



COR USER GUIDE

APEX-CONNECTED COR-15 & COR-20



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INTRODUCTION

Congratulations on your purchase of the Neptune Systems APEX COR pump!



This Guide is for use by persons who will be using their COR pump in conjunction with a Neptune Systems APEX controller system. If you will be using the COR-20 without a Neptune Systems APEX system, refer to the COR-20 Standalone User Guide found on the Documentation page on the [Neptune Systems web site](#).

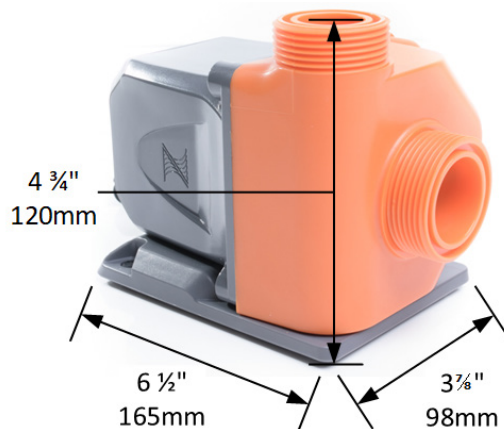
The COR-15 and COR-20 pumps are flow-optimized, energy-efficient variable-speed DC pumps which are ideal for use as a return pump, closed loop pump, or reactor manifold pump in saltwater and freshwater aquariums. The COR-series pumps were designed from the ground up to be tightly integrated with the Neptune Systems APEX family of aquarium controllers for ease of use and advanced control, however the COR-20 CAN be operated WITHOUT connecting it to an APEX.

A Neptune Systems APEX controller with a free 1LINK port (provided by either the 1LINK module or Energy Bar 832) is required to utilize the COR-15; it cannot function as a standalone pump.

The COR pumps systems are fully compatible with all APEX controller models, including the APEX A2, APEX A3, and APEX A1 (Apex Classic, APEX Gold, APEX Jr, and APEX Lite). The COR is not compatible with pre-APEX generations of Neptune Systems controllers such as the AquaController 3 or ACjr.

COR FEATURES AND SPECIFICATIONS

- ❖ COR-20: 2000GPH @ 0', 90w maximum current
- ❖ COR-15: 1500GPH @ 0', 60w maximum current
- ❖ COR Pump cable length: 9 feet (275cm)
- ❖ Multicolor status LED to indicate the operating state of the pump system and of any conditions requiring user attention
- ❖ Speed indicator 8-LED bar to visually show the speed for the pump
- ❖ Convenient push buttons to turn the pump on & off, and to activate a feed mode which may be used during feeding times or during aquarium maintenance periods
- ❖ COR pumps may be used submerged/in-sump or for externally-plumbed installations
- ❖ 2-port AquaBus hub for APEX system interconnection (COR-20)
- ❖ Dedicated 100-watt 24VDC power supply (COR-20)
- ❖ Watertight connectors in the cables between the COR driver and COR pump
- ❖ 1LINK port for system interconnection to an APEX system, delivering power and communications through a single cable (COR-15)
- ❖ Active performance monitoring and error notifications through the APEX and APEX Fusion
- ❖ Fallback fail-safe setting. If a communication failure occurs between the APEX and the COR driver, the COR may be configured to revert to a user-configurable default speed or to turn off.
- ❖ Pump dimensions: 120mm x 98mm x 165mm



WHAT'S IN THE BOX



COR-20 Package Contents

The COR-20 package, depicted above, comes with:

- ❖ COR-20 driver
- ❖ COR pump
- ❖ 6' (2m) AquaBus cable for connection to an APEX system
- ❖ 100w 24VDC power supply & power cord
- ❖ 1-1/4" threaded x 1-1/4" slip union for use on the COR pump output
- ❖ 1-1/4" threaded x 3/4" slip fitting for optional hard-piped use on the pump output
- ❖ 1-1/2" threaded x 1" slip fitting for optional hard-piped external plumbing
- ❖ O-rings for each fitting (not depicted)
- ❖ 5mm hex wrench

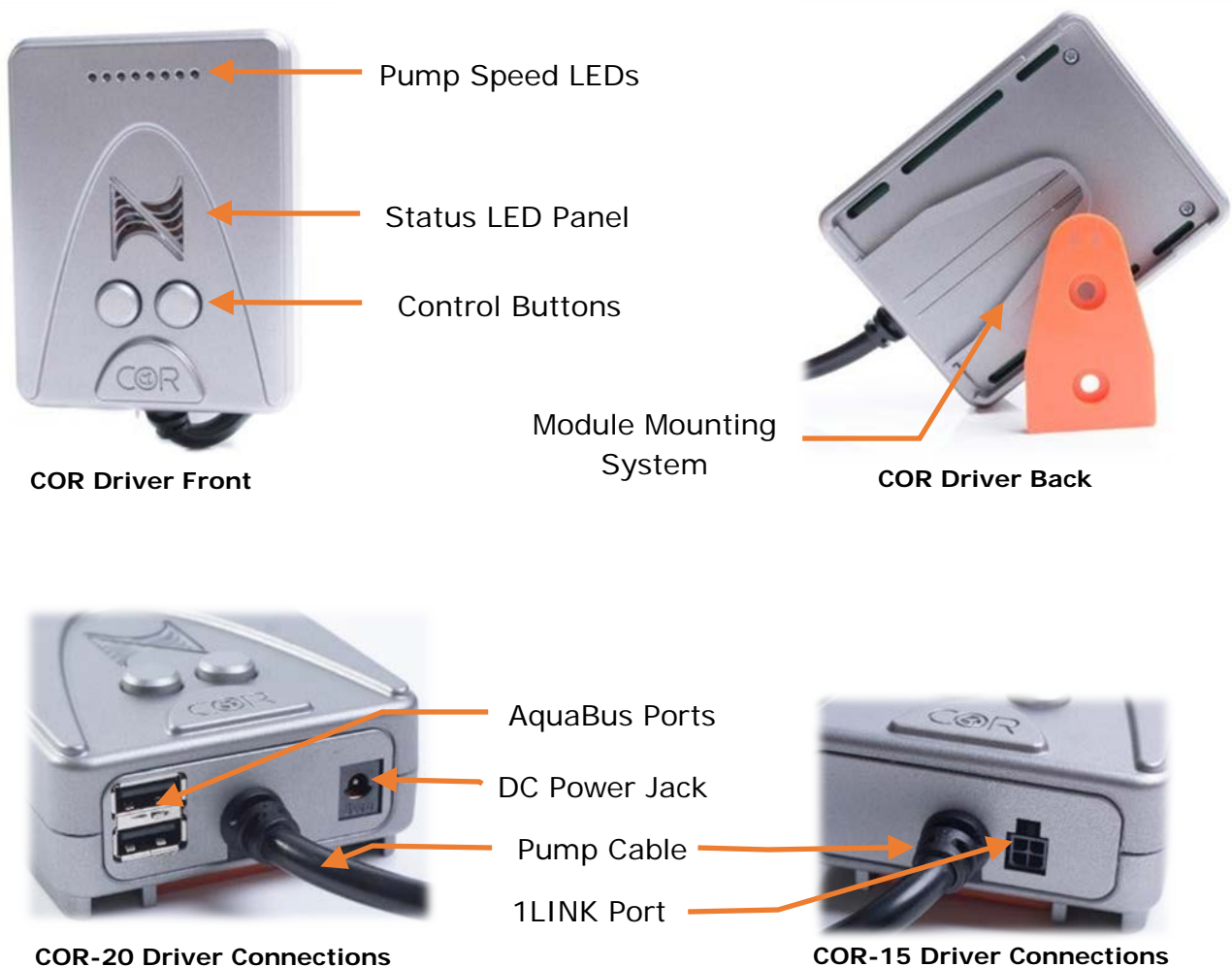
Note: the included power supply may be slightly different than the one depicted

The COR-15 package (not depicted) comes with:

- ❖ COR-15 driver
- ❖ COR pump
- ❖ 10' (3m) 4-pin 1LINK male-to-male cable for connection of the COR-15 to an APEX system via a 1LINK module or EnergyBar 832.

