

MiX DriveMate

Installation Guide

1 Introduction

The DriveMate display has been designed to provide “real time” driver feedback by measuring four different vehicle parameters:

- Acceleration
- Braking
- Cornering
- Speed

These parameters are measured using the MiX FM3xxx or MiX4000 OBC, either via the on-board accelerometer or external CAN data. The OBC will be pre-configured to generate warning and error events for the 4 events above, depending on the type of vehicle it is fitted to, and the customer’s requirements. The DriveMate serial script will access all this information and then control the DriveMate display via simple messages exchanged over the serial interface.



(Actual Size)

GREEN indicates driving within the defined parameters. AMBER is a warning and indicates operation outside of the parameters allowing the driver to take corrective action (no event is recorded at that time). If the driver ignores this warning and further exceeds the parameter, the light progresses to RED and a buzzer will sound to notify the driver. This event is recorded as an infringement in MiX Fleet Manager and Reports for authorised persons to view.

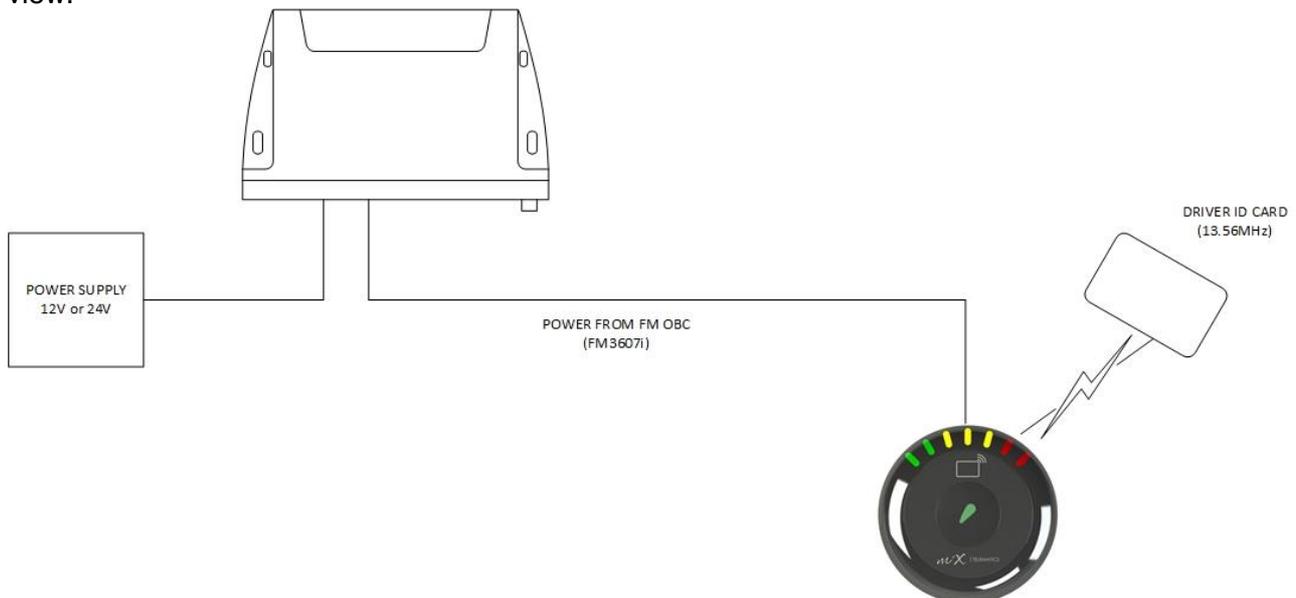


Figure 1 Concept Diagram

2 Installation Requirements

The system should only be installed by a suitably qualified vehicle technician with a basic knowledge of the operation of telematics equipment.

- 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 PBS 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.

3 Precautions

3.1 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.

3.2 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.

- The DriveMate unit is a visual aid for the driver and therefore should be placed in the driver's eye view.
- The DriveMate unit should not be placed on a metal surface as the card reader range will be reduced
- 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.
- 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.

3.3 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.
- 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 must be installed with a fuse.
- 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.

3.4 After Installation

- Verify that no interference is caused to the vehicle's electrical system or remote locking key.
- Check dashboard warning lights and error messages.
- Should any error conditions exist, remove the PBS and contact MiX Telematics for assistance.

3.5 Take Note During Operation

- 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.

