

**PART R69****SUPPLY AND INSTALLATION OF VEHICLE DETECTOR SYSTEMS****CONTENTS**

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**1. GENERAL**

- .1 This Part specifies the requirements for the supply and installation of vehicle detector systems, which provide traffic data for analysis by the Principal's traffic management system. It must be read in conjunction with Part R60 General Requirements for the Supply of ITS Equipment and if installation is to be undertaken, Part R61 Installation of ITS Equipment. The vehicle detector systems detect vehicles by recording an inductance change caused when a vehicle passes over a loop buried in the road surface
- .2 Documents referenced in this Part are listed below:
 

AS 2703	Vehicle Loop Detector Sensors
AS 2276.2	Cables for Traffic Signal Installations. Part 2: Feeder Cable for Vehicle Detectors
AS 3000	Electrical Installations
AS 3100	Approval and test specification - General requirements for electrical Equipment
AS CISPR 22:	Information technology Equipment - Radio disturbance characteristics - Limits and methods of measurement
AS 9001	Quality Management Systems – Requirements
AS 4252.1	Electromagnetic compatibility – Generic immunity standard – Residential, Commercial and Light industry
ANSI/NEMA TS1	Traffic Control Systems

**2. QUALITY REQUIREMENTS**

- .1 The Contractor must prepare and implement a Quality Plan that includes or annexes the following documentation:
  - (a) Acceptance Test Plans (refer Part R60 General Requirements for the Supply of ITS Equipment, Clause 13 "Testing and Acceptance"), which provides full details of all tests necessary;
  - (b) Routine maintenance recommendations;
  - (c) Training Plan (refer Part R60 General Requirements for the Supply of ITS Equipment, Clause 15 "Training");
  - (d) Spare part requirements;
  - (e) Manufacturer's specifications (catalogue extracts) of all major components detailing ratings and performance characteristics; and
  - (f) All layout, fabrication, interconnection and assembly drawings and diagrams necessary for this Contract.
- .2 Where STREAMS compatibility has been specified, the Contractor must provide evidence of this compatibility in accordance with Part R60 General Requirements for the Supply of ITS Equipment, Clause 6 "STREAMS".
- .3 The Contractor must provide samples for acceptance in accordance with Part R60 General Requirements for the Supply of ITS Equipment, Clause 3 "Equipment Requirements".
- .4 If not submitted beforehand, the samples and documentation required by this Clause must be submitted at least 28 days prior to the commencement of site work or placing an order for Equipment.
- .5 Provision of the documentation and samples listed in this Clause shall constitute a **HOLD POINT**.

### **3. EQUIPMENT REQUIREMENTS**

#### **General Configuration**

- .1 The vehicle detector system must include Equipment suitable for mounting in a roadside traffic management cabinet with a 19" racking system. The vehicle detector system integrates the vehicle detector module/rack, vehicle loop detector sensor/card, power supply and field processor interface card. The vehicle detector system includes the loop feeder terminal panel and its associated cabling to the vehicle detector module. The vehicle detector system may be rack-mounted.
- .2 All detection Equipment must conform to the functional and operational requirements of AS 2703.

#### **Vehicle Detector Module**

- .3 The Vehicle Detector module may be either stand-alone or rack mountable. Rack-mounted vehicle detector systems should be 19" for installing in roadside Traffic Management field cabinets.
- .4 The vehicle detector module must have a minimum capacity of 24 vehicle loops. The rack should occupy minimal space in the cabinet. Components in the rack should be connected using industry standard connectors. The Vehicle Detector Module should be constructed of Aluminium.

#### **Vehicle Loop Detector Sensor**

##### **General**

- .5 The materials and form of construction of the vehicle detector sensor unit, including the protective enclosures for independent sensor units, must comply with the requirements of AS2703 Section 2.

##### **Dimensions**

- .6 Rack-mounted sensor units must comply with the requirements for either ANSI/NEMA TS1 Part 7, Standard Eurocard Format or equivalent.

##### **Channels**

- .7 The sensor unit must be multi-channel with either 4 channels or 8 channels per sensor unit.

##### **Operating Modes**

- .8 Each individual loop detection channel must be able to operate in either passage or presence detection mode.

