

CLASS 701, DATA PROCESSING: VEHICLES, NAVIGATION, AND RELATIVE LOCATION

SECTION I - CLASS DEFINITION

This class provides for electrical computers, digital data processing systems, and data processing processes for transferring data between a plurality of computers or processes wherein the computers or processes employ the data before or after transferring and the employing affects the transfer of data therebetween. More specifically, this class provides for the following subject matter:

A. This class is for electrical apparatus and corresponding methods for performing data processing operations in which there is a significant change in the data or for performing calculation operations wherein the electrical data processing system or calculating computer functions to indicate a condition of a vehicle, to regulate the movement of a vehicle, to monitor the operation of a vehicle, or to solve a diagnostic problem with the vehicle.

B. This class also provides electrical apparatus and corresponding methods wherein the electrical data processing system or calculating computer function to determine the course, position, or distance traveled.

C. This class further provides electrical apparatus and corresponding methods wherein the electrical data processing system or calculating computer functions to determine the relative location of an object (e.g., person or vehicle) and may include communication of the determined relative location to a remote location.

Class 701 is structured into three main divisions:

- A. Vehicle control, guidance, operation or indication.
- B. Navigation.
- C. Relative location.

See Subclass References to the Current Class, below, for the location of subclasses for each of the main divisions.

SECTION II - LINES WITH OTHER CLASSES AND WITHIN THIS CLASS

A. VEHICLE CONTROL, GUIDANCE, OPERATION, OR INDICATION

1. This class includes subject matter directed to significant data processing or calculation in determining the control, monitoring, guidance, and condition for one or more of the components or subsystems associated with a vehicle.

2. This class does not include subject matter wherein significant details of the mechanical construction of the component or subsystem within a vehicle are disclosed and claimed. Examples of subject matter not included are detailed mechanical structure of a transmission, internal combustion engine, power steering, suspension, and braking systems, each in conjunction with a nominally recited computer implemented function. See Search Class notes below for appropriate class.

3. This class also does not include subject matter wherein the data processing or calculation is employed solely for the purpose of manipulating or controlling robotic arm movement. See Search Class notes below for Class 700.

B. NAVIGATION

1. This class is limited to significant data processing or calculating operation to provide navigation information to either a vehicle or an operator.

2. This class does not include subject matter wherein significant details of the display device and/or technique in displaying the determined navigation information are disclosed and claimed. See the Search Class notes below in References to Other Classes for Class 340.

C. RELATIVE LOCATION

1. This class includes subject matter directed to significant data processing or calculation for determining the relative location of an object and may include communicating the determined relative location to a remote location for further processing and/or use.

2. This class does not include subject matter wherein significant details of the communication device and/or the technique of communicating are disclosed and claimed. See the Search Class notes below in References to Other Classes for Classes 340 and 375.

SECTION III - SUBCLASS REFERENCES TO THE CURRENT CLASS

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 1, through 124, for vehicle control, guidance, operation or indication.
400 through 541, for navigation.

SECTION IV - REFERENCES TO OTHER CLASSES

SEE OR SEARCH CLASS:

- 33, Geometrical Instruments, appropriate subclasses, especially subclass 232 for aircraft or marine ground speed indicator, subclasses 268+ for celestial navigational instruments, subclasses 316+ for a magnetic field sensitive device (compass, flux valve) utilized to monitor a directional gyroscope by orienting the gyroscope in the direction of the magnetic meridian, and subclasses 318+ for a gyroscope utilized to (a) indicate direction or (b) maintain the equilibrium of a directional indicator or datum structure with respect to a reference plane (plurality of coordinates).
- 73, Measuring and Testing, appropriate subclass for a process or apparatus for making a measurement of any kind or for making a test of any kind especially subclasses 11.04+ for the testing of a shock absorber device, subclasses 112.01 - 112.06 for turbine engine testing, 114.01 - 114.81 for internal combustion engine measuring and testing, subclasses 121+ for brake testing excluding data processing techniques, and subclasses 178+ for navigational instruments.
- 74, Machine Element or Mechanism, subclasses 473+ for a system to manually control a transmission.
- 91, Motors: Expansible Chamber Type, subclass 473 for condition responsive control of a drive transmission.
- 92, Expansible Chamber Devices, subclasses 12.1+ for displacement control of plural cylinders arranged in parallel, radial, or conical relationship with a rotary transmission axis.
- 104, Railways, appropriate subclass for railway rolling stock and track, especially subclass 284 for sensing or controlling railway position or attitude with respect to a guide way.
- 105, Railway Rolling Stock, appropriate subclass for wheeled transportation equipment for a railway, especially subclass 4.4 for train having a wheel steering provision and 453 for body suspension and springs.

- 116, Signals and Indicators, subclass 31 for a vehicle steering wheel position indicator.
- 123, Internal-Combustion Engine, subclasses 319+ for engine speed regulators responsive to vehicle acceleration or deceleration, subclasses 350+ for electrical sensing or regulating of engine speed, subclasses 395+ for an engine speed regulator responsive to (a) an engine parameter, or (b) an environmental condition to alter the present engine speed without regard to the resulting engine speed, subclasses 406.12+ for electronic spark ignition timing control, subclasses 406.24+, 406.59 for speed responsive engine control, subclasses 406.25, 406.36, 406.5+, 492, and 493 for acceleration/deceleration condition responsive means, subclasses 406.53+ and 491 for the starting or cold running condition of an engine, subclass 429 for a combustion chamber means combined with air-fuel mixture forming means, subclasses 438+ for a charge forming device which includes an electronic control system for carburetor fuel metering, subclasses 478+ for a fuel injection system having an actuator circuit (e.g., engine condition responsive electronic circuit actuates injector valve), subclass 479 for backup and fail-safe systems, subclass 480 for fuel injection which includes a microprocessor, subclass 486 for digital memory addressed by an engine parameter, subclasses 531+ for a charge forming device using auxiliary air or gas to inject fuel, subclasses 568.21+ for the electrical control of an e.g.r. valve for a charge forming device, subclasses 575+ for a means of forming a mixture of a diverse supply of fuel and an oxidant, subclasses 585+ for a charge forming device having auxiliary air or oxygen added to combustible mixture, subclasses 672+ for exhaust gas sensing, and subclass 690 for a charge forming device with fail-safe, backup, or malfunction means including an exhaust gas condition responsive means.
- 180, Motor Vehicles, appropriate subclasses for control devices in combination with vehicle structure especially subclasses 6.2+ for steering by driving systems, subclasses 65.1+ for electric vehicles, per se, subclasses 167+ for a motor vehicle with a means for controlling an operation responsive to electromagnetic radiation, magnetic force, or sound waves received from a source, or reflected from an object or surface, located apart from vehicle, subclasses 170+ for speed responsive means combined with vehicular structure, subclass 197 for anti-

- spin, traction control, and antiskid/antilock systems combined with vehicular structure, subclasses 234+ for steering of four wheel drive vehicles, subclasses 271+ for a vehicle with means for promoting safety of vehicle, its occupant, or load, or an external object, steering; subclass 315 for manually controlling the motor or driving mechanism with transmission control, subclasses 337+ for a vehicle drive train or transmission, subclass 408 for a vehicle having each wheel steerable, subclasses 421+ for condition modulated, and subclass 443 for electric power assist steering.
- 187, Elevators, Industrial Lift Truck, or Stationary Lift for Vehicle, subclass 231 for industrial lift truck steering by a walking attendant and 343+ for cushioning contact of load support.
- 188, Brakes, appropriate subclasses for brake control which includes specific structure to the brakes especially subclass 350 for brakes in combination with a steering gear control.
- 192, Clutches and Power-Stop Control, subclasses 3.51+ for transmission control and clutch control, subclasses 215+ for control of transmission and brake, and subclass 137 for a safety device in which the power-transmitting connections are disabled in response to the transmission guard striking an extraneous object.
- 244, Aeronautics and Astronautics, subclasses 3.1 through 3.3 for missile control, 3.18 for celestial navigation, subclasses 17.17, 50, and 51 for aircraft steering, subclasses 75.1-99.9 for aircraft control, and subclasses 158.1-173.3 for spacecraft control.
- 246, Railway Switches and Signals, subclasses 182+ for the automatic actuation of signals and changeable exhibitors upon the cab or train or for stopping it or controlling its speed, usually by cooperation with means not on the train, but not disclosing a complete block system having speed-control means which is inoperative below but operative above predetermined speeds when predetermined points are reached.
- 250, Radiant Energy, subclasses 203.1+ for a means for illuminating a photocell in accordance with the relative position of the photoelectric cell and an object, and having means for causing the photoelectric cell to follow the object under the control of said illumination.
- 267, Spring Devices, subclasses 2+ for vehicle spring suspension devices.
- 280, Land Vehicles, appropriate subclasses, particularly subclasses 5.5+ for a general utility land vehicle including an active suspension system having a regulatable elastic means which is caused to alter its elasticity property in response to a force encountered while the vehicle is in surface traversing motion; subclasses 6.15+ for a general utility land vehicle including means, interposed between the vehicle body, chassis, or frame and running gear thereof, for altering height or levelness of the vehicle body, chassis, or frame; subclass 47.22 for a handle-propelled tiltable vehicle stabilized by the attendant or article and having a spring suspension; subclasses 124.1+ for a suspension arrangement for a general utility land vehicle, in particular subclasses 124.125+ for a land vehicle suspension arrangement including a wheel separately supported upon an individual stub axle; subclass 402 for a single end suspension of a transported articulated land vehicle; subclasses 676+ for a general utility land vehicle having an equalized frame, tandem axles, and a suspension arrangement; subclasses 734+ for an inflatable passenger restraint or confinement (e.g., air bag) or attachment responsive to a vehicle condition; subclasses 757+ for an attachment relating to antiskid or antislid; subclass 787 for a land vehicle frame of the single longitudinal beam type with spring suspension means; and subclass 788 for a land vehicle frame with resilient means for suspension.
- 303, Fluid-pressure Brake and Analogous Systems, subclasses 22.6+ for railway vehicle load control, subclasses 122+ for speed-controlled vehicle with failure responsive means, subclasses 139+ for traction control which includes structure related to fluid-pressure brakes, subclass 141 for speed and traction control by regulating the engine torque, subclasses 146+ for yaw control which includes structure related to fluid-pressure brakes, subclasses 149 for speed control with a split coefficient of friction, 163 for speed control using a slip ratio as related to fluid-pressure brakes, and 167 for vehicle speed control by regulating brake pressure not having a positive recitation of data processing steps.
- 307, Electrical Transmission or Interconnecting Systems, subclasses 9.1+ for vehicle mounted systems (e.g., safety devices).
- 318, Electricity: Motive Power Systems, subclasses 580+ for vehicular guidance systems with single axis control using a positional servo system, subclass 582 for vehicular guidance systems with celestial navigation, and sub-

- classes 588+ for marine vehicular guidance systems with single axis control.
- 340, Communications: Electrical, subclass 436 for a system designed to indicate contact between the vehicle and an external object, subclasses 438-462 for monitoring or solving diagnostic problems associated with vehicle operation, subclasses 453 and 454 for means responsive to vehicular brake conditions and indication thereof which exclude data processing techniques, subclass 465 for indicator of steering or turning, subclass 507 for a fail-safe responsive indicating system, subclass 903 for a vehicle collision alert system, subclasses 907-932.1 for electrical signaling in a vehicle or traffic environment, subclasses 933-943 for vehicle detectors, subclasses 945-983 for a flight condition indicating system excluding data processing technique, subclass 951 for airport landing guidance systems which do not include data processing techniques, subclasses 984-987 for nautical vehicle alarm or indicator, subclasses 988-996 for vehicle position indication, and subclass 990 and subclasses 995.1-995.28 for vehicle position indication with a map display.
- 342, Communications: Directive Radio Wave Systems and Devices, subclasses 1+ for radar navigation systems, 42+ for radar transmitter and receiver system, 71 for return control signal for braking or steering, 72 for safety device, 357 for sending or receiving radio wave energy which is characterized by some quality that varies according to the relative direction or position of a satellite used to locate the position of an object, 385+ for radio wave energy for direction finding receivers, and 450+ for an apparatus for determining the position in space of an object, vehicle or atmospheric condition by the reception of signals not having distinctive bearing or position determinative characteristics.
- 348, Television, subclasses 113+ for a picture signal generator or reproducer is used with a steerable vehicle to permit control of the vehicle from a remote location or to provide an indication in the vehicle of its position as an aid in the guidance of the vehicle.
- 353, Optics: Image Projectors, subclasses 11+ for a projector especially adapted to project an image of a map or navigation chart, an image of a target onto a map or chart, or a target which represents a vehicle such as an aircraft onto a screen.
- 356, Optics: Measuring and Testing, subclasses 3+ for optical range finders and 27+ for velocity or height measuring.
- 361, Electricity: Electrical Systems and Devices, subclass 238 for electrical speed signal circuitry used for antispin and antilock/antiskid detection and which does not include significant data processing.
- 365, Static Information Storage and Retrieval, appropriate subclass for particular memory device.
- 375, Pulse or Digital Communications, subclasses 219+ for transceivers, 237+ for modulation techniques, 295+ for transmitters, and 316+ for receivers.
- 382, Image Analysis, appropriate subclass for an apparatus or corresponding method for the automated analysis of an image or recognition of a pattern, especially subclass 104 for vehicle or traffic control.
- 434, Education and Demonstration, subclass 1 for training in the use of radar or sonar detecting or range finding, subclasses 30+ for aircraft training per se, and subclasses 111, 186, and 239+ relating to training or instructions in the area of navigation.
- 440, Marine Propulsion, subclass 53 for a means effecting or facilitating movement of propulsion unit or a segment of the propulsion unit (e.g., tilting or steering) and subclasses 84+ for engine, motor, or transmission control means.
- 441, Buoys, Rafts, and Aquatic Devices, appropriate subclass for structure or an attachment peculiar to a mooring buoy, marker buoy, container buoy, or other buoy; structure or an attachment peculiar to a raft, to rafting, and guiding of floating logs; water rescue apparatus or other aquatic devices.
- 475, Planetary Gear Transmission Systems or Components, subclass 43 for a transmission with speed or torque responsive clutch.
- 477, Interrelated Power Delivery Controls Including Engine Control, subclass 5 and 6 for plural engines having clutch control, subclass 8 for an electric engine with clutch control, subclasses 15+ for an electric engine with transmission control, subclass 31 for continuously variable transmission with a gas turbine engine, subclasses 34+ wherein the operation of an engine regulates or is regulated by the operation of a transmission, subclass 39 for a continuously variable friction transmission with clutch control, subclasses 57, 62, and 70+ for transmission control and clutch control, subclasses

- 166+ for clutch control, per se, and 182+ for engine brake control responsive to engine speed.
- 700, Data Processing: Generic Control Systems or Specific Applications, subclasses 245 through 264 for robotic arm control.
- 706, Data Processing: Artificial Intelligence, appropriate subclasses for artificial intelligence, in general, including cross-reference art collections 905 and 913 for application of detailed artificial intelligence to vehicle control or diagnostics.
- 714, Error Detection/Correction and Fault Detection/Recovery, subclasses 799+ for general testing of programming digital data systems.

SECTION V - GLOSSARY

The terms below have been defined for purposes of classification in this class and are shown in underlined type when used in the class and subclass definitions. When these terms are not underlined in the definitions, the meaning is not restricted to the glossary definitions below.

ANTILOCK OR ANTISKID

A process of controlling a vehicle to enhance the braking performance during deceleration of the vehicle by manipulating the brake pressure.

ANTISPIN

A process of controlling a vehicle to enhance the driveability of the vehicle during starting or acceleration of the vehicle by manipulating at least one of (1) brake pressure, (2) engine torque, and (3) transmission torque.

ARTIFICIAL INTELLIGENCE (AI)

Computer emulation of aspects of human intelligence such as speech recognition, deduction, inference, creative response, the ability to learn from past experience, and the ability to make reasonable inferences from incomplete information. Examples of AI include expert systems, neural networks, and fuzzy logic.