4 Environmental Requirements

- The device can't be installed in places where it is exposed to water jets and temporary immersion into water.
- The device was designed to endure standard transport vibration and shock.
- The device can endure a limited number of accidental drops.
- The operating temperature for the MiX DriveMate Sense is between -20 and 60 °C.

5 OBC Configuration

DriveMate can be used on MiX OBC's with the relevant serial script. DriveMate will not work with FM Tracers.

The OBC needs to be setup with following:

- DriveMate serial script
- System events
- Custom events

5.1 Serial Script

There are 3 DriveMate scripts which can be selected based on the vehicle type that the OBC is fitted to. The script naming convention provides some clue as to the vehicle type and the required DriveMate serial script in the Peripheral Library should be made available:

DriveMate Heavy Vehicles V1.x.x.x

DriveMate Van/Cube V1.x.x.x

DriveMate Light Vehicles V1.x.x.x

Each of the scripts have different g-force values for cornering, braking and acceleration. This is due to the different dynamics of each vehicle type where for instance, the settings for a light vehicle were far too high for a bus or truck which needed values that are a lot lower.

Note: Please see section 0 for more detail on the above scripts.

5.1.1 Peripheral Device Configuration

Once the selected DriveMate script has been added to the serial port of the OBC, the device needs to be configured as shown below (script added to S1 on a MiX4000).

Asset: Steve Mix4000

	I1	<input type="checkbox"/>	I1 Voltage
	I2		Not connected
	I3/F1		Not connected
	I4/F2		Not connected
	O1		Not connected
	O2		Not connected
	S1		DriveMate Light Vehicles V1.1.0.7
	S2		Not connected
	K		Not connected

In the “Features & settings” section of the configuration the following can be applied:

Extended Driver ID properties:

Tick “Actively lookup Unknown Extended Driver ID to facilitate matching to known driver” if driver ID via the RFID card reader is required.

Edit peripheral device: S1 - (MIX4000 Fuel Code, J1939) Cancel Save

S1 - DriveMate Light Vehicles V1.1.0.7 (Scriptable Device)

Select peripheral device
DriveMate Light Vehicles V1.1.0.7 (Scriptable Device)

Parameter	Calibration						
DriveMate Acceleration	<table border="1"> <thead> <tr> <th>Value</th> <th>Input Reading</th> </tr> </thead> <tbody> <tr> <td>0 g</td> <td>0</td> </tr> <tr> <td>2.55 g</td> <td>255</td> </tr> </tbody> </table>	Value	Input Reading	0 g	0	2.55 g	255
Value	Input Reading						
0 g	0						
2.55 g	255						

Features and settings

- Extended Driver Id properties
 - Unknown Extended Driver IDs will disarm unit, and be matched to a known driver during the data download
 - Actively lookup Unknown Extended Driver ID to facilitate matching to a known driver
 - Duration until extended id is cleared: 0 : 0 : 10 (10 seconds)
- DriveMate
 - DriveMate mode: Business, Personal, Privacy, and Ala
 - Brightness level: 80%
 - Event beep length: 2000 millisecond
 - Event flash length: 2000 millisecond
 - Warning beep length: 400 millisecond
 - Warning flash length: 1000 millisecond
 - Card reader power:

Note: Do not edit the “DriveMate Acceleration” parameters as this has no effect on the way DriveMate displays accelerometer based events – these are fixed in the script.

DriveMate:

DriveMate mode: select the option required from the drop down list. **This MUST be set to one of the options – if not the configuration will not compile.**

Brightness level: leave at default

Event beep length: set to 1 if no beep is required – else leave at default (do not set to zero)

Event flash length: time the LED event will dwell – leave as default

Warning beep length: set to 1 if no beep is required – else leave at default (do not set to zero)

Card reader power: this must be ticked if the RFID card reader function is required

5.1.2 Available Parameters

The DriveMate script will automatically add the parameters below when loaded and these will be used within the script and for default and custom events.

