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CrossLink BTC

User manual and reference handbook

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Contents

1. Introduction

CrossLink BTC is a compact and ruggedized communication module designed for mobile applications. The unit has a wide power supply range, a wide operating temperature range and is EMC certified. Silicon moulding ensures high resistance to moisture, vibration and shock loads.

With a pair of CrossLink BTC modules you can create a wireless CAN bridge via a Bluetooth Network. This means that you can connect CAN networks on different vehicles, machines and devices. The CAN bridge is completely transparent to the network. Because of this, any CAN protocol may be used, including DeviceNet, CANopen, SDS, CANaerospace, J1939 and CAN Kingdom.

CrossLink BTC can also be paired with a CrossCode BT unit. This arrangement is intended for applications with a handheld, or stationary, remote unit where the CrossCode BT unit handles HMI-related I/O such as joysticks, switches, push buttons etc.

This manual describes how the CrossLink BTC should be used.

1.1. Functions and Features

CrossLink BTC is a gateway module between 2 CAN networks. The following types of networks can be linked together:

- CAN Interface - ISO 11898-2 (High Speed CAN)
  Supports all CAN protocols, including: CANopen, DeviceNet, SDS, CANaerospace, J1939 and CAN Kingdom.
- Bluetooth® Class 1 Interface
  - 100 m range

1.2. Technical data

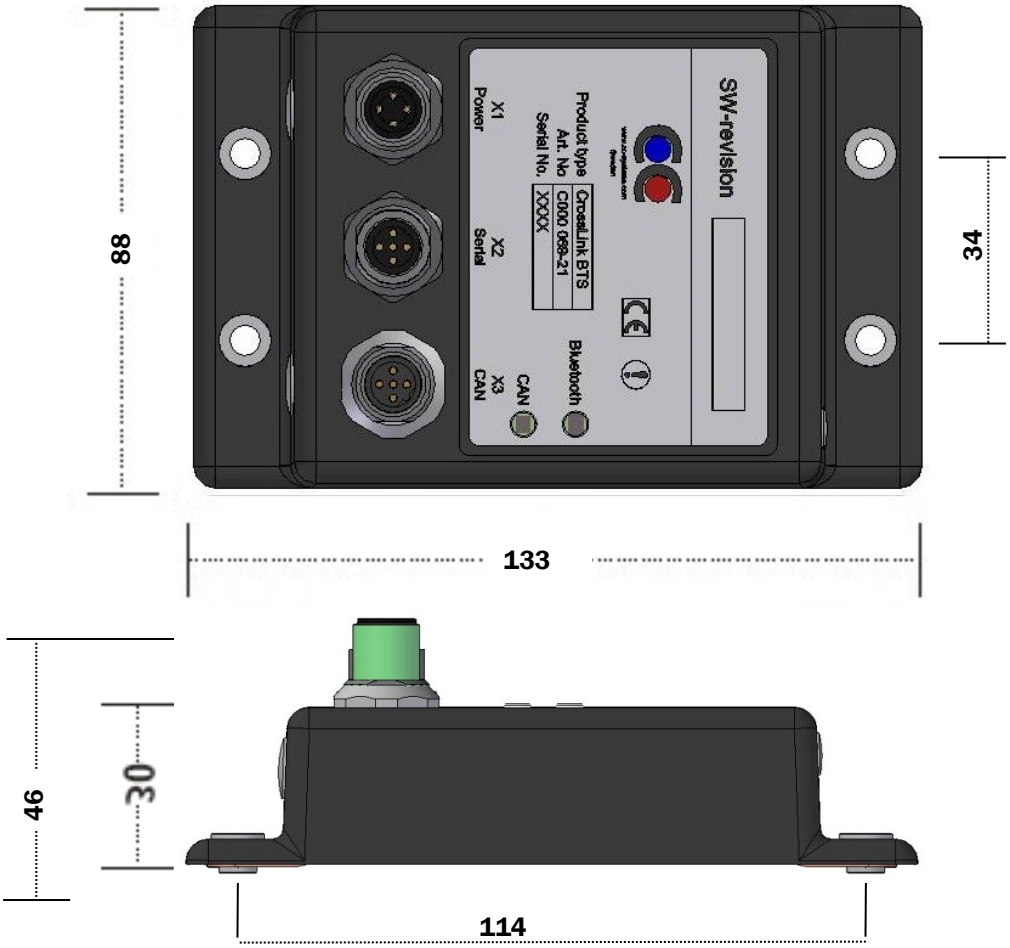
Processor	Fujitsu MB90F342CAS PFV-G SE1
Physical **Housing** **Dimensions**	Plastic enclosure filled with silicon compound. With base plate L x W x H: 133 x 88 x 30 (46.including connectors)
Environment **Operating Temperature Range** **Protection rating** **EMC Conformity**	 -40 ˚C to +75 ˚C IP67 (IEC 60529) ISO 14982 for Emissions, ISO 11452-2 for Immunity
Power Supply **Operating voltage**	 9 to 32 VDC
Indicators	One red/green LED indicator for CAN interface One blue LED indicator for Bluetooth©
CAN interface **Baud Rate**	ISO 11898-2 (High Speed CAN) 20 kbit/s to 1 Mbit/s set with rotary selector switch 0-7
Bluetooth® Interface **Range** **Baud Rate**	Wireless serial interface via Bluetooth®, Class 1 100 meters 1 Mbit/s
Connectors	SERIAL: DIN M12 CAN: DIN M12 Power: DIN M12
FCC ID and IC	ID: QOQWT11I I C: 5123A-BGTWT11I Modular approach has been used in accessing the USA and Canada markets.
Certifications / Compliance	CE ISO IEC Bluetooth

