

UDS \$19服务介绍

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\$19服务的三个核心

- DTC码
- Mask码
- Subfunction码

1.DTC码

- DTC码由三个byte组成

DTC包含3个Bytes

➤ Byte1/bit7-bit6: 故障所属系统

- 00: powertrain(P)
- 01: chassis(C)
- 10: body(B)
- 11: generic/network(U)

➤ Byte1/bit5-bit4

- 00: ISO控制
- 01: 可使用
- 10: 可使用
- 11: ISO预留for Powertrain ECU

b, c的限制仅适用powertrain ECU, 对其他系统ECU无限制

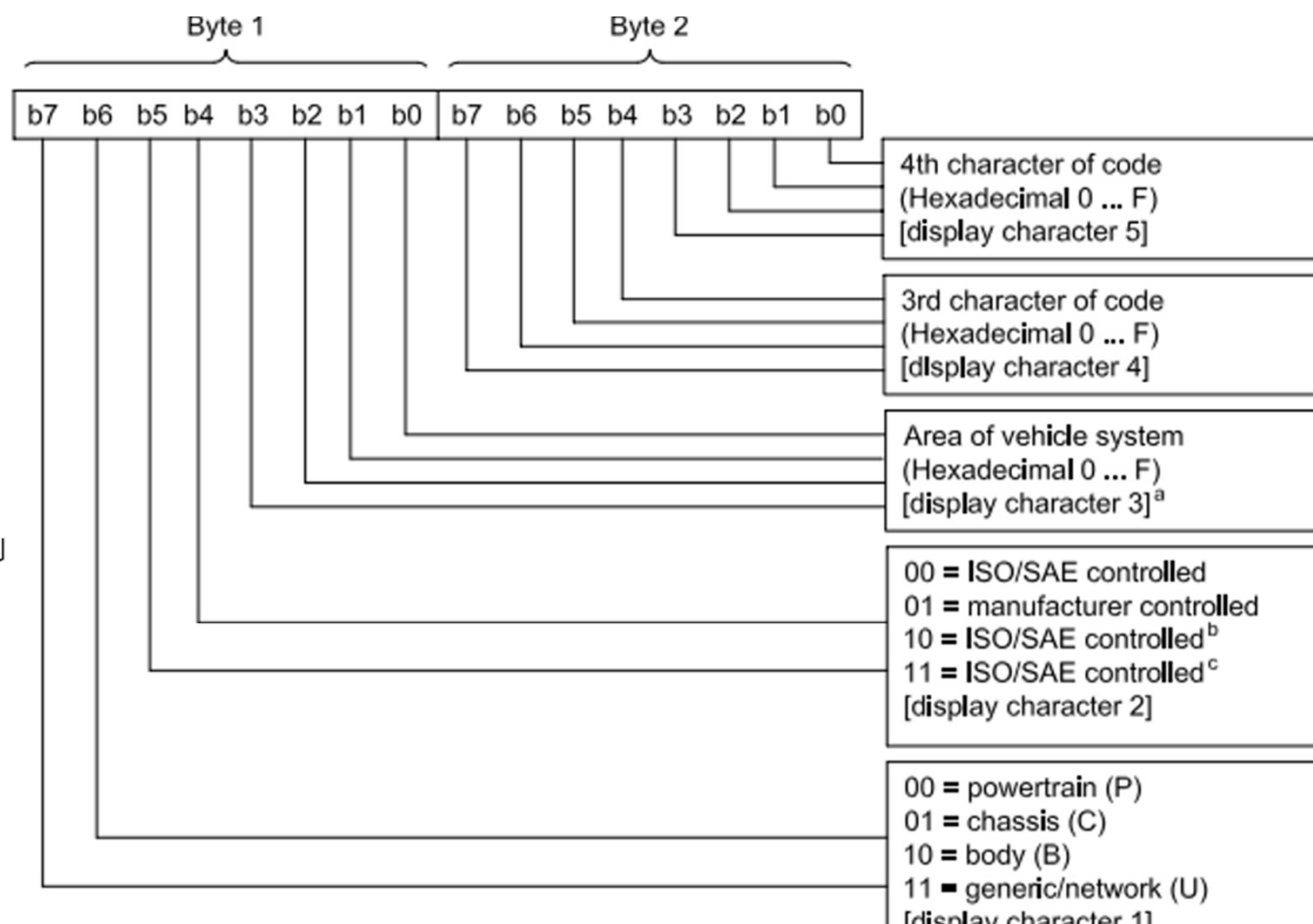
可使用范围: 01, 10, 11

➤ Byte1/bit3-bit0: 车辆区域

可使用范围: 0000-1111

➤ Byte2

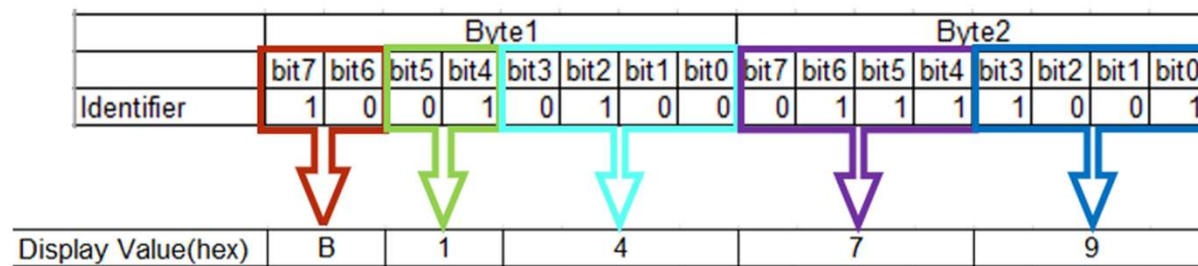
可使用范围: 0000-1111



1.DTC码

- DTC码和现实码转换关系

Identifier	Alt. Display Value
947912	B147912



1.DTC码

- DTC码第三个BYTE转换关系

Byte3—DTCFailureType

Byte3/bit7-bit4: DTC Failure Category

指故障类型，常用故障例如下，

0001: 一般电气故障

0100: 系统内部故障

0101: 系统编程故障

1000: 总线/信号故障

Byte3—DTCFailureType

Byte3/bit3-bit0: DTC Failure Sub Type

一般电气故障[短路到地，短路到电源，开路故障]

系统内部故障(内存故障，功能相关故障)

系统编程故障(VIN/CCP写入无效值或CRC错误故障)

总线/信号故障(Bus off, 节点丢失，报文CRC error故障)

- 练习：常用的DTC转换

Identifier	Alt. Display Value	Software label	Description
90F413	B10F413		Right front position light General Electrical Failures Circuit open

Identifier	Alt. Display Value	Software label	Description
97D571	B17D571		Left Front Door Outside Open/Close Switch Mechanical Failures Actuator stuck

