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PREVENTIVE MAINTENANCE [MAINTAINING EXO SONDE & SENSOR WETMATE CONNECTORS]

GENERAL: Developed by YSI Repair Center using “Best Known Methods” to prevent Sonde WETMATE and SENSOR pin damage caused by galvanic corrosion. Users in Brackish/high salinity/turbidity water seem to be the most prone to this.

BE SURE TO WEAR PROPER EYE PROTECTION WHEN CLEANING AN EXO SONDE!

TOOLS

- BRUSH – UTILITY OR TOOTHBRUSH
- Q-TIPS SMALL/MEDIUM TIPs
- VINEGAR FOR CLEANING – SQUIRT BOTTLE VERY HANDY
- ISOPROPYL ALCOHOL FOR CLEANING

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1. Cleaning residual lubricant and water contamination from the connectors each and every pre-deployment is as important as applying lubricant! This can be accomplished using a toothbrush with vinegar [corrosion] & alcohol [old lubricant]. We recommend flushing all SONDE bulkhead ports out using vinegar between deployments to remove any contaminates before reinstalling sensors.

The image on the left shows an attempt at lubricating, but just applying a big glob of Kyrtox and shoving the connector in the port does not always cover the rubber around the pin in keeping water off the pin. The image on the right shows what happens when the SONDE WETMATES are not properly serviced.

BEFORE AFTER

CLEANING! -- Battery cap after cleaning -- all contaminates removed before lubricating.

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BEFORE AFTER

Battery compartment threads and WETMATE connectors before and after clean and lubricated. All cleaning done with a toothbrush and isopropyl alcohol.

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Here are properly lubricated WETMATE connectors [all surfaces are covered].

2. Both connectors male/female must be lubricated using Kyrtox and a small brush – *your fingers can not reach between WETMATE pins* [refer to page 123 in EXO User's Manual]
3. Keeping WETMATE port connectors clean is very important. Putting a sensor back in a contaminated port could likely lead to a port failure.

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EXO Bulkhead with Typical Contaminates

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Vinegar soak fill ports for ~10-min, this will help in removing old Kyrtox and any contaminates that got past the sediment O-ring on the sensor.

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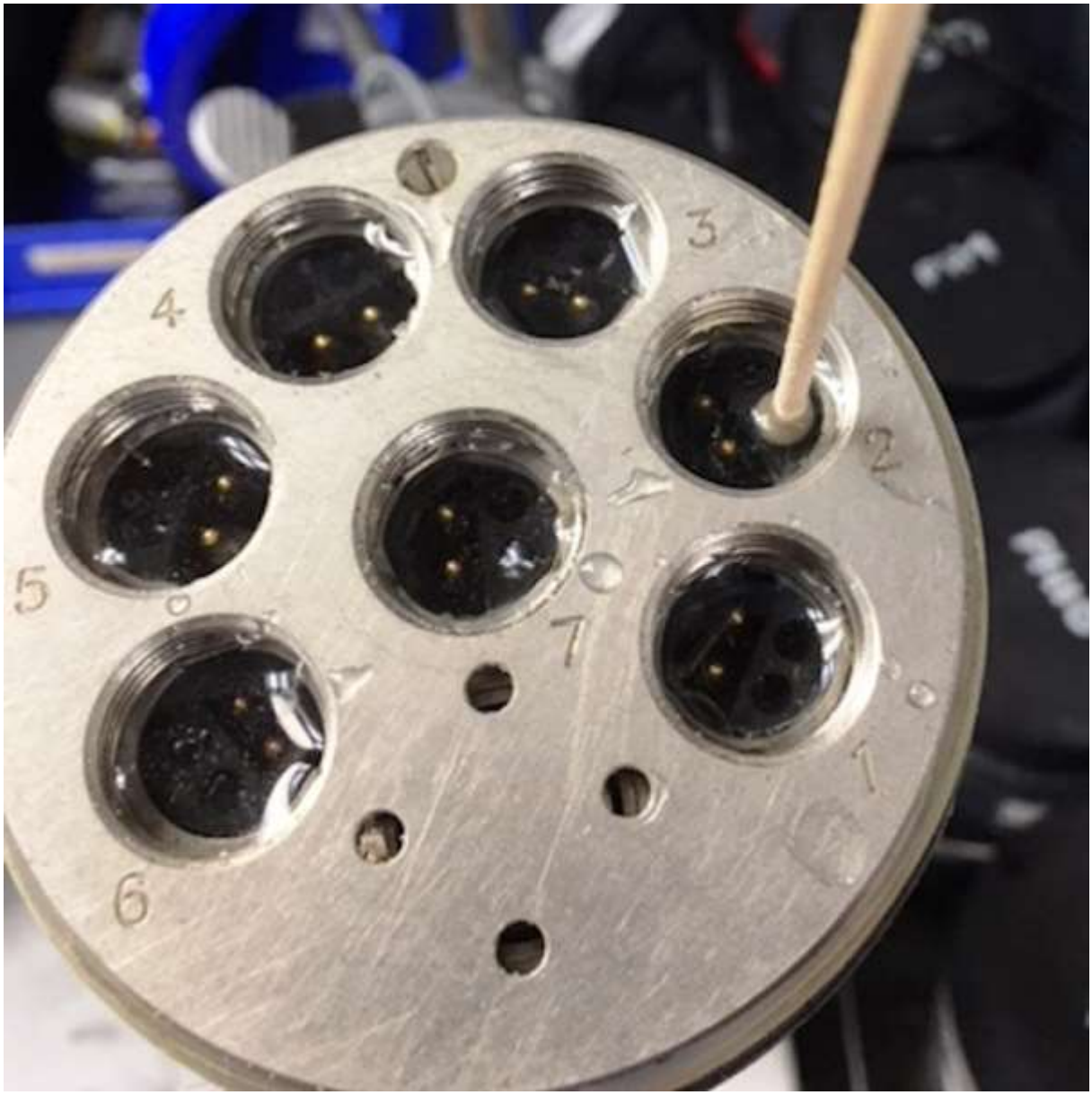

