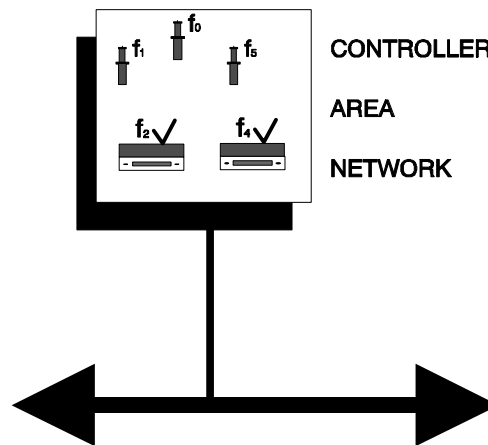


**CAN in Automation (CiA)
International Users and Manufacturers Group e.V.**



**CAN Application Layer for Industrial Applications
CiA/DS204-2
February 1996**

DBT Protocol Specification

1. SCOPE

This document contains the protocol specification of the Distributor (DBT). DBT is part of the CAN Application Layer. This document is part of a set of documents that standardize the CAN Application Layer for Industrial Applications.

2. REFERENCES

/1/: CiA/DS201, CAN Reference Model

/2/: CiA/DS204-1, DBT Service Specification

/3/: CiA/DS207, Application Layer Naming Conventions

/4/: Robert Bosch GmbH, CAN Specification 2.0 Part B, September 1991

3. GENERAL DESCRIPTION

3.1 DBT Protocol Perspective

The Distributor (DBT) service element in the CAN Reference Model (see /1/), provides the DBT services. The DBT Protocol is executed between the DBT Master and each of the DBT Slaves (see /2/) to implement these services.

3.2 DBT Slave Synchronization

Since in the DBT Protocol all DBT Slaves use the same COB to send information to the DBT Master, there must be only one DBT Slave at a time that communicates with the DBT Master. This synchronization between the DBT Slaves is established by the NMT service element of the CAN Application Layer, see /1/.

3.3 DBT Protocol Descriptions

A protocol description specifies the sequence of COB's and their format that are exchanged between the DBT Master and DBT Slave for a particular DBT service.

In the description of the COB data format, bytes are numbered from 0 to and including 7. Bits within a byte are numbered from 0 to and including 7. Byte 0 is transmitted first, byte 7 is transmitted last. Within a byte, bit 0 is the least significant bit, bit 7 is the most

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significant bit. In the protocol descriptions, [a, b] denotes the range of integers from a to b with a and b included. If $a > b$, the range is empty.

The terms 'lsb' and 'msb' stand for 'least significant byte' (lsb) and 'most significant byte' (msb) respectively and are used to define how an integer number is stored in more than one byte for the DBT Protocol. The order of significance is from lsb to msb.

