Communication Wires

Prop Adapter

Heat Shrink

Instruction Manual

Motor Module

Mounting Screws Prop Adapter Screws

Prop Adapter Nut

Warning: you must initialize your motor module through the IQ GUI before use

Power Wires Capacitor

1 Box Contents

- Motor module
- Power wires
- Communication wires
- Capacitor
- Propeller adapter
- Propeller adapter nut
- Propeller adapter screws
- Mounting screws
- Heat shrink

2 Module Assembly

- Solder power wires to the top part of the PCB
 - Black wire to -
 - Red wire to +
- Solder communication wires to bottom part of the PCB
 - Black wire to -
 - Red wire to PCB's TX/Tel
 - White wire to PCB's RX/PWM
- Solder external capacitor on top of power wires*
 - Cut capacitor leads down to desired size (rec: 8mm)
 - Side with white marking to (over black power wire)
 - Side without marking to + (over red power wire)
- Put heat shrink over the wires and capacitor and apply heat

*optional, but suggested when applying more than 8V (2S battery)



3 Module Settings

- Download the IQ user interface
 - Go to https://github.com/dskart/IQ_gui_windows_release
 - Click "Clone or Download"
 - Select "Download ZIP"
 - Once downloaded, unzip the file and open IQ.exe
- Connect your module (see sections 7, 8, or 9 for specific details)
 - Make sure the module is disconnected from any application and does not have propellers attached
 - Plug FC, arduino, or USB to UART chip into computer
 - Plug/solder communication wires to the above device
 - Plug/solder power wires to a power source (must be between 5V and 25V)
 - In the top right of the interface, click "Check Port" and select the correct com port
 - Click the "Connect" button
- Set module application values
 - At the bottom of the Home tab, you can upload specific settings for your application
 - If your application is in the list, select it and click "Set"
 - * Example: 3D drone using APC 6x3R props, select and set "APC6x3R.json"
 - * Example: Position application mimicking stepper motor, select and set "200_step.json"
 - * These pre-made settings were designed to give users optimal performance in their specific application
 - If your application is not in the list or you prefer to change settings yourself, you'll have to change settings manually
- Navigate to the General, Tuning and Advanced tabs to change specific module settings
 - All users should visit the "General" tab before using their module
 - Change module settings to desired value or mode, if necessary
 - Click the "Save" button next to a changed setting to update it on the module
 - WARNING: exercise extreme caution when changing values in the Advanced tab. A bad setting
 may result in a motor being permanently damaged or cause erratic behavior

4 Drone Setup

- Prior to connecting the modules to your drone, open the IQ GUI to initialize (see section 3)
 - Set appropriate module settings using the pre-made settings at the bottom of the IQ GUI home tab (see section 11) or set your own
 - Set module direction (this includes both CW vs. CCW and 2D vs. 3D mode)
 - If necessary, set motor PID gains in the Tuning tab. In most cases, the default values are satisfactory
- Configure your flight controller to be compatible with IQ modules
 - WARNING: Always keep your FC in 2D mode, even when flying 3D
 - $\ast\,$ If you're flying 2D, keep both motor and FC in 2D
 - $\ast\,$ If you're flying 3D, change your motor settings to 3D but keep the FC in 2D mode
 - * Why? IQ modules translate the 2D message into the correct command in both modes
 - Enable Air Mode
 - * This prevents the motor from shutting off at minimum throttle
 - * WARNING: you may see integrator wind up when the vehicle is on the ground depending on your FC and settings
 - Lower motor idle throttle (optional)
 - $\ast\,$ IQ motors do not require an idle throttle value
 - $\ast\,$ If you set this to 0, the motors will not spin when the FC is armed
- Fasten the modules to your drone's frame with mounting screws
- Solder/plug in the power wires to the power distribution board
- Solder/plug in the communication wires to the flight controller
- Arming Procedure
 - If this is your first time setting up the vehicle, do this without props to test motor settings
 - Arm your FC normally
 - The motors will only arm once throttle is in the appropriate place
 - * 2D mode motors arm at minimum throttle (throttle stick all the way down)
 - * 3D mode motors arm at mid throttle (throttle stick in the middle)
 - The motors will play the arming tune and spin slowly
 - Once you've tested motor settings, disarm your FC
- Add the propellers (see section 5)
- Repeat the arming process and fly!

