

## TRUCK, LIGHTWEIGHT AND TRUCK LIGHT – ALL TYPES – LAND ROVER 110 4X4 AND 6X6

### POWER ASSISTED STEERING BOX – REPAIR AND WARRANTY PROCEDURES

## GENERAL INSTRUCTION

This instruction is authorised for use by command of the Chief of Army. It provides direction, mandatory controls and procedures for the operation, maintenance and support of equipment. Personnel are to carry out any action required by this instruction in accordance with EMEI General A 001.

### GENERAL

#### Background

1. In 2006 and 2007, the Land Rover 110 variants fitted with power steering suffered a series of catastrophic failures of the Power Assisted Steering (PAS) box sector shaft. The resultant investigation determined that the sector shaft displayed evidence of fatigue cracking. A process was implemented to replace all Land Rover 110 PAS boxes with a rebuilt PAS box that had the sector shaft inspected and certified as free from defect.
2. In order to maintain the technical integrity of the Land Rover 110 fleet fitted with power steering, this instruction details the management of the Land Rover 110 PAS box repair and warranty process.

#### Application

3. This EMEI applies to the PAS box fitted to all Land Rover 110 6x6, Land Rover 110 4x4 Regional Force Surveillance Vehicle (RFSV), Land Rover 110 4x4 Surveillance and Reconnaissance Vehicle (SRV) and Land Rover 110 4x4 Surveillance and Reconnaissance Vehicle – Special Forces (SRV-SF).

#### Associated Publications

4. Reference may be necessary to the latest issue of the following publications:
  - a. [EMEI Vehicle G 204-2](#) – Truck, Cargo, Light and Truck, Cargo, Light, Winch, MC2 – Land Rover 110 6x6 – Heavy Grade Repair;
  - b. [Electronic Supply Chain Manual](#) (ESCM); and
  - c. Technical Regulation of Army Materiel Manual – Land (TRAMM-L) (available from DTR-A website <http://intranet.defence.gov.au/armyweb/Sites/DTRA>).

#### Standard Job

5. Standard Job 003838 is to be used when replacing the PAS box.

#### Recording action

6. **Recording Action.** On completion of the PAS box fitment or change out, the following action is to be taken in accordance with TRAMM-L:
  - a. Complete the repair action details in the GM120 – Record Book for Service Equipment, Part 4 annotating the PAS box serial number fitted.
  - b. Complete and close the Standard Job on MILIS.
  - c. Forward the repair action completion details including the PAS box serial number and date and meter reading using form GM 119 – Advice of Change in Build State to:  
  
Fleet Manager Light B Vehicles  
CGSVSPO, DMO  
Defence Plaza, 661 Bourke St.  
MELBOURNE VIC 3000

## DETAIL

### Identification



**NSN 2530-66-155-0739 is the only PAS box authorised to be fitted to the Land Rover 110 fleet. The PAS box is painted olive drab for ease of identification.**

**7.** The Land Rover 110 PAS box is catalogued under NSN 2530- 66-155-0739. Only PAS boxes with this NSN are to be fitted to the Land Rover 110 fleet. This NSN includes the following components with manufacturer's part number (MPN) as listed:

- a.** Either:
  - (1)** BYG 6582, Steering gear remanufactured; or
  - (2)** QAF500110, Steering Gear Power Assisted, Adwest;
- b.** QFW000020 Drop Arm; and
- c.** BYG6580, Trimcast Case.

**8.** The PAS box is painted olive drab for identification purposes, has the drop arm fitted and is supplied in a Trimcast case for shipping purposes..

### Serial Number

**9.** All PAS boxes are quantity tracked on MILIS but each individual PAS box has a unique serial number identifier.

**10.** The serial number is located either on a plate attached to the box (Figure 1) or stamped on the body for a PAS box refurbished in the UK (Figure 2).



**Figure 1 Serial Number Plate Location**

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**Figure 2 UK Refurbished Serial Number Location**

### Repairable Item Management

11. The Land Rover 110 PAS box is managed in MILIS under the Repairable Item Management Code 006 - Return to JLU-V Bandiana MMM Managed.

