TELEMATICS
MOBILE INFORMATION EXCHANGE

MiX 6000
Installation Guide

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1 Introduction

The MiX 6000 is a high-end fleet management on-board computer that incorporates the latest market trends. MiX 6000 is built on the same MESA architecture as the MiX 2000 and MiX 4000. MiX 6000 uses an automotive grade Linux operating system (OS) and an ARM9 processor

1.1 MiX 6000 Hardware Features

Digital/Analog Inputs	Up to 8 different digital or, alternatively, analogue inputs can be configured to monitor any device that generates a change in voltage, e.g. seat belts, headlights, refrigeration units, temperature sensors, emergency lights, doors, PTO, UDS, trailer coupling etc. Disconnection of these inputs can be detected using open-wire detect.
Frequency Inputs	Up to 4 x frequency/pulse inputs for integration with legacy sensors exist
Tacho Inputs	It is possible to configure any of the 12 existing inputs listed above (Digital/Analogue and Frequency) as tacho inputs
Ignition input	Used to monitor the ignition switch status. Maximum 36V input, impedance > 100kOhm. The unit is able to detect when the Ignition gets connected or disconnected. Disconnection of this input can be detected with open-wire detect
CAN	The system has 2 x CAN inputs that support J1939 and OBDII. Configuration of the termination resistor and the transmit disable can be done either with jumpers (for safety critical installs) or via software settings.
GNSS	GPS and Glonass available.
GSM	3G UMTS/HSDPA/HSUPA & 2G GSM/GPRS/EDGE Characteristics
Serial Ports	4x RS232 serial ports (3 with flow control) 2x USB ports
Ethernet	10/100 Mbps Ethernet Mac Controller (GMAC) with IEEE1588 support
K-line and D8	K-line interface for Digital Tachograph (DTCO D8 input)
Bluetooth	Support Bluetooth V4 and CSA2.
WiFi	WiFi Module Support IEEE Std 802.11b/g/n
Accelerometer	3-axis ±2g /±4g / ±8 g / ±16 g dynamically selectable full-scale and is capable of measuring acceleration with output data rates from 1 Hz to 5.3 kHz
Gyro	Unit contains a built-in Gyro
Positive drive	8 x Positive drive with open-load detect and current sense diagnostics, 1x with 1.5A current limit and 7x with 250mA current limit
Tamper detection	Tamper switches on the front and back panel of the housing will detect when the covers are removed. Shorting, cutting, or unplugging any of the external antennas will also be detected.

Code Plug	Standard code plug circuit (Optional: 5V aux output)
Internal backup battery	An internal battery provides power for between 4 and 8 hours if the supply from the vehicle's battery is removed.
Buzzer and LED	A Buzzer is available to warn the driver and to provide feedback of the vehicle's status. 3 x LEDs provide feedback on the status of the unit.
RF Transceiver	433 or 915 MHz RF transceiver
Optional SD-card	An SD card may be fitted for extra storage capacity
RTC	Real time clock with coin-cell battery.
SIM	Dual Nano
Antennae	Provision for external GSM, GNSS and WiFi/BT antennae (default: internal antennae)

2 Product Variants and Part Numbers

The following product variants are available:

Part Number	Picture	Product Name	Description
440FT0742		MiX 614A-3G-B	MiX 6000 (Model 614A-3G) electronic unit with battery fitted. It also has Magix 434 MHz support.
440FT0880		MiX 619A-3G-B	MiX 6000 (Model 619A-3G) electronic unit with battery fitted. It also has Magix 915 MHz support.
440FT0926		MiX 614A-3G	MiX 6000 (Model 614A-3G) electronic unit with no battery fitted. It also has Magix 434 MHz support.
440FT0927		MiX 619A-3G	MiX 6000 (Model 619A-3G) electronic unit with no battery fitted. It also has Magix 915 MHz support.

Part Number	Picture	Product Name	Description
440FT0921		Main Harness MP2	Mandatory/Required for all installations. Provides power, ground and ignition and as well as some essential inputs (CAN, Frequency, Analogue) and outputs (Relay and Positive Drive)
440FT0928		Auxiliary Harness AX1	Optional Provides access to the second CAN port, all the analogue/digital inputs, the K-Line, Motor Running Detect and Positive Drives #1 and #2
440FT0929		Auxiliary Harness AX2	Optional Provides access to all the other Relay Drives and Frequency Inputs.
440FT0930		Code Plug Harness CP2	Optional - Code Plug Extension Harness (1m)
440FT0931		Serial Harness SR1	Optional (Up to 4) Serial Harness (RX, TX, CTS, RTS, GND, DSR-DTR looped, RS232 with DB9 Male Connector)
440FT0932		External GSM Antenna PA1	External GSM Antenna with Fakra Connector; Compatible with MiX 6000 Series and MiX Talk.
440FT0933		External GNSS Antenna PA2	External GNSS Antenna with Fakra Connector; Compatible with MiX 4000 and MiX 6000 Series.
440FT0934		MiX 6000 External WiFi Antenna	Optional

Part Number	Picture	Product Name	Description
440FT0244		MiX 6000 Mounting Bracket	An alternative mounting bracket with clips that can be fitted with screws. Note that these brackets are supplied as consumables in bulk bags of 50 items per bag and it is not part of any kit.

2.1 MiX 6000 Power Requirements

The MiX 6000 is designed for use in 12V or 24V vehicles. Special vehicles and working machines with voltages above 32V will require a voltage converter to facilitate the required power supply input.

3 Safety - read before installation

3.1 Installer Requirements

- Installation should only be undertaken by a vehicle technician with comprehensive occupation specific 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.

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.

3.2 Tools

- Standard technical equipment and appropriate tools for use with vehicles are required to install the MiX 6000.
- Vehicle specific tools may be required for the removal of consoles and covers.
- Supporting tools:
    - Multi-meter

3.3 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.

3.4 ESD - Installation Handling Precautions

Prior to touching the PCB, inserting a new SIM or replacing the battery, always take ESD precautions:

- Either use an earthed wrist strap or touch a known earth point (or negative potential in the vehicle) prior to handling the unit
- 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

4 Sim Card

4.1 Preparing the SIM card

The two SIM card slots are at the back of the unit. One must first remove the battery compartment as described in the steps below.

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 6000 will change the PIN to a unique number that it calculates for the device.
- The SIM is then locked to the device and the PUK will be locked if inserted into another device.

If an unsecured SIM is required:

- Ensure that the SIM is configured as "PIN not required".
- The MiX 6000 will leave the SIM with this configuration.
- This SIM can be moved to a different device without risk of the PUK begin locked.

4.2 Inserting the SIM card

In order to insert the SIM card, the following steps must be followed:

- The SIM card is accessible from the back panel. Insert the SIM card as indicated below.

Figure 1: Opening of side clips

Figure 2: Unhook the cover

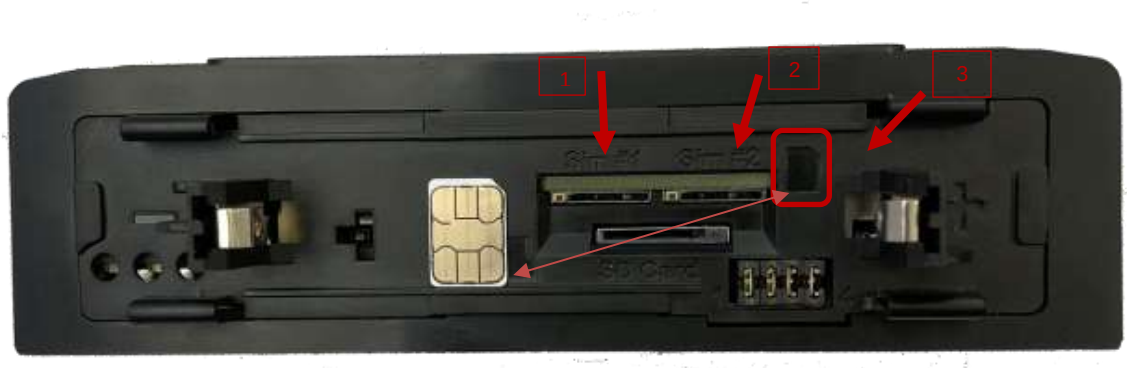


Figure 3: Position the SIM as shown on the unit

Note the orientation must be as shown above on Figure 3:

- Arrow “1” shows the position of SIM card #1
- Arrow “2” shows the position of SIM Card #2
- Arrow “3” shows the orientation of SIM Cards (both the same and contacts facing the PCB)

Figure 4: Insert the SIM card into the correct SIM card slot; ensure it is fully seated (clicks into place).

Figure 5: Clip the cover back on, make sure it clicks into place.

4.3 Configuration of unit

The MiX 6000 is configured with default fleet settings during commissioning. It is possible to make over the air (OTA) changes to some settings via the MiX Fleet Manager software interface.

5 Installation

5.1 Installation Steps

Step	Action	Software Tools
1)	Ensure the SIM is correctly prepared (refer to section 4.1)	None
2)	Insert the SIM card (refer to ESD precautions in section 3.4). The SIM card orientation is illustrated in section 4.2	None
3)	Configure the unit as described in section 4.3	DynaMiX
4)	Configure Bluetooth if applicable (section 13)	Bluetooth Installation Tool
5)	Configure WiFi if applicable (section 14)	WiFi Installation Tool
6)	Install harness	None
7)	Install code plug socket	None
8)	Install GSM external antenna (optional for special cases)	None
9)	Install GPS external antenna (optional for special cases)	None
10)	Connect power and signal inputs	None
11)	Test Installation	Verify that the unit reports to the Back End
12)	Test GSM observing the LED flashing sequence (see section 0)	None
13)	Test GPS observing the LED flashing sequence (see section 0)	None
14)	Install	

The MiX 6000 unit maintains an on-board GPS 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 of the MiX 6000 unit with the vehicle odometer at install time. An updated value can be sent at any time to realign these two values.

