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WAR DEPARTMENT TECHNICAL MANUAL

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ORDNANCE MAINTENANCE HULL *and* TURRET, ELECTRICAL SYSTEMS, TRACKS *and* SUSPENSION FOR 3-INCH GUN MOTOR CARRIAGES

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M10 *and* M10A1

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ORDNANCE MAINTENANCE
HULL *and* TURRET, ELECTRICAL
SYSTEMS, TRACKS *and*
SUSPENSION FOR 3-INCH GUN
MOTOR CARRIAGES
M10 *and* M10A1



WAR DEPARTMENT
9 December 1943

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WAR DEPARTMENT
Washington 25, D. C., 9 December 1943

TM 9-1750L—Hull and Turret, Electrical Systems, Tracks and Suspension for 3-inch Gun Motor Carriages M10 and M10A1, is published for the information and guidance of all concerned.

[A.G. 300.7 (6 Aug. 43)]

BY ORDER OF THE SECRETARY OF WAR:

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Chief of Staff.

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J. A. JULIO,
*Major General,
The Adjutant General.*

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(For explanation of symbols, see FM 21-6.)

ORDNANCE MAINTENANCE

HULL AND TURRET, ELECTRICAL SYSTEMS, TRACKS AND SUSPENSION FOR 3-INCH GUN MOTOR CARRIAGES M10 AND M10A1

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**HULL AND TURRET, ELECTRICAL SYSTEMS, TRACKS AND SUSPENSION
FOR 3-INCH GUN MOTOR CARRIAGES M10 AND M10A1**

CHAPTER 1

INTRODUCTION

	Paragraph
Scope	1
Arrangement	2
Maintenance allocation	3

1. SCOPE.

a. The instructions contained in this manual are for the information and guidance of personnel charged with the maintenance and repair of the 3-inch gun motor carriages, M10 and M10A1. Information on the detailed constructions of these units, disassembly and assembly procedure, inspection, maintenance and repair is contained in various Technical Manuals of the 1000-series. These instructions are supplementary to those in the Field and Technical Manuals prepared for the using arm. This manual does not contain information which is intended primarily for the using arm, since such information is available to ordnance maintenance personnel in 100-series TM's or FM's.

b. This manual contains a description of, and procedure for, the removal, disassembly, inspection, and repair of the tracks, suspensions, hull, turret and the electrical systems.

2. ARRANGEMENT.

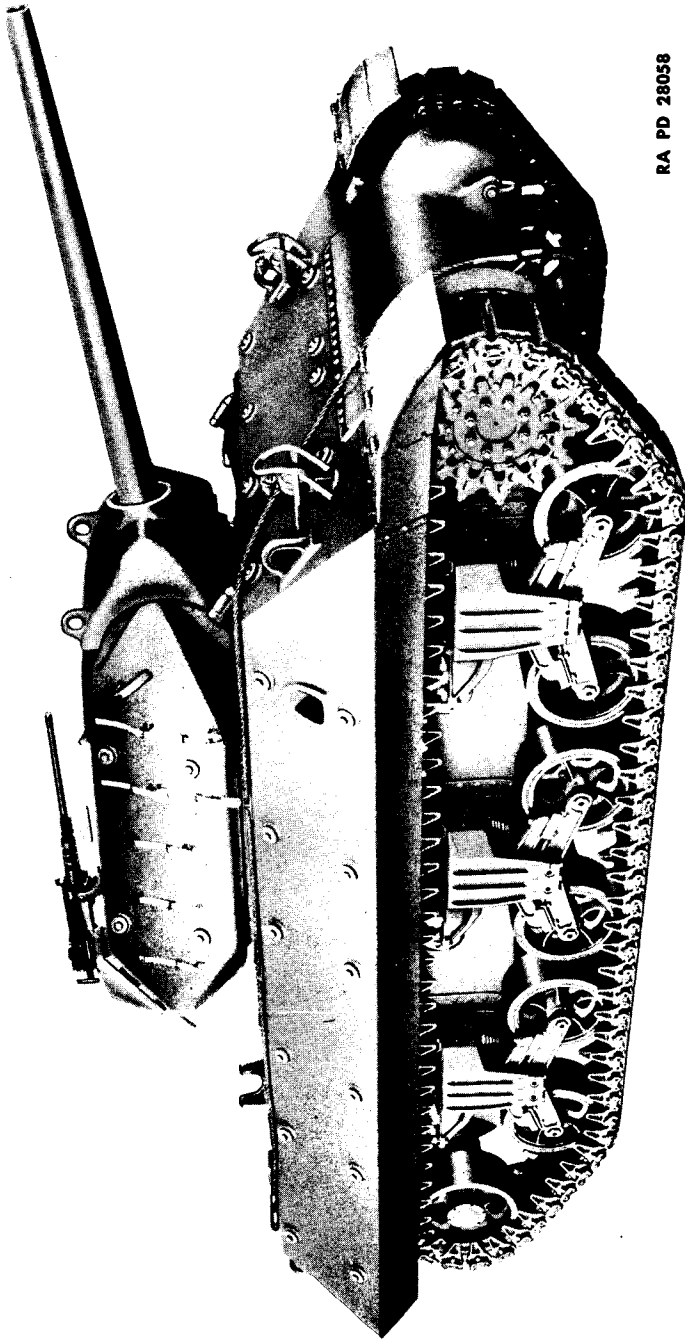
a. Separate chapters are provided for suspensions and tracks, hull and turret and electrical systems. The major units in each of the above chapters are covered in individual sections. Chapter 5 contains a list of special tools necessary for disassembly, inspection, repair, and assembly of the various units.

3. MAINTENANCE ALLOCATION.

a. **Scope.** The scope of maintenance and repair by the crew and other units of the using arms is determined by the availability of suitable tools, availability of necessary parts, capabilities of the mechanics, time available, and the tactical situation. All of these are variable, and no exact system of procedure can be prescribed. Many second echelon operations are often done by ordnance personnel.

b. **Allocation of Maintenance.** Indicated below are the maintenance duties for which tools and parts have been provided for the using arm personnel. Other replacements and repairs are the responsibility of ordnance maintenance personnel but may be performed by using arm personnel when circumstances permit, within the discretion of the

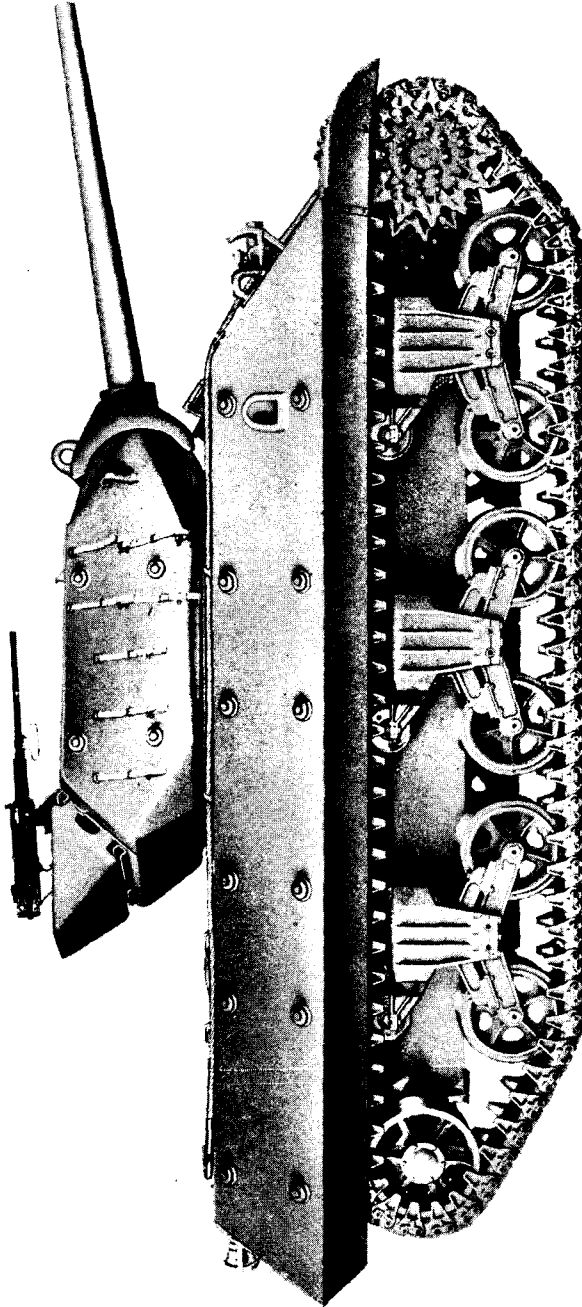
INTRODUCTION



RA PD 28058

Figure 1—Three-quarter Front View of 3-Inch Gun Motor Carriage M10A1

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RA PD 27542

Figure 2—Right Side View of 3-Inch Gun Motor Carriage M10

INTRODUCTION

commander concerned. Echelons and words as used in this list of maintenance allocations are defined as follows:

FIRST AND SECOND ECHELON: Table III AR 850-15	Operating organizations, driver, operator, or crew, companies and detachments, battalions, squadrons, regiments, and separate companies and detachments (first and second echelons, respectively).
THIRD ECHELON: Table III AR 850-15	Technical light and medium maintenance units, including post and port shops.
FOURTH ECHELON: Table III AR 850-15	Technical heavy maintenance and field depot units, including designated post and service command shops.
FIFTH ECHELON: Table III AR 850-15	Technical base units.
SERVICE: Par. 24 a (2) and (3) in part AR 850-15	Preventive maintenance, checking and replenishing fuel, oil, grease, water and antifreeze, air, and battery liquid; checking and tightening nuts and bolts; cleaning; and making external adjustment of subassemblies or assemblies and controls.
REPLACE: Par. 24 a (5) AR 850-15	To remove an unserviceable part, assembly, or subassembly from a vehicle and replace it with a serviceable one.
REPAIR: Par. 24 a (4) in part AR 850-15	To restore to a serviceable condition, such parts, assemblies or subassemblies as can be accomplished without completely disassembling the assembly or subassembly, and where heavy riveting, or precision machining, fitting, balancing, or alining is not required.
REBUILD: Par. 24 a (6) AR 850-15	Consists of stripping and completely reconditioning and placing in serviceable condition any vehicle or unserviceable part, subassembly, or assembly of the vehicle, including welding, riveting, machining, fitting, alining, balancing, assembling, and testing.

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RECLAMATION: Salvage of serviceable or economically AR 850-15 reparable units and parts removed from Par. 24 a (7) and vehicles, and their return to stock. This in part CIR. 75, includes the process which recovers dated 3/16/43 and/or reclaims unusable articles or component parts thereof and places them in a serviceable condition.

- NOTES: (1) Operations allocated will normally be performed in the echelon indicated by "X".
- (2) Operations allocated to the third echelon as indicated by "E" may be performed by these units in emergencies only.
- (3) Operations allocated to the fourth echelon by "E" are normal fifth echelon operations. They will not be performed by the fourth echelon, unless the unit is expressly authorized to do so by the chief of the service concerned.
- (4) Technical Bulletins of the 2830 series should be consulted for detailed information relative to reclamation procedure.

ECHELONS

2nd 3rd 4th 5th

BOXES AND RACKS, AMMUNITION

Boxes, ammunition—replace	X			
Boxes, ammunition—repair		X		
Racks, ammunition—replace	X			
Racks, ammunition—repair		X		

CLUTCHES

Bearings, clutch pilot—replace	X			
Bearings, clutch release—replace	X			
Clutch assemblies—replace and/or repair		X		
Clutch assemblies—rebuild			X	
Controls and linkage—adjust and/or replace	X			
Controls and linkage—repair		X		
Housing, clutch (M10A1)—replace		X		
Housing, clutch (M10A1)—rebuild (recondition)			E	X
Plates, clutch driven—replace	X			
Plates, clutch driven—repair (reline)		X		

COOLING GROUP

Connections—replace	X			
Fan assembly (M10A1)—replace	X			
Fan assembly (M10A1)—repair		X		
Fan assembly (M10A1)—rebuild			X	
Radiator assemblies—replace	X			
Radiator assemblies—repair		X		
Radiator assemblies—rebuild			X	
System, cooling—service	X			

INTRODUCTION

	ECHELONS			
	2nd	3rd	4th	5th
COOLING GROUP (Cont'd)				
Tanks, surge—replace.....	X			
Tanks, surge—repair.....		X		
DRIVE ASSEMBLY, GENERATOR AND FAN (M10A1)				
Drive assemblies, generator and fan—replace... X	X			
Drive assemblies, generator and fan—repair... X		X		
Drive assemblies, generator and fan—rebuild... X			X	
Shaft and universal joint assemblies—replace... X	X			
Shaft and universal joint assemblies—repair... X		X		
Shaft and universal joint assemblies—rebuild... X			X	
ELECTRICAL GROUP				
Batteries—service (recharge) and/or replace... X	X			
Batteries—repair..... X		X		
Batteries—rebuild..... X			X	
Box, battery—replace..... X	X			
Box, battery—repair..... X		X		
Boxes, terminal—replace..... X	X			
Boxes, terminal—repair..... X		X		
Breakers, circuit—replace..... X	X			
Breakers, circuit—repair..... X		X		
Breakers, circuit—rebuild..... X			X	
Cables, battery—replace..... X	X			
Cables, battery—repair..... X		X		
Conduit—replace..... X	X			
Conduit—repair..... X		X		
Filters—replace..... X	X			
Filters—repair..... X		X		
Generator assembly—replace..... X	X			
Generator assembly—repair..... X		X		
Generator assembly—rebuild..... X			X	
Lamp assemblies—service and/or replace..... X	X			
Lamp assemblies—repair..... X		X		
Regulator, current and voltage—replace..... X	X			
Regulator, current and voltage—adjust and/or repair..... X		X		
Regulator, current and voltage—rebuild..... X			X	
Siren—replace..... X	X			
Siren—repair..... X		X		
Siren—rebuild..... X			X	
Solenoids—replace..... X	X			
Solenoids—repair..... X		X		
Switches—replace..... X	X			

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ECHELONS

2nd 3rd 4th 5th

ELECTRICAL GROUP (Cont'd)

Switches—repair.....		X		
Switches—rebuild.....			X	
Units, signal sending—replace.....	X			
Units, signal sending—repair.....		X		
Wiring—replace.....	X			
Wiring—repair.....		X		

ENGINE

(GMC TWIN DIESEL MODEL 6046)

Bearings, connecting rod (inserts)—replace.....		E	X	
Bearings, crankshaft (inserts)—replace.....		E	X	
Block and cylinder sleeve assemblies—rebuild (recondition).....			E	X
Blower assemblies—replace and/or repair.....		X		
Blower assemblies—rebuild.....			E	X
Control assemblies, injector—replace.....	X			
Control assemblies, injector—repair.....		X		
Cooler, oil—replace.....	X			
Cooler, oil—repair.....		X		
Cooler, oil—rebuild.....			X	
Crankshafts—rebuild (recondition).....			E	X
Dampers, vibration—replace.....		X		
Drive assembly, tachometer—replace.....	X			
*Engine assembly (twin)—replace.....	*	X		
Engine assembly (twin)—repair.....		X		
Engine assembly (twin)—rebuild.....			E	X
Fan assemblies—replace.....	X			
Fan assemblies—repair.....		X		
Fan assemblies—rebuild.....			X	
Filters, oil—service and/or replace.....	X			
Filters, oil—repair.....		X		
Flywheels—replace and/or repair.....		X		
Flywheels—rebuild.....			E	X
Gaskets, cylinder head and manifold—replace..	X			
Gear trains, timing—replace.....		X		
Generator assemblies—replace.....	X			
Generator assemblies—repair.....		X		
Generator assemblies—rebuild.....			X	

*The second echelon is authorized to remove and reinstall items marked by an asterisk. However, when it is necessary to replace an item marked by an asterisk with a new or rebuilt part, subassembly or unit assembly, the assembly marked by an asterisk may be removed from the vehicle by the second echelon *only after authority has been obtained from a higher echelon of maintenance.*

INTRODUCTION

ECHELONS

	2nd	3rd	4th	5th
ENGINE (Cont'd)				
(GMC TWIN DIESEL MODEL 6046)				
Governor assemblies—adjust and/or replace . . .		X		
Governor assemblies—rebuild			X	
Head assemblies, cylinder—replace and/or repair		X		
Head assemblies, cylinder—rebuild			E	X
Heaters, air—service and/or replace	X			
Heaters, air—repair		X		
Injector assemblies—replace	X			
Injector assemblies—repair		X		
Injector assemblies—rebuild			E	X
Lines and connections, oil (external)—replace . .	X			
Lines and connections, oil (external)—repair . .		X		
Lines and connections, oil (internal)—replace and/or repair		X		
Manifold assemblies, fuel—replace	X			
Manifold assemblies, fuel—repair		X		
Manifold, exhaust—replace	X			
Manifold, exhaust—rebuild			X	
Motor assemblies, starting—replace	X			
Motor assemblies, starting—repair		X		
Motor assemblies, starting—rebuild			X	
Pan assemblies, oil—replace and/or repair		X		
Pistons and rings—replace		E	X	
Pump assemblies, fuel—service and/or replace . .	X			
Pump assemblies, fuel—repair		X		
Pump assemblies, fuel—rebuild			X	
Pump assemblies, oil—replace and/or repair . . .		X		
Pump assemblies, oil—rebuild			X	
Pump assemblies, water—adjust and/or replace X				
Pump assemblies, water—repair		X		
Pump assemblies, water—rebuild			X	
Rods, connecting—replace		E	X	
Reservoirs, oil—replace	X			
Reservoirs, oil—repair		X		
Sleeves, cylinder—replace		E	X	
Valve assemblies, oil cooler and strainer— service and/or replace	X			
Valve assemblies, oil cooler and strainer—rebuild			X	
Valve assemblies, pressure oil pump—service and/or replace		X		
Valve assemblies, pressure oil pump—rebuild . .				X
Valve assemblies, pressure regulator—replace and/or repair		X		
Valve assemblies, pressure regulator—rebuild . .			X	

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ENGINE (FORD V8—MODEL GAA)	ECHELONS			
	2nd	3rd	4th	5th
Bearings, camshaft—replace			E	X
Bearings, connecting rod—replace		E	X	
Bearings, crankshaft main—replace		E	X	
Belts—service and/or replace	X			
Block, cylinder—rebuild (recondition)			E	X
Brackets, engine mounting—replace	X			
Brackets, engine mounting—repair		X		
Carburetor assembly—adjust and/or replace	X			
Carburetor assembly—repair		X		
Carburetor assembly—rebuild			X	
Crankshaft—rebuild (recondition)			E	X
Drive, tachometer—replace	X			
*Engine assembly—replace	*	X		
Engine assembly—repair		X		
Engine assembly—rebuild (recondition)			E	X
Filter, crankcase breather—replace	X			
Filter, crankcase breather—repair		X		
Filter, engine oil—replace	X			
Filter, engine oil—repair		X		
Gaskets, cylinder head and manifold—replace	X			
Governor assembly—adjust and/or replace		X		
Governor assembly—rebuild			X	
Head assembly, cylinder and valve—repair and/or replace		X		
Head assembly, cylinder and valve—rebuild (recondition)			E	X
Lines, oil (external)—replace	X			
Lines, oil (external)—repair		X		
Lines, oil (internal)—replace and/or repair		X		
Magneto assemblies—replace	X			
Magneto assemblies—repair		X		
Magneto assemblies—rebuild			X	
Manifolds, intake, exhaust and water—replace	X			
Manifolds, intake, exhaust and water—repair		X		
Motor assembly, starting—replace	X			
Motor assembly, starting—repair		X		
Motor assembly, starting—rebuild			X	

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INTRODUCTION

ECHELONS

2nd 3rd 4th 5th

ENGINE (Cont'd)

(FORD V8—MODEL GAA)

Pan assembly, oil—service and/or replace gasket	X			
Pan assembly, oil—replace and/or repair		X		
Pistons and rings—replace		E	X	
Plugs, spark—service and/or replace	X			
Plugs, spark (two piece)—repair		X		
Pulleys, accessory drive—replace	X			
Pump assembly, fuel—service and/or replace	X			
Pump assembly, fuel—repair		X		
Pump assembly, fuel—rebuild			X	
Pump assembly, oil—replace and/or repair		X		
Pump assembly, oil—rebuild			X	
Pump assembly, water—replace	X			
Pump assembly, water—repair		X		
Pump assembly, water—rebuild			X	
Rods, connecting—replace		E	X	
Screen assembly—replace	X			
Units, signal sending, oil and water—replace	X			
Valves—service	X			
Wiring and conduit assembly, ignition—replace	X			
Wiring and conduit assembly, ignition—repair		X		

EXHAUST GROUP (M10)

Brackets—replace	X			
Mufflers and connections—replace	X			

EXTINGUISHER SYSTEM, FIRE

Controls and linkage—adjust and/or replace	X			
Controls and linkage—repair		X		
Cylinders (carbon dioxide CO ₂)—replace	X			
Cylinders (carbon dioxide CO ₂)—service (re-charge) and/or repair		X		
Extinguishers, fire (carbon dioxide CO ₂)—replace	X			
Extinguishers, fire (carbon dioxide CO ₂)—service (recharge) and/or repair		X		
Extinguishers, fire (carbon dioxide CO ₂)—rebuild			E	X
Lines and nozzles—replace	X			
Lines and nozzles—repair		X		

FUEL GROUP

Cleaners, air—service and/or replace	X			
Cleaners, air—repair		X		
Filters, fuel—service and/or replace	X			
Filters, fuel—repair		X		
Lines and connections—replace and/or repair	X			

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ECHELONS

2nd 3rd 4th 5th

FUEL GROUP (Cont'd)

Pump, priming (M10A1)—replace.....	X			
Pump, priming (M10A1)—repair.....		X		
Pump, priming (M10A1)—rebuild.....			X	
Tanks, fuel—service and/or replace.....	X			
Tanks, fuel—repair.....		X		
Valves—replace.....	X			
Valves—rebuild.....			X	

HULL

Brackets, engine support—replace.....			E	X
Doors and cover plates—replace.....	X			
Doors and cover plates—repair.....		X		
Guards—replace.....	X			
Guards—repair.....		X		
Housing, propeller shaft—replace.....	X			
Housing, propeller shaft—repair.....		X		
Hull—repair.....		X		
Hull—rebuild.....			E	X
Insulation and padding—replace.....	X			
Periscopes—replace.....	X			
Periscopes—repair.....		X		
Periscopes—rebuild.....			X	
Pintle assembly—replace.....	X			
Pintle assembly—repair.....		X		
Pintle assembly—rebuild.....			X	
Seats—replace.....	X			
Seats—repair.....		X		
Subfloor—replace and/or repair.....	X			

INSTRUMENTS AND PANEL

Instruments—replace.....	X			
Instruments—repair.....		X		
Instruments—rebuild.....			E	X
Panel and connections—replace.....	X			
Panel and connections—repair.....		X		

POWER TRAIN

(DIFFERENTIAL, FINAL DRIVES AND TRANSMISSION)

Brake, parking—adjust and/or replace.....	X			
Brake, parking—repair (reline).....		X		
Controls and linkage—adjust and/or replace...	X			
Controls and linkage—repair.....		X		

INTRODUCTION

ECHELONS

2nd 3rd 4th 5th

POWER TRAIN (Cont'd)
(DIFFERENTIAL, FINAL DRIVES AND
TRANSMISSION)

Cooler, oil—replace	X			
Cooler, oil—repair		X		
Cooler, oil—rebuild			X	
*Differential assembly—replace		*	X	
Differential assembly—repair		X		
Differential assembly—rebuild			E	X
*Drive assemblies, final—replace		*	X	
Drive assemblies, final—repair		X		
Drive assemblies, final—rebuild			E	X
Drum, brake—replace		X		
Drum, brake—rebuild (recondition)			E	X
Hubs, sprocket—replace	X			
Hubs, sprocket—repair		X		
Hubs, sprocket—rebuild			E	X
Lines and connections, oil—replace and/or repair	X			
*Power train assembly—replace		*	X	
Power train assembly—repair		X		
Power train assembly—rebuild			E	X
Shoe assemblies, steering brake—adjust and/or replace	X			
Shoe assemblies, steering brake—repair (reline)		X		
Sprockets—replace	X			
Sprockets—rebuild (recondition)			E	X
*Transmission assembly—replace		*	X	
Transmission assembly—repair		X		
Transmission assembly—rebuild			E	X

SHAFT, PROPELLER

Shaft assembly, propeller (w/universal joints)— replace	X			
Shaft assembly, propeller (w/universal joints)— repair		X		
Shaft assembly, propeller (w/universal joints)— rebuild			X	

TRACK SUSPENSION GROUP

Bogie components—replace	X			
Bogie components—repair		X		

*The second echelon is authorized to remove and reinstall items marked by an asterisk. However, when it is necessary to replace an item marked by an asterisk with a new or rebuilt part, subassembly or unit assembly, the assembly marked by an asterisk may be removed from the vehicle by the second echelon *only after authority has been obtained from a higher echelon of maintenance.*

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ECHELONS

2nd 3rd 4th 5th

TRACK SUSPENSION GROUP (Cont'd)

Bogie components—rebuild.....			E	X
Idler components—replace.....	X			
Idler components—repair.....		X		
Idler components—rebuild.....			E	X
Roller assemblies, track supporting—replace....	X			
Roller assemblies, track supporting—repair.....		X		
Roller assemblies, track supporting—rebuild....			E	X
Track assembly—replace and/or repair.....	X			
Track assembly—rebuild.....			E	X

TRANSFER GEAR GROUP (M10)

Transfer components—replace and/or repair...		X		
Transfer components—rebuild.....			E	X

TURRET ASSEMBLY

Lock, turret—replace.....	X			
Lock, turret—repair.....		X		
Mechanism, turret traversing—replace.....	X			
Mechanism, turret traversing—repair.....		X		
Mechanism, turret traversing—rebuild.....			X	
Ring, turret—replace.....		X		
Turret assembly—replace and/or repair.....		X		
Turret assembly—rebuild.....			E	X

VEHICLE ASSEMBLY

Vehicle assembly—service.....	X			
Vehicle assembly—rebuild (with serviceable unit assemblies).....			X	

CHAPTER 2

TRACKS AND SUSPENSION

Section I

DESCRIPTION AND DATA

Description and data	Paragraph 4
--------------------------------	----------------

4. DESCRIPTION AND DATA.

a. Description. Six two-wheeled rubber-tired bogies, or suspensions, bolted to the hull, support the vehicle on volute springs. The tracks are driven by sprockets on the front of the vehicle. Two idle wheels are mounted on eccentric shafts at the rear of the hull and provide means for the adjustment of track tension. The weight of the upper part of the track, between the idle wheel and the sprocket, is carried by three steel track support rollers mounted on brackets attached to the bogie brackets.

b. Data.

Tracks	Rubber block or steel
Track shoe width (tread)	12 $\frac{1}{8}$ in.
Track pitch	6 in.
Ground contact	3,346 sq in.
Blocks per track	79

CHAPTER 2

TRACKS AND SUSPENSION (Cont'd)

Section II

REPLACEMENTS ON VEHICLE

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Sprocket and hub assembly replacement.....	5
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Bogie wheel grease seal and bearing replacement.....	7
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Track support roller and bracket replacement.....	9
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Track support roller grease seal and bearing replacement.....	11
Dead track block replacement.....	12
Turning the track blocks.....	13
Thrown track replacement.....	14
Track replacement.....	15
Reversing track direction.....	16
Idle wheel replacement.....	17
Idle wheel bearing and grease seal replacement.....	18
Idle bracket replacement.....	19
Track tension adjustment.....	20

5. SPROCKET AND HUB ASSEMBLY REPLACEMENT.

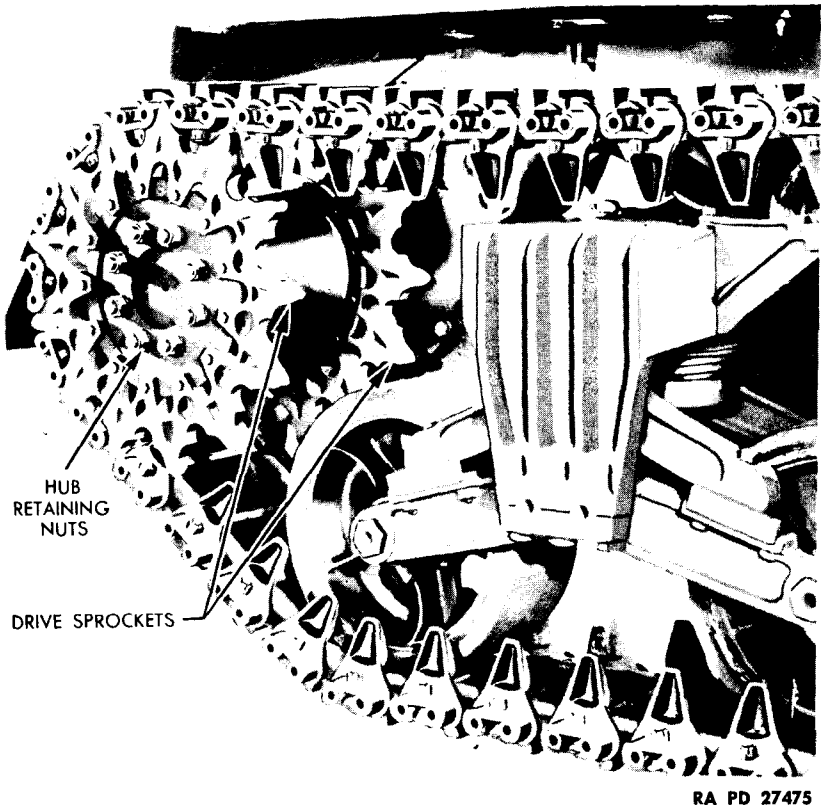
a. Slacken the track (par. 20 a). Disconnect the track below the sprocket (par 12 b.). Remove the eight hub retaining nuts (fig. 3). Remove the hub assembly. To install, reverse sequence of steps in the removal procedure.

6. BOGIE WHEEL REPLACEMENT.

a. Removal.

(1) **RAISE WHEEL WITH BOGIE LIFT.** Place the bogie lift (41-L-1375) (fig. 4) on the track under the suspension arms to be lifted. Carefully drive the vehicle forward or backward (depending on which bogie wheel is to be lifted) until the bogie lift is vertical and the bogie wheel has been lifted.

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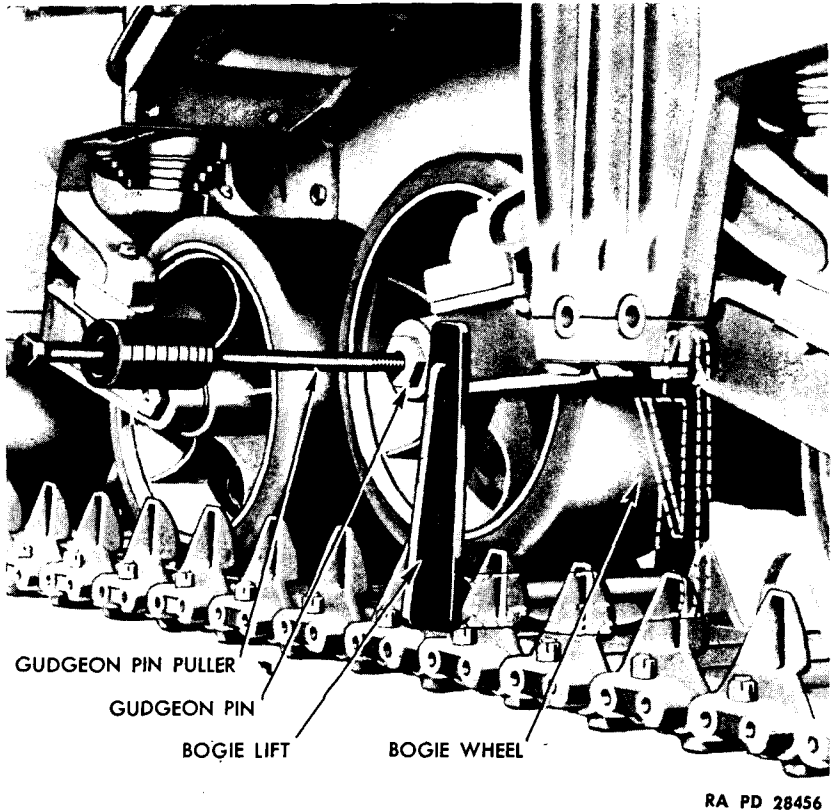
RA PD 27475

Figure 3—Sprocket and Hub Assembly

(2) **REMOVE GUDGEON AND WHEEL.** Remove the cotter pin from the nut on the inner end of the wheel gudgeon, and remove the gudgeon nut, using gudgeon wrench (41-W-2573-150). Two types of gudgeons have been used and are removed as follows: On gudgeons having a threaded hole on the outer end, screw the slide hammer gudgeon puller (41-P-2957-27) (fig. 4) into the threaded hole and pull the gudgeon. On gudgeons with no hole provided for the puller, drive the gudgeon out, using a drift on its inner end. Remove the wheel from between the arms.

b. Installation. Move the wheel into place between the two arms. Raise the arms and align their holes with the hole in the wheel. Start the wheel gudgeon through the outer arm and into the spacer, grease seals, and outer bearing of the wheel. Line up the center spacer by means of an alignment bar inserted from the inner side of the wheel, and tap the gudgeon into the spacer. Then drive the gudgeon through far enough to allow the key slot in the gudgeon to be lined up with the

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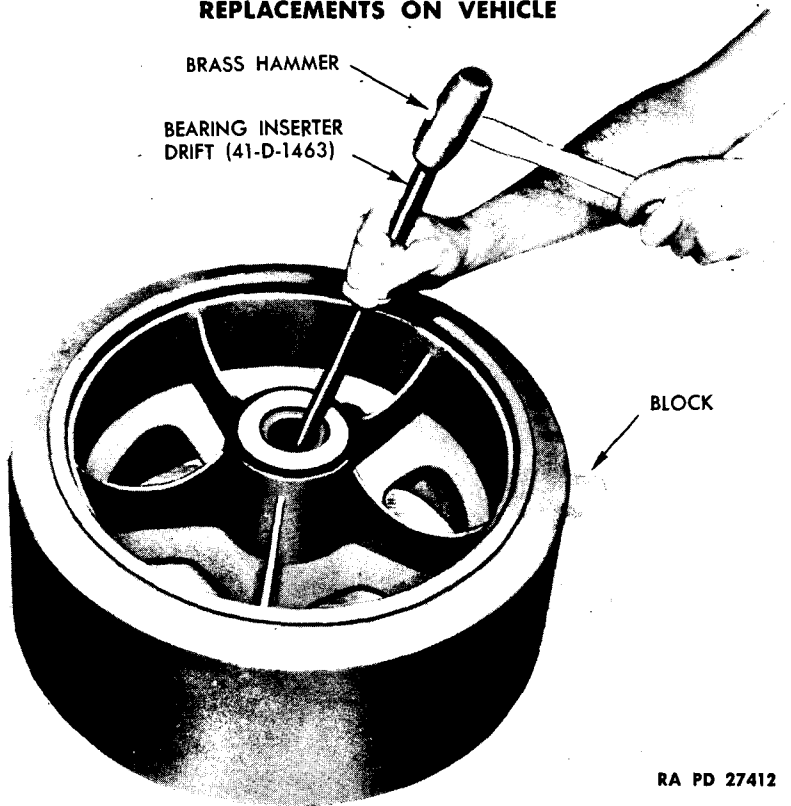
Figure 4—Pulling Wheel Gudgeon to Remove Bogie Wheel

slot in the arm. Install the key, and drive in the gudgeon. Install and tighten the gudgeon nut on the inner end of the gudgeon and secure it with a cotter pin. Remove the bogie lift.

