Reefer Interface G2
based on
FMS Gateway G2™
Legal Notice

Information furnished in this publication is believed to be accurate and reliable. However, Inventure assumes no responsibility for the consequences of use. Information contained in this publication regarding the device applications and the like is intended through suggestion only. Product specifications are subject to change or modification without notice.

This document is for use by the intended recipient and contains confidential information under applicable law. You are hereby formally notified that any use, copying or distribution of the document, in whole or in part, is strictly prohibited.

This publication supersedes and replaces all information previously supplied.

Trademarks

The Inventure logo and product names are trademarks of Inventure, Inc. and are protected by copyright law.

All rights reserved.

Copyright Notice

© Copyright 2020, Inventure, Inc.

Revision

D01-018-09-04-08-03EN

Contact

INVENTURE Automotive Electronics R&D, Plc.
11 Tarcali Street
H-1113 Budapest
HUNGARY
Phone: +36 1 381-0970
E-mail: support@inventure-automotive.com
URL: www.inventure-automotive.com
# Table of contents

1 INTRODUCTION ............................................................................................................. 5  
2 THE FMS GATEWAY G2 REEFER INTERFACE ............................................................ 5  
2.1 MAIN FEATURES ........................................................................................................ 5  
2.2 ADDITIONAL FEATURES .............................................................................................. 5  
2.3 HOW TO USE INVENTURE FMS GATEWAY G2 REEFER INTERFACE ................. 6  
3 SAFETY NOTICES .......................................................................................................... 7  
4 PACKAGE CONTENTS .................................................................................................. 8  
5 CONNECTION OVERVIEW ............................................................................................. 9  
5.1 V_CAN1 CONNECTOR ............................................................................................ 10  
5.2 MAIN CONNECTOR ................................................................................................ . 10  
5.3 USB MINI CONNECTOR ........................................................................................... 11  
6 INSTALLATION TO VEHICLE ...................................................................................... 12  
7 TROUBLESHOOTING, LED STATUS .......................................................................... 13  
7.1 PROPER OPERATION ............................................................................................... 13  
7.2 V_CAN1 ERROR ................................................................................................... 14  
7.3 V_CAN1 IDLE ........................................................................................................ 14  
7.4 DIAG IDLE ............................................................................................................... 14  
7.5 UNKNOWN VEHICLE .............................................................................................. 14  
7.6 V_CAN2 ERROR ................................................................................................... 14  
7.7 FMS CAN OUTPUT ERROR ..................................................................................... 14  
7.8 BOOTLOADER STATE (USB CONNECTED) ............................................................ 15  
8 INVENTURE SUPPORT INFORMATION ...................................................................... 15  
9 SYSTEM CHARACTERISTICS ..................................................................................... 16  
10 WARRANTY .................................................................................................................. 17  
11 HOW TO CONTACT INVENTURE? .............................................................................. 18  
12 LIST OF FIGURES ........................................................................................................ 19  
13 LIST OF TABLES .......................................................................................................... 19
1 Introduction
Thank you for purchasing an Inventure product. Your new FMS Gateway G2™ interface is a carefully engineered, high quality durable product with intelligent features and robust styling. It is designed to give you the quality and convenience you expect from an automotive measuring instrument.
To familiarize yourself with all the features of your unit please read the following instructions carefully. Retain this guide for future reference.

2 The FMS Gateway G2 Reefer Interface
The interface connects to Thermo King Smart Reefer controller electronic communication channel, acquires and transfers real time sensor data on its output. The output format can be compliance with standard FMS CAN, and/or RS232. The output data can be transferred via hardwire (FMS Gateway output cable – FMS CAN and/or RS232) method.
The FMS Gateway G2™ basically has only one firmware for each manufacturing group and it uses Automatic Vehicle Detection which means that after installing the device will detect your vehicle by itself. To use the standard FMS Gateway G2 as Reefer Interface you need to use the General Truck firmware and upload it by using the proper Device Database (the method is detailed in this document)

2.1 Main features
This intelligent interface provides contactless and safety solution for Thermo King refrigerators with comprehensive measurement as listed below:

- High-Speed CAN and/or RS232 output
- Multiple zone temperature up to three separated zones¹
- No need for OEM translator interface
- FMS compatible (CAN output compliance with FMS CAN bus)
- Easy integration with any telematics systems

The Reefer Interface solution can be used as extra feature² on reefer equipped rigid trucks to acquire vehicle related FMS data and reefer related data with one device at once.

