

TRAFFIC SAFETY SYSTEMS

VASCAR 5000
OPERATOR'S MANUAL

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CHAPTER 1

GENERAL DESCRIPTION

The TSS VASCAR 5000 is designed to record the distances travelled by a vehicle and the time taken to cover the distance. It then computes the average speed of that vehicle over the measured distance.

The distances travelled is recorded by counting the pulses sent from either a) the pulse feed of the vehicle's speedometer, b) an odometer fitted to the vehicles speedometer cable, or c) a "Hall Effect" sensor system. Traffic Safety Systems will advise you as to the most suitable sensor for your vehicle, although most modern vehicles are now built with an electronic speedometer feed and the TSS VASCAR takes the distance directly from that. The time taken to cover that distance is provided by a quartz crystal clock built into the VASCAR.

The VASCAR is a self-contained device with a single 15-pin D-connector. This connector is used for power input, distance measurement input, remote control switches, for down loading information to the Autovision system or printer and for connection for the external bleeper.

The front panel has 5 biased toggle switches with tactile feedback. This provides a sharp, positive feeling when the switches are operated.

There are three switches below the display labelled 'D', 'T' and 'S' standing for Distance, Time and Synchronous. They are spaced a specific distance from each other for maximum ease of operation. There are two further switches sited to the left and right of the display. The functions of these switches varies and the display always indicates the function.

The display is an alpha-numeric two-line x 16 character LCD (Liquid Crystal Display) with L.E.D. back-lighting. This allows the machine to communicate with the operator. The large LCD is clear to read in strong sunlight and has a backlight for night operation which is gentle on the operator's eyes.

The case is powder coated steel making it durable and strong. It is DIN standard size and will mount in a vehicle radio slot. It is also supplied with a simple mounting bracket for installations where the radio slot is not available. The mounting bracket has four knurled nuts to hold the VASCAR in place and facilitate easy removal, thus enabling the VASCAR to be moved from vehicle to vehicle or to be taken from the vehicle for use in the hand held mode. The housing is weather proofed so it may be used on motorcycles.

The VASCAR has an in-built Nickel-Cadmium battery which will operate the system for a minimum of 4 hours for hand held use when disconnected from the vehicle and carrying out prefed checks. When connected to the vehicle the VASCAR will recharge itself on a continuous trickle charge whilst it is operating. It is not possible to overcharge the in-built battery.

For motorcycle use a harness is provided which plugs into the rear. It comprises two switches on leads which fit onto the motorcycle handlebars allowing operation without removal of the hands from the hand grip.

A remote control may be provided for in-car use to allow the officer to operate the system at a distance from the VASCAR. The remote control switches may be fitted permanently in a fixed position, or supplied in a small case incorporating a bleeper on a flying lead for flexibility.

The VASCAR 5000 Special has an integral serial interface with a line driver enabling it to communicate with the TSS Autovision or printer systems if required.

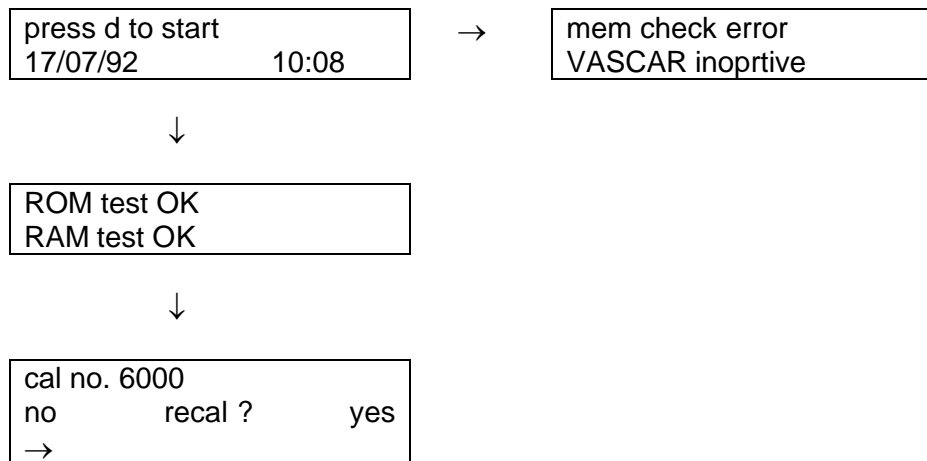
CHAPTER 2

GENERAL OPERATING PROCEDURES

Note FOR EQUIPMENT SUPPLIED TO OPERATE IN KILOMETRES, THE DISPLAY WILL SHOW KM/H INSTEAD OF MPH. WHERE THESE INSTRUCTIONS INDICATE MILES, READ KILOMETRES.

a. Switching on and self testing

To switch the VASCAR on, follow the instructions on the display and 'press D to start'. When the VASCAR is switched on it automatically carries out ROM and RAM tests. These are tests on the memory hardware and software to determine whether any corruption has occurred. If the program has been corrupted the VASCAR will inform the operator and not allow further operation. The unit should be returned to the supplier. If the tests are OK, the VASCAR will inform the operator.



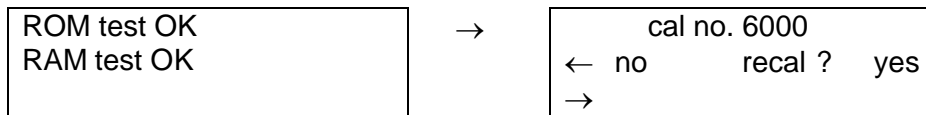
If the ROM and RAM tests are OK the VASCAR will display the calibration number and ask the operator if re-calibration is required, 'recal'?

b. Calibration of the VASCAR

The calibration number of the VASCAR 5000 is stored in the memory.