##### **Operational Performance**

- .9 The operational performance of the sensor unit must comply with AS2703 Section 4. Presence times and sensitivities should be individually selectable for each channel by DIP switches on the front panel of the sensor unit.
- .10 The operating frequencies of the sensor unit must lie within the range 10kHz to 150kHz. The frequency may be selected by a DIP switch mounted on the printed circuit board or an operator terminal. The detector sensor must automatically tune on power-up and manual reset when the inductance connected across its input terminals lies within the range 50uH to 700uH and a Q-factor in the range of:
  - 5 to 50 below 60kHz; and
  - 3 to 50 above 60kHz
- .11 The operating temperature and humidity must comply with the requirements of AS2703 Section 4.16.

##### **Electrical Requirements**

- .12 The power supply must be suitable for connection to a nominal 230Volt, 50Hz earthed-neutral electricity supply.

##### **Light Emitting Diodes (LEDs)**

- .13 LEDS on the faceplate must comply with AS2703 Section 3. The LEDS must operate on vehicle detection, power failure, or if the loop terminals are short circuited or open circuited. Each channel must have an associated LED.

**Interaction (Crosstalk)**

- .14 The detector sensor must comply with the requirements of AS 2703 Section 4. The detector sensor should employ sequential channel sampling or a similar technique to eliminate crosstalk between loops connected to the same module.

**Reset Pushbutton**

- .15 The sensor unit must have a reset pushbutton on the front panel.

**Susceptibility to Interference**

- .16 The sensor unit must comply with the requirements of AS 2703 Section 4. The sensor must be capable of operating without fault in the presence of induced electrical noise introduced via the input terminals.

**Accuracy**

- .17 The required accuracy of traffic count data is  $\pm 2\%$  or better where individual vehicle speeds are between 20km/hr and 100km/hr. Accuracy below this speed must be stated in the manufacturer's specifications.

**Field Processor Interface****General**

- .18 The vehicle detector system must provide a serial communications interface for connection to the field processor. The serial interface must use a serial communications protocol compatible with the field processor. The serial interface must provide information about detector status, fault status, all switch settings (including those on the detectors) and software version.

**Field Processor Header Pinouts**

- .19 The vehicle detector system may also provide either a solid-state or relay output contact closure to the field processor through a 50 way ribbon cable connector. The solid-state or relay output contact closure and 50 way ribbon cable must be supplied with the vehicle detector system in accordance with this section.
- .20 The 24 TTL digital I/O lines on the Field Processor are provided by an 82C55 chip. Each line can source 2.5mA in a logic 0 state and sink 2.5mA in a logic 1 state. The I/O lines are unbuffered – that is, there is a direct connection between the 82C55 and the I/O header. All I/O lines are connected to +5V through 10K $\Omega$  pull-up resistors.
- .21 The Digital I/O lines are accessed through 50-pin headers. They provide 24 digital I/O lines, +5, and ground. Pin 1 is in the upper right corner of the board. The keyed part of the connector is on the left hand side. Pin 50 in the lower left hand corner is the +5V. Pin 49 in the upper left corner of the board is ground. The next horizontal pair (pin 47 and pin 48) is loop 1 input.
- .22 The pinouts for the Field Processor Header pinouts must be Opto 22 Standard.
- .23 Field Processor Header Pinouts must comply with Table 3.4.2.

**TABLE 3.4.2 FIELD PROCESSOR HEADER PINOUTS**

Loop 24	A7	1	2	Gnd
Loop 23	A6	3	4	Gnd
Loop 22	A5	5	6	Gnd
Loop 21	A4	7	8	Gnd
Loop 20	A3	9	10	Gnd
Loop 19	A2	11	12	Gnd
Loop 18	A1	13	14	Gnd
Loop 17	A0	15	16	Gnd
Loop 16	C7	17	18	Gnd
Loop 15	C6	19	20	Gnd
Loop 14	C5	21	22	Gnd
Loop 13	C4	23	24	Gnd
Loop 12	C3	25	26	Gnd
Loop 11	C2	27	28	Gnd
Loop 10	C1	29	30	Gnd
Loop 9	C0	31	32	Gnd
Loop 8	B7	33	34	Gnd
Loop 7	B6	35	36	Gnd
Loop 6	B5	37	38	Gnd
Loop 5	B4	39	40	Gnd
Loop 4	B3	41	42	Gnd
Loop 3	B2	43	44	Gnd
Loop 2	B1	45	46	Gnd
Loop 1	B0	47	48	Gnd
	+5	49	50	Gnd

**Digital I/O Circuitry**

.24 The Digital I/O Circuitry must comply with Table 3.4.3.

