Diagnostic Sheet
FROM: Maserati TSO
TO: Maserati Network

Maserati
PERSONAL SERVICE LAB
MASTERS OF CARE

Cambiocorsa "F1" Gearbox Diagnosis

DATE: February 21, 2024

The purpose of this Diagnostic Sheet is to provide guidance and information about the most common points to be considered when diagnosing issues on the Cambiocorsa transmission of the M139 and M145 models equipped with this robotized "F1" transmission.

MODELS: Quattroporte (M139) and GranTurismo (M145) with Cambiocorsa (also known as F1 gearbox) transmission

TOPIC: During the execution of Diagnosis on NCR ECU, some points need to be considered.

Section A: Important Notes on the Active Diagnosis Self-Learning (All)

Never perform the NCR > Active Diagnosis > Self Learning (All).

This Active Diagnosis will permanently damage the NCR ECU, for which reason the latter will require replacement.
Note: if the Self-Learning (All) was already carried out, the following steps can be attempted to restore proper NCR functionalities:

1. Install the NCR ECU on a like vehicle.
2. Perform the DEIS procedure.
3. Reinstall the NCR ECU on the Vehicle it came from and perform the F1 Grid.

Section B: Execution of the NCR Self-Learning

Steps for the execution of the Self-Learning of the NCR:

1. Set the new clutch position and the PIS (Punto Incipiente Slittamento, i.e. slip beginning point). Note: the PIS is also referred to as Kiss Point.
2. Make the DEIS operation in Active Diagnosis so that the clutch is mapped by the NCR.
3. Perform the Gear Structure self-learning.
4. Drive the car some distance to be sure that all the gears are working: no need to go fast, just a simple gentle drive to get the gearbox oil warm.
5. Perform again the Gear Structure self-learning.
6. Perform the superfast shift learning with warm gearbox oil. If the Superfast shift is not available on the Vehicle in subject, skip to the following step.
7. Reset the accelerometer offset via Active Diagnosis.
8. Perform NCR > Specific Function > Kiss Point

Based on the Model and the System version (please refer to the Training Manual for further details) the Kiss Point basic values are summarized in Table 1.

© 2024 Maserati North America. Aftersales
www.maseratiusa.com

All rights reserved. Reproduction or translation in whole or in part is not permitted without authorization from the publisher. Printed in USA

Table 1: Kiss Point values based on model and system.

Kiss Point basic values				
Model	**System**	**Min**	**Standard**	**Max**
M138 Coupé, Spyder, Gransport	Pre-Sofast	4,8 mm	5,1 mm	5,4 mm
	Sofast 1	4,8 mm	5,1 mm	5,4 mm
	Sofast 2	4,8 mm	5,1 mm	5,4 mm
M139 Quattroporte Duoselect	Sofast 2	4,8 mm	5,1 mm	5,4 mm
	Sofast 3	3,9 mm	4,2 mm	4,4 mm
	Sofast 3 +	3,9 mm	4,2 mm	4,4 mm
M145 GranTurismo S	Sofast 4 Superfast shift	3,9 mm	4,2 mm	4,4 mm
M145 GranTurismo MC Stradale	Sofast 4 Superfast shift 2	3,9 mm	4,2 mm	4,4 mm
Alfa Romeo 8C & 8C Spider	Sofast 3 +	3,9 mm	4,2 mm	4,4 mm

Section C: Execution of the F1 Grid

1. Download the **Excel file F1_Grid.xlsm.**
2. The values required for the filling of the tables "Threshold min./max. Engagement" and "Threshold min./max. Selection" (Figure 1, on the left) can be found in Vehicle in the NCR Parameters Groups Engagement Thresholds and Selection Thresholds (Figure 2, on the right). These values must be pasted in the Excel file for each gear. into NCR ECU and just copy & paste the values for every gear.

Threshold min. engagement		Threshold min. selection	
S_S_INN_MIN_N		S_SEL_MIN_N	
S_S_INN_MIN_1		S_SEL_MIN_1	
S_S_INN_MIN_2		S_SEL_MIN_2	
S_S_INN_MIN_3		S_SEL_MIN_3	
S_S_INN_MIN_4		S_SEL_MIN_4	
S_S_INN_MIN_5		S_SEL_MIN_5	
S_S_INN_MIN_6		S_SEL_MIN_6	
S_S_INN_MIN_RM		S_SEL_MIN_RM	
Threshold max. engagement		**Threshold max. selection**	
S_S_INN_MAX_N		S_SEL_MAX_N	
S_S_INN_MAX_1		S_SEL_MAX_1	
S_S_INN_MAX_2		S_SEL_MAX_2	
S_S_INN_MAX_3		S_SEL_MAX_3	
S_S_INN_MAX_4		S_SEL_MAX_4	
S_S_INN_MAX_5		S_SEL_MAX_5	
S_S_INN_MAX_6		S_SEL_MAX_6	
S_S_INN_MAX_RM		S_SEL_MAX_RM	

