

# Main Roads Technical Standard

## **MRTS204** **Provision of Vehicle Loop Detectors**

**October 10**

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# Provision of Vehicle Loop Detectors

## 1 INTRODUCTION

This standard defines the supply, installation, testing and commissioning, performance, documentation, training and maintenance requirements for vehicle loop detectors.

The vehicle loop detectors will be connected to STREAMS via a Field Processor to collect vehicle volume, occupancy, speed, length and headway data.

This Technical Standard shall be read in conjunction with MRTS01 *Introduction to Technical Standards*, MRTS50 *Specific Quality System Requirements* and other Technical Standards as appropriate.

This Technical Standard forms part of the Transport and Main Roads Specifications and Technical Standards Manual.

## 2 DEFINITION OF TERMS

The terms defined in MRTS201 apply to this standard. Additional terminology relevant to this standard is defined in Table 2 below.

**Table 2 – Definitions**

Term	Definition
Traffic Flow Data	Data describing traffic speed, volume, occupancy, headway and classification
LED	Light Emitting Diode

## 3 REFERENCE DOCUMENTS

The requirements of the referenced documents listed in Table 3 of MRTS201 and Table 3 below apply to this standard. Where there are inconsistencies between this standard and the referenced MRTS (including those referenced in MRTS201), the requirements specified in this standard shall take precedence.

**Table 3 – Referenced Documents**

Document ID	Document Name / Description
ANSI/NEMA TS1 Part 15	Inductive loop detectors
AS 2276.2	Cables for traffic signal installations - Feeder cable for vehicle detectors
AS 2703	Vehicle loop detector sensors
AS 4252.1	Electromagnetic compatibility - Generic immunity standard Part 1: Residential, commercial and light industry
MRTS201	General Equipment Requirements
MRTS232	Provision of Field Processors
TMR Traffic and Road Use Manual Interim Part 5.5	“Guidelines for the Configuration and Placement of Vehicle Detection Sensors”
Standard Drawing 1424	Transport and Main Roads Standard Drawing – Detector loops installation details in asphalt
Standard Drawing 1425	Transport and Main Roads Standard Drawing – Detector loops placement details

## 4 QUALITY SYSTEM REQUIREMENTS

The quality system requirements defined in MRTS201 apply to this standard.

## 5 FUNCTIONAL REQUIREMENTS

The vehicle loop detectors shall detect vehicles by means of an inductance change caused by a vehicle passing over a loop buried in the road surface. As a minimum, the detectors shall collect vehicle volume, occupancy, speed, length and headway data. The detectors shall transmit this data to STREAMS via a Field Processor connected to the Principal's telecommunications network.

Each detector card shall be able to automatically retune each input, and have local and remote reset facilities. When a detector is automatically re-tuning, it must advise the Field Processor of the start and end of the automatic re-tuning process.

## 6 EQUIPMENT COMPONENTS

Each vehicle loop detector installation shall include:

- vehicle loop detector module / card mounting rack;
- loop feeder cable terminal panel;
- vehicle loop detector electronics/cards and cabling to loop feeder cable terminal panel;
- interface card / port to connect to the Field Processor;
- a telecommunications field cabinet that complies with MRTS201; and
- power supply, Field Processor and associated cabling and infrastructure.

## 7 MECHANICAL AND PHYSICAL REQUIREMENTS

The mechanical and physical requirements defined in MRTS201 apply to this standard. Additional mechanical and physical requirements for equipment provided under this standard are given in Clauses 7.1 to 7.4.

### 7.1 General

The detector module / rack shall be suitable for mounting in a telecommunications field cabinet that complies with MRTS201.

The vehicle detection equipment listed in Clause 6 shall be of a modular construction to permit minimisation of redundant capacity when installed. Each vehicle detector installation shall allow expansion to a minimum of 24 detector loop inputs. The vehicle detection equipment shall be supplied in a basic configuration and shall be expandable by installation of additional modules if/when required.

### 7.2 Dimensions

The vehicle loop detector electronics/cards shall comply with the requirements for either ANSI/NEMA TS1 Part 7, or Standard Eurocard Format. Rack mounted cards shall utilise industry standard connectors.

### 7.3 Indicator

Each channel of the vehicle loop detector electronics/cards shall have at least one associated LED located on the front faceplate of the detector card. The LEDs shall be illuminated for the duration of each output signal, or if the loop terminals are short-circuited or open-circuited.

The LEDs shall comply with AS 2703 Section 3.

### 7.4 Reset Facility

Each detector card shall have a reset push-button accessed from the front faceplate.

