



IMAGENEX MODEL 882-GS GYRO STABILIZED MULTI-FREQUENCY IMAGING SONAR

APPLICATIONS:

- ROV, AUV, & UUV
- Manned Submersibles
- Search & Recovery
- Borehole/cave work
- Drop sonar
- Scientific Research

FEATURES:

- **Ethernet** (or Optional Serial)
- Programmable (format available)
- Gyro stabilized transducer steering
- Simple set-up and installation
- Full scale range from 1 m to 100 m
- Orientation module

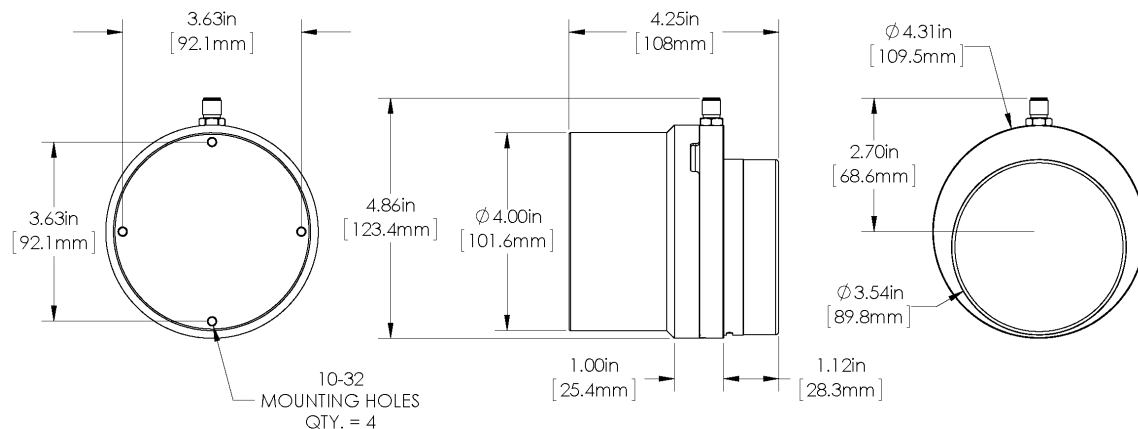
Gyro-stabilization makes the high resolution 882-GS sonar capable of crystal clear visualization of the ocean environment from moving platforms, no longer compromised by the blurring effects of host vehicle rotation. An advanced, low drift gyro is integrated directly into the sonar head, so the sonar can compensate for vehicle motion in real time with unprecedented accuracy, stability, and robustness.

Using Ethernet communications, this all-in-one, high performance digital imaging sonar exceeds 100 shots per second on short range at up to 2 mm range resolution, and can auto-adjust acoustic frequency and resolution to scan up to a 100 m radius, 360° surrounding area.

The Model 882-GS has low power, simple set-up, and small size that make it an ideal tool for large work ROV's and small inspection vehicles. On it's own it is an amazingly simple drop sonar and borehole inspection package: just add a laptop computer and power supply and run the included Imagenex software.



HARDWARE SPECIFICATIONS:	
FREQUENCY	675 kHz or 1 MHz (standard default settings) -Other frequencies can be selected through programmable software configurations (Tunable from 280 kHz to 1.1 MHz in 5 kHz steps)
TRANSDUCER	Imaging type, fluid compensated
TRANSDUCER BEAM WIDTH	675 kHz: 1.8° x 20° 1 MHz: 0.9° x 10°
RANGE RESOLUTION	1 m – 4 m: 2 mm (0.08") 5 m & up: 10 mm (0.4")
ORIENTATION MODULE (accuracies):	
PITCH & ROLL	± 0.1° typical
HEADING (Magnetic)	± 1.0° typical
MIN. DETECTABLE RANGE	150 mm (6")
MAX. OPERATING DEPTH	300 m and 1000 m available
MAX. CABLE LENGTH	Standard: 100 m on CAT5e (Ethernet) Cable length may be increased up to ~9000 m using an Ethernet extender. Please enquire for more information.
(Optional Serial Interface)	1000 m on typical twisted shielded pair (RS-485)
INTERFACE	Standard: 10 Mbps Ethernet (10 BASE-T) using TCP/IP Bit rate may vary if an Ethernet extender is in use.
(Optional Serial Interface)	RS-485 serial interface @ 115.2 kbps (or optional RS-232)
CONNECTOR	Ethernet IE55-1206-BCR
	Serial IE55-1004-BCR
POWER SUPPLY	20 – 32 VDC at less than 7 Watts
DIMENSIONS	300 m unit: See drawing below 1000 m unit: TBA
WEIGHT: In Air	300 m unit: ~1.2 kg (~2.6 lbs) 1000 m unit: TBA
In Water	300 m unit: ~0.3 kg (~0.7 lbs) 1000 m unit: TBA
MATERIALS	6061-T6 Aluminum & Polyurethane
FINISH	Hard Anodize



SOFTWARE SPECIFICATIONS:	Win881AL.exe
WINDOWS™ OPERATING SYSTEM	Windows™ XP, Vista, 7, 8, 10
MODES	Sector, Polar and Side Scan
GYRO MODES	North Up, Heading Up, Target Steering
RANGE SCALES	1 m, 2 m, 3 m, 4 m, 5 m, 10 m, 20 m, 30 m, 40 m, 50 m, 60 m, 80 m, 100 m
TRAIN ANGLES	Continuous rotation, 3° increments
SECTOR SIZE: SECTOR MODE POLAR MODE	0° – 180°, 3° increments 0° – 357°, 3° increments, or Continuous rotation
STEP SIZES	Slow (0.3°), Medium (0.6°), Fast (0.9°), Faster (1.2°), Fastest (2.4°)
GRID TYPES	Polar and rectangular
FILE FORMAT	(filename).81R
RECOMMENDED MINIMUM COMPUTER REQUIREMENTS:	2 GHz Pentium 4 256 MB RAM 20 GB Hard Disk 1024 x 768 Screen Resolution

ORDERING INFORMATION:		
300 m UNIT	Standard	882-000-100
1000 m UNIT	Standard	882-000-101
RS-232	Option	-006
RS-485	Option	-007
IP Address* (for Ethernet version only)	Option	-020

*Note: Standard IP Address is 192.168.0.5
A different IP Address may be specified upon ordering.

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I M A G E N E X

IMAGENEX TECHNOLOGY CORP.

**Model 882L
Gyro Stabilized Scanning Sonar**

(Ethernet Version)

Quick Start

Number	430 - 032	
Revision	Date	Description
00	July 24, 2014	Release
01	September 24, 2014	Increase Minimum Power Supply to 2A
02	January 22, 2015	Added auto bias, and auto file size

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1.0 Introduction

The Model 882L is an advanced gyro-stabilized, high-resolution scanning sonar system that has been designed to provide simple, reliable, and accurate representation of underwater images.

2.0 Getting Started:

The 882L was designed to be user friendly and simple to set up in the field. It is generally recommended however to perform a preliminary setup before heading out into the field.

2.1 Step-By-Step Start Up Guide

1. Physically mount the sonar referring to **Section 2.4** on **page 5** for details.
2. Ensure 24V_{DC}@ 2A minimum power supply is off
3. Referring to **Appendix A – Ethernet Setup Guide**, configure the network cards IP address.
4. Connect the RJ45 (looks like a large telephone connector) to the PC's network card.
5. Plug the underwater connector to the sonar.
6. Deploy to stable, flat location
7. Power up the 882L.
8. Wait for gyro calibration to complete. The sonar, upon power up, will calibrate the motor, and automatically perform a gyro calibration. No communication to the gyro sub system is available at this time.
9. Verify the “**Local Latitude**” setting in the “.ini” file and adjust if necessary. Refer to **Section 2.5.2** on **page 11** for details
10. Launch the “*Win88IAL_GS.exe*” program
 - If file playback is desired, use the menu command “*File->Open File to Playback*”.
 - If real-time operation is desired, use the menu command “*File->Connect to Sonar Head*”.
11. Proceed to **Section 2.5** on **page 6** for software instructions.

2.2 Gyro Calibration

Imagenex Gyro enabled scanning sonars now incorporate an automatic gyro biasing feature which is selectable in the program. This mode continuously re-bias's the gyro in real time accommodating for temperature fluctuations. Refer to Table 2.1 on page 6 for details on enabling / disabling this mode. The information below describes the manual biasing mode which may be necessary in strong magnetic field environments.

All gyros are sensitive to the environment (i.e. temperature, motion, Earth's rotation, etc.) and will naturally drift with time. Therefore, from time to time, it is recommended to issue a gyro calibration to remove the accumulated drift.