To calibrate the VASCAR, switch on as instructed on screen by operating the 'D' switch. The VASCAR will proceed through the self-test procedure as detailed in a). After this

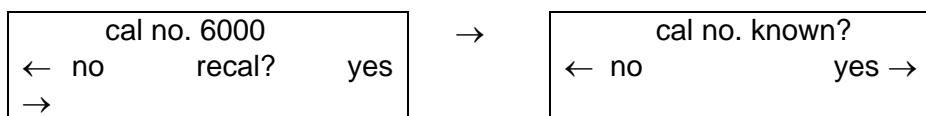
has been completed the VASCAR will display the recalibration menu and ask if recalibration is required.



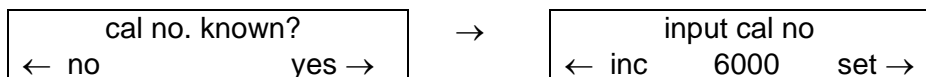
The procedure for calibration is as follows:-

i. When the calibration number is known

In the 'recal'? mode, press 'yes' and the display will ask if the calibration number is known.



Press 'yes' and the display will instruct you to input the calibration number. The left and right switches will have changed functions to 'inc' and 'set' and a cursor will blink on the number that may be altered.

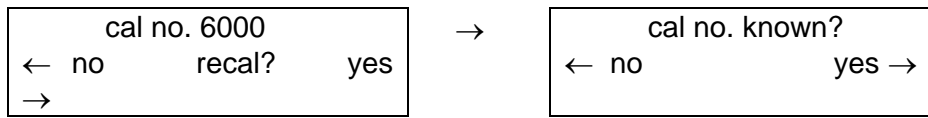


Press 'inc' or increment to increase the number and 'set' to lock that number into the VASCAR and transfer the cursor to the next number. When the last number has been correctly entered, press 'set' and the VASCAR will return to the first screen but with the new calibration number displayed.

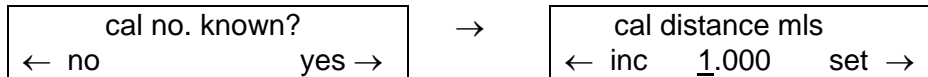


ii. When the calibration number is not known

In the 'recal'? mode, press 'yes' and the VASCAR will ask if the calibration number is known.



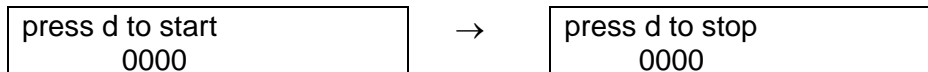
Press 'no' and the VASCAR will instruct you to enter the calibration distance of either 1.000 or 0.500. This is the known measured distance on the highway over which the unit is to be calibrated (e.g. 1.000 for one mile or 0.500 for half a mile). The left and right hand buttons will have changed functions to 'inc' and 'set' to allow that number to be altered. Only 1.000 or 0.500 are available.



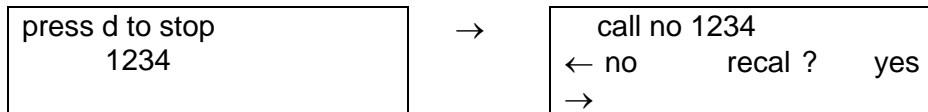
When the number has been correctly entered press set and the display will change, instructing you to press D, thus allowing the input of distance pulses into the VASCAR.



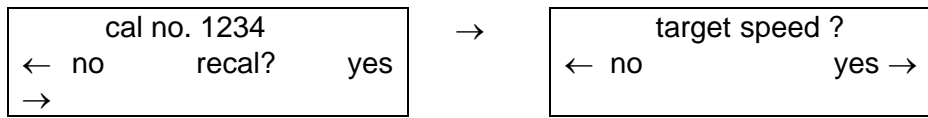
When D is pressed the display will change instructing you to press D at the end of the known distance. Drive the vehicle over the measured distance and press D stopping the input of pulses automatically locking the calibration number into the VASCAR's memory.



The display will return to the 'recal'? screen but with the new calibration number displayed.

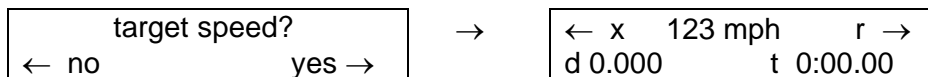


Both methods of calibration can be carried out as many times as required. When you are satisfied press 'no' in the 'recal'? mode and the VASCAR will move to the target speed mode.



c. Measuring the targets speed

To measure the speed of a vehicle the mode 'target speed' must be selected. In this mode the patrol vehicles own speed is displayed rounded down to the nearest mph, updating every second. This is displayed continuously at all times except when a target speed check has been completed and is held on the display. It is displayed while the check takes place.



The VASCAR operator always measures distance with the patrol car and times the vehicle under observation (target car) over that same distance. He operates the time switch (t) when the target car passes a clearly defined reference point along the highway and switches off when that car passes a second reference point. He operates the distance switch (d) when the patrol car passes the same first reference point and off and when it passes the second reference point. The computed average speed, time taken and distance travelled will then appear on the display. The time, distance and sync switches may be operated in any order, simultaneously or overlapping. During the check the time and distance measurements update continuously so that the operator knows the time taken and distance travelled. The VASCAR will not allow speed measurements to be made over a distance of less than 0.125 of a mile in this mode.



