

Liquivision X-Link (Hardwired Version) Hardware User Manual

Version 2.0 December 2009

TABLE OF CONTENTS

▶ IMPORTANT NOTICE.....	2
▶ PARTS LIST.....	5
▶ X-LINK HARDWARE SPECS	6
▶ ANATOMY OF THE X-LINK.....	6
▶ PUTTING IT ALL TOGETHER.....	9
▶ X-LINK CHARGING ACCESSORIES	10
▶ CHARGING THE X-LINK.....	11
▶ SETTING UP YOUR X-LINK.....	14
▶ X-LINK TROUBLESHOOTING GUIDE.....	15
▶ APPENDIX	16

► IMPORTANT NOTICE

THE X-LINK AND THE LIQUIVISION X1 DIVE COMPUTER ARE NOT INTENDED TO BE USED AS THE ONLY MONITOR OF OXYGEN OR OXYGEN PRESSURE. AN ADDITIONAL, OXYGEN PRESSURE MONITOR AND CONTROL DEVICE SHOULD BE USED AT ALL TIMES.

THE INFORMATION PROVIDED BY THE X-LINK AND THE X1 DIVE COMPUTER MAY NOT BE ACCURATE AND SHOULD NOT BE USED FOR MAKING ADJUSTMENTS TO REBREATHER OXYGEN SETTINGS.

THE X-LINK AND THE LIQUIVISION X1 DIVE COMPUTER ARE NOT CONTROLLERS, AND DO NOT HAVE ANY CONTROL OVER A REBREATHER OXYGEN SYSTEM OR OTHER REBREATHER SYSTEM COMPONENTS.

THE X-LINK CAN STOP FUNCTIONING OR PROVIDE INACCURATE INFORMATION, WITHOUT WARNING, DUE TO VARIOUS UNCONTROLLABLE CAUSES (INCLUDING DEFECTIVE OXYGEN SENSORS OR OTHER REBREATHER SYSTEM COMPONENTS) OR THE USE OF A MANUAL OXYGEN PRESSURE SETPOINT. DEFECTIVE OR OLD OXYGEN SENSORS CAN PROVIDE INACCURATE INFORMATION, WHICH CAN LEAD TO INCORRECT AMOUNTS OF DECOMPRESSION AND DEADLY CONSEQUENCES. OXYGEN SENSORS SHOULD BE VALIDATED AND CALIBRATED USING PRESCRIBED PROCEDURES AND TEST EQUIPMENT BEFORE USE. THE X-LINK AND THE X1 DIVE COMPUTER SHOULD NOT BE USED TO VALIDATE OR CALIBRATE OXYGEN SENSORS OR OTHER REBREATHER SYSTEM COMPONENTS.

THE X-LINK IS DESIGNED TO BE INSTALLED BY DIRECT HARDWIRE CONNECTION TO A REBREATHER HEAD. THIS PROCEDURE SHOULD BE PERFORMED ONLY BY A QUALIFIED SERVICE CENTER APPROVED BY THE REBREATHER MANUFACTURER. INCORRECT INSTALLATION (INCLUDING INCORRECT WIRING) CAN DAMAGE OR DESTROY THE REBREATHER OR THE X-LINK, OR CAUSE THE REBREATHER, THE X-LINK OR THE X1 DIVE COMPUTER TO MALFUNCTION RESULTING IN INCORRECT INFORMATION WHILE DIVING (WHICH COULD RESULT IN PERSONAL INJURY OR DEATH).

User Agreement and Warranty

Use of your Liquivision X-Link Rebreather Interface (the “**X-Link**”) is subject to the X-Link User Agreement and Warranty (the “**Agreement**”) included in the X-Link package, and available at the Liquivision website: www.liquivision.ca.

You must read the entire Agreement before using your X-Link. If you do not agree with any term of the Agreement, you must not use the X-Link, and you may return the X-Link to Liquivision or the authorized Liquivision dealer from which you purchased the X-Link for a full refund within 30 days after your date of purchase.

If you use the X-Link, you are deemed to have agreed to the Agreement.

User Manual

This X-Link User Manual is delivered to you on the CD included in the X-Link package, and is available at the Liquivision website: www.liquivision.ca.