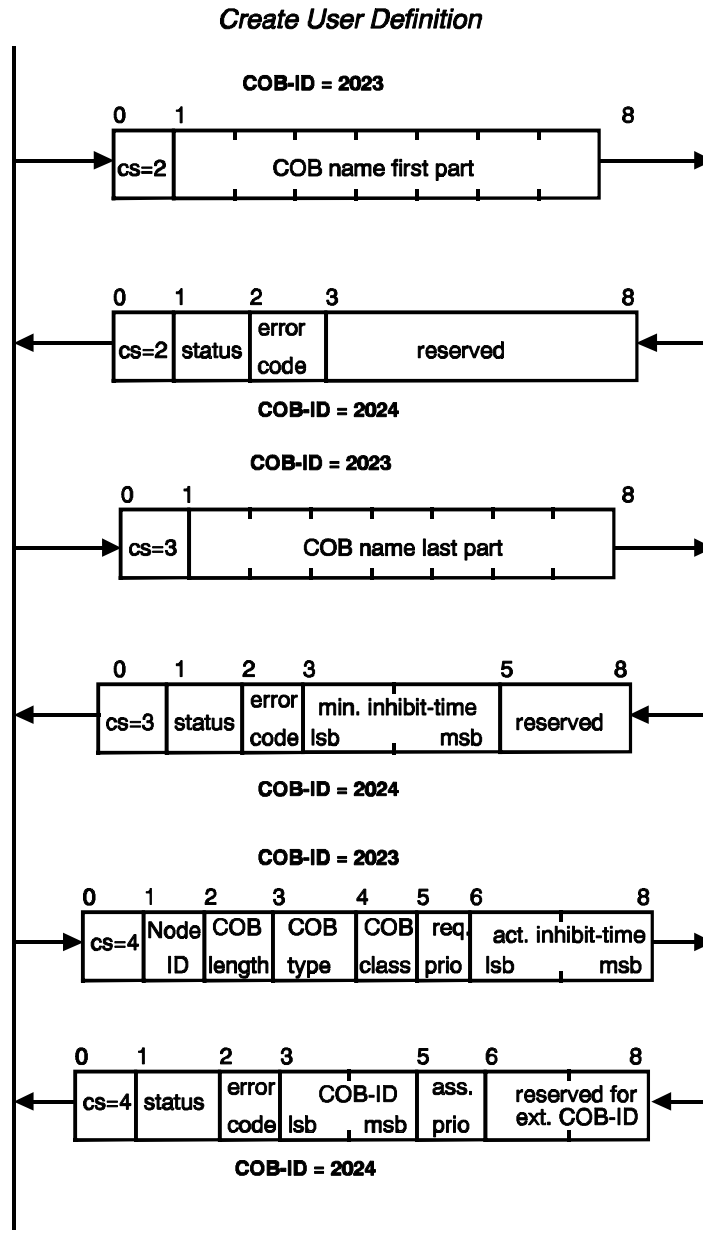
4. DISTRIBUTION CONTROL PROTOCOLS

4.1 Create User Definition Protocol

This protocol is used to implement the 'Create User Definition' service, see /2/.

DBT Slave

DBT Master



- **cs:** DBT command specifier
 - 2: COB name first part command
 - 3: COB name last part command
 - 4: COB attribute command

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- **COB-name first part:** the first seven characters of the COB-name, see /3/.
- **COB-name last part:** the last seven characters of the COB-name, see /3/.
- **min. inhibit-time:** only valid if status = 0, otherwise reserved for further use by CiA. If valid it contains the value of the minimum inhibit-time attribute of the selected COB Definition, see /2/. If there is no COB definition in the COB Database whose user set or predefinition set contains a User Definition respectively a Predefinition for COB-name, its value must be 0
- **act. inhibit-time:** the value of the inhibit-time attribute of the User Definition, in units of 100 usec, see /2/.
- **Node-ID:** the value of the Node-ID attribute of the User Definition, see /2/.
- **COB-length:** the value of the COB-length attribute of the User Definition, see /2/.
- **COB-class:** the value of the COB-class attribute of the User Definition, see /2/.
- **COB-type:** the value of the COB-type attribute of the User Definition, see /2/.
 0: RECEIVE
 1: TRANSMIT
- **req. priority:** a value in the range [0, 7]. It indicates the priority of the CMS object that uses this COB for the CMS Protocol, see /2/.
- **status:** indicates the succes or failure of the service.
 0: service successful
 1: service not successful
- **error code:** only valid if status = 1, otherwise reserved for further use by CiA. If valid it indicates the reason for the failure.
 0: reserved for further use by CiA
 1: there are no matching, no offending and no free COB definitions in the COB Database
 2: COB Database is in the DISABLED state, see /2/
 3: there exists an offending COB Definition whose predefinition- or user set contains a definition with the same COB-name but whose user set contains definitions with a different COB-class, see /2/
 4: there exists an offending COB Definition whose predefinition- or user set contains a definition with the same COB-name but whose user set contains definitions with a different COB-length, see /2/
 5: reserved for other DBT services

- 6..253: reserved for further use by CiA
- 254: cs not expected by DBT Protocol
- 255: other error occurred

