



Stratomaster Ultra

Model "L" with RDAC IV EIS

Owner's Manual

&

Installation guide

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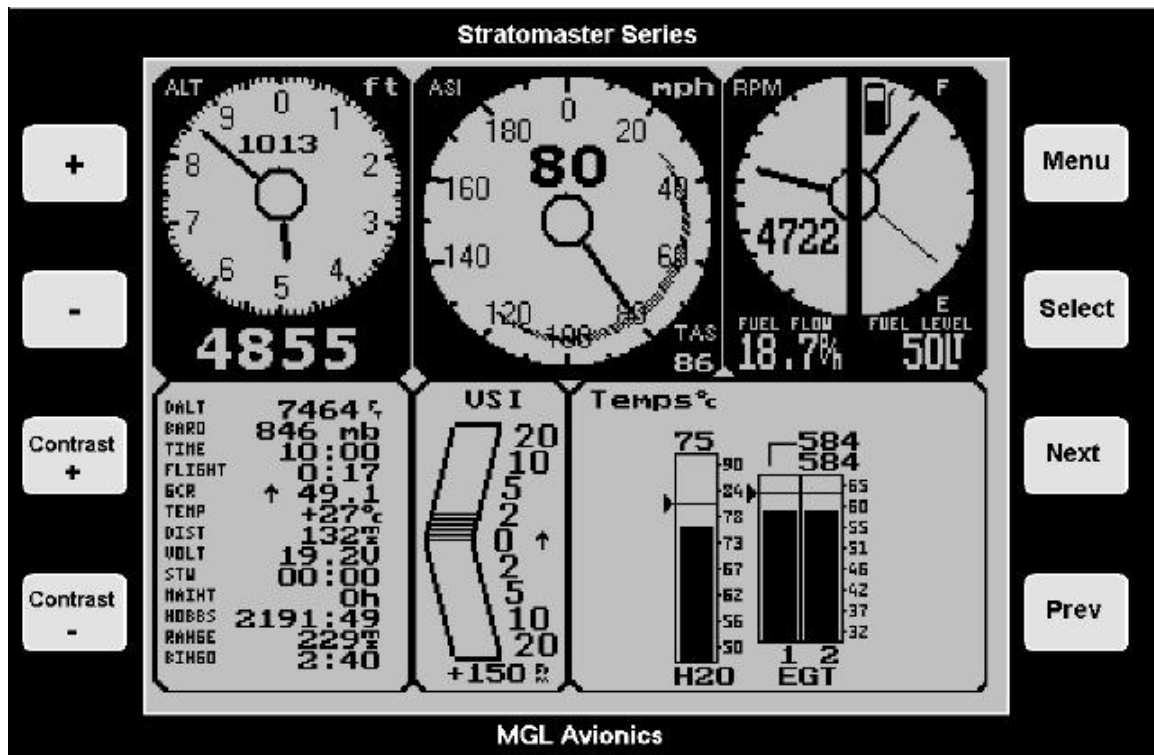
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The Stratomaster Ultra



A typical setup including Rotax 582 EIS (engine information system)

The **Stratomaster Ultra "L"** is a digital multifunction instrument designed for use in ultralight, microlight, experimental and homebuilt aircraft as well as any aircraft that permit use of such instrumentation under general or special operating permits.

Most civil aviation authorities permit installation of this type of instrument as a secondary instrument on certified aircraft. Please ensure that you obtain the required permits or STCs before operating this instrument on a certified aircraft.

The Stratomaster Ultra includes a remote EIS (Engine information system) called RDAC (Remote Data Acquisition Computer) in addition to a full future primary flight information system (PFIS). The Stratomaster Ultra brings glass cockpit functionality to small aircraft, replacing unreliable and expensive analogue dials while extending the functions normally available to include fuel and flight management items amongst many other useful features.

The Stratomaster Ultra further reduces empty weight of an aircraft and simplifies instrumentation installation to an incredible degree as only a single wire is required between the RDAC and the display unit. All engine related probes and wires terminate in the RDAC unit which is to be located in the engine compartment. This practically eliminates costly and unpractical wiring while offering benefits such as improved electrical noise immunity.

The Stratomaster Ultra has been designed with the following objectives in mind:

- Provide a cost effective solution for a complete instrumentation system for small aircraft.
- Provide instrumentation with uncompromising accuracy and range.
- Provide a display unit with a shape and form factor suitable for installation into most small aircraft panels and pods.

- d) Provide a display with the best possible viewing qualities over a wide temperature range, taking into account operation in bright sunlight as well as low light conditions.
- e) Provide a system that offers long term stability and reliability.
- f) Provide a system that is easy to install and that maintains its usefulness should a different type of engine be installed in the aircraft.

Many of the objectives have been achieved using the latest available embedded processing devices, which result in a drastic reduction of the amount of individual components required. This has a direct effect on improving reliability and reducing EMI (Electromagnetic interference), long a bane of digital systems.

For the computer minded: The Stratomaster Ultra and the RDAC unit are programmed using **Embedded Pascal**, a powerful and unique development system created by the same people that designed your Stratomaster instrument! Embedded Pascal, released to the public in 1998 has become a successful development environment used in many countries.

SPECIFICATIONS:

General specifications

Size: 202x135 mm. Mounting depth 95mm (including connectors and wiring). Panel cutout 196x122 mm.

Weight: 980 grams. Excluding external senders, including RDAC unit.

Power supply requirements: 12V DC nominal. Range 7.5V DC to 18V DC. Internally protected to 40 V DC.

Current consumption: 80 mA without back light, 280 mA with back light. (includes current consumption of RDAC EIS unit)

Rev counter input: High impedance. Accepts signals up to 100V RMS. Maximum frequency 10 Khz. Internally protected against over voltage.

External temperature sensor input: Optimized for National Semiconductor LM335 temperature sender.

Fuel flow sender connection: Optimized for RS 256-225 flow sender. Will accept other senders with a 5 volt TTL output.

Engine temperature senders:

Thermocouple inputs for K or J type senders.

NTC inputs for Rotax senders and MGL senders (standard automotive senders).

Accepts MGL precision semiconductor senders for water and oil temperature (optional items)

Fuel level sender: Optimized for standard automotive level senders from 100 to 500 ohms resistance, any slope (increasing resistance with level or decreasing resistance with level).

Alarm contacts: Uncommitted reed relay output. Recommended not to exceed 500 mA DC current. Maximum voltage 50 volts. Please note: heavy inductive loads must be protected by means of a reverse polarity diode in order to prevent sparks from destroying the reed relay contacts.

Air-talk link: Two Air-talk links are provided. These are used to connect to other Air-Talk compatible devices. Standard audio RCA cable and connectors are used as medium. Air-talk is intended as a short distance, multi master communications link allowing Air-talk compatible devices to share information. The Stratomaster Ultra uses the Air-talk link to connect to

another Stratomaster Ultra, Ultra or Flight slave unit, a PC, Flight data recorder (black box), and key download devices (for transfer of the log to a remote PC).

Technical specifications

Altimeter

Range 0-40 000 ft (12 195 m), 1ft (or 1 m) dynamic resolution, 7.5 ft (or 2 m) static resolution at sea level. Dynamic resolution applies with the aircraft in flight. Dynamic resolution is measured by mathematically evaluating the turbulence created around the aircraft.

Basic accuracy at 20 degrees C (68 degrees F) +/- 30 ft (9 m) based on calibration to mercury manometer at +/- 1 mb (0.0295 Inch of Hg).

Maximum theoretical error factor +/- 1.5% over temperature range 0-40 degrees C (104 degrees F). Typical error factor over temperature range 0-40 degrees C (104 degrees F) is less than 0.5%

Note: The altimeter can be operated to altitudes above 40 000 ft (12 195 m). Range and accuracy above the 40 000 ft (12 195 m) level are dependant on individual units. The achievable range is in the region of 45 000 ft (13 720 m) to 60 000 ft (18 293 m) depending on manufacturing tolerances of the pressure sensor.

Airspeed indicator

Range 0-200 mph (322 Kph or 174 Knots), 1 mph (1 Kph or 1 Knot) resolution. Theoretical accuracy 1% at 20 degrees C (68 degrees F), subject to installation of pitot tube and airflow pattern around aircraft.

Versions for higher airspeeds are available at reduced low speed sensitivity.

VSI

Range +/- 9 990 ft. (3 045 m) Resolution truncated to 10 ft/minute (5cm per second). Internally 1 ft/minute. Accuracy +/-5 %, Please note: The VSI is compensated for altitude.

Analogue VSI display is logarithmic providing both very high sensitivity and a wide range. Minimum display resolution is as low as 10 ft/min (5cm per second) with a +/-2 000 ft (610 m) maximum reading.

Rev counter

Range 0 to 9 999 revs. Resolution is dependant on rev counter setup in instrument. Accuracy: +/- 0.0005% + resolution.

Fuel flow sender input

Accuracy of measurement is +/-0.05% subject to accuracy of fuel flow sender used. Example sender is RS 256-225: +/- 3% uncalibrated, typically less than 1% calibrated.

External temperature probe

Display resolution 1 degree C or 1 degree F. Accuracy 0.5 degrees typical. Range -50 to +99 degrees C (-58 degrees F - 210 degrees F).

NTC temperature sender inputs

Measurement accuracy +/- 2% subject to accuracy of sender. Note: Senders are manufactured with a tolerance of up to +/- 20%.

Thermocouple temperature sender inputs

Measurement accuracy +/- 1%. The thermocouple amplifier system used is highly stable and long-term drift elimination is achieved by using a chopper stabilized system. The system employed features full, accurate cold junction compensation and bow voltage correction. The system is further highly immune to received EMI from high powered radio transmitters.

Fuel level sender input

Measurement accuracy of input: +/-2%. Overall measurement accuracy of fuel level is subject to quality and installation of chosen fuel level sender as well as complexity and form of tank shape.

Using the prescribed calibration procedure we find we can calibrate within 5% of actual level for most tank shapes.

Power supply

The Stratomaster Ultra unit is optimized and intended for operation on a 12V DC supply such as a motorcycle battery. However, it can be operated on any power supply down to about 7 volts as well as aircraft power supplies of 24 or 28V DC.

For high voltage power supplies (above 18V) MGL Avionics recommends the installation of a pre-regulator to reduce heat build up in the instrument. Such a pre-regulator is inexpensive and only needs to provide a maximum current of ½ ampere. Please contact your supplier or MGL Avionics on further details is required.

Current consumption may vary slightly between units but is typically in the region of 80 mA without display back light and 280 mA with display back light. Please note that when connecting external sensors such as the fuel level sender, this is supplied from the unit and the current consumption of the sender has to be added to the consumption of the basic unit. The above figures include the current needs of the RDAC EIS unit.

The unit is internally protected against temporary over voltage loads such as those that can be produced by a cranking starter motor.

It is advisable to power the unit via a fuse or circuit breaker. A fuse rating of 1A (slow blow) is recommended. Generally it is accepted to use circuit breakers that can be reset during flight should the need arise. Ordinary fuses are not recommended for aircraft use.

The Stratomaster Ultra “L” features and functions

Basic system functions

- Altitude to 40 000 ft (12 195 m) calibrated, 1ft dynamic resolution
 - Airspeed ASI analog and digital, TAS digital
 - Stopwatch
 - Glide and climb ratio to 1/99
 - QNH 960 to 1 060 mb (28.3 - 31.3 Inch of Hg)
 - QNE 1013 mb quick select (29.9 Inches of Hg)
 - Time of day, Date for flight log entries
 - Air time since take-off (or lesson time)
 - Ambient temperature using external sensor
 - Fuel level using flow sender or optional level sender
 - Fuel flow using optional flow sender
 - Current range estimate (range at current speed and fuel burn)
 - Fuel bingo estimate (time until tank empty)
 - Air distance made good
 - Voltage. Supply to unit. Usually 12V battery.
 - VSI +/- 9 990 ft/minute (50.7 meters per second) range with logarithmic analogue display
-

- Vario output for glider or motor glider use
- Flight log (or lesson log) storing up to 240 entries
- User programmable pre-takeoff checklist
- Hobbs meter, presetable to current engine time
- Density altimeter
- Barometer for ambient pressure
- Aircraft registration number display
- Maintenance timer
- Warnings for engine temperature, speed high, speed low, maximum altitude and low fuel level
- Alarm contact output to switch a warning lamp
- Audio alarm output to drive a panel speaker or low level output for alarm tone injection into a suitably equipped headset or intercom system.
- Instructor modes
- Master and slave modes for dual instrument setup
- Measuring take-off run to 50 ft (15.24 m) above ground level
- Air talk link for connection to:
 - A) PC's and Laptops using optional cable
 - B) Stratomaster "Black Box" flight recorder
 - C) Stratomaster Ultra secondary instrument
 - D) Key ring flight log download device

RDAC EIS functions

- Four channel thermocouple amplifier, high resolution chopper stabilized system with full cold junction compensation and bow voltage correction to laboratory standards. The inputs can accept K-type or J-type thermocouples (selectable via provided menu functions)
- Two channel NTC measurement input for Rotax 912 standard CHT senders.
- Oil or Water temperature NTC input compatible with Rotax oil temperature sender and MGL water temperature sender. Also accepts MGL precision semiconductor senders for water and oil temperature.
- Universal rev counter input. Can be used on a wide variety of engines using a variety of interface methods.
- Fuel flow sender input. Can be used with most commercial liquid flow senders. Calibration via provided menu functions.
- Oil pressure sender input. Accepts most commercial oil pressure senders including the VDO unit used by Rotax.
- Fuel level sender input with extensive calibration functions provided to allow direct readout of fuel quantity corrected for tank shape and sender tolerances.

The EIS included with the Ultra "L" provides for a wide variety of engines and the display unit can be configured in many different ways as outlined under the "Device setup menu".

Typical engines range from small single cylinder two strokes, the Rotax series of engines from the 447, 503, 582, 618 and the four stroke 912 and 914 engines. All of the 2SI (Two-stroke international) engines can be used as well as many typical automotive engine conversions, VW, BMW and Subaru being only a few. The EIS is also a perfect fit for the Australian Jabiru engines and the HKS two cylinder four-strokers.

For larger engines or additional thermocouple channels please have a look at the "Stratomaster Ultra X" line of instruments.

Other functions

FLIGHT LOG OR LESSON LOG

Perhaps one of the most useful features of the Stratomaster Ultra instrument is the ability to record a flight log. Using one of several methods, the Stratomaster Ultra will record flight details suitable for entry into a flight and engine log.

You can setup your Stratomaster Ultra to record a log entry in one of the following ways:

1. Automatic flight log. This will automatically detect the start of a flight and end of a flight. The unit uses engine revs in combination with airspeed to detect a flight. This is the way most pilots prefer to operate the Stratomaster Ultra.
2. Manual flight log. In this case the pilot manually starts a flight and ends it. This mode is used mainly if no rev counter input to the instrument is available.
3. Instructor mode. In this case the log is used to record "lessons" rather than "flights". A lesson is started by the instructor or automatically if setup accordingly and lesson time is accumulated according to the instruments lesson mode setup. A single lesson may consist of more than one flight.

The Stratomaster Ultra will log all flights/lessons of longer than one minute. Any lessons or flights with less than one minute accumulated time are not stored in the log.

The Stratomaster Ultra will store the last 224 flights or lessons in the log.

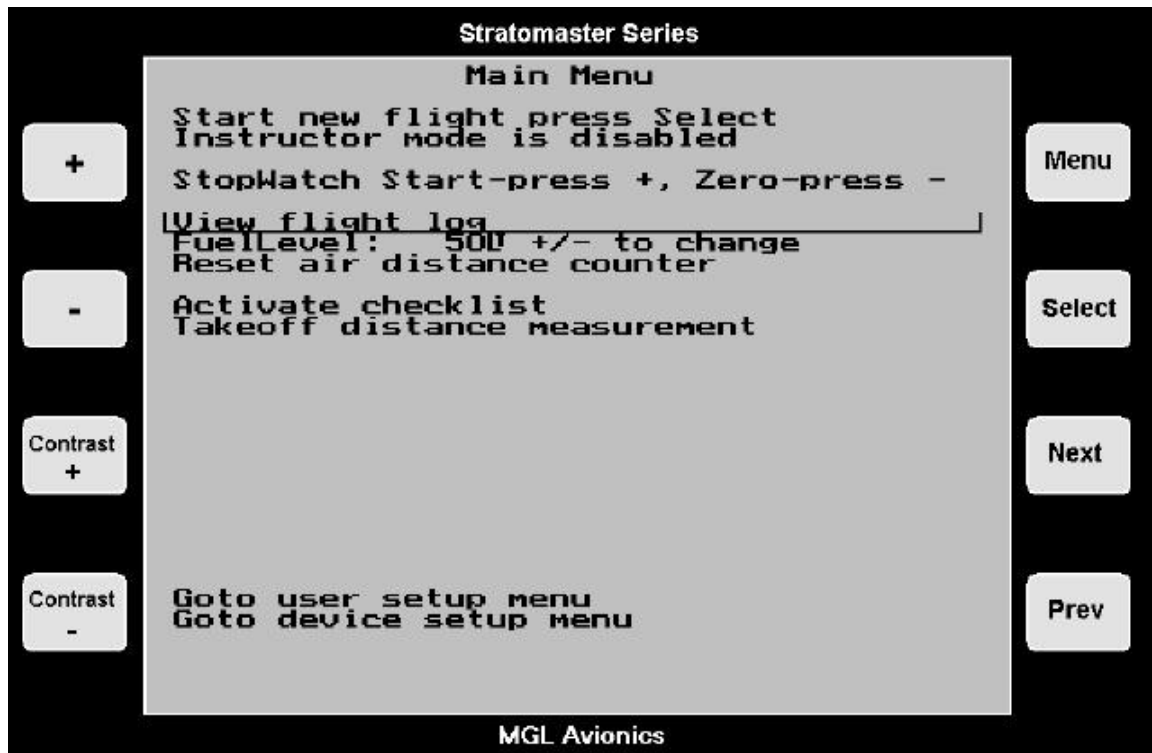
The log can be viewed at any time. Please also note that the log may be downloaded to a PC using a direct cable connection or key-ring download device (optional extras).

The following information pertaining to a flight/lesson will be logged:

- Date (DD/MM) of take-off
- Take-off time or Lesson Start time.
- Flight or Lesson time. Displayed in either hours and minutes or hours and fraction of hours depending on setup.
- Highest altitude reached (In ft or meters depending on setup)
- Maximum airspeed obtained. Displayed airspeed depends on whether ASI or TAS is selected. (Displayed in kilometers, miles or knots depending on setup).
- Hobbs meter reading at end of flight/lesson (Displayed in either hours and minutes or hours and fraction of hours depending on setup)
- Student number (Instructor mode only)

The steps for viewing the flight log/lesson log are:

From the main display press "Menu". This will display the main menu as follows:



Use the "Next" and "Prev" keys to select the "View Flight log" entry.

Now press "select" to view the log.

Flight log examples

Definition start of flight: The point in time when engine RPM increases above a preset limit as determined by you (Refer take-off revs page 46), as well as from the time at which the airspeed increases to above 30 mph, 48 kph or 26 knots.

Definition end of flight: The point in time when the airspeed decreases to below 20 mph, 32 kph or 17 knots for longer than 30 seconds.

Example one:

Stratomaster Ultra setup:

Instructor mode:	Normal
Flight detect mode:	Automatic
Hour fraction mode:	Hour has minutes
Altitude	Feet
Distance	Miles
Airspeed	ASI

Time of day Action

13h06	Increase revs to higher than hobbs revs
13h08	Increase revs to higher than take-off revs
13h09	Airspeed as per start of flight definition
13h29	Airspeed as per end of flight definition

Log results:

T/O 05/07	13:09	00:21
ALT 4636Ft	SPD 183mph	Hobbs 0155:51

Day/Month	Take-off time	Duration of flight
Highest altitude	Highest airspeed	Hobbs reading at end flight

(Note: Take-off revs only determines the start of the flight. Revs for the remainder of the flight are not taken into account).

Example two:

Stratomaster Ultra setup:

Instructor mode:	Normal
Flight detect mode:	Automatic
Hour fraction mode:	Hour has decimals
Altitude	Feet
Distance	Miles
Airspeed	ASI

Time of day Action

13h06	Increase revs to higher than hobbs revs
13h08	Increase revs to higher than take-off revs
13h09	Airspeed as per start of flight definition
13h29	Airspeed as per end of flight definition

Log results:

T/O 05/07 13:09 00:35
 ALT 4636Ft SPD 183mph Hobbs 0155.85

Day/Month Take-off time Duration of flight
 Highest altitude Highest airspeed Hobbs reading at end flight

(Note: Take-off revs only determines the start of the flight. Revs for the remainder of the flight are not taken into account).

Example three:

Stratomaster Ultra setup:

Instructor mode: Normal
 Flight detect mode: Manual
 Hour fraction mode: Hour has minutes
 Altitude Feet
 Distance Miles
 Airspeed ASI

Time of day Action

12h36 Manual input - Start new flight
 12h37 Increase revs to higher than hobbs revs
 12h41 Increase revs to higher than take-off revs
 12h42 Airspeed as per start of flight definition
 12h55 Airspeed as per end of flight definition
 13h00 Manual input - End current flight

Log results:

T/O 05/07 12:36 00:23
 ALT 4636Ft SPD 183mph Hobbs 0155:21

Day/Month Manual start of flight Duration of flight
 Highest altitude Highest airspeed Hobbs reading at end flight

(Note: Flight time calculated from manual starting of flight to manual ending of flight).

Lesson Log Examples

Definition: Start of lesson. Such time as the engine revs increases above either hobbs or take-off revs (Refer lesson start page 23).

Definition: Lesson time. Lesson time accumulates if engine revs are above hobbs revs or if the aircraft is in flight.

A lesson ends when the "End current lesson" menu item is selected. At this point in time the lesson details are written to the log.

