Technical Specification

Transport and Main Roads Specifications
MRTS232 Provision of Field Processors

April 2015
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1 Introduction

1.1 Purpose

This Specification defines the design, supply, installation, testing and commissioning, performance, documentation, training and maintenance requirements for the provision of a STREAMS compatible Field Processors (FP).

A Field Processor is an industrial, microprocessor-based computer suitable for use in traffic management applications hosted by the STREAMS System. They are used by the STREAMS system to provide a platform to host the distributed components of the STREAMS software that interface to the field equipment.

Field Processors are used in a number of different applications by STREAMS. The units may be mounted in cabinets on roadside plinths or within traffic signal controller cabinets. In some situations, they may be deployed within Traffic Management Centres to interface to ITS infrastructure and networks.

1.2 Scope

The Field Processor is a component of the STREAMS system which forms the basis of the Transport and Main Roads ITS Platform and Transport Management System.

2 Definition of terms

The terms defined in MRTS201 apply to this Specification. Additional terminology relevant under this Specification are defined in Table 2 below.

Table 2 – Definitions

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACMA</td>
<td>Australian Communications and Media Authority</td>
</tr>
<tr>
<td>BIOS</td>
<td>Basic Input Output System</td>
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<tr>
<td>CPU</td>
<td>Central Processing Unit</td>
</tr>
<tr>
<td>C-Tick</td>
<td>An identification trademark registered to the government authority (ACMA) which indicates compliance with EMI (electromagnetic interference) standards. C-Tick covers only emission standards both conducted and radiated.</td>
</tr>
<tr>
<td>DIMM</td>
<td>Dual Inline Memory Module</td>
</tr>
<tr>
<td>ECP</td>
<td>Enhanced Capability Port</td>
</tr>
<tr>
<td>EIA/RS</td>
<td>Electronics Industries Association/Recommended Standard</td>
</tr>
<tr>
<td>EPP</td>
<td>Enhanced Parallel Port</td>
</tr>
<tr>
<td>Field Processor</td>
<td>Ruggedised field computer used to connect field devices to the ITS Network</td>
</tr>
</tbody>
</table>
### 3 Referenced documents

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

**Table 3 – Referenced documents**

<table>
<thead>
<tr>
<th>Reference</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>AS 1768:2007</td>
<td>Lightning protection</td>
</tr>
<tr>
<td>AS/NZS 4251.1</td>
<td>Electromagnetic Compatibility (EMC) – generic Emission Standard</td>
</tr>
<tr>
<td>AS 60529</td>
<td>Degrees of protection provided by enclosures (IP Code)</td>
</tr>
<tr>
<td>MRTS201</td>
<td>General Equipment Requirements</td>
</tr>
<tr>
<td>MRTS226</td>
<td>Telecommunications Field Cabinets</td>
</tr>
<tr>
<td>MRTS232.1</td>
<td>Annexure - Provision of Field Processors Specific Contract Requirement</td>
</tr>
<tr>
<td>MRTS245</td>
<td>Principal’s Telecommunications Network</td>
</tr>
</tbody>
</table>

### 4 Quality system requirements

The quality system requirements defined in MRTS201 apply under this Specification. There are no additional quality system requirements for equipment provided under this Specification.

### 5 Functional requirements

#### 5.1 General

The FP shall be an industrial PC and shall interface to, control and manage the operation of field systems and devices that form part of ITS applications. The scope of such functionality for each device and/or system is described in the respective MRTS.
The Field Processor shall be capable of operating in the STREAMS environment as detailed in Sections 6.2 and 6.3.

The FP shall be located within a roadside field cabinet or within a Traffic Signal Controller cabinet.

6 Equipment components

6.1 Field processor

The Field Processor equipment shall consist of:

a) a FP, including memory and input/output interface cards
b) DIN rail-mounted bracket
c) serial site identifier
d) external power supply
e) 240V AC mains supply power cable (AS/NZS 3112 10A three-pin plug, flat earth)
f) DC supply power cable
g) Ethernet cable RJ45/RJ45

Where required, serial cables with EIA/RS 232, EIA/RS 422 and/or USB connectors shall be provided.

The serial site identifier (Item ‘c’) shall have an integral I/O for enclosure door monitoring.

