VRM Communication Protocol

Version 1.01

Date: October, 24th, 2002

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History

Version	Modifications	Name	Date
0.01	• First Draft	Willmer	11/22/01
0.02	• Variable 1000 added.	Willmer	12/03/01
0.03	• ID 101 renamed as ID 102. • New ID 101 inserted. ID 1001 range changed 0 to 65535. • ID 1001 changed to read only. • ID 1002 added. • ID 1003 added.	Willmer	02/07/02
0.04	• CRC checksum replaced by MOD255+1 checksum. • Fixed frame format replaced by variable frame format. • Error codes changed. • Fields "Representation" and "Access" removed from description of variables. • Field "Availability" added to description of variables. • ID 2 added. • ID100 changed to 16Bit. • ID101 operating modes changed. • ID102 renamed to 103 and replaced by new ID102 (Service Mode). • ID104 added. • ID1001 renamed to ID1002 and replaced by new ID1002 (Turn off cause).	Willmer	04/04/02
0.05	• ID 1003 resolution changed. • Operating mode 0 removed from protocol.	Willmer	04/05/02
1.00	• Added error message 6. • Country code available in all operating modes now. • Number of fueling points reduced to 32. • First public release of the protocol.	Willmer	09/11/02
1.01	• Added error message 7. • Description of ID104 changed. • Description of ID1003 changed.	Willmer	10/24/02

1 Interface

Modulation:	RS232C (RxD, TxD, GND)
Mode:	Halfduplex
Baudrate:	9600bps
Databits:	8
Stopbits:	1
Parity:	none

2 Timing conditions

Response time (start of reply) of VAPORIX Master:	< 1s
Required delay between reply and next command:	> 1ms
Allowed delay between the characters of a command:	< 2s

3 Communication Format

The ASCII based communication protocol works on the master slave principle. The site controller is the master and the VAPORIX Master works as slave. The VAPORIX Master provides all important data of the VAPORIX Control units inside the dispensers. The VAPORIX Master can handle one command at a time. It means that the site controller has to wait for the VAPORIX Masters reply before sending the next command.

3.1 Format of read command

The read command (sent by the site controler) consists of the letter 'R' (case sensitive), a fueling point number, a variable identifier and a checksum, each seperated by colons. The command is concluded by carriage return and line feed.

R : *f* : *i* : *c cr lf*

f : Fueling point number. The value range is 0 to 32. 0 is the number for common data of the VAPORIX Master, e.g. Version of this protocol. 1 to 32 are the numbers of the dispensers real fueling points.

i : Identifier of the desired variable. See chapter 4.

c : Checksum. MOD255 + 1 of the sum of the previous command letters including the last colon.

cr : Carriage Return, ASCII 13_{Dec}.

lf : Line Feed, ASCII 10_{Dec}.

3.2 Reply Format

The reply of the VAPORIX Master consists of the letter 'r', a copy of the received command parameters (fueling point number, variable identifier) and the contents of the variable.

r : *f* : *i* : *v* : *c cr lf*

f : Copy of the fueling point number of the read command.

i : Copy of the variable identifier of the command.

v : Contents of the variable. See chapter 4.

c : Checksum. MOD255 + 1 of the sum of the previous command letters including the last colon.

cr : Carriage Return, ASCII 13_{Dec}.

lf : Line Feed, ASCII 10_{Dec}.

3.4 Error messages

If the VAPORIX Master can't reply to a read command it answers with an error message.

e : *u* : *c cr lf*

e : Letter 'e' indicates an error message.

u : Error code.

1 - No variables available since the VAPORIX Master is in service mode. This message will occur when VAPORIX Master is in use to configure the VAPORIX Controls.
2 - Checksum error.
3 - Fueling point does not exist or is not configured.
4 - Unknown variable identifier.
5 - Variable not available at the current VAPORIX Control operating mode (ID 101) or country settings (ID 103).
6 - Fueling point does not answer.
7 - Fueling point and VAPORIX Master are in different operating modes.

c : Checksum. MOD255 + 1 of the sum of the previous command letters including the last colon.

cr : Carriage Return, ASCII 13_{Dec}.

lf : Line Feed, ASCII 10_{Dec}.