A small pointed tipped Q-Tip can help in cleaning contamination out of port pins. ***DO NOT FORCE THE Q-TIP INTO THE PIN HOLE JUST LIGHTLY ROTATE IT AROUND AND THE CONTAMINATES SHOULD COME OUT!***

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Nice and clean after vinegar treatment. Properly Kyrtox'ed sensor WETMATES will apply a small amount into the pin cavities.

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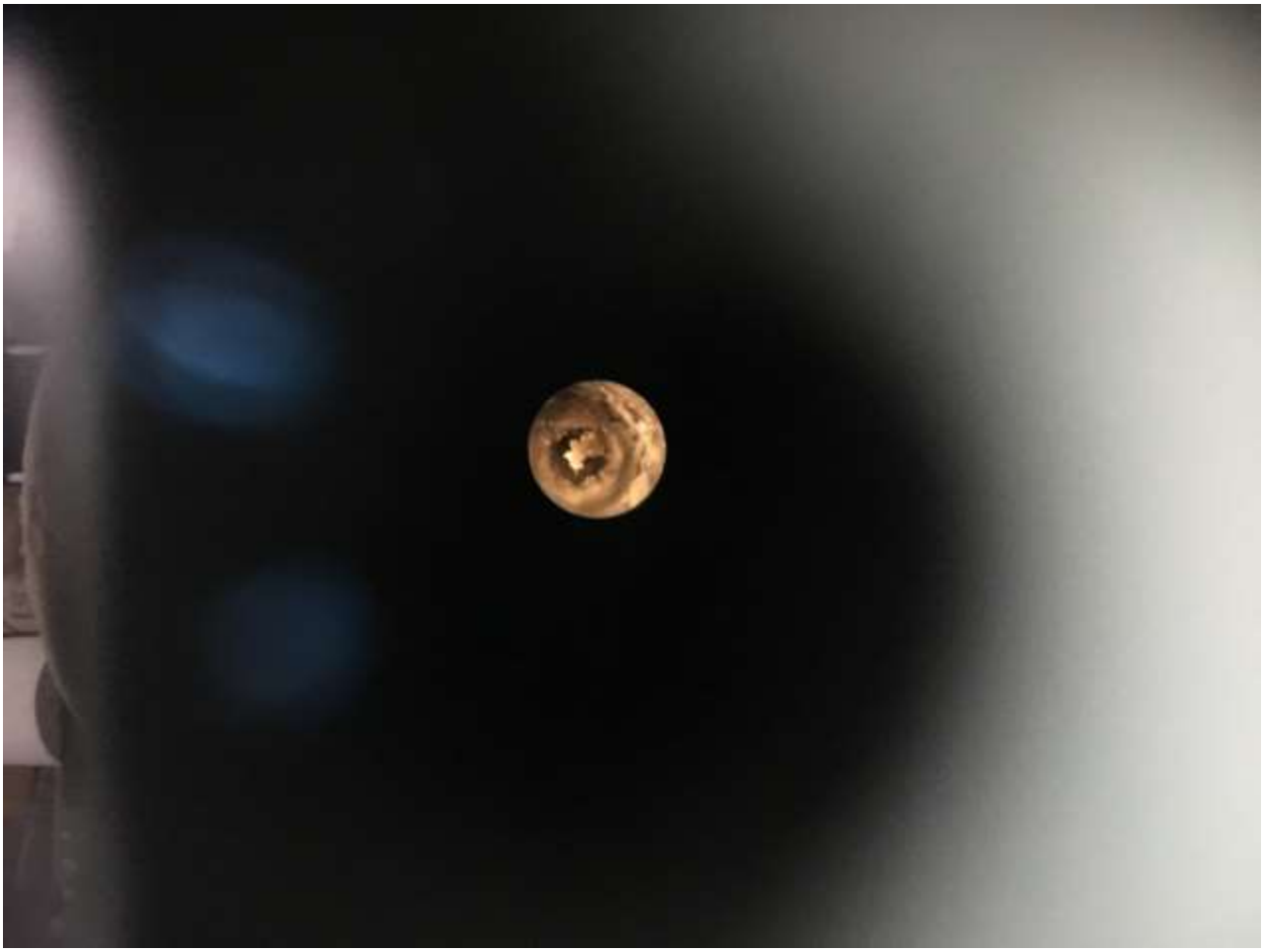

