CANopen®: CiA 301 - application layer and communication profile

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Object dictionary (OD)

Overview

Index range	Description
0000_h	Reserved
0001_h to $025F_h$	Data types
0260_h to $0FFF_h$	Reserved
1000_h to $1FFF_h$	Communication profile area
2000_h to $5FFF_h$	Manufacturer-specific profile area
6000_h to $9FFF_h$	Standardized profile area
$A000_h$ to $AFFF_h$	Network variables
$B000_h$ to $BFFF_h$	System variables
$C000_h$ to $FFFF_h$	Reserved

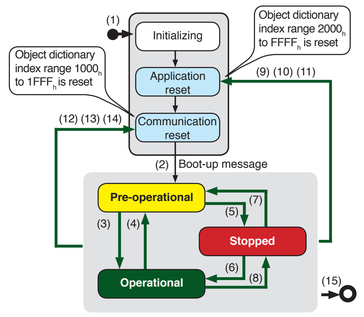
Communication profile area

Index range	Description
1000_h to 1029_h	General communication objects (CiA 301)
$102A_h$	NMT inhibit time (CiA 302-2)
1100_h to 1107_h	*CANopen security (CiA 322) (under development)*
1180_h to 1186_h	CANopen energy saving (CiA 302-9)
1200_h to $12FF_h$	SDO parameters (CiA 301)
1300_h to $13FF_h$	CANopen safety parameters (EN 50325-5)
1400_h to $1BFF_h$	PDO parameters (CiA 301)
$1F00_h$ to $1F11_h$	SDO manager (CiA 302-5)
$1F20_h$ to $1F27_h$	Configuration manager (CiA 302-3)
$1F2A_h$ to $1F4F_h$	CANopen multi-level networking (CiA 302-7)
$1F50_h$ to $1F58_h$	Program control parameters (CiA 302-3)
$1F60_h$	Redundancy configuration (CiA 302-6)
$1F70_h$	Process image (CiA 302-4)
$1F78_h$	CANopen message data reception (IEC 61375-3-3)
$1F80_h$ to $1F91_h$	NMT manager parameters (CiA 302-2)
$1FA0_h$ to $1FCF_h$	Object scanner list (CiA 301)
$1FD0_h$ to $1FFF_h$	Object dispatching list (CiA 301)

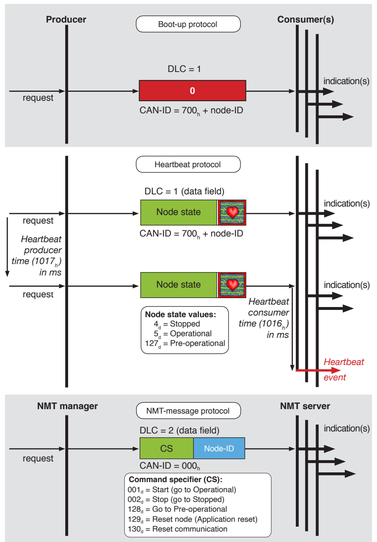
General communication objects

Index	Object	Name
1000_h	VAR	Device type
1001_h	VAR	Error register
1002_h	VAR	Manufacturer status register
1003_h	ARRAY	Pre-defined error field
1005_h	VAR	COB-ID Sync message
1006_h	VAR	Communication cycle period
1007_h	VAR	Synchronous window length
1008_h	VAR	Manufacturer device name
1009_h	VAR	Manufacturer hardware version
$100A_h$	VAR	Manufacturer software version
$100C_h$	VAR	Guard time
$100D_h$	VAR	Life time factor
1010_h	VAR	Store parameters
1011_h	VAR	Restore default parameters
1012_h	VAR	COB-ID time stamp
1013_h	VAR	High resolution time stamp
1014_h	VAR	COB-ID EMCY
1015_h	VAR	Inhibit time EMCY
1016_h	ARRAY	Consumer heartbeat time
1017_h	VAR	Producer heartbeat time
1018_h	RECORD	Identity object
1019_h	VAR	Sync. counter overflow value
1020_h	ARRAY	Verify configuration
1021_h	VAR	Store EDS
1022_h	VAR	Storage format
1023_h	RECORD	OS command
1024_h	VAR	OS command mode
1025_h	RECORD	OS debugger interface
1026_h	ARRAY	OS prompt
1027_h	ARRAY	Module list
1028_h	ARRAY	Emergency consumer
1029_h	ARRAY	Error behavior

