KDEDirect

For the latest instruction manual revisions, software updates, liability policy, and warranty information, visit the KDE Direct website at: http://www.KDEDirect.com.

All technical inquiries, contact support@kdedirect.com.

IMPORTANT: To reduce the risk of fire, bodily injury, and damage to the product, read through Instruction Manual before operating the Device Manager and always follow all instructions.
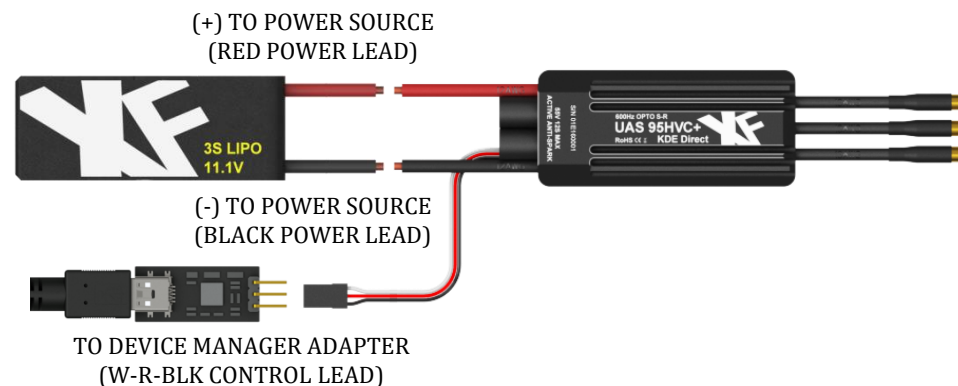
⚠ KEEP OUT OF THE REACH OF CHILDREN.

⚠ Disconnect brushless motor from ESC (electronic speed controller) motor leads before programming ESC. An electric motor that is connected to the ESC can start unexpectedly and cause serious injuries or damage.

⚠ If the ESC does not include the dedicated Programming Lead (see diagrams under Device Installation and Wiring), a 9V to 12V power source (2S to 3S LiPo preferred) is required for powering the ESC during programming. A maximum power source of 25V (6S LiPo) can be used for the update procedure. Do not exceed this maximum voltage or immediate damage to the electronics can occur.

⠀⠀⚠ If power is required, ensure the polarity is correct with the power supply to the ESC power source leads. Reverse polarity may cause fire and/or serious injury, and will immediately damage the ESC and Device Adapter beyond warranty coverage.

⚠ KDE Direct is not responsible for the use of this Product(s) or for any damages or injuries caused or sustained by its usage. Always observe all laws and instructions regarding the use of this Product(s), and the operation of devices using this Product(s).

⚠ Do not disassemble or open the Device Manager Adapter. Opening of the case or removal of shrink-wrap may cause damage to the internal components, void all warranty claims, and yield unsafe operation.

⚠ Ensure all connectors are protected from conductive areas to prevent unwanted shorts and damage.

⚠ This product may contain chemicals known in the State of California to cause cancer and/or birth defects or other reproductive harm. Do not ingest or attempt to ingest this product.

The KDE Direct Device Manager provides the ability to update and program the KDE Direct UAS Brushless ESC Series to the latest production firmware releases, and customize advanced options for multiple applications. Advanced technologies, such as Synchronous Rectification and Regenerative Braking, can be enabled for enhanced performance and optimized control algorithms.

DEVICE INSTALLATION AND WIRING

TO DEVICE MANAGER ADAPTER
(O-R-BRN PROGRAMMING LEAD)