2.DTC mask码

- Mask码只有一个BYTE，每个bit都有自己的含义

DTC status bits	Bit	Name
	0	<u>testFailed</u>
	1	<u>testFailedThisOperationCycle</u>
	2	<u>pendingDTC</u>
	3	<u>confirmedDTC</u>
	4	<u>testNotCompletedSinceLastClear</u>
	5	<u>testFailedSinceLastClear</u>
	6	<u>testNotCompletedThisOperationCycle</u>
	7	<u>warningIndicatorRequested</u>

2.DTC mask码

- Bit0:当前测试结果

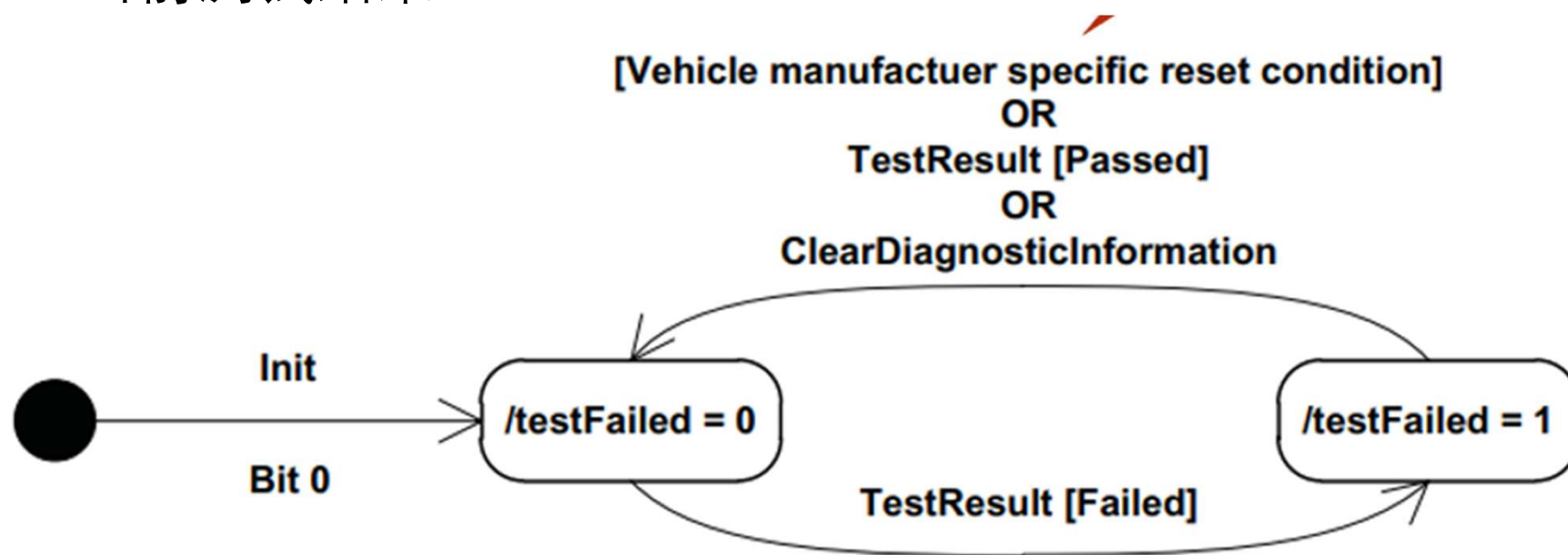


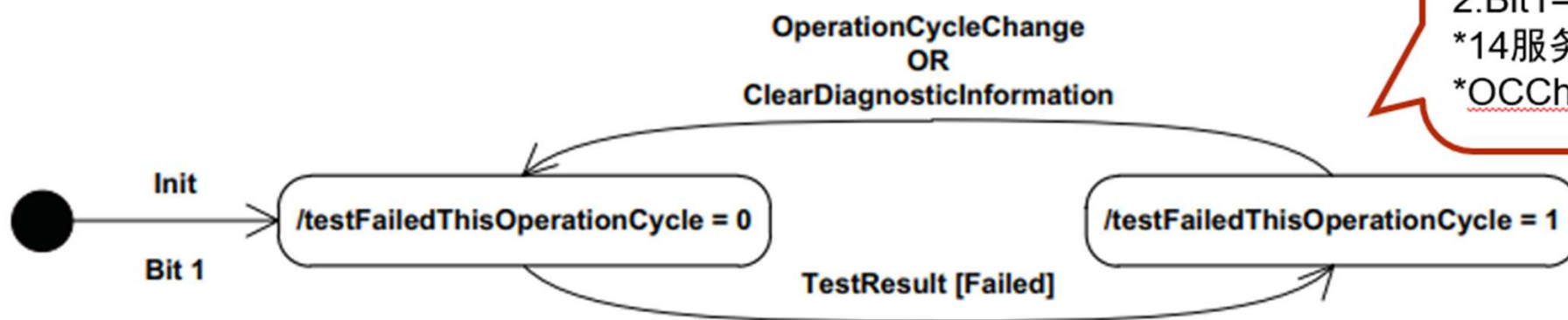
Figure D.1 — DTC status bit 0 testFailed logic

2.DTC mask码

Bit1: testFailedThisOperationCycle

当前OperationCycle中是否出现过bit0置1的情况

Operation Cycle: An operation cycle defines the start and end conditions for monitors to run.



