B500 VE (Vario Engine) Operation Manual

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1. INTRODUCTION
1.1 Background

Since 1978   BORGELT INSTRUMENTS have been manufacturing instruments for the soaring community. Continuing our commitment to incorporate improved methods and technology whenever appropriate we present to you the **B500 VE (VARIO ENGINE)**. The B500VE not only offers the proven features of the Borgelt B50 but continues our unsurpassed reputation for reliability and ease of use.

Progress in electronic technology has brought many instrumentation options to soaring. However one instrument that is still essential is the variometer. Design of a variometer system to allow response and display of information that is not only useful to the pilot's decision making but minimises the time spent looking at the information is essential. The B500 VE replaces the B50 with the addition of exciting new technology and functions providing a new presentation of information. The "information rich" 2 channel audio and a selection of high brightness LED's give the pilot relevant information at a glance.

 However we are mindful of the large variation of experience and expertise of the users of our instruments and careful consideration has been given to design an instrument system which not only serves the needs of early cross-country pilots but delivers high performance to top competition pilots.

Note 1: The B500 system architecture allows us to use the B500 as a development platform and add other features and functions in the future.

Note 2: We reserve the right to change specifications and features at any time.

Note 3: Please note that this document describes the operation of the B500 system as at March 9th 2007.

1.2 Components

The new **Borgelt B500 VE** variometer system consists of several components designed to be compatible and is a complete GPS linked variometer engine capable of driving almost any glide computer. (e.g. Borgelt B2000/B2500 or various PDA based glide computers)

The 'heart' of any vario is the sensor , something we at Borgelt Instruments are proud to have perfected in our varios. Pressure transducers replaced flow sensors in our variometers in 1982 and their reliability and accuracy has been excellent. The B500VE uses surface mount technology in the electronics, and the variometer display is by a small stepper motor driven pointer plus several high brightness LEDs. This provides a display with exceptional resolution and far better contrast than the LCD type pointers (often described as 'muddy' or 'indistinct' or lacking in resolution typically 0.4Kt or 0.2m/s) The LED's allow quick interpretation minimising scan times. A quick glance delivers the information.

The system components are:
### 1.2.1 **B500 SYSTEM UNIT**

provides basic total energy variometer/audio functions and ALL the advanced variometer functions of averager, speed command, netto/relative netto and speed command audio, with all functions properly altitude compensated to 22,000ft (6,700m) and serial data output including GPS data.

The B500 system unit is 115mm deep including connectors and is available in 57mm or 80mm sizes. An airspeed sensor is included in the B500 which enables calculation and display of advanced variometer functions. Only one standard panel hole is required. (57mm version shown with all LEDs lit)

1.2.2 Glareshield Control and Display unit (B500 GCD)or B500GCD2
The GCD is a small unit 30mm high by 82mm wide and only 30mm deep, which is designed to mount under, over, in the lip of the instrument panel cover or mounted on the front of it.
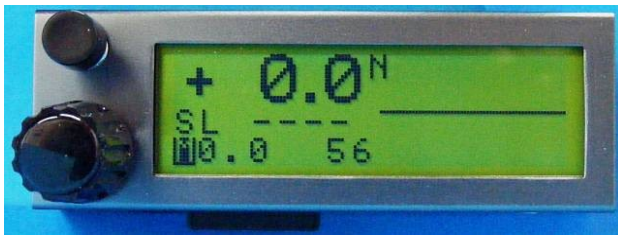
See drawings in Appendix 2 Installation section for suggested mounting methods.

The controls are closer to the pilot and the display is very close to his/her line of sight, assisting with orientation and lookout. By separating it from the variometer the variometer pointer does not obscure its displays.
It is supplied with a 0.5m cable with plug, which connects to the B500 variometer unit by plugging it in to a socket on the back of the instrument.

The B500 GCD receives GPS and air data from the B500 variometer unit/B500 HP-GPS and in addition to the display of the average rates of climb the B500 is controlled by the GCD. The pilot can enter MacCready, bugs contamination, ballast state, control B500 audio volume and balance and in addition a simple **GPS navigation display with turnpoint database, wind** and **final glide computer** is included. This makes the instrument ideal for club gliders and as a backup while the B500 also supplies RS 232 serial air and GPS data to any desired full function glide and navigation computer such as the Borgelt B2000/B2500 or any of the PDA type devices. *(see PDA-PS later)

While in theory the B500 could be controlled by a PDA or other air data computer such as the Borgelt B2000, using the GCD keeps the variometer "housekeeping" functions separate from the glide computer which simply picks up these changes in the serial data stream going to it from the B500 VE. This simplifies both the control of the variometer and of the glide computer and provides the advantages of the near line of sight display. It also declutters the glide computer display by putting variometer housekeeping functions on the GCD instead of the glide computer screen.

The B500GCD2 is the same as the B500GCD except that the GCD2 has a mini SD card slot under the display. This eliminates the 75 turnpoint database limit and GCD program upgrades and system EEprom changes are handled by writing files to the card using a PC/card reader.

1.2.3 GPS unit for B500 VE (B500 HP_GPS)

A small high performance 16 channel GPS unit is part of the B500 VE and plugs in to a connector at the rear of the B500 VE. This GPS uses the latest low power technology and draws less than 30mA at 12 volts as well as providing genuine 4Hz (4 times a second) fixes.

Total energy is by probe. TE probes provide by far the best and most reliable TE compensation.
Borgelt Instruments manufactures and recommends a suitable two hole TE probe of the modified Irving type in both fuselage and fin mount varieties.

The B500 has an **Outside Air Temperature** probe (OAT) and the temperature is displayed on one of the GCD pages and when fitted the temperature is used in the internal calculations.

The **B500 VE** allows optional expansion to a Glide Computer (e.g. Borgelt B2000/B2500, various PDA type devices) by transmitting serial data, GPS and air data from the B500 in the form of serial messages at 1 Hz in the same manner as done by the B50. The decode of this message is available on the Borgelt Instruments website under "manuals - B50 - DDM".
See **www.borgeltinstruments.com**

The B500 VE is the "variometer engine" for these systems.

1.2.4 **Options**

Borgelt B2500 Tactical Glide Computer (see Borgelt Instruments website
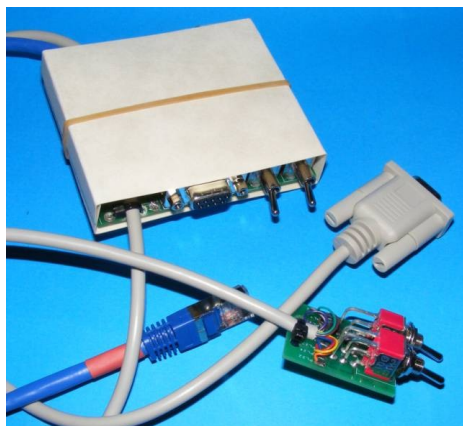www.borgeltinstruments.com)

PDA(Personal Digital Assistant - Palmtop computer)) (not available from Borgelt Instruments)

Universal PDA_PS/dataport   - PDA Power Supply/Dataport/power & data distribution center

This optional device connects to the B500 and supplies power and data to various other devices - a B2500 glide computer, a logger, a Flarm unit(or second logger) and a PDA can receive 5 volt power at 1 amp and data from the B500.

Installation is simplified as 12 volt power must be supplied only to the B500 and the PDA-PS distributes power and data to and from the logger, FLARM, PDA and B2500 and there is a serial port for B500/B2500 program maintenance.

There is a connection for a logger on this unit, connection for a FLARM (or second logger) and two panel mountable switches which allows connection of the data to/from logger/FLARM direct to the PDA for declarations and optionally allows selection of Logger/FLARM GPS or B500 air data/GPS for flight information.

1.2.5 Specifications:
Weights B500 VE includes HP_GPS and GCD/GCD2 but excluding speakers.

	57mm	550	gr	(19 oz)
	80mm	630	gr	(21 oz)
Speakers (each)		160	gr	(5 oz)

Universal PDA_PS/dataport 160gr (6 oz)

B500 power consumption (depending on audio volume)
Approx 100-180 milliamps at 10 to 16 volts DC depending on audio volume.
All B500 variometer functions are altitude compensated to 22,000ft.

2.OPERATION:

{   **CAUTION:** AT ALL TIMES THE FLIGHT ENVELOPE OF THE SAILPLANE MUST BE ADHERED TO.

