



The D015M is a multi-purpose MVB interface on a 40x85mm size footprint (PC/30).

All features of the MVB architecture are available:

- **Process Data and Message Data (Bus Administrator as an option)**
- **EMD or ESD+.**

The D015M is available in two configurations:

- **MDFULL: Passive MVB interface with a full featured Duagon MVB controller.**
- **SERVER: Active MVB interface including the Message Data Real Time Protocol stack.**



Data Sheet

D015M PC/30 MVB Interface

Duagon Data Sheet Preamble

On having purchased products described in this data sheet, the customer acquires the right to use the products according to its specified purpose and in accordance with all operation, service and maintenance instructions. All other rights to the product, Duagon's intangible assets rights in particular, belong solely to Duagon and may not be deemed to have been assigned along with the sale of the products.

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Document history

Rev.	Date	Author	Comments	Ident-Number
1	August 19 th , 2008	Klauser	see chapter	d-002190-005589
2	Dec 15 th , 2008	Klauser	"Document History"	d-002190-006359
3	June 25 th , 2009	Klauser		d-002190-007249
4	May 11 th , 2010	Klauser		d-002190-008593
5	Sept. 6 th , 2010	Klauser		d-002190-008729
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7				
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Introduction

The D015M is a multi-purpose MVB interface on a 40x85mm size footprint (PC/30). All features of the MVB architecture are available: Process Data, Message Data, Bus Administrator as an option and physical layer EMD or ESD+.

The D015M is available in two configurations:

- **MDFULL:** Passive MVB interface with a Duagon MVB controller.
- **SERVER:** Active MVB interface including the Message Data Real Time Protocol stack MD RTP (see also section "MVB Software Protocols" on page 29).

The D015 complies to the TCN standard IEC61375. It is designed for the harsh traction environment and conforms to the EN 50121 / EN 50155 / EN 61373 standards, e.g. by:

- -40 to +85°C operating temperature
- coating against humidity
- enhanced EMI and vibration robustness

Other Members of the D015 Product Family

The D015 Product Family covers interface boards for the following vehicle bus systems:

- D015E: Ethernet
- D015C: CAN

All interface products of the D015 family have the same PC/30 footprint. That way, modules of this product family can easily be exchanged without adaptation of the customer's host PCB (see also page 40).

How to Get Started?

This data sheet describes the properties and functions of the D015M MVB interface. It includes the essential information required for the integration of the D015M into a host system.

For detailed information about the integration and how to proceed step by step, please refer to the "PC/30 Integration – User's Guide", d-002241-nnnnnn.

All driver software related documentation and source code is contained in the host driver packages (see Chapter "Links to other Duagon Documents" on page 45).

When using the Duagon D221 PCI-Express Adapter Card (see D221 Data Sheet, d-002530-nnnnnn), the D015 can be plugged in any PC system for fast software development. The purpose of the D221 – in combination with the D015 – is to support the integration into a customer controller platform. The application engineer can start implementation of the MVB application software before the final hardware platform is ready.

Online Support

For additional information, please visit our web page www.duagon.com.

There you will find:

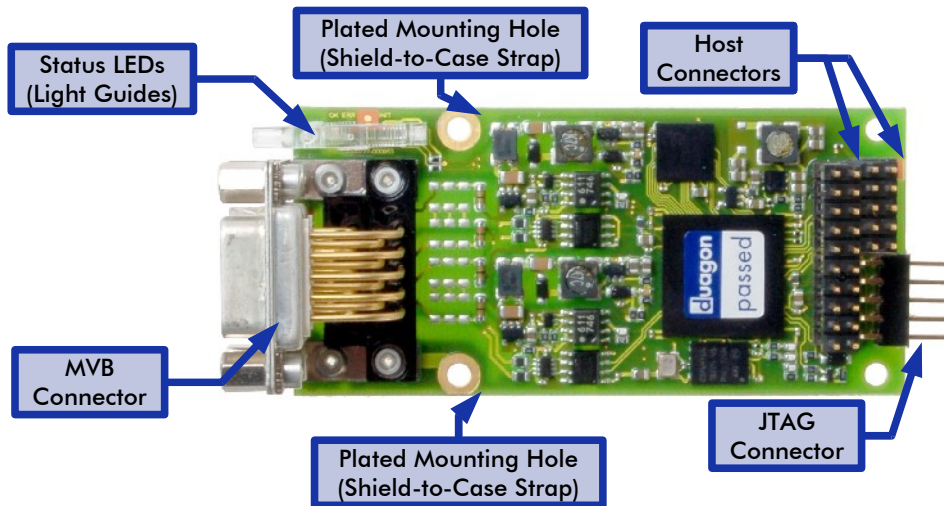
- up to date documents
- frequently asked questions
- description of new product versions

On our web page it is also possible to subscribe to an email news service providing notifications about all kind of news.

Architecture

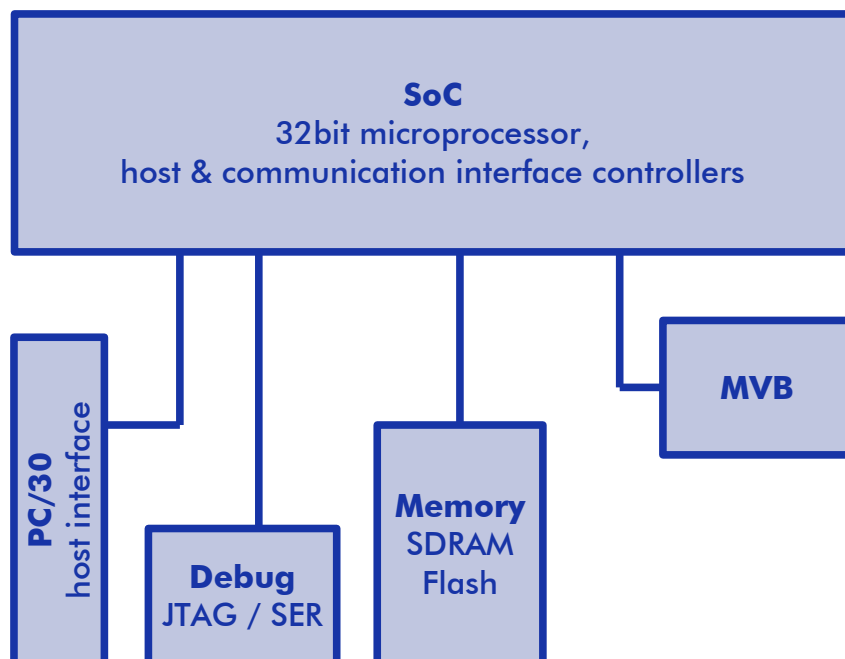
Hardware Structure

The figure below shows the top view of a D015M equipped with a double SUB-D connector for MVB.



Basic Function Blocks

The basic function blocks within the D015M are shown in the drawing below:



The "**System on a Chip SoC**" contains the local microprocessor and all relevant logic circuitry, like MVB controller, memory controller, host interface controller, etc.

This component is implemented as a programmable logic device. This ensures the versatile change of e.g. controller specifications, bug fixes after hardware production and future portability to new silicon technologies.

The **PC/30 host interface** ensures a data communication path between the D015M and the CPU of the host system.

The **MVB interface** supports both wire based standards, the ESD+ and the EMD; both with galvanic insulation.

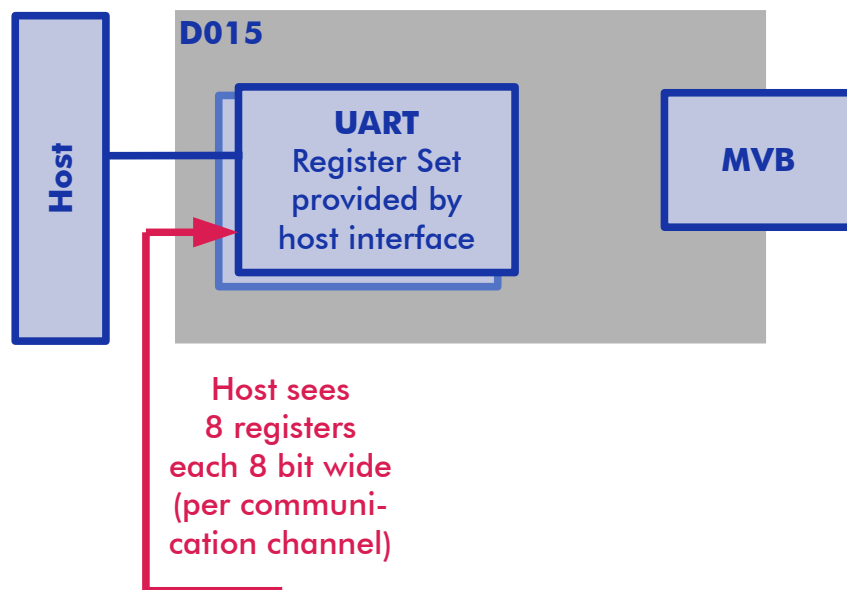
Host Interface

By choosing a specific MODE-pin combination (see page 13) on the PC/30 interface, the Host Interface follows one of two definitions "Parallel Host Interface" or "Serial Host Interface".

The host interface offers communication channels. Typically, there are two communication channels. One channel is used for "fast" real time critical data (MVB communication), the other is used for "slower" data (file system access, service protocol, etc).

8 Bit Parallel Host Interface

The D015M behaves like a UART device, i.e. it maps UART register sets into the host system. These register sets are used for communication between the host processor and the communication interface. For details about the register map see the "PC/30 Integration – User's Guide", d-002241-nnnnnn.



Communication with the D015M over the Duagon UART device basically means transferring data "as if it was sent through a serial line"; i.e. data bytes are sent and received in a sequential manner.

The communication does not really pass a serial line, just the registers of the Duagon UART device. Therefore the transmission is very fast (depending on the host microprocessor: approx. 1 to 8 Mbaud).

Serial Host Interface

There are two Serial Line Interfaces on logic levels. Using serial lines (basically one TX for transmit, one RX for receive) yields the lowest count of required pins for the host interface. In principle, this interface can perform all functionality. However, the serial communication requires more time for completion of an access to the communication controller. We therefore recommend this interface for very "simple" applications, only: for example if only less than 10-20 PD ports have to be exchanged over MVB.

Memory

The D015 local microprocessor includes memory spaces as follows:

Memory Type	Size
Flash (YAFFS flash file system, see also page 30)	up to 6 MByte ¹⁾
SDRAM (RAM file system, see also page 30)	up to 100 kByte

Remarks:

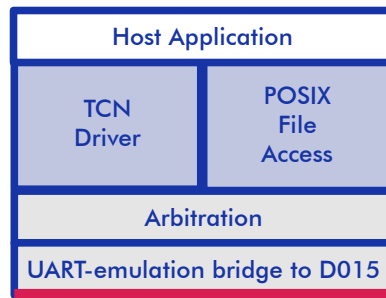
- 1) This is the size of the flash file system available to the user.
Extension to up to 30 MByte possible. Please call Duagon for more information.