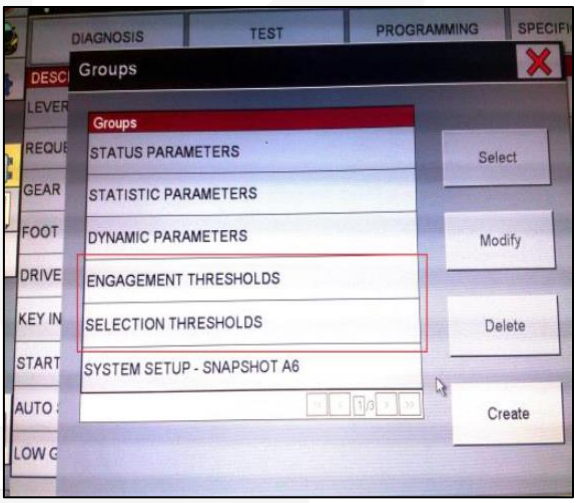


Figure 1: threshold values (minimum/maximum) for engagement and selection (left) and Parameter Groups in the NCR ECU (right).

3. To fill the upper table of the Excel file, perform the NCR > Active Diagnosis > Gear Selection in the sequence N/1/2/3/4/5/6; after every single engagement, copy & paste the related value of parameters "Engagement Potentiometer Position" and "Selection Potentiometer Position" in the table (see Figure 3). Those parameters are inside the Dynamic Parameters group of the NCR ECU.

	N	1	2	3	4	5	6	R
Engagement position								
Selection position								

Figure 2: upper table of the F1 Grid Excel file.

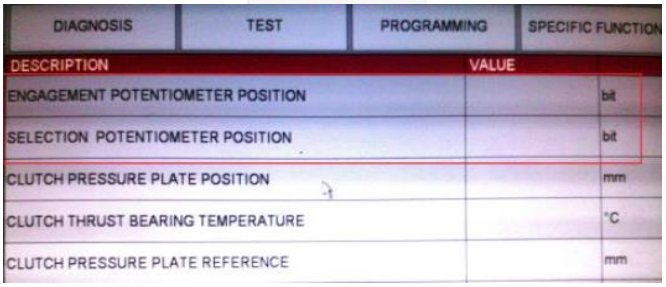


Figure 3: Engagement and Selection Potentiometer position values in the Dynamic Parameters group of the NCR ECU.

© 2024 Maserati North America. Aftersales
www.maseratiusa.com

All rights reserved. Reproduction or translation in whole or in part is not permitted without authorization from the publisher. Printed in USA

Section D: possible Clutch noise technical explanation

In certain conditions, e.g. driving at low-speed uphill, and especially when the engine and transmission are not yet warmed up, the Customer may complain about a noise that is perceivable in the attached video F1_Cambiocorsa_Transmission_Clutch_Noise.m4v.

It can be said that this is not a defect, as it is related to how the clutch works, as better explained below. Technically, it can be stated that the clutch of the Cambiocorsa (also known as F1) Gearbox is a twin plate, so one clutch makes contact first and the second plate then oscillates, and this can lead to noise generating in the clutch area and then transmitted to the environment. This type of noise can be better described by hearing the video. Performing the maneuver of the video F1_Cambiocorsa_Transmission_Clutch_Noise.m4v is worsening the situation: this happens because the slippage of the clutch and its consequent overheating emphasizes the vibration described above.

Section E: various DTCs of the type P177x

Example of possible DTCs:
P1770 Gear Engagements with wrong shifts.

1. Is it possible to reproduce the Customer's concern in the workshop?
   If yes, when you try to insert the reverse gear, can you hear if the F1 actuator is working?
2. Verify if the F1 actuation circuit hydraulic system has any leakage.
3. Save the NCR > Dynamic Parameters.
4. Check Gearbox oil quality and oil level: is the Gearbox Oil Level correct and is it smelling burnt and/or does it have a dark color?
5. Perform the F1 Grid as detailed in **Section C: Execution of the F1 Grid**: with both cold and warm engines and attach two different Excel files.
6. Save the NCR > Dynamic Parameters > Clutch SV Leakage Not Engaged and Engaged is increasing with respect to Cold Condition.
7. Perform F1 actuator bleeding as indicated in the attached F1_Actuator_Bleeding.pdf, which includes the instructions to perform the Self Learning.
8. Verify if the issue is still there.