- ❖ 1-1/4" PVC union for use on the COR pump output
- ❖ 1-1/4" threaded x 3/4" slip fitting for optional hard-piped use on the pump output
- ❖ 1-1/2" threaded x 1" slip fitting for use on the pump intake when the pump is plumbed for external use
- ❖ O-rings for each fitting
- ❖ 5mm hex wrench

GET TO KNOW YOUR COR DRIVER



The COR-15 and COR-20 driver provides power and speed control to the COR pump. When connected to an Apex system, the COR driver appears to the Apex as an AquaBus expansion module, and is managed by the Apex like any other Apex expansion module.

The COR-15 and COR-20 driver may also be referred to as a 'module', however, the term 'driver' will be used throughout this user guide.

GET TO KNOW YOUR COR PUMP



APEX SYSTEM AOS/FIRMWARE REQUIREMENTS

Your APEX system **MUST** have a version of firmware installed which contains support for the COR. The minimum required versions are:

- ❖ APEX A2 and A3 systems must have AOS version 5.03_AB17 or newer.
- ❖ APEX A1 (Apex Classic) systems must have firmware version 4.53_AB17 or newer.

It is recommended to upgrade your APEX AOS or firmware to the latest available version even if your APEX currently meets the minimum version requirement.

- ❖ Refer to the [APEX A2/A3 Get Started Guide](#) for instruction about updating the APEX Operating System to the latest release.
- ❖ Refer to the [Firmware Updates](#) page on Neptune Systems' web site for instructions and download of APEX Classic firmware.



WARNING: Do not connect your new COR-15 or COR-20 driver to your APEX system until you have verified that your APEX has the required minimum firmware version or newer, or have upgraded your APEX if needed.

PHYSICAL INSTALLATION – COR-15 AND COR-20 DRIVER

The COR-15 or COR-20 driver should be securely mounted in a location free from moisture. The COR driver uses an innovative mounting system which provides safe secure mounting yet allows easy removal of the COR from the mounting plate. It is recommended that the COR driver be mounted on a vertical surface such as a wall, an upright mounting board, or the side or back of your aquarium stand. Use the included screws to mount the COR driver mounting plate, then slip the COR over the mounting plate and press downward to firmly seat the COR driver on the mounting plate. If mounting on drywall, use drywall anchors (screws and anchors not included). A printable mounting template is available [HERE](#). The mounting template contains additional mounting guidelines.

- ❖ Be sure to utilize drip loops on all cables plugged into the COR driver.
- ❖ Leave at least 1" of clearance at the top of the COR driver to allow for easy dismounting of the driver.
- ❖ Leave at least 2.5" of clearance below the COR driver to allow sufficient room for cabling



WARNING: Water damage will void your COR driver warranty! Mount the COR driver in a location safe from any form of moisture exposure – drips, splashes, etc.

PHYSICAL INSTALLATION – COR PUMP

The COR pump may be installed for use either submerged (in sump) or externally-plumbed. An extensive discussion of aquarium plumbing design, PVC plumbing cementing, etc. is beyond the scope of this user guide; however, some tips and suggestions are provided here. If you need assistance with plumbing design or assembly, enlist the help of a local aquarist or an aquarium design, installation, and maintenance professional.

Submerged/In Sump Installation

It is highly recommended that your return plumbing has 1-1/4" piping and fittings to obtain the most flow from your COR pump. Smaller diameter piping will reduce the overall flow of water.

- ❖ If your tank return piping is 1-1/4", use the included 1-1/4" union.
- ❖ If your tank return piping is 1" diameter, use the included 1-1/4" union and a 1-1/4" to 1" slip x slip PVC reducer fitting (not included).
- ❖ Do not use the small orange O-ring on the pump if using the 1-1/4" union.



1-1/4" Union Mounted on COR output

- ❖ If your tank return piping is 3/4" or smaller, use the smaller 1-1/4" x 3/4" slip adapter and the smaller orange O-ring.



3/4" Slip Adapter Mounted on COR output

- ❖ It is recommended that you install the outer collar part of the 1-1/2" x 1" slip adapter on the intake threads, as this will provide protection for those threads. Do not use the inner 1" slip part of the adapter, just use the outer collar.



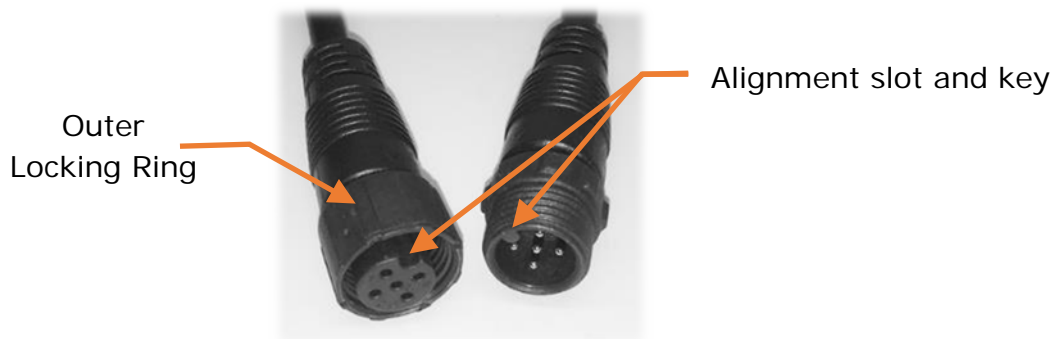
Slip Adapter Collar Mounted on COR Intake

Externally-Plumbed Installation

If you will install your COR external to the sump, use both supplied slip adapter fittings, or optionally, use the 1-1/2" x 1" slip fitting on the pump intake and the 1-1/4" union on the pump output. Note that the reduced diameter of these fittings will restrict the flow through the pump. Optionally, use a 1-1/2" BSPP coupler or union (not supplied) to connect to larger intake piping. The included orange O-rings must be installed when using the slip adapter fittings.

COR PUMP AND COR DRIVER CONNECTION

To connect the COR pump and driver, simply connect the pump's cable to the short pigtail cable of the COR driver. The connectors are keyed; align the connectors carefully; do not force the connectors together.



Use the outer locking ring of the driver-side connector to tighten the connection and form a water-resistant seal. The mated and properly tightened connectors are not intended to be submerged in water.



The COR driver and COR pump cables should be connected prior to connecting power and APEX cables to the COR driver. If you need to disconnect the COR pump from the COR driver, COR driver power and APEX connection cables should be disconnected first, before you disconnect the pump cable.