1.3. References

Bluetooth:	http://www.bluetooth.com/
CE Marking:	http://ec.europa.eu/
International Standards Organisation:	http://www.iso.org/
International Electrotechnical Commission:	http://www.iec.ch/

1.4. Dimensions

The CrossLink BTC dimensions and placement of the four mounting holes are illustrated below. All dimensions are in millimetres.



1.5. Identification

There is a label on the front of CrossLink BTC. On the label there are numbers which identify your unique module. Take note of them. During service and other contact with the supplier it is important to be able to provide these numbers.

1.6. Environmental Tolerance

CrossLink BTC has been designed to cope with tough environmental demands. Strict tests have been conducted on the unit in order to ensure that it fulfils the expectations of a rugged unit. Much work has been performed to choose and design integral components so that they, in the best possible way and under all circumstances, provide you with a dependable working instrument. In Appendix 1, a list of standards can be found according to which CrossLink BTC has been tested and approved.

Despite thorough design requirements and testing specifications, it is always best to install and handle CrossLink BTC with care. For more information, read further.

1.7. Installation

CrossLink BTC should be installed in such a way that the module is not exposed to any unnecessary stress, heat, vibration or moisture. In this section, some recommendations are made regarding methods for how the unit should be installed.

Minimum safety distance between human and the Bluetooth antenna is 20cm.

If the unit is opened by non-authorised personnel, the warranty becomes void.

1.7.1. Cooling

Although CrossLink BTC can operate in relatively high temperatures, cooling should still be considered when installing. If the unit becomes too warm, it may not perform to its full capacity and, with high temperature, cease to function.

Inadequate cooling may lead to overheating, causing permanent damage to the unit.

1.7.2. Vibration

We recommend installing CrossLink BTC in such a way that it is not unnecessarily exposed to vibration or other stress.

1.7.3. Rain / Moisture

CrossLink BTC shall preferably be covered or enclosed in order to prevent direct exposure to water.

2. Electrical Interface

2.1. Connectors

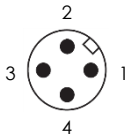
Notice that the connector descriptions are those which are located on the unit, not those that the attached cables shall have in order to mate with them.

Use caution when plugging/unplugging connectors. If the pins become bent or damaged they may not function correctly, or in the worst case, CrossLink BTC or other equipment may be damaged.

