

FITTING INSTRUCTIONS

GENERAL

Keep the probe and cables away from the car's H.T. circuits and/or electronic ignition and alternator cables. Protect the probe/cable from damage by stones, etc., e.g., cover with flexible plastic tubing; it is generally safer, where possible, to fit the probe to the rear (trailing) of the vertical centre line of the wheel assembly. Do not over tighten the probe locknuts. Make sure that the electrical connections at the terminal strip, on the instrument are tight. If you lose or damage any of the three M5 mounting screws do not replace with screws longer than 10mm or you may short out and damage the internals of the electronics unit. Before switching on the electrical supply to the unit make absolutely sure you have made the correct connections at the terminal bar.

STANDARD PROBE - FITTING

Position the probe such that it 'looks' at the bolt heads which secure the brake disc to the hub of a non-driven wheel - see drawing.

In some cases it may be convenient to look at holes in the metal surface. The probe should be co-axial with the centre line of the bolts, and the front face of the probe must be parallel with the heads of the bolts. Ideally any indentations or other markings on the bolt heads should be removed but care must be taken to ensure that the fitted heights of the bolt head are the same for each wheel set. Remove dirt, rust and grease accumulations from the inner face of the disc/hub assembly.

Screw in the probe until it just touches the head of one of the bolts and then turn it out 1 to 1.75 turns. Tighten the locknut to a maximum torque of 5ft. lbs. Run the probe cable up to the electronic unit.

The thread of the unit is an uncommon size (M14x1), you may therefore find it useful to weld/braze the nut to a small plate and then screw or rivet the plate to the probe support bracket. If this is done then it is easy to remove the probe fixing nut from one suspension unit to another.

NB If you weld/braze one of the probe nuts to the bracket or brake back plate for a fixing DO NOT UNDER ANY CIRCUMSTANCES use the probe to hold the nut whilst welding.

TYPICAL PROBE INSTALLATION

1. The bolt head must be steel. The probe will sense aluminium but the sensing distance is reduced by 50%.
2. Cup head bolts are not suitable targets for the probe to sense from.
3. The bolt head must be at least 80% of the diameter of the probe.

CABLE DRIVE PROBES - FITTING JAPANESE CABLE DRIVE PROBES

These probes fit most Japanese and some American cars. Push forked peg into probe from end of probe with ring nut, push square peg into probe from other end so that it engages into fork peg. The probe is screwed onto the gearbox between the gearbox and the speedometer cable. Tighten by hand NOT with a wrench.

UNIVERSAL CABLE DRIVE PROBES

This probe is designed to fit all cars. Remove the inner cable and cut out 40mm (1-1/2 inches) section from the outer cable. Put the metal sleeves and ring nuts over each cable end. Push the inner cable through one outer half and through sensor. Push inner cable through other outer cable, tighten the 2 rotor screws onto inner cable. Fasten ring nuts.

The sensor is designed for inner cables of 3.2mm (1/8 inch). If your cable is larger remove the two rotor screws and fit a M2.5 screw in one of the rotor screw holes. Carefully drill out the rotor to the required size.

Some cars have an inner cable which cannot be easily withdrawn. If you cannot release the crimp which holds the inner cable into the outer cable proceed as follows: cut through both inner and outer cable. Carefully remove 20mm (3/4 inch) from each end of each outer cable half. Push sleeve and ring nut onto each end of outer cable. Push inner cable into each end of sensor and tighten rotor screws.

ELECTRICAL CONNECTIONS

Terratrip 1/2/3 ARC.

Green=Ov White=P Orange=P+

Note this probe CANNOT be used on some early Terratrips where the voltage between P- and P+ is 8 volt. Use only on units where the voltage is 5 volts.

Terratrip 202/303/404

White=Pin2 Orange=Pin 10 Green=Pin 11

(Note on Pin 11 you will also have car battery (-) connection).

