

CHAPTER 1

INTRODUCTION

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CHAPTER 1

INTRODUCTION

CHAPTER INDEX

1.0. PURPOSE.

1.1. Upgrade Improvements. Improvements to the performance of various parts of the M1A1 fire control system have been engineered and it is required that changes be made to the hardware in order to implement the improvements. Also, the software of the Ballistic Computer System (BCS) has been modified. It is required that all the fielded tanks and the spares be upgraded with minimum interference with the operational status of the tanks. The objective is to upgrade all the M1A1 tanks, spare Computer Electronics Units (CEU), spare Computer Control Panels (CCP), spare Memory, Circuit Card Assemblies (CCA), and spare Gunner's Primary Sight (GPS) Lower Panels that are presently in the field.

2.0. DESCRIPTION OF UPGRADE.

2.1. Task Summary. The following summarize the retrofit scope of work:

Task 1: Gunner's Primary Sight (GPS). The Lower Panel is to be modified requiring its removal from the sight and tank. The GPS will be modified by removal of the Lower Panel and replacing it with a modified panel from float. The panel having been removed from the tank will be reworked using Modification Kit 57K4103 in accordance with Chapter 4. Spare items will be reworked in a similar manner and repacked to best commercial standards per SOW paragraph C.1.2.1.

Task 2: Gunner's Auxiliary Sight (GAS). N/A.

Task 3: Computer Electronics Unit (CEU). The CEU is to be replaced in the tank by a reworked unit from the float. The removed unit is to be modified using Modification Kit 12993556 in accordance with Chapter 4. A new motherboard is to be installed and a new Sensor Input Circuit Card Assembly. A reprogrammed Memory CCA is to be installed. The upgrade procedure shall also include the addition of diodes to chokes L1 and L2, if not already added. Verification of Functional performance will be accomplished by performing Self Test in the Tank. Verification of the functional performance of a reprogrammed A3 CCA is done using the verify feature of the Memory Programmer Unit.

Task 4: Computer Control Panel (CCP). The CCP in the tank is to be reworked by installing a new identification plate and a new instruction plate, using Modification Kit 12925909. See Chapter 3.

Task 5: Gunner's Primary Sight Body Assembly. The GPS Body assembly is to be reworked using Modification Kit 12931908 in accordance with Chapter 3. This is essentially removal and replacement of an identification plate and the removal and replacement of the Lower Panel.

Task 6: N/A.

3.0. RECORD KEEPING.

3.1. Procedure. Contractor will record details of the upgrade to the tank, the CEU, the A3 CCA, the CCP, and the GPS Lower Panel. Serial numbers of original and upgraded units will be recorded. Lists of completed items will be compiled for each site and transmitted to CMO and CFO. The transmittals will occur monthly.

3.2. Monthly Reports. The monthly reports will be submitted on or before the 15th day of the month following the month for which the report applies. The report will be provide an accounting of the Government Furnished Material (GFM) items consumed, listing of tanks upgraded by unit and serial

number, and listing of upgraded spare items by serial number and location. All these additional items apply over the report period.

4.0. APPLICABLE DOCUMENTS.

Drawings

57K4103	Modification Kit
12993556	Modification Kit
12925909	Modification Kit
12931908	Modification Kit
TM 9-1200-206-34-2	Direct Support and General Support Maintenance Manual
TM 9-E2350-264-10-2	Unusual Conditions, Troubleshooting and Maintenance
MWO 9-1200-206-50 -1	M1A1 CEU Upgrade
MWO 9-1200-206-50-2	M1A1 CCP Upgrade

CHAPTER 2

TANK FUNCTIONALITY CHECKS

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1.0. INTRODUCTION.

1.1. General. The functionality of each tank for upgrade is assessed prior to the Upgrade Team performing upgrade requirements. Any lack of battery or hydraulic power is reported to the local Maintenance Officer immediately so that the tank can be made functional.

1.2. The Egypt upgrade consists of modifications to the Computer Electronics Unit, both hardware and software, and modifications to the Lower Panel of the Gunner's Primary Sight.

2.0. TANK UPGRADE PRE AND POST UPGRADE CHECKS.

2.1. Access to Tank and Turret. The procedure to access the tank and enter the Turret is as follows:

STEP 1. Access to Tank.

WARNING

If main gun is to the front of tank, climb on tank from left side only to keep from getting in laser or machine gun firing path. Notify driver before climbing on tank if engine is running.

- A. Climb on tank using ladder skirt step (1) and hand hold (2) at left front (3) or using skirt step (1) at right front (4) of hull.

STEP 2. Enter Turret.