Pwer Supply Connector X1

Pin	Default Signal	Comments
X1.1	+24 V_{batt}	Main Power Input
X1.2	+24 V_{batt}	Main Power Input
X1.3	GND	Main Ground Input
X1.4	GND	Main Ground Input

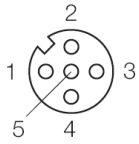
DIN M12 x 1 male, 4-pole, A-coded



SERIAL Connector X2

Pin	Default Signal	Comments
X2.1	GND	
X2.2	RXD	
X2.3	TXD	
X2.4	RTS	
X2.5	CTS	

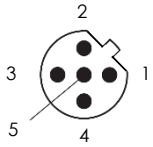
DIN M12 x 1 female, 5-pole, A-coded



CAN 1 Connector X3

Pin	Default Signal	Comments
X3.1	CAN Sheild	
X3.2	V+	
X3.3	GND	
X3.4	CANH	
X3.5	CANL	

DIN M12 x 1 male, 5-pole, B-coded



SMA Antenna Connector

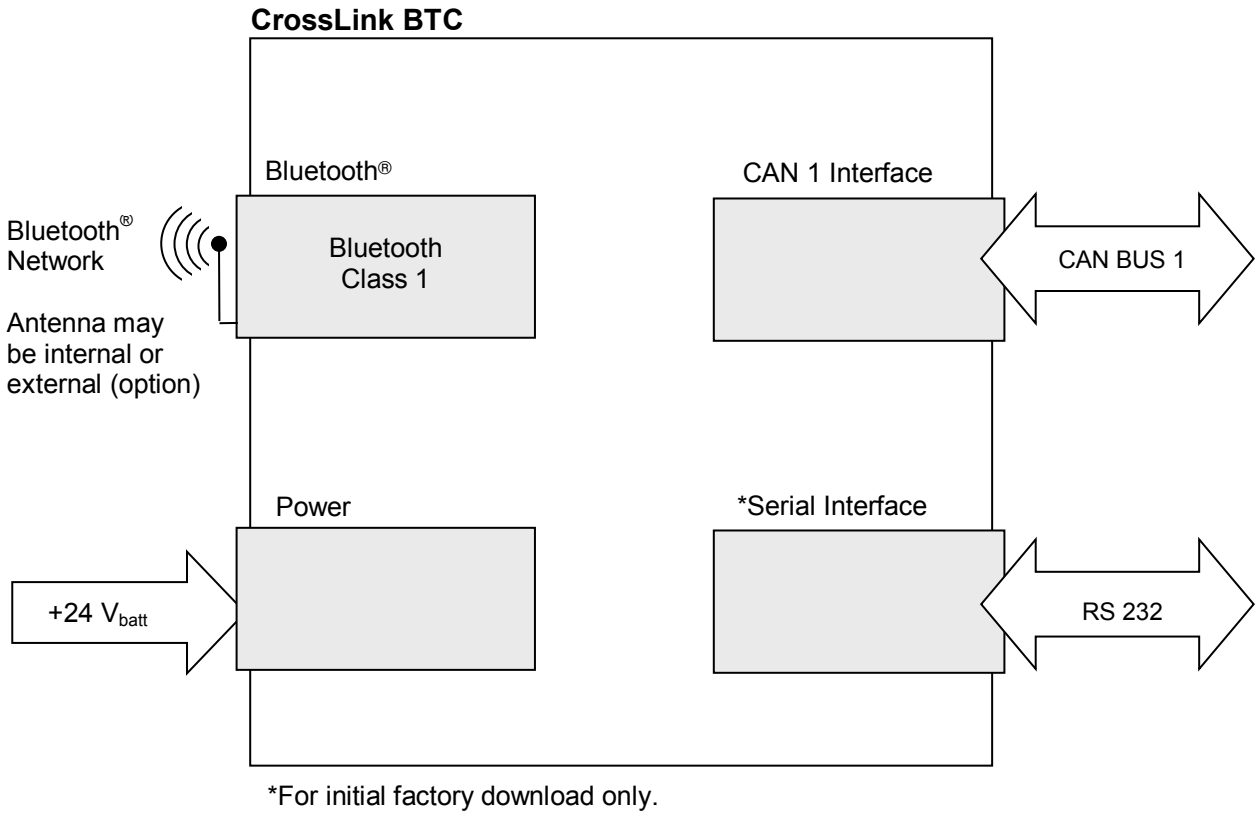
This connector is used to attach an external Bluetooth antenna. Only antennas certified to use with Bluegiga circuit (WT11) should be used. If an extension cable shall be used between the unit and the antenna, choose a cable suited for 2,4 GHz.X4.1