7. BOGIE WHEEL GREASE SEAL AND BEARING REPLACEMENT.

a. **Remove.** Remove the bogie wheel (par. 6). Pull out the two outer spacers. Turn the wheel on its side on blocks (fig. 5). With drift (41-D-1463) through the upper side of the wheel, move the center spacer to one side in order to set the drift on the outer race of the bearing. Drive the bearing and grease seals out of the lower side, moving the drift around the entire circumference of the bearing to prevent damage to the bearing. The spacer will drop out when the bearing is removed. Turn the wheel over, and remove the other bearing and grease seals by the same method.

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RA PD 27412

Figure 5—Removing Bearings and Retainer from Bogie Wheel

b. Install. Install the bearing by starting it by hand and tapping it lightly into place with drift (41-D-1463), working around the outer race. Be sure the bearing is squarely seated against the shoulder in the wheel, to allow room for the grease seals. Slide two new grease seals into place on an outer spacer, being sure that the seals are installed with their lips toward the flange of the spacer. Start the lower seal into the wheel and tap the seals and spacer into place with a rawhide mallet. Turn the wheel over, insert the center spacer and install bearing, oil seals and outer spacer in the same manner.

8. VOLUTE SPRING REPLACEMENT.

a. Remove. Place two five-ton jacks beneath the center of each end of the spring seat plate (fig. 6). Raise each jack until the thrust of the springs has been taken up. Remove the two locking cap screws and loosen the center cap screw that secures the gudgeons (fig. 6) in the bogie bracket. Remove the bogie gudgeons. When the gudgeons

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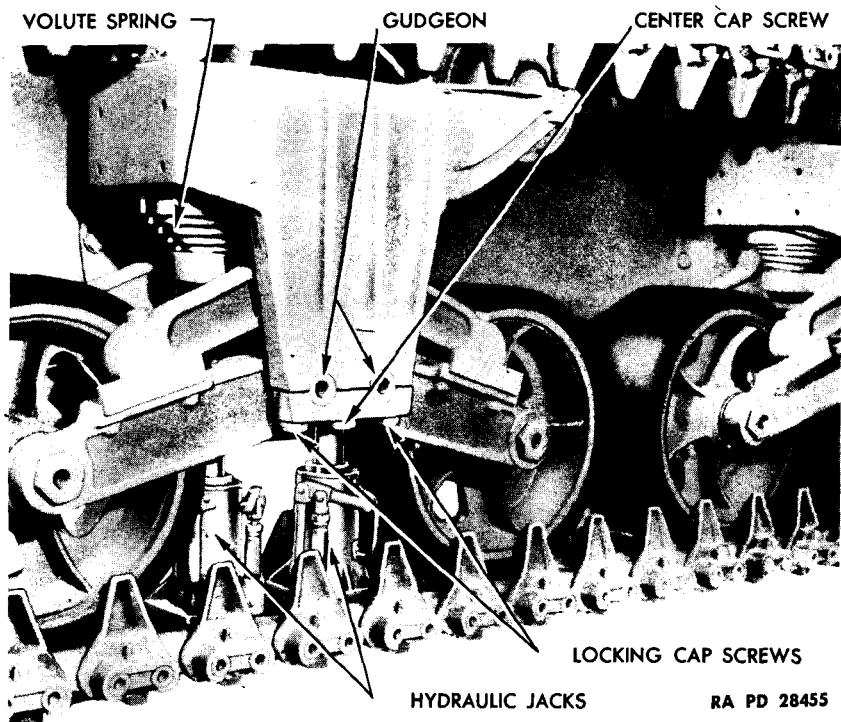


Figure 6—Taking up Thrust of Volute Springs with Jacks

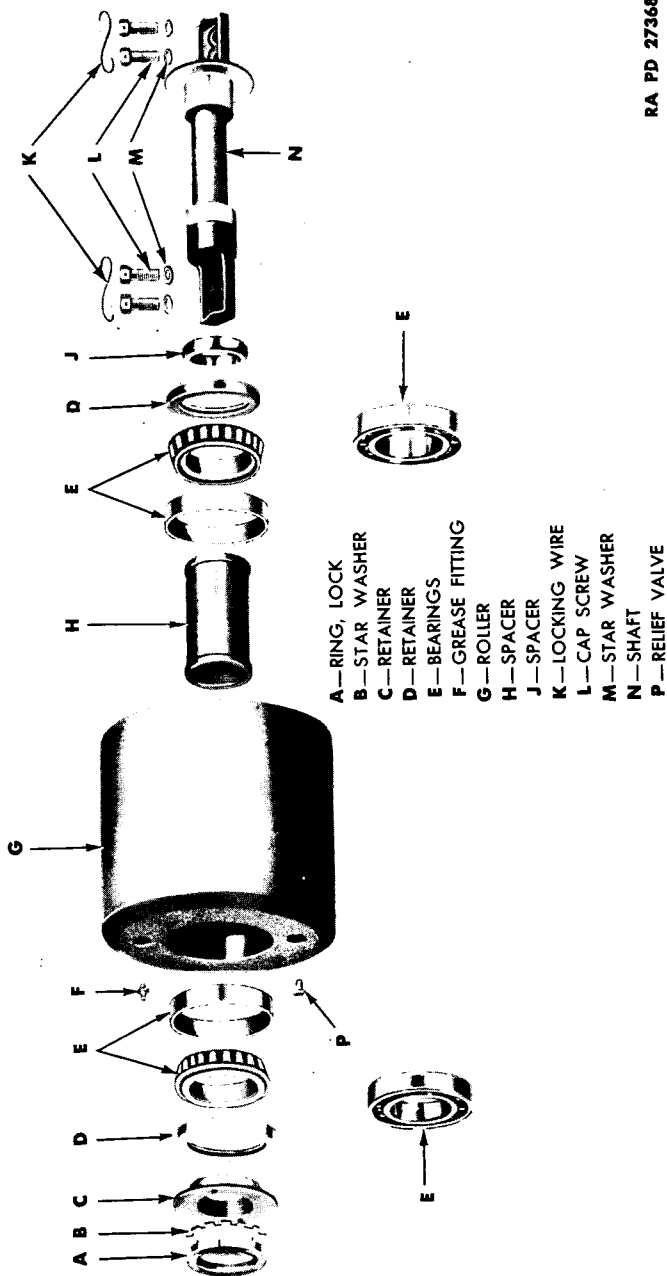
are pulled out, the bogie arms and the gudgeon spacers will drop. Lower the jacks. If the spring seat plate and springs do not drop out on removal of the jacks, free them with a hammer or block of wood. Whenever a new volute spring is required install two new springs, never one old and one new spring.

b. **Install.** Place the springs and spring seat plate in position and raise with the jacks until the springs are compressed sufficiently. Aline the bogie arms and spacer plates and install the gudgeons, making sure that their grooves are on the side to permit the installation of the locking cap screws. Install the gudgeon locking cap screws and secure by bending the lock plate on the cap screw heads. Lower and remove the jacks, allowing the bogie levers to resume their normal position on the wheel arms.

9. TRACK SUPPORT ROLLER AND BRACKET REPLACEMENT.

a. Remove the lock wires and the four cap screws securing the track skid to the top of the bogie bracket. Place a jack between the

REPLACEMENTS ON VEHICLE

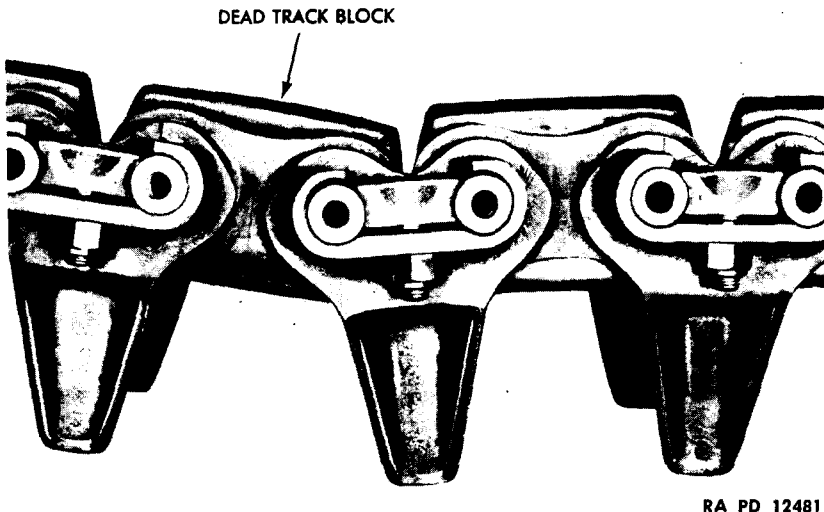


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Figure 7—Track Support Roller, Disassembled

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front bogie wheel and track, and raise the track to remove its weight from the track support roller. Remove the track skid (K, fig. 13). Remove the lock wire and the six cap screws holding the roller bracket to the bogie frame, and remove the roller and bracket assembly. Remove the lock wire and the four cap screws securing the roller shaft to the bracket, and lift the roller off the bracket. To install, reverse the sequence of the steps in removal procedure.



RA PD 12481

Figure 8—Dead Track Block Dropping Out of Line on Top of Track

10. TRACK SKID REPLACEMENT (K, fig. 13).

a. Remove the lock wire and the four bolts that secure the track skid to the bogie bracket. Remove the track skid from the bogie bracket. To install, reverse the sequence of the steps of removal procedure.

11. TRACK SUPPORT ROLLER GREASE SEAL AND BEARING REPLACEMENT.

a. **Remove.** Remove the track support roller from the vehicle (par. 9 a). Remove the lock ring from the shaft (A, fig. 7) with a spanner wrench. Remove the retainer (C, fig. 7) from the shaft with a spanner wrench. Drive the shaft from the roller with a brass drift and hammer. Turn the roller on its side on blocks. With a brass drift through the upper side of the roller, move the center spacer to one side in order to set the drift on the outer race of the bearing. Drive the bearing and grease seal out of the lower side, moving the drift around the entire circumference of the bearing to prevent damage to the bear-

REPLACEMENTS ON VEHICLE

ing. The spacer will drop out when the bearing is removed. Turn the roller over and remove the other bearing and grease seals by the same method.

b. **Install.** Install the bearing by starting it by hand and tapping it lightly with a brass drift, working around the outer race. Slide the grease seals into place with their lips toward the flange of the spacer.



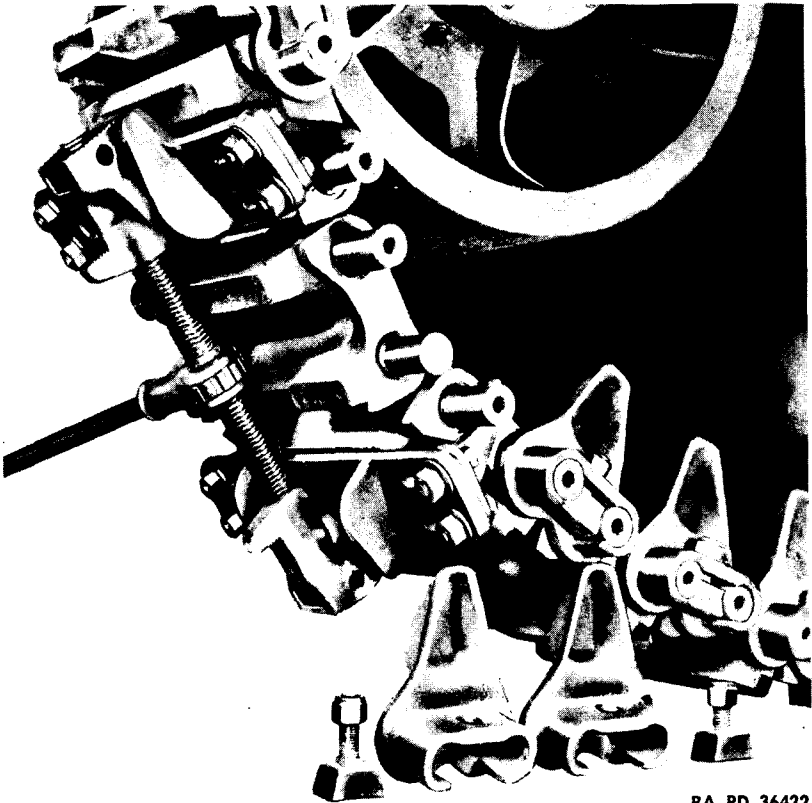
Figure 9—Removing Track Wedge Nut

Start the seal into the wheel, and tap the seal and spacer into place with a rawhide mallet. Turn the roller over, insert the center spacer, bearing and grease retainer as outlined above. Slide the track support roller shaft (M, fig. 7) in the track support roller. Install the retainer and lock ring (B and A, fig. 7).

12. DEAD TRACK BLOCK REPLACEMENT (fig. 8).

a. **Definition.** A dead track block is one in which the rubber bond between the pin and the metal frame of the block has failed, leaving the pin free to turn. Dead blocks are easily recognizable (fig. 8), and should be replaced immediately as they may result in a broken track.

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Figure 10—Replacing Dead Track Block

b. **Remove.** Move the vehicle so that the block to be replaced is midway between the idle wheel and the rear bogie wheel. Set the parking brake. Release the track tension (par. 20 a). Remove the wedge nuts on the two inside and two outside connections (fig. 9) attached to the block to be replaced. Tap out the wedges, being careful not to injure the threads. Drive the two inside and two outside track connectors halfway off the pins of the track block to be removed. Insert the curved fingers of the special jack track connecting fixture (fig. 10) between the track connectors and the blocks, over the exposed pins in the two track blocks immediately adjacent to the dead track block. The surfaces of the track connecting fixture plates must fit snugly against the tread surfaces of the track blocks. Insert the handle in the jack ratchet fitting. Pull up the track until the fixture is securely solid, then knock off the four loosened connectors (fig. 10).

REPLACEMENTS ON VEHICLE

c. **Install.** Place the new track block in position (fig. 10). Install the track connectors, driving them halfway onto the pins, operating the jack if necessary to position the pins. Back off the jack and remove the track connecting fixture. Drive connectors the rest of the way on. Install the wedges in the connectors, drawing them tight.

13. TURNING THE TRACK BLOCKS.

a. Break the track just below the sprocket. Move the upper part of the track to the rear over the drive sprocket by turning the sprocket with a bar, and pull the track back off the rollers. Again break the track, this time just in back of the rear bogie. Reverse the blocks of the part of the track just removed by removing all the connectors and turning each block over. To equalize the wear on the connectors, turn them end for end and install them on the opposite side of the track. Connect this reversed section of the track to the section underneath the bogie wheels, and tow the vehicle back on the section already reversed. Disconnect the remaining section of the track, and reverse the blocks and connectors. Again connect the two sections of the track. Tow the vehicle onto the front section, and roll the rear section over the idle wheel, support rollers and sprocket, using a bar to turn the sprocket. Connect the two ends of the track.

14. THROWN TRACK REPLACEMENT.

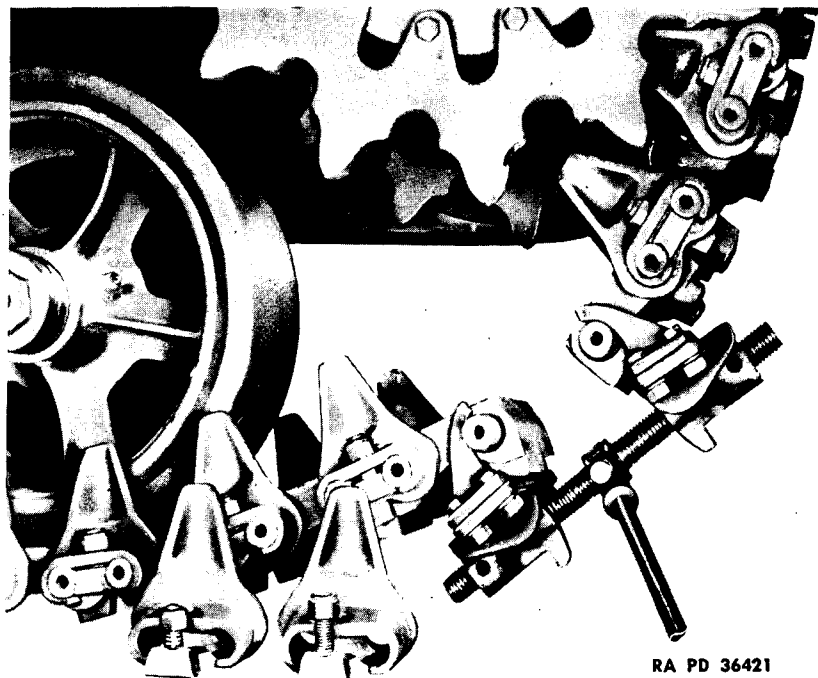
a. Break the track underneath either the idle wheel or the sprocket, depending on which end of the track has the least twist. Tow the vehicle completely off the track. Roll up the track and move it to the front or to the rear of the vehicle, depending on which has the best ground for towing the vehicle back onto the track. Lay the track out with the end at the nearest bogie with several blocks sunk in a trench dug deep enough so that the bogie can roll onto the track without having to climb. Tow the vehicle on the track until the leading bogie wheel is about 16 inches from the end of the track. Roll the track up over the idle wheel and support roller, and around the sprocket, using a bar to turn the sprocket.

15. TRACK REPLACEMENT.

a. **Old Track Still On the Vehicle.** Break the old track under the sprocket and roll the track back off the sprocket and rollers, using a bar to turn the sprocket. Lay out the new track in front of the old one and connect the two. Tow the vehicle on the new track until the front bogie wheel is about 16 inches from the end of the track. Disconnect the old track, and roll the new one up over the idle wheel, track support rollers, around the sprocket, and connect the ends (fig. 11).

b. **Old Track Off the Vehicle.** To install a new track when the old track is off the vehicle, proceed as in paragraph 14.

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Figure 11—Joining Ends of Track, Using Track Assembling Fixture

16. REVERSING TRACK DIRECTION.

a. **General Instructions.** With good ground conditions, the shift can best be made by breaking the tracks at the front, just below the sprocket, working the tracks up and off the sprockets and pulling the vehicle completely off both tracks. The following method can be used, when, because of mud, soft ground, or other conditions, it is advantageous to keep the vehicle on part of the track at all times and to move the vehicle under its own power.

b. **Procedure.** Break the right track at the rear, just below the idle wheel, and, using the left track for traction, move the vehicle ahead until the end of the right track comes off the sprocket. Break the right track at the middle, turn the free section around end for end, and drive the connectors on enough to hold the ends together. Move the vehicle back until the bogie wheels are on the reversed section of the track; then reverse the other half of the track and reconnect the track, this time driving the connectors completely on and pulling down the wedges. Move the vehicle forward until the front bogie wheel is on the fourth tread block from the end. Attach the towing cable, by means of a chain, to the other end of the track, bringing the

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free end of the cable up over the idle wheel and support rollers and around the hub of the sprocket. Insert a short bar through the sprocket and the towing eye of the cable, and, using the sprocket hub as a windlass, pull the track forward to the sprocket with the engine power of the vehicle. Both steering levers should be left free during this operation. Remove the cable from sprocket drum, and work the track over the sprocket. Connect the track as described in paragraph 14 (fig. 11). Repeat the above operations for the left track.

17. IDLE WHEEL REPLACEMENT.

a. **Remove.** Break the track between the idle wheel and the rear bogie wheel (par. 12 b). Remove the track off the idle wheel. Remove the six cap screws from the bearing cap and remove the bearing cap. Remove the cotter pin and nut from the idle wheel shaft. Install the idle wheel puller (fig. 20), and remove the idle wheel.

b. **Install.** Place the idle wheel on the shaft and drive it on with a brass hammer. Install the washer, nut, cotter pin, and bearing cap, as shown in figure 21. Connect the tracks (par. 12 c) and adjust (par. 20 b).

18. IDLE WHEEL BEARING AND GREASE SEAL REPLACEMENT.

a. Place the idle wheel on its side with the outer bearing on top. Install the bearing puller on the idle wheel, and remove the outer bearing. Turn the wheel over on the other side and remove the inner spacer (M, fig. 21). Install the bearing puller on the inner bearing and remove the two grease retainers (H, fig. 21) and inner bearing (J, fig. 21) from the wheel.

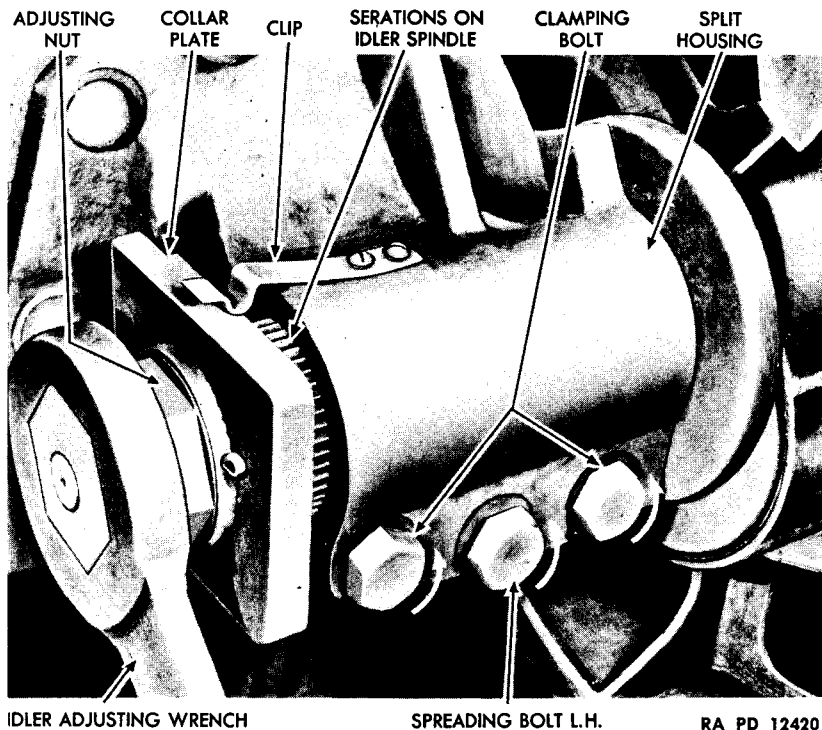
19. IDLE BRACKET REPLACEMENT.

a. To remove the idle bracket, remove the idle wheel (par. 17 a). Remove the fourteen cap screws which secure the bracket to the hull. To install, reverse the sequence of the steps of the removal procedure, except coat the surface of bracket which bears against the hull with sealer before installing.

20. TRACK TENSION ADJUSTMENT.

a. **Setting the Adjustment.** Partially back out (do not remove) the two clamping bolts of the three bolts on the rear of the split housing (fig. 12). Turn down the spreading bolt (fig. 12) to open up the housing. Raise the spring clip at the end of the housing, loosening its screw if necessary, and tap the collar plate all the way off the serrations on the spindle to the position shown in figure 12. It may be necessary to take the load off the collar by using the idle adjusting wrench on the hexagon end of the spindle, as in tightening the track.

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RA PD 12420

Figure 12—Tightening Track with Idle Adjustment

Tighten or loosen the track by using the idle wheel adjusting wrench on the hexagon at the end of the spindle. To tighten, raise the handle of the wrench (using a pipe for leverage, or a jack under the end of the handle) until the track shows a sag of $\frac{1}{2}$ to $\frac{3}{4}$ inch midway between the second and third support rollers, counting from the front. Sag can be measured from a straightedge placed on the track between the support rollers. Tracks that are too tight will cause a serious reduction in the performance of the vehicle.

b. Locking the Adjustment. Drive the collar plate back on the serrations of the spindle and lock it in place with the spring clip. Back out the center spreader bolt by turning it clockwise. (Make sure that it does not project into the split of the housing.) Pull both outside clamping bolts up tight, and tighten down the spreader bolt until it binds sufficiently to hold it from working loose.

CHAPTER 2

TRACKS AND SUSPENSION (Cont'd)

Section III

BOGIE REMOVAL AND DISASSEMBLY

	Paragraph
Removal	21
Disassembly	22

21. REMOVAL.

a. Break the track between the idle wheel and rear bogie wheel (par. 12 b), and roll the track off the track support rollers. Raise the vehicle until the weight is off the bogie assembly on the side from which the bogie is to be removed. Remove the 16 bolts that secure the bogie assembly to the hull. Place a hydraulic jack under bogie assembly and pull the assembly away from the hull.

22. DISASSEMBLY.

a. **Remove Track Skid (K, fig. 13).** Remove the lock wire and four bolts that secure the track skid to the bogie bracket. Remove the track skid from the bogie bracket.

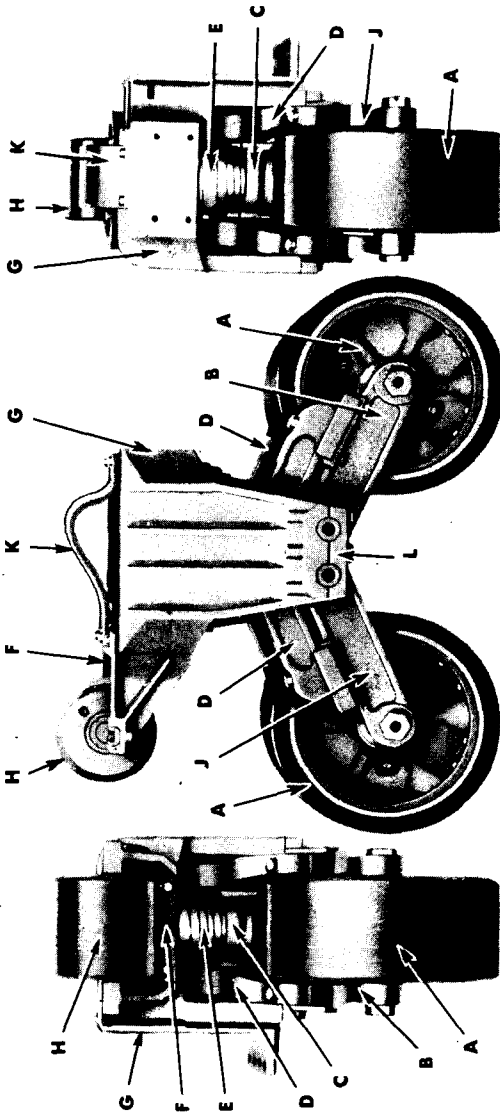
b. **Remove Track Support Roller (H, fig. 13).** Remove the lock wire and four bolts that secure the track support roller to the track support roller bracket, and remove the track support roller.

c. **Remove Track Support Roller Bracket (F, fig. 13).** Remove the lock wire and six bolts that secure the track support roller bracket to the bogie bracket, and remove the track support roller bracket.

d. **Remove Arm Gudgeons (fig. 18).** Remove the two plugs at the top of the bogie bracket. Install the spring compressor (41-C-2556) (fig. 14) in the holes where the plugs were removed. Tighten until the tension of the springs is off the gudgeons (KK, fig. 18). Straighten the ears of the locking plates (D, fig. 18) on both sides of the bogie bracket. Remove the three bolts from the gudgeon caps (E, fig. 18) on both sides of the bogie bracket. The gudgeons will drop down from the bogie bracket when the nuts are removed. Remove the gudgeons (KK, fig. 18) from the bogie arms (G, fig. 18). Roll the bogie wheel and arms away from the bogie bracket.

e. **Remove Bogie Arms from the Bogie Wheels (fig. 13).** Remove the cotter pin from the nut on the wheel gudgeon (A, fig. 18), and remove the gudgeon nut. Pull the gudgeon out of the wheel. Remove the bogie arms from the bogie wheel.

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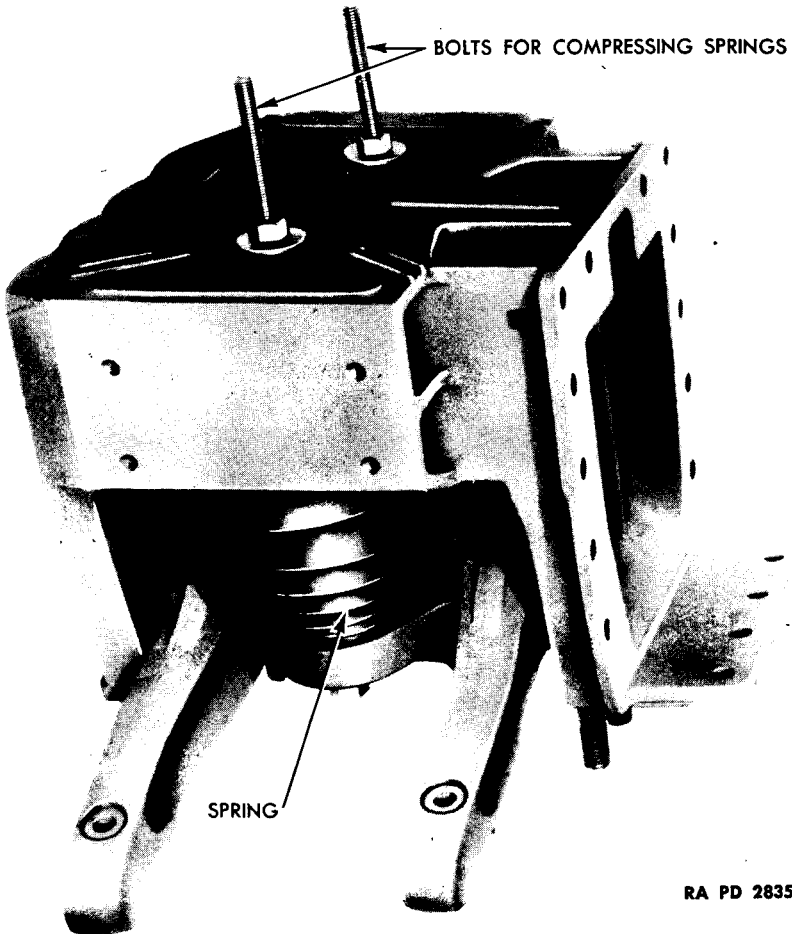
- A—WHEEL ASSY.—W/TIRE, BEARINGS, SPACERS AND RETAINERS
- B—ARM, RIGHT
- C—SEAT, SPRING BOTTOM
- D—LEVER
- E—SPRING, VOLUTE

- F—BRACKET
- G—BRACKET
- H—ROLLER, TRACK SUPPORT
- J—ARM, LEFT
- K—SKID, TRACK
- L—CAP

RA PD 27346

Figure 13—Bogie Suspension—Rear View, Outside View and Front View

BOGIE REMOVAL AND DISASSEMBLY



RA PD 28352

Figure 14—Compressing Spring with Spring Compressor

f. Remove Volute Springs, Spring Seat and Levers (C, D, and E, fig. 13). Remove the spring compressors that were installed to compress the springs. The volute springs, spring seat, and levers can now be removed from the bogie bracket.

g. Remove Bogie Wheel Bearings and Grease Retainer. See paragraph 7 a.

h. Remove Track Roller Grease Retainer and Bearings. See paragraph 11 a.

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TRACKS AND SUSPENSION (Cont'd)

Section IV

CLEANING AND INSPECTION OF BOGIE COMPONENTS

	Paragraph
Cleaning	23
Inspection	24

23. CLEANING.

a. All parts must be thoroughly cleaned of all mud, grease or other foreign matter. Use water under pressure to loosen and remove as much foreign matter as possible. Use a stiff brush and dry-cleaning solvent to remove the remaining grease and dirt. In a container free from metal chips and dirt, rotate the bearings while immersed in dry-cleaning solvent until all trace of lubricant has been removed. Oil the bearings immediately to prevent corrosion of the highly polished surfaces. Wrap the bearings in oiled paper if not to be used at once.

24. INSPECTION.

a. **Check Bearings.** The condition of a ball bearing is best determined by the surface condition of the balls and races and the looseness in its races. Check for pits caused by corrosion. Check for discoloration of the balls, races, or retainers, as this is evidence of overheating. Bearings that have been overheated must be discarded. Spinning a bearing while holding it in the hands is not an accurate check for its running qualities, although this test will indicate presence of dirt or foreign matter in the bearing. Bearings in this condition are to be rewashed, lubricated, and checked again.

b. **Inspect Gudgeons.** Gudgeons that are grooved, worn or out-of-round must be discarded. Check for out-of-round with a micrometer. Examine the threads for damage.

c. **Inspect Bogie Arms.** Check the bogie arms for cracks in the casting. Check the bushing in the bogie arms for excessive wear, using a new gudgeon as a plug gage. If the bushing shows excessive wear, the bushing must be replaced (par. 26 a).

d. **Inspect Skid Plates, Rubbing Plates and Caps** (fig. 18). Inspect skid plates, rubbing plates, and gudgeon caps, and discard parts showing excessive wear, cracks or damage.

