Hyundai Motors Co., LTD.

Specification name:
Mighty/County Diagnostic Communication Specification

Specification No. S1-2012-0456△10
Product name: V2T

Date of issue: Apr 6, 2017
ADVICS Co., Ltd.
Control Software Engineering Dept.

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Revsion history

Rev.	Date	Contents
0	Nov,29,2012	Newly created
1	Mar,1,2013	Added description 'Supported service ID'. Added 'Note'. Added note Service$10 'Communication specification'. Modified Service$19 Lev$06 to 'not supported'. Corrected spelling (RID$FF00) and improper print margin (Service$10 NRC$22, Service$34 NRC$31).

2	Jul, 29, 2013	Added note about 'In Boot'.
		Added symbol 'Supported service ID'.
		Modified Service$31 in EXTDS to 'supported'.
		Modified description Service$10 'Communication specification'.
		Added condition Service$2E 'Supported NRC'.
		Added note Service$19 'Communication specification'.
		Modified Snapshot storable number.
		Added condition Service$2F 'Supported NRC'.
		Added condition Service$31 'Supported NRC'.
		Added condition Service$34 'Supported NRC'.
		Deleted condition Service$36 'Supported NRC'.
		Added parameter DID$FD09.
		Added DID$FE00, $FE01.
		Deleted DID$FD06, $FD12.
		Corrected content DID List.
		Added RID$0200, $0201.

3	Sep, 19, 2013	Added note 'Maximum length of diagnostic message'. Added 'CANdelaFormat'. Added condition Service$2E 'Supported NRC'. Added parameter DID$FD04, $FD05. Modified parameter DID$FE00. Added note DID$FE00 'Brake No.'. Added note 'Vehicle information writing method flow'.
4	Oct, 22, 2013	Corrected parameter DID$FE00.
5	Jan, 31, 2014	Modified condtion Service$2F 'Supported NRC $22'. Modified parameter DID$FE00. Modified parameter Table-(*2)-1 of DID$FE00. Modified parameter Table-(*2)-2 of DID$FE00. Modified parameter Table-(*2)-3 of DID$FE00.
6	Mar, 31, 2014	Modified parameter Table-(*2)-1 of DID$FE00. Modified parameter Table-(*2)-2 of DID$FE00.
7	Jun, 30, 2014	Added DID$ FD1B Description modify DID$ FD18

Rev.	Date	Contents
8	Sep,27,2016	Modified parameter Table-(*2)-1 of DID$FE00. Modified parameter Table-(*2)-3 of DID$FE00.
9	Nov,28,2016	Modified parameter Table-(*2)-1 of DID$FE00. Modified parameter Table-(*2)-3 of DID$FE00.
10	Apr,06,2017	Modified parameter Table-(*2)-3 of DID$FE00.

Ⅰ. Overview of diagnostic CAN functionality

ECU-specific specified value

Item	Set value
CAN-ID	18DA0BF9<hex>(TOOL→Brake) *Physical
	18DBFFF9<hex>(TOOL→All any node) *Functional
	18DAF90B<hex>(Brake→TOOL)
Bit timing	81.3%
CAN message data length	Fixed to 8byte
BS (Block size)	0 (Respond even if other value is received.)
Stmin(Separation Time)	2 (Respond even if other value is received.) (*3) If the value greater than or equal to 128 is received, that value will be processed as 127.
Maximum length of diagnostic message	127($7F) (*4)
Padding value (*1)(*2)	Request=$55
	Response=$AA
Others	MSB first

(*1)The value to be set to unused byte.
(*2)Negative response will not be returned even if another value is received.
(*3)In Boot, the value is zero(0).
(*4)In Boot, the value is 1026.

CANdelaFormat

Name	Category	Value (MAX)			Description
		Default Session	Programming Session	Extended Diag. Session	
Bus Type	Communication	CAN			Type of transport media
Transport Protocol Type	Communication	ISO15765			Type of used Transport Protocol (e.g. ISO15765)
Addressing Scheme	Communication	Normal			Addressing Scheme used for physical requests and responses.
CAN-ID Type	Communication	29-Bit			Addressing Scheme used for physical requests and responses.
Request CAN-ID	Communication	0x18DA0BF9			The request CAN identifier for physical requests. The hex value not only describes the identifier but also the priority of the message. The higher the number, the lower the priority.
Response CAN-ID	Communication	0x18DAF90B			The response CAN identifier for physical responses.The response for functional requests is sent via the physical path.
P2Server	Timing	50	4500	50	Performance requirement for the server to start with the response message after the reception of a request message. In UDS this is the timeout for the default session.The tester will also require the P2Server timeout, since in UDS service "DiagnosticSessionControl"returns the P2Server and P2*Server timeouts – the tester has to calculate the offset manually and has to add it to the returned P2Server and P2*Server timeouts.
P2*Server	Timing	5000			Performance requirement for the server to start with the response message after the transmission of a negative response message with response code 78 hex (enhanced response timing). In UDS this is the timeout for the default session.
S3Server	Timing	5000			Time for the server to keep a diagnostic session other than the defaultSession active while not receiving any diagnostic request message
STmin	Timing	2 *In Boot, the value is zero(0).			(Separation Time) defines the minimum time gap between consecutive frames.Values from 0x00 to 0x7F (0 – 127) are absolute milliseconds.~~Values from 0xF1 to 0xF9 are even 100 micro seconds.~~Every other value range is reserved and should not be used.
Blocksize	Communication	0			The Blocksize parameter indicates, how many consecutive frames shall be sent in a transmission before a flow control frame is sent. The number 0 tells the sender, that no more flow controls should disrupt the sending of the remaining flow controls
Timeout As	Timing	1000			Time for transmission of frame, sender side
Timeout Ar	Timing	1000			Time for transmission of frame, receiver side
Timeout Bs	Timing	1000			Time until reception of next flow control
Time Br	Timing	10			Time for next transmission of flow control
Time Cs	Timing	10			Time until next transmission of consecutive frame
Timeout Cr	Timing	1000			Time until reception of next consecutive frame
Max Length of TP Message	Communication	127 *In Boot, the value is 1026.			
Baudrate	Communication	250000 or 500000			Bus Speed of the used transport media. Caution, the Bus Speed has to be set identical in all ECUs connected to one subnet.
Functional Addressing Scheme	Communication	Normal			Addressing Scheme used for functional requests.
Functional CAN-ID Type	Communication	29-Bit			CAN-ID Type used for functional request
Functional Request CAN-ID	Communication	0x18DBFFF9			The request CAN identifier for functional requests.
CANFrameFillerByte	Communication	0xAA			Fill byte used for filling CAN frames to eight byte length.
FillerByteHandling	Communication	TRUE			Enables use of fill bytes; if "true", fill bytes are used, otherwise DLC may be smaller than 8.

