

## MIC6 J1939

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## 1 Introduction

### 1.1 Purpose of the Document

This document describes the J1939 MOTORTECH implementation of the ignition controller MIC6.

### 1.2 Validity of the Document

This document is valid for MIC6 ignition controller.

### 1.3 Applicable Documents

- SAE J1939
- SAE J1939/21
- SAE J1939/71
- SAE J1939/73
- SAE J1939/81
- svn://motdev01.motortech.local/development/projects/P920380/trunk/900-Software/930-Design/MIC6-Status-Bits\_EN.odt
- svn://motdev01.motortech.local/development/projects/ P920380/trunk/900-Software/910-Requirements/J1939/BinaryFileLayout.odg
- svn://motdev01.motortech.local/development/projects/ P920380/trunk/900-Software/910-Requirements/J1939/J1939\_AddressClaiming.odg
- svn://motdev01.motortech.local/development/projects/ P920380/trunk/900-Software/910-Requirements/J1939/MIC6\_J1939\_BinaryFileTransmission.odt
- svn://motdev01.motortech.local/development/projects/ P920380/trunk/900-Software/910-Requirements/J1939/J1939\_MemoryWriteAccessStateMachine.odg
- svn://motdev01.motortech.local/development/projects/ P920380/trunk/900-Software/910-Requirements/J1939/J1939\_TransportProtocolStateMachine.odg
- svn://motdev01.motortech.local/development/projects/ P920380/trunk/900-Software/910-Requirements/J1939/SequenceDiagramMultipleMemoryAccesses.odg
- svn://motdev01.motortech.local/development/projects/ P920380/trunk/900-Software/910-Requirements/J1939/SequenceDiagramOneMemoryAccess.odg

### 1.4 Definitions of Terms and Abbreviations

Term or Abbreviation	Comment
BL	Boot Loader
CA	Crank Angle
FW	Firmware
MIC	<b>MOTORTECH Ignition Controller</b>
MICT	<b>MOTORTECH Integrated Configuration Tool</b>
PDU	Protocol Data Unit
PF	PDU Format

PS	PDU Specific
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**Tab. 1** Terms and Abbreviations**1.5 Notation Notes**

Ignition controller is used as synonym for the MIC6 **MOTORTECH** Ignition **C**ontroller (MIC).

## 2 J1939 Implementation

### 2.1 Source Address of Ignition Controller

The J1939 source address of the ignition controller can be configured via:

MICT → Communication → J1939 → Source Address

The default source address value is 52 (0x34), used by single address capable address claiming.

### 2.2 Timing Sign

Sign	Direction
Positive	later, retarded
Negative	earlier, advanced

**Tab. 2** Timing Sign

### 2.3 Start Phase / Normal Operation and Schedule A/B

It is not recommended to use *start phase / normal operation* or *schedule A/B*, if *spark intensity* and *spark duration* should be controlled via J1939. These values are the sum of a configured parameter, only changeable by configuration download, and an adjustment, which can be modified at runtime. This adjustment is calculated in a way that *spark duration / spark intensity* meet the appropriate values, transmitted via J1939.

The configured values used for the calculation depend on current active *schedule A/B* and *start phase / normal operation*. Therefore the resulting *spark intensity / spark duration* can be changed, if the appropriate configured values for *schedule A/B* and *start phase / normal operation* are different. The adjustment calculation uses the configuration value according *schedule A/B* and *start phase / normal operation* present at receive time of the PGN.

### 2.4 Cylinder Numbering

The cylinders are counted in ignition sequence order, that means, that the cylinder with the lowest firing angle is numbered with 1 and the cylinder with the highest firing angle is numbered as N (N = number of cylinders).

### 2.5 Bit / Byte Numbering

Byte 0								Byte 1								Byte 2								Byte 3							
7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0

  

Byte 4								Byte 5								Byte 6								Byte 7							
7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0

**Tab. 3** Bit/Byte Numbering

Other than SAE J1939-71 bits and bytes are numbered from 7 (MSB) to 0 (LSB) and not from 8 (MSB) to 1 (LSB).

### 2.6 Unavailable / Unconfigured Values

Unavailable or unconfigured values are marked in accordance to SAE J1939-71 with 0xFF, 0xFFFF or 0xFFFFFFFF. For example if only 4 ignition outputs are used, cylinders from 5 to number of MIC6 outputs are treated as unconfigured.

Cylinders above the number of MIC6 outputs to 24 are treated as unavailable.

The MIC6 supports up to 24 cylinders.

## 2.7 PGNs

Rx PGNs are received by the ignition controller. Tx PGNs are sent by the ignition controller on request or periodically.

PGNs with PDU format 0xFF are proprietary.