2.2 Additional features
The FMS Gateway G2 interface has advantageous features that are accessible via mini USB connector, such as:

- Vehicle measurement: If the vehicle is not supported, then you can easily make a CAN measurement using FMS Gateway G2. You just send this measurement to Inventure Support (support@inventure.hu), we analyze the files and update new firmware as soon as possible

¹ if the Thermo King unit is able to handle multiple zones
² Extra feature: please contact Inventure Automotive for details
Troubleshooting: should you need further assistance during installation, measurements can be recorded from the Support Tool PC software. The measurement can be analyzed by Inventure experts and effective support can be provided.

Explanation:
- Firmware Update
  - An option to update the firmware of the device so it is usable in other vehicles

2.3 How to use Inventure FMS Gateway G2 Reefer Interface

- Identify your Reefer controller module
  - Supported Thermo King units:
    - All Thermo King units equipped with SR2 controller
    - All Thermo King units equipped with SR3 controller

- Firmware update process (skip if you ordered with updated firmware)
  - Install FMS Gateway Support Tool PC Software
    - See further details in the FMS Gateway Support Tool User’s manual
  - Acquire and refresh the Device Database in FMS Gateway Support Tool
  - Update the latest Truck firmware via FMS Gateway Support Tool
  - Enable the related output messages in G2 Configuration menu via FMS Gateway Support Tool

- On site installation process
  - During installation please refer to the Reefer specific Installation guide. Please contact Inventure Support (support@inventure.hu) for the install guide.
    - E.g.: ThermoKing_SR3_Reefer_IF_G2_Installation_Guide_v01.pdf
  - Install the CL-CAN sensor according to the guide, connect its cable to the V_CAN 1 slot.
  - Connect the power supply wires of the Main cable to the proper points
  - After device installation, please connect input cables (Power, Ground, Vehicle CAN input and other inputs when needed). See Section 5 for more details.
  - Connect the FMS Gateway G2 output to the input of your AVL device.

- After successful installation and power-up, the device testing can be started.
  - The FMS Gateway G2 has an in-built Status LED that indicates its operating status. If everything works as it should, the LED flashes green once in every 5 seconds. If not, please check Section 7 for further information.
The complete Reefer tracking system can be tested online by visiting your fleet tracking system’s website, where you are able to see the Reefer data beside the GPS position.

3 Safety notices

Please read the following safety instructions carefully. Inventure Automotive accepts no liability for damage that results from disregarding the safety instructions.

- Usage of the interface is permitted for industrial purposes only.
- The interface must not be used in situations in which human lives depend upon the operation of this equipment.
- Product must be installed by professional and this fact should be recorded legally
- The interface may be damaged by contact with water or any liquids. Use and store the interface in an area protected from water
- Do not expose the interface to direct sunlight or high temperature (see section 11 for reference) to ensure proper operation
4 Package Contents

Please make sure that the package contains the items listed below.

- FMS Gateway G2 Reefer Interface
- CL-CAN (contactless CAN) sensor
- Cable set (optional)
- User's Manual (this guide)
- Installation guide on the specific Reefer model
5 Connection overview

<table>
<thead>
<tr>
<th>INPUT DESCRIPTION</th>
<th>CONNECTOR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vehicle CAN 1 channel – Default input for Reefer</td>
<td>V_CAN 1</td>
</tr>
<tr>
<td>Vehicle CAN 2 channel</td>
<td>V_CAN 2</td>
</tr>
<tr>
<td>Diagnostics channel</td>
<td>DIAG</td>
</tr>
<tr>
<td>Tachograph connection</td>
<td>TACHO</td>
</tr>
</tbody>
</table>

Main harness (Power, FMS CAN, RS232, Analog)       MAIN
Programming / Configuring / Measuring channel       mini USB B

Table 1: Input description

For the device proper functioning, please make sure to connect only to the following points according to the charts. The rest should be left as is (DNC - Do Not Connect).

