

KLEIN SERIES 3000 SYSTEM TROUBLESHOOTING GUIDE

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INFORMATION FOR SYSTEM 3000 OPERATIONS WITH A MAGNETOMETER 1

CHAPTER 4

TROUBLESHOOTING GUIDE

(Version 2.8)

4.1 BASIC SYSTEM REQUIREMENTS.

We suggest that you get the fastest PC system available to you at the time of purchase; however, as a minimum it should include the following:

- 400 MHz pentium II
- 512 megabytes of RAM
- 10 Gigabyte hard drive - the bigger the better
- 8 megabyte video board - the faster the better
- Lan Card, Fast Ethernet (100 Base/T), 3Com 3C905 works well
- Windows NT 4.0 or Windows 2000 Professional
- Windows NT disk defragmenter
- Power backup module.

When running the PC system it is important to make sure that you leave at least 500 megabytes of free disk space for temporary system disk swap files.

You will need to connect the Klein 3000 **T**ransceiver and **P**rocessing **U**nit (TPU) to the Host PC computer. A Fast Ethernet Hub, 3Com, 8 port, product number 3C16722, works well.

Before turning the TPU on make sure your computer is configured correctly and the computer is booted up and running.

WARNING

Do not use a cross-over cable.

4.2 BASIC SYSTEM SETUP.

Refer to the following diagram for system set up information. 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 shipboard power.

SYSTEM 3000 OPERATIONS AND MAINTENANCE MANUAL

4.3 3000 BASIC SYSTEM SETUP DIAGRAM.

Sample navigation strings:

The preferred is RMC

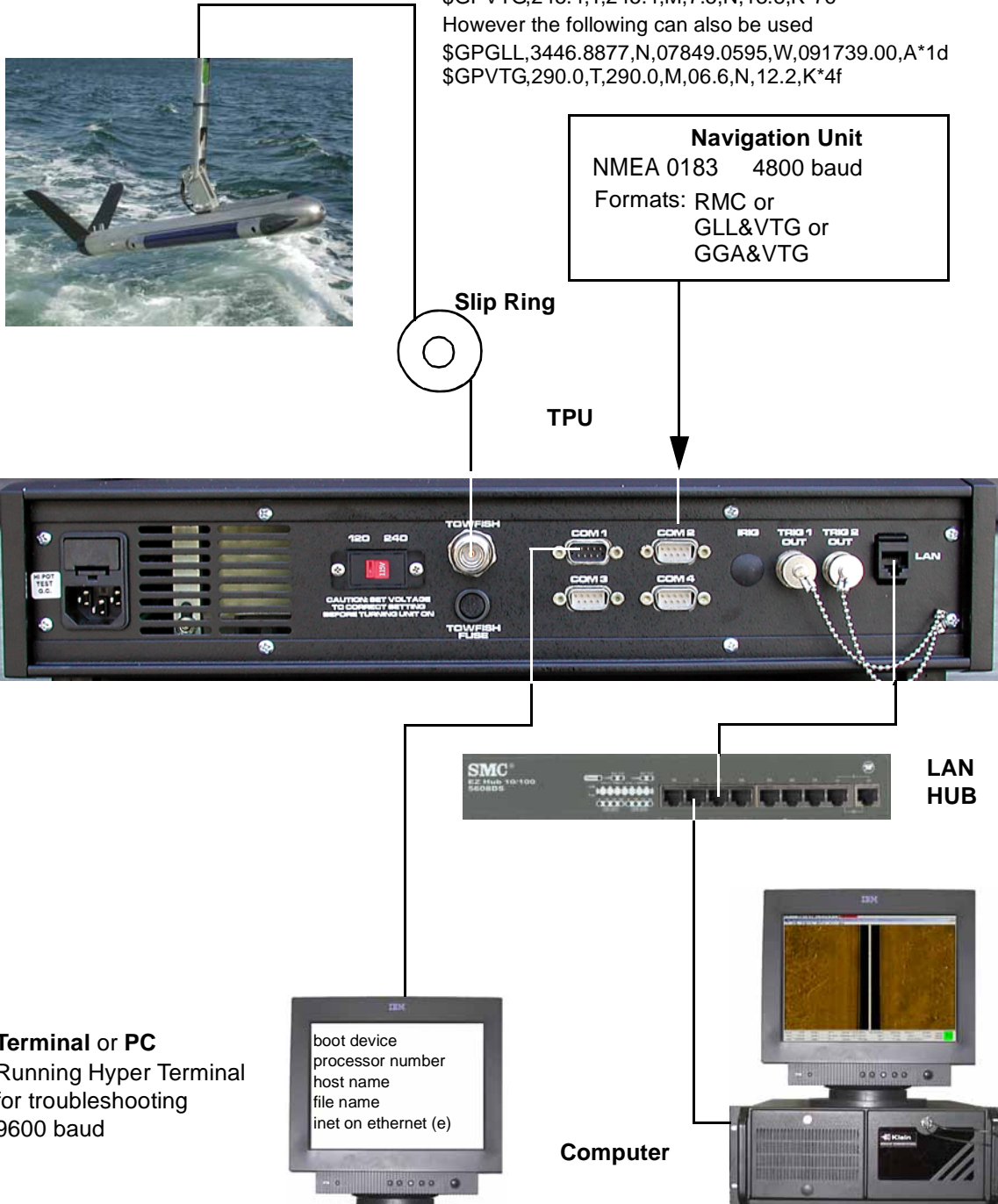
\$GPRMC,101842.572,A,3318.577,N,07845.424,W,7.452,2
45.4,050202,0.0,E*72

\$GPVTG,245.4,T,245.4,M,7.5,N,13.8,K*76

However the following can also be used

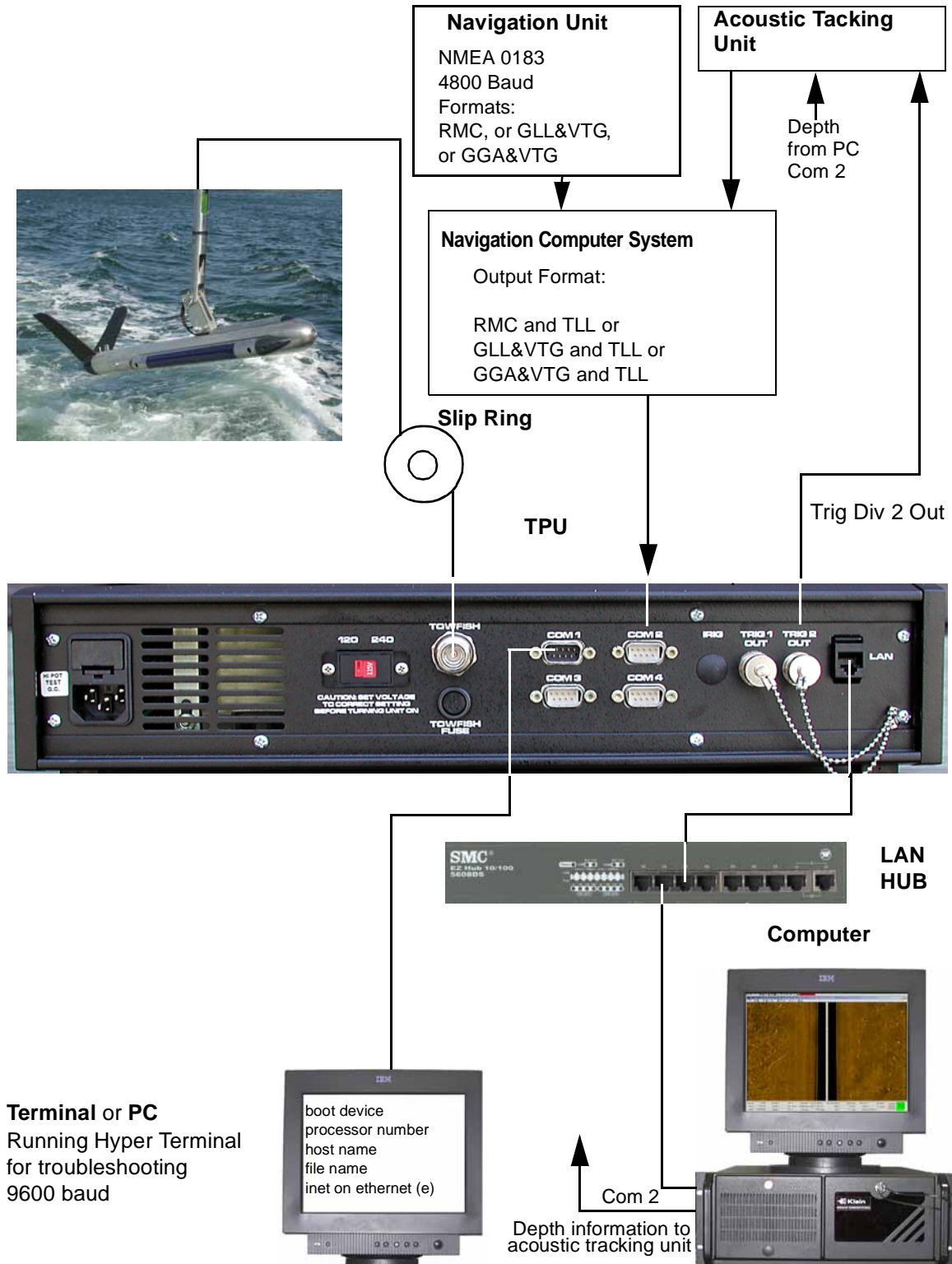
\$GPGLL,3446.8877,N,07849.0595,W,091739.00,A*1d

\$GPVTG,290.0,T,290.0,M,06.6,N,12.2,K*4f



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4.4 3000 SYSTEM DIAGRAM WITH ACOUSTIC POSITIONING SYSTEM.



See NMEA 0183 formats on page 66.

4.5 INSTALLING THE KLEIN SONARPRO SOFTWARE SUITE.

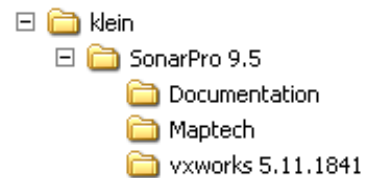
Insert the SonarPro CD into your CD drive.

Locate the SonarPro installation .pdf file.

It is very important that you follow instructions in the SonarPro installation.pdf. We suggest that you print this file.

Double click on the SonarPro installation program, setup.exe in the SonarPro Software folder and follow the directions carefully.

Installed file structure sample is on the right.



4.6 SETTING UP THE LAN CONFIGURATION, WINDOWS NT.

You should have a working PC with a Fast Ethernet (100 Base /T) card set up.

First check the TCP/IP protocol.

On the desktop

Select:

START

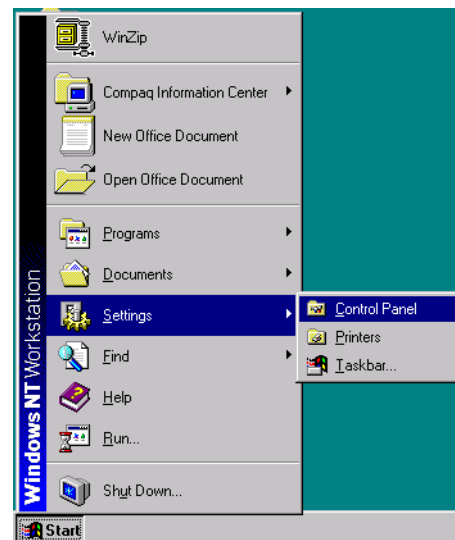
SETTINGS

CONTROL PANEL

Locate the **NETWORK** icon and double click:

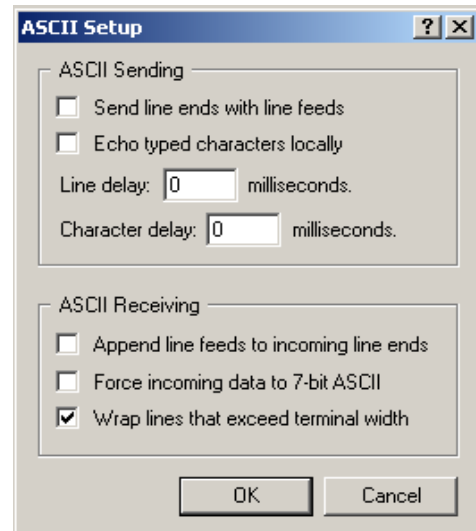


Network



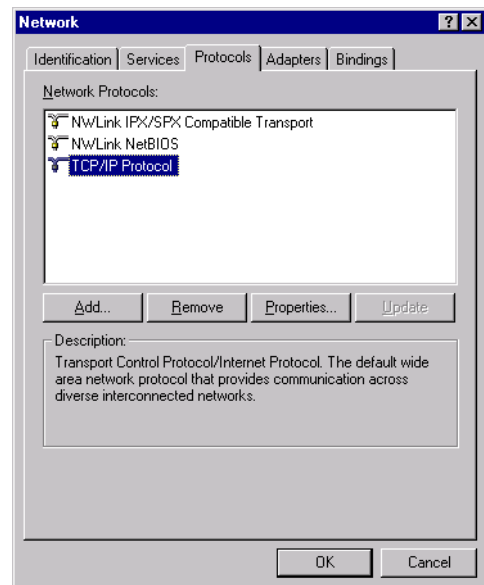
SYSTEM 3000 OPERATIONS AND MAINTENANCE MANUAL

Note your computer name:



Select:

PROTOCOLS

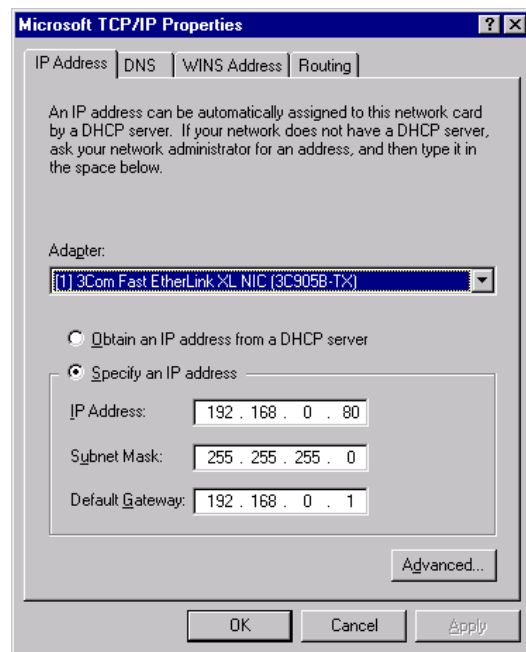


Select:

PROPERTIES

Note or set your IP address and subnet mask.

These will be used later to direct the TPU to the location of the boot program vxWorks.



SYSTEM 3000 OPERATIONS AND MAINTENANCE MANUAL

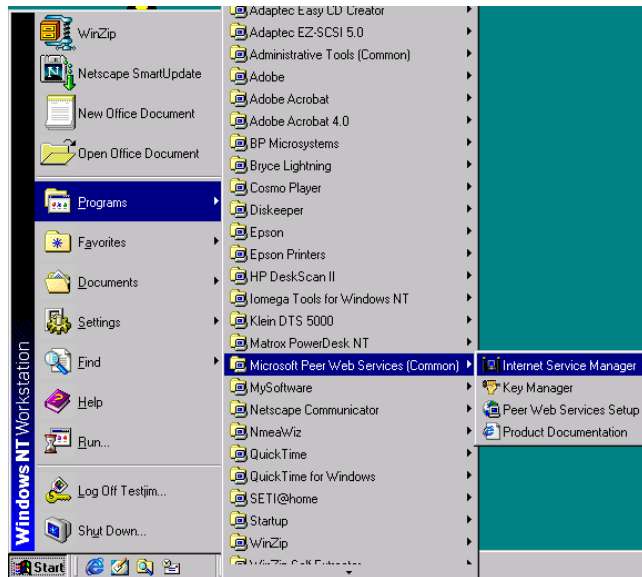
Next check to see if you have **Internet Service Manager** and **FTP Service** installed and set up on your computer.

