

# Best Practices

## Caring for Acoustic Instruments



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# Instruments Registered in Acoustic Quality Assurance Program

- 174 M9 – 30K each
- 272 StreamPro – 21K each
- 297 RioGrande – 31K each
- 130 RiverRay – 32K each
- 3 RiverPro – 32K each
- 1194 FlowTracker – 9K each

QA  
294/yr

QA  
385/yr



**\$35,009,000**

*Handle With Care*

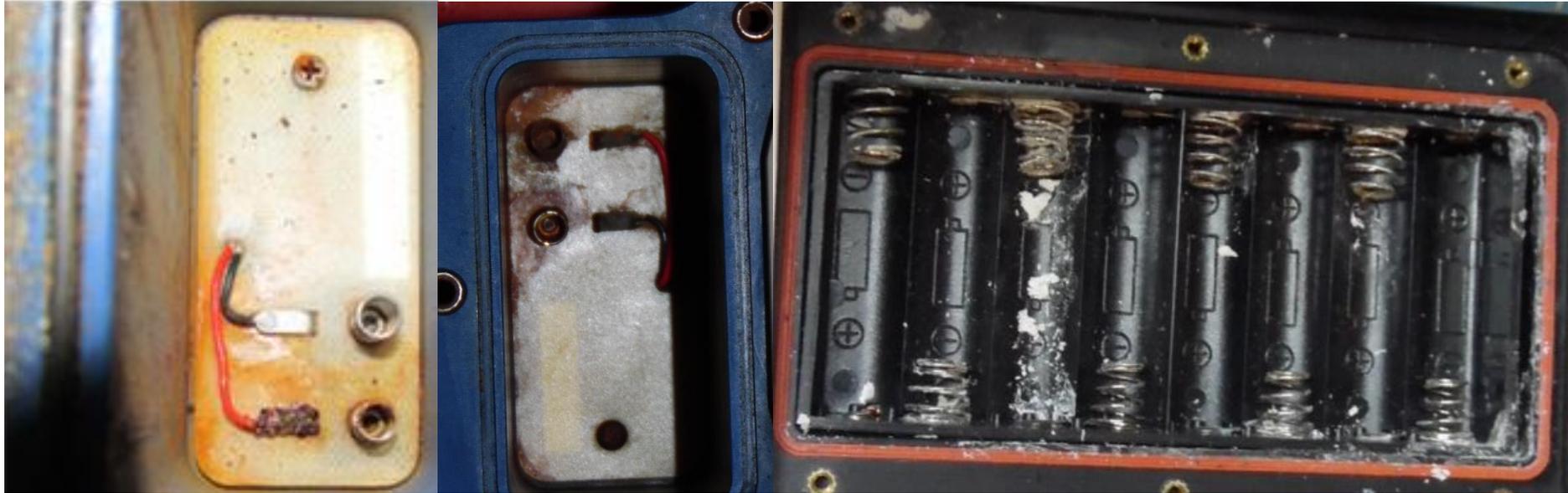
11% of FT and  
13% of ADCPs  
Fail or need Repair



All monetary figures in this presentation regarding instrument pricing and repair are ballpark estimates, not actual quotes, and are subject to change.



# Most Common Cause of Repairs in instruments called for QA



8% of ADCPs

## Corrosion

3% of FTs



# 2<sup>nd</sup> Most Common Cause of Repairs in instruments called for QA



Damaged in field or not properly protected  
during transit or shipping



4% of ADCPs

3% of FTs



# Cause of Corrosion

**Batteries** function by a process of controlled corrosion of two different elements which creates a voltage potential and a current if the circuit is completed.

- **Batteries Discharge continuously** whether in use or not, near end of life corrosion breaches battery and damages compartment
- **Moisture** can accelerate battery discharge, shortening life, a wet battery will corrode rapidly
- **Changes in Temperature** can cause condensation (moisture) in the battery compartment & accelerate discharge or cause corrosive battery chemicals to expand and leak out into the compartment

# Remove Batteries to Prevent Corrosion

- Remove Batteries when not in use
- Batteries can corrode before they are too weak to run the instrument
- NEVER leave dead batteries in compartment
- Store batteries with the instrument, but not installed (in a ziplock)
- Check batteries periodically for expiration dates and leakage
- NEVER mix cells by type, brand, or age



# Preventative Maintenance = Saving \$\$

Use white vinegar to clean minor corrosion ASAP,  
before it creeps into the electronics!



For more serious corrosion, send to the HIF electronics  
repair shop.