{   **DO NOT EXCEED PLACARDED AIRSPEEDS FOR THE PREVAILING CONDITIONS**

General
On power up the B500 goes to full scale down for a few seconds, back to zero then all LED's light momentarily, then the pointer moves slightly down then slowly goes to zero variometer reading. The normal minute or two on first power up is still required before the vario indicates zero (CLIMB Mode only).

There is no mechanical zero adjust knob in the middle of the meter scale. DO NOT open the case to adjust the mechanical zero. This is done automatically every time the B500VE is powered up.

On power up the GCD shows the setup page with the volume, bugs, ballast, arrival height and for GCD2 name of database selected. Arrival height always reverts to default on power up.

In Flight

In flight, information is available from audio, round meter/LEDs and GCD (Glareshield Controller Display).

The vario pointer is driven by a miniature stepper motor. The variometer scale has been expanded and reads from -10 knots to +12 knots and the 0 to +12 knots occupies 180 degrees of pointer movement giving 15 degrees of pointer angle shift per knot versus the older varios giving 12 degrees per knot, a 25% increase.

2.1 **Climb Mode** (Mode or cruise/climb switch closed – Note mode switch sense can be inverted in customer software setup for gliders with the switch installed in reverse)

The rate of climb is shown on the round display and has a range from 10knots(5m/s) sink to 12 knots(6m/s) climb. Red and green LEDs are located near the "zero" point of the variometer. When climbing the green LED is ON when the variometer is above the running 20 second value , the red LED when below and the audio climb "beeps" change on/off ratio above and below this value.

The audio ranges from 10 knots sink to 15 knots climb beginning at 10 knots sink with "clicks" which become a solid tone above 5 knots sink and above zero the tone becomes interrupted.

When current rate of climb is below the 20 second average rate of climb the audio beeps are on 70%, off 30%. When above on and off 50%. This provides clear information about the good and bad parts of the circle and also warns of the thermal weakening.

The audio is muted and restored by pressing the push button in the lower left mounting screw position.

The large number on the main page 1 of the GCD is the current 20 second running average rate of climb and the graphic on the right hand side shows the last one minute history of the rate of climb.

2.2 **Cruise Mode** (Mode switch open – see above)

In cruise mode the red and green LED's indicate when the airmass is rising or sinking and the vario becomes optionally TE vario, netto or Relative netto. (selected in customer software setup)
Speed to fly is indicated by blue and amber LEDS. "Fly slower" lights up one blue LED, "fly lots slower" two. Likewise the two amber LEDs indicate "fly faster".

{ **At all times it is the pilot's responsibility to fly the glider within its safe flight envelope.**
The "fly faster" and "fly slower" sounds are the same as in the B50 - two alternating tones for "fly slower" and two very rapidly alternating tones for "fly faster". There is a silent zone at around the correct speed to fly and the audio will not make any sound on the "fly faster" side unless you are flying slower than the speed for zero MacCready. This makes the audio more pleasant and less annoying in gusty conditions.

If you wish the audio speed command to operate in the usual way with a symmetrical silent zone around the optimum speed to fly, please contact BORGELT INSTRUMENTS.

The silent band is adjustable. We recommend initial flights are made with the factory settings.

When the relative vario goes above the Macready setting the sound changes to the normal climb TE vario warning of a significant lift encounter. This feature may be disabled in customer software setup.

The audio is muted and restored by pressing the push button in the lower left mounting screw position.

In cruise mode the large numbers on page 1 of the GCD display are the NETTO(AIRMASS) average over the last 20 seconds and the graph shows airmass movement over the last minute. NETTO(AIRMASS) indication is most useful for picking the best path through the air between thermals and for meteorological awareness of what the AIRMASS you are flying in is doing.

See Glareshield Controller/Display section for a complete explanation of all features and functions available on the GCD/GCD2.

{ **CAUTION:** AT ALL TIMES THE FLIGHT ENVELOPE OF THE SAILPLANE MUST BE ADHERED TO.

{ **DO NOT EXCEED PLACARDED AIRSPEEDS FOR THE PREVAILING CONDITIONS**

2.3 Audio
The B500 has a two channel audio and is supplied with left and right speakers. When the two channel audio feature is enabled the following applies:
When thermalling the sound is switched to one speaker when the circle should be opened in that direction.
When cruising the speed command sounds come from the side where the next turnpoint lies.
(see B500GCD/B500GCD2 Operation for details)
SEE OPERATION GCD/GCD PAGE 5

Various B500 audio functions are customisable by connecting the unit to a PC, including the audio silent zone. Contact factory for details.

2.4 B500GCD/B500GCD2 OPERATION

Please note: DO NOT insert or remove mini SD card from GCD2 with power applied. The card may become corrupted.

QUICK START

Top button

Momentary press changes pages between first two (flying) pages.

Press and hold switches to setup pages. Momentary press changes setup pages until first page comes around.

Rotary encoder

Press encoder knob to move cursor on page.

Rotate encoder forwards or backwards to change number highlighted by cursor.

Press and hold to move selected turnpoint to "next turnpoint" field on page 2

Detailed explanation

The B500GCD/B500GCD2 has BLACK push button top left and under it a **Black** rotary encoder knob with push button action and the rest of the area is occupied by a 122 x 32 graphics LCD.

The BLACK push button changes the display page (5 pages). Momentary pushing of the BLACK push button cycles the display between pages 1 and 2 which are the pages you normally want flight information on. Holding the BLACK push button down down for 2 seconds accesses pages 3, 4 and 5 which are the setup pages. Momentary pushes on these pages will eventually cycle back to pages 1 and 2.

The **Black** rotary encoder push button moves the cursor to the variable the pilot wishes to change whereupon rotating the encoder changes the variable. The value last set is the one used by the instrument. There is no "enter" function.

On power up the GCD and GCD2 come up on Page 3, the first setup page. This is to remind you that you need to set volume, bugs, ballast and arrival altitude and select the correct turnpoint database.

GCD/GCD2 Page 1:
Cruise Mode:
The large numbers on the GCD display are the NETTO(AIRMASS) average over the last 20 seconds (N next to number for Netto) and the graph shows airmass movement over the last minute. NETTO(AIRMASS) indication

is most useful for picking the best path through the air between thermals and for meteorological awareness of what the AIRMASS you are flying in is doing.

Climb Mode:
The large number on the GCD is the current 20 second running average rate of climb (V next to number for variometer) and the graphic on the right hand side shows the last one minute history of the rate of climb.

The MacCready setting is the only variable so just rotating the encoder is all that is required to change MacCready setting.
Also shown is the Speed to Fly in still air for that MacCready setting (Bugs and ballast are on Page 3).
The number next to the SL in the middle left of the screen is the altitude surplus or deficit on the glideslope for the settings that have been entered on the second page.

In both climb and cruise the dotted line is the current 20 second average value, TE variometer in climb, Netto in cruise.

GCD/GCD2 Page 2: The Nav/glide/wind page

This page is organised in two columns of four rows of fields as below:

Next Turnpoint (TP)   NAV status/wind speed and direction
Following TP   previous wind speed/direction
Distance to next turnpoint   actual wind component - wind component used in glide calculation
Bearing/steer x degrees left/right to Next TP   Glideslope surplus/deficit around next to following TP

The cursor is moved by pressing the encoder button momentarily.
The cursor is always on Following TP when changing to this page so just rotate the encoder and a name will appear.
The operation is designed so that a single button press will allow you to round a TP, and then immediately select another following TP from the database.
To do this, select the desired TP name from the database. Press and hold the encoder knob for 1 second. The name will transfer to the Next TP slot at the top. Then select the following TP from the database for the second slot.
Then navigation will be to the Next TP, and glide slope is calculated to the Following TP.

On AAT tasks just press and hold the button when you decide to proceed to the following turnpoint once in the Next TP zone.

Wind computer

The cursor may also be moved to the "wind component used in glide calculation" field (the rightmost of the two wind component fields). This field will display the wind component to the next turnpoint from the present position, based on the wind speed and direction in the top field above which will produce a value when circling in climb mode on the B500 and at least two circles have been completed. It will be updated every next circle and the previous wind speed and direction is displayed below it so as you climb you can see how the wind is changing (or not). An "A" will appear denoting "Automatic" wind, next to the "used wind component" number.

Normally the headwind/tailwind component should not need to be altered unless you suspect meteorological conditions have changed up ahead, however you can place the cursor over this field and change the

headwind/tailwind component that is being used in the glide calculation. An "M" will appear denoting that the wind component used is now "Manually" set. This will revert to automatic wind when a turnpoint is changed and you can revert at any time by momentarily changing the turnpoint to another and back to your original one. The wind component shown to the left of this field is the actual head or tail wind component derived from the difference between the GPS groundspeed and the True Air Speed (TAS) at any moment in cruise mode. If this is different from the component to the right you should be thinking of the reason for this. Maybe the wind has changed since you left the last thermal?
In climb mode this isn't very useful so the component shown is the wind component from present position to the next turnpoint based on the latest wind speed and direction calculation.

