Standards and specifications

This section provides news from standardization bodies and nonprofit associations regarding CAN-related documents. Included are also recommended practices, application notes, implementation guidelines, and technical reports.

SAE J3271/2 references CAN

SAE has launched the SAE J3271-Air7357 Megawatt Charging System Standards (MCS) for all large-battery vehicles that roll, fly, or float. A task force of industry stake holders and subject matter experts was launched in 2018 as the CharIN Megawatt Charging System (MCS). As an industry group, it developed documents and specifications that can be used by Standards Developing Organizations (SDOs). The white paper of MCS specifications is due to be released in summer of 2022. SAE has developed the J3271/2 Technical Information Reference (TIR) document referencing a CAN communication. ◼

ISO 11898-2 submitted for DIS ballot

The reviewed and updated ISO 11898-2 standard (Controller Area Network – Part 2: Physical medium attachment sub-layer) has been submitted to national standardization bodies for DIS (Draft International Standard) balloting. It comprises requirements for high-speed (HS), signal improvement capability (SIC), and SIC XL (mode switching) transceivers. The HS and SIC transceivers use non-return-to-zero (NRZ) coding. The CAN XL transceivers supports additionally a pulse-width modulation (PWM) coding. The benefit for chipmakers, all requirements are in one document including sleep and selected wake-up functionality. ◼

ISO 11783-13 (file server) released

ISO has released a new edition of the Isobus file server standard. The ISO 11783-13 document specifies a set of messages providing access to a file server (FS). An FS is a distinct control function (CF) on the mobile implement control system that enables all CFs to store or retrieve data from a file-based storage device. The ISO 11783 series specifies a CANbased communication based on J1939 protocols, intended for agricultural and forestry vehicles. ◼

New SAE 1939 documents

Beginning of August, SAE has published the next version of the J1939 Digital Annex (DA). The DA is updated quarterly. Among others, this spreadsheet specifies suspect parameters or parameter groups.

In August, also the SAE J1939-73 application profile specification has been released. It specifies the SAE J1939 diagnostic messages (DMs) to accomplish diagnostic services. Additionally, it identifies the diagnostic connector to be used for the vehicle service tool interface. DMs provide the utility needed when the vehicle is being repaired. They are also used during vehicle operation by the networked ECUs (electronic control units) to allow them to report diagnostic information. DMs include services such as periodically broadcasting active DTCs (diagnostic trouble codes), identifying operator diagnostic lamp status, reading or clearing diagnostic trouble codes, reading or writing control module memory, providing a security function, stopping/starting message broadcasts, reporting diagnostic readiness, monitoring engine parametric data, etc. California-, EPA-, or EU-regulated OBD requirements are satisfied with a subset of the specified connector and the specified DMs. ◼

CiA 1305 released

The CiA 1305 document specifies the layer setting services (LSS) for CANopen FD. These services are used to communicate between an LSS manager (typically residing in the CANopen FD host controller featuring NMT manager functionality) and LSS servers. They enable the LSS manager to modify the LSS server's CANopen FD network-ID and node-ID. LSS provide means to modify the CAN FD bit-timing parameters (for nominal bit rate and data-phase bit rate) in all CANopen FD devices.

The entire 128 bit of the CANopen FD identity array (vendor-ID, product-code, revision number, serial number, as specified in CiA 1301) make the LSS address. The LSS address is a worldwide unique identifier addressing a CANopen FD device. Therefore, an LSS manager can differentiate between several LSS servers, by means of the LSS address, even if these LSS servers do not own a valid network-ID or node-ID. Via the LSS switch state selective FD command, the LSS manager forces exactly one LSS server to enter the LSS configuration state. In this state, the LSS server accepts a new network-ID or node-ID that is determined by the LSS manager. It is the LSS manager's task to ensure that during the assignment of the network-ID or node-ID, there is only one LSS server in the LSS configuration state.

In case the LSS addresses of the LSS servers are unknown to the LSS manager, the LSS manager can have several means to detect the LSS server's address. In case the LSS server own already a valid network-ID and node-ID, the LSS manager just reads the content of the identity array (data object 1018_h) of all LSS servers in the network using the USDO (universal service data object) service. In case the LSS servers do not own a valid network-ID and node-ID, the LSS manager has to rely on additional LSS services. The LSS switch state selective FD service, enables the LSS manager to scan via 4-bit-nibble-masks, whether there exists an unconfigured LSS server, that's LSS address is in a given LSS address range. By executing several scanning cycles, the LSS manager can identify exactly one unconfigured LSS server and provides subsequently a valid CANopen FD network-ID and node-ID.

LSS enables the LSS manager to switch the entire CANopen FD network from one pair of nominal bit rate and data-phase bit rate, to another. The LSS manager configures via LSS in all CANopen FD devices in the network the intended bit-timing parameters, individually. After the successful configuration, the LSS manager requests the bit-timing switch, by means of a global LSS service. After a switch delay, all devices in the CANopen FD network operate on the new nominal and data-phase bit rates.