# O-ring Maintenance

(corrosion prevention)

Tools & supplies needed:

O-ring pick

Silicone lubricant

Lint-Free Cloth or disposable wipe

Replacement O-ring (if needed)

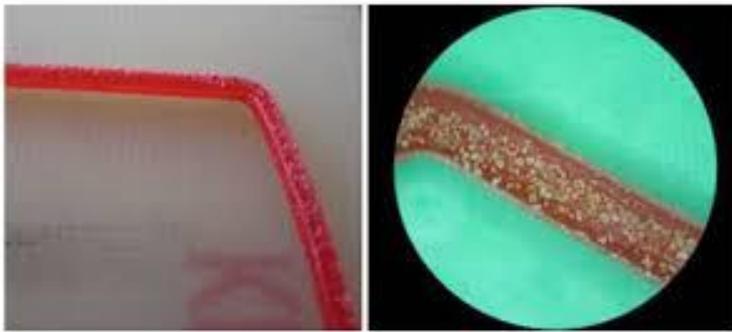


A plastic o-ring pick is best – it will not scratch the o-ring surface

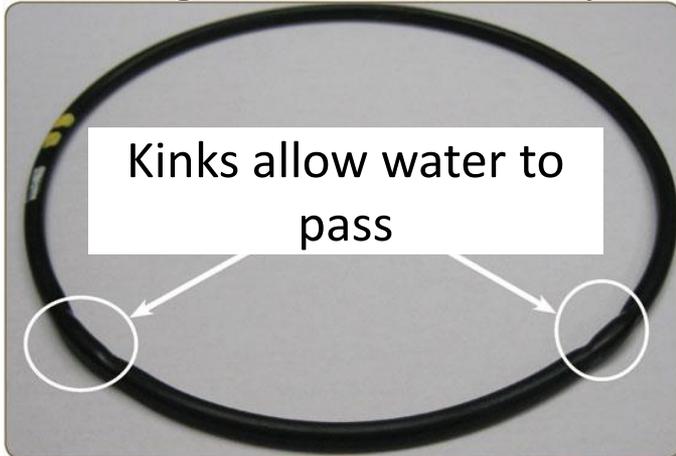


A guitar pick makes a great inexpensive o-ring pick!





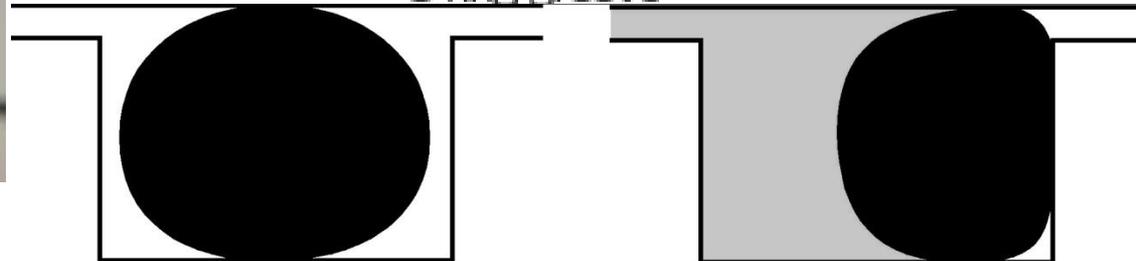
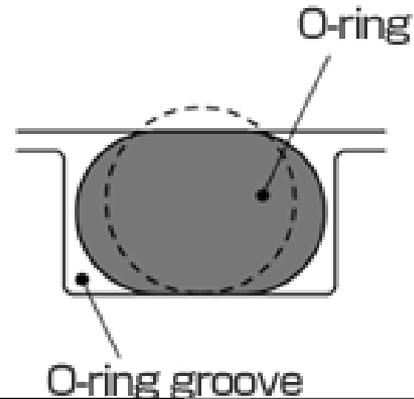
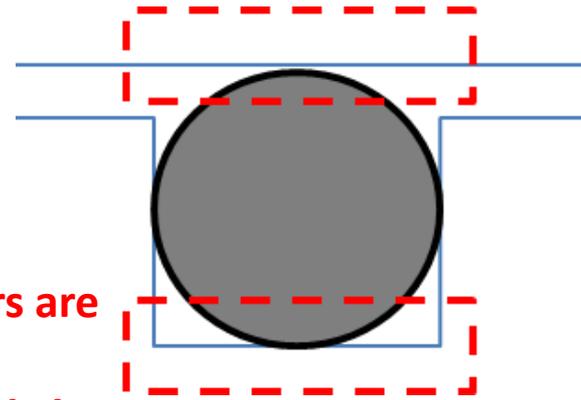
Sand and grit allow water to pass



