Survmaster3 Precision Odometer Mk 3. Firmware version F1.001

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www.survmaster.com

The Survmaster3 1998 model is a distance measuring meter designed to fit to 12 volt road vehicles having either negative or positive ground. The surveymaster case of the Mk3 model is not electrically connected to ground so no damage will occur if it is fitted to a positively grounded vehicle. This model should not be used directly from a 24 volt supply. The device will measure in kilometres to three decimal places (i.e. metres) or in yards or feet according to how it is calibrated via the three digit calibration figure. Max speed is 140km/hr. Survmaster3s come in one of two models; the Survmaster3 PC has a 9 pin socket on the base which will communicate its' distance readings to a personal computer running suitable software. A fully functional 'Windows' program for road data collection is available FOC with the Survmaster3 PC and Surveymaster 'Video'. An option is the standard plug kit which allows the Survmaster3 to be removed quickly from the vehicle. The sensor and part of the plug kit remain in the vehicle.

installation:

The functionality should be tested by wiring-up the full system to a battery on the testbench before fitting to car.

The motion of the vehicle is detected by one of the electronic sensors which can be fitted to a speedometer cable as per the instructions in the separate sheet. If the vehicle does not have a speedometer cable then the meter can derive its' motion information from different types of sensor. Vehicles which have an electronically controlled speedometer fed by digital puses can work the Survmaster3 via a 'Dividing Prescaler' which is one of the available options. This part is available from the English manufacturers. A further optional sensor is an easy fit gearbox sensor which fits most Japanese vehicles as they have standardized almost all of their speedometer fittings to M22 x 1.5 size. If none of the above sensors are appropriate then a M12 x 1.0 wheel type sensor can be fitted to detect the bolts which hold the brake disc to the rotating wheel hub, or a BRH22 sensor can detect the rotation of a transmission shaft. Some fabrication of brackets will be necessary for these last two options by the engineer fitting the meter to the vehicle. The Survmaster3 can be mounted in the vehicle by means of brackets to the favoured location within the vehicle. We recommend soft Aluminium strips for this purpose fastened to the four corner screw holes of the meter or better still, 'VELCRO hook and loop' so as to present low injury risk in the event of a vehicle collision.

Wiring: Two cables come out of the base of the Survmaster3. The grey cable goes to the sensor only and is connected as described in the white sensor fitting sheet. If this cable or any of the wires in it are connected to anything other than the sensor then permanent damage will result. The universal speedo cable sensor goes Bn to Bn, Gn/y to Gn/y, Bu to Bu. The black cable emerging from the base of the Survmaster3 is the power supply cable. The brown wire within this cable goes to a +12 volts supply which should be fused at no more than two

amps. The supply should be permanent (i.e. does not go on or off with the ignition switch) and is best derived directly from the vehicle's battery terminals to avoid the meter being affected by other devices on the vehicle being switched on. The green/yellow wire within the black cable goes to the negative -12v. terminal of the battery. The blue wire within the black cable is not used. Important: Connections must be made using screw type terminals only, as crimp and other similar connectors will not give a sufficiently reliable contact to ensure the accurate working of the Surveymaster.

Operation of the Survmaster3:

To make the meter read accurately it must be calibrated to read the desired units. To calibrate to read kilometres to three decimal places (i.e. metres) set the three digits of the calibration switches to 000. Press the projections above or below each calibration digit to move the value of the digits. The meter is switched on by the switch on the right side of the meter. When switched on, the black digits should appear in the lower window of the meter, and the letters CAL will appear in the upper window. Above the on/off switch is the switch for the night lights which only work when the main on/off switch is in the 'on' position. There is a TEST MODE accessed by holding the AMEND button pressed whilst powering up. This gives the firmware version in the top window and reads the thumbwheel value in the low window. The thumbwheel values can be rotated and checked for accuracy. Exit the test mode by releasing the AMEND button. To calibrate, drive to the start of an accurately measured kilometre. The lower read-out should be zeroed by the large rocker switch second down on the right hand side of the Survmaster3. Press the bottom of this switch and then restore it to its' normal central position. Do not leave this switch in the Hold position which is the top fully pressed position, the hold will be described later. Drive the measured kilometre and stop accurately at the end of the distance. A three figure number will be in the lower read-out window. Enter this three digit number onto the three digit calibration switches (bottom right hand corner of the surveymaster). Turn the vehicle around and zero the read-outs at the kilometre mark, drive the kilometre accurately and check that the Survmaster3 measures the kilometre as 1.000 kilometres. It may be necessary to adjust the calibration figure up or down very slightly to optimize the accuracy within advertised tolerance of 99.6%. Tyre pressures on the vehicle should be kept within ten percent of the manufacturer's recommendations as pressures outside this range could affect accuracy. Other functions: Pressing the top of the Reverse switch will cause both read-outs to count downwards. Pressing the top of each large rocker switch marked Hold will cause the related read-out to hold its' figure at that point so that notes can be made, but the changes to that read-out continue to be made inside the meter so that when the Hold switch is restored to its' normal central position the read-out will catch up with the distances traveled and the readings will be as if the Hold had never been pressed. The Freeze switch however is for the upper six digit read-out and pressing the top of this switch will stop the top read-out from moving and any distance traveled whilst the Freeze is operated will not be added to that six digit read-out. The two round push button switches marked PRESET are to enter a given figure onto either the top six digit read-out or the bottom four digit read-out. If the top read-out is required to be set to say 123.456 kilometres at a certain point then the upper button is pressed repeatedly to select each digit to be modified. As a digit is selected it will flash, and this flashing digit can be incremented by repeated presses of the lower button. When all digits have been selected by the upper button the next press will quit the editing mode and return to the measuring mode. Alternatively the DIG button can be pressed for a few seconds until the next digit stops flashing and this will exit the editing mode. Following the successful PRESETTING of a value onto the readouts, this same value can be quickly entered again by first pressing the AMEND button, and whilst holding it pressed, press the DIG button momentarily. This facility could be useful for measuring repeat distances probably counting in the downwards direction.

