



SURFACE VEHICLE RECOMMENDED PRACTICE

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Automatic Baud Rate Detection Process

RATIONALE

This version was created for the following reasons:

- Five-year document review
- Clarify that baud rate detection capability can vary per individual controller area network (CAN) port on a given electronic control unit (ECU)
- Clarify that baud rate detection capability of an ECU (or CAN port) can change depending on the ECU life cycle stage

FOREWORD

This series of SAE Recommended Practices has been developed by the Truck and Bus Control and Communications Network Committee of the Truck and Bus Electrical and Electronics Steering Committee. The objectives of the committee are to develop information reports, recommended practices, and standards concerned with the requirements, design, and usage of devices that transmit electronic signals and control information among vehicle components. The usage of these documents is not limited to truck and bus applications; other applications may be accommodated with immediate support being provided for construction and agricultural equipment, as well as stationary power systems. These documents are intended as a guide toward standard practice and are subject to change so as to keep pace with experience and technical advances.

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1. SCOPE

Define a process enabling network devices to detect the baud rate of a CAN Classic network as specified by physical layers SAE J1939-11, SAE J1939-14, or SAE J1939-15. The intent is to minimize or eliminate communication disruption between existing network devices. These networks only support Classical Base Frame Format (CBFF) and Classical Extended Frame Format (CEFF) Data Frames, as defined in ISO 11898-1:2015.

Baud rate detection on a SAE J1939 CAN FD network is not in scope, as SAE J1939-17 is currently the only SAE J1939 CAN FD physical layer option and specifies only one supported baud rate combination (500 kbit/s / 2000 kbit/s).

2. REFERENCES

2.1 Applicable Documents

The following publications form a part of this specification to the extent specified herein. Unless otherwise indicated, the latest issue of SAE publications shall apply.

2.1.1 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or +1 724-776-4970 (outside USA), www.sae.org.

SAE J1939-11 Physical Layer, 250 Kbps, Twisted Shielded Pair

SAE J1939-14 Physical Layer, 500 kbit/s

SAE J1939-15 Physical Layer, 250 Kbps, Un-Shielded Twisted Pair (UTP)

SAE J1939-17 CAN FD Physical Layer, 500 kbps/2 Mbps

2.1.2 ISO Publications

Copies of these documents are available online at <https://webstore.ansi.org/>.

ISO 11898-1:2015 Road Vehicles - Controller Area Network (CAN) - Part 1: Data Link Layer and Physical Signaling

ISO 15765-4:2021 Road Vehicles - Diagnostic Communication Over Controller Area Network (DoCAN) - Part 4: Requirements for Emission Related Systems

3. DEFINITIONS AND ABBREVIATIONS

3.1 Definitions

3.1.1 ACK BIT

The acknowledge (ACK) bit of a CAN frame.

3.1.2 ACK ERROR

A CAN protocol error that occurs when the transmitter fails to detect a dominant level asserted bit in the ACK bit of a CAN frame.

3.1.3 ACTIVE BAUD DISCOVERY MODE

The ECU is operating in Baud Discovery Mode (see [3.1.5](#)) while in Active Mode (see [3.1.4](#)).

3.1.4 ACTIVE MODE

The CAN interface operating in this mode is an active participant of the network. It asserts a dominant value in the ACK bit when it successfully receives a CAN frame.

3.1.5 BAUD DISCOVERY MODE

Operational mode of an ECU when it can detect the baud rate of the CAN network based on the procedures listed in this document.

3.1.6 BIT-TIME MEASUREMENT

The method of determining the CAN network baud rate by measuring the time duration of a single bit.

3.1.7 DATA FRAME

For the purposes of this document, data frame refers to Classical Extended Frame Format (CEFF) and Classical Base Frame Format (CBFF) data frames. Note that remote frames are excluded.

3.1.8 ECU NETWORK INITIALIZATION

Action of the ECU accessing the network the first time. This could be accomplished by the traditional key switch, ignition switch, or wake-up on CAN activity. It is not intended to include recovery after errors, such as loss of communication.

3.1.9 ERROR-FREE DATA FRAME

A data frame is considered to be error-free if it is received without errors and the ACK bit has been asserted; refer to ISO 11898-1:2015, 10.7, "Frame Validation." If supported by the CAN hardware, a data frame can also be considered error-free if a receiving node would have asserted the ACK bit if that node was not in Silent Mode.

3.1.10 PERMANENTLY INSTALLED ECU

The classification of an ECU which is required for normal operation of the system, including, but not limited to, engine control module (ECM), transmission control module (TCM), instrument cluster, body controller, etc. The ECU is a node on an SAE J1939 network.

3.1.11 SILENT BAUD DISCOVERY MODE

This is where the ECU is operating in Baud Discovery Mode (see [3.1.5](#)) while in Silent Mode (see [3.1.12](#)).

