

ARMOUR

VOLUME 6

USER MANUAL – LAV

COMMANDER'S EQUIPMENT READINESS CHECKLIST

PART 4

(ENGLISH)

Issued on Authority of the Chief of the Defence Staff

OPI: ARMOUR SCHOOL

1998-08-01

Canada

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FOREWORD

1. B-GL-323-013/FP-001, Armour, Volume 6, User Manual LAV, Part 4, Commander's Equipment Readiness Checklist, is issued on authority of the Chief Defence Staff.
2. B-GL-323-013/FP-001 is effective upon receipt.
3. Suggestions for changes shall be forwarded through normal channels to the Armour School, Attention: IG Stds Cell.
4. Unless otherwise noted, masculine pronouns apply to both men and women.

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CHAPTER 1
LAV STABILIZATION SYSTEM

SECTION 1
OPENING UP DRILL

INTRODUCTION

1. Activation and testing of the Light Armoured Vehicle (LAV) stabilization system requires that the members of the crew carry out the following opening up drill. This drill is done prior to the crew carrying out daily routine duties which may include traversing the turret or moving the LAV. It must be done everytime the crew returns to a closed down (switched off) vehicle.

EXTERIOR

2. **Commander.** The commander shall:
- a. supervise;
 - b. walk around the right hand side of the vehicle and check for security of kit, obstructions on his side of the turret, flat tires and ensure back doors and troop/air sentry hatches are closed and locked;
 - c. remove the muzzle covers off the gun and coax;
 - d. ensure barrels are locked and secured;
 - e. inspect casing eject port and link ejection opening for obstructions;
 - f. inspect the multi-barrel grenade dischargers (MBGDs) for security;
 - g. ensure pintle mount is secured;

- h. ensure antennas are tied down;
 - i. check for obstructions in front of the commander's sight head;
 - j. remove the laser warning receiver (LWR) cover and ensure the line of sight is unobstructed;
 - k. secure the commander's hatch in the open position.
3. **Gunner.** The gunner shall:
- a. walk around the left hand side of the vehicle and check for security of kit, for obstructions on his side of the turret, flat tires and ensure escape hatch and signal entry panel are closed and locked;
 - b. ensure wire cutter is up;
 - c. inspect MBGDs for security;
 - d. check for obstructions in front of the gunner's sight head;
 - e. secure the gunner's hatch in the open position.
4. **Driver.** The driver shall:
- a. ensure winch hatch is closed and locked;
 - b. ensure wire cutter is up if driving hatches up and down if driving hatches down;
 - c. check for security of the tow cable;
 - d. secure the driver's hatch in the open position if driving hatches up.

INTERIOR

NOTE

Prior to this drill, the commander must prove the weapons.

5. **Commander.** The commander shall:
 - a. supervise;
 - b. check components and electrical cables on his side of turret for security;
 - c. check night sight, thermal viewer, laser warning display (LWD), laser range readout (LRR), precision locator ground receiver (PLGR) and radios to ensure power switches are off;
 - d. check link chutes for security and serviceability;
 - e. ensure that cannon is set to **SAFE**;
 - f. ensure all kit is properly stowed and secured;
 - g. unlock turret;
 - h. adjust seat;
 - i. adjust browpad.
6. **Gunner.** The gunner shall:
 - a. check components and electrical cables on his side of the turret for security and condition;
 - b. ensure thermal sight is off;
 - c. ensure laser is off;
 - d. check operation of control display assembly (CDA) cover;

- e. ensure stabilization system (STAB) is turned off;
 - f. ensure battle override is turned off;
 - g. ensure MBGDs are set to **SAFE**;
 - h. ensure gun armed switch is set to **SAFE**;
 - i. check feed chutes for security and serviceability;
 - j. check security of bridge plates;
 - k. check primary ammo box for cleanliness, security and serviceability;
 - l. adjust seat;
 - m. adjust browpad;
 - n. check kit stowage.
7. **Driver.** The driver shall:
- a. ensure all circuit breakers on the power distribution assembly (PDA) are turned off;
 - b. check secondary ammo box for cleanliness, security and serviceability;
 - c. ensure escape hatch is closed and locked;
 - d. inspect automatic fire and explosion suppression system (AFESS) control panel (ensure external discharge switch is disarmed);
 - e. turn on vehicle master switch;
 - f. complete AFESS daily test;
 - g. ensure compass circuit breaker is in and set to **RUN** then observe built-in test (BIT);

- h. check operation of commander's display, LWD and laser warning system (LWS) display;
- i. install and complete opening up procedure for driver's viewing aid (DVA) (if required);
- j. complete annunciator alarm test.

SECTION 2 TURRET POWER UP DRILL

NOTE

Ensure opening up drill is completed.

COMMANDER

- 1. The commander shall:
 - a. ensure commander's thermal viewer is turned on and commander's override is off (after circuit breakers are turned on);
 - b. turn on the LWS and complete BIT; and
 - c. turn on night sight, PLGR and LRR if required.

GUNNER

- 2. The gunner shall:
 - a. set turret, weapon and auxiliary circuit breakers on the PDA to **ON**;
 - b. verify that turret, weapon and auxiliary indicators illuminate;
 - c. complete CDA lamp test;

- d. turn on STAB switch and set drift null switch to **AUTO**;
- e. turn on laser and observe BIT; and
- f. turn on thermal sight and observe BIT.

SECTION 3 TURRET POWER DOWN DRILL

COMMANDER

- 3. The commander shall:
 - a. ensure commander's thermal viewer and override are turned off;
 - b. turn off LWS; and
 - c. turn off night sight, PLGR and LRR.

GUNNER

- 4. The gunner shall:
 - a. turn off thermal sight;
 - b. switch off laser;
 - c. ensure all switches on CDA are turned off and close the cover; and
 - d. set turret, weapon and auxiliary circuit breakers on the PDA to **OFF**.

SECTION 4 CLOSING DOWN DRILL

NOTE

Ensure the turret power down drill is completed.

COMMANDER

1. The commander shall:
 - a. lock the turret;
 - b. close and lock the commander's hatch; and
 - c. replace the main armament and coax muzzle covers.

GUNNER

2. The gunner shall close and lock the gunner's hatch.

DRIVER

3. The driver shall:
 - a. pull the fuel cut off switch out;
 - b. set ignition switch down;
 - c. turn off master switch;
 - d. push fuel cut off switch in;
 - e. exit vehicle, complete last parade; and
 - f. close and lock the driver's hatch.

SECTION 5 SERVICING

DAILY TESTS

NOTE

Ensure opening up drill is completed, power up drill is completed and turret is unlocked.

LAV Stabilization System

1. CHECK MANUAL TRAVERSE (BOTH SPEEDS).
2. CHECK MANUAL ELEVATION.
3. TEST BOTH COMMANDER'S AND GUNNER'S PALM SWITCHES.
4. TEST RESPONSE (BOTH).
5. TEST COMMANDER'S OVERRIDE.
6. COMPLETE TURRET DRIVE TEST.
7. TEST SPEED OF TRAVERSE.
8. CHECK DECK LIMITERS.

TURRET DRIVE BIT TEST

| TEST RESULTS | | LAMP | |
|------------------------|---|--|----------------|
| | | ELEVATION | AZIMUTH |
| Suspected Fault | | Number of Light Bursts Per Lamp | |
| 1 | PASS System Integrity Test | 1 | 1 |
| 2 | Computer Processor, Gun Turret Drive Electronics (GTDE) | 2 | 2 |
| 3 | Elevation Motor and Motor Controller | 2 | 2 |
| 4 | Azimuth Motor and Motor Controller | 2 | 3 |
| 5 | DC/DC Converter Power Electronics Unit (PEU) | 2 | 4 |
| 6 | Azimuth Electromechanical System | 3 | 1 |
| 7 | Elevation Electromechanical System | 3 | 2 |
| 8 | Elevation Gun Gyroscope | 3 | 3 |
| 9 | Azimuth Gun Gyroscope | 4 | 4 |
| 10 | Elevation Turret Gyroscope | 4 | 1 |
| 11 | Elevation Resolver | 4 | 2 |
| 12 | Azimuth Brake | 4 | 3 |
| 13 | Elevation Brake | 4 | 4 |

CHAPTER 2 SIGHTS

SECTION 1 DAY SIGHTS

THE POWER UP/DOWN PROCEDURES

1. **Power Up**
 - a. Vehicle master switch to **ON**.
 - b. Auxiliary power circuit breaker to **ON**.
 - c. Laser sight ON/OFF/BIT switch **ON**.
 - d. Observe the BIT test.

2. **Power Down**
 - a. Laser sight ON/OFF/BIT switch **OFF**.
 - b. Auxiliary power circuit breaker to **OFF**.
 - c. Vehicle master switch to **OFF**.

CARE AND CLEANING

NOTE

Lenses are easily damaged. Do not use materials that will scratch surfaces and degrade performance. Never touch lens surface with fingers.

3. **Gunner's and Commander's Day Sights**
 - a. Carefully remove all loose particles of dust and dirt from the lenses with a lens dusting brush.
 - b. Flush lenses with water and mild detergent to remove the

remaining dirt.

- c. Using optical lens cleaning compound and lens paper, carefully dab lenses to remove oil deposits and finger prints.
- d. Clean metal and rubber parts with a clean wiping rag dampened with clean fresh water and mild detergent.
- e. Dry all metal and rubber parts with a clean dry wiping rag.
- f. Inspect security and condition of rubber eyepiece protective cover for gunner's day sight.
- g. Check condition and operation of sight head wiper.

DAY SIGHT TESTS

- 4. Complete turret opening up and powering up drills.
- 5. Turn the ON/OFF/BIT switch to **BIT**.
- 6. The laser range finder (LRF) will display **E** followed by 3 numbers and then will display **0000** in the range display if the BIT passes.
- 7. If the LRF fails the BIT, the LRF will display one of the following error codes:
 - a. **F1**-Power supply failure;
 - b. **F2**-Transceiver or receiver failure; or
 - c. **F3**-Range logic failure.
- 8. Return ON/OFF/BIT to **ON**.

9. Rotate the reticle brightness knob ensuring that the gunner's reticle can be dimmed and brightened.
10. Rotate the display brightness knob ensuring that the gunner's display can be dimmed and brightened.
11. Lay onto a target approximately 1000 m. Press the laser fire button ensuring a range display appears in the gunner's thermal sight, the crew commander's display unit, the gunner's day sight, and the laser range readout.
12. Lay the graticule pattern on the top left corner of a target at approximately 1000 m. Press the laser fire button, continue this with the top left corner, bottom left corner, and the bottom right corner ensuring a comparable range readout appears. (If not the laser is not aligned with the sight).
13. While looking through the sight rotate the FILTER knob both in and out ensuring the filter appears then disappears.
14. Lay onto a target approximately 1000 m. Press the laser fire button until a double range display appears in both the gunner's sight and the crew commander's thermal display. Rotate the FIRST/LAST control knob ensuring the range read out switches from long range to short range on the gunner's thermal sight, the crew commander's display unit, the gunner's day sight, and the laser range readout.
15. To test the boresighting adjustment knobs the following should be completed:
 - a. lay the gunner's sight onto a target approximately 1000 m using the manual controls;
 - b. push in and rotate the elevation boresighting knob both left and right to ensure the graticule pattern moves both in a circular motion in elevation and depression; and
 - c. push in and rotate the azimuth boresighting knob both left and right to ensure the graticule pattern moves both in a circular motion left then right.

NOTE

If any problems occur call a tech.

SECTION 2 THERMAL SIGHTS

THE POWER UP/DOWN PROCEDURES

1. **Power Up**
 - a. Vehicle master switch to **ON**.
 - b. Auxiliary power circuit breaker to **ON**.
 - c. Laser sight to **ON** (in order to use laser).
 - d. Gunner's and commander's thermal mode switch to **ON**.

2. **Power Down**
 - a. Gunner's and commander's thermal mode switch to **OFF**.
 - b. Laser sight set to **OFF**.
 - c. Auxiliary power circuit breaker to **OFF**.
 - d. Vehicle master switch to **OFF**.

BUILT IN TEST (BIT)

3. The thermal imaging system BIT is performed as follows:
 - a. set commander's override switch to **OFF**. Set system mode switch to **NORMAL**;
 - b. set thermal mode switch to **ON**;
 - c. listen for the cooler on sensor assembly to turn on;
 - d. wait until sensor/power control unit (PCU) indicators are illuminated for approximately 10 minutes;

- e. if sensor/PCU indicators begin flashing, record pattern of flashing indicator;
- f. refer to table for test result and inform tech.

MANUAL BIT

- 4. A manual BIT is performed when the system has been operating for long periods. The manual BIT is performed as follows:
 - a. set system mode switch to **BIT**, observe thermal temperature in display, below 85° C;
 - b. if sensor/PCU indicators begin flashing, record pattern of flashing indicator; and
 - c. refer to table for test result and inform tech.

CARE AND CLEANING

- 5. Carefully remove all loose particles of dust and dirt from the lenses with a lens dusting brush.
- 6. Flush lenses with water and mild detergent to remove the remaining dirt.
- 7. Using optical lens cleaning compound and lens paper, carefully dab lenses to remove oil deposits and finger prints.
- 8. Clean metal and rubber parts with a clean wiping rag dampened with clean fresh water and mild detergent.
- 9. Dry all metal and rubber parts with a clean dry wiping rag.
- 10. Check condition and operation of sight head wiper.

THERMAL SIGHT TEST

- 11. Complete turret opening up and powering up drills.

12. Turn thermal sight mode switch to **ON**.
13. Listen for the cooler on sensor assembly to turn on.
14. Ensure sensor/PCU ready lights illuminate (immediately for the PCU and approximately 10 minutes for the sensor).
15. Adjust the field of view (FOV) switch both **WIDE** and **NARROW** ensuring the FOV in both the gunner's and commander's thermal sight adjust.
16. On **WIDE** FOV, lay the gunner's graticule on a well defined target, at no less than 300 m.
17. Ensure the commander's sight is layed on the exact same point of aim and the commander's override is in the **OFF** position.
18. Set system mode switch to **BORESIGHT**.

NOTE

Record the readings.

19. Using the boresighting control switch, move 3 mils to the left ensuring the graticule moves left off the target in both gunner's and commander's thermal sight.
20. Using the boresighting control switch, move 3 mils to the right ensuring the graticule moves right back on the target in both gunner's and commander's thermal sight.
21. Using the boresighting control switch, move 3 mils in elevation ensuring the graticule moves up off the target in both gunner's and commander's thermal sight.
22. Using the boresighting control switch, move 3 mils in depression ensuring the graticule moves back on the target in both gunner's and commander's thermal sight.
23. Switch the gunner's FOV to **NARROW** and repeat 16 through 22 (this will ensure the narrow and wide FOV work independent of each other).