Supported service ID

Service ID	Service name	Default Session ($01)	Programming Session ($02)	Extended Diag. Session ($03)	Safety System Diag. Session ($04)
Diagnostic and Communication Management Functional Unit					
$10	DiagnosticSessionControl	◆, ▲ (*2)	◆, ▲ (*2)	◆, ▲ (*2)	
$11	ECUReset	◆, ▲ (*2)	◆, ▲ (*2)	◆, ▲ (*2)	
$27	SecurityAccess	X	◆, ▲ (*2)	◆, ▲ (*2)	
$28	CommunicationControl	X	X	◆, ▲	
$3E	TesterPresent	◆, ▲ (*2)	◆, ▲ (*2)	◆, ▲ (*2)	
$84	SecuredDataTransmission	X	X	X	
$85	ControlDTCSetting	X	X	◆, ▲	
$86	ResponseOnEvent	X	X	X	
$87	LinkControl	X	X	X	
$83	AccessTimingParameter	X	X	X	
Data Transmission Functional Unit					
$22	ReadDataByIdentifier	◆, ▲ (*2)	X	◆, ▲ (*2)	
$23	ReadMemoryByAddress	X	X	◆, ▲	
$24	ReadScalingDataByIdentifier (*1)	X	X	X	
$2A	ReadDataByPreriodicIdentifier	X	X	X	
$2C	DynamicallyDefineDataIdentifier	X	X	X	
$2E	WriteDataByIdentifier	X	X	◇, ▲	
$3D	WriteMemoryByAddress	X	X	X	
Stored Data Transmission Functional Unit					
$19	ReadDTCInformation	◆, ▲	X	◆, ▲	
$14	ClearDiagnosticInformation	◆, ▲	X	◆, ▲	
Input/Output Control Functional Unit					
$2F	InputOutputControlByIdentifier	X	X	◆, ▲	
Remote Activation Of Routine Functional Unit					
$31	RoutineControl	X	◇, ▲ (*2)	◆, ▲	
Upload/Download Functional Unit					
$34	RequestDownload	X	◇, ▲ (*2)	X	
$35	RequestUpload	X	X	X	
$36	TransferData	X	◇, ▲ (*2)	X	
$37	RequestTransferExit	X	◇, ▲ (*2)	X	

◆ : Function possible in the selected diag. session without security access
◇ : Function possible in the selected diag. session with security access level 1
○ : Specific sub-function possible in the selected diag.Mode (see each function descriptions)
X : Function impossible in selected diag. session.
▲ : Response to Physical request message or Functional request message
△ : Response to Physical request message not Functional request message

(*1)Not supported, because SID$22 is substitutable.
(*2)Supported in Boot.

Any received request message (regardless of addressing mode physical or functional) will be ignored, during ECU self check time (1.5 sec (typical)).

Note

・In Boot
This means that 'In Flash reprogram procedure (when the ECU is in the Boot Area)'.
・Vehicle is not in the stopped state.
This means that 'all wheel speed is more than 0km/h'.

DiagnosticSessionControl ($10)

・Communication specification

Byte	1	2	3	4	5	6
Request	$10	diagnosticSessionType				
PosRsp	$50	diagnosticSessionType	$P2_{CAN\_SERVER\_MAX}$ (*1)		$P2^*_{CAN\_SERVER\_MAX}$ (*1	
NegRsp	$7F	$10	NRC			

$P2_{CAN\_SERVER\_MAX}$: 4500ms

$P2^*_{CAN\_SERVER\_MAX}$: 5000ms

(*1)These parameters can be used only in programmingSession ($02).

・Supported Sub-Function (= diagnosticSessionType)

Hex (bit 6-0)	Description	Default Session	Programming Session	Extended Diag. Session	Safety System Diag. Session
$01	defaultSession	◆	◆	◆	
$02	programmingSession	◆	◆	◆	
$03	extendedDiagnosticSession	◆	X	◆	
$04	safetySystemDiagnosticSessior	X	X	X	
Other	–	X	X	X	

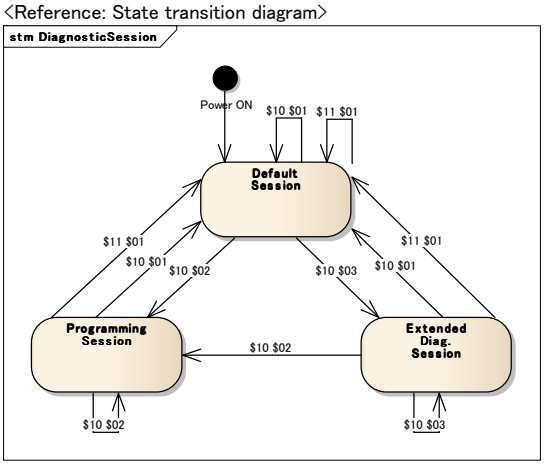
・Supported NRC

Hex	NegativeResponseCode	Cause of Occurrence
$12	subFunctionNotSupported	When Sub-Function is not supported.
$13	incorrectMessageLengthOrInvalidFormat	When request format is incorrect.
$22	conditionNotCorrect	If any of the followings is met, when transition to ProgrammingSession is requested in other than ProgrammingSession. ・Vehicle is not in the stopped state. ・Power supply voltage is reduced. ・Control in progress.

・Description of functionalities

Transit to requested DiagnosticSession.
Return to DefaultSession if S3 timeout occurs in other than DefaultSession.
All states are initialized when returning to DefaultSession.
(All states are initialized when transition to DefaultSession is requested while in DefaultSession as well.)
Have the security locked when transitioning from ExtendedDiag.Session to ProgrammingSession.
Functionalities not related to Flash Reprogramming cannot be used in ProgrammingSession.
ECU reset will occur when returning to DefaultSession from ProgrammingSession (including S3 timeout), therefore, frequency during one IG is limited as same as SID$11. (ECU malfunction will occur at the 8th time of ECU reset.)

<Reference: State transition diagram>



ECUReset ($11)

・Communication specification

Byte	1	2	3
Request	$11	resetType	
PosRsp	$51	resetType	
NegRsp	$7F	$11	NRC

・Supported Sub-Function (= resetType)

Hex (bit 6-0)	Description	Default Session	Programming Session	Extended Diag. Session	Safety System Diag. Session
$01	hardReset	◆	◆	◆	
Other	–	X	X	X	

・Supported NRC

Hex	NegativeResponseCode	Cause of Occurrence
$12	subFunctionNotSupported	When Sub-Function is not supported.
$13	incorrectMessageLengthOrInvalidFormat	When request format is incorrect.
$22	conditionNotCorrect	If any of the followings is met, when not in ProgrammingSession. ・Vehicle is not in the stopped state. ・Power supply voltage is reduced. ・Control in progress.

