ROADS AND MARITIME SERVICES

TRAFFIC SYSTEMS

SPECIFICATION NO. TSI-SP-021

MODEMS FOR DIAL-UP SCATS COMMUNICATIONS

Issue: 3.0
Dated: 26 Sep. 2018
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## RECORD OF AMENDMENTS

<table>
<thead>
<tr>
<th>Version</th>
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<th>Approved</th>
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<tbody>
<tr>
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- Clause 2.1 – Added AS/NZS 61000.6.1 to list.  
- Clause 4.1 – Editorial change with original requirements recast into subclauses 4.1.1 to 4.1.3.  
- Clause 4.1.4 – New clause to allow for alternative equipment identifications.  
- Clause 4.1.5 – New clause on issue of multiple Type Approval Certificates.  
- Clause 4.4 – Added surge voltage test.  
- Clause 4.7 – Editorial change to extend requirements to Type Approval Certificate holder.  
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- Clause 5.1.2 – Changed serial connector to DB-25 female connector.  
- Clause 5.1.9 – Added requirements for a sleeved-on label for the serial port cable.  
- Clause 5.5.2 – Minimum enclosure protection level changed to IP3X.  
- Clause 5.5.3 – Changed (b) to align with standard EMC tests.  
- Clause A.2 – Added requirements for the interface connector.  
- Clause A.3 – Added requirements for the interface connector. | 26 August, 2008 | Mgr, TSI |
| 2.1     | Draft update for review  
- Formatting changed, “RTA” replaced by “RMS”  
- Formatting changed, “Authority” replaced by “Agency”  
- Clause 2.2 – Amended  
- Clause 4.1.2 – Amended submission details for Type Approval | 10 September 2018 |  |
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1 SCOPE

This specification covers requirements for modems for use in New South Wales in traffic signal controllers for communication between the traffic signal controllers and their respective SCATS Regional Computers over the public switched telephone network (PSTN).
2 REFERENCES AND APPLICABLE DOCUMENTS

2.1 Australian Standard Specifications

The following Australian Standards have been referred to in subsequent clauses of this Specification:

- ACA TS 001 – Safety requirements for Customer Equipment
- AS/ACIF S002 – Analogue interworking and non-interference requirements for Customer Equipment for connection to the Public Switched Telephone Network
- AS/ACIF S008 – Requirements for authorised cabling products
- AS 1768 – Lightning protection
- AS/NZS 3100 – Approval and test specification - General requirements for electrical equipment
- AS/NZS 3112 – Approval and test specification – Plugs and socket-outlets
- AS/NZS ISO 9001 – Quality management systems - Requirements
- AS 60068.2.6 – Environmental testing - Tests - Test Fc: Vibration (sinusoidal)
- AS 60068.2.29 – Environmental testing - Tests - Test Eb and guidance: Bump
- AS/NZS 60320 – Appliance couplers for household and similar general purposes
- AS 60529 – Degrees of protection provided by enclosures for electrical equipment (IP Code)
- AS/NZS 60950.1 – Information technology equipment – Safety Part 1: General requirements
- AS/NZS CISPR 22 – Information technology equipment - Radio disturbance characteristics - Limits and methods of measurement

2.2 RMS Specifications and Documents

The following RMS Specifications (as amended) have been referred to in subsequent clauses of this Specification:

- TSI-QA-TS201 – Approval of ITS Field Equipment
## 2.3 Other Specifications and Documents

The following other Specifications (as amended) have been referred to in subsequent clauses of this Specification:

<table>
<thead>
<tr>
<th>Specification</th>
<th>Description</th>
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<tbody>
<tr>
<td>ISO 9001</td>
<td>Quality Management Systems - Requirements</td>
</tr>
<tr>
<td>ISO 9660</td>
<td>Information processing; volume and file structure of CD-ROM for information interchange</td>
</tr>
<tr>
<td>Bell 103</td>
<td>Asynchronous data transmission, full-duplex operation over 2-wire dialup or leased lines, 300-bps data rate</td>
</tr>
<tr>
<td>Bell 212A</td>
<td>Synchronous/asynchronous data transmission, full-duplex operation over 2-wire leased or dialup lines, 1200-bps data rate</td>
</tr>
<tr>
<td>CCITT V.32 bis</td>
<td>A duplex modem operating at data signalling rates of up to 14,400 bit/s for use on the general switched telephone network and on leased point-to-point 2-wire telephone-type circuits</td>
</tr>
<tr>
<td>CCITT V.42 bis</td>
<td>Data compression procedures for data circuit-terminating equipment (DCE) using error correction procedures</td>
</tr>
<tr>
<td>ITU-T V.21</td>
<td>300 bits per second duplex modem standardized for use in the general switched telephone network</td>
</tr>
<tr>
<td>ITU-T V.22</td>
<td>1200 bits per second duplex modem standardized for use in the general switched telephone network and on point-to-point 2-wire leased telephone-type circuits</td>
</tr>
<tr>
<td>ITU-T V.22 bis</td>
<td>2400 bits per second duplex modem using the frequency division technique standardized for use on the general switched telephone network and on point-to-point 2-wire leased telephone-type circuits</td>
</tr>
<tr>
<td>ITU-T V.23</td>
<td>600/1200-baud modem standardized for use in the general switched telephone network</td>
</tr>
<tr>
<td>ITU-T V.32</td>
<td>A family of 2-wire, duplex modems operating at data signalling rates of up to 9600 bit/s for use on the general switched telephone network and on leased telephone-type circuits</td>
</tr>
<tr>
<td>ITU-T V.34</td>
<td>A modem operating at data signalling rates of up to 33,600 bit/s for use on the general switched telephone network and on leased point-to-point 2-wire telephone-type circuits</td>
</tr>
<tr>
<td>ITU-T V.42</td>
<td>Error-correcting procedures for DCEs using asynchronous-to-synchronous conversion</td>
</tr>
<tr>
<td>TIA-232 (formerly RS-232)</td>
<td>Interface between Data Terminal Equipment and Data Communications Equipment employing serial binary data interchange</td>
</tr>
</tbody>
</table>
2.4 Issues of Standards, Specifications and Drawings

It is to be noted that any Australian or other Standard specification, or RMS document, specification or drawing referred to in this Specification shall be the issue that is current seven (7) days prior to the close of tenders, including such errata, amendments and addenda as may be issued from time to time. It shall be the responsibility of the Tenderer to obtain the relevant issues of such documents, specifications and drawings referred to in this Specification from the relevant issuing bodies.

NOTE: RMS documents, specifications and drawings referred to in this Specification may be obtained from the tender-issuing office.

2.5 Compliance with Specifications

All equipment and materials, where not otherwise specified, shall be in accordance with Australian Standard Specifications, where such exist, and in their absence, with relevant ITU-T Recommendations, IEC or ISO Specifications.

The equipment shall comply with the safety requirements of AS/NZS 3100. The equipment shall also comply with the requirements of the NSW Occupational Health and Safety Act.

In addition, the equipment shall comply with the following standards:

(a) ACA TS 001;
(b) AS/ACIF S002;
(c) AS/NZS 60950.1;
(d) AS/NZS CISPR 22 (Class A).

2.6 Precedence of Specifications

In the event of conflicts between the referenced specifications, the order of precedence shall be as follows:

(a) this Specification (as amended);
(b) other RMS specifications and documents;
(c) ACMA and Australian Standard Specifications; and then
(d) ITU-T Recommendations, IEC and ISO Specifications.

