ALFA

MEDALIST

Owners Manual

Rev 1.0, June 2023

Small Systems Specialists

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Introduction:

Congratulations! You have just purchased the latest in rally technology. ALFA brand rally computers, clocks and odometers have led the industry since 1981. The ALFA-Medalist pulls together all of the features you need to compete and win in one simple to operate, streamlined package. The system combines GPS synchronized time of day with a precise, correctable, odometer which can use either the GPS or a wheel/transmission mounted sending unit as its source. Built in battery backup insures that the system will continue to function even when vehicle power is completely lost.

Installation:
The ALFA-Medalist weighs only 11oz, and is easily mounted to your dashboard using the supplied 3M Dual Lock fasteners. The ALFA should be mounted on a flat surface, with the LCD display facing towards the operator. The GPS antenna is mounted on the top of the ALFA and should have a clear view of the sky through the windshield. You can fine tune the GPS reception using the GPS monitoring feature, described elsewhere in this manual.

There is a single electrical connection point on the right side of the ALFA-Medalist. This connector is "D" shaped and can not be plugged in backwards. Please be sure to plug the connector straight into the receptacle without twisting it to avoid damage. When fully inserted, snug the two screws into place to prevent the connector from accidentally coming loose.

The ALFA-Medalist is supplied with a pre-wired plug which connects power, optional wheel sending unit, and optional remote hold input. Both a lighter plug and a power cord for direct wiring are provided and plug into the pre-wired connector. Electrical connection details are elsewhere in this manual. Make sure all wires running to the ALFA-Medalist are secured for maximum reliability.

The ALFA-Medalist can operate from any DC source in your vehicle, from 6 volts up through 16 volts. You may connect directly to a fuse or to the battery, or use the included lighter plug. Caution: Lighter plugs are notoriously unreliable, so please make sure there is no stress pulling the plug from its socket.

Power On :

The *ALFA-Medalist* does not have a power on/off switch! As soon as you insert the battery, or plug in the 12-volt power cord, the unit begins working. (Without a power switch, it becomes impossible to accidentally shut off the clock in the middle of a rally.) To insert the 9-volt battery, slide the battery cover off of the bottom of the *ALFA* to expose the battery compartment. The battery attaches to the snaps found inside the compartment. To make sure the battery snaps fit snugly (with a "click") you may have to occasionally give the snaps a gentle squeeze.

It is important to use *only 9-volt* ***Alkaline*** batteries in your *ALFA*. (Energizer and Duracell are examples of appropriate batteries.) In normal operation, the battery will last for 10 - 20 hours of continuous operation. This life will vary depending upon the display lighting and other selected options. We suggest a fresh battery for each full day of operation for best results. Normal operation is from an external 12-volt power source, in which case the internal battery is used as a backup and will not drain.

When the *ALFA* first turns on, it will briefly display its serial number, and then will begin normal operation.

Operation:

Your new *ALFA* clock has two modes of operation: "RUN Mode", which you will use during competition, and the "SETUP Mode" where you may change various options, calibrate the odometer and configure the wheel mounted sending unit. (If installed)

The various controls on your ALFA-Medalist are:

1. The **LCD** display shows the user all time, speed and distance information. It is also used to show interactive menus to configure the ALFA for use. The display lights up for use at night.
2. The ∧ ∨ **SWITCH** is used to control the direction of the odometer, and to set numeric values. This is a spring loaded switch which may be moved upward (forward, increment or next) or downward (reverse, decrement or prior).
3. The **ADJUST** switch is used to adjust the odometer reading, select a digit, or enter the SETUP mode. This is a spring loaded switch which moves horizontally.
4. The **HOLD BUTTON** is used to split (freeze) the clock and odometer display. It also is used as an ENTER button while setting certain functions.
5. The **BATTERY COVER** is located on the back side of the *ALFA*.
6. The **DB9 CONNECTOR** provides a single-point plug in for power, remote hold, time sync and *Rally-Link* ™ communications.

The three modes, Clock, Odometer and Setup, are accessed by moving the SETUP/CLEAR switch upward to the SETUP position.

Run Mode:

The ALFA-Medalist continuously displays your odometer, speed, and time of day on the LCD display. In addition there are icons which show the sensor being used, the status of the GPS receiver, and the condition of the battery.

The odometer is fully factor correctable, and can display distance in miles or kilometers. The correction factor is a 6 digit additive factor, and its adjustment is described below. The odometer is internally measured to 8 decimal places, and is displayed normally to 2 decimal places while running and 3 decimal places in Hold (Split).