24. Ensure original readings are replaced and the system mode switch returned to **NORMAL**.
25. Adjust the focusing switch both **FAR** and **NEAR** ensuring both gunner's and commander's thermal sight can be focused.
26. Adjust the polarity switch from **WHITE HOT** to **BLACK HOT** ensuring the visible change from white to black appear in the thermal sight and the crew commander's viewer.
27. Adjust the contrast control both left and right ensuring the contrast changes both bright then dim in the thermal sight and the crew commander's viewer.
28. Adjust the brightness control both left and right ensuring the brightness changes both light then dark on the thermal sight only. This is independent from the commander's override switch.
29. Adjust the reticle brightness control both left and right ensuring the reticle brightness changes both light then dark in the thermal sight and the crew commander's viewer. This is independent from the commander's override switch.
30. Turn the system mode switch to **BIT** and complete the BIT as follows:
- a. complete the thermal sight test;
 - b. turn the system mode switch to **BIT** on the gunner's thermal sight ensuring the cooling temperature is below 85° C; and
 - c. the sensor and PCU lights will flash faults according to the following table:

THERMAL IMAGING SYSTEM BIT RESULTS

| TEST RESULT | SENSOR | PCU | SUSPECTED FAULT |
|--------------------|---------------|------------|------------------------|
| (1) | 1 | 1 | Sensor Unit |

| | | | |
|------|---|---|-----------------|
| (2) | 2 | 1 | Sensor Unit |
| (3) | 4 | 1 | Electronic Unit |
| (4) | 1 | 2 | Electronic Unit |
| (5) | 2 | 2 | Sensor Unit |
| (6) | 3 | 2 | Electronic Unit |
| (7) | 4 | 2 | Sensor Unit |
| (8) | 2 | 3 | Electronic Unit |
| (9) | 3 | 3 | Electronic Unit |
| (10) | 4 | 3 | Electronic Unit |
| (11) | 1 | 4 | Electronic Unit |
| (12) | 2 | 4 | Electronic Unit |
| (13) | 3 | 4 | Electronic Unit |
| (14) | 4 | 4 | Electronic Unit |

SECTION 3
COMMANDER'S IMAGE INTENSIFICATION (II) SIGHT

OPERATION

CAUTION

Equipment can be damaged if the nightsight is operated in sunlight or illuminated area.

1. Power up turret.
2. Adjust brow pad.
3. Set nightsight elbow assembly power switch to **ON**.
4. On the elbow assembly, select diopter ring setting.

5. To determine personal diopter setting:
 - a. adjust diopter ring for sharp focus on nightsight reticle overlay screen; and
 - b. note diopter setting for reference.
6. Adjust reticle control knob to minimum required for accurate aiming.
7. Adjust tube control knob as required.
8. At end of mission and before full daylight or moving in illuminated area, turn reticle brightness control to **LO** and set nightsight power switch to **OFF**.

SECTION 4 BORESIGHTING

PREPARATION BEFORE BORESIGHTING

1. Position vehicle on firm, level surface.
2. Position the boresighting screen down range at 1200 m.
3. Prove the weapons.
4. Ensure vehicle engine and heater are off, and hull master switch is on.
5. Ensure all sights are powered up.

NOTE

No movement on the vehicle while boresighting.

25 MM BORESIGHTING PROCEDURE

6. Have crew mount and prepare for boresighting.
7. Insert 25 mm boresight adapter with boresight telescope and red

streamer attached, into gun barrel until stop rests against muzzle and at the 3 o'clock position.

8. Have gunner, using the upside down T on the laser sight, lay on the center of the boresight screen at 1200 m.
9. Once the gunner has layed on to the very center of the boresight screen, he reports "**ON**".
10. Turn eyepiece until boresight telescope graticule is in focus.
11. Look through the eyepiece of the boresight and order the gunner to traverse and elevate or depress until the dot of the boresight is laid exactly on the center square of the boresight screen, using the traverse and elevation hand crank (ensuring last lay is in elevation each time).
12. Order the gunner to move the boresight mark to the exact center of the boresighting screen using the azimuth and elevation knobs on the gunner's sight.
13. Order the gunner to traverse and elevate off the screen and then relay onto the exact same point of aim, a minimum of three times, "**BREAK YOUR LAY AND RELAY**".
14. If the boresight dot is not laid exactly on the center of the boresighting screen, complete steps 9-13 again; may be:
 - a. the gunner has made an incorrect adjustment; or
 - b. the gunner's lay is inconsistent.
15. Carefully rotate the boresight 3200 mils.
16. Order the gunner to relay exactly on the center of the screen, then look through the eyepiece and note the position of the boresight dot. If the boresight dot is laid exactly on the centre aim point of the screen, boresighting is complete (allowable error is 0.15 mils); if the error is more than 0.15 mils, the boresight requires calibration and must be reported to an Fire Control Systems (FCS) Technician.
17. Remove boresight equipment and streamer, return boresight equipment to case.

NOTE

If at any time during the above procedure, a step cannot be performed or completed as described, stop at once and notify an armour gunnery specialist (AGS) or maintenance personnel.

PREPARATION FOR BORESIGHTING THE 7.62 MM COAX

18. Position vehicle on firm, level surface.
19. Prove all weapons.
20. Ensure main gun boresighting has been completed.
21. Ensure vehicle engine and heater are off, and hull master switch is on.

BORESIGHTING THE 7.62 MM COAX

22. Have gunner lay the boresight aiming mark on a target at 1200 m (ensure last lay is in elevation) using the manual elevation and traverse hand wheel.
23. Insert the boresight into coax gun barrel until the boresight adapter stop rests against muzzle.
24. Position boresight telescope so the eyepiece is facing the 9 o'clock position.
25. Focus the telescope until the reticle is clear and well defined.
26. Using the 14 mm ratchet wrench, adjust coax gun elevation drive nut and azimuth drive nut to align marks of boresight telescope reticle with aiming point of target.

CAUTION

Over tightening drive nuts can damage coax mount.

27. If marks are not aligned, inform AGS or FCS technician.
28. If marks are aligned, remove and stow the boresight.

SECTION 5 ZEROING PROCEDURE

PREPARATION FOR ZEROING

1. Ensure all boresighting procedures have been completed.

WARNING

Ensure boresighting equipment has been removed from the barrel.

ZERONING REGISTRATION FORM

2. **Crew Zeroing Registration Form.** The information required in each block is detailed as follows:
 - a. **Block 1.** Record the AFV Canadian Forces Registration (CFR) number, the date of zeroing and the names of the commander and gunner.
 - b. **Block 2.** Record the following:
 - (1) examination of ordnance (DATE);
 - (2) equivalent full charges (EFCs) from gun log book;
 - (3) gun number;
 - (4) ammo type; and
 - (5) ammunition batch number.
 - c. **Block 3.** Record the exact location in centimetres of each confirming round from the center of the zeroing

screen in both azimuth and elevation and compute as follows:

- (1) **column total** - total the azimuth LEFT, RIGHT columns and the elevation PLUS, MINUS columns;
 - (2) **difference** - subtract the azimuth LEFT, RIGHT columns and record the difference in the appropriate column and subtract the elevation PLUS, MINUS columns and record the difference in the appropriate column; and
 - (3) **MPI cm** - divide the azimuth column (either LEFT or RIGHT) by five to determine the mean point of impact (MPI) cm for azimuth; divide the elevation column (either PLUS or MINUS) by five to determine the MPI cm for elevation. Round off both results to the nearest centimetre.
- d. **Block 4.** Record the location of each shot of the practice fired for armour piercing (AP).

| CFR # | DATE | COMMANDER NAME | SN | GUNNER NAME | SN | | | |
|--------------------------------|----------------------------|----------------|-----------|-------------|----------------------------|---|-----------|---|
| | | | | | | | | |
| EXAMINATION OF ORDNANCE (DATE) | | | | | | | | |
| EFC'S FROM GUN LOG BOOK | | | | | | | | |
| GUN NO | | | | | | | | |
| AMMO TYPE | | | | | | | | |
| LOT NO | | | | | | | | |
| SABOT/ FRANG | ZEROING (cm/100) | | | | CONFIRMATION (cm/100) | | | |
| | IMPACT COORDINATES (in cm) | | | | IMPACT COORDINATES (in cm) | | | |
| ROUND # | AZIMUTH | | ELEVATION | | AZIMUTH | | ELEVATION | |
| | L | R | - | + | L | R | - | + |
| 1 | | | | | | | | |
| 2 | | | | | | | | |
| 3 | | | | | | | | |
| 4 | | | | | | | | |
| 5 | | | | | | | | |
| COLUMN TOTAL | | | | | | | | |
| DIFFERENCE | | | | | | | | |
| MPI cm (BY 5) | | | | | | | | |
| Standard Deviation | | | | | | | | |
| IGTM STATS | | | | | | | | |

ZEROING PROCEDURES

3. Verify that the M242 main gun has already been uploaded with **25 mm** Target Practice Discarding Sabot-Tracer (**TPDS-T**) ammo.
4. With vehicle on level surface, locate target at 1200 meters.
5. Using gunner's daysight, locate aiming mark on zeroing screen.
6. On gunner's hand control, set MAIN/COAX switch to **MAIN**.
7. Set gunner's 200/100/SS switch to **SS**.
8. Set gunner's P/S switch to **P**.
9. Set cannon manual safety to **FIRE**.
10. Set gun armed switch to **ARMED**.
11. Using elevation and traverse handcrank, move the turret to the 1200 m aiming mark, ensuring last lay is in elevation.
12. Fire one round off the zeroing screen to warm up the barrel prior to firing for centre of impact calculation.
13. Press auxiliary trigger to fire one round at zeroing screen.
14. Repeat firing until five rounds have been fired, then perform clear weapon drill.
15. Proceed down range and measure the distance, in centimetres, from the centre of each round, to the centre of the zeroing screen, both in azimuth and elevation. Record the readings on the registration form.
16. To calculate the MPI mils, add the columns, determine the difference and divide by five to find the MPI cm for both azimuth and elevation. Convert the MPI cm to MPI mils (nearest tenth of a mil) and record all totals on the Registration form block (to convert, move the decimal two places to the left).

17. Mark the MPI cm on the zeroing screen, cover or mark the previous shots on the screen and return to the LAV and perform the upload drill.
18. Elevate and traverse gun manually to position graticule sighting point on original aiming point, ensuring last lay in elevation.
19. Adjust gunner's daysight boresight adjustment knobs to align range graticule sighting point to center of impact.
20. Elevate and traverse gun manually to position graticule sighting point on original aiming point.
21. Press auxiliary trigger and fire one check round.
22. If check round is satisfactory, proceed to step 25.
23. If check round is not satisfactory, repeat zeroing procedure.
24. Set gun armed switch to **SAFE**.
25. Set main gun manual safety to **SAFE**.

COAX ZEROING

NOTE

If, at any time during the following procedure, a step cannot be performed or completed as described, stop at once and notify AGS or maintenance personnel.

26. With the vehicle on level surface, using the gunner's daysight, locate a target at 700 m.
27. Ensure the coax upload is completed and the coax half loaded.
28. The commander will issue a battle coax fire order at a target 700 m away.
29. Fire a ten round burst at the center of the target, noting the fall of shot.

30. If the MPI is in the center of the target or in the target area the zeroing is complete.
31. If adjustment is required, perform the turret make safe drill.
32. Insert the 7.62 mm boresight adapter and boresight into the coax barrel.
33. Focus the boresight.
34. With the commander looking through the boresight, order the gunner to manually traverse the turret so that the boresight graticule is layed on to the MPI.

NOTE

1. The coax MG is adjusted within its mount by two drive nuts which extend forward parallel to the barrel. Turn elevation drive nut either clockwise or counter-clockwise to raise or lower boresight telescope graticule. Turn azimuth drive nut either clockwise or counter-clockwise to move boresight telescope graticule left or right.
 2. Due to the way the coax is mounted, the azimuth and elevation drive nuts move the coax in an angular direction.
35. Using a 14 mm ratchet wrench, turn coax mount elevation and azimuth drive nuts to move boresight graticule aiming point from centre of impact area (beaten zone) to original aiming point. (This applies a correction equal and opposite to the error.)
 36. Remove boresight equipment and return equipment to case.
 37. Repeat steps at paragraphs 27 to 30 to check coax zeroing.
 38. If the centre of impact is within 5 mils of the aim point, the coax MG is considered zeroed.
 39. If the centre of impact is not within 5 mils of the aim point, repeat steps at paragraphs 31 to 34.

LASER RANGE FINDER

NOTE

The laser range finder (LRF) graticule is the same graticule as the gunner's daysight. Since the gunner's daysight was previously boresighted and zeroed, sight convergence for the LRF is not required.

40. Laser range finder aiming mark verification is performed by lasing a target at a known distance greater than 250 metres. If an incorrect range is displayed, notify maintenance.

NOTE

If sights cannot be aligned, notify maintenance personnel.

COMMANDER'S SIGHT

41. Using the traverse and elevation handcranks, place the gunner's daysight graticule 1200 m aim mark on the target aiming point at 1200 m.
42. Adjust commander's daysight azimuth and elevation knobs to place the graticule 1200 m aiming mark on the target aiming point at 1200 m.
43. Set commander's daysight scaled deflection and elevation collars to midscale (four).
44. With collars set to midscale (four), check travel of elevation and deflection knobs.
45. If a stop occurs before 1.5 mils of graticule travel, notify unit maintenance personnel.
46. Set elevation and deflection knobs back to midscale (four).

SECTION 6 ALIGNING AND ZEROING ADDITIONAL EQUIPMENT

THERMAL SIGHTS

1. Ensure turret is powered up.
2. On thermal sight sensor unit, set thermal mode switch to **ON**.
3. Set FOV switch to **NARROW**.
4. Obtain good thermal image of aiming point.
5. On thermal sight sensor unit, set system mode switch to **BORESIGHT**.
6. Using traverse and elevation handcranks, place gunner's daysight graticule battle aiming mark on a well defined point of the target. Ensure the commander's override is set to **OFF** on this display unit.
7. Adjust boresight switch to place graticule battle aim mark on target aiming point 1200 m.
8. Set FOV switch to **WIDE**.
9. Adjust boresight switch to place dot, in centre of graticule, on target aiming point.

WARNING

If system mode switch is not returned to normal after boresight procedure, new boresight values will not be saved.

10. Set system mode switch to **NORMAL**.

COMMANDER'S SIGHT

CAUTION

Do not set nightsight shutter switch to **ON** during daylight or in a lighted area without a sunlight shield. Exposure to bright light can damage image intensifier tube.

NOTE

The range to the target for convergence of the sights is 1200 metres, the same as the boresighting distance.

11. Set nightsight shutter switch to **ON**.
12. Using traverse and elevation handcranks, place gunner's daysight graticule 1200 m aim mark on target aiming point at 1200 m.

NOTE

If a target cannot be obtained using the gunner's daysight due to low light conditions, the thermal sight can be substituted, if previously converged with the gunner's daysight.

13. Adjust elbow assembly deflection and elevation knobs to place elbow assembly graticule battle aim mark on target aiming point.
14. Set scaled collars on elbow assembly deflection and elevation knobs to midscale (four).
15. With all collars set to midscale (four), check travel of elevation and deflection knobs.
16. If a stop occurs before 1.5 mils of graticule travel, notify unit maintenance personnel.
17. Set elevation and deflection knobs back to midscale (four).

