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Version 1.1

MiX 2450-B Installation Guide

1 Introduction

The MiX 2450-B is a Consumer Vehicle tracking device featuring an LTE modem with 2G fallback. It contains a GNSS, accelerometer, a 434 MHz Short Range Device (MagiX), and a 1000mAh Li-Ion Polymer backup battery.

1.1 MiX 2450-B Features

1.1.1 General

Feature	Description
Trip Data Recording	The following data is recorded: date and time, distance travelled, journey duration, vehicle speed, journey departure and arrival time, driver name, driver ID and vehicle ID.
Driving Violations	The following standard violations are recorded: over speeding, harsh braking, harsh acceleration, harsh cornering moderate and severe impact detected.
GPS Data Recording	Essential information is recorded with every GNSS tracking point, e.g. vehicle and driver ID, date and time, latitude and longitude, altitude, heading, velocity, number of satellites, etc.
Active Tracking	Track your vehicle movements in real-time using automated vehicle location (AVL) updates from the vehicle replay routes taken on street level or satellite maps.
Active Events	Be notified via email and/or text/SMS message, when selected standard or user-defined events occur.

1.1.2 Hardware

Feature	Description
Supply	Automatic 12/24V operation Backup Battery 3.7 V; 1000 mAh Li-Ion Polymer Battery
Communication	LTE CAT1/2G Over-the-air firmware downloads
SIM Card	Nano SIM (4FF)
Short Range Device (MagiX)	Use in conjunction with a Two Button Remote for panic and roadside alerts
Serial Communication	TTL serial interface (115kbps) (not accessible from outside the enclosure)
LED	Modem status/power indication
Battery	10 h operation without primary supply
3-Axis Accelerometer	The 3-axis motion sensor capable of measuring accelerations with an output data rate of 1 Hz to 5 kHz. Dynamically selectable full-scale: ±2g/±4g/±8g/±16g
Location	GNSS with GPS, GLONASS, BDS, Galileo and QZSS Number of concurrent GNSS: 4 + QZSS
Events	Over-speeding Harsh Acceleration

	Harsh Braking Harsh Cornering Moderate/ Severe Impact Low Vehicle Battery Vehicle Battery Disconnect / Vehicle Battery Reconnect Ignition On / Ignition Off
GNSS Antenna	Internal
Enclosure IP rating	IP54

1.1.3 Environmental Requirements

The device is suitable for installations where:

- the temperature is between -20°C and +60°C
- the IP rating requirement is not more than IP54

1.1.4 Power Requirements

The MiX 2000 is designed for use in vehicles (12V to 24V). Special vehicles and working machines with a 24 to 110 volt DC battery system will require a voltage converter to facilitate the required 12V to 24V power supply input.

The power and ignition lines must be installed with the fuse (rated 3A) supplied inside the power harness plastic bag.

2 Read before Installation

2.1 Installer Requirements

- Installation should only be undertaken by a vehicle technician with comprehensive occupation specific knowledge. Installation by an unqualified technician may adversely affect the operating reliability of the vehicle and could endanger other road users.
- A basic knowledge of vehicle electrical and mechanical systems is required to successfully install the Fleet Manager system.
- The system should only be installed by a suitably qualified vehicle technician with a basic knowledge of the operation of computers.
- Installation technicians should attend a training course to acquire the skills needed for installation, configuration and operation of the Fleet Manager system.
- Installers should consult the vehicle manufacturer's documentation for the specific vehicle make and model prior to undertaking an installation.
- Installers should pay particular attention to the location of fuel systems, hydraulic systems, compressed air systems and other electrical and mechanical systems, which may have a bearing on the installation.
- Installers should pay attention to any changes to the vehicle's systems or settings, which should be noted prior to the installation.
- Installers should not smoke or make use of naked flames, which could cause a fire in or near the vehicle.

1.1.5 Tools

- Standard technical equipment and appropriate tools for use with vehicles are required to install the MiX 2000.
- Vehicle specific tools may be required for the removal of consoles and covers.

2.2 Secure the workplace

- Remove the ignition key from the vehicle's ignition lock.
- Ensure that the vehicle's engine cannot be unintentionally started during the installation.