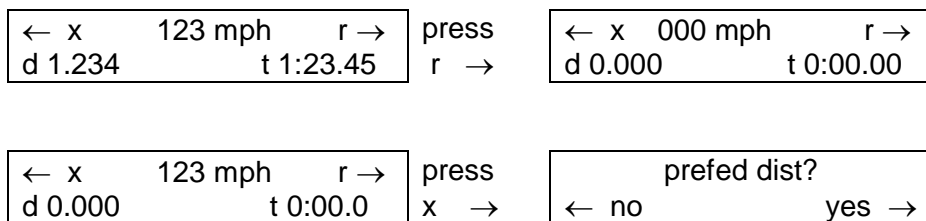
Operate 'reset' to take a new measurement and the previous display will return. In normal mode the VASCAR must be reset before taking a further check. If auto reset has been selected (see h) the operation of t, d and s resets the VASCAR and commences a new check. Press exit to leave the target speed option and progress to the next option.

There is no need for the operator to take his eyes from the road at any time during the speed checking procedures. He can glance at the average speed readout when he is ready as it will remain displayed until he clears the computer by operating the reset switch or commencing a new check.

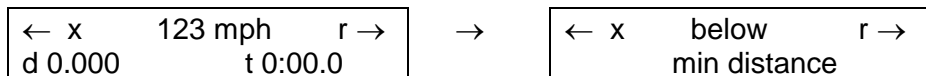
Location of reference points used by the operator can be fixed landmarks that are clearly visible. For example, shadows on the road surface cast by trees, buildings, road signs or other fixed objects by the roadside, over bridges, changes in road surface colours,

manhole covers, white lines or other road surface markings, breaks in the kerb line at side of junction or driveways etc. The operator, however, will not use his judgement to determine when the target car passes a reference point. He must be guided by some indisputable fact such as a stationary shadow striking the target car or the target cars' shadow passing over a white line, manhole or change in road surface. Even on the dullest day a distinct change of light density can be seen underneath the target car or when that car passes under a bridge. Therefore, depth perception and parallax do not apply. Reaction time is not a significant factor as the VASCAR operator, having first picked the reference point, can anticipate when the target car will arrive at the reference point and switch instantly. Even if the reference point is missed by several feet, the resultant error will have negligible effect on the average speed over a reasonable distance. For this reason the VASCAR will not operate below a minimum distance of 0.125 of a mile (200 metres approximately).

At any time whilst a check is in progress the VASCAR may be reset to take a new measurement by operating the top right switch downwards. Exit to leave the target speed option and progress to the next option by operating the top left switch.



If the distance of less than 0.125 (200 meters) miles has been travelled when the check is completed the VASCAR will not provide a speed reading but will default automatically to read the following:-



Press 'r' to reset or 'x' to exit and progress to the next option.

d. Speed with prefed distance

The prefed distance mode enables a known distance (previously measured by VASCAR) to be fed into the 5000 without the need to drive over the route. Checks may then be performed repeatedly at the same site whilst the operator remains stationary. The VASCAR can be removed from the vehicle to operate in this mode, using the internal battery power supply.

Select the 'prefed dist?' mode and the display will ask you if you wish to use the last prefed distance. Press 'yes' and there are three options. When first connecting the VASCAR or the internal power supply has been discharged, it will default to a distance of 1.000. Normally the default will not be displayed and the VASCAR will show the last

prefed used that has been stored in the memory. If a new distance has been driven over in target speed mode and recorded on the distance counter, the distance will over ride the stored distance and be displayed as the last prefed. This means the operator does not have to manually enter the distance.

prefed dist? ← no yes →	press yes →	last prefed? ← no d1.000 yes →
---	----------------	---

(e.g. default)

prefed dist? ← no yes →	press yes →	last prefed? ← no d1.234 yes →
---	----------------	---

(e.g. memory stored distance)

prefed dist? ← no yes →	press yes →	last prefed? ← no d0.321 yes →
---	----------------	---

(e.g. distance from 'target speed')

By selecting 'yes', the displayed distance is entered automatically. The distance cannot now be reset. By selecting 'no' you will be instructed to enter a prefed distance.

The left and right switches will have changed function to inc and set as indicated. Use as previously detailed to input the prefed distance. When the last number has been correctly entered, press set and the VASCAR will display the prefed mode operating screen. Note that the distance is locked into the display and cannot be reset.

last prefed ? ← no d1.000 yes →	press no →	input prefed dis ← inc d <u>0</u> .000 set →
--	---------------	---

input prefed dist ← inc d0.32 <u>1</u> set →	press set →	← x 000.0 mph r → d 0.321 t 0:00:00
--	----------------	---

Operate 't' to check the suspect vehicle. On completion of the check time, distance and speed are all displayed on-screen for the operators reference. Operating reset clears the time and speed readouts but leaves the distance locked in. If auto reset has been selected there is no need to operate the reset between checks.