---

3 Not used for Reefer Interface
4 Not used for Reefer Interface
5 Not used for Reefer Interface

© Inventure Automotive Electronics R&D, Plc.
5.1 V_CAN 1 connector

![Image of 4-pin V_CAN 1 connector assignment]

<table>
<thead>
<tr>
<th>Pin Nr.</th>
<th>Designation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>GND</td>
<td>Ground</td>
</tr>
<tr>
<td>2</td>
<td>V CAN_L 1</td>
<td>Vehicle CAN 1 bus CAN Low line</td>
</tr>
<tr>
<td>3</td>
<td>CL_PWR</td>
<td>Power output for CL-CAN sensor</td>
</tr>
<tr>
<td>4</td>
<td>V CAN_H 1</td>
<td>Vehicle CAN 1 bus CAN High line</td>
</tr>
</tbody>
</table>

Table 2: Micro Fit 4-pin (V_CAN 1) assignment

5.2 MAIN connector

![Image of 10-pin MAIN connector assignment]

<table>
<thead>
<tr>
<th>Pin Nr.</th>
<th>Designation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>GND</td>
<td>Ground</td>
</tr>
<tr>
<td>2</td>
<td>RS232 GND</td>
<td>RS232 Ground</td>
</tr>
<tr>
<td>3</td>
<td>RS232 RXD</td>
<td>RS232 channel receive data line</td>
</tr>
<tr>
<td>4</td>
<td>FMS CAN_L</td>
<td>FMS CAN bus CAN Low line</td>
</tr>
<tr>
<td>5</td>
<td>FMS TER 2</td>
<td>FMS CAN bus terminating resistor activation loop 2</td>
</tr>
<tr>
<td>6</td>
<td>IGN / BATT</td>
<td>Ignition / Battery + input</td>
</tr>
<tr>
<td>7</td>
<td>ANALOG IN</td>
<td>Analog sensor input (e.g.: fuel level sensor)</td>
</tr>
<tr>
<td>8</td>
<td>RS232 TXD</td>
<td>RS232 channel transmit data line</td>
</tr>
<tr>
<td>9</td>
<td>FMS CAN_H</td>
<td>FMS CAN bus CAN High line</td>
</tr>
<tr>
<td>10</td>
<td>FMS TER 1</td>
<td>FMS CAN bus terminating resistor activation loop 1</td>
</tr>
</tbody>
</table>

Table 3: Micro Fit 10-pin (MAIN) assignment
5.3 **USB Mini connector**

Please make sure to follow the below steps:

- Connect FMS Gateway to computer (use Mini USB – USB cable)

![USB Mini B to USB A cable](image)

- Install device driver
- Install FMS Gateway Support Tool software
- Activate FMS Gateway Support Tool software using license file (Send the activation request file in e-mail to Inventure Automotive support)
6 Installation to vehicle

In order to avoid damaging the vehicle or the device the installation must be performed by professional, skilled person.

During installation please consider safety instructions (see Section 3) and follow the instructions below:

1. Make sure that the FMS Gateway G2 Reefer Interface device has the latest firmware installed, and it is appropriately configure for the Reefer model (check firmware version and configuration by using FMS Gateway Support Tool)

2. Update the appropriate firmware and configuration to the device if necessary (by using FMS Gateway Support Tool)

3. Update the settings if you need specific configuration (by using FMS Gateway Support Tool)

4. Connect the vehicle communication bus wires to the interface input connectors by using vehicle specific Installation guide
   - Connect CL-CAN sensor to V_CAN 1

5. Connect device output to the telematics device
   - FMS CAN and/or
   - RS232

6. Turn vehicle ignition ON, and check FMS Gateway device LED status. LED should be flashing green once in every 5 seconds. Should it be different, please see Troubleshooting on Section 9.

7. Check telematics device’s operating status (LED indicator if available) then verify the dataflow from vehicle on remote server database.
7 Troubleshooting, LED status

The FMS Gateway has a status LED on the face of the enclosure which indicates the current operational mode.

When ignition turns ON the status LED lights RED for 5s (initialization process), after this the status LED indicates the current operation state. The status LED flashes 1-5 times in 5s period with different color, see attached table.

Status LED flashing states:

<table>
<thead>
<tr>
<th>State</th>
<th>Status LED</th>
<th>Flashing / 5s</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proper operation</td>
<td>Green</td>
<td>1</td>
</tr>
<tr>
<td>No communication on device input</td>
<td>Not flashing</td>
<td>0</td>
</tr>
<tr>
<td>V_CAN 1 input Error</td>
<td>Red</td>
<td>2</td>
</tr>
<tr>
<td>V_CAN 1 input Idle</td>
<td>Red</td>
<td>3</td>
</tr>
<tr>
<td>DIAG input Idle</td>
<td>Red</td>
<td>4</td>
</tr>
<tr>
<td>Unknown Vehicle</td>
<td>Red</td>
<td>6</td>
</tr>
<tr>
<td>V_CAN 2 input Error</td>
<td>Red</td>
<td>7</td>
</tr>
<tr>
<td>V_CAN 2 input Idle</td>
<td>Red</td>
<td>8</td>
</tr>
<tr>
<td>K-Line input Idle</td>
<td>Red</td>
<td>9</td>
</tr>
<tr>
<td>FMS CAN output Error</td>
<td>Yellow</td>
<td>5</td>
</tr>
<tr>
<td>Bootloader state (USB Connected)</td>
<td>Yellow</td>
<td>rapid</td>
</tr>
</tbody>
</table>

