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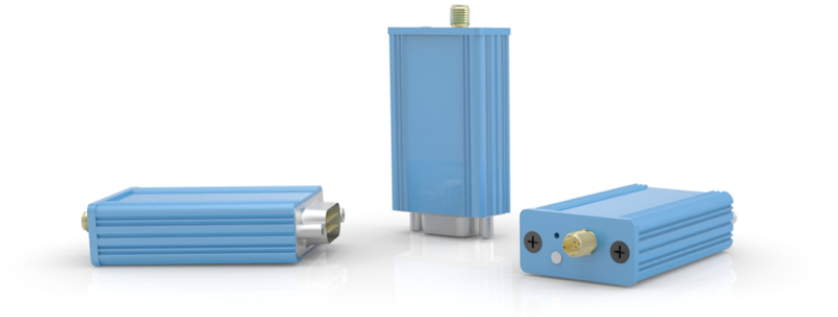

TRX-1000

Pilot's and Installation Manual

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Notes

General Information

IMPORTANT!

Please read this manual carefully before installing or operating the device!

Pay attention to the restrictions on use!

This manual is an essential part of the device and must be kept in a safe place!

Document identification / revision status

This manual supports the following product types:

- P/N B105-001 "TRX-1000"

Actual version: **TRX-1000 Pilot's and Installation Manual • 18.B105.1-1.1-EN, Version 1.1**

Version history

REV	Date	Status	Author	Changes	Approved
0.1	JUL 13	prerelease	MF	Initial Doc Creation	-
0.9	OCT 13	release candidate	MF	Major Edits	-
1.0	JAN 14	release	MF	Minor Refinements	-
1.1	MAR 14	release	MF	Minor Refinements	-

Contents

1 Information about TRX-1000

1.1 General System Description

TRX-1000 is a compact, lightweight and rugged ADS-B receiver. TRX-1000 receives ADS-B 1090 traffic data and transmits them through its integrated RS-232 Interface to CDTIs (Cockpit Display of Traffic Information) or other systems capable of displaying traffic data. Currently well over 50 systems from many leading manufacturers are compatible.
TRX-1000 features one central Power/Data connector (D-SUB 9) and a standard SMA antenna connector including a small quarter-wave 1090MHz antenna. TRX-1000 is supplied by a DC source in the range of 5V to 32V and typically consumes less than 250mA. It can be easily installed in many places inside the aircraft, remote antenna options with cables are available.