You must read this entire X-Link User Manual before you install or use your X-Link. Incorrect installation or use of the X-Link or its accessories will invalidate your Warranty and can cause permanent damage to the X-Link or its accessories and other devices.

Liquivision X1 Dive Computer

The X-Link is a computer hardware expansion interface designed to be used only with a Liquivision X1 Dive Computer (the “**X1 Dive Computer**”). Your use of the X1 Dive Computer is governed by the applicable Liquivision X1 User Agreement and Warranty, which was included in the box with the X1 Dive Computer.

Important Rules

Here are some important rules you must follow while using the X-Link. Not abiding by these rules will void your Warranty. Please consult the Agreement for details (section 6.3 “Warranty Limitations and Exclusions”).

- The X-Link is designed to be installed by direct hardwire connection to a rebreather head. This procedure should be performed only by a qualified service center approved by the rebreather manufacturer. Incorrect installation (including incorrect wiring) can damage or destroy the rebreather or the X-Link, or cause the rebreather, the X-Link or the X1 Dive Computer to malfunction resulting in incorrect information while diving (which could result in personal injury or death). Incorrect installation of the X-Link will void the warranty.
- The X-Link may only be submerged when worn by a human being. Any un-manned submersions including, but not limited to, submersions in an un-manned vehicle or on a rope, will void the Warranty.
- The X-Link (hardwired version) is rated for 180m (591 ft). Submersion beyond the rated depth will void the warranty.
- The X-Link must be recharged prior to use. It can be recharged using the multifunction attachment and AC adapter that are included with the X1 Dive Computer.
- Only the X-Link itself has been designed for underwater use. Never submerge the multifunction attachment or AC adapter, and never dive with the multifunction attachment or AC adapter connected to the X-Link. Doing so will damage these accessories and/or the X-Link, and will void the Warranty.
- Do not recharge the X-Link in direct sunlight, or allow the temperature of the X1 to exceed 45°C (113°F) during recharging.
- Do not expose the X-Link to chemical products including, but not limited to, mosquito repellents.
- Do not attempt to open, modify or repair your X-Link yourself. Contact your dealer for assistance.

Important Notice on Charging

The X-Link must be charged using the multifunction attachment and AC adapter that are sold with the X1 Dive Computer.

When you want to charge your X-Link, **FIRST** you must connect the X-Link to the Multifunction Attachment, **THEN** you can connect the attachment to the AC Adapter and into a power supply.

When you want to stop charging your X-Link, **FIRST** disconnect the unit from power, **THEN** disconnect the Multifunction attachment from the X-Link.

If you do not follow these rules, your X-Link may not function properly and you may need to reset it.

CE Certification

The Liquivision X-Link hardware has received CE certification (EN 13319).

Liquivision Limitation of Liability

The Agreement includes exclusions and limitations of Liquivision's liability to you. These exclusions and limitations include, but are not limited to, the following:

YOU AGREE THAT YOU UNDERSTAND AND ACCEPT ALL RISKS ASSOCIATED WITH DIVING, AND THAT LIQUIVISION IS NOT LIABLE TO YOU OR ANY OTHER PERSON, INCLUDING YOUR HEIRS, EXECUTORS OR PERSONAL REPRESENTATIVES, FOR ANY LOSS, DAMAGE, COST, EXPENSE OR CLAIM ARISING OUT OF, CAUSED BY OR RELATING TO YOUR PERSONAL INJURY OR DEATH WHILE DIVING, EVEN IF YOUR PERSONAL INJURY OR DEATH IS CAUSED, IN WHOLE OR IN PART AND DIRECTLY OR INDIRECTLY, BY THE X1 DIVE COMPUTER, THE X-LINK, ANY 3RD PARTY SOFTWARE OR YOUR USE OF THE X1 DIVE COMPUTER, THE X-LINK, ANY 3RD PARTY SOFTWARE, AND REGARDLESS OF WHETHER OR NOT THE X1 DIVE COMPUTER, THE X-LINK, ANY 3RD PARTY SOFTWARE FUNCTIONED PROPERLY OR WAS DEFECTIVE IN ANY WAY.