It is **ESSENTIAL** that the sonar is completely stationary and at constant temperature during gyro calibration. **ANY** movement will cause undesirable drift in the gyro.

2.2.1 Manual Gyro Calibration procedure

Do not calibrate the gyro until the internal temperature of the sonar has stabilized, approximately 30-60minutes underwater.

1. Mount sonar on a level, stable surface, or settle the ROV on a flat bottom.
2. Under the “Options” Menu, select “Calibrate Gyro”.
3. Standard sonar operation is suspended during gyro calibration.
4. The message “Calibrating Gyro” will appear. Calibration takes approximately 30secs.
5. Once the message disappears, standard operation commences.

2.3 Overview

While traditional scanning sonars provide excellent imagery, they have a significant short coming...they rely on the sonar being perfectly still during data acquisition. Imagenex has developed the ideal solution...the 882L. Figure 2.1, below, shows a non stabilized image taken while the sonar was spinning. Note the wavy lines in the lower 2 quadrants. Now refer to the same area scanned with Gyro stabilization enabled (Figure 2.2, below). Now the image is well defined and straight.

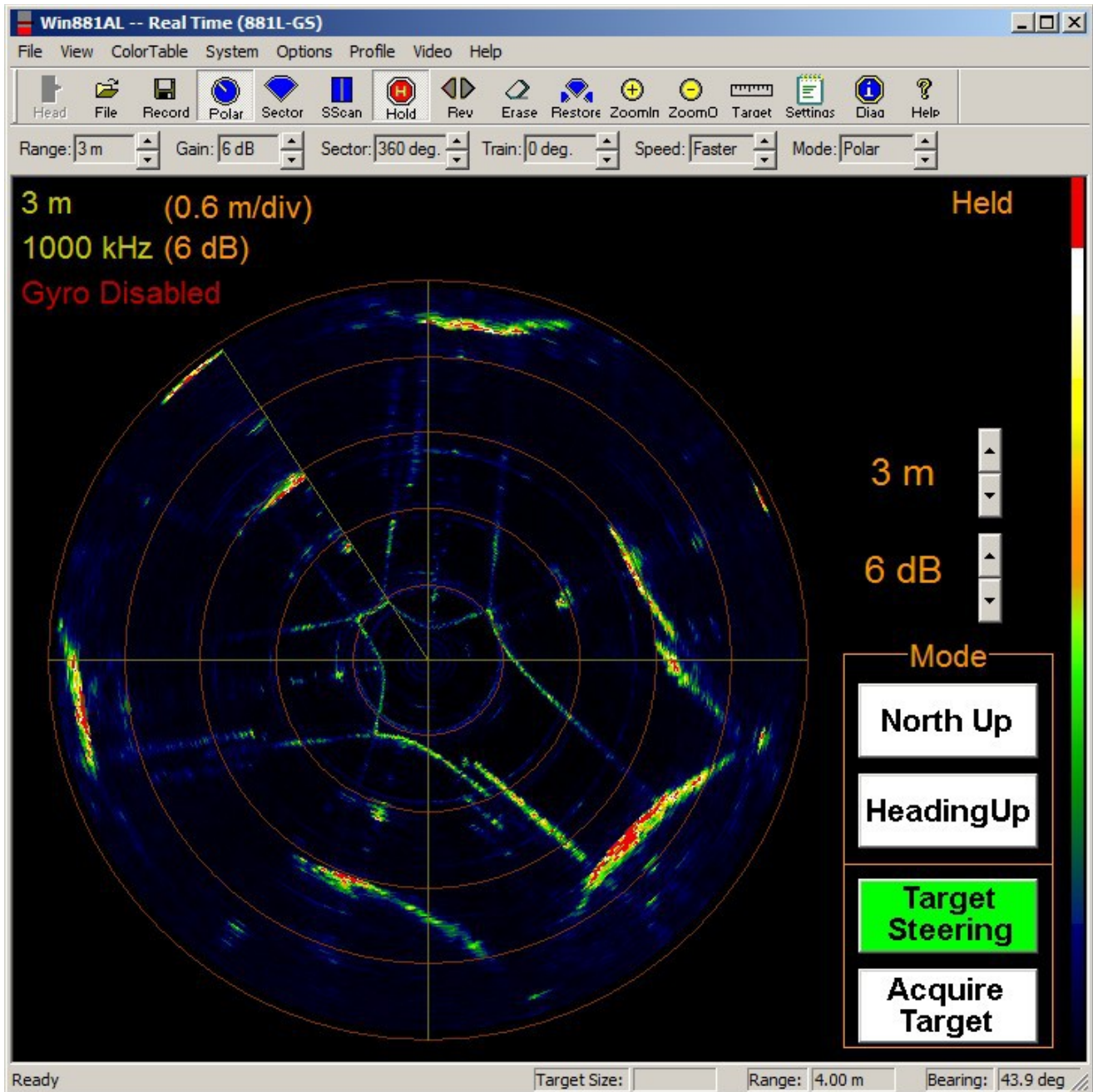


Figure 2.1: Unstabilized Image

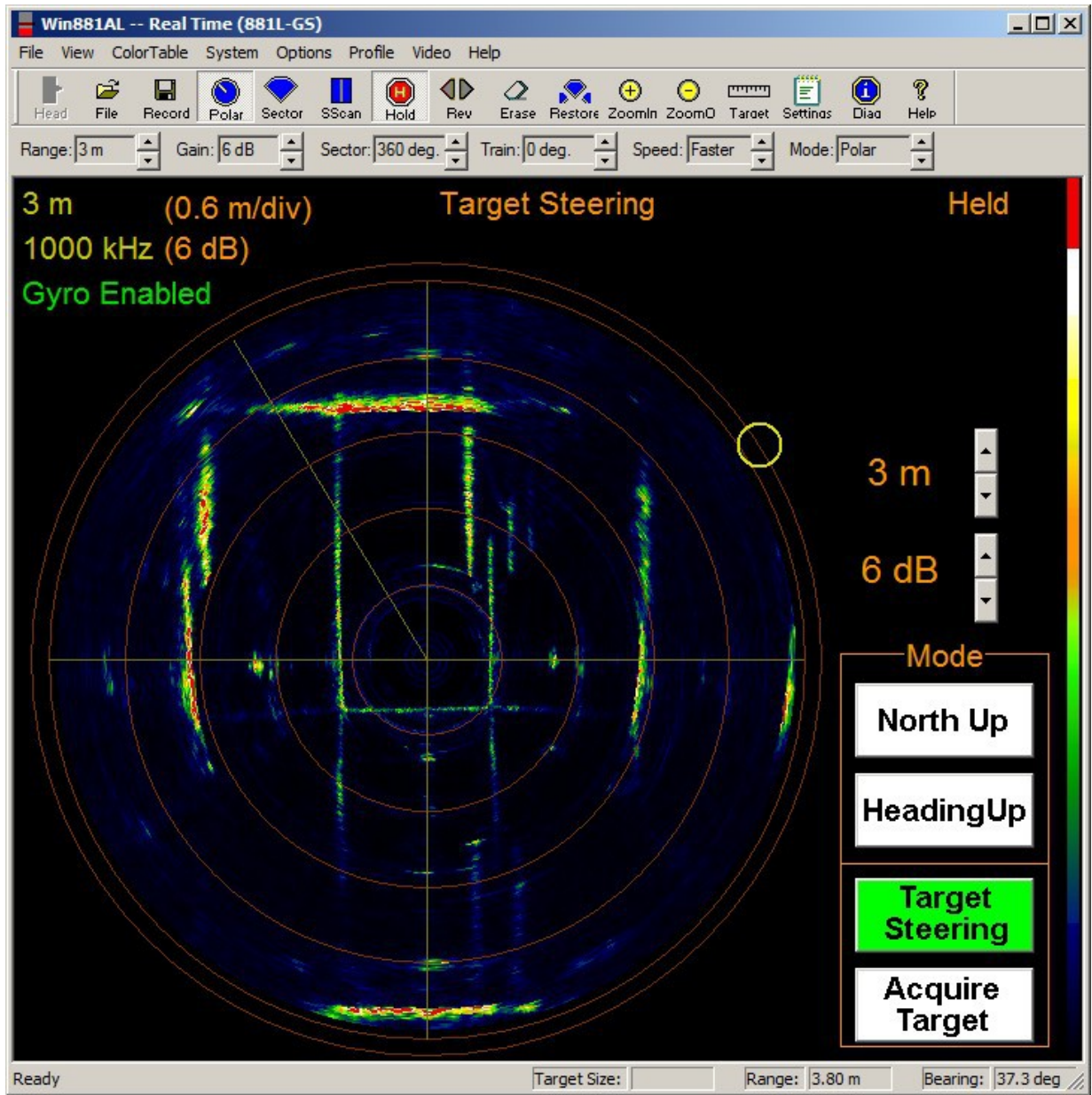


Figure 2.2: Stabilized Image

2.4 Hardware

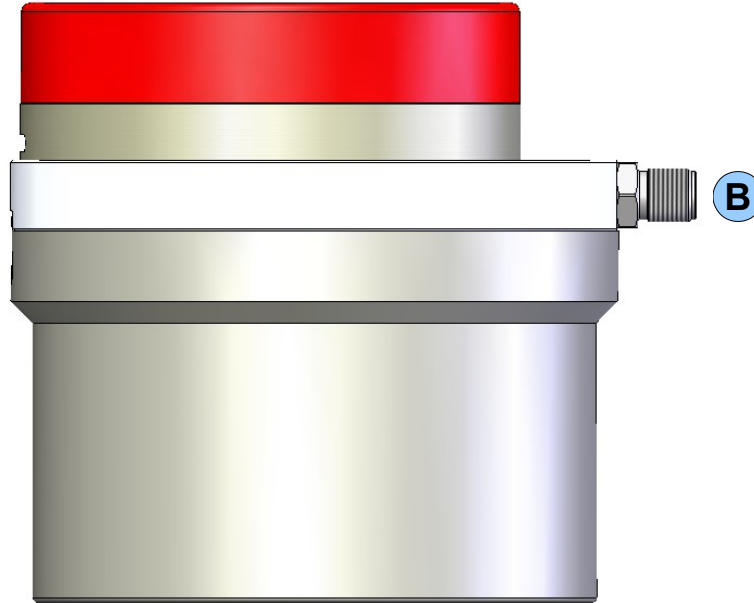


Figure 2.3: 882L

Figure 2.3, above, indicates the 882L in the “Transducer Up” orientation.

- A** Transducer End. **FRAGILE**. This area **MUST** be exposed to the water with no obstruction. Do not mount sonar using this area.
- B** Connect sonar cable. Ensure locking sleeve is used. Do not bend pins.
- C** Electronics Bottle. Use this area for mounting the sonar.

2.5 Software

After installing the “Win881AL_GS.exe” program (generally “C:\Program Files (x86)\Imagenex”), load the program by double-clicking on its icon.

The program, which supports the 881A, 881L, 881A-GS, 881L-GS, 882L, and 882L will need to be told which sonar type is being connected. Choose 882L from:

“System => Sonar Type => 882L”

This configures the program to operate in 882L mode.

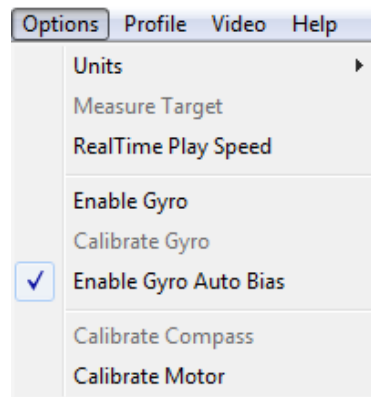


Figure 2.4: Options Menu

Ref	Item	Description
1	Enable Gyro	Enables Gyro Stabilized Image. Deselect to operate as standard 882L.
2	Calibrate Gyro	Calibrates gyro to compensate for drift.
