

VDM10 Demo Application User Guide

Document history

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1. About this User Guide

This user guide refers to the usage of the *VDM10 Demo Application* [1].

In this user guide,

- files and folders are represented in the **Arial** typeface,
- code fragments, function names etc. as well as text typed into input fields are represented in the **Courier New** typeface,
- GUI elements such as button descriptions etc. are represented in “quotation marks”,
- titles of other documents are presented in *Italic* type.

This manual assumes that the reader has successfully installed iShell and is familiar with its usage. For further information on these steps, consult the *Development Environment Setup User Guide* [1] and the *iShell User Guide* [4]. For details on programming iSense Applications, please refer to the *Writing iSense Applications User Guide* [5].

2. General Description of AMR Demo Application

The AMR demo application can be used with a sensor node that consists of

- an iSense Core Module (CM10x, CM20x, CM30x)
- an iSense Vehicle Detection Sensor Module (VDM10)
- an iSense Gateway Module (GM10x, GM20-xP)

The iShell programming, operating and analysis tool is the personal computer counterpart of the iSense AMR demo application on the node. iShell offers its functionality to the user in a number of different views (so called plugins) that group activities on separate tabulator windows.

The AMR demo Application makes use of the following plugins:

- Serial monitor
- Curve illustrator
- Messenger

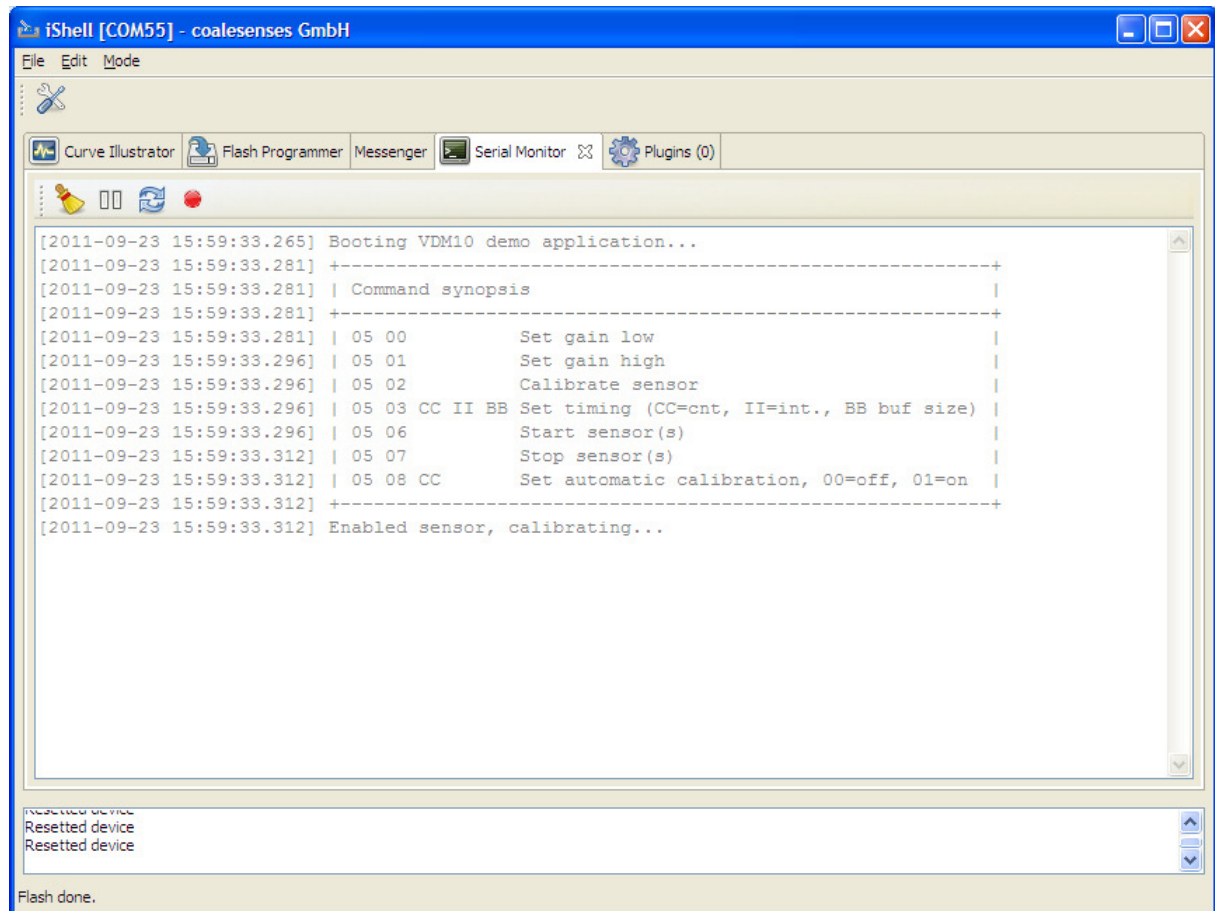
In addition, the Flash programmer plugin is used to flash the demo application onto the sensor node..