## 8 ELECTRICAL REQUIREMENTS

The electrical requirements defined in MRTS201 apply to this standard. Additional electrical requirements for equipment provided under this standard are as follows:

- the mains power supply input shall be fused, be isolated from the detector sensors and operate at 230 VAC  $\pm$  10%;

- the output from the power supply shall be protected fully against short circuit conditions and provide overload voltage protection;
- a main power switch shall be located on the front faceplate and illuminated to indicate the availability of mains power;
- LEDs shall be located on the front faceplate to indicate available regulated output voltages; and
- lightning protection shall be provided on all detector inputs.

## 9 OPERATIONAL REQUIREMENTS

### 9.1 *General*

The operational requirements defined in MRTS201 apply to this standard. Additional operational requirements for equipment provided under this standard are given in Clauses 9.2 to 9.8.

### 9.2 *Operating Modes*

Each detector card channel shall be able to operate in passage or presence mode. The detector shall generally be configured to operate in presence mode. However, where installed as a permanent counting site it shall be configured to operate in passage mode.

### 9.3 *Operational Performance*

The operational performance of the sensor unit shall comply with AS 2703 Section 4.

The detector shall finalise detection within 80 ms of the vehicle departing the loop.

The operating frequencies of the sensor unit shall lie within the range of 40 kHz to 150 kHz. Facilities shall be available to select the operating frequencies of the detector either on the printed circuit board or via an operator terminal.

Facilities shall also be available to select sensitivity for each channel individually, preferably on the front panel of the detector card.

The unit shall be capable of operating the loop with up to 200 m of detector feeder cable that complies with AS 2276.2.

### 9.4 *Auto-tune*

The detector sensor shall tune automatically on;

- i. power-up; and
- ii. on manual reset

when the inductance connected across its input terminals:

- iii. lies within the range 50  $\mu$ H to 800  $\mu$ H; and
- iv. has a Q-factor in the range of:
  - a) 5 to 50 below 60 kHz; and
  - b) 3 to 50 above 60 kHz.

### 9.5 *Crosstalk*

The detector sensor shall comply with the requirements of AS 2703 Section 4.

### 9.6 *Susceptibility to Interference*

The sensor unit shall comply with the requirements of AS 2703 Section 4.

The sensor shall be capable of operating without fault in the presence of induced electrical noise introduced via the input terminals.

### 9.7 *Electromagnetic Compatibility*

All equipment shall be tested and certified by the Contractor as complying with the electromagnetic compatibility requirements of AS 4252.1.

## **9.8 Accuracy**

The required accuracy for traffic flow data is  $\pm 2\%$  or better where individual vehicle speeds are between 20 km/hr and 110 km/hr and traffic flow is up to 2400 vehicles/hr/lane.

Speed will be measured with dual loops installed in accordance with TMR Traffic and Road Use Manual Interim Part 5.5 "Guidelines for the Configuration and Placement of Vehicle Detection Sensors", TMR Standard Drawing 1424 – Detector loops installation details in asphalt and/or TMR Standard Drawing 1425 – Detector loops placement details.

## **10 INSTALLATION REQUIREMENTS**

### **10.1 Vehicle Detector Loops**

Vehicle detector loops shall be provided in accordance with TMR Standard Drawing 1424 – Detector loops installation details in asphalt and/or TMR Standard Drawing 1425 – Detector loops placement details.

### **10.2 Loop Feeder Terminal Panel**

The vehicle detector system shall connect, via the loop feeder terminal panel, to loop feeder cables complying with the requirements of AS 2276.2.

The loop feeder terminal panel shall provide terminal strips for all vehicle detector loops.

Cable looms are to connect the loop feeder terminals to the vehicle detector module. The cable loom shall provide a minimum of 24 vehicle detector inputs.

Each set of adjacent terminals is denoted a designated pair. The conductors of each pair shall be twisted together, at the rate of approximately 8 turns/metre, over the entire length of the loom.

All cables within the harness or loom leading from the loop feeder terminal panel or terminal strip to the vehicle detector module shall incorporate screening and/or noise suppression.

The loom connecting the loop feeder terminal panel shall have a length of 1 metre.

### **10.3 Detector Sensors**

The detector sensor shall employ sequential channel sampling or a similar technique to eliminate crosstalk between all channels.

Loop feeder cables shall be installed so as to minimise likelihood of crosstalk between channels.