IMPORTANT NOTE

The universal probe is not waterproof. Protect with fireproof and waterproof material if exposed to excess water. The probes should not be fitted close to exhaust system, engine block. Upper temperature limit 125 celcius.

ELECTRONIC UNIT

The electrical supply to the electronic unit **MUST** be fused (at no more than 2 amps). Use a line fuse, using a separate 12V feed from the remainder of the car' s electrics - from a permanently available supply, (e.g., NOT ignition switch controlled).

It is generally best to take the supply direct from the battery terminals (both positive and negative). You must fit a line fuse immediately after the positive battery terminal (negative if you have a positive earth system). As all units have their own on/off switch we suggest that you do not fit an on/off switch in the tripmeter supply.

NOTE: Terratrip 1 is suitable for negative earth systems only. Terratrip 202/303/404 are suitable for both negative and positive earth systems.

ELECTRONICS ON/OFF

The electronics on/off switch on model T1 is marked I/O, I=on, O=off. On T202/T303/T404 the electronics on/off switch is on the upper right hand side of the unit. When the switch is ' up' the electronics are ' off' and when the switch is ' down' the electronics are ' on' .

ADDITIONAL NOTES FOR USERS

The following notes are provided for your assistance. We suggest that you read the notes thoroughly before installing your instrument.

PROBES

Wheel Mounted Probes - Mounting

The most likely cause of failure of this type of probe is damage caused by stones or by the electrical cable being allowed to flex at the point where the cable enters the probe. This problem is easily overcome as follows:

Get a rubber sheath of the type which are fitted on the ends of H.T. distributor leads. Put the sheath over the probe lead and push it over the end of the probe. The rubber sheath should be secured in position using plastic "Ty-Raps" (or similar from such manufacturers as Panduit, etc.).

We also recommend that you use a strong steel bracket, minimum thickness 3mm to hold the probe in position. Check the probe gap with the car ' on the road' .

Speedometer Cable Probes - Mounting

This type of probe should not be mounted where it is likely to be splashed with water nor should it be mounted such that the electrical connecting cable unavoidably passes along or over wiring looms, especially those which carry ignition and/or alternator control cables.

TESTING

Wheel Mounted Probes - Terratrip 1

Test the voltage across ' P-' and ' P+' . The voltage should be approximately 5 volt. Touch the end of the probe with a piece of metal, the probe voltage should rise by approximately 0.5 volts.

Wheel Mounted Probes - T202/303/404

Test the voltage across ' P-' and ' P+' . The voltage should be approximately 8 volt. Touch the end of the probe with a piece of metal, the probe voltage should rise by approximately 1.0 volt.

Speedometer Probes - All Models

Test the voltage across ' OV' and ' P+' ; this should be approximately 5 volts. Test the voltage across ' OV' and ' P-' ; the voltage should vary between approximately 0 volts and 0.45 volts when the speedometer cable is turned slowly.

CONCLUSIONS

- If you have the correct probe voltage and the voltage rise then the probe is okay.
- If you have the voltage but not the voltage rise then the probe is faulty.
- If you have no voltage across the probe then the tripmeter is faulty.

Note - Terratrip 1

If you have two ' P+' terminals, one will be live when the 1/0/2 switch is at "1" and the other ' P+' terminal live when the 1/0/2 switch is at "2".

CABLE LENGTH

The length of probe may be shortened or lengthened to suit your application. It is best to adjust the cable length so that it is just long enough to reach the tripmeter. Loops of cable may pick up interference (see later section).

DISPLAYS - CLEANING

From time to time the displays may become dusty. Clean the displays using an anti-static cleaner (e.g., record cleaner cloth). Never spray cleaner directly onto the displays - spray onto a lint-free cloth and use the now damp cloth to clean the displays.

DISPLAYS - ILLUMINATION

The bulbs used for night time illumination of LCD displays are 14 volt wire ended. Bulbs of greater wattage must not be fitted otherwise permanent damage may be caused to the displays.