Reliability: Accuracy is greatly dependent on the quality of installation of the Survmaster3. Attention should be paid to first class electrical supply and connections and vibration free installation of the meter and its' sensor. Very high temperatures can cause failure of any of the electronic components on a temporary or permanent basis. Guard against exhaust heat reaching the sensor, and powerful direct sunlight on the meter. Fluids or exceptionally high humidity will cause degradation of the electronic parts. Powerful radio transmissions close to

the meter from a transmitter or faulty spark ignition systems will degrade accuracy. If it is noted that the meter steps of its' own accord or zeros itself then radio interference is the likely cause and the cause must be fixed.

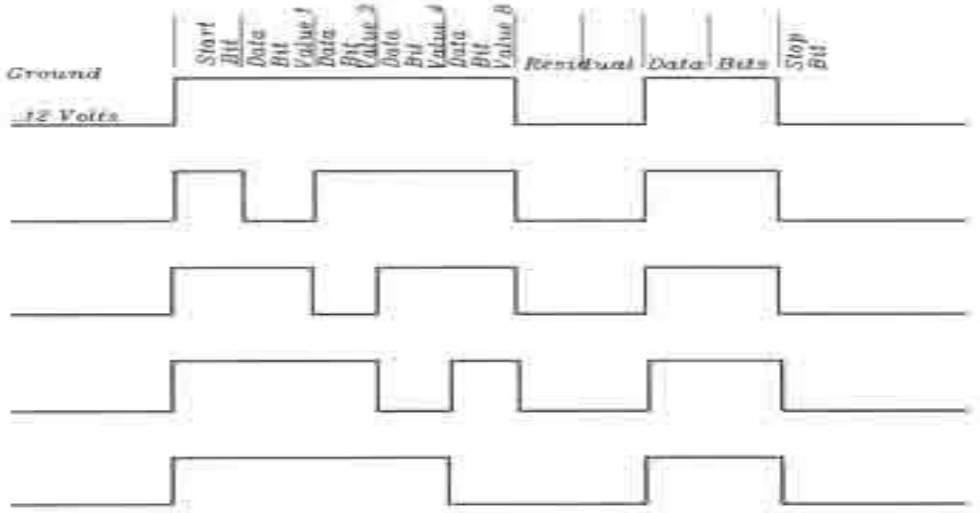
Data Communications format:

9-Pin 'D' Connector to PC serial port set at 9600,N,8,1. Quiescent state = -12volts

Pin 2 = Receive data from the PC.

Pin 3 = Transmit data from Survmaster3 to PC.

Pin 5 = Common ground.



The Survmaster3 PC will talk to Procomm and many other serial comms software packages including a freely available road data collection program (which appears for a free download from www.survmaster.com) as shown in the above graph. Data is derived in text ASCII format 123.456 3.456 ie six digit top readout, space, four digit lower readout. The above chart shows, top to bottom of the diagram, 01248 being sent. Use a standard AT type computer serial printer cable (9 pin to 25 pin or 9 to 9, not a nul modem cable, or if it is to be connected to a 9-pin computer serial port, use a IBM monitor extension cable, possibly with a gender-changer at one end. Data is transmitted on demand when any ASCII character is sent to the meter. The functions are viewed in an extremely self-explanatory way if the meter is connected up to a PC running PROCOMM.EXE. No control of the meter is possible via the comms port other than to demand the information above. The Survmaster3 VIDEO model (Oct 2002 onwards) has a clock which will show only on the screen of the video monitor whilst the distance information is showing. The clock can be set at power-up by holding down the AMEND button, whilst the power ON switch is thrown. The firmware version of the meter shows. Release the AMEND button and the clock digits show with one digit flashing. Amend this digit to 24hour format with the AMEND button then select the next digit to amend with the DIG button. Selecting after the last digit with the DIG button quits the 'time set' mode.

Performance Specification for Survmaster3 Mk3 (April 1999):

Power supply D.C. 11v to 14v at power lead. Fuse 1 to 2 amps.

RF Immunity to standards 89/336/EEC

Accuracy: Minimum corrected calibrated accuracy after deducting vehicle errors = 99.6% +/- 1.0 metre.

For metric calibration: Pulse source should be minimum 3 and maximum 6 per metre travelled. Max speed = 140kph.

Pulse characteristics are Low = less than 1.0 volt, High = more than 4.5 volt but not exceeding 5.1 volt.

High or low minimum duration 2mS measured with meter connected to pulse source.

RS232 parameters 9600 bauds, no parity, 8 data bits, 1 stop bit.

Data demand One ASCII character sent to the meter at the above parameters every 20mS up to 5 times, but only if the previous demand has not been satisfied. Demand rate not more than two per second, excluding repeat demands as above.

