCONN PIN #	WIRE LENGTH	SPADE COLOR	100 KHZ XCVR PCB	500 KHZ XCVR PCB
1		RED	STBD +	NA
2		BLK	STBD -	NA
3		RED	NA	STBD +
4		BLK	NA	STBD -
5		CONNECT TO CHASSIS		

MAGNETOMETER (MAG)
6 PIN SUBCONN TO 6 PIN MOLEX (.100")

SUBCONN PIN #	WIRE LENGTH	MOLEX PIN #	NOTES
1		1	VS
2		2	GND
3		3	TX
4		4	RX
5		5	GND
6		6	GND

PORT TRANSDUCER (PORT)
5 PIN SUBCONN TO SPADE CONNECTORS

SUBCONN PIN #	WIRE LENGTH	SPADE COLOR	100 KHZ XCVR PCB	500 KHZ XCVR PCB
1		RED	PORT +	NA
2		BLK	PORT -	NA
3		RED	NA	PORT +
4		BLK	NA	PORT -
5		CONNECT TO CHASSIS		

RESPONDER (RESP)
4 PIN SUBCONN TO 4 PIN MOLEX (.156")

SUBCONN PIN #	WIRE LENGTH	MOLEX PIN #	NOTES
1		1	TX+
2		2	TX-
3		3	VS/TRIG
4		4	GND

SUB BOTTOM PROFILER (SBP)
8 PIN SUBCONN F TO 10 PIN MOLEX (.156")

SUBCONN PIN #	WIRE LENGTH	MOLEX PIN #	NOTES
1		1	
2		2	
3		3	
4		4	
5		5	
6		6	
7		7	
8		8	
NA	NC	9	
NA	NC	10	

Figure C-22: *Feed-Thru Connector Pin Orientations and Pinouts*

C.8.7 Setting up for Testing the Electronics

Remove the towfish electronics as described in “Removing the Towfish Electronics” on page C-42 and place the electronics in a position so that you can reconnect the transducers and cable. The towfish electronics is shown removed and ready for servicing in Figure C-23.

Figure C-23: *Towfish Electronics Ready for Servicing*

C.8.8 Checking the Multiplexer Board

The Multiplexer board is shown in Figure C-21 on page C-44 and performs the following functions:

- Receives the 200 VDC and telemetry from the surface and separates out the telemetry from the 200 VDC.
- Routes the 200 VDC to the power supply, and then receives the converted + 5 VDC and ±15 VDC.
- Routes the 200 VDC to the Transceiver boards.
- Generates ±5 VDC.
- Generates the time varied gain (TVG) curves for the received sonar signals from the transducers.
- Multiplexes all the data channels and transmits the telemetry back to the surface.
- Provides the fiber-optic interface.

CAUTION *Do not short the high voltage connection.*

The towfish requires 200 VDC from the TPU to operate. Using a voltmeter check for 200 VDC at the TOWFISH connector of the TPU. Measure the voltage between the center pin to the side of the connector. If you do not have 200 VDC here, check the towfish fuse on the TPU.

Next verify that 200 VDC is reaching the towfish end of the tow cable. Measure the voltage across pins 1 and 2 of the tow cable connector at the towfish end.

The 200 VDC enters the towfish and passes though the feed-thru connector. It then enters the Multiplexer board on a gold SMA connector. Unplug the connector and measure the voltage between the center contact of the connector and the outside edge. This connector is shown in Figure C-24.

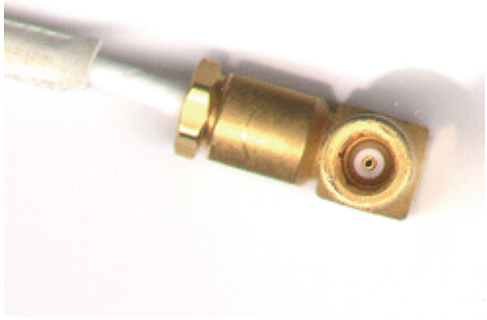


Figure C-24: *SMA Connector*

At the Multiplexer board the 200 VDC goes through L3, L4, and L5 and exits the board at JP9. The 200 VDC supplies power to the low voltage power supply which then supplies +5 VDC, +15 VDC and -15 VDC back to the Multiplexer board.

The 200 VDC on the Multiplexer board also supplies 200 VDC power to the Transceiver boards. If the 200 VDC is being pulled down on the Multiplexer board, remove the two Transceiver boards and measure the voltage again.

The data are coupled with the 200 VDC. TP1 on the Multiplexer board shows the data signals before they are coupled to the 200 VDC as shown in Figure C-25. Check this point if you have 200 VDC but no towfish activity. These measurements were made with a 30-meter test cable and a 3-dB attenuator at the input to the Multiplexer board.

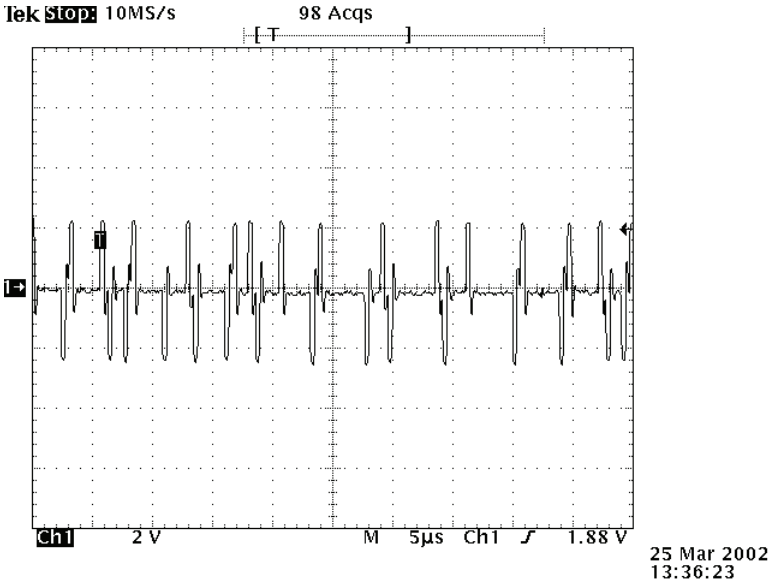


Figure C-25: *Data Output Signals on TP1 of the Multiplexer Board before being coupled to 200 VDC*

The data output signals at TP2 are shown in Figure C-26.

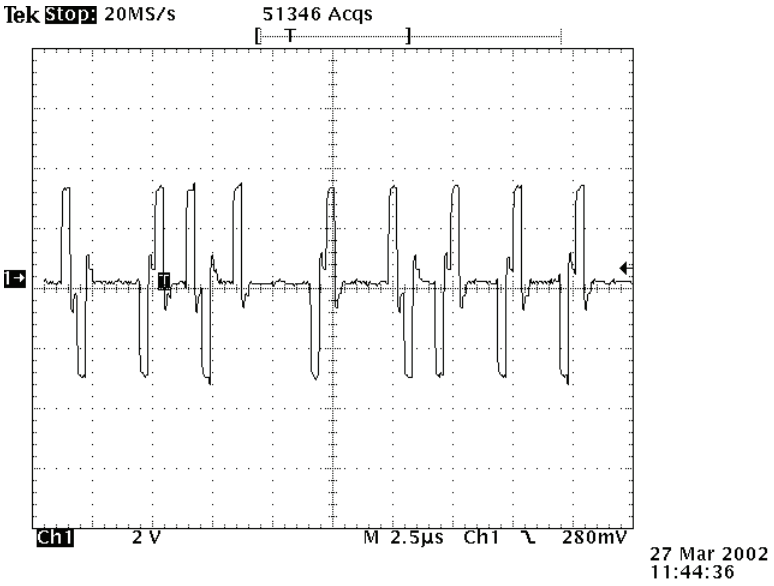


Figure C-26: *Data Output Signals on TP2 of the Multiplexer Board*

TP7 in Figure C-27 shows the trigger FSK signals. Check here if the towfish is not transmitting.

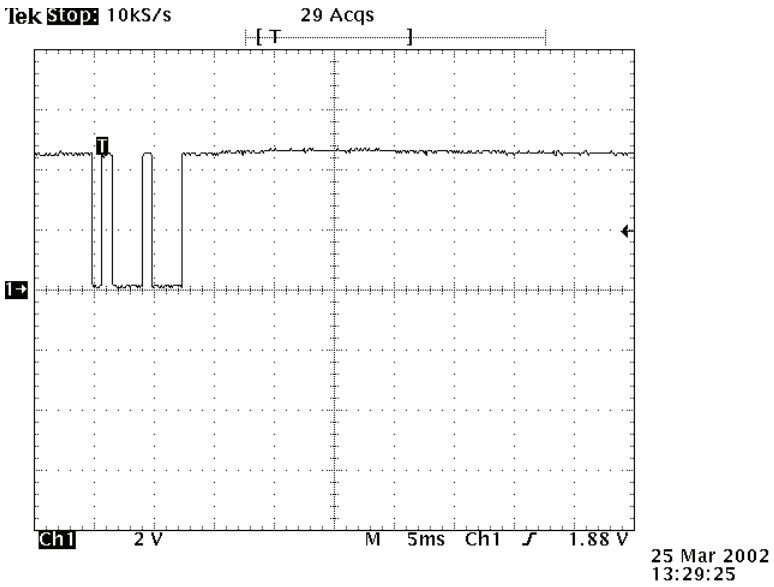


Figure C-27: *Trigger FSK Signals on TP7 of the Multiplexer Board*

TP5 in Figure C-28 shows the uplink data signals. Check here if the towfish is transmitting but there are data problems.

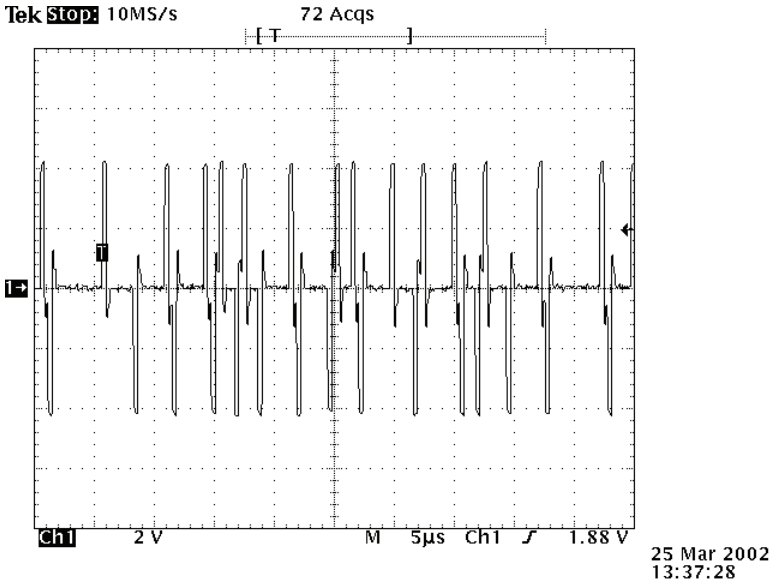


Figure C-28: *Data Uplink Signals on TP5 of the Multiplexer Board*

Each Transceiver board has a TVG curve that controls the signal gain. TP6 in Figure C-29 shows the TVG for the 500-kHz Transceiver board.

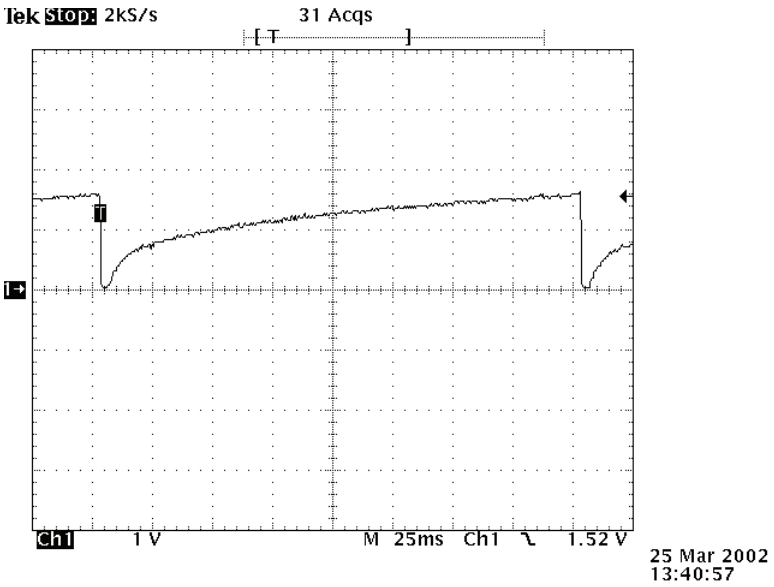


Figure C-29: *TVG Signal on TP6 of the 500-kHz Transceiver Board*

C.8.9 Multiplexer Connectors

The connectors on the Multiplexer board are shown in Figure C-30.

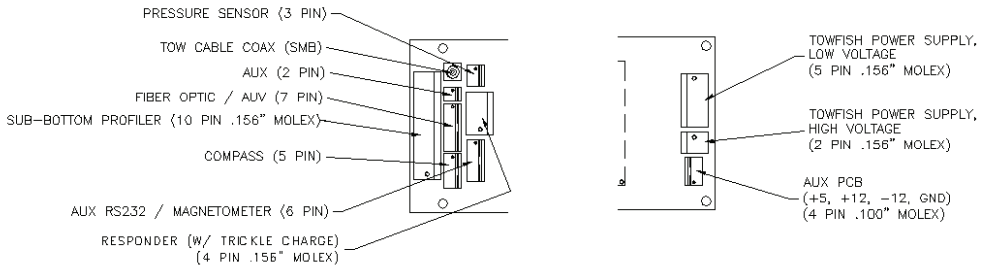


Figure C-30: *Multiplexer Board Connectors*

C.8.10 Magnetometer Voltage

The power voltage for an optional magnetometer is set on the Multiplexer board with a jumper on JP2. The power supply for the optional magnetometer is shown in Figure C-31.