ATTITUDE

Orientation of a vehicle with respect to a reference plane. An example in an automobile would be orientation of the vehicle body relative to the road surface

whereas in aeronautics it may define the orientation of the aircraft relative to the earth.

BRAKE-SLIP

The slippage of a wheel caused by the braking operation during deceleration of the vehicle.

CALCULATING OPERATIONS

Arithmetic and/or some limited logic operations performed upon or with signals representing numbers or values.

DATA PROCESSING

For the purpose of this class, data processing is defined as a systematic operation on data in accordance with a set of rules which results in a significant change in the data.

DRIVE SLIP

The slippage of a wheel caused by the driving condition during acceleration of the vehicle.

FUZZY LOGIC

A form of AI in which variables can have degrees of truthfulness or falsehood represented by a range of values between 1 (true) and 0 (false). The outcome of an operation using fuzzy logic can be expressed as a probability rather than as a certainty (e.g., inexact reasoning).

NAVIGATION

The determination of a course, position, or distance traveled.

SLIP

Loss of adhesion or friction between an object and a surface. An example in a vehicle would be the reduction of friction between a wheel and a road surface (e.g., wheel slippage).

VEHICLE

Any means in or by which someone or something is carried or conveyed. This term includes, but is not limited to, automobiles, aircraft, spacecraft, blimps, trains, motorcycles, bicycles, watercraft, and submarines.

SUBCLASSES

- spacecraft control, and subclasses 75-99.9 for aircraft control.
- 1 VEHICLE CONTROL, GUIDANCE, OPERATION, OR INDICATION:**
 This subclass is indented under the class definition. Subject matter wherein the electrical data processing system or calculating computer functions to indicate a condition or position of a vehicle, to regulate the movement of a vehicle, to monitor the operation of a vehicle, or to solve a diagnostic problem with the vehicle.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
 400 through 541, for navigational systems, per se.
- SEE OR SEARCH CLASS:
 180, Motor Vehicles, for control devices in combination with vehicle structure.
 318, Electricity: Motive Power Systems, subclasses 580+, for vehicular guidance systems with single axis control.
 340, Communications: Electrical, subclasses 22+ for electrical signaling in a vehicle or traffic environment, 438+ for monitoring or solving diagnostic problems associated with vehicle operation.
 703, Data Processing: Structural Design, Modeling, Simulation, and Emulation, subclass 8 for computer to simulate a vehicle.
- 2 Remote control system:**
 This subclass is indented under subclass 1. Vehicle control, guidance, operation, or indication wherein regulation of the vehicle is based on a signal transmitted from a location not physically connected to, but received by, the system or computer.
- 3 Aeronautical vehicle:**
 This subclass is indented under subclass 1. Vehicle control, guidance, operation, or indication wherein the electrical data processing system or calculating computer is designed to control, guide, or operate an airborne or space vehicle (e.g., helicopter, airplane, spacecraft, blimp, etc.).
- SEE OR SEARCH CLASS:
 244, Aeronautics and Astronautics, subclasses 3.1 through 3.3 for missile control, subclasses 158-173.3 for
- 4 Altitude or attitude control or indication:**
 This subclass is indented under subclass 3. Aeronautical vehicle control or indication wherein the data processing system or calculating computer functions to control or maintain the orientation of an airborne or space vehicle with respect to a reference plane.
- 5 Rate of change (e.g., ascent, descent):**
 This subclass is indented under subclass 4. Altitude or attitude control or indication wherein the data processing system or calculating computer is designed to control or indicate change in the orientation of an aeronautical vehicle as a function of time.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
 16+, for the control or indication of a vehicle or its function as it performs the act of landing (e.g., engaging the ground).
- 6 Angle of attack:**
 This subclass is indented under subclass 5. Rate of change control or indication wherein the data processing system or calculating computer is designed to control or indicate a specified angular relationship defined as the acute angle between the chord of an airfoil and the line of relative air flow or horizontal.
- 7 Air speed or velocity measurement:**
 This subclass is indented under subclass 4. Altitude or attitude control or indication further comprising a means to determine vehicle air-speed.
- SEE OR SEARCH CLASS:
 73, Measuring and Testing, appropriate subclass for a process or apparatus for making a measurement of any kind or for making a test of any kind.
- 8 Threshold or reference value:**
 This subclass is indented under subclass 4. Altitude or attitude control or indication further comprising a predetermined or operator determined altitude or attitude setting.

- 9 Warning signal or alarm:**
This subclass is indented under subclass 8. Altitude or attitude control or indication further comprising a means to alert the aeronautical vehicle operator of a condition relative to the predetermined or operator determined altitude or attitude setting.
- 10 Compensation for environmental conditions:**
This subclass is indented under subclass 4. Altitude or attitude control or indication further comprising meteorological correction means.
- 11 Auto pilot:**
This subclass is indented under subclass 4. Altitude or attitude control or indication further comprising an automatic flight control system.
- 12 Inner/outer loop:**
This subclass is indented under subclass 11. Automatic flight control system further comprising a stability control loop (i.e., inner loop) which controls the attitude, or altitude of the aeronautical vehicle, with respect to attitude or altitude reference signals provided by a full pilot authority control loop (i.e., outer loop).
- 13 Spacecraft or satellite:**
This subclass is indented under subclass 4. Altitude or attitude control or indication specific to an aeronautical vehicle adapted to be placed in an orbit or which substantially operates outside the earth's atmosphere.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:
531, for the navigation of a vehicle within a space orbit or path.
- 14 Flight condition indicating system:**
This subclass is indented under subclass 3. Aeronautical vehicle wherein a condition significantly affecting aircraft flight is indicated.
- (1) Note. Included here are such conditions as wind shear, air speed, etc.
- (2) Note. Excluded here is altitude indication.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:
4+, for altitude indication of an aircraft.
- SEE OR SEARCH CLASS:
340, Communication: Electrical, sub-classes 945+ for a flight condition indicating system excluding data processing technique.
- 15 With indication or control of take-off:**
This subclass is indented under subclass 3. Vehicle control, guidance, operation, or indication wherein the data processing system or calculating computer controls, indicates, or monitors the vehicle or its functions as it performs the intended act of disengaging from the ground.
- SEE OR SEARCH CLASS:
73, Measuring and Testing, subclass 178 for takeoff and landing monitors.
- 16 With indication or control of landing:**
This subclass is indented under subclass 3. Vehicle control, guidance, operation, or indication wherein the data processing system or calculating computer controls, indicates, or monitors the vehicle or its functions as it performs the intended act of engaging the ground.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:
5, for the indication or control of the altitude or attitude rate of change for an aeronautical vehicle.
- SEE OR SEARCH CLASS:
73, Measuring and Testing, subclass 178 for takeoff and landing monitors
340, Communications: Electrical, sub-classes 933+ for vehicles which are controlled by traffic conditions.
- 17 I.L.S. or radar guidance:**
This subclass is indented under subclass 16. Indication or control of landing wherein an instrument landing system or radio detecting and ranging equipment are employed.

- SEE OR SEARCH CLASS:
343, Communications: Radio Wave Antennas, subclasses 5+ for radar transmitter and receiver.
- 18 Profile of descent:**
This subclass is indented under subclass 16. Indication or control of landing wherein the characteristic of the vehicle's ground approach, such as a glide slope, is employed.
- 19 Railway vehicle:**
This subclass is indented under subclass 1. Vehicle control, guidance, operation, or indication wherein the electrical data processing system or calculating computer is designed to control, guide, or operate a vehicle, or its components, confined to a predetermined path defined by a track or rail.
- (1) Note. This subclass does not include art wherein the railway speed or velocity is controlled. See search note below.
- SEE OR SEARCH CLASS:
33, Geometrical Instruments, subclasses 287, 338, 532.1, and 651 for indication means.
104, Railways, appropriate subclass for railway rolling stock and track.
105, Railway Rolling Stock, appropriate subclass for wheeled transportation equipment for a railway.
246, Railway Switches and Signals, subclasses 182+ for railway vehicle speed control systems.
295, Fluid-pressure Brake and Analogous Systems, subclasses 22.6+ for railway vehicle load control.
- 20 Railway vehicle speed control:**
This subclass is indented under subclass 19. Railway vehicle wherein the electrical data processing system or calculating computer functions to regulate the velocity of a vehicle confined to a track or rail.
- SEE OR SEARCH CLASS:
246, Railway Switches and Signals, especially subclass 182 for train speed control means which are actuated by agencies not on the train or by wheel
- derailment or defects in train structure and mechanism.
- 21 Marine vehicle:**
This subclass is indented under subclass 1. Vehicle control, guidance, operation, or indication wherein the electrical data processing system or calculating computer is designed to control, guide, or operate a vehicle designed for water traffic.
- SEE OR SEARCH CLASS:
33, Geometrical Instruments, subclass 232 for a marine speed indicator.
318, Electricity: Motive Power Systems, subclass 588, for marine vehicular guidance systems with single axis control.
440, Marine Propulsion, especially subclass 84 for engine, motor, or transmission control means.
441, Buoys, Rafts, and Aquatic Devices, appropriate subclass for structure or an attachment peculiar to a mooring buoy, marker buoy, container buoy, or other buoy; structure or an attachment peculiar to a raft, to rafting, and guiding of floating logs; water rescue apparatus or other aquatic devices.
- 22 Electric vehicle:**
This subclass is indented under subclass 1. Vehicle control, guidance, operation, or indication wherein the electrical data processing system or calculating computer is designed to control, guide, or operate a vehicle wherein the prime mover is powered by an electrical current.
- SEE OR SEARCH CLASS:
180, Motor Vehicles, subclasses 65.1+ for electric vehicles, per se.
318, Electricity: Motive Power Systems, subclasses 139+ for a motor generator used in an electric vehicle.
- 23 Automatic route guidance vehicle:**
This subclass is indented under subclass 1. Vehicle control, guidance, operation, or indication wherein the electrical data processing system or calculating computer is designed to control, guide, or operate an autonomous or unmanned vehicle (e.g., AGV).

- SEE OR SEARCH THIS CLASS, SUB-CLASS:
 400 through 541, for a navigation system.
- SEE OR SEARCH CLASS:
 180, Motor Vehicles, subclasses 167+ for a motor vehicle with a means for controlling an operation responsive to electromagnetic radiation, magnetic force, or sound waves received from a source, or reflected from an object or surface, located apart from vehicle.
 318, Electricity: Motive Power Systems, subclasses 580+ for a vehicular guidance systems with single axis control using a positional servo system.
 348, Television, subclasses 113+ for a picture signal generator or reproducer used with a steerable vehicle to permit control of the vehicle from a remote location or to provide an indication in the vehicle of its position as an aid in the guidance of the vehicle.
- 24 On-board computer interact with a host computer:**
 This subclass is indented under subclass 23. Automatic route guidance vehicle having two processing units, one of which is the primary controller communicating with a second controller physically mounted to the vehicle.
- 25 Storage or planning of route information:**
 This subclass is indented under subclass 23. Automatic route guidance vehicle wherein the electrical data processing system or calculating computer is also capable of retaining in a memory device a path of travel or developing a path of travel.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:
 410 through 430, for route searching or determining in a map database system utilizing location determining.
 533, for route searching or determining in a map database system, in general.
- 26 Modification or correction of route information:**
 This subclass is indented under subclass 25. Planned or stored route information wherein the electrical data processing system or calculating computer is further capable of manipulating data associated with a traveled path to alter the vehicle's route.
- 27 Artificial intelligence (e.g., fuzzy logic):**
 This subclass is indented under subclass 23. Automatic route guidance vehicle wherein the electrical data processing system or calculating computer is designed to control, guide, or operate the vehicle by the logical manipulation of a value of a predetermined function of antecedent and consequent operations corresponding to the coordinate location of the vehicle.
- SEE OR SEARCH CLASS:
 706, Data Processing: Artificial Intelligence, appropriate subclasses for artificial intelligence, in general, including cross-reference art collections 905 and 913 for detailed artificial intelligence applied to vehicle control or diagnostics.
- 28 Having image processing:**
 This subclass is indented under subclass 23. Automatic route guidance vehicle wherein the electrical data processing system or calculating computer is designed to control, guide, or operate the vehicle by information received as an optical signal.
- SEE OR SEARCH CLASS:
 348, Television, subclasses 113+ for a picture signal generator or reproducer used with a steerable vehicle to permit control of the vehicle from a remote location or to provide an indication in the vehicle of its position as an aid in the guidance of the vehicle.
 382, Image Analysis, appropriate subclass for an apparatus or corresponding method for the automated analysis of an image or recognition of a pattern.

- 29.1 Vehicle diagnosis or maintenance determination:**
This subclass is indented under subclass 1. Subject matter wherein the electrical data processing system or calculating computer is designed to evaluate, monitor, or indicate the performance, operating condition or servicing need of a vehicle.
- (1) Note. Error or fault handling in navigational systems is classified elsewhere.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:
400 through 541, for error or fault handling in navigational systems.
- SEE OR SEARCH CLASS:
702, Data Processing: Measuring, Calibrating, or Testing, subclasses 183 through 185 for data processing diagnostic analysis, in general.
- 29.2 Failure detection initiates subsequent vehicle control:**
This subclass is indented under subclass 29.1. Subject matter wherein the diagnostic or maintenance data processing system or calculating computer produces a subsequent change in vehicle operation following a failure occurrence.
- 29.3 For multiple vehicles (e.g., fleet, etc.):**
This subclass is indented under subclass 29.1. Subject matter wherein the diagnostic or maintenance data processing system or calculating computer analyzes a group of plural vehicles.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:
482, for plural object locating using a satellite positioning system.
- 29.4 Indication of maintenance interval:**
This subclass is indented under subclass 29.1. Subject matter wherein the diagnostic or maintenance data processing system or calculating computer determines a need for vehicle servicing based on a constraint parameter (e.g., time, operating condition or vehicle mileage).
- 29.5 Caused by oil condition degradation:**
This subclass is indented under subclass 29.4. Subject matter wherein the constraint parameter is the state of vehicle lubricating fluid.
- 29.6 Vehicle or device identification:**
This subclass is indented under subclass 29.1. Subject matter wherein the diagnostic or maintenance data processing system or calculating computer generates a signal identifying the vehicle (e.g., make, model, year of manufacture, etc.) or vehicle component to be diagnosed.
- (1) Note. Included herein is vehicle or device identification using RFID (radio frequency identification).
- 29.7 Detection of faulty sensor:**
This subclass is indented under subclass 29.1. Subject matter wherein the diagnostic or maintenance data processing system or calculating computer functions to identify a malfunction of a vehicle sensing device.
- 29.8 By applying signal to test sensor:**
This subclass is indented under subclass 29.7. Subject matter wherein an artificially produced stimulus is applied to determine sensor condition.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:
32.8, for active system testing by applying a stimulation thereto.
- 29.9 Fault prediction:**
This subclass is indented under subclass 29.7. Subject matter wherein a forecast of future sensor failure is produced.
- 30.1 Inhibiting fault indication:**
This subclass is indented under subclass 29.7. Subject matter wherein a preliminary showing of a failure is suppressed from further processing or display.
- 30.2 Using mathematical model:**
This subclass is indented under subclass 29.7. Subject matter wherein a theoretical numeric representation of a system or element is used in the identification of the malfunctioning vehicle sensor.