Select:

START

PROGRAMS

MICROSOFT PEER WEB SERVICE (COMMON)



If the **MICROSOFT PEER WEB SERVICE (COMMON)** is not under your **START** menu, it will have to be installed. 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; look for d:\I386\inetsev\inetstp.exe.

This program will ask for the files to be added. Install the **Internet Service Manager** and the **FTP Service** only, and use the defaults when prompted.

NOTICE

A new empty directory C:\InetPub\ftroot will be created on your C: drive. **Do not delete it.**

SYSTEM 3000 OPERATIONS AND MAINTENANCE MANUAL

Next check or set up the following parameters.

Select:

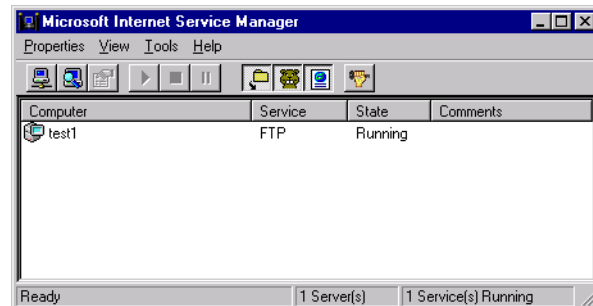
START

PROGRAMS

MICROSOFT PEER WEB SERVICE (COMMON)

INTERNET SERVICE MANAGER

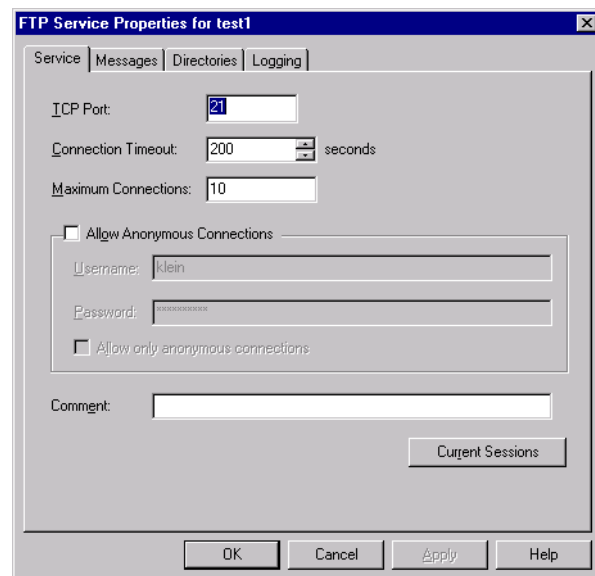
Right click on the computer running the **FTP Service**. It should be your computer name noted earlier.



Select:

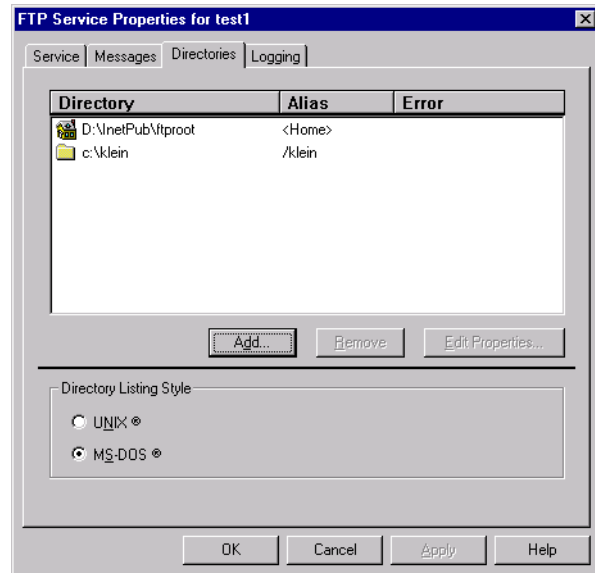
SERVICE PROPERTIES

This will bring up the FTP Service Properties for your computer. Set the following parameters under the Service tab. Make sure the dialog boxes match.



SYSTEM 3000 OPERATIONS AND MAINTENANCE MANUAL

Click the **Directories** tab and look for the c:\klein Directory.

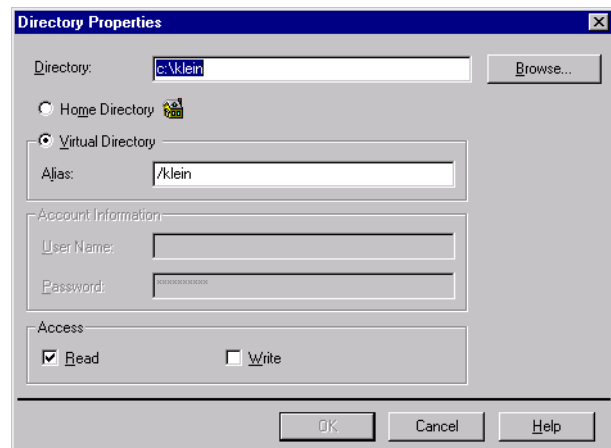


If it is not present

Select:

Add

and set up the dialog box as follows below.



SYSTEM 3000 OPERATIONS AND MAINTENANCE MANUAL

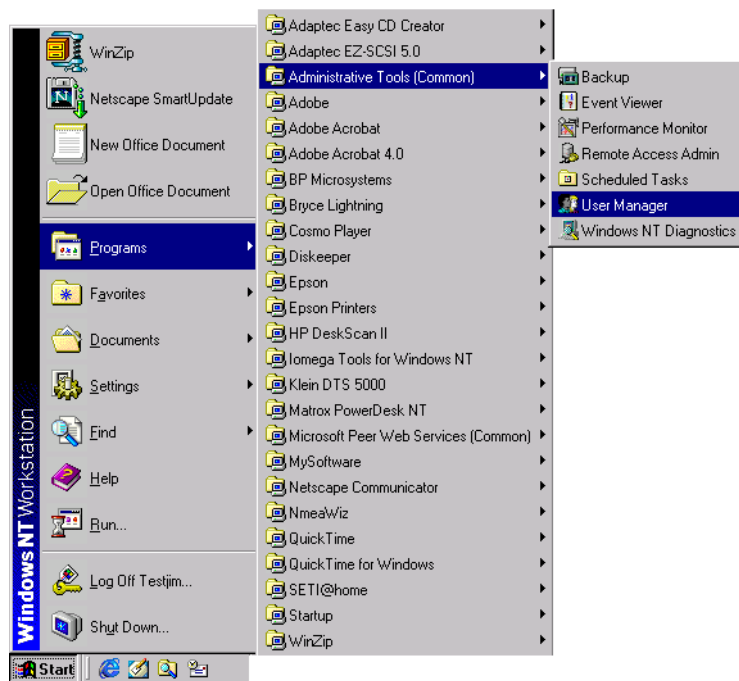
Select:

START

PROGRAMS

ADMINISTRATIVE TOOLS (COMMON)

USER MANAGER



Check or add New User **Klein**.

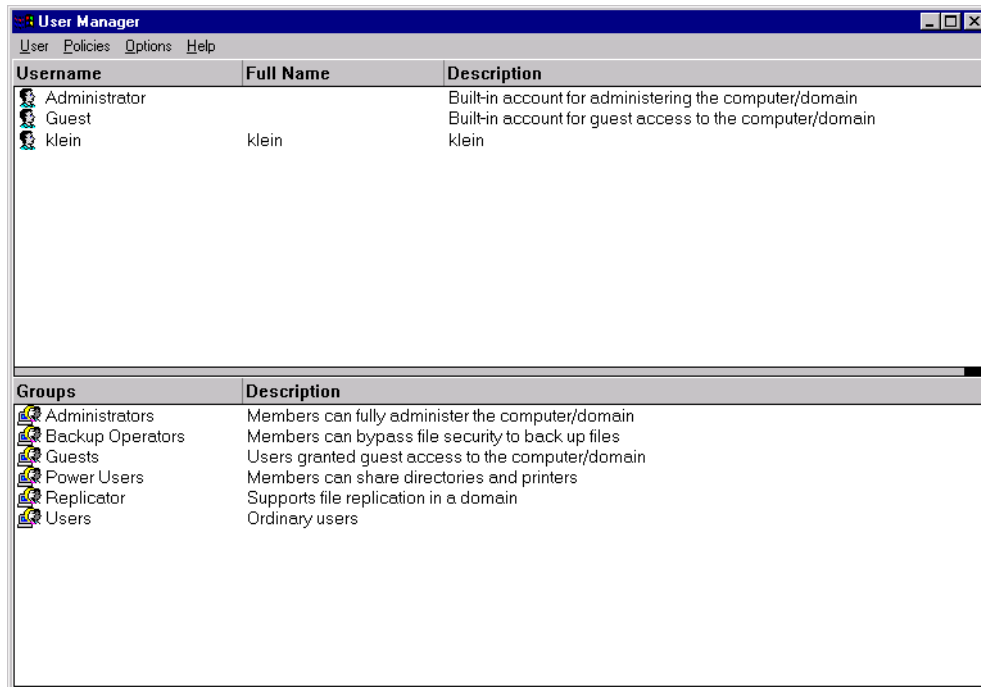
SYSTEM 3000 OPERATIONS AND MAINTENANCE MANUAL

If adding a new user

Select:

USER

NEW USER



Fill out the dialog box as follows, making sure the password and confirmation match.

If checking the user **Klein** setup, click on **Klein** and check the dialog box.

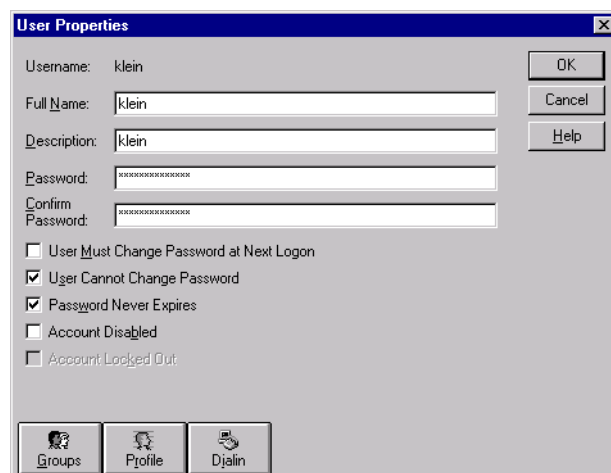
user name: **klein**

full name: **klein**

description: **klein**

password: **klein**

confirm password: **klein**



4.7 WINDOWS 2000 CONFIGURATION.

First check the TCP/IP protocol.

On the desktop

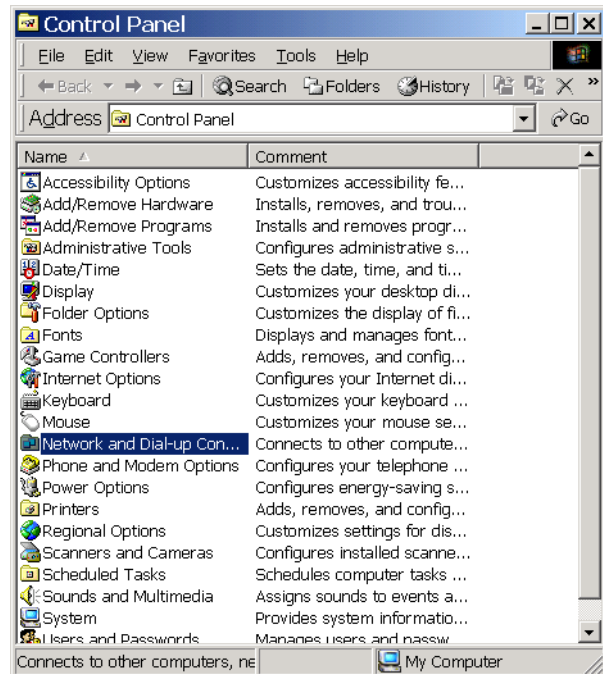
Select:

Start

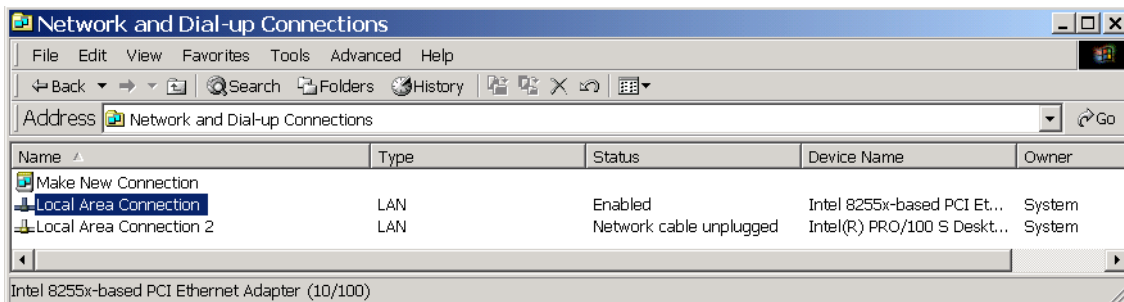
Settings

Control Panel

Network and Dial-up Connection



Local Area Connection



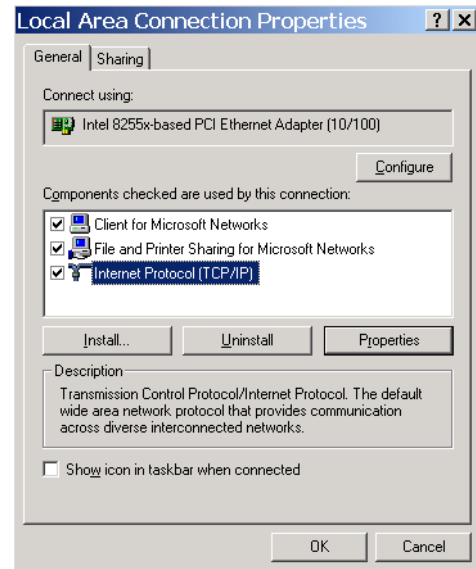
Right click to bring up

Local Area Connection dialog box.

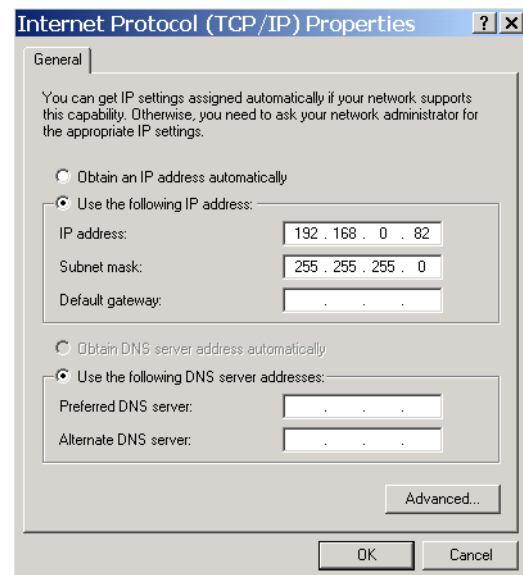
Select:

Internet Protocol (TCP/IP)

and click **Properties**.



