MOVING TERRAIN
Air Navigation Systems AG ®

Moving Terrain

Installation Manual MT-VisionAir

MTUP / 17 - 02 REV E Datum: 17. 11. 2009

Contents

1. General

MT-VisionAir was designed to be installed and operated as a panel mounted device, but can easily be removed for flight planning. MT-VisionAir is equally suited as a hand-held device**.**

Technically the MT-VisionAir is to be viewed as a hand-held / removable device as it can easily be removed from the panel without the use of tools. !

The quick release tray is permanently installed in the panel. The MT-VisionAir slides into the tray, but can easily be removed (for flight planning, updates of the navigation data or charts, etc.).

Installation of the the MT-VisionAir has virtually no influence on the weight and balance calculation.

Following installation, an EMI test has to be performed in the aircraft. Prior to the first flight it is mandatory to turn on the system and check cockpit instruments for deviations from normal performance.

1.1. Power Supply

The manufacturer recommends attaching MT-VisionAir devices to a power supply whose fuse is directly connected to the battery and does not include any other substantial power loads. !

Recommended:	Ground Clearance Switch Hot Bus
<u>Not</u> Recommended:	general avionics bus

Only under these conditions is the pilot able to perform his preflight work with Moving Terrain without draining the battery. (For power consumption see No. 5 Technical Data)

Circuit breaker:	minimum 2 ampere slow for 24 volt minimum 5 ampere slow for 12 volt

1.2. Recommended Installation Location of the GPS Antenna

The manufacturers strongly recommends installation of the integral GPS or GPS/GSM combined antenna on the glare shield. !

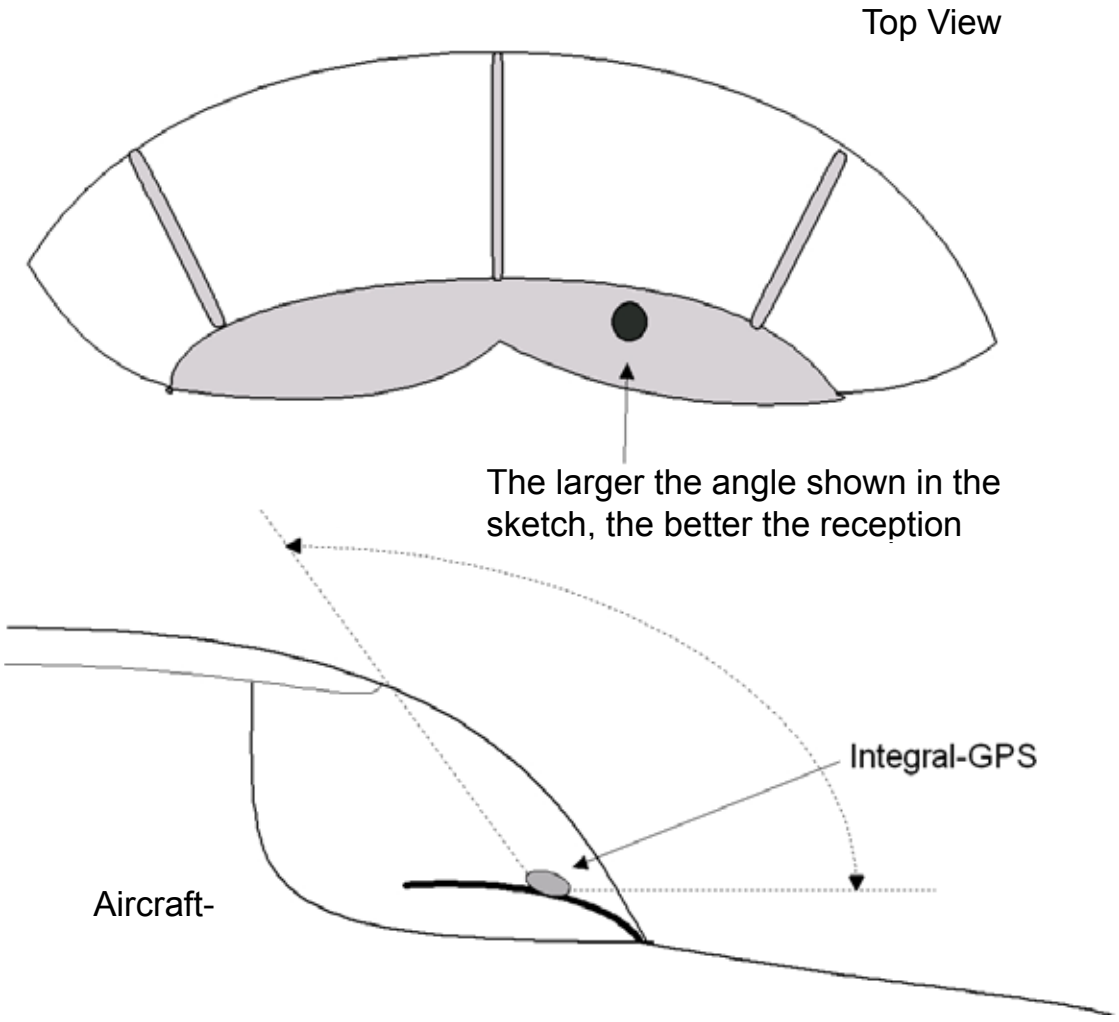
A windshield heater usually attenuates the incoming signal to such an

extent that placing the antenna under it does not make sense.

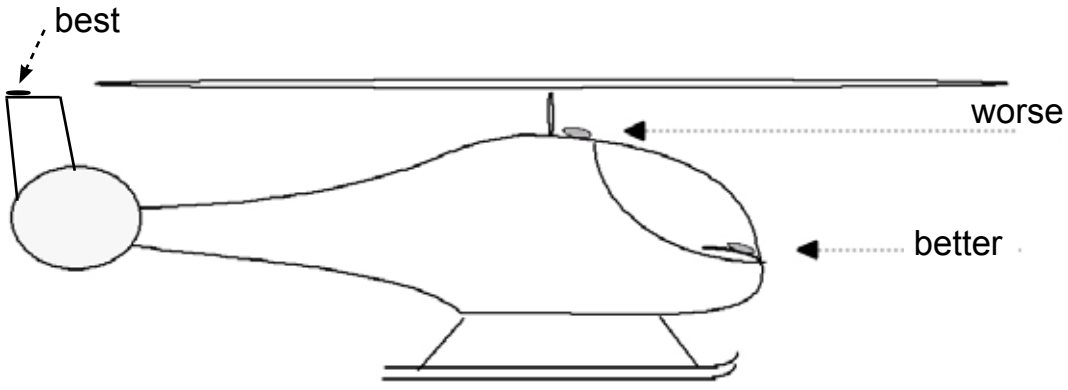
1.2.1. Integral GPS

A segment of the sky as large as possible must be visible for the antenna (integrated in the integral GPS!). The cable length is limited to 20 m.

Because of the high peaks of the digital signal a well shielded cable is recommended to prevent interference with other units.



Please consider the shadowing effect of the rotor and possible interference from the ignition box.



Notice: The integral GPS can also be mounted on the outside of the aircraft. In general a temperature limit of -20°C must be observed.

1.2.2. GPS/GSM Combined Antenna (for Systems with GPS/GSM Module)

As in the case of the integral GPS, as large a segment of the sky as possible must be visible (see installation sketch).

The GPS part of the combined antenna has an integrated preamplifier, so the cable attenuation is not critical.

1.2.3. Use of External Antennae

1.2.3.1. Supply of GPS-Antennae with Integrated Preamplifier

When using (external) antennae with an integrated preamplifier, the following technical data must be conformed with or not exceeded.

Frequency:	1575.42MHz +/- 1.023MHz
Impedance:	50 Ohm
VSWR Rx max:	1.5 : 1
Polarisation:	RHCP
Antenna gain	15 dB typ. 45dB max.
Power supply voltage:	3,6V, new 5V
Power consumption max:	50mA

1.2.3.2. Antenna Splitter for External Antenna

In order to attach two devices to a single GPS external antenna, an antenna splitter can be installed in the cable.

1.3. Recommended Installation Location of an Iridium Antenna

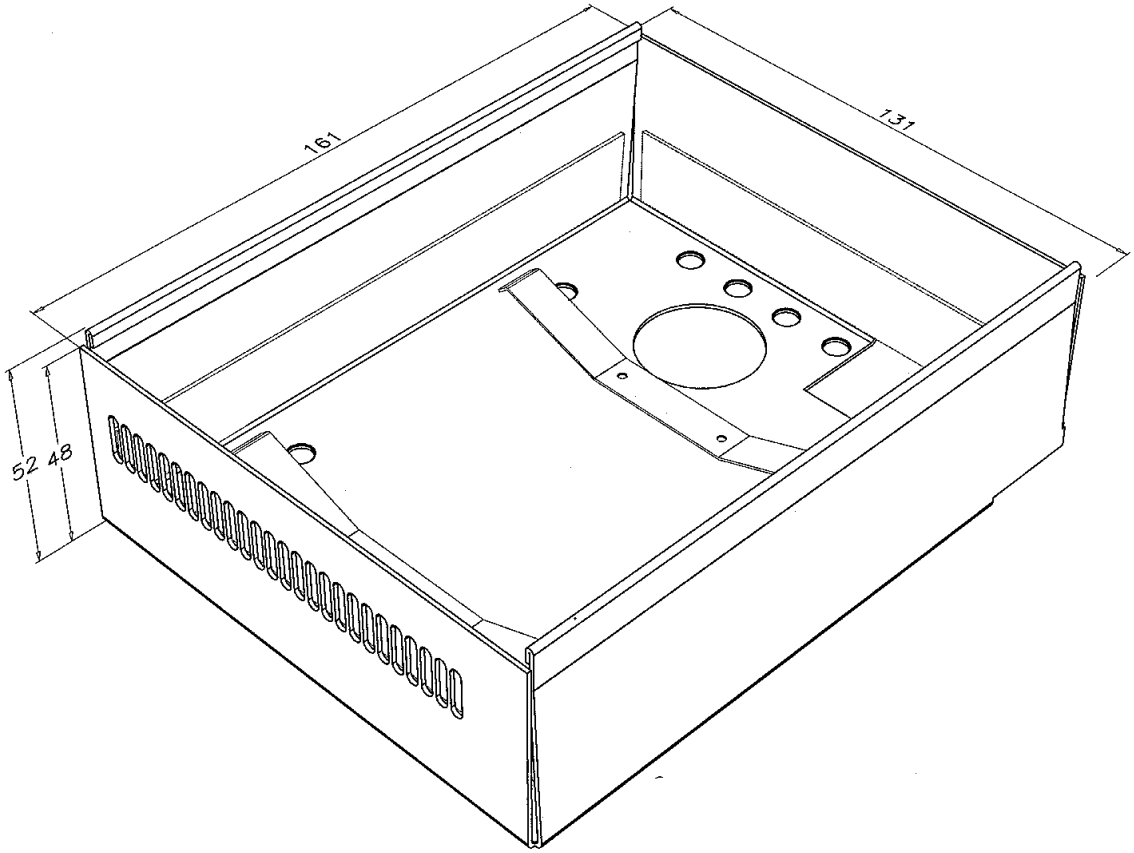
see chapter 5.3.

2. Installation

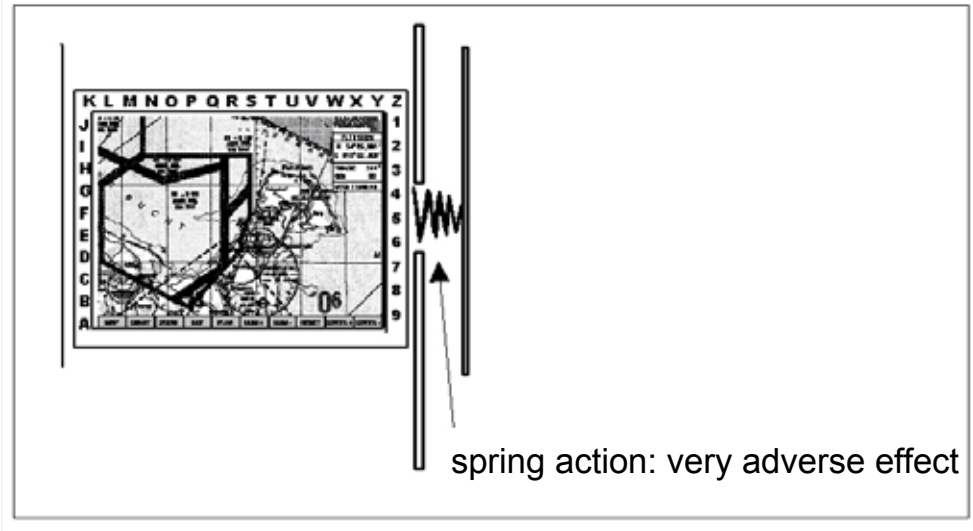
2.1. Quick release tray

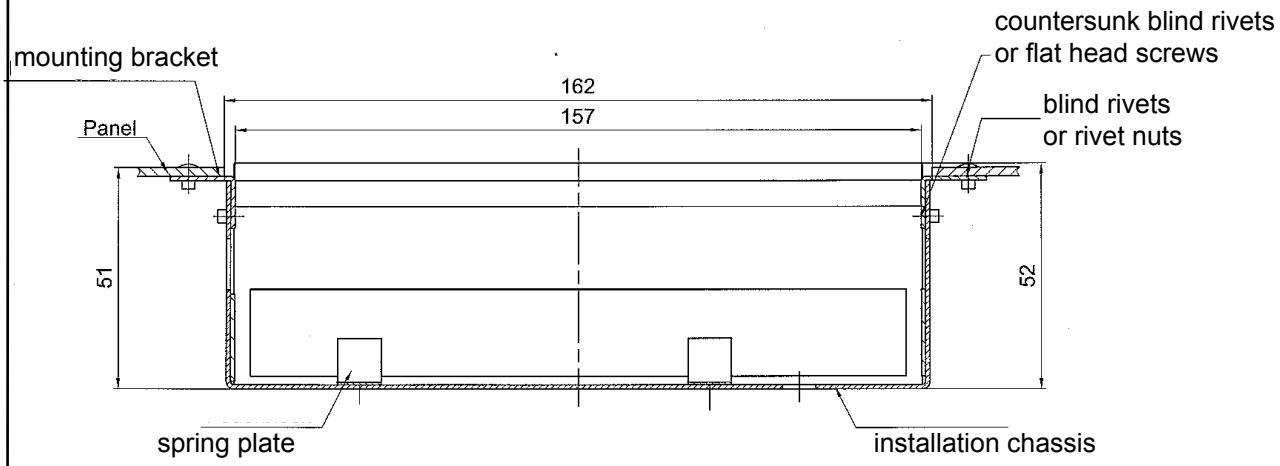
2.1.1. Remarks regarding Installation.

The mounting tray must be firmly attached to the cockpit panel with screws.