YOU HEREBY IRREVOCABLY WAIVE AND RELEASE LIQUIVISION FROM ANY LIABILITY OR OBLIGATION TO YOU OR YOUR HEIRS, EXECUTORS OR PERSONAL REPRESENTATIVES FOR ANY LOSS, DAMAGE, COST, EXPENSE OR CLAIM ARISING OUT OF, CAUSED BY OR RELATING TO YOUR PERSONAL INJURY OR DEATH WHILE DIVING, EVEN IF YOUR PERSONAL INJURY OR DEATH IS CAUSED, IN WHOLE OR IN PART AND DIRECTLY OR INDIRECTLY, BY THE X1 DIVE COMPUTER, X-LINK, ANY 3RD PARTY SOFTWARE OR YOUR USE OF THE X1 DIVE COMPUTER, X-LINK, ANY 3RD PARTY SOFTWARE, AND REGARDLESS OF WHETHER OR NOT THE X1 DIVE COMPUTER, X-LINK, ANY 3RD PARTY SOFTWARE FUNCTIONED PROPERLY OR WAS DEFECTIVE IN ANY WAY.

You must read the Agreement for all limitations and exclusions of Liquivision's liability to you.

3rd Party Software

The X-Link will not operate or perform any function independently of an X1 Dive Computer that has third party decompression software ("**3rd Party Software**") installed on it.

Here is a list of X1-compatible 3rd Party Software available at time of printing:

V-Planner Live [VPM-B/E]: www.hhssoftware.com/v-planner-live/

GAP X1 [Buhlmann-GF]: www.gap-software.com

MultiDeco-X1 [VPM-B/R and Buhlmann-GF]: www.hhssoftware.com/multideco-x1/

You can find a current list of 3rd Party Software on the Liquivision website: www.liquivision.ca.

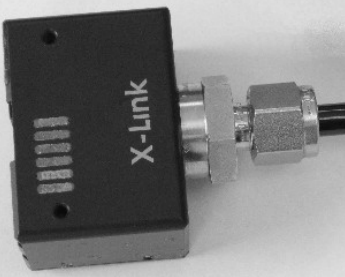

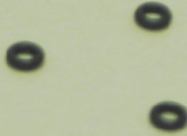
Liquivision does not recommend or endorse any 3rd Party Software, and you are responsible to select, purchase, install and properly use the 3rd Party Software of your choosing. Liquivision is not responsible or liable for any problems you may experience as a result of use of the 3rd Party Software, including death, personal injury or loss or damage to your computer, software, data or other personal property.

Liquivision makes no representation, warranty, condition or guarantee regarding the current or future availability or quality of 3rd Party Software, including the availability of software updates or upgrades. Any claims regarding 3rd Party Software should be directed to the manufacturers of the 3rd Party Software.

Contact your preferred software company for software user manual, download and installation instructions, and technical support.

► PARTS LIST

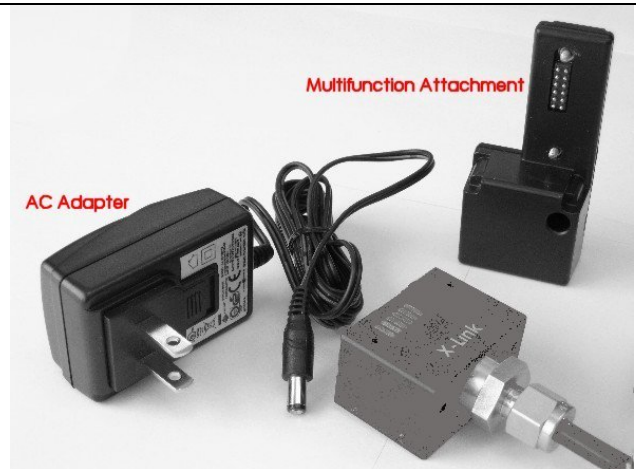
In your X-Link package, you will find the following items:

1. X-Link (Hardwired Version)	 A black rectangular component with the text "X-Link" printed on its side. It has a silver-colored metal fitting on the right side, which appears to be a threaded connector or a hose fitting.
2. Thumbscrews	 Two brass thumbscrews with black plastic caps, lying on a light-colored surface.
3. O-rings	 Three small, black, circular O-rings arranged on a light-colored surface.

The following items are NOT included, and must be purchased separately:

Multifunction Attachment and AC Adapter

These items are purchased together with the X1 Dive Computer and are NOT provided again with the X-Link.