Software Structure

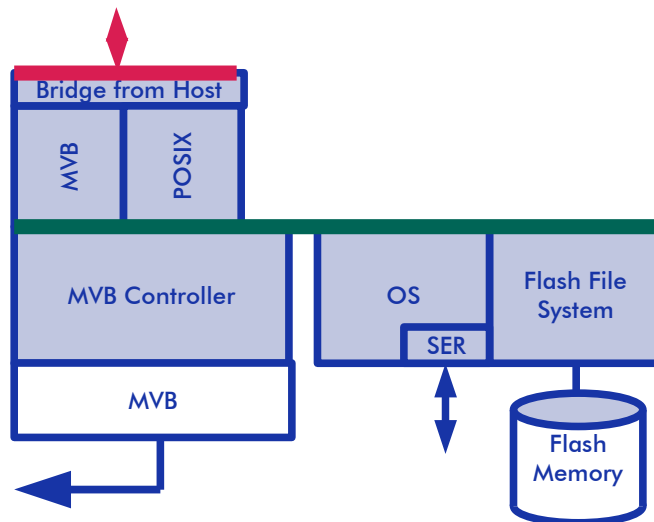
The software structure depends on the chosen configuration passive interface (MDFULL) or active interface (SERVER):

Passive MVB Interface MDFULL

In case of the passive MVB interface MDFULL, the TCN Driver Software running on the host (see also section "MVB Software Protocols" on page 29) directly accesses the MVB controller on the D015M:



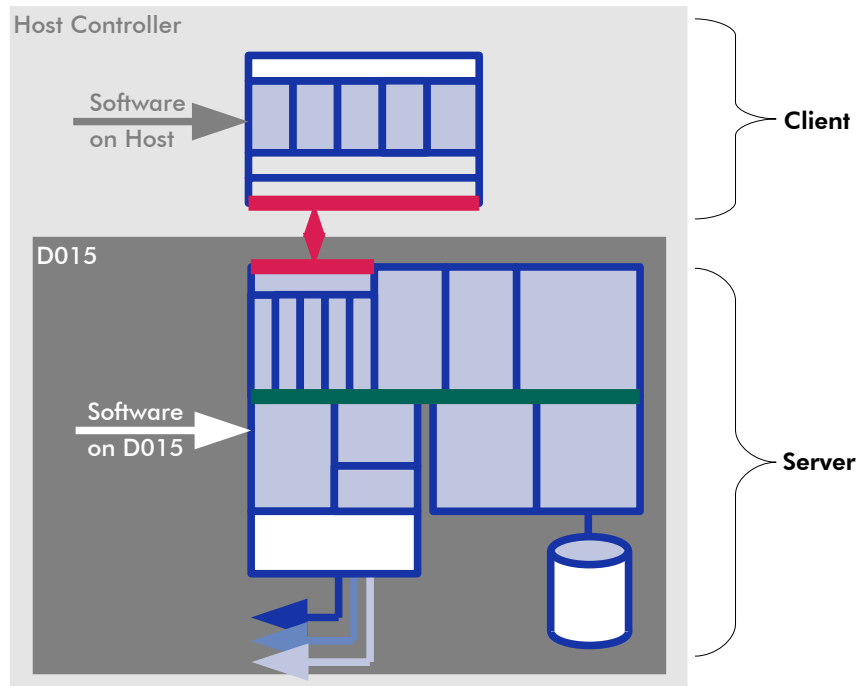
The D015M just contains the MVB controller and a small operating system to serve the diagnostic serial line and to access the local flash file system:



Active MVB Interface D015M SERVER

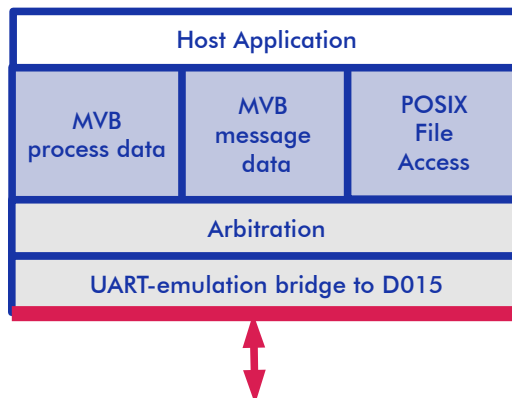
On the D015M SERVER, the overall concept follows the "**Client-Server Model**":

- **Client**: a small client software is installed on the host
- **Server**: the major parts of the communication stack are included in D015M.



"Client" Software Running on the Host System

The drivers shown below are installed on the host side. The software itself as well as the interface description is included in the "Host Driver SERVER," and may need simple adaptations in order to run on the host's operating system.

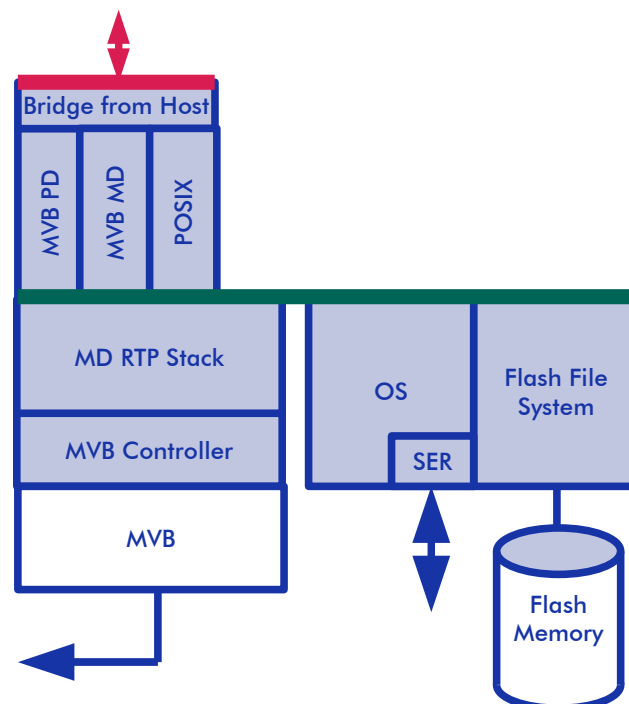


The "Client" is very "thin", i.e. there are no complex requirements for the host system to fulfill:

- No real-time operating system needed. All real-time requirements needed for communication are covered within the D015M. The host system is free from real-time requirements.
- The "Host Client" driver software is available as ANSI C source files, which allows an easy porting to any host/operating system combination. For more information, please refer to the "Host Driver" package.
- Integration of the "Client" to a customer's system typically needs a few days of work.

"Server" Software Running on the D015M

The structure shown below is running on the D015M. The software is installed on the D015M during delivery and may be changed by downloading other software parts.



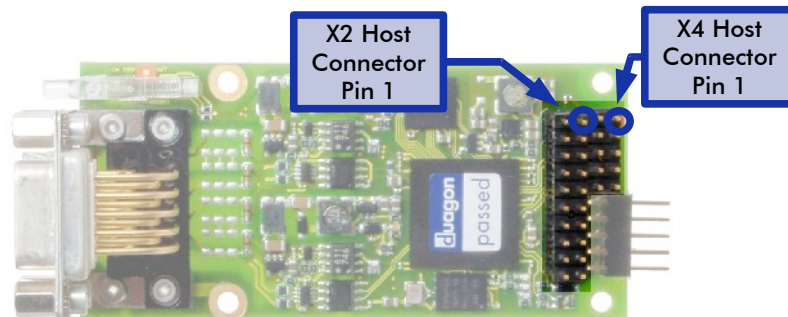
For more information about the Message Data Real Time Protocol stack (MD RTP), please refer to the chapter "MVB Software Protocols" on page 29.

Physical Interfaces

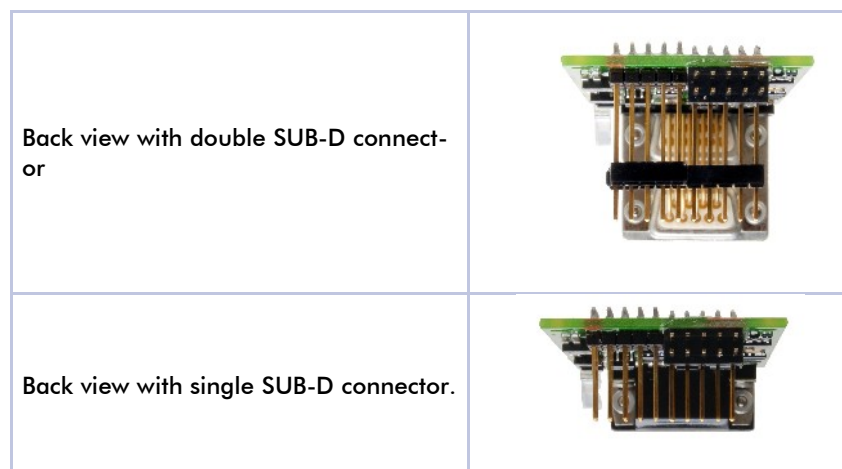
PC/30 Host Interface (X2 and X4)

The D015M can either be accessed through a parallel or a serial host interface. The selection "parallel" or "serial" interface is made by the MODE pins. The host interface consists of two header connectors with 2.54mm pattern:

- X2: 2x10 pins
- X4: 2x5 pins



The height of the module and the length of the two host connectors depends on whether a single or a double MVB connector is used (see description of the MVB interface on page 20):



The host interface provides access to

- the Message Data Real Time Protocol stack (D015M, see also section "MVB Software Protocols" on page 29)
- the MVB controller if no Message Data Real Time Protocol stack is available (MDFULL)
- the D015 flash file system (see also page 30)

Remark:

- The mechanical and electrical properties of the PC/30 host interface is for all members of the D015 product family identical.

PC/30 Pin Definition

X2				
Pin #	MODE= 00 (Parallel Host) Signal Name	MODE= 01 (Serial Host) Signal Name	MODE= 10 (Production use)	MODE= 11 (Production use)
1	GND	GND	GND	GND
2	GND	GND	GND	GND
3	D0	/RXD_0	Test pattern	Test pattern
4	D1	HOLD_RX_0	Test pattern	Test pattern
5	D2	/TXD_0	Test pattern	Test pattern
6	D3	HOLD_TX_0	Test pattern	Test pattern
7	+3.3V	+3.3V	+3.3V	+3.3V
8	+3.3V	+3.3V	+3.3V	+3.3V
9	D4	/RXD_1	Test pattern	Test pattern
10	D5	HOLD_RX_1	Test pattern	Test pattern
11	D6	/TXD_1	Test pattern	Test pattern
12	D7	HOLD_TX_1	Test pattern	Test pattern
13	A0	BAUDS0	Test pattern	Test pattern
14	A1	BAUDS1	Test pattern	Test pattern
15	A2	BAUDS2	Test pattern	Test pattern
16	A3	RXTXC	Test pattern	Test pattern
17	A4	- n.u. -	Test pattern	Test pattern
18	+3.3V	+3.3V	+3.3V	+3.3V
19	/RD	PEN	Test pattern	Test pattern
20	/WR	EPS	Test pattern	Test pattern

X4				
Pin #	MODE = 00 (Parallel Host) Signal Name	MODE = 01 (Serial Host) Signal Name	MODE = 10 (Production use)	MODE = 11 (Production use)
1	/RESET	/RESET	/RESET	/RESET
2	/RDY	- n.u. -	Test pattern	Test pattern
3	/CE	- n.u. -	Test pattern	Test pattern
4	/SERVICE_RX	/SERVICE_RX	Test pattern	Test pattern
5	/SERVICE_TX	/SERVICE_TX	Test pattern	Test pattern
6	GND	GND	GND	GND
7	/INT	/INT	Test pattern	Test pattern
8	MODE0	MODE0	MODE0	MODE0
9	MODE1	MODE1	MODE1	MODE1
10	GND	GND	GND	GND

Remarks

- Inverted or "active low" signals are indicated by a slash "/".
- - n.u. - pins are not used. Recommended to connect to GND in order to avoid floating inputs.

Signal Description – Common Pins

GND, +3.3V

Power supply pins for the D015. It is highly recommended to connect all power pins in a way, that the overall impedance of the power lines is reduced to a minimum.

EMI note: Galvanic islands require bypass capacitors to meet Agency EMI Standards by shunting common-mode noise currents and keeping them local. For this reason, a special classification of capacitor, referred to as a "Y-capacitor" is recommended. These capacitors contain a dielectric with unique "self healing" properties to help prevent against excessive leakage. Therefore we highly recommend to conduct Y-capacitors (e.g. 4.7nF 250-VAC) between GND and Shield.

/RESET

Input, active low. The D015 has to be reset during power up / power down or any other under voltage condition. For normal operation, /RESET must be driven high.

In addition to this, we highly recommend the CPU watchdog trigger line to pull the reset line active. This will safely stop all communication activity on the bus after a watchdog trigger.

Service Serial Line /SERVICE_RX, /SERVICE_TX

Logic level serial line interface providing a Command Line Interface for diagnostics and debugging. See also page 30.

We recommend to implement for these signals a small connector somewhere close to the D015. By this way, the service serial line can be accessed without removing the D015 from its host.

