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United States Patent Application Publication	20250264064
Kind Code	A1
Publication Date	August 21, 2025
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Throttle Control System

Abstract

A throttle control system and methods are disclosed that provide a driver of a vehicle with greater control over engine functions and vehicle performance. The throttle control system processes input signals from a throttle pedal of the vehicle and sends modified throttle position signals to a throttle body of the vehicle so as to increase throttle responsiveness of the vehicle. The throttle control system includes a control module, a wiring harness, and a signal adjuster. The wiring harness electrically couples the control module with the throttle pedal and the throttle body. The control module sends signals directly to the throttle body of the engine, bypassing an electronic control unit of the vehicle. The signal adjuster includes a rheostat that enables manual adjustment of the throttle responsiveness of the vehicle. A control dial coupled with the rheostat facilitates hand operation of the rheostat.

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Appl. No.:	**19/197790**
Filed:	**May 02, 2025**

Related U.S. Application Data

parent US continuation 16656513 20191017 parent-grant-document US 12297783 child US 19197790
us-provisional-application US 62751351 20181026

Publication Classification

Int. Cl.: **F02D11/10** (20060101); **B60R16/02** (20060101); **F02D11/02** (20060101)

U.S. Cl.:

CPC **F02D11/105** (20130101); **F02D11/106** (20130101); B60R16/0207 (20130101); F02D11/02 (20130101); F02D2011/102 (20130101); F02D2200/0404 (20130101); F02D2200/602 (20130101)

Background/Summary

PRIORITY [0001] This application claims the benefit of and priority to U.S. patent application Ser. No. 16/656,513 filed on Oct. 17, 2019 and U.S. Provisional Application, entitled “Throttle Control System,” filed on Oct. 26, 2018 and having application Ser. No. 62/751,351, the entirety of said application being incorporated herein by reference.

FIELD

[0002] Embodiments of the present disclosure generally relate to the field of vehicle control systems. More specifically, embodiments of the disclosure relate to a throttle control system and methods that provide greater control over electronic throttle control functions.

BACKGROUND

[0003] Electronic throttle control (ETC) generally is an automobile technology that electronically couples an accelerator pedal to a throttle, thereby replacing a mechanical linkage. A typical ETC system includes an accelerator pedal module with two or more independent sensors, an electronic throttle body (ETB), and an engine control module (ECM). The ECM is a type of electronic control unit (ECU) configured to determine required throttle positions through calculations based on data measured by various sensors, such as accelerator pedal position sensors, an engine speed sensor, a vehicle speed sensor, and cruise control switches. The ETB is then opened and closed by way of a closed-loop control algorithm within the ECM.

[0004] A drawback to many ETC implementations is that they may overrule some driver decisions, such as delaying an amount of acceleration a driver desires from a vehicle. In some instances, the delayed acceleration is perceived as an undesirable power lag or a “flat spot” in the acceleration curve of the vehicle. As such, there is a continuing desire to provide ETC systems that are capable of providing drivers with greater control over ETC functions and vehicle performance.

SUMMARY

[0005] A system and methods are provided for a throttle control system configured to provide a driver of a vehicle with greater control over engine functions and vehicle performance. The throttle control system is configured to process input signals from a throttle pedal of the vehicle and send modified throttle position signals to a throttle body of the vehicle so as to increase throttle responsiveness of the vehicle. In an embodiment, the throttle control system includes a control module, a wiring harness, and a signal adjuster. The wiring harness is configured to electrically couple the control module with the throttle pedal and the throttle body. The control module is configured to send signals directly to the throttle body of the engine, thereby bypassing an electronic control unit of the vehicle. The signal adjuster includes a rheostat that is configured to enable manual adjustment of the throttle responsiveness of the vehicle. A control dial coupled with the rheostat is configured to facilitate hand operation of the rheostat.

[0006] In an exemplary embodiment, a throttle control system for providing a driver of a vehicle with greater control over engine performance comprises: a control module for sending signals directly to a throttle body of the engine; a wiring harness for electrically coupling the control module with a throttle pedal and the throttle body; and a signal adjuster for enabling manual adjustment of throttle responsiveness of the vehicle.

