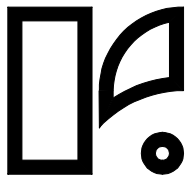
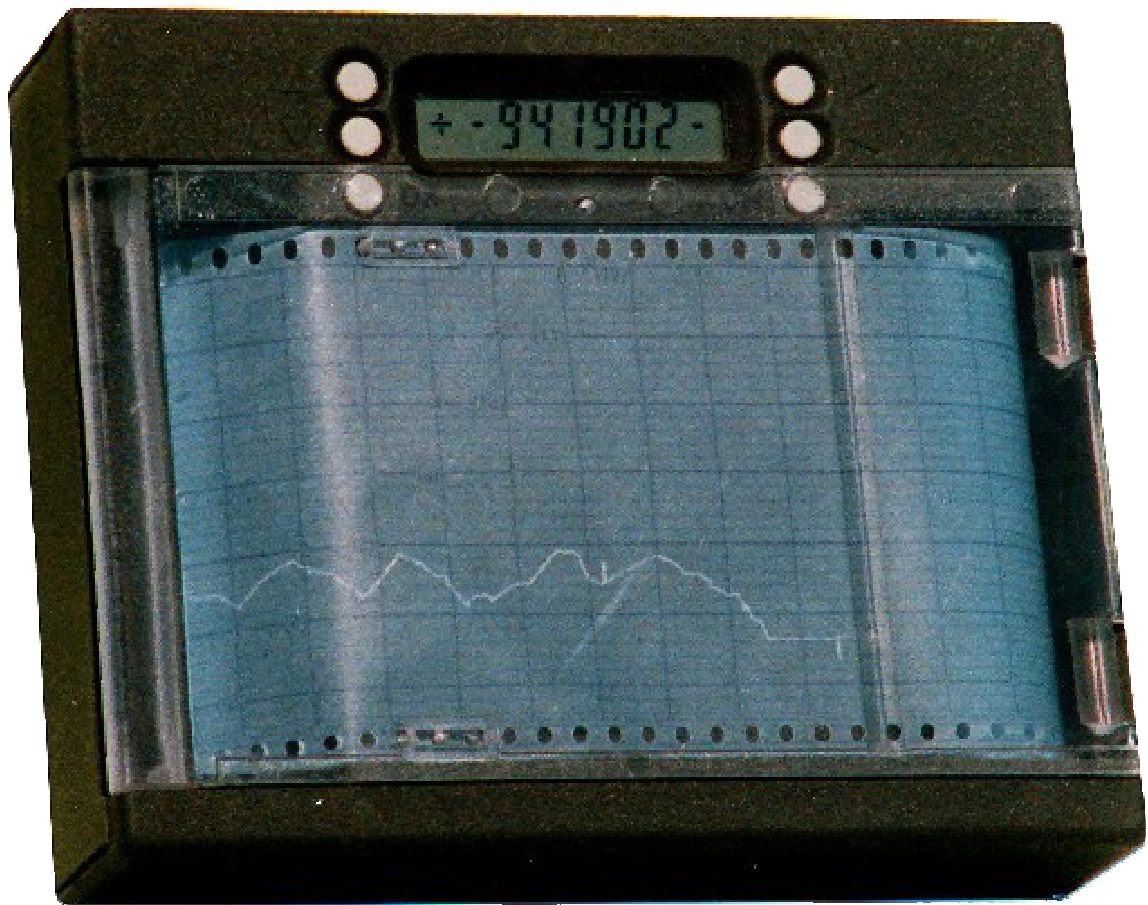


Specifications / Operating Instructions

Aerograf 2000

Precision Barograph for Gliding and Ballooning



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Caution!

⇒ The Aerograf 2000 and its accessories are designed for gliding and balloon flying only. They are not to be used as altimeters in flight navigation.

⇒ Only use rechargeable NiCa batteries. The charging current (mains adapter, solar panel...) could cause non-rechargeable batteries to explode or leak!

