

**TRUCK, WRECKER, HEAVY RECOVERY VEHICLE (HRV), MC3, 123T GCM, 6X6
MACK 'R' SERIES**

WINCH SET-UP AND CONSTANT PULL SYSTEM CHECK

MISCELLANEOUS 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.

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GENERAL

1. This instruction details the procedures for winch set up and constant pull system check of the winches fitted to the Truck, Wrecker, Heavy Recovery Vehicle (HRV), MC3, 123T GCM, 6X6, Mack 'R' Series.

Associated Publications

2. Reference may be necessary to the latest issue of the following documents:
- a. Technical Regulation of Army Materiel Manual-L (TRAMM-L);
 - b. EMEI Vehicle D 323 – Truck, Wrecker, Heavy, MC3, 8 Tonne (Mack), Army (Aust) 6778 – Light Repair;
 - c. EMEI Vehicle D 324-1 – Truck, Wrecker, Heavy, MC3, 8 Tonne (Mack), Army (Aust) 6778 – Medium Repair;
 - d. EMEI Vehicle D 324-2 – Truck, Wrecker, Heavy, MC3, 8 Tonne (Mack), Army (Aust) 6778 – Heavy Repair;
 - e. EMEI Vehicle D 329 – Truck, Wrecker, Heavy Recovery Vehicle (HRV), MC3, 123T GCM, 6x6, Mack 'R' Series – Servicing Instruction;
 - f. EMEI Workshop E series – Work Health and Safety Instructions;
 - g. LWP-CSS-4-2-1 Recovery Handbook, Chapter 4 Safety; and
 - h. Technical Manual User Handbook – Truck, Wrecker, Heavy Recovery Vehicle (HRV), MC3, 123T GCM, 6X6, Mark 'R' Series.

Introduction

3. The HRV winch set up and constant pull system is to be tested as follows:
- a. after replacing or repairing any of the following HRV components:
 - (1) the Power Take Off (PTO) Pump;
 - (2) the winch assembly;
 - (3) the winch motor; or
 - (4) components associated with the hydraulic block or constant pull mechanism;
 - b. in accordance with EMEI Vehicle D 329; and
 - c. When there is any doubt as to the accuracy of the winch calibration.

Action Required

WARNING

Tradespersons are to be aware that parts of this procedure are carried out at heights above two meters. They are to ensure that they are securely positioned on stable platforms to negate the chance of a fall when carrying out tasks. Failure to comply may result in injury or death.

Tradespersons are to ensure that the rear stowage cabinet doors are closed when carrying out procedures in accordance with this EMEI when operating on the recovery platform. Failure to comply may result in injury or death.

The winch calibration test and adjustment must be carried out by qualified tradespersons. Failure to comply may result in injury or death.

4. All procedures and adjustments detailed in this EMEI are to be performed by technical maintenance organisations authorised to carry out Light, Medium or Heavy Grade Repairs.

Trade Requirements

- 5.** All Procedures and adjustments are to be carried out by Defence tradespersons or civilian equivalent as follows:
- a.** two recovery mechanics (ECN226), the senior recovery mechanic shall be responsible for:
 - (1)** the operation of the recovery system,
 - (2)** inspection of the recovery system to ensure system integrity,
 - (3)** inspection of all tackle layouts,
 - (4)** operation of the load cell,
 - (5)** safety briefing prior to live winching , and
 - (6)** overall safety coordination.
 - b.** a vehicle mechanic (ECN 229) or civilian equivalent is to record all readings (see Table 2 & 3), adjust the system when required and certify the system's serviceability in the log book (GM 120).

Facility and Support Equipment Requirements

- 6.** The following facilities and support equipment are required to perform the tasks detailed in the Winch Set-Up and Constant Pull System Check:
- a.** Winching area with 14 tonne anchor point, where a fixed anchor is not available a second HRV or equivalent may be used as an anchor point. When using a HRV as the load anchor, tackle is to be utilised in accordance with HRV User Handbook.
 - b.** Load cell with a minimum working capacity of 13 tonnes. Load cell is to be operated in accordance with its authorised operating procedures. The load cell is only to be fitted to the tackle layout during load testing.
 - c.** Two handheld radios (required for communication between the load cell operator and winch operator) from the HRV CES.
 - d.** Recovery equipment for the layout of recovery tackle from HRV CES.
 - e.** Two support vehicles to be used as personnel shield when conducting live winching.

WARNING

The conduct of the winch set-up and constant pull system check must be carried out by qualified tradespersons. Failure to comply may result in injury or death.

The senior recovery mechanic must inspect the vehicle recovery system to ensure system integrity prior to commencing winching operations. The recovery mechanic must also inspect all CES associated to the task to ensure that it is serviceable. Failure to comply may result in injury or death.