1.Bit1=0→1,
TestResult[Failed]
2.Bit1=1→0,
*14服务
*OCChange

Figure D.2 — DTC status bit 1 `testFailedThisOperationCycle` logic

2.DTC mask码

- Bit2: : pending DTC.
- 和Bit1不同的地方在于Bit2不仅仅当前是否出现，还检查历史记录中是否出现

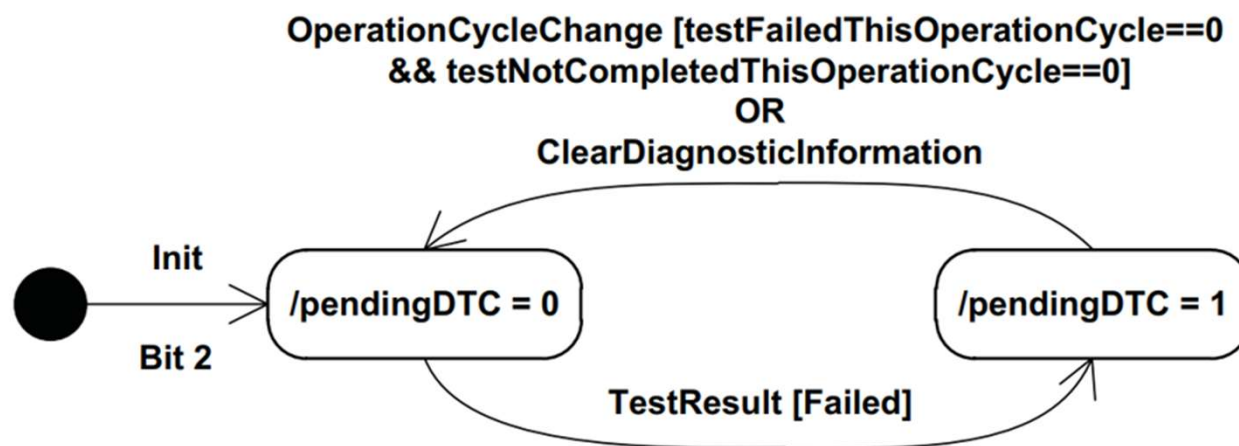


Figure D.3 — DTC status bit 2 pendingDTC logic

2.DTC mask码

- Bit3: : confirmedDTC
- 必须先有BIT0才有bit3, 在多次连续BIT0之后系统才会触发bit3

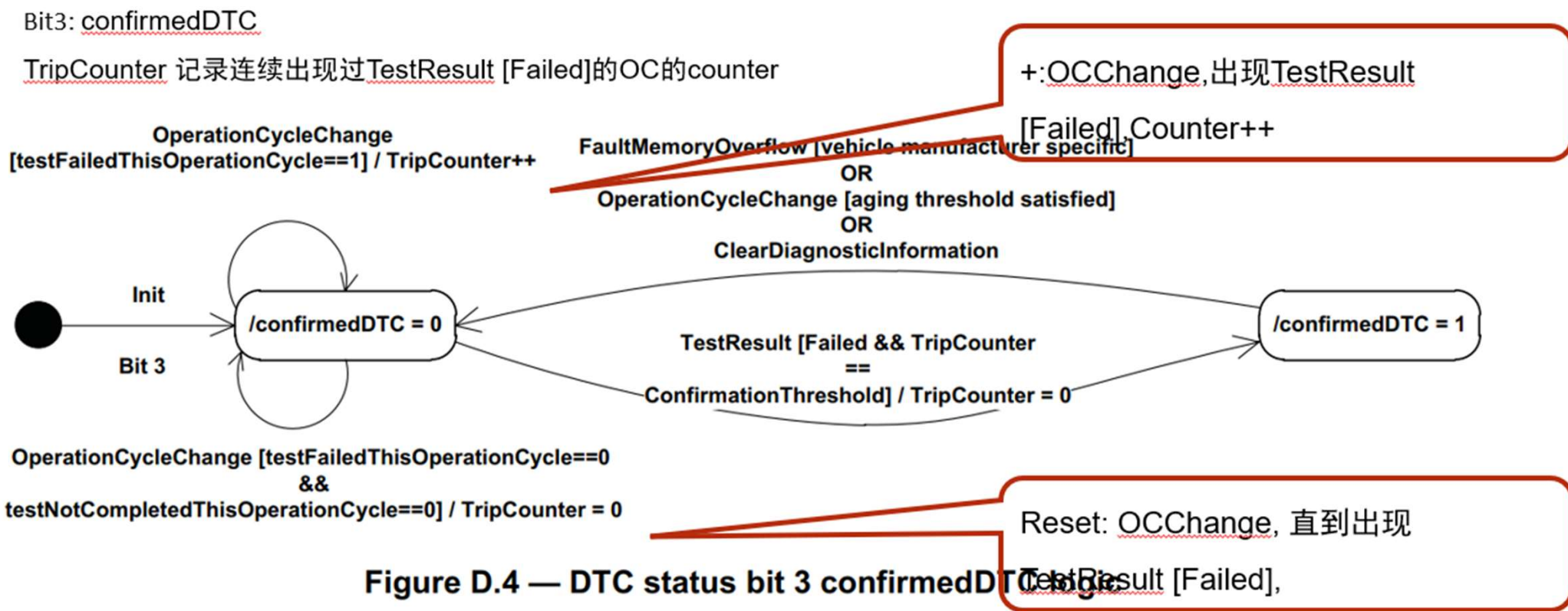


Figure D.4 — DTC status bit 3 confirmedDTC

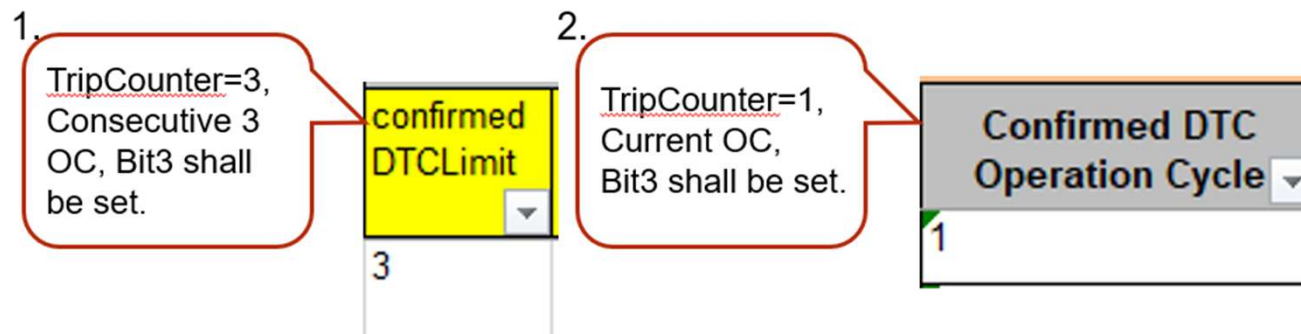
2.DTC mask码

- Bit3: : confirmedDTC
- 经过一定数量bit0的老化才会触发bit3, 同时此DTC记录在EEPROM里面

✓ 1.Bit3=0→1

*TestResult [Failed && TripCounter == ConfirmationThreshold]

Examples for TripCounter definition:



2.DTC mask码

- 清除BIT3的方法，必须要记录多次循环中没有触发bit0，系统才能清除
- 使用\$14服务清除

✓ Bit3=1→0

*14服务

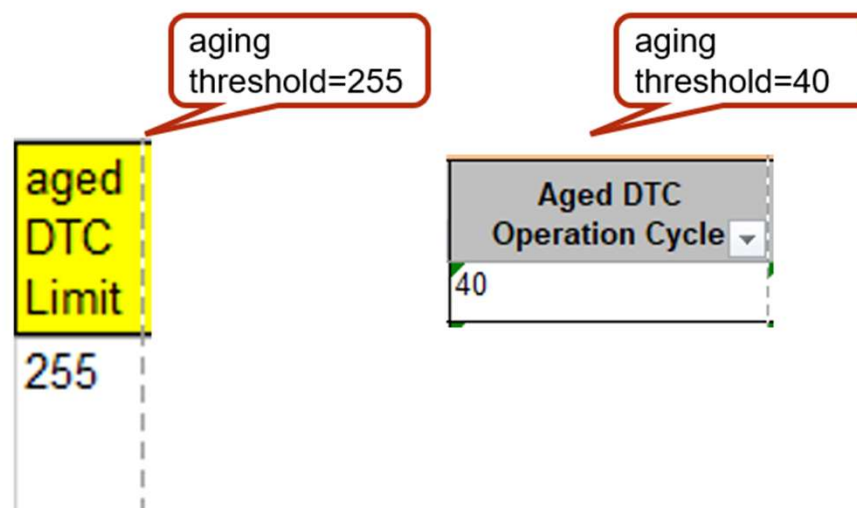
* OCChange [aging threshold satisfied]

