

# User's Manual

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## M-Series Sonars



*Part Number: 205608-00*

*Revision: -*

*April 2015*

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# System Contents

Along with the M-Series Sonar, you will receive an accessory kit containing the following:

|                         |
|-------------------------|
| Sonar to Surface Cable  |
| Cable Whip (4 ft.)      |
| 7ft Cat6 Ethernet Cable |
| 60 W POE Box            |
| Power Cable             |
| Carrying Case           |

The Manual Packet includes:

|  |
|--|
| Manual CD with:  |
| <ul style="list-style-type: none"><li>• Electronic copy of M-Series User's Manual</li><li>• Electronic copy of M-Series Quickstart Guide</li></ul> |
| Printed copy of the M-Series Quickstart Guide  |
| ProViewer CD   |

For SeaNet Sonars only:

|   |
|---|
| SeaNet Specific Parts:  |
| <ul style="list-style-type: none"><li>• SeaNet to RJ45 Adapter</li><li>• Additional 7ft Cat6 Ethernet Cable</li></ul> |

For VDSL Sonars only:

|   |
|---|
| VDSL Specific Parts:  |
| <ul style="list-style-type: none"><li>• VDSL G3 Top Side Converter Box with power cable</li><li>• Sonar to Surface Cable with VDSL and Ethernet</li><li>• VDSL Top Side Whip (RJ11)</li></ul> |

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## Disclaimers:

“Open Source License (GPLv2):

The firmware included in this product contains copyrighted software that is licensed under the GPL, specifically a modified Linux kernel. A copy of that license is at the following link; <https://www.gnu.org/licenses/gpl-2.0.html>. A hard copy is available upon request. You may obtain the complete Corresponding Source code from us for a period of three years after our last shipment of this product by contacting Teledyne BlueView Customer Support. This offer is valid to anyone in receipt of this information.”

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## Warnings:

**Warning!** This device should not be used as a navigational aid to prevent collision, grounding, boat damage, or personal injury.

**Warning!** This product contains lead, a chemical known to the state of California to cause cancer, birth defects and other reproductive harm. Handling and/or opening this unit may result in exposure to lead, in the form of solder.

**Warning!** Disassembly and repair of this electronic unit should only be performed by authorized service personnel. Any modification of the serial number or attempt to repair the original equipment or accessories by unauthorized individuals will void the warranty.

**Warning!** Changes or modifications to this unit not expressly approved by the party responsible for compliance may void the user’s authority to operate this equipment.

**Warning!** This equipment contains High Voltage electronics. Tampering with or using damaged equipment could lead to serious injury.

## Warranty Information:

The sonar is backed by a standard 12-month parts and labor warranty policy. Seller’s terms and conditions of sale can be found at [www.blueview.com](http://www.blueview.com)

For more information on safety and/or maintenance issues please call Teledyne BlueView, Inc. at 425.492.7400.

## Chapter 1: M-Series Sonar Overview

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The M-Series sonar is a general purpose underwater imaging sonar designed for ROV, AUV, vessel mounted and stationary tripod integration. With its Ethernet interface and user-friendly software, the sonar system is designed to be just as easy-to-use as it is functional. This manual covers operations of all the M-Series sonar systems.

### About the Sonar

The M-Series sonar provides streaming sonar imagery, making it easy to search and navigate in low and zero visibility water. Teledyne BlueView, Inc. has coupled high-performance imaging capability with a powerful software package creating one of the world's most versatile underwater imaging systems available today.

Advanced sonar technology, rugged design, and powerful software are just a few highlights of your sonar system. This manual explains imaging sonar interpretation and provides instructions on the installation and operation of your sonar system. For detailed information on using the sonar imaging software, please see the ProViewer Software Handbook found both on the software CD as well as under the software's help menu.

## Chapter 2: Understanding an Imaging Sonar

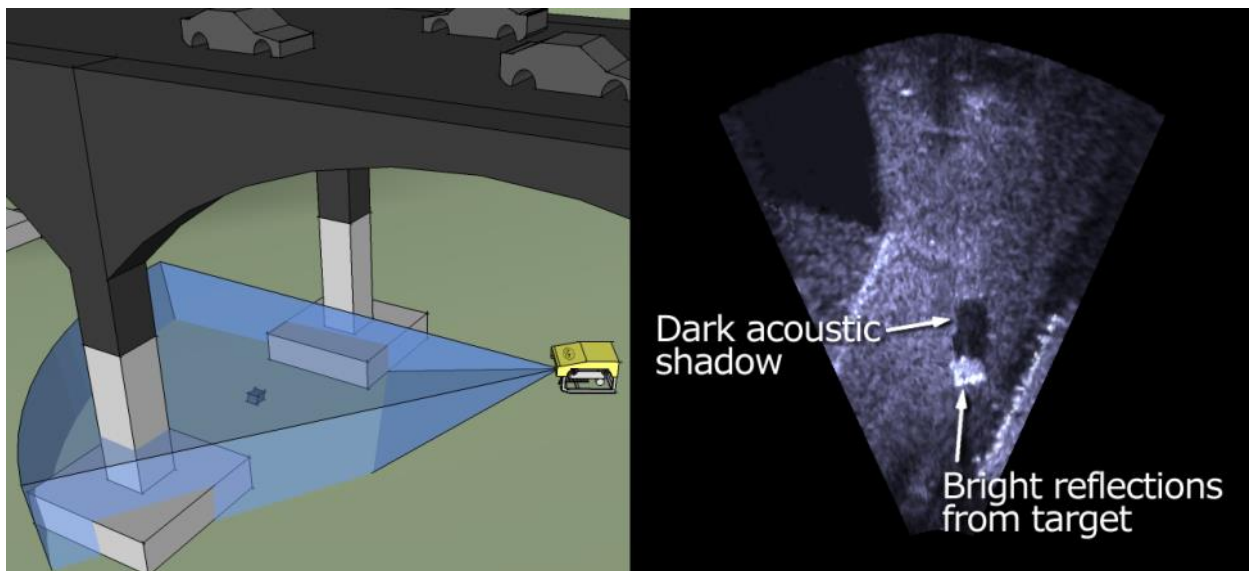
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### What is an Imaging Sonar?