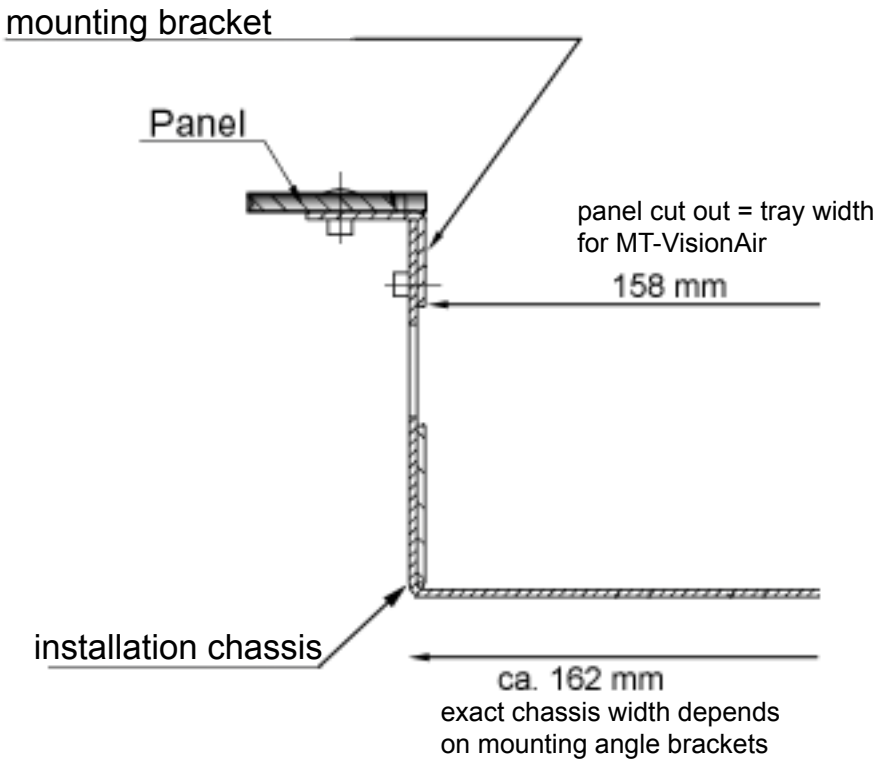
The device can be adverseley affected if it is allowed to vibrate against fixed parts of the aircraft - see the symbolic sketch below.





Please use flat head screws for installation in the instrument panel (or onto the angled rail) as space of 158 mm including any protruding screwheads must remain available for the device.
The edges of the chassis are not welded together. If necessary, the side parts can easily be widened in order to push the chassis over an angled rail.

Detailed view showing installation with angles on the back of the panel:



2.1.2. Panel cutout

The Quick Release chassis is screwed to the rack on the back of the panel using brackets. Mounting holes have purposely not been provided on the Quick Release chassis because the dimensions of the racks in the panel vary.

The cutout in the panel is 158 by 130 mm.

The cutout must not detract from the stabillity of the panel.

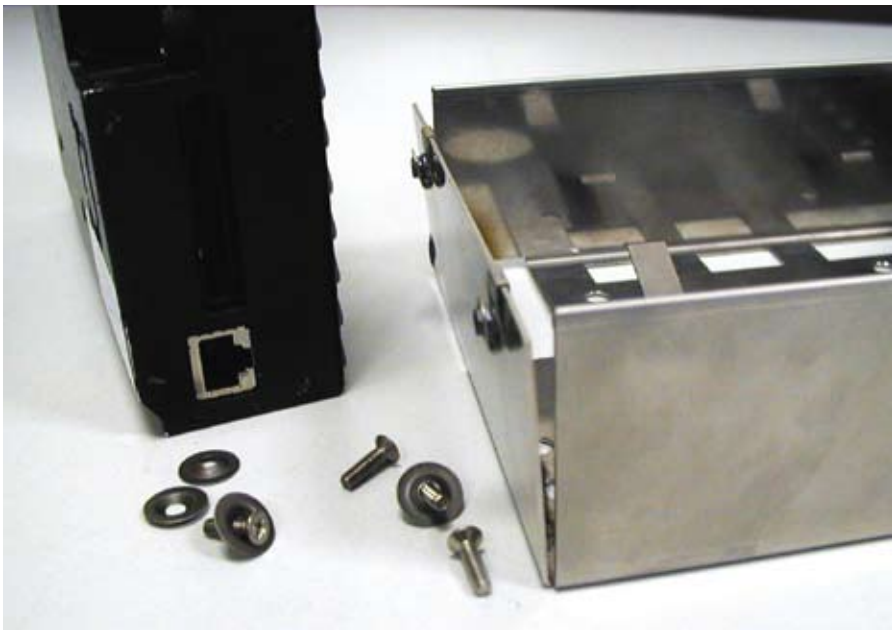
If necessary, braces must be mounted around the panel cutout. The required angle brackets can be viewed as such a brace.

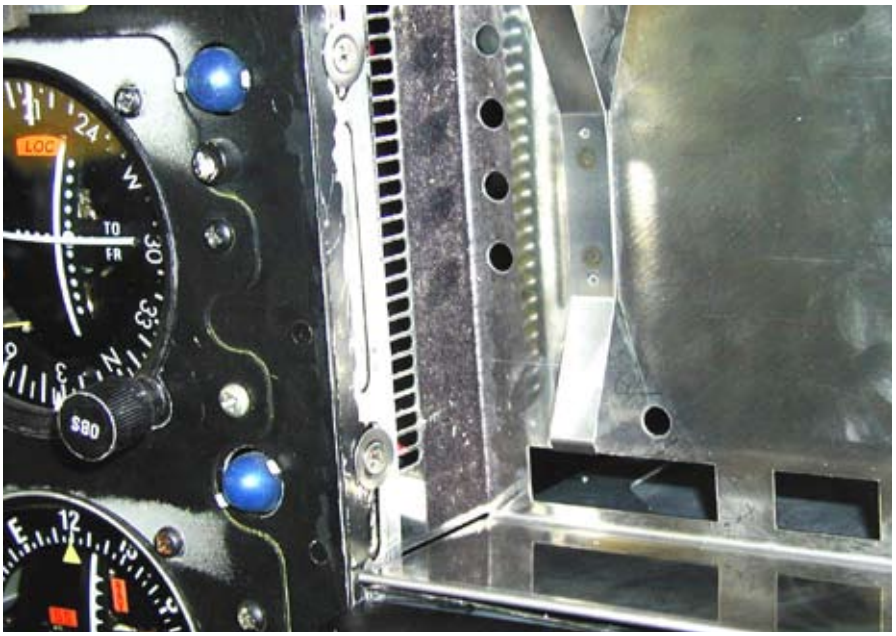
!

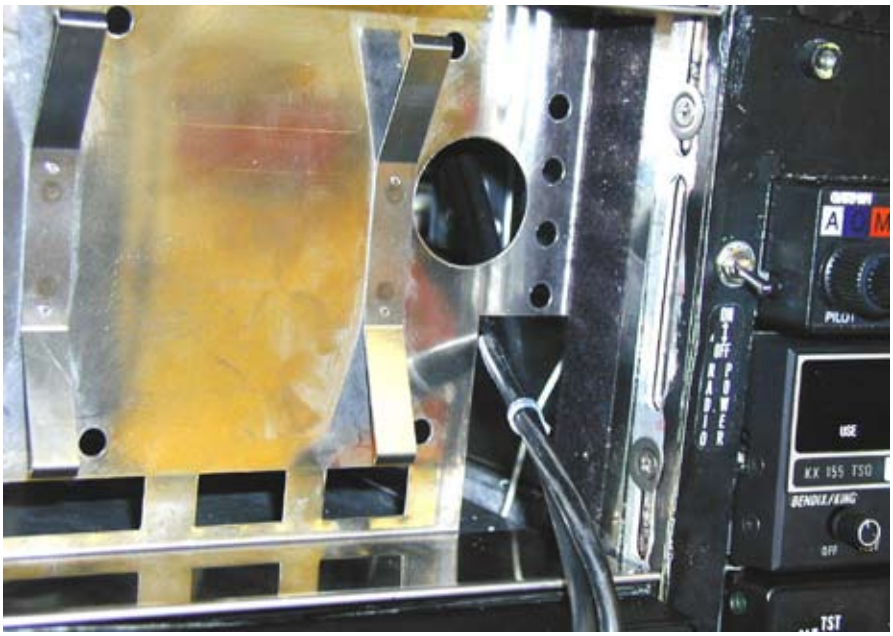
The manufacturer points out that the device must be easy to remove from the Quick Release chassis. This requires that the QRchassis be installed in the panel in such a fashion, that the MT-VisionAir is not too tight on the left and right. Both on top and bottom space of at least 1 mm must remain so that the QR Chassis can easily be tilted up. Removal is required for updates via CF and for print options. Furthermore, flight preparation can be performed outside of the cockpit.

We recommend that pilots make themselves familiar with the removal of the device together with the facility providing installation service and to pay attention to the correct installation method of the QR chassis.

2.1.3. Detailed view of an installation in a cockpit






KX 155 TSO
TST


KX 155 TSO

2.1.4. Installation depth

The Quick release chassis is delivered such that the MT-VisionAir is flush with the panel surface when pushed in.

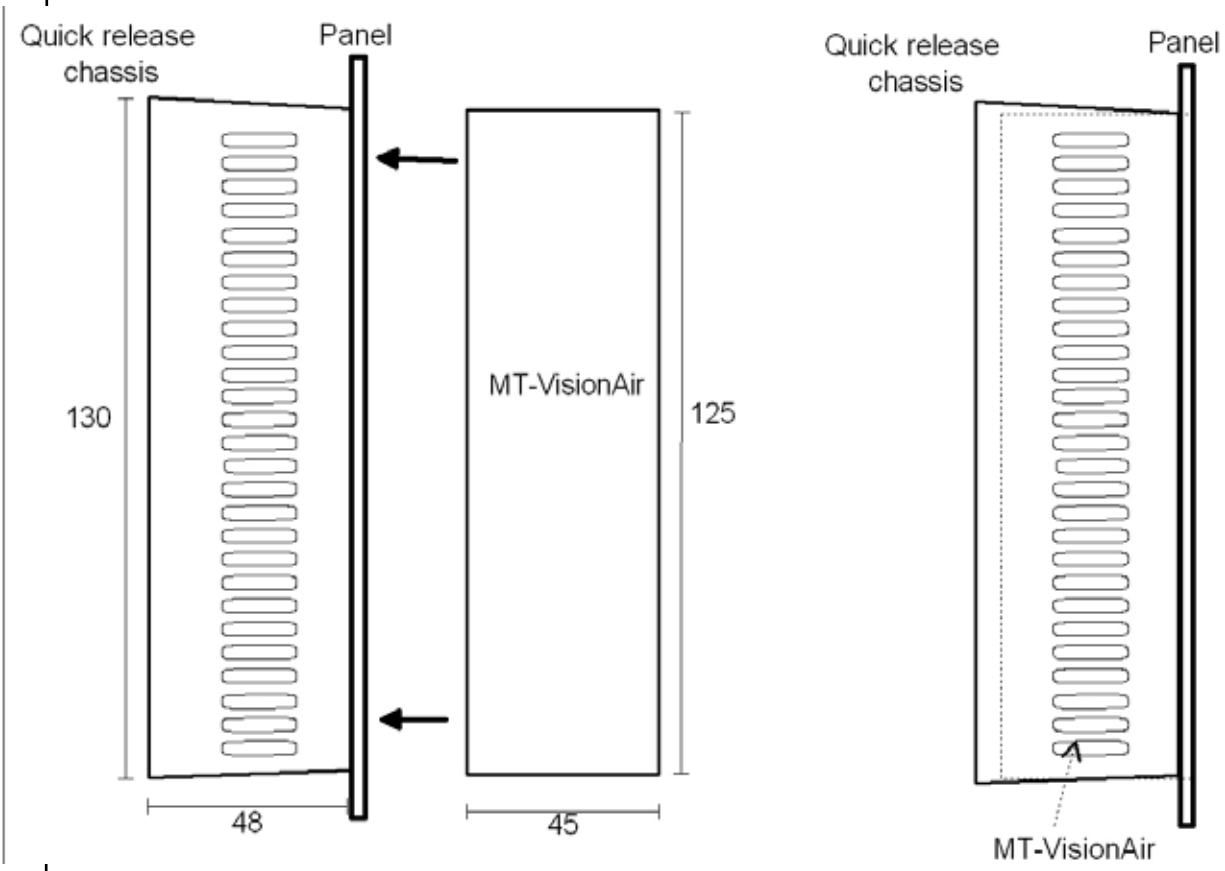


Image: flush installation

If an overhang is required, e.g. to be flush with other overhanging avionics devices, the Quick Release chassis must be shortened as required (max 10 mm). Please shorten on the non crimped side panels of the Quick Release chassis itself. However, please consider that the seam at the top and bottom of the frame may not be modified, as these are required for the fastening of the device.

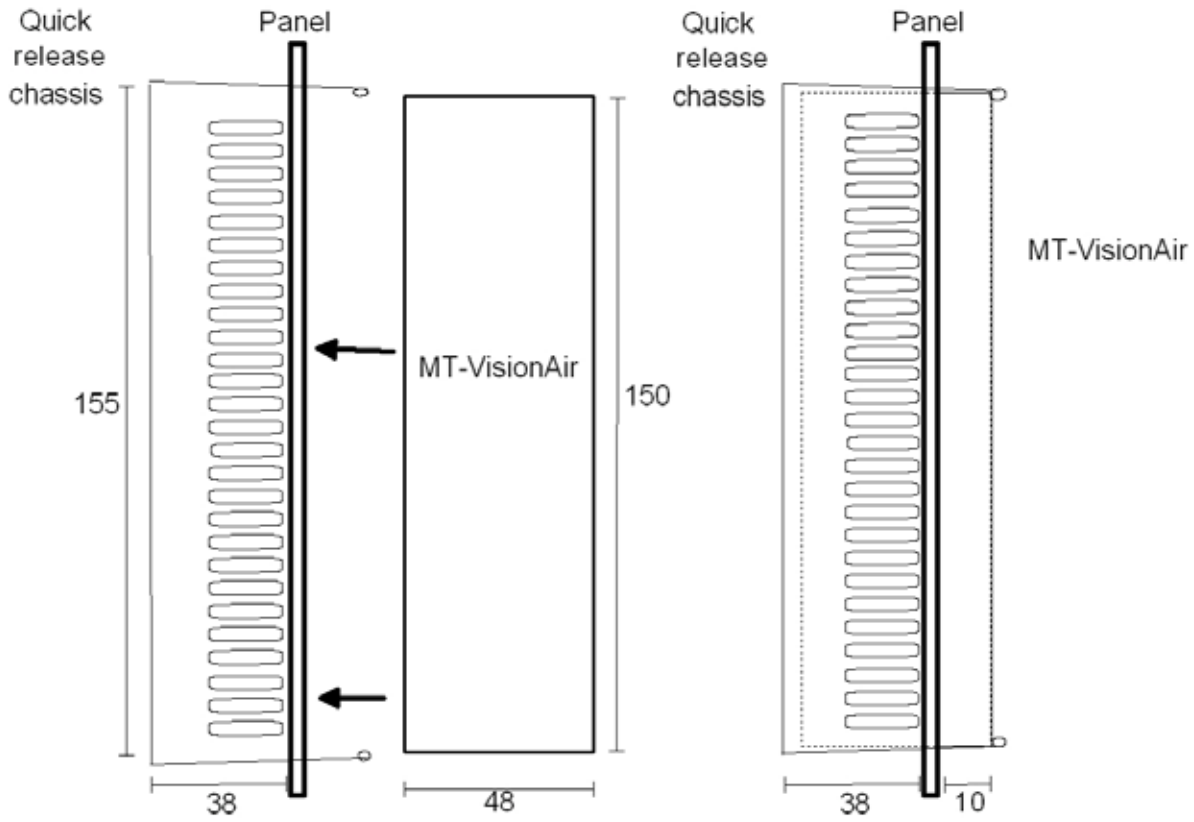


Image: overhanging installation

The round ventilation opening on the back of the device must remain free. The connecting cable for GPS and power is fed through the lower rectangular opening.

For devices with a central connector, this is fed through the central rectangular opening.

In both cases please leave a loop of the cable and bundle the cables so that the device can easily be removed again.

!