- Short-circuiting the vehicle's electrical system may result in fire, explosion of the battery and/or damage to other electrical systems.
- Electrical shock from high voltage batteries must be avoided, as this may lead to death or injury.
- The negative terminal of the vehicle's battery should be disconnected before commencing installation. If the vehicle has additional batteries, it may be necessary to disconnect the negative terminals of these batteries too.

2.3 Precautions

1.1.6 ESD

Prior to touching the PCB, replacing the battery or retrieving a SIM that has fallen into the housing, always take ESD precautions:

- If the PCB must be handled, avoid direct contact with any of the components and handle it by only touching the edges of the PCB.

1.1.7 During Installation

Should it be necessary to remove seats, covers or other components, care should be taken to avoid accidental damage and/or disconnection of cables.

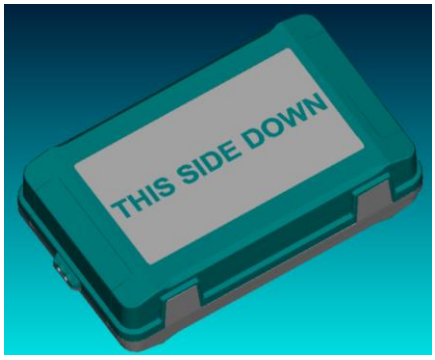
- All components should be checked for damage prior to being installed into the vehicle.
- For small installation openings, a drill should be used.
- For larger openings, a conical milling cutter, compass saw or file should be used.
- All rough edges should be trimmed.
- Careful attention must be paid to the manufacturers' safety regulations for all tools used.
- Oils and fuels must be collected in appropriate containers and disposed of in accordance with the law.

1.1.8 Positioning of product components

Installers should ensure that the components of the product do not influence or hamper the functioning of the vehicle's systems.

- Care should be taken to ensure that the product's components do not get damaged during installation.
- Ensure that sufficient space is available for all components of the product, prior to commencing the installation.
- Avoid installing in known high-temperature areas, such as parts of the engine bay or near major heat sources.
- Ensure that the unit and harness are secured to prevent the harness vibrating differently to the unit at the harness connectors.
- **Correct orientation** of the unit is important to ensure good GNSS reception if the internal GNSS antenna is being used. (See mounting picture below.)

  The bottom side that is marked "**THIS SIDE DOWN**" must face towards the ground. Thus, the Product Label Side must face towards the sky as the GNSS antenna is on that side.



- Additionally, it is advisable to install the unit in a location where the **GNSS view of the sky is relatively unobstructed by metal**. Most vehicle boots for example, may form a metal cage which prevents GNSS reception. Under the vehicle bonnet will also not give good performance.
- Please pay attention to the routing course of cables and wiring.
- Do not install the product in or near the location of mechanical or electrical airbags.
- Do not drill into supporting or stabilizing braces or beams.

1.1.9 Installation of wiring

Note the product's wire gauge cross-sectional area. If the wire gauge cross-section is reduced, current density increases which may cause the wiring to overheat.

- Cables should be routed in existing channels and should not be routed parallel to ignition cables or other cables subject to high current.
- Cables should be fixed with cable-ties or adhesive tape.
- Do not route cables over moving parts or too close to the high voltage areas (like the spark plugs).
- Do not fix cables on the steering column.
- Ensure that the cables are not exposed to pulling, pressure or shearing deformation.
- If the cables are routed through drilled holes, rubber grommets or similar protection should be used.
- Suitable cable-strippers should be used to strip insulating material from cables and cable-strippers should be adjusted to suit the wire gauge being stripped, to avoid damaging or separating the wire strands.
- Cables should only be connected using solder or suitable crimping lugs.
- A proper crimping tool should be used on all crimping lugs.
- Careful attention must be paid to the manufacturers' safety regulations for all tools used.
- Insulate all exposed wires to prevent short-circuits. Use good quality adhesive tape or heat shrink (provided).
- Connections to vehicle power supply and the ignition wire **must be installed with a fuse**. Fuses are supplied separately inside the main harness plastic bag.
- Be aware that short-circuiting may be caused by faulty connections and crushed or damaged cables.
- Short-circuiting the vehicle's electrical system may result in fire, explosion of the battery and/or damage to other electrical systems. To prevent this, all connections carrying current must be soldered and insulated correctly. Other connections such as the speed signal, RPM signal, brake light or clutch switch can be made with crimping lugs.
- Incorrect connections can lead to short circuits. Connections should only be made in accordance with the vehicle's wiring diagram.
- Current and voltage should be measured with a multi-meter or diode test lamp.
- The use of inadequate test equipment may result in damage to control devices or other electrical systems.
- Route the harness in such a way as to prevent water condensation that may form on the cable from running into the unit. This can be achieved by having the harness at a lower point just before it connects to the unit.