← x 000.0 mph r → d 0.321 t 0:00:00	press t →	← x 38.52 mph r → d 0.321 t 0:02:00
---	--------------	---

NOTE: DISTANCE EXCEEDING 1.999 MILES CANNOT BE ENTERED. IF A DISTANCE EXCEEDING THIS IS RECORDED IN 'TARGET SPEED MODE' WHEN ENTERING PREFED THE VASCAR WILL DEFAULT TO 1.000.

e. Pace speed and training

The synchronous or sync switch (s) on the VASCAR is a versatile and useful addition. Not only can it be used in the normal target speed mode to simultaneously start or stop the time and distance switches but it also has two additional functions.

i. Pace speed

For straightforward following checks which provide an average speed of the patrol vehicle simply operate 's'. As you follow the target vehicle at a constant distance the time and distance since the operation of the switch are displayed. When you have travelled a sufficient distance, operation of 's' closes both switches thus removing the necessity of operating the 't' and 'd' switches together. Pace speeds or following checks are particularly useful in conditions where reference points are scarce or at night-time when they may be difficult to determine.

ii. Training

Typically in training, the target vehicle is equipped with VASCAR and a trained officer operating the VASCAR. On a command from the trainee in the patrol car he operated the 't' and 'd' simultaneously at the start and finish of the check. Now, by using the sync switch any discrepancies in switch operation are removed.

f. Moving prefed checks

The VASCAR 5000 can be used to carry out pace speeds or following checks over a prefed distance, known as moving prefed. The differences between this and a pace speed as described in e)i) above is that the check, once started by the officer, automatically stops after a predetermined distance.

Select the 'prefed mode' and enter the required distance as you would for a normal stationary prefed check, perhaps 0.250 or 0.500. If the required distance is already entered then no alteration is necessary. If the time switch is then operated whilst the vehicle is moving, a moving prefed check is carried out stopping automatically when the prefed distance is completed. The operator need NOT press the time switch again.

If a bleeper is connected it will sound once when the t switch is operated and again when the check is completed to let the operator know he has a valid speed.

g. Synchronous or 'sync' switch

The sync switch as seen in e) can be implemented for functions other than starting and stopping both time and distance together.

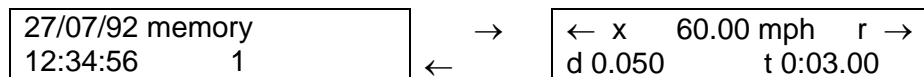
It is also used to reset the VASCAR and start a synchronous check (both time and distance) when; in memory, at any point in the prefed mode, in 'target speed?', in 'prefed dist?' or when only time or distance functions have been operated in target speed mode. This is useful if a target car is spotted passing the patrol vehicle whilst carrying out another function with the VASCAR. It saves the operator the time necessary to get into the target speed mode.

h. Memory (VASCAR 5000 Special Only)

The VASCAR has a memory of the last 100 checks which are stored automatically when a check is completed. The checks are stored whether the VASCAR is in prefed distance mode or target speed mode. When 100 memory entries are stored further checks are added to the memory and the first recorded check (the 100th memory entry), is discarded. The information stored is as follows:-

- i) Average speed of check
- ii) Time duration of check
- iii) Distance of check
- iv) Date of check
- v) Time of check
- vi) Memory number

It is displayed on two alternating screen as follows:-



The memory entries can be recalled in target speed mode when idle or when a measurement is completed. The memory entries can be recalled in prefed mode when idle or when a measurement is completed. To access to memory, operate the right hand switch upwards to display the last recorded entry. Further operations of the switch step through earlier entries. To leave the memory, operate reset (right hand switch downwards) or the sync switch. If the auto reset has been selected the operation of the time or distance switches in target speed mode will leave the memory and start a check. The operation of time only in prefed mode will leave the memory and start a check.

i. Setting the clock/calendar and auto reset

THE VASCAR 5000 SPECIAL HAS CLOCK/CALENDAR AND AUTO RESET FACILITIES. THE VASCAR 5000 STANDARD HAS AUTO RESET ONLY.

The clock/calendar must be set to ensure the correct date record of the check is entered into the memory and down loaded to the TSS Autovision and printer systems if connected.

The auto-reset, if selected, allows checks to be carried out without manually resetting the VASCAR. Some operators prefer a manual reset and the option to change to either method is built in.

To access both the clock/calendar and auto-reset operate the 'sync' switch when the VASCAR is off rather than the d switch as instructed.

VASCAR 5000 SPECIAL

press d to start
15/07/92 10:08



ROM test OK
RAM test OK



set date & time
← no yes →

VASCAR 5000 STANDARD

press d to start



ROM test OK
RAM test OK



auto reset off?
← no yes →

For the 5000 Special press 'yes' and the display will allow you to enter the year, month and day. The left and right buttons will have changed functions to 'inc' and 'set'. When the last number is entered press set and the VASCAR will prompt you to enter the time in the same manner.

set date & time
← no yes →

press
yes

← inc date set →
27/07/92

press
set

← inc date set →
15/07/92

← inc time set →
10:08

← inc	time	set →	press	auto reset off?
	10:08		set	← no yes →

For the 5000 Special when the clock/calendar has been entered the display will ask you if you want to switch the auto reset off. The 5000 Standard goes straight to this. Select yes or no and the VASCAR continues to target speed mode and operates as normal.

j. Beeper

An external beeper can be connected to the VASCAR which sounds when a speed check function is activated. This gives an extra audible indication that the device is operating correctly and the officer need not look from the road to ensure the device is running.

k. Remote control switches

The VASCAR 5000 may be remotely controlled for in-car use.

The remotes may be supplied as 5 panel mounting press button switches for mounting in the vehicle fascia or centre consul to control all facilities except the memory re-call. Alternatively the handset can be supplied with 5 press buttons mounted on it with an internal beeper.

For the motorcycle, a waterproof harness is supplied enabling the officer to operate the 5000 with removing his hands from the hand grips. They are very positive switches so the action can be felt when operating them with thick gloves.

l. Accident Investigation mode (brake lock).

The Vascar 5000 may be supplied with an 'accident investigation' or 'brake lock' mode. The Vascar may be recognised as an Accident Investigation version by the start up screen when pressing "S" as follows:

Vascar 5000 AI Rev 1.1 30/05/97

To use this facility the "S" input on the rear connector must be connected to the 12 volts brake light circuit of the vehicle. As soon as the brakes are operated the exact speed of the vehicle is locked on the screen.