5 Propeller Setup

- Place the prop adapter over the steel extrusion and align the screw holes
- Screw in the adapter tightly with the 4 M2 screws (we recommend using threadlocker)
- Screw on the propeller
- Screw on the nut tightly

6 Position Application Setup

- Prior to connecting the module to your application, open the IQ GUI to initialize (see section 3)
 - If your application involves a rotation to linear conversion, change the conversion factor to meters per radian in the General tab
 - Set safety features, such as timeout and max angular speed
 - Set initial position, PID gains, etc.
- Connect your module's power wires to a power source (between 5V and 25V)
- Connect your communication wires to your arduino, computer, etc.
- Mount your module to the application
- Using IQ libraries (available at iq-control.com/downloads), send commands to your module*

 ${}^{*}\!Refer \ to \ the \ IQ \ Programming \ Manual \ for \ more \ detailed \ instructions \ on \ the \ commands$

7 Connect to IQ GUI: BetaFlight

Set up FC as Passthrough Device

- Download and open the Betaflight Configurator
- Connect your Flight Controller (FC)
 - Plug your FC into your computer through USB
 - Before you Connect, select your FC's communication port (check device manager)
 - Click "Connect"
- Making a Backup
 - Click on the CLI tab in the menu on the left
 - In the textbox, type:
 - diff

- Click Save to File in the bottom right corner
- Name it something simple like "bf_backup.txt" and press save

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BETAFLIGHT Configurator: 10.4.1 Firmware: BTFL 3.2.0 (Target: BFF4)	0.1V	Syro Accel Mag E	Dataflash: fre	xpert Mode
2018-10-17 @ 17:21:47 CLI mode detected				
🖌 Setup				
Ports Note: Leaving CLI tab or pressing Disconne lost.	ct will automatically send "e	xit " to the board. With the latest f	irmware this will make the controller <mark>rest</mark>	art and unsaved changes will be
Configuration				
Power & Battery P				-
A PID Tuning resource MOTOR 3 C09				
Receiver resource MOTOR 5 806 resource PM 1 808				
Modes resource PMM 1 B08 resource LED_STRIP 1 B06				
Motors Pesource SERIAL_TX 1 A09 Pesource SERIAL_TX 2 A02 Pesource SERIAL_TX 2 A02 Pesource SERIAL_TX 2 B00 Pesource SERIA				
resource SERIAL_IX 3 B10 #III: Blackbox resource SERIAL_IX 6 C06 resource SERIAL RX 1 A10				
CLI resource SERIAL_RX 2 A03 resource SERIAL_RX 3 B11				-
Write your command here				
				Save to File
Port utilization: D: 0% U: 0% Packet error: 0 I2C error: 0 Cycle Time: 12	7 CPU Load: 4%		Firmware: BTFL 3.2.0 (Target: BFF4), Configurator: 10.4.1

- Setting up Software Serial (use above image for example references)
 - To find which FC microcontroller pins are connected to the ESC lines, type this in the console: resource
 - Take note of the motor's PWM/DShot line (Example: MOTOR 1's resource is B00)
 - Take note of the ESC telemetry line (Example: Serial RX 1's resource is A10)

Tip: look in the FC's documentation or on the FC's silkscreen to figure out motor location and which pin is connected to ESC telemetry

- Map motor resource to software serial resource
 - * First, disconnect the the current resources from the pins by typing the following in the console: resource motor 1 none resource Serial_RX 1 none
 - * Now to connect the software serial resources, type: resource Serial_TX 11 B00 resource Serial_RX 11 A10

Tip: the red-colored text above indicates that particular value will change for each motor. So for motor 2, you would type: resource motor 2 none and resource Serial_TX 11 B01. The other two commands remain the same.