► X-LINK (HARDWIRED VERSION) HARDWARE SPECS

Depth rating: 180 m / 591 ft

Casing: Hard anodized aluminum

Battery: Lithium polymer rechargeable (factory changeable)

Battery life: Approximately 7-10 days, or 150 hours of dive time

Oxygen Channel Input Range: 0 - 180mV

CO₂/Helium Channel Input Range: 0 - 3.3V

► ANATOMY OF THE X-LINK

Internal Components

Gel Filling

The electronics in the X-Link are potted with a gel that allows for the elimination of O-rings. You may see gel around certain parts of the unit. Exposed gel does not compromise the function of the X-Link.

Lithium Polymer Battery

The X-Link features a rechargeable battery that has a spec lifespan of over ten years. Depending on software energy consumption by 3rd party software, the X-Link can operate for over 150 hours of continual use in dive mode and last 7-10 days in sleep mode. The battery life of the rechargeable battery may decline gradually with use, but the X-Link is designed to maintain functional battery power for over 10 years. If needed, the rechargeable battery can be changed by the Liquivision factory.

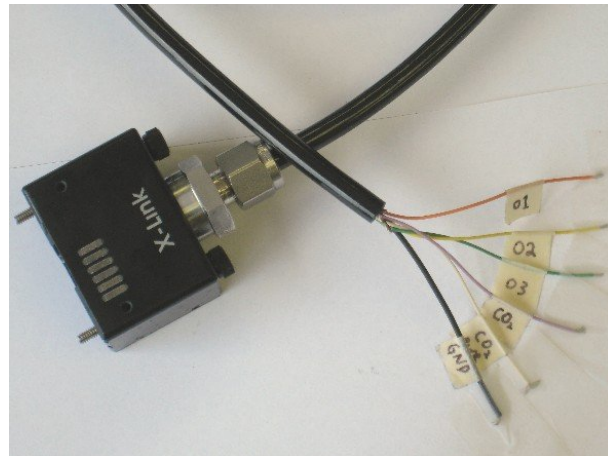
Rebreather Cable

The X-Link (hardwired version) includes a water-stop cable which needs to be connected to the rebreather. The outside diameter of the cable is 6mm.

The color code for the wires inside the water-stop cable is as follows:

Cable Color Code:

O2 #1	Orange
O2 #2	Yellow
O2 #3	Green
CO2	Purple
CO2 Power	White
GND	Black

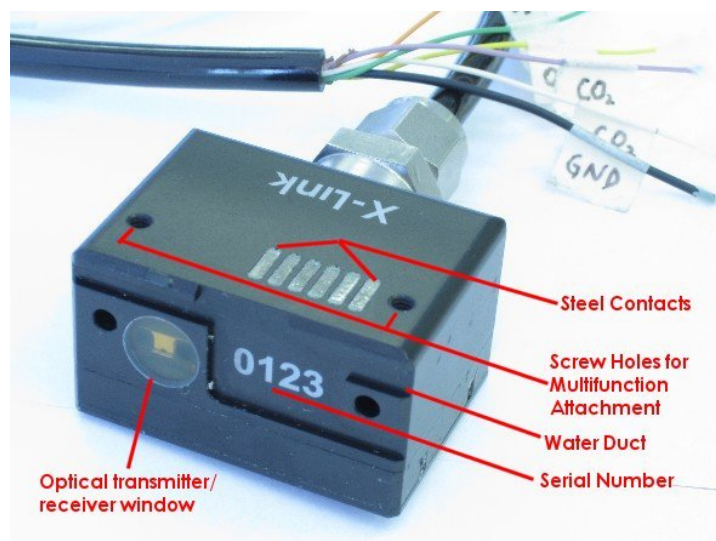


Software

The X-Link contains a low power microcontroller which digitizes the analog oxygen levels and sends them over the optical interface to the X1 Dive Computer. The X-Link comes pre-loaded with its own internal operational software. There is little reason to change the software internal to the X-Link. However, using the multifunction attachment, it is possible to load new software into the X-Link if needed. ***In order to use the X-Link, your X1 Dive Computer must be loaded with 3rd party decompression software that specifically supports the X-Link. If you have been using the X1 Dive Computer for some time, you may need to upgrade to the newest version of your software package to ensure support for the X-Link.***

Anodized Aluminum Casing

The X-Link casing is built from hard anodized aluminum. The casing is scratch resistant. While most knives and sharp tools won't scratch the X-Link, certain barnacles, certain types of sharp rocks and other marine invertebrates can cause minor scratches if the X-Link is forcefully struck or scraped against them.