### Trimcast Case

12. The PAS box is supplied in a Trimcast case, NIIN 66-155-0446 (Figure 3), for transit purposes.

13. **Features.** The Trimcast case has the following features:

- a. AQIS approved high density foam inserts;
- b. a document pocket for the TI or other shipping documents; and
- c. 3 double-sided tags located on the outside of the case or in a storage clip inside the case as follows:
  - (1) a useability tag with the useability code – ‘SV’ on one side and ‘XX’ on the other side;
  - (2) an identification tag for a Trimcast case complete with a PAS box on one side and for an empty Trimcast case on the other; and
  - (3) an identification tag for a Trimcast case complete with a manual steering box on one side and for an empty Trimcast case on the other.



**Figure 3 Trimcast Case**

**14. Care and Maintenance.** The Trimcast case is of a robust design and should provide a long service life if the case is maintained. Regular care includes:

- a. ensuring that 'RP' (repairable) PAS boxes are clean and drained of all oil prior to shipping;
- b. cleaning the foam insert to remove oil and dirt residue;
- c. cleaning the external surface to remove oil, grease and dirt;
- d. inspecting the case catch operation;
- e. inspecting the foam insert for deterioration; and
- f. ensuring that the tags are attached in the pockets provided.

**15.** The National Logistic Unit (NLU) is to ensure that the Trimcast cases are Fully Functional prior to placing a Fully Functional PAS box inside. Any Trimcast cases that do not meet the above criteria are to be returned to the NLU.

## MAINTENANCE POLICY

### Levels of Repair

**16.** The maintenance concept for the PAS box is for all repairs to be conducted at Heavy Grade Repair by trade repair utilising only authorised trade repair facilities endorsed by the ADFLM. The exception to this is to allow for limited Light Grade Repair.

### Light Grade Repair

- 17.** Light Grade Repair is limited to the replacement of the following components:
- a. top cover seal (operational/field environment only);
  - b. sector shaft seal (operational/field environment only);
  - c. pitman arm; and
  - d. pitman arm ball joint.

## Heavy Grade Repair

### WARNING

**The Land Rover 110 PAS box is not to be refurbished by regional units. Only the contract repair agencies authorised by the ADFLM are to refurbish a PAS box.**

18. The Land Rover 110 PAS box is to be returned to the NLU for all Heavy Grade Repair action.

## Repair Authority

### WARNING

**No repairs, other than those detailed in Para 26, are to be carried out to the Land Rover 110 PAS box.**

19. All repair action other than Light Grade Repair is to be carried out by trade repair utilising only authorised trade repair facilities endorsed by the ADFLM, Light B Vehicles as authorised to repair the Land Rover 110 PAS box.

## Authorised Repair Agency

20. The criteria for endorsing a repair agency as authorised to repair Land Rover 110 PAS boxes is as follows:
- a. The repair facility will be a licensed vehicle repair facility (accreditation with the appropriate state authorities is preferred).
  - b. All repairs are to be completed by competent personnel in possession of a suitable training qualification to complete repairs to vehicle steering systems.
  - c. The repair facility shall be able to complete repairs to the standard detailed in this instruction using the correct tools and test equipment.
  - d. The repair facility will be, or have access to, an authorised test agency to carry out Non-Destructive Inspection (NDI) testing of the PAS box sector shaft.
  - e. The repair facility will have the capability to test the PAS box for correct functionality as detailed in this instruction.
  - f. All parts used shall be authorised for use on the Land Rover 110 PAS box.
  - g. The repair facility shall provide a warranty as detailed in this instruction.
  - h. The repair facility shall provide certification that the PAS box conforms to this instruction.

## Repair Standard

21. Each PAS box rebuild is to be completed in accordance with the following standard:
- a. All repairs shall be completed in accordance with EMEI Vehicle G 204-2.
  - b. All components are to be thoroughly cleaned, inspected and replaced if worn/damaged.
  - c. The sector shaft shall be NDI tested (Para 22) and certified to be free from defects (Para 25).
  - d. All bearing and seal surfaces are to be free from scratches, burrs and are to be re-furbished if worn.
  - e. The PAS box shall be functionally tested at its operating pressure without leaks or binding (Para 24) after repair.
  - f. Each PAS box shall have the drop arm fitted (Para 8).
  - g. Each PAS box shall be painted green (olive drab)
  - h. Each PAS box shall have a visible/legible serial number either stamped on the body or on the attached plate.