TO FLIGHT CONTROLLER
(W-R-BLK CONTROL LEAD)
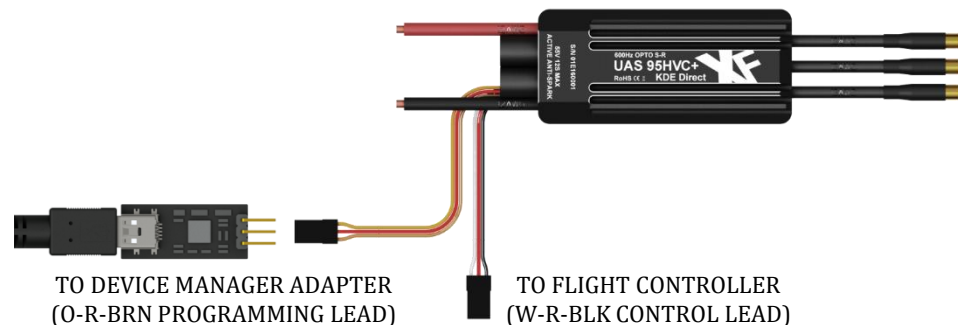
Pay close attention to proper wiring as shown in the diagram(s). ESC is automatically powered via the USB Device Manager Adapter when using the Programming Lead (orange-red-brown cable). External power is NOT required to properly arm and program the microprocessor in most cases.

(+) TO POWER SOURCE
(RED POWER LEAD)

(-) TO POWER SOURCE
(BLACK POWER LEAD)

TO DEVICE MANAGER ADAPTER
(W-R-BLK CONTROL LEAD)

If the ESC does not include the dedicated Programming Lead or does not connect, a 9V to 12V power source (2S or 3S LiPo preferred, 25V maximum) is required for powering the ESC during programming. Once external power is properly applied to the ESC, the microprocessor is programmed via connection of the Device Manager Adapter to the Control Lead (white-red-black cable).

DEVICE MANAGER SOFTWARE INSTALLATION

1. Download and install the Device Manager software from the KDE Direct Device Manager Adapter (DMA) webpage at:
    www.kdedirect.com/products/kdexf-dma

2. Complete installation of the software (and all prerequisites), and run the KDEDevice application from the Windows start menu or desktop shortcut.

3. Connect the Device Manager Adapter to an available USB port.
    - Adapter will be recognized via an activated "red" LED signal.
    - Adapter will change to a "green" LED signal upon recognition by the KDEDevice application and proper installation.

4. Connect the ESC to the Device Manager Adapter, ensuring proper orientation of the 3-wire plug (see diagrams in Device Installation and Wiring).
    - Adapter will NOT be damaged with incorrect orientation. Software will simply not recognize device until proper installation.
    - Detection of the ESC via the Device Manager software may take up to five (5) seconds to properly boot the internal microprocessor and download current settings.

ESC PROGRAMMING AND FIRMWARE UPDATE

1. Download the latest production firmware file (make sure to choose the appropriate version for your ESC model) from the KDE Direct website at:
    www.kdedirect.com/products/kdexf-dma

2. Update the ESC to the latest production firmware release by pressing the "UPDATE FIRMWARE" button in the Device Manager software and selecting the downloaded firmware file (.kde).
    - ⚠ Do not disrupt power or connection to the ESC or Adapter during the update process, or corruption of the firmware and permanent-failure of the ESC can occur (*[6]ESC can be restored in most cases via the "REPAIR MODE" feature*).

3. When update is completed, the default settings will be automatically applied to the ESC and confirmed (allow up to five (5) seconds for this to complete).
    - Optimized settings will be applied to the ESC, and no additional changes are required for correct operation with the KDE Direct UAS Multi-Rotor Brushless Motor Series for UAS and multi-rotor applications.
    - Default Settings can be reloaded by pressing the "DEFAULT SETTINGS" button, followed by pressing the "SEND SETTINGS" button in the Device Manager software (allow five (5) seconds to pass before unplugging).

4. Disconnect power from the ESC (if required), then disconnect the Adapter from the ESC Programming Lead or Control Lead to complete the update.

ESC PROGRAMMING AND ADVANCED SETTINGS

NOTE: The KDE Direct Device Manager allows for modification of control algorithms and tuned ESC operation – in rare instances will the Advanced Settings need to be changed for proper UAS and multi-rotor flight application.

STARTUP POWER	
DYNAMIC	Dynamically adjusts to the startup-requirements of the motor, optimal for most setups and KDE Direct brushless motors.
HIGH (HARD)	Increases the startup-power for high-cogging torque motors or high-stall loading setups.