The lowest field on the right is the altitude surplus or deficit on the glideslope for the current MacCready, bugs ballast and wind. This is the same as on page 1.
Note there is no magic in the wind calculation. It depends on the drift in the thermal

Note that when on the ground the Bearing/steer x degrees left/right to Next TP field shows bearing to next TP.

When airborne this field shows degrees to steer left or right to the Next TP with left/right arrows.

When you pass through 30 knots on takeoff roll the two TP fields show "takeoff" if no other turnpoints have been selected. If you do nothing else you will get nav and final glide guidance to the takeoff point.
Great for local soaring!
If you select turnpoints before takeoff this feature still works but you need to select "takeoff" from the database. It is always placed at the beginning of the database.

The NAV status/wind speed and direction field will show Nav status on the ground, "No Nav" until the GPS acquires enough satellites to get a fix and "Nav good" when it does. Once airborne it will show wind speed and direction once at least two circles have been done with the B500 in climb mode. If you do not do good circles this will require more time to get a valid wind as it depends on the thermal drift to get wind speed and direction.

A typical screen view might look like this in flight:

```
Bunya Mt        240/12
Jandowae        230/11
18.4            hw7 Ah5
 >012>          SL-8567
```

We are 18.4 km from Bunya Mt need to turn right 12 degrees to go directly there and are going to Jandowae after Bunya Mt and we need another 8567 feet to arrive at Jandowae at the selected height above ground.(This is set on Page 3) The wind is 240 degrees at 12 knots, the previous wind calculation result was 230/11, the current headwind in the direction currently being flown is 7 knots and the wind component in the direction of Bunya Mt from present position is 5 knots based on the wind being 240/12 and the wind calculation is "Automatic". This vector wind is being used in the glide calculations on both legs. The component will change when you turn and proceed on the next leg.
Note: All bearings and wind directions are relative to TRUE north not magnetic north for simplicity.

GCD/GCD2 Page 3(setup page):

To change volume, bugs, ballast, press and hold the page button for 2 seconds to get to the next page.. The cursor is on Volume when you switch to this page so to change volume just rotate the encoder. To change the other variables press the encoder knob to move the cursor to **Ballast** for example and then rotate the encoder to change the ballast setting.
For final glides this page is also where you set the desired arrival height.
This is the Arrival height above the turnpoint elevation as in the turnpoint database. The factory default here is 2000 feet. We can provide an EEprom file to let you change this on GCD's. The default appears every time the B500 is powered up. On the GCD 2 this is settable in user options and a new setup_U.eec file is transferred to the mini SD card which is read on power up. See software appendix before doing this.
OAT and Battery Voltage are also shown.

GCD Page 4(setup page):

LCD contrast can be adjusted here.
Audio balance (relative level of left/right speakers to compensate for left/right ear hearing or small speaker differences)
Init Vol is the volume level of the audio on power up.
Vario response can be adjusted here to be fast or slow.
Changes on this page are stored on changing from this page.

GCD/GCD2 page 5(setup page): Thermal centering

Currently the status of this feature is "experimental".
We need feedback from users as to what settings they find are most useful for the variables. We will then make the averages from users default settings.
This page contains the adjustable settings for the left/right audio thermal centering feature.
The page looks like this:

LR Gain		xx
Threshold		yy
Delay		zz
Bal	128	Alg 1

You can change the numbers next to these variables by putting the cursor on them and rotating the encoder. They can be saved by changing pages back to the first main flying page. Currently these settings will not survive a power cycle if changed from the defaults.

The numbers are our best estimate of useful settings after our testing. There are actually 2 algorithms and you can change to alg 0 which is a smooth level transition from side to side. This may not be as noticeable in a glider cockpit as Alg 1's switching completely so only one speaker is on when the threshold is exceeded.
The most useful number to change will likely be the threshold number.

In order for this feature to work the speakers must be installed reasonably close to the pilots ears, either each side of the headrest or in the turtledeck just a little further aft. The right hand speaker is connected to the speaker socket closest to the left hand side of the aircraft. Then the thermal centering signal is such that you fly towards the sound. This will also work in cruise so that if navigating with the B500 when cruising and off course to the next turnpoint the audio speed command sounds come from the same side as the turnpoint.
The technique used is basically the simple "if lift increasing significantly, open out - decreasing, tighten back"
This feature may be disabled by setting LR Gain to zero AND the centering algorithm to 0
You must do this if using only one speaker.

Sailplane/pilot settings

Macready: 0 - 9.5Kt   = speed to fly in 0.5 knot increments to 9.5 knots
          0 - 4.9m/s = speed to fly in 0.1 m/s increments to 4.9 m/s
Ballast: ballast state 1.0 = sailplane lowest flying weight adjustable to 1.6 times lowest flying weight.
Note lowest flying weight is weight of glider + lightest pilot + fixed equipment (including parachute).

Bugs = sailplane performance is degraded by bugs or rain on the wings which changes the polar and hence makes the netto/relative netto and speed command inaccurate. The bugs control may be adjusted to reflect the degradation in sink rate up to a maximum 30% degradation.

3. FACTORY/DEALER CONTACT

Current addresses can be found on our website   www.borgeltinstruments.com

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alternatively contact   BORGELT INSTRUMENTS

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Appendix 1

PC Support

System Architecture

So as to have better idea of what is done here, here is a discussion of the system architecture

The B500 VE consists of the B500 system unit with the variometer display *(available in either 57mm or 80mm size)*, the HP_GPS(GPS sensor) and the GCD(Glareshield Controller/Display). The GCD2 is the same as the GCD but with the addition of a mini SD card which removes the 75 turnpoint limit and allows upgrade of the GCD2 program and all EEprom settings by loading appropriate files on the card.

Inside the system unit are the meter drive processor, the sensor processor and the audio processor (along with pressure sensors and their amplifiers). These processors are networked together with the GCD processor and GPS.

The B500 operating software is distributed amongst the processors so a program upgrade or bug fix may involve one or more processors in the system.

Operational settings like the polar variables, variometer speed of response, customer choices, and much of the operating detail such as audio tones, chop rates, pitch etc are held in non volatile memory (EEprom Electrically Erasable programmable read only memory) as numbers which are *automatically* read after power up and then used to control the operating software.

This allows a user to customise the instrument without changing the operating program, which is held in another kind of non-volatile memory (FLASH).

For older B500's with original No Card GCD, some Eeprom(polar and setup choices) settings may be changed by using the Customer version of the B500Setup_NoCard.exe program. Other B500 settings may also be changed. Contact the factory for details.

A B500 with a GCD2 normally has the common EEprom numbers (polar and setup choices) changed using the customer version of B500Setup_Card.exe, making a new Setup_U.eec file, placing a new file on the card and powering up the B500 after the card is inserted in its slot. The new file with settings is then loaded.
For other changes to the B500 contact the factory.

GETTING STARTED

Note: Familiarity with the Windows Operating System is assumed. Windows Help is a valuable source of information on how to carry out Windows operations such as file copying, pasting and moving. Borgelt Instruments does not provide a "how to use Windows" service.

Download the B500Install.zip file from our website **www.borgeltinstruments.com** to a temporary folder. Unzip it and run Setup.exe, which will install the B500Support.exe and other needed files into your Program Files\B500 folder.

Then download the latest versions of PC support programs – B500Setup Card.exe and B500Setup NoCard.exe and also download Setup_U.eec and GCD_U.tea put them in the same folder as the rest of the support programs.

Any turnpoint database files may be placed here also. The source files for turnpoint databases are in WinPilot *.dat format usually obtainable from the World Wide Soaring Turnpoint Exchange on the web. These files are easily human editable.

Run the B500Setup NoCard.exe program by double-clicking the name. Select PC from the menu bar and select the correct serial port - corresponding to the PC hardware physical port.
Create a desktop shortcut in the usual way.
Do the same for the B500Setup Card.exe program.
Both versions of the PC support software are now ready to use.

If your B500 has not been set up for you by the factory or dealer you will need to enter data for the sailplane polar and some user choices. The method depends on whether you have a B500 with the GCD2 (mini SD card) version or the original GCD (no card).