### 2.7.1 Rx PGNs

#### 2.7.1.1 Request (0xEAXy)

Data length: 3

Default priority: 6

PGN: 0xEAXy (xy = source address of ignition controller)

Byte	Bit	Name	Value Range	Unit and Scaling
0		PS of requested PGN		
1		PF of requested PGN		
2		Data page of requested PGN		

**Tab. 4** Request (0xEAXy)

With this PGN the Tx PGNs can be requested. In case of requesting an invalid Tx PGN a negative acknowledge will be sent from the ignition controller.

#### 2.7.1.2 Time and Date Adjust (0xD5xy)

Data length: 8

Default priority: 6

PGN: 0xD5xy (xy = source address of ignition controller)

Byte	Bit	Name	Value Range	Unit and Scaling
0		Adjust Seconds	0x00...0xFA	1:0.25 s
1		Adjust Minutes	0x00...0xFA	1:1 min
2		Adjust Hours	0x00...0xFA	1:1 h
3		Adjust Month	0x00...0xFA	1:1 month
4		Adjust Day	0x00...0xFA	1:0.25 days
5		Adjust Year	0x00...0xFA	1:1 year Offset 1985
6		Adjust Local Minute Offset	0x00...0xFA	1:1 min Offset -125 min

7		Adjust Local Hour Offset	0x00...0xFA	1:1 h Offset -125 h
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**Tab. 5** Time and Date Adjust (0xD5xy)

The real-time clock (RTC) of the ignition controller stores the local time. In case of UTC with offset the RTC is set to the resulting local time. If the time standard is unknown, the received time will be assumed as local time without offset. Pure UTC is ignored.

The flowchart for interpreting time, date and local hour offset is described in J1939-21, May 2012, Appendix D.

The time in bytes 0 to 7 is coded as followed:

- Adjust Seconds
  - Operational range: 0...59.75 seconds
  - PGNs with values beyond the operational range will be completely discarded.
- Adjust Minutes
  - Operational range: 0...59 minutes
  - PGNs with values beyond the operational range will be completely discarded.
- Adjust Hours
  - Operational range: 0...23 hours
  - PGNs with values beyond the operational range will be completely discarded.
  - Values beyond the range from 0x00 to 0xFA will be discarded. The last valid value will be used instead.
- Adjust Month
  - Operational range: 1...12, 1 → January ... 12 → December
  - PGNs with values beyond the operational range will be completely discarded.
- Adjust Day
  - Operational range: 1...124, 1...4 → day 1, 5...8 → day 2 ... 121...124 → day 31
  - PGNs with values beyond the operational range will be completely discarded.
- Adjust Year
  - Operational range: 15...114, 15 → 2000 ... 114 → 2099, offset from year 1985
  - The operational range is restricted to range 15 to 114 due to hardware requirements of the used RTC.
  - PGNs with values beyond the operational range will be completely discarded.
- Adjust Local Minute Offset
  - Operational range: -59...+59 min, 66 → -59 min ... 184 → +59 min
- Adjust Local Hour Offset
  - Operational range: -23...+23 h, 102 → -23 h ... 148 → 23 h

The used time standard is interpreted from *Adjust Local Hour Offset* as follows:

Adjust Local Hour Offset	Time Standard	RTC Setting
0xFF	unknown time standard	RTC is left unchanged
0xFA	local time without offset	RTC is set
0xF9	UTC	not supported, RTC is left unchanged
0x66 to 0x94	UTC with offset	set RTC to resulting local time, if <i>Adjust Local Minute Offset</i> is valid (i.e. 0x42 to 0xB8)

**Tab. 6** Time Standard Used

It is recommended, to use local time without offset mode (*Adjust Local Hour Offset* = 0xFA)

### 2.7.1.3 Stop Start Broadcast, DM13 (0xDFxy)

Data length: 8

Default priority: 6

PGN: 0xDFxy (xy = source address of ignition controller)

Byte	Bit	Name	Value Range	Unit and Scaling
0	0	J1939 Network 1	Unused	
	1	Primary vehicle network		
	2	J19299	Unused	
	3			
	4	J1787	Unused	
	5			
	6	Current Data Link	00...01	00: Stop Broadcast 01: Start Broadcast 10: Reserved 11: Don't care, no action
	7			
1	0	Other, Manufacturer Specific Port	Unused	
	1			
	2	J1850	Unused	
	3			
	4	ISO 9141	Unused	
	5			
	6	J1939 Network 2	Unused	
	7			
2	0	SAE Reserved	Unused	



	1			
	2	SAE Reserved	Unused	
	3			
	4	SAE Reserved	Unused	
	5			
	6	J1939 Network 3	Unused	
	7			
3	0	Suspend Signal	Unused	
	1			
	2			
	3			
	4	Hold Signal	0000...0001	0000: All Devices 0001: Modified Devices
	5			
	6			
	7			
4		Suspend Duration	Unused	
5				
6		SAE Reserved	Unused	
7				

**Tab. 7** Stop Start Broadcast, DM13 (0xDFxy)

According to SAE-J1939-73 the broadcasts can be stopped for 6 seconds via these PGN.