Manual for Survmaster1 & 2 precision odometer

The Survmaster 1 special purpose tripmeter is designed for high accuracy measurement from a road vehicle at any U.K. legal speed. The four digit Light Emitting Display features top quality 0.6 inch digits and an accuracy of better than 99.6%. High quality on/off and other controls, along with solid-state electronics ensure reliability in service. The meter measures approximately 120mm x 100mm x 50mm and may be fitted to the cabin area of any 12 volt vehicle in less than two man-hours. Distance information is fed to the meter for correlation from a sensor normally fitted to the speedometer cable drive. See the list of alternative sensors available if your vehicle does not have a speedometer cable. Alterations to the vehicle's road wheel size (such as the fitting of snow tyres, or general tyre wear or the transference to another vehicle can be quickly and accurately accommodated by means of the electronic calibration. The meter has the facility of zeroing the measured readings, counting backwards, and by holding the zeroing button pressed whilst powering up the instrument, the decimal point of the readout will shift one place to the right to show 99.99 km or miles instead of the usual 9.999. Distances do of course roll over when the readout reaches 9999. Calibration procedure is the same for Survmaster 1 and 2 meters: Set the rotary calibration switches to 000 and drive to the start of an accurately measured Km. Zero the readout(s) and drive the distance exactly. The figure which has accumulated on the readout is entered onto the rotary calibration switches. The meter should now be calibrated to read metres accurately. Drive back over the kilometre to confirm this. Calibrate for miles as above but substitute the word 'mile' for the word 'kilometre (Km) '.

The Survmaster 2 has all the facilities of the Survmaster 1 plus a second readout which can be zeroed independently or frozen to take spot readings, and is the popular choice from the Survmaster range if funds will not allow for the Survmaster3, as it permits two readings to take place at on single vehicle journey. Calibration is the same as for the Survmaster 1.

Wiring:

Connections must be of a very high standard as any loose contacts will prevent accuracy. The black cable coming from the base of the Survmaster is wired Brown to +12 volts (which is NOT ignition controlled) and the Green/Yellow goes to -12 volts (normally ground). Use a 2amp fuse. The GREY cable goes to the sensor only, and is wired as directed in the sensor section of the instructions (the universal speedometer cable sensor connects Blue to Blue, Brown to Brown, and Green to Green (/yellow). Incorrect wiring will cause damage. Remember; crimp connections were designed primarily to cause havoc, and occasionally to conduct electricity. Choose screw type terminals or even better, solder them. Meters carry a 12 month warranty which can be extended indefinitely. See www.survmaster.com for full fitting instructions.

Survmaster Compact 1 Precision Odometer

Measuring just 120mm x 60mm x 30mm the tripmeter is designed to be light and transportable. The black digits are backlit and indicate distances in the format 123.456 on one (Total) screen and 123.456 on a second (Trip) screen. Four digits are shown at any one time, the screens can be swapped and the digits can be shuffled along to show the area of the six digit format which is of interest from say 123.4 km to 3.456 km as in the example. The format could read in miles instead of km. The tripmeter head is fitted with a plug and lead so that it is easily removed from the vehicle, leaving a sensor and a socket in that vehicle. Survmaster Compact 1 precision tripmeter. Wiring: The tripmeter plugs into the socket provided. Do not cut into the wiring section between the tripmeter and its' plug. The socket has two cables coming from it. The black power cable contains a brown wire which should be connected to +12 volts via a quarter amp fuse and a switch if you do not wish to use the plug as an on/off connector. The green/yellow wire in the black cable should be connected to -12 volts. The grey cable coming from the socket should have three wires in it and is connected to the sensor. If it is the speedometer cable type sensor the three colours will go to three matching colours on the sensor. On no account should the wires in the grey cable be connected to anything other than the sensor or damage will occur. The sensor is fitted to the speedometer cable so that the inner rotates freely with the inner core of the speedometer cable.

Calibration: Set the four rotary switches to 0000. Take care never to press the + and – switch controls at the same time, or mechanical damage may result. Switch on the tripmeter and proceed to the start of a measured kilometre or mile according to which units you wish to use. Press the Z button to zero the screen you are using and drive the measured distance. The screen flashes alternately as CAL then a four digit number. This four digit number will increase until you reach the end of your measured distance where you should stop. Enter this four digit number onto the rotary switches. Your tripmeter is now calibrated for the car's present combination of gears and tyre size. Note this number and repeat the procedure if you have other tyres or gears you wish to fit during the period of use.

Operation: The digits are permanently backlit, but pressing the L button will increase the backlight intensity whilst the button is pressed. The two screens that are available are selected by alternate presses of the S button. Most buttons need to be pressed for about a quarter of a second to register them. The screen announces 'tot' or 'trip' as an indication of which screen has been selected. Also the 'trip' screen's decimal point flashes whereas the 'total' decimal point is permanent. The viewing area of each (which digits) is moved about with the M button, and can be different for each screen. The value of these digits can be edited by using the H button to select appropriate digits and the M button to amend them. Pressing the H button until all digits have been selected will quit the digit edit mode. The Z button zeros the screen currently being viewed. The R button reverses the direction of count and the words UP and Dn will follow operation of this button as a reminder of the direction selected. Manuals are available on www.survmaster.com

Guarantee

On receipt of your Survmaster unit: _____ Serial No. _____

Read the testing and fining instructions carefully as all aspects of them should be closely followed. The case may be cleaned with isopropyl alcohol or a cloth moistened with soapy water. Solvents must not be used.

Guarantee: This meter/clock is guaranteed for one full year from the date of purchase. We will repair or replace it at our discretion free of charge except where faults are caused by misuse or fair wear and tear. This guarantee does not cover the outer case and screen. We reserve the right to relinquish all responsibilities for repairs if the item has been opened up, has been tampered with in any way, has been invaded by any fluids or has been connected up incorrectly. The unit has been designed to operate satisfactorily when connected to vehicles fitted with all normal interference suppression devices to meet current EEC specifications and no guarantee is given that the meter / clock will tolerate abnormal electrical conditions or excessive vibration. Repairs undertaken by mail are done so for the convenience of the purchaser who must enclose sufficient funds for the return of the unit by whichever method is preferred. To avoid cost of shipping a fault-free unit, test it away from the original vehicle, either on the bench with a battery, or in another car. To make sure that any obscure fault is found, please include the fullest description of the fault symptoms and return to Survmaster at Padside Green, Summerbridge, Harrogate, England HG3 4AL.