MODE[1..0]

The MODE pins define the general behavior of the D015. During power up or reset, the D015 is completely passive; during this time, the D015 scans the MODE pins. After releasing reset, the value of the MODE signals is latched internally and defines the behavior of the D015. Even though a later change of the MODE pins does not influence the D015 operation, we still recommend to hard wire the MODE pins. This ensures safe signal status even during spurious RESET activity.

MODE1	MODE0	Behavior
0	0	Parallel host interface
0	1	Serial host interface
1	0	Production test mode (reserved)
1	1	

Parallel Host Interface

Eight bit parallel bus. This is the preferred host interface, since it delivers the highest performance. This type of host interface has been widely proven in the PC/104 Product family.

Serial Host Interface

Two Serial Line Interfaces on logic levels (one for a "fast" and one for a "slow" communication channel). Using serial lines (basically one TX for transmit, one RX for receive) yields the lowest count of required pins for the host interface. In principle, this interface can perform all functionality. However, the serial communication requires more time for completion of an access to

the communication controller. We therefore recommend this interface for very "simple" applications, only: for example if only less than 10-20 PD ports have to be exchanged over MVB.

Production Test Mode (Reserved)



This mode is used during manufacturing of the module and is not intended for customer use. Never activate this operating mode, since it will spontaneously drive weird logic levels to all IO pins.

/INT

Open drain output, active low. Add an external pullup resistor for successful operation. When active, marks an interrupt request state.

- The /INT is not required for the up to date driver software. All communication controller functionality can be obtained without using the /INT line.

This signal is intended for future new products.

Signal Description – Parallel Host Interface Pins

Communication with the bus interface over the Duagon UART emulation basically means transferring data "as if it was sent through a serial line"; i.e. data is sent and received in a sequential manner.

The communication does not really pass a serial line, just the registers of the Duagon UART device. The behavior is like a device with a big FIFO buffer; i.e. received bytes follow each other very fast and transmitted bytes are sent in a very fast sequence. Therefore the transmission is very fast (depending on the host microprocessor: approx. 1 to 8 Mbaud).

Note: Since the reaction time of the internal controller is in the range of a few microseconds, interrupts are not required: an interrupt handler is usually slower than polling.

For the timing specification see page 17.

Data Bus D[7..0]

Bidirectional data bus lines. Used for Read and Write Accesses to the internal register sets.

Address Bus A[4..0]

These inputs are used to select the different communication channels and internal registers on the Host Interface.

/CE, /RD, /WR

Control signal inputs. These signals define the access to be performed as well as the timing of the access.

/CE	/RD	/WR	Description	Data bus...
0	0	0	- illegal state -	undefined
0	0	1	READ access	...driven by D015
0	1	0	WRITE access	... high impedance inputs on D015
0	1	1	Idle, no operation	
1	0	0		
1	0	1		
1	1	0		
1	1	1		

/RDY

Output pin. May be used to generate wait states on the host CPU or to trigger a logic analyzer during debugging.

Not required for normal operation. Please note, that the D015 has deterministic access times; i.e. there is no need to dynamically generate wait states.

Add an external pullup resistor for successful operation.

Signal Description – Serial Host Interface Pins

There are two serial line interfaces with independent data and handshake signals (RXD, TXD, HOLD_TX, HOLD_RX). The configuration signals BAUDS[2..0], RXTXC, PEN and EPS affect both serial line interfaces.

Note: We recommend this interface for very "simple" applications, only: for example if only less than 10-20 PD ports have to be exchanged over MVB.

/RXD_0, /RXD_1

Receive Data. Input pin to D015, active low.

/TXD_0, /TXD_1

Transmit Data. Output pin from D015, active low.

HOLD_TX_0, HOLD_TX_1

Input pin to D015. Implements hardware handshake of transmit direction.

HOLD_RX_0, HOLD_RX_1

Output pin from D015. Implements hardware handshake of receive direction.

BAUDS[2..0] Baud Rate Selection

These inputs pins define the baud rate on both serial line interfaces. The fixed baud rates are completely generated inside the D015; the RXTXC pin (see below) may be used to externally generate non-standard baud rates.

BAUD-S2	BAUDS1	BAUD-S0	Description
0	0	0	1200 Baud
0	0	1	4800 Baud
0	1	0	9600 Baud
0	1	1	19200 Baud
1	0	0	38400 Baud
1	0	1	57600 Baud
1	1	0	115200 Baud
1	1	1	Use RXTXC pin as baud rate input

RXTXC Baud Rate Clock Input

Input for an externally generated clock; with a frequency of 16 times the intended baud rate. Influences both serial line interfaces.

PEN

Input pin. Parity enable. When set, a parity bit is generated during transmission and checked during reception. Influences both serial line interfaces.

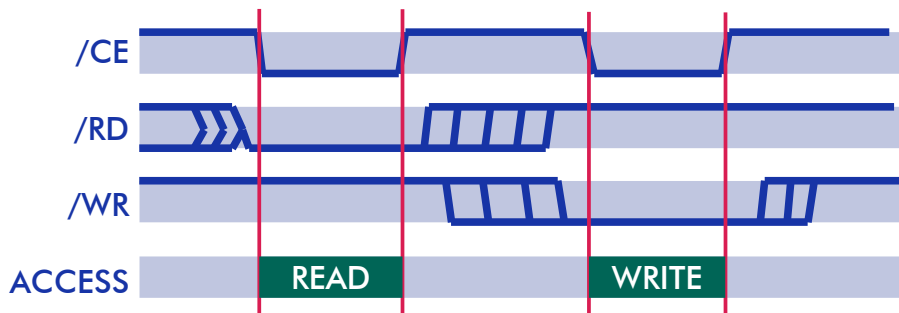
EPS

Input pin. Even Parity Select. Has only an effect if PEN is set, too. Influences both serial line interfaces.

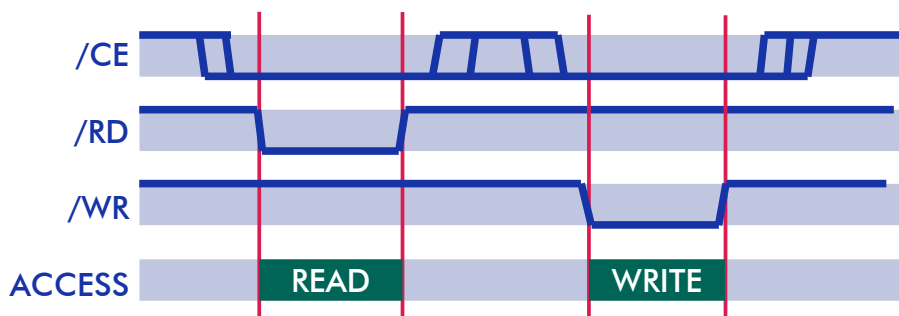
Timing Specification (Parallel Host Interface)

The timing of the access may be shaped by /CE or by /RD,/WR. The Boolean expression "/CE active" AND "/RD active" yields the READ access; in a similar way "/CE active" AND "/WR active" delivers the WRITE access.

This is an example for **"/CE shaped timing"**: The beginning and end of /CE defines the beginning and end of the access.

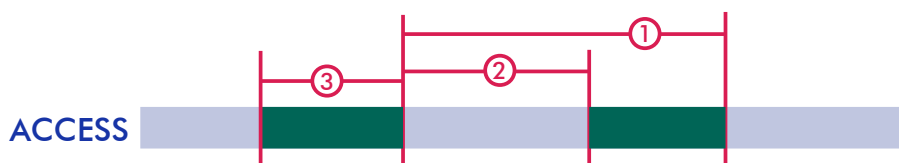


For the **"/RD, /WR shaped timing"**, the access timing is defined from /RD respectively /WR:



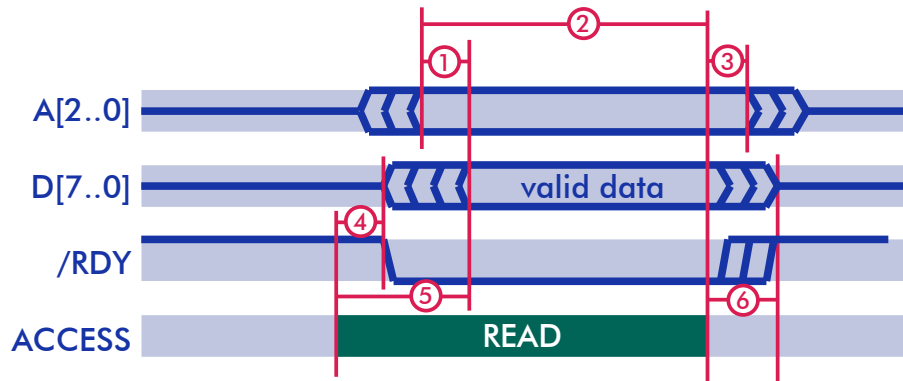
If necessary, the begin and end definition can be derived from different signals; e.g. the begin is shaped by /CE, the end by /RD.

The accesses must have a certain distance to each other (independent from READ or WRITE):



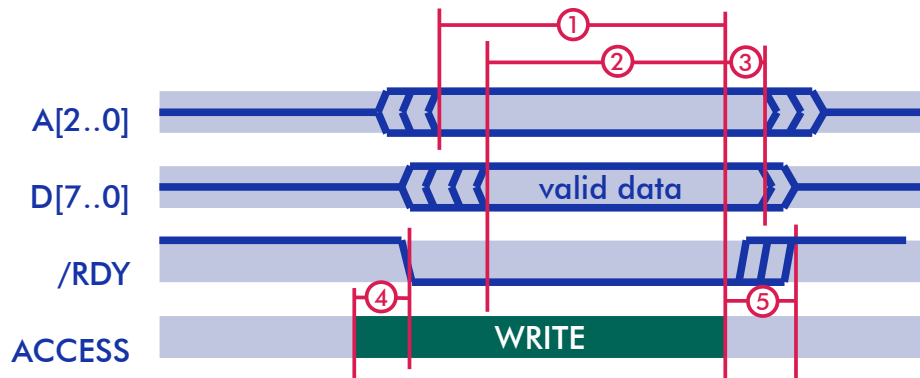
No.	Name	min	max	Unit
1	Access repetition time	195	∞	ns
2	Access idle time	50	∞	ns
3	Access active length	145	∞	ns

Read Timing



No.	Name	min	max	Unit
1	Address to read data access delay		120	ns
2	Address setup before end of access	120	∞	ns
3	Address hold after end of cycle	0	∞	ns
4	/RDY and D[7..0] driven by D015 to bus after begin of read access	0	25	ns
5	Enable to read data valid access delay		100	ns
6a	D[7..0] hold after access	0		ns
6b	/RDY hold after access	0		ns
6c	D[7..0] high impedance after access		25	ns
6d	/RDY inactive after access		25	ns

Write Timing



No.	Name	min	max	Unit
1	Address setup before end of write access	85	-	ns
2	Data setup before end of write access	85	-	ns
3	Address and data hold after end of cycle	0	-	ns
4	/RDY driven by D015 to bus after begin of write access	0	25	ns
5a	/RDY hold after access	0	-	ns
5b	/RDY inactive after access	-	25	ns

Operating Conditions

The following operating conditions are valid for all members of the D015 product family and for all host interface modes (for exceptions, refer to the remarks below).