CHAPTER 3
SECONDARY ARMAMENT

SECTION 1
MACHINE-GUN (MG) PREPARATION FOR FIRING

PRE-FIRE CHECKS

1. **Breech Block**
 - a. Ensure working parts are fully forward and remove backplate/butt or spade assembly.
 - b. Remove driving spring and rod.
 - c. Remove breech block and piston assembly.
 - d. Hold piston extension and pull breech block fully to rear.
 - e. Firing pin should protrude and be well rounded and not damaged.
 - f. Push breech block fully forward, firing pin must NOT protrude.
 - g. Place an empty casing on face of breech block, so that it is held by the extractor; push up on casing so that ejector is compressed.
 - h. Let go of empty casing; it should be thrown from face of breech block by the action of the ejector spring reasserting itself.
 - i. Check serial number on breech block ensuring identical to serial number on gun body.

2. **Piston and Piston Head Friction**

- a. With piston and piston extension dismantled, rotate piston rod slightly and confirm it moves a small distance independent of piston extension.
- b. Piston head friction:
 - (1) place piston assembly into gun body without inserting the driving spring and rod;
 - (2) push assembly fully forward; and
 - (3) hold trigger fully down and pull back on piston assembly checking for free movement of piston in gas cylinder. When moving piston assembly back and forth along its full run, listen for scraping noises in gas regulator housing.

3. **Backplate/Butt or Spade Assembly**

- a. Replace breech block and piston assembly.
- b. Replace driving spring and rod.
- c. Check backplate as follows:
 - (1) cap screw is tight;
 - (2) locking ring is in position and punched; and
 - (3) condition of guides.
- d. Check butt as follows:
 - (1) condition of guides; and
 - (2) security of butt plate (physically tighten the two screws).
- e. Replace backplate/butt or spade assembly and check that catch operates correctly.

4. **Feed Mechanism**

- a. Cock gun and apply safety catch.
- b. Open cover.
- c. Check cover latches are spring loaded.
- d. Check belt feed lever is spring loaded and that the movement of the belt feed lever is reflected by the feed pawls.
- e. Check belt feed lever retaining circlip is in position.
- f. Check cartridge guide and link stripper are spring loaded.
- g. Check inner and outer pawls are spring loaded.
- h. Check the following for security and burring:
 - (1) bullet guide;
 - (2) feed aperture;
 - (3) cartridge stops;
 - (4) feed horns; and
 - (5) feed tray.
- i. Set safety catch to **FIRE**, allow action to go forward under control and check feed horns protrude through aperture in feed tray.
- j. Check security of feed roller on breech block and that it is spring loaded.

5. **Trigger Assembly**

- a. Cock gun and set safety catch to **SAFE**.
- b. Press trigger; working parts should stay to rear.

- c. Set safety catch to **FIRE**.
- d. Press trigger fully and ease working parts forward under control.

6. **Barrel Assembly**

- a. Ensure gas regulator is at correct setting, **1** being the normal setting.
- b. Ensure barrel is locked and secured between two and eight "clicks" of the locking lever.
- c. Check serial numbers against gun body.
- d. Check the barrel for obstructions.
- e. Ensure all barrels are checked.

7. **Sights**

- a. Front Sight-for condition and security.
- b. Rear Sight:
 - (1) for condition and security;
 - (2) scales are legible; and
 - (3) correct operation.

NOTE

If any part of the above checks fail or the adjustment is found incorrect, the gun will not be fired. The fault will be reported.

**SECTION 2
OPERATION OF THE MULTI-BARREL GRENADE
DISCHARGER (MBGD)**

LOADING SEQUENCE

1. Remove the muzzle covers from the grenade barrels and secure to holding stud.
2. Check the backplate and ensure the locking spring is in the locking groove.
3. Ensure the barrels are clean and free from rust.
4. Conduct firing circuit test.
5. Ensure power to turret and weapons is turned off.
6. Turn selector knob to **SAFE**.
7. Remove grenades from package and check for damage.
8. Insert the grenades with the contact rings facing down and press them firmly downward.
9. While pushing down on the grenade, turn it left and right to ensure the grenade is fully home and the rubber closure cap is seated on the barrel.

FIRING SEQUENCE FOR SMOKE GRENADES

10. Switch power to turret and weapons to **ON**.
11. Yellow indicator light must be illuminated.

12. Turn selector switch to either **LEFT, RIGHT or BOTH BANKS**.

13. Lift switch cover and activate firing button.

FIRING SEQUENCE FOR HE GRENADES

14. Switch power to turret and weapons to **ON**.

15. Yellow indicator light must be illuminated.

16. Turn selector switch to right or left depending what bank is required and select **1, 2, 3, or 4** HE position in turn.

17. Lift switch cover and activate firing button.

UNLOADING SEQUENCE

18. Switch power to turret and weapons to **OFF**.

19. Yellow indicator light must be extinguished.

20. Turn selector knob to **SAFE**.

21. Remove grenades from barrels and restow grenades.

22. Replace muzzle covers.

SECTION 3 MBGD CIRCUIT TESTS

CIRCUIT TEST PROCEDURE FOR SMOKE GRENADES

1. Remove muzzle covers and ensure barrels are clean.

2. Insert circuit tester (ensuring bulb is serviceable).

3. Switch power to turret and weapons to **ON**.

4. Yellow indicator light must be illuminated.
5. Turn selector knob to either **LEFT, RIGHT or BOTH BANKS**.
6. Lift switch cover and activate firing button.
7. If circuit tester lights, test in turn the remainder of the barrels.
8. Follow the same procedure for the opposite bank.
9. If circuit tester does not light up, remove the barrel or barrels and check the condition of the electrical contact inserts.
10. Thoroughly clean all contact insert ports and replace any faulty electrical contact inserts, reassemble and test all barrels in the bank.
11. If the circuit test fails a second time report to a technician.

CIRCUIT TEST PROCEDURE FOR HE GRENADES

12. Remove muzzle covers and ensure barrels are clean.
13. Insert circuit tester (ensuring bulb is serviceable) in number one barrel (closest barrel toward rear of turret).
14. Switch power to turret and weapons to **ON**.
15. Yellow indicator light must be illuminated.
16. Turn selector knob to number **1** of appropriate bank.
17. Lift switch cover and activate firing button; circuit tester should illuminate.
18. Select other barrels, in turn; tester should not illuminate.
19. Repeat this procedure for the remaining barrels.
20. If circuit tester does not light up or lights up incorrectly, remove the barrel or barrels and check the condition of the electrical contact inserts.

Secondary Armament

21. Thoroughly clean all contact insert ports and replace any faulty electrical contact inserts, reassemble and test all barrels in the bank.
22. If the circuit test fails a second time report to a technician.

CHAPTER 4 ANCILLARY EQUIPMENT

SECTION 1 OPERATE THE CLIMATE CONTROL SYSTEMS

THE HEATER SYSTEM

NOTE

Ensure both the levers for engine preheat and crew compartment heat are in the **ON** position.

1. The following sequence is to be used to operate the system:
 - a. **Switch On.** The **ON** LED on the controller will light. The heater goes to pre-check.

NOTE

If the heater does not fire upon initial start-up, wait. The heater will attempt a re-start in three minutes. In some cases it takes longer for the fuel pump to prime the empty fuel lines during the initial state. If the heater fails to operate after the re-start, then there is a problem. Advise maintenance personnel.

- b. **Pre-check.** The controller performs a short build-in-test (BIT). This takes several seconds; it is checking components for:
 - (1) proper ranges;
 - (2) short circuits; and
 - (3) open circuits.

NOTE

1. If no errors are indicated, the heater will go to start.
2. The heater will go into purge mode for three reasons; they are:
 - a. COOLANT HAS REACHED 85°C (185°F);
 - b. FUNCTION ERROR OR COMPONENT FAULTS; and
 - c. THE SYSTEM IS IN FULL OUTPUT WHEN SWITCHED OFF.
3. Heater motor will run for about three minutes after combustion has ended, then will automatically stop. The heater must be shut down prior to exiting the vehicle for any prolonged period of time.
4. Always let the heater run through two cycles when trouble shooting. The heater will attempt one re-start after any function or component error. The heater will not start if it is in a purge cycle or if the coolant temperature is above 85°C (185°F).

OPERATE THE AIR CONDITIONING SYSTEM

2. Ensure master switch is **ON**, the engine is running and the winch is not being used.
3. Both air conditioning systems are activated individually using the ON/OFF switches on the control box. As each system is turned on the corresponding indicator light will illuminate.
4. When only one air conditioning system is operating the added load will have minimal effect on the engine idle which will rise to approximately 900 rpm. With both on, engine idle will rise to approximately 1500 rpm.

CAUTION

Both air conditioning units must be turned off prior to using the self-recovery winch. If the air conditioning and winching systems are operated concurrently, the air conditioning system could suffer damage and winching capability would be severely reduced.

SECTION 2
AUTOMATIC FIRE AND EXPLOSION SUPPRESSION SYSTEM
(AFESS)

DANGER

Inhalation of the fire suppressant used for the engine compartment (HFC 125/FE 25) can result in cardiac arrest. Care must be taken to avoid breathing the substance.

OPERATE THE AFESS

1. **Manual Activation**
 - a. Activation of the manual engine compartment discharge fires the engine second-shot, if available. If not available, it fires the engine first-shot. A five second delay is required between activation.
 - b. Activation of the manual crew compartment discharge fires the crew compartment first-shot extinguishers. If first-shot is not available, the crew compartment second shot extinguishers are fired. A five second delay is required between activation.
 - c. After the first-shot of the crew or engine compartment have been fired, the indicator light comes on and remains on until the system reset switch is activated. Do not reset system before new extinguishers are installed in the vehicle.
 - d. The crew vent fan if not already operating, automatically turns on when the crew compartment extinguishers are

activated. The vehicle master switch need not be in the **ON** position in order for the vent fan to start.

2. **Resetting the System**

- a. Depressing the reset button on the annunciator panel will reset the alarm warning system.
- b. Activating and releasing light test switch will initiate the BIT system test.

3. **Visual Inspection of the System**

- a. Check that the sensors are clean and not blocked.
- b. Check that the gauges are reading in the green.
- c. Ensure there is no kit blocking the discharge valves.
- d. Ensure the system lights and alarms all function during self test (AUTOMATIC BIT).
- e. The anti-recoil plug is secured to the rear when not in use.
- f. The locking pins are in place securing the handles.

4. **Servicing the AFESS System**

- a. **Initiate Self Test.** Once the self test switch has been initiated there is nothing else that can be done if no failure lights occur. If a failure light occurs the maintenance personnel must be notified immediately, (crew visual inspection only).

CAUTION

If a circuit failure indicator lamp illuminates other than during lamp test, contact maintenance personnel.

- b. With the master switch and the ignition switch in the **ON** position, perform the daily light test. All indicator lights

and audible tone should come on.

- c. Inspect the control electronics to ensure it is secured to the vehicle hull. Ensure that the wiring harnesses are properly connected and there is no visible damage.
- d. Ensure the distribution tubing is not pinched, cracked or broken.
- e. Ensure the linear thermal detector has not been cut or broken and is properly connected.
- f. Ensure the fire extinguishers are fully charged (needle on the gauge is in the green) and the safety pins are installed. Check for proper electrical connections, and ensure that each fire extinguisher is securely mounted in the bracket. Also check for visible damage.

SECTION 3 RADIAC METER AN-VDR-2

SAFETY PRECAUTIONS

1. Never use the radiac meter connected to the vehicle with batteries in.
2. The radiac set will not be operated with probe detached and can be damaged if probe is attached or detached while the power switch is in the **ON** position. Plug the probe in before installing the batteries.
3. The detector must be switched off before any connection or disconnection can be done; also, before doing any battery change.
4. The probe's window is very fragile; **HANDLE IT WITH CARE.**
5. Under no circumstance should the detector be dismantled.
6. When working with any electrical items, ensure that rings and jewellery are not worn. This will prevent possible electric shock.

OPERATING PROCEDURES

NOTE

1. Keep corresponding serialized parts together.
2. Make sure you plug in the probe before inserting the batteries.
7. Ensure the power switch is **OFF** (down).
8. Loosen, but do not remove the battery cover screws.
9. Remove the battery cover and the batteries.
10. Insert new batteries (6135-01-063-1978) with the large terminal on each battery in the top hole (top) and the small terminal in the small hole (bottom).
11. Replace the battery cover and tighten the cover screws.

PRE-OPERATIONAL TEST PROCEDURES

12. Set power switch to **ON** (up).
13. Set alarm switch to **AUD** (up).
14. Press and hold the **CLR/TEST** button until the alarm sounds, then release (the alarm will be heard from the test set and through the headset, **WITHIN 10 SECONDS**).
15. Set alarm switch to **OFF** (centre); alarm sound stops.
16. Set alarm switch to **VIS** (down); **RATE** and **DOSE** lights illuminate.
17. Set alarm switch back to **AUD** (up); lights go out and alarm sounds.
18. Set alarm switch to **OFF** (centre).

19. When the segment display appears, check that your display is showing **.8.8.8.**
20. At the end of the 10 second segment test, the digit/unit test begins with three **0**'s and the sequence of **0**'s through **9**'s in sets of three on the chart. Check each display in the sequence for correctness of all characters, including decimals.
21. During the electrical tests that start immediately after the **999Gy/hr** display, you may see one-digit codes on the display. You can ignore these codes.
22. If a fault is discovered during this test a flashing **0** appears and the alarm pulsates. Turn unit off.
23. If all test results are good, after 10 to 60 seconds, a flashing **9** appears with the pulsating alarm.
24. When you see the flashing **9**, press and release **CLR/TEST** button. **ALL IS IN ORDER!**

CAUTION

The radiac meter batteries must be removed when vehicle power is used.

READ AND CLEAR ACCUMULATED DOSE

25. **Read Accumulated Dose**
 - a. With power **ON**, press and hold the **ACCUM DOSE** button to read the display.
 - b. Release button.
26. **Clear Accumulated Dose**
 - a. Press and hold the **ACCUM DOSE** and **DOSE PER HR** buttons.
 - b. With these buttons held, press and hold the **CLR/TEST**

button.

- c. While these three buttons are held down, the previous accumulated dose clears.

NOTE

All three buttons must be held until the display reads **000** Gy/hr. When these buttons are released the display will show dose rate.

27. **Display Dose Rate Alarm Set Point**

- a. Press and hold the **DOSE PER HR** button.
- b. With button held, press and hold **CLR/TEST** until alarm set point for dose is displayed in a flashing mode.

NOTE

The display will flash the dose rate for 10 seconds, then revert to normal operation and display dose rate.

28. **Display Accumulated Dose Rate Alarm Set Point**

- a. Press and hold the **ACCUM DOSE** button.
- b. While holding button down, press and hold **CLR/TEST** button until the accumulated dose set point is displayed in a flashing mode.
- c. Release both buttons.

NOTE

The display will flash the accumulated dose alarm set for 10 seconds, then revert to dose rate.

29. **Set Alarm Mode**

- a. Set alarm switch to **AUD** (up) for audio alarm.
- b. Set alarm switch to **VIS** (down) for visual alarm.

- c. Set alarm switch to **OFF** (centre) for no alarm.

NOTE

Appropriate rate or dose light will flash when the alarm set point is exceeded or when a fault occurs.