3	Enable Gyro Auto Bias	Enabling this puts the sonar into auto bias mode where the sonar will continuously re-bias the gyro in real time. Disabling this mode requires a manual bias as described in Section 2.2.1 on page 2.
4	Calibrate Compass	Field Calibrates the internal Compass. To calibrate the compass, the sonar head MUST be rotated 360° (direction is irrelevant). Check “Calibrate Compass”, rotate 360°, then un-check “Calibrate Compass” to store the settings.
5	Calibrate Motor	Calibrates Motor and realigns the sonar head position relative to the transducer position.

Table 2.1: Options Menu

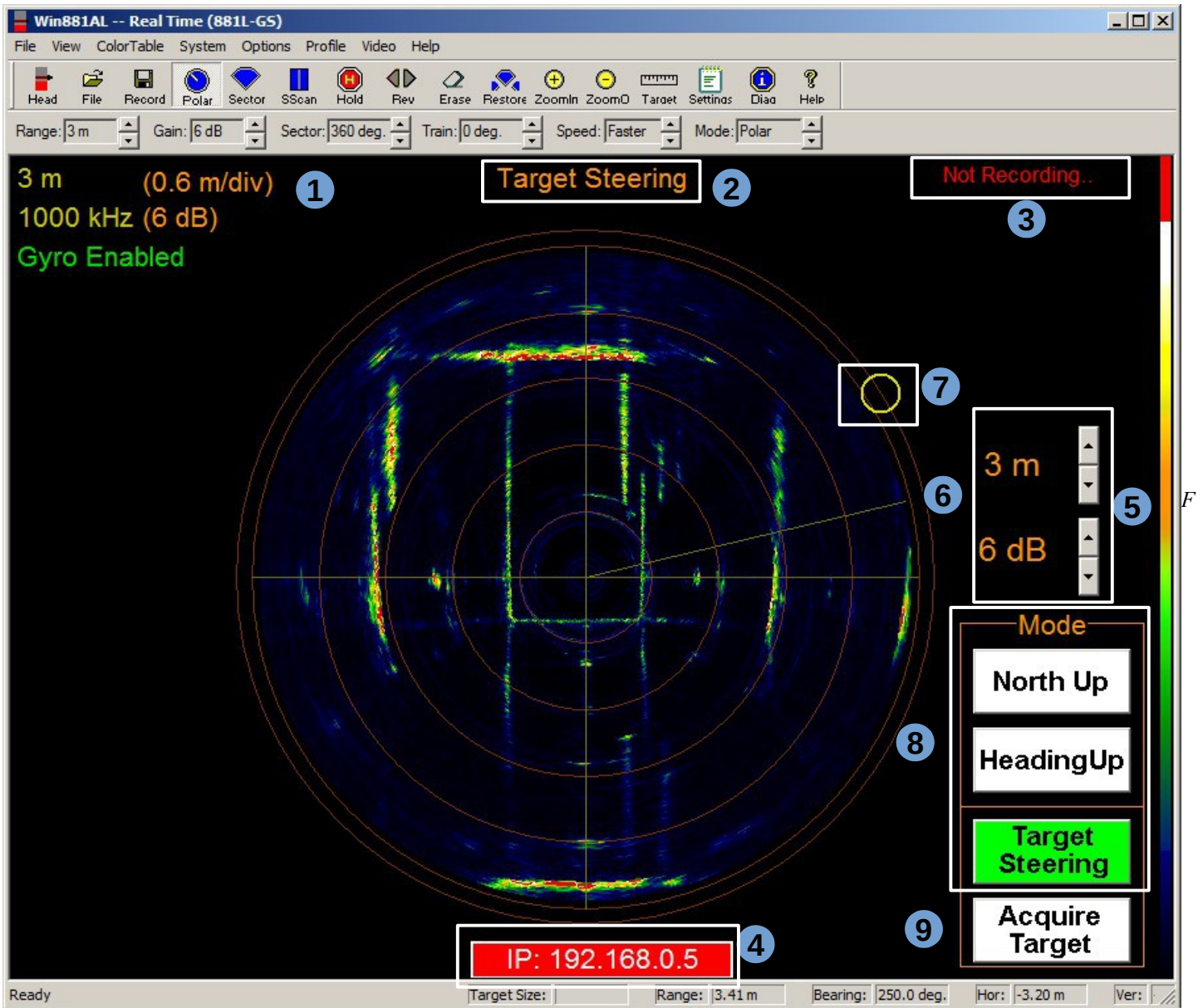


figure 2.5: Standard 882L Display

Ref	Item	Description
1	Range / Frequency Display	Display current acoustic range and frequency of sonar in yellow. Displays Grid scale and current gain in orange
2	Gyro stabilized operating mode	Displays only when Gyro Stabilized Image is enabled. One of: North Up, Heading Up, or Target Steering.
3	File Recording information	Displays “Not Recording” or “Recording...”
4	Communication Error Status	Displays “No Connection” when communication to the sonar is interrupted.
5	Quick Setting	Quick Setting for sonar range and gain
6	Wiper	Current transducer position for the “ping”
7	Sonar Position Indicator	The yellow circle indicates the current sonar position independent of the transducer position. In North Up mode, the circle will transverse around the perimeter of the sonar image which remains stationary in a North up orientation. In Heading Up mode, the circle will remain stationary at the top of the screen, while the sonar image rotates. In Target Steering mode, the circle will transverse around the perimeter of the sonar image which remains stationary
8	Gyro Stabilized Image mode selection	Selects the various modes of display. In North Up mode, the circle will transverse around the perimeter of the sonar image which remains stationary in a North up orientation. In Heading Up mode, the circle will remain stationary at the top of the screen, while the sonar image rotates according to the heading. In Target Steering mode, the circle will transverse around the perimeter of the sonar image which remains stationary
9	Acquire Target	Only active in “Target Steering mode, “Acquire Target” allow the user to select a target location. The sector will then be centred on the selected target and rotated to place the target at the top of the display. See Section 2.5.1, below for details.


