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(54) **CONTROL STRATEGY FOR AN ELECTRIC MACHINE IN A VEHICLE**

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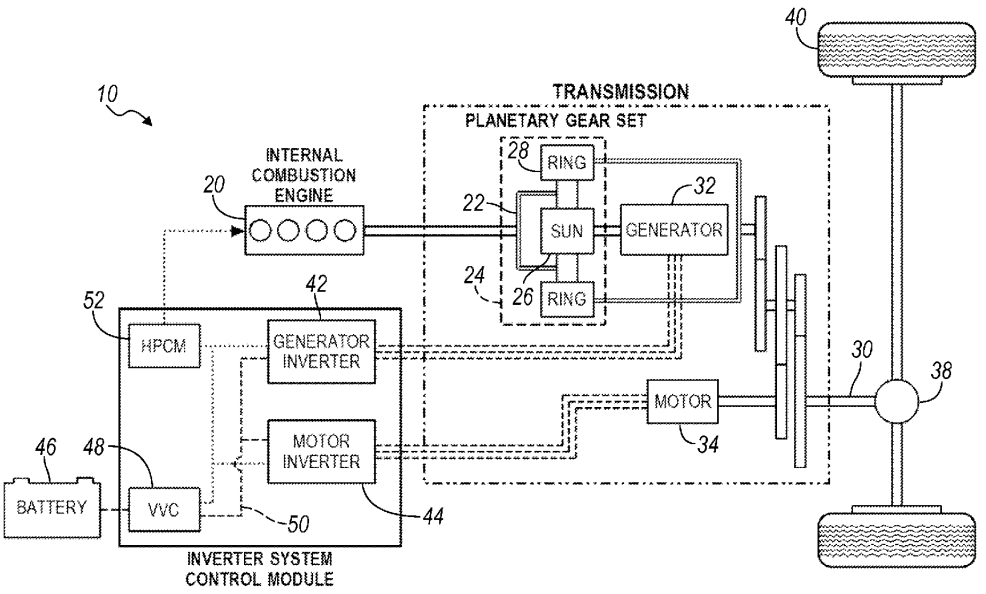
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(57) **ABSTRACT**

A vehicle is provided including an electric machine and at least one controller. The controller, or controllers, are configured to, in response to a reset of the at least one controller while a speed of the vehicle is greater than a threshold value, provide a current command to the electric machine in accordance with calibration values calculated prior to the reset such that inoperability of the electric machine due to the reset is less than one second.



