National Marine Electronics Association

International Marine Electronics Association

NMEA 2000®

Appendix B.6 Class & Function Codes

Standard for Serial-Data Networking of Marine Electronic Devices

Version 2.00
July 2012

NATIONAL MARINE ELECTRONICS ASSOCIATION

INTERNATIONAL MARINE ELECTRONICS ASSOCIATION

EFFECTIVE DATE AUGUST 1, 2012

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Appendix B.6: NMEA 2000 Class and Function Codes

Version: **2.00** ***Effective Date:*** **7/19/2012**

Class Code	Funct Code	Class / Function Name	Description

Class Code	Funct Code	Class / Function Name	Description
00		Reserved	Reserved for NMEA 2000 use

Class Code	Funct Code	Class / Function Name	Description
10		System Tools	Equipment that queries and measures NMEA 2000 bus traffic and may be used to configure, troubleshoot and/or test. System Tools shall not be permanently connected to the NMEA 2000 bus.
	130	Diagnostic	Devices that stress the system for diagnostic purposes
	140	Bus Traffic Logger	Devices that may be connected to a NMEA 2000 backbone to record bus traffic; as used in this class, these devices promiscuously capture and save CAN frames without regard for source or content

Class Code	Funct Code	Class / Function Name	Description
20		Safety Systems	Equipment that is inheritantly designed to ensure personnel and/or vessel safety by recording, detecting, and/or alerting on safety/security related occurances.
	110	Alarm Enunciator ***DEPRECATED - Function not for use in new designs!***	Alarm Enunciator {Deprecated - See Display/Alarm Enunciator - Class Code 120, Function Code 140 }
	130	Emergency Position Indicating Radio Beacon (EPIRB)	Devices that transmit ownship position to aid in vessel location for distress and search and rescue
	135	Man Overboard	Devices that detect/report events where personnel are absent from the vessel

Class Code	Funct Code	Class / Function Name	Description
	140	Voyage Data Recorder	Devices that collect data from various vessel sensors and stores the information for later retrieval; as used in this class, these devices are typically configured to record specific parameters from specific sources, such as vessel position from a GNSS receiver.
	150	Camera	Devices that record ownship compartment, equipment and personnel video images for the purpose of ensuring ownship security and/or safety.

Class Code	Funct Code	Class / Function Name	Description
25		Inter/Intranetwork Device	NMEA 2000 equipment used as nodes to interconnect communication paths, including both inter- and intra- network communication
	130	PC Gateway	Device that brings both NMEA 2000 data onto a computer, and computer data onto an NMEA 2000 network.
	131	NMEA 2000 to Analog Gateway	Device that brings NMEA 2000 data to an analog system or display
	132	Analog to NMEA 2000 Gateway	Device that converts analog device data and sends this onto the NMEA 2000 network
	135	NMEA 0183 Gateway	Device that joins an NMEA 2000 network to NMEA 0183 circuit(s) and provides translation between NMEA 2000 and 0183 data formats.
	140	Router	Device that joins network segments with the same network protocol. On each side of a router address space, data rate and physical media may differ.
	150	Bridge	Device that joins network segments using the same network protocol and address space. Data rate and physical media may differ on each side to the bridge. A bridge may perform message filtering.
	160	Repeater	Device that receives a signal and retransmits it at a higher level or higher power.

Class Code	Funct Code	Class / Function Name	Description
30		Electrical Distribution	Equipment that monitors and/or controls non-propulsion electrical power use aboard a vessel.

Class Code	Funct Code	Class / Function Name	Description
	130	Binary Event Monitor	Provides status and/or notification of binary conditions on the vessel. For example, binary conditions include switch positions (On/Off) and float levels (High Bilge Detected/Not Detected).
	140	Load Controller	Manages (enables/disables or is otherwise in control of) loads under command from a triggering mechanism or control function.
	141	AC/DC Input	Reports electrical properties of AC and/or DC connections feeding power to products/loads.
	150	Function Controller	Logical controller that interprets trigger events to determine functional state transitions. For example, a function controller might be responsible for turning on all bilge pumps in the event of a high bilge condition signaled from a binary event monitor by sending commands to one or more load controllers.

Class Code	Funct Code	Class / Function Name	Description
35		Electrical Generation	Equipment that outputs electrical "power", not used primarily to propel the vessel
	140	Engine	Devices that convert chemical energy in a fuel into kinetic energy; Primarily under this class, the engine acts as a kinetic energy source for a generator. This function is normally only used for an Engine ECU separate from the Generator ECU.
	141	DC Generator/Alternator	Converts kinetic energy to DC power; under this function, the kinetic energy source is relatively stable and can respond to load variations. This function is used both by ECUs that report/control only the DC generation parameters, and by ECUs that report/control both DC generation parameters and the associated engine parameters.
	141	Solar Panel (Solar Array)	Converts solar energy to DC power
	143	Wind Generator (DC)	Converts kinetic wind energy to DC power, under this function the kinetic energy source is unstable, and may not sustain a given load for any length of time.
	144	Fuel Cell	Produces DC power by electrochemical conversion.
	145	Network Power Supply	Provides power to an NMEA 2000 network.