CLEANING AND INSPECTION OF BOGIE COMPONENTS

e. **Inspect Spring Levers (D, fig. 13).** Check the casing for cracks. Check the bushing for scored surface or excessive wear. If the bushing shows excessive wear, it must be replaced (par. 26 b). Worn rubbing plates (N, fig. 13) should be replaced.

f. **Inspect Spring Seat (C, fig. 13).** Check the spring seat casting for cracks. Check the bushing for scores, excessive wear, or out-of-round. This can be checked with a micrometer. If the bushing shows excessive wear, the bushing must be replaced.

g. **Inspect Volute Springs (E, fig. 13).** Inspect volute spring coils.

h. **Inspect Bogie Bracket (G, fig. 13).** Check the bogie bracket casting for cracks. Inspect all threaded holes and studs for damaged threads. If threaded holes are found damaged, the bogie bracket must be discarded. Damaged studs must be replaced (par. 25 a).

i. **Inspect Track Support Roller (H, fig. 13).** Check for the presence of grease fitting and relief valve. Inspect the roller surface for deep scratches or dents which may damage the track shoes. If damaged beyond repair, the roller must be discarded.

j. **Inspect Track Support Roller Bracket (F, fig. 13).** Inspect the bracket for cracks in the casting. See that the threaded holes are not damaged. If damaged, the bracket must be discarded.

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CHAPTER 2
TRACKS AND SUSPENSION (Cont'd)

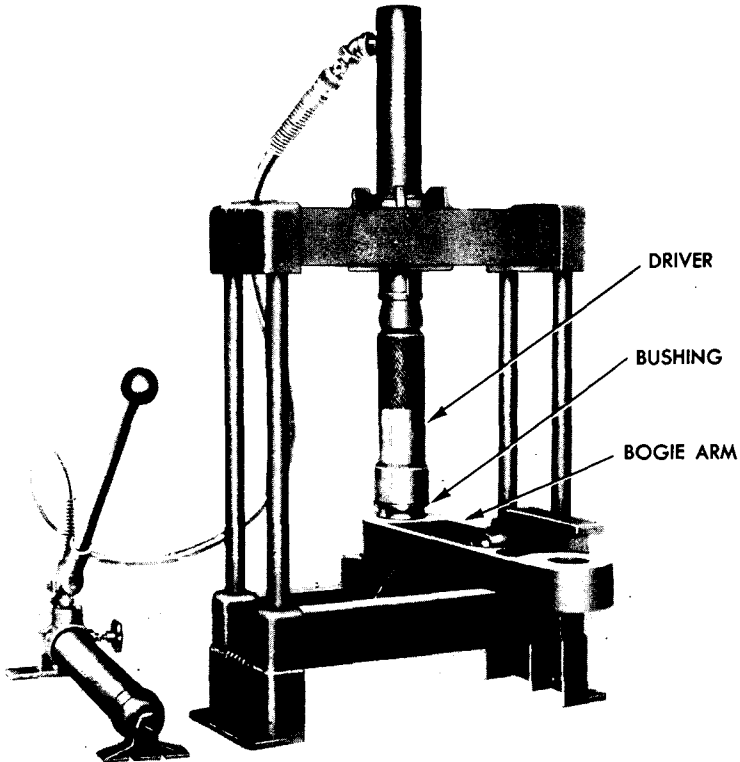
Section V

BOGIE REPAIRS, ASSEMBLY AND INSTALLATION

	Paragraph
Stud replacement.....	25
Bushing replacement.....	26
Assembly	27
Installation	28

25. STUD REPLACEMENT.

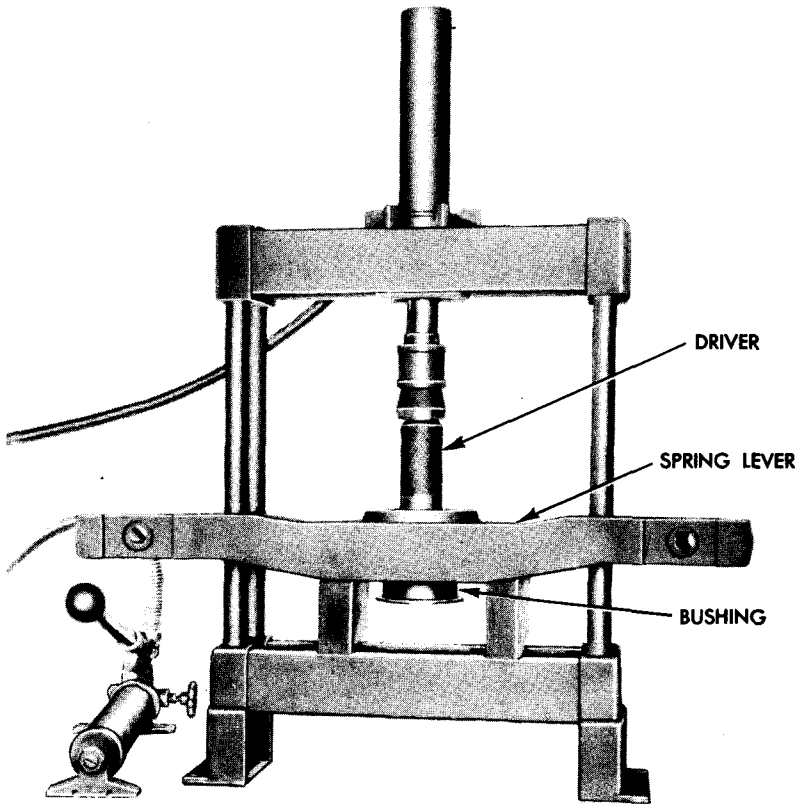
a. **Remove.** Bent studs or studs with damaged threads must be replaced. To remove a damaged stud, use a standard stud remover.



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Figure 15—Installing New Bushing in Bogie Arm

BOGIE REPAIRS, ASSEMBLY AND INSTALLATION



RA PD 28159

Figure 16—Removing Bushing from Lever

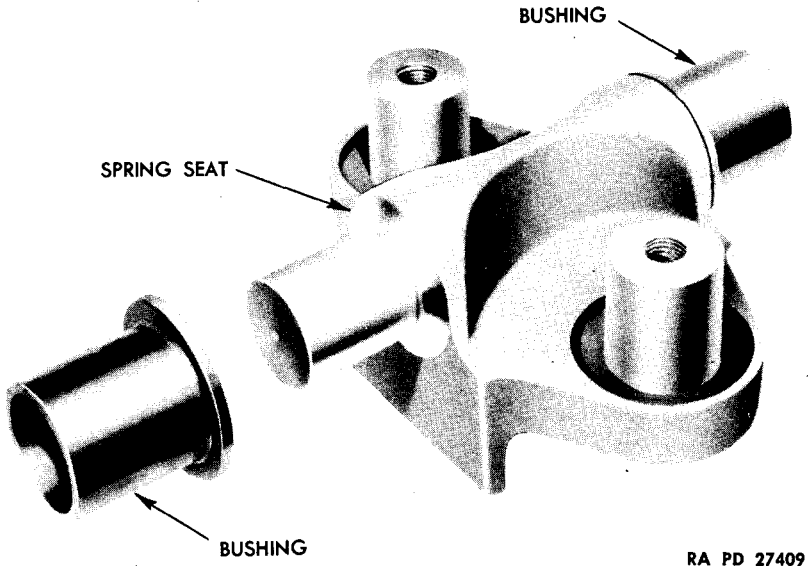
To remove a broken stud, indent the end of the broken stud exactly in the center with a center punch. Drill approximately $\frac{2}{3}$ through the broken stud, using a small drill, then follow up with a larger drill. The size of the drill depends on the size of the stud to be removed, but the size drill selected must leave a wall thicker than the depth of the thread. Select an easy-out tool of the proper size, insert it into the drilled hole, and screw out the remaining part of the broken stud.

b. Install. With a standard stud driver, drive the new stud until no threads show at the bottom of the stud. If the stud is too tight or too loose in the stud hole, select another stud.

26. BUSHING REPLACEMENT.

a. Bogie Arm Bushing Replacement (fig. 15). Place the bogie arm in an arbor press (fig. 15) and with a suitable driver, press bush-

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Figure 17—Bushing Removed from Spring Seat

ing from the bogie arm. Before installing a new bushing, oil the outer surface of the bushing. Set the bushing in position on the bogie arm and with a suitable driver, press the bushing in place.

b. Spring Lever Bushing Replacement (fig. 16). Place the spring lever in an arbor press (fig. 16) and, with a suitable driver, press the bushing out of the spring lever. Before installing a new bushing in the spring lever, oil the outer surface of the bushing. Set the bushing in position on the spring lever, and, with a suitable driver, press the bushing in place in the spring lever.

c. Spring Seat Bushing Removal. Place the spring seat on a solid base and, with a two-pound ball-peen hammer, hit repeated blows with the ball of the hammer along the top of the bushing, starting at the outer edge and working toward the bushing flange. This will cause the bushing to expand enough so that it can be removed from the spring seat. If the bushing does not free itself from the spring seat, repeat with harder blows. If the bushing is not free after the above procedure, place a chisel between the flange of the bushing and the spring seat, and with a hammer, tap the bushing off the spring seat. Figure 17 shows one bushing removed from the spring seat.

d. Spring Seat Bushing Installation. Place the new bushing in oil heated to a temperature of approximately 270° F for approximately

BOGIE REPAIRS, ASSEMBLY AND INSTALLATION

20 minutes. While the bushing is being heated, place the spring seat in a vise, with the trunnion vertical, as close to the heating oil as possible. This will permit quick installation when the bushing is removed from the oil. Remove the bushing from the oil with a hook, and pick the bushing up with well padded gloves. Line the bushing up with the trunnion of the spring seat, and slide the bushing in place.

27. ASSEMBLY.

a. **Install Volute Springs.** Assemble the two spring levers (P, fig. 18) to the spring seat. Insert the spring seat washer (V, fig. 18) and volute springs on the spring seat. Place the assembly in the bogie bracket. Install the spring compressor tool (fig. 14) and compress the springs.

b. **Assemble Bogie Arms to Bogie Bracket.** Lay the four bogie arms in position (fig. 18). Place the inner spacer (L, fig. 23) between the bogie arms. Insert the gudgeons (KK, fig. 18) through the bogie arms and spacers. Slide the two outer spacers (K, fig. 18) on the gudgeon at both ends. Place this assembly on the bogie bracket, and install the gudgeon caps (E, fig. 18).

c. **Assemble and Install Bogie Wheels.** Install the bearings, grease retainers, and spacer, in the bogie wheels as outlined in paragraph 7 b. Roll the bogie wheel between the bogie arms. Insert the gudgeon (A, fig. 18) in the bogie arms and wheel. Install the nut and cotter pin.

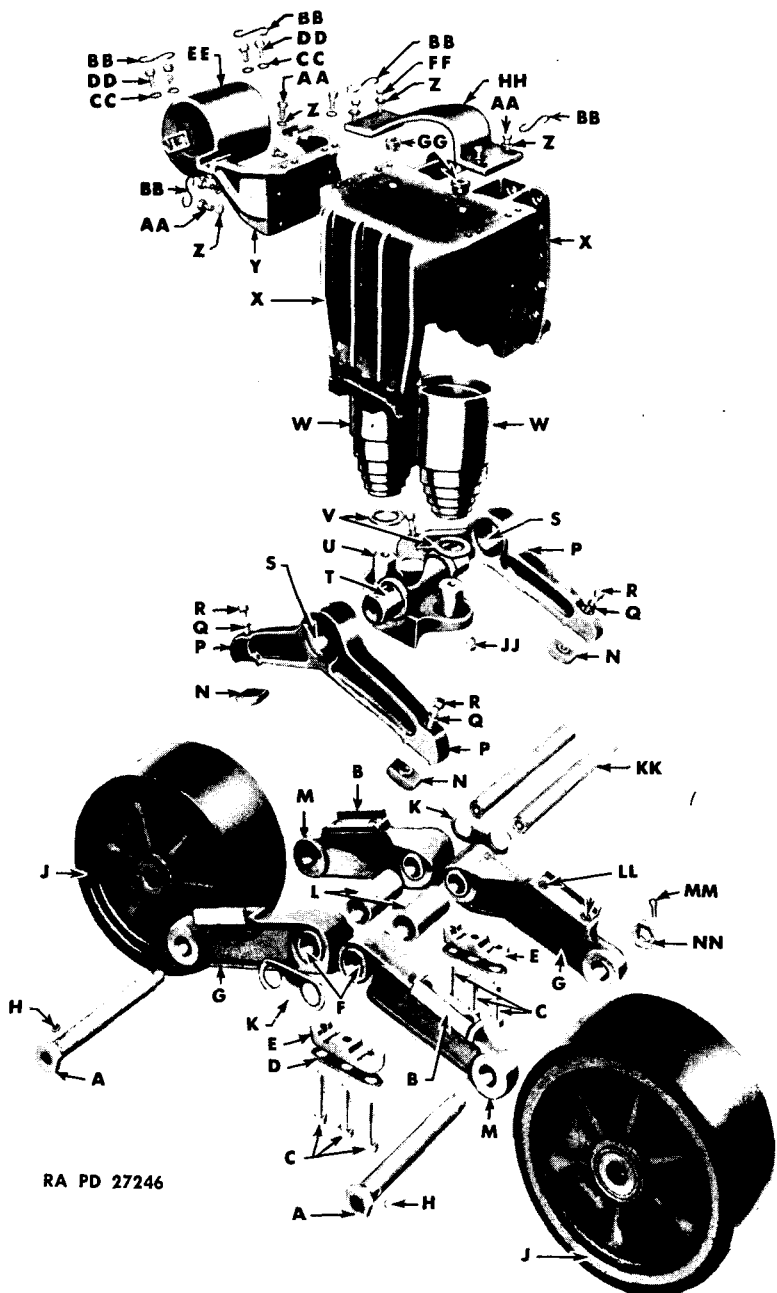
d. **Install Track Support Roller Bracket and Track Skid.** Install the four bolts that hold the roller bracket to the side of the bogie bracket. Place the track skid on the bogie bracket, and install the remaining six bolts to the track skid and support roller bracket. Lock all the bolts with lock wire.

e. **Assemble and Install Track Support Roller.** Install the bearings, grease retainer, and spacer in the track support roller (par. 11 b). Install the spacer (H, fig. 7) on the track support roller shaft, and slide the shaft into the track support roller. Install the retainer (C, fig. 7), washer, and lock ring (A, fig. 7) on the shaft. Place the track support roller on the track support roller bracket, and install the four cap screws. Lock the cap screws with lock wire.

28. INSTALLATION.

a. Place a hydraulic jack under the bogie assembly, and raise the assembly until the holes in the bogie bracket are in line with the holes in the hull. Install the 16 bolts that secure the bogie assembly to the hull. Remove the jack from the assembly. Connect the track (par. 12 c), and adjust the track tension (par. 20 b).

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Figure 18—Bogie Suspension Assembly, Disassembled

BOGIE REPAIRS, ASSEMBLY AND INSTALLATION

A—BOGIE WHEEL GUDGEON
B—RUBBING PLATE
C—BOLTS
D—LOCKING PLATE
E—GUDGEON CAP
F—BOGIE ARM BUSHING
G—BOGIE ARM, LEFT
H—WOODRUFF KEY
J—BOGIE WHEEL
K—OUTER SPACER
L—INNER SPACER
M—BOGIE ARM, RIGHT
N—RUBBING PLATE
P—LEVER
Q—STAR WASHER
R—CAP SCREW
S—LEVER BUSHING
T—SPRING SEAT BUSHING
U—SPRING SEAT
V—SPRING SEAT WASHER
W—VOLUTE SPRING
X—BOGIE BRACKET
Y—SUPPORT ROLLER BRACKET
Z—STAR WASHER
AA—BOLT
BB—LOCKING WIRE
CC—STAR WASHER
DD—CAP SCREWS
EE—TRACK SUPPORT ROLLER
FF—BOLT
GG—PLUG
HH—TRACK SKID
JJ—PLUG
KK—BOGIE ARM GUDGEON
LL—FLAT HEAD SCREW
MM—COTTER PIN
NN—CASTELLATED NUT

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Legend for Figure 18—Bogie Suspension Assembly, Disassembled

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CHAPTER 2

TRACKS AND SUSPENSION (Cont'd)

Section VI

IDLE WHEEL ASSEMBLY

	Paragraph
Description	29
Removal from vehicle.....	30
Disassembly	31
Cleaning	32
Inspection	33
Assembly	34
Installation on vehicle.....	35

29. DESCRIPTION.

a. Two steel idle wheels are mounted on eccentric shafts at the rear of the hull. These shafts are made eccentric to provide for the adjustment of the track tension.

30. REMOVAL FROM VEHICLE.

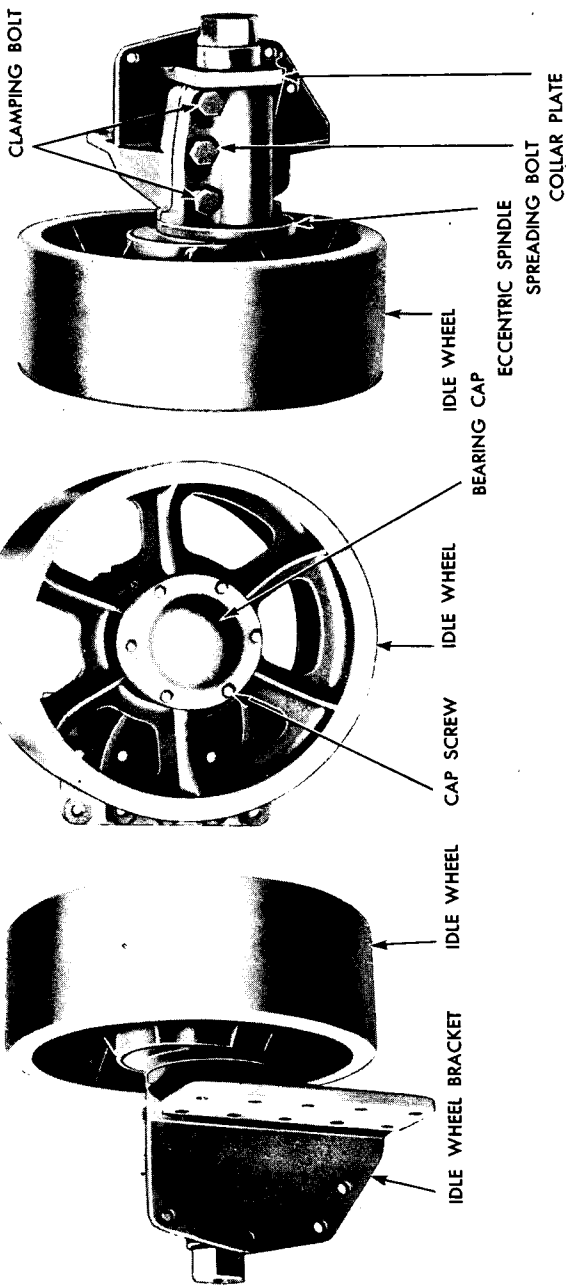
a. Break the track between the idle wheel and the rear bogie wheel (par. 12 b). Place a hydraulic jack under the assembly, and remove the 14 cap screws that secure the idle wheel bracket to the hull. Remove the assembly from the hull.

31. DISASSEMBLY.

a. **Remove Idle Wheel from Assembly.** Remove the bearing cap (fig. 19) by removing six cap screws. Take out the cotter pin securing the wheel nut and remove the nut. Install the idle wheel puller (41-P-2940-200) on the idle wheel (fig. 20), and remove the idle wheel from the spindle.

b. **Remove Eccentric Spindle from Idle Wheel Bracket.** Remove the cotter pin from the end of the spindle (fig. 21). Remove the two end clamping bolts (fig. 19) of the three bolts on the split bracket. Turn down the spreading bolt (fig. 19) to open up the split bracket. Raise the spring clip at the end of the bracket, and tap the collar plate (fig. 19) all the way off the spindle. Pull the eccentric spindle (G, fig. 21) out of the idle wheel bracket and remove.

IDLE WHEEL ASSEMBLY



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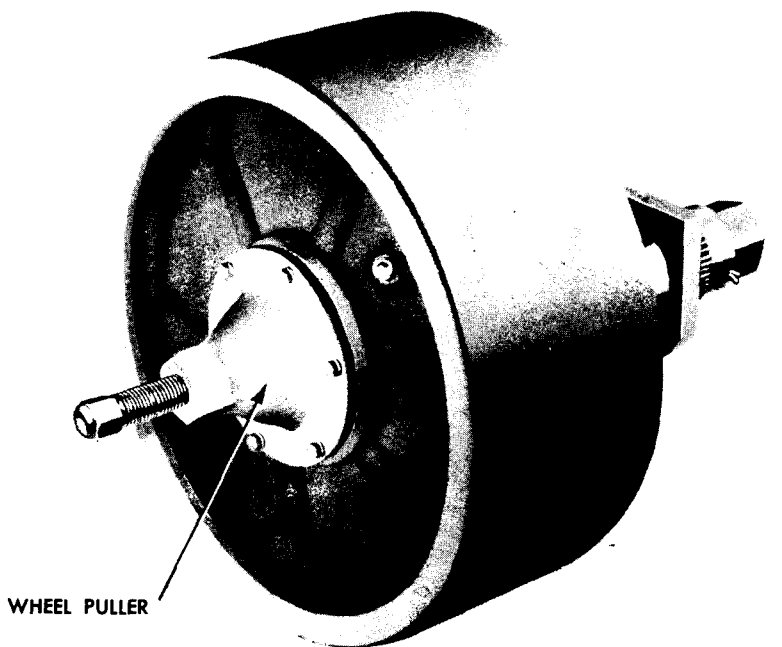
Figure 19—Idle Wheel Assembly

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c. **Remove Idle Wheel Bearings and Grease Retainer.** To remove the idle wheel bearings and grease retainers, refer to paragraph 18 a.

32. **CLEANING.**

a. Wash all parts in dry-cleaning solvent. The container must be free from metal chips and dirt. Rotate the bearing while immersed in



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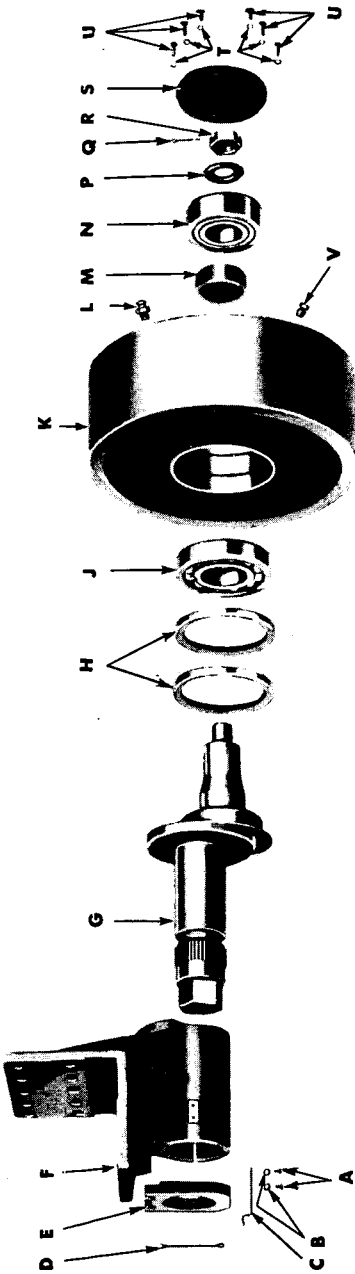
Figure 20—Pulling Idle Wheel with Wheel Puller

the dry-cleaning solvent until all trace of lubricant has been removed. If the bearing is very dirty, rinse it the second time in dry-cleaning solvent. Oil the bearing immediately to prevent corrosion of the highly polished surfaces. Wrap each bearing in oiled paper, if not to be used at once.

33. **INSPECTION.**

a. **Inspect Bearings.** The inspection of bearings is best performed after the bearing is washed, dried, and dipped in light oil (par. 32). The condition of bearings is best determined by the surface condition

IDLE WHEEL ASSEMBLY



- A—CAP SCREW
- B—LOCK WASHER
- C—SPRING CLIP
- D—COTTER PIN
- E—SERRATED LOCK COLLAR
- F—IDLE WHEEL BRACKET
- G—IDLE ECCENTRIC SPINDLE
- H—GREASE RETAINER
- J—INNER BALL BEARING
- K—IDLE WHEEL

- L—RELIEF VALVE
- M—INNER SPACER
- N—OUTER BALL BEARING
- P—FLAT WASHER
- Q—COTTER PIN
- R—CASTELLATED NUT
- S—BEARING CAP
- T—LOCK WASHER
- U—LOCK SCREW
- V—GREASE FITTING

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Figure 21—Rear Left Idle Wheel Assembly

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of the balls and races and the looseness in their races. Check for pits caused by corrosion. Check for discoloration of the balls, races, or retainers, as this is evidence of overheating. Bearings that have been overheated must be discarded. Spinning a bearing while holding it in the hands is not an accurate check for its running qualities, although this test will indicate presence of dirt or foreign matter in the bearing. Bearings in this condition are to be rewashed, lubricated, and checked again.

b. Inspect Eccentric Spindle. Inspect the spindle for grooved or worn condition. Check for stripped serrations on the spindle and collar plate. If any of these conditions are found, the spindle must be discarded.

c. Inspect Idle Wheel Bracket. Inspect the bracket for cracks in the casting, also for any damaged threaded holes.

34. ASSEMBLY.

a. Instructions. All parts which the previous inspection found unfit for further use must be replaced. All gaskets and grease seals must be replaced.

b. Install Bearings and Grease Retainer in Idle Wheel. Start the inner bearing (J, fig. 21) by hand, and, working around the outer race, tap it lightly into place with a brass drift. Be sure the bearing is squarely seated against the shoulder in the wheel, to allow room for the grease retainers. Slide two new grease retainers (H, fig. 21) into place on the inner bearing. Turn the wheel over, and install the inner spacer (M, fig. 21) in the wheel. Install the outer bearing (N, fig. 21) in the wheel, using the same method as outlined above.

c. Install Eccentric Spindle in Idle Wheel. Place the eccentric spindle (G, fig. 21) in the idle wheel. Start the spindle through the inner bearing. Line up the center spacer (M, fig. 21) by means of an alinement bar inserted from the outer side of the wheel, and tap the spindle in the spacer and outer bearing (N, fig. 21). Install the flat washer (P, fig. 21) and castellated nut (R, fig. 21) on the spindle. Install the bearing cap (S, fig. 21) on the wheel.

d. Install Idle Wheel Bracket on Eccentric Spindle. Install the idle wheel bracket (F, fig. 21) on the eccentric spindle (G, fig. 21). Install the collar plate (E, fig. 21) on the eccentric spindle. Install the cotter pins (D, fig. 21) on the eccentric spindle. Install the spring clip (C, fig. 21) to the idle wheel bracket with two cap screws (A, fig. 21).

35. INSTALLATION ON VEHICLE.

a. Raise the idle wheel assembly until the holes in the idle wheel bracket are in line with the holes on the hull. Install the 14 cap screws that secure the bracket to the hull. Connect the track (par. 12 c) and adjust the tension of the track (par. 20 b).

CHAPTER 2
TRACKS AND SUSPENSION (Cont'd)

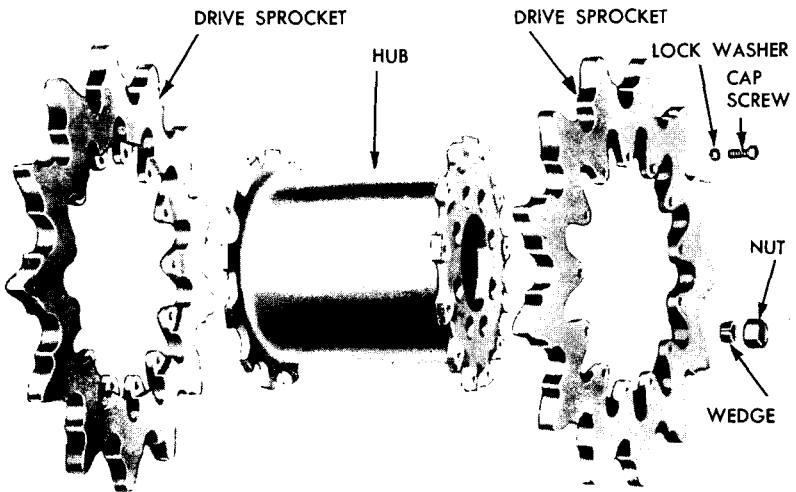
Section VII

SPROCKET AND HUB ASSEMBLY

Sprocket and hub assembly..... Paragraph 36

36. SPROCKET AND HUB ASSEMBLY.

a. Description. The sprocket and hub assembly is formed by bolting two sprockets to a hub, which, in turn, is attached by studs and



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Figure 22—Sprocket and Hub Assembly

nuts to the drive flange of the final drive shaft. Sprocket and hub assemblies, interchangeable as units, should be transposed between the right and left drive shafts when the sprocket teeth have become appreciably worn on their flanks from long use in one direction.

b. Remove. To remove the sprocket and hub assembly, slacken the track (par. 20 a). Disconnect the track below the drive sprocket. Remove the eight hub retaining nuts. Remove the sprocket and hubs from the vehicle as an assembly.

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c. **Disassemble.** Remove the 13 cap screws that secure each sprocket to the hub, and remove the sprocket from the hub.

d. **Clean and Inspect.** Clean all the parts in dry-cleaning solvent. Inspect the hub for stripped threads or cracks in the hub casting. Discard drive sprocket if it shows excessive wear or missing teeth.

e. **Assemble.** Place the drive sprockets (fig. 22) in position on the hub (fig. 22), and install cap screws.

f. **Install.** Place the sprocket and hub assembly on the final drive shaft and line up studs with holes in the hub. Install the eight cap screws that secure the hub to the final drive shaft.

CHAPTER 3

HULL AND TURRET

Section I

HULL AND TURRET DESCRIPTION

	Paragraph
General description.....	37
Differences between M10 and M10A1.....	38

37. GENERAL DESCRIPTION.

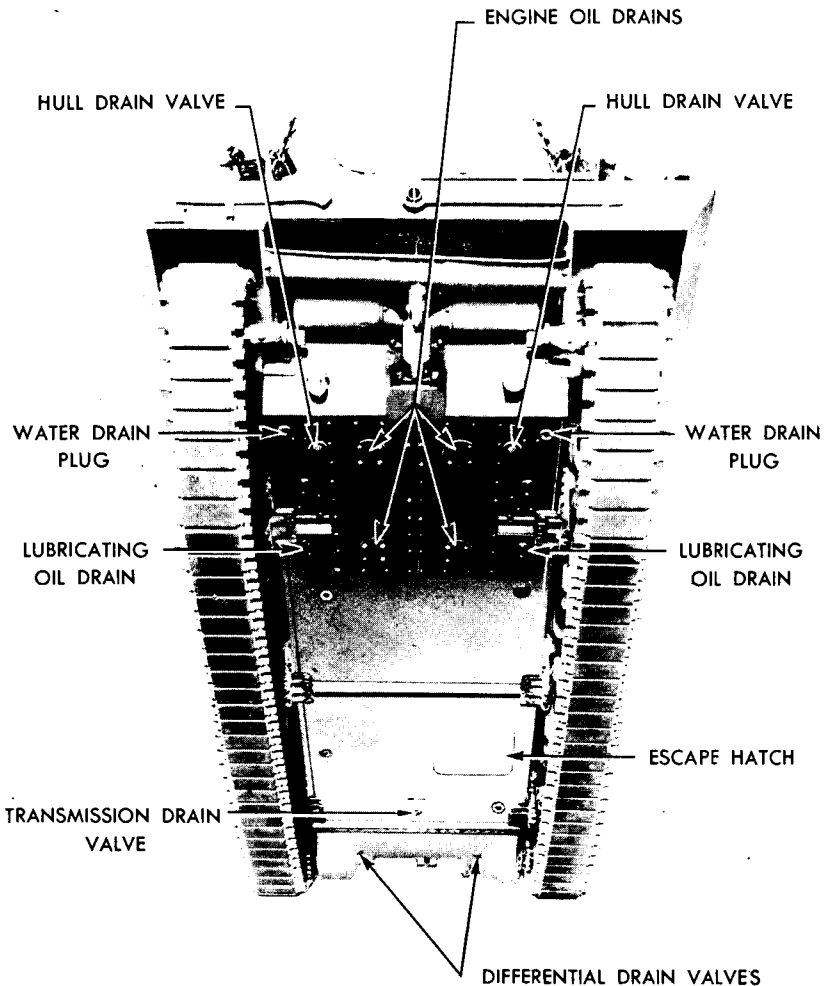
a. Description. The hull of the M10 and the M10A1 is made of welded armor plate, 1½ inches thick at the front, one inch thick at the lower side plate, ¾ inch thick at the upper side plate, ⅜ inch thick at the rear and ¾ inch thick at the top. The armor plate over the engine compartment is ⅜ inch thick. An apron of ¼-inch armor is provided for the upper part of each track. The hull is divided into two sections by a bulkhead. The engine compartment is located in the rear section, the fighting compartment and driver and assistant driver's sections are located in the front section. The fighting compartment has a platform 16 inches above the hull floor. The platform is stationary, extends the full width of the vehicle, and runs lengthwise from the bulkhead to just behind the driver's compartment seats. The space beneath the platform contains storage compartments, battery box, and generator regulators, which are reached through hinged metal covers flush with the platform.

b. Auxiliary Armor. Provision is made for increasing the armor protection on the front and upper slopes of the hull and on the sides of the turret by attaching auxiliary armor of varying thicknesses. Large circular bosses are welded to the armor plate of the vehicle. Holes in the auxiliary armor plates fit over these bosses. Heavy bolts, with large washers, screw into the center of the bosses to hold the auxiliary armor in place. A spacer surrounds each of the bosses, resulting in a ¾-inch air space between the hull and the auxiliary armor plate.

38. DIFFERENCES BETWEEN M10 AND M10A1.

a. Major Differences. The major differences between the hull of the M10 and the hull of the M10A1 are: drains and engine compartment floor plates (par. 38 e), rear baffles (figs. 25 and 26), the engine compartment covers (par. 38 b and c) and such other differ-

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Figure 23—Under Side of M10 Gun Motor Carriage

ences in mounting brackets, etc., as are required for the Ford tank engine in the M10A1 and the twin Diesel engine in the M10.

b. **M10 Engine Compartment Covers** (fig. 27). The M10 engine compartment covers consist of three sections of $\frac{3}{8}$ -inch armor plate and two bar meshed doors mounted to the side covers on hinges. The gun rest bracket is welded to the rear cover. The lubricating oil filler covers and the water filler covers are mounted to the side covers.