2.7 Exceptions to Specifications

The Tenderer/Supplier shall clearly tabulate all exceptions to this Specification, if any, under the heading “Exceptions to Specification”.

Notwithstanding any other statements made in any other part of the Tenderer’s/Supplier’s submission, it shall be deemed that the tendered equipment complies fully with this Specification except for the particular points tabulated under the heading “Exceptions to Specification”.
3 DEFINITIONS AND GLOSSARY OF TERMS

For the purposes of this Specification, the following definitions and abbreviations shall apply:

- **ACA** – Australian Communications Authority; the new name is ACMA (Australian Communications and Media Authority)
- **ACIF** – Australian Communications Industry Forum
- **ACMA** – Australian Communications and Media Authority; formerly known as ACA (Australian Communications Authority)
- **Agency** – Roads and Maritime Services
- **bps** – Bits per second
- **Carrier** – The holder of a telecommunications carrier licence in force under the Telecommunications Act 1997
- **CCITT** – The International Telegraph and Telephone Consultative Committee; it was replaced by the ITU-T in 1992
- **CTS** – Clear To Send
- **DTMF** – Dual-tone multi-frequency
- **DCE** – Data Communication Equipment
- **DTE** – Data Terminal Equipment
- **IEC** – International Electrotechnical Commission
- **ISO** – International Organisation for Standardisation
- **ITU-T** – International Telecommunications Union – Telecommunications Division
- **LED** – Light emitting diode
- **the Manager** – Refers to the Manager, Traffic Systems Integration, of the Intelligent Transport Branch
- **MNP, MNP2, MNP3, MNP4, MNP5** – Microcom Network Protocol, a set modem-to-modem protocols that provide error correction and compression, including MNP2, MNP3, MNP4, and MNP5
- **Modem, Modems** – The modem(s) covered by this Specification
- **MTBF** – Mean Time Between Failure
- **NSW** – New South Wales
- **PC** – Personal computer
- **PCB** – Printed circuit board
- **PSTN** – Public telecommunications network for which a Carrier is responsible and which provides services to the public
- **Regional Computer, SCATS Regional Computer** – A SCATS entity which manages traffic signal controllers. Its functions include co-ordinating multiple intersections, storing backups of Flexilink data, and controlling the modes of operation of the controllers.
- **RMS** – Roads and Maritime Services
- **RTS** – Ready To Send
- **SCATS** – Sydney Co-ordinated Adaptive Traffic System
<table>
<thead>
<tr>
<th>Term</th>
<th>Description</th>
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<tbody>
<tr>
<td>Supplier</td>
<td>The company or person that directly supplies the equipment covered by this Specification to the RMS</td>
</tr>
<tr>
<td>TIA</td>
<td>Telecommunications Industry Association</td>
</tr>
<tr>
<td>Type Approval</td>
<td>The type approval of equipment under this Specification</td>
</tr>
<tr>
<td>Type Approval Certificate</td>
<td>A type approval certificate issued under this Specification</td>
</tr>
<tr>
<td>Type Approval Certificate holder</td>
<td>The company in whose name a Type Approval Certificate was issued.</td>
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</table>
4 TYPE APPROVAL

4.1 General

4.1.1 Equipment Covered

The Agency requires that all Modems covered by this Specification shall be subjected to type approval under this Specification. The suitability and performance of the equipment for use in SCATS communications will be verified as part of the type approval assessment process. A Type Approval Certificate will be issued for equipment that meets the Agency’s requirements.

The Type Approval procedure will apply also to previously purchased or type approved Modems following design changes.

4.1.2 Application for Type Approval

To gain type approval of a Modem, the Supplier shall follow the process defined in TS201. The suitability and performance of the equipment for use in SCATS communications will be verified as part of the type approval assessment process.

To obtain any assistance the manufacturers or Suppliers of the Modem shall contact the ITS help desk (ITSHelpDesk@rms.nsw.gov.au.)

4.1.3 Quality Management System

It is a pre-requisite for Type Approval that the equipment manufacturer operates a quality management system complying with AS/NZS ISO 9001 or ISO 9001. Refer to Clause 6.1 for requirements for third-party certification of the quality management system.

4.1.4 Alternative Equipment Identifications

The Agency may permit the Supplier to nominate alternative brand names and/or model numbers for a single item of type approved equipment for listing on a Type Approval Certificate.

Where a Supplier wishes to add alternative brand names and/or model numbers to the Type Approval Certificate, the Supplier shall submit the following documents to the Manager:

(a) A declaration from the Supplier that, apart from branding and model identification, the equipment to be identified by the alternative brands and/or model numbers is identical to the equipment that was submitted for Type Approval by the Supplier and given Type Approval by the Manager;

(b) A list of the brand names and model numbers by which the equipment will be identified.
If the information provided is satisfactory and complete, the Manager will issue a Type Approval Certificate that includes the alternative brand names and/or model numbers.

4.1.5 Issue of Multiple Type Approval Certificates

The Manager may issue Type Approval Certificates for an item of type approved equipment to more than one company subject to conditions.

Where a Supplier wishes to obtain a Type Approval Certificate in the name of another company, the Supplier shall submit the following documents to the Manager:

(a) A declaration from the Supplier that, apart from branding and model identification, the equipment to be supplied by the nominated company is identical to the equipment that was submitted for Type Approval by the Supplier and given Type Approval by the Manager;

(b) A written undertaking from an authorised officer of the nominated company that it will abide by all applicable requirements, conditions and obligations of the Type Approval;

(c) A submission from an authorised officer of the nominated company with the following documentation:

(i) Confirmation that the manufacturer of the equipment has a third-party certified quality management system to AS/ANZ ISO 9001 (see Clause 4.1.3);

(ii) An overview of the software and firmware upgrade support that will be provided to the Agency, and the software and firmware development process including quality system, control and audits for the software and firmware to be provided;

(iii) Particulars of the nominated company’s quality management system and the Manufacturer’s quality management system, and evidence of third-party certification;

(iv) A quality plan for the equipment, including details of tests and verification checks to be carried out during and at the end of the manufacturing process;

(d) A list of the alternative brand names and model numbers, if any, by which the equipment will be identified.

If the information provided is satisfactory and complete, the Manager will issue a Type Approval Certificate in the name of the nominated company.
4.2 Procedure

The procedure for obtaining Type Approval is as follows:

(a) Submission of a formal request for Type Approval of the equipment. Applications and submissions for Type Approval shall be directed to the Manager.

(b) Supply of the specified documentation for the equipment for a preliminary compliance evaluation by the Manager (refer to Clause 4.3.1).

(c) Initial scrutiny of one sample of the equipment by the representative(s) of the Manager at the nominated premises of the Roads and Maritime Services (the Agency)(refer to Clause 4.3.2).

(d) Formal testing by the Supplier, witnessed by the representative(s) of the Manager (refer to Clause 4.4). These tests shall be performed on the same equipment tested by the Manager, if so required by the Manager. Following the tests the equipment shall be returned to the Agency's premises.

(e) Final scrutiny by the representative(s) of the Manager (refer to Clause 4.5).

(f) Field evaluation of a number of equipment samples (refer to Clause 4.6).

(g) Submission of the Inspection and Test Plan and final documentation.

The above procedure is also applicable to previously purchased or type approved equipment following major design changes.

