Mode S Transponder with ADS-B

BXT6513-(0XX)

Installation and Operation

Manual DV15104.03
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Article-No. 0647.225-071

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Preface

Dear Customer,

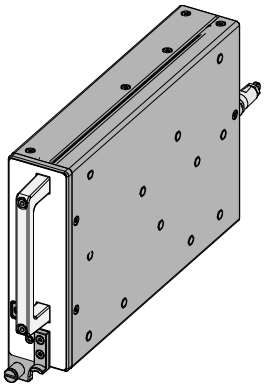
Thank you for purchasing a Becker Avionics product. We are pleased that you have chosen our product and we are confident that it will meet your expectations.

For development and manufacturing of our product, the guidelines for highest quality and reliability have been borne in mind, supplemented by selection of high quality material, responsible production and testing in accordance to the ISO 9001 and DIN EN 9100 standards.

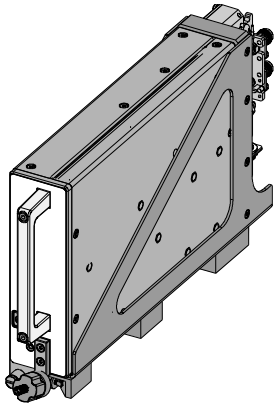
Our competent customer support department will respond on any technical question you may have.

Please do not hesitate to contact us at any time.

Transponder Design



BXT6513
with EM module



BXT6513
with mounting tray and backshell

List of Effective Pages and Changes

Only technical relevant modifications are described in this table.

Document:	**DV15104.03 / issue 03 Article Number 0647.225-071**		
Cover Page	11/2016		
Introduction	11/2016		
Chapter 1 – 4	11/2016		
Issue	**Page No.:**	**Section / Chapter**	**Description**
03	1-64	all	Updated: Descriptions aligned about technical capability.
	--	all	Added: New variant.
	--	1.4	Added: Descriptions about functionalities.
	--	1.7	Added: Technical details. Updated: Environmental Conditions, Certification statements.
	--	1.8	Added: Equipment details for configuration and documentation.
	--	2.5 2.6	Added: Details about configuration and interfaces.
	--	2.8 2.9	Updated: More details for configuration tasks. Added: Description Software Update.
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Table of Contents

List of Abbreviations

List of Abbreviations	
AA	Aircraft Address (24-bit ICAO)
AC	Alternating Current Altitude Code
ACAS	Airborne Collision Avoidance System
ADLP	Airborne Data Link Processor
ADC	Air Data Computer
ADS-B	Automatic Dependent Surveillance-Broadcast
ARINC	Aeronautical Radio Inc.
ATCRBS	Air Traffic Control Radar Beacon System
AWG	American Wire Gauge
CAN	Controller Area Network
CBIT	Continuous Built-In Test
DC	Direct Current
DF	Downlink Format
DME	Distance Measurement Equipment
EM	External Memory
ES	Extended Squitter
EUROCAE	European Organisation for Civil Aviation Equipment
FAA	Federal Aviation Administration
FCC	Flight Control Computer
FMC	Flight Management Computer
FLS	Field Loadable Software
GND	Ground (electrical)
GNSS	Global Navigation Satellite System
GPS	Global Positioning System
IBIT	Initiated Built-In Test
ICAO	International Civil Aviation Organization
ID	Identifier
I/O	Inputs/Outputs
IP	Internet Protocol
IRS	Inertial Reference System
LED	Light Emitting Diode
MCP	Mode Control Panel
MSL	Mean Sea Level
NAV	Navigation
PBIT	Power-On Built-In Test
PC	Personal Computer
RF	Radio Frequency
RTCA	Radio Technical Commission for Aeronautics Inc.
RX	Receiver, Receive
SI	Surveillance Identifier
SW	Software

List of Abbreviations	
TCAS	Traffic Alert and Collision Avoidance System
TX	Transmitter
USB	Universal Serial Bus
VHF	Very High Frequency
XPDR	Transponder

Units

Units	
A	Ampere
mA	Milliampere
°C	Degree Celsius
cm	Centimeter
dBm	Power Ratio In Decibel
dB	Decibel
ft	Foot, feet
g	Gram
kg	Kilogram
kHz	Kilohertz
km/h	Kilometer Per Hour
kt	Knots
MHz	Megahertz
Mbps	Mega Bits Per Second
mm	Millimeter
Nm	Newton Meter
Ohm (Ω)	Resistance
s	Second
V	Volt
mV	Millivolt
W	Watt
mW	Milliwatt
"	Inch

General Safety Definitions

⚠DANGER Indicates a hazardous situation which, if not avoided, will result in death or serious injury.

⚠WARNING Indicates a hazardous situation which, if not avoided, could result in death or serious injury.

⚠CAUTION Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

NOTICE Is used to address practices not related to physical injury.

SAFETY INSTRUCTIONS Safety instructions (or equivalent) signs indicate specific safety-related instructions or procedures.

Disposal

⚠CAUTION The packaging material is inflammable, if it is disposed of improperly by burning, toxic fumes may develop.

This product contains materials that fall under the special disposal regulation, which corresponds to the EC directive for dangerous disposal material. We recommend disposing of the respective materials in accordance with the respectively valid environmental laws. The following table states the materials suitable for recycling and the materials which have to be disposed of separately.

Material	Suitable for recycling	Disposal
Metal	yes	no
Plastics	yes	no
Circuit boards	no	yes

Dispose of the circuit boards:

- Disposal via a technical waste dump which is allowed to take on e.g. electrolytic aluminium capacitors. Do under no circumstances dump the circuit boards with normal waste dump.

Warranty Conditions

User Conversions and Changes are Not Permitted.

Any change made by the user excludes any liability on our part (excluding the work described in this manual).

- The device must not be opened.
- Do not make any modifications to the device, except for those described in the manual.
- Make connections to the inputs, outputs and interfaces only in the manner described in the manual.
- Fix the devices according to the mounting instructions.
  We cannot provide any guarantee for other mounting methods.

Conditions of Utilization

General Introductory Notes

With this device you bought a product which was manufactured and tested before delivery with the utmost care.

Please take your time to read the following notes which you ought to follow closely during installation and operation.

Unless, all claims under the warranty will become void and a reduced service life or even damages must be expected.

⚠CAUTION The user is responsible for protective covers and/or additional safety measures in order to prevent damages to persons and electric accidents.

Additional Conditions of Utilization

Please refer to "Safety-Conscious Utilization", page 19.

Non Warranty Clause

We checked the contents of this publication for compliance with the associated hard and software. We can, however, not exclude discrepancies and do therefore not accept any liability for the exact compliance. The information in this publication is regularly checked, necessary corrections will be part of the subsequent publications.

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1. General Description

In this chapter you can read about:

This manual describes the operation and installation of the remote controlled BXT6513-(0XX) Mode S Transponder. The ID label on your device shows the part number for identification purposes (see "Type Plate", page 31).

Before starting operation of the unit(s) please read this manual carefully, with particular attention to the description referring to your device(s).

1.1. Introduction

The technical information in this document apply to the described product BXT6513-(0XX).

The manuals “Maintenance and Repair” (**M&R**), “Installation and Operation **(I&O)** contain the following sections:

	Section	DV15104.04 M&R	DV15104.03 I&O
	General	X	X
	Installation	X	X
	Operation	X	X
	Theory of Operation	X	N/A
	Maintenance and Repair	X	N/A
	Illustrated Parts List	X	N/A
	Modification and Changes	X	N/A
	Circuit Diagrams	X	N/A
	Certifications	X	N/A
	Attachments	X	N/A

1.2. Purpose of Equipment

The BXT6513-(0XX) transponder is designed as a remote controlled single block unit and is intended for installation in aircraft avionics bay.

BXT6513-(0XX) is a transponder which provides to other stations Mode A/C/S messages as well ADS-B Extended Squitter functionality (ES).

BXT6513-(0XX) is a remote controlled unit, which does not include a control panel. It can receive commands and provides data through a set of standard interfaces.

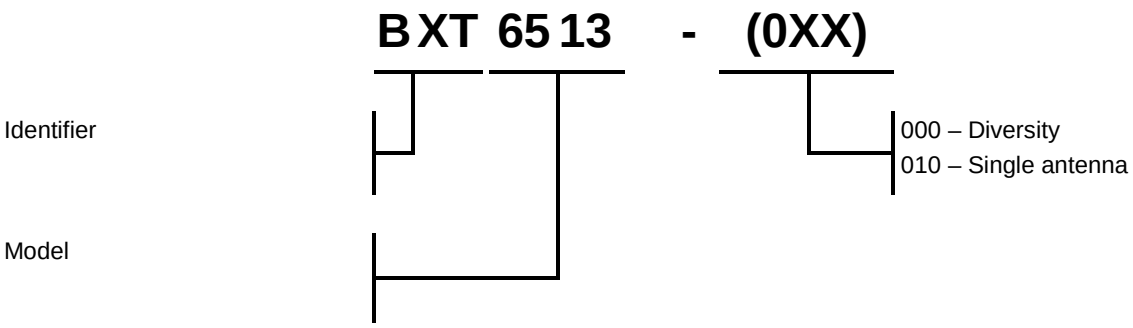
Features:

- Control Interface ARINC 429.
- Mode A - in this mode, the 4096 character code is sent as a reply to interrogation from a ground station.
- Mode C - in this mode, the encoded altitude is sent in addition to the mode A reply.
  - Data range for 25 ft resolution: -1000… 50187 ft.
  - Data range for 100 ft resolution: -1000… 126750 ft.
  - The altitude information must be delivered from an external device.
- Mode S - interrogations are selective and Mode S transponders will respond to a single directed interrogation from ground stations or another aircraft with ICAO 24-bit address.
- ADS-B Broadcast-Only System, transmit:
  - Airborne Position Message,
  - Surface Position Message,
  - Airborne Velocity Message,
  - Aircraft Identification and Category Message,
  - Aircraft Operational Status Message,
  - Extended Squitter Aircraft Status Message.
- Diversity - operation with two antennas (top and bottom), required for installation in aircrafts with gross mass in excess of 5700 kg or a maximum cruising true airspeed in excess of 175 kt (324 km/h).
- Support of the SI code (Surveillance Identifier).
- Register capability for elementary surveillance (ELS) and enhanced surveillance (EHS).
- Data link capability.
- GPS receiver connection capability.
- Selftests (BITs) are integrated in the transponder.

NOTICE Actual generation of each ADS-B message type and data within each message depends on availability of navigation data and GPS capabilities.

1.3. Variants Overview

Within the part number, the meaning of "BXT6513-(0XX)" is:



1.3.1. Software Status

Details please see "Software Data Plate", page 32.

1.4. Scope of Functionality

BXT6513-(0XX) is a transponder providing downlink of aircraft information and single antenna and diversity antenna installations. For single antenna one shall be installed on the bottom side. For diversity one antenna is installed on the top side, and the other on the bottom side of the aircraft fuselage (detailed type description see "Type Plate", page 31).

The BXT6513-(0XX) operates on radar frequencies; receiving ground radar and ACAS interrogations and replies via its transmitter with coded pulse packages on 1090 MHz. A special position identification pulse (SPI) can be added for a period of 18 seconds to each pulse package after activation of the dedicated discrete signal input on the unit.

The BXT6513-(0XX) meets Mode S Enhanced Surveillance (EHS) requirements.EHS parameters require additional interface with other aircraft systems and the BXT6513-(0XX). Aircraft that can provide the list of eight Downlink Aircraft Parameters (DAPs) listed in BDS registers 4.0, 5.0 and 6.0 are considered to be Mode S EHS capable. Aircraft that cannot provide these parameters will be considered as, not EHS capable.

1.4.1. Fixed and Non-Volatile Data

The BXT6513-(0XX) configuration is stored in a non-volatile memory. There are two possibilities where to store configuration data:

- Use the internal memory
- Use the external memory module EM6100.

The selection of equipment configuration source is done by hardware configuration (see “Unit Configuration", page 46).

1.4.2. **Diversity**

Antenna diversity reduce the potential for antenna "shading", and helps to prevent target drop out in each situation.

BXT6513-(000) is capable to operate with two antennas (top and bottom), required for installation in aircrafts with gross mass in excess of 5700 kg or a maximum cruising true airspeed in excess of 175 kt (324 km/h).

1.4.3. **Mode S**

BXT6513-(0XX) as Mode S transponder is an airborne part of Mode S Secondary Surveillance Radar system which detects ground interrogations arriving at 1030 MHz signal frequency, processes them and generates responses at 1090 MHz signal frequency.

