



TRIDENT™
MARINE AQUARIUM WATER ANALYZER

Trident Installation: Preface

This guide will illustrate how to physically install the Trident.

The guide below will walk through the different steps illustrated on the Get Started card included with your Neptune Systems Trident, but the recommended method is to use the Trident Initial Setup task found in Apex Fusion. The guide can also be used to supplement the Trident Initial Setup Task and provide additional information for those looking for further details.

DO NOT CONNECT THE TRIDENT TO YOUR APEX

While this may seem counterintuitive, do not connect your Trident to the Apex until instructed to do so. Connecting the Trident before other necessary connections are made will cause the Trident to go into an error mode and will cause the installation of the system to take additional time.

Update Apex AOS

On the Apex dashboard click the button with 3 gears, then click the WiFi button. If there is not a large orange Update AOS button, then your Apex already has the latest AOS version installed. If you see a large orange Update AOS button, click that button and then click the Update button

The minimum required AOS version for the Apex is **5.05_5D19**.

Review Package Contents

Items included with the Neptune Systems Trident: (Select a link for more information, click it again to dismiss the pop-up)

- Trident Marine Aquarium Water Analyzer
- [Two Month Reagent Kit](#)
- [Trident Calibration Solution](#)
- [1LINK Cable](#)
- Sample Line Tubing and Holder
- Waste Line Tubing

Connect Black Sample Line Tubing

It is suggested to make the initial connections to the Trident in an open space. The first connection that should be made is to connect the black sample line tubing to the black connector on the back of the Trident.

—DO NOT EXTEND OR SHORTEN THE LENGTH OF THE TUBING—

Altering the length of the sample tubing will cause significant issues with the proper measurement of the Alkalinity, Calcium, and Magnesium levels.

Connect Waste Line Tubing

Connect the clear waste line tubing to the clear connector on the back of the Trident. Place the other end of the waste tubing in a suitable container. The minimum recommended capacity of the waste container is 2 liters. Optionally, if you have a drain close by, you may place the far end of the waste tubing into that drain.

Like with the sample line tubing, do not cut or extend the waste tubing.

Connect 1LINK Cable to Trident

Connect the 1LINK cable to the 4-pin jack on the back of the Trident.

Customers outside the US and Canada and those without an available 1LINK port, connect the [AquaBus cable](#) and [power supply](#).

— DO NOT CONNECT THE CABLES TO THE APEX YET —

Install Reagent C

Turn the Trident around so the front is accessible and open the reagent drawer.

Find the reagent C bottle and give it a good shake.

Place the bottle in the drawer and connect the reagent C intake assembly (green) to the bottle.

Make sure the intake assembly tubing is pointed towards the back left corner of the reagent drawer — this prevents the tubing from kinking when the drawer closes.

Install Reagent B

Find the reagent B bottle and give it a good shake.

Place the bottle in the drawer and connect the reagent B intake assembly (blue) to the bottle.

Make sure the intake assembly tubing is pointed towards the right side of the reagent drawer — this prevents the tubing from kinking when the drawer closes.

Install Reagent A

Find the reagent A bottle and give it a good shake.

Place the bottle in the drawer and connect the reagent A intake assembly (red) to the bottle.

Make sure the intake assembly tubing is pointed towards the right side of the reagent drawer — this prevents the tubing from kinking when the drawer closes.

NOTE: It is recommended that you keep a set of three caps for reagent bottles just in case you need to reseal the bottles. Rinse with tap water, let dry, then store in a suitable spot, such as in the Trident box.

Close the drawer and keep the packaging

Close the Trident reagent drawer taking special care to guide the intake assembly line tubing appropriately.