Examples of aging threshold

Definition:

+:TestResult [Passed] 的OC

Reset: TestResult [Failed]



2.DTC mask码

- Bit4: testNotCompletedSinceLastClear 上次清除DTC后，是否完成了测试

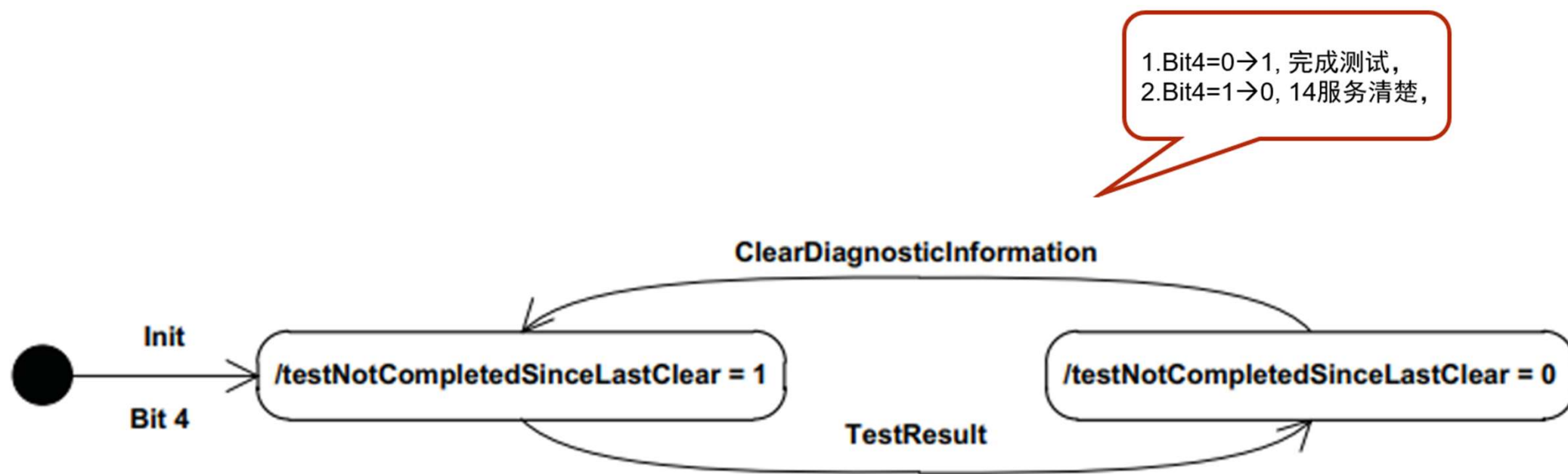


Figure D.5 — DTC status bit 4 testNotCompletedSinceLastClear logic

2.DTC mask码

- Bit5:testfailedsincelastclear.上次清除DTC后，是否出现过TESTFAIL

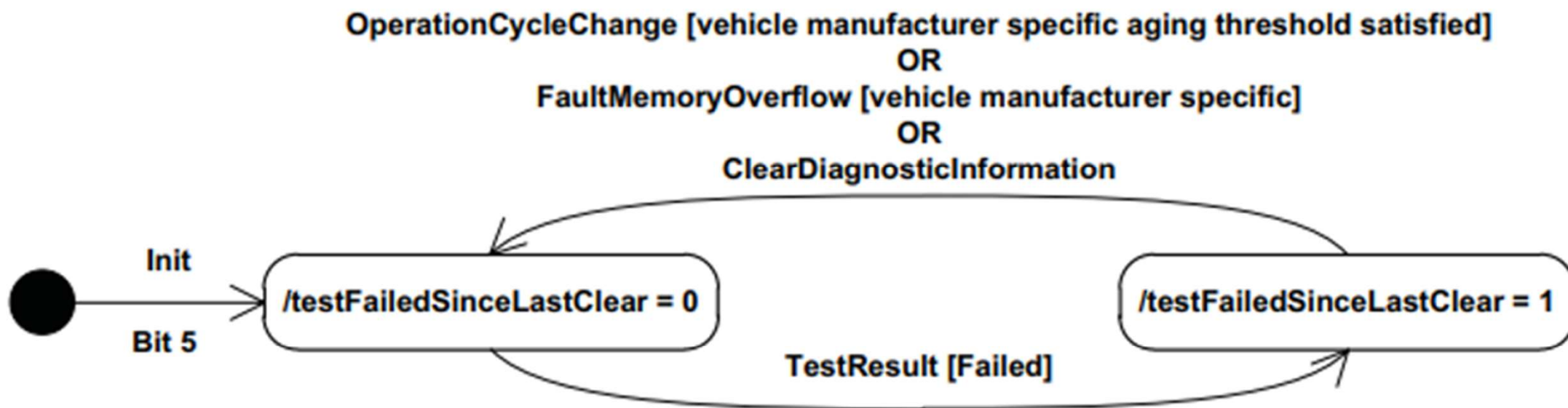


Figure D.6 — DTC status bit 5 testFailedSinceLastClear logic

2.DTC mask码

- Bit6:testnotcompletedthisoperationcycle.当前操作循环是否完成监测

