

Greater Wellington Regional Council

Bus Services Equipment Operations Manual- Part A

December 2018

Document History

Version	Issue Date	Changes	Issued to	Author
1	30 Sept 2016	RFT release version	RFT release	Ai-Bee Tan
1.1	21/4/2017	Update of ticketing-related content	Ai-Bee Tan; David Lewry; David Dale;	Eamon Sweeney
1.2	10/5/2017	Minor updates to Ticketing Equipment content lists Added draft Ticketing Equipment Maintenance and support protocol	A-Bee Tan; David Lewry;	Eamon Sweeney
1.2	8/6/2017	N/A	Operators	Ai-Bee
1.3	14/5/2018	Split into Part A and Part B Part B in separate document		Patrick Farrell
1.4	31/10/2018	Minor updates, plus inclusion of revised provisions for reporting of faults		Amy Helm
1.5	10/12/18	Minor grammatical updates	Operators	Matthew Lear/ Salsabil Elmegreisi

Contents

Contents

Document History	2
Glossary.....	5
1 The purpose of this document.....	7
2 Document outline	7
Part A.....	7
Part B.....	7
Part A.....	8
3 Real Time Information and Ticketing System description	8
4 Components of the RTPI and Ticketing Systems.....	8
5 On-Board Equipment	9
RTPI System components.....	9
Ticketing On-Board Equipment.....	9
Installation Kit expectations.....	10
6 Applications.....	10
RTPI Applications	10
Ticketing Applications	10
7 Operator-supplied components.....	10
8 De-installation or transfer of Equipment.....	11
Operational Guide for Drivers.....	11
9 Summary of data entry requirements	11
10 Pre-departure checks, signing on, and start of trip	12
Pre-departure checks.....	12
11 GPS issues during trip.....	12
12 Printer paper replacement	12
13 End of trip and end of shift	13
14 Summary of Incident / Breakdown or Handover instructions.....	13
Driver change mid-shift.....	13
Leaving the bus	13
Transferring passengers between buses in cases of bus breakdown.....	13
Vehicle change	13
Faults and repairs – instructions for Depot staff	14

15	Faults diagnosis by drivers	14
16	Fault diagnosis by Depot staff.....	14
	Table 1 - LED status indications	16
17	Reporting of faults by Depot staff.....	17
	Faults, damage and repairs to RPTI System.....	17
	Faults, damage and repairs to the On-board ticketing equipment	17
	Inspection, cleaning and maintenance	18
18	Access for maintenance and repairs.....	18
19	Inspection, cleaning and maintenance by the Operator	18

Glossary

Application means software or a web-based programme used by the Operator's operational support staff to interact with the RTPI or Ticketing Systems.

Automatic Vehicle Location (AVL) Unit means the electronic device that comprises the RTPI On-Board Equipment. Also known as **DT Unit**

Bus Driver Console (BDC) which is a Ticketing On-Board Equipment component that is used by bus drivers to log into and interact with the Ticketing System and other on board Ticketing Equipment. It allows them to process payments for cash fares and record journey events such as concessionary travel. The BDC communicates specific journey activity to the RTPI System.

Bus Ticketing Driver User Manual (BTDUM) means the training manual provided by Snapper to the Operators that describes how drivers are expected to interact with the Ticketing Systems on-board equipment.

Depot Equipment means the RTPI or Ticketing System components installed at a Depot.

Equipment means the equipment provided by GWRC under the Partnering Contract, for the purposes of Vehicle tracking, real time passenger information and ticketing systems

GPRS means 'general packet radio service'. It is a packet oriented mobile data service on the 2G and 3G cellular communication system's global system for mobile communications (GSM)

GPS means 'global positioning services'. This is a space-based satellite navigation system that provides location and time information in all weather, anywhere on or near the Earth, where there is an unobstructed line of sight to four or more global positioning services satellites

Horizon means Vix Horizon which is RTPI System software application that allows the Operator to interface with the RTPI System's operational support and passenger information functionalities.

Interface means a shared boundary across which two separate components of a computer system exchange information

On-Board Equipment means the RTPI or Ticketing System components installed on a Vehicle.

Operator means the contracted provider of Passenger Operating Services in the Wellington region

Operator Reports means the Vix RTPI System software which allows the Operator to interface with the RTPI System's data warehouse and reporting functionality.