Please be sure to keep the Trident packaging. Later this packaging may need to be re-used for the Trident's routine service interval (**NEEDS LINK**)

Position Trident

Place the Trident near the aquarium in a position which meets the following requirements:

1. Level Surface
2. Must remain upright
3. Close to the aquarium or sump – no more than 3-4' from the aquarium or sump. The sample line tubing must not be extended or shortened under any circumstances

Install the Sample Line

Install the black sample line tubing in the long slot of the sample line holder. The following requirements need to be met in regards of the sample line placement:

1. The intake should ideally be 2-3" from the bottom of the sump. When the sample line tubing comes in contact with the bottom of your sump it is more likely to get clogged with micro and macro-fauna.
2. The intake should be positioned in an area without microbubbles. If the sample line is near or in an area with a high density of micro-bubbles, then those bubbles may be drawn into the Trident along with test sample water and will affect the precision and accuracy of the measurements.
3. The intake should be positioned away from dosing additive lines. If additive enters the test sample, then the precision and accuracy of the measurements will drastically be affected.
4. Avoid placing the sample line above the Trident. If the sample line becomes disconnected, then a gravity siphon can occur.

Connect 1LINK to Apex

Connect the 1LINK cable to an available 1LINK port.

For customers outside the United States and Canada or those without an available 1LINK port, connect the Aaquabus cable and power supply. The power supply should *not* be plugged into an Energy Bar outlet. If the power supply is connected to an Energy Bar outlet, that outlet *must* be programmed to be always on.

Upon connection the Trident status LED panel will turn blue, indicating that it is initializing. The initialization will take 2-4 minutes to complete. Upon completion, the Trident status LED panel will turn orange.

Set Waste Size Container

1. Click on the configuration button (the button with 3 gears)
2. Select the Module icon
3. Select the Trident
4. Select Container or Drain
5. If you selected Container, enter the capacity of your waste container in milliliters
6. Update to the cloud

Prime Reagent and Sample Lines

Once the Trident has a solid orange status LED panel, then:

1. Select the Prime dropdown
2. Select the "Select All" option
3. Update to the cloud

Trident Tile

The Trident Tile offers many different features. Clicking on the gear:

1. Can initiate an alkalinity or combined test (Alk, Ca, and Mg) immediately.
2. Can turn your trident to "off" by switching it to "Manual."
PLEASE NOTE: THAT IF TURNING THE TRIDENT OFF FOR MORE THAN 72 HOURS THE SHUTDOWN PROCESS MUST BE INITIATED!
3. Offers further configuration options – such as choosing a testing schedule.

Clicking on the tile will:

1. Show the Trident mini-graphs
2. Illustrate the remaining volume in the reagent bottles
3. Illustrate how full the waste container is
4. Illustrate the number of tests remaining

Schedule Tests

After observing the Trident tile, schedule the testing interval desired for the Trident.

1. Select the gear
2. Select "Schedule"
3. Choose the desired testing frequency
4. Update to Apex Fusion

Please note the included reagent with the Trident purchase will last for approximately a two month period and allow for testing of alkalinity four times per day and calcium and magnesium twice per day. Choosing a higher

testing frequency will use reagent at a greater rate and therefore the reagents will need to be replenished more frequently.

Add Trident Error Notification

Make sure to be notified if the Trident experiences an error that can be resolved in the [Trident Troubleshooting Guide](#) (below).

1. Select the gear associated with the email alert outlet
2. Type the following line to the email alert outlet
"If Error Tri"
3. Select the auto filled Trident name
4. Complete the coding line:
"If Error Trident_#_3 Then ON" (# will be unique for your installation; it is the Trident's Aquabus address)
5. Update to Apex Fusion

This completes the Trident Installation Guide.

Trident Troubleshooting: Preface

This guide will help to resolve Trident errors than can occur with the operation of the Trident.

It is important that you complete this troubleshooting before contacting Neptune Systems. While Neptune Support would be happy to take your call if you are having trouble—the troubleshooting steps required for the Trident take time. The steps contained here will help achieve the best possible support for you as our customer.

While you should rarely need to use this resource, if your Trident has a “red” status light, then that means that your Trident is currently in an error condition. You can determine the error by simply looking at the Trident tile on your Apex Fusion dashboard.