- Save your settings by typing:

save

- Your flight controller will restart. If the GUI doesn't disconnect automatically, press "Disconnect"

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	GHT					Datafiesh: Nee 160HB	Disconnect OF
2019-01-03 @ 19:25-08 - Craft name:							Show Log
Jr Setup							
j⊈r Ports	Other Features			3D ESC/Moto	r Features		
Configuration	Note: Not al features are succorte	d by all flight controllers. Hypu enable a			30 mode for use a	ith reversible EDCci	
CD Power & Battery	specific feature, and it is disabled at this feature is not supported on you	ter you hit 'Save and Reboot', it means that, ir board.			our risker per ear a	CONTRACTOR CONTRACTOR	
A PID Tuning				GPS			
de Receiver	INFLIGHT, ACC, CAL	In-flight level calibration		(T) (P	s GPS for navigation	and belemetry	
2 Modes	SERVO_TILT	Seve proa			-	,	
A Motors	SOFTSERIAL	Enable CPU based serial ports	2				
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· Distant	TELEMETRY	Telemetry output					
I DACKDOK	LED, STRIP	Multi-color RSB LED strip support					
80						1	Save and Reboot
Port utilization: D. 23% U. 1% Pack	et error: 0 12C error: 0 Cycle Tim	e: 128 CPU Load: 4%			Firmwa	ne. BTFL 3.2.0 (Target: BFF4	E Configurator: 10.4.1

- Enable Software Serial (use above image for reference)
 - Click the "Connect" button again
 - Click Configuration tab in the menu on the left
 - Scroll down to Other Features and enable SOFTSERIAL
 - Click Save and Reboot in the bottom right corner
 - Your flight controller will restart. If the GUI doesn't disconnect automatically, press "Disconnect"
- Make the FC a Passthrough Device
 - Click the "Connect" button again
 - Select the CLI tab in the menu on the left

Tip: for future use you can save this configuration to easily talk to your motors. Use the **diff** command now by mimicking the steps in the "Making a backup" section so you can make this process easier the next time. Use the steps in "Restore your FC" to setup the softserial. Make sure you use a different filename for your backup file!

- In the textbox, type: serialpassthrough 30 115200
- The console should say something like this: serialpassthrough 30 115200
 Port 30 opened, baud = 115200. Forwarding, power cycle to exit.
- Do not power cycle!
- Click the "Disconnect" button and move to the next section

Change module settings in IQ GUI

• Download and open the IQ GUI (see section 3)

- Ensure the communication wires are connected to the FC in the proper location
- Power the motor (anything between 5V and 25V)
- Select the same com port used to connect to your FC in the top right
- Click the "Connect" button
- Now you can change settings (see sections 3 and 4) and flash new firmware (see section 12)

Tip: the IQ GUI may disconnect or not read a setting from time to time on some older flight controllers because softserial requires a lot of CPU. If this happens, just reconnect the motor and check to make sure you saved all the settings you changed.

Restore your FC

- Remove your FC from serial passthrough mode by unplugging all power, then reconnecting to USB (power cycle)
- Switch back to the BetaFlight GUI and connect the FC
- In the Setup tab, click Reset Settings (don't worry, we will put your custom settings back on the FC in the next step)
- In the popup confirmation window, click Reset (see image below for reference)