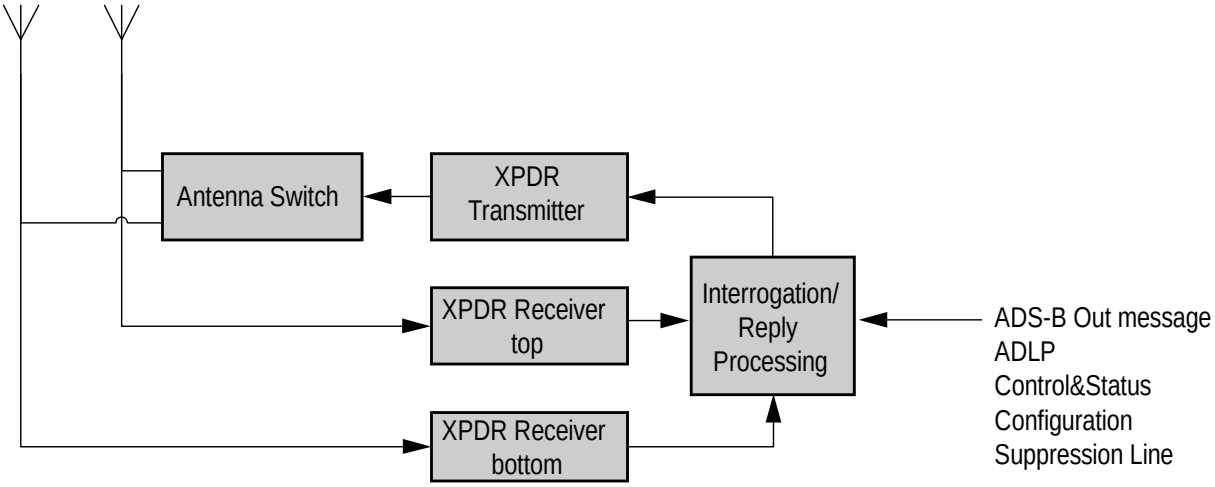


Figure 1: Block Diagram – Mode S Transponder Concept

1.4.4. **ADS-B (Automatic Dependent Surveillance-Broadcast)**

ADS-B is a GPS based technology to define and provide aircraft relevant data. To support ADS-B Out, the aircraft needs a certified GPS receiver as the position source, and this device to send the ADS-B data. This data can be received by other air- and ground stations.

The Automatic Dependent Surveillance-Broadcast Out (ADS-B Out) function provides position, velocity and status data on the transponder for broadcasting as extended squitters (ES). When data is available, it is transmitted at specific periods and enable other participants to determine current position, velocity and status of the aircraft without interrogation.

BXT6513-(0XX) is an ADS-B class B1 or B1S (aircraft broadcast only) Mode S transponder capable for automatically sending out ADS-B data like:

- (BDS 0,5) Airborne Position Message.
  - SPI.
  - Emergency Indicator.
  - Barometric Altitude.
  - Quality Indicator (NIC).
  - Latitude (Airborne Position).
  - Longitude (Airborne Position).

- (BDS 0,6) Surface Position Message.
  - Quality Indicator (NIC).
  - Latitude (Surface Position).
  - Longitude (Surface Position).
  - Surface Ground Speed.
  - Surface Ground Track.

- (BDS 0,8) Aircraft ID and Category Message.
  - Aircraft Identification & Categorie.

- (BDS 0,9) Airborne Velocity.
  - Airborne Ground Velocity.
  - Geometric to Barometric Altitude Difference.
  - Geometric Vertical Speed.

- (BDS 6,1) Emergency/Priority Status.
  - Squawk Code.
  - Emergency Status.

- (BDS 6,5) Aircraft Operational Status Message, Airborne and Surface.
  - Quality Indicator (NACp, NACv and GVA).
  - Quality Indicator (SIL and SDA).
  - Version Indicator.
  - Surface Length/Width.
  - Surface Antenna Offset.

1.4.5. **Supported Transponder Messages**

BXT6513 supports the following Binary Data Selector (BDS) registers.

General Mode S Registers:

- (BDS 1,0) Data Link Capability Report.
- (BDS 1,7) Common Usage GICB Capability Report.
- (BDS 1,8 to 1,C) Mode S Specific Services GICB Capability Report.

Elementary Surveillance Registers:

- (BDS 2,0) Flight ID.
- (BDS 2,1) Aircraft Registration.

Enhanced Surveillance Registers:

- (BDS 4,0) Selected Vertical Intention Report (except Vertical Mode).
- (BDS 5,0) Track and Turn Report.
- (BDS 6,0) Heading and Speed Report.

Extended Squitter/ADS-B Registers:

- (BDS 0,5) Airborne Position Message.
- (BDS 0,6) Surface Position Message.
- (BDS 0,8) Aircraft ID and Category Message.
- (BDS 0,9) Airborne Velocity.
- (BDS 6,1) Emergency/Priority Status.
- (BDS 6,5) Aircraft Operational Status Message, Airborne.
- (BDS 6,5) Aircraft Operational Status Message, Surface.

1.4.6. Interfaces

1.4.6.1. ARINC 429

The ARINC 429 specification is a standard how avionics equipment and systems communicate on aircraft. The specification defines:

- Electrical characteristics,
- Word structures,
- Protocol for bus communication.

Electrical and data format characteristics are defined for a two-wire serial bus with one transmitter and up to 20 receivers. This simple architecture provides a highly reliable transfer of data. The bus is capable of operating at a speed of 100 kbit/s.

For detailed information about ARINC 429 specifications please refer to: www.arinc.com.

1.4.6.2. Logical Inputs/Outputs

The hardware design of BXT6513-(0XX) provides a subset of inputs and outputs required for transponder operation.

1.4.6.3. Status and Control Ports

The hardware design of BXT6513-(0XX) provides a subset of ports for provide information about transponder status and for controlling.

1.4.6.4. Internal and External Memory

An internal or external memory is used as configuration data source, saving aircraft data installation and configuration data.

On start-up BXT6513-(0XX) reads from this non-volatile memory configuration data which include parameters specific to the actual aircraft and installation. Typically, an external memory (EM) is used. If BXT6513-(0XX) is replaced e.g. for maintenance, so the new BXT6513-(0XX) can be assembled with the external memory module in this way it is guaranteed that all relevant data is available for fast & easy exchange.

NOTICE We recommend the usage of the External Memory module EM6100 as data source.

1.4.7. Built-In Test

BXT6513-(0XX) has advanced Built-In-Test. It monitors most of internal circuits against failures.

1.5. Safety-Conscious Utilization

For safe operation of the product the following notes have to be observed:

SAFETY INSTRUCTIONS

- The installation of the BXT6513-(0XX) into an aircraft may be carried out only by an authorized installation company. The country regulations always have to be observed.
- Use the product only within the specified conditions, see "Technical Data" page 20.
- Circuit breaker:
  - Use the recommended fuses in the power line to protect the application, see "Technical Data", page 20.

SAFETY INSTRUCTIONS

Excessive pulses on the DC bus of the aircraft may cause damage on electrical circuits of any installed instrument.

SAFETY INSTRUCTIONS

It is the responsibility of the installer to ensure the ADS-B Out system is compliant with current national regulations e.g. AC 20-165B and to ensure compatibility between the BXT6513 and the ADS-B Out position source equipment.

1.6. Restriction for Use

SAFETY INSTRUCTIONS

- Installation of BXT6513-(0XX) is limited to configurations where the aircraft is equipped with an ARINC-743A compliant GNSS receiver having an time mark output, the transponder is configured to use the time mark signal and time mark output of the GNSS receiver is connected to the corresponding input of the transponder.

- Installation of BXT6513-(0XX) is limited to configurations where the aircraft has Weight-On-Wheels/Ground Sensor, the transponder is configured to use Weight-On-Wheels/Ground Sensor input and Weight-On-Wheels/Ground Sensor is connected to the corresponding input of the transponder.

1.7. Technical Data

1.7.1. General Characteristics

BXT6513-(0XX)	Specifications
Supply voltage	28 VDC (18.0...32.2 VDC)
Emergency voltage	18 VDC min.
Power consumption	27 W max.
Recommended external fuse protection	3 A
RF port	
Impedance	50 Ω
Transmitter frequency	1090 ± 1 MHz
Transmitter power	min. 125 W at antenna terminal
Receiver frequency	1030 MHz
Mode A/C sensitivity	-73 ± 4 dBm at antenna terminal
Mode S sensitivity	-74 ± 3 dBm at antenna terminal
Interrogations - Mode	Mode A, C, A/S All Call, C/S All Call, Mode S (DF=0, 4, 5, 11, 16, 20, 21)
Replay rate capability	
Mode A/C	Continuous: 500 replies per second Peak (100 ms): 1200 replies per second
Mode S	60 long replies per second 12 short and 6 long replies in 100 ms 4 short and 4 long replies in 25 ms 2 short and 2 long replies in 1.6 ms
Squitter	Short (56 bits): Acquisition Long (112 bits): Identification Airborne Position Airborne Velocity Surface Position Aircraft Operational Status Extended Squitter Aircraft Status Custom messages (TYPE=23)
Interface	
Control Interface	ARINC 718A, 3x ARINC 429 In
Air Data Computer	ARINC 706, 2x ARINC 429 In
ADLP	ARINC 718A, 1x ARINC 429 In, 1x ARINC 429 Out
FCC	ARINC 701, 1x ARINC 429 In
FMC	ARINC 702, 1x ARINC 429 In

BXT6513-(0XX)	Specifications
IRS	ARINC 704, 1x ARINC 429 In
GNSS	ARINC 743A, 1x ARINC 429, 1x Time Mark (differential)
Radio Altimeter	ARINC 707, 1x ARINC 429 In
Data concentrator	2x ARINC 429 In
Data output	ARINC 718A, 2x ARINC 429 Out
Field Loadable Software	ARINC 826, 1x CANbus, 1x Discrete In
Mutual Suppression	ARINC 718A
IDENT	1x Discrete In
Standby	1x Discrete In
Control Port select	1x Discrete In
ADC select	1x Discrete In
Weight on Wheels	1x Discrete In
Ext. Squitter disable	1x Discrete In
Burst Mode	1x Discrete In
Reply indication	1x Discrete Out
Status	3x Discrete Out
Maintenance	1x USB (front panel)

1.7.2. **Dimensions & Weight**

	Specifications
BXT6513-(0XX) only (HxWxD)	171 x 47.4 x 276 mm (6.73 x 1.87 x 10.87 in)
BXT6513-(0XX) depth with EM module	310 mm (12.21 in)
BXT6513-(0XX) with mounting + backshell (HxWxD)	172.5 x 52.4 x 331 mm (6.79 x 2.06 x 13.03 in)
Weight	
Transponder BXT6513-(0XX)	≤ 1.6 kg (3.53 lb)
Mounting tray MT6533-(000)	≤ 0.50 kg (1.10 lb)
Backshell BS6533-(100)	≤ 0.3 kg (0.66 lb)
External memory module EM6100	≤ 0.018 kg (0.04 lb)

1.7.3. **Software**

As a result of the safety assessment process the failure condition of the BXT6513-(0XX) was determined to be Category MAJOR.

As the failure condition of the software used in the BXT6513-(0XX) was categorized MAJOR, the Design Assurance Level (DAL) of the unit is determine to be Level C according DO-178C.

1.7.4. **Hardware**

The Complex Electronic Hardware (CEH) included into BXT6513-(0XX) has been designed in accordance with EUROCAE/RTCA Document ED-80/DO-254; “Design Assurance Guidance for Airborne Electronic Hardware”. And satisfy criteria of:

Hardware Assurance Level (HAL) C

1.7.5. **Continued Airworthiness**

- The BXT6513-(0XX) maintenance is defined as "on condition" only.
- No scheduled or regular maintenance of this product is required.

1.7.6. **Environmental Conditions**

BXT6513-(0XX) was tested in accordance with ED-14G/DO-160G under consideration of listed environmental categories and conditions:

Characteristics	Section	Cat.	Condition
Temperature	4	B2	Intended for installation in non-pressurized and non-controlled temperature location of an aircraft that is operated at altitudes up to 25 000 ft (7620 m) MSL. -45…70 °C.
Altitude	4	F1	Intended for installation in non-pressurized but controlled temperature location of an aircraft that is operated at altitudes up to 55 000 ft (16 800 m) MSL
In-flight Loss of Cooling	4	X	No test
Temperature Variation	5	B	Non-temperature controlled or partially temperature controlled internal sections of the aircraft
Humidity	6	B	Severe humidity environment
Operational Shocks and Crash Safety	7	B	Tested for standard operational shock and crash safety
Vibration	8	SMB2	Standard vibrations test: • sine vibration curve M • random vibration curve B2
	8	U2FF1	Robust vibrations test: Helicopters with unknown frequencies, Zone 1a and 2: fuselage, instrument panel, console and equipment rack
Explosion Proofness	9	X	No test
Water Proofness	10	X	No test
Fluids Susceptibility	11	X	No test
Sand and Dust	12	X	No test
Fungus Resistance	13	F	Fungus Resistance Compliance performed by Analysis
Salt Spray	14	X	No test
Magnetic Effect	15	Z	Deflection for magnetic compass is ≤ 1°, if unit is installed with a distance of ≤0.3 m.
Power Input	16	B	28 VDC equipment installed in aircrafts supplied with engine-driven alternator/rectifiers or DC generators where a battery of significant capacity is floating on DC bus all the time.
DC current ripple	16	X	No test
Inrush current	16	X	No test
Voltage Spike	17	A	High degree of protection against damage by voltage spikes
Audio Freq. Conducted Susceptibility	18	Z	28 VDC equipment with no battery or battery small compared with the capacity of the DC generator

Characteristics	Section	Cat.	Condition
Induced Signal Susceptibility	19	CCX	Equipment for which interference-free operation is required; installed on aircraft where severe coupling occurs due to long wire runs
Radio Frequency Susceptibility	20	RR	Compliant to high intensity radiated fields associated with the normal environment.
Emission of Radio Frequency Energy	21	M	Located in areas where apertures are significant and not directly in view of radio receiver's antenna.
Lightning Induced Transients Susceptibility	22	A3E3XX	Pin test waveform set A, level 3. Cable bundle test waveform set E, level 3
Lightning Direct Effects	23	X	No test
Icing	24	X	No test
Electrostatic Discharge	25	A	Installed, repaired or operated in an aerospace environment
Fire, Flammability	26	X	No test

BXT6513-(0XX) is fulfilling the related requirements of AC20-158A and AC20-136B.