- SEE OR SEARCH THIS CLASS, SUB-CLASS:
32.9, for a mathematical model used in vehicle diagnosis or maintenance determination generally.
- SEE OR SEARCH CLASS:
703, Data Processing: Structural Design, Modeling, Simulation, and Emulation, subclass 2 for modeling by mathematical expression, in general.
- 30.3 Plausibility, verification or confirmation of sensor output:**
This subclass is indented under subclass 29.7. Subject matter wherein the output of the sensor is checked for reasonableness, substantiation, or authentication.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:
31.7, for determination of the confirmation of a system fault.
- 30.4 Utilizing time related property of sensor output (e.g., period or frequency, etc.):**
This subclass is indented under subclass 29.7. Subject matter wherein some time-based characteristic of the sensor output (such as period or frequency) is utilized.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:
33.6, for diagnosis or maintenance determination using a time related property.
- 30.5 By specific comparison with sensor output:**
This subclass is indented under subclass 29.7. Subject matter wherein a match operation is performed with the actual sensor output.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:
33.7, for signal comparison in vehicle diagnosis and maintenance determination.
- 30.6 Mutual comparison of plural identical sensors:**
This subclass is indented under subclass 30.5. Subject matter wherein the outputs of multiple sensors of the same type are matched.
- 30.7 Comparison of sensor with output of different type sensor:**
This subclass is indented under subclass 30.5. Subject matter wherein the output of a sensor is matched with that of a diverse variety of sensor.
- 30.8 Comparing current sensor output with previously stored value thereof:**
This subclass is indented under subclass 30.5. Subject matter wherein the output of a sensor is matched with past samples of the same sensor.
- 30.9 Sensor output compared to range of values:**
This subclass is indented under subclass 30.5. Subject matter wherein the output of a sensor is matched to a respective band of values.
- 31.1 Sensor output compared to threshold:**
This subclass is indented under subclass 30.5. Subject matter wherein the output of a sensor is compared to a discrete value.
- 31.2 Variable or dynamic:**
This subclass is indented under subclass 31.1. Subject matter wherein the discrete value can change periodically or continually.
- 31.3 Including event counter:**
This subclass is indented under subclass 29.7. Subject matter wherein an element which enumerates occurrences is utilized.
- 31.4 Diagnosis or maintenance need determined externally to vehicle:**
This subclass is indented under subclass 29.1. Subject matter wherein the diagnostic or maintenance data processing system or calculating computer produces the diagnosis or maintenance need determination at a location remote from the vehicle.
- 31.5 Having particular communication link (e.g., Internet, satellite, etc.) with external site:**
This subclass is indented under subclass 31.4. Subject matter wherein a specified communication system or method conveys diagnostic or maintenance information between a vehicle and a remote site which produces the diagnosis or maintenance need determination.
- (1) Note. For classification herein, the communications link must be broadly

recited. Detailed communication systems are classified elsewhere.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

484 through 485, for a satellite positioning system having a communication link to an external ground site.

31.6 Determining repair needed to correct fault:
This subclass is indented under subclass 29.1. Subject matter wherein the diagnostic or maintenance data processing system or calculating computer can establish the specific corrective action which is needed to eliminate the fault condition.

31.7 Validation or confirmation of fault:
This subclass is indented under subclass 29.1. Subject matter wherein the diagnostic or maintenance data processing system or calculating computer checks a detected failure for reasonableness or authentication.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

30.3, for confirming the output of a diagnostic sensor.

31.8 Determining likely cause of fault:
This subclass is indented under subclass 29.1. Subject matter wherein the diagnostic or maintenance data processing system or calculating computer provides a most probable cause of an observed failure.

31.9 Failure prediction:
This subclass is indented under subclass 29.1. Subject matter wherein the diagnostic or maintenance data processing system or calculating computer produces a forecast of future vehicle fault.

32.1 Trend analysis:
This subclass is indented under subclass 29.1. Subject matter wherein the diagnostic or maintenance data processing system or calculating computer determines a generally linear movement with time of a diagnostic or maintenance need variable.

32.2 Data recording following vehicle collision:
This subclass is indented under subclass 29.1. Subject matter wherein diagnostic or maintenance data processing system or calculating computer stores specific vehicle data for future analysis in the event of a vehicle making unintentional contact with another object.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

33.4, for storing operational history in a vehicle diagnostic system.

430, for particular data storage or retrieval in route searching or determining.

461 through 464, for map data storage or retrieval in a map database system.

540, for data storage or retrieval in a navigation system, in general.

32.3 Including vehicle location determination:
This subclass is indented under subclass 29.1. Subject matter wherein diagnostic or maintenance data processing system or calculating computer obtains and utilizes data providing vehicular position in space.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

408 through 526, for navigation employing position determining.

32.4 By satellite positioning system (e.g., GPS, etc.):
This subclass is indented under subclass 32.3. Subject matter wherein vehicular location is determined by communication with satellites dedicated to a world wide navigational tracking system.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

468 through 491, for navigation using a satellite positioning system in general.

412, for route correction in a route searching system including a satellite positioning system.

SEE OR SEARCH CLASS:

342, Communications: Directive Radio Wave Systems and Devices (e.g., Radar, Radio Navigation), subclasses 357.21 through 357.78 for sending or receiving radio wave energy which is

characterized by some quality that varies according to the relative direction or position of a satellite used to locate the position of an object and subclasses 450-465 for an apparatus for determining the position in space of an object, vehicle, or atmospheric condition by the reception of signals not having distinctive bearing or position determinative characteristics.

32.5 Including vehicle distance travelled determination:

This subclass is indented under subclass 29.1. Subject matter wherein the diagnostic or maintenance data processing system or calculating computer calculates the total path length traversed by a vehicle during a period of interest.

32.6 Including data security (e.g., encryption, password, etc.):

This subclass is indented under subclass 29.1. Subject matter wherein the diagnostic or maintenance data processing system or calculating computer provides some measure to protect the access to or ability to modify data used therein.

SEE OR SEARCH THIS CLASS, SUBCLASS:

486, for a satellite positioning system including security processing.

SEE OR SEARCH CLASS:

380, Cryptography, subclass 258 for communication system position dependent or authenticating.

726, Information Security, appropriate subclasses for information security, in general.

32.7 Having internal vehicle network to distribute diagnosis or maintenance data therein:

This subclass is indented under subclass 29.1. Subject matter wherein a local network (e.g., a Vehicle Area Network) within a vehicle facilitates the relay of diagnosis or maintenance data therein.

32.8 Active testing (i.e., providing input to system):

This subclass is indented under subclass 29.1. Subject matter wherein the diagnostic or maintenance data processing system or calculating computer applies an artificially produced stim-

ulus to the system to facilitate diagnosis or maintenance need determination.

SEE OR SEARCH THIS CLASS, SUBCLASS:

29.8, for applying a signal to test a sensor.

32.9 Using mathematical model:

This subclass is indented under subclass 29.1. Subject matter wherein the diagnostic or maintenance data processing system or calculating computer uses a theoretical numeric representation of a system or element to determine the diagnosis or maintenance need.

SEE OR SEARCH THIS CLASS, SUBCLASS:

30.2, for a mathematical model used in detection of a faulty diagnostic sensor.

SEE OR SEARCH CLASS:

703, Data Processing: Structural Design, Modeling, Simulation, and Emulation, subclass 2, for modeling by mathematical expression, in general.

33.1 Calibration:

This subclass is indented under subclass 29.1. Subject matter wherein the diagnostic or maintenance data processing system or calculating computer compares a system or component to a standard and determining the deviation from the standard so as to ascertain the proper correction factors.

33.2 Including portable or handheld element (e.g., linked to an On Board Diagnostic system, etc.):

This subclass is indented under subclass 29.1. Subject matter wherein the diagnostic or maintenance data processing system or calculating computer incorporates an element which is readily moved between locations by a user or which can be readily held by a user.

SEE OR SEARCH THIS CLASS, SUBCLASS:

491, for a portable satellite positioning system.

- 33.3 Having removable data recording device:**
This subclass is indented under subclass 33.2. Subject matter wherein the portable or hand-held element is one in which desired data has been stored and which is readily extractable.
- 33.4 Storing operational history (e.g., data logging, etc.):**
This subclass is indented under subclass 29.1. Subject matter wherein the diagnostic or maintenance data processing system or calculating computer records information regarding past diagnostic or maintenance data.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
33.2, for data recording following a collision.
430, for particular data storage or retrieval in route searching or determining.
461 through 464, for map data storage or retrieval in a map database system.
540, for data storage or retrieval in a navigation system, in general.
- SEE OR SEARCH CLASS:
702, Data Processing, Measuring, Calibrating, or Testing, subclass 187 for measurement history logging, in general.
- 33.5 Pass, fail or inconclusive status:**
This subclass is indented under subclass 29.1. Subject matter wherein the diagnostic or maintenance data processing system or calculating computer produces either an acceptable, unacceptable or indeterminate indication.
- 33.6 Utilizing time related property of fault signal (e.g., duration, etc.):**
This subclass is indented under subclass 29.1. Subject matter wherein the diagnostic or maintenance data processing system or calculating computer uses a time related characteristic of an error signal.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
30.4, for sensor diagnosis using a time related property of sensor output.
- 33.7 Including signal comparison:**
This subclass is indented under subclass 29.1. Subject matter wherein the diagnostic or maintenance data processing system or calculating computer performs a matching operation with a particular system signal.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
30.5 through 31.2, for detecting faulty sensor by comparison.
- 33.8 To range of values:**
This subclass is indented under subclass 33.7. Subject matter wherein the particular signal is matched to a respective band of values.
- 33.9 To threshold:**
This subclass is indented under subclass 33.7. Subject matter wherein the particular signal is matched to a discrete value.
- 34.1 Variable or dynamic:**
This subclass is indented under subclass 33.9. Subject matter wherein the discrete value can change periodically or continually.
- 34.2 Customized for particular vehicle type or model:**
This subclass is indented under subclass 29.1. Subject matter wherein the diagnostic or maintenance data processing system or calculating computer can be adapted to a particular variety of vehicle.
- 34.3 Having plural diagnostic processors:**
This subclass is indented under subclass 29.1. Subject matter wherein the diagnostic or maintenance data processing system or calculating computer includes at least two circuits which are dedicated to determining diagnosis or maintenance need.
- 34.4 Diagnosis or maintenance of specific vehicle subsystem:**
This subclass is indented under subclass 29.1. Subject matter wherein a particular element of a vehicular system is analyzed by the diagnostic or maintenance data processing system or calculating computer.

36 Vehicle subsystem or accessory control:

This subclass is indented under subclass 1. Vehicle control, guidance, operation, or indication wherein the electrical data processing system or calculating computer is designed to control, guide, or operate a secondary vehicle structure.

- (1) Note. This subclass is inclusive of such systems as air conditioning, power steering, seat adjustment, and suspension.

37 Suspension control:

This subclass is indented under subclass 36. Vehicle subsystem or accessory control wherein the electrical data processing system or calculating computer is designed to control the resilient mechanism, used primarily for ride stability, located between the ground engaging means and the vehicle frame.

SEE OR SEARCH CLASS:

- 73, Measuring and Testing, subclasses 11.04+ for testing of shock absorber device.
- 105, Railway Rolling Stock, subclass 453 for body suspension and springs.
- 180, Motor Vehicles, appropriate subclass, especially subclasses 337+ for a vehicle suspension system in combination with a drive train or transmission.
- 187, Elevators, Industrial Lift Truck, or Stationary Lift for Vehicle, subclasses 187+ for cushioning contact of load support.
- 267, Spring Devices, subclasses 2+ for vehicle spring suspension devices.
- 280, Land Vehicles, appropriate subclasses, particularly subclasses 5.5+ for a general utility land vehicle including an active suspension system having a regulatable elastic means which is caused to alter its elasticity property in response to a force encountered while the vehicle is in surface traversing motion; subclasses 6.15+ for a general utility land vehicle including means, interposed between the vehicle body, chassis, or frame and running gear thereof, for altering height or levelness of the vehicle body, chassis, or frame; subclass 47.22 for a handle-propelled tiltable

vehicle stabilized by the attendant or article and having a spring suspension; subclass 124.1+ for a suspension arrangement for a general utility land vehicle, in particular subclasses 124.125+ for a land vehicle suspension arrangement including a wheel separately supported upon an individual stub axle; subclass 402 for a single end suspension of a transported articulated land vehicle; subclasses 676+ for a general utility land vehicle having an equalized frame, tandem axles, and a suspension arrangement; subclass 787 for a land vehicle frame of the single longitudinal beam type with spring suspension means; and subclass 788 for a land vehicle frame with resilient means for suspension.

38 Attitude change suppressive control (e.g., antiroll or antipitch):

This subclass is indented under subclass 37. Suspension control the electrical data processing system or calculating computer is designed to control a vehicle with respect to movement about a lateral axis or movement with respect to a lateral axis.

SEE OR SEARCH CLASS:

- 104, Railways, subclass 284 for sensing or controlling of railway position or attitude with respect to a guide way.
- 280, Land Vehicles, appropriate subclasses, particularly subclasses 5.5+ for a general utility land vehicle including an active suspension system which alters its elasticity during travel to control the attitude of the vehicle.

39 Fail-safe system:

This subclass is indented under subclass 37. Suspension control wherein the electrical data processing system or calculating computer is designed to detect an abnormality in operating conditions and carry out the appropriate sequence of instructions to stabilize the system.

SEE OR SEARCH CLASS:

- 708, Electrical Computers: Arithmetic Processing and Calculating, subclasses 530+ for an electric digital calculating computer having a specialized function of error detection or correction.

- 714, Error Detection/Correction and Fault Detection/Recovery, subclasses 2+ for apparatus fault recovery and fail-safe shutdown.
- 40 Artificial intelligence (e.g., fuzzy logic):**
This subclass is indented under subclass 37. Suspension control wherein the electrical data processing system or calculating computer is designed to control, guide, or operate the vehicle by the manipulation of a value of a predetermined function of antecedent and consequent operations corresponding to the state of the suspension system.
- 41 Steering control:**
This subclass is indented under subclass 36. Vehicle subsystem or accessory control wherein the electrical data processing system or calculating computer is designed to control or monitor either (a) a direction of travel, (b) the yaw of a vehicle, or (c) a force applied to or exerted by a vehicle navigational system.
- SEE OR SEARCH CLASS:
- 105, Railway Rolling Stock, subclass 4.4 for train having a wheel steering provision.
- 114, Ships, subclasses 144+ for ship steering mechanisms.
- 116, Signals and Indicators, subclass 31 for a vehicle steering wheel position indicator.
- 180, Motor Vehicles, appropriate subclass, especially subclasses 6.2+ for steering by driving systems and 234+ for steering of four wheel drive vehicles, 408+ for a vehicle having each wheel steerable, 410 for condition modulated steering, and 443+ for electric power assist steering.
- 187, Elevators, Industrial Lift Truck, or Stationary Lift for Vehicle, subclass 231 for industrial lift truck steering by a walking attendant.
- 188, Brakes, subclass 350 for brakes in combination with a steering gear control.
- 244, Aeronautics and Astronautics, subclasses 17.17, 50, and 51 for aircraft steering.
- 280, Land Vehicles, appropriate subclass for steering a vehicle.
- 340, Communications: Electrical, subclass 465 for indicator of steering or turning.
- 342, Communications: Directive Radio Wave Systems and Devices (e.g., radar, radio navigator), appropriate subclass especially subclass 71 for return control signal for steering.
- 440, Marine Propulsion, subclass 53 for a means effecting or facilitating movement of propulsion unit or a segment of the propulsion unit (e.g., tilting or steering).
- 42 Feedback, transfer function or proportional and derivative (P&D) control:**
This subclass is indented under subclass 41. Steering control wherein the electrical data processing system or calculating computer utilizes a response signal corresponding to the status of the steering system, to regulate or monitor the steering operation or where the system shifts from proportional control to a combination of proportional and derivative control.
- 43 Fail-safe system:**
This subclass is indented under subclass 41. Steering control wherein the electrical data processing system or calculating computer is designed to detect an abnormality in operating conditions and carry out the appropriate sequence of instructions to stabilize the steering system.
- SEE OR SEARCH CLASS:
- 340, Communication: Electrical, subclass 507 for a fail-safe responsive indicating system.
- 708, Electrical Computers: Arithmetic Processing and Calculating, subclasses 530+ for an electric digital calculating computer having a specialized function of error detection or correction
- 714, Error Detection/Correction and Fault Detection/Recovery, subclasses 2+ for a fail-safe fault recovery apparatus.
- 44 Artificial intelligence (e.g., fuzzy logic):**
This subclass is indented under subclass 41. Steering control wherein the electrical data processing system or calculating computer is designed to control, guide, or operate the vehic-