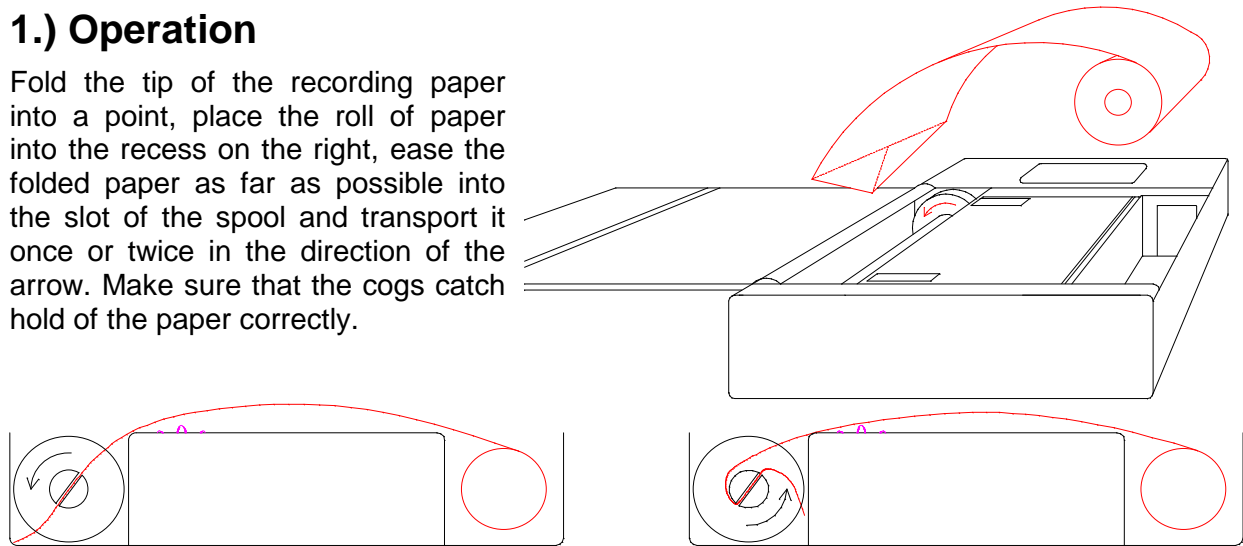
⇒ The device and its connecting cable should not interfere with the handling of the glider nor hinder the emergency release of the canopy!

When the instrument is switched-off and the lid is closed the LCD indicates a 6-digit serial number, e.g.: **-940503-**.

As soon as the lid is opened the LCD changes to the actual calibration date, e.g.: **CA.05.06.94** (5th June 1994).

1.) Operation

Fold the tip of the recording paper into a point, place the roll of paper into the recess on the right, ease the folded paper as far as possible into the slot of the spool and transport it once or twice in the direction of the arrow. Make sure that the cogs catch hold of the paper correctly.



Press the "ON" button to activate the instrument. After a brief display test (**+8.8.8.8.8.8.8.**) the LCD indicates the time in hours, minutes and seconds e.g. : **CL.12.27.19.**

While the lid is open the two buttons \uparrow, \downarrow on the left allow you to recall the following information on the display:

- **Time (CL).** HH.MM.SS
- **Altitude (ALt.)** in meters or feet
- **QNH** atmospheric pressure in hPa
- **Chart speed (SPEEd.)** 0.5; **1.0**; 2.0; 4.0 mm/Min.
- **Switching (Alt.)** meter/feet
- **Battery Capacity (bAt)** in Ah
- **Serial Number**
- **Calibration Date (CA.)** TT.MM.JJ

The two buttons on the \Rightarrow, \Leftarrow allow you to adjust the time, the present altitude or the present atmospheric pressure, the speed of the paper transport and whether the altitude should be indicated in meters or feet. Changes in altitude cause a change in the display of the atmospheric pressure and vice versa. Changes of altitude, atmospheric pressure and paper speed are reset to standard values every time the instrument is switched-on. The altitude according to the atmospheric pressure of 1013.2 hPa, the paper speed to 1.0 mm/min.

When closing the lid while the instrument is on, the recording needle moves to approx. "-500 meters" (initialising) and then advances to the present altitude. The paper is advanced by the distance of a 10 min. interval (e.g. at 1.0 mm/min. = 10 mm). A personal mark is drawn at the end of the 10-minute-recording (base-line) .

The LCD indicates a control number: the 3 digits on the left display how many times the lid has been closed since the instrument has been switched-on, to the right there is a 4-digit random number. By pressing one of the buttons on the \uparrow, \downarrow the display can be alternated between control number and time. The "ON" and "OFF" buttons are protected by Plexiglas and cannot be operated.

The Aerograf 2000 is now in waiting mode ready for an activity. The interpretation of activity is: taking a photograph with a connected camera, running the engine of a motor glider or take-off (change of altitude of ± 10 meters).