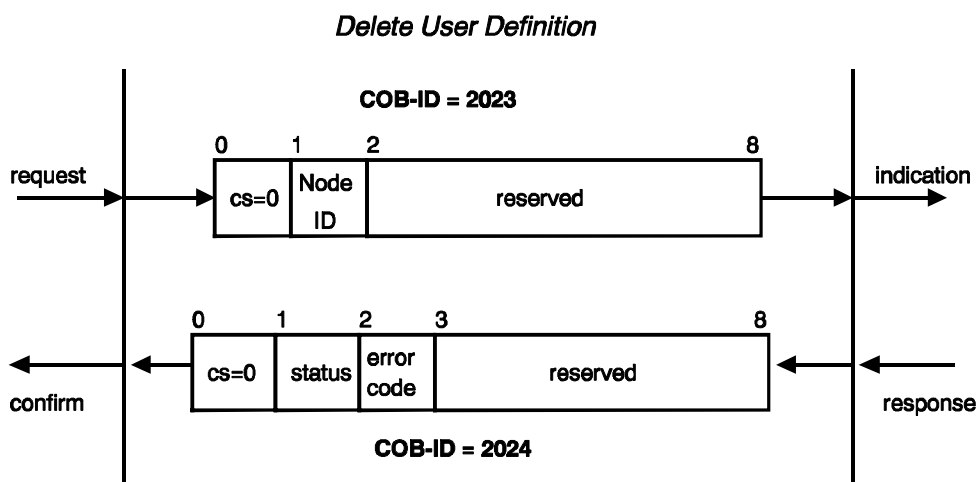
- **COB-ID:** only valid if status = 0, otherwise reserved for further use by CiA. If valid it contains the identifier as distributed by the DBT Master
- **reserved for ext. COB-ID:** reserved to contain the value of the COB-ID if extended identifiers are used, see /4/. Its value must be 0.
- **ass. priority:** only valid if status = 0, otherwise reserved for further use by CiA. If valid it contains the priority of the CMS object according to the COB-ID as distributed by the DBT Master, see /2/.
- **reserved:** reserved for further use by CiA.

4.2 Delete User Definition Protocol

This protocol is used to implement the 'Delete User Definition' service, see /2/.

DBT Slave

DBT Master



- **cs:** DBT command specifier
0: delete COB command
- **Node-ID:** the value of the Node-ID attribute of the User Definitions that must be deleted (see /2/), or 0. If 0, all User Definitions must be deleted.
- **status:** indicates the success or failure of the service.
0: service successful
1: service not successful

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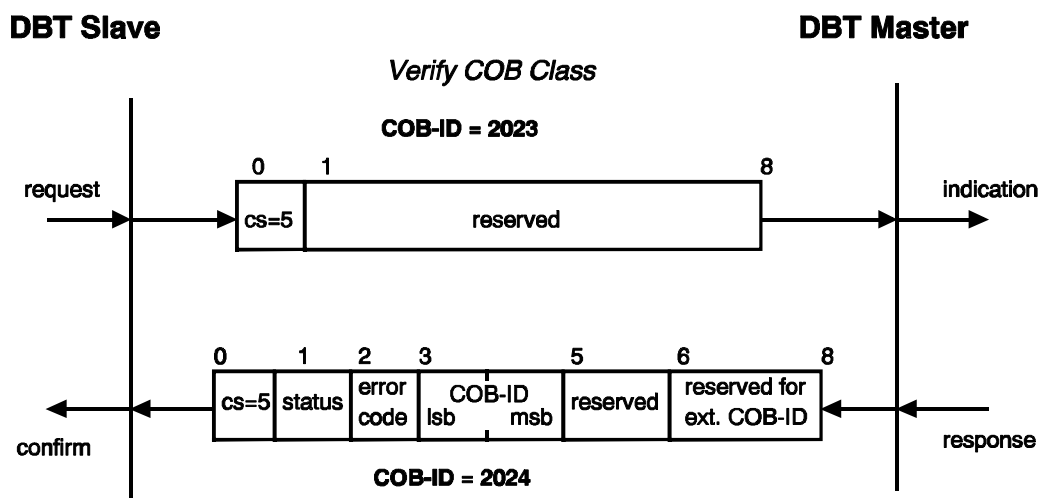
- **error code:** only valid if status = 1, otherwise reserved for further use by CiA. If valid it indicates the reason for the failure.
 - 0: reserved for further use by CiA
 - 1: reserved for other DBT services
 - 2: COB Database is in the DISABLED state, see /2/
 - 3..5: reserved for other DBT services
 - 6..253: reserved for further use by CiA
 - 254: reserved for other DBT services
 - 255: other error occurred

- **reserved:** reserved for further use by CiA.

5. CONSISTENCY CONTROL PROTOCOLS

5.1 Verify COB Class Protocol

This protocol is used to implement the 'Verify COB Class' service, see /2/.



