



# Butterfly Displays

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## User- and Installation Manual

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Datum: 24/07/2013

# 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 B101 / B102 "Butterfly Display"

Actual version: **Butterfly Displays User- and Installation Manual • 18.101102.1-1.1-EN, Version 1.1**

### Version history

Revision	Date	Status	Author	Changes	Approved
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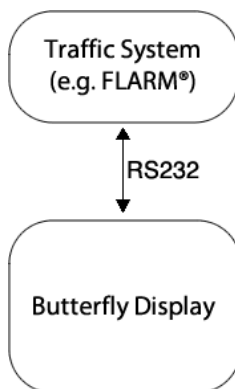
# 1 General

## 1.1 System Description

Butterfly Displays are small and affordable Cockpit Displays for Traffic Information (CDTI).

Butterfly Displays display traffic data from FLARM<sup>®</sup>, PowerFLARM<sup>®</sup> or ADS-B traffic receivers. Comprehensive position and danger-level information on dangerous traffic is given. Additionally soaring-tactical informations are displayed.

Butterfly Displays feature a sunlight readable transfective TFT display with 2" screen size. Two housing versions, 57mm panelmount or external display, are available. Butterfly Displays give audible alerts through integrated warning sounders.



**Figure 1:** Typical Installation

## 2 Safety, Liability and Support

### 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! Restrictions of connected Collision Warning Units (CWU) apply.***

***Never make safety critical decisions based on displayed information.***

***Butterfly Displays do not have an ETSO or FAA-TSO airworthiness certification. Make sure that it is legal to install it in your aircraft.***

***Do not use Butterfly Displays if pilot-workload is increased by failure of Butterfly Displays or attached subsystems.***

### 2.2 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 Butterfly Vario.

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.

### 2.3 Support

#### 2.3.1 World

To get support, please contact your local authorized Butterfly dealer.

#### 2.3.2 Europe

Please contact us via eMail or Phone. Find more information on [www.butterfly.aero](http://www.butterfly.aero) or +49 (0) 6224 82 83 87 0

## 3 Hardware

### 3.1 Delivered parts and Accessories

#### 3.1.1 Delivered Parts

The following parts are contained in every Butterfly Display delivery.

Item	Part Number	Description
Butterfly Display	B101 or B102	Butterfly Display main unit
RJ12 cable	-	cable RJ12, FLARM-standard
Installation material	-	4 screws for mounting the device
Short Documentation	-	Printed short manual

#### 3.1.2 Accessories

Following accessories can be obtained from Butterfly or authorized dealers.

Item	Part Number	Description
RAM-Mount for Butterfly Display external version	6.1.2.0002	Robust RAM-Mount system
Reduction 80mm/57mm	27.1.0.0001	Reduction from 80mm to 57mm panel cutout
Updatecable	1.1.0.0008	Cable for software updates

Visit [www.air-store.eu](http://www.air-store.eu) to order accessories.

## 3.2 Hardware-Types

### 3.2.1 Hardware-Types

Two types of Butterfly Displays with identical functionality are available. A 57mm panelmount type and an external type. The following table shows all currently available hardware types.

Hardware Type	Partnumber /Version	Sold from	rotary-knobs	Housing
57mm Panelmount	B102 / 2	März 2010	2, concentric	Aluminium, powder-coated
57mm Panelmount	B102 / 2.1	August 2012	1	Aluminium, powder-coated
externals unit	B101 / 3	April 2011	1	Aluminium, powder-coated





**Figure 2:** Hardware Versionen: B102 Version 2 / B102 Version 2.1 / B101 Version 3

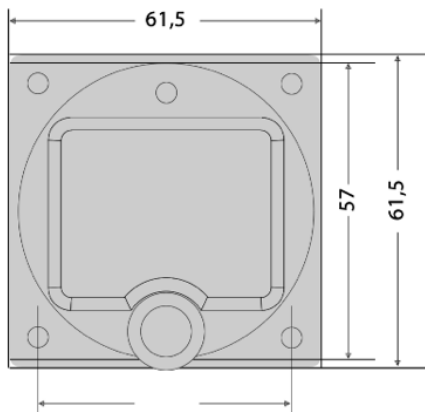
### 3.2.2 Discontinued hardware-types

The following table shows old, no longer sold hardware types/versions.