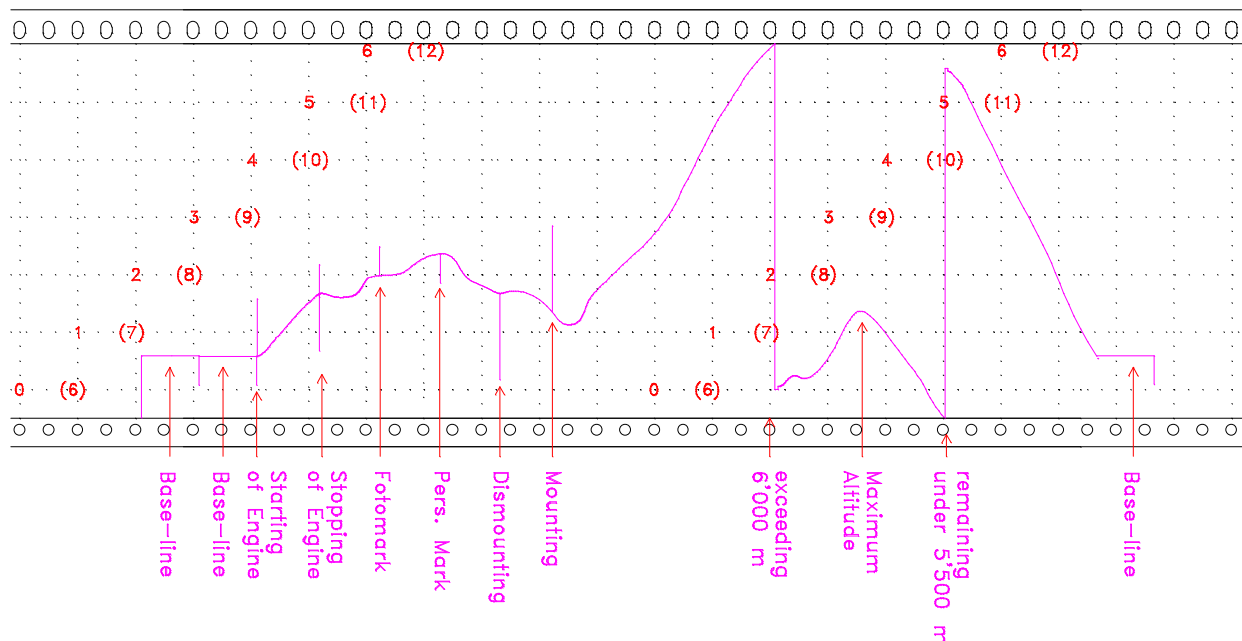
If the atmospheric pressure changes by more than 10 m while the Aerograf is in waiting mode, it will record another base-line for 10 minutes which will be concluded with a personal mark. With rapid changes in the atmospheric pressure several base-lines can be recorded before take-off.

The installation time (connection Aerograf/camera) is recorded in the data memory.

After detection of an activity (photograph, running of engine, change of altitude) the recording stylus begins to draw. If the stylus is activated by a photograph, a photo mark will be recorded, running of the engine will be recorded with a "motor-on-mark". All activities are recorded in the data memory.

The altitude display on the LCD is interrupted for 1 minute with the taking of each photograph while the time of the photo is displayed.

Throughout the flight the altitude is registered and the following events are recorded in the data memory:



- base-line before and after the flight, concluded with a personal mark.
- starting of engine when using a motor glider En on -200 / +600 m
- stopping of engine when using a motor glider En off -600 / +200 m
- photo marks +300 m
- personal marks -300 m
- dismounting (connection Aerograf/camera was interrupted) -1000 m
- mounting (connection Aerograf/camera was established) +1000m

When exceeding an altitude of 6'000 meters the recording continues automatically from the bottom of the paper strip. When exceeding an altitude of 12'000 meters a horizontal line is recorded. If you remain under 5'500 meters after your altitude flight, the rest of the flight will be recorded from above.

After the flight (no change in altitude, last photograph and stopping of the engine) the Aerograf 2000 writes a base-line for 10 minutes and concludes the recording with a personal mark. The instrument is again on stand-by, waiting for a new start or analysis of the recorded data. The LCD indicates the control number, alternatively the time.

The Aerograf 2000 should be switched-off after use. This guarantees that the energy consumption is reduced to an absolute minimum. The LCD changes to the calibration date and after the closing of the lid, to the serial number.

If the Aerograf 2000 is left in waiting mode for more than 10 hours (before or after a flight), it turns itself off automatically. The LCD does then not indicate any reading. The instrument has to be restarted by pressing first the "OFF" and then the "ON" button. The time will be adjusted.

2.) Motor Sensor

The integrated sound sensor in the Aerograf 2000 establishes whether the engine of a power glider is switched-on. Additional installations on the glider or on the motor are not necessary. The sensitivity of the sound sensor can be customised by the manufacturer.

3.) Data Memory

The following events are automatically recorded in the data memory:

- control number (3 digits for the number of times the lid has been closed and 4 digits for the random number)
- setting of altitude (meters or feet) / setting of atmospheric pressure (selection of the QNH to measure altitude)
- mounting/demounting (time, connection Aerograf/camera or interruption)
- start/landing (time, actual altitude)
- photograph (number of photo, time, actual altitude, minimal and maximal altitude since the last photograph)
- starting/stopping of motor (time and altitude when starting/stopping the engine of a power glider)

The time is recorded in hours, minutes and seconds, the altitude according to selection in meters or in feet.

In order to recall data press the two buttons on the left \uparrow, \downarrow simultaneously for about 2 seconds while the instrument is switched-on and opened. The LCD changes to the control number of the recorded flight. The two buttons \uparrow, \downarrow allow you to scroll through the recorded data from top to bottom. The two buttons to the right \Rightarrow, \Leftarrow can be used to obtain additional information (altitude, minimum or maximum altitude).