The jumper positions are the following:

- 1-2 for external power (default when no magnetometer is in use)
- 3-4 for +5 volts
- 5-6 for +12 volts
- 7-8 for +200 volts

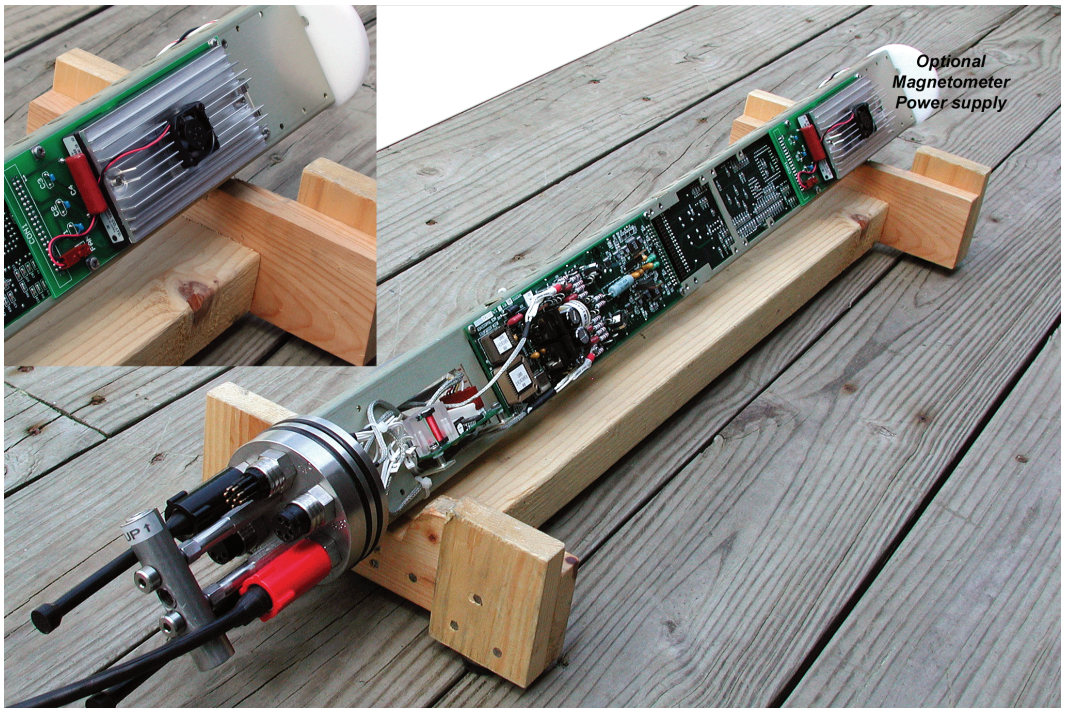


Figure C-31: *Power Supply for Optional Magnetometer*

C.8.11 Towfish Low Voltage Power Supply Connector Pinouts

The connector pinouts for the low voltage power supply in the towfish are shown in Figure C-32.

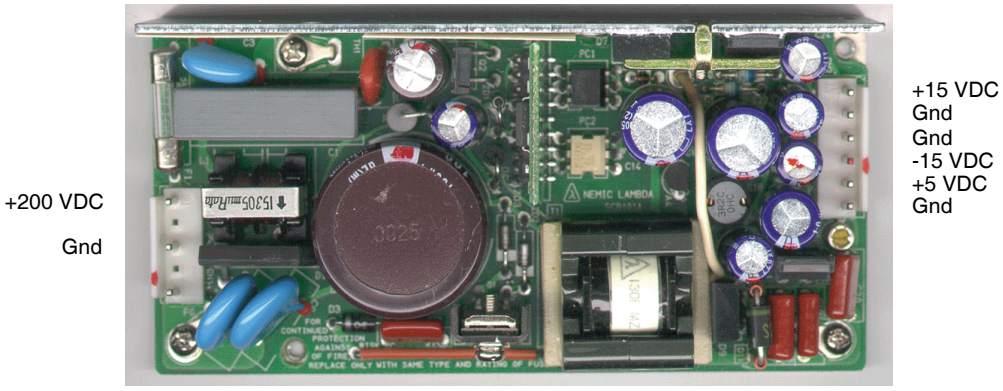


Figure C-32: *Low Voltage Power Supply Connector Pinouts*

C.8.12 Checking the Transceiver Boards

Before checking the Transceiver boards, make sure the Multiplexer board is functioning properly. A Transceiver board is shown in Figure C-33. Next, verify the following voltages on the Transceiver board:

- +15 VDV on pins 23 and 24
- -15 VDC on pins 27 and 28
- +5 VDC coming into the board on pins 35 and 36
- +5 VDC on board + side of C8 (See Figure C-34.)
- -5 VDC on board - side of C9 (See Figure C-34.)
- +200 VDC on pins 1, 2, 3, 4, 5, and 6

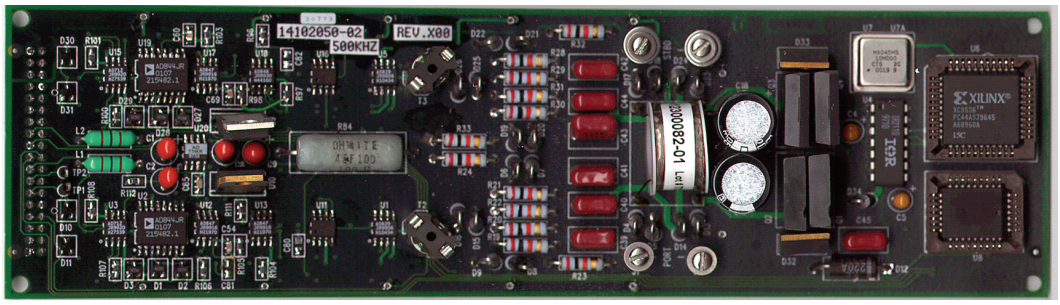


Figure C-33: *Transceiver Board*

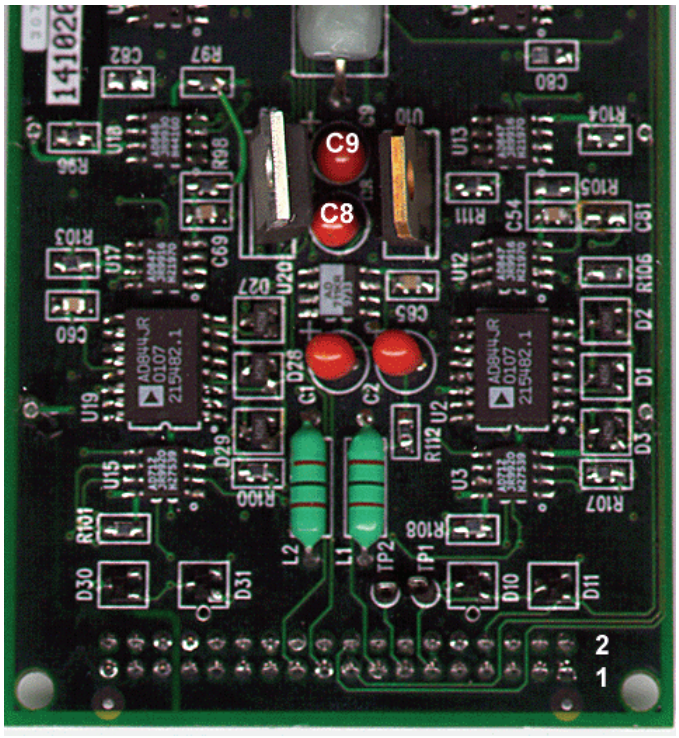


Figure C-34: *C8 and C9 on Transceiver Board*

Check for a trigger signal on Pin 21. The trigger signal should be as shown in Figure C-35.

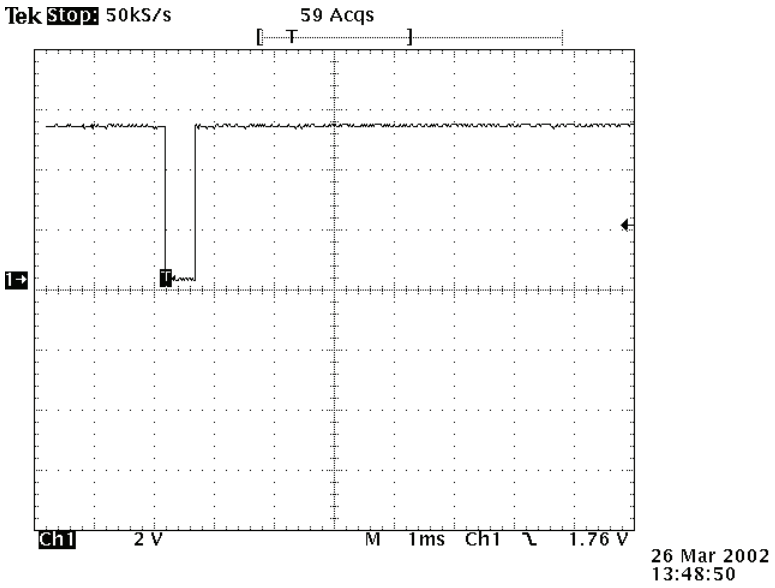


Figure C-35: *Trigger Signal on Pin 21 of the Transceiver Board*

Lay an oscilloscope probe, with the tip on, against the +transducer lead on each Transceiver board and verify the transmit pulses as shown in Figure C-36 for the 100-kHz Transceiver board and in Figure C-37 for the 500-kHz Transceiver board.

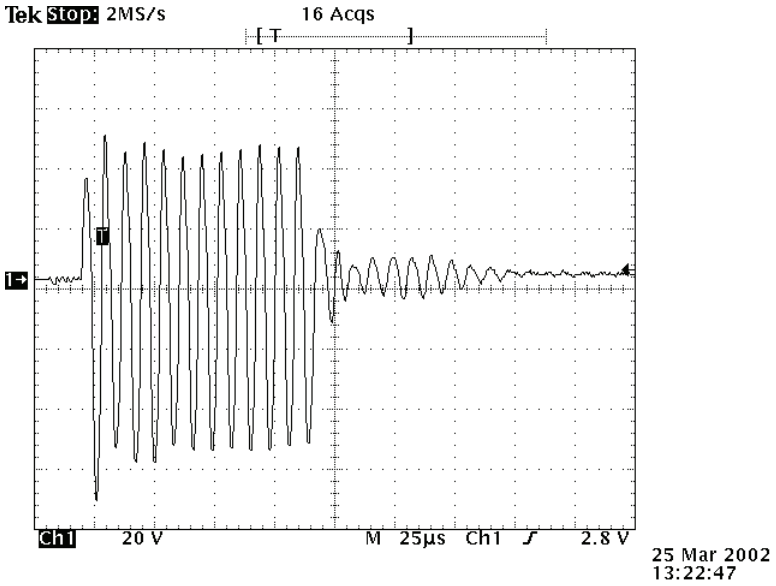


Figure C-36: *100-kHz Transmit Waveform*

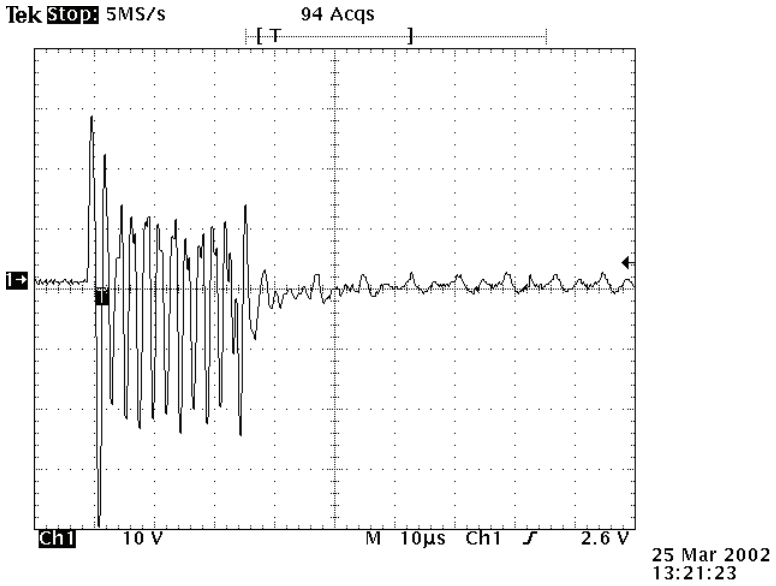


Figure C-37: *500-kHz Transmit Waveform*

C.8.13 Checking the FETs

If you are having transmitter problems, you can check FETs Q1, Q2, Q3, and Q4 on the Transceiver boards with a multimeter. These FETs are shown in Figure C-38.

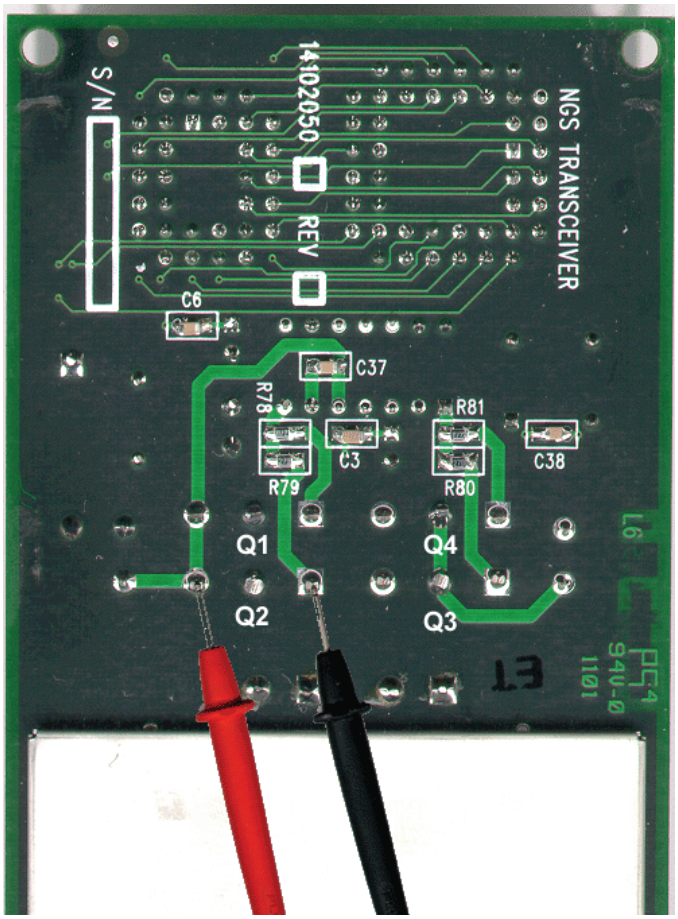


Figure C-38: *Checking the FETs on the Transceiver Board*

Measure the resistance across each of the FETs as shown in Figure C-38. The readings should be about 2.4 megohms. Reverse the test leads and re-measure. The readings should be about 3.7 megohms. The readings will vary slightly, but if there is a large reduction in resistance for an FET, it may not be functioning properly.

C.8.14 Checking the Receiver Section

If your sonar image seems to be having problems on one side, this is an indication that you may have a receiver problem. Try swapping to a spare Transceiver board to see if the problem follows the board. Alternately you can swap the transducers at the feed-thru to see if the problem stays the same (still most likely a board problem), or if it changes sides, it could possibly be a transducer problem.

C.8.15 Checking the Sensors

Sensor readings can be read out directly in the Information window as shown in Figure C-39. Move the towfish in pitch, roll and heading and check to see if the readings change. If you have no sensor readings, check that the cable is properly plugged into the Multiplexer board at JP3. Also check that the cable is properly connected at the compass board.