Hardware Typ	Teilenummer /Version	Verkauft ab	rotary-knobs	Gehäuse
57mm Panelmount	B102 / 1	November 2007	2, concentric	plastic
57mm Panelmount	B102 / 1.1	June 2008	2, concentric	plastic
externals unit	B101 / 1	November 2007	2, concentric	plastic
externals unit	B101 / 2	June 2008	2, concentric	plastic

### 3.3 Dimensions

#### 3.3.1 Dimensions 57mm panelmount



*Dimensions in [mm]*

**Figure 3:** Mechanical Dimensions 57mm panelmount

### 3.3.2 Dimensions external unit

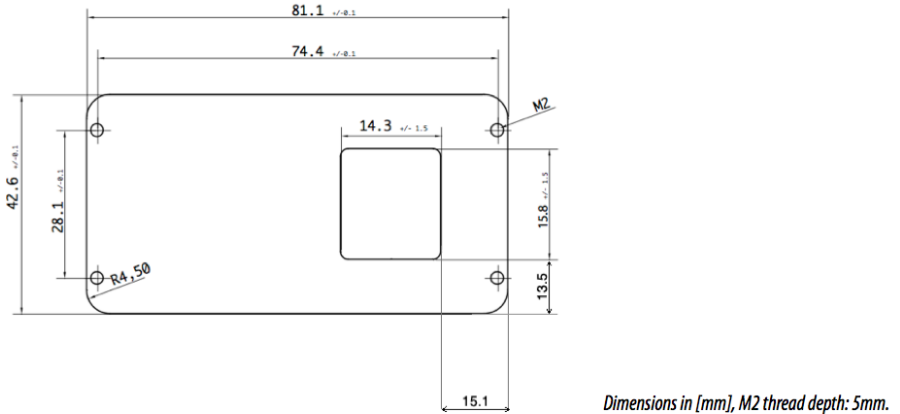


Figure 4: Mechanical Dimensions external unit

## 3.4 Connector and cabling

### 3.4.1 Power and Data Connector

Butterfly Displays feature one central connector für power and Data with FLARM-Display standard (RJ12) pinout.

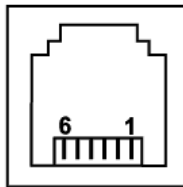


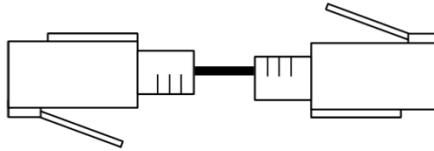
Figure 5: RJ12 Power/Data Connector

Pin Number RJ12	Signal/Purpose
1	not used
2	RS232 TX - Display sends data
3	RS232 RX - Display receives data

4	GND - Ground (minus)
5	3.0V to 3.3V (Power supply)
6	not used

### 3.4.2 RJ12 cable

An RJ12 to RJ12 Patchcable is included in delivery.



**Figure 6:** RJ12 cable

*Additional cables are available directly from Butterfly at [www.air-store.eu](http://www.air-store.eu)*

***Butterfly Displays have a supply voltage range of 3.0 to 3.3VDC. Higher voltages permanently destroy Butterfly Displays. All FLARM<sup>®</sup>-compatible units (FLARM, Power-FLARM, TRX) supply Butterfly Displays with the required voltage.***

## 3.5 Technical data

### 3.5.1 Power supply and consumption

Input voltage range	3.0V bis 3.3V DC
Recommended Fuse	0.3A CB (only when supplied externally).
Typical power consumption	45mA at 3.3V DC
Typical energy consumption	<0.2W at 3.3V DC

### 3.5.2 Environmental Conditions

Vibration	moderate vibration
Operating temperature	-20C to +70C

*Additional information about environmental criteria after RTCA DO-160(G) on request*

## 4 Installation

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.

### 4.1 Cabling

***When installing Butterfly Display cables, make sure to comply with basic rules of cabling in aircraft regarding to EMI minimization. Wrong routing may disturb critical systems like e.g. the aircrafts radio system.***

Butterfly Displays are directly supplied using the RJ12 connector. Make sure that all requirements regarding power supply are being met. Using aviation grade certified wires is recommended.