COR-20 CONNECTION TO APEX SYSTEM AND POWER

The COR-20 driver communicates with the APEX base unit and other system modules through the AquaBus connectors. The COR-20 has two AquaBus connectors which may be utilized to connect the COR-20 to an APEX system and optionally, daisy-chain an additional module or modules downstream of the COR. There are no limitations on the order AquaBus accessories can be connected or to which AquaBus ports accessories must be connected. The total length of all AquaBus cables should be limited to 200 feet. Refer to the APEX Started Guide for more information about AquaBus in general.



WARNING: NEVER plug standard USB devices into any AquaBus connector or connect an APEX controller or AquaBus modules to computer equipment's USB ports. Damage to the AquaBus modules and/or USB device may result.

To connect your COR-20 driver to the APEX system, simply use the included AquaBus cable to connect either of the COR-20 driver AquaBus ports and any available AquaBus port on your APEX system.

Plug the included detachable power supply power cord into the power supply and plug the other end into a wall outlet or power strip. *It is not necessary or recommended to plug the power supply into an EnergyBar outlet.* It is highly undesirable to turn power to the COR system ON and OFF; it should have constant power.

If you do use an EnergyBar outlet despite the recommendation not to do so, that outlet should be programmed to be ALWAYS ON by using the Always Control Type or by manually programming the EnergyBar outlet with this simple program:

Fallback ON
Set ON

COR-15 CONNECTION TO APEX SYSTEM

To connect a COR-15 to an APEX system, that APEX system must be equipped with an available 1LINK port on an EnergyBar 832 or a 1LINK module. The EnergyBar 832 and the 1LINK module each have three 1LINK ports; any of those 1LINK ports may be used. However, if you also have WAV pumps and/or DC24 accessories, and other 1LINK and DC24 devices such as WAV and PMUP pumps on a single EnergyBar 832 or 1LINK module, calculate the total possible load of all connected 24VDC devices. Do not exceed the maximum 24VDC load of the EB832 or 1LINK module, which is 100 watts. Add another 1LINK module or EB832 if necessary.

- The COR15 may draw up to 60 watts
- WAVs draw up to 30 watts
- PMUP draws approximately 17 watts
- D \bar{O} S draws up to 22 watts
- Trident draws approximately 15 watts
- GRO draws approximately 20 watts

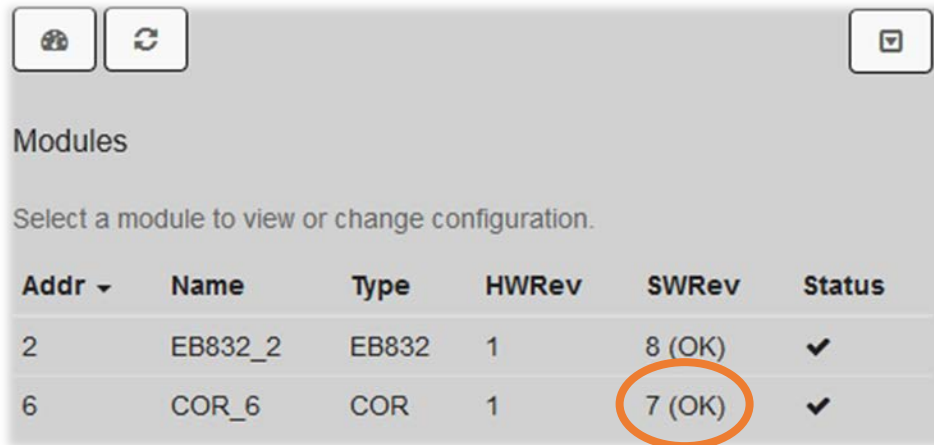


Do NOT connect a COR-15 driver to a DOS' 1LINK port or a Trident's 1LINK port. A COR-15 may only be connected to a EB832, EB632, or 1LINK module.


COR DRIVER FIRMWARE UPDATE

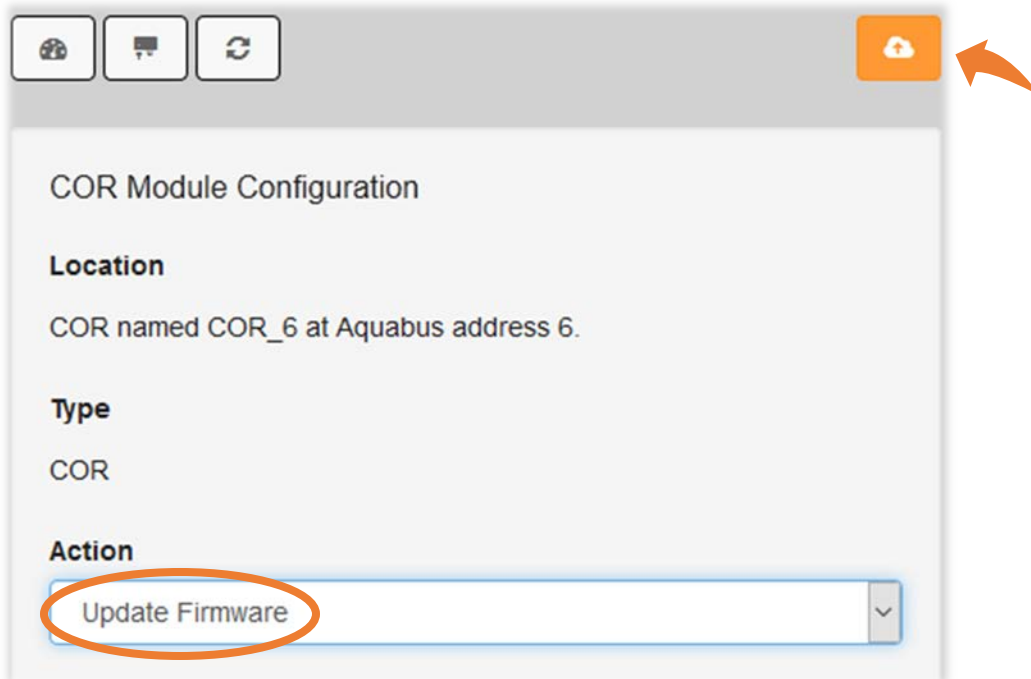
After initially connecting the COR-20 or COR-15 to your APEX System, and after any subsequent APEX system firmware or AOS update, check the COR driver's installed firmware version, and update it if it shows as OLD.

If you have an APEX A2 or A3 model, go to the Modules page in either APEX Local or APEX Fusion. Look in the SWRev column; if it says OK for your COR, no update is needed. If it shows OLD, then click on the COR line, choose Update Firmware from the Action menu, then click the orange Update APEX button.



Addr	Name	Type	HWRev	SWRev	Status
2	EB832_2	EB832	1	8 (OK)	✓
6	COR_6	COR	1	7 (OK)	✓

If it shows OLD, then click on the COR line, choose Update Firmware from the Action menu, then click the  (Update APEX) button.



COR Module Configuration

Location
COR named COR_6 at Aquabus address 6.

Type
COR

Action
Update Firmware

If you have an APEX A1 (Apex Classic) model, you must use the Classic Dashboard to check the COR firmware version, and if necessary, update it. This cannot be done through APEX Fusion. Go to the Configuration->Module Setup page, and look at the table at the bottom of that page.