- i. Each PAS box shall be compatible with the Land Rover 110 configuration without deviation from the build standard.

### NDI Testing

22. Each sector shall be subject to NDI testing by a suitable means to ensure that the sector shaft is free from defects. Magnetic particle inspection is considered to be the minimum standard of suitable NDI testing to be carried out. Dye penetrant inspection is **not** considered to be a suitable method of NDI testing.

23. All NDI testing shall be carried by a person certified in the use of the NDI testing method.

### Functional Testing

24. Every PAS box shall be tested on a suitable test rig after repair to confirm that its functions correctly and is free from leaks or binding. The test is to consist of:

- a. The PAS box operates at system operating pressure for at least five cycles (lock to lock).
- b. The PAS turns from lock to lock and is free from binding.
- c. The PAS will return freely to the central position.

### Certification

25. The authorised repair agency is to certify by serial number, that the PAS box has been repaired in accordance with this instruction to the required standard and that the sector shaft has been NDI tested and certified fit for use for each PAS box repaired. A copy of the Certification of Inspection and Conformity form is in Figure 4. The completed certification document is to be sent to the ADFLM to be placed on file for future reference or warranty claims.

## REPAIR PROCESS

### Receipt Action

26. When the NLU receives a PAS box that is 'RP' it is to be assessed for the correct rectification action as follows:

- a. **Warranty Action.** All PAS boxes returned that are still under warranty as detailed in Para 40 are to be returned to the repair agency for warranty rectification action.
- b. **Repairable.** All PAS boxes that are no longer under warranty and require repair are to be sent to the authorised repair agency to be assessed for suitability to be repaired.
- c. **Beyond Repair.** All PAS boxes assessed as 'BR' are to be salvaged by the NLU and parts inspected for suitability to be reused to sustain the PAS box repair program.

**Repair Procedure**

**27.** The NLU, upon receipt of the repairable PAS box, is to ensure each PAS box is rebuilt following the process detailed in Table 1.

**Table 1 Repair Procedure**

Serial	Level of Repair	Repair Procedure
1	NLU	Faulty PAS box received by NLU and identified as a repair candidate
2	NLU	Raise WO for quote for repair to authorised trade repair agency
3	NLU	Quote does not exceed ORTL (60% of new item cost price). Proceed to Serial 5
4	NLU	Quote does exceed OTRL – BR action taken for salvage of PAS box
5	NLU	Quote accepted and repair authorised
6	Trade agency	PAS box repaired in accordance with Para 21
7	NLU	Rebuilt PAS box passes QA by NLU
8	NLU	Raise a GI042 to classify the PAS box as Fully Functional
9	NLU	Ensure the FF PAS box is packed in a Trimcast case before issue
10	NLU	Send certificate for completed PAS box to ADFLM

**Quality Control**

**28.** The NLU trade repair office is to carry out random inspections of rebuilt PAS boxes and audit the authorised trade repair agency to ensure that all repair processes comply with this instruction.

**Conversion of Existing Stock**

**29.** Land Rover 110 PAS boxes that have not been previously inspected and rebuilt to the new PAS box standard are to be assessed for suitability to be rebuilt. These power steering boxes will generally be painted black and stocked under the following NIIN:

- a. 99-729-2344;
- b. 66-128-6240;
- c. 66-128-6454; and
- d. 99-449-3388.

**30.** All the power steering boxes identified above can be considered as suitable for rebuild and conversion to NSN 2530-66-155-0739. The procedure for rebuild and conversion is the same as detailed in Para 27.

**WARRANTY POLICY**

**Warranty Period**

**31.** Land Rover 110 PAS boxes are warranted to be free from defects for a 12 months period or 10 000 km from date of fitting to the vehicle.

**Warranty Claim Form**

**32.** The parts warranty claim form attached in Figure 5 is to be submitted to the repair agency.

**Warranty Procedure**

**33.** All PAS boxes found to be defective are to be returned to the NLU with a Technical Inspection (TI) form attached stating the exact nature of the defect, the date/km fitted to and defitted from the vehicle and the vehicle's ARN.

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**34.** The warranty procedure is detailed in Table 2.