Example one:

Stratomaster Ultra setup:

Instructor mode: Instructor
 Flight detect mode: Automatic
 Hour fraction mode: Hour has minutes
 Lesson timer mode Hobbs revs
 Altitude Feet

Distance Miles
Airspeed ASI

Time of day/Action

16h17 Manual input - Start new lesson (P Flashing)
16h19 Increase revs to higher than hobbs revs (A Flashing)
16h22 Increase revs to higher than take-off revs (A Flashing)
16h25 Airspeed as per start of flight definition
16h31 Decrease revs to lower than take-off revs
16h37 Decrease revs to lower than hobbs revs
16h40 Airspeed as per end of flight definition (A Flashing)
16h45 Manual input - End current lesson
 Student number: 1

Log results:

T/O 05/07 16:19 00:21
ALT 4626Ft SPD 166mph Hobbs 0155:21 St 1

Day/Month Time - Start of lesson Duration of lesson
Highest altitude Highest airspeed Hobbs reading Student

(Note: Lesson time calculated from higher than hobbs revs to airspeed as per end of flight definition e.g. 16h19 - 16h40).

Flashing P = Lesson has been primed
Flashing A = Lesson has been activated

Example two:

Stratomaster Ultra setup:

Instructor mode: Instructor
Flight detect mode: Automatic
Hour fraction mode: Hour has decimals
Lesson timer mode Hobbs revs
Altitude Feet
Distance Miles
Airspeed ASI

Time of day/Action

16h17 Manual input - Start new lesson (P Flashing)
16h19 Increase revs to higher than hobbs revs (A Flashing)
16h22 Increase revs to higher than take-off revs (A Flashing)
16h25 Airspeed as per start of flight definition
16h31 Decrease revs to lower than take-off revs
16h37 Decrease revs to lower than hobbs revs
16h40 Airspeed as per end of flight definition (A Flashing)
16h45 Manual input - End current lesson
 Student number: 1

Log results:

T/O 05/07 16:19 00:35
ALT 4626Ft SPD 166mph Hobbs 0155:35 St 1

Day/Month	Time - Start of lesson	Duration of lesson	Student
Highest altitude	Highest airspeed	Hobbs reading	

(Note: Lesson time calculated from higher than hobbs revs to airspeed as per end of flight definition e.g. 16h19 - 16h40).

Flashing P = Lesson has been primed
 Flashing A = Lesson has been activated

Example three:

Stratomaster Ultra setup:

Instructor mode:	Instructor
Flight detect mode:	Automatic
Hour fraction mode:	Hour has minutes
Lesson timer mode	Take-off revs
Altitude	Feet
Distance	Miles
Airspeed	ASI

Time of day/Action

16h55	Manual input - Start new lesson (P Flashing)
17h00	Increase revs to higher than hobbs revs (P Flashing)
17h03	Increase revs to higher than take-off revs (A Flashing)
17h04	Airspeed as per start of flight definition
17h11	Decrease revs to lower than take-off revs
17h14	Decrease revs to lower than hobbs revs
17h16	Airspeed as per end of flight definition (A Flashing)
17h20	Manual input - End current lesson
	Student number: 2

Log results:

T/O 05/07	17:03	00:13	
ALT 4583Ft	SPD 200mph	Hobbs 0159:08	St 2

Day/Month	Time - Start of lesson	Duration of lesson	Student
Highest altitude	Highest airspeed	Hobbs reading	

(Note: Lesson time calculated from higher than take-off revs to airspeed as per end of flight definition e.g. 17h03 - 17h16).

Flashing P = Lesson has been primed
 Flashing A = Lesson has been activated

Example four:

Stratomaster Ultra setup:

Instructor mode:	Instructor
Flight detect mode:	Manual
Hour fraction mode:	Hour has minutes
Lesson timer mode	Hobbs revs
Altitude	Feet
Distance	Miles
Airspeed	ASI

Time of day/Action

17h26 Manual input - Start new flight
 17h29 Manual input - Start new lesson
 17h31 Increase revs to higher than hobbs revs
 17h36 Increase revs to higher than take-off revs
 17h38 Airspeed as per start of flight definition
 17h45 Decrease revs to lower than take-off revs
 17h52 Decrease revs to lower than hobbs revs
 17h56 Airspeed as per end of flight definition (A Flashing)
 17h58 Manual input - End current flight
 18h00 Manual input - End current lesson
 Student number: 3

Log results:

T/O 05/07 17:31 00:27
 ALT 4572Ft SPD 82mph Hobbs 0159:29 St 3

Day/Month	Time - Start of lesson	Duration of lesson	
Highest altitude	Highest airspeed	Hobbs reading	Student

(Note: Lesson time calculated from higher than hobbs revs to manual ending of flight i.e. 17h31 - 17h58).

Flashing P = Lesson has been primed
 Flashing A = Lesson has been activated

Example five:

Stratomaster Ultra setup:

Instructor mode:	Instructor
Flight detect mode:	Manual
Hour fraction mode:	Hour has minutes
Lesson timer mode	Take-off revs
Altitude	Feet
Distance	Miles
Airspeed	ASI

Time of day/Action

19h06 Manual input - Start new flight
 19h16 Manual input - Start new lesson
 19h19 Increase revs to higher than hobbs revs
 19h24 Increase revs to higher than take-off revs
 19h25 Airspeed as per start of flight definition
 19h30 Decrease revs to lower than take-off revs
 19h37 Decrease revs to lower than hobbs revs
 19h40 Airspeed as per end of flight definition
 19h42 Manual input - End current lesson
 Student number: 5

(Note: Ending a lesson automatically ends the flight)

Log results:

T/O 05/07 19:24 00:18
 ALT 4557Ft SPD 200mph Hobbs 0160:17 St 5

Day/Month	Time - Start of lesson	Duration of lesson	
Highest altitude	Highest airspeed	Hobbs reading	Student

(Note: Flight time calculated from higher than take-off revs to manual ending of lesson e.g. 19h24 - 19h42).

Example six:

Stratmaster Ultra setup:

Instructor mode:	Instructor
Flight detect mode:	Manual
Hour fraction mode:	Hour has minutes
Lesson timer mode	Take-off revs
Altitude	Feet
Distance	Miles
Airspeed	ASI

Time of day/Action

16h32	Manual input - Start new flight
16h34	Manual input - Start new lesson
16h37	Increase revs to higher than hobbs revs
16h39	Increase revs to higher than take-off revs
16h40	Airspeed as per start of flight definition
16h45	Decrease revs to lower than take-off revs
16h53	Decrease revs to lower than hobbs revs
16h56	Airspeed as per end of flight definition
16h59	Manual input - End current flight
17h02	Manual input - End current lesson

Student number: 6

Log results:

T/O 06/07	16:39	00:19	
ALT4859Ft	SPD 85mph	Hobbs 0163:41	St 6

Day/Month	Time - Start of lesson	Duration of lesson	
Highest altitude	Highest airspeed	Hobbs reading	Student

(Note: Flight time calculated from higher than take-off revs to manual input end of flight e.g. 16h39 - 16h59).

AIRCRAFT REGISTRATION NUMBER

The Stratmaster Ultra makes 6 digits available for entering the aircraft registration number (Refer aircraft registration page 40).

The Aircraft registration number will only be displayed at the time the instrument is switched on.

The registration number or other text you might enter in this field is used to personalize and identify your instrument. It is used with the key ring download device if you operate multiple aircraft and would like your log to operate accordingly.

ALTITUDE ALARM

The Stratomaster Ultra will warn you once your aircraft's altitude exceeds a predetermined level. (Refer altitude alarm page 40) by flashing the altitude display field. The altitude will remain flashing until the aircraft descends below the predetermined altitude.

Altitude alarms can be set in increments of 500 ft (152.4m) to a maximum of 60 000 ft (18 287 m). When setting the alarm all factors should be taken into account. It is the pilot's responsibility to ensure that the alarm is correctly set prior to take-off.

The altitude alarm can be switched off should you wish not to make use of this function. (Refer altitude alarm page 40).

An active alarm will result in the Stratomaster Ultra alarm output switching at a rate of once per second. This is normally used to switch a warning lamp or indicator in the cockpit. The indicator will flash until the alarm has been acknowledged or the alarm condition no longer exists. To acknowledge the alarm, press any key. This will switch off the alarm indicator but the display field will continue flashing until the alarm condition no longer exists.

TEMPERATURE ALARMS

The Stratomaster Ultra will warn you once your aircraft's engine temperatures exceed predetermined levels (Refer engine detail setup page 52). Alarms can be set on items such as water or oil temperature, EGT and CHT temperatures. Selecting on of the engine type quick selects will set the alarms to the recommended levels for the selected engine (See Engine quick select menu).

Alarms are shown by flashing the relevant bargraph and activating audio and relay contact pulsing. Any temperature alarms active will remain flashing until the temperature drops below the alarm level. Acknowledging an alarm will only stop the external alarms, not the flashing bargraphs.

Temperature alarms cannot be switched off. If you would like to disable an alarm, set its alarm level to a very high value (Engine detail setup).

An active alarm will result in the Stratomaster Ultra alarm output switching at a rate of once per second. This is normally used to switch a warning lamp or indicator in the cockpit. The indicator will flash until the alarm has been acknowledged or the alarm condition no longer exists. To acknowledge the alarm, press any key. This will switch off the alarm indicator but the display field will continue flashing until the alarm condition no longer exists.

SPEED LOW ALARM

The Stratomaster Ultra will warn you once your aircraft's airspeed falls below a predetermined level (Refer speed low alarm page 40) by flashing the ASI (TAS) display field. This display field will remain flashing until the aircraft's speed increases to above the predetermined speed. When landing the speed low alarm will also flash but only for as long as the aircraft is deemed to be in flight e.g. for 30 seconds. (Definition of in flight: When the airspeed decreases to below 20 mph, 32 kph or 17 knots for longer than 30 seconds).

Speed alarms can be set in increments of 1 mile, 1 knot or 1 kilometer. The minimum speed, which can be entered is 20 mph, 32 kph or 17 knots and the maximum speed which can be entered is 120 mph, 193 kph or 104 knots. When setting the alarm factors

such as aircraft type etc. should be taken into account. It is the pilot's responsibility to ensure that the alarm is correctly set prior to take-off.

The speed low alarm can be switched off should you not wish to make use of this function. (Refer speed low alarm page 40).

An active alarm will result in the Stratomaster Ultra alarm output switching at a rate of once per second. This is normally used to switch a warning lamp or indicator in the cockpit. The indicator will flash until the alarm has been acknowledged or the alarm condition no longer exists. To acknowledge the alarm, press any key. This will switch off the alarm indicator but the display field will continue flashing until the alarm condition no longer exists.

SPEED HIGH ALARM (OVER SPEEDING ALARM)

The Stratomaster Ultra will warn you once your aircraft's airspeed increases above a predetermined level (Refer speed high alarm page 40) by flashing the ASI (TAS) display field. This display field will remain flashing until the aircraft's speed decreases to below the predetermined speed.

Speed alarms can be set in increments of 1 mph, 1 knot or 1 kph. The lowest speed, which can be entered is 30 mph (48 kph or 26 knots) and the highest speed which can be entered is 250 mph (402 kph or 217 knots). When setting the alarm factors such as aircraft type etc. should be taken into account. It is the pilot's responsibility to ensure that the alarm is correctly set prior to take-off.

The speed high alarm can be switched off should you not wish to make use of this function. (Refer speed high alarm page 40).

An active alarm will result in the Stratomaster Ultra alarm output switching at a rate of once per second. This is normally used to switch a warning lamp or indicator in the cockpit. The indicator will flash until the alarm has been acknowledged or the alarm condition no longer exists. To acknowledge the alarm, press any key. This will switch off the alarm indicator but the display field will continue flashing until the alarm condition no longer exists.

SAFE SPEED ARC DISPLAY

The ASI indicator will display a "safe speed arc" between your speed low alarm and speed high alarm settings, provided that you have selected a scale that allows both points to be displayed within the scale (Scale selection in the Device basic setup menu).

FUEL LOW ALARM

Fuel low alarm is only available if your aircraft is equipped with a fuel flow sender or fuel level sender.

The Stratomaster Ultra will warn you once your aircraft's fuel level falls below a predetermined level (Refer fuel low alarm page 47) by flashing the wording "Fuel level low" across the bottom row of the display every eight seconds for eight seconds. This display field will remain flashing and it is not possible to acknowledge the alarm.

Fuel low alarms can be set in increments of 1 liter, 0.2 Imperial gallons or 0.2 US gallons. The highest fuel level, which can be entered is 250 liters (54.9 Imperial gallons or 65.9 US gallons). When setting the alarm factors such as engine type etc. should be taken into account. It is the pilot's responsibility to ensure that the alarm is correctly set prior to take-off.

The fuel low alarm can be switched off should you not wish to make use of this function. (Refer fuel low alarm page 47).

Should your aircraft not be equipped with either a fuel low sender or a fuel level sender then the fuel low alarm should be switched off to prevent the fuel low alarm from flashing during flight.

INSTRUCTOR MODE

The Stratomaster Ultra can be set to either instructor mode or normal mode. (Refer instructor mode page 50) When set to instructor mode it enables instructors to time and log lessons instead of flights. A lesson could consist of multiple flights. Provision is further made for a student number, thus by viewing the log the student who flew the lesson can be identified. A maximum of 250 student numbers can be entered.

Air time since take-off field shall now display lesson time.

A lesson will have to be started and ended manually. Should the letter "P" flash in the ASI field this indicates that a lesson has been primed. Should the letter "A" flash in the ASI field this indicates that a lesson has been activated. Should your Stratomaster Ultra be set to manual detection of flight and the flight is started manually before a lesson is started then no flashing A or P will appear.

Primed: Lesson has started but no time has accumulated yet. The instrument is now waiting for revs to reach hobbs revs or take-off revs depending on setup.

Active: Conditions for starting time accumulation has been met. Time is now accumulating if revs are higher than hobbs revs setting.

The steps for starting a lesson are:

From the main display, press "Menu".

Press "Next" until the Instructor mode is highlighted

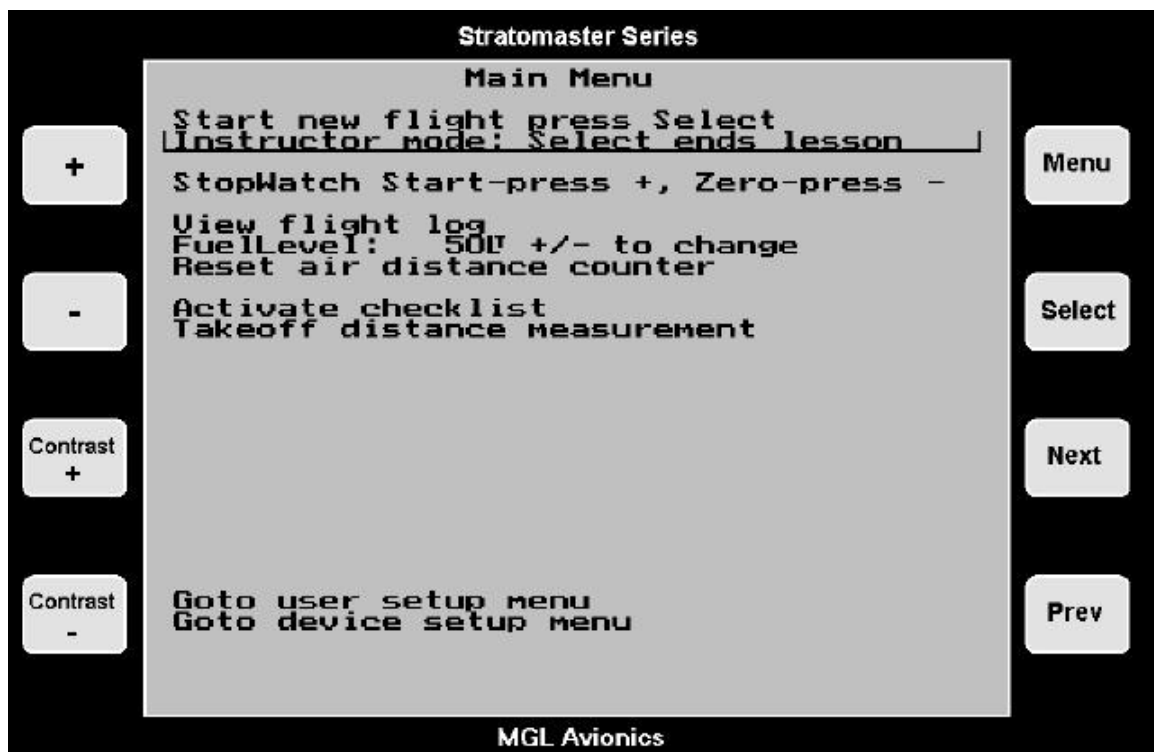


Now press "Select" to start the lesson and to exit

The steps for ending a lesson are:

From the main display press "Menu".

Now press "Next" until the following wording is highlighted



Finally press "Select" to end the lesson. The instrument will now ask you for a student number to log the flight under.



Student : 5

Press plus or minus to change the number. Press Menu to store the log entry and exit.

(Note: Student number can be from 1 - 250. Should you not wish to enter a student number press select without a number being entered).

Student numbers are relevant for the lesson accounting software available for the Stratomaster Ultra. Should you not enter a student number, the lesson is deemed not chargeable to a student. You might use this to log demonstration or check flights etc.

LESSON TIMER MODE

This function allows instructors to determine the starting point of a lesson e.g. the start up of the engine or the take-off.

Should an instructor prefers the starting point of a lesson to be the start up of the engine then hobbs revs should be selected. If an instructor prefers the starting point of a lesson to be the take-off then take-off revs should be selected. In this case a lesson would typically start with the engine run up. (Refer lesson start page 50).

LESSON START/END MODE

This function allows instructors to either start and end lessons manually or automatically. Engine revs e.g. either Hobbs or take-off revs as specified under lesson timer mode are still taken into account. E.g. Should the lesson be started manually the lesson timer will only start counting from such time at which the engine revs increases to above either hobbs or take-off revs, depending on setup.

LESSON MANUAL OR AUTOMATIC START/STOP

A further mode of operation is possible by allowing the instrument to determine the start and stop of a lesson.. Should you select the automatic mode in the mode setup menu, then the instrument will start a lesson based on the Lesson timer mode automatically. The lesson will end automatically about 15 minutes after the engine has been stopped or the last flight has landed. You can of course stop the lesson yourself immediately by using the manual lesson stop as described above.

The idea is that it would normally take at least 15 minutes for a new student to take over the aircraft for another lesson.

After the last lesson of the day, end the lesson manually if required.

MASTER OR SLAVE

Your aircraft can be equipped with two Stratmaster Ultra instruments, which may be interconnected using the Air-Talk link. In such a case it would be necessary to determine which Stratmaster Ultra is the Master (Primary) instrument and which Stratmaster Ultra is the Slave (Secondary) instrument. At such time, when the slave instrument is switched on, it will obtain the QNH from the master instrument. This is the only difference between the master and slave instruments. The slave instrument is a fully functional instrument in all aspects. (Refer airtalk page51)

Please see installation manual for details on sensor connections for two instruments. Please note here that it is not possible to reliably connect a fuel level sender to two instruments simultaneously. You should setup at least one of the two instruments to calculate fuel remaining from a fuel flow sender.

TAKE-OFF DISTANCE

The Stratmaster Ultra contains a semi-automatic take-off distance measuring mode. This is the distance traveled through the air from the point at which a minimum speed of 16 mph (26 kph or 14 knots) is reached to the aircraft gaining 50 ft of altitude (15.24 m). The result is shown in meters regardless of any mode setups. Pilots should familiarize themselves with the term air distance.

Please note that take-off distance is dependant of many factors such as weight of the aircraft and density altitude. The result of one take-off run is valid only for the exact take-off configuration of the aircraft at that point in time.

This function is very useful to determine your aircraft's take-off performance under varying conditions. Please use this function with care and responsibility.

Never use the results of this function to determine whether you have enough runway length in situations where you have a runway that is too short for safe aircraft operations.

The steps for measuring take-off distance are:

Align your aircraft with the runway in readiness for your take-off run.

- 1) Press Menu and hold it down (do not release).
- 2) Press Select key while the Menu key is being held down.
- 3) Start the take-off run when prompted by the instrument

The instrument commences measuring the length of the take-off distance when 16 mph (26 kph or 14 Knots) has been exceeded:

The measurement ends when the altimeter shows a 50 ft increase in altitude.

Once the take-off distance is shown, press any key to return to normal flight displays.

Note: you can also select the take-off distance function from the main menu.



Please note:

The ultimate accuracy of this measurement depends on your installation of the Stratomaster Ultra Instrument. Should you not have installed a static port, it is possible for pressure changes to occur in the instrument pod or cabin as your aircraft gains speed. This may lead to a slight under- or over reading of the altimeter. This in turn will affect the instrument's determination of the 50 ft (15.2 m) obstacle.

The Stratomaster Ultra uses TAS (true airspeed) calculations to determine the distance the aircraft traveled through the air.

This measurement should be performed on days with low wind speeds. Wind speeds as such are canceled out of the measurement by default as the instrument can only measure actual distance traveled through the air. However, be aware that if your aircraft performs a take-off run into stronger wind it will leave the ground at a lower ground speed. This means less friction of your wheels on the ground. The result of this is a decreased take-off run even if only air-distance is measured.

DISPLAY BLANKING

This function disables the display and is an instruction tool to force student pilots to fly without instrumentation e.g. simulation of instrument failure

Press Select and hold it down for five seconds. You will get:



To activate the normal display press any key

DISPLAY BACKLIGHT

The Stratmaster Ultra includes display backlighting as standard. You can select one of three modes of operation in the “Basic setup menu” (see page 42).