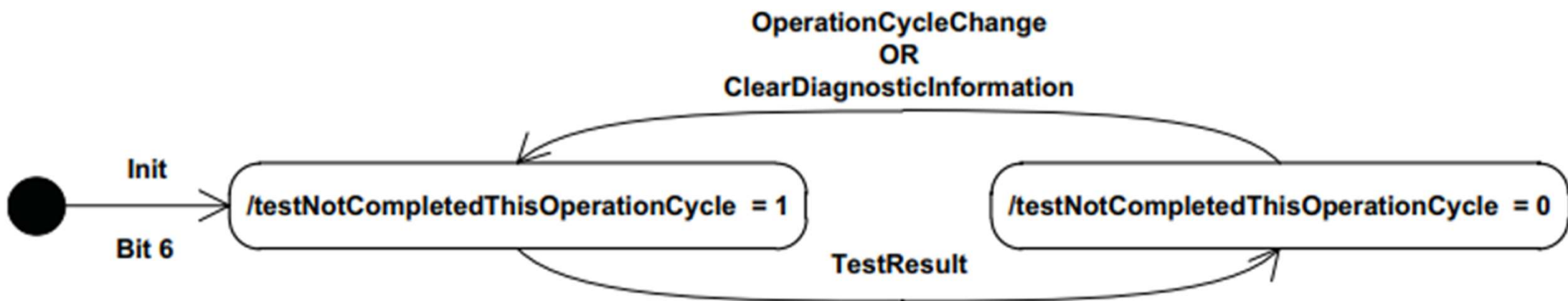
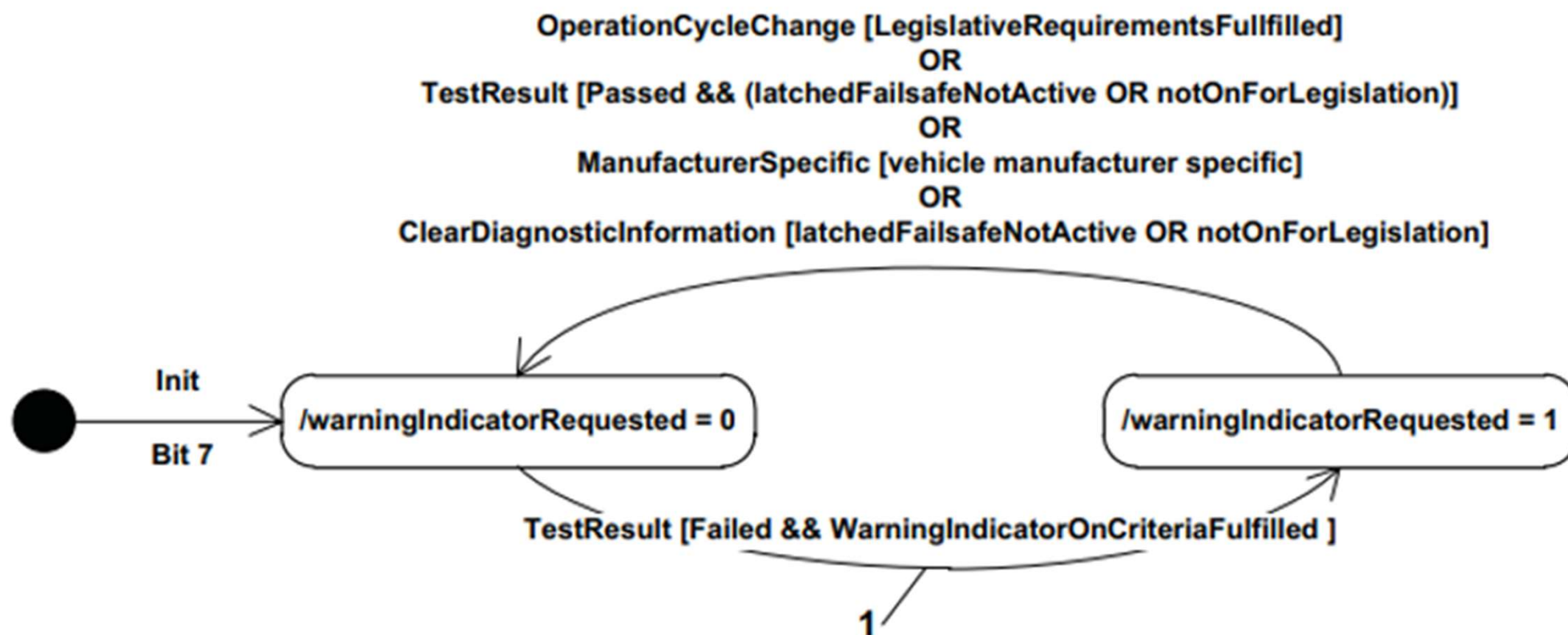


Figure D.7 — DTC status bit 6 `testNotCompletedThisOperationCycle` logic

2.DTC mask码

- Bit7:warningindicatorrequested当前DTC是否显示



2.DTC mask码

TripCounter=2

未知状态

0: 执行14服务→0x50

1,2: TestResult [Passed]→0x00

[检测完成, 结果是Passed, 故障未发生]

3,4,5,6: TestResult [Failed]→0x27

[检测结果Failed,故障发生,

TripCounter+1]

7: TestResult [Passed]→0x26

[检测结果Passed, 故障消失]

8: TestResult [Failed]→0x27

[检测结果Failed, 故障消失]

11: OEM定义(keep previous status)