3.1.12 SILENT MODE

The CAN interface operating in this mode will not transmit messages, nor assert the ACK bit for any received CAN frame. Some CAN hardware specification documents refer to a Listen Only Mode, which might not be the same as Silent Mode. ISO 11898-1:2015 refers to this as Bus Monitoring Mode. Regardless of the terminology used in the CAN hardware specification, it is important that the mode chosen for Baud Discovery Mode be one that does not participate in the ACK or error processes. The CAN interface operating in Silent Mode is prohibited from transmitting dominant bits but is capable of receiving messages.

3.1.13 TEMPORARILY INSTALLED ECU

The classification of an ECU which is not required for the normal operation of the system, including, but not limited to, service tools and datalink adapters for tools. The ECU is a node on an SAE J1939 network.

3.2 Abbreviations

ACK	Acknowledge
CAN	Controller Area Network
CBFF	Classical Base Frame Format
CEFF	Classical Extended Frame Format
ECU	Electronic Control Unit
ECM	Engine Control Module
PI-ECU	Permanently Installed ECU
TCM	Transmission Control Module
TI-ECU	Temporarily Installed ECU
UML	Unified Modeling Language

4. TECHNICAL REQUIREMENTS

4.1 Overview

This document describes the processes used to detect the baud rate of an SAE J1939 network segment by ECUs with the ability to adjust their CAN baud rate while in use. The specified approach provides a reliable method to detect the baud rate of a network segment without interrupting network communications. The general baud rate detection behaviors are the same for all baud-rate adjustable ECUs; however, there are some minor behavior differences depending upon whether the ECU is intended as permanently installed or temporarily installed on the network.

With Silent Baud Discovery Mode, a baud rate-adjustable ECU puts its CAN interface into Silent Mode and cycles through its supported baud rates until it successfully receives an error-free data frame. However, Silent Baud Discovery Mode is only useful when at least one fixed baud rate network device transmits at least one periodic message on the network segment.

With Active Baud Discovery Mode, a temporarily installed baud rate-adjustable ECU transmits a special CBFF “test message” to determine the network segment baud rate. The baud rate-adjustable ECU puts its CAN interface into Active Baud Discovery Mode and transmits the CBFF test message at each supported baud rate until another network ECU asserts the ACK bit. Active Baud Discovery Mode shall only be performed by one network device at a time. Simultaneous Active Baud Discovery could allow one network device to assert the ACK bit of another network device’s test message at a baud rate different than that of the network segment, leading to incorrect baud rate detection.

Active Baud Discovery Mode can result in setting the network segment baud rate, such as during an off-vehicle programming event between a temporarily installed baud rate-adjustable ECU and a target ECU in Silent Baud Discovery Mode. The objective is simply to establish communication between two ECUs when a preselected baud rate does not exist. The target ECU in Silent Baud Discovery Mode should detect the CBFF test message, set its baud rate accordingly, and exit Silent Mode. When the ECU in Active Baud Discovery Mode sends the next CBFF test message at that same baud rate, the target ECU (no longer in Silent Baud Discovery Mode) will now assert the ACK bit. At that point, the ECU in Active Baud Discovery Mode will set its baud rate to that baud rate and communication can commence. Multiple ECUs in Silent Baud Discovery Mode will likely not work in this scenario, due to ECU variations in power up time and the time spent listening for each baud rate.

The processes in this document are intended to be performed after power is applied to the ECU and before it transmits any messages. Although these processes are not intended to be performed during the same key cycle after an ECU has determined the baud rate of the SAE J1939 network segment, nothing prevents an ECU from entering Baud Discovery Mode after a baud rate has been determined. However, this document does not specifically address those situations.

Bit-time measurement is an alternate method of baud rate detection. However, it is not considered a robust baud rate detection method and is discouraged for baud rate detection on SAE J1939 networks.

4.2 Baud Rate Detection ECU Classifications

There are six different baud rate detection ECU classifications. The classifications are based upon the permanence of network installation and the ability for run time baud rate adjustment. The ECU classifications are used to describe the minimum requirement on SAE J1939 network architecture for baud rate detection and describe and associate specific baud rate detection behaviors for baud rate-adjustable ECUs. Three of the ECU classifications identify fixed baud rate ECUs, and three of the ECU classifications identify baud rate-adjustable ECUs.

4.2.1 Permanently Installed ECU (PI-ECU) Classifications

A PI-ECU is an ECU which is required for normal operation of the system and, therefore, is expected to be connected to the SAE J1939 network segment at all times. PI-ECUs are typically ECUs which are dedicated to a single vehicle or application, and a PI-ECU rarely, if ever, is connected to another different vehicle during its useful life. Some examples of PI-ECUs are an engine ECU, transmission ECU, instrument cluster, and body controller.

4.2.1.1 Adjustable Baud Rate PI-ECU

This classification describes a permanently installed ECU that will adjust its CAN baud rate to the SAE J1939 network segment baud rate, provided that rate is supported by the ECU. This class of ECU should store the last detected baud rate in some form of persistent memory over ECU power cycles to expedite the baud rate discovery time on the next ECU network initialization event.