After opening, enter the IP address and the Subnet mask for your computer and press OK.



Setting up the FTP Service

On the desktop

Select:

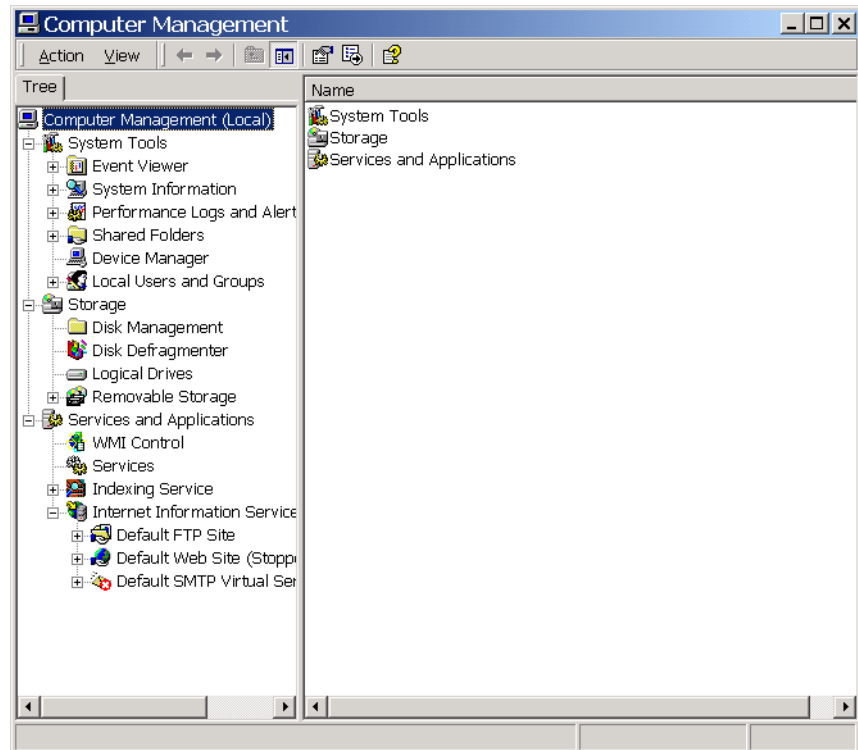
Start

Settings

Control Panel

Administrative Tools

Computer Management



Select:

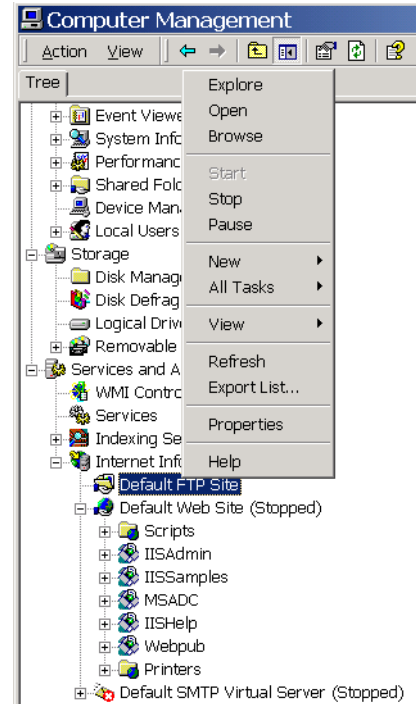
Internet Information Service

Check closely. If the **Internet Information Service** is not in this menu, it will have to be installed. Locate your Windows 2000 CD. Select: **Install Add-on Components**, and Select: **Internet Information Service**.

Setting up the Default FTP Site

Right click on **Default FTP Site** and select **properties**.

This will bring up the Default FTP Site Properties dialog box.

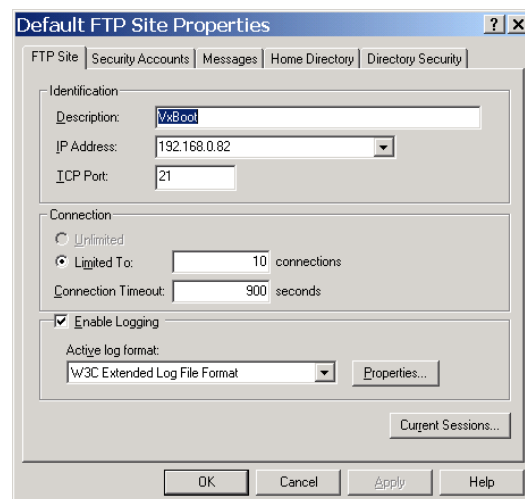
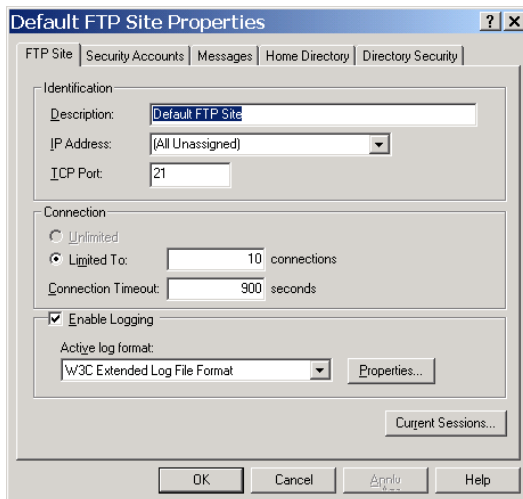


Under Identification, Description

Enter: VxBoot

Under IP Address:

Enter the Computer IP Address set up earlier.



Under the Default FTP Site Properties Dialog box

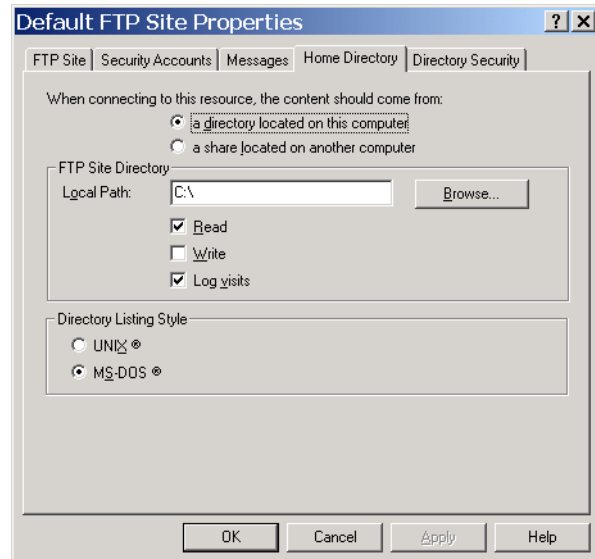
Select:

Home Directory

Under FTP Site Directory

Local Path

Enter: C:\



Setting Up the User Profile

On the desktop

Select:

Start

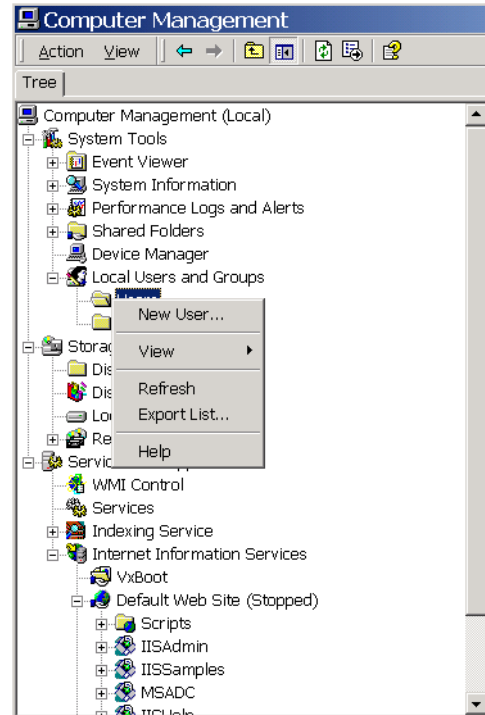
Settings

Control Panel

Administrative Tools

Computer Management

Local Users and Groups



Select:

USERS

Right click and Select:

New User

This Brings up the New User Dialog box.

Enter:

klein

klein

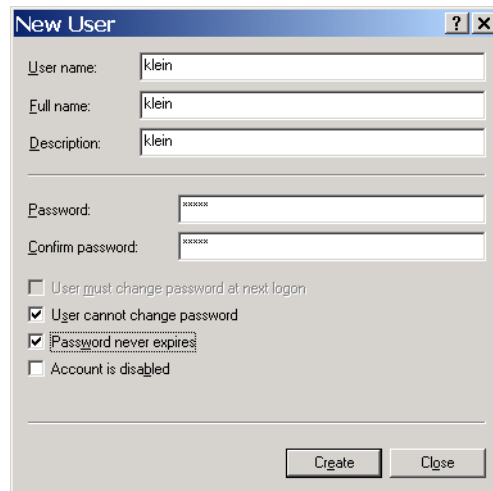
klein

klein

klein

in all the text boxes.

Set up the check boxes as shown on the right.

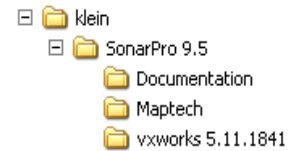


This completes the WINDOWS 2000 setup.

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Double check the **klein** directory on the hard drive and make sure the **vxWorks** file is located in it.

The LAN configuration for the Host PC should now be set up.

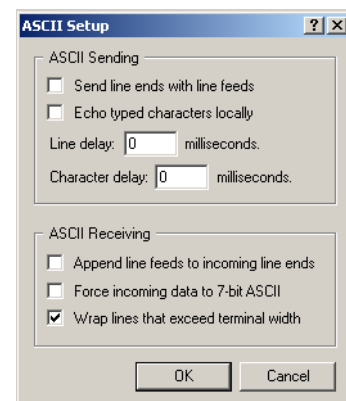


4.8 CONFIGURING THE KLEIN 3000 TPU.

Connect a Terminal or PC running Hyper Terminal to COM port 1 on the back of the TPU.

Configure the device to:

- 9600 baud
- 8 bit
- 1 stop bit
- none flow control
- tty emulation



ASCII Setup is as shown in dialog box.

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: 1.2/1
Creation date: Feb 18 2003, 16:30:21

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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... 1228944
Starting at 0x100000...

sysScsilnit() Failed, SCSI system not initialized
0x1ffffde8 (tRootTask): SCSI controller not found
Attached TCP/IP interface to fei unit 0
Attaching interface lo0...done
-> No SCSI controller specified.
System SCSI controller not found.
Determining Sonar Type from sonarclient:\klein\startup.ini

```
+-----+  
|\_____ /|  
||                                     ||  
|| ##### # # ##### ##### # # ||  
|| # # # # # # # # # # # # # ||  
|| # # # # # # # # # # # # ||  
|| # # # # # ##### # # # # ||  
|| # # # # # # # # # # # # ||  
|| # # # # # # # # # # # # ||  
|| # # # # # # # # # # # # ||  
|| ##### # ##### # ##### # # ||
```

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```
||
|| 3333333333 00000000 00000000 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 ||
|| 3333333333 00000000 00000000 00000000 ||
||
|| ----- ||
|| Copyright (C) 2002 Klein Associates, Incorporated ||
||-----||
|/ |
+-----+
```

Version 5.11.1841 7/31/2003

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

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\$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 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. Note: “?” 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

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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

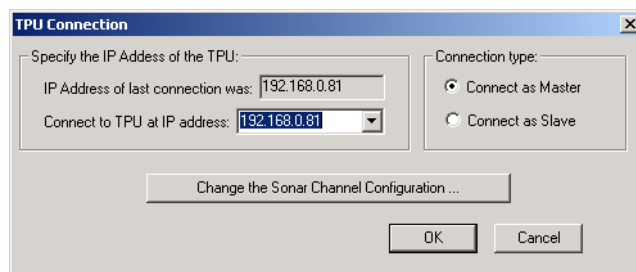
Turn the TPU off and then back on, and watch the boot sequence again.

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
```

Once you have a properly booted system, the Klein SonarPro software suite needs to know the IP address of the TPU. Open the SonarPro application suite, and

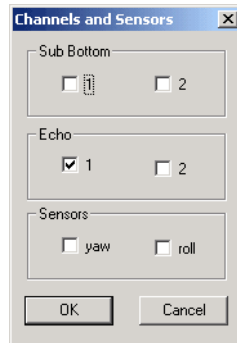
press  to connect to the towfish in real time. The TPU Connection dialog box will open. Enter the TPU IP address into the box if different.



The LAN configuration should now be complete.

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While you have the TPU Connection dialog box open, click the “Change the Sonar Channel Configuration” button, and check that the settings are as follows.



4.9 TOW CABLE CONSIDERATIONS.

Klein recommends that tow cables have the following characteristics.

LIGHTWEIGHT TOW CABLE

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:	150 m maximum
Voltage Rating:	600 VDC
Termination:	Stainless steel shackle at towfish end

ARMORED TOW CABLE

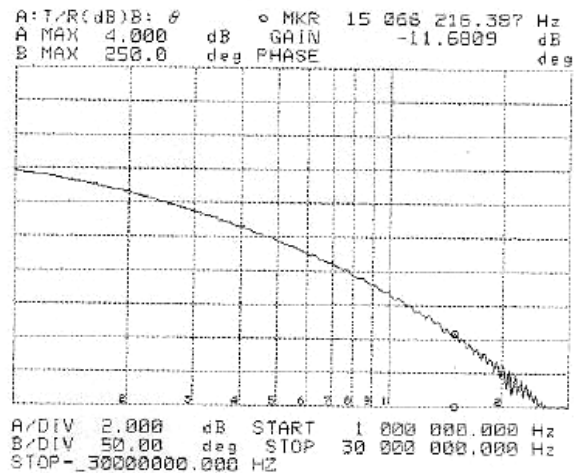
Type:	Double layer, counter helical, galvanized improved plow steel (GIPS) Stainless steel available as option
Conductors:	Coaxial copper
Diameter (OD):	10.2 mm (0.40 in)
Breaking Strength:	4990 kg (11,000 lb)
Working Load:	1247 kg (2,750 lb)
Operational Length:	150 m maximum
Voltage Rating:	1200 VDC
Termination:	Stainless steel shackle at towfish end

Other important characteristics to consider are that electrically the cable must be 50 ohms, and the whole cable assembly, deck cable, slip ring, winch, cable, and connectors must be coax all the way from the TPU to the towfish.

4.10 MEASURING CABLE INSERTION LOSS.

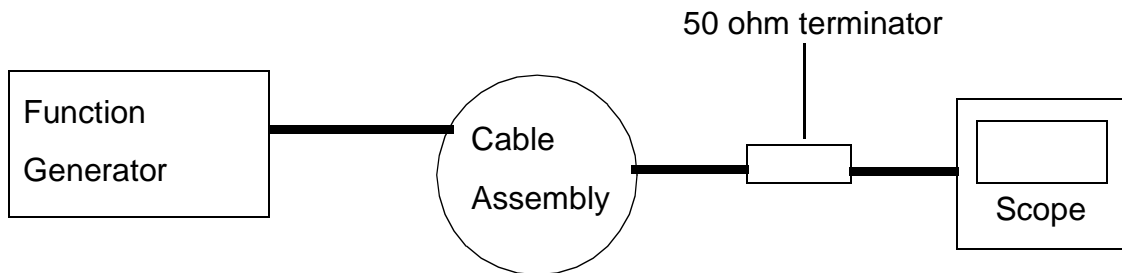
To get an accurate assessment of your tow cable assembly, we suggest you use a Hewlett Packard 4194A Impedance / Gain -Phase Analyzer (or equivalent).