INTERNAL RESERVE POWER (IRS)

The IRS is an integral and necessary part of the electronic system. The IRS must be kept in a charged state at all times. The following guidelines will be of assistance.

- a. Always switch off the tripmeter electronics using switch on the underside of tripmeter if the car battery is to be switched off for more than 20 minutes, e.g., when car in Parc Ferme for more than 24 hours or after a rally.
- b. The power supply can be taken direct from the car battery. If this is done then you must fit a ' line fuse' directly after the battery. Switch off the displays when the tripmeter is not in use for longer than 24 hours.
- c. If the IRS becomes completely discharged as it would become if the tripmeter were to be left on for more than one hour without the car battery supply being connected, the following operation must be carried out:
 - i. Connect the tripmeter to a 12 volt car battery and leave displays of tripmeter on for at least 2 hours.
 - ii. Disconnect car battery from tripmeter and as soon as the displays start to fade or disappear switch off the tripmeter electronics using the electronics on/off switch.
 - iii. Reconnect car battery to tripmeter.
 - iv. Repeat steps (i), (ii), (iii) until IRS will keep tripmeter displays operating for at least 1-1/2 minutes. The tripmeter may now be left connected to the car battery for 24 hours to fully recharge the IRS.

Note

1. The number of times taken to complete the above will be greatly reduced if the car battery is connected to a battery charger.
2. The charge/discharge operations detailed above are not necessary when the IRS is used under normal conditions, i.e., to support the tripmeter when changing the car battery. In this case the IRS will automatically recharge properly as long as it has not been allowed to completely discharge (i.e., to zero volts).
3. The IRS is a Nickel Cadmium re-chargeable battery (Berec SB 1166 or equivalent). No other type of battery may be used or serious damage may occur.

INSTRUMENT MALFUNCTIONS

If your instrument malfunctions you can be 99.99% sure that the problem is caused by interference, only rarely is the instrument at fault. It is our experience that the usual cause of interference is spark plug leads and ignition coil/distributor lead. In cases of persistent interference we strongly recommend that you use Lucas ' Speedlead' for the plug and distributor/ignition coil leads. If you cannot get the leads locally, contact Lucas Competitions Department. Telephone 021 236 5050. Most times though you can cure interference problems by careful installation.

Interference manifests itself as follows:

1. Distance displays count when car stationary with the engine running.*
2. Distance displays show different reading to each other.*
3. Displays freeze and tripmeter controls have no effect.*
4. Displays freeze and show incomplete numbers.*
5. Tripmeter zeroes or malfunctions when car ' yumps' but tapping case of tripmeter when car stationary does not make instrument malfunction.*
6. Displays ' flash' occasionally.

* In these cases the only way to get the displays to operate properly is to switch off the electronics and wait for 5-10 seconds before switching electronics on. If the displays are left on when they are ' frozen' then the optics will be permanently damaged. The displays can be replaced but this is not a warranty claim, i.e., we will make a charge for the work.

Areas of interference may be:

Ignition circuits, alternator circuits, fuel pumps, relays, windshield motors, fan motors, etc.

We have found the following installation to be successful:

Power cable:

- a. For rear mounted car battery, run power cable through bulkhead, avoiding all electrical apparatus and looms, up to the roll cage, along top of roll cage, down the windscreen pillar section of roll cage, along the front of the dashboard (not behind where it may pick up interference from other wiring looms) and then straight into tripmeter.
- b. For front mounted batteries run cable either towards front of car, or straight through inner wing. In both cases now run cable inside wheel arch (protect cable with plastic tubing), through panel between outer wing and doorpost, through or round door post, along front of dashboard and straight into tripmeter.

Note: A line fuse must be used immediately after the battery.

Probe cables:

Pass nearside (kerbside) probe lead from wheel into inner wing. Then follow route as per Power Cable (b) route.

Pass offside probe lead either forward and then across front of car to join up with nearside probe lead or along wheel arch through small panel between outer wing and door post, through or round door post along top of dashboard and then straight into tripmeter.