Section F: Remarks on the interpretation of some Dynamic Parameters

Some remarks on some of the Dynamic Parameters of the NCR ECU:

a. The Clutch Wear percentage is the real (the actual) wear of the Clutch. It is a computed value, as described in the following. This means that, with a calculated clutch wear of 30%, the estimated residual clutch is 70%.
b. The maximum acceptable value of the solenoid leakages is 30 cc/min
   The Parameters are:
   OIL LEAKAGE WITH CLUTCH SV TRIGGERED
   OIL LEAKAGE WITH SV NOT TRIGGERED
   They need to be compared in both Cold and Warm Conditions.
c. New Clutch Position (Parameter name: CLOSED CLUTCH POSITION (NEW CLUTCH)), whose value is expressed in mm, should be lower than the Clutch Position and different from 0 mm.
   A typical value for this parameter is 20,50 mm.
   If the Self-Calibrated Clutch Position is greater than the New Clutch Position value, then the Clutch Wear percentage is not reliable. This is because the clutch wear percentage is computed as shown in the formula shown in Figure 4.

Calculation of clutch wear percentage:

$$\frac{\text{Autocalibrated closed clutch value} - \text{NEW closed clutch value}}{\text{Clutch thickness (5.6 mm)}} \times 100 = \text{\% Wear on clutch}$$

Figure 4: clutch wear percentage calculation formula.

Example:
SELF-CALIBRATED CLOSED CLUTCH POSITION = 21,83 mm
CLOSED CLUTCH POSITION (NEW CLUTCH) = 0 mm
PERCENTAGE CLUTCH WEAR = (21,83 mm – 0 mm)/5,6 mm = 3,8984 = 389,84%.

© 2024 Maserati North America. Aftersales
www.maseratiusa.com

All rights reserved. Reproduction or translation in whole or in part is not permitted without authorization from the publisher. Printed in USA

In this case, the values of Closed Clutch Position (New Clutch) and Percentage Clutch Wear are abnormal.
For a normal Vehicle, Closed Clutch Position (New Clutch) is different from 0 mm.
As such, the NCR ECU Parameters need to be initialized.
As described in the Workshop Manual:
03.90.001 - 00 F1 GEARBOX ECU - Removal/refitting or replacement
at step 10. Perform the self-calibration procedure for the DEIS control parameter.
Note: at the step 11. Perform the "SELF LEARNING" procedure, i.e. the gearshift grid self-learning procedure, please do NOT perform SELF LEARNING (ALL) but the SELF LEARNING.
Referring to Figure 5, when replacing the NCR ECU, reading of closed clutch value from new on the replaced NCR and setting of this value on the new NCR is necessary. However, if this is not available, a sensible value is 20,50 mm.

Advanced Electronics 1 Robotized Gearbox Control System

Service operations for vehicles using Sofast 4:

Maserati M145 GranTurismo S and GranTurismo MC Stradale all vehicles

HW CFC 301 (hardware ECU is identical to SOFAST III)

Action	Required servicing operation for SOFAST IV
Clutch replacement	Clutch bleeding procedure Calibration of DEIS parameters Kiss point (includes resetting the clutch degradation index and configuring the clutch)
Gearbox replacement	Self-learning Superfast shift self-learning
Hydraulic actuator replacement	Hydraulic actuator bleeding Self-learning Superfast shift self-learning
Replacement of solenoid valves EV1-2-3-4-5	Gearbox actuator bleeding Self-learning Superfast shift self-learning
Replacement of clutch solenoid valve EVF	Clutch actuator bleeding Calibration of DEIS parameters Kiss Point (includes resetting the clutch degradation index and configuring the clutch)
Pump replacement	Hydraulic actuator bleeding
NCR replacement	Remote loading of software Calibration of DEIS parameters Self-learning Superfast shift self-learning Reading of closed clutch value from new on the replaced NCR and setting of this value on the new NCR Autocalibration of acceleration sensor offset Kiss point
Acceleration sensor replacement or ABS unit replacement	Autocalibration of acceleration sensor offset

Note: In any event, it is advisable to perform the self-learning procedures (DEIS; Self-Learning, Superfast shift, acceleration sensor offset during each servicing operation.

Maserati Academy 171

Figure 5: service operations for Vehicles equipped with Sofast 4.