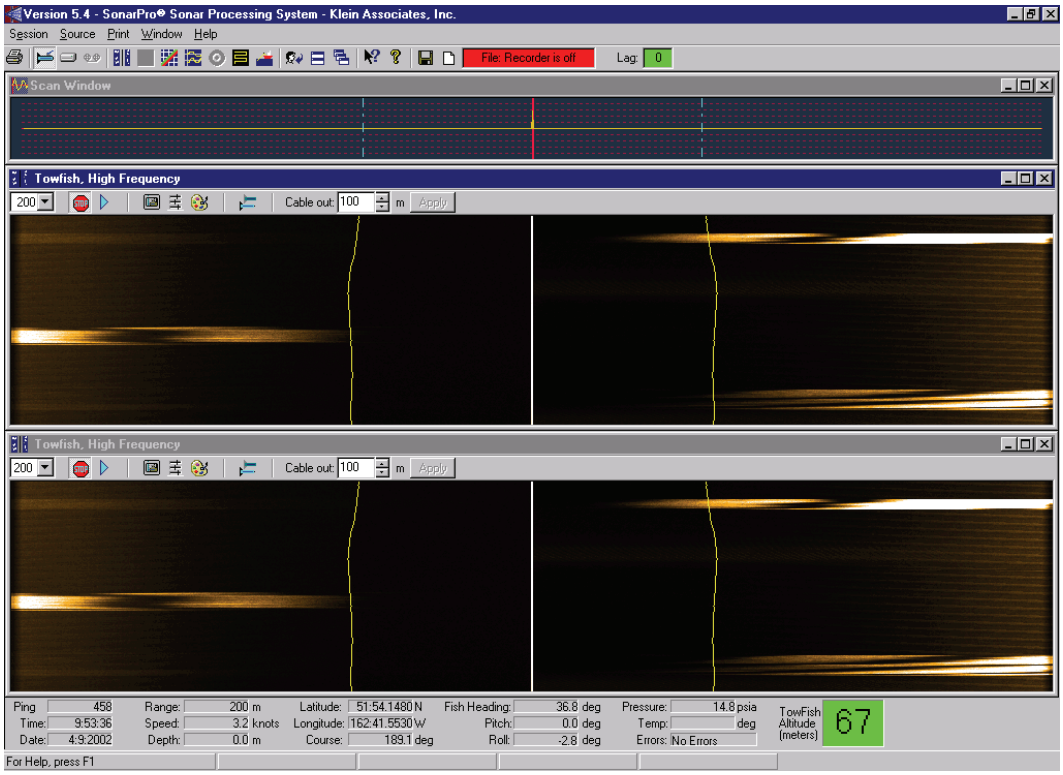


Figure C-39: *Sensor Readings in Information Window*

C.8.16 Calibrating the Compass

Starting with version SonarPro 5.2 a Compass Calibration Wizard was added.

To start the Compass Calibration Wizard, click **Run Compass Calibration Wizard** on the *Towfish Diagnostics* tab of the *Sonar Interface* dialog box. Follow the instructions and play the demonstration animation.

The compass calibration must be done away from all magnetic and metal sources, most likely off the ship. You enable the towfish compass calibration mode and then rotate the towfish slowly 360 degrees in a circle (more than a minute). At the same time you must pitch and roll the towfish beyond its 20 degree limits, we suggest 45 degrees to be safe.

NOTE *Excellent calibration results have been obtained by enabling the compass calibration and towing the towfish in a series of three circles with the boat.*

NOTE *If trying the method mentioned in the note above, survey the area first making sure you have enough water to operate safely since the transmitters are turned off.*

The compass calibration can also be done by manually entering commands in the **Operator command** area of the *Towfish Diagnostics* tab. After entering a command, click **Send Command** to send the command to the towfish.

To calibrate the compass manually, enter the following commands in the order shown.

$MAF:	Turn off the low frequency transmitter.
$MBF:	Turn off the high frequency transmitter.
$Ch:	Halt compass transmission.
$Cmpcal=d:	Disables compass multi-point calibration mode.
$Ccc:	Clears compass calibration table.
$Cmpcal=e:	Enables multi-point calibration.
$Cgo:	Starts compass for calibration. Rotate the towfish 360 degrees while rotating the towfish through the limits of pitch and roll. This should be done over a time frame of 1 minute.
$Ch:	Halt compass calibration.

$Cmpcal=d: Disables compass multi-point calibration mode.

$Cgo: Starts compass.

$MA0: Turn on low frequency transmitter.

$MB0: Turn on high frequency transmitter.

Turn the towfish off and then on again and check that the compass is working.

C.8.17 Calibrating the Compass with a Magnetometer (Optional)

Before running the compass calibration, you must turn off the magnetometer uplink.

To calibrate the compass with a magnetometer:

1. Open the startup.ini file in the klein directory.
2. Change the line set DEFAULTUPLINK 1 to set DEFAULTUPLINK 0.
3. Save the startup.ini file.
4. Run the compass calibration as described in “Calibrating the Compass” on page C-57.
5. Open the startup.ini file and change set DEFAULTUPLINK 0 back to DEFAULTUPLINK 1.

C.8.18 Series 3000 Sonar System Towfish Commands

The following are multiplexer commands:

$MLn: Low frequency TVG page select. 7 is default.

$MHn: High frequency TVG page select. 7 is default.

The following are transmitter commands:

$MAF: Turns the 100-kHz transmitter off.

$MA0: Turns the 100-kHz transmitter on.

$MBF: Turns the 500-kHz transmitter off.

$MBO: Turns the 500-kHz transmitter on.

C.9 Software Troubleshooting

If for some reason SonarPro will not open, or SonarPro gets saved in some corrupted condition and will not operate, you can recover to the default installation condition by editing the operating system's Registry.

To edit the registry:

1. Select *Start/Run*, enter REGEDT in the **Open** text box, and then click **OK**.
2. Navigate the path *My Computer/HKEY_CURRENT_USER/Software/Klein Associates*.
3. Select and then delete *SonarPro*.
4. Start SonarPro, and then select *New State* from the *Session* Menu.

To totally remove C-Maps from the registry:

1. Select *Start/Run*, enter REGEDT in the **Open** text box, and then click **OK**.
2. Navigate the path *My Computer/HKEY_CURRENT_USER/Software*.
3. Select and delete *C-Map*.
4. Navigate the path *My Computer/HKEY_LOCAL_MACHINE/Software*.
5. Select and delete C-Map.
6. Select and delete *Aladin*.

C.10 Terminating an Optical Fiber

When terminating optical fibers, use a termination kit such as the Fotec Fiber-Optic Termination Kit.

WARNING *Safety glasses should be worn when handling optical fiber. In addition, when handling broken fiber, use extreme caution as the fiber can easily penetrate clothing and skin causing injury and infection.*

To terminate an optical fiber:

1. Plug oven in.
2. Place a piece of tape on the table to catch the fiber when cut.
3. Mix epoxy.
4. Put epoxy into the syringe.
5. Slide the strain relief over the fiber.

6. Strip fiber every 1/8 inch until you have stripped 1 inch off (yellow handled strippers).
7. Clean stripped fiber with an alcohol wipe.
8. Take the connector and fill barrel with epoxy until a blue dot appears on the end of the ceramic part of the connector. Withdraw the syringe and fill the barrel.
9. Feed the fiber into the barrel by twisting the fiber in the rotational axis until the fiber seats and some of the fiber comes out of the ceramic connector end.
10. Carefully insert the fiber connector into the oven with a pair of needle nose pliers. Do not touch the side of the oven with the fiber. It will break.
11. Cook for 10 minutes.
12. When cured, cut the protruding fiber end off using the sapphire pencil tool. Use a light slicing motion.
13. Polish the tip of the ceramic connector with the pink polishing pad. Polish until all epoxy has been removed. Use a figure 8 pattern. If there is epoxy on the side of the barrel, remove it completely with this pad.
14. Place some slurry onto the rubber mat, glass, purple diamond polishing pad.
15. Place the connector into the stainless steel polishing puck. Use a figure 8 polishing stroke.
16. Inspect with the inspection tool, and test for db loss.

C.11 Problem Troubleshooting

For general troubleshooting refer to Table C-2.

Table C-2: *General Troubleshooting*

PROBLEM	CHECK
No operation, but the LOCK LOSS and Carrier Loss lights are off.	Ethernet Hub. LAN cables. Path and location path to vxWorks. Network setup on the computer and TPU.
TPU not functioning properly for no apparent reason.	Check for proper AC voltage setting. Check AC fuses. Replace boards one at a time.

Table C-2: *General Troubleshooting (Continued)*

PROBLEM	CHECK
After a cable problem and the correction of the cable problem, the CARRIER LOSS and LOCK LOSS lights are on.	Check the towfish fuse. Check the 200 VDC. Check the TP7 and TP12 waveforms on Multiplexer board. Check the diodes in the hybrid circuit. Replace the Demultiplexer board in the TPU.
After a cable problem and the correction of the cable problem, the Carrier Loss and Lock Loss lights are off, but the data on SonarPro is breaking up.	Check that R30 is 4.7 ohms on the Multiplexer board in the towfish. Check U2 on the Demultiplexer board. Change the Demultiplexer board. Check diodes D7, D8, D9, D10 and check that R11 is reading 4.7 ohms on the TPU 200 VDC power supply.
After a cable problem and the correction of the cable problem, the 200 VDC to the towfish is reading around 300 VDC.	Check or change U1 on the TPU 200 VDC power supply.
SonarPro operating slow over the network with jittery display updates and large lag numbers.	Incompatibility with the TPU CPU and the vxWorks software. Check the CPU version in the TPU and the version of vxWorks software. CPU versions 14103184 can only be used with vxWorks version 5.11.1841 or higher. CPU version 14102073, recognized by unpopulated area near front of board, can only be used with vxWorks version 5.5.0291 or earlier. Contact L-3 Klein technical support for more information.
TPU will not boot. **Error in boot line.** **Gibberish data.** **"Can't load boot file!!" message.** **Error messages.**	The likely cause is the failure of the backup battery on the CPU board. Contact L-3 Klein for a replacement. See "Replacing the CPU Battery" on page C-62 for battery replacement instructions.

C.11.1 Replacing the CPU Battery

If you have problems with the TPU booting up and you get the error message "Error in boot file!!" along with a boot up screen similar to that shown in Figure C-40, the likely cause is the failure of the backup battery on the CPU board.

```
                                VxWorks System Boot

Copyright 1984-2001  Wind River Systems, Inc.



CPU: Motorola MVME5100-0133 - MPC 750
Version: VxWorks5.4.2
BSP version: 1.2/0
Creation date: Feb  1 2002, 10:45:26



Press any key to stop auto-boot...
 0
auto-booting...

Error in boot line:
   Ո■          Ո  ■Ո ▪Û ▪  Ո ┐ₙ  ≈    Ո   ▪▪  ┐  o  ≈▪          Û     ²     ▪
      ■      Ո Ո                                  ≈≈      ■▪      ▪Ո      ▪
▪       ▪  √         ≈      ƒ       Ո   ≈Ո   ²   Û      Ū√              ▪       ╗
    ≈  ┐   ▪
                ^
Can't load boot file!!
```

Figure C-40: *"Can't load boot file!!" Message on Boot-Up*

Locate the battery on the CPU board. It is near the heatsink and is labeled U14. The battery is piggybacked on top of the IC as shown in Figure C-41. Note the location of the pin 1 dot.

Install the new battery. When you turn the TPU on you will have to set up the boot parameters. (See "TPU LAN Configuration Setup" on page C-24.)

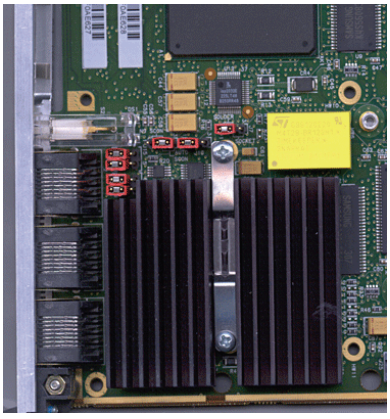


Figure C-41: *CPU Battery*

C.11.2 Recommended Test Equipment

The following equipment is recommended when servicing or performing troubleshooting operations.

- Fluke 87 multimeter
- Tektronix TDS 3014 4-channel digital oscilloscope or a THS720A 2-channel digital oscilloscope
- Hewlett Packard 4194A impedance / gain – phase analyzer with measurement unit
- Terminal program such as HyperTerminal
- Small flat blade screwdriver for adjustments
- Medium phillips head screwdriver for #4, 6, 8 screws
- 6-mm hex wrench
- ¾-inch wrench
- Flat blade screwdriver about 5 inches long for #4 screws
- Wire cutters
- 9/16-inch wrench
- 9-pin to 9-pin null modem cable

C.11.3 Spare Boards and Components

Listed in Table C-3 through Table C-6 are the recommended spare boards and components.

Table C-3: *TPU Spares*

QTY	DESCRIPTION
1	Demultiplexer board
4	U2 AD826 IC for Demultiplexer board
1	CPU board
1	Power Supply
10	Towfish fuses
6	AC fuses

Table C-4: *Towfish Spares*

QTY	DESCRIPTION
1	Multiplexer board
1	100-kHz Transceiver board
1	500-kHz Transceiver board
1	Compass assembly
1	Power Supply

Table C-5: *TPU Power Supply Board Components*

QTY	PART NO.	DESCRIPTION
4	MUR130	Diodes for D7 and D9
4	P6KE10	Diodes for D9 and D10
2	MJ10012	Transistor for Q1
2	4.7 ohm 1 watt	Resistors for R11

Table C-6: *Transceiver Board Components*

QTY	PART NO.	DESCRIPTION
1	IR2110	Driver U1 to U8
2	IRF254	Power FET
1	12300082	Transformer
1	12300149	Transformer
2	HFA25TB60	D32, D33

Table C-7: *Multiplexer Board Components*

QTY	PART NO.	DESCRIPTION
1	MC7905ACT	-5volt regulator
1	MC7805ACT	+5volt regulator
1	1mH	Coil L3
4	4.7 ohm 1 watt	Resistors
4	100mH	Coil L1, L2

In addition, a spare lightweight tow cable is recommended.

C.11.4 Current Draw

The following is the system current draw and power under various operating conditions at 120 VAC:

TPU Standby:	0.5 A, no towfish connected 0.9 A, towfish connected
TPU / Towfish (transmitting):	1.1 A, 25-m range setting 1.0 A, 75-m range setting 0.9–1.0 A, 400-m range setting
TPU inrush:	1.6 A, no towfish connected 2.4 A, towfish connected
TPU with towfish:	240 w
Ethernet Hub:	21 w
Laptop computer:	100 w

C.11.5 PRF/Period Per Range

The PRF/Period Per Range is shown in Table C-37.

Table C-8: *PRF/Period Per Range*

RANGE (m)	PERIOD (ms)	PRF
25	33	30
37.5	50	20
50	67	15
75	100	10
100	133	7.5
150	200	5

The formula for PRF/Period is

$T = 2R/C$

where,

T = Time
R = Range
C = Speed of sound in water = 1500 m/s

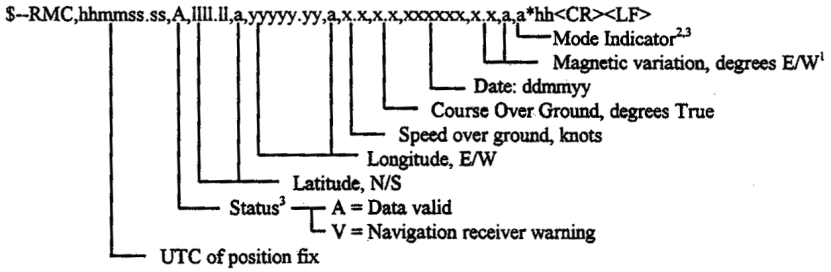
Therefore,

$T = 2R/1500$

C.12 NMEA 0183 Formats and Information

RMC - Recommended Minimum Specific GNSS Data

Time, date, position, course and speed data provided by a GNSS navigation receiver. This sentence is transmitted at intervals not exceeding 2-seconds and is always accompanied by RMB when a destination waypoint is active. RMC and RMB are the recommended minimum data to be provided by a GNSS receiver. All data fields must be provided, null fields used only when data is temporarily unavailable.

