

Manual for B40

VARIOMETER/audio/averager

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Introduction:

BORGELT INSTRUMENTS are proud to present the **B40 VARIOMETER/audio/averager** which is our latest stand alone variometer. The **B40** also provides an efficient, accurate alternative to the mechanical vario. We have been manufacturing instruments for the soaring community since 1978 and we have continued to incorporate improved methods and technology whenever appropriate. Pressure transducers replaced flow sensors in our variometers in 1982 and their reliability and accuracy has been excellent.

There are many electronic variometers on the market which provide the basic total energy variometer/audio functions and likewise there are many instruments which are straight variometers.

The **B40 VARIOMETER/audio/averager** provides the basic total energy variometer/audio functions plus a push button averager, all functions properly altitude compensated to 22,000ft (6,700m) in one instrument which requires only 1 x 57mm (2.25") or 1 x 80mm (3.125") instrument panel hole, which can be operated **stand alone** or with repeater meters in 2 seat configuration or a **B40 DAD** - digital averager module, measures 48x24mm, displays average at all times.

B40 VARIOMETER/audio/averager

Installation Guidelines

To get the most out of your **B40 VARIOMETER/audio/averager** some straight forward installation guidelines should be followed. Please take the time to read these

guidelines in full BEFORE commencing 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.

Mechanical

1. Install the B40 into a standard 57mm or 80mm panel hole (dependent on size purchased) using the 3mm bolts provided.
2. Mount the speaker supplied in a convenient location. e.g. on instrument panel, facing aft toward the pilot, or near the pilot's ear using double sided tape supplied. Ensure the mounting is secure.

Optionally: an 8 ohm CB style extension speaker may be installed. This will provide slightly improved sound with increased volume available. **WARNING:** increased volume will increase current drain, which may be an issue when running from 9 Volt battery. 3. Mount the repeater(s) and/or B40DAD (if supplied)

Electrical

Follow the wiring diagram attached to the side of the B40*.

All wiring attaches to an external connection board (XCB) by way of screw terminal connectors. **DO NOT OVERTIGHTEN THE SCREWS** on the XCB as the connector may suffer damage. After the power, speaker wires (+optional repeater and/or optional remote averager selection button) have been attached to the XCB the cable tie (supplied) may be used as a strain relief for these wires. Use the 2 M3 holes in the XCB for this. A 9 volt alkaline battery may be attached to the XCB using cable ties through the 4 M3 holes. Three M3 machine screws attach the XCB to the rear of the B40, these may be removed and the board then gently detached from the rest of the instrument allowing easier installation or so that wiring can remain in the aircraft in the event that servicing of the B40 is required.

Extreme care should be taken to ensure correct polarity power is connected to the B40. While reverse polarity protection has been fitted, we do not guarantee that under all circumstances this will necessarily protect the B40 from damage. A 0.25 AMP fuse (M205 type) is fitted. A SCHOTTKY protection diode (1N5189RL) is attached to the rear of the XCB.

*Further explanation of the wiring diagram:

The B40 requires positive(+) polarity (6-16 volts) and ground(-) supplied from the glider's main power system.

Standby 9 volt alkaline battery - a battery snap connector is attached to the XCB, once the battery is correctly attached the battery should be attached firmly to the XCB with cable ties threaded through the 4 x M3 holes provided in the board.

Low battery is indicated by the vario reading becoming unstable.

PWR = 12 volt power - **DO NOT REVERSE POWER SUPPLY TO THE B40.**

SPKR = speaker

AV.SEL. = remote averager button

REP = **Repeater** (B40 SAM) or **B40 DAD** - remote digital averager display module (also requires power connections)

Pneumatic

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 is 1 pneumatic connection - connect the tube leading from the sailplane T.E. source to the pneumatic connection on the rear of the B40 labelled `TE PROBE'. Providing a good T.E. source is very important.

Leak check the system following installation.

Good Practice

Mechanical

Plan your instrument panel layout for optimum scan.

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. 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 B40 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 B40 will perform properly down to a battery voltage of 5.5 volts.

