The Anchoring Process
BEFORE
Setting the Anchor Alarm

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The anchor alarm in Aqua Map is easily the best one available, although it could use a couple of changes listed at the end of the document. But like every other anchor alarm out there, it comes close, but doesn't completely assist with anchoring BEFORE the anchor alarm is set. The capabilities are close but a few small changes are needed to make it complete.

There are 4 steps to anchoring and setting an anchor alarm:

1. Picking the spot to drop the anchor and stopping the boat.

2. Dropping the anchor, setting the anchor position, and releasing chain/rode.

3. Assisting the anchor to dig into the sea floor and verifying that it is set and safe.

4. Enabling the anchor alarm for continued monitoring.

This document will address items 1, 2, and 3. In general, the word "chain" is used for rode. Smaller boats use a combination of line and chain and some even use all chain. The material of the rode isn't important although all chain boats need to be more careful since chain can easily scratch and even damage the hull if it rubs against it.

Much of this discussion is also using the technique of having a phone on the bow when the anchor is dropped (method A in Use GPS Position). That method is much preferred since it gives more accurate results. If method B is used, much of the real time anchoring assistance described here would not likely be done. But if method A is used, this process will always be done.

Step 1 - Picking the spot
A general area is often decided upon by looking at charts, using ActiveCaptain markers, or just using past experience. The captain will often move around the area where they want to anchor watching depths, making estimates of the distances to other boats, and watching other environment features (staying away from a channel, staying far enough from land, not going near loud boats, etc).

Once the spot is decided upon, the boat needs to come to a stop. And I mean a full stop. Because if the boat is still moving forward and the anchor is dropped, the boat will end up riding over the chain, possibly causing damage to the boat. Dropping the anchor while the boat is moving backwards can start pulling hard against the windlass that is releasing chain and can damage the windlass or even pull it out of the boat's mounting. Most windlasses are attached to a boat with 4 or more screws. In front of the windlass will be some locking mechanism designed to hold the entire weight of the boat. The windlass itself is not designed to hold a heavy boat and moving backwards with only the windlass holding the chain because it is being let out has torn out many windlasses from boats causing severe damage and possible injury.

Consider that arriving at an anchorage often finds some wind and/or current in the area. In those cases, watching the water to determine when the boat has stopped is very difficult. Debris in the water may well be moving with the wind or current and you cannot easily tell if the boat has stopped moving.

The perfect device to show if the boat is moving is a GPS. It shows the speed against the ground. It can also show the direction of travel because, believe me, you often cannot even tell if the boat is moving forward or backwards.

DragQueen had a feature that was very useful in this Step 1 situation. It allowed the anchor position to be selected very quickly and then immediately gave the distance in feet from that point. I would often stand at the bow waiting for the moment to drop the anchor. When I thought we were close, I'd set the anchor position and watch the distance number change. I know that when the distance was changing by less than 1 foot per second, we were as stopped as I needed. At that point, I'd drop the anchor and reset the anchor position point to very accurately record the anchor location for the anchor alarm - I even hang over the bow so I can be as close as possible to the anchor position.

Step 2 - Releasing chain

The anchor has been dropped and the boat is still not moving. Our bow is 10 feet above the water line and I usually allow about 10 feet + the water depth to be released and in the water before setting the GPS position of the anchor for the anchor alarm. After another 10-25 feet has been released, I ask my wife to put both engines in reverse. We wear wireless headsets to talk to each other during every anchoring/de-anchoring task. Wireless headsets for anchoring and docking are very common from 30 foot sailboats to megayachts. Especially with husbands/wives, it removes the need to raise your voice to be heard especially in windy or rain conditions. Raising your voice can be interpreted as being angry and it can turn a tense situation into a marriage challenge! Headsets remove all yelling. My wife and I can easily and clearly talk to each other as long as we are within 100 feet of each other.

Prior to starting the entire anchoring process, most people will decide how much chain they want to release. That's often based on scope which is the ratio between chain released and bow height + water depth. For example, I normally put out 5:1 scope if we're anchoring for a night or 7:1 if we'll be anchored for a few days. Predicted storms will make me increase scope too. The anchor is more

secure with larger scope. I have put out more than 10:1 scope when I knew a storm was approaching.

My boat's bow is 10 feet above the water line. If the water depth at high tide is 15 feet, then for me to anchor at 7:1, I'll put out (10 + 15) * 7 = 175 feet. I'll know this number before I drop the anchor (or something close). I'll adjust it in my head based on the actual water depth we see (my wife will tell me the depth number) along with an estimate for where we are in the tide cycle.

Cycling this back into the app, an obvious easy addition would be scope assistance. The height of the bow above the water line could be entered and known as a boat setting. The user would have to enter the depth at high tide for the anchorage area or more elegantly, enter the amount of extra tide expected and use the current depth received along with a special factor giving the transducer depth (different people like seeing depth in different ways but scope must be calculated at full water depth).

A less elegant but more important feedback needed is the distance the boat is from the anchor. I aways want to be putting out more chain than we've moved back so there will never be pull on the windlass. I also want 10+ seconds before getting to the end to give me time to engage the chain lock. Once the lock is engaged, step 3 happens. I watch the distance as we're moving back very carefully to command my wife to be in or out of gear.