REMOVAL OF ALL SENSORS AND PORT PLUGS! This Port Pin looked normal at first glance and then caused a Sensor Fault error 0020 on the SONDE when a sensor was installed for functional check. After looking through a Borescope we discovered this corroded pin where an unremoved Port plug had been left in for multiple deployments. The plug had just been installed and never removed over time. Water eventually was able to get past the dry rubber pins.

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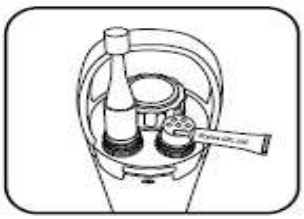
5.19 Connectors
Maintenance and Storage

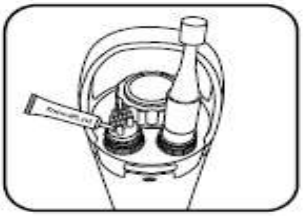
EXO sondes utilize wet-mate connectors that greatly reduce problems associated with traditional underwater connectors. However these connectors must be properly maintained to reap the full benefit of this design. Following these instructions will minimize most potential issues.

Never stick any foreign object into a female connector. Use only Krytox grease to lubricate the mating surfaces of the connectors.



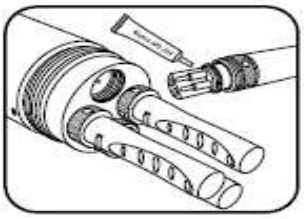
1 Female 6-pin connectors

These connectors are located on field cables, the EXO2 accessory connector, and the EXO Handheld. Periodically inspect the connectors for signs of contamination. If you detect debris, remove it with a gentle blast of compressed air. Prior to initial installation, or when dry, apply a light coat of Krytox grease to the flat rubber mating surface on top of the connector. When not in use, always install the connector's plug.



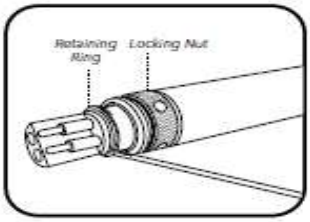
2 Male 6-pin connectors

These connectors are located on field cables and topside sonde connectors. Periodically inspect the connectors for signs of contamination. If you detect debris, carefully remove it. Prior to initial installation, or when dry, apply a light coat of Krytox grease to the rubber mating surfaces of the connector (including the rubber portions of the pins). When not in use, always install the connector's plug.



3 Sensor connectors (4-pin)

These connectors are located on sonde bulkheads (sockets) and sensors. Periodically inspect the female portions of these hermaphroditic connectors and the entire socket for contamination, and remove any debris with a gentle blast of compressed air. Prior to initial installation, or when dry, apply a light coat of Krytox grease to the rubber area of the sensor's connector.



4 Replace locking nut

If the locking nut near the sensor connector wears out, users can replace it with 599668 (sensor) or 599669 (EXO central wiper).

First remove the retaining ring by inserting the tip of a small, flat-blade screwdriver under the lip of the ring and pry upward. Pull ring out of groove. Slide off locking nut and replace with new locking nut. Install new retaining ring by prying up one edge with screwdriver and fitting it into groove. Use the screwdriver to follow the diameter of the ring around the groove to seat it fully.

⚠ **CAUTION:** Wear eye protection when servicing the retaining ring.