Select the "brake lock?" mode and the Vascar will show the patrol vehicles' speed to 2 decimal places .

brake lock?
← no yes →

← x 000.0 mph r →

When the brake is applied the display will change to read brake locked and the speed at that time will be locked onto the display until it is either reset by pressing "r" or the mode is exited by pressing "x".

← x 37.39 mph r → brake
 applied

← x 37.39 mph r →
 brake locked

REMEMBER: IF THIS FACILITY IS CONNECTED THE VASCAR SYNCH SWITCH - ON THE UNIT OR REMOTE - MUST NOT BE OPERATED. IT IS RECOMMENDED THAT A SWITCH IS USED IN THE WIRE FROM THE BRAKE CIRCUIT SO THE VASCAR MAY BE ISOLATED FROM THE BRAKE LOCK CIRCUIT WHEN IT IS NOT USED FOR THIS PURPOSE.

CHAPTER 3

OPERATIONAL METHODS OF CHECKING SPEEDS

During a speed check the operator is concerned only with the three switches marked 'D', 'T' and 'S'. The switch on the left below the display marked 'D' is for measuring distance. The switch to the right below the display marked 'T' is for measuring time. The switch centrally below the

display marked 'S' is for synchronous start or stop of the 'T' and 'D' switches. With all these switches, operate once to start and once to stop.

With auto-reset on, subsequent checks can be carried out immediately. With auto reset off, before a second or subsequent check can be carried out it is necessary to clear the VASCAR. This is done by pressing the switch to the right of the display indicated 'r' for reset. The VASCAR will not allow double entries of time or distance.

Remember that time checks on a target vehicle should always be started and stopped only when the shadow of that vehicle touches an object or when the target vehicle is touched by the shadow of an over bridge or other fixed object, or when the target vehicle can clearly be seen to bounce into a gully, pothole, sunken trench or over a bump, or when it physically touches a reference point.

NEVER start or stop a check where there is no definite reference point. VASCAR has the advantage over most other methods of speed detection devices in that several checks may be obtained and stored to memory. Therefore, always be certain. If in doubt start again. NEVER GUESS.

Although there are many variations, operational methods fall broadly into five classifications as described below. Methods 1, 2, 4 and 5 are carried out in target speed mode, while 3 is carried out in prefed dist mode.

1. THE FOLLOWING CHECK

(The patrol vehicle is following the target vehicle). The operator switches on the time switch when the target vehicle passes a first reference point and the distance switch when the patrol vehicle passes the same point. He switches off the time switch when the target vehicle passes a second reference point and the distance switch when the patrol vehicle reaches the second point. Average speed is displayed instantly on the LCD display where it remains as evidence, with the elapsed time of check and distance travelled.

If after the check has commenced, the patrol vehicle overtakes the target vehicle two courses of action are open as follows:-

- a) The sync switch is operated when the two vehicles are level (or both time and distance switches are turned off simultaneously).
- b) The patrol vehicle continues ahead until it reaches a reference point when the distance switch is switched off. The time switch is switched off when the target vehicle reaches the same point.

2. THE BEING FOLLOWED CHECK

(The target vehicle is following the patrol vehicle). The operator selects a suitable reference point and switches on the distance switch when that point is reached by the patrol vehicle. He switches on the time switch when the target vehicle arrives at the same point (viewed in the driving mirror). He switches off the distance switch when the patrol vehicle reached a second reference point and likewise the time switch when the target vehicle reaches the second point.

If, after the check has commenced, the target vehicle overtakes the patrol car, two courses of action are open:-

- a) The sync switch is operated when the two vehicles are level (or both time and distance switches are turned off simultaneously).
- b) The target vehicle is allowed to continue ahead until it reaches a reference point when the time switch is switched off. The distance switch is switched off when the patrol vehicle reached the same point.

3. THE PREFED DISTANCE CHECK

(The patrol vehicle is parked). The operator will select two reference points, both of which can clearly be seen from a suitable parked position. He will drive the patrol vehicle over the route and switch the distance switch on at the first point and off at the second. This will be done in target speed mode. He will record the distance, select 'prefed mode' and input the distance. With the distance thus stored in the VASCAR he will take up his parked position. He will then time vehicle passing from one reference point to the other by operating the time switch only. On completion of the time switching, the average speed of the vehicle checked will be displayed as well as the time taken and the prefed distance. Provided the references points are suitable, vehicles travelling in either direction can be checked from the same parked position.

Should road traffic conditions favour hand held operation, the VASCAR can be removed from the vehicle by unplugging the connector at the rear. The in-built battery will power the unit for a minimum of four hours operation in this mode and will recharge when reconnected to the vehicle. Hand held operation may be used by going to the site on foot provided the operator has, on some previous occasion, measured and recorded the distance between the two reference points.

This method of checking is appropriate to create an impact on a short section of road with a high accident record or where there have been complaints from local members of public of excessive speeds. However, it should not, in the normal way, take precedence over the use of VASCAR in the course of normal patrol. The greatest deterrent to speeding will be achieved by exploiting the versatility of VASCAR to the full.

4. THE ONCOMING TRAFFIC CHECK

(Patrol vehicle and target vehicle travelling in opposite directions). This method requires a clear and distant reference point, such as the shadow from an overpass. The target vehicle is timed from the reference point to the point where it is abreast of the patrol vehicle as they pass in opposite directions. When they are abreast both time and distance switches are operated at the same time i.e., time switch off and distance switch on. The patrol vehicle continues to the first reference point (in this example the shadow from the overpass) where the distance is switched off. Once again, time and distance give average speed.