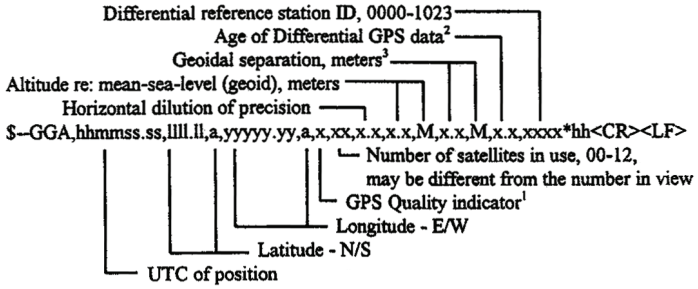


Notes:

1) Easterly variation (E) subtracts from True course
   Westerly variation (W) adds to True course
2) Positioning system Mode Indicator:
   A = Autonomous mode
   D = Differential mode
   E = Estimated (dead reckoning) mode
   M = Manual input mode
   S = Simulator mode
   N = Data not valid
3) The positioning system Mode Indicator field supplements the positioning system Status field, the Status field shall be set to V = Invalid for all values of Indicator mode except for A= Autonomous and D =

GGA - Global Positioning System Fix Data

Time, position and fix related data for a GPS receiver.

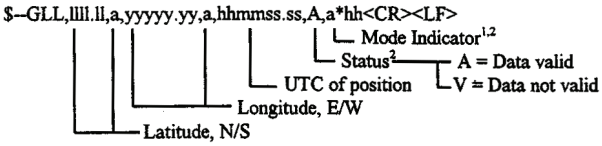


Notes:

1) GPS Quality Indicator:
   0 = Fix not available or invalid
   1 = GPS SPS Mode, fix valid
   2 = Differential GPS, SPS Mode, fix valid
   3 = GPS PPS Mode, fix valid
   4 = Real Time Kinematic. System used in RTK mode with fixed integers
   5 = Float RTK. Satellite system used in RTK mode, floating integers
   6 = Estimated (dead reckoning) Mode
   7 = Manual Input Mode
   8 = Simulator Mode

   The GPS Quality Indicator field shall not be a null field.
2) Time in seconds since last SC104 Type 1 or 9 update, null field when DGPS is not used
3) Geoidal Separation: the difference between the WGS-84 earth ellipsoid surface and mean-sea-level (geoid) surface, "-" = mean-sea-level surface below WGS-84 ellipsoid surface.

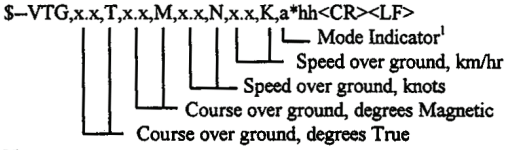
GLL - Geographic Position - Latitude/Longitude
Latitude and Longitude of vessel position, time of position fix and status.



Notes:
1) Positioning system Mode Indicator: A = Autonomous mode
D = Differential mode
E = Estimated (dead reckoning) mode
M = Manual input mode
S = Simulator mode
N = Data not valid

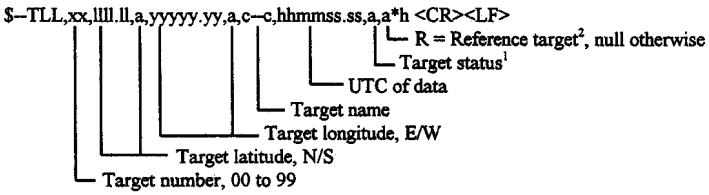
2) The positioning system Mode Indicator field supplements the positioning system Status field, the Status field shall be set to V = Invalid for all values of Indicator mode except for A= Autonomous and D = Differential. The positioning system Mode Indicator and Status fields shall not be null fields.

VTG - Course Over Ground and Ground Speed
The actual course and speed relative to the ground.



Notes:
1) Positioning system Mode Indicator: A = Autonomous mode
D = Differential mode
E = Estimated (dead reckoning) mode
M = Manual input mode
S = Simulator mode
N = Data not valid
The positioning system Mode Indicator field shall not be a null field.

TLL - Target Latitude and Longitude
Target number, name, position and time tag for use in systems tracking targets.



Notes
1) Target status: L = Lost, tracked target has been lost
Q = Query, target in the process of acquisition
T = Tracking
2) Reference Target: set to "R" if target is a reference used to determined own-ship position or velocity, null otherwise.

***DPT - Depth**

Water depth relative to the transducer and offset of the measuring transducer. Positive offset numbers provide the distance from the transducer to the waterline. Negative offset numbers provide the distance from the transducer to the part of the keel of interest.

$--DPT,x.x,x.x,x.x*hh<CR><LF>

- Maximum range scale in use
- Offset from transducer[1,2], meters
- Water depth relative to the transducer, meters

Notes:

1) "positive" = distance from transducer to water-line, "-" = distance from transducer to keel

* 2) For IEC applications the offset shall always be applied so as to provide depth relative to the keel.

Sample navigation strings:

The preferred is RMC
$GPRMC,101842.572,A,3318.577,N,07845.424,W,7.452,2 45.4,050202,0.0,E*72
$GPVTG,245.4,T,245.4,M,7.5,N,13.8,K*76

However the following can also be used
$GPGLL,3446.8877,N,07849.0595,W,091739.00,A*1d
$GPVTG,290.0,T,290.0,M,06.6,N,12.2,K*4f

Depth
$SNDPT,28.2,0.0,998.9*66

ORE
1 28.2

C.13 TPU Operating System Notes (vxWorks)

- CPU version 14102073 recognized by unpopulated area near front of board can only be used with vxWorks version 5.5.0291 or earlier. This board may be reflashed with an updated boot file to make it compatible with the newer vxWorks files.
- CPU version 14103184 can only be used with vxWorks version 5.11.1841 or higher.
- vxWorks version 5.27.0788 should use a new startup.ini file. The following line should be added:

  set TOWFISHECHO 0

APPENDIX D: SETTING UP THE SYSTEM FOR A MAGNETOMETER

The Series 3000 Sonar System is designed for easy operation with most popular magnetometers. This appendix provides instructions on how to set up the Series 3000 for use with an optional magnetometer.

D.1 Configuring the System for a Magnetometer

The power voltage for an optional magnetometer is set on the Multiplexer board with a jumper on JP2. The power supply for the optional magnetometer is shown in Figure C-31 on page C-51.

The jumper positions are the following:

- 1-2 for external power (default when no magnetometer is in use)
- 3-4 for +5 volts
- 5-6 for +12 volts
- 7-8 for +200 volts

The Klein startup.ini file located in the klein folder is used to set boot parameters. The following is a typical .ini file:

```
set SONARTYPE 3000
set RANGE 2
set RESPDIV 15
set RESPFREQ 7
set DESPECKLESWITCH 0
set SPEEDFILTERSWITCH 1
set TVGPAGE 7
set SPEEDSOUND 150000
set BAUDRATE 4800
set STANDBYMODE 0
set DIAGLEVEL 1
```

When adding a magnetometer o the system, the startup.ini file must be modified by adding the line set DEFAULTUPLINK 1. The new startup.ini file will be the following:

set SONARTYPE 3000

set RANGE 2

set RESPDIV 15

set RESPFREQ 7

set DESPECKLESWITCH 0

set SPEEDFILTERSWITCH 1

set TVGPAGE 7

set SPEEDSOUND 150000

set BAUDRATE 4800

set STANDBYMODE 0

set DEFAULTUPLINK 1

set TOWFISHECHO 0

set DIAGLEVEL 1

If you switch back to not using a magnetometer, you can simply set the DEFAULTUPLINK to 0. The startup.ini file will now be the following:

set SONARTYPE 3000

set RANGE 2

set RESPDIV 15

set RESPFREQ 7

set DESPECKLESWITCH 0

set SPEEDFILTERSWITCH 1

set TVGPAGE 7

set SPEEDSOUND 150000

set BAUDRATE 4800

set STANDBYMODE 0

set DEFAULTUPLINK 0

set TOWFISHECHO 0

set DIAGLEVEL 1

Don’t forget to save the changed startup.ini file.

NOTE *When calibrating the compass, the default uplink has to be set to 0.*

NOTE *The startup.ini is a text file and may be edited in any word processing program such as Wordpad.*

D.2 Connecting the Magnetometer for Data Transfer

There are several ways to connect to the magnetometer for data transfer.

D.2.1 Method 1

1. Connect the magnetometer PC to COM4 on the TPU using a straight (non null modem) RS-232 cable.
2. If using HyperTerminal, make sure it is in the connect state.
3. Configure your terminal or software for 9600-8-N-1, and set none for flow control.
4. Power up the sonar system and wait for the system to boot. Once the towfish is active, start SonarPro and start the sonar. Magnetometer data will be transmitted out of COM4.
5. To send commands down to the magnetometer, open the *Sonar Interface* dialog box in SonarPro, select the *Towfish Diagnostic* tab, and enter the command in the **Operator command** text box. Commands can be up to 24 characters in length. The following format is uppercase:

   $PKLA,FC$Axxxx, where xxxx is the magnetometer command.

   Example: $PKLA,FC$AF00
6. Click **Send Command** to send the command to the towfish.

D.2.2 Method 2

1. Connect a PC with a null modem cable to COM3 on the TPU.
2. Configure your terminal or software for 9600-8-N-1 and set none for flow control.
3. Power up the sonar system and wait for the system to boot. Once the towfish is active, start SonarPro or open the terminal program or magnetometer software. Communication with the magnetometer should be established. If you are using SonarPro and want to send a command to the magnetometer, it is advised that you stop the sonar while the commands are sent down to the magnetometer.

D.2.3 Method 3

1. Connect the magnetometer PC to COM4 on the TPU using a straight (non null modem) RS-232 cable.
2. Configure your terminal or software for 9600-8-N-1, and set flow control to none.
3. Power up the sonar system and wait for the system to boot. Once the towfish is active, start SonarPro and start the sonar. Magnetometer data will be transmitted out of COM4.
4. Connect a PC with a null modem cable to COM2 on the TPU.
5. Configure your terminal or software for the same baud rate that the startup.ini file is set for (in most cases it will be set to 4800-8-N-1), and set flow control to none.
6. To send commands down to the magnetometer, open the *Sonar Interface* dialog box in SonarPro, select the *Towfish Diagnostic* tab, and enter the command in the **Operator command** text box. Commands can be up to 24 characters in length. The following format is uppercase:

   $PKLA,FC$Axxxx where xxxx is the magnetometer command.

   Example: $PKLA,FC$AF00.

D.2.4 Echoing Commands Out of COM3

To echo the sent commands out of COM3:

1. Set the computer terminal program to 1200 baud.
2. Use a a null modem cable.
3. Change the following line in the startup.ini file to read:

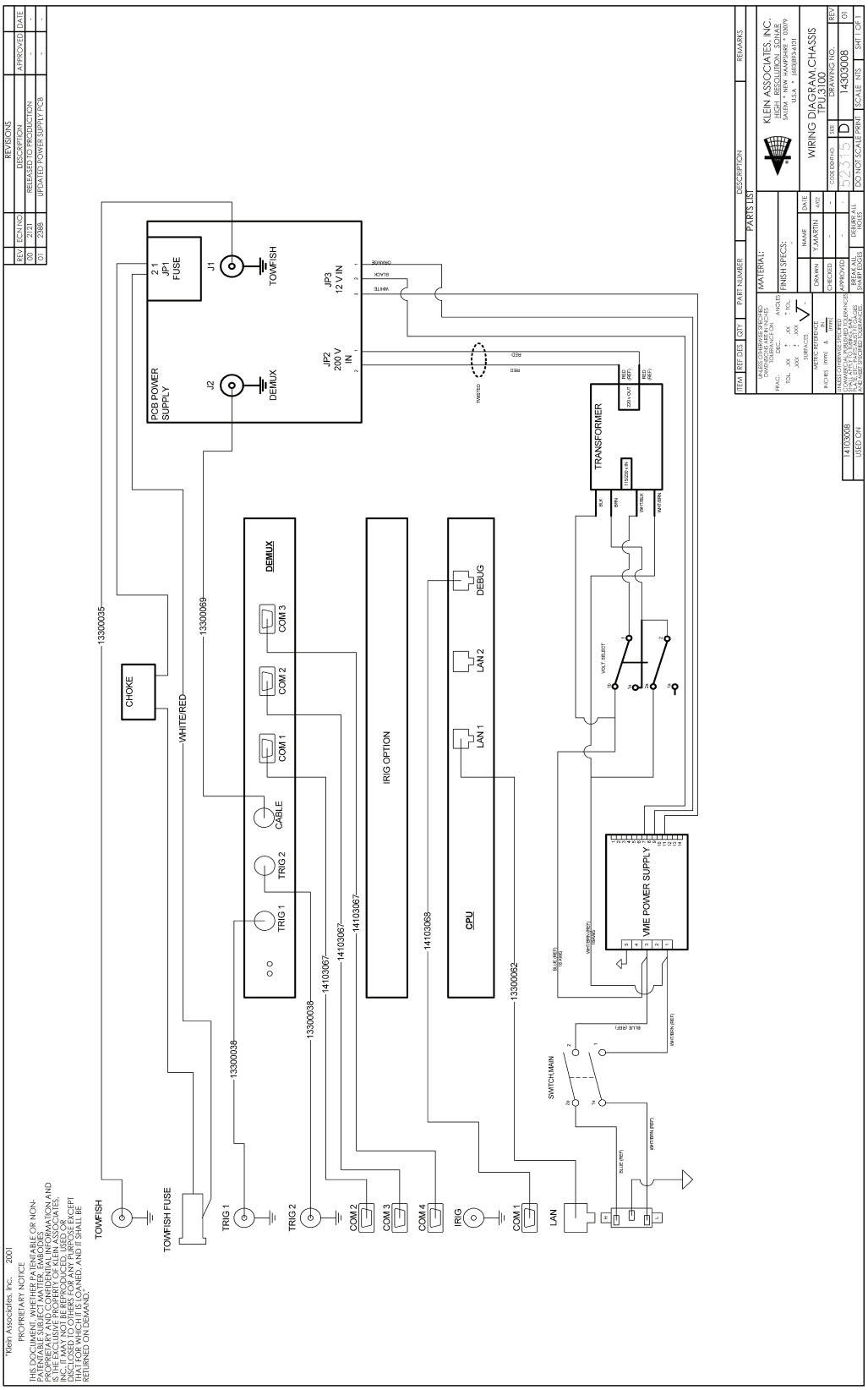
   set TOWFISHECHO 1.

APPENDIX E: DRAWINGS AND PARTS LISTS

Listed in Table E-1 are the drawings and parts lists included in this appendix. They are provided for reference and troubleshooting purposes. Each assembly drawing is followed by its corresponding parts list.