4.2.1.2 Fixed Baud Rate PI-ECU with Periodic Message Transmits

This classification describes a permanently installed ECU that communicates on the SAE J1939 network segment using one designated baud rate. This class of ECU is configured to transmit one or more periodic messages onto the SAE J1939 network promptly after ECU power up. The periodic messaging by this class of ECU is the cornerstone for baud rate detection by baud rate-adjustable ECUs.

4.2.1.3 Fixed Baud Rate PI-ECU with No Periodic Message Transmits

This classification describes a PI-ECU that communicates on the SAE J1939 network segment using one designated baud rate. This class of ECU is not configured to transmit any periodic messages onto the SAE J1939 network.

4.2.2 Temporarily Installed ECU (TI-ECU) Classifications

A TI-ECU is an ECU which is not required for normal operation of the system, but may be connected to the SAE J1939 network segment randomly and for short periods of time, as required. TI-ECUs (e.g., a service tool) are typically not dedicated to any single vehicle or application; rather, the nature of the TI-ECU involves being connected to any number of different vehicles over its useful life.

4.2.2.1 Adjustable Baud Rate Only TI-ECU with Silent Baud Discovery Mode

This classification describes a TI-ECU that will adjust its CAN baud rate to the SAE J1939 network segment baud rate, provided that rate is supported by the ECU. This class of ECU will only use Silent Baud Discovery Mode for detecting the SAE J1939 network segment baud rate.

4.2.2.2 Adjustable Baud Rate Only TI-ECU with Active Baud Discovery Mode

This classification describes a TI-ECU that will adjust its CAN baud rate to the SAE J1939 network segment baud rate, provided that rate is supported by the ECU. This class of ECU will first use Silent Baud Discovery Mode for detecting the SAE J1939 network segment baud rate. If the baud rate is not detected through the Silent Baud Discovery Mode, then this class of ECU will go into Active Baud Discovery Mode and potentially transmit CAN data frames in order to detect the SAE J1939 network segment baud rate. This class of ECU should be used sparingly since the Active Baud Discovery Mode operation has the potential to interrupt network communications.

4.2.2.3 Fixed Baud Rate TI-ECU

This classification describes a TI-ECU that communicates on the SAE J1939 network segment using one designated baud rate. This class of ECU should only be installed on SAE J1939 networks designated with the same baud rate to avoid interrupting network communications due to baud rate differences.

4.2.3 Additional Considerations

4.2.3.1 Multiple ECU CAN ports

For simplicity, discussion in this document assumes a given ECU has one CAN port with one classification. However, in practice, an ECU can have multiple CAN ports, and each CAN port can have its own unique classification. For example, a PI-ECU with three CAN ports can have one CAN port with an Adjustable Baud Rate, while the other two CAN ports can have Fixed Baud Rates.

4.2.3.2 Baud Rate Detection Classification versus Product Life Cycle Stage

Discussion in this document assumes that the Baud Rate Detection Classification for a given ECU (or CAN port) does not change over time. However, an ECU (or CAN port) Baud Rate Detection Classification can change depending on an ECU's current life cycle stage. For example, a new, unprogrammed PI-ECU can operate as an Adjustable Baud Rate PI-ECU until it is programmed, after which it behaves as a Fixed Baud Rate PI-ECU. It is possible that the ECU (or CAN port) can be reverted back to Adjustable Baud Rate operation via a service tool event or other scenario.

4.3 SAE J1939 Network Architecture for Baud Rate Detection

SAE J1939 network architecture needs to conform to several constraints regarding the number and types of connected ECUs in order for ECUs to reliably detect the network segment baud rate. The constraints are described in this section.

- a. The SAE J1939 network segment should have at least two active fixed baud rate PI-ECUs (see [4.2.1.2](#) and [4.2.1.3](#)), and at least one of these fixed baud rate PI-ECUs shall support periodic message transmits (see [4.2.1.2](#)). A minimum of two active ECUs at the target baud rate allows CAN interfaces in Baud Discovery Mode to observe an asserted Acknowledgement bit in the transmitted CAN data frames.
- b. In some instances, the network segment may only require one fixed baud rate PI-ECU that supports periodic message transmits (see [4.2.1.2](#)). This is only feasible if the CAN hardware in at least one baud rate-adjustable ECU can detect CAN data frames without observing an asserted ACK bit in the transmitted CAN data frames.
- c. The SAE J1939 network segment may have any number of adjustable-rate PI-ECUs (see [4.2.1.1](#)).
- d. The SAE J1939 network segment may have any number of adjustable-rate TI-ECUs using Silent Baud Discovery Mode (see [4.2.2.1](#)).
- e. The SAE J1939 network segment shall have no more than one adjustable baud rate TI-ECU using the Active Baud Discovery Mode to detect the baud rate (see [4.2.2.2](#)) at the same time.
- f. The SAE J1939 network segment may have any number of fixed baud rate TI-ECUs (see [4.2.2.3](#)). The baud rate of each TI-ECU shall be the same as the baud rate of the SAE J1939 network.