Parameter	Units	Range	Info
DriveMate Acceleration	g	0 - 2.55	Maximum instantaneous value of Fwd/Rev/Cornering Acceleration (for diagnostic use)
DriveMate Button State	n/a	1-3	Current drive state – as generated by device. 1=Business, 2=Personal, 3 = Privacy
DriveMate Button Timer	s	0-127	Time in seconds since last button state change.
DriveMate LED State	n/a	0-255	Bit map for generated LED display (diagnostic)
DriveMate Alarm Button	n/a	0-1	Panic Alarm from device
DriveMate Key Press	n/a	0-1	Alarm State Key Press
DriveMate Read Buttons	n/a	1-3	Button Status

5.2 DriveMate System Events

DriveMate was designed to display the following fundamental driver monitoring events known as the ABC'S:

- Acceleration
- Braking
- Cornering
- Speeding

In order for these events to be displayed the corresponding events need to be included in the event template for the OBC, i.e. Harsh Braking Warning, Harsh Acceleration, Over Speeding etc.

Note: Cornering is displayed on DriverMate as progressively illuminated LED's depending on the measured G force. The value for each LED for each script is shown in section 0.

5.2.1 Over Revving

With the newer DriveMate scripts e.g. "DriveMate Light Vehicles V1.1.x.x", over revving events can also be displayed. If required then the relevant system events need to be included in the template i.e. Over Revving.

Warning: Too many events displayed on DriveMate may be confusing for the driver.

5.3 DriveMate Custom Events

Custom events can be added to increase the visual information provided to the user on the time line or for reporting.

From the parameters available it is suggested that the following additional events are included in the template.

5.3.1 DriveMate Business

Event type : Summarised

Parameter Returned: "DriveMate Read Buttons".

Trigger : parameter "In Trip(drive)" is True and parameter "DriveMate Read Buttons" =1

5.3.2 DriveMate Personal

Event type : Summarised

Parameter Returned: "DriveMate Read Buttons".

Trigger : parameter "In Trip(drive)" is True and parameter "DriveMate Read Buttons" =2

5.3.3 DriveMate Privacy

Event type : Notification

Parameter Returned: "DriveMate Read Buttons".

Trigger : parameter "In Trip(drive)" is True and parameter "DriveMate Read Buttons" =3

5.3.4 DriveMate Privacy Confirmation

Event type : Notification

Parameter Returned: "DriveMate Read Buttons".

Trigger : parameter "In Trip(drive)" is True and parameter "DriveMate Read Buttons" =4

5.3.5 Panic Button Pressed

Event type : Active Notification

Parameter Returned: DriveMate Alarm Button

Trigger : parameter "In Trip(drive)" is True and parameter "DriveMate Alarm Button" =1

5.3.6 Harsh Cornering

The Default event called "3-Axis – Harsh Cornering" but this event can't be set to trigger at a specific G force value. If this is required then the following custom event can be set up:

Event Name: 3-Axis Harsh Cornering - DriveMate

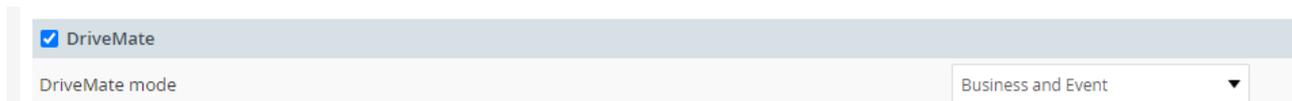
Event type : Notification

Parameter Returned: 3-Axis Cornering G-Force (High Sensitivity)

Trigger : parameter "In Trip(drive)" is True and parameter "3-Axis Cornering G-Force (High Sensitivity)" >2.5G (as an example)

5.3.7 Event Button

If the DriveMate mode in the script is configured to "Business and Event" as shown below the center button can now be used to trigger and event. This is because the button is not used to change driving reason modes (fixed to Business) or for the Alarm function.



When configured the center button can be used to trigger an event for example trigger a camera event if MiX Vision is also fitted.