The list of items to be provided in Section 6.1 has been expanded to incorporate items required for installation.

6.2 Field Processor configuration

The Contractor shall provide Field Processors which meet the requirements specified in this Specification. In addition, the contractor shall engage Transmax Pty Ltd to confirm that the hardware is suitable for installation of the STREAMS software. The STREAMS software to be run on the Field Processor will be provided by Transmax Pty Ltd. The Contractor shall engage Transmax Pty Ltd for the loading and configuration of the STREAMS software onto the Field Processor.

6.3 STREAMS compliance testing

Field Processor units supplied under this contract are required to undergo STREAMS Level 1 compliance testing. The Contractor shall provide a STREAMS compatibility certificate to the Administrator for acceptance.

7 Technical Specifications

The Field Processors shall comply with the following minimum requirements unless described otherwise in the attached Annexure MRTS232.1 Provision of Field Processors.

7.1 General

The operational requirements defined in MRTS201 shall apply to equipment provided under this Specification. Additional operational requirements for equipment are described below.
The FP shall meet the following general requirements:

a) A ‘technology guarantee’ backward compatibility of future replacement products for a period of at least five years shall be provided

b) No hardware modules shall be configured using ‘Plug and Play’ (PnP). The PnP functionality shall not be provided or shall be disabled (and the module configured) by jumper/BIOS

c) All hardware shall be certified as compatible with the Linux kernel approved by Transmax Pty Ltd current at the time. Supported chipsets are itemised in Appendix A ‘Supported Chipsets’

d) All hardware shall be compliant with AS/NZS 4251.1 (EN 50081.1) for C-Tick or RCM approval¹, and

e) Fanless design.

7.2 CPU and motherboard

The CPU and motherboard shall meet the following requirements:

a) The processor shall be of a 32-bit architecture, compatible with – and providing the performance of – at least an Intel Celeron 400 MHz or as defined in the attached annexure

b) the processor board architecture shall be functionally compatible with the IBM PC/AT specification

c) the processor board shall be capable of standalone operation without keyboard, video, mouse, disk drive, etc., connected

d) the processor card shall be able to operate from an input voltage in the range of +5 V to +24 V DC

e) the Field Processor power connector shall be fastened and keyed to ensure that the positive and negative inputs cannot be reversed.

7.3 System resources

The FP system resource requirements include:

a) The system shall be supplied with minimum 128 MB RAM, expandable to minimum 512 MB, in standard DIMM or SO-DIMM format or as defined in the attached annexure

b) the system shall be supplied with minimum 128 MB solid state removable industrial-grade compact flash disk and be capable of supporting up to a 2 GB removable compact flash disk or as defined in the attached annexure. The compact flash disk shall be bootable and have direct BIOS support

c) the system shall provide a battery-backed (or equivalent) ‘Real Time Clock’, capable of retaining accurate date/time for a minimum of 12 months without mains power. The clock shall be accurate to within one second per day, and

d) the system shall provide a dedicated hardware watchdog timer circuit with the ability to reset the system on timeout. It shall be possible to enable and disable the watchdog timer either by

¹ From 1 March 2016, all suppliers must use the RCM as the compliance label.
software or by jumper/BIOS, and provide a range of timeout values from one second to several minutes.

7.4 **I/O requirements**

The FP shall provide the following I/O interfaces:

a) **Serial Interfaces:**
   i. one EIA/RS 232C serial port for the console terminal
   ii. one EIA/RS 232C serial application port
   iii. one EIA/RS 232C port for the Site Identification Dongle
   iv. minimum two serial ports that are individually software configurable for either EIA/RS 232C or EIA/RS 422
   v. serial port chipset shall use a 16C550 or compatible UART
   vi. all serial ports shall be capable of 300 to 115 200 bits per second
   vii. base addresses and IRQs selectable by jumper/BIOS
   viii. all serial ports are to be available on the front panel by D-style nine-way connectors with locking screws
   ix. termination resistors for ports in EIA/RS 422 can be jumpered; isolation shall be provided for ports when configured for the EIA/RS-232 and EIA/RS-422 standards. Isolators shall suppress at least 3 KV and be replaceable without opening the enclosure and,
   x. any additional requirements as defined in the annexure.