Steel Contact Pins

The X-Link features six contact pins that perform a variety of roles:

- Recharging the X-Link
- Upgrading the software in the X-Link
- Resetting the X-Link

The contact pins must be clean and dry before connecting the multifunction attachment.

Screw Holes and Thumbscrews

There are two sets of screw holes on the X-Link. The two screw holes in the same plane as the steel contact pins are for the purpose of attaching the Multifunction Attachment.

The other screw holes run the entire width of the X-Link and have thumbscrews pre-inserted in them. These thumbscrews are for the purpose of attaching the X-Link to the X1 Dive Computer (not shown in picture above).

Water Duct

The mating side of the X-Link contains a duct that allows water to flow between the X1 Dive Computer and the X-Link. This allows the X1 Dive Computer to detect the presence of the water and turn on automatically if you have enabled 'water wake-up.' When the X-Link is connected to the X1 Dive Computer, you cannot use a wet finger to wake up the X1 Dive Computer. For this reason, you may want to keep taps active on the X1 Dive Computer, to make it easier to wake up the X1 Dive Computer when you are on land. In V-Planner Live you can set Standby mode to 'always' to keep taps active at all times.

Optical transmitter/receiver window

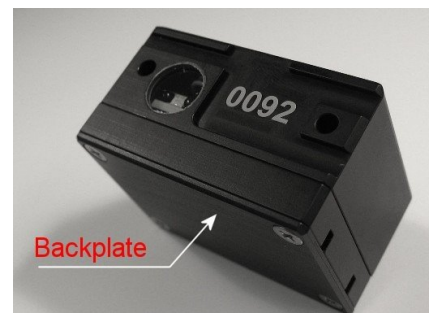
The optical window is reinforced mineral glass that provides a medium for the transmission and reception of digital optical signals. The X-Link's optical transmission speed and protocol are optimized for underwater use. The data rates and protocol are perfectly synchronized with the X1 Dive Computer's own internal clocks. The X-Link and X1 Dive Computer were specifically designed to talk to each other. This makes the communication interface extremely reliable.

Serial Number

The X-Link unit serial number is located beside the optical transmission window of the unit, and should also be written on the retail box. The serial number is required for your warranty, 3rd party software downloads and to track compatibility with future software upgrades. We recommend that you write down your serial number and keep it in a secure place in case of theft. Liquivision and the 3rd party software companies all maintain data to prevent any software updates for stolen units.

Back plate

The backplate is glued and screwed onto the X-Link. Do not attempt to remove it. Only authorized Liquivision personnel can remove the backplate in order to change the battery in the X-Link.



▶ PUTTING IT ALL TOGETHER

X-Link Connected to X1 Dive Computer



X-Link Connected to Multifunction Attachment and AC Adapter for charging (please see detailed instructions in next section)



