



OzCAN CAN Communication Protocol

Functional Specification

FS-0046

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1. Introduction

This document is intended to provide a detailed specification of the OzCAN Controller Area Network (CAN) bus communication protocol. The document covers the details of the CAN message identifier as well as supported message formats, common to all applications implementing this protocol. It does not provide any message information specific to a particular application, as this level of detail is covered in separate, application-specific message specifications.

1.1 Referenced Documents

Ref.	Document	Description
[1]	n/a	n/a

1.2 Definitions

CAN	Controller Area Network
CRC	Cyclic Redundancy Check
DSP	Digital signal processor
EEPROM	Electrically Erasable Programmable Read Only Memory
GUI	Graphical User Interface
PCB	Printed Circuit Board
POR	Power On Reset
RAM	Random Access Memory
USB	Universal Serial Bus

2. Overview

Controller Area Network (CAN) is a multi-master broadcast serial bus standard for connecting electronic control units (ECUs). Each node is able to send and receive messages, but not simultaneously. A message consists of an ID — usually chosen to identify the message-type/sender — and up to eight message bytes. Messages are transmitted serially onto the bus, one bit after another. This signal-pattern codes the message in non-return-to-zero (NRZ) line codes and is sensed by all nodes.

At any point in time, if the bus is free, any node may begin to transmit. If two or more nodes begin sending messages at the same time, the message with the more dominant ID (which has more dominant bits i.e. bit 0) will overwrite other nodes' less dominant IDs, so that eventually after this arbitration on the ID only the dominant message remains and is received by all nodes. Bit rates up to 1 Mbit/s are possible at network lengths below 40 m. Decreasing the bit rate allows longer network distances (e.g. 125 kbit/s at 500 m).

3. OzCan Protocol

OzCan is a communication protocol and device profile specification used by a variety of Oztek products including Active Front End controllers (AFE), Motor Controllers, and DC/DC Converters. In terms of the OSI model, OzCan implements the layers above the network layer. The OzCan standard consists of an addressing scheme, message protocol, and an application layer defined by a device profile.

3.1 CAN Message ID Format

Figure 1 illustrates the OzCan Message ID format. The CAN extended (29-bit) message identifier format is used over its standard (11-bit) counterpart in order to provide for greater flexibility in addressing and message identification.

CAN Message Identifier						
Bit 28	Bits 27 - 24	Bits 23 - 19	Bits 18 - 16	Bits 15 - 12	Bits 11 - 7	Bits 6 - 0
Message Priority	Destination Group ID	Destination Module ID	Message Type	Source Group ID	Source Module ID	Group Message ID

Figure 1 – Extended (29-bit) CAN Message Identifier Format

- **Message Priority** (1 bit): **0** = High **1** = Normal. Interpretation and action based on message priority is device specific and defined in the application's associated device message profile.
- **Destination/Source Group IDs** (4 bits): Up to 15 unique groups can be defined using IDs of 1 through 15. A group could define a specific vendor or device classification within the system. When assigned to the Destination Group ID field, a value of 0 is used for system-wide broadcast transmissions. In the case of broadcasted messages, the Destination Module ID field is ignored.
- **Destination/Source Module IDs** (5-bits): Up to 31 modules can be defined for a group using IDs of 1 through 31. When assigned to the Destination Module ID field, a value of 0 is used for group-wide multicast transmissions. For multicast messages, the Destination Group ID specifies the destination group.
- **Message Type** (3 bits): The currently defined message types are as follows:
 - **0 - Command Message**
 - **1 - Memory Map Message**
 - **2 - Status Message**

- **3 - Configuration Operation Message**
- **4 through 7 - Reserved**
- **Group Message ID (7 bits):** Each message type within the system can have up to 128 unique message IDs using values of 0 through 127. **Note:** Since a broadcast message consumes a single Group ID (ID = 0), up to 128 unique broadcast messages can be defined for the system (message IDs 0 – 127).

3.2 Group IDs

Group IDs are used to distinguish between different device types within the network. The default group IDs are presented in Table 1. Note that the group ID may be customized for any given network implementation by modifying the appropriate configuration variable.

Table 1 Default Group ID Assignments

ID Value	Description
0	Broadcast
1	Host Controller
2	Active Front End Controller
3	Motor Controller
4	DC/DC Converter
5-15	Reserved for future use

3.3 Module IDs

Module IDs are used to distinguish between different devices of the same type, i.e. same Group ID, within the network. By default, application module IDs are usually set to one. In a network with more than one module of the same type, modules 2 through N must be commissioned with the correct module ID, either by modifying the appropriate configuration variable or setting the hardware ID if supported.

3.4 Message Types

3.4.1 Command Message

Command messages are usually sent by a Host Controller during runtime operation and affect the operational state of a device. Examples of typical command messages include On/Off, Operating Setpoint, Fault Reset, etc.

3.4.2 Memory Map Message

Memory Map messages allow the Host Controller to write/read data to/from pre-defined memory locations within a device. These messages provide a mechanism for devices to query specific instrumentation or status data on an as-needed basis.

3.4.3 Status Message

Status messages are predefined groups of information intended to be sent from a device controller to the Host Controller during runtime operation to convey device status. Typically these are configured as unsolicited, periodic messages.

3.4.4 Configuration Operation Message

Configuration messages are used to modify the contents of non-volatile configuration memory constants. Configuration constants are used to determine the operational behavior of a particular device.

