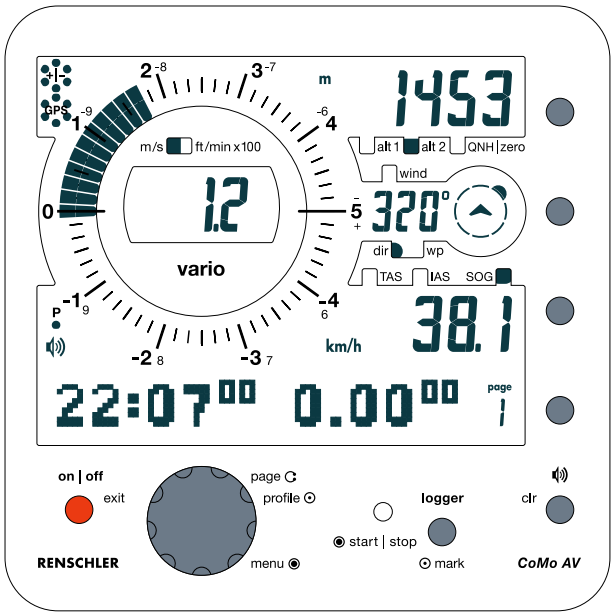
CoMo AV Instruction Manual

The operation of your CoMo is probably one of the easiest of all flight instruments on the market today.
To provide a most simple access, this manual is divided into 3 chapters. The following first chapter is a quick-access with the most important hints to operation. A more detailed description is found in main chapter 2.



Chapter 1: CoMo Quick Access

Funktion of the single keys:

Turn on: Push the red on|off-Button

if a GPS-Module is connected, there are two options:
1. Short push on the Rotary-Button will turn the GPS on.
2. Short push on the CLR-Button will leave the GPS off.

- short push on the button will choose the next function of the corresponding indication, e.g. from "alt1" to "alt2".

- short push on the Rotary-Button will shift profiles.

- rotating the Rotary-Button will turn the pages forward or backward.

- a long push on any button will switch to adjustment mode of indicated function.

- a long push on the Rotary-Button switches to adjustment menu

within the adjustment menu:

- turning of the Rotary-Button chooses a function or adjusts values (selection is also possible by shortly pushing the Page-Button).

- short push on the Rotary-Button confirm selection, respectively value (storage of value is confirmed by "o.k.").

- short push on the Exit-Button shifts one level back within the menu. Changed values will not be taken over. Push the Exit-Button repeatedly to leave the main menu.

turn off: long push on the red on|off-Button

Erklärung der verwendeten Symbole:

 *Taste drehen*

 *Taste kurz Drücken*

 *Taste lange Drücken*

Adjustment-menu general view

a long push on the Rotary-Button opens the adjustment-menu. Rotation selects the desired function, a short push confirms your choice.

Menu-level 0	Menu-level 1	Menu-level 2
adjustments	*altimeter*	
		– alt 1 manual adjustment
		– alt 2 manual adjustment
		– (zero) alt 3 manual adjustment
	acoustic	
		– descend tone level (point of response)
		– response-sensitivity ("damp")
		– volume loud
		– volume soft
		– fundamental time (interval between two climbing beeps)
		– acoustic-simulator
		– digitalvario (integrated vario)
	time	
		– hours, – minutes
	date	
		– day, – month, – year
	digital-vario	*– integrationtime in seconds (1-32 seconds)*
	logger	*– recording rate*
		– clear
profile	*profile 2 on* | *off (according to current state)*	
info	*battery-clock (can be reset)*	
logbook	*Flug 1 – date, take off and landing time, flight duration*	
	Flug 1 – maximum values	
	Flug 1 – minimum values	
	Flug 2 ...	
	...	*entspricht Software: Stand 1.0*
	Flug 63	

The keys of the CoMo AV

For easy operation the keys are divided into two sections: **Functional-Section** and **Adjustment-Section**.

The onloff-Button
in contrast to most other flight instruments the CoMo is equipped with a real onloff-Button. Short push will turn the CoMo on, long push will turn it off again.