DRIVE FREQUENCY	
PRECISION (30 kHz – 32 kHz)	Fastest PWM drive frequency to the motor, providing the smoothest/quietest operation (increases ESC temperature).
DYNAMIC (16 kHz – 18 kHz)	Dynamically adjusts the PWM drive frequency to the motor, providing the best overall balance of performance.
BALANCED (8 kHz – 10 kHz)	Lowers the PWM drive frequency to the motor, reducing ESC temperatures (increases motor commutation noise).

SYNCHRONOUS RECTIFICATION (ACTIVE-FREEWHEELING)	
ENABLED	Enables synchronous rectification (also termed active-freewheeling) for improved efficiency and regenerative braking algorithms ideal for UAS and multi-rotor operation.
DISABLED	Disables synchronous rectification for improved light-loading operation (such as motor bench-testing) and minimal-brake activation ideal for specific single-rotor applications.

S.R. BRAKING ACTIVATION (REGENERATIVE-BRAKING)	
PRECISION	Enables synchronous rectification immediately, ideal for FPV racing and light multi-rotor applications. Provides immediate response at spool-up and flight take-off.
DYNAMIC	Enables synchronous rectification upon reaching optimal ESC temperatures, allowing for smooth operation during initial motor spool-up and flight take-off.
BALANCED	Enables synchronous rectification upon reaching higher ESC temperatures, allowing for smooth operation during initial motor spool-up and further into initial flight.

THROTTLE CALIBRATION MODE

DYNAMIC	Factory-calibrated, automatic throttle calibration to the flight controller for simple, drop-in installation (ideal for most UAS and multi-rotor applications, such as the DJI™ A2/A3 series).
MANUAL	[1]Enables manual (fixed) throttle calibration. After selection, throttle calibration will proceed upon next power-up: - Turn on the transmitter and move throttle stick to maximum upper position (100% throttle). Apply power to ESC. - Motor will emit dual tones, memorizing upper position. - Quickly move throttle stick to low position (0% throttle). - Motor will emit tones, memorizing lower position and arming. - Calibration is now complete and ready for operation.
RANGE	[1]Allows direct input of the throttle calibration, via the MIN(LOW) and MAX(HIGH) range. When selected, values can be typed into the THROTTLE CALIBRATION RANGE textboxes: - Allowable value for MIN(LOW): 800 to 1250 [μs]. - Allowable value for MAX(HIGH): 1750 to 2200 [μs].

VOLTAGE CUTOFF

ON	[2]Enables voltage-cutoff for specific applications, resulting in a 50% RPM limit reduction when reaching the target cell voltage (selectable with pull-down menu, i.e. 3.2V/CELL).
OFF	Disables voltage-cutoff, **highly-recommended** and default setting for UAS and multi-rotor flight applications to prevent power stall and potential loss of flight control.

ADVANCE TIMING

DYNAMIC	Dynamically adjusts advance timing (15° to 22°) to the brushless motor, providing higher efficiency and balance of power.
PRECISION	Dynamically adjusts advance timing (22° to 30°) for maximum thrust output and acceleration response (at a slight loss of efficiency), best for high-pole count motors and heavy-lift.

MOTOR DIRECTION

FORWARD	Default motor direction, determined by the motor windings and motor lead connection order.
REVERSE	Alternate motor direction (opposite of Forward setting), reversing the rotational direction for ease of installation.

ARMING TONES

STANDARD	Initialization of the ESC will emit voltage count tones (number of LiPo battery cells), followed by final arming tones. - Safety warning tones will emit until arming signal is received.
ARM ONLY	Initialization of the ESC will emit final arming tones only. - Safety warning tones will emit until arming signal is received.
INITIALIZE	[3]Initialization of the ESC will emit final arming tones only. - Safety warning tones will not emit before arming signal.

PROPELLER HOLD

ENABLED	[4]Enables an active-brake to the propeller when minimum throttle position (0%) is received, providing a rapid propeller-stop and hold to position (ideal for emergency parachute recovery).
DISABLED	Disables an active-brake to the propeller, allowing free-spool of the propeller when minimum throttle position (0%) is received.