b) **Digital input/output:**
   i. minimum 1 x 8-bit port. Each bit is capable of being configured as either input or output
   ii. all outputs to be capable of driving one standard TTL load
   iii. each input capable of generating interrupts on rising/falling/both edges of each input pulse
   iv. base addresses and IRQs selectable by jumper/BIOS
   v. connections made by an appropriate connector-mounted on the enclosure complete with locking screws, and
   vi. any additional requirements as defined in the annexure

c) **Network adaptor:**
   i. 10/100 or 10/100/1000-megabit Ethernet adaptor with Linux driver. For Linux version, refer Clause 7.1 ‘General’
   ii. connection made by standard Ethernet RJ45 modular connector on the enclosure, and
   iii. base addresses and IRQs selectable by jumper/BIOS
   iv. any additional Ethernet ports as defined in the attached annexure.
d) USB interface:
   i. minimum four USB 2.0 compliant universal serial bus port with two of these used for keyboard interface and mouse interface where required
   ii. the USB connections on the enclosure shall provide a securing mechanism to overcome vibration issues relating to harsh environments. Preference will be for a connection utilising a thumb screw or similar securing device. The Contractor shall provide details on the securing mechanism being proposed for the unit and,
   iii. any additional requirements as defined in the annexure.

7.5 Expansion bus interface/s

The expansion bus interface requirements include:

   a) Where required, the PC/104 bus shall provide both a PC/104 bus conforming to V2.2 or later electrical and mechanical specifications and a PC/104-Plus bus conforming to V2.0 or later electrical and mechanical specifications. All adaptor cards are to provide ‘stack-through’ bus connection (except the processor card, which may be a non-stack through ‘base’ card) and,

   b) Any additional requirements as defined in the annexure.

7.6 Field processor enclosure

Enclosure-related requirements for the FP shall include:

   a) FPs will normally be mounted within telecommunications field cabinets that comply with MRTS201, MRTS226 or traffic signal controller cabinets. A space of approximately 300 x 200 x 200 mm shall be sufficient for mounting the field processor within these cabinets.
   b) LED indicators for the power and disk drive status shall be provided on the external face of the enclosure on the same face as the data connectors.
   c) All interface ports shall be clearly labelled with indelible markings.
   d) The FP enclosure shall be suitable for mounting on a DIN rail bracket conforming to EN50022.
   e) Connectors for all data interfaces and power supply shall be provided with a locking mechanism, either screwed or latching.
   f) Metallic construction of high quality, sealed against dust and moisture to a minimum rating of IP51 as specified in AS 60529.
   g) No moving parts (e.g., no fan forced cooling).
   h) To meet the temperature specifications, the field processor may use the metal enclosure as a heat sink. Suitable measures shall be employed to all external the heat sinks to prevent damage/injuries from high temperatures to other equipment/ personnel.
   i) The enclosure shall be constructed in a manner that will prevent entry and nesting of vermin.
   j) The enclosure shall be made of corrosion resistant material or be treated with corrosion resistant coatings to ensure it remains corrosion free under normal roadside conditions for a minimum period of 10 years.
   k) The FP shall detect and register whenever the enclosure door is opened. This shall be done via an input through the serial dongle, and
l) Any additional requirement as defined in the annexure.

8 Standards compliance

The device shall pass the following tests and be certified for commercial sale:

a) Equipment shall comply with the relevant electrical safety requirements specified in AS/NZS 3100. The equipment shall not suffer damage if any of the terminations are open-circuited, short-circuited or disconnected while energised.

b) Ethernet ports compliant with Institute of Electrical and Electronics Engineers standard IEEE 802.3.

c) Serial ports compliant with Electronics Industries Association (EIA) Standard RS-232-C and/or RS 422 as appropriate.

d) C-Tick or RCM compliance in accordance with AS/NZS 4251.1 (EN 50081.1).

e) IS18 – Queensland Government Information Security Policy, and

f) any additional requirement defined in the annexure.

9 Service, warranty, guarantee and repair

Each Field Processor supplied shall include, as a minimum, a 12-month parts and labour warranty (return to base) from the date of delivery.