The time of day clock can work in either seconds or hundredths of a minute. The clock is displayed to the second or hundredth while running and 1/10 second or 1/1000 minute while in Hold (Split). (Note: The ":" between the hour and minute will flash for about 15 minutes after the ALFA is first turned on. This indicates that the GPS time sync may not yet be precise.)

The speed display is optional, and displays factor corrected speed to 1 mph or kph. Speed is not displayed in Hold (Split).

Pressing the HOLD button will alternately freeze and release the time and distance on the display, and the word "HOLD" will flash on the screen. These continue to progress unseen, and the up to date values are displayed as soon as the Hold is released.

Moving the Adjust switch to the left will allow you to change the odometer reading. You may adjust the odometer while it is running or in HOLD. You enter the reading which was desired at the moment HOLD or Adjust was pressed. The ALFA will automatically update the odometer reading for that moment, regardless of if the car is moving or standing still. In the odometer entry mode, the Adjust switch selects which digit to change, and the ∧ ∨ switch changes the value of that digit. When you've entered the desired reading, press ENTER to return to the normal Run mode. If you've entered and incorrect value, or wish to abort the odometer change for any reason, press the ENTER button for at least 3 seconds.

(Note: Any time you are asked to hold a switch or button for 3 seconds, the ALFA will beep when the time is reached. Hold the switch or button until you here the beep, then release it.)

While the odometer is running, the ∧ ∨ switch controls the direction of the odometer. Pressing the ∧ ∨ switch upward causes the odometer to run forward, pressing it downward once parks the odometer (odometer off) and downward again runs the odometer in reverse. Note that the shape of the decimal

point in the odometer display indicates the direction of the odometer. Note that Park is not the same as Hold. When the odometer is parked, all odometer counting stops, but the clock continues to display the actual time. When placed into Forward or Reverse, the odometer will resume counting from the parked reading. When in Hold, the clock and odometer are frozen on the screen, but continue to count normally in the background.

Moving the Adjust switch to the right, and holding it for at least 3 seconds, will reset the odometer to zero. Moving it to the left, and holding it for at least 3 seconds, will enter the Setup mode.

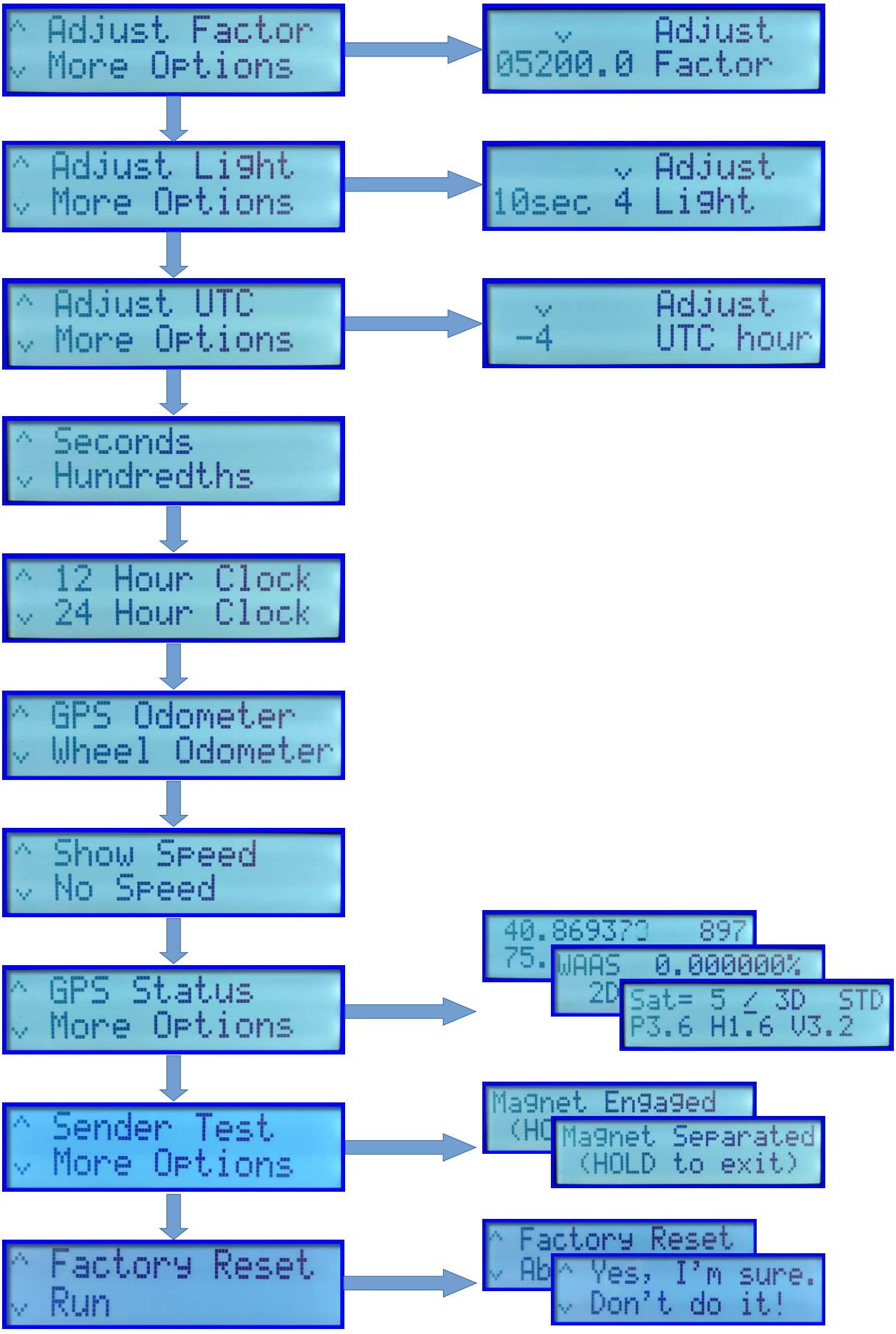
Setup Options:

Activate the Setup mode by moving the Adjust switch to the left, and holding it for at least 3 seconds. This mode is where you set the odometer factor, and other operating features of the device. At any time during the setting of values or options, you may press the HOLD to abort and access the standard Run mode. Press the HOLD for more than 3 seconds to undo the current input and return to Run mode.

Whenever a menu appears, make a selection using the ∧ ∨ switch. To select the option on the top line of the display, press the ∧ ∨ switch upward, and to select the option on the lower line of the display press the ∧ ∨ switch downward. For menus requiring that you enter a value, the HOLD button will serve to enter the value.

These are the options currently available:

(Continues Next Page)


^ Adjust Factor
v More Options
v Adjust
05200.0 Factor
^ Adjust Light
v More Options
v Adjust
10sec 4 Light
^ Adjust UTC
v More Options
v Adjust
-4 UTC hour
^ Seconds
v Hundredths
^ 12 Hour Clock
v 24 Hour Clock
^ GPS Odometer
v Wheel Odometer
^ Show Speed
v No Speed
^ GPS Status
v More Options
40.869370 897
75.
WAAS 0.000000%
2D
Sat= 5 / 3D STD
P3.6 H1.6 V3.2
^ Sender Test
v More Options
Magnet Engaged
(HO
Magnet Separated
(HOLD to exit)
^ Factory Reset
v Run
^ Factory Reset
v Ab
^ Yes, I'm sure.
v Don't do it!

Odometer Factor:

To set the odometer correction factor, enter it in the same manner described for presetting the odometer. The correction factor is used to calibrate your *ALFA* odometer so that it measures the same distance as the rally-master for easier course following. The correction factor works exactly the same way regardless of using GPS or Wheel mounted sensors.

To determine your odometer correction factor use this formula:

$$\text{New Factor} = \frac{\text{Current Factor}}{\text{Measured Miles}} \times \text{Course Miles}$$

For example: Start the odometer leg with the factor set to 5000. The end of the odometer check leg is officially at 12.56 miles, but your *ALFA* measured only 11.21 miles. 5000 divided by 11.21, multiplied by 12.56 equals 5602. 5602 is your new factor and should be entered into your *ALFA*.

Format Clock:

The displayed format of the clock may be switched between several popular formats. The clock will record all holds (splits) at maximum resolution, 1/10th of a second or 1/1000th of a minute, regardless of the display setting. Available time formats are:

HOURS:MINUTES:SECONDS.TENTHS	09:43:14.4
HOURS:MINUTES:SECONDS	09:43:14
HOURS:MINUTES.HUNDREDTHS.THOUSANDTHS	09:43.24.0
HOURS:MINUTES.HUNDREDTHS	09:43.24

Additionally, the clock's hours may be displayed in either 12 or 24 hour format.

Backlight:

Your *ALFA* has an adjustable backlight. It may be turned on or off, has 5 brightness settings, and an automatic setting which preserves battery life. *The best battery life is obtained when the backlight is completely OFF.* The LCD display used in the *ALFA* is a type which has extremely good viewing characteristics with no backlighting while in normally lit situations. The backlight is only necessary in darkness.