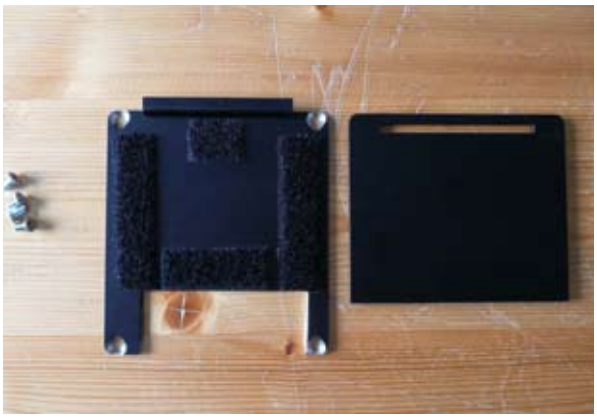
2.1.5. Insertion of the MT-VisionAir in the Quick release chassis

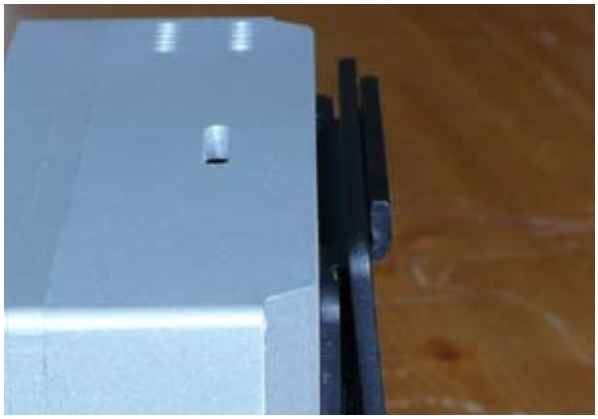
When the Quick Release chassis is securely installed, the MT-VisionAir is inserted in the frame and locked in place under the edge of the upper and lower seams of the frame with a force of approximately 4 kgs.

The MT-VisionAir device can be removed from its installed position by lightly pressing the entire unit into the installation chassis and slightly bending the upper and lower QR wall outwards. Since the device is no longer locked in by the seam edges at top and bottom, the spring force pushes the MT-VisionAir up. In order to extract the device the screwed connectors to the GPS and the power supply or the central connector must be released with 2 clips.

2.2. Two-part Quick Release Mount

The two-part Quick Release mount was developed to enable installation outside of the panel, e.g. on the control wheel.





2.2.1 Instructions for installation

The unit mounting plate is screwed to the frame with 4 flat head screws M4x5.
Do not use screws where the inserting screw-part is longer than 5 mm!

The mounting and fastening of the counterpart is customer specific, e.g. on the control wheel or on the side in the cockpit etc..

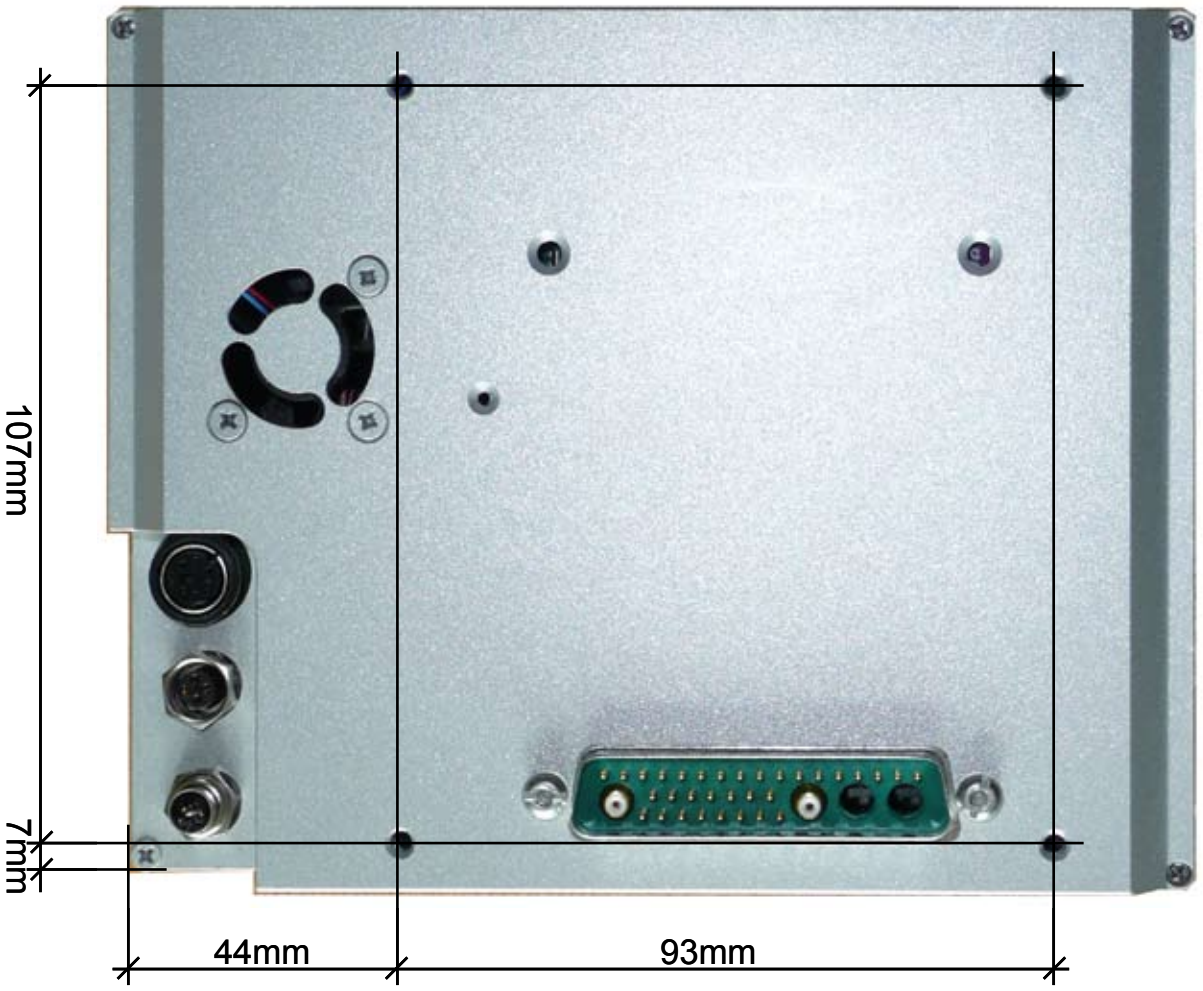
Material: 3 mm black anodized aluminium.

2.3. Third party mounts

Many installation problems can be solved with third-party mounts.
Here is a selection:

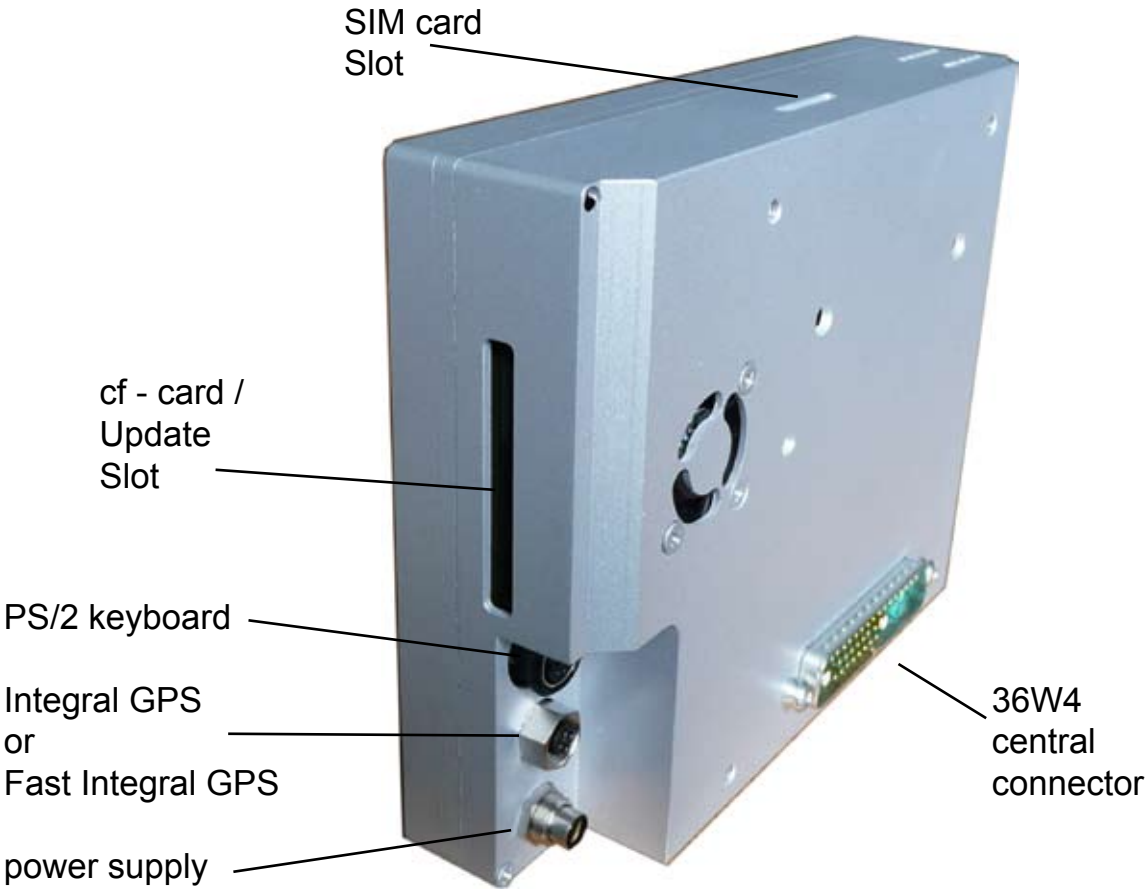
2.3.1. R.A.M. Mounts

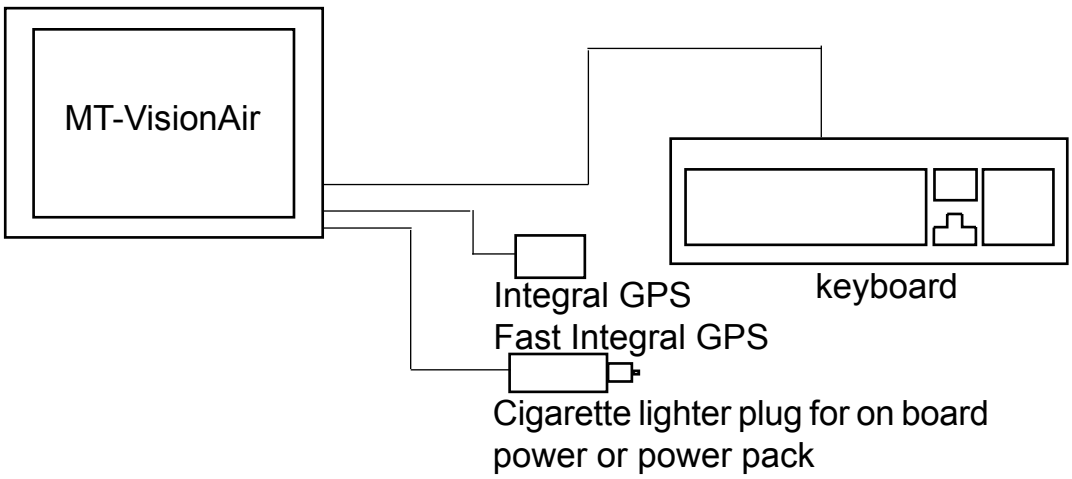
2.4. Image of holes for installation



3. Connectors

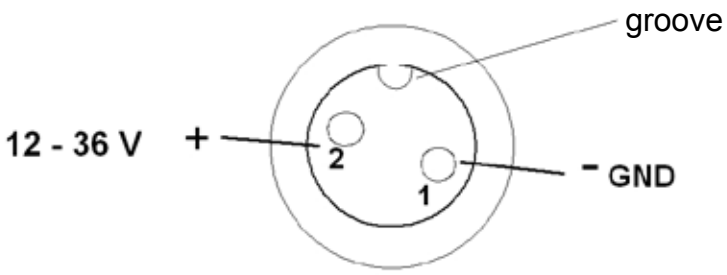
3.1. General connection of MT - VisionAir





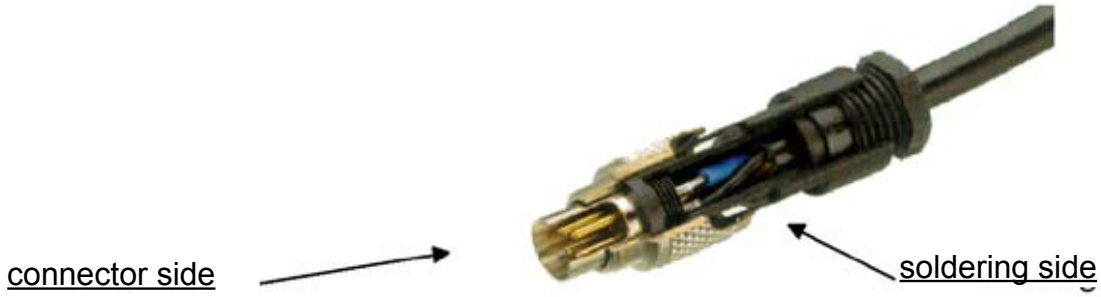
3.2. Pin layout for power supply / GPS / Fast Integral GPS (round connector on side of unit)

Connector cable power jack

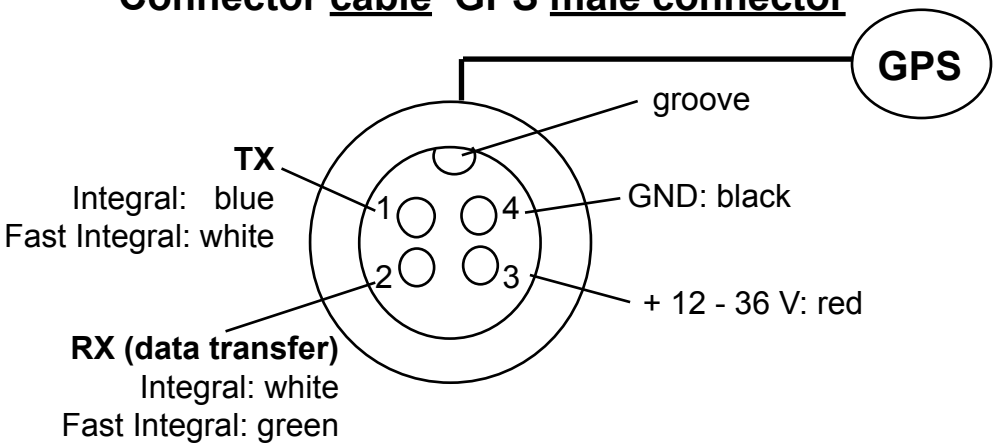


connector side

Gnd has to be connected before start-up!!



Connector cable GPS male connector



RX and TX in relation to VisionAir, i.e. MT receives data on PIN 2

connector side

Important! Make sure which GPS you are connecting (**Fast Integral GPS** or **Integral GPS)** in order to get the right color code for the cables (see p 22).

!

Fast Integral GPS

Integral GPS

3.3. Instructions for power supply

The manufacturer recommends attaching MT-VisionAir devices to a power supply whose fuse is directly connected to the battery and does not include any other substantial power loads.

Recommended: Ground Clearance Switch
Hot Bus

Not recommended: General avionics bus

Only under these conditions is the pilot able to perform his preflight work with Moving Terrain without draining the battery.

For panel installation the Quick Release Chassis includes an installation cable with a straight connector and open ends.

Units with a central connector can use this for the power supply.

3.4. Connections for the GPS/GSM module and the “Harting” central connector

In the course of designing for the GPS/GSM module option, the device was equipped with a central connector for serial, VGA video signals and power.