WARNING

Do not operate loader's hatch (1) while tank is moving except in case of emergency. If you must operate hatch (1) while tank is moving, use extreme care. Loader's hatch (1) is heavy and can cause personal injury.

NOTE

Hatch (1) is spring loaded and will raise three to four inches when unlocked.

- A. Unlock and take off padlock (2).
- B. Grasp handle (3) and pull hatch (1) back until it locks in the intermediate open position. Make sure hatch locking handle (4) is in secure position.
- C. Try to move hatch (1) back and forth to make sure it is locked.
- D. Enter tank through loader's hatch feet first. Step on loader's seat post, then on turret floor.

2.2. Safety Checks in Turret.

- A. Make sure that GUN/TURRET DRIVE switch (5) on loader's panel (6) is down in MANUAL position.
- B. Make sure SAFE/ARMED handle (located at left of gun breech) is down in SAFE position.
- C. Make sure CWS POWER/MANUAL lever is in POWER position.
- D. Make sure loader's KNEE SWITCH (2) is locked in UP position.
- E. Make sure LASER SWITCH (4) is in SAFE position.
- F. Ensure MRS SWITCH light is out.

2.3. Turn Turret Power On and Off.**NOTES**

- Turret power must be on for equipment at gunner's station to work.
- It is anticipated that all work will be performed on a tank being supplied with external power and the engine not running. Although sometimes it may be necessary to work with the engine running, extreme caution should be taken and hearing protection used.
- While the tank battery may have sufficient reserve for the duration of the entire procedure, it is strongly recommended that external power be used.
- In cases where the tank battery is used, the LOW BAT CHG (10) light on the gunner's panel must be observed. If it comes on, it could cause erratic performance of the turret systems.
- Fire control system is designed to function normally at 18 to 30V dc. Operating system at lower voltages may result in erratic performance.
- If engine is not running AUX HYDR POWER switch (11) on commander's control panel must be set to ON.
- Vehicle Master Power can also be controlled from the driver's station.
- Vehicle Master Power and turret power will come on when TURRET POWER switch (6) is moved to the ON position.

A. Vehicle Master Power.

1. Make sure CWS POWER/MANUAL lever (5) is in POWER position.
2. If turret equipment is going to be used, set and hold TURRET POWER switch (1) on Commander's Control Panel to ON until VEHICLE MASTER POWER light (4) and TURRET POWER light (6) come on.

3. Make sure ENGINE FIRE (7), CKT BKR OPEN (8), FIRE CONTROL MALFUNCTION (9), and LOW BAT CHG (10) warning lights are out. If lit, switch off Turret Power and inform Lead Hand.
4. Switch on AUX HYDR PWR switch (12) to ON. Light should come on.

NOTE

Panel lights controls (13, 14) on commander's panel (3) also control lights on loader's panel.

5. Press PANEL LIGHTS TEST pushbutton (13) and make sure that all lights on commander's and loader's panels light. If not, inform Lead Hand, who should arrange for replacement of lamp.
6. Adjust brightness of commander's and loader's panel lights by watching VEHICLE MASTER POWER light (4) and turning knob (14) clockwise to brighten and counterclockwise to dim.

B. Turn off Turret Power.

1. Switch TURRET POWER switch (2) to OFF on commander's control panel (1).
2. Set FIRE CONTROL MODE switch (3) on gunner's panel (5) to MANUAL (4).
3. Set GUN/TURRET DRIVE switch (6) on loader's panel (7) to MANUAL (4).

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2.4. Check Hydraulic Pressure System.

- A. Check hydraulic pressure. If the tank crew is not present verify hydraulic pressure is correct as follows. Do not proceed unless hydraulic pressure is correct.

CAUTION

If a loud, high-pitched, squealing noise is heard, or hydraulic pressure drops suddenly to 500 psi, or less, a large hydraulic leak could be present. Turret power should be shut off immediately.

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- B. Check hydraulic pressure gage (7) as follows:
1. Gage (7) should be steady and show 1500 to 1700 psi.
 2. If gage (7) shows 1700 to 2000 psi, continue mission but notify Lead Hand as soon as possible. It is safe to operate fire control system in NORMAL mode.
 3. If gage (7) does not indicate between 1500 and 2000 psi switch off turret power and notify Lead Hand that upgrade tests cannot be done.

2.5. Check Out Computer Control Panel.**NOTE**

Do not proceed unless all CCP lamps are OK.

- A. Unlatch and open cover on computer panel (9).
- B. Set computer control panel power switch (10) to ON. If PWR light (11) does not light, notify Lead Hand.