・Description of functionalities

Reset ECU.
From the characteristics of ECU circuit, frequency of reset during one IG is limited.
(ECU reset is allowed up to 7 times. ECU malfunction will occur at the 8th time of ECU reset.)

SecurityAccess ($27)

・Communication specification

＜RequestSeed＞

Byte	1	2	3	4
Request	$27	requestSeed		
PosRsp	$67	requestSeed	seed	

＜SendKey＞

Byte	1	2	3	4
Request	$27	sendKey	key	
PosRsp	$67	sendKey		

Byte	1	2	3
NegRsp	$7F	$27	NRC

・Supported Sub-Function (= securityAccessType [requestSeed / sendKey])

Hex (bit 6-0)	Description	Default Session	Programming Session	Extended Diag. Session	Safety System Diag. Session
$01	RequestSeed	X	◆	◆	
$02	SendKey	X	◆	◆	
Other	–	X	X	X	

・Supported NRC

Hex	NegativeResponseCode	Cause of Occurrence
$12	subFunctionNotSupported	When Sub-Function is not supported.
$13	incorrectMessageLengthOrInvalidFormat	When request format is incorrect.
$22	conditionNotCorrect	When not supported in active session.
$24	requestSequenceError	When sendKey is received before receiving requestSeed.
$31	requestOutRange	–
$35	invalidKey	When invalid key is received.
$36	exceededNumberOfAttempts	When invalid key is received 3 times or more.
$37	requiredTimeDelayNotExpired	When requestSeed is received within 10 seconds after sending the negative response $36.

・Description of functionalities

Security is unlocked when the correct KEY is returned in response to SEED sent by ECU.

See the calculation method of SEED and KEY below.

KEY = ((SEED + P2) * P1) MOD $10000

P1 = $12371, P2 = $125

CommunicationControl ($28)

・Communication specification

Byte	1	2	3
Request	$28	controlType	$01
PosRsp	$68	controlType	
NegRsp	$7F	$28	NRC

・Supported Sub-Function (= controlType)

Hex (bit 6-0)	Description	Default Session	Programming Session	Extended Diag. Session	Safety System Diag. Session
$00	enableRxAndTx	X	X	◆	
$01	EnableRxAndDisableTX	X	X	X	
$02	DisableRxAndEnableTX	X	X	X	
$03	disableRxAndTx	X	X	◆	
Other	–	X	X	X	

・Supported NRC

Hex	NegativeResponseCode	Cause of Occurrence
$12	subFunctionNotSupported	When Sub-Function is not supported.
$13	incorrectMessageLengthOrInvalidFormat	When request format is incorrect.
$22	conditionNotCorrect	–
$31	requestOutOfRange	communicationType (3rd byte of request data) is other than $01.

・Description of functionalities

Enable/Disable periodic communication.
No malfunction detection conducted in communication system while periodic communication is disabled.
Each control is also disabled while periodic communication is disabled.
EnableRxAndDisableTX and DisableRxAndEnableTX are not supported, as they are same as disableRxAndTx.

TesterPresent ($3E)

・Communication specification

Byte	1	2	3
Request	$3E	zeroSubFunction	
PosRsp	$7E	zeroSubFunction	
NegRsp	$7F	$3E	NRC

・Supported Sub-Function (= zeroSubFunction)

Hex (bit 6-0)	Description	Default Session	Programming Session	Extended Diag. Session	Safety System Diag. Session
$00	zeroSubFunction	◆	◆	◆	
Other	-	X	X	X	

・Supported NRC

Hex	NegativeResponseCode	Cause of Occurrence
$12	subFunctionNotSupported	When Sub-Function is not supported.
$13	incorrectMessageLengthOrInvalidFormat	When request format is incorrect.

・Description of functionalities

Keep the active diagnostic service state.

ControlDTCSetting ($85)

・Communication specification

Byte	1	2	3
Request	$85	DTCSettingType	
PosRsp	$C5	DTCSettingType	
NegRsp	$7F	$85	NRC

・Supported Sub-Function (= DTCSettingType)

Hex (bit 6-0)	Description	Default Session	Programming Session	Extended Diag. Session	Safety System Diag. Session
$01	ON	X	X	◆	
$02	OFF	X	X	◆	
Other	-	X	X	X	

・Supported NRC

Hex	NegativeResponseCode	Cause of Occurrence
$12	subFunctionNotSupported	When Sub-Function is not supported.
$13	incorrectMessageLengthOrInvalidFormat	When request format is incorrect.
$22	conditionNotCorrect	-
$31	requestOutOfRange	-

・Description of functionalities

Enable/Disable failure detection in communication system.
Each control is disabled while failure detection is disabled.
Not supported as no failure detection is conducted in ProgrammingSession.

ReadDataByIdentifier ($22)

・Communication specification

Byte	1	2	3	・・・	n-1	n
Request	$22	dataIdentifier#1		・・・	dataIdentifier#m	

Byte	1	2	3	4	・・・	(k-1)+4	・・・	n-(o-1)-2	n-(o-1)-1	n-(o-1)	・・・	n
PosRsp	$62	dataIdentifier#1		dataRecord#1 (*1)			・・・	dataIdentifier#m		dataRecord#m (*1)		
NegRsp	$7F	$22	NRC									

(*1)Data length of dataRecord varies depending on dataIdentifier.

・Supported dataIdentifier

See DID List

(*)In Boot, DID$F189 only.

・Supported NRC

Hex	NegativeResponseCode	Cause of Occurrence
$13	incorrectMessageLengthOrInvalidFormat	When request format is incorrect. In Boot, when the length of the request message is not equal to 3.
$22	conditionNotCorrect	–
$31	requestOutOfRange	Under any of the following case ・None of the requested dataIdentifier is supported. ・Depending on the combination of requested dataIdentifier, response will exceed the maximum length of diagnostic message.
$33	securityAccessDenied	–

・Description of functionalities

Retrieve data defined in dataIdentifier.

WriteDataByIdentifier ($2E)

・Communication specification

Byte	1	2	3	4	・・・	m+3
Request	$2E	dataIdentifier		dataRecord (*1)		

(*1)Data length of dataRecord varies depending on dataIdentifier.

Byte	1	2	3
PosRsp	$6E	dataIdentifier	
NegRsp	$7F	$2E	NRC

・Supported dataIdentifier

See DID List.

・Supported NRC

Hex	NegativeResponseCode	Cause of Occurrence
$13	incorrectMessageLengthOrInvalidFormat	When request format is incorrect.
$22	conditionNotCorrect	Under any of the following case ・Vehicle information writing method of DID:"FE00" is performed when "Vehicle information writing complete=0b1" is written. ・When "1" is written at "Vehicle information writing complete" with DID:"FE00" initial value.
$31	requestOutOfRange	Under any of the following case ・Requested dataIdentifier is not supported. ・dataRecord value is incorrect.
$33	securityAccessDenied	Request is received when security is locked.
$72	generalProgrammingFailure	When EEPROM was unwritable.