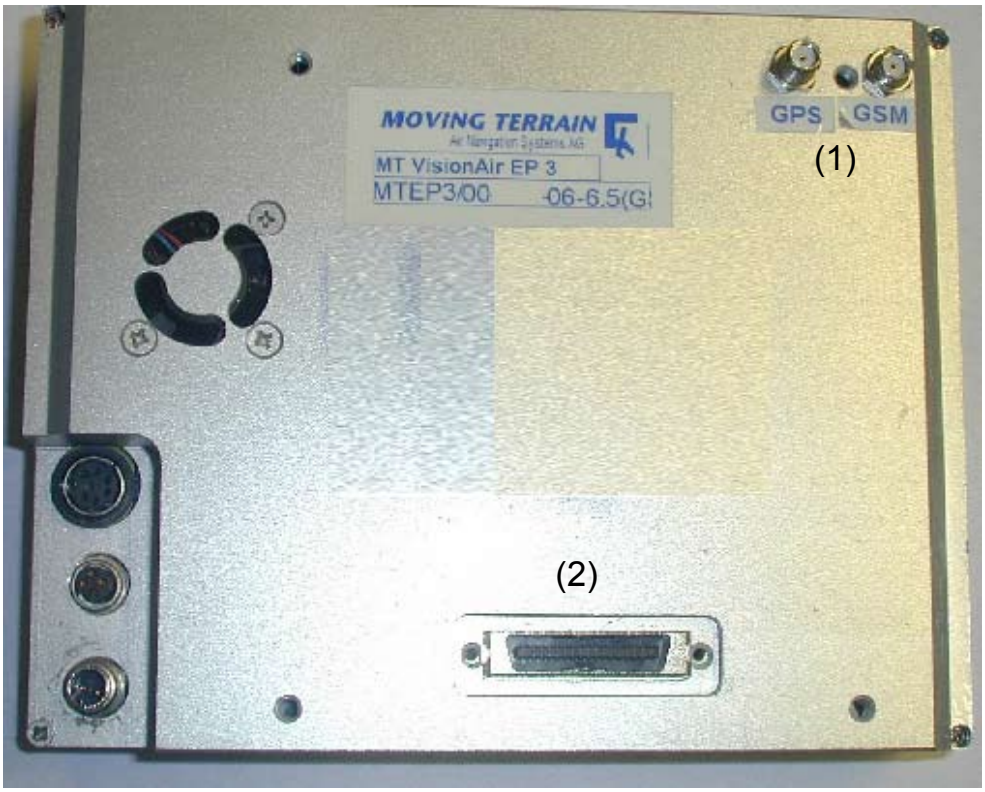
The GPS/GSM module for the MT-VisionAir is an extension of the functionality of the basic device with combined GPS and GSM (cell phone) hardware. Data transmission (e.g. for the Blitzplan module) is performed by the modem function of the integrated "cell phone”. Due to the built-in GPS module the Integral GPS is no longer required.

On the back of the housing there are two additional connectors:

(1) SMA jacks for connecting a GPS and a GSM antenna

(2) Harting 36 pin connector for power, COM 1-4 and VGA signals.

Thanks to the design the unit is now easier to remove from the panel since only the central connector and the SMA connections have to be disconnected.

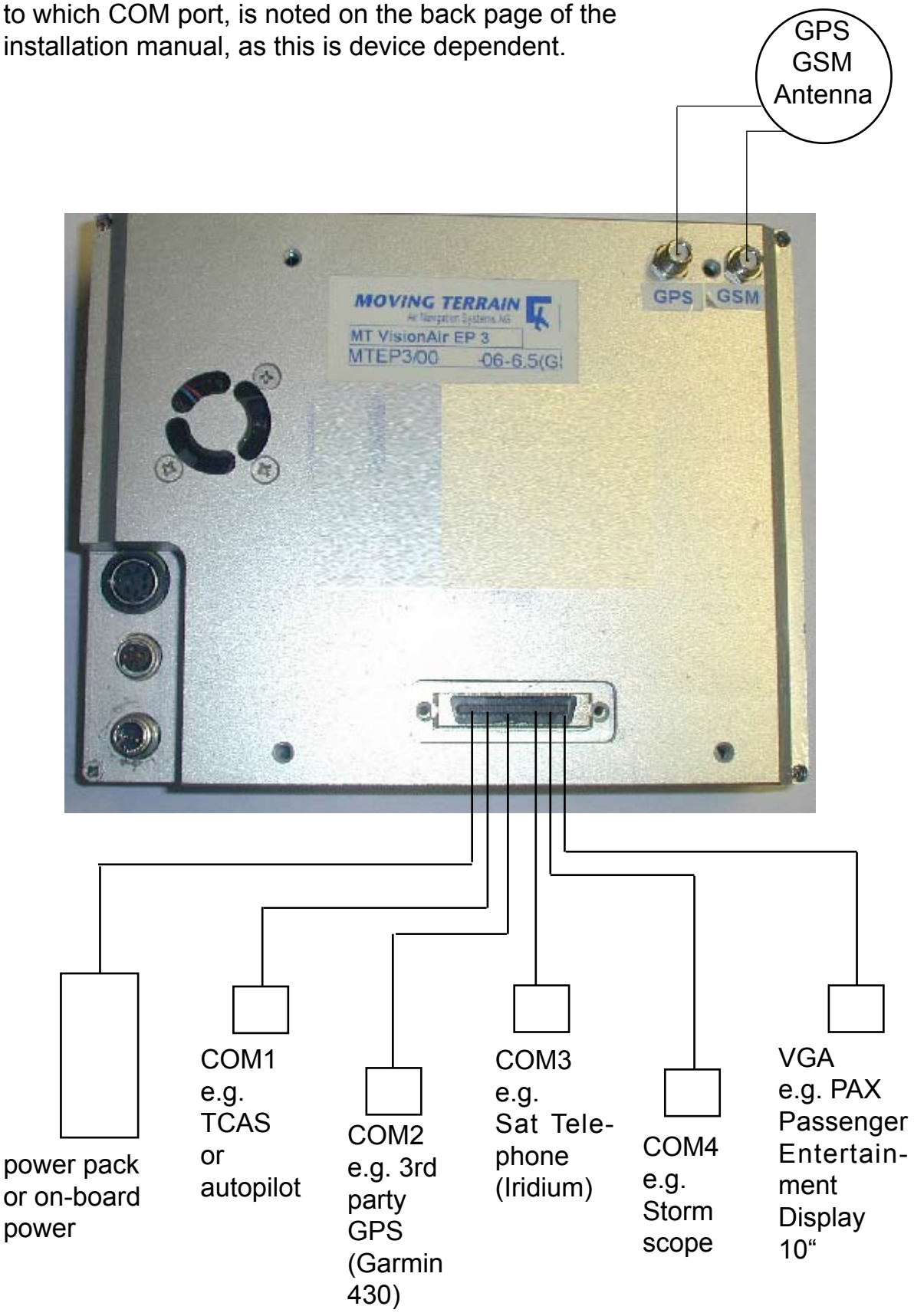


By default a GPS/GSM combination antenna with SMA connectors is attached to this system version:

The form of connectors for the GPS/GSM antenna cable are basically identical (SMA form).
Therefore it is necessary to use special care when attaching the two antenna cables to the cabinet.
The connectors on the cable and the jacks on the cabinet are appropriately labeled.
Systems with additional peripheral devices, e.g. TCAS, Iridium telephone, Stormscope, etc. or if requested can include a Harting central connector which can be appropriately wired by the installation facility.

3.4.1. General connection options for the “Harting” central connector

The configuration defining which peripheral device is connected to which COM port, is noted on the back page of the installation manual, as this is device dependent.



3.4.2. Pin Layout of „Harting“ Central Connector

Harting-Stecker

Datei : Stecker Harting Moving 110506.xls

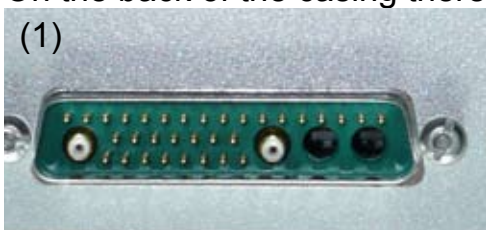
Signal	Wire Color								Wire Color	Signal
Power DC 12-36V	red AWG18		Vin	19		1		HDSUB PIN1	brown	VGA red
Power DC 12-36V	red AWG18		Vin		20		2 GND	HDSUB PIN6	red	VGA red GND
Receive Data	brown	COM2 DSUB PIN2		21		3		HDSUB PIN2	orange	VGA green
Transmit Data	red	COM2 DSUB PIN3			22		4 GND	HDSUB PIN7	yellow	VGA green GND
Signal GND	orange	COM2 DSUB PIN5	GND	23		5		HDSUB PIN3 Video	green	VGA blue
Receive Data	yellow	COM4 DSUB PIN2			24		6 GND	HDSUB PIN8	blue	VGA blue GND
Transmit Data	green	COM4 DSUB PIN3		25		7		HDSUB PIN13	purple	VGA H-Sync
Signal GND	blue	COM4 DSUB PIN5	GND		26		8 GND	HDSUB PIN10	gray	VGA Sync GND
Power GND	black AWG 18		GND	27		9		HDSUB PIN14	white	VGA V-Sync
Signal GND	white	5	~~GND~~		28		10 ~~GND~~	5	white	Signal GND
Ring Indicator	gray	9		29		11		9	gray	Ring Indicator
Data Terminal Ready	purple	4			30		12	4	purple	Data Terminal Ready
Clear to Send	blue	8		31		13		8	blue	Clear to Send
Transmit Data	green	COM1 3			32		14	3 COM3	green	Transmit Data
Request to Send	yellow	7		33		15		7	yellow	Request to Send
Receive Data	orange	2			34		16	2	orange	Receive Data
Data Set Ready	red	6		35		17		6	red	Data Set Ready
Data Carrier Detect	brown	1			36		18	1	brown	Data Carrier Detect

GND and GND with Y-cable to power supply (Vin analog)

3.5. Connections of the 36W4 central connector

In the course of further development of the internal GPS/GSM module option, the system was equipped with a central connector for serial interfaces, VGA video signals, GPS/GSM, autopilots, video-in and power.
The objective of the development was to consistently provide the capability of easily connecting and detaching all required signals via a single connector. The round connectors on the side for power and integral GPS are no longer required.

On the back of the casing there is now only the 36W4 central connector (1).



counterpart

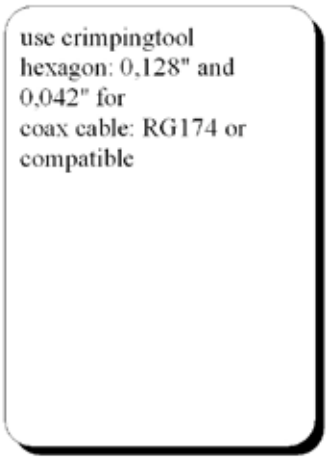
The connector can be disconneted by unlatching the two black lateral hooks and then pulled off.

wiring loom

Attention!
If you use the 34W4 central connector, **always** use this to connect the power supply. In this case **do not** use the round connector at the back of the unit. Otherwise there is a danger of short circuiting the unit!

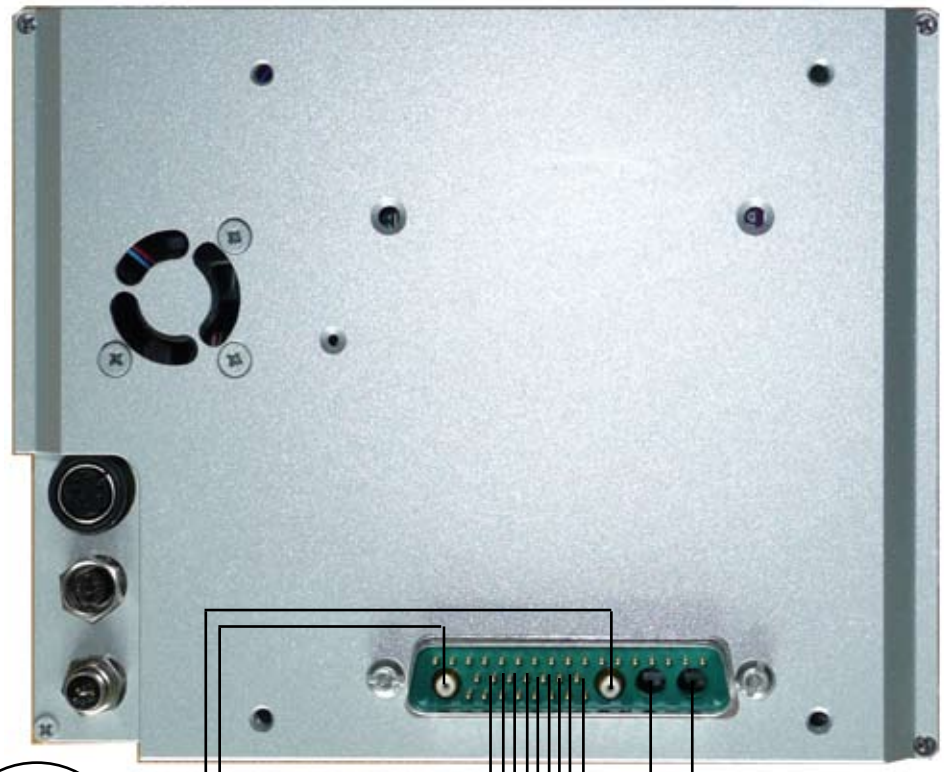
A central connector with a permanently attached GPS/GSM antenna and power input is available as an accessory, enabling flight preparation at home or in the hotel room.
In combination with the cigarette lighter cable, mobile utilisation is also possible.

An installation kit is provided by default with the unit, containing all required parts enabling the installation facility to connect ´the MT-VisionAir with the on-board peripheral units.



During flight the GPS/GSM Antenna should be placed on top of the dashboard with an uninterrupted view of the sky. While it is not expected, the antenna mounting magnet may in some circumstances interfear with the on-board instrumentation. To avoid this happening a ferros metal plate of 20-30 cm diameter should be attached to the magnet. This has the added advantage that it will increase the effectiveness of the antenna.

3.5.1. General connection options of the 36W4 central connector



GPS
GSM
antenna

Video in FBAS
(only with MT
camera)

autopilot
analog port
(optional)

Ethernet
(currently unused)

power pack
or on-board
power

PS/2
keyboard

USB
(currently unused)

COM1
e.g.
TCAS or
autopilot

VGA
e.g.PAX
Passenger
Entertainment
Display 10“

COM2
e.g. 3rd party
GPS
e.g.Garmin
430

COM4
e.g.
Storm-
scope,
Clock-
sensor

COM3
e.g.
Sat Tel-
ephone
(Iridium)

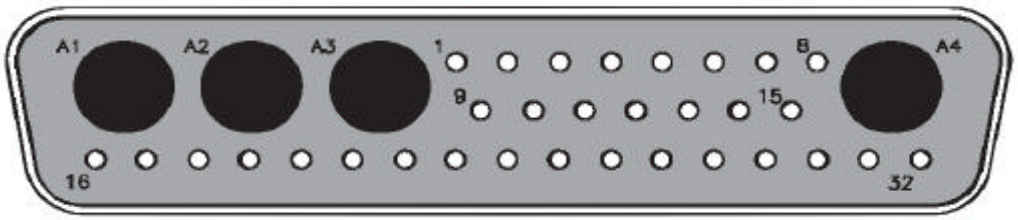
applicable configuration of the particular unit see chapter 11, page 64.