***Never flex or crack cables.***

***Wrong polarity will permanently destroy the device.***

***It is very important that the cable is fixated closely to the display so that no force or vibration can be applied to the display connector. The cable may only be shortened by experts.***

### 4.2 Mechanical Installation

***Make sure that the mechanical installation does not interfere with control movement or emergency procedures . Especially canopy jettison/release must not be constrained.***

Butterfly Displays can be installed in the area of the instrument panel of the aircraft. Plan sufficient space for connecting/disconnecting the main power/data cable. Butterfly Displays have to be installed at least in a distance of 30cm to magnetical compasses.

The enclosure is not watertight. The ingress of solid particles or liquids is to be strictly avoided. If the unit gets moist, dry it before further use. If the unit gets wet, please consult an expert / repair facility to adequately clean the unit before further use.

***Butterfly Displays do not contain a security glass front. Mechanical force applied to the display will destroy the display.***

#### 4.2.1 Installation of the 57mm panelmount version

The device is installed in standard-57mm-panel cutout (2.25") and fixated with four M3 DIN7985 screws (included in delivery).

After installation of the main unit, the supplied rotary knobs have to be checked/installed and the power/data cable is connected.

#### 4.2.2 Installation of the external version

The external display may either be fixated with the supplied M2 screws, with DualLock® tape (not included in delivery) or with mounts (see accessories list). Screen direction and thus installation direction can be modified in 90deg steps.

After installation of the main unit, the power/data cable is connected.

#### 4.2.3 Viewing angle and readability

When installing your display make sure that the viewing angle is as straight as possible. Readability largely depends on the viewing angle.

*Polaroid sunglasses may reduce display luminance depending on polarization and screen direction.*

*Butterfly Display external: The display screen direction can be rotated 90deg-wise for optimal installation. Not only "landscape" but also "portait-mode" is possible.*

## 5 Communication and connection to traffic systems

### 5.1 RS232 interface and compatibility

Butterfly Displays are compatible to systems, that transmit data via TIA-232-F ("RS232") standards using the FLARM-NMEA-Protocol. Butterfly Displays may communicate bidirectionally.

#### 5.1.1 data-rate of RS232 Interface

The data-rate of the RS232-interface is variable. Butterfly Displays automatically adjust to the used data-rate. The minimum data-rate is 19200Bd, the maximum data-rate 57600Bd.

#### 5.1.2 Compatible Systems

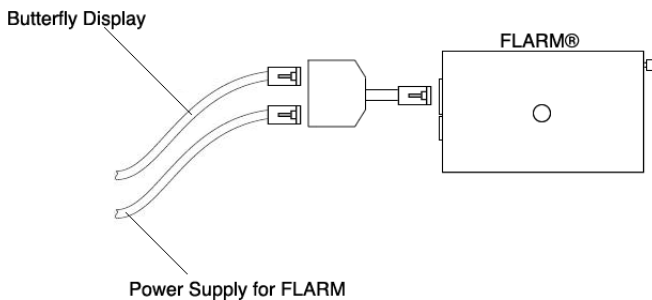
All FLARM®-compatible devices are compatible. A not complete list of the most common devices is shown in the following table.

Manufacturer	Device
FLARM Technology	FLARM®, PowerFLARM®
Garrecht Avionik	All TRX-Systems, TRX-1500, TRX-1500A, TRX-2000, TRX1090
LxNav, LX Navigation	All LX-FLARM Systems, LX glide computer with integrated FLARM®-Module
Ediatec	ECW-100

## 5.2 Examples of connections to traffic systems

### 5.2.1 Classic FLARM® devices

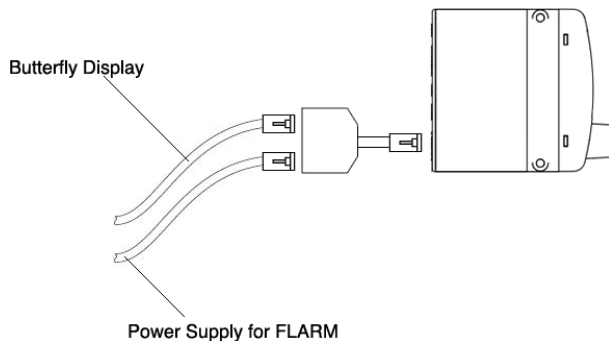
Connect the Butterfly Display via an Y-Adapter to the „Power/Data“-Port of classic FLARM®-devices.