5.2 Installation Precautions

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.
- A drill should be used for small installation openings.
- 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.

5.3 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 are not damaged during installation.

- Ensure that sufficient space is available for all components of the product, prior to commencing the installation.
- Should the bracket be used to fix the unit to the vehicle, make sure that the unit and bracket are securely clipped together. Add a cable-tie around the complete housing and bracket assembly for a more secure mounting if required.
- Avoid installing in known high-temperature areas, such as parts of the engine bay or near major heat sources.
    - Operating range (with backup battery): -20°C to +60°
    - Operating range (without backup battery): -20°C to +80°
    - Battery will only charge in the range 0°C to +45°C
- 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 (it is not a problem if the external antenna is used). In this case where the internal antenna is used, the unit should be mounted with the top side (with MiX Telematics engraved) facing up, and the label side down. 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.

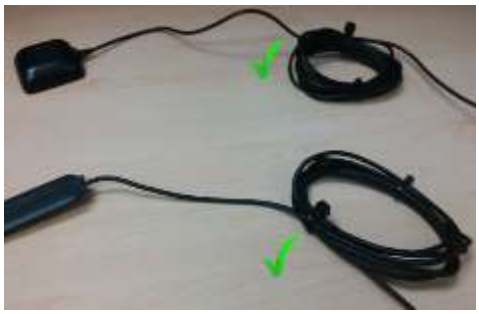
Figure 6: this side facing up

- Please note that the voltage of the external relay is rated to the vehicle voltage specification. Do not run a 12V relay at 24V. The Relay Specifications are:
    - Coil current rating: < 250 mA
    - Coil Voltage Rating: Must match the vehicle battery supply
- 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.

5.4 General Wiring Requirements

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.

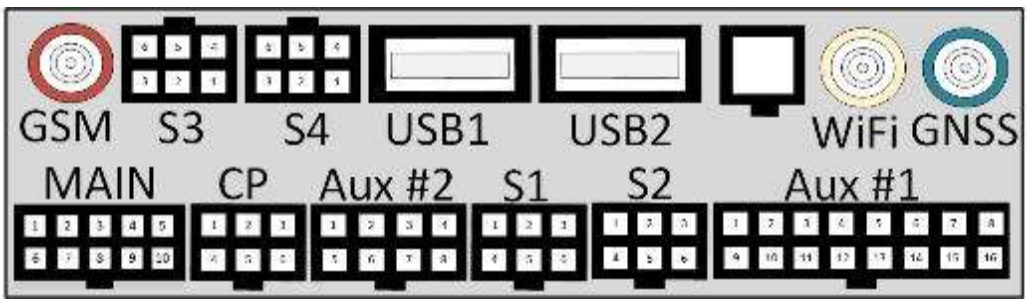
- Cables should be routed in existing channels and should not be routed parallel to ignition cables or other cables subject to high current.
- Cables should be fixed with cable-ties or adhesive tape.
- Do not route cables over moving parts or too close to the high voltage areas (like the spark plugs).
- 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 must be installed with a fuse (check if the main harness is fitted 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. If the back plate is lower than the rest of the unit, water can accumulate inside the unit with no way to escape and invalidates the IP54 rating. The unit should also never be exposed to direct water spray and jets.
- Shortening of antenna wires:
    - It would be better to circle/coil excess wires. Avoid sharp bends (zigzags). Take care not to tie coax wires too tight. The coax should not be squeezed or pinched. Use the broadest possible cable tie.
    - The best place to circle/coil the wires is about 300 mm in line from the antenna.
    - If the GSM and GNSS antennas are both coiled, they should be spaced apart.
        - Refer to section 5.5.11 for more detailed GNSS wiring instructions
        - Refer to section 5.5.12 for more detailed GSM wiring instructions

✗ Avoid	✓ Recommended
Avoid sharp corners and bends:	Use rounded bends:
	
Avoid coupling between 2 different pieces of wire:	Separate coiled wires where possible:
	

5.5 Harnesses and connectors

Please read the Safety section (Section 2) of this document before installing the vehicle harness.
Confirm which of the harnesses will be used in the installation, as the colour of the wires will differ depending on the harness selected. All connector diagrams are shown from the back (wiring side) of the harness.

See the diagram below for a numbered depiction.



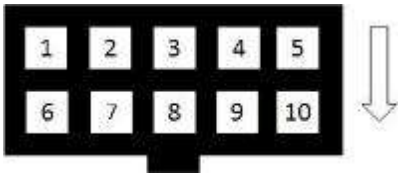
The pin layout and wire colours of the various harness options as well as detailed tables describing pin functions are shown below.

5.5.1 Harness Part Numbers

440FT0921	Main Harness MP2
440FT0928	Auxiliary Harness AX1
440FT0929	Auxiliary Harness AX2
440FT0930	Code Plug Harness CP2
440FT0931	Serial Harness SR1
440FT0932	External GSM Antenna PA1
440FT0933	External GNSS Antenna PA2GNSS
440FT0934	MiX 6000 External WiFi Antenna

(See Section 2 for more details.)

5.5.2 Main Harness

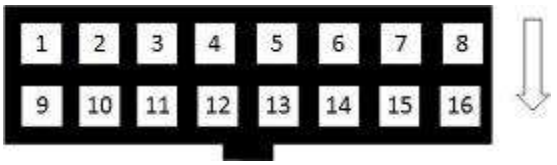


Connector viewed from the back (wiring side) of harness (440FT0921) (connector mounted upside down)

Pin	Colour (Prim/Sec)	Name	Function	Application Information
1	Brown	GND	Ground	Connect directly to vehicle ground. Do not tap into an existing ground wire carrying high current.
2	Red/White	CP-5V-Out	5V Output	Can deliver nominal 100 mA
3	Blue/White	Speed	Speed (Frequency)	Engine speed signal (RPM) connected here Maximum signal voltage level = 38V
4	Yellow/Green	Buzzer	Buzzer	
5	Red/Blue	Relay	Driver Relay for Immobilizer	Load current must not exceed 250 mA Output controlled by MiX 6000 and selected in Vehicle Properties of front end user software
6	Red	BAT+	Positive Supply	Connect to vehicle battery +12V to +24V. Must be protected with the provided 7.5 amp slow blow fuse, or a similar one already present in the vehicles wiring.
7	Black	IGN	Ignition	Connect to vehicle ignition switch. Must be protected with a 1 amp fuse
8	Green (dark)	RPM	RPM (Frequency)	RPM frequency Input Maximum signal voltage level = 38V
9	Green	CAN-L	CAN Low	1st CAN Bus: Used to monitor supported CAN bus
10	Yellow	CAN-H	CAN High	1st CAN Bus: Used to monitor supported CAN bus

Pin	Colour (Prim/Sec)	Name	Function	Application Information
	Red	Buzzer +	Buzzer Power Spliced to pin 4	Spliced to Yellow/Green Buzzer
	Black	Buzzer -	Buzzer Ground Spliced to pin 1	Spliced to Brown wire

5.5.3 Auxiliary Harness AX1

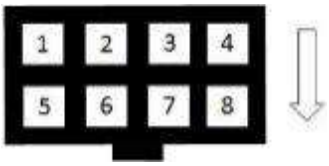


Connector viewed from the back (wiring side) of harness (440FT0928) (connector mounted upside down)

Pin	Colour (Prim/Sec)	Signal Name	Function	Application Information
1	Red/Grey	Positive Drive #2	Power to external devices	Load current must not exceed 250 mA Output controlled by MiX 6000 and selected in Vehicle Properties of front end user software.
2	Brown/Black	GND Sense	Ground sense line	This is an analog signal and is connected to the furthest ground point. It allows the system to pick up ground level shifts
3	White/Violet	Analog #1	Digital/Analog Input 1	Maximum signal voltage = 38V. Do not connect signals from unsuppressed inductive sources such as relay coils (where severe voltage spikes can be generated)
4	White/Red	Analog #2	Digital/Analog Input 2	Maximum signal voltage = 38V. Do not connect signals from unsuppressed inductive sources such as relay coils (where severe voltage spikes can be generated)
5	White/Green	Analog #3	Digital/Analog Input 3	Maximum signal voltage = 38V. Do not connect signals from unsuppressed inductive sources such as relay coils (where severe voltage spikes can be generated)
6	White/ Yellow	Analog #4	Digital/Analog Input 4	Maximum signal voltage = 38V. Do not connect signals from unsuppressed inductive sources such as relay coils (where severe voltage spikes can be generated)
7	White/Grey	Analog #8	Digital/Analog Input 8	Maximum signal voltage = 38V. Do not connect signals from unsuppressed inductive sources such as relay coils (where severe voltage spikes can be generated)
8	White/Black	Analog #5	Digital/Analog Input 5	Maximum signal voltage = 38V. Do not connect signals from unsuppressed inductive sources such as relay coils (where severe voltage spikes can be generated)
9	Red/Black	Positive Drive #1	Power to external devices	Load current must not exceed 1500 mA Output controlled by MiX 6000 and selected in Vehicle Properties of front end user software.