Event type : Notification

Parameter Returned: DriveMate Event Mode

Trigger : parameter "DriveMate Event Mode" =1

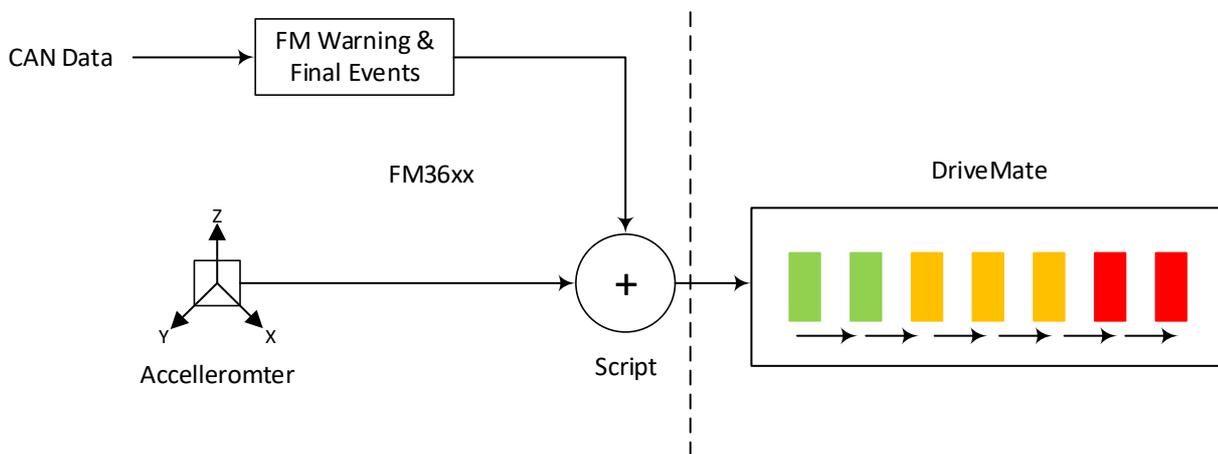
Record Actions: Start position and Record video

Actions: Sound buzzer for 1 second

6 DriveMate Functional Description

The DriveMate serial script has been developed to access the event and accelerometer data from the OBC, make the relevant calculations and then control the DriveMate settings and display via commands transmitted over the serial interface. The DriveMate display is therefore a device which is simply told how to set up, what to display & sound and feedback when a button has been pressed.

Events are calculated by the OBC and are read by the script when the event conditions are met. As shown in the diagram above, the 4 system events or warning events will make the script set the DriveMate display LED's and sounder as shown in the LED sequences in section 7 below. In short the system warning events drive the green and amber LED's all on and sound a warning beep. The main events will drive all green, amber and red LED's and sound a longer warning beep.



Color	LED	Heavy Vehicles			Truck/Cube VAN			Light Vehicles		
		Cornering Gforce	Braking Gforce	Acceleration Gforce	Cornering Gforce	Braking Gforce	Acceleration Gforce	Cornering Gforce	Braking Gforce	Acceleration Gforce
Green	1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Green	2	0.13	0.19	0.12	0.16	0.22	0.14	0.19	0.25	0.18
Amber	3	0.16	0.24	0.15	0.20	0.28	0.17	0.24	0.31	0.22
Amber	4	0.20	0.30	0.19	0.26	0.35	0.22	0.30	0.39	0.28
Amber	5	0.26	0.38	0.23	0.32	0.43	0.27	0.38	0.49	0.34
Red	6	0.32	0.47	0.29	0.40	0.54	0.34	0.47	0.61	0.43
Red	7	0.38	0.56	0.35	0.48	0.65	0.41	0.56	0.73	0.52

Cornering, braking and acceleration forces are shown by progressively illuminating the LED's as per the table below. There are 3 different scripts available depending on the vehicle size, Light Vehicles, Truck/Van or Heavy Vehicles each with slightly different scaling factors.

6.1 DriveMate Modes

MiX DriveMate has up to three modes (as defined by device configuration within MiX FM) which can be selected by the driver as defined in section 3.0.

Business Mode: All Telematics functions and data available – Trip Driving Reason allocated to Business

Personal Mode: All Telematics functions and data available – Trip Driving Reason allocated to Personal

Privacy Mode: Telematics positioning not reported but mileage reported at end of each trip. Over Speeding events will be triggered and reported (no position)

Trip Driving Reason allocated to Privacy

Note: Over Speeding events can be modified not to trigger when in Privacy mode

6.2 Card Reader

DriveMate has an integrated Mifare type card reader which reads the unique ID,UID (serial number) from the presented card. All Mifare cards are pre-programmed with a UID at manufacture

The card reader operates on a frequency of 13.56MHz which is an internationally recognized frequency for proximity/passive card readers. The card needs to be presented to the DriveMate plastic housing to 1cm, or less, from the top surface for the card to be in range for reading. The antenna of the reader is around the outer edge of the internal pcb, so if the card is presented off-set from the centre of the DriveMate housing, it will not be read.



Note: DriveMate is NOT compatible with low frequency proximity card systems using 125kHz such as HID, PAC etc.