Safety precautions for winch operations in accordance with LWP-CSS-4-2-1 Recovery Handbook (Chapter 4, Safety) are to be strictly adhered to. Failure to comply may result in injury or death.

When conducting live winch operations, at no time shall the winches be allowed to exceed 14 tonne as read by the load cell. The load cell operator is to provide constant feedback of the load cell reading to the winch operator via two-way radio. Failure to comply may result in injury or death.

Two support vehicles are required to provide protection for both the winch operator and load cell operator in the event of tackle failure. Failure to comply could result in injury or death.

NOTE

All winching operations must be carried out using the LH control panel to enable smooth control of hydraulic control valves.

DETAIL

Vehicle Preparation

7. Prepare the vehicle as follows:
 - a. Prepare the vehicle to conduct rear winching operations in accordance with the HRV User Handbook.
 - b. Clean reversing sheave shaft.
 - c. Lubricate reversing sheave and shaft and fairlead assemblies on both winches. Ensure all assemblies operate correctly and rotate freely.
 - d. Check rope tensioner functions correctly.
 - e. Check freespool piston for correct engagement and disengagement.
 - f. Check the hydraulic reservoir level.
 - g. Start engine.
 - h. Confirm main air system pressure is a minimum of 620 kPa. Failure to comply may result in damage to the PTO.
 - i. Engage winch PTO.
 - j. Set the winches to manual mode using the selector valve lever on the hydraulic block.
 - k. Turn power on to the PLC at the PLC isolation switch in the LH work station. The display will then read as follows:
 - (1) Displayed for 2 seconds.

NT2S-SF122B-E
V2.00A OMRON

- (2) Displayed for 2 seconds.

Driver V06.00E OMRON PLC

- (3) Menu 28 will now be displayed, indicating that the winch is in the 'MANUAL CONTROL'.

Manual Control

- (4) Followed by Menu 1.

Load: 0.0 tonne Level: 4 52mm

- l. If the display does not read as indicated, refer to EMEI Vehicle D 324-1 Table 7.
- m. Manually cycle the hydraulic system cooling fan to confirm operation from the LH work station.
- n. Bleed and warm up the recovery hydraulic system as follows:
 - (1) Run the **system** with all valves in the neutral position for approximately 5 minutes.
 - (2) Activate the **engine** throttle switch, confirming that engine speed reaches but does not exceed 1500 rpm.
 - (3) Disengage free spool pistons and free spool 10 metres of rope from both winches to reduce the risk of damage to the sheave head assemblies.
 - (4) Extend and retract all recovery system cylinders to their full travel several times and, with the free spool cylinders disengaged, operate both winches for one minute in each direction. Visually ensure that the winch drum does not rotate at commencement of winch operation.
- o. On completion of system bleed check the hydraulic oil level and top up if required.

NOTE

To ensure consistent results, the recovery system hydraulic oil must be at its normal operating temperature. The system will have reached operating temperature after completion of the bleeding and warm-up procedure. If at any time the vehicle is shut down, the operator must exercise the system to bring the hydraulic oil temperature back to its operating temperature before recommencing any system checks and adjustments.

Winch System Preparation

8. This procedure will ensure that the winch system has been set correctly allowing the winch to operate within the safe working limits of the winch and winch rope. The first part of the procedure is to confirm that the correct default values are entered into the PLC. To check and set the PLC proceed as follows:

- a. Start the truck and build up air pressure.
- b. Engage the winch PTO.
- c. Set the winch to manual mode via the valve on the hydraulic block.
- d. Activate the appropriate PLC by turning the PLC isolation switch to the ON position.
- e. Press the NEXT button on the display unit until Menu 4 is displayed, showing the Maximum Pressure setting which should be 173 bar.
- f. Press the NEXT button again to check all default values listed in Table 1.
- g. If any of the settings are not displayed as stated in Table 1 refer to EMEI Vehicle D324-1 Table 7.

Table 1 PLC Default Settings

Menu 4	Menu 5	Menu 6	Menu 7	Menu 8
173 bar	124 bar	206mm	156mm	51mm
Menu 9	Menu 11	Menu 12	Menu 13	Menu 14
10mm	38	400cc	250cc	1mm
Menu 18	Menu 19	Menu 20	Menu 21	

- h.** Turn the PLC OFF. Repeat the procedure for the other winch.

NOTE

Cycling the PLC isolation switch will return menu display to Menu 1.