30. **Set Dose Rate Alarm**

- a. Setting the dose rate involves entering the proper decimal point, range unit and first, second and third digits into the radiax meter memory.

31. **Set Decimal Points and Units**

- a. While holding the **DOSE PER HR** button, press and hold **CLR/TEST** until previous dose rate alarm set point is displayed in a flashing mode, then release both buttons.
- b. Within **10** seconds, press and hold **CLR/TEST** button again until only decimal point and unit indicator are flashing. Release **CLR/TEST** button.
- c. While decimal point and unit indicator are flashing, press and release the **DOSE PER HR** button. Repeat this until the desired decimal point setting and units appear.
- d. When certain that the desired combination of decimal point location and unit ($\mu\text{Gy/hr}$, cGy/hr , Gy/hr) are shown, press and release **CLR/TEST** button.

32. **Set First Digit**

- a. Press and release **DOSE PER HR** button until desired first digit appears.
- b. When desired first digit appears, press and release **CLR/TEST** button. The first digit is locked into set.

NOTE

When the first digit is locked into the set, the display will

flash the second digit. To set second and third digits, repeat steps a. and b. of the above paragraph.

33. **Read Attenuation Factor**

- a. While holding **ATTEN** button, press **CLR/TEST** button.

NOTE

1. The attenuation factor is set by maintenance and can not be altered by the operator.
2. The multiplying factor of protection against gamma rays, offered by different vehicles or enclosures varies. The factor for the LAV-recce is to be determined.
3. As long as the **ATTEN** and **CLR/TEST** buttons are depressed, the display will indicate the preset attenuation factor. When the buttons are released, the unit returns to dose rate measured at the probe.
4. If the radiac meter is installed in a vehicle and it is required to set the dose rate and/or dose alarm for radiation outside the vehicle, you must divide by the attenuation factor assigned to the vehicle. For example: the radiac set is installed in an M-1 tank, which has an attenuation factor of 20.0, and you wish to set the dose rate alarm so that it alarms at an external dose rate of 500 $\mu\text{Gy/hr}$.

Example:

$$\frac{500 \mu\text{Gy/hr}}{20} = 25 \mu\text{Gy/hr}$$

34. **Read Dose Rate Outside Vehicle**

- a. Press and hold **ATTEN** button.
- b. Release **ATTEN** button.

NOTE

1. While the button is pressed, the display shows dose sensed at the probe multiplied by the attenuation factor. When the button is released, the display returns to the dose rate at the probe.
2. For beta radiation the cover must be open.

35. **Turn Unit Off**

- a. Set power switch to **OFF**.

NOTE

1. The attenuation factor is set by maintenance and can not be altered by the operator.
2. Power to the set is turned off but stored information, such as accumulated dose and alarm set points, is retained until vehicle power is off.

OPERATOR SERVICING

36. In accordance with the operator servicing schedule, included in the Operator's Instructions, a visual inspection of components and connections will be conducted regularly.

37. Except as required for the replacement of batteries, the operator is not to dismantle the components of the radiac meter. Repairs are to be referred to maintenance personnel.

TROUBLESHOOTING

38. If the display remains blank when the unit is turned on (vehicle mounted), check that all connectors are securely connected.

39. If the display indicates **0** when the unit is turned on, check that the probe is securely connected to the radiac meter.

40. Improper or no alarm indication during normal operation, check

alarm set points.

SECTION 4 GRASEBY IONIC DETECTOR (GID-3)

SAFETY PRECAUTIONS

WARNING

1. The GID-3 chemical detector contains two radioactive sources within the cell assembly of the sensor unit. The radioactive material is 10 millicuries of Ni 63, and emitters of beta radiation of approximately 67 kev energy. If the cell assembly is damaged or replacement is necessary, the equipment must be returned to maintenance.

2. The high voltage within the GID-3 detector is a low current of ± 1050 v dc between specific points within the detector. A voltage as high as 2100 v will be present while the detector is switched on and may remain for a short period after switching off the detector.

START UP

1. To operate chemical detector:
 - a. Remove blanking cap from inlet tube.
 - b. Remove inlet tube and exhaust tube from stowed position on inlet assembly.
 - c. Install inlet and exhaust tube on inlet assembly.
 - d. Install blanking caps in stowed position on inlet assembly.
 - e. Remove two draw straps, securing core in **CLOSED** position within the inlet assembly.

- f. Pull core down approximately 7 mm (1/4 in) and rotate 180 degrees and push core up in **OPEN** position, seating it within the inlet assembly.
- g. Fasten two draw straps to secure core in **OPEN** position.
- h. Set master switch in the **ON** position.
- i. Set GID-3 to **ON**.
- j. Set alarm switch to **ON**.
- k. The system performs its BIT.

PERFORM BUILT IN TEST (BIT)

- 2. The BIT is performed automatically when chemical detector is switched to **ON**; proceed as follows:
 - a. Set chemical detector switch to **ON**, all LEDs in the remote display/alarm box window will illuminate for approximately one second.
 - b. Record time and make entry in GID-3 log to monitor total hours of operation. (The chemical detector must be replaced after 1500 hours.)
 - c. The LEDs in the remote display/alarm box window will extinguish and will again illuminate one at a time in the following order: G-1 LEDs through to G-8 LEDs, H-1 LEDs through to H-8 LEDs, green **SAMPLING LED**, red **ALARM LED** and then yellow **WAIT LED** in approximately five seconds.
 - d. When the remote display/alarm box red **ALARM LED** illuminates the alarm will sound for one beep.
 - e. All remote displays/alarm box windows and illuminated LEDs will then extinguish.
 - f. Either the G LED and H LED or H LED and G LED will

illuminate alternately every second on the two bar graph for 10 seconds indicating that communications are being established between the remote display/alarm and the chemical detector.

- g. The yellow **WAIT** LED will be illuminated indicating the chemical detector is carrying out the BIT, lasting a minimum of two minutes.
- h. Prior to the chemical detector exiting BIT and at hourly intervals, the chemical detector will not be operational for 10 seconds. The pumps will stop and the yellow **WAIT** LED will flash every 10 seconds. This indicates that the chemical detector internal pump operations are being verified. After a 10 second period the chemical detector will resume normal sampling operation.
- i. After BIT has run, the flashing yellow **WAIT** LED will extinguish and green **SAMPLING** LED will illuminate continuously, indicating a fully operational mode and the air is now being drawn in the chemical detector through the inlet assembly for analyzing.

CONFIDENCE SAMPLE TEST

- 3. To perform a confidence sample test proceed as follows:
 - a. Remove syringe from stowed position on the chemical detector.
 - b. Remove plug from confidence sample cylinder located on chemical detector. Position syringe nozzle into confidence sample cylinder and draw syringe full of stimulant sample vapour and install plug on confidence sample cylinder.
 - c. Remove plug from confidence sample inlet located on inlet assembly. Position syringe nozzle into confidence sample inlet opening and expel stimulant sample vapour from syringe. Install plug on confidence sample inlet.

- d. Install confidence sample syringe in stowed position.
- e. After a few seconds have elapsed there should be three or more remote/alarm, G LEDs or H LEDs illuminated.
- f. If there is no response to the confidence sample, repeat the start-up procedure.
- g. If there is still no response, leave chemical detector switched on for one hour.
- h. If there is still no response refer to maintenance.
- i. The remote display/alarm box window alarm LED will illuminate and remain illuminated for the length of time that three or more, G LEDs or H LEDs are illuminated.
- j. With the remote display/alarm box switch set to **ON**, an audible alarm will be generated at a one second rate for the period that three or more, G LEDs or H LEDs are illuminated.
- k. An audible alarm will be generated through the annunciator panel and the **CHEMICAL LED** on the annunciator panel will illuminate.
- l. The remote display/alarm window G LEDs or H LEDs should extinguish or only have one LED bar illuminated in less than two minutes, in a clean air environment.

NOTE

This may not be the case if the vehicle is inside a building and may take longer.

- m. If six or more G LEDs or H LEDs are illuminated, the chemical detector will enter a clear down process. It will go into a standby mode until it cleans itself out. When it reaches two or less bars it will go back into the normal operating mode.
- n. The chemical detector, GID-3, is now ready for

operation and the remote display/alarm switch may be switched off, if it is not required to operate.

CLEAR DOWN PROCEDURE

4. During the clear down procedure the following steps will be observed:
 - a. The chemical detector will stop sampling external air and recirculate the last air sample through an internal filter pack.
 - b. The green **SAMPLING** LED will flash and a number of G LEDs or H LEDs will be illuminated. More than six will remain illuminated on the remote display/alarm window until the chemical detector has recirculated the last air sample through the filter pack and filtered it to a level of three G LEDs or H LEDs or less.
 - c. When the air sample has been recirculated through the filter pack sufficiently to reduce the level of G LEDs or H LEDs to three or less the chemical detector will exit the clear down process and recommence normal external air sampling. With normal air sampling the green **SAMPLING** LED will stop flashing and remain illuminated continuously.

NOTE

During normal operation the following has to be adhered to:

- a. **SECURE VEHICLE AND CLOSE ROOF FAN.**
- b. **NBC PROTECTIVE GEAR MUST BE WORN AND VENTILATED RESPIRATOR SYSTEM BE CONNECTED TO PROTECTIVE FACE MASK.**

SHUTDOWN PROCEDURE

5. To shutdown the chemical detector GID-3 proceed as follows:
 - a. Ensure that the remote display/alarm has zero or one G LED, or zero or one H LED illuminated.
 - b. If two or more G LEDs or two or more H LEDs are illuminated the chemical detector should be run in a clean environment until zero or one G LED or H LED is illuminated.
 - c. Set chemical detector switch to **OFF** and record time and enter in chemical detector GID-3 log to monitor total hours of operation.
 - d. Remove two draw straps securing core in **OPEN** position within inlet assembly.
 - e. Pull core down approximately 7 mm (1/4 in) and rotate 180 degrees and push core up in **CLOSED** position, seating it within inlet assembly.
 - f. Fasten two draw straps to secure core in **CLOSED** position within inlet assembly.
 - g. Set remote display/alarm switch to **OFF**.
 - h. If the GID-3 chemical detector is to be non-operational an extended period of time, it must be stowed.

STOWED POSITION

6. To place the inlet assembly in the stowed position proceed as follows:
 - a. Remove blanking caps from their stowed positions on inlet assembly.
 - b. Remove inlet tube and exhaust tube from inlet assembly.

- c. Install inlet tube and exhaust tube in their stowed positions on inlet assembly.
- d. Install blanking caps on inlet assembly.
- e. Ensure that inlet assembly core is in **CLOSED** position, if not proceed as follows:
 - (1) remove two draw straps securing core in **OPEN** position within the inlet assembly;
 - (2) pull core down approximately 7 mm (1/4 in) and rotate 180 degrees and push core up in **CLOSED** position, seating it within the inlet assembly; and
 - (3) fasten two draw straps to secure core in **CLOSED** position within the inlet assembly.

MAINTENANCE/CLEANING

- 7. To clean the GID-3 components, proceed as follows:
 - a. Remove any dirt or dust from all chemical detector components, wiring harness, and cable assembly.
 - b. Remove any dirt or dust from inside inlet tube and proceed as follows:
 - (1) remove the inlet tube;
 - (2) flush with hot clean water; and
 - (3) dry completely with a clean cloth or dry hot air.

INSPECTION

8. To inspect the chemical detector components, inspect the following:
 - a. all chemical detector components for cracks, dents or other damage;
 - b. all outer surfaces of the wiring harness and cable assemblies for cuts, tears, corrosion or unusual wear; and
 - c. all brackets for cracks and wear.

FUSE REPLACEMENT

9. To replace a fuse in the chemical detector proceed as follows:
 - a. Ensure the master switch is on **OFF**.
 - b. Set chemical detector switch to **OFF**.
 - c. Remove the suspect fuse from the chemical detector.
 - d. Test and replace the fuse as necessary in fuse holder.
 - e. Install fuse holder in chemical detector.
 - f. Proceed with start-up procedure.

SECTION 5 VENTILATED RESPIRATOR SYSTEM (VRS)

OPERATING INSTRUCTIONS

1. **Switch On**
 - a. Vehicle master switch has to be **ON** to operate the system.

- b. Carry out normal NBC drills and don the respirator.
- c. Switch on the system at the control box and ensure the LED is illuminated and the rheostat is turned to **MAXIMUM**.
- d. Allow purified air to be forced through the hose for approximately 30 seconds to purge the hose of contaminants. Then attach the hose to the adaptor on the respirator canister.
- e. Adjust the rheostat on the control box for individual preference.

2. **Switch Off**

- a. Disconnect the hose from the adaptor on the respirator canister.
- b. Switch the system off with the ON/OFF switch on the control box.
- c. Secure the hose.

FUNCTIONAL TEST OF THE VRS

3. The functional test of the VRS does not require the person carrying out the test to don the NBC respirator mask, and is conducted as follows:

- a. Turn on the vehicle master switch.
- b. Remove the flexible rubber hose from the dummy coupling.
- c. Check that the rheostat on the motor controller is set to **LOW**.
- d. Turn on the blower unit by placing the toggle switch on the motor controller into the **ON** position.

- e. Remove the hose from the dummy coupling and direct the end of the hose to your hand. You should feel a positive air flow and the LED should be illuminated. As the rheostat on the control box is adjusted to **HIGH**, the air flow should increase.

CAUTION

Do not exceed 10 seconds carrying out the leak test on the VRS, otherwise damage to the blower unit may result.

- f. Check for leaks by placing the palm of the hand over the end of the coupling on the hose; this will force air to build up in the hose and the blower unit sound will change to a faster speed.
- g. When the functional test is completed, return the switches and components to their original positions.
- h. This function test will be performed in all crew positions.

SECTION 6 PRECISION LOCATOR GROUND RECEIVER (PLGR) OPERATIONS

PLGR CHECKLIST # 1

- 1. Turn on.
- 2. Adjust screen brightness.
- 3. **Conduct self test** (if required):
 - a. depress **MENU**;
 - b. select **TEST**;
 - c. enter **TEST**;
 - d. activate; and

- e. to abort test depress **MENU, WP, POS, NAV.**
4. **Turn off AUTOMARK:**
- a. depress **MENU**;
 - b. select **SETUP**;
 - c. enter **SETUP**;
 - d. select **SETUP AUTOMARK**; and
 - e. **MODE: OFF.**
5. **Setup Day, Time, Month (DTM):**
- a. **DTM:** enter regional ident, EG: World Geodetic System (WGD); and
 - b. **TIMER:** select your auto off time if required.
6. **Setup Wide Area GPS Enhancement (WAGE):**
- a. **ELHOLD:** automatic;
 - b. **TIME:** for your area, EG: Gagetown ZULU -0300; and
 - c. **ERR:** \pm Factor of merit (FOM), or \pm m.
7. **Setup units:**
- a. **MGRS-NEW METRIC**;
 - b. **EL:** meter Mean Sea Level (MSL); and
 - c. **ANG:** MIL-U MAG.
8. **Setup MODE:**
- a. **SETUP MODE:** CONT; and
 - b. **SV-TYPE:** MIXED.