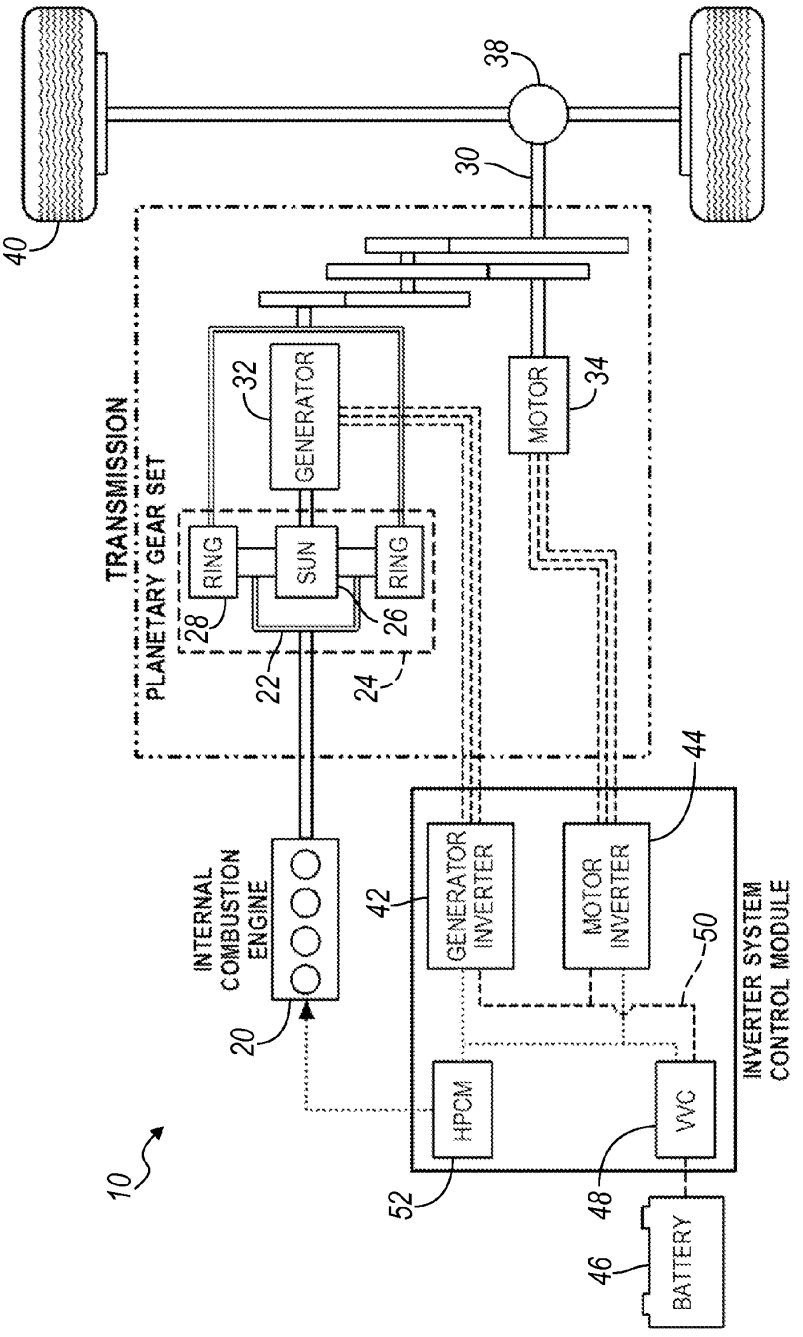

38
30
40
TRANSMISSION
PLANETARY GEAR SET
32
GENERATOR
MOTOR
34
RING
SUN
RING
28
26
22
24
INTERNAL COMBUSTION ENGINE
20
42
GENERATOR INVERTER
MOTOR INVERTER
44
50
INVERTER SYSTEM CONTROL MODULE
HPCM
VVC
52
48
46
BATTERY
10

FIG. 1

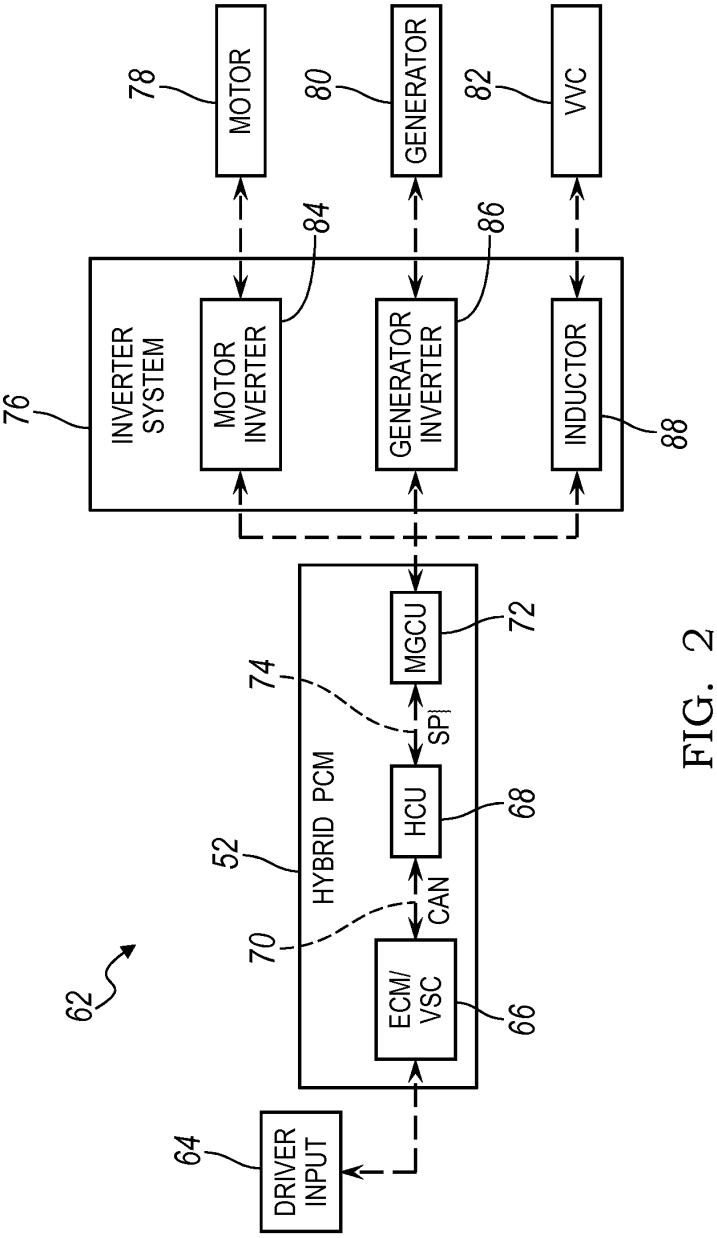

78
MOTOR
80
GENERATOR
82
VVC
84
86
76
INVERTER SYSTEM
MOTOR INVERTER
GENERATOR INVERTER
INDUCTOR
88
MGCU
72
74
SPI
HCU
68
52
HYBRID PCM
CAN
70
62
ECM/ VSC
66
64
DRIVER INPUT