[0007] In another exemplary embodiment, the control module is configured to create an increase in throttle responsiveness of the vehicle. In another exemplary embodiment, the control module is configured to bypass signals sent to the throttle body by an electronic control unit of the vehicle. In another exemplary embodiment, the control module is comprised of one or more microprocessors that can process input signals received from the throttle pedal. In another exemplary embodiment, the control module comprises an internal lookup table whereby throttle pedal positions may be evaluated against throttle position sensor readings received by way of the wiring harness.

[0008] In another exemplary embodiment, the control module includes a rigid enclosure and an input socket. In another exemplary embodiment, the input socket is configured to receive a signal connector comprising the wiring harness so as to couple the control module with the throttle pedal and the throttle body. In another exemplary embodiment, the rigid enclosure is configured to withstand an environment encountered within an engine compartment of the vehicle.

[0009] In another exemplary embodiment, the wiring harness includes a cable, a pedal connector, a throttle position sensor connector, a signal connector, and a controller socket. In another exemplary embodiment, the cable includes an exterior sheath configured to protect the cable from potential damage due to nearby components comprising the vehicle. In another exemplary embodiment, the pedal connector is configured to be coupled directly with the throttle pedal. In another exemplary embodiment, the throttle position sensor connector is configured to be coupled with a wiring harness that was originally coupled with the throttle pedal. In another exemplary embodiment, the signal connector is configured to be plugged into an input socket of the control module. In another exemplary embodiment, the controller socket is configured to be coupled with the signal adjuster.

[0010] In another exemplary embodiment, the signal adjuster comprises a cable that extends from a controller connector to a rheostat. In another exemplary embodiment, the cable includes an exterior sheath configured to protect the cable from potential damage due to nearby components comprising the vehicle. In another exemplary embodiment, the controller connector is configured to be plugged into a controller socket comprising the wiring harness. In another exemplary embodiment, the rheostat is configured to enable manual adjustment of a throttle signal being communicated to the throttle body. In another exemplary embodiment, the signal adjuster includes a control dial configured to be coupled with the rheostat to facilitate hand operation of the rheostat.

[0011] In an exemplary embodiment, a method for a throttle control system to provide greater control over engine performance of a vehicle comprises: configuring a control module to interpret signals received from a throttle pedal and send corresponding signals to a throttle body of the engine; fabricating a wiring harness for electrically coupling the control module with the throttle pedal and the throttle body; and coupling a signal adjuster with a controller socket comprising the wiring harness for enabling manual adjustment of engine performance.

[0012] In another exemplary embodiment, configuring includes incorporating one or more microprocessors that can process input signals received from the throttle pedal. In another exemplary embodiment, configuring includes providing an internal lookup table whereby throttle pedal positions may be evaluated against throttle position sensor readings. In another exemplary embodiment, fabricating includes configuring the wiring harness to be coupled directly with the throttle pedal and a throttle position sensor that was originally coupled with the throttle pedal. In another exemplary embodiment, coupling the signal adjuster includes coupling a control dial whereby throttle signals communicated to the throttle body may be manipulated by hand.

Description

BRIEF DESCRIPTION OF THE DRAWINGS

[0013] The drawings refer to embodiments of the present disclosure in which:

[0014] FIG. **1** illustrates an exemplary embodiment of a throttle control system configured to provide a driver of a vehicle with greater control over ETC functions and vehicle performance;
[0015] FIG. **2** illustrates an exemplary embodiment of a control module configured to create an increase in throttle responsiveness of a vehicle;
[0016] FIG. **3** illustrates an exemplary embodiment of a wiring harness configured to electrically couple the control module of FIG. **2** with a throttle pedal and a throttle body of the vehicle;
[0017] FIG. **4** illustrates an exemplary embodiment of a signal adjuster configured to facilitate manual adjustment of throttle responsiveness of the vehicle;
[0018] FIG. **5** is a graph illustrating a throttle position sensor signal as a function of throttle pedal position percentage; and
[0019] FIG. **6** is a block diagram illustrating an exemplary data processing system that may be used with a throttle control system according to the present disclosure.
[0020] While the present disclosure is subject to various modifications and alternative forms, specific embodiments thereof have been shown by way of example in the drawings and will herein be described in detail. The invention should be understood to not be limited to the particular forms disclosed, but on the contrary, the intention is to cover all modifications, equivalents, and alternatives falling within the spirit and scope of the present disclosure.

