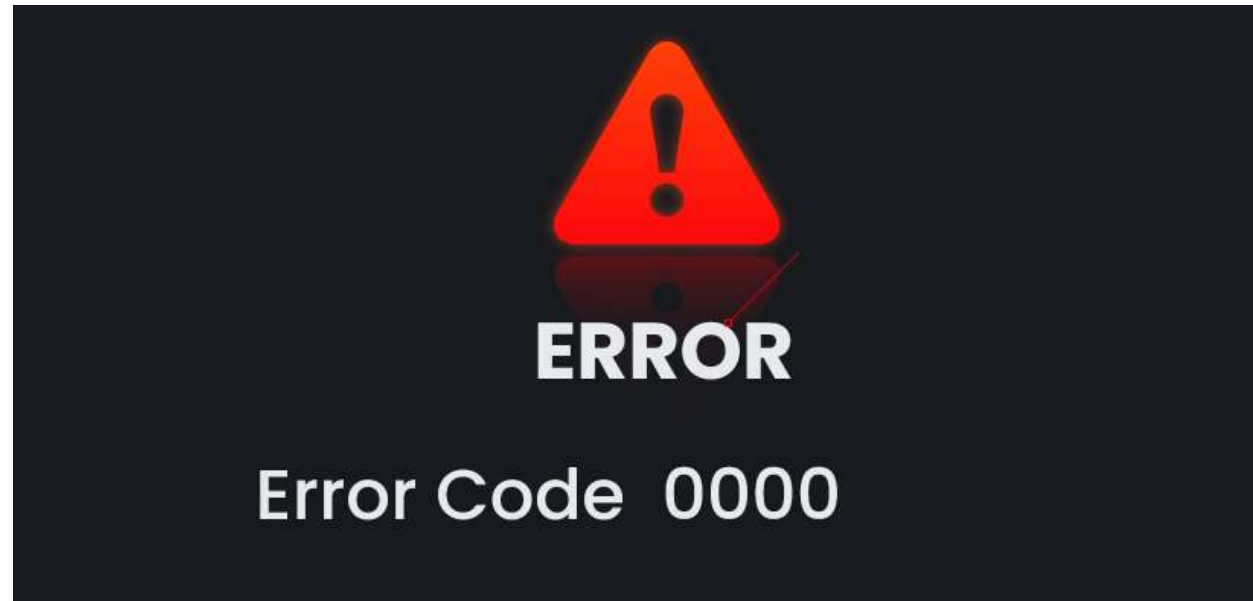


# Diagnostic Manual

- Error List
- Software update
- Keys
- LCD
- Battery
- ECU
- Connectors
- Motor and propeller
- Replacing parts
- Use
- Maintenance

# Error list

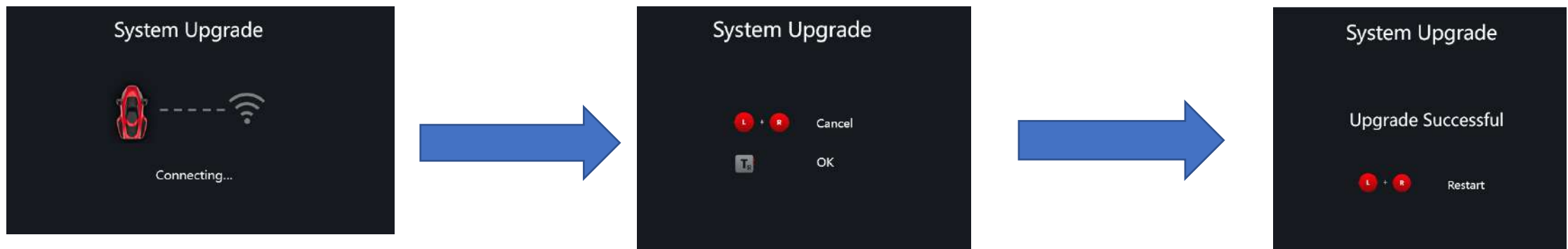
- If machine is functional, various errors may come up during operation
- Each error code indicates a specific fault, most will resolve by themselves
- Below full list of errors and required actions in the event of each