Apex Module List				
HW Type	HW Rev	SW Rev	Addr	Name
Display module	001	010(OK)	001	Disp_1
EB8 module	001	012(OK)	003	EB8_3
COR module	001	007(OK)	004	COR_4

Look in the SWRev column; if it says (OK) for your COR, no update is needed. If it shows (OLD), then select the COR using the Module dropdown; after the page refreshes, click Update Firmware, then click Submit Module Change.

Module Configure

Module COR_4 (COR module - 4)

Name: COR_4

☐ Rename
☒ Update Firmware
☐ Delete Module

Submit Module Change

You can observe the module firmware update progress just above the Module List on that page.

Apex Module List				
Firmware update in progress: Addr: 6 - 21% done				
HW Type	HW Rev	SW Rev	Addr	Name
EB832 module	001	008(OK)	002	EB832_2
COR module	001	007(OK)	006	COR_6

COR DRIVER STATUS LED PANEL AND LED BAR





The Neptune Systems logo on the face of the COR-15 and COR-20 driver is a multicolor LED panel which indicates the status of the COR.

The top bar of 8 small LEDs provides additional information. In most cases, it indicates the approximate speed of the pump.

There are several possible states of the LED panel.

Logo Color	Status Meaning and 8-LED Bar Indication
Solid Orange	<ul style="list-style-type: none"> The COR driver is operating normally and is communicating with the APEX system. If a COR-20 is being used in standalone mode, this also indicates normal operations. The number of LEDs lit on the 8-LED bar indicates the current pump speed. There are 16 speed levels when in standalone mode.
Flashing Orange	<ul style="list-style-type: none"> The COR driver is in fallback mode and is attempting to communicate with an APEX base unit. The number of LEDs lit on the 8-LED bar indicates the current pump speed.
Pink	<ul style="list-style-type: none"> The COR pump has been manually turned OFF using the left COR button or by using the COR tile on the APEX Classic, APEX Local, or APEX Fusion dashboard. None of the small LEDs will be lit.
Green	<ul style="list-style-type: none"> One of these three conditions exist: <ul style="list-style-type: none"> FeedA has been activated using the right COR button FeedA has been activated through the APEX The COR driver is in Minimum Speed Calibration Mode The number of LEDs lit on the 8-LED bar indicates the current pump speed
Blue	<ul style="list-style-type: none"> The COR driver is in Maximum Speed Calibration Mode The number of LEDs lit on the 8-LED bar indicates the current pump speed
Red	<ul style="list-style-type: none"> An error condition exists. When the status LED is red, one of the LEDs of 8-LED bar will flash to indicate the specific issue detected. <ul style="list-style-type: none"> The COR driver has detected an overcurrent condition (LED #1, #4, or #5 may be flashing) This may indicate that the pump's intake is blocked or a foreign object is preventing the impeller from rotating The input power voltage is too high (LED #2 will be flashing) The COR-20 driver is connected to an APEX system but it has no 24VDC input power (LED #3 will be flashing) The input power voltage is low (LED #3 will be flashing) The COR pump is running while dry or out of water (LED #6 will be flashing) The internal temperature of the pump is high (LED #7 will be flashing)
Yellow	<ul style="list-style-type: none"> The COR driver's internal firmware is being updated by the APEX
Not Lit	<ul style="list-style-type: none"> One of these conditions exist: <ul style="list-style-type: none"> The COR-15 driver's 1LINK cable is disconnected The COR-20 in Standalone Mode has no 24VDC power The COR-15 or COR-20 driver has suffered a failure

ADDITIONAL NOTES:

- Whenever the LED panel is lit red, a specific error message will also be shown on APEX Fusion and APEX Local dashboards; these are not shown on the Classic Dashboard. The error conditions must be enabled however, for these status messages to appear.
- The LED panel may continue to be red for up to one minute after an error condition has cleared or has been resolved.
- Similarly, the display of an error message on the APEX Fusion or APEX Local dashboard may persist for 1-2 minutes after an error condition has cleared or was resolved.

COR DRIVER BUTTONS

The function of the two buttons on the COR driver will vary depending on the operating mode of the COR driver.

During normal APEX-connected operations, the left button may be used to turn the COR output OFF and then back to AUTO. The right button may be used to activate or cancel Feed Cycle A.

- ❖ To turn the COR output OFF, press and hold the left button for 3 seconds; the status LED panel will turn pink to indicate that the output is OFF. The OFF state will also be shown on the COR tile on the APEX Local, APEX Fusion, or Classic Dashboard.
- ❖ To return the COR output to AUTO, press and hold the left button for 3 seconds; the status LED panel will turn orange to indicate that the output is back in the normal AUTO state. The AUTO state will also be shown on the COR tile on the APEX Local, APEX Fusion, or Classic Dashboard.
- ❖ To activate FEEDA, press and hold the right button for 3 seconds; the status LED will turn green to indicate that FEEDA is active. The status LED panel will return to normal orange illumination when the FEEDA timer expires or is canceled using an APEX Dashboard Feed tile.
- ❖ To cancel FEEDA from the COR driver, press and hold the right button again for 3 seconds. The COR right button may be used to cancel FEEDA even if FEEDA was activated by means other than the COR button.

The COR's right button can activate FEEDA only; it is not configurable for activation of Feed Cycles B, C, or D instead.

Refer to other APEX documentation for more information about using Feed Cycles.

COR IQ-Level Adjust Mode and COR Standalone Mode

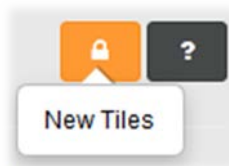
During these modes, the left and right buttons are used to control the speed and flow rate of the COR pump.

- ❖ The left button will decrease the pump speed
- ❖ The right button will increase pump speed
- ❖ Each button press changes the pump speed by approximately 6%


COR DASHBOARD TILES

When you connect your COR-15 or COR-20 to your APEX, one or two tiles will be created on your Dashboard, depending on the APEX model and the user interface in use.


If using APEX FUSION or APEX Local, you should be alerted of the availability of new tiles after connecting your COR driver to your APEX:



If you do not see the New Tiles indicator in the upper right area of the Dashboard, refresh the Dashboard by clicking on your APEX's name in the upper right, then selecting Dashboard from the displayed menu.

Click on the  button to reveal the unused tiles area, then drag the COR tiles out to your dashboard as position them as desired. You may need to use the horizontal scroll bar to scroll to the far right to see the new tiles, which will have a blue halo.



Click on the  button when done.

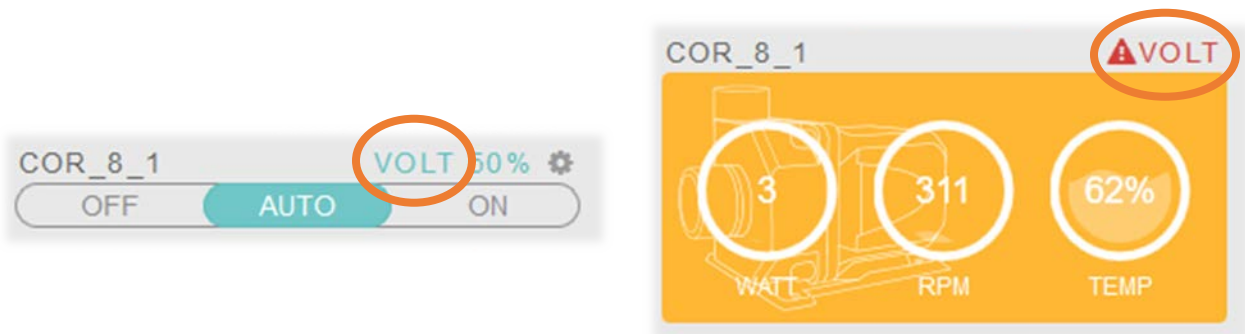


The COR slider tile shows the current state of the COR output: manual OFF, AUTO, or manual ON. The current speed of the COR is shown as a percentage. The COR tile must be in the AUTO position for the COR to be operated under program control.

