

ROADWAY WORKER PROTECTION SYSTEM

OPERATIONS MANUAL



100925DOC001



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INTELLECTUAL PROPERTY

The contents of this Roadway Worker Protection System (RWPS) Operations Manual are the intellectual property of Metrom Rail, LLC. Copies may be made by Metrom Rail customers for their authorized personnel only. No duplication or distribution of this document or any portion thereof shall take place without the express written permission of Metrom Rail, LLC. No part of this manual may be reproduced, distributed, or transmitted in any form or by any means, electronically or mechanical, for any purpose without the express written permission of Metrom Rail, LLC.

DECLARATION OF CONFORMITY

The RWPS system incorporates a wireless transceiver. The antenna included with the RWPS system has been chosen to match the requirements of this radio equipment. Do not attempt to use a substitute antenna, at risk of violating US / Canadian regulations. The radio hardware has been certified for operation under FCC Part 15 Rules, Section 15.247.

WARNING: This device operates under Part 15 of the FCC rules. Any modification to this device, not expressly authorized by Metrom Rail, LLC, may void the user's authority to operate this device.

This apparatus complies with part 15 of the FCC rules and Industry Canada license-exempt RSS standard(s). - Operation is subject to the following two conditions:

- (1) this device may not cause interference, and
- (2) this device must accept any interference received, including interference that may cause undesired operation of the device.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes :

- (1) l'appareil ne doit pas produire de brouillage, et
- (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement

PRECAUTIONS

Metrom Rail's RWPS system is intended as a safety enhancement to supplement existing procedures and safe operating principles. It is not intended as a replacement for existing on-track safety rules or protocols.

The RWPS system is intended for use on railroad property only.

Whenever RWPS equipped machinery is operated or transported off railroad property, the RWPS system should not be powered.

ATTENTION! The Personnel Module meets the FCC RF exposure guidelines when used as directed in this User's Manual. In order to limit exposure to RF fields, do not modify the device enclosure or wear it closer to the skin than is illustrated in this manual.

BATTERY SAFETY INFORMATION

The Roadway Worker Protection System contains a charger and a Personnel Module with rechargeable batteries. The batteries should never be removed from the Personnel Module except by Metrom Rail personnel. Charging of the batteries is to be done exclusively in the provided charging station.

Use the docking station with the provided wall adapter only. Replacements can be ordered through Metrom Rail. Other adapters

have not been approved by Metrom Rail, LLC or the FCC and are therefore not recommended for use and may cause damage to the equipment.

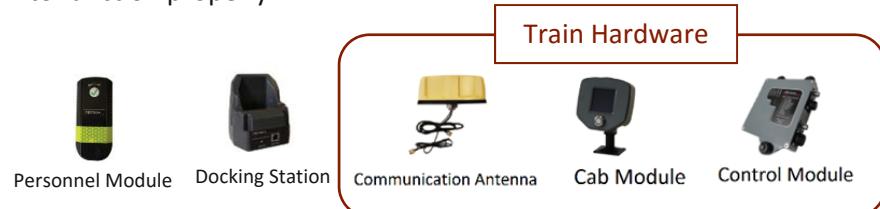
- The radio will turn off automatically when placed in the docking station.
- The charger should be used only in dry locations and condition.
- Charger is designed to operate with a standard 110V AC outlet.
- Ambient charging temperature between 0°C and 40°C (32°F and 104°F).
- Power output from the power supply unit must not exceed the ratings stated on the product label located at the bottom of the charger.
- To reduce the risk of damage to the plug and cord, pull by the plug rather than the cord when disconnecting.
- To reduce the risk of fire, electric shock or injury, do not operate the charger if damaged in any way.
- Do not disassemble the charger. This may result in the risk of electrical shock or fire.
- Charging will automatically cease once battery is charged.

INTRODUCTION

Thank you for choosing the Metrom Rail Roadway Worker Protection System (RWPS). This system is designed to provide advanced warning to workers with simultaneous visual, tactile, and auditory alerts. Equipment operators receive an audible alert along with information detailing the number of workers, distance, and confirmation status.

Note: Read this operations manual carefully to ensure you know how to properly operate the system before use.

Below is the RWPS hardware. All portions are necessary for the system to function properly.



The RWPS system wirelessly communicates location and speed information between workers and train operators allowing for another level of safety. It includes alarming so that workers know when to vacate the tracks and the train operators know workers are present and if they are aware that a train is approaching. The system is designed to be easy to use and to minimize the number of nuisance alarms so that alarming is meaningful and respected. All devices are designed to meet rail standards for durability.