HULL AND TURRET DESCRIPTION

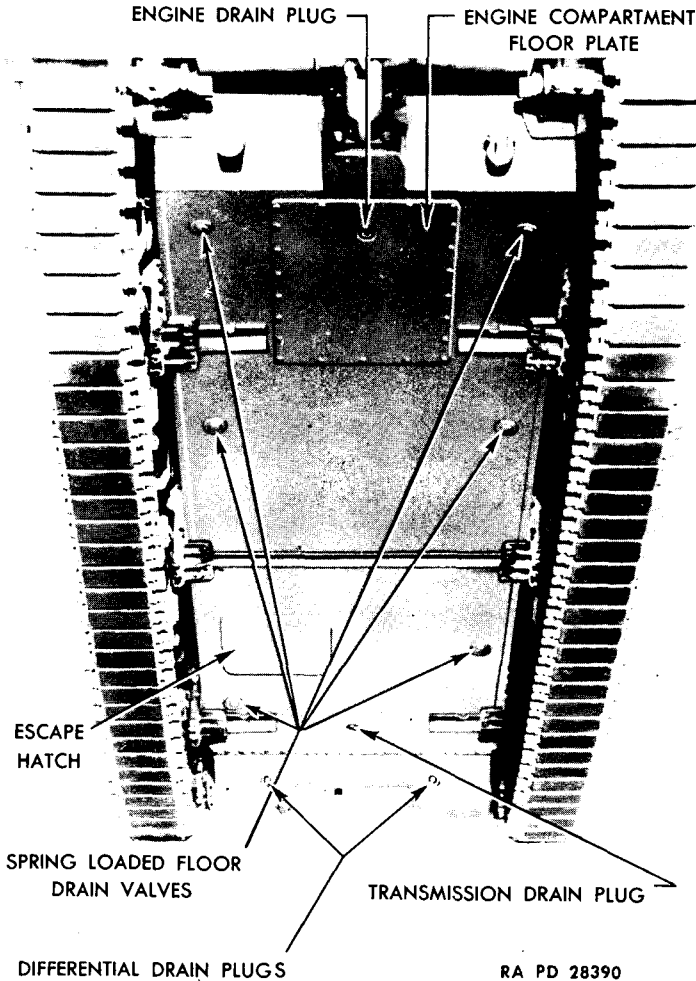


Figure 24—Under Side of M10A1 Gun Motor Carriage

c. **M10A1 Engine Compartment Covers** (fig. 28). The engine compartment covers on the M10A1 consist of a front cover, a rear cover, and two doors. The engine compartment doors are mounted directly to the hull. No removable side covers are used. The doors are provided with bullet splash shields under the grilles.

d. **M10A1 Engine Compartment Rear Door** (fig. 29). An engine compartment rear door is provided on the M10A1 to permit access to the cooling system drain plug, oil filler plug, oil bayonet gage, and magnetos.

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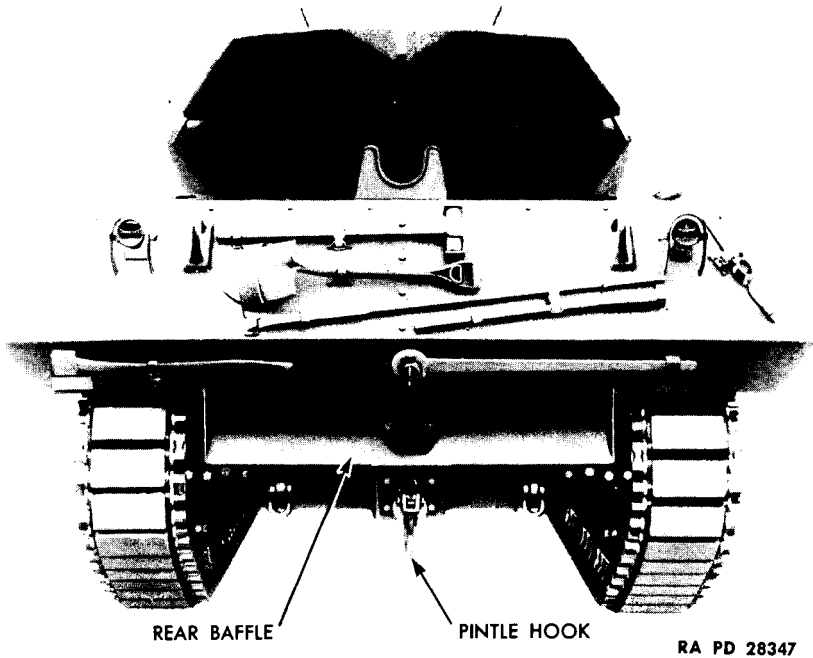


Figure 25—Rear View of M10

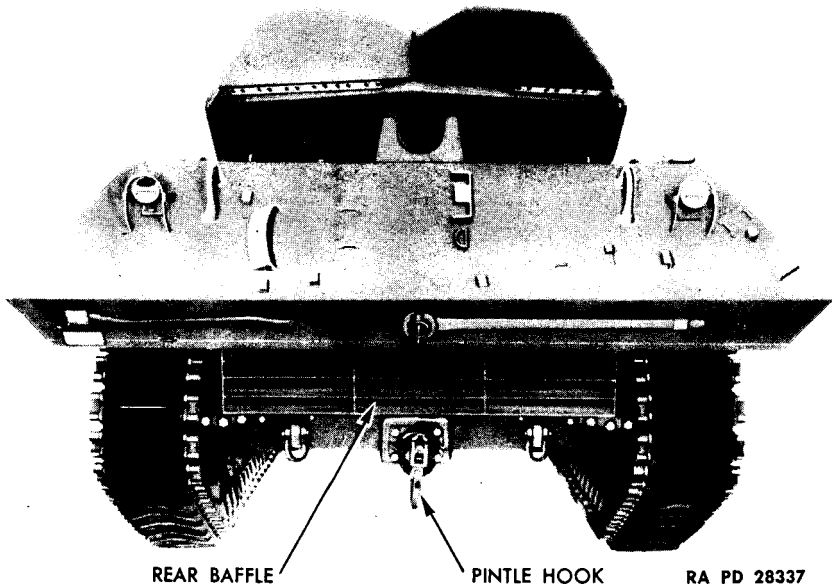


Figure 26—Rear View of M10A1

HULL AND TURRET DESCRIPTION

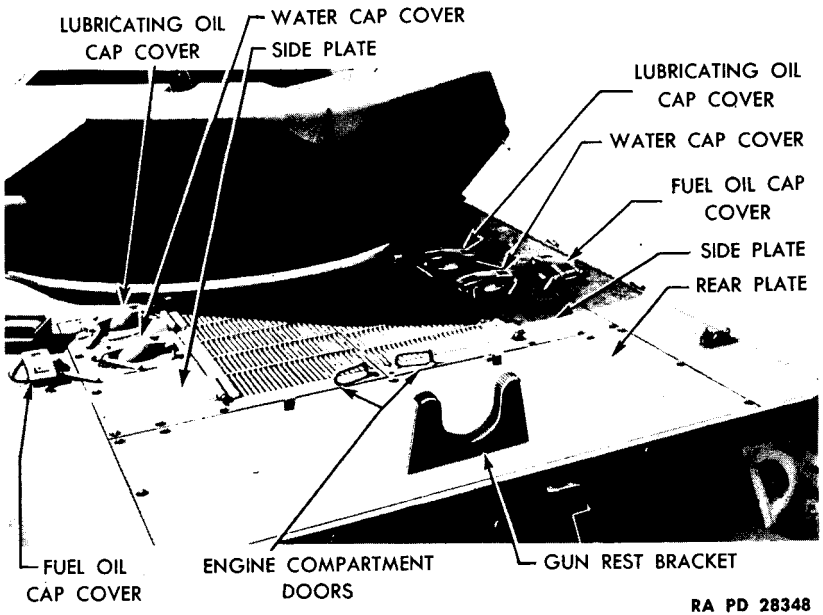
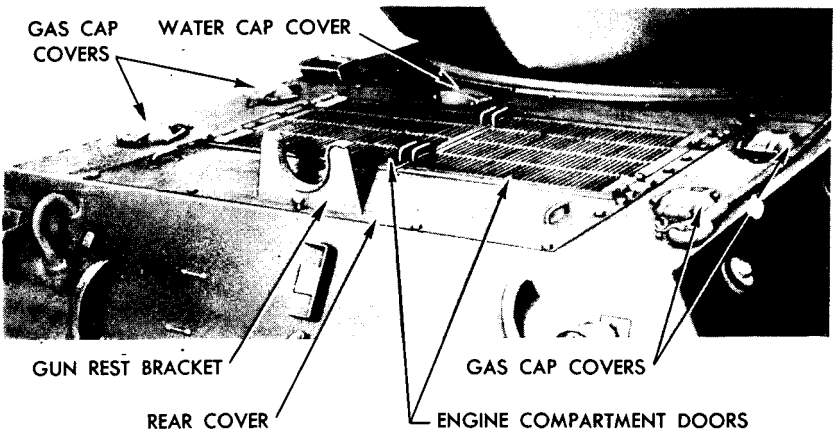


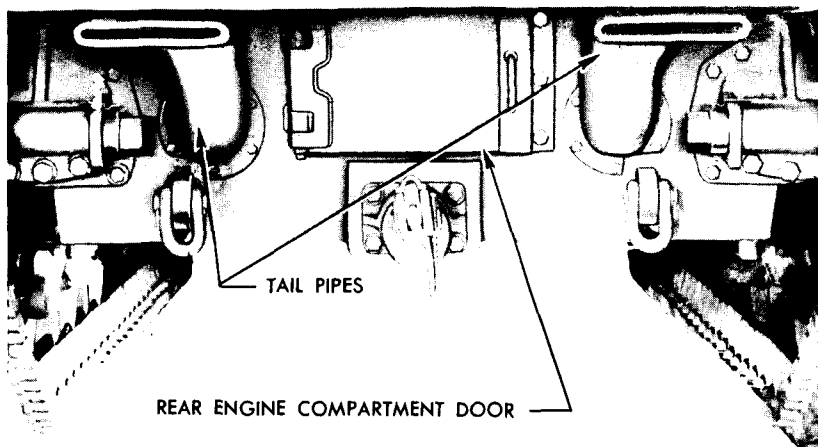
Figure 27—Engine Compartment Covers on M10



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Figure 28—Engine Compartment Covers on M10A1

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RA PD 28335

Figure 29—Engine Compartment Rear Door on M10A1

e. **Engine Compartment Floor Plate** (figs. 23 and 24). The M10A1 and M10 are both provided with engine compartment floor plates, located at the rear of the vehicle directly beneath the engines. These plates are equipped with plugs to gain access to various drains. The M10 has two engine compartment floor plates and the M10A1 has one.

CHAPTER 3

HULL AND TURRET (Cont'd)

Section II

GUN AND GUN MOUNT

	Paragraph
Removal	39
Installation	40

39. REMOVAL.

a. **Remove Telescopic Sight.** Remove the four cap screws that secure the telescopic sight (fig. 30) to the mounting on the left-hand side of the shield.

b. **Remove Elevation Mechanism** (fig. 30). Install the gun mount in the traveling lock. Remove the castellated nut, and remove the bolt that secures the elevation screw to the mounting bracket on the turret. Use a brass drift, if necessary, to drive this bolt out of the mounting bracket. Remove the flathead screw that secures the wire leading to the firing solenoid. Remove the knurled nut connection on the solenoid, and pull the wire out of the solenoid. Remove the six bolts that secure the elevation mechanism to the cradle, and remove the elevation mechanism.

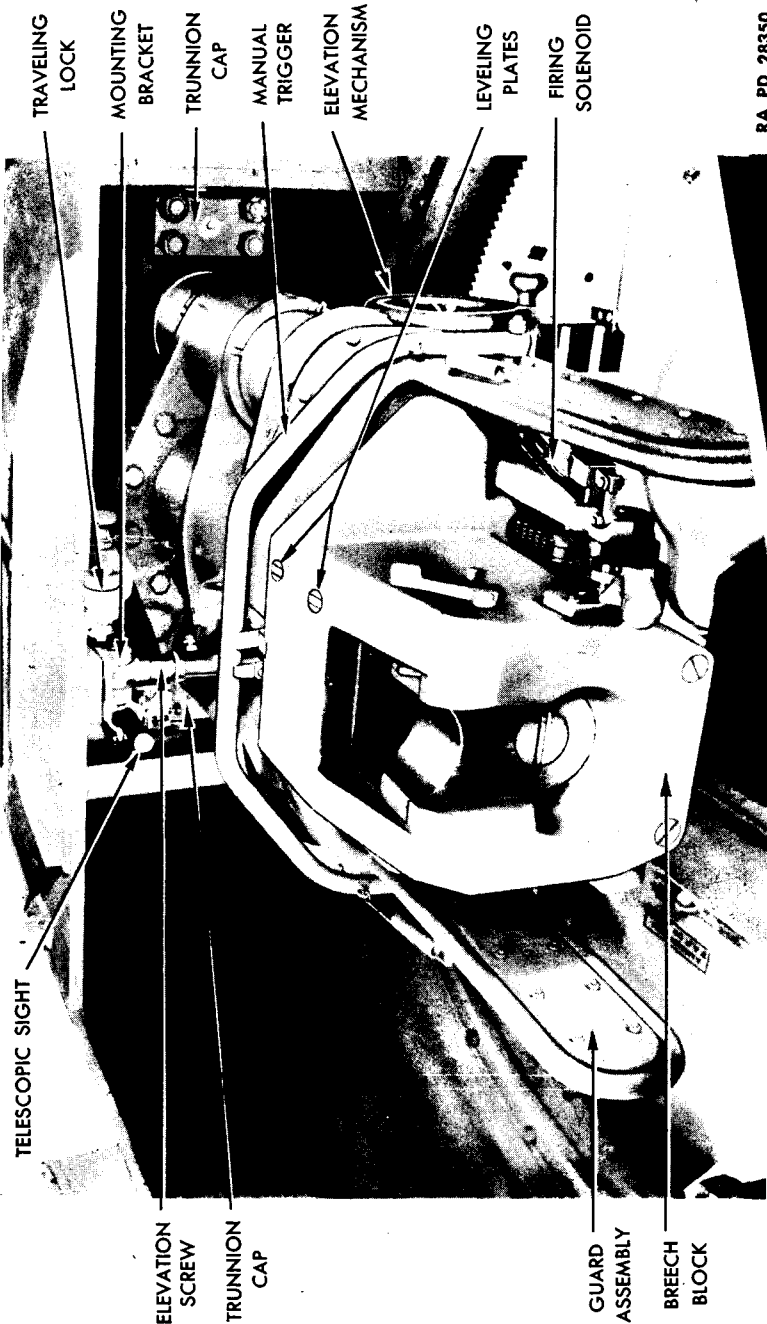
c. **Remove Trunnion Caps** (fig. 30). Install the gun mount lifting fixture on the gun mount (fig. 31). Raise the gun mount until the weight of the gun mount is off the trunnions. With a chisel, mark the trunnion caps (fig. 31) so that they can be installed in their original position. Remove the four nuts that secure each of the trunnion caps to the shield. Using a brass hammer, tap the trunnion caps off.

d. **Remove Gun Mount from Turret** (fig. 31). Slowly pull the gun mount off the trunnions, being very careful not to damage the trunnion bushings. Care must be taken not to scrape the leveling plate (fig. 30) on the breechblock when sliding the gun mount out of the turret. Work the gun mount to one side until the manual trigger on the guard assembly will clear the trunnions. Remove the gun mount from the turret.

40. INSTALLATION.

a. **Enter Gun Mount in Turret Opening.** Check the trunnions, trunnion cups, and trunnion bushings, as outlined in paragraph 42 b. Install the lifting fixture on the gun and gun mount (fig. 31). Raise the gun mount and line it up with the opening in the turret. Insert the gun mount part way in the turret, being careful that the leveling

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Figure 30—Gun Mount

GUN AND GUN MOUNT

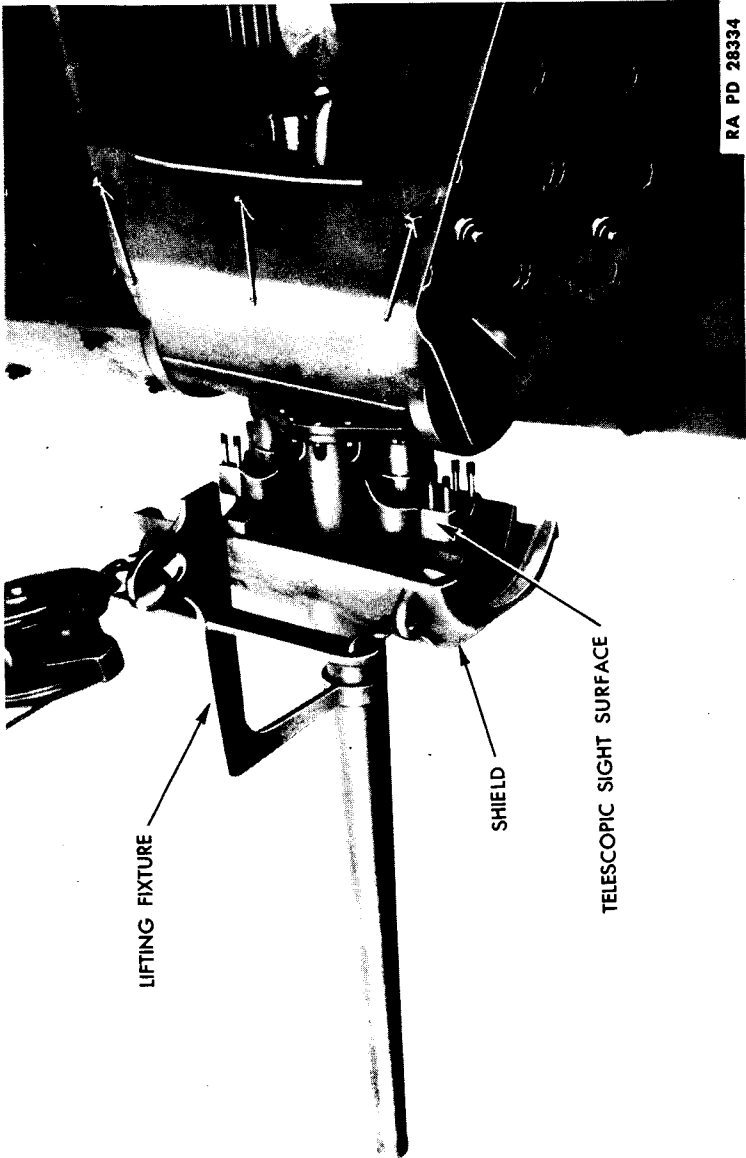


Figure 31—Removing Gun and Gun Mount from Turret

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plates on the breechblock (fig. 30) do not scrape on the upper part of the turret. Turn the gun mount to one side to allow the manual trigger lever on the guard assembly to slide past the trunnion. Then straighten the gun mount, and slide the gun mount into position on the trunnions.

b. Install Trunnion Caps. Line up the slots on the trunnion bushing with the dowel pins on the trunnion caps. If the trunnion caps were marked when removed, be sure they are put back in their original position. Install the four nuts on each trunnion cap, drawing the nuts up evenly.

c. Install Elevation Mechanism (fig. 30). Insert the elevation screws in the opening between the left-hand recoil cylinder and cradle. Install the six cap screws that secure the elevation mechanism to the cradle. Line up the elevation screw in the mounting bracket. Install the bolt and nut that secure the elevation screw to the mounting bracket on the turret, being careful not to damage the rubber mounting in the bracket. Install the wire leading from the firing switch on the elevation wheel to the solenoid.

d. Install Telescopic Sight (fig. 30). Clean the telescopic sight surface on the shield (fig. 31). Place the telescopic sight in position on the shield, and install the four cap screws that secure the telescopic sight to the shield.

CHAPTER 3
HULL AND TURRET (Cont'd)

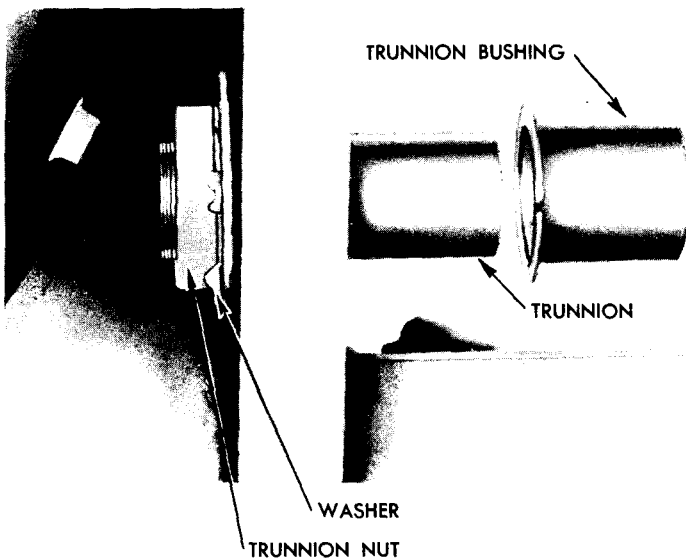
Section III

TURRET

	Paragraph
Turret assembly removal.....	41
Turret repair.....	42
Turret installation.....	43
Turret ring.....	44
Traversing mechanism.....	45
Turret lock.....	46

41. TURRET ASSEMBLY REMOVAL.

a. Mark the turret directly above the turret ring with a chisel, and mark the turret ring directly below and in line with the mark on the turret. This will permit their reinstallation in their original relationship to each other. Remove the 30 cap screws that secure the turret to the turret ring. Install the turret lifting fixture to the turret (fig. 33), and raise the turret off the turret ring.



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Figure 32—Trunnion and Trunnion Bushings

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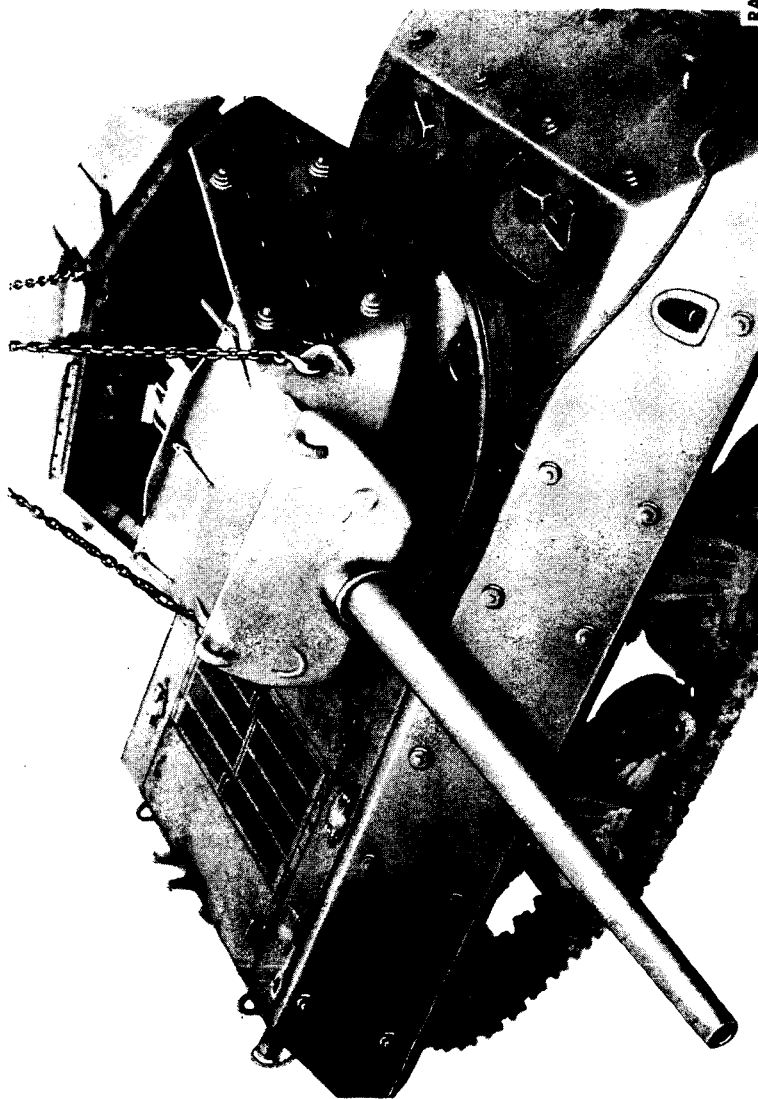


Figure 33—Removing Turret Assembly

TURRET

42. TURRET REPAIR.

a. **Trunnion Removal** (fig. 32). Remove the gun and gun mount from the turret (par. 39). Slide the trunnion bushing off the trunnion. Bend the ears of the washer off the trunnion nut (fig. 32). Remove the trunnion nut, and remove the trunnion.

b. **Trunnion Inspection, Repair, and Installation.** Replace any trunnion bushings (fig. 32) that are out-of-round or excessively worn. Small scratches or nicks in the trunnion bushings can be removed with a bearing scraper. Replace the trunnions if they are excessively worn or have damaged threads.

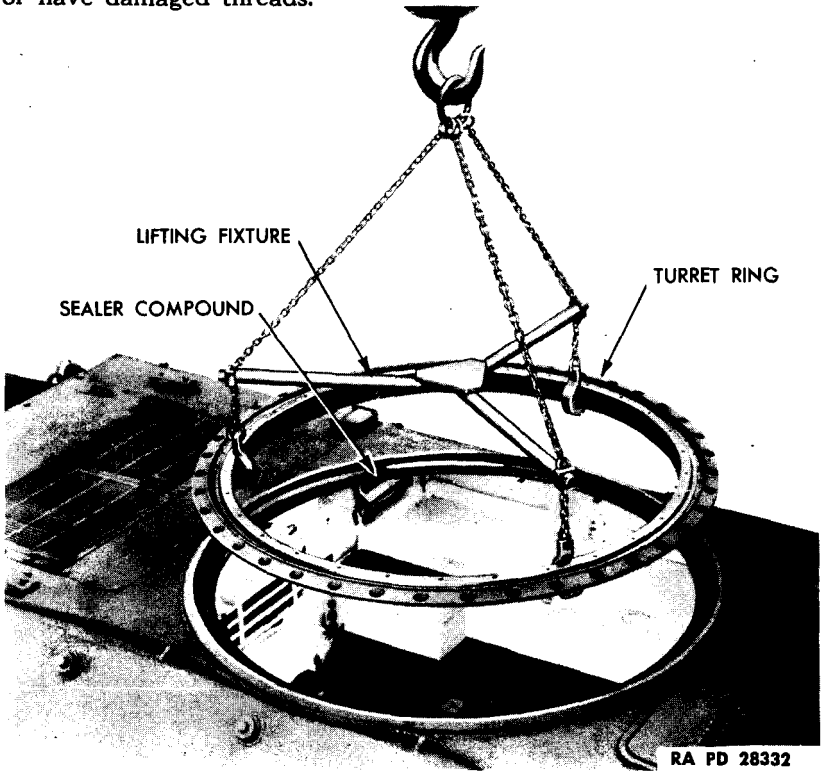


Figure 34—Removing Turret Ring

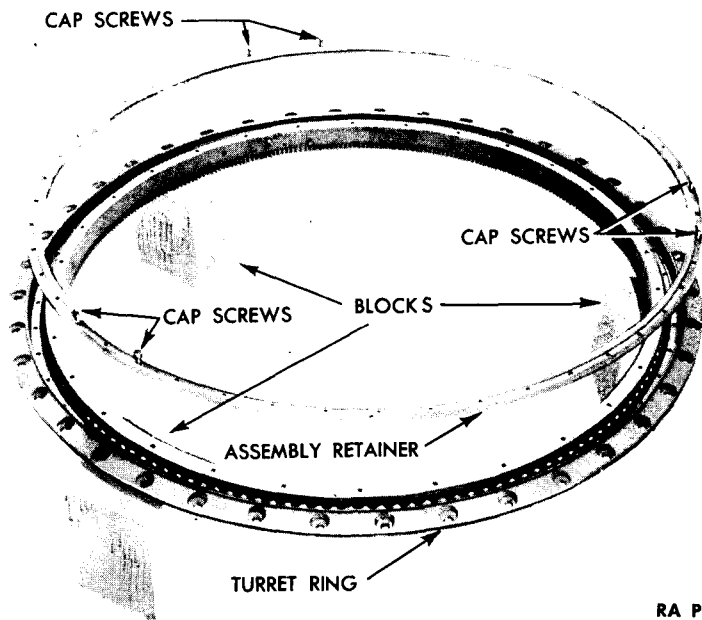
43. TURRET INSTALLATION.

a. Install the gun and gun mount in the turret (par. 40). Install the lifting fixture on the turret assembly (fig. 33). Raise the turret, and line the turret up with the turret ring. If the turret and turret ring were marked before being removed, line up the marks. Lower the turret assembly on the turret ring, and line up the holes. Install the 30 cap screws that secure the turret to the turret ring.

HULL AND TURRET, ELECTRICAL SYSTEMS, TRACKS AND SUSPENSION FOR 3-INCH GUN MOTOR CARRIAGES M10 AND M10A1

44. TURRET RING.

a. **Removal** (fig. 34). Remove the turret assembly (par. 41 a). Remove the traversing mechanism (par. 45 a). Remove the turret locks (par. 46 a). Mark the turret ring and hull, with a chisel, directly in line with each other. This will permit their reinstallation in their original relationship to each other. Remove the 40 nuts and bolts that secure the turret ring (fig. 39) to the hull. Install the lifting fixture on the turret ring, and raise the turret ring off the hull (fig. 34).



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Figure 35—Retainer Removed from Turret Ring

b. Disassembly.

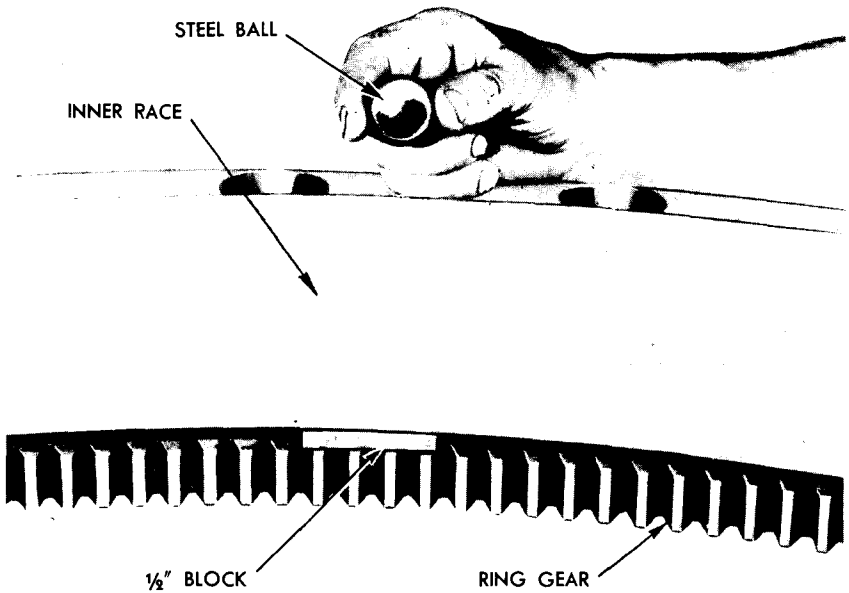
(1) **REMOVE ASSEMBLY RETAINER** (fig. 35). Place the turret ring on three blocks. Remove the 48 cap screws that secure the assembly retainer to the turret ring. Install six cap screws in pairs, one hole apart, with the three pairs evenly spaced around the assembly retainer. Raise the assembly retainer off the ring gear, using the six cap screws for lifting.

(2) **REMOVE STEEL BALLS AND STEEL BALL RETAINERS.** Install six cap screws in the threaded holes on the inner race ring (fig. 38). Using these cap screws as lifts, raise the inner race ring approximately $\frac{1}{2}$ inch off the ring gear, and install three wooden blocks, evenly spaced

TURRET

around the inner race ring, between the inner race ring and ring gear (fig. 38). Remove the 150 steel balls and the 15 ball retainers (fig. 36).

(3) **REMOVE INNER RACE RING** (fig. 38). After all the steel balls and steel ball retainers have been removed, raise the inner race ring completely out of the ring gear.



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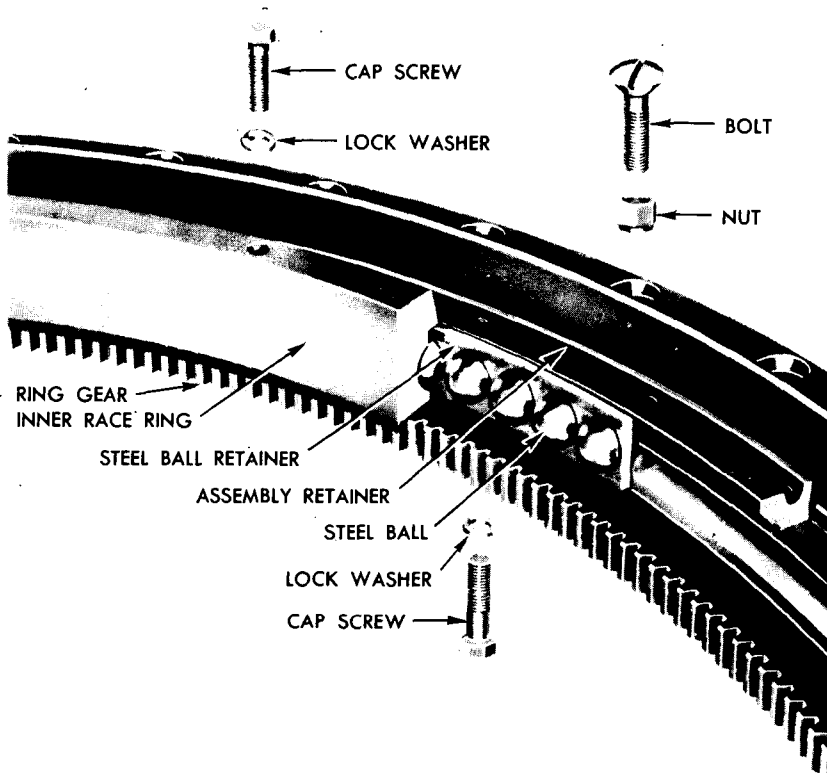
Figure 36—Removing Steel Balls from Turret Ring

c. **Cleaning, Inspection, and Repair.** Clean all parts with dry-cleaning solvent. Replace any of the balls that are worn, nicked, or scratched. Replace any ball retainers that are cracked or that have elongated holes. Replace the ring gear if excessively worn or cracked, if any of the teeth are missing, or if the bearing outer race is worn or badly scored. Replace the inner race if worn or badly scored. Remove any small nicks or scratches from either ball race by honing away the raised metal and polishing with a fine stone. Remove any small nicks or scratches from the bearing surface of the assembly retainer by honing away the raised metal and polishing with a fine stone.

d. **Assembly.**

(1) **INSTALL INNER BEARING RACE IN RING GEAR** (fig. 38). Place the ring gear on three wooden blocks, evenly spaced. Place three wooden blocks approximately 1/2-inch thick on the ring gear, and ar-

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RA PD 27225

Figure 37—Turret Ring, Disassembled View

range the wooden blocks so they are evenly spaced. Install six cap screws in pairs, one hole apart, with the pairs evenly spaced around the inner bearing race. Using these cap screws as lifts, raise the inner bearing race and place the inner bearing race on the $\frac{1}{2}$ -inch blocks.