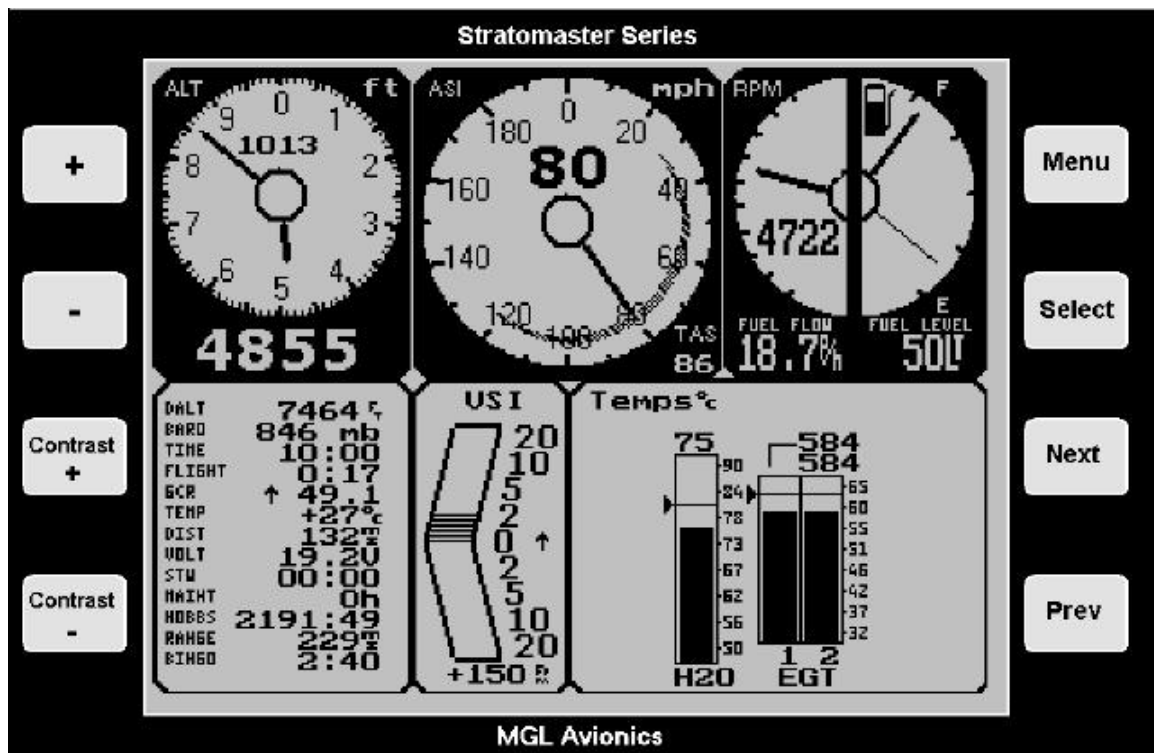
- Auto – display backlight switches off after 4 minutes of inactivity (no key presses or engine revs detected)
- On – backlight is always on.
- Off – backlight is always off.

We recommend that you leave the backlight off if you intend operating from a limited capacity power supply. This will allow the instrument to operate at about a third of its normal current consumption.

Should you be operating from a rechargeable battery such as a motor cycle or similar battery, choose “Auto”. This will help to prevent running the battery down should you accidentally leave the Stratmaster switched on without the engine or charging circuit running.

The backlight is a great aid when flying in dawn or dusk conditions as it provides you with a crisp and clear display. During normal daylight, the display operates in a “transflective” mode. In this case a reflective surface behind the LCD display provides much of the display contrast. The backlight is not required in this mode.

The main display – a detailed look



The above display is active whenever you are not viewing one of the functions available through the menu system. This is the display that you will see both on the ground and in flight. Flight mode is shown with a flashing “F” to the right of the digital altimeter display. An active flight is subject to storage of its details in the flight log as the flight ends.

The Altimeter

The digital altimeter displays the pressure altitude in either feet or meters (select in the mode menu).

QNH or local pressure as given to you by ATC is selected by pressing the + or the – keys.

Pressing both + and – keys at the same time selects QNE (1013 mb). QNH can be displayed in either millibars (mb) or in inches or mercury (InHg), selectable in the mode menu.

The digital altimeter is very accurate and has an exceptional resolution of as little as one foot in flight (or one meter if selected).



The Stratmaster Ultra provides you with a total of three altimeters. The analog, two pointer altimeter shown here and a digital readout of the same altitude. The third altimeter is shown in the information field below this altimeter. This is a density altitude altimeter that determines the lift performance of your aircraft.

The Air speed indicator

The airspeed indicator (ASI) can indicate airspeed in mph (miles per hour), knots (nautical miles per hour) or km/h (kilometers per hour). This is selected in the mode menu.

The scale can be set in 100,200,300 or 400 units of measure. This is done in the User setup menu.

The airspeed indicator displays ASI (indicated airspeed). A second, digital airspeed indicator shows TAS (true airspeed). TAS is indicated airspeed corrected for air density. As air density decreases with altitude, an airspeed indicator will under read at altitude. This error can be appreciable, for example at an altitude of 5 000 ft (1 524 m) errors of 5% to 10% are possible depending on local weather and temperature conditions. As you increase the altitude the error gets larger quickly. Setting your instrument to read TAS will correct for this error based on the pressure altitude reading, taking your current QNH setting into account. This results in an airspeed reading that can be as accurate as 1%, depending mainly on the errors introduced by the airflow around your aircraft and pitot tube.

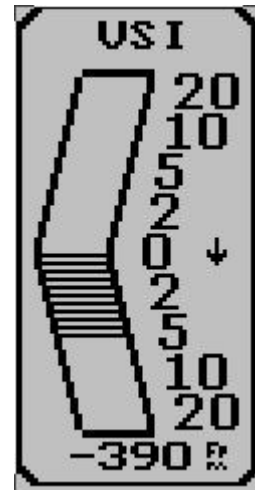
However: A word of **warning** when using TAS: You aircraft’s stall, rotation and approach speeds are based on sea-level ASI indication. Should you use TAS indication at altitude you must correct for the reduced ambient pressure effects on the control and flight surfaces of your aircraft. Should you fail to do so you will endanger your flight by flying too slowly for prevailing conditions. Always use the ASI indication to determine your rotation or approach speeds.



The ASI can display a safe speed arc as shown in the above picture. This arc is automatically drawn from your low speed alarm to your high speed alarm settings. These settings are entered in the “user setup menu”. The arc is only drawn if both high speed and low speed points are contained in the selected scale of the ASI.

The VSI indicator

The VSI (vertical speed indicator) shows your rate of sink or climb. The Stratomaster Ultra has two such indicators, one digital, the other analogue. The digital indicator is shown below the analogue indicator. It has a range of +/- 9 990 ft/min (50.7 mps) with a 10 ft/min resolution. The analogue VSI is a logarithmic indicator. This means it is very sensitive around the 0 ft/min area and will display a climb or sink of as little as +/- 10 ft/min. The range of the analogue VSI is +/- 2 000 ft/min (610 m). The VSI further has a climb/sink indicator in the form of an arrow that points up or down when the climb or sink rate exceeds 100 ft/min (0,5 mps). This is a useful feature for the trainee pilot who is practicing straight and level flying. Flying straight and level without the arrows appearing makes the instructor happy!



The VSI can be set to read feet per minute or meters per second (mps). This choice is made in the mode setup menu.

Note: All Stratomaster Ultra instruments have a Vario output. This is found at the rear of the instrument. An optional Vario panel can be connected to this port. This will allow indication of climb and sink by means of altering the pitch of a pilot tone. The human ear is very sensitive to pitch changes. This feature is intended for use in gliders and motor gliders where it is required to keep a view outside of the cockpit if many gliders are found circling in the same thermal. The tone pitch will inform you on how your thermaling is doing without the need to look at the instrument.

The Vario panel is an optional accessory available from MGL Avionics. The Vario panel has a built in speaker, volume and pitch controls and the vario tone can be injected into a suitably fitted out intercom or headset system if required.

Auxiliary flight information

The display on the right will be shown if you have a fuel flow sender installed and it is selected as being available in the mode setup menu. Should the fuel flow sender be deselected, the fuel flow related items will not be shown.

DALT	11909	f
BARO	738	mb
TIME	11:20	
FLIGHT	0:04	
GCR	↑ 31.4	
TEMP	+27	°C
DIST	212	f
VOLT	19.2	V
STW	00:00	
HAHT	0h	
HOBBS	2192:41	
RANGE	221	f
BIH60	2:40	

DENSITY ALTITUDE

Density altitude is pressure altitude corrected for air density. This relates to altitude and temperature. To use this function you must install the included ambient temperature probe so the instrument can measure the correct ambient temperature.

Density altitude is a useful indicator for your aircraft's performance at altitude. The altitude given is the equivalent altitude that you should consider your aircraft to be at currently, regardless of the actual altitude. This in turn will enable you to correctly assess required take-off and landing distances as well as load carrying abilities. Consult your aircraft's handbook on relevant de-rating curves.

BAROMETER

The barometer shows your current ambient pressure. It is the basis of your altimeter.

Why include a barometer in an aircraft – this is a question we get asked often. Here is why:

Firstly and perhaps most obviously, it has uses when predicting frontal systems and general weather forecasting. Sailors use it with great effect and much the same reasons apply for many of us aviators.

The second reason however I value as the most important: To convince you that flying too high in an unpressurised aircraft without added oxygen is not a good idea. At an altitude of 12.000 ft (3 658 m), considered by many as limit for unaided ascent, the barometer reading will be as little as 640 mb (18,9 Inch of Hg) even less depending on local conditions at the time. Further considering that at sea-level you will be at around 1000-1025 mb (29,5 – 30,3 Inch of Hg) most of the time, you should easily see that you're going to deprive your lungs of badly needed oxygen. Many accidents have happened as a result.

TIME

The current time of day. This is set in the "user setup menu". Should you often fly in controlled airspace you may want to set the time to read UTC rather than local time. Date and time of day are relevant for flight information stored in the logbook. The date and time originates from a built in crystal controlled watch with low drift characteristics. You may need to correct the time for small drift every few months. This is done in the "user setup menu".

FLIGHT

The duration from take-off of the current flight or the duration of the last flight if no flight is currently active.

Note: We recommend that you set the instrument to "automatic flight detect" in the mode menu. Should you prefer manual flight start and stop then the FLIGHT timer will show the time from the manual start of a flight to its manual stop.

Manual flights are started and stopped in the relevant menu item in the main menu.

GCR

Glide or climb ratio indicator. This useful item divides your forward distance made good by your vertical speed. The ratio is shown as a number from 0.00 to 99.9. It should be interpreted as follows:

Example: GCR 8.5. This means for every 1 ft (or meter) of vertical sink or climb you are traveling 8.5 ft (or meters).

The arrow in front of the number indicates climb or sink rate. This function is useful to optimize glide ratio or judge the effects of changes to your airframe or power plant.

TEMP

The ambient temperature. You need to install the included ambient temperature probe in such a fashion that it is exposed to the outside air. Do not install the probe inside your cockpit or instrument pod. Install the probe in such a fashion that it will not be heated by engine exhaust or sunlight. Ambient temperature is required to calculate density altitude.

DIST

A flight distance trip counter similar to a trip counter in a car's speedometer. The trip counter is reset using the relevant menu entry in the main menu. You can also set the instrument to reset the trip counter automatically at the start of a flight (mode setup menu). The trip

counter shows the actual distance traveled through the air and does not take wind speed or direction into account. The distance is based on TAS (true airspeed) regardless of the setting of the air speed indicator.

The trip counter is useful during navigation competitions when GPS may be banned.

VOLT

The supply voltage level to the unit. This would normally be the voltage of your battery. This indication serves as a battery charge indicator. Should you be using a lead-acid battery (sealed unit or open, motor cycle battery), your maximum voltage should not exceed 13.8 volts if you have a 12 volt battery or else overcharging and damage to your battery will result. Many regulators are of poor quality and will overcharge your battery.

A voltage level of under 11 volts indicates a discharged battery. Do not discharge your battery below this level as you will damage it.

A charged, healthy battery will have voltage levels between 12V and 12.6V when not charged.

RANGE

Should you have a fuel flow sender installed and calibrated correctly, this field will show you your current range given your current fuel flow, remaining fuel level and airspeed. This function is among the most important items for the seasoned cross-country flyer. It allows you to optimize your aircraft's range by choosing the best power setting.

The RANGE estimate is dependant on the quality of calibration and installation of your fuel flow sender, as well as the correctness of reported fuel levels in your tank. The RANGE estimate applies for still air (no winds) using your current power setting.

Remaining fuel level can be a calculated item if you do not have a fuel level sender installed. In this case you enter a starting fuel level in the main menu and the unit calculates remaining fuel level by subtracting fuel used as reported by the fuel flow sender.

We recommend, should this be possible in your aircraft, to fit a fuel level sender.

BINGO

The fuel bingo estimate is related to the RANGE estimate. The fuel bingo estimate is the time in minutes it will take at your current power setting to reach a fuel level of zero. We do recommend that you setup your system so the zero fuel level corresponds to your fuel reserve level. Should you not do this, BINGO will mean "engine out", usually a condition for heightened heart beat rate for the Pilot. Land **before** you reach BINGO time, even if that means putting down in a less desirable place.

VOLT

The supply voltage level to the unit. This would normally be the voltage of your battery. This indication serves as a battery charge indicator. Should you be using a lead-acid battery (sealed unit or open, motor cycle battery), your maximum voltage should not exceed 13.8 volts if you have a 12 volt battery or else overcharging and damage to your battery will result. Many regulators are of poor quality and will overcharge your battery.

A voltage level of under 11 volts indicates a discharged battery. Do not discharge your battery below this level as you will damage it.

A charged, healthy battery will have voltage levels between 12V and 12.6V when not charged.

STW

The stopwatch. Use the relevant main menu item to start, stop and reset the stopwatch. The stopwatch is independent of any flight operation and can be used for various tasks. Often, it can be a useful aid as leg timer during navigation competitions. The range is to 60 minutes with a one second resolution and thereafter to 99 hours with a one minute resolution.

The stopwatch can be used in one of the following ways:

Method one:

Clearing the stopwatch to zero and timing the current leg only.

Activating the stopwatch

Step one: Press Menu, then press Next until cursor is on the Stopwatch menu item.

```
start new flight press select
Instructor mode: Select starts lesson
|StopWatch Start-press +, Zero-press -|
View flight log
```

Step two: Press + to start the stopwatch

Step three: Press - to Zero the stopwatch if required

Step four: Press Menu to exit

Deactivating the stopwatch

Step one: Press Menu and then use Next to select the stopwatch item

```
start new flight press select
Instructor mode: Select starts lesson
|StopWatch Stop-press +, Zero-press -|
View flight log
```

Step two: Press + to stop

Step three: Press Menu to exit

Resetting the stopwatch to zero and starting/stopping are two different operations. This allows you to stop the watch and restart at a later stage without clearing the reading if required.

HOBBS METER

The hobbs meter shows your engine running time. The hobbs meter is presetable to your current engine time (User setup menu). Engine running time accumulates when the engine revs is above the "hobbs revs" as defined in the "Basic setup menu". This setting allows you to ignore idle time if you so wish.

MAINTENANCE METER

The maintenance meter is a "hobbs meter in reverse". You set the meter to your desired engine maintenance interval (for example 50 hours) in the "user setup menu". When the meter has counted down to 0 hours, your maintenance is due.

The maintenance meter takes the “hobbs revs” setting in the “Basic setup menu” into account.

Fuel level indicator



The fuel level indicator is available if one of the two possible methods of obtaining fuel level has been enabled.

Fuel level is either obtained from a fuel level sender installed in your fuel tank or indirectly via calculations if you have a fuel flow sender installed.

The fuel level indication requires your tank size. This is setup in the "Fuel tank/level sender setup menu". This menu is found under the "Device setup menu"

Fuel level can be displayed in one of the following units:

Liters, U.S. Galons, Imperial Galons, KG, lbs

This is selected in the "mode setup menu".

Should you be operating using only the fuel flow sender, the procedure would be to enter your current fuel level (for example after you have filled your tank) and thereafter the unit will show you the remaining fuel level by subtracting the fuel used as reported by the fuel flow sender. The steps for entering fuel level manually are:

Steps one: Press Select from the main display and then select "fuel level".

```
View flight log
Fuel level: 230 +/- to change
Reset air distance counter
```

Step two: Enter estimated fuel level. Press plus or minus to change.

Step three: Press Menu to exit

The fuel tank capacity is selected in the Fuel tank/level sender setup available under the Device setup menu.

Either fuel level sender, fuel flow sender (or both) are enabled or disabled in the Mode setup menu.

The fuel flow meter



If you have a fuel flow sender installed and enabled (Mode setup menu), this field will show you your current fuel flow per hour. The indication will be in liters per hour, imperial or U.S. gallons per hour. Select this in the mode setup menu.

Fuel flow rate is an important and useful indicator showing you the health status of your engine and fuel system. We recommend from actual past experience that you include the fuel flow rate in your pre-flight checks at engine run up time. You will soon know what fuel flow rates to expect from your engine at various power settings. At run-up time, run the engine for at least 30 seconds to a minute at full take-off power and watch the fuel flow rate. Should your fuel pump and related system not be capable of supplying enough fuel the fuel

flow rate indication will tell you that you have a problem before you take to the air. If the fuel flow rate is not where you remember it should be, it is not because your engine is very economical today but because you have a potentially dangerous problem!

The rev counter



The Stratmaster Ultra includes a very flexible rev counter that can be adapted to a very wide variety of engines. In the main this is done in the Device setup menu under "Basic device setup". Here you enter the number of pulses the rev counter pickup (whatever it may be) will generate for every ten revolutions. The instrument will actually use this information to work out revs from the time it takes to complete ten revolutions of the engine. This way high resolution of the rev counter is guaranteed even if only one pulse is generated for a single revolution as would be the case for the 912 engine.

Pickups vary from those provided by the engine manufacturers in the form of magneto coil tapings (Rotax / Ducati) but can be anything from a few loops of wire coiled tightly around one of the ignition wires to pickups from generator A/C outputs or the W output of a car type alternator. In fact, anything that is able to provide at least a 3-4 volt, reasonably stable signal at the rev counter input of the RDAC EIS system. Signals with a voltage as high as 100 volts can be used as well as is the case with Ducati systems if no ballast resistor is fitted.

On unusual engines it is often a matter of experimenting with various pickup methods to find a satisfactory solution. Once a stable reading can be obtained, set the calibration of the rev counter so that correct revs are indicated.

The range of the rev counter is up to 9 999 revs.

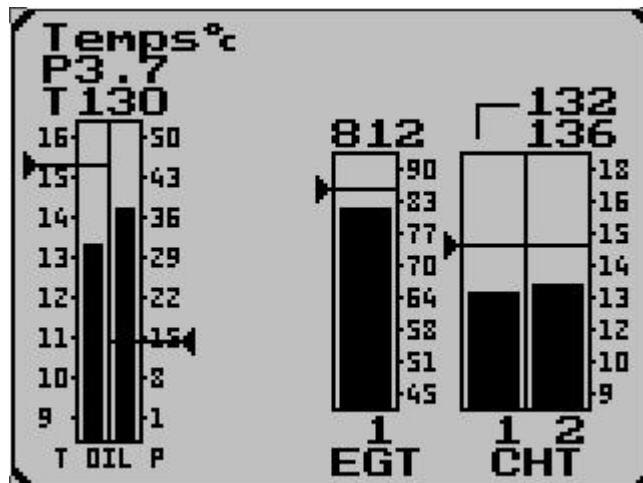
You need to select the scale of the analog RPM display. This is done in the user setup menu. You can choose from 3000 to 9000 RPM full scale. For example, if you have a typical Rotax two-stroke engine you might select 7000 RPM full scale. A Rotax 912 would call for 6000 RPM full scale.

EIS Panel display

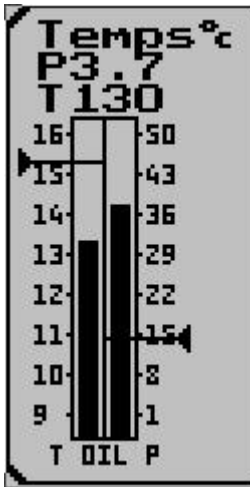
The engine information panel is a flexible display that is configured to the needs of your engine. In this picture you have a typical setup for a single carburetor four stroke engine.

This panel is used to display EGT and CHT temperatures, oil and water temperatures as well as oil pressure.

The panel will configure itself depending on how you setup your engine monitoring.



Combined Oil temperature and Oil pressure indicator



Should you select both oil temperature and oil pressure indicators in the "Engine detail setup menu" then you will get a display as shown on the left.

Pressure is shown either in bar or psi as selected in the "mode setup menu". Temperature units are selected in the same menu and can be either degrees F or degrees C.

Should you have a requirement to measure oil pressure, select the oil pressure bargraph display by selecting the label to "OILP" in the engine detail setup menu.

Please select the required oil pressure sender setting under the "Sender setup menu".

The RDAC IV EIS supports standard resistive automotive oil pressure senders. These are available in a number of different resistance ranges and as a consequence, the Stratomaster Ultra allows you to select resistance range in steps of 50 ohms from 50 ohms to 1000 ohms. The sender fitted to a Rotax 912 for example has a 200 ohm resistance. The RDAC expects resistance to increase with pressure, with the maximum resistance at 10 bars (145 PSI).

Should you have a sender with a maximum pressure rating of less than 10 bars, please select the resistance setting in such a way that correct pressure reading would be obtained at the maximum pressure sender output.

Oil pressure can be displayed in PSI or BAR. Select your preference in the "mode menu" (see page 42).

Please note: Should you switch on alarms for the oil pressure reading, the alarm will be activated if oil pressure falls below the set level. This implies that the alarm will be activated should you switch your engine off.

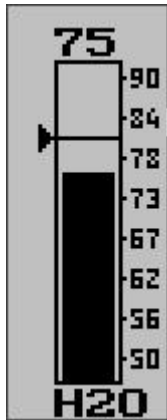
Set the required alarm level in the Engine detail setup menu (page 42). Most requirements would use a minimum pressure of 1.5 to 2.0 Bars (20 – 30 PSI).

Enabling the oil temperature display is done in the Engine detail setup menu. Select the label for the oil temperature channel to "OILT".