4.4 Baud Rate Detection Procedure General Constraints

The following set of constraints and requirements apply to all adjustable baud rate PI-ECUs and adjustable baud rate TI-ECUs which use the baud rate detection procedures.

- a. Adjustable baud rate PI-ECUs and adjustable baud rate TI-ECUs shall be able to set their CAN interface to Silent Mode during baud rate detection.
- b. Adjustable baud rate PI-ECUs and adjustable baud rate TI-ECUs shall have a list of possible baud rates that are acceptable for the ECU to use.
- c. Adjustable baud rate PI-ECUs and adjustable baud rate TI-ECUs shall be able to detect CAN errors while in Silent Mode.

4.5 PI-ECU Baud Rate Detection Procedure

The procedural behaviors described in this section apply to baud rate detection by a baud rate-adjustable PI-ECU. The model of baud rate detection behaviors is shown in the Unified Modeling Language (UML) diagram in [Figure 1](#).

A baud rate-adjustable PI-ECU shall perform the baud rate detection process on every ECU network initialization event. Typically, a PI-ECU will be installed on and remain on the same SAE J1939 network segment over its useful life, and once the PI-ECU successfully detects the baud rate of the SAE J1939 network segment, then the detected baud rate on each subsequent ECU network initialization will normally be the same. However, there are external conditions where the SAE J1939 network segment's baud rate might not be the same as detected during the last ECU network initialization, such as when the PI-ECU is physically connected to a different SAE J1939 network segment. This might be for troubleshooting or for replacement of a failed ECU, or the fixed rate PI-ECU with periodic transmits was replaced by a different fixed rate PI-ECU that uses a different baud rate.

In order to expedite the baud rate discovery time for the PI-ECU during each ECU network initialization, baud rate-adjustable PI-ECUs should maintain the last detected baud rate in some form of persistent memory over ECU power cycles and use this baud rate as the initial rate during baud rate discovery.

- a. Upon network initialization, the PI-ECU shall select a starting baud rate for baud rate discovery and put itself into Silent Mode (Silent Baud Discovery Mode). If the ECU has retained the last detected baud rate, then the ECU shall use this baud rate as the starting rate for baud rate discovery. Otherwise, the PI-ECU shall select a supported baud rate (starting with the highest rate is preferred).
- b. The PI-ECU shall wait until it receives an error-free data frame which was transmitted from any other network device or until it detects an error frame.
- c. If the PI-ECU successfully receives an error-free data frame or receives a data frame with only an ACK bit error on the CAN bus, then it shall latch on the current baud rate as the detected baud rate. The PI-ECU shall end Baud Discovery Mode and begin normal communications on the SAE J1939 network.
- d. If the PI-ECU receives a data frame that is not error-free or receives a CAN error frame, then the PI-ECU shall continue to remain in Silent Mode and switch to the next supported baud rate (next lower rate is preferred method). If the PI-ECU reaches the end of the list of supported rates, then the PI-ECU shall wrap around to the start of the list of supported baud rates.
- e. The ECU shall repeat the procedure steps b. to d. until the condition in step c. is satisfied.
- f. If the PI-ECU's attempts to detect and select the baud rate were not successful for any of its supported baud rates, then the PI-ECU may either restart the Baud Discovery Mode or may remain in Silent Mode such that it has no impact on network communications.