NOTE

If CCP is not operating correctly in-form Lead Hand. Proceed with up-grade when Lead Hand has verified faulty condition.

- C. Push and hold TEST pushbutton (12) on computer control panel (9). If any of the lights (13) do not light, do the following:
 - 1. If all computer control panel lights (13) do not light, notify Lead Hand.
 - 2. If any of the five display window numbers (14) do not light or show a number other than the figure eight, notify Lead Hand.
 - 3. If display window numbers (14) show figure eight but any other light does not light, notify Lead Hand.
- D. Release TEST pushbutton (12).

2.6. Operate Turret Traverse Lock and Main Gun Elevation Lock.**WARNING**

During Computer Self Test procedure, the gun and turret must be free to move. Turret and gun movement are minimal but it is necessary to ensure no personnel are near the gun barrel or breech when test is to be carried out.

STEP 1. Unlock Turret Traverse Lock.**UNLOCK**

- A. Lift up handle (1).
- B. Turn handle (1) toward loader's station (counterclockwise) to UNLOCKED position. Make sure handle locks in place and the word UNLOCKED is showing.

LOCK

- A. Lift up handle (1).
- B. Turn handle away from loader's station (clockwise) to LOCK position. Make sure handle locks in place and the word LOCKED is showing.

STEP 2. Unlock Gun Elevation Travel Lock.

- A. Press and hold button (2) on end of lock pin (3).
- B. Take out lock pin (3) from roof bracket (4).
- C. Swing main gun elevation travel lock (1) down into main gun bracket (5).

NOTE

- It may be necessary to elevate or depress the gun manually to help line up holes in gun elevation travel lock (1) and main gun bracket (5).
- D. Line up holes in main gun elevation travel lock (1) and main gun bracket (5).
 - E. Put lock pin (3) into main gun bracket (4).

2.7. Operate Gunner's Handle.

- A. Ensure turret power is on (see para 2.3.).
- B. Set FIRE CONTROL MODE switch (1) on GPS to NORMAL or EMERGENCY and check that associated light (2 or 3) is lit.

WARNING

Before depressing palm switches, alert crew and make sure all personnel are clear of turret, breech, and main gun. Crew members can be injured or killed if turret is traversed while body parts are extended between turret and hull or if main gun is moved while body parts are near breech or gun tube.

NOTES

- Squeezing palm switches (4) on gunner's handles (5) starts the stabilization system if FIRE CONTROL MODE switch (1) is set to NORMAL only.
 - Either palm switch (4) on gunner's handles (5) must be squeezed for handles (5), buttons (6) and triggers (7) to operate.
- C. Grasp gunner's handles (5) and squeeze either or both palm switches (4).

NOTES

- The further counterclockwise or clockwise gunner's handles (5) are turned, the faster turret traverses.
- When traversing turret over back deck with gunner's handles (5), a deck clearance switch automatically causes main gun to elevate if it is depressed too low to clear back deck.
- If bilge pump is being operated using auxiliary pump hydraulic pressure, turret cannot be operated in power mode.

- D. Turn the gunner's handles (5) clock-wise to traverse turret right and counter-clockwise to traverse turret left.

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NOTE

The further forward or backward you move gunner's handles (5), the faster main gun and coaxial machine gun will elevate or depress.

- E. Rotate gunner's handles (5) back to elevate weapons, and rotate gunner's handles (5) forward to depress weapons.

- 2.8. Operate Hydraulic Pump Handle.
- A. Make sure gun travel lock is unlocked (see para 2.6.).
 - B. Grasp and squeeze hydraulic pump handle (1) and palm switch (2) to move main gun as follows:
 - 1. To elevate main gun and coaxial machine gun, crank clockwise.
 - 2. To lower main gun and coaxial machine gun, crank counterclockwise.
 - C. Stow hydraulic pump handle (1) by releasing palm switch (2), and rotating hydraulic pump handle (1) until the stowed lock latches.

2.9. Operate Manual Drive Handle.

- A. Make sure turret lock is unlocked (see para 2.6.).

WARNING

Make sure palm switch (1) is fully closed when operating manual drive handle (2). Holding palm switch (1) partially closed during tank operation may cause loss of turret control and possible injury to personnel.

NOTES

- Palm switch (1) must be fully squeezed for manual drive handle (2) to operate. If switch (1) is not squeezed, handle (2) rotates freely.
 - Slide (3) is used to select high or low speed on manual drive handle (2). Push slide (3) in for high speed and pull slide (3) out for low speed.
- B. Select desired speed with slide (3). Grasp and squeeze manual drive handle (2) and palm switch (1) to traverse turret as follows:
1. To traverse right, crank clock-wise.
 2. To traverse left, crank counter-clockwise.