Error Condition

Current

Explanation of Error

Current

The “current” error indicates that the peristaltic pump inside the Trident is malfunctioning.

Recommended Course of Action

This indicates an issue that can only be diagnosed by Neptune Systems Support.

Error Unresolved

We are sorry this troubleshooting did not resolve your Trident Error.

Error Condition

No Test in 24H

Explanation of Error

No Test in 24H

The “No Test in 24H” error indicates that the Trident has been off for more than 24 hours. For the Trident to continue to run appropriately and not require a Neptune Systems service, it must be run at least once every 24 hours.

It is also possible to experience this error if the Trident had a previous error condition that has since been cleared, but a new test has not yet been initiated.

Recommended Course of Action

No Test in 24H

Check to make sure the Trident is not in Manual operation mode. If it is set to manual, then change it to Automatic. Next, run a test of your choosing.

Error Condition

No Water Sample

Explanation of Error

No Water Sample

The “no water sample” error indicates that no water is being drawn into the Trident.

Recommended Course of Action

No Water Sample

Check to make sure the sample line is in the water and is not kinked.

If the sample line was out of the water or it was kinked, then remove the 1LINK cable to the Trident and reconnect it to clear the error.

Error Condition

Reagent A Empty

Explanation of Error

Reagent A Empty

The “Reagent A Empty” error indicates that the reagent A bottle is empty or nearly empty.

Recommended Course of Action

Reagent A Empty

If the reagent A is nearly empty, then run the reagent A replacement task in Apex Fusion or see the guide to manually replace reagents

Error Condition

Reagent B Empty

Explanation of Error

Reagent B Empty

The “Reagent B Empty” error indicates that the reagent B bottle is empty or nearly empty.

Recommended Course of Action

Reagent B Empty

If the reagent B is nearly empty and the other reagents are close to empty too, then run reagent replacement task in Apex Fusion or see the guide to manually replace reagents

Error Condition

Reagent C Empty

Explanation of Error

Reagent C Empty

The “Reagent C Empty” error indicates that the reagent B bottle is empty or nearly empty.

Recommended Course of Action

Reagent C Empty

If the reagent C is nearly empty and the other reagents are close to empty too, then run reagent replacement task in Apex Fusion or see the guide to manually replace reagents

Error Condition

Stirrer

Explanation of Error

Stirrer

The “Stirrer” error indicates that the mixing stir bar inside the Trident is not working.

Recommended Course of Action

This indicates an issue that can only be diagnosed by Neptune Systems Support.

Error Unresolved

We are sorry this troubleshooting did not resolve your Trident Error.

Error Condition

Test A Fail

Explanation of Error

Test A Fail

The “Test A Fail” error indicates there is an error in the titration associated with reagent A.

Recommended Course of Action

Test A Fail

This most often occurs because there is no reagent in the reagent bottle, but there is still reagent level according to the Trident tile and Apex.

To resolve this, run the reagent A replacement task in Apex Fusion or see the guide to manually replace reagents.

After replacing the reagent, reboot the Trident or unplug the 1LINK cable to the Trident.

Error Condition

Test B Fail

Explanation of Error

Test B Fail

The “Test B Fail” error indicates there is an error in the titration associated with reagent B.

Recommended Course of Action

Test B Fail

This most often occurs because there is no reagent in the reagent bottle, but there is still reagent level according to the Trident tile and Apex.

To resolve this, run the reagent B replacement task in Apex Fusion or see the guide to manually replace reagents.

After replacing the reagent, reboot the Trident or unplug the 1LINK cable to the Trident.

Error Condition

Test C Fail

Explanation of Error

Test C Fail

The "Test C Fail" error indicates there is an error in the titration associated with reagent C.

Recommended Course of Action

Test C Fail

This most often occurs because there is no reagent in the reagent bottle, but there is still reagent level according to the Trident tile and Apex.

To resolve this, run the reagent C replacement task in Apex Fusion or see the guide to manually replace reagents.

After replacing the reagent, reboot the Trident or unplug the 1LINK cable to the Trident.