The RDAC IV EIS can interface to the oil temperature sender used in Rotax 912/914 engines. This is a standard sender that can be obtained from automotive spares outlets. The Rotax sender exhibits a resistance of 100 ohms at 85 degrees C and 1000 ohms at 20 degrees C.

It is also possible to use the MGL precision semiconductor sender instead of a standard automotive sender. This sender, although more expensive, is very accurate and does not suffer from the wide tolerances of standard automotive components. You need to select the type of sender used for the oil pressure in the "sender setup menu". The default sender selected is the standard automotive type.

Water temperature indicator



This is used for water or oil cooled engines. You select which by means of selecting the appropriate label below the bargraph.

Please note that the senders for water and oil temperature are usually different and using the wrong sender will result in incorrect readouts.

Temperatures can be displayed in degrees C or degrees F. Use the mode menu to select your preferred choice.

Water temperature measurements requires the sender available from MGL Avionics. This is a standard automotive sender with the following characteristics: 900 Ohms at 20 degrees C and 93 ohms at 85 degrees C.

You can also use the precision semiconductor temperature sender available from MGL Avionics. We recommend the use of this sender for applications were you need to know the exact water temperature.

When procuring oil or water temperature senders, be aware that these senders are based on NTC resistors and typically have a fairly large tolerance. They tend to be more accurate at higher temperatures but can have large errors at low temperatures.

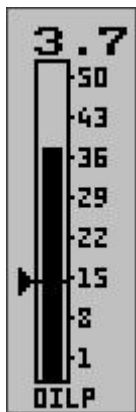
We suggest that you use a multimeter in combination with the ambient temperature probe of the Stratomaster Ultra to verify that you have the correct sender.

Using the Stratomaster connected to a 12V battery or similar power supply, use the included ambient temperature probe to measure the temperature of a jug filled with boiling water.

Insert the temperature probe in question connected to the resistance measurement setting of your multimeter. Ensure that the top terminal of the sender remains dry to avoid measurement errors.

Wait until the temperature drops to 85 degrees and then take a reading of the resistance. A tolerance of up to 5% is acceptable.

Oil pressure indicator (without oil temperature)



Should you have a requirement to measure oil pressure, select the oil pressure bargraph display by selecting the label to “OILP” in the engine detail setup menu. Please select the required oil pressure sender setting under the “Sender setup menu”.

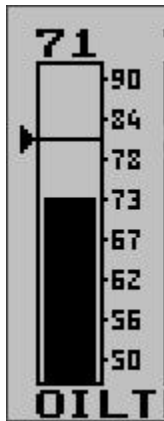
The RDAC IV EIS supports standard resistive automotive oil pressure senders. These are available in a number of different resistance ranges and as a consequence, the Stratomaster Ultra allows you to select resistance range in steps of 50 ohms from 50 ohms to 1000 ohms. The sender fitted to a Rotax 912 for example has a 200 ohm resistance. The RDAC expects resistance to increase with pressure, with the maximum resistance at 10 bars (145 PSI). Should you have a sender with a maximum pressure rating of less than 10 bars, please select the resistance setting in such a way that correct pressure reading would be obtained at the maximum pressure sender output.

Oil pressure can be displayed in PSI or BAR. Select your preference in the “mode menu” (see page 42).

Please note: Should you switch on alarms for the oil pressure reading, the alarm will be activated if oil pressure falls below the set level. This implies that the alarm will be activated should you switch your engine off.

Set the required alarm level in the Engine detail setup menu (page 42). Most requirements would use a minimum pressure of 1.5 to 2.0 Bars (20 – 30 PSI).

Oil temperature indicator (without oil pressure indicator)



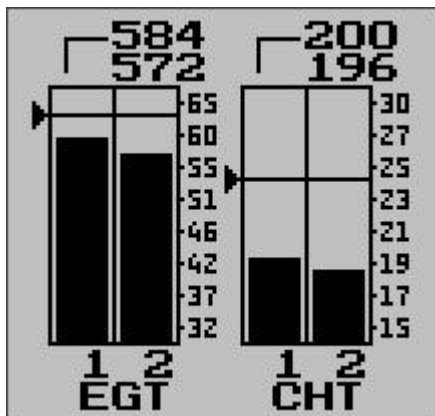
Enabling the oil temperature display is done in the Engine detail setup menu. Select the label for the oil temperature channel to "OILT".

The RDAC IV EIS can interface to the oil temperature sender used in Rotax 912/914 engines. This is a standard sender that can be obtained from automotive spares outlets.

The Rotax sender exhibits a resistance of 100 ohms at 85 degrees C and 1000 ohms at 20 degrees C.

It is also possible to use the MGL precision semiconductor sender instead of a standard automotive sender. This sender, although more expensive, is very accurate and does not suffer from the wide tolerances of standard automotive components. You need to select the type of sender used for the oil pressure in the "sender setup menu". The default sender selected is the standard automotive type.

EGT and CHT thermocouple display



The RDAC IV EIS makes four thermocouple channels available. These can be used for EGT probes (exhaust gas temperature) or cylinder head probes (typically the spark plug washer types).

You determine how and if these channels are used in the "engine detail setup menu". You can enable/disable individual channels, set the indicated temperature range for every channel and you can select the alarm level to monitor.

Most thermocouple senders are known as K types. These can be used with the RDAC IV. Some CHT probes used mainly in the U.S. may be "J types". These can also be used but you need to select this type in the "sender setup

menu". Note that you may use a mixture of K and J type probes if you so require.

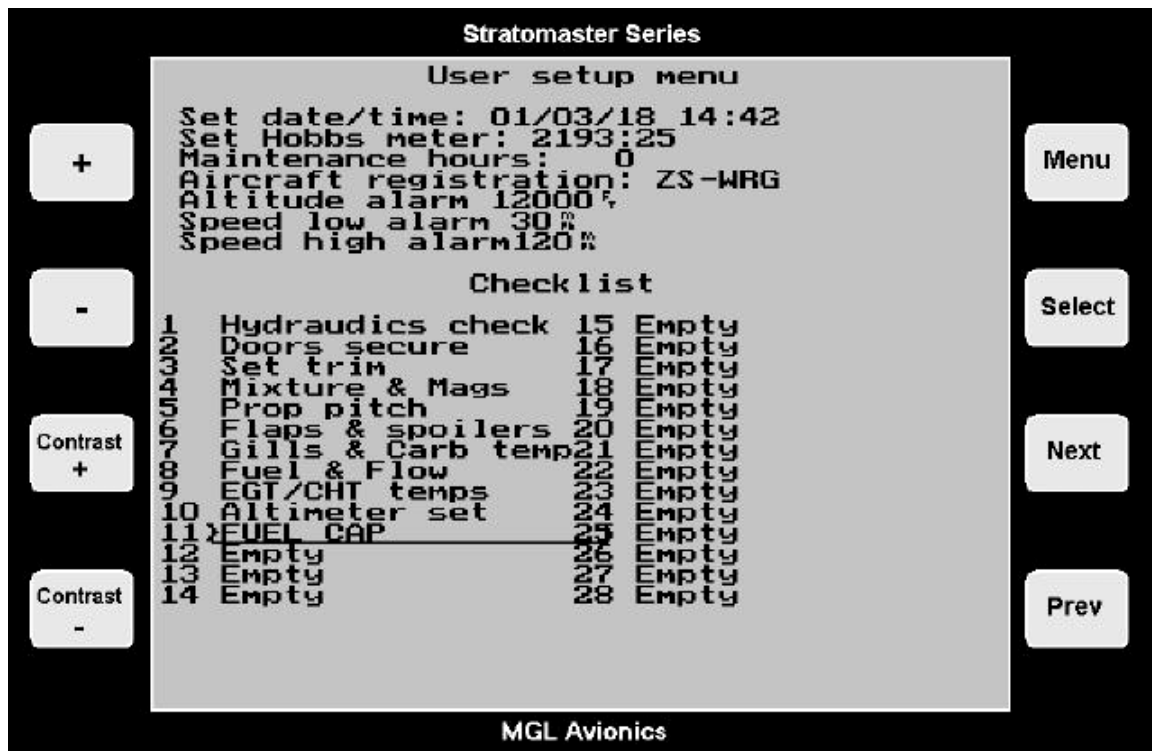
User menu

The following items are setup under the user menu:

- a) Date and time for the built in clock
- b) Hobbs meter pre-set
- c) Maintenance meter
- d) Aircraft registration number
- e) Altitude alarm
- f) Speed low alarm
- g) Speed high alarm
- h) Setup of the pre-takeoff checklist

There are two ways of entering this menu. You can from the main display press and hold the menu key, then press “+”.

Alternatively, enter the main menu as usual and select the “User setup menu”.



Date and time

Date and time is used for your flight or lesson log. Time of day is a display available both during flight and on the ground. Please note: The year is never stored in the log. The only reason for entering the year is to be able to correct for leap years. The internal real-time clock contains a year based counter that can count from 0 to 3 for leap year correction.

Use Next/Prev to select the item and then use +/- to change it.

(Nb: The Stratomaster Ultra uses a 24-hour clock)

Hobbs meter

The hobbs meter contained the the Stratomaster Ultra is pre-settable. You can set the meter to any time you like, usually this would be to your currently known engine time.

Use the Prev/Next keys to select the item and then use +/- to change it.

Maintenance meter

The maintenance meter can be viewed as a hobbs meter "in reverse". It counts engine running time down instead of up. This timer is used to control engine maintenance times, for example spark plug changes or MPI's. The maintenance timer is subject to the setting of the hobbs revs.

Use the Prev/Next keys to select the item and then use +/- to change it.

Aircraft registration

Enter your name or aircraft registration marks into this field to personalize your instrument.

You have 6 characters available.

Use the Prev/Next keys to select a character and then use +/- to change it.

Available characters:

Alphabet in capital letters

Alphabet in small letters

Numbers 0 - 9

Symbols:

! " # \$ % & ' () * + , . - . / : ; < = > ? @ [¥] ^ _ ` { | } ?

Altitude alarm

This function determines the maximum altitude that should be reached before the Stratomaster Ultra will activate the altitude alarm.

Note: Altitude alarm can be set in increments of 500 ft (152 m) to a maximum of 60 000 Ft (18 293 m).

Should you wish to switch the altitude alarm off continue pressing the plus or minus until the wording "altitude alarm off" appears.

Speed low alarm

This function determines the minimum speed that should be reached before the Stratomaster Ultra will activate the speed low alarm.

Note: Speed low alarm can be set in increments of 1 mile (1 Kn or 1 Km) between 17 m (27 Km or 51 Kn) and 104 m (167 Km or 310 Kn)

Should you wish to switch the speed low alarm off continue pressing the plus or minus until the wording "speed low alarm off" appears.

Speed high alarm

This function determines the maximum speed that should be reached before the Stratmaster Ultra will activate the speed high alarm.

Note: Speed high alarm can be set in increments of 1 mile (1 Kn or 1 Km) between 17 m (27 Km or 51 Kn) and 104 m (167 Km or 310 Kn)

Should you wish to switch the speed low alarm off continue pressing the plus or minus until the wording "speed high alarm off" appears.

Checklist

The Stratmaster Ultra contains a user definable pre-takeoff checklist. This checklist can be activated automatically after engine start (if not in flight) or you can activate it manually from the main menu.

Checklist			
1	Hydraulics check	15	Empty
2	Doors secure	16	Empty
3	Set trim	17	Empty
4	Mixture & Mags	18	Empty
5	Prop pitch	19	Empty
6	Flaps & spoilers	20	Empty
7	Gills & Carb temp	21	Empty
8	Fuel & Flow	22	Empty
9	EGT/CHT temps	23	Empty
10	Altimeter set	24	Empty
11	>FUEL CAP	25	Empty
12	Empty	26	Empty
13	Empty	27	Empty
14	Empty	28	Empty

You have a total of 28 items in this checklist as shown above. The items will appear in the order as numbered.

Checklist items consist of predefined items and user defined items. The instrument allows you to choose from the following predefined items:

- 'Hydraulics'
- 'Doors'
- 'Harness'
- 'Trim'
- 'Mixture & Mags'
- 'Prop pitch'
- 'Flaps'
- 'Gills & Carb temp'
- 'Gyros'
- 'Brakes'
- 'Fuel & Flow'
- 'EGT/CHT temps'
- 'Water temp'
- 'Oil temp & press.'
- 'Altimeter set'

In addition to the above you may create up to 16 items yourself. User defined items are marked in the above list with a ">" as shown in item 11.

Selecting any item is done by using the Prev/Next to move the cursor to the required item and then use the +/- key to select the item you require in that slot. Should a ">" appear to the

left of the selection then you can edit that selection by pressing “select”. Now it is simply a matter of selecting the character position you want to change and then using the +/- keys to change it. Once you are finished, press select again to write your changes to permanent memory.

Device setup menu

The device setup menu combines the many setup and operation options that you can choose. The Stratmaster Ultra is a very versatile instrument that you can customize to operate the way you want it to. Typical setups are for example units of measure like altitude display in feet or meters but also settings that you can choose to customize the EIS (engine information system) part of the Stratmaster Ultra.



In any case, to get to the device setup menu, either choose the relevant entry from the main menu or press and hold “Menu” and then press “-“ while the main display is showing.

The following picture is the device setup menu. We will briefly discuss every menu item and then give full details for every item.

Basic setup menu

The basic setup menu combines basic calibration functions for airspeed, altimeter, rev counter and fuel flow sender settings. Here you will also find setups for the scales used on the airspeed and RPM indicators.

Mode setup menu

The mode setup menu allows you to choose certain operational modes as well as units of measurement.

Engine type quick select

This menu gives you a quick way to select a particular engine type for use with the instrument. This allows you to quickly configure the instrument for recommended monitoring parameters. Often, you would use this function to choose a particular engine and then use the Engine detail setup menu to refine settings to your liking or engines needs.

Engine detail setup menu

This menu allows you to choose a particular display mode by choosing a relevant engine type that comes closest to yours. You can then further adjust many parameters to cater for your engines needs or your personal preferences. Often you will first use the Engine type quick select before changing any settings in the detail setup menu.

Sender setup menu

The sender setup menu allows you to choose temperature sender types for use by your instrument. The Stratomaster Ultra allows you to use a variety of different temperature senders for anything from oil or water temperature to CHT or EGT. It is important that you inform the instrument which type of sender(s) you are using so the instrument knows how to interpret the readings given by the sender(s). Incorrect sender type selections will result in incorrect temperature readings.

Fuel tank/level sender setup

This menu item allows you to calibrate a fuel level sender. You would normally only do this once, a procedure that will take you 10 to 30 minutes depending of your aircraft. After calibration the Stratomaster Ultra will be able to give you a tank level reading that has been corrected for tank shape and volume. You can then enjoy a tank level reading that accurately reflects your fuel level in liters or gallons (choose the latter in the “mode setup menu”).

Technical items

This menu item may show if it has been enabled (Press + and – and hold these keys down when you switch the unit on).

The items available under this menu may change between releases of the firmware and are not normally used by the user of this instrument. They are functions that are used in the factory for testing and calibration of your unit. **Please do not alter any of the settings as this may affect the accuracy of your instrument.**

The basic device setup menu



Please note:

Airspeed calibration, Zero ASI/USI and set altimeter calibration settings. Changing these could result in your Stratomaster Ultra displaying incorrect readings. (Refer calibration certificate).

Airspeed calibration

This function is used to calibrate the airspeed reading. It works in % relative to a nominal value. Your calibration certificate will give you the setting required for correct reading if no external airflow factors are present. In many aircraft installations it may be required to correct the reading to cater for errors created by the airflow around your aircraft. You can use the + and – keys to change the calibration factor.

An easy method to determine the amount of position error on your aircraft would be to wait for a wind still day, set the Stratomaster Ultra to display TAS, equip your aircraft with a GPS and take a flight. The ground speed as reflected by the GPS and the TAS as reflected by the Stratomaster should agree if there is no position error. Any difference between these two readings would be the position error.

It should be remembered that if you enter an incorrect adjustment here all airspeed readings would reflect this error. It is thus important that the amount of error be determined accurately.

Examples:

Stratomaster Ultra under reading

TAS as indicated by Stratomaster Ultra	= 53 mph
Ground speed as indicated by GPS	= 55 mph
Difference	= 2 mph

Express difference as a % of TAS.

$$(2 \times 100) / 53 = 3.77 \% \text{ rounded to } 4 \%$$

Enter $(100 + 4) = 104$ under airspeed calibration.

Stratomaster Ultra over reading

TAS as indicated by Stratomaster Ultra	= 60 mph
Ground speed as indicated by GPS	= 55 mph
Difference	= 5 mph

Express difference as a % of TAS.

$$(5 \times 100) / 60 = 8.3 \% \text{ rounded to } 8 \%$$

Enter $(100 - 8) = 92$ under airspeed calibration.

Stratomaster Ultra reading correct

Enter 100 under airspeed calibration.

To enter airspeed calibration the following steps should be followed:

Step one: Press Next until the required field is highlighted

Step two: Press plus and minus to change

Step three: Press next to move to the next field

Zero ASI and VSI

This function is used to calibrate the zero point readings of airspeed and vertical speed indicators (ASI and VSI). Use this function from time to time to zero the readings. This way your instrument will always perform at its best. Perform the zero calibration when your aircraft is on the ground and **not exposed to any airflow (for example when it is parked inside the hangar). (The engine should not be running).**

Do take care to perform the calibration in conditions where no air pressure fluctuations are present. For example windy conditions can have an effect of air pressure inside your hanger that may lead to a false setting of the zero point for the VSI.

Use "select" to perform the calibration. The display will not change but may flicker for a moment. The calibration takes only a few fractions of a second. You may find that it is perfectly sufficient to perform this calibration once a year.

Altimeter calibration

This calibration is done at the factory using very accurate references. It is not normally required to change this setting. You may do so if you feel that you would rather use another reference, like your local airfield's elevation according to survey maps.

Be aware that generally survey maps and GPS readings may not give you the expected readings and are subject to small errors. For example, your GPS receiver may be using a different datum of reference to the survey maps.

The value entered here is a correction factor that is entered during calibration of your instrument. This factor is shown on your calibration certificate.

At sea-level, one unit corresponds to an air pressure difference as expected for a 7 ft (2,1 m) change in altitude. At 5 000 ft (1 524 m) MSL this corresponds to about 10 ft (3 m). A positive correction factor will decrease the altimeter reading and a negative factor will increase the reading.

Please do not confuse this setting with the QNH (local pressure) setting available from the main display (+ and – keys).

Fuel flow calibration

This setting is used to calibrate the fuel flow sender if you fit such a device. Increase the setting to lower the fuel flow reading and vice versa.

The value of 208 corresponds to the recommended setting for the RS 256-225 liquid flow sender. Using this setting and a correctly installed sender you should expect an accuracy of about +/- 3% maximum error.

This factor will affect the instrument's range and fuel bingo time estimates so be careful should you choose to change this setting. Should you have difficulty in obtaining the correct fuel flow indication your problems are most likely due to vapor bubbles trapped in the fuel sender housing. Make sure you install the sender in such a way that it is not possible for bubbles to remain trapped in the sender housing.

Rev setup: Pulses per 10 revs

Use this function to calibrate your rev counter. A value of 60 is used for most two-stroke Rotax engines based on the Ducati DCDI system (6 pulses per rev). Rotax 912/914 engines produce 1 pulse per rev so the correct setting would be 10.

Select the value according to your engine's tach generator output for all other engines.

Should you have an engine without a tach generator such as a VW, we suggest that you try a pickup using a wire looped tightly about 20 times around one of the spark plug leads. (See installation manual for further details on this method). A spark is generated every second revolution per cylinder on a four stroke engine so you should enter a value of 5 in this case. You can also try pickups directly from the switched end of the ignition coil (points). This may give you a better signal. In this case the factor to be entered will depend on the number of cylinders. You should find two cylinders firing for every revolution in a typical four-cylinder four stroke engine so this would give you a factor of 20 to enter.

Take-off revs

This is the rev limit to use for automatic take-off detection. Take-off detection is relevant for the automatic logbook. The instrument uses a combination of take-off revs exceeded and airspeed above 30 mph (48 kph or 26 knots) to detect the start of the flight.

Note: Once a flight is started, revs are ignored. Only airspeed is relevant then.

Hobbs revs

This is the rev limit above which engine running time is added to the hobbs meter and maintenance meter. This setting allows you to choose whether or not to add engine idle speed time to the hobbs meter. Should you wish to have engine idle count towards the hobbs meter time, set the Hobbs revs value to less than your normal engine idle speed.

Fuel low alarm

Set the minimum fuel level below which the unit will generate an alarm.

If you select a value of zero, the fuel level alarm is off.

In order to use the fuel level alarm you must have either a fuel tank level sender installed or you must use a fuel flow sender (in which case the fuel level can be calculated from a starting value).

Please note that we recommend that you calibrate your system in such a way that you have reserve fuel at all times. It is not considered good airmanship to fly your tank empty!

Make allowance that any type of fuel flow or fuel level sensor may malfunction for whatever reason. Should you find unusual, unexpected fuel economy reported by your system, you most likely are getting incorrect readings. Always backup your fuel management with manual inspections and plan your flights using known fuel burn rates of your power plant.

Back light

The back light can be used in one of three ways. Permanently on. Permanently off or in "Auto mode". In auto mode the back light will switch on if the engine is running or if any key on the instrument is pressed. The back light will automatically switch off if the engine is not running or no keys have been pressed for a period of ten minutes.

ASI scale

Here you select what scale to use for your analog ASI (airspeed) indicator. You have a choice of 100,200,300 or 400 units of measure. Units of measure may be miles per hour, kilometers per hour or knots.

Please note that standard instruments are made for a speed range up to 200 miles per hour (approximately 320 km/h).

RPM scale

Select the maximum RPM for the analog RPM indicator here. You can choose from 3000,4000,5000,6000,7000,8000 or 9000 RPM.