Mechanical Flag Check

9. The next step in the winch set-up is to ensure that the gap between the distance sensor and the mechanical flag of the constant pulling device is set to 19 mm ± 2 mm for Level 2. The constant pull system relies on the mechanical flag information to determine and supply the correct hydraulic pressure to the winch drive motors in order to achieve a maximum pull between 11.50 and 13.25 tonne for each layer on the winch drum. Failure to correctly set the mechanical flag at this point will prevent the constant pull system from determining the required hydraulic pressure for each layer.

10. To check the gap, proceed as follows:

- a.** Ensure that the PTO is engaged.
- b.** Set the winch to manual mode via the valve on the hydraulic block.
- c.** Turn the PLC isolation switch on.
- d.** Disengage the free spool cylinder/s on the winch/es.
- e.** Connect the winch rope/s to the anchor point.
- f.** Drive HRV being tested at low speed (less than 2 kmh in low range, 1st gear) till the rope/s are positioned in the middle of the winch drum on Layer 2. An observer is to be stationed on the catwalk above the winches and within the line of sight of the driver, to monitor the payout of the rope and to advise the driver to stop.
- g.** Apply sheave tensioner/s and make the rope/s dead.
- h.** Disengage the PTO and shut down the engine.
- i.** Ensure that the pressure plate/bar is resting hard up against the rope on the drum. If there is any slack in the rope or it is not laying correctly on the drum, adjustment of the mechanical flag will be incorrect.
- j.** Check that the mechanical flag gap is set to 19 mm ± 2 mm between the flag and the distance sensor (see Figure 1). Adjust flag distance as required.

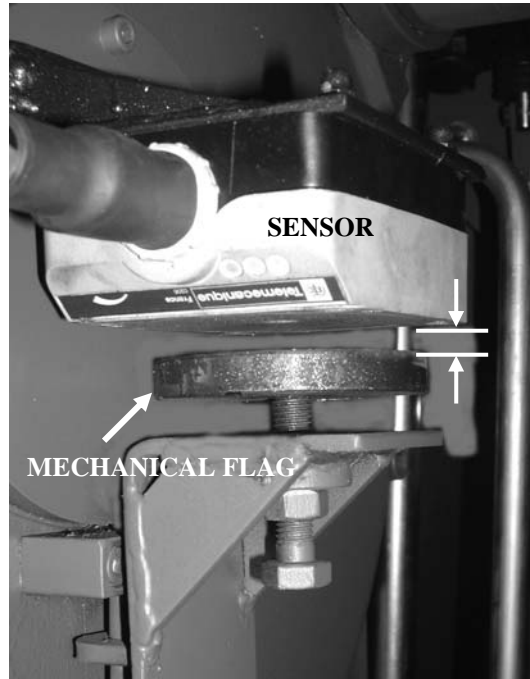


Figure 1 Distance Measurement

- k. With the gap correctly set, restart the engine, engage the PTO and activate the PLC. The display should indicate as follows:

Under Range Level: 2 18 mm

- l. If display does not read as indicated refer to EMEI Vehicle D324-1 Table 7.

Maximum Load Test – Manual Mode

11. The next step in the winch set-up is to check the maximum manual load pull at layer one. A maximum pull of no more than 13.25 tonne is permitted. The procedure is as follows:

- a. Re-connect the rope/s to the anchor point.
- b. Disengage the free spool cylinder/s on the winch/es and disengage the sheave tensioner/s.
- c. Drive HRV being tested at low speed (under 2 km/h in low range, 1st gear) till the rope/s are positioned in the middle of the winch drum on Layer 1. An observer is to be stationed on the catwalk above the winches and within the line of sight of the driver, to monitor the payout of the rope and to advise the driver to stop.
- d. Apply sheave tensioner/s and make the rope/s dead.
- e. Confirm the winch/es are set to manual mode.
- f. Engage the free spool cylinder.
- g. Activate the engine throttle switch to increase the engine speed.
- h. Set the tackle layout for a straight pull on Layer 1 with the winch rope connected to the load cell and the load cell connected to the anchor point.
- i. A support vehicle is to be positioned between the winch operator and the live rope, and the second vehicle between the load cell operator and live rope.
- j. Prepare the vehicle for rear winching by extending both spades, taking up the slack in the rope, disengaging sheave tensioner.
- k. Complete at least two light pulls to settle the rope and spades prior to taking measurements.

- l.** Conduct at least three (3) maximum pull tests. To minimise load spikes the operator is to winch the rope in until the rope is taut, then feather and hold the control lever until the maximum pull has stabilised.
- m.** Record the settled load cell readings and the PLC displayed loads.
- n.** The recorded load cell values are to be within 11.50 and 13.25 tonnes. If the values are not within these parameters refer to EMEI Vehicle D 324-1 Pilot Controlled Pressure Reducing Valve Adjustment.
- o.** The recorded PLC display values are to be within ± 0.5 tonnes of the corresponding loads cell readings. If the values are not within these parameters the 14 Tonne System Block will not operate correctly, refer to EMEI Vehicle D 324-1 Table 7.
- p.** De-activate the engine throttle switch.