HARDWARE OVERVIEW

Personnel Module

The workers are equipped with Personnel Modules. The Personnel Module provides protection for any worker in the vicinity of RWPS equipped trains. The module deploys a multi-color LED beacon, a speaker, and vibration effects to alert a worker when an equipped train is within a certain distance or time to arrival. The confirmation button is used to silence alarms and thereby send the confirmation to the train operator. The module is to be clipped onto either belt, vest, or coat with the Metrom Rail logo facing outward from the body.



The Personnel Module is completely self-contained and should never be opened except by Metrom Rail personnel.

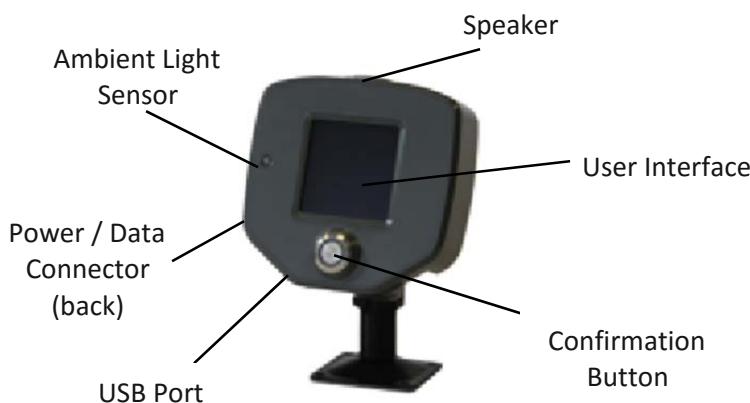
Train Hardware

The train hardware includes a Control Module, Cab Module, and Communication antenna. If the train travels in two directions, dual systems would need to be installed on both sides of the train and contain all hardware types.

The Communications Antenna is an external, weather-proof, directional, long-range antenna that facilitates the transfer of information between train and workers. It is mounted on the front roof of a train.

Cab Module

The train operator interfaces with the Cab Module. The Cab Module serves as an interface that alerts the operator to the presence of nearby workers. The module provides real-time information on worker id, distance, quantity, as well as whether the worker has confirmed the alarm. The Cab Module alarms audibly and visually with the illuminated button once alarming rules are met. The train operator can quiet the alarm by pressing the illuminated confirmation button. Dual cab modules may be configured if needed for multiple train operators.



If a worker is detected by the RWPS, the user interface within the cab displays a warning to the vehicle operator, indicating the quantity of workers detected, and the approximate distance to the nearest worker.

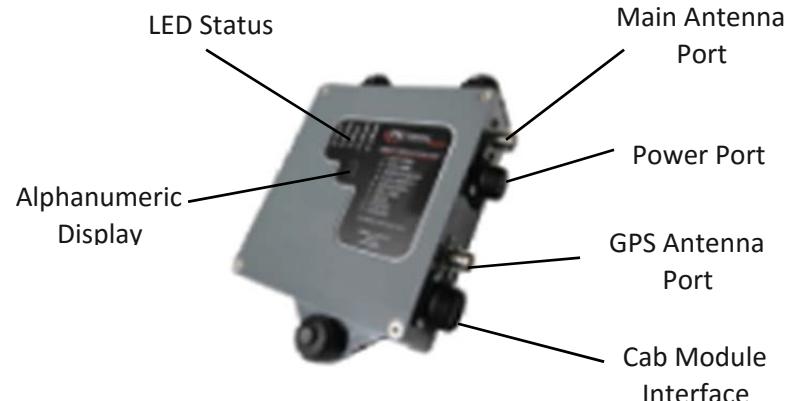
When customer-specified thresholds are met, the cab module will sound a tone, change the indicator light to blue, and display the status of each worker. A checkmark indicates that the worker has confirmed the alarm on their module.



Control Module

The Control Module serves as the data control and intelligence center of the train system. The Control Module can be installed anywhere inside the train / vehicle, preferably in a location which minimizes the coaxial cable distance to the antenna. The module includes all ports as well as diagnostics.

The Control Module connects directly to the train/vehicle's power and is powered whenever the train/vehicle is powered. The Cab Module is powered by the Control Module.



Docking Station

The Docking Station is used to charge the Personnel Modules as well as for log downloads and firmware uploads.



USING THE PERSONNEL MODULE

The Personnel Module is shipped in transport mode to ensure it remains powered off for safe transport.



For the initial power on of the Personnel Modules, the confirmation button needs to be held for 2 seconds, released for 2 seconds, held for 2 seconds, and released. Charge the module once activated.

For subsequent power ups, hold the button for 3 seconds and release. Once powered, a blinking green light indicates that the device is operating properly. The module is able to convey diagnostic status through the LED and speaker.

To turn off the personnel module, hold the confirmation button for 10 seconds until the LED turns magenta and then release.