Another procedure is to connect the switched-on Aerograf to a PC and to utilise the software delivered with the PC-Aerograf-Cable or to transfer the data onto a PC (see page 9).

The data memory is only erased when a new activity takes place. This means when the instrument is switched-on, the lid is closed and an activity causes the instrument to start recording. Up to this point you are free to recall the recorded data via the LCD or a PC.

The recorded data is not lost when the batteries are changed.

4.) Battery, Charging, Discharging, Measuring Capacity

The Aerograf 2000 takes its supply of energy from a single NiCa-Cell (baby, size C). It is located at the battery compartment at the back. Only use rechargeable NiCa batteries suitable for current of 220 mA.

When this cell is changed an auxiliary battery takes over the power supply e.g. for the clock. The life expectancy of this auxiliary battery is about 10 years providing the main battery is inserted, otherwise it lasts about 5 years. For this reason the main battery should be stored in charged condition inside the instrument.

The battery ought to be recharged every 4 - 6 months (according to temperature) or whenever the capacity indicator shows up (minus blinking). The charging socket is placed at the back next to the battery compartment. It can be connected to any supply (AC/DC) between 7 and 15 volts (mains adapter, car battery etc.). We recommend a connection with a 500 mA fuse. The charging current is approx. 220 mA. The charging procedure lasts about 15 to 20 hours. Once the battery is fully charged, the loading mechanism changes to preserving mode. Because of this the Aerograf 2000 can be connected to the charging device for an indefinite period of time. However, there may not be any interruptions as the charging is renewed with every interruption. Throughout the charging the ":" (colon) remains blinking, in preserving mode the "+" shows continuously.

If NiCa batteries are discharged too little they lose part of their capacity. In order to counteract this and to measure the capacity at the same time, the battery in the Aerograf 2000 can be discharged. The discharging is started by pressing to two buttons on the right \Rightarrow, \Leftarrow (approx. 2 seconds). Throughout this procedure the instrument has to be switched-off, the lid is to remain open and a charging device has to be connected. (All conditions must be fulfilled!) The LCD indicates the discharging with "bAt. di". Once the battery is discharged, the instrument changes automatically to charging procedure. The LCD indicates the measured capacity of the battery e.g. bAt. 2.1Ah. This figure is also used to calculate the service life (see capacity indicator). The discharging procedure takes about 10 to 12 hours, the subsequent charging 15 to 20 hours. In all you have to calculate over 30 hours! As mentioned above the charging procedure is completed when "+" shows up continuously (preserving mode).

When using new batteries or batteries that have not been used for a long time, several charging and discharging procedures are necessary for the batteries to reach their full capacity.

If the Aerograf 2000 is connected to the camera mounting support the battery is automatically buffered by the solar panel (see connecting camera).

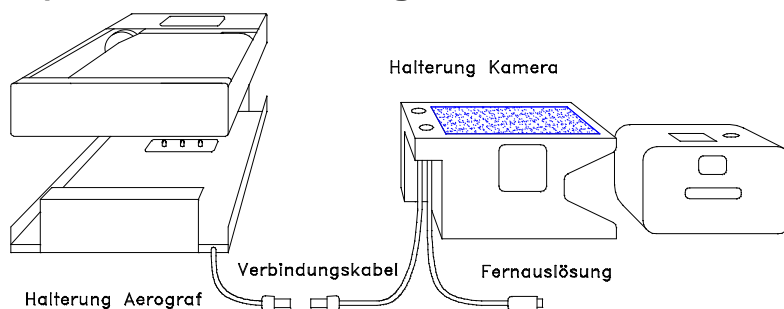
5.) Capacity Indicator

The LCD indicates the remaining capacity with + or -. Remaining capacity when the instrument is switched-on:

+ continuous	= = 40 hours
+ blinking	= = 30 hours
- continuous	= = 20 hours
- blinking	= = 10 hours
no +/-	= remaining capacity uncertain!!

The calculation of the remaining service time is based on the last capacity reading with inserted batteries. If the present battery has not been discharged or the charging was prematurely interrupted there is no capacity reading.

6.) Connection Aerograf 2000/Camera



The Aerograf 2000 and the appropriate data back camera are each equipped with a 5 pole socket. The respective holding devices have been fitted out with plugs. Therefore, the connection of the Aerograf 2000 to the data back camera is automatically established

through a cable when the instruments are inserted into their holding devices. The establishment or interruption of this connection is recorded in the memory when the instrument is switched-on and throughout the flight it is noted on the altitude curve.

The 2 press buttons on the holding support of the camera are used to release a photograph/photo mark or a personal mark. The photograph/photo mark can also be released by a remote control (closed contact). The solar panel of the camera support provides the power supply for the Aerograf 2000. This is indicated on the LCD with three small arrows in the left top corner. Even when the sky is overcast there is enough energy to operate the Aerograf. Surplus energy is stored in the accumulator and for this reason charging the Aerograf is hardly ever necessary. The energy supplied by the solar panel is taken into account when calculating the remaining capacity.