INITIALIZATION

9. **Cold start time:** between 6-15 minutes (after PLGR has been zeroed):
 - a. **SETUP MODE: FIX.**
10. **Initialize**
 - a. **MENU;**
 - b. **INIT;**
 - c. select **POS** page;
 - d. init **POS;**
 - e. grid zone, EG:19T;
 - f. 100,000 m, EG:FL, type in 10 figure grid if known; and
 - g. **EL.**
11. **Time:** PLGR WILL ALREADY HAVE THIS DONE.
12. **Init TRK/GS:** PLGR WILL ALREADY HAVE THIS DONE.

OPERATE THE PLGR

13. **Getting a Grid**
 - a. Ensure PLGR is on **CONT** or **FIX**.
 - b. Wait for a FOM of 4 or less, or a \pm of at least 100 meters.
 - c. Read grid.
14. **Marking Way Points (WPs)**
 - a. Depress **MARK** button once:

- (1) depress **MARK** again, WP will be saved; and
 - (2) depress **ON** to cancel WP.
- b. Entering WPs using **WP** button:
- (1) depress **WP**;
 - (2) press **ENTER**;
 - (3) WP number, WP name;
 - (4) map sheet, EG:FL, 10 figure grid, Num Lock 12345,67890;
 - (5) Num Lock **OFF**;
 - (6) if no EL is displayed, put in the EL from map;
 - (7) arrows beside P,toggle down, WP will be stored; and
 - (8) go back, enter WP 2 , repeat until all WPs are in PLGR.

15. **Entering Routes**

- a. Depress **WP**.
- b. Wait for **ROUTE** to flash.
- c. Enter **ROUTE**.
- d. Press **ENTER**.
- e. Route number, route name.
- f. Enter WP in order of use, EG: 001, 002, 003, 004 (you must use Num Lock).
- g. If more than eight WPs, use arrows beside S and toggle down, continue to enter WP; once route is complete

depress **WP** to enter route.

16. **Navigating**

a. **ALERTS:**

- (1) depress **MENU** button;
- (2) arrows beside **P**;
- (3) toggle down;
- (4) wait for **ALERTS** to flash;
- (5) enter **ALERTS**;
- (6) **ALL-OFF** flashing ,toggle down.

b. Depress **NAV** button:

- (1) select speed, EG: 2D FAST;
- (2) select type, EG: DIRECT;
- (3) select WP you want to go to, EG: WP 001;
- (4) arrows beside **P**, toggle down;
- (5) this gives you track (trk), azimuth (az), steering (str); and
- (6) if you want range (rng), time-to-target (ttg), toggle down again.

NAVIGATING IN A VEHICLE

17. Place **PLGR** in vehicle mount.
18. Select **NAV** and route to be used.
19. Ensure that the driver's control box function switch is in the **RUN**

position.

20. Ensure that both the commander and the driver have selected **NAV** on their displays.

BATTERY LIFE

| BATTERY | MINIMUM LIFE (CONT MODE, AT 71° C) |
|--|---|
| Lithium Rockwell # 221-0134-010 | 15 hours (10 hours typical) for pn 822-0255-XX2 27 hours (20 hours typical) for pn 822-02550-XX3 |
| NiCad Rockwell #221-0134-020 | 4 hours |
| AA-alkaline (8) (Eveready) | 10 hours |
| AA-lithium (8) (Eveready) | 13 hours |
| LS6 BA | 1 year (change annually) |
| DANGER: Lithium batteries will not be use until further notice. | |

**SECTION 7
TACTICAL NAVIGATION SYSTEM (TAC-NAV)**

MAINTENANCE CALIBRATION

1. **INSTALL CAL**
 - a. Set driver's control box (DCB) function switch to **CAL**; display shows **CAL ERROR=±XX**.
 - b. Press and hold toggle switch up for 15 seconds; release toggle when **OFFSET CAL** appears on display.
 - c. Toggle up or down until **INSTALL CAL** appears.
 - d. Press and hold toggle switch up for five seconds until **WAIT** appears.

- e. **TURN 45°** will appear on display.
- f. Turn the vehicle to the right, stopping every 45 degrees.
- g. Toggle at each stop.
- h. **WAIT** will appear each time, followed by **TURN 45°**.
- i. This procedure requires two complete turns.
- j. If calibration error is greater than ± 15 degrees, repeat the procedure.
- k. Set DCB function switch to **RUN**.

2. **COMPASS CAL**

- a. Set DCB function switch to **CAL**; display shows **CAL ERROR= \pm XX**.
- b. Toggle up or down until **COMPASS CAL** appears.
- c. Press and hold toggle switch up for five seconds.
- d. **WAIT**, will appear.
- e. **TURN** will be indicated by steer-to-chevrons.
- f. Turn the vehicle as directed by the display until chevrons disappear and **WAIT CAL** appears on display; stop vehicle.
- g. Repeat step f. when **TURN** is displayed.
- h. This procedure requires two complete turns.
- i. If calibration error is greater than ± 3 degrees, repeat the procedure.
- j. Set DCB function switch to **RUN**.

NOTE

Steer-to-chevrons will change direction if you go too far; simply back-up until **WAIT CAL** appears.

3. **SETTING OFFSET CAL MANUALLY**

- a. Set DCB function switch to **CAL**; displays shows **CAL ERROR=±XX**.
- b. Press and hold toggle switch up for 15 seconds.
- c. Release toggle when **OFFSET CAL** appears.
- d. Press and hold toggle up for five seconds; the **OFFSET** value appears in the lower part of the display.
- e. Check **OFFSET**; if at **00.0**, return DCB function switch to **RUN**.
- f. If **OFFSET** is not at **00.0**, note bearing from display.
- g. Take bearing from compass, note the difference.
- h. Repeat steps f. and g. four or more times, using different reference points and ensuring that the vehicle faces each reference point in turn; note the differences.
- i. Add the differences.
- j. Divide by the number of bearings.
- k. This gives you the **OFFSET CAL**.
- l. Use the toggle switch to enter this **OFFSET CAL** into DCB.
- m. Set DCB function switch to **RUN**.

NOTE

If **OFFSET CAL** cannot be entered, report to a technician.

4. **AUTOMATIC OFFSET CAL**

- a. Set DCB function switch to **CAL**; display shows **CAL ERROR=±XX**.
- b. Press and hold toggle switch up for 15 seconds.
- c. Release toggle when **OFFSET CAL** appears.
- d. Press and hold toggle up for five seconds; **OFFSET=XX** appears.
- e. Press and hold toggle up for five seconds; **OFFSET ACAL** appears.
- f. Toggle up momentarily, display will flash **WAIT**; then **READY** will appear.
- g. Toggle up once again, display will flash **WAIT**; then **DRIVE** will appear.
- h. Select a point no less than one km away, looking through sight heading North to South.
- i. Drive to this point, toggle up.
- j. The display will flash **WAIT**, then **TURN 180°** will appear.
- k. Turn 180 degrees, aiming at the original starting point, toggle.
- l. **READY** will appear; toggle, **DRIVE** will appear.
- m. Drive to original starting point; toggle up.
- n. **OFFSET** will appear on display and will be stored automatically.
- o. Set DCB function switch to **RUN**.

5. **PITCH CAL**

- a. Use inclinometer to obtain actual vehicle pitch.
- b. Set DCB function switch to **CAL**; display shows **CAL ERROR=±XX**.
- c. Press and hold toggle switch up for 15 seconds; release toggle when **OFFSET CAL** appears on the display.
- d. Toggle up or down until **PITCH CAL** appears.
- e. Press and hold toggle for five seconds; the vehicle pitch value will appear in the lower portion of the display.
- f. Toggle until actual pitch is entered (± 3).
- g. Set DCB function switch to **RUN**.

6. **ROLL CAL**

- a. Obtain actual roll using inclinometer/level.
- b. Set DCB function switch to **CAL**; display shows **CAL ERROR=±XX**.
- c. Press and hold toggle switch up for 15 seconds; release toggle when **OFFSET CAL** appears on the display.
- d. Toggle up or down until **ROLL CAL** appears.
- e. Press and hold toggle five seconds; the vehicle roll value will appear in the lower portion of the display.
- f. Toggle until actual roll is entered.
- g. Set DCB function switch to **RUN**.

7. **ODOMETER CAL**

- a. Mark a line at 100 meter.
- b. Set DCB function switch to **CAL**; display shows **CAL ERROR=±XX**.

- c. Press and hold toggle switch up for 15 seconds; release toggle when **OFFSET CAL** appears on the display.
- d. Toggle up or down until **ODOMETER CAL** appears.
- e. Press and hold toggle for five seconds.
- f. **RD4 (READY)** will appear on display.
- g. Toggle once, **DRIVE** will appear; drive to 100 meter line mark.
- h. Stop on mark, toggle once; the value will be stored automatically.
- i. Set DCB function switch to **RUN**.

FIELD CALIBRATION

8. COMPASS CAL

- a. Set DCB function switch to **CAL**; display shows **CAL ERROR=±XX**.
- b. Toggle up or down until **COMPASS CAL** appears.
- c. Press and hold toggle up for five seconds.
- d. **WAIT** will appear.
- e. **TURN** will be indicated by steer-to-chevrons on the display.
- f. Turn the vehicle as directed by the display until chevrons disappear and **WAIT CAL** appears; stop the vehicle.
- g. Repeat step f. when **TURN** is displayed.
- h. This procedure requires two complete turns.
- i. If calibration error is greater than ± 3 degrees, repeat the

procedure.

- j. Set DCB function switch to **RUN**.

NOTE

Steer-to-chevrons will change direction if you go too far; simply back-up until **WAIT CAL** appears.

9. **TILT UP CAL**

- a. Set DCB function switch to **CAL**; display shows **CAL ERROR=±XX**.
- b. Toggle up or down until **TILT UP CAL** appears.
- c. Press and hold toggle up for five seconds.
- d. **TURN E-W** will appear.
- e. Execute the turn in the direction indicated
- f. The display will show **WAIT CAL** when the vehicle heading is correct.
- g. The display will show **READY CAL** when the magnetic heading information is stabilized.
- h. Toggle once; the display will flash **WAIT CAL**.
- i. Wait for **TILT UP** to appear along with a number.
- j. Drive up hill until bottom number matches the top one; stop the vehicle.
- k. Toggle once.
- l. The display will show **WAIT CAL**, then **CAL ERROR=±XX**.
- m. Set DCB function switch to **RUN**.

10. **TILT DOWN CAL**

- a. Set DCB function switch to **CAL**; display shows **CAL ERROR=±XX**.
- b. Toggle up or down until **TILT DOWN CAL** appears.
- c. Press and hold toggle for five seconds.
- d. **TURN E-W** will appear.
- e. Execute the turn in the direction indicated
- f. The display will show **WAIT CAL** when the vehicle heading is correct.
- g. The display will show **READY CAL** when the magnetic heading information is stabilized.
- h. Toggle once; the display will flash **WAIT CAL**.
- i. Wait for **TILT DOWN** to appear along with a number.
- j. Drive backwards up the hill until the bottom number matches the top one; stop the vehicle.
- k. Toggle once.
- l. The display will show **WAIT CAL**, then **CAL ERROR=±XX**.
- m. Set DCB function switch to **RUN**.

NOTE

For both pitch-up and pitch down if system will not return to **CAL ERROR** at end, the check must be redone.

11. **TURRET CAL**
 - a. Position turret a minimum of 200 mils left of zero.
 - b. Set DCB function switch to **CAL** ; display shows **CAL ERROR=±XX**.
 - c. Toggle up or down until **TURRET CAL** appears.
 - d. Press and hold toggle five seconds.
 - e. **SLEW** will appear with direction.
 - f. Turn the turret 360 degrees at slow speed until **WAIT** appears; if turret is turned too quickly, **TOO FAST ERR** will appear and the procedure must be redone.
 - g. Stop on **WAIT**.
 - h. **CAL ERROR=±XX** will appear.
 - i. Set DCB function switch to **RUN**.

SECTION 8 LASER WARNING SYSTEM

POWER UP

1. Ensure that the vehicle master switch is **ON**.
2. Ensure that the auxiliary power is **ON**.
3. Check the laser warning display for secure connectors.
4. On the commander's display, set the ON/OFF switch to **ON**.
5. On the commander's display, observe and verify that the forward direction indicator is flashing.
6. On the driver's display, set the ON/OFF switch to **ON**.
7. On the driver's display, observe and verify that the forward direction indicator comes on steady.

8. On the commander's display, observe and verify that forward direction indicator stops flashing. If it remains flashing, the other display is not **ON**. In that situation, push **CLEAR/TEST** to get a solid arrow.

BIT

9. The following action, initiates a system integrity test of the laser warning system (LWS). Suspected failures are communicated to the operator through the display indicators of the display performing the test.

10. On the commander's display, press and hold the **CLEAR/TEST** push button for approximately five seconds, until the centre arrow goes out.

11. Observe and verify sector indicator test pattern. The sector indicator test will illuminate all round sector indicators, all sector arrow indicators, and then each indicator in turn. It will start at the top round sector indicator, proceed clockwise, and then continue with the sector arrow indicators.

12. After approximately 30 seconds, observe and verify that no round sector indicators are displayed.

13. If round sector indicators remain illuminated, record the pattern. Count the indicators in a clockwise direction, starting with the top (12 o'clock) as the number 1 indicator and ending with the 11 o'clock indicator as the number 10.

14. Clear display by pushing the **CLEAR/TEST** push button once.

15. Continue recording and clearing until no round sector indicators are displayed.

16. Repeat the BIT for the drivers display (This can be done at the same time as the commander's).

17. To interpret the BIT results, go to the **LWS BIT RESULTS TABLE**.

18. Any faults, are to be reported to a technician.

LWS BIT RESULTS

| TEST RESULT | SUSPECTED FAULT | ROUND SECTOR INDICATOR |
|---------------------|----------------------------|-------------------------------|
| (1) | LWD | 2 |
| (2) | PDA | 1,2 |
| (3) | PDA,W109 | 3 |
| (4) | LWD | 1,3 |
| (5) | LWD | 1,2,3 |
| (6) | LWD | 4 |
| (7) | W136,LWR | 1,5 |
| (8) | W136,LWR | 2,5 |
| (9) | LWR | 1,2,5 |
| TEST RESULTS | SUSPECTED FAULT | ROUND SECTOR INDICATOR |
| (10) | W136,LWR | 3,5 |
| (11) | LWD,W109,SLIPRING,W136,LWR | 1,3,5 |
| (12) | LWD | 1,6 |
| (13) | LWD | 2,6 |
| (14) | LWD,LWR | 1,2,6 |
| (15) | LWD | 3,6 |
| (16) | LWD,W109,SLIPRING,LWR | 1,3,6 |
| (17) | LWD | 4,6 |
| (18) | LWD,W109,SLIPRING | 3,5,6 |
| (19) | LWD | 1,3,5,6 |
| (20) | LWD | 2,3,4,6 |
| (21) | LWD | 1,2,3,5,6, |

| | | |
|------|-----|----|
| (22) | LWD | 9 |
| (23) | LWD | 10 |

TURRET ANGLE TEST

19. The following action initiates the turret angle test which verifies information received from the turret angle encoder.
20. Position the turret at 6400 mils.
21. With the system off, press and hold the **CLEAR/TEST** push button.
22. Turn on the commander's LWD.
23. When the number **1** round LED is illuminated, release the **CLEAR/TEST** push button.
24. Traverse the turret, use the azimuth indicator to verify that the round LED changes approximately every 640 mils (36 degrees) (320 mils left and right of 6400 mils).
25. To end the test, press and release the **CLEAR/TEST** push button.
26. Any faults are to be reported to a technician.