Continuing my example, let's say I've put out 175 feet of chain - chain is almost always marked on the chain itself and I know pretty accurately how much has been released. The engines are in reverse - what I want to see is how many feet back we are - and it'll be moving by a few feet per second. It'll show 100…110……..140…145…150… At that point with 25 feet to go, I'd tell my wife to take the boat out of gear. We'll still be moving backwards but I want to slow down with only 25 feet to go. Displaying the number in a large font size in this stage showing that distance is very valuable and something difficult to get with the current app. You can enable the entire anchor alarm and watch the main display. But the distance number is very small given the limited concentration available and sunlight often present. Besides, we're still part of the pre-anchor alarm stage here.

Step 3 - Digging in the anchor

Properly digging in an anchor into the sea floor takes experience. I have learned that you want to slowly persuade the anchor to gently start to dig in and allow it to penetrate the surface very slowly. Without penetrating the floor, the anchor is really only as good as the weight of the anchor plus the chain. Both of my anchors are 171 lbs and my chain weights about 1 pound per foot. So in my example, I have about 350 pounds of weight trying to hold our 200,000 pound boat. The anchor will never hold that. But if the anchor can dig into the floor, the holding power becomes immense and will easily hold enormous weight with less weight in the anchor itself.

So we're drifting back those last 25 feel slowly. The amount of distance I give to the end is based on experience too. If there was more current pushing us back, I might start this process at 50 feet. Wind has an effect too. The important thing to know is how many feet we are from the anchor so I can work on letting the anchor dig in.

My goal is that when the display is showing 170 or so, the chain will start to go taught. That will slow the boat more too. I like to see it drift back a little more and come to a stop or even move a little forward because the chain is now lifted off the floor with the anchor partially dug in - the weight of the chain will pull us back. What I look for is the number to go from 175 to 170 to 165. Then I'll tell my wife to put both engines in reverse again. This time I'll let the distance go closer to 175, still drifting back a little to slowly "convince" the anchor to dig in.

After 2-3 cycles like this, it'll feel like the anchor is dug in. There's no way to know but there is a feel based on the bottom material (mud, sand, clay) and the way the chain lifts off the bottom. I'll work with my wife to put the engines in reverse and hold it there watching the distance number very closely. We'll hold like that in reverse for 30 seconds. I'll often then have her increase the throttle in reverse to 800 RPM (idle is 740), and then 1,000 or 1,200. Each change, again, watching the distance to see it moves.

Even at this stage, the distance might change. There is strong pull against the anchor and it might dig in deeper and move back 1-5 feet. If it moves more than about 5 feet, I decide to stop, move forward (under commands over the headsets), and bring in the anchor completely and re-anchor to start the whole process over again. In our early years of anchoring, we probably re-anchored 20-30% of the time. After 20 years, it rarely happens now - it has been over 2 years since we've had to re-anchor. It can happen for many reasons but experience helps in getting the feel of knowing when the anchor has dug in. Experience is everything as long as you have good numeric feedback.

Once the display shows that the distance is not increasing, I'll tell my wife to slowly take the boat out of gear. The boat will move a little forward. I'll close up the windlass controls, and go inside to finish setting up the anchor alarm (**Step 4**).

Hopefully this gave explanation to the type of display needed. It would easily fit into a more complex Use GPS Position form that is displayed now to assist in setting the anchor position.

Other improvements to the anchor alarm and distance display

Every calculation about anchor distance and swing must be calculated by the distance between the chain attach point on the bow and the anchor position. But if the boat's GPS is used, the exact anchor position will be wrong because the captured position will be the location of the GPS at the time of selection, not the bow position.

The error caused by this for the real anchor distance is 2 times the distance from the bow to the GPS in the worst case (swung 180 degrees around). This distance can be significant. My GPS is 45 feet back from my bow. So the existing alarm could show that I've dragged 90 feet and yet the boat will still be in the anchor swing area that I selected without us dragging one inch.

It can all be made much more accurate by using a fixed distance from the bow to GPS (and angle off center), along with the boat's heading. With the boat stopped and the anchor dropped, the GPS

distance and heading will create a very accurate anchor position. The GPS position, distance to bow, and heading should then also be used for all distance calculations.

If External GPS mode isn't used in the app, then you can't do much about the error removal unless the user continuously enters the distance they are from the bow of the boat. For example, if the iPhone GPS is used, just walking back to the back of the boat will make it look like the boat is moving backwards. But if the user was able to enter that they were 30 feet back, and heading was known, the error could be removed. I don't think it's important enough to add this moving distance because you really want to give your customers one more reason to install External GPS capabilities for your app. The more that's done, the more you can replace their chartplotter.

One last point for my own use. Currently, I use my iPhone running the app without using the External GPS when setting the anchor. With that, when I lean over the bow, I'm getting a very accurate position of the anchor. Then when setting the anchor alarm, I switch all apps to use External GPS mode because it's a better signal and is fixed on the boat. But because I used the iPhone GPS to get the real position of the anchor, the GPS error will only be 45 feet for me - it's 1 times the distance from the bow to the GPS. That seems to work for me and I've learned to ignore the 45 foot errors. It would be very nice if there was no error though.