The PGNs which can be stopped are:

- 0xF004: Electronic Engine Controller 1
- 0xFF0F: MIC Status
- 0xFF11: MIC Error 1
- 0xFF12: MIC Error 2
- 0xFF13: Ignition Primary Error
- 0xFF14: Ignition Secondary Error

Broadcasts can be enabled or disabled via global (0xDFFF) or specific (0xDFxy, xy = own address) request. Hold signal can only be sent via global request.

- To disable broadcasts of the above mentioned PGNs bits 7:6 of byte 0 must be set to 01 and bytes 3 to 7 to 0xFF.
- To enable broadcasts before 6 seconds are elapsed, bits 7:6 of byte 0 must be set to 00 and bytes 3 to 7 to 0xFF.
- To extend the disable time a hold signal must be sent before 6 seconds are elapsed. Bits 7:4 of byte 3 must be set to 0000 or 0001 and all other bytes must be set to 0xFF.

#### 2.7.1.4 Global Timing and Intensity (0xEFxy)

Data length: 8

Priority: 6

PGN: 0xEFxy (xy = source address of ignition controller)

Byte	Bit	Name	Value Range	Unit and Scaling
0		Global Timing Correction	0x0000...0xFAFF	1:1/128° CA, Offset -200° CA
1				
2		Reserved		
3		Reserved		
4		Spark Intensity A	0x00...0xFA	1:1 mA
5		Spark Intensity B	0x00...0xFA	1:1 mA
6		Reserved		
7		Reserved		

**Tab. 8** Global Timing and Intensity (0xEFxy)

The *global timing* is the sum of *base timing*, *potentiometer timing*, *analog current* and *voltage input timing*, *speed curve* and *global timing correction*. If *global timing* should be controlled only by *global timing correction*, transmitted via this PGN, all other above mentioned timings can be set to zero or disabled via MICT.

The *spark intensity* is the sum of configured spark intensity and an internal offset. The ignition controller calculates these offsets, so that the resulting spark intensity meets value, which is transmitted via this PGN.

The *global timing correction* and the offsets for spark intensity A and B are stored persistently. After downloading a new configuration, these values will be set to 0, therefore this PGN should be sent after every configuration download.

There are two spark intensity configuration parameters per schedule: one for *start phase* and one for *normal operation*. Therefore these PGN should be sent every time the start phase is entered or left, if there are different spark intensity configuration for start and normal operation phase.

#### 2.7.1.5 Software Identification (0xFEDA)

Data length: from 17 to 51; depends on firmware and boot loader version

Priority: transmitted via multi-packet broadcast or peer to peer transfer

PGN: 0xFEDA

Byte	Description		Value Range	
0	Number Of Identification Fields		2	
up to 3 bytes	Firmware Version	Major Number	0x30...0x39	
			0x30...0x39	
			0x30...0x39	
1 byte			0x2E	

up to 3 bytes		Minor Number	0x30...0x39	
			0x30...0x39	
			0x30...0x39	
1 byte			0x2E	
up to 5 bytes		Bugfix Number	0x30...0x39	
			0x30...0x39	
			0x30...0x39	
			0x30...0x39	
			0x30...0x39	
1 byte			0x2E	
up to 10 bytes		SVN version	0x30...0x39	
			0x30...0x39	
			0x30...0x39	
			0x30...0x39	
	0x30...0x39			
	0x30...0x39			
	0x30...0x39			
	0x30...0x39			
	0x30...0x39			
	0x30...0x39			
1 byte			0x2A	
up to 3 bytes	Boot Loader Version	Major Number	0x30...0x39	
			0x30...0x39	
			0x30...0x39	
1 byte			0x2E	
up to 3 bytes		Minor Number	0x30...0x39	
			0x30...0x39	
			0x30...0x39	
1 byte			0x2E	
up to 5 bytes		Bugfix Number	0x30...0x39	
			0x30...0x39	
			0x30...0x39	

			0x30...0x39	
			0x30...0x39	
1 byte			0x2E	
up to 10 bytes		SVN version	0x30...0x39	
			0x30...0x39	
			0x30...0x39	
			0x30...0x39	
			0x30...0x39	
			0x30...0x39	
			0x30...0x39	
			0x30...0x39	
			0x30...0x39	
			0x30...0x39	
1 byte			0x2A	

**Tab. 9** Software Identification (0xFEDA)

The software identification PGN can be requested via PGN 0xEAxy.