DETAILED DESCRIPTION

[0021] In the following description, numerous specific details are set forth in order to provide a thorough understanding of the present disclosure. It will be apparent, however, to one of ordinary skill in the art that the invention disclosed herein may be practiced without these specific details. In other instances, specific numeric references such as "first module," may be made. However, the specific numeric reference should not be interpreted as a literal sequential order but rather interpreted that the "first module" is different than a "second module." Thus, the specific details set forth are merely exemplary. The specific details may be varied from and still be contemplated to be within the spirit and scope of the present disclosure. The term "coupled" is defined as meaning connected either directly to the component or indirectly to the component through another component. Further, as used herein, the terms "about," "approximately," or "substantially" for any numerical values or ranges indicate a suitable dimensional tolerance that allows the part or collection of components to function for its intended purpose as described herein.
[0022] Electronic throttle control (ETC) generally is an automobile technology that electronically couples an accelerator pedal to a throttle, thereby replacing a mechanical linkage. A drawback to many ETC implementations is that they may overrule some driver decisions, such as delaying an amount of acceleration a driver desires from a vehicle. In some instances, the delayed acceleration is perceived as an undesirable power lag or a "flat spot" in the acceleration curve of the vehicle. Embodiments disclosed herein provide ETC systems that are capable of providing drivers with greater control over ETC functions and vehicle performance.
[0023] FIG. **1** illustrates an exemplary embodiment of a throttle control system **100** that is configured to provide a driver of a vehicle with greater control over ETC functions and vehicle performance. The throttle control system **100** includes a control module **104**, a wiring harness **108**, and a signal adjuster **112**. The throttle control system **100** generally is configured to process input signals from a throttle pedal **52** of the vehicle and sends modified throttle position signals to a throttle body **56** of the vehicle that increase the throttle responsiveness of the vehicle. It is contemplated that the throttle control system **100** is configured to provide a plug and play installation without requiring a practitioner to modify or fabricate components. The components comprising the throttle control system **100** are discussed in greater detail herein.
[0024] FIG. **2** illustrates an exemplary embodiment of a control module **104** configured to create an increase in throttle responsiveness of a vehicle. The control module **104** generally is configured to bypass the factory signal to the ECU and send a modified signal directly to the throttle body **56** to create an increase in throttle responsiveness and acceleration. The control module **104** may be

comprised of one or more microprocessors that can process input signals received from throttle pedal **52** of the vehicle. As will be appreciated, the control module **104** may include hardware comprising electronic components on a printed circuit board (PCB), ceramic substrate or a thin laminate substrate, and include a micro controller chip (CPU). Software may be stored in the microcontroller or other chips on the PCB, such as EPROMs or flash memory, so that the CPU can be re-programmed by uploading updated code or replacing chips. The control module **104** preferably has a fixed programming, such as an internal lookup table whereby throttle pedal **52** positions may be evaluated against throttle position sensor readings received by way of the wiring harness **108**.

[0025] As shown in FIG. **2**, the control module **104** includes a rigid enclosure **116** and an input socket **120**. The input socket **120** is configured to receive a signal connector comprising the wiring harness **108**, as discussed herein. The input socket **120** facilitates coupling the control module **104** with the throttle pedal **52** and the throttle body **56** of the vehicle, as well as coupling the control module **104** with the ECU of the vehicle. Further, it is contemplated that the rigid enclosure **116** is configured to withstand the environment encountered within an engine compartment of the vehicle for the purpose of protecting the internal circuitry of the control module **104**.

[0026] FIG. **3** illustrates an exemplary embodiment of a wiring harness **108** configured to electrically couple the control module **104** with a throttle pedal **52** and a throttle body **56** of the vehicle. The wiring harness **108** generally includes a cable **124**, a pedal connector **128**, a throttle position sensor (TPS) connector **132**, a signal connector **136**, and a controller socket **140**. As will be recognized, the cable **124** includes an exterior sheath configured to protect the cable **124** from potential damage due to nearby components comprising the vehicle. The pedal connector **128** is configured to be coupled directly with the throttle pedal of the vehicle, while the TPS connector **132** is configured to be coupled with the wiring harness that was originally coupled with the throttle pedal **56** (see FIG. **1**). The signal connector **136** is configured to be plugged into the input socket **120** of the control module **104**. Thus, the wiring harness **108** and the control module **104** effectively provide direct communication between the throttle pedal **52** and the throttle body **56**, bypassing the ECU of the vehicle. The controller socket **140** is configured to be coupled with the signal adjuster **112** to facilitate the driver manually adjusting the signals being passed to the throttle body **56**, as described herein. It is contemplated that, in some embodiments, the signal adjuster **112** may be omitted from the throttle control system **100**, thereby providing a fully automated adjustment of throttle responsiveness of the vehicle.