The best compromise is to use the AUTOMATIC backlight setting when you are running the *ALFA* on battery power. This setting turns on the backlight for several seconds whenever any switch is activated. You may set the backlight to remain on from 5 to 30 seconds, or it may be turned off. When running on external 12 volt power, the backlight is always on.

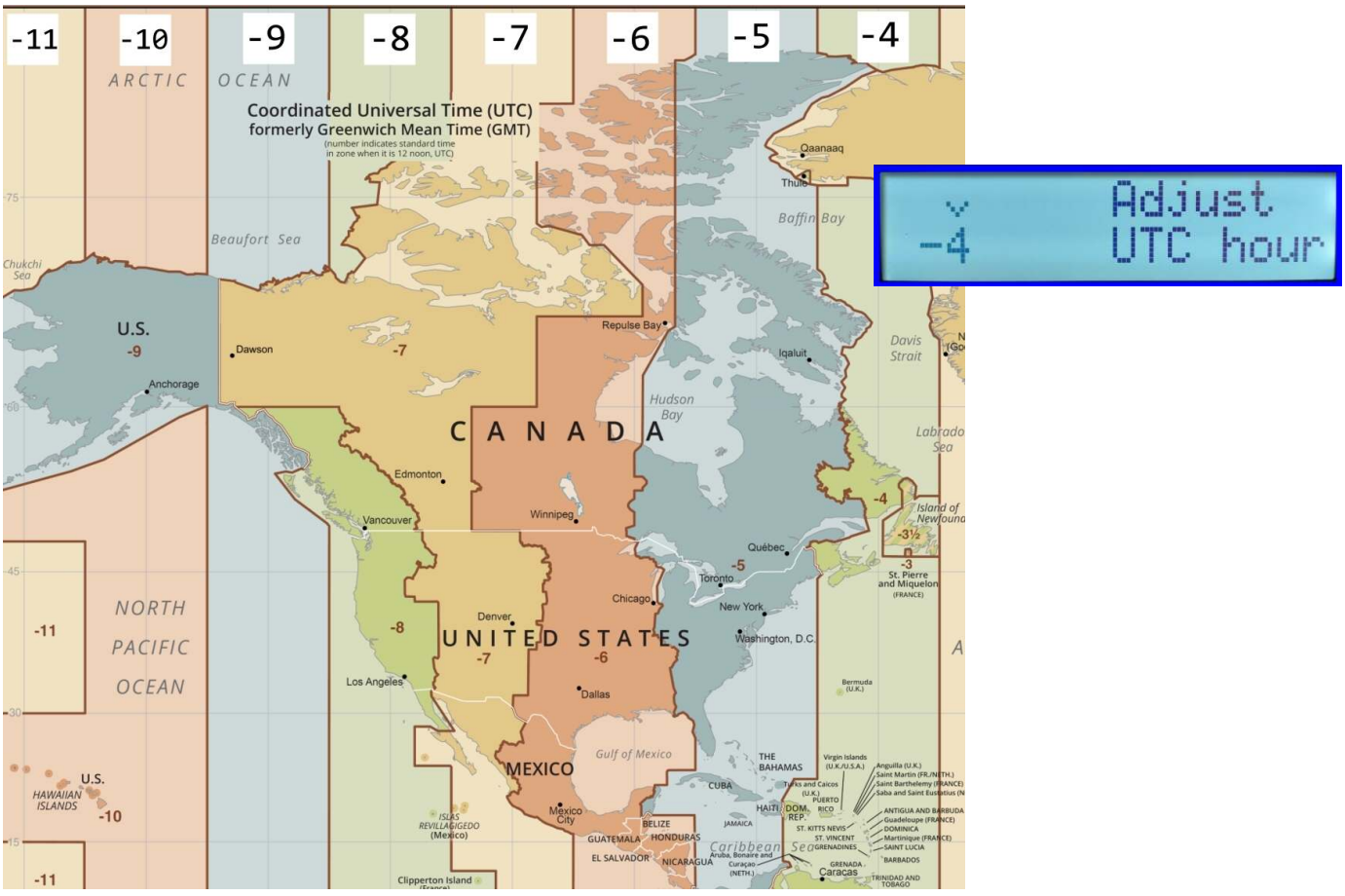
Note: Battery life will be extremely limited if the backlight is on constantly.