POWER DOWN

27. To power down the LWS, you must turn off the commander's and driver's display.
28. There are no other special operators instructions.

SECTION 9 ANNUNCIATOR PANEL TEST

WITH ENGINE NOT RUNNING

1. Turn on master switch.
2. Turn on ignition switch, at this time the first warning should be heard through both external speaker and headsets, this is the **laser warning**. To silence alarm press the **SILENCE/ADVANCE** button.

ENGINE RUNNING

3. Start engine and watch panel to ensure all light are extinguished within 20 seconds (except park brake/transfer case gear lock if it is engaged). If a light remains on investigate problem before commencing test.
4. Once all light are extinguished press **START** the word **ON** should illuminate.
5. Then press the **ADVANCE** button **twice** to initiate test; at this time the **FIRE** warning light will illuminate and a audio tone should be heard.
6. Press the **ADVANCE** button once; **CHEM** will illuminate and an audio tone should be heard.
7. Press the **ADVANCE** button once; **RADIAC** will illuminate and an audio tone should be heard.
8. Press the **ADVANCE** button once; **ENGINE COOLANT** will illuminate and an audio tone should be heard.
9. Press the **ADVANCE** button once; **ENGINE OIL PRESSURE** will illuminate and an audio tone should be heard.
10. Press the **ADVANCE** button once; **LOW FUEL** will illuminate and an audio tone should be heard.
11. Press the **ADVANCE** button once; **LOW BRAKE AIR** will illuminate and an audio tone should be heard.
12. Press the **ADVANCE** button once; **ALTERNATOR FAIL** will illuminate and an audio tone should be heard.

13. Press the **ADVANCE** button once; **TRANS OIL TEMP** will illuminate and an audio tone should be heard.
14. Press the **ADVANCE** button once; **PARKING BRAKE/TRANSFER CASE** will illuminate and an audio tone should be heard.
15. Press the **ADVANCE** button once; **BRAKE FAILURE** will illuminate and an audio tone should be heard.
16. Press the **ADVANCE** button once; **HYD OIL TEMP** will illuminate and an audio tone should be heard.
17. Press the **ADVANCE** button once; **SPARE** will illuminate and an audio tone should be heard.
18. Press the **ADVANCE** button once; all lights will illuminate and the fence audio tone should be heard.

NOTE

At any time you can stop the test by pressing the **STOP/RESET** button.

**CHAPTER 5
GUN DRILLS**

**SECTION 1
25 MM CANNON MISFIRE DRILL**

IMMEDIATE ACTIONS

1. The following table details the immediate actions drill.

| IMMEDIATE ACTIONS | | |
|---|--|---|
| PROBLEM | COMMANDER | GUNNER |
| SER #1 Cannon fails to fire on initial burst Bolt Position Indicator (BPI) is in SEAR | | Reports " MISFIRE " Retains sight picture |
| | Reports " MISFIRE WAIT " Checks posn of BPI (SEAR) Reports " SEAR " Checks on CDA - If gun armed switch is not set to ARMED , corrects it and reports " ARMED " | |

| IMMEDIATE ACTIONS | | |
|-------------------|---|--------|
| PROBLEM | COMMANDER | GUNNER |
| | <p>- If SEAR light is not ON, must order "TURRET MAKE SAFE" and re-time cannon</p> <p>- If LOW AMMO indicator is lit, toggles low ammo switch and reports "LOW AMMO"</p> <p>- If WPN indicator light is flashing, instructs the driver to check/secure his hatch</p> <p>- If LOW BATTERY indicator is lit, orders "LOW BATTERY" and orders driver to start vehicle</p> <p>- If TEMP/FAULT indicator light is flashing, turns on the battle override (in wartime only)</p> <p>- If fault is</p> | |

| IMMEDIATE ACTIONS | | |
|--|--|---|
| PROBLEM | COMMANDER | GUNNER |
| | <p>found, it is corrected and "LOADED" is reported</p> <p>- If fault is not found go to secondary actions</p> | |
| If weapon fires, carry on with engagement | | <p>Fires the action, reports "FIRING NOW"</p> |
| <p>Cannon still does not fire</p> <p>BPI is in SEAR</p> | | <p>Reports "MISFIRE"</p> <p>Selects SINGLE SHOT and reports "SINGLE SHOT"</p> <p>Retains sight picture</p> |
| | <p>Reports "MISFIRE WAIT"</p> <p>Checks posn of BPI (SEAR)</p> <p>Reports "SEAR"</p> <p>Orders "TURRET MAKE SAFE"</p> <p>Supervises crew</p> | |
| | | <p>Selects SAFE on the gun armed switch, reports "GUN SAFE"</p> <p>Switches weapon</p> |

| IMMEDIATE ACTIONS | | |
|---|--|---|
| PROBLEM | COMMANDER | GUNNER |
| | | power off, reports "WEAPON OFF" Assists commander with secondary actions |
| | Makes safe During peace time, puts up yellow flag and reports to tower Go to secondary actions | |
| SER #2 Cannon fails to fire on initial burst BPI is in MISFIRE Manual safe on SAFE | | |
| | | Reports "MISFIRE" Retains sight picture |
| | Reports "MISFIRE WAIT" Checks posn of BPI (MISFIRE) Checks MISFIRE reset | |

| IMMEDIATE ACTIONS | | |
|--------------------------|--|--|
| PROBLEM | COMMANDER | GUNNER |
| | <p>to see if illuminated</p> <p>Checks manual safety to ensure safety is set to FIRE (Inline)</p> <p>If set to SAFE, orders "SINGLE SHOT"</p> | |
| | | <p>Selects SINGLE SHOT on hand control and reports "SINGLE SHOT"</p> |
| | <p>Presses MISFIRE reset button on CDA and holds until light goes out and reports "RESET"</p> <p>Observes movement of rounds in feed chutes</p> | |
| | | <p>Fires the action, reports "FIRING NOW"</p> |
| | <p>Checks posn of BPI (SEAR)</p> <p>Reports "SEAR"</p> <p>Sets manual safety to FIRE</p> | |

| IMMEDIATE ACTIONS | | |
|--|--|--|
| PROBLEM | COMMANDER | GUNNER |
| | (Inline) and reports " 200 LOADED " | |
| | | Selects 200 rpm on hand control, reports " 200 " and carries on firing reporting " FIRING NOW " |
| If weapon fires, carry on with engagement | | |
| SER #3 Cannon fails to fire on initial burst | | BPI is in MISFIRE , manual safe on FIRE Reports " MISFIRE " Retains sight picture |
| | <p>Reports "MISFIRE WAIT"</p> <p>Checks posn of BPI (MISFIRE)</p> <p>Checks MISFIRE reset to see if illuminated</p> <p>Checks manual safety to ensure safety is set to FIRE (Inline)</p> <p>Presses MISFIRE reset button on CDA</p> | |

| IMMEDIATE ACTIONS | | |
|--|---|--|
| PROBLEM | COMMANDER | GUNNER |
| | and holds until light goes out and reports "RESET" Observes movement of rounds in feed chutes | |
| If weapon fires, carry on with engagement | | |
| | | Fires the action, reports "FIRING NOW" |
| Cannon still fails to fire BPI is in MISFIRE | | |
| | | Reports "MISFIRE" Selects SINGLE SHOT and reports "SINGLE SHOT" Retains sight picture |
| | Reports "MISFIRE WAIT" Checks posn of BPI (MISFIRE) If in MISFIRE , presses MISFIRE reset | |

| IMMEDIATE ACTIONS | | |
|--------------------------|--|--|
| PROBLEM | COMMANDER | GUNNER |
| | button and holds until light goes out and reports "RESET" | |
| | | Fires the action, reports "FIRING NOW" |
| | Checks posn of BPI (SEAR) Reports "SEAR" Orders "TURRET MAKE SAFE" Supervises crew | |
| | | Selects SAFE on the gun armed switch and reports "GUN SAFE" Switches weapon power off and reports "WEAPON OFF" Assists commander with secondary actions |
| | Makes safe During peace time, puts up yellow flag and reports to tower Go to secondary actions | |
| SER #4 | | Reports "MISFIRE" |

| IMMEDIATE ACTIONS | | |
|--|---|-----------------------|
| PROBLEM | COMMANDER | GUNNER |
| Cannon fails to fire on subsequent bursts BPI is in SEAR | | Retains sight picture |
| | Reports "MISFIRE WAIT" Checks posn of BPI (SEAR) Reports "SEAR" Checks on CDA - If SEAR light is not ON , must order "TURRET MAKE SAFE" and re-time cannon - If LOW AMMO indicator is lit, toggles low ammo switch and reports "LOW AMMO" - If WPN indicator light is flashing, instruct the driver to check/secure his hatch - If LOW BATTERY indicator is lit, | |

| IMMEDIATE ACTIONS | | |
|---|--|---|
| PROBLEM | COMMANDER | GUNNER |
| | <p>orders "LOW BATTERY", and orders driver to start vehicle</p> <p>- If TEMP/FAULT indicator light is flashing, turns on the battle override (in wartime only)</p> <p>- If fault is found, it is corrected and "LOADED" is reported</p> <p>-If fault is not found go to secondary actions</p> | |
| If weapon fires, carry on with engagement | | Fires the action, reports " FIRING NOW " |
| Cannon still does not fire BPI is in SEAR | | |
| | | <p>Reports "MISFIRE"</p> <p>Selects SINGLE SHOT and reports "SINGLE SHOT"</p> <p>Retains sight picture</p> |
| | <p>Reports "MISFIRE WAIT"</p> <p>Checks posn of</p> | |

| IMMEDIATE ACTIONS | | |
|--------------------------|--|--|
| PROBLEM | COMMANDER | GUNNER |
| | BPI (SEAR) Reports " SEAR " Orders "TURRET MAKE SAFE" Supervises crew | |
| | | Selects SAFE on the gun armed switch and reports " GUN SAFE " Switches weapon power off and reports "WEAPON OFF" |
| | Makes safe During peace time, puts up yellow flag and reports to tower Go to secondary actions | |

| IMMEDIATE ACTIONS | | |
|---|--|--|
| PROBLEM | COMMANDER | GUNNER |
| <p>SER #5</p> <p>Cannon fails to fire on subsequent bursts</p> <p>BPI is in MISFIRE</p> | | <p>Reports "MISFIRE"</p> <p>Retains sight picture</p> |
| | <p>Reports "MISFIRE WAIT"</p> <p>Checks posn of BPI (MISFIRE)</p> <p>Checks MISFIRE reset to see if illuminated</p> <p>Presses MISFIRE reset button on CDA and holds until light goes out and reports "RESET"</p> <p>Observes movement of rounds in feed chutes</p> | |
| <p>If weapon fires, carry on with engagement</p> | | <p>Fires the action, reports "FIRING NOW"</p> |

| IMMEDIATE ACTIONS | | |
|---|--|---|
| PROBLEM | COMMANDER | GUNNER |
| <p>Cannon still fails to fire</p> <p>BPI is in MISFIRE</p> | | <p>Reports "MISFIRE"</p> <p>Selects SINGLE SHOT and reports "SINGLE SHOT"</p> <p>Retains sight picture</p> |
| | <p>Reports "MISFIRE WAIT"</p> <p>Checks posn of BPI (MISFIRE)</p> <p>Presses MISFIRE reset button and holds until light goes out and reports "RESET"</p> | <p>Fires the action, reports "FIRING NOW"</p> |
| | <p>Checks posn of BPI (SEAR)</p> <p>If in SEAR reports "SEAR, TURRET MAKE SAFE"</p> <p>Supervises crew</p> | <p>Selects SAFE on the gun armed switch, reports "GUN SAFE"</p> <p>Switches weapon power off, reports "WEAPON OFF"</p> <p>Assists Commander with secondary actions</p> |
| | <p>Makes safe</p> <p>During peace time, puts up yellow flag and reports to tower</p> | |

| IMMEDIATE ACTIONS | | |
|--|---|---|
| PROBLEM | COMMANDER | GUNNER |
| | Go to secondary actions | |
| SER #6 Cannon fails to fire BPI is not in MISFIRE nor in SEAR | | Reports " MISFIRE " Retains sight picture |
| | Reports " MISFIRE WAIT " Checks posn of BPI (JAMMED) If not in SEAR nor in MISFIRE , reports " JAMMED CANNON " Orders " TURRET MAKE SAFE " Supervises crew | |
| | | Selects SAFE on the gun armed switch reports " GUN SAFE " Switches weapon power off, reports " WEAPON OFF " |

| IMMEDIATE ACTIONS | | |
|--------------------------|---|---------------|
| PROBLEM | COMMANDER | GUNNER |
| | <p>Makes safe</p> <p>During peace time, puts up yellow flag and reports to tower</p> <p>If cannon is cold, or hot, but not in yellow cookoff zone, proceeds with jammed cannon drill</p> <p>If cannon is hot, and in yellow cookoff zone, performs hot cannon drill</p> <p>WARNING: NEVER CYCLE THE CANNON INTO YELLOW COOKOFF ZONE WITH A HOT GUN</p> | |

SECONDARY ACTIONS

2. The following table details the secondary actions.

| SECONDARY ACTIONS | | |
|--------------------------|---|--|
| PROBLEM | COMMANDER | GUNNER |
| SER #1 | Orders " TURRET OFF " | Switches turret power off, reports " TURRET OFF " |
| | <p>Checks posn of BPI and ensure it is in SEAR; if not rotates until in SEAR using the handcrank</p> <p>Checks for trapped links</p> <p>Checks for trapped rounds in ammo box</p> <p>If fault is found, and corrected reports "TURRET ON", "WEAPON ON"</p> <p>Issues a new fire order</p> | <p>Checks for ammo in feed chutes</p> <p>Checks for trapped belt in feed chutes, and ammo forwarders</p> <p>Checks electrical connection on the W104 cable</p> |
| | | <p>"TURRET ON", "WEAPON ON"</p> <p>Reacts to the new fire order</p> |
| | If cannon does not fire, report to a tech | |

HOT CANNON DRILL

3. The following table details the hot cannon drill.

| HOT CANNON DRILL | | | |
|-------------------------|---|---|---|
| PROBLEM | COMMANDER | GUNNER | DRIVER |
| Hot Cannon Drill | <p>If cannon is hot, orders "COOKOFF EVACUATE"</p> <p>Orders crew to evacuate by safest means</p> <p>After 30 min performs either secondary actions or jammed cannon drill</p> | Exits vehicle ensuring that it is safe to do so | Exits vehicle ensuring that it is safe to do so |

JAMMED CANNON DRILL

4. The following table details the jammed cannon drill.

| JAMMED CANNON DRILL | | |
|----------------------------|----------------------------|--|
| PROBLEM | COMMANDER | GUNNER |
| Jammed Cannon Drill | Orders "TURRET OFF" | Switches turret power off, reports "TURRET OFF" |
| | Completes download | Completes download |
| | | Removes feeder Inspects feeder for damage |

| JAMMED CANNON DRILL | | |
|---|---|--|
| PROBLEM | COMMANDER | GUNNER |
| | | <p>If feeder is jammed, locates and removes obstruction</p> <p>If it cannot be safely removed, info tech</p> |
| | <p>Inspects receiver for damage and jammed round</p> <p>If jammed round cannot be removed safely, informs Range Safety Officer (RSO)/tech</p> | |
| <p>If a round is jammed in the chamber and the bolt is closed in the locked position, retract the bolt from the chamber as follows:</p> | <p>Place 12 inch adjustable wrench on square part of bolt shaft just behind bolt lugs</p> <p>Turn bolt to right with wrench</p> <p>Turn vertical drive shaft on bottom of the receiver to retract the bolt from the chamber</p> <p>If bolt will not retract, contact a tech</p> | |

ACTION ON A RUNAWAY CANNON

5. The following table details the actions on a runaway cannon.

| PROBLEM | COMMANDER | GUNNER |
|--|---|---|
| Cannon still fires after releasing the trigger | | Reports " RUNAWAY GUN " Keeps the gun pointed in a safe direction and releases the hand control |
| If cannon still continues to fire | | Reaches down to the PDA and sets WEAPON POWER circuit breaker to OFF |
| If cannon still continues to fire | Instruct gunner to switch off the vehicle master switch | |

NOTE

The cannon cannot operate without electrical power.