In case of a global request with xy = 0xFF the software identification will be sent via broadcast multi-packet transmission described in J1939/21 (transport protocol, broadcast transfer).

In case of a peer to peer request with xy = own address the software identification will be sent via peer to peer multi-packet transmission described in J1939/21 (transport protocol, connection mode transfer).

The software identification uses the following template:

- FW Major.FW Minor.FW Bugfix.FW SVN Release\*
- BL Major.BL Minor.BL Bugfix.BL SVN Release\*

FW abbreviates firmware and BL boot loader.

Major and minor number ranges are from 0 to 255, bugfix range is from 0 to 65535 and SVN release from 0 to 4294967295.

Every digit is transmitted in ASCII.

#### 2.7.1.6 Spark Durations 1 – 3 (0xFF4A – 0xFF4C)

Data length: 8

Priority: 6

PGN: 0xFF4A – 0xFF4C

Byte	Bit	Name	Value Range	Unit and Scaling
0		Spark Duration Cyl 1 / 9 / 17	0x00...0xFA	1:10 µs
1		Spark Duration Cyl 2 / 10 / 18	0x00...0xFA	1:10 µs

2		Spark Duration Cyl 3 / 11 / 19	0x00...0xFA	1:10 $\mu$ s
3		Spark Duration Cyl 4 / 12 / 20	0x00...0xFA	1:10 $\mu$ s
4		Spark Duration Cyl 5 / 13 / 21	0x00...0xFA	1:10 $\mu$ s
5		Spark Duration Cyl 6 / 14 / 22	0x00...0xFA	1:10 $\mu$ s
6		Spark Duration Cyl 7 / 15 / 23	0x00...0xFA	1:10 $\mu$ s
7		Spark Duration Cyl 8 / 16 / 24	0x00...0xFA	1:10 $\mu$ s

**Tab. 10** Spark Durations 1 – 3 (0xFF4A – 0xFF4C)

PGN 0xFF4A controls *spark duration* of cylinders 1 to 8, PGN 0xFF4B of cylinders 9 to 16 and PGN 0xFF4C of cylinders 17 to 24.

The ignition controller calculates the cylinder individual spark duration offset, so that the resulting spark duration meets the value, which is transmitted via this PGN.

The calculated offset is stored persistently but will be set to 0 after configuration download.

Because there are four configured spark duration parameters, one per *schedule A/B* and one per *start phase/normal operation*, this PGN must be sent every time, the configured parameter changes.

#### 2.7.1.7 Misc Setup (0xFF4D)

Data length: 8

Priority: 6

PGN: 0xFF4D

Byte	Bit	Name	Value Range	Unit and Scaling
0		Offset Index Mark Position	0x00...0xFA	1:0.1° CA Offset -12,5° CA
1		Command		
2		Sub Command		
3		Optional Cmd Parameter 0		
4		Optional Cmd Parameter 1		
5		Optional Cmd Parameter 2		
6		Optional Cmd Parameter 3		
7		Optional Cmd Parameter 4		

**Tab. 11** Misc Setup (0xFF4D)

The *reset position* is the sum of configured index/reset position and the offset index mark position. The index mark position is stored persistently but is set to 0 after configuration download.

The index/reset position can be configured via:

MICT → Pickups → Index/Reset Position

The following commands are available:

Command		Sub Command		Optional Parameter				
Value	Name	Value	Name	0	1	2	3	4
0	do nothing	---	---	---	---	---	---	---
1	configuration start	---	---	---	---	---	---	---
2	configuration end	---	---	---	---	---	---	---
3	configuration end with discard	---	---	---	---	---	---	---
4	acknowledge warnings	---	---	---	---	---	---	---
5	acknowledge operational errors	---	---	---	---	---	---	---
6	acknowledge alarms	---	---	---	---	---	---	---
7	Reserved	---	---	---	---	---	---	---
8	Reserved	---	---	---	---	---	---	---
9	access ctrl	0	enable	---	master pin		---	---
		1	disable	---	master pin		---	---
		2	change pin	level	old pin		new pin	
		3	reset all pins	---	master pin		---	---
10	enable testbed	---	---	---	---	---	---	---
11	disable testbed	---	---	---	---	---	---	---

**Tab. 12** Available commands

*2.7.1.8 Individual Timing Offsets 1 – 3 (0xFFF5 – 0xFFF7)*

Data length: 8

Priority: 6

PGN: 0xFFF5 – 0xFFF7

Byte	Bit	Name	Value Range	Unit and Scaling
0		Timing Offset Cyl 1 / 9 / 17	0x00...0xFA	1:0.1° CA Offset -12.5° CA
1		Timing Offset Cyl 2 / 10 / 18	0x00...0xFA	1:0.1° CA