Pin	Colour (Prim/Sec)	Signal Name	Function	Application Information
10	Orange	MRD-in	Motor Running Detect	Normally connected to the vehicle power rail, or depending on application. This is an AC-coupled analog signal
11	White/Blue	Analog #6	Digital/Analog Input 6	Maximum signal voltage = 38V. Do not connect signals from unsuppressed inductive sources such as relay coils (where severe voltage spikes can be generated)
12	White/Brown	Analog #7	Digital/Analog Input 7	Maximum signal voltage = 38V. Do not connect signals from unsuppressed inductive sources such as relay coils (where severe voltage spikes can be generated)
13	Grey	K-line	K-line	Serial communication to DTCO
14	Brown	GND	Ground	System ground
15	Yellow/Black	CAN-H	CAN High	2nd CAN Bus: Used to monitor supported CAN bus
16	Green/Black	CAN-L	CAN Low	2nd CAN Bus: Used to monitor supported CAN bus

5.5.4 Auxiliary Harness AX2

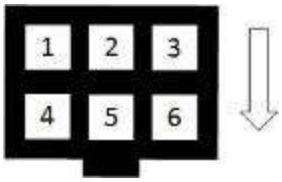


Connector viewed from the ~~back~~ (wiring side) of harness (440FT0929) (connector mounted upside down)

Pin	Colour (Prim/Sec)	Signal Name	Function	Application Information
1	White/Orange	Analog #9	Digital/Analog Input 9	Maximum signal voltage = 38V. Do not connect signals from unsuppressed inductive sources such as relay coils (where severe voltage spikes can be generated)
2	White	Analog #10	Digital/Analog Input 10	Maximum signal voltage = 38V. Do not connect signals from unsuppressed inductive sources such as relay coils (where severe voltage spikes can be generated)
3	Brown	GND	Ground	System Ground
4	Red/Violet	ExtDrv#1	External Drive 1	Load current must not exceed 250 mA Output controlled by MiX 6000 and selected in Vehicle Properties of front end user software
5	Red/Orange	ExtDrv#2	External Drive 2	Load current must not exceed 250 mA Output controlled by MiX 6000 and selected in Vehicle Properties of front end user software.
6	Red/Brown	ExtDrv#3	External Drive 3	Load current must not exceed 250 mA Output controlled by MiX 6000 and selected in Vehicle Properties of front end user software.
7	Red/Yellow	Positive Drive #7	Positive Drive 7	Load current must not exceed 250 mA Output controlled by MiX 6000 and selected in Vehicle Properties of front end user software.

Pin	Colour (Prim/Sec)	Signal Name	Function	Application Information
8	Red/Green	Positive Drive #8	Positive Drive 8	Load current must not exceed 250 mA Output controlled by MiX 6000 and selected in Vehicle Properties of front end user software.

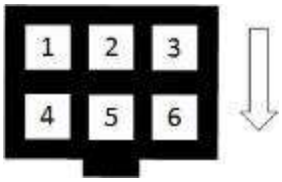
5.5.5 Code Plug Harness CP2



Connector viewed from the back (wiring side) of harness (440FT0930) (connector mounted upside down)

Pin	Colour (Prim/Sec)	Name	Function	Application Information
1	White	CP Clock	Code Plug Clock	
2	Red/White	CP 5V	Code Plug 5V	
3	Green	CP Data	Code Plug Data	
4	Red (Twisted with white)	LED	Code Plug LED	
5	NC			Not connected
6	Black/White	GND	Ground	

5.5.6 Serial Harness SR1

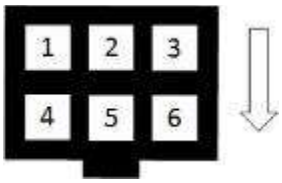


Connector viewed from the back (wiring side) of harness (440FT0931) (connector mounted upside down)

Pin	Colour (Prim/Sec)	Name	Function	Application Information
1	Yellow	TXD	RS-232 Transmit	
2	White	RXD	RS-232 Receive	
3	Blue	RTS	Ready to send	
4	Green	CTS	Clear to send	
5	Red	POSD1	Positive Drive 1	Load current must not exceed 1.5 A. Suitable for driving capacitive loads such as Rovi terminals.

Pin	Colour (Prim/Sec)	Name	Function	Application Information
				Output controlled by MiX 6000 and selected in Vehicle Properties of front end user software
6	Brown	GND	Ground	

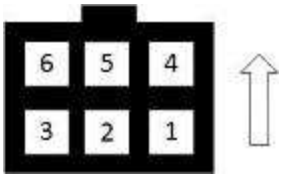
5.5.7 Mix 6000 Serial Harness 2 (use Serial Harness SR1)



Connector viewed from the back (wiring side) of harness (440FT0931) (connector mounted upside down)

Pin	Colour (Prim/Sec)	Name	Function	Application Information
1	Yellow	TXD	RS-232 Transmit	
2	White	RXD	RS-232 Receive	Also used for communication to DTCO D8 line
3	Blue	RTS	Ready to send	RTS looped to CTS inside the unit on the PCB
4	Green	CTS	Clear to send	RTS looped to CTS inside the unit on the PCB
5	Red	POSD2	Positive Drive 2	Load current must not exceed 0.25 A Output controlled by MiX 6000 and selected in Vehicle Properties of front end user software
6	Brown	GND	Ground	

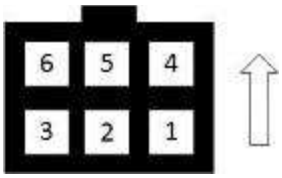
5.5.8 Mix 6000 Serial Harness 3 (use Serial Harness SR1)



Connector viewed from the back (wiring side) of harness (440FT0931)

Pin	Colour (Prim/Sec)	Name	Function	Application Information
1	Yellow	TXD	RS-232 Transmit	
2	White	RXD	RS-232 Receive	
3	Blue	RTS	Ready to send	RTS looped to CTS inside the unit on the PCB
4	Green	CTS	Clear to send	RTS looped to CTS inside the unit on the PCB
5	Red	POSD7	Positive Drive 7	Supplies power to a speed sensor Load current must not exceed 0.25 A Output controlled by MiX 6000 and selected in Vehicle Properties of front end user software
6	Brown	GND	Ground	

5.5.9 Mix 6000 Serial Harness 4 (use Serial Harness SR1)



Connector viewed from the back (wiring side) of harness (440FT0931)

Pin	Colour (Prim/Sec)	Name	Function	Application Information
1	Yellow	TXD	RS-232 Transmit	
2	White	RXD	RS-232 Receive	
3	Blue	RTS	Ready to send	RTS looped to CTS inside the unit on the PCB
4	Green	CTS	Clear to send	RTS looped to CTS inside the unit on the PCB
5	Red	POSD8	Positive Drive 8	Supplies power to a speed sensor Load current must not exceed 0.25 A Output controlled by MiX 6000 and selected in Vehicle Properties of front end user software
6	Brown	GND	Ground	

5.5.10 GSM, GNSS and WiFi-BT Antennas

The WiFi and Bluetooth transceivers share the same antenna. The GSM, GNSS and WiFi-BT all have internal antennas with an external antenna option as well, to allow for cases where better reception is required. Thus, fitting the external antenna is optional. The system detects automatically whether an external antenna is fitted or not. It can also detect tampering, like an external antenna disconnect or a short. In the case where there is no external antenna or in the case of tampering, the system will automatically switch to the internal antenna.

For deep installs with a lot of metal obstruction, it is recommended to use the external antenna.
Refer to the picture in section 5.5 showing the positions of the connectors for the external antennas.

The Unit contains an internal GSM antenna and must be mounted more than 20cm away from the human body under normal operating conditions.

5.5.11 GNSS antenna connection

For best results when the unit cannot be mounted with a good view of the sky, the external GNSS antenna should be used. Mount the GNSS antenna horizontally where the least metal (or any conductive) obstruction between the antenna and the satellites will occur. The top side of the antenna is the rounded side**. For best results place the antenna on a metal surface facing towards the sky** (see picture below). Mount as far away from any radio signal or wire bundles as possible.

a) Avoid pinching the coaxial cable or bending it sharply (zigzags).

b) It would be better to circle/coil excess wires. Take care not to tie coax wires too tight. Using the broadest possible cable tie (refer to section 5.4).

c) The best place to circle/coil the wires is about 300 mm in line from the antenna.

d) If the GSM and GNSS antennas are both coiled, they should be spaced apart.

5.5.12 GSM antenna connection

For deep installs with a lot of metal obstruction it is recommended to use a MiX approved external GSM antenna. Please confirm whether this requirement is applicable before installing the external GSM antenna as the internal GSM may be adequate for the installation.

It is recommended to adhere to following important principles:

a) **Do not mount the GSM blade antenna on metal**, as this effects GSM communication. For best results, mount on glass or other non-conducting surfaces.

b) Do not mount a GSM antenna directly on another GSM antenna or any other antennae.

c) Do not mount the GSM antenna directly on the OBC.

d) Do not pinch the coaxial cable.

e) Avoid pinching the coaxial cable or bending it sharply (zigzags).

f) It would be better to circle/coil excess wires. Take care not to tie coax wires too tight. Using the broadest possible cable tie (refer to section 5.4).

g) The best place to circle/coil the wires is about 300 mm in line from the antenna.

h) If the GSM and GNSS antennas are both coiled, they should be spaced apart.