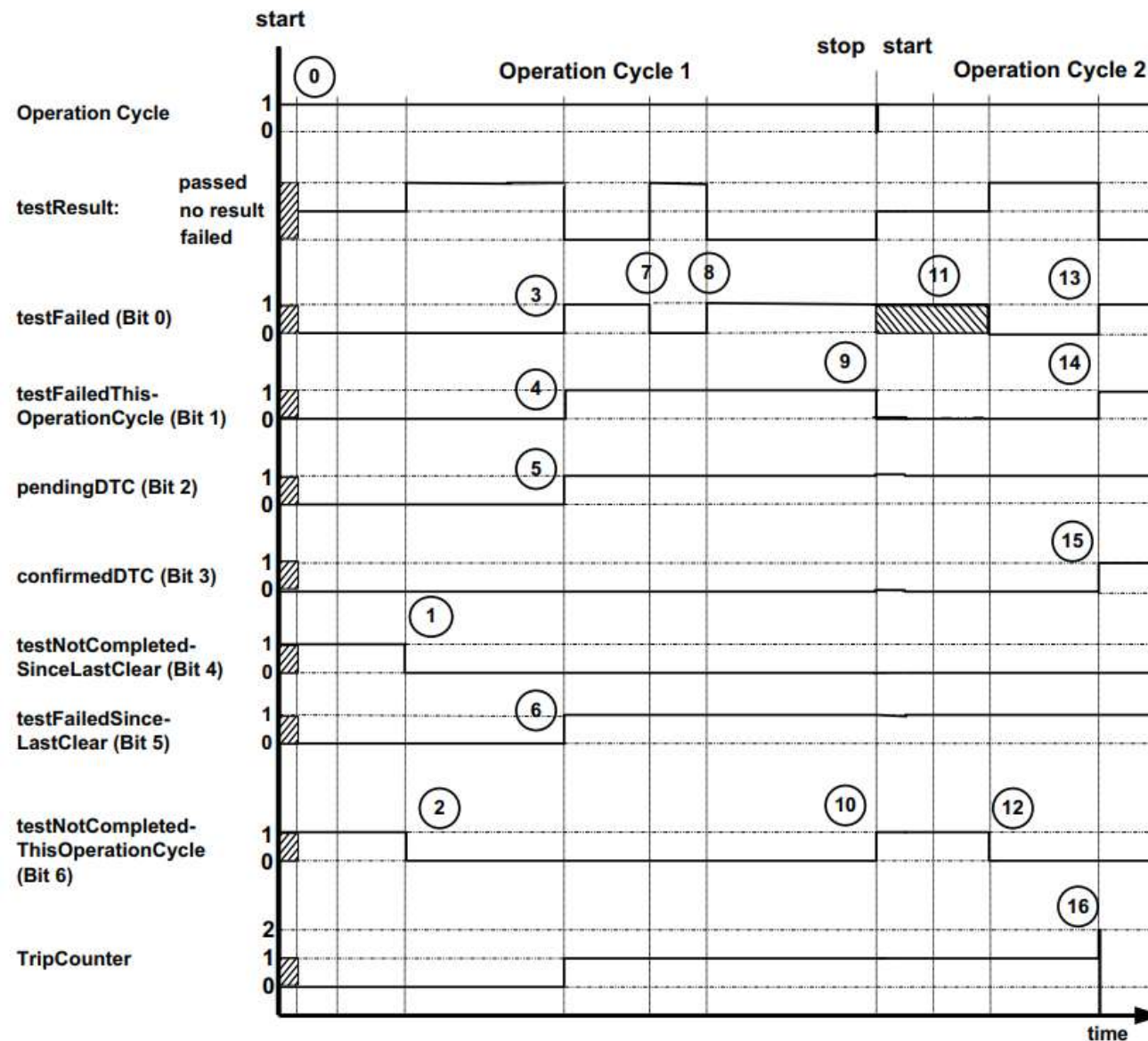
9,10: OCChange→0x65

12: TestResult [Passed]→0x24

[New OC Start, 完成检测, 结果Passed]

13,14,15,16: TestResult [Failed]→0x2F

[完成检测, 结果Passed,TripCounter满足]



3.Subfunction码

在14229-中， 19服务定义了28个子服务， 常用的有如下5种，

0x01 reportNumberOfDTCByStatusMask(读取客户端定义状态掩码匹配的DTC数量)

0x02 reportDTCByStatusMask(读取客户端定义状态掩码匹配的DTC)

0x04 reportDTCSnapshotRecordByDTCNumber(读取DTC的快照信息)

0x06 reportDTCExtDataRecordByDTCNumber(读取DTC的扩展数据)

0x0A reportSupportedDTC(读取ECU支持的所有DTC)

3.subfunction码

- 19 01

➤ 请求格式定义：

A_Data byte	Parameter Name	Cvt	Byte Value	Mnemonic
#1	ReadDTCInformation Request SID	M	0x19	RDTCI
#2	sub-function = [reportType =	M		LEV_
	reportNumberOfDTCByStatusMask		0x01	RNODTCBSM
	reportDTCByStatusMask		0x02	RDTCBSM
	reportMirrorMemoryDTCByStatusMask		0x0F	RMMDTCBSM
	reportNumberOfMirrorMemoryDTCByStatusMask		0x11	RNOMMDTCBSM
	reportNumberOfEmissionsOBDDTCByStatusMask reportEmissionsOBDDTCByStatusMask]		0x12 0x13	RNOOEBDTCBSM ROBDTCBSM
#3	DTCStatusMask	M	0x00 – 0xFF	DTCSM

19 01的请求包含3个Bytes, 19(SID)+01(sub-function)+DTCStatusMask

3.subfunction码

- DTCStatusAvailabilityMask
客户要求实现的DTC status bits

Example for 19 01:

Tester→ECU, Report bit0=1 的DTC 数量

Request:19 01 01(DTC Status bits, bit0=1)

Response:59 01 FF 01 20(bit0=1的DTC数量是32个)

32个包含DTC3, DTC4

运算: DTCStatusMask&&DTC Status bits !=0

凡是这个mask都计数

DTC1: 0x50

DTC2: 0x00

DTC3: 0x2F

DTC4: 0x27

.
.

.

.

DTC status bits			M/O
Bit no See note 1	Name	Definition	
0 (SB0)	testFailed	See note 2 with the following addition: -[Data_50] Road vehicles – Diagnostics systems – Diagnostic services allows for additional reset conditions to be defined by the vehicle manufacturer or implementer. No such additional reset condition of this bit is allowed. Note that the value of this bit shall not be reset to 0 at start of an operation cycle (the value from previous operation cycle shall be kept).	M
1 (SB1)	testFailedThisOperationCycle	See note 2.	M
2 (SB2)	pendingDTC	See note 2.	M
3 (SB3)	confirmedDTC	See note 2 with the following addition: - The bit shall be set to 1 when the trip counter (OCC6) reaches the confirmedDTCLimit. The value of confirmedDTCLimit is specified by the implementer according to the requirements specified in section <i>Generic requirements on calibration of DTCs</i> . The value shall be in the range of [1, +15]. Refer to section <i>DTC operation cycle counters</i> for definition of the OCC6. - The bit shall be reset to 0 when the DTC is aged. Refer to table <i>Requirements in implementation of clear of DTC information</i> in section <i>Clear DTC information</i> for when a DTC is aged. - The bit shall not be set to 1 and it shall be reset to 0, in case of the bit is already set to 1, if there are no aging counter (OCC2 or OCC5) allocated to the DTC due to the long term memory overflow. Refer to table <i>Requirements in implementation of clear of DTC information</i> in section <i>Clear DTC information</i> for definition of long term memory overflow.	M
4 (SB4)	testNotCompletedSinceLast-Clear	See note 2.	M
5 (SB5)	testFailedSinceLastClear	See note 2.	M
6 (SB6)	testNotCompletedThis-OperationCycle	See note 2.	M
7 (SB7)	warningIndicatorRequested	See note 2 with the following addition:	M

3.subfunction码

• 19 01

➤ 回复格式定义:

A_Data byte	Parameter Name	Cvt	Byte Value	Mnemonic
#1	ReadDTCInformation Response SID	M	0x59	RDTICIPR
#2	reportType = [	M		LEV_
	reportNumberOfDTCByStatusMask		0x01	RNODTCBSM
	reportNumberOfDTCBySeverityMaskRecord		0x07	RNODTCBSMR
	reportNumberOfMirrorMemoryDTCByStatusMask		0x11	RNOMMDTCBSM
	reportNumberOfEmissionsOBDDTCByStatusMask]		0x12	RNOEOBDDTCBSM
#3	DTCStatusAvailabilityMask	M	0x00 – 0xFF	DTCSAM
#4	DTCFormatIdentifier = [SAE_J2012-DA_DTCFormat_00 ISO_14229-1_DTCFormat SAE_J1939-73_DTCFormat ISO_11992-4_DTCFormat SAE_J2012-DA_DTCFormat_04]	M		DTCFID_
			0x00	J2012-DADTCF00
			0x01	14229-1DTCF
			0x02	J1939-73DTCF
			0x03	11992-4DTCF
			0x04	J2012-DADTCF04
#5 #6	DTCCount[] = [DTCCCountHighByte DTCCCountLowByte]	M	0x00 – 0xFF	DTCC_ DTCCHB
		M	0x00 – 0xFF	DTCCLB