Pin assignment 36W4 central connector including coax contacts

Standard Pin assignment						optionale Beschaltung			
Signal	central connector Pin	Pin at common connector	common connector	common wire color	description	Signal optional	Pin at common connector	common connector	common wire color
Power DC 12-36V	01	2		red	use both pins (01+02) togehter				
Power DC 12-36V	02	2	2 Pin Binder	red					
PWR GND	11	1	round connector	blue / black					
COM 1 RxD	13	2							
COM 1 TxD	12	3							
COM 1 DTR	25	4	9 Pin Sub-D		GND for COM 1 is Pin 24	Ethernet TX+	1	RJ45	green/white
COM 1 CTS	26	8				Ethernet TX-	2	8 pin Western	green
COM 1 RTS	27	7				Ethernet RX+	3	connector	orange/white
COM 1 DSR	28	6				Ethernet RX-	6		orange
COM 2 RxD	22	2	9 Pin Sub-D		GND for COM 1 is Pin 24				
COM 2 TxD	23	3							
COM 3 RxD	17	2							
COM 3 TxD	19	3							
COM 3 DTR	21	4	9 Pin Sub-D		GND for COM 1 is Pin 24				
COM 3 CTS	20	8							
COM 3 RTS	18	7							
COM 3 DSR	16	6							
COM 4 RxD	14	2	9 Pin Sub-D		GND for COM 1 is Pin 24				
COM 4 TxD	15	3							
GND COM 1 - 4	24	5	9 Pin Sub-D						
VGA red	08	1							
VGA green	07	2	15 pin		use 75 Ohm impedance				
VGA blue	06	3	high desnity		cable for color and sync signals				
VGA h-sync	05	13	Sub -D						
VGA v-sync	04	14							
VGA GND	03	6,7,8,10							
USB / PS/2_Keyboard +5V	30	1		red					
USB data -	31	2	USB Buchse	white					
USB data +	32	3		green					
USB / PS/2_Keybaord GND	29	4		black					
PS/2 Keyboard data	09	1	6 pin		use 5V and GND from USB				
PS/2 Keyboard clock	10	5	Mini DIN		at Mini DIN: 5V pin 4 / GND pin 3				

Pin assignment coax contacts				
GPS antenna	A4	SMA	RG174 cable 50 Ohm	
GSM antenna	A3	SMA	RG174 cable 50 Ohm	
autopilot heading (option)	A2		RG174 cable 50 Ohm	
video in (option)	A1		RG179 cable or similar 75 Ohm	

Pin 11 Power Gnd has to be connected before start-up!!



female connector solder side

view: jack, soldering side

Color Codes (Fast) Integral GPS

function	PIN central connector	cable Integral GPS	cable Fast Integral GPS
RXD	22	white	green
TXD	23	blue	white
+ 12-36V	1 or 2	red	red
GND	24	black	black

3.6. Instructions for connection of peripheral devices

- The port assignment defining which peripheral device (Iridium telephone, TCAS, Stormscope ….) is to be attached to which COM port can be found on the back page of the installation manual, since these are device dependent.
- When connecting an Iridium telephone or GSM telephone, it must be verified that all 7 lines are attached, because they are all required. (Typical error: if lines are missing, the telephone dials but then hangs up during the weather download.) In general, connection is made to COM3 and must always be connected 1:1 (no crossed cable).
- COM ports that are marked as "internally cabled“ in the list on the back may not be used on the central connector.
- Shielded lines are to be used for cabling and the shield must be connected to aircraft ground to avoid interference of other avionics units.
- The power supply coming from the central connector is not switched by the unit, i.e. ab Integral GPS connected to the central connector draws 50-70 mAmps even when the unit is swiched off. If no master switch is used this can drain the aircrafr battery in a couple of weeks, therefore always connect the unit with a master swich

3.7. Configuration of the correct GPS driver in the software

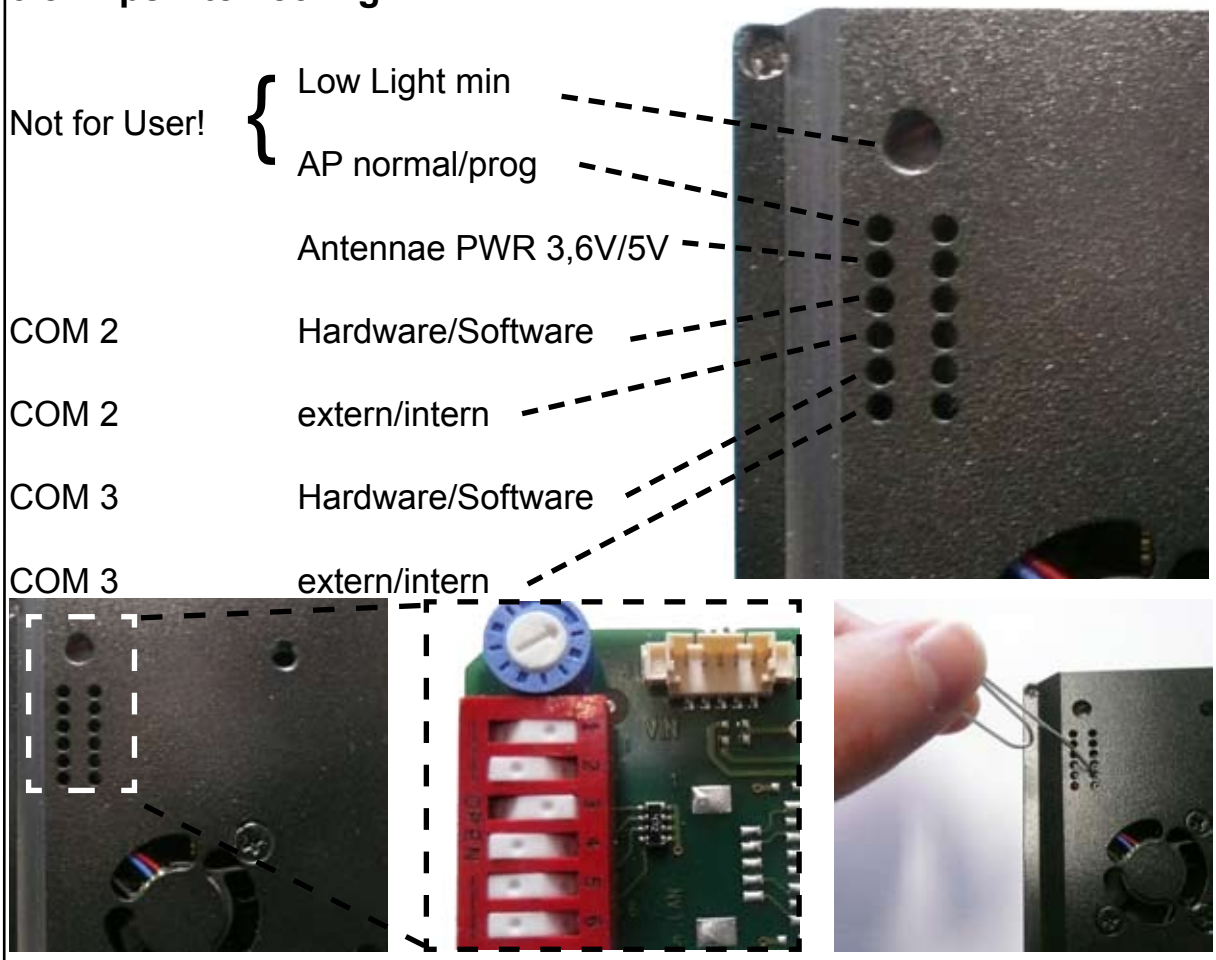
From version 7.4 onwards the matching GPS driver can be configured with the software:

AUX
SETUP
GPS

Intern -> switching to the internal GPS/GSM Modul =
BUILT-IN GPS (4800, NMEA)

Extern -> switching to an external GPS
INTEGRAL GPS (4800, NMEA)
FAST INTEGRAL GPS (9600, NMEA)
TRIMBLE (9600, AVIATION)
KING KLN90 (9600, AVIATION)
GARMIN 430/530 (9600, AVIATION)
UNIVERSAL FMS (9600, AVIATION)

3.8. Dipswitch config



internal board, enlarged

Handling e.g. with paper clip

4. MT Autopilot

The MT-VisionAir is optionally available with an integrated autopilot control module. The Moving Terrain autopilot software is integrated into the main program. The module can be activated with an authentication code.
Following that it is operational and must be calibrated.

4.1. Connecting the autopilot and defining the control voltage

If the MT-VisionAir was ordered with an autopilot module, there will be a coaxial contact at location A2 of the 36W4 central connector (see image). This must be connected with the source selector. The central pin has an analogue voltage (deviation voltage) that controls the autopilot to enable the aircraft to:

a) hold a DIRECT course or
b) follow a ROUTE

This voltage can be configured to match the autopilot.
e.g. for a connection as a NAV source:

+150mV = full-scale deflection to the right
-150mV = full-scale deflection to the left
0V = neutral

or for example a connection as HEADING source:

+15V = full-scale deflection to the right
-15V = full-scale deflection to the left
0V = neutral

or:

+10V = full-scale deflection to the right
+5V = neutral
0V = full-scale deflection to the left

The voltages given above are only examples. In order for Moving Terrain to carry out the preliminary configuration, it is necessary for the autopilot configuration form to be completed.

4.2. Worksheet for the configuration of MTDA/21-xxx-02-

(to be filled out by the installation facility)

1. Type of autopilot

Manufacturer: _____

Model: _____

2. Control voltage

Neutral element (autopilot does not make any course corrections) at:
_____ (m)V

Maximum course correction to left at: _____ (m)V

Maximum course correction to right at: _____ (m)V

3. Contact person at the installation facility

Name of the installation facility: _____

Surname: _____

First name: _____

Telephone number for inquiries: _____

Please fill out the sheet to ensure correct D/A converter configuration and fax to +49 (0)8376-921414.

INTENTIONALLY LEFT BLANK

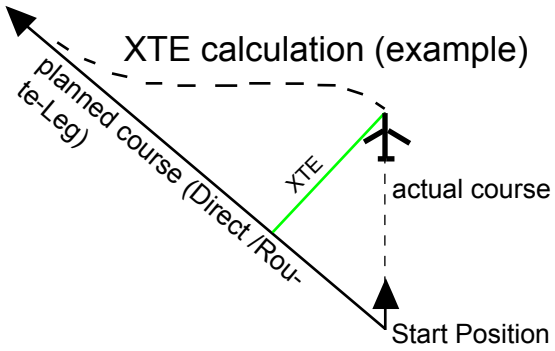
4.3.Connection diagram

At the source selector there is usually no input available, so either the NAV or the HEADING input must be provided with a selector switch (toggle switch). The MT autopilot interface can be operated both as a NAV source as well as a HEADING source.

4.4. Initial operation

4.4.1. Mode of operation

The MT autopilot only works if an APDCT (Direct) or an APRTE (Route) is active in the MT system and at the same time the ground speed is at least 5 knots. If neither a DIRECT nor a ROUTE is active no signal is transferred to the D/A converter and thus no control voltage is supplied to the autopilot.
If a Route or a Direct is active a so-called "cross track error“ (XTE) is calculated between the current position (GPS/MT) and the planned course (Direct/Route leg). Depending on the magnitude of this XTE a heading change is affected by the autopilot.



4.4.2. Polarity test

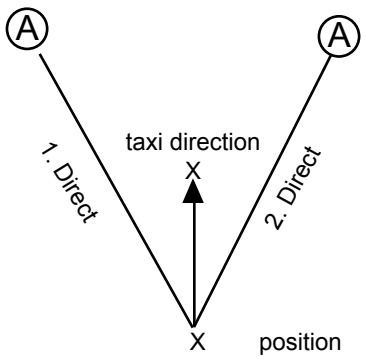
In order to check polarity a minimum speed of 5 knots is required, so the functionality should be checked during taxiing.

a) Turn on all required devices (MT-VisionAir, autopilot computer, etc.) and select the appropriate input switch of the autopilot computer (e.g. HDG-Mode, Nav Mode, MT-Switch).

b) Wait for GPS SatFix and switch to FLT mode by pressing <K>.
Chart is positioned.

c) Using the following procedure set a Direct to a point left of intended taxi direction (see diagram):

NAVWPT, choose destination, press DCT



d) Activate autopilot, select, <AUX> <AP> and <APDCT>

e) With the aircraft moving in the taxi direction, there is a deviation from the DCT course. In this case the rudder must now be correctly deflected (laterally to the left).
This is only possible with a ground speed > 5 kts. At a ground speed under 5 knots the autopilot is deactivated and the rudder is brought into neutral position. The status of the autopilot is displayed instead of “ModeMAP“ or “ModeFLT“.

f) Testing the autopilot in the simulator with the aircraft standing still:
Procedure e) can also be carried out without the aircraft moving using only the built-in simulator. In this case it is not necessary to use a SatFix mentioned in b).

g) If the rudder deflection is in the wrong direction, the polarity can be changed using the parameter ***Polarity*** in the file MTPRO.INI.

In the section [autopilot] there is a parameter:

Polarity = R
By changing “R” to “L” the deviation voltage can be inverted (see also 4.5 MTPRO.INI).

4.4.3. Dynamic calibration

Dynamic calibration is dependent on aircraft type and model, it must be performed for each aircraft as each one reacts differently. As demonstrated in the following diagrams the operation of the autopilot is observed and the following values set in the file MTPRO.INI:

[Autopilot]
Sensitivity = 250 means that the sensitivity is set to 250% and a maximum turn rate is achieved beginning at an **XTE** of 0.5 nm (two-minute turn assumed).

When Sensitivity is set to 100 the autopilot has a maximum turn rate when **XTE** is 1.25 nm (Nautical Miles).

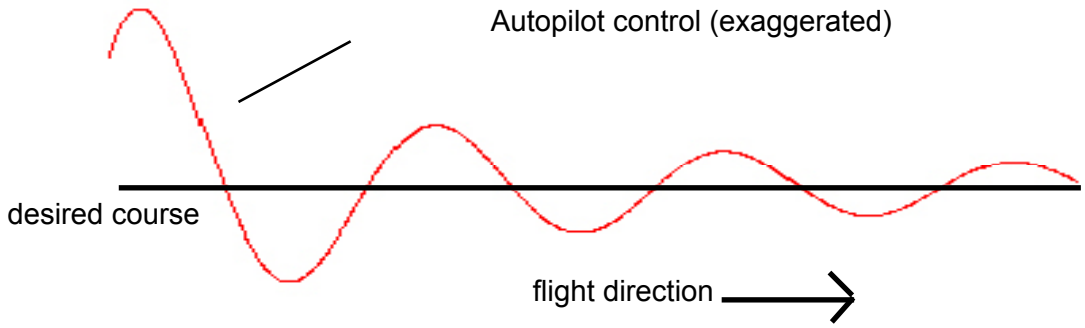
The value of 250 is suggested by Moving Terrain based on tests and experience. However it can vary with different aircraft types.

Sensitivity should only be changed if the aircraft tends to oscillate (reduce sensitivity) or reacts sluggishly to course changes (increase sensitivity).

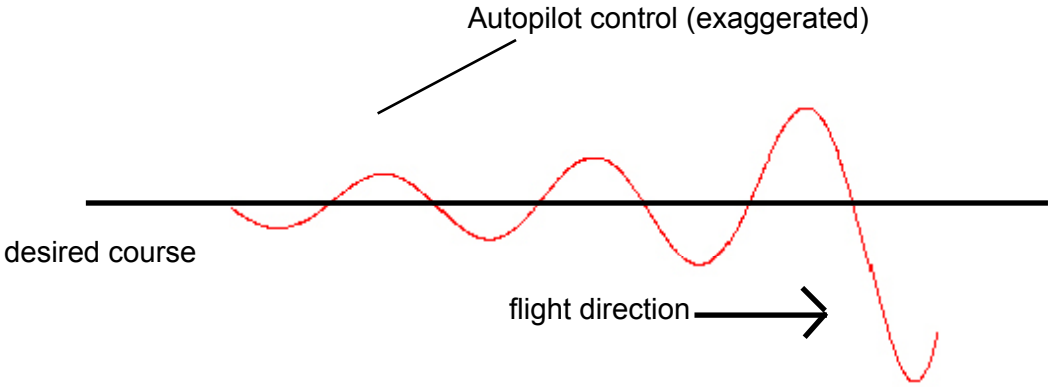
Dynamic calibration can only be performed in flight.