PURCHASE DATE: _____ (attach copy of receipt). RETAILER: _____

The above guarantee can be extended indefinitely by means of an inexpensive maintenance contract. This maintenance contract can only be made during the period of an existing guarantee, or by agreement following a factory service. Full details from the manufacturer. MAINTENANCE CONTRACT to extend the period of guarantee: The above guarantee is acknowledged by the manufacturers to cover the EXTENDED Period _____ to _____ subject to a valid maintenance code and authorised signature below.

CODE _____MANUFACTURER'S AUTHORISED SIGNATURE_____

This contract does not detract from a purchaser's statutory rights.

For ALL operating manuals and other technical information see www.survmaster.com INFORMATION about accessories and peripherals (Sensors etc) for Survmaster meters available on www.survmaster.com

Technical support from: Brent Communications UK Tel No. (0) 1943 880499.

Before fitting any type of sensor to a vehicle, connect it up to the Survmaster meter and check its' correct operation by rotating the inner of speedometer cable types, or repeated touching of wheel types to a metal object. Use a low calibration figure on the meter, and watch the readouts increment. If the readouts do not increment there is a problem which should be investigated. Make absolutely sure that sensors are correctly connected before turning on the meter as they will be destroyed by reverse current

Troubleshooting suspect sensor installations:

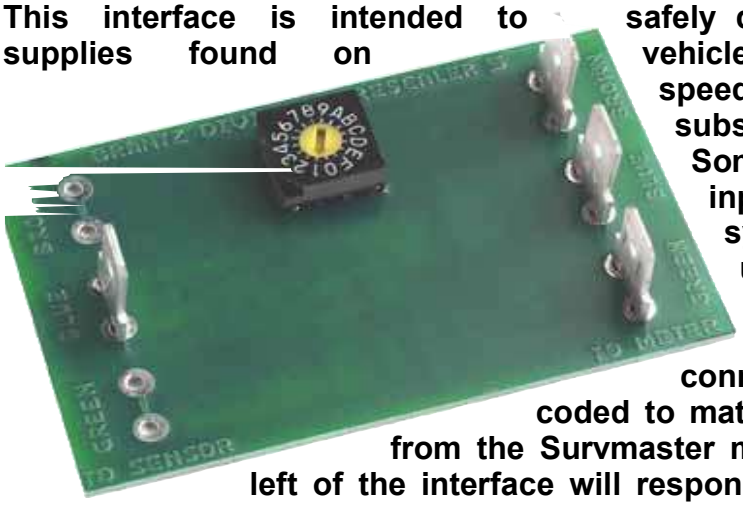
If it is suspected that either a wheel or speedometer sensor has been damaged in service (ie tripmeter does not increment on the road) then the output from the sensor can be tested with a voltmeter (voltage varies as wheel or sensor is rotated 2 volts to 4 volts). Alternatively the tripmeter itself can be proven to be OK by the following test which must be carried out strictly in the order described, a) Switch off the meter. b) Pull off the three push-on connectors from the grey cable to the sensor. c) Ease back the insulating sleeves from the Blue and Green wires of the grey cable described in b). Keep these away from contact with anything else. d) Select calibration 001 on the tripmeter. e) Switch on the tripmeter. f) Press all the zeroing buttons. g) Tap the above Blue and Green wire connectors together electrically many times. The tripmeter should increment. If it does, and there is no increment during normal use on the road with the sensor connected, then the sensor has indeed been damaged and the tripmeter itself is still functional. The other type of misoperation from which a tripmeter can suffer is self-stepping whilst the vehicle's engine is running, or self zeroing, or readouts going on and off by themselves. Assuming the power supply is reliable (try powering the meter directly

from a separate battery placed temporarily in the passenger area) then suspect powerful radio interference from home-made H.T. sparkplug leads. This is particularly common with historic vehicles. Replace them with standard proprietary parts from an accessory shop. Testing for interference is easily demonstrated using a portable radio on the AM band (important). Tune away from the stations into a quiet frequency, turn up the volume, then start up the engine. Listen for loud clicks. That's interference which should be cured, as it is far too powerful to defend against with screening etc. Vehicles with interference will normally fail pre-event scrutineering.

PLUG KIT (to enable the removal of Survmaster meters from the vehicles for safe keeping, or to share one meter between several vehicles. Can be factory fitted or DIY). Wiring configuration of the four pin plug kit as fitted to Survmaster meters: The pins are marked with numbers one to four on both male and female sections as follows: The female socket section is fitted to the vehicle and as supplied from the factory comes with a length of wiring, configuration as follows: The number one pin is connected to the two green/yellow wires, one of which is in the grey cable and one of which is in the black cable (this is the vehicle's negative power connection. Normally negative = Ground, but could be otherwise with historic vehicles, pre 1960). The number two pin is connected to the brown of the grey cable (this feeds +5volts from the meter to the sensor). The number three pin is connected to the blue wire in the grey cable (this is the digital signal wire from the sensor to the meter). The number four pin is connected to the brown wire in the black cable (this is the vehicle's +l2volt power feed to the meter and should be fused at 2 amps). The male section of the plug kit is normally factory fitted to the meter (but DIY fitting should follow the above instructions) so that the only interaction a customer normally has is with the cables of the female section. The female section is connected to the vehicle as follows: The Black cable contains a green/yellow wire which connects to the vehicle's negative ground. The black cable also contains a brown wire which connects via a 2 amp fuse to a permanent +l2volt supply which is not controlled by the ignition switch etc. If there is a blue wire in the black cable, ignore it. The grey cable goes to the sensor which is wired as per separate instructions relating to each type of sensor.

