LAK Auto Consultants Pte Ltd

Company Registration No. 199607198R

51 UBI AVE 1, #01-25 PAYA UBI INDUSTRIAL PARK, SINGAPORE 408933 TEL : (065) 62563561 FAX : (065) 67414108

Your Ref: AC180189
Our Ref : CI/III18011169/N

4 June 2018

M/s India International Insurance Pte. Ltd.
64 Cecil Street #05-00
IOB Building
Singapore 049711
(P & C Claims Department)

TECHNICAL REPORT OF AUTO TRANSMISSION GEARBOX DAMAGE CLAIM FOR THE MOTOR BUS PC 4769J

1. We refer to your request dated 25 May 2018 to carry out a physical inspection of the motor bus PC 4769J (herein referred to as **"Motor Bus"**) to determine the possible cause(s) of fault to its automatic transmission system.

Reported Incident

2. On 23 April 2018 at 0930 hours the driver of the Motor Bus, Mr Joe Remy (herein referred to as **"Mr Joe"**) had sent the Motor Bus for the mandatory yearly vehicle inspection at the Vicom Inspection Centre (herein referred to as **"Vicom"**) located at 385 Sin Ming Drive, Singapore 575718.

3. As per the guidelines of the inspection, the Motor Bus is required to go through and pass 4 stages before the test certificate can be issued.

4. The Motor Bus passed all stages except for the above-carriage check. Mr Joe was informed by 1 of the testers, Mr Ng Koon Hoo (herein referred to as **"Mr Ng"**) that he had to rectify 4 issues before the Motor Bus could pass the inspection which were the balding front tyres, insecure cab partition, defective 'Children Crossing' sign and missing 'EMERGENCY DOOR' letterings. Mr Joe was told to rectify these issues and return to Vicom before 5pm on the same day.

5. Mr Joe then proceeded to exit Vicom to rectify the issues which was when he noticed that there was something wrong with the Motor Bus. The transmission could not automatically shift to the next gear. Mr Joe tried shifting to the other gears manually but the transmission was still stuck at the 1st gear. The Motor Bus could only travel at a low speed. He decided to turn right into Block 29 Sin Ming Drive and stop at Chuan Mei Audio Centre (herein referred to as **"Chuan Mei"**) located at #01-229/231.

6. Mr Joe noticed 2 warning lights on the instrument panel. He left the Motor Bus at Chuan Mei to rectify the insecure cab partition and defective 'Children Crossing' sign. He then proceeded to arrange for a replacement vehicle and continue with his other pickups. He returned to Chuan Mei at 1700 hours to retrieve the Motor Bus and drove it to Vicom. Mr Joe met Mr Ng at 1745 hours and informed him about the faulty automatic transmission system. Mr Ng allowed Mr Joe to temporarily park the Motor Bus at Vicom.

Inspection of the Motor Bus

7. Following the request, we had physically inspected the Motor Bus on 25 May 2018 at the premises of Vicom. Mr Joe was also present during the physical inspection.

8. During this inspection, we were able to gather further information pertaining to the faulty automatic transmission system complaint that was raised by Mr Joe of the Motor Bus. According to Mr Joe, the gears of the transmission system could not be automatically shifted, followed by the illumination of 2 warning lights on the instrument panel.

9. The following general information of the Motor Bus was first recorded during the inspection:-.

Vehicle Registration No.	: PC 4769J
Make / Model	: HIACE COMMUTER GL 3.0 AT 2WD 4DR LWB
Engine Capacity	: 2982 cc
Chassis No	: KDH2230027151
Year of Registration	: May 2016
Mileage	: 164,938km
Transmission Type	: 4- speed automatic transmission

10. The Motor Bus was observed to be in good general condition. Our visual examination of its exterior body revealed no loose exterior fittings or connections. We observed that the 'brake override system failure' warning light had appeared on the instrument panel of the Motor Bus after its ignition was switched on.

11. Upon starting up the engine and engaging the Motor Bus to 'drive' mode, both the 'brake override system failure' warning light and 'check engine' warning light had appeared on the instrument panel of the Motor Bus.

Operational Behaviour of the Motor Bus

12. A short operational test of the Motor Bus, to primarily determine whether there was any abnormality to its engine system, its transmission system and braking system was subsequently carried out.

13. During the operational test, the transmission system of the Motor Bus was able to be shifted to 'drive' mode and 'reverse' mode without any difficulty. The sound of the engine revving could be heard when the accelerator pedal was depressed however the Motor Bus was unable to travel more than 30kmph. The same occurrence was observed when the gear shift lever was shifted to '3', '2' and 'L' modes respectively. The Motor Bus was able to move backward normally when the reverse gear was engaged. The braking system was found to be in working condition as the Motor Bus was able to gradually slow down and come to a complete stop upon depressing of the brake pedal. See photos 1 - 4 below.