B500 GCD2 version

Note: In order to prevent corruption of the data structure on the mini SD card, do not insert or remove card from GCD2 while the B500 is powered up.
In order to remove a card from a card reader slot in a PC the drive represented by that card must be deactivated. In Windows XP this can be done by right clicking on the drive in "My Computer" and selecting "eject", then removing the card.

An SD card reader attached to a PC is required to change the data on the card. Some PC's have built in SD card slots.
The mini SD card supplied (with SD adapter to fit in SD slots on card readers) already has a B500 folder created on it with two files on it, GCD_D.tea and Setup_D.eec .
When reloading a new program version or EEprom file these files are called GCD_U.tea and Setup_U.eec.
When the files have been loaded by the GCD2 the names are changed to GCD_D.tea and Setup_D.eec so that a GCD2 can tell whether the files are old or new ones that require loading.

Setting a new polar/user choices for your sailplane

Use the Customer mode of the CARD program (see below) to make a new version of setup_U.eec with your polar and custom user choices on it. Once you have done this it would be wise to keep a copy on your PC for future use.

Important: Some Windows versions may have trouble automatically deleting and immediately replacing a file with the same name but altered contents. Move a copy of your old Setup_U,eec to another folder before carrying out the following:
When you wish to change the polar or any other EEPROM setups in the B500 put the card in your card reader attached to your PC.

Launch the B500Setup_CARD version and select Customer mode.

Use Open on the form to open the file Setup_U.eec which puts default settings on screen. Make your instrument setup choices and insert the appropriate polar numbers then use Save As to save the setup file as a filename appropriate for your use (for example Ventus_C.eec). A new Setup_U.eec file is then created in the B500SetupCard folder with these values also. Copy the new Setup_U.eec to the folder B500 on the card. When the card is inserted in the GCD2 and the B500 is powered up the new values are copied into the appropriate EEproms in the B500. Follow the instructions on the GCD screen.

Turnpoint files

The GCD2 operates on turnpoint files in WinPilot *.dat format. The support program translates the .dat format file into a .tpc format file for direct use in the GCD2

From TP Data, Select Open and Open the WinPilot*.dat file you wish to use. The turnpoints will appear in the window and you can check them if desired. Then select Convert and a *.tpc file containing those turnpoints is then created.

 Place this file in the B500 folder on the card.

When the card is placed in the GCD and the B500 is powered up the first setup page (volume is at the top) appears. Scroll to the space at the bottom of the page by moving the cursor, then rotate the encoder knob and you will see the turnpoint filename. Change the page and this filename will be stored in EEPROM. When you next power up the instrument this file will be the active turnpoint file.
You may change the turnpoint file at any time by going to the first setup page and changing to another file. Up to 10 turnpoint files may be stored on the card. Effectively there is no limit on the number of turnpoints in any one file but for ease of scrolling we suggest 50 to 100 turnpoints per file is enough.

Other choices

Many other variables in this instrument can be set in the EEproms such as the audio tones, break points etc. If you decide that something could be different or better please let us know and we can implement this if feasible. Contact the factory for details of how to do this.

Correction for Position Error in airspeed system

We will provide a new EEprom file for you if you send us a copy of the position error table or graph for your glider. We will provide this to you or your dealer so that the B500 can be set up properly.

Conversion to metric units

The B500 VE is available with metric units. The only difference is a 6m/s label over the 12 knots on the meter scale and selection of metric units in the PC customer support program. The meter and other necessary calibrations are then set on power up.

Original GCD (no mini SD card)

Setting a new polar/user choices for your sailplane

The provided load cable has a DB9 on one end, a red band and a RJ plug on the other. Plug it into the red banded socket on the *XCB (eXternal Connection Board of the B500)* normally used for the B2500/PDA data.

OPTIONALLY available: We do have available a PDA_PS/dataport module which consists of a circuit board with connectors and switches which can be permanently panel mounted and plugged in to the B500 which lets you connect a PC to the B500 from the front of the panel using a straight through serial cable.

NOTE: If you use the PDA_PS dataport with a PDA you MUST disconnect the PDA from the system while doing PC communications.

For B500 stand alone installations *(ie no PDA or B2000/B2500 connected)* you can mount the DB9 of the load cable in the instrument panel and plug the RJ connector permanently in to the B500.

Connect the DB9 to a PC serial port using a standard straight through DB9F/DB9M serial cable.

NOTE THIS PORT MUST NOT BE USED BY ANY OTHER SOFTWARE RUNNING IN THE BACKGROUND, such as MICROSOFT ACTIVESYNC.

If your PC doesn't have a serial port, only USB ports, you need a USB to serial converter. Install this and the associated software to create a serial port, taking note of the port number.

With USB to serial devices we have found a way to improve reliability of serial communications with these at the 4800 baud rate we use for the B500 PC communications. We only use this baud rate as it is the same as the 4800 baud NMEA output from the same port in normal operation.
In control panel - system - hardware - device manager - ports, right click on the serial port to get properties and select port settings - advanced - USB transfer sizes and set to 64 for both transmit and receive or lowest value. This screen varies in details with the particular USB to serial device (may have slide bars). This has vastly improved our Belkin and Prolific USB to serial devices' performance with the B500.
We have found one other USB to serial device which seems generally superior to the rest (www.dontronics.com). Judging by the comments from customers on that website it seems that problems with other types are not uncommon but setting transfer sizes to minimum seems to help greatly.
19th May 2006 testing: Belkin USB to serial device may still have problems on some machines. Prolific and Dontronics devices work well.

Unplug the GPS from the B500. This is not be strictly necessary on later B500's as the GPS is set up to be temporarily disabled by the PC software when attempting communication between the PC and B500.

Launch the B500setup_ NoCard.exe program and select customer mode from the "settings" menu.

Power up B500.

After you power up the B500 you will see the NMEA messages in the box at the bottom. (this may take 10 - 15 seconds during which you see some startup messages).

Once you see the NMEA messages in the window at the bottom of the form (once per second), the B500 will automatically be put into PC communications mode. DO NOT HURRY as it takes a few seconds for the sequence to be completed.

Press the START button and the greyed out buttons will become active.

There is a default polar in the B500 (LS4 at 345Kg, 760lb)

You can import to the PC program the default values in the B500. For this press B500>>PC. The form will be filled in with the default polar settings and default customer settable user options obtained from the B500.

Obtain polar values for your glider by using B500polar.exe available from our website (read B500polar.txt first) or contact us and we'll give you the numbers. You will need to provide us with the minimum flying weight of your glider: glider + lightest pilot + parachute + fixed equipment.

Note the format to be typed into the boxes is that of the numbers produced by the B500polar.exe program. The numbers are always positive, any negative signs are automatically added as required inside the B500.
You can also change the units calibration (you will need the 6 m/s decal for the vario scale if changing to metric), cruise/climb switch sense (default is closed = climb), whether the audio automatically switches to climb mode when the relative netto reading exceeds the current Speed to Fly (MacCready) setting (default is active) and the netto type chosen (default is Relative Netto)

No Netto is just TE vario. For explanations of netto and relative see the article on "Basic sailplane instruments" on our website.

When you have changed the default values to your choices and polar numbers, press PC>>B500 and the new values will be loaded and you will see the form filled in.

When finished, power off the B500, reconnect the GPS (if you disconnected it).
The instrument is then ready for use with the new configuration.

Loading new turnpoint database

With the B500 and PC connected as above:

Launch B500Setup No Card.exe program on the PC.

Power up the B500. Once it has finished its startup cycle and is operating normally:

Select TP Data from the menu bar

The software will take a few seconds to place the B500 in PC communications mode.
The turn point database to be loaded may then be selected by pressing the "OPEN" button and selecting the correct file.
The database uses WinPilot *.dat format and is limited to 75 turnpoints.

Once selected press TP>>B500 .

If the button to do this is greyed out and inactive, shut down and redo the sequence making sure it is done in correct order.

The database will then be loaded and progress monitored on the progress bar. When finished, shut down the B500 and PC program.
Disconnect cables and the B500 will be ready to use when next powered up. The name of the database loaded will appear on the GCD startup screen for a few seconds after power up.

Other choices

Many other variables in this instrument can be set in the EEproms such as the audio tones, break points etc. If you decide that something could be different or better please let us know and we can implement this if feasible. Contact the factory for details of how to do this.

Note:

B500's before serial number 055(last 3 digits off serial number on label) need the GPS configured to work with the Nav software. Contact Borgelt Instruments for instructions on this.