6 Positioning the MiX 6000 Unit in the vehicle

Note: Please follow the instructions, regarding the positioning of product components, as contained in the "Safety" section, of this document, 3Safety - read before installation.

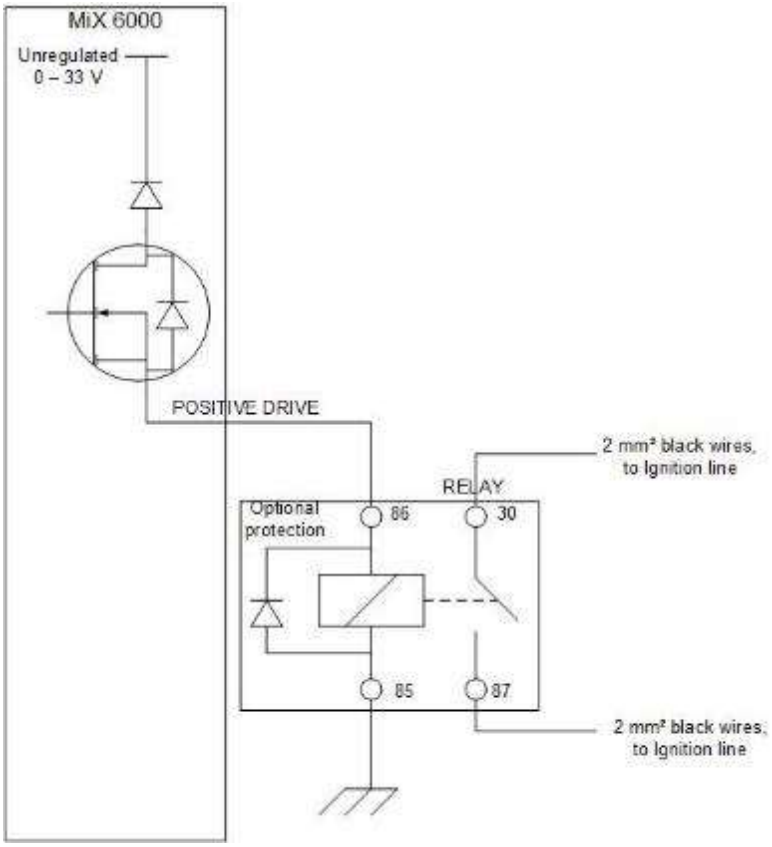
- The MiX 6000 must be installed inside the passenger compartment or the driver cabin, to protect it from possible damage by water, solvents, fuel or other environmental factors.
- The MiX 6000 should not be installed in or near the ventilation, heating system, or hot surfaces, which may cause it to overheat or be damaged by condensed water vapour.
- The MiX 6000 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.

7 Starter Interrupt

The MiX 6000 requires an external relay for the interruption of the vehicle's starter circuit. The relay required should be adequately rated for the purpose intended. Please note that a 30A or 40A (contact rating) relay should be selected. A standard 5 PIN automotive relay manufactured by a reputable supplier (e.g. Bosch) would be adequate. The correct relay operating voltage is required; failure to do so may damage the relay. 24V relays will not function correctly in 12V applications and 12V relays will be damaged when used at 24V.

To connect the relay, it only needs to be plugged into the relay socket on the Main Harness. The two 2mm² black wires represent the two sides of the relay contacts that are controlled via the driver ID Plug. Cut the wires as short as possible, where higher current will be interrupted via the relay.
Also use a cable-tie to secure the relay through the mounting ear (5mm hole) to the main harness, or where possible an M5 lock-nut and bolt is to be used to secure the relay to the vehicle. Ensure that the relay wires have enough play on them not to strain the relay terminal crimps connecting the relay to the wires.

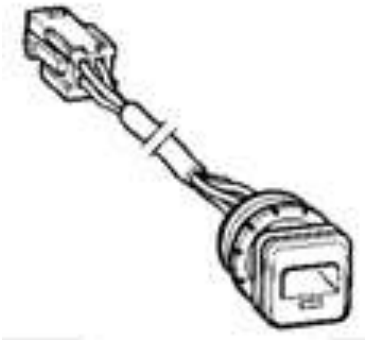
It is not necessary to use a relay with a build in protective diode, because the MiX 6000 has built in protection already. Positive drive/relay outputs are protected against shorts to ground and battery positive and the system can detect these faults. See simplified connection diagram below:



8 Code Plug Socket Installation

Note: Please follow the instructions, regarding the positioning of product components, as contained in the "Safety" section 3 of this document.

- The Code Plug Socket must be installed inside the passenger compartment or the driver cabin, to protect it from possible damage by water or other environmental factors.
- The Code Plug Socket should not be installed in or near the ventilation or heating systems, which may cause damage to it due to overheating.
- The Code Plug Socket should be installed in a position where it will not be subjected to pressure, impact or excessive vibration.
- Select the installation position carefully before proceeding with the installation.
- Mark and drill or cut the required hole. Hole size = 13/16" or 20 mm
- Remove the mounting clip from the socket.
- Remove the protection film from the adhesive surface of the foam ring and press it firmly against the back of the interface.
- Insert the socket into the mounting hole and slide the mounting clip into position.

