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Australian Standard[®]

Radar speed detection

Part 2: Operational procedures

This Australian Standard was prepared by Committee CS/68, Radar Speed Detection. It was approved on behalf of the Council of Standards Australia on 22 November 1991 and published on 16 March 1992.

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Australian Automobile Association
Australian Road Research Board
Commercial Vehicle Industry Association of Australia
Confederation of Australian Industry
National Standards Commission
Police Department, New South Wales
Police Department, South Australia
Queensland Police Department
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Australian Standard[®]

Radar speed detection

Part 2: Operational procedures

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PREFACE

This Standard was prepared by the Standards Australia Committee on Radar Speed Detection following an initial request by the Australian Automobile Association which wished to see the procedures for using radar speed detection devices formalized in a public document.

In preparing this Standard, cognizance was taken of *Model Performance Specifications for Police Traffic Radar Devices*, published by the US National Highway Traffic Safety Administration.

Part 2: *Operational procedures*, specifies the procedures to be followed when using devices which comply with the requirements of AS 2898.1 to measure the speed of target vehicles for the purpose of law enforcement or scientific measurement. It does not purport to be an exhaustive set of requirements for the metrological aspects of speed measurements by means of doppler radar. The establishment of such requirements falls within the area of responsibility of the National Standards Commission (NSC) rather than Standards Australia. The Committee was aware of OIML R91 *Radar equipment for the measurement of the speed of vehicles*, which sets out comprehensive metrological requirements and may be endorsed by the NSC for use in Australia.

This edition of the Standard has been expanded from the 1986 edition to include radar speed detection devices linked to a photographic system.

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FOREWORD

This Standard has been prepared to take into account the state of the art of radar speed detection in Australia at the time of publication.

This Standard is not intended to inhibit further advances in radar speed detection technology. The committee will consider amending the Standard to include suitable requirements for new types of equipment as they become available.

Radar equipment which operates in X-band has been phased out following the decision of the Department of Transport and Communications to allocate this range of frequencies to a usage other than radar speed detection. In future the frequency band of 10 000 to 20 000 MHz (which includes the former X-band) will be known as J-band and will be used for purposes other than radar speed detection. All new equipment should operate in K-band; however, the Department has recognized that a small number of existing X-band devices will need to remain in service for the next few years.

STANDARDS AUSTRALIA

Australian Standard
Radar speed detection

Part 2: Operational procedures

SECTION 1 SCOPE AND GENERAL

1.1 SCOPE This Standard sets out the procedures to be followed when using a radar device to measure the speed of a target vehicle for law enforcement or for scientific measurement.

1.2 APPLICATION This Standard is applicable to the use of radar devices complying with AS 2898.1.

1.3 REFERENCED DOCUMENTS The following Standards are referred to in this Standard:

AS

2898 Radar speed detection

2898.1 Part 1: Functional requirements and definitions

1.4 DEFINITIONS For the purpose of this Standard, the definitions set out in AS 2898.1 apply.

SECTION 2 OPERATIONAL PROCEDURES

2.1 OPERATOR For the purpose of law enforcement, the operator of the radar device shall be a person authorized by the appropriate Regulatory Authority to use radar devices to measure the speed of vehicles.

The Regulatory Authority shall maintain records of persons authorized to use radar devices to measure the speed of vehicles.

NOTES:

- 1 Appendix A gives advice on the type of training that should be given to persons seeking to become authorized operators.
- 2 The appropriate Regulatory Authority is the government body charged with the responsibility for enforcing laws relating to vehicle speed at the location where the radar device is to be used.
- 3 Speed measurements taken by persons other than authorized operators are not considered to be valid for the purpose of this Standard unless such persons are under training and are being directly supervised by an authorized operator.

2.2 EQUIPMENT CERTIFICATION

2.2.1 Testing Authority Each Testing Authority shall be an organization or company recognized as being competent to carry out electronic testing in accordance with this Standard.

2.2.2 Frequency of testing The radar device shall be tested and certified by a Testing Authority as meeting the requirements set out in Clause 2.2.3 and be sealed by the Testing Authority at least every 12 months.

NOTE: This testing only relates to the accuracy of the device in a laboratory situation without any allowance for the effects introduced by mounting slant radar at an angle to the path of the target vehicle. Therefore, the accuracy specified in this Clause is slightly different to that specified for field testing in Clause 2.5.2.

2.2.3 Testing procedure The testing procedure shall ascertain that—

- (a) the speed computing circuit is in accordance with the manufacturer's circuit design including any modifications approved by the manufacturer or the Testing Authority;
- (b) the device is in a satisfactory electrical condition and that any maintenance has been satisfactorily carried out; and
- (c) the device is correctly calibrated in accordance with the manufacturer's instructions.