4.4.4. Behaviour of aircraft with various sensitivity settings:

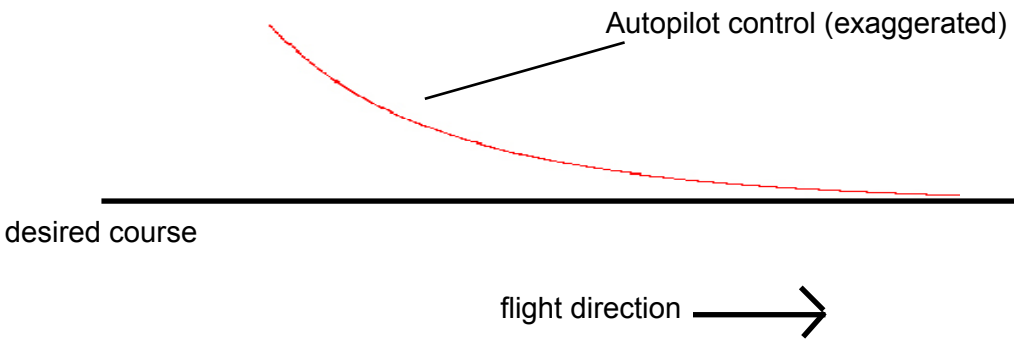
Case 1. Oscillatory convergence => Aircraft turns to course slowly.
Possible cause: sensitivity set too low.



Case 2. Oscillatory divergence => Aircraft tends to oscillate.
Possible cause: sensitivity set too high or much too low, e.g. in very unstable aircraft



Case 3. Asymptotic behavior => Aircraft intercepts course
=> Sensitivity OK



Remarks:
In case of failure of the MT system or of the GPS the control voltage is reset to the neutral value after approximately 3 seconds (no heading change by the MT autopilot module).

4.5. MTPRO.INI

In case these adjustments do not produce the desired results, please contact the MT service.
Through modifications of the MTPRO.INI file the autopilot can be accommodated to special conditions.

The default values for the autopilot software:

In the section [General]

LookAheadSecsXTE = 45.0
LegFinishedSecsVFR = 20.0
LegFinishedSecsIFR = 30.0
LegFinishedSecsFlyOver = 5.0

In the section [Autopilot]

Sensitivity = 70
Polarity = R

Heads up!
Lines in MTPRO.INI beginning with a semicolon ";" are commented out. The semicolon must be removed in order for the parameter to take effect.

Preparation: Plug a standard keyboard with a PS2 connector to the 1st of the 3 female connectors on the back of the unit. (Please make sure the power supply is connected).

Switch on the Unit and press EXT (instead of AGREE). Type NC, press Enter, Norton Commander is now starting.

Choose mtpro.ini with the arrow-keys. For safety make a copy of the file: press F5, type: c:\MOVTER.PRO\mtproini.sav, press Enter

Choose mtpro.ini with the arrow-keys, press F4, search for [AUTOPILOT].

Attention! Make sure not to change the program structure!

At this stage it is possible to make an alteration to *.ini, e.g. change polarity from R to L.

Save any changes with F2. Close editor with F10. Close Norton commander with F10. Reboot the unit.

5. MT Sat Radar and Blitzplan

5.1. System components for data transfer

MT Satellite Radar requires the following components:

5.1.1. Hardware

- MT-VisionAir with central connector for data transfer
- GPS receiver
- MT-GPS/GSM antenna with built-in GPS module or
- MT Integral GPS

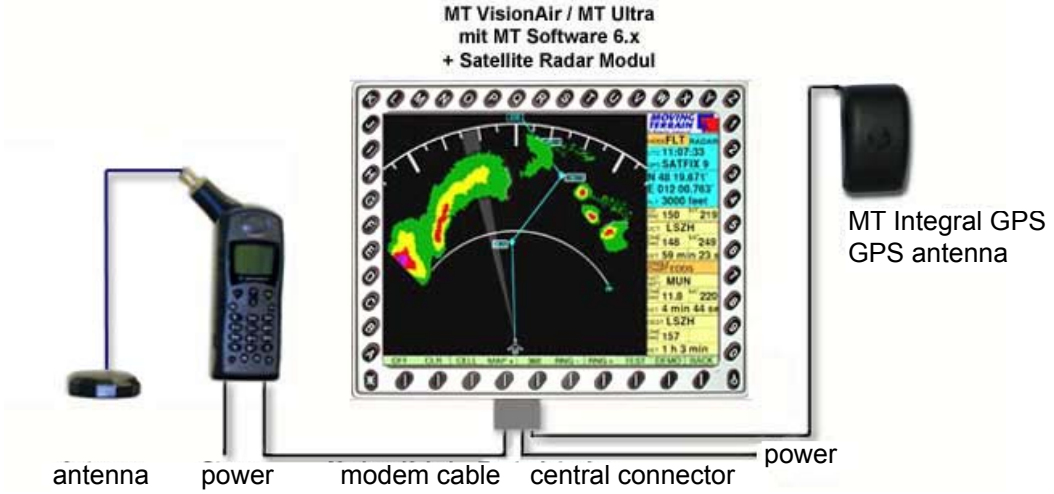
Important: The GPS has to transmit current time, because weather download is not possible otherwise. Currently known GPS models that are not suitable and do not transmit the time: Garmin GNS430, GNS530.
These have to be combined with the the GPS-clock. Please call us for more information.

- Satellite telephone Motorola 9505A with modem kit, data transfer cable and antenna or
- External cell phone (GSM technology) (very restricted functionality in the air) or
- Built-in GPS/GSM module with antenna.

5.1.2. Software

- MT-Satellite Radar Display software
- Access to DWD weather data (PCMET access)

5.2. Block diagram



Important:
For calling and for downloading data the connector between the satellite telephone and antenna must be **set at 45°**, pointing upwards.

The components of the system must be correctly connected:
Pin assignment of the central connector is described under 3.4.2 or 3.5.2.

When connecting an Iridium telephone or GSM telephone, it must be verified that all 7 lines are attached, because they are all required. (Typical error: if lines are missing, the telephone dials but then hangs up during the weather download.) In general, connection is made to COM3 and must always be connected 1:1 (no crossed cable).

5.3. Remarks about installation of the Iridium Antenna

5.3.1. Recommended installation of the Iridium Antenna

Like with the Integral-GPS or GPS/GSM combination antenna the visible segment of the sky must be as big as possible (see installation sketch p. 8).

Position of the antenna: Half of the sky (e.g. antenna is at the wall of the hangar or house) is enough for the GPS, but not for the satellite-telephone:
The satellite antenna needs ideally about 180° free vision. The positioning under the glare shield isn‘t ideal as it offers only vision of 2/3 of the sky.

Solution:
- Installation in the rear roof window (Cessna)
- Installation directly under the plastic fuselage
- external antenna (mounted on the roof)

The antenna provided by Motorola can be extended using the RG 58 cable (ideally shielded against interference).

5.3.2. Ground plane

For the installation a base plate (min 20 x 20cm) made of conducting material is recommended. On this base plate the antenna is mounted **with upward vision**. Conducting material (e.g. galvanized sheet metal) improves the reception.

5.3.3. Extension of the antenna cable

Material:
RG58C/U 500 Ohm cable with foil- and braided shield
TCN male connector for RG58
SMA female connector for RG58
SMA male connector for RG174 resp. RGS316

Important: Trim the thin antenna cable as close as possible to the antenna.

5.3.4. Interference of the antenna - experience report

- Distance (GPS to Iridium-Antenne) for optimal GPS reception > 1,3 m
- Distance between the antennas < 40cm results in complete failure of GPS => SATACQ

The following scenarios will give no problems:

- Cables tied together (Integral GPS serial and/or antenna coaxil)
- Integral GPS with angled plug (unshielded cable)
- Integral GPS with staight plug (shielded)

Attention: Interference often only shows up on the GPS (SATAQ or other error messages), but the satellite telephone has no reception in spite of showing a good signal quality. A good signal doesn‘t mean a good reception.

Attention: Non-MT GPS receivers sometimes show no error message in spite of a failure, because they still send data from the cache.

Remarks:
- An ideal SatRadar download lasts less then 2 min.
- The Iridium reception is generally unstable, sometimes weak.
- The Iridium antenna should be installed with an optimal vision of the sky (horizon to horizon).
- At testing keep enough distance to hangar etc.
- While installing the Iridium antenna watch out for other GPS antennas (non-MT)!

5.3.5. Example for an internal installation

Installation of the GPS antenna on the glare shield, the antenna of the satellite telephone in the rear window - if available - facing up, such as in a Cessna. Such an installation is well suited as long as the minimum distance to the GPS antenna is 1.3 m.

5.3.6. Advice for certification tests

Please be aware that interference of GPS reception by use of a satellite telephone cannot be totally ruled out (see also AC-20-138). It is therefore recommended to check the critical avionics devices when the satellite telephone is turned on during a ground test and during a test flight.

5.4. Initial operation of the satellite telephone

Connect the telephone with the MT-VisionAir using the modem cable.
Make sure of reliable power supply for the telephone (on board power).

Suppression of the PIN Code
Standard satellite telephones (e.g. Iridium) allow the deactivation of the security code, so that the telephone need only be turned on. Further input is not required.

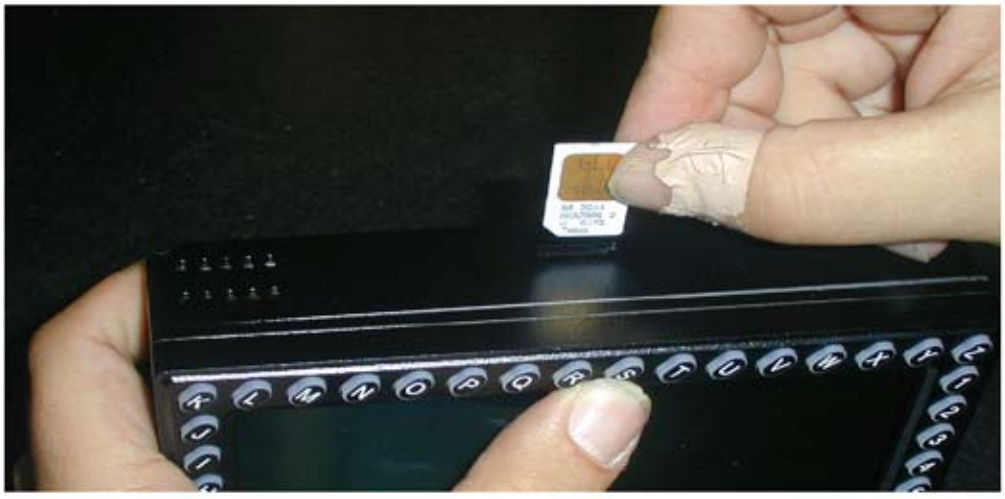
5.5. Inserting the cell phone SIM card in the built-in GSM module

Prior to insertion in an installation chassis (panel mounted) or generally prior to initial operation of the system an activated SIM card for a telephone network must be inserted. Such a card with the associated cell phone contract is not included in the MT-VisionAir delivery package. They must be acquired as a standard contract from a cell phone provider (e.g. as a partner card etc.).

In addition, for this SIM card the use of the PIN must be turned off with the help of a cell phone (deactivate PIN).

SIM cards of the provider O2 are currently not yet compatible with the system.

The SIM card must be inserted in the MT-VisionAir as shown in the image. The card should be pushed in with a small coin until it clicks in.



5.6. Remove the SIM card of the built-in GSM module

To activate the spring release mechanism, press the top of the card with a small coin or something similar.

5.7. Initial operation and test of the satellite telephone

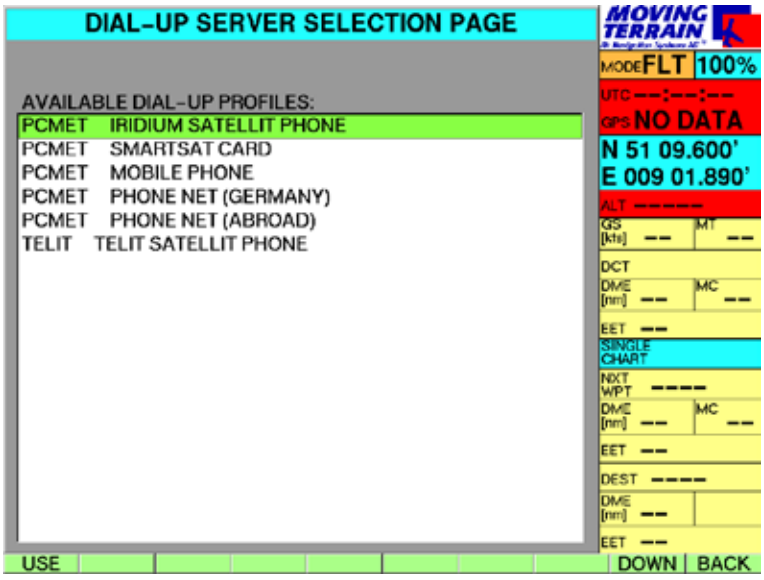
Following installation of the satellite telephone it should be tested:
Practical test of weather download as follows:

5.7.1. Authorisation of download of weather data

1. Turn unit on and confirm with AGREE
2. Enter MT satellite weather radar RADAR

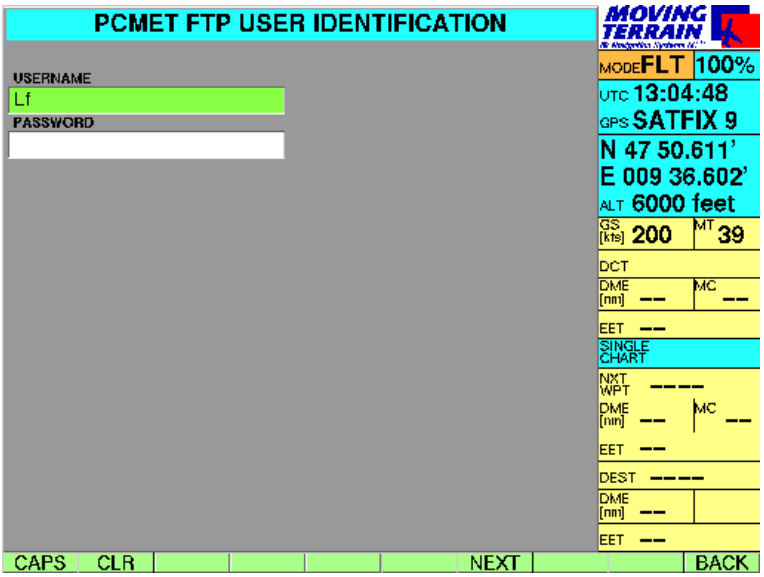
Before radar data can be downloaded from Deutscher Wetterdienst prior authorization is required.

AUTH



This leads to the **PCMET FTP authorisation page** where access data, i.e. **Username** (beginning with Lf) and **Password** must be entered. These are communicated by DWD on request. **Upper and lower case must be observed.**

To enter an uppercase letter first press CAPS key followed by the appropriate letter key.