・Description of functionalities

Write the data defined in dataIdentifier.

ReadMemoryByAddress ($23)

・Communication specification

Byte	1	2	3	4	5	6	7
Request	$23	14	memoryAddress				memorySize

Byte	1	2	・・・	n
PosRsp	$63	dataRecord (*1)		

(*1)Data length of dataRecord varies depending on memorySize.

Byte	1	2	3
NegRsp	$7F	$23	NRC

・Supported NRC

Hex	NegativeResponseCode	Cause of Occurrence
$13	incorrectMessageLengthOrInvalidFormat	When request format is incorrect.
$22	conditionNotCorrect	–
$31	requestOutOfRange	Under any of the following case ・Requested address range is not within 0x03FF6000 to 0x03FFBFFF. ・memorySize is 5 or more. ・addressAndLengthFormatIdentifier (2nd byte of request data) is other than $14.
$33	SecurityAccessDenied	–

・Description of functionalities

Retrieve data of requested address.

ClearDiagnosticInformation ($14)

・Communication specification

Byte	1	2	3	4
Request	$14	$FF	$FF	$FF
PosRsp	$54			
NegRsp	$7F	$14	NRC	

・Supported NRC

Hex	NegativeResponseCode	Cause of Occurrence
$13	incorrectMessageLengthOrInvalidFormat	When request format is incorrect.
$22	conditionNotCorrect	–
$31	requestOutOfRange	When groupOfDTC (2nd to 4th byte of request data) is other than $FFFFFF.

・Description of functionalities

Delete past malfunction, Snapshot Data .

Do not delete current malfunction and related information (flag, counter, timer, etc.).

ReadDTCInformation ($19)

・Communication specification

＜ReportDTCByStatusMask＞

Byte	1	2	3
Request	$19	reportType	DTCStatusMask

Byte	1	2	3	4	5	6	7	・・・	n-3	n-2	n-1	n
PosRsp	$59	reportType	$09	DTC#1			statusOfDTC#1	・・・	DTC#m			statusOfDTC#m (*1)

(*1)m = maximum 31. (When more than 31 DTCs, response sends only 31 DTCs.)

＜ReportDTCSnapshotIdentification＞

Byte	1	2
Request	$19	reportType

Byte	1	2	3	4	5	6	・・・	n-3	n-2	n-1	n
PosRsp	$59	reportType	DTC#1			$01	・・・	DTC#m			$01

＜ReportDTCSnapshotRecordByDTCNumber＞

Byte	1	2	3	4	5	6
Request	$19	reportType	DTCMaskRecord			$01

Byte	1	2	3	4	5	6	7	8	9	・・・	n
PosRsp	$59	reportType	DTC			statusOfDTC	$01	DTCSnapshotRecordNumberOfIdentifiers (*1)	DTCSnapshotRecord (*2)		

(*2)See DID List for dataIdentifier included in DTCSnapshotRecord.

Byte	1	2	3
NegRsp	$7F	$19	NRC

・Supported Sub-Function (= reportType)

Hex (bit 6-0)	Description	Default Session	Programming Session	Extended Diag. Session	Safety System Diag. Session
$02	reportDTCByStatusMask	◆	X	◆	
$03	reportDTCSnapshotIdentification	◆	X	◆	
$04	reportDTCSnapshotRecordByDTCNumber	◆	X	◆	
$06	reportDTCExtendedDataRecordByDTCNumber	X	X	X	
Other	-	X	X	X	

・Supported StatusOfDTC bit

Bit	Description	Support
0	TestFailed	Y
1	TestFailedThisOperationCycle	N
2	PendingDTC	N
3	ConfirmedDTC	Y
4	TestNotCompletedSinceLastClear	N
5	TestFailedSinceLastClear	N
6	TestNotCompleteThisOperationCycle	N
7	WarningIndicatorRequested	N

・Supported NRC

Hex	NegativeResponseCode	Cause of Occurrence
$12	subFunctionNotSupported	When Sub-Function is not supported.
$13	incorrectMessageLengthOrInvalidFormat	When request format is incorrect.
$31	requestOutOfRange	Under any of the following case ・DTCMaskRecord is not supported. ・DTCSnapshotRecordNumber(6th byte of request data of sub-function$04) is other than $01.

・Description of functionalities

Retrieve failure information.
WarningIndicatorRequested is not supported because it behaves as same as TestFailed.
Only one Snapshot is stored per one DTC .
If DTC which has already stored Snapshot is detected again, information of Snapshot will not be updated.
Snapshot as many as 2DTCs can be stored simultaneously.
If Snapshot as many as 2DTCs have been already stored, Snapshot of DTC newly detected will not be stored.

InputOutputControlByIdentifier ($2F)

・Communication specification

＜ReturnControlToECU＞

Byte	1	2	3	4
Request	$2F	dataIdentifier		$00
PosRsp	$6F	dataIdentifier		$00

＜ShortTermAdjustment＞

Byte	1	2	3	4	5	・・・	5+(m−1)	5+m	・・・	5+m+(r−1)
Request	$2F	dataIdentifier		$03	controlState (*1)			controlMask (*1)		
PosRsp	$6F	dataIdentifier		$03						

(*1)Data length of controlState/controlMask varies depending on dataIdentifier.

Byte	1	2	3
NegRsp	$7F	$2F	NRC

・Supported dataIdentifier

See DID List

・Supported NRC

Hex	NegativeResponseCode	Cause of Occurrence
$13	incorrectMessageLengthOrInvalidFormat	When request format is incorrect.
$22	conditionNotCorrect	Under any of the following case ・Vehicle is not in the stopped state. ・Power supply voltage is reduced. ・Power supply voltage rise. ・During routine control. ・Malfunction, which is related to target object, exists. (Malfunction of target object: − Solenoid Valve malfunction − Linear valve malfunction − Solenoid relay(Valve relay) malfunction − Motor malfunction − Motor relay malfunction)
$31	requestOutOfRange	Under any of the following case ・Requested dataIdentifier is not supported. ・inputOutputControlParameter (4th byte of request data) is other than $00/$03. ・The value of controlState is incorrect (not supported).
$33	securityAccessDenied	−

・Description of functionalities

Activate as defined in dataIdentifier.

Stop activation when the condition of conditionNotCorrect is met during activation.

Automatically stops when a period of time of 5 seconds have elapsed since receiving the last activation request.