Sending Unit Test:

Installing a wheel mounted sending unit on your rally car has always been a challenge. Selecting the Sending Unit Test mode provides visual and audio feedback of when the sensor engages and releases each magnet. This makes alignment of the magnets easy, and insures that you're getting all of your pulses all of the time. (Shameless Plug: For an easy to setup and use wheel mounted sending unit, try our EZ-Pulse. It takes just minutes to mount on any car, including rentals.)

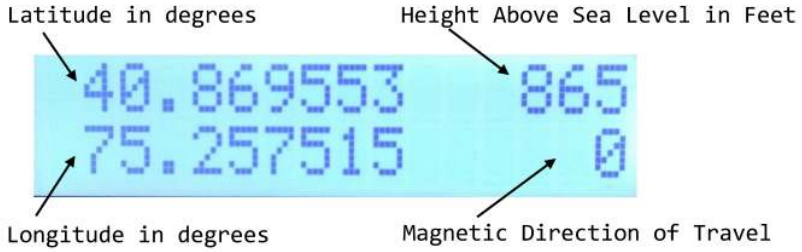
UTC Adjustment:

The GPS clock supplies the time of day in UTC. (UTC is also known as GMT or Zulu time) In order to display the correct local time, you must enter your time zone difference from UTC time. This setting will vary depending upon your location and whether Daylight Savings Time is active. For example, New York during Standard Time would be -5 hours, and during Daylight Savings Time it's -4 hours.

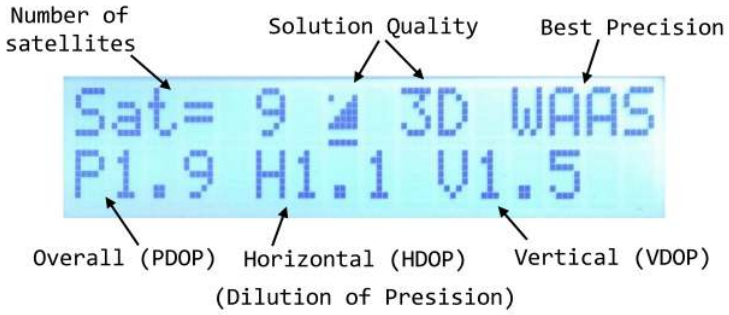


GPS Status:

When mounting the ALFA-Medalist equipped with a GPS, it is important for it to have a clear view of the sky with the antenna facing upwards. The antenna is located at the top edge of the unit, and faces upwards when the LCD display is facing towards the operator. Good reception is essential to accurate measurements, and so the GPS Status screens are available to you to help optimize your installation. There are three GPS Status screens. Use the ∧ ∨ switch to view them:



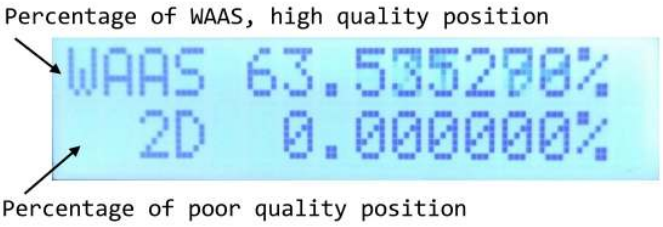
Screen 1 is simply a direct readout of the current position information being provided by the GPS receiver. The Latitude and Longitude are provided in decimal degrees, and not the more common degrees, minutes and seconds. The height is given in feet above mean sea level.



Screen 2 is crucial for setting up your devices position for good reception. Ideally, you should maximize the number of satellites being received, and the WAAS indicator should be on. (See “GPS Operations” for the meaning of the signal quality symbol.)

For the GPS to provide any service at all, at least 3 satellites need to be received, which will only provide a two dimensional location with very low precision. With 4 or more satellites the receiver can generate a three dimensional position with much higher accuracy. The more satellites, the more consistant the position will be. The best precision is obtained with the WAAS indicator on. (vs STD) (WAAS is a GPS correction system. See GPS Limitations below.) Driving through hilly or urban areas makes it even harder to receive satellites, and so optimizing these readings is critical.

The bottom line of the display shows the “Dilution of Precision” of the received GPS signals. How precisely a GPS receiver can fix a position depends upon the geometry of the orbits of the available satellites, how many are blocked by local geography, and other environmental considerations. The lower these number are, the better the position and the more consistent your odometer will be. PDOP is the overall quality of the position, taking all factors into account. HDOP and VDOP are the horizontal and vertical precision. A DOP of 1.0 is nominal, giving around 8 feet accuracy 95% of the time *under ideal conditions*. The DOP is a factor which essentially multiplies this error.