Partnering Contract means the contract between GWRC and the Operator for the provision of bus services under the Public Transport Operating Model framework

RTPI Equipment means all real time information equipment licensed to the Operator under a Partnering Contract that is either installed in a Vehicle or held at the Operator's premises

RTPI System means the real time passenger information system supplied by the supplier, in line with the Supply Agreement. Also known as **RTI System**

Snapper BDC (bus driver console) means the Ticketing On-Board Equipment unit which includes the touch screen interface to issue paper tickets for cash payment and to monitor the status of the bus validators installed on-board. Also be referred to as the **ETM (Electronic Ticketing Machine)**

Software means the software forming part of the RTPI or Ticketing System/s to enable the system/s to operate in line with the specifications set out in the Supply Agreement or as directed by GWRC

Supervisor means whoever the driver needs to report to in any given situation e.g., the manager, shift or duty supervisor, shift engineer, workshop staff person, cashier etc.

Supplier means the provider of relevant equipment to GWRC in line with a Supply Agreement, and includes the Supplier's subcontractors

Thermal Printer means the Ticketing On-Board Equipment component that is used to print paper tickets for customers. It is also used to generate other paper-based outputs in relation to the Ticketing System data and information.

Trip Off (or Tripped Off) means the action of using the BDC to transmit information to the Ticketing System indicating that a trip that the Ticketing System was Tripped On to, has stopped being delivered.

Trip On (or Tripped On) means the action of using the BDC to transmit information to the Ticketing System indicating that a specific trip in the schedule is currently being delivered.

Validator means the Ticketing On-Board Equipment component that is used to validate transactions made using eligible electronic media (e.g. a smartcard) and debit the fare. Also known as the **Snapper Card Reader** or **Fare Payment Device (FPD)** in some materials.

Vehicle means a vehicle used by the Operator to provide Passenger Operating Services in the Wellington region

Note: Defined terms in the Partnering Contract have the same meaning where used in this document.

1 The purpose of this document

- 1.1 The Bus Services Equipment Operations Manual (BSEOM) provides instructions about how to manage and use the components of GWRC's Real Time Passenger Information (RTPI) and Ticketing Systems made available to the Operator.
- 1.2 It is intended to work as a supporting document, providing detail about how to use the equipment components of those systems to meet contractual obligations, without duplicating information already included in the Partnering Contract or other manuals.
- 1.3 The BSEOM will be updated from time to time to ensure it remains fit for purpose.

2 Document outline

- 2.1 The BSEOM is formed of two parts.

Part A

- 2.2 This part focuses on the on-bus equipment components that the drivers will interact with. The sections of **Part A** include:
- 2.3 *RTPI and Ticketing Systems Description*: This section lists the on-board equipment components that the driver will manage or use, as well as the applications that operate in the backend of that equipment.
- 2.4 *Operational Guide for Drivers*: This section is supporting information for drivers with regard to the on-board equipment. This part is able to be detached from the BSEOM and issued to bus drivers as a stand-alone document to describe key activities that drivers undertake.
- 2.5 *Faults and repairs – instructions for Depot staff*: This section describes the procedures for reporting faults to GWRC and its contractors.
- 2.6 *Inspections, cleaning and maintenance*. This section outlines expectations regarding inspections, cleaning and maintenance.

Part B

- 2.7 This part focuses on the back-end systems and applications that enable the RTPI and Ticketing Systems provided by GWRC and used by Operators. The sections of **Part B** include:
- 2.8 *Overview*: This section outlines the GWRC owned systems (Resolve, PTWFS and PTBIS) that the Operator will manage or use.
- 2.9 *Applications and Software systems*: This section describes the functions of the background technology systems that the Operator will interact with and the information requirements that the Operator is expected to provide into those systems.
- 2.10 *Maintenance activities*: This section describes the maintenance activities that are the responsibility of Operators.

- 2.11 Part B is currently getting drafted and will be distributed to Operators once finalised.