4 Variables

There are two general kinds of variables, common variables and country specific variables.

Common variables are located in the identifier range from 1 to 999. They are independent of country specific laws and regulations. The range from 1 to 99 is reserved for system wide variables (e.g. Version of this communication protocol). The range from 100 to 999 is reserved for fueling point specific variables.

The identifier range from 1000 to 9999 contains variables which are required to comply with the specific laws and regulations of a country. Each country will get its own identfier range.

This identifier structure allows the expansion of the communication protocol without the need to program seperate software moduls for different countries and without the risk to loose backward compatibility.

ID 1 to 999 Basic Variables	ID 1 to 99	Systemwide variables. Access by adressing fueling point number 0 in the command.
	ID 100 to 999	Fueling point specific variables. Access by adressing the real fueling point number.
ID 1000 to 9999 Country Specific Variables	ID 1000 to 1003	Germany. Variables according with German laws and regulations. Available if country code of fueling point = 49.
	... to ...	Reserved for other country.
	... to 9999	Reserved for other country.

4.1 Systemwide variables

The fueling point number has to be 0 to get access to the systemwide variables.

4.1.1 ID 1 - Version of communication protocol

Range:	1 to 9999
Resolution:	0.01
Unit:	None
Availability:	Independent of VAPORIX control operating modes.
Description:	Version of this communication protocoll. For example 104 would mean version 1.04.

4.1.2 ID 2 - Version of VAPORIX Master Firmware

Range:	1 to 9999
Resolution:	0.01
Unit:	None
Availability:	Independent of VAPORIX control operating modes.
Description:	Version of this communication protocoll. For example 7 would mean version 0.07.

4.2 Fueling point specific variables

4.2.1 ID 100 – Status of VAPORIX Control

Range: 0 to 65535

Resolution: 1

Unit: None

Availability: VAPORIX Control operating modes 1, 2, 3.

Description: The value of these status variable represents two bytes with the status bits 0 to 15:

Bit	Description	Bit = 0	Bit = 1
LSB 0	VAPORIX Flow	Ok	VAPORIX Flow not available. Possibly not/wrong connected or defect.
1	Fueling point asignment	Ok	VAPORIX Control detects fuel and vapor flow at different sides of the dispenser. Possibly something is permuted in the vapor recovery system or in the wiring of the monitoring system.
2	VAPORIX Control clock battery low	Ok	Voltage low. Battery should be changed within the next month if the VAPORIX control is in operating mode 1 or 2. In operating mode 3 this bit can be ignored since the battery is not in use.
3	VAPORIX Control clock battery low low	Ok	Voltage very low. Battery should be changed within the next few days if the VAPORIX control is in operating mode 1 or 2. The battery is empty when bit 2 and bit 3 are set. In operating mode 3 this bit can be ignored since the battery is not in use.
4	VAPORIX Control selftest	Ok	Internal error.
5 - 15	Reserved for future options	--	--

4.2.2 ID 101 – VAPORIX Control operating mode

Range: 1 to 3

Resolution: 1

Unit: None

Availability: VAPORIX Control operating modes 1, 2, 3.

Description: The operating mode prescribes which functions has to be performed by the VAPORIX Control and which by a superior system (e.g. site controller). Depending on the operating mode different variables of this communication protocol will become available.

1 - Valuation of vapor recovery and turn off of fueling point by VAPORIX Control.
2 - Valuation of vapor recovery by VAPORIX Master. Turn off of fueling point by site controller. The superior system is a part of the vapor recovery monitoring system.
3 - Valuation of vapor recovery and turn off of fueling point by site controller. The superior system is a part of the vapor recovery monitoring system.

4.2.3 ID 102 – Service mode

Range: 0 to 1

Resolution: 1

Unit: None

Availability: VAPORIX Control operating modes 1, 2, 3.

Description: 0 - VAPORIX Control in regular operation mode.
1 - VAPORIX Control in service operation mode.

4.2.4 ID 103 – Country code

Range: 1 to 9999

Resolution: 1

Unit: None

Availability: VAPORIX Control operating modes 1, 2, 3.