Screen 3 gives an idea of GPS quality over time. After a rally, or a test run, this screen shows the percentage of time that WAAS signals were received, showing a high quality signal over time. It also shows the number two dimensional, low quality, signals received over time. Ideally, the WAAS line should be close to 100% and the 2D line should be near zero.

GPS Odometer Limitations:

The Global Positioning System, or GPS for short, is all the rage these days. Most people think of it as magically precise, and for many purposes it is just that. However, as rallyists, we have great expectations for precise mileage measurements and there are technical issues with GPS which conspire to make it less precise than a traditional wheel-mounted sending unit. Using the ALFA-Club with its built-in GPS odometer will provide a huge level of convenience and generally accurate and correctable mileages, however you should be aware of the system's inherent limitations.

"GPS" is a term which can apply to several different systems, with different capabilities. The United States, Russia, China, Japan, India and the European Union currently each have their own "GPS" system in orbit. The USA system is the oldest and most well known, but the Russian system works well too, and the other systems are under construction but will shortly give the USA system a run for its money. The USA system requires 24 satellites to be fully operational, and presently has 33 in orbit. These satellites are in constant motion, and each rises and sets roughly every 12 hours.

The ALFA-Club uses a receiver which operates on both the USA and Russian systems. In addition, it uses a supplemental system called WAAS, or Wide Area Augmentation System. WAAS monitors the system using ground stations and relays correction data via geo-synchronous satellite. While WAAS, and systems like it, make the position data more accurate, the 22,000 mile stationary orbit makes receiving the signal a bit more difficult. You will see that the WAAS indicator takes a while to "lock on", and can be lost from time to time while driving around. The WAAS service is designed to operate within the USA, but is interoperable with other services, including those operated by Japan (MSAS), Europe (EGNOS), and India (GAGAN).

GPS accuracy is a much debated subject, and the answer is not simple or a single number. The Air Force, which operates GPS in the USA, says a typical cell phone GPS under ideal conditions is good to about 16 feet. The GPS receiver in the ALFA-Club is considerably better, with accuracy possible to less than 6 feet with WAAS and about 8 feet without it – *under ideal conditions.* However, this accuracy is assumed to be during 95% of the time, while during the other 5% of the time it could be considerably worse even under good conditions. In rally terms, think about a checkpoint being misplaced by 8-16 feet, this might not bother some, but experienced Equipped class rallyists would not be happy. This is under IDEAL conditions, which rarely exist on a rally route in motion.

So, what sorts of things affect GPS accuracy:

- Satellite signal blockage due to buildings, bridges, trees, etc.
- Signals reflected off buildings or terrain ("multipath")

- Location of the GPS antenna, its view of the sky, and metallic window tinting.
- Radio interference
- Indoor or underground use (Not usually a rally problem!)
- Major solar storms
- Satellite maintenance/maneuvers creating temporary gaps in coverage

These type of inaccuracies may happen individually or in groups, and can cause small, but rally significant, jumps in position. The government web sites which track GPS problems, gps.com and uscg.gov, are loaded with reports of GPS suddenly jumping ½ mile or more and just as suddenly returning, with matching data on multiple receivers. Scheduled outages and testing make GPS all but unusable from time to time in specific areas, and these are scheduled on the web site. For example, there are 12 scheduled outages for March 2020 in areas all around the USA, some scheduled to last more than a week. One is a 33 mile area of Upstate New York known to host some of the best rallying in the area. The trick is, be aware before you go rally and know what to expect.

The designers of ALFA brand rally odometers have been working with GPS, for both land and air based applications, for nearly as long as the system has existed. Over the years we have designed algorithms to provide the best simulation of a linear odometer possible. Our position data updates 10 times per second to insure a lag-free experience familiar to any rallyist who has used a conventional wheel driven odometer. However, we have to acknowledge that a GPS odometer will never be as accurate as a wheel driven odometer for rally purposes, given the present affordable technology.

GPS Time Limitations:

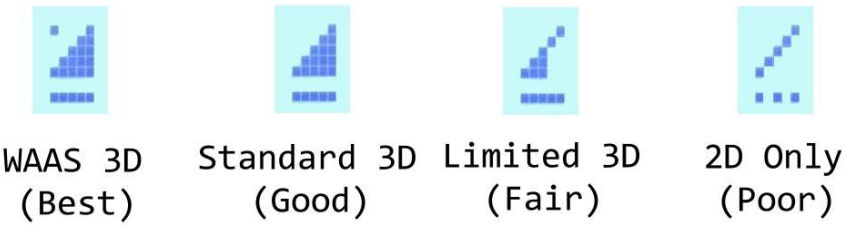
The GPS system works by measuring the amount of time a radio signal takes to travel from space to the receiver. For this to happen it requires an extremely precise clock to synchronize all of the satellites. This gives us an excellent source for our time of day clock in the ALFA-Club. However, there's always a catch, and the catch is that GPS time is not exactly the same as our clock time. During the startup of the GPS receiver, the time of day may be off by as much as a few seconds until the receiver is fully synchronized. Unfortunately, there is no status signal for us to monitor to know when the clock is fully sync'd. If the GPS has been running within the past few hours, the time is correct almost immediately. But, during a "cold start" where the GPS has been turned off for days or has been moved a significant distance from its last use, it could take several minutes for the clock to be on-time. Our testing has shown a maximum of 15 minutes is required for the clock to become accurate, even if the odometer has begun functioning much sooner. Please allow for this and power up the ALFA some time before its needed to assure accuracy.

GPS Operational Information:

- Chipset: UBX-M8030-KT
- 56 Channels
- Cold Start time < 1 minute
- 10 position reports per second
- 115,200 bps data transfer speed

Those are the official numbers. In practice, please allow a few minutes for the GPS to acquire its signal and begin tracking. You will see the signal quality indicator gain bars over the first few minutes as the receiver syncs up. It is best to start the receiver 15-30 minutes ahead of its anticipated use to assure both time and distance are up to spec.

The signal quality indicator show a combination of accuracy and number of satellites being used for tracking. The overall signal is shown as “bars” similarly to cell phone or WiFi signal indicators. An additional dot appears above the bars when the WAAS signal is received. If the signal is tracking, but at a very low, two dimensional, precision the underline will appear broken.



Flash Memory:

The ALFA-Club uses a Flash (non-volatile) memory to store certain settings and the checkpoint memories. It stores:

- Unit serial number
- Crystal/Clock calibration information
- Time format
- Odometer format
- Backlight configuration
- GPS configuration information

The ALFA-Medalist does NOT store the odometer when the power is removed. The time will be immediately restored when the GPS starts up. The GPS has its own battery which keeps time during power down for several hours.

In The Box:

- ALFA-Medalist main unit.
- Cable with connectors for power, remote hold, and external odometer sending unit.
- Lighter Plug.
- Velcro mounting material.
- This owners manual.

Options:

- Basic Sending Unit. (wheel mounted magnetic sensor with rare-earth magnets)
- EZ-Pulse hub mounted (removable) sending unit.
- GPS-Pulser external GPS receiver which supplies odometer pulses similar to the wheel mounted sending units.
- Hand-held Remote Hold switch.
- Additional connectors and cables.

Notes:

1: You should keep a battery in your ALFA clock as a power backup in case the 12 volt cord falls out of the lighter plug.

2: It is best to wire the ALFA directly to the battery or fuse box, and not use a lighter cord. Use a lighter cord only for temporary installations.

3: **The ALFA sending unit will operate from 5-16 volts DC**. If you use another brand sending unit, make sure it will withstand the 12 volt power source.

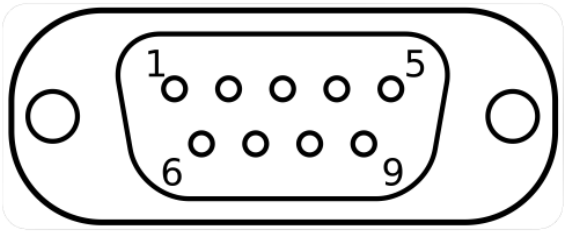
4: You can connect the pulse input directly to the pulse output of most car's Vehicle Speed Sensors (VSS). In this case, DO NOT connect the 12 volt power to the VSS – it gets its power from the car's system independently. See WWW.RALLY.CC for connection details. *NEVER USE THE ABS BRAKE SENSOR AS AN ODOMETER INPUT!*

5: When using the ALFA-Medalist with an external sending unit, it should be powered from the car's 12 volt system. Battery life is limited when powering external devices.

Connector Information:

This information is provided for the technically curious and otherwise insane user. There is no need for most users to read or understand this section. The manufacturer of this *ALFA* Clock/Odometer takes no responsibility for damage caused to or by, this or any other equipment, when created or wired by the user.