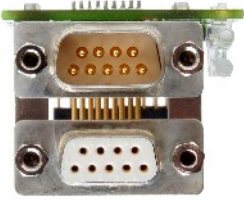
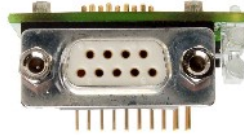
Symbol	Parameter	Conditions	Min	Max	Unit
V_{CC}	Supply voltage	with respect to GND	3.00	3.60	V
t_{pu}	Power up ramp	0 ... 3.00V; monotonic rise		100	ms
V_{IN}	Input voltage	with respect to GND	-0.3	$V_{CC} + 0.3$	V
V_{OUT}	Output voltage		0	V_{CC}	V
V_{IH}	High level input voltage		1.7	$V_{CC} + 0.3$	V
		recommended to keep for better compatibility	2.0	$V_{CC} + 0.3$	V
V_{IL}	Low level input voltage		-0.3	0.8	V
V_{OH}	High level output voltage	$I_{OH} = -4.0\text{mA DC}$, $V_{CC} = \text{min.}$	2.4		V
V_{OL}	Low level output voltage	$I_{OL} = 4\text{mA DC}$, $V_{CC} = \text{min.}$		0.45	V
I_{IN}	Input leakage current	$V_{IN} = \text{GND or } V_{CC}$	-10	10	μA
I_{OZ}	Tristated output leakage current	$V_{OUT} = \text{GND or } V_{CC}$	-10	10	μA
I_{CC}	V_{CC} supply current ¹⁾	$V_{IN} = V_{CC}$ or GND, no load	300	600	mA
		$V_{IN} = V_{CC}$ or GND, MVB terminator voltage short circuit		2000	mA
t_R	input rise time			40	ns
t_F	input fall time			40	ns
R_{CONF}	I/O pin pull-up resistor during PLD configuration	After Reset, for 450ms (PLD load time)	10	50	kOhm
C_{IN}	I/O pin capacitance	$V_{IN} = 0\text{V}$, $f = 1.0\text{MHz}$		10	pF

Remarks:

- 1) Use the typical current in the "min" column to calculate average power requirements.
This is a D015M specific property. Other members of the D015 product family may have different "min" and "max" values.

MVB Interface

The D015M can be equipped with the following types of 9-pin SUB-D connectors (see also order information on page 49):

<ul style="list-style-type: none"> • Double SUB-D connector (one male, one female). <p>All MVB signals of both connectors are internally interconnected.</p>	
<ul style="list-style-type: none"> • Single female SUB-D connector. <p>An external T-Stub or a T-cabling connector must be used to properly connect to the MVB network. Note: To achieve compliance with IEC61375, the external stub length must be less than 5cm (5cm are already located on the D015M).</p>	

Other types of MVB connectors (headers, etc) are available on request.

Independent from the type of physical interface (ESD+ or EMD), the D015M supports two redundant MVB lines A and B.

Each line has its own decoder circuitry. Both redundant lines are monitored at the same time and the D015M decides dynamically which line is the better one.

In this way, the application gains optimal stability in "less than perfect" environments: noise, crosstalk and cable effects are reduced to a minimum.

ESD+ Description

This paragraph applies to the D015M-D versions, only.

Pin #	Pin Shortcut	Input / Output as seen from the D015M	Description
1	A.data.P	bidirectional	non- inverted MVB bus line, with RS485- level
2	A.data.N		inverted MVB bus line, with RS485- level
3	NC	-	Not connected
4	B.data.P	bidirectional	non- inverted MVB bus line, with RS485- level
5	B.data.N		inverted MVB bus line, with RS485- level
6	A.0V.term	power output	power supply from D015M to external terminator
8	A.5V.term		
7	B.0V.term		
9	B.5V.term		
shell	Shield	-	Connection to shield resp. housing.

According to the TCN standard, NC (pin 3) may optionally be used for a "TxE signal". This signal is intended for controlling bus couplers (for example in-

terface from ESD+ to EMD). Since the D015M is available in both EMD and ESD+ version, the TxE signal is not required any more.

Note: If the D015M is equipped with two MVB connectors, both connectors have the same pinout, and all pins except pin "NC" are routed from one connector to the other.

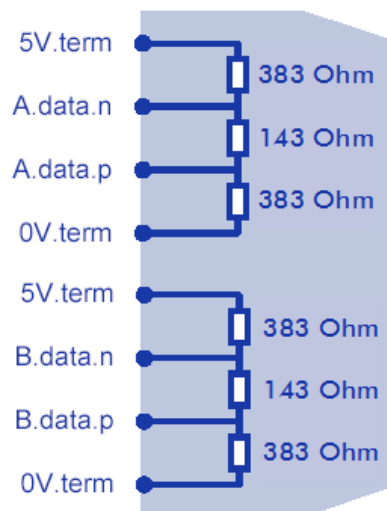
Terminator Supply ESD+

Item	Value	Unit	Remarks
Output voltage	5	V	±5% tolerance
Short circuit current limitation	300	mA	The terminator supply delivers a higher current of up to 0.87A for a short time. After a short time period the current is limited at approx. 0.3A.
Maximum output current	70	mA	When terminator connected

The output power is sufficient for one terminator. Mounting two terminators makes no sense; but this at least does not cause harm to the D015M (voltage specifications not guaranteed).

Terminators ESD+

The following terminator is recommended for the use with the D015M version for ESD+:



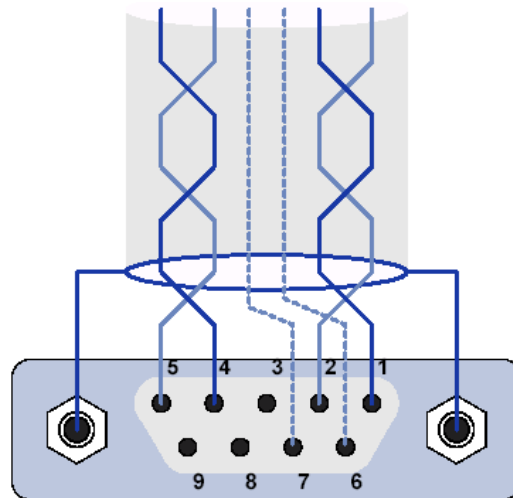
In case the D015M is the last of several MVB nodes, one of the D015M- MVB connectors remains free. The terminator is mounted on this connector and delivers the correct line termination.

The resistors inside will offset an "idle" line when not driven by a node transmitter. The effective line termination matches the recommended cable impedance of 120Ω. The terminator is not included within the D015M. Call Duagon for availability and supply information.

MVB Cable Attachment ESD+

The figure shows the recommended cable attachment.

The dotted lines are the "potential equalization lines". They have the goal to connect all MVB nodes together.



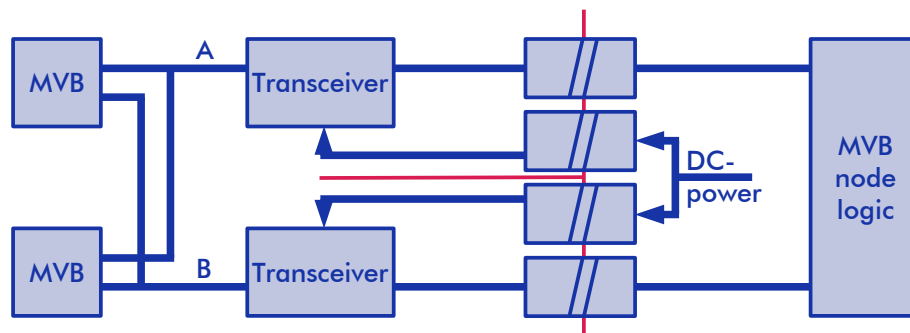
Important Note:



- Pin 3, 8 and 9 are not connected on the outside. Do not use cables where all pins are connected, this may impair proper functionality or even damage devices!

Insulation ESD+

The two MVB lines A and B are galvanically insulated from the logic/IO and from each other.



EMD Description

This paragraph applies to the D015M-T versions, only.

Pin #	Pin Short-cut	Input / Output as seen from the D015M	Description
1	A.data.P	bidirectional	non- inverted MVB bus line
2	A.data.N		inverted MVB bus line
3	NC	-	Not connected
4	B.data.P	bidirectional	non- inverted MVB bus line
5	B.data.N		inverted MVB bus line
6, 7	A.term	Passive resistor	Termination resistor between two pins
8, 9	B.term		
Shell	Shield	-	Connection to shield resp. housing.

According to the TCN standard, NC (pin 3) may optionally be used for a "TxE signal". This signal is intended for controlling bus couplers (for example interface from ESD+ to EMD). Since the D015M is available in both EMD and ESD+ version, the TxE signal is not required any more.

The effective line termination matches the recommended cable impedance of 120 Ω.

Note: If the D015M is equipped with two MVB connectors, both connectors have the same pinout, and all pins except pin "NC" are routed from one connector to the other.

Terminators EMD

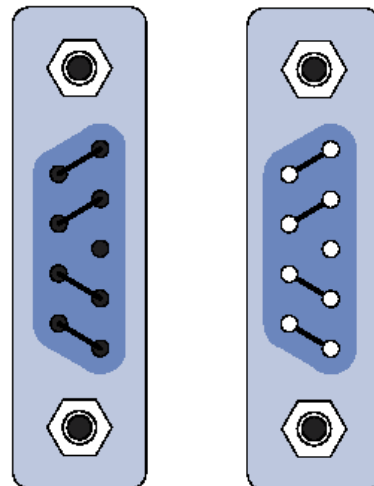
The following terminator is recommended for the use with the D015M-T:

The appropriate pins from the MVB line are connected to the local terminating resistor within the D015M.

In case the D015M is the last of several MVB nodes, one of the MVB connectors remains free. The terminator is mounted on this connector and delivers the correct line termination.

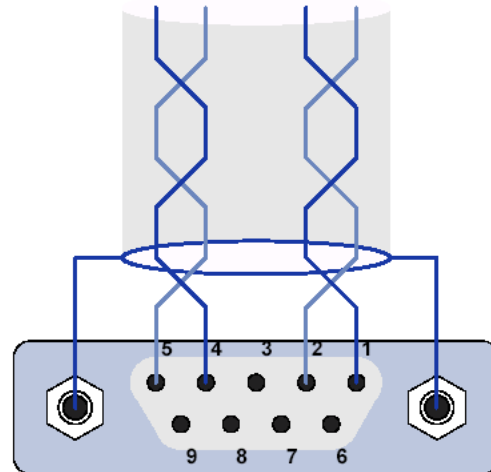
Please note:

- Depending on the cabling concept, it is typically required to have two types of terminators: one with a male SUB-D- connector and one with a female connector.
- The terminator is not included within the D015M. Call Duagon for availability and supply information.



MVB Cable Attachment for EMD

The schematic shows the recommended cable attachment.



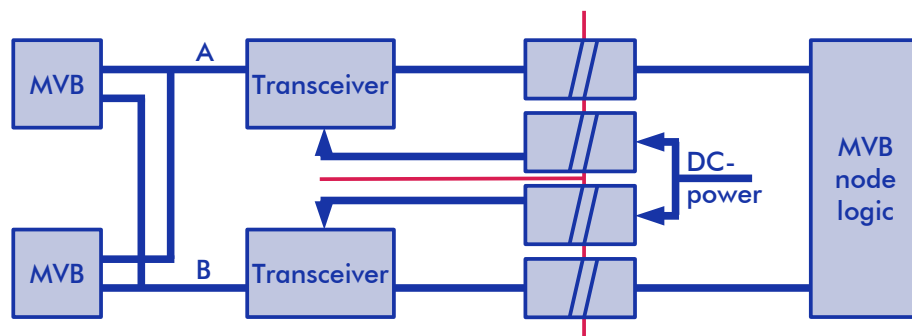
Important Note:



- Pin 3, and 6 to 9 are not connected on the outside. Do not use cables where all pins are connected, this may impair proper functionality or even damage devices!

Insulation EMD

The two MVB lines A and B are galvanically insulated to the logic/IO and to each other.

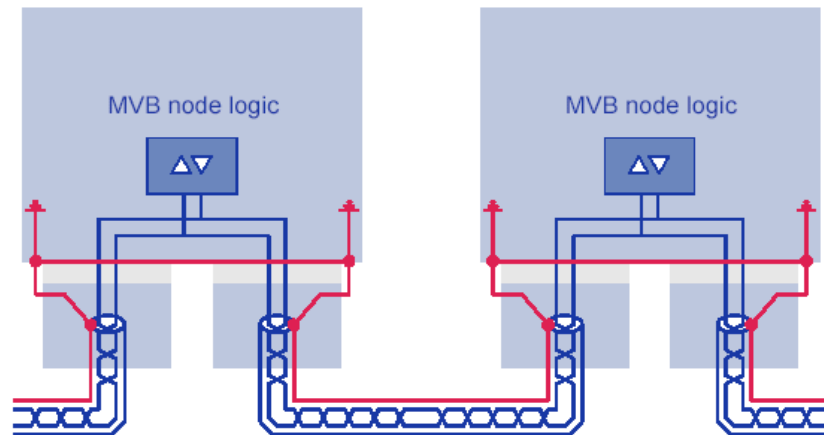


MVB Shielding Concept

There are basically two different shielding concepts used in applications. The D015M is optimized to use the concept described below; therefore we recommend to use this concept.