A sample plot is below.



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, 50 ohm terminator and an oscilloscope.

4.11 FUNCTION GENERATOR AND A SCOPE.



With the function generator and the scope connected to the cable, monitor input on the scope 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 : $dB = 20 \log (V \text{ out} / V \text{ in})$

Info: If you use 1 volt peak for $V \text{ in}$, $V \text{ in} = 1$

Example: At 750 kHz you get a reading of 160 mV

.16 v

$\log .16$

$\times 20$

-15.9 dB loss

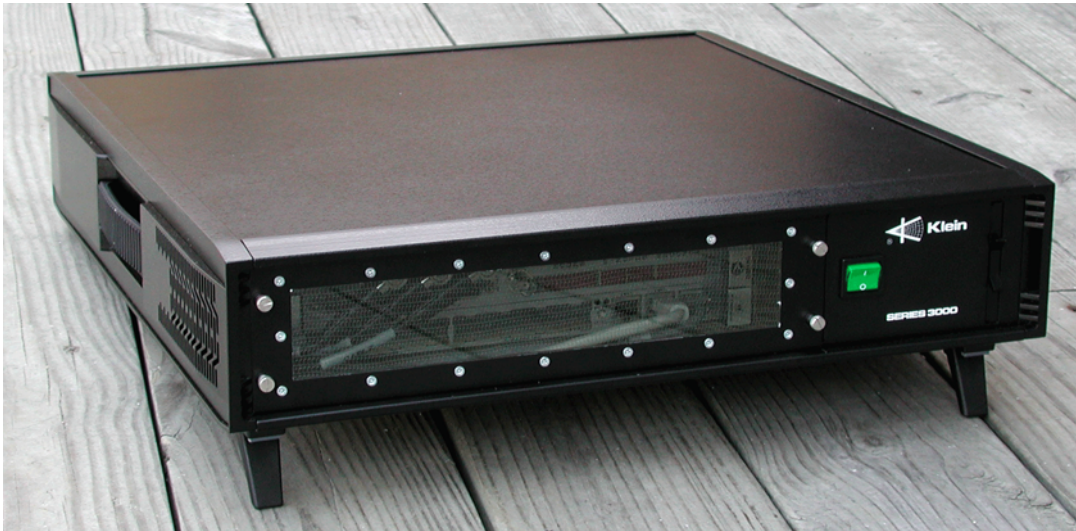
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4.12 SPARE TOW CABLE.

With the nature of high speed towing, cable problems can occur. We suggest that you have on hand a lightweight Kevlar reinforced 150 meter (minimum length) tow cable for troubleshooting purposes.

This will allow you to bypass your primary tow cable assembly and speed fault isolation.

4.13 TRANSCEIVER AND PROCESSING UNIT.

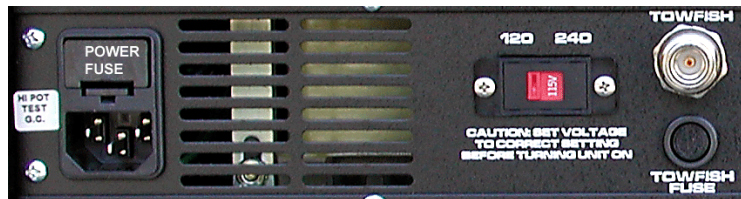


4.14 INPUT POWER.

Check that the proper AC input voltage setting, 120VAC or 240VAC, has been selected on the back of the TPU. The 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 input. 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 Amp 250 Volt 5x20mm slo-blo, Part Number #13000045.



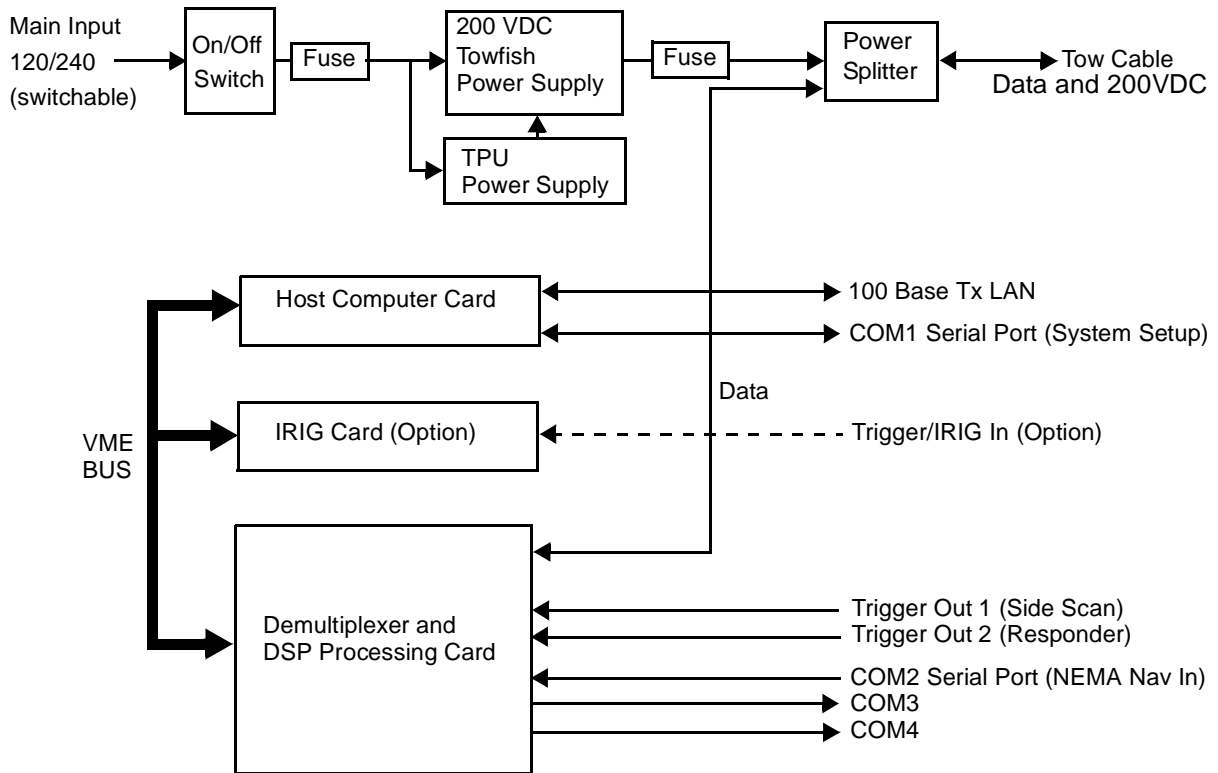
4.15 TOWFISH FUSE.

This 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 630ma 250 volt 5x20mm slo-blo, Part Number #13000043.

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4.16 TPU (Transceiver Processing Unit) BLOCK DIAGRAM SYSTEM 3000.



4.17 TPU INTERNAL ACCESS.

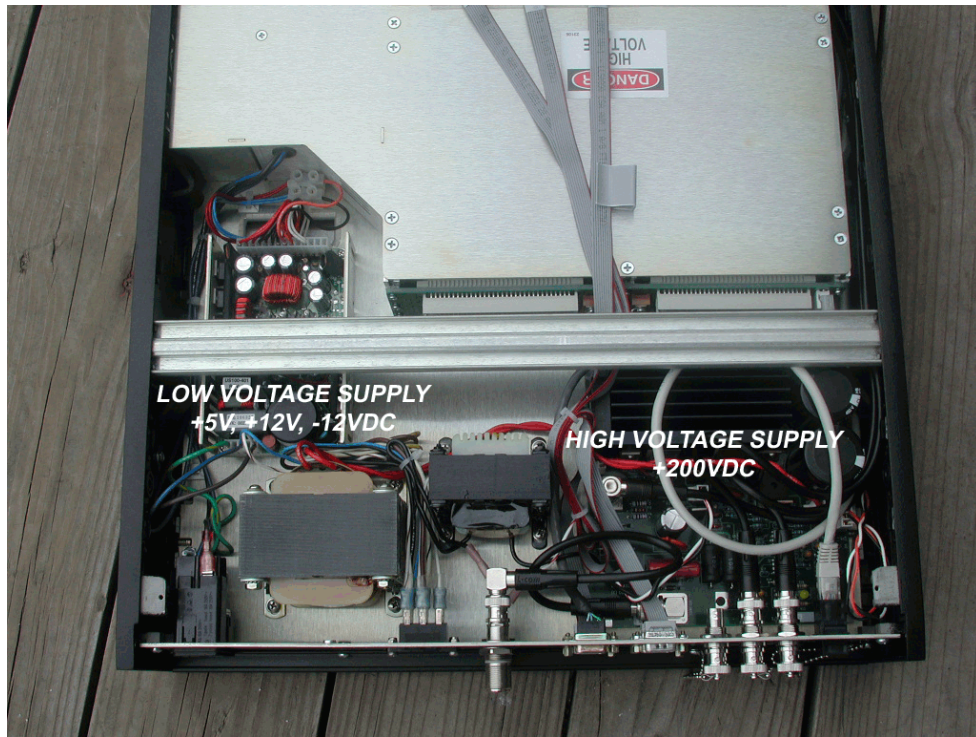
To access the inside of the TPU, you must remove the two screws on the upper rear of the unit.

Slide the back locking frame off to one side, and then slide the TPU top towards the back of the unit.

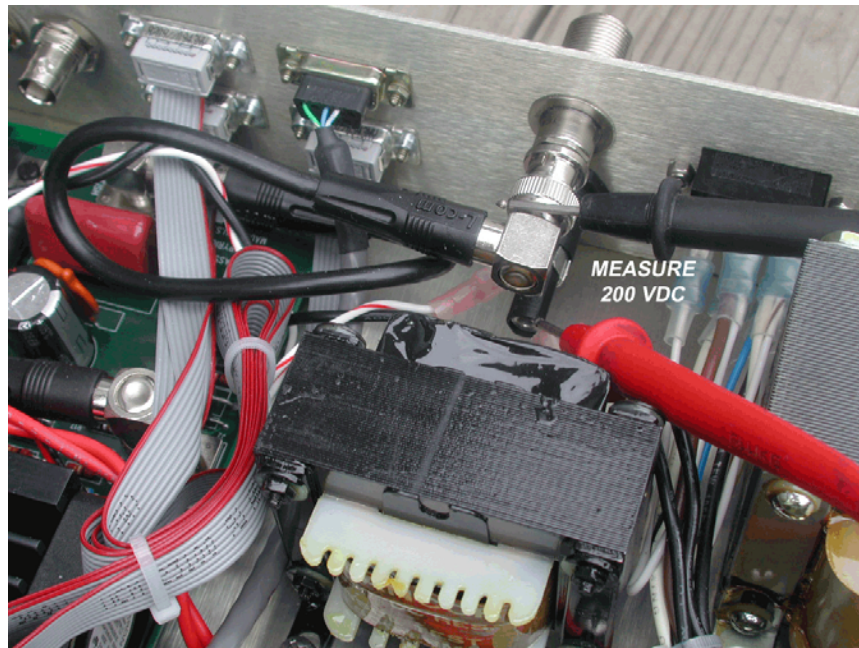
WARNING

AC Voltage and high levels of DC voltage are present inside the unit. Only qualified individuals should access the unit to this level.

4.18 POWER SUPPLIES.



200 Volts High Voltage Supply and Data Coupler



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The 200 volts supplies power to the towfish and is fused onto the back of the TPU.

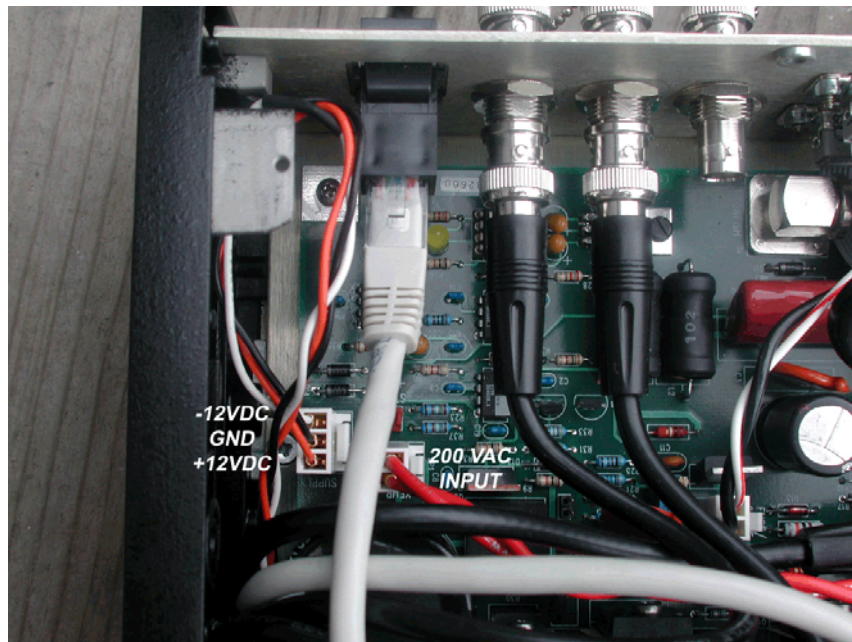
200 volts AC enters the power supply board from the transformer at JP1 HV.

200 volts DC is generated and can be measured between the base of the fuse holder and the BNC cable.

L.E.D. D9 lights if there is excessive current draw (cable short).

Low Voltage Supply

+5 volts, +12 volts, and -12 volts are generated from a separate power supply located center right. This is also used to supply the VME chassis. The +5 volts can be measured on the power supply across the red and black wires. 200VAC is the input power at JP1. The +12 volts and -12 volts can be measured at connector JP4.

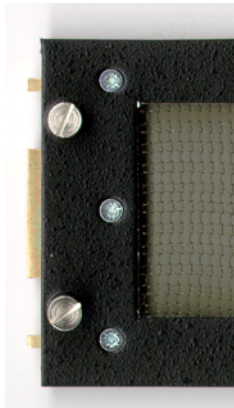


Board Placement



Front Panel Access

To access the boards in the TPU, loosen the four captive screws on the access panel. The two screws on the left should be loosened until threads are seen. Lift the right side out first, and slide the panel to the right slightly, freeing the panel. To install, insert the tabs on the left side and reverse the process.

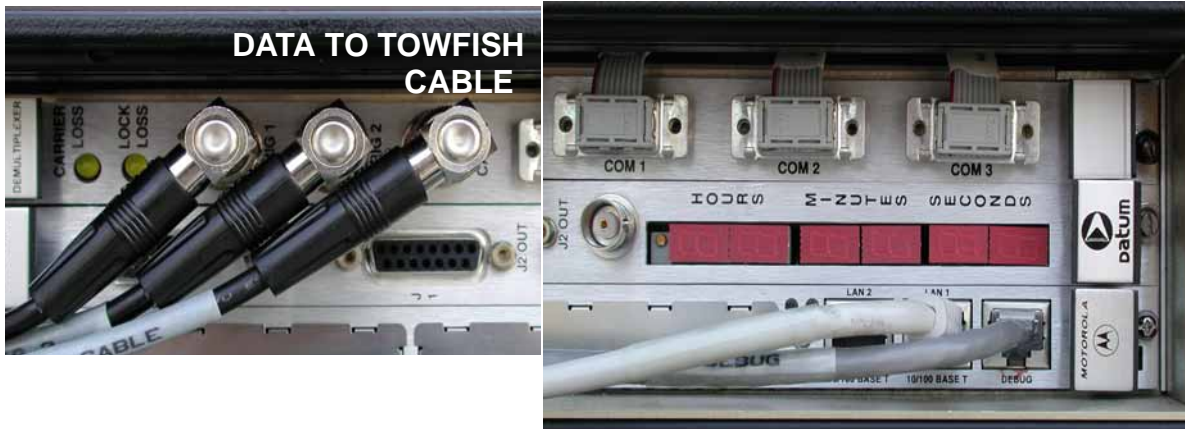


Access panel off, showing boards and wiring.