Photo 1 shows a general view of the Motor Bus at the time of our physical inspection at Vicom. The Motor Bus was observed to be in good general condition with no loose exterior fittings or connections.

Photo 2 shows the 'brake override system failure' warning light that had appeared on the instrument panel of the Motor Bus after its ignition was switched on (arrowed).

Photo 3 shows the brake 'override system failure' warning light and 'check engine' warning light that had appeared on the instrument panel of the Motor Bus (circled) after its engine was started and the gear was engaged to 'drive' mode (arrowed).

Photo 4 shows the 'brake override system failure' warning light and 'check engine' warning light that were still visible on the instrument panel of the Insured Vehicle (circled) after performing the short operational test of approximately 2km based on the odometer reading (arrowed). The results of the short operational test corroborated with Mr Joe's complaint, which is the gears of the transmission system could not be automatically shifted.

14. During the course of our investigations, we were able to obtain the results of a diagnostic test that was carried out on the Motor Bus by Mr Joe at Auto Soon Pte. Ltd. located at 176 Sin Ming Drive, #01-10, Sin Ming Autocare, Singapore 575721.

15. The diagnostic test is to primarily check on the reason(s) for the warning lights, in particular whether there was any electronic fault(s) to the transmission system of the Motor Bus. Such diagnostic tests normally detects whether there is any electronic problem to the various electronically controlled operating systems of a motor vehicle. For this case, the result after the diagnostic test had showed 2 fault codes relating to the transmission system of the Motor Bus which were recorded. The fault codes were P0722 and P2716. See photo 5 below.

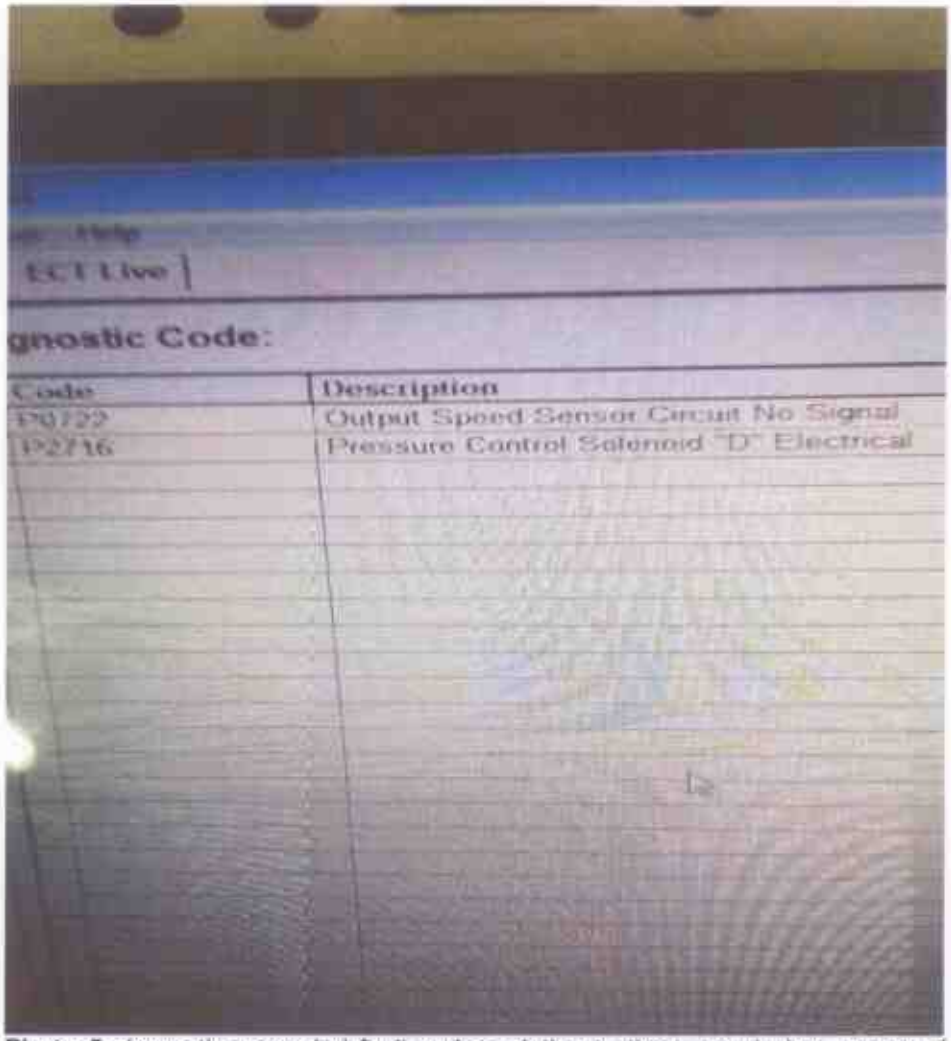


Photo 5 shows the recorded fault codes relating to the transmission system of the Motor Bus. The fault codes were P0722 and P2716 respectively.