4.3 Type Tests

4.3.1 Documentation

The following supporting documentation for the equipment shall be furnished by the Supplier to the Manager for a preliminary evaluation of the equipment:

(a) Outline diagrams and/or photographs of the complete equipment (including the Telecommunications Line Transient Protection Unit; see Clause 5.1.8), showing the type of construction and major external dimensions and features;

(b) A detailed technical manual and specification covering the complete equipment, including maintenance information describing fault diagnosis and fixes;

NOTE: The adequacy of the technical information for operation and maintenance is subject to assessment. Maintenance information may be separately bundled into a maintenance manual. Refer also to Clause 9 on documentation.

(c) Certificate of Suitability (see also Clause 5.5.6);

(d) Documentary evidence of ACMA approval for connection to the Telecommunications network (see also Clause 5.5.6), including compliance information for the Telecommunications Line Transient Protection Unit (see Clause 5.1.8);
(e) Documentary evidence of C-tick compliance (see also Clause 5.5.6);

(f) A description of the operating software and firmware available for the equipment. Details of the software and firmware versioning scheme used and the versions of the software and firmware supplied shall also be provided;

(g) An overview of the software and firmware upgrade support that will be provided to the Agency, and the software and firmware development process including quality system, control and audits for the software and firmware to be provided;

(h) Information on installation and commissioning (including details for the Telecommunications Line Transient Protection Unit; refer to Clause 5.1.8);

(i) Particulars of the Manufacturer's quality management system and evidence of third party certification;

(j) A quality plan for the equipment, including details of tests and verification checks to be carried out during and at the end of the manufacturing process;

(k) A detailed description of any departures from the dedicated equipment specification (i.e. this Specification, TSI-SP-021) and associated referenced requirements.

Note: If the Modem fully complies with the specified requirements, a statement to that effect should be provided.

4.3.2 Initial Examination

The Manager will arrange the initial examination of the supplied documentation and sample equipment.

As a result of the initial scrutiny, the Manager may request further information from the Supplier to assist the scrutiny process. The Manager may also request the Supplier to address and/or rectify certain issues to enable the type approval process to progress further.

4.4 Testing by the Supplier

If the initial examination of the equipment is satisfactory, the Manager will advise the Supplier that formal testing by the Supplier may be carried out. Formal testing by the Supplier may be witnessed by the representative(s) of the Manager. The Supplier shall notify the Manager of a preliminary test programme not less than seven (7) days before the scheduled start of tests, and provide not less than 3 working days of notice for each test.

Formal testing by the Supplier shall cover the following environmental tests:

(a) Temperature and Humidity;

(b) Enclosure protection test;
(c) Immunity to surges on mains supply voltage;
(d) Bump test;
(e) Vibration test.

Refer to Clause 5.5.7 for test requirements.

The environmental tests shall be performed by a NATA registered laboratory or approved test organisation. If the test facilities are not NATA registered for the types of test to be performed, the Supplier shall furnish a full description of the test facilities and technical expertise of the testing organisation(s) the Supplier intends to use, for approval of the Manager before commencement of these tests.

4.5 Final Scrutiny

Following the testing by the Supplier referred to in Clause 4.4, the tested equipment shall be returned to the Agency's premises together with certified test reports and documentation for final scrutiny.

The representative(s) of the Manager will repeat inspections and operational checks on the equipment.

4.6 Field Evaluation

If final scrutiny of the equipment is satisfactory, the Manager will advise the Supplier that field evaluation may be commenced.

The quantity of equipment to be deployed for field evaluation will be decided by the Manager and will generally be between eight (8) to fifteen (15) units.

The duration of the field evaluation will generally be 120 days and may be varied by up to 30 days by the Manager.

The Manager will advise the supplier of the quantity of equipment and duration of test required for the field evaluation.

In the event that the equipment fails during field evaluation due to a design failure, the trial shall be halted. The Manager will determine whether the design fault is of a minor nature or not. Accordingly:

(a) For the case of a minor design fault, the Supplier shall resolve the design problem and make remedial repairs. At the discretion of the Manager, the field evaluation period shall then be either started again from day one, or resumed; or

(b) For the case of a serious design fault, the Type Approval procedure shall be terminated. The Supplier may re-submit the equipment with a new application for Type Approval after the design fault(s) have been resolved.
In the above stipulation, failures are defined as those not induced by misuse, careless handling, operation outside the limits of temperature (Clause 5.5.1), and supply voltage (Clause 5.4.1), or caused by failure of other associated equipment.

### 4.7 Issue of Type Approval

On the successful completion of field evaluation and the submission and approval of final documentation including Inspection and Test Plan and “as-built” drawings, the Manager will issue Type Approval.

The Supplier shall provide three (3) full sets of printed approved final documentation and one (1) electronic copy on an ISO 9660 compliant CD-ROM before the issue of Type Approval.

All Type Approvals have a nominal validity of five (5) years. This validity applies only to the original equipment and not to subsequently modified versions unless agreed in writing by the Manager.

The number of the Type Approval shall be displayed on a label affixed to the equipment in a prominent position as described in Clause 5.3.5.

If the design of the equipment is altered during the validity period of the Type Approval, the Supplier or the Type Approval Certificate holder where relevant, shall notify the Manager of all the particulars for endorsement of the Type Approval. In the case of major design changes, the Manager may require that the modified equipment be submitted for further tests.

### 4.8 Revocation of Type Approval

The following are circumstances in which a Type Approval Certificate holder may be requested to show cause why Type Approval should not be revoked:

**NOTE:** Where Type Approval is revoked, the revocation will apply to all Type Approval Certificates issued under the Type Approval (see Clause 4.1.5 regarding multiple Type Approval Certificates).

(a) an adverse service history of the equipment in regard to performance; or

(b) modification to the equipment or the intended method of use which makes it different from that for which Type Approval was issued; or

(c) loss of third-party Quality System certification specified in Clause 6.1; or

(d) repeated failure to supply equipment in compliance with specified requirements; or

(e) serious breaches in quality procedures as established in quality audits conducted by or on behalf of the Agency; or

(f) fraudulent claims or misrepresentations regarding the equipment operation by the Supplier (or Type Approval Certificate holder where relevant), the Manufacturer or their agent (refer to Clause 4.9); or
(g) failure to provide software or firmware maintenance or upgrades to correct deficiencies to the operation of the equipment or to make the equipment fully compatible with the Agency’s control system. For the case of software or firmware maintenance, the supplier shall provide a new software or firmware release within three (3) calendar weeks from the date of a formal request by the Agency for a software or firmware update. For the case of a software or firmware upgrade, the supplier shall provide a new software or firmware release within 6 calendar months from the date of a formal request by the Agency for a software or firmware update.

NOTE: For the case of software or firmware maintenance, where the supplier is able to provide an acceptable interim solution (e.g. a temporary work-around) within one week from the date of a formal request by the Agency for a software or firmware update, the time duration within which the supplier shall provide a new software or firmware release to properly rectify the software or firmware issue is extended to six (6) weeks (from the 3 weeks specified above) from the date of the formal request by the Agency for software or firmware update.

4.9 Fraudulent Claims

If the Supplier or the Manufacturer of the equipment submitted for Type Approval, or its agent, is found to have made fraudulent claims or misrepresentations concerning the operation of the equipment, then Type Testing may be terminated at the discretion of the Manager.

If fraudulent claims or misrepresentations are discovered after Type Approval has been granted, then the Type Approval may be revoked at the discretion of the Manager.