(2) **INSTALL STEEL BALL RETAINERS AND STEEL BALLS** (fig. 36). Insert the 15 retainers in position between the inner bearing race and ring gear. Insert the 150 steel balls in the retainers. Remove the three $\frac{1}{2}$ -inch blocks between the inner bearing race and the ring gear, to allow the inner bearing race to drop in position on the ring gear.

(3) **INSTALL ASSEMBLY RETAINERS** (fig. 35). Insert six cap screws in the upper side of the assembly retainer, arranging the cap screws so they are in pairs, one hole apart, and evenly spaced around the assembly retainer. Using these cap screws as lifts, raise the assembly retainer

TURRET

and place in position on the ring gear. Line up the holes in the assembly retainer with the holes on the ring gear. Remove the six cap screws that were used as lifts. Install the 48 cap screws that secure the assembly retainer to the ring gear. Grease the turret ring, revolving the turret ring until the grease is well worked into the ball bearings. See TM 9-731G, TM 9-752, or Lubrication Guide, for proper lubricant.

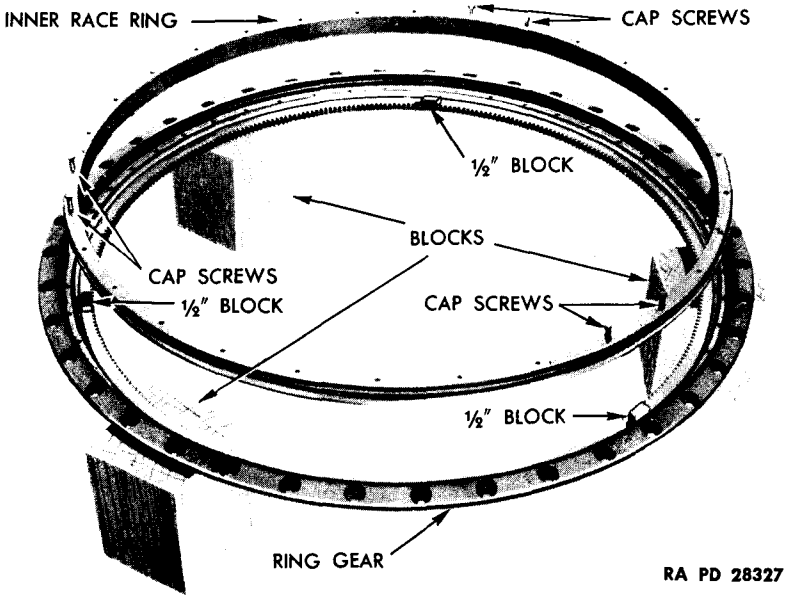


Figure 38—Installing Inner Race on Ring Gear

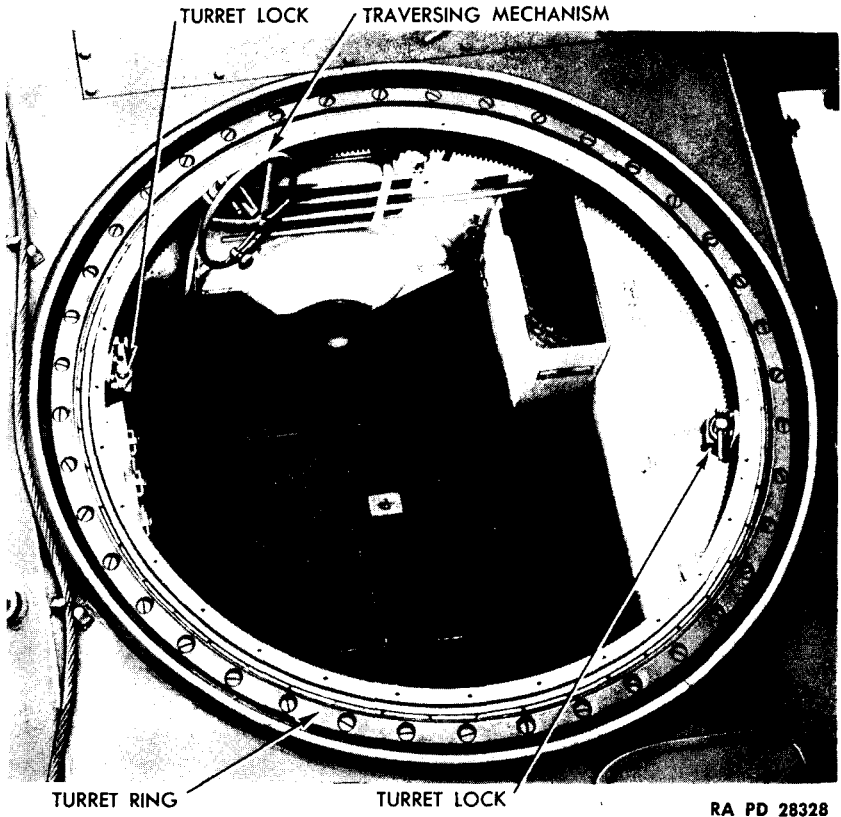
e. **Installation** (fig. 34). Apply a sealer compound around the edge of the turret ring opening on the hull. Install the lifting fixture to the turret ring, and raise the ring. Line up the chisel mark on the turret ring with the mark on the hull, and lower the turret ring into place on the hull. Use a drift to line up the holes in the turret ring with the holes in the hull. Install the 40 nuts and bolts that secure the turret ring to the hull. Install the turret locks (par. 46 e). Install the traversing mechanism (par. 45 f). Install the turret assembly (par. 43 a).

45. TRAVERSING MECHANISM.

a. **Removal.** Remove the five cap screws that secure the traversing mechanism (fig. 40) to the turret ring, and remove the traversing mechanism.

b. **Disassembly** (fig. 41). Bend the ears of the external toothed lock washer off the wheel nut, and remove the wheel nut and lock

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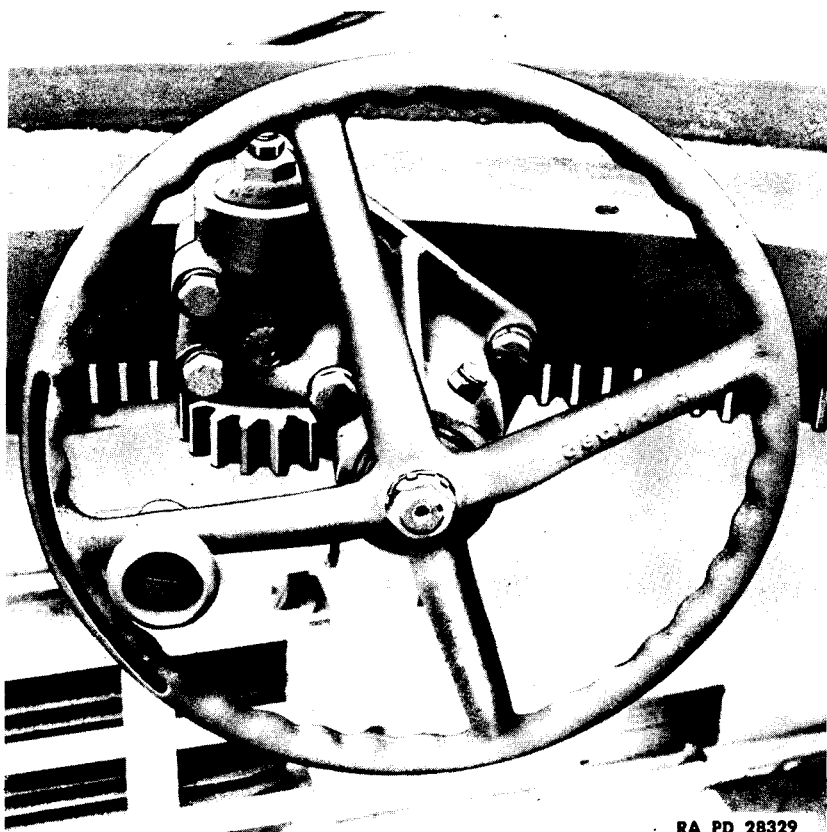
RA PD 28328

Figure 39—Turret Ring in Position on Hull

washer. Pull the wheel off the worm gear shaft. Remove the plug from the traversing gear housing. Remove the lock nut and adjusting nut from the pinion gear. With a brass hammer, tap the pinion gear out of the housing. Slide the upper ball bearing out of the housing. Insert a brass drift in the opening in the housing, and drive the needle bearing out of the housing. The grease retainer will also come out when the needle bearing is removed. With a brass hammer, tap the worm gear shaft out of the housing. The flat washer and inner ball bearing should come out with the shaft. Slide the inner bearing spacer and outer bearing out of the housing.

c. **Cleaning.** Clean all parts with dry-cleaning solvent. Rotate the bearings while immersed in dry-cleaning solvent until all trace of lubricant has been removed. Oil the bearings immediately to prevent corrosion of the highly polished surface. Wrap the bearings in oiled paper if not to be used immediately.

TURRET



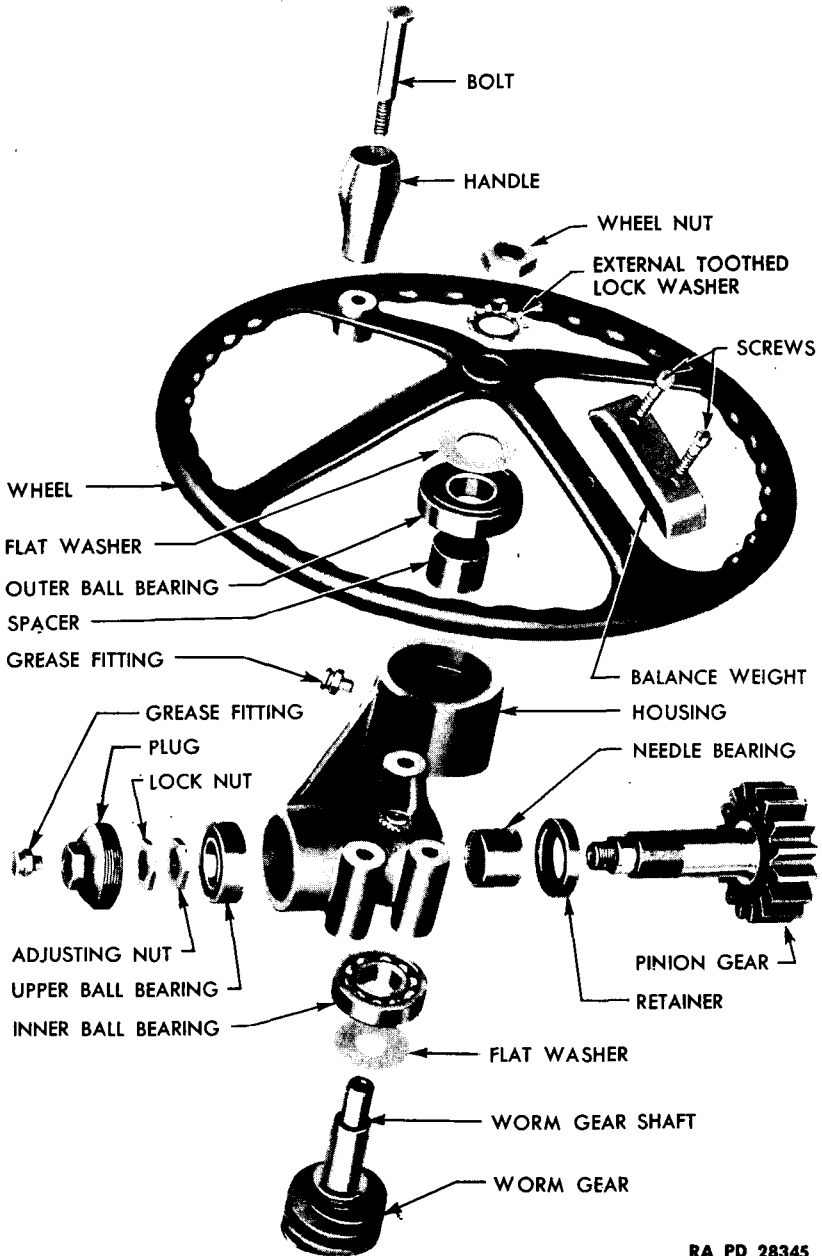
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Figure 40—Traversing Mechanism

d. **Inspection.** Examine the surface condition of the balls and races and check the looseness in their races. Check for pits caused by corrosion. Replace worm gear, or pinion gear, if excessively worn, cracked, or if any teeth are missing. Replace the handwheel if bent or if it has any cracked spokes. Replace the traverse mechanism housing if cracked. Discard the grease retainer regardless of its condition.

e. **Assembly (fig. 41).** Place the flat washer, inner bearing, and spacer, on the worm gear shaft, and insert the assembly in the housing. Insert the outer bearing on the worm gear shaft, and, with a brass hammer, tap the outer bearing in the housing. Install the flat washer and Woodruff key in the slot on the worm gear. Line up the slot in the handwheel with the Woodruff key, and slide the handwheel in place. Install the external toothed lock washer and wheel nut. With a brass hammer, tap the needle bearing in the housing until it is flush with the shoulder in the housing. Also with a brass hammer, tap a new grease

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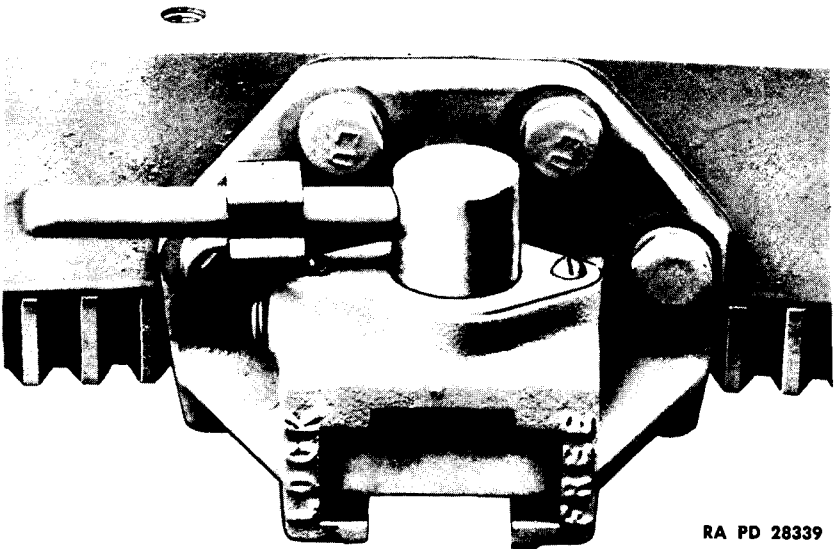
RA PD 28345

Figure 41—Traversing Mechanism, Disassembled View

TURRET

retainer in the housing until the grease retainer is flush with the outer edge of the housing. Insert the pinion gear through the retainer and needle bearing. Insert the upper bearing on pinion gear. Install the adjusting nut and lock nut on the pinion gear. Install the plug on the housing.

f. Installation. Place the traversing mechanism in position on the turret ring, and install the five cap screws that secure the traversing mechanism to the turret.



RA PD 28339

Figure 42—Turret Lock

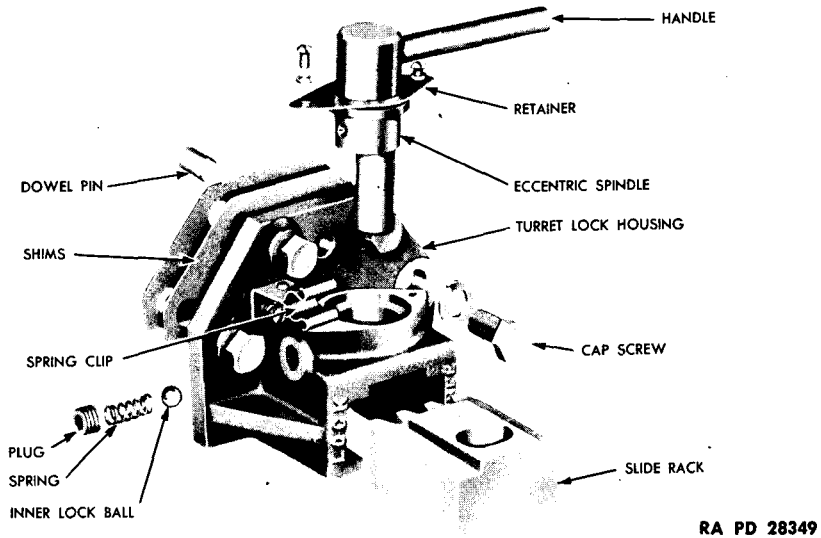
46. TURRET LOCK (fig. 42).

a. Removal. Remove the four cap screws that secure the turret lock to the turret ring. Note the number of shims between the turret lock and turret ring. Remove the turret lock.

b. Disassembly (fig. 43). Remove the plug that secures the spring and inner lock ball in the turret lock housing. Remove the spring and ball from the housing. Remove the two screws that secure the eccentric spindle retainer to the housing, and lift the eccentric spindle from the housing. Remove the slide rack from the housing.

c. Cleaning and Inspection. Clean all parts with dry-cleaning solvent. Replace the slide rack if excessively worn or if it has any missing teeth. Replace eccentric spindle if excessively worn. Replace the turret lock housing if found cracked.

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Figure 43—Turret Lock, Disassembled View

d. **Assembly** (fig. 43). Insert the slide rack in the housing. Insert the eccentric spindle in the housing and through the hole in the slide rack. Install the retainer on the housing. Install the inner lock ball, spring, and plug.

e. **Installation** (fig. 43). Install the same number of shims that were originally removed from the turret lock. Install the four cap screws that secure the turret lock to the turret ring. Turn the turret lock handle to the locked position. If the handle enters the clip without too much effort, the correct number of shims has been used. If too loose, take away shims until the right number is obtained. If too tight or if the handle does not enter the spring clip, add shims until the right number is obtained.

CHAPTER 4
ELECTRICAL SYSTEMS

Section I

M10A1 ELECTRICAL SYSTEMS

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Conduit and wire replacement	48
Lights and siren circuit	49
Gun firing circuit	50
Radio circuit	51
Starting circuit	52
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Electrical instrument circuits	55

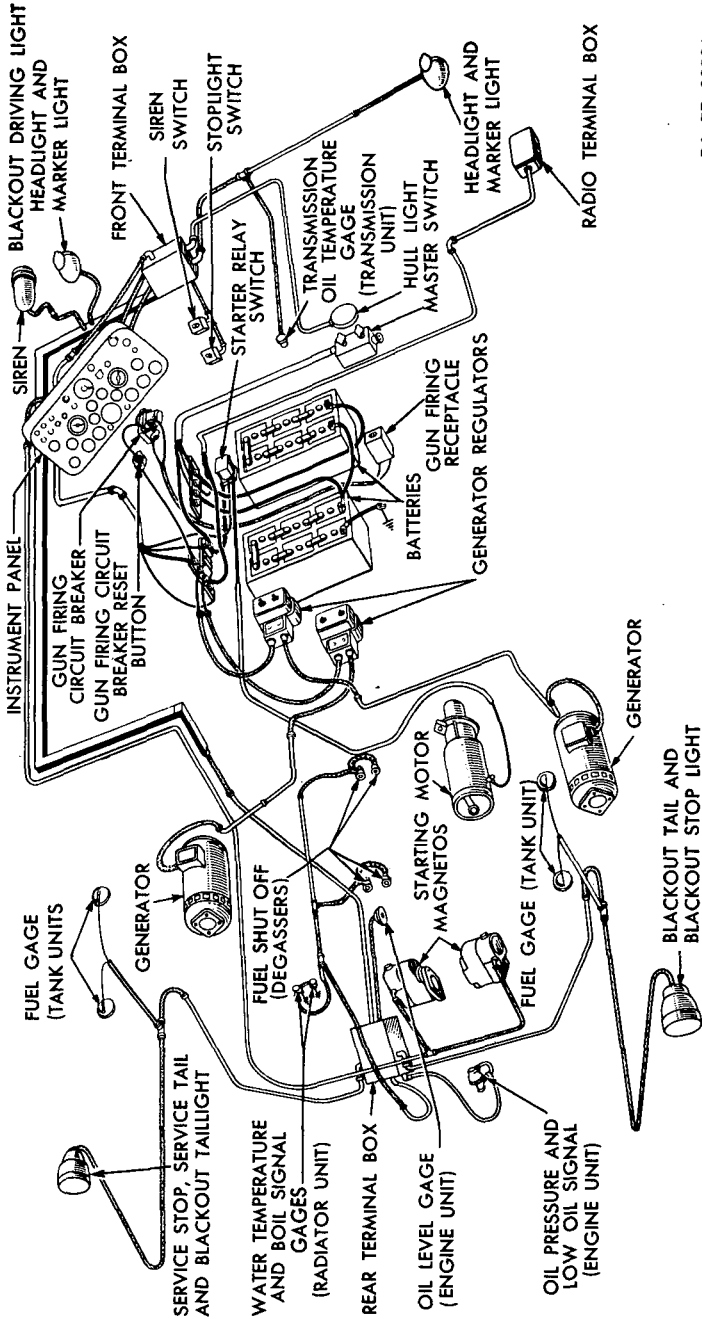
47. GENERAL DESCRIPTION.

a. The various electrical units (generators, cranking motor, switches, electrical gages, etc.) are but briefly mentioned in this section since complete descriptions and replacement procedures for these units are included in TM 9-731G. A drawing of the complete electrical system (fig. 44) shows the location of the various units and the conduits of the system, as viewed from above the right rear corner of the vehicle. Separate drawings (figs. 45 through 60), indicating the use and color of the wires, are provided for the various individual circuits. In these drawings the terminal numbers shown for the various terminal boxes do not actually appear in the terminal boxes but were arbitrarily included in the drawings to assist in identifying the terminals. The hull and turret wiring is carried through metal conduits for the protection of the insulation of the wires. In the various drawings the shaded portions of the conduits (figs. 45 through 60) represent braided flexible conduits, and the portions of the conduits illustrated by two parallel lines represent rigid conduits. The color and size of the wires in each circuit are shown in the drawings of the various electrical systems.

48. CONDUIT AND WIRE REPLACEMENT.

a. **Conduit Replacement.** Dented or cracked conduits, or conduits with damaged couplings, must be replaced. Flexible portions of a conduit which have become frayed must be replaced. The main conduits are made up in sections and, in most cases, they can be replaced without disturbing undamaged sections.

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Figure 44—M10A1 Electrical System

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b. **Wire Replacement.** In most cases, replacement of wires can be made without the necessity of removing the conduit from the vehicle. Remove the terminals from the defective wire, solder a piece of fish wire, longer than the conduit, to the end of the wire to be replaced. Pull the defective wire out of the conduit, pulling the fish wire in through the conduit at the same time. Cut a new piece of wire the same color and size as the one removed. Solder one end of the new wire to the fish wire. Rub wires with soapstone, to make pulling easier and to prevent jamming. Pull the fish wire back through the conduit, pulling the new wire or wires in place.

49. LIGHTS AND SIREN CIRCUIT (figs. 45 and 46).

a. The lights and siren circuit drawing shows the location of the conduits and wiring for lights and siren circuit, and indicates the size and color of the wires to the various electrical units.

50. GUN FIRING CIRCUIT (fig. 47).

a. The gun firing circuit receptacle is located at the center of the turret floor. Two wires from this plug are carried in a fabric flexible conduit and are attached to the gun firing circuit breaker located in the battery box. An extension containing two wires is attached to the gun firing solenoid and the two firing switches. The other end of the extension is equipped with a conventional two-pronged electrical plug which is inserted in the receptacle at the center of the turret floor.

51. RADIO CIRCUIT (fig. 48).

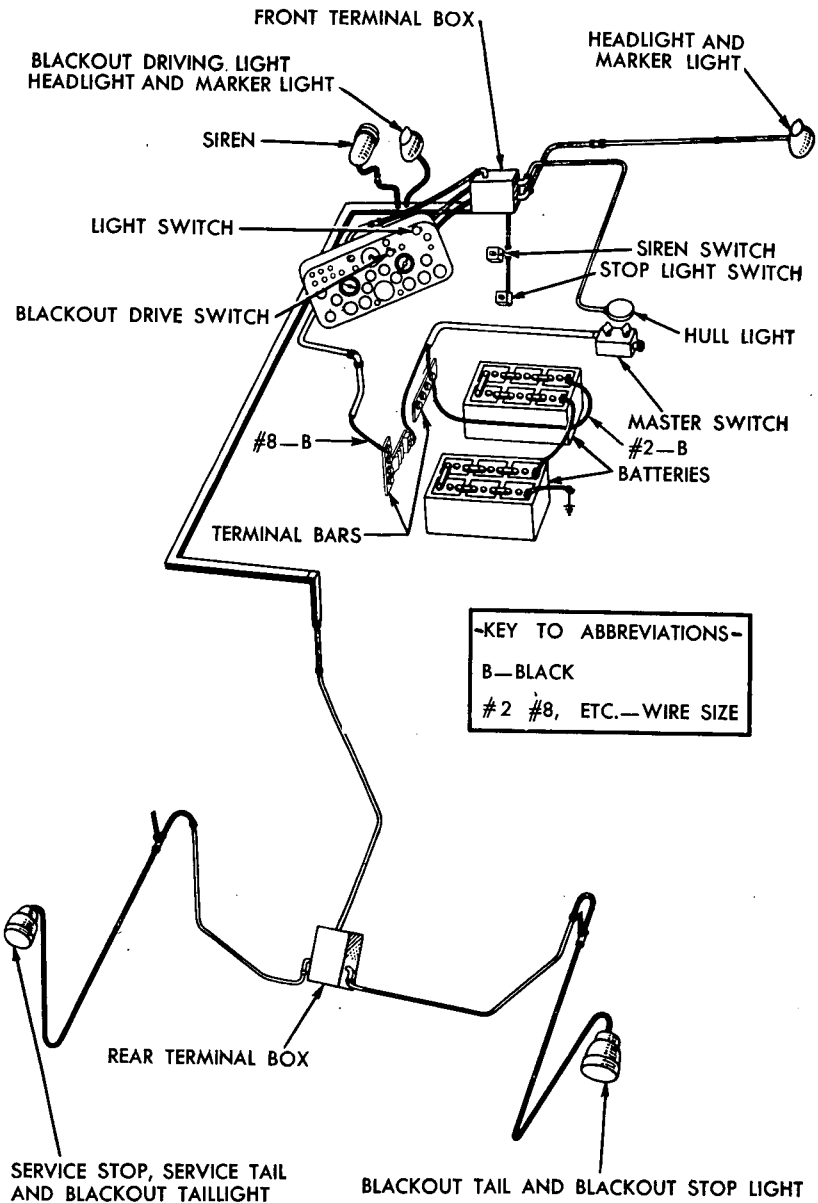
a. The radio circuit consists of one of the 12-volt batteries, radio master switch, radio terminal box and the necessary conduits and wiring. The current for the radio is taken from one battery (rear battery). A rigid conduit runs from the battery box across the back of the driver's compartment to the radio terminal box on the right-hand sponson. This conduit consists of two sections attached together with a union coupling. Two wires are contained in this conduit. The large black wire is a utility wire and is attached to the terminal bar in the battery box. The smaller black wire is the radio wire, and is attached to the radio master switch.

52. STARTING CIRCUIT.

a. **General** (fig. 49). The starting circuit consists of two 12-volt batteries connected in series (24 volts) master switch, starting relay switch, starter button in the instrument panel, cranking motor (24 volts), and connecting wires.

b. **Conduits and Wiring** (fig. 49). The heavy cable, extending from the cranking motor to the starter relay switch in the battery box, is contained in a rigid conduit. This conduit extends from the bulkhead,

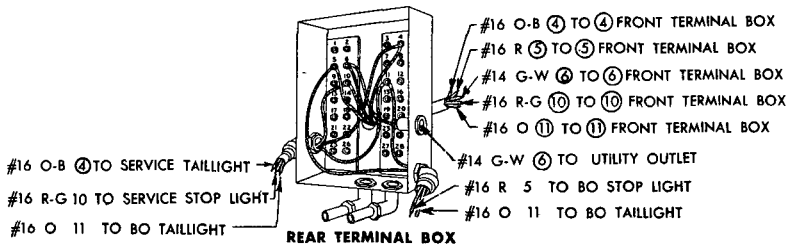
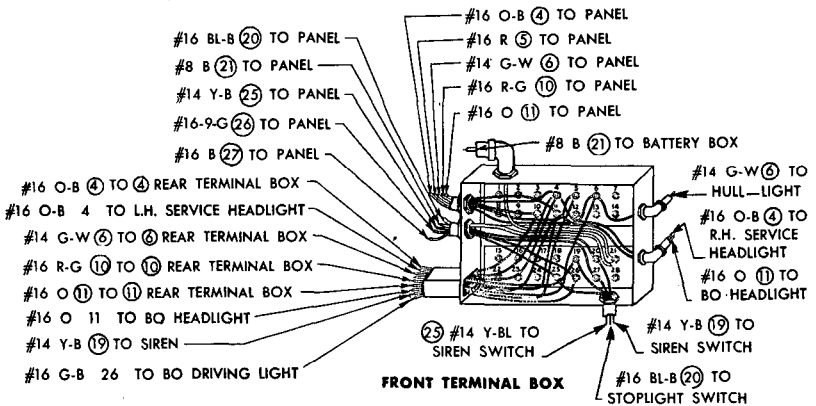
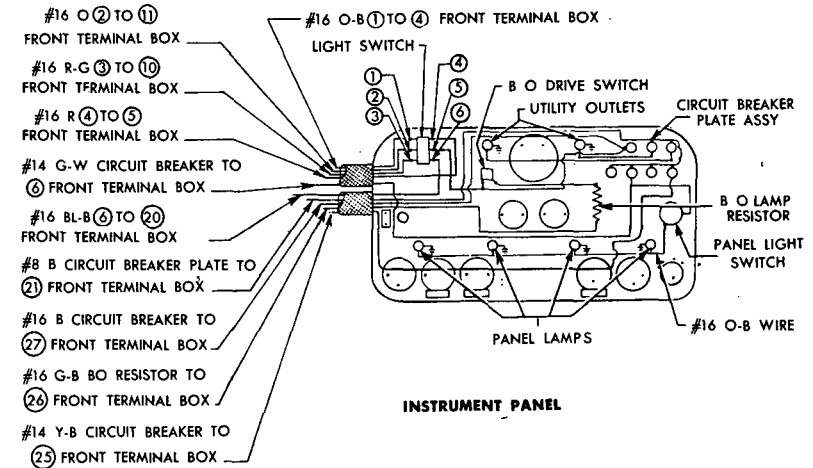
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Figure 45—M10A1 Lights and Siren Circuit

M10A1 ELECTRICAL SYSTEMS



KEY TO ABBREVIATIONS

B—BLACK	O—ORANGE	R—RED	BL-B—BLUE WITH BLACK TRACER	G-W—GREEN WITH WHITE TRACER	G-B—GREEN WITH BLACK TRACER	B O—BLACKOUT
O-B—ORANGE WITH BLACK TRACER	R-G—RED WITH GREEN TRACER	Y-B—YELLOW WITH BLACK TRACER	Y-BL—YELLOW WITH BLUE TRACER	④, ⑤ ETC., TERMINAL NUMBERS	#14, #16, ETC.—WIRE SIZE	

RA PD 28459

Figure 46—Instrument Panel, Front and Rear Terminal Boxes for M10A1 Lights and Siren Circuit

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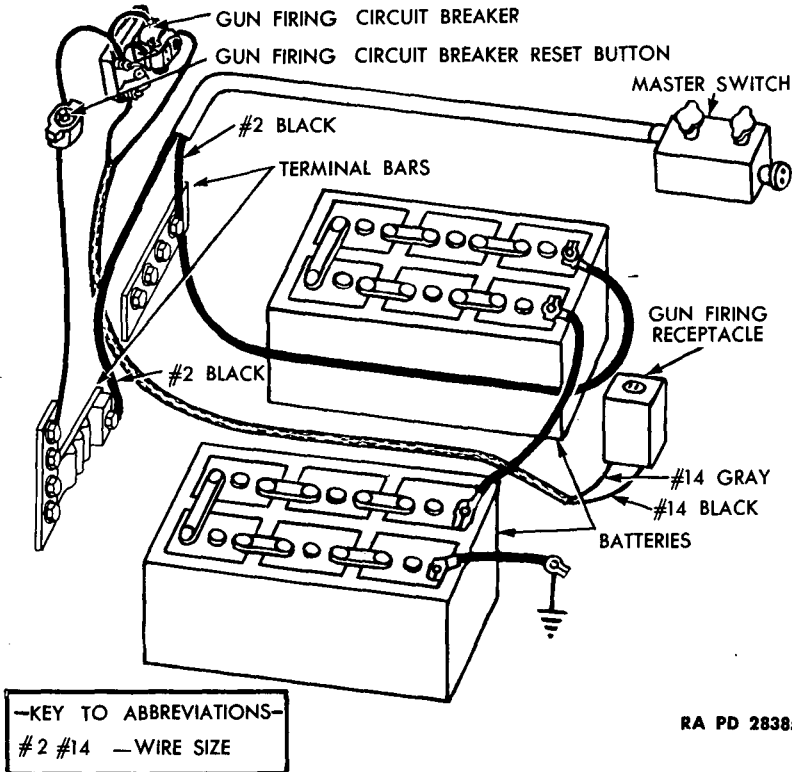


Figure 47—M10A1 Gun Firing Circuit

right side, to the battery box and is located under the turret floor. The wire from the starter relay switch to the starter button in the instrument panel is carried through a conduit to the terminal (No. 23) in the front terminal box. A wire of the same color (white with black tracer) extends from the starter button in the instrument panel to this same terminal (No. 23) in the front terminal box. The other terminal on the starter button is connected to the live terminal at the circuit breaker, thus completing the circuit.