WARNING

Make sure palm switch (1) releases when manual drive handle (2) is released. If palm switch (1) stays engaged and turret is traversed, manual drive handle (2) can rotate and may cause injury.

- C. Release manual drive handle (2) and palm switch (1) to disengage from traverse mechanism.

3.0. GUNNER'S STATION.3.1. Power Up Gunner's Station.**NOTES**

- Turret power must be on for equipment at gunner's station to work (see para 2.3.).
 - Fire control system is designed to function normally at 18-30V dc. Operating system at lower voltage may result in erratic performance.
- A. Push PANEL LIGHTS TEST pushbutton (1). Check that all lights on GPS Upper and Lower Panels (2, 3) and TIS panel (4) light. Let go of pushbutton (1). If any light(s) was not lit, notify Lead Hand after trying replacement bulb.
- B. Adjust brightness of the GPS Upper and Lower Panels (2, 3) and TIS panel (4) lights by turning PANEL LIGHTS knob (5) clockwise to brighten and counter-clockwise to dim.
- C. Make sure gun travel lock is unlocked (see para 2.6.).
- D. Unlock turret lock (see para 2.6.).

4.0. ASSEMBLY IDENTIFICATION.

4.1. Identification Plate Check. Check identification plate on GPS Main Body and note part number. Using Table 2-1, determine if sight has had Retro Reflector upgraded. If any GPS Assembly does not match 12549762-2, notify the CFO POC.

4.2. Retro Reflector Check. N/A.

Table 2-1. Gunner's Primary Sight Configurations

GPS Assemblies	GPS Body Assemblies	Body With Container	Configuration	PCC	Required Action
9338430	12337709 1240-01- 190-3318	5705205 1240-01- 249-8884	Non OIP, flat window	L84	Do not modify.
9377185	9377275 1240-01- 251-4846	9377285 1240-01- 251-6020	OIP, flat window	U61	Do not modify.
12549150	12549149 1240-01- 291-6269	12549705 1240-01- 289-2706	OIP, 10 degree window	V14	Add retro reflector. Add Lower Panel.
12549764	12549763 1240-01- 289-5278	12549772 1240-01- 289-2708	OIP, TRU PIN, flat window	V18	Do not modify.
12549762-1	12549761-1 1240-01- 288-9922	12549773 1240-01- 289-2707	OIP, TRU pin	V19	Add retro reflector. Add Lower Panel.
12549762-2	12549761-2 1240-01- 323-6080	12918198 1240-01- 320-1256	OIP,TRU pin, ARR	V46	Add Lower Panel.
12549762-3	12549761-3 1240-01- 325-7620	12918231 1240-01- 325-7621	OIP, NO PIN, ARR	V52	Add Lower Panel.
12549762-4	12549761-4	12931823	OIP,TRU pin, ARR, AEI	V90	Completed version. Latest configuration.
12549762-5	12549761-5	12931824	OIP, NO PIN, ARR,AEI	V91	Completed version. Latest configuration.
Configuration Legend					
TRU	Newest TRU Configuration				
OIP	Optical Improvement Program				
ARR	Anti-Random Ranging				
NO PIN	Will Not Accommodate the New TRU				
AEI	Armament Enhancement Initiatives				

5.0. GUNNER' PRIMARY SIGHT.5.1. Perform GPS Functional Check.**NOTES**

- If you discover a problem during the checks, notify Lead Hand.
 - Fire control system is designed to function normally at 18 to 30V dc. Operating system at lower voltages may result in erratic performance.
- A. Power up gunner's station (see para 3.0.).

WARNING

Main gun may move abruptly if palm switches on gunner's or commander's handles are squeezed when FIRE CONTROL MODE switch (3) is set to NORMAL, TURRET POWER switch is set to ON, and GUN/TURRET DRIVE switch on loader's panel is set to POWERED. Abrupt movement could cause injury if any part of their body is under or over the main gun.

- B. Set GUN/TURRET DRIVE switch to POWERED.
- C. Set FIRE CONTROL MODE switch (3) to NORMAL. Make sure green NORMAL light (4) comes on.

- D. Open both GPS ballistic doors (see para 5.2.).
- E. Make sure FLTR/CLEAR/SHTR switch (13) is set to CLEAR and look into GPS eyepiece (14). View should be clear.
- F. Rotate FLTR/CLEAR/SHTR switch (13) to FLTR. Make sure filter is present in view through eyepiece (14).
- G. Rotate FLTR/CLEAR/SHTR switch (13) to SHTR. Make sure daylight view is blocked out in eyepiece (14).
- H. Rotate FLTR/CLEAR/SHTR switch (13) to CLEAR. Make sure daylight view in eyepiece (14) is again clear.