The main properties of the used concept are:

- The cable shield is connected to the device housing.
- The cable shield has the same connection to the device housing in all nodes



As a result, all housings are connected together. Within the vehicle concept, it must be ensured, that there are no ground potential differences that may harm the cable shield or the connectors.

The connection between the cable shield and the device housing is done via the cable connector housing and the fixing screw / cable lock (as required by the TCN standard).

Note: The other shielding concept (with the shield being insulated from the housing) can be supported on customer's request. However, this concept requires some production changes and is therefore more expensive.

MVB Cabling

There is a wide variety of different manufacturers for "SUB-D" cable connectors. For the cable connector itself, the user may choose a supplier that fits his own requirements: The various versions are selected according to obvious quality level versus cost considerations.

For the connector hoods, Duagon recommends to thoroughly check the following issues:

- **Shield continuity:** The MVB requires to have a shield that is routed through the nodes. Therefore the user has to make sure, that the connector has a good conducting path between the cable shield and the connector shell on D015M.

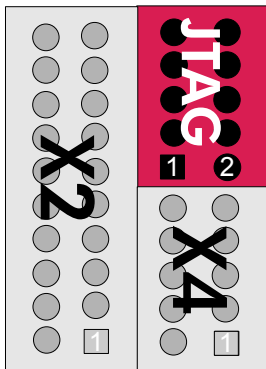
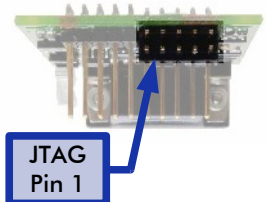
In this sense, a metallic hood is the best solution. Plastic hoods with metallization are less suitable; pure plastic is recommended for special purposes, only (e.g. in-rack-cabling, lab use).

Some connectors have "dimples" with the intention to install a conductive path between the two metal shells. These are of benefit, but it is good design practice, not to rely completely on these contacts (manufacturers hardly ever specify for example the contact resistance). Always consider the screw cable locks as the main shield contact.

JTAG Interface

The D015 series provide a JTAG interface for debugging and loading the flash memory (at virgin state after production).

There are three possibilities to deal with the JTAG interface on customer side:

<p>1. Choose the upright JTAG header option (default, see order information on page 49), and route all signals to a separate 10 pin connector on the host PCB.</p> <p>This solution requires additional space for the JTAG connector on the host PCB.</p> <p>In case of reprogramming / panic recovery, the D015 does not need to be dismantled from the host PCB and is powered by the host.</p> <p>This is the solution recommended by Duagon.</p>	
<p>2. Choose the upright JTAG header option (default, see order information on page 49), but do not connect the signals.</p> <p>In case of reprogramming / panic recovery, the D015 must be dismantled from the host PCB and powered externally.</p>	<p>(view as seen on host PCB)</p>
<p>3. Choose the 90 degree angled header option ("J", see order information on page 49). There is no need to route additional signals or place additional connectors on the host PCB.</p> <p>This solution requires additional free space on the host PCB for the angled header and for plugging the JTAG adapter. For details about the required space, please refer to the "PC/30 Integration – User's Guide", d-002241-nnnnnn.</p> <p>In case of reprogramming / panic recovery, the D015 does not need to be dismantled from the host PCB and is powered by the host.</p>	

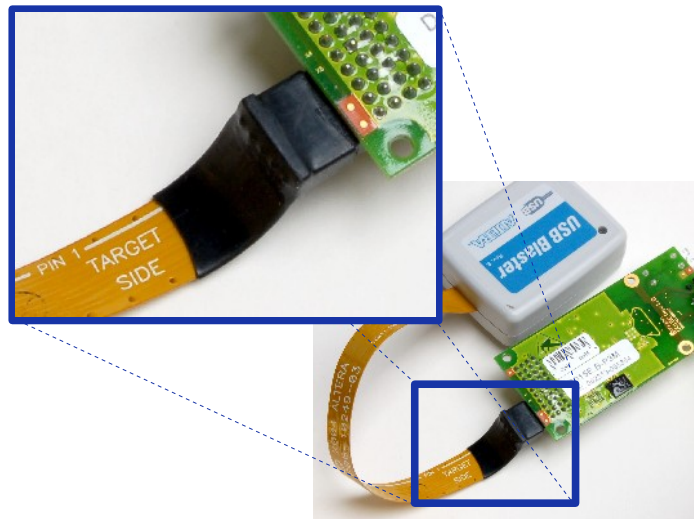
For more information about reprogramming / panic recovery, see also the application hint on page 39.

Important Remark:



As a matter of fact, new firmware versions may occur. In order to avoid dismantling and mounting for reprogramming, we strongly recommend to keep the access to the JTAG connector free (when the D015 is mounted in your system).

The picture below shows a D015-P3J with 90 degree angled header, connected to a JTAG adapter (note the pin 1 localization):



Pin Definition

Pin # JTAG	Signal Name	Comment
1	TCK	JTAG signal line
2	GND	Local power reference
3	TDO	JTAG signal line
4	+3.3V	Local power line
5	TMS	JTAG signal line
6	+3.3V	Local power line
7	Not connected	
8	Reserved	For Duagon internal test purposes, only
9	TDI	JTAG signal line
10	GND	Local power reference

Remarks:

- The pin number 1 has a "square" pad, all other pins have a round pads.
Caution: Pin numbering on the JTAG connector is different from pin numbering on X2 and X4.
- All voltages are 3.3V low voltage logic compatible.

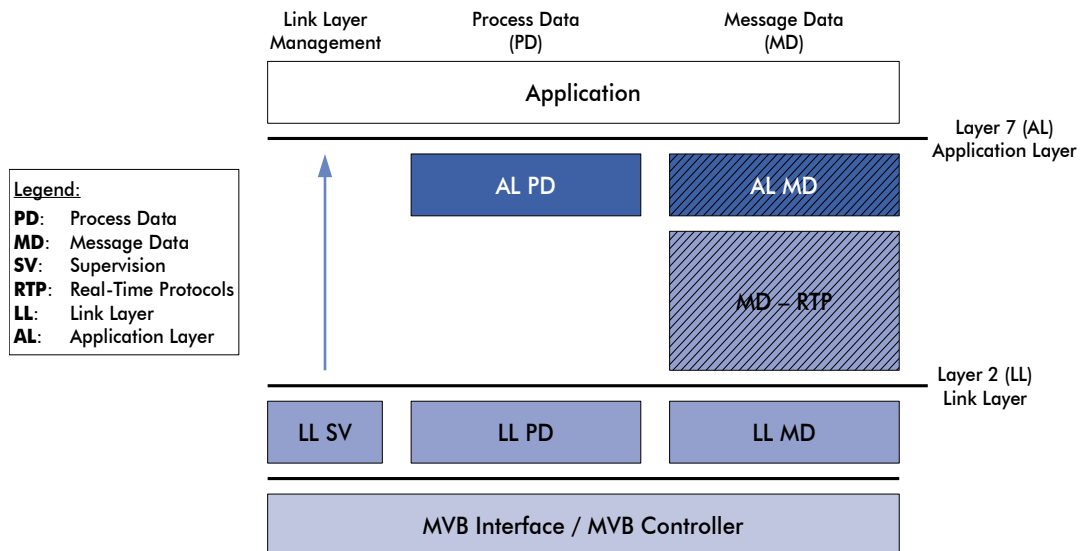
Software Protocols

MVB Software Protocols

Driver Software Structure

The MVB Driver provides an easy way to implement the communication between the customer's application and the MVB.

The following figure shows the structure of the TCN/MVB driver:



Configuration "MDFULL"

For applications requiring PD only, the customer may prefer to use the "MD-FULL" interfaces (AL / LL PD). This integration is done in a few hours.

Complex applications requiring PD variables or MD will preferably use the Layer 7 API Interface of the provided driver software.

Note: The MDFULL host driver package does not contain the software part "Message Data Real Time Protocol stack MD RTP" (also known as "TCN Real-Time Protocols"). It can be licensed from a former JDP member, which forced the TCN development (i.e. Bombardier, Siemens, Firema).

Configuration "SERVER"

The SERVER host driver offers the Layer 7 API Interface to the customer system according to the "MVB Client-Server Model".

Due to the "MVB Client-Server Model" the software part "MD-RTP" (also known as "TCN Real-Time Protocols") is integrated in the standard application (i.e. MVB Server).

This is the preferred configuration for the D015M, if the customer system should support PD and MD without real-time requirements.

MVB Bus Administrator

As an option, the D015M can act as a full featured MVB Bus Administrator. The Duagon tool D2000 is used to administrate an MVB network and to generate the bus administrator configuration file.

For more information about Bus Administrator configuration call Duagon or see our web page.

POSIX File System Access

The D015's local file system consists of

- a non volatile YAFFS flash file system (to store configuration and logging data)
- a volatile RAM file system (for fast data exchange)

The entire local file system can be accessed from the host by POSIX commands. The API supports file and directory functions, and is mostly compatible to the standard POSIX functions.

For more information, please refer to the "POSIX File System Access on Duagon Interfaces – Data Sheet", d-001829-nnnnnn.

Service Protocol

The Duagon Service Protocol provides a simple mechanism to access configuration and other data on the Duagon interface. For more information, please refer to the data sheet "Service Protocol – Data Sheet", d-002751-nnnnnn.

CLI on Service Serial Line

On X4, there is also a logic level serial line interface (/SERVICE_RX, /SERVICE_TX see page 13). This serial line provides a Command Line Interface (CLI) for diagnostics, debugging and maintenance. The following functions are available:

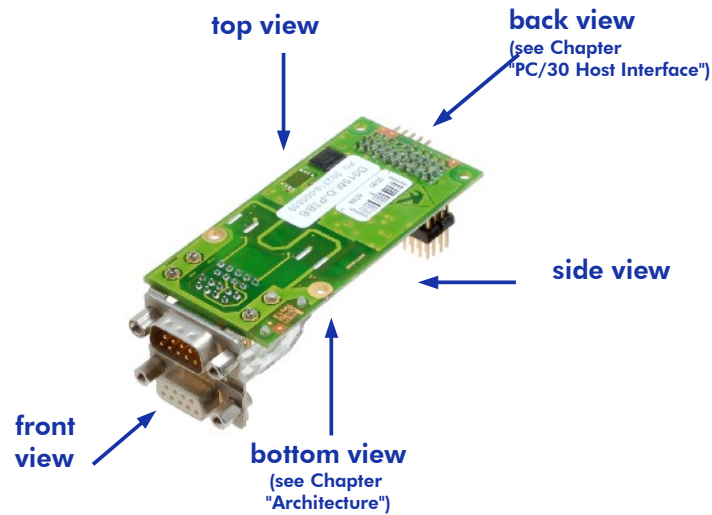
- Access to the local flash file system
- Download and Upload of product firmware using Xmodem protocol

Default serial line transmission parameters are 115kBaud, no parity, one stop bit, no hardware handshake.

For more information about the CLI, please refer to the "Command Line Interface - Data Sheet", d-002357-nnnnnn.

