ACCELERATED SYSTEMS INC
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BAC Object Dictionary

Definitions of Parameters, Commands and Variables Used with BAC Series of Motor Controls

Prepared for:

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Document Revision

Document Owner(s)	Project/Organization Role
Name	Application Engineering

Version	Date	Author	Change Description

1.0		Craig M	Document created

Version Support	**Hardware**	**Software**	**BacDoor**
	BAC all	5.xx and above	1.2.0.3 and above

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Overview

This document contains definitions of the parameters, commands and data that comprise the BAC Object Dictionary.

Document Conventions

Parameter Read/Write Access

Parameters that have been deemed as Read only begin with a lower case letter while those that are Read/Write begin with an uppercase letter instead. An example is shown below.

battery time to empty HDQ is read only.

Control command source is read/write

Numbers

All number represented in this document are assumed to base 10 or decimal in nature unless otherwise specified. Base 16 or Hexadecimal numbers in this document are represented as follows:

Hexadecimal values such as 0x7FFF would be represented as 7FFFh.

Parameter Representation in This Document

When a BAC Object Dictionary parameter is referenced in this document, it is presented italicized and in bold type.

Parameter Access Level

The parameters defined in this dictionary are grouped based on the concept of access level. The higher the access level given, the more parameters a user can access. The access parameters correspond to the following levels of access:

Access Level	End User
0	End customer
1	Fully qualified service personnel
2	eBike or eScooter OEM

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Parameter Access Level 0

Control command source

Address	Type	Read	Write	Saved	Scale	Units	Range		Default
							Min	Max	
208	Parameter	Yes	Yes	Yes	1	enum			1

Description

The command input is the electrical signal(s) that is interpreted by the BAC controller that results in motion of the bike/vehicle. The command input can come from one of four sources:

0 = serial stream (ie. commands over network)
1 = throttle
2 = pedal sensor
3 = throttle and pedal sensor

Battery management interface type

Address	Type	Read	Write	Saved	Scale	Units	Range		Default
							Min	Max	
209	Parameter	Yes	Yes	Yes	1	enum			0

Description

The battery management interface type allows the user to select the method of communication between the battery management system and the BAC controller. The options are as follows:

0 = none
1 = voltage model
2 = analogue 10V with 0V equal 0% state of charge and 10V equal to 100% state of charge
3 = HDQ is low speed single wire form of communication. HDQ variables are further defined below.

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Assist mode source

Address	Type	Read	Write	Saved	Scale	Units	Range		Default
							Min	Max	
210	Parameter	Yes	Yes	Yes	1	enum			0

Description

The assist mode source defines what device generates the electrical signal(s) that are interpreted by the BAC controller when used in pedal assist mode. The assist mode can come from one of three sources:

0 = none
1 = analogue (LED assist pod)
2 = reserved
3 = ASI display using ModBus

Pedal sensor type

Address	Type	Read	Write	Saved	Scale	Units	Range		Default
							Min	Max	
211	Parameter	Yes	Yes	Yes	1	enum			0

Description

The pedal sensors supported by the BAC controllers are as follows:

0 = single Hall
1 = dual Hall
2 = FAG sensor
3 = Quadrature torque
4 = Quadrature speed

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Features

Address	Type	Read	Write	Saved	Scale	Units	Range		Default
							Min	Max	
212	Parameter	Yes	Yes	Yes	1	enum			0

Description

The features bit vector allows an eBike/eScooter user to enable the following features:

Bit 0 = Freewheel detection enabled if set to 1
Bit 4 = Analogue braking is enabled if set to 1. The brake 2 input is capable of reading continuous voltages ranging from 0 to 5 Volts.
Bit 5 = Temperature sensing capability is enabled if set to 1. The temperature sensor mapping is based on properly setting Temperature reading at 0 to 125 C parameters defined later in this document.
Bit 6 = Motor shut off on sensorless stall is enabled if set to 1. Normally, when operating a motor in sensorless mode, the controller maintains a small amount of current in the windings in order to improve starting performance. If the bit is set, no current is maintained in the motor when the vehicle is not moving.
Bit 11 = Walk mode enabled if set to 1. This enables the motor to run at a very low speed while the user is walking beside the bike.

Throttle high voltage reading

Address	Type	Read	Write	Saved	Scale	Units	Range		Default
							Min	Max	
213	Parameter	Yes	Yes	Yes	4096	Volts			NA

Description

The throttle reading in Volts when the throttle is open (fully on)

Throttle low voltage reading

Address	Type	Read	Write	Saved	Scale	Units	Range		Default
							Min	Max	
214	Parameter	Yes	Yes	Yes	4096	Volts			NA

Description

The throttle reading in Volts when the throttle is closed (fully off)

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Maximum braking effort voltage reading

Address	Type	Read	Write	Saved	Scale	Units	Range		Default
							Min	Max	
215	Parameter	Yes	Yes	Yes	4096	Volts			NA

Description

This parameter represents the analogue brake voltage reading above which no greater braking effort will be applied to the system.

Brake off voltage reading

Address	Type	Read	Write	Saved	Scale	Units	Range		Default
							Min	Max	
216	Parameter	Yes	Yes	Yes	4096	Volts			NA

Description

This parameter represents the analogue brake voltage reading below which no braking effort applied to the system.

Assist voltage high reading

Address	Type	Read	Write	Saved	Scale	Units	Range		Default
							Min	Max	
217	Parameter	Yes	Yes	Yes	4096	Volts			NA

Description

This parameter represents the assist level's voltage reading when the high level assist has been selected.

Assist voltage low reading

Address	Type	Read	Write	Saved	Scale	Units	Range		Default
							Min	Max	
218	Parameter	Yes	Yes	Yes	4096	Volts			NA

Description

This parameter represents the assist level's voltage reading when the low level assist has been selected.

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Assist gain

Address	Type	Read	Write	Saved	Scale	Units	Range		Default
							Min	Max	
219	Parameter	Yes	Yes	Yes	4096	Per unit			NA

Description

This parameter defines the assist gain when the low level of assist is selected.

Positive motoring torque ramp

Address	Type	Read	Write	Saved	Scale	Units	Range		Default
							Min	Max	
220	Parameter	Yes	Yes	Yes	1	milliseconds			500

Description

The minimum time in milliseconds to reach the maximum motoring torque set point.

Negative motoring torque ramp

Address	Type	Read	Write	Saved	Scale	Units	Range		Default
							Min	Max	
221	Parameter	Yes	Yes	Yes	1	milliseconds			50

Description

The maximum time, in milliseconds, to reach the zero motoring torque.

Positive braking torque ramp

Address	Type	Read	Write	Saved	Scale	Units	Range		Default
							Min	Max	
224	Parameter	Yes	Yes	Yes	1	milliseconds			500

Description

The minimum time in milliseconds to reach the maximum braking torque set point.

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Negative braking torque ramp

Address	Type	Read	Write	Saved	Scale	Units	Range		Default
							Min	Max	
225	Parameter	Yes	Yes	Yes	1	milliseconds			50

Description

The maximum time, in milliseconds, to reach the zero braking torque.