1.1.10 After Installation

- Check all relevant vehicle functions.
- Explain the functions of the MiX 2000 system to the user.
- The MiX 2000 contains an internal battery which should be inspected annually.

1.1.11 Take Note During Installation

- The product must be operated in accordance with operating instructions.
- Failure to use the product as directed might result in personal injury, material damage and/or damage to the environment.

3 Part Numbers

Part Number	Name	Picture
U0195MT	MiX 2450-B MiX 2000 **LTE CAT1/2G Consumer** Electronic Unit (contains fitted battery)	
A0136MT	Power Harness MP24 for MiX 2450-B	

4 Preparing the SIM card

Caution: Be careful to use only nano SIM (4FF) with the standard thickness. Cutting a micro SIM to a 4FF size may damage the SIM card holder.

Before inserting the SIM card determine if the SIM needs to be secured with a unique PIN.

If a PIN secured SIM is required:

- Ensure that the SIM is configured as "PIN required"
- Ensure that the PIN is set as either 0000 or 00000
- The MiX 2000 will change the PIN to a unique number that it calculates for the device
- The SIM is then locked to the device and will be PUK locked if inserted in another device

If an unsecured SIM is required:

- Ensure the SIM is configured as "PIN not required"
- The MiX 2000 will leave the SIM with this configuration
- This SIM can be moved to a different device without risk of it being PUK locked

5 Installation

5.1 Requirements

Please note the requirements specified in the "Safety" section of this document.

5.2 Summary of Installation Steps

Step	Action	Software Tools
1)	Install harness	
2)	Ensure the SIM is correctly prepared (refer to section on **Preparing the SIM card**)	None
3)	Insert the SIM card (refer to ESD precautions in section on **ESD**). Ensure the SIM is orientated correctly as per marking on the PCB.	None
4)	Connect power.	None
5)	Test Installation.	Verify that the unit reports to the Back End
6)	Test GSM observing the LED flashing sequence (see 5.6).	None

5.3 Overview

Installation of MiX 2000 should only be carried out by trained installers.

- On the MiX 2000, the unit maintains an on-board GNSS odometer. This starts at 0 km from the factory. An offset can be sent from the MiX Telematics Fleet Manager user interface to align the odometer value on the MiX 2000 unit with the vehicle odometer at install time. An updated value can be sent at any time to realign these two values.
- It is important to select the correct mounting location for the MiX 2000. Do not mount close to air ducts that can channel cold or hot air directly onto the unit.
- The Unit contains and internal GSM antenna and should be mounted more than 20cm away from the human body under normal operating conditions.

After installation, verify that no interference is caused to the vehicle's electrical system. Check dashboard warning lights and error messages. Should any error conditions exist, remove the installed unit and contact MiX Telematics for assistance.

5.4 Tools and Inspection

Supporting tools

Multi-meter

5.5 Wiring and Connections

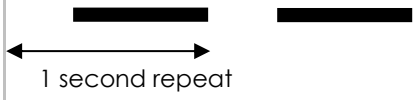
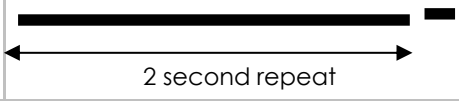
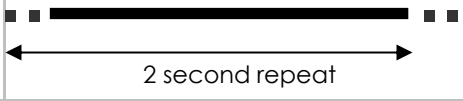
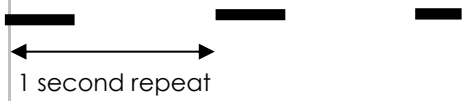
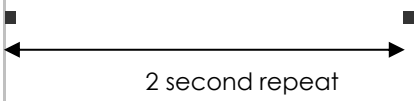
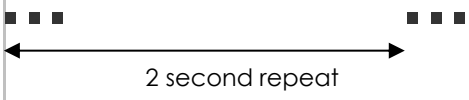
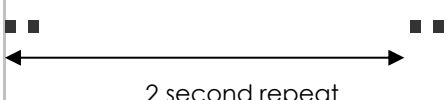
Please read the "Safety" section (2) of this document before installing the vehicle harness.