- cle by the manipulation of a value of a predetermined function of antecedent and consequent operations corresponding to the state of the steering system or by inexact reasoning implemented using set membership functions.
- 45 Control of vehicle safety devices (e.g., air-bag, seat-belt, etc.):**
This subclass is indented under subclass 36. Vehicle subsystem or accessory wherein the electrical data processing system or calculating computer is designed to control or monitor a system dedicated for the protection or security of a vehicle, its passengers, or cargo.
- (1) Note. This subclass includes art related to the control of air bags, seat belts, restraint systems, etc.
- SEE OR SEARCH CLASS:
180, Motor Vehicles, subclasses 271+ for a with means for promoting safety of vehicle, its occupant, or load, or an external object.
280, Land Vehicles, subclasses 734+ for an inflatable passenger restraint or confinement (e.g., air bag) or attachment responsive to a vehicle condition.
340, Communication: Electrical, subclasses 436+ for a system designed to indicate contact between the vehicle and an external object and 903 for a vehicle collision alert system.
- 46 By integrating the amplitude of the input signal:**
This subclass is indented under subclass 45. Vehicle safety device control further comprising activation of the safety device responsive to an input integrated signal exceeding a predetermined system condition threshold value.
- 47 By frequency or waveform analysis:**
This subclass is indented under subclass 45. Vehicle safety device control further comprising activation of the safety device responsive to a vibratory electric signal, having various frequency components, indicating an unsafe vehicle condition.
- 48 Cooperative or multiple control (e.g., suspension and braking):**
This subclass is indented under subclass 36. Vehicle subsystem or accessory wherein the electrical data processing system or calculating computer is designed to control or monitor more than one subsystem or accessory, each being in direct or indirect communication with the other.
- 49 Vehicle equipment position control (e.g., seat, mirror, door, window, headrest or headlamp):**
This subclass is indented under subclass 36. Vehicle subsystem or accessory wherein the electrical data processing system or calculating computer is designed to control or monitor the location, orientation, or movement of an apparatus.
- 50 Construction or agricultural vehicle type (e.g., crane, forklift):**
This subclass is indented under subclass 1. Subject matter providing control of a vehicle used in construction or farming and particularly the control of a special purpose implement associated with such a vehicle.
- (1) Note. This subclass includes control of the boom of a crane, the fork of a forklift, etc.
- 51 Transmission control:**
This subclass is indented under subclass 1. Vehicle control, guidance, operation, or indication wherein the electrical data processing system or calculating computer functions to regulate or monitor the operation of the transmission.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
87, for control of transmission torque to regulate the antispin behavior of a vehicle.
- SEE OR SEARCH CLASS:
74, Machine Element or Mechanism, subclasses 473.1+ for a system to manually control a transmission.
91, Motors: Expansible Chamber Type, subclass 473 for condition responsive control of drive transmission.

- 92, Expansible Chamber Devices, subclasses 12.1+ for displacement control of plural cylinders arranged in parallel, radial, or conical relationship with rotary transmission axis.
- 180, Motor Vehicles, subclass 336 for manually controlling the motor or driving mechanism with transmission control and 337+ for a transmission mechanism.
- 192, Clutches and Power-Stop Control, subclasses 3.51+ for transmission control and clutch control and 215+ for control of transmission and brake.
- 440, Marine Propulsion, subclasses 84+ for an engine, motor, or transmission control means.
- 477, Interrelated Power Delivery Controls Including Engine Control, subclasses 15+ for an electric engine with transmission control, 31 for a continuously variable transmission with a gas turbine engine, and 34+ wherein the operation of an engine regulates or is regulated by the operation of a transmission.
- 52 Semiautomatic control (e.g., switchable between automatic and manual):**
This subclass is indented under subclass 51. Transmission control wherein the electrical data processing system or calculating computer functions in concert with a selectable mode transmission (e.g., gear ratio selected manually by the vehicle operator or automatically according to operating conditions of the transmission system).
- 53 And other vehicle control:**
This subclass is indented under subclass 51. Transmission control wherein the electrical data processing system or calculating computer is designed to integrally control the transmission in conjunction with another vehicle control system.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
87, for antispin control by regulating the torque of a transmission.
95, for regulating vehicle speed by transmission shift control.
- 54 Engine output control:**
This subclass is indented under subclass 53. Integrated control system wherein the electrical data processing system or calculating computer further comprises a means to regulate the output torque, power, or speed of the vehicle power plant.
- 55 By changing shift map, schedule, or pattern:**
This subclass is indented under subclass 51. Transmission control wherein the electrical data processing system or calculating computer regulates the gear selection of the transmission by selecting or modifying a stored set of schemes used for proper gear selection.
- 56 Having a plurality of preset maps, schedules, or patterns:**
This subclass is indented under subclass 55. Transmission control having multiple stored gear selection schemes.
- 57 Fuzzy logic:**
This subclass is indented under subclass 51. Transmission control wherein the electrical data processing system or calculating computer is designed to control or regulate the transmission by inexact reasoning implemented using set membership functions.
- SEE OR SEARCH CLASS:
706, Data Processing: Artificial Intelligence, subclasses 1 through 9 for fuzzy logic hardware, subclasses 45-61 for a knowledge processing system, and cross-reference art collection 900 relating to fuzzy logic.
- 58 Adaptive control:**
This subclass is indented under subclass 51. Transmission control wherein the electrical data processing system or calculating computer is designed to compensate, in the course of its operation, for variations in operating characteristics of the vehicle.
- SEE OR SEARCH CLASS:
700, Data Processing: Generic Control Systems or Specific Applications, subclasses 28 through 55 for a control which seeks to optimize a system's performance criterion (e.g., efficiency, consumption, or profit).

- 59 Model or learning means (e.g., neural network):**
This subclass is indented under subclass 58. Adaptive control wherein stored historical data, or data relating to present operating conditions, is used to modify the operating parameters of the transmission.
- SEE OR SEARCH CLASS:
700, Data Processing: Generic Control Systems or Specific Applications, subclass 29 for a data processing control system having a mathematical model.
706, Data Processing: Artificial Intelligence, subclasses 12 and 13 for artificial intelligence machine learning; subclass 14 for artificial intelligence adaptive systems; subclasses 15-44 for neural networks, in general; and cross-reference art collection 905 for detailed artificial intelligence applied to vehicle control.
- 60 Feedback control (e.g., closed loop):**
This subclass is indented under subclass 58. Adaptive control wherein input for the compensation means is a response signal corresponding to the status of the transmission system.
- 61 Using a transmission ratio as feedback control:**
This subclass is indented under subclass 60. Feedback control wherein the response signal is determine to be the ratio between the transmission input and output shaft speeds.
- 62 Fail-safe control (e.g., preventing a gear shift):**
This subclass is indented under subclass 51. Transmission control wherein the electrical data processing system or calculating computer is designed to detect an abnormality in operating conditions and carry out or modify the appropriate sequence of instructions to stabilize operation of the transmission.
- SEE OR SEARCH CLASS:
708, Electrical Computers: Arithmetic Processing and Calculating, subclasses 530+ for an electric digital calculating computer having a specialized function of error detection or correction.
- 63 Responsive to faulty sensor:**
This subclass is indented under subclass 62. Fail safe control wherein the abnormal condition exist in a device for detecting an operating characteristic of the vehicle.
- 64 Indicating a completion of a shift or a shift to be completed:**
This subclass is indented under subclass 51. Transmission control further comprising a means to exhibit the completion of a particular shift or to alert the operator of the proper timing to optimize shift execution.
- 65 Responsive to road, external, or ambient condition:**
This subclass is indented under subclass 51. Transmission control wherein the electrical data processing system or calculating computer is designed to compensate, in the course of its operation, for variations in conditions external to the vehicle.
- 66 Time regulated operations:**
This subclass is indented under subclass 51. Transmission control wherein the electrical data processing system or calculating computer is designed to either receive or deliver instructional signals at a particular point in time, or within a set time period, for synchronizing the operation of a transmission with the operation of a secondary mechanism.
- 67 Clutch control:**
This subclass is indented under subclass 1. Vehicle control, guidance, operation, or indication wherein the electrical data processing system or calculating computer functions to control or monitor the operation of the device which enables the coupling of two working parts in such a way as to permit connection or disconnection at will, without the necessity of bringing both parts to rest.

SEE OR SEARCH CLASS:

- 192, Clutches and Power-Stop Control, subclasses 3.51+ for clutches and power-stop control.
- 475, Planetary Gear Transmission Systems or Components, subclass 43 for a transmission with speed or torque responsive clutch.
- 477, Interrelated Power Delivery Controls Including Engine Control, subclasses 5 and 6 for plural engines have clutch control, 8 for an electric engine with clutch control, 39 for a continuously variable friction transmission with clutch control, 57, 62, and 70+ for transmission control and clutch control, and 166+ for clutch control, per se.

68 Adaptive control:

This subclass is indented under subclass 67. Clutch control wherein the electrical data processing system or calculating computer is designed to compensate in the course of its operation for variations in operating characteristics.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 58, for adaptive transmission control.

SEE OR SEARCH CLASS:

- 700, Data Processing: Generic Control Systems or Specific Applications, subclasses 28 through 55 for a control which seeks to optimize a system's performance criterion (e.g., efficiency, consumption, or profit).

69 Control of power distribution between vehicle axis or wheels (e.g., four wheel drive vehicle):

This subclass is indented under subclass 1. Vehicle control, guidance, operation, or indication wherein the electrical data processing system or calculating computer functions to regulate vehicle movement by the connection, disconnection, or transfer of power from a vehicle propelling means to a mechanism having separate outputs driven simultaneously by a member of a planetary gear transmission.

70 Indication or control of braking, acceleration, or deceleration:

This subclass is indented under subclass 1. Vehicle control, guidance, operation, or indication wherein the electrical data processing system or calculating computer functions to regulate the increase or decrease in speed of a vehicle.

SEE OR SEARCH CLASS:

- 73, Measuring and Testing, subclasses 121+ for brake testing excluding data processing techniques.
- 188, Brakes, for brake control which includes specific structure to the brakes; in particular, subclasses 137+ for an electrically controlled braking system and 182 for fluid-pressure and electric-operated brakes.
- 303, Fluid-Pressure and Analogous Brake System, subclasses 121+ for speed control which includes specific structure to fluid-pressure brakes.
- 340, Communications: Electrical, subclass 52 for means responsive to vehicular brake conditions and indication void data processing techniques.

71 Antiskid, antilock, or brake-slip control:

This subclass is indented under subclass 70. Braking, acceleration, or deceleration control wherein the electrical data processing system or calculating computer utilizes information received concerning vehicle speed, wheel speed, or any derivatives thereof in determining activation of the appropriate speed altering action to control an undesired sliding, binding, or engagement of a vehicle, or its wheel, due to wheel deceleration.

- (1) Note. Skid control is a process of controlling the vehicle to enhance the braking performance during the deceleration of the vehicle by manipulating the brake pressure.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 82+, for undesired vehicle wheel spinning control wherein such spinning is caused by excessive wheel acceleration.

SEE OR SEARCH CLASS:

- 180, Motor Vehicles, subclass 197 for traction control systems combined with vehicular structure.
- 280, Land Vehicles, subclasses 757+ for an attachment relating to antiskid or antislid.
- 303, Fluid-Pressure Brake and Analogous Systems, subclasses 139+ for traction control which includes specific structure to fluid-pressure brakes.
- 361, Electricity: Electrical Systems and Devices, subclass 238 for electrical speed signal circuitry used for anti-skid/antilock detection void of significant data processing techniques.

72 During cornering or turning of vehicle:

Antiskid or antilock control under 71 wherein the electrical data processing system or calculating computer regulates the speed of a vehicle when a lateral acceleration or yaw condition is detected or sensed.

SEE OR SEARCH CLASS:

- 303, Fluid-Pressure Brake and Analogous Systems, subclasses 146+ for specific structure to fluid-pressure brakes including yaw control.

73 On split coefficient surface (m):

Antiskid or antilock control under 71 wherein the electrical data processing system or calculating computer regulates the brake pressure of a vehicle when it is sensed to experience a varying degree of adhesion along the traveled surface.

SEE OR SEARCH CLASS:

- 303, Fluid-Pressure Brake and Analogous Systems, subclass 149 for speed control with a split coefficient of friction.

74 Having particular means to determine a reference value for wheel slippage or pseudo-vehicle speed:

Antiskid or antilock control under 71 wherein the electrical data processing system or calculating computer employs a technique to calculate a value associated with a velocity or velocity variation gradient for use in determining a skidding or locking condition.

SEE OR SEARCH CLASS:

- 303, Fluid-Pressure Brake and Analogous Systems, subclass 163 for speed control using a slip ratio as related to fluid-pressure brakes.

75 Correction or modification:

This subclass is indented under subclass 74. Determining means further comprising a substitution means or compensation means for changing the reference value or pseudo vehicle speed.

76 Fail-safe system:

This subclass is indented under subclass 71. Antiskid or antilock control wherein the electrical data processing system or calculating computer is designed to detect an abnormality in operating conditions and carry out the appropriate sequence of instructions to stabilize vehicle braking, acceleration, or deceleration.

SEE OR SEARCH CLASS:

- 303, Fluid-Pressure Brake and Analogous Systems, subclasses 122.02+ for antilock brake failure with warning.
- 340, Communication: Electrical, subclass 507 for a fail-safe responsive indicating system.
- 708, Electrical Computers: Arithmetic Processing and Calculating, subclasses 530+ for an electric digital calculating computer having a specialized function of error detection or correction.
- 714, Error Detection/Correction and Fault Detection/Recovery, subclasses 2+, for a fail-safe fault recovery apparatus.

77 Artificial intelligence (e.g., fuzzy logic):

This subclass is indented under subclass 71. Antiskid or antilock control wherein the electrical data processing system or calculating computer is designed to indicate information or control the vehicle by the manipulation of a value of a predetermined function of antecedent and consequent operations corresponding to the state of the braking, acceleration, or deceleration of the vehicle.

78 Control of brake pressure:

This subclass is indented under subclass 71. Antiskid or antilock control wherein the electrical data processing system or calculating computer is designed to control the braking, acceleration, or deceleration of a vehicle by regulation of a fluid pressure exerted by the braking system.

SEE OR SEARCH CLASS:

- 188, Brakes, appropriate subclasses for a means of retarding the motion of or stopping machines, including vehicles.
- 303, Fluid-Pressure Brake and Analogous Systems, subclass 167 for vehicle speed control by regulating brake pressure not having a positive recitation of data processing steps.

79 Having speed variation responsive means (e.g., acceleration, deceleration):

This subclass is indented under subclass 78. Brake pressure control wherein the control of the brake pressure is regulated by the change in velocity or a change in the sensed velocity of the vehicle.

80 Having coefficient of friction or road condition determining means:

This subclass is indented under subclass 78. Brake pressure control wherein the control of the brake pressure is regulated by variations in the gradient or texture of the traveling surface.

81 Four wheel drive, electric, or heavy vehicles:

This subclass is indented under subclass 78. Brake pressure control wherein the control of the brake pressure is specifically designed for vehicles characterized as one of either (a) having driving means in direct connection with four wheels of the vehicle, (b) having an electrical prime mover, or (c) vehicles categorized as large machinery (i.e. heavy duty).

82 Antispin, traction control, or drive slip control:

This subclass is indented under subclass 70. Braking, acceleration or deceleration control wherein the electrical data processing system or calculating computer utilizes information received concerning vehicle speed, wheel speed, or any derivative thereof in determining

activation of the appropriate speed altering action to control an undesired rotation of a vehicle's wheel due to wheel acceleration.