Part A

3 Real Time Information and Ticketing System description

- 3.1 The **Real Time Passenger Information (RTPI) System** tracks all vehicles on the GWRC/Metlink Network in real time, provides customers with real time predictions of vehicle departure/arrival times, and provides the Operator and GWRC with real time predictions of departure times, vehicle location information and other RTPI data.
- 3.2 RTPI equipment on-board vehicles provide communication, tracking and data logging functions for operational systems, and GPS tracking capability for the RTPI System. This GPS data is provided in real time to the RTPI System via a web service interface.
- 3.3 Data captured by the RTPI System about trip performance is also used to assess performance against PTOM contractual Key Performance Indicators (KPIs).
- 3.4 The **Ticketing System** is used to collect farebox revenue on Metlink bus services. It is also used to tell the RTPI System which trip a driver is delivering. This information is used by the RTPI System to support effective tracking of Vehicles and accuracy of RTPI signs.

4 Components of the RTPI and Ticketing Systems

- 4.1 The components of the RTPI and Ticketing Systems made available to the Operator by GWRC are split into two categories:
- On-Board Equipment, which is the physical equipment installed on the vehicles
 - Applications, which is the software enabling functioning of the RTPI and Ticketing Systems.
- 4.2 There is currently no Depot equipment although GWRC reserves the right to require Depot equipment to be installed. GWRC will give reasonable notice and work with the affected Operator if the need arises.

5 On-Board Equipment

RTPI System components



5.1 RTPI On-Board Equipment includes:

- Automatic Vehicle Location (AVL) Unit, comprising a DT421 On Vehicle Computer (or equivalent) and a DT470 Driver Display (seen in pictures above) – it can also be referred to as a DT Unit
- RTPI On-Board Equipment Installation Kit, consisting of:
 - Antenna
 - Wiring
 - Driver Display mounting bracket

Ticketing On-Board Equipment

EQUIPMENT OVERVIEW



BUS DRIVER CONSOLE (BDC)
1 PER BUS



TICKET PRINTER
1 PER BUS



SNAPPER CARD READERS
2-3 PER BUS

5.2 Ticketing On-Board Equipment includes:

- Snapper Bus Driver Console (BDC)
- Ticket Printer (Thermal Printer)

- Validator (also called Snapper Card Reader or Fare Payment Devices (FPD))
- Ticketing On-Board Equipment Installation Kit, consisting of:
 - Cable looms
 - Switched-mode Power Supply (SMPS)
 - GPS antenna
- BDC mounting bracket
- Thermal printer mounting bracket
- Leaner/grabber bracket

Installation Kit expectations

- 5.3 The Installation Kit is installed by bus builders if being installed on a new build bus.
- 5.4 The Installation Kit is installed by the Equipment Supplier, if being installed in an existing bus.
- 5.5 All other On-Board Equipment is installed by the Equipment Supplier at the time of bus commissioning.

6 Applications

- 6.1 Applications will be further detailed in **Part B** of this document

RTPI Applications

- 6.2 RTPI Applications consist of:
 - Vix Horizon
 - Operator Reports

Ticketing Applications

- 6.3 Ticketing Applications consist of:
 - Snapper Operator Reporting Portal
 - Snapper Service Desk tool

7 Operator-supplied components

- 7.1 Operator-supplied components consist of:
 - A PC or other device, with the following capabilities:
 - Operating System: Windows 7 or above
 - broadband internet connection

- internet browsing software (currently Internet Explorer 11.0 or newer) that is compatible with RTPI Applications and Ticketing Applications
- security settings that allow the computer or device to access RTPI Applications and Ticketing Applications
- a suitable permanent power supply

Note: A dedicated computer or device is not required.

- Thermal printer paper for Ticketing On-Board Equipment Thermal Printer, with the following specifications:
 - Type: Thermal transfer paper
 - Width: 57mm
 - Maximum Length: 50 metres

8 De-installation or transfer of Equipment

8.1 In no circumstances should the Operator de-install or transfer the RPTI Equipment. If the Vehicle is leaving the fleet, the Operator must:

- notify their GWRC Account Manager
- log a service request through Metlink Systems for the RTPI Equipment to be de-installed
- log a service request through the GTA portal for the Ticketing Equipment to be de-installed.

8.2 For transferring Ticketing Equipment the Workshop Team should follow the procedure for swap-outs manual.

8.3 All On-Board Equipment must be de-installed before the Vehicle leaves the fleet.

Operational Guide for Drivers

Handle with care

RPTI Equipment and Ticketing Equipment must be handled with care. While you may adjust the positioning of displays, take care not stretch, pull or unplug any wires.