In adjusment mode the button will take the "exit"-function. False input may be reset by a short push. Push repeatedly to leave the menu.

Adjustment-Section
Adjustment changes can be performed by the keys in this section. They will be mainly used before take-off, respectively after landing.

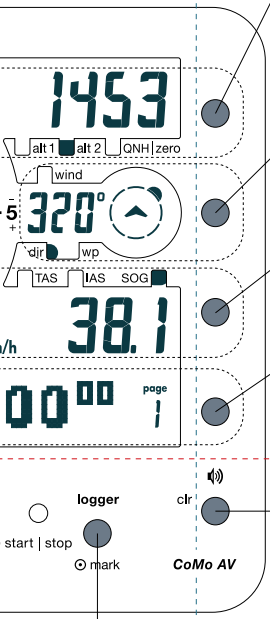
Rotary-Button
Push the Button to shift into next Flyingprofile (if active). Rotation turns pages forward or backward.

A long push on the button opens the menu of the instrument. Rotation selects a function, which is confirmed by a short push. Within the menu any adjustment can be executed. The page-indication will provide additinal information.

Explanation of symbols:

- turn
- short push
- long push

Functional-Section
The keys in this section offer direct access in flight.
Every function button is located right next to the corresponding indication, false operation is nearly impossible.



altitude-function-button
A short push shifts to the next value (e.g. from "alt 1" to "alt 2").
Make a long push to enter the adjustment menu.

Track-Function-Button
(no function yet)

Speed-Function-Button
Switches between different speed-indications, according to connected sensors.

Page-Function-Button
Switches between all page indication.
A long push opens the corresponding menu.

Acoustic-Function-Button
Acoustic can be set to "off", "soft" or "loud".
A long push opens the acoustic menu for further adjustment.

CLR-Button
In adjustment mode the Acoustic-Function-Button converts into a Clear-Button, by which a value can be set to "0" directly (e.g. altitude of landing ground).

Logger-Function-Button
This button allows to record flight data. A long push will start/stop the recording.
In standard version your personal log-book (date, max-/min-values) is activated, in OLC-version the "OLC-logger". (Getting beyond a change of altitude of more than 15 m will automatically start the recording).

The indicatins of the CoMo AV

Digital-Variometer-Indication (integrated-vario)
The figure gives information about the integrated climbing rate (i.e. average within a given space of time, which can be adjusted in the menu).

Bat. full Bat. empty

Battery-State-Indication
The more dots are shown, the more power is yet available (more details on battery-life are found on the Page-Indication "page 2")

GPS-State-Indication
This indication flashes when the instrument is seeking satellites. When ever a satellite is found, one more dot will light up. All dots on means that the GPS receives 6-12 satellites.

Profile-State-Indication
Shows which profile is activated (one dot = profile 1).

Acoustic-State-Indication
Shows if the acoustic function is set to "soft", "loud" or "off".

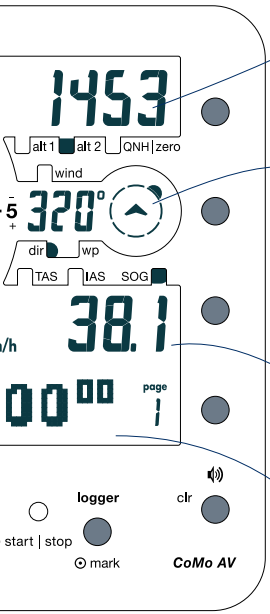
OLC-Logger-Indication
shows if the instrument is recording flight data (only with built-in OLC logger, since release 2.0)

Page-Indication
in adjustment mode:

hints for operation

Analogue-Variometer-Indication (direct-vario)
The position af the needle is quickly and precisely discernible. Shows directly climb- or descend-rate up to 10 m/sec (current value shown on display: 1,7 m/sec climb-rate)

Altitude-Indication
At the moment there are 3 individually adjustable altitude-indications available.



Track-Indication
Gives information about the track (only in combination with a GPS, otherwise temperature is indicated).