1.7.7. **Certifications**

The Remote Controlled Mode S Transponder BXT6513 is certified.

Part Number	EASA Approval
BXT6513-(0XX)	EASA.21O.10058306

BXT6513-(0XX) meets the requirements of:

	Specifications
ETSO	C112d – Level 2 dens, Class 1 (single antenna: Level 2 ens) C166b Class B1 (single antenna: Class B1S)
ED12C / DO178C	DAL C
ED80 / DO-254	DAL C
ICAO	Annex 10, Vol IV
MOPS	RTCA/DO-160G, EUROCAE ED-73E, EUROCAE ED-102A

1.7.7.1. FCC Approval

Radiofrequency radiation exposure information:

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance of 50 cm between the radiator and your body.

This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

NOTE:

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

NOTE:

This device complies with Part 15 of the FCC Rules [and with Industry Canada licence-exempt RSS standard(s)].

Operation is subject to the following two conditions:

- This device may not cause harmful interference, and
- This device must accept any interference received, including interference that may cause undesired operation.

NOTE:

Changes or modifications made to this equipment not expressly approved by Becker Avionics may void the FCC authorization to operate this equipment.

1.8. Order Code

1.8.1. BXT6513-(0XX)

Qty	Transponder	
1	BXT6513-(000): XPDR (class1, Level 2 dens) /ADS-B Out (B1)	Article No. 0645.141-915
1	BXT6513-(010): XPDR (class1, Level 2 ens) /ADS-B Out (B1S)	Article No. 0649.732-915

1.8.2. Accessories

Qty	External Memory	
1	EM6100-(000) External memory	Article-No. 0608.270-921

Qty	Configuration Equipment	
1	EMP Kit, Configuration Set External Memory • Programming module • EM Programmer (software on USB stick) • USB cable	Article-No. 0649.961-954
1	CANbus Kit, Configuration Set • CAN USB-adapter • EM Programmer & ARINC Data Loader on USB stick	on request

Qty	Mounting Equipment	
1	Mounting tray MT6533-(000)	Article-No. 0635.952-264
1	Backshell BS6533-(100) for MT6533	Article-No.0645.168-284
1	Backshell BS6533-(110) single antenna for MT6533	Article-No.0649.767-284

Qty	Antenna	
-	BXT6513-(0XX) accept all types of transponder antennas. Please use only antennas which are certified to one of the following TSOs: (E)TSO-C66() (E)TSO-C74() (E)TSO-C112()	--

Qty	Connector Kit	
1	CK6513-(100): 90°TNC connector kit for 311201 ECS coax cable	Article-No. 0647.551-954

Qty	Available Documentation	
1	BXT6513-(0XX) Installation and Operation, English	Article-No. 0647.225-071
1	BXT6513-(0XX) Maintenance and Repair, English	Article-No. 0647.233-071
1	EMP Extended Memory Programmer User Manual, English	Article-No. 0648.655-071
1	ARINC 826 Data Loader Manual	Article-No.0649.562 071
1	ICD Manual (Interface Control Document), English	on request
1	FLS Manual, English	on request

1.8.3. **Spare Parts**

Qty	Repair Kit	
1	RK6533-(100): Repair Kit for the BS6533-(100)	Article-No. 0647.195-954

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2. Installation

This manual must be available close to the device during the performance of all tasks.

Careful planning should be applied to achieve the desired performance and reliability from the product. Any deviations from the installation instructions prescribed in this document are under own responsibility.

In this chapter you can read about:

2.1. Packaging, Transport, Storage

Visually inspect the package contents for signs of transport damage.

2.1.1. Packaging Material and Transport

⚠CAUTION The packaging material is inflammable, if it is disposed of improperly by burning, toxic fumes may develop.

The packaging material can be kept and reused in the case of a return shipment. Improper or faulty packaging may lead to transport damages.

Make sure to transport the device always in a safe manner and with the aid of suitable lifting equipment if necessary. Do never use the electric connections for lifting. Before the transport, a clean, level surface should be prepared to place the device on. The electric connections may not be damaged when placing the device.

First Device Checkup

- Check the device for signs of transport damages.
- Please verify if the indications on the type plate correspond to your purchase order.
- Check if the equipment is complete ("Scope of Delivery", page 30).

Storage

If you do not wish to mount and install the device immediately, make sure to store it in a dry and clean environment. Make sure that the device is not stored near strong heat sources and that no metal chippings can get into the device.

2.2. Device Assignment

This manual is valid for the following devices:

- BXT6513-(0XX) + supplement

2.2.1. Scope of Delivery

- Manuals
  - Installation and Operation manual
- Transponder
  - BXT6513-(0XX)
- EASA Form One

2.2.2. Additional Required Equipment

- Mounting kit MT6533, mandatory to meet the conditions for certification
- Backshell BS6533, mandatory to meet the conditions for certification
- Connectors + cables
- Antennas + antenna cables
- External Memory module (depends on configuration)
- Configuration set
- Control unit (controlling and operating BXT6513-(0XX))

Details see "Accessories", page 26.

2.2.3. **Type Plate**

The device type is defined by the type plate (on the housing):
Example:

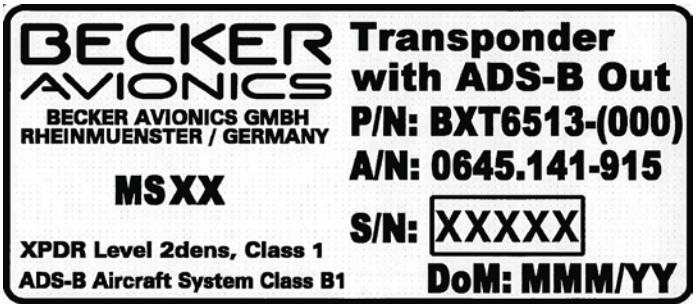

Figure 2: Type plate (example)

Explanation:

PN:	**Example Type designation:** **BXT** = Remote Controlled Transponder with ADS-B out **6513 =** Model number **Options:** **-(000):** Diversity **-(010):** Single antenna **Functionality:** XPDR class 1: Output power at antenna ≥125 W Level 2: Surveillance and Comm-A/B d: Diversity e: Extended squitter n: Enhanced surveillance s: Surveillance identifier code (SI) **ADS-B class** B1: Aircraft broadcast only B1S: Aircraft broadcast only, single antenna
SN:	Unique number of the particular device
AN:	Article number (=order number)
DoM:	Date of Manufacturing
MS	Mode state
	Compliance and Certifications Corresponding to the displayed text and logos

2.2.4. **Software Data Plate**

The software state is defined by the software data plate (on the housing):
Example:

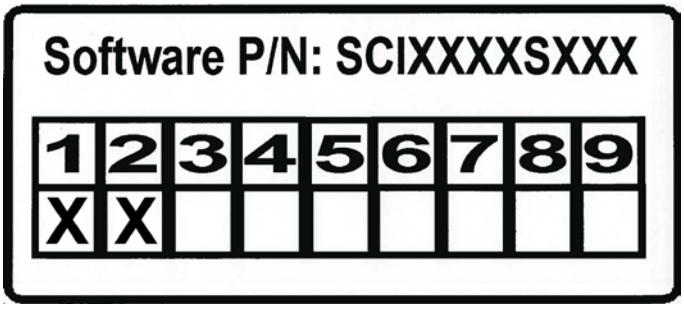

Figure 3: Software data plate (example)

Explanation:

X	Example description: The labelling on this data plate example shows: Software status of the device = software package version 2.

2.2.5. **Meaning of Status LEDs**

The two front panel LEDs indicate basic information about overall equipment status.

Device Status	**ERR (LED yellow)**	**OK (LED green)**
Off	off	off
Initializing	off	off
Failure of any of basic function(s)	**on**	off
Operating, minor failures reported	**on**	**on**
Operating, no error	off	**on**

2.3. Mounting Requirements

NOTICE

The installation of the BXT6513-(0XX) into an aircraft may be carried out only by an authorized installation company. The country regulations always have to be observed.

Antenna and cable installations on pressurized cabin aircraft require FAA/EASA approved installation design and engineering substantiation data whenever such installations incorporate alteration (penetration) of the cabin pressure vessel by connector holes and/or mounting arrangements. Use of existing bulkhead connectors previously approved by other means is permissible without additional approval.

SAFETY INSTRUCTIONS

The device must not be opened.

When installing the device, make sure the heat dissipators of the device receive sufficient air. Ensure air circulation gaps as specified, see “Mounting Distance”, page 33.

The mounting place shall be at least 30 cm from the magnetic aircraft compass, to avoid any interference to the magnetic compass.

Make sure that the mounting plate is not exposed to external temperature influences.

BXT6513-(0XX) is mounted to the airframe using the dedicated mounting which consists of a mounting tray MT6533) and a backshell (BS6533). The mounting tray provides fixing the BXT6513-(0XX) to the aircraft structure. The backshell provides fixing for cable harness. Details see "Dimensions", page 37.

Fixing the mounting tray MT6533 to the airframe:

- Use six M5 (metric) or size 10 (imperial) screws with countersunk head.
  - Minimum torque for fixing screws should be 2.5 Nm.
- Torque for ground stud nut should be normally 1.5 Nm (max. 1.7 Nm).

2.3.1. Mounting Distance

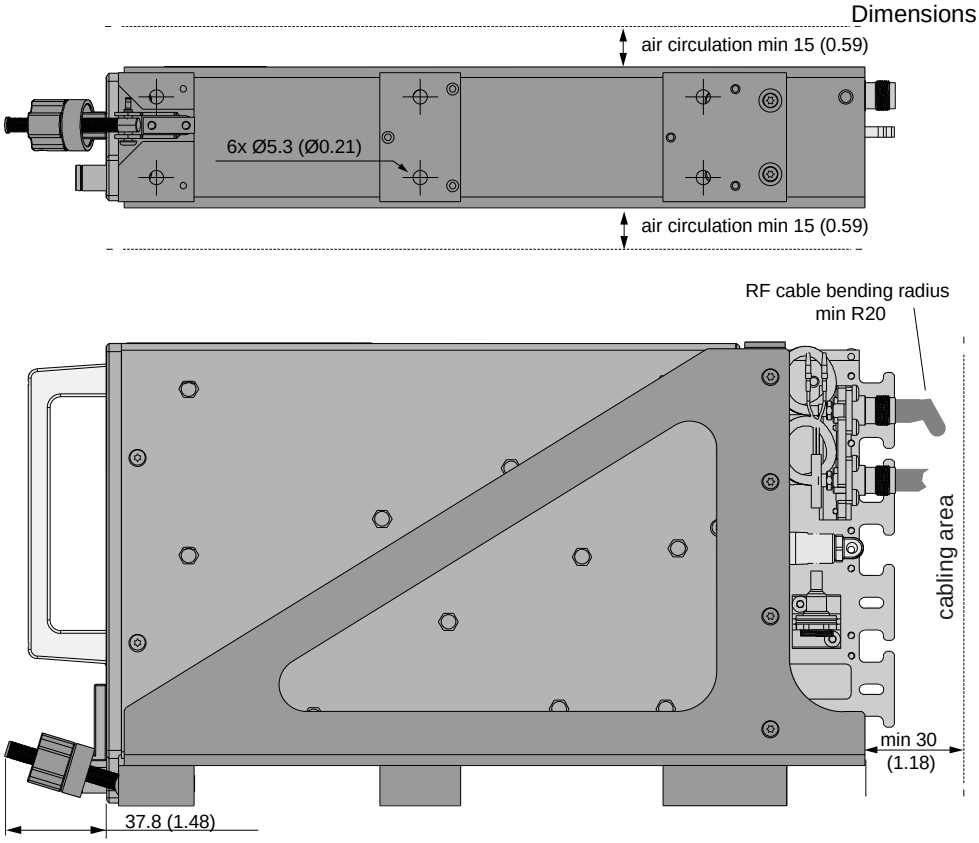

Figure 4: BXT6513-(0XX) mounting area

2.3.2. Grounding

SAFETY INSTRUCTIONS Make sure that the grounding contact area is adequate and that the connection has low resistance and low inductance. Never use a grounding point on paint-coated surfaces!

The mounting tray (MT6533) must be connected to the aircraft electrical frame. Use the dedicated grounding stud at the rear part of the mounting.

The grounding stud is marked on the mounting tray.

- Wire cross section: min. 4 mm^2.
- Length: max.150 mm (6 in).

2.3.3. Cable Installation

- General requirements (except power wires)
  - Use only shielded cables.
  - Connect each shield to the ground individually (no series connections).
  - Connect all cable shields at both ends, ensuring large contact areas!
  - Cable routing should be kept as short and as direct as practical.
  - Avoid sharp bends to prevent cable break and defects of insulation.
  - Avoid routing close to sharp edges to prevent cable break and defects of insulation due to vibration handling the cable.
  - Avoid routing cables near power sources
  - Avoid routing cables near aircraft control cables.
  - Avoid routing antenna cables near DME, TCAS, radar altimeter, and ADF antenna cables (allow min. 12 inch separation)
- Shielded cables
  - Wire cross section (cable shield – ground): min. AWG 24 (0.25 mm^2).
  - Shield connection length: max. 75 mm (3 in).
- Signal cables for configuration inputs
  - Wire cross section (signal cables – ground): AWG 24 (0.25 mm^2).
  - Length: max. 150 mm (6 in).