Many people are familiar with scanning type sonar, which employ mechanical rotation of a single acoustic beam over an imaging area. This works well when used on stationary platforms and/or when imaging static targets. They become much less useful when working from a moving platform and/or trying to image moving targets since any motion can cause errors in the final image. By comparison, Teledyne BlueView, Inc. imaging sonar are multi-beam sensors, which form many small acoustic beams at once. This allows them to work well from stationary and moving platforms. An imaging sonar can produce several high-quality images per second, making it possible to get movie-like imagery from the sonar.

### How do I interpret the Sonar images?

Imagine a flashlight lying on a table and an object such as a coffee cup located in front of the flashlight. If you look down on this scene, you will see a bright area where light is reflecting off the face of the coffee cup. You will also see a dark shadow behind the coffee cup where light is unable to reach. The same idea can be applied to a Teledyne BlueView, Inc. imaging sonar by replacing the light source with a sound source. Bright areas on the sonar image are the result of objects reflecting sound, while dark areas are acoustic shadows resulting from an object blocking the sound. The two figures below provide an example of how a given scene would appear when viewed visually and with high-definition imaging sonar:



## Chapter 3: Bench Top Setup

The following chapter contains step by step instructions for setting up your Teledyne BlueView, Inc. sonar.

### Install the Software

Whether connected to an external PC or an onboard AUV controller, the ProViewer software is required to operate the M-Series Sonar. The following describes how to install the ProViewer 4 software on a user-supplied PC. For more information on ProViewer and integration, see the ProViewer Software Handbook found on the software CD, as well as under the software's help menu.

**Note:** Running other applications in conjunction with the ProViewer Software may affect performance of one or both of the applications.

- 1) Place the ProViewer CD-ROM in the CD-ROM drive. Installation will start automatically.

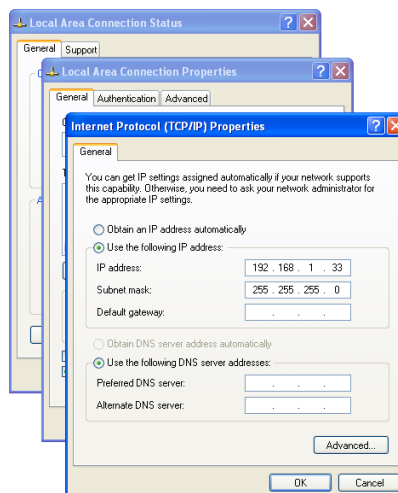
**If the CD-ROM drive does not automatically run:**

Select **Run** from the **Start** menu, and type `x:\setup` in the **Open** box (where x is the drive letter for the CD-ROM drive), then click **OK**.

- 2) The Welcome window opens. Click **Next**.
- 3) Follow the instructions on the screen to complete the installation

### Configure the PC

The IP address on the user's PC will need to be set either to "Obtain an IP address automatically," or to a static IP: 192.168.1.x where x is any number besides 45 that doesn't conflict with the user's system:



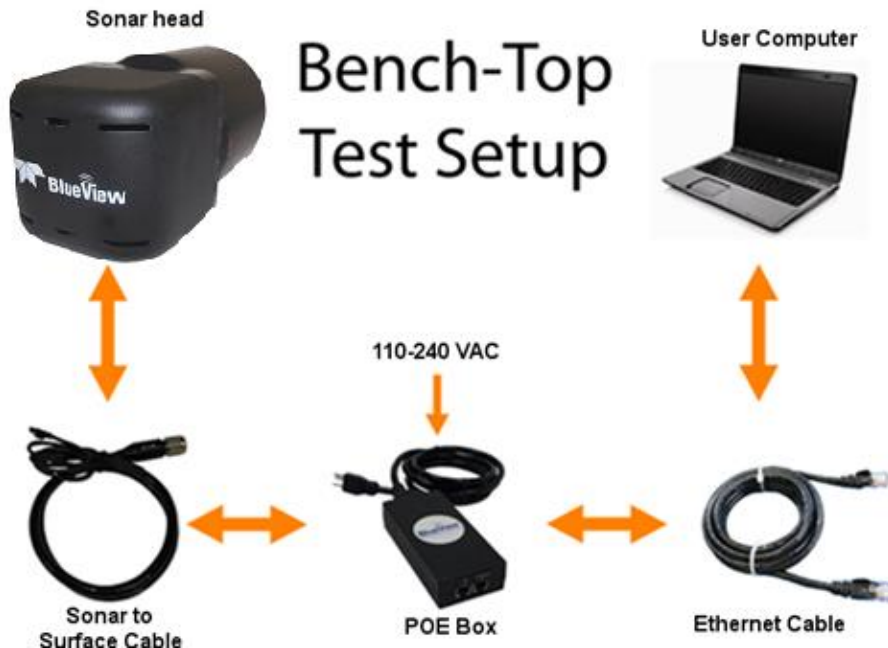
## Firewall Software

ProViewer Software communicates with the Sonar Head using standard networking protocols. If your PC has firewall software, you may see a warning “**popup**” that asks permission to allow the ProViewer Software to connect to the Sonar. In that case, you may need to configure the firewall to allow communications between your Sonar and your PC using TCP and UDP on port 1149. Refer to your anti-virus software vendor or your computer tech support resources for assistance with your anti-virus software.