9 Summary of data entry requirements

9.1 More detail on the data entry requirements are in the Bus Ticketing Driver User Manual (BTDUM) issued by Snapper. Refer to the BTDUM for all instructions on how to use the Snapper BDC.

9.2 Drivers do not need to enter any data into the RTPI on-board AVL unit.

9.3 All data is entered on the Snapper BDC which is then used by the RTPI System.

- 9.4 Drivers MUST enter accurate data into the Snapper BDC at the correct time and when the vehicle is at the correct location - the accuracy of the RTPI System is (amongst other things) critically dependent on this action by all drivers.

10 Pre-departure checks, signing on, and start of trip

Pre-departure checks

- 10.1 The pre-departure checks are a quick check performed by the driver on the AVL unit, Snapper BDC, and Snapper Card Reader before the vehicle starts its first journey of the day OR when the vehicle or driver changes.
- 10.2 Any faults found must be reported immediately to the Depot Supervisor. The driver should also report if any on-board equipment is damaged or missing.
- 10.3 The driver must check that the AVL unit:
- Turns on when the vehicle starts
 - Boots up to the main interface screen
 - GPS and GPRS 4G cellular indicators both show signal
- 10.4 Instructions on how and when to SIGN ON and TRIP ON are provided in the Snapper BTDUM.
- 10.5 After 'tripping on' the driver is to ensure the AVL Unit displays the correct route number, next stop, date & time, driver details, and punctuality information
- 10.6 If the AVL does not turn on and boot up, or any information on the AVL Unit is incorrect, or does not match what appears on the BDC, drivers should follow the RTI On Board Equipment 1st Level Fault Diagnosis Check sheet. If the fault is not resolved, the driver should report the fault to the Depot Supervisor immediately.

11 GPS issues during trip

- 11.1 If there is a problem with the GPS connection during the trip, then the driver may need to move the BDC manually through the stops on the route. If the GPS signal fails, arrows will appear and the driver can tap them to move the information on to the next stop. Full instructions are provided in the BTDUM.
- 11.2 This is important as the fares will be calculated based on the stop information being correct.

12 Printer paper replacement

- 12.1 The driver will monitor the Printer to ensure it contains paper to print tickets and the paper is scrolling correctly. If it runs out of paper, the driver must put more paper in the printer.
- 12.2 Instructions on interacting with the Printer can be found in the BTDUM.

13 End of trip and end of shift

- 13.1 Details on end of trip and end of shift procedures are provided in the BTDUM.
- 13.2 Always check that the AVL Unit shows *NOT IN SERVICE* after tripping off.
- 13.3 The same process is followed if a relief driver comes to take over a route for any reason.

14 Summary of Incident / Breakdown or Handover instructions

- 14.1 Details on the correct data entry steps to follow in the event of an incident, vehicle breakdown, or driver handover are provided in the BTDUM.
- 14.2 If drivers do not adhere to these data entry requirements, service information for passengers will be negatively affected. (i.e. vehicle won't track or track correctly).
- 14.3 Instructions for diagnosing and handling faults on the Ticketing Systems on-board equipment are provided in the BTDUM. Any unresolved faults should be reported to the Depot Supervisor immediately.

Driver change mid-shift

- 14.4 Driver changes may occur mid-shift, either between scheduled service trips or during a scheduled trip at a nominated bus stop.
- 14.5 Refer to BTDUM for instructions on how to interact with the Snapper BDC during a mid-shift driver change.

Leaving the bus

- 14.6 If the driver has to leave the bus for whatever reason, then the ticketing equipment must be locked first. Instructions on how to do this are provided in the BTDUM.

Transferring passengers between buses in cases of bus breakdown

- 14.7 Refer to BTDUM for instructions on how to interact with the Snapper BDC when transferring passengers between buses.

Vehicle change

- 14.8 Vehicle changes may occur mid-shift, either between scheduled in-service trips, or during a scheduled in-service trip in cases of a breakdown, etc.
- 14.9 Refer to BTDUM for instructions on how to interact with the Snapper BDC during a vehicle change.
- 14.10 If the vehicle change occurs between scheduled in-service trips, the standard SIGN ON and TRIP ON process is followed.