MOTOR EDITION

DEFAULT	Enables motor-drive control-algorithm optimizations for simple compatibility to the widest range of motors – ideal for the KDE5215XF and smaller series brushless motors.
KDE6213XF-185 ↓ ↑ KDE8218XF-120	Enables motor-drive control algorithm optimizations for specific KDE Direct motor editions, ideal for the industrial heavy-lift brushless motor series (KDE6213XF and larger).

ACCELERATION RATE

MEDIUM	Optimizes the maximum acceleration/deceleration control profiles for smooth reaction-rates and safety in industrial-heavy lift applications (dynamic reduction up to 20%).
MEDIUM-HIGH	Optimizes the maximum acceleration/deceleration control profiles for balanced operation in commercial aerial-cinematography applications (dynamic reduction up to 15%).
HIGH	Optimizes the maximum acceleration/deceleration control profiles for increased stability in adverse weather conditions and long-endurance flights (dynamic reduction up to 10%).
ULTRA-HIGH	Maximizes the acceleration/deceleration control profiles for high-speed applications, where fast-reaction rates and tight-control to the flight-controller commands is required.

OVERLOAD PROTECTION	
ULTRA-HIGH	ESC will enable overload protection when witnessing a three (3) second continuous-current duration above 175% of the continuous amperage rating (i.e., 170A for the 95A ESC).
STANDARD	ESC will enable overload protection when witnessing a three (3) second continuous-current duration above 150% of the continuous amperage rating (i.e., 145A for the 95A ESC).
DISABLED	Overload protection is disabled. **Use with caution** - overload protection is designed to protect the internal electronics from high continuous-current situations and circuit damage.

DEVICE MANAGER GRAPHING

KDE UVC series ESC's have data logging capabilities built in. To enable these features, you will need to update your ESC to firmware D460114.dfu or later. You will also need to install the new KDE Device Manager V1.32 or later.

After updating the ESC to the latest firmware, during flight: the ESC will begin to log the following attributes:

- Drive Voltage   - Output Throttle
- Drive Current   - RPM
- Temperature   - Power Consumption
- Drive Power   - Flight Number
- Input Throttle   - Log Frequency

READING THE DATA LOG

1. Update the ESC to the latest production firmware (D460114.dfu)

2. Install the new KDE Device Manager V1.32 from the KDE Direct website:
   www.kdedirect.com/products/kde-dms

3. Run a test flight/motor test.

4. Connect the ESC to your computer with the USB cable provided with the ESC.

5. Open the graph window from the menu "File" -> "Export ESC Data Log"

6. Press the READ ESC LOG button located at the bottom of the graph window. The KDE Device Manager will now copy the data log from the ESC and show the data in the graph interface. The progress bar at the bottom of the graph will show how full the data logs is.

BASIC GRAPHING OPPERATIONS

Graph Navigation:

Zoom: Left click on the chart and drag the mouse to the bottom-right A rectangle will appear allowing you to zoom into the area selected.

Pan: The pan is controlled with the right mouse button. To pan the graph, right-click on the chart and move the mouse in the desired direction.

Reset Zoom & Pan: Left click on the chart, similar to zoom, and drag the mouse to the top left. Zoom and pan will reset.

Display:

Click "View" -> "Display Options" to change the visibility of data plots, graph colors, and axis locations.

Data Sessions:

Choose which session you wish to display by clicking "View" -> "Select Data Log Session".

A new logging session is started each time the ESC is powered down or the input throttle drops to 0. When there are multiple sessions, the Flight Number will be displayed in the bottom right hand corner based on the current location of your mouse cursor.

Changing Units:

Changing the units on the graph can be done by clicking "Edit" -> "Change Units"

If an axis is not selected in "View" -> "Display Options" the unit selection will not be available.

The following units can be changed:
- Temperature: Fahrenheit or Celsius
- Time: Seconds or Minutes
- Power: Watts or Horsepower
- Capacity: Amp Hours or Milliamp Hours or Watt Hours

Saving A Screenshot:

Screenshots can be saved by clicking "File" -> "Export Image".