Track and the north-pointer are only shown when the instrument moves faster than 1,5 km/h (the GPS is unable to identify a track without movement!).

Speed-Indication
In combination with a GPS the SOG (**S**peed **O**ver **G**round) can be shown. A factor of relevance for your safety.

Page-Indication
Displays further information like time, date, battery-state (up to nine pages according to software).
In adjustment-mode the page-indication turns into a **built-in instruction-manual**.

directional / functional hints

Menu-Level

Chapter 2

Description of the functions:

2.1 **Altimeter**
2.2 **Variometer**
- Analogue
- Integrated (digital)

2.3 **Acoustic**
2.4 **Profile**
2.5 **Time, Date**
2.6 **Logbook**
2.7 **Batteryinfo**
- general information on batteries
- changing batteries

only with GPS-Module:

2.8 **GPS** (Global-Positioning-System)
- general informations
- SOG (Speed over ground) and wind determination
- Position and GPS-Altitude
- Track and north indication
- Satellite indication

2.1 Altimeter

Push shortly Altitude-Function-Futton to shift between three different altitude-indications.
"alt 1" and "alt 2" can be individually adjusted. The third altitude "zero" sets the indication to 0, whenever this function is activated.

"alt 2" is linked to QNH (air pressure). If you are within the alt 2 adjustment menu, the speed indication shows the QNH value corresponding to altitude. You may now adjust the altitude value to the matching QNH.

"zero"-function can be useful if you are flying in weak thermal conditions over a longer period of time and want to be informed about altitude gain or loss at one glance! (From software 2.0 on)

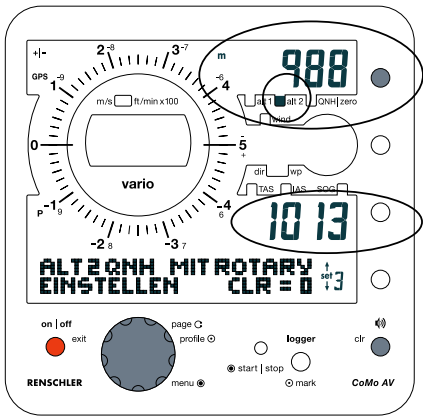
Altitude adjustment

Altitude values may be changed by Quick-Adjustment (3 steps) or Main-Menu-Adjustment (6 steps, but with further options).

Quick-Adjustment

- Push and hold the Altitude-Function-Button while the indication shows the altitude value you wish to adjust. The instrument opens automatically the adjustment menu.
- Adjust to desired altitude value by turning the Rotary-Button, or set to zero by short push on the CLR-Button.
- Confirm value by short push on the Altitude-Function-Button. The new value is confirmed by indication "o.k." and adjustment menu is closed.

Quick-Adjustment of alt 2
(Display shown after step 1.)



Display ***Altitude alt 2***

1. *open adjustment-menu*

3. *confirm (back to standard indication)*

Menu indication on alt 2 ***QNH in mbar***

2b. *set to zero*

leave menu without storing changed values (push repeatedly if necessary).

2a. *set to desired value*

Push the EXIT-Button repeatedly to leave the adjustment menu without changes.

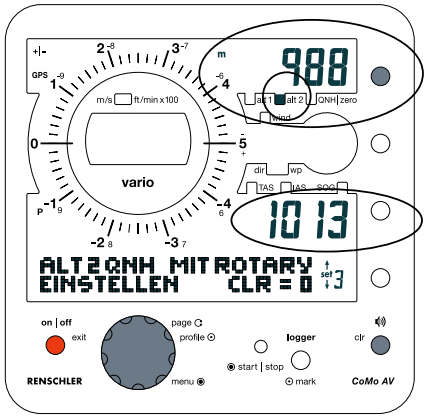
Hint: In case you want to change more altitude values, confirm input by pushing the Rotary-Button instead of the Altitude-Function-Button. This way you keep the adjustment menu active for further adjustments.