2.3.4. Recommended Crimp Tools

NOTICE Cable cross section – Crimp tool

Please always verify the use of the suited positioner (insert) in the crimping pliers to guarantee a reliable wired connection.

	Connector / cable cross section
Crimp tool category	(for the D-Sub connectors)
Crimps	CONEC part number: 360X10329X
Positioner	for CONEC pins – part number 360X20069X
Insertion/Removal tool	CONEC part number: 360X12009X

2.3.5. Antenna Cables

The antenna installation needs to comply with following limitations:

- The total attenuation of a connection between any antenna and the equipment, including cables, connectors, microwave switch (if used), etc. shall not be more than 3 dB.
- The connection attenuation difference between antennas shall not be greater than 0.5 dB.
- The signal delay of a connection between any antenna and the equipment shall not be greater than 75 ns.
- The signal delay difference between antennas shall not be greater than 20 ns.

NOTICE It is recommended that "Top" & "Bottom" antenna cables are of the same type and have similar length.

2.3.5.1. Attenuation: Cable length vs coax cable type

Data below shall be used as guideline only.

cable type	max. loss	max. cable length
RG400	0.5 dB/m	6 m
RG142	0.42 dB/m	7.14 m
RG393	0.29 dB/m	10.3 m
ECS310801	0.11 dB/m	27 m
ECS310701	0.10 dB/m	30 m

2.3.6. **Antenna Installation**

For antenna installation, refer always to the manufacturer´s maintenance documentation for the aircraft. Carry out the antenna installation in accordance with AC 43.12-2A Chapter 3.

NOTICE Penetration of the pressurised cabin on a pressurised aircraft requires additional data, which are not contained in this installation manual.

⚠CAUTION Radiation risk:

A safe distance to the installed antenna must be ensured by corresponding installation measures around human body damage (e.g. at the eyes) and/or avoid the inflammation of combustible materials by radiated energy.

The picture shows a typical location for top and bottom antenna installation for Diversity Mode S transponder.

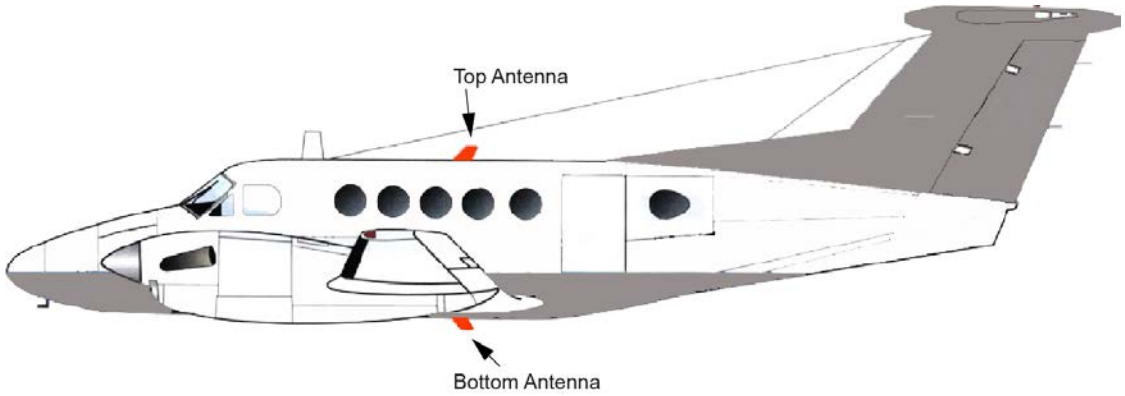

Figure 5: Antenna Installation (Diversity)

Transponder antennas should be installed as far away as practical from:

- Other antennas,
- Shadowing produced by other installations on the surface of the aircraft body,
- Exhaust path of the engine(s),
- Landing gear doors or other openings.
- Check the skin panels for sufficient bonding before the antenna installation.
- Separate the transponder antennas from DME and TCAS as much as possible (approx. 1.8 m or 6 feet as guideline).
- Generally, transponder antennas should not be closer to the XPDR transceiver installed as 3 ft. Otherwise RF interference may occur.
- Mount the main antenna on the bottom of the aircraft fuselage in a vertical position, same as the top antenna. Horizontal separation of both antennas should not exceed 7.6 meters (25 ft).
- Follow the manufacturer´s installation instruction for the antenna to ensure achieving maximum performance of the BXT6513-(0XX).
- If existing antennas on the aircraft will be used an inspection of the area between antenna and the aircraft skin is highly recommended to avoid negative effects of possible corrosion in this area.
- On composite aircraft, add sufficient ground plane material.

2.4. Dimensions

2.4.1. Transponder BXT6513-(0XX)

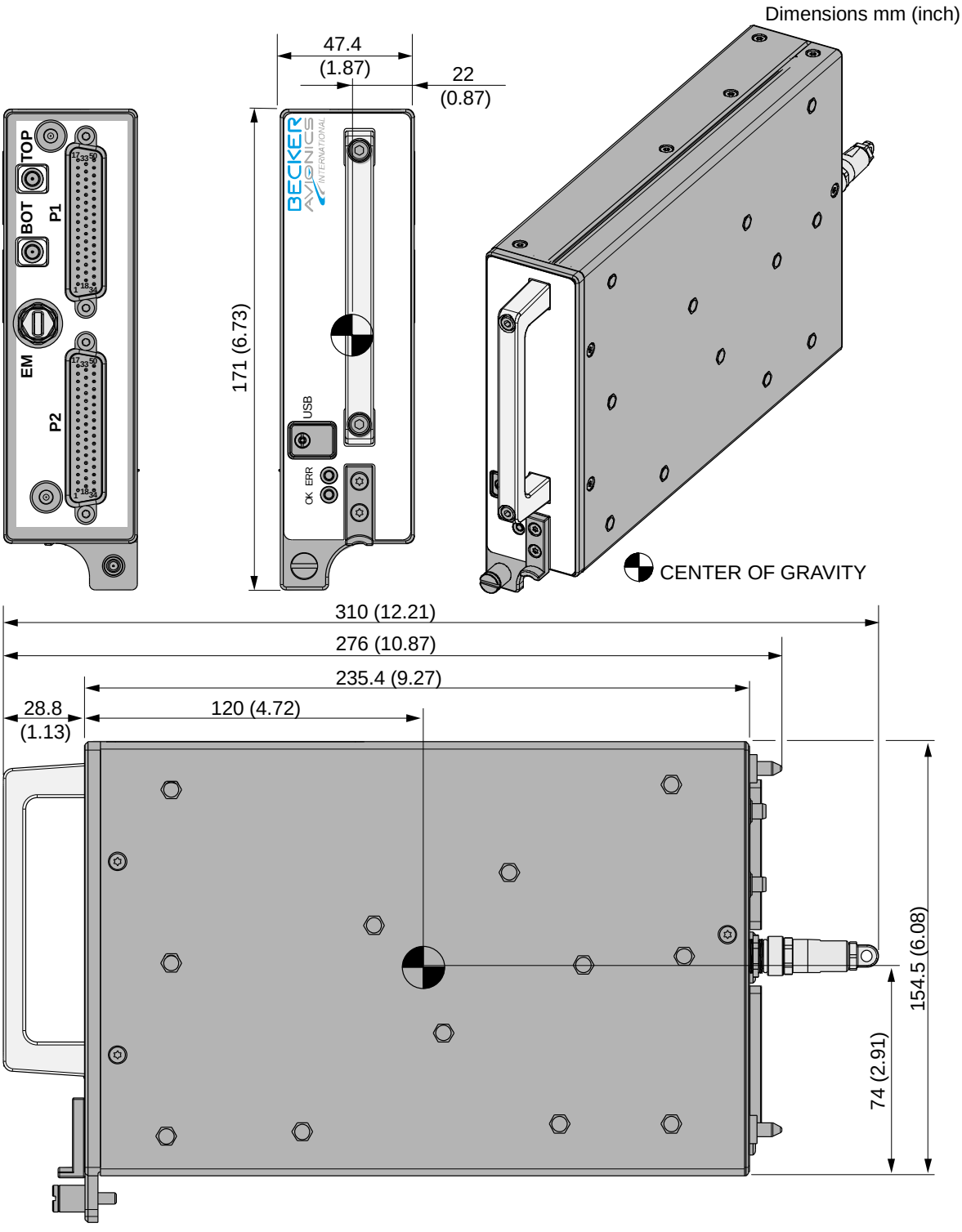

Figure 6: BXT6513-(0XX)

NOTICE "Center of Gravity" for BXT6513-(0XX) with EM module.

Allowable deviation for dimensions without tolerances: DIN ISO 2768 T1 C		
xx...6 (±0.3)	>30...120 (±0.8)	>400...1000 (±2.0)
>6...30 (±0.5)	>120...400 (±1.2)	>1000...2000 (±3.0)

2.4.2. **BXT6513-(0XX) with Mounting MT6533**

Dimensions mm (inch)

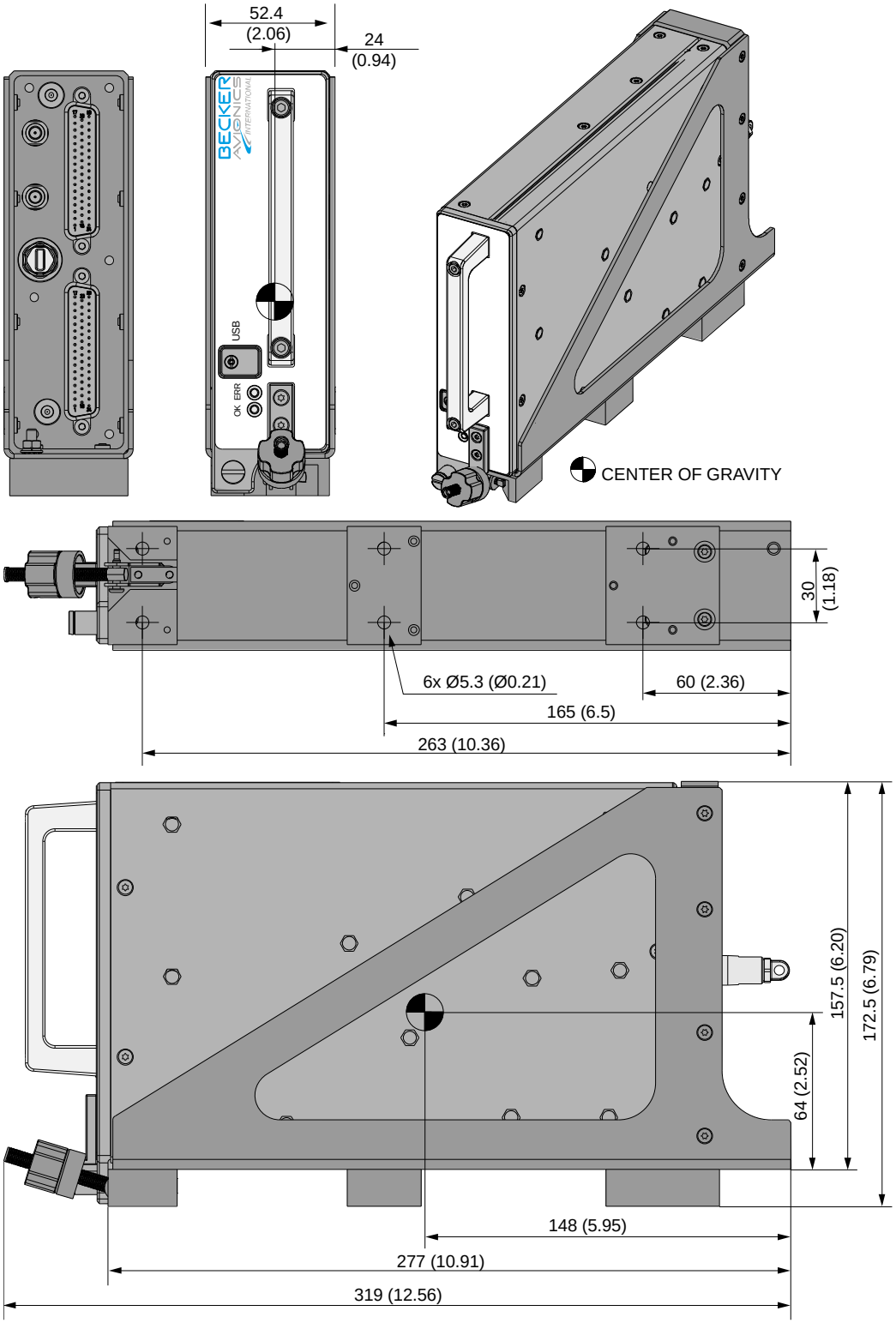

Figure 7: BXT6513-(0XX) with Mounting Tray MT6533

NOTICE "Center of Gravity" for BXT6513-(0XX) with EM module and mounting.