NOTE

The Vehicle Mechanic is to monitor the PLC displays to ensure correct response during transitioning between layers. If the PLC display indicates incorrectly refer to EMEI Vehicle D 324-1.

Maximum Load Test – Automatic Mode

- 12.** The purpose of this test is to ensure that a pull of between 11.50 and 13.25 tonne is achievable at all rope layers, and that a maximum pull of 13.25 tonne is not exceeded on any rope layer.
- 13.** To confirm that the constant pull system is functioning correctly, proceed as follows, recording the readings on the HRV Winch Test Sheet which can be copied from Table 3:

NOTE

The Vehicle Mechanic is to monitor the PLC displays to ensure correct response during transitioning between layers. If the PLC display indicates incorrectly refer to EMEI Vehicle D 324-1.

- a.** Place the winch in automatic mode by moving the lever on the hydraulic block to the vertical position.
- b.** Activate the engine throttle switch and confirming that engine speed reaches but does not exceed 1500 rpm.
- c.** With the rope positioned in the middle of the drum on Layer 1, winch in on the winch connected to the load cell and conduct three maximum pulls as described in Para 11.1. Record the settled load cell reading on the test sheet.

NOTE

If the PLC displays 'System Blocked, Safety Relay On', reset the constant pull system by turning the PLC off for a minimum of 5 seconds, then back on.

- d.** Disconnect the load cell and connect the rope/s to the anchor point.
- e.** Reposition the HRV being tested to its next test position by winching the vehicle toward its anchor point until the rope is in the middle of the drum on the layer 2. The senior Recovery Mechanic shall be positioned on the catwalk so that he can observe the rope lay-on whilst operating the winch remote control pendant. The second Recovery Mechanic shall steer the vehicle to maintain a direct pull, whilst applying brake pressure to provide loading for the rope lay-on. The brake pressure must be sufficient to maintain the winch rope/s aloft whilst winching-in.

NOTE

Failure to load the winch rope/s under load may result in rope damage when winching at layers 3 and 4.

- f.** The Vehicle Mechanic shall monitor the PLC displays to ensure that the rope layer is displayed correctly.
- g.** Reposition the support vehicle.

- h.** Reconnect the load cell and conduct three maximum pulls, record the settled load cell reading on the test sheet.
- i.** Repeat the procedure for Layers 3 and 4.

Winch System – Fully Functional

- 14.** If the winch system is operating correctly and the maximum pull for manual mode layer 1 and auto mode for all layers is within the range of 11.50 tonnes and 13.25 tonnes the vehicle winch system is to be classified Fully Functional (FF).
- 15.** The Vehicle Mechanic shall sign off the HRV Winch set up sheet (see Table 2) and vehicle log, GM 120. A copy of the HRV winch set up sheet is to be stored with the GM 120.
- 16.** The recovery mechanic shall disconnect the load cell and prepare the vehicle for travel.

Winch System – Failure

- 17.** If the winching system fails the Winch Set-Up and Constant Pull System Check and the fault can be repaired on site, the fault shall be repaired in accordance with EMEI Vehicle D 324-1 and the failed element of the Winch Set-Up and Constant Pull System Check repeated.
- 18.** If the winching system fails the Winch Set-Up and Constant Pull System Check and the fault can not be repaired on site. The vehicle is to be classified Restricted Use (RU) identifying the faulty winch. The supporting maintenance facility is to be contacted for repair. The recovery mechanic shall disconnect the load cell and prepare the vehicle for travel.

Table 2 HRV Winch Set-Up Sheet

HRV WINCH SET-UP SHEET						
ARN _____						
Item	Reference	Description				
1.	Para 8	PLC Default Settings – Check PLC Default Settings (refer Error! Reference source not found.1)				
2	Para 9	Mechanical flag adjustment – Check and adjust mechanical flag distance 19 mm ± 2 mm				
3	Para 11	Maximum Load Test – Manual Mode (11.50 to 13.25 tonnes)	LH Winch			RH Winch
3.1	Para 11.l	Record three (3) Maximum Pull				
3.2	Para 11.m	Record PLC Load Display (Menu 1)				
4	Para 12	Maximum Load Test – Auto Mode (11.50 to 13.25 tonnes)	LH Winch			RH Winch
4.1		Layer 1				
4.2		Layer 2				
4.3		Layer 3				
4.4		Layer 4				
Name: _____ Rank: _____ Signature: _____ Date: _____						