4. Wiped CT configurations must use proper port selection and binding procedure [refer to page 69 in EXO User's Manual] ***[THIS WILL ALSO MINIMIZE MOVEMENT OF THE SENSORS WHICH COULD ALLOW WATER SEEPAGE INTO NON-PROPERLY MAINTAINED WETMATE CONNECTORS]***

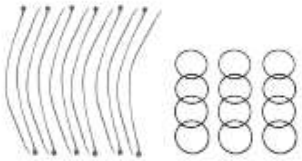
Wiped Conductivity & Temperature Sensor
Spacing Kit Instruction Sheet

Maintaining better conductivity measurements.

This kit includes the following items:

- 12 – Wiper o-rings
- 12 – Zip ties used to optimally align the EXO Wiped Conductivity & Temperature sensor to the central wiper brush in an EXO2 sonde.

The use of this kit will improve the performance of your conductivity probe and extend the lifetime of the wiper brush by aligning the wiped channel to the central wiper. Reinstall a new o-ring and zip tie for each long-term deployment.



The o-rings and zip ties included in this kit are key to a successful deployment.

NOTE: These consumable items may be sourced locally with like specifications, or reordered using part 599831. The included o-rings are EPDM material. Many available o-rings are not resistant to UV and will break down in seawater. Be sure to use <u>all plastic</u> zip ties. **DO NOT** purchase zip ties with a metal retention device as it will allow biofouling a place to grow.

Installing spacing o-ring:

1 Remove your central wiper from the sonde. Install one of the included o-rings on the wiper, starting from the connector end. Roll the o-ring so the majority of it rests in the groove directly below the black, plastic wiper guard (see figures 1 & 2).

This o-ring is used to ensure a consistent space between the wiper and the adjacent sensors.

Figure 1 - Roll on the new o-ring starting at the connector end

Figure 2 - The o-ring rolled up to the proper position

NOTE: If you need a replacement, black plastic wiper guard, a new one can be ordered at **YSI.com** (part# 599676).

NOTE: If using YSI copper anti fouling tape, the tape can be installed over the o-ring without significantly impacting the spacing.

2 After the o-ring is placed on the wiper, install the wiper back into the central port. Next, install all the sensors used for your field deployment noting the optimal position of the wiped C/T sensor in ports 3 or 4 (see figures 3, 4, & 5).

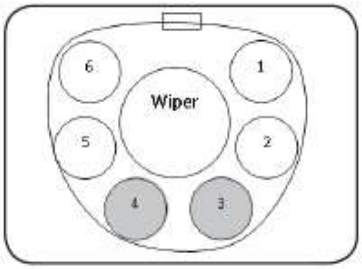


Figure 3 - Optimal Wiped (C/T) Sensor Positions: Ports 3 or 4

Figure 4 - Sensors installed around the Central Wiper with o-ring in place

Figure 5 - Wiped C/T sensor in optimal position ready to be secured

Spacing Kit installation continued on reverse.

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3 After all the sensors have been installed and calibrated, apply an all plastic zip tie roughly in the middle of the sensor grouping as shown (see figures 6 & 7).

The latch on the zip tie should be positioned so it is between ports 1 and 6, this will ensure adequate clearance between the zip tie and sensor guard.

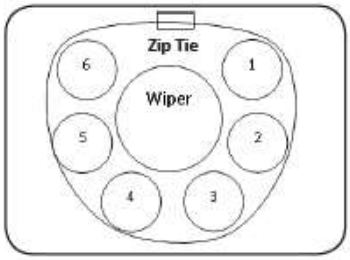

Figure 6 - Note the zip-tie wrapped around the sensors, holding them in place

Figure 7 - Securing the sensors with the zip-tie with adequate clearance

NOTE: Do not over tighten the zip tie. The goal of the zip tie is to hold the sensors against the o-ring around the central wiper. You should still be able to gently slide the zip tie up and down, and it is normal for the sensors to still move slightly.

4 Visually inspect to ensure the sensors are making contact with the o-ring. Cut the excess length of the zip tie off.

Reinstall the EXO sensor guard and you are ready to collect data (see figures 8, 9 & 10)!

Figure 8 - Carefully cut away excess length from the secured zip-tie

Figure 9 - Inspect the finished payload for proper installation

Figure 10 - Finally, to ensure that the zip tie is out of the way, place the sensor guard back on the sonde.

Wiped Conductivity & Temperature sensor in optimal wiping position with o-ring and tie in place.