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Configuration	Calibrate Acceler		form is not	moving during calibration p	eriod
	Calibrate Magnet WARNING: Are you si	are you want to reset ALL settings to default?	ds to perfor	m this task	
கூ PID Tuning	Reset Settin	_			
💩 Receiver	Backup R Reset Cancel		d - use the c	ommand 'diff all' in CLI for t	his.
🖀 Modes					
🛓 Motors	Heading: 5 deg		Reset Z axis, offset: 0 deg	Info	
	Roll: 8.9 deg			Arming Disable Flags:	3
M 03D				Battery voltage:	0 V
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- Open your backup file in any text editor
- Select all (ctrl-a in Windows) and copy the text (ctrl-c in Windows)

bf_backup.bt - Notepad	_	×
Elle Edit Format View Help		
# adjrange		^
# rxrange		
# vtx		
# rxfail		
# master set motor_pwm_protocol = DSHOT600		
# profile profile 0		ł
# rateprofile rateprofile 0		
		 ~

- Switch back to the BetaFlight GUI
- Click on the CLI tab
- In the textbox, paste the copied settings (ctrl-v in Windows), then press enter
- When all of the commands have been sent, type and enter:

save

• Your flight controller will restart. If the GUI doesn't disconnect automatically, press "Disconnect"

You're done! Get flying!

8 Connect to IQ GUI: Arduino

9 Connect to IQ GUI: USB to UART

10 Change settings using DShot

- Open the BetaFlight Configurator and connect to your FC
- Select the CLI tab in the menu on the left
- The syntax for the dshotprog command is below:

```
dshotprog - program DShot ESC(s)
<index> <command>+
```

• NOTE: index is motor number minus 1, so...

```
Motor 1 is <index> 0
Motor 2 is <index> 1
Motor 3 is <index> 2
Motor 4 is <index> 3
```

- The following command values are supported by the IQ motors:
 - 0 <Disarm>
 1 <Beep 1>
 2 <Beep 2>
 3 <Beep 3>
 4 <Beep 4>
 5 <Beep 5>
 7 <Spin direction CCW>
 8 <Spin direction CW>
 9 <3D mode off>
 10 <3D mode on>
 12 <Save direction and 3D mode>
 ple, if you want to change Motor 3 to
- For example, if you want to change Motor 3 to CW 3D, type the following in the CLI:

dshotprog 2 8 dshotprog 2 10

- After changing the spin direction or the 3D mode, you must save the changes
- Continuing the above example on Motor 3, type:

dshotprog 2 12

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BETAI Configurator: 10 Firmware: BTFL	ELIGHT 14.1 3.2.0 (Target: BFF4			□ ▲ ♥	ov 👌	8 🙏 ro Accel				Dataflash: free 10.4MB	Disconnect	¢°
2019-01-07 @ 19:04:31 CLI m	ode detected											Log
	Note: Leav lost.	ving CLI tab or	pressing Disconnect v	vill automatically	send " exit " to th	e board. Wi	th the latest f	irmware this	will make th	e controller restart and unsa	aved changes will I	be
Configuration												
Power & Battery	\$M>⊡n Entering	i CLI Mode, t	ype 'exit' to re	turn, or 'help'								Î
	# dshotp Using out	rog 2 8 tput 2.										
📩 Receiver	Command	8 written.										
🖀 Modes	Using out Command :	rog 2 10 tput 2. 10 written.										
🛔 Motors												
📲 Blackbox												Ŧ
🖻 CLI	dshotpro	g 2 12										
											Save to Fi	lle
Port utilization: D: 0% U: 0%	Packet error: 0	I2C error: 0	Cycle Time: 126	CPU Load: 4%					Firmwar	e: BTFL 3.2.0 (Target: BFF4), Configurator:	10.4.1

11 Pre-Made Application Settings

- These pre-made settings were designed to give users maximum performance in their specific application
- Settings Description: Speed Module
 - speed_default factory default, unconfigured
 - APC6x4 standard 2D drones using APC6x4 props, velocity (closed-loop) mode
 - APC6x3R reversible 3D drone using APC6x3R props, velocity mode
 - APC5x4R reversible 3D drone using APC5x4R props, velocity mode
 - Dal5045 standard 2D Dal5045 props, velocity mode
 - other_prop use any prop as you would with a standard motor/ESC, PWM (open-loop) mode. You will not get peak performance in this mode, but it is best for those that do not know the properties of their propeller.