**Figure 7:** Classic FLARM® connected via Y-Adapter

### 5.2.2 PowerFLARM<sup>®</sup> devices

Connect Butterfly Displays to the RJ45-connector of the PowerFLARM<sup>®</sup>-device. RJ45 to RJ12 cables are available at [www.air-store.eu](http://www.air-store.eu). If you supply your PowerFLARM<sup>®</sup> over the same connector, use a Y-Adapter or a connection power set available at [www.air-store.eu](http://www.air-store.eu) as well.

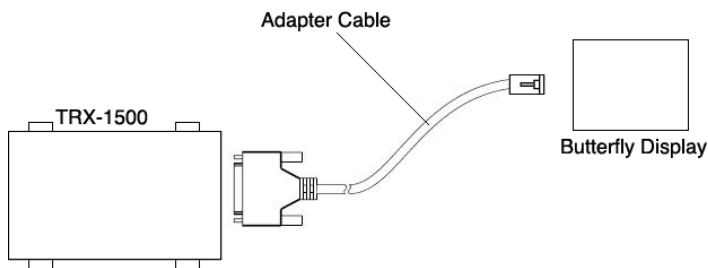


**Figure 8:** PowerFLARM<sup>®</sup> connection via Y-Adapter

### 5.2.3 TRX-devices

Butterfly Displays can be directly connected to TRX-1090 or TRX-2000 devices on Port 2 (RJ45). RJ45 to RJ12 cables are available at [www.air-store.eu](http://www.air-store.eu).

For connection to TRX1500 devices a special adapter-cable is required. This cable is available as well from Butterfly at [www.air-store.eu](http://www.air-store.eu).



**Figure 9:** TRX-1500 Connection via adapter cable

## 6 Operation and Controls

### 6.1 Controls

Butterfly Displays are controlled with a rotary-knob with an integrated push-button.

#### 6.1.1 Controls of different hardware-types and -versions

Hardware types	Partnumber /Version	Sold from	rotary-knobs
57mm Panelmount	B102 / 2	March 2010	two, concentric
57mm Panelmount	B102 / 2.1	August 2012	one
externals unit	B101 / 3	April 2011	one



**Figure 10:** Different Hardware: B102 Version 2 / B102 Version 2.1 / B101 Version 3

### 6.2 Operation

#### 6.2.1 Possible user actions for hardware with one single rotary knob

Element	Action	Function
rotary-knob	rotate	Selection of traffic-target or menu item
rotary-knob and pushbutton	push, hold and simultaneously Rotate	Zoom / Display page selection
Push-Button	short push (shorter than 1 second)	Execute a menu item, enter detail-view of traffic-target
Push-Button	long push (longer than 2 seconds)	Open and close the menu

#### 6.2.2 Possible user actions for hardware with two concentric rotary knobs

Element	Action	Function
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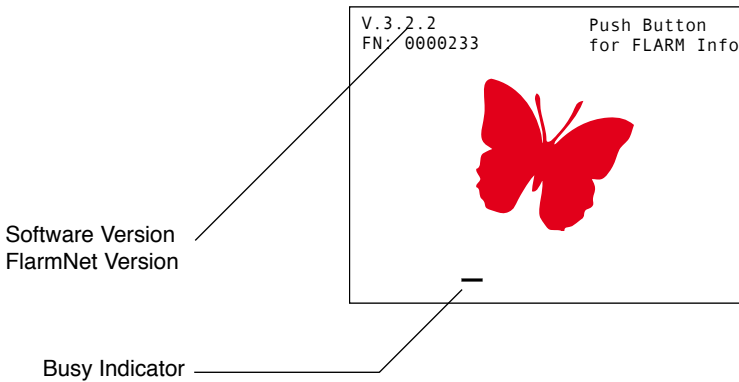


small rotary-knob	rotate	Selection of traffic-target or menu item
big rotary-knob	rotate	Zoom / Display page selection
Push-Button	short push (shorter than 1 second)	Execute a menu item, enter detail-view of traffic-target
Push-Button	long push (longer than 2 seconds)	Open and close the menu