© 2024 Maserati North America. Aftersales
www.maseratiusa.com

All rights reserved. Reproduction or translation in whole or in part is not permitted without authorization from the publisher. Printed in USA

As mentioned in the Training Manual (an extract is shown in Figure 6), the "clutch configuration", which is a command in the "Active diagnostic" menu of Maserati Diagnosi, is used to store the actual "closed clutch position", as measured by the clutch position sensor in real-time, as the "closed clutch position of the new clutch". Therefore, this operation must only be performed after the installation of a new clutch. The clutch configuration is crucial for the correct calculation of the clutch wear %. With the current Maserati Diagnosi diagnostic software, the Clutch configuration is integrated in the Kiss Point Active Diagnosis. Hence it is crucial to perform the KISS Point Active Diagnosis of NCR ECU.

Cluch configuration:

The "clutch configuration", which is a command in the "Active diagnostic" menu of Maserati Diagnosi, is used to store the actual "closed clutch position", as measured by the clutch position sensor in real time, as the "closed clutch position of new clutch". Therefore, this operation must only be performed after the installing of a new clutch. The clutch configuration is crucial for the correct calculation of the clutch wear %.
Note: it is advised to perform the clutch configuration after a brief bedding in of the new clutch.
Note (2): with recent diagnostic software, the clutch configuration is integrated in the Kisspoint procedure.

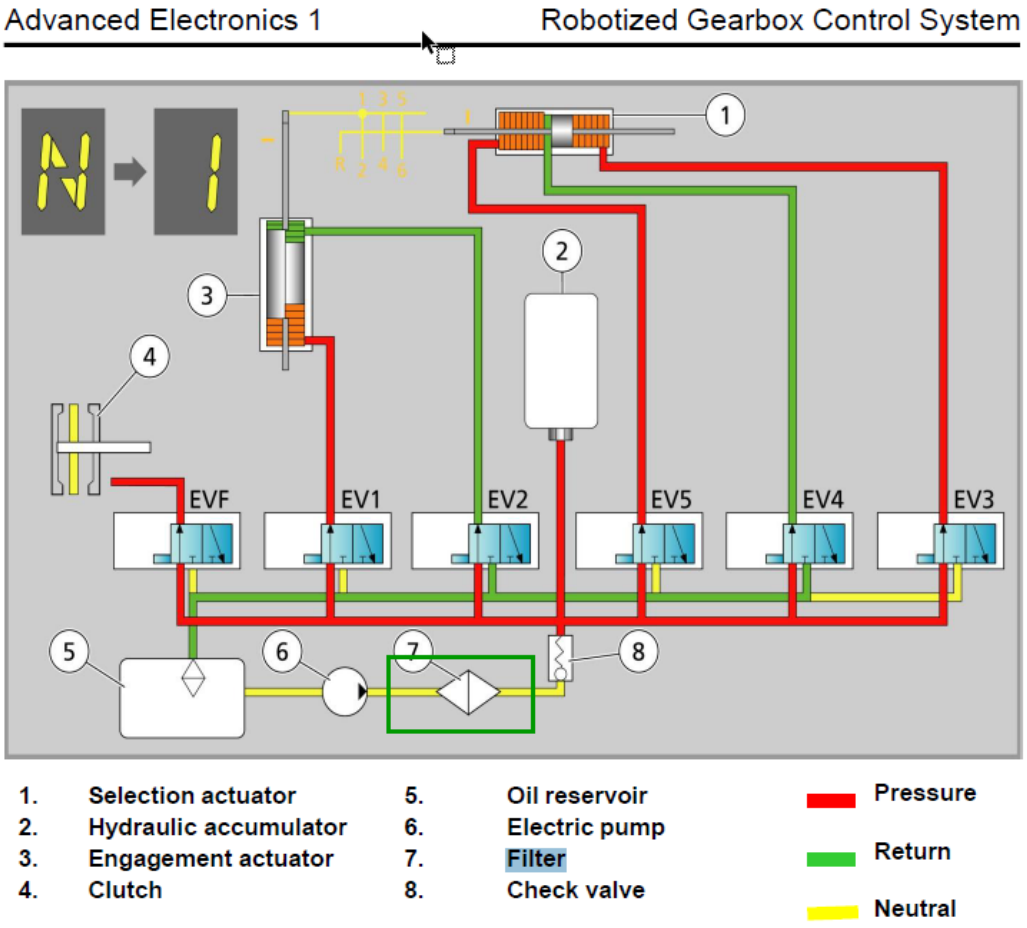
Figure 6: clutch configuration active diagnosis.

When examining the NCR Dynamic Parameters, please bear in mind the typical value of the system working pressure (40 bar).