3. Getting Started

First of all, connect the sensor node to a PC, and start iShell. Open the “Messenger” and the “Serial Monitor” plugin.

Switch on the sensor node(s). For details on switching on the nodes, please refer to the *Core Module 2 User Guide* [3].

Then, connect iShell to the device by selecting the appropriate serial port. The message “Booting VDM10 Demo Application” as well as a command synopsis appear in the serial monitor.

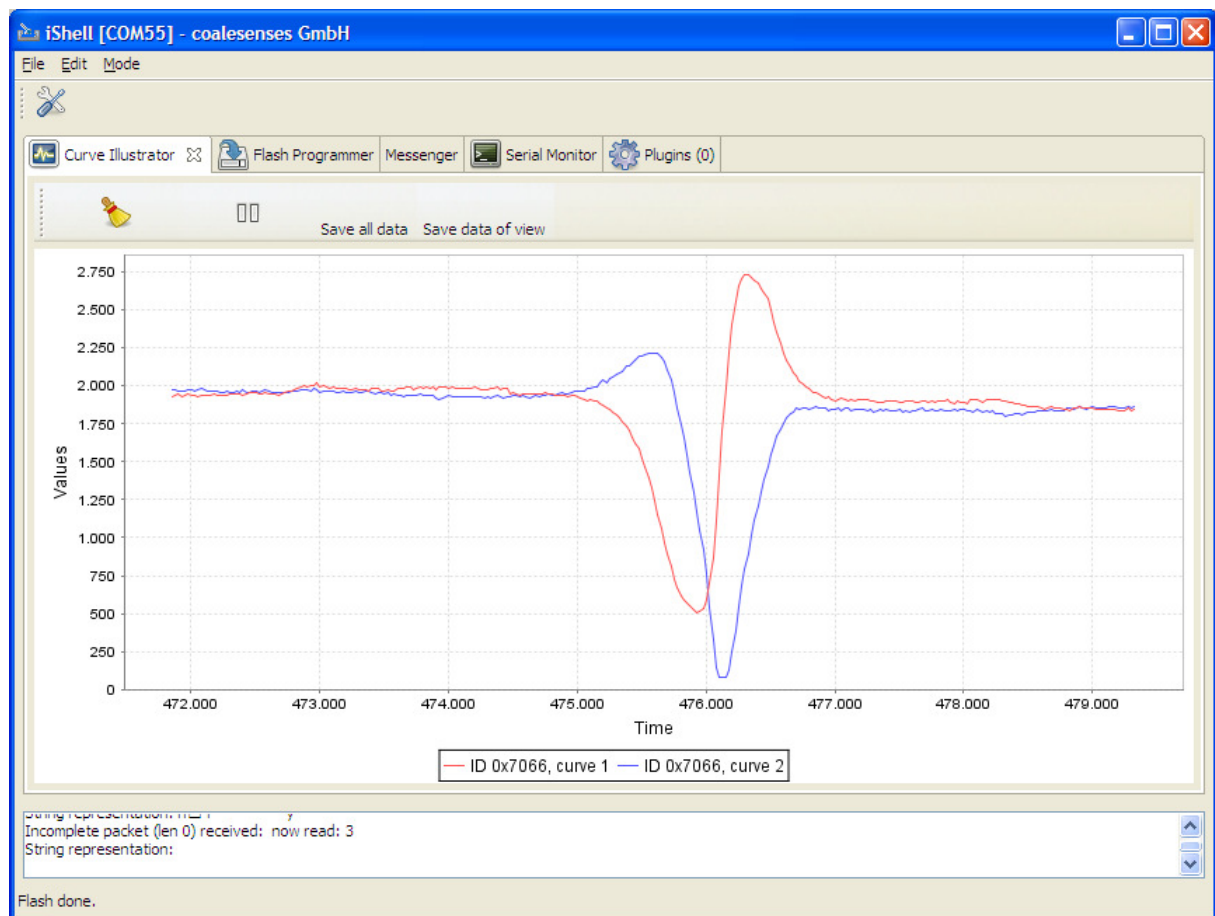


Upon being switched on, the sensor will calibrate their AMR sensors, and start transmitting data after a few seconds. As a result, sensor data will start being displayed in the Curve illustrator window.

By default, the sensor takes a sample every 5ms. After having taken 4 samples, the values will be averaged and stored as one sample in a buffer. After having stored 25 samples in the buffer, the buffer will be transmitted to the connected PC via USB. iShell will then display the values in the Curve Illustrator.

The sensor provides data for both channels in a range from 0 to 4096. As a result of the calibration, an “idle” sensor should deliver data in the middle of the full range, i.e. somewhere around 2000.

When a ferro-magnetic object is moved by the sensor node, the curves will show the typical profile (see below).