Confirm which of the harnesses will be used in the install as the wire colours will differ depending on the harness selected. All connector diagrams are shown from the back (wiring side) of the harness.

The pin lay-out and wire colours of the various harness options as well as detailed tables describing pin functions are shown below:

Pin	Action	Name	Function
1	Brown	GND	Ground
2	Red	BAT+	Vehicle battery +

5.6 LED Flash Codes

No communication settings received (LED mostly ON)			
Modem OFF			RED LED: OFF
Modem ON, searching for network*			RED LED: Mostly ON with some OFF time once every second
SMS only			RED LED: Almost completely ON with one short OFF blip once every two seconds
GPRS ready			RED LED: Almost completely ON with three short OFF blips once every two seconds
Modem Connected			RED LED: Almost completely ON with two short OFF blips once every two seconds
Communication settings received (LED mostly OFF)			
Modem OFF			RED LED: OFF
Modem ON, searching for network			RED LED: Mostly OFF with some ON time once every second
SMS only			RED LED: Almost completely OFF with one short ON blip once every two seconds
GPRS ready			RED LED: Almost completely OFF with three short ON blips once every two seconds
Modem Connected			RED LED: Almost completely OFF with two short ON blips once every two seconds

5.7 Positioning the Unit in the vehicle

Please read the "Safety" section (2) of this document, regarding the positioning of product components.

- The MiX 2000 must be installed inside the passenger compartment or the driver cabin, to protect it from possible damage by water, solvents, fuel or other environmental factors.
- The MiX 2000 should not be installed in or near the ventilation, heating system, or hot surfaces which may cause it to overheat or be damaged by condensed water vapour.
- The MiX 2000 should be installed in a position where it will not be subjected to pressure, impact or excessive vibration. Uneven surfaces, where the box can be deformed or damaged should be avoided.
- Select the installation position carefully before proceeding with the installation.
- Mark and drill the required holes.

Route cables from the unit to the appropriate senders within the vehicle. Additional information can be found in the "Harness Installation" section 5.5 of this document.

5.8 Signal Inputs

5.8.1 Serial Communication

The MiX 2450-B has a TTL serial interface (115kbps) that is only accessible from inside the enclosure. This interface is currently limited to allow serial port communication for debugging purposes.

5.9 Configuration of unit

The MiX 2000 is configured with default fleet settings during commissioning. Via the MiX Fleet Manager software interface it is possible to make over the air changes to the following settings:

- Odometer – Default 0km
- Over Speed Limit – Default 120 km/h/s
- Harsh braking limit – Default 15 km/h/s
- Harsh Acceleration Limit – Default 10 km/h/s
- External GNSS Antenna Connected – Default No (No external antenna option on the MiX 2450-B)
- Ignition Wired – Default No
- Driver ID Prompt Duration – Default 0 Sec

6 Troubleshooting

Supporting Documentation can be found on the https://knowledge.powerfleet.com/hc/en-us .

Symptom	Probable Cause	Action
Unit does not switch ON (LED does not flash)	No battery voltage applied to MiX 2000.	- Check the voltage supply to the MiX 2000 Ensure the connectors are properly fitted Check fuse if applicable.
GNSS does not get lock	Orientation of the unit is incorrect. Location of unit is limiting good GNSS reception (internal antenna)	Mount the unit with the top side (label) facing up. Install the unit in a location where the GNSS view of the sky is relatively unobstructed by metal or conductive parts.
GSM unable to register on network (see GSM LED flash codes in section 5.6)	No SIM card inserted or SIM inserted the wrong way round.	Ensure the SIM is orientated correctly as per marking on the PCB. Alternatively replace the SIM card.

7 Maintenance

Pay attention to the battery warning events on the Back End and replace the backup battery (or unit) if required.

8 Regulatory

ICASA