5.2. Operate Gunner's Primary Sight Ballistic Doors.**NOTE**

Keep GPS ballistic doors closed when not using GPS (1).

- A. To use daylight sight of GPS or laser range finder, open left (DAY) ballistic door by grasping left (DAY) handle (2), squeezing finger lever on top, and turning clockwise.
- B. To use Thermal Imaging System (TIS), left (DAY) ballistic door must be open. Open right (THERMAL) ballistic door by grasping right (THERMAL) handle (3), squeezing finger lever on top, and turning counterclockwise.
- C. To close right (THERMAL) ballistic door, grasp right (THERMAL) handle (3), squeezing finger lever on top and turn clockwise.
- D. To close left (DAY) ballistic door, grasp left (DAY) handle (2) squeeze finger lever and turn counterclockwise.

5.3. Perform Gunner's Primary Sight (GPS) Tests.

- A. Look into GPS eyepiece (1) and adjust RETICLE brightness knob (2). Turn knob (2) clockwise to increase bright-ness and counterclockwise to decrease brightness.
- B. Ensure Reticle is present (9).

WARNING

Make sure all crew members are clear of main gun before squeezing palm switches on gunner's handles. When FIRE CONTROL MODE switch (3) is in NORMAL and GUN/TURRET DRIVE switch is in POWERED, squeezing palm switch-es starts the stabilizing system and main gun may move suddenly and could injury.

6.0. THERMAL IMAGING SYSTEM (TIS) CHECK.6.1. Perform TIS Check.**NOTES**

- Turret power must be on to operate TIS (see para 2.3.).
 - Gunner's station must be powered up to operate TIS (see para 3.0.).
 - When operating TIS without engine running, check LOW BAT CHG light (1) on commander's panel (2) every 10-15 minutes. If light (1) comes on, notify Lead Hand.
- A. Set FLTR/CLEAR/SHTR switch (4) to SHTR.
- B. Set POLARITY switch (5) to WHITE HOT.
- C. If equipped, set ANTI-GLARE knob (6) to filter position 1.

NOTE

Make sure THERMAL MAGNIFICATION lever (7) snaps into position.

- D. Set THERMAL MAGNIFICATION lever (7) to 3X.

NOTES

- Any time UNIT TEST PATTERN switch (7) is moved, FAULT light (8) may come on, but should go off within 5 seconds.
 - If correct test pattern does not appear for any switch position, notify Lead Hand.
- E. Set UNIT TEST PATTERN switch (7) to PCU and look at FAULT light (8). If FAULT (8) stays on for more than 5 seconds, notify Lead Hand.

- F. Look into GPS eyepiece (9). View should contain a test pattern image. Range symbol (10) already in the computer will appear at bottom of view. A rectangular box (11) (TIS raster) may be faintly visible and the 'F' fire control fault symbol (12) may appear. If symbol does appear, ignore it for now.
- G. Set UNIT TEST PATTERN switch (7) to ICU and look at FAULT light (8). If FAULT light (8) stays on more than 5 seconds, notify Lead Hand.
- H. Look into GPS eyepiece (9). View should have a test pattern with a darkened upper right quarter of picture. Rectangular box (11) may be faintly visible. No symbols should be visible at bottom view.
- I. Set UNIT TEST PATTERN switch (7) to EU.
- J. Look at FAULT light (8). If FAULT light (8) stays on more than 5 seconds, notify Lead Hand.
- K. Look into GPS eyepiece (9). View should have corner symbols (13) and all symbols will be visible at bottom of view. Range symbol will show '8' in all positions. Rectangular box (11) may be faintly visible.

- L. Set THERMAL MAGNIFICATION lever (6) to 10X.

NOTE

Direction of reticle (14) travel may be either clockwise or counter-clockwise

- M. Look into GPS eyepiece (9). View should show TIS reticle (14) moving around. Range symbols (10) will show '8' in all positions.

NOTE

FAULT light (8) may come on for 3 to 5 seconds when UNIT TEST PATTERN switch (7) is set to TRU.

- N. Set UNIT TEST PATTERN switch to TRU and look at FAULT light (8). If FAULT light stays on for more than 5 seconds, notify Lead Hand.
- O. Look into GPS eyepiece (9). View should have reticle (14) in center area with vertical bar (16) left of reticle (14). Range symbols (10) already in computer will appear at bottom of view. Rectangle box (11) may be faintly visible and 'F' fire control fault symbol (12) might appear. If 'F' symbol (12) does not appear, ignore it for now.