## Setup Equipment

After installing ProViewer 4, the M-Series Sonar is ready for standalone operation. The only additional items required are the included Power Over Ethernet box (POE) and Sonar to Surface Cable. The diagram below illustrates the proper connections needed for the system to function properly.

**Note:** The sonar shown may not look like your sonar but still has the same setup.



1. Inspect all cable connector contacts to ensure no moisture, corrosion, or damage exists before assembling the system.
2. Connect the underwater connector on the Sonar to Surface Cable to the mating bulkhead connector on the rear of the sonar. Once connected, ensure that the connector is fully engaged and tightened.
3. Connect the RJ45 connector on the Sonar to Surface Cable to the “SONAR J1” port on the POE Junction Box.
4. Connect one end of the Standard Ethernet Cable to the “PC J2” port on the POE Box.  
**Note:** The Sonar Head cabling is conveniently designed so that you can connect your POE Box to a PC with a **standard** Ethernet cable.
5. Connect the other end of the Standard Ethernet Cable to the Ethernet port on the User computer.



6. Plug the POE Box power cable into a standard 120 or 220 VAC wall outlet. The Sonar Head will power up and initialize itself in approximately 40 seconds. Correct operation requires that power be cycled from the AC side of the Junction Box.  
**Note:** If you cycle the power off briefly, make sure you leave the power unplugged for at least 10 seconds.
7. Turn on your computer.

## Chapter 4: Bench Top Setup VDSL

The following chapter contains step by step instructions for setting up your Teledyne BlueView, Inc. sonar using VDSL connection.

### Assemble the System for VDSL Connectivity

The VDSL option enables communication over a single twisted pair. The figure below depicts how the components are interconnected. Your sonar and VDSL top side box may look different than the ones depicted below.

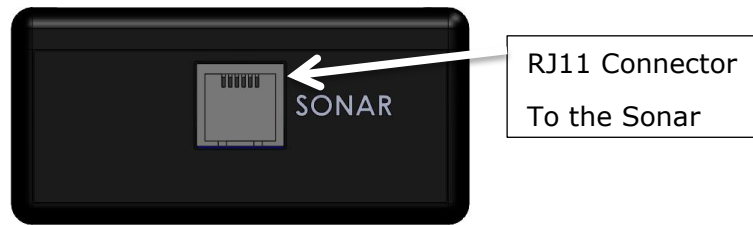
**Note:** The sonar shown may not look like your sonar but still has the same setup.



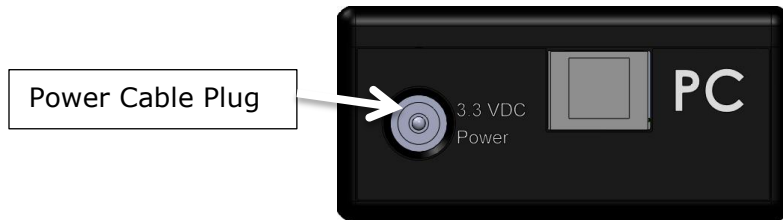
### Recommended Assembly Procedure

1. Inspect all cable connector contacts to ensure no moisture, corrosion or damage exists before assembling the system.
2. Connect the underwater connector on the "25ft Sonar to Surface Test Cable" to the mating bulkhead connector on the rear of the sonar head. Make sure that all O-rings are present and in good shape before making the connection. Once connected, ensure that the connector is fully engaged and tightened. Connect the RJ45 connector on the Sonar to Surface Cable to the "SONAR J1" port on the POE Junction Box.

3. Connect the RJ11 connector on the Sonar to Surface Test Cable to the “SONAR” port on the VDSL Top Side box as shown below.



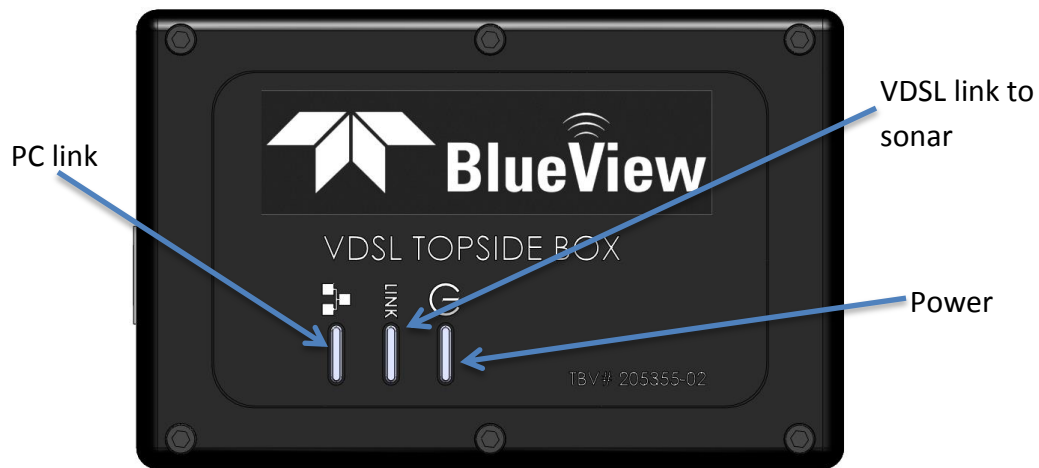
4. Plug the power cable to the VDSL Top Side box to a standard wall outlet.



5. Connect one end of the Standard Ethernet Cable to the “PC” port on the VDSL Top Side Box.
6. Connect the other end of the Standard Ethernet Cable to the Ethernet port on the User computer.
7. Plug in the POE box power cable and the VDSL power cable into a standard wall outlet. The sonar head will power up and initialize itself in approximately 60 seconds.