Comments & Opinions

16. Our checks and enquiries revealed that fault code P0722 was related to a malfunction within the transmission output speed sensor (herein referred to as "**TOSS**") circuit of the Motor Bus. Fault code P2716 was for an electrical error pertaining to the pressure control solenoid 'D' of the Motor Bus. These fault codes are a generic transmission diagnostic trouble code (DTC) and typically apply to on-board diagnostics (OBD)-II vehicles equipped with an automatic transmission system.

17. Briefly, the purpose of the TOSS is to provide the Powertrain Control Module (herein referred to as **"PCM"**) with a signal that indicates the speed of the transmission output shaft rotation. The PCM uses these readings to control the shift solenoids. The solenoids direct fluid between various hydraulic circuits and change the transmission gear ratio at the appropriate time. Based on the vehicle and the transmission configuration the TOSS may also control the speedometer reading. An automatic transmission system is controlled by bands and clutches that change gears by having fluid pressure in the right place at the right time. This process starts with the TOSS. Fault code P0722 is set by the PCM when it is not seeing a signal from the TOSS. Symptoms of this malfunction may include illumination of the vehicle's 'Check Engine' light, non- shifting or rough shifting of the vehicle's transmission.

18. When the P2716 fault code is set, the PCM has detected a problem with the Transmission Pressure Control Solenoid (herein referred to as **"TPCS"**) 'D'. The purpose of the TPCS 'D' is to control the pressure of the fluid for the proper operation of an automatic transmission. The PCM receives an electronic signal based on the pressure within the solenoids. Based on the signals from associated devices monitoring the speed of the vehicle, the PCM controls the pressure solenoids to direct fluid at the appropriate pressure to various hydraulic circuits that change the transmission gear ratio at the correct time. The fault code P2716 is set by the PCM when the TPCS 'D' is experiencing an electrical malfunction. Symptoms of this electrical malfunction may include illumination of the vehicle's 'Check Engine' light, the vehicle enters limp mode, transmission slips when shifting, transmission overheating and/or transmission catches in gear.

19. For this case, Mr Joe's claim is that the issue to the automatic transmission system of the Motor Bus had started after going through the vehicle inspection at Vicom, in particular after the CDST.

20. We managed to obtain the vehicle inspection form from Mr Ng of Vicom. The form showed that the Motor Bus had passed the CDST but failed the above carriage inspection. See Inspection Form 1 below.

VICOM

VEHICLE INSPECTION FORM — OFFICIAL INSPECTION No: SMB071180SSM1

Vehicle No:	PC4768J	Registration Date:	23/05/2016
Make & Model:	TOYOTA/HIACE COMMUTER	Road Tax Expiry Date:	24/05/2018
Engine No:	1HD2394385	Inspection Date/Time:	23/05/2018 09:45 Test No: 3
Chassis No:	KDH223B37331	Location: Sin Ming	Lane No: 3
ID No:	1588289170	Mileage:	

Overall Result	Above Carriage	Noise * Level	Idling/Horn signals	Brake	Head-Light	Under-Carriage	Speed * Limiter	CO * Emission	Diesel * Smoke	Taxi-Meter	Aircon Temp.
FAIL	FAIL	PASS	PASS	PASS	FAIL	PASS			PASS		

Items	Status	Remarks
Above carriage:		
Tyres	Fail	Bald
Cab Partition	Fail	Insecure _ Others
Emergency Door Lettering/Buzzer	Fail	Missing letterings
Body Lettering/Children Crossing Sign	Fail	Defect children crossing sign

CDST Power result : Passed
CDST Smoke result : Passed

NB: Please produce this form for REPEAT INSPECTION
I have witnessed that the "Vehicle Under Inspection" sticker was pasted on the vehicle (for commercial vehicles only)
Name: _____ I/C No: _____ Signature: _____

Inspection Form 1 shows the inspection results on the Motor Bus conducted at Vicom on 23 May 2018 at 0945 hours (arrowed). The Motor Bus had passed the CDST but failed the above carriage inspection.