Table 2.2: Main Display

2.5.1 Acquire Target

The 882L-GS has the ability to select a target of interest, and automatically centre and scan that target on screen. The procedure is as follows.

1. Ensure the gyro is enabled and in “Target Steering” mode.
2. Select the button “Acquire Target”.
3. Select desired target on screen

The image will perform a full polar scan.

The mouse cursor will change to 

The screen will automatically change to a top sector view with the target centred within the sector

This is described further below.

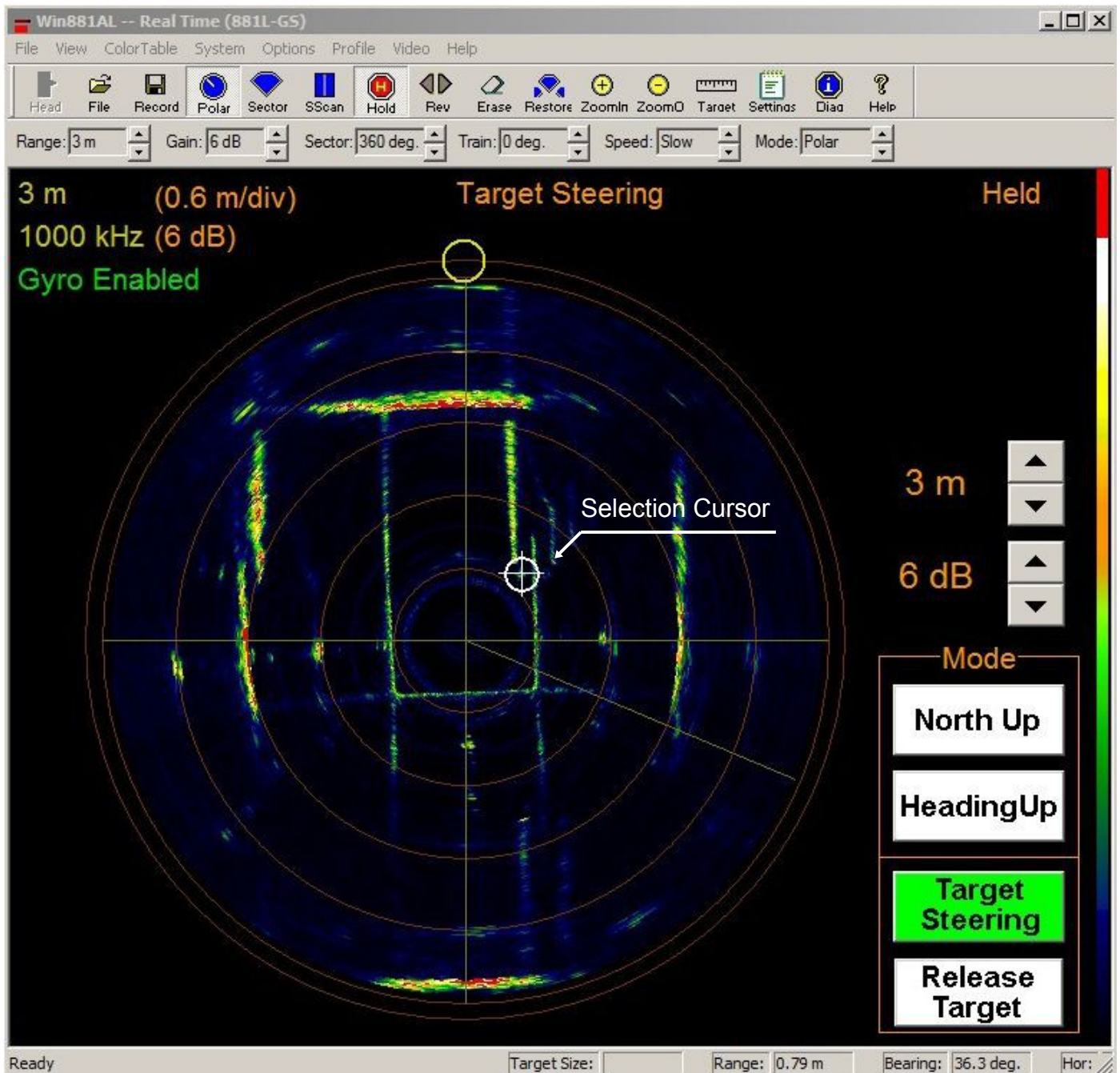



Figure 2.6: Acquire Target button has been selected

In Figure 2.6, above, the “Acquire Target” was selected and the mouse cursor changed to . In this example, the target of interest is positioned under the target cursor.

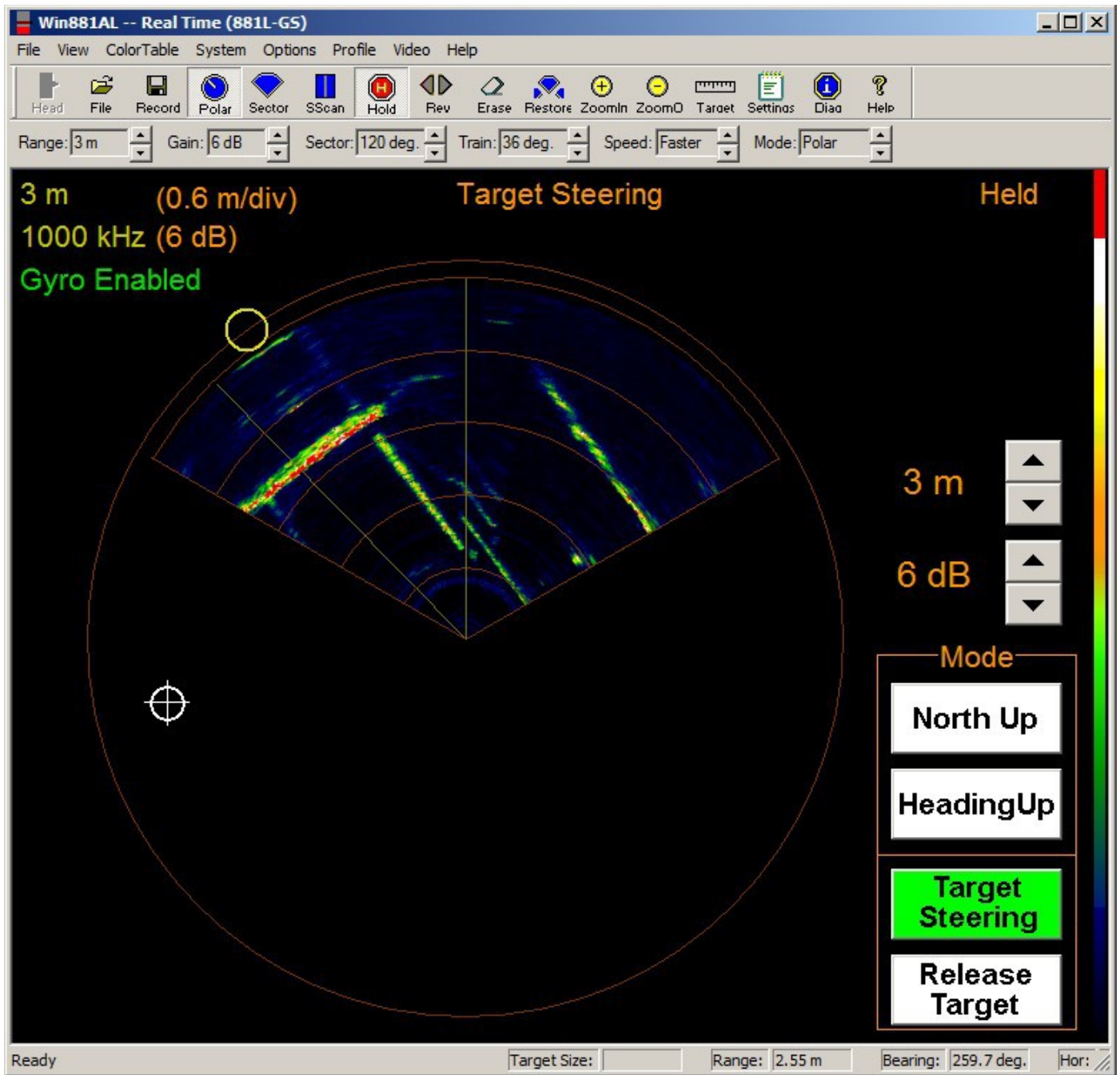


Figure 2.7: Target has been selected

In Figure 2.7, above, the desired target from Figure 2.6 was selected. The screen automatically centred the target within a sector and rotated the sector to the top of the screen. The sonar will now scan the sector with the centred target.