- (1) Note. Spin control is the process of controlling the vehicle to enhance the driveability of the vehicle during starting or acceleration of the vehicle by manipulating at least one of (a) brake pressure, (b) engine torque, or (c) transmission torque.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 71, for undesired vehicle wheel skidding or locking control wherein such skidding or locking is caused by excessive wheel deceleration.

SEE OR SEARCH CLASS:

- 180, Motor Vehicles, subclass 197 for anti-spin systems combined with vehicular structure.
- 303, Fluid-Pressure Brake and Analogous Systems, subclasses 91+ for antispin control which includes specific structure to fluid-pressure brakes.
- 361, Electricity: Electrical Systems and Devices, subclass 238 for electrical speed signal circuitry used for anti-spin detection and which does not include significant data processing techniques.

83 Control of brake pressure:

This subclass is indented under subclass 82. antispin, traction control or drive slip control wherein the electrical data processing system or calculating computer is designed to control the braking, acceleration, or deceleration of a vehicle by regulation of a fluid pressure exerted by the braking system.

SEE OR SEARCH CLASS:

- 188, Brakes, appropriate subclasses for a means of retarding the motion of or stopping machines, including vehicles.
- 303, Fluid-Pressure Brake and Analogous Systems, subclass 167 for vehicle speed control by regulating brake pressure not having a positive recitation of data processing steps.

84 Control of engine torque:

This subclass is indented under subclass 82. Antispin, traction control, or drive slip control wherein the electrical data processing system or calculating computer is designed to control the braking, acceleration, or deceleration of a vehicle by regulation of the engine output power.

SEE OR SEARCH THIS CLASS, SUBCLASS:

110, for internal-combustion engine control or indication wherein a digital or programmed data processing system is designed to include the regulation of the vehicle speed, acceleration or deceleration.

SEE OR SEARCH CLASS:

123, Internal-Combustion Engines, subclasses 320+ for engine speed regulators responsive to vehicle acceleration or deceleration.
303, Fluid-Pressure Brake and Analogous Systems, subclass 141 for speed and traction control by regulating the engine torque.
477, Interrelated Power Delivery Controls, Including Engine Control, subclasses 182+ for engine brake control responsive to engine speed.

85 Having throttle valve positioning:

This subclass is indented under subclass 84. Engine torque control wherein the engine torque control is implemented by varying the cross-sectional area of fuel flow by partially closing or opening a damper, gate, or other flow regulator.

86 Having fuel cutting or ignition timing retarding:

This subclass is indented under subclass 84. Engine torque control wherein the engine torque control is implemented by the regulation of fuel supply to the engine or by the adjustment of the ignition timing.

SEE OR SEARCH THIS CLASS, SUBCLASS:

110, for internal-combustion engine control or indication wherein a digital or programmed data processing system

is designed to restrict fuel flow in response to a sense a stop condition or an emergency condition of the engine.

87 Control of transmission torque:

This subclass is indented under subclass 82. Antispin, traction control, or drive slip control wherein the electrical data processing system or calculating computer is designed to control the braking, acceleration, or deceleration of a vehicle by regulation of power transfer to a driving mechanism.

SEE OR SEARCH CLASS:

192, Clutches and Power-Stop Control, subclass 137 for a safety device in which the power-transmitting connections are disabled in response to the transmission guard striking an extraneous object.

88 Restricting differential operation:

This subclass is indented under subclass 82. Antispin, traction control, or drive slip control wherein the electrical data processing system or calculating computer is designed to control the braking, acceleration, or deceleration of a vehicle by independently regulating the output torque to the wheels of the vehicle.

89 Four wheel drive vehicle:

This subclass is indented under subclass 82. Antispin, traction control, or drive slip control wherein the electrical data processing system or calculating computer is designed to control the braking, acceleration, or deceleration of a four wheel drive vehicle.

90 Having particular slip threshold, target slip ratio, or target engine torque determining means:

This subclass is indented under subclass 82. Antispin, traction control, or drive slip control wherein the electrical data processing system or calculating computer further is capable of determining a reference parameter and utilizing said parameter to determine the undesired condition of excessive wheel spinning due to vehicle acceleration.

- 91 Integrated with antiskid or other vehicle control system (e.g., cruise control, suspension):**
This subclass is indented under subclass 82. Antispin, traction control, or drive slip control wherein the electrical data processing system or calculating computer operates in conjunction with another vehicle control system to effectively control the undesired condition of excessive wheel spinning due to vehicle acceleration.
- 92 Fail-safe system:**
This subclass is indented under subclass 82. Antispin, traction control, or drive slip control wherein the electrical data processing system or calculating computer is designed to detect an abnormality in operating conditions and carry out the appropriate sequence of instructions to stabilize traction control.
- SEE OR SEARCH CLASS:
303, Fluid-Pressure Brake and Analogous Systems, subclasses 122+ for speed controlled vehicle with failure responsive means.
340, Communication: Electrical, subclass 507 for a fail-safe responsive indicating system.
708, Electrical Computers: Arithmetic Processing and Calculating, subclasses 530+ for an electric digital calculating computer having a specialized function of error detection or correction.
714, Error Detection/Correction and Fault Detection/Recovery, subclasses 2+, for a fail-safe fault recovery apparatus.
- 93 Vehicle speed control (e.g., cruise control):**
This subclass is indented under subclass 70. Braking, acceleration, or deceleration control wherein the electrical data processing system or calculating computer is designed to maintain vehicle velocity at a specified value.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
110, for internal-combustion engine speed control by digital processing techniques.
- SEE OR SEARCH CLASS:
123, Internal-Combustion Engines, subclasses 350+ for electrical sensing or regulating of engine speed.
180, Motor Vehicles, subclasses 170+ for a vehicle with speed responsive means.
- 94 Having gradient responsive control to suppress hunting, overshooting, or undershooting:**
This subclass is indented under subclass 93. Vehicle speed control further comprising a means to regulate the shift in response to an impulsive momentary change in vehicle speed caused by the slope, or change in the slope, of a traveling surface.
- 95 By transmission shifting control:**
This subclass is indented under subclass 94. Gradient response wherein the means to regulate the impulsive momentary change in vehicle speed is executed by varying the gear ratio as a means to transfer power to a driving mechanism.
- 96 Having inter-vehicle distance or speed control:**
This subclass is indented under subclass 93. Vehicle speed control wherein vehicle velocity is regulated in response to a detected velocity or a measured separation of a second vehicle relative to a first vehicle.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
300+, for determining a spacial relationship between two vehicles.
- 97 Fail-safe system:**
This subclass is indented under subclass 93. Vehicle speed control wherein the electrical data processing system or calculating computer is designed to detect an abnormality in operating conditions and carry out the appropriate sequence of instructions to stabilize vehicle speed.
- SEE OR SEARCH CLASS:
303, Fluid-Pressure Brake and Analogous Systems, subclasses 122+ for speed controlled vehicle with failure responsive means.

- 340, Communication: Electrical, subclass 507 for a fail-safe responsive indicating system.
- 708, Electrical Computers: Arithmetic Processing and Calculating, subclasses 530+ for an electric digital calculating computer having a specialized function of error detection or correction.
- 714, Error Detection/Correction and Fault Detection/Recovery, subclasses 2+, for a fail-safe fault recovery apparatus.
- 98 Artificial intelligence (e.g., fuzzy logic):**
This subclass is indented under subclass 93. Vehicle speed control wherein the electrical data processing system or calculating computer is designed to indicate information or control the vehicle by the manipulation of a value of a predetermined function of antecedent and consequent operations corresponding to vehicle speed.
- SEE OR SEARCH CLASS:
706, Data Processing: Artificial Intelligence, appropriate subclasses for artificial intelligence, in general; cross-reference art collection 900 relating to fuzzy logic; and cross-reference art collection 905 for detailed artificial intelligence applied to vehicle control.
- 99 With indication or control of power plant (e.g., performance):**
This subclass is indented under subclass 1. Vehicle control, guidance, operation, or indication wherein the data processing system or calculating computer controls, indicates, or monitors the prime mover of the vehicle.
- (1) Note. This subclass includes the performance of a power plant.
- 100 Gas turbine, compressor:**
This subclass is indented under subclass 99. Indication or control of power plant wherein the power plant is a gas turbine which may include a compressor.
- SEE OR SEARCH CLASS:
415, Rotary Kinetic Fluid Motors or Pumps, subclasses 13+ for control means responsive to condition sensing.
- 101 Internal-combustion engine:**
This subclass is indented under subclass 99. Indication or control of power plant wherein the power plant is an internal-combustion engine.
- SEE OR SEARCH CLASS:
123, Internal-Combustion Engines, wherein significant structure of an internal-combustion engine is claimed, in particular, subclasses 406.12+ for electronic timing control; and subclasses 438+ for a charge forming device which includes an electronic control system.
- 102 Digital or programmed data processor:**
This subclass is indented under subclass 101. Internal-combustion engine controlled digitally or by a programmed data processor.
- SEE OR SEARCH CLASS:
123, Internal-Combustion Engines, subclasses 406.12+ for electronic ignition timing control.
- 103 Control of air/fuel ratio or fuel injection:**
This subclass is indented under subclass 102. Control system wherein the digital or programmed data processing system is designed to control the air/fuel ratio or the injection of fuel based on engine operating conditions or environmental conditions.
- SEE OR SEARCH CLASS:
123, Internal-Combustion Engines, subclass 406.45 for electronic control of combustible mixture or a constituent thereof, subclass 480 for fuel injection which includes a microprocessor, and subclass 486 for digital memory addressed by an engine parameter.
- 104 Controlling fuel quantity:**
This subclass is indented under subclass 103. Control system wherein the air/fuel ratio or fuel injection is controlled by modifying the supply of fuel to the combustion engine.
- SEE OR SEARCH CLASS:
123, Internal-Combustion Engines, subclasses 406.45+ for electronic control of combustible mixture or a constituent

ent thereof, subclass 429 for a combustion chamber means combined with air-fuel mixture forming means, subclasses 478+ for a fuel injection system having an actuator circuit (e.g., engine condition responsive electronic circuit actuates injector valve), and subclasses 575+ for a means of forming a mixture of a diverse supply of fuel and an oxidant.

105 Controlling timing:

This subclass is indented under subclass 103. Control system wherein the air/fuel ratio or fuel injection is controlled in response to the synchronization operation associated with the combustion or the ignition.

SEE OR SEARCH CLASS:

123, Internal-Combustion Engines, subclasses 406.11+ for spark ignition timing control.

106 Artificial intelligence (e.g., fuzzy logic):

This subclass is indented under subclass 103. Control system wherein the digital or programmed data processing system is designed to indicate information or control the air/fuel ratio or fuel injection by the manipulation of a value of a predetermined function of antecedent and consequent operations corresponding to the operating conditions of the combustion engine.

SEE OR SEARCH CLASS:

706, Data Processing: Artificial Intelligence, appropriate subclasses for artificial intelligence, in general; cross-reference art collection 900 relating to fuzzy logic; and cross-reference art collection 905 for detailed artificial intelligence applied to vehicle control.

107 Fail-safe system:

This subclass is indented under subclass 103. Control system wherein the digital or programmed data processing system is designed to detect an abnormality in operating conditions and carry out the appropriate sequence of instructions to stabilize the air/fuel ratio or fuel injection operation.

SEE OR SEARCH CLASS:

123, Internal-Combustion Engines, subclasses 395+ for an engine speed regulator responsive to (a) an engine parameter or (b) an environmental condition to alter the present engine speed without regard to the resulting engine speed, subclasses 406.13+ for a spark ignition timing regulator which includes upon detecting failure in a circuit or circuit element (a) shifts operation (1) into a substitute circuit or (2) to a substitute mechanism to accomplish the same function or (b) indicates functioning of the circuit or circuit element outside of accepted parameters, subclass 479 for a fail safe fuel injector system, and subclass 690 for a charge forming device with fail-safe, backup, or malfunction means including an exhaust gas condition responsive means.

708, Electrical Computers: Arithmetic Processing and Calculating, subclasses 530+ for an electric digital calculating computer having a specialized function of error detection or correction.

108 Exhaust gas circulation (EGC):

This subclass is indented under subclass 103. Control system wherein the air/fuel ratio or fuel injection is controlled in response to a change in the exhaust gas system.

SEE OR SEARCH CLASS:

123, Internal-Combustion Engines, subclasses 568.21+ for the electrical control of an e.g.r. valve for a charge forming device and subclasses 672+ for a charge forming device including an exhaust gas sensing means.

109 Detection of O₂ concentration:

This subclass is indented under subclass 103. Control system wherein the exhaust gas circulation is controlled or modified in response to a sensed oxygen content in the exhaust gas.

SEE OR SEARCH CLASS:

123, Internal-Combustion Engines, subclasses 531+ for a charge forming device using auxiliary air or gas to inject fuel and 585+ for a charge

forming device having auxiliary air or oxygen added to combustible mixture.

110 Speed, acceleration, deceleration:

This subclass is indented under subclass 102. Internal-combustion engine control or indication wherein the digital or programmed data processing system is designed to include the regulation of the vehicle speed, acceleration, or deceleration.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 84, for the control of engine torque for the purpose of controlling the antilock/antiskid of a vehicle.
- 93, for vehicle speed control.

SEE OR SEARCH CLASS:

- 123, Internal-Combustion Engines, subclasses 406.24+ for regulating means responsive to sudden variations in the rate of rotation of the engine output shaft, subclasses 406.59+ for speed responsive timing control and subclasses 406.25, 406.36, 406.5+, 492, and 493 for acceleration/deceleration responsive means.

111 Vibration, roughness, knock:

This subclass is indented under subclass 102. Internal-combustion engine control or indication wherein the digital or programmed data processing system is designed to control or sense vibration, roughness, or knocking condition of the engine.

SEE OR SEARCH CLASS:

- 73, Measuring and Testing, subclasses 114.02 through 114.12 for irregular combustion of internal combustion engine (e.g., misfire) testing, especially subclass 114.07 for vibration measurement to determine irregular combustion.
- 123, Internal Combustion Engines, subclass 406.16 for a knock control malfunction response system, subclass 406.21 for a closed loop feedback control of spark timing responsive to engine knocks, subclass 406.24 for a closed loop feedback control system responsive to instantaneous changes in the engine speed (e.g. roughness,

unstable combustion, etc.) and subclass 406.5 for acceleration and deceleration electronic ignition timing control.

112 Engine stop, fuel shutoff:

This subclass is indented under subclass 102. Internal-combustion engine control or indication wherein the digital or programmed data processing system is designed to restrict fuel flow in response to a sense a stop condition or an emergency condition of the engine.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 86, for control of an antiskid or antilock condition by cutting the fuel supply thus controlling the engine torque.

113 Starting, warmup:

This subclass is indented under subclass 102. Internal-combustion engine control or indication wherein the digital or programmed data processing system is designed to sense or control the starting condition or warmup condition of the engine.

SEE OR SEARCH CLASS:

- 123, Internal-Combustion Engines, subclasses 406.53+ and 491 for the starting or cold running condition of an engine.

114 Backup, interrupt, reset, or test:

This subclass is indented under subclass 102. Internal-combustion engine control or indication wherein the digital or programmed data processing system includes specific structure to function as either a backup, interruption, reset, or test circuit.

SEE OR SEARCH CLASS:

- 123, Internal-Combustion Engines, subclass 479 for backup systems.
- 714, Error Detection/Correction and Fault Detection/Recovery, subclasses 724+, for general digital logic testing.