Click on the  button on the OFF/AUTO/ON slider tile to configure the COR.

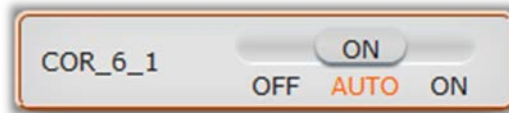


The larger graphical tile displays COR status as well as the current power consumption in watts, the COR pump RPM (revolutions per minute), and the pump's internal temperature, expressed as a percentage. The OK message seen above is the normal status; if there is some sort of error or abnormal condition, a message will be displayed in red instead of the OK status, as seen here:



Additional information about COR error conditions is provided later in this guide.

For APEX Classic controllers, one tile will appear on the Classic Dashboard:



The COR slider tile shows the current state of the COR output: manual OFF, AUTO, or manual ON. The COR tile must be in the AUTO position for the COR to be operated under program control. Click on the name of the COR in the tile to configure the COR.

Regardless of the APEX model and user interface in use, the default name of a COR-15 or COR-20 output is **COR_#_1**, where **#** is the AquaBus address of the COR driver. You may change the name if desired.

ABOUT IQ-LEVEL


IQ-Level is a form of calibration that allows you to configure the pump's minimum and maximum speeds to be optimal for your aquarium. Using IQ-Level is entirely optional but is highly recommended.

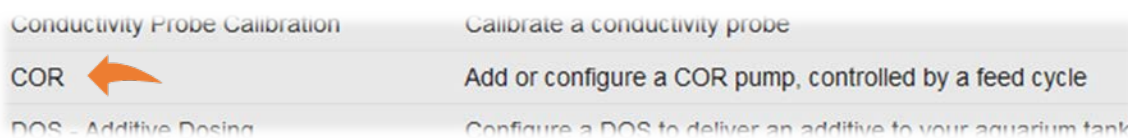
In the next few paragraphs, we will discuss IQ-Level as it should be done for a common aquarium setup in which the COR is used as a return pump. Other COR uses, such as closed loop applications, will require different criteria be used for IQ-Level.

Ideally, the pump's maximum speed will be calibrated so that 100% speed corresponds to that speed which moves the perfect amount of water for the tank's overflow drain(s), without exceeding the capacity of the overflow or pumping insufficient volume of water to maintain a constant full siphon drain. This is important to do, as properly setting the maximum speed of the pumps ensures that the output of the pump will not exceed the capacity of the overflow and drain system, even if the COR slider on the Dashboard is set to manual ON.


Ideally, the COR's minimum speed will be set with IQ-Level so that when the pump is running at 1%, the pump does not slow so much that the water in the return piping drains out backwards. The perfect minimum speed is that speed which just holds the water column full and in a quiescent state, and does not actually cause water to be pumped. You would then program to COR to run at that minimum speed during feeding times and in other situations when no water movement is desired.

INITIAL COR CONFIGURATION

Using the COR Task in APEX Fusion is the fastest and easiest way to do the initial configuration of a newly-installed COR. The COR Task will guide you through the IQ-Level adjustment process and then through basic programming of the COR. The COR Task will also (optionally) walk you through the process of modifying your skimmer programming so that the skimmer is turned off whenever the COR is off or running at a lower than normal speed. To use the COR Task, login to [APEX Fusion](#), select your Apex, then click on the  (Tasks) button, then select the COR Task, then follow the prompts.



IQ-LEVEL ADJUSTMENT

To perform IQ-Level Adjustment without using the COR Task, login to APEX Fusion, click the  (Configure) button on the COR slider tile, then click the large blue IQ-Level Adjustment button to run the COR IQ-Level Adjustment wizard.



WARNING: NEVER start the IQ-Level process or adjust its settings while away from your tank. You MUST be able to observe the water flow in your tank while calibrating or tuning your COR or you may cause a flood or stop circulation in your display tank.


Follow the steps in the IQ-Level wizard.

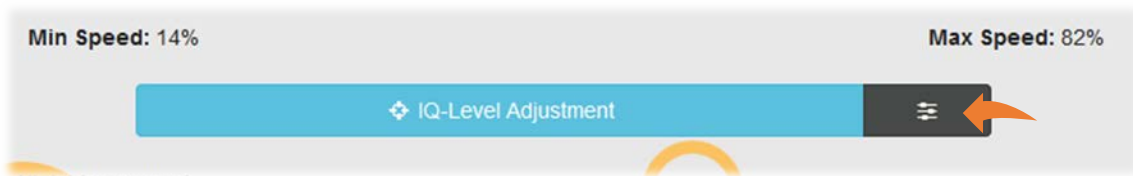
- ❖ When calibrating the maximum speed, use the left and right buttons to set the COR so that the water in the display is stable, and that the water volume being pumped matches the ideal water flow rate for your overflow or drain system. You

may not be able to find the perfect speed; that's OK; get as close as you can. You can fine-tune it later.

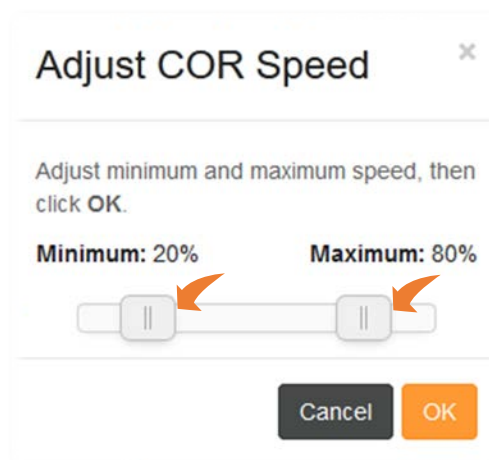
- ❖ When setting the minimum speed, use the left and right buttons on the COR driver to set the COR so that the water in the return line plumbing is at a point of equilibrium – when the water is neither draining back into the sump through the COR nor is water being pumped into the tank. Each press of the button equates to roughly a 6% change in pump speed, so you may not be able to find the perfect speed; that's OK; get as close as you can. You can fine-tune it later.
- ❖ When the wizard has been completed, the new minimum and maximum speeds will be sent to the APEX, and can be seen on the COR output page:




After calibration is complete, it may be necessary to adjust and fine-tune the minimum and/or maximum speed. To do this, click the  (Tune) button.

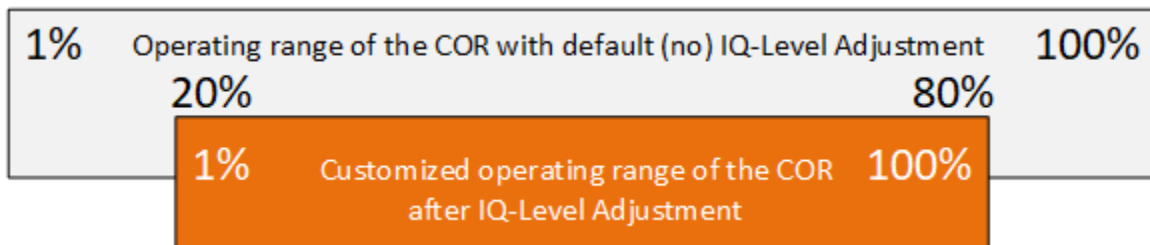


Using the dual sliders, fine-tune the calibration percentages.