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. 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.

Filters:

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. 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.

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.

Specifications

Weight: B40 incl speaker, excl 9V battery

57mm 400g 0.9lb

80mm 450g 1.0lb

B40 power consumption (depending on audio volume)

approx 18 to 40 milliAmps at 6 to 16 volts DC

The B40 variometer is altitude compensated to 22,000ft.

General:

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.

B40 OPERATION

Explanation of Controls and Displays:

Vario - total energy rate of climb is displayed on the round meter except when the averager push button is pressed when 23 second average is displayed. Audio continues to indicate variometer.

Volume (symbol) adjusts audio volume

AV - Push button switch - selects averager on the meter while the button is pressed.

Power switch - selects voltage source.

position Up = **INT** = selects 9 volt battery (if fitted)

Centre = **OFF**

Down = **EXT** = selects 12 volt sailplane power

ARROWS (symbol) Audio mode switch

position up = audio above zero only

down = full range audio

Explanation of Audio - the audio is at all times an audio variometer.

In lift a chopped rising tone is heard which saturates at 15 knots of lift, sink provides a solid tone which becomes 'clicks' if sinking faster than 5 knots. If 'up only' mode is selected for the audio, no sound is heard in sink.

FLYING WITH THE B40

On power up the vario needle will go full scale for a few seconds and then slowly return to zero. This is the normal warmup cycle.

If **B40 DAD** (digital AVERAGER display module) is fitted the digital display shows achieved climb rate over the last one to two circles providing a good guide as to when the thermal is weakening. It is useful in making you work harder (i.e. 3Kts let's try for 3.5). The AUDIO chopped tone for CLIMB has a wide dynamic range (goes over range to about 15 Kt so that strong thermals may be centred even with the vario pegged.) The averager reads to ± 19.9 knots or m/s.

TE Compensation

For the B40 to perform properly a source of correct Total Energy compensation is required. Probes which provide correct compensation are available from BORGELT INSTRUMENTS.

MAINTENANCE OF THE B40

Cleaning

Meter glass: use a soft cloth dampened with water or a proprietary glass cleaning solution.

LCD - (digital averager module) 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.

Conversion to Metric Units

The meter is available with metric scale.

Zero Adjustments

The round meter has a mechanical zero adjuster in the centre of the glass. The electrical zero adjust trimpot is accessible through a small hole on the side of the B40 (see label on side of instrument).

Under normal conditions the variometer zero will not require readjustment. DO NOT TRY TO ADJUST VARIO MECHANICAL OR ELECTRICAL ZERO in gusty conditions.

Adjusting variometer speed of response:

As supplied the B40 variometer has a time constant of approximately 2 seconds. This will normally be satisfactory.

If desired the variometer time constant may be changed by accessing a trimpot through the 4mm hole in the side of the B40. under the zero adjust trimpot. Gently turning the trimpot fully anticlockwise reduces the time constant to about 1.0 second. Most pilots will find this too fast. The total trimpot movement available is 180 degrees which allows 1 to 5.0 seconds to be selected. It is recommended that you do not change the factory setting unless you are sure that the factory setting does not meet your requirements AFTER some flying time.

WARRANTY

If, under normal operating use, any part of the B40 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.

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Specifications

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MEMO: To All Distributors/Customers

SUBJECT: 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 greater than Aust\$1000** we request you use FEDEX, DHL or UPS (to your account). The reason for this is we used to perform our own customs clearances, however Australian Customs Service have elected to charge a fee for manual entries - currently A\$44.25 which we would have to pass on. Also because they insist on posting notifications, there is a delay of several days added to the shipping time.

(ii) **for goods with a declared value of less than A\$1000** you may use post - airmail, EMS or UPS or FEDEX - all optionally insured. We can complete the customs clearance by fax and there is currently no charge imposed by customs for this type of clearance. We will return goods by the same method.

At all times shipping costs are to be borne by the customer unless advised otherwise by BORGELT INSTRUMENTS.

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, description and reason for return for customs clearance purposes.

January 15, 1998