The principles of the above are:

- a. Avoid all other wiring looms and electrical equipment inside car and behind dashboard.
- b. Avoid running tripmeter cables through engine compartment.
- c. Keep all cables neat and tidy and cut off any excess cable.

Interference may be transmitted into the instrument via:

- Remote Zeroing Unit - 1st Suspect
- Power Cable(s) - 2nd Suspect
- Power Feed - 3rd Suspect

To identify the cause of interference:

- a. Remove RZU - interference ceased? If yes, re-route RZU cable. If not, see (b).
- b. Remove probe lead(s) - has interference ceased? If yes, re-connect one probe and see if interference re-occurs, re-route cable. Disconnect probe and connect other probe. If interference re-occurs re-route cable.
- c. If interference is not cured by (a) or (b) re-route power cable and/or fit one microfarad capacitor across +12v and 0v terminals.

In rare cases it may be necessary to fit screened (shielded) cable for the probe and power leads. You should use 2 core cable. Cut probe cable about 2 inches (50mm) from the probe and joint on the screen cable; the joints must be soldered and adequately insulated. The screens of the cable should be earthed at only one end of each cable; this may be done by joining the screens of probe(s) and power cables at the tripmeter and insulate the joint. The screen of the power cable is then earthed at the car battery negative terminal or where the earth strap from the battery is connected to the car body.

That is the bad news. The good news is that the majority of installations do not suffer from interference. When you install your instrument we recommend that you put in your cables on a temporary basis and do a proper final installation when you are satisfied that the tripmeter works properly.

You are always welcome to write, telephone or telex for advice. UK customers are welcome, subject to prior appointment, to come to our premises for assistance should they so wish.

OPERATING INSTRUCTIONS

CALIBRATION - SETTING NUMBER

Terratrip 1

Set CAL switch to CAL, display shows C100. Press F and S to adjust hundreds, F to adjust tens, S to adjust units.

Terratrip 202/303/404

Press CAL (CAL1 on T404). Distance displays shows CAL and a 4 digit number with one digit flashing. The flashing digit can be adjusted by pressing S (S+ or S- on T404). Press F and the next digit can be adjusted, again press S if you want to adjust the flashing digit. Continue to press F and then S until the Calibration Number is set to the number you require. Note that when the Calibration Number is being shown there will always be one digit flashing. To get out of Calibration Mode press CAL (T202), DIS (T303), CAL1 (T404). The Distance Displays will now show distance.

NOTE: With T404 you can store 2 Calibration Numbers (e.g., one for tarmac tyres and the other for loose surface tyres). To set the second Calibration Number press CAL2 and then proceed as above.

CHANGING CALIBRATION No.1 TO CALIBRATION No.2 AND VICE VERSA-T404 ONLY

The T404 can store 2 Calibration Numbers. To change from CAL1 to CAL2: press CAL2, the Distance Displays will now show the Calibration Numbers in memory No.2. Press CAL2 again and the Distance Displays will return to showing distance. The distance will now be calculated using Calibration No.2. Vice versa for changing from Calibration No.2 to Calibration No.1.

NOTE: If you are using Calibration No.1 but you need to amend Calibration No.2 proceed as follows: Press CAL2. You may now amend Calibration No.2. When you have amended Calibration No.2, press CAL1 twice. While you have been amending Calibration No.2 the distance has been calculated using Calibration No.1. Vice versa for using Calibration No.2 and you wanting to amend Calibration No.1.

The calibration is stored when the unit is switched off, and restored when the unit is switched on. If errors are detected in the calibration when the unit is switched on the displays will show CAL1000. Corruption of the calibration will incur if the internal battery becomes discharged or is removed. With the internal battery fully charged the calibration number will be held for approximately 1000 hours. If the instrument is left connected to the car battery (even if the displays are switched off) the calibration number will be held for as long as the voltage of the car battery remains above 8 volts.