### 6.3 Boot-process and first use

#### 6.3.1 Switching the unit on / boot process

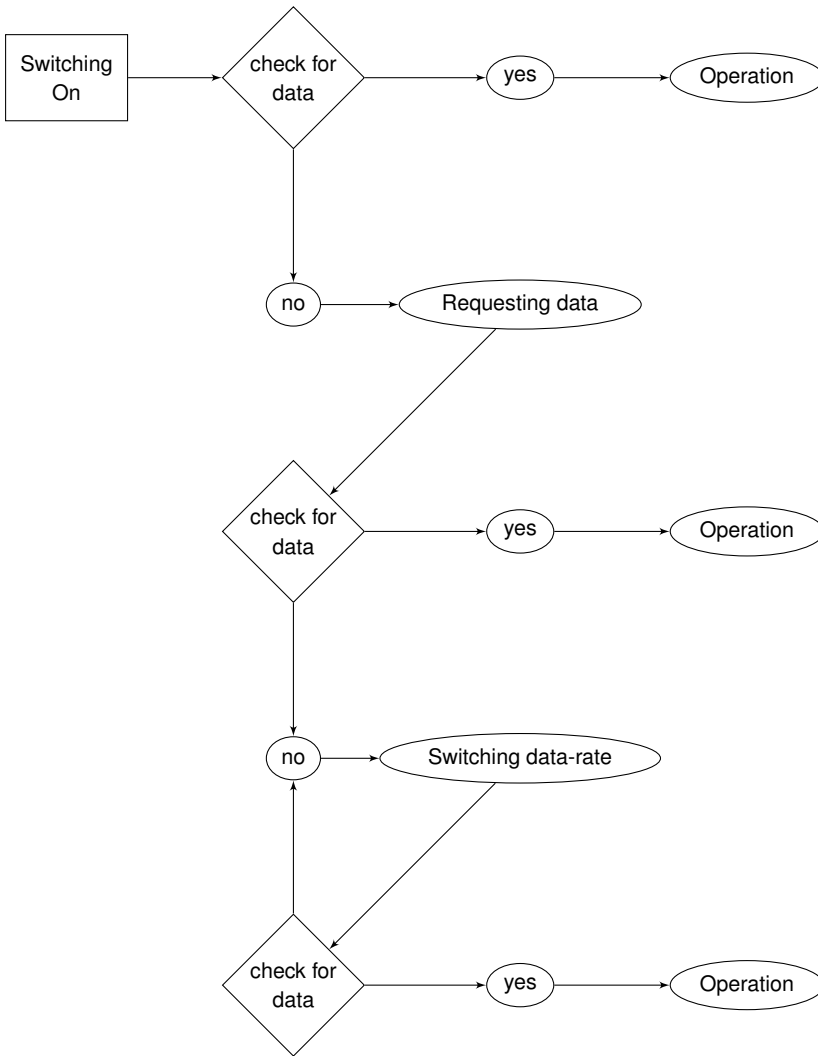
Butterfly Displays are switched on as soon as power is supplied to the power-supply pin. Normally Butterfly Displays are switched on by the connected collision warning device. During the boot process important system and version information is displayed on a dedicated boot-screen.



**Figure 11:** Boot-Screen.

A small cursor ("busy indicator") shows that the system is working. During booting, the unit tries to establish a data connection to the host collision warning unit. The following diagram shows the process

*If boot process stops without success the busy indicator will stop. This means that your display does not receive data from the host device.*



### 6.3.2 Settings before first flight

*Details zu den genannten Einstellungen finden Sie in der Sektion Einstellungen dieses Handbuchs.*

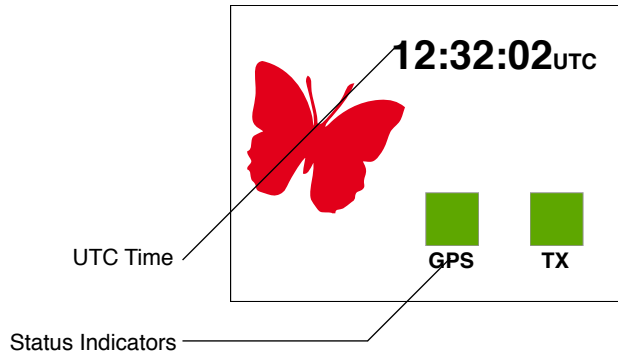
- Volume: Open the menu, go to *Volume* and set your desired volume of the alert-buzzer.
- Selection mode or Nearest mode: Open the menu, go to *System* and select your desired mode
- Units: Open the menu, go to *System* and set up your desired units-combination

**|| Never fly with Butterfly Displays without extensive familiarization on ground!**

## 7 Traffic Display

### 7.1 No traffic received

If there is no traffic in range / received, Butterfly Displays show a special information screen with an UTC Clock and information about GPS and FLARM system status of the connected collision warning unit. Green indicators show normal operation, red ones indicate failures.