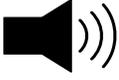
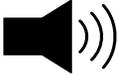
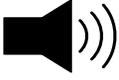
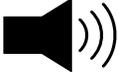
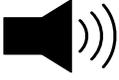
If the card is read for the first time, a 1 second beep sounded. If the card is re-presented a short beep will be sounded to acknowledge the card.

The long serial number of the presented card will be sent to the Script from DriveMate which will then be sent to the FM OBC and an Extended FM Driver ID.

The Script can also provide the FM ID from a driver list look up to DriveMate where an immobiliser function is required.

7 DriveMate LED Sequence

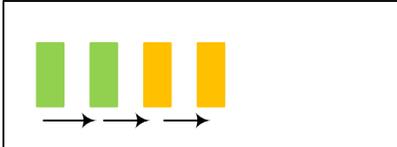
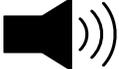
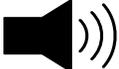
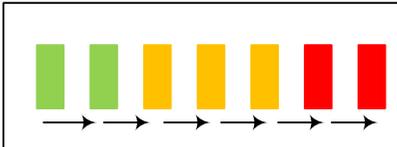
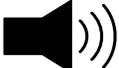
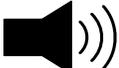
7.1 Driving Mode Selection & Logon

LED Status	Sounder	State	Description
	0.5s x 10 	No Driver ID Business Mode	When the vehicle ignition is first switched on, the MiX DriveMate display will flash the first green LED. The first green LED is indicating Business mode. A flashing LED is indicating that a Driver Card should be presented. ¹ 10 short beeps will be sounded to remind the driver to present a valid card
	1s 	Driver Logged on Business Mode	Once a valid Driver Card has been read and accepted the first green LED will change from flashing to permanently on. The sounder will beep for 1s to indicate that a valid Driver Card has been accepted.
	0.5s 	No Driver ID Personal Mode	On ignition on, MiX DriveMate will default to Business mode as above i.e. single first green LED flashing. To select Personal mode, the centre button needs to be pressed until a short beep is heard - the middle Amber LED will start to flash.
	1s 	Driver Logged on Personal Mode	Once Personal mode has been selected, a valid Driver Card can be presented - the middle amber LED will change to permanently on - the sounder will beep for 1s to indicate that a valid Driver Card has been accepted.
		Privacy Mode	Privacy mode is selected by pressing the button until the last red LED is illuminated. The sounder will beep each time the button is pressed. In this mode no driver feedback will be displayed and the card reader will not function.
	0.5s x 2 	Privacy Mode Persist	MiX DriveMate provides a reminder when the vehicle ignition is switched on, if the previous trip was set to Privacy mode. The last red LED will illuminate and a double beep every 2s will sound – this state will last for 20s during which the driver must press the center button to retain Privacy mode. If the button is not pressed, MiX DriveMate will revert back to Business mode

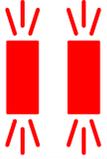
Note: Once a driver has logged on, the driving mode can still be changed.

¹ The flashing LED only indicates that a driver card needs to be presented. The card reader function can be switched off through Config within MiX FM

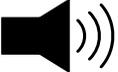
7.2 Driver Feedback

LED Status	Sounder	State	Description
		Driver Logged on Personal Mode	In personal mode the middle amber LED will be on to indicate personal mode. Once the vehicle is moving at a speed of >10kmph the amber LED will go off and the first green LED will go on to start indicating driver behaviour. When the vehicle slows down to <10kmph the middle amber LED will go on.
		Driver Logged on Business Mode	In business mode the first green LED will be illuminate at all times until feedback parameters are met and additional LED's are illuminated
	0.25s 	Driver Logged on Business/Personal Mode Other Warning Events	As the vehicle is being driven DriveMate will indicate the driving style by illuminating LED's from green to amber to red. For acceleration, braking and cornering warning events the LED's are incremental When the middle amber LED is reached a warning event is generated and the sounder beeps.
	0.25s 	Driver Logged on Business/Personal Mode Speed Warning Event	As the vehicle is being driven DriveMate will indicate the driving style by illuminating LED's from green to amber to red. When the middle amber LED is reached a warning event is generated and the sounder beeps. For speed warning events the first 5 LED's will illuminate when the event is reached
	1s 	Driver Logged on Business/Personal Mode Final Event	From the above, if the driving style continues past the warning event then the LED's will continue to illuminate until the first red LED is illuminated and the sounder beeps for 1 second. For acceleration, braking and cornering final events the LED's are incremental For speed final events the all LED's will illuminate when the event is reached
	1s 	Driver Logged on Business/Personal Mode Speed Final Event	Following from the above, if the driving style continues past the warning event then the red LED's will illuminate and the sounder beeps for 1 second. For speed final events the all LED's will illuminate when the event is reached