[0027] FIG. **4** illustrates an exemplary embodiment of a signal adjuster **112** configured to facilitate manual adjustment of throttle responsiveness of the vehicle. The signal adjuster **112** comprises a cable **144** that extends from a controller connector **148** to a rheostat **152**. In the illustrated embodiment of FIG. **4**, the cable **144** includes an exterior sheath configured to protect the cable **144** from potential damage due to nearby components comprising the vehicle. The controller connector **148** is configured to be plugged into the controller socket **140** comprising the wiring harness **108**. The rheostat **152** is configured to enable a practitioner, such as the driver, to manually adjust the throttle signal being communicated to the throttle body **56** of the vehicle. The signal adjuster **112** includes a control dial **156** configured to be coupled with the rheostat **152** to facilitate hand operation of the rheostat **152**. It is contemplated that the practitioner may mount the rheostat **152** and the control dial **156** in an advantageous location within the passenger cabin of the vehicle, such as a dashboard, and then route the cable **144** to the wiring harness **108**. The practitioner may then plug the controller connector **148** into the controller socket **140** to place the rheostat **152** into electrical communication with the control module **104**.

[0028] FIG. **5** is a graph **160** illustrating a throttle position sensor signal as a function of throttle pedal position percentage. The data plotted in the graph **160** are based on experimental observations before and after installation of the throttle control system **100** into a test vehicle. As indicated in the graph **160**, the throttle control system **100** outputs a signal showing more acceleration than would be provided in absence of the system **100**. Further, graph **160** shows that when the acceleration requested by the driver levels off, the throttle control system **100** outputs a constant pedal position. Graph **160** shows, therefore, that the throttle control system **100** provides a desirable increase in throttle responsiveness and acceleration as compared with the performance provided by the factory ECU.

[0029] FIG. **6** is a block diagram illustrating an exemplary data processing system **600** that may be used with an adjustable throttle control system, such as the throttle control system **100** to perform any of the processes or methods described herein. System **600** may represent a desktop, a tablet, a server, a mobile phone, a media player, a personal digital assistant (PDA), a personal communicator, a network router or hub, a wireless access point (AP) or repeater, a set-top box, or a combination thereof.

[0030] In an embodiment, illustrated in FIG. **6**, system **600** includes a processor **624** and a peripheral interface **628**, also referred to as a chipset, to couple various components to the processor **624**, including a memory **632** and devices **636-648** by way of a bus or an interconnect. Processor **624** may represent a single processor or multiple processors with a single processor core or multiple processor cores included therein. Processor **624** may represent one or more general-purpose processors such as a microprocessor, a central processing unit (CPU), and the like. More particularly, processor **624** may be a complex instruction set computing (CISC) microprocessor, reduced instruction set computing (RISC) microprocessor, very long instruction word (VLIW) microprocessor, or processor implementing other instruction sets, or processors implementing a combination of instruction sets. Processor **624** may also be one or more special-purpose processors such as an application specific integrated circuit (ASIC), a field programmable gate array (FPGA), a digital signal processor (DSP), a network processor, a graphics processor, a network processor, a communications processor, a cryptographic processor, a co-processor, an embedded processor, or any other type of logic capable of processing instructions. Processor **624** is configured to execute instructions for performing the operations and steps discussed herein.

[0031] Peripheral interface **628** may include a memory control hub (MCH) and an input output control hub (ICH). Peripheral interface **628** may include a memory controller (not shown) that communicates with a memory **632**. The peripheral interface **628** may also include a graphics interface that communicates with graphics subsystem **634**, which may include a display controller and/or a display device. The peripheral interface **628** may communicate with the graphics device **634** by way of an accelerated graphics port (AGP), a peripheral component interconnect (PCI) express bus, or any other type of interconnects.

[0032] An MCH is sometimes referred to as a Northbridge, and an ICH is sometimes referred to as a Southbridge. As used herein, the terms MCH, ICH, Northbridge and Southbridge are intended to be interpreted broadly to cover various chips that perform functions including passing interrupt signals toward a processor. In some embodiments, the MCH may be integrated with the processor **624**. In such a configuration, the peripheral interface **628** operates as an interface chip performing some functions of the MCH and ICH. Furthermore, a graphics accelerator may be integrated within the MCH or the processor **624**.