FIG. 2

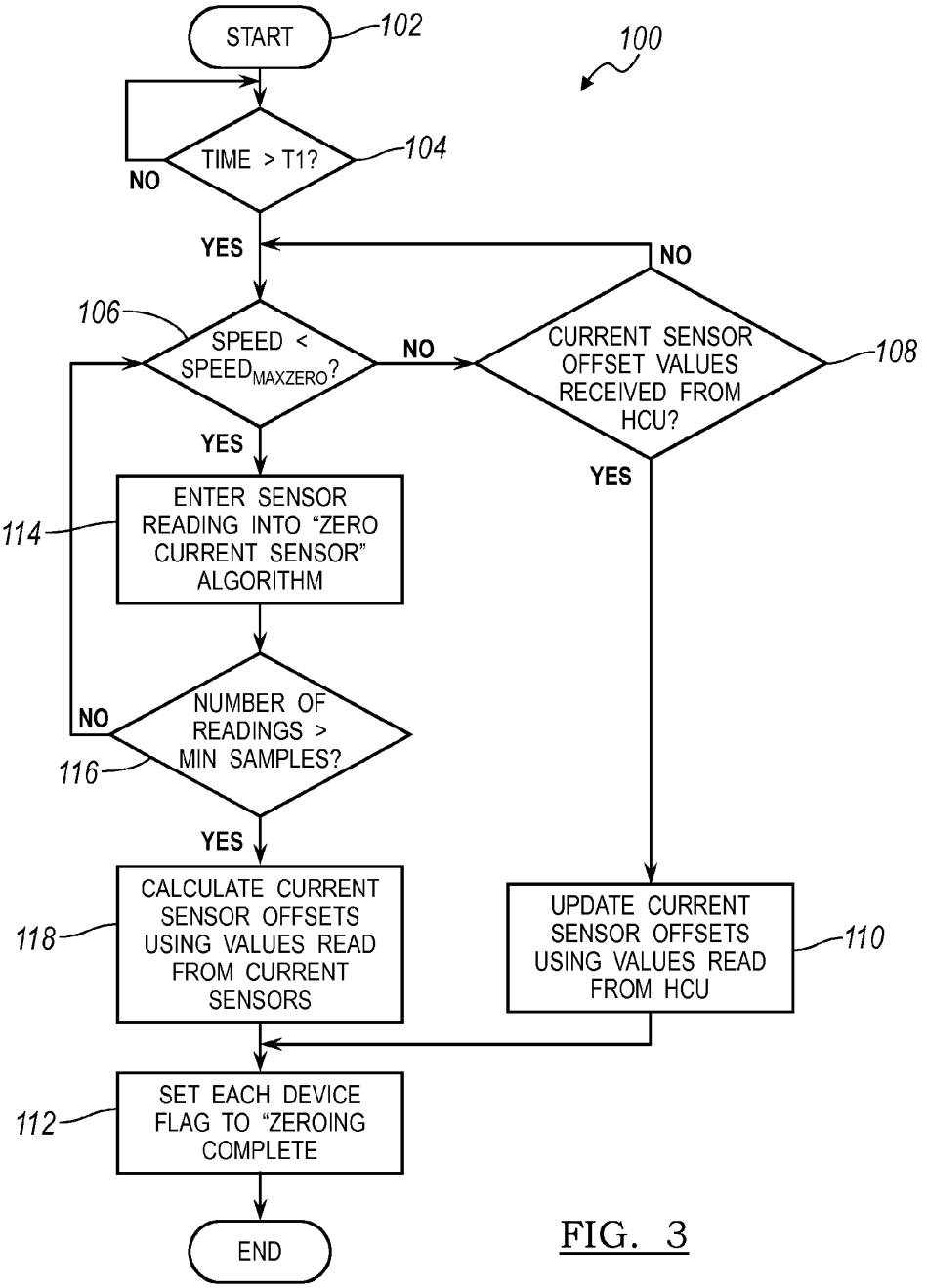

START
102
100
TIME > T1?
104
NO
YES
NO
106
SPEED < SPEED$_{MAXZERO}$?
NO
CURRENT SENSOR OFFSET VALUES RECEIVED FROM HCU?
108
YES
YES
ENTER SENSOR READING INTO "ZERO CURRENT SENSOR" ALGORITHM
114
NO
NUMBER OF READINGS > MIN SAMPLES?
116
YES
CALCULATE CURRENT SENSOR OFFSETS USING VALUES READ FROM CURRENT SENSORS
118
UPDATE CURRENT SENSOR OFFSETS USING VALUES READ FROM HCU
110
SET EACH DEVICE FLAG TO "ZEROING COMPLETE
112
END