**Note:** When power cycling, correct operation requires that power be cycled from the AC side of the POE box. If you cycle the power off briefly, make sure you leave the power unplugged for at least 10 seconds before reconnecting the plug

8. The Power and VDSL link to sonar lights should illuminate a steady green color. This indicates a valid link between the top side box and the sonar exists. If the link light is orange this means that a connection exists between the sonar and the topside box, but that the unit has reduced the data throughput to 10BASE-T, or 10 Mbit/s. Possible reasons for this are the use of a non-Teledyne BlueView cable or cable length in excess of the rated specification. If the VDSL link to sonar light does not illuminate, there is no connection. Please verify all connections are properly secured and inspect the cable for damage.



9. Turn on your computer. The PC link light should illuminate a steady green color.

**Note:** If the computer is not connected, the light will not illuminate.

10. Start ProViewer, and click the “Connect” icon .

11. For Troubleshooting issues, please visit Chapter 8 “Troubleshooting”.

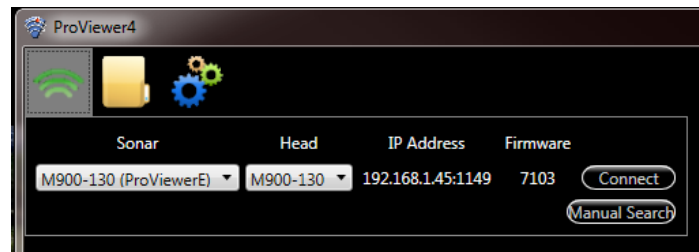
### Connecting with ProViewer 4

Once the network settings are properly configured, open the ProViewer Software on the User Computer and click on the connect button, as shown below.

**Note:** If the sonar has just received power, it will take 30- 60 seconds to boot and be ready for a connection.

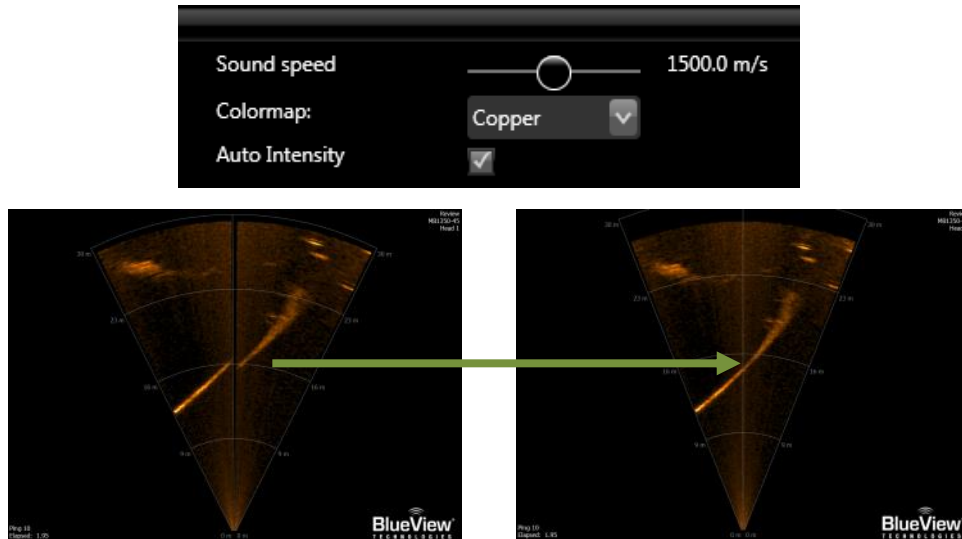


When the Connect button is pressed, the ProViewer software will automatically search for and list any sonars which are connected to the PC. If more than one sonar is present, or a sonar with multiple heads is present, ProViewer displays the available sonar heads to connect to in the Sonar and Head dropdown menu, respectively.



## Sound Speed Calibration

If an image looks broken or misaligned, the most likely cause is an incorrect sound speed value. To access the Sound Speed slider from within ProViewer 4, right-click anywhere in the imagery window and adjust the slider bar to align the image.



## Shutdown

To shut down the sonar, close the Sonar Window by clicking on the X icon in the top right-hand corner of the window, or select **Exit** from the **File** menu to close the entire program. To avoid data loss, be sure to close and save any sonar data files before removing the sonar power. It is now safe to power down the sonar or dis-connect the sonar Ethernet cable from the computer.

When power cycling the sonar, be sure to allow at least 10 seconds of 'off time' before turning the sonar back on.

# Chapter 5: Sonar Installation

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## Mount the Sonar

After installing your software and running your sonar for the first time, you're ready to put the sonar into the water.

In order to do this, the sonar needs a mounting structure to hold it securely in its underwater environment. This mount can either be one purchased from Teledyne BlueView, Inc. or a customer supplied mount. The preferred mounting method is a clamp type fixture around the cylindrical portion of the unit. For custom mounts, refer to the technical drawings provided in your kit.

## Mounting Location

The sonar images like a camera out of the front of the nose cone. It should be mounted looking forward, preferably on the same pan-and-tilt as the ROV's main camera.



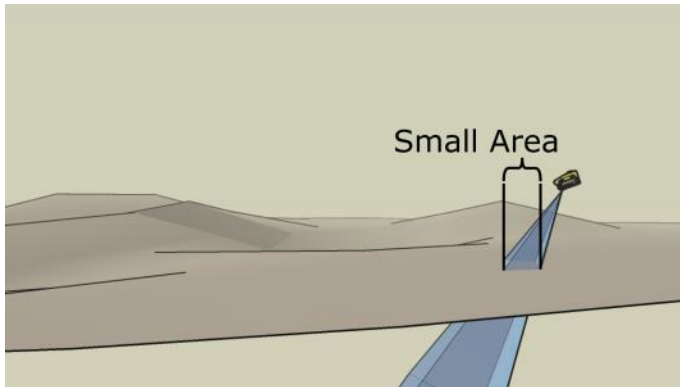
## Sonar Up-Down Orientation

The Teledyne BlueView, Inc. logo on the front of the sonar is used to determine the up-down orientation of the sonar (pictured below).

