Technical Specification

Transport and Main Roads Specifications
MRTS232 Provision of Field Processors

November 2024

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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 several 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 *General Equipment Requirements* 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
DIMM	Dual Inline Memory Module
DIO	Digital Input Output
EIA/RS	Electronics Industries Association/Recommended Standard
Field Processor	Ruggedised field computer used to connect field devices to the ITS Network
FP	Field Processor
GB	Gigabyte
IRQ	Interrupt Request
IS18	QGCIO Information Security Standard
ITS	Intelligent Transport Systems

Term	Definition
ITS Network	Principal's Telecommunications Network in accordance with MRTS245 *ITS Telecommunications Network (ITS TN)*
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
RCM	Regulatory Compliance Mark
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	The Principal's traffic management system and primary user interface to ITS field devices
TTL	Transistor-Transistor Logic
UART	Universal Asynchronous Receiver Transmitter
USB	Universal Serial Bus

3 Referenced documents

The requirements of the referenced documents listed in 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	*Lightning protection*
AS/NZS 3000	*Electrical installations (known as the Australian/New Zealand Wiring Rules)*
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 4417.2	*Regulatory compliance mark for electrical and electronic equipment, Part 2: Specific requirements for particular regulatory applications*
AS 60529.2004	*Degrees of protection provided by enclosures (IP Code)*
AS/NZS 61000.6.3	*Electromagnetic compatibility (EMC), Part 6.3: Generic standards — Emission standard for equipment in residential environments*
MRTS201	*General Equipment Requirements*
MRTS226	*Telecommunications Field Cabinets*
MRTS232.1	Annexure *Provision of Field Processors*

4 Quality system requirements

The quality system requirements defined in MRTS201 *General Equipment Requirements* 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 Clause 6.2 and Clause 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 microprocessor, including memory and input/output interface cards

b) DIN rail mounting 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.

6.2 Field Processor configuration

The Contractor shall provide Field Processors which meet the requirements specified in this Technical 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

STREAMS compliant Field Processor Units provided under this contract must be listed under the hardware section of the Transmax website. The listed products have already been evaluated and certified as compliant.

7 Technical Specifications

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

7.1 General

The operational requirements defined in MRTS201 *General Equipment Requirements* 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 61000.6.3 and provide a valid RCM (Regulatory Compliance Mark) as defined in AS/NZS 4417.2. Details of RCM compliance is provided by the Australian Communication and Media Authority (ACMA), 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 64-bit architecture, compatible with – and providing the performance of – at least an Intel® Atom™ x5-E3930 or as defined in Annexure MRTS232.1.

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 +12V to +24 V DC, and

e) The power connector to the Field Processor shall be fastened and keyed to ensure polarity protection, preventing the inadvertent reversal of positive and negative inputs.

7.3 System resources

The FP system resource requirements include:

a) The system shall be supplied with minimum 2GB RAM, in standard DIMM or SO-DIMM format or as defined in Annexure MRTS232.1.

b) The system shall be supplied with solid a state removable industrial-grade MicroSD card. The MicroSD card 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 5 years 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. 4 x DB9, supporting standard RS232 pinout and Transmax RS422 pinout

ii. at least one EIA/RS 232 port above (i) shall support Full Handshaking

iii. at least one RS232 port above (i) shall support Full Handshaking

iv. at least two RS232/RS422 port above (i) shall support dynamically selectable via software

v. at least one RS422 port above (i) shall support dynamically selectable via terminating resistor software

vi. minimum two serial ports that are individually software configurable for either EIA/RS 232C or EIA/RS 422

vii. serial port chipset shall use a 16C550 or compatible UART

viii. all serial ports shall be capable of 300 to 115 200 bits per second

ix. base addresses and IRQs selectable by jumper/BIOS

x. all serial ports are to be available on the front panel by D-style nine-way connectors with locking screws

xi. 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

xii. any additional requirements as defined in Annexure MRTS232.1.

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 Annexure MRTS232.1.

c) Network adaptor:

   i. 10/100 or 10/100/1000-megabit Ethernet adaptor with Linux driver. For Linux version, refer Clause 7.1'

   ii. connection made by standard Ethernet RJ45 modular connector on the enclosure

   iii. base addresses and IRQs selectable by jumper/BIOS, and

   iv. any additional Ethernet ports as defined in Annexure MRTS232.1.

d) USB interface:

   i. minimum of two USB 3.0 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 Annexure MRTS232.1.

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 Annexure MRTS232.1.

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 *General Equipment Requirements*, MRTS226 *Telecommunications Field Cabinets* 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 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 facilitated via the DIO Interface, and

l) Any additional requirement as defined in Annexure MRTS232.1.

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) RCM compliance in accordance with AS/NZS 61000.6.3.

e) IS18 – Queensland Government Information Security Policy, and

f) Any additional requirement defined in Annexure MRTS232.1.

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 Annexure MRTS232.1.

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 Annexure MRTS232.1.

11 Mechanical and physical requirements

11.1 Environmental conditions

The environmental condition requirements defined in MRTS201 *General Equipment Requirements* and 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 + 70°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 *General Equipment Requirements* and 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 cabinet that comply with MRTS201 *General Equipment Requirements* or traffic signal controller cabinets.

13 Electrical requirements

The electrical requirements defined in MRTS201 *General Equipment Requirements* and Annexure MRTS232.1 apply to equipment provided under this Technical 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 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 AC.

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 Annexure MRTS232.1.

14 Testing and commissioning

The testing and commissioning requirements defined in MRTS201 *General Equipment Requirements* and Annexure MRTS232.1 apply to equipment provided under this Technical Specification.

15 Documentation

The documentation requirements defined in MRTS201 *General Equipment Requirements* and 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 *General Equipment Requirements* and Annexure MRTS232.1 apply to equipment provided under this Technical Specification.

17 Maintenance

The maintenance requirements defined in MRTS201 *General Equipment Requirements* and Annexure MRTS232.1 apply to equipment provided under this Technical Specification.

18 Handover

The handover requirements defined in MRTS201 *General Equipment Requirements* and 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 is:

- Intel Atom X7-E3950