Gear ratio

Address	Type	Read	Write	Saved	Scale	Units	Range		Default
							Min	Max	
226	Parameter	Yes	Yes	Yes	256	N			1

Description

The ratio of motor revolutions to one complete wheel revolution.

Wheel diameter

Address	Type	Read	Write	Saved	Scale	Units	Range		Default
							Min	Max	
227	Parameter	Yes	Yes	Yes	1	millimeters			

Description

The diameter in millimeters of the wheel being used to derive/calculate vehicle speed

Assist cut out distance

Address	Type	Read	Write	Saved	Scale	Units	Range		Default
							Min	Max	
228	Parameter	Yes	Yes	Yes	256	metres			1.5

Description

The distance in metres that the bike is allowed to travel using motor assistance after being commanded to remove power due to the user ceasing to pedal the bike.

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Maximum vehicle speed

Address	Type	Read	Write	Saved	Scale	Units	Range		Default
							Min	Max	
229	Parameter	Yes	Yes	Yes	256	Km/hour			

Description

The maximum speed the vehicle can travel at using motor assistance.

Vehicle jog speed

Address	Type	Read	Write	Saved	Scale	Units	Range		Default
							Min	Max	
230	Parameter	Yes	Yes	Yes	256	Km/hour			

Description

The commanded maximum speed the vehicle can travel when in jog mode.

Wheel speed sensor pulses per revolution

Address	Type	Read	Write	Saved	Scale	Units	Range		Default
							Min	Max	
231	Parameter	Yes	Yes	Yes	1	Pules per revolution			

Description

This parameter represents the wheel speed sensor's number of pulses per wheel revolution. If set to zero, this feature is disabled.

Pedalelec minimum timeout

Address	Type	Read	Write	Saved	Scale	Units	Range		Default
							Min	Max	
232	Parameter	Yes	Yes	Yes	1	milliseconds			

Description

This parameter represents the minimum time to disable pedal when no change in pedal position is observed.

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Pedalelec maximum timeout

Address	Type	Read	Write	Saved	Scale	Units	Range		Default
							Min	Max	
233	Parameter	Yes	Yes	Yes	1	milliseconds			

Description

This parameter represents the maximum time to disable pedal when no change in pedal position is observed.

Pedal speed sensor pules per revolution

Address	Type	Read	Write	Saved	Scale	Units	Range		Default
							Min	Max	
234	Parameter	Yes	Yes	Yes	1	Pulses per revolution			

Description

Represents the number of pedal speed sensor pulses per complete revolution of the pedal

Pedal sense delay

Address	Type	Read	Write	Saved	Scale	Units	Range		Default
							Min	Max	
235	Parameter	Yes	Yes	Yes	1	Pedal sensor pulses			

Description

Represents the number of pedal speed sensor pulses that must be observed for the pedals to be deemed active.

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Light on delay

Address	Type	Read	Write	Saved	Scale	Units	Range		Default
							Min	Max	
237	Parameter	Yes	Yes	Yes	1	seconds			

Description

This time represents the amount of delay before turning the headlight on.

Light off delay

Address	Type	Read	Write	Saved	Scale	Units	Range		Default
							Min	Max	
238	Parameter	Yes	Yes	Yes	1	seconds			

Description

This time represents the amount of delay before turning the headlight off.

Light on voltage

Address	Type	Read	Write	Saved	Scale	Units	Range		Default
							Min	Max	
239	Parameter	Yes	Yes	Yes	4096	Volts			

Description

This parameter represents the voltage reading of the output of the light sensor that will turn the headlight on.

Light off voltage

Address	Type	Read	Write	Saved	Scale	Units	Range		Default
							Min	Max	
240	Parameter	Yes	Yes	Yes	4096	Volts			

Description

This parameter represents the voltage reading of the output of the light sensor that will turn the headlight off.

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Assist speed low

Address	Type	Read	Write	Saved	Scale	Units	Range		Default
							Min	Max	
241	Parameter	Yes	Yes	Yes	4096	Per unit			

Description

This parameter sets the fraction of maximum speed the bike will be limited to when the assist voltage is set to low.

Freewheel detection maximum cog ratio

Address	Type	Read	Write	Saved	Scale	Units	Range		Default
							Min	Max	
242	Parameter	Yes	Yes	Yes	256	N:1			

Description

This parameter represents the maximum allowed ratio of wheel speed to pedal speed for freewheel detection. If the measured cog ration is greater than this value, pedal assist will be disabled.

Freewheel detection minimum speed

Address	Type	Read	Write	Saved	Scale	Units	Range		Default
							Min	Max	
243	Parameter	Yes	Yes	Yes	256	Km/hour			

Description

This parameter sets the vehicle speed threshold above which the freewheel detection function is enabled.

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Freewheel detection delay

Address	Type	Read	Write	Saved	Scale	Units	Range		Default
							Min	Max	
244	Parameter	Yes	Yes	Yes	1	milliseconds			

Description

This parameter represents the detection time delay for a locked or unlocked freewheel in milliseconds.

faults

Address	Type	Read	Write	Saved	Scale	Units	Range		Default
							Min	Max	
258	Data	Yes	No	No	1	Bit vector			NA

Description

A fault is issued when the drive or motor could be damaged by further operation or the motor cannot be operated safely. When a fault occurs, the drive attempts to bring the motor to a stop, and then stops driving the motor (the bridge goes into a high impedance state). The drive enters the "Stop" state. To start the drive, it is necessary to clear the fault indicator and change the state to "Run". If the fault persists, another fault will be issued.

This bit vector represents the various faults that occur on the controller. If the bit value is equal to one, a fault corresponding to the bit number is present. The faults are defined below:

Bit #	Fault	Description	LED Flashes
0	Controller Over Voltage	The filtered battery voltage measurement has exceeded the ***Slow over voltage threshold*** and the bridge has been disabled	1
1	Phase Over Current	The motor phase current measurement has exceeded the ***Averaged overcurrent trip threshold*** for the number of samples specified by ***Averaged overcurrent trip sample length***, and the bridge has been disabled	2
2	Current Sensor Calibration	The offset calibration of the current sensors has failed and the bridge has been disabled	14
3	Current Sensor Over Current	The motor phase current has exceeded the amount measureable by the current sensors resulting in a hardware triggered over current fault. The bridge has been disabled. This fault latches the output of the current sensors and as such requires that the controller's power be	11