The 9 Pin DB9 male connector on the right side of the ALFA is its outlet to the rest of the world. The pins for the mating connector are defined as follows:



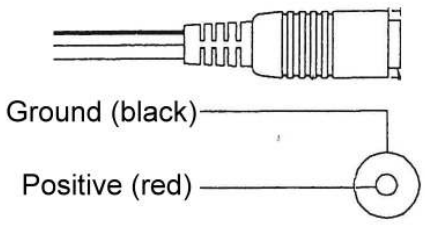
Female DB9 connector as viewed from the solder side

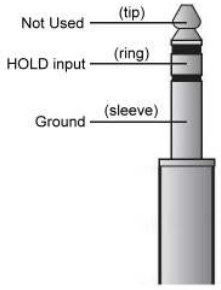
1. 12-volt DC power Input. The *ALFA* requires a minimum of 6-volts DC to operate. Power consumption is approximately 35ma without the backlight, 50ma with the backlight full bright.
2. Serial communications Output. (0-5v signal, idle high)
3. Serial communications Input. (Accepts either 0-5v signal or RS-232)
4. Remote Hold switch input for momentary switch. (Toggles Hold each time the switch is closed)
5. Ground.
6. 5-volt, ½ amp output. (May be used to power external sending unit or other devices)
7. Do not connect
8. Odometer Input. (Negative edge triggered)
9. Remote Hold switch input for latching switch. (Unit is in Hold only while switch is closed)

Power Cord:

The ALFA-Medalist is supplied with a pre-wired DB9 which splits off the power, sending unit, and remote HOLD inputs.

- Power is input to a 2.1mm x 5.5mm female barrel connector, center pin is positive.
- Sending unit input is to an RJ45 modular jack. Pin 2 is +5v output, Pin 4 is the signal input, and Pin 7 is ground.
- Remote hold is a 3.5mm 3 conductor jack. The tip is unused, ring is hold input, and the sleeve is ground. This connector is wired to the DB9 latching input described above.





ALFA-Medalist Quick Reference Card

Run mode:

- Up, Down: Odometer forward, park, reverse modes.
- Left: Adjust Odometer. (Works in motion)
- Left 3 secs: Setup mode.
- Right 3 seconds: Quick odometer zero. (Use standing still only)
- Hold: Freezes displays (Split) in high precision.

Hold Mode:

- Left: Adjust odometer. (Works in motion).
- Right: Zero odometer. (Works in motion).
- Hold: Exit to run mode.

Adjust Odometer Mode:

- Up, Down: Adjust selected digit.
- Left, Right: Select next digit to adjust.
- ENTER: Enter new value into odometer.
- ENTER 3 secs: Abort – Use original odometer.
- Right 3 secs: Quick set to zero.

Setup Mode:

- Adjust Factor
  - Up, Down: Adjust selected digit.
  - Left, Right: Select next digit to adjust.
  - Hold: Use new factor.
  - Hold 3 secs: Abort – Use original factor.
- Adjust Backlight
  - Up, Down: Set brightness or timeout.
  - Left, Right: Select brightness or timeout. (“Cont” = Continuous light)
  - Hold: Use new settings.
- Adjust UTC hour offset.
  - Up, Down: Adjust hours. (Negative numbers are west.)
  - Hold: Use new hour offset.
- Seconds/Hundredths select. (HOLD to exit without change.)
- 12/24 hour clock. (HOLD to exit without change.)
- GPS or Wheel odometer. (HOLD to exit without change.)
- Show Speedometer/No Speedometer. (HOLD to exit without change.)
- GPS Status
  - Up, Down: Select screen:
    - Lat, Lon, Elevation, Speedometer.
    - Satellite status and signal condition (PDOP, HDOP, VDOP).
    - % of high precision WAAS readings, % of poor 2D readings.
- Sending Unit installation test:
  - Shows magnet engagement with sensor.
  - Hold: Exit to run mode.
- Factory Reset
  - Provides 2 chances to abort.
  - Returns all settings to factory defaults.

WARRANTY:

Your *ALFA* is warrantied against defects in material and workmanship for a period of one year from the original date of purchase. This warranty does not cover any parts broken due to abuse, neglect, normal wear or misuse of this product as determined by Small Systems Specialists.

The Liquid Crystal Display is warrantied against electrical failure for one year, but not against breakage of the glass enclosure.

Although every effort has been made to assure reliable and accurate operation, Small Systems Specialists is not responsible for any loss of money, property, time, or trophies due to the malfunction of this product. Good operating practice dictates that the user verify the product is in good working, and the operator has been trained in its use, order before it is relied upon in competition.

The ALFA, like many electronic clocks, may require periodic calibration. This function will be performed for the cost of shipping and handling only at any time during the life of the product.

Updates may become available from time to time for this product. Software updates are free, plus the cost of shipping. Hardware update prices will vary depending upon the situation.

All prices and specifications are subject to change without notice.