RoutineControl ($31)

・Communication specification

Byte	1	2	3	4	5	・・・	n
Request	$31	routineControlType	routineIdentifier		routineControlOptionRecord (*1)		
PosRsp	$71	routineControlType	routineIdentifier		routineStatusRecord (*1)		
NegRsp	$7F	$31	NRC				

(*1)Data length of routineControlOptionRecord/routineStatusRecord varies depending on routineControlType/routineIdentifier.

・Supported Sub-Function (= routineControlType)

Hex (bit 6-0)	Description	Default Session	Programming Session	Extended Diag. Session	Safety System Diag. Session
$01	startRoutine	X	◇	◆	
$02	stopRoutine	X	X	◆	
$03	requestRoutineResults	X	◇	◆	
Other	-	X	X	X	

・Supported routineIdentifier

See RID List

・Supported NRC

Hex	NegativeResponseCode	Cause of Occurrence
$12	subFunctionNotSupported	When Sub-Function is not supported
$13	incorrectMessageLengthOrInvalidFormat	When request format is incorrect.
$22	conditionNotCorrect	Under any of the following case ・startRoutine is received during download. ・startRoutine is received during routine control. ・Yaw/G sensor calculation is not authorized, when startRoutine of RID$0200 is received. ・Steering angle sensor calculation is not authorized, when startRoutine of RID$0201 is received.
$24	requestSequenceError	stopRoutine or requestRoutineResults is received before receiving startRoutine.
$31	requestOutOfRange	Under any of the following case ・Requested routineIdentifier is not supported. ・The value of routineControlOptionRecord is incorrect.
$33	seurityAccessDenied	If requested routineIdentifier is protected when security is locked.
$72	GeneralProgrammingFailure	When FlashMemory was unwritable.

・Description of functionalities

Behave as defined in routineIdentifier.

RequestDownload ($34)

・Communication specification

Byte	1	2	3	4	5	6	7	8	9	10	11
Request	$34	$00	$44	memoryAddress				memorySize			

Byte	1	2	3	・・・	n
PosRsp	$74	lengthFormatIdentifier	maxNumberOfBlockLength		

Byte	1	2	3
NegRsp	$7F	$34	NRC

・Supported NRC

Hex	NegativeResponseCode	Cause of Occurrence
$13	incorrectMessageLengthOrInvalidFormat	When request format is incorrect.
$22	conditionNotCorrect	Under any of the following case ・Request is received during download. ・Request is received during routine control. ・Request is received before executing Erase Memory.
$31	requestOutOfRange	Under any of the following case ・dataFormatIdentifier (2nd byte of request data) is other than $00. ・addressAndLengthFormatIdentifeir (3rd byte of request data) is other than $44. ・The value of memoryAddress/memorySize is incorrect.
$33	securityAccessDenied	Request is received when security is locked.
$70	uploadDownloadNotAccepted	–

・Description of functionalities

Go into wait state for data transfer (download) from client to server.

TransferData ($36)

・Communication specification

Byte	1	2	3	・・・	n
Request	$36	blockSequenceCounter	transferRequestParameterRecord		
PosRsp	$76	blockSequenceCounter			
NegRsp	$7F	$36	NRC		

・Supported NRC

Hex	NegativeResponseCode	Cause of Occurrence
$13	incorrectMessageLengthOrInvalidFormat	When request format is incorrect. (″transferRequestParameterRecord″ length is not a multiple of 4.)
$24	requestSequenceError	Under any of the following case ・Request has been received before receiving RequestDownload. ・Deta as many as memorySize has already been received after receiving RequestDownload.
$31	requestOutOfRange	–
$71	transferDataSuspended	When sum of received data does not match memorySize.
$72	generalProgrammingFailure	When FlashMemory was unwritable.
$73	wrongBlockSequenceCounter	The value of blockSequenceCounter is incorrect.
$92	voltageTooHigh	–
$93	voltageTooLow	

・Description of functionalities

Data transfer.

RequestTransferExit ($37)

・Communication specification

Byte	1	2	3
Request	$37		
PosRsp	$77		
NegRsp	$7F	$37	NRC

・Supported NRC

Hex	NegativeResponseCode	Cause of Occurrence
$13	incorrectMessageLengthOrInvalidFormat	When request format is incorrect.
$24	requestSequenceError	Under any of the following case ・Request has been received before data as many as memorySize is received. ・Request has been received before receiving RequestDownload.

・Description of functionalities

Terminate the wait state for data transfer.

Ⅱ. DID List

R: ReadDataByIdentifier (SID $22)
C: InputOutputControlByIdentifier (SID $2F)
W: WriteDataByIdentifier (SID $2E)
*: With SecurityAccess (SID $27)