4.10 Notes On Time Allowance for the Type Approval Process

The Type Approval process involves several stages and the extensive evaluation of the equipment characteristics and testing of equipment performance. Very often, there may be a need for modifications to the equipment design and documentation to address functional, safety and/or other probable shortcomings. Depending on the complexity of the equipment for which Type Approval is sought, and the availability of the pre-requisite documentation, there may also be delays in providing the required information to enable the Type Approval scrutiny to proceed smoothly. Prospective Suppliers are therefore advised that they should submit their application for Type Approval as early as possible and practicable, and make sufficient, including contingent, allowances in their programming for the Type Approval process.
5 TECHNICAL REQUIREMENTS

5.1 General Requirements

5.1.1 General

All Modems covered by this Specification shall be two-wire line modems with
dial-up capability, and shall be compatible with Hayes AT commands and
Hayes extended AT commands.

NOTE: Refer to Clause 2.5 regarding compliance with Standards and
Specifications.

Each Modem shall be a self-contained unit of equipment complete with all
hardware, firmware and processor capability necessary for providing all of the
functions required by this Specification.

NOTE: Refer to Clauses 5.1.2 and 5.1.4 for interface requirements. Refer to
Clause 5.2.2 for requirements relating to the transfer of SCATS
message strings.

The Modem shall be able to work correctly with modems used by SCATS
Regional Computers over the PSTN to enable communications between the
traffic signal controller and the SCATS Regional Computer.

The Modem shall include the following characteristics / capabilities:

(a) General features:
   - Serial interface for interfacing with a traffic signal controller or a
     computer;
   - Asynchronous full duplex communications;
   - Automatic answer;
   - Built-in call progress monitoring speaker

(b) Data speeds:
   - 300 to 33,600 bps full-duplex supporting all international and Bell
     standards;
   - Adaptive rate to provide the highest possible data rates;

(c) Standards compliance:
   - ITU-T V.34, CCITT V.32 bis, ITU-T V.32, ITU-T V.23, ITU-T V.22 bis,
     ITU-T V.22, ITU-T V.21, Bell 103, and Bell 212A;
   - Compression – CCITT V.42 bis, MNP5;
   - Error Control – ITU-T V.42, MNP2, MNP3, MNP4;

(d) Dialling:
   - Supports programmable duration DTMF (touchtone)
   - Call progress tone detection (dial tones, busy, ring, etc.)
(e) Flow control:
   - Hardware CTS/RTS;
   - Software XON/XOFF;

(f) Operating system support:
   - Windows® 2000 and Window® XP¹ (Plug and Play)

5.1.2 Controls and Interface Ports

The Modem shall be provided with the following controls and interface ports:

(a) A power on/off switch;
(b) Volume control for the built-in speaker;
(c) A TIA-232 port for connecting to the traffic signal controller or a PC;
(d) A telephone line socket for connecting to the PSTN line;
(e) A mains inlet receptacle for connection of mains power.

NOTE: Additional controls and interfaces may be provided to provide additional functions.

The TIA-232 interface (item (c)) shall use a DB-25 (female) connector.

The telephone line socket (item (d)) shall be a 6P2C (RJ11) (6-position 2-contact) telephone line socket.

Refer to Clause 5.4.2 for requirements for the mains inlet receptacle.

5.1.3 Data Word Structures and Bit Rates

The TIA-232 serial port (refer to Clause 5.1.2(c)) shall be capable of operating with 10-bit and 11-bit words with even, odd or no parity, and with a speed of between 300 to 19,200 bits per second (bps) inclusive. The particular settings shall be configurable. The preset default values shall be 1200 bps and 11-bit words with odd parity.

NOTE: The bit rate settings available shall include 300, 600, 1200, 1800, 2400, 4800, 7200, 9600, 14400 and 19200.

NOTE: A great majority of the existing traffic signal controllers require one of the following data word structure and bit rate combination in operation:

¹ Windows is a registered trademark of Microsoft Corporation in the United States and other countries.
(a) 10-bit word (comprising 1 start bit, 8 data bits, no parity bit, and 1 stop bit) at 300 bps; or

(b) 10-bit word (comprising 1 start bit, 8 data bits, no parity bit, and 1 stop bit) at 1200 bps; or

(c) 11-bit word (comprising 1 start bit, 8 data bits, 1 odd parity bit, and 1 stop bit) at 300 bps; or

(d) 11-bit word (comprising 1 start bit, 8 data bits, 1 odd parity bit, and 1 stop bit) at 1200 bps.

5.1.4 User Interface

The Modem shall be provided with a user interface to enable changes to be made to the Modem’s configuration settings.

All necessary drivers and software for the user interface shall be provided for the Modem. The drivers and software shall be able to operate under Windows® 2000 and Window® XP².

5.1.5 Flow Control

The Modem shall provide for the hardware CTS/RTS flow control and software XON/XOFF to be turned off. The Modem shall operate correctly without both of these flow control functions operating.

NOTE: SCATS Communication applications require both hardware CTS/RTS and software XON/XOFF be turned off.

5.1.6 Visual Indicators

The Modem shall be provided with the following visual indicators using light emitting diodes (LED). The LED indicators shall be high intensity types with clear packages and shall provide unambiguous displays with good visibility in direct sunlight.

(a) “Power On” indicator. This indicator shall be energised when the Modem is switched on;

(b) “Modem Ready” indicator. This indicator shall be energised when the Modem is ready for serial communications;

(c) “Off Hook” indicator. This indicator shall be energised when the Modem is “off hook”;

(d) “Carrier Detect” indicator. This indicator shall be energised when the Modem is receiving a carrier signal from the remote modem;

² Windows is a registered trademark of Microsoft Corporation in the United States and other countries.
(e) “Send Data” indicator. This indicator shall flash on and off continuously when the Modem is receiving data from the traffic signal controller or PC. The rate of flashing shall be indicative of the real rate at which the data transfer is occurring, with a higher flashing rate indicating a higher data rate;

(f) “Receive Data” indicator. This indicator shall flash on and off continuously when the Modem is sending data to the traffic signal controller or PC. The rate of flashing shall be indicative of the real rate at which the data transfer is occurring, with a higher flashing rate indicating a higher data rate.

5.1.7 Call Progress Monitoring

The Modem shall provide call progress monitoring via its built-in speaker. This monitoring function shall be configurable via the Modem’s configuration settings. If the monitoring function is enabled, the Modem shall output all audible signals, including dial tone, busy tone, ring tone, and link negotiations from the PSTN line via its speaker. The Modem shall suppress data transfer signals from the speaker output.

The volume of the speaker shall be adjustable via a volume control knob (refer to Clause 5.1.2), from 0% (no output) to 100% (full volume).

5.1.8 Telecommunications Line Transient Protection Unit

5.1.8.1 Each Modem shall be provided with a separate Telecommunications Line Transient Protection Unit.

The Telecommunications Line Transient Protection Unit shall be suitable for installation on the back of the telecommunications line terminal box in the traffic signal controller housing (see drawings VM621-6 and VM621-31, and Appendix B), in place of the existing telecommunications line protection PCB therein. Alternatively, it shall be suitable for installation on the side or immediately adjacent to the telecommunications line terminal box in the traffic signal controller housing, with external dimensions not larger than (length x width x height) 50 x 25 x 25 mm.