Description: Defines which country specific vapor recovery laws and regulations are currently used by the VAPORIX Control at the fueling point. The country code is the international dialling code. This variable indicates which country specific variables are available. At this protocol version only Germany has regulations for vapor recovery monitoring.

Country code	Availabe country specific variables
49	1000 to 1003

4.2.5 ID 104 – Test functions

Range: 0 to 2

Resolution: 1

Unit: None

Availability: VAPORIX Control operating modes 1, 2, 3.

Description: The VAPORIX Control offers different test functions for the service on site. In operating mode 1 these functions are performed by the VAPORIX Control. In operating mode 2 these functions must be performed by the superior system (e.g. site controller). In operating mode 3 these functions can be used by the superior system, but it is also possible that the superior system has an own service interface to perform test procedures.

0 - No test functions.

1 - Test of the fueling point alarm and turn off (ID 1000 and ID 1001 can be changed manually by the maintenance man). This function will be cancelled (ID 104 switches back to 0) automatically after 10 minutes if it isn't cancelled by the maintenance man within this time.

2 - Temporary unlock of a fueling point (if turned off) for service diagnosing. This function will be cancelled (ID 104 switches back to 0) automatically after 60 minutes if it isn't cancelled by the maintenance man within this time.

3 - Unlock of a fueling point after defect repaired. This function will reset all turn off related components of the fueling point. This function will be cancelled when service operation is finished (ID 102 = 0) if it isn't cancelled by the maintenance man within this time.

4.3 Country specific variables

4.3.1 ID 1000 – Turn off counter - Germany

Range: 0 to 65535

Resolution: 1

Unit: None

Availability: VAPORIX Control operating modes 1, 2.

Description: In Germany a fueling point must be turned off 72 hours after the occurance of a vapor recovery defect or monitoring defect. This variable is a minute counter which contains the value 65535 as long as there is no defect detected. When a defect occurs the counter will be set to 4320 minutes (72 hours) and starts to count down. The turn off counter remains 0 after the 72 hours are expired. If the counter is 0 the fueling point must be turned off. This can be done either inside the dispenser by the VAPORIX Control turn off output (operating mode 1) or by the site controller (operating mode 2). A reset of the counter can be performed only by the maintenance staff.

4.3.2 ID 1001 – Turn off cause - Germany

Range: 0 to 2

Resolution: 1

Unit: None

Availability: VAPORIX Control operating modes 1, 2.

Description:
0 - Turn off counter not active.
1 - Turn off counter active. Caused by a defect of the vapor recovery system .
2 - Turn off counter active. Caused by a defect of the monitoring system.

4.3.3 ID 1002 – Fueling counter - Germany

Range: 0 to 65535

Resolution: 1

Unit: Minutes

Availability: VAPORIX Control operating mode 3.

Description: In Germany an evaluable fueling process is defined as a continuous fueling with at least:

- A flow of 25 litres per minute.
- A duration of 20 seconds.

In this way it is not required to evaluate canister and motorbike fuelings where the vapor recovery systems does not work properly.

The fueling counter shows the number of evaluated fueling processes. When the counter reaches 65535 it will turn over and restart with 0 at the next evaluated fueling.

The fueling counter can be used by the site controller to determine whether the last fueling has been evaluated by the VAPORIX Control.

Note: The counter may be incremented twice or more when there are pauses of more than 60 seconds during a fueling.

This variable is available only if the VAPORIX Control is configured for operating mode 3 (ID 101) which can be done by the maintenance staff only.

4.3.4 ID 1003 – Last recovery rate - Germany

Range: 0 to 199

Resolution: 1

Unit: Percent

Availability: VAPORIX Control operating mode 3.

Description: This value shows the vapor recovery rate of the last evaluated fueling (>25l/m, >20sec). It can be used by the site controller to make an own valuing of the evaluated fueling. To detect whether a fueling has been evaluated by the VAPORIX Control the site contoller has to check the fueling counter (ID 1002).

This variable is available only if the VAPORIX Control is configured for operating mode 3 (ID 101) which can be done by the maintenance staff only.