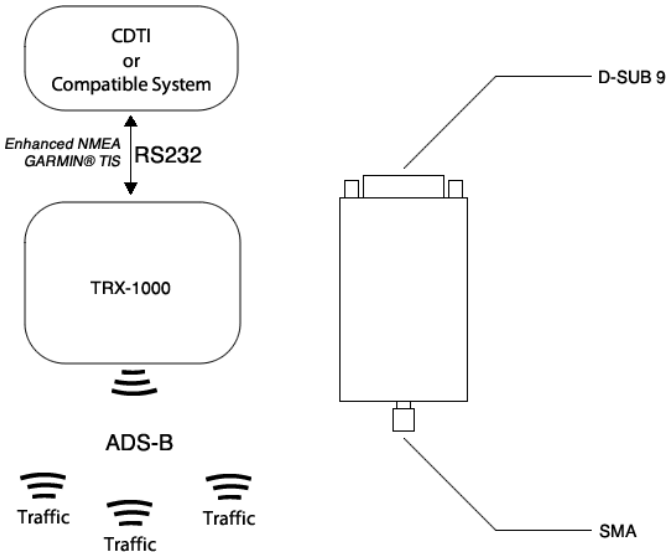

Figure 1: System Diagram

1.2 Mechanical Dimensions

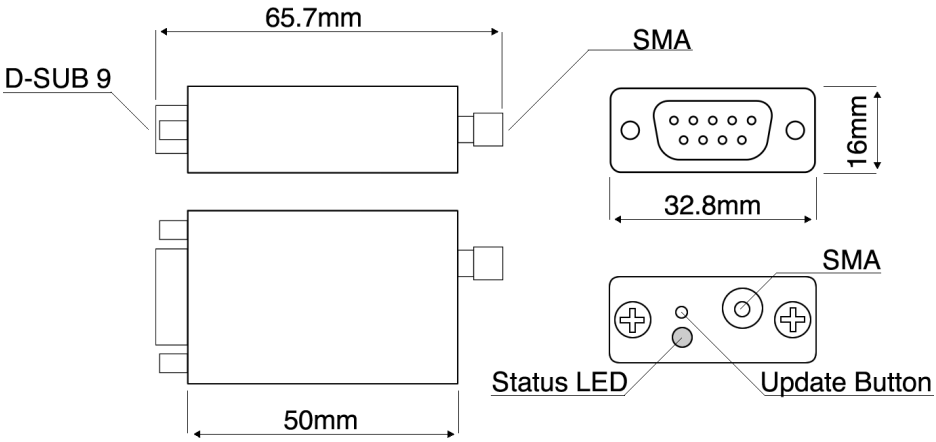

Figure 2: Mechanical Dimensions

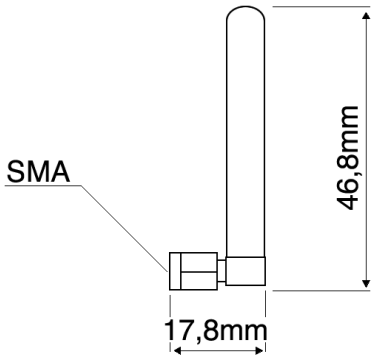

Figure 3: Mechanical Dimensions Antenna

1.3 Status LED

TRX-1000 features a single, blue status LED that gives information about system status.

LED Status	System Status
OFF	system not running
permanently ON	system fault, reset after 20 seconds
blinking long with short pause	system waiting for GPS Data
blinking short with long pause	system in normal operation
short double blink	no data connection

2 General Information

2.1 Safety instructions and restrictions on use

Installation and operation must be on the basis of non-interference with and no hazard to the existing suite of other equipment necessary for safe flying operation, or installed to comply with official requirements. Installation and operation must comply with official regulations and requirements.

The pilot is ultimately responsible for all flight decisions and for operating the aircraft safely at all times. For situational awareness only!

Never make safety critical decisions based on transferred information.

TRX-1000 does not have a ETSO or FAA-TSO airworthiness certification. Make sure that it is legal to install it in your aircraft.

2.2 Included Parts and Accessories

2.2.1 Delivery Part List

The following parts are contained in each TRX-1000 delivery.

Item	Partnumber	Description
TRX-1000	B105-001	TRX-1000 main unit
D-SUB 9 Cable	B105-002	Standard D-SUB 9 cable with open ends
Short 90° Antenna	B105-002	90° ADS-B 1090MHz antenna for direct connection to TRX-1000
Documentation	-	Printed user and installation documentation

2.2.2 Available Accessories

The following parts may be ordered directly from AIR Avionics or from authorized dealers.

Item	Ordernumber	Description
Remote dipole antenna	1.0.0.0005	Antenna with 1.5m cable for remote installation (rsSMA to SMA adapter required)
Wire for individual wiring	see AIR-Store	MIL27500 Spec Tefzel® wire
Connection Kit	see AIR-Store	Connection kit for GARMIN®,FLARM® and Display Installations
GARMIN 695 Cable	see AIR-Store	Connection cable for GARMIN® 695 GPS
GARMIN 496 Cable	see AIR-Store	Connection cable for GARMIN® 695 GPS

GARMIN 795 Cable	see Store	AIR-	Connection cable for GARMIN® 695 GPS
GARMIN AERA 500 Cable	see Store	AIR-	Connection cable for GARMIN® 695 GPS

To order accessories, visit www.air-store.eu

2.3 Intellectual Property and Liability

Butterfly Avionics GmbH will not be liable for errors/changes/omissions in this document - specifications are subject to change without notice. Butterfly Avionics its associates, development team, suppliers, manufacturers and data suppliers accept no responsibility for any damage or claims that may arise from use of TRX-1000.

Trademarks referred to in this document are the property of their respective holders. Any decompiling, disassembly, reverse engineering, or modification of the instrument or firmware are strictly prohibited without specific written permission from Butterfly Avionics GmbH.

2.4 Support

2.4.1 World

To get support, please contact your local authorized AIR Avionics dealer.

2.4.2 Europe

Please contact us via eMail or Phone. Find more information on www.airavionics.aero or +49 (0) 6224 82 83 87 0

3 Installation

3.1 Electrical Installation

3.1.1 Wiring

The electrical installation has to be undertaken according to the guidelines and regulations applicable to the specific aircraft type. When uncertain as to how to perform any aspect of the installation, you should consult with an aeronautical engineer or an aircraft maintenance facility. In all cases the installation is to be performed only with expert advice in accordance with this guidance.

A voltage supply with a current limiting safety device must be secured, to cut the power in the event of an overload in the voltage supply. The safety device must be marked clearly, e.g. "TRX-1000".