Table E-1: *List of Drawings and Parts Lists*

DRAWING NO.	PARTS LIST NO.	TITLE
14303008		Wiring Diagram, Chassis, TPU, 3100
14603008		Outline Drawing, System 3000 TPU, 2U High
15103008	14103008	Assembly Drawing, Chassis, TPU, 2U High, 3100
14602911		Outline Drawing, Towfish, 3200
15102813	14102813	Assembly Drawing, Towfish, Chassis, Electronics, 3200 (Sheets 1 and 2)
15102911	14102911	Assembly Drawing, Towfish, 3200 (Sheets 1 and 2)
	14103010	
15103019	14103019	Assembly Drawing, Nose, Towfish, 3200


REVISIONS
REV | ECN NO | DESCRIPTION | APPROVED | DATE
02 | 2131 | RELEASED TO PRODUCTION | - | -
03 | 2386 | UPDATED POWER SUPPLY PCB | - | -
KLEIN ASSOCIATES, INC.
WIRING DIAGRAM,CHASSIS TPU,3100
DRAWING NO. 14303008
REV 01
SHT 1 OF 1
PCB POWER SUPPLY
JP1 FUSE
J1
TOWFISH
J2
DEMUX
JP3 12 V IN
JP2 200 V IN
TRANSFORMER
CHOKE
DEMUX
COM 1
COM 2
COM 3
CABLE
TRIG 1
TRIG 2
IRIG OPTION
CPU
DEBUG
LAN 1
LAN 2
VME POWER SUPPLY
SWITCH,MAIN
VOLT SELECT
13300035
13300069
13300038
13300067
14103067
14103068
13300062
WHITE/RED
BLUE (REF)
WHITE/BLK (REF)
TOWFISH
TOWFISH FUSE
TRIG 1
TRIG 2
COM 2
COM 3
COM 4
IRIG
COM 1
LAN

"Klein Associates, Inc. 2001
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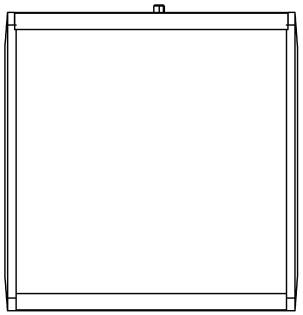
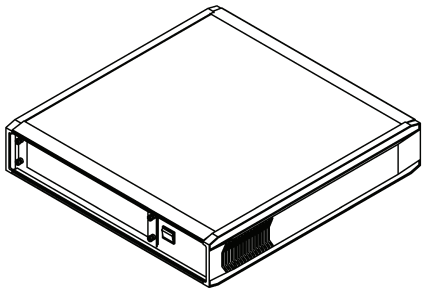
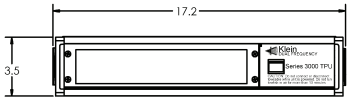
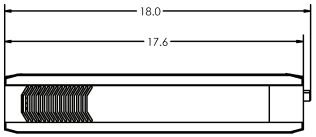
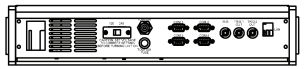
REVISIONS				
REV	ECN NO.	DESCRIPTION	APPROVED	DATE
00	2121	RELEASED TO PRODUCTION	YM	4/02











NOTES:
1) 23 LBS WITH COMPONENTS
2) 19" RACK MOUNT KIT NOT SHOWN

ITEM	REF DES	QTY	PART NUMBER	DESCRIPTION	REMARKS

PARTS LIST

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCE ON
FRAC. DEC. ANGLES
TOL. .XX ± .XX ± TOL.
.XXX ± .XXX
SURFACES

METRIC REFERENCE
INCHES (mm) & (mm)

UNLESS OTHERWISE SPECIFIED: COMMERCIAL PUBLISHED TOLERANCES SHALL APPLY TO TUBING, BAR, PLATE, ETC. PARTS MUST FIT GAGES AND MEET SPECIFIED TOLERANCES.

MATERIAL:

FINISH SPECS:

	NAME	DATE
DRAWN	Y.MARTIN	4/02
CHECKED	-	-
APPROVED	-	-

BREAK ALL SHARP EDGES | DEBURR ALL HOLES

KLEIN ASSOCIATES, INC.
HIGH RESOLUTION SONAR
SALEM * NEW HAMPSHIRE * 03079
U.S.A * (603)893-6131

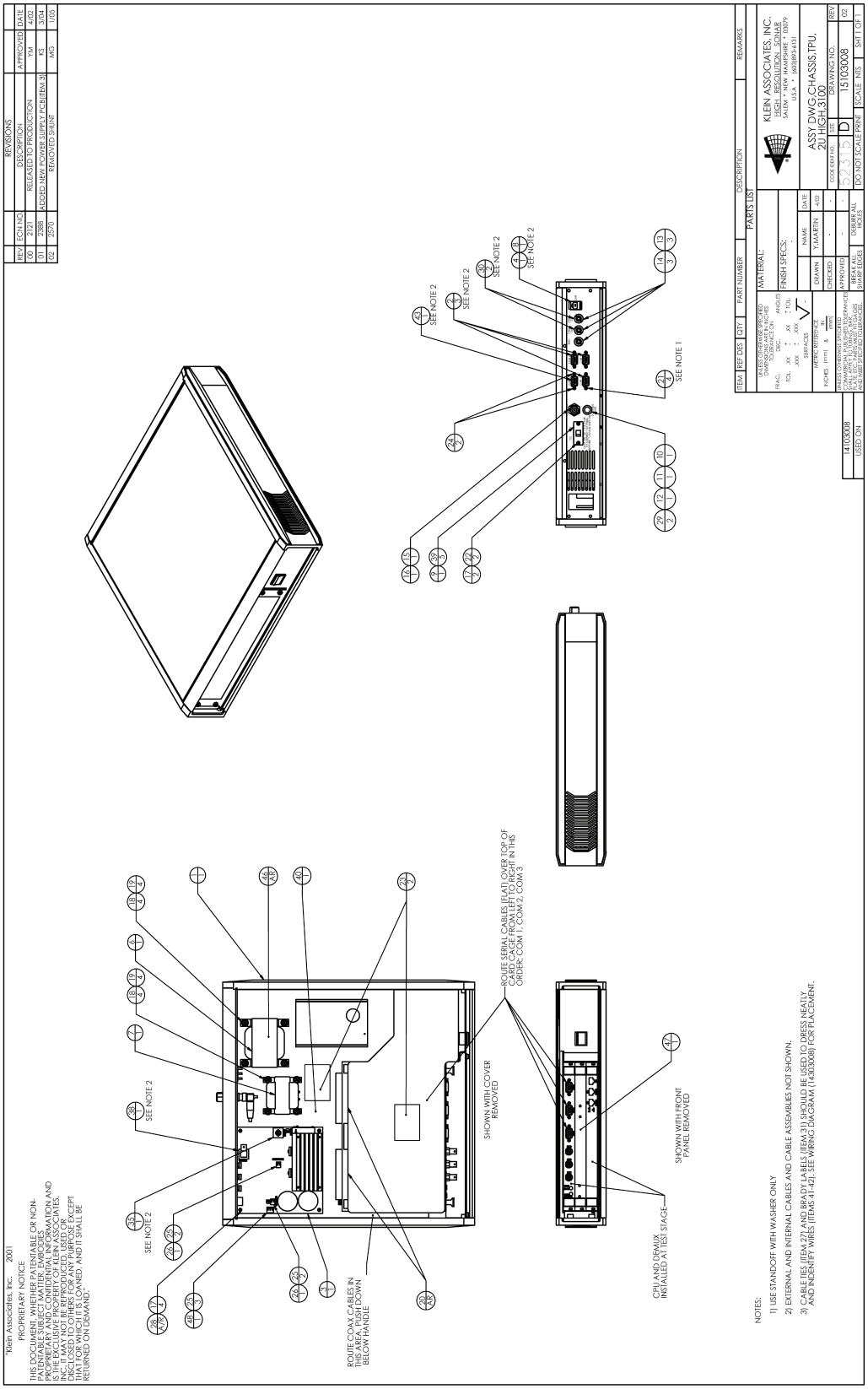
OUTLINE DWG,SYSTEM 3000 TPU, 2U HIGH

CODE IDENT NO.	SIZE	DRAWING NO.	REV
52315	D	14603008	00

DO NOT SCALE PRINT | SCALE NTS | SHT 1 OF 1

14103008
USED ON

L3 communications
Klein Associates, Inc.


REVISIONS
REV | CO'N NO | DESCRIPTION | APPROVED | DATE
00 | 2121 | RELEASED TO PRODUCTION | MG | 4/02
01 | 2386 | ADDED NEW POWER SUPPLY PCB(ITEM 3) | KS | 3/04
02 | 2570 | REMOVED SHUNT | MG | 7/05
Klein Associates, Inc. 2001
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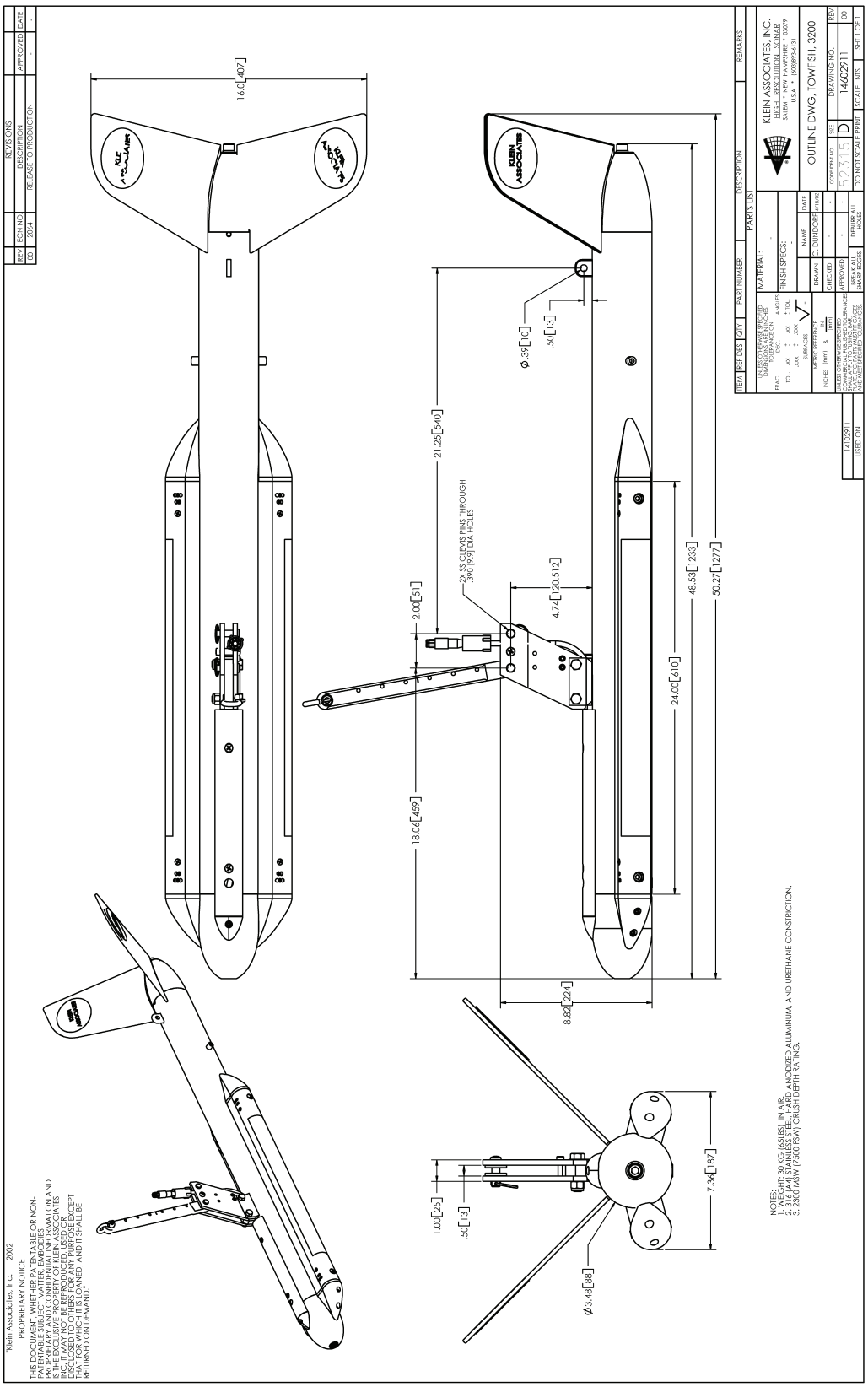
ITEM | REF DES | QTY | PART NUMBER | DESCRIPTION | REMARKS
PARTS LIST
MATERIAL:
FINISH SPECS:
KLEIN ASSOCIATES, INC.
ASSY DWG, CHASSIS, TPU, 21" HES 3100
DRAWING NO. 15103008
REV 02
SCALE NTS
SHT 1 OF 1
DO NOT SCALE PRINT
SEE NOTE 1
SEE NOTE 2
SHOWN WITH COVER REMOVED
SHOWN WITH FRONT PANEL REMOVED
ROUTE SERIAL CABLES (FLAT) OVER TOP OF CARD CAGE FROM LEFT TO RIGHT IN THIS ORDER: COM 1, COM 2, COM 3
ROUTE COAX CABLES IN THIS AREA, PUSH DOWN BELOW HANDLE
CPU AND DEMUX INSTALLED AT TEST STAGE
NOTES:
1) USE STANDOFF WITH WASHER ONLY
2) EXTERNAL AND INTERNAL CABLES AND CABLE ASSEMBLIES NOT SHOWN.
3) CABLE TIES (ITEM 27) AND BRADY LABELS (ITEM 31) SHOULD BE USED TO DRESS NEATLY AND INDENTIFY WIRES (ITEMS 41-42). SEE WIRING DIAGRAM (14303008) FOR PLACEMENT.
14103008
USED ON

14103008
Assy, Chassis, TPU, 2U High, 3100

Item	Part Number	Qty	Refdes	Rev	Description	Alternate	Notes
1	12300142	1	7	-	CHOKE, FLTR, .035 H	REV X00	
2	12300143	1	6	-	TRANSFORMER,115-240V/200V,150VA		
3	12500092	2	24	-	NUT,LOCK NYLON INSERT 4-40 MINI		
4	12500723	6	17	-	SCREW,PHMS M3X8MM PHLPS SS		
5	12500725	2	22	-	NUT,LOCK,NYLON INSERT M3 SS		
6	12500729	8	18	-	SCREW,PH MS M4X8mm PHLPS SS		
7	12500773	8	19	-	WASHER,FLAT,4MM 18-8 SS		
8	12700025	0	41	-	WIRE,TFL #18 WHT/RED		
9	12700029	10	27	-	TIE,CABLE 4 IN	REV X	
10	12700082	0	28	-	ADHESIVE,LOCTITE #277, RED		
11	12700287	0	42	-	WIRE, TFL #18 WHT/BRN		
12	12700393	2	23	-	LABEL,DANGER,HIGH VOLTAGE		
13	12700425	0	31	-	LABEL,BRADY 517-2	LABEL X6 TTL TRIG 2 TRIG 2 OUT TRIG 1 TRIG 1 OUT J	
14	12700620	0	46	-	TAPE,TEFLON,2"WD	4"	
15	12800075	1	9	-	SWITCH,115/230V,PANEL MNT		
17	12900436	4	21	-	KIT,STANDOFF CONN. MTG.		
18	12900446	1	15	-	CONN,BHD TYPE N/BNC		
19	12900516	0	16	-	DUST CAP,TF CONN DSP		
20	12900530	1	48	-	CONN,3 PIN MOLEX HOUSING, .156" SPC		
21	12900536	2	26	-	CONN,2 POS,.156" SPC		
22	12900603	1	8	-	CONN,8 COND COUPLER RJ45		
23	12900768	3	13	-	CONN, BNC/BNC,BHD	REV X	
24	12900769	3	14	-	DUST CAP,BNC,WITH	REV X	
25	13000029	1	12	-	FUSE HOLDER		
26	13000030	1	11	-	FUSE DRAWER		
27	13000043	1	10	-	FUSE,630MA SLO-BLO 250V,5MM X 20MM		
28	13300035	1	38	-	CABLE,50 OHM,STRT/RTAGL 1 FOOT		
29	13300038	2	30	-	CABLE,50 OHM,STRT/RTAGL 2 FOOT		
30	13300062	1	4	-	CABLE, LAN, RJ45 TC	REV X	
31	13300069	1	35	-	CABLE,50 OHM,RTAC	REV X	
32	13500088	9	25	-	TERMINAL CRIMP (156" SPC MOLEX)		
33	13500119	5	39	-	TERMINAL,CRIMP #6		
34	13500123	2	29	-	TERMINAL,CRIMP #6 RED 22-18		
35	14000155	1	40	-	CLIP,CABLE FLAT		
36	14000164	0	20	-	STRIP, GROMMET #3	APPOX 9" PER UNIT	
37	14102048	1	3	3	ASSY,PCB DMB/NGS POWER SUPPLY		
38	14103067	3	2	1	ASSY CABLE, SERIAL PORT, 25"		
39	14103068	1	43	3	ASSY, CABLE, DEBUG,TPU, 32"		
40	14303008	0	900	1	WRG DIAG,CHASSIS TPU 3100		
41	14603008	0	910	0	OUTLINE DWG,CHASSIS,TPU,2U HIGH 3100		
42	15103008	0	920	2	ASSY DWG,CHASSIS TPU,2U HIGH,3100		
43	16400172	1	1	-	ENCLOSURE, TPU, S	REV XOO	
44	14103072	1	47	0	ASSY,PANEL,BLANKING,VME		