Class Code	Funct Code	Class / Function Name	Description
	151	AC Generator	Converts kinetic energy to AC power; under this function, the kinetic energy source is relatively stable and can respond to load variations. This function is used both by ECUs that report/control only the DC generation parameters, and by ECUs that report/control both AC generation parameters and the associated engine parameters.
	152	AC Bus	Reports and/or controls AC electrical properties of an AC electrical bus.
	153	AC Mains (Utility/Shore)	Reports and/or controls AC electrical properties of power originating off the vessel.
	154	AC Output	Reports and/or controls AC electrical properties of an AC connection feeding power to a bus or another group of products.
	160	Power Converter - Battery Charger	Device capable of charging a battery/batteries; This function applies to both AC and DC sourced chargers.
	161	Power Converter - Battery Charger+Inverter	Devices that convert AC power to DC power to charge a battery AND convert DC power to AC.
	162	Power Converter - Inverter	Converts DC power to AC power
	163	Power Converter - DC	Converts one voltage of DC power to another DC power voltage
	170	Battery	Reports battery status
	180	Engine Gateway	Device that brings information from an engine used for electrical generation onto the NMEA 2000 network.

Class Code	Funct Code	Class / Function Name	Description
40		Steering and Control Surfaces	Equipment used to change the direction and/or attitude of the vessel {Formerly 'Steering Systems'}
	130	Follow-up Controller	Follow-up controller (Helm/JoyStick/etc.)
	140	Mode Controller	Mode controller
	150	Autopilot	Devices that employ a mechanical, electrical or hydraulic system to guide the ship without assistance from a human being (also known as self-steering gear) {Formerly 'Automatic Steering Controller'}

Class Code	Funct Code	Class / Function Name	Description
	155	Rudder	Devices that monitor and/or control a control surface used to steer vessel by re-directing the flow of water past the hull (i.e. rudders)
	160	Heading Sensors ***DEPRECATED - Function not for use in new designs!***	Heading sensors {Deprecated - See Navigation/Own ship Attitude - Class Code 60, Function Code 140}
	170	Trim (Tabs)/Interceptors	Devices that monitor and/or control a control surface used to provide lift to compensate for changes in speed, weight distribution and water conditions
	180	Attitude (Pitch, Roll, Yaw) Control	Devices that employ a mechanical, electrical or hydraulic system to maintain a given vessel attitude without assistance from a human being (also known as stabilizer)

Class Code	Funct Code	Class / Function Name	Description
50		Propulsion	Equipment used to move the vessel (ex. Trolling, Thruster, Kicker, and Propulsion devices) {Formerly Propulsion Systems}
	130	Engineroom Monitoring ***DEPRECATED - Function not for use in new designs!***	Engineroom monitoring {Deprecated - See Internal Environment - Class Code 90, Function Code 130}
	140	Engine	Devices that convert chemical energy in a fuel into kinetic energy; In this class the engine acts primarily as a propulsion device (Combustion). This function is used both by component level ECUs that report control only propulsion engine parameters and also by system level ECUs that report/control parameters related to an entire propulsion train (for esample an engine and transmission). {Formerly Engine interface}
	141	DC Generator/Alternator	Devices that convert kinetic energy to DC power used to drive propulsion devices (generator). These devices shall be tied to the engine.
	150	Engine Controller ***DEPRECATED - Function not for use in new designs!***	Engine controller {Deprecated - See Propulsion/Engine - Class Code 50, Function Code 140}
	151	AC Generator	Devices that convert kinetic energy to AC power used to drive propulsion devices (generator). These devices shall be tied to the engine
	155	Motor	Devices that convert electrical energy into kinetic energy; In this class, the motor acts primarily as a propulsion device (Electrical)

Class Code	Funct Code	Class / Function Name	Description
	160	Engine Gateway	Device that brings information from an engine used for propulsion onto the NMEA 2000 network
	165	Transmission	Gear systems providing speed-power conversion
	170	Throttle/Shift Control	Local to the propulsion system, may be the actuator or fuel injection system, etc. { Previously "Control Head" }
	180	Actuator ***DEPRECATED - Function not for use in new designs!***	Actuator {Deprecated - unused prior to version 2.00}
	190	Gauge Interface ***DEPRECATED - Function not for use in new designs!***	Gauge interface {Deprecated - unused prior to version 2.00}
	200	Gauge Large ***DEPRECATED - Function not for use in new designs!***	Gauge, large {Deprecated - See Display/Display - Class Code 120, Function Code 130}
	210	Gauge Small ***DEPRECATED - Function not for use in new designs!***	Gauge, small {Deprecated - See Display/Display - Class Code 120, Function Code 130}