The sensors have an auto-calibration feature that is enabled by default. To enable or disable the auto-calibration, please refer to the following section. Auto-calibration automatically starts the calibration at a sensor if the average value for one of the sensor channels is either above 3600 or below 500 for one buffer. However, be aware that a passing ferro-magnetic object may lead to a calibration run, as it might drive sensor values high or low for more than one buffer period, if the sensor samples quickly.

Please be aware that the sensor is extremely sensitive to movement. If the AMR sensor nodes are moved, they must be calibrated again (see below for details).

The sampling interval, the averaging count and the buffer size can be set using the messenger. For details, see the following sections.

4. Operating the AMR Sensor Nodes

You can use the messenger plugin of iShell to send command to the AMR sensor node. To do so, enter the command into the “Message” input field of the “Messenger” plugin, and click on “Send”. For general details on the usage of the “Messenger” plugin, please refer to the *iShell User Guide* [4].

Commands consist of two or more unsigned 8-bit values in hexadecimal representation, divided by a space character. All commands have the following structure:

05 CC P1 P2 ... Pn

where CC is the command, and P1 to Pn are the command parameters.

4.1. Setting the Sensor Gain

The AMR sensor nodes provide two sensor gain settings: high and low. In the low gain setting, the sensor signal is amplified by a factor of approx. 2,000, whereas the high gain setting amplifies by about 20,000.

By default, the sensors operate in the low gain setting, which should be appropriate for most applications. It is recommended to stick to the low gain setting, as the calibration gets significantly more difficult in the high gain setting and might hence fail.

After changing the gain setting, the sensor will automatically re-calibrate.

To set the sensor(s) to the low gain setting, type

05 00

and click on “Send”. The gateway sensor node will confirm the reception of the command by displaying “Sending 'set gain low' command...” in the serial monitor, and forward it to the sensor nodes, which will in turn alter their gain setting, and send back a confirmation message. As a result, the gateway sensor node will display “gain set low” for each sensor node.

Accordingly, the gain is set to high with the command

05 01.

4.2. Manual Sensor Calibration

The sensor(s) can be calibrated with the command

05 02

which the gateway sensor node will confirm with an immediate “Sending 'compensate' command...”. After calibration, the sensor(s) will send a confirm, and “compensating from XXXX” will be displayed in the serial monitor, where XXXX is the sensor’s address.

4.3. Auto-calibration

The sensors have an auto-calibration feature that is disabled by default. To enable or disable the auto-calibration, use command

05 08 XX

where XX is 00 for disabling and 01 for enabling the auto-calibration.

Auto-calibration automatically starts the calibration at a sensor if the average value for one of the sensor channels is either above 3600 or below 500 for one buffer. However, be aware that a passing

ferro-magnetic object may lead to a calibration run, as it might drive sensor values high or low for more than one buffer period, if the sensor samples quickly.

4.4. Sensor Timing Parameters

After boot, the sensor(s) will sample every 5ms, and average 4 such sensor readings into one before putting it into the transmit buffer. When the buffer contains 25 readings per channel, it is transmitted to the gateway sensor node. Consequently, the buffer contains readings at a frequency of 50Hz.

These settings can be changed by the command

```
05 03 CC II BB
```

where CC is the number of samples averaged into one buffer entry, II is the original sample interval, and BB is the number of samples per transmitted buffer.

Be aware that the maximum buffer size is 25 (i.e. 19h), and keep in mind to enter values in the hexadecimal format.

Example 1: to restore the default settings, enter

```
05 03 04 05 19.
```

Example 2: to set the sample rate to 500 Hz without averaging, enter

```
05 03 01 02 19,
```

for sampling at 500 Hz while averaging 2 samples at a buffer size of 20 samples, use

```
05 03 02 01 14.
```

The maximum sampling frequency is consequently bounded at 1 kHz.

It is recommended to always use a buffer size of 25, as this maximum size reduces transmission overhead.

Especially when using high sample rates and multiple sensors, messages (be it command messages, command confirmation messages or data messages) may get lost. If one or more sensors do not reply, simply resend the according commands in iShell.

4.5. Starting and Stopping the Sensors

The sampling process at the AMR sensor nodes can be stopped and starting remotely using the

```
05 07
```

command to stop the sensor(s), and

```
05 06
```

for starting them.

5. References

- [1] coalesenses VDM10 Demo Application, online available at
<http://www.coalesenses.com/index.php?page=hardware-docs-and-demos>
- [2] coalesenses Development Environment Setup User Guide, online available at
<http://www.coalesenses.com/index.php?page=development-environment>
- [3] coalesenses Core Module 3 User Guide, online available at
<http://www.coalesenses.com/index.php?page=hardware-docs-and-demos>
- [4] coalesenses iShell User Guide, online available at
<http://www.coalesenses.com/index.php?page=development-environment>
- [5] coalesenses Writing iSense Applications User Guide, online available at
<http://www.coalesenses.com/index.php?page=isense-applications>

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