CALIBRATION NUMBER - CALCULATION

Terratrip 1

Set calibration to 10% of number of pulses probe gives per mile (for mileage readout) or per kilometre (for kilometre readout).

Terratrip 202 and 303

Set Calibration Number to number of pulses probe gives per mile (for mileage readout) or per kilometre (for kilometre readout).

ALL MODELS

Set the Calibration Number to 100 (T1), or 0100 (T202/303/404). Exit from Calibration Mode so that displays are now showing Distance. Start with the Distance Displays at zero and run the car over a distance of 1 mile (1 kilometre if you want kilometres displayed). At the end of the run make a note of the number in the Interval Distance Display. Set the tripmeter to Calibration Mode and set the Calibration Number to the same number as was shown on the Interval Distance Display at the end of 1 mile (or 1 kilometre). Exit from Calibration Mode. The instrument is now calibrated.

DISTANCE SECTION CONTROLS

Terratrip 1

Press ZERO to zero display. Switch +/- makes display count up or down. Switch 1/0/2 selects which probe is to be used for distance sensing. The centre position of the switch, marked 0, cuts out both probes.

To adjust the Distance Display press S to adjust the hundredths, F to adjust the tenths, F and S to adjust the units.

Terratrip 202/303/404

- Press DIS (303 only). Total display shows 5 digits 000.00 on 303 and 404 and 00.00 on 202 model. Interval shows 00.00. Press 1, Probe 1 selected. Press 2, Probe 2 selected. Press 0, Probes disconnected. Press (-), Displays count down. Upper display shows flashing colon (:) on 202 model and minus (-) on 303/404.
- Press (+), Display count up. Press upper CLR (Zt on 404) for 4 seconds, Total zeros.
- Press CLR (Zi on 404), Interval clears immediately.
- Press FRZ. On 202 model colon (:) is shown without flashing; on 303 and 404 upper display shows F. Both distance displays freeze. Internally Total carries on counting and Interval resets to zero and starts to count again, on 404 Stopwatch freezes, is internally zeroed and restarts. In TSD mode (303 models only) pressing FRZ will freeze both displays, internally both Stopwatch and Interval reset to zero and then start counting again. Press FRZ again and displays count normally.

TSD MODE- 303 Model Only

Press TSD, upper display shows Stopwatch, lower display shows Internal distance. In TSD mode pressing FRZ will freeze both displays, internally both Stopwatch and Interval reset to zero and then start counting again. Press FRZ and displays count normally.

The unit normally Shows Stopwatch + Interval Distance in TSD mode. To change to Time of Day + Interval Distance press TSD for 4 seconds. The Time of Day is operated by pressing the upper CLR - the sequence of operation of Time of Day is: run/freeze/rejoin/freeze/rejoin. To revert to Stopwatch + Interval Distance press TSD for 4 seconds.

MANUAL SETTING OF TOTAL DISTANCE

Terratrip 1

Press S to adjust hundredths, F to adjust tenths and F + S to adjust units.

Terratrip 202/303/404

Press F and the least significant digit will flash. Press S and the flashing digit advances one count. After one second the display counts automatically if S is still being pressed. Press F again and the next digit will flash and can be set. The hundredths of miles/kilometres, model 303 only, cannot be advanced by the above technique. To stop displays flashing press F.

SETTING DISTANCE ALARM - T404 Only

Press Zi for 4 seconds, the distance displays will change to show AL and 000.00, with one digit flashing. Press S-or S+ to adjust this digit. Press F to make next digit flash, press S- or S+ to adjust this digit. Continue to press F then S- or S+ until the setting is complete and the displays stop flashing. The alarm will sound at the set distance and the lower display will show AL. To stop alarm, press F.

TIME MODE

Terratrip 303

To set time of day press upper CLR for 4 seconds. Seconds flash. Press S to zero seconds. Press CLR again, Minutes flash. Press S to adjust minutes. Press F to adjust tens of minutes. Press CLR again, Hours flash. Press S to adjust hours. If you press F the hours will advance 12 hours. Press CLR again, Time stops flashing.