LED / Speaker	Status
Blinking green (every second)	Operating properly
Multi-color fast blink	Initializing successfully
Blinking red/ Vibrating / Audible alarm	In alarm / vehicle detected
Blinking red (every second) / Silent	Unit in confirmed alarm state
Double red blink / chirp	Low battery
Fast red blink/ 3 chirps	Battery is critically low, unit is powering down

To use the Personnel Module, power it on and clip it to a vest or belt and begin work. When the shift is over, power down the module and place it on the charger.

CHARGING



To charge the battery, place the Personnel Module into the charger so that the clip is above the docking station USB port. The LED on the docking station will communicate the status of charging. Charging stops when complete.

The battery on the Personnel Module is designed to work for 48 hours on one charge under normal conditions.

Docking Station LED	Charging Status
Solid Red	Standby Mode
Blinking Red	Charging Error
Blinking Green	Device Charging
Solid Green	Charging complete

Metrom Rail recommends charging the Personnel Modules in the docking station when not in use.

For a fully depleted battery, charging will take a maximum of 7 hours. Use only the wall adapter provided with the docking station.

USING THE CAB MODULE

Once the equipment is successfully installed into the train, the system works with minimal human interaction. In the event that workers are present on the track, an alarm and information would be issued. To quiet the alarm, the operator would only need to hit the confirmation button on the Cab Module and follow FRA guidelines for a work zone.

In the case of an error, the Control Module contains LED and an alphanumeric character to quickly assess the situation to get it resolved. The device contains LED feedback for input power, system power, system status, as well as errors with the cab modules.

For additional information, the alphanumeric display contains an array of error codes. These should be communicated to Metrom Rail in the event that an issue occurs.

Code	Error
1	User Interface 1 Error
2	User Interface 2 Error
3	Accelerometer
4	Flash Memory
5	GPS Antenna
6	GPS COMM
7	Range
8	Speaker
9	Auxiliary

CONFIGURATION

The Docking Station and Cab Module contain USB ports for configuration, firmware updates, and logging downloads. Metrom Rail provides software that can run on a tablet or laptop and that interacts with the devices.

The devices can be configured to assign name, speed thresholds, distance thresholds, advanced alarm times as well as change volume/sound, brightness, and vibration frequency.

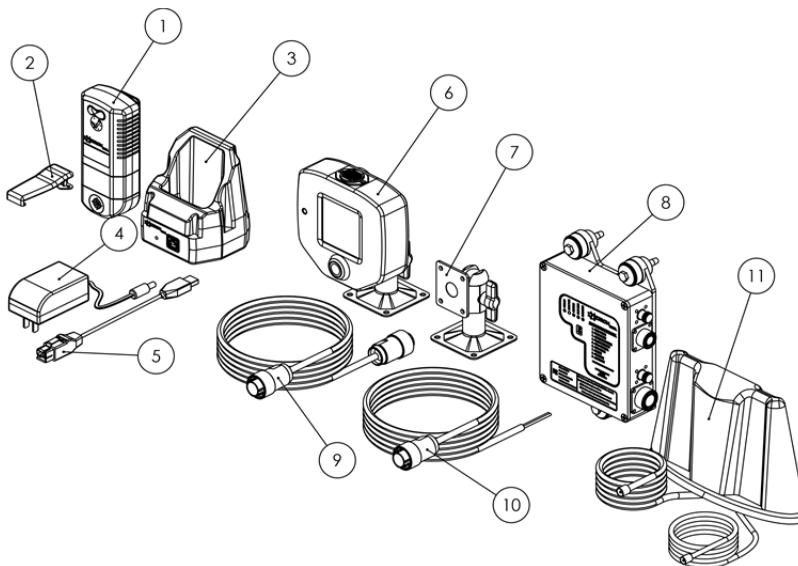
Refer to the Configuration Manual for a full tutorial of functionality.

LOGGING

All Roadway Worker Protection System modules deploy GPS-aided event recording when operating in the field. Event recording can provide insight into the location of work gangs and can be used as an auditing tool or as a means to re-create events retroactively. Logging may be enabled or disabled.

Refer to the Metrom Rail Configuration Manual for more information on logging.

REPLACEMENT PARTS LIST



Item	Part #	Description
1	100842ASM001	Personnel Module
2	100835CMP001	Belt Clip w/ Screws
3	100854ASM001	Docking Station
4	100883ELM001	12VDC Power Adapter
5	100884CBL001	Data Cable
6	100863ASM001	Cab Module
7	100205CMP001	Pedestal Mount w/ Screws
8	100872ASM001	Control Module
9	100912ASM001	Control Module to Cab Module Datalink Cable
10	100911ASM001	Control Module Power Cable
11	100920ASM001	Train Mounted Communication Antenna