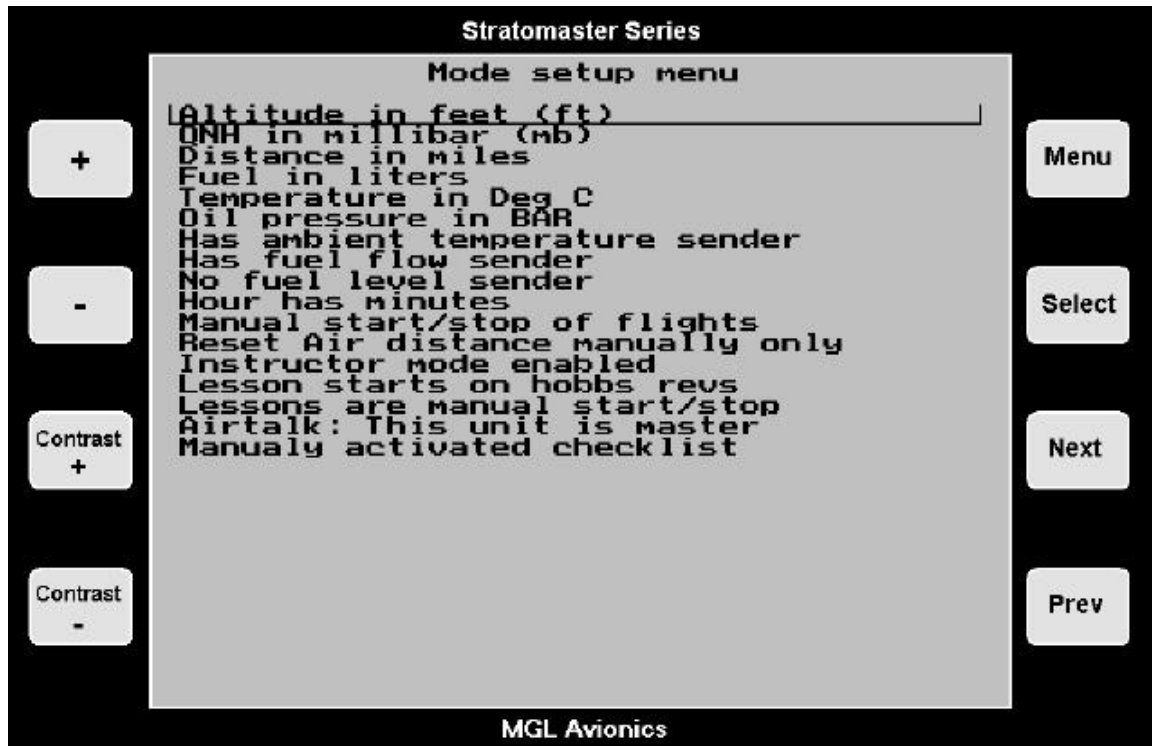
For example, a typical Rotax two-stroke would need a setting of 7000 RPM. A Rotax four stroke would need a setting of 6000 while most other four stroke engines may need a setting of 4000 or 5000.

Fuel flow scale

This setting is not currently used with this instrument.

The mode setup menu

The mode setup menu allows you to choose certain operational modes as well as units of measurement.



Altitude

Select whether you would like to display the altitude in meters or feet. This setting also influences the units used for the VSI. This will be selected to either feet/minute or meters/second.

Use the + or – keys to change.

QNH

Select your units of local pressure. Options are MilliBar (Hecto-Pascal) or Inches of Mercury.

QNH is the local pressure setting of your airfield as given to you by your ATC. Be sure to use the correct QNH to ensure that your altitude is displayed correctly according to local conditions. This will keep your ATC happy as you will be flying your assigned altitude.

Use the + or – keys to change.

Distance

Select how you want to display your distance. You can choose between Nautical miles (Nm), Statute miles (m) and Kilometers (Km). This setting also influences your airspeed display, resulting in the display of Knots, mph, or kph.

Distances are displayed by the distance traveled indication and range estimate.

Use the + key to change the setting.

(Note: The Stratomaster Ultra will only give you two of the three options at any time. To make the third option available press to minus key).

Fuel

Select if you want fuel quantity displayed in liters, imperial gallons or U.S. gallons. This setting also influences the fuel flow display.

Use the + key to change the setting.

(Note: The Stratomaster Ultra will only give you two of the three options at any time. To make the third option available press to minus key).

Temperature

Select if you would like temperature displayed in degrees Fahrenheit or Celsius. This setting influences all temperature displays such as ambient, water or oil, EGT, CHT etc.

Use the + and – keys to change the setting.

Oil Pressure

Select if you would like oil pressure displayed in Bar or PSI.

Use the + and – keys to change the setting.

Ambient temperature sender

Normally you should have the ambient temperature sender that is included with the instrument installed. This setting switches the sender on (default). The sender is required for density altitude calculations.

Should you switch this item off, the unit will use an internal temperature sensor to obtain a less accurate temperature reading. It is much preferable to measure the temperature at the outside of your aircraft or instrument pod.

Use the + and – keys to change the setting.

Fuel flow sender

Select whether or not you have a fuel flow sender installed. The unit will make certain adjustments to the main display to accommodate the additional fuel flow related displays if this item is switched on.

You can use the fuel flow sender to display a calculated fuel level should you not have a fuel level sender installed.

The fuel flow sender is required to calculate range (if the remaining fuel quantity and true airspeed (TAS) is known).

Fuel flow and remaining fuel quantity are used for the fuel bingo estimate.

Use the + and – keys to change the setting.

Fuel level sender

Select this item if you have installed a fuel level sender. Note: once you have installed the sender you need to calibrate it. The calibration procedure is outlined further on in the device setup menu. Alternatively, you may elect to have fuel level calculated from fuel flow. We recommend however that you install a fuel level sender. This is not subject to incorrect fuel level reporting which may be a factor if incorrect starting fuel level is entered if only the fuel flow sender is used.

Use the + and – keys to change the setting.

Hour fraction mode

Select whether you want hour fractions to display in decimal fractions of an hour or in minutes. This applies for the display of hobbs meter and flight time. Time of day always displays minutes.

Use the + and – keys to change the setting.

Flight detect mode

Select here if you want the instrument to detect the start of a flight automatically or if you want to manually start and stop a flight.

This setting is relevant for the automatic logbook and the flight timer display. If you choose automatic flight detection, a flight starts if airspeed is above 30 mph (48 Kph or 26 Kn) and engine revs above the limit set in the take-off revs setting (basic setup menu).

Flights are logged automatically if a flight duration of at least a minute has been detected.

In the manual flight detect mode, you can start and stop flights for logging purposes yourself using the main menu. We recommend you use the automatic flight detect mode.

Use the + and – keys to change the setting.

Reset air distance

Select if you would like the air distance trip counter to reset to zero automatically when you start a flight. In any case you can reset this trip counter at any time manually from the main menu.

Use the + and – keys to change the setting.

Instructor mode

Select if you would like to use the flight log in a way suitable to log lessons rather than individual flights.

Use the + and – keys to change the setting.

Lesson start

Select which criteria to use to start a lesson (instructor mode only). Eg. either hobbs revs or take-off revs.

Automatic Lesson start/end

Select if you want to enable automatic lesson start and end detections.

Use the + and – keys to change the setting.

Airtalk

If you have two Stratmaster units interconnected within your cockpit using the airtalk link, you must set one unit to be the slave while the other is the master. This is relevant for the QNH setting. If both instruments power up at the same time, the QNH from the master is transferred to the slave.

You can interconnect any Stratmaster Flight, Ultra and Ultra models, even in a mixed batch.

Checklist

Select if you want the checklist to be activated automatically once you start your engine. Note this will not happen if you start your engine while you are in flight.

Should you disable this function, you can still activate your checklist from the main menu.

Engine type quick select

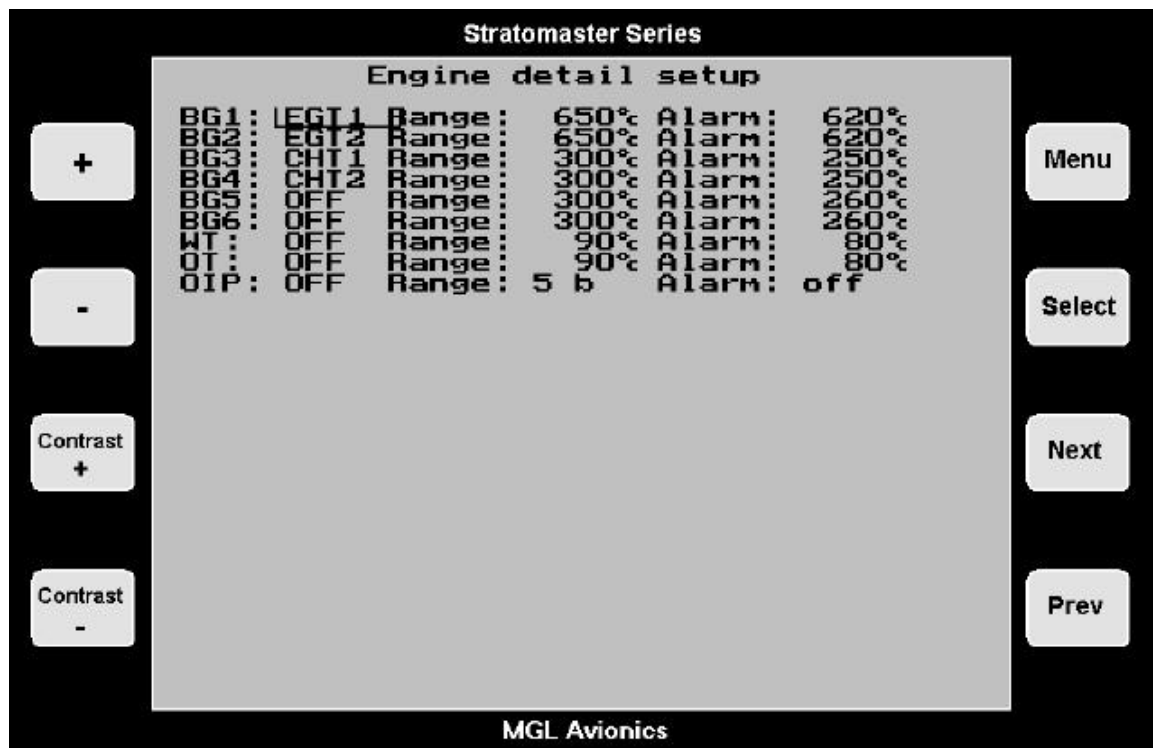


This menu allows you to quickly select an engine type for your Ultra setup. This selection presets many of the programmable items to our recommended values for the selected engine. The engine types presented should be seen as samples. If you have an engine not in the list, select a type that is closest and use the Engine detail setup to modify relevant settings.

As example, many operators with a 503 engine may select the 582 engine in this menu as they prefer to rather have two large EGT/CHT bargraph indicators in a scanning mode than four smaller ones in a non-scanning mode. The water temperature indicator is then switched off in the Engine detail setup.

Once you have selected a basic engine from the list presented, please view the engine detail setup and verify that all settings are as you would like them. Feel free to change anything you like according to your engines needs.

Engine detail setup menu



This page sets the display and alarm characteristics that define most of your Stratomaster Ultra EIS system. EIS stands for "Engine Information System", a standard acronym used in aviation for this type of instrument.

The top four lines define the settings of up to six bargraphs used for engine temperature monitoring. Typical uses are EGT or CHT monitoring (Exhaust gas or Cylinder head temperature).

Each bargraph consists of a label, which appears below the bargraph. This is used to identify what the bargraph is indicating. The Stratomaster Ultra gives you a choice of labels that you can use. The label itself does not determine anything about how the channel operates. It is just a label without any function. The label can be set to "off". With certain displays this can be used to suppress drawing of the bargraph.

The temperature range setting sets the maximum temperature the bargraph should be able to display. Choose a value that is close to your maximum operating temperature for the type of item to be monitored (EGT or CHT). Choosing a value too large will give poor resolution of the bargraph. A value too small will result in the bargraph displaying maximum reading before the maximum temperature has been reached.

Please note that all temperature related bargraphs start reading at half the value entered as range. This means that a bargraph with a range of 700 degrees C (1 292 degrees F) will display values from 350 to 700 degrees C (662 – 1 292 degrees F). This has been done to increase usable resolution of the bargraph.

The alarm setting sets the level over which the alarm mechanism will be activated (note: the oil pressure gauge alarm sets the low level under which the alarm will be activated).

Should you set an alarm level outside of the visible range of the gauge, this will not disable the alarm. Select the alarm level to be above the maximum expected level in order to disable the alarm.

Oil pressure bargraph should be set for range in bar (5-8 bars is typical for most engines). The alarm level is typically set to 2 bars, below which the alarm will be activated. Should you not use an oil pressure indication, please turn the bargraph off by setting the label to read "off".

The various settings, ranges and levels you select here will determine the way the gauges are drawn on the display.

The top 6 bargraph settings relate directly to the four thermocouple inputs and two Rotax 912 type CHT channels available on the RDAC IV unit.

The first four lines (BG1 to BG4) are equivalent to RDAC channels TC1 to TC4. BG5 is CHT1 and BG6 is CHT2.

Please note that it is not possible to enable CHT1 (BG5) and the Water temperature bargraph at the same time. This is because these two items share the same physical connection on the RDAC IV unit.

Sender type selection



The sender type selection menu is used to select the kind of senders you have connected.

The RDAC unit supports 4 thermocouple inputs as well as two N-Type inputs intended for use with 912/914 engines that have two built in NTC CHT senders.

EGT senders are practically always K type thermocouples. CHT senders (the types used on spark plug bases) are mostly K types as well but sometimes J types are used. J types are found mostly for U.S. made instruments.

The characteristics of J and K types are very different so it is important that you select the correct thermocouple type.

All thermocouples supplied by MGL Avionics are type K.

The top four entries can only assume either J or K type thermocouples. These are equivalent of RDAC thermocouple input channels 1,2,3 and 4.

The next two channels may be set to N Type, M type or MGL precision. N types are only used with Rotax 912/914 CHT. These senders are fitted to the 912 engine as standard. The M type refers to a sender available from MGL Avionics for special applications. For a description of the MGL precision sender see below.

The H2O entry selects which probe you have connected as water temperature probe. You can select the M type probe (MGL supplied NTC probe) or the MGL precision temperature probe (see below).

The OILT entry selects which probe you have connected as oil temperature probe. You can select the N type probe (Rotax type oil temperature probe as fitted to the 912/914) or the MGL precision temperature probe (see below).

Oil pressure resistance refers to the resistance the oil pressure sender will exhibit at maximum pressure of 10 bars (145 PSI). 200 ohms is the reading for the oil pressure sender fitted as standard to Rotax 912 and 914 engines. You can adjust the setting over a wide range to allow use of the instrument with a large variety of oil pressure senders. Oil pressure senders supported must increase resistance fairly linearly with pressure. This is the case with most standard automotive senders.

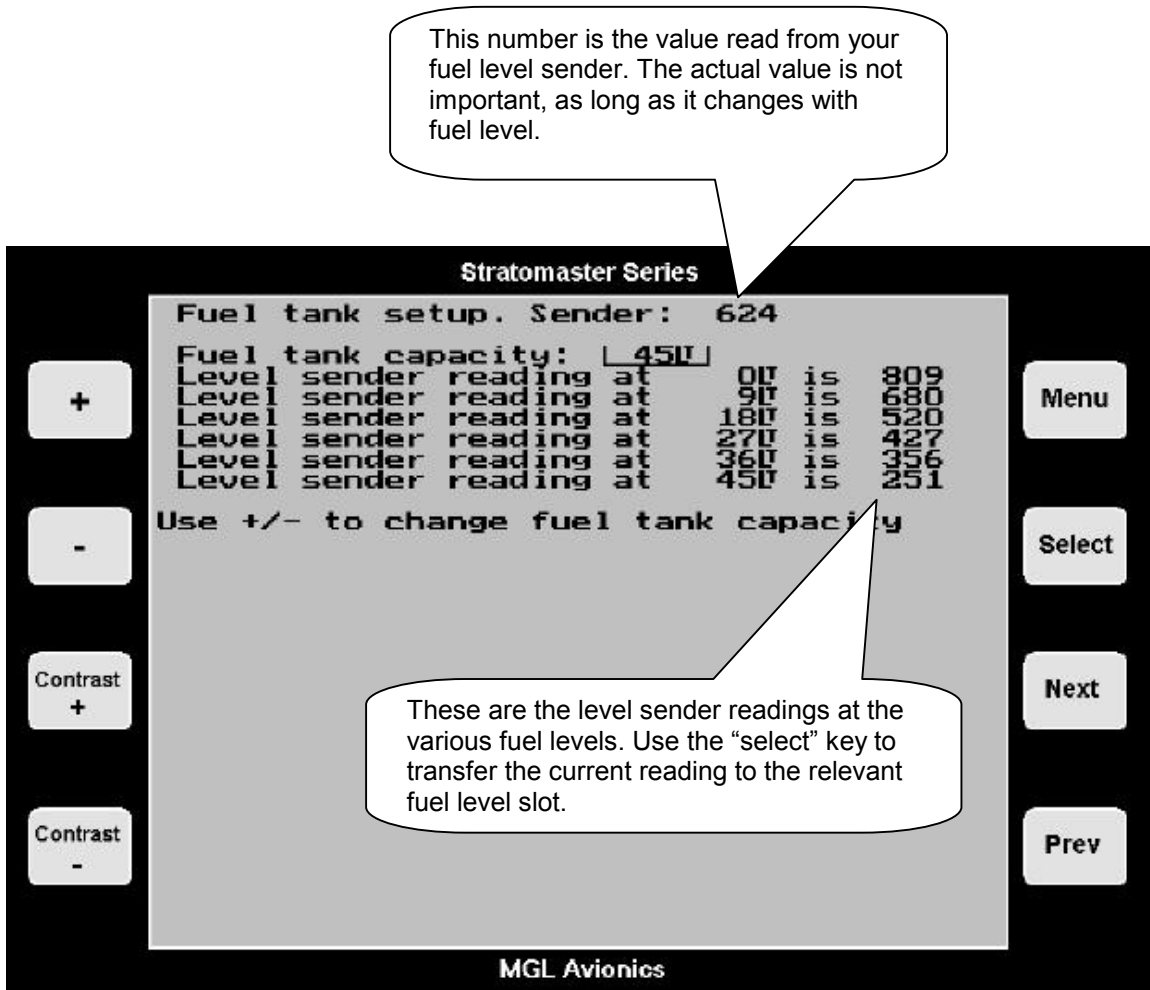
Most available automotive senders will be in the range of 100 to 400 ohms. We recommend the oil pressure senders available from VDO.

The MGL precision temperature probe

MGL Avionics manufactures a precision temperature probe based on an accurate and well proven semiconductor chip. This sender is more expensive compared to the ordinary automotive senders used in standard applications but offers outstanding accuracy and as additional advantage is completely electrically isolated from the engine it is fitted to. This is an advantage in some installations as the temperature reading is not influenced by electrical currents flowing in the engine. This sender can be used to measure temperatures from zero degrees Celsius to about 180 degrees Celsius. The sender is suitable for water or oil temperature measurements to an accuracy of +/-1 degree over the full temperature range.

Fuel tank/level sender setup

This function is used to setup and calibrate your fuel level sender. You would use this function partially even if you do not have a fuel level sender installed but are using a fuel flow sender. In this case the instrument can provide you with a tank level display as well as it will calculate the remaining fuel by subtracting fuel used (after you have given it a starting value). In this case all you have to do in this menu is to enter the capacity of your fuel tank so that the fuel level bargraph can show the correct level. You should also note that it is not possible to enter a fuel level greater than the tank capacity even if you only use the fuel flow sender and not a tank level sender.



Regardless of your use of a fuel flow sender, you can install a fuel level sender into your fuel tank. These level senders are inexpensive and are available as after market replacement fittings from a car spares outlet. We recommend the senders available from VDO. **Be aware** that some makes of cheap level senders can prove troublesome, as the lever arms tend to be sticky. This prevents the floats from floating on the surface of the fuel at all times. As a consequence, this will lead to incorrect fuel level indication.

Once you have installed a fuel level sender into your tank, make sure the float can travel all the way from empty to full position without hindrance of any kind.

The calibration procedure should be carried out with your aircraft in flight attitude. This means you need to lift the tail if you have a tail-dragger or lift the nose wheel if you have a weightshift trike. You start the calibration procedure with an empty tank.

Your first determination should be how much reserve fuel you should carry. Reserve fuel would be fuel that is not taken into account by the fuel level sender. We recommend at least 10% of your fuel tank capacity as reserve fuel, preferably even more.

To illustrate the calibration procedure, let us assume we have a weightshift trike with a tank capacity of 50 liters without reserve.

We decide to use a five-liter reserve, leaving us with a usable fuel capacity of 45 liters.

Our first step is now to enter this capacity into the instrument. Use the "prev" and "next" keys to move the highlight to the "fuel tank capacity" item. Then use the + and – keys to set the entry to read 45 liters.

Our next step would be to raise the nose gear of the trike to flight position. An upturned bucket or similar item is normally all that is required.

We now start with the empty tank. Add five liters of fuel (our reserve quantity) using a suitable measure. Make sure the measure is suitably accurate.

This is now the "level sender reading at 0 Lt" position. Move the highlight to this position and wait until the sender reading has stabilized (You will see the sender reading at the top line). This could take up to a minute so have patience.

Should this number not react to changes of your level sender position, then you have a problem. Please check your wiring according to the installation section of this manual.

If you see the number changing then everything is well. Once it has stabilized and the highlight is on the 0 Lt position, press the "select" key to transfer the reading from the sender to the calibration point.

Now you are ready for the next step. Add the required amount of fuel to get to the next level (In our case 9 Lt – this is 20% tank capacity). Once done, wait for the reading to stabilize and press "select" again after you have moved the highlight to the "9 Lt" position.

Proceed in a similar manner until you have reached the last calibration position at 100% tank capacity.

You are done !