Main-Menu-Adjustment

Altitude values may also be adjusted within the main menu: Push and hold the Rotary-Button to enter the main menu. The display reads "einstellungen" (settings). Push Rotary-Button to select "höhenmesser" (altimeter). Push again to enter the altitude adjustment menu. Any available adjustment functions display by turning the Rotary-Button. Press the Rotary-Button to confirm the value you like to change. Set altitude to desired value by rotating the Rotary-Button and confirm with a short push.

Push the EXIT-Button repeatedly to leave the adjustment menu without changes.

Main-Menu-Adjustment of alt 2
(Display shown after step 5.)



Display ***Altitude alt 2***

Menu indication on alt 2
QNH in mbar

leave menu without storing changed values (push repeatedly if necessary).

5b. *set to zero*

1. *open Main-Menu*

2. *select "einstellungen" (settings)*

3. *select "höhenmesser" (altimeter)*

4. *select desired function*

5a. *adjust*

6. *confirm*

2.2 Variometer

The variometer calculates climb or descend rate by measuring air pressure differences.
This value is almost instantly indicated on the Analogue-Variometer-Display, while the integrated value (average within a given space of time) shows up in the Digital-Variometer-Display.

Analogue Variometer
At the moment the analogue variometer is limited to a range of +/- 10 m/sec

Digital Variometer (integrated variometer)
The period of time for the average climb/descend rate calculation can be selected from 1 to 32 seconds.
Example: To determine the average climb descend rate within a complete 360° turn, you choose a value of approx. 10 to 15 sec.. This feature is very useful if you find yourself circling alternately in ascending and descending air.

2.3 Acoustic


loud


soft


off

The volume can be quickly adjusted in flight by the acoustic-button.
A short push shifts from "loud" to "soft" and further on to "off". The present state of the acoustic is shown in the corresponding display.

Volume levels
Each acoustic ("loud" as well as "soft") has 5 programmable volume levels:
Adjust "soft"-volume (respectively "loud"-volume) in the main-menu to your personal taste on a scale from "1" to "6".
Hold acoustic-button pressed to enter the quick-adjustment-mode.

Descend-tone threshold
The threshold of the descend-tone can be adjusted within the adjustment menu from "0" to "9.9" m/s, according to personal taste. E.g.: If adjusted to 1,5 m/s the sound sets in beyond a descend-rate of 1,5 m/s while it remains quiet between 0 an 1,5 m/s. Most pilots prefer a set-up between 3 and 4 m/s, more than the average descend-rate in turns.

Fundamental-time (interval between 2 climbing beeps)
Some pilots prefer in weak conditions really wide intervals between the beeps, while others prefer a perpetual acoustic indication.

Hint: Set profile 1 and 2 to identical acoustic modes, but the first profile with slow (1) the other with fast (9) fundamental time. Change profiles in flight to find out your personal preference.

Response-sensitivity
This is the most important adjustment option concerning acoustic. Usually you do not want your variometer to react nervously on too short, too narrow lifts.
A practical value will be about 1 sec. delay. If you are flying at 36 km/h this means that the thermal has a diameter of at least 10 m!

2.4 Profile

The new feature of freely adjustable profiles is very useful for varying flying tasks. For any demand (thermalling, cross-country, acro) there is a configuration you can pre-adjust and recall when needed.

In delivery-state only profile 1 is active!

To use further profiles, they have to be activated in the menu.

By a short push on the Rotary-Button you can shift between different profiles. The page-indication shows for the duration of approx. 1 sec. which profile is active.

appears for 1 sec. after profile has been changed

The profile-state-indication shows permanently the actual profile. The number of visible dots corresponds to profile-number

profile-state-indication
profile 2 active

All adjustments in the menu will be stored within the actual profile.

Example for practical use:
Set profile 1 for normal conditions to descend-tone-threshold 3 m/s and response-sensitivity to 1,0 sec.
Set profile 2 to descend-tone-threshold 1,5 m/s and response-sensitivity to 1,2 sec for struggling in weak conditions.