Table 4: Device working status

![Image showing LED status](image)

Figure 5: Status LED flashing

7.1 Proper operation

Device works correctly, LED flashes GREEN 1 time in 5s period.

In this working state the device gets power supply (voltage and current OK) and detects the input CAN and/or DIAG communication channels’ messages.

In this operating state the device and the GPS device connection are correct, the GPS device sends CAN acknowledges (in case of FMS CAN connection).
7.2 V_CAN 1 Error

In case of the status LED flashes RED 2 times in 5s period the FMS Gateway detects error on V_CAN 1 input channel. The device detects CAN errors on vehicle CAN communication bus.

Possible Faults:

- **FMS Gateway Firmware does not fit for this vehicle model**
  - Check the updated firmware version, use FMS Gateway Support Tool to read firmware version. Update firmware if necessary.

- **V_CAN 1 bus connection wrong:**
  - Check V_CAN 1 connections (CAN Low ~2,3V, CAN High 2,7V DC)

- **V_CAN 1 bus lines reverse connection:**
  - Check V_CAN 1 connections reverse polarity (CAN Low ~2,3V, CAN High 2,7V DC)

7.3 V_CAN 1 Idle

This state is not relevant on Reefer Interface.

7.4 DIAG Idle

This state is not relevant on Reefer Interface.

7.5 Unknown vehicle

This state is not relevant on Reefer Interface.

7.6 V_CAN 2 Error

This state is not relevant on Reefer Interface.

7.7 FMS CAN Output Error

In case of the status LED flashes YELLOW 5 times in 5s period the connection between the FMS Gateway device and the GPS device is not working properly. Check connections!

Possible Faults:

- **FMS CAN bus connection is wrong:**
  - Check FMS CAN connections (CAN Low ~2,3V, CAN High 2,7V DC)

- **FMS CAN bus lines have reverse connection:**
  - Check FMS CAN connections for reverse polarity (CAN Low ~2,3V, CAN High 2,7V DC)

- **No CAN acknowledge from GPS device:**
  - If there is no acknowledge on FMS CAN bus then FMS Gateway cannot transfer CAN messages to GPS device.
7.8 Bootloader state (USB Connected)

In case of the status LED flashes YELLOW rapidly the FMS Gateway is in firmware update mode. In this mode you can easily update the firmware of the FMS gateway device, change device settings and make measurement from the vehicle’s input communication channels.

Possible Faults:

- **No CAN terminating resistor:**
  - Check 120Ohm terminating resistors on CAN bus according ISO11898-2 standard.

- **FMS CAN bus baudrate is wrong:**
  - The FMS CAN output baudrate is 250kb/s according to FMS Standard. Set this baudrate in GPS device settings.

8 Inventure Support information

In case of any problem with device installation, firmware upgrade or any questions please contact Inventure Automotive support team ([support@inventure-automotive.com](mailto:support@inventure-automotive.com)). To get the fastest answer please describe the problem as detailed as possible.

Please provide the following information in case of any problem:

- Vehicle Type, model year, VIN, Engine code
- Short description of the problem
- Company name
- Device serial number
- LED status (which color and how often it flashes)
- Firmware name
- If you can connect to the device, the whole device information screen content (use FMS Gateway Support Tool)
  - **Bootloader version**
  - **Last update was successful or not**
  - **Update trial counter**
  - **Last update trial date**
  - **Firmware description**
9 System Characteristics