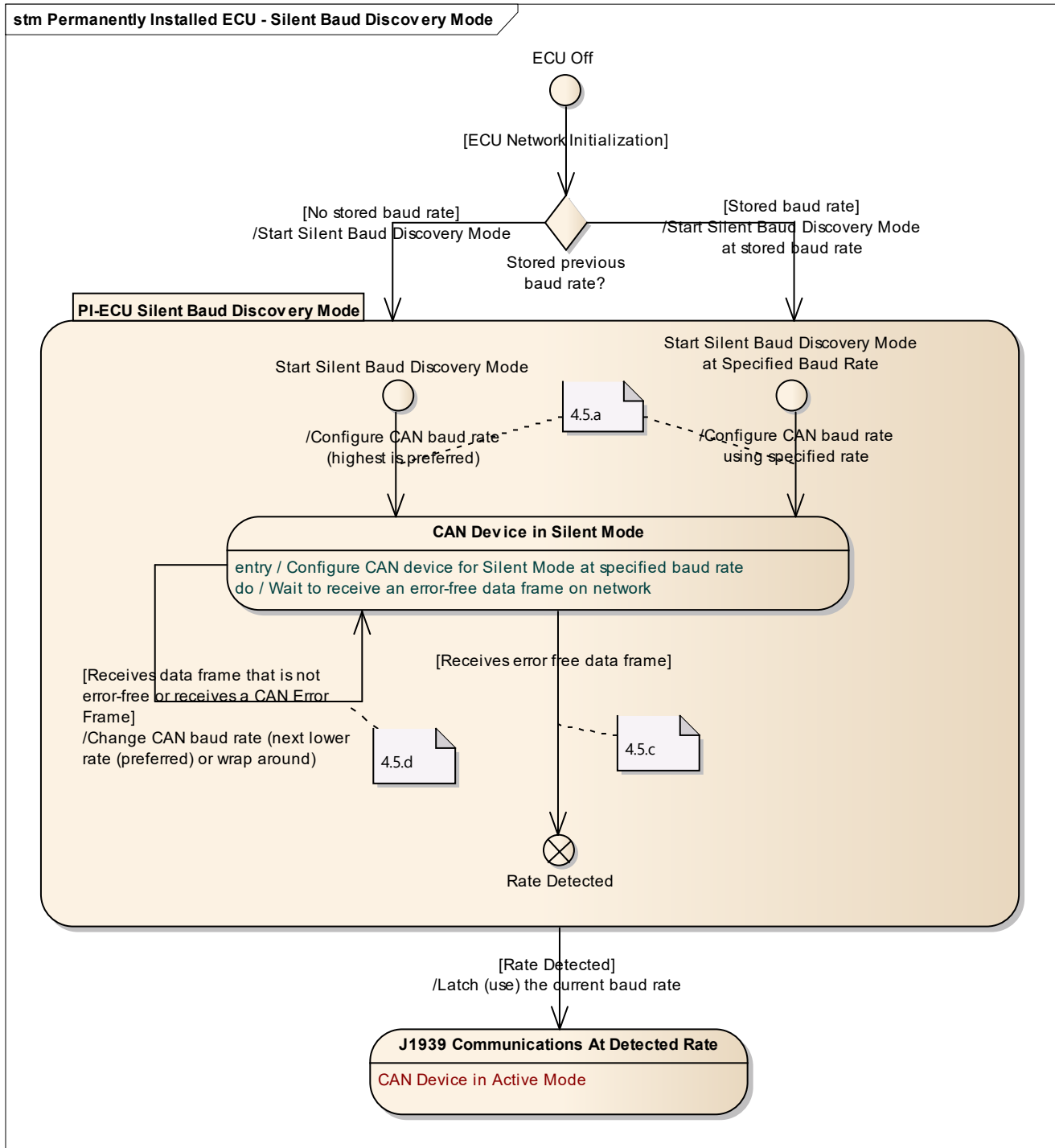


Figure 1 - PI-ECU baud rate detection behavior model

4.6 TI-ECU Baud Rate Detection Procedure While in Silent Baud Discovery Mode

The procedural behaviors described in this section apply to baud rate detection by a baud rate-adjustable TI-ECU that will only use the Silent Mode approach. The model of baud rate detection behaviors is shown in the UML diagram in [Figure 2](#).

A baud rate-adjustable TI-ECU shall perform the baud rate detection process on every ECU network initialization event. This class of TI-ECU will exclusively rely upon the Silent Mode approach for detecting the baud rate of the SAE J1939 network.

- a. Upon network initialization, the TI-ECU shall select a starting baud rate for baud rate discovery and put itself in Silent Mode (Silent Baud Discovery Mode). The recommendation is for the TI-ECU to start with highest supported baud rate first.
- b. The TI-ECU shall wait until it receives an error-free data frame which was transmitted from any other network device or until it detects an error frame.
- c. If the TI-ECU successfully detects an error-free data frame or detects a data frame in which the ACK bit was not asserted on the CAN bus, then it shall latch on the current baud rate as the detected baud rate. The TI-ECU shall end Baud Discovery Mode and begin normal communications on the SAE J1939 network.
- d. If the TI-ECU detects a data frame that is not error-free or receives a CAN error frame, then the TI-ECU shall continue to remain in Silent Mode and switch to the next supported baud rate (next lower baud rate is preferred method). If the TI-ECU reaches the end of the list of supported baud rates, then the TI-ECU shall wrap around to the start of the list of supported baud rates.
- e. The ECU shall repeat procedure steps b. to d. until the condition in step c. is satisfied.
- f. If the TI-ECU's attempts to detect and select the baud rate are not successful for any of the supported baud rates, then the TI-ECU may either restart the Baud Discovery Mode or remain in Silent Mode such that it has no impact on network communications.