Hex	Description	Size (bytes)	Byte	Bit(s)	Unit	Data Type	LSB	Offset	Minimum value	Maximum value	Initial value	Abnormal circumstance (*1)	Direction	Default Session	Programming Session	Extended Diag. Session	Safety System Diag. Session	SID $2F	SID $19	Remarks
																		control Mask	DTCSnapshotRecord	
F189	VehicleManufacturerECUSoftwareVersionNumberDataIdentifier	10	–	–	–	ASCII	–	–	–	–	–	–	–	R	–	R		–	–	Software Parts No
F191	VehicleManufacturerECUHardwareNumberDataIdentifier	10	–	–	–	ASCII	–	–	–	–	–	–	–	R	–	R		–	–	OEM Parts No/HU Parts No The value is stored in EEPROM. (The value will not change after reprogramming.)
F199	ProgrammingDateDataIdentifier	4	–	–	–	BCD	–	–	–	–	–	–	–	R	–	R		–	–	Software Release Date
FD00	FR wheel speed	1	–	–	km/h	Unsigned	1.0	0	0	255	–	–	–	R	–	R		–	Y	
FD01	FL wheel speed	1	–	–	km/h	Unsigned	1.0	0	0	255	–	–	–	R	–	R		–	Y	
FD02	RR wheel speed	1	–	–	km/h	Unsigned	1.0	0	0	255	–	–	–	R	–	R		–	Y	
FD03	RL wheel speed	1	–	–	km/h	Unsigned	1.0	0	0	255	–	–	–	R	–	R		–	Y	
FD04	Stop SW information (BRK SW)	1	1	0	–	–	–	–	–	–	–	–	–	R	–	R		–	Y	1:ON
FD04	Diagnostic SW information	1	1	1	–	–	–	–	–	–	–	–	–	R	–	R		–	Y	1:ON
FD04	TCS disable switch	1	1	2	–	–	–	–	–	–	–	–	–	R	–	R		–	Y	0:TCS/VDC permit 1:TCS/VDC prohibit
FD04	BRK SW2	1	1	3	–	–	–	–	–	–	–	–	–	R	–	R		–	Y	1:ON
FD04	R RANGE	1	1	4	–	–	–	–	–	–	–	0	–	R	–	R		–	Y	Always 0 for AT 1:ON
FD04	N RANGE	1	1	5	–	–	–	–	–	–	–	0	–	R	–	R		–	Y	Always 0 for AT 1:ON
FD04	PARKING SW	1	1	6	–	–	–	–	–	–	–	–	–	R	–	R		–	Y	1:ON
FD05	FR holding solenoid output	2	1	0	–	–	–	–	–	–	–	–	–	R	–	RC		Y	–	1:ON
FD05	FR decompression solenoid output	2	1	1	–	–	–	–	–	–	–	–	–	R	–	RC		Y	–	1:ON
FD05	FL holding solenoid output	2	1	2	–	–	–	–	–	–	–	–	–	R	–	RC		Y	–	1:ON
FD05	FL decompression solenoid output	2	1	3	–	–	–	–	–	–	–	–	–	R	–	RC		Y	–	1:ON
FD05	RR holding solenoid output	2	1	4	–	–	–	–	–	–	–	–	–	R	–	RC		Y	–	1:ON
FD05	RR decompression solenoid output	2	1	5	–	–	–	–	–	–	–	–	–	R	–	RC		Y	–	1:ON
FD05	RL holding solenoid output	2	1	6	–	–	–	–	–	–	–	–	–	R	–	RC		Y	–	1:ON
FD05	RL decompression solenoid output	2	1	7	–	–	–	–	–	–	–	–	–	R	–	RC		Y	–	1:ON
FD05	Front linear valve output	2	2	0	–	–	–	–	–	–	–	–	–	R	–	RC		Y	–	1:ON Equivalent to 3MPa of differential pressure requested value when requesting activation.
FD05	Rear linear valve output	2	2	1	–	–	–	–	–	–	–	–	–	R	–	RC		Y	–	1:ON Equivalent to 3MPa of differential pressure requested value when requesting activation.
FD05	Stop LAMP Relay output (BRK-LP)	2	2	3	–	–	–	–	–	–	–	–	–	R	–	RC		Y	–	1:ON Only ON drive available
FD05	ESS Relay output (BRK-LP2)	2	2	4	–	–	–	–	–	–	–	–	–	R	–	RC		Y	–	1:ON Only ON drive available
FD05	Solenoid relay output	2	2	5	–	–	–	–	–	–	–	–	–	R	–	RC		Y	–	1:ON Only OFF drive available
FD05	Fail safe motor relay output	2	2	6	–	–	–	–	–	–	–	–	–	R	–	R		–	–	1:ON
FD05	Motor relay output	2	2	7	–	–	–	–	–	–	–	–	–	R	–	RC		Y	–	1:ON Only ON drive available
FD07	ABS_W_LAMP	1	1	0	–	–	–	–	–	–	–	–	–	R	–	RC		Y	–	1:Request to turn on
FD07	EBD_W_LAMP	1	1	1	–	–	–	–	–	–	–	–	–	R	–	RC		Y	–	1:Request to turn on
FD07	TCS_LAMP	1	1	2-4	–	–	–	–	–	–	–	–	–	R	–	RC		Y	–	000:OFF 001:ON 010:Blinking
FD07	TCS_OFF_LAMP	1	1	5	–	–	–	–	–	–	–	–	–	R	–	RC		Y	–	1:Request to turn on
FD08	ESS status	1	1	0-2	–	–	–	–	–	–	–	–	–	R	–	R		–	–	000:OFF 001:ON 010:Addictional Function (not used)
FD09	ABS control in progress	2	1	0	–	–	–	–	–	–	–	–	–	R	–	R		–	–	1:Control in progress
FD09	EBD control in progress	2	1	1	–	–	–	–	–	–	–	–	–	R	–	R		–	–	1:Control in progress
FD09	TCS engine control in progress	2	1	2	–	–	–	–	–	–	–	–	–	R	–	R		–	–	1:Control in progress
FD09	TCS brake control in progress	2	1	3	–	–	–	–	–	–	–	–	–	R	–	R		–	–	1:Control in progress
FD09	High G assists control in progress	2	1	4	–	–	–	–	–	–	–	–	–	R	–	R		–	–	1:Control in progress
FD09	Failure assist control in progress	2	1	5	–	–	–	–	–	–	–	–	–	R	–	R		–	–	1:Control in progress