Faults and repairs – instructions for Depot staff

Services must not run without working RTPI Equipment or Ticketing Equipment

All faults must be reported immediately. If there is a fault with either the RTPI Equipment or Ticketing Equipment you may finish the service you are on and run the next service for that Vehicle (as long as attempts are made to fix the Ticketing Equipment between services). Otherwise, the Vehicle must stay out of service until the RTPI Equipment or Ticketing Equipment is working properly.

15 Faults diagnosis by drivers

- 15.1 Drivers must report all faults, damaged or lost on-board equipment to the Depot Supervisor immediately. Before reporting the fault, damage or lost equipment to GWRC or its contractors, Depot staff must ensure the driver has undertaken the relevant diagnostic checks. This helps to ensure only genuine faults are reported for repair to the Equipment Supplier.
- 15.2 Driver diagnostic checks:
- AVL unit not working correctly – refer to the RTI On Board Equipment 1st Level Fault Diagnosis Check sheet
 - On-board Ticketing Equipment not working correctly – refer to the BTDUM.

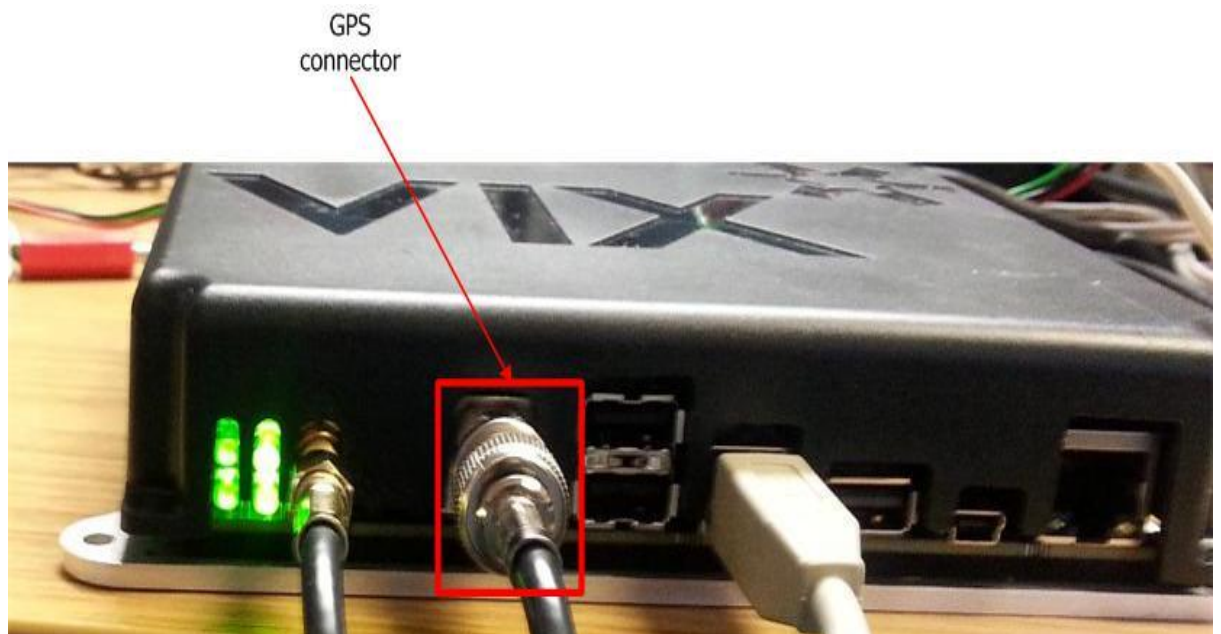
16 Fault diagnosis by Depot staff

- 16.1 When a vehicle is not tracking on the Vix Horizon Application, additional checks may be carried out by Depot staff. This requires accessing the DT421 On-Vehicle Computer, fitted within a locker on the Vehicle.

- 16.2 Check the LED pattern on the DT421 On-Vehicle Computer shows all four LED lights are green. If not, refer to Table 1 below for analysis.



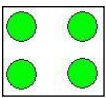
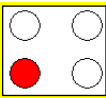
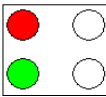

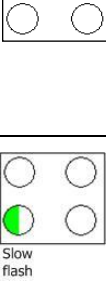
- 16.3 If a GPS fault is indicated, the Level 1 fault resolution process is to check if the GPS cable (highlighted in red) is plugged in and screwed up tight.