► X-LINK CHARGING ACCESSORIES

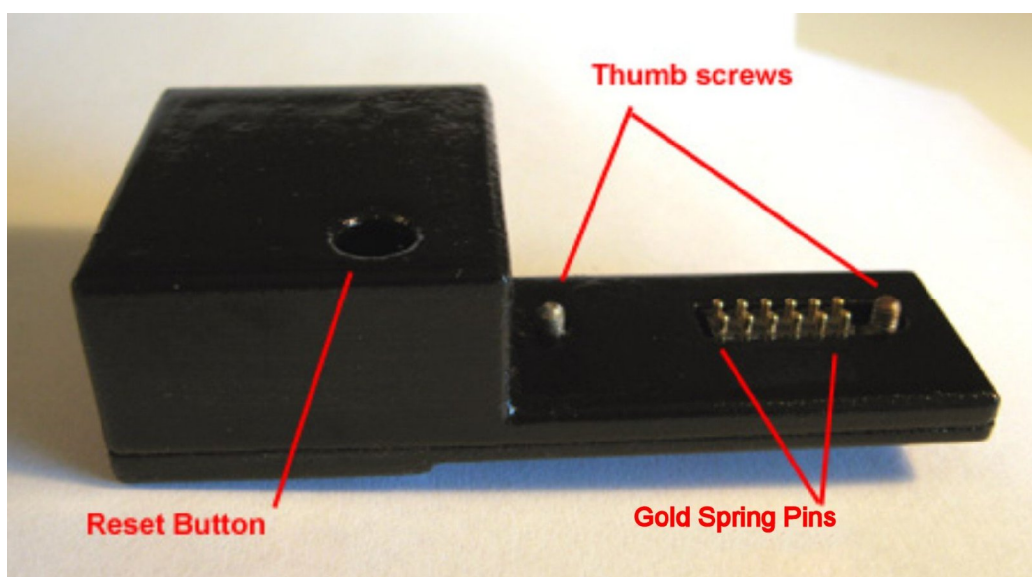
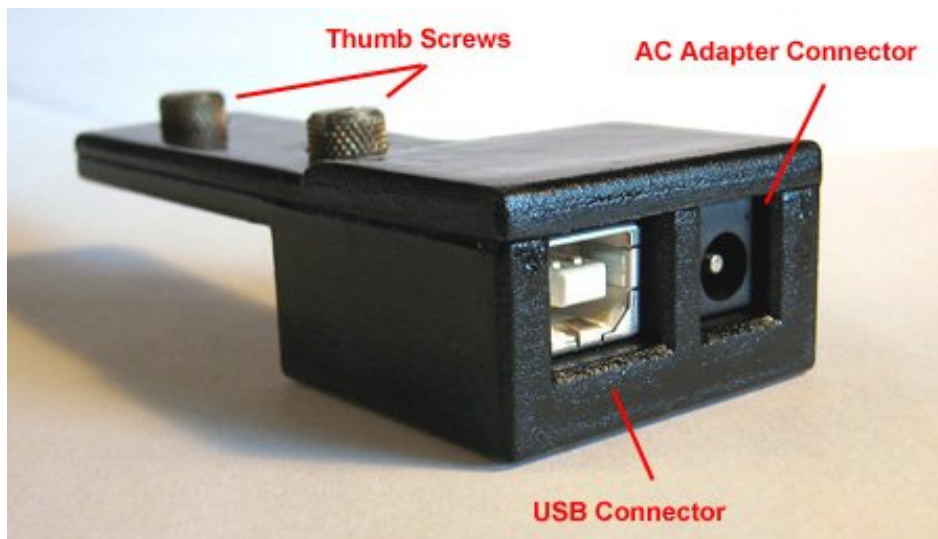
Multifunction Attachment

The Multifunction Attachment is sold with the X1 Dive Computer, but it is NOT included with the X-Link. It can also be purchased as an accessory, together with the AC Adapter, in a package called “X1 Charging Kit”.

When used with the X1 dive computer, the Multifunction Attachment allows for a variety of functions, including:

- Charging of the X1 battery via the AC Adapter
- Connection of the X1 via USB cable to a PC, to upload software to the X1
- Download of the X1 dive data to a PC
- Resetting of the X1 with the reset button

When used with the X-Link, the Multifunction Attachment allows for the charging of the X-Link battery via the AC Adapter and for the resetting of the X-Link.



AC Adapter

The AC Adapter is sold together with the X1 Dive Computer, but it is NOT included with the X-Link. It can also be purchased as an accessory, together with the Multifunction Attachment, in a package called “X1 Charging Kit”.

The AC Adapter allows you to connect the X-Link to a wall outlet. The AC adapter autoswitches between different international voltages (90-260V AC).

Plug Adapters

Four plug adapters are included with the AC Adapter that allow compatibility with wall sockets in most countries.

► CHARGING THE X-LINK



Battery Life

Battery life for the X-Link will vary depending on 3rd party software. The X-Link will generally last for about 150 hours of dive time, or 7-10 days in sleep mode.

We recommend charging your X-Link fully, once you have received it. Your X-Link may already have a partial charge or be completely discharged.