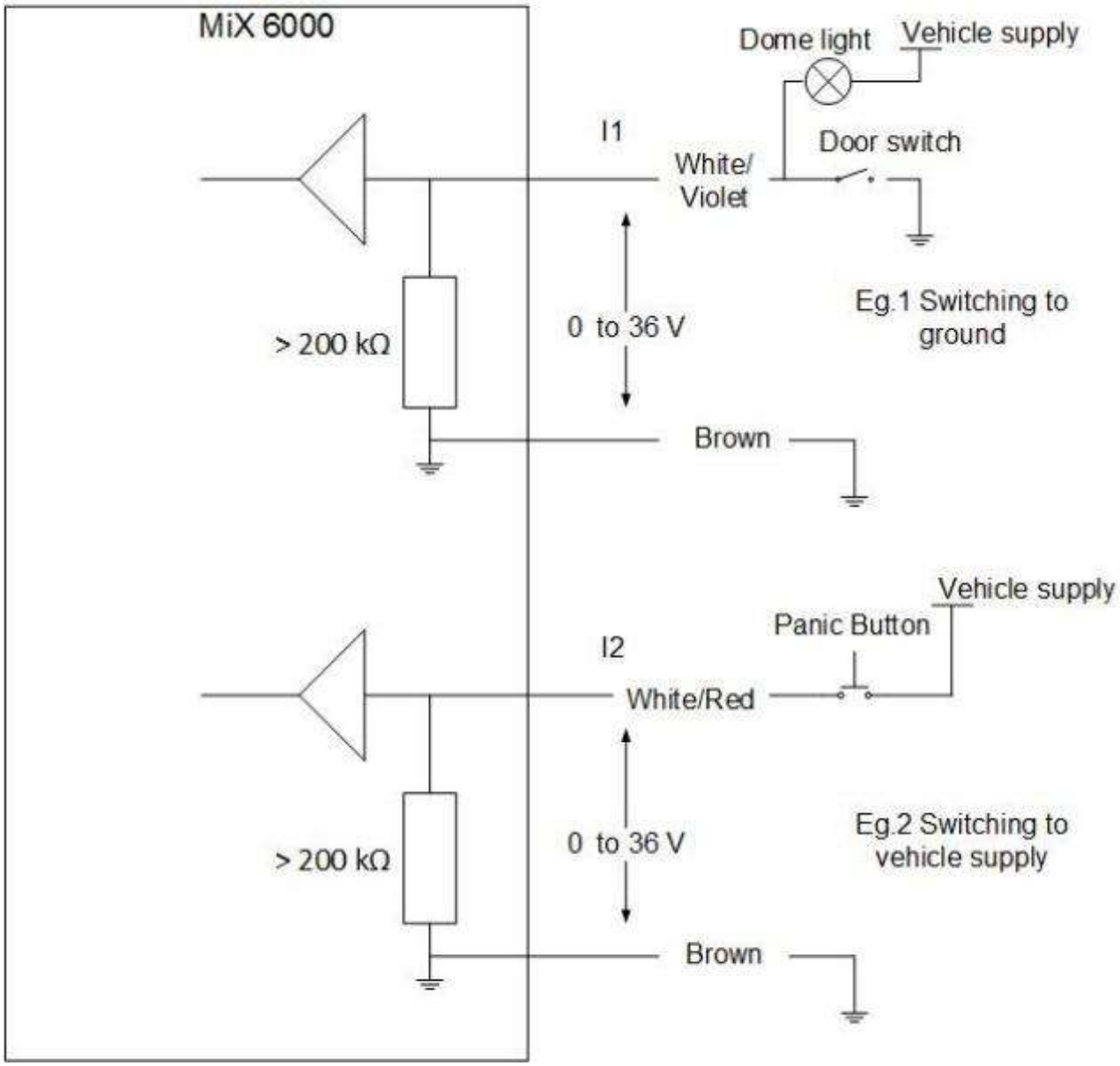


9 Signal Inputs

9.1 Digital Inputs

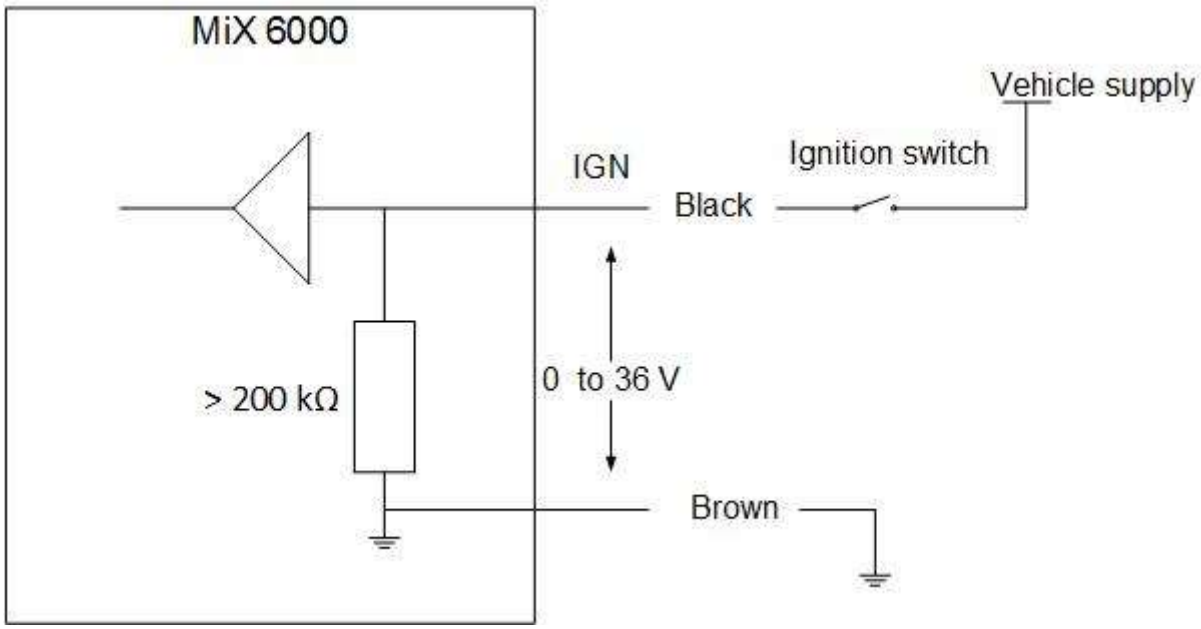
The MiX 6000 is equipped with eight digital/analog inputs (I1-I8), which can be used to monitor digital signals. When the voltage threshold is crossed, an event is triggered. The voltage threshold and the hysteresis are set in software. Please refer to the "Specifications" (21.2) and "Harness Installation" (5.5) sections, of this document, for more details. The external inputs and ignition line are protected from typical vehicle transients and can be directly connected to most vehicle inputs between 0 and 36 V. The input impedance is >200 kΩ. Typical connections are shown below:

Note: There is no internal pull-up resistor in the MiX 6000 so observe the correct wiring configurations shown below for switching to ground or switching to vehicle supply.



9.2 Ignition Input

The MiX 6000 includes a dedicated ignition input that must be wired if the starter interrupt immobilizer functionality is required. The input should be connected to the ignition signal on the vehicle. The MiX 6000 will automatically compensate for a 12 or 24V vehicle supply and no configuration is required. For a typical connection, see below:



Note: If a minimal install is being performed and the vehicle's ignition wire is not available the MiX 6000 can use its internal accelerometer, GNSS, Gyro and measurements of the vehicle's power supply to determine trip start and stop conditions. If this configuration is required, it is important to configure the unit correctly see 4.3. For improved trip start/end plotting accuracy on the MiX Telematics Fleet Manager user interface, it is recommended that the wired ignition configuration be used.

10 Power Outputs

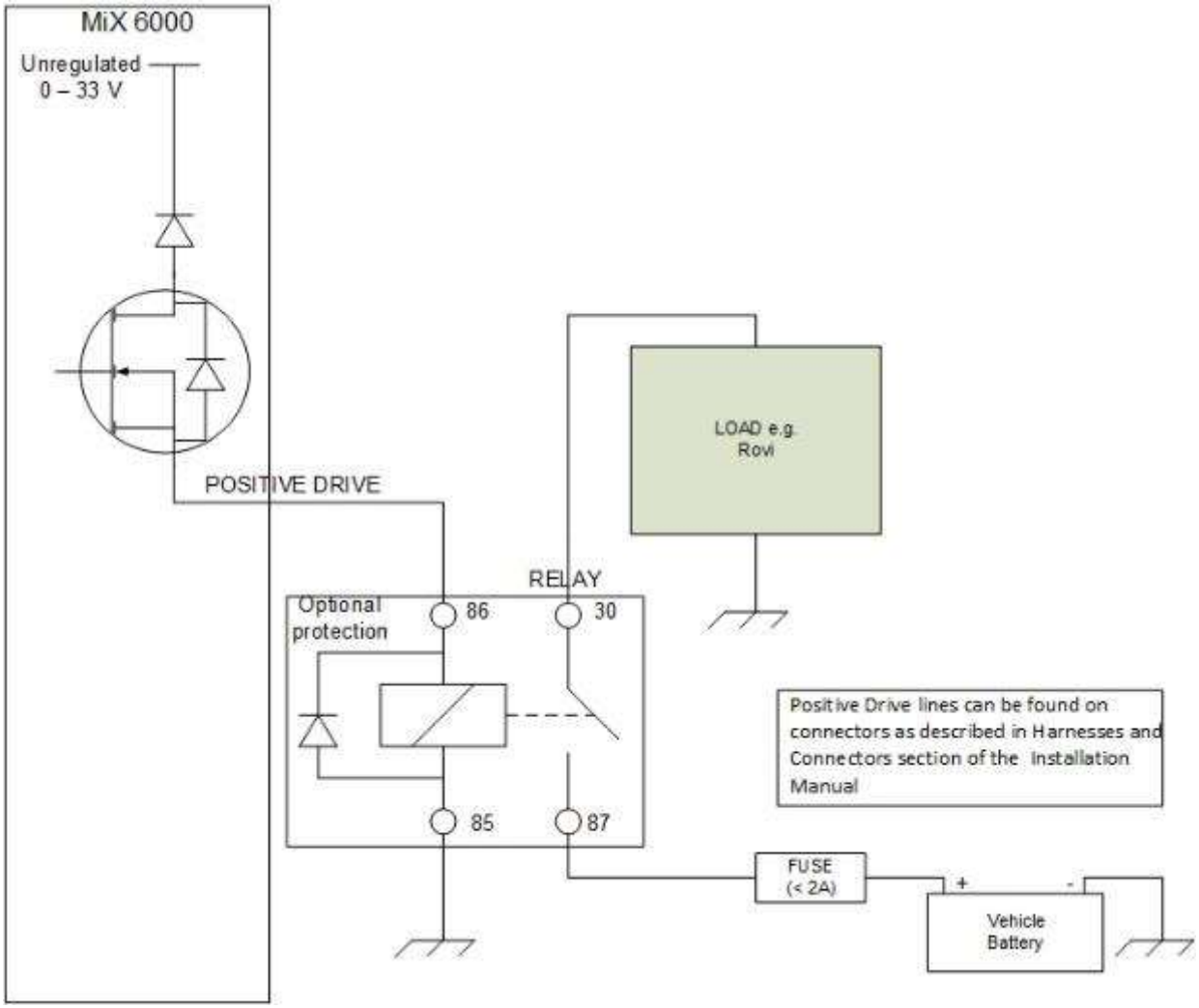
10.1 Positive Drive

The Positive Drive output supplies power to MiX 6000 accessories. There are eight Positive Drives in total.

- This output is controlled by the MiX 6000 and is configured in the Vehicle Properties of the Fleet Manager Application software.
- Access to these outputs is described in section 5.5.
- Do NOT connect an external voltage to the positive drive line.

Positive drive 1 can drive at least 1.5A and is suitable for powering up capacitive loads such as a MiX Rovi terminal, while the remaining drives can manage 250 mA each. These circuits are protected against over current and voltage. Should "Positive Drive 1" be occupied already and it is necessary to drive more peripheral devices (e.g. MiX Rovi, Mix Display, etc.) that draw more than 250 mA at any stage, it is advisable to make use of an alternative relay to ensure reliable functionality.

Below is a functional block diagram that describes how to wire such a device.



Please refer to the Starter Interrupt section 7 of this document, for more details.

11 Serial Communication

The MiX 6000 is equipped with four RS232 external serial ports. Refer to 5.5 for details of the wiring. The serial ports can be used to connect to external peripherals.
Serial 1 does RTS/CTS flow control, and is paired with POSD1, so it is suitable for connection to MiX Rovi terminals and other devices that use more power. It is normally enabled, even when the vehicle is out of trip

Serial 2 has no flow control and is paired with POSD2. It is intended for general purpose use or as a D8 input for DTCO use. It is normally enabled, even when the vehicle is out of trip

Serials 3 and 4 do RTS/CTS flow control, and is paired with POSD7 and POSD8. They are suitable for general-purpose use, however, sometime after the vehicle is out of trip these ports may be disabled to reduce power consumption.

All serial ports are capable of up to 115200 baud operation.

12 CAN

12.1 Overview

Installation of MiX 6000 CAN-bus should only be carried out by trained installers:

- Improper connection of the MiX 6000 to the vehicle's CAN-bus may cause interference with the vehicle's normal operation.
- The MiX 6000 is already loaded with compatible device drivers.
- The unit still needs to be configured for the vehicle in which it will be installed, and the vehicle ID and odometer still need to be configured. Specifically, the MiX 6000 may not record any CAN data until it is configured.

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 MiX 6000 installation and contact MiX Telematics for assistance.