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		cycled in order to clear the fault	
4	Controller Temperature	The measured MOSFET tab temperature has exceeded the factory programmed limit and the motor phase current has been folded back to protect the controller	4
5	Parameter CRC 32	The parameter CRC 32 value does not match the calculated value indicating the possibility of corrupted flash. The bridge has been disabled	15
6	Controller Under Voltage	The filtered battery voltage measurement has exceeded the ***Slow under voltage threshold*** and the bridge has been disabled	13
7	Bridge Open Circuit	The open circuit voltage measurements made on the MOSFET bridge fall outside the preprogrammed thresholds and the bridge has been disabled	3
8	Communication Timeout	The controller has not received a valid communications packet over an elapsed time that exceeds the ***Command timeout threshold***	6
9	Instantaneous Phase Current	The instantaneous motor phase current measurement has exceeded the ***Instantaneous overcurrent trip threshold*** and the bridge has been disabled	7
10	Motor Temperature	The estimated/measured motor temperature has exceeded the ***Motor over temperature trip threshold*** and the motor phase current has been folded back to protect the controller	8
11	Throttle Outside Voltage Range	The measured throttle voltage is outside the ***Throttle voltage high/low reading*** + ***Throttle fault range*** and the bridge has been disabled	9
12	Fast DC Over Voltage	The instantaneous battery voltage measurement has exceeded the ***Fast over voltage threshold*** and the bridge has been disabled	10
13	Internal Error	The processor has detected an internal microelectronic hardware failure and the bridge has been disabled	12
14	Bridge Turn On Test	The voltage measurements for fixed duty cycle turn on of the MOSFET bridge fall outside the preprogrammed thresholds and the bridge has been disabled	5
15	Fast DC Under Voltage	The instantaneous battery voltage measurement was less than the ***Fast under voltage threshold*** and the bridge has been disabled	

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controller temperature

Address	Type	Read	Write	Saved	Scale	Units	Range		Default
							Min	Max	
259	Data	Yes	No	No	1	°Celsius			NA

Description

This value represents the temperature of the controller's base plate.

vehicle speed

Address	Type	Read	Write	Saved	Scale	Units	Range		Default
							Min	Max	
260	Data	Yes	No	No	256	Km/hour			NA

Description

This value represents the current speed of the vehicle in kilometers per hour.

temperature

Address	Type	Read	Write	Saved	Scale	Units	Range		Default
							Min	Max	
261	Data	Yes	No	No	1	°Celsius			NA

Description

This value represents the temperature of any device that is connected to the brake 2 input. This temperature measurement can be used indicate motor or outside temperature as an example.

motor current

Address	Type	Read	Write	Saved	Scale	Units	Range		Default
							Min	Max	
262	Data	Yes	No	No	32	Amperes			NA

Description

This variable represents the peak (not RMS) motor current in Amperes.

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motor rpm

Address	Type	Read	Write	Saved	Scale	Units	Range		Default
							Min	Max	
263	Data	Yes	No	No	1	RPM			NA

Description

This variable represents the motor's speed in RPM.

battery voltage

Address	Type	Read	Write	Saved	Scale	Units	Range		Default
							Min	Max	
265	Data	Yes	No	No	32	Volts			NA

Description

This variable represents the measured battery voltage.

battery current

Address	Type	Read	Write	Saved	Scale	Units	Range		Default
							Min	Max	
266	Data	Yes	No	No	32	Amperes			NA

Description

This variable represents the estimated battery current.

battery state of charge

Address	Type	Read	Write	Saved	Scale	Units	Range		Default
							Min	Max	
267	Data	Yes	No	No	32	%			NA

Description

This variable represents the battery capacity remaining. The battery state of charge can either represent an estimated (voltage model) or measured quantity depending on the BMS interface type selected.

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battery power

Address	Type	Read	Write	Saved	Scale	Units	Range		Default
							Min	Max	
267	Data	Yes	No	No	1	Watts			NA

Description

This variable represents the estimated battery output power.

throttle voltage

Address	Type	Read	Write	Saved	Scale	Units	Range		Default
							Min	Max	
270	Command	Yes	No	No	4096	Volts			

Description

This variable represents the filtered throttle voltage.

brake 1 voltage

Address	Type	Read	Write	Saved	Scale	Units	Range		Default
							Min	Max	
271	Command	Yes	No	No	4096	Volts			

Description

This variable represents the filtered brake 1 voltage.

brake 2 voltage

Address	Type	Read	Write	Saved	Scale	Units	Range		Default
							Min	Max	
272	Command	Yes	No	No	4096	Volts			

Description

This variable represents the filtered brake 2 voltage.

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raw controller temperature sensor voltage

Address	Type	Read	Write	Saved	Scale	Units	Range		Default
							Min	Max	
273	Data	Yes	No	No	4096	Volts			

Description

This variable represents the unfiltered temperature sensor voltage.

Light sensor voltage

Address	Type	Read	Write	Saved	Scale	Units	Range		Default
							Min	Max	
274	Data	Yes	No	No	4096	Volts			

Description

This variable represents the filtered light sensor voltage.

analogue bms soc voltage

Address	Type	Read	Write	Saved	Scale	Units	Range		Default
							Min	Max	
275	Data	Yes	No	No	1024	Volts			

Description

This variable represents the scaled analogue battery management systems state of charge voltage where 0 Volts represents 0% capacity and 10 Volts represents 100% capacity.

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digital inputs

Address	Type	Read	Write	Saved	Scale	Units	Range		Default
							Min	Max	
276	Data	Yes	No	No	1	Bit vector			NA

Description

This bit vector represents the state of the controller's digital inputs. If the bit value is equal to one, this represents a logic high state. If the bit value is equal to zero, this represents a logic low state. The digital inputs are defined below:

Bit #	Digital Input Name
0	Hall C
1	Hall B
2	Hall A
3	Pedal First Sensor
4	Cruise Control
5	Brake 1
6	Brake 2
7	Hardware Over Current Pin
8	Hardware Over Current Latch

DSP core temperature

Address	Type	Read	Write	Saved	Scale	Units	Range		Default
							Min	Max	
281	Data	Yes	No	No	1	°Celsius			

Description

This variable represents the internal temperature of the controller's process.

phase A current

Address	Type	Read	Write	Saved	Scale	Units	Range		Default
							Min	Max	
282	Data	Yes	No	No	32	Amperes			NA

Description

This variable represents the measured motor phase A current.

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phase B current

Address	Type	Read	Write	Saved	Scale	Units	Range		Default
							Min	Max	
283	Data	Yes	No	No	32	Amperes			NA

Description

This variable represents the calculated motor phase B current.

phase C current

Address	Type	Read	Write	Saved	Scale	Units	Range		Default
							Min	Max	
284	Data	Yes	No	No	32	Amperes			NA

Description

This variable represents the measured motor phase C current.

phase A voltage

Address	Type	Read	Write	Saved	Scale	Units	Range		Default
							Min	Max	
285	Data	Yes	No	No	32	Volts			NA

Description

This variable represents the measured motor phase A voltage.

phase B voltage

Address	Type	Read	Write	Saved	Scale	Units	Range		Default
							Min	Max	
286	Data	Yes	No	No	32	Volts			NA

Description

This variable represents the measured motor phase B voltage.

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phase C voltage

Address	Type	Read	Write	Saved	Scale	Units	Range		Default
							Min	Max	
287	Data	Yes	No	No	32	Volts			NA

Description

This variable represents the measured motor phase C voltage.

boot loader software revision

Address	Type	Read	Write	Saved	Scale	Units	Range		Default
							Min	Max	
288	Data	Yes	No	Yes	1000	NA			NA

Description

This parameter represents the revision number of the controller's boot loader firmware.

ia RMS

Address	Type	Read	Write	Saved	Scale	Units	Range		Default
							Min	Max	
289	Data	Yes	No	No	32	Amperes			NA

Description

This variable represents the measured RMS value of the motor phase A current used during current sensor calibration.

ic RMS

Address	Type	Read	Write	Saved	Scale	Units	Range		Default
							Min	Max	
290	Data	Yes	No	No	32	Amperes			NA

Description

This variable represents the measured RMS value of the motor phase C current used during current sensor calibration.