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Wiring close up:



COM PORT wiring

Front panel	Back Panel	To
debug	com1	computer and hyper terminal
com1	com2	Navigation..NEMA 0183
com2	com3	Magnetometer
com3	com4	Magnetometer and Diag

4.19 TPU POWER TURN ON.

CAUTION **VERY IMPORTANT**

Do not connect or disconnect the towfish with the power turned on.
Do not run the towfish for more than fifteen minutes out of the water.

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With the towfish and LAN cables removed from the TPU, turn the power on. Listen for the cooling fan to come on, and meter the towfish connector for 200 VDC. This will test the basic TPU.

With the towfish cable removed and the LAN cable connected through the hub to the computer (assuming that the system has been working and the LAN system is configured correctly), you will see the computer port on the hub lit.

Turn the TPU on. The TPU port on the hub will light. This will add the LAN side to the TPU test.

With the towfish, tow cable, and LAN cable connected through the hub to the computer, you will see the computer port on the hub lit (assuming that the system has been working and the LAN system is configured correctly).

Turn the TPU on. The TPU port on the hub will light.

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. Carrier Loss and Lock Loss L.E.D.'s will be on until the TPU finishes its boot cycle with the host computer (about 45 seconds). Once the boot sequence is complete, the L.E.D.'s will go out.



The boot process sequence may be monitored with an external terminal or with Windows default terminal Hyperterminal. See the on page 2 of this chapter.

If the Carrier Loss and Lock lights do not go off on the first try, turn the TPU off and back on. If the Carrier Loss and Lock Lights are still on, check for a towfish fuse failure or cable assembly problems; for example: mis-wire, 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.

TPU Cooling

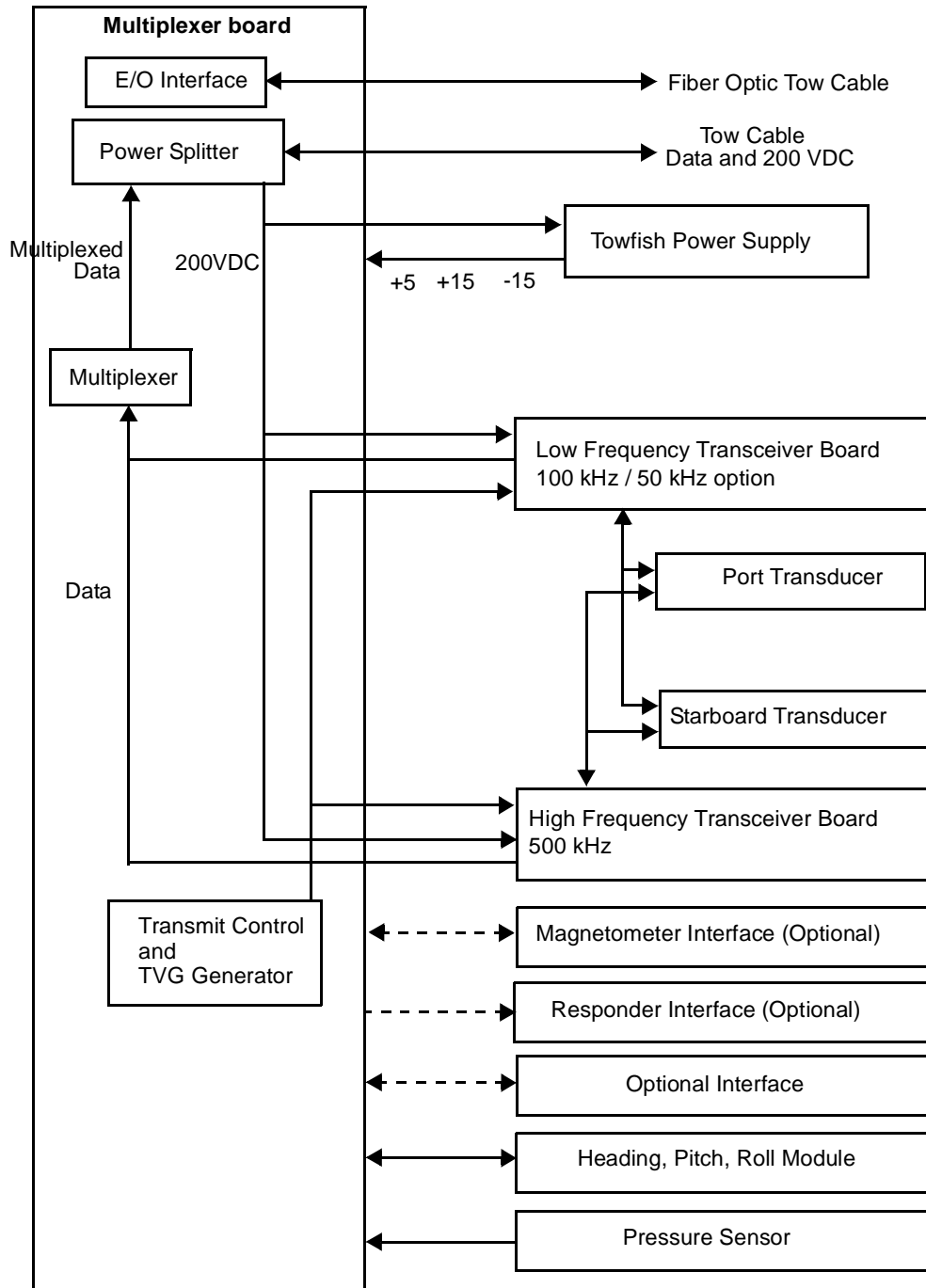
For proper unit cooling, any unused board slots should be closed with a blank panel.



The TPU has an air filter located on the right side of the front panel. This should be checked at regular intervals. Once a month should be OK. If the filter is dirty, it can be removed and washed in water or blown out with compressed air. To remove the filter, pull out slightly on the tabs.

4.20 TOWFISH.

Towfish Block Diagram



Transducer Configuration



4.21 TESTING THE TOWFISH.

Check the telemetry link to the towfish.

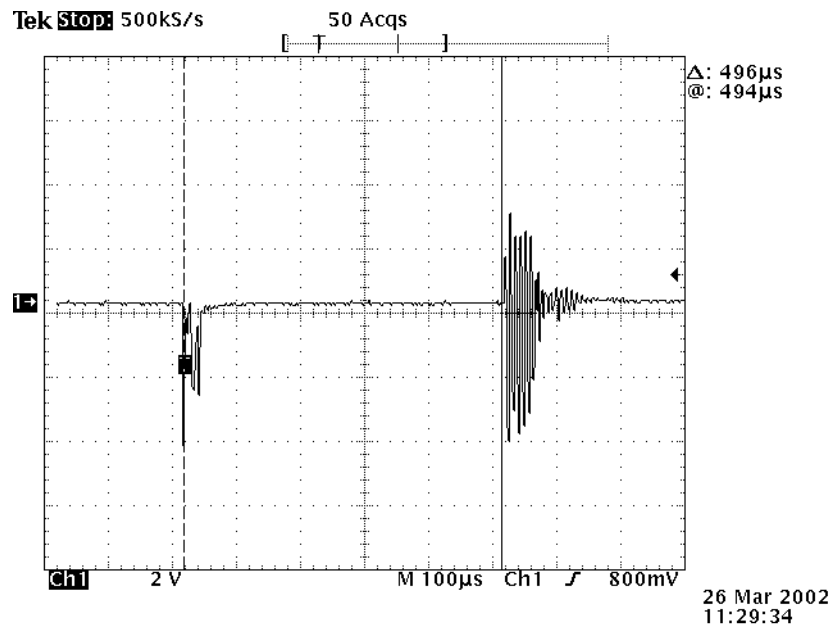
Turn the TPU on and check the Carrier Loss and Lock Loss lights. The lights should stay on for about 45 seconds as the system runs through the boot process, then they should go off and the towfish should start to ping. If the lights are on or flickering, there is a problem. Again a telemetry link problem could be one or more of the following: Towfish fuse failure or cable assembly problems; mis-wire, open, cable length too long, wrong type of cable, or a failure in the towfish.

Check the transmitters before deployment.

There are two different frequency transmitters, a 100 kHz and a 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 a range of 100 meters. You can place an oscilloscope probe with the scope tip along the transducer to see the transmit wave form as in the following image.

SYSTEM 3000 OPERATIONS AND MAINTENANCE MANUAL

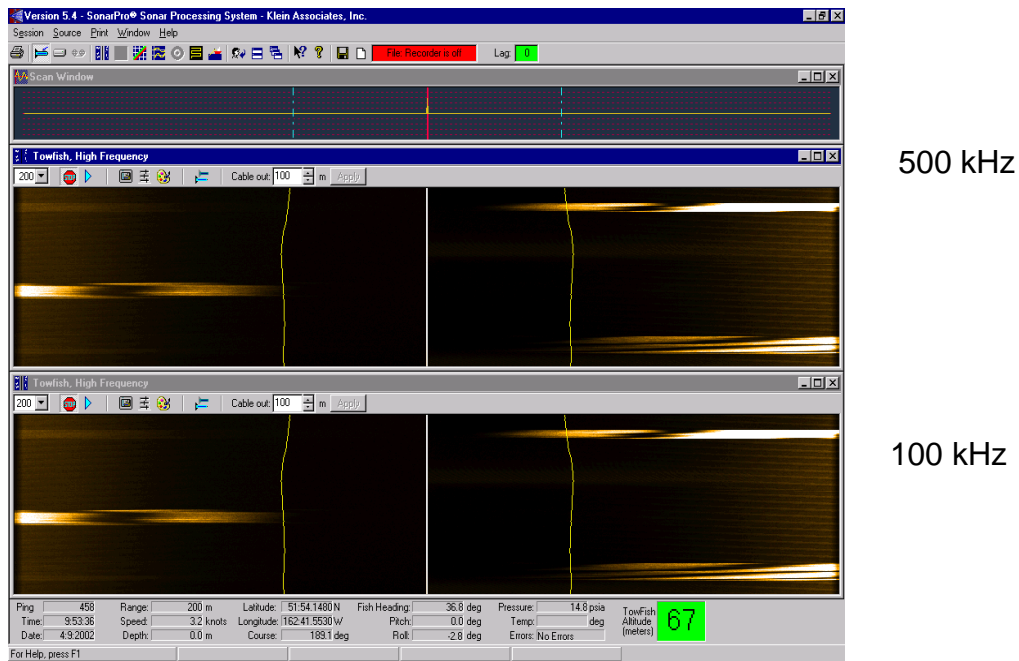


The transmitters fire in a staggered mode with about a 500 usec delay. The first pulse will be the 500kHz transmitter followed by a second 100kHz. If there is a problem with a transmitter, it will show up as a very weak transmit wave form or none at all.

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4.22 CHECK THAT THE TOWFISH IS RECEIVING (Rub Test).

With the towfish running on deck. Start SonarPro. Open a viewing window for each the high and low frequency. Set the range to 150 meters. Allow the TVG gain to adjust. Rub the transducers firmly one transducer at a time. Your rub test should look similar to the image below.



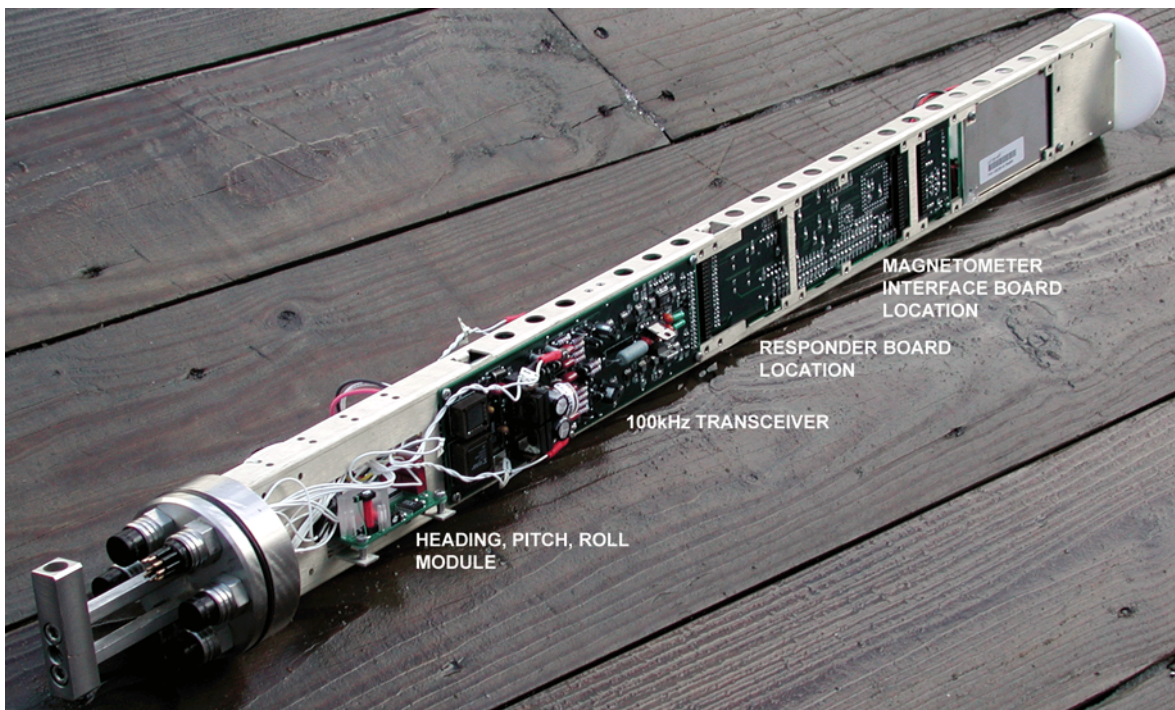
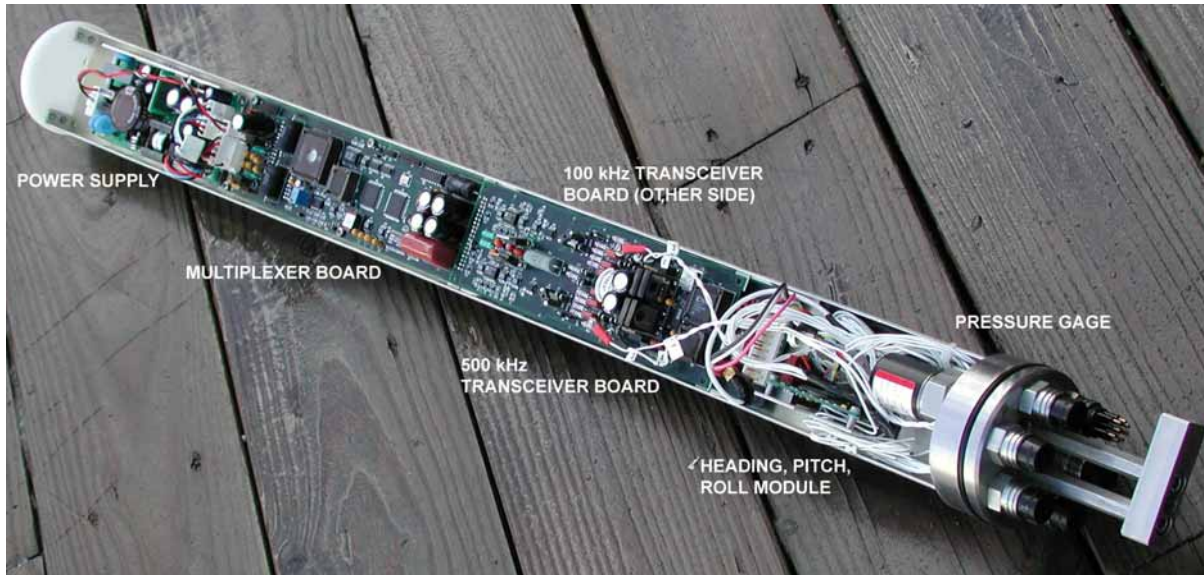
4.23 TOWFISH ELECTRONICS BOTTLE.