SMA, Female

Minimal safety distance between human and the Bluetooth antenna is 20cm.

2.2. Electrical Interface Overview

The following illustration consists of several boxes which represent the main functional groups on CrossLink BTC. The arrows leading to and from the functional groups represent power or communication busses.



2.3. Electrical Interface Characteristics

2.3.1. CAN 1 Interface

CAN Interface Electrical Characteristics

Parameter	Value			Unit	Comment
	Min	Typ	Max		
Baud Rate	20	-	1000	kbit/s	

The CAN Baud Rate is selected with the rotary selector switch underneath a plastic cover on the right side of the unit (in front of the CAN connector X3). No special tools are required to remove the plastic cover.

The table below describes the different CAN Baud Rate settings. To change the CAN Baud Rate setting the power to the unit has to be turned off. Then set the rotary switch according to the table below. Turn power on to activate the new CAN Baud Rate.

The CAN Interface Baud Rate

Rotary Switch Position	CAN Baud Rate (kbit/s)
0	1000
1	800
2	500
3	250
4	125
5	100
6	50
7	20
8	Reserved
9	Reserved

The CAN Interface Baud Rate must be selected via a rotary switch inside CrossLink BTC

2.3.2. Bluetooth® Interface

CrossLink BTC operates as a class 1 Bluetooth® device, and supports Bluetooth® Version 2.0 with EDR (Enhanced Data Rate) which is 3 times faster than Version 1.2.

Bluetooth® Interface Electrical Characteristics

Parameter	Value			Unit	Comment
	Min	Typ	Max		
Range		100	200	m	
Baud rate			1000	kbit/s	
Band		2.4		GHz	ISM band
Max transmit power			84	mW	

The Bluetooth Channel and Role are selected via a rotary switch underneath a plastic cover on the left side of the unit (in front of the Power Supply connector X1). No special tools are required to remove the plastic cover.

The plastic covers must be handled with care and always re-mounted properly to preserve the environmental protection.

The table below describes the different Bluetooth® Channel and Role settings. To change the Bluetooth® Channel and Role settings the power to the unit must be turned off. Then set the rotary switch according to the table below. Turn power on to activate the new Bluetooth® Channel and Role. For more information about Establishing a Bluetooth Network, see section 2.3.3 below.

Bluetooth® Interface Channel and Role Selection

Rotary Switch Position	Bluetooth® Channel	Bluetooth® Role
0	1	Client (Master)
1	1	Server (Slave)
2	2	Client (Master)
3	2	Server (Slave)
4	3	Client (Master)
5	3	Server (Slave)
6	4	Client (Master)
7	4	Server (Slave)
8	5	Client (Master)
9	5	Server (Slave)
0	1	Client (Master)

The Bluetooth® Channel and Role is set via a rotary selector switch inside the unit. There are 5 possible Bluetooth® Channels, and 2 different Bluetooth® Roles, for a total of 10 rotary switch positions.

2.3.3. Establishing a Bluetooth® Network

To set up a wireless Bluetooth® Network, follow the steps below.

1. Turn off power to all devices that will be removed, added or remain in the Bluetooth® Network.
2. Designate a Bluetooth® Role for each of the devices. The designation is arbitrary. The Bluetooth® Role may be set to either Client or Server. Both devices in the network cannot have the same Role.
3. Both units must be on the same Bluetooth® Channel. Once the Channel and Role of the device is determined, use the table in section 2.3.2 to set the Bluetooth® rotary switch

If you are modifying an existing Bluetooth Network, you must change to a different Bluetooth® Channel than the one previously used.