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raw battery voltage

Address	Type	Read	Write	Saved	Scale	Units	Range		Default
							Min	Max	
291	Data	Yes	No	No	32	Volts			NA

Description

This variable represents the unfiltered battery voltage.

phase A current sensor offset

Address	Type	Read	Write	Saved	Scale	Units	Range		Default
							Min	Max	
315	Command	Yes	No	No	4096	Per unit			NA

Description

This parameter represents the current sensor offset for phase A expressed as a percentage of the full scale sensor reading. The nominal value is 0.5.

phase C current sensor offset

Address	Type	Read	Write	Saved	Scale	Units	Range		Default
							Min	Max	
316	Command	Yes	No	No	4096	Per unit			NA

Description

This parameter represents the current sensor offset for phase C expressed as a percentage of the full scale sensor reading. The nominal value is 0.5.

low voltage foldback gain

Address	Type	Read	Write	Saved	Scale	Units	Range		Default
							Min	Max	
317	Command	Yes	No	Yes	4096	Per unit	0	1	NA

Description

This parameter represents the low voltage foldback gain. If the low voltage foldback is inactive, it value will be one. Once the foldback is active, it will decrease depending on the battery's output

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voltage and how the ***Low battery starting/end thresholds*** have been configured. When the foldback gain equals zero, the bridge will be disabled.

maximum current foldback

Address	Type	Read	Write	Saved	Scale	Units	Range		Default
							Min	Max	
318	Command	Yes	No	No	4096	Per unit	0	1	NA

Description

This parameter represents the controller's maximum output current after all foldback gains have been applied. Essentially it equals the peak current limit times all of the foldback gains.

i^2t foldback gain

Address	Type	Read	Write	Saved	Scale	Units	Range		Default
							Min	Max	
319	Command	Yes	No	No	4096	Per unit	0	1	NA

Description

This parameter represents the foldback gain associated with the motor thermal model. If the motor thermal model foldback is inactive, it value will be one. Once the foldback is active, it will decrease depending on the estimated motor temperature and how the i^2t thresholds have configured. When the foldback gain equals zero, the bridge will be disabled. More information on how to set up the thermal model for motor can be found later in this document.

motor temperature foldback gain

Address	Type	Read	Write	Saved	Scale	Units	Range		Default
							Min	Max	
320	Command	Yes	No	No	4096	Per unit	0	1	NA

Description

This parameter represents the foldback gain associated with the motor temperature measurement. If the motor temperature foldback is inactive, it value will be one. Once the foldback is active, it will decrease depending on the measured motor temperature and how the ***Motor foldback starting/end temperatures*** have been configured. When the foldback gain equals zero, the bridge will be disabled.

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inverter temperature foldback gain

Address	Type	Read	Write	Saved	Scale	Units	Range		Default
							Min	Max	
321	Command	Yes	No	No	4096	Per unit	0	1	NA

Description

This parameter represents the foldback gain associated with the controller temperature measurement. If the controller temperature foldback is inactive, it value will be one. Once the foldback is active, it will decrease depending on the measured controller temperature and how the ***Controller foldback starting/end temperatures*** have been configured. When the foldback gain equals zero, the bridge will be disabled.

speed foldback gain

Address	Type	Read	Write	Saved	Scale	Units	Range		Default
							Min	Max	
322	Command	Yes	No	No	4096	Per unit	0	1	NA

Description

This parameter represents the foldback gain associated with the vehicle speed measurement. If the speed foldback is inactive, it value will be one. Once the foldback is active, it will decrease depending on the vehicle speed. When the foldback gain equals zero, the bridge will be disabled. This foldback gain is only used when the ***speed regulator mode*** is set to 2.

current limit

Address	Type	Read	Write	Saved	Scale	Units	Range		Default
							Min	Max	
322	Command	Yes	No	No	4096	Per unit	0	1	NA

Description

This parameter represents the phase current limit when the controller's output power is being governed by either the output power or battery current limit.

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State of charge foldback gain

Address	Type	Read	Write	Saved	Scale	Units	Range		Default
							Min	Max	
324	Command	Yes	No	No	4096	Per unit	0	1	NA

Description

This parameter represents the foldback gain associated with the batteries state of charge measurement/estimate. If the state of charge foldback is inactive, it value will be one. Once the foldback is active, it will decrease depending on the battery's state of charge and how the ***Battery state of charge foldback starting/end capacities*** have been configured. When the foldback gain equals zero, the bridge will be disabled.

compensated state of charge HDQ

Address	Type	Read	Write	Saved	Scale	Units	Range		Default
							Min	Max	
420	Command	Yes	No	No	1	%	0	100	NA

Description

This parameter represents the calculated battery state of charge that has been communicated to the controller from the battery management system using the HDQ protocol.

battery temperature HDQ

Address	Type	Read	Write	Saved	Scale	Units	Range		Default
							Min	Max	
422	Command	Yes	No	No	1	°Celsius	0	100	NA

Description

This parameter represents the measured battery cell temperature that has been communicated to the controller from the battery management system using the HDQ protocol.

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cell voltage HDQ

Address	Type	Read	Write	Saved	Scale	Units	Range		Default
							Min	Max	
423	Command	Yes	No	No	1000	Volts	0	100	NA

Description

This parameter represents the measured battery cell voltage that has been communicated to the controller from the battery management system using the HDQ protocol.

autotune Rs

Address	Type	Read	Write	Saved	Scale	Units	Range		Default
							Min	Max	
425	Command	Yes	No	No	1	milliohms	0	100	NA

Description

This parameter represents the motor's estimated stator resistance in milliohms. These values are calculated as part of the ***Motor discover enable's*** motor parameter test.

autotune Ls

Address	Type	Read	Write	Saved	Scale	Units	Range		Default
							Min	Max	
426	Command	Yes	No	No	1	µhenries	0	100	NA

Description

This parameter represents the motor's estimated stator inductance in micro Henries. These values are calculated as part of the ***Motor discover enable's*** motor parameter test.

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autotune hall sector [0 to7]

Address	Type	Read	Write	Saved	Scale	Units	Range		Default
							Min	Max	
440 to 447	Command	Yes	No	No	4096	NA			NA

Description

These parameters represent a motor's Hall mapping for a given wiring (motor phase and Hall sensors). These values are calculated as part of the ***Motor discover enable's*** Hall sequence test.

Write parameters to flash

Address	Type	Read	Write	Saved	Scale	Units	Range		Default
							Min	Max	
511	Command	Yes	Yes	No	1	NA			NA

Description

Writing the value 32767 to this parameter will save parameters to flash memory. Note that parameters cannot be saved to flash when the controller is in the RUN state. This parameter can also be read to determine if the attempt to save parameters to flash was successful. A value of 4096 indicates a successful operation whereas a value of 8192 shows that the flash write failed.