TRX-1000 is powered through Pins 5 (GND) and 7 (DC-in) of its D-SUB 9 connector. Please make sure to carefully comply with the power requirements of the device.
The use of aviation grade wires is recommended. Please consult the aircrafts maintenance documentation for information on required wire specifications.

Cable fires are a common and dangerous cause of flight accidents. Never use cables/wires that are not suitable for use in aircraft.

3.1.2 Power Consumption and Requirements

Item	Value
Input Voltage Range	5V to 32V DC
Recommended Fusing	2.0A CB
Typical Power Consumption	200mA at 12V DC
Power Requirements	$<$3W at 12V DC

Take care that the power supplied has correct polarity, otherwise damage to the device may occur.

3.2 Mechanical Installation

Aircraft instruments, controls and safety features such as canopy jettison or emergency exit must never be disturbed by the way TRX-1000 is installed.

Secure all cables! Connected cables must be fixated closely to the unit. Vibration may cause damage to TRX-1000 or connected devices if cables are not secured.

3.2.1 Main Unit

TRX-1000 may be installed inside the aircrafts instrument compartment or in any other suitable area. Cables must not be cracked or installed under tension. Adequate space must be left for the

cable connectors. TRX-1000 should be located at least 30cm away from the magnetic compass.

The metallic housing is not watertight and users should avoid the ingress of solid particles and liquids. Should the unit get moist, it must be completely dried prior to further use. If the unit becomes wet, it may be permanently damaged and rendered unusable. Should the unit be suddenly cooled this may result in the formation of condensation.

Temperature is the main influence factor on aging and limited reliability of aircraft electronics. Although TRX-1000 does not require active cooling it is recommended that the unit is installed in a position with exposure to fresh air.

> ***Depending on system load and input voltage the enclosure of the unit may exceed temperatures of 80C. Make sure TRX-1000 is not installed next to heat sensitive parts of your aircraft.***

3.2.2 Antenna

Correct antenna installation is a crucial factor regarding overall system performance of the integrated ADS.B receiver. Always carefully comply with the following basic rules for antenna installation.

- Antennas are vertically polarized. Always install the antenna aligned vertically
- Conductive parts shield received signals. Make sure there is no conductive material between the antenna and the outside world
- Make sure there is a minimum distance of 2m/6ft from the antenna to any 1090MHz aircraft Antenna like e.g. DME or Transponder Antennas

> *If you are unfamiliar with antenna installations, please consult an expert.*

4 Interfacing and Configuration

4.1 Main Power and Data Connector

TRX-1000 features one central D-SUB 9 connector for power and data. Included in delivery is a D-SUB 9 cable with open, color-coded ends.

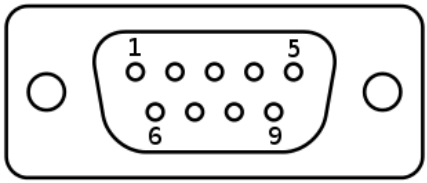

Figure 4: Main D-SUB 9 Power/Data connector

Pin D-SUB 9	Signal/Purpose	Color
1	Do not connect!	brown
2	RS232 RX2, DATA IN - NMEA IN (9600Bd)	red
3	RS232 TX2, DATA OUT - GARMIN® TIS® (9600Bd)	orange
4	Do not connect!	yellow
5	GND - main ground (minus)	green
6	Do not connect!	blue
7	DC IN - main power supply (plus)	purple
8	RS232 TX1, DATA OUT - FLARM® compatible Display (19200Bd)	grey
9	RS232 RX1, DATA IN - FLARM®-Device (19200Bd)	white

Aditional Adapter Cables, Y-Splitters are available at AIR Store: www.air-store.aero

4.2 RS232 Interfaces and Compatibility

TRX-1000 is compatible to aircraft systems that accept traffic data in the FLARM® enhanced NMEA or the GARMIN® TIS® protocol. TRX-1000 interfaces via the TIA-232-F (”RS232”) standard. TRX-1000 features bidirectional communication. Traffic data received via RS232 (FLARM® enhanced NMEA protocol only) is combined/multiplexed with received ADS-B Traffic data and sent out to compatible aircraft systems in the FLARM® enhanced NMEA or the GARMIN® TIS® protocol.

In high traffic situations that exceed the current RS-232 interface bandwidth, it is possible that not all received targets are transferred (from TRX-1000 to connected systems). Traffic information may be omitted!

4.2.1 Compatible Aircraft Systems

Butterfly Avionics has tested the following third party systems for compatibility. All Butterfly branded systems are compatible.

