

Fatigue sensor

Introduction

MR688 fatigue sensor is a driver monitoring sensor designed for commercial fleets and can be connected to Ruptela FM devices via an RS232 interface.

The FM device can be configured to request real-time pictures from the sensor when driver fatigue/distraction is detected or on demand via an SMS command. The pictures are stored in the SD card of the FM device in a .jpg format. The user can remotely manage these pictures. Pictures serve as evidence to check the driver's state of fatigue and along with other data can assist in evaluating and improving driver safety and performance.



Compatibility

MR688 fatigue sensors are compatible with the following Ruptela FM devices with the latest firmware version:

- FM-Tco4 HCV
- FM-Tco4 LCV
- FM-Pro4

You can get the latest firmware and configurator from our documentation website: doc.ruptela.it

More information about the sensors themselves can be found on the manufacturer's [website](#).

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Document change log

Date	Version	Change details
2019-02-15	1.0	Initial draft.
2019-05-29	1.1	Parameters configuration section added. Updated connection schematic.

Principles of operation

Operation

Once the sensor detects a distracted or drowsy driver, it will immediately send out a sharp and loud alarm. At the same time, the sensor's camera will take a picture.

If the fatigue sensor is enabled in the configuration, it will send the gathered data (file name, source ID and alert ID) to the FM device. If requested, the FM device will represent the gathered data and can also indicate how many pictures were taken since the last record and were stored in the SD card. If the FM device has not obtained correct date and time from GNSS fix, NTP server or GSM operator, pictures cannot be taken or sent to the server.

Picture storage

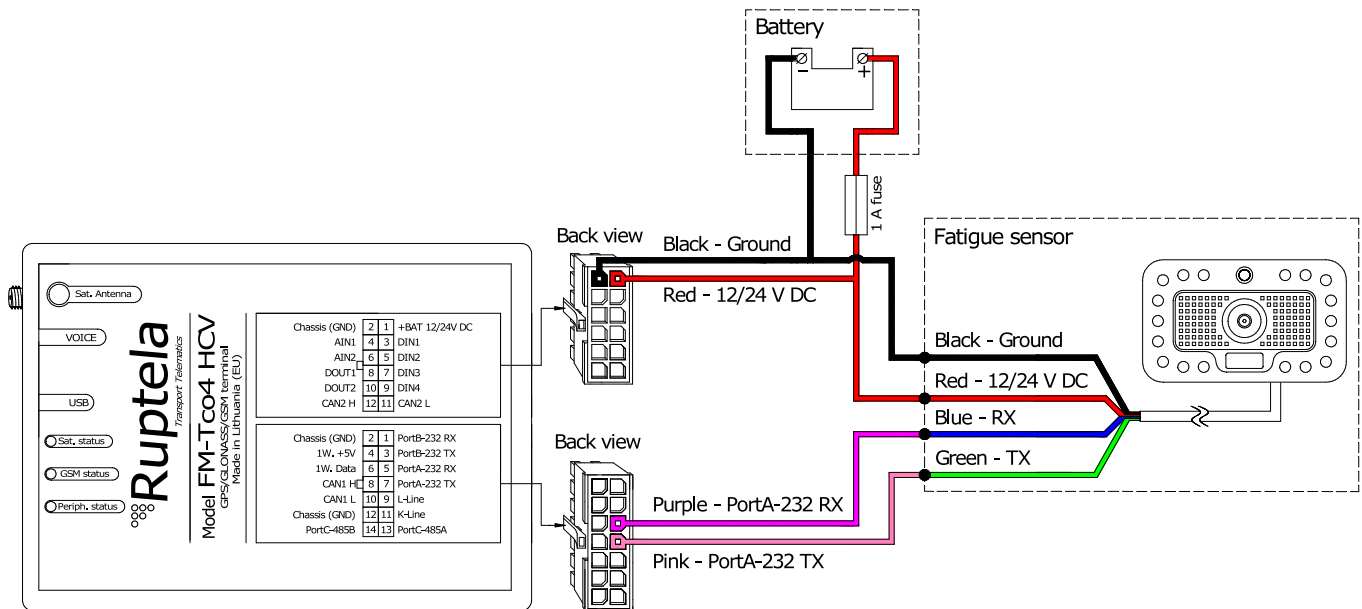
If the FM device has an SD card, the pictures will be stored in the card and sent to a server upon request. If the fatigue sensor folder on the SD card is full, the oldest picture will be overwritten. If the folder is full and there are no pictures on the card, the taken picture will be discarded. After receiving the pictures, the server can then send a request to delete them from the SD card in order to conserve the memory. A maximum of 2000 pictures can be stored in the fatigue sensor folder.