7.0. CEU SELF TEST.

NOTES

- Computer self test should be performed when preparing gunner's station for operation to make sure fire control system is operating at full capacity.
- If main gun is over back deck, main gun must be elevated at least 5 degrees to prevent deck clearance switch interference with test.

7.1. CEU Self Test Procedures.

- A. Power up Gunner's Station (see para 3.0.).

NOTE

Computer self test will require use of the fire control system in NORMAL mode. When hydraulic pressure drops below 1500 psi, NORMAL mode operation can be erratic.

- B. Check hydraulic pressure gage (1) before starting self test as follows:

1. If engine is running, make sure pressure gage (1) shows 1500 psi to 1700 psi. If not, notify Lead Hand.
2. If auxiliary hydraulic power is being used, make sure pressure gage (1) shows 1450 psi to 1750 psi. If pressure is below 1450 psi, operate main gun until pressure drops enough to turn on auxiliary hydraulic pump which should bring pressure above 1450 psi. If pressure does not rise above 1450 psi, notify Lead Hand.

- C. Set FIRE CONTROL MODE switch (2) to NORMAL.
- D. Unlatch and open door (3) on CCP (4).
- E. Set CCP power switch (5) to ON and check that PWR light (6) comes on.

NOTES

- Turret power must be on 90 seconds before starting test.
 - Computer self test can be performed using either commander's handle or gunner's handles.
 - Do not release gunner's/com-mander's handle(s) (7) palm switch (8) until told to do so in the follow-ing steps. Once palm switch is re-leased, self test must be started over.
 - Be sure you do not move gunner's/commander's handle(s) (7) up, down, left, or right gunner's/commander's handle(s) must remain in its normal centered position during the entire test.
- F. Squeeze and hold palm switch (8) on gunner's/commander's handle(s) (7).

- G. Push and release TEST pushbutton (9). TEST pushbutton (9) lights and stays lit during entire test.
- H. Watch display (10) and NO GO light (11). When display (10) and/or NO GO light (11) comes on, do step below for that display.

NOTES

- During the self test numbers will appear in display (10) as part of the test. These numbers will remain in display (10) for 4 seconds, and then go out. Numbers should be between 8.0 and 12.0. If not, notify Lead Hand.
- All failure numbers 1 through 8 and 400 FA are listed on the instruction plate inside of CCP door.
- The self test failure numbers and words "PASS" or "FAIL" will go off automatically 10 seconds after appearing in display (10).

- Step 1. If NO GO light (11) comes on and a number 2, 3, 4, 8, or 9 appears in display (10), continue to squeeze palm switches (8) and go to para I.
- Step 2. If NO GO light (11) comes on and one or more of the numbers 5, 6, or 7 appears in display (10), release palm switches (8) and go to para J.
- Step 3. If NO GO light (11) comes on and 400 FA appears in display (10), release palm switches and notify Lead Hand.
- Step 4. If word "PASS" appears in display (10), hold palm switches (8) until light in TEST pushbutton (9) goes out. Release palm switches (8) and go to para L.
- Step 5. If word "FAIL" appears in display (10), release palm switches (8) and go to para K.
- Step 6. If unusual characters (sym-bols) appear in display (10), release palm switches (8) and, notify Lead Hand.

- Step 7. If NO GO light (11) comes on and the number 1 appears in the display (10), release the Palm Switches. If this is the first operation of Self Test after powering up the tank, repeat the test from para F. If it is the second or later test after powering up the tank, notify the Lead Hand.

NOTE

If NO GO light (11) comes on and a number 2, 3, 4, 8, or 9 appears in display (10), one of four AUTO INPUTS pushbuttons (12) will flash on and off. The AUTO INPUTS pushbutton for each failure number is as follows:

<u>Failure Number</u>	<u>Flashing Pushbutton</u>	<u>Failed System</u>
2	CANT (13)	Cant Sensor
3	CROSSWIND (14)	Crosswind Sensor
4	LEAD (15)	Azimuth Rate
8	RANGE (16)	Laser Range Finder

- I. Bypass failed system to continue self test as follows:
1. Push and release flashing AUTO INPUTS pushbutton (13, 14, 15, or 16). Pushbutton will light and remain lit even after self test is completed.
 2. Push and release ENTER pushbutton (17). This cancels all inputs from failed system.

NOTE

Self test will now continue auto-matically if palm switches (8) were not released.

3. Go back to para H. and continue test.
- J. When any combination of numbers 5, 6, or 7 appear in display (10), write down or remember the number(s). Go to para I.