To return, select “Release Target” to remove the sector restrictions and train angle.

2.5.2 Latitude Adjustment and Compass Declination

The geographical local latitude compensates for drift caused by the Earth's rotation. To set the latitude of the current location, open the file "*Win881AL.ini*" in a text editor and edit the lines:

- Local Latitude=49.250000 → (0 to 90 for northern latitudes, 0 to -90 for southern latitudes)
- CompassDeclination=16.5 → ($\pm 180^\circ$, offset to Magnetic North. West is negative, East is positive).

To match the approximate location of the sonar.

Once these are set, run the "*Win881AL_GS.exe*" program as per usual.

Initiate a Gyro Calibration once the sonar is operating.

The "Local Latitude" will not take effect until a "**CALIBRATE GYRO**" command is initiated manually under the "*Options*" menu.

The compass declination angle is used for displaying the sonar image referenced to True North rather than Magnetic North.

The default values are for Vancouver, BC, Canada which has a latitude of 49.25° North and a magnetic compass declination of 16.5° (as of 2014).

2.5.3 File Size Limits

Storing video can generate very large files, The software is able to automatically split the recorded file in predefined file sizes as shown below in Figure 2.8

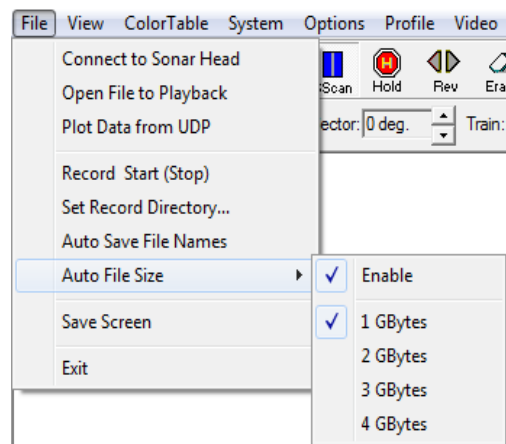


Figure 2.8: Auto File Sizes

In order to re-join two split files, from the command prompt type:

```
copy /b "Source1.81R"+"Source2.81R" "dest.81R"
```

without the quotes.

Appendix A – Ethernet Setup Guide

The Imagenex Model 882L sonar system consists of an underwater sonar head connected via Ethernet directly (or indirectly) to a Windows[®] based computer.

This document covers the necessary setup procedures to enable your Windows[®] XP[®] based PC to communicate with the sonar.

Ethernet Cable

The included Ethernet cable specifications are:

- Cat 5e
- RJ-45
- 568B wiring scheme

If this cable needs to be replaced, ensure that the above specifications are met.

A1. Configuration of Windows XP Ethernet Communications

For the 882L system, the following Address's are used

PC

IP Address	192.168.0.X
Subnet Mask	255.255.255.0

Where 'X' is a decimal number between 3 and 224. The number '1' is reserved for a network server '5' is reserved for the 882L sonar head, and 255 is reserved for broadcasting.

The 882L sonar head has a statically assigned IP Address of **192.168.0.5**. This is the number to enter for "*IP Address*" in the "*System*" menu of the 882L program.

The Recommended PC's IP address and Subnet Mask on the PC are:

IP Address	192.168.0.3
Subnet Mask	255.255.255.0

On a Windows[®] XP[®] based machine, this is done as follows:

1. Navigate to the Control Panel and double click "Network Connections"
2. Right click on the Ethernet interface you wish to connect with and select "Properties"

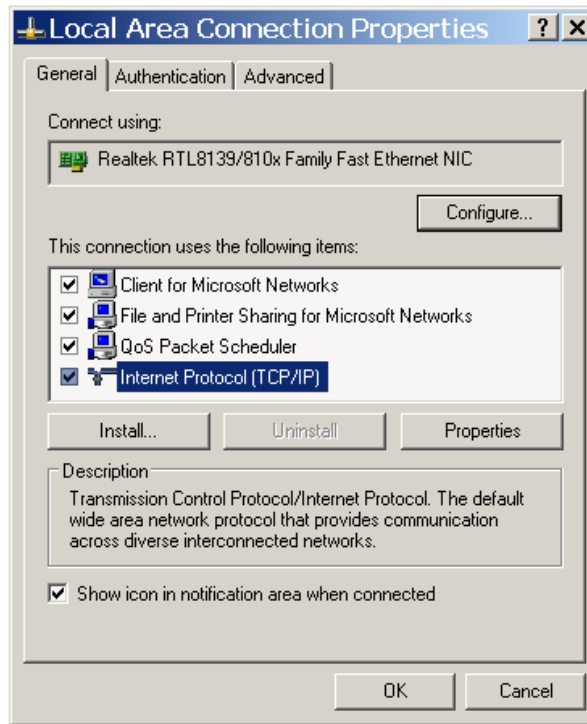


Figure A.1: Local Area Connection Properties Dialogue Box

3. Select Internet Protocol (TCP/IP) and select “Properties”

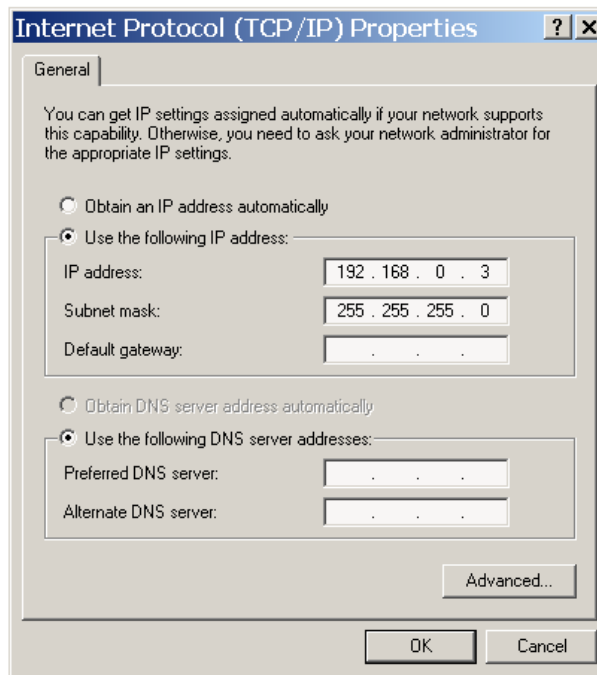


Figure A.2: TCP/IP Priorities Dialogue Box

4. Enter the information shown above in **Figure A.2** and click “OK” to accept the changes.
5. Click “OK” again to accept the changes.

Now your computer is on the same “*Network*” as the sonar head. When starting the “*Win881AL_GS.exe*” program, the IP address stored in the “882L.INI” file is read and a connection will be established.

The sonar head has a statically assigned IP Address of **192.168.0.2**. Enter this number in the menu item “*Setup -> IP Address*”.

The sonar head will run fine. However, if communication to the head does not function properly, try the suggestions located on **page 16**.

A2. Configuration of Windows 7 Ethernet Communications

Windows 7 requires a few more steps than XP for network configuration, but is generally the same.