16.0[407]
21.25[540]
2X SS CLEVIS PINS THROUGH .390 [9.91] DIA HOLES
2.00[51]
4.74[120.512]
18.06[459]
24.00[610]
48.55[233]
50.27[277]
8.82[224]
Ø.39[10]
.50[13]
1.00[25]
.50[13]
7.36[187]
Ø3.46[88]
KLEIN ASSOCIATES
KLEIN ASSOCIATES, INC.
OUTLINE DWG, TOWFISH, 3200
DRAWING NO. 1460291
REV 00
SHT 1 OF 1
SCALE: NTS
DO NOT SCALE PRINT
NOTES:
1. WEIGHT: 30 KG (65.8 LBS) IN AIR.
2. 2.44 M (8 FT) STAINLESS STEEL ARMOR AND ANODIZED ALUMINUM, AND URETHANE CONSTRUCTION.
3. 2300 MSW (7500 FSW) CRUSH DEPTH RATING.

L-3 COMMUNICATIONS
KLEIN ASSOCIATES, INC. - 2005

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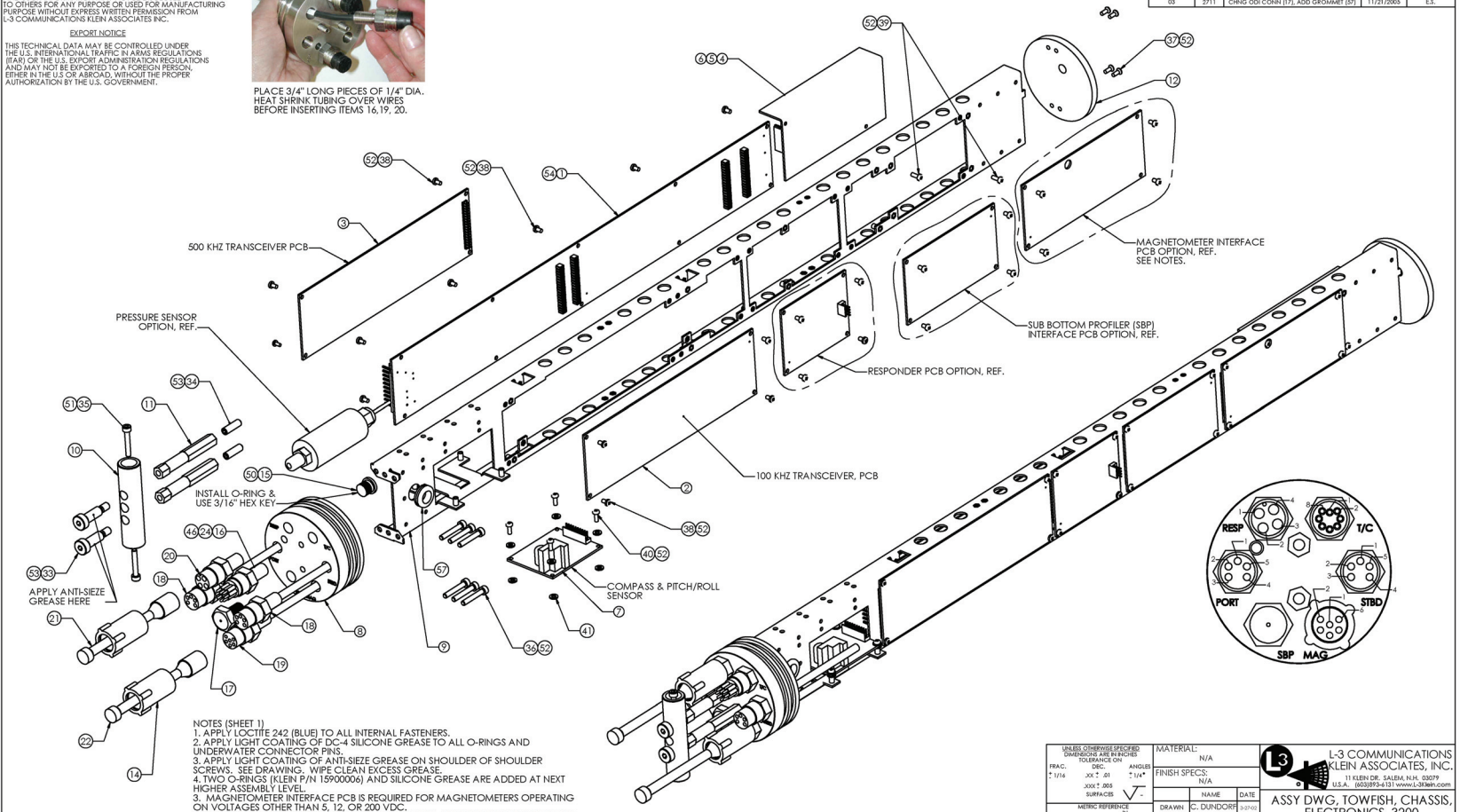
PLACE 3/4" LONG PIECES OF 1/4" DIA. HEAT SHRINK TUBING OVER WIRES BEFORE INSERTING ITEMS 16, 19, 20.

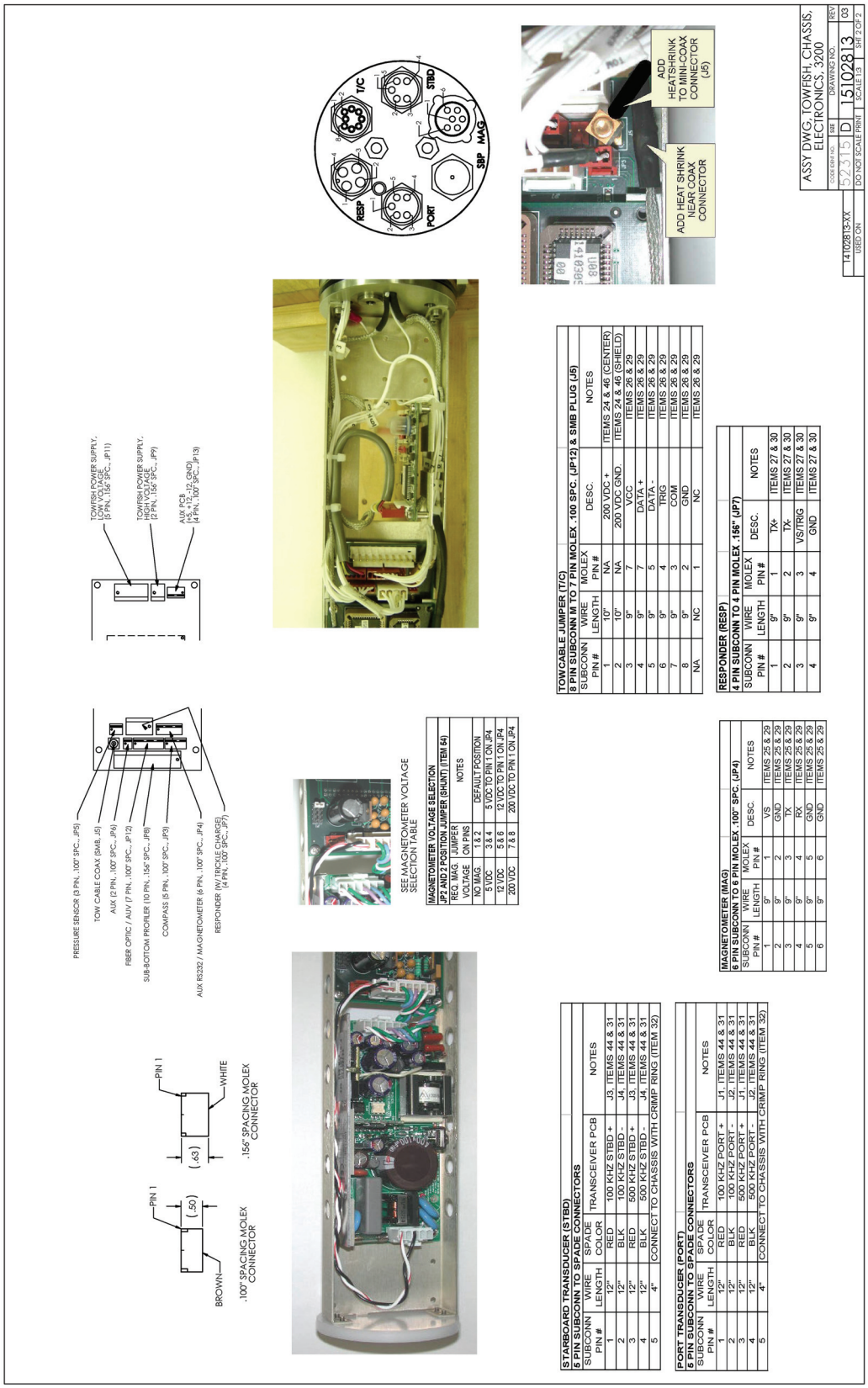
REVISIONS				
REV.	ECN	DESCRIPTION	DATE	APPROVED
00	2064	REL TO PROD. ADD LOCK SLEEVES		
01	2230	ADDED HEATSHRINK & NOTE		
02	2468	CHANGED ITEM 17 TO BLANKING PLUG	7/7/2004	
03	2711	CHNG ODI CONN (17), ADD GROMMET (57)	11/21/2005	E.S.



NOTES (SHEET 1)
1. APPLY LOCTITE 242 (BLUE) TO ALL INTERNAL FASTENERS.
2. APPLY LIGHT COATING OF DC-4 SILICONE GREASE TO ALL O-RINGS AND UNDERWATER CONNECTOR PINS.
3. APPLY LIGHT COATING OF ANTI-SIEZE GREASE ON SHOULDER OF SHOULDER SCREWS. SEE DRAWING. WIPE CLEAN EXCESS GREASE.
4. TWO O-RINGS (KLEIN P/N 15900006) AND SILICONE GREASE ARE ADDED AT NEXT HIGHER ASSEMBLY LEVEL.
3. MAGNETOMETER INTERFACE PCB IS REQUIRED FOR MAGNETOMETERS OPERATING ON VOLTAGES OTHER THAN 5, 12, OR 200 VDC.
4. UNLESS ASSY IS TO BE CONFIGURED FOR MAGNETOMER OPERATION PLACE SHUNT (JUMPER) (ITEM 54) IN DEFAULT POSITION (PINS 1&2). SEE PHOTO & TABLE ON SHEET 2.

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCE ON FRAC. ± 1/16, DEC. .XX ± .01, ANGLES ± 1/4°, .XXX ± .005, SURFACES	MATERIAL: N/A	L-3 COMMUNICATIONS KLEIN ASSOCIATES, INC.	
	FINISH SPECS: N/A	11 KLEIN DR. SALEM, N.H. 03079 U.S.A. (603)893-6131 www.L-3klein.com	
	NAME / DATE	ASSY DWG, TOWFISH, CHASSIS, ELECTRONICS, 3200	
METRIC REFERENCE IN INCHES[mm] & [mm]	DRAWN C. DUNDORF 3-27-05	CODE IDENT NO. 52315	SIZE D
UNLESS OTHERWISE SPECIFIED COMMERCIAL PUBLISHED TOLERANCES SHALL APPLY TO TUBING, BAR, PLATE, ETC. PARTS MUST FIT GAGES AND MEET SPECIFIED TOLERANCES.	CHECKED - -	DRAWING NO. 15102813	REV 03
	APPROVED - -	DO NOT SCALE PRINT	SCALE 1:3 SHT 1 OF 2
	BREAK ALL SHARP EDGES / DEBURR ALL HOLES		

14102813-XX
USED ON



MAGNETOMETER VOLTAGE SELECTION
JP2 AND 3 POSITION JUMPER (SHUNT) (ITEM 54)

REQ. MAG. VOLTAGE	JUMPER ON PINS	NOTES
NO MAG.	1 & 2	DEFAULT POSITION
5 VDC	3 & 4	5 VDC TO PIN 1 ON JP4
12 VDC	5 & 6	12 VDC TO PIN 1 ON JP4
200 VDC	7 & 8	200 VDC TO PIN 1 ON JP4

TOW CABLE JUMPER (T/C)
8 PIN SUBCONN (M) TO 7 PIN MOLEX, 100 SPC. (JP12) & SMB PLUG (J5)

SUBCONN PIN #	WIRE LENGTH	MOLEX PIN #	DESC.	NOTES
1	10"	NA	200 VDC +	ITEMS 24 & 46 (CENTER)
2	10"	NA	200 VDC GND.	ITEMS 24 & 46 (SHIELD)
3	9"	7	VCC	ITEMS 26 & 29
4	9"	7	DATA +	ITEMS 26 & 29
5	9"	5	DATA -	ITEMS 26 & 29
6	9"	4	TRIG	ITEMS 26 & 29
7	9"	3	COM	ITEMS 26 & 29
8	9"	2	GND	ITEMS 26 & 29
NA	NC	1	NC	ITEMS 26 & 29

RESPONDER (RESP)
4 PIN SUBCONN TO 4 PIN MOLEX .156" (JP7)

SUBCONN PIN #	WIRE LENGTH	MOLEX PIN #	DESC.	NOTES
1	9"	1	TX+	ITEMS 27 & 30
2	9"	2	TX-	ITEMS 27 & 30
3	9"	3	VS/TRIG	ITEMS 27 & 30
4	9"	4	GND	ITEMS 27 & 30

STARBOARD TRANSDUCER (STBD)
5 PIN SUBCONN TO SPADE CONNECTORS

SUBCONN PIN #	WIRE LENGTH	SPADE COLOR	TRANSCEIVER PCB	NOTES
1	12"	RED	100 KHZ STBD +	J3, ITEMS 44 & 31
2	12"	BLK	100 KHZ STBD -	J4, ITEMS 44 & 31
3	12"	RED	500 KHZ STBD +	J3, ITEMS 44 & 31
4	12"	BLK	500 KHZ STBD -	J4, ITEMS 44 & 31
5	4"	CONNECT TO CHASSIS WITH CRIMP RING (ITEM 32)		