To remove the electronics from the towfish you must first remove the towfish nose cone. This is done by unscrewing the socket head cap screw in the center with a 8mm hex key or driver. Once you have the nose cone off you will find the electronics extraction handle. Unplug all cables at the feed-thru. Inspect this area for dirt and debris, flush clean before opening. On the top and bottom of the handle is a 6mm hex set screw; screw it **into** the handle to release the feed-thru. Using the handle, firmly pull; the electronics module may pop out quickly. Avoid over stressing the transducer leads. Carefully slide the electronics out of the housing, while keeping the electronics assembly level.

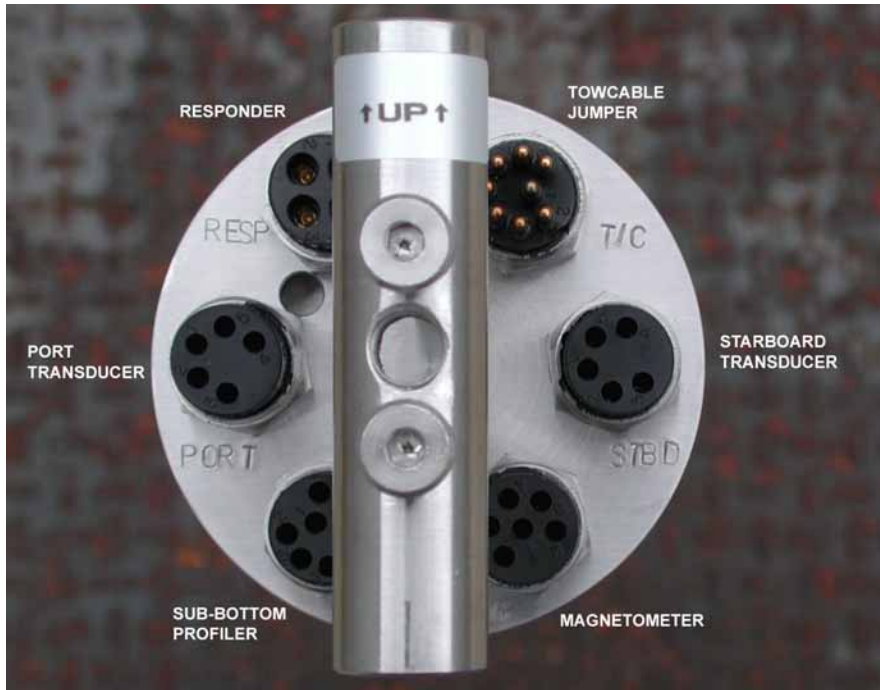
To install the electronics into the pressure housing, inspect and clean the o-ring and the corresponding surface in the pressure housing. If needed apply a light coat of silicon grease to the o-ring and mating surface. Slide the electronics gently and carefully into the pressure bottle; position the handle **UP** label to the top. Once seated properly, screw **out** the 6mm set screws in the top and bottom of the handle to lock the feed-thru in the pressure housing.

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With the electronics out of the pressure housing, you can identify some of the components.

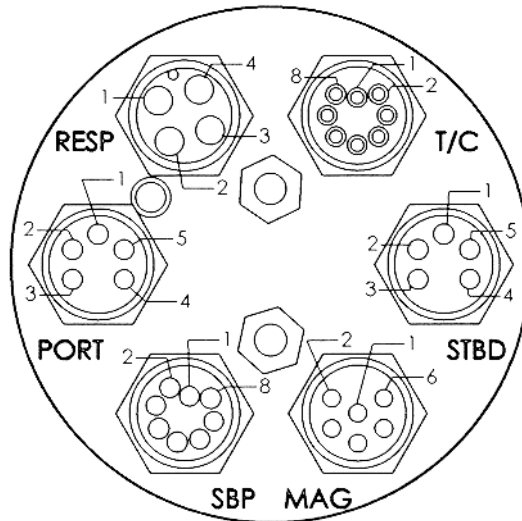


Feed-Thru Connections



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4.24 FEED-THRU CONNECTOR PINOUTS.



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

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		

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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			

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	

4.25 SETTING UP FOR TESTING THE ELECTRONICS.

Remove the towfish electronics and place the electronics in a position so that you can reconnect the transducers and cable.



Checking the Multiplexer Board

The Multiplexer board performs the following functions:

- 1 Receives the 200 volts and telemetry from the surface; separates the telemetry from the 200 volts DC.
- 2 Routes the 200 volts DC to the power supply, and then receives the converted plus 5 volts DC, plus 15 volts DC, and minus 15 volts DC.
- 3 Routes the 200 volts DC to the Transmitter boards.
- 4 Generates plus and minus 5 volts DC.
- 5 Generates the Time Variable Gain (TVG) curves for the received sonar signals from the transducers.
- 6 Multiplexes all the data channels and transmits the telemetry back to the surface.
- 7 Provides fiber optic interface.

Checking 200 VDC

CAUTION
High Voltage - Do Not Short!

The towfish requires 200 volts DC from the TPU to operate. Using a volt meter check for 200 vdc at the towfish connector of the TPU. Meter from 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 the 200 VDC is reaching the towfish end of the tow cable. Meter across pins 1 and 2 of the tow cable/towfish connector.

The 200 VDC enters the towfish and passes through the feed-thru connector; it then enters the Multiplexer board on a gold SMA connector. To check, unplug the connector and meter from the center to the outside edge.

At the Multiplexer board the 200 VDC goes through L3, L4, and L5 and exits the board at JP9. The 200 volts supplies power to the low voltage power supply which then supplies +5, +15, and -15 volts back to the Multiplexer board.

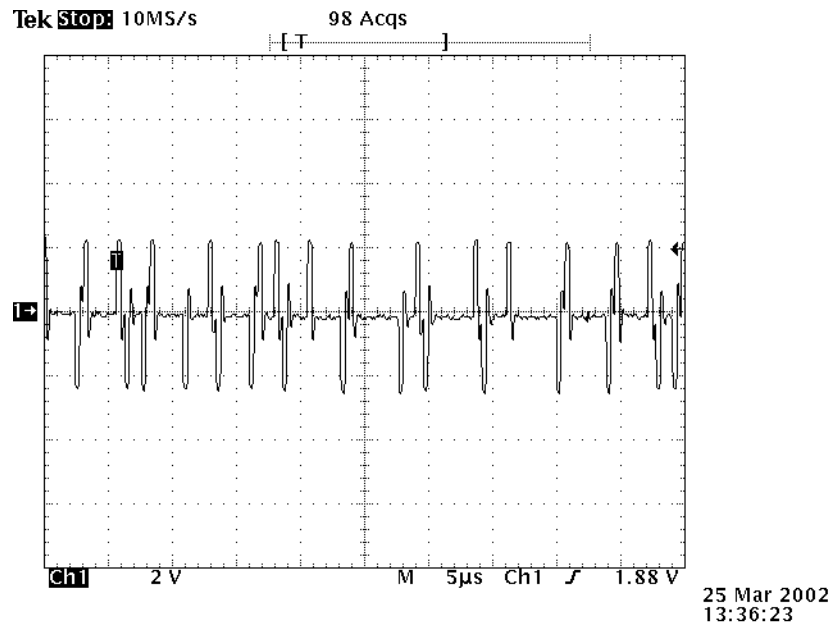


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The 200 VDC on the Multiplexer board also supplies 200VDC power to the Transceiver boards. If the 200 volts is being pulled down on the Multiplexer board, remove the two Transceiver boards and meter again.

The Data is coupled with the 200 VDC.

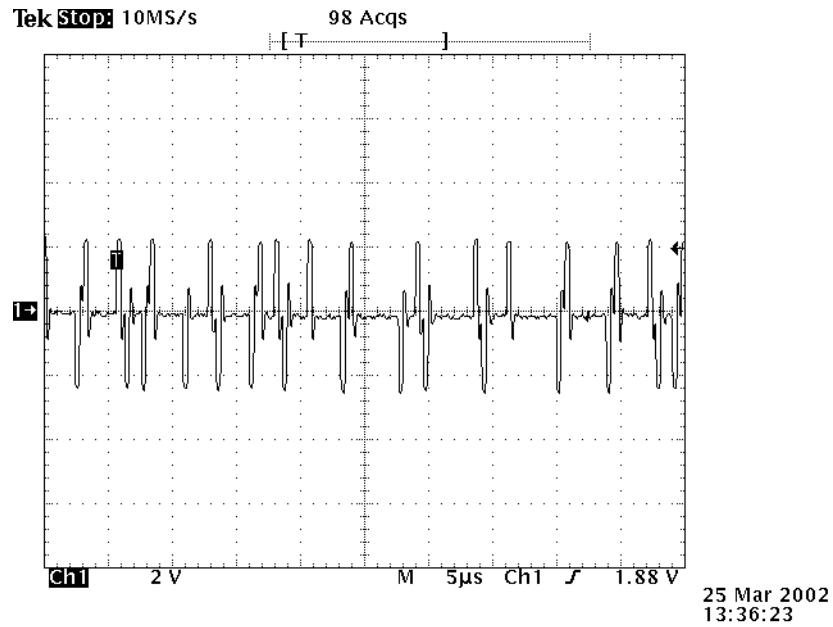
TP1 shows the data before it is coupled to the 200 volts.



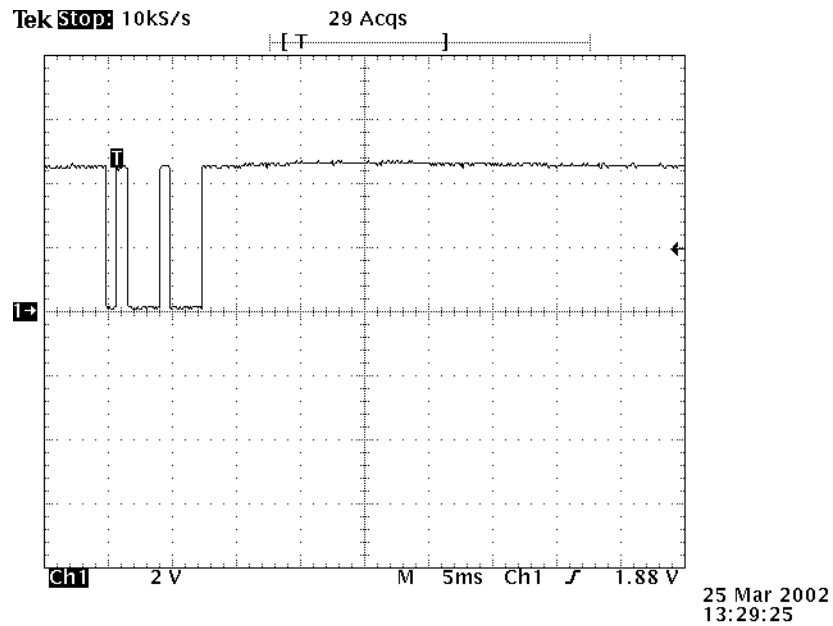
Check this point if you have 200 VDC but no towfish activity. Info: these measurements were made with a 30 meter test cable and a 3dB attenuator at the input to the Demultiplexer board.

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TP2 shows the downlink data. Check here if the towfish is not transmitting.

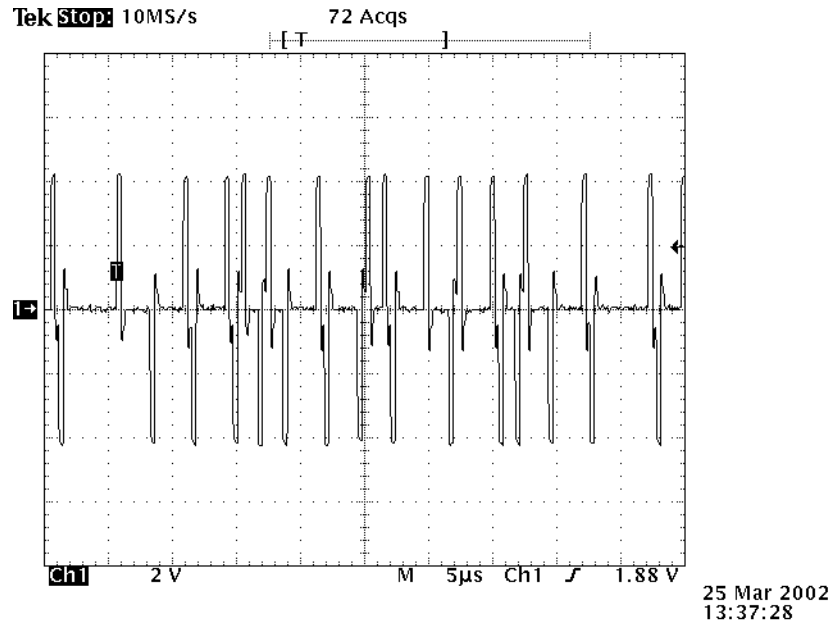


TP7 shows the Trigger FSK information. Check here if the towfish is not transmitting.



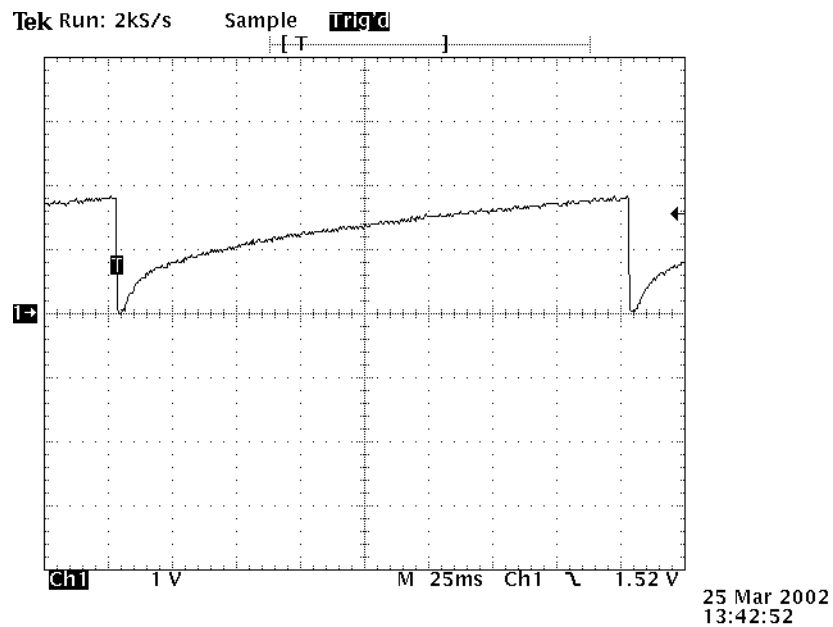
SYSTEM 3000 OPERATIONS AND MAINTENANCE MANUAL

TP5 shows the Uplink data. Check here if the towfish is transmitting but there are data problems.