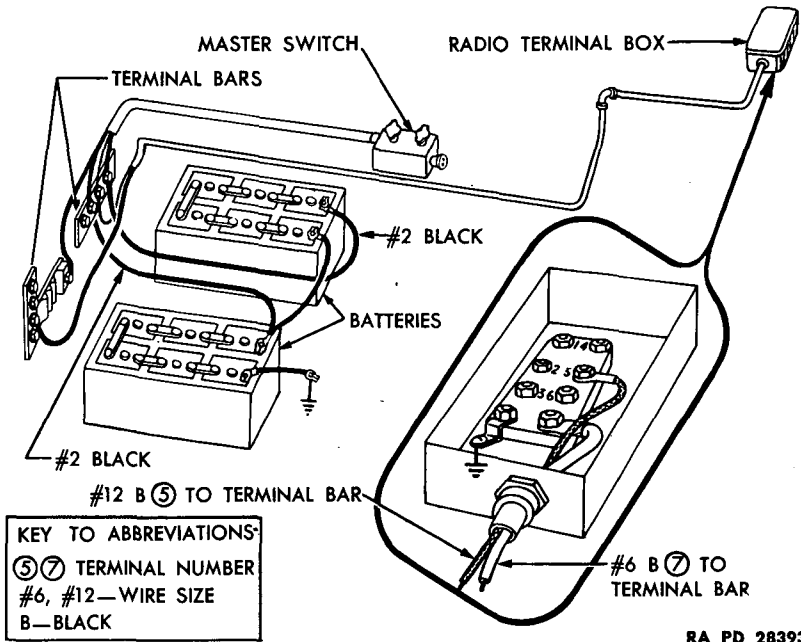
53. GENERATING CIRCUIT (figs. 50 and 51).

a. The generating circuit (fig. 50) consists of two generators, two generator regulators, two batteries, an ammeter, a voltmeter, a generator circuit breaker for each generator, and connecting wires.

b. **Generators.** The two 30-volt generators are mounted on the accessory drive gear housing on each side of the engine compartment.

c. **Generator Regulators.** The two generators are each equipped with a regulator (fig. 50) located on the subfloor of the fighting com-

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RA PD 28393

Figure 48—M10A1 Radio Circuit

partment. The generator regulator includes a voltage regulator unit, current limiter unit, and reverse current relay or cut-out unit.

d. **Batteries.** Two 12-volt storage batteries, connected in series, are secured in a battery box located on the left side of the fighting compartment subfloor. A battery master switch and the radio master switch are located in the driver's compartment. When these switches are off, the batteries are completely disconnected, and all electrical circuits are open.

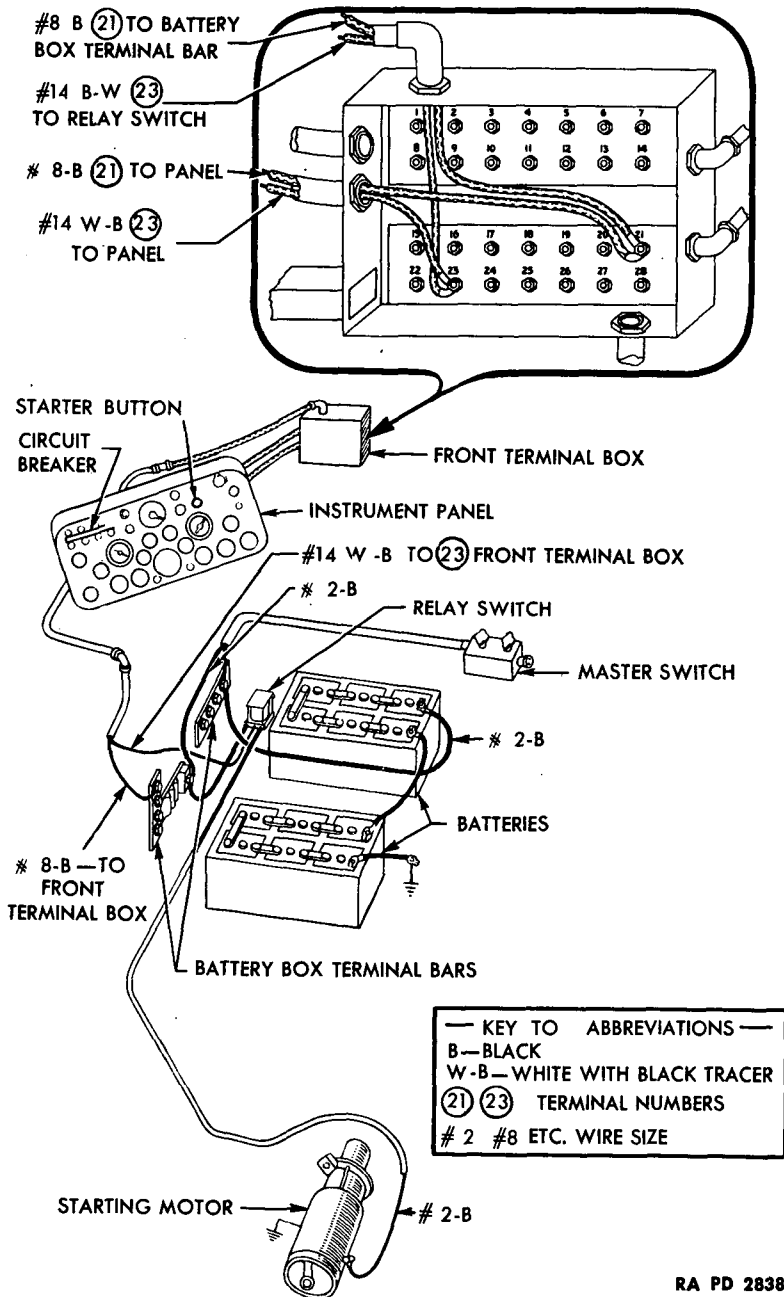
e. **Ammeter and Voltmeter.** An ammeter and voltmeter are located in the instrument panel and are accessible for removal, after first removing the instrument panel from its mounting brackets, and removing the cover from the back of the panel.

f. **Generator Circuit Breakers.** A generator circuit breaker is located in the terminal box of each generator. They are accessible for removal after the cover from the terminal boxes has been removed.

g. **Conduits and Wiring (fig. 50).**

(1) **GENERATORS TO GENERATOR REGULATOR CONDUITS AND WIRING.** The conduit between each generator and generator regulator consists of three sections, a flexible section attached to each end of a rigid section by means of union couplings. The rigid section is secured to the floor of the engine compartment with clips. Each of these con-

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Figure 49—M10A1 Starting Circuit

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duits contains a large black wire and a smaller yellow wire. One end of the black wire is attached to the terminal of the generator circuit breaker and the other end to the terminal marked "ARM" on the generator regulator. One end of the yellow wire is attached to the field terminal on the generator and the other end to the terminal marked "FIELD" on the generator regulator.

(2) **GENERATOR REGULATOR TO BATTERY BOX CONDUIT AND WIRING.** A flexible conduit is provided between each of the generator regulators and the battery box. Each of these conduits contains a heavy black wire with one end attached to the terminal marked "BATT" in the generator regulators and the other end attached to the two center terminal posts on the terminal bar in the battery box.

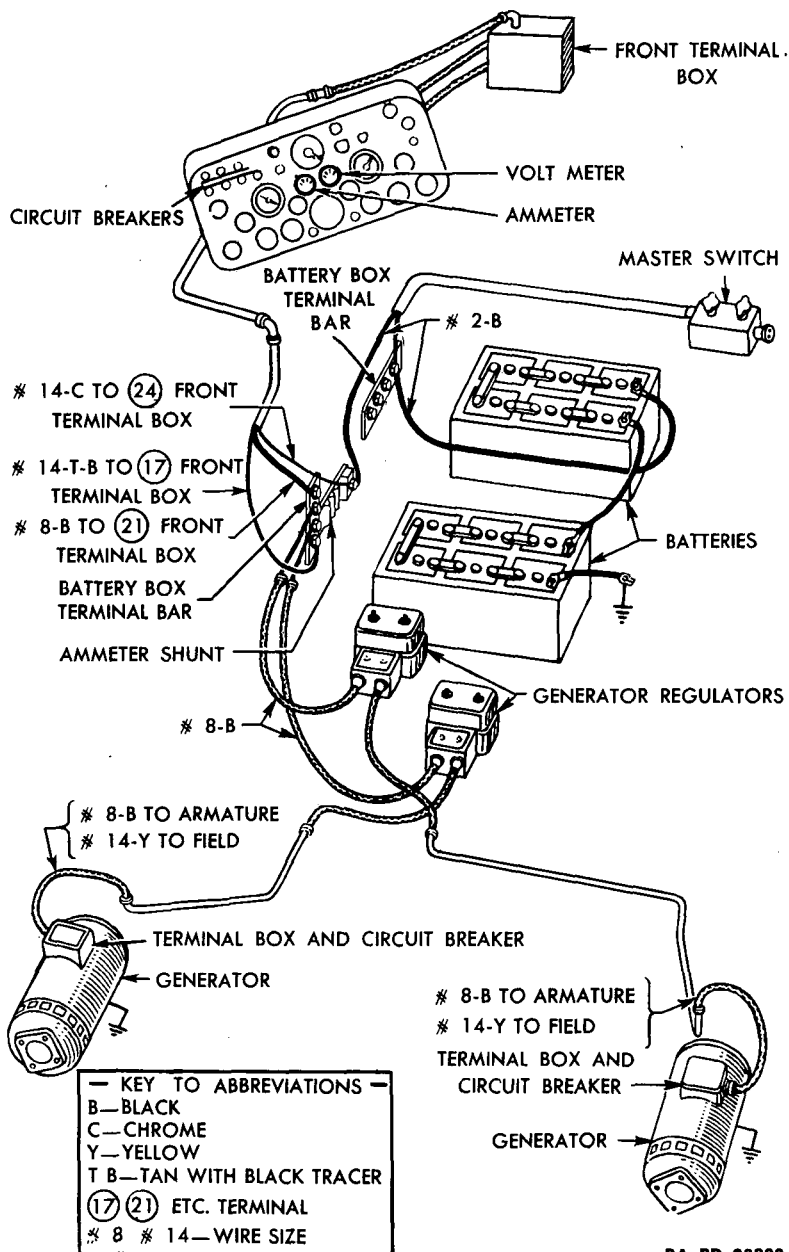
(3) **CONDUIT AND WIRING FROM BATTERY BOX TO FRONT TERMINAL BOX.** A conduit, extending from the battery box to the front terminal box, extends along the left side of the hull and is made up of two rigid sections and a flexible section connected together with union couplings. The flexible end connects to the top of the front terminal box. The rigid section is secured to the sponson with clips. This conduit contains four wires, two of which are part of the generating system. The colors of these two wires are tan with black tracer, and chrome. One end of the tan with black tracer wire is connected to the bottom post of the terminal bar in the battery box. The other end is attached to number 17 (fig. 51) terminal in the front terminal box. One end of the chrome-colored wire is attached to the ammeter shunt in the battery box. The other end of the chrome-colored wire is attached to number 24 (fig. 51) terminal in the front terminal box.

(4) **CONDUIT AND WIRING FROM FRONT TERMINAL BOX TO AMMETER IN INSTRUMENT PANEL** (fig. 50). A flexible conduit is connected between the front terminal box and the instrument panel. This conduit contains 12 wires, two of which are a part of the generating system. The color of these two wires are tan with black tracer, and chrome. One end of the tan with black tracer wire connects to number 17 terminal in the front terminal box, and the other end connects to the left-hand terminal of the ammeter in the instrument panel (fig. 51). One end of the chrome-colored wire connects to number 24 terminal in the front terminal box and the other end to the right-hand terminal of the ammeter (fig. 51). Right and left are determined by facing the back of the instrument panel.

54. IGNITION CIRCUIT (fig. 52).

a. The magnetos are normally on, and are turned off by grounding them through the ignition switch. The conduit, carrying the magneto ground wires, consists of a rigid section running along the sponson on the left side of the hull and to the rear of the engine compartment. The forward end of this rigid section is connected to the back of the instrument panel by means of a flexible section. The rear end of the

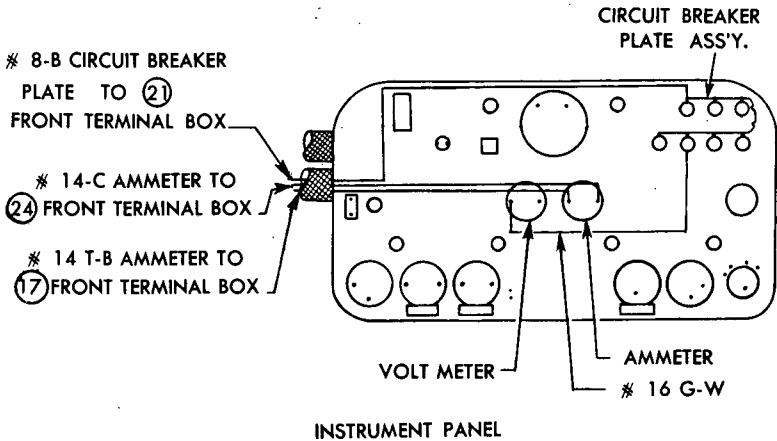
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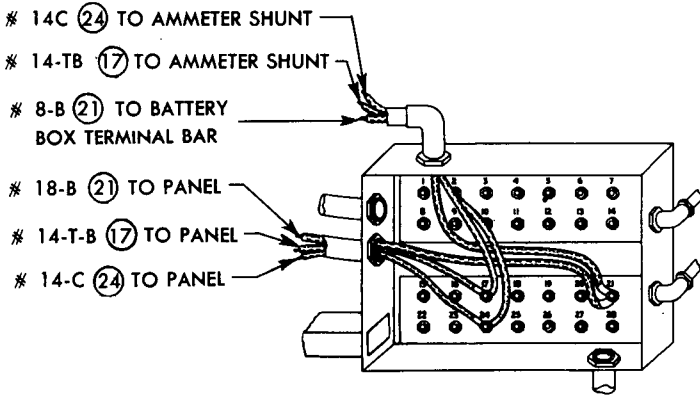
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Figure 50—M10A1 Generating Circuit

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INSTRUMENT PANEL



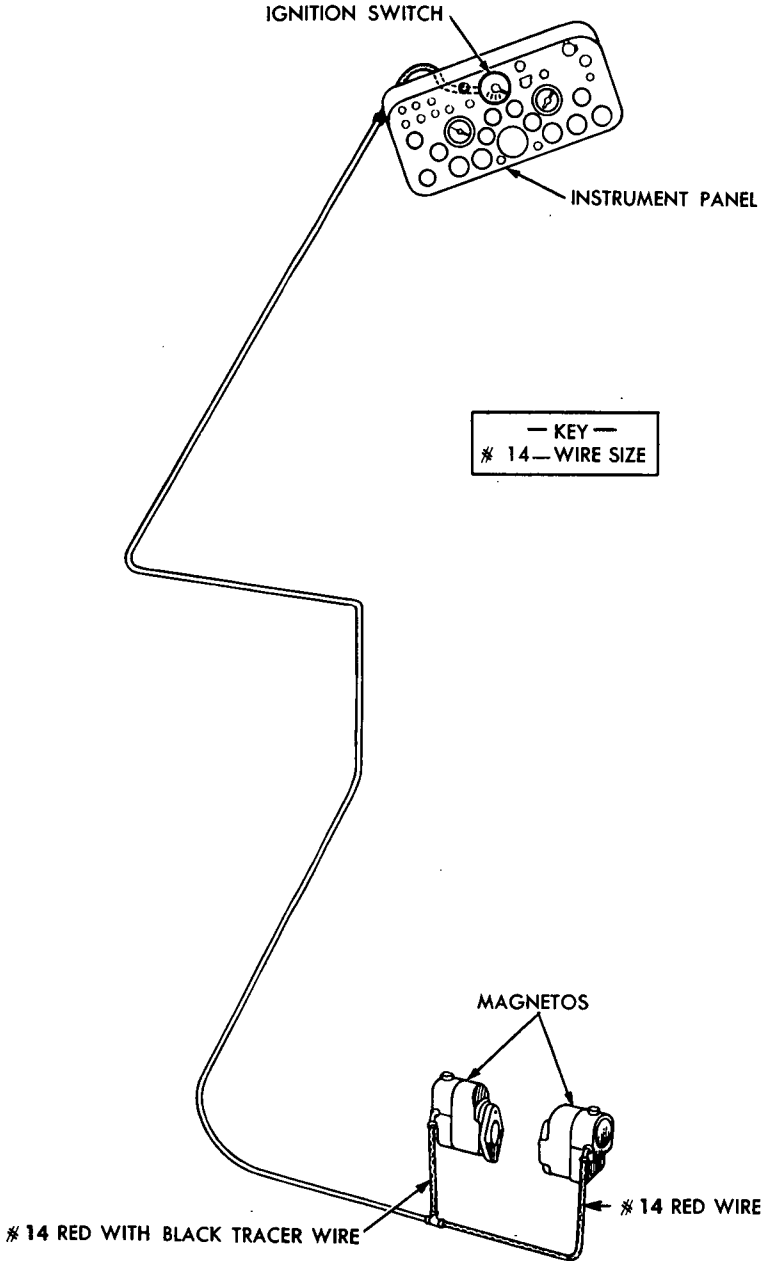
FRONT TERMINAL BOX

— KEY TO ABBREVIATIONS —	
B	—BLACK
C	—CHROME
Y	—YELLOW
T-B	—TAN WITH BLACK TRACER
G-W	—GREEN WITH WHITE TRACER
(17) (21) ETC.	TERMINAL NUMBERS
# 8 # 14	—WIRE SIZE

RA PD 28462

Figure 51—Instrument Panel and Front Terminal Box for M10A1 Generating Circuit

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Figure 52—M10A1 Ignition Circuit

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rigid section is connected to each of the magnetos by means of flexible sections. This conduit contains a red wire and a red with black tracer wire. The red wire is attached to the right-hand magneto and the red with black tracer wire to the left-hand magneto.

55. ELECTRICAL INSTRUMENT CIRCUITS.

a. General Description. The electrical instruments consist of an oil level gage, oil pressure gage, low oil pressure signal, transmission oil temperature gage, water temperature gage, water boil signal, fuel cut-off (degassers), and fuel level gage. The oil level gage, oil pressure gage, water temperature gage, and boil signal are six-volt instruments, adapted to the 24-volt system by means of resistors and voltage dividers. They are attached to each of these gage units in the instrument panel. The balance of the instruments operate at 24 volts.

b. Conduits and Wiring. The conduit, running from the front terminal box to the rear terminal box, is located on the left side of the hull on the sponson, and continues across the floor of the engine compartment to the rear terminal box. Replacement of a damaged conduit in most cases can be accomplished by replacing the section which is damaged. This conduit contains all the instrument wires except the wire to the transmission oil temperature gage. The conduits between the rear terminal box to the various instruments are connected to the terminal boxes, and to the various electrical units, by knurled nuts.

c. Oil Level Gage Circuit (figs. 53 and 54). The oil level gage circuit consists of an engine unit and instrument panel unit. The engine unit is located on the left side of the engine oil pan.

d. Oil Pressure Gage and Low Oil Pressure Signal Circuits (figs. 55 and 56). The oil pressure gage and the low oil pressure signal consist of two engine units, an indicator, and a signal unit in the instrument panel. The engine units are located on the hull at the rear of the engine compartment and are connected to the engine by means of a high pressure hose.

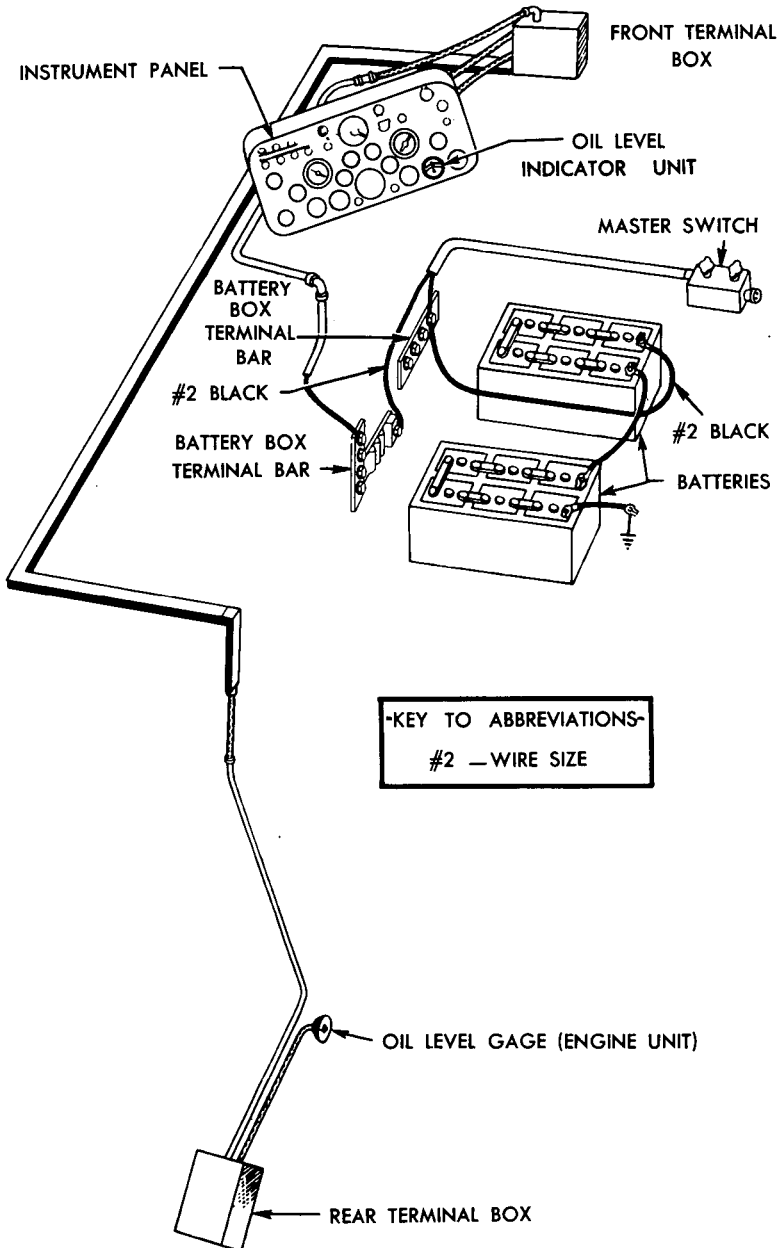
e. Transmission Oil Temperature Gage Circuit (figs. 55 and 56). The transmission oil temperature gage consists of a transmission unit and an instrument panel unit. The transmission unit is located in the driver's compartment on the left side of the transmission.

f. Water Temperature and Boil Signal Gage Circuit (figs. 57 and 58). The water temperature gage and the boil signal gage consist of two units located at the radiator inlet housing, a temperature indicator unit, and a boil signal unit located in the instrument panel.

g. Fuel Cut-off Circuit (degassers) (figs. 57 and 58). The fuel cut-off (degassers) circuit consists of four degassers—two at each carburetor—and a fuel cut-off button located in the instrument panel.

h. Fuel Gage Circuit (figs. 59 and 60). The fuel gage circuit consists of a float unit, located at the top in each of the four fuel tanks, and a fuel gage unit, with selector switch, located in instrument panel.

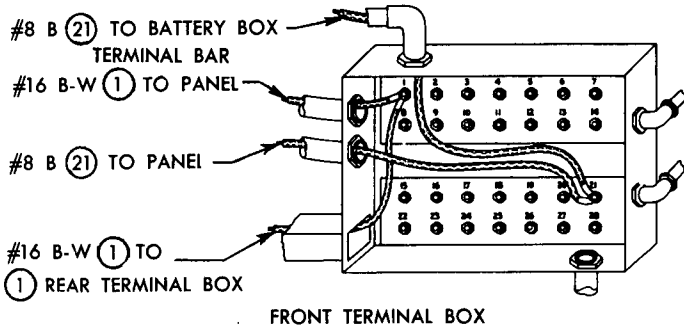
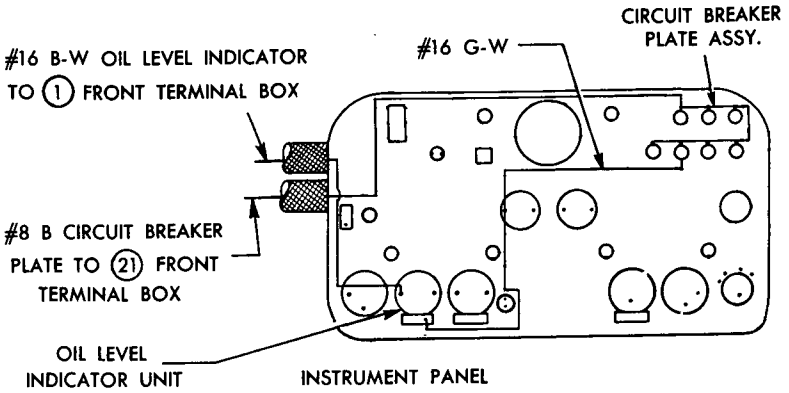
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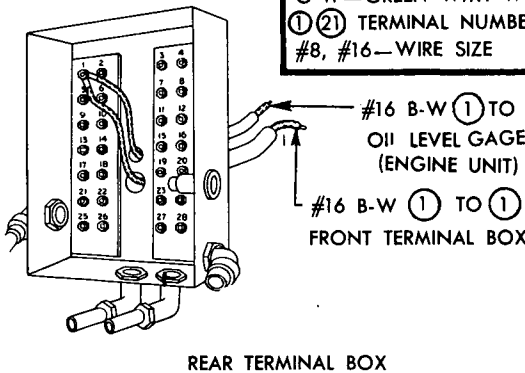
Figure 53—M10A1 Oil Level Gage Circuit

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— KEY TO ABBREVIATIONS —

B—BLACK
B-W—BLACK WITH WHITE TRACER
G-W—GREEN WITH WHITE TRACER
① ②① TERMINAL NUMBERS
#8, #16—WIRE SIZE

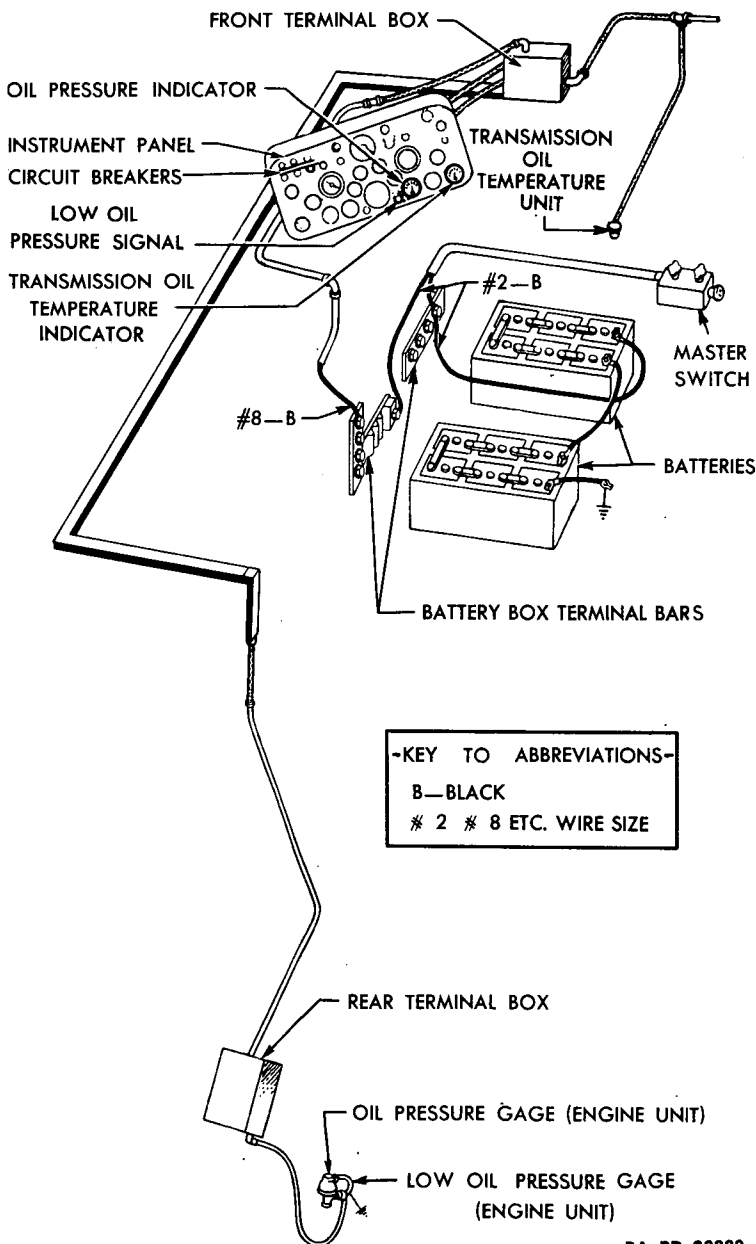


RA PD 28457

Figure 54—Instrument Panel, Front and Rear Terminal Boxes for M10A1 Oil Level Circuit

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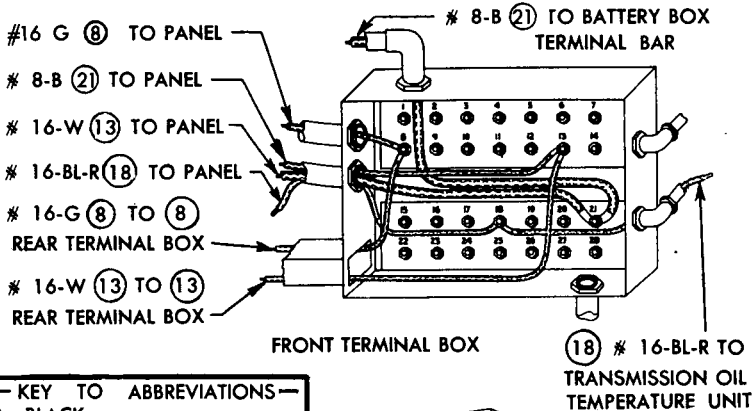
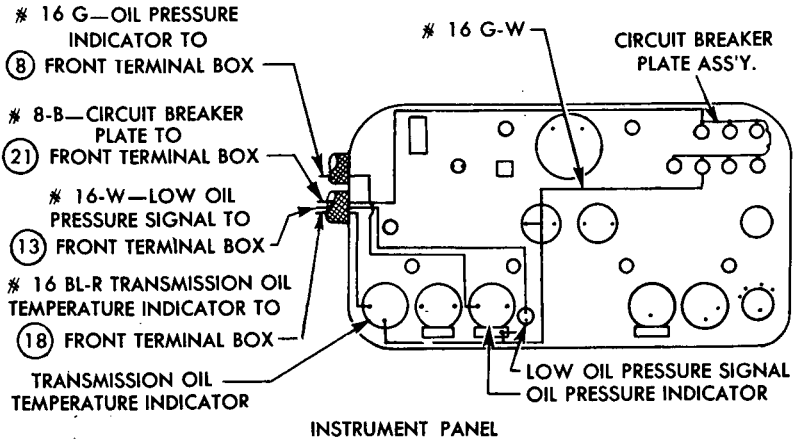
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FOR 3-INCH GUN MOTOR CARRIAGES M10 AND M10A1



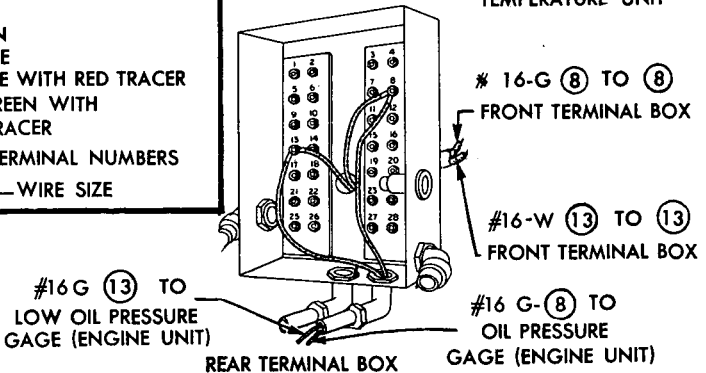
RA PD 28383

Figure 55—M10A1 Oil Pressure Gage, Low Oil Pressure Signal and Transmission Oil Temperature Gage Circuits

M10A1 ELECTRICAL SYSTEMS



— KEY TO ABBREVIATIONS —
 B—BLACK
 G—GREEN
 W—WHITE
 BL-R—BLUE WITH RED TRACER
 G-W—GREEN WITH WHITE TRACER
 (8) (13) TERMINAL NUMBERS
 #8, #16—WIRE SIZE