21. For this case, we managed to speak to Mr Ng on 28 May 2018 where we were able to gather further information pertaining to the incident as well as information pertaining to the CDST that was conducted during the mandatory yearly vehicle inspection.

22. In general the CDST is to measure the vehicle power in accordance to its engine capacity and the smoke level that is generated to achieve that power. The CDST consists of 3 components that will be attached to the vehicle.

23. The 1st component would be an engine revolutions- per- minute (herein referred to as "**rpm**") sensor which is attached magnetically to the oil sump of the vehicle. The rpm sensor measures the engine vibration when the gear is engaged. The sensor converts the vibrations, calculating the rpm of the vehicle as the accelerator is depressed.

24. The 2nd component would be the dynamometer which consist of rollers that the wheels of the vehicle will be placed in (depending on whether the vehicle is a front-wheel drive or a rear- wheel drive). When the gear is engaged and the accelerator is depressed, the wheels of the vehicle will begin to rotate and the dynamometer simulates the load and inertia of the vehicle when driven on the road. It will then measure the power of the vehicle's engine.

25. The 3rd component is a device which is inserted into the exhaust pipe of the vehicle before the CDST commences. It collects a sample and measures the level of smoke generated during the test.

26. Mr Ng explained that there will be a list of pre- set estimated maximum horsepower output of a vehicle based on the input of the vehicle's engine capacity and chassis from the database by the Vicom tester before the commencement of the CDST. The testers will always input a number equivalent to half of the estimated maximum horsepower output of a vehicle to safeguard against excessive revving of the vehicle's engine during the CDST which may result in engine damage. So for instance if the estimated maximum horsepower output of a vehicle is 60bhp based on its engine capacity of 2499cc as indicated in the database, then the tester will input 30bhp as the estimated maximum horsepower output that should be achieved by the vehicle's engine in order to pass the CDST.

27. For this case, the estimated maximum horsepower output of the Motor Bus as reflected in the database based on the input of its engine capacity of 2,982cc is 80bhp or thereabouts. Hence the tester will input 40hp as the estimated maximum horsepower output for purposes of the CDST.

28. The video recording of the CDST in preparation of this report was provided to us by Mr Ng. The recording showed the speedometer, rpm and horsepower output of the Motor Bus that was measured as the CDST was conducted. The length (duration) indicated in the video recording was 1 minute 47 seconds. The maximum rpm of the Motor Bus that was measured during the test was 2158. Since the Motor Bus is of an automatic transmission, it is unlikely possible for excessive revving of the engine or malfunction of the transmission system of the Motor Bus to occur during the CDST as if that was the case, then neither the rpm nor speed of the Motor Bus would have increased gradually throughout the test. Therefore the engine and transmission system of the Motor Bus was operating normally during the CDST. See screenshots 1 - 8 below.

Screenshot 1 of the video recording shows the dynamometer lift being dropped on the rear wheels of the Motor Bus (as it is a rear-wheel drive) before the commencement of the CDST (arrowed).

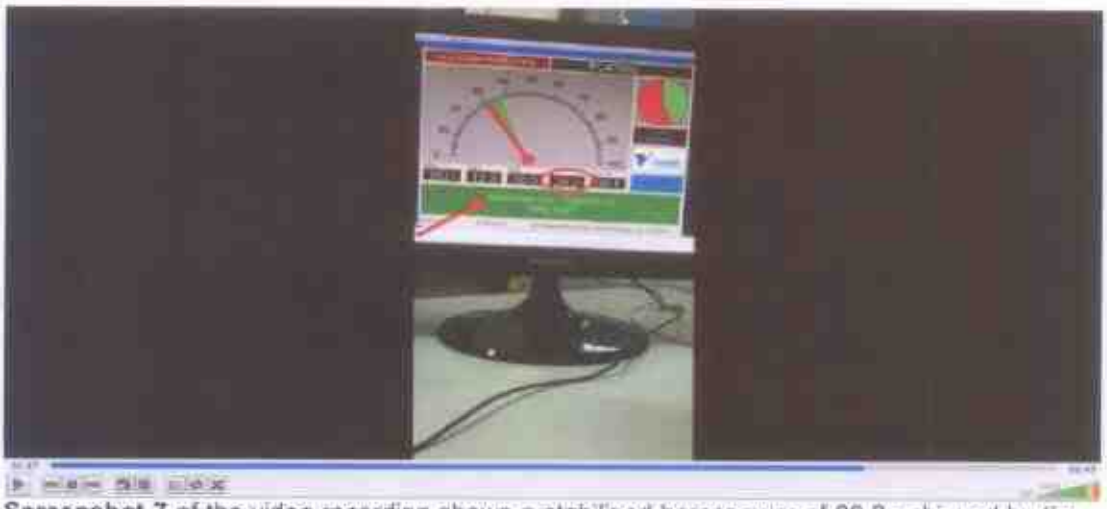
Screenshot 2 of the video recording shows the transmission of the Motor Bus in 'neutral' mode with the engine running as the speed is at '0' kmph and the rpm is idling at 852 (arrowed).

