

**Technical Specification**

**Transport and Main Roads Specifications  
MRTS232 Provision of Field Processors**

**July 2017**

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## 1 Introduction

### 1.1 Purpose

This Technical 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.

This Technical Specification shall be read in conjunction with MRTS01 *Introduction to Technical Specifications*, and other Technical Specifications as appropriate.

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

### 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 Technical Specification. Additional terminology relevant under this Technical Specification are defined in Table 2 below.

**Table 2 – Definitions**

Term	Definition
ACMA	Australian Communications and Media Authority
BIOS	Basic Input Output System
CPU	Central Processing Unit
C-Tick	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.
DIMM	Dual Inline Memory Module
ECP	Enhanced Capability Port
EIA/RS	Electronics Industries Association/Recommended Standard
EPP	Enhanced Parallel Port
Field Processor	Ruggedised field computer used to connect field devices to the ITS Network
FP	Field Processor
GB	Gigabyte
IRQ	Interrupt Request

Term	Definition
IS18	QGCIO Information Security Standard
ITS	Intelligent Transport Systems
ITS Network	Principal's Telecommunications Network in accordance with MRTS245
LPT	Line Printer Terminal
MB	Megabyte
PC	Personal Computer
PC/104 and PC/104-Plus	An embedded computer standard controlled by the PC/104 Consortium
PnP	Plug and Play
RAM	Random Access Memory
Site Identifier	A non-volatile memory device that stores a site identification. It connects to a dedicated serial port on the Field Processor.
SO DIMM	Small Outline – Dual Inline Memory Module
STREAMS	Transport and Main Roads ITS Platform and Transport Management System
TTL	Transistor-Transistor Logic
UART	Universal Asynchronous Receiver Transmitter
USB	Universal Serial Bus
VGA	Video Graphics Array

### 3 Referenced documents

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

**Table 3 – Referenced documents**

Reference	Title
AS/NZS 1768:2007	<i>Lightning protection</i>
AS 60529:2004	<i>Degrees of protection provided by enclosures (IP Code)</i>
AS/NZS 4251.1	<i>Electromagnetic Compatibility (EMC) – generic Emission Standard</i>
MRTS201	<i>General Equipment Requirements</i>
MRTS226	<i>Telecommunications Field Cabinets</i>
MRTS232.1	<i>Annexure Provision of Field Processors</i>
MRTS245	<i>Principal's Telecommunications Network</i>

### 4 Quality system requirements

The quality system requirements defined in MRTS201 apply under this Technical Specification. There are no additional quality system requirements for equipment provided under this Technical 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, and
- 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 Technical 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 approval<sup>1</sup>, 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, and
- 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 flask disk or as defined in the attached annexure. The compact flash disk shall be bootable and have direct BIOS support.

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<sup>1</sup> From 1 March 2016, all suppliers must use the RCM as the compliance label.

- 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 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, and
  - 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 60529.2004.
- 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 Technical 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 Technical 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 Technical Specification.

#### **15 Documentation**

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

#### **17 Maintenance**

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

#### **18 Handover**

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

## **Appendix A: Supported Chipsets**

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

### **A1 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, and
- Realtek RTL8129,RTL8139

### **A2 Serial adapter chipsets**

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