115 Specific memory or interfacing device:

This subclass is indented under subclass 102. Internal-combustion engine control or indication wherein the digital or programmed data processing system includes specific structure to

- function either as data storage or as an information interconnecting device.
- SEE OR SEARCH CLASS:
123, Internal Combustion Engines, subclass 406.33 for a learning system responsive to engine knocking and subclass 406.6+ for speed responsive timing control having a counter or addressable memory.
365, Static Information Storage and Retrieval, appropriate subclasses for memory devices.
- 116 With indication or control to maintain fixed position:**
This subclass is indented under subclass 1. Vehicle control, guidance, operation, or indication wherein the data processing system or calculating computer controls or indicates a particular fixed position of a vehicle with respect to a particular reference.
- 117 Traffic analysis or control of surface vehicle:**
This subclass is indented under subclass 1. Vehicle control, guidance, operation, or indication wherein the data processing system or calculating computer controls or indicates the organized movement of surface vehicles.
- SEE OR SEARCH CLASS:
340, Communications: Electrical, subclasses 933+ for vehicles which are controlled by traffic conditions.
- 118 With determination of traffic density:**
This subclass is indented under subclass 117. Traffic analysis or control of surface vehicle which includes a determination of the number of vehicles per unit of time that pass a particular point.
- 119 With determination of traffic speed:**
This subclass is indented under subclass 117. Traffic analysis or control of surface vehicle which includes a determination of a distance traveled per unit time for the traffic.
- 120 Traffic analysis or control of aircraft:**
This subclass is indented under subclass 1. Vehicle control, guidance, operation, or indication wherein the data processing system or calculating computer controls or indicates the organized movement of aircraft along particular routes.
- SEE OR SEARCH CLASS:
340, Communications: Electrical, subclass 951 for airport control systems which do not include data processing techniques.
- 121 With speed control or order:**
This subclass is indented under subclass 120. Traffic analysis or control of aircraft wherein the data processing system or calculating computer controls or indicates the velocity of the aircraft.
- 122 With course diversion:**
This subclass is indented under subclass 120. Traffic analysis or control of aircraft wherein the data processing system or calculating computer controls or indicates departure from prior course of flight.
- 123 With indication of fuel consumption rate or economy of usage:**
This subclass is indented under subclass 1. Vehicle control, guidance, operation, or indication wherein the data processing system or calculating computer controls or indicates the amount of fuel consumed per unit time or most economical fuel consumption rate or distance available for a given amount of fuel.
- 124 Determining balance or center of gravity (e.g., load distribution of vehicle):**
This subclass is indented under subclass 1. Vehicle control, guidance, operation, or indication wherein the data processing system or calculating computer functions to determine the weight distribution of a vehicle.
- SEE OR SEARCH CLASS:
73, Measuring and Testing, subclasses 65.01+ for measuring and determining the center of gravity, per se, subclasses 66+ for determination of the amount of unbalance of a rotor, and subclass 172 for weight distribution on a human foot.
- 300 RELATIVE LOCATION:**
This subclass is indented under the class definition. Subject matter wherein the data processing system or calculating computer functions to

	determine the location of one object with respect to a secondary object or point.	318,	Electricity: Motive Power Systems, subclass 582 for a vehicular guidance system with celestial <u>navigation</u> .
301	Collision avoidance: This subclass is indented under subclass 300. Relative location wherein the <u>data processing</u> system or calculating computer functions to determine the relative movement between points for collision avoidance.	340,	Communications: Electrical, subclasses 988 through 996 for vehicle position indication.
302	Course to intercept: This subclass is indented under subclass 300. Relative location wherein the <u>data processing</u> system or calculating computer functions to determine an indication or control action to bring the two points together.	342,	Communications: Directive Radio Wave Systems and Devices (e.g., Radar, Radio Navigation), subclasses 1 through 205 for radar <u>navigation</u> systems; and subclasses 350-465 for directive object location determining devices and processes for sending or receiving radio wave energy which is characterized by some quality that varies according to the relative direction or position of the sender or receiver.
400	NAVIGATION: This subclass is indented under the class definition. Subject matter wherein the electrical <u>data processing</u> system or calculating computer functions to determine a course, position, or distance traveled.	348,	Television, subclasses 113 through 205 for a picture signal generator or reproducer which is used with a steerable <u>vehicle</u> to permit control of the <u>vehicle</u> from a remote location or to provide an indication in the <u>vehicle</u> of its position as an aid in the guidance of the <u>vehicle</u> .
	(1) Note. In Class 116, Signals and Indicators, Digest 43, there exists an unofficial collection of art relating to <u>navigation</u> devices.	353,	Optics: Image Projectors, subclasses 11 through 12 for a projector especially adapted to project an image of a map or <u>navigation</u> chart, an image of a target onto a map or chart, or a target which represents a <u>vehicle</u> such as an aircraft onto a screen.
	(2) Note. Navigation systems using spread spectrum signaling are included in this subclass.	356,	Optics: Measuring and Testing, subclasses 3 through 22 for optical range finders and subclasses 27-28.5 for velocity or height measuring.
	SEE OR SEARCH THIS CLASS, SUBCLASS:	375,	Pulse or Digital Communications, subclass 130 for spread spectrum.
	300 through 302, for an electrical <u>data processing</u> system or a calculating computer to determine the relative location between two points.	434,	Education and Demonstration, subclasses 1 through 10 for training in the use of radar or sonar detecting or range finding, subclasses 30-59 for aircraft training, per se, and subclasses 111, 186, and 239-244 for subject matter relating to training or instruction in the area of <u>navigation</u> .
	SEE OR SEARCH CLASS:	455,	Telecommunications, subclasses 456.1 through 457 for location monitoring in a zoned or cellular telephone system having significant communication details.
	33, Geometrical Instruments, appropriate subclasses and particularly subclasses 268 through 271 for a celestial <u>navigation</u> instrument.		
	73, Measuring and Testing, appropriate subclasses and particularly subclasses 178 through 187 for <u>navigation</u> instruments.		
	244, Aeronautics and Astronautics, subclass 3.18 for optical celestial <u>navigation</u> in missile control.		

- 408 Employing position determining equipment:**
This subclass is indented under subclass 400. Subject matter wherein the electrical data processing system or calculating computer functions to compute, establish, or indicate location based on the information provided by a position determining device.
- SEE OR SEARCH CLASS:
380, Cryptography, subclass 258 for position dependent or authenticating communication system.
434, Education and Demonstration, subclass 1 for detection or range determination of distant object by apparatus using sensor of electromagnetic or sound energy.
- 409 For use in a map database system:**
This subclass is indented under subclass 408. Subject matter wherein position information is utilized in conjunction with a map information processing data system.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
532 through 533, for navigation using a map database, in general.
- SEE OR SEARCH CLASS:
340, Communications: Electrical, subclass 539.2 for condition responsive indicating system with particular radio coupling link including central station detail map, and subclass 990 and subclasses 995.1-995.28 for vehicle position indication with a map display.
- 410 Including route searching or determining:**
This subclass is indented under subclass 409. Subject matter further capable of processing stored electrical data corresponding to locations within a given geographical area to determine a path of travel between a point of origin and a destination point.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
533, for route searching or determining in a map database system, in general.
- 411 Route correction, modification or verification:**
This subclass is indented under subclass 410. Subject matter wherein the electrical data processing system or calculating computer is designed to either, (a) alter the path of travel, or determine a supplemental path of travel, (b) provide instructions to resume to the original path of travel, or (c) validate position or course.
- 412 Including satellite positioning system (e.g., GPS, etc.):**
This subclass is indented under subclass 411. Subject matter wherein the route correction, modification, or verification utilizes positional data via communication with satellites dedicated to a world wide navigation tracking system.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
32.4, for vehicle location by GPS in a vehicle diagnostic or maintenance need determination.
468 through 491, for navigation using a satellite positioning system in general.
- SEE OR SEARCH CLASS:
342, Communications: Directive Radio Wave Systems and Devices (e.g., Radar, Radio Navigation), subclasses 357.21 through 357.78 for sending or receiving radio wave energy which is characterized by some quality that varies according to the relative direction or position of a satellite used to locate the position of an object and 450-465 for an apparatus for determining the position in space of an object, vehicle, or atmospheric condition by the reception of signals not having distinctive bearing or position determinative characteristics.
- 413 Cancellation of newly corrected or modified route:**
This subclass is indented under subclass 411. Subject matter wherein a recently corrected or changed route is removed.

- 414 Based on traffic condition (e.g., congestion, etc.):**
This subclass is indented under subclass 411. Subject matter wherein a factor related to the state of vehicles around a given vehicle in a particular area is utilized.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:
423, for route searching or determining in general based on traffic or weather.
- 415 Based on weather condition:**
This subclass is indented under subclass 411. Subject matter wherein a meteorological factor is utilized.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:
423, for route searching or determining based on traffic or weather.
- 416 Regenerating entirely new route from current position:**
This subclass is indented under subclass 411. Subject matter wherein a complete different route from a current location to a destination is determined.
- (1) Note. This would exclude a case where the system merely determines a correction path back to a previously determined route.
- 417 Having particular off-route detection:**
This subclass is indented under subclass 411. Subject matter wherein a detail of determining a condition of no longer following a determined route is provided.
- 418 User interface:**
This subclass is indented under subclass 411. Subject matter wherein an intermediate device is provided which allows communication between an individual and a route correction, modification or verification system.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:
487 through 488, for a user interface in a GPS system.
- 419 Audio:**
This subclass is indented under subclass 418. Subject matter wherein the interface involves sound.
- (1) Note. Included herein are speech synthesis and speech recognition.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:
428 through 429, for audio or visual route guidance.
431 through 444, for audio or visual route guidance in a map database system.
488, for a speech recognition or synthesis user interface in a satellite positioning system.
- 420 Remote route searching or determining:**
This subclass is indented under subclass 410. Subject matter wherein route searching or determining takes place at a location distant from a user.
- 421 Route information sent to user in successive portions:**
This subclass is indented under subclass 420. Subject matter wherein remotely determined route information is transmitted to the user one segment at a time.
- 422 For plural moving bodies:**
This subclass is indented under subclass 410. Subject matter wherein route searching or determining is performed for multiple objects in motion.
- 423 Based on real time condition (e.g., traffic, weather, etc.):**
This subclass is indented under subclass 410. Subject matter wherein the current state of the environment in the vicinity of a user is used in route searching or determining.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:
414, for route correction based on traffic.
415, for route correction based on weather condition.

- 424 Based on user driving history:**
This subclass is indented under subclass 410. Subject matter wherein stored data related to previous driver habit or performance is utilized.
- 425 Based on user input preference:**
This subclass is indented under subclass 410. Subject matter wherein specific user choices are included in the route searching or determining.
- 426 Point of interest (POI) or landmark:**
This subclass is indented under subclass 425. Subject matter wherein specific objects or locations that a user would like to visit are input.
- 427 Using speech recognition:**
This subclass is indented under subclass 425. Subject matter wherein words spoken by a user are understood by a route searching or determining system.
- 428 Having audio or visual route guidance:**
This subclass is indented under subclass 410. Subject matter further comprising audio or visual information providing directional instructions in map database route searching.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
419, for an audio interface used in route correction, modification or verification.
431 through 444, for audio or visual route guidance in a map database system.
488, for a speech recognition synthesis user interface in a satellite positioning system.
- 429 Using color to differentiate route portion:**
This subclass is indented under subclass 428. Subject matter wherein a particular hue is used to designate a particular segment of a route.
- 430 Having particular storage or retrieval of data:**
This subclass is indented under subclass 410. Subject matter wherein specific manipulation of information to or from a holding device is utilized.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
32.2, for data recording following a collision.
33.4, for storing operational history in a vehicle diagnostic system.
461 through 464, for map data storage or retrieval in a map database system.
540, for data storage or retrieval in a navigation system, in general.
- 431 Having audio or visual route guidance:**
This subclass is indented under subclass 409. Subject matter further comprising use of hearing or eyesight information providing directional instructions to follow a chosen path.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
419, for an audio interface in map database route searching correction or modification.
488, for a speech recognition synthesis user interface in a satellite positioning system.
454 through 460, for particular presentation of location data as well as map database data.
- 432 Plural mode display:**
This subclass is indented under subclass 431. Subject matter wherein selection among multiple presentation scenarios is performed.
- (1) Note. An example of multiple modes would be the presentation or suppression of topographic details in a given view.
- 433 Pedestrian guidance:**
This subclass is indented under subclass 431. Subject matter wherein assistance is provided to an individual walking to a destination.
- 434 Within building:**
This subclass is indented under subclass 433. Subject matter wherein navigational guidance is provided to an individual seeking a particular destination in a self-contained structure.
- (1) Note. Included herein is navigation within an apartment building, hospital, or shopping mall.

- direction or another inside a vehicle which provide directional guidance.
- 435 Prohibitive indication (e.g., do not enter, etc.):**
This subclass is indented under subclass 431. Subject matter wherein a message is provided to a user to inhibit them from performing some navigational action.
- 436 Visual guidance having enhanced realism (e.g., 3 dimensional, etc.):**
This subclass is indented under subclass 431. Subject matter wherein the visual guidance is more lifelike than a traditional 2-dimensional view.
- 437 Detailed route intersection guidance:**
This subclass is indented under subclass 431. Subject matter wherein particular guidance at a location where two or more roads meet is provided.
- 438 Including point of interest (POI) or landmark:**
This subclass is indented under subclass 431. Subject matter which includes a representation of a fixed location facility potentially attractive to a traveler or which is historically or geographically significant.
- 439 Providing supplemental information (e.g., environmental condition, etc.):**
This subclass is indented under subclass 431. Subject matter wherein audio or visual output unrelated to route guidance is provided in addition to that necessary to guide a user along a particular route.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:
441, for unspoken audio route guidance.
- 440 Guidance by text:**
This subclass is indented under subclass 431. Subject matter wherein the visual route guidance is written.
- 441 Audio guidance other than speech:**
This subclass is indented under subclass 431. Subject matter wherein sounds for route guidance is provided.
- (1) Note. Included here, for example, are sounds which appear to move in one
- 442 Providing indication of off-route condition:**
This subclass is indented under subclass 431. Subject matter wherein an audio or visual signal conveys a condition of not following a desired path.
- 443 Using speech recognition or synthesis:**
This subclass is indented under subclass 431. Subject matter wherein vocal language is artificially understood or generated.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:
427, for speech recognition in a location based route searching or determining.
488, for speech recognition or synthesis in a GPS system.
539, for speech recognition or synthesis in a navigational system generally.
- 444 Having particular mounting of guidance device to vehicle:**
This subclass is indented under subclass 431. Subject matter wherein detail of a structure attaching a vehicle guidance device thereto is provided.
- 445 Having location correction:**
This subclass is indented under subclass 409. Subject matter wherein an initial position determination is made more accurate.
- 446 By map matching:**
This subclass is indented under subclass 445. Subject matter wherein an initial position determination is adjusted to coincide with a previously stored geographic region representation.
- 447 Of multiple locations:**
This subclass is indented under subclass 446. Subject matter wherein map matching is performed at plural positions along a path.