Error	Code	UI	Action
BMS 485 Communication error	1	Error Code 001	Hard reset the unit and attempt to use again, if error persists there is likely BMS damage. Remove the battery pack and replace
Charging Battery Over Heat Error	2	Error Code 002	Unplug the charger, leave the unit in a well-ventilated environment for 1h to allow the battery to cool. Plug in the charger again to resume charging. If error is frequent, likely the cells are damaged and battery may require replacement
Discharging Battery Over Heat Error	3	Error Code 003	Perform hard reset, when the machine turns on run at a slower speed to allow the battery to fully cool. If error is frequent, likely the cells are damaged and battery needs to be replaced
Discharging Over Current (50A-3S, 100A-50mS)	4	Error Code 004	Perform hard reset, inspect the propeller in case something is caught on it or something is obstructing the revolution. Resume operation at a slower speed
Charging Voltage >51V	5	Error Code 005	Unplug the charger and try a different power outlet for the charging. If error persists, replace the charger
Discharging Voltage <30V	6	Error Code 006	Hard reset the unit and attempt to use again, if error persists there is likely cell damage. Remove the battery pack and replace
ECU with MCU Communicaiton Error	7	Error Code 007	Reset the unit and resume operation. If error persists, replace ECU
MCU Current Error	8	Error Code 008	Inspect the duct and propeller to check for any obstruction or debris. Check if the unit is running in normal position or wrong orientation (eg vertical). If error persists likely the cells are damaged and battery needs replacement
Motor RPM Error	9	Error Code 009	Perform a hard reset, check if there are any obstructions on the propeller or duct. If error persists, perform a software upgrade
MCU Over Heat Error > 90°	10	Error Code 010	Perform hard reset, when the machine turns on run at a slower speed to allow the battery to fully cool. If error is frequent, ECU may require replacement

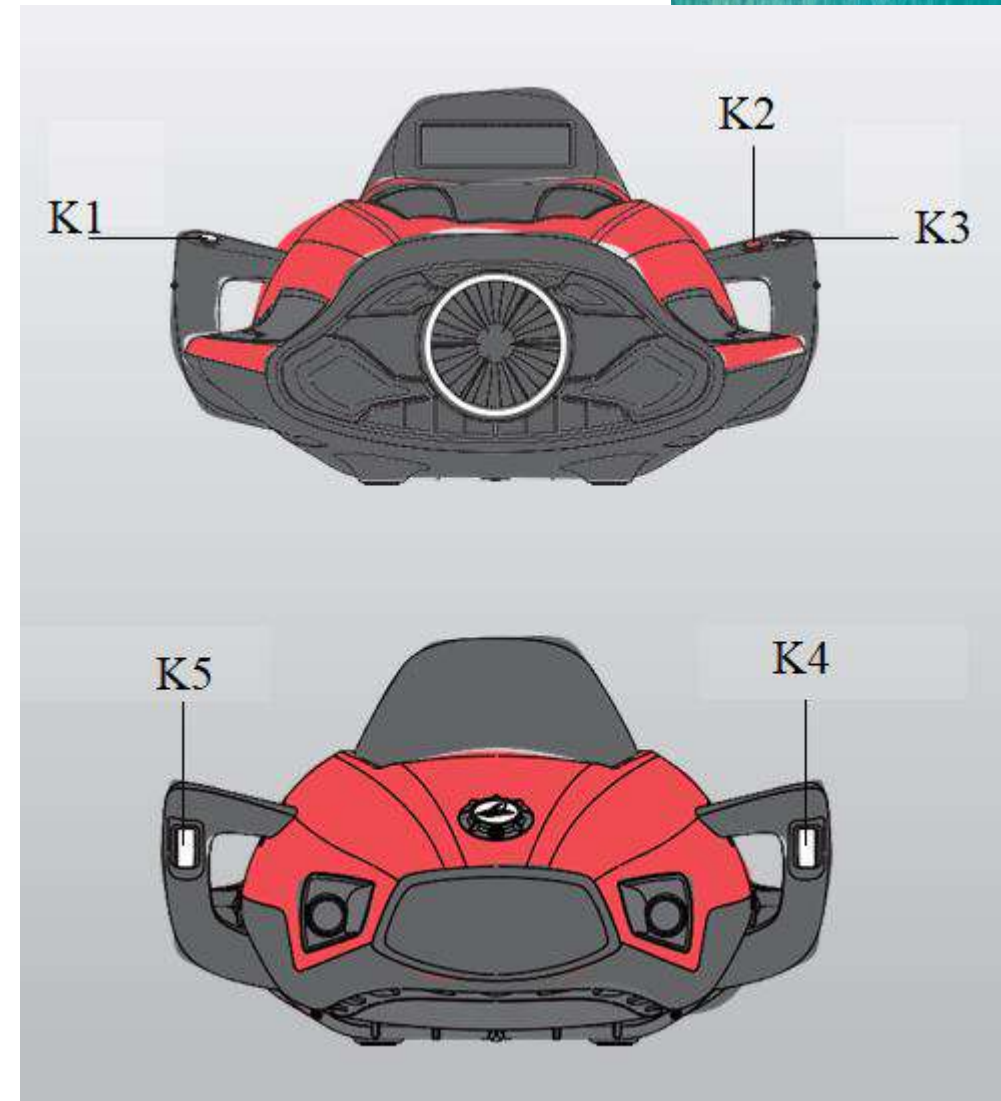
# Software update

1. Connect to Machine via SubblueGO and establish a Wifi connection
2. With the machine switched off, press K2+K3+K5 keys (please refer to the manual)
  1. A prompt will open for software download (if successfully connected to Wifi)
  2. Press K5 to accept the download
  3. Wait 3-5min for the upgrade to install after which the machine can be started as normal