Hex	Description	Size (bytes)	Byte	Bit(s)	Unit	Data Type	LSB	Offset	Minimum value	Maximum value	Initial value	Abnormal circumstance (*1)	Direction	Default Session	Programming Session	Extended Diag. Session	Safety System Diag. Session	SID $2F control Mask	SID $19 DTCSnapshotRecord	Remarks
FD09	VDC control in progress	2	1	6	–	–	–	–	–	–	–	–	–	R	–	R		–	–	1:Control in progress
FD09	Requesting exhaust brake prohibition	2	1	7	–	–	–	–	–	–	–	–	–	R	–	R		–	–	1:Requesting
FD09	HSA control in progress	2	2	0	–	–	–	–	–	–	–	–	–	R	–	R		–	–	1:Control in progress
FD0A	ABS failure state	2	1	0	–	–	–	–	–	–	–	–	–	R	–	R		–	–	1:Failure state
FD0A	EBD failure state	2	1	1	–	–	–	–	–	–	–	–	–	R	–	R		–	–	1:Failure state
FD0A	TCS failure state	2	1	2	–	–	–	–	–	–	–	–	–	R	–	R		–	–	1:Failure state
FD0A	High G assists control failure state	2	1	4	–	–	–	–	–	–	–	–	–	R	–	R		–	–	1:Failure state
FD0A	Failure assist control failure state	2	1	5	–	–	–	–	–	–	–	–	–	R	–	R		–	–	1:Failure state
FD0A	VDC failure state	2	1	6	–	–	–	–	–	–	–	–	–	R	–	R		–	–	1:Failure state
FD0A	HSA failure state	2	2	0	–	–	–	–	–	–	–	–	–	R	–	R		–	–	1:Failure state
FD0B	System voltage	1	–	–	V	Unsigned	0.15	0	0	34.5	–	–	–	R	–	R		–	Y	
FD0C	M/C pressure sensor output (voltage value)	1	–	–	V	Unsigned	5/256	0	0	4.98	–	–	–	R	–	R		–	Y	
FD0D	Engine speed	2	–	–	r/min	Unsigned	0.125	0	0	8031.88	–	0	–	R	–	R		–	Y	
FD0E	Actual throttle opening angle	1	–	–	%	Unsigned	0.4	0	0	100	–	0	–	R	–	R		–	Y	
FD0F	Engine output torque (ratio)	1	–	–	%	Unsigned	1	−125	−125	125	–	0	–	R	–	R		–	Y	
FD10	Driver request torque (ratio)	1	–	–	%	Unsigned	1	−125	−125	125	–	0	–	R	–	R		–	Y	
FD11	Vacuum sensor 1 output (voltage value)	1	–	–	V	Unsigned	5/256	0	0	4.98	–	–	–	R	–	R		–	Y	
FD13	Longitudinal G	1	–	–	G	Signed	0.02	0	−2.56	2.54	–	0	–	R	–	R		–	Y	
FD14	Lateral G	1	–	–	G	Signed	0.02	0	−2.56	2.54	–	0	–	R	–	R		–	Y	
FD15	GL1	2	–	–	G	Signed	0.00366	0	−1.5	1.5	–	0	–	R	–	R		–	–	
FD16	GL2	2	–	–	G	Signed	0.00366	0	−1.5	1.5	–	0	–	R	–	R		–	–	
FD17	Yaw rate value	1	–	–	Deg/sec	Unsigned	0.976	−124.93	−124.93	123.952	–	0	–	R	–	R		–	Y	
FD18	Steering angle value (calibrated value)	2	–	–	Deg	Signed	0.1	0	−3276.8	3276.7	–	0	–	R	–	R		–	Y	
FD19	Gear Position	1	–	–	gear	Unsigned	1	−125	−125	125	–	0	–	R	–	R		–	Y	Always 0 for MT 0x7C:reverse 0x7D:neutral positive value(0x7E〜0xFA):forward 0x7D:park
FD1A	Gate Position	1	–	–	gear	Unsigned	1	−125	−125	126	–	0	–	R	–	R		–	Y	Always 0 for MT 0x7C:reverse 0x7D:neutral 0x7E:forward 0xFB:park
FD1B	Steering angle value (uncalibrated value)	2	–	–	Deg	Signed	0.1	0	−3276.8	3276.7	–	0	–	R	–	R		–	–	The receiving value from "Steering Angle Sensor" is output when "Steering Angle Sensor" is failure. (The value in which the failure of "Steering Angle Sensor" is indicated is not output.)
FD1C〜	Reserved										–	–	–							
FE00	Vehicle Type No.	10	1	0-3	–	–	1	0	1	15	0	–	–	R	–	RW*		–	–	Vehicle Type No of Vehicle information writing method(Variant coding). (*2)
FE00	Brake No.	10	1	4-7	–	–	1	0	1	15	0	–	–	R	–	RW*		–	–	Brake No of Vehicle information writing method (Variant coding). (*2)(*3)
FE00	Transmission No.	10	2	0-3	–	–	1	0	1	15	0	–	–	R	–	RW*		–	–	Transmission No of vehicle information writing method(Variant coding).(*2)
FE00	Wheelbase	10	3-4	–	mm	Unsigned	5	2000	2000	7115	2795	–	–	R	–	RW*		–	–	Wheelbase of Vehicle information writing method (Variant coding).(*2) <Example when writing in 3395mm> Set 279(DEC). ((3395−2000)/5 = 279)
FE00	MAX engine torque	10	5	0-4	Nm	Unsigned	20	190	190	810	410	–	–	R	–	RW*		–	–	MAX engine torque of Vehicle information writing method (Variant coding) (*2) See (*4) for detail of the writing contents.
FE00	Front tire ~~diameter~~ radius	10	6-7	–	mm	Unsigned	1	0	300	450	400	–	–	R	–	RW*		–	–	Front tire ~~diameter~~ radius of Vehicle information writing method(Variant coding) (*5)
FE00	Rear tire ~~diameter~~ radius	10	8-9	–	mm	Unsigned	1	0	300	450	400	–	–	R	–	RW*		–	–	Rear tire ~~diameter~~ radius of Vehicle information writing method(Variant coding). (*5)
FE00	ESS	10	10	0	–	–	1	0	0	1	0	–	–	R	–	RW*		–	–	ESS of Vehicle information writing method(Variant coding) 0b0:with no ESS 0b1:with ESS
FE00	Cruise Control	10	10	1	–	–	1	0	0	1	0	–	–	R	–	RW*		–	–	Cruise Control of Vehicle information writing method(Variant coding) 0b0:with no Cruise Control 0b1:with Cruise Control
FE01	Vehicle information writing complete	1	1	0	–	–	1	0	0	1	0	–	–	R	–	RW*		–	–	Completion of Vehicle information writing method (Variant coding) (*6) 0b0:Not completed 0b1:Completed

(*1)The physical value describes abnormal circumstance.
Abnormal circumstance is communication failure and function not available.

(*2)Combination of Vehicle information writing method (Variant coding).
The following items can only be written using the combination described in Table-(*2)-1, Table-(*2)-2 and Table-(*2)-3.
- ・Wheelbase
- ・MAX engine torque
- ・Brake No.
- ・Transmission No.

Table- (*2)-1

		Vehicle Type No.				
	Type	HD55	HD65	HD78	~~County Leaf~~	~~County Indp~~
	writing value (DEC)	1	2	3	~~4~~	~~5~~
Wheelbase	physical value (mm)	~~2500～3400~~ 2700～3450	~~2800～4100~~ 2800～4400	~~2800～4450~~ ~~2800～4100~~ ~~2800～4000~~ 2800～4400	~~3300～4100~~	~~3300～4100~~
	writing value (DEC)	~~100～280~~ 140～290	~~160～420~~ 160～480	~~160～490~~ ~~160～420~~ ~~160～400~~ 160～480	~~260～420~~	~~260～420~~
MAX engine torque	physical value (Nm)	<24V-500kbps software> <24V-250kbps software> ~~280～420~~ 360～380	<12V-500kbps software> ~~360～400~~ 360～520	380～620	380～620	~~380～620~~	~~600～620~~
	writing value (binary)	<24V-500kbps software> <24V-250kbps software> ~~0b00101～0b01011~~ 0b01001	<12V-500kbps software> ~~0b01001～01010~~ 0b01001～0b10000	0b01010～0b10101	0b01010～0b10101	~~0b01010～0b10101~~	~~0b10101~~

Table- (*2)-2 ○ Writable × Not writable

			Vehicle Type No.				
	Type		HD55	HD65	HD78	~~County Leaf~~	~~County Indp~~
	writing value (DEC)		1	2	3	~~4~~	~~5~~
Brake No.	Type	Fr: φ314 54x2 Rr: φ314 54x2	~~○~~ ×	○	×	~~×~~	~~×~~
	writing value (DEC)	1					
	Type	Fr: φ314 54x2 Rr: φ320 31.75	○	○	×	~~○~~	~~○~~
	writing value (DEC)	2					
	Type	Fr: φ320 31.75 Rr: φ320 28.57	○	○	×	~~○~~	~~○~~
	writing value (DEC)	3					
	Type	Fr: φ314 54x2 Rr: φ308 22.22	○	○	×	~~×~~	~~×~~
	writing value (DEC)	4					
	Type	Fr: φ320 31.75 Rr: φ308 22.22	○	○	×	~~×~~	~~×~~
	writing value (DEC)	5					
	Type	Fr: φ314 57x2 Rr: φ314 57x2	×	×	○	~~×~~	~~×~~
	writing value (DEC)	6					
	Type	Fr: φ314 57x2 Rr: φ330 31.75	×	×	○	~~×~~	~~×~~
	writing value (DEC)	7					
	Type	Fr: φ330 31.75 Rr: φ330 31.75	×	×	○	~~×~~	~~×~~
	writing value (DEC)	8					