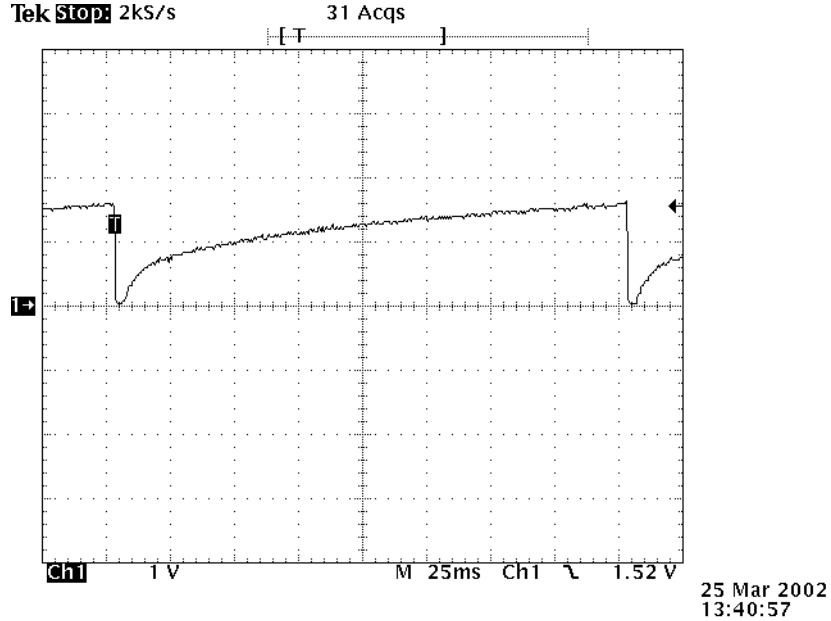
Each Transmitter board has a TVG (Time Variable Gain) curve that controls the signal gain.

TP6 shows the TVG for the 500 kHz transmitter board.

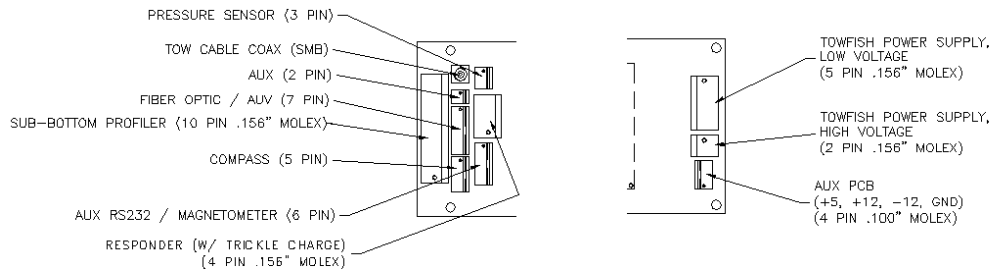


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TP4 shows the TVG for the 100 kHz transmitter board.



Multiplexer Connectors:

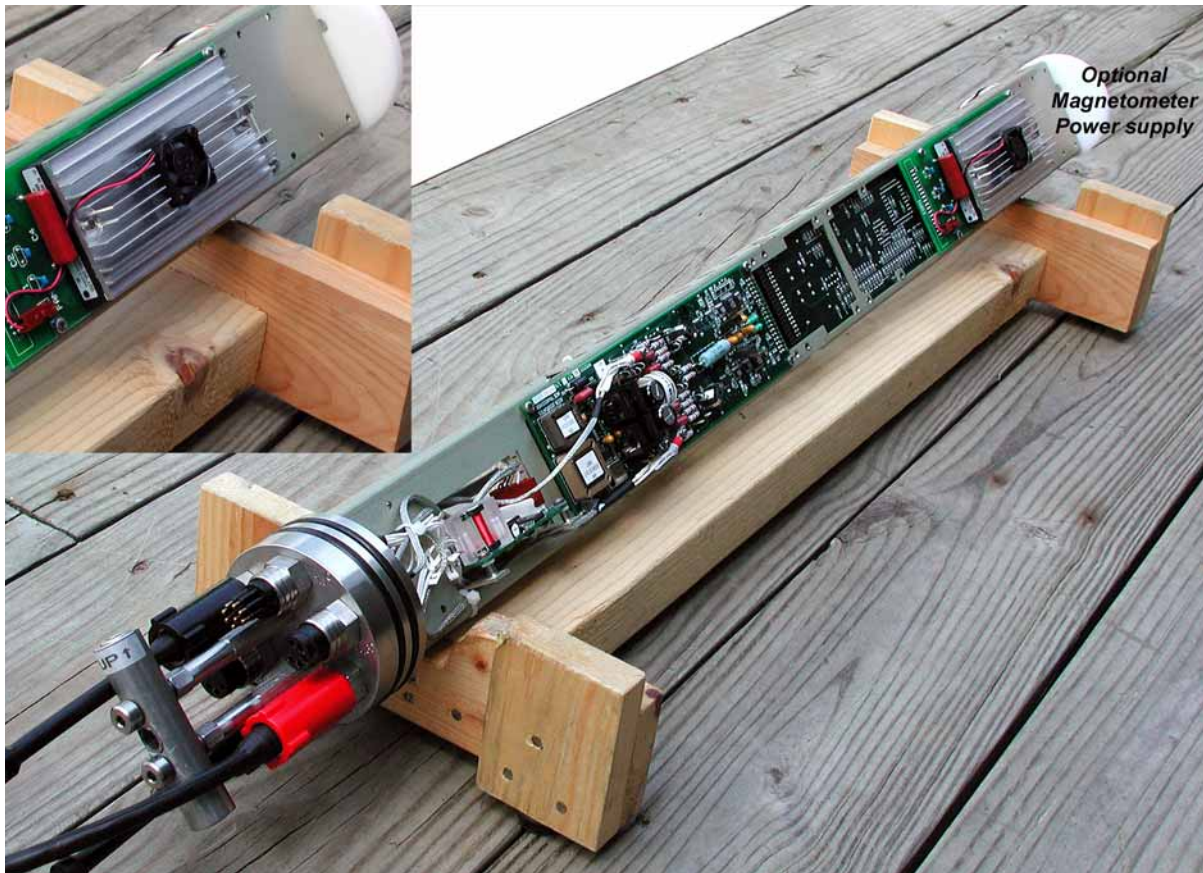


4.26 MAGNETOMETER VOLTAGE.

The power voltage for an optional magnetometer is set on the Multiplexer board with a jumper on JP2.

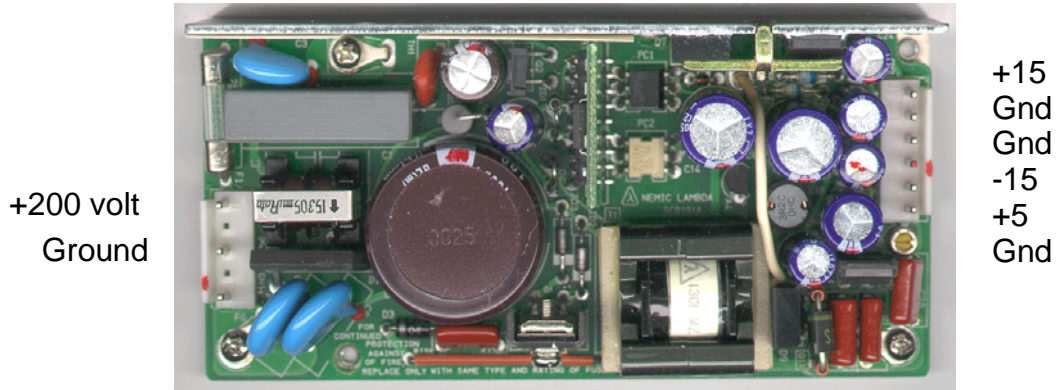
Positions:

- 1-2 external power (default when no magnetometer is in use)
- 3-4 +5 volts
- 5-6 +12 volts
- 7-8 +200 volts

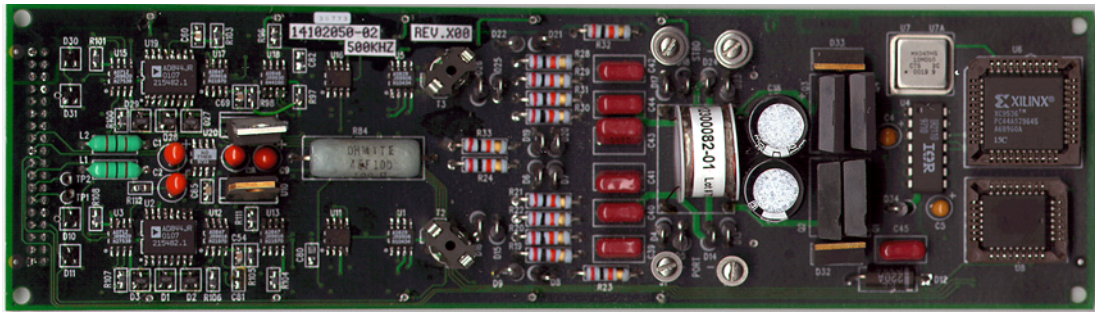


View of power supply for optional magnetometer.

4.27 TOWFISH LOW VOLTAGE POWER SUPPLY PINOUTS.



4.28 CHECKING THE TRANSCEIVER BOARDS.

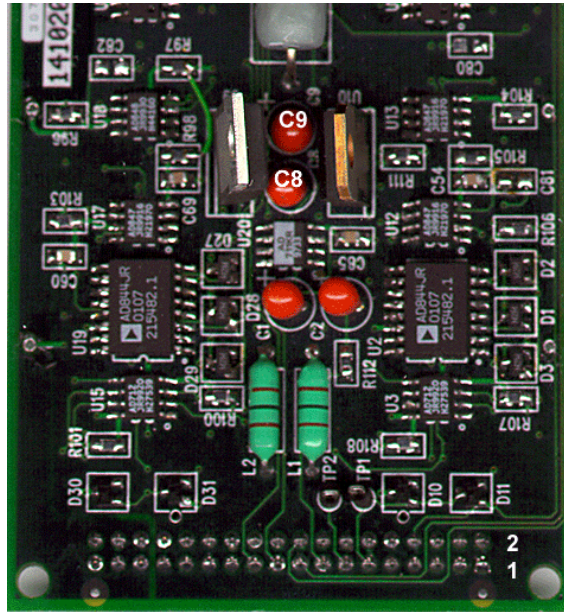


First make sure you have a good Multiplexer board.

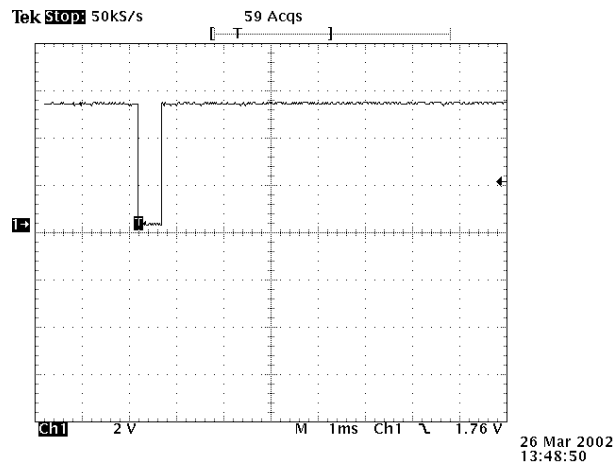
Verify the power on the Transceiver board.

- +15 pins 23, 24
- 15 pins 27, 28
- +5 coming into board on 35, 36
- on board + side of C8
- 5 on board - side of C9
- +200 pins 1, 2, 3, 4, 5, 6

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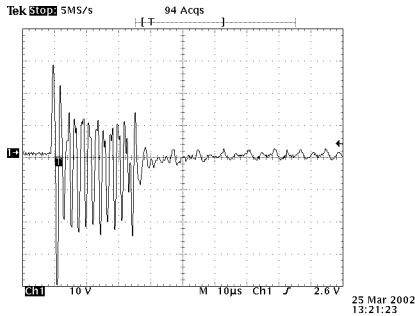


Check for a Trigger pulse on Pin 21.

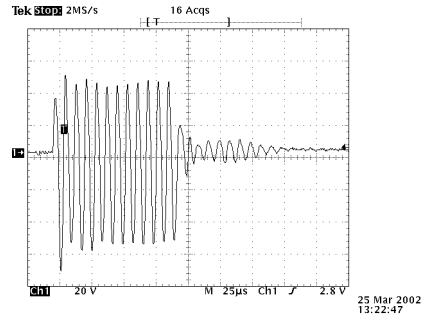


Lay an oscilloscope probe, with tip on, against the + transducer lead on each board to verify the transmit pulse.

Sample Transmit waveform



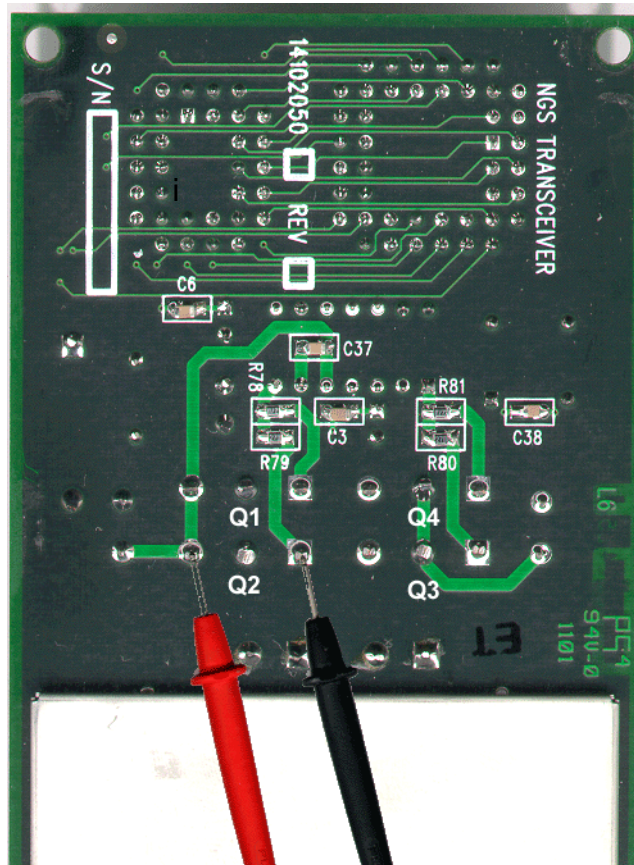
500 kHz



100 kHz

Checking the FET's

If you are having Transmitter problems, you can check FET's Q1, Q2, Q3, and Q4, on the Transceiver boards with a meter.