SECTION 2
7.62 MM C6 IMMEDIATE ACTIONS (AI) AND STOPPAGES

IMMEDIATE ACTIONS

1. The following table details the immediate actions drill.

| IMMEDIATE ACTIONS | | |
|--|-------------------|--|
| PROBLEM | COMMANDER | GUNNER |
| SER #1 Gun fails to fire on initial burst Ammo select wrong | | Releases pressure on the trigger and reports "STOPPAGE" |
| | Supervises gunner | Checks ammunition selection on the gunner's hand control and reports "AMMO SELECT WRONG" Selects proper ammunition on the gunner's hand control and reports "AMMO SELECT CORRECT" |
| | Supervises gunner | |
| | | Lays back on target Squeezes the trigger and reports "FIRING NOW" |
| If gun fires alright, carry on firing If gun fails | | |

| IMMEDIATE ACTIONS | | |
|--|--|--|
| PROBLEM | COMMANDER | GUNNER |
| <p>to fire, carry on with immediate actions</p> <p>On completion of the engagement ensure the BPI is in SEAR</p> | | |
| <p>SER #2</p> <p>Gun fails to fire on initial burst</p> <p>Ammo select Correct</p> | | <p>Releases pressure on the trigger and reports "STOPPAGE"</p> |
| | Supervises gunner | <p>Checks ammunition selection on the gunner's hand control and reports "AMMO SELECT CORRECT"</p> |
| | <p>Checks on CDA</p> <p>- If gun armed switch is not set to ARMED, corrects it and reports "ARMED"</p> <p>- If LOW AMMO</p> | |

| IMMEDIATE ACTIONS | | |
|--------------------------|--|--|
| PROBLEM | COMMANDER | GUNNER |
| | <p>indicator is lit, toggles low ammo switch and reports "LOW AMMO"</p> <p>- If WPN indicator light is flashing, instructs driver to check/close his hatch</p> <p>- If LOW BATTERY indicator is lit, orders "LOW BATTERY" and orders driver to start vehicle</p> <p>- If TEMP/FAULT indicator light is flashing, turns on the battle override (in wartime only)</p> <p>- If fault is found, it is corrected and "LOADED" is reported</p> | |
| | | Squeezes the trigger and reports " FIRING NOW " |
| | <p>- If fault is not found on the CDA, checks position of safety catch</p> <p>If on SAFE set to FIRE and reports</p> | |

| IMMEDIATE ACTIONS | | |
|--|--|--|
| PROBLEM | COMMANDER | GUNNER |
| | "LOADED" | |
| | | Squeezes the trigger and reports "FIRING NOW" |
| | If safety is on FIRE , checks position of working parts | |
| <p>If gun fires alright, carry on firing</p> <p>If gun fails to fire check position of working parts</p> | | |
| a. Working parts fully to the rear | <p>Reports "FIRING CIRCUIT"</p> <p>Opens the zipper on the weapons enclosure bag</p> <p>Attempts to fire by using the manual firing lever and reports "FIRING NOW" (initial burst only and then reacts to gunner reporting "FIRING NOW")</p> <p>(He will observe through his sight to</p> | |

| IMMEDIATE ACTIONS | | |
|--|--|---|
| PROBLEM | COMMANDER | GUNNER |
| | fire the proper size burst) | |
| If gun fires alright, carry on firing If gun fails to fire, go to secondary actions | | |
| b. Working parts fully forward | Cocks the gun, reports "LOADED" | Checks for feed by ammo box |
| | | Lays back on target Squeezes the trigger and reports "FIRING NOW" |
| If gun fires alright, carry on firing If gun fails to fire, go to secondary actions | | |
| c. Working parts not fully forward | Reports "PROLONGED STOPPAGE" | |
| Go to secondary actions | | |
| SER #3 Gun fails to | | Releases pressure on the trigger and reports |

| IMMEDIATE ACTIONS | | |
|-------------------------------------|---|-------------------|
| PROBLEM | COMMANDER | GUNNER |
| fire after subsequent bursts | | "STOPPAGE" |
| | <p>Checks on CDA</p> <ul style="list-style-type: none"> - If LOW AMMO indicator is lit, toggles low ammo switch and reports "LOW AMMO" - If WPN indicator light is flashing, informs driver to check/close his hatch - If LOW BATTERY indicator is lit, orders "LOW BATTERY" and orders driver to start vehicle - If TEMP/FAULT indicator light is flashing, turns on the battle override (in wartime only) - If fault is found, it is corrected and "LOADED" is reported | |

| IMMEDIATE ACTIONS | | |
|--|---|--|
| PROBLEM | COMMANDER | GUNNER |
| | | Squeezes the trigger and reports " FIRING NOW " |
| <p>If gun fires alright, carry on firing</p> <p>If gun fails to fire check position of working parts</p> | Checks the position of the working parts using the charging cable | |
| a. Working parts fully to the rear | <p>Reports "FIRING CIRCUIT"</p> <p>Opens the zipper on the weapons enclosure bag</p> <p>Attempts to fire by using the manual firing lever and reports "FIRING NOW" (initial burst only and then reacts to gunner reporting "FIRING NOW") (He will observe through his sight to fire the proper size burst)</p> | |

| IMMEDIATE ACTIONS | | |
|--|--|--|
| PROBLEM | COMMANDER | GUNNER |
| If gun fires alright, carry on firing If gun fails to fire, go to secondary actions | | |
| b. Working parts fully forward | Cocks the gun, reports "LOADED" | |
| | | Squeezes the trigger and reports "FIRING NOW" |
| If gun fires alright, carry on firing If gun fails to fire, go to secondary actions | | |
| c. Working parts not fully forward | Reports "PROLONGED STOPPAGE" | |
| Go to secondary actions | | |

NOTE

No secondary action will be carried out with turret or weapon power on.

SECONDARY ACTIONS

2. The following table details the secondary actions.

| SECONDARY ACTIONS | | |
|--------------------------|--|--|
| PROBLEM | COMMANDER | GUNNER |
| | <p>Orders "TURRET MAKE SAFE"</p> <p>Sets manual safety on cannon to SAFE, reports "CANNON SAFE"</p> <p>Pulls charging cable to rear and sets coax safety to SAFE, reports "COAX SAFE"</p> <p>Sets MBGDs to SAFE, reports "MBGDs SAFE"</p> | <p>Selects SAFE on the gun armed switch reports "GUN SAFE"</p> <p>Switches weapon power off, reports "WEAPON OFF"</p> <p>Assists commander with secondary actions</p> |
| | <p>Orders gunner to elevate to maximum elevation by ordering "ELEVATE ...ON"</p> | <p>Elevates on order from the commander</p> |
| | <p>Orders gunner to turn off turret power, "TURRET OFF"</p> | <p>Sets turret power switch to OFF, reports "TURRET OFF"</p> |
| | <p>Opens the weapons enclosure bag</p> | |
| | <p>Unload</p> | |

| SECONDARY ACTIONS | | |
|---|---|---------------|
| PROBLEM | COMMANDER | GUNNER |
| WARNING | | |
| <p>When unloading, if a round is found in the chamber: immediately close the cover, and under direction of the commander, the gunner will fire the action and report "FIRING NOW". If the round does not fire, the gun will be left for five minutes prior to unloading.</p> | | |
| | Checks the belt and for trapped links | |
| | Removes the upper bridge plate on the cannon, separates links and removes links from the upper link eject chute and replaces the bridge plate | |
| | Removes the upper link eject chute Opens the cover and checks for an obstruction in the gun body | |
| | Checks the feed mechanism (As per pre-fire check) | |
| | Changes the barrel and attempts to fire Checks for obstructions, separated casings or fouled gas regulator when time permits | |

| SECONDARY ACTIONS | | |
|--|-----------------------|--------|
| PROBLEM | COMMANDER | GUNNER |
| REPLACE THE UPPER LINK EJECT CHUTE RE-LOAD, ATTEMPT TO FIRE | | |
| GUN STILL FAILS TO FIRE | Reports to technician | |

SECTION 3
76 MM SMOKE GRENADE MISFIRE DRILL

ALL SMOKE GRENADES IN A BANK FAIL TO EJECT

1. Check selector knob on grenade discharger control box is at **SMOKE**.
2. Ensure ON/OFF switch on grenade discharger control box is **ON**.
3. If RED control light is not **ON**, check:
 - a. top right circuit-breaker on main relay box; and
 - b. 6.5 amp fuse on grenade discharger control box.
4. Attempt to refire the bank.
5. If grenades fail to eject:
 - a. switch the ON/OFF switch to **OFF**;

- b. WAIT 10 MINUTES;
- c. UNLOAD;
- d. report; and
- e. treat grenades as "MISFIRES" until technician has completed his test and determined the fault.

ONE SMOKE GRENADE IN A BANK FAILS TO EJECT

- 6. Switch ON/OFF switch to **OFF**.
- 7. WAIT 10 MINUTES.
- 8. Either reload the grenade in another barrel and attempt to fire or carry out procedure for throwing by hand.

SMOKE GRENADE THROWN BY HAND FAILS TO IGNITE

- 9. WAIT 10 MINUTES.
- 10. Dispose of smoke grenade in accordance with Canadian Forces Technical Order C-74-050-005/MS-000, and Range Standing Orders.

CHAPTER 6
SURVEILLANCE SUITE

TO BE PUBLISHED AT A LATER DATE.

CHAPTER 7 CREW SERVICING

SECTION 1 25 MM CANNON

LOW AMMUNITION SENSOR TEST

1. Complete turret opening up and powering up drills.
2. Place a rag in front of the sensor in the primary ammo box to ensure the primary low ammunition sensor light on the CDA goes out; attempt to fire, weapon should cycle (ensure weapon is set back to **SEAR**). Remove the rag and the primary low ammunition sensor light on the CDA should illuminate; attempt to fire, weapon should not cycle.
3. Place a rag in front of the sensor in the secondary ammo box to ensure the secondary low ammunition sensor light on the CDA goes out; attempt to fire, weapon should cycle (ensure weapon is set back to **SEAR**). Remove the rag and the secondary low ammunition sensor light on the CDA should illuminate; attempt to fire, weapon should not cycle.
4. Place a rag in front of the sensor in the coax ammo box to ensure the coax low ammunition sensor light on the CDA goes out; attempt to fire, the firing circuit should operate. Remove the rag and the coax low ammunition sensor light on the CDA should illuminate; attempt to fire, the firing circuit should not operate.

NOTE

If any problems occur call a technician.

CLEANING THE BARREL ASSEMBLY

5. Use solvent (mil spec approved) and clean chamber.
6. Use solvent through bore to loosen debris.
7. Wipe outside of barrel with solvent.

8. Clean muzzle brake vent slots with brush or carbon scraper.
9. Inspect for loose muzzle brake or obvious bends in barrel, if found report to a weapon technician.
10. Run dry swabs through bore until swabs are clean, repeat solvent bore brushing as necessary. Leave dry after firing and wet when conducting periodic servicing.

LUBRICATING THE BARREL ASSEMBLY

11. Soak swab in oil (mil spec approved) and run through bore until bore is completely coated with oil.
12. Wipe entire outside surface of barrel and muzzle brake with oil.
13. Apply grease (mil spec approved) to barrel support bearing surface.

CLEAN AND INSPECT THE FEEDER ASSEMBLY

14. Wipe feeder with clean cloth dipped in solvent.
15. Keep solvent off all electrical connectors and rubber or plastic parts.
16. Inspect for loose bolts, damaged connectors, broken lock wire.

NOTE

Ensure feed select knob is in (push in)(upper feed path) to reduce the chance of damage.

CLEAN AND INSPECT THE RECEIVER ASSEMBLY

17. Wipe receiver cavity with a clean dry rag.
18. Wipe breech lugs and barrel support bearing ring with rag dampened in solvent.

19. Inspect recoil mechanism for lock wire security. Two places at front recoil spring cap and two places at rear (one on damper nut & one on spanner nut).

NOTE

If the nut at the back of the recoil mechanism, where it attaches to the breech is not safety wired, the gun is unsafe to fire.

20. Inspect recoil mechanism fluid level. If recoil indicator rod is retracted to first hole (only one or no hole visible) recoil should be serviced.

21. Turn vertical drive shaft to verify smooth receiver gear operation.

22. Visually check the sear release, track hook latch and the sear solenoid.

23. Check proper operation of manual sear retractor, sear release link and barrel lock.

LUBRICATE THE RECEIVER ASSEMBLY

24. Apply grease (mil spec approved) to the following surfaces:

- a. recoil actuator rod (operating rod);
- b. breech lugs;
- c. external breech surfaces (light coat);
- d. barrel support bearing; and
- e. rear track rails.

BOLT AND TRACK ASSEMBLY

25. Disassemble and clean all components of the bolt and track assembly.
26. Wipe all components with a clean dry cloth.
27. Clean face of bolt with wire brush to remove primer sealant.
28. Apply grease (mil spec approved) to:
 - a. idler sprockets and shafts;
 - b. chain assembly;
 - c. master link slider; and
 - d. drive sprocket.
29. Lube and assemble bolt and carrier.

INSPECT BOLT AND TRACK

30. Check the following components for cracked, broken or missing parts:
 - a. the firing pin;
 - b. the chain assembly for broken or cracked links; and
 - c. the springs for breaks and bends.

NOTE

1. Do not apply lube to bolt face.
2. Do not immerse chain in solvent.

SEVICE THE 25 MM FEED AND EJECT SYSTEM

31. **25 mm Gun Mount and Rotor.** Ensure that, upon the removal of the main gun receiver, the grease inside the forward extension is

replaced with mil spec approved grease. Ensure that locking latch will lock receiver in the rotor.