Motor RPM:

In order to calculate motor rpm the magnetic poles of your motor must be entered. To enter magnetic poles select "Edit" -> "RPM Setup".
Note: If the magnetic poles are not entered the rpm shown will be the electrical rpm and not the motor rpm.

Loading From a File:
Once the data log is loaded from the ESC, you can choose to save the data log from "File" -> "Save Data". Notes can be added when saving. You can also load a previously saved data log from "File" -> "Load Data".

Clearing Data From the ESC:
To clear the data log on the ESC press the "CLEAR ESC LOG" button.

Note: After data has been loaded from the ESC, unplug the ESC to increase the speed of the graph. 26 logs can be recorded on the ESC before it needs to be cleared. When the data log runs out of space, it continues logging from the top (it begins overwriting the oldest logged data)

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[1]*Default calibration for Manual and Range mode is 1100μs to 1940μs and changes will be stored to the EEPROM memory. When changing the Throttle Calibration Mode, EEPROM memory will automatically reset to this default range for safety before calibration.*

[2]*Voltage-cutoff should always be "OFF" for UAS and multi-rotor flight applications, or a potential loss of flight stability and control can occur during low-voltage events. Voltage-cutoff is advantageous for single-rotor and fixed-wing applications as desired.*

[3]*Arming tones are provided as three notifications: (1) power application to the ESC via the power-input leads and failsafe-operation state, (2) voltage supplied to the ESC via LiPo cell count, and (3) receipt of flight-controller and/or receiver arming signal for armed and ready-operation state. The arming tones selection of "INITIALIZE" will not provide the failsafe-operation state tones, so special care is needed to ensure safe operation before the appropriate arming signal is received to the ESC for ready-operation state.*

[4]*Propeller Hold rapidly decelerates and stops the propeller when the throttle reaches minimum value (0% position). Make sure this throttle value does not occur during flight in multi-rotor applications, or an immediate loss of flight control can occur. Propeller Hold is designed for emergency parachute recovery systems and/or operation in high-wind conditions (for quick deceleration of the propeller after landing) and activated via minimum throttle-hold position, to prevent propeller blade rotation and parachute cord strike. Also applicable for fixed-wing applications – allowing for propeller blade fold-back and aerodynamic-drag reduction.*
KDE Direct is not responsible for damages or injuries when using this specialized function – make sure to understand the requirements for proper operation before enabling.

[5]*Overload Protection will decrease the maximum current output to the continuous rating of the ESC (i.e., 95A for the 95A ESC) over a five (5) second interval when triggered. The ESC will not allow amperage higher than the rating until the next initialization or power-cycle (reboot).*

[6]*Repair Mode provides the ability to force upload firmware to the ESC, in the case of data corruption from a power-outage or other unusual event. Upon connecting the ESC to the Device Manager Adapter, turn on Repair Mode by selecting the available checkbox and await for the software to reconnect to the ESC. Once the DEVICE STATUS has turned green solid-fill, press the UPDATE FIRMWARE button to upload the correct firmware file. Upon completion, unselect the Repair Mode checkbox and the software will again reconnect and read the parameters for the Advanced Settings from the internal MCU.*

⚠ *Repair Mode allows the install of any firmware file edition – make sure the appropriate version is selected before installation, or incorrect operation of the ESC can occur and potential damage beyond warranty coverage.*

LIMITED WARRANTY

KDE Direct, LLC (KDE Direct) warrants to the original purchaser that the Product(s) will be free from defects in materials and workmanship for a period of one (1) year from the date of purchase. This warranty does not cover abuse, neglect, or damage to the Product(s) from preventable failure methods, such as incorrect wiring, reverse polarity, voltage exceeding the maximum specification, or amperages exceeding the maximum specification (overloading).

The full definition and terms of this limited warranty are available at: https://www.kdedirect.com/pages/warranty-and-returns-policy.

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Always observe all laws and instructions regarding the use of this product, and the operation of devices using this product.

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