Allowable deviation for dimensions without tolerances: DIN ISO 2768 T1 C		
xx...6 (±0.3)	>30...120 (±0.8)	>400...1000 (±2.0)
>6...30 (±0.5)	>120...400 (±1.2)	>1000...2000 (±3.0)

2.4.3. BXT6513-(0XX) with Mounting MT6533 and Backshell BS6533

Dimensions mm (inch)

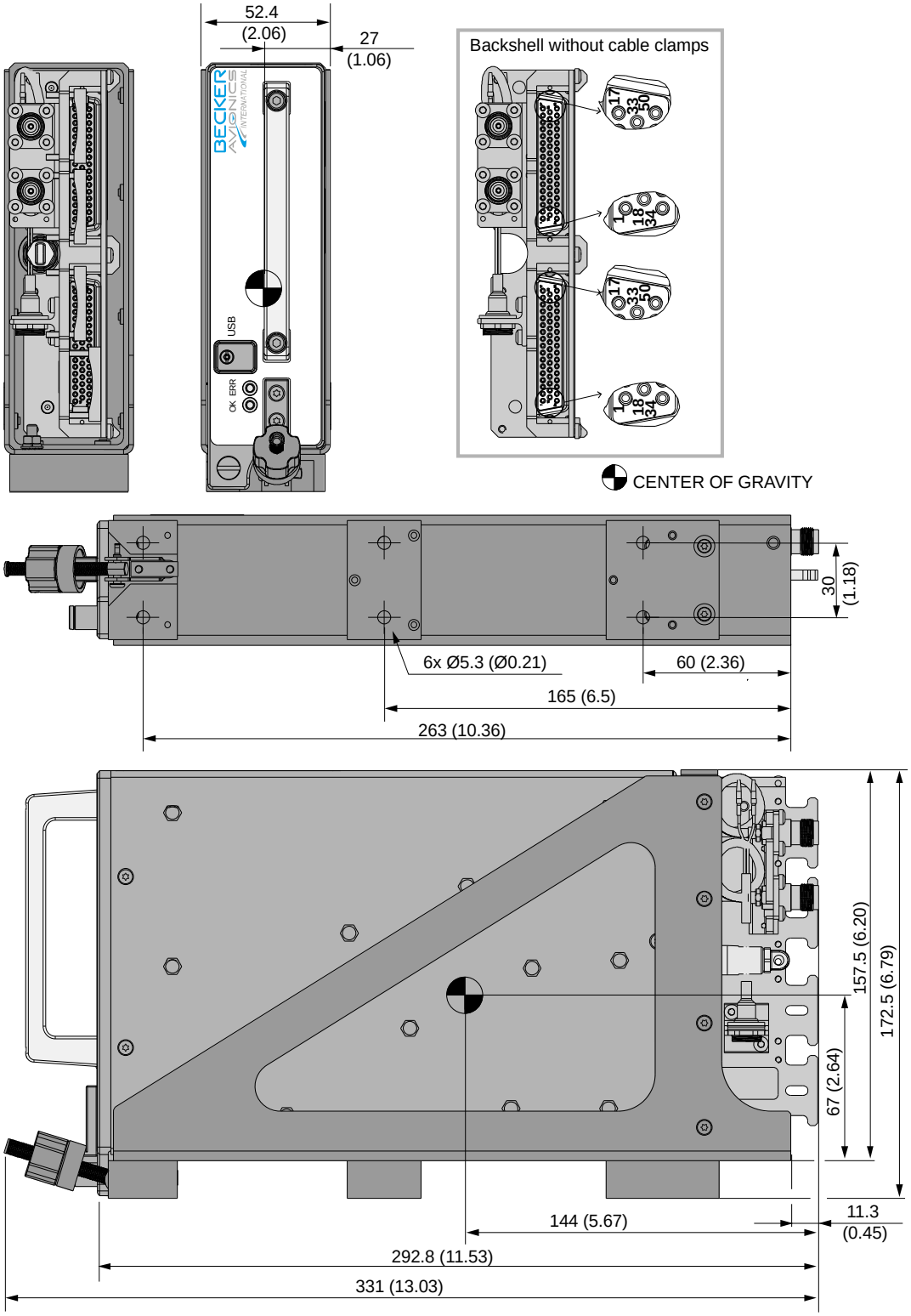

Figure 8: BXT6513-(0XX) with Mounting Tray MT6533 and Backshell BS6533

NOTICE "Center of Gravity" for BXT6513-(0XX) with EM module, mounting and backshell.

Allowable deviation for dimensions without tolerances: DIN ISO 2768 T1 C		
xx...6 (±0.3)	>30...120 (±0.8)	>400...1000 (±2.0)
>6...30 (±0.5)	>120...400 (±1.2)	>1000...2000 (±3.0)

2.5. Electrical Installation

NOTICE

For installations in a more severe electromagnetically environment use shielded cable connectors and a common shielding for the transponder interwiring.

Detailed information according electrical signals and wiring are available in ICD manual; please see “Order Code”, “Available Documentation” page 26.

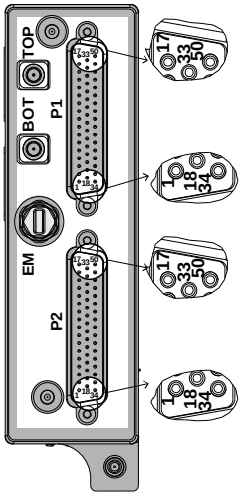

Figure 9: BXT6513-(0XX) connector layout

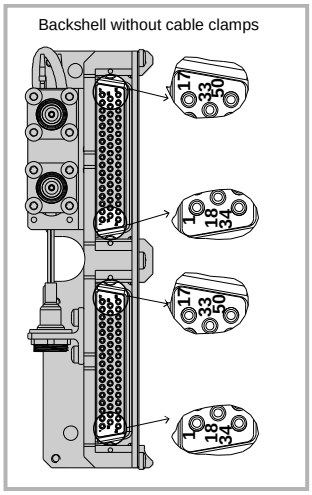

Figure 10: BS6533 connector layout (backshell)

SAFETY INSTRUCTIONS Reserved Pins shall not be connected.

2.5.1. Connector P1

P1 Pin	Signal name	Pin Name	Function	I/O	Remarks
1	CAX0B	Reserved		-	factory only
2	C4XXIB0	XPDR Control, Port A, Line B	ARINC 429	I	
3	C4XXIB1	GNSS Data, Line B	ARINC 429/RS422	I	configurable,
4	C4XXIB2	ADC/Altitude Encoder, Port A, Line B	ARINC 429/RS422	I	configurable
5	CIX2	Reserved		-	factory only
6	CIX3	XPDR Standby	Discrete	I	
7	CIX0	XPDR Reply	Discrete	O	Low active, ≈ 200 ms after every generated reply.
8	CIX1	Ident Activation	Discrete	I	Low active, < 3.5 V
9	C429IA0	FMC, Line A	ARINC 429	I	
10	C429IB0	FMC, Line B	ARINC 429	I	
11	C429IA1	Reserved		-	factory only
12	C422IN0	Time Mark, inverting	RS422	I	Line B
13	C422IP0	Time Mark, non-inverting	RS422	I	Line A
14	CSI1	Configuration Source Select	Discrete	I	data source configuration

P1 Pin	Signal name	Pin Name	Function	I/O	Remarks
15	CRDY	System Status	Discrete	O	Low active, < 1.0 V
16	PGND	Ground	Supply Return	-	
17	PGND	Ground	Supply Return	-	
18	CAX0A	Reserved		-	factory only
19	C4XXIA0	XPDR Control, Port A, Line A	ARINC 429	I	
20	C4XXIA1	GNSS Data, Line A	ARINC 429/RS422	I	configurable
21	C4XXIA2	ADC/Altitude Encoder, Port A, Line A	ARINC 429/RS422	I	configurable
22	C429XB0	XPDR Data, Port A, Line B	ARINC 429	O	
23	C429XA0	XPDR Data, Port A, Line A	ARINC 429	O	
24	GND	Ground	Signal Return	-	
25	C429XB1	Reserved		-	factory only
26	C429XA1	Reserved		-	factory only
27	C429XB2	Reserved		-	factory only
28	C429XA2	Reserved		-	factory only
29	GND	Ground	Signal Return	-	
30	CSI0	Configuration Source Selection	Discrete	I	data source configuration
31	CSI2	XPDR Source/Destination select	Discrete	I	unit number (No.1, No.2) in dual installations
32	SUPP	DC Power Supply	28 VDC aircraft power	I	
33	SUPP	DC Power Supply	28 VDC aircraft power	I	
34	C3V3	External Memory Module supply	Supply	I	
35	CSDA	External Memory Module data	Data	I/O	
36	CSCL	External Memory Module clock	Clock	O	
37	GND	Ground	Signal Return	-	
38	CCANN0	CAN Bus, Port 0	CAN	I/O	
39	CCANP0	CAN Bus, Port 0	CAN	I/O	
40	C4XXIA3	ADC/Altitude Encoder, Port B, Line A	ARINC 429/RS422	I	configurable
41	C4XXIB3	ADC/Altitude Encoder, Port B, Line B	ARINC 429/RS422	I	configurable
42	GND	Ground	Signal Return	-	
43	CSIX	Mutual Suppression	ARINC 718A	I/O	
44	CIHL0	Weight on Wheel Sensor	Discrete	I	active State configurable, (High or Low active)
45	C429IB1	Reserved		-	factory only

P1 Pin	Signal name	Pin Name	Function	I/O	Remarks
46	GND	Ground	Signal Return	-	
47	CSI3	Transmitter Test Inhibit	Discrete	I	active if strapped to GND.
48	CI10	ADC/Altitude Encoder Port Select	Discrete	I	Source selection Low = Port B High= Port A
49	CI11	Reserved		-	factory only
50	CILLI	Reserved		-	factory only

2.5.2. **Connector P2**

P2 Pin	Signal name	Pin Name	Function	I/O	Remarks
1	CAX1B	Reserved		-	factory only
2	CI9	Reserved		-	factory only
3	CIX7	Reserved		-	factory only
4	CIX6	ADS-B Function Status	Discrete	I/O	Closed = ADS-B position data receiving, (max. drain = 100 mA) Open = No valid position data available.
5	CIX4	Reserved		-	factory only
6	CIX5	Burst mode enable	Discrete	I	Low = Enabled High = Disabled
7	C429XB7	XPDR Data, Port B, Line B	ARINC 429	O	
8	C429XA7	XPDR Data, Port B, Line A	ARINC 429	O	
9	C429XB6	Reserved		-	factory only
10	C429XA6	Reserved		-	factory only
11	C429XB5	ADLP Output, Line B	ARINC 429	O	
12	C429XA5	ADLP Output, Line A	ARINC 429	O	
13	C232X	Reserved		-	factory only
14	C429XB4	Reserved		-	factory only
15	C429XA4	Reserved		-	factory only
16	C429XB3	Reserved		-	factory only
17	C429XA3	Reserved		-	factory only
18	C4XXIA4	XPDR Control, Port B, Line A	ARINC 429	I	
19	C4XXIB4	XPDR Control, Port B, Line B	ARINC 429	I	
20	C4XXIB5	XPDR Control, Port C, Line B	ARINC 429	I	
21	C4XXIB6	Reserved		-	factory only
22	CI8	XPDR Control Port Select		I	
23	C4XXIB7	Reserved		-	factory only

P2 Pin	Signal name	Pin Name	Function	I/O	Remarks
24	GND	Ground	Signal Return	-	
25	CLRXN	Ethernet Receive	10/100BASE-TX	I/O	
26	CLTXN	Ethernet Transmit	10/100BASE-TX	I/O	
27	C429IA7	Data Concentrator, Port A, Line A	ARINC 429	I/O	
28	C429IA6	Radio Altimeter/Data Concentrator, Port B, Line A	ARINC 429	I/O	configurable
29	GND	Ground	Signal Return	-	
30	C429IA5	IRS, Port A	ARINC 429	I	
31	C429IA4	Reserved		-	factory only
32	C429IA3	FCC/MCP Data, Port A	ARINC 429	I	
33	C429IA2	ADLP, Port A	ARINC 429	I	Data from ADLP
34	CAX1A	Reserved		-	factory only
35	GND	Ground	Signal Return	-	
36	C4XXIA5	XPDR Control, Port C, Line A	ARINC 429	I	
37	C4XXIA6	Reserved		-	factory only
38	CIX13	Extended Squitter Disable	Discrete	I	Low = Disabled High = Enabled
39	C4XXIA7	Reserved		-	factory only
40	CIX14	Software Update Enable	Discrete	I	High = Normal operation Low = Update enabled.
41	CLRXP	Ethernet Receive	10/100BASE-TX	I	
42	GND	Ground	Signal Return	-	
43	CLTXP	Ethernet Transmit	10/100BASE-TX	O	
44	C429IB7	Data Concentrator, Port A, Line B	ARINC 429	I/O	
45	C429IB6	Radio Altimeter/Data Concentrator, Port B, Line B	ARINC 429	I/O	configurable
46	GND	Ground	Signal Return	-	
47	C429IB5	IRS, Port B	ARINC 429	I	
48	C429IB4	Reserved		-	factory only
49	C429IB3	FCC/MCP Data, Port A	ARINC 429	I	Data from FCC/MCP
50	C429IB2	ADLP, Port B	ARINC 429	I	Data from ADLP

2.5.3. Connector TOP, BOT (Antenna)

- Type: BMA female at the rear side of the unit (transformed into TNC by the backshell BS6533).
- Antenna cable: low-loss cable.
- Signal: bi-directional

2.5.4. Connector USB

- Only for service operation
- Type: USB 2.0 Micro B
- Cable: Max. cable length: 5 m (15 ft)
- Data transfer: Bidirectional data exchange

2.5.5. Connector EM

Connection for external memory, if installed.