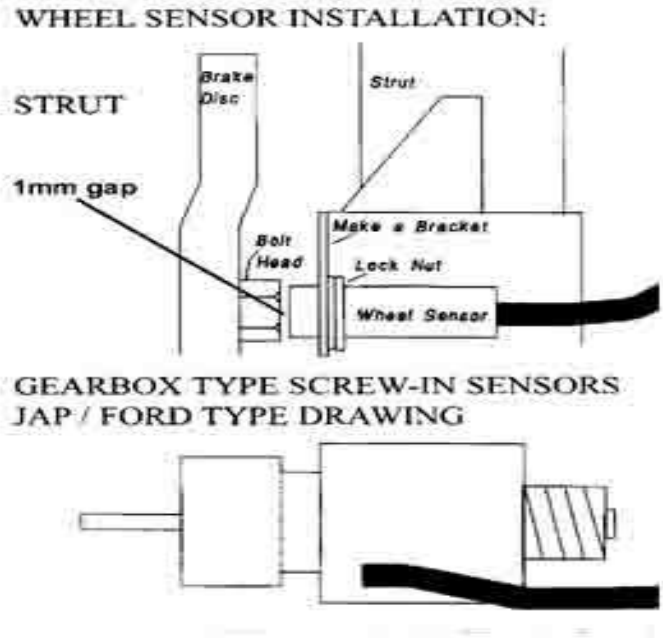
SURVMASTER PRESCALING INTERFACE:

This interface is intended to safely drive Survmaster meters from digital pulse supplies found on vehicles fitted with digitally lsed electronic speedometers or tachographs and as such, substitute for other types of motion sensors. Some types of ABS sensors are suitable as inputs to the interface, though some ABS systems do not generate a speedometer pulse until they reach a certain speed and so are not capable of accurate work Check with your car supplier. The three push-on connectors on the right of the device are colour coded to match the wires inside the GREY cable coming from the Survmaster meter. The single push-on connector on the left of the interface will respond to digital ground pulses coming from the vehicle. Confirm suitability with a voltmeter before connecting the interface to the vehicle's pulse wire: Low signal = less than one volt, high signal is greater than 4 volts positive with respect to ground. Analogue sources are not suitable. Check that the signal occurs at very low speeds as well as at normal driving speeds.

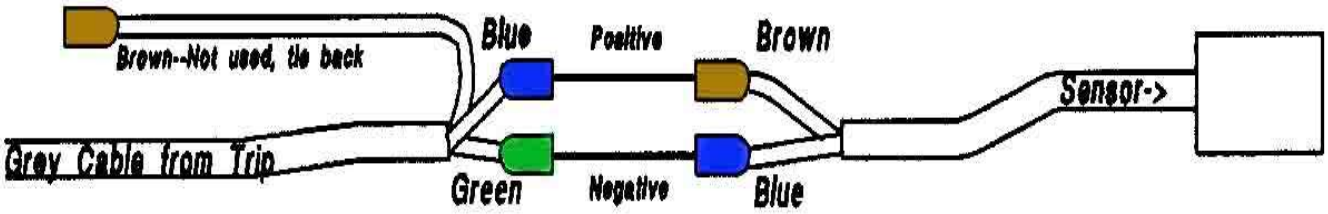


The rotary switch on the interface sets the prescale ratio and should be greater than zero. The lower the prescale ratio is, the greater the meter accuracy will be, but this facility is provided to compensate for very high pulse rates which would take the Survmaster meter out of its normal calibration range of up to 999. If the meter calibration is out of range, rotate the prescale ratio above the normal setting of ONE. Some models have a rotary SENSITVITY control which can adjust to different voltage thresholds. Adjust this to the centre of its' workable range. Technical information: Drain on the vehicle's sensor is less than 0.5mA, TTL Compatible. Interface current consumption is less than lOmA. Input is 'dioded' to prevent interaction of the interface and the vehicle if the meter is switched off. Divide ratio = figure on

the rotary switch (1 to *15)* zero is not valid. Power source from meter is 5 volts, interface is not protected from reverse connection. Output is open collector.



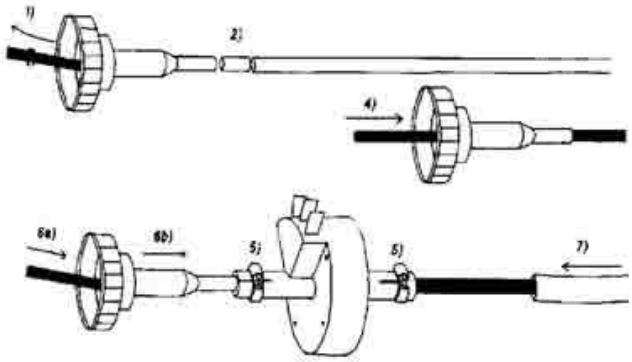
A bracket to mount the wheel sensor to the suspension strut should be made rigid enough to prevent flexing. Bolt heads (a minimum of four for accuracy, and NOT of the socket head type as these cause problems) should pass squarely across the centre of the face of the sensor all at the same distance of 1mm. Make provision to prevent the sensor from overheating. Correct fitting can be checked when the meter has been wired to the sensor. Select calibration 001 and switch on the meter. Zero the meter readouts. Rotate the wheel having the sensor fitted. Each bolt head passing the sensor should cause the meter to increment. Monitor with a voltmeter: Low is about 2 volts, High is about 4 volts.