Press "Menu" to exit this function. This will write the new calibration to permanent memory in the instrument. You can repeat this calibration many times so do not worry if you do not get it right the first time.

The instrument uses the 6 calibration points to work out a correction curve that takes into account the tolerances of your fuel level sender and the shape of your fuel tank. This results in an incredibly accurate and usable fuel level display that far exceeds that available from ordinary dial type gauges.

Note:

The calibration positions may be edited by using the + and – keys. This allows you, in theory, to copy calibration settings from one instrument to another. We however recommend that you do go through the calibration procedure even if the two aircraft are identical in all respects.

Tolerances do exist and the calibration cancels these out.

Accurate fuel level displays are a vital safety factor for an aircraft and a very useful feature for peace of mind during cross county flights.

Notes on Slope error

Sender value is a value determined by the Stratmaster Ultra. It is used to calculate e.g. fuel level, fuel bingo estimate and current range estimate. The fuel tank setup sender value can either increase in value as fuel is added or decrease in value if fuel is added. This is dependant on the type of fuel level sender used. However should the second reading be larger than the first reading all readings will have to be larger than the previous reading. Likewise should the second reading be smaller than the first reading all readings will have to be smaller than the previous reading. If this is not the case the wording "Slope error" will be displayed. This could happen when fuel was removed instead of added between steps, no fuel was added between steps or when the fuel level sender was moved in the wrong direction e.g. moving the fuel level sender manually when it is not inserted in to the fuel tank.

Should you get a slope error message determine the cause of the error. If you do not know the cause of your error it is best to start from scratch. It should be remembered that accuracy is the fuel tank calibration is Ultraly important to enable your Stratmaster Ultra to display the correct data.

CARING FOR THE STRATOMASTER ULTRA***Pitot tube***

Dust etc. can cause a blockage in the pitot tube. Such blockage will effect the operation of the pitot tube which will in turn affect the accuracy of the ASI/TAS readings. We recommend that the pitot tube be covered when the aircraft is not in operation.

Cleaning

The Stratmaster Ultra can be cleaned by wiping it with a damp cloth. A mild soap may be used if necessary.

Take care not to wet the instrument excessively.

Do not use chemicals e.g. petrol, spirits, turpentine when cleaning the instrument.

Calibration

The Stratmaster Ultra instrument does not require re-calibration if it is used in normal operation.

Stratmaster Instruments used as references to calibrate other instruments may be sent in for periodic calibration to MGL Avionics. For this application we recommend a two year calibration interval. Please contact MGL Avionics for details.

Altimetry

This section is intended to clarify how an altimeter works and what determines its accuracy in simple terms.

As you know an altimeter is a simple absolute pressure gauge. This means it measures the pressure of the surrounding air relative to absolute vacuum as you would find in outer space.

Ordinary, well made altimeters are intricate mechanical devices that can achieve very good performance. However, these are subject to a whole host of influences that introduce errors in the readings. Vibrations tend to wear out the tiny gears, temperature has an effect on the

elasticity of the materials used and therefore has a direct influence on the reading. The quality of the vacuum has a direct bearing on errors and the maximum altitude the instrument can indicate with a reasonable error.

The Stratomaster Ultra is based on a silicon pressure sensor. In principle, these sensors are subject to many of the problems that affect ordinary mechanical instruments and many digital altimeters have poor accuracy and resolution.

What is different in the Stratomaster Ultra?

The Stratomaster Ultra employs the most accurate absolute pressure sensor available. This sensor is not cheap or simple. It starts with a tiny cavity in a silicon chip. This cavity is about $\frac{1}{4} \text{ mm}^3$ in size and contains a near perfect vacuum. It is sealed with a very thin membrane that is only a few thousand atoms thick. The air pressure on the one side of this membrane bends the membrane towards the vacuum cavity. This introduces tiny changes in the electrical properties of the membrane. These changes are measured. Temperature effects on the membrane are taken into account by measuring the temperature on the membrane and compensating for known effects. During manufacture of this sensor, the membrane is exposed to a focused electron beam that, atom by atom removes material from the membrane until the sensor reads exactly the correct value. The Stratomaster Ultra then converts this reading into digital form. But the results are not taken for granted. The Stratomaster Ultra attempts to measure the signal to levels below those created by thermal noise. This electrical noise is caused by the vibration of atoms. The Stratomaster Ultra knows the characteristics of this unwanted signal and eliminates errors caused by this signal. In addition, the Stratomaster Ultra measures the temperature surrounding the sensor and compensates for any remaining temperature induced error. This compensation is different from sensor to sensor as it depends on tiny, remaining manufacturing tolerances of the sensors. But your instrument knows the behavior of its sensor and can correct for errors.

Once the pressure of the surrounding air has been accurately determined, how does one calculate the altitude? Is atmospheric pressure not supposed to change with the local weather as well?

Well, there you have it: All this accuracy and then a storm comes in and all is lost.

Back in the beginning of flight, (sometime after the Wright Brothers did the silly thing of inventing powered flight), it was thought that it would be a good idea to have some indication as to how high one was flying. Early, primitive altimeters were based on principles much like we use today but were very crude and what was more disturbing, they depended on each manufacturer's interpretation as to how pressure changes with altitude.

We all know that pressure gets less as we increase our altitude. But by how much? The American National Standards Institute and other standards bodies came up with the idea of simply dictating how the atmosphere behaves. So ANSI created the "standard atmosphere" which was valid on a "standard day". The "standard day" was decreed to be a day at mean sea level with a temperature of 15 degrees Celsius (59 degrees Fahrenheit). Further to this it was decided that the temperature would decrease at a certain rate as we increased our altitude. All of this and a portion of maths would now determine how our altimeter should work. Of course, suitable "fudge factors" were used to make the maths agree with what could be implemented using a bunch of mechanical gears.

So, the formula to use became:

$$P=P_0*(1-6.8755856*10^{-6}*H)^{5.2558797}$$

Where:

P= pressure

P₀= pressure at sea level (1013.25 mb on the "standard day")

H= height in feet above mean sea level

This formula is used to a level of 36.000 ft (10 975 m) . Above that a different formula is used.

Now what does all of this mean to you?

It means you have an exceedingly accurate altimeter that implements the ANSI standard in detail. It does not mean that your altitude is correct as indicated !

Your local pressure is determined by many factors, temperature and weather are only a few. All of these influence your altitude reading. Place your Stratmaster Ultra on the ground and run it for a whole day. Notice slight changes in the altitude (perhaps up to 60 ft (18 m) or even more?). These are caused by local changes of atmospheric pressure.

These are some of the reasons the altimeter has a QNH setting. This is simply a correction factor that is entered into your altimeter to correct for current local atmospheric conditions. As long as all altimeters use the same QNH they should all read the same altitude. This is all that aviation requires.

Should you be interested in your actual altitude, we recommend using a GPS. It is probably the most accurate method available today. However, it is not suitable for use on an aircraft due to the inability to display altitude according to ANSI standards and local QNH settings. It is important that all aircraft fly to a common altitude reference, **even if is not correct**.

True airspeed (TAS)

The Stratmaster Ultra instrument can indicate true airspeed. TAS is used for most internal calculations where air distance is of importance.

What is TAS and how is it calculated?

TAS is indicated airspeed (ASI) compensated for altitude and temperature. Often pilots ignore the effect of temperature and only take altitude into account when converting ASI to TAS. For practical purposes this is quite accurate and gives a good reflection on your true airspeed. Keeping in mind that ASI measurement is subject to errors caused by airflow around your aircraft, there seems little point in taking this calculation to absolute resolution.

Again, we have decided to use a formula often used by pilots. This way the instrument reading will agree with what pilots are used to.

Based on Worthingtons 13th edition page 349:

Add 1.75% of IAS per 1 000 ft (304.9 m) increase in altitude above sea level.

We assume here that IAS = RAS (rectified air speed).

The Stratmaster Ultra applies the above rule but works it at a finer resolution of 100 ft (30.5m).

WARRANTY

The Stratomaster Ultra is guaranteed against faulty workmanship on the part of MGL Avionics for a period of 12 months from date of purchase. MGL Avionics may at their discretion decide to either repair or replace the instrument. MGL Avionics will provide free labor and parts. Courier costs or postage costs will be for the account of the purchaser.

Please note: Certain parts are subject to breakage by misuse or external influences that cannot be covered by any warranty.

In particular the following possible damages are excluded:

- LCD display – glass cracked due to mechanical damage or freezing of the liquid crystal. The LCD must not be exposed to temperatures below –20 degrees Celsius (-4 degrees Fahrenheit) or above +80 degrees Celsius (176 degrees Fahrenheit).
- Any damage due to unusual events e.g. aircraft crashes, hard landings, dropping the instrument, excessive G forces, excessive vibration.
- Exposing the instrument to incorrect power supply voltages, such as connecting the instrument to mains power supply, any voltage in excess of 30 volts DC, and any AC voltage.
- Connection of unqualified or incorrect devices. Please contact us before you connect anything unusual to this instrument.
- Destruction of the air-talk link due to connecting the unit to PC's with unconnected earth leads or leaky power supplies.
- Damage due to excessive static discharge.
- Damage due to lightning strike.
- Damage due to overpressure of any sensors, in particular ruptured silicon diaphragms due to overpressure or mechanical action.

Any signs of opening the instrument or tampering with any of the internal parts will invalidate the warranty.

MGL Avionics endeavors to repair any faulty unit whether inside or outside of the warranty period speedily and at the lowest possible cost. Your first stop in case of a malfunction should be the dealer where you bought the instrument. It may be possible to repair your instrument without it having to be shipped to us.

DISCLAIMER

MGL Avionics cannot be held responsible for incidents or damage by whatsoever nature caused by incorrect fuel level indication. Installation and operation of the instrument and its related parts is outside our sphere of influence and control. We do not manufacture either the fuel level sender or the fuel flow sender and are not appointed agents of either.

MGL Avionics cannot be held responsible for incidents or damage by whatsoever nature caused by incorrect readings, displays, installation or operation of the instrument.

Operation of the Stratomaster Ultra instrument is the responsibility of the pilot in command of the aircraft. The pilot in command has to make himself/herself familiar with the operation and limitations of the Stratomaster Ultra instrument before commencing ground or flight operations as well as all other aspects of operation.

The Stratomaster Ultra intended for operation by a licensed pilot who is the holder of a MPL (Micro light pilot license) or PPL (Private Pilot license) or the equivalent thereof. The pilot should further be rated on the aircraft type on which the Stratomaster Ultra is being operated.

The Stratomaster Ultra has not been submitted to the CAA or FAA or any of its agencies for any form of certification. Operation and installation of this instrument is subject to the relevant rules and regulations of your country and flight authority.

If any of the above is not acceptable to the pilot in command he/she must refrain from operating the aircraft or remove the Stratomaster Ultra from the aircraft before commencing aircraft operations.

Installation manual for the Stratomaster Ultra "X"

Introduction

Before you commence any attempt at installing this instrument it is your duty to familiarize yourself with the relevant aircraft equipment installation requirements and regulations of your country. Proceed only if you are certain that you are permitted to install this instrument or seek approval from the required authorities. Also note that in some countries only approved persons may perform the installation of this instrument.

This instrument has not been submitted to CAA or FAA approval of any kind. Although this instrument surpasses all known specifications, it has not been the manufacturers intention to submit this instrument for approval due to the large costs involved. In addition, the instrument is targeted for aircraft classifications that do not require or warrant such approval.

In particular the instrument is intended for use with:

- Home built or amateur built aircraft
- Experimental aircraft
- Microlight and Ultralight aircraft
- Aircraft not falling in any of the above categories that may use non-certified instruments
- Aircraft having obtained special flight permits specifying the use of this instrument

Please note:

You should perform the following settings after installation:

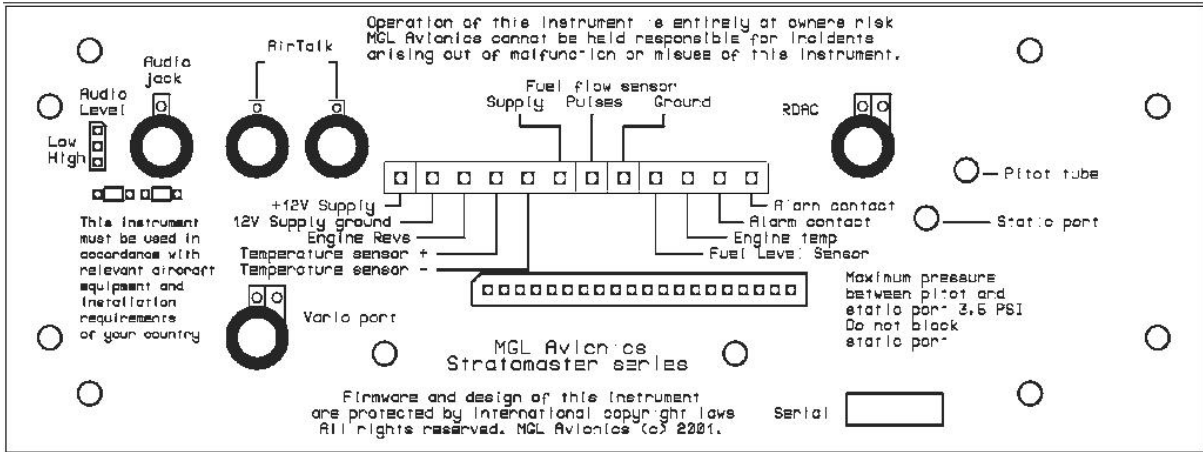
1. ASI/VSI zero procedure.
2. Set the date and time.
3. Change any other settings as required.
4. Verify that Altimeter correction and ASI gain are set to the values given in the calibration certificate of this instrument

All mode setups are permanent and do not rely on a battery.

Values that may be affected by a low battery are:

- Date and time (real time clock)
- Current fuel level if you use the calculated fuel level using the fuel flow sender
- Hobbs and maintenance timer
- Current flight details if the flight was not yet logged due to a power failure in flight

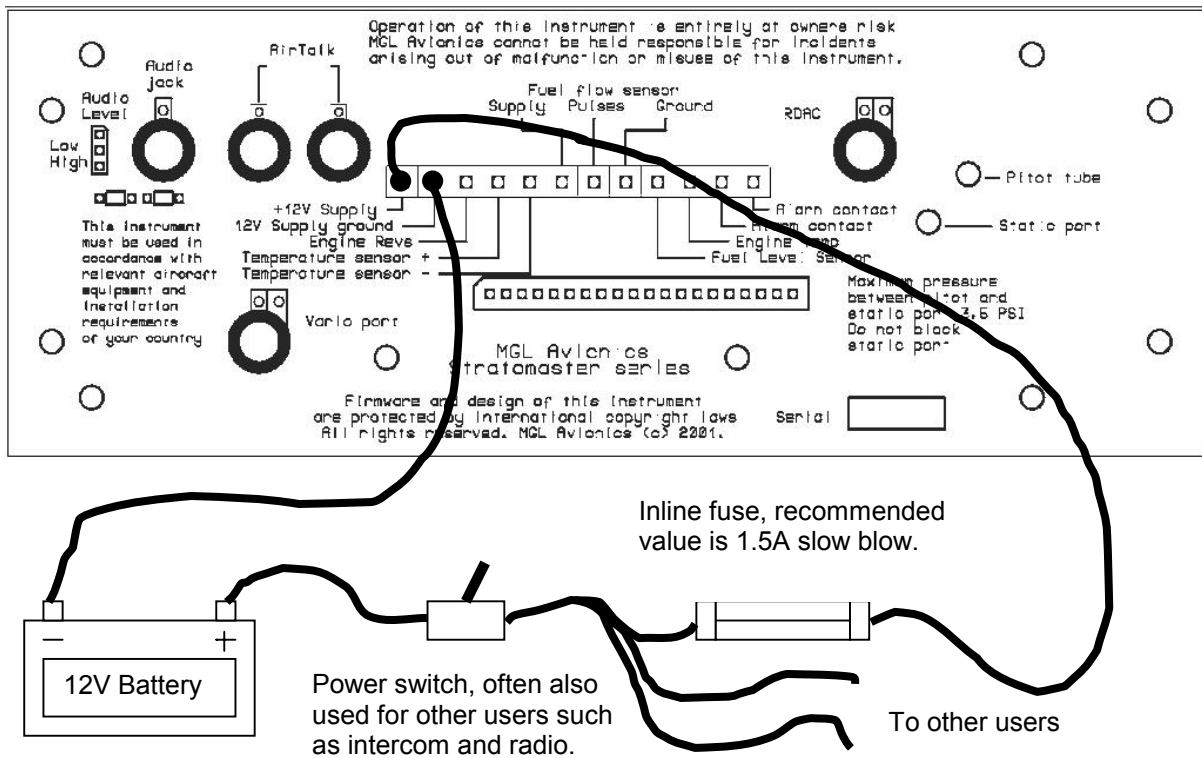
This unit is fitted with a Lithium battery. The expected lifetime of this battery is 10 years. A suitably qualified electronics technician should do replacement of this battery. Battery replacement requires minor solder work.



The above image is the rear panel of the Stratmaster Ultra. At a minimum, you need to connect a 8V to 28V DC power supply, usually a 12V battery fitted to your aircraft. In addition you should fit the included ambient temperature sender and connect an optional alarm indicator lamp. Suitable lamps are available as "pilot lights" or "panel lights" from electronics or automotive supplies.

The following pages show the recommended connections one item at a time. Proceed with your installation according to your requirements.

Power supply connections



The Stratmaster Ultra requires between about 7.5V to 28V of DC power supply. Current consumption is very low at about 60-80 mA without display backlighting and in the region of 280 mA with backlight. This current consumption includes the power requirements of the RDAC EIS unit.

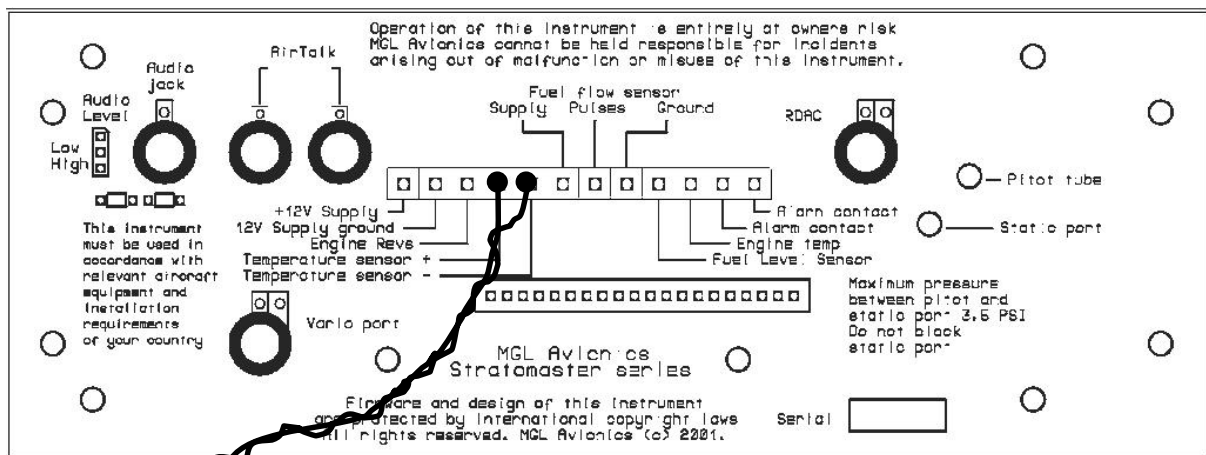
Generally it is not required to fit any form of power supply filters or surge suppressors as the Stratmaster Ultra includes the required protection devices. External power line filters or surge protectors should only be considered in very unusual conditions.

Important note: Please provide the Stratmaster with its own ground (earth) return wire to the battery. Do not share this wire with any other equipment like lamps, radios or any other items. Spurious currents caused by other equipment can cause the Stratmaster to receive an invalid ground reference. This reference (minus pole of the battery) must be of best possible quality as it is a reference for many senders like EGT, CHT water temperature and oil pressure.

Please note: If you set the display backlight mode to “auto”, the display backlight will be switched off automatically after four minutes of no activity to conserve power. The display backlight will remain switched on if engine revs are detected.

You can select backlight modes in the Device Setup Menu under Device Basic Setup.

Ambient temperature sender



The Stratmaster Flight includes a precision semiconductor temperature probe. It is recommended that you install it as shown above. The **RED** wire connects to the “Temperature sensor +” terminal. The remaining wire may be **GREEN, BLUE** or **BLACK**. This wire connects to the “Temperature sensor –” terminal.

The probe head itself should be mounted using suitable means outside of the instrument pod or aircraft if a closed cockpit aircraft is used. The probe should be placed in the shadow of the pod or aircraft or in a place where sunlight cannot heat the probe. Also ensure that engine heat or exhaust gases cannot heat the probe at any time. Remember – the probe is intended to show the temperature **outside** of your aircraft – not inside.