NOTE: The purpose of Drawings VM621-6 and VM621-31 in Appendix B is to show the mechanical arrangement for the telecommunications line terminal boxes in existing traffic signal controllers. The circuit schematics in these drawings do not apply to the Modem.

The Telecommunications Line Transient Protection Unit shall provide for connection to the telecommunications line terminals on the telecommunications line terminal box, for connection to the PSTN. It shall also provide a 6P2C (RJ11) socket for connection to the Modem.

The Telecommunications Line Transient Protection Unit shall be tested and approved by a registered testing authority for compliance with the telecommunications line transient protection requirements and other relevant requirements of applicable ACMA Standards. Documentary evidence shall be supplied to confirm the approval when the Modem
and Telecommunications Line Transient Protection Unit is submitted to the Manager for Type Approval.

5.1.8.2 The Telecommunications Line Transient Protection Unit shall provide effective protection against transients and surges present on the telephone line connected to the Modem (via the unit).

The protection unit shall not include fuses with replaceable fuse cartridges; however fusible links may be used.

The protection unit shall limit the surge voltage presented to the Modem to a safe value.

An adequate earth connection for the protection circuits shall be provided for bonding to the traffic signal controller housing adjacent to the equipment.

**NOTE:** For effective surge protection, the earth conductor shall be either multistrand cable or copper braid with an effective cross sectional area of not less than 2.5 mm². The conductor shall be kept as short as is practicable and shall not have any small radius bends. Units with different lengths of earth conductor for different housing types will be required.

5.1.9 Cables

Each Modem shall be provided with the following interface cables:

(a) A serial port cable for connecting the traffic signal controller to the Modem. The cable shall be complete with connectors on both ends for the connection. The connector for connecting to the serial port of the Modem shall be a DB-25 male connector. The connector for connecting to the traffic signal controller shall be a 25 pin female Miniature "D" type connector. Two versions of connectors shall be provided, respectively for connecting to the existing PSC traffic signal controllers and TSC/4 traffic signal controllers. Refer to Appendix A for pin functions and other connector details;

**NOTE:** The Supplier shall confirm with the Agency as to the quantity of each version of connector/cable to be provided.

The serial port cable shall be provided with a sleeved-on label (or similar cable marker(s)) on the portion of the cable within 300 mm of the connector that interfaces with the traffic signal controller. The sleeved-on label shall be of a low-profile, non-interfering design, and shall not be longer than 50 mm in length. The attachment of the label to the cable shall be firm and shall not materially affect the flexibility of the cable. The label shall be durable and water-resistant. The following markings shall be permanently and legibly marked on the label:

(i) Modem manufacturer’s identification;

(ii) Part number of the serial port cable;

(iii) Controller type the cable is used for.
(b) A cable with connectors (also known as cord in AS/ACIF S002) for connecting the Modem to the Telecommunications Line Transient Protection Unit. The cable shall be complete with a 6P2C (RJ11) connector (plug) at each end for the connection, and shall be ACA, ACMA or AUSTEL approved. The complete cable with connectors shall comply with the relevant requirements for cordage and cords in AS/ACIF S008.

NOTE: Refer to Clause 5.1.8 for requirements for the Telecommunications Line Transient Protection Unit.

(c) A power supply cable. Refer to Clause 5.4.2.

The lengths of the cables shall be sufficient for the connection and allow for the proper routing inside the traffic signal controller housing.

5.1.10 Configuration Data

The factory preset default configuration settings of the Modem shall be in accordance with settings required by the Agency. The Agency will advise the Supplier of the preset settings required after such have been tested and confirmed to be suitable. The Supplier shall forthwith incorporate the required settings into the firmware and provide a copy of the firmware to the Agency within two (2) weeks of the Agency’s request for same for updating of installed equipment. The Supplier shall update all undelivered equipment to the new firmware prior to delivery to the Agency.

NOTE: From time to time, the Agency may change the default configuration settings to suit changes in operations or to ensure better operational compatibility. The Supplier shall update the firmware with the new settings upon a request from the Agency for a firmware update. Note that provision of firmware maintenance and upgrades is also a condition of equipment type approval; see Clause 4.8(g).

5.1.11 Connectors

All connectors shall be rated for a minimum of 500 insertion and removal cycles without degradation of the contact performance outside specification.

Except for power supply connectors, all connection pins and contacts in connectors shall have a minimum of 0.76 micrometres (30 microinches) thickness of gold plating over nickel in the contact area. The contacts shall be rated with a maximum contact resistance of 15 milliohms.

5.1.12 Reliability

The Modem shall be designed to provide reliable service throughout its life, with a mean time between failure (MTBF) not less than 40,000 hours.
5.2 System Requirements

5.2.1 System Overview

The Modem is intended to be installed in a traffic signal controller housing to provide a communications link, via a PSTN line, between the SCATS Regional Computer and the traffic signal controller.

The Modem shall connect to the serial data port of the traffic signal controller and to the PSTN line installed in the traffic signal controller housing.

Upon power on, the Modem shall reset and initialise its configurations and operating system, and commence operation thereafter.

The Modem shall automatically go off-hook and answer incoming connection calls from the SCATS Regional Computer. The Modem shall automatically negotiate with the remote modem (SCATS modem) to establish the connection.

NOTE: In normal operation, the SCATS Regional Computer will initiate the connection by dialling out to the traffic signal controller.

The Modem shall receive SCATS messages from the traffic signal controller, encapsulate these messages in suitable protocols, and transmit them to the SCATS modem via the connected PSTN line.

The Modem shall receive signals from the SCATS modem, and decapsulate the SCATS messages embedded in the signal and forward them to the traffic signal controller via TIA-232 port.

NOTE: Other Modem functions, such as configuration, are described elsewhere in this Specification.

The Modem shall return to the on-hook state if no carrier signal from the remote modem is detected for 30 seconds. The Modem shall not do so before this time.

5.2.2 SCATS Operation

When the Modem is operating in its data mode, some legitimate SCATS message strings may contain character strings which coincide with legitimate Modem configuration commands. The Modem shall be capable of being configured so that these characters are not interpreted as commands but are passed transparently through the modem like all other characters.

The Modem shall be capable of being configured so that when it is operating in data mode, the Modem shall not insert any self-generated characters into the data stream.

5.2.3 Latency

The latency of the Modem shall be not more than 200 ms. For the purpose of this requirement, the latency of the Modem is defined as the larger of the times taken for data received at the Modem’s TIA-232 port to appear at its telephone line port, and for data received at the Modem’s telephone line socket to appear at its TIA-232 port.
5.3 Mechanical and Physical Requirements

5.3.1 Dimensions

The external dimensions of the Modem shall be not larger than (width x depth x height) 190 x 140 x 80 mm.

5.3.2 Mounting in a Traffic Signal Controller Housing

The Modem shall be suitable for desk top mounting, both in the upright orientation and on its side, on the equipment shelf of the traffic signal controller. Suitable mounting accessories shall be provided by the Supplier to allow the Modem to be installed securely without modification to the traffic signal controller housing and not to become dislodged due to vandalism (e.g. kicking on the housing).

5.3.3 Protective Coating

All printed circuit cards shall be protected from the environment by a conformal coating or a spray on lacquer designed for this purpose. The coating used shall be a solder-through type.

5.3.4 Ventilation

The Modem shall be designed with adequate ventilation by natural convection to allow free air flow for cooling and to prevent condensation inside the housing under all weather conditions.

*NOTE:* Refer to Clause 5.5.2 for requirements for enclosure protection.