Class Code	Funct Code	Class / Function Name	Description
60		Navigation	Equipment that provide information related to the passage of the vessel and potental obstructions/hazards {Formerly Navigation Systems}
	130	Bottom Depth	Devices that report distance to bottom {Fomerly Sounder, Depth}
	135	Bottom Depth/Speed	Devices that report distance to bottom AND speed through water. This allows combination devices of this type to provide both functions with one address. {Formerly Unnamed}
	140	Ownship Attitude	Devices that report heading, pitch, roll, yaw, angular rates
	145	Ownship Position (GNSS)	Devices that report vessel Latitude, Longitude, ground speed, etc. using satellites (ex. GPS, GLONAS, GALILEO, etc.) {Formerly Global Navigation Satellite System (GNSS)}
	150	Ownship Position (Loran C)	Devices that report vessel Latitude, Longitude, speed (water/ground), etc. using terrestrial instrumentation (i.e. LORAN C)
	155	Speed	Devices that report water/ground speed. {Formerly Speed Sensors}

Class Code	Funct Code	Class / Function Name	Description
	160	Turn Rate Indicator ***DEPRECATED - Function not for use in new designs!***	{Deprecated - See Navigation/Own ship Attitude - Class Code 60, Function Code 140}
	170	Integrated Navigation ***DEPRECATED - Function not for use in new designs!***	{Deprecated - See Navigation/Own ship Position - Class Code 60, Function Code 145 OR Navigation/Integrated Navigation System - Class Code 60, Function Code 175}
	175	Integrated Navigation System	Devices that receive navigation data from NMEA 2000 bus and/or internal sources. These devices report back to bus the data selected/used in vessel navigation. The data reported back to the bus should NOT be interpreted as source data for other data consumers.
	190	Navigation Management	Devices that report general information necessary to manage navigational equipment as opposed to measured/sensed parameters. Such information includes route/waypoints, distance to waypoint, cross track error, estimated arrival times, waypoint position, datum to use, variation, navigation events such as waypoint arrival, etc.
	195	Automatic Identification System (AIS)	Devices that provides dynamic and static information about other vessels in the waterway for the purpose of collision avoidance. These devices may broadcast ownship dynamic and static information to other vessels.
	200	Radar	Devices that report position of potential obstructions. These devices typically use electromagnetic waves to identify the range, direction and speed of both moving and fixed objects. {Formerly Radar and/or Radar Plotting}
	201	Infrared Imaging	Devices that report position of potential obstructions. These devices typically use infrared radiation generated by both moving and fixed objects to identify their range, direction and speed.
	205	ECDIS ***DEPRECATED - Function not for use in new designs!***	Electronic Chart Display and Information System (ECDIS) {Deprecated - See Display/Display - Class Code 120, Function Code 130}
	210	ECS ***DEPRECATED - Function not for use in new designs!***	Electronic Chart System (ECS) {Deprecated - See Display/Display - Class Code 120, Function Code 130}
	220	Direction Finder ***DEPRECATED - Function not for use in new designs!***	Direction finder {Deprecated - unused prior to version 2.00}
	230	Voyage Status	Devices that report time aggregated data, such as average speed, or total distance traveled.

Class Code	Funct Code	Class / Function Name	Description

Class Code	Funct Code	Class / Function Name	Description
70		Communication	Equipment used to communicate ship to ship, ship to shore, or intra ship, such as VHF, SSB, Intercom(s) and SATCOMs, etc. {Formerly Communications Systems}
	130	EPIRB ***DEPRECATED - Function not for use in new designs!***	Emergency Position Indicating Radio Beacon (EPIRB) {Deprecated - See Safety/EPIRB - Class Code 20, Function Code 130}
	140	AIS ***DEPRECATED - Function not for use in new designs!***	Automatic Identification System (AIS) {Deprecated - See Navigation/AIS - Class Code 60, Function Code 195}
	150	DSC ***DEPRECATED - Function not for use in new designs!***	Digital Selective Calling (DSC) {Deprecated - See Communication/Radiotelephone - Class Code 70, Function Code 190}
	160	Data Receiver/Transceiver	One or two way communication devices intended primarily for digital data (ex. NavTex, WeatherFax) {Formerly Data Receiver}
	170	Satellite	Satellite Communications
	180	Radio-telephone (MF/HF) ***DEPRECATED - Function not for use in new designs!***	Radio-telephone (MF/HF) {Deprecated - See Communication/Radiotelephone - Class Code 70, Function Code 190}
	190	Radiotelephone	One or two way communication devices intended primarily for voice. This includes equipment with DSC hailing capabilities. {Formerly Radio-telephone (VHF)}