JAPANESE SENSORS AND THE FORD/GM TYPE GEARBOX SENSOR.

Most Japanese manufacturers have standardised their gearbox outputs to accept a M22 x 1.5 threaded sensor which has a round peg drive with a 'lug' pinched onto the side. Unscrew the original speedometer cable from the gearbox, screw in the Survmaster Jap sensor with the drive pin in place, and screw the original speedometer cable into the sensor. Wiring is to the Survmaster GREY cable as follows: Green to Green, Blue to Blue, Brown to Brown. Some Jap sensors have a different colour code and are wired as follows: Green to Black or Silver, Brown to Red, Blue to White. Many Ford/GM/Vauxhall Fiat/VW/Skoda/Lada gearbox outputs are similar in that they have a square drive and a MI8 x 1.5 screw thread. The Survmaster Europpean Ford/GM sensor will fit many of these vehicles but will require some degree of filing/cutting/drilling before they are an acceptable engineering fit. Select this sensor only if you have the skills to do this. Wiring is the same as for the Jap sensor above.

UNIVERSAL SPEEDOMETER CABLE SENSOR



This plastic unit fits in the length of almost any speedometer cable, though some old cables require holes to be slightly enlarged due to 'chunky' cable dimensions, and some modern speedometer cables need ingenuity to dismantle them as manufacturers seem to want to prevent customers from separating the inner from the outer. Generally with the so-called 'sealed' cables, a section of sheath from the centre of the cable should be removed first to obviate the fixing system used on the ends of the inner. Replacement lengths of sheath can always be put back in after the cable has been separated. Heat-shrink sleeve, particularly the type which is adhesive-lined makes easy repairs to segmented sheaths. To assist with fitting, a cross-section of the universal sensor is shown. Note that the rotor floats in air and puts no additional strain on the speedometer drive, but this construction demands that the sensor should not be subjected to 'end thrust' which could be produced by a worn cable, or being fitted on a bend in the cable. Modern sensors can be stripped to help with fitting in difficult cases. Connections are Brown to Brown, Blue to Blue; Green to Green.

1) Remove inner core. Cut through the outer sheath at the location of the sensor with a fine toothed hacksaw. 32 teeth/inch recommended.

2) Make a second cut through sheath to shorten the sheath by 1/2 inch (13mm).

3) Remove any burrs with a fine file.

4) Wipe off any excess grease and any metal debris from the inner and the outer, and re-insert the inner which has an enlarged end through its' section of sheath.

5) Place clamps (Jubilee clips or preferably screw type petrol hose clips) on to both ends of the plastic sensor.

6) Insert the loose end of the speedometers cable inner into one end of the sensor and push very firmly through the sensor's internal friction bushing until the sheath section is fully seated in the sensor. If your speedometer cable sheath is of a smaller diameter than can be easily clamped by the sensor then build up the diameter of the sheath with adhesive aluminium tape. Tighten the clamps moderately.

7) Feed the loose end of the inner through the last piece of sheath until it is fully inside the sensor. Tighten the clamps moderately. If you do not wish to use clamps, they could be replaced with adhesive lined heat-shrink sleeve.

Part BRH2

Subject: Special sensors for generic detection of rotating shafts to provide bigger distance sensing for the Survmaster range of odometers.

The Type BRH2 sensor types are a fall-back fitment to be utilised when the more easily implemented standard types are unuseable and they require some level of interpretation for each individual situation. Select these sensor options only if you are able to provide some amount of engineering expertise and originality. The detector section of the BRH2 is wired using only two of the three wires. Green/Yellow is to the sensor's White wire, Blue is to the sensor's Brown wire. BEFORE fitting to the vehicle is attempted, demonstrate the functionality of the sensor IN THE HAND by wiring to the Survmaster odometer (on a low calibration figure) and pass the active side of the magnet across the sensing point of the sensor several times. See the odometer increment.

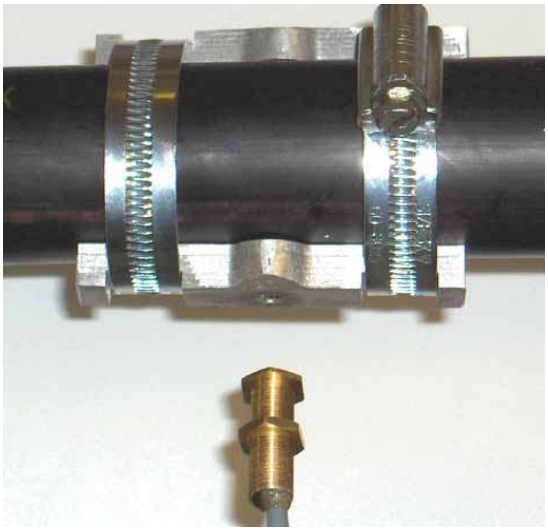
Do not proceed to the fitting stage without this test.

BRH2 sensor

The sensor has a detection spot at the non-wired end. The actual package appearance of the sensor may differ from the picture below. The supplied magnet has a 5mm hole on one side which must pass the sensor end at about 5mm to 15mm distance. The magnet must be attached to the rotating shaft so that the white 5mm hole is pointing radially out from the shaft. Two worm-thread bands (Jubilee Clips) should be wrapped around the shaft and magnet(s), and a holding compound such as sanitary silicone sealant could be used to prevent looseness. Attach clips and magnets evenly around the shaft so that the shaft remains in dynamic balance.