FIG. 3

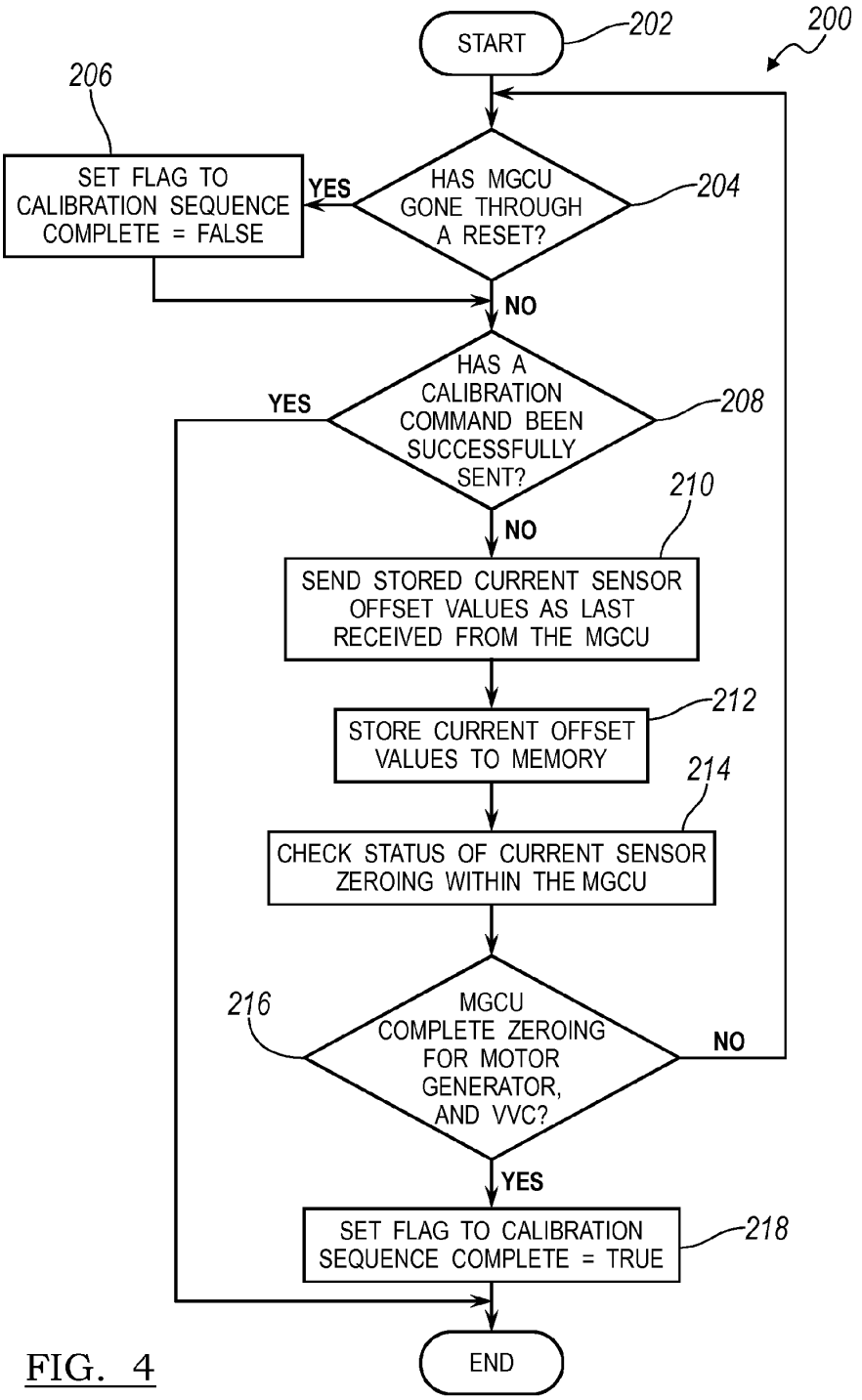

START
202
200
206
SET FLAG TO CALIBRATION SEQUENCE COMPLETE = FALSE
YES
HAS MGCU GONE THROUGH A RESET?
204
NO
HAS A CALIBRATION COMMAND BEEN SUCCESSFULLY SENT?
208
YES
NO
210
SEND STORED CURRENT SENSOR OFFSET VALUES AS LAST RECEIVED FROM THE MGCU
212
STORE CURRENT OFFSET VALUES TO MEMORY
214
CHECK STATUS OF CURRENT SENSOR ZEROING WITHIN THE MGCU
216
MGCU COMPLETE ZEROING FOR MOTOR GENERATOR, AND VVC?
NO
YES
218
SET FLAG TO CALIBRATION SEQUENCE COMPLETE = TRUE
END

FIG. 4

CONTROL STRATEGY FOR AN ELECTRIC MACHINE IN A VEHICLE

TECHNICAL FIELD

[0001] The present disclosure relates to a system for controlling an electric machine in an electric vehicle.

BACKGROUND

[0002] Battery electric vehicles (BEVs) include a traction battery that is rechargeable from an external electric power source and powers the electric machine. Hybrid electric vehicles (HEVs) include an internal combustion engine, one or more electric machines, and a traction battery that at least partially powers the electric machine. Plug-in hybrid electric vehicles (PHEVs) are similar to HEVs, but the traction battery in a PHEV is capable of recharging from an external electric power source. These vehicles are examples of vehicles that are capable of being at least partially driven by an electric machine.

[0003] These vehicles often rely on a network of microcontrollers to perform an array of tasks related to powertrain operation. Although internal microprocessors are generally reliable, they are not infallible. It is possible to have intermittent, and/or irreproducible issues that lead to an internal reset of a given controller. Internal microprocessor resets can have multiple causes. A reset can result in lost communication between the reset controller and other modules. Such a failed communication can disable the vehicle from continued operation. A failure of this sort while the vehicle is in motion, also referred to as a rolling reset, can greatly impact customer satisfaction. A strategy for a rapid recovery while the vehicle remains in a motive state is desirable.

SUMMARY

[0004] In at least one embodiment, a vehicle is provided comprising an electric machine and at least one controller. The controller(s) is configured to, in response to a reset of the at least one controller while a speed of the vehicle is greater than a threshold value, provide a current command to the electric machine in accordance with calibration values calculated prior to the reset such that inoperability of the electric machine due to the reset is less than one second.

[0005] In at least one embodiment, a vehicle powertrain control system is provided comprising an electric machine, a first controller configured to supply a torque command, and a second controller configured to generate a calibration value and to provide a current command to the electrical machine. The current command is further based on the torque command and the calibration value. Additionally, the first controller stores the calibration value and further provides the calibration value to the second controller in response to a reset of the second controller while a speed of the vehicle is greater than a threshold value. The response of the first controller is such that inoperability of the electric machine due to the reset is less than one second.

[0006] In at least one embodiment, a method for controlling torque actuation of a hybrid-electric vehicle is provided. The method comprises generating a current command signal based on a torque request, generating a calibration value indicative of a current command adjustment offset, and sending a signal to a first controller indicative of the calibration value. The method further comprises storing the calibration value in a memory of the first controller, providing the calibration value to a second controller in response to a reset of the second controller while a speed of the vehicle is above a threshold, and resuming operation of the second controller using the calibration value such that a period of inoperability of an electric machine propelling the vehicle is less than one second.