[0033] Memory **632** may include one or more volatile storage (or memory) devices, such as random access memory (RAM), dynamic RAM (DRAM), synchronous DRAM (SDRAM), static RAM (SRAM), or other types of storage devices. Memory **632** may store information including sequences of instructions that are executed by the processor **624**, or any other device. For example, executable code and/or data of a variety of operating systems, device drivers, firmware (e.g., input output basic system or BIOS), and/or applications can be loaded in memory **632** and executed by the processor **624**. An operating system can be any kind of operating systems, such as, for example, Windows® operating system from Microsoft®, Mac OS®/iOS® from Apple, Android® from Google®, Linux®, Unix®, or other real-time or embedded operating systems such as Vx Works.

[0034] Peripheral interface **628** may provide an interface to I/O devices, such as the devices **636-**

648, including wireless transceiver(s) **636**, input device(s) **640**, audio I/O device(s) **644**, and other I/O devices **648**. Wireless transceiver **636** may be a WiFi transceiver, an infrared transceiver, a Bluetooth transceiver, a WiMax transceiver, a wireless cellular telephony transceiver, a satellite transceiver (e.g., a global positioning system (GPS) transceiver) or a combination thereof. Input device(s) **640** may include a mouse, a touch pad, a touch sensitive screen (which may be integrated with display device **634**), a pointer device such as a stylus, and/or a keyboard (e.g., physical keyboard or a virtual keyboard displayed as part of a touch sensitive screen). For example, the input device **640** may include a touch screen controller coupled with a touch screen. The touch screen and touch screen controller can, for example, detect contact and movement or break thereof using any of a plurality of touch sensitivity technologies, including but not limited to capacitive, resistive, infrared, and surface acoustic wave technologies, as well as other proximity sensor arrays or other elements for determining one or more points of contact with the touch screen.

[0035] Audio I/O **644** may include a speaker and/or a microphone to facilitate voice-enabled functions, such as voice recognition, voice replication, digital recording, and/or telephony functions. Other optional devices **648** may include a storage device (e.g., a hard drive, a flash memory device), universal serial bus (USB) port(s), parallel port(s), serial port(s), a printer, a network interface, a bus bridge (e.g., a PCI-PCI bridge), sensor(s) (e.g., a motion sensor, a light sensor, a proximity sensor, etc.), or a combination thereof. Optional devices **648** may further include an imaging processing subsystem (e.g., a camera), which may include an optical sensor, such as a charged coupled device (CCD) or a complementary metal-oxide semiconductor (CMOS) optical sensor, utilized to facilitate camera functions, such as recording photographs and video clips.

[0036] Note that while FIG. **6** illustrates various components of a data processing system, it is not intended to represent any particular architecture or manner of interconnecting the components; as such details are not germane to embodiments of the present disclosure. It should also be appreciated that network computers, handheld computers, mobile phones, and other data processing systems, which have fewer components or perhaps more components, may also be used with embodiments of the invention disclosed hereinabove.

[0037] Some portions of the preceding detailed descriptions have been presented in terms of algorithms and symbolic representations of operations on data bits within a computer memory. These algorithmic descriptions and representations are the ways used by those skilled in the data processing arts to most effectively convey the substance of their work to others skilled in the art. An algorithm is here, and generally, conceived to be a self-consistent sequence of operations leading to a desired result. The operations are those requiring physical manipulations of physical quantities.

[0038] It should be borne in mind, however, that all of these and similar terms are to be associated with the appropriate physical quantities and are merely convenient labels applied to these quantities. Unless specifically stated otherwise as apparent from the above discussion, it should be appreciated that throughout the description, discussions utilizing terms such as those set forth in the claims below, refer to the action and processes of a computer system, or similar electronic computing device, that manipulates and transforms data represented as physical (electronic) quantities within the computer system's registers and memories into other data similarly represented as physical quantities within the computer system's memories or registers or other such information storage, transmission or display devices.