Correction for Position Error in airspeed system

We will provide a new EEprom numbers for you if you send us a copy of the position error table or graph for your glider. We will provide this to you or your dealer so that the B500 can be set up properly.

Conversion to metric units

The B500 VE is available with metric units. The only difference is a 6m/s label over the 12 knots on the meter scale and selection of metric units in the PC customer support program. The meter and other necessary calibrations are then set on power up.

B500 SOFTWARE UPGRADES

GCD2 (mini SD card) version

COMMUNICATING WITH B500

The provided load cable has a DB9 on one end, a red band and a RJ plug on the other. Plug it into the red banded socket on the *XCB (eXternal Connection Board of the B500)* normally used for the B2500/PDA data.

OPTIONALLY available: We do have available a PDA_PS/dataport module which consists of a circuit board with connectors and switches which can be permanently panel mounted and plugged in to the B500 which lets you connect a PC to the B500 from the front of the panel using a straight through serial cable.

NOTE: If you use the PDA_PS dataport with a PDA you MUST disconnect the PDA from the system while doing B500 to PC communications.

For B500 stand alone installations *(ie no PDA or B2000/B2500 connected)* you can mount the DB9 of the load cable in the instrument panel and plug the RJ connector permanently in to the B500.

Connect the DB9 to a PC serial port using a standard straight through DB9F/DB9M serial cable.

NOTE THIS PORT MUST NOT BE USED BY ANY OTHER SOFTWARE RUNNING IN THE BACKGROUND, such as MICROSOFT ACTIVESYNC.

If your PC doesn't have a serial port, only USB ports, you need a USB to serial converter. Install this and the associated software to create a serial port, taking note of the port number. If you have trouble getting a program upload to work or the process stops before completion contact Borgelt Instruments.

With USB to serial devices we have found a way to improve reliability of serial communications with these at the 4800 baud rate we use for the B500 program and EEprom loads. We only use this baud rate as it is the same as the 4800 baud NMEA output from the same port in normal operation. In control panel - system - hardware - device manager - ports, right click on the serial port to get properties and select port settings - advanced - USB transfer sizes and set to 64 for both transmit and receive or lowest value. This screen varies in details with the particular USB to serial device (may have slide bars). This has vastly improved our Belkin and Prolific USB to serial devices' performance with the B500.
We have found one other USB to serial device which seems generally superior to the rest (www.dontronics.com). Judging by the comments from customers on that website it seems that problems with other types are not uncommon but setting transfer sizes to minimum seems to help greatly.
19th May 2006 testing: Belkin USB to serial device may still have problems on some machines. Prolific and Dontronics devices work well.

Note: Power or data must not be interrupted during a program load.

After launching the B500Setup_card.exe and selecting dealer mode by dropping down the "settings" menu and selecting "dealer", power up the B500 and wait until the NMEA messages are visible in the message box at the bottom of the form.

Then in the upper left select "sensor" in the " Device active –select" menu. Click on the small circle to do this and you will see it fills with a black dot.

Also select "Log to PC" as this will help us in the event of difficulties as a log file of what you did is created in the PC which can be emailed to us.

Then press the PC mode button and a second or two later the button will go green and the GPS disabled message will appear after that. Do not be in a hurry to go through the steps as the B500/PC system may take a few seconds to complete the previous command.

You may now check on the program version date for the sensor processor by pressing the "get version" button in the Program file box. This will automatically check for the processor type in the sensor processor. Both AT32 and AT64 types have been used with AT 64 being current. The processor version has no effect on B500 functioning.

If it does not match the version shown in PC, press Program, a programming box will appear and after a few seconds the new program version will load. A progress bar shows progress and after the program is loaded the default factory EEprom file is automatically loaded.

When done, select either "meter" "Audio" or "ADU"(ADU refers to repeaters, not normally present in a single seat installation) by clicking in the small circle. The "Pass thru" button will automatically go green. Then the program version can be checked and a new version uploaded if required. There is a separate processor in each of these modules. Again, do not be in a hurry, let each step complete before proceeding to the next one.
When the first of these is done check the box for the next one and repeat the procedure until all have been upgraded.

Some B500 program upgrades will only require one or two of the processors to be upgraded. This will be noted with the upgrade.

If you have problems with the above procedure and the meter/audio do not load when commanded then use this procedure:
When done, exit the program, power down the B500 and then relaunch the program and power up the B500 and start the same procedure as above but this time, after the PC mode button is green and the GPS disable command sent, instead of checking the sensor processor version date, select either "meter" "Audio" " GCD" or "ADU"(ADU refers to repeaters, not normally present in a single seat installation) by clicking in the small circle. The "Pass thru" button will automatically go green. Then the program version can be checked and a new version uploaded if required. There is a separate processor in each of these modules. Again, do not be in a hurry, let each step complete before proceeding to the next one.
Repeat for each processor in turn.

When finished upgrading the sensor processor, meter and audio (NOTE: NOT the GCD program) in the main unit, the GCD2 program is upgraded via the mini SD card by loading the new GCD_U.tea file and the default Setup_U.eec file into the B500 folder on the card (files available for download from our website, www.borgeltinstruments.com), inserting the card in the slot while the B500 system is powered down and then powering up with the GCD2 connected to the main unit. This takes about 35 seconds and will be followed by an EEprom load (Setup_U.eec) which is indicated on the screen.

An SD card reader attached to a PC is required to change the data on the card. Some PC's have built in SD card slots.

Note: In order to prevent corruption of the data structure on the card, do not insert or remove card from GCD2 while the B500 is powered up.
In order to remove a card from a card reader slot in a PC the drive represented by that card must be deactivated. In Windows XP this can be done by right clicking on the drive in "My Computer" and selecting "eject", then removing the card.

The mini SD card supplied (with SD adapter to fit in SD slots on card readers) already has a B500 folder created on it with two files on it, GCD_D.tea and Setup_D.eec .
When reloading a new program version or EEprom file these files are called GCD_U.tea and Setup_U.eec. When the files have been loaded by the GCD2 the names are changed to GCD_D.tea and Setup_D.eec so that a GCD2 can tell whether the files are old or new ones that require loading.

When finished upgrading reload your custom version of setup_U.eec on the card, inset card in the GCD2 and power up. Follow the instructions on the GCD2 screen to set your polar, user choices and units as these will have been reset to factory defaults.

GCD version (no mini SD card)

COMMUNICATING WITH B500

The provided load cable has a DB9 on one end, a red band and a RJ plug on the other. Plug it into the red banded socket on the *XCB (eXternal Connection Board of the B500)* normally used for the B2500/PDA data.

OPTIONALLY available: We do have available a PDA_PS/dataport module which consists of a circuit board with connectors and switches which can be permanently panel mounted and plugged in to the B500 which lets you connect a PC to the B500 from the front of the panel using a straight through serial cable.

NOTE: If you use the PDA_PS dataport with a PDA you MUST disconnect the PDA from the system while doing B500 to PC communications.

For B500 stand alone installations *(ie no PDA or B2000/B2500 connected)* you can mount the DB9 of the load cable in the instrument panel and plug the RJ connector permanently in to the B500.
Connect the DB9 to a PC serial port using a standard straight through DB9F/DB9M serial cable.

NOTE THIS PORT MUST NOT BE USED BY ANY OTHER SOFTWARE RUNNING IN THE BACKGROUND, such as MICROSOFT ACTIVESYNC.

If your PC doesn't have a serial port, only USB ports, you need a USB to serial converter. Install this and the associated software to create a serial port, taking note of the port number. If you have trouble getting a program upload to work or the process stops before completion contact Borgelt Instruments.

With USB to serial devices we have found a way to improve reliability of serial communications with these at the 4800 baud rate we use for the B500 program and EEprom loads. We only use this baud rate as it is the same as the 4800 baud NMEA output from the same port in normal operation. In control panel - system - hardware - device manager - ports, right click on the serial port to get properties and select port settings - advanced - USB transfer sizes and set to 64 for both transmit and receive or lowest value. This screen varies in details with the particular USB to serial device (may have slide bars). This has vastly improved our Belkin and Prolific USB to serial devices' performance with the B500.
We have found one other USB to serial device which seems generally superior to the rest (www.dontronics.com). Judging by the comments from customers on that website it seems that problems with other types are not uncommon but setting transfer sizes to minimum seems to help greatly.
19th May 2006 testing: Belkin USB to serial device may still have problems on some machines. Prolific and Dontronics devices work well.

Note: Power or data must not be interrupted during a program load.

After launching B500setup_NOCARD.exe and selecting dealer mode by dropping down the "settings" menu and selecting "dealer", power up the B500 and wait until the NMEA messages are visible in the message box at the bottom of the form.