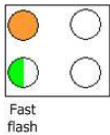
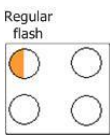
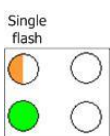
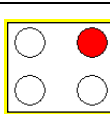
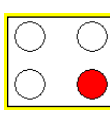


- 16.4 If a GPRS fault is indicated, the Level 1 fault resolution process is to check if the GPRS cable (highlighted in red) is plugged in and screwed up tight.



Table 1 - LED status indications

Description	Graphical representation	Meaning
All LEDs on constant green. Start sequence is complete and the DT421 On Vehicle Computer is on.		Normal operation.
Bottom left LED on constant red, all other LEDs off.		The DT421 On Vehicle Computer internal fuse has blown.
Top left LED on constant red, bottom left LED on constant green, other LEDs off.		The DT421 On Vehicle Computer has started up with a low supply voltage (less than 7V). The DT421 On Vehicle Computer stays in this state until the supply voltage rises above 7.5V.
Top left LED on constant red, all other LEDs off.		At some point after start-up the DT421 On Vehicle Computer supply voltage has dropped below 7V. The DT421 On Vehicle Computer stays in this state until the supply voltage rises above 7.5V.
Bottom left LED flashes green slowly (on 0.5s /off 2s).		Main power has been applied but the vehicle master switch is off. You can start the DT421 On Vehicle Computer by switching the vehicle master switch on.

Description	Graphical representation	Meaning
Top left LED on constant amber, bottom left LED flashes green fast (50ms alternating), other LEDs off.		<p>The vehicle master switch has been switched off and the DT421 On Vehicle Computer is counting down a preconfigured number of seconds before switching off.</p> <p>You can cancel this at any time during the countdown by switching the vehicle master switch on.</p>
Top left LED slow flashing amber (on 0.5s /off 2s), all other LEDs off.		<p>The On Delay routine has been activated. The DT421 On Vehicle Computer is waiting for a predefined number of seconds before a normal switch on.</p>
Top left LED gives a single amber 50ms flash then returns to constant green, bottom left LED on constant green. Other LEDs irrelevant.		<p>The internal system health check heartbeat is active.</p>
Top right LED on constant red, other LEDs irrelevant.		<p>No GPRS coverage.</p>
Bottom right LED on constant red, other LEDs irrelevant.		<p>No GPS coverage.</p>

17 Reporting of faults by Depot staff

17.1 All faults, damage or lost equipment must be reported immediately.

Faults, damage and repairs to RPTI System

17.2 If there is a fault with or damage to the RTPI on-board equipment, report the fault via email to Metlink Systems following the process in Raising Support Calls. This includes information on how to classify the fault and what information must be supplied when reporting the fault.

17.3 If the RPTI Equipment is damaged, include high quality images of the damage in the email. Also provide a brief report of the cause of the damage.

Faults, damage and repairs to the On-board ticketing equipment

17.4 If there is a fault with or damage to the On-board ticketing equipment, report the fault to Snapper via the GTA Portal.

17.5 If the On-board ticketing equipment is damaged, Snapper's contractors will take high quality images of the damage and provide a brief report to Snapper on the cause of the damage.

17.6 Operators may repair or replace some components of the On-board ticketing equipment, as advised by Snapper. Operators must follow the instructions of

Snapper in carrying out this work, including any instructions regarding the return of faulty equipment.

Inspection, cleaning and maintenance

18 Access for maintenance and repairs

- 18.1 To allow for maintenance and repair of the RPTI System as required, the Operator and GWRC will mutually agree dates and times when GWRC (or its contractors) will have access to Depots and relevant Vehicles at the Depots. If the relevant Vehicles are not made available at the agreed times, the Operator may be charged a call-out fee.
- 18.2 To allow for maintenance and repair of the Ticketing System the Operator will report the request to Snapper via the GTA Portal.

19 Inspection, cleaning and maintenance by the Operator

- 19.1 Drivers are to conduct regular inspections and checks of the On-Board Equipment as set out in section 10 of this manual. On-board Equipment should be maintained to a reasonable standard of cleanliness, following any instructions for cleaning in the Equipment Suppliers operating manuals.