32. **25 mm Ammunition Box**

- a. Open secondary ammo box cover, remove primary ammo box cover and inspect for damage. Ensure ammunition box is free of dirt and debris. Close secondary ammo box cover and replace primary ammo box cover and verify fastener operates securely. If any item appears damaged, notify maintenance.
- b. Check ammo forwarders of the primary and secondary 25 mm ammunition boxes for visible damage. By hand, operate release levers on forwarders and using 14 mm socket wrench, rotate sprocket extensions to verify free movement.

33. **Low Ammunition Sensors.** Check low ammunition sensors, and reflectors of the primary and secondary box, for damage and dirt. Ensure electrical connector is securely attached and not damaged in any way. Ensure the low ammunition sensors operate properly by blocking path between the sensor and light on the CDA reflector.

34. **Primary and Secondary Feed Chutes.** Verify that feed chutes can be securely attached to both the feeder and ammunition box. Ensure feed chutes are clean and free from visible damage. There is no lubricant or grease applied to the feed chutes.

35. **Upper/Lower Link/Casing Eject.** Verify that link eject chutes can be securely installed and free from visible damage and that casing eject is clear of debris and spent ammunition. There is no lubricant or grease applied to the link/casing eject chutes.

PRE-FIRE CHECKS ON THE CANNON

36. **Inspect the Recoil Mechanism**

- a. Inspect the recoil mechanism for lock wire security. Two places at the front of the recoil spring cap and two places at the rear (one on damper nut and one on spanner

nut).

WARNING

If the nut at the back of the recoil mechanism, where it attaches to the breech is not safety wired, the gun is unsafe to fire.

- b. Inspect recoil mechanism fluid level. If recoil indicator rod is retracted to first hole (only one or no hole visible) recoil should be serviced.

37. Time the Receiver

- a. Lower the drive shaft.
- b. Manually release the sear.
- c. Turn the drive shaft and continue turning drive shaft to run bolt and carrier assembly through it's cycle.
- d. Bolt and carrier will stop in **MISFIRE**. Once it has stopped, re-activate the sear and turn drive shaft.
- e. Complete cycle and when master link stops at **SEAR** the receiver is timed.
- f. Ensure serial number on receiver matches the track and bolt and barrel assembly.

38. Time and Install the Feeder

- a. Stand feeder assembly on the face of the forward feed assembly.
- b. Push in on the timer release rod and hold.
- c. Once timer release rod has been held in, turn special worm nut counterclockwise and at the same time release the timer release rod.
- d. Turn the special worm nut until the feeder has cycled

through entire feed cycle.

NOTE

Do not use handcrank to cycle the feeder as possible damage may occur. This check is for the operator to feel any restriction in the movement and get them corrected prior to installation of the feeder assembly.

- e. Verify that the selected feed sprockets rotates and that the rotor only turns 1/3 rd of a turn during a complete cycle.
- f. Manually activate the feed select solenoid to select opposite feed. Repeat procedure to verify operation of both feeder assemblies.
- g. Ensure serial number on feeder matches the receiver and barrel assembly.
- h. Install the feeder onto the receiver.

39. **Inspect and Install Chutes**

- a. Remove visible corrosion.
- b. Remove dust, dirt and grease.
- c. Look for uneven surfaces.
- d. Bend the chutes back and forth.
- e. Install chutes.

40. **Barrel.** Make sure it is locked in position by trying to pull it. Ensure barrel is clean and serial number matches the receiver and feeder.

41. **Function Test.** The function test is simply a dry cycle. This is done to confirm smooth function of the feeder, and receiver as a complete unit.

TEST WEAPONS SELECTION AND FIRING CIRCUITS

42. Complete turret opening up and powering up drills.
43. Switch the battle override to **ON** if the weapon power indicator light is flashing.
44. Switch the gun armed switch to **ON**.
45. Put the main/coax switch to **MAIN**, switch the rate to **SINGLE SHOT** on the gunner's hand controller ensuring the 25 mm light on the CDA illuminates.
46. Ensure the low ammo override switch is engaged.
47. Squeeze the palm switch and activate the trigger, the weapon should cycle to **MISFIRE** and the misfire light should illuminate.
48. Push in on the misfire reset button until the light goes out.
49. Squeeze the palm switch and activate the trigger, the weapon should cycle from **MISFIRE** to **SEAR**.
50. Put the main/coax switch to **COAX** on the gunner's hand controller ensuring the coax light on the CDA illuminates.
51. Ensure the low ammo override switch is engaged.
52. Squeeze the palm switch and activate the trigger, ensuring the solenoid on the C6 mount engages.
53. Release the trigger, ensure the solenoid on the C6 mount disengages.
54. Put the main/coax switch to **MAIN**, switch the rate to **SINGLE SHOT** on the commander's hand controller ensuring the main light on the CDA illuminates.
55. Ensure the low ammo override switch is engaged.
56. Squeeze the palm switch and activate the trigger, the weapon

should cycle to **MISFIRE** and the misfire light should illuminate.

57. Push in on the misfire reset button until the light goes out.
58. Squeeze the palm switch and activate the trigger, the weapon should cycle from the **MISFIRE** to **SEAR**.
59. Put the main/coax switch to **COAX** on the commander's hand controller ensuring the coax light on the CDA illuminates.
60. Ensure the low ammo override switch is engaged.
61. Squeeze the palm switch and activate the trigger, ensuring the solenoid on the C6 mount engages.
62. Release the trigger, ensure the solenoid on the C6 mount disengages.
63. Put the main/coax switch to **MAIN**, switch the rate to **SINGLE SHOT** on the gunner's hand controller ensuring the 25 mm light on the CDA illuminates.
64. Ensure the low ammo override switch is engaged.
65. Press in on the auxiliary trigger, the weapon should cycle to **MISFIRE** and the misfire light should illuminate.
66. Push in on the misfire reset button until the light goes out.
67. Press in on the auxiliary trigger, the weapon should cycle from **MISFIRE** to **SEAR**.
68. Put the main/coax switch to **COAX**, switch to **COAX** on the gunner's hand controller ensuring the coax light on the CDA illuminates.
69. Ensure the low ammo override switch is engaged.
70. Press in on auxiliary trigger, ensure the solenoid on the C6 mount engages.
71. Put the gun armed switch to **SAFE**.

NOTE

If coaxial machine gun is not available, firing circuit can still be checked by verifying actuation of the coax machine gun firing solenoid.

**SECTION 2
7.62 MM MG**

LUBRICANT

1. 3GP335-cleaning, lubricating and preserving under all temperature conditions.

ROUTINE CLEANING (WEEKLY)

2. The cleaning should be carried out as follows:
 - a. Strip the MG as for normal stripping.
 - b. Clean, inspect and oil the gun body, paying particular attention to the machined surfaces, cover group and gas cylinder.
 - c. Clean, inspect and oil the body piston assembly dust plate and assemble to the gun body.
 - d. Clean, inspect and oil the bipod and assemble it to the gun.
 - e. Clean, inspect and oil the trigger assembly and assemble it to the gun.
 - f. Clean, inspect and oil the breech block and piston assembly and assemble them to the gun.
 - g. Clean, inspect and oil the driving spring and rod and assemble them to the gun.
 - h. Clean, inspect and oil the backplate or butt assembly and

assemble it to the gun.

- i. Clean, and inspect the barrel for pitting, rust and moisture, and oil.

NOTE

If rust is present, the barrel will be scrubbed.

- j. Complete the pre-fire check during assembly.
- k. Clean, inspect and oil all spare parts and tools.

WARNING

Only one gun will be stripped at any one location at a time. This ensures that parts do not become mixed with parts from another weapon. Serial numbers will be checked before assembly.

CLEANING BEFORE FIRING

3. The procedure is the same as per routine cleaning, with the exception that the following parts are left dry:

- a. exterior of the gun body;
- b. gas cylinder;
- c. piston;
- d. face of the breech block;
- e. backplate or butt assembly; and
- f. barrel assembly to include:
 - (1) bore;
 - (2) chamber;

- (3) gas regulator and housing; and
- (4) flash hider.

CLEANING DURING FIRING

4. During a lull in firing or when time permits always lubricate the working parts of the MG. Ensure the weapon is clear, lift the body cover and lubricate the interior of the weapon. Run the working parts back and forth under control to ensure the weapon functions smoothly.

NOTE

Cleaning during a lull in firing will consist mainly of lubricating the working parts. If time permits, the gas affected parts should be scraped of carbon.

WARNING

Barrel temperature may be excess of 500° C. Ensure that the barrels are cool enough to handle prior to attempting to clean the gas regulator of carbon.

CLEANING AFTER FIRING

5. The bore, chamber and the gas affected parts must be thoroughly cleaned, inspected and reoiled daily for at least three days after firing.
6. **Gas Cylinder.** Using the provided tool, insure that the shoulders of the tool are against the fore end of the cylinder. If not the tool could damage the cylinder and cause gas leakage that could cause gun stoppages.
7. **Feed Mechanism.** If necessary, additional stripping will be carried out and all of the feed mechanism cleaned.
8. **Trigger Mechanism.** The trigger mechanism does not require special cleaning. Usually, it will be dipped in mil spec approved solvent, wiped dry and reoiled. If necessary, additional stripping will be carried out and trigger mechanism cleaned.

9. **Breech Block and Piston Assembly.** Remove breech block from the piston extension and remove the extractor. Clean the face of the breech block, extractor, firing pin and firing pin recess. Inspect for burrs, oil and reassemble.
10. **Piston Head.** The piston head holds a considerable amount of carbon and must be cleaned with the proper tool.
11. **Barrel Assembly.** Clean, inspect and oil the barrel and gas regulator and reassemble them to the weapon.

SPECIAL CONDITIONS

12. **Sand or Dust**
 - a. Strip and clean frequently.
 - b. Lubricate to reduce wear to a minimum.
 - c. Working parts must be lightly oiled to prevent rust and allow MG to run more smoothly.
 - d. Outer and non fiction surfaces are left dry.
13. **Cold Conditions**
 - a. Clean with gun oil and if not available then leave weapon dry.
 - b. Clean weapon outside of heated sheds to prevent condensation.
14. **Tropical Conditions**
 - a. Strip, clean, inspect for rust and oil frequently.
 - b. Strain lubricating oils before use.
 - c. Store oil containers on their sides, tightly sealed.

ADJUST FRONT SIGHT

15. Elevation adjustment-1/2 turn equals to 9.7cm at 100 metres.
16. Line adjustment-one "click" equates to 1.4cm at 100 metres.

**SECTION 3
MULTI-BARREL GRENADE DISCHARGERS**

SERVICING

17. Clean barrels and oil.
18. Conduct circuit test.
19. Check security of all electrical connections and components.
20. Check electrical contact inserts for resilient mounting.

**ANNEX A
ABBREVIATIONS AND ACRONYMS**

| ABBREVIATION/ ACRONYMS | | MEANING |
|-----------------------------------|---------------|--|
| English | French | English/French |
| AFESS | AFESS | automatic fire and explosion suppression system / système automatique de suppression d'incendie et d'explosion |
| AFV | VBC | armoured fighting vehicle / véhicule blindé de combat |
| AGS | STAB | armour gunnery specialist / spécialiste du tir de l'Arme blindée |
| ALM | ALM | alarm / alarme |
| ANG | ANG | angle / angle |
| AP | --- | armour piercing / obus perforant |
| BIT | BIT | built-in-test / autovérification |
| CDA | CDA | control display assembly / boîtier de commande et d'affichage |
| CFR | NMFC | Canadian Forces registration / numéro matricule des Forces canadiennes |
| COAX | mit coax | coaxial machine-gun / mitrailleuse coaxiale |
| DCB | --- | driver's control box / boîte de commande du conducteur |
| DTM | DTM | date, time, month / jour, heure, mois |
| DVA | DVA | driver's viewing aid / appareil de vision du conducteur |
| EFC | C max E | equivalent full charge / charge maximale équivalente |

Annex A
Abbreviations and Acronyms

| ABBREVIATION/ ACRONYMS | | MEANING |
|-----------------------------------|---------------|--|
| English | French | English/French |
| EL | EL | elevation / élévation |
| ERR | ERR | error / erreur |
| FCS tech | TSCT | fire control systems technician / technicien en système de conduite du tir |
| FOM | FOM | factor of merit / écart moyen |
| FOV | FOV | field of view / champ de vision |
| GID | GID | Graseby ionic detector / détecteur d'agents chimiques Graseby |
| GPS | GPS | global positioning system / système universel d'orientation |
| GTDE | GTDE | gun turret drive electronics / ordinateur du dispositif électrique d'entraînement de la tourelle |
| HE | --- | high explosive / explosif brisant |
| IGTM | éqp ITAB | instructor in gunnery team / équipe d'instructeurs de tir de l'Arme blindée |
| II | II | image intensification / intensification d'image |
| LAV | VBL | light armoured vehicle / véhicule blindé léger |
| LED | DEL | light emitting diode / diode émettrice de lumière |
| LRF | T LASER | laser range finder / télémètre laser |
| LRR | LRR | laser range readout / indicateur de distance laser |

Annex A
Abbreviations and Acronyms

| ABBREVIATION/ ACRONYMS | | MEANING |
|-----------------------------------|---------------|--|
| English | French | English/French |
| LWD | LWD | laser warning display / afficheur d'alerte laser |
| LWR | RAL | laser warning receiver / récepteur d'alerte laser |
| LWS | LWS | laser warning system / système d'alerte laser |
| MBGD | LGM | multi-barrel grenade discharger / lance-grenades multitube |
| MG | mit | machine-gun / mitrailleuse |
| mil spec | --- | military specification / spécification militaire |
| MPI | PMI | mean point of impact / point moyen d'impact |
| MSL | NMM | mean sea level / niveau moyen de la mer |
| NAV | NAV | navigation system / système de navigation |
| NBC | NBC | nuclear, biological and chemical / nucléaire, biologique et chimique |
| PCU | --- | power control unit / bloc de commande de l'alimentation |
| PDA | PDA | power distribution assembly / boîtier d'alimentation électrique |
| PEU | PEU | power electronics unit / unité d'alimentation électrique |
| PLGR | PLGR | precision locator ground receiver / récepteur GPS léger de précision |
| RSO | OSCT | range safety officer / officier de sûreté du champ de tir |

Annex A
Abbreviations and Acronyms

| ABBREVIATION/ ACRONYMS | | MEANING |
|-----------------------------------|---------------|---|
| English | French | English/French |
| STAB | --- | stabilization system / système de stabilisation |
| TAC NAV | TAC-NAV | tactical navigation system / système de navigation tactique |
| TPDS-T | TPDS-T | target practice discarding sabot-tracer / munition d'exercice traçante à sabots détachables |
| trk | trk | track / poursuite |
| VRS | SRF | ventilated respirator system / système de respirateur filtrant |
| WAGE | WAGE | wide area GPS enhancement / GPS élargi |
| WGD | WGD | World geodic system / système géodésic mondial |
| WP | WP | way point / point de cheminement |
| WPN | --- | weapon / arme |