Connecting the Attachment and AC Adapter for charging

There are two ways to re-charge the X-Link:

<u>A) Stand-alone recharging</u>	<u>B) Mated recharging</u> Re-charging the X-Link while the it is connected to the X1
	

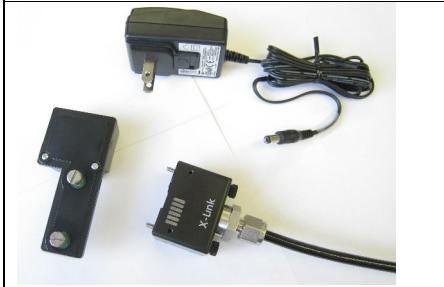


The advantage of stand-alone recharging is that it is quick and easy (no need to set up the X1 Dive Computer in any way). However, you will not know when charging is finished.

The advantage of mated recharging is that some software packages can report to you the progress of the X-Link recharge sequence.

Method #1: Stand-alone recharging

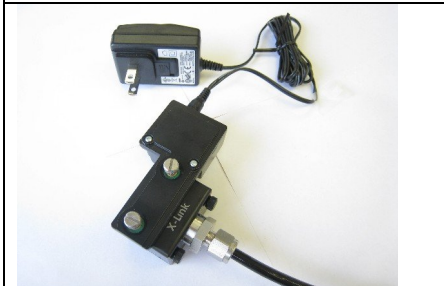

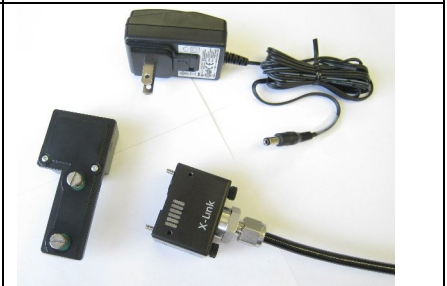
CONNECTING

1. First connect the Attachment to the X-Link using the thumbscrews
2. THEN connect the Attachment to the AC Adapter and to power

0. Required parts	1. Connect Attachment	2. Connect AC Adapter
		

DISCONNECTING

3. Disconnect the AC Adapter from the Attachment
4. THEN disconnect the Attachment from the X-Link





CHARGE FOR 4 HOURS	3. Disconnect AC Adapter	4. Disconnect Attachment
		

If you do not follow this procedure, your X-Link could malfunction and require a hardware reset. The procedure for resetting your X-Link is detailed in the Appendix to this manual.

Method #2: Mated recharging.

CONNECTING


1. FIRST wake up the X1 Dive Computer by taps or by wet finger contact.
If your software offers a menu for monitoring X-Link recharging, then enter that menu.
For V-Planner Live: X1 Settings -> Clocks, Calibrate -> CCR Calibrations
2. THEN connect the X-Link to the X1 Dive Computer using the thumbscrews.
3. THEN connect the Attachment to the X-Link by using thumb screws.
4. FINALLY, connect the Attachment to the AC Adapter and to power.

<p>1. Wake Up X1</p> 	<p>2. Connect X-Link to X1</p> 	<p>3. Connect Attachment to X-Link</p> 
<p>4. Connect Attachment to AC Adapter & power</p> 		

- Your X-Link should automatically start charging once the Attachment and AC Adapter are connected.
- If your software supports an X-Link recharge monitoring function, then the display will show a “charging status” – how it appears will depend on the 3rd party software you have installed on the X1 Dive Computer.
- Charging should take approximately 4 hours.

DISCONNECTING

5. Disconnect the AC Adapter from the Attachment
6. Disconnect the Attachment from the X-Link

<p>CHARGE FOR 4 HOURS</p> 	<p>5. Disconnect the AC Adapter</p> 	<p>6. Disconnect the Attachment</p> 
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If you do not follow this procedure, your X-Link could malfunction and require a hardware reset. The procedure for resetting your X-Link is detailed in the Appendix to this manual.