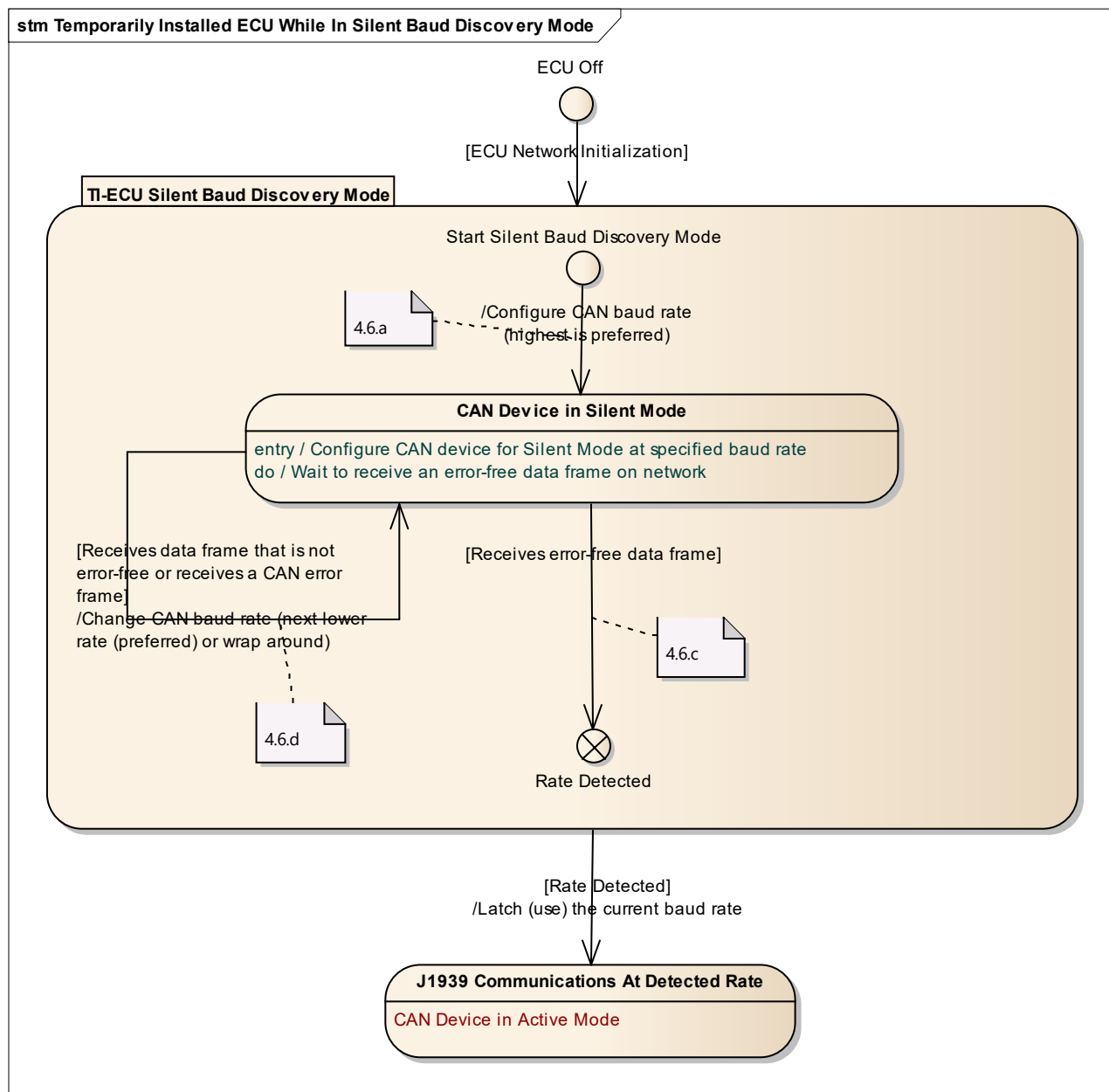


Figure 2 - TI-ECU silent mode baud rate detection behavior model

4.7 TI-ECU Baud Rate Detection Procedure While in Active Baud Discovery Mode

The procedural behaviors described in this section apply to baud rate detection by a baud rate-adjustable TI-ECU that will use the Active Baud Discovery Mode approach if unable to detect the baud rate using the Silent Baud Discovery Mode approach. The model of baud rate detection behaviors is shown in the UML diagram in [Figure 3](#). A baud rate-adjustable TI-ECU shall perform the baud rate detection process on every ECU network initialization event.

- a. TI-ECUs should attempt to detect the baud rate using Silent Baud Discovery Mode as described in [4.6](#) before attempting to detect the baud rate using Active Baud Discovery Mode.
- b. If the TI-ECU is unable to detect the baud rate of the SAE J1939 network segment while in Silent Mode, then the TI-ECU shall select a starting baud rate and put itself in Active Mode. The TI-ECU should start with the highest supported baud rate first. It is up to the implementer to decide when the TI-ECU shall switch from Silent Mode to Active Mode.
- c. If the TI-ECU successfully detects an error-free data frame on the CAN bus, then it shall latch on the current baud rate as the detected baud rate. The TI-ECU shall end Baud Discovery Mode and begin normal communications on the SAE J1939 network.
- d. If the TI-ECU detects a data frame that is not error-free or receives a CAN error frame, then the TI-ECU shall switch to the next supported baud rate (next lower baud rate is preferred method). If the TI-ECU reaches the end of the supported baud rate list, then the TI-ECU shall wrap around to the start of the supported baud rate list. The purpose of this step is to accommodate situations where another TI-ECU transmits a message in order to detect the baud rate.
- e. If the TI-ECU was unable to detect the baud rate of the SAE J1939 network segment as stated in step c., then the TI-ECU shall attempt to send an CBFF data frame message on the bus as specified in [Table 1](#).