Warranty and Product Information

Limited Warranty

What does this warranty cover and how long does it last? This Limited Warranty is provided by Oztek Corp. ("Oztek") and covers defects in workmanship and materials in your Oztek product. This Warranty Period lasts for 18 months from the date of purchase at the point of sale to you, the original end user customer, unless otherwise agreed in writing. You will be required to demonstrate proof of purchase to make warranty claims. This Limited Warranty is transferable to subsequent owners but only for the unexpired portion of the Warranty Period. Subsequent owners also require original proof of purchase as described in "What proof of purchase is required?"

What will Oztek do? During the Warranty Period Oztek will, at its option, repair the product (if economically feasible) or replace the defective product free of charge, provided that you notify Oztek of the product defect within the Warranty Period, and provided that through inspection Oztek establishes the existence of such a defect and that it is covered by this Limited Warranty.

Oztek will, at its option, use new and/or reconditioned parts in performing warranty repair and building replacement products. Oztek reserves the right to use parts or products of original or improved design in the repair or replacement. If Oztek repairs or replaces a product, its warranty continues for the remaining portion of the original Warranty Period or 90 days from the date of the return shipment to the customer, whichever is greater. All replaced products and all parts removed from repaired products become the property of Oztek.

Oztek covers both parts and labor necessary to repair the product, and return shipment to the customer via an Oztek-selected non-expedited surface freight within the contiguous United States and Canada. Alaska, Hawaii and locations outside of the United States and Canada are excluded. Contact Oztek Customer Service for details on freight policy for return shipments from excluded areas.

How do you get service? If your product requires troubleshooting or warranty service, contact your merchant. If you are unable to contact your merchant, or the merchant is unable to provide service, contact Oztek directly at:

USA
Telephone: 603-546-0090
Fax: 603-386-6366
Email techsupport@oztekcorp.com

Direct returns may be performed according to the Oztek Return Material Authorization Policy described in your product manual.

What proof of purchase is required? In any warranty claim, dated proof of purchase must accompany the product and the product must not have been disassembled or modified without prior written authorization by Oztek. Proof of purchase may be in any one of the following forms:

- The dated purchase receipt from the original purchase of the product at point of sale to the end user
- The dated dealer invoice or purchase receipt showing original equipment manufacturer (OEM) status
- The dated invoice or purchase receipt showing the product exchanged under warranty

What does this warranty not cover? Claims are limited to repair and replacement, or if in Oztek's discretion that is not possible, reimbursement up to the purchase price paid for the product. Oztek will be liable to you only for direct damages suffered by you and only up to a maximum amount equal to the purchase price of the product. This Limited Warranty does not warrant uninterrupted or error-free operation of the product or cover normal wear and tear of the product or costs related to the removal, installation, or troubleshooting of the customer's electrical systems. This warranty does not apply to and Oztek will not be responsible for any defect in or damage to:

- a) The product if it has been misused, neglected, improperly installed, physically damaged or altered, either internally or externally, or damaged from improper use or use in an unsuitable environment
- b) The product if it has been subjected to fire, water, generalized corrosion, biological infestations, or input voltage that creates operating conditions beyond the maximum or minimum limits listed in the Oztek product specifications including high input voltage from generators and lightning strikes
- c) The product if repairs have been done to it other than by Oztek or its authorized service centers (hereafter "ASCs")
- d) The product if it is used as a component part of a product expressly warranted by another manufacturer
- e) The product if its original identification (trade-mark, serial number) markings have been defaced, altered, or removed
- f) The product if it is located outside of the country where it was purchased
- g) Any consequential losses that are attributable to the product losing power whether by product malfunction, installation error or misuse.

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Return Material Authorization Policy

Before returning a product directly to Oztek you must obtain a Return Material Authorization (RMA) number and the correct factory "Ship To" address. Products must also be shipped prepaid. Product shipments will be refused and returned at your expense if they are unauthorized, returned without an RMA number clearly marked on the outside of the shipping box, if they are shipped collect, or if they are shipped to the wrong location.

When you contact Oztek to obtain service, please have your instruction manual ready for reference and be prepared to supply:

- The serial number of your product
- Information about the installation and use of the unit
- Information about the failure and/or reason for the return
- A copy of your dated proof of purchase

Return Procedure

Package the unit safely, preferably using the original box and packing materials. Please ensure that your product is shipped fully insured in the original packaging or equivalent. This warranty will not apply where the product is damaged due to improper packaging. Include the following:

- The RMA number supplied by Oztek clearly marked on the outside of the box.
- A return address where the unit can be shipped. Post office boxes are not acceptable.
- A contact telephone number where you can be reached during work hours.
- A brief description of the problem.

Ship the unit prepaid to the address provided by your Oztek customer service representative.

If you are returning a product from outside of the USA or Canada - In addition to the above, you **MUST** include return freight funds and you are fully responsible for all documents, duties, tariffs, and deposits.

Out of Warranty Service

If the warranty period for your product has expired, if the unit was damaged by misuse or incorrect installation, if other conditions of the warranty have not been met, or if no dated proof of purchase is available, your unit may be serviced or replaced for a flat fee. If a unit cannot be serviced due to damage beyond salvation or because the repair is not economically feasible, a labor fee may still be incurred for the time spent making this determination.

To return your product for out of warranty service, contact Oztek Customer Service for a Return Material Authorization (RMA) number and follow the other steps outlined in "Return Procedure".

Payment options such as credit card or money order will be explained by the Customer Service Representative. In cases where the minimum flat fee does not apply, as with incomplete units or units with excessive damage, an additional fee will be charged. If applicable, you will be contacted by Customer Service once your unit has been received.