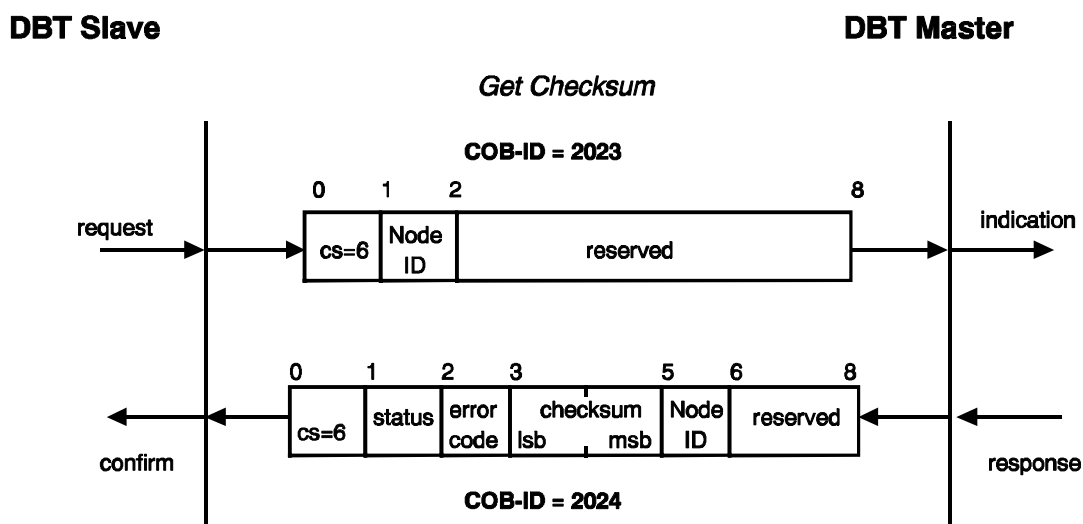
- cs:** DBT command specifier
 5: verify COB class command
- status:** indicates the success or failure of the service.
 0: service successful
 1: service not successful
- error code:** Only valid if status = 1, otherwise reserved for further use by CiA. If valid it indicates the reason for the failure.
 0: reserved for further use by CiA
 1: reserved for other DBT services
 2: COB database is in the DISABLED state, see /2/
 3..4: reserved for other DBT services
 5: verification failed
 6..253: reserved for further use by CiA
 254: reserved for other DBT services
 255: other error occurred
- COB-ID:** only valid if status = 1, otherwise reserved for further use by CiA. If valid it contains an identifier for which the verification failed.

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- **reserved for ext. COB-ID:** reserved to contain the value of a COB-ID for which the verification failed, if extended identifiers are used, see /4/. Its value must be 0.
- **reserved:** reserved for further use by CiA.

5.2 Get Checksum Protocol

This protocol is used to implement the 'Get Checksum' service, see /2/.



- **cs:** DBT command specifier
6: get checksum command
- **Node-ID:** the value of the Node-ID attribute of the User Definitions for which the checksum must be calculated (see /2/), or 0. If 0, the checksum must be calculated for all User Definitions.
- **status:** indicates the success or failure of the service.
0: service successful
1: service not successful
- **error code:** only valid if status = 1, otherwise reserved for further use by CiA. If valid it indicates the reason for the failure.
0: reserved for further use by CiA
1: reserved for other DBT services
2: COB Database is in the DISABLED state, see /2/
3..5: reserved for other DBT services
6..253: reserved for further use by CiA
254: reserved for other DBT services
255: other error occurred

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- **checksum:** only valid if status = 0, otherwise reserved for further use by CiA. If valid it contains the requested checksum.
- **reserved:** reserved for further use by CiA.

ANNEX I

IMPLEMENTATION RULES

When implementing the DBT protocols, the following rules have to be followed to guarantee inter-operability. These rules deal with the following implementation aspects:

Invalid COB's

A COB is invalid if it has a COB-ID that is used by the DBT Protocol, but it contains invalid parameter values according to the DBT Protocol. This can only be caused by errors in the lower layers (see /1/) or implementation errors. Invalid COB's must be handled **locally** in an implementation specific way that does not fall within the scope of the CiA Standard on the CAN Application Layer for Industrial Applications. As far as the DBT Protocol is concerned, an invalid COB must be ignored.

Time-out's

Since COB's may be ignored, the response of a confirmed DBT service may never arrive. To resolve this situation, an implementation may, after a certain amount of time, indicate this to the service user (time-out). **A time-out is not a confirm of that DBT service.** A time-out indicates that the service has not completed yet. The application must deal with this situation. Time-out values are considered to be implementation specific and do not fall within the scope of the CiA Standard on the CAN Application Layer for Industrial Applications. However, it is recommended that an implementation provides facilities to adjust these time-out values to the requirements of the application.