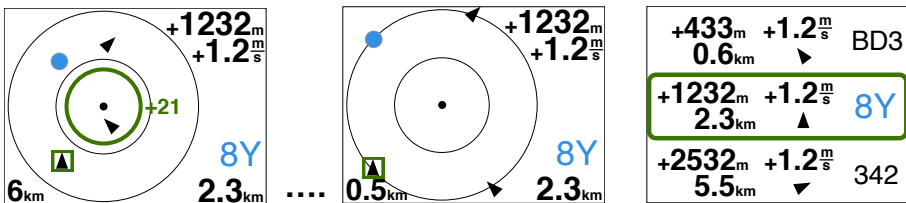


**Figure 12:** Info-Screen with status indicators and UTC time

A red GPS-Indicator means that the connected collision warning unit does not have sufficient GPS reception to determine the current position.

### 7.2 Traffic is received

If traffic is received, the pilot is able to select different views. A radar-like view with different zoom-factors and a list-view are available.



**Figure 13:** Different views when traffic is received (not all zoom-scales shown)

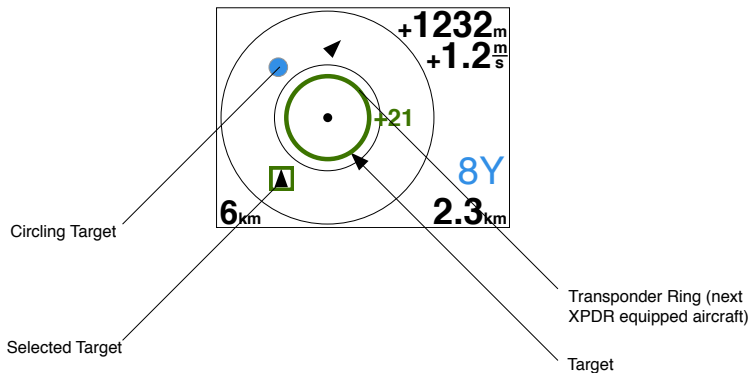
## 7.2.1 NEAREST and SELECT-mode

There are two different modes NEAREST and SELECT-Mode, the current mode can be set up in the menu, *System*.

- In SELECT-Mode (Standard) targets can be selected with the rotary knob
- on NEAREST-Mode targets can be selected with the rotary knob, the selection automatically switches back to the nearest (closest) target after 10 seconds.

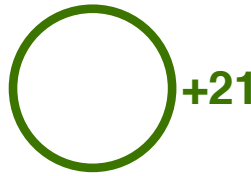
## 7.2.2 Radar-View

In the radar-view received traffic is shown on a radar-like display. Traffic is displayed as arrows with the arrow direction depicting the current flight direction. Circling traffic is displayed as blue circles.



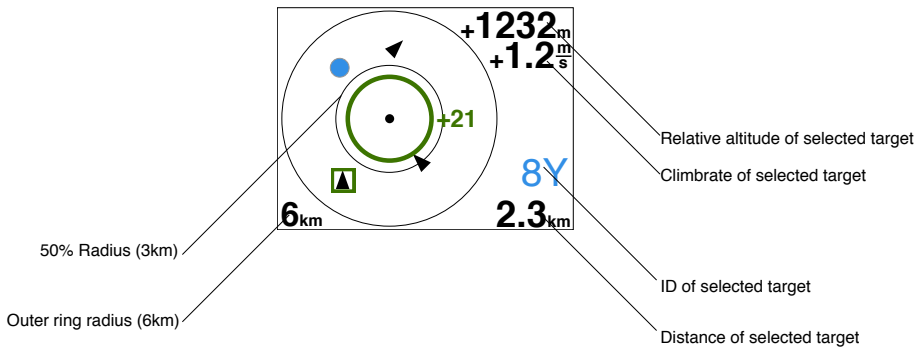
**Figure 14:** Radar-view with different symbols

Non directional traffic info (transponders without ADS-B) is displayed as a ring around the own ships position with relative altitude display. The ring diameter - corresponding to the current zoom-scale shows the distance, the relative altitude indicator on the right shows vertical separation. Depending on selected unit vertical separation is displayed in 100m or FL (100ft) steps.