- Colour coding of the wires are shown in sections 5.5.2 and 5.5.3:
    - CAN1 Interface wires are designated by a green and a yellow wire, connected to pins 9 and 10 on the Main Harness.
    - CAN2 Interface wires are designated by a green and a yellow wire, connected to pins 16 and 15 on the AUX1 Harness.
    - The convention is that the wire with the colour closer to white in the spectrum (lighter colour) is CAN-H and the wire with the colour closer to black in the colour spectrum (darker colour) is CAN-L.
    - This means that the Green wire is CAN-L and the Yellow wire is CAN-H. The two wires should always be twisted together and if they are not already twisted, they should be twisted together.
- The MiX 6000 has a total of four Jumpers on the main PCB (SW3) to set the Read/Write or "Listen Only" mode and the Terminating Resistor (120 Ohm) of each CAN interface (see Figure 7 on the next page.)

12.1.1 Tools and Inspection needed for CAN Installation:

Supporting tools

- Multi-meter
- Oscilloscope
- Laptop with CAN to USB interface (for example Vector CANcaseXL, IXXAT)

- Identify possible CAN busses by looking for twisted pair wires in the vehicle.
- With the vehicle's ignition turned on, measure the voltages relative to ground on each of the wires using a multi-meter.
  - For CAN, the voltage readings of the two wires should be very similar (usually 2.5V), with CAN-H likely to read only slightly higher than CAN-L.
- The actual data can be probed using an oscilloscope.
- With a properly configured 3rd party CAN tool, like the Vector CANcaseXL, the actual data can be recorded.
- CAN Baud rates of 250kb/s (SAE J1939) and 500kb/s are the most common.

12.1.2 Wire lengths

The CAN wires between the MiX 6000 and the vehicle's bus should not be longer than 300mm. Excessive wire length may cause interference with the vehicle's normal operation.

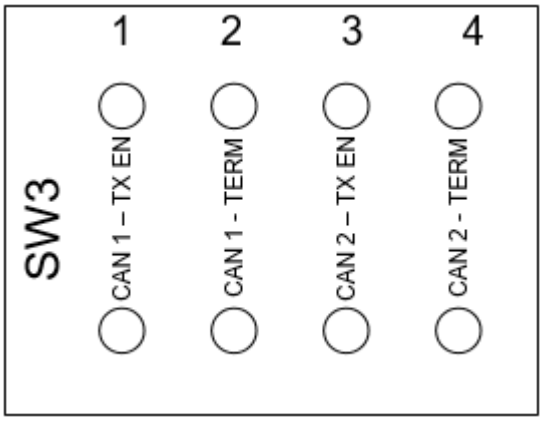
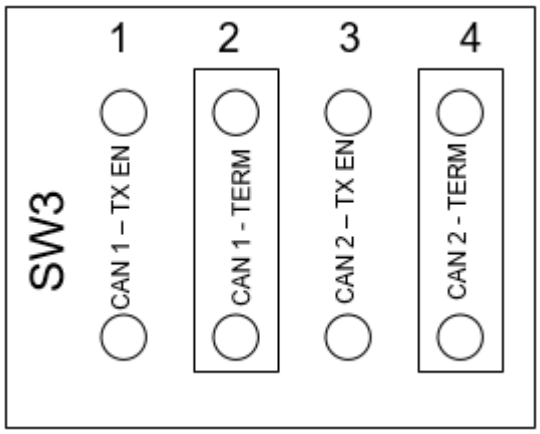
12.1.3 CAN jumper settings

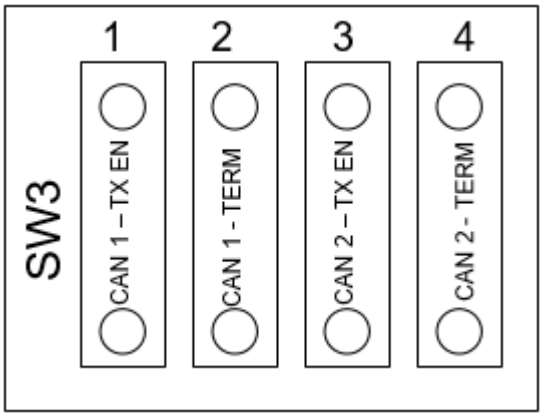
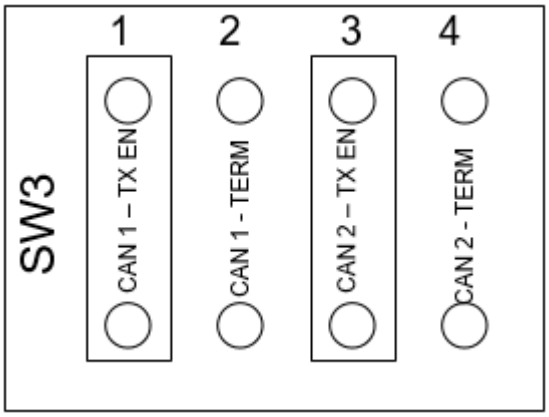
Warning: It is very important to ensure that these jumper settings are correct at installation time. If these jumpers are set incorrectly it is possible that when a new configuration or script is downloaded to the MiX 6000, it could bring down the CAN bus of the vehicle and interfere with the operation of the vehicle.
Conduct ESD precautions as described in section 3.4.

In order to access the jumper settings, remove the battery compartment at the back of the unit.

Refer to Figure 7 and the table on the next page and the markings engraved on the back of the unit: Jumper 1 of SW3 corresponds to "1" (left side) and jumper 4 with "4" (right side):

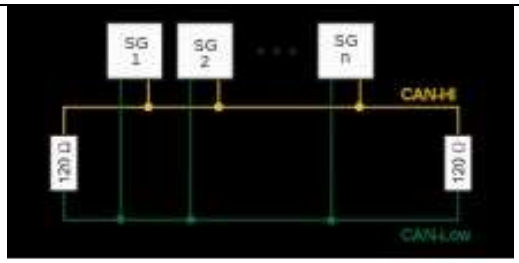
Figure 7: Position of jumpers on the PCB (viewed from the back)

Setting 1 **All jumpers removed** • NOT Terminated (120 Ω) • "Listen Only" mode	When all SW3 jumpers are removed, both CAN1 and CAN2 interfaces are set for: - 120 Ω termination is disabled (i.e the 120 Ω termination resistor is removed from the circuit and cannot be switched in by software) - "Listen Only" mode (i.e. the software cannot transmit any messages) 
Setting 2 **Jumpers 2 and 4 inserted** • 120 Ω Termination is under software control • "Listen Only" mode	When SW3 jumpers 2 and 4 are inserted, both CAN1 and CAN2 interfaces are set for: - 120 Ω termination is under software control (i.e. the software can switch the 120 Ω resistor in or out of the circuit) - "Listen Only" mode (i.e. the software cannot transmit any messages) 
Setting 3 (FACTORY DEFAULT) **All Jumpers inserted** • 120 Ω Termination under software control	When all SW3 jumpers are inserted, both CAN1 and CAN2 interfaces are set for: - 120 Ω termination is under software control (i.e. the software can switch the 120 Ω resistor in or out of the circuit) - RD/WR or "Listen Only" mode is under software control (i.e. the software can transmit messages on the CAN bus)

• RD/WR or "Listen Only" mode is under software control	
Setting 4 **Jumpers 1 and 3 inserted** • NOT Terminated (120 Ω) • RD/WR or "Listen Only" mode is under software control	When SW3 jumpers 1and 3 are inserted, both CAN1 and CAN2 interfaces are set for: - RD/WR or "Listen Only" mode is under software control (i.e. the software can transmit messages on the CAN bus) - 120 Ω termination is disabled (the 120 Ω termination resistor is removed from the circuit and cannot be switched in by software) 

12.1.4 When must the 120 Ohm terminating resistor be in the circuit?

- A properly terminated CAN bus will have a DC resistance of approximately 60 Ω (one 120 Ω terminating resistor at each end).
- By measuring the DC resistance on the vehicle bus between CAN-H and CAN-L, before the MiX 6000 is connected, an installer can determine whether additional termination is required.
- **If the resistance measures 60 Ω, no further termination is required**.
- If it measures 120 Ω, then additional termination must be configured.
- To configure additional termination, the jumper must be fitted and the termination resistor enabled in the software.
- See the table below for a diagram of a CAN bus that is correctly terminated and how the 60 Ω is calculated.