# Keys

- If the machine is not functional, one reason could be the keys
- There are a total of 5 keys: K1-K2-K3-K4-K5 (please refer to User Manual)
  - K1+K3 is required to turn on the unit
  - K2 turns the LED lights on and off
  - K4+K5 run the motor and are necessary for navigation through menu
- Turn on the machine and navigate a full cycle through Menu + toggle the lights on and off
- If screen is responsive and only specific keys aren't, likely the handle containing those keys needs to be swapped (button or sensor defect)
- If the unit is unresponsive and cannot be switched on
  - Plug in the charger to force start the unit
  - If the unit turns on when the charger is plugged in, go to Menu and determine whether K1 or K3 is unresponsive
  - Swap the handle containing K1 or K3



# LCD

- If the screen remains dark whether or not a charger is plugged in, this could be the LCD's fault
- LCD is attached to ECU by a single connector and runs a separate Android-based operating system
- To diagnose screen problems, while the screen is dark, hold K1+K3 for 3 seconds to see if a beeping noise comes on
  - If the noise is heard, all of Handle+ECU+battery+motor are working fine, only the screen must be defective
  - Screen would need to be replaced by disassembling the machine
  - If no beeping noise is heard and the unit is also unresponsive after the charger is plugged in, the defect is likely in ECU or battery
- If the SubblueGO app fails to connect to unit, this is an Android defect, attempt a software update
  - If update also fails, screen has to be replaced
- If screen freezes during operation, perform a hard reset to get rid of the problem
  - If screen freezes frequently, perform a software upgrade
  - If software upgrade doesn't get rid of the issue, the screen may have to be exchanged

# Battery

- If the unit is unresponsive to charging and to any of the keys, there's a high chance the battery is defective or in sleep mode
- Remove the battery
- Check the voltage between pin 1 and 2 (thick pins)
  - If voltage is less than 38V, the battery is totally drained and needs to be charged. Connect the battery to ECU and plug in the fast charger. Check the voltage again after 1h, the unit should have woken up by then. If the voltage does not recover after 1h of fast charging the cells are likely damaged. Dispose off the pack per local directives and replace it
  - If voltage is more than 38V, the battery seems functional and likely isn't the problem
- If battery constantly triggering high temperature or high current errors, the cells are likely defective and pack needs to be replaced. Dispose off the pack per the local directives
- If there are traces of water visible ingressing into the pack, open the screws along the top cap and lift up the cap. **EXERCISE EXTREME CAUTION** when touching anywhere near the +/- terminals. If water marks are found inside the pack, dispose off the pack as soon as possible per the local guidelines
- **Always report any battery related defect to Altivs (Subblue) as soon as they are found**