2.5 Time, Date and Stopwatch

Time and Stopwatch

On page 1 appears time on the left and stopwatch on the right. The stopwatch can be started manually by a long push on the logger-button, or starts automatically when the instrument passes through a change in altitude beyond 15 m.
The date is shown on page 3.

Quick-adjustment
If the page indication shows time, a long push on the page button opens the time-adjustment-menu. Adjust time to the desired values by turning the rotary-button and confirm every time by a short push.

Date

Date is displayed on page 3.

Quick-adjustment
If the page-indication shows date, push and hold the page-button to open the date-adjustment-menu. Adjust date to the desired values by turning the rotary-button and confirm every time by a short push.

2.6 Logbook

Values of interest of the last 63 flights are stored in the logbook.

Logbook Autostart
The logbook is started automatically when the instrument passes through a change in altitude beyond 15 m.

Logbook Manuell Start
The logbook can also be started manually by a long push on the logger-button. The indication skips automatically to the time/stopwatch-page and the stopwatch starts running.

Stoppuhr gestartet,
Flug wird aufgezeichnet

Logbook Evaluation
The logbook is accessible over the menu (long push on the rotary-button, turn rotary until display reads "logbook"). A short push on the rotary-button will open flight 1 (latest flight).

Three pages per flight are shown.
The logbook begins with the first page of the latest flight giving fundamental information:

- Flightnumber, - Date
- Takeoff- and Landing-time, - Flightduration in hours and minutes
- Takeoff altitude (in Altitude-indication)

Turning the rotary-button clockwise leads to maximum values:

- max. climbingrate (Analogue-Vario), - max. integrated climbingrate (Digital-Vario), - max. Altitude, - max. Temperature, - max. SOG (only in combination with a GPS Module)

Another clockwise turn leads to minimum values:

- min. climbingrate (Analogue-Vario), - min. integrated climbingrate (Digital-Vario), - min. Altitude, - min. Temperature

The next clockwise turn leads to flight 2, page1, ... etc.

2.7 Batteryinformation

The CoMo AV runs by two AA-cells. The battery-state-indication and battery-info-page 2 keeps you informed about battery state. The battery-info-page shows on the left the actual voltage. New cells should provide at least 3.2 V. If voltage falls short of 2.2 V, cells should be changed.
Next to it is a meter for operating-hours. The percentage-indication converts the voltage into an easily understandable percent-value.

Any kind of battery-state-indication has its problems by a severe capacity loss of battery-cells or accumulators under cold conditions. E.g. a pilot may take off at 20 °C with the instrument indicating a capacity of 40 % only to find it soon afterwards reduced to 5 % at a temperature of -10 °C in 4000 m MSL...

Apart from competition flying, Alkali-Mg cells should work very well. To make sure in low temperature environment (winter flying or high altitudes) 1,5 V Lithium cells can be used as well (www.energizer-eu.com). The ultimate solution represents our Solar-Module which is to appear later this year.

If voltage drops below 2.2 V, the GPS is turned off, while vario-acoustic is maintained. In this case it is high time to change batteries.

Batterychange
Remove the mounting-plate on the backside of the instrument. Beneath, the cell compartment is covered by a silicon cap. Remove the cap cautiously and put in new cells. Never mix different kind of cells and make sure you load the compartment properly (+/- are marked inside).

You can estimate the remaining operation-time by watching the battery-time-counter. A new set of batteries should be good for about 700 h airtime without GPS (CoMo AV + easy GPS approx. 140 h airtime).

2.8 GPS

After turning on the CoMo AV + easy GPS you are asked if you intend to turn on the GPS.

Activate the GPS by a short push on the rotary-button. The pageline reads:

When the GPS has found 4 satellites, the present position is indicated:

If the GPS is not needed, push the CLR-button. When you call up the GPS-page, it reads:

(At the time of printing you have to decide if GPS shall be employed or not when you switch on the instrument).

Important Note: The GPS-Module must not be covered, this could spoil the reception. The less obstacles (trees, buildings, rocks, etc.) the better it will perform. Indoor it won´t work at all.

We destinguish between "cold-" and "warm-start".