A scratch or dent in the groove or battery panel allows water to pass

**⚠ DO NOT SCRATCH**

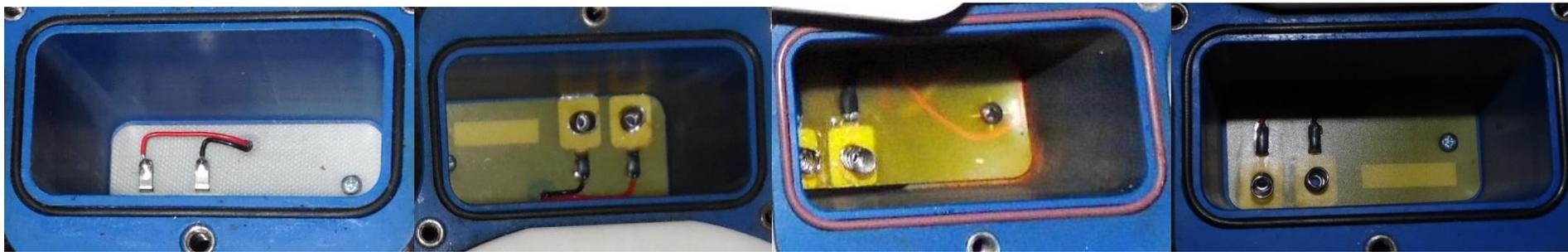
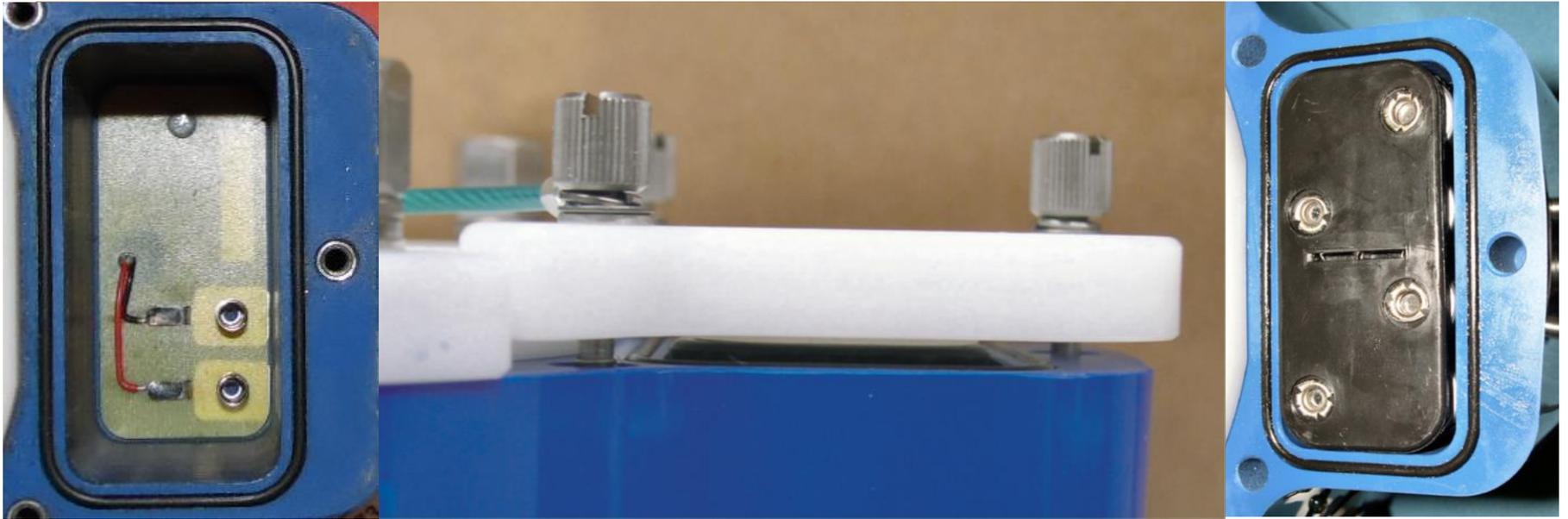
**Screwdrivers are NOT O-ring picks!**



*O-Ring seal with no pressure.*

*O-Ring seal under pressure.*

# Smooth clean seals keep water out



Dirty, compromised and missing seals let moisture in



**Remember: Remove batteries when not in use to prevent corrosion**



# When to Check O-ring?

- every time battery compartment is opened visually check o-ring - if dirty, clean o-ring and groove with lint-free cloth/wipe, if damaged, replace
- whenever the batteries are changed clean o-ring and groove with a lint-free cloth/wipe, check both visually and o-ring by touch, if damaged, replace
- Use a small amount of silicone lubricant (shiny not goopy) before placing o-ring in groove



# O-ring Maintenance is CHEAP



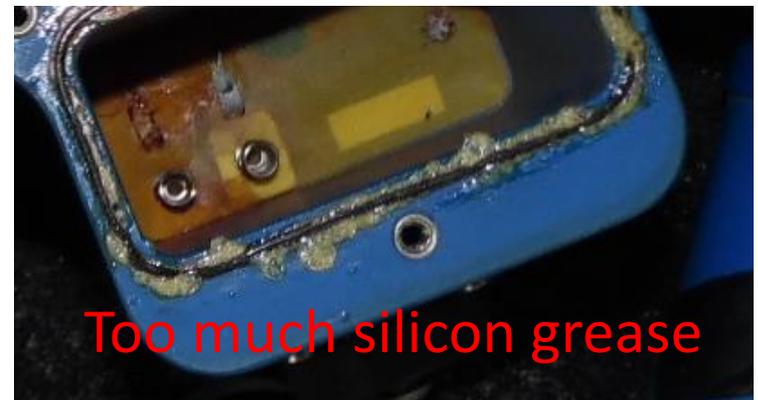
FlowTracker Battery Compartment O-ring \$4 at 1stop, item 1113080

StreamPro Battery Compartment O-ring \$1 at 1stop, item 1115018

- When in doubt about the sealing capability of an O-ring, **discard and replace**.
- Don't over grease! Too much grease attracts debris that will disrupt the seal and let in moisture.
- Silicone grease is not a sealant; it only protects the O-ring from abrasion.



Corrosion



# Corrosion is Expensive

Dirty seals & bent screws let water into the battery compartment. Once corrosion starts it needs to be addressed immediately, or it will lead to more costly repairs.