5. THE CROSSING CHECK

(The patrol vehicle comes to rest at a 'T' junction and whilst waiting to emerge, sees a vehicle approaching at speed along the other road. He switches on the time as his target vehicle crosses a reference point just past the junction. When traffic conditions allow, the patrol driver goes into pursuit and switches on the distance switch as the patrol vehicle crosses the same reference point. When the target vehicle reaches a second reference point, the time is switched off, and the distance is switched off when the patrol vehicle reaches the second reference point. It matters not if the time switching between the first and the second reference points is completed and stored in the VASCAR before the patrol vehicle has pulled away from the junction. Provided the patrol vehicle then measures the distance between the two selected points, an average speed reading of the target vehicle will be displayed.

BASIC OPERATING PROCEDURES IN BRIEF

Average speed is computed by dividing measured distance by recorded time. To check suspected speed limit offences, the traffic patrol officer has only to switch on the time and distance recorders when the car under observation and the police vehicle pass a selected reference point, switching off at a second reference point. There are five standard checks:

1. The FOLLOWING check in which the operator switches on the time recorder when the suspect passes a first reference point and the distance recorder when the police car itself passes the same point. When the suspect passes a second reference point, the time recorder is switched off, the distance recorder is stopped as the police car passes the same reference point. Average speed is computed and shown instantly on the display with the elapsed time and distance travelled of the check. It remains to be seen as evidence until operation of the reset button clears the system for the next speed check.
2. The BEING FOLLOWED check uses a similar procedure - but the in reverse order - remembering that distance is always measured by the police car.
3. The PREFED DISTANCE check enables a stationary police car, having first measured a distance between two fixed reference points, to check the average speed of any vehicle between those points merely by operating the time switch. The VASCAR 5000 can be removed from the vehicle and operated from the internal battery by entering the measured distance.
4. The ON-COMING TRAFFIC check required a clear distance reference point such as the shadow of an overpass. The suspect car is timed from the overpass to the point at which it is level with the police car, at this moment, time off and distance on switches are operated together - the distance recorder being switched off as the police car reached the overpass. The suspect's average speed is computed instantly.
5. The CROSSING check enables suspects to be checked from junctions and other positions of opportunity by measuring the suspects time between two reference points. The distance is measured by the police car over the same route as traffic conditions permit.

In all cases, the elapsed time and the distance over which the speed was recorded is displayed with the average speed upon completion of the check.

CHAPTER 4

TRAINING GUIDE

NO EQUIPMENT, HOWEVER EXCELLENT IN ITS CONCEPT, DESIGN AND MANUFACTURE, IS BETTER THAN THE MAN WHO USES IT.

This training guide, based on well proven procedures used by Police forces in the UK and the USA, is intended to assist police, or other law enforcement agencies, to mount their own VASCAR Operators training programme.

The first step is to arrange for one or more personnel to be trained as VASCAR instructors. This may well be done by the Police, by arrangement with another Police force which has an established training programme in operation. If this is not practicable, guidance should be sought from Traffic Safety Systems.

The VASCAR training programme should be placed under the control of a supervising officer who will ensure that the correct standards are maintained.

The programme should consist of:-

- a. Two full days of instruction.
 - b. Twenty hours of familiarisation.
 - c. A practical test.
- a. Whilst no hard and fast rules can be laid down a general guide to the training syllabus would be:-
- i. First Day
 - am
 - Introductory talk
 - Training film (video or other visual aid)
 - Demonstration in classroom using ODOSIM training simulator and VASCAR
 - Documentation
 - Policy
 - pm
 - Demonstration of VASCAR on the road by instructor
 - Practice by students under instructor supervision
 - ii. Second Day
 - am
 - Practice by students under instructor supervision
 - pm
 - Practice by students where the target car is fitted with VASCAR
 - Explanation of final test

b. Twenty hours of familiarisation:-

This can be done at the students normal station providing there is a VASCAR equipped car in which he can practice. If a student is able to patrol with a qualified VASCAR operator, so much the better. If other duties, leave or sickness significantly interrupt this period, then it should be extended.

c. The practical test:-

Twenty five separate checks will be made on the known target car (patrol car equipped with VASCAR). Five examples of each of the five basic operational methods will be included. No one check may exceed a 2 mph error and the total average error must not exceed 0.7mph.

Minimum recommended training hours:-

Twenty hours instruction, including progress checks and final test. Twenty hours familiarisation.

NO OFFICER SHOULD BE PERMITTED TO DEAL WITH SPEED OFFENDERS UNTIL HE IS TRAINED AND HAS PASSED THE TEST.