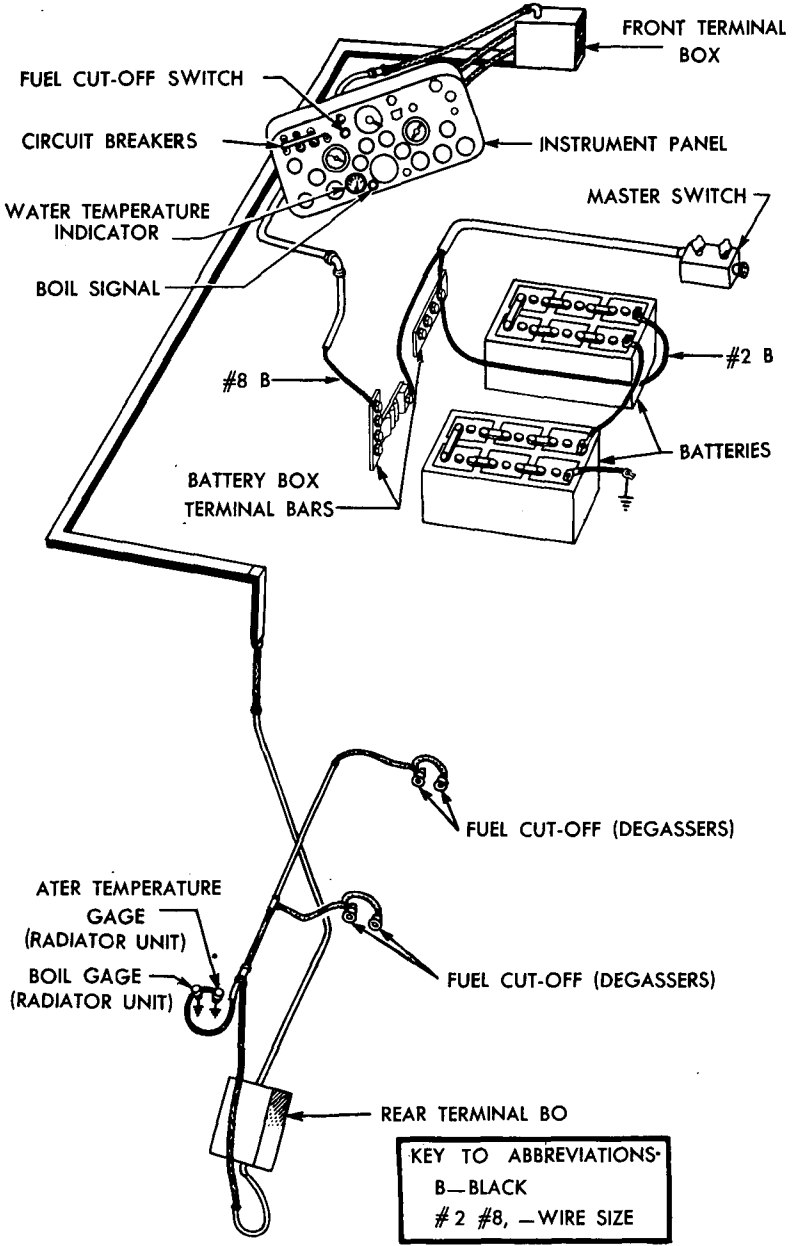


RA PD 28461

Figure 56—Instrument Panel, Front and Rear Terminal Boxes for M10A1 Oil Pressure Gage, Low Oil Pressure Signal and Transmission Oil Temperature Gage Circuits

ORDNANCE MAINTENANCE

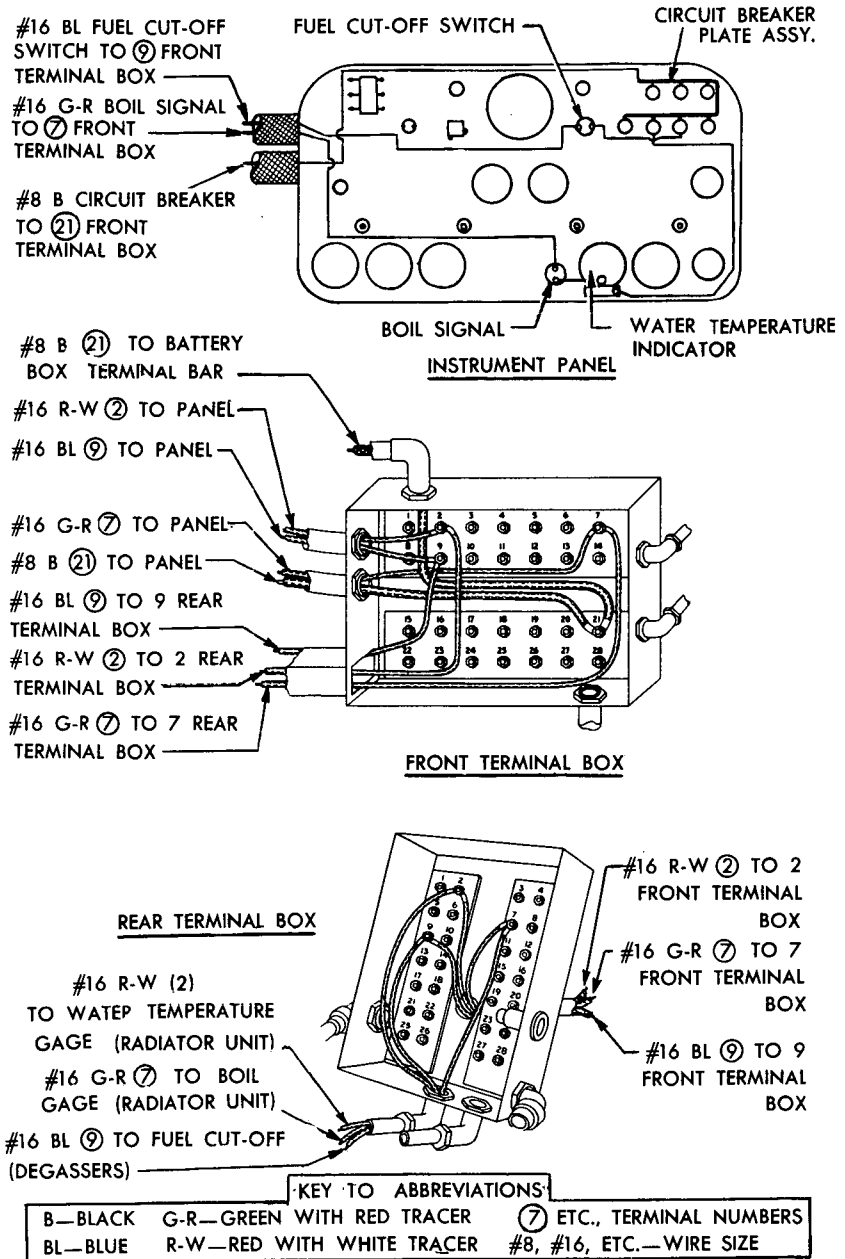
HULL AND TURRET, ELECTRICAL SYSTEMS, TRACKS AND SUSPENSION FOR 3-INCH GUN MOTOR CARRIAGES M10 AND M10A1



RA PD 28380

Figure 57—M10A1 Water Temperature Gage, Boil Signal and Fuel Shut-off (degassers) Circuits

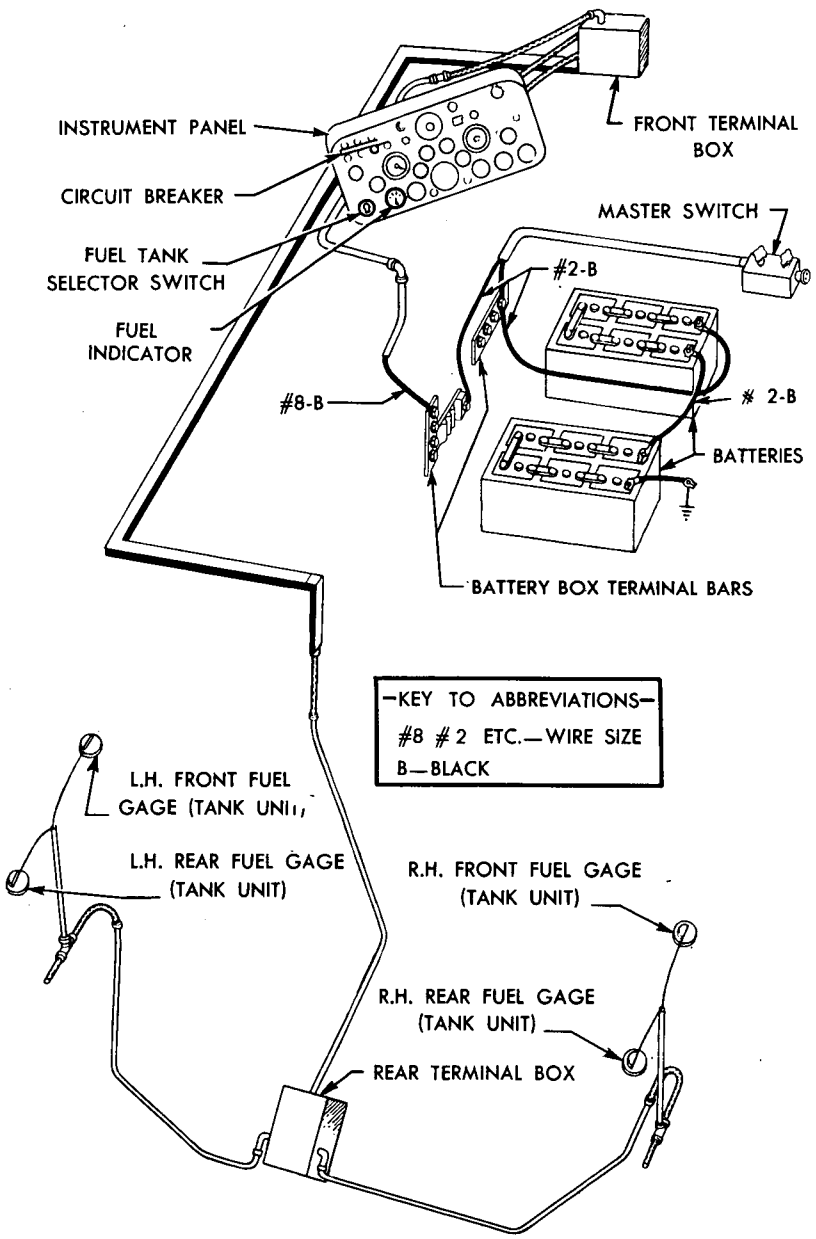
M10A1 ELECTRICAL SYSTEMS



RA PD 28458

Figure 58—Instrument Panel, Front and Rear Terminal Boxes for M10A1 Water Shut-off Gage, Boil Signal and Fuel Shut-off (degassers) Circuits

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HULL AND TURRET, ELECTRICAL SYSTEMS, TRACKS AND SUSPENSION
FOR 3-INCH GUN MOTOR CARRIAGES M10 AND M10A1



RA PD 28381

Figure 59—M10A1 Fuel Gage Circuit

M10A1 ELECTRICAL SYSTEMS

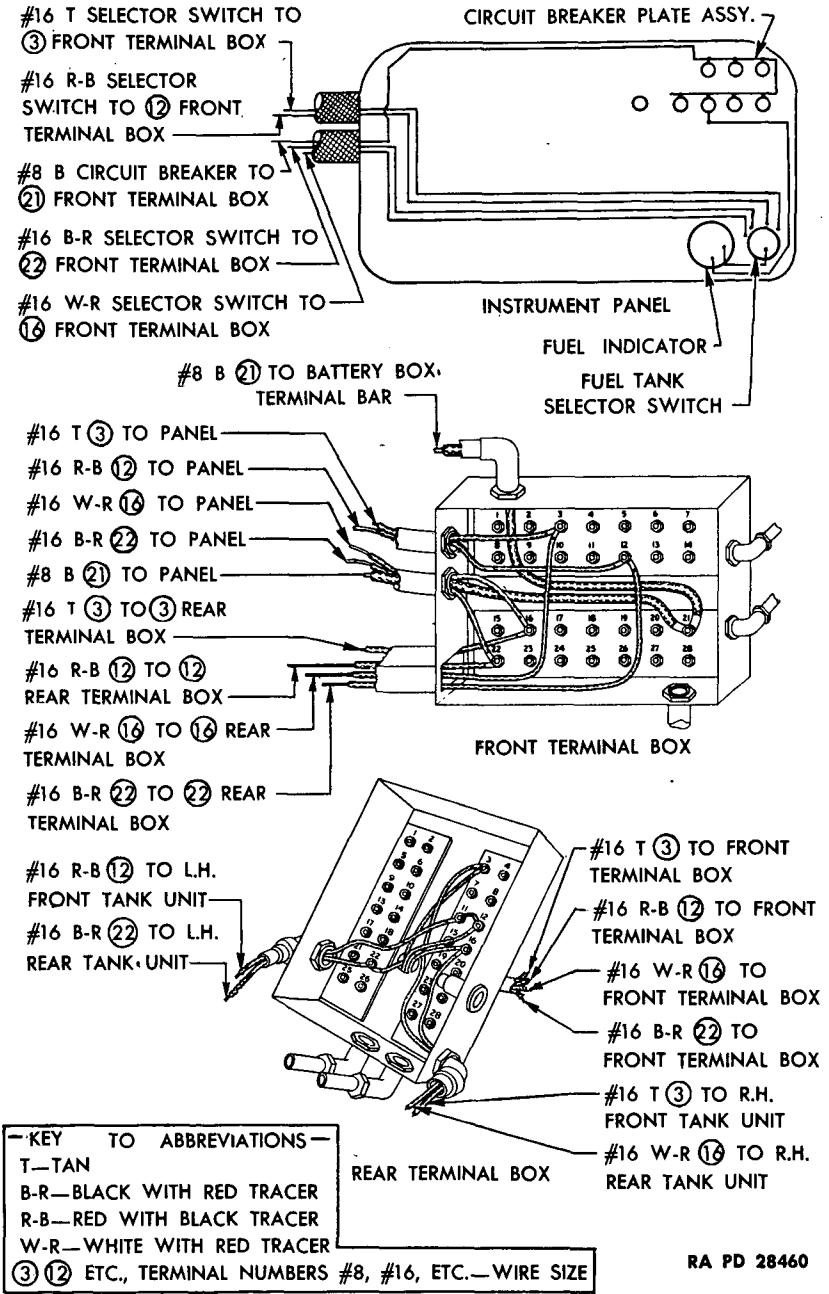


Figure 60—Instrument Panel, Front and Rear Terminal Boxes for M10A1 Fuel Gage Circuit

ORDNANCE MAINTENANCE
HULL AND TURRET, ELECTRICAL SYSTEMS, TRACKS AND SUSPENSION
FOR 3-INCH GUN MOTOR CARRIAGES M10 AND M10A1

CHAPTER 4

ELECTRICAL SYSTEMS (Cont'd)

Section II

M10 ELECTRICAL SYSTEMS

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Gun firing circuit	59
Radio circuit	60
Starting circuit	61
Generating circuit	62
Electrical instrument circuits	63

56. GENERAL DESCRIPTION.

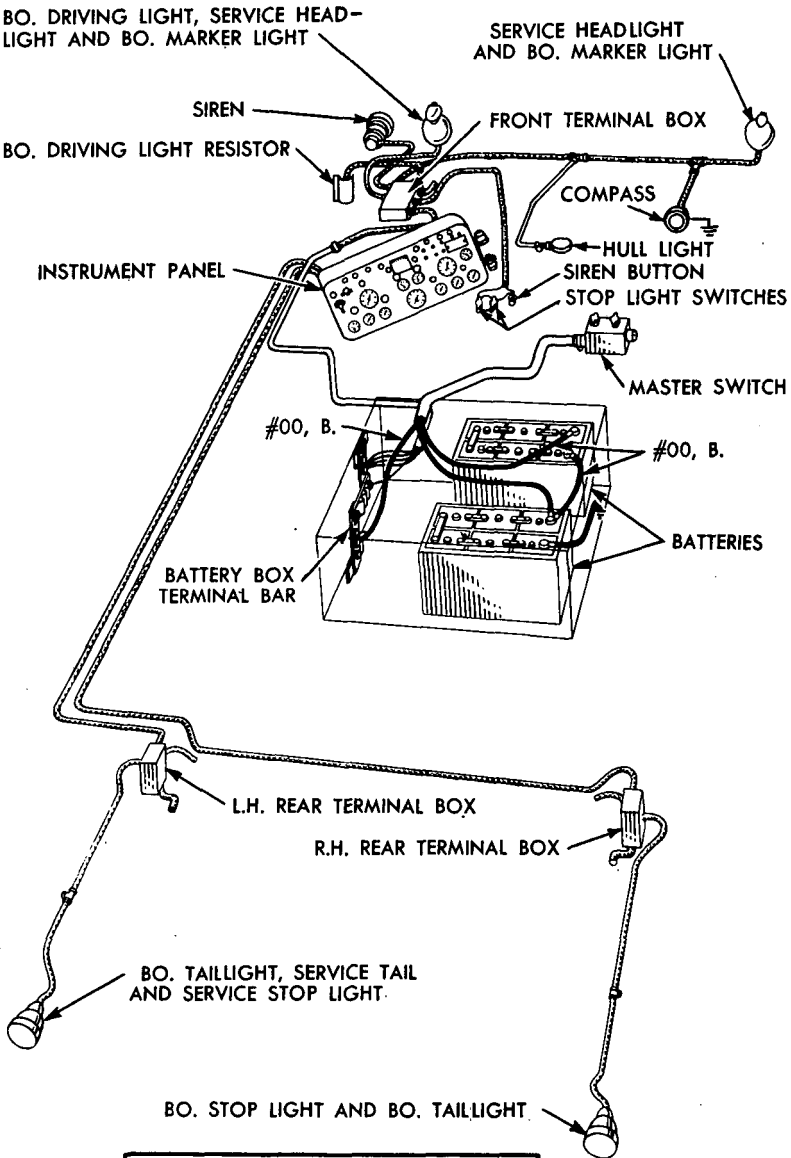
a. The various electrical units (generators, cranking motors, switches, electrical gages, etc.) are but briefly mentioned in this section, since complete descriptions and replacement procedures for these units are included in TM 9-752. A drawing of the complete electrical system (fig. 61) shows the location of the various units and the conduits of the system as viewed from above the right rear corner of the vehicle. Separate drawings (figs. 62 through 73), indicating the size and color of the wires, are provided for the various individual circuits. In these drawings, the terminal numbers shown for the various terminal boxes do not actually appear in the terminal boxes, but were intentionally included in the drawings to assist in identifying the terminals. The hull and turret wiring is carried through metal conduits for the protection of the insulation of the wires. In the various drawings, the shaded portions of the conduits (figs. 62 through 73) represent braided flexible conduits, and the portions of the conduits illustrated by two parallel lines represent rigid conduits.

57. CONDUITS AND WIRE REPLACEMENT.

a. **Conduit Replacement.** Dented or cracked conduits or conduits with damaged couplings must be replaced. Flexible portions of a conduit which have become frayed must be replaced. The main conduits are made up in sections, in most cases, and can be replaced without disturbing undamaged sections.

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HULL AND TURRET, ELECTRICAL SYSTEMS, TRACKS AND SUSPENSION
FOR 3-INCH GUN MOTOR CARRIAGES M10 AND M10A1

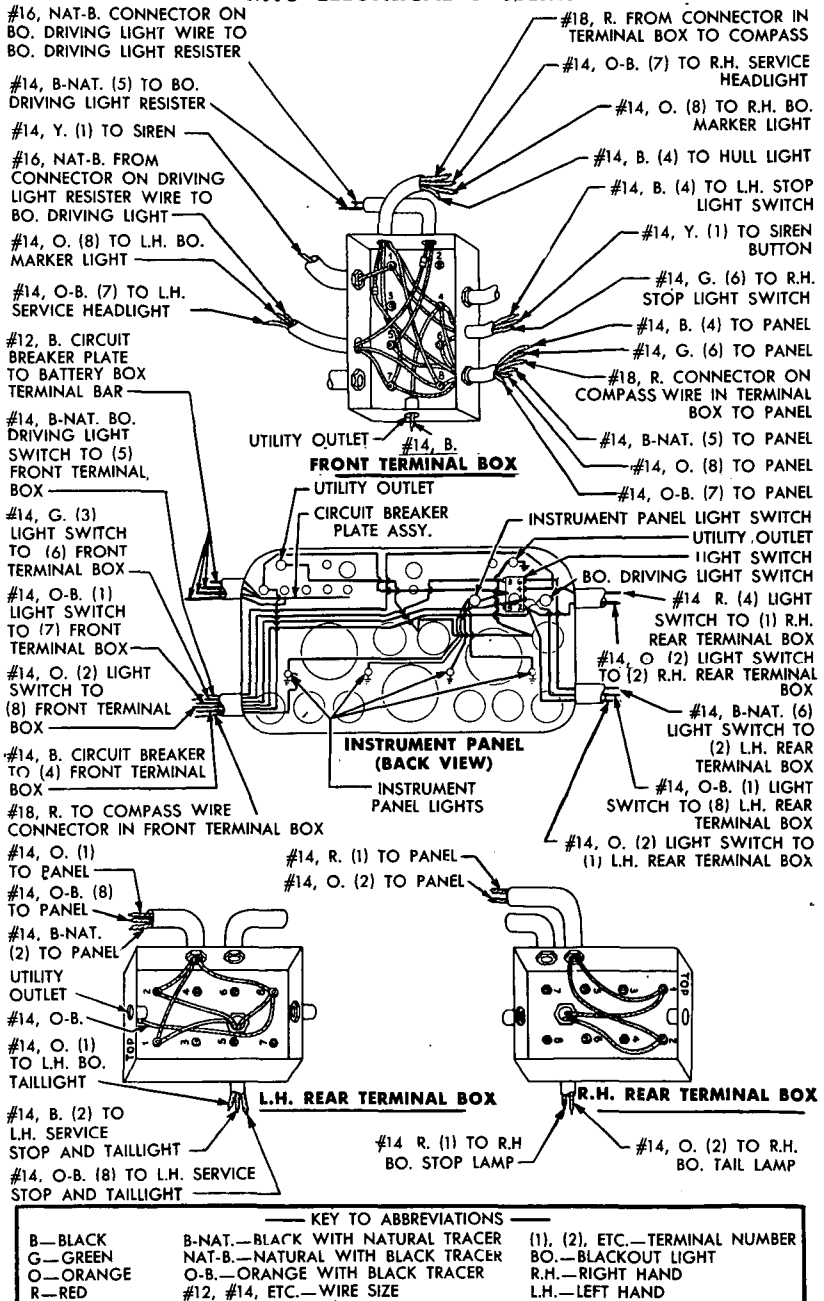


— KEY TO ABBREVIATIONS —
 B.—BLACK BO.—BLACKOUT
 #00—WIRE SIZE R.H.—RIGHT HAND
 L.H.—LEFT HAND

RA PD 28475

Figure 62—M10 Lights and Siren Circuit

M10 ELECTRICAL SYSTEMS

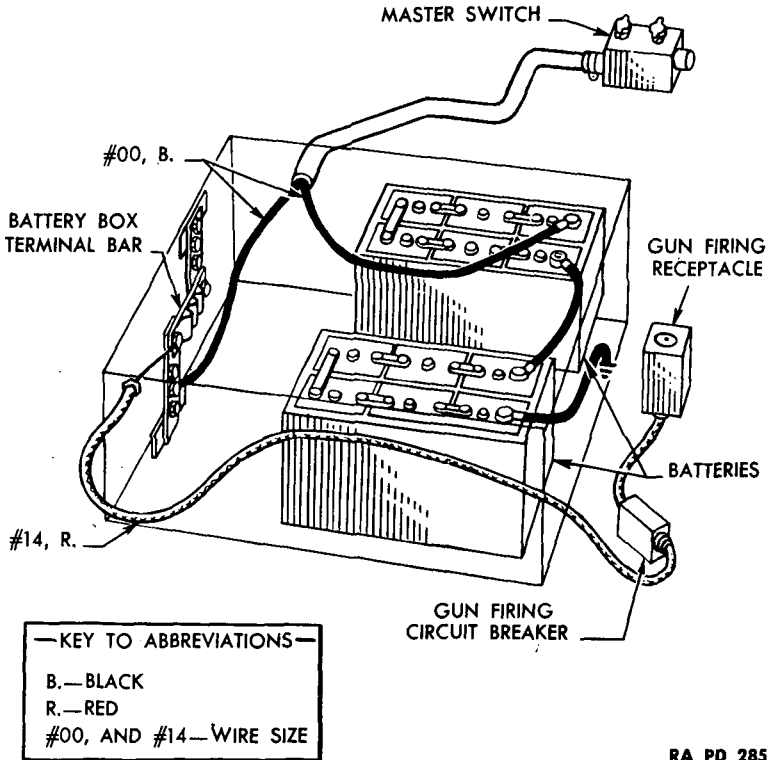


RA PD 28576

Figure 63—Instrument Panel, Front and Rear Terminal Boxes for M10 Lights and Siren Circuit

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HULL AND TURRET, ELECTRICAL SYSTEMS, TRACKS AND SUSPENSION
FOR 3-INCH GUN MOTOR CARRIAGES M10 AND M10A1

b. **Wire Replacement.** In most cases, replacement of wires can be made without the necessity of removing the conduit from the vehicle. Remove terminals from the defective wire, solder a piece of fish wire, longer than the conduit, to the end of the wire to be replaced. Pull the defective wire out of the conduit, pulling the fish wire in through the conduit at the same time. Cut a new piece of wire, the same color and size as the one removed. Solder one end of the new wire



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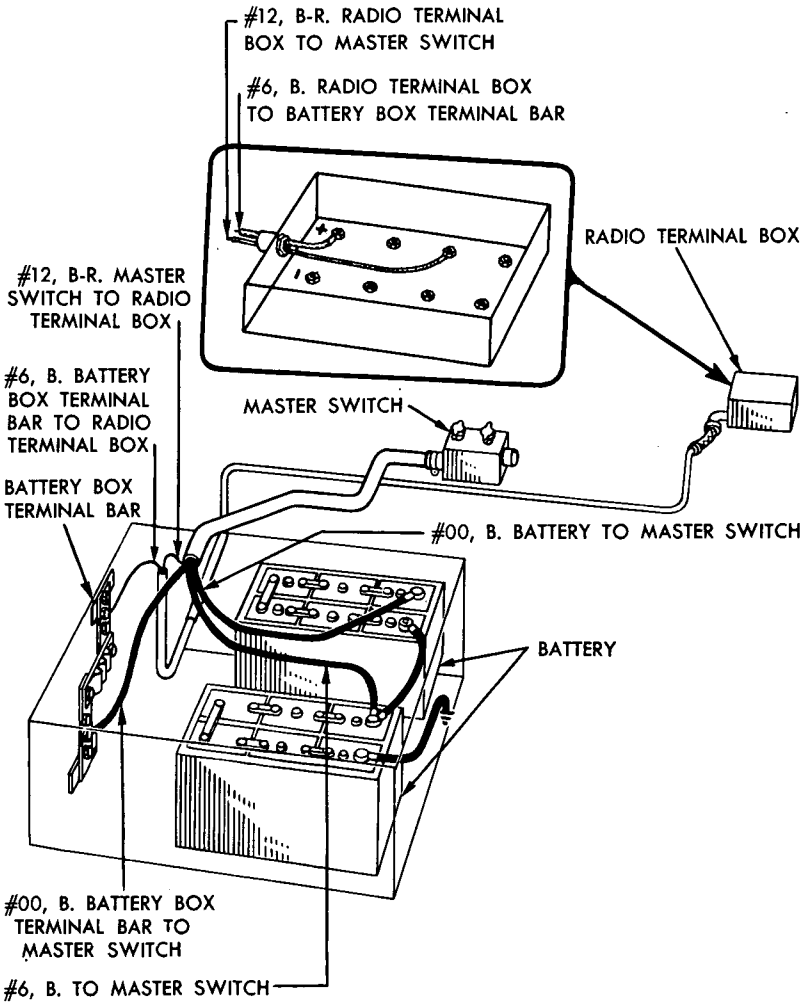
Figure 64—M10 Gun Firing Circuit

to the fish wire. Rub wires with soapstone to make pulling easier and to prevent jamming. Pull the fish wire back through the conduit, pulling the new wire or wires into place.

58. LIGHTS AND SIREN CIRCUIT (fig. 62).

a. The lights and siren circuits drawing shows the location of the conduits and wiring for lights and siren circuits and indicates the size and color of the wires to the various electrical units.

M10 ELECTRICAL SYSTEMS



— KEY TO ABBREVIATIONS —

B.—BLACK

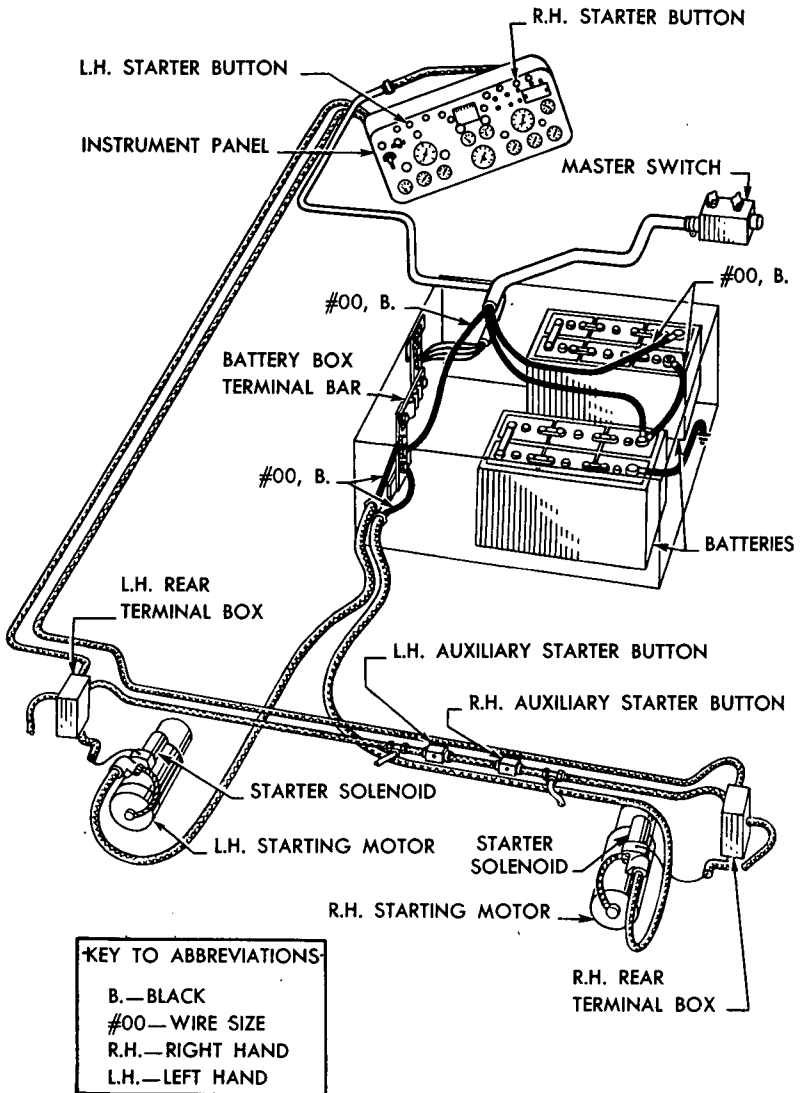
B-R.—BLACK WITH RED TRACER

#00, #6, ETC.— WIRE SIZE

RA PD 28578

Figure 65—M10 Radio Circuit

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 HULL AND TURRET, ELECTRICAL SYSTEMS, TRACKS AND SUSPENSION
 FOR 3-INCH GUN MOTOR CARRIAGES M10 AND M10A1



RA PD 28579

Figure 66—M10 Starting Circuit

M10 ELECTRICAL SYSTEMS

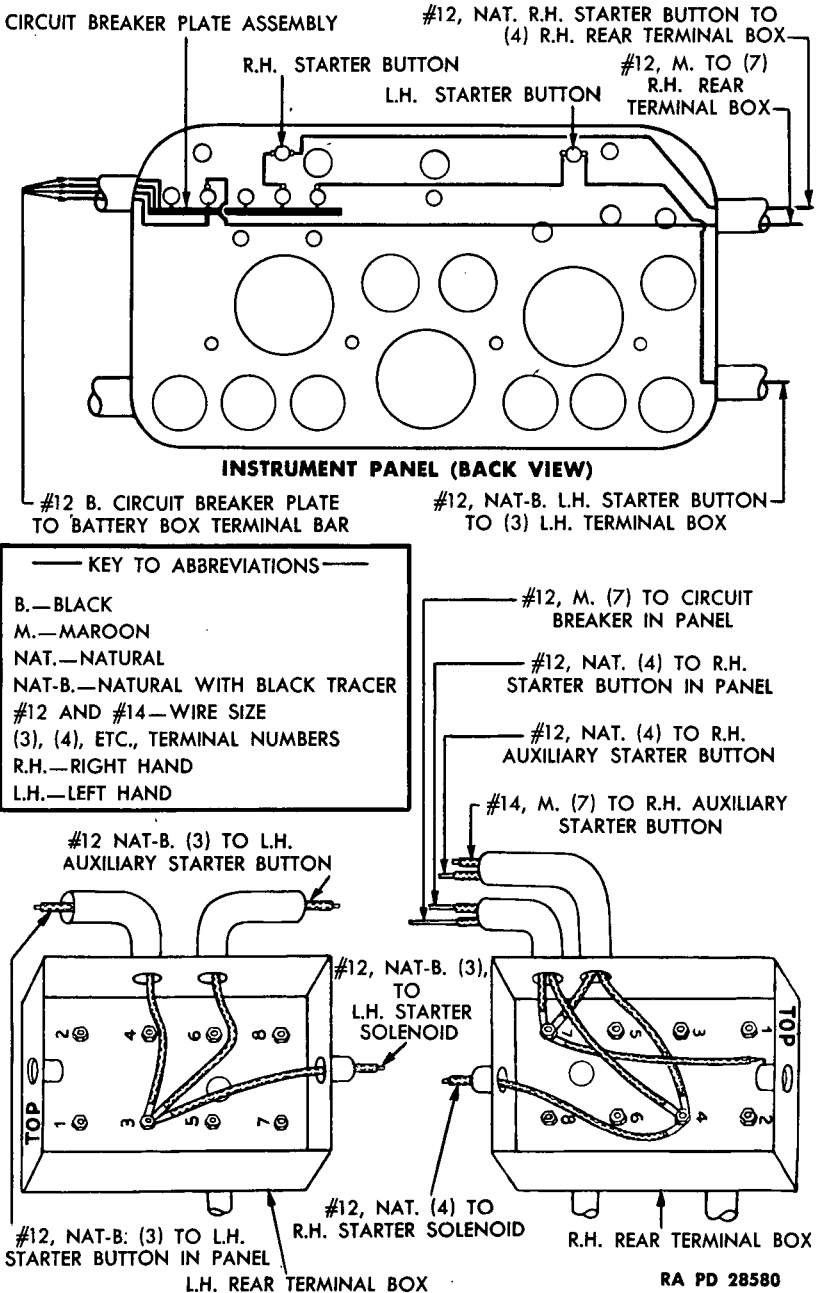
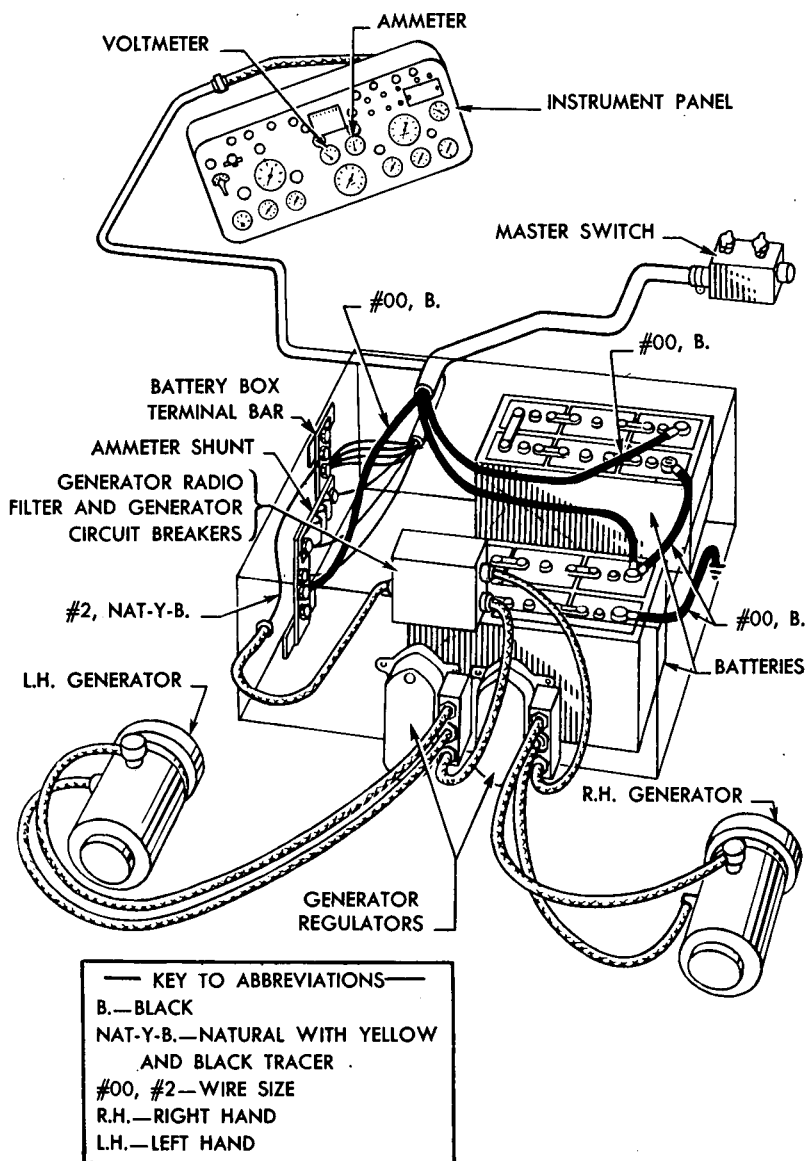