Terratrip 404

To set the time of day start with the left hand displays showing Time of Day and Stopwatch, Press Sw for 4 seconds, the seconds will then flash. Press S- or S+ to zero seconds. Press Sw and minutes will flash. Press S- or S+ to adjust unit minutes, press F to adjust tens of minutes. Press Sw and hours will flash, Press S- or S+ or F to adjust hours. Press Sw and displays will stop flashing.

SETTING TIME ALARM - T404 Only

To display alarm time press T/Sp for 4 seconds (the lower timing display will show AL, the upper display will show 00:00:00). Set the minutes using S-, S, F. Press Sw and hours will flash. Press S-, S+, F to adjust hours. Press Sw to return to normal time. When the alarm sounds the lower left hand display will show AL. The alarm is switched off by pressing F.

STOPWATCH

The 404 has two stopwatch modes - see table below. The Terratrip 303 is permanently in 'Continental' mode. The stopwatch is controlled by lower CLR on 303 model and SW on 404 model.

On the 404 the stopwatch and average speed have two control sequences which can be selected by an internal switch (see later).

UK TARGET TIMING

SW pressed	1	2	3
Stopwatch	Starts	Stop	Zeroed
Time of Day	Runs	Frozen	Rejoins real time
Av.Speed	Runs	Zeroed and restarted	Runs

CONTINENTAL TARGET TIMING

SW pressed	1	2	3	4	5
Stopwatch Zeroed	Starts	Frozen	Rejoins	Stops	
Time Rejoins time	Runs	Frozen	Rejoins real time	Frozen	real
Av.Speed	Zeroed and Restarted	Runs	Runs	Runs	Runs

SPEED/AVERAGE SPEED - T404 Only

When T/Sp is operated the two time displays will show speed and average speed. When retracing the route after taking a wrong turn you should press (-) when you turn around, to correct the Distance Displays. If this is done then the average speed is automatically reduced so that when you regain the correct route the average speed display is correct.

NOTE: The point from which the Average speed is started is controlled by the stopwatch mode or Zav.

DISPLAY CHECK - T202/303

To check the display press, in turn, DIS (303 only), (-), FRZ, TIME (303 only), CAL then press upper CLR for 5 seconds. The displays will blank out and after 1 second show each part of the display in turn. When all the display has been shown the display will start to disappear. If you now press upper CLR for 2 seconds (303) then FRZ (202 only) the displays will return to normal.

DISPLAY TEST - T404

Press T/SP so that displays shows speed and Average speed. Press, in turn: CAL2, (-), FRZ, then press F for 2 seconds. The displays will then self test. When the displays start to disappear press CAL2 to return to normal displays.

INTERNAL BATTERY - ALL MODELS

This is a Nickel Cadmium rechargeable type and MUST NOT be replaced with any other type of battery. If you use other than Nickel Cadmium batteries at best you will damage the unit and at worst you may cause yourself personal injury when the battery explodes!

INTERNAL SWITCHES - T303/404 Only

Seconds/Decimal Minutes

The unit is normally set to record time in seconds. The unit can also record time in decimal minutes, e.g., 1.50 minutes instead of 1 minute 30 seconds. Open the unit and operate the small switch on the left hand side of the circuit board.

Stopwatch Mode (T404 Only)

The unit is normally set for UK Target Timing. If you want to change to Continental Target Timing open the unit and operate the centre switch on the rear circuit board.

Keyboard Bleeper (T404 Only)

The unit is normally set with the keyboard bleeper on. To switch off the bleeper open the unit and operate the switch on the right hand side of the rear circuit board.

INSTRUMENT MOUNTING

Liquid Crystal Displays have a finite viewing angle, therefore to get the maximum visibility the instrument should be mounted so that the co-driver can look at the displays at an angle of 90 in both the vertical and horizontal planes. When viewed from angles of more than +/- 20 the display contrast may be reduced.