Section G: DEIS Error message: Unexpected value (6)

In case of an error message: Unexpected Value (6) during the execution of the DEIS procedure of the NCR ECU, the issue is likely related to the Clutch or its thrust bearing. In some cases, this error message is related to problems in the Hydraulics of the F1 Hydraulic actuation systems.
Hence, it is advisable to perform these steps:

1. Please inspect the filters shown in the points highlighted in Figure 7.



© 2024 Maserati North America. Aftersales www.maseratiusa.com

All rights reserved. Reproduction or translation in whole or in part is not permitted without authorization from the publisher. Printed in USA

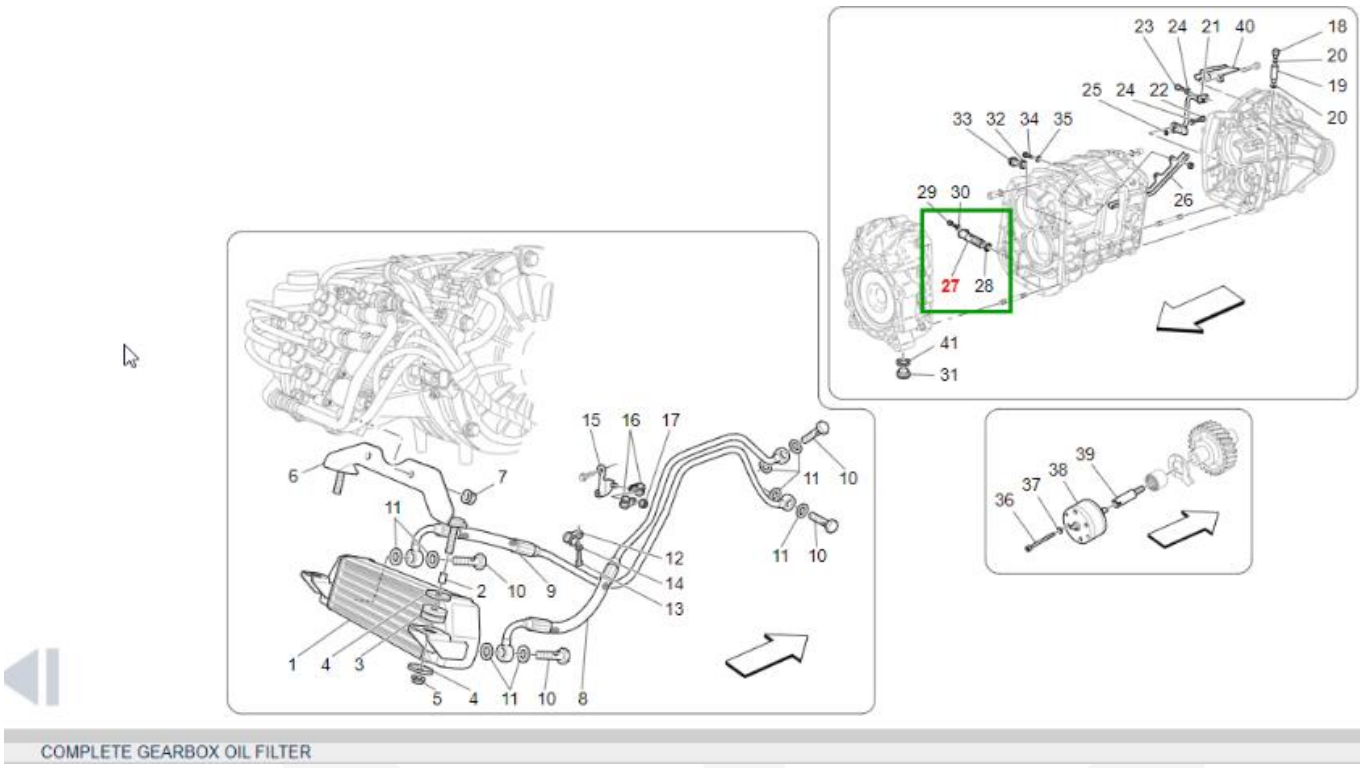


Figure 7: position of the filters in the hydraulic actuation circuit.

Please verify the presence of metal shavings or contamination on their surface, as shown in Figure 8.

Figure 8: filters of the F1 hydraulic actuation circuit. In this case, they were found to be dirtied by metal shavings.

2. Verify the status of actual wear of the friction material on the Clutch Plate itself, as well as the absence of free play or abnormalities on the Clutch Thrust Bearing, as shown in Figure 9.

Figure 9: checks of the wear of the friction material of the clutch plate (left) and of the status of the clutch thrust bearing (right).

© 2024 Maserati North America. Aftersales
www.maseratiusa.com

All rights reserved. Reproduction or translation in whole or in part is not permitted without authorization from the publisher. Printed in USA