[0039] The techniques shown in the figures can be implemented using code and data stored and executed on one or more electronic devices. Such electronic devices store and communicate (internally and/or with other electronic devices over a network) code and data using computer-readable media, such as non-transitory computer-readable storage media (e.g., magnetic disks; optical disks; random access memory; read only memory; flash memory devices; phase-change memory) and transitory computer-readable transmission media (e.g., electrical, optical, acoustical

or other form of propagated signals-such as carrier waves, infrared signals, digital signals).
[0040] The processes or methods depicted in the preceding figures may be performed by processing logic that comprises hardware (e.g. circuitry, dedicated logic, etc.), firmware, software (e.g., embodied on a non-transitory computer readable medium), or a combination of both. Although the processes or methods are described above in terms of some sequential operations, it should be appreciated that some of the operations described may be performed in a different order. Moreover, some operations may be performed in parallel rather than sequentially.
[0041] While the invention has been described in terms of particular variations and illustrative figures, those of ordinary skill in the art will recognize that the invention is not limited to the variations or figures described. In addition, where methods and steps described above indicate certain events occurring in certain order, those of ordinary skill in the art will recognize that the ordering of certain steps may be modified and that such modifications are in accordance with the variations of the invention. Additionally, certain of the steps may be performed concurrently in a parallel process when possible, as well as performed sequentially as described above. To the extent there are variations of the invention, which are within the spirit of the disclosure or equivalent to the inventions found in the claims, it is the intent that this patent will cover those variations as well. Therefore, the present disclosure is to be understood as not limited by the specific embodiments described herein, but only by scope of the appended claims.

Claims

1. A throttle control system for providing a driver of a vehicle with greater control over engine performance, the system comprising: a control module for sending signals directly to a throttle body of the engine; a wiring harness for electrically coupling the control module with a throttle pedal and the throttle body; and a signal adjuster for enabling manual adjustment of throttle responsiveness of the vehicle.
2. The system of claim 1, wherein the control module is configured to create an increase in throttle responsiveness of the vehicle.
3. The system of claim 1, wherein the control module is configured to bypass signals sent to the throttle body by an electronic control unit of the vehicle.
4. The system of claim 1, wherein the control module is comprised of one or more microprocessors that can process input signals received from the throttle pedal.
5. The system of claim 1, wherein the control module comprises an internal lookup table whereby throttle pedal positions may be evaluated against throttle position sensor readings received by way of the wiring harness.
6. The system of claim 1, wherein the control module includes a rigid enclosure and an input socket.
7. The system of claim 6, wherein the input socket is configured to receive a signal connector comprising the wiring harness so as to couple the control module with the throttle pedal and the throttle body.
8. The system of claim 6, wherein the rigid enclosure is configured to withstand an environment encountered within an engine compartment of the vehicle.
9. The system of claim 1, wherein the wiring harness includes a cable, a pedal connector, a throttle position sensor connector, a signal connector, and a controller socket.
10. The system of claim 9, wherein the pedal connector is configured to be coupled directly with the throttle pedal, and wherein the throttle position sensor connector is configured to be coupled with a wiring harness that was originally coupled with the throttle pedal.
11. The system of claim 9, wherein the signal connector is configured to be plugged into an input socket of the control module.
12. The system of claim 9, wherein the controller socket is configured to be coupled with the signal

adjuster.

13. The system of claim 1, wherein the signal adjuster comprises a cable that extends from a controller connector to a rheostat.

14. The system of claim 13, wherein the controller connector is configured to be plugged into a controller socket comprising the wiring harness.

15. The system of claim 13, wherein the rheostat is configured to enable manual adjustment of a throttle signal being communicated to the throttle body.

16. The system of claim 13, wherein the signal adjuster includes a control dial configured to be coupled with the rheostat to facilitate hand operation of the rheostat.

17. A method for a throttle control system to provide greater control over engine performance of a vehicle, the method comprising: configuring a control module to interpret signals received from a throttle pedal and send corresponding signals to a throttle body of the engine; fabricating a wiring harness for electrically coupling the control module with the throttle pedal and the throttle body; and coupling a signal adjuster with a controller socket comprising the wiring harness for enabling manual adjustment of engine performance.

18. The method of claim 17, wherein configuring includes incorporating one or more microprocessors that can process input signals received from the throttle pedal.

19. The method of claim 17, wherein configuring includes providing an internal lookup table whereby throttle pedal positions may be evaluated against throttle position sensor readings.

20. The method of claim 17, wherein fabricating includes configuring the wiring harness to be coupled directly with the throttle pedal and a throttle position sensor that was originally coupled with the throttle pedal.

21. The method of claim 17, wherein coupling the signal adjuster includes coupling a control dial whereby throttle signals communicated to the throttle body may be manipulated by hand.