Then in the upper left select "sensor" in the " Device active –select" menu. Click on the small circle to do this and you will see it fills with a black dot.

Also select "Log to PC" as this will help us in the event of difficulties as a log file of what you did is created in the PC which can be emailed to us.

Then press the PC mode button and a second or two later the button will go green and the GPS disabled message will appear after that. Do not be in a hurry to go through the steps as the B500/PC system may take a few seconds to complete the previous command.

You may now check on the program version date for the sensor processor by pressing the "get version" button in the Program file box. This will automatically check for the processor type in the sensor processor. Both AT32 and AT64 types have been used with AT 64 being current. Processor type has no effect on B500 functioning.
If it does not match the version shown in PC, press Program, a programming box will appear and after a few seconds the new program version will load. A progress bar shows progress and after the program is loaded the default factory EEprom file is automatically loaded.

When done, select either "meter" "Audio" " GCD" or "ADU"(ADU refers to repeaters, not normally present in a single seat installation) by clicking in the small circle. The "Pass thru" button will automatically go green.

Then the program version can be checked and a new version uploaded if required. There is a separate processor in each of these modules. Again, do not be in a hurry, let each step complete before proceeding to the next one. When the first of these is done check the box for the next one and repeat the procedure until all have been upgraded.

When finished upgrading run the customer mode to set the polar, user choices and units as these will have been reset to factory defaults.

If you have problems with the above procedure and the meter/audio/GCD do not load when commanded then use this procedure:
When done, exit the program, power down the B500 and then relaunch the program and power up the B500 and start the same procedure as above but this time, after the PC mode button is green and the GPS disable command sent, instead of checking the sensor processor version date, select either "meter" "Audio" " GCD" or "ADU"(ADU refers to repeaters, not normally present in a single seat installation) by clicking in the small circle. The "Pass thru" button will automatically go green. Then the program version can be checked and a new version uploaded if required. There is a separate processor in each of these modules. Again, do not be in a hurry, let each step complete before proceeding to the next one. Repeat for each processor in turn.

Appendix 2

INSTALLATION

AT ALL TIMES EXTREME CARE SHOULD BE USED TO PREVENT ANY INTERFERENCE WITH FULL CONTROL MOVEMENT OF THE SAILPLANE. WE STRONGLY SUGGEST THAT YOU HAVE A QUALIFIED PERSON INSTALL OR CHECK YOUR INSTALLATION BEFORE FLIGHT.

To get the most out of your **B500 VE** some straightforward installation guidelines should be followed. Please take the time to read these guidelines in full BEFORE commencing installation.

Good Practice - Mechanical
Plan your instrument panel layout for optimum scan.

    {   Require assistance with layout?   Contact Borgelt Instruments

2.1 Install the B500 System Unit into a standard 57mm or 80mm panel hole (dependent on size purchased) using the 3 x M4 screws provided. – note push button switch lower left. Make sure the button operates freely in the hole.
        2.1.1 All wiring attaches to an external connection board (XCB).

The top label of the B500 contains a labelled diagram of the electrical and pneumatic connections.

DO NOT OVERTIGHTEN THE SCREWS on the XCB as the connector may suffer damage.
        Power +12V (+11 to +16 volts) and Ground (-) to marked screw terminals.
Extreme care should be taken to ensure correct polarity power is connected to the B500. While reverse polarity protection has been fitted, we do not guarantee that under all circumstances this will necessarily protect the B500 from damage. A 2 AMP fuse (M205 type) is fitted.
        2.1.2 Cruise Climb Switch (Normal mode, switch closed - climb mode, switch open - cruise mode. There is a software option to invert the sense of the switch for gliders which have the switch installed in the opposite sense.)
Connect switch leads using screw terminal connectors on XCB and install switch in a convenient location. Suggested places are on the control column beside the radio press-to-talk switch. (many sailplane factories offer this option in new sailplanes); on flap handle in flapped sailplanes. (switch shaft requires 1/4" hole).
If desired you may install a microswitch in the flap circuit although we do not prefer this option.

        2.1.3 Audio speakers - left and right side of cockpit. Note: the B500VE will operate with only one speaker attached, however you lose the features of the 2 channel audio.
   **If you elect to install only one speaker you must set the LR Gain to zero on the third setup page on the GCD for the audio to work properly.**
        2.1.4 Outside Air Temperature Sensor - should be installed in the air vent as close to inlet as possible but shielded from solar radiation..

2.2 B500 HP-GPS Mount the GPS using the M5 nylon bolts. Note orientation

2.3 B500GCD/B500GCD2. Install the GCD/GCD2 using a bracket under or in front of the glare shield – note position should be within usual eyescan (this minimises time of scan) and should NEVER obscure any part of the normal view from the cockpit.

You may use the two case mounting screws on each side of the GCD to attach it to the bracket. DO not substitute longer screws. *See drawings for suggested mounting ideas.*
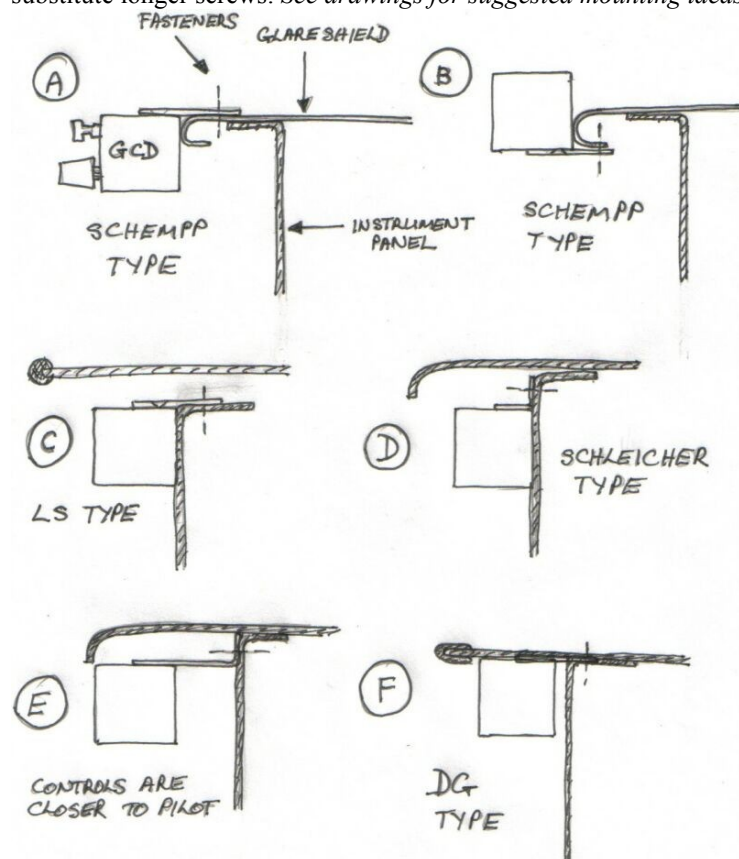

The GCD may also be mounted on Schempp type panels using a similar scheme to that shown for Schleicher.

Mounting the GCD is not much more difficult than mounting an instrument in a panel hole and has the advantages of being easier to reach and the GCD display is just below the pilot's external line of sight. Even when changing Macready, bugs, ballast, volume etc the pilot's peripheral vision is still effective outside the cockpit.

Photos of installations in a Discus 2 and an ASW27B.

Note the mini SD card slot under the GCD2. This is for card access and you should allow for the card to be present in your installation as the database is always read from the card. While the GCD2 will work without a card present you will be unable to navigate using the B500 as there will not be a database.
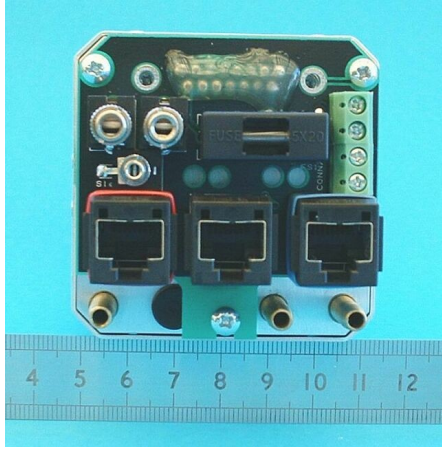
Rear view of B500 System Unit showing XCB (centimeter ruler used in photo). Note XCB is same size on both 57mm and 80mm
versions.