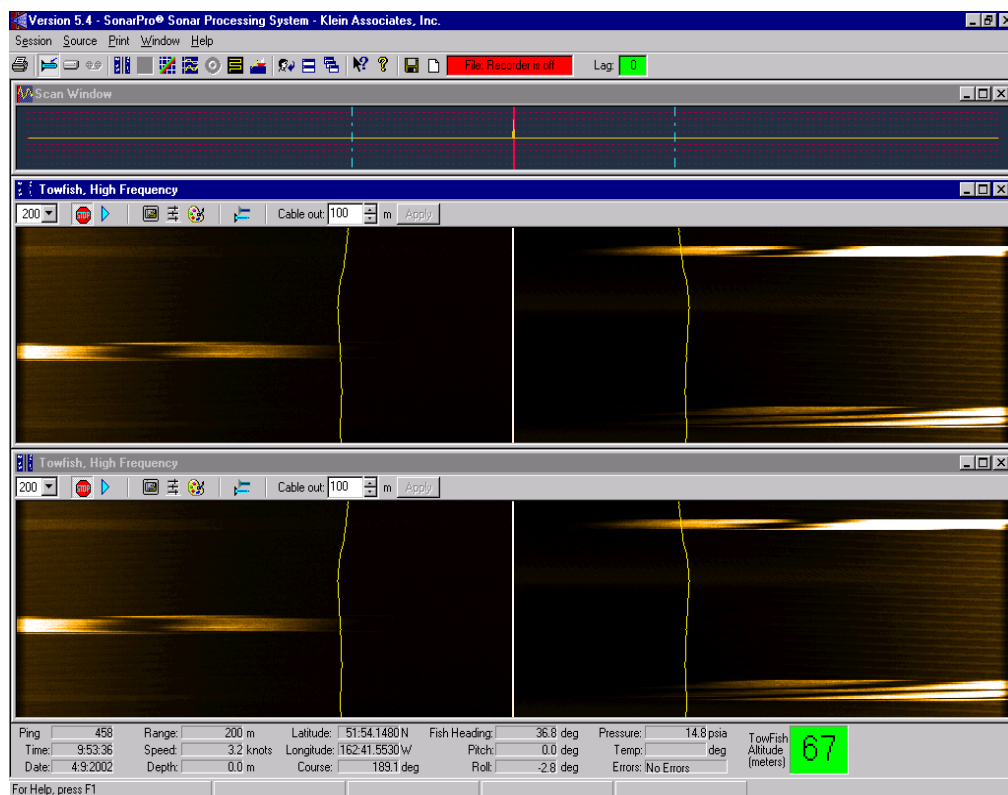
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Meter across each of the FET's as in the previous photo. The reading should be about 2.4 Meg ohms. Reverse your test leads and re-measure. The reading will now be about 3.7 Meg ohms. Readings will vary slightly, but if there is a large reduction in resistance, the FET may be questionable.

4.29 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.

4.30 CHECKING THE SENSORS.



Sensor readings can be read out directly on the display as seen in the above picture. 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.

4.31 COMPASS CALIBRATION.

A compass calibration wizard was added to SonarPro, with the release of version 5.2.

To use, Select:

Sonar Interface

Towfish Diagnostics

Run Compass Calibration Wizard

Follow the instructions and play the demonstration animation.

This must be done away from all magnetic and metal sources, and in most cases, it will have to be done off the ship.

First, enable the towfish compass calibration mode; then rotate the towfish slowly 360 degrees in a circle (for 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.

NOTICE

Excellent calibration results have been obtained by enabling the compass calibration and towing the towfish in a series of three circles with the boat.

4.32 COMPASS CALIBRATION WITH A MAGNETOMETER (OPTION).

Before running the compass calibration, you must turn off the magnetometer uplink.

Open the startup.ini file in the klein directory, and change the line

set DEFAULTUPLINK 1 to set DEFAULTUPLINK 0.

save startup.ini file.

Run the compass calibration in SonarPro. Once compass has been calibrated, open the startup.ini file, and change the set DEFAULTUPLINK back to 1.

CAUTION

If trying this method, survey the area first, making sure you have enough water to operate safely, since the transmitters are turned off.

Compass calibration can also be done manually by selecting:

Sonar Interface

Towfish Diagnostics

Enter the following command sequence into the Operator command area.

Compass Calibration Commands

(Follow the order below, and make sure to use "Send Command")

\$MAF	Turn off low frequency transducer transmitter
\$MBF	Turn off high frequency transducer 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 transducer transmitter
\$MB0	Turn on high frequency transducer transmitter

Now turn towfish off and then on again, and check that the compass is working. This completes the calibration.

Series 3000 Towfish Commands for Troubleshooting

Multiplexer Commands:

\$MLn	Low frequency TVG page select. 7 is default.
\$MHn	High frequency TVG page select. 7 is default.

Transmitter Commands:

\$MAF	Turns the 100kHz transmitter off.
\$MA0	Turns the 100kHz transmitter on
\$MBF	Turns the 500kHz transmitter off
\$MB0	Turns the 500kHz transmitter on

4.33 SOFTWARE TROUBLESHOOTING.

If SonarPro will not open, or if SonarPro is saved in a corrupted condition and will not operate, you can recover to the default installation condition by editing the operating system's Registry.

This is done as follows.

Open REGEDIT and follow the path

My computer

Hkey_current user

Software

Klein Associates

SonarPro

Select and **delete** the SonarPro entry.

To update the registry to default status.

Open SonarPro and click SESSION, NEW STATE.

To totally remove C-Maps from the registry

Open REGEDIT and follow the path

My computer

HKEY_CURRENT_USER

Software

Delete C-Map

HKEY_LOCAL_MACHINE

Software

Delete C-Map

Delete Aladin

4.34 FIBER OPTIC TERMINATION INFORMATION.

Terminating the Fibers.

Use a termination kit, such as the Fotec fiber optic termination kit.

Plug oven in.

Place a piece of tape on the table to catch the fiber when cut.

Mix epoxy.

Put epoxy into the syringe.

Slide strain relief over fiber.

Strip fiber every 1/8 inch until you have stripped 1 inch off (yellow handled strippers).

Clean stripped fiber with alcohol wipe.

Take 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.

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.

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.

Cook for 10 minutes.

When cured cut the protruding fiber end off using the sapphire pencil tool. Use a light slicing motion.

Polishing

Air 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.

Place some slurry onto the rubber mat, glass, and purple diamond polishing pad.

Place the connector into the stainless steel polishing puck. Use a figure 8 polishing stroke.

Inspect with the inspection tool, and test for db loss.

4.35 PROBLEM TROUBLESHOOTING.

Problem:

No operation, but the Lock Loss and Carrier Loss lights are off.

Check:

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.

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 volts DC.
 Check TP7, and TP12 wave forms 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 200VDC 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 klein tech. support for more details.

TPU will not boot.

The probable cause is the failure of the backup battery on the CPU board.

Error in boot line:

gibberish data

Contact Klein for a replacement.

Can't load boot file!!

See replacement information.

error messages.

4.36 CPU BATTERY REPLACEMENT

If you have problems with the TPU booting up and you get the error message:

Error in boot line

and a boot up screen similar to the following:

Carefully pull up on the battery to remove.

Install the new battery. When you turn the TPU on you will have to set up the boot parameters. Please refer to the boot up configuration section on page 18 and on page 21.

4.37 SUGGESTED TOOLS FOR 3000 SERVICE.

- Fluke 87 multimeter
- Tektronix TDS 3014, 4-channel or a THS720A 2-channel digital oscilloscope
- Hewlett Packard 4194 A, impedance / gain-phase analyzer with measurement unit
- Terminal program such as "Hyperterminal for Windows"
- Small flat blade screwdriver for adjustments
- Medium philips-head screwdriver for #4, 6, and 8 screws
- 6mm 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

4.38 SPARE BOARDS AND COMPONENTS.

We suggest the following for full spare components:

For TPU

1	Demultiplexer board
4	U2 AD826 IC For Demultiplexer board
1	TPU CPU board
1	Power Supply board
10	Towfish fuses
6	AC fuses

For Towfish

1	Multiplexer board
1	100 kHz Transceiver board
1	500 kHz Transceiver board
1	Compass assembly
1	Towfish Power Supply

Components

For Multiplexer Board

1	MC7905ACT	-5volt regulator
1	MC7805ACT	+5volt regulator
1	1mH	Coil L3
4	4.7 ohm 1 watt	Resistors
4	100mH	Coil L1, L2

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For Transmitter Board

1	IR2110	Driver U4
2	IRF254	Power FET
1 each	Transformer	12300082, 12300149
2	HFA25TB60	D32, D33

For TPU 200VDC Power Supply Board

4	MUR130	Diodes for D7 and D8
4	P6KE10	Diodes for D9 and D10
2	MJ10012	Transistor for Q1
2	4.7 ohm 1 watt	Resistor for R11

Spare 100 meter lightweight tow cable.

4.39 SYSTEM 3000 CURRENT DRAW.

3000 TPU Current Draw at 120 VAC

TPU Standby:

No Towfish Connected: 0.5 amps

Towfish Connected: 0.9 amps

TPU / Towfish Transmitting:

25M Range Scale: 1.1 amps

75M Range Scale: 1.0 amps

400M Range Scale: 0.9 to 1.0 amps

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TPU Inrush:

No Towfish Connected: 1.6 amps

Towfish Connected: 2.4 amps

For power planning purposes, a System 3000 operating with the following components would use 361w:

TPU with towfish	240w
Hub	21w
Laptop Computer	100w
Total	361w

4.40 3000 PRF / PERIOD PER RANGE

Range in Meters	Period in Milliseconds	PRF
25	33	30
37.5	50	20
50	67	15
75	100	10
100	133	7.5
150	200	5

Formula for PRF/Period

$$T=R/C/2$$

T = Time

R = Range

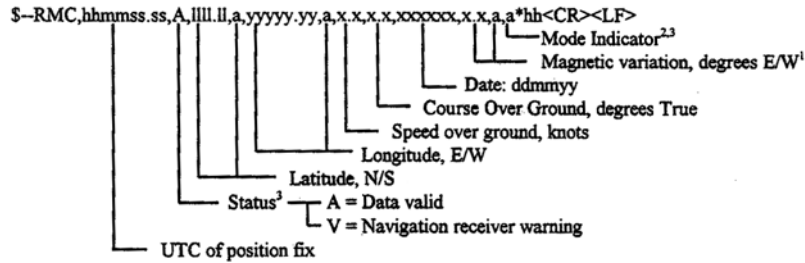
C/2 = Speed of sound in water/2 = 750

$$T=R/750$$

4.41 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.



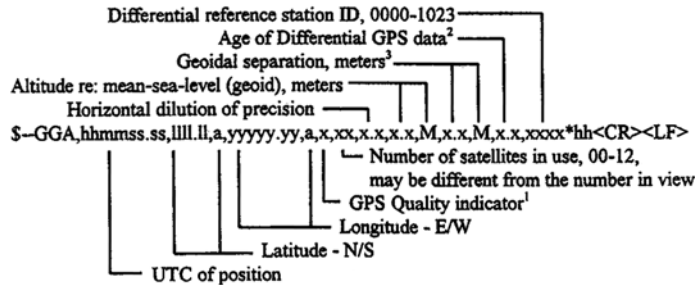
Notes:

- 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 =

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GGA - Global Positioning System Fix Data

Time, position and fix related data for a GPS receiver.



Notes:

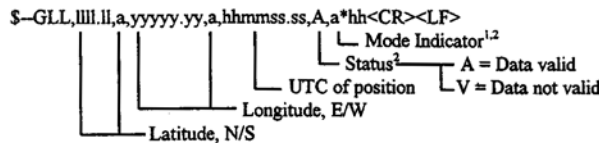
- 1) GPS Quality Indicator: 0 = Fix not available or invalid
 1 = GPS SPS Mode, fix valid
 2 = Differential GPS, SPS Mode, fix valid
 3 = GPS PPS Mode, fix valid
 4 = Real Time Kinematic. System used in RTK mode with fixed integers
 5 = Float RTK. Satellite system used in RTK mode, floating integers
 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

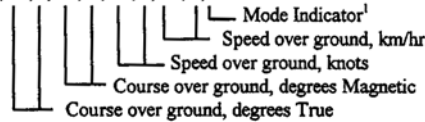
- 2) The positioning system Mode Indicator field supplements the positioning system Status field, the Status field shall be set to V = Invalid for all values of Indicator mode except for A= Autonomous and D = Differential. The positioning system Mode Indicator and Status fields shall not be null fields.

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VTG - Course Over Ground and Ground Speed

The actual course and speed relative to the ground.

\$-VTG,x.x,T,x.x,M,x.x,N,x.x,K,a*hh<CR><LF>



Notes:

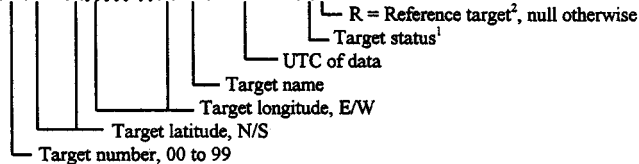
- 1) Positioning system Mode Indicator: A = Autonomous mode
 D = Differential mode
 E = Estimated (dead reckoning) mode
 M = Manual input mode
 S = Simulator mode
 N = Data not valid

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.

\$-TLL,xx,llll.ll,a,yyyyy.yy,a,c-c,hmmss.ss,a,a*h <CR><LF>



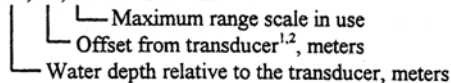
Notes

- 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>



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.

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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
```

4.42 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. The 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

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APPENDIX C

INFORMATION FOR SYSTEM 3000 OPERATIONS WITH A MAGNETOMETER

The System 3000 is designed for easy operation with most popular magnetometers.

Configuring the System 3000 for use with the magnetometer.

Magnetometer power voltage is set on the Multiplexer board with a jumper on JP2. Select the appropriate voltage from one of the following positions.

- 1-2 external power (default when no magnetometer is in use)
- 3-4 +5 volts
- 5-6 +12 volts
- 7-8 +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
```

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When Adding a magnetometer into the system, the **startup.ini** file must be modified by adding the line set DEFAULTUPLINK 1. The new **startup.ini** file will look like this:

```
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 look like this:

```
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.

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NOTICE

When calibrating the compass, the default uplink has to be set to 0.

NOTICE

The startup.ini is a text file and may be edited in any word processing program such as Wordpad.

There are a few ways to connect to the magnetometer for data transfer.

Method 1

Connect the magnetometer PC into Com 4 on the TPU using a straight (non null modem) RS232 cable.

If using Hyperterminal make sure it is in the connect state.

Configure your terminal or software for 9600-8-N-1, and set none for flow control.

Power up the sonar system and wait for the system to boot. Once the towfish is active open SonarPro and start the sonar. Magnetometer data will be transmitted out of Com 4.

To send commands down to the magnetometer, click on the Sonar Interface tab in SonarPro, select the towfish diagnostic tab, and enter your command in the "Operator Command" string window. The following format is uppercase:

\$PKLA,FC\$Axxxx where xxxx is the magnetometer command.

Example: \$PKLA,FC\$AF00

Commands can be up to 24 characters in length.

Click Send Command button.

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Alternate Method 2

Connect a PC with a null modem cable to Com 3 on the TPU.

Configure your terminal or software for 9600-8-N-1 and set none for flow control.

Power up the sonar system and wait for the system to boot. Once the towfish is active, open 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 place SonarPro in Standby while the commands are sent down to the magnetometer.

Alternate Method 3

Connect the magnetometer PC into Com 4 on the TPU using a straight (non null modem) RS232 cable.

Configure your terminal or software for 9600-8-N-1, and set flow control to none.

Power up the sonar system and wait for the system to boot. Once the towfish is active open SonarPro and start the sonar. Magnetometer data will be transmitted out of Com 4.

Connect a PC with a null modem cable to Com 2 on the TPU.

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.

To send commands down to the magnetometer, use the following format in uppercase:

\$PKLA,FC\$Axxxx where xxxx is the magnetometer command.

Example: \$PKLA,FC\$AF00.

Echoing Commands Out of Com 3.

To echo the sent commands out of Com 3, set the computer terminal program to 1200 baud.

Use a null modem cable.

Change the following line in the startup.ini file to read:

set TOWFISHECHO 1.