2.2.4 Sealing The Testing Authority shall certify and seal the radar device only if the testing carried out in Clause 2.2.3 confirms that—

- (a) the circuit is in accordance with the manufacturer's circuit design including any modifications approved by the manufacturer or the Testing Authority;
- (b) the device is in a satisfactory electrical condition; and
- (c) the intervals at which testing is carried out indicate that speed measurements with an accuracy of ± 2 km/h of the true speeds are determinable.

2.3 VEHICLE-MOUNTED EQUIPMENT

2.3.1 Vehicle power source If a radar device uses a vehicle for its source of power, the power supply shall be isolated from the effects of the vehicle's ignition circuit by connecting the radar device directly to the vehicle's battery using shielded cable.

This arrangement shall be permitted only if the radar device incorporates an effective filter which enables the radar device to be used when the vehicle's motor is running and when auxiliary equipment in the vehicle is operating.

2.3.2 Antenna The antenna of a radar device may be mounted within the cabin of a vehicle; however, regardless of where the antenna is mounted, personnel should not come within 100 cm of the front of the radar antenna when the radar is operating.

2.3.3 Speed displays Speed displays on a radar device which is mounted in a vehicle shall be in clear view of the operator. Mirrors shall not be used as a means of reading speed displays. Neither speed displays nor other parts of the radar device should obscure any speedometer in the vehicle.

2.4 SITE SELECTION

2.4.1 General When selecting a site for the use of a radar device in the stationary mode, the factors listed in Clauses 2.4.2 to 2.4.8 shall be taken into account.

2.4.2 Radiofrequency interference (RFI) The operator shall ensure that the effects of radiofrequency interference are minimized by careful site selection.

NOTE: Some common sources of RFI are radio transmitters, power transformers, power lines and airport radar equipment.

2.4.3 Reflections from stationary objects The operator shall ensure that the radar beam is not being reflected away from the direction in which it is being aimed by stationary objects as this may lead to incorrect target identification.

NOTE: Typical stationary reflective objects are advertising hoardings, traffic signs, parked vehicles, metallic fences, sheds and phone boxes.

2.4.4 Detection area The operator shall take into account the full detection area and the fact that the speed of any moving object within the detection area could be being measured at any given time.

NOTE: The detection area varies with different makes of radar devices.

2.4.5 Effective range Where facilities for such adjustment are fitted, the effective range of a radar device should be reduced to the minimum required for the site by adjusting the sensitivity of the device.

2.4.6 Traffic density The operator shall take into account the traffic density at the site at the time of measurement to ensure that target vehicles can be clearly identified.

2.4.7 Extraneous moving vehicles The operator shall take into account the fact that moving vehicles which are not on the roadway being monitored may be within the detection area.

NOTE: Such vehicles may be on adjacent service roads or highways, on the other side of divided roads, on properties bordering the roadway, or there may be trains on adjacent railways.

2.4.8 Alignment The operator shall ensure as near as possible that the beam of the radar device is parallel to the horizontal plane of the roadway and is related to the flow of traffic as follows:

(a) *For slant radar devices* At the angle specified by the manufacturer, within the manufacturer's specified tolerances.

NOTE: The operator should be aware of the fact that if a slant radar antenna is not aligned in accordance with the manufacturer's specification, the speed measured by the radar device will be greater or less than the true speed of the target vehicle according to whether the angle to the flow of traffic is smaller or larger than specified.

(b) *For direct radar devices* As close as possible to being directly in line with the direction of travel of the target vehicle.

NOTE: The operator should be aware of the fact that if a direct radar antenna is not aligned with the direction of travel of the target vehicle the speed measured by the radar device will be less than the true speed of the target vehicle. This is referred to as the 'cosine angle effect' because the measured speed is equal to the true speed multiplied by the cosine of the angle between the antenna and the direction of travel of the target vehicle and hence cannot be higher than the true speed.

2.5 CIRCUIT TESTING

2.5.1 General The accuracy of the radar device shall be tested in accordance with Clause 2.5.3 at the commencement and at the end of each operator's period of operation. Where the period of operation exceeds nine hours, the accuracy of the radar device shall also be tested in accordance with Clause 2.5.3 at intervals not exceeding nine hours.

2.5.2 Required accuracy When tested in accordance with Clause 2.5.3, the required accuracy shall be—

- (a) for a direct radar device: ± 2 km/h; or
- (b) for a slant radar device: ± 3 km/h up to a displayed speed of 100 km/h and ± 3 percent of the reading for a displayed speed greater than 100 km/h.