Table 1 - Standard 11-bit message TI-ECUs use to detect the baud rate

CAN ID	Data Bytes							
	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
7DF ₁₆	01 ₁₆	00 ₁₆	20 ₁₆	40 ₁₆	60 ₁₆	80 ₁₆	A0 ₁₆	FF ₁₆

NOTE: CAN ID 7DF₁₆ is defined by ISO 15765-4:2021 and should not have any adverse effects on other network devices.

- f. If the TI-ECU successfully transmits the CBFF data frame message specified in step e. (i.e., no error frame encountered on the bus and the ACK bit was properly asserted), then it shall latch on the current baud rate as the detected baud rate. The TI-ECU shall end Baud Discovery Mode and begin normal communications on the SAE J1939 network.
- g. If the TI-ECU detects an ACK error, then it shall try to re-transmit as specified by ISO 11898-1:2015.
- h. If the TI-ECU encounters one to five consecutive CAN errors (other than an ACK bit error) while transmitting the CBFF data frame message specified in step e. at the current baud rate, then the TI-ECU shall select the next supported baud rate. If the TI-ECU reaches the end of the supported baud rate list, then the TI-ECU shall wrap around to the start of the supported baud rate list.
- i. The TI-ECU shall repeat procedure steps e. to h. until the condition in step f. is satisfied or until the TI-ECU has attempted to detect the baud rate with all of the supported baud rates. If the TI-ECU's attempts to detect and select the baud rate were not successful for any of the supported baud rates, then the TI-ECU shall stop transmitting messages and transition to Silent Mode (see step a.).

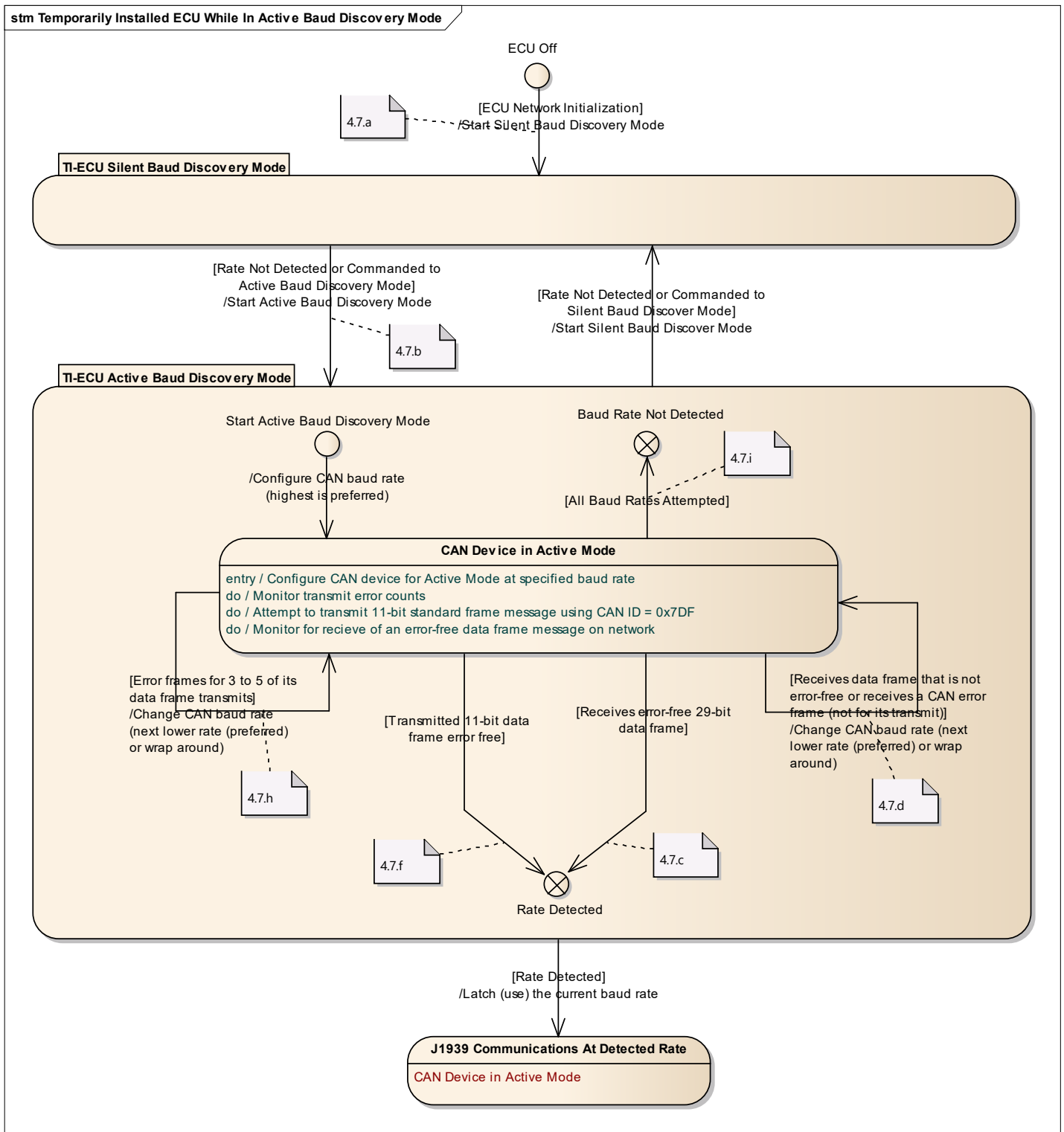


Figure 3 - TI-ECU active baud discovery mode behavior model

5. NOTES

5.1 Revision Indicator

A change bar (|) located in the left margin is for the convenience of the user in locating areas where technical revisions, not editorial changes, have been made to the previous issue of this document. An (R) symbol to the left of the document title indicates a complete revision of the document, including technical revisions. Change bars and (R) are not used in original publications, nor in documents that contain editorial changes only.