Error Condition

Volts

Explanation of Error

Volts

A "Volts" error usually indicates an issue with the 24VDC power supplied to the Trident from the 1LINK or power supply.

Recommended Course of Action

Volts- 1LINK

If you are using a 1LINK cable with the Trident, this error can be resolved by simply removing the 1LINK cable from the Trident and then reconnecting it.

If the VOLT error continues, disconnect the far end of the 1LINK cable from the EB832 or 1LINK module then reconnect it.

Volts- Aquabus and Power Supply

Ensure that the power supply cord is properly connected to the Trident power input jack. Also verify that the power supply has AC input power.

Neptune Systems does not recommend plugging the Trident power supply into an EnergyBar outlet. But if you have done so, the EnergyBar outlet must be programmed to be always on, like this:

Fallback ON

Set ON

Error Condition

Waste Full

Explanation of Error

Waste Full

The "Waste Full" error occurs because the waste container is completely full.

Recommended Course of Action

Waste Full- Container

To resolve this:

1. Empty the waste container
2. From the Trident tile click the gear and select "Configure Trident"
3. Select "Reset"
4. Select "Waste"
5. Sent the update to Apex Fusion

The error should clear in about a minute.

Waste Full- Drain

To resolve this:

1. From the Trident tile click the gear and select "Configure Trident"
2. Select "Waste Ine"
3. Select "Drain"
4. Sent the update to Apex Fusion

The error should clear in about a minute.

Trident Controlled DŌS: Preface

This guide will walk through setup of Trident controlled dosing using the Neptune Systems DŌS. Controlled dosing allows you to set desired levels for alkalinity, calcium, and magnesium, and have automatic control of those parameters. The best way to configure this will be with the task found in Apex Fusion called "Trident Controlled Dosing." Optionally, you may use this guide in lieu of the Trident Controlled Dosing Task.

Neptune Systems does not recommend running the Trident Controlled Dosing Task or going through this guide until the Trident has been in operation for at least 7 to 10 days.

You, as the aquarist, must generally understand the amount of each additive needed to maintain stable alkalinity, calcium, and magnesium parameters in the aquarium for this guide to be successful.

Select DŌS Pump

This guide assumes the Neptune Systems DŌS has already been connected to the Apex system and that the DŌS has been properly calibrated. If that still needs to be completed, then please see the [DŌS Get Started Guide](#) to physically install the DŌS.

Provided that is complete, select the DŌS pump you wish to configure with the Trident by selecting the gear above the dashboard slider control for that DŌS pump.

Configure Amount to Dose

1. Select Modify Interval
2. Enter the Start time as "0:00"
3. Enter the End time as "23:59"
4. Make sure Action is set to "Add"
5. Enter the volume of additive to dose to maintain the parameter. In this example, that is calcium. This is called the "normal dosing amount."
6. Select "OK"

For Trident Controlled Dosing of calcium and magnesium supplements, Neptune Systems recommends as few intervals as possible to experience the best results; a single interval spanning the full 24-hour day is suggested for calcium and magnesium additives, and also for alkalinity dosing for aquariums with a relatively low to moderate rate of alkalinity consumption.

Typically in aquariums with high rates of calcification, the majority (about 75%) of the daily alkalinity consumption occurs during the primary lighting

period of the aquarium. Consequently, when configuring Trident Controlled Dosing of alkalinity supplements, the use of three intervals is suggested. Here is an example:

1. the first interval will cover the period from 0:00 until the start of the primary lighting period; the volume configured for this interval will be approximately 15% of the total nominal daily amount of alkalinity supplement
2. the second interval will cover the primary lighting period, for example, 08:00 to 19:00; the volume configured for this interval should be approximately 70% of the total nominal daily amount of alkalinity supplement
3. the third interval will cover the period from the end of the primary lighting period until 23:59; the volume configured for this interval will be approximately 15% of the total nominal daily amount of alkalinity supplement

Optionally, distribute the volume proportionally (rather than equally) between the first and third intervals based on the number of hours of those intervals.