BRIEF DESCRIPTION OF THE DRAWINGS

[0007] FIG. **1** is a schematic diagram of a vehicle powertrain;

[0008] FIG. **2** is a system block diagram illustrating an example of a powertrain control system of the vehicle;

[0009] FIG. **3** is a flow chart of an algorithm implemented in the control system of the vehicle; and

[0010] FIG. **4** is a flow chart of an algorithm implemented in the control system of the vehicle.

DETAILED DESCRIPTION

[0011] Embodiments of the present disclosure are described herein. It is to be understood, however, that the disclosed embodiments are merely examples and other embodiments can take various and alternative forms. The figures are not necessarily to scale; some features could be exaggerated or minimized to show details of particular components. Therefore, specific structural and functional details disclosed herein are not to be interpreted as limiting, but merely as a representative basis for teaching one skilled in the art to variously employ the present invention. As those of ordinary skill in the art will understand, various features illustrated and described with reference to any one of the figures can be combined with features illustrated in one or more other figures to produce embodiments that are not explicitly illustrated or described. The combinations of features illustrated provide representative embodiments for typical applications. Various combinations and modifications of the features consistent with the teachings of this disclosure, however, could be desired for particular applications or implementations.

[0012] A schematic diagram of a powertrain system of a hybrid-electric vehicle **10** according to the present disclosure is illustrated in FIG. **1**. The claimed invention may however, be applied to other powertrain topology. Internal combustion engine **20** drives carrier **22** of planetary gear set **24**. The engine torque is divided by gear set **24** between sun gear **26** and ring gear **28**. The ring gear torque is mechanically transmitted to output shaft **30**. The sun gear torque is absorbed by an electric generator **32** in connection with the sun gear **26**. An electric traction motor **34** is also driveably connected to output shaft **30**. Throughout this description, the terms generator and motor are used merely as labels to identify these components. Both the generator **32** and the motor **34** are reversible electric machines capable of both converting mechanical shaft power into electrical power, and converting electrical power into mechanical shaft power. The driveshaft is driveably connected to a differential **38** which divides the power between wheels **40** while accommodating some differences in wheel speeds.

[0013] Still referring to FIG. **1**, generator **32** and motor **34** are electrically powered through inverters **42** and **44** respectively via three-phase power circuits. Electrical power connections are illustrated by dashed lines with long dashes. Inverters **42** and **44** draw power from or supply power to a DC electrical bus **50**. Electrical power stored in battery **46** is sent

through a DC-DC voltage converter to modify the vehicle voltage level according to the devices being powered. The variable voltage control (VVC) **48** converts the DC voltage level of battery **46** to the DC desired voltage level of high-voltage electrical bus **50**.

[0014] The generator **32** and motor **34** can both be referred to as electric machines. Each electric machine can operate as a generator by receiving torque from the engine **20** and supplying AC voltage to an inverter. Alternatively, the electric machine can operate as a motor whereby the electric machine receives power from the battery **46** via the inverter and provides an assistive torque actuation through the transmission to the wheels.

[0015] The vehicle **10** may be powered by the engine **20** and the generator **32**, by the battery **46** and motor **34** alone, or by a combination of the engine **20** with the battery **46** and motor **34**. In a mechanical drive mode, or a first mode of operation, the engine **20** is activated to deliver torque through the planetary gear set **24** as described above. In the mechanical drive mode, the motor **34** may also be activated to assist the engine **20** in powering the transmission.

[0016] It should be understood that while a power-split powertrain is illustrated in the vehicle **10**, the vehicle **10** can include many other configurations. As such, it is contemplated that individual components of the powertrain may differ to suit various particular applications. For example, in another configuration that does not include a planetary gear set **24**, an electric machine (motor/generator) can be provided to operate as a generator by receiving torque from the engine or regenerative braking, while the same electric machine can also operate as a motor by receiving power from the traction battery and providing torque through the transmission. Other vehicle configurations of vehicle powertrains and implementations of electric machines are contemplated, and are therefore considered to be within the scope of the present disclosure.

[0017] The battery **46** further includes a two-way electrical connection, such that it can also receive and store energy provided through regenerative braking, for example, and then supply the energy to an electric machine. Electrical energy that is generated from torque absorbed by the generator **32** can be transferred to the battery **46** through electrical connections. The battery **46** supplies stored energy to the motor **34** for operation. The motor **34** can use the energy to provide an assistive torque actuation to the engine **20**. A portion of the power delivered from the engine **20** to the generator **32** may also be transmitted directly to the motor **34**.

[0018] A hybrid powertrain control module (HPCM) **52** issues control signals to the VVC **48** specifying the desired voltage for the DC electrical bus **50**. Control signal connections are illustrated by dashed lines with short dashes. The HPCM **52** also senses voltage levels of both the battery **46** the output voltage of the VVC **48**. In response to a driver input, the HPCM **52** issues control command signals to engine **20** and inverters **42** and **44** to regulate the aggregate torque generated by the combination of the engine **20**, generator **32**, and motor **34**. The HPCM **52** further senses the actual output of inverters **42** and **44**. If the torque actually delivered by motor **34** differs significantly from the requested torque, then vehicle acceleration will not match the driver's expectation. If the torque actually delivered by generator **32** differs significantly from the requested torque, then engine speed will depart from expected behavior.