Electric fans, blowers, and similar devices shall not be used to provide the air flow for cooling of parts and ventilation.

5.3.5 Marking

The equipment shall be clearly marked with a permanent and durable label(s) with the following information:

(a) Manufacturer’s identification;
(b) Equipment code or type number;
(c) Date of supply (for warranty claims);
(d) A unique serial number;
(e) Batch code or other markings to provide traceability under the Manufacturer’s quality management system (Note: the unique serial number referred to in (d) above may be used for this purpose);
(f) The approval number of the Certificate of Suitability (see Clause 5.5.6);

(g) ACMA A-tick and C-tick approvals;

(h) Approval marks of standards to which the equipment complies;

(i) Power supply information;

(j) The RMS type approval number (see Clause 4.7).

5.4 Electrical Requirements

5.4.1 Operating Voltage

The Modem shall operate correctly and reliably for mains supply voltages over the range 180 - 280 V r.m.s. and for any variations of frequency in the range 48 - 52 Hz.

The equipment shall not be damaged by mains supply voltages in the range 0 - 280 V r.m.s. and for any variations of frequency in the range 45 - 55 Hz.

NOTE: Refer to Clause 2.5 for requirements for compliance with the electrical safety stipulations of AS/NZS 3100 and other ACMA Standards and Australian Standards.

5.4.2 Power Supply Configuration

The power supply unit for the Modem shall be an internal circuit within the Modem’s housing.

A type C14 3-pin mains inlet receptacle complying with AS/NZS 60320 shall be provided on the back of the Modem for the connection of a power supply connector. A matching power supply cable complete with a type C13 connector complying with AS/NZS 60320 shall be provided. The source end of the power supply cable shall be a 10 A 3-pin side-entry power plug complying with AS/NZS 3112, for use with the socket outlet in the traffic signal controller.

5.4.3 Breaks and Brownouts in Mains Supply Voltage

The Modem shall maintain normal operation and shall not be adversely affected by breaks or brownouts in the mains supply of duration up to 5 seconds.

Breaks in the mains supply of duration greater than 10 seconds shall cause the Modem to switch off (i.e. after maintaining operation as required in the preceding paragraph), and restart when the mains supply is restored.

NOTE: The ability of the Modem to continue normal operation for not less than 5 seconds after a break in the mains supply voltage provides an opportunity for the traffic signal controller to have “last-gasp” communications with SCATS.

Where backup batteries are used to provide this function, the batteries shall be of a type suitable for such applications.
NOTE: It is expected that breaks and brownouts in the mains supply are infrequent occurrences.

NOTE: Refer also to Clause 5.1.12 for MTBF requirements.

5.5 Environmental Requirements

5.5.1 Ambient Conditions

The Modem shall be capable of continuous operation in an ambient temperature within the range -10°C to +70°C and with a relative humidity of up to 90%.

5.5.2 Enclosure Protection

The equipment shall have an enclosure protection of not less than classification IP3X in AS 60529.

5.5.3 Surge Protection

The requirements for surge protection shall be as follows:

(a) The equipment shall be designed to withstand transient disturbances and surges induced onto the mains supply, such as by lightning. The equipment shall provide surge protection to withstand the surges specified in AS 1768, Category B, with medium exposure peak amplitudes;

(b) The equipment shall include effective protection against transients and surges present on the 240 V a.c. mains due to load switching, operation of power equipment, and lightning discharges. For the purpose of this Specification the equipment shall operate within specification when subjected to test 4.4 in Table 4 in AS/NZS 61000.6.1.

5.5.4 Fire Hazard

Materials and components used in the equipment shall be selected so as to minimise the risk of fire. In this respect the requirements of Section 6 of AS/NZS 3100 shall apply. See also fire hazard related requirements of AS/NZS 60950.1.

All materials used inside the housing shall be of a composition which does not support combustion or has self-extinguishing properties.
5.5.5 **Dissimilar Materials**

All metallic parts, including screws, nuts and washers, shall be plated or manufactured of non-corrodible material such that dissimilar metals in contact shall have an electro-chemical potential difference not exceeding 0.5 volt.

5.5.6 **Certifications**

The equipment shall have all necessary certifications in accordance with industry and statutory requirements.

In particular, the following Australian statutory certifications shall be provided with the equipment:

(a) **Certificate of Suitability**

A Certificate of Suitability issued by the NSW Department of Fair Trading;

(b) **ACMA Approval**

The equipment shall be tested by a registered testing authority for compliance with the relevant requirements for connection to the PSTN. Documentary evidence that the equipment complies with all relevant ACMA requirements is required;

(c) **C-tick**

The equipment shall comply with all statutory electromagnetic compatibility requirements and be certified as such.

5.5.7 **Environmental Tests**

The equipment shall pass the following environmental tests:

(a) **Temperature and Humidity**

The equipment shall be operated for 72 hours at an ambient temperature of 70°C and relative humidity of 85% minimum. The equipment operation shall be continuously monitored throughout the test to confirm correct operation of the equipment;

(b) **Enclosure Protection Test**

The complete equipment shall be tested for compliance with Clause 5.5.2. There is no requirement for the equipment to be operational during the test, but the equipment shall operate correctly after the test.
(c) Immunity to Surges on Mains Supply Voltage

The equipment shall be tested in accordance with the test conditions described in Clause 5.5.3(b). The equipment operation shall be continuously monitored throughout the tests to confirm correct operation of the equipment;

(d) Bump Test

The equipment, in unpacked condition, shall be subjected to a bump test in accordance with AS 60068.2.29. The severity shall be 1,000 bumps at an acceleration of 98 m/s² (10g) with a pulse duration of 16 ms;

(e) Vibration

The equipment shall be subjected to the vibration tests described in this clause. The test procedures shall be in accordance with AS 60068.2.6 for sinusoidal vibration. For all tests specified in this clause, the amplitude shall be 0.75 mm up to the cross-over frequency, (approximately 8.2 Hz), where the acceleration is 0.2g, and for higher frequencies the acceleration shall be maintained constant at 0.2g.

The operation of the equipment shall be recorded during the tests and its overall performance summarised in the test report.

The tests shall be performed for three (3) mutually perpendicular axes with the equipment in the normal orientation.

For each axis of the tests, the equipment shall be tested with an endurance of 20 sweep cycles over the frequency range 5-55 Hz with an initial amplitude of 0.75 mm. The sweep rate shall be 1 octave per minute.
6 QUALITY ASSURANCE

6.1 General

The Manufacturer of the Modem shall operate a quality management system complying with AS/NZS ISO 9001 or ISO 9001. This quality management system shall be certified by a quality management system certification body either accredited under the criteria laid down in the Joint Accreditation System of Australia and New Zealand (JAS-ANZ), or listed in the International Standards Organisation ISO Directory of ISO 9000 and ISO 14000 Accreditation and Certification Bodies.

6.2 Traceability

Each Modem shall be marked with a batch code, serial number, or other marking to provide traceability under the Manufacturer’s quality management system. (Refer also to Clause 5.3.5(e)).
7 PRE-DELIVERY INSPECTION

All Modems purchased under this Specification shall be subject to a pre-delivery inspection at the Manufacturer’s Works or Supplier’s Premises in the Sydney area prior to delivery.