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Parameter Access Level 1

Low battery foldback starting voltage

Address	Type	Read	Write	Saved	Scale	Units	Range		Default
							Min	Max	
141	Parameter	Yes	Yes	Yes	40.96	%	0	100	1

Description

The parameter sets the threshold to start folding back the controller's output based on the battery's voltage as a percentage of ***Rated motor voltage***.

Low battery foldback end voltage

Address	Type	Read	Write	Saved	Scale	Units	Range		Default
							Min	Max	
142	Parameter	Yes	Yes	Yes	40.96	%	0	100	1

Description

The parameter sets the threshold where the controller's output disabled based on the battery's voltage as a percentage of ***Rated motor voltage***.

Cold battery foldback starting temperature

Address	Type	Read	Write	Saved	Scale	Units	Range		Default
							Min	Max	
143	Parameter	Yes	Yes	Yes	1	°Celsius	0	100	1

Description

The parameter sets the threshold to start folding back the controller's output based on the battery's temperature.

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Cold battery foldback end temperature

Address	Type	Read	Write	Saved	Scale	Units	Range		Default
							Min	Max	
144	Parameter	Yes	Yes	Yes	1	°Celsius	0	100	1

Description

The parameter sets the threshold where the controller's output disabled based on the battery's temperature.

Battery state of charge foldback starting capacity

Address	Type	Read	Write	Saved	Scale	Units	Range		Default
							Min	Max	
145	Parameter	Yes	Yes	Yes	1	%	0	100	1

Description

The parameter sets the threshold to start folding back the controller's output based on the battery's state of charge.

Battery state of charge foldback end capacity

Address	Type	Read	Write	Saved	Scale	Units	Range		Default
							Min	Max	
146	Parameter	Yes	Yes	Yes	1	%	0	100	1

Description

The parameter sets the threshold where the controller's output disabled based on the battery's state of charge.

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Fast over voltage threshold

Address	Type	Read	Write	Saved	Scale	Units	Range		Default
							Min	Max	
147	Parameter	Yes	Yes	Yes	40.96	%	0	100	1

Description

This parameter sets the threshold voltage that is compared against the instantaneous voltage measurement. If the instantaneous voltage is greater than the ***Fast over voltage*** threshold, a fault has occurred and the bridge is disabled. The voltage comparison is made as a function of rated motor voltage. For example, if ***Fast over voltage*** threshold is set to 120% and ***Rated motor voltage*** is set to 48 Volts, an over voltage fault will occur if the measured battery voltage is greater than 57.6 Volts.

Fast under voltage threshold

Address	Type	Read	Write	Saved	Scale	Units	Range		Default
							Min	Max	
148	Parameter	Yes	Yes	Yes	40.96	%	0	100	1

Description

This parameter sets the threshold voltage that is compared against the instantaneous voltage measurement. If the instantaneous voltage is less than the ***Fast under voltage*** threshold, a fault has occurred and the bridge is disabled. The voltage comparison is made as a function of rated motor voltage.

Slow over voltage threshold

Address	Type	Read	Write	Saved	Scale	Units	Range		Default
							Min	Max	
149	Parameter	Yes	Yes	Yes	40.96	%	0	100	1

Description

This parameter sets the threshold voltage that is compared against the filtered voltage measurement. If the filtered voltage is greater than the ***Slow over voltage*** threshold, a fault has occurred and the bridge is disabled. The voltage comparison is made as a function of rated motor voltage.

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Slow under voltage threshold

Address	Type	Read	Write	Saved	Scale	Units	Range		Default
							Min	Max	
150	Parameter	Yes	Yes	Yes	40.96	%	0	100	1

Description

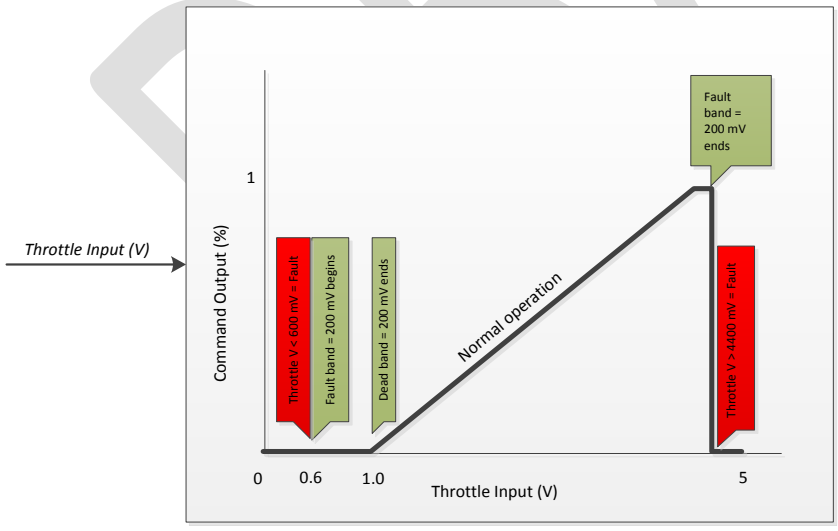
This parameter sets the threshold voltage that is compared against the filtered voltage measurement. If the filtered voltage is less than the ***Slow under voltage*** threshold, a fault has occurred and the bridge is disabled. The voltage comparison is made as a function of rated motor voltage.

Throttle deadband threshold

Address	Type	Read	Write	Saved	Scale	Units	Range		Default
							Min	Max	
151	Parameter	Yes	Yes	Yes	4096	Volts			0.200

Description

This parameter sets the deadband voltage that is added to the ***Throttle low voltage reading*** to insert some "play" into the throttle's initial response. Power will not be output to motor until the deadband region has been exited. An example using a deadband threshold of 200 millivolts and a ***Throttle low voltage reading*** equal to 800 millivolts is show in the figure below.



Throttle fault range

Address	Type	Read	Write	Saved	Scale	Units	Range		Default
							Min	Max	
152	Parameter	Yes	Yes	Yes	4096	Volts			0.200

Description

This parameter sets the fault range voltage that is added/subtracted to the ***Throttle high/low voltage reading*** to allow the controller to determine if the throttle has failed. An example using a fault range of 200 millivolts and a ***Throttle high/low voltage readings*** equal to 4200 and 800 millivolts respectively is show in the figure above.

Maximum motoring torque

Address	Type	Read	Write	Saved	Scale	Units	Range		Default
							Min	Max	
153	Parameter	Yes	Yes	Yes	40.96	%			

Description

This parameter sets the maximum motoring torque limit as a function of the rated motor current.

Maximum braking torque

Address	Type	Read	Write	Saved	Scale	Units	Range		Default
							Min	Max	
154	Parameter	Yes	Yes	Yes	40.96	%			

Description

This parameter sets the maximum braking torque limit as a function of the rated motor current.

Battery current limit

Address	Type	Read	Write	Saved	Scale	Units	Range		Default
							Min	Max	
155	Parameter	Yes	Yes	Yes	40.96	%			

Description

This parameter sets the controller imposed battery limit when motoring.