PREPARED BY SAE TRUCK BUS CONTROL AND COMMUNICATIONS NETWORK COMMITTEE

APPENDIX A - BAUD RATE DETECTION USE CASES

Table A1 specifies the expected result for different combinations of network devices that are attempting to detect the baud rate or are operating at a fixed baud rate. The column headings represent specific conditions for the ECUs on a given network. Letters A through D indicate different ECU instances. Each use case, or row in the table, represents combinations of these conditions. If a cell in the table is “Yes,” then the condition in that column header is present for that use case. If a cell in the table is “No,” then the condition in that column header is not present for that use case. If a cell in the table is “Don’t Care,” then the cell in the “Expected Result” column applies whether the condition in the column header is present or not.

Table A1

Use Case	One TI-ECU in Active Baud Discovery Mode (Can Introduce Error Frames with ECU[A] and/or PI-ECU[B])	Number of ECUs (Referred to as ECU[D] in Silent Baud Discovery Mode [Could Be PI-ECUs or TI-ECUs])	Number of ECUs Transmitting Periodic Messages (Referred to as ECU[A])	One or More PI-ECU in Active Mode, But Not Transmitting Periodic Messages (Referred to as PI-ECU[B])	One or More PI-ECUs in Silent Mode (Referred to as PI-ECU[C])	Expected Result	Comments
1	No	One or more	Zero	No	Don't Care	No Auto Baud	
2	No	One or more	Zero	Yes	Don't Care	No Auto Baud	
3	No	One or more	One	No	Don't Care	Timing dependent: ECU(D) in Silent Baud Discovery Mode can detect Baud Rate of ECU(A) if ECU(D) is on the network before ECU(A) goes bus off (because no other node asserted the ACK bit)	For this use case, ECU(A) can mitigate the timing issues depending on how it recovers from bus off.
4	No	One or more	Two or more	No	Don't Care	ECU(D) in Silent Baud Discovery Mode should detect Baud Rate of ECU(A)	
5	No	One or more	One or more	Yes	Don't Care	ECU(D) in Silent Baud Discovery Mode should detect Baud Rate of ECU(A)	
6	Yes	One	Zero	No	Don't Care	ECU(D) should set the baud rate to that of the data frame in which the ACK bit would have been asserted if the ECU(D) was not in Silent Baud Discovery Mode	

Use Case	One TI-ECU in Active Baud Discovery Mode (Can Introduce Error Frames with ECU[A] and/or PI-ECU[B])	Number of ECUs (Referred to as ECU[D] in Silent Baud Discovery Mode [Could Be PI-ECUs or TI-ECUs])	Number of ECUs Transmitting Periodic Messages (Referred to as ECU[A])	One or More PI-ECU in Active Mode, But Not Transmitting Periodic Messages (Referred to as PI-ECU[B])	One or More PI-ECUs in Silent Mode (Referred to as PI-ECU[C])	Expected Result	Comments
7	Yes	Two or more	No	No	Don't Care	Baud rate detection will be intermittent and depend on the duration that each ECU in Silent Baud Discovery Mode is in each supported baud rate relative to the other ECUs in Silent Baud Discovery Mode	This use case scenario should be avoided.
8	Yes	Zero	Zero	Yes	Don't Care	TI-ECU should detect Baud Rate of PI-ECU(B)	
9	Yes	One or more	Zero	Yes	No	TI-ECU and ECU(D) should detect baud rate of PI-ECU(B)	If the PI-ECU(B) is in error passive, then the TI-ECU and the ECU(D) could detect an incorrect baud rate.
10	Yes	One or more	Zero	Yes	Yes	TI-ECU and ECU(D) should detect baud rate of PI-ECU(B)	If the PI-ECU(B) is in error passive, then the TI-ECU and the ECU(D) could detect an incorrect baud rate. PI-ECU(C) might not operate properly.
11	Yes	Zero	One or more	No	Don't care	TI-ECU should detect Baud Rate of ECU(A)	
12	Yes	One or more	One or more	No	Don't Care	TI-ECU and ECU(D) should detect Baud Rate of ECU(A)	
13	Yes	Zero	One or more	Yes	Don't Care	TI-ECU should detect Baud Rate of ECU(A)	
14	Yes	One or more	One or more	Yes	Don't Care	TI-ECU and ECU(D) should detect Baud Rate of ECU(A)	