It is recommended to use the switching of LSS bit-timing parameters carefully. In case there is at least one device that is not switching correctly, a proper CANopen FD communication is not more guaranteed. One or more CANopen FD interfaces enter the CAN bus-off state. They cannot be accessed anymore. Only in another network, running on the configured bit rates, these devices can be re-configured. For the initial adjustment of the CANopen FD bit-timing parameters, the LSS bit-timing switch service is not suitable. For such scenarios, methods such as the CANopen automatic bit rate detection (CiA 801) can be used, in an adapted format, suitable for CANopen FD.

If several unconfigured LSS servers exist in a CANopen FD system, they can be identified by means of the
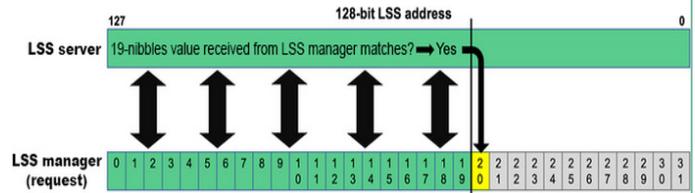

Figure 1: The LSS manager sends a request for nibble 20 of the 128-bit LSS address; the LSS servers, which have matched the previous 19 nibbles provide a response with the nibble 20 values indicated by the CAN-ID (e.g. $07DA_h$ for the value A_h)

LSS switch-state selective FD service. To perform this service, the 128-bit LSS address is divided into 32 pieces (nibbles). The LSS manager consequently asks the LSS servers for the values of each nibble. Sixteen CAN FD data frames with the CAN-IDs from $07D0_h$ to $07DF_h$ are used as possible feedback. When the LSS manager requests the value of the first nibble, the LSS servers reply with the CAN-ID $07D0_h$ if their first nibble is zero. The CAN-ID $07D1_h$ is used, if the nibble is one and so forth (CAN-IF $07DF_h$ if the nibble values 0Fh). The LSS manager takes the first response (all others are ignored for this cycle) and packs the first nibble value into the next request. The LSS servers with the first matching nibble inform the LSS manager about the second-nibble value using the 16 LSS messages with the mentioned CAN-IDs. This cycle is repeated until all nibbles have been processed and a single, unconfigured LSS server is identified. Then, the LSS manager can assign the network-ID and the node-ID to a single LSS server.

To decrease the boot-up time in CANopen FD systems this procedure can be modified. The LSS manager software can store LSS addresses that have been identified. On each power-up, the LSS manager can try those LSS addresses first and if there is then still an unconfigured LSS server left in the system, the LSS switch-state selective FD cycle is started. ■

CiA profiles released as DS

CiA has released several profile specifications in DS (Draft Specification) status. This means, they are now part of the CiA 400 series subscription. CiA specifications in DSP (Draft Specification Proposal) state are available only for CiA members. Documents in PAS (Public Available Specification) state are downloadable free of charge from the CiA website.

The DS stage upgraded profile specifications include:
◆ CiA 442: CANopen profile for IEC 61915-2 compatible motor starters
◆ CiA 444 series; CANopen profiles for container-handling machine add-on devices
◆ CiA 445: CANopen device profile for RFID devices
◆ CiA 453: CANopen device profile for power supplies
◆ CiA 458: CANopen device profile for energy measurements

CiA plans to upgrade additional CiA profile specifications to DS state, to make them available for the entire CAN community. Several profile specifications are under review to follow the new profile specification structure. In the future, profile specification series will comprise a Part A with parameter specifications, a Part C specifying the mapping to classic CANopen and a Part F for the mapping to CANopen FD. Additionally, there could be specified mappings to J1939 (Part J) or to other higher-layer protocol approaches. ■

Get the CAN-related knowledge!

Online seminars	Date	Language
CAN	2022-09-27	English
CANopen	2022-09-28	English
CAN	2022-11-30	English
CANopen	2022-12-01	English

Onsite seminars	Date	Language
CAN	2022-10-12	German
CANopen	2022-10-13	German

Webinars	Date	Language
CAN in rail vehicles	2022-09-08	English
CAN XL - Status 2022 and future	2022-10-06	English
CANopen FD - Status 2022	2022-11-17	English
CAN XL - Status	2022-12-08	Chinese

Technology days	Date	Language
Chinese CiA technology day	2022-09-19	Chinese
CiA in action technology day	2022-12-06	English

Workshop	Date	Language
CAN in rail vehicles	2022-09-30	English
CAN in laboratory automation	2022-10-06	English
Battery and energy management	2022-12-13	English

Subject to change without notice.

CiA in-house seminars

CiA engineers discuss your urgent CAN-related issues that are currently of high interest with regard to your projects.

For more details please contact CiA office: events@can-cia.org

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