**Corrosion = \$300** VS **Prevention < \$20**

Clean & grease

O-ring,

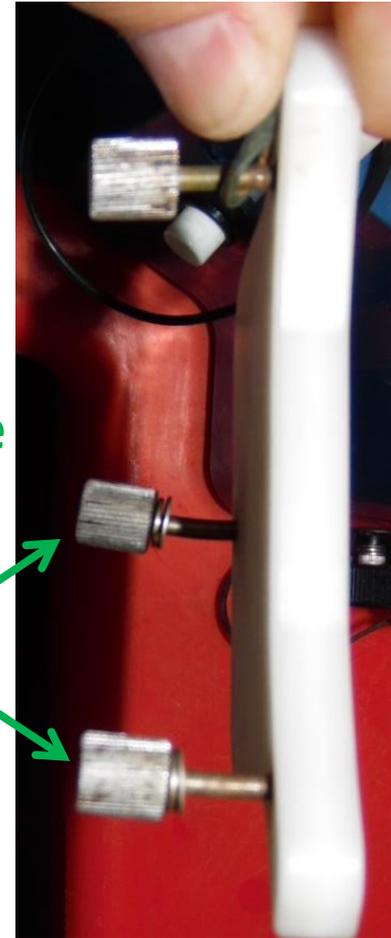
5-10 minutes tech time

Thumb Screw

\$5 each

O-ring \$1

On 1stop



# Common Repairs Caused by Corrosion

## StreamPro:

- Replace Battery board \$300
- Repair Bluetooth Module \$400



## FlowTracker:

- Replace Battery cover \$110 and holder \$185
- Replace Display \$330
- Replace CPU board \$390
- Replace Analog board \$565



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# Cable Care

(for instruments and boats)

## Cables are expensive

FlowTracker and StreamPro - in most cases if the cable fails you're buying a new probe \$\$\$

### AVOID:

- Stressing watertight connections
- Sharp bends
- Repeated bending
- Crimping cable
- Nicks and cuts
- Loose wet-mate connection



# Cable Care (cont)

- Check cables periodically for Nicks, Separation and Crimps
- To avoid nicking cables with a knife, use diagonal cutters or scissors to remove fasteners
- Never place cable inside of clamps used to secure the instrument
- Prevent cables from rubbing on edges, shield cables from edges and rough places that can't be avoided

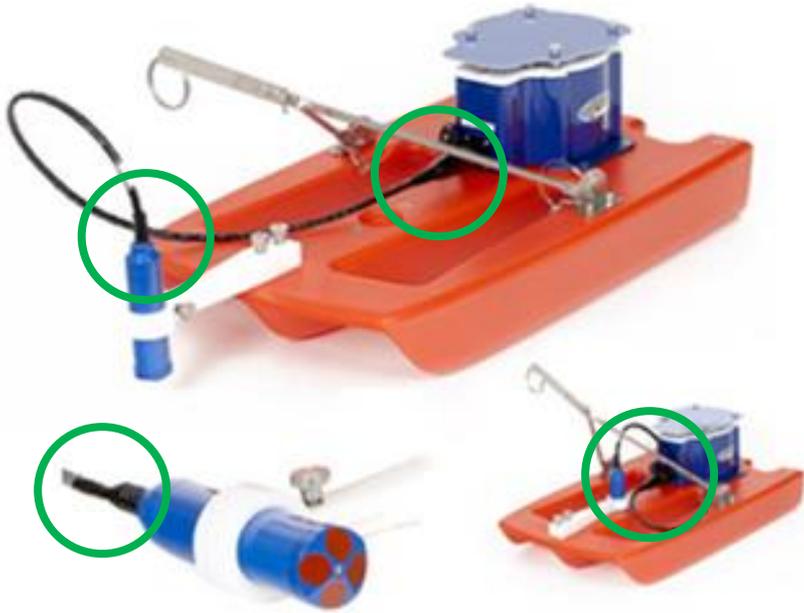


# Separation at watertight connections

- Do not allow cable coming from watertight connections to bend to close to the connection
- Never pull on the cable, hold the connector firmly to remove from the connection
- Avoid letting probe or electronics hang from the cable