Figure 67—Instrument Panel and Rear Terminal Boxes for M10 Starting Circuit

ORDNANCE MAINTENANCE

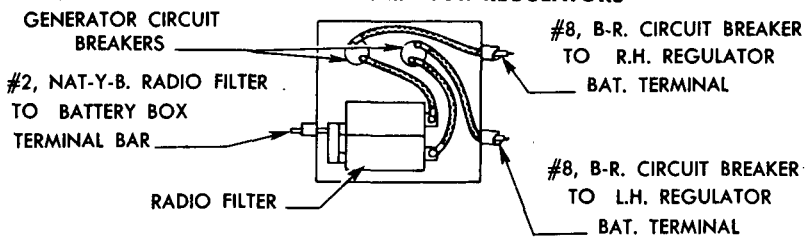
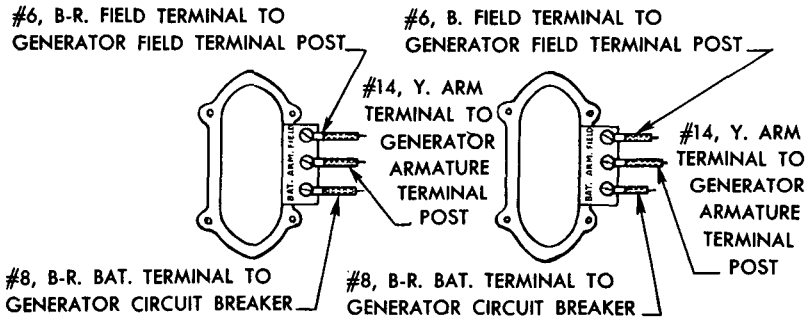
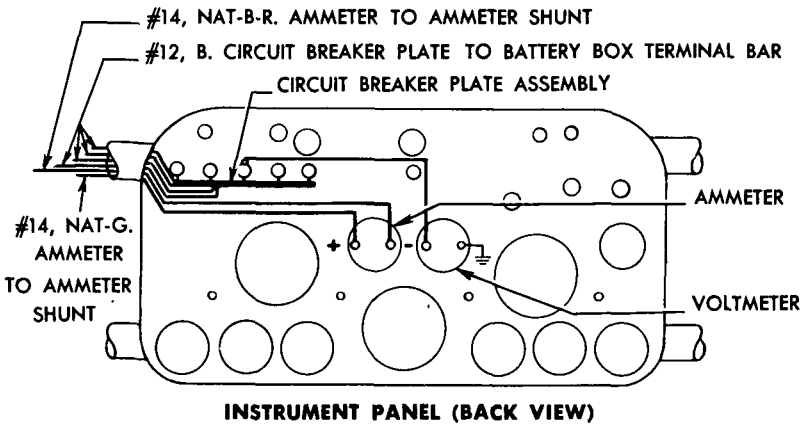
HULL AND TURRET, ELECTRICAL SYSTEMS, TRACKS AND SUSPENSION
FOR 3-INCH GUN MOTOR CARRIAGES M10 AND M10A1



RA PD 28581

Figure 68—M10 Generating Circuit

M10 ELECTRICAL SYSTEMS



KEY TO ABBREVIATIONS	
B.—BLACK	#2 AND #8, ETC.— WIRE SIZE
Y.—YELLOW	BAT.—BATTERY
B-R.—BLACK WITH RED TRACER	ARM.—ARMATURE
NAT-G.—NATURAL WITH GREEN TRACER	R.H.—RIGHT HAND
NAT-Y-B.—NATURAL WITH YELLOW AND BLACK TRACER	L.H.—LEFT HAND

RA PD 28582

Figure 69—Instrument Panel, Generator Regulators, Generator Circuit Breakers and Radio Filter for M10 Generating Circuit

**HULL AND TURRET, ELECTRICAL SYSTEMS, TRACKS AND SUSPENSION
FOR 3-INCH GUN MOTOR CARRIAGES M10 AND M10A1****59. GUN FIRING CIRCUIT (fig. 64).**

a. The gun firing circuit receptacle is located at the center of the turret floor. A wire from this receptacle is carried in a flexible conduit and is attached to the gun firing circuit breaker located on the floor of the turret. An extension wire is attached to the gun firing solenoid and the two firing switches. The other end of the extension is equipped with a conventional one-prong electrical plug which is inserted in the receptacle at the center of the turret floor.

60. RADIO CIRCUIT (fig. 65).

a. The radio circuit consists of one of the 12-volt batteries, radio master switch, radio terminal box, and the necessary conduits and wiring. The current for the radio is taken from one battery (rear battery). A rigid conduit runs from the battery box across the back of the driver's compartment to the radio terminal box on the right-hand sponson. Two wires are contained in this conduit. The large black wire is a 24-volt utility wire and is attached to the terminal bar in the battery box. The smaller black wire is the radio wire, 12-volt, and is attached to the radio master switch.

61. STARTING CIRCUIT (fig. 66).

a. **General.** The starting system consists of two 12-volt batteries connected in series (24 volts), a master switch, two starter buttons in the instrument panel, a starting motor (24 volts) for each engine, starting solenoid switch for each starting motor, auxiliary starter buttons in engine compartment, and connecting wires.

b. **Conduits and Wiring.** Flexible conduits extend from the battery box to each of the starting motor solenoid switches. Each of these conduits contains a No. 00 black cable which is attached to the terminal bar in the battery box at one end and to its respective solenoid switch at the other end. The wires from the starting buttons located in the instrument panel are carried in separate flexible conduits extending from the instrument panel to each of the rear terminal boxes. The wire extending from the right-hand starter button is attached to a terminal post in the right-hand rear terminal box. The wire extending from the left-hand starter button is attached to a terminal post in the left-hand rear terminal box. Wires of the same size and color continue from these terminal boxes to their respective solenoid switches, as shown in figure 67. The conduit extending from the instrument panel to the right-hand rear terminal box also carries a No. 12 maroon wire, connected to a circuit breaker in the instrument panel at one end, and at the other end to No. 7 terminal in the right-hand rear terminal box. A wire of the same color continues through a conduit to each of the auxiliary starter buttons. Another wire from each of the auxiliary

M10 ELECTRICAL SYSTEMS

starting buttons extends through this conduit to the terminal box and each wire is attached to the terminal to which the starter solenoid wires are attached (fig. 67).

62. GENERATING CIRCUIT (fig. 68).

a. **General.** The generating system consists of two generators, two generator regulators, two batteries, an ammeter, a voltmeter, a radio filter, a generator circuit breaker for each generator, and connecting wires.

b. **Generators.** A 24-volt generator is mounted on the flywheel housing on each of the engines.

c. **Generator Regulators** (fig. 68). The two generators are each equipped with a regulator located at the rear of the battery box. The generator regulator includes a voltage regulator unit, current limiter unit, and reverse current relay or cut-out unit.

d. **Batteries.** Two 12-volt storage batteries connected in series are secured in a battery box located under the left side of the fighting compartment subfloor. A battery master switch and the radio master switch are located in the driver's compartment. When these switches are off, the batteries are completely disconnected, and all electrical circuits are open except the air heater and the emergency stop circuits. These units receive current from a wire attached to the hot side of the radio master switch.

e. **Ammeter and Voltmeter.** An ammeter and a voltmeter are located in the instrument panel and are accessible for removal after instrument panel face plate has been removed.

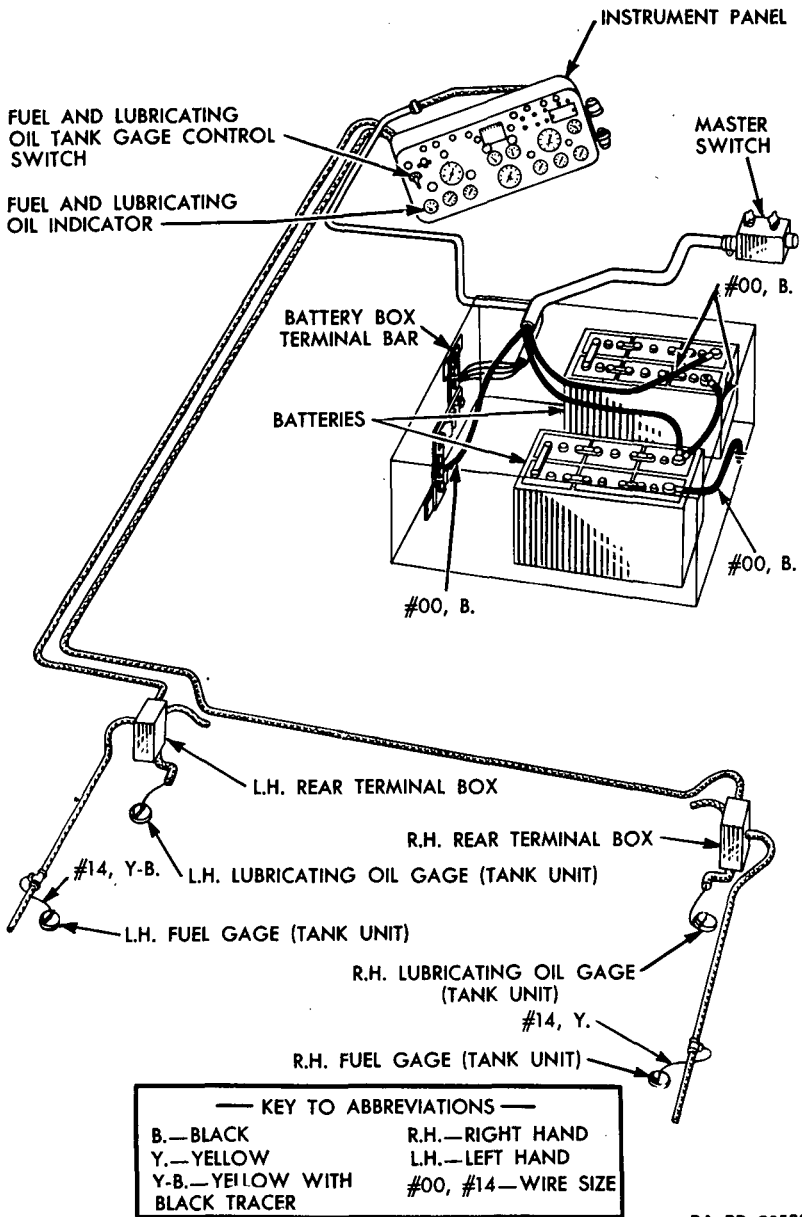
f. **Generator Circuit Breakers and Radio Filter** (fig. 68). Generator circuit breakers—one for each generator circuit—and a radio filter are incorporated in a box which is located at the rear of the battery box. These units are accessible for removal after the cover of the box has been removed.

g. Conduits and Wiring (figs. 68 and 69).

(1) **GENERATORS TO GENERATOR REGULATOR CONDUITS AND WIRING.** The two conduits between each generator and generator regulator consist of flexible conduits. One of these conduits contains a No. 6 wire and the other contains a No. 14 wire. One end of the No. 6 wire is attached to the armature terminal post at each generator, and the other end to the terminal marked "ARM" at each generator regulator. One end of the No. 14 wire is attached to the field terminal post at each generator and the other end of the terminal marked "FIELD" at each generator regulator (fig. 68).

(2) **GENERATOR REGULATOR TO RADIO FILTER AND CIRCUIT BREAKER BOX CONDUIT AND WIRING.** A flexible conduit is provided between each of the generator regulators and the radio filter and circuit

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 FOR 3-INCH GUN MOTOR CARRIAGES M10 AND M10A1**



RA PD 28583

Figure 70—M10 Fuel Gage and Lubricating Oil Gage Circuits

M10 ELECTRICAL SYSTEMS

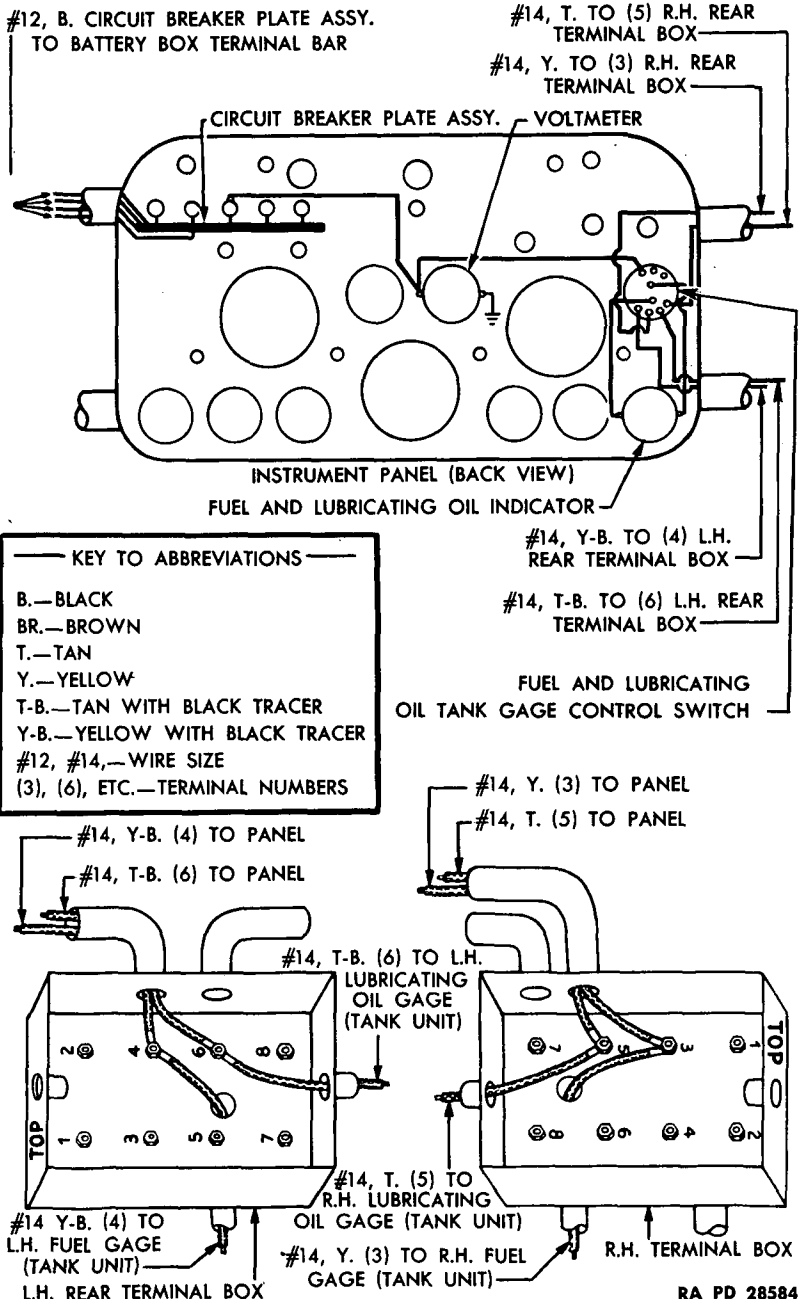


Figure 71—Instrument Panel and Rear Terminal Boxes for M10 Fuel Gage and Lubricating Oil Gage Circuits

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FOR 3-INCH GUN MOTOR CARRIAGES M10 AND M10A1

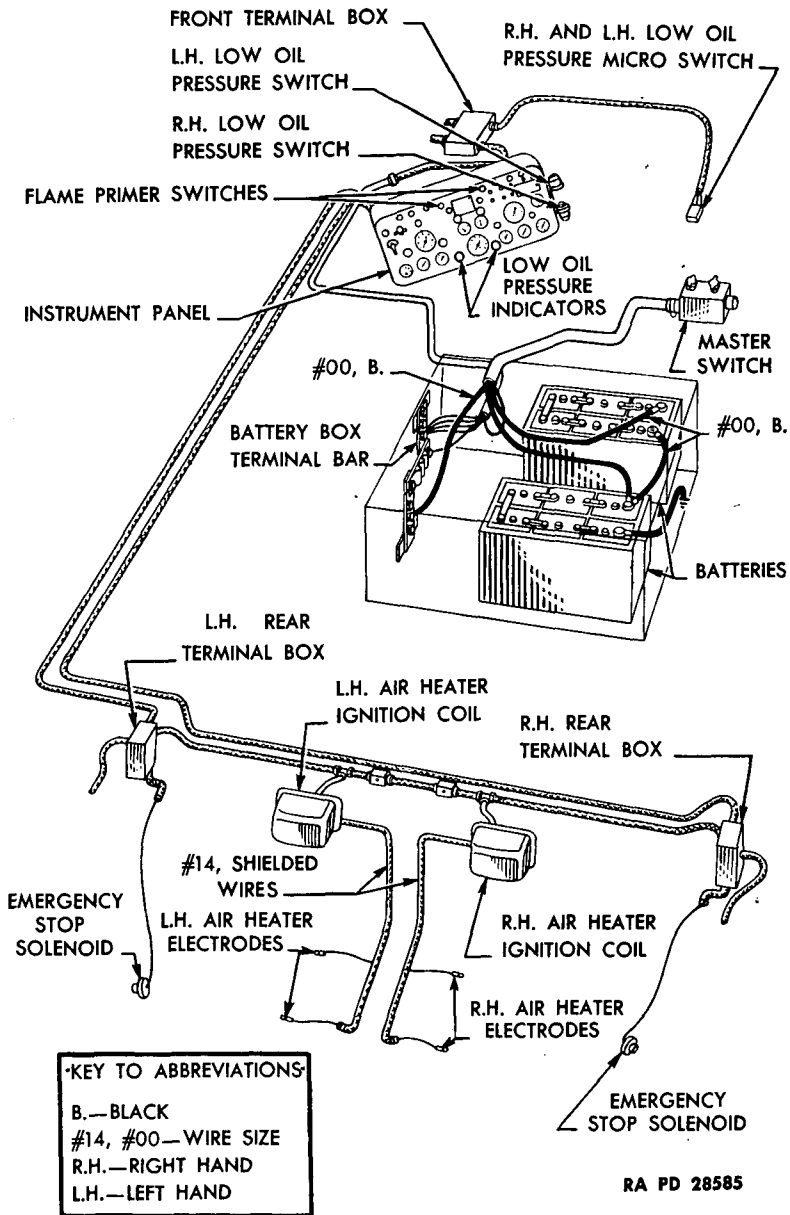
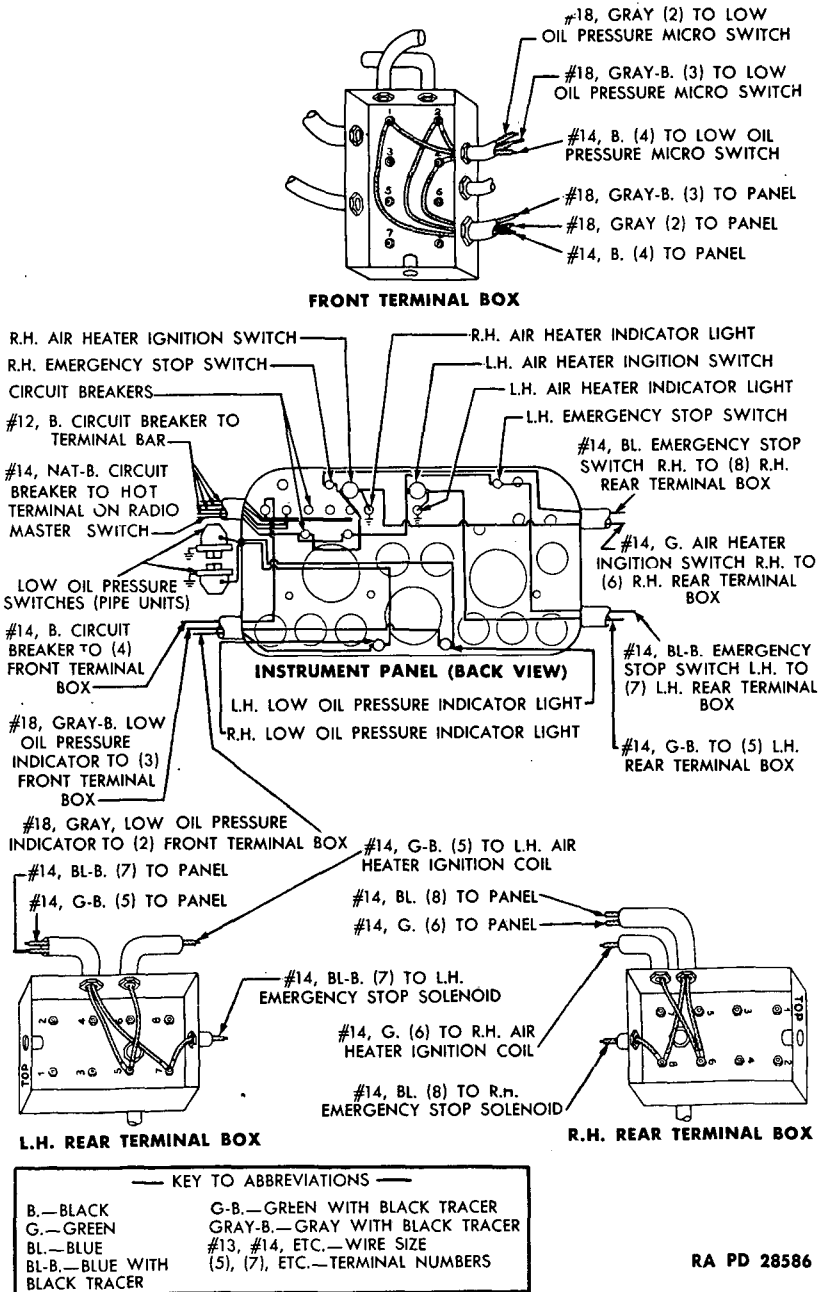


Figure 72—M10 Low Oil Pressure, Emergency Stop Air Shut-off and Air Heater Circuits

M10 ELECTRICAL SYSTEMS



RA PD 28586

Figure 73—Instrument Panel, Front and Rear Terminal Boxes for M10 Low Oil Pressure, Emergency Stop Air Shut-off and Air Heater Circuits

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breaker box. Each of these conduits contains a No. 8 black with red tracer wire with one end attached to the terminal marked "BATT" at the generator regulators. The other ends of these wires are attached to their respective circuit breakers. A No. 2 natural with yellow and black tracer wire is connected between the radio filter and the battery box terminal bar. This wire is contained in a flexible conduit (fig. 68).

(3) **CONDUIT AND WIRING FROM BATTERY BOX TO INSTRUMENT PANEL.** A conduit, extending from the battery box to the instrument panel extends along the left side of the hull and is made up of a rigid section and a flexible section connected together with a union coupling. The flexible section connects to the instrument panel. The rigid section is secured to the sponson with clips. Two of the wires in this conduit are part of the generating system. The color of these two wires are natural, with black and red tracer and natural with green tracer. One end of the natural with black and red tracer wire is connected to the rear end of the ammeter shunt at the terminal bar in the battery box. The other end of this wire is attached to the negative terminal post of the ammeter. One end of the natural with green tracer wire is attached to the front end of the ammeter shunt in the battery box. The other end of this wire is attached to the positive terminal post of the ammeter (fig. 69). The four No. 12 black wires contained in this same conduit are power wires, all of which are attached to the same terminal on the terminal bar in the battery box (fig. 68). The other ends of these wires are attached to the circuit breaker plate assembly in the instrument panel (fig. 69).

63. ELECTRICAL INSTRUMENT CIRCUITS.

a. **General Description.** The electrical instruments consist of the fuel gage and lubricating oil gage, low oil pressure gage, emergency stop air shut-off, and air heater circuits.

b. **Conduits and Wiring (fig. 61).** Two conduits extend from the instrument panel to the rear terminal boxes and are located on the left side of the hull on the sponson. The conduit for the right rear terminal box continues across the forward end of the engine compartment. Replacement of a damaged conduit, in most cases, can be accomplished by replacing the section which is damaged. The conduits to the various instruments are connected to the terminal boxes, and to the various electrical units, by means of knurled nuts.

c. **Fuel Gage and Lubricating Oil Gage Circuits (figs. 70 and 71).** The fuel gage and lubricating oil gage circuits consist of a float unit at the top of each of the two upper fuel tanks and a float unit at the top of each of the two lubricating oil tanks. The indicating gage unit and a control switch for both the fuel and lubricating oil tanks are located in the instrument panel.

M10 ELECTRICAL SYSTEMS

d. **Low Oil Pressure Circuit** (figs. 72 and 73). Two low oil pressure signal lamps, one for each engine, are located in the instrument panel. Each of these lamps is controlled by a switch attached to the oil pressure pipe leading from each of the engines. These pressure operated switches are located at the right end of the instrument panel. When the oil pressure drops below a predetermined value, these pressure operated switches will make contact and the signal lamps will light. A mechanically operated switch (microswitch) is also connected in this circuit and operates in connection with the throttle lever. When the throttle lever is moved to idle position, the signal lamps will light. They will automatically turn off when the proper oil pressure is reached, as the speed of the engine is increased.

e. **Emergency Stop, Air Shut-off Circuit** (figs. 72 and 73). The air intake of each engine is equipped with an emergency engine shut-down valve, controlled by a solenoid located at the air intake of each engine. There is an emergency stop button on the instrument panel for each engine. When the button is pressed, the solenoid closes a valve which prevents air from entering the blower and thereby stops the engine.

f. **Engine Air Heater Circuit** (figs. 72 and 73). The engine air heater circuit consists of an air heater switch and indicator light for each engine, and an ignition coil and two electrodes for each engine. An air heater is installed in the engine air box on each engine and provides pre-heated air to the cylinders to overcome cold-weather starting difficulties. The air heater switches and indicator lamps are in the instrument panel. The ignition coils are attached to the bulkhead in the forward side of the engine compartment. Two electrodes are installed in the air heaters on each engine. Turning the switch knobs to the "ON" position causes a continuous spark between the electrodes in the air heater for igniting the fuel. When the switch is turned on the indicator lamp glows as a warning to turn off the current when the engine starts.

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CHAPTER 5

SPECIAL TOOLS

Special overhaul tools..... Paragraph
64

64. SPECIAL OVERHAUL TOOLS.

a. Listed below are the special tools used in the overhaul of this materiel.

Name	Manufacturer's Number	Federal Stock Number
Bolt, eye, lifting engine compartment top plate	MTM-M3-497	41-B-1586-200
Bolt, eye, 1-inch 8NC-2, transmission lifting		41-B-1586-350
Cable, extension, rubber covered, two conductor, standard, No. 1 gage, with plug on each end		17-C-568
Compressor, suspension volute spring	MTM-M3-3	41-C-2556
Drift, bogie wheel bearing installing	MTM-M3-13	41-D-1463
Drift, idler wheel inner bearing	MTM-M3-15	41-D-1540-500
Drift, idler wheel, inner bearing, use with MTM-M3-8 puller	MTM-M3-41	41-D-1543-800
Drift, idler wheel outer bearing	MTM-M3-14	41-D-1540-550
Fixture, track connecting and link pulling, R.H. & L.H.		41-F-2997-86
Fixture, track connecting and link pulling R.H.		41-F-2997-388
Fixture, track connecting and link pulling L.H.		41-F-2997-389
Guide, bogie wheel gudgeon, installing	MTM-M3-5	41-G-2500
Lift, bogie wheel	MTM-M3-813	41-L-1375
Puller, bogie gudgeon, screw type, without adapter	MTM-M3-6	41-P-2905-63
Puller, idler wheel	MTM-M3-8	41-P-2940-800
Puller, idler wheel outer bearing	MTM-M3-40	41-P-2900-27
Puller, slide hammer type, bogie gudgeon		41-P-2957-33

SPECIAL TOOLS

Name	Manufacturer's Number	Federal Stock Number
Tool, idler wheel, installing	MTM-M3-7	41-T-3216-150
Wrench, box socket, suspension spring.	MTM-M3-24	41-W-640-200
Compressor, special 1½-in. hex		
Wrench, drain plug final drive, differential ¾-in. hex	MTM-M3-130	41-W-877
Wrench, drain plug, transmission ⅙ hex	MTM-M3-10	41-W-1960
Wrench, socket, bogie wheel gudgeon nut, 2⅜ in. hex	MTM-M3-137	41-W-2573-150
Wrench, socket, idler wheel shaft lock nut	MTM-M3-21	41-W-2574-300
Wrench, spanner, track support roller, lock ring	MTM-M3-19	41-W-3260
Wrench, spanner, track support roller retainer	MTM-M3-11	41-W-3261

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REFERENCES

STANDARD NOMENCLATURE LISTS.

Carriage, motor, 3-in. gun, M10	SNL G-130
Carriage, motor, 3-in. gun, M10A1	SNL G-170
Cleaning, preserving and lubrication materials, re- coil fluids, special oils, and miscellaneous related items	SNL K-1
Soldering, brazing, and welding materials, gases and related items	SNL K-2
Interchangeability chart of organizational special tools for combat vehicles	SNL G-19
Ordnance maintenance sets	SNL N-21
Tools, maintenance, for repair of automotive ve- hicles	SNL G-27
Tool sets, motor transport	SNL N-19
Tool sets, for ordnance service command, automo- tive shops	SNL N-30
Current Standard Nomenclature Lists are listed above. An up-to-date list of SNL's and other pub- lications is maintained in the Index to Ordnance Publications	OFSB 1-1

EXPLANATORY PUBLICATIONS.

General.

List of publications for training	FM 21-6
Military motor vehicles	AR 850-15
Standard military motor vehicles	TM 9-2800

Related Technical Manuals.

3-inch gun motor carriage, M10	TM 9-752A
3-inch gun motor carriage, M10A1	TM 9-731G
Ordnance maintenance: Ford tank engine model GAA V-8	TM 9-1731B
Ordnance maintenance: Accessories for tank engine, model GAA V-8 (Ford)	TM 9-1731C
Ordnance maintenance: Auxiliary generator (Homelite HRUH-28) for medium tank M4 and modifications	TM 9-1731K
Ordnance maintenance: Fire extinguishers	TM 9-1799
Ordnance maintenance: General motors twin Diesel 6-71 power plant for medium tanks M3A3, M3A5, and M4A2	TM 9-1750G

REFERENCES

Ordnance maintenance: Stabilizers	TM 9-1334
Ordnance maintenance: Power train (one-piece differential case) for medium tanks M3, M4, and modifications, and related gun motor carriages . . .	TM 9-1750B
Ordnance maintenance: Power train unit (three-piece differential case), for medium tanks M3, M4, and modifications	TM 9-1750
Maintenance and Repair.	
Automotive electricity	TM 10-580
Basic maintenance manual	TM 38-250
Cleaning, preserving, lubricating and welding materials and similar items issued by the Ordnance Department	TM 9-850
Detailed lubrication instructions for ordnance materiel	OFSB 6-Series
Motor vehicle inspections and preventive maintenance services	TM 9-2810
Protection of Materiel.	
Chemical decontamination, materials and equipment	TM 3-220
Decontamination of armored force vehicles	FM 17-59
Defense against chemical attack	FM 21-40
Explosives and demolitions	FM 5-25
Storage and Shipment.	
Ordnance storage and shipment chart, group G—major items	OSSC-G
Registration of motor vehicles	AR 850-10
Storage of motor vehicle equipment	AR 850-18
Rules governing the loading of mechanized and motorized army equipment, also, major caliber guns, for the United States Army and Navy, on open top equipment published by Operations and Maintenance Department of Association of American Railroads.	

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