Enable Trident Control

1. Select the “Configuration Gear”
2. Select “Control Interval”
3. Check the “Automatically adjust dosing using Trident measurements.”

Select Parameter

1. Select “Test”
2. Choose the parameter that will influence the total dosing volume

Select Control Value

Enter the “Value” you wish to maintain for the selected parameter

The dosing volume will change up or down in order to maintain this desired value.

Select the Control Range

Enter the control range for the desired parameter.

This is the range in which the Trident will have influence over the dosing volume. Outside the range the Trident will return to the “normal dosing amount.”

For example, in the situation illustrated here with a control value of 425 and a range of +/-50, the Trident will have influence over the calcium level between 375 and 475. The greatest degree of influence will be 375 ppm and the least degree of influence at 475 ppm.

Parameter	Recommended Range
Alkalinity (dKH)	0.4
Calcium	50
Magnesium	50

Select the Control Limit

Enter the control limit for the dosing pump of the controlled parameter.

This is the degree in which the Trident will have influence over the dosing volume. When the maximum or minimum dosing amount is reached the Trident will no longer influence and the dosing will return to the “normal dosing amount.”

For example, in the situation illustrated here with a control limit of 40% and a “normal dosing amount” of 25 mL, the maximum volume of additive that could be added over 24 hours is 35 mL($25*1.4 = 35$) and the minimum amount is 15 mL ($25*0.6=15$).

Parameter	Recommended Limit (%)
Alkalinity (dKH)	35
Calcium	40
Magnesium	40

Update to Apex Fusion

1. Select OK
2. Update to Apex Fusion
3. Review the dosing settings by selecting the “Interval Summary”

What Values Should I Enter?

This is an involved question and Neptune Systems recommends to use the starting values and fine-tune those values as the Trident and DŌS become dialed in.

The best analogy for how Trident Controlled Dosing works is using that of a car speeding up and slowing down. Imagine there is a car and the driver wants to maintain a certain speed.

When the car is going far below the speed limit, the driver will push hard on the gas to achieve that speed. This is what the Trident will do when the parameter is near the minimum allowable range- it will add the highest allowable amount of additive according to the control limit.

When the car is only going a couple miles below the speed limit, then the driver will only slightly press on the gas to reach the desired speed. The Trident will only influence the DŌS to increase small percentage over the “normal dosing amount”

The inverse of both examples holds true when the car is going above the desired speed. If the driver is going too fast, then a hard break press is warranted. Only a couple miles over the limit, the driver will lightly press the brakes.

How do I fine tune this?

As illustrated above, there are several variables that influence Trident Controlled Dosing. Take a look at each variable to fine-tune the settings:

Normal Dose Amount

This is the value to always look at first. If the desired parameter is not being maintained appropriately, then the dosing volume is likely too much or too little to maintain that desired parameter.

Control Value

This is the second value to look at. It's possible the "control value" that has been selected is an "ideal value." However, if the "control value" is too far above or below the "actual value" the Trident is reading, then temporarily adjust that value up or down closer to the level the Trident is

reporting. Make small changes. For example, if the “ideal” alkalinity is 9.0 dKH and the “actual” alkalinity is 6.0 dKH, then a good “control value” would be 6.7. Then as the “actual value” becomes closer to the “control value” move the “control value” closer to the desired, “ideal value.”

Control Range

In most situations, it is best to keep the control range consistent and unchanged. Too narrow of a range is like being behind a driver that speeds up and slows down frequently and behaves erratically. It best to keep this around the recommended values listed above. If using too narrow of range, then the Trident will not be able to effectively influence controlled dosing.

Control Limit

In most situations, this is the variable to change if fine-tuning the desired level. If overshooting or consistently too high, then decrease the control limit. If undershooting or consistently too low, then increase the control limit.

Closing

If adjustments are being made, then only adjust one variable at time and wait at least 24 hours to see what kind of affect that has on the controlled parameter before changing another parameter.