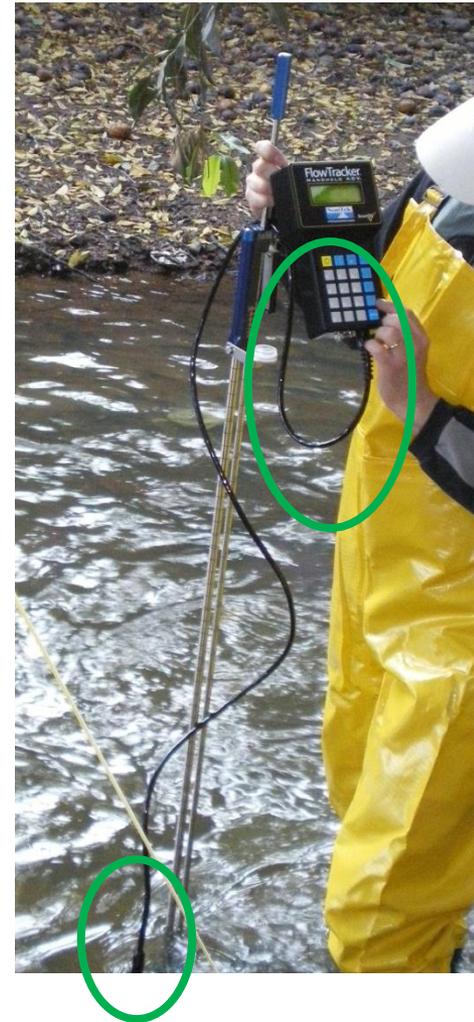


# Don't Stress cables during use

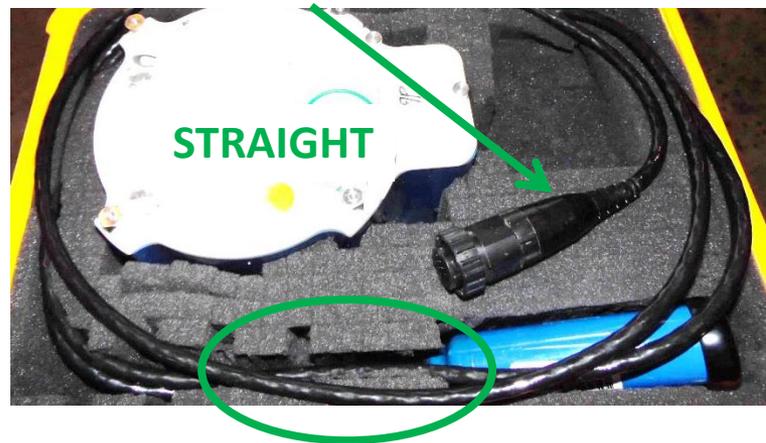


**STRAIGHT**

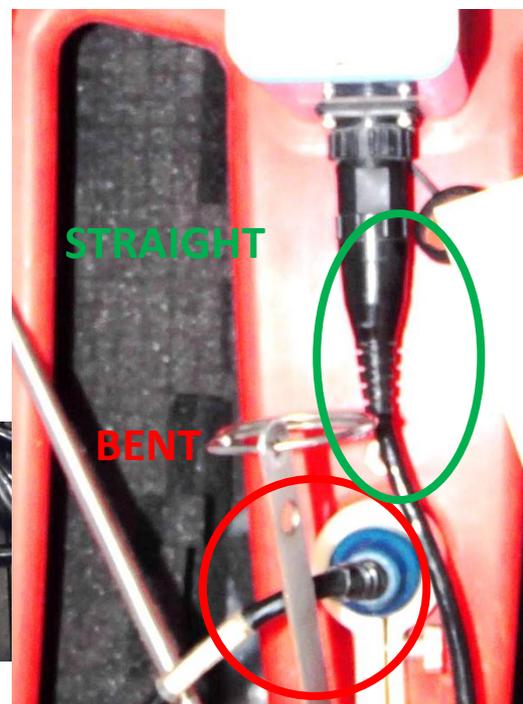
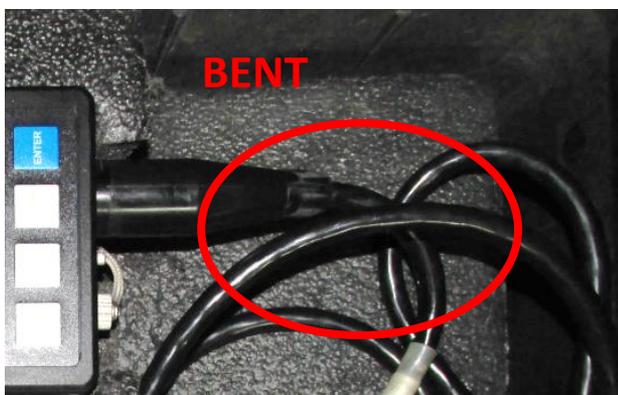
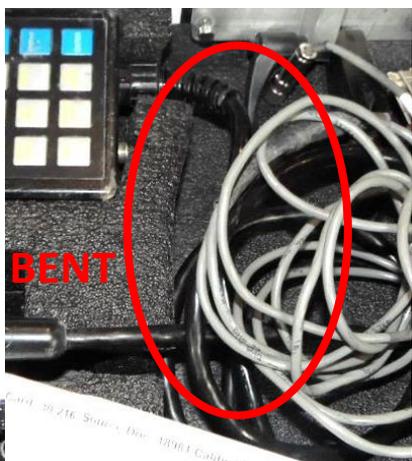
Don't force cables to bend.



# When possible disconnect cables



# Don't Stress cables during shipping & storage



# Connections

- Locking rings (\$2) help ensure tight connection
- Even with wet-mate connections, a loose connection can cause com issues and corrosion
- An instrument can short if the cable comes unplugged, in the water, while under power
- When possible, Disconnect cables & clean connections before shipping or storing

Broken, stripped and missing locking rings can lead to a less than watertight connection, corroding connector pins and leading to expensive repairs.