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Battery negative current limit

Address	Type	Read	Write	Saved	Scale	Units	Range		Default
							Min	Max	
156	Parameter	Yes	Yes	Yes	40.96	%			

Description

This parameter sets the controller imposed battery limit when generating.

Power map Watts setpoint 1 to 8

Address	Type	Read	Write	Saved	Scale	Units	Range		Default
							Min	Max	
157 to 164	Parameter	Yes	Yes	Yes	40.96	%			

Description

These parameters set the power speed map power setpoints as a % of maximum rated power. Further details on setting up power versus speed mapping can be found in the appropriate application note.

Power map speed setpoint 1 to 8

Address	Type	Read	Write	Saved	Scale	Units	Range		Default
							Min	Max	
165 to 172	Parameter	Yes	Yes	Yes	40.96	%			

Description

These parameters set the power speed map speed setpoints as a % of maximum rated speed. Further details on setting up power versus speed mapping can be found in the appropriate application note.

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Torque map offset

Address	Type	Read	Write	Saved	Scale	Units	Range		Default
							Min	Max	
173	Parameter	Yes	Yes	Yes	4096	Per unit			

Description

This parameter defines the torque setpoint at zero percent throttle.

Torque map throttle maximum

Address	Type	Read	Write	Saved	Scale	Units	Range		Default
							Min	Max	
174	Parameter	Yes	Yes	Yes	4096	Per unit			

Description

This parameter defines the throttle output level that represents maximum torque setpoint.

Pedal speed map offset

Address	Type	Read	Write	Saved	Scale	Units	Range		Default
							Min	Max	
175	Parameter	Yes	Yes	Yes	4096	Per unit			

Description

This parameter defines the speed setpoint when the pedal rpm is equal to zero.

Pedal speed map end

Address	Type	Read	Write	Saved	Scale	Units	Range		Default
							Min	Max	
176	Parameter	Yes	Yes	Yes	64	rpm			

Description

This parameter defines the pedal speed in rpm that equates to full gain.

DRAFT

Brake map offset

Address	Type	Read	Write	Saved	Scale	Units	Range		Default
							Min	Max	
177	Parameter	Yes	Yes	Yes	4096	Per unit			

Description

This parameter defines the brake setpoint when the braking effort is equal to zero.

Brake map end

Address	Type	Read	Write	Saved	Scale	Units	Range		Default
							Min	Max	
178	Parameter	Yes	Yes	Yes	4096	rpm			

Description

This parameter defines the braking effort that equates to maximum braking.

Pedalelec power gain

Address	Type	Read	Write	Saved	Scale	Units	Range		Default
							Min	Max	
179	Parameter	Yes	Yes	Yes	1024	G			

Description

This parameter scales pedal torque in Nm to throttle % as using the following equation:

$$Throttle = 100\% \times \mathrm{T}(Nm) \times Pedalelec\ Power\ Gain\ (pu)/64$$

Pedalelec initial torque

Address	Type	Read	Write	Saved	Scale	Units	Range		Default
							Min	Max	
180	Parameter	Yes	Yes	Yes	64	Nm			

Description

This parameter defines an initial torque value that is used by the system to compensate for the lack of an initial right leg torque measurement.

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Pedalelec deadband torque

Address	Type	Read	Write	Saved	Scale	Units	Range		Default
							Min	Max	
181	Parameter	Yes	Yes	Yes	64	Nm			

Description

This parameter defines a negative saturation value for calculating average pedal torque.

.Torque sensor offset

Address	Type	Read	Write	Saved	Scale	Units	Range		Default
							Min	Max	
182	Parameter	Yes	Yes	Yes	4096	Volts			

Description

This parameter defines torque sensor's initial offset voltage.

Torque sensor gain

Address	Type	Read	Write	Saved	Scale	Units	Range		Default
							Min	Max	
183	Parameter	Yes	Yes	Yes	1	Nm/Volt			

Description

This parameter defines sensor output voltage to a torque measurement. For example, the Thun sensor is -100Nm/V.

Datalog channel select 1 to 4

Address	Type	Read	Write	Saved	Scale	Units	Range		Default
							Min	Max	
184 to 187	Parameter	Yes	Yes	Yes	enum	NA			

Description

Each channel allows the user to set the selection number equal to the ModBus address of the parameter/variable that is to be datalogged.

DRAFT

Datalog trigger level

Address	Type	Read	Write	Saved	Scale	Units	Range		Default
							Min	Max	
188	Parameter	Yes	Yes	Yes	int	NA			

Description

This parameter allows the user to set the oscilloscopes trigger level as a signed integer.

Datalog trigger mask

Address	Type	Read	Write	Saved	Scale	Units	Range		Default
							Min	Max	
189	Parameter	Yes	Yes	Yes	hex	NA			

Description

This parameter allows the user to mask off non wanted bits if triggering off of a bit vector. Setting this parameter to 7FFFh disables this feature.

Datalog hold off

Address	Type	Read	Write	Saved	Scale	Units	Range		Default
							Min	Max	
190	Parameter	Yes	Yes	Yes	counts	NA			

Description

This parameter allows the user to the number of samples that scope will hold off before triggering.

Datalog time base

Address	Type	Read	Write	Saved	Scale	Units	Range		Default
							Min	Max	
191	Parameter	Yes	Yes	Yes	ISRs	NA			

Description

This parameter allows the user to specify the number of interrupt service routines that occur per sample. If the ISR is 19200 Hz, then sample time is approximately 52 microseconds.

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Datalog trigger mode

Address	Type	Read	Write	Saved	Scale	Units	Range		Default
							Min	Max	
192	Parameter	Yes	Yes	Yes	integer	NA			

Description

This parameter allows the user to specify the triggering condition. The options are as follows:

0 = rising edge
1 = falling edge
2 = equal to
3 = not equal to

Wheel speed sensor source

Address	Type	Read	Write	Saved	Scale	Units	Range		Default
							Min	Max	
193	Parameter	Yes	Yes	Yes	enum	NA			

Description

This parameter allows the user to specify the input that reads the wheel speed sensor pulses. The options are as follows:

0 = cruise control input
1 = pedal first sensor input
2 = Hall sensor A input

software revision level

Address	Type	Read	Write	Saved	Scale	Units	Range		Default
							Min	Max	
256	Data	Yes	No	Yes	1000	NA			

Description

This parameter provides the user with the BAC controller's current software revision level. For example, software revision 5.0.03 corresponds to revision 5 build 3.

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warnings

Address	Type	Read	Write	Saved	Scale	Units	Range		Default
							Min	Max	
277	Data	Yes	No	No	1	Bit vector			NA

Description

A warning is issued when the drive detected that further operation could result in a fault occurring. When a warning occurs, the drive continues to run.