NOTES

- The numbers 1, 5, 6, or 7 only come on at the end of the self test. Numbers stay in display (10) for 10 seconds and then go out and the word "FAIL" will appear in display (10).
 - After 10 seconds, "FAIL" will go out in display (10). TEST push-button light (9) and NO GO light (11) will go off at the same time. Any AUTO INPUTS pushbuttons (13,14,15, or 16) will remain lit.
- K. The word "FAIL" will appear in display if any failure number 1 through 8 appeared during self test. Take the following corrective action:
1. If only failure number 6 appeared, notify Lead Hand.
 2. If any other failure number appeared, take note and notify Lead Hand.
- L. Close and latch CCP door (3).

8.0. GUNNER'S AUXILIARY SIGHT (GAS) FUNCTIONAL CHECKS.

N/A

9.0. DOCUMENTATION.

Ensure that results of pre and post upgrade tests are recorded on the Tank Upgrade Forms (Reference SOW paragraph C.2.1..

CHAPTER 3

TURRET COMPONENT MODIFICATION PROCEDURES

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1.0. TANK UPGRADE.

1.1. Verification of Original Components.

1.2. Introduction. The identification of components to be replaced shall be checked prior to starting upgrade procedures. The five areas to be upgraded are the Gunner's Primary Sight, Computer Electronics Unit (CEU), Computer Control Panel (CCP), and Gunner's Primary Sight (GPS) Body Assembly. For details see Chapter 1, Tasks 1 to 6. (Tasks 2 & 6: Not Applicable to Egypt)

1.3. General.

- A. Rotate turret so that gun is over side of tank (see Chapter 2, para 2.6.).
- B. Check hydraulic system (see Chapter 2, para 2.4.).
- C. Turn off turret power (see Chapter 2, para 2.3.).

2.0. COMPUTER ELECTRONICS UNIT REPLACEMENT.

2.1. Introduction. The following covers the removal and installation of the CEU.

WARNING

Ensure that Turret Power and Main Vehicle Power is OFF prior to performing any of the following procedures. Serious bodily injury may result if these precautions are overlooked.

2.2. Loader's Foot Guard.

REMOVAL

- A. Lift up on guard (1) until pins (3) clear hinges (4).

INSTALLATION

- A. Aline two pins (3) on guard (1) with hinges (4) on guard (2).
- B. Lower guard (1) in place on guard (2).

2.3. Loader's Vehicular Accessories Stowage Box.

REMOVAL

- A. Remove screw (2) from box (1) and platform cover (3).
- B. Remove three screws (4) and washers (5) from knee guard (6).
- C. Remove screw (7), washer (8), nut (9) and box (1) from guard (6).

INSTALLATION

- A. Install box (1) on cover (3) with screw (2).
- B. Install box (1) to guard (6) with screw (7), washer (8) and nut (9).
- C. Install three screws (4) and washers (5) to guard (6).

2.4. Loader's Knee Guard.

REMOVAL

- A. Remove screw (4) and washer (5) from turret platform cover (2) and guard (1). Remove guard (1).

INSTALLATION

- A. Align hole in guard (1) with hole in cover (2) and hole in slip ring access cover (3).
- B. Install screw (4) and washer (5) in guard (1) and cover (2).

2.5. Access Cover.

REMOVAL

- A. Loosen screw (2) and washer (3).
- B. Remove three screws (4) and washers (5) from cover (1).
- C. Slide cover (1) back and remove.

INSTALLATION

- A. Slide slot in cover (1) under screw (2) and washer (3).
- B. Align cover (1) with turret floor. Install three screws (4) and washers (5) in cover.
- C. Tighten screw (2) and washer (3).

2.6. Computer Electronics Unit Replacement.

SUPPLIES Lock washer (MS35333-40).

EQUIPMENT CONDITION Access cover removed (para 2.5.)

REMOVAL

A. Remove CEU (1).

CAUTION

Three connectors (1) look alike. Be sure each connector (1) is installed on the correct receptacle (2) on unit (3) to avoid damage to connectors (1).

1. Remove three electrical connectors (2) from power control PCU (3).
2. Remove three electrical connectors (4) from receptacles of CEU (5).
3. Remove screw (6), lock washer (7), washer (8), and lead (9) from CEU (1). Discard lock washer (7).
4. Remove three screws (12), wash-ers (13), and CEU (1) from rack (14).

INSTALLATION

A. Install CEU (1).

1. Install CEU (1) in rack (14). Reach behind rack (14) and lift up on CEU (1). Align unit (1) to seat on eccentric pin (15).
2. Install three screws (12) and washers (13) in CEU (1).