At pairing it is important that only two units with the same channel number are powered on at the same time. After the pairing procedure, several pairs can run in parallel with the same channel number since the connection within the pairs is made with the MAC address and the channel is only used to control whether the channel has changed since the last pairing.

4. Initiate Bluetooth Pairing by turning on power to the Server.
    - The Server will set its Bluetooth® Name to a name that contains its Channel (for example "BT_Module_x", where x is the Server's Bluetooth® Channel)
5. Turn on power to the Client
    - The Client will search for the name "BT_Module_y", where y is the Client's Bluetooth® Channel
    - If the Client and Server have the same Bluetooth® Channel then the Server will be found
    - When the Client finds the Server, it will store the Server BT address (the unique address of the Bluetooth chip) in its EEPROM. Bluetooth Pairing is now complete

The next time the units start, the Client will not search for the Server; instead it will just connect directly to the Server BT address stored in the EEPROM. This is to speed up the connection, since the search takes around 50 seconds.

The Bluetooth® LED on the units verifies a successful pairing.

The plastic covers must be handled with care and always re-mounted properly to preserve the environmental protection.

2.4. Power Interface

Power Interface Electrical Characteristics

Parameter	Value			Unit	Comment
	Min	Typ	Max		
Voltage	9	24	32	V	Load dump protected
Consuption			240	mA	@ 24V (5.8 W)

2.5. LED Indicators

LED Indicators

LED Description	Condition	Meaning
CAN Status	Solid Green	Operational mode, Communication OK
	Solid Red	Bus off
	Off	No CrossLink BTC power, or voltage too low
Bluetooth® Status	Solid Blue	Bluetooth® OK
	Off	Bluetooth® Communication Error

3. Appendix 1 – Environmental Tolerances

Environmental Test	Level	Standard
High temperature	Functional During test +75 °C, 24 hours Functional After test +85 °C, 16 hours	IEC 60068-2-2
Low temperature	Functional During test -40 °C, 24 hours Functional After test -40 °C, 16 hours	IEC 60068-2-1
Change of temperature	Functional During test -40 °C – +50 °C, 5 °C/min 2 test cycles x 24 hours	IEC 60068-2-14 Nb
Damp heat	Functional During test +25 °C / +55 °C, Rel. Humidity > 90% 6 x 24 hours	IEC 60068-2-30 Db
Shock	Functional During test 50 g / 6 ms 1000 impulses in 6 directions	IEC 60068-2-29
Vibration	Functional During test sinusoidal 3.5 mm 10 – 27 Hz 10 g 27 – 500 Hz 2 hours in 3 directions	IEC 60068-2-6
Electrical Transients	Conducted transients Pulse 1: -50 V / 2 ms 2: +25 V / 2 ms 3a: -220 V / 10 ms 3b: +220 V / 10 ms 4: -5 V 5: +70 V	ISO 7637-2
EMC Susceptibility (Component)	RF electromagnetic field 100 V/m 200 – 1000 MHz 80% AM 1 kHz sine	ISO 11452-2
	Bulk Current Injection 60 mA 20 – 200 MHz 80% AM 1 kHz sine	ISO 11452-4
EMC Emissions (Component)	**Frequency MHz** / **Narrowb. dBmV/m** / **Broadb. dBmV/m** 30-75 / 54-44 / 64-54 75-400 / 44-55 / 54-65 400-1000 / 55 / 65	ISO 14982
Electrostatic Discharge	4 kV contact, 8 kV air	ESD EN 61000-4-2
Enclosure	IP67	IEC 60529

4. Technical Support

Contact your reseller or supplier for help with possible problems with CrossLink BTC. In order to get the best help, you should have access to your CrossLink BTC and be prepared with the following information before you contact support.

- Part number and serial number of the unit, which you find on the brand label
- Date of purchase, which is found on the invoice
- The conditions and circumstances under which the problem arises
- LED indicator colours and blink patterns
- Description of external equipment which is connected to CrossLink BTC

5. Trade Mark, etc.

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