Mechanical Data

The D015M is mounted upside down to the host PCB. This leads to the following view definitions:



Mechanical Dimensions and Weight

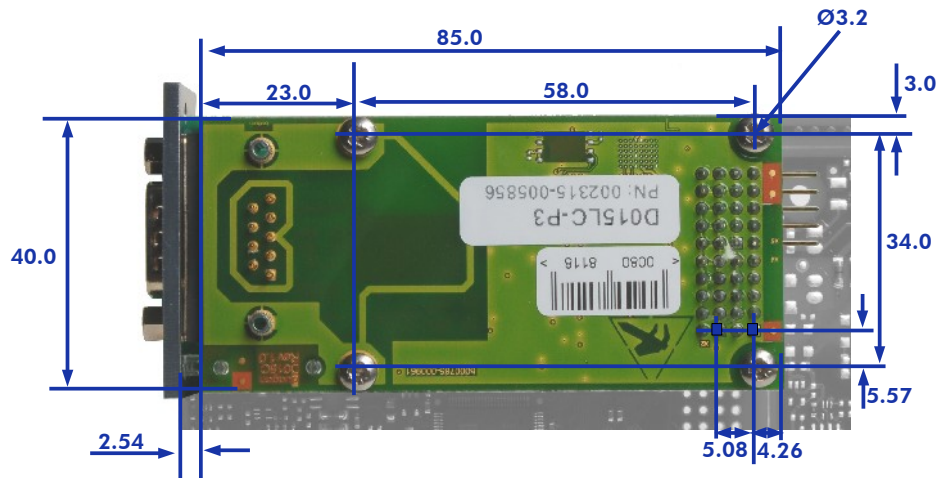
Item	Value	Unit	Remark
PCB thickness, nominal	1.6	mm	
Maximum Height ¹⁾	24.2	mm	for D015 variants with single SUB-D connector
	34.2	mm	for D015 variants with double SUB-D connector
Weight of board ²⁾	< 40	g	fully equipped (without front bezel)

Remarks:

- 1) Absolute maximum height of the D015. Add some millimeters of "safety margin". See also picture on page 35.
All members of the D015 product family have a maximum height of either 24.2mm or 34.2mm (for more information, refer to the "PC/30 Integration – User's Guide", d-002241-nnnnnn).
- 2) The precise weight of the board may vary according to the selected connector options and may vary for other members of the D015 product family.

Top View

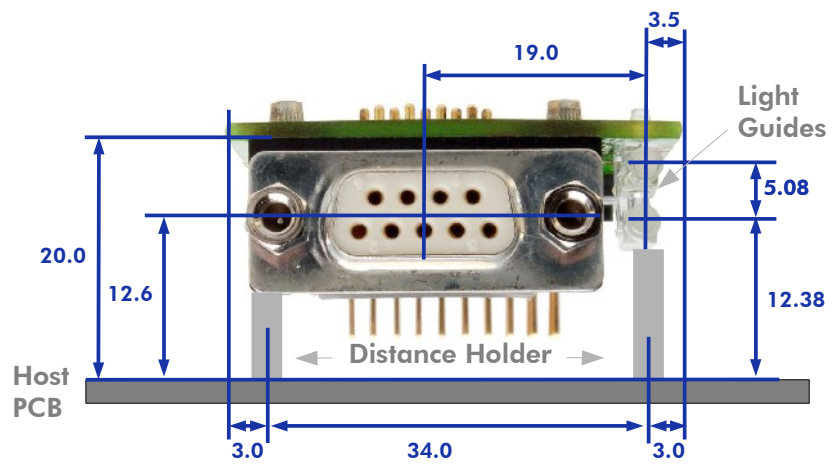
Top view (all measures are in mm):



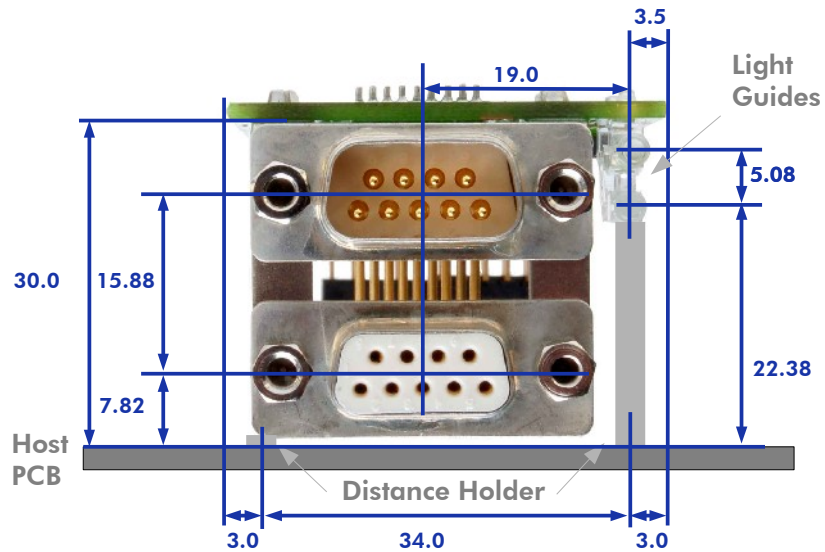
Note: The measures of the top view are identical for all members of the D015 product family.

Front View

Single SUB-D connector (all measures are in mm):



Double SUB-D connector (all measures are in mm):

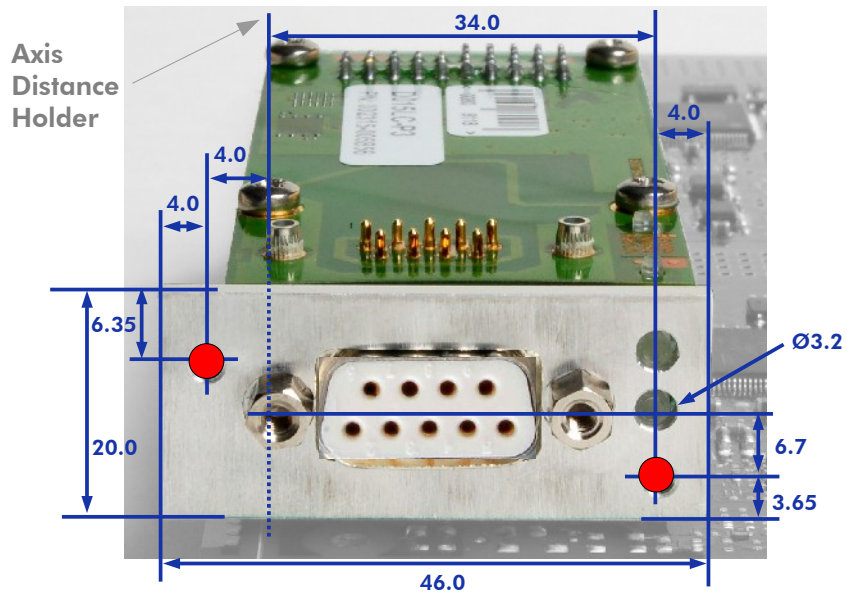


Notes:

- The diameter of the light guides is 3.0mm
- The front view may be different for other members of the D015 product family. The Duagon front bezel provides an identical mechanical front interface for all members of the D015 product family.

Front Bezel

The standard Duagon front bezel is only available for the D015M variants with single SUB-D connector (all measures are in mm):



Notes:

- The thickness of the front bezel is 2.5mm
- The the two fixture holes(●) have an M3 thread
- The outer dimensions and the positions of the two fixture holes are identical for all front bezels of all members of the D015 product family. For more information about the front bezel mounting, refer to the "PC/30 Integration – User's Guide", d-002241-nnnnnn).

PC/30 Mounting

The board is always mounted upside down, with the connectors facing downwards. The D015 is connected to the host PCB by two host sockets and four distance holder bolts to guarantee mechanical stability.

Item	Property	Remark
Distance holder bolts	Length	<p>For D015 with a double SUB-D connector, 30mm bolts must be used; the D015 with a single SUB-D connector requires 20mm bolts.</p> <p>All other members of the D015 product family require either 20mm or 30mm bolts, too.</p>
Sockets on host PCB (counterparts of D015 host connector)	Height	<p>The host connectors on the D015 are such that the required sockets on the host PCB have always the same height of 11.45mm.</p> <p>This is also true for all other members of the D015 product family.</p>
	Number of pins	<p>The host socket for X2 is always 2x10 pins.</p> <p>The host socket for X4 and the JTAG interface is by default also 2x10 pins. In case of the 90° angled header option for JTAG (see also page 27), a 2x5 pin socket is sufficient.</p> <p>The same applies for all other members of the D015 product family.</p>
Free space under the D015 (can be used to place other components under the D015) 1)	volume	<p>width: 40mm (width of the D015) length: 43mm height: 13mm (23mm for D015 with double SUB-D connector)</p> <p>These values contain already a safety margin and are valid for all members of the D015 product family.</p>

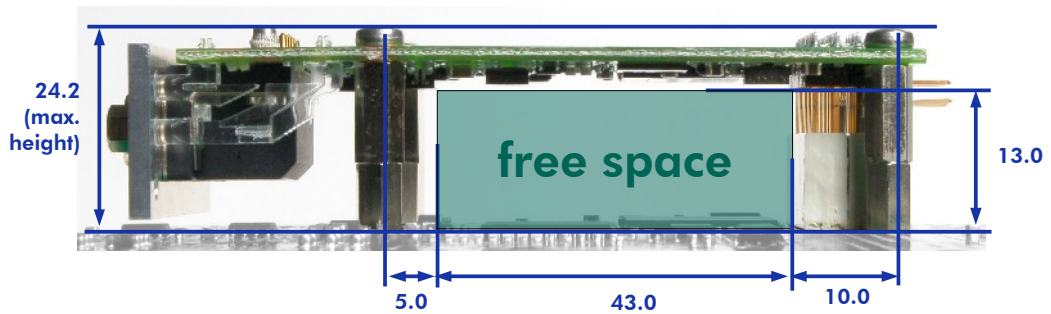
Remarks

- 1) If you wish to place components under the D015M, it is recommended to position them only in the declared free space (see also page 35). That way it is guaranteed that the D015M can be exchanged by any other product of the D015 family.

For more information, please refer to the "PC/30 Integration – User's Guide", d-002241-nnnnnn).

Side View

Side view single SUB-D connector (all measures are in mm):



Note: This free space (for other components to be placed under the D015) is guaranteed for all members of the D015 product family (it may be larger for some product variants, such as the D015M with double SUB-D connector).

PC/30 Integration

All PC/30 mounting properties are identical for the entire D015 product family. Therefore modules of the D015 product family can easily be exchanged without adaptation of the customer's host PCB (see also application hint on page 40).

For detailed information about

- which host connectors (counterparts) to use
- suggested host PCB layout (D015 footprint)
- detailed clearance information for all D015 products
- hardware integration check list

please refer to the "PC/30 Integration – User's Guide", d-002241-nnnnnn.

Cabling / Cable Locks

The SUB-D connectors use M3 threads.



Be sure not to apply the UNC4-40 thread; it will damage the thread.

The maximum torque for the screw locks is 40cNm. A higher torque may destroy the thread!

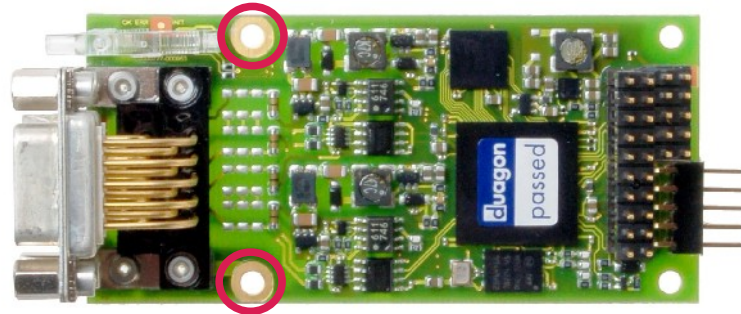
Alternatives:

- As an option, screw locks with UNC4-40 are available (option "U", see order information on page 49).
- Alternatively, the D015M may be ordered without screw locks (option "N", see order information on page 49).

For more information see the "Material and Components for Wiring – Technical Note", d-000842-nnnnnn.

Shield-to-Case Strap

The two plated mounting holes can be used to connect the MVB connector's shield to the device housing. The two holes are internally connected. This allows the user to realize individual shielding concepts.



The picture shows the D015M from the bottom side (the other two mounting holes do not connect the screw to anything else).