[0019] Although the vehicle powertrain system **10** is illustrated to have a HPCM, such a control system can include more or less than two controllers, as desired. For example, a separate battery control module (BCM) can directly control the battery **46**. Furthermore, a separate motor control module can be directly connected to the motor **34** and to the other controllers in the vehicle. It should be understood that all contemplated propulsion controllers in the vehicle are each characterized in the HPCM embodiment.

[0020] Electrical energy generated by generator **32** can be provided in the form of three-phase alternating currents. Similarly, the load of the traction motor **34** may also be three-phase analog alternating current. The HPCM **52** senses outputs of both the generator **32** and motor **34** as analog signals. Other sensed values are also received by the HPCM **52** in analog form. For example, the DC bus **50** voltage, the battery **46** voltage, additional vehicle on-board voltages, and a plurality of temperature sensors may all be monitored by the HPCM **52**. The analog signals indicative of vehicle operating conditions can be converted to digital signals for processing by microcontrollers within the HPCM **52**. Microcontrollers are often equipped with a limited number of analog to digital converters (ADC's). Additionally, command signals for the motor and generator are generated in a digital form from the HPCM **52**. In order to control the motor **34**, the generator **32** and the VVC **48**, the ADC's must be ready to convert the sensed analog current signals associated with each of the motor and generator, as well as sensed voltage associated with the VVC **48**. In response to the monitored values, the HPCM **52** issues command signals to the motor inverter **44**, the generator inverter **42** and the VVC **48** all at a predetermined cadence. The plurality of required conversions and data acquisitions may all be managed using a single microcontroller.

[0021] Referring to FIG. **2**, a block diagram illustrating an embodiment of a powertrain control system **62** within the vehicle **10** is shown. A driver inputs a request **64**, such as by pressing the accelerator to input an acceleration request. The driver requests **64** are received by an engine control module/vehicle system controller, or ECM/VSC **66**. The ECM/VSC **66** processes these driver requests **64** and communicates commands throughout the vehicle **10**. The ECM/VSC **66** is electrically connected to various subsystems in the vehicle **10** and acts as an overall control of the vehicle **10**. For example, the ECM/VSC **66** is connected to the hybrid HPCM **52** that controls the hybrid-specific components in the vehicle **10**, such as the motor **78**, the generator **80**, the VVC **48**, and/or the battery **46**.

[0022] The HPCM **52** can include a combination of internal microcontrollers having different functions. In at least one embodiment, a dedicated hybrid control unit (HCU) **68** is included to receive torque commands from the ECM/VSC **66** via a vehicle CAN BUS **70**. The HPCM **52** further includes a motor/generator control unit (MGCU) **72**. The HCU **68** is communicatively connected to the MGCU **72** via a serial peripheral interface (SPI) **74** link. The HCU **68** provides torque request signals to the MGCU **72** through the SPI **74**. In response, the MGCU **72** provides current command signals to an inverter system **76** that regulates current provided to each of the motor **78** and generator **80**. The command signals can comprise modulated pulse widths, or PWM, in order to employ digital control logic to create an analog equivalence. The inverter system **76** further regulates the VVC **82** to cause

an adjustment in the voltage supplied between the vehicle battery and each of the motor **78** and generator **80**.

[0023] The HPCM **52** can also be communicatively connected to other control units such as an engine control unit, or ECU, such that the HCU **68** commands the ECU to control the engine **20** in various manners. In another embodiment, a separate control unit is provided for each of the motor **78** and the generator **80**. Further, a battery control module (BCM) may also be included to receive commands from the HCU **68** and control the power distribution of the **46** battery. As illustrated in FIG. **2**, motor inverter **84** and generator inverter **86** are controlled by, and communicatively connected to the MGCU **72**. The motor inverter **84** and generator inverter **86** receive commands from the MGCU **72**, and open and close internal switches to enable and disable power flow to and from the electric machines.

[0024] The VVC **82** is also communicatively connected to and controlled by the MGCU **72**. The MGCU **72** controls the inductor **88** such that the VVC **82** modifies voltage supplied to both of the motor **78** and generator **80**. Specifically, the VVC **82** is used to boost the battery **46** voltage to a higher level voltage in a HEV drivetrain system for multi-purposes such as, but not limited to, torque capability optimizations for electric machines, system loss optimization, and so on.

[0025] Although a hierarchy of controllers is thus provided in the illustration shown in FIG. **2**, other hierarchies of controllers are contemplated without deviating from the scope of the present disclosure. For example, the ECM/VSC **66** may directly communicate with the MGCU **72** without the presence of an HCU **68**. Other configurations are contemplated that would be beneficial for different particular vehicles. The ECM/VSC **66** controls each of the servient controllers, according to requested torque and power demands. More or less controllers than those described herein are contemplated, and one or more of these controllers can communicatively cooperate to accomplish certain tasks. Any and all of these controllers or combination thereof can simply be referred to as a "controller".

[0026] Related to the required precision of provided electric current levels, the vehicle can be configured to undergo schedule calibration procedures upon a power up. In at least one embodiment, a plurality of current sensors are zeroed such that offset values are added to sensor readings to account for trace current present in the electric system, vehicle external conditions affecting current readings, or other sources of sensor drift. Each of the three-phase source current connections for both the motor and the generator undergo a zeroing process on vehicle startup. As a result of this process, the MGCU **72** generates calibration values, or current sensor offsets, which are associated with each of the source current connections. The MGCU **72** in turn generates current commands which are adjusted based on the current sensor offset values. Additionally, the VVC **82** undergoes a similar self-test scheduled to occur at power up events. In further embodiments, a plurality of diagnostic signal assessments may be conducted to verify the integrity of the electrical system. For example, a pulse test performed precedent to providing current commands can be used to verify high voltage connectivity throughout the system.