Screenshot 3 of the video recording shows the maximum rpm of 2158 achieved by the Motor Bus as the vehicle speed is maintained within the green zone (arrowed).

Screenshot 4 of the video recording shows the maximum horsepower of 44.9 achieved by the Motor Bus as the vehicle speed is maintained within the green zone (circled).

Screenshot 5 of the video recording shows a stabilized horsepower of 40.3 achieved by the Motor Bus (circled) as full throttle is maintained within the green zone (arrowed).

Screenshot 6 of the video recording shows a stabilized horsepower of 33.8 achieved by the Motor Bus (circled) as 90% throttle is maintained within the green zone (arrowed).



Screenshot 7 of the video recording shows a stabilized horsepower of 29.2 achieved by the Motor Bus (circled) as 80% throttle is maintained within the green zone (arrowed).

Screenshot 8 of the video recording shows the completion of the CDST (circled) and a reduction in vehicle speed as the accelerator pedal is released (arrowed).

29. Mr Ng explained that if the engine of a vehicle did not meet the horsepower output requirements or if the smoke levels measured were over the required limit then the CDST would be discontinued immediately. The vehicle would however proceed with the other stages of the inspection but it would fail and the owner of the vehicle would be required to rectify the issues with the engine before coming for a re- inspection.

30. Mr Ng further mentioned that the Motor Bus passed the CDST on the 1st attempt. The results also showed that the maximum horsepower output achieved by the Motor Bus was 38.1 kilowatts (KW) which corroborates with Mr Ng's explanation pertaining to the maximum horsepower output value input by the tester for purposes of the CDST as previously described in paragraph 27. See Inspection Form 2 below.

PC4766J OFFICIAL-Inspection 25/May 09:39.51 - 09:45.46
INSPECTORS : L/76306 P/02113 D/00000 C/06062

A: IN 0.5 m/km

	WEIGHT(kg)	R-BR(kg)	L-BR(kg)	SUM(%)	DIFF(%)	DRAG(%)
FB1:	1390	519	509	73.4	0.7	3.3
RB1:	997	362	207	47.0	5.5	2.5
RP1:	997	247	219	46.7		3.6
ALL:				62.4		

	Luminous(X100cd)	U/D(cm/10m)	L/R(cm/10m)
*LH:	* 25	*U 1.5	*R 28.0
*RH:	* 17	*U 19.8	*R 29.8

DS:	Min Power required	33.0 KW	100% Engine Sp at Max P.	2072 RPM	20 HSU
	Corr. Max Power Measured	38.1 KW ←	90% Engine Sp at Max P.	1850 RPM	21 HSU
	Velocity Maximum Power	40.7 Kph	80% Engine Sp at Max P.	1677 RPM	15 HSU

SL: 67 dB 0 RPM

Inspection Form 2 shows in particular the results of the CDST. According to Mr Ng, the Motor Bus passed the CDST on the 1st attempt. The results also showed that the maximum horsepower output achieved by the Motor Bus was 38.1 kilowatts (KW) (arrowed) which corroborates with Mr Ng's explanation pertaining to the maximum horsepower output value input by the tester for purposes of the CDST.

31. Our checks with both local and international bodies and associations revealed that at the time of writing this report, there is no on-going manufacturer recall campaign relating to transmission system malfunction that involved the Motor Bus. See screenshot below showing search result from LTA.

Enquiry on Vehicle Recall - Vehicle Specific

Conclusion

32. Basing on our inspection of the Motor Bus and the information gathered during the course of our investigations, we are of the view that some of the components of the Motor Bus had electronically malfunctioned, rendering the transmission system of the Motor Bus to operate partially (gears could not be shifted automatically).

33. However the malfunction was most likely due to wear and tear of the electronic/electrical components of the Motor Bus.

34. For this case, we did not find any evidence to suggest that the malfunction of the transmission system was a direct result of the CDST conducted during the mandatory yearly vehicle inspection of the Motor Bus.

Muhd Nazril
Technical Investigator

Ang Bryan Tani
AMSOE, AMIRTE, AFF SAE, M.MATAI, AFF Inst.AEA
Senior Technical Investigator
Technical Investigation & Reconstructionist (SAE-A)