Network management (NMT)

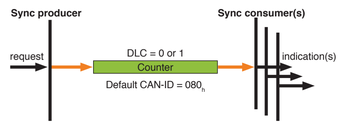


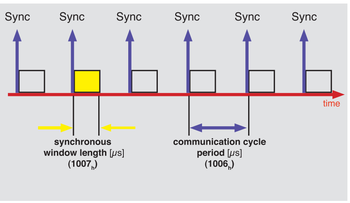
(1) Power on
(2) Automatic switch to Pre-operational
(3) and (6) NMT switch to Operational
(4) and (7) NMT switch to Pre-operational
(5) and (8) NMT switch to Stopped
(9), (10) and (11) NMT switch to Application reset
(12), (13) and (14) NMT switch to Communication reset
(15) Power-off or hardware reset



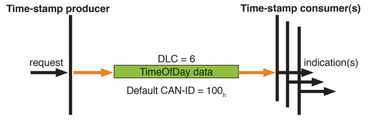
Special protocols

Sync protocol





Time-stamp protocol

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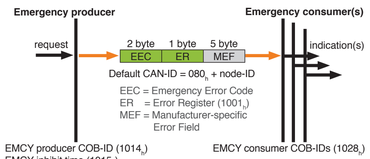
STRUCT OF
    UNSIGNED28    ms,        (after midnight)
    VOID4         reserved_1,
    UNSIGNED16    days,      (since January 1, 1984)
```

TIME COB-ID (1012_h)

Emergency protocol

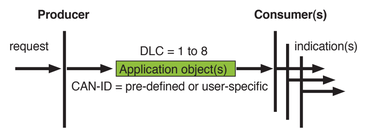


Pre-defined CAN-IDs

Object	Specification	CAN-ID
NMT	CiA 301	000_h
Global failsafe command	EN 50325-5	001_h
Flying manager	CiA 302-2	071_h to 076_h
Indicate active interface	CiA 302-6	$07F_h$
Sync	CiA 301	080_h
Emergency	CiA 301	081_h to $0FF_h$ (080_h + node-ID)
Time stamp	CiA 301	100_h
Safety-relevant data objects	EN 50325-5	101_h to 180_h
TPDO 1	CiA 301	181_h to $1FF_h$ (180_h + node-ID)
RPDO 1	CiA 301	201_h to $27F_h$ (200_h + node-ID)
TPDO 2	CiA 301	281_h to $2FF_h$ (280_h + node-ID)
RPDO 2	CiA 301	301_h to $37F_h$ (300_h + node-ID)

Object	Specification	CAN-ID
TPDO 3	CiA 301	381_h to $3FF_h$ (380_h + node-ID)
RPDO 3	CiA 301	401_h to $47F_h$ (400_h + node-ID)
TPDO 4	CiA 301	481_h to $4FF_h$ (480_h + node-ID)
RPDO 4	CiA 301	501_h to $57F_h$ (500_h + node-ID)
Default SDO server-to-client	CiA 301	581_h to $5FF_h$ (580_h + node-ID)
Default SDO client-to-server	CiA 301	601_h to $67F_h$ (600_h + node-ID)
Dynamic SDO request	CiA 302-5	$6E0_h$
Node claiming procedure	CiA 416-1	$6E1_h$ to $6E3_h$
Node claiming procedure	CiA 416-1	$6F0_h$ to $6FF_h$
NMT error control	CiA 301	701_h to $77F_h$ (700_h + node-ID)
Layer setting services	CiA 305	$7E4_h$ to $7E5_h$

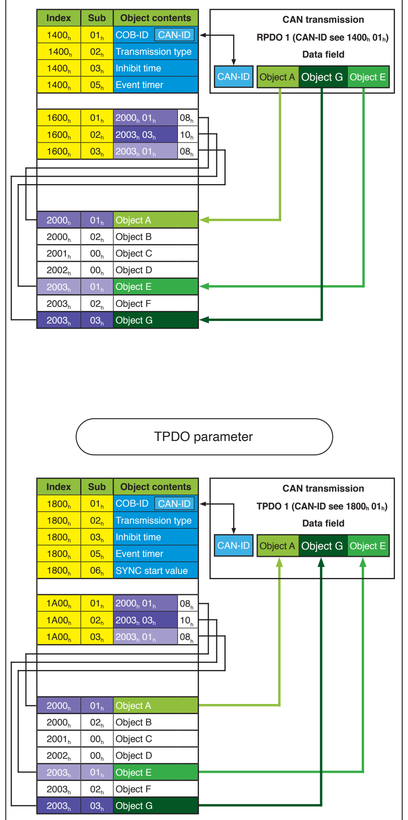
Process data object (PDO)



PDO communication parameter

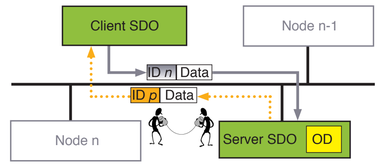
Index	Sub-index	Description	Data type
RPDO: 1400_h to $15FF_h$	00_h	Number of entries	Unsigned8
	01_h	COB-ID	Unsigned32
	02_h	Transmission type	Unsigned8
	03_h	Inhibit time	Unsigned16