7.) Electronic Sealing

After closing the lid of the switched-on Aerograf 2000 a vertical line on -500 meters is drawn as well as a horizontal line (base-line) on the actual altitude for a period corresponding to 10 minutes. This line is concluded with a personal mark. The LCD indicates a new control number after each closing of the lid. This measure allows to detect a subsequent change of the daily task. Furthermore, the paper speed selected can be determined based on the length of the base-line.

Establishing and interrupting the connection Aerograf 2000/camera is recorded in the memory as well as in the altitude record throughout the flight.

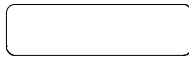
The controls of the camera cannot be manipulated once it is inserted into its holding device (all buttons are covered).

Mechanical sealing of the Aerograf 2000, the data back camera or of the whole system is, therefore, obsolete!

Another security measure is that unauthorised removal of the back (manipulation of the device) causes the calibration date to be replaced by dashes ("CA.--.--"). Every manipulation can be witnessed easily. The calibration date can only be reset by the manufacturer.

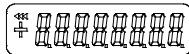
8.) Indicator (LCD)

The following readings are possible on the 8-digit LCD:



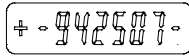
No Reading

(no battery, voltage too low or too high, the instrument has not been switched-off.)



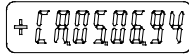
Full Display

(when the instrument is switched-on.)



Serial Number

(device switched-off, lid closed, or read back when instrument is switched-on, lid open)



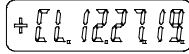
Calibration Date (CALibration)

(instrument switched-off, lid open or read back, instrument switched-on, lid open.)



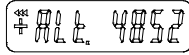
Manipulation

(The back was removed by unauthorised person.)



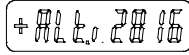
Time (Clock)

(when the instrument is switched-on or to be selected in sleeping mode.)



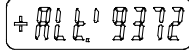
Altitude

(actual altitude in flight or when reading data from memory.)



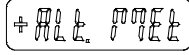
Minimum Altitude

(since last photograph when reading from memory.)



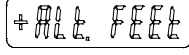
Maximum Altitude

(since last photograph when reading from memory.)



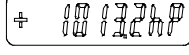
Altitude in Meters

(altitude is indicated and processed in meters.)



Altitude in Feet

(altitude is indicated and processed in feet.)



Pressure Setting

(pressure setting by which altitude is measured.)

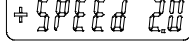
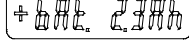


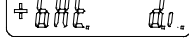
Chart Speed

(possible setting are: 0.5; 1.0; 2.0; 4.0 mm/min.)



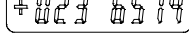
Battery Power (bAttery)

(when charging after discharging or read back after instrument is switched-on.)



Battery Discharging

(display throughout discharging.)



Control Number

(counting lid and random number when instrument in waiting mode or while reading from memory.)

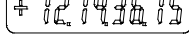
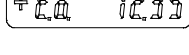


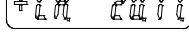
Photo: Image No. (blinking) / time

(in flight or when reading from memory.)



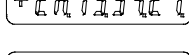
Take-Off

(when reading from memory.)



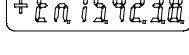
Landing

(when reading from memory.)



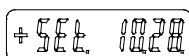
Engine On

(when reading from memory, alternatively En/on.)



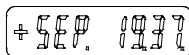
Engine Off

(when reading from memory, alternatively En/off.)



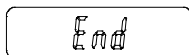
Mounting Time (Set)

(time of connection Aerograf/camera, when reading from memory.)



Dismounting (SEPARate)

(time of separation Aerograf/camera, when reading from memory.)



End of Recordings

9.) Chart Speed

The Chart speed is reset to 1.0 mm/min. every time the instrument is switched-on. To select a different speed use the buttons on the left $\uparrow\downarrow$ to obtain the reading "**SPEED**". The buttons on the right $\Rightarrow\Leftarrow$ allow you to alter the setting (0.5; 1.0; 2.0; 4.0 mm/min). Please take note that 0.5 mm/min. is not approved for certain FAI-flights.

10.) Setting Time

Use the buttons on the left $\uparrow\downarrow$ to activate the clock (CL....) when the instrument is switched-on and the lid is open. The button at the bottom right \Leftarrow activates the seconds. Set the seconds to 00 with the button at the top right \Rightarrow . Change to the minutes with the button at the bottom right \Leftarrow . Increase the minutes accordingly by using the top right button \Rightarrow . Change to hours with the button \Leftarrow at the bottom right. Set the hours with the button at the top right \Rightarrow . Conclude the procedure with the button at the bottom right \Leftarrow .