The Manufacturer shall provide a Compliance Certificate to cover the batch of equipment to be delivered, and access to all quality records related to the batch. The Compliance Certificate shall be a formal document stating that the equipment has been fully tested in accordance with the Inspection and Test Plan approved by the Agency and meets all specified requirements. The Compliance Certificate shall clearly identify the equipment, the batch information and the purchaser’s order number. The Compliance Certificate shall be personally signed and dated by a designated representative of the Manufacturer.

NOTE: The Inspection and Test Plan for the equipment is an integral part of the Type Approval issued under this Specification (see Clause 4). Subject to the approval of the Manager Traffic Systems Integration, it may be revised from time to time to suit the need of the Manufacturer’s quality management system.

The pre-delivery inspection shall include an examination of the goods and a check of the Manufacturer’s Compliance Certificate and quality records. Before leaving the Supplier’s premises the Agency’s Inspector will issue the Supplier with documentation to confirm that the goods …

(a) have been accepted and are cleared for delivery; or
(b) have been rejected for stated reasons; or
(c) are subject to further verification for stated reasons.

The Supplier shall give the Agency’s Inspectors at least two working days’ notice of the availability of the goods for pre-delivery inspection.

Requests for pre-delivery inspection are to be directed to ITS help desk (ITSHelpDesk@rms.nsw.gov.au.)

NOTE: The contact details for arranging pre-delivery inspections may change from time to time due to operational or organisational change. If the Supplier is unable to make contact for arranging a pre-delivery inspection, the Supplier shall notify the RMS office that issued the purchase order and request for updated contact details.
8 PACKAGING

The equipment and any spare parts, tools and ancillary equipment shall be packed to protect them from damage during transport and handling. All fittings liable to damage during shipment shall be removed and packed separately. Where necessary, reusable transit bars or other forms of additional support shall be provided with the equipment.

Equipment must not be damaged and preset adjustments must not be affected when subjected to the shock and vibration of transport between the Supplier’s premises and the nominated delivery point. Unless otherwise directed, the Supplier shall select the means of transport and pack the equipment to ensure compliance with this clause.

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9 DOCUMENTATION

A detailed technical manual complete with operations, maintenance and specification covering the complete equipment shall be provided for the Modem.

NOTE: The technical manual may be bundled into separate volumes respectively for field and workshop use.

A full set of manuals shall be supplied with each of the first twenty (20) units of equipment purchased by the Agency.

NOTE: Thereafter, additional copies of manuals will normally be purchased separately from the equipment.
10 **WARRANTY AND SPARES**

10.1 **Warranty**

Purchase of any equipment under this Specification shall be subject to a warranty period of 12 months after installation or 24 months after dispatch from the Manufacturer’s Works or Agent’s Premises to the Agency’s Store, whichever comes first.

Any equipment failed in service or found to be defective within the warranty period, will be delivered to the Supplier, who shall then make good the defect or arrange to have the defect made good, and subsequently return the good unit to the Agency at no charge to the Agency. Unless otherwise agreed, defective goods shall be processed and returned within 30 calendar days from the date the defective item is delivered to the Supplier.

It is expressly understood that any equipment damaged as a result of a traffic accident, abuse or act of vandalism after delivery to the Agency will not be covered by warranty provisions.

10.2 **Spares**

The Supplier shall maintain a reasonable supply of spare parts and modules to allow the Modem to be maintained in service for a minimum period of ten (10) years.

The Supplier shall give notice to the Agency prior to the last manufacturing run before cessation of manufacture for the particular spares type. The Supplier shall maintain spares for a minimum period of five (5) years after cessation of manufacture for the particular spares type.

Spare parts and modules for maintenance purposes shall include:

(a) mechanical assemblies;
(b) electrical assemblies;
(c) electronic assemblies; and
(d) electrical and electronic components.
11 INFORMATION TO BE SUPPLIED BY TENDERERS

Tenders will only be considered in respect of equipment for which type approval under Clause 4 has previously been obtained.

**NOTE:** The Agency may consider competitive quotations on equipment which has been submitted for type approval and successfully completed the initial examination under clause 4.3, for the purpose of acquiring a (small) sample quantity of the equipment for field evaluation only.

With the quotation the Tenderer shall supply details of previous type approvals. Any departures shall be fully described. The Tenderer shall also confirm particulars (if any) of the warranty requirements referred to in Clause 10.1, or provide information on the alternative warranty being offered.

Failure to furnish the full information called for in this clause and the associated quotation documents, or supply of incorrect information, will render the quotation liable to rejection.
APPENDIX A  CONNECTOR PIN FUNCTIONS AND CONNECTIONS

This Appendix provides information on the pin functions of the traffic signal controller’s serial port to which the Modem shall connect, and additional information on the pin connections for the interfacing connector.

A.1 GENERAL

Two versions of interfacing connector will be required to be provided with the Modem, for connecting respectively to the existing PSC traffic signal controllers and TSC/4 traffic signal controllers (see Clause 5.1.9(a)).

NOTE: Some older models of traffic signal controllers currently in use may have differing pin functions and require differing connections. The Agency will provide the relevant details to the Supplier if connectors for connecting to such controllers are required.

A.2 CONNECTOR FOR USE WITH PSC TRAFFIC SIGNAL CONTROLLERS

The Modem shall be able to connect to the serial port of the PSC type traffic signal controller which functions as a DTE.

The PSC type traffic signal controller’s serial port uses a 25 pin male miniature "D" connector (designated XM4) and its pin functions are shown in Table A.1. This connector is equipped with latching blocks equivalent to AMP part number 745007-3.

The mating connector on the serial port cable provided with the Modem (refer to Clause 5.1.9(a)) for connecting to PSC type traffic signal controllers shall be equipped with spring clip latches that are compatible with the connector on the traffic signal controller.

The connector shall be fitted with a backshell to provide strain relief for the wiring. The backshell shall have an angled cable entry, at approximately 45° to the axial direction of the connector, on the side where connector pins 13 and 25 are located. The connector and cable assembly, when installed onto the serial port XM4 connector of a PSC type traffic signal controller, shall not extend more than 55 mm outward from the connection interface.

NOTE: The angled cable entry shall not be significantly larger than 45°; otherwise the cable may interfere with other adjacent connector(s) in the traffic signal controller housing below the cable.

NOTE: The need for an angled cable entry and a footprint limit is to ensure that the serial port cable does not intrude into the zone occupied by other internal equipment installed in some traffic signal controller.

Table A.1 also contains information on the pin connections for the interfacing connector.
Table A.1 Connector Pin Functions and Connection Information (PSC Controllers)