► SETTING UP YOUR X-LINK

1. Make sure your X1 Dive Computer software supports the X-Link. You may need to download a newer version of your X1 Dive Computer software. You can contact the software suppliers as follows:
 - a. Ross Hemingway, HHS Software, author of V-Planner Live: support@hhssoftware.com
 - b. Kees Hofwegen, GAP Software, author of GAP for X1: sales@gap-software.com
 - c. Ross Hemingway, HHS Software, author of MultiDeco-X1: support@hhssoftware.com
2. Re-charge the X-Link fully following the procedure detailed above.
3. Install the X-Link by direct hardwire connection to your rebreather. **Important Notice: This procedure should be performed only by a qualified service center approved by the rebreather manufacturer.**
4. Connect the X-Link to the X1 Dive Computer with the thumbscrews.
5. Calibrate the oxygen sensor readings using the X1 Dive Computer (follow the instructions in your 3rd party software). If you have questions, please contact the software suppliers.
6. Test & compare the oxygen PO2 values with your primary oxygen monitoring system.

► X-LINK TROUBLESHOOTING GUIDE

If you have problems with the X-Link, please refer to the table below to solve the problem.

Symptom	Solution
The X-Link will not re-charge.	<ul style="list-style-type: none"> • First try cleaning the X-Link contacts (see Appendix). • Double check that the AC adapter is plugged into a reliable power outlet. Also, try an alternate Attachment and AC Adapter (by borrowing from a friend, for example) • Reset the X-Link (see Appendix). • If all of those fail, contact your Dealer or Liquivision.
The X1 Dive Computer does not detect the X-Link.	<ul style="list-style-type: none"> • Reset the X-Link • The X-Link may not have enough battery power. Recharge the X-Link and try connecting it again. • The X-Link contacts may need cleaning (see Appendix). • Also, check with your software supplier. Make sure your current X1 software supports the X-Link. You may need to download a newer version of your X1 software.
The X-Link thumbscrews have fallen out of the X-Link.	<ul style="list-style-type: none"> • Add new O-rings as described in the Appendix.
There are small knobs of gel that appear on the side of the X-Link after recharging.	<ul style="list-style-type: none"> • This is normal. Do not remove them. Store your X-Link in such a way that the gel can move in and out freely.
There are holes or voids on the side of the X-Link.	<ul style="list-style-type: none"> • This is normal.
I just recharged the X-Link and now it is no longer detected by the X1 Dive Computer.	<ul style="list-style-type: none"> • Reset the X-Link (see Appendix).

► APPENDIX

1. X-Link Reset Sequence

In order to reset the X-Link:

- Connect the attachment to the X-Link
- Make sure the USB cable is *not* connected
- Connect power to the attachment
- Use a thin pen, and push the reset button that is on the attachment
- Disconnect power, then disconnect the attachment

2. Cleaning the X-Link contacts

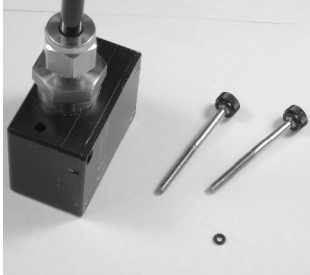


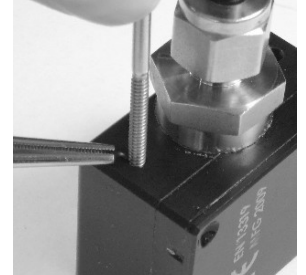
In order to clean the X-Link contacts:

- Use a sharp stainless steel tool, such as a very small flat-head screwdriver, and scrape the contacts
- Scrape off rust or residue, until the contacts become shiny
- Be careful *not* to scrape or damage the anodized aluminum around the contacts
- After scraping, rinse the contacts with water
- Then, you can further clean the contacts with a cloth and rubbing alcohol
- Dry off the contacts

3. Securing the Thumbscrews in the X-Link

If the thumbscrews fall out of your X-Link, you can secure them again in the following manner:

1. A couple of spare O-rings have been provided in your X-Link package. Choose one and cut it in half.
2. Place half an O-ring on the edge of the thumbscrew hole.
- 3, 4 & 5. Insert thumbscrew by twisting it, squeezing the O-ring into the hole until it disappears entirely.
6. The thumbscrew should now stay inside the hole, but be able to rotate freely.

0. What you need:	1. Cut the O-ring in half	2. Place on edge of thumbscrew hole	3. Insert thumbscrew into the hole by twisting
			
4. Keep pushing/twisting thumbscrew	5. Until O-ring disappears	6. Thumbscrew is secure, but rotates freely	