59(SID)+01(reportType)+DTCStatusAvailabilityMask+DTCFormatIdentifier+DTCCCount

3.subfunction码

• 19 02

➤ 请求格式定义：

A_Data byte	Parameter Name	Cvt	Byte Value	Mnemonic
#1	ReadDTCInformation Request SID	M	0x19	RDTCI
#2	sub-function = [reportType =	M		LEV_
	reportNumberOfDTCByStatusMask		0x01	RNODTCBSM
	reportDTCByStatusMask		0x02	RDTCSM
	reportMirrorMemoryDTCByStatusMask		0x0F	RMMDTCBSM
	reportNumberOfMirrorMemoryDTCByStatusMask		0x11	RNOMMDTCBSM
	reportNumberOfEmissionsOBDDTCByStatusMask		0x12	RNOOEBDTCBSM
#3	reportEmissionsOBDDTCByStatusMask]	M	0x13	ROBDTCBSM
	DTCStatusMask		0x00 – 0xFF	DTCSM

19 02的请求包含3个Bvtes. 19(SID)+02(sub-function)+DTCStatusMask

3.subfunction码

- 19 02回复格式:
- 59(SID)+02(reportType)
+DTCStatusAvailability
Mask+DTCAndStatusR
ecord
- Example for 19 02:
- Tester→ECU, Report
bit0=1 的DTC
- Request:19 02 01(DTC
Status bits, bit0=1)
- Response:59 02 FF DTC3
2F DTC4 27

A_Data byte	Parameter Name	Cvt	Byte Value	Mnemonic
#1	ReadDTCInformation Response SID	M	0x59	RDTICIPR
#2	reportType = [	M		LEV
	reportDTCByStatusMask		0x02	RDTCBISM
	reportSupportedDTCs		0x0A	RSUPDTC
	reportFirstTestFailedDTC		0x0B	RFTFDTC
	reportFirstConfirmedDTC		0x0C	RFCDDTC
	reportMostRecentTestFailedDTC		0x0D	RMRTFDTC
	reportMostRecentConfirmedDTC		0x0E	RMRCDDTC
	reportMirrorMemoryDTCByStatusMask		0x0F	RMMDDTCBSM
	reportEmissionsOBDDTCByStatusMask		0x13	ROBDDTCBSM
	reportDTCWithPermanentStatus]		0x15	RDTCWPS
#3	DTCStatusAvailabilityMask	M	0x00 – 0xFF	DTCSAM
#4	DTCAndStatusRecord[] = [			DTCASR_
#5	DTCHighByte#1	C ₁	0x00 – 0xFF	DTCHB
#6	DTCMiddleByte#1	C ₁	0x00 – 0xFF	DTCMB
#7	DTCLowByte#1	C ₁	0x00 – 0xFF	DTCLB
#8	statusOfDTC#1	C ₁	0x00 – 0xFF	SODTC
#9	DTCHighByte#2	C ₂	0x00 – 0xFF	DTCHB
#10	DTCMiddleByte#2	C ₂	0x00 – 0xFF	DTCMB
#11	DTCLowByte#2	C ₂	0x00 – 0xFF	DTCLB
#12	statusOfDTC#2	C ₂	0x00 – 0xFF	SODTC
:	:	:	:	:
#n-3	DTCHighByte#m	C ₂	0x00 – 0xFF	DTCHB
#n-2	DTCMiddleByte#m	C ₂	0x00 – 0xFF	DTCMB
#n-1	DTCLowByte#m	C ₂	0x00 – 0xFF	DTCLB
#n	statusOfDTC#m]	C ₂	0x00 – 0xFF	SODTC

3.subfunction码

• 19 04

A_Data byte	Parameter Name	Cvt	Byte Value	Mnemonic
#1	ReadDTCInformation Request SID	M	0x19	RDTCI
#2	sub-function = [reportType = reportDTCSnapshotIdentification reportDTCSnapshotRecordByDTCNumber]	M	0x03	LEV_ RDTCSI
			0x04	RDTCSBDTC
#3	DTCMaskRecord[] = [DTCHighByte DTCMiddleByte DTCLowByte]	C	0x00 – 0xFF	DTCMREC_ DTCHB
#4		C	0x00 – 0xFF	DTCMB
#5		C	0x00 – 0xFF	DTCLB
#6	DTCSnapshotRecordNumber	C	0x00 – 0xFF	DTCSSRN
C: The DTCMaskRecord record and DTCSnapshotRecordNumber parameters are only present in case the sub-function parameter is equal to reportDTCSnapshotRecordByDTCNumber.				

19 04的请求包含6个Bytes, 19(SID)+04(sub-function)+DTCMaskRecord+DTCSnapshotRecordNumber

3.subfunction码

- 19 04回复格式:
- 59(SID)+04(reportType)+DTC+DTC Status+SnapshotID +SnapshotInformation

A_Data byte	Parameter Name	Cvt	Byte Value	Mnemonic
#1	ReadDTCInformation Response SID	M	0x59	RDTCIPLR
#2	reportType = [reportDTCSnapshotRecordByDTCNumber]	M	0x04	LEV_RDTCCSBDTC
#3	DTCAndStatusRecord[] = [DTCHighByte DTCMiddleByte DTCLowByte statusOfDTC]	M	0x00 – 0xFF	DTCASR_
#4		M	0x00 – 0xFF	DTCHB
#5		M	0x00 – 0xFF	DTCMB
#6		M	0x00 – 0xFF	DTCLB
#7	DTCSnapshotRecordNumber#1	C ₁	0x00 – 0xFF	DTCSSRN
#8	DTCSnapshotRecordNumberOfIdentifiers#1	C ₁	0x00 – 0xFF	DTCSSRNI
#9	DTCSnapshotRecord[]#1 = [dataIdentifier#1 byte#1 (MSB) dataIdentifier#1 byte#2 (LSB) snapshotData#1 byte#1 : snapshotData#1 byte#p : dataIdentifier#w byte#1 (MSB) dataIdentifier#w byte#2 (LSB) snapshotData#w byte#1 : snapshotData#w byte#m]	C ₁	0x00 – 0xFF	DTCSSR_
#10		C ₁	0x00 – 0xFF	DIDB11
#11		C ₁	0x00 – 0xFF	DIDB12
:		C ₁	:	SSD11
:		C ₁	:	:
# 11+(p-1)		C ₁	0x00 – 0xFF	SSD1p
:		C ₁	:	:
#r-(m-1)-2		C ₂	0x00 – 0xFF	DIDB21
#r-(m-1)-1		C ₂	0x00 – 0xFF	DIDB22
#r-(m-1)		C ₂	0x00 – 0xFF	SSD21
:		C ₂	:	:
#r		C ₂	0x00 – 0xFF	SSD2m
:	:	:	:	:
#t	DTCSnapshotRecordNumber#x	C ₃	0x00 – 0xFF	DTCSSRN
#t+1	DTCSnapshotRecordNumberOfIdentifiers#x	C ₃	0x00 – 0xFF	DTCSSRNI
#t+2	DTCSnapshotRecord[]#x = [dataIdentifier#1 byte#1 (MSB) dataIdentifier#1 byte#2 (LSB) snapshotData#1 byte#1 : snapshotData#1 byte#p : dataIdentifier#w byte#1 (MSB) dataIdentifier#w byte#2 (LSB) snapshotData#w byte#1 : snapshotData#w byte#u]	C ₃	0x00 – 0xFF	DTCSSR_
#t+3		C ₃	0x00 – 0xFF	DIDB11
#t+5		C ₃	0x00 – 0xFF	DIDB12
:		C ₃	0x00 – 0xFF	SSD11
:		C ₃	:	:
#t+5+(p-1)		C ₃	0x00 – 0xFF	SSD1p
:		C ₃	:	:
#n-(u-1)-2		C ₄	0x00 – 0xFF	DIDB21
#n-(u-1)-1		C ₄	0x00 – 0xFF	DIDB22
#n-(u-1)		C ₄	0x00 – 0xFF	SSD21
:		C ₄	:	:
#n		C ₄	0x00 – 0xFF	SSD2u