The cable (RJ45) connectors with strain reliefs are colour coded (matching heat shrink on the socket and corresponding cable)
RED – B2000/PDA
BLACK – GCD/GCD2
BLUE -GPS
After the power, mode switch, speakers, temperature sensor have been attached to the XCB the cable tie (supplied) may be used as a strain relief for these wires. Use any 2 of the 4 M3 holes in the XCB for this.
Three M3 machine screws attach the XCB to the rear of the B500, the top two can be removed and the board gently tilted back to disengage the DB15 then removed upwards. The lower M3 machine screw is retained in the standoff and IS NOT TIGHTENED as it is locked with thread locking compound. This allows wiring to remain undisturbed in the aircraft in the event that servicing of the B500 is required.

Good Practice - Electrical
Separate power circuits for the radio and vario systems are highly recommended. The reason for this is that varios draw 100-200mA and a typical radio on TRANSMIT draws 2 AMPS. If the radios and varios share the same power bus any resistance in the circuit is multiplied by the 2 AMP current draw of the radio on transmit instead of the 200mA of the vario circuit resulting in a much larger voltage drop. This can result in your vario failing to work properly during radio transmissions particularly if the battery is low. Of course it is a good idea to minimise resistance in the power wiring for optimal radio performance. Sources of unwanted resistance are poor switch contacts, poor fuses, poor fuseholders, poor battery connectors, wire gauge too small and bad soldering. We recommend 18 gauge or larger **aircraft** wire, electronics industry type switches (not automotive as these sometimes have unplated brass contacts which oxidise) and CANNON type latching connectors for the battery. (4 pin - pin 1 positive, pin 4 ground. 3 pin - pin 1 positive, pin 3 ground.)

Extremely effective radio interference protection is built into the B500 and no difficulties should be experienced. However it is good practice not to run antenna coax and power leads in close proximity for any great length. The B500 will perform properly down to a battery voltage of 10 volts. This voltage may be monitored on the digital display on the GCD/GCD2.

2.4 Pneumatics – static, pitot, T.E.

Total energy compensation is by probe. TE probes provide by far the best and most reliable TE compensation. If you require a good TE probe, Borgelt Instruments offer a modified Irving TE probe (2 hole style).
All tubing must be in good condition and should be a very tight press fit over the fitting to avoid air leaks. Even a small air leak will compromise any variometer's performance. For extra insurance against air leaks we supply small, thick walled elastic `donuts' which you may install over tubing several inches past the end. After the tubing is properly attached to the fitting on the instrument, slide the `donut' back toward the end of the tube so that it supplies extra squeeze around the tubing/fitting area. Do not use electronic type nylon cable ties or twisted wire as this will guarantee a leak.

There are 3 connections - connect the tubes leading from the sailplane PITOT and STATIC and T.E. source to the pneumatic connections on the rear of the B500 labelled `PITOT' and `STATIC' and `TE PROBE'. Providing

a good pitot and static source is very important. A Prandtl probe works well and has minimal position error. Position error will result in incorrect speed commands and netto computation. This may be compensated for by redefining the polar in terms of IAS (indicated airspeed) instead of CAS (Calibrated airspeed). See section on `Setting up the Polar' in Appendix 1 PC support and consult aircraft flight manual for IAS/CAS relationship.

{ **Leak check the system following installation**. (see "leaks" article on our website)

Good Practice -Pneumatic
The most common mistake in variometer installations is to connect two vario systems to one Total Energy line with a T-piece at the instrument panel. The only time that this is permissible is when both instruments are of the pressure transducer type.(for example a B500 and B400 or B50 and B40 or any combination of these) That is, no flasks hence no flow. Flow sensor type instruments cause significant flows in the line to the T.E. probe and these flows can cause these instruments to interact with each other or with a pressure transducer type variometer causing weird behaviour or a general slowing of the response of both instruments connected to the T.E. probe. The T-piece in the T.E. line should be as close as possible to the T.E. probe although in practice it has been found that if the T.E. line is split under the pilot's seat, further aft, behind the seat or near the trailing edge of the wing, no problems will result. Maximising the flow resistance between two vario systems and minimising the flow resistance between each system and the outside air is the aim here. DO NOT place restrictors or gust filters in the T.E. line and then split the line to two vario systems. Place a separate restrictor or gust filter in each line to the separate vario systems. Mechanical/pneumatic gust filters(restrictors/capacities) are not recommended with modern electronic instruments. Try also to ensure that there is no excessive flow resistance in the T.E. probe mount or in the probe itself.

If a paper element filter is installed in the TE line the filter body MUST BE EXTREMELY RIGID otherwise the static pressure changes during a pullup will cause spurious variometer readings. This applies also to any gust filter bottles which may be installed ANYWHERE in the T.E. System. We DO NOT recommend this practice.

There should be no leaks in any of the plumbing and long lengths of tubing should be of the less flexible plastic or rigid nylon pressure hose. This prevents problems with the sudden static pressure changes in the fuselage during zoom or pushover causing weird transients in the T.E. vario readings due to these pressure changes being transmitted through soft tubing in the T.E. line. Tubing should be securely tied down.

Appendix 3

MAINTENANCE OF THE B500

3.1 Maintenance & Care
All aircraft instruments contain glues, paints and plastics. Their life may be extended by not subjecting them to extreme heat. It is good practice to use a canopy cover if the sailplane sits in the sun before and after flying and also to insulate under the black antireflection cover. `Space blanket material' works well. Make sure the material does not short any electrical connections and does not cover the GPS.
3.1.1 Cleaning:
LCD - if required use only a soft cloth and gently wipe the display, taking care not to scratch the surface.
Caution: the LCD is easily damaged. Solvents MUST NOT BE USED on LCD or labels.
Meter glass: use a soft cloth dampened with water.

3.2 Being a software based instrument various B500 functions are customisable by connecting the unit to a PC. Software updates are accomplished the same way. Many of these functions are user configurable however default setup will be performed prior to purchase for those not willing/able or ready to perform setups. Customer preferences can also be incorporated at this time.

3.3 Entering a new polar in the B500: is performed by software upload - if requested at time of order this will be done by the factory
The B500 uses a quadratic polar approximation for the netto and speed command functions. This requires 3 coefficients labelled a, b and c. Contact BORGELT INSTRUMENTS or your dealer for the correct coefficients for your sailplane. BORGELT INSTRUMENTS has available a small computer program (B500polar.exe) to derive these coefficients from a given polar. If you have any queries regarding software upload, please contact your supplier or BORGELT INSTRUMENTS for guidance.

3.4 Zero Adjustments:
The B500 variometer automatically zeros on startup - no adjustment is necessary.
Under normal conditions the variometer zero **will not** require readjustment.
The Airspeed zero may require adjustment occasionally (once a year at most).
This is done by connecting the B500 to a PC and following the zero set instructions.
(Contact factory or dealer)

Adjustment of audio silent band in cruise mode: Contact factory
Adjusting variometer speed of response: Contact factory

3.5 TO CHECK POLAR IN B500
Fly in smooth air (no convection or wave)
Stabilise speed at 40 knots or 75km/hr (if possible)
Place B500 in cruise mode, select correct weight (ballast control), BUGS to 0 (zero)
Repeat at 50, 60, 70, 80, 90, 100 knots or 20km/hr increments.
Fill in the following table:

IAS(KTS)	40	50	60	70	80	90	100
IAS(km/hr)	75	95	115	135	155	175	195

RELATIVE NETTO
     (units)
Glider type:
Weight at test:
Minimum flying weight:
Maximum flying weight:
Current A,B,C, NETTO OFFSET numbers
Your name: Address:
Phone/fax: Email:

Send to: **BORGELT INSTRUMENTS**
             P.O. BOX 7474
             TOOWOOMBA M.C. QLD 4352
             AUSTRALIA
             fax: 07 4635 8796 or overseas Int+61-7-4635 8796
or   **email: mborgelt@borgeltinstruments.com** or the distributor in your country.
A new polar will be derived and forwarded to you.

Appendix 4

Universal Power Supply/Dataport/Power-data distribution centre.

This optional device connects to the B500 and supplies power and data to various other devices - a B2500 glide computer, a logger, a Flarm unit(or second logger) and a PDA can receive 5 volt power at 1 amp and data from the B500.

Installation is simplified as 12 volt power must be supplied only to the B500 and the PDA-PS distributes power and data to and from the logger, FLARM, PDA and B2500 and there is a serial port for B500/B2500 program maintenance.

There is a connection for a logger on this unit, connection for a FLARM (or second logger) and two panel mountable switches which allows connection of the data to/from logger/FLARM direct to the PDA for declarations and optionally allows selection of Logger/FLARM GPS or B500 air data/GPS for flight information.