NOTICE

- Please mount a dust cup on EM connector (BXT rear side) if this connector is not used.

For example:

- Internal memory is used.
- External memory module EM6100 connection is done via backshell.

2.5.6. Service Connector (optional)

Becker Avionics recommend the installation of a service connector. This allows the configuration of the BXT6513-(0XX) after installation inside the aircraft.

2.5.6.1. Service connector inside the aircraft

Pinout service connector (Dsub, 9pol.) see "Figure 12: Wiring Diagram (example)" page 47.

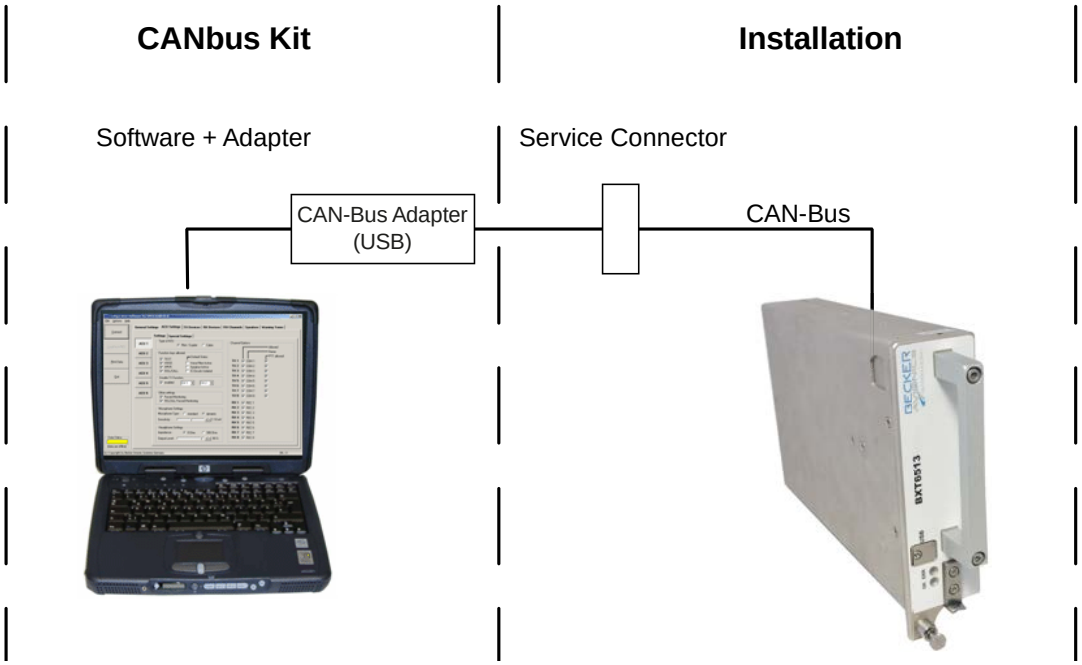

Figure 11: Service Connector inside the Aircraft

2.6. Interfaces

2.6.1. ARINC 429 Input Labels

Parameter	Label
XPDR control	016 or 031
Selected altitude	102
GNSS track angle	103
GNSS latitude	110
GNSS longitude	111
GNSS ground speed	112
GNSS latitude fine	120
GNSS longitude fine	121
GNSS horizontal integrity limit	130
GNSS vertical figure of merit	136
UTC fine	140
UTC	150
Radio altitude	164
GNSS vertical velocity	165
North-south velocity	166
East-west velocity	174
Altitude	203
Mach number	205
Indicated airspeed	206
True airspeed	210
Altitude rate	212
Flight ID	233…237 or 360
Baro correction	234
GNSS horizontal figure of merit	247
Ground speed	312
True track angle	313
True heading	314
Magnetic heading	320
Roll angle	325
Track angle rate	335
Inertial vertical velocity	365
GNSS altitude, HAE	370

2.6.2. ARINC 429 Output Labels

Parameter	Label
XPDR control	016 or 031
Flight ID	233…237
Mode S address	275, 276
Maintenance	350, 353, 354
GA equipment identification	371
Equipment identification	377

2.7. Unit Configuration

The figure "General Architecture (example)", page 47 shows an example of a single unit installation including:

- Power supply without separate switch,
- Configuration from internal memory,
- Single ADC conformant to ARINC 706,
- FMC,
- ADLP,
- GNSS sensor conformant to ARINC 743A,
- Weight-on-wheels switch, active low,
- Indicators for system status and transponder reply,
- Standby switch,
- Dual antenna (Diversity).
- Service Connector (optional).

Relevant configuration settings:

Configuration	Set to
Air Data Source Configuration	Single
Air Data Format and Resolution	ARINC 429
Air Data Port A Selection	Dedicated port
Ground Sensor Enable	Enable, active low
XPDR Control Port A Selection	Dedicated port
TCAS Interface Enable	Disable
ADLP Interface Enable	Enable
FMC Input Selection	Dedicated port
GNSS Receiver Input Selection	Dedicated port
GNSS Data Format	ARINC 743A

2.7.1. General Architecture (example)

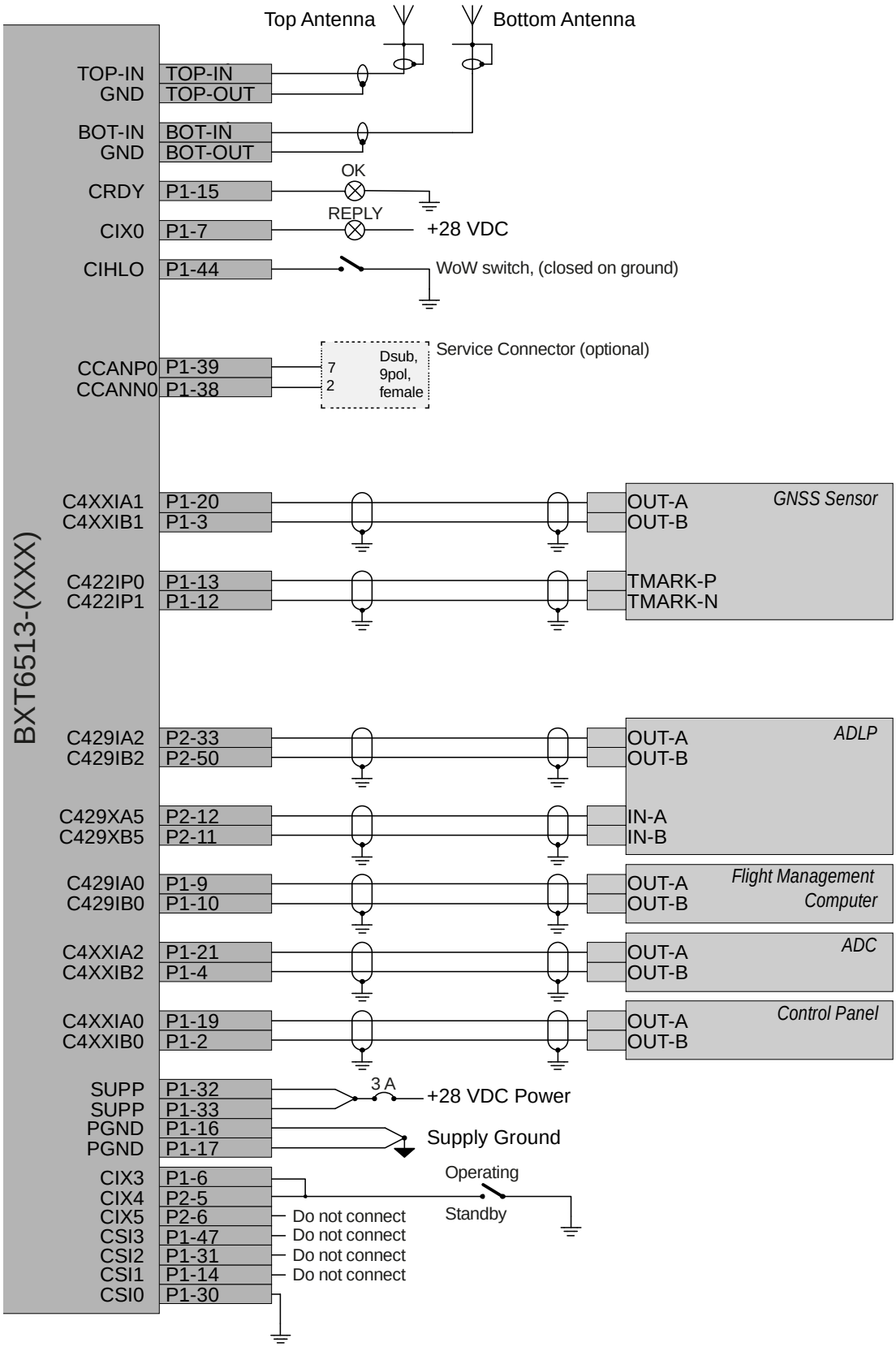

Figure 12: Wiring Diagram (example)

NOTICE Detailed information about wiring is available in ICD manual; please see “Order Code”, “Available Documentation” page 26.

2.7.2. **Single Unit Installation**

Electrical connections:

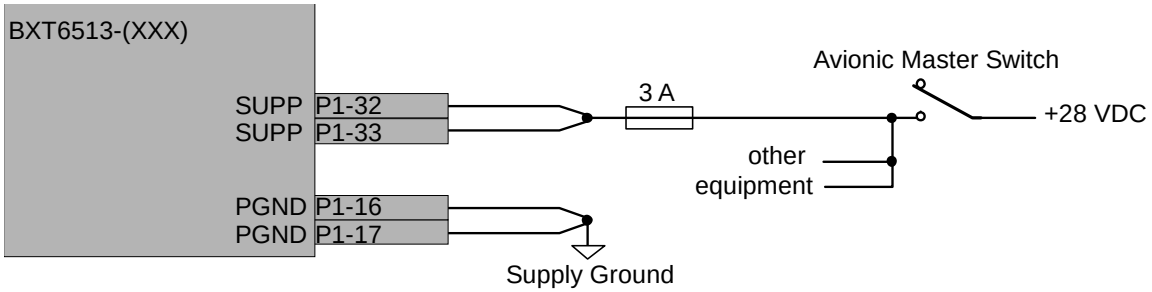

Figure 13: Single Unit Installation

2.7.3. **Dual Unit Installation**

Electrical connections:

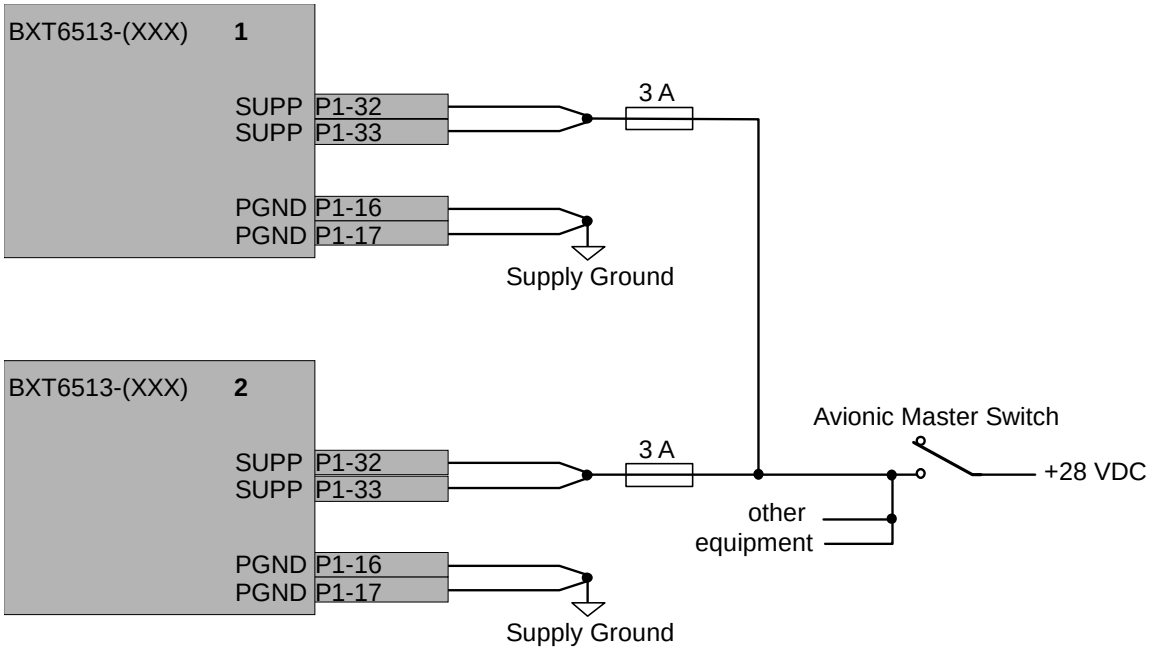

Figure 14: Dual Unit Installation

2.7.4. **Unit Installation Number**

In a single unit installation set the installation number to 1.