				Offset -12.5° CA
2		Timing Offset Cyl 3 / 11 / 19	0x00...0xFA	1:0.1° CA Offset -12.5° CA
3		Timing Offset Cyl 4 / 12 / 20	0x00...0xFA	1:0.1° CA Offset -12.5° CA
4		Timing Offset Cyl 5 / 13 / 21	0x00...0xFA	1:0.1° CA Offset -12.5° CA
5		Timing Offset Cyl 6 / 14 / 22	0x00...0xFA	1:0.1° CA Offset -12.5° CA
6		Timing Offset Cyl 7 / 15 / 23	0x00...0xFA	1:0.1° CA Offset -12.5° CA
7		Timing Offset Cyl 8 / 16 / 24	0x00...0xFA	1:0.1° CA Offset -12.5° CA

**Tab. 13** Individual Timing Offsets 1 – 3 (0xFFF5 – 0xFFF7)

PGN 0xFFF5 controls timing offset of cylinders 1 to 8, PGN 0xFFF6 of cylinders 9 to 16 and PGN 0xFFF7 of cylinders 17 to 24.

The cylinder individual timing offsets are stored persistently and will be set to 0 after configuration download.

## 2.7.2 Tx PGNs

### 2.7.2.1 Electronic Engine Controller 1 (0xF004)

Transmission rate: on request, on change, every 20 ms, minimum time 20 ms

Data length: 8

Priority: 3

PGN: 0xF004

Byte	Bit	Name	Value Range	Unit and Scaling
0		Reserved		
1		Reserved		
2		Reserved		
3		Engine Speed	0x0000...0FAFF	1:0.125 RPM
4				Offset 0 RPM
5		Source Address of Controlling Device for Engine Control	0x00...0xFA	The configured source address of the MIC6 Offset 0

6		Reserved		
7		Reserved		

**Tab. 14** Electronic Engine Controller 1 (0xF004)

### 2.7.2.2 Engine Spark Voltage 6 – 1 (0xFD72 – 0xFD77)

Transmission rate: on request

Data length: 8

Priority: 6

PGN: 0xFD72 – 0xFD77

Byte	Bit	Name	Value Range	Unit and Scaling
0		Secondary Voltage Cylinder 21 / 17 / 13 / 9 / 5 / 1	0x0000...0FAFF	1:1 V
1				Offset 0 V
2		Secondary Voltage Cylinder 22 / 18 / 14 / 10 / 6 / 2	0x0000...0FAFF	1:1 V
3				Offset 0 V
4		Secondary Voltage Cylinder 23 / 19 / 15 / 11 / 7 / 3	0x0000...0FAFF	1:1 V
5				Offset 0 V
6		Secondary Voltage Cylinder 24 / 20 / 16 / 12 / 8 / 4	0x0000...0FAFF	1:1 V
7				Offset 0 V

**Tab. 15** Engine Spark Voltage 6 – 1 (0xFD72 – 0xFD77)

PGN 0xFD72 shows *secondary voltage* of cylinders 21 to 24, PGN 0xFD73 of cylinders 17 to 20, PGN 0xFD74 of cylinders 13 to 16, PGN 0xFD75 of cylinders 9 to 12, PGN 0xFD76 of cylinders 5 to 8 and PGN 0xFD77 of cylinders 1 to 4.

*Secondary voltage estimation* must be supported by the selected *coil type*. It is configured via:

MICT → Schedule A/B → Energy → Max. Breakdown Voltage

The *maximum breakdown voltage* depends on the selected coil and must be set to the correct value. If *secondary estimation* is disabled due to above mentioned causes, 0xFFFF will be sent.

### 2.7.2.3 Time and Date (0xFEE6)

Transmission rate: on request

Data length: 8

Priority: 6

PGN: 0xFEE6

Byte	Bit	Name	Value Range	Unit and Scaling
0		Adjust Seconds	0x00...0xFA	1:0.25 s
1		Adjust Minutes	0x00...0xFA	1:1 min
2		Adjust Hours	0x00...0xFA	1:1 h



3		Adjust Month	0x00...0xFA	1:1 month
4		Adjust Day	0x00...0xFA	1:0.25 days
5		Adjust Year	0x00...0xFA	1:1 year Offset 1985
6		Adjust Local Minute Offset	0x00...0xFA	1:1 min Offset -125 min
7		Adjust Local Hour Offset	0x00...0xFA	1:1 h Offset -125 h

**Tab. 16** Time and Date (0xFEE6)

The real-time clock (RTC) is set to local time, UTC with local offset is not supported.