<table>
<thead>
<tr>
<th>Pin Number</th>
<th>Pin Name</th>
<th>Pin Function Signal</th>
<th>Direction</th>
<th>Information for Interfacing Connector</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Ground</td>
<td>Protective Ground</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>TxD</td>
<td>Transmitted Data</td>
<td>Out</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>RxD</td>
<td>Received Data</td>
<td>In</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>RTS</td>
<td>Request To Send</td>
<td>Out</td>
<td>Do not use – leave open</td>
</tr>
<tr>
<td>5</td>
<td>CTS</td>
<td>Clear To Send</td>
<td>In</td>
<td>Connect to Pin 9</td>
</tr>
<tr>
<td>6</td>
<td>DSR</td>
<td>Data Set Ready</td>
<td>In</td>
<td>Do not use – leave open</td>
</tr>
<tr>
<td>7</td>
<td>Common</td>
<td>Signal Common</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>DCD (RLSD)</td>
<td>Data Carrier Detect</td>
<td>In</td>
<td>Connect to Pin 9</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(forces 1200bps mode)</td>
</tr>
<tr>
<td>9</td>
<td>V+ Protected</td>
<td>+12V@10mA</td>
<td>Out</td>
<td>Connect to Pins 5 and 8</td>
</tr>
<tr>
<td>10</td>
<td>V- Protected</td>
<td>-12V@10mA</td>
<td>Out</td>
<td>Connect to Pin 22</td>
</tr>
<tr>
<td>11</td>
<td>-</td>
<td>Unused</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>-</td>
<td>Unused</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>-</td>
<td>Unused</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>-</td>
<td>Unused</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>-</td>
<td>Unused</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>-</td>
<td>Unused</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>-</td>
<td>Unused</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>-</td>
<td>Unused</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>Tel</td>
<td>Telephone Line</td>
<td>In/Out</td>
<td>Do not use – leave open</td>
</tr>
<tr>
<td>20</td>
<td>DTR</td>
<td>Data Terminal Ready</td>
<td>Out</td>
<td>Do not use – leave open</td>
</tr>
<tr>
<td>21</td>
<td>Tel</td>
<td>Telephone Line</td>
<td>In/Out</td>
<td>Do not use – leave open</td>
</tr>
<tr>
<td>22</td>
<td>RI</td>
<td>Ring Indicator</td>
<td>In</td>
<td>Connect to Pin 10</td>
</tr>
<tr>
<td>23</td>
<td>-</td>
<td>Unused</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>Do Not Use</td>
<td>Do Not Use</td>
<td>Out</td>
<td>Do not use – leave open</td>
</tr>
<tr>
<td>25</td>
<td>-</td>
<td>Unused</td>
<td>-</td>
<td></td>
</tr>
</tbody>
</table>

A.3 CONNECTOR FOR USE WITH TSC/4 TRAFFIC SIGNAL CONTROLLERS

The Modem shall be able to connect to the serial port of the TSC/4 type traffic signal controller which functions as a DTE.

The TSC/4 type traffic signal controller’s serial port uses a 25 pin male miniature "D" connector (designated XM) and its pin functions are shown in Table A.2. This connector is equipped with latching blocks equivalent to AMP part number 747080-2.

The mating connector on the serial port cable provided with the Modem (refer to Clause 5.1.9(a)) for connecting to TSC/4 type traffic signal controllers shall be equipped with spring clip latches that are compatible with the connector on the traffic signal controller.

The connector shall be fitted with a backshell to provide strain relief for the wiring. The cable entry into the backshell shall be in the axial direction of the connector. The connector and cable assembly, when installed onto the serial port XM connector of a TSC/4 type traffic signal controller, shall be able to fit into a space within 70 mm outward from the connection interface without undue
stress on the connection and mechanical structure of the cable/connector assembly.

Table A.2 also contains information on the pin connections for the interfacing connector.

### Table A.2 Connector Pin Functions and Connection Information (TSC/4 Controllers)

<table>
<thead>
<tr>
<th>Pin Number</th>
<th>Pin Name</th>
<th>Pin Function Signal</th>
<th>Direction</th>
<th>Information for Interfacing Connector</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Ground</td>
<td>Protective Ground</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>TxD</td>
<td>Transmitted Data</td>
<td>Out</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>RxD</td>
<td>Received Data</td>
<td>In</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>RTS</td>
<td>Request To Send</td>
<td>Out</td>
<td>Do not use – leave open</td>
</tr>
<tr>
<td>5</td>
<td>CTS</td>
<td>Clear To Send</td>
<td>In</td>
<td>Connect to Pin 10</td>
</tr>
<tr>
<td>6</td>
<td>DSR</td>
<td>Data Set Ready</td>
<td>In</td>
<td>Do not use – leave open</td>
</tr>
<tr>
<td>7</td>
<td>Common</td>
<td>Signal Common</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>DCD (RLSD)</td>
<td>Data Carrier Detect</td>
<td>In</td>
<td>Do not use – leave open</td>
</tr>
<tr>
<td>9</td>
<td>V+ Protected</td>
<td>+12V@10mA</td>
<td>Out</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>V- Protected</td>
<td>-12V@10mA</td>
<td>Out</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Line Sense</td>
<td>Use Telephone Line</td>
<td>In</td>
<td>Do not use – leave open</td>
</tr>
<tr>
<td>12</td>
<td>Plug Sense</td>
<td>Sense connector mated</td>
<td>In</td>
<td>Connect to Pin 13</td>
</tr>
<tr>
<td>13</td>
<td>Common</td>
<td>Signal Common</td>
<td>-</td>
<td>Connect to Pin 12</td>
</tr>
<tr>
<td>14</td>
<td>-</td>
<td>Unused</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>-</td>
<td>Unused</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>-</td>
<td>Unused</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>-</td>
<td>Unused</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>-</td>
<td>Unused</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>-</td>
<td>Unused</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>DTR</td>
<td>Data Terminal Ready</td>
<td>Out</td>
<td>Do not use – leave open</td>
</tr>
<tr>
<td>21</td>
<td>-</td>
<td>Unused</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>RI</td>
<td>Ring Indicator</td>
<td>In</td>
<td>Do not use – leave open</td>
</tr>
<tr>
<td>23</td>
<td>-</td>
<td>Unused</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>Tel</td>
<td>Telephone Line</td>
<td>In/Out</td>
<td>Do not use – leave open</td>
</tr>
<tr>
<td>25</td>
<td>Tel</td>
<td>Telephone Line</td>
<td>In/Out</td>
<td>Do not use – leave open</td>
</tr>
</tbody>
</table>
APPENDIX B  LIST OF DRAWINGS

This Appendix lists the drawings directly referred to in this Specification. A copy of these drawings is appended to the end of this Specification. The issues of drawings that are appended were current at the time this Specification version was approved, but may have been subsequently superseded by newer issues. Unless otherwise specified, the applicable issue of a reference drawing shall be the issue current at the date one week before the closing date for tenders. It shall be the responsibility of the Tenderer to obtain the applicable issue of such drawings from the tender-issuing office and relevant RMS Offices.

<table>
<thead>
<tr>
<th>Drawing No.</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>VM621-6</td>
<td>Specification Drawing for Telecom Line Facility for Controller Housing</td>
</tr>
<tr>
<td>VM621-31</td>
<td>Telecommunications Line Facility for Controllers to Spec TSC/4</td>
</tr>
</tbody>
</table>
1. All dimensions are in millimetres unless otherwise stated.

2. Interior of line terminal box is to be double-insulated in accordance with AS3000.

3. All items associated with telecommunications must be manufactured to AU Technical Standards AS269 and installed to technical standards AS269.

4. Conductors must be substantially straight, allowing no more than one bend in its length & its run must not depart from vertical by more than 25°.

5. Transformer and printed circuit board with protection circuit shall be mounted as near as practicable to the terminal panel, assembly and all wiring between the box and the panel, assembly shall be mechanically protected.

6. For details of standard key for telecom access door see DIN 5004-6.

7. The telecommunications access door must not have any hinges or locks on the outside.

8. Hook shall be suitably well anchored so that a standard telephone for 260 sounds once around it will break under strain before hook pulls out. The hook shall be fully insulated by means of a tough heat-shrinkable PVC sleeve.

9. Transformer must withstand 2.5kV AC RMS 50Hz breakdown test for 1 minute between windings and shields and between windings and mounting inserts.

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