In a dual unit installation set the installation number for one unit to 1 and for the other unit to 2.

Unit installation number	**unit 1**	**unit 2**
P1 pin31	do not connect	GND

2.7.5. **Data Source Configuration**

Select the data source:

Data source	**Internal memory**	**External memory**
P1 pin14	do not connect	GND
P1 pin30	GND	do not connect

2.7.5.1. External Memory Module

External memory interface signals are available at P1 connector and EM connector.

If the External Memory module EM6100 is used as configuration data source the mechanical installation is as per description:

- Backshell installation
  (fix the EM6100 module to the pre-assembled connector at the back shell. Please note, use a cable connection as short as practical but not longer than 150 mm).

NOTICE Do not install two External Memory modules at same unit. The External Memory module must always be installed when it is defined as configuration data source (see "Data Source Configuration", page 48.

NOTICE In dual unit installations with External Memory module as a configuration data source, each unit needs its own External Memory module.

In case of dual unit installation, it is the responsibility of the installer to provide correlated data to each unit.
Please make sure that configuration data of both units match to the aircraft and installation. Aircraft properties include:

- Mode S address
- Maximum airspeed
- Aircraft registration
- Aircraft category
- Length and width code

Electrical connections:

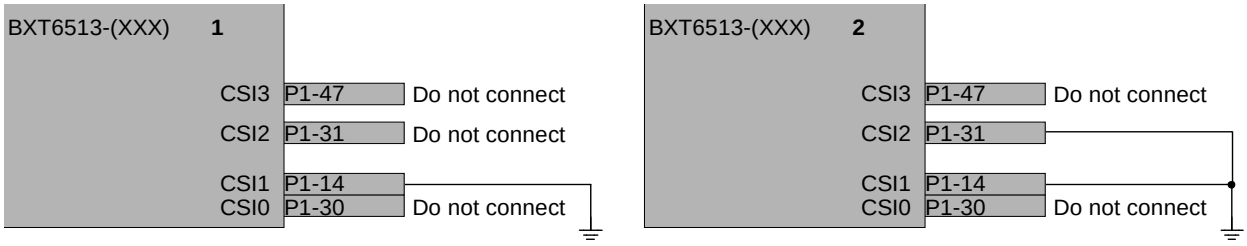

Figure 15: Dual Unit Installation, Data Source = External Memory Module

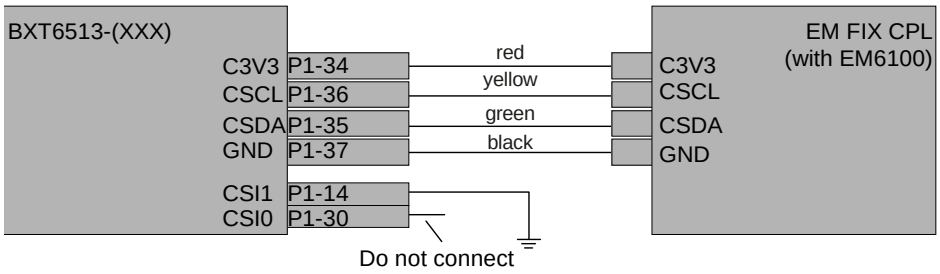

Figure 16: External Memory Module via Backshell

2.7.5.2. **Internal Memory**

Electrical connections:

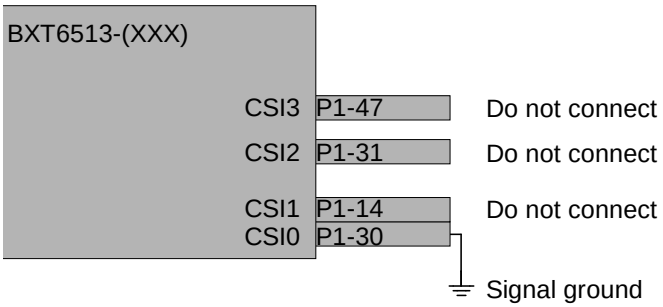

Figure 17: Single Unit Installation, Data Source = Internal Memory

2.7.6. **Single Unit Installation - Antenna Diversity**

Electrical connections:

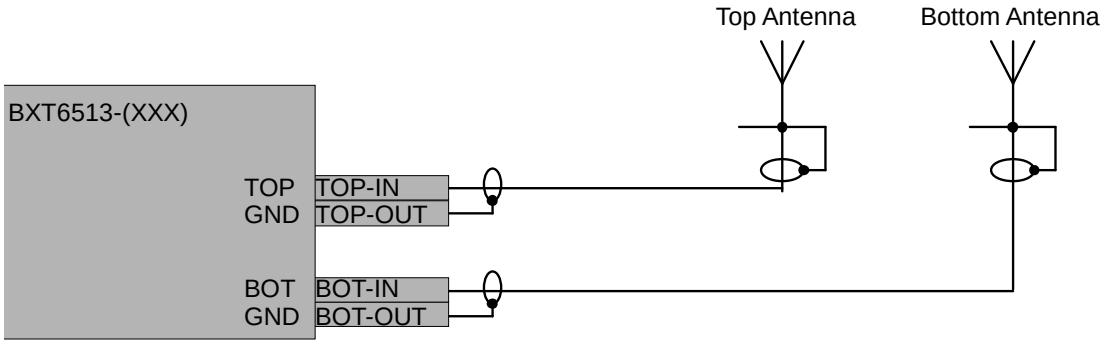

Figure 18: Single Unit Installation - Antenna Diversity

2.7.7. **Dual Unit Installation - Antenna Diversity**

Electrical connections:

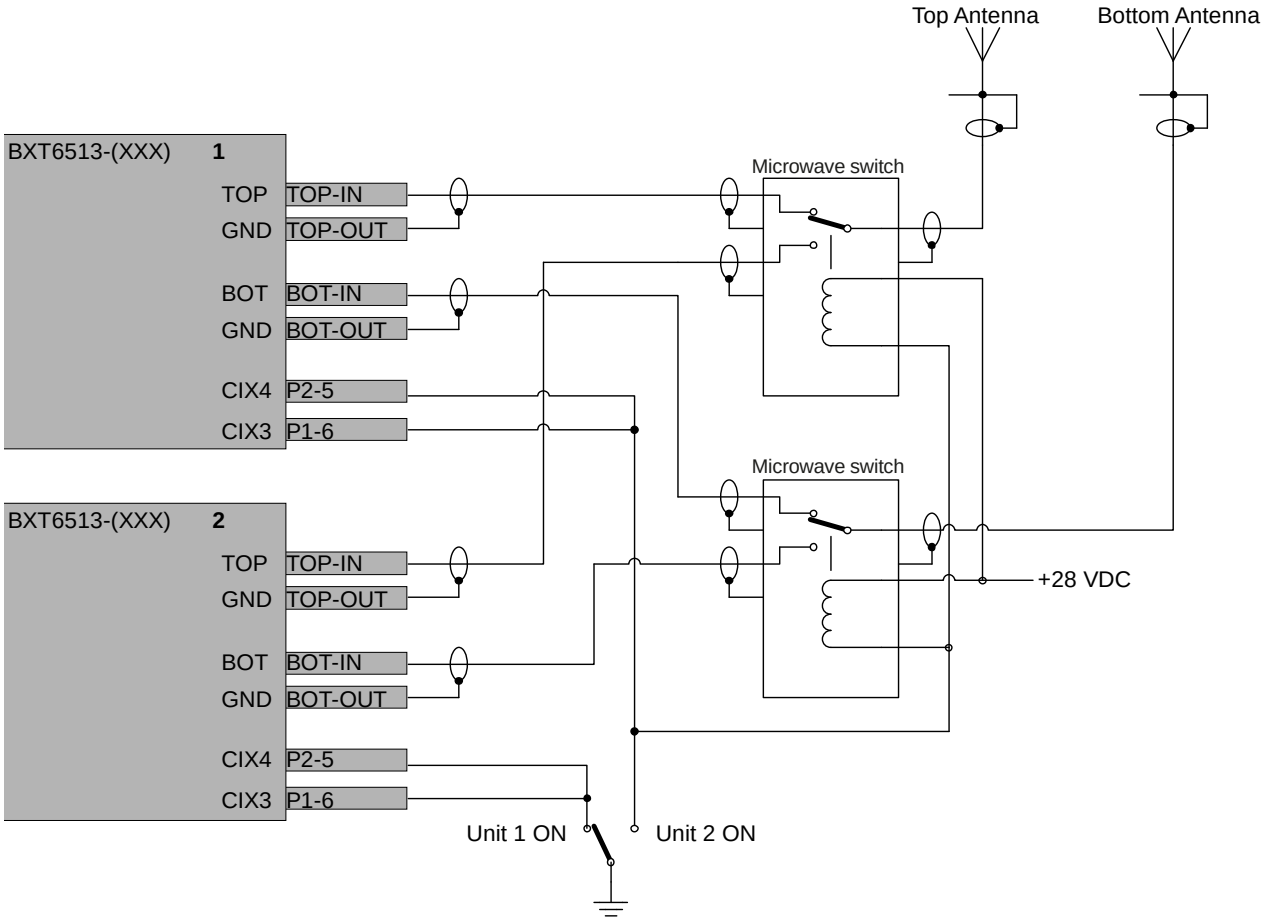

Figure 19: Dual Unit Installation - Antenna Diversity

2.7.8. **Single Unit Installation – Single Controller**

Relevant configuration settings:

Option	Set to
XPDR Control Port A Selection	Dedicated Port

Electrical connections:

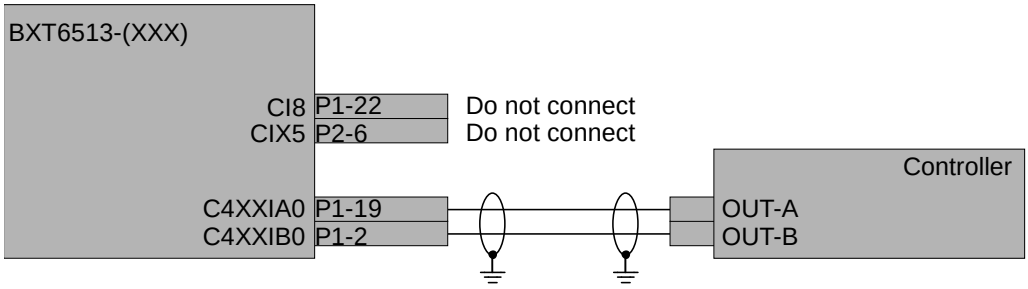

Figure 20: Single Unit Installation - Single Controller

2.7.9. **Single Unit Installation – Dual Controller**

Relevant configuration settings:

Option	Set to
XPDR Control Port A Selection	Dedicated Port
XPDR Control Port B Selection	Dedicated Port

Electrical connections:

With open switch, Controller 1 controls the transponder function.
With closed switch, Controller 2 controls the transponder function.

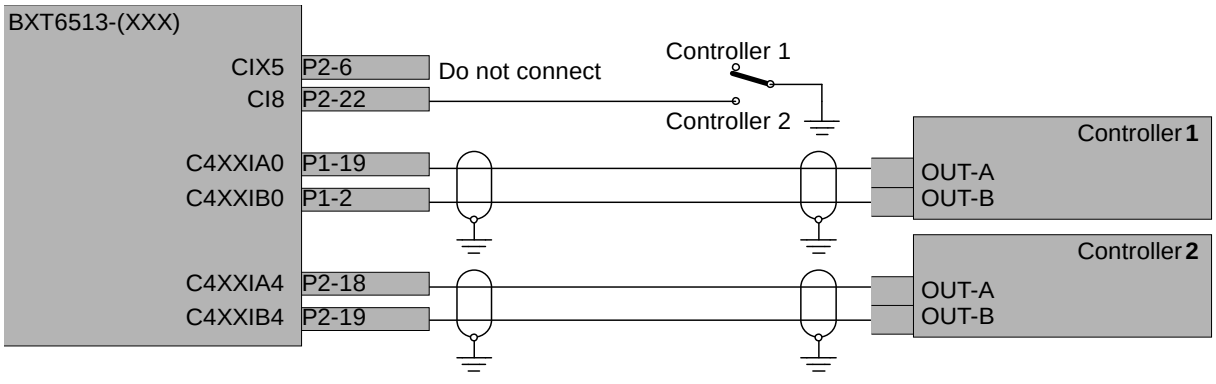

Figure 21: Single Unit Installation – Dual Controller

2.7.10. **Burst Mode - Single Unit Installation**

The burst mode allows for up to three sources to control the transponder operation. The selection of the active source is dynamic. The operation in burst mode depends on “XPDR Burst Mode Control” option.