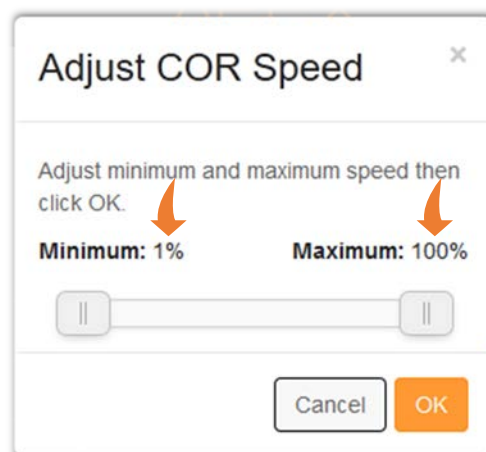
Go slowly! You have already done the rough calibration, so during this fine-tuning process, make a small adjustment of 1-2%, then click the OK button to apply the change. Observe the water flow in the aquarium for 60 seconds or more in between each change of the minimum or maximum percentage. To make further minor adjustments, click the  (Tune) button again.

After configuring IQ-Level, the pump's operation speed range (1-100%) as used in programming will then correspond to range set by the calibration points.




In the image above, after IQ-Level calibration 1% is now the same speed as 20% was before calibration, and 100% is now the same speed as 80% was prior to calibration. So now, when programming the COR, you simply use 1% when you want no water movement (such as during feeding times) and 100% (or ON) for normal operations of the COR.

To restore the COR to the default values, simply use the Tune button to reset the Minimum and Maximum back to 1% and 100% respectively.



ESSENTIALS OF COR PROGRAMMING

As a new COR owner, you should use the COR Task in [APEX Fusion](#) to get up and running your COR quickly and easily. Click on the  (Tasks) button, then select the COR Task. Follow the prompts, which will step you through these actions:

- Running IQ-Level adjustment
- Assigning a custom name to the COR
- Configuring a Feed Cycle to slow the COR to 1% during feeding times
- Configuring the Apex system to shut off an in-sump skimmer whenever the COR is running in feed mode or otherwise is running at less than normal speed (optional)
- Enabling alerts to be sent via APEX Fusion if any COR error conditions are detected (optional)

The COR Task will generate a program for the COR output like this:

```
Fallback ON  
Set ON  
If FeedA 005 Then 1
```

For many COR installations, this is all that is needed. You may desire to modify the duration of the FeedA statement, add statements for additional Feed Cycles, or add other programming.

In many cases, the simple programming created by the COR task is quite suitable and relatively simply to adapt to your preferences. However, you may use the APEX Fusion schedule wizard instead to create your COR operating schedule.

Experienced APEX users will note that the If FeedA statement above contains a number rather than ON, OFF, or the name of a profile. This number corresponds to a percentage of COR pump speed, and may be 0 – 100. This enhanced syntax of the If FeedX statement was specifically created for use with the COR, and first appears in APEX A2/A3 AOS version 5.03 and APEX Classic firmware version 4.53. The Set and Fallback statements, when used in a COR output program, also now support the use of a percent value, e.g. **Set 10**, **Set 50**, **Set 88**. **Set 0** and **Set OFF** are direct equivalents, as are **Set 100** and **Set ON**. Additional information about Fallback is covered in the [COR Fallback Mode](#) topic.

The use of a percent speed/intensity value in Set and Fallback, as well as in If Feed, If Time, If *probe*, If *switch*, If Output *outputname*, statements is also supported for use in programs for Apex base and VDM variable (VarSpd) outputs, VDM serial outputs, WAV, and Vortech outputs. The enhanced syntax using a percent value is not supported for



any other type of output, including EnergyBar, virtual, AI (Hydra/Vega), or Radion outputs.

Additional notes:

- The % symbol should not be used in programming; use only a number when you wish to specify a percentage.
- When specifying percentage, use only whole numbers, 0 through 100, such as 25, 77, or 100. The use of a value containing a decimal point, such as 99.5, is not supported.

Advanced APEX users may, in some cases such as for a closed loop system, desire to use APEX profiles in COR programming. Only the Ramp type profile may be used with a COR. All other types of APEX profiles, including the Pump profile type, are not supported.

Also supported is a programming keyword, 'Percent' which is used in programming to test and take actions based on the current speed of a COR pump. The syntax is:

If Output *CORname* Percent [\leq / \geq] % Then [ON/OFF/*profile*/%]

Apex Classic firmware does not support the 'Percent' keyword; Apex Classic users should use 'Speed' instead.

Examples:

- If Output COR_8_1 Percent < 50 Then OFF
- If Output COR_8_1 Percent > 90 Then ON
- If Output COR_8_1 Percent > 60 Then RampUp
- If Output COR_8_1 Percent = 0 Then OFF

As a practical example, let's say you wish to have your in-sump skimmer turn off whenever the COR is running at less than 95% speed and have the skimmer startup be delayed, allowing the water level in the sump to normalize after the COR return pump is running again. The programming for your skimmer outlet will be:

```
Fallback OFF
Set ON
If Output COR_8_1 Percent < 95 Then OFF
Defer 3:00 Then ON
```

The **If Output COR_8_1 Percent < 95 Then OFF** statement will turn the skimmer off whenever the COR is running at less than 95% speed or the COR is turned OFF, and the skimmer will not turn back ON until 3 minutes after the COR is running at a speed of 95 percent or greater.

Apex owners who choose to use this capability in advanced Apex programming should use the < or > operators whenever possible; the = operator will rarely be preferable to use.

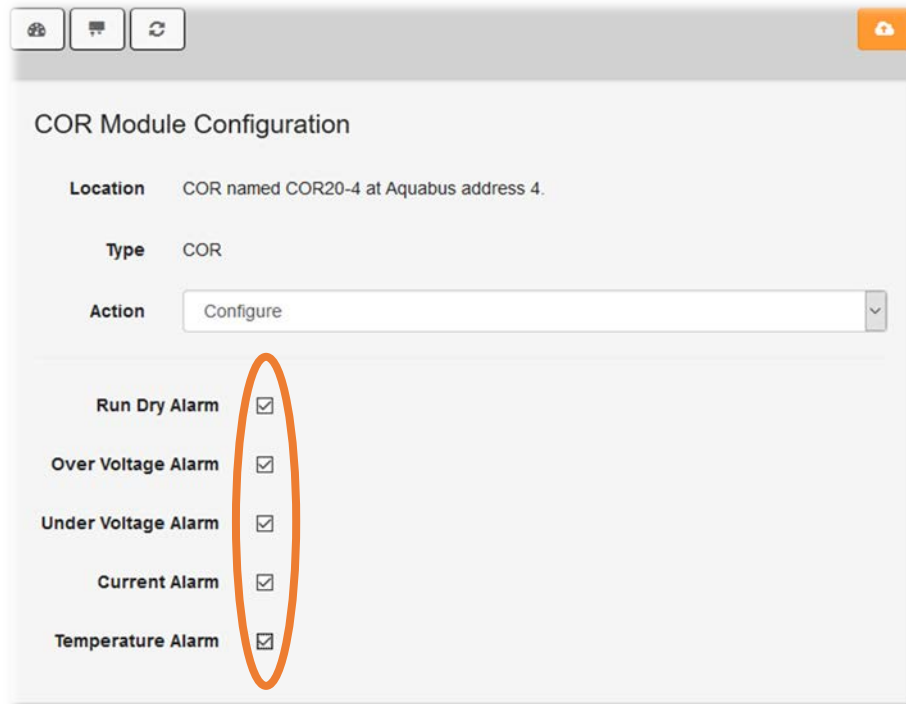
COR ERRORS AND ALERTS

The COR-15, and the COR-20 in APEX-Connected Mode, have the capability to report various abnormal conditions via the APEX Local Dashboard [APEX A2 & A3 models only] and the APEX Fusion Dashboard [all APEX models]; there are 5 types of COR alarms:

- ❖ Run Dry Alarm
- ❖ Over Voltage Alarm - the COR can detect and report a high voltage condition with the 24VDC input power
- ❖ Under Voltage Alarm - the COR can detect and report a low voltage condition with the 24VDC input power
- ❖ Current Alarm - the COR can detect and report an over-current condition, specifically, if the pump is drawing more electrical power than normal. This could be a result of the pump intake being blocked or a foreign object is stuck in the impeller
- ❖ Temperature Alarm - the COR can sense and report a high pump internal temperature

These alarms may be individually enabled or disabled for each COR. All five are enabled by default.

For APEX A2 & A3 models, use APEX Local or APEX Fusion. Go to the Modules page, then select the COR, then select Configure from the Action menu. Click the orange Update APEX button when done.



COR Module Configuration

Location COR named COR20-4 at Aquabus address 4.

Type COR

Action Configure

Run Dry Alarm ☒

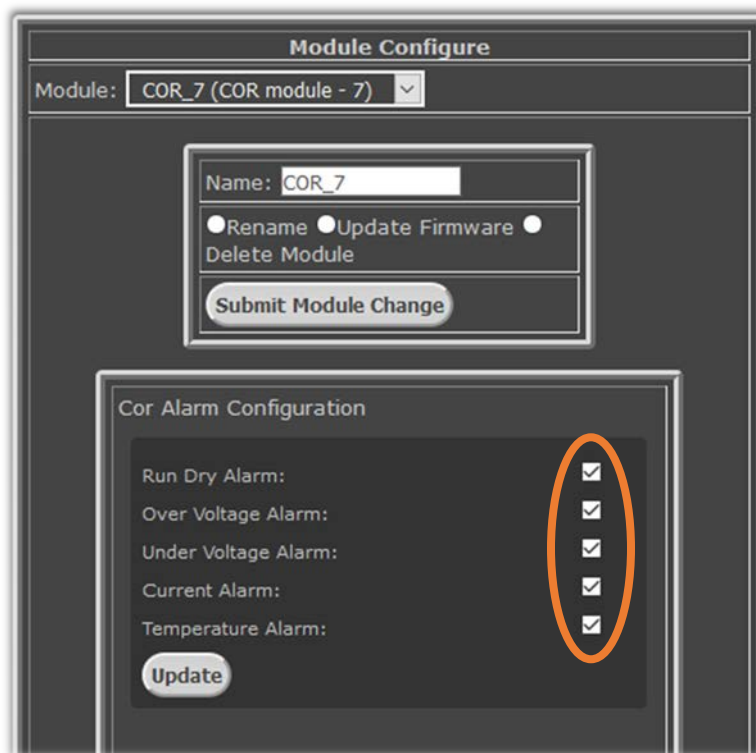
Over Voltage Alarm ☒

Under Voltage Alarm ☒

Current Alarm ☒

Temperature Alarm ☒

For all APEX Classic models, use the Classic Dashboard. Go to the Configuration->Module Setup page, select then select COR. Click the Update button when done.



Module Configure

Module: COR_7 (COR module - 7)

Name: COR_7

☐ Rename ☐ Update Firmware ☐ Delete Module

Submit Module Change

Cor Alarm Configuration

Run Dry Alarm: ☒

Over Voltage Alarm: ☒

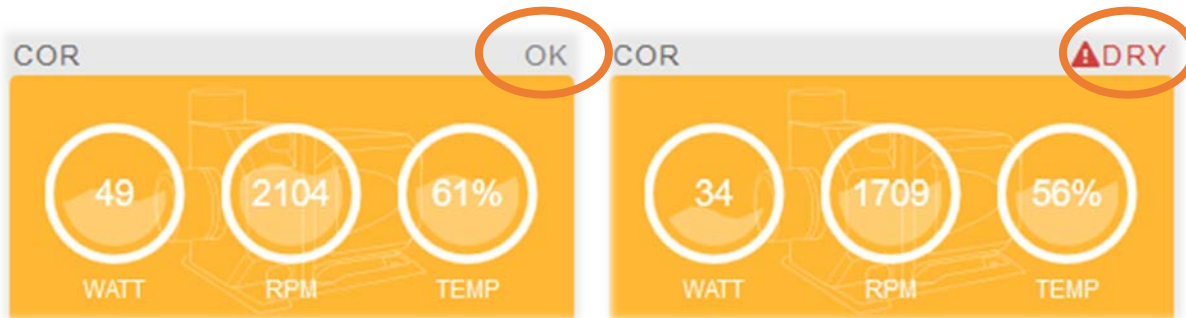
Under Voltage Alarm: ☒

Current Alarm: ☒

Temperature Alarm: ☒

Update

If none of the COR Alarms are present, the COR tile in APEX Fusion (and in APEX Local for APEX A2 and A3) will show an OK status; if any enabled COR Alarm is active, it will be displayed on the COR tile in APEX Fusion or APEX Local.



COR alarms can be reported via APEX Fusion emails, SMS alerts, and Apple Push Notifications (Apple iOS devices only; requires the APEX Fusion app). The syntax is:

If Error *outputname* Then [ON/OFF]

Replace *outputname* with the actual name of your COR output. Here is an example used in a program for the email output:

```
Set OFF
If Temp < 77.0 Then ON
If Temp > 78.5 Then ON
If pH < 7.90 Then ON
If pH > 8.25 Then ON
If Leak1 CLOSED Then ON
If Error Cor_7_1 Then ON
```

Note that a COR alarm notification will only indicate a COR alarm is present; to see which specific COR alarm triggered the notification, you must login to APEX Fusion or APEX Local.

COR FALLBACK MODE

Fallback is a special APEX programming command which, if used in an output program, tells an AquaBus module what to do in the rare event that a module loses communications with the APEX/APEX Classic/APEX Lite base unit or the APEX Jr. Fallback has no effect during normal operations, and cannot be used in lieu of a Set statement.

Two examples of when Fallback might "kick in":

- ❖ If the AquaBus cable between an AquaBus module and the rest of the APEX system gets disconnected
- ❖ If the controller fails

The Fallback command requires one of four parameters: ON, OFF, a profile name, or a numeric value, which is the desired percentage of the COR maximum speed/intensity if Fallback kicks in.