Manufacturer	Unit	Data Protocol
LXNav, LX-Navigation, Ediatec, SwissBat, Butterfly	FLARM compatible Displays	Enhanced NMEA
LXNav, Cambridge, Butterfly, LX-Navigation	Glide Computers	Enhanced NMEA
SkyDemon, Butterfly Apps, SkyMap, WinPilot	iOS and Android Apps	Butterfly Connect
GARMIN	GARMIN GPS devices (e.g. AERA,795,G3X, 496, 695)	GARMIN TIS

4.2.2 Data Channels and Baudrates

TRX-1000 features four independent data channels with predefined, non-configurable use and datarates. Depending on system configuration some channels may be left unused, yet always one data input channel must be connected to an appropriate datasource.

TRX-1000 does not work without a connected NMEA Datasource (either RX1 or RX2 must be used).

Channel	PIN	Use	Datarate
RX1	9	Data input from FLARM® Compatible Device	19200Bd
RX 2	2	Data input from NMEA GPS Datasource	9600Bd
TX 1	8	Data output to FLARM® Compatible Display Devices	19200Bd
TX 2	3	Data output to GARMIN® TIS® compatible Devices	9600Bd

5 Cabling

5.1 Standard Cabling

TRX-1000 comes with a standard D-SUB-9 Cable with one side of bare, color-coded wires. For a detailed pinout and wire colors, please refer to the section *Main Power and Data Connector* of this manual.

> ***If you are unfamiliar with aircraft wiring/cabling, consult experienced personnel or use the* TRX-1000 Connection Kit**

> *A special TRX-1000 Connection Kit for easy solder-free connection of compatible devices is available. Also other special interface cables allowing for plug-and-play operation are available. Cables and accessories can be purchased online at www.air-store.eu*

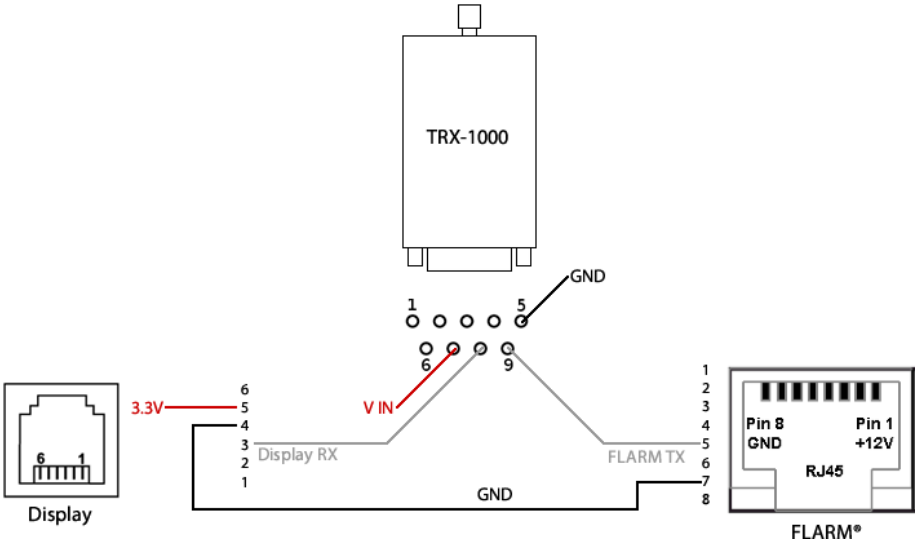

Figure 5: Example wiring with FLARM, Display and TRX-1000.

> ***When using TRX-1000, do not connect display TX (data send) line to FLARM RX (data receive) lines.***

5.2 Cabling with TRX-1000 Connection Kit

For easier installation a special connection kit for use with standard RJ45 Connectors is available for purchase at AIR-Store or authorized resellers. The TRX-1000 Connection Kit features four

RJ45 connectors with dedicated use and comes with a preconfigured connection cable to TRX-1000 (with an RJ45 Connector).

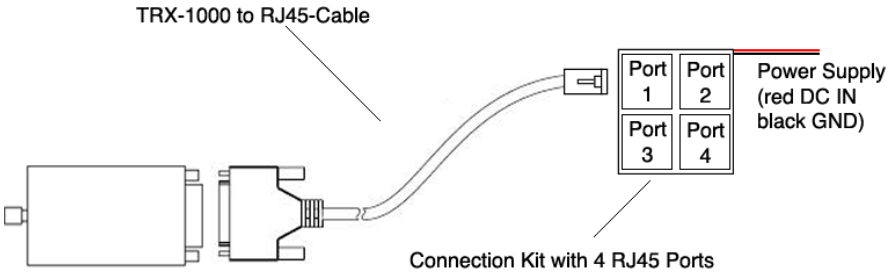

Figure 6: TRX-1000 Connection Kit

The included power supply wires are used to supply TRX-1000 and connected subsystems with power. Make sure to always comply to input voltage ranges of all connected devices. Permanent damage is possible.