Relevant configuration settings:

Option	Set to
XPDR Control Port A Selection	Dedicated Port
XPDR Control Port B Selection	Dedicated Port

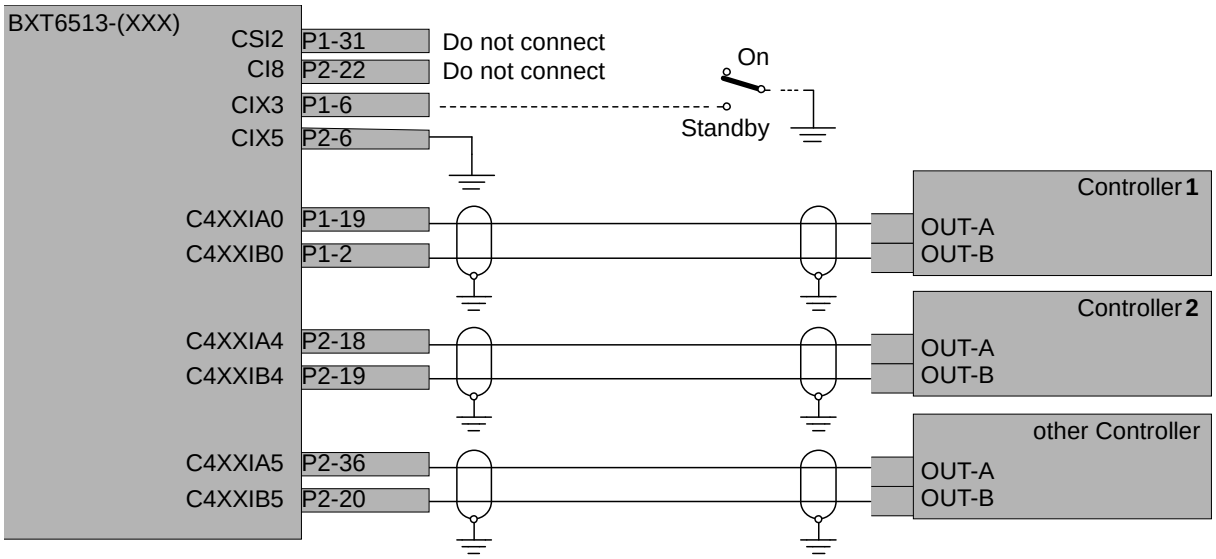

Figure 22: Single Unit Installation – Dual Controller

2.7.11. **Transmitter Disable**

This input is relevant for several tests during shop maintenance.

Leave this input open in all installations.

Relevant configuration settings:

	Operation		Remarks
P1 pin47	enable	do not connect	Normal configuration
P1 pin47	disabled	GND	No transmissions from equipment – for tests only

2.8. Configuration Data

The BXT6513-(0XX) must be configured with the characteristic aircraft data.

The BXT6513-(0XX) configuration is stored in a non-volatile memory.

There are two possibilities where to store or load configuration data (see "Data Source Configuration" page 48):

- Usage of the internal memory or
- Usage of an external memory module.

NOTICE

- We recommend the usage of the External Memory module EM6100 as data source.

SAFETY INSTRUCTIONS

- The usage of the internal memory as configuration data storage can only be approved when customers have and maintain an own data base memory.
  - It is a condition to store the current configuration data in the customer data base memory.

2.8.1. Configuration of BXT6513-(0XX) with EM module

The configuration parameters of the BXT6513-(0XX) with EM module can be set via two ways:

- CANbus interface at BXT6513-(0XX) to program EM6100 which is connected to BXT6513-(0XX) via "CANbus Kit".
- Program EM6100 by PC directly via "EMP Kit".

Detailed information are available in "EMP Extended Memory Programmer User Manual" and "ARINC 826 Data Loader Manual", please see “Order Code”, “Available Documentation” page 26.

2.8.2. Configuration of BXT6513-(0XX) with internal memory

SAFETY INSTRUCTIONS

- The usage of the internal memory as configuration data storage can only be approved when customers have and maintain an own data base memory.
  - It is a condition to store the current configuration data in the customer data base memory.
- In case the internal memory is used a service connector needs to be placed at a suitable place inside the aircraft to be able to configure the device without removing it.

Detailed information are available in "EMP Extended Memory Programmer User Manual" and "ARINC 826 Data Loader Manual", please see “Order Code”, “Available Documentation” page 26.

For wiring example - service connection - see also "Figure 23: Software update – Aircraft Installation" page 55.

2.9. Software Update

The BXT6513-(0XX) provides an interface for Field Loadable Software (FLS). This interface enables in-field loading of equipment software and unit configuration.

Details in "FLS Manual" (Field Loadable Software); please see “Order Code”, “Available Documentation” page 26.

SAFETY INSTRUCTIONS

- A software update may be carried out only by authorized aircraft maintenance personnel.
- Aircraft maintenance personnel are responsible for proper marking of performed changes.
- After update procedure the ID plates on the BXT6513-(100) have to be changed.

NOTICE Information about software and configurable hardware versions are available via maintenance USB connector (for details refer ICD manual chapter "Configurable items identification”).

2.9.1. PC Requirements

- MS Vista SP2 or newer with installed .NET Framework 4.5.
- ARINC 665 Data Loader application
  (recommended ARINC 826 Data Loader version 3.6.34.0 or higher available on request).
- CAN interface - PCAN USB
  (details how to install PCAN USB interface see http://www.peak-system.com).

Windows Vista, Windows .NET Framework are trademarks of Microsoft Corporation.

2.9.2. Software Update Installation

2.9.2.1. Software Update – Aircraft Installation

The BXT6513-(0XX) software update can be done without removing equipment from installation.

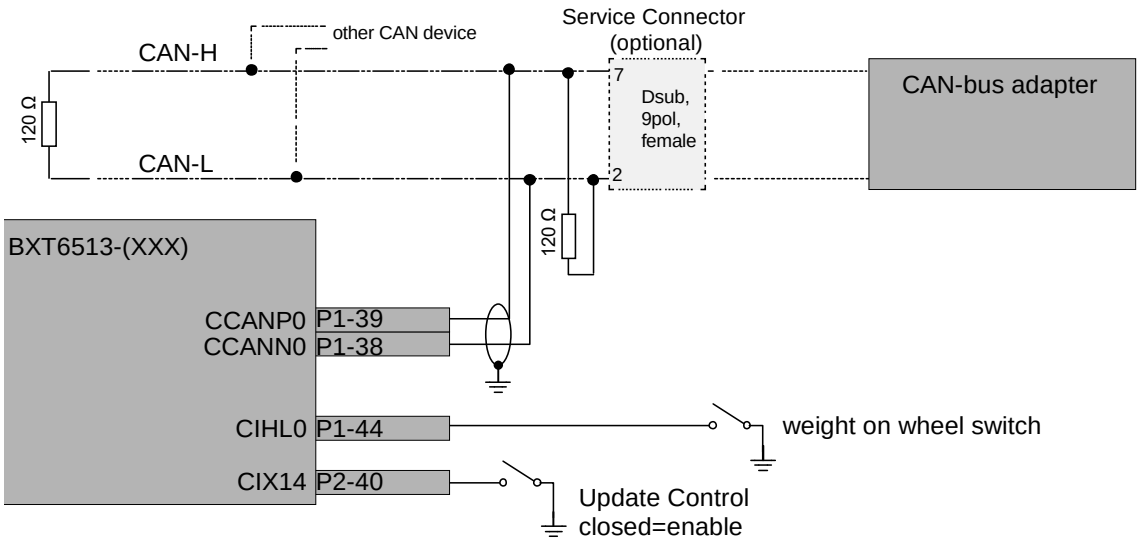

Figure 23: Software update – Aircraft Installation

Note: If only one BXT6513 +one PC with cable length < 2 m is used, the topology without 120 Ω resistor may be used, see "Figure 24: Software update – Laboratory Installation" page 56.

2.9.2.2. Software Update – Laboratory Installation

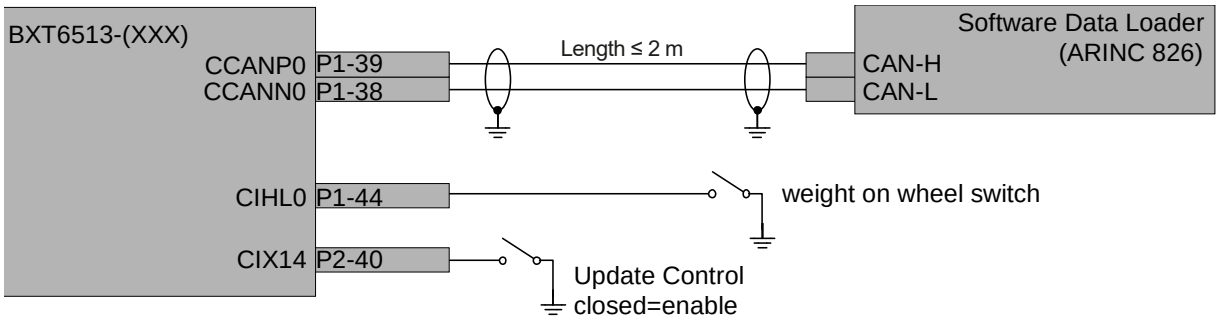

Figure 24: Software update – Laboratory Installation

- Detailed information about required equipment, wiring, FLS interface and update procedure in "ICD Manual (Interface Control Document)".
- It is recommended as a minimum to perform “Mode S ground test (for details see "Mode S Ground Test", page 58).

Details in "FLS Manual" (Field Loadable Software); please see “Order Code”, “Available Documentation” page 26.

The equipment enables Field Loadable Software (FLS) only at power-on when following conditions are provided:

- FLS function enable input is active.
- If "weight-on-wheels" input is enabled in equipment configuration and it reports "on-the-ground" state.

NOTICE When in-field loading of software is enabled, the equipment does not perform normal operations.

Details in "FLS Manual" (Field Loadable Software); please see “Order Code”, “Available Documentation” page 26.

2.10. Aircraft Wiring

SAFETY INSTRUCTIONS Installation of the unit varies according to aircraft and equipment design. It is therefore only possible to provide general guidelines in this section.

See "General Architecture (example)", page 47.

2.11. Post Installation Check

NOTICE It is assumed that the installation and configuration has been done before the "Post Installation Check" will be carried out.

Once the unit is installed completely a test procedure to verify system functionality. Ensure compliance with authority required procedures. Refer to the installation order of the minor change document or use an own approved test protocol. The following text provides guidance for such tests.

2.11.1. Mechanical Installation and Wiring Check

- Verify all cables are securely fixed and shields connected properly to signal ground.
- Check the movement of aircraft controls to verify there is no interference.
- Verify all screws are tight, check if all connections are mechanically secured.

2.11.2. Power Supply

- Check the power supply lines and confirm correct polarity. Don´t apply reverse voltage!
- Confirm that the aircraft power supply is within the specified limits, with and without a running engine.

2.11.3. Antenna Check

- Applying portable reflectometer or network analyzer measure the voltage standing wave ratio (VSWR) at the transponder end of antenna aircraft installation.
- The measured VSWR at frequencies 1030MHz and 1090MHz shall not exceed 1.5:1.

2.11.4. **Interference Check**

- Check the unit while engine is running and powered on all other avionics/ electrical systems on the aircraft, to verify that no significant interference exists.
- Check also that the unit does not cause significant interference with other systems.

The installer´s standard test procedure may use for the interference check and the following table can be taken as a reference. Depending on the individual avionic systems installed in the aircraft, it might be necessary to extend the following checklist accordingly.

Aircraft System	**Function**	
	OK	**NOT OK**
DME		
Audio		
Generators / Inverters		
GPS System		
Compass 1		
ADF		
VHF / NAV 1 all channels		
VHF / NAV 2 all channels		
Marker Beacon		
Motor(s)		
Engine Instruments		
Storm scope		
Transponder		
Air Data Computer		
Autopilot and Servos		

For the remaining avionic equipment repeat all interference checks during a flight and include all equipment not previously checked out on ground.

2.11.5. **Mode S Ground Test**

After successful completion of the previously described post installation checks perform a Mode S ground test. (Refer to FAR 43 Appendix F or EASA CS-ACNS). The part 145 company approved test protocol shall finally be used.

An experienced test setup configuration shall also be arranged, otherwise refer to the user instruction of your specific test equipment.

2.11.6. **Error / Failure Indication**

It is possible to read out and reset error flags for details contact Becker Avionics Customer Service.

Error / Failure List for details contact Becker Avionics Customer Service.

3. Operating Instructions

In this chapter you can read about:

3.1. Device Description

BXT6513-(0XX) is a remote controlled unit, which does not include a control panel. It can receive commands and provides data through a set of interfaces.

3.1.1. Device Assignment

This manual is valid for the following devices:

- See page 30

3.1.2. Packing, Transport, Storage

- See page 29

3.1.3. Scope of Delivery

- See page 30

3.1.4. Type Plate

- See page 31

3.2. Start-up

3.2.1. Built In Tests (BIT)

BXT6513-(0XX) has advanced Built-In-Test. It monitors most of internal circuits against failures. In addition BIT monitors some external (installation) conditions to increase reliability. There are three types of BIT implemented:

- PBIT (performed after Power ON the unit).
  The test routine PBIT checks:
  - System integrity,
  - Software integrity,
- IBIT (initiated by special command via serial protocol).
  The test routine IBIT checks:
  - Transmitter operation
- CBIT (which continuously check operation).
  The test routine CBIT checks:
  - Reply transmissions,
  - Squitter transmissions,
  - Transponder receivers operation,
  - Interfaces operation,
  - System integrity,
  - Equipment temperature,
  - Internal voltages.

3.3. Operating

3.3.1. Operating with OEM Controller

For detailed information please refer to the manual of the connected respective OEM product.

3.4. Read Out and Reset Error Flags

It is possible to read out and reset error flags.

Read out with:

- Connected OEM product,
  for detailed information please refer to the manual of the respective connected OEM product.

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4. Index

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