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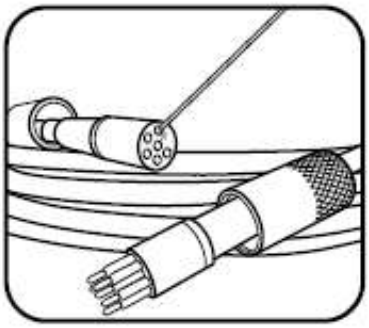
EXO field cable connectors need to be properly maintained in order to prevent expensive repairs to Sonde or cable connector failure! Clean off all previous lubricants and water contaminates then lubricate using same procedure as SONDE WETMATES at <u>EVERY</u> deployment!

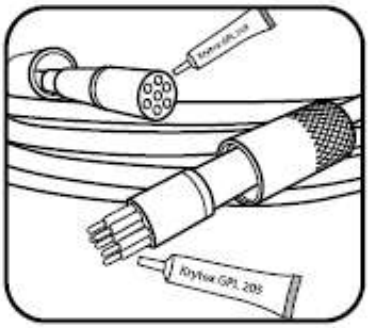
5.18 EXO Field Cable Maintenance and Storage

EXO field cables are rugged and provide years of reliable service when properly maintained. As with all field cables, they are most vulnerable at their connectors. Take extra caution to protect the connectors from debris and physical harm.



1 Inspect and clean cables

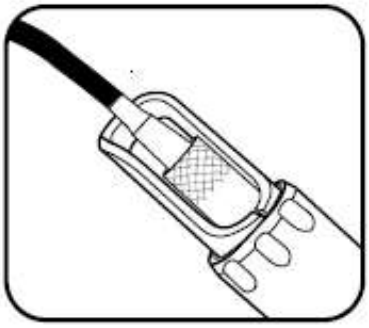
Inspect the cable's connectors for contamination and remove any detected debris with a blast of compressed air. Periodically inspect the cable for nicks and tears to ensure best performance.



2 Lubricate cable connectors

To maintain the cable assembly, users should also apply a thin coat of Krytox grease to both ends when they appear dried out.

NOTICE: It is better to apply too little grease than too much. Too much grease can encourage contamination.



3 Cable storage

Users should leave the cable installed on the sonde to protect the connectors. If necessary users may remove it from the sonde, but extra care should be taken to protect the connectors. Store the cable in a safe location free from direct sunlight.

If the cable is vented, ensure the storage cap is affixed to the desiccant inlet. Store vented cables in a bag containing desiccant.

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EXO CABLE MAINTENANCE CHECK

The following is an easy check for testing your EXO cables. This can prevent damage to the SONDES wet-mate connector should a cable have an internal short. **CHECK PIN 3 TO ALL PINS USING THE FEMALE SIDE AS SHOWN BELOW. THERE SHOULD BE NO READINGS! MAKE SURE THE CABLE IS FULLY DISCONNECTED AT BOTH ENDS.**

NO PINS SHOULD HAVE READINGS TO EACH OTHER [SEE PICTURE 1 BELOW!] PICTURE 2 SHOWS LEAKAGE BETWEEN PINS.

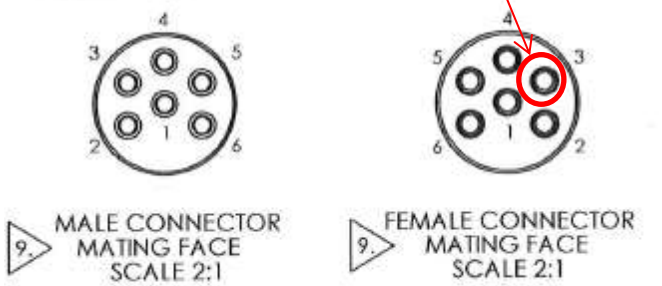
Tools need:

- Digital Volt Ohm Meter

EXO CABLE CONNECTOR PIN OUT

TABLE I - WIRING CHART

CABLE CONDUCTOR	CONNECTOR PIN NUMBER	DESCRIPTION
ORANGE	1	SPARE
BLACK	2	GROUND
RED	3	POWER
BARE	4	DRAIN
YELLOW	5	COM (A)
WHITE	6	COM (B)



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GOOD CABLE READING

BAD CABLE READING

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Leaking cables cause galvanic corrosion [an electrochemical process in which one metal corrodes preferentially when it is in electrical contact with another, in the presence of an electrolyte/water] on power pin 3 and leads to an expensive Sonde repair – battery compartment replacement and down time.

SUMMARY: EXO WETMATE connectors do a wonderful job in protecting the connections of EXO SONDES if properly maintained. Cleaning them prior to lubricating is a must and this must be done before every deployment.

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ANTIFOULING: if your site has bio-fouling issues YSI has developed heat shrinkable sleeves P/N 599663 for the SONDE, sensors and wiper. These can then be covered by copper tape P/N 616189 on the sensors and Duct Tape on the SONDE body per lower right picture.