# Boat Care

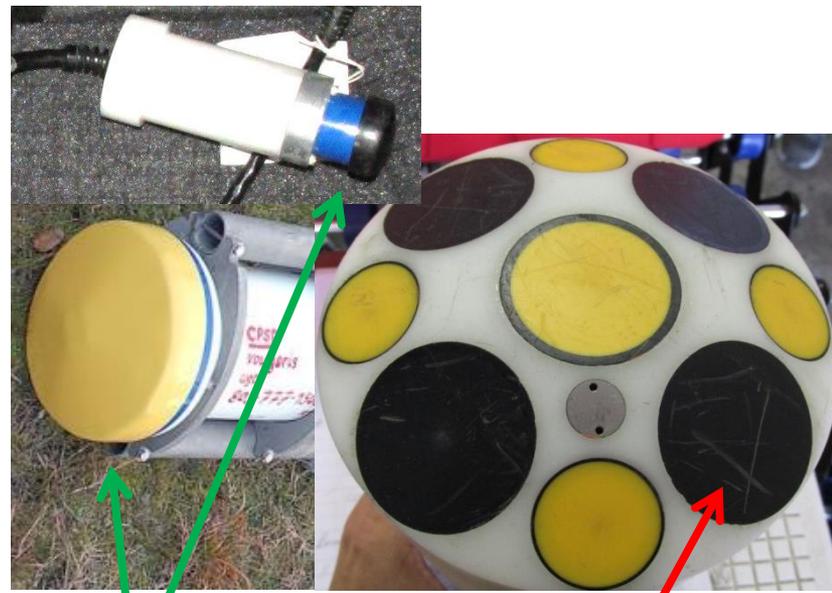


- Check the tightness and overall water-tight integrity of through hull cables and connections
- Check all o-rings, including the deck plate
- Check connectors inside the boat for corrosion
- Same tips apply for corrosion as for acoustic instruments
- Hull should be cleaned thoroughly after each use to prevent transfer of aquatic invasive species from one body of water to another.
- Check integrity of harness, bridle and any pins, clips or connectors (don't want your 30K investment floating away)



# Transport

- ADCP HAT
- Always secure the unit: either in it's shipping case or strapped to the boat/truck/cart so it cannot move
- Carrying long distances? use a cart and/or transport case to protect and prevent from dropping



**Hats** help prevent **scratches**



# Shipping

## CASE MUST:

- Be hard sided
- Be shock resistant
- Have locking mechanism

## PADDING MUST:

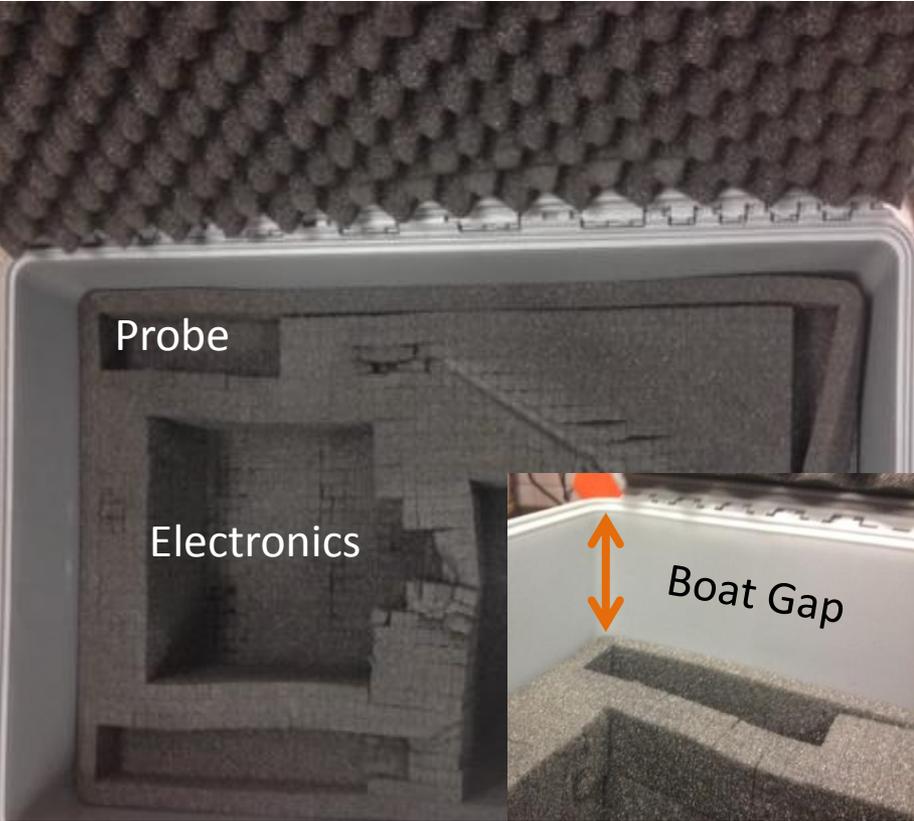
- Be at least 2-3" thick on every side
- Have no large empty spaces
- Ensure instrument cannot move around



Instruments shipped to HIF in an inappropriate case will be shipped back in a new one at the owner's expense!