PORT TRANSDUCER (PORT)
5 PIN SUBCONN TO SPADE CONNECTORS

SUBCONN PIN #	WIRE LENGTH	SPADE COLOR	TRANSCEIVER PCB	NOTES
1	12"	RED	100 KHZ PORT +	J1, ITEMS 44 & 31
2	12"	BLK	100 KHZ PORT -	J2, ITEMS 44 & 31
3	12"	RED	500 KHZ PORT +	J1, ITEMS 44 & 31
4	12"	BLK	500 KHZ PORT -	J2, ITEMS 44 & 31
5	4"	CONNECT TO CHASSIS WITH CRIMP RING (ITEM 32)		

MAGNETOMETER (MAG)
6 PIN SUBCONN TO 6 PIN MOLEX .100" SPC. (JP4)

SUBCONN PIN #	WIRE LENGTH	MOLEX PIN #	DESC.	NOTES
1	9"	1	VS	ITEMS 25 & 29
2	9"	2	GND	ITEMS 25 & 29
3	9"	3	TX	ITEMS 25 & 29
4	9"	4	RX	ITEMS 25 & 29
5	9"	5	GND	ITEMS 25 & 29
6	9"	6	GND	ITEMS 25 & 29

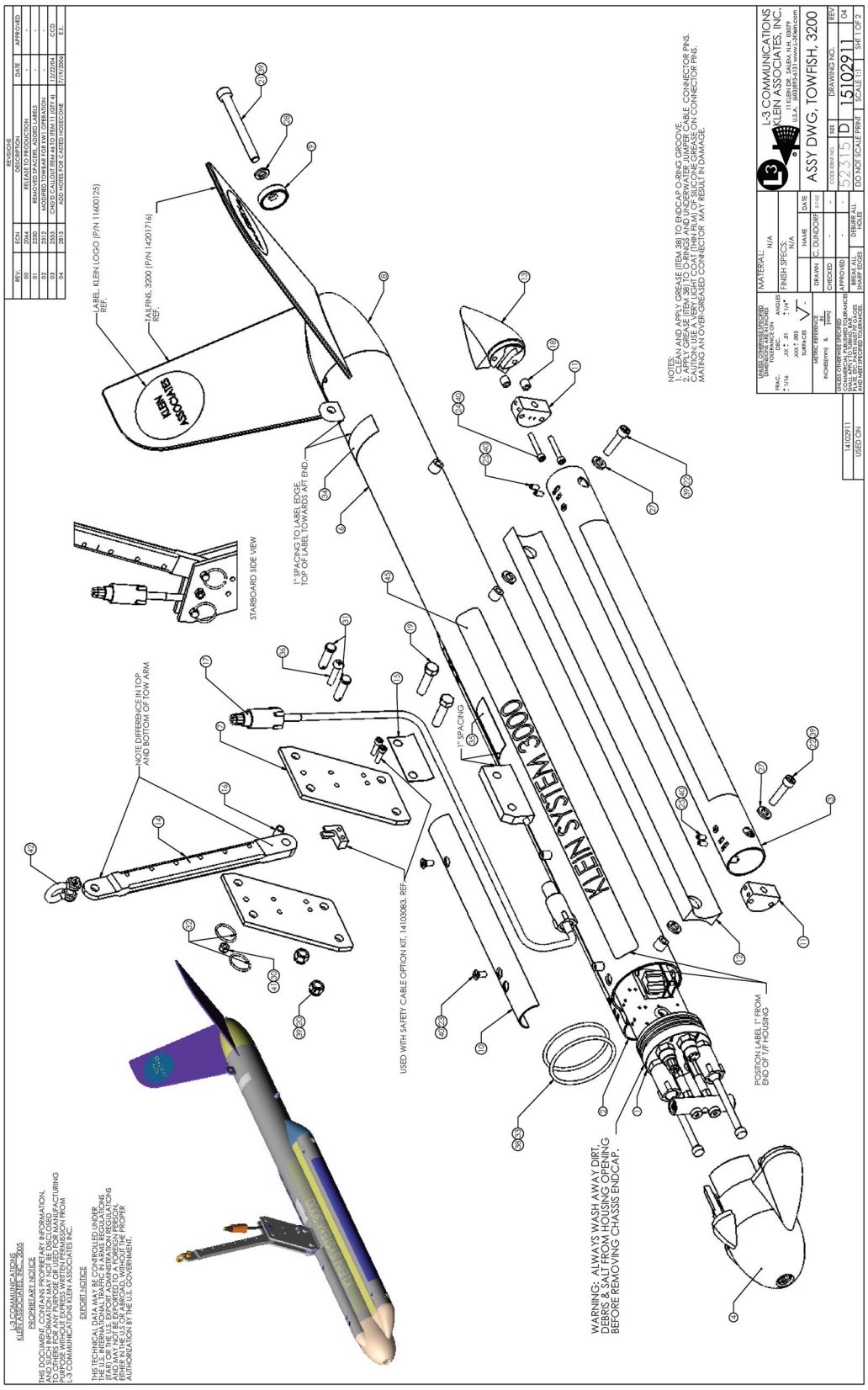
ASSY DWG, TOWFISH, CHASSIS, ELECTRONICS, 3200

CAGE CODE NO.	SIZE	DRAWING NO.	REV
52315	D	1510281 3	03

1410281 3-XX	DO NOT SCALE PRINT	SCALE: 1:3	SHT 2 OF 2
USED ON			

14102813
Assy, Towfish, Chassis, Electronics, 3200

Item	Part Number	Qty	Refdes	Rev	Description
1	11700042	1	4	-	POWER SUPPLY,5,15+/-V,17W
2	12500325	8	41	-	WASHER,FLAT #4X1/4X.032 NYLON
3	12500695	18	38	-	SCREW,PH MS M3X5MM SS
4	12500723	4	40	-	SCREW,PHMS M3X8MM PHLPS SS
5	12500757	2	39	-	SCREW,PH MS M3X6MM PHLPS SS
6	12500789	4	37	-	SCREW,FHMS,M3X10MM PHLPS 18-8 SS
7	12500887	6	36	-	SCREW, SHCS, M4X8MM, 18-8 SS
8	12500873	2	33	-	SCRW,SH SHOULD,M8X20MM,M6X1.0 THRD,316
9	12500875	2	34	-	SCREW,SH SET,M6X20MM,SS
10	12500876	2	35	-	SCREW,SHCS,M8X12MM,316
11	14000297	1	15	-	PLUG,7/16-20,O-RG,HOLLOW HEX KEY,SS
12	12700021	0	52	-	ADHESIVE,LOCTITE #242, BLUE
13	12700090	0	45	-	SPIRAL WRAP,1/8 IN CLEAR NYLON
14	12700101	0	42	-	SLEEVING,SHRINK 3/16 IN BLACK
15	12700139	0	51	-	COMPOUND,LUBRICATION
16	12700169	0	43	-	SLEEVING,SHRINK 3/16 IN RED
17	12700322	0	46	-	WIRE, 1 COND SHLD #20 WHITE
18	12700418	0	50	-	SILICONE GREASE,DC-4
20	12700543	0	53	-	ADHESIVE,LOC 277(RED) 10ML BTL
21	12700617	0	44	-	BRAID,FLAT,1/8"X.020" THK,TINNED COPPER
22	12700618	0	47	-	LABEL,SLV,SHRNK,WIRE MARK,.35X1.00,WHT
24	12900252	1	54	-	CONN,SHUNT .100 GOLD PLATED
25	12900315	1	24	-	CONN,SMB MINI-COAX RIGHT ANGLE
26	12900531	1	27	-	CONN,4 PIN MOLEX,.156" SPACING
27	12900590	1	26	-	CONN,7 PIN MOLEX,.100" SPC
28	12900626	1	20	-	CONN,BHD,4 PIN MICRO,FEMALE,7/16-20,SS
29	14103258	1	17	2	ASSY,PLUG,BLNK,7/16-20,W/ORNG,W/RLF
30	12900629	1	21	-	CONN,DUMMY PLUG,4 PIN MICRO,MALE
31	12900640	2	14	-	CONN,LOCKING SLEEVE FEMALE 2P-8P MICRO
32	12900657	1	16	-	CONN,BHD,8 PIN MICRO,MALE,7/16-20,SS
34	12900700	2	18	-	CONN,BHD,5 PIN MICRO,FEMALE,7/16-20,SS
35	12900701	1	19	-	CONN,BHD,6 PIN MICRO,FEMALE,7/16-20,SS
36	12900765	1	22	-	CONN,DUMMY PLUG,6 PIN MICRO,MALE
37	12900766	1	25	-	CONN,6 PIN MOLEX,.100" SPC,LOCKING
38	12900767	1	28	-	CONN,10 PIN MOLEX,.156" SPC,LOCKING
39	13500045	2	32	-	TERM,RING TONGUE #8 RED
40	13500046	8	31	-	TERM,FLG SPADE TONGUE #2
41	13500088	12	30	-	TERMINAL CRIMP (156" SPC MOLEX)
42	14102050-01	1	2	6	ASSY,PCB,XCVR 100 KHZ,3200
43	14102050-02	1	3	6	ASSY,PCB,XCVR 500 KHZ,3200
44	14102051	1	1	10	ASSY,PCB,MUX, 3200
45	14102959	1	7	2	ASSY,COMPASS AND CABLE,3200
46	14103025	1	5	1	ASSY, CABLE, POWER SUPPLY, HI-VOLT, 3200
47	14103026	1	6	2	ASSY, CABLE POWER SUPPLY, LOW-VOLT,3200
48	14201702	1	9	2	CHASSIS,TOWFISH,3200
49	14202165	1	8	0	ENDCAP,CHASSIS ELECTRONIC,2 SLOT,3200
50	14201711	1	10	0	BAR,CROSS,3200
51	14201712	2	11	1	SPACER,CROSS BAR,3200
52	14201713	1	12	0	DISK,CHASSIS END,3200
53	14302813	0	900	X	WIRING DIAG ,TOWFISH,3200
54	15102813	0	901	3	ASSY DWG,TF,CHASSIS,ELECTRONICS 3200
55	16200036	12	29	-	PIN,CRIMP (.100" SPC MOLEX)
56	12700029	0	55	-	TIE,CABLE 4 IN
57	14000248	1	57	-	GROMMET,RUBBER,7/16X9/16 GRV D,1/16W


L-3 COMMUNICATIONS
KLEIN ASSOCIATES, INC.
11 KLEIN DR. SALEM, N.H. 03079
L3 KLEIN ASSOCIATES, INC.
ASSY DWG, TOWFISH, 3200
DRAWING NO. 11510211
SCALE 1:1
SHT 1 OF 2
DO NOT SCALE PRINT
REV 04
MATERIAL: N/A
FINISH SPECS: N/A
DRAWN C. DUNDORF
DATE
CHECKED
APPROVED
DEBURR ALL HOLES
BREAK ALL SHARP EDGES
REVISIONS
REV. ECN DESCRIPTION DATE APPROVED
00 2844 RELEASE TO PRODUCTION - -
01 2350 REMOVED SPACERS, ADDED LABELS - -
02 2315 ADDED CABLE OPTION, NEW CONFIGURATION 12/22/04 CCD
03 2353 CHGD CALLOUT ITEM 44 TO ITEM 11 QTY 4) 12/22/04 CCD
04 2813 ADD NOTES FOR CASTED HOSECHOKE 7/19/2006 ES
LABEL, KLEIN LOGO (P/N 11600125) REF.
TAILPINS, 3200 (P/N 14201716) REF.
KLEIN ASSOCIATES
STARBOARD SIDE VIEW
1" SPACING TO LABEL EDGE
TOP OF LABEL TOWARDS AFT END.
NOTE DIFFERENCE IN TOP AND BOTTOM OF TOW ARM
1" SPACING
USED WITH SAFETY CABLE OPTION KIT, 14103083, REF
POSITION LABEL 1" FROM END OF T/F HOUSING
KLEIN SYSTEM 3000
WARNING: ALWAYS WASH AWAY DIRT, DEBRIS & SALT FROM HOUSING OPENING BEFORE REMOVING CHASSIS ENDCAP.
NOTES:
1. CLEAN AND APPLY GREASE (ITEM 38) TO ENDCAP O-RING GROOVE.
2. APPLY GREASE (ITEM 38) TO O-RINGS AND UNDERWATER JUMPER CABLE CONNECTOR PINS.
CAUTION: USE A VERY LIGHT COAT (THIN FILM) OF SILICONE GREASE ON CONNECTOR PINS.
MATING AN OVER-GREASED CONNECTOR MAY RESULT IN DAMAGE.
L-3 COMMUNICATIONS
KLEIN ASSOCIATES, INC.
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L3 COMMUNICATIONS
KLEIN ASSOCIATES, INC. 2006

"Klein Associates, Inc. 2002

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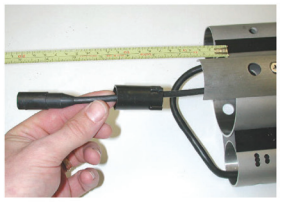
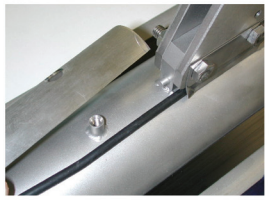
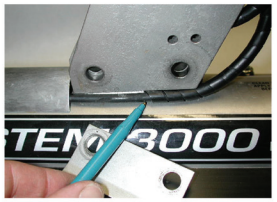
1. CLEAN SURFACE WITH ALCOHOL, THEN PLACE LABELS (ITEMS 34 & 35) AS SHOWN PHOTO AND CAD DRAWING.



2. SET DISTANCE FROM CONNECTOR MATING FACE TO END OF TOWFISH HOUSING (PIPE) TO 8" (200 MM). NOTE: SPIRAL WRAP ON JUMPER CABLE NOT SHOWN.

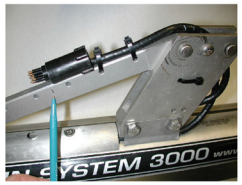


3A. ROUTE TOWCABLE JUMPER BEHIND CABLE RETAINING PLATE THEN REPLACE CURVED CABLE COVER AND SECURE (USE LOCTITE 242).



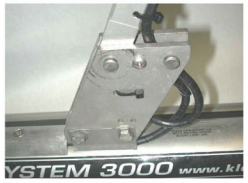
3B. APPROXIMATELY 1" (25MM) OF SPIRAL WRAP SHOULD BE BEHIND THE CABLE RETAINING PLATE AS SHOWN.

4. ROUTE TOWCABLE JUMPER BEWEEN TOW BRACKETS MAKING A SINGLE LOOP AS SHOWN. (NOTE: CABLE PASSES BETWEEN AFT CLEVIS PIN AND SPACER AT TOP OF TOW BRACKETS.) USE A CABLE TIE (ITEM 37)PASSED BETWEEN THE TWO TOW BRACKETS TO RETAIN TOWCABLE JUMPER LOOP.



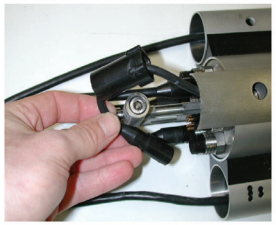
5. POSITION CONNECTOR MATING FACE TO STAMPED MARK AT CENTER OF TOWBAR. APPLY CABLE TIES, SO THAT JUMPER CABLE CAN SLIDE UP OR DOWN TOWBAR WITH LIGHT FORCE.

NOTE: DO NOT OVERTIGHTEN TOWARM CABLE TIES.