If the accuracy of the radar device determined in accordance with Clause 2.5.3 is not within the required accuracy, then—

- (i) the device shall not be used until it has been rendered capable of producing the required accuracy. This may require breaking the seal on the device, in which case it shall not be used until it has been certified and resealed in accordance with Clause 2.2; and
- (ii) all readings taken since the device was last tested in accordance with Clause 2.5.3 shall be deemed to be invalid.

2.5.3 Field testing procedure The accuracy of the radar device shall be tested in at least one of the following ways:

- (a) In accordance with the manufacturer's recommended field testing procedure using any test equipment (e.g. tuning forks) approved by the manufacturer.
- (b) Against a vehicle's speedometer of known accuracy. Allowance shall be made for the known tolerance on the speed measured by the speedometer.

NOTE: The accuracy of the vehicle's speedometer need not necessarily be within the required accuracy specified in Clause 2.5.2 as this test is only intended to detect a gross error in the test carried out in accordance with the manufacturer's instructions.

- (c) Against another radar device which has been tested in accordance with Item (a) or Item (b) and meets the requirements of Clause 2.5.2.

2.6 TARGET IDENTIFICATION

2.6.1 General A valid speed measurement shall only be taken when the target vehicle is clearly identifiable by direct observation or by photographic means.

2.6.2 Slant radar

2.6.2.1 General Identification of the target vehicle by means of slant radar shall be achieved by employing the factors described in Clauses 2.6.2.2 to 2.6.2.5 to identify the target vehicle within the radar beam.

2.6.2.2 Target vehicle The operator of a slant radar device, other than one linked to a photographic system, shall ensure that there is only one vehicle within the radar beam capable of producing the measured speed. In the case of slant radar fitted with directional discrimination, only those vehicles travelling in the selected direction shall be considered capable of producing the measured speed.

2.6.2.3 Operator presence and visual observation The operator of a slant radar device, other than one linked to a photographic system which has been designed and tested for unattended operation, shall visually monitor the vehicle under investigation for sufficient time to identify it as the target vehicle. If the operator has any doubt that the speed measured by the radar device is not that of the vehicle under identification that speed measurement shall be considered invalid. Mirrors shall not be used to observe the vehicle under investigation.

An operator shall be in attendance whenever a radar device linked to a photographic system is taking a valid speed measurement to ensure that the device remains correctly aligned to the roadway and is functioning correctly.

NOTES:

- 1 The operator of a radar device linked to a photographic system is only required to monitor individual vehicles under investigation if the device has not been designed and tested for unattended operation.
- 2 Regardless of the fact that a radar device may have been designed and tested for unattended operation, this Standard only specifies requirements for attended operation of such devices.

2.6.2.4 Directional discrimination Where fitted, the operator of a slant radar device other than one linked to a photographic system shall ensure that the directional discrimination facility is always used and is correctly set for the direction in which speed measurements are to be taken.

2.6.2.5 Speed preselection Where the slant radar device is fitted with the facility for speed preselection, the operator should use the facility to discriminate between a target vehicle travelling at, or above, the preselected speed and surrounding traffic moving slower than the preselected speed.

2.6.3 Direct radar

2.6.3.1 General Identification of the target vehicle by means of direct radar shall be achieved by employing the factors described in Clauses 2.6.3.2 to 2.6.3.6 to identify the target vehicle within the radar beam.

2.6.3.2 Visual observation The operator of a direct radar device shall visually monitor the vehicle under investigation for sufficient time to identify it as the target vehicle. If the operator has any doubt that the speed measured by the radar device is not that of the vehicle under investigation that speed measurement shall be considered invalid. Mirrors shall not be used to observe the vehicle under investigation.

2.6.3.3 Audio tracking The operator shall monitor the audio doppler signal of a direct radar device for sufficient time to identify the target vehicle prior to taking a valid speed measurement. The audio doppler over this period shall be a single clear tone and its pitch shall only vary in proportion to the visually observed changes in speed of the vehicle under investigation.

2.6.3.4 Reflective capability The operator of a direct radar device shall take into account the effects of the relative size and shape of the target vehicle and its distance from the radar device when identifying the target vehicle.

2.6.3.5 Directional discrimination Where fitted, the operator of a direct radar device shall ensure that the directional discrimination facility is always used, and is correctly set for the direction in which speed measurements are to be taken.

2.6.3.6 Speed preselection Where the direct radar device is fitted with the facility for speed preselection, the operator should use the facility to discriminate between a target vehicle travelling at, or above, the preselected speed and surrounding traffic moving slower than the preselected speed.

2.7 MOBILE RADAR

2.7.1 General In addition to the other applicable requirements specified in Section 2, radar devices shall comply with the requirements of Clauses 2.7.2 to 2.7.5 when used in the mobile mode.