DC Resistance Calculation	**Correctly terminated CAN bus with 120 Ω resistors at both ends.**	**Incorrectly terminating CAN bus with 120 Ω resistors at both end and a node that puts another 120 Ω resistor in circuit.**
R_{total} = 1/(1/R1+1/R2) R1 = 120 Ω and R2 = 120 Ω R_{total} = 1/(1/120+1/120) R_{total} = 60 Ω		If you measure less than 60 Ω (e.g. 40 Ω), then it means the CAN Bus is already incorrectly terminated and loaded by another 120 Ω resistor (R3). **In this case DO NOT ATTEMPT to connect to this CAN bus under any circumstances and seek the advice of the owner to determine why the CAN bus is incorrectly terminated**. R_{total} = 1/(1/R1+1/R2+1/R3) R1 = 120 Ω and R2 = 120 Ω and R3 = 120 Ω R_{total} = 1/(1/120+1/120+1/120) = 40 Ω

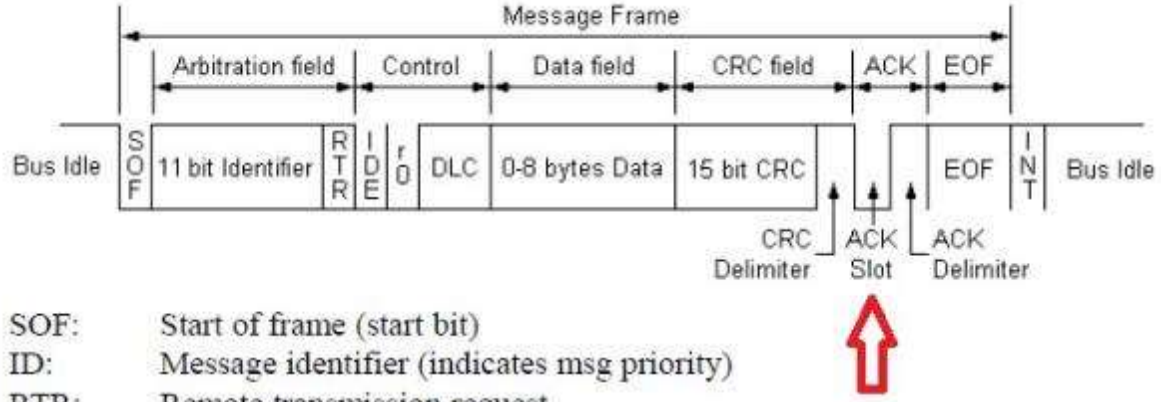
12.1.5 General Rules for CAN terminating resistors

- A properly terminated CAN bus will have a DC resistance of approximately 60 Ω (one 120 Ω terminating resistor at each end). By measuring the DC resistance on the vehicle bus between CANH and CANL, before the MiX 6000 is connected, an installer can determine whether additional termination is required. If the resistance measures 60 Ω, no further termination is required. If it measures 120 Ω, then additional termination must be configured. To configure additional termination, the jumper must be fitted and the termination resistor enabled in the software.
- Typically, a bus showing 120 Ω before installation will only have one node on it, and will not be safety critical. Examples of this might be a DTCO bus or any of the OBDII connections.
- A bus showing 40 Ω before installation may indicate triple termination, which can cause CAN errors and failure. If this is the case, it is best to advise the customer and ensure this error is corrected by removing the offending unit or termination before MiX 6000 installation.
- For non-safety-critical CAN bus installations, it is recommended to leave the jumper fitted and configure the termination resistor to OFF or ON in software, as needed, as this allows the maximum flexibility.

- For safety-critical CAN bus (e.g. so-called “hot bus”) installations where a hard disconnect must be guaranteed and physical safety is needed, the 120 Ω termination jumper must be removed. This will guarantee that termination resistors cannot be accidentally enabled by software, potentially disrupting the CAN bus. Note that permission from the customer to connect to a safety critical CAN bus should always be obtained.
- If the installer is in doubt as to the safety critical nature of the CAN bus, the jumper must be left off.
- After installation of the MiX 6000 and configuration of the termination resistance the CAN bus should measure as 60 Ω, with the unit powered on and if not, the settings should be checked.
- Note that the MiX 6000 terminating resistor automatically disconnects from the CAN bus if the MiX 6000 unit loses power.

12.1.6 When must the RD/WR Jumpers be in the circuit?

- For non-safety-critical CAN bus installations, it is recommended to leave the transmit enable jumper fitted and configure the transmit enable to OFF or ON in software, as needed, as this allows the maximum flexibility.
- For OBDII connections the RD/WR (transmit enable jumper) must be fitted, since OBDII is a request/response protocol and requires the MiX 6000 to transmit messages on the CAN bus.
- For safety-critical CAN bus (e.g. so-called “hot bus”) installations where guaranteed, physical safety is needed, the transmit enable jumper must be removed. This will guarantee that transmissions cannot be accidentally enabled by software, potentially disrupting the CAN bus.
- ⓘ **Note that permission from the customer to connect to a safety critical CAN bus should always be obtained.**
- If the installer is in doubt as to the safety critical nature of the CAN bus, the jumper must be left off.
- Some FMS gateways requires an acknowledgement ("ACK") on the physical layer and the RD/WR (transmit enable jumper) must be fitted for the CAN chip to be able to assert the "ACK" bit in the header, otherwise the host will stop transmitting any CAN messages. See diagram below. Note that no messages are transmitted on the CAN bus, the messages are just acknowledging, so this is a safe mode.



SOF:	Start of frame (start bit)
ID:	Message identifier (indicates msg priority)
RTR:	Remote transmission request
IDE:	Identifier extension bit (2.0A or 2.0B)
r0:	Reserved bit. Sent as dominant.
DLC:	Data length code. Valid range 0 – 8.
CRC D:	CRC delimiter. Marks end of CRC field.
ACK S:	Used for receiver to ACK msg. Sent as recessive.
ACK D:	Marks end of ACK field.
EOF:	End of frame. (stop bit). Sent as 7 recessive bits.
INT:	Intermission. Sent as 3 recessive bits.

12.2 DLD and DTCO

The MiX 6000 also satisfies the need for Remote DTCO Download functionality by incorporating CAN, D8 and K-line communication. The main functionality is the ability to remotely download DTCO data as well as the D8 status change for the Hours of Service solution.

This functionality allows the user to perform the following:

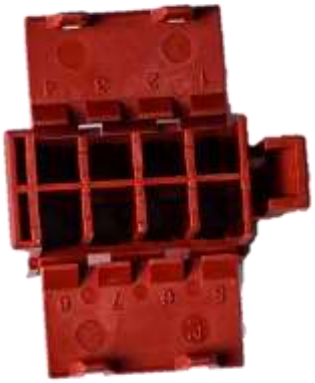
- Synchronise download schedules.
- Authenticate remote tachograph cards.
- Transfer downloaded files to back-office archiving systems.
- Receive updated firmware and configuration settings.

12.2.1 D-8

The D8-line is a free running data interface for fleet management systems. The DTCO information (like date, time, currently selected driver and co-driver activity, hours of service, speed of vehicle, etc.) is sent on this communication line. The receiving line of Serial Port 2 is used for the D8-line. The pin numbers of the serial port are shown in sections 5.5.7. Connect to pin 2 (of J6 on MiX 6000 PCB) to pin 8 of the brown DTCO D-connector.

12.2.2 Connect CAN to DTCO

Refer to section 12.1 on CAN. One of the available CAN busses (normally CAN #2) can be routed to the DTCO CAN. The Yellow and Green wires must be routed to DTCO C (red) connector pin 5 (Yellow) (CAN-H) and 7 (Green) (CAN-L). See pictures below.



12.2.3 K-line

Connect the DTCO K-line to pin 13 of the Auxiliary 1 Harness (see section 5.5.2).

13 MiX TechTool

An Android and iOS version of the MiX Tech Tool is available that can connect to the MiX 6000 via Bluetooth. Refer to the documentation on this tool for detailed instructions.

14 WiFi Installation

The WiFi can be used to connect the MiX 6000 to local WiFi networks.

15 Ethernet port

The Ethernet port is mainly used for debug purposes and video applications.

16 After Installation

16.1 Beep codes

The MiX 6000 has an output that drives a buzzer. The buzzer is not included inside the enclosure but is part of the 10-wire main harness. If any of the other reduced wire count main harnesses are installed, beep codes will not be audible.

The following beep codes will apply when a harness with an external buzzer is installed:

- Double beep when the device reboots or is powered up from shipping mode.
- Triple beep when an over speeding, harsh braking, harsh acceleration or harsh cornering event occurs.
- Continuous slow beeping at trip start for the duration of the user configured driver ID prompt period. (When a valid driver ID is inserted two short beeps will sound and the slow prompt beeps will stop – Default driver ID prompt period is set to zero seconds, disabling the driver ID prompt).
- Five very short beeps when new configuration is sent to the device. (This will typically happen when the first configuration settings are sent to a new device during a successful first connection. This will repeat every time any adjustment is made to device configuration or settings, such as adjusting an over speeding threshold).

16.2 LED flash codes

The MiX 6000 has three LEDs for diagnostic purposes. Refer to the Figure 8 below.

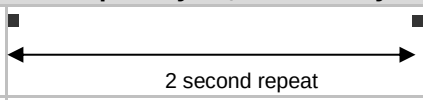
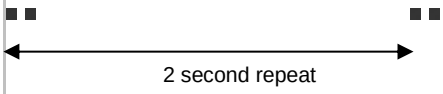
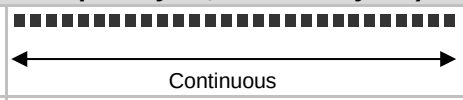
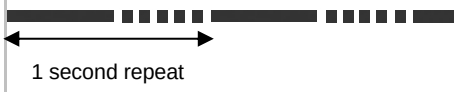
Figure 8: Picture indication the sequence and position of diagnostic LEDs

LED 1: Under FW control (left)

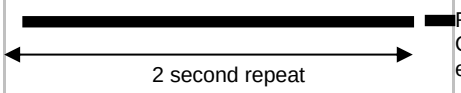
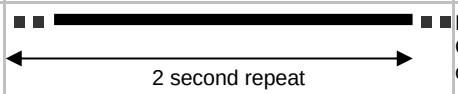
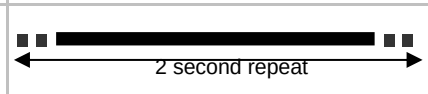
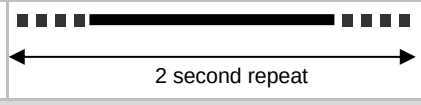
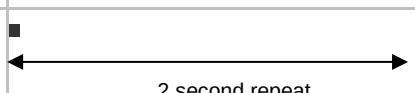
LED 2: Under FW control (middle)