11.) Disconnecting Automatically

If there is no change of altitude for 10 hours or more ± 200 meters while the instrument is switched-on, we assume that the instrument has not been switched-off accidentally. The Aerograf 2000 then disconnects itself automatically. The LCD remains blank. Only the time will be recorded. The barograph can be reconnected by pressing first the "OFF" and then the "ON" button. In the case of insufficient battery voltage the instrument disconnects itself automatically after a brief display of "**bAt.Err**". Before going through the procedure of pressing the "OFF" and then the "ON" button the battery needs to be recharged.

12.) Mounting in Glider/Balloon

Attach the holding devices for the Aerograf 2000 and the camera firmly inside the glider to ensure that the pilot cannot be injured by these instruments when increasing speed.

Owing to the electronic sealing the Aerograf 2000 can be attached to the cockpit in a way that the display as well as the recording can be observed throughout the flight.

It is advisable to attach the camera directly to the glider rather than to the canopy frame. This way the connecting cable does not have to be placed over the centre of rotation of the canopy. Pulling out of the cable can, therefore, be avoided.

Make sure that there is no traction force on the plugs.

The emergency release of the canopy may not be impeded by the cable!

Do not drill any holes into the glider without consulting the manufacturer!

When using a gas balloon make sure that the instrument is protected from sand.

13.) Recording Paper

Use permanent markers to write onto the special wax paper. Avoid using stickers, they could hinder the paper transport.

To achieve good results when making photostat copies, place a black sheet of paper behind.

14.) Flights in extreme Cold

The Aerograf 2000 is designed for operating temperatures to -20°C . If even lower temperatures are expected, insulate the Aerograf 2000 with a cooling element (camping accessory for cool boxes). The freezing-energy of the water inside the element preserves a temperature of 0°C for a period of time.

15.) Maintenance

The Aerograf 2000 does not need any maintenance apart from the occasional charging of the battery. Do not open the instrument under any circumstances! Opening of the back is indicated on the LCD with "CA.--.--.". Calibration has then become invalid and the instrument has to be checked by the manufacturer.

16.) Storage

Store the Aerograf 2000 and the time camera in a dry, cool place. High temperatures cause a rapid discharging of the built-in battery. (At 40°C ca. 50% in 14 days.)

17.) Cleaning

The Aerograf 2000 can be cleaned with a soft cloth and a little alcohol. Do not use any detergents, they could damage the surface.

18.) Calibration / Delivery

The Aerograf 2000 is delivered with a calibration certificate. The date of calibration is indicated on the LCD when the switched-on instrument is opened. Calibration is valid for 1 year (independent of product). For most FAI flights (apart from altitude records) calibration can be effected after the flight (see Code Sportive).

Please note that the Aerograf 2000 must be wrapped into ca. 5 cm of soft packing material! (Postage is calculated according to weight and not according to volume.)

For parcel post outside of Switzerland use the green customs sticker and indicate: "Barograph for calibration. Value CHF 50.--". (Registered Mail).

19.) Technical Details

A micro computer controls and calculates all functions of the Aerograf 2000. The analogue signal of the atmospheric pressure sensor is enhanced in a signal processor, then digitised (16-bit AD-converter) and transferred to the micro computer. The calculation of the atmospheric pressure and altitude are based on this information. Owing to the mathematical correction of linearity and temperature errors of the atmospheric pressure probe, extreme accuracy is achieved (difference of few meters) over the whole temperature and altitude range. As there are no trim potentiometers, the Aerograf 2000 is equipped with a very good long term stability. Later differences can be neutralised with correction factors by the manufacturer. In order to preserve energy, the micro computer switches automatically into energy saving mode in between calculations. Only the LCD and other basic functions are continued.

Two small servo motors with gears control the paper transport and the adjusting of the recording stylus.

The recording stylus engraves from the back a continuous, linear, right-angled record into the wax paper. This allows immediate viewing of the flight in the control panel.

In order to avoid problems with oxidation, all plugs, switches and other contacts in the Aerograf 2000 have been gold-plated. Only the plug for the charging device is chrome-plated.

20.) Data transfer onto a PC

To transfer data from the Aerograf 2000 onto a PC you will need:

- PC (IBM PC or compatible) with serial 9 pole port (com 1 / com 2)
- cable with 5 pole plug for Aerograf 2000 and 9 pole plug for PC
- software Aerograf 2000 on 3 1/2" disk

The Aerograf 2000 software consists of:

- Readme.txt (details as listed below)
- FI last.txt (last recorded flight)
- Aegf2000.exe (selection program)

The following parameters can be added to the selection program:

- COM2 activates COM2 instead of COM1.
- LINES additional lines after each entry when printing with standard line feed.
- HP uses HP-Laser Jet ESC sequence in order to generate additional separating lines with half a line feed.
- EPSON uses Epson printer ESC sequence in order to generate additional separating lines with half a line feed.
- NOCOM No data read via COM. The editor is started with the last modified file "FI last.txt". The file "FI last.txt" has to exist!
- HELP list of possible arguments and their meaning.