On a Windows[®] 7 based machine, this is done as follows:

1. Go to the Start Menu and select “Control Panel”.
2. Select “Network and Sharing Center”.

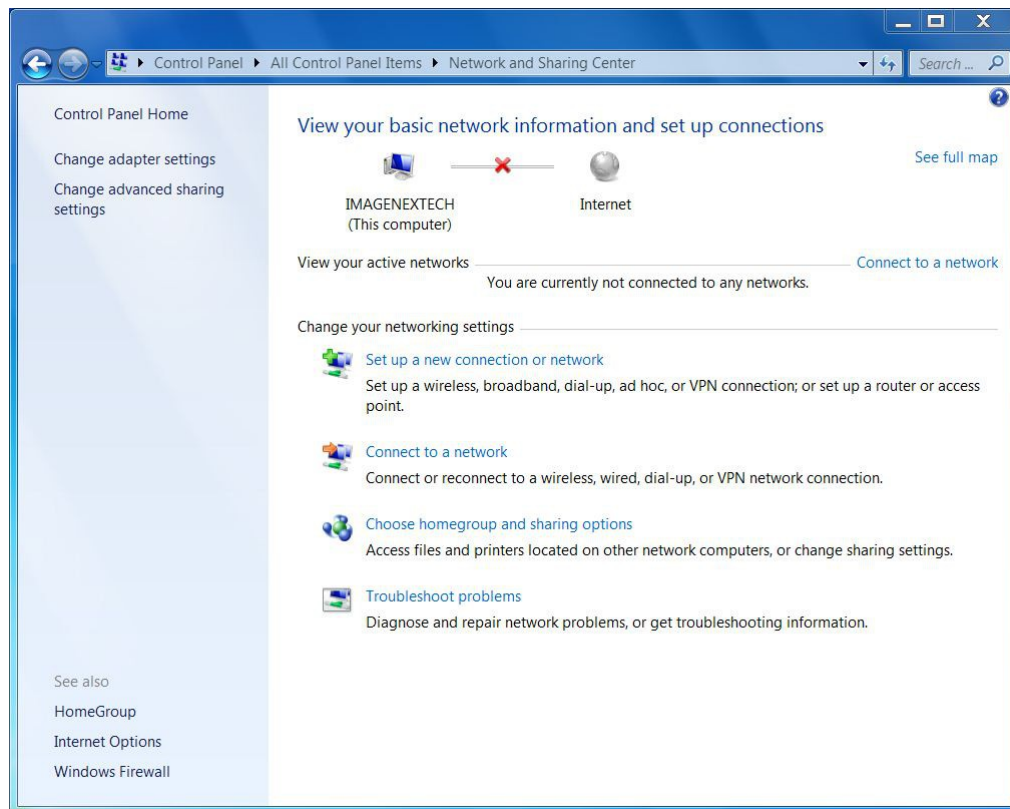


Figure A.3: Windows 7 - Network and Sharing Center

3. Select “Change adaptor settings”.

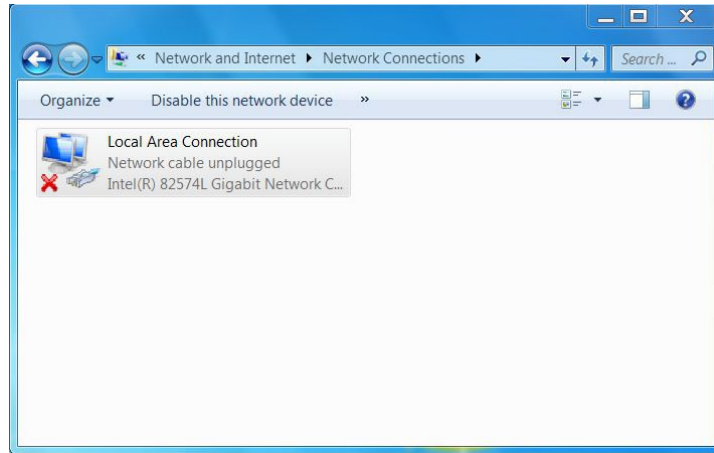


Figure A.4: Windows 7 - Network Connections

4. Right-click on “Local Area Connection” and select “Properties”.

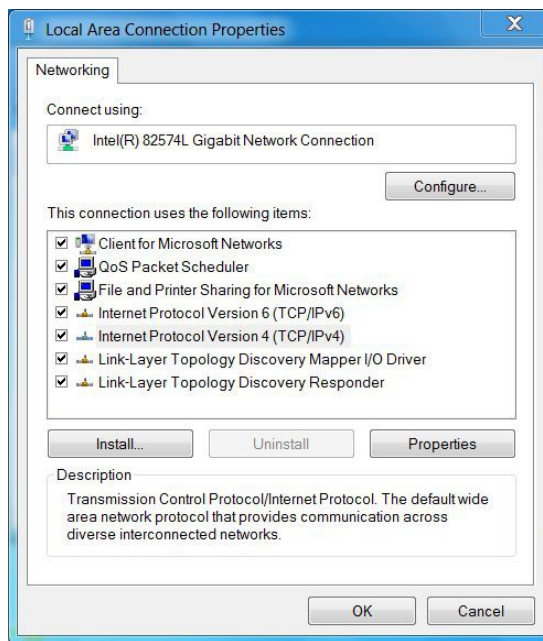


Figure A.5: Windows 7 - Local Area Connection Properties

5. Select “Internet Protocol Version 4 (TCP/IPv4)” and select “Properties”.
6. Continuing from item 4 and **Figure A.2**, on page 13, enter the required information.

Appendix B – Troubleshooting Communications

Disable any network bridges that are present

- A network bridge allows a separate port, such as “USB”, or “Firewire” to piggyback the Ethernet connection.
- Under “Network Connections”, if there is a network bridge icon, disable it.

Disable any other network devices that are present on the computer

- Often, if there are multiple network cards present, Windows may get confused on which one to communicate through. This is more of an issue on laptops with wireless connections.
- Right-click on each connection and select “*Disable*”.

Under “Network Connections”, right-click on the Ethernet card and select properties.

Clear unnecessary network protocols

- De-select all services except for “*Internet Protocol (TCP/IP)*”

Remove any firewalls present (Note that Windows® has a rudimentary firewall built into it. Disable this one first).

- Select the “Advanced” Tab. De-select the Firewall option (if present).

Click on “Configure” (in the “General” tab) and a new dialogue box will appear.

Set Link speed to “Auto” or “10Mbps”

- In the “Advanced” tab, select “Link Speed / Duplex Mode” and set to either “*Auto Mode*” or “*10 Full Mode*”.

Disable any power saving that shuts down the Ethernet card.

- In the “Advanced” tab, select “Link Down Power Saving” and set to “*Disable*”.
- In the “Power Management” tab, de-select any power saving option.

Repair the Ethernet connection.

Windows remembers the hardware address for each socket. To clear the Windows settings:

- Right click on the Local Area Connection.
- Select “Repair”.

IMAGENEX .81R RAW DATA FILE FORMAT

Version: 1.00

The .81R file format is used for the following gyro stabilized sonar heads:

Model 881A-GS
 Model 881L-GS
 Model 882A
 Model 882L

For each sonar ping, the following sections are written to the .81R file.

1. Ping Header - 1024 bytes
2. Device List - 1024 bytes
3. Raw Sonar Data - variable length
4. Internal Sensor Data
5. External Sensor Data
6. Future Expansion
7. Video Frame (if available)

1. Ping Header

- contains overhead information such as total number of bytes this ping, byte offsets and lengths of each section, ping timestamp, frequency, range, gain, etc.

2. Device List

- contains information on all connected devices (i.e. sonar head, GPS, MRU, Gyro/Heading, Sound Velocity sensor, etc.). Includes the device name, transfer speed, rep-rate, mounting offsets, mounting angles and data latency. Information in this section is not required and may be zero filled.

3. Raw Sonar Data

- contains Switch Data Command, Sonar Return Header and Raw Sonar Data

4. Internal Sensor Data

- contains values from optional sensors installed inside the sonar head (i.e. MRU)

5. External Sensor Data

- contains values from external sensors

6. Future Expansion

7. Video Frame

- if video is available from a connected USB frame grabber, the video frame is written to the file after the current ping data

Storage Format

All data is stored LSB first (least significant byte first or "Little-Endian" mode). The following conventions are used:

char	1-byte signed value	
BYTE	1-byte unsigned value	
ASCII	1-byte unsigned value	
short	2-byte signed value	(LSB,MSB)
WORD	2-byte unsigned value	(LSB,MSB)
int	4-byte signed value	(LSB,MDL,MDH,MSB)
DWORD	4-byte unsigned value	(LSB,MDL,MDH,MSB)
float	4-byte single precision floating point value	(LSB,MDL,MDH,MSB)

Section 1: **Ping Header** (length = 1024 bytes)

