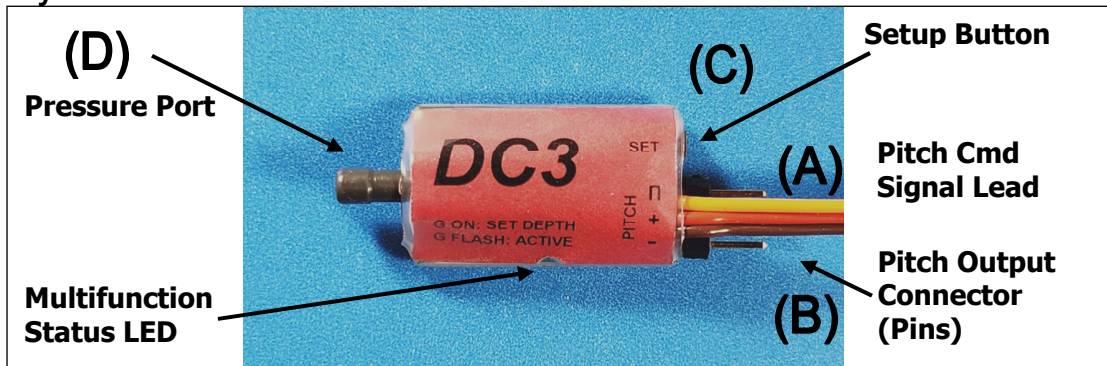


Depth Cruiser 3

General layout



Quick Setup Guide

1. Install and setup your receiver and bowplane pitch servo. (Setup your end-points and reverse as required.)
2. Plug the **Pitch Command Signal Lead (A)** into the bowplane pitch channel of your receiver.
3. Plug the bowplane servo into the **Pitch Output Connector (B)** on the DC3 taking note of the correct polarity.
4. Use the **Setup Button (C)** to set the planes neutral, full rise and full dive servo positions and planes sensitivity settings.
5. Connect the **Pressure Port (D)** to the pressure pickup tube.

Features

- Maintains operating depth of your submarine by direct pressure measurement.
- Plugs-in inline with existing bow-plane control channel, no additional channels required.
- Can be turned off (standby) for surfacing or for use with retractable bowplanes.

Multifunction Status LED

When power is initially switched on the green LED will light as part of a power on self test. A repeating double-blink after this indicates a failed self-test, if this is observed contact KMc Designs at the email address below to arrange repair.

During setup operation the function of the Multifunction Status LED changes to indicate:

2 blinks	Set pitch neutral command
3 blinks	Set pitch full rise command
4 blinks	Set pitch full dive command

During normal operation the function of the Multifunction Status LED changes to indicate:

GREEN (solid)	DC3 Active - Depth update mode
GREEN (rapid flash)	DC3 Active - Depth maintaining mode

Theory of Operation

The DC3 uses a very simple control algorithm to help keep your boat at a constant depth. Even when activated it is designed to not interfere with your ability to adjust your operating depth, but it *must* be controlled from a “spring return to center” stick on your transmitter. After activating the DC3 use the bow-planes drive your boat to a desired depth and once there let go of the control stick. While the DC3 sees a rise- or dive command on the bow-plane channel it passes that command along to the connected servo but also updates the stored “reference depth” that it should try to achieve. When the DC3 sees a neutral command on the bow-plane channel it will compare the current depth to the reference depth and drive the bow-plane servo as needed to return to (or remain at) the reference depth. To the operator this means the DC3 does not get in your way when you want to change depth, and will simply hold the depth you left off at when you last released the control stick.

Installation

The DC3 can be mounted in any location that’s convenient, front or aft in your watertight compartment. (The point at which the depth/pressure is sensed will be within the pressure pick-up tube, not the location of the pressure sensor.) The DC3 is not affected by local pressure changes in the WTC so it does not need to be located in a separate compartment if you’re using an RCABS- or SAS-type ballast system. It is recommended that you choose a location that will allow easy access to the setup button should any tweaking be required and has a view of the LEDs as these can be helpful for diagnostic purposes. The pressure port on the DC3 should be connected to your pressure pick-up with a soft silicone tube.