This bit vector represents the various warnings that occur on the controller. If the bit value is equal to one, a warning corresponding to the bit number is present. The warnings are defined below:

Bit #	Fault	Description
0	Communication timeout	
1	Hall sensor	
2	Feedback scaling	
3	Wheel speed senor	
4	HDQ	

DRAFT

Parameter Access Level 2

Rated motor voltage

Address	Type	Read	Write	Saved	Scale	Units	Range		Default
							Min	Max	
70	Parameter	Yes	Yes	Yes	1	Volts			

Description

This parameter is equivalent to the motor's name plate voltage rating. From the controller's point of view it is also considered to equal the system's battery or peak line to line voltage. If a motor is to be run at double its name plate voltage, the battery voltage should input into this parameter instead.

Rated motor current

Address	Type	Read	Write	Saved	Scale	Units	Range		Default
							Min	Max	
71	Parameter	Yes	Yes	Yes	1	Amperes			

Description

This parameter is equivalent to the motor's name plate peak phase current rating. From the controller's point of view it is also considered to equal the system's maximum current rating as well.

Rated motor speed

Address	Type	Read	Write	Saved	Scale	Units	Range		Default
							Min	Max	
72	Parameter	Yes	Yes	Yes	1	rpm			

Description

This parameter is equivalent to the motor's name plate N load rated motor RPM rating. From the controller's point of view it is also considered to equal the system's maximum speed rating as well.

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Rated motor power

Address	Type	Read	Write	Saved	Scale	Units	Range		Default
							Min	Max	
73	Parameter	Yes	Yes	Yes	1	Watts			

Description

This parameter is equivalent to the motor's name plate electrical power rating. From the controller's point of view it is also considered equivalent to:

$$Rated\ motor\ power = Rated\ motor\ voltage \times Rated\ battery\ current$$

Ls

Address	Type	Read	Write	Saved	Scale	Units	Range		Default
							Min	Max	
74	Parameter	Yes	Yes	Yes	1	µhenries	0	100	NA

Description

This parameter represents the motor's stator inductance in micro Henries.

Rs

Address	Type	Read	Write	Saved	Scale	Units	Range		Default
							Min	Max	
75	Parameter	Yes	Yes	Yes	1	milliohms	0	100	NA

Description

This parameter represents the motor's stator resistance in milliohms.

Kv

Address	Type	Read	Write	Saved	Scale	Units	Range		Default
							Min	Max	
76	Parameter	Yes	Yes	Yes	1	mV/rpm	0	100	NA

Description

This parameter represents the motor's back electromotive force constant in millivolts per rpm.

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Motor position sensor type

Address	Type	Read	Write	Saved	Scale	Units	Range		Default
							Min	Max	
77	Parameter	Yes	Yes	Yes	enum	NA			NA

Description

This parameter allows the user to specify the sensor configuration that is used to provide commutation information to the motor. The options are as follows:

0 = Hall sensor
1 = Hall sensor start and sensorless run
2 = Sensorless
3 = Reserved

of motor pole pairs

Address	Type	Read	Write	Saved	Scale	Units	Range		Default
							Min	Max	
78	Parameter	Yes	Yes	Yes	1	NA			NA

Description

This parameter allows the user to specify the number of electrical pole or magnet pairs at motor has.

Hall offset

Address	Type	Read	Write	Saved	Scale	Units	Range		Default
							Min	Max	
79	Parameter	Yes	Yes	Yes	91.02222	degrees			NA

Description

This parameter allows the user to compensate for poor positioning of a motor's Hall sensor. Setting this parameter correctly is described in the BAC manual.

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Hall sector [0 to7]

Address	Type	Read	Write	Saved	Scale	Units	Range		Default
							Min	Max	
80 to 87	Parameter	Yes	Yes	Yes	1	NA			NA

Description

These parameters correspond to the motor sector that is represented by a certain Hall sequence. Note that -1 represents an illegal state. The Hall states are ordered as follows:

Sector 1 = 001
Sector 2 = 010
Sector 3 = 011
Sector 4 = 100
Sector 5 = 101
Sector 6 = 110
Sector 0/7 = -1

Hall interpolation start frequency

Address	Type	Read	Write	Saved	Scale	Units	Range		Default
							Min	Max	
88	Parameter	Yes	Yes	Yes	32	Hertz			NA

Description

This parameter corresponds to the Hall sensor frequency at which the calculated rotor angle transitions from a series of six discrete steps to a smooth triangle wave based on interpolating the time between Hall sensor edges.

Hall interpolation stop frequency

Address	Type	Read	Write	Saved	Scale	Units	Range		Default
							Min	Max	
89	Parameter	Yes	Yes	Yes	32	Hertz			NA

Description

This parameter corresponds to the Hall sensor frequency at which the calculated rotor angle transitions from a smooth triangle wave based on interpolating the time between Hall sensor edges back a series of six discrete steps. Typically this value is set to be half of the starting frequency to add a bit of hysteresis which results in smoother low speed motor operation.

DRAFT

Motor over temperature trip threshold

Address	Type	Read	Write	Saved	Scale	Units	Range		Default
							Min	Max	
90	Parameter	Yes	Yes	Yes	1	°Celsius			NA

Description
This parameter corresponds to the maximum motor temperature which, if exceeded, will result in the controller issuing a fault and disabling the bridge.

Motor foldback staring temperature

Address	Type	Read	Write	Saved	Scale	Units	Range		Default
							Min	Max	
91	Parameter	Yes	Yes	Yes	1	°Celsius			NA

Description
This parameter corresponds to the temperature at which the controller begins to foldback the output current in order to prevent damage to the motor.

Motor foldback end temperature

Address	Type	Read	Write	Saved	Scale	Units	Range		Default
							Min	Max	
92	Parameter	Yes	Yes	Yes	1	°Celsius			NA

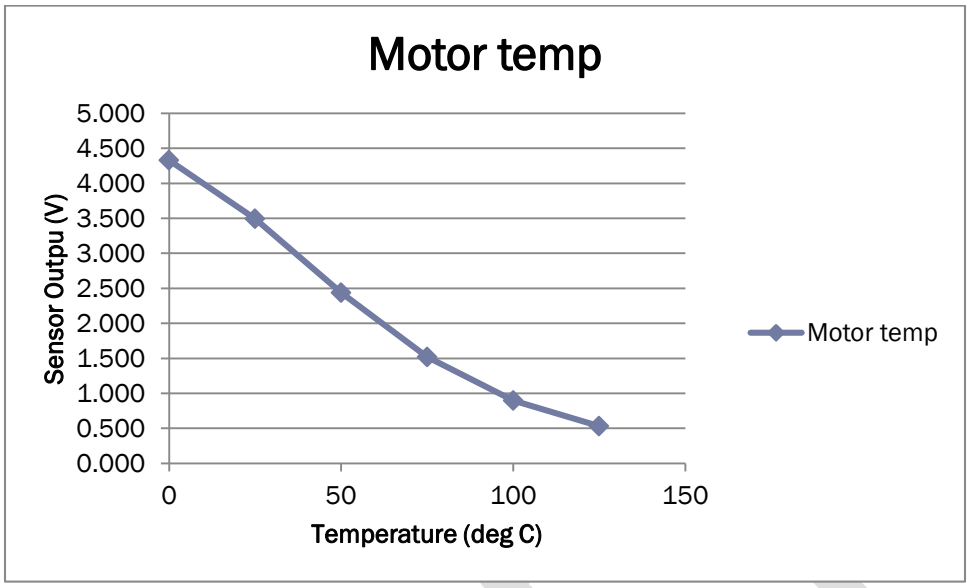
Description
This parameter corresponds to the temperature at which the controller folded back the output current to zero Amperes in order to prevent damage to the motor.