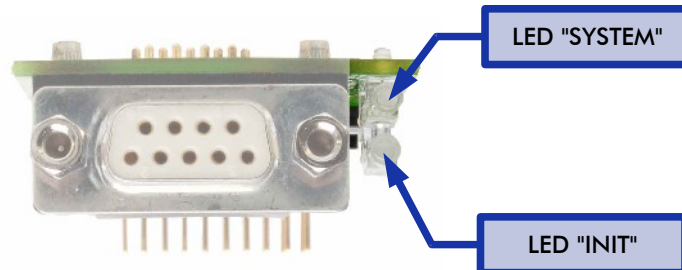
Environmental Data

Issue	min.	typ.	max.	Unit	Remarks
Operational temperature range	-40	+25	+85	°C	EN50155:2007 4.1.2: Class TX
Temperature rise of directly surrounding air after power-on		1	5	°C	measurement 10min after power on
Altitude above sea level			1800	m	EN50155:2007 4.1.1 For derating of maximum temperature with respect to altitude levels in excess please call Duagon.
Relative humidity		<75%	95%		Typical value for yearly average, max value for 30 consecutive days per year. Short term moisture condensation without malfunction (DIN EN 60068-2-30:2006-05)
Vibration			2 50	mm m/s ²	EN50155:2007 12.2.11 for 5-25 Hz for 25- 150 Hz
Shock			50	m/s ²	duration 50ms
RFI susceptibility from 0.15 to 2000 MHz.	20			V/m	

Application Hints

Diagnostic by LEDs

There are two diagnostic LEDs on the D015M:



The LEDs display the general status of the D015:

"SYSTEM" Bicolor LED Red/Green	Meaning
Green ON	Power on, no error
Red ON	An error occurred: - initialization error - missing user configuration file - stack error Refer to the service serial line to find out more about the error
OFF	device not powered

"INIT" Yellow LED	Meaning
ON	Initialization or firmware update ongoing: Not full functionality available
OFF	normal operation mode

Panic Recovery

The D015 supports a workaround solution, when the usual download via service serial line (see also page 30) does not work any more. This could be the case, when the download procedure is stopped too early or when the downloaded application does not work properly.



For low level programming, the module does not need to be removed from the mounting location. The JTAG interface can be accessed on connector X6. For more information about the JTAG interface, see page 27.



However, since the JTAG connector is not equipped with a galvanic insulation, a problem may arise. Be sure, that none of the debugging tools (notebook? JTAG debugging box?) touch sensitive contact areas (even protective ground may damage the devices...).

Power Up (PLD Loading)

On the D015 the PLD chip has to be loaded after each power up. This procedure takes up to approx. 1 second and is automatically performed. However, the device is completely passive during this time, "as if nothing is plugged in".

If a host CPU tries to access the D015 directly after power on, it will not find it. In order to avoid any wrong conclusions ("D015 defective ..."), the host CPU has to wait for the PLD being ready.

For more information, please refer to the "PC/30 Integration – User's Guide", d-002241-nnnnnn.

EMI Considerations

We assume the following implementation for the D015M:

- The supply is filtered before any conversion of the voltage. This topology makes the host immune against any coupling of noise and prevents the broadcast of noise on the supply. It also could be useful to add a folding ferrite.
- The power supply of the host is galvanically insulated from the battery and the case.
- Connect all power pins in a way, that the overall impedance of the power lines is reduced to a minimum.

Interchangeability of D015 Modules

The D015 Product Family covers interface boards for the following vehicle bus systems:

- D015E: Ethernet
- D015C: CAN
- D015M: MVB (this product)

Hardware Aspects

All interface products of the D015 family have the same PC/30 footprint. The host interface is on all products mechanically and electrically identical. That way, modules of the D015 product family can easily be exchanged without adaptation of the customer's host PCB.

As an option, a standard front bezel is available (see also order information on page 49). The outer dimensions of the front bezel are for all D015 products 20x46mm. It contains holes for the field bus connector (M12, SUB-D, etc., depending on the type of module) and LEDs. By using this front bezel, modules of the D015 product family can even be exchanged without adaptation of the customer's housing.



Software Aspects

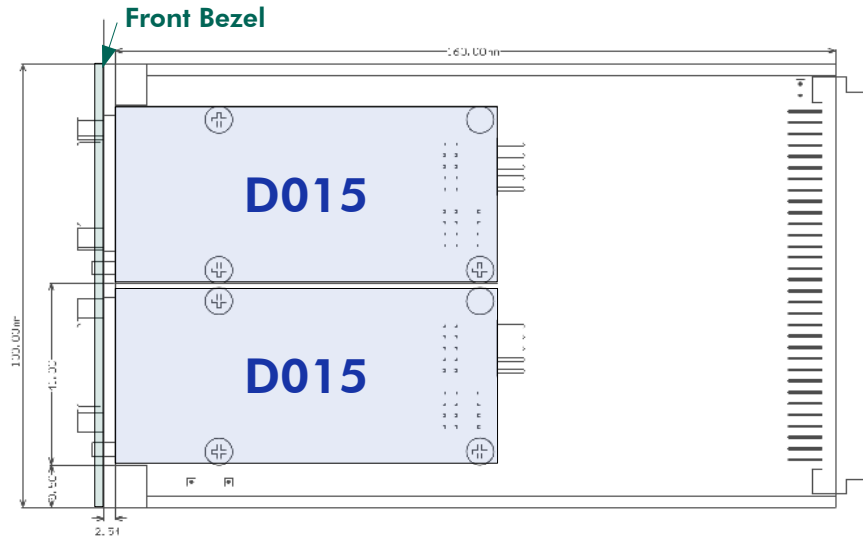
In order to provide full functionality and performance of the different communication protocols, a dedicated driver is used for every vehicle bus system. This means that a change to an other bus system requires a change of drivers.

As an option, a universal communication driver for MVB, CAN and Ethernet is available. For more information, please call Duagon.

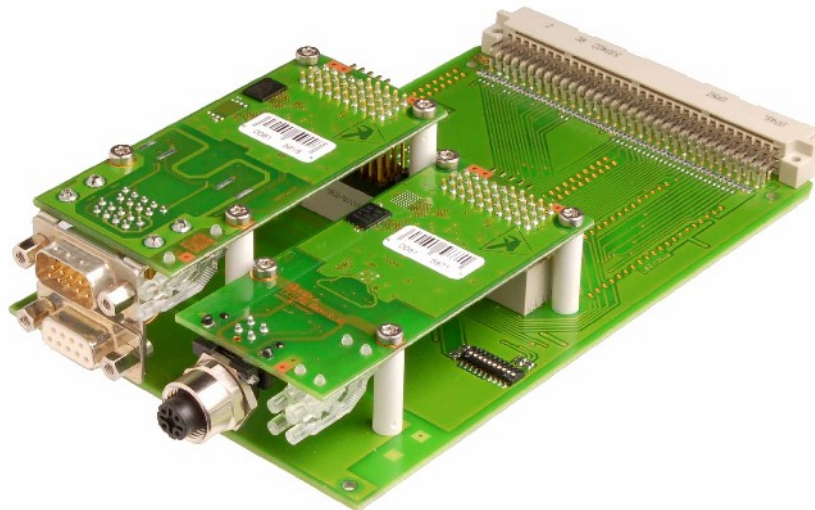
Combination of Several D015 Modules

It is possible to integrate several D015 on a host system, for example to connect a host system to Ethernet and MVB. The PC/30 footprint is such that two modules can be placed next to each other on a 3U card.

For a 3U card, we recommend the following placement of the 2 D015 modules:



Example of a 3U card with a double SUB-D and a M12 PC/30 module:



Form Factor PC/30 vs PC/30+

Duagon provides communication interface families in two small form factors:

- **PC/30** form factor:
D015M (MVB), D015E (Ethernet), D015C (CAN)
- **PC/30+** form factor:
D016M (MVB), D016E (Ethernet), D016C (CAN)

The two form factors PC/30 and PC/30+ are very similar. In particular, for a given module, the following properties are identical on PC/30 and PC/30+:

- outer dimensions, including height
- position of the field bus connectors and LED's
- position of the fixture holes

From the mechanical point of view, PC/30 and PC/30+ differ only in the type of host interface connector.

Hence, when moving from PC/30 to PC/30+ or vice versa, the customer's housing does not need to be adapted.

From the point of view software, the drivers for a PC/30 and PC/30+ communication module provide the same API. The undermost driver layers are different and timing behavior may be different as well.

Standards Reference

The D015 complies to the standards EN50155, EN50121-3-2 and IEC61375 in general. For exceptions, not applicable subclauses etc. please refer to the following paragraphs and, in more detail, to the "D015M Type Test – Report" with the document number d-002295-nnnnnn:

Electromagnetic Compatibility

EN50121-3-2:2006: The D015 product line complies to EN50121 under the precondition, that it is used in an environment being on acceptable technical level. The reason for this restriction is, that our product cannot be tested according to the mentioned standard as it is (it is a board level product, not a device). EMI effects are influenced by e.g. housing and cabling. We do not have an influence on these parameters. In addition, these parameters change from application to application, which voids the statements from previously made tests; i.e. the tests have to be repeated. The statements apply in a similar way to both emission and immunity.

For a typical MVB interface application, most of the statements about "**transients**" have no influence to the D015. There are no battery referenced inputs or outputs from the D015 available on the outside of the devices. We assume, that the D015 power supply is galvanically insulated and/ or the D015 signal lines have no connection with unshielded cables to the outside.

Please note, that the MVB must be used with shielded cables. This leads to the fact, that the successful survival under these tests depends from a well working grounding structure. We therefore highly recommend to have a low impedance path from the MVB cable shield to the housing ground.

Insulation

IEC61375-1:2007: MVB physical layer, applied to EMD and ESD in the same way, according to IEC60571:2006, 500Vrms, 1M Ω for 1 minute. Each individual device is tested prior to shipment (routine testing). During routine testing, the testing is optionally changed to sinusoidal 708Vrms or 1000Vdc, 1M Ω for 10sec.

EN50155:2007 12.2.9: Insulation measurement test / Voltage withstand test. Same as for IEC61375.

Note: From EN50155:2007 7.2.1 it is assumed that the power supply for the D015 is galvanically insulated from the vehicle battery.

Useful Life

EN50155:2007 6.2: There are reprogrammable components used in the D015. These are specified from the manufacturer with 20 years data retention at 125° Celsius, which fits clause 6.2. The actual "useful life" can be extended by reprogramming these devices.

There are no other components with a limited useful life. Particularly, there are no electrolytic capacitors, which typically introduce a limitation to useful life.

Components

EN50155:2007 8.1.5 and 8.1.7: There may be specialized components/ single source components included in the product. Contact Duagon for more information about repair and long term shipment procedures.

Shock and Vibration

EN50155:2007 4.1.3: The D015 product line complies to EN50155 under the precondition, that it is used in an environment being on acceptable technical level. The reason for this restriction is, that our product cannot be tested according to the mentioned standard as it is (it is a board level product, not a device). Resonance effects are influenced by the housing. We do not have an influence on these parameters. In addition, these parameters change from application to application, which voids the statements from previously made tests; i.e. the tests have to be repeated.

EN61373:1999: There is no specific definition of the mounting direction in the vehicle, i.e. the highest requirement is to be applied to all directions of the D015. The D015 applies to mounting location "Category 1, Class B".

Fire and Smoke

EN45545-2:2010: The D015M falls in the category of "not-listed" products. There are no special requirements for products with a mass lower than 100g (interior location) and 400g (exterior location). The mass of the D015M is approximately 40g.

NF F16-102:1992: According to the French standard NF F16-102 no requirements are necessary for electrical systems with a mass lower than 300g, which are situated in a technical compartment, in the open air, a box, a cabinet or as a block equipment. The mass of the D015M is approximately 40g.

MVB

IEC61375-1:2007, International Electrotechnical Commission, "Electric Railway Equipment, Train bus, Train Communication Network": Clause 3 describes the MVB "Multifunction Vehicle Bus".

Manufacturing

The manufacturing of the PCB assembly is done according to **IPC-A-610D:2005 level 2**.

The product complies to the European Union directive **EC/2002/95 (RoHS compliance)**.

REACH

Concerning the European Union directive **EC/1907/2006 (REACH compliance)**, Duagon does not need to register any substance. Duagon's products do not use quantities of more than 1 ton of a certain substance and the substances are not released under normal conditions of use. For a registration, both criteria would have to be fulfilled.