### **10.4 Detector Type**

#### **10.4.1 Serial I/O Detectors**

The vehicle detector system shall interface with the Field Processor via an EIA / RS-232 port in accordance with MRTS232. The serial communications cable shall be provided with the vehicle detector system.

Data and status information via the serial connection shall be at least equivalent to that available from Nortech serial detectors. The detector must classify vehicles into at least 4 length bins.

#### **10.4.2 Digital I/O Detectors**

Where specified, the vehicle detector system shall provide solid state digital outputs to the Field Processor through a 50 way ribbon cable connector in accordance with MRTS201, Table 15 and Figure 15 of this specification. The 50 way ribbon cable shall be supplied with the vehicle detector system.

## **11 TELECOMMUNICATIONS REQUIREMENTS**

The telecommunications requirements defined in MRTS201 apply to this standard.

## **12 TESTING AND COMMISSIONING**

The testing and commissioning requirements defined in MRTS201 apply to this standard.

### 13 DOCUMENTATION

The documentation requirements defined in MRTS201 apply to this standard. Additional documentation requirements for equipment provided under this standard are described below.

- Details on detector loop mapping to detector card inputs shall be provided within the field cabinet, and on the drawings.

### 14 TRAINING

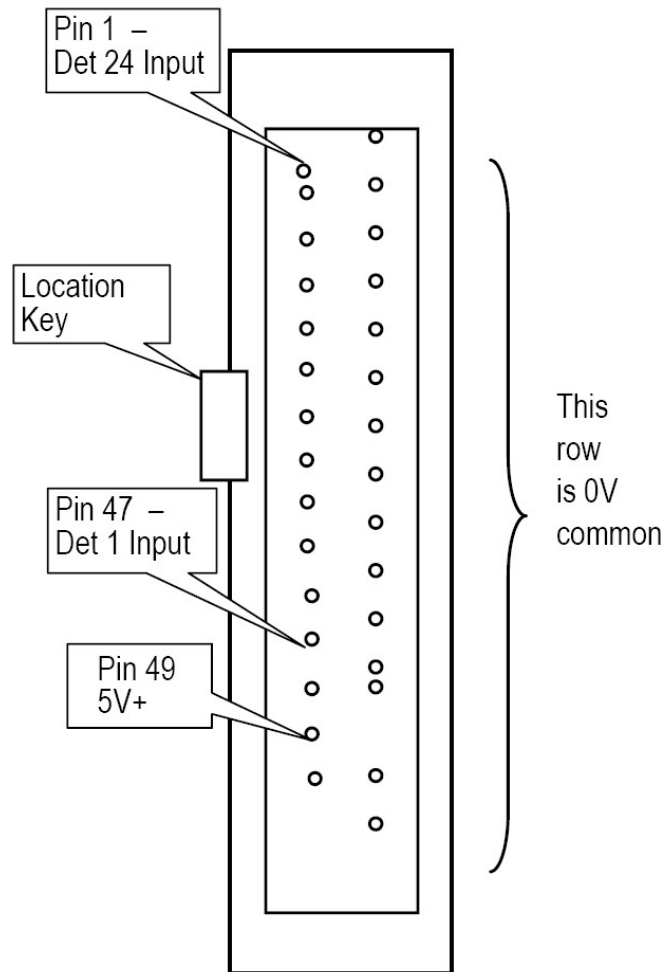
The training requirements defined in MRTS201 apply to this standard.

### 15 MAINTENANCE

The maintenance requirements defined in MRTS201 apply to this standard.

**Table 15 – 50-Way Ribbon Cable Connector**

Loop 24	1	2	Ground
Loop 23	3	4	Ground
Loop 22	5	6	Ground
Loop 21	7	8	Ground
Loop 20	9	10	Ground
Loop 19	11	12	Ground
Loop 18	13	14	Ground
Loop 17	15	16	Ground
Loop 16	17	18	Ground
Loop 15	19	20	Ground
Loop 14	21	22	Ground
Loop 13	23	24	Ground
Loop 12	25	26	Ground
Loop 11	27	28	Ground
Loop 10	29	30	Ground
Loop 9	31	32	Ground
Loop 8	33	34	Ground
Loop 7	35	36	Ground
Loop 6	37	38	Ground
Loop 5	39	40	Ground
Loop 4	41	42	Ground
Loop 3	43	44	Ground
Loop 2	45	46	Ground
Loop 1	47	48	Ground
5V+	49	50	Ground



**Figure 15 – Front View – Optional Field Processor Connector to mate with dual 50-way ribbon cable header**

## **16 HANDOVER**

The handover requirements defined in MRTS201 apply to this standard.