Spare or replacement components (to the board level) shall be available for purchase from the supplier for a period of at least 12 months following the warranty period (four years is desired).

The supplier shall provide a repair service that allows for FP repairs to be completed within four weeks from delivery to the supplier.

Additional requirements for the service, warranty, guarantee and repair of supplied FP are as defined in the annexure.

10 Packaging and delivery

The systems shall be supplied fully assembled and packaged individually for shipping. Additional requirements for the packaging and delivery are as defined in the annexure.

11 Mechanical and physical requirements

11.1 Environmental conditions

The environmental condition requirements defined in MRTS201 and the Annexure MRTS232.1 apply to equipment provided under this Specification except as described below:

a) The field processor shall be capable of continuous operation in field cabinets where the ambient temperature is in the range -10 to +80°C and humidity is in the range 0-90% (non-condensing), and

b) The power supply for the Field Processor shall be capable of continuous operation in field cabinets where the ambient temperature, as a minimum, is in the range -10 to +65°C and humidity is in the range 0-90% (non-condensing).
12 Installation requirements
The installation requirements defined in MRTS201 and the Annexure MRTS232.1 apply to equipment provided under this Specification.

In addition, the FP and power supply shall be suitable for DIN rail mounting within a telecommunications field cabinets that comply with MRTS201 or traffic signal controller cabinets.

13 Electrical requirements
The electrical requirements defined in MRTS201 and the Annexure MRTS232.1 apply to equipment provided under this Specification.

Where an FP is connected to any equipment exposed to electrical transients and overvoltage, the connection shall incorporate surge protection in accordance with AS 1768:2007 so as to prevent damage to the FP.

13.1 Power supply unit
The power supply unit shall:

a) Be a separate unit contained within its own enclosure
b) Plug pack power supplies shall not be permitted. Power supply shall be of the in-line type and have the option to be DIN rail mountable. The power supply shall not be hardwired to mains power
c) Be suitable for connection to nominal 230 VAC 50 Hz earthed-neutral electrical supply, capable of correct operation between 200 V and 265 V a.c.
d) Provide a regulated DC output voltage to match the nominal input voltage required by the processor board/unit, with a fastening connection compatible with that required by processor board/unit
e) B-rated at 120% of the maximum power required by the FP when operating with devices connected to all ports
f) Have a minimum rating of 75% efficiency at 20% full load or 85% efficiency at 100% full load
g) Incorporate (or be provided with) adequate transient protection and filtering
h) Be ‘safe’ in accordance with AS/NZS 3000 and AS/NZS 3100 (e.g., no exposed 230 V contacts, etc.)
i) Provide adequate power to the FP, and
j) Include any additional requirement defined in the annexure.

14 Testing and commissioning
The testing and commissioning requirements defined in MRTS201 and the Annexure MRTS232.1 apply to equipment provided under this Specification.

15 Documentation
The documentation requirements defined in MRTS201 and the Annexure MRTS232.1 apply to equipment provided under this Specification.
In addition, the following documents shall be provided to the Administrator and Transmax Pty Ltd prior to obtaining the STREAMS Compliance certificate:

- an electronic copy of engineering hardware documentation
- an electronic copy of Technical and User Manuals, and
- an electronic copy of all certification documentation.

16 Training

The training requirements defined in MRTS201 and the Annexure MRTS232.1 apply to equipment provided under this Specification.

17 Maintenance

The maintenance requirements defined in MRTS201 and the Annexure MRTS232.1 apply to equipment provided under this Specification.

18 Handover

The handover requirements defined in MRTS201 and the Annexure MRTS232.1 apply to equipment provided under this Specification.
Appendix A: Supported Chipsets

This Appendix lists the specific device chipsets certified as supported by the STREAMS field processor software package.

1   Network adapter chipsets

The network adapter chipsets currently certified to work with STREAMS are:

- Intel Pro/100 i82557-i82559
- Davicom DM9801, DM9802, DM9802A
- National Semi DP8381x
- SMC SMC91xxx
- AMD LANCE 7990, 79C960, 79C961, NE1500, NE2100
- Realtek RTL8129, RTL8139

2   Serial adapter chipsets

The serial adapter chipset shall use a 16C550 or compatible UART.