- 448 Using terrain recognition:**
This subclass is indented under subclass 446. Subject matter wherein map matching includes comparing currently observed ground characteristics with previously stored ground characteristics of the same area.
- 449 Correcting for terrestrial magnetic field**
This subclass is indented under subclass 445. Subject matter wherein the correction negates the influence of the attraction/repulsion force of the earth on position determination.
- 450 Updating existing user map database:**
This subclass is indented under subclass 409. Subject matter wherein an organized collection of personal geographic data is made current.
- 451 Data sent to user from remote location:**
This subclass is indented under subclass 450. Subject matter wherein update data is transmitted to a user from a distant position.
- 452 Data sent in increments:**
This subclass is indented under subclass 451. Subject matter wherein remote data is sent out in consecutive segments.
- 453 Per user request:**
This subclass is indented under subclass 451. Subject matter wherein the remote data is sent out in response to a person specifically asking for such data.
- 454 Having particular presentation of location along with data from map database:**
This subclass is indented under subclass 409. Subject matter wherein details of current location in addition to geographic region representation database data are presented to a user.
- 455 Having variable map scale:**
This subclass is indented under subclass 454. Subject matter which permits adjustment of the graphical representation of a particular geographic region to an appropriate level of detail.
- 456 Inhibiting presentation change:**
This subclass is indented under subclass 454. Subject matter wherein modification of the data presentation is prevented.
- 457 Conditionally changed presentation:**
This subclass is indented under subclass 454. Subject matter wherein the display is modified based on a particular state of a user or vehicle.
- 458 Bird's eye view:**
This subclass is indented under subclass 454. Subject matter wherein the presentation represents that of an observer elevated above the ground.
- 459 Field within field:**
This subclass is indented under subclass 454. Subject matter wherein a relatively small presentation is embedded within a larger presentation.
- 460 Vehicle having fixed position within the presentation along with navigational map moving relative thereto:**
This subclass is indented under subclass 454. Subject matter wherein a symbolic vehicle representation is shown in an unchanging position in the presentation while a navigational geographic region representation is moved appropriately past it.
- 461 Including map data storage or retrieval:**
This subclass is indented under subclass 409. Subject matter wherein transfer of data to or from a geographic region representation database is specified.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
32.2, for data recording following a collision.
33.4, for storing operational history in a vehicle diagnostic system.
430, for particular data storage or retrieval in route searching or determining.
540, for data storage or retrieval in a navigation system in general.
- 462 Selecting from plural storage devices to obtain map data:**
This subclass is indented under subclass 461. Subject matter wherein one of multiple geographic region representation data storage devices is chosen to supply map data.

463 Using hard drive:

This subclass is indented under subclass 461. Subject matter wherein data is transferred to or from a device having a permanently mounted inflexible magnetic disk.

SEE OR SEARCH CLASS:

360, Dynamic Magnetic Information Storage or Retrieval, appropriate subclasses for magnetic data storage, in general.

464 Using cassette tape:

This subclass is indented under subclass 461. Subject matter wherein data is transferred to or from a device which includes a long narrow flexible spooled strip having a magnetic coating.

SEE OR SEARCH CLASS:

360, Dynamic Magnetic Information Storage or Retrieval, appropriate subclasses, for magnetic data storage, in general.

465 Determination of estimated time of arrival (ETA):

This subclass is indented under subclass 408. Subject matter wherein location determining is utilized to find approximate the hours, minutes, seconds of reaching a destination point.

466 Determination of along-track or cross-track deviation:

This subclass is indented under subclass 408. Subject matter wherein the data processing system or calculating computer functions to determine the off track of a present position from a desired position in a direction parallel to or perpendicular to a course.

467 Including way point navigation:

This subclass is indented under subclass 408. Subject matter wherein a position relative to an intermediate point between an origin and a destination is determined.

468 Using satellite positioning system (e.g., Global Positioning System (GPS), etc.):

This subclass is indented under subclass 408. Subject matter wherein the electrical data processing system or calculating computer receives positional data via communication

with artificial Earth orbiting device dedicated to a world wide navigational tracking system.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

32.4, for vehicle location using GPS in a diagnostic or maintenance system.

SEE OR SEARCH CLASS:

340, Communications: Electrical, subclass 426.19 for land vehicle alarm or indicators of burglary or unauthorized use with a remote alarm using GPS (i.e., location) and subclass 539.13 for condition responsive indicating system with particular radio coupling link including personal, portable device tracking location (e.g., GPS, etc.).

342, Communications: Directive Radio Wave Systems and Devices (e.g., Radar, Radio Navigation), subclasses 357.21 through 357.78 for sending or receiving radio wave energy which is characterized by some quality that varies according to the relative direction or position of a satellite used to locate the position of an object and 450-465 for an apparatus for determining the position in space of an object, vehicle, or atmospheric condition by the reception of signals not having distinctive bearing or position determinative characteristics.

469 Having accuracy improvement of position or location:

This subclass is indented under subclass 468. Subject matter wherein the electrical data processing system or calculating computer utilizes a secondary or supplemental method or structure to more exactly indicate locale.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

495 through 496, for accuracy improvement in a dead-reckoning system.

470 Having multiple antennas or receivers (e.g., differential GPS, etc.):

This subclass is indented under subclass 469. Subject matter having a plurality of devices to collect information from satellites associated with a world wide navigational system.

- 471 Including plural widely separated fixed GPS stations (e.g., Wide Area Augmentation System (WAAS), etc.):**
This subclass is indented under subclass 470. Subject matter wherein multiple unmoving GPS stations distributed over a wide area are utilized.
- 472 Having a self-contained position computing mechanism (e.g., dead-reckoning, etc.):**
This subclass is indented under subclass 469. Subject matter having a secondary system for independently calculating or indicating location for the substitution, modification, or verification of the satellite position data such as determination without the aid of celestial observation of the vehicle positions from the record of the course, distance made, and known drift.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:
494 through 499, for a non-inertial dead-reckoning system per se.
500 through 512, for inertial sensing systems which may inherently or explicitly perform dead-reckoning.
- 473 Correcting multiple diverse errors:**
This subclass is indented under subclass 469. Subject matter wherein plural mistakes of differing type which produce positional or location inaccuracy are compensated.
- 474 Anti-jamming:**
This subclass is indented under subclass 469. Subject matter wherein compensation for an intentionally generated interference signal is provided.
- SEE OR SEARCH CLASS:
455, Telecommunications, subclasses 296 through 312 for detailed telecommunication interference (e.g., jamming, etc.) elimination.
- 475 Dilution of precision compensating:**
This subclass is indented under subclass 469. Subject matter wherein accuracy is improved by taking into account geometric configuration of positioning satellites.
- 476 Isolating data from error producing satellite:**
This subclass is indented under subclass 469. Subject matter wherein information derived from a satellite determined to be defective is blocked from subsequent processing.
- 477 Integer ambiguity resolution:**
This subclass is indented under subclass 469. Subject matter wherein inaccuracy resulting from an unknown number of whole carrier wavelengths occurring between positioning satellite and positioning receiver is compensated.
- 478 Correcting clock signal error:**
This subclass is indented under subclass 469. Subject matter wherein timer imprecision of a positioning satellite or a positioning receiver is compensated.
- 478.5 Multipath distortion reduction:**
This subclass is indented under subclass 469. Subject matter wherein interference resulting from portions of a transmitted signal being received at differing times at a positional receiver due to intervening physical obstacles is compensated.
- 479 Using filter:**
This subclass is indented under subclass 469. Subject matter wherein positional or location inaccuracy is reduced by the use of a device which removes or diminishes an undesired signal frequency component.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:
509 through 510, for filtering of inputs or outputs of an inertial sensing device in a navigation system employing position-determining equipment.
535 through 536, for a navigation system providing enhanced navigational accuracy using filtering.
- SEE OR SEARCH CLASS:
708, Electrical Computers: Arithmetic Processing and Calculating, subclasses 300 through 323 for digital filtering, per se.

- 480 Kalman:**
This subclass is indented under subclass 479. Subject matter wherein the filtering is provided by a recursive filter which acts on a series of imprecise or noisy data values and which can provide an accurate estimate of the state of the respective linear system.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:
510, for Kalman filtering of inputs or outputs of an inertial sensing device in a navigation system employing position-determining equipment.
536, for a navigation system providing enhanced navigational accuracy using Kalman filtering.
- 481 Using artificial intelligence (e.g., neural network, etc.):**
This subclass is indented under subclass 469. Subject matter wherein processing elements which are designed to mimic human thought processes are utilized.
- SEE OR SEARCH CLASS:
706, Data Processing: Artificial Intelligence, appropriate subclasses for artificial intelligence processing, in general.
- 482 Plural object location determination (e.g., fleet, etc.):**
This subclass is indented under subclass 468. Subject matter wherein the position of multiple objects is calculated.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:
29.3, for multiple vehicle diagnosis or maintenance determination.
- 483 Multi-mode (e.g., stand-alone/network assisted, etc.):**
This subclass is indented under subclass 468. Subject matter wherein one of plural operating scenarios for a positioning receiver can be selected such as an independent or separate system aided.
- 484 Having communication link to external ground site:**
This subclass is indented under subclass 468. Subject matter wherein a communication path between a positioning receiver and a remote ground location is utilized.
- (1) Note. For classification herein, the communications link must be broadly recited. Detailed communication systems are classified elsewhere.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:
31.5, for a communication link in an externally determined vehicle diagnosis or maintenance need.
- 485 Location or position determined at external ground site:**
This subclass is indented under subclass 484. Subject matter wherein specific locale of the positioning receiver is calculated at the remote Earth location.
- 486 Having security processing (e.g., password, encryption, etc.):**
This subclass is indented under subclass 468. Subject matter wherein positioning data is protected.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:
32.6, for data security in vehicle diagnosis.
- SEE OR SEARCH CLASS:
726, Information Security, appropriate subclasses for information security, in general.
- 487 User interface:**
This subclass is indented under subclass 468. Subject matter wherein an intermediate device is provided which allows communication between an individual and a positioning system.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:
418 through 419, for a user interface in route correction.

- 488 Speech recognition or speech synthesized output:**
This subclass is indented under subclass 487. Subject matter wherein the user interface understands conversational sounds spoken by the user or artificially generates conversational sounds providing information to the user.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
- 419, for an audio interface in map database route searching.
- 427, for speech recognition in a location based route searching or determining.
- 431 through 444, for audio or visual route guidance in a map database system.
- 443, for speech recognition or synthesis in an audio or visual route guidance system.
- 539, for speech recognition or synthesis in a navigational system generally.
- 489 Using vector processing:**
This subclass is indented under subclass 468. Subject matter wherein a data structure representing a magnitude and direction of a quantity is utilized.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
- 512, for vector processing in an inertial sensing system.
- 490 Having power conservation:**
This subclass is indented under subclass 468. Subject matter wherein the utilization of a quantity reflecting the magnitude of electrical current multiplied by the magnitude of electrical voltage is minimized
- 491 Portable:**
This subclass is indented under subclass 468. Subject matter wherein a positioning receiver is readily hand-held and transportable by a user.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
- 33.2, for a vehicle diagnostic or maintenance need determination having a portable element.
- 526, for a portable position determining device.
- 541, for a portable navigational device, in general.
- 492 Using VHF omnidirectional radio range/distance measuring equipment (VOR/DME) (e.g., Tacan, etc.):**
This subclass is indented under subclass 408. Subject matter providing aircraft positioning wherein a ground station transmits a station identifier and other data to allow an aircraft to derive a bearing from the station and where the aircraft determines distance to the ground station by sending/receiving a pulse pair thereto.
- (1) Note. Included herein are separate VOR or DME subsystems.
- SEE OR SEARCH CLASS:
- 342, Communications: Directive Radio Wave Systems and Devices (e.g., Radar, Radio Navigation), subclass 399 for Tacan.
- 493 Using hyperbolic lines of position (e.g., Loran, Decca, etc.):**
This subclass is indented under subclass 408. Subject matter using multiple hyperbola shaped curves to find position wherein each point on a given curve has the same constant time difference between the receipt of signals from two separate transmitters.
- SEE OR SEARCH CLASS:
- 342, Communications: Directive Radio Wave Systems and Devices (e.g., Radar, Radio Navigation), subclass 388 for Loran and subclass 397 for Decca.
- 494 Using non-inertial dead-reckoning apparatus:**
This subclass is indented under subclass 408. Subject matter wherein position is determined from a last known position along with subsequent displacement without using an inertial detecting device.
- (1) Note. Excluded herein are specifically claimed inertial sensing systems which may inherently or explicitly perform dead-reckoning. A search for dead-reckoning subject matter should include appropriate areas per SEARCH THIS CLASS, SUBCLASS notes below.

- SEE OR SEARCH THIS CLASS, SUB-CLASS:
 472, for a satellite positioning system (e.g., GPS) which includes a self-contained position computing mechanism such as any type of dead-reckoning.
 500 through 512, for inertial sensing systems which may inherently or explicitly perform dead-reckoning.
- 495 Having accuracy improvement of position or location:**
 This subclass is indented under subclass 494. Subject matter wherein the electrical data processing system or calculating computer utilizes a secondary or supplemental method or structure to more exactly indicate locale.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:
 469 through 481, for accuracy improvement in a satellite positioning system.
- 496 Correction for ellipticity of earth:**
 This subclass is indented under subclass 495. Subject matter wherein an adjustment is made for the fact that the earth is not perfectly spherical (i.e., the polar circumference is smaller than the equatorial circumference).
- 497 Wind speed correction:**
 This subclass is indented under subclass 495. Subject matter wherein an adjustment is made for the impact of the velocity of wind on positional determination.
- 498 Wheel sensor provides distance or heading information:**
 This subclass is indented under subclass 494. Subject matter wherein a detector associated with a vehicle wheel provides data indicative of vehicle distance or direction.
- 499 Including integrator:**
 This subclass is indented under subclass 494. Subject matter wherein a device providing a mathematical the operation of finding a function whose differential is known function is utilized.
- SEE OR SEARCH CLASS:
 708, Electrical Computers: Arithmetic Processing and Calculating, subclass 444 for generic digital integration processing.
- 500 Using inertial sensing (e.g., Inertial Navigation System (INS), etc.):**
 This subclass is indented under subclass 408. Subject matter wherein a navigation system utilizes a detector directly responsive to acceleration.
- (1) Note. Included herein are inertial sensing systems which may inherently or explicitly perform dead-reckoning.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:
 472, for a satellite positioning system (e.g., GPS) which includes a self-contained position computing mechanism such as any type of dead-reckoning.
 494 through 499, for non-inertial dead-reckoning.
- SEE OR SEARCH CLASS:
 244, Aeronautics and Astronautics, subclass 3.2 for missile stabilization or trajectory control inertial automatic guidance.
- 501 Having correction by non-inertial sensor:**
 This subclass is indented under subclass 500. Subject matter wherein correction is provided by a detector of other than an inertial property.
- 502 Using four or more accelerometers:**
 This subclass is indented under subclass 500. Subject matter wherein more than three acceleration sensors are utilized.
- 503 Including Doppler effect in inertial sensing signal processing:**
 This subclass is indented under subclass 500. Subject matter wherein the observed frequency shift of an electromagnetic wave due to relative motion between two objects is used.

504 Including gravitational effect in inertial sensing signal processing:

This subclass is indented under subclass 500. Subject matter wherein the attraction between objects based on their mass is used.

505 Having error correction of inputs to or outputs from an inertial sensing device:

This subclass is indented under subclass 500. Subject matter wherein an inaccurate input to or output from an acceleration detecting device is compensated.

506 Plural diverse signals:

This subclass is indented under subclass 505. Subject matter wherein multiple different pulse or digital communication types are compensated.

507 Velocity:

This subclass is indented under subclass 505. Subject matter wherein a signal representative of speed is compensated.

508 Azimuth:

This subclass is indented under subclass 505. Subject matter wherein correction is made to a signal representing the angle measured clockwise from true north to a point on the horizon directly beneath an elevated object.

509 By filtering:

This subclass is indented under subclass 505. Subject matter wherein an undesired signal frequency component is removed or diminished.

SEE OR SEARCH THIS CLASS, SUBCLASS:

479 through 480, for a navigation system employing position-determining equipment using a satellite positioning system and utilizing a filter to reduce positional or location inaccuracy.

535 through 536, for a navigation system providing enhanced navigational accuracy using filtering.

SEE OR SEARCH CLASS:

708, Electrical Computers: Arithmetic Processing and Calculating, subclasses 300 through 323 for digital filtering, per se.

510 Kalman:

This subclass is indented under subclass 509. Subject matter wherein the filtering is provided by a recursive filter which acts on a series of imprecise or noisy data values and which can provide an accurate estimate of the state of the respective linear system.

SEE OR SEARCH THIS CLASS, SUBCLASS:

480, for a navigation system employing position-determining equipment using a satellite positioning system and utilizing a Kalman filter to reduce positional or location inaccuracy.

536, for a navigation system providing enhanced navigational accuracy using Kalman filtering.

511 Including matrix processing:

This subclass is indented under subclass 500. Subject matter wherein data represented by an $m \times n$ element mathematical structure is manipulated.