[0027] The MGCU **72** is generally configured to undergo scheduled power up procedures after a reset. However, sensor calibration while active current is flowing through the electrical network would be ineffective, and further may disable the powertrain. In at least one embodiment, a recovery strategy is included for the HPCM **52** to rapidly recover from a rolling reset event. This prevents complete shutdown of the vehicle **10**, which can be undesirable to drivers. The MGCU **72** is configured to provide the calibration values to the HCU **68** after each determination. The HCU **68** stores the values in a memory. The HCU **68** is configured to sense the cause of a reset. For example, the HCU **68** can recognize an internal controller reset versus a customer-induced reset. In response to sensing an internal reset of the MGCU **72** while the vehicle is above a predetermined speed threshold, the HCU **68** provides the previously stored calibration values to the MCGU **72**. In this way, the MCGU **72** is configured to bypass predetermined power up procedures and accept stored values that are provided from the HCU **68**. The MCGU **72** in turn resumes operation in accordance with the calibration values identified prior to the reset. This strategy allows for inoperability of the electric machine as a result of a reset of the MGCU **72** during vehicle movement to be minimized. Ideally, the effect of the rolling reset is imperceptible to a driver and torque commands are supplied in a substantially immediate fashion. For example, in at least one embodiment the electric machine has a period of inoperability in the general range of 200 to 300 milliseconds following a reset.

[0028] FIG. **3** depicts a flow chart of a controller recovery method, generally indicated by reference numeral **100**. The algorithm shows the recovery process of a slave controller, for example the MGCU, after a rolling reset. The algorithm initiates at step **102**. The controller is configured to make assessments at time interval T1. Therefore if the elapsed time is greater than T1 at step 104, the controller proceeds to the next step and considers the vehicle speed. If the elapsed time is less than T1 at step **104**, the controller holds until the elapsed time reaches T1.

[0029] The controller senses vehicle speed at step **106**. If the vehicle speed is above a threshold, indicated by $Speed_{MAXZERO}$, then the controller does not attempt to recalibrate current sensors to obtain new offset values. The maximum speed threshold may be set to a sensed value of the rotation of the motor resolver at, for example, 10 rpm. The threshold can be set to low value to ensure that the speed is sufficiently low before attempting a current sensor calibration. The controller then advances to step **108** to assess whether current sensor offset values have been provided by the HCU. If no offset values have been received, the controller returns to step **106** to reassess vehicle speed. This loop would continue with the MGCU disabled until either offsets were provided by the HCU, or the vehicle speed was low enough to perform a zeroing calibration of the current sensors.

[0030] If the current offset values have been received from the HCU at step **108**, the controller updates current sensor offset values at step **110** using those values provided by the HCU. The controller proceeds to step **112** and sets an internal flag to "zeroing complete" for each device that corresponding offset values were received. This flag provides an indication to the master controller HCU that the MGCU is ready to provide current commands to each of the motor and generator, and/or voltage commands to the VVC.

[0031] If the vehicle speed is below the threshold, indicated by $Speed_{MAXZERO}$, at step **106** then the controller enters a process to zero the current sensors. The controller takes current readings at step **114** for each of the sensors to be calibrated. The mode includes collecting an adequate number of sample readings to generate current offset values with a confidence of no false readings or anomalies. The controller

assesses at step **116** whether the required minimum number of sample current sensor readings has been supplied in order for the calculation algorithm to determine new offset values. If less than the required number of readings has been acquired, the controller returns to step **106** to reassess vehicle speed to ensure it is appropriate to continue gathering more calibration readings.

[0032] If at step **116** the required number of readings has been acquired, the controller calculates at step **118** new current sensor offset values based on the readings. The controller proceeds to step **112** and sets an internal flag to "zeroing complete" for each device that corresponding offset values were received. Again, this flag notifies the HCU that the MGCU is in an operational state to provide appropriate current commands to the electric machine.

[0033] FIG. **4** depicts a recovery method flowchart according to a master controller, for example the HCU, which is indicated generally by reference numeral **200**. The controller begins the recovery procedure at step **202**. The controller first determines at step **204** whether the slave controller, for example the MGCU, has undergone a reset. If the slave controller has gone through a reset at step **204**, the master controller sets an internal calibration sequence complete flag to "false" in step **206**, indicating that sensor calibration is required. The controller assesses at step **208** whether a prior successful sensor calibration command has been sent to the slave controller. If a prior command has been sent, the recovery sequence **200** is complete from the perspective of the master controller.

[0034] If at step **208** no prior successful calibration sequence is indicated, the master controller sends previously stored current sensor offset values to the slave controller. These values may have been stored to memory upon receipt from a prior calculation performed by the slave controller. The controller then stores the current offset values to memory as up to date values. The values may carry a new time stamp.

[0035] The master controller then checks the status of current sensor zeroing of the slave controller at step **214**. The master controller assesses the zeroing status at step **216**. If the zeroing is complete within the slave controller at step **216**, the master controller sets the calibration sequence complete flag to "true" in step **218**. This flag can serve to indicate that a calibration sequence is no longer required, and authorize further torque commands. If the current sensor zeroing is not complete at step **216**, the master controller returns to step **204** to re-attempt the recovery sequence.