CLR deletes the character last entered,

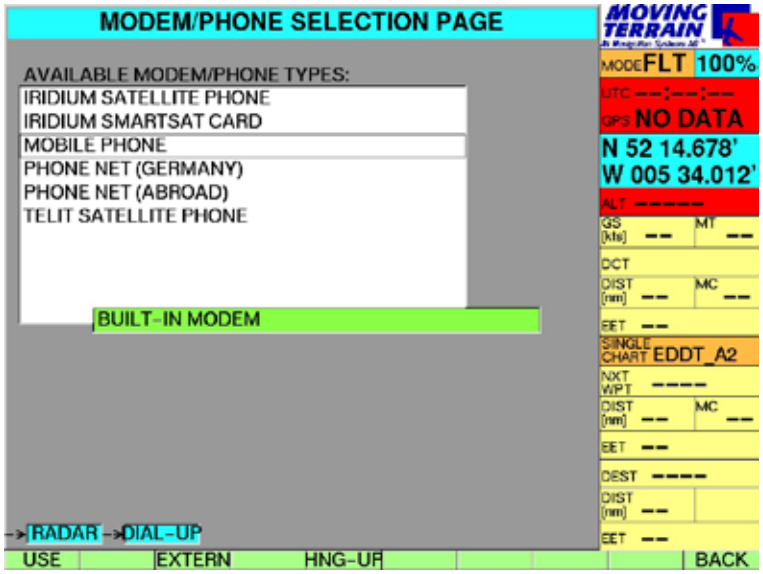
NEXT tabs between the fields USERNAME and PASSWORD.

When leaving this page by pressing BACK both entries will be automatically stored. These need not be re-entered.

The key **AUTH** is only re-displayed if the weather service refuses the authorisation and access data must be corrected.

5.7.2. Selection of the telephone

With DIAL-UP you can choose in the RADAR-Menu between INTERN (integrated GPS/GSM-module) and EXTERN (Satellite Telephone or Mobile Phone)

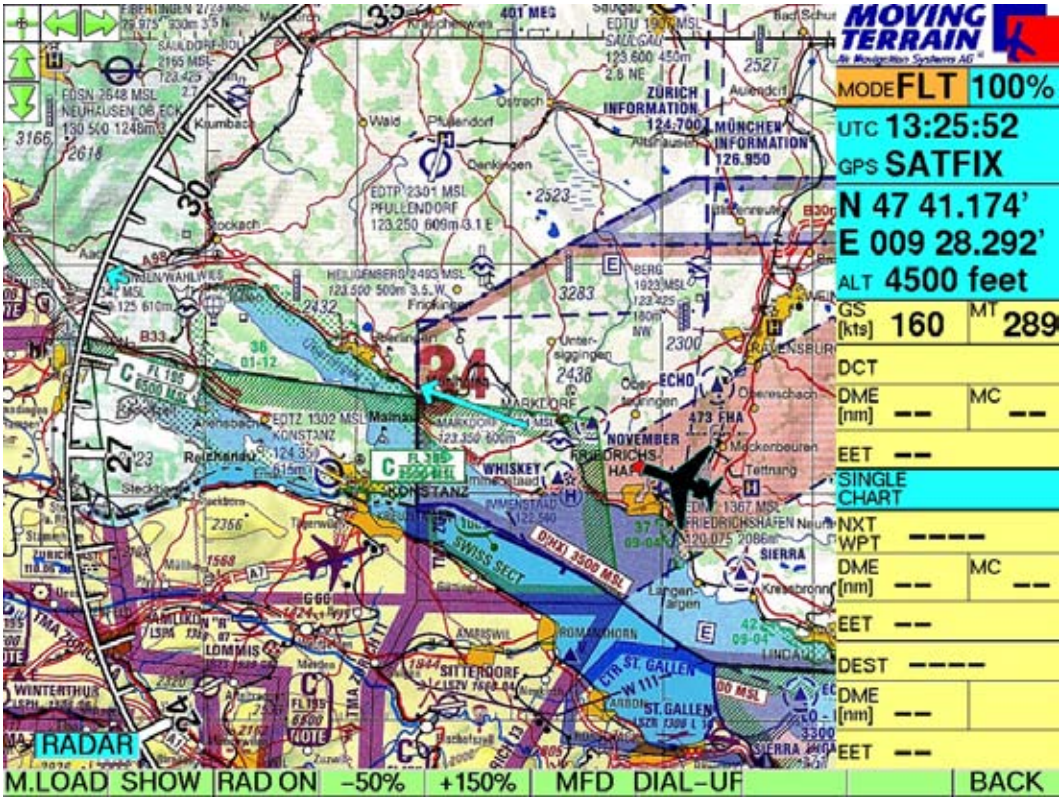


EXTERN: Selection of the respective connection (e.g. MobilePhone, SmartSat card in the Satelite Telephone or Telit Satellite Phone), confirm with USE

By default the DIAL-UP number of the DWD is set for satellite telephones or GSM cell phones. Should you wish to obtain the data from the fixed network by means of a modem, use the UP/DOWN key to select the dial-up number to PHONE NET (GERMANY) and confirm with USE.

5.7.3. Download of Weather Data

• Turn unit on and confirm with AGREE
• Enter MT satellite weather radar RADAR



• M.LOAD –manual download of radar data
• SHOW – display of radar data previously downloaded
• HIDE – suppress radar layer for better legibility of the chart
• RAD ON - turn on automatic download every 15 minutes

By pressing the same key, now labeled RAD OFF, the automatic download is turned off.

Once weather radar data has been loaded onto the MT-VisionAir it can be displayed with SHOW
-50% and +150% allows zooming out and zooming in of the chart.

MFD activates the MFD mode

Please be aware:
The keys are labelled with the appropriate function that is to be executed. The **status** is displayed in the small green window on the lower left of the display.

Manual Mode
Allows an immediate one time download of weather data, e.g. at the beginning of the weather briefing.
M.LOAD - no further entries required!

5.7.4. The Download in Detail: StatusWindow

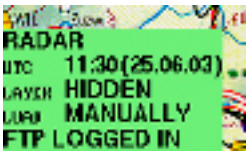
dial up

Time and date of data displayed

connect

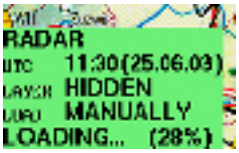
Various connection modes displayed in parantheses

FTP logged in
connection to server
download of data

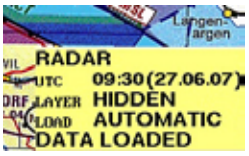


Loading

Data loaded



Progress report in parantheses



All data are successfully downloaded and are displayed on the chart.

The connection is automatically terminated!

If precipitation information is not displayed there are two possible causes:

1. Layer is still suppressed (status HIDDEN), solution: press **SHOW**.
2. No precipitation was recorded for the area of the chart displayed (check status display: layer SHOWN)

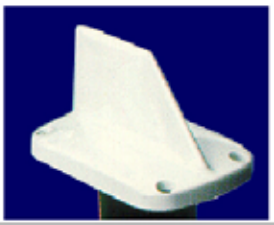
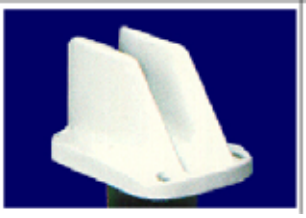
After completion of all the above steps, it may be asumed that installation has been succesful.

6. MT TCAS

6.1. Antenna arrangement

6.1.1. Standard installation

The Ryan 9900 BXSystem has 2 double antennae (2 serial antennae in a single casing). Together both antennae are responsible for direction determination (bearing).

type of antenna		installation location	diagram
serial, 2 antennae integrated in one casing		top	The diagram of the single casing antenna alternately points forward and back.
parallel, 2 antennae parallel side by side		bottom	The diagram of the single casing antenna alternately points left and right.

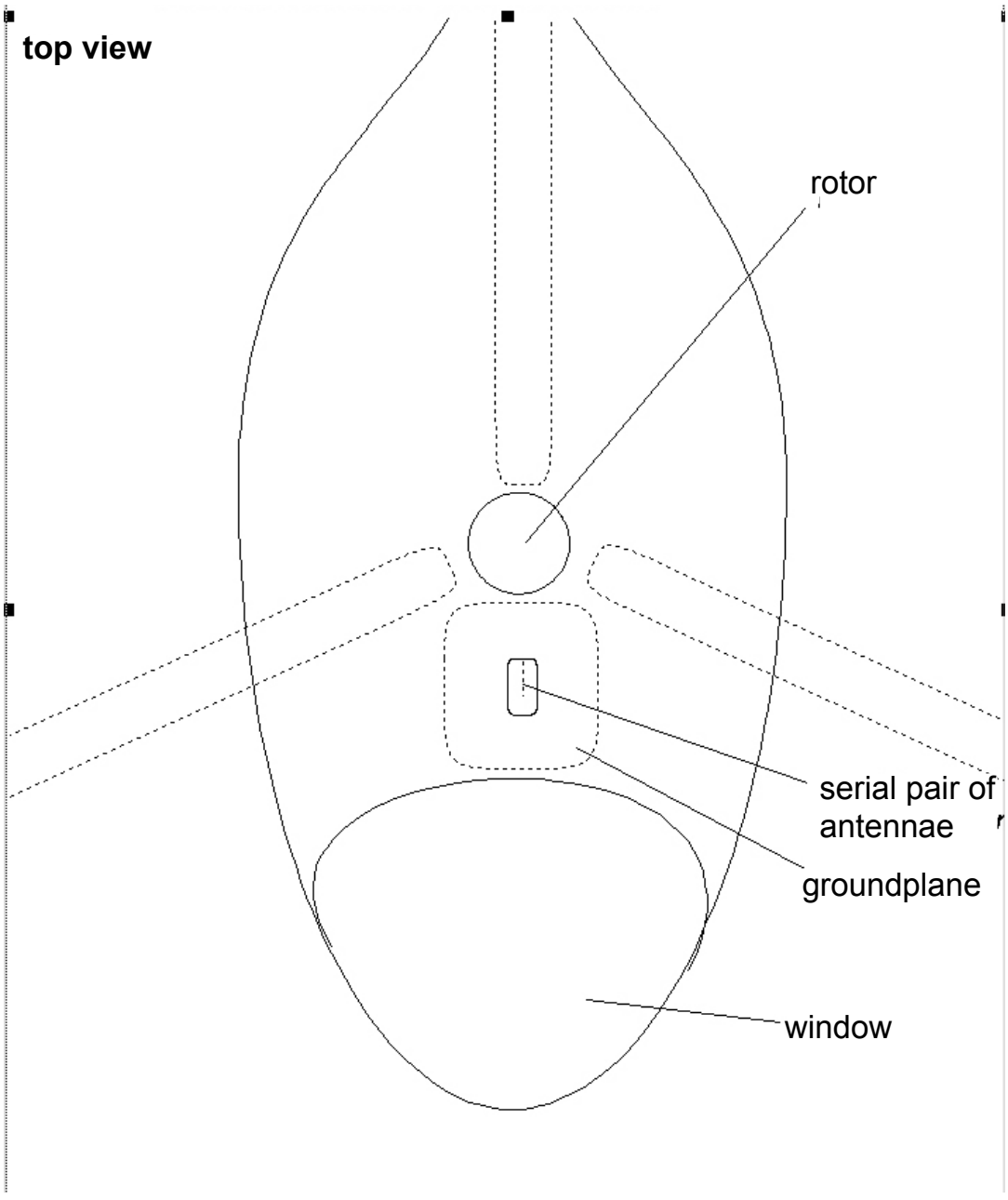
Function:

The four different antenna diagrams are wired sequentially. The bearing is calculated from the various signal strengths of the pulses received.

Distance is calculated from the time differential between the transmitted pulse and the received response pulse (as in any secondary radar).

Ryan installation recommendations for serial antennae (head antennae)

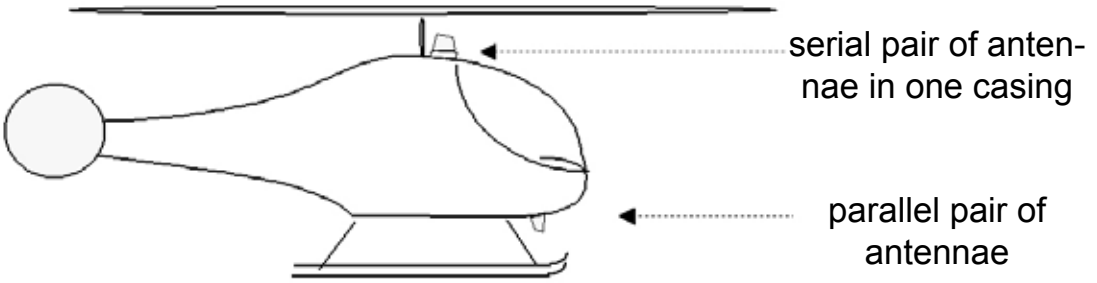
The installation location should be close to the longitudinal axis of the aircraft.
For plastic covers a ground plane (foil inside)
Radius larger or equal 30 cm, diameter larger or equal 60 cm
(l = 27 cm)
At least 20 cm distance from other antennae.



Ryan installation recommendations for parallel antennae (lower antennae)

The installation location should be close to the longitudinal axis of the aircraft.
At least 1 m distance from transponder and DME.
At least 20 cm distance from other antennae (e.g. glide slope, ILS).

Important:
The installation of both antennae should be symmetrical.
The serial antenna should have free visibility forwards.



6.1.2. Non-Standard Installation

The installation location of the two antenna types may be swapped, e.g. if free forward visibility is not available for the serial antenna on top.

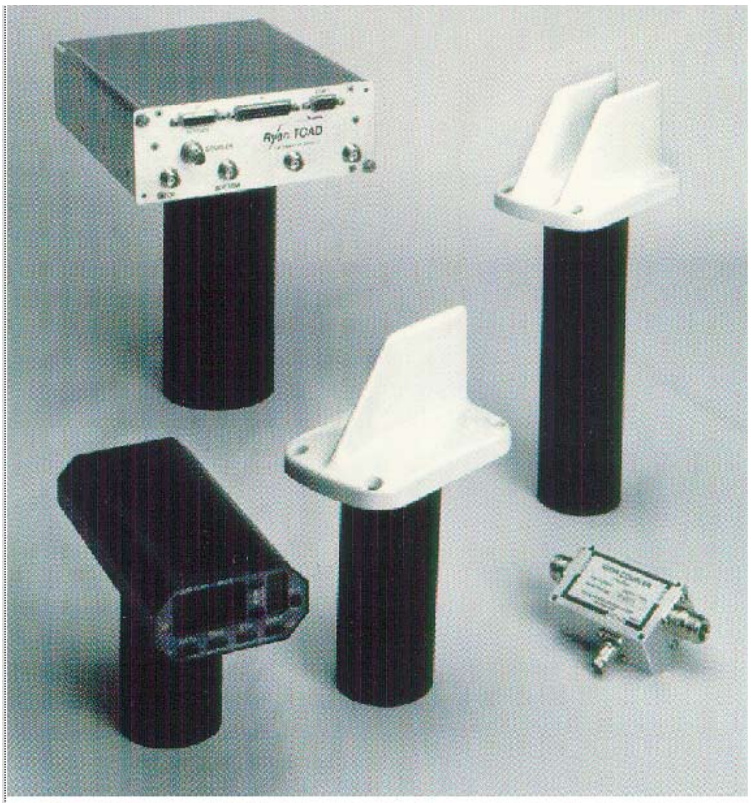
- Example Agusta 109 (pitot tubes mask the upper installation location).