B. Torque three screws (10) and washers (12) between 360-430 lb-in (41-49 N·m).

C. Install washer (8), lead (9), new lock washer (7), and screw in CEU (1).

D. Torque screw (6) between 95-120 lb-in (11-14 N·m).

CAUTION

Three connectors (1) look alike. Be sure each connector (1) is installed on the correct receptacle (2) on unit (3) to avoid damage to connectors (1).

- E. Install six connectors (1, 4) on receptacles (2, 5).
- F. Install access cover (para 2.5.).
- G. Ensure that serial numbers of original and replacement CEU are recorded on the Tank Upgrade Form.s (Reference SOW paragraph C.2.1)

3.0. GUNNER'S AUXILIARY SIGHT REPLACEMENT.

N/A.

4.0. AZIMUTH DRIVE ASSEMBLY UPGRADE.

N/A.

5.0. UPGRADE COMPUTER CONTROL PANEL.

5.1. Introduction. The upgrade of the CCP requires the installation of a Instruction Plate and a Identification Plate. Procedures for upgrade are listed below.

5.2. Instruction Plate. The following tools and supplies are required to upgrade the old Instruction Plate and replace it with the new Instruction Plate from the upgrade kit.

Tools: Pocket knife, chisel.

Supplies: Instruction plate, methyl-ethyl-keytone, and wiping rag.

5.3. Replacement of Instruction Plate.

NOTE

New plate installed over old plate.

A. Install new plate (1).

1. Lift handle (2) up and pull access door (3) open.
2. Clean inside of door (3). Use methyl-ethyl-keytone and rag.
3. Peel backing off new plate (1).
4. Install plate (1) over old plate on door (3).
5. Close door (3) and pull handle (2) down.

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5.4 Removal and Installation of Computer Control Panel Identification Plate.

REMOVAL

- A. Remove Plate (1).
 - 1. Scrape plate (1) off housing (2).
 - 2. Clean housing (2). Use methyl-ethyl-keytone and rag.

INSTALLATION

- A. Install New Plate (1) (part number 12925904).
 - 1. Peel protective backing off plate (1). Apply methyl-ethyl-keytone to back of plate (1) until adhesive becomes tacky. Use rag.
 - 2. Install plate (1) on housing (2). Wipe dry using a rag.

5.5. Documentation. Ensure that all details of this upgrade are recorded on Tank Upgrade Forms (Reference SOW paragraph C.2.1)

6.0. REMOVE AND REPLACE GPS LOWER PANEL ASSEMBLY

6.1. Introduction. The upgrade of the GPS requires the replacement of the Lower Panel and the replacement of the GPS Identification Plate.

6.2. Remove and Replace Lower Panel Assembly.

REMOVAL

A. Remove Lower Panel (1).

1. Turn lock-release lever (2) on adjusting bracket (3) counter-clockwise. Remove headrest assembly (4).
2. Take electrical connector (5) off connector (6). Remove nut (7) from Lower Panel (1).
3. Loosen two set screws (8) on filter select knob (9). Remove knob (9) from Lower Panel (1).
4. Remove 10 screws (10) and lock washers (11) from Lower Panel (1). Discard lock washer (11).
5. Remove Lower Panel (1), connector (6), and gasket (12) from sight body (13).

INSTALLATION

WARNING

Sealing compound can cause skin rash and eye irritation. Wash immediately with soap and water if compound gets on skin. Flush immediately with water and get medical aid if compound gets in eyes.

- A. Install Lower Panel (1).
 - 1. Put connector (6) in place on side of body (5) with wide key way up. Install nut (7) to connector
 - 2. Apply sealing compound on back side of gasket (4). Put Lower Panel (1) in place on body (5). Install 10 screws (8) and new lock washers (9).
- B. Install knob (10), connector (11), and headrest (12).
 - 1. Put knob (10) in place on Lower Panel (1) and tighten two set screws (13) in knob (10).
 - 2. Install connector (11) on connector (6).
 - 3. Put headrest (12) in place on body (5). Turn lever (14) on bracket (15) clockwise and lock headrest (12) in place.

- 7.0 PERFORM POST UPGRADE TESTS. (See Chapter 2.0.)
- 8.0. IDENTIFICATION PLATE REPLACEMENT. Replace identification plate on GPS body if not previously changed.
- 9.0 TANK UPGRADE FORM. Ensure that all details of this upgrade are recorded per SOW paragraph C.2.1..

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CHAPTER 4

WORKSHOP UPGRADE PROCEDURES

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