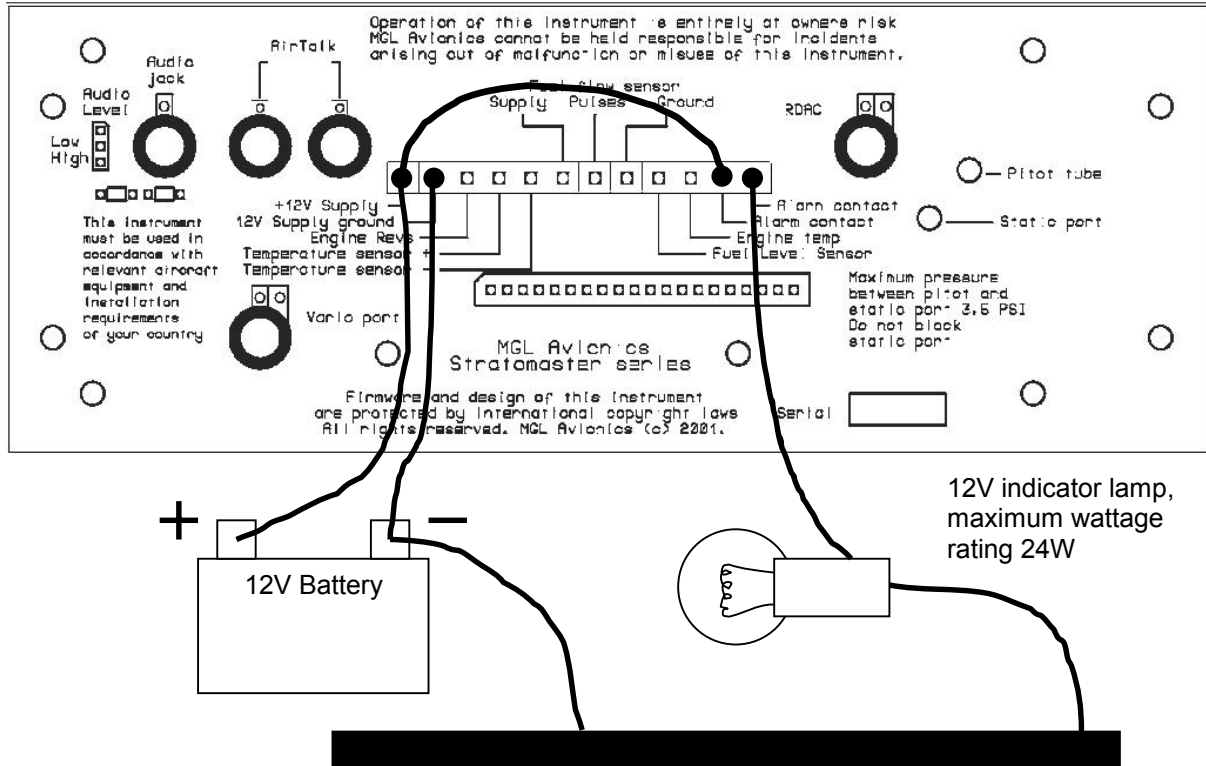
The twisted cable can be extended should this be required. In this case please use a similar cable type and continue the twist for the length of the cable.

The probe is required for the display of ambient temperature and density altitude. Should you choose not to use the probe, please disable the “External temp sens” in the mode menu. In this case the unit will use the internal temperature probe. Due to self-heating of the unit this may lead to incorrect, exaggerated density altitude readings.

We recommend that you install the external temperature probe.

Should you require a suitable replacement probe, it can be obtained from MGL Avionics at reasonable cost or you can make up your own probe. In this case please obtain a National Semiconductor Temperature Sensor type LM335 in a TO92 package.

External, visual alarm indicator



The above drawing shows a suggested wiring layout for an external alarm indication. We suggest using a 12V / 1W indicator lamp such as can be found in many automotive parts supply shops. These indicators (called pilot lights) come in many colors, sizes and shapes. Choose a pilot lamp that will ensure that you will see it flashing, even in bright sunlight. Install the lamp in a position on your dash or aircraft that will ensure that you will see it. Remember many costly engine failures can be prevented if you see problems early enough.

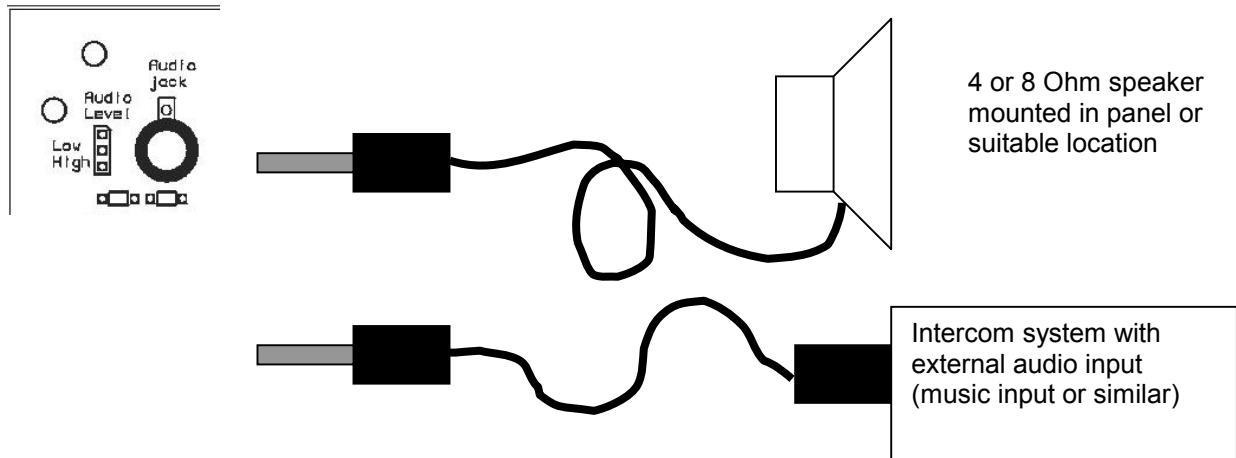
Please note: the drawing above leaves out the switch between the (+) terminal of the battery and the Stratomaster Flight unit for simplicity.

The Stratomaster Ultra provides an uncommitted contact (i.e. not connected to anything) that opens and closes once a second in the case of an active alarm. This can be used to switch a light bulb (as shown above) or switch a small buzzer or siren.

The contact is rated for a maximum current of 0.5 amperes (500 mA) at 50 V maximum. Please do not exceed this specification as this could harm the internal reed relay contact.

Alarms can be generated for over speed, under speed, engine temperature over limit, altitude over limit and low fuel levels. Please view the Owners manual on how to setup the alarms.

Please note that the Stratomaster Ultra will close the alarm contact for a few seconds every time the unit is switched on. This is intended to provide a means of checking that the alarm is functional during pre-take-off checks.

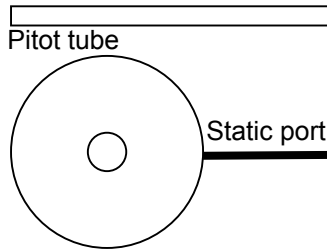
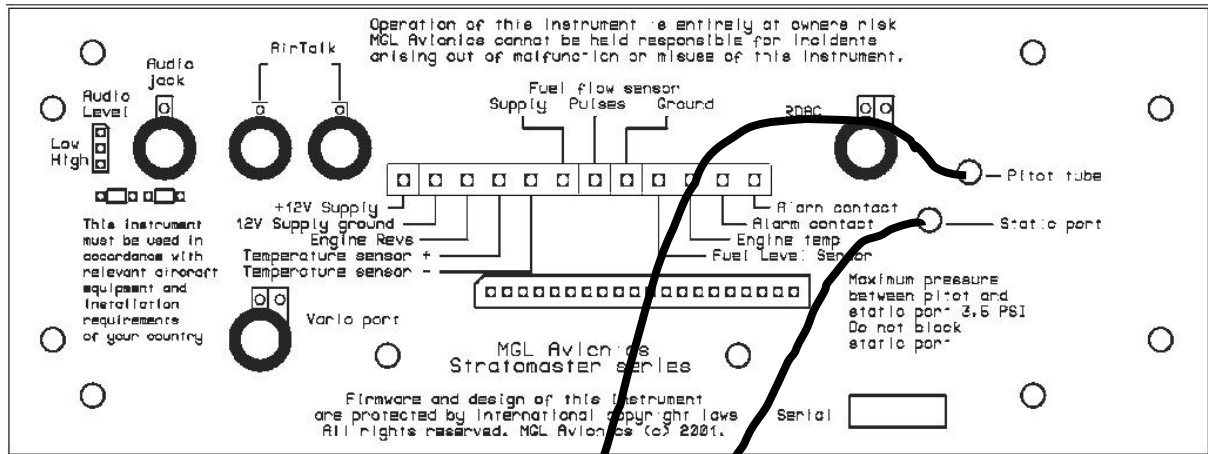
External, audible alarm

In addition to the alarm output contact described in the previous section, you can connect either a speaker or an intercom system to the Stratomaster Ultra. In this case an alarm tone will sound once a second for half a second whenever an alarm is active.

In case you connect a speaker, you should set the audio level to "high" by bridging the relevant link position. Should you want to connect to an intercom system that has an external audio input, set the audio level to "low".

Note: Please ensure that your intercom system will mute any external audio should radio transmissions be received. It may be illegal in your country to use any other system.

Pitot tube and static port



Pitot tubes are found in a large variety in at your aircraft parts shop, in mail order catalogs or you can make your own.

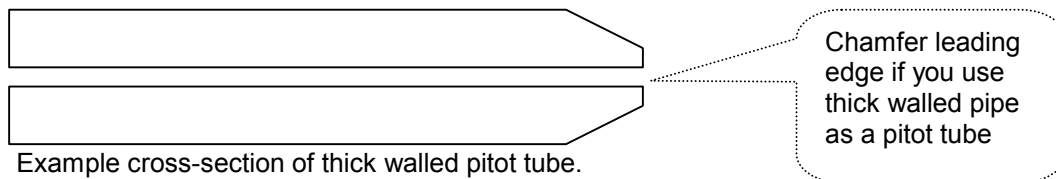
Contrary to popular belief, Pitot tubes are not carefully designed and calibrated but are simple orifices or tubes that get pointed in the direction that you are flying. The forward movement of the aircraft causes air to dam inside the pitot tube. This increases the pressure inside the tube. The Stratmaster Flight contains a sensitive silicon diaphragm sensor that measures the pressure difference between the pitot pressure port and the static port. This measurement is used to calculate the airspeed.

In addition, the static port is connected to the altimeter sensor.

Most small aircraft such as ultralights or microlights do not require a connection to a static port. In these cases, simply leave the static port open. Ensure however that the static port does not receive pressurized air due to the forward movement of the aircraft.

Static ports are usually mounted at a strategic position on the rear side of the aircraft fuselage for faster, pressurized aircraft.

Suitable pitot tubes can be made from a short piece of hollow aluminium or copper piping. Length and diameter are not important. Ensure that the front of the pitot tube has a suitable chamfer if you use thick walled tubing or you may introduce a speed reading error if you have a faster aircraft.



Example cross-section of thick walled pitot tube.

Pitot and static port (Continued from last page)

Suitable connection hose for both pitot tube and static port can be obtained from a hardware store or even a pet shop. Good quality tubing is often used for fish tanks and it has just the right diameter.

Please note that this kind of tubing is not advised for pressurized aircraft. In this case you would need to obtain aircraft grade tubing of suitable diameter. You would also have to use hose clamps to fasten the hose onto the Stratomaster pitot and static ports.

The Stratomaster Flight instrument allows you to calibrate the airspeed reading. This is done in the "Device setup Menu" "ASI Gain". The main reason for this is to be able to remove errors introduced due to the airflow around your aircraft which may have an effect of your pitot tube pressure build up.

If you have a GPS receiver with a ground speed function you can use this as reference after allowing for any winds (Choose a wind still, absolutely calm day if possible). You should also compensate for density altitude before you correct the ASI reading. It is quite normal to under-read on the ASI if you are flying at higher than sea level in moderate or high temperatures. You can set the Stratomaster Flight instrument to display "True airspeed" or TAS. In this case a correction factor depending on your current altitude is applied.

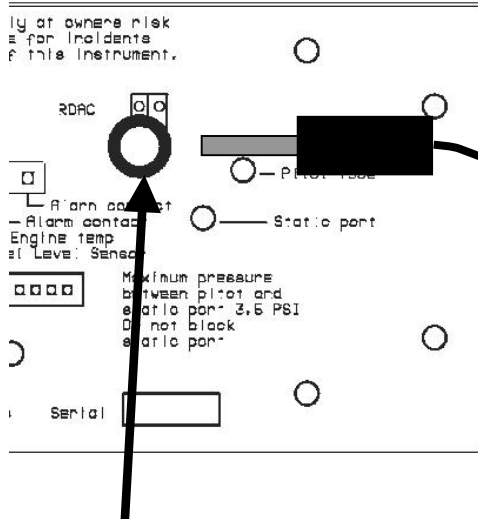
Zeroing the air-speed sensor.

It may be required from time to time to zero the airspeed and VSI readings. This will be true if you are reading a small VSI or ASI when the aircraft is standing still on the ground.

Ensure that the readings are not caused by winds or other factors before performing the zero calibration. Also, ensure that no wind is blowing into the pitot tube.

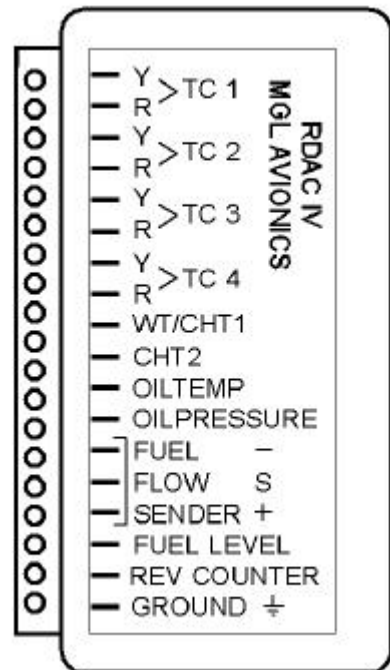
The zero calibration is outlined in the owners manual. It is quick and easy and will ensure that your Stratomaster Flight will perform at its best at all times.

Connecting the RDAC IV EIS

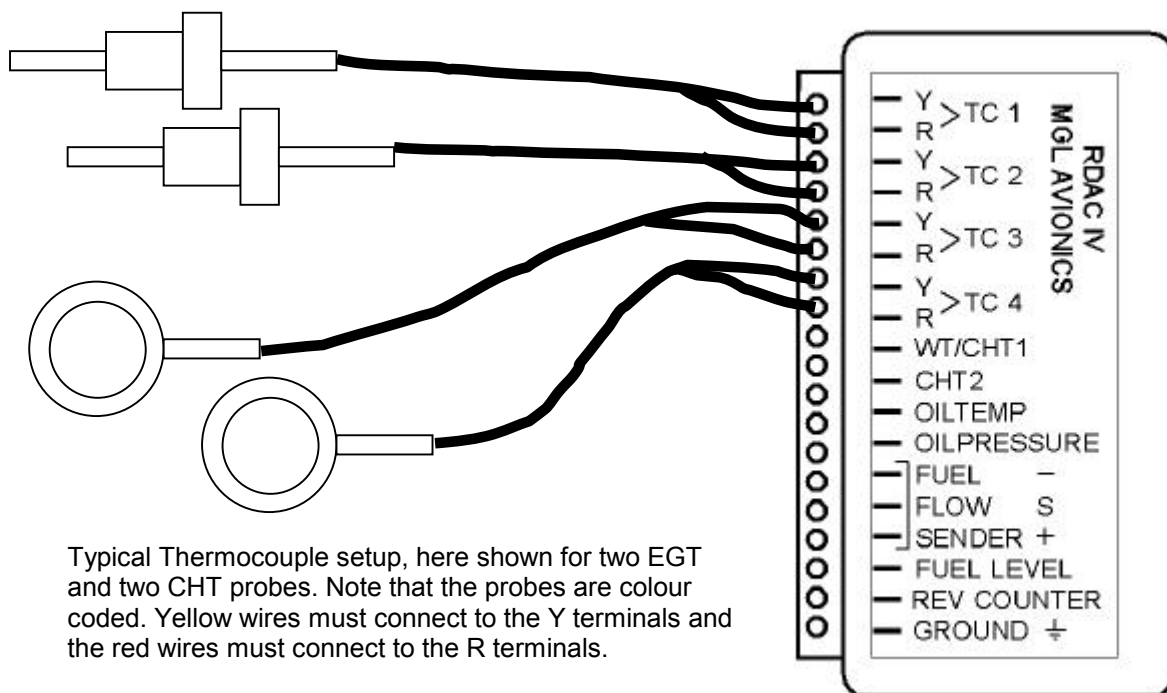


Please see following pages for RDAC EIS probe connections.

Plug lead from the RDAC EIS unit into the socket marked "RDAC". Press connector firmly and all the way until it clicks into place. Secure cable in such a way that it cannot come to any harm from sharp edges or engine heat. Ensure that vibrations will not cause wear on either the connector or cable.



RDAC EIS unit thermocouple inputs



Thermocouple inputs – details

The RDAC EIS provides four thermocouple inputs for use with EGT and CHT probes. Both K as well as J type probes can be used. K types are used for EGT probes while most CHT probes are also K types. Some makes of CHT probes are J type. The probe type selection is done in the Device Setup Menu (Sender Type Selection). Incorrect selection will lead to incorrect temperature display.

The RDAC IV EIS will accept both grounded and isolated thermocouple probes. Your only consideration in case of the more common grounded configurations is that you need to ensure that the thermocouple mounting position (Exhaust flange, etc) is at the same electrical potential as the negative supply line of the Stratmaster Ultra (normally the – (minus) of the battery). The RDAC unit has an earth point marked “ground” that you should connect to the engine block via a short cable.

Probe usage depends on your setup of the Stratmaster Ultra, mainly the “Bargraph type selection” and other items in the “Engine Detail Setup”.

Typical choices are:

2xEGT	Rotax 582, 912, 914
2xEGT 2xCHT	Rotax 503, 582, VW
1xEGT 2xCHT	Rotax 447
4xEGT	Rotax 912, 914 (in addition to two NTC CHT channels)

The above are only the more common selections.

The thermocouple amplifier is a precision device providing full cold junction compensation and bow voltage correction. In addition the amplifier measures and corrects for its own errors. This

results in very accurate measurements providing you install high quality probes. Here are some guidelines:

EGT Probes: select probes that are made from 316 stainless steel and that use glass-fiber insulated conductors. Teflon insulated conductors as found in many cheap probes introduce errors as the insulation melts moving the measuring point towards the mounting bolt which transfers a lot of heat to the exhaust material. This results in under reading probes. Stay away from probes that use simple plastic heat shrink sleeving – it does not last. Choose probes that use a generous amount of stainless steel spring as strain relief. The Bolt itself should be stainless as well or it will rust very quickly.

CHT probes: These are made from washers to fit spark-plug bases. Temperatures are considerably lower so most thermocouple cables will work without problems. The biggest area of concern should be the connection of the thermocouple cable to the washer. This often breaks after the spark plug has been changed a few times. Choose a probe that is suitably reinforced at this point for a long and trouble free life.

EGT and CHT probes supplied by MGL Avionics are of highest quality. We recommend that you consider using our probes if at all possible.

Warning: Four stroke engines produce much hotter exhaust gases compared to two stroke engines. Do not use EGT probes made from lower grade stainless steel (for example 310), these probes will not withstand the high temperatures and can fail as the metal gets very soft at 800 degrees C. Many four strokes (such as the Rotax 912) will produce exhaust gases of up to 850 degrees C.

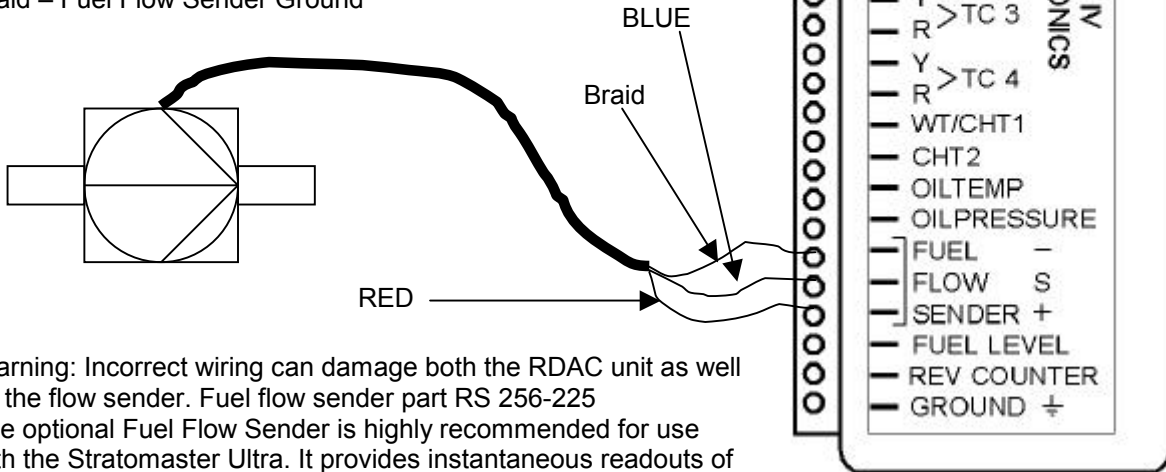
Important installation note:

EGT and CHT probes use wire made from plain Iron and other basic metals. As a result these probes are not able to withstand much flexing of the wires due to engine vibrations. Avoid making nice looking coils or similar constructions that will result in excessive vibration or flexing of the wire. Route the cables from the probe points tightly along suitable engine mounting points eliminating any chance of unnecessary wire flexing during engine operation.

RDAC Fuel flow sender installation

Note: Direction of fuel flow
Indicated by arrow on sender

RED wire – Fuel Flow Sender Supply
BLUE wire – Fuel Flow Sender signal
Braid – Fuel Flow Sender Ground



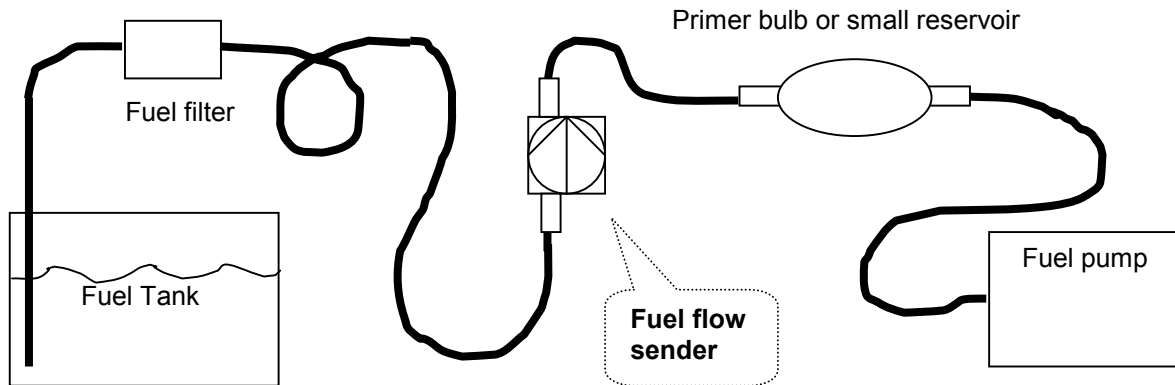
Warning: Incorrect wiring can damage both the RDAC unit as well as the flow sender. Fuel flow sender part RS 256-225

The optional Fuel Flow Sender is highly recommended for use with the Stratomaster Ultra. It provides instantaneous readouts of hourly fuel usage, and both time and distance estimates on remaining fuel in flight. You can also verify the performance of your fuel pump during the pre-takeoff engine run up – a very valuable check !