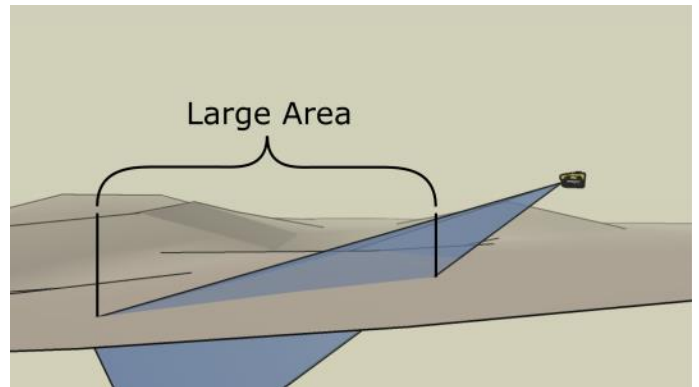


## Sonar Angle

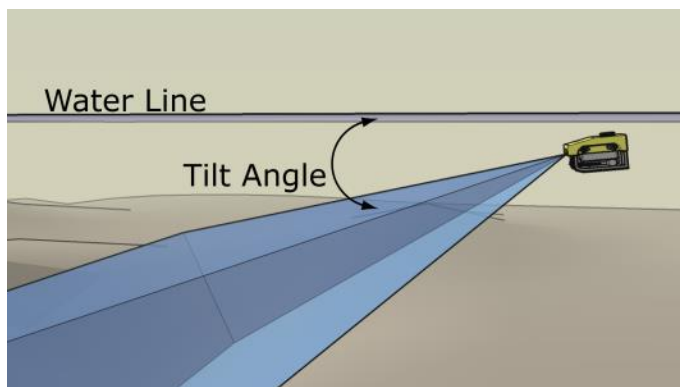
To achieve the optimal performance while imaging targets and/or the bottom at a given depth, the angle that the sonar is tilted down from the surface is important. This issue is demonstrated in the figures below. On the left, the sonar is tilted down at a steep angle that provides only a narrow field of view of the bottom. The sonar on the right-hand figure is set at a much shallower angle that provides both a better perspective on targets and a larger field-of-view of the bottom.



The sonar's steep tilt-angle in this figure produces imagery of a narrow strip of the bottom.



The sonar's shallow tilt-angle in this figure produces an image of the bottom over a broad area. In general, shallower tilt-angles, which give larger areas of bottom imaging, are preferred.



### Recommended tilt angles.

|                         |   |    |    |    |    |
|-------------------------|---|----|----|----|----|
| Target Depth (ft)       | 0 | 10 | 20 | 30 | 40 |
| Approx. Tilt Angle(Deg) | 0 | 3  | 8  | 10 | 10 |

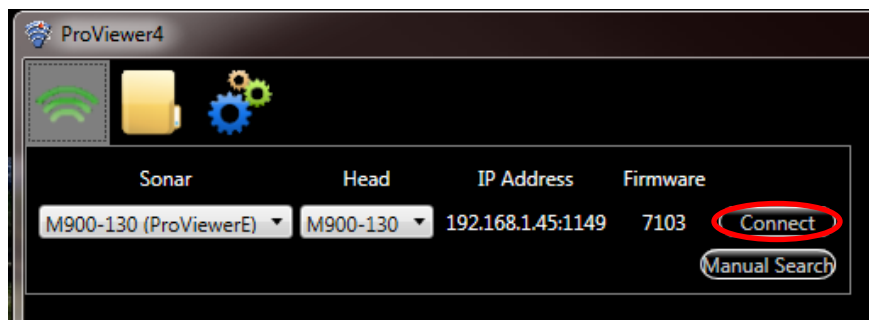
# Chapter 6: Advanced Sonar Network Configuration


## Changing the Sonar IP Settings

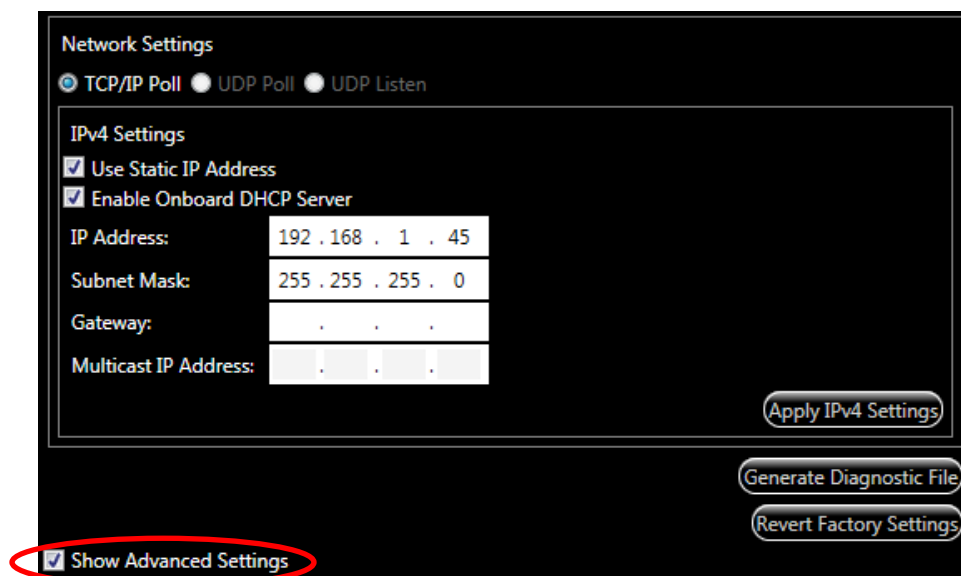
As communication with the M-Series sonar is handled through an Ethernet interface, the sonar requires an IP address to function properly. There are 3 ways to accomplish this – Static IP, DHCP server, or DHCP host – but the system is shipped from the factory with a Static IP address of 192.168.1.45 and a DHCP server enabled. These settings, however, can be changed using the ProViewer Software.