Humidity

EN60068-2-30:2006: Provides a composite test procedure, primarily intended for component type specimens, to determine, in an accelerated manner, the resistance of specimens to the deteriorative effects of high temperature/humidity and cold conditions.

Links to other Duagon Documents

In general, most of the documents are located on www.duagon.com, and may be downloaded from there in the most up to date version.

Configuration – User's Guide, d-001785-nnnnnn

This document describes the configuration options on Duagon interfaces. The configuration mainly includes fieldbus and host-interface related parameters.

PC/30 Integration – User's Guide, d-002241-nnnnnn

This document is intended for developers of control electronics, who want to integrate a Duagon PC/30 product.

D015M Type Test – Report, d-002295-nnnnnn

This document covers the type testing performed with the D015M device.

Host Driver MDFULL, d-002996-nnnnnn

The Host Driver provides an easy way to implement your application on the MVB interface. It contains the source code of the host driver software and documentation. This package is intended for the D015M-L MDFULL.

Host Driver SERVER, d-002994-nnnnnn

The Host Driver provides an easy way to implement your application on the MVB interface. It contains the source code of the host driver software and documentation. This package is intended for the D015M-S SERVER.

POSIX File System Access on Duagon Interfaces – Data Sheet, d-001829-nnnnnn

This document describes the POSIX file system API, which makes the file system on Duagon interface boards accessible over the host interface. The API supports file and directory functions, and is mostly compatible to the standard POSIX functions.

Service Protocol – Data Sheet, d-002751-nnnnnn

This document describes the features and the API of the service protocol available on Duagon communication interfaces.

Command Line Interface - Data Sheet, d-002357-nnnnnn

This document describes the Command Line Interface on the service serial line of Duagon products.

D221 PCI-Express Adapter Card – Data Sheet, d-002530-nnnnnn

The D221 is a PCI-Express Card providing slots for Duagon PC/104 and PC/30 interface cards. This adapter card allows you to access Duagon Ethernet, MVB and CAN interface cards through PCI-Express.

Labeling and Packaging – Specification, d-000778-nnnnnn

This document describes all product labels (e.g. serial number label) used in relation with customers. It describes furthermore how Duagon packs the products for shipment.

Quality Plan for Duagon Products – Specification, d-000796-nnnnnn

This document is a specification about test procedures for series testing of Duagon products. It is valid for all Duagon products in general. For each specific product an applicable subset of the described tests is selected; according to the procedures specified here.

Life Cycle of Duagon's Products – Technical Note, d-000526-nnnnnn

Opens up some MTBF and Life Cycle considerations; may be used for planning the life time repair stock in order to ensure long support times.

Material and Components for Wiring – Technical Note, d-000842-nnnnnn

This document is intended for engineers to help them select the right components and wires. may be used for planning the life time repair stock in order to ensure long support times

D015M Order Information

The basic architecture of the D015M allows a large number of different options. In order to find out the right option profile for your application, follow these three steps:

Step 1: Select the desired functions: Passive interface MDFULL or active interface SERVER, MVB Bus Administrator or not, MVB physical layer EMD or ESD+.

Step 2: Select the desired integration properties (connector options, front bezel, etc).

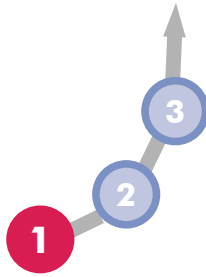
The options from step 1 and 2 are required to be specified prior to manufacturing (normally at order time). These options may have an influence on pricing.

Any changes at a later date may cause significant trouble with respect to cost and/ or delivery time.

Step 3: Customer or project specific software options (communication parameters for MVB, BA list, etc). These options are downloadable to the hardware, and come readily programmed with the shipped devices. Their selection is required prior to delivery of boards, i.e. possibly after hardware manufacturing.

D015M	-L	F	T	-P3	BB	
MVB Function:						
MDFULL	-L					
SERVER	-S					
MVB Bus Administrator:						
with Bus Administrator		F				
without Bus Administrator		<empty>				
MVB Type:						
EMD			T			
ESD+			D			
Form Factor:						
PC/30 with Front Bezel				-Z3		
PC/30 without Front Bezel				-P3		
MVB Connector Type:						
single SUB-D					B	
double SUB-D					BB	
Connector Options: (Add all Characters that apply)						
SUB-D with UNC4/40 screw locks						U
SUB-D without screw locks						N
90° angled JTAG instead of upright header						J
defaults						<empty>

Step 1: Select Your Functions / Features



First, decide on the type of MVB interface:

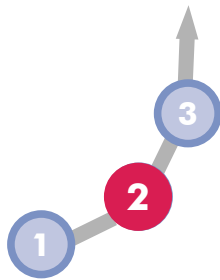
- **MDFULL (D015M-L):** Passive MVB interface.
- **SERVER (D015M-S):** Active MVB interface including Message Data Real Time Protocol stack (MD RTP).

Then, decide whether you need an MVB Bus Administrator ("F") or not

Finally, choose the MVB physical layer: EMD ("T") or ESD+ ("D").

D015M	-L	F	T	-P3	BB
MVB Function:					
MDFULL	-L				
SERVER	-S				
MVB Bus Administrator:					
with Bus Administrator		F			
without Bus Administrator		<empty>			
MVB Type:					
EMD			T		
ESD+			D		
Form Factor:					
MVB Connector Type:					
Connector Options: (Add all Characters that apply)					

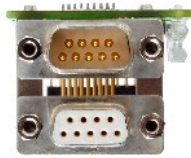
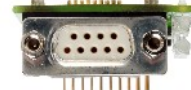
Step 2: Select Your Integration Properties



First, make your choice whether to use the Duagon standard front bezel ("Z3") or design your own front bezel and order the D015 without front bezel ("P3").



Then, decide on the MVB connector type:

<p>double SUB-D for MVB ("BB")</p> 	<p>single SUB-D for MVB ("B")</p> 
---	--

Decide on the type of screw locks on the SUB-D:

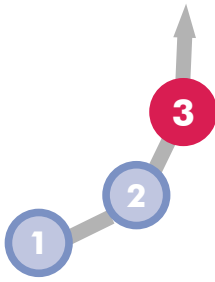
- default is M3
- "U" for UNC4/40
- "N" for no screw locks at all

Finally, decide on the type of JTAG connector:

- default is upright header connector
- "J" for 90° angled header connector

D015M	-L	F	T	-P3	BB	
MVB Function:						
MVB Bus Administrator:						
MVB Type:						
Form Factor:						
PC/30 with Front Bezel				-Z3		
PC/30 without Front Bezel				-P3		
MVB Connector Type:						
single SUB-D					B	
double SUB-D					BB	
Connector Options: (Add all Characters that apply)						
SUB-D with UNC4/40 screw locks						U
SUB-D without screw locks						N
90° angled JTAG instead of upright header						J
defaults						<empty>

Step 3: Project Specific Software Options ("OP" number)



There are a large number of software configuration options on the D015M:

- MVB communication parameters such as device address, line configuration, etc. For a detailed list and default values of all MVB configuration parameters refer to the "Configuration – User's Guide", d-001785-nnnnnn
- Definition of the Bus Administrator list.

The configuration files containing all these parameters are stored D015's local flash file system. Unless otherwise specified, the D015 is shipped with default configuration parameters and the customer may download new configuration files with appropriate configuration.

The selection of all options may become a rather complex process. This process does not have to be repeated for each commercial order! All application specific features (including the configuration files) are concluded within a single identification number, the so called "OP".

How to get such a project specific OP number?

- Make your selections and submit all information (including your configuration files) to Duagon, e.g. by email.
- Duagon will archive this information and release an OP number for it.
- The customer introduces this number into his commercial ordering system; any future orders will refer to this identification.

Preferred Option Set Combinations ("OP")

The functionality as described (no customer specific changes) can be identified with the following document numbers:

Intended for hardware...	Document number downloadable options (also known as "OP")	Description
D015M-LF	d-003007-nnnnnn	MDFULL ¹⁾ , Bus Administrator, POSIX
D015M-L	d-003113-nnnnnn	MDFULL ¹⁾ , POSIX
D015M-SF	d-003661-nnnnnn	SERVER ¹⁾ , Bus Administrator, POSIX
D015M-S	d-003114-nnnnnn	SERVER ¹⁾ , POSIX

Remark:

- 1) This firmware supports both physical layers EMD and ESD+ (the physical layer is determined by the hardware, i.e D015M-xT for EMD and D015M-xD for ESD+).

Document History

d-002190-008729

- Update ESD Terminator value recommendation
- REACH statement added
- company address and phone number updated
- Various minor changes, mainly editorial

d-002190-008593

- References to Driver Kits replaced by references to Host Driver packages
- Chapter "Standards": RoHS compliance added
- Various minor changes, mainly editorial

d-002190-007249

- First release of this data sheet
- Update power consumption values (Chapter "Operating Conditions")
- Feature "Service Protocol" added (Chapter "Software Protocols")
- Update Standards Reference
- Various minor changes, mainly editorial
- removed connector examples
- new Humidity standard added

d-002190-006359

- Correction of the order code
- Diameter of the light guides corrected to 3.0mm (instead of 2.8mm)
- various minor changes, mainly editorial

d-002190-005589

- First preliminary release of this data sheet

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Appendix A: Document Numbering System

All Duagon documents have a unique identification number. The identification number has a certain internal structure in order to ease the tracking of different documents. In general, there are two parts:

Prefix	Document number	Filing number
d	-000310	-001952
Always identical	<p>Specifies a certain purpose of a document with the intention to link several documents with different filing numbers.</p> <p>Please note, that the purpose of the document number is not stored for each document number, but can be derived from the document title, which is stored for each filing number.</p> <p>The format is either 6 digits or not available.</p>	<p>Unique number, that identifies a particular document (revision). Released in sequential manner as the documents are filed in the archive. A Duagon internal data base contains exactly one document title text for each filing number.</p> <p>Always 6 digits.</p>

Examples for identification numbers

Identification number	Document Title / Remarks
d-000310-001606	"DXIO data sheet Rev 2.2"
d-000310-001952	<p>"DXIO data sheet Rev 2.3"</p> <p>A document, that is updated from time to time: the document number has the purpose to link several versions of the "DXIO data sheet" together. The filing number distinguishes between different versions.</p> <p>Please note, that the document number part is kept the same, as long as the basic intention of the early versions is kept, for example during revisions due to debugging or manufacturing updates.</p> <p>In case a significant change happens, another document number will be applied.</p>
d-000719	<p>"Notes from prototype meeting ..."</p> <p>A document, that is obviously not updated after release. The "document number" part is missing and the filing number remains the only used part for identification.</p>

Recommendation:

In your order, you may specify for example "d-000584-nnnnnn" in order to get the "newest" version of a specific product. When you do not want to follow the sequence of newer versions, i.e. you want to stick to a specific version, then specify the full identification number like "d-000584-002043".

Appendix B: Software Licensing

The software components used on the D015 are subject to specific license agreements. The following sections describe the relevant issues in a generalized form for Duagon products:

eCos - RTOS Real-Time Operating System

The RTOS eCos is a registered trademark of Red Hat, Inc. The eCos source code and the "eCos license" agreement are available for public download on Sourceware Web Site (<http://ecos.sourceware.org/>).

The packages below are delivered under the terms of the "eCos license":

- The "eCos Library for D015" is based on a public available eCos release and Duagon's eCos Package Distribution "NIOS2-DUAGON" both configured using eCos template "duagon_D015".

YAFFS Flash File System

YAFFS is distributed under the terms of the license between Duagon GmbH (<http://www.duagon.com>) and Aleph One Ltd (<http://www.yaffs.net/>).

Please contact Duagon GmbH for more information about this license.

Internal Altera Drivers

Altera driver and headers:

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This agreement shall be governed in all respects by the laws of the State of California and by the laws of the United States of America.

TCN Driver, MVB Client Driver, MVB Server, Demo Applications

The following software is released under the terms of the DUAGON SOFTWARE LICENSE:

- TCN Driver Software
- MVB Client Driver Software
- MVB Server Application
- Demo Applications

These software packages (source code and/or binary) and their license agreement are available on request.

Note: The following software parts are delivered as binary, only:

- MVB Server application

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