Further, it is possible to set up the Stratomaster Ultra to calculate Fuel remaining by subtracting fuel used from a value entered when you filled your tank(s).

In this case you may omit the installation of the optional fuel level sender.

Please note that the installation of the Fuel Flow sender should be done in such a fashion that dirt or debris from the fuel tank cannot lodge inside the flow sender. These will not block you fuel flow but may lead to the impeller inside the sender jamming. It is usually sufficient to mount the Flow sender **AFTER** the fuel filter but before the fuel pump. It is a good idea to provide a small reservoir such as a primer bulb between the flow sender and the fuel pump.



As indicated in the recommended fuel flow sender installation drawing, it can be of advantage to install the flow sender in such a fashion that the inlet points down and the outlet points up. This prevents vapor from forming a bubble inside the flow sender.

The flow sender is delivered with a small jet that can be installed in the flow sender inlet. Installation of this jet is recommended for engines with fuel flow rates lower than about 50 liters per hour. This would apply to most small two and four stroke engines.

The Stratomaster Ultra is shipped with the Fuel sender calibration set for the jet installed. In a good installation you can expect about +/- 3% maximum flow reading error with this factor. You can calibrate the flow sender yourself to a higher degree of accuracy if you so desire.

Recommended procedure to calibrate the fuel flow sender:

Note: You must disable the Fuel Level sender if you have one installed first.

Fill your tank exactly to a known level (for example 50 liters).

Set your fuel level to 50 liters using the Main Menu. If required you may have to disable the fuel level sender first using the Mode Menu.

Fly your aircraft for a period that you know will use approximately 20 liters of fuel. The exact fuel burn is not important, just burn about 20 liters of your fuel.

At the end of your flight the Stratomaster Ultra should give you a reading of how much fuel you have left – the reading should be about 30 liters left.

Now place your aircraft in exactly the same position that you used when you first filled the tank and refill the tank to 50 liters using a measuring jug. You should find that you need 20 liters of fuel to refill to 50 liters.

If you find that the Stratomaster under or over reads the fuel used, you should perform a simple adjustment of the Fuel Flow sender calibration factor. This is outlined in the Owners Manual.

Example:

Actual fuel used: 21.5 liters, Stratomaster fuel burn calculated 29.7 liters left in tank. This means the Stratomaster measured $50 - 29.7 = 20.3$ liters. We are under reading by 1.2 liters.

Default calibration factor in Fuel Flow setup (Basic device setup menu) = 208.

Let the corrected calibration factor be X.

$$X = (21.5 * 208) / 20.3$$

$$X = 220.29$$

The closest setting you can enter as factor is 220. Enter it into the unit and you are done !

Repeat the above procedure to verify that your flow sender is now reading correctly.

Please note:

Before you calibrate the flow sender ensure there are no problems with your installation. We find the senders are very accurate if everything is installed and working properly. If your fuel burn indication is out by a large amount you have a problem that you should not attempt to fix by fiddling with the calibration factor !

Please ensure that no fuel vapor can be trapped inside the sender housing in the form of bubbles. Due to the low fuel flow rates the bubbles will prevent the tiny impeller from turning freely, You can verify the turning of the impeller. You should notice three dark spots that are just visible in the inside of the fuel flow sender. These are small magnets that are attached to the impeller. With fuel flowing you should see the magnets turning.

The best defense against vapor bubbles is to install the flow sender in such a way that the bubbles can escape. The easiest way is to point the outlet upwards and the inlet (with the jet) downwards.

Another possible problem is the fuel sender jet. When you install it, do not damage it. Use a drill bit of suitable diameter to push the jet all the way the opening of the jet must be just in front of the impeller.

(Fuel flow sender – continued from previous page)

Using other Flow Senders

It is quite possible to use Flow Senders other than the RS device. In this case ensure that the Sender outputs a 5V TTL square wave or a similar signal. The Stratomaster interface electronics will adapt to a variety of different voltages and pulse shapes as it contains a schmidt-trigger input stage. The calibration factor can be entered in a wide range making the unit particularly suited to other Flow senders.

The supply output terminal for the Sender provides a positive, regulated 5 volt output. This may be used to power the Flow Sender provided the Sender will not draw more than 40 mA of current. Should your sender require a higher voltage or more current, then you must supply the sender from a different power source. Exceeding the rating on the Stratomaster Flow sender supply terminal can affect the operation on the unit negatively or even damage it.

Settings for the calibration factor for other Flow senders can be estimated, using the following formulae:

Estimated calibration factor:

$1000 / (\text{Number of pulses per 4 second period for 1 liter/hour flow})$

Recommended Calibration Factors for RS Flow Sender Part No. 256-225

With jet installed = 130. Recommended with flow rates below 60 liters/hour maximum.

Without jet installed = 750. Recommended with flow rates above 60 liters/hour.

Please refer to the leaflet included with the Flow Sender for information on pressure drop vs. flow rate, wetted materials etc.

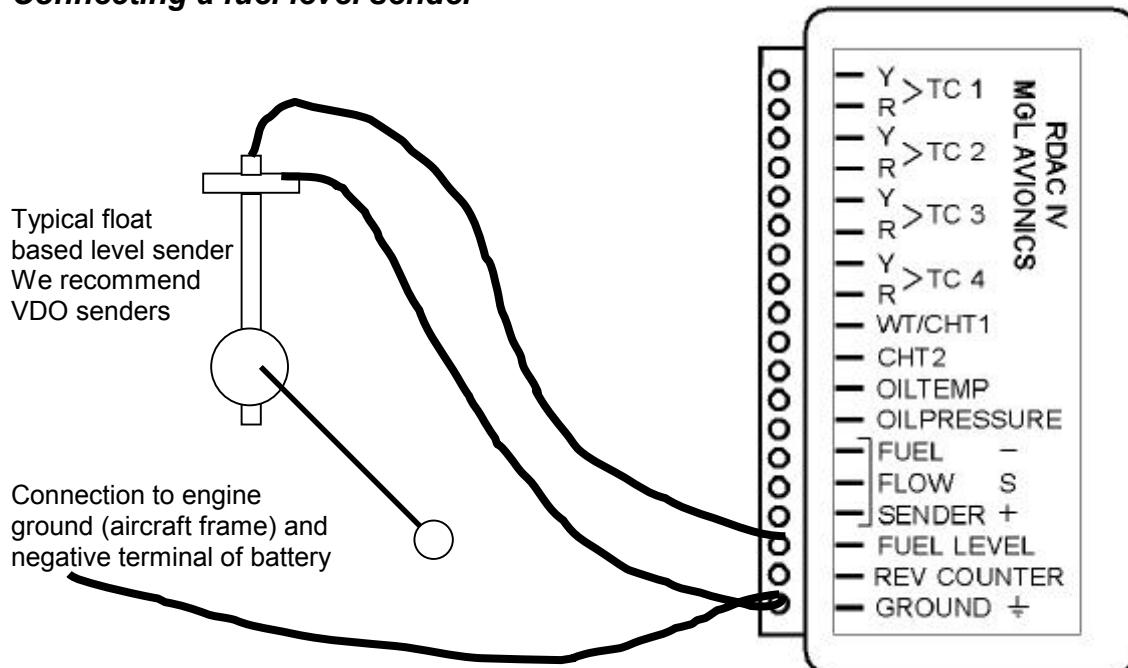
It is your responsibility to ensure that the flow sender used is compatible with the fuels you intend using. We have found the RS sender to be very compatible with automotive fuels used in South Africa, many of which contain methanol. 100LL AVGAS also appears not to harm the sender in any way. We have exposed a RS sender continuously to our automotive fuels for a duration of two years without any noticeable ill effect on the sender. However, despite this MGL Avionics or its appointed agents cannot assume responsibility for any incident or damage, even loss of life by whatsoever cause connected with the fuel flow sender or the Stratomaster Flight Instrument. Usage of this or other senders is your own sole responsibility. If you do not agree with the above statement you must not use the fuel flow sender.

Note to Pilots: (Even though this is the installation manual)

You must always have a visual indication of the fuel level available, either by means of a sight glass, direct tank observation or a known, reliable secondary fuel level gauge. Fuel level indication by means of calculated fuel burn is subject to errors both by entering incorrect starting fuel levels as well as mechanical problems causing the flow sender impeller to turn too slowly, resulting in under reading fuel burn and thus over reading remaining fuel.

As pilot in command of an aircraft it is your responsibility to ensure that you have sufficient fuel to reach your intended destination. Always ensure that you have a generous amount of reserve fuel and never use your reserve fuel except in an emergency if it is unavoidable.

Connecting a fuel level sender



The Stratmaster RDAC EIS permits the connection of a standard automotive fuel level sender. These senders can be obtained at automotive spares outlets at reasonable cost. When you choose a float level sender, ensure that you select a model that is sturdy and promises reliable and long lifetime. In particular, select a model that does not have any metal parts that can rust.

The RDAC EIS can interface to a large variety of these fuel level senders. It does not matter if the sender resistance increases or decreases with the fuel level as long as it changes. The calibration procedure outlined "Set fuel tank" in the owners manual describes in great detail the procedure to follow.

In essence, the calibration procedure will measure the resistance of the fuel level sender at various fuel levels and then work out the readings in between those known settings.

Typical fuel level senders that can be used with the RDAC EIS have resistance ranges in the region of 100 ohms to 500 ohms.

Tip:

It is possible to wire two fuel level senders in series if you have two fuel tanks. In this case the reading will be shown of the combined fuel level in both tanks.

(Fuel level sender – continued from previous page)

Safety Hazard ! Please read this:

Be careful when installing fuel level senders into fuel tanks. Ensure that the fuel tank is completely empty when you proceed with the installation. Ensure that the fuel tank is well ventilated and does not contain any fuel vapors – these are highly explosive when mixed with air. Ensure that at all times the ground connection (the connection of the fuel level sender mounting flange) is securely connected to the aircraft frame (in case of a metal frame) and to the negative terminal of the battery. In addition the negative terminal of the battery must at all times be connected to the Supply ground terminal of the RDAC EIS.

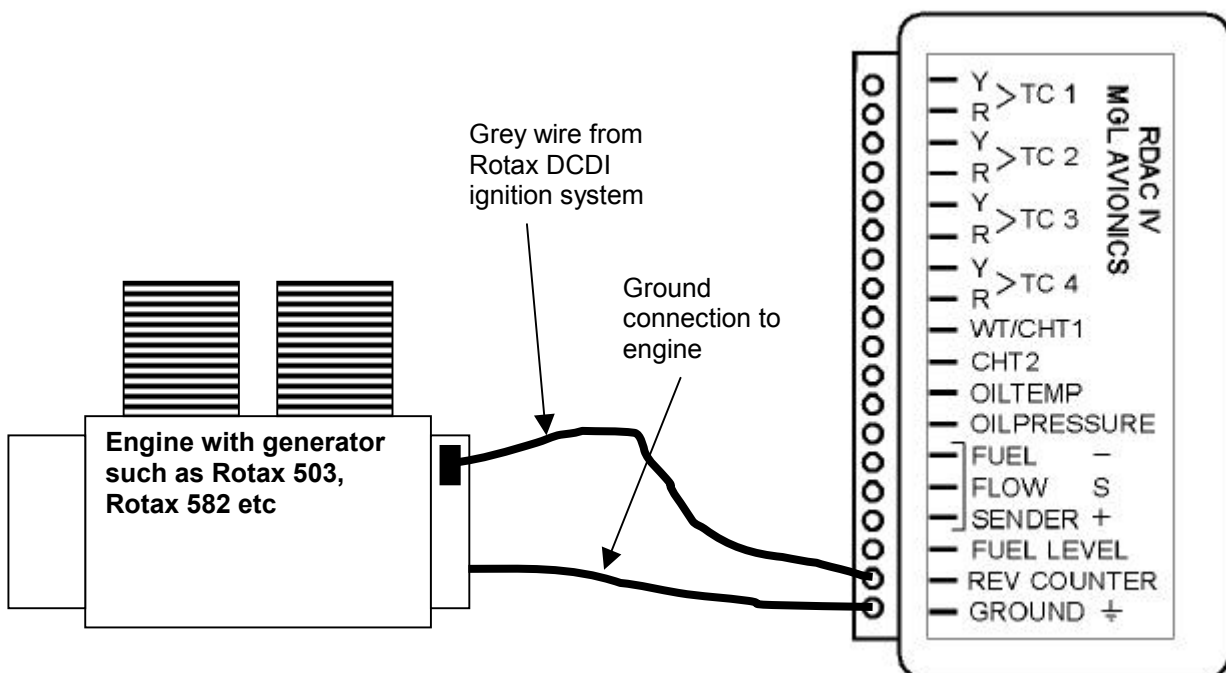
Please note – this wiring is critical and must never break in flight. It would be possible to create electrical sparks in the fuel tank if your wiring is faulty or incorrect. The consequences of this can be imagined. This has nothing to do with the RDAC EIS itself but is a general hazard for any automotive fuel level sender installation.

If you have no experience with electrical wiring, **PLEASE** delegate the task to a qualified automobile electrician or electronics technician.

If you need to remove the RDAC EIS, please first disconnect and secure the fuel level sender wire before disconnecting anything else.

Connecting the rev counter

Typical connection in case of a Rotax two stroke engine with Ducati dual ignition.

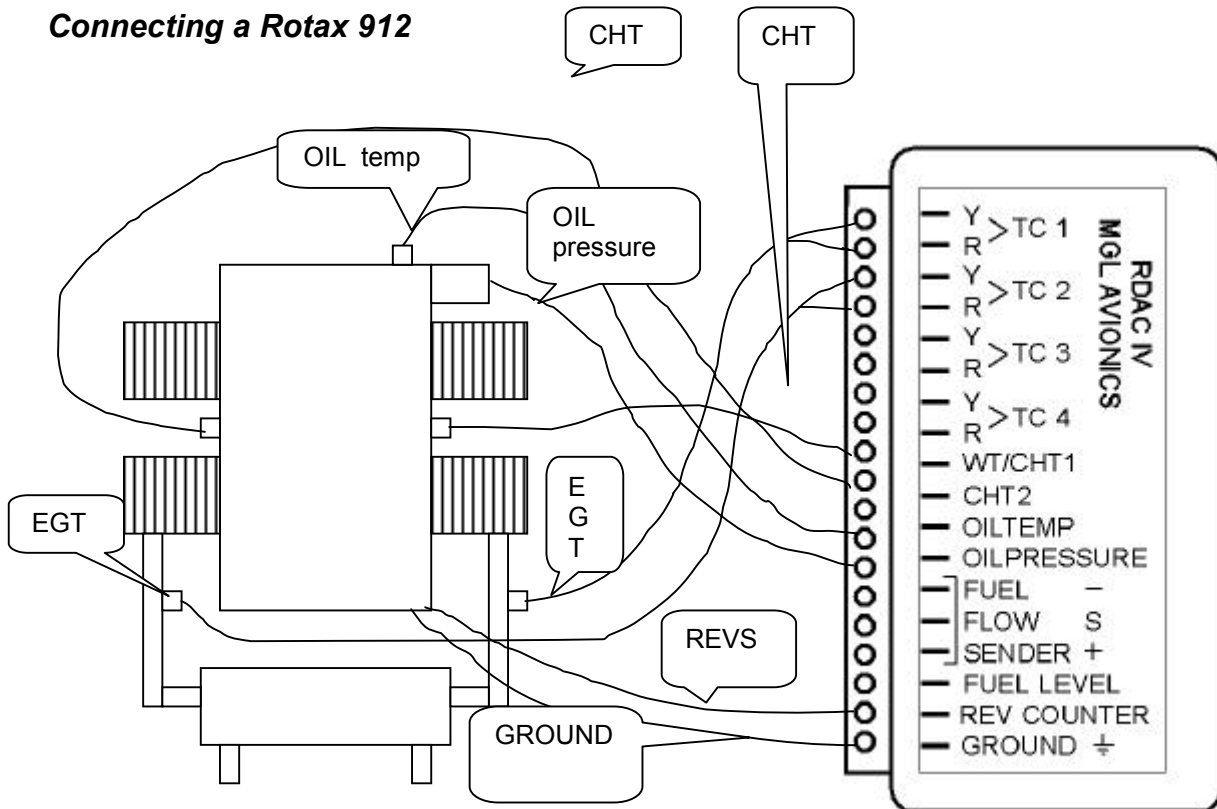


The Stratomaster Ultra assumes as a default that you will be connecting a Rotax with DCDI ignition system. Such a system produces 6 pulses for every revolution of the engine. Other engines can be used but you must adjust the rev counter calibration setting accordingly (Device basic setup menu). The value entered is for 10 revs.

Rotax 503,582,618 DCDI - value 60.
Rotax 912,914 – value 10.

The rev counter input can be connected to a variety of different sources such as the low voltage side of a ignition coil (at the points contact breaker) or to rev counter outputs of fuel injection computers.

Note: The RDAC EIS package contains a 220 ohm resistor. Normally you would not need it. We have found a few Rotax engines that create a very noisy signal where you will need to use it. The problem manifests itself by several rev band regions giving unstable rev readings. Should you be unlucky enough to have one of these systems, please connect the resistor between the rev counter input and the ground input in parallel to your connection to the grey rev counter wire from the engine.

Connecting a Rotax 912

The Rotax 912/914 contains two built in NTC type CHT temperature senders. In addition oil temperature and oil pressure sender is provided as standard.

Due to the fact that the 912 has two carburetors (one for each side of the engine), two EGT probes should be connected, one for each exhaust stack. You can connect four EGT probes if you like. In this case the relevant EGT displays will indicated the highest reading of any two pairs of probes. You would use TC1 and 3 as one pair and TC2 and 4 as the other pair. Each pair monitors one side of the engine.

CHT1 and CHT2 connect to the standard CHT senders, again one for each side. Connect oil pressure and oil temperature and you are done.

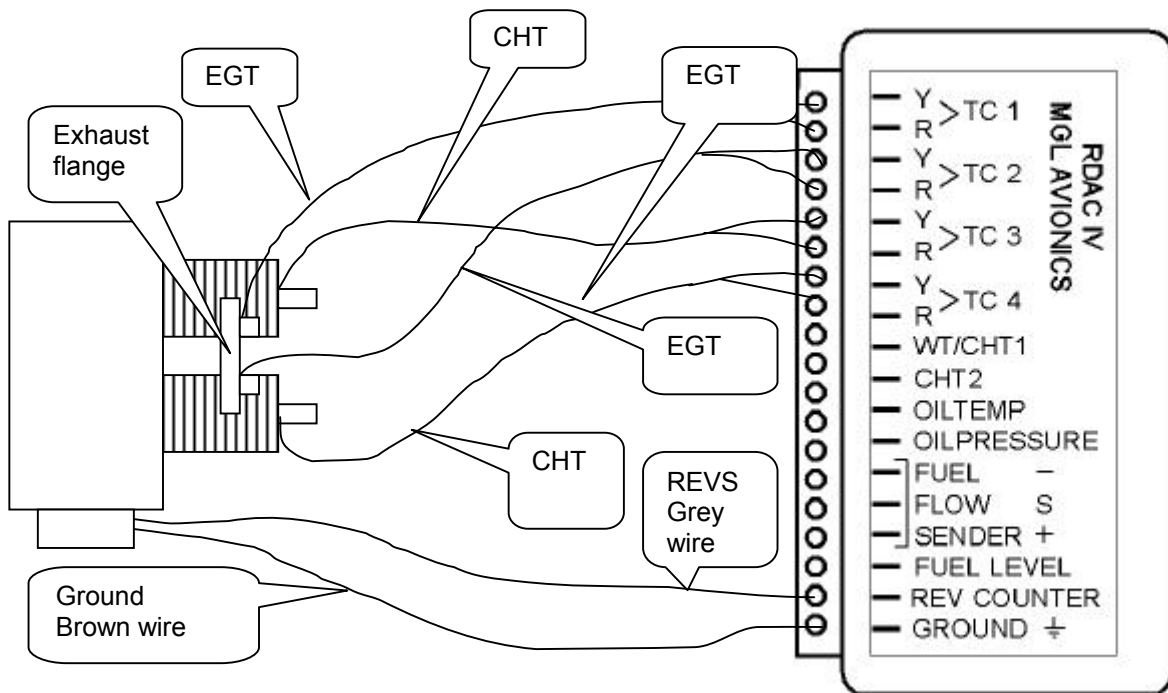
In the Stratomaster Ultra, use "Engine quick select" to choose the 912 setup and then use "Engine detail setup" to change any settings to your liking.

Connect the Rev counter wires (blue/yellow and white/yellow) as follows: One of the two wires to the Ground terminal of the RDAC, the other to the REV counter input. It is recommended to also connect the supplied 220 ohm ballast resistor. Connect one end to the Rev counter input, the other to the Ground terminal of the RDAC.

Do not forget to set the "rev counter setup" in the "Basic setup menu". Select a value of 10 as the engine generates one pulse for every revolution.

Please note: Most of the senders are "grounded configurations" This means they connect electrically to the engine block. It is vital for good and stable readings that you connect the "Ground" terminal of the RDAC to the engine block using a short, good quality electrical connection.

Connecting a Rotax 503



Connecting a Rotax 582

Note: CHT is optional on the 582.