CHAPTER 5

POLICY

Independent methods of checking the accuracy of VASCAR, provided it has been calibrated as prescribed earlier in this manual are as follows:-

- a.
 - i. Drive the police car at any constant speed as indicated on the cars certified speedometer.
 - ii. With the VASCAR in target speed mode operate the sync switch, leave for a few seconds and operate the sync switch again.
 - iii. Compare the VASCAR speed reading with that of the speedometer.
 - b.
 - i. Drive the car over a known and independently measured distance on the highway with the VASCAR in target speed mode. Switch the distance switch on and off at the beginning and end of the measured distance. Care should be taken to ensure that this is done with high precision as VASCAR is capable of measuring distance to a very high degree of accuracy.
 - ii. Enter a known quantity of time with an accurate stopwatch by use of the time switch. Actuate the stopwatch and time switch simultaneously.
 - iii. Check the average speed displayed on the readout panel.
- e.g. 1 mile distance and 60 seconds of time = 60mph
1/2 mile distance and 30 seconds of time = 60 mph
(A variation of 0.2 mph in the reading is accepted as normal)

No hard and fast rule can be laid down concerning the minimum distance over which a speed check should be carried out, as the influence of any human error will vary in proportion to the speed of the target vehicle. However, experience and research have shown that a qualified operator can function within an acceptable level of accuracy over distances of 0.125 of a mile for speed limits found on public roads whether moving or stationary. For prefed (stationary) checks where the maximum speed limit does not exceed 40mph and the reference points are physical features on the road surface (i.e. painted lines, blocks, change in road surface) a minimum distance of 0.07 of a mile is considered acceptable. In practice, greater distances are mostly used, especially at high speeds. VASCAR will not allow checks over less than 0.125 of a mile yard to be completed in target speed mode and will show the message 'below min dist' (below minimum distance) if an under distance check is attempted.

CHAPTER 6

MAINTENANCE, WARRANTY AND CONNECTION

a. WARRANTY

The VASCAR 5000 Standard and VASCAR 5000 Special speed detection devices are warranted to the original purchaser to be free of defects and Traffic Safety Systems Limited (TSS) undertakes to repair the equipment to the specification or to replace at its option any units which fails because of defective parts or workmanship for a period of one year from date of purchase.

During that period there will be no charge for labour or parts. This warranty applies only to internal electronic components and circuitry. Warranty excludes normal wear and tear such as frayed cords, broken connectors, exterior hardware, trim and cases and any damage caused by physical abuse.

b. GENERAL MAINTENANCE

Traffic Safety Systems Limited hold stocks of component parts and printed circuit boards. In normal circumstances TSS or the distributor are able to repair and return by post equipment, and dispatch within seven days of receipt. If damage is suspected for any reason and if the equipment is not functioning properly it should be returned to TSS with - whenever possible - full details of the type and circumstances of damage or defect incurred.

VASCAR equipment should be serviced at 12 monthly intervals to ensure correct operation. Return the device to TSS or their distributor for this service.

c. CONNECTIONS FOR THE VASCAR 5000 AND 5000 SPECIAL

Each pin's function is indicated on the VASCAR connector.

Power should be supplied directly from the vehicle's supply and the odometer input directly from the supply also. Connection of other items and accessories is detailed with the accessories. Refer to Chapter 8 on installation for full details.

CHAPTER 7

SPECIFICATION

Time Accuracy

32 KHz crystal controlled oscillator with 50 ppm accuracy.

Distance Accuracy

+(-) 1 odometer pulse.

Internal Calculation Accuracy

Calculated to 3 decimal places, displayed to 4 most significant digits (leading zero blanking on display).

Speed Range

0-9999 mph or 0-9999 kmh.

Power Consumption

250 mA operational connected to supply, 25mA in shutdown, Nominal.

Power Supply Voltage

6-20 volts dc, 14 volts nominal. Reverse polarity protected.

Internal power supply

Allows 2 1/2 hours nominal use without external supply.

Control Panel

Bi-directional biased toggle switches.

Display

Supertwist nematic two line x 16 character LCD, with LED backlight and 9.2mm character height.

Microprocessor

7.3728 MHz crystal controlled.
8 bit CMOS microprocessor.

Interface

Internal universal vehicle interface for odometer pulse conditioning.

Serial Interface (VASCAR 5000S only)

Interfaces for optional printer and Autovision connection (RS232 & T.T.L. serial)

Memory (VASCAR 5000S only)

100 memory capacity for storing speed detection. Each memory entry consists of a two page entry. The first page shows date and time @ completion of check along with memory entry number. The second page contains the distance, time and computed average speed detail. The two pages are alternated on the display for ease of readability.

Clock/Calendar (VASCAR 5000S only)

Internal time/date information will be maintained for 20 days minimum when disconnected from supply.

Temperature Range

-10 degrees C to 70 degrees C.

Construction

Water protected welded steel case, powder coated.

Weight

700 grams.

Dimensions

To fit DIN E slot.

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VASCAR FIELD TEST

OFFICER
DIVISION/FORCE
DATE
TESTED BY
NUMBER OF TESTS

WEATHER CONDITIONS
TYPE OF ROAD (2 lane divided etc)
TOTAL AVERAGE ERROR MPH

No.	VASCAR Police Vehicle	VASCAR Target Vehicle	Average Error mph	Method of Clock
1				
2				
3				
4				
5				
6				
7				
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REMARKS :

CHAPTER 8

INSTALLATION GUIDE AND WIRING DIAGRAMS

The VASCAR 5000's minimum requirements for operation from a vehicle are connection to a 12 volt supply (power connection) and connection to the vehicles speedometer drive (distance input connection). Additionally remote controls can be added, an external bleeper and a printer.

POWER CONNECTION

The VASCAR 5000 should be connected directly to the vehicles' battery for its' power supply to avoid any possible interference from or to the vehicles electrical system. It should NOT be connected through the vehicles' ignition as the VASCAR's internal battery will not therefore maintain its' charge.

Run two wires from the battery terminals for 12 volts and 0 volts to the VASCAR fitting position. A 5 Amp fuse should be installed in-line of the 12 volt supply. This is not to protect the VASCAR which only draws 250 milliamps when operational but as a precaution against a possible fire hazard., in the event that the wire is damaged the fuse will blow before possible overheating. This applies whether fitting to a motorcycle or car. It is recommended that a wire suitable for carrying a 5 amp load is used as a minimum for durability.