[0036] In the above embodiments, the master controller recognizes a reset of the slave controller, and in response, provides sensor calibration values. It is contemplated that alternative embodiments may include the slave controller providing an active request to the master controller for previously stored current sensor offset values in response to a reset.

[0037] The processes, methods, or algorithms disclosed herein can be deliverable to/implemented by a processing device, controller, or computer, which can include any existing programmable electronic control unit or dedicated electronic control unit. Similarly, the processes, methods, or algorithms can be stored as data and instructions executable by a controller or computer in many forms including, but not limited to, information permanently stored on non-writable storage media such as ROM devices and information alterably stored on writeable storage media such as floppy disks, magnetic tapes, CDs, RAM devices, and other magnetic and optical media. The processes, methods, or algorithms can also be implemented in a software executable object. Alternatively, the processes, methods, or algorithms can be embodied in whole or in part using suitable hardware components, such as Application Specific Integrated Circuits (ASICs), Field-Programmable Gate Arrays (FPGAs), state machines, controllers or other hardware components or devices, or a combination of hardware, software and firmware components.

[0038] While exemplary embodiments are described above, it is not intended that these embodiments describe all possible forms encompassed by the claims. The words used in the specification are words of description rather than limitation, and it is understood that various changes can be made without departing from the spirit and scope of the disclosure. As previously described, the features of various embodiments can be combined to form further embodiments of the invention that may not be explicitly described or illustrated. While various embodiments could have been described as providing advantages or being preferred over other embodiments or prior art implementations with respect to one or more desired characteristics, those of ordinary skill in the art recognize that one or more features or characteristics can be compromised to achieve desired overall system attributes, which depend on the specific application and implementation. These attributes can include, but are not limited to cost, strength, durability, life cycle cost, marketability, appearance, packaging, size, serviceability, weight, manufacturability, ease of assembly, etc. As such, embodiments described as less desirable than other embodiments or prior art implementations with respect to one or more characteristics are not outside the scope of the disclosure and can be desirable for particular applications.

What is claimed is:

1. A vehicle comprising:

an electric machine; and

at least one controller configured to, in response to a reset of the at least one controller while a speed of the vehicle is greater than a threshold value, provide a current command to the electric machine in accordance with calibration values calculated prior to the reset such that inoperability of the electric machine due to the reset is less than one second.

2. The vehicle of claim **1** wherein the at least one controller is further configured to, in response to a reset of the at least one controller while a speed of the vehicle is greater than a threshold value, provide a current command to the electric machine in accordance with calibration values identified prior to the reset such that inoperability of the electric machine due to the reset is less than 300 milliseconds.

3. The vehicle of claim **1** wherein the at least one controller is further configured to, after the reset, request calibration values from a master controller.

4. The vehicle of claim **1** wherein the calibration values are indicative of at least one electric machine source current offset value corresponding to an adjustment of the current command.

5. The vehicle of claim **1** wherein the at least one controller is further configured to perform a predetermined power up procedure and to calculate new calibration values once the vehicle is restarted following a power down and the speed of the vehicle is less than threshold value.

6. The vehicle of claim **5** wherein the predetermined power up procedure includes a diagnostic signal assessment precedent providing a current command to the electric machine.

7. The vehicle of claim **1** further comprising a master controller configured to sense a reset of the at least one controller and provide the calibration value to the at least one controller such that the controller resumes the provision of the current command.

8. A vehicle powertrain control system comprising:

an electric machine;

a first controller configured to supply a torque command; and

a second controller configured to generate a calibration value and to provide a current command to the electric machine based on the torque command and the calibration value, wherein the first controller is further configured to store the calibration value and provide the calibration value to the second controller in response to a reset of the second controller while a speed of the vehicle is greater than a threshold value such that inoperability of the electric machine due to the reset is less than one second.

9. The control system of claim **8** wherein the second controller is further configured to retrieve the calibration value from the first controller in response to a reset of the second controller while a speed of the vehicle is greater than a threshold value such that inoperability of the electric machine due to the reset is less than 300 milliseconds.

10. The control system of claim **8** wherein the calibration value is indicative of an electric machine source current sensor offset value indicative of an adjustment of the current command.

11. The control system of claim **8** wherein the second controller is further configured to, in response to a reset, request the calibration value from the first controller.

12. The control system of claim **8** wherein the second controller is further configured to undergo a predetermined power up sequence and identify new calibration values once the vehicle is restarted following a power down and the speed of the vehicle is less than the threshold value.

13. A method for controlling torque actuation of a hybrid-electric vehicle, the method comprising:

generating a current command signal based on a torque request;

generating a calibration value indicative of a current command adjustment offset;

sending a signal to a first controller indicative of the calibration value;

storing the calibration value in a memory of the first controller;

providing the calibration value to a second controller in response to a reset of the second controller while a speed of the vehicle is above a threshold; and

resuming operation of the second controller using the calibration value such that a period of inoperability of an electric machine propelling the vehicle is less than one second.

14. The method of claim **13** wherein the calibration value is generated by the second controller.

15. The method of claim **13** further comprising sending a current command to the electric machine, wherein the current command is based on the calibration value.

16. The method of claim **13** further comprising providing a request signal to the first controller in response to a reset of the second controller while the vehicle is in motion such that the first controller provides the calibration value to the second controller.

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