Byte	Description	Format
0	'8' - Ping Header byte 0	ASCII
1	'1' - Ping Header byte 1	ASCII
2	'R' - Ping Header byte 2	ASCII
3	Sonar Type 0 = Model 881L-GS 1 = Model 881A-GS 2 = Model 882L 3 = Model 882A	BYTE
4-7	Total Bytes This Ping (including Ping Header)	DWORD
8 - 9	.81R File Version 0 = 1.00 - initial release	WORD
10 - 27	Ping Timestamp - (18 bytes) DDMMYYYYHHMMSSmmmh 10-11: DD - day, 01-31 12-13: MM - month, 01-12 14-17: YYYY - year 18-19: HH - hours, 00-23 20-21: MM - minutes, 00-59 22-23: SS - seconds, 00-59 24-26: mmm - milliseconds, 000-999 27: NULL	ASCII
28	Reserved - always 0 (1 byte)	BYTE
29 - 58	Sonar Control Program Version Number (30 bytes) i.e. "Version 1.0.1.5 (19Sept14)" plus zero fill	ASCII
59 - 62	Byte offset to previous 81R Ping Header Note: all byte offsets are referenced to the beginning of the current Ping Header	DWORD
63	Status Byte 1 Bit 0: 1 = internal sensors available Bit 1: 1 = external sensors available Bit 2-7: Reserved	BYTE
64	Status Byte 2 - Reserved - always 0	BYTE
65	Status Byte 3 - Reserved - always 0	BYTE
66	Status Byte 4 - Reserved - always 0	BYTE
67	Status Byte 5 - Reserved - always 0	BYTE
68	Status Byte 6 - Reserved - always 0	BYTE
69	Status Byte 7 - Reserved - always 0	BYTE
70	Status Byte 8 - Reserved - always 0	BYTE
71 - 74	Reserved - always 0 (4 bytes)	BYTE
75 - 78	Ping Header length - 1024	DWORD
79 - 82	Byte offset to Device List - 1024	DWORD
83 - 86	Device List length - 1024	DWORD
87 - 90	Byte offset to Raw Sonar Data - 2048	DWORD
91 - 94	Raw Sonar Data length - variable	DWORD

95 - 98	Byte offset to Internal Sensors (0 if not available)	DWORD
99 - 102	Internal Sensor length (0 if not available)	DWORD
103 - 106	Byte offset to External Sensors (0 if not available)	DWORD
107 - 110	External Sensor length (0 if not available)	DWORD
111 - 318	Reserved - always 0 (208 bytes)	BYTE
319	Transducer Up/Down, Display Mode Bits 0-2: 000 = North Up 001 = Heading Up 010 = Target Steering Bits 3-6: Reserved Bit 7: Transducer Up/Down 0 = Down, 1 = Up	BYTE
320	Start Gain (dB)	BYTE
321	Sector Width Command 0 to 120 = 0 to 360 Degrees in 3 degree increments	BYTE
322	Train Angle Command 0 to 119 = 0 to 357 Degrees in 3 degree increments	BYTE
323	Step Size Command 0 = No Step 1 = 0.3 Degrees (Slow) 2 = 0.6 Degrees (Medium) 3 = 0.9 Degrees (Fast) 4 = 1.2 Degrees (Faster) 8 = 2.4 Degrees (Fastest)	BYTE
324	Mode 0 = Sector 1 = Polar 2 = Sidescan	BYTE
325 - 328	Range Offset (meters)	float
329 - 332	Absorption (dB/meter)	float
333	Reserved - always 0	BYTE
334 - 337	Pulse Length (microseconds)	DWORD
338 - 341	Sound Velocity (meters/second)	float
342 - 345	Acoustic Transmit Frequency (Hz)	float
346 - 349	Sonar Ping Repetition Rate (seconds)	float
350 - 352	Reserved - always 0	BYTE
353 - 356	Samples per ping	DWORD
357 - 360	Sector Size (degrees)	float
361 - 364	Train Angle (degrees)	float
365 - 368	Step Size - Angle Increment (degrees)	float
369 - 372	Acoustic Range Setting (meters)	float
373 - 376	Range Resolution (meters)	float
377 - 380	Ping Number	DWORD
381	System Information Flag	BYTE
382	Gyro Status (0=Disabled, 1=Enabled)	BYTE
383 - 386	Mounting Angle Offset (-180 to +180 in decimal degrees)	float
387 - 390	Local Latitude (-90 South to +90 North in decimal degrees)	float
391 - 394	Compass Declination (-180 to +180 in decimal degrees)	float
395 - 1023	Reserved - always 0 (629 bytes)	BYTE

Section 2: **Device List** (length = 1024 bytes)

Note: information in this section is not required and may be zero filled.

Each connected device contains the following 64-byte structure:

Byte	Description	Format
0 - 15	Device Name (16 bytes) i.e. "881L-GS Sonar" plus zero fill	ASCII
16 - 19	Transfer Speed (bits per second)	DWORD
20 - 23	Repetition Rate (seconds)	float
24 - 27	Starboard mounting offset (meters, portside is negative)	float
28 - 31	Forward mounting offset (meters, aft is negative)	float
32 - 35	Vertical mounting offset (meters, up is negative)	float
36 - 39	Yaw - mounting offset (degrees, counter-clockwise is negative)	float
40 - 43	Pitch - mounting offset (degrees, nose down is negative)	float
44 - 47	Roll - mounting offset (degrees, portside roll is negative)	float
48 - 51	Latency (seconds)	float
52 - 63	Reserved - always 0 (12 bytes)	BYTE

Device 1 (Sonar Head):

- Byte 0 = Byte offset to Device List (from Ping Header, Bytes 79-82)
- note: sonar head transfer speed is 10 for 10Mbps or 100 for 100Mbps

Device 2 (GPS Antenna):

- Byte 0 = Byte offset to Device List + 64

Device 3 (MRU):

- Byte 0 = Byte offset to Device List + 128

Device 4 (Gyro/Heading):

- Byte 0 = Byte offset to Device List + 192

Section 3: Raw Sonar Data (length = Variable)

The Raw Sonar Data section contains the communications transfers to and from the sonar head for the current ping. The transfers consist of the Switch Data Command to the sonar head as well as the Sonar Return Header and Sonar Echo Data from the sonar head. The length of this section varies depending on the type of sonar head.

The following tables describe the total number of bytes stored for each sonar head type:

Sonar Type = Model 881L-GS

Ping Header Byte 3 = 0

1. Switch Data Command - 128 bytes
2. Sonar Return Header - 256 bytes
3. Sonar Echo Data - 500 bytes (IBX mode)
Total = 884 bytes

Byte Offset	Description	Length
0000 - 1023	Ping Header	1024
1023 - 2047	Device List	1024
2048 - 2175	Switch Data Command	128
2176 - 2431	Sonar Return Header	256
2432 - 2931	Sonar Echo Data	500

For IBX mode, the Sonar Echo Data starts at byte offset 2432 and consists of 500 range bins of 8-Bit (0-255) echo intensity values. Each range bin is (Range/500) in length. Range (in meters) is located in "Range" (Bytes 20-21) of the Sonar Return Header. Range bins assume a sound velocity of 1500m/s. The angular position of the ping echo is encoded in "Transducer Head Position" (Bytes 35-36) of the Sonar Return Header.

Please refer to document "**425-050-01 - 881L - GS Ethernet Specification.pdf**" for detailed information about the Sonar Return Data format for the Model 881L-GS sonar head.

Sonar Type = Model 881A-GS

Ping Header Byte 3 = 1

1. Switch Data Command - 40 bytes
2. Sonar Return Header - 32 bytes
3. Sonar Echo Data - 500 bytes (INB mode)
Total = 572 bytes

Byte Offset	Description	Length
0000 - 1023	Ping Header	1024
1023 - 2047	Device List	1024
2048 - 2087	Switch Data Command	40
2088 - 2119	Sonar Return Header	32
2120 - 2619	Sonar Echo Data	500

For INB mode, the Sonar Echo Data starts at byte offset 2120 and consists of 500 range bins of 7-Bit (0-127) echo intensity values. Each range bin is (Range/500) in length. Range (in meters) is located in "Range" (Byte 7) of the Sonar Return Header. Range bins assume a sound velocity of 1500m/s. The angular position of the ping echo is encoded in "Transducer Head Position" (Bytes 5-6) of the Sonar Return Header.

Please refer to document "**425-051-03 - 881A - gyro Serial Specification.pdf**" for detailed information about the Sonar Return Data format for the Model 881A-GS sonar head.