If there is no SD card in the FM device, no pictures will be taken. The fatigue sensor will indicate alerts in any case.

Note
If you insert/remove the SD card, the FM device should be restarted to ensure correct operation.

Connection

Connect the MR688 fatigue sensor to your FM device as follows (PortA is used in this schematic):



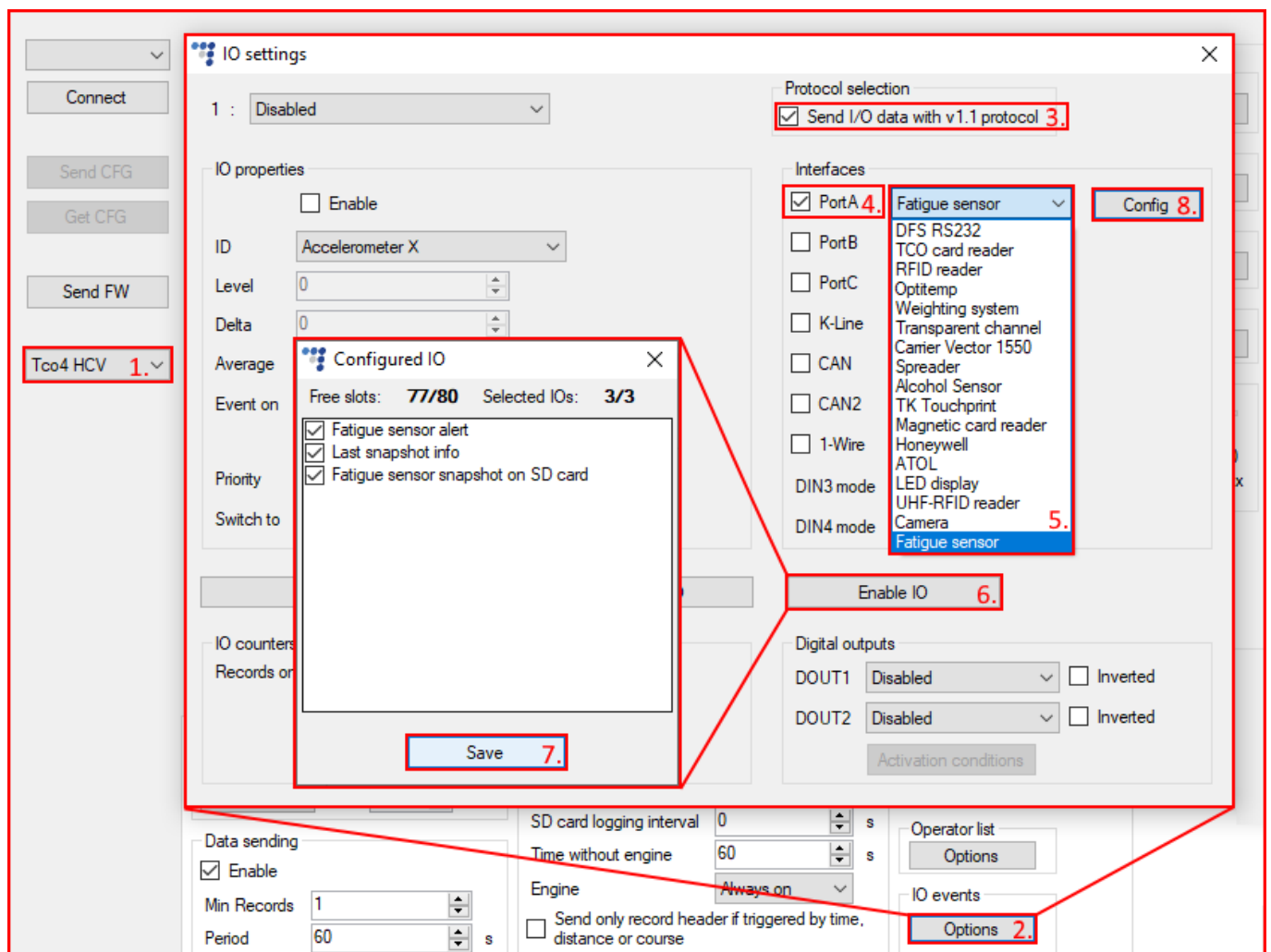
Alternatively, you can connect the fatigue sensor to PortB:

FM device	Fatigue sensor (PortB)
Black – Ground	Black – Ground
Red – 12/24 V DC	Red – 12/24 V DC
Yellow – PortB-232 RX	Blue – RX
Orange – PortB-232 TX	Green – TX

Configuration

In order for the sensor to work with the FM device, follow these steps:

1. Open the FM device configurator and select your device model in the drop-down list.
2. Click on the **Options** button in the **IO events** section. The **IO settings** window will open.
3. Tick the **Send I/O data with v1.1 protocol** checkbox in **Protocol Selection**.
4. In the **Interfaces** section, select the port to which you connected the sensor (**PortA** or **PortB**).
5. A drop-down list will appear next to the selected port. Select *Fatigue sensor* in the drop-down list. The sensor can be configured on only one port at a time.
6. Click the **Enable IO** button.
7. A new **Configured IO** window will open where all available sensor IO parameters are listed. It is recommended to keep all the checkboxes ticked, however, the checkboxes can be unticked to enable only the desired IO parameters according to your needs. Click the **Save** button to enable the selected IO parameters. All properties for the selected IO parameters will be automatically set as described in the "IO properties" section below. If needed, the IO parameters can be configured manually.
8. Optionally, the sensor's parameters can be configured in order to customize its operation and sensitivity. Click the **Config** button to open the **Fatigue sensor configuration** window. Refer to the "Parameters configuration" section below for more detailed information.



Close the **Configured IO** and the **IO settings** windows. Send the configuration to the device.

Parameters configuration

In the **Fatigue sensor configuration** window five different parameters can be configured if the **Customize** checkbox is ticked.

1. **Fatigue alarm start up speed** – determines the minimum speed of the vehicle for the fatigue alarm to activate. The default value is 5 km/h, the input range – from 0 to 255 km/h.
2. **Distraction detection sensitivity** – use the slider bar to calibrate the sensitivity of distraction detection. The default value is 5, the slider can be set to 10 different positions from 1 to 10 inclusively.
3. **No portrait sensitivity** – calibrate the sensitivity of **No portrait** detection. The default value is 15, the input range – from 0 to 255.
4. **Fatigue alarm sensitivity** – use the slider bar to calibrate the sensitivity of the fatigue alarm. The default value is 5, the slider can be set to 10 different positions from 1 to 10 inclusively.
5. **Alarm volume** – the use slider bar to set the volume of the alarm. There are 3 available positions:
 - **No sound** – turns off the alarm sound;
 - **Low** – sets the volume to low;
 - **High** – sets the volume to high.
6. Click the **Close** button and send the configuration to the device.

The screenshot shows the 'Fatigue sensor configuration' window with the following settings:

- Fatigue alarm start up speed:** 5 km/h (Customize checked, labeled 1.)
- Distraction detection sensitivity:** 5 (Customize checked, labeled 2.)
- No portrait sensitivity (0-255):** 15 (labeled 3.)
- Fatigue alarm sensitivity:** 5 (Customize checked, labeled 4.)
- Alarm volume:** Low (Customize checked, labeled 5.)

A **Close** button is located at the bottom (labeled 6.).

IO properties

When using the **Enable IO** functionality, the enabled IO parameters will be configured with the following properties by default:

Configured IO parameter	Event	Priority
Fatigue sensor alert	On change	High
Last snapshot info	On change	High
Fatigue sensor snapshot on SD card	Monitoring	Low

The following "Event on" properties are available when configuring the IO parameters manually:

Configured IO parameter	Monitoring	On Change	Hysteresis
Fatigue sensor alert	Yes	Yes	No
Last snapshot info	Yes	Yes	No
Fatigue sensor snapshot on SD card	Yes	Yes	Yes

Picture request via SMS

The user can take pictures on demand with the *snapshot* SMS command, using the following structure:

```
password snapshot 3
```

After sending the SMS command the FM device will send a response, using the following structure:

```
snapshot 3 <answer>
```

<answer> can be one of the following:

- *ok* – indicates that the fatigue sensor took a picture successfully;
- *busy* – indicates that the fatigue sensor is busy with a previously taken picture at the moment;
- *n/a* – indicates that the fatigue sensor is either not configured on the given port, not connected or not responding;
- *fullsd* – indicates that the memory of the SD card is full and the picture will be discarded, as there are no pictures to be overwritten;
- *err* – indicates that there was an error.

If the SD card is missing and the SMS command *snapshot* is received, the device responds with *sdcard missing*.

Example

Request:

```
password snapshot 3
```

Response:

```
snapshot 3 ok
```