2.7.2 Equipment certification Both target channel and patrol channel of the radar device shall be tested and certified in accordance with Clause 2.2.

2.7.3 Circuit testing The accuracy of both target speed and patrol speed shall be tested in accordance with Clause 2.5.

2.7.4 Reflections from stationary objects Radar devices should not be operated in the mobile mode in built-up areas because of the number of stationary reflective objects normally present.

2.7.5 Patrol vehicle speed The speed of the patrol vehicle shall be checked against a speedometer of known accuracy whenever a target speed measurement is taken. The operator shall ensure that the speed of the patrol vehicle is kept relatively constant while a target speed measurement is being taken.

2.8 EVALUATION OF FILMS AND PHOTOGRAPHS For the purpose of law enforcement, films or photographs produced by a radar device linked to a photographic system shall be evaluated by a person authorized by the appropriate Regulatory Authority to undertake this task. The evaluator need not be present at the time the film was exposed.

NOTE: Appendix B gives advice on the type of training that should be given to persons seeking to become authorized evaluators.

APPENDIX A
OPERATOR TRAINING
(Informative)

A1 SCOPE This Appendix gives guidance on the elements which should be included in the training program for radar device operators. It is recognized that the proper use of radar devices relies on the skill and training of the operator.

A2 THEORY The theory elements set out in Paragraphs A2.1 to A2.3 should be included in the program.

A2.1 Radar principles The basic principles of doppler radar should be explained and their application to the type of radar which the operator will be using (slant or direct) should be pointed out. This should include the following points:

- (a) The principle of the doppler effect relating to waves.
- (b) Effective range and width of the detection area.
- (c) Cosine angle effect.
- (d) Causes of interference.
- (e) Factors affecting target identification.
- (f) Differences between stationary and mobile modes.
- (g) The differential effect as it applies to mobile radar.
- (h) Shadowing as it applies to mobile radar.
- (i) Limitations of radar speed detection.
- (j) Effects of relative size, shape and distance of target vehicles.

A2.2 Set-up and field test procedures The procedures to be followed when setting up the radar device and the method of testing the accuracy of the device should be explained. The maximum allowable period between accuracy tests (nine hours) and the procedure to be followed if the device fails the test should be set out.

A2.3 Site selection The factors involved in the selection of a site at which to operate the radar device should be explained.

A3 PRACTICAL TRAINING Practical training in the operation of radar devices should be carried out at typical sites under the supervision of an experienced certified operator.

A4 EXAMINATION At the completion of the program, candidates should be set a written examination on the theory elements of radar operation and satisfy an examiner that they have achieved an acceptable level of proficiency in radar speed detection.

A5 CERTIFICATION Certification should only be granted to those candidates who achieve a satisfactory result in the written examination and practical test.

A6 RETRAINING When a new type of radar device is introduced into operation, each operator who will be using it should be retrained to use the new device.

A7 RECERTIFICATION The certification of an operator should lapse if the operator has not used a radar device for more than 12 months. Such an operator may be recertified following an adequate period of retraining.

APPENDIX B
TRAINING OF PERSONNEL TO EVALUATE PHOTOGRAPHS OR FILMS
(Informative)

B1 SCOPE This Appendix gives guidance on the elements which should be included in the training program for personnel involved in the identification of target vehicles from photographs or films produced by radar speed detection devices linked to a photographic system.

B2 VERIFICATION The evaluator should be trained to correctly execute the following procedures:

- (a) Verify details on the data block against the operator's statement. These details typically include:
 - (i) Location of site.
 - (ii) Date.
 - (iii) Time of day.
 - (iv) Direction of travel.
 - (v) Speed limit.
 - (vi) Camera identification.
 - (vii) Camera lens identification.
- (b) Understand and initiate the appropriate actions in response to any operator notes which may include reference to anomalous speeds being recorded.
- (c) Examine the film and, for each frame, check the following points:
 - (i) Frame number.
 - (ii) Any objects in the photographed frame, including the background, which may reflect the radar beam away from the direction in which it was being directed.
 - (iii) Whether or not there is more than one vehicle in the frame. If more than one vehicle is in the frame, apply the prescribed procedure for target vehicle identification or reject the photograph, according to the guidelines being used.
 - (iv) Registration number of target vehicle.
 - (v) Whether the description of the target vehicle according to registration records matches the vehicle in the frame.
- (d) Reject those photographs where there is a possibility of an incorrect speed having been recorded or where the target vehicle cannot be clearly identified.

B3 RETRAINING When a new type of radar device is introduced into operation each evaluator should be retrained in the appropriate evaluation techniques for use with the new system.