The PDA-PS also supplies power and data to a B2500 glide computer as well as to a PDA. (5 volts at 1 amp to PDA)

In addition, when fitted with the optional combiner board, the PDA_PS substitutes the logger or FLARM (whichever is selected) data for the B500 GPS data. If logger or FLARM data is not available B500 GPS data is supplied. This means that logger pressure altitude or FLARM aircraft data and pressure altitude may be passed to the PDA. To cope with the large quantity of data in some messages, input baud rates higher than 4800 are allowed and the data is passed to the PDA at this higher rate. Auto bauding is used so this is transparent to the user.

Other variometer systems may also use the PDA_PS for this purpose. Check with us for compatibility details.

A DB9 plugs into rear of B2500, RJ45 into rear of B500.

PC upgrades/data loads of B500/B2500 may be performed via the DB9 serial port on the circuit board and controlled by the two switches to the right of the DB9. As these are considered maintenance functions the PDA_PS can be mounted anywhere behind the panel. A Nomex insulating cover is fitted.

At the rear edge of the circuit board are one DB9 connector and a row of screw terminals. The DB9 is for a PDA (palmtop computer) and 5 volts at 1 amp is supplied to this by a low noise filtered switch mode power supply. The screw terminals are for a GPS logger.

There is another row of screws terminals along one side where another GPS logger or FLARM unit may be connected.

Note: The markings on the board next to the connections refer to the name of the connection coming from the Flarm or logger, NOT the connection name on the PDA_PS.
i.e SDO refers to Serial Data Out of the logger or Flarm, SDI refers to Serial Data In on logger or Flarm.
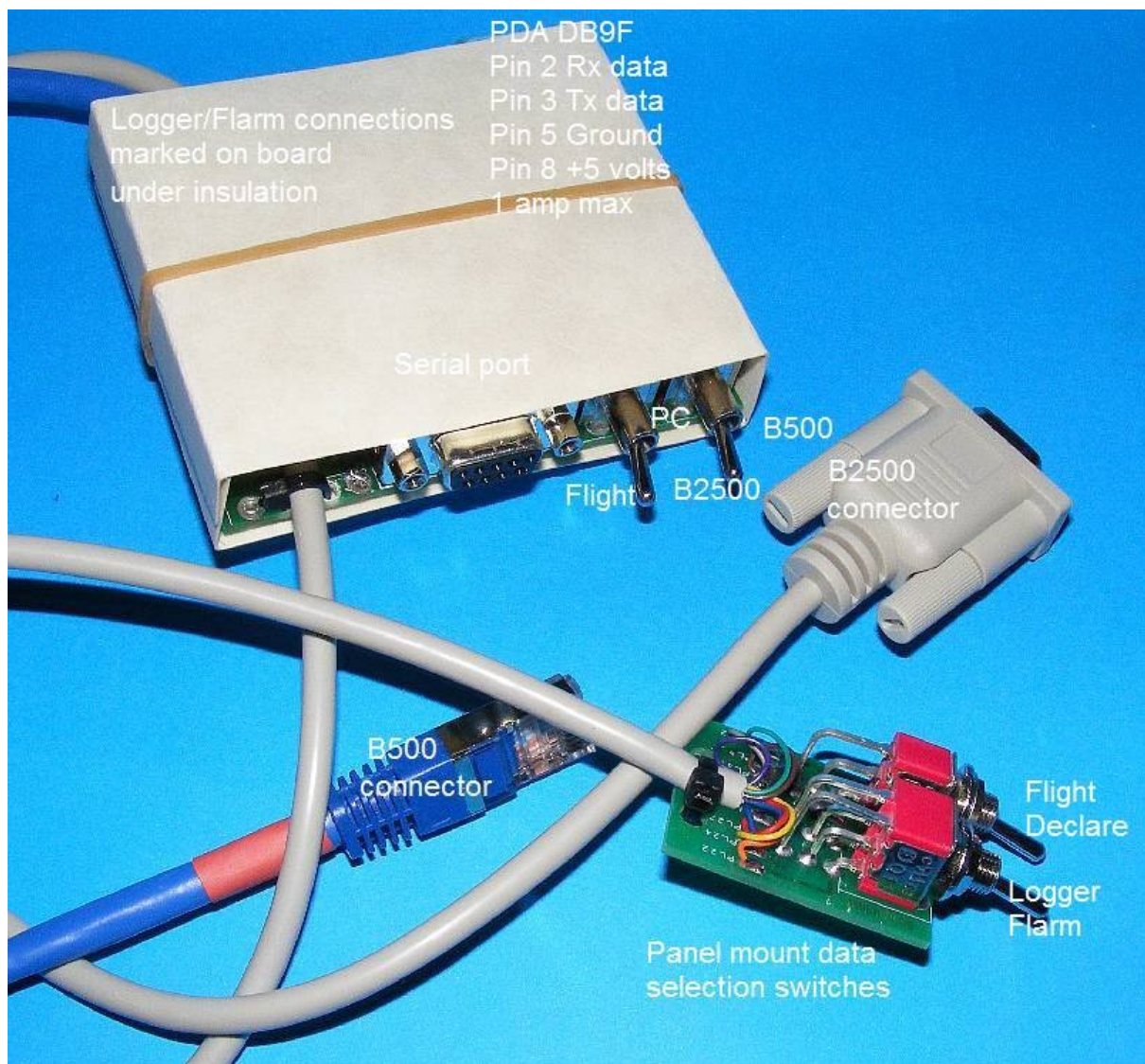

Image shows PDA_PS with DB9 for B2500, RJ connector for B500, panel mount data control switches and serial port for B500/B2500 software maintenance.

PDA connector and logger /FLARM connectors not visible (under Nomex cover)

The panel mount switches select flight or declaration mode and which logger or logger/FLARM is connected to the PDA and is supplying data to the combiner board.

In flight mode the B500 settings, air data and GPS data go to the PDA and B2500. In declaration mode the logger is connected to the PDA for two way communication and this can be done in flight also but the PDA program will then be operating with GPS data only.

There is a socket on the board for the optional combiner board, which is secured by one screw when fitted.

A jumper selects whether the B500/logger combined datastream is sent to the B2500 or whether the original B500 datastream is sent to the B2500.

File switches.pdf from our website has a full sized outline of the panel holes and labelling required for this unit.

Appendix 5

WARRANTY
If, under normal operating use, any part of the B500 hardware proves to be defective in material and/or workmanship within the warranty period of twenty-four months from date of purchase such defective parts and/or workmanship will be repaired by Borgelt Instruments or their approved agent. All freight charges are to be borne by the owner. This warranty is not transferrable.
This warranty does not cover damage caused by misuse, neglect, accident, reversal of polarity or repair or attempts to repair by unauthorized personnel.

Return for repair

All Distributors/Overseas Customers

Return of instruments
1. Please advise via email, fax or phone if intending to return an instrument for repair or modification giving model number and serial number and brief reason. Await our response before shipping. We may be able to guide you through a repair to remove the need to ship it to us. Or it may be an installation problem that we can get you to check.
2. Method of return
 (i) For goods with a declared value of less than A$1000 you may use post - airmail or express all optionally insured. We can complete the customs clearance by fax and there is currently NO ENTRY CHARGE imposed by customs for this type of clearance. We will return goods by the same method.
 If you elect to use UPS, FEDEX or DHL we will pass on the ENTRY CHARGES to you (currently approx $60)
 (ii) For goods with a declared value of greater than AUD$1000 you may use POST (airmail or express) , FEDEX, DHL or UPS (to your account). There is an entry charge for all of these methods, we will pass on this charge to you.
 For POST parcels, Australian Customs Service charge a fee for manual entries performed by us - currently approx AUD$45 Also because notifications are posted to us by Customs, there is a delay of several days added to the shipping time.
For COURIER (i.e. DHL, FEDEX, UPS) parcels, Australian Customs Service charge a fee for entries performed by -the courier company – currently approx AUD$60.
At all times shipping and clearance costs are to be borne by the customer unless advised otherwise by BORGELT INSTRUMENTS.
Outside of package must be clearly labelled
               'GOODS BEING RETURNED TO MANUFACTURER FOR REPAIR'.
A note must be attached which includes shipper's name and address, value (must be greater than AUD$0), description and reason for return for customs clearance purposes.
IMPORTANT: a copy of the note must be forwarded to us separately by fax or email as it is required for clearance documentation.
We accept VISA or Mastercard for payments.
March 2009