5.2.1 Pinout of RJ45 Connectors

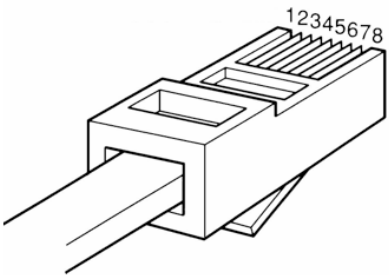

Figure 7: RJ45 Connector Pinout (pin-numbers of mating connector and RJ45 jack are identical)

PIN	PORT1 (TRX-1000)	PORT2 (FLARM)	PORT3 (GARMIN)	PORT4 (Display)
1	GND	GND	GND	GND
2	GND	GND	GND	GND
3	TX1 (NMEA OUT)	RX1 (FLARM IN)	TX2	do not connect

4	RX1 (FLARM IN)	do not connect	RX2	TX1 (NMEA OUT)
5	RX2 (NMEA IN)	GND	GND	GND
6	TX2 (TIS OUT)	3V DC - Input	3V DC Output	3V DC Output
7	VDC (e.g. 12V)	VDC (e.g. 12V)	VDC (e.g. 12V)	VDC (e.g. 12V)
8	VDC (e.g. 12V)	VDC (e.g. 12V)	VDC (e.g. 12V)	VDC (e.g. 12V)

3V DC output is intended as powersupply for FLARM® compatible displays and only available with a connected FLARM®-compatible device that has a 3V output.

5.2.2 Example Setup

The following example shows how to connect systems using the connection kit.

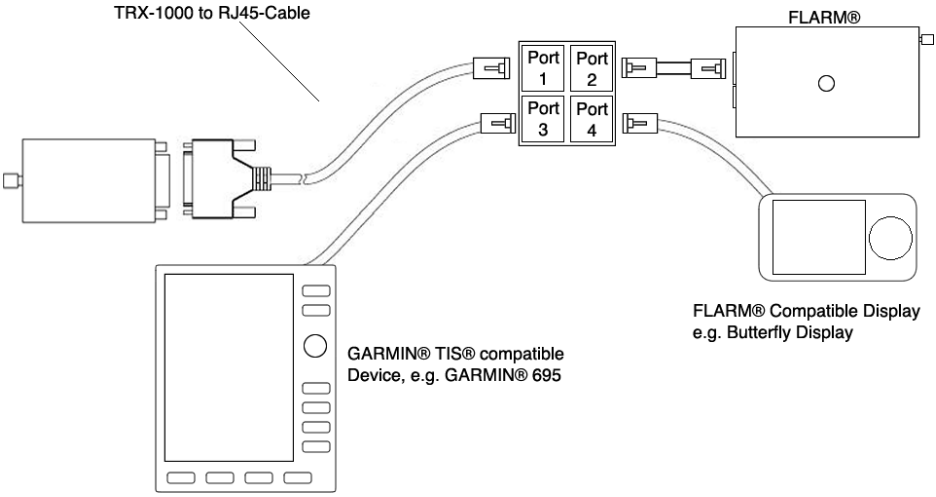

Figure 8: FLARM®-Compatible System, TRX-1000 and GARMIN TIS Capable Device + FLARM Compatible Display

6 Updates and Maintenance

Never fly with damaged equipment. If you discover damages or abnormal behavior, disconnect TRX-1000 from power and clearly mark the device as inoperative. Consult an expert or call AIR Avionics support.

6.1 Checks and Maintenance

6.1.1 Before every flight

Check if display devices (FLARM® or GARMIN®) receive traffic data. If possible check status LED and make sure TRX-1000 operates normally

6.1.2 Once in a year or every 100h of use

- TRX-1000 installations shall be carefully inspected for correct installation and for vibration caused damages on connectors or cabling.
- Check receiving range of all connected traffic units and TRX-1000. Document range.

6.1.3 Maintenance

TRX-1000 has no user-serviceable parts inside our outside of the unit. It requires no maintenance.

Never open the enclosure, damage to the device may occur. ESD sensitive!

6.2 Firmware Updates

TRX-1000 Firmware is field updateable. In order to update TRX-1000, a special Update-cable and a PC is required. Currently there are no software updates or cables officially available.

Notes