DISTANCE INPUT CONNECTION

The VASCAR must be connected to the vehicles speedometer drive to enable it to count distance pulses to calculate a speed. The VASCAR reads these pulses **independently** of the vehicles speedometer allowing it to calibrate to such high levels of accuracy. A vehicle may have either a mechanically or electronically driven speedometer.

Mechanically driven speedometers

For vehicles with a mechanically (cable) driven speedometer an odometer must be fitted to the cable. An odometer generates 2 pulses per revolution of the cable and feeds these to the VASCAR. The odometer is designed to fit all cars and motorcycles and is available from TSS.

To fit the odometer, first remove the cable and cut out a 40mm (1 1/2 inch) section from the outer cable. Put the metal sleeves and ring nut over each cable end. Push the inner cable through one outer half and through the odometer itself. Push the inner cable through the other outer cable and tighten the two rotor screws onto the inner cable with the allen key provided. Finally fasten the ring nuts securely. In some instances the outer cable is not thick enough for the metal sleeves and ring nuts to create a snug fit, in this instance wind a few turns of electrical tape around the outer cable once the metal sleeves and ring nuts have been put on and they will 'draw up' on the tape.

The sensor is designed for inner cables of 3.2mm (1/8 inch). If the 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.

With some vehicles the inner cable cannot be easily withdrawn. If the crimp which holds the inner cable into the outer cable cannot be released proceed as follows: Cut through both the inner and outer cables. Carefully remove 20mm (3/4 inch) from each end of the outer cable halves. Push the sleeve and ring nut onto each end of the outer cable. Push the inner into each end of the odometer and tighten the rotor screws.

There are three wires running from the odometer. They are 12 volts, 0 volts and signal. For the 12 volt supply either connect this to the VASCAR connection block or directly to the vehicles' battery. Connect the signal wire to the VASCAR connection block terminal marked 'ODO'. The wires are as follows:

Blue - Odometer signal.

Green - 0 volts.

Red - 12 volts.

NOTE: The odometer is not waterproof. It is generally mounted in the vehicle engine bay for a car or near the instruments for a motorcycle, if there is a possibility of it getting wet it should be shielded to avoid this. The upper temperature limit is 125 degrees centigrade and it should not be positioned too close to the engine block or exhaust system to avoid overheating.

Electronically driven speedometers

Many vehicles have an electronically driven speedometer even though the readout or dial may be analogue in the traditional manner (the speedometer clock). The VASCAR has an in-built interface which allows it to read a wide range of signal values and a pulse rate per kilometre or mile up to 9999.

To connect the VASCAR to vehicles with electronically driven speedometers first determine the relevant signal wire. TSS can advise on this or the vehicle manufacturer / distributor will have the details. There will typically be three wires coming from the vehicles gearbox - 12 volts, 0 volts and signal, the signal can be determined with a meter if the installer is comfortable doing so.

Once the correct signal wire has been located connect a wire to this, run it to the VASCAR connection block terminal marked 'ODO'.

Some vehicles may produce more than 9999 pulses per mile or kilometre and a 'divider' needs to be fitted. Dividers are available from TSS in several variations. Some vehicles may produce a very low signal and an additional interface is required to boost the signal, these are available from TSS.

MOTORCYCLE INSTALLATION.

The VASCAR 5000 should be installed centrally, preferably above the instrument console. This allows the operator to view the VASCAR display without removing his eyes from the road for a prolonged period in the interest of safety. For motorcycle operation a control harness is always used which consists of remote switches for TIME and DISTANCE operation which fit onto the handlebars near to the hand-grips. This allows the operator to use the VASCAR without removing his hands from the hand-grips. The switches connect to the 'D', 'T' and 'COM' or common terminals on the VASCAR connection block.

Although all the switches may be remotely controlled, for motorcycle use it is recommended that only the time and distance functions are used. With the auto-reset facility selected no other switches are needed.

CAR INSTALLATION

The VASCAR should be mounted in the vehicle dashboard or central console using the bracket supplied. The VASCAR will fit into a standard DIN E slot if available for easier installation. It should be positioned to allow viewing and access for operation by both the driver and passenger without causing an obstruction to the operation of the normal vehicle controls. Whilst it is recognised that there are increasing demands made on the space in a vehicle, priority should be given to the VASCAR as it will be in frequent use.

Mounting of the unit on top of the dashboard should be avoided as it presents a safety hazard in the event of an accident, it may also subject the VASCAR to excessive heat exposure when left in direct sunlight.

The VASCAR can be connected to a remote control hand set which incorporates a duplication of the 5 switches and an internal bleeper. This allows simple operation of the unit and for a double manned car, means the passenger can control the VASCAR without encroaching on the drivers space.

Wiring diagrams for the VASCAR 5000 follow. More detailed information can be provided by TSS is needed.

VASCAR UNIVERSAL ODOMETER PULSE DIVIDER

Installation Instructions

The divider is required when the pulse output of the vehicle's odometer is greater than 10,000 pulses per mile (or kilometre). The unit will divide the pulse output from the vehicle's odometer by a factor of 2, 4 or 8, each type being identified by the colour of the lead as follows :-

Yellow	:	Divide by 2
White	:	Divide by 4
Blue	:	Divide by 8
Red	:	+12 volts
Green	:	0 volts

For connection to a VASCAR three connections are required:

Red for the supply voltage
Green for the 0 volts connection
Then either Yellow, White or Blue
depending on the divide factor required.

The final connection is the Grey flying lead which should be connected to the pulse output of the vehicle's odometer.