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Min.</th>
<th>Tip.</th>
<th>Max.</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power Supply</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Voltage supply</td>
<td>VIGN</td>
<td>8</td>
<td>32</td>
<td></td>
<td>V</td>
</tr>
<tr>
<td>Operating current (12V)</td>
<td>I_op</td>
<td>50</td>
<td>70</td>
<td></td>
<td>mA</td>
</tr>
<tr>
<td>Operating current (24V)</td>
<td>I_op</td>
<td>30</td>
<td>50</td>
<td></td>
<td>mA</td>
</tr>
<tr>
<td>Operating current (Sleep)</td>
<td>I_op</td>
<td>3</td>
<td>4</td>
<td></td>
<td>mA</td>
</tr>
<tr>
<td>Environmental characteristics</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Storage temperature</td>
<td></td>
<td>-40</td>
<td>85</td>
<td></td>
<td>ºC</td>
</tr>
<tr>
<td>Operating temperature</td>
<td></td>
<td>-20</td>
<td>75</td>
<td></td>
<td>ºC</td>
</tr>
<tr>
<td>Humidity</td>
<td></td>
<td>0</td>
<td>70</td>
<td></td>
<td>%</td>
</tr>
<tr>
<td>FMS CAN output interface</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baud rate</td>
<td></td>
<td>250</td>
<td></td>
<td></td>
<td>Kbaud</td>
</tr>
<tr>
<td>FMS CAN terminating resistor</td>
<td></td>
<td>120</td>
<td></td>
<td></td>
<td>Ohm</td>
</tr>
<tr>
<td>CAN mode</td>
<td></td>
<td>Normal</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CAN 2.0B ID</td>
<td></td>
<td>29</td>
<td></td>
<td></td>
<td>bit</td>
</tr>
<tr>
<td>Box parameters</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Length</td>
<td></td>
<td>110</td>
<td></td>
<td></td>
<td>mm</td>
</tr>
<tr>
<td>Width</td>
<td></td>
<td>50</td>
<td></td>
<td></td>
<td>mm</td>
</tr>
<tr>
<td>Height</td>
<td></td>
<td>30</td>
<td></td>
<td></td>
<td>mm</td>
</tr>
<tr>
<td>Mass</td>
<td></td>
<td>75</td>
<td></td>
<td></td>
<td>g</td>
</tr>
</tbody>
</table>

Table 5: System characteristics
10 Warranty

There is a one-year warranty on FMS GATEWAY G2™ starting from the date of the original purchase. The warranty covers any defect in materials or workmanship. The warranty is valid only if FMS GATEWAY G2™ was operated under normal circumstances in regular use. The warranty does not include damage from misuse or neglect.

As FMS GATEWAY G2™ has a well thought design, it is thoroughly tested before release and it is composed of high quality parts, there should be no need for maintenance of any parts of FMS GATEWAY G2™ during normal operation. If the box was damaged the warranty for FMS GATEWAY G2™ is no longer valid.

Remember to save your sales receipt in case of you ever need warranty service. Please refer to the serial number of your FMS GATEWAY G2™ in case of any problems. The serial number can be found on a label outside the box. In case of warranty claims contact your local dealer or directly Inventure, Inc.
11 How to contact Inventure?

Inventure provides customer support via its World Wide Web (WWW) site. The Inventure website is available by using from your favorite Internet browser at:

www.inventure-automotive.com

Our website provides a variety of services. Read up-to-date information about the company, the products, application possibilities and the services. Frequently asked questions and the corresponding answers are also available on the Inventure site.

If you have problems, questions, suggestions, or you just want to express your opinion about us or our products, please feel free to write an email to us, and we will surely find a way to the solution.

support@inventure-automotive.com

Come and visit our website, tell us your experience concerning our product, fill out the registration form to be able to inform you directly about the latest results of research and development and the continuously improving customer services.

Your comments are also welcome under the following address:

Inventure Automotive Electronics R&D, Inc.
H-1124 Budapest
Fürj Street 2.
HUNGARY

Phone: (+36) 1 381-0970
12 List of figures

Figure 1: Device connectors .................................................................................................. 9
Figure 2: Micro Fit 4-pin (V_CAN 1) assignment ................................................................. 10
Figure 3: Micro Fit 10-pin (MAIN) assignment ................................................................. 10
Figure 4: USB Mini B to USB A cable ............................................................................... 11
Figure 5: Status LED flashing ........................................................................................... 13

13 List of Tables

Table 1: Input description .................................................................................................. 9
Table 2: Micro Fit 4-pin (V_CAN 1) assignment ................................................................. 10
Table 3: Micro Fit 10-pin (MAIN) assignment ................................................................ 10
Table 5: Device working status ....................................................................................... 13
Table 6: System characteristics ...................................................................................... 16