**Figure 15:** Transponder-Ring with vertical separation indication in 100ft steps, here 2100m above

On the right side of the display, additional numerical information to the selected target is shown. If a target is selected, values like relative altitude, distance, climb/sinkrate and identification regarding the selected target are shown. When a target is circling, the circling direction is shown as well. Units of displayed values are user-configurable.



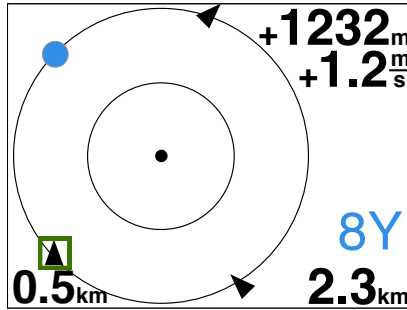
**Figure 16:** Radar view: values of selected target



**Figure 17:** Circling direction right and left

The current zoom-level of the radar screen (magnification) is shown in the lower left-hand corner. The displayed value corresponds to the outer range-circle of the radar screen. The inner range

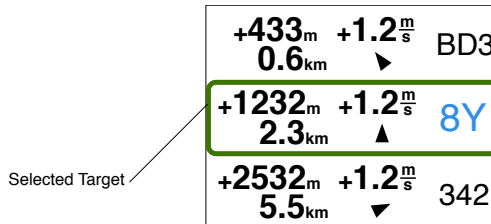
circle is a half of the outer one. If traffic is outside of the currently set up range, it still is shown on the edge of the radar for better situational awareness at high zoom-scales.



**Figure 18:** High zoom scale, targets with larger distance than zoom-scale still are displayed on the edge of the radar screen.

### 7.2.3 List-view

In addition to the radar-view a scrollable list (sorted after distance) is available.



**Figure 19:** Listview

### 7.2.4 Flarmnet-Funktion

With a single short button-push you can open a FlarmNet detail page where details to the selected target are shown.

*FlarmNet is a free-to-use database of FLARM users. Anybody can participate and add their personal data on <http://www.flarmnet.org>.*

### 7.2.5 Team-Funktion

Important targets like team-mates can be marked in a special team-color (orange).

Marking a target in team colors: • Open the Flarmnet detail view with a short button-push • Push long to mark/unmark a target



**Figure 20:** Marked and not marked target

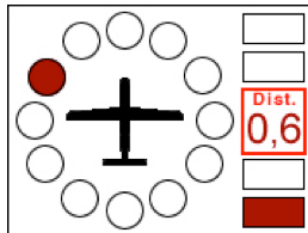
### 7.2.6 Stealth-Function

In the menu, *FLARM*, *Stealth* you can activate the FLARM-STEALTH mode. Details can be found in the user manual of your connected FLARM device.

## 8 Dangerous traffic and warnings

If there is a dangerous situation and the connected collision warning unit detects a threat, a dedicated warn-screen appears together with an audible warning. The warning screen may not be quit by the user.

The warning-screen shows the viewing angle to the most dangerous collision threat. A compass-style indicator gives information about the horizontal viewing angle to the threat. The vertical viewing angle is depicted on the right side of the warn screen. Additionally the distance to the most dangerous target is indicated on the right (always in the set up unit, i.e. Kilometer, Nautical Miles or statute Miles).



**Figure 21:** Warning screen, threat at 10 O'Clock position, below, distance 0.6(km)



### 8.0.7 Warning-screen vertical viewing angles

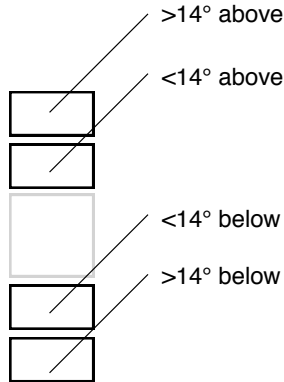


Figure 22: Vertical Viewing-Angles

### 8.0.8 Warning-screen distance Indicator

The displayed distance corresponds to the projected horizontal distance, this means not the actual distance (function of relative altitude and horizontal distance) but only the horizontal component.