Use of just one magnet sensing shafts rotating faster than the road wheels may be necessary if the meter shows that it needs a calibration figure which exceeds the number available on the meter's calibration switches, and two or more magnets should be used on shafts rotating at road-wheel speed to give accuracy. The sensor should be provided with a mounting bracket which senses horizontally so that gaps are not varying unduly if the shaft moves up and down. Pick a place where the shaft has minimum movement (typically near the gearbox). Check the output on the blue wire with a voltmeter when everything is connected up to show that a voltage change occurs (0volts to 5volts and back etc) as the magnet passes the sensor.

The Type BRH2 Hall-Effect DriveShaft Sensor fits as shown in the photograph below. Use a non magnetic bracket (Brass or Aluminium, but NOT STEEL as this will prevent the sensor from 'seeing' the magnetic field; Similarly don't use steel washers around the sensor). The bracket should be made up to give a gap of about 5mm to 15mm between the end of the gold-coloured sensor and the magnet face(s). Wiring of this type of sensor is to the Survmaster GREY SENSOR CABLE using only two of the three wires. Green/Yellow is to the sensor's White wire, Blue is to the sensor's Brown wire. When the sensor is correctly connected to the Survmaster and the Survmaster is turned on, a voltmeter connected between the two wires will change from 5 volts to about zero volts alternately as the shaft is rotated and the sensor detects the magnets.



Part BRH2 sensor

Information regarding the use of Survmaster odometers is available on www.survmaster.com

Trouble-Shooting help (if things aren't working properly).

General. The following written guarantee accompanies all new Survmaster tripmeters. If you did not receive this, along with instructions on how to connect up the tripmeter and any Survmaster sensors, then contact your retailer, or download a copy from elsewhere on this site. It is vital that these instructions are followed and that the vehicle to which the instruments are connected is 'electronics compatible'.

Guarantee. On receipt of your Survmaster unit: _____ Serial No. _____ Read the testing and fitting instructions carefully as all aspects of them should be closely followed. The case may be cleaned with isopropyl alcohol or a cloth moistened with soapy water. Solvents must not be used. Guarantee: This meter/clock is guaranteed for one full year from the date of purchase. We will repair or replace it at our discretion free of charge except where faults are caused by misuse or fair wear and tear. This guarantee does not cover the outer case and screen. We reserve the right to relinquish all responsibilities for repairs if the item has been opened up, has been tampered with in any way, has been invaded by any fluids or has been connected up incorrectly. The unit has been designed to operate satisfactorily when connected to vehicles fitted with all normal interference suppression devices to meet current EEC specifications and no guarantee is given that the meter / clock will tolerate abnormal electrical conditions or excessive vibration. Repairs undertaken by mail are done so for the convenience of the purchaser who must enclose sufficient funds for the return of the unit by whichever method is preferred. To avoid cost of shipping a fault-free unit, test it away from the original vehicle, either on the bench with a battery, or in another car. To make sure that any obscure fault is found, please include the fullest description of the fault symptoms and return to Survmaster at Padside Green, Summerbridge, Harrogate, England HG3 4AL. PURCHASE DATE: _____ (attach copy of receipt). RETAILER: _____ The above guarantee can be extended indefinitely by means of an inexpensive maintenance contract. This maintenance contract can only be made during the period of an existing guarantee, or by agreement following a factory service. Full details from the manufacturer. MAINTENANCE CONTRACT to extend the period of guarantee: The above guarantee is acknowledged by the manufacturers to cover the EXTENDED Period _____ to _____ subject to a valid maintenance code and authorised signature below. CODE _____MANUFACTURER'S AUTHORISED SIGNATURE_____ This contract does not detract from a purchaser's statutory rights. For ALL operating manuals and other technical information see www.Survmaster.com INFORMATION about accessories and peripherals (Sensors etc) for Survmaster meters available on www.Survmaster.com Technical support from: Brent Communications UK Tel No. (0) 1943 880499. Before fitting any type of sensor to a vehicle, connect it up to the Survmaster meter and check its' correct operation by rotating the inner of speedometer cable types, or repeated touching of wheel types to a metal object. Use a low calibration figure on the meter, and watch the readouts increment. If the readouts do not increment there is a problem which should be investigated. Make absolutely sure that sensors are correctly connected before turning on the meter as they will be destroyed by reverse current. Troubleshooting suspect sensor installations: If it is suspected that either a wheel or speedometer sensor has been damaged in service (ie tripmeter does not increment on the road) then the output from the sensor can be tested with a voltmeter which has the negative lead connected to ground, (wheel sensor voltage varies as wheel is rotated 2.0 volts to 4 volts approximately) or speedo cable sensor blue connection varies 0v to 5v as internals are rotated. Alternatively the tripmeter itself can be proven to be OK by the following test which must be carried out strictly in the order described, a) Switch off the meter. b) Pull off the three push-on connectors from the grey cable to the sensor. c) Ease back the insulating sleeves from the Blue and Green wires of the grey cable described in b). Keep these away from contact with anything else. d) Select calibration 001 on the tripmeter. e) Switch on the tripmeter. f) Press all the zeroing buttons. g) Tap the above Blue and Green wire connectors together electrically many times. The tripmeter should increment. If it does, and there is no increment during normal use on the road with the sensor connected, then the sensor has indeed been damaged and the tripmeter itself is still functional. The other type of misoperation from which a tripmeter can suffer is self-stepping whilst the vehicle's engine is