Table- (*2)-3 ○ Writable × Not writable

			Vehicle Type No.				
	Type		HD55	HD65	HD78	~~County Leaf~~	~~County Indp~~
	writing value (DEC)		1	2	3	~~4~~	~~5~~
Transmission No.	Type	M035S5 (5MT)	○	○	○	~~○~~	~~×~~
	writing value (DEC)	1					
	Type	T06S5 (5MT)	×	○	○	~~○~~	~~○~~
	writing value (DEC)	2					
	Type	T06S6 (6MT)	×	○	○	~~○~~	~~○~~
	writing value (DEC)	3					
	Type	T045S5 (5MT)	×	○ (Only "12V-500kbps software")	○ (Only "12V-500kbps software")	~~×~~	~~×~~
	writing value (DEC)	4					

(*3)Number of teeth depends on Brake No.
writing value (DEC) : 4 or 5 –> teeth number : 52
writing value (DEC) : other –> teeth number : 56 (Initial value)

(*4)Details of MAX engine torque

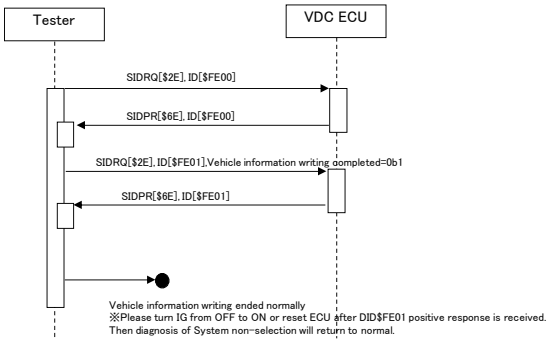
writing value 5bit (binary)	MAX engine torque (Nm)
00000	190±10
00001	210±10
00010	230±10
00011	250±10
00100	270±10
00101	290±10
00110	310±10
00111	330±10
01000	350±10
01001	370±10
01010	390±10
01011	410±10 (Initial value)
01100	430±10
01101	450±10
01110	470±10
01111	490±10
10000	510±10
10001	530±10
10010	550±10
10011	570±10
10100	590±10
10101	610±10
10110	630±10
10111	650±10
11000	670±10
11001	690±10
11010	710±10
11011	730±10
11100	750±10
11101	770±10
11110	790±10
11111	810±10

(*5)Details of front tire ~~diameter~~ radius and rear tire ~~diameter~~ radius
Writable range :300 ～ 450 mm

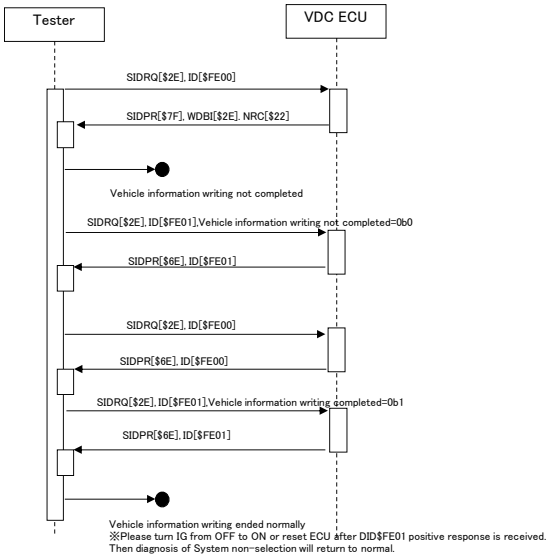
writing value 16bit (DEC)	Front tire ~~diameter~~ radius Rear tire ~~diameter~~ radius	○:Writable ×:Not writable
0	0 mm	×
1	1 mm	×
・ ・ ・	・ ・ ・	・ ・ ・
299	299 mm	×
300	300 mm	○
301	301 mm	○
・ ・ ・	・ ・ ・	・ ・ ・
399	399 mm	○
400	400 mm (Initial value)	○
401	401 mm	○
・ ・ ・	・ ・ ・	・ ・ ・
449	449 mm	○
450	450 mm	○
451	451 mm	×
・ ・ ・	・ ・ ・	・ ・ ・
65534	65534 mm	×
65535	65535 mm	×

(*6)Details of Vehicle information writing complete
When "0b0:not completed" is written in Vehicle information writing complete, it will be "System non-selection".
After "0b1:completed" is written in Vehicle information writing complete and IG OFF, it will return to normal.
When "0b1:completed" is written in Vehicle information writing complete, Vehicle information writing of "FE00" cannot be performed.
When performing vehicle type writing once again, before that, please rewrite vehicle type writing completion to "0".

【Vehicle information writing method flow】
1.When "0b0:not completed" is written in Vehicle information writing complete(DID[$FE01]).
(In the extendedDiagnosticSession, security level $01 is already unlocked.)



2.When "0b1: completed" is written in Vehicle information writing complete(DID[$FE01]).
(In the extendedDiagnosticSession, security level $01 is already unlocked.)



Ⅲ. RID List

Y: Supported
N: Not supported
*: With SecurityAccess (SID $27)

Hex	Description	Method	routineControlType	Type	Record Description	Size (bytes)	Unit	Data Type	Minimum value	Maximum value	Default Session	Programming Session	Extended Diag. Session	Safety System Diag. Session	Remarks
0200	Y/G Sensor zero position memorization	B	$01	–	–	–	–	–	–	–	N	N	Y		
			$02	–	–	–	–	–	–	–					
			$03	Response	Result	1	–	–	–	–					$0:Under control (Under Calbration) $1:Not under control (not Calibration or after Calibration)
0201	Steering angle Sensor zero position memorization	B	$01	–	–	–	–	–	–	–	N	N	Y		
			$02	–	–	–	–	–	–	–					
			$03	Response	Result	1	–	–	–	–					$0:Under control (Under Calbration) $1:Not under control (not Calibration or after Calibration)
FF00	Erase Memory	B	$01	–	–	–	–	–	–	–	N	Y*	N		
			$03	Response	Result	1	–	–	–	–					$0:Normal end $1:Executing $2:Abnormal end
FF01	Check Programming Dependencies	B	$01	–	–	–	–	–	–	–	N	Y*	N		
			$03	Response	Checksum	2	–	HEX	–	–					