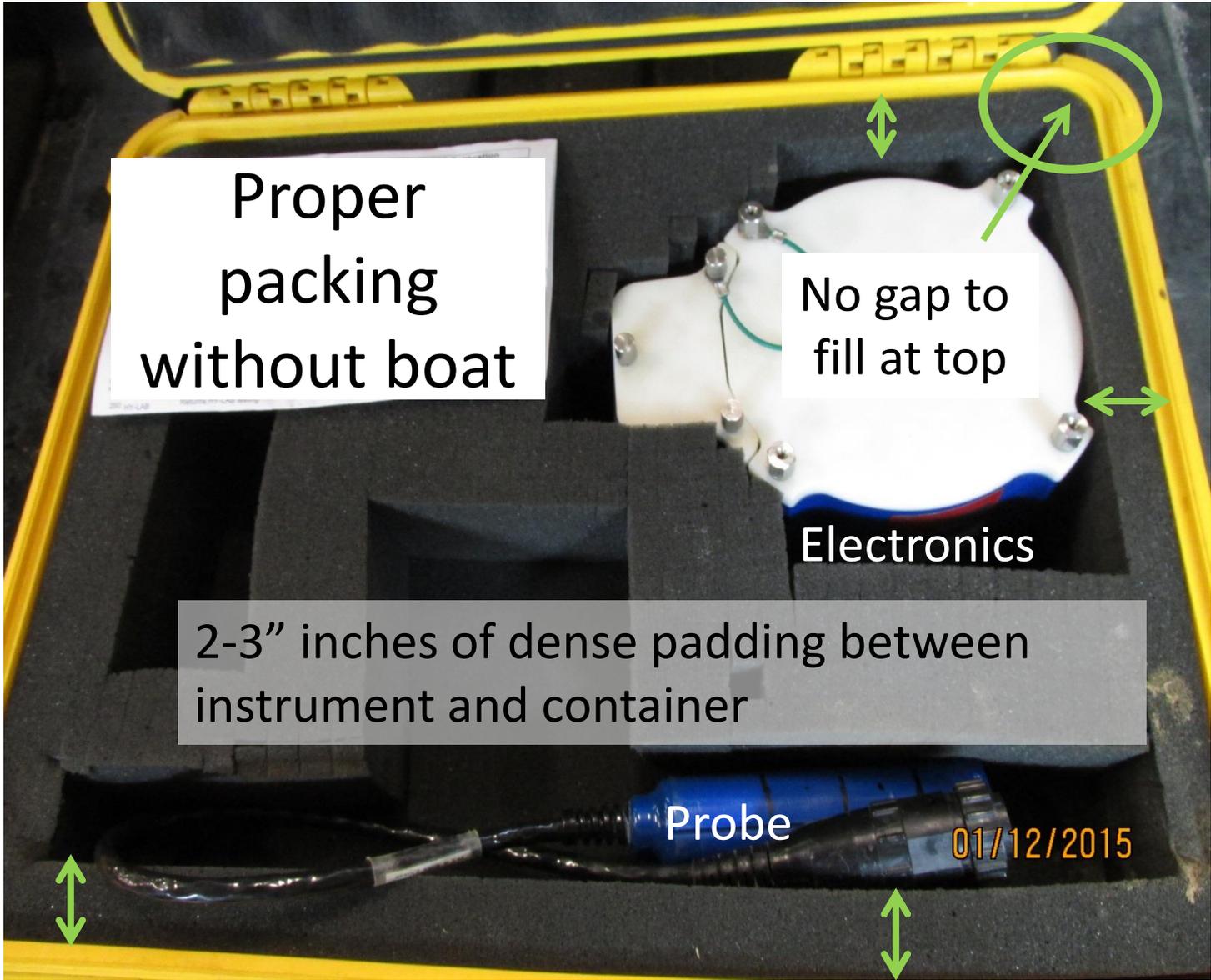


Always be sure to fill the boat gap.



Foam padding deteriorates, be sure the instrument is still secure.