**TABLE 3.4.3 DIGITAL I/O CIRCUITRY**

Aspect	Details
Chip	82C55A
Number of I/O lines	24
Direction	All lines programmable for input or output in groups of 4/8
Input voltage	Low: 0.5Vmin,0.8Vmax High: 2.0V min, 5.5V max
Output voltage	Low: 0.0V min, 0.4V max High: 3.0Vmin,Vcc-0.4Vmax
Output current	±2.5mA max, each line
Pullup resistors	10KΩ all lines

**Power Supply Card**

- .25 The Equipment must operate on a mains power supply of 230Vac 50Hz. The power supply input should be fused, isolated from the detector sensors and operate at 230Vac ± 10%. The power output from the power supply card should be fully protected against short circuit conditions and provide overload voltage protection.
- .26 An illuminated main power switch should be located on the front faceplate to indicate primary power. LEDs should be used to indicate regulated output voltages. These must be located on the front faceplate. A power lead must be provided.

**Loop Feeder Terminal Panel**

- .27 Loop feeder cables must comply with the requirements of AS 2276.2. The vehicle detector system must connect to the loop feeder cables via the loop feeder terminal panel. The loop feeder terminal panel must provide terminal strips for 24 vehicle detector loops.
- .28 Cable looms are to connect the loop feeder terminals to the vehicle detector module. The cable loom must provide a minimum of 24 vehicle detector inputs.
- .29 Each set of adjacent terminals is a designated pair, and the conductors of each pair must be twisted together for 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 must incorporate screening and/or noise suppression. The loom connecting the loop feeder terminal panel should have a length of 1 metre.

**Electromagnetic Compatibility**

- .30 All Equipment must be tested and approved to comply with the electromagnetic compatibility requirements of either AS 4252.1 or AS CISPR 22.

**4. CONFIGURATION OF DELIVERED EQUIPMENT**

- .1 The vehicle detector module/rack, vehicle loop detector sensor, loop feeder termination panel and cable, must be ordered and supplied as separate entities. The vehicle detector module must include the power supply card, field processor interface card and cable, and serial communications card. The vehicle detection Equipment should be of a modular construction to permit minimisation of redundant capacity when installed. The Equipment must be securely packed and sealed to prevent damages.
- .2 To facilitate redundant capacity minimisation, the vehicle detection Equipment must be supplied in a basic configuration that is then expandable if required with the purchase and installation of additional modules.
- .3 The optimum basic configuration for the data collection Equipment and processing module is defined in terms of the minimum number of vehicle detector loops as follows:

**TABLE 4.3.1 OPTIMUM BASIC CONFIGURATIONS**

Equipment	Configuration
Vehicle Detector Module/Rack	a) 24 vehicle detector inputs (minimum) b) Min 24 vehicle detector outputs (minimum)
Vehicle Detector Loop Terminal Panel and cable	Minimum 48 terminals
Vehicle Detector Sensor	Minimum 4 channels

**5. OPERATIONAL AVAILABILITY**

- .1 All Equipment supplied must have an operational availability of 99.8%, excluding down time created by the Principal. In the event of a defect occurring during the defects liability period, the Contractor must provide the Principal with details on the course of action to be undertaken within four hours of notification of the defect.

**6. HOLD POINTS**

The following is a summary of Hold Points, referenced in this Part:

CLAUSE REF.	HOLD POINT	RESPONSE TIME
2	Quality Plan	7 days
2	Evidence of STREAMS compatibility	7 days
2	Samples for acceptance	7 days

**7. VERIFICATION REQUIREMENTS AND RECORDS**

The Contractor must supply the following records:

CLAUSE REF.	CLAUSE AND TITLE	RECORD TO BE PROVIDED
R60	11 "Manuals"	Operation and maintenance manual(s)
R60	12 "Warranty"	Manufacturer's Warranty

CLAUSE REF.	CLAUSE AND TITLE	RECORD TO BE PROVIDED
R60	13 "Testing and Commissioning"	Factory Acceptance Test (FAT) Records
R60	14 "System Documentation"	"As Built" documentation
R61	6 "Testing and commissioning" (where installation is to occur)	Site Acceptance Test (SAT) and System Integration Acceptance Test (SIAT) Records - refer Part R61 "Installation of ITS Equipment".