TPDO: 1800_h to $19FF_h$	04_h	Reserved	Unsigned8
	05_h	Event timer	Unsigned16
	06_h	SYNC start value	Unsigned8

RPDO parameter

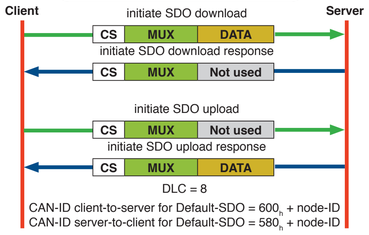


TPDO parameter

Service data object (SDO)



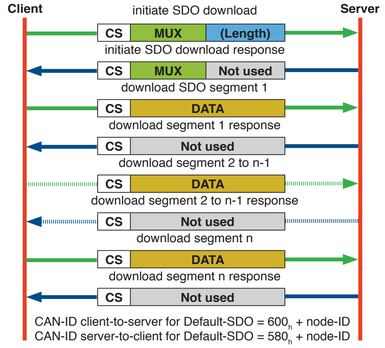
Expedited SDO protocol



CAN-ID client-to-server for Default-SDO = 600_h + node-ID
CAN-ID server-to-client for Default-SDO = 580_h + node-ID

CS: Command specifier (read or write access, transfer type)
MUX: Multiplexer (index and sub-index of an object)

Normal SDO protocol



CAN-ID client-to-server for Default-SDO = 600_h + node-ID
CAN-ID server-to-client for Default-SDO = 580_h + node-ID

SDO abort codes

Abort code	Description
0503 0000h	Toggle bit not alternated
0504 0000h	SDO protocol timed out
0504 0001h	Client/server command specifier not valid or unknown
0504 0002h	Invalid block size (block mode only)
0504 0003h	Invalid sequence number (block mode only)
0504 0004h	CRC error (block mode only)
0504 0005h	Out of memory
0601 0000h	Unsupported access to an object
0601 0001h	Attempt to read a write only object
0601 0002h	Attempt to write a read only object
0602 0000h	Object does not exist in the object dictionary
0604 0041h	Object cannot be mapped to the PDO
0604 0042h	Number, length of the objects would exceed PDO length
0604 0043h	General parameter incompatibility reason
0604 0047h	General internal incompatibility in the device
0606 0000h	Access failed due to an hardware error

Abort code	Description
0607 0010h	Data type does not match, length does not match
0607 0012h	Data type does not match, length too high
0607 0013h	Data type does not match, length too low
0609 0011h	Sub-index does not exist
0609 0030h	Invalid value for parameter (download only)
0609 0031h	Value of parameter written too high (download only)
0609 0032h	Value of parameter written too low (download only)
0609 0036h	Maximum value is less than minimum value
060A 0023h	Resource not available: SDO connection
0800 0000h	General error
0800 0020h	Data cannot be transferred
0800 0021h	Data cannot be transferred or stored to the application because of local control
0800 0022h	Data cannot be transferred because of the present device state
0800 0023h	Object dictionary dynamic generation fails or no object dictionary is present
0800 0024h	No data available

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