Proper  
packing  
without boat

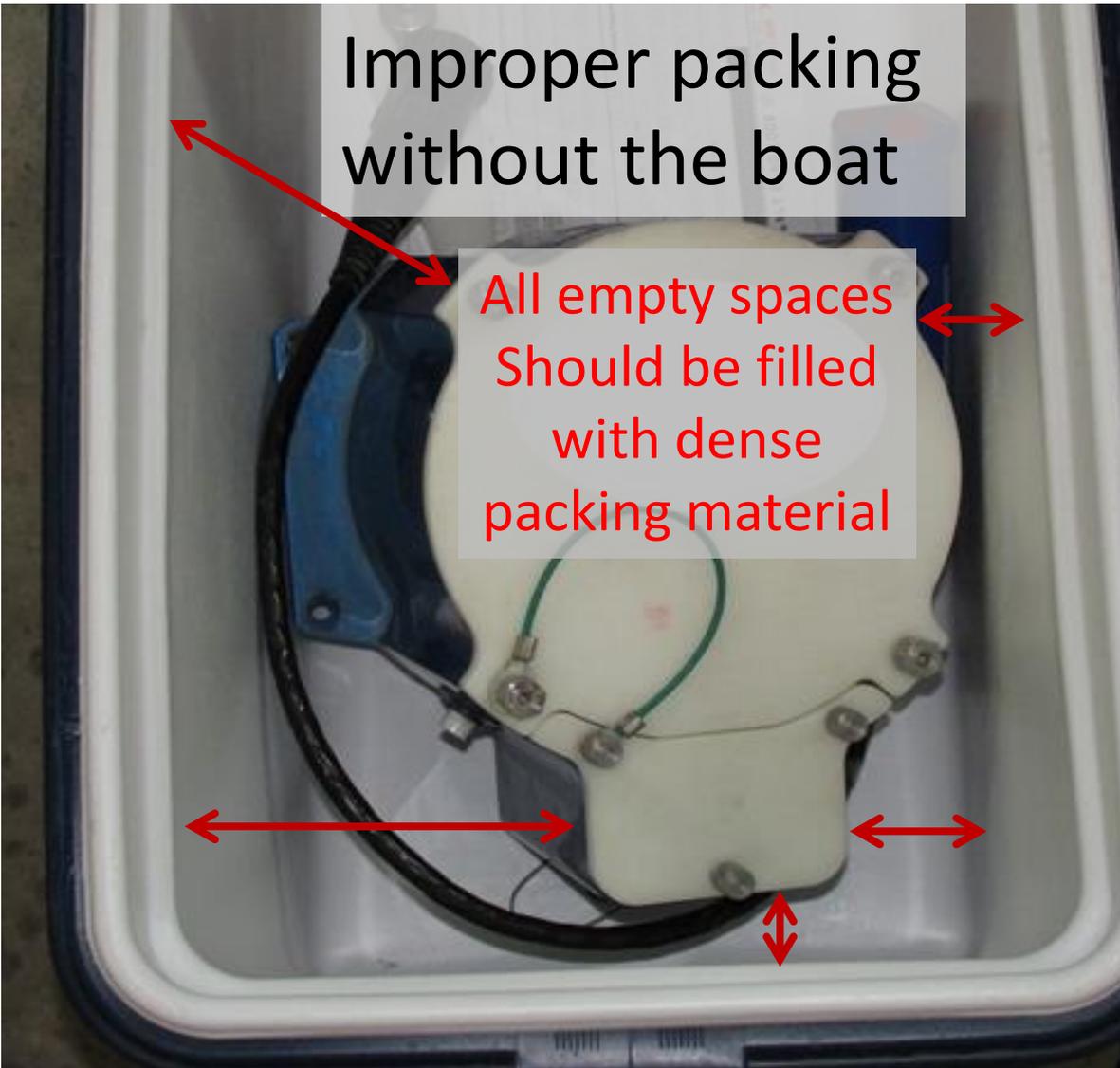
No gap to  
fill at top

Electronics

2-3" inches of dense padding between  
instrument and container

Probe

01/12/2015



Improper packing  
without the boat

All empty spaces  
Should be filled  
with dense  
packing material

Too much space  
can lead to:

- Internal damage
- Bent/pinched cables
- Scratched transducer

No locking  
mechanism

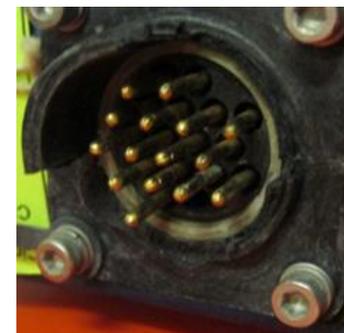
- Could open during shipping

# Common Repairs Caused by Mishandling

(dropped, not properly packed, not properly secured)

## StreamPro:

- Transducer replacement \$7000
- Sun Shield \$35 (less brittle than original)



## FlowTracker:

- Probe replacement \$3000
- Faceplate & keypad \$650 + display \$350
- Bottom housing \$660



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# Storage (< 4weeks)

- Remove Batteries (corrosion prevention)  
check for corrosion, clean if needed
- Check o-ring, clean if needed,  
replace if necessary (store ready to use)
- Disconnect Cables where possible
- Store with no sharp bends or kinks  
in cables
- Clean and Dry Instrument (prevent rot,  
mildew, corrosion)



# Storage (> 4weeks)

- Remove Batteries (corrosion prevention), check for corrosion clean if needed
- Check, clean & grease o-ring, replace if necessary (store ready to use)
- Clean and Dry Instrument (prevent rot, mildew, corrosion)
- Disconnect cables where possible, check for corrosion, clean cable connections with contact cleaner, and dry
- Check for cable damage, store with no sharp bends or kinks in cables
- All parts and pieces accounted for and functional (checklist)

Storing already clean & packed in shipping container makes sending in for QA easy



Performing maintenance checks each time when opening the battery compartment or storing instruments helps ensure maintenance is done **ROUTINELY** and is not forgotten, helping WSCs to avoid expensive repairs.

# Tips For a Quick HIF QA Turnaround

- ✓ Remember to include the RMA paperwork
- ✓ Only need to send instrument or instrument and probe (StreamPro)
- ✓ Do not need to send com cables or accessories
- ✓ Do not need to send the boat (unless necessary to secure unit in shipping case)
- ✓ Remove batteries and clean compartment (StreamPro and FlowTracker)
- ✓ Make sure instrument is clean and dry
- ✓ Format disk to remove data (M9)
- ✓ Do not send the bluetooth module (M9, extra paperwork = delay)

**Batteries left in instrument will be discarded.**

**Data left on instrument will be deleted.**



Only send Instrument or instrument and probe  
(StreamPro) in appropriate shipping container  
with padding and RMA – save \$ on shipping



# Maintenance Items Available at HIF

<http://1stop.usgs.gov/>



1115015- SUN  
SHIELD FOR  
STREAMPRO



1115018- O-RING FOR  
STREAMPRO BATTERY  
COMPARTMENT

1113080- O-RING FOR  
FLOWTRACKER BATTERY  
COMPARTMENT

# Contact

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