**Note:** The ability to change IP settings is an advanced feature of the ProViewer software and is only recommended for users familiar with IP settings and network configurations. **Incorrect settings can result in the loss of communication with the sonar.**

1. With the M-Series sonar powered and connected, open the ProViewer 4 software and click the connect button.
2. In the window that comes up, select the M-Series sonar and click **Connect**.



3. Under Settings , choose the Sonar tab and select Show Advanced Settings. Under **Network Settings**, you can change the various network settings of the sonar.







4. If any changes are made, click **Apply IPv4 Settings** and power cycle the sonar.

**Note:** By factory default, the sonar provides DHCP service to the computer or network it is attached to. If your network has a DHCP server operating, you should disable the sonar DHCP server before connecting it to the new network.

**Note:** The sonar Ethernet wiring is designed to connect directly to a PC network card (i.e. it is wired as a crossover cable). You can connect your sonar to an 'auto sensing' network device with the same cable you use to attach to a PC.

## When You Forget the M-Series Sonar's IP Address

To connect with the sonar, the M-Series Sonar's IP address must be compatible with the network or computer to which it is attached. If you mis-configure the sonar's network settings and are unable to connect to it, follow this procedure to re-establish communications with the sonar:

1. Connect the sonar communication cable directly to a Windows computer's network interface card.
2. As described above, open the Internet Protocol (TCP/IP) Properties window for the network interface card you plugged the sonar into.
3. Under the General tab, select '**Obtain an IP address automatically**'.
4. Under the Alternate Configuration tab, select '**Automatic private IP address**' and click OK.
5. Close the rest of the windows folders you opened.
6. Cycle the sonar power off (for at least 10 seconds), then turn the sonar back on.
7. After about 100 seconds, the Windows PC and the sonar should have negotiated a 'link local' IP address (in the range of 169.254/16).
8. Using the ProViewer software, connect normally and reconfigure the sonar's network settings to be compatible with its intended network.

# Chapter 7: Maintenance

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## Before Use

1. Prior to the assembly of the components, ensure that all connector contacts are clean, dry and free of dirt and/or corrosion.
2. Inspect the sacrificial zinc anode on the rear bulkhead of the sonar head and replace if it appears that more than half of the anode has been lost to corrosion.
3. Inspect all cables and connectors for abrasion, cuts or cracks. Repair or replace as needed.
4. Inspect the anodized sonar shell and front/rear bulkheads for excessive corrosion. If there is any question as to usability with the extent of any corrosion, contact Teledyne BlueView, Inc.
5. Inspect the front and rear bulkhead joints of the sonar head to insure the flush mount housing screws are in place.

**Note:** These are not a field replaceable item and should never be removed except by factory trained personnel.

## After Use

1. After use, rinse the sonar, the rear connector on the sonar, and the sonar cable with a solution of mild soap and fresh water. At this time, inspect all components for corrosion, wear or damage. This includes the sonar, connectors, cables, and anode. Replace any component showing corrosion or damage.
2. Clean the connectors on the sonar cable and the connector on the rear bulkhead of the sonar unit with alcohol.

**Note:** The connector on the rear bulkhead of the sonar unit is NOT a field replaceable item. If any damage is detected, please contact Teledyne BlueView, Inc. for an RMA number to return the sonar to the factory for replacement, repair, and re-test.

3. Apply 3M silicon spray lube or equivalent to the external mating surface of the sonar connector and the internal mating surface of the sonar cable connector. Do not grease.
4. Check that the anode is in place and it has not deteriorated. Replace as necessary. More than 50% should remain or the anode should be replaced. When replacing the anode, make sure the surface under the anode is bare and bright before the anode is installed to ensure good electrical contact. For a replacement anode, please contact Teledyne BlueView, Inc.

## Chapter 8: Troubleshooting

| Possible Cause                            | Solution   |
|---|--|
| No Power                                  | Confirm that the POE Box is plugged into a standard 120 or 220 VAC outlet and that the small green LED on the POE Box is illuminated. Check that the Sonar-to-Surface cable is plugged into the <b>SONAR J1</b> port on the POE Box.   |
| Improperly connected                      | In addition to the connections described above, verify that you have a good cable between the computer Ethernet port and the <b>PC J2</b> port on the POE Box.   |
| Bad State                                 | Reset the sonar by removing the POE box AC power cord for 10 seconds. The sonar head takes ~ 40 seconds to reboot after power is re-applied.   |
| Dirty connectors                          | Make sure that all connector pins are clean and corrosion free.  |
| Improper Ethernet cable                   | The Sonar Head cabling is conveniently designed so that you can connect your POE Box to a PC with a <b>standard</b> Ethernet cable.<br><br>However, when connecting your POE Box to a network hub, a crossover Ethernet cable is required <b>unless</b> your network hardware is capable of automatically handling crossed Ethernet cables.    |
| PC networking software is confused        | Restart the networking software. There are several ways to do this depending on your particular operating system: Open the windows network connection window and right click on the Ethernet connection. Select <b>repair</b> or <b>disable</b> then <b>enable</b> . You can also simply restart the computer or cycle the power on the sonar. |
| IP subnet masks don't match               | Make sure the subnet mask is <b>the same</b> on both PC and sonar. For the factory default Class C network configuration, the subnet mask is 255.255.255.0. The 255 defines the <b>network</b> portion of the IP address. The 0 defines the <b>device</b> portion of the IP address.   |
| IP network addresses don't match.         | Make sure the IP <b>network</b> part of the IP address is <b>the same</b> on both the sonar and the computer. In the factory default case, this is the first 3 numbers in the IP address: 192.168.1.   |
| IP network device addresses are the same. | The <b>device</b> part of the IP address must be <b>different</b> for every device on the network. In the factory default case, the sonar is set to 45 and the PC is set to 3. Do not use 255 as it is reserved for broadcast use.   |
| PC ARP table is stale.                    | In the ProViewer Sonar Devices window, click the <b>Add</b> button and enter the IP address you think the sonar is set to respond to, then click <b>OK</b> . The sonar should respond within several seconds. Alternatively, the PC power can be cycled to refresh the ARP table.  |
| Poor connection quality                   | Use an Ohmmeter to verify <b>Tx</b> and <b>Rx</b> line connectivity between the Ethernet connector that plugs into the PC and the connector that plugs into the Sonar Head. Refer to the ProViewer Sonar to Surface Cable Drawing in the Spec sheet for pin to pin connection information.   |