Tip: The defaults for specific props allow you to run the motor in velocity (closed-loop) mode for maximum performance. If you're unable to do this, we suggest using PWM mode as you would with a standard motor/ESC

- Settings Description: Position Module
 - $-\,$ position_default factory default, unconfigured
 - 200_step mimics a 200 count stepper motor

12 Flashing New Firmware

Download Firmware

- Go to: iq-control.com/downloads
- Select and download your desired firmware (.bin file)

Put Motor in "Boot Mode" in the IQ User Interface

- Open the IQ GUI (see section 3 for download instructions)
- Disconnect motor from your application and remove props
- Connect your module (see sections 7, 8, or 9 for specific details)
 - Plug FC, Arduino, or USB to UART chip into computer
 - Plug/solder IQ module's communication wires to above device
 - Plug/solder wires to power source (anything between 5V and 25V)
 - In the GUI, locate the correct com port in the upper right corner
 - Click the "Connect" button
- Navigate to the "Firmware" tab
- Click the "Boot Mode" button

• Keep the motor plugged in and go to the ST Demonstrator

ST Demonstrator

- Install the ST Demonstrator: http://www.st.com/en/development-tools/flasher-stm32.html
- Run the Demonstrator. It will open to window 1 (images below)
- Window 1
 - Locate the correct com port (should be the same as in the IQ GUI)
 - Set the Timeout to 1 second (optional)
 - Click "Next." This will open window 2
- Click "Next." This will open window 3
- Click "Next." This will open window 4
- Window 4
 - Click "Download to device"
 - Click "..." and navigate to the folder in which you saved the firmware file
 - Change the file type from the default to .bin and select the binary file
 - Click the "Jump to the user program" and "Verify after download" boxes
 - Ensure "Erase necessary pages" is selected. DO NOT select "Global Erase"
 - Click "Next." This will open window 5
- Window 5
 - Wait for program to load and verify
 - If it verifies correctly, it will display green. You have successfully put new firmware on your motor!
 - If it fails it will display red. Restart the process
 - Contact IQ if you are unable to get the module back into programming mode

Flash Load	er Demonstrator	_		_		×
	57	life.aug	mented			
elect the cor	nmunication port and	d set setting	s, then cli	ck next	to open	
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UART						
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Window 1

🧼 Flash Loa	ader Demonstrator		_		×
	5	life.augn	nented		
Please, sele	ect your device in the	e target list			
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PID (h)	0439				
BID (h)	4.0				
Version	3.1				
Flash mappir	ng				
Name	Start address	End address	Size		^
🔷 Page0	0x 8000000	0x 80007FF	0x800 (2K)		
💊 Page1	0x 8000800	0x 8000FFF	0x800 (2K)		
💊 Page2	0x 8001000	0x 80017FF	0x800 (2K)		
💊 Page3	0x 8001800	0x 8001FFF	0x800 (2K)		
💊 Page4	0x 8002000	0x 80027FF	0x800 (2K)		
🔷 Page5	0x 8002800	0x 8002FFF	0x800 (2K)		
💊 Page6	0x 8003000	0x 80037FF	0x800 (2K)		
💊 Page7	0x 8003800	0x 8003FFF	0x800 (2K)		
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Window 3

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Window 2

🧼 Flash Loader Demonstrator	- 🗆 X
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C Erase	
C Selecti	on
Download to device Download from file	
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 Erase necessary pages No Erase 	ase 🔿 Global Erase
@ (h) 8000000 🔽	Jump to the user program
C Optimize (Remove some FFs)	Verify after download
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DISABLE 👻 WRITE PRO	TECTION 💌
	1
<u>B</u> ack <u>N</u> ext	<u>C</u> ancel <u>Close</u>

Window 4

Flash Load	ier Demonstr	ator	-		~
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Target	STM32F3_02	2_01_64K			
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Window 5