**Table 2 Warranty Procedure**

<b>Serial</b>	<b>Level of Action</b>	<b>Procedure</b>
1	Unit	Identify that faulty PAS box is within warranty period (less than 12 months from date of fitting or 10 000 km)
2	Unit	Raise Technical Inspection form stating the date/km fitted/defitted setting the Inventory class as RP and the maintenance code to WA
3	Unit/RLU	Transfer faulty PAS box to the NLU (MSO039P)
4	RLU	Transfer PAS box to NLU for repair in accordance with RIMC
5	NLU	Warehouse receipts PAS box and identifies that it is a warranty candidate
6	NLU	NLU identifies who is responsible to warrant the PAS box (OEM or trade repair agency)
7	NLU	Submits a warranty claim form to the appropriate agency (ADFLM copy of form)
8	NLU	Advised of warranty claim accepted or rejected (if claim rejected refer serial 11)
9	NLU	Raise WO for warranty repair
10	NLU	Receipt in replacement/repared PAS box if warranty accepted
11	NLU	Rejected PAS box warranty claims redirected to ADFLM for direction on next COA

**35.** Upon receipt of the PAS box at Bandiana, the warehouse will read the TI and use the serial number to ascertain if it is for warranty action and which agency the warranty liability is with. For all PAS boxes supplied by Land Rover Australia, a Parts Warranty Claim form (Figure 5) will need to be submitted to LRA. For all other repair agencies, the form is to be submitted directly to that repair agency. PAS boxes that are outside the warranty period or not accepted for warranty action, are to be assessed for repair suitability.

**36.** Once the repair agency has established that the item is accepted under warranty, a Workshop Order Repair is to be raised.

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**CERTIFICATE OF INSPECTION  
AND CONFORMITY**

Issuing Agency: .....

Item: Land Rover 110 - Power Assisted Steering Box

Serial Number: .....

Internal  
Work Order /Job .....

Card Number:

Defence Work Order  
Number .....

This Certificate of Inspection is issued by the above listed repair agency against the above stated unit and Defence Work Order.

The item above is supplied fully compliant with the specifications defined in the Electrical and Mechanical Engineering Instructions applicable to Land Rover 110 4x4 and Land Rover 110 6x6. All materials contained therein and forming part of this assembly conform to the requirements and have been inspected for compliance with the following criteria. All re-used components have been inspected and are free from defects and considered safe and suitable for re-use. All seal and bearing surfaces are free from defects and worn surfaces have been reclaimed or refurbished using suitable proprietary approved methods. Defective components have been replaced with conforming replacement parts and all gaskets and seals have been replaced with new conforming parts.

Signature: .....

Name: .....

Position/Title: .....

Date: .....

Send completed form to:

ADFLM LT B Vehicles  
CGSVSPO  
DPM 7  
661 Bourke St  
MELBOURNE VIC 3000

**Figure 4 Certificate of Inspection and Conformity**

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**PARTS WARRANTY CLAIM FORM**  
SUBJECT TO AUDIT

Repairer:	Dealer No.						
	A.R.N.			-			
	Dealer claim No.						
Contact Name:	Dealer Job No.						
Fax No.							

VEHICLE TYPE	VIN	DATE OF PART FITMENT	DATE OF REPAIR
	PREFIX	NUMBER	
ODOMETER READING:	KMS:		

PARTS INVOICE No (when purchased)	REPAIR ORDER No (when fitted)	CUSTOMER CONCERN CODE:

Customer Narrative:


Technician's Narrative:


Major Unit Repair? Y or N	Description of Unit:
If Yes -	Serial No. of Unit Repaired:
Major Unit Replaced? Y or N	Description of Unit:
	New Serial No.:

CAUSAL PART DESCRIPTION:	CAUSAL PART No:	QTY:	CONDITION CODE:

ADDITIONAL PARTS DESCRIPTION:	ADDITIONAL PART No:	QTY:

MISCELLANEOUS ITEMS:	QTY:	VALUE:	SCHEDULED REPAIR OPERATION:	REPAIR TIME
			/	.
			/	.
			/	.
			/	.
			/	.
			TOTAL TIME:	.

NAME:	TITLE	SIGNATURE	DATE
			/ /

Figure 5 Warranty Claim Form

END  
Distribution List: VEH G 20.0 – Code 2 (Maint Level)  
(Sponsor: CGSV SPO, Lt B Vehicles Section)

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