The parameters may be used randomly, spelt with upper or lower cases.

Data Transfer

- Switch-on Aerograf 2000 (lid open or closed).
- Connect Aerograf 2000 with PC at COM1 or 2.
- Insert disk Aerograf 2000 into PC
- Start program with "Aegf2000" followed by the required parameters separated by a space (e.g. "Aegf2000 com2 hp").
- Flight certificate is established.
- Complement flight certificate with the required data. (The data from the Aerograf 2000 cannot be modified.)
- Print/save flight certificate.

Instruction for an easier set-up

For a more convenient set-up we recommend that you create a batch file with the selected parameters. Use a word processing program or the DOS command "EDIT". The extension for batch files is "BAT".

E.g. "FLIGHT.BAT with the following details "Aegf2000 hp",
or "FILE.BAT" with the following details "Aegf2000 nocom hp".

21.) Documentation of Flights

The procedure for FAI-flights corresponds with a conventional barograph:

Inscribe recording paper, insert paper, switch-on Aerograf 2000 and close lid. Fill in starting board and photograph when required. Complete flight.

After the flight: final photo (landing board/glider) and request landing confirmation.

For **flights with time valuation** (speed or record flights at competitions) we recommend the following procedure with a **firmly mounted control clock**:

Inscribe recording paper, insert paper, switch-on Aerograf 2000 and close lid.

Photograph the Aerograf 2000 (with the LCD indicating the control number) together with the starting board and the control clock. Change to the actual time with the buttons on the left $\uparrow\downarrow$ and photograph the Aerograf 2000 once more together with starting board and control clock.

Insert Aerograf 2000 and the camera into the holding device previously installed into the glider.

Complete flight.

After the flight photograph the landing board and the control clock together with the Aerograf 2000. Take the first photograph showing the time, and the second one showing the control number on the LCD.

In case of a **mobile control clock** the following procedure can be used:

Inscribe recording paper, insert paper, switch-on Aerograf 2000 and close lid.

Insert Aerograf 2000 and the camera into the holding device previously installed into the glider. (The two holding devices have to be connected.) Photograph the starting board together with the control clock from the glider. The time will be recorded in the Aerograf 2000.

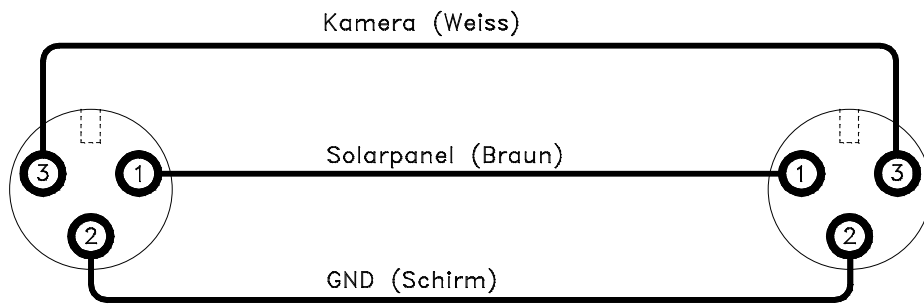
Complete flight.

After the flight photograph the same control clock once more before removing the devices from the glider.

The two procedures can be combined.

22.) Connections / Cable

Connections holding device Aerograf/holding device camera:

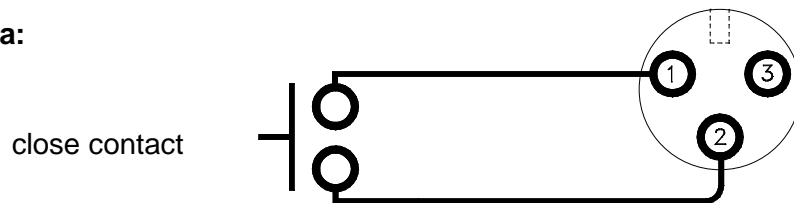


plug
(Binder 09-9747-70-03)

socket
(Binder 09-9748-70-03)

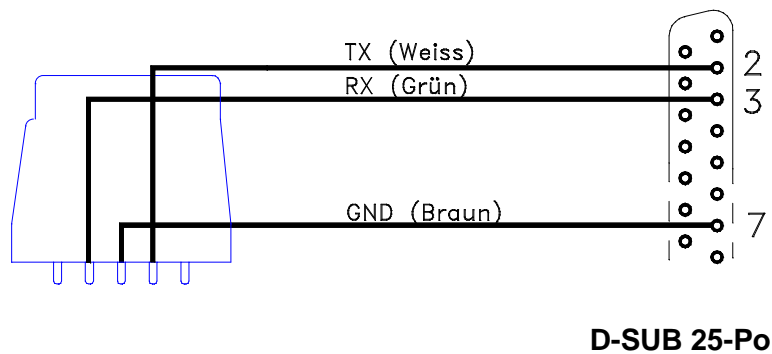
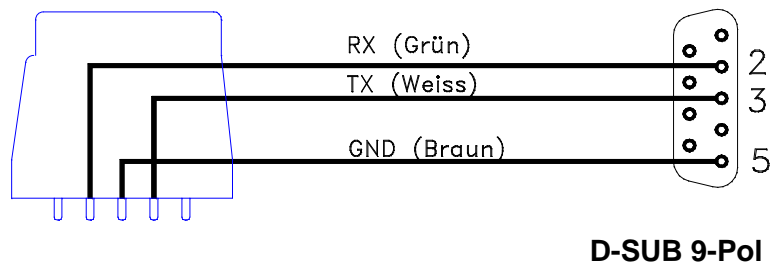
(view of open housing from the side of the cable)