Cold-Start
After each change of battery cells or after moving to another location, the GPS can not refer to already stored data, which can delay the determination of the position up to 15 min.

Warm-Start
If the GPS is activated on the same spot where it was turned off before, it can quickly find its position again by using already stored data (within 1-3 min.).

Hint: Turn on your GPS as soon as you arrive at the take off area, to give it maximum time for orientation. When a position is identified, turn the GPS off and you are ready for a quick "warm-start" when you actually begin your flight.

SOG (Speed over Ground) and Windanalysis

When GPS has found a position, the speed indication shows speed over ground (SOG). As SOG is a horizontal movement only, climb and descend-rates have no influence at all on its value. The SOG-indication lets you judge the wind situation, as it is a compound of air-speed and wind-speed. Flying with tail-wind adds values, while flying with head-wind subtracts wind-speed from air-speed.

Warning: Never try to judge wind-direction near to ground just by watching your SOG! Valle wind-systems, thermals, etc. may alter completely the wind-direction and wind-speed in a potential landing zone. Better rely on the good old trusty windsock or natural indicators (smoke, a rustle in the trees, waves on a lake, etc.)!

Indication of Position and Altitude

Position is shown in degrees of longitude and latitude. The GPS uses the world cup standard format WGS 84 (degreedegree,decimaldecimaldecimaldecimaldecimal) to display the position.

There is no indication in minute- or second-format yet. Knowing your position in degrees of longitude and latitude is useful when you have to guide people in case of emergency, or just to bring you back after a cross country flight.

For technical reasons altitude determination by GPS is less precise than the analysis of the geographic position. GPS-altitude is shown with a significant delay after the position is found. At first, values are rather inaccurate (aberrations of up to 50 m!). After a while of operation the GPS-altitude becomes more exact.

Warning: Considering the lack of accuracy in GPS-altitude, it is rather an approximate value when adjusting the barometric altimeter.

Track and Northpointer

To define a track the GPS has to be moved horizontally by a speed of at least 1,5 km/h (remember: This is by no means a magnetic compass!), no matter if you are flying or if you are just walking.

indication only from 1,5 km/h on!

Satellite-State-Indication

This indication keeps you informed about GPS-reception. If the core of the indication flashes, the GPS is in search-mode. For every satellite found, one dot lights up. Although your GPS is capable to receive up to 12 Satellites, the indication shows a maximum of 6. Further Satellites won´t lead necessarily to better perfomance.

flashing core = search for satellites
- no position displayed

on more dot for each satellite found.

4 satellites found, flashing stops.
- sufficient reception for position analysis

6 -12 satellites found
- perfect reception

Chapter 3

Release 1.02 remarks:

After 14 months of LCD-Dispaly development plus another 15 months designing new hard- and software we take a lot of pride in our new CoMo AV, as it sets completely new standards in some domains.
- extremely sensitive variometer (definite measurement of climbing rates from 5 cm/sec on).
- fabulous 700 h of battery life (without GPS)
- even with GPS the instrument endures an operation time of 140 h.
- operation ist nearly fool-proof with the solid Rotary-Button
- "FOCUS Energy" award for excellence in industrial design

There are still some limitations in release 1.02:

- analogue variometer can only display values up to +/- 10 m/sec.
- vario and altimeter indication only in meters
- no glide ratio over ground
- no temperature indication when easy-GPS-Module is employed
- no "zero-click" acoustic when altitude level remains the same over a longer period of time
- no support for altitude "Zero|QNH"
- no support for airspeed-sensors
- nix english, readings in german only

Next steps in software development (Release 2.0):
- GPS Logger for OLC (Online Contest)
- Update via internet

Release 2.0 is scheduled for 2008

the following products are in the design stage:
- Solar- and Solar-GPS-Module
- G-Meter (G-Force measurement for Acro-Pilots)
- PWC-Contest version

We will keep you informed on our web site: ***www.renschler.de*** about updates and accessories.

Don´t hesitate to give us your opinions and suggestions on the CoMo. Mail to: ***como@renschler.de***

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