Class Code	Funct Code	Class / Function Name	Description
75		Sensor Communication Interface	Equipment that measures one or more of the same parameter per function code for general purpose use. Devices under this class code may require configuration, such as temperature source. For example a device that reports data from two (2) temperature sensors would require one address (Class 75, Function 130). A device that reports data from one (1) temperature sensor and one (1) pressure sensor would require two (2) addresses, one to report the temperature (Class 75, Function 130) and one to report the pressure (Class 75, Function 140)
	130	Temperature	Devices that measure/report temperature

Class Code	Funct Code	Class / Function Name	Description
	140	Pressure	Devices that measure/report pressure
	150	Fluid Level	Devices that measure/report fluid level
	160	Flow	Devices that measure/report flow
	170	Humidity	Devices that measure/report humidity

Class Code	Funct Code	Class / Function Name	Description
80		Instrumentation/General Systems ***DEPRECATED - Class not for use in new designs!***	Instrumentation/General systems {Deprecated class and assigned functions - see specific functions for recommendations for future use}
	130	Time/Date Systems ***DEPRECATED - Function not for use in new designs!***	Time/Date systems {Deprecated - unused prior to verision 2.00}
	140	VDR ***DEPRECATED - Function not for use in new designs!***	Voyage Data Recorder (VDR) {Deprecated - See Communication/Radiotelephone - Class Code 70, Function Code 190}
	150	Integrated Instrumentation ***DEPRECATED - Function not for use in new designs!***	Integrated instrumentation {Deprecated - See Sensor Communication Interface - Class Code 75}
	160	General Purpose Displays ***DEPRECATED - Function not for use in new designs!***	General purpose displays {Deprecated - See Display/Display-Class Code 120, Function Code 130}
	170	General Sensor Box ***DEPRECATED - Function not for use in new designs!***	General sensor box {Deprecated - See Sensor Communication Interface - Class Code 75}
	180	Weather Instruments ***DEPRECATED - Function not for use in new designs!***	Weather instruments {Deprecated - See External Environment/Atmospheric - Class Code 85, Function Code 130}
	190	Transducer/General ***DEPRECATED - Function not for use in new designs!***	Transducer/general {Deprecated - See Sensor Communication Interface - Class Code 75}
	200	NMEA 0183 Converter ***DEPRECATED - Function not for use in new designs!***	NMEA 0183 converter {Deprecated - See Inter/Intranetwork Device/ NMEA 0183 Gateway - Class Code 25, Function Code 135}

Class Code	Funct Code	Class / Function Name	Description

Class Code	Funct Code	Class / Function Name	Description
85		External Environment	Equipment monitoring the meteorological conditions on the exterior of the vessel.
	130	Atmospheric	Devices that measure/report weather conditions such as Wind, Barometric Pressure, Temperature, Humidity, Dew point, Wind Chill, Heat Index, etc.
	160	Aquatic	Devices that measure/report water conditions such as Temperature, Salinity, Current, Tide, Wave Frequency/Height, etc.

Class Code	Funct Code	Class / Function Name	Description
90		Internal Environment	Equipment monitoring the conditions of interior spaces such as cabins, compartments and engine rooms. {Formerly Environmental (HVAC) Systems}
	130	HVAC	Systems that report and/or control climate conditions such as a heating system, an airconditioning system, etc. For example a heating system that measures cabin temperatures. Where the cabin temperature sensor is not on the bus, would use this class/function code. A stand-alone device that measures and reports cabin temperature and is directly on the bus should use class 75, function 130.

Class Code	Funct Code	Class / Function Name	Description
100		Deck, Cargo and Fishing Equipment	Deck, cargo and fishing equipment systems
	130	Scale (Catch)	Equipment used to measure/weigh aquatic species caught in commercial or recreational fishing activities.

Class Code	Funct Code	Class / Function Name	Description
120		Display	Equipment that provides visual or audible indication/reporting of data parameters
	130	Display	Devices that provide active or passive user interface. A display may also include alarm enunicator functions.

Class Code	Funct Code	Class / Function Name	Description
	140	Alarm Enunciator	Stand-alone devices that provide passive visual and/or audible alert indication(s).

Class Code	Funct Code	Class / Function Name	Description
125		Entertainment	Multimedia or other communication equipment not impacting safe vessel navigation.
	130	Multimedia Player	Equipment that provides visual or audible playback of recorded media for entertainment purposes.
	140	Multimedia Controller	Equipment that transmits multimedia commands in response to man-machine input or other external events.