running, or self zeroing, or readouts going on and off by themselves. Assuming the power supply is reliable (try powering the meter directly from a separate battery placed temporarily in the passenger area) then suspect powerful radio interference from home-made H.T. sparkplug leads. This is particularly common with historic vehicles. Replace them with standard proprietary parts from an accessory shop. Testing for interference is easily demonstrated using a portable radio on the AM band (important). Tune away from the stations into a quiet frequency, turn up the volume, then start up the engine. Listen for loud clicks. That's interference which should be cured, as it is far too powerful to defend against with screening etc. Vehicles with interference will normally fail pre-event scrutineering.
Fault-Finding Procedures for Survmaster Products: Issue July 2000. Not for general circulation. If a tripmeter installation is giving trouble, the recommended way to find faults is by progressively removing areas of the installation so that there is an obvious point at which things are either good or bad. The most important split is the one most resisted by customers as it's inconvenient. Take the customer's car out of the equation by fitting the tripmeter into another car. Often it is not necessary to fit the sensor in the replacement car; simply connect up to the new car's power supply and observe all the tripmeter functions which do not need the distance increments. If the opportunity presents itself, a sensor can be connected to the new car tripmeter installation without the sensor being fitted to the vehicle in a permanent way (ie just placed loose inside the car and operated by hand). Only after the above should the following become necessary. Survmaster may be able to offer advice about typical car problems, but it is ultimately the car owner's responsibility to have a car with normal trouble-free electrics.

Survmaster1/Survmaster2/Survmaster3/Survmaster Compact

1) **The meter is installed in a customer's vehicle. The meter digits light up correctly when the meter's ON/OFF switch is switched ON--GOTO4. The meter digits light up incompletely when the meter's ON/OFF switch is switched ON—GOTO9. The meter digits do not light up when the meter's ON/OFF switch is switched ON--GOTO2.**

2) **2)Disconnect the Black Power Cable coming from the base of the meter from the vehicle's supply and connect it directly to a spare charged 12 volt battery placed in the vehicle next to the meter. Observe that it is the Black cable which connects to power; Brown to +12 volts, Green/Yellow to -12 volts. Battery chargers are not a suitable power supply as they are not smoothed. There is normally a Blue wire in the Black cable. This Blue wire is not normally connected to anything. If the meter digits light up, find the problem with the vehicle's supply. Often the polarities are reversed or of poor quality. Use Screw-type connections and definitely NOT crimps. If the meter does not light up--GOTO3.**

3) **3) Check that the cables (Black and Grey) are not fractured or cut-into by bodywork. Disconnect the sensor from the Grey cable. If the meter lights up—GOTO8. If the meter does not light up—GOTO9.**

4) **4) The problem is that on the road the meter digits flash on and off--GOTO2 and 3. The problem is that the digits zero themselves from time to time GOTO3 and 7. The problem is that the digits increment themselves even when the vehicle is standing still--GOTO7. The problem is that the digits do not increment when the vehicle is travelling--GOTO5. The problem is that the meter does read distance but not accurately—too low GOTO5, too high GOTO6.**

5) **5) The meter is not seeing all of the pulses from the sensor. This could mean that the sensor is not functioning or that the meter's pulse input is damaged. Connect the negative of a voltmeter to the Green/Yellow wire inside the Grey cable (The sensor Cable). Test the Brown of the Grey cable with the other positive voltmeter lead and see that +5 volts is present. If it is not GOTO9. If it is +5 volts then test the Blue lead in the Grey cable. This lead should go up and down in voltage as the sensor is rotated (or if a wheel type sensor its' end is touched repeatedly by a steel object. When the Blue wire is in the Low state its' voltage should be less than 2 volts. When the Blue wire is in the High state, its' voltage**

should be over 4 volts. Note that the meter requires that either state has to be present for more than 2 milliseconds to recognise it, (this can be a problem if the customer is using a wheel type sensor to sense on a drive shaft which rotates very quickly. The answer here is to use a larger target). If the voltage does go up and down sufficiently--GOTO6. If the voltage does not go up and down—GOTO8.

6) **6) The meter is receiving external pulses of energy from interference sources--GOTO7 or the sensor is not reliably detecting rotation--GOTO5 and if a wheel type sensor check for correct gaps on all detected targets and also check that socket head screws are not being detected. Check wheel sensor operation with a voltmeter whilst it is connected to the tripmeter. Voltages should be about 4.0v when sensor is near to metal and about 2.0 volts when not near metal. Remember that gaps can alter whilst the vehicle is being driven due to vehicle parts bending and flexing.**

7) **7) Test for interference. This is particularly common when home-made HT sparkplug leads have been used, but can come from damaged alternators or fuel pumps/horn/wipers etc. If interference is present it is always too powerful to defend against and should be fixed at source by suppressors or new silicon leads etc. Take a portable radio, select the AM band (important) and tune into a quiet spot between stations. Turn up the volume and start the vehicle. Listen for loud clicks. That's interference. Compare the vehicle with a normal road car as a guide to what is acceptable. Try other vehicle accessories to locate intermittent sources of trouble.**

8) **8) The sensor is damaged. Replace and install new unit with best chance of survival against heat and shock etc. Use first class connections.**

9) **9)The meter's internal circuit is damaged so the meter and sensor must be returned to the factory for service or replacement. Installation tips: On receipt of a tripmeter test it on the bench with a charged battery (NOT a battery charger as the current is not smoothed) and its' sensor connected. Before installing into a vehicle, do the vehicle interference checks as in 7) and operate other car accessories to see if any of them produce interference type clicks etc.. Always derive 12volt power AND the ground lead DIRECTLY from the two battery TERMINALS. Use screw connections (NEVER use crimp connections. These are almost always loose and account for the vast majority of unreliable customer installations). Support cables at terminal entry points to prevent them from pulling on connectors.**