Sonar Type = Model 882L

Ping Header Byte 3 = 2

1. Switch Data Command - 128 bytes
2. Sonar Return Header - 256 bytes
3. Sonar Echo Data - 500 bytes (IBX mode)
Total = 884 bytes

Byte Offset	Description	Length
0000 - 1023	Ping Header	1024
1023 - 2047	Device List	1024
2048 - 2175	Switch Data Command	128
2176 - 2431	Sonar Return Header	256
2432 - 2931	Sonar Echo Data	500

For IBX mode, the Sonar Echo Data starts at byte offset 2432 and consists of 500 range bins of 8-Bit (0-255) echo intensity values. Each range bin is (Range/500) in length. Range (in meters) is located in "Range" (Bytes 20-21) of the Sonar Return Header. Range bins assume a sound velocity of 1500m/s. The angular position of the ping echo is encoded in "Transducer Head Position" (Bytes 35-36) of the Sonar Return Header.

Please refer to document "**425-xxx-xx - 882L - GS Ethernet Specification.pdf**" for detailed information about the Sonar Return Data format for the Model 882L sonar head.

Sonar Type = Model 882A

Ping Header Byte 3 = 3

1. Switch Data Command - 40 bytes
2. Sonar Return Header - 32 bytes
3. Sonar Echo Data - 500 bytes (INB mode)
Total = 572 bytes

Byte Offset	Description	Length
0000 - 1023	Ping Header	1024
1023 - 2047	Device List	1024
2048 - 2087	Switch Data Command	40
2088 - 2119	Sonar Return Header	32
2120 - 2619	Sonar Echo Data	500

For INB mode, the Sonar Echo Data starts at byte offset 2120 and consists of 500 range bins of 7-Bit (0-127) echo intensity values. Each range bin is (Range/500) in length. Range (in meters) is located in "Range" (Byte 7) of the Sonar Return Header. Range bins assume a sound velocity of 1500m/s. The angular position of the ping echo is encoded in "Transducer Head Position" (Bytes 5-6) of the Sonar Return Header.

Please refer to document "**425-054-0C - 882A - Serial Specification.pdf**" for detailed information about the Sonar Return Data format for the 882A sonar head.

Section 4: **Internal Sensor Data**

This section is reserved for future use.

Byte offset to Internal Sensors, (Ping Header, Bytes 95-98) = 0

Internal Sensor length, (Ping Header, Bytes 99-102) = 0

Section 5: **External Sensor Data**

This section is reserved for future use.

Byte offset to External Sensors, (Ping Header, Bytes 103-106) = 0

External Sensor length, (Ping Header, Bytes 107-110) = 0

Section 6: **Future Expansion**

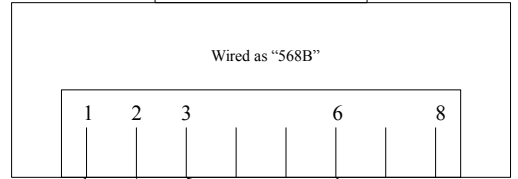
This section is reserved for future use.

Section 7: **Video Frame** (length is variable)

Byte	Description	Format
	Bitmap Header	
0	'B' - Video Frame Header byte 0	ASCII
1	'M' - Video Frame Header byte 1	ASCII
2 - 5	Video Frame Filesize 14 + 40 + (ImageWidth x ImageHeight x 3) bytes	DWORD
6 - 7	Reserved1 - always 0	WORD
8 - 9	Reserved2 - always 0	WORD
10 - 13	Image Data Offset = 54	DWORD
	Bitmap Information Header	
14 - 17	HeaderSize = 40	DWORD
18 - 21	ImageWidth (in pixels)	DWORD
22 - 25	ImageHeight (in pixels)	DWORD
26 - 27	NumberOfImagePlanes = 1	WORD
28 - 29	BitsPerPixel = 24	WORD
30 - 33	CompressionMethod = 0	DWORD
34 - 37	SizeOfBitmap = (ImageWidth x ImageHeight x 3)	DWORD
38 - 41	HorzResolution = 0	DWORD
42 - 45	VertResolution = 0	DWORD
46 - 49	NumColorsUsed = 0	DWORD
50 - 53	NumSignificantColors = 0	DWORD
	24 Bit ImageData (stored as 3 bytes per pixel)	
54 - 57	Pixel 0 - Blue, Green, Red (lower-left corner of image)	BYTE
58 - 60	Pixel 1 - Blue, Green, Red	BYTE
.	.	.
.	.	.
Video Frame Filesize-3	Pixel N (ImageWidth x ImageHeight - 1) - Blue, Green, Red (upper-right corner of image)	BYTE

RJ-45 Connector

Wired as "568B"



ORG/WHT (TD+)

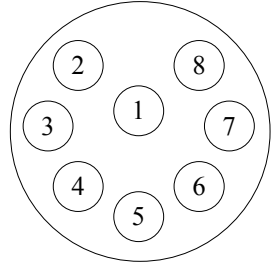
ORG (TD-)

GRN/WHT (RX+)

GRN (RX-)

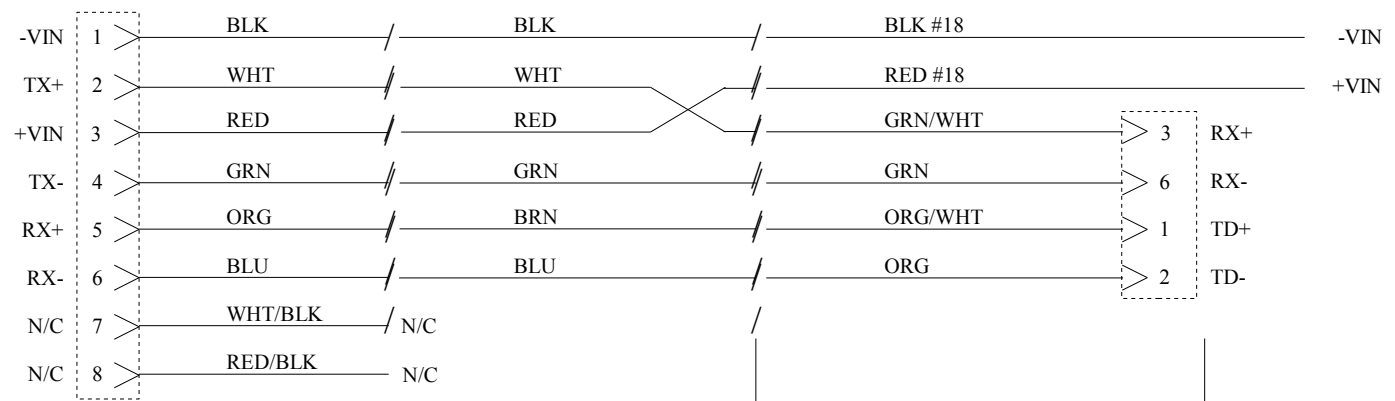
SUBCONN MCIL8F

(F)



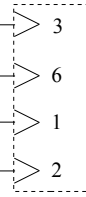
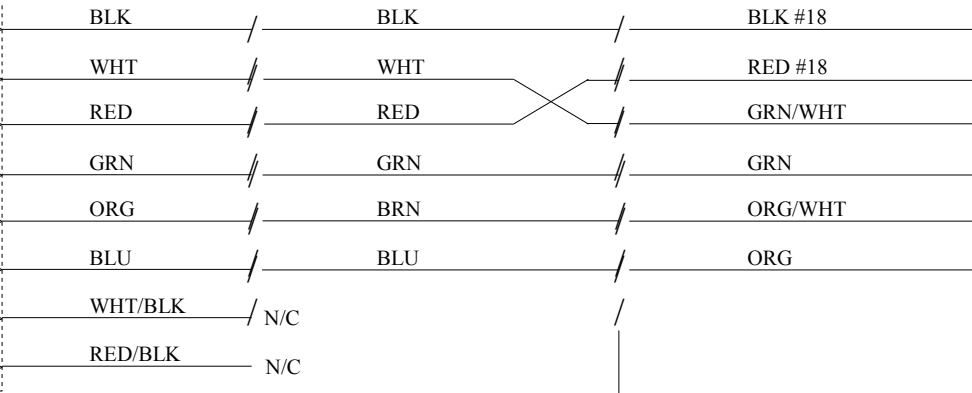
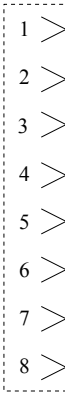
Socket View

SUBCONN MCIL8F (F)



2ft #18

-VIN
TX+
+VIN
TX-
RX+
RX-
N/C
N/C



3 RX+
6 RX-
1 TD+
2 TD-



2ft Whip

50ft 6 Conductor Cable

5ft CAT.5e UTP Ethernet Cable

IMAGENEX TECHNOLOGY CORP.

Title: Model 881L Test Cable

Document Number: 881-200-187

Rev 01

Date: Jan 11, 2006

Sheet 1 of 1