Temperature feedback V at 0 to 125 C

Address	Type	Read	Write	Saved	Scale	Units	Range		Default
							Min	Max	
93 to 98	Parameter	Yes	Yes	Yes	4096	Volts			NA

Description
This parameter corresponds to a temperature sensor's output in Volts from 0 to 125 °Celsius. The controller interpolates temperature for all voltages between these defined output voltages. If the sensor is run off of a 5 Volt supply, a typical mapping looks like the figure show below:

DRAFT



Overload continuous current

Address	Type	Read	Write	Saved	Scale	Units	Range		Default
							Min	Max	
99	Parameter	Yes	Yes	Yes	4096	Per unit			NA

Description

Overload i overload

Address	Type	Read	Write	Saved	Scale	Units	Range		Default
							Min	Max	
100	Parameter	Yes	Yes	Yes	4096	Per unit			NA

Description

Overload t overload

Address	Type	Read	Write	Saved	Scale	Units	Range		Default
							Min	Max	
101	Parameter	Yes	Yes	Yes	1	seconds			NA

Description

DRAFT

Overload i cool

Address	Type	Read	Write	Saved	Scale	Units	Range		Default
							Min	Max	
102	Parameter	Yes	Yes	Yes	4096	Per unit			NA

Description

Overload t cool

Address	Type	Read	Write	Saved	Scale	Units	Range		Default
							Min	Max	
103	Parameter	Yes	Yes	Yes	1	seconds			NA

Description

Overload foldback start

Address	Type	Read	Write	Saved	Scale	Units	Range		Default
							Min	Max	
104	Parameter	Yes	Yes	Yes	4096	Per unit			NA

Description

Overload foldback end

Address	Type	Read	Write	Saved	Scale	Units	Range		Default
							Min	Max	
105	Parameter	Yes	Yes	Yes	4096	Per unit			NA

Description

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Sensorless open loop starting current

Address	Type	Read	Write	Saved	Scale	Units	Range		Default
							Min	Max	
106	Parameter	Yes	Yes	Yes	4096	Per unit Amperes			NA

Description

This parameter corresponds to the open loop sensorless AC current injection limit with respect to *Rated motor current*.

Sensorless open loop injection current ramp time

Address	Type	Read	Write	Saved	Scale	Units	Range		Default
							Min	Max	
107	Parameter	Yes	Yes	Yes	1	milliseconds			NA

Description

This parameter defines the amount of time it takes the controller to ramp current up to *Sensorless open loop starting current*.

Sensorless closed loop enable frequency

Address	Type	Read	Write	Saved	Scale	Units	Range		Default
							Min	Max	
108	Parameter	Yes	Yes	Yes	1	Hertz			NA

Description

This parameter defines the motor electrical frequency at which the transition from open loop to closed loop sensorless control occurs.

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Sensorless open loop frequency ramp time

Address	Type	Read	Write	Saved	Scale	Units	Range		Default
							Min	Max	
109	Parameter	Yes	Yes	Yes	1	milliseconds			NA

Description

This parameter defines the amount of time it takes the injected motor current to go from DC to the *Sensorless closed loop enable frequency*.

Sensorless open loop dc current hold time

Address	Type	Read	Write	Saved	Scale	Units	Range		Default
							Min	Max	
110	Parameter	Yes	Yes	Yes	1	milliseconds			NA

Description

This parameter defines the amount of time the controller will maintain DC current in the windings at start up prior to injecting AC current.

Field weaken speed 1 to 8

Address	Type	Read	Write	Saved	Scale	Units	Range		Default
							Min	Max	
111 to 118	Parameter	Yes	Yes	Yes	40.96	% of rated rpm			NA

Description

These parameters correspond to eight field weakening speed setpoints that are mapped against eight field weakening current setpoints. The setpoints are defined as a percentage of ***Rated motor speed***. A typical mapping looks like the figure show below:

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Field weaken current 1 to 8

Address	Type	Read	Write	Saved	Scale	Units	Range		Default
							Min	Max	
119 to 126	Parameter	Yes	Yes	Yes	40.96	% of rated current			NA

Description

These parameters correspond to eight field weakening current setpoints that are mapped against eight field weakening speed setpoints. The setpoints are defined as a percentage of ***Rated motor current***.

controller status

Address	Type	Read	Write	Saved	Scale	Units	Range		Default
							Min	Max	
257	Data	Yes	No	No	Bit vector				NA

Description

This parameter defines the controller's current state machine value.

last fault

Address	Type	Read	Write	Saved	Scale	Units	Range		Default
							Min	Max	
269	Data	Yes	No	Yes	1	Bit vector			NA

Description

This parameter contains a record of the last fault that occurred on the controller

This bit vector represents the various faults that occur on the controller. If the bit value is equal to one, the last fault(s) that occurred on the controller will correspond to the appropriate bit number. The faults are defined below:

Bit #	Fault
0	Controller Over Voltage
1	Phase Over Current
2	Current Sensor Calibration
3	Current Sensor Over Current
4	Controller Temperature
5	Parameter CRC 32
6	Controller Under Voltage

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7	Bridge Open Circuit
8	Communication Timeout
9	Instantaneous Phase Current
10	Motor Temperature
11	Throttle Outside Voltage Range
12	Fast DC Over Voltage
13	Internal Error
14	Bridge Turn On Test
15	Fast DC Under Voltage

illegal Hall sector transitions

Address	Type	Read	Write	Saved	Scale	Units	Range		Default
							Min	Max	
279	Data	Yes	No	No	1	counts			NA

Description
This parameter represents the accumulated value of all illegal Hall sector transitions that have occurred.

illegal Hall state errors

Address	Type	Read	Write	Saved	Scale	Units	Range		Default
							Min	Max	
280	Data	Yes	No	No	1	counts			NA

Description
This parameter represents the accumulated value of all illegal Hall s that have occurred.

Current ISR execution time

Address	Type	Read	Write	Saved	Scale	Units	Range		Default
							Min	Max	
350	Data	Yes	No	No	60	microseconds			NA

Description
This variable indicates the amount of time in microseconds that the last interrupt service routine took to execute.

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Battery time to empty HDQ

Address	Type	Read	Write	Saved	Scale	Units	Range		Default
							Min	Max	
421	Data	Yes	No	No	1	Not defined yet			NA

Description

This variable represents the calculated battery time to empty that has been communicated to the controller from the battery management system using the HDQ protocol.

Battery average current HDQ

Address	Type	Read	Write	Saved	Scale	Units	Range		Default
							Min	Max	
422	Data	Yes	No	No	1	Not defined yet			NA

Description

This variable represents the calculated average battery current that has been communicated to the controller from the battery management system using the HDQ protocol.

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