6. SWING TOWARM FORWARD AND AFT TO INSURE UNINHIBITED MOTION. ADJUST CABLE POSITION AS NECESSARY.

7. CLEAN AND APPLY A LIGHT COAT OF SILICONE GREASE TO THE ORING MATING SURFACE IN THE TOWFISH HOUSING.



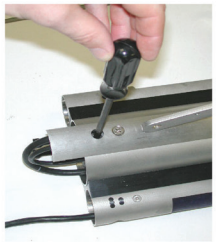
8. AFTER SETTING THE ELECTRONICS CHASSIS INTO THE HOUSING AS SHOWN, COAT CONNECTOR PINS (RUBBER AND BRASS) WITH A VERY LIGHT COAT OF SILICONE GREASE. LIGHTLY COAT RUBBER SHOULDERS USED BY LOCKING SLEEVE. PLUG ALL CABLES INTO BULKHEAD CONNECTOR & SECURE WITH LOCKING SLEEVE. NOTE: SPIRAL WRAP ON JUMPER CABLE NOT SHOWN.

WARNING: REMOVE CONNECTORS BY GRASPING CONNECTOR BODY, NEVER PULL DIRECTLY ON CABLE.

9. SLOWLY AND FIRMLY PUSH CHASSIS INTO TOWFISH UNITL ENDCAP SEATS. PROPERLY GREASED O-RINGS WILL HELP DURING THIS STEP.

NOTE:
IF THIS OPERATION IS FOUND TO BE DIFFICULT, THREAD THE NOSE BOLT (PART OF ITEM 4) 2-3 TURNS INTO THE CROSS BAR AND PUSH AGAINST THE END OF THE NOSE. THIS ALLOWS MORE FORCE TO BE APPLIED TO THE CHASSIS (ITEM 1) AND WILL HELP SEAT THE ENDCAP AND ORINGS.

10. THE TOP OF THE SOCKET HEAD CAP SCREW (SHCS) MUST BE COMPLETELY VISIBLE THROUGH THE TOOL ACCESS HOLE.

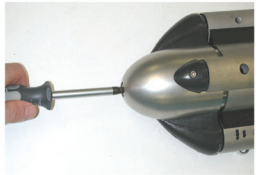


11. WHILE HOLDING THE ENDCAP FROM MOVING (HAND NOT SHOWN), USE A 6MM HEX DRIVER TO BACK OUT THE TOP AND BOTTOM SOCKET HEAD CAP SCREWS APPROX. 3 TURNS. THE TOP OF THE (SHCS) MUST STAY VISIBLE THROUGH THE TOOL ACCESS HOLE. REMEMBER THE BOTTOM SHCS!

NOTE: NOSECONE MAY ALSO BE A ONE PIECE CAST.

12. CAREFULLY SLIDE THE NOSE CONE INTO PLACE. WARNING: DO NOT PINCH CABLES

13. THE FORWARD CABLE COVER SCREW MAY REQUIRE LOOSENING DURING THE FINAL PUSH.



14. TIGHTEN NOSE BOLT WITH 8MM HEX DRIVER. WARNING: DO NOT OVER TIGHTEN.

ITEM	REF DES	QTY	PART NUMBER	DESCRIPTION	REMARKS

PARTS LIST

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCE ON FRAC. DEC. ANGLES TOL. .XX ± .XX ± TOL. .XXX ± .XXX ± SURFACES

METRIC REFERENCE INCHES (mm) & IN (mm)

UNLESS OTHERWISE SPECIFIED COMMERCIAL PUBLISHED TOLERANCES SHALL APPLY TO TUBING BAR PLATE ETC. PARTS MUST FIT GAGES AND MEET SPECIFIED TOLERANCES.

MATERIAL: -

FINISH SPECS: -

	NAME	DATE
DRAWN	C. DUNDORF	3/7/02
CHECKED		
APPROVED		

BREAK ALL SHARP EDGES | DEBURR ALL HOLES

KLEIN ASSOCIATES, INC.
HIGH RESOLUTION SONAR
SALEM * NEW HAMPSHIRE * 03079
U.S.A * (603)893-6131

ASSY DWG, TOWFISH, 3200

CODE IDENT NO.	SIZE	DRAWING NO.	REV
52315	D	15102911	04

DO NOT SCALE PRINT | SCALE NTS | SHT 2 OF 2

14102911
USED ON

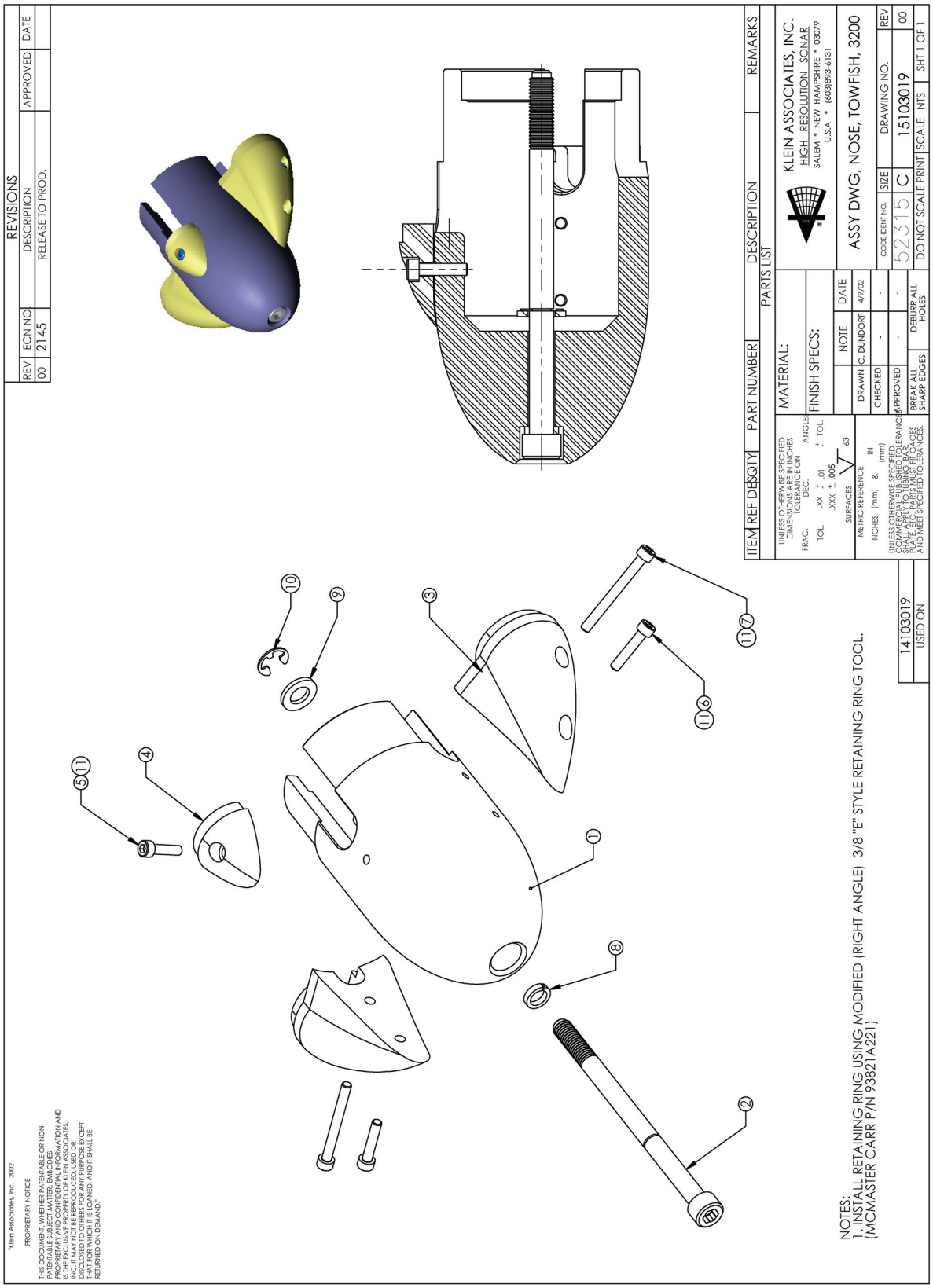
L3 communications
Klein Associates, Inc.

14102911
Assy, Towfish, 3200

Item	Part Number	Qty	Refdes	Rev	Description
1	11600198	1	35	-	LABEL,CLEAN & GREASE
2	11601760	1	34	1	LABEL,TOWFISH,3200
3	12500087	1	30	-	NUT,LOCK NYLON INSERT 1/4-20
4	12500091	2	20	-	NUT,LOCK NYLON INSERT 3/8-16
5	12500464	2	19	-	BOLT,HH 3/8-16X1-3/4 18-8 SS
6	12500823	2	23	-	SCREW,FHMS,M6X12MM,PHLPS,316
7	12500835	1	28	-	WASHER,LOCK, M10, 316 SST
8	12500861	4	22	-	SCREW,SHCS,M8X35MM,316
9	12500862	4	27	-	WASHER,LOCK SPLIT,M8,316
10	12500864	1	21	-	SCREW,SHCS,M10X100MM,316
12	12500880	4	24	-	SCREW,HH,M5X35MM,BRASS
13	12500881	8	25	-	SCREW,SH SET,M5X12MM,18-8
14	12500882	4	18	-	SPACER,.375 ODX.192 IDX.375 LG,NYL,WHT
16	12500885	1	36	-	SCREW, PH MS, 1/4-20 X 1 1/4, PHLPS, 316
17	12700021	0	40	-	ADHESIVE,LOCTITE #242, BLUE
18	12700082	0	41	-	ADHESIVE,LOCTITE #277, RED
19	12700139	0	39	-	COMPOUND,LUBRICATION
20	12700418	0	38	-	SILICONE GREASE,DC-4
21	12700510	5	37	-	TIE, CABLE 7.5X .185 IN BLACK
22	12700625	0	43	-	ADHESIVE,THREADLOCKER,VIBRA-TITE F3, RED
23	12900850	1	17	2	CONN,JUMPER,8P MICRO,F TO M,COAX,PU,45"
24	13900078	1	42	-	SHACKLE,ANCHOR,5/16 (3/8 PIN),316SS
25	14102813	1	1	8	ASSY,TOWFISH,CHASSIS,ELECTRONICS 3200
26	14104319	1	4	2	ASSY, NOSE, TOWFISH, CASTED
27	14103078	1	2	5	ASSY,XDUCER,100/500 Khz,16",3200,STB
28	14103079	1	3	5	ASSY,XDUCER,100/500 Khz,16",3200,PORT
29	14201708	1	6	0	HOUSING,TOWFISH,3200,3.5"X38.5"
30	14201717	1	9	0	CUP,RETAINING,TAILFIN,3200
31	14201718	1	10	1	CABLE COVER,3200
32	14202265	4	11	0	CLAMP,D-BLOCK, XDCR, 3200
33	14201727	2	13	4	FAIRING,TRANSDUCER END,AFT,3200,1.90"DIA
34	14201728	2	12	1	FAIRING,TRANSDUCER BACK,3200,1.90"DX24"
35	14202112	1	14	3	TOWBAR,3200, 1/2"
36	14201833	2	7	6	TOWBRACKET,3200
37	14202018	1	15	0	PLATE, CABLE RETAINING, 3200
40	15102911	0	900	4	ASSY DWG, TOWFISH, 3200
41	14602911	0	901	0	OUTLINE DWG, TOWFISH, 3200
42	15900006	2	33	-	O-RING,2.984ID X 3.262OD BUNA N
43	16200044	2	32	-	RING,COTTER 1 IN 316SS
44	16200050	2	31	-	PIN,CLEVIS,.375DX1.31(1.08 GRIP),18-8
45	14202027	1	8	0	TAILCONE, 2 SLOT, 3/16", 90 DEG, 3200
46	11602059	2	45	0	LABEL,TOWFISH,"SYSTEM 3000", 1.25X21.5
47	14202019	1	16	0	SPACER, .375 OD X .277 ID X .500, 316SS

14103010

Item	Part Number	Qty	Refdes	Rev	Description
2	11600125	4	5	3	LABEL,LOGO
3	12900687	1	4	-	CONN,DUMMY PLUG,8 PIN MICRO FEMALE
5	14102911	1	1	9	ASSY, TOWFISH, 3200
6	14103011	1	2	1	ASSY, ACCESS KIT, 3200
7	14202028	2	3	0	TAILFIN, 3/16" FRP, 3200
8	13800107	1	7	-	CRATE,3200
9	11602060	1	8	0	PLACARD,L/W TWCBLE-3200 T/F INSTRUCTIONS
10	11603132	1	9	0	PLACARD, ARMRD, GREASE FLD, TERM, INSTR.


REVISIONS
REV ECN NO DESCRIPTION APPROVED DATE
00 2145 RELEASE TO PROD.
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ITEM REF DES QTY PART NUMBER DESCRIPTION REMARKS
PARTS LIST
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCE ON DEC. ANGLES FRAC. ± TOL. .XX ± .01 .XXX ± .005 SURFACES 63
MATERIAL:
FINISH SPECS:
NOTE
DATE
DRAWN C. DUNDORF 4/9/02
CHECKED - -
APPROVED - -
BREAK ALL SHARP EDGES
DEBURR ALL HOLES
METRIC REFERENCE INCHES (mm) & IN (mm)
UNLESS OTHERWISE SPECIFIED COMMERCIAL PUBLISHED TOLERANCES SHALL APPLY TO BUSHINGS, BAR, PLATE, ETC. PARTS MUST FIT GAGES AND MEET SPECIFIED TOLERANCES.
KLEIN ASSOCIATES, INC.
HIGH RESOLUTION SONAR
SALEM * NEW HAMPSHIRE * 03079
U.S.A. * (603)893-6131
ASSY DWG, NOSE, TOWFISH, 3200
CODE IDENT NO. 52315 SIZE C DRAWING NO. 15103019 REV 00
DO NOT SCALE PRINT SCALE NTS SHT 1 OF 1
NOTES:
1. INSTALL RETAINING RING USING MODIFIED (RIGHT ANGLE) 3/8 "E" STYLE RETAINING RING TOOL. (MCMASTER CARR P/N 93821A221)
14103019
USED ON

14103019
Assy, Nose, Towfish, 3200

Item	Part Number	Qty	Refdes	Rev	Description
1	12500869	1	5	-	SCREW, SHCS, M5X20MM, 316
2	12500870	2	6	-	SCREW, SHCS, M5X25MM, 316
3	12500871	2	7	-	SCREW, SHCS, M5X50MM 316
4	12500872	1	8	-	WASHER, SPLIT LOCK, 10MM, HIGH COLLAR, 1
5	12500874	1	10	-	RING, RETAINING, EXTERNAL, 3/8 "E", .303
6	12500884	1	9	-	WASHER, FLAT,.406X.812X.06,18-8
7	12700021	0	11	-	ADHESIVE,LOCTITE #242, BLUE
8	14201707	1	1	0	**OBS**NOSE,TOWFISH,3200
9	14201838	1	2	0	SCREW,SHCS M10 X 150MM + GROOVE, SS
10	14201839	2	3	2	FAIRING, XDCR END, FORWARD, 3200, 1.90"
11	14201840	1	4	0	FAIRING, CABLE COVER, 3200, 1.50" DIA
12	15103019	0	900	0	** OBS** ASSY DWG, NOSE, TOWFISH, 3200