3.subfunction码

- 19 06

A_Data byte	Parameter Name	Cvt	Byte Value	Mnemonic
#1	ReadDTCInformation Request SID	M	0x19	RDTCI
#2	sub-function = [reportType =	M		LEV_
	reportDTCExtDataRecordByDTCNumber		0x06	RDTCEDRBDN
	reportMirrorMemoryDTCExtDataRecordByDTCNumber]		0x10	RMDEDRBDN
#3	DTCMaskRecord[] = [DTCHighByte DTCMiddleByte DTCLowByte]	M	0x00 – 0xFF	DTCMREC_ DTCHB
#4		M	0x00 – 0xFF	DTCMB
#5		M	0x00 – 0xFF	DTCLB
#6	DTCExtDataRecordNumber	M	0x00 – 0xFF	DTCEDRN

19 06的请求包含6个Bytes, 19(SID)+06(sub-function)+
DTCMaskRecord+DTCExtDataRecordNumber

3.subfunction码

- 19 06回复格式
- 59(SID)+06(reportType)
+ DTC+DTC
Status+ExtDataNumb
er+ExtData

A_Data byte	Parameter Name	Cvt	Byte Value	Mnemonic
#1	ReadDTCInformation Response SID	M	0x59	RDTICIPR
#2	reportType = [reportDTCEstDataRecordByDTCNumber reportMinorMemoryDTCEstDataRecordByDTCNumber]	M	0x06 0x10	LEV RDTCEDRBD RMBEDRBDN
#3 #4 #5 #6	DTCAndStatusRecord[] = [DTCHighByte DTCMiddleByte DTCLowByte statusOfDTC]	M M M M	0x00 – 0xFF 0x00 – 0xFF 0x00 – 0xFF 0x00 – 0xFF	DTCASR_ DTCHB_ DTCMB DTCLB SODTC
#7	DTCEstDataRecordNumber#1	C ₁	0x00-0xFD	DTCEDRN
#8 : #8+(p-1)	DTCEstDataRecord[]#1 = [extendedData#1 byte#1 : extendedData#1 byte#p]	C ₁ C ₁ C ₁	0x00 – 0xFF : 0x00 – 0xFF	DTCSSR_ EDD11 : EDD1p
:	:	:	:	:
#t	DTCEstDataRecordNumber#x	C ₂	0x00 – 0xFD	DTCEDRN
#t+1 : #t+1+(q-1)	DTCEstDataRecord[]#x = [extendedData#x byte#1 : extendedData#x byte#q]	C ₂ C ₂ C ₂	0x00 – 0xFF : 0x00 – 0xFF	DTCSSR_ EDDx1 : EDDxq

C₁: The DTCEstDataRecordNumber and the extendedData in the DTCEstDataRecord parameter are only present if at least one DTCEstDataRecord is available to be reported.

C₂: The DTCEstDataRecordNumber and the extendedData in the DTCEstDataRecord parameter are only present if all records are requested to be reported (DTCEstDataRecordNumber set to 0xFE or 0xFF in the request) and more than one record is available to be reported.

3.subfunction码

- 19 0A

A_Data byte	Parameter Name	Cvt	Byte Value	Mnemonic
#1	ReadDTCInformation Request SID	M	0x19	RDTCl
#2	sub-function = [reportType =	M		LEV
	reportSupportedDTC		0x0A	RSUPDTC
	reportFirstTestFailedDTC		0x0B	RFTFDTC
	reportFirstConfirmedDTC		0x0C	RFC DTC
	reportMostRecentTestFailedDTC		0x0D	RMRTFDTC
	reportMostRecentConfirmedDTC		0x0E	RMRC DTC
	reportDTCFaultDetectionCounter		0x14	RDTCFDC
	reportDTCWithPermanentStatus]		0x15	RDTCWPS

19 02的请求包含2个Bytes, 19(SID)+0A(sub-function)

3.Subfunction码

- 19 0A回复格式
- 59(SID)+0A(reportType)+DTC+DTC Status

A_Data byte	Parameter Name	Cvt	Byte Value	Mnemonic
#1	ReadDTCInformation Response SID	M	0x59	RDTICIPR
#2	reportType = [reportDTCByStatusMask reportSupportedDTCs reportFirstTestFailedDTC reportFirstConfirmedDTC reportMostRecentTestFailedDTC reportMostRecentConfirmedDTC reportMirrorMemoryDTCByStatusMask reportEmissionsOBDDTCByStatusMask reportDTCWithPermanentStatus]	M	0x02 0x0A 0x0B 0x0C 0x0D 0x0E 0x0F 0x13 0x15	LEV_ RDTCSBM RSUPDTC RFTFDTC RFCDDTC RMRTFDTC RMRCDDTC RMMDDTCBSM ROBDDTCBSM RDTCWPS
#3	DTCStatusAvailabilityMask	M	0x00 – 0xFF	DTCSAM
#4	DTCAndStatusRecord[] = [DTCHighByte#1 DTCMiddleByte#1 DTCLowByte#1 statusOfDTC#1 DTCHighByte#2 DTCMiddleByte#2 DTCLowByte#2 statusOfDTC#2 : DTCHighByte#m DTCMiddleByte#m DTCLowByte#m statusOfDTC#m]	C ₁	0x00 – 0xFF	DTCASR_ DTCHB
#5		C ₁	0x00 – 0xFF	DTCMB
#6		C ₁	0x00 – 0xFF	DTCLB
#7		C ₁	0x00 – 0xFF	SODTC
#8		C ₂	0x00 – 0xFF	DTCHB
#9		C ₂	0x00 – 0xFF	DTCMB
#10		C ₂	0x00 – 0xFF	DTCLB
#11		C ₂	0x00 – 0xFF	SODTC
:		:	:	:
#n-3		C ₂	0x00 – 0xFF	DTCHB
#n-2		C ₂	0x00 – 0xFF	DTCMB
#n-1		C ₂	0x00 – 0xFF	DTCLB
#n		C ₂	0x00 – 0xFF	SODTC

谢谢观看



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