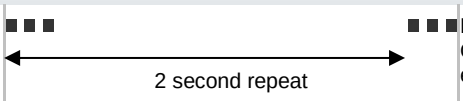
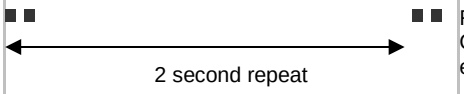
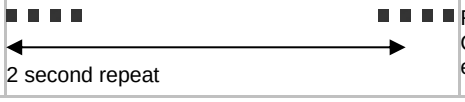
LED 3: Controlled Power by Power Manager (right)

16.3 GNSS LED flash codes (GREEN) (LED 2 - Middle)

Out of trip (2 second repeat cycle, LED mostly OFF)			
Out of trip with no GNSS lock			GREEN LED: One short ON blip once every two seconds
Out of trip with 2D GNSS lock			GREEN LED: Two short ON blips every two seconds
Out of trip with 3D GNSS lock			GREEN LED: Three short ON blips every two seconds
In trip (1 second repeat cycle, LED mostly ON)			
In trip with no GNSS lock			GREEN LED: Toggles ON/OFF in quick succession continuously
In trip with 2D GNSS lock			GREEN LED: 50% ON and 50% toggling ON/OFF in quick succession every second
In trip and GNSS has acquired 3D lock. The unit will subsequently be able to report accurate GNSS points.			GREEN LED: Mostly ON followed by two short OFF blips every second

16.4 GSM LED flash codes (RED) (LED 1 - Left)

No communication settings received (LED mostly ON)			
GSM OFF			RED LED: OFF
GSM 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
GSM Connected			RED LED: Almost completely ON with two short OFF blips once every two seconds
Other (e.g. WiFi or Ethernet) connected			RED LED: Almost completely ON with 4 short OFF blips once every two seconds
Communication settings received (LED mostly OFF)			
GSM OFF			RED LED: OFF
GSM ON, searching for network			RED LED: Mostly OFF with some ON time once every second
SMS only			RED LED: Almost completely OFF with 1 short ON blip once every two seconds

GPRS ready			RED LED: Almost completely OFF with 3 short ON blips once every two seconds
GSM Connected			RED LED: Almost completely OFF with 2 short ON blips once every two seconds
Other (e.g. WiFi or Ethernet) Connected			RED LED: Almost completely OFF with 4 short ON blips once every two seconds

16.5 Power Indicator (LED 3 – Right)

LED 3 is the power indicator. When the power is ON, the LED is solid ON (GREEN).

17 Testing Installation

17.1 Test Drive

Disarm the system by inserting the blue plug into the Code Plug socket.

- Wait for the audible signal.
- Remove the plug.
- Start the engine.
- Carry out a test drive.

18 Closing Steps

- Check all relevant vehicle functions.
- Explain the functions of the MiX 4000 system to the user.

19 Troubleshooting

Supporting Documentation can be found at:
Confluence Link: https://confluence.mixtelematics.com/display/MFHF/MiX+6000+Home+Page

The audible and visual information generated by the MiX 6000 are described in section 16.1 and 16.2 of this document.

Symptom	Probable Cause	Action
Unit does not switch ON (LED does not flash)	No battery voltage applied to MiX 6000.	▪ Check the voltage supply to the MiX 6000. ▪ 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). Location of the GNSS antenna is limiting good GNSS reception (external antenna).	▪ Mount the unit with the rounded surface facing up, and the label side down. ▪ Install the unit in a location where the GNSS view of the sky is relatively unobstructed by metal or conductive parts. Refer to section 5.5.11. ▪ If this is not possible it may be necessary to install the external GNSS antenna. ▪ Check the installation of the external GNSS antenna and ensure that the antenna is facing towards the satellites 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 0)	No SIM card inserted or SIM inserted the wrong way round Automatic commissioning is not possible on the GSM network selected GSM network is out of range External antenna not proper type External antenna not correctly mounted.	▪ Refer to section 4.2 for the correct SIM card orientation. Alternatively replace the SIM card. ▪ Use a serial configuration harness and the Configuration software to manually program APN and server settings for the unit. ▪ Check wiring - refer to section 5.5.11. ▪ Check coverage of chosen GSM network using coverage map or a cell phone on the same network. ▪ If the MiX 6000 fails to detect a MiX approved GSM antenna it will switch to internal antenna operation. ▪ Refer to section 5.5.125.5.12

20 Routine Maintenance

Item	Maintenance	Period
1)	Please ensure that the Code Plug Socket is kept clean and free of dust and dirt. This part is available as an accessory if it needs to be replaced.	Monthly
2)	The internal battery needs to be replaced when a replacement message is generated. Replace the battery if it is swollen.	Back End Warning Message

21 MiX 6000 Specifications

21.1 Technical description

Refer to the section on Product Variants and Part Numbers (Section 2) for more details.

21.2 Auxiliary inputs/outputs

10 x Configurable Analogue or Digital Inputs (I1 to I10)	10* analogue or digital inputs can be configured to monitor any device that generates a change in voltage. e.g. seat belts, headlights, refrigeration units, temperature sensors, emergency lights, doors, PTO, UDS, trailer coupling etc. Voltages are measured in the range of 0 – 38 volts in steps of approximately 9.3 mV and 0-5V in steps of 1.2 mV Do not connect signals from unsuppressed inductive sources such relay coils (where severe voltage spikes can be generated) *I9 and I10 can be configured to measure slow frequency inputs (120-200 Hz). Disconnection of these inputs can be detected using open-wire detect.
1 x Speed Input	F1 input can measure speed pulses. The input impedance is 100 kOhm. Frequencies of up to 20 kHz can be measured. Maximum signal voltage level = 38V Disconnection of this input can be detected using open-wire detect.
1 x RPM Input	F2 input can measure RPM pulses. The input impedance is 94 kOhm. Speed and RPM calibration sensitivity is configurable. Frequencies up to 20 kHz can be measured. Maximum signal voltage level = 38V Disconnection of this input can be detected using open-wire detect.
4 x RS232 Serial Interface	This can be connected to any RS232 serial device.
2 x CAN Interface	This can be connected to a J1939 CAN bus, termination resistors and transmit disable can be configured by jumpers (for safety-critical installs) or by settings.
1 x Positive Drive	Positive Drive output is used to power external devices at a current up to 1500 mA. Disconnection of loads can be detected using open-load detect.

7 x Positive Drive	Positive Drive outputs are used to power external devices at currents up to 250 mA. Disconnection of loads can be detected using open-load detect.
1 x K-line	DTCO K-line
1 x D8	The D8-line is a free running data interface for fleet management systems. The DTCO information (like date, time, currently selected driver and co-driver activity (hours of service), speed of vehicle etc.) is sent on this communication line. The receive line of Serial Port 2 is used for the D8-line.
Ignition input	The ignition input is used only to monitor the vehicle's ignition line state, and can measure up to 38V. Disconnection of this wire can be detected with open-wire detect.

22 Regulatory and Environmental Considerations

1) The product cannot be installed in places where it is exposed to water jets and temporary immersion into water.
2) The product was designed to endure standard transport vibration and shock.
3) The optimal operating temperature for the product (with battery) is between -20 and 60 ºC.
4) The unit (with a battery fitted) SHALL NOT BE EXPOSED to temperatures > 90 °C

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

(1) this device may not cause harmful interference, and

(2) this device must accept any interference received, including interference that may cause undesired operation.

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.

This equipment complies with FCC radiation exposure limits for an uncontrolled environment. This equipment shall be installed and operated with a minimum distance of 20 cm (7.9 in) between users and/or bystanders and the device.

23 Appendix A: Fitting battery compartment and mounting of unit

The MiX 6000 can be ordered with or without backup battery. Refer to table in section 2 with product variants for more details.

Figure 9: When shipped with a battery kit.

Figure 10: The battery kit.

Attach the battery compartment to the back of the unit. Latch both clips by gently pushing on the clips until they engage. Normally one can hear and feel when the clips latch onto the main unit. See the diagram below:

Figure 11: Make sure the compartment is secured by gently pressing on the side clips until they click into place.

a) Four individual mounting clips are shipped with the product as shown in Figure 12 below:

Figure 12: Individual mounting clips.

Figure 13: Attach the clips by sliding them over the brackets on the unit.

23.1.1 Alternative mounting bracket

a) As an alternative, a large single bracket can also be used to mount the bracket as shown in Figure 14 and Figure 16 below:

Figure 14: Single mounting bracket (440FT0244)

b) If the single mounting clip is used to mount the unit, note that the mounting bracket fits over the clips. It helps to secure the side clip.

c) To open the unit, one must first remove the mounting clip that helps to secure the side clips as shown in Figure 15. Use a flat, think plastic object (to avoid scratching the enclosure) when opening the unit.

Figure 15: Alternative option: Single mounting clip

Figure 16: Position the single bracket mounting clip as shown above.

24 Glossary

Abbreviation	Description
BT	Bluetooth
DLD	Download Device
DTCO	Digital Tachograph
GPS	Global Positioning System
GNSS	Global Navigation Satellite System
GSM	Global System for Mobile Communications
GND	Ground (0V)
RX	Receive
TX	Transmit
WiFi	Local Area Wireless Computer Network
BT	Bluetooth