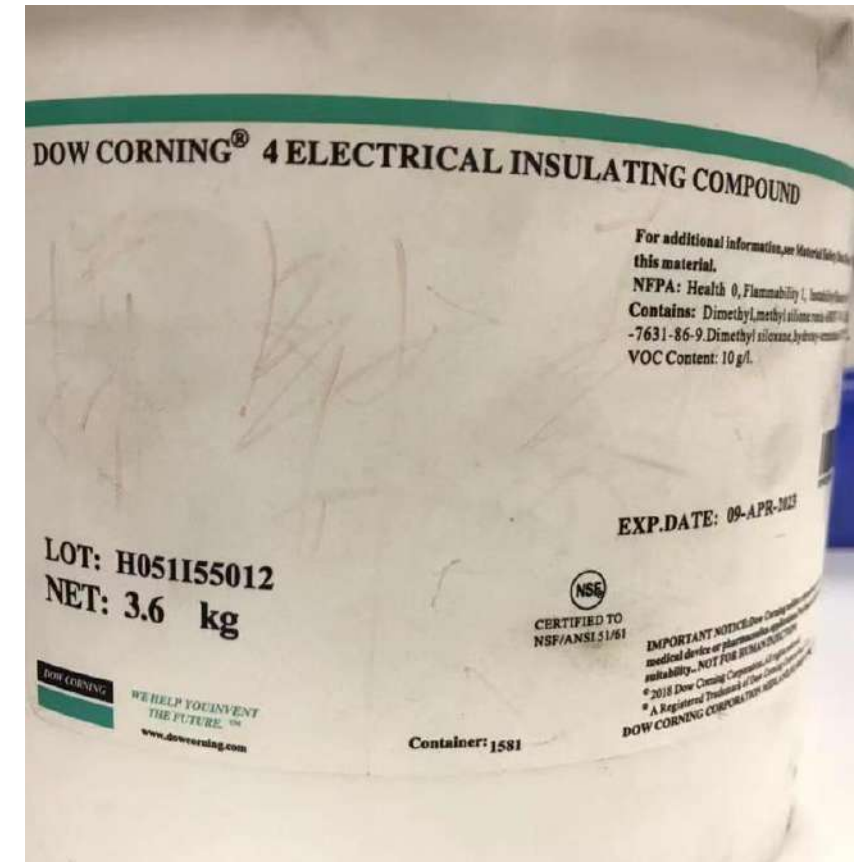
# ECU

- The ECU box houses both the mainboard and the motor controller
- If the unit is not functioning well, it could be a software glitch, attempt the software upgrade before disassembling the unit
- If the unit is unresponsive and all above tests failed to revive it while the battery is showing about 38V, it is likely the ECU needs to be exchanged
- MCU (motor controller) problems shown to UI frequently may be a sign that ECU needs to be exchanged
- When examining the ECU, please check all of the connectors leading up to it (2x handle, LED, LCD, motor and battery) to check for any signs of water ingress (please check “Connectors” section)
- **Do not disassemble the ECU cap unless explicitly instructed to do so by Altivs (Sublue)**



# Connectors

- There are 6 connectors leading to ECU (4 front+2 rear). Front connectors have 1 oring each inside; rear connectors have 2 orings each inside
  - 4x (14mm inner diameter x 1.5mm thickness)
  - 4x (22mm inner diameter x 2.5mm thickness)
- Each time a connector is opened, it's better to swap the oring
- **At least once a year every oring must be exchanged**
- All connectors are filled with dielectric grease. We recommend using Dow Corning (Molykote) Electrical Insulating Compound 4
  - Each time a connector is opened, it's better to top up the connector grease inside
  - **At least once a year all grease in each connector must be topped up**
- If there are signs of water inside any connector
  - Dry up the connector well, inspect for signs of mechanical damage
  - If no signs of mechanical damage found, top up the grease, replace the oring(s) and close the connector



# Connectors

- Large and small connectors are shown below



# Motor and propeller

- If machine is not washed in fresh water frequently, salt deposits may build up inside the bearing leading to noises and eventually a water ingress in the motor
  - **It is recommended to exchange the bearing and shaft seals on the motor once a year**
- If the motor fails there will not be any beeping sound when you boot the machine. Once there's water in the motor, it has to be replaced
- Proper use and regularly washing the internals in fresh water will prevent any chance of damage to the motor shaft
- If a clashing noise is heard during operation, please check that intake is unobstructed and nothing is stuck on the propeller
- In case of mechanical damage, the duct could be offset, resulting in a clash with the propeller
  - Examine the duct to determine the clashing area
  - Most commonly the clash occurs at the top of the duct, in which case adding an M4 washer will increase the clearance for the duct

# Replacing parts

- ALTIVS relies on a plug and play design, which makes replacing any defective part very simple
- The parts are held together by M4 screws, which may be opened in any field conditions. Only sizes except M4 are the M8 screw in the propeller hub and M3 in the battery and motor connectors
- The connectors on the front of the ECU have designations for each matching part written down (left/right handle, LED, LCD)
- The connectors can be opened by hand
- **Once a new part is installed, remember to top up the dielectric grease in the connector and swap the oring on ECU side**
- **During replacement DO NOT remove or disassemble the pressure valve in the LCD, ECU or battery**



# Use

- Please refer to manual for this section
- Please rinse the machine in fresh water after use in salt water as follows
  - Fill up the EPP box with water until roughly a quarter full
  - Push the ALTIVS APX down until bubbles come out through gaps in the top bezel
  - Lift the machine up to allow the water to drain
  - Continue for 2-3 presses after each use
- Please transport the machine at only 30% charge and store the machine at 60% charge to avoid a chance of battery damage

# Yearly maintenance

- Once a year it is recommended to review each unit to perform the following
  - Upgrade the ECU firmware and Android APK to latest version
  - Swap all orings and top up grease across all connectors
  - Swap the bearing and shaft seals in the motor
  - Check other sub-assemblies for any sign of damage
- Performing these operations will extend the machine life span to perform as new for the upcoming season