The time in bytes 0 to 7 is coded as followed:

- Adjust Seconds
  - Operational range: 0 to 59.75 seconds
  - The resolution of the RTC is restricted to seconds.
- Adjust Minutes
  - Operational range: 0 to 59 minutes
- Adjust Hours
  - Operational range: 0 to 23 hours
- Adjust Month
  - Operational range: 1 to 12, 1 → January ... 12 → December
- Adjust Day
  - Operational range: 1 to 124, 1...4 → day 1, 5...8 → day 2 ... 121...124 → day 31
- Adjust Year
  - Operational range: 15 to 114, 15 → 2000, 114 → 2099, offset from year 1985
  - The operational range is restricted to range 15 to 114 due to hardware requirements of the used RTC.
- Adjust Local Minute Offset
  - To indicate usage of local time Adjust Local Minute Offset is set to 0xFF.
- Adjust Local Hour Offset
  - To indicate usage of local time Adjust Local Hour Offset is set to 0xFA.

#### 2.7.2.4 MIC Status (0xFF0F)

Transmission rate: on request, on change, every 1000 ms, minimum time 50 ms

Data length: 8

Priority: 6

PGN: 0xFF0F

Byte	Bit	Name	Description
0		General Status 1	See document Status-Bits EN for details.
1			
2			
3			
4		General Status 2	See document Status-Bits EN for details.
5			
6			
7			

**Tab. 17** MIC Status (0xFF0F)*2.7.2.5 Configuration Signature (0xFF10)*

Transmission rate: on request

Data length: 8

Priority: 6

PGN: 0xFF10

Byte	Bit	Name	Value Range	Unit and Scaling
0		Signature		0 = configuration via MICT
1		Reserved		
2		Reserved		
3		Reserved		
4	0	Reserved		
	1	Access Ctrl State	0...1	0 = AccessCtrl disabled 1 = AccessCtrl enabled
	2	Reserved		
	3	Reserved		
	4	Reserved		
	5	Reserved		
	6	Reserved		
	7	Reserved		
5		Command Reply		
6		Reserved		
7		Reserved		

**Tab. 18** Configuration Signature (0xFF10)

If the MIC enters the configuration state, the signature will be set to 0. In case of configuration via J1939 memory access the signature can be set to a characteristic value to identify this configuration. Therefore configuration via MICT can be detected.

The AccessCtrl state is signalled via bit 1 of byte 4, the return value of the last command, initiated by PGN 0xFF4D (MiscSetup), can be read via byte 5.

#### 2.7.2.6 MIC Error 1 (0xFF11)

Transmission rate: on request, on change, every 5000ms, minimum time 50ms

Data length: 8

Priority: 6

PGN: 0xFF11

Byte	Bit	Name	Description
0		Error	See document Status-Bits EN for details.
1			
2			
3			
4		Pickup Status 1	See document Status-Bits EN for details.
5			
6			
7			

**Tab. 19** MIC Error 1 (0xFF11)

#### 2.7.2.7 MIC Error 2 (0xFF12)

Transmission rate: on request, on change, every 5000 ms, minimum time 50 ms

Data length: 8

Priority: 6

PGN: 0xFF12

Byte	Bit	Name	Description
0		Pickup Status 2	See document Status-Bits EN for details.
1			
2			
3			
4		Pickup Status 3	See document Status-Bits EN for details.
5			
6			
7			

**Tab. 20** MIC Error 2 (0xFF12)

*2.7.2.8 Ignition Primary Error (0xFF13)*

Transmission rate: on request, on change, every 5000 ms, minimum time 50 ms

Data length: 8

Priority: 6

PGN: 0xFF13

Byte	Bit	Name	Value Range	Unit and Scaling
0	0	Primary Open Cylinder 1		
	1	Primary Open Cylinder 2		
	2	Primary Open Cylinder 3		
	3	Primary Open Cylinder 4		
	4	Primary Open Cylinder 5		
	5	Primary Open Cylinder 6		
	6	Primary Open Cylinder 7		
	7	Primary Open Cylinder 8		
1	0	Primary Open Cylinder 9		
	1	Primary Open Cylinder 10		
	2	Primary Open Cylinder 11		
	3	Primary Open Cylinder 12		
	4	Primary Open Cylinder 13		
	5	Primary Open Cylinder 14		
	6	Primary Open Cylinder 15		
	7	Primary Open Cylinder 16		
2	0	Primary Open Cylinder 17		
	1	Primary Open Cylinder 18		
	2	Primary Open Cylinder 19		
	3	Primary Open Cylinder 20		
	4	Primary Open Cylinder 21		
	5	Primary Open Cylinder 22		
	6	Primary Open Cylinder 23		
	7	Primary Open Cylinder 24		
3		Reserved		
4	0	Primary Short Cylinder 1		