7.3 Panic Button

LED Status	Sounder	State	Description
		Panic Mode	<p>To enter the Alarm mode, the centre button needs to be pressed and held for 10 seconds. A short beep will sound when the button is first pressed. When the Alarm mode is activated the last 2 red LED's will flash alternately.</p> <p>MiX DriveMate will remain in the Alarm state until ignition off.</p> <p>The button is active all the time there is power to the FM OBC so can be activated at any time.</p>

7.4 Event Button

LED Status	Sounder	State	Description
	<p>0.5s</p> 	Event Button	<p>When DriveMate is configured for Business mode only the centre button can be configured as an Event button. When the button is pressed for more than 0.5s the sounder will beep and a 10s second event will be generated.</p>

8 Hardware Installation

8.1 Part numbers

Part Number	Name	Description	Picture
B7560/0	DriveMate Unit	In-Cab visual device providing Driver ID and driver behavior feedback	
B7564/2	DriveMate FM Interface Cable	Interface cable for DriveMate to FM36xx OBC	

8.2 Ignition Input

Part Number	Name	Description	Picture
B7380	FM Serial Harness – RIBAS & DTCO	Level shifter cable to allow DriveMate to be used on S1 and DTCO on S3	
B7374	FM Serial Harness – RIBAS & MiX Vision	Level shifter cable to allow DriveMate to be used on S1 and MiX Vision on S3	
S-CARDBUREAU K0413(1)	Mifare (1K) Card	Mifare Fudan (1K) card with MiX printed logo	

8.3 Wiring Instructions

Fit the cable B7564/2 to the FM3xxx and DriveMate units as described in the steps below.

Step	Part Number	Picture	Description
1	B7564/2		<p>Connect the 10-way connector from the DriveMate device to the S3 RS 232 port of the FM3xxx. S3 is on the left side (viewed from front) of the FM3xxx.</p> <p>Ensure that the connector clip catches and lock securely.</p>
2	B7560/0		<p>Remove the cable plate from the rear of the DriveMate housing to expose the connector</p>
3	B7564/2		<p>Ensure that the mating cable connector is orientated as shown with the "clean" side up</p>
4	B7564/2		<p>Push home mating connector to DriveMate pcb.</p> <p>Note: the mating connector is keyed so it will only insert into the mating connector in the correct orientation</p>
5	B7560/0		<p>Re-assemble cable plate to rear of DriveMate housing</p>

8.4 Applications Requiring S1

The FM3xxx OBC provides 2 serial ports, S1 and S3. Some installations will require both serial ports i.e. MiX Vision and DriveMate. These types of installations will require a level shifter type harness to convert S1 from TTL output to RS232 levels.

There are several possible solutions depending on the devices using S1 and S2. The cable harnesses described in section 8.3 are compatible with the DriveMate cable B7564.

9 Verifying the DriveMate Install

When the vehicle ignition is first switched on, the DriveMate display will flash the first green LED and after a short delay, the sounder will beep 10 times.

A flashing green LED is indicating that a Driver Card should be presented.

10 Limitations

The DriveMate product has the following limitations,

- Only Mifare type RFID cards operating at 13.56MHz will work with DriveMate.
- DriveMate does not support low frequency RFID cards using the 125kHz band i.e. HID, PAC etc.
- DriveMate must be powered by the FM OBC only – do not connect DriveMate directly to the vehicle battery.

11 Certification

This device complies with EU Radio Equipment Directive (RED) 2014/53/EU. It also complies with the applicable requirements of Type Examination Certification under Schedule 3, Module B, of the Radio Equipment Regulations (RER) 2017.

Operation is subject to the following condition: The device always operates in conjunction with the FM Fleet range (e.g. MiX 4000). The device relies on the ISO 7637-2 protection of this Fleet Management Products.

No changes / modifications shall be made to the equipment without the manufacturer's permission as this may void the user's authority to operate the equipment.