## Image Updates Seem Slow

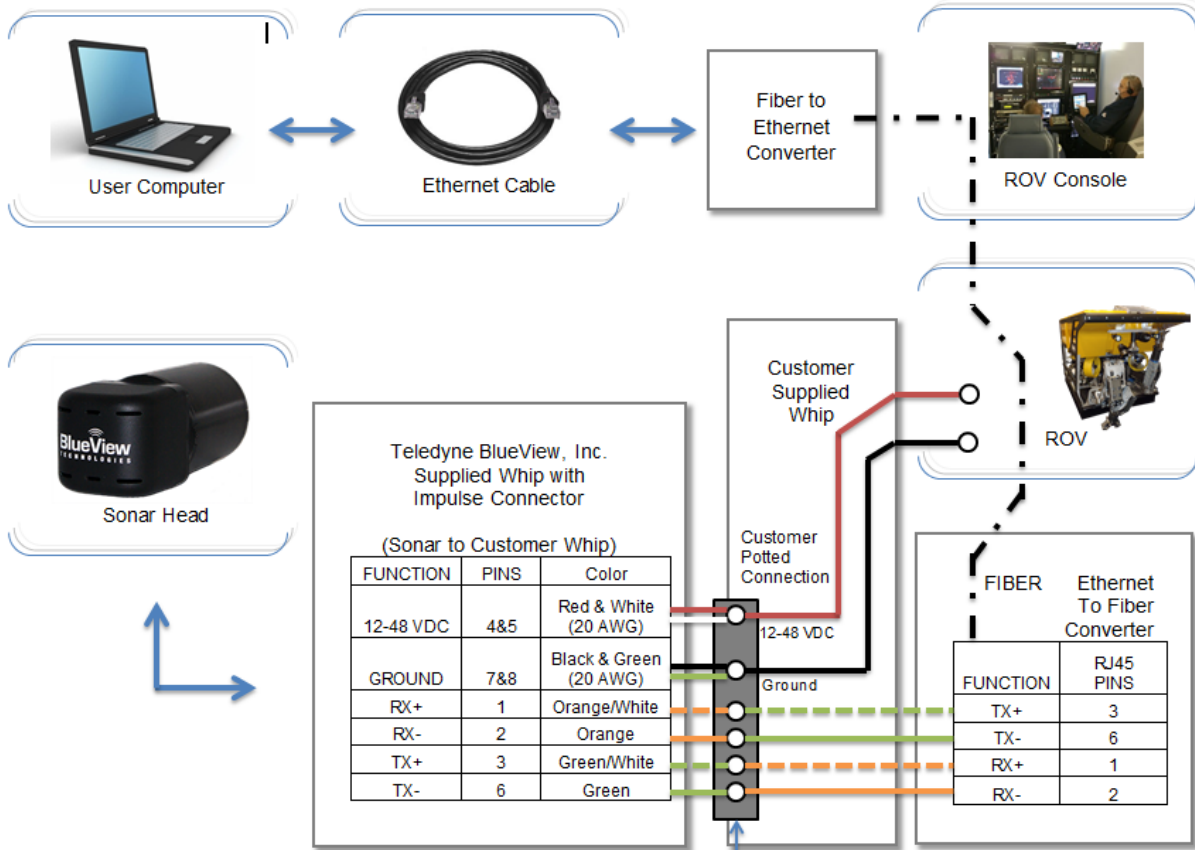
| Possible Cause      | Solution  |
|---------------------|---|
| Ethernet congestion | Shut down any other computers or services that are consuming the Ethernet network bandwidth   |
| Range settings      | When your sonar pings, it must wait for the echo to return from a distant object; long range settings directly cause slow updates. Reduce the <b>Range Stop</b> distance to increase the update rate.   |
| GUI window size     | The larger the displayed sonar image, the longer it takes for the ProViewer software to construct the image. To increase the image display update rate, decrease the size of the sonar image display window by grabbing one of sides or corner of the GUI and dragging it towards the center of the GUI window. |

## Still not working

Please contact us:  
Teledyne BlueView, Inc. Customer Support  
Website: [www.blueview.com](http://www.blueview.com)  
Email: [SWA\\_Support@teledyne.com](mailto:SWA_Support@teledyne.com)  
Phone Number: +1.425.492.7400  
Hours of operation: 8am – 5pm PST Mon through Fri