	1	Primary Short Cylinder 2		
	2	Primary Short Cylinder 3		
	3	Primary Short Cylinder 4		
	4	Primary Short Cylinder 5		
	5	Primary Short Cylinder 6		
	6	Primary Short Cylinder 7		
	7	Primary Short Cylinder 8		
5	0	Primary Short Cylinder 9		
	1	Primary Short Cylinder 10		
	2	Primary Short Cylinder 11		
	3	Primary Short Cylinder 12		
	4	Primary Short Cylinder 13		
	5	Primary Short Cylinder 14		
	6	Primary Short Cylinder 15		
	7	Primary Short Cylinder 16		
6	0	Primary Short Cylinder 17		
	1	Primary Short Cylinder 18		
	2	Primary Short Cylinder 19		
	3	Primary Short Cylinder 20		
	4	Primary Short Cylinder 21		
	5	Primary Short Cylinder 22		
	6	Primary Short Cylinder 23		
	7	Primary Short Cylinder 24		
7		Reserved		

**Tab. 21** Ignition Primary Error (0xFF13)*2.7.2.9 Ignition Secondary Error (0xFF14)*

Transmission rate: on request, on change, every 5000 ms, minimum time 50 ms

Data length: 8

Priority: 6

PGN: 0xFF14

Byte	Bit	Name	Value Range	Unit and Scaling
0	0	Secondary Open Cylinder 1		

	1	Secondary Open Cylinder 2		
	2	Secondary Open Cylinder 3		
	3	Secondary Open Cylinder 4		
	4	Secondary Open Cylinder 5		
	5	Secondary Open Cylinder 6		
	6	Secondary Open Cylinder 7		
	7	Secondary Open Cylinder 8		
1	0	Secondary Open Cylinder 9		
	1	Secondary Open Cylinder 10		
	2	Secondary Open Cylinder 11		
	3	Secondary Open Cylinder 12		
	4	Secondary Open Cylinder 13		
	5	Secondary Open Cylinder 14		
	6	Secondary Open Cylinder 15		
	7	Secondary Open Cylinder 16		
2	0	Secondary Open Cylinder 17		
	1	Secondary Open Cylinder 18		
	2	Secondary Open Cylinder 19		
	3	Secondary Open Cylinder 20		
	4	Secondary Open Cylinder 21		
	5	Secondary Open Cylinder 22		
	6	Secondary Open Cylinder 23		
	7	Secondary Open Cylinder 24		
3		Reserved		
4	0	Secondary Short Cylinder 1		
	1	Secondary Short Cylinder 2		
	2	Secondary Short Cylinder 3		
	3	Secondary Short Cylinder 4		
	4	Secondary Short Cylinder 5		
	5	Secondary Short Cylinder 6		
	6	Secondary Short Cylinder 7		
	7	Secondary Short Cylinder 8		

5	0	Secondary Short Cylinder 9		
	1	Secondary Short Cylinder 10		
	2	Secondary Short Cylinder 11		
	3	Secondary Short Cylinder 12		
	4	Secondary Short Cylinder 13		
	5	Secondary Short Cylinder 14		
	6	Secondary Short Cylinder 15		
	7	Secondary Short Cylinder 16		
6	0	Secondary Short Cylinder 17		
	1	Secondary Short Cylinder 18		
	2	Secondary Short Cylinder 19		
	3	Secondary Short Cylinder 20		
	4	Secondary Short Cylinder 21		
	5	Secondary Short Cylinder 22		
	6	Secondary Short Cylinder 23		
	7	Secondary Short Cylinder 24		
7		Reserved		

**Tab. 22** Ignition Secondary Error (0xFF14)*2.7.2.10 Ignition Timing 1 – 5 (0xFE82 – 0xFE86), Ignition Timing 6 (0xFFF4)*

Transmission rate: on request

Data length: 8

Priority: 6

PGN: 0xFE82 – 0xFE86 / 0xFFF4

Byte	Bit	Name	Value Range	Unit and Scaling
0		Cylinder Ignition Timing 1 / 5 / 9 / 13 / 17 / 21	0x0000...0FAFF	1:1/128° CA
1				Offset -200° CA
2		Cylinder Ignition Timing 2 / 6 / 10 / 14 / 18 / 22	0x0000...0FAFF	1:1/128° CA
3				Offset -200° CA
4		Cylinder Ignition Timing 3 / 7 / 11 / 15 / 19 / 23	0x0000...0FAFF	1:1/128° CA
5				Offset -200° CA
6		Cylinder Ignition Timing 4 / 8 / 12 / 16 / 20 / 24	0x0000...0FAFF	1:1/128° CA

7				
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**Tab. 23** Ignition Timing 1 – 5 (0xFE82 – 0xFE86), Ignition Timing 6 (0xFFFF4)

PGN 0xFE82 contains relative firing angle of cylinders 1 to 4, PGN 0xFE83 of cylinders 5 to 8, PGN 0xFE84 of cylinders 9 to 12, PGN 0xFE85 of cylinders 13 to 16, PGN 0xFF86 of cylinders 17 to 20 and PGN 0xFFFF4 of cylinders 21 to 24.