Pressure Pick-up Tube Fabrication and Installation

The DC3 must be connected to an external pressure pick-up tube to correctly sense the depth of your submarine. Although the diameter of this pick-up tube is not critical its shape and location are – the pick-up tube must end with a vertical section of tube that's at least 2 inches long and be open at the bottom. (The 2" vertical rise is necessary to ensure a bubble of air is trapped in the tube.) The top end of the pressure pick-up tube will be plumbed back to the DC, the bottom end will be open to the surrounding water. You will also have to make a pressure port through a bulkhead as part of the connection from the pressure pick-up to the DC3. It is recommended that you construct the pick-up tube and bulkhead pass-through from 3/32" or 1/8" OD brass or aluminum tube. All other plumbing may be made with any convenient combination of rigid and flexible tubing. The vertical run of the pick-up tube should be installed as close to the bow of your submarine as you can practically achieve, although any location forward of the center of gravity will provide acceptable results. (You may also create the vertical run by wrapping the tube around the outside of your WTC from top center to bottom center.)

Setup

Setup mode is required to teach the DC3 the useable servo range, as well as what direction to drive the pitch servo when commanding dive or rise. You must configure your transmitter with the appropriate end points and control direction before you begin the setup procedure. The DC3 also must be controlled on a channel that's driven by a spring-return to center stick, not a dial or slider. (While successful operation from a slider may be possible it is not recommended.)

To enter setup mode begin with the system OFF. Turn on your transmitter, press and hold the setup button on the Depth Cruiser, then turn on your receiver. The status LED will flash to indicate the power on self test result and will then show a solid green to indicate that you've entered Setup mode. (You may now release the Setup button.)

1. The status LED will now flash with a 2-blink pattern. Ensure your pitch stick is in the neutral position. Press and hold the setup button to save the neutral command input and servo position until the green LED is lit (nolonger flashing) then release the button.
2. The status LED will now flash a 3-blink pattern. Command full-rise on the bow-planes from your transmitter. While holding full-rise press and hold the setup button until the green LED is lit (nolonger flashing) then release the button.
3. The status LED will now flash a 4- blink pattern. Command full-dive on the bow-planes from your transmitter. While holding full-dive press and hold the setup button until the green LED is lit (nolonger flashing) then release the button. This completes the DC3 setup, the DC3 will now automatically return to normal operation.

Setting the Sensitivity

During normal operation mode, press and hold the set button for at least 1 seconds, then release. When the button is released the sensitivity setting will change to the next setting and the LED will flash the new value. There are three sensitivity settings: 3 being the most sensitive and 1 being the least sensitive. The default speed setting is 2 (mid).

Operation

After completing the power-on test the DC3 will begin operation in a standby condition. When in the standby condition the DC3 will read and pass the command signal directly to the bow-planes without any modification. To bring DC3 out of the standby condition to an active condition quickly jab the bowplane control stick from neutral to full dive, then release. When DC3 is active it can be returned to standby again by jabbing from neutral to full-rise. (Commands to change between standby and active *must* begin from a neutral command setting. If the control stick is off-neutral before going to full-dive or full-rise the transition will be ignored.) When active the DC3 will operate in depth maintenance mode (LED quickly flashing) when the control stick is in the neutral position, and when the stick is outside the neutral position the DC3 will operate in depth-update mode (LED on solid). While in depth-update mode the bowplane position will be as commanded by the control stick, and the DC3 will continuously update desired depth based on the current pressure reading. In depth maintenance mode the DC3 will continuously compare the current depth to the desired depth and drive the bow-planes in the appropriate direction to get there.

Additional Notes

- The DC3's ability to hold depth is affected by many things including operating speed: The bow-planes are more effective at controlling your depth while at higher speed and less effective at slow speeds. A well-adjusted DC3 will have a range of speeds where it performs well at holding depth. Speeds higher than this range will cause oscillation up and down as the DC3 "chases" the desired depth. Below this range the bowplanes will not have enough authority to make the boat rise or dive as needed.
- The importance of a (statically) well trimmed boat cannot be understated. With ballast tanks flooded you should be very close to neutral buoyancy. It is recommended to check this every outing and adjust with small weights as needed.
- To maintain good depth control your boat must also be able to hold itself with a near zero-bubble attitude in submerged trim when running fast and slow. If the boat naturally adopts a bow-up or bow down attitude the DC3 will be constantly fighting this "dynamic" tendency and its ability to maintain a constant depth will be greatly reduced. (Adjustment of the stern plane position may be used to counter this.)

Questions?

- If you have questions or concerns about your DC3 please contact Kevin McLeod by email at KevinMc.Electronics@gmail.com