Examples:

- Fallback ON
- Fallback OFF
- Fallback COR-Slow
- Fallback 75

Experienced APEX users may recognize that the Fallback % syntax as new; it was introduced in the same new firmware which contains COR support. Note that in the example above, the % symbol is not used, and should not be specified in the programming; just use the number. **Fallback 100** has the same effect as **Fallback ON**; **Fallback 0** has the same effect as **Fallback OFF**.

Neptune Systems recommends the use of either the **Fallback ON** or **Fallback %** option for the COR when used as a return pump. Other, less-common, cases may be better suited by use of **Fallback OFF** or **Fallback %** with a reduced pump speed specified. Typically, if the COR has been calibrated, **Fallback ON** or **Fallback 100** are the best choices. The use of **Fallback *profile-name*** is not recommended with the COR; generally, if a state other than ON or OFF is desired, **Fallback %** is preferred, as it is easier and simpler than using a profile.

Fallback of a COR driver will occur approximately 100 seconds after the COR driver detects a loss of communications. At that moment, the COR driver logo LED will begin to flash orange and the pump will be operating at the state or speed specified. If communications with the APEX are restored, then the COR will resume operating with its normal programming. If the COR is in Fallback mode and either COR button is pressed, the COR will change from Fallback mode into Standalone Mode and the COR driver logo LED will change from flashing to being lit solid orange. The buttons may then be used to manually adjust pump speed.

USING A COR-20 IN STANDALONE MODE

If you want or need to operate your COR-20 in Standalone Mode rather than integrated with your Apex, refer to the COR-20 Standalone User Guide found on the Documentation page on the [Neptune Systems web site](#).

To put your COR-20 into Standalone Mode:

1. Disconnect the power cord from the COR-20 power jack
2. Disconnect the AquaBus cable(s) from the COR-20.
3. If you have daisy-chained additional Apex modules, reconnect the AquaBus cable to another module so that those modules are reconnected to the Apex system
4. Reconnect the power cord to the COR-20 power jack.
5. Your COR-20 will now be in Standalone Mode

To return to APEX-connected Mode, simply reconnect your COR-20 to your Apex system using an AquaBus cable.

COR PUMP MAINTENANCE

Like all pumps, the COR pump should be serviced periodically as part of routine maintenance or may need to be disassembled if, for example, a foreign object becomes lodged in the pump.

To disassemble the pump:

1. Disconnect the power cable from the COR-20 driver or disconnect the 1LINK cable from the COR-15 driver
2. Disconnect the pump cable from the COR driver
3. Disconnect plumbing
4. Remove the pump, and drain excess water out
5. Slide the baseplate toward the rear of the pump and remove it
6. Use the supplied 5mm hex wrench to remove the 4 screws
7. Carefully slide the volute away from the pump body
8. Grasp the impeller firmly and slide it out of the pump body.



WARNINGS

- ❖ The impeller may roll and fall off a flat work surface; use caution to ensure the impeller assembly does not become damaged as a result.
- ❖ Do not attempt to further disassemble the impeller.

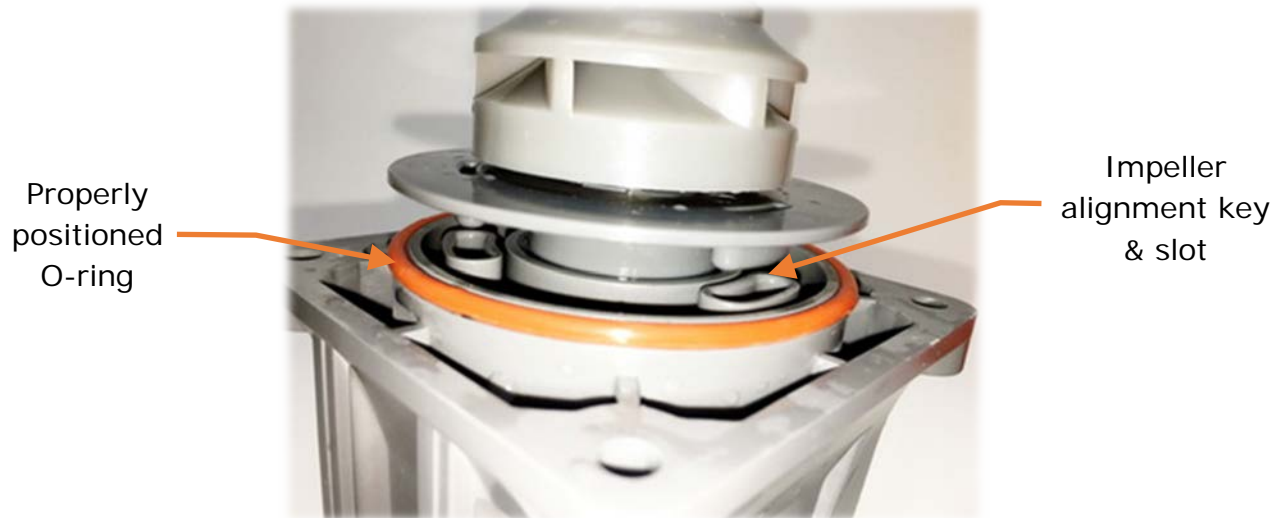


Clean the impeller assembly, the pump cavity, the volute, and the exterior of the pump case with a toothbrush or other suitable brush. If necessary, the pump components may

be soaked in a vinegar and water solution to remove calcium or hardwater mineral deposits. Gently clean and dry the O-ring with a cloth, then apply a light coating of silicone grease.

To reassemble the COR pump:

1. Carefully position the O-ring on the circular ridge on the pump body (*see image below*)
2. Position the pump body so the impeller cavity is up.
3. Slip the impeller assembly down into the pump body until it is fully seated, ensuring that the 3 keys in the impeller plate are aligned with the corresponding slots in the pump body (*see image below*)
4. While continuing to hold the pump pointing up, position and seat the volute over the face of the pump body
5. Holding the volute firmly against the pump body, then set the pump down on its base
6. Reinstall the 4 screws. Tighten the screws just enough to hold the volute snugly in place against the pump body; *do not overtighten*.





NEPTUNE SYSTEMS LIMITED WARRANTY

Neptune Systems warrants this product to be free from defects in material and workmanship for a period of 1 year from the date of purchase. If repair or adjustment is necessary and has not been the result of abuse, Neptune Systems warrants this product to be free from defects in material and workmanship for a period of 1 year from the date of purchase. If repair or adjustment is necessary and has not been the result of abuse, misuse, or accidental damage, within the 1-year period, please return the product with proof of purchase, and correction of the defect will be made without charge.

For your protection, items being returned must be carefully packed to prevent damage in shipment and insured against possible damage or loss. Neptune Systems will not be responsible for damage resulting from careless or insufficient packaging. Before returning please obtain a return authorization (RMA) number from Neptune Systems. Returned merchandise will not be accepted without a RMA number. To obtain assistance with your Neptune Systems product, contact Neptune Systems technical support by phone or via the [Technical Support Contact Web Page](https://www.neptunesystems.com) at <https://www.neptunesystems.com>.

Except for the warranty set forth above, Neptune Systems is not responsible for any damages including, but not limited to, consequential damage occurring out of or relating to the delivery, use or performance of Neptune Systems' products. Buyer's remedies for breach of warranty shall be limited to repair, or replacement and full or partial adjustment to purchase price.

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