remote control camera:

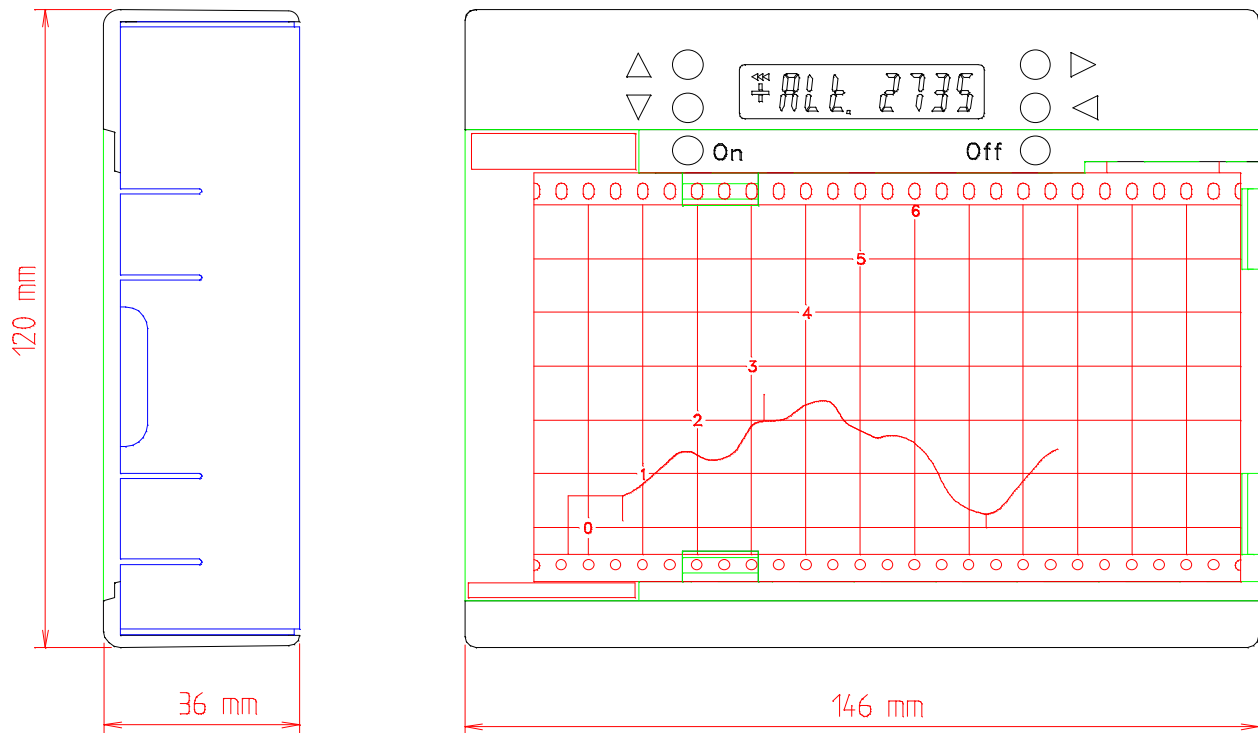


socket
(Binder 09-9748-70-03)

connection Aerograf 2000 / computer:



23.) Dimension drawing



24.) Technical Data

altitude range	-500 to 6'000 / 12'000 m (automatic change-over at 6'000 m)
resolution	1 m (for the display), 0.1 hPa (for gauging and calculating)
range of temperature	-20°C to + 60°C
paper speed mm/min.)	0.5; 1.0; 2.0; 4.0 mm/min. (according to selection, standard setting = 1.0)
paper supply	150 hours (at 1.0 mm/min.)
style of recording	right-angled, linear (no maintenance)
data memory	for all important flight data (even without power supply)
display	8 digit LCD
interface	RS 232 (data can be transferred onto a PC within seconds)
energy supply	1 NiCa cell 1.2 V; 2.2 Ah (over 150 hours operation time)
charging voltage	7 to 15 V (AC/DC, e.g. all-mains set, car battery)
charging current	approx.. 220 mA
weight	560 g (incl. battery and paper)