#### 2.7.2.11 Desired and Actual Ignition Timing (0xFE87)

Transmission rate: on request

Data length: 8

Priority: 6

PGN: 0xFE87

Byte	Bit	Name	Value Range	Unit and Scaling
0		Engine Desired Ignition Timing	0x0000...0xFAFF	1:1/128° CA Offset -200° CA
1				
2		Reserved		
3		Reserved		
4		Reserved		
5		Reserved		
6		Engine Actual Ignition Timing	0x0000...0xFAFF	1:1/128° CA Offset -200° CA
7				

**Tab. 24** Desired and Actual Ignition Timing (0xFE87)

The engine desired ignition timing is the *global timing* point, the sum of *base timing*, *potentiometer timing*, *analog current* and *voltage input timing*, *speed curve* and *global timing correction*. The engine actual ignition timing is the engine desired ignition timing, limited by min/max timing points 1 and 2 configured via

MICT → Schedule A/B → General → Min/Max Timing Point 1, Min/Max Timing Point 2

#### 2.7.2.12 Ignition Primary Energy (0xFF30 – 0xFF32)

Transmission rate: on request

Data length: 8

Priority: 6

PGN: 0xFF30 – 0xFF32

Byte	Bit	Name	Value Range	Unit and Scaling
0		Primary Energy Cyl. 1 / 9 / 17	0x00...0xFA	1:3 mJ
1		Primary Energy Cyl. 2 / 10 / 18	0x00...0xFA	1:3 mJ



2		Primary Energy Cyl. 3 / 11 / 19	0x00...0xFA	1:3 mJ
3		Primary Energy Cyl. 4 / 12 / 20	0x00...0xFA	1:3 mJ
4		Primary Energy Cyl. 5 / 13 / 21	0x00...0xFA	1:3 mJ
5		Primary Energy Cyl. 6 / 14 / 22	0x00...0xFA	1:3 mJ
6		Primary Energy Cyl. 7 / 15 / 23	0x00...0xFA	1:3 mJ
7		Primary Energy Cyl. 8 / 16 / 24	0x00...0xFA	1:3 mJ

**Tab. 25** Ignition Primary Energy

PGN 0xFF30 contains *primary energy* of cylinders 1 to 8, PGN 0xFF32 of cylinders 9 to 16 and PGN 0xFF33 of cylinders 17 to 24.

#### 2.7.2.13 Engine Misfire Statistics 1 – 3 (0xFF33 – 0xFF35)

Transmission rate: on request

Data length: 8

Priority: 6

PGN: 0xFF33 – 0xFF35

Byte	Bit	Name	Value Range	Unit and Scaling
0		Misfire Rate Cyl. 1 / 9 / 17	0x00...0xFA	1:1% Misfire Rate last 32 fires
1		Misfire Rate Cyl. 2 / 10 / 18	0x00...0xFA	1:1% Misfire Rate last 32 fires
2		Misfire Rate Cyl. 3 / 11 / 19	0x00...0xFA	1:1% Misfire Rate last 32 fires
3		Misfire Rate Cyl. 4 / 12 / 20	0x00...0xFA	1:1% Misfire Rate last 32 fires
4		Misfire Rate Cyl. 5 / 13 / 21	0x00...0xFA	1:1% Misfire Rate last 32 fires
5		Misfire Rate Cyl. 6 / 14 / 22	0x00...0xFA	1:1% Misfire Rate last 32 fires
6		Misfire Rate Cyl. 7 / 15 / 23	0x00...0xFA	1:1% Misfire Rate last 32 fires
7		Misfire Rate Cyl. 8 / 16 / 24	0x00...0xFA	1:1% Misfire Rate last 32 fires

**Tab. 26** Engine Misfire Statistics 1 – 3 (0xFF33 – 0xFF35)

PGN 0xFF33 contains misfire rate of cylinders 1 to 8, PGN 0xFF34 of cylinders 9 to 16 and PGN 0xFF35 of cylinders 17 to 24.

The misfire rate is calculated about the last 32 fires.

## I. Document Management

### History of changes

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### Persons authorized to make changes

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