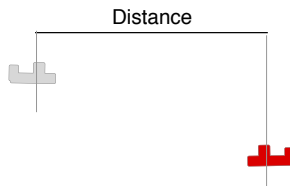


Figure 23: Distances on the warn-screen

***Displayed directions relate to the aircrafts movement relative to ground (GPS-Track). Strong wind may falsify displayed directions significantly.***

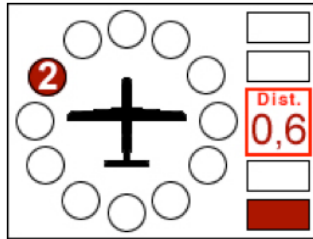
***Depending on your collision warning unit, reception and its set up, the first warning will be given approximately 18 seconds before an eventual collision. When you encounter a warning only take a short look at the display and immediately look outside to find and identify the collision threat. Never try to look inside the cockpit or on the display when planning traffic avoidance maneuvers.***

|| **Carefully read the restrictions of your connected collision warning unit!**

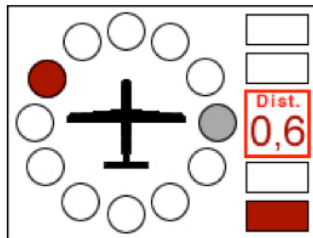
|| **Train on ground on how to react in case of a collision warning before flying!**

## 8.1 Special warning-screens

In special cases additional information is displayed on warning-screens.



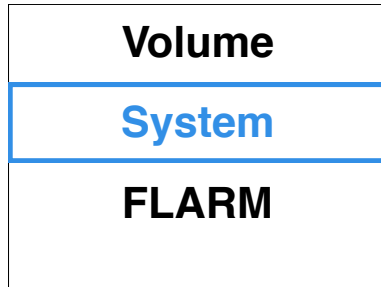
**Figure 24:** warning with two threats, the more important of which is at 10 O'Clock position, below, distance 0.6(km)



**Figure 25:** warning with team-mate/formation-mate that may be dangerously near when turning sharply to the right.

## 9 Settings

In the menu you can access settings that help you adapt Butterfly Displays to your individual requirements. You can access the menu by pushing longer than 2 seconds on the push-button.



**Figure 26:** Menu-Screen

### 9.0.1 Menu-Diagramme

Main menu:

- Volume: Volume setup
- System: System setup
- FLARM: FLARM setup

Main menu - Volume:

- Volume setup

Main menu - System:

- Units (currently used units are displayed)
- Nearest Mode / Select Mode: Currently used mode is displayed
- XPDR-Alarm: Activates/deactivates XPDR alarms
- Screen Direction: rotates the screen in 90degrees steps (only external version)

Main menu - FLARM:

- Stealth: Activates/deactivates FLARM Stealth Mode
- FLARM UI: Activates/deactivates the userinterface of classic FLARM devices

## 9.1 Updates

### 9.2 Update with PC and Cable

- Download the update-software and run it on your PC.
- Connect the update cable to your pc and supply the cable with power.

| *Do not connect the Butterfly Display yet.*

- Select the appropriate COM-port and process all dialogues with „OK“.
- Push the pushbutton on your display and hold.
- Now connect your display and release the pushbutton after connecting.
- Wait until the update is finished.

| *To update your display you need a Butterfly Display update adapter or a similar cable.*

### 9.3 Update via PowerFLARM Devices

#### 9.3.1 PowerFLARM CORE:

- Copy Butterfly firmware (.bfw) and/or flarmnet (.bfn) to a USB stick.
- Connect stick to Core.
- Switch on system with BF display knob pressed.
- Verify BF display goes into UPDATE MODE with 'WAITING', then 'LOADING'.
- Wait until BF display restarts (can take up to two minutes).

#### 9.3.2 PowerFLARM Portable:

- Copy Butterfly firmware (.bfw) and/or flarmnet (.bfn) to micro SD card.
- Insert micro SD card into slot.
- Activate menu entry Info -> Disp. update.
- Switch on system with BF display knob pressed.
- Verify BF display goes into UPDATE MODE with 'WAITING', then 'LOADING'.
- Wait until BF display restarts (can take up to two minutes).

# Notes