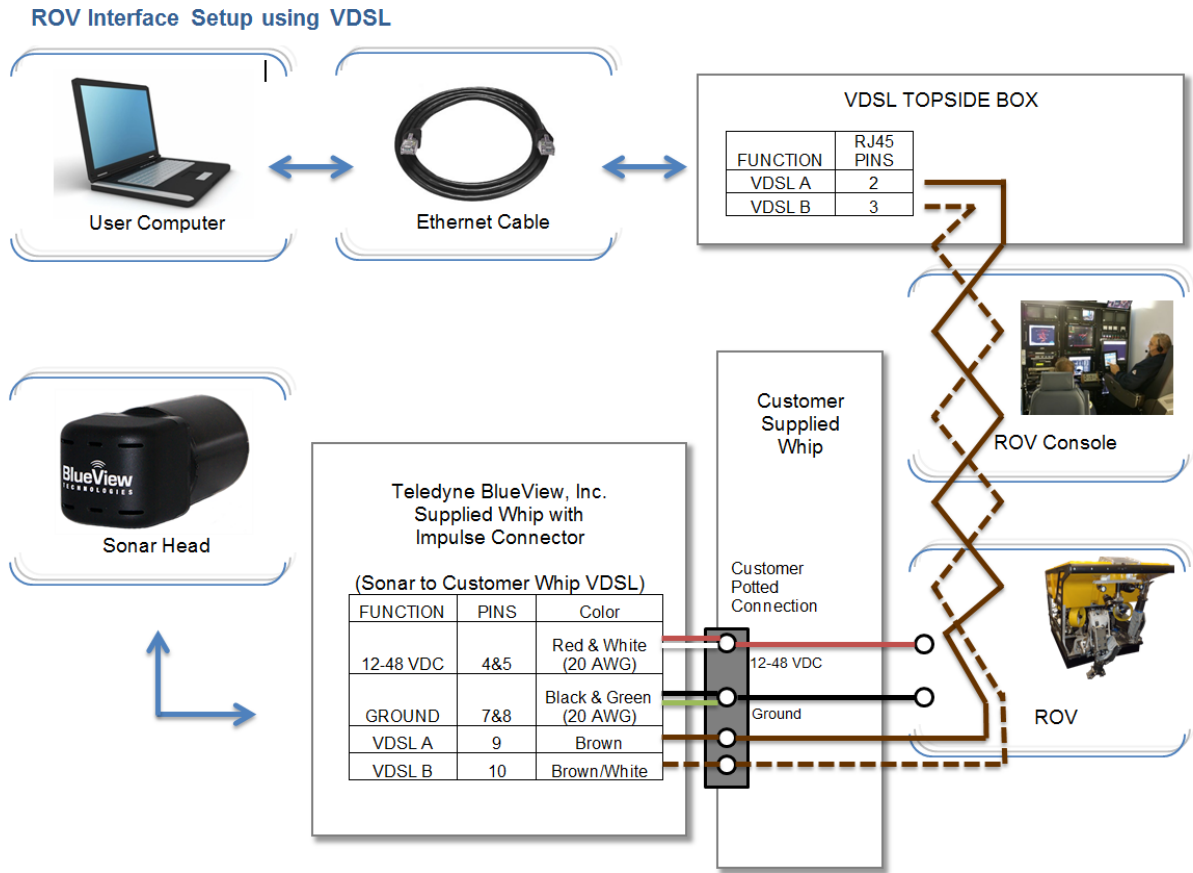
# Appendix A: Non-VDSL ROV Interface Setup

## ROV Interface Setup



Note: If no sonar communication, try a straight Ethernet connection. (Swap 1 & 3, 2 & 6)

# Appendix B: VDSL ROV Interface Setup



# Appendix C: Hardware Trigger

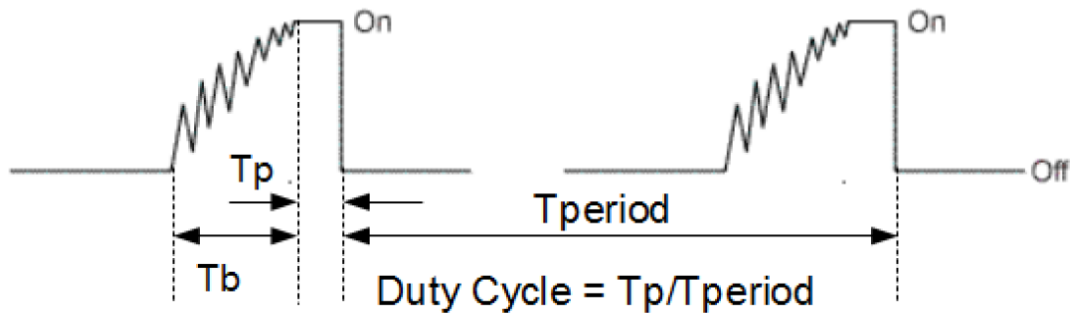
## Introduction

This addendum provides the required instructions to utilize your Teledyne BlueView sonar’s hardware trigger capabilities. Wiring details are provided with reference to specific functions. To correlate these functions with particular connector points and/or wire colors, see the cable pin-out addendum for your specific unit.

### ➤ Utilizing the Hardware Trigger

Connect your trigger signal source to the **HW TRIG** wire and your trigger ground to the **HW TRIG GND** wire on the provided Test Cable. In general, the hardware trigger requires a 5V pulse and a 10 μs minimum pulse width on the leading edge. See the tables below for more detailed information.

| Specification                               | Quantity    |
|---|-------------|
| Trigger Input Type                          | 5V TTL/CMOS |
| Minimum input as logic '1'                  | 3.68 Volts  |
| Maximum input as logic '0'                  | 2.06 Volts  |
| Maximum input current to drive to logic '1' | 0.32 mA     |
| Maximum input current [ @ Vin = 5V ]        | 0.53 mA     |



| Specification                            | Quantity               |
|--|------------------------|
| Activate Trigger Pulse                   | Leading Edge           |
| Minimum pulse width after bounce “Tp”    | 10 uS                  |
| Maximum bounce allowed “Tb”              | < (pulse width - 10uS) |
| Maximum Duty cycle                       | 1%                     |
| Maximum trigger delay after leading edge | 100 mS                 |

### ➤ Software Setup

- See the BlueView ProViewer or SDK manual for the procedure to enable the hardware trigger within the software.



# Appendix D: GNU General Public License

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