512 Including vector processing:

This subclass is indented under subclass 500. Subject matter wherein a data structure representing a magnitude and direction of a quantity is utilized.

SEE OR SEARCH THIS CLASS, SUBCLASS:

489, for vector processing in a satellite positioning system.

513 Using star tracker:

This subclass is indented under subclass 408. Subject matter further comprising a mechanism to determine the position of the stars.

SEE OR SEARCH CLASS:

250, Radiant Energy, subclasses 203.1 through 203.7 for a photocell following a star.

434, Education and Demonstration, subclass 111 for celestial navigation.

709, Electrical Computers and Digital Processing Systems: Multicomputer Data Transferring, FOR 101 for a foreign art collection relating to object detection or tracking.

- 514 Including radar or optical ground scanner:**
This subclass is indented under subclass 408. Subject matter further comprising a mechanism to scan the ground by radar or by light.
- SEE OR SEARCH CLASS:
342, Communications: Directive Radio Wave Systems and Devices (e.g., Radar, Radio Navigation), subclasses 42 through 51 for radar transmitter and receiver system.
- 515 Emergency use:**
This subclass is indented under subclass 408. Subject matter wherein the position determining is used in a crisis situation requiring an immediate response.
- 516 Location dependent distribution of information to a user:**
This subclass is indented under subclass 408. Subject matter wherein data is automatically sent to a person upon reaching the vicinity of a geographic location.
- 517 Transmission of location information to remote site:**
This subclass is indented under subclass 408. Subject matter wherein determined location information is conveyed to a point distant from a user.
- SEE OR SEARCH CLASS:
340, Communications: Electrical, subclass 539.13 for condition responsive indicating system with particular radio coupling link including personal, portable device tracking location (e.g., GPS, etc.).
- 518 Error correction:**
This subclass is indented under subclass 408. Subject matter wherein a modification is made to a determined location to enhance its accuracy.
- 519 Object tracking:**
This subclass is indented under subclass 408. Subject matter wherein the location of an object is continuously determined.
- 520 Conversion of location coordinates:**
This subclass is indented under subclass 408. Subject matter wherein numbers representing a location in one geometric system are translated into an equivalent representation in a differing geometric system.
- 521 Including history log:**
This subclass is indented under subclass 408. Subject matter wherein a record of location data is maintained.
- 522 Using computer network (e.g., Internet, etc.):**
This subclass is indented under subclass 408. Subject matter wherein location determination utilizes a system of plural interconnected data processing units.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
537, for navigation using a computer network, in general.
- SEE OR SEARCH CLASS:
709, Electrical Computers and Digital Processing Systems: Multicomputer Data Transferring, appropriate subclasses for computer networks, per se.
- 523 Using imaging device:**
This subclass is indented under subclass 408. Subject matter wherein location determining utilizes a device which is optically responsive and which produces a representation of a view.
- 524 Using neural network:**
This subclass is indented under subclass 408. Subject matter wherein the location determining utilizes elements having weighted outputs which are subsequently summed and which mimic the interconnection of biological neurons.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
706, Data Processing: Artificial Intelligence, subclasses 15-44 for neural networks, in general.

- 525 Using magnetometer:**
This subclass is indented under subclass 408. Subject matter location determining uses a detector of a attraction/repulsion force.
- SEE OR SEARCH CLASS:
324, Electricity: Measuring and Testing, subclasses 200 through 263 for magnetic measuring, per se.
- 526 Portable:**
This subclass is indented under subclass 408. Subject matter wherein a location determining device is readily held and movable between locations by a user.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
33.2, for a vehicle diagnostic or maintenance need determination having a portable element.
491, for a portable satellite positioning system.
541, for a portable navigational device, in general.
- 527 Determination of travel data based on distance measured from a starting point:**
This subclass is indented under subclass 400. Subject matter wherein the electrical data processing system or calculating computer functions to compute, establish, or indicate travel information associated with a distance measured from an initial position.
- 528 Aircraft preflight route search:**
This subclass is indented under subclass 400. Subject matter wherein a predetermined flight path is established for an aeronautical vehicle prior to take-off.
- 529 Great circle route search:**
This subclass is indented under subclass 400. Subject matter wherein a course is determined along the shortest line between two points on the surface of a sphere.
- 530 Including compensated direction finder (e.g., for compass deviation, etc.):**
This subclass is indented under subclass 400. Subject matter including adjustment for an abnormal condition at a bearing finding device.
- (1) Note. This often includes correction for local anomalous magnetic fields.
- 531 Space orbit or path:**
This subclass is indented under subclass 400. Subject matter wherein the course, path, or position is outside the atmosphere of a planet.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
13, for the control of a spacecraft or satellite.
- SEE OR SEARCH CLASS:
244, Aeronautics and Astronautics, subclass 158.1 through 173.3 for spacecraft.
- 532 Employing map database system:**
This subclass is indented under subclass 400. Subject matter wherein a navigation system utilizes a geographic region representation information processing data system.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
409 through 464, for position determining used in a map database system.
- 533 Including route searching or determining:**
This subclass is indented under subclass 532. Subject matter wherein the map database system is further capable of processing stored electrical data corresponding to locations within a given geographical area to determine a path of travel between a point of origin and a destination point.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
410 through 430, for position determining used in map database route searching.
- 534 Having error or fault correction:**
This subclass is indented under subclass 400. Subject matter providing enhanced navigational accuracy.
- 535 Using filter:**
This subclass is indented under subclass 534. Subject matter wherein unwanted frequency components of a signal are eliminated or reduced.

- SEE OR SEARCH THIS CLASS, SUB-CLASS:
 479 through 480, for a navigation system employing position-determining equipment using a satellite positioning system and utilizing a filter to reduce positional or location inaccuracy.
 509 through 510, for filtering of inputs or outputs of an inertial sensing device in a navigation system employing position-determining equipment.
- SEE OR SEARCH CLASS:
 708, Electrical Computers: Arithmetic Processing and Calculating, subclasses 300 through 323 for digital filtering, per se.
- 536 Kalman:**
 This subclass is indented under subclass 535. Subject matter wherein the filtering is provided by a recursive filter which acts on a series of imprecise or noisy data values and which can provide an accurate estimate of the state of the respective linear system.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:
 480, for a navigation system employing position-determining equipment using a satellite positioning system and utilizing a Kalman filter to reduce positional or location inaccuracy.
 510, for Kalman filtering of inputs or outputs of an inertial sensing device in a navigation system employing position-determining equipment.
- 537 Using computer network (e.g., Internet, etc.):**
 This subclass is indented under subclass 400. Subject matter wherein a system of plural interconnected data processing units is utilized.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:
 522, for location determining using a computer network.
- SEE OR SEARCH CLASS:
 709, Electrical Computers and Digital Processing Systems: Multicomputer Data Transferring, appropriate subclasses for computer networks, per se.
- 538 Having user interface:**
 This subclass is indented under subclass 400. Subject matter including a device which permits interaction between an individual and a navigation system.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:
 487 through 488, for a GPS system user interface.
- 539 Speech recognition or synthesis:**
 This subclass is indented under subclass 538. Subject matter wherein the user interface understands conversational sounds spoken by a user or artificially generates conversational sounds providing information to a user.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:
 488, for speech recognition or synthesis in a GPS system.
- 540 Having particular data storage or retrieval:**
 This subclass is indented under subclass 400. Subject matter wherein specific manipulation of information to or from a holding device is utilized.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:
 32.2, for data recording following a collision.
 33.4, for storing operational history in a vehicle diagnostic system.
 430, for particular data storage or retrieval in route searching or determining.
 461 through 464, for map data storage or retrieval in a map database system.
- 541 Portable:**
 This subclass is indented under subclass 400. Subject matter wherein a navigation device is readily held and movable between locations by a user.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 33.2, for a vehicle diagnostic or maintenance need determination having a portable element.
- 491, for a portable satellite positioning system.
- 526, for a portable position determining device.

FOREIGN ART COLLECTIONS

The definitions below correspond to abolished subclasses from which these collections were formed. See the Foreign Art Collection schedule of this class for specific correspondences. [Note: The titles and definitions for indented art collections include all the details of the one(s) that are hierarchically superior.]

FOR 100 Vehicle diagnosis or maintenance indication (701/29):

This foreign art collection is indented under the class definition. Foreign art collection for vehicle control, guidance, operation, or indication wherein the electrical data processing system or calculating computer is designed to evaluate, monitor, or indicate the performance, operating condition, or servicing need of a vehicle.

FOR 101 Indication of maintenance interval (701/30):

This foreign art collection is indented under FOR 100. Foreign art collection for vehicle diagnosis or maintenance indication wherein the electrical data processing system or calculating computer determines and communicates to an interested party, a need for vehicle servicing based on a constraint parameter (e.g., time, operating condition or vehicle millage).

FOR 102 Self-test (701/31):

This foreign art collection is indented under FOR 100. Foreign art collection for vehicle diagnosis or maintenance indication wherein the electrical data processing system or calculating computer functions to check the diagnostic equipment or elements within said system, absent any external device.

FOR 103 Vehicle or device ID (701/32):

This foreign art collection is indented under FOR 100. Foreign art collection for vehicle diagnosis or maintenance indication wherein the electrical data processing system or calculating computer generates a signal identifying the vehicle (i.e., make, model, year of manufacture, etc.) or vehicular component to be diagnosed.

FOR 104 Plural processors or external processor (701/33):

This foreign art collection is indented under FOR 100. Foreign art collection for vehicle diagnosis or maintenance indication wherein the diagnosis or indication process is facilitated by multiple processors or a remote processor.

FOR 105 Detection of faulty sensor (701/34):

This foreign art collection is indented under FOR 100. Foreign art collection for vehicle diagnosis or maintenance indication wherein the electrical data processing system or calculating computer functions to identify a malfunction of a vehicle sensor.

FOR 106 With data recording device (701/35):

This foreign art collection is indented under FOR 100. Foreign art collection in which the sensed vehicular condition parameter or diagnostic result is stored in a recording medium.

FOR 107 NAVIGATION (701/200):

This foreign art collection is indented under the class definition. Foreign art collection wherein the electrical data processing system or calculating computer functions to determine a course, position, or distance traveled. (1) Note. In Class 116, Signals and Indicators, Digest 43, there exists an unofficial collection of art relating to navigation devices.

FOR 108 Determination of travel data based on the start point and destination point (701/201):

This foreign art collection is indented under FOR 107. Foreign art collection for navigation system wherein the electrical data processing system or calculating computer functions to compute, establish, or indicate travel information associated with the dis-

tance measured from a present position to a terminating position.

FOR 109 Route pre-planning (701/202):

This foreign art collection is indented under FOR 108. Foreign art collection for determination of travel data further comprising a static means to determine a travel course prior to the departure of the vehicle.

FOR 110 Great circle route (701/203):

This foreign art collection is indented under FOR 108. Foreign art collection for determination of travel data wherein the course lies along the shortest line between two points on the surface of a sphere.

FOR 111 Determination of E.T.A. (701/204):

This foreign art collection is indented under FOR 107. Foreign art collection for navigation system wherein the data processing system or calculating computer functions to determine the time of arrival at a destination.

FOR 112 Determination of a long-track or cross-track deviations (701/205):

This foreign art collection is indented under FOR 107. Foreign art collection for navigation system wherein the data processing system or calculating computer functions to determine the deviation of a present position from a desired position in a direction parallel to or perpendicular to the course.

FOR 113 Employing way point navigation (701/206):

This foreign art collection is indented under FOR 107. Foreign art collection for navigation system wherein the data processing system or calculating computer functions to determine the position relative to an intermediate point between origin and destination.

FOR 114 Employing position determining equipment (701/207):

This foreign art collection is indented under FOR 107. Foreign art collection for navigation system wherein the electrical data processing system or calculating computer functions to compute, establish, or indicate the location of a vehicle based on the information provided by the position determining device.

FOR 115 For use in a map data base system (701/208):

This foreign art collection is indented under FOR 114. Foreign art collection for positioning determining equipment wherein the vehicle position information is utilized in conjunction with a map information processing data system.

FOR 116 route searching or determining device (701/209):

This foreign art collection is indented under FOR 115. Foreign art collection for map data base system further capable of processing stored electrical data corresponding to locations within a given geographical area to determine a path of travel between a point of origin and a destination point.

FOR 117 Route correction, modification, or verification (701/210):

This foreign art collection is indented under FOR 116. Foreign art collection for searching system wherein the electrical data processing system or calculating computer is designed to either (a) alter the path of travel, (b) determine a supplemental path of travel, (c) provide instructions to resume to the original path of travel, or (d) validate vehicle position or course.

FOR 118 Having audio or visual route guidance (701/211):

This foreign art collection is indented under FOR 115. Foreign art collection for map data base system further comprising audio or visual information providing directional instructions to follow a chosen path.

FOR 119 Having variable map scale (701/212):

This foreign art collection is indented under FOR 115. Foreign art collection for map data base system further capable of being responsive to a predetermined condition to adjust either (a) the graphical representation of a particular geographic region to an appropriate level of detail or (b) the graphical representation of the vehicle to a specified orientation.

FOR 120 Using Global Positioning System (GPS) (701/213):

This foreign art collection is indented under FOR 114. Foreign art collection for position determining equipment wherein the electrical data processing system or calculating computer receives positional data via communication with satellites dedicated to a world wide navigational tracking system.

FOR 121 Means to improve accuracy of position or location (701/214):

This foreign art collection is indented under FOR 120. Foreign art collection for global positioning system wherein the electrical data processing system or calculating computer utilizes a secondary or supplemental means to more exactly indicate a vehicle's locale.

FOR 122 Having multiple GPS antennas or receivers (e.g., differential GPS) (701/215):

This foreign art collection is indented under FOR 121. Foreign art collection for method of correcting position data having a plurality of devices to collect information from satellites associated with a world wide navigational system.

FOR 123 Having a self-contained position computing means (e.g., dead reckoning) (701/216):

This foreign art collection is indented under FOR 121. Foreign art collection for method of correcting position data having a secondary system for independently calculating or indicating vehicle location for the substitution, modification, or verification of the GPS position data.

FOR 124 Using dead-reckoning apparatus (701/217):

This foreign art collection is indented under FOR 114. Foreign art collection for navigation system wherein position is determined from course and distance made from the last known position and known or estimated drift.

FOR 125 With R-O (D.M.E. and path) or Tacan equipment (701/218):

This foreign art collection is indented under FOR 114. Foreign art collection for navigation system having either Tacan or distance and bearing measuring equipment.

FOR 126 With Loran or Shoran or Decca equipment (701/219):

This foreign art collection is indented under FOR 114. Foreign art collection for navigation system wherein a position is determined from hyperbolic lines of position.

FOR 127 With inertial sensor (701/220):

This foreign art collection is indented under FOR 114. Foreign art collection for navigation system having a means to sense a force caused by acceleration.

FOR 128 With correction by noninertial sensor (701/221):

This foreign art collection is indented under FOR 127. Foreign art collection for inertial sensor having a means for correction by sensing a noninertial property.

FOR 129 With star tracker (701/222):

This foreign art collection is indented under FOR 114. Foreign art collection for navigation system further comprising a means to determine the position of the stars.

FOR 130 With radar or optical ground scanner (223):

This foreign art collection is indented under FOR 114. Foreign art collection for navigation system further comprising a means to scan the ground by radar or optically.

FOR 131 With indicated course correction (compass deviation) (701/224):

This foreign art collection is indented under FOR 107. Foreign art collection for navigation system further comprising a means of notification for modified or corrected course.

FOR 132 Determining range without range measurement (701/225):

This foreign art collection is indented under FOR 107. Foreign art collection for navigation system wherein the data processing system or calculating computer functions to determine a travel distance indirectly.

FOR 133 Space orbits or paths (701/226):

This foreign art collection is indented under FOR 107. Foreign art collection for navigation system wherein the course, path, or

position is outside the atmosphere of a planet.

END