Important:
For a non-standard installation with the serial antennae at the lower location the same recommendations apply as for the standard installation of the parallel antennae:

- Minimum 1 m distance from transponder and DME
- Minimum 30 cm distance from other antennae (e.g. glide slope, ILS)

6.2. Views, Dimensions and Weight*

Total view of the components:



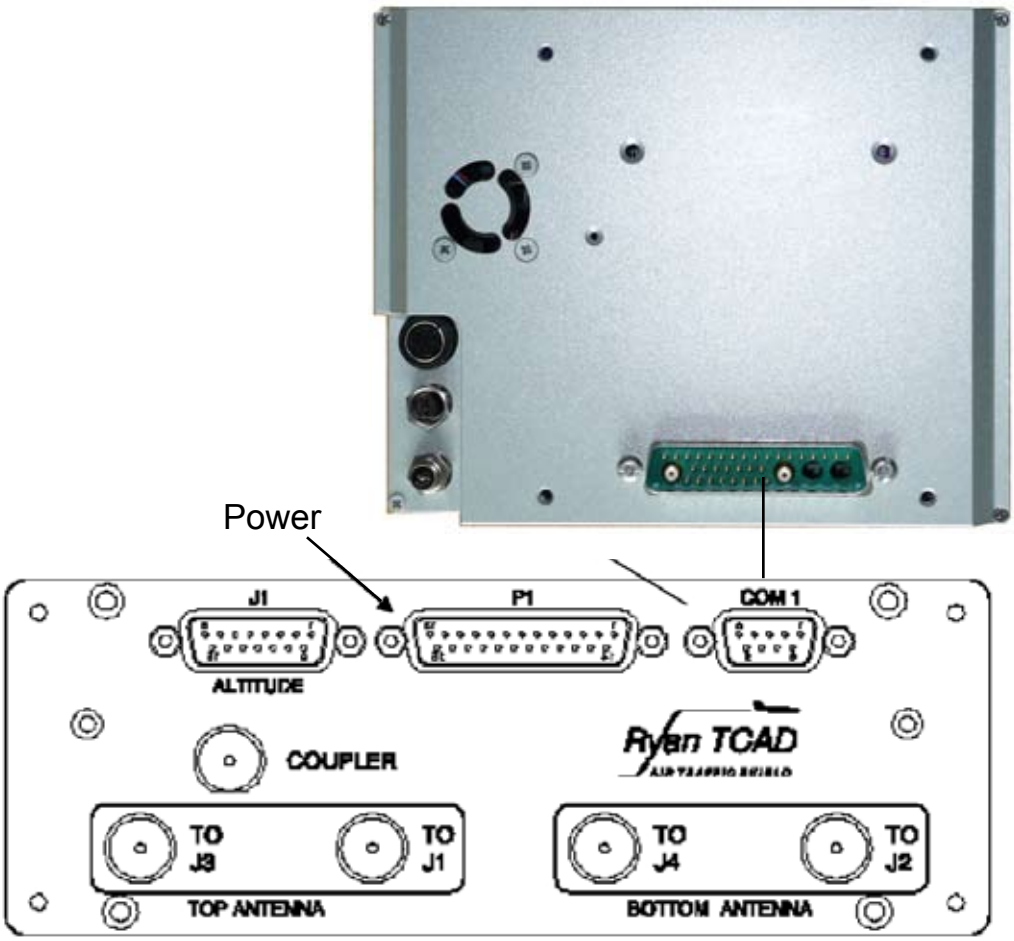
system weight: 4,18 kg

component dimensions		width	height	depth	depth with connectors
processor		18,41 cm	7,87 cm	23,68 cm	29,65 cm
operating panel		8,28 cm	3,94 cm	17,15 cm	21,59 cm
directional antennae		8,23 cm		13,06 cm	
serial					
parallel					
transponder coupler		4,57 cm	4,07 cm	6,86 cm	

6.3. Connection to COM 1 of TCAD (Ryan TCAD / Avidyne TAS)

For VisionAir (EP) units the TCAS can be connected to COM 1 or COM 4.

Connection of MT-VisionAir to Ryan TCAS:



The connection can be implemented from the central connector to COM 1 or P1 of the TCAD. The cabling must be crossed (zero modem), i.e.

TCAD		VA
RxD	-	TxD
TxD	-	RxD
GND	-	GND

6.3.1. Connection to COM 2, 3 or 4 of the Ryan TCAD

As COM 1 of the Ryan TCAD is generally used as a Service Port for potential programming of the Ryan TCAD due to its easy accessibility, the manufacturer recommends a connection to one of the other COM ports that are located on P1 (see "Ryan TCAD Model 9900BX Installation Manual, Revision 2 - July 26, 2001“, p. 26, Connection diagram p. 38, Fig. 2-22: “Wiring Diagram for connection to Multi-Function Displays without a TCAD Display/Controller.“)

6.3.2. Pin assignment COM 1 port for MT devices

The pin assignment of the serial COM 1 ports (RS232-Port 1) on the MT-Ultra and the MT-VisionAir conforms to the standard:

PIN 2 = RX
PIN 3 = TX
PIN 5 = Gnd

6.3.3. Configuration for the operation of the Ryan TCAD 9900 BX with Moving Terrain

Display as MFD without TCAD Display/Controller

a) preconditions for the certified operation of the device are:

- Annunciator light labeled "Traffic“ or "Traffic alert“
- Mute switch
- Feed into the audio system of the aircraft
- MFD is optionally certified.

b) Configuration

see "Ryan TCAD Model 9900BX Installation Manual, Revision 2 - July 26, 2001“, p. 26, Connection diagram p. 38, Fig. 2-22: “Wiring Diagram for connection to Multi-Function Displays without a TCAD Display/Controller.“

ba) 1 switch ON/OFF to GND,
Can be replaced with a permanent ground wire and + to the unit (permanent power)

bb) 1 switch Mute to GND (warning signal only to be interrupted, not switched off)

- The mute switch must be within easy reach of the pilot.
- The mute switch interrupts the optical and acoustic warning for a certain period.
- The mute switch does not turn off the loudspeaker nor the TCAD.

bc) 1 switch for annunciator light to GND

bd) connection to the audio system of the aircraft

be) optional: gear down switch or weight-on-wheel switch (also works without a gear down/ w.o.w. switch due to recognition of the altitude change from the altitude encoder)

Important: apply power to the transmitter (including the Ryan TCAD) only when antennae (or substitute resistors) are connected!

7. MT Stormscope

7.1. System Components

MT-Stormscope requires the following components:

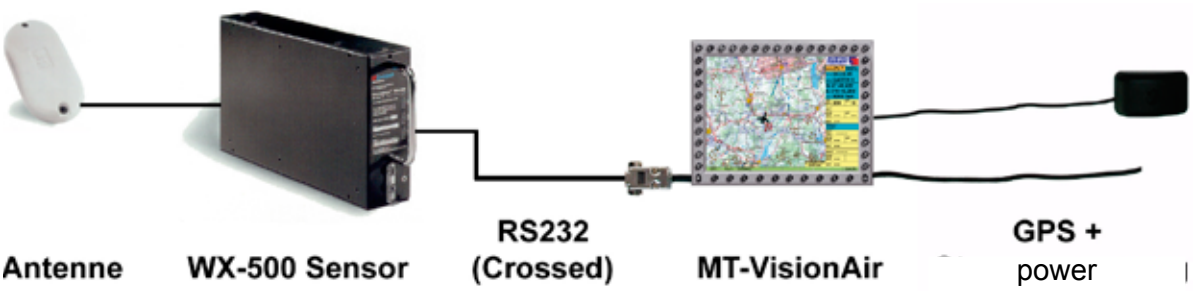
Hardware

- MT VisionAir with COM port for data transfer
- GPS receiver (MT Integral GPS recommended) with antenna
- WX-500 Sensor with data transfer cable and antenna

Software

- MT-Stormscope display software

7.2. Block Diagram



The components of the system must be correctly connected:
Connection for power and GPS to the MT-VisionAir are explained in the basic manual.
Connection of the antenna, WX-500 and power supply for the WX-500 shown in the appropriate operations manual.
For the connection of the WX-500 sensor with the planned and labelled COM port that is fed out of the MT-VisionAir unit a crossed RS232 data cable must be used.
.

8. Check List for acceptance after installation

8.1. General Installation Check

The unit can be easily inserted and removed from the Quick Release Chassis?	☐ correct
The power supply takes place via the Ground Clearance Switch /Hot Bus / Battery Bus?	☐ correct
The GPS positiones correctly (SATFIX), the correct GPS source selected?	☐ correct
The GPS signal is not shielded by a heated windshield?	☐ correct

8.2. Check Moving Terrain with Satellite Telephone Iridium 9505a

8.2.1 Check Satellite Telephone Antenna

The distance between GPS antenna and Satellite telephone antenna is at least 1,3 m?	☐ correct
The Sat Tel antenna has optimal view (about 180°) to the sky?	☐ correct
The position of the Sat Tel Antenne is suitable for reception?	
It is neither vertical nor installed vice versa? Please inform yourself in detail about the installation!	☐ correct
The extension of the antenna was done according to the guideline (page 43)?	☐ correct
Ground plane installed?	☐ correct
The connecting part between Satellite telephon and antenna is ***locked in a 45° angle***?	☐ correct

8.2.2. Check Connection Satellite Telephone

The Satellite telephone is supplied/loaded by on board power?	☐ correct
The Satellite telephone is connected correctly with MT?	☐ correct

Data adapter connected at the base of the telephone? ☐ correct

Cable connection withe central connector at the MT established? ☐ correct

8.2.3. Check Satelliten Telephone in Use

Telephone switched on? ☐ correct

Captains PIN deactivated? ☐ correct

The satellite telephone can receive data ☐ correct
(check with Unicom)

8.2.4. Check Settings in the Moving Terrain

The DWD Code with Username (Lf_____) and Password is typed in correctly? ☐ correct

The UTC (see Info Box) is transmitted by GPS? ☐ correct

The correct telephone source is selected? ☐ correct
(in most cases Smart Sat Card!)

8.3. Check Moving Terrain with GSM

SIM Karte in Slot? ☐ correct

Security PIN code deactivated with a cell phone? ☐ correct

The correct telephone source selected (INTERN, Built-in Modem)? ☐ correct

The field intensity in the info box shows enough %? ☐ correct

8.4. Check the Autopilot Connection

The acceptance test has been carried out? ☐ correct

9. Technical Specifications

(as of January 1, 2007, subject to change without notice)

Type highly integrated navigation unit for cockpit panel mount or as mobile unit

Screen TFT colour display 6,5“ (diagonal), 1024 x 768 pixels, 256 colours, optimum readability in sunlight, ideal readability up to an angle > 50°

Presentation horizontal
Diagonal position of keys enables vertical use, provided appropriate software changes are made.

Keyboard integrated keyboard (similar to cell phone keys) alphanumeric keys: 36 keys (alphabet and numbers) + 10 multi function keys + on/off switch + hard wired key to trigger peripheral equipment and MFD sensors

Ports I for operation power and GPS (on COM II)

Ports II for Service PS/2 (external keyboard), compact flash slot for fast update via CF

Optional Ports III
Via Central connector: Power, GPS/GSM, COM 1, 2, 3, 4, VGA (external screen), USB, PS/2, Ethernet, Autopilot, Video in FBAS

Casing aluminum, black varnish
aluminum, silver metallic for EP version

Weight 800 g

Dimension 157 x 125 x 40 mm (w x h x d)

Power Supply
12 - 28 V, adapts automatically

Power Consumption
MT-VisionAir: 12 W; MT-VisionAir EP: 14 W.

Environmental Conditions
temperature: -10°C /+50°C operational, -40°C /+80°C storage;
shock and g loading: 22 g in x, y, z direction;
vibration: 1 g at 1-100 Hz; EP version 10 g at 1-100 Hz

Software MT - basic moving map software with optional software modules

Optional Accessories

- MT Integral GPS (12-channel) incl. antenna
- GPS/GSM antenna with central connector for mobile use
- Quick release chassis for panel mount option
- Quick release mount for yoke / side mounting
- Mobile station
- Pax: passenger entertainment screen 10 ``
- central connector kit

10. System Components

10.1. MT-VisionAir: Hardware Identification Numbers

HWI	
MTV/002 - S/N - Config - SW version	Moving map system: MT-VisionAir
MTV/006 - S/N - Config - SW version	Panel mount kit: Quick release chassis
MTV/010 - S/N - Config - SW version	MT-Integral GPS (12 channel)
MTV/011 - S/N - Config - SW version	Module GPS (12 channel)
MTV/013 - S/N - Config - SW version	GPS/GSM antenna for units with integrated GPS/GSM module with 2 SMA plugs
MTV/124 - S/N - Config - SW version	Quick release mount (2 countertop system)
MTV/127 - S/N - Config - SW version	Glareshield
MTV/141 - S/N - Config - SW version	Mobile station with rechargeable battery pack and charging control
MTV/021 - S/N - Config - SW version	Power supply 100 - 240 V with euro supply
MTV/131 - S/N - Config - SW version	Board power cable with 2 pin plug socket (straight connector)
MTV/132 - S/N - Config - SW version	Cigarette lighter cable for mobile use
MTV/144 - S/N - Config - SW version	User manual
MTV/183 - S/N - Config - SW version	Installation manual
MTV/184 - S/N - Config - SW version	Central connector Harting (installation kit)
MTV/187 - S/N - Config - SW version	Central connector 36W4 (installation kit)
MTV/181 - S/N - Config - SW version	Central connector 36W4 with GPS/GSM antenna and power plug for mobile use
MTV/185 - S/N - Config - SW version	Satellite telephone connector kit
MTV/134 - S/N - Config - SW version	Case for MT-VisionAir
MTV/186 - S/N - Config - SW version	Case for Mobile station
MTV/057 - S/N - Config - SW version	PAX: remote display 10“
MTV/125 - S/N - Config - SW version	Iridium outdoor antenna

10.2. MT-VisionAir EP: Hardware Identification Numbers

HWI	
MTEP/004 - S/N - Config - SW version	Moving map system: MT-VisionAir
MTEP/006 - S/N - Config - SW version	Panel mount kit: Quick release chassis
MTEP/010 - S/N - Config - SW version	MT-Integral GPS (12 channel)
MTEP/011 - S/N - Config - SW version	Module GPS (12 channel)
MTEP/013 - S/N - Config - SW version	GPS/GSM antenna for units with integrated GPS/GSM module with 2 SMA plugs
MTEP/124 - S/N - Config - SW version	Quick release mount (2 countertop system)
MTEP/127 - S/N - Config - SW version	Glareshield
MTEP/141 - S/N - Config - SW version	Mobile station with rechargeable battery pack and charging control
MTEP/021 - S/N - Config - SW version	Power supply 100 - 240 V with euro supply
MTEP/131 - S/N - Config - SW version	Board power cable with 2 pin plug socket (straight connector)
MTEP/132 - S/N - Config - SW version	Cigarette lighter cable for mobile use
MTEP/144 - S/N - Config - SW version	User manual
MTEP/183 - S/N - Config - SW version	Installation manual
MTEP/184 - S/N - Config - SW version	Central connector Harting (installation kit)
MTEP/187 - S/N - Config - SW version	Central connector 36W4 (installation kit)
MTEP/181 - S/N - Config - SW version	Central connector 36W4 with GPS/GSM antenna and power plug for mobile use
MTEP/185 - S/N - Config - SW version	Satellite telephone connector kit
MTEP/134 - S/N - Config - SW version	Case for MT-VisionAir
MTEP/186 - S/N - Config - SW version	Case for Mobile station
MTEP/057 - S/N - Config - SW version	PAX: remote display 10“
MTEP/125 - S/N - Config - SW version	Iridium outdoor antenna

11. Unit specific configuration ex factory

S/N:_____

	internal cabling	COM 1	COM 2	COM 3	COM 4
Autopilot	O	O	O	O	O
GPS	O	O	O	O	O
GSM	O	O	O	O	O
TCAS		O	O	O	O
Sat-Telephone Iridium		O	O	O	O
Stormscope		O	O	O	O
	O	O	O	O	O

GPS Protocol Configuration:

O NMEA 0183 (Standard setting)

O Garmin 430 / 530

O Arinc-TNL

Configuration Autopilot:

max. left deflection: neutral position: max. right deflection:

_____ _____ _____