TECHNICAL MANUAL

OPERATOR'S MANUAL

TRACTOR, FULL TRACKED; LOW SPEED; DED; MEDIUM DRAWBAR PULL; OSCILLATING TRACK, 78-IN. GAGE (CATERPILLAR MODEL D7F) WITH RIPPER; FSN 2410-177-7283 WITH WINCH; FSN 2410-177-7284

HEADQUARTERS, DEPARTMENT OF THE ARMY

28 NOVEMBER 1972

This reprint includes all changes in effect at the time of publication - Change 3.

WARNING

HYDRAULIC OIL UNDER PRESSURE

1975+ PSI is used in the operation of this equipment.

DEATH

or severe injury may result if personnel fail to observe safety precaution.

Passengers are NOT permitted to ride other than in the seat, as there is danger of being thrown into the tracks when tractor is in motion.

TM 5-2410-233-10
***C 3**

CHANGE No. 3

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, DC *12 November 1980*

Operator's Manual
TRACTOR, FULL TRACKED; LOW SPEED; DED; MEDIUM DRAWBAR PULL; OSCILLATING TRACK, 78-IN. GAGE (CATERPILLAR MODEL D7F)
WITH RIPPER; NSN 2410-00-177-7283
WITH RIPPER AND ROPS; NSN 2410-00-185-9794
WITH RIPPER, ROPS (CAB) WINTERIZED; NSN 2410-00-300-6665
WITH WINCH; NSN 2410-00-177-7284
WITH WINCH AND ROPS; NSN 2410-00-185-9792
WITH WINCH, ROPS (CAB) WINTERIZED; NSN 2410-00-300-6664

TM 5–2410–233–10, 28 November 1972, is changed as follows:

Title is changed to read as shown above.

*** This change supersedes. C 2, 8 July 1974.**

Inside front cover, Add the following warnings:

WARNING

Operation of this equipment presents a noise hazard to personnel in the area. The noise level exceeds the allowable limits for unprotected personnel. Wear ear muffs or ear plugs which were fitted by a trained professional.

WARNING

Drycleaning solvent, P-D-680, used to clean parts, is potentially dangerous to personnel and property. Do not use near open flame or excessive heat. Flash point of solvent is 100°F.-138°F.

Page 1-1.

Paragraph 1-1 is superseded as follows:

1-1. Purpose and Scope

This manual is for use in operating and maintaining the Caterpillar Model D7F tractor which is issued with a ripper (NSN 2410-00-177–7283); with a ripper and ROPS (NSN 2410-00-l85-9794); with ripper, ROPS (cab) winterized (NSN 2410-00-300-6665); with a winch (NSN 2410-00-177-7284); or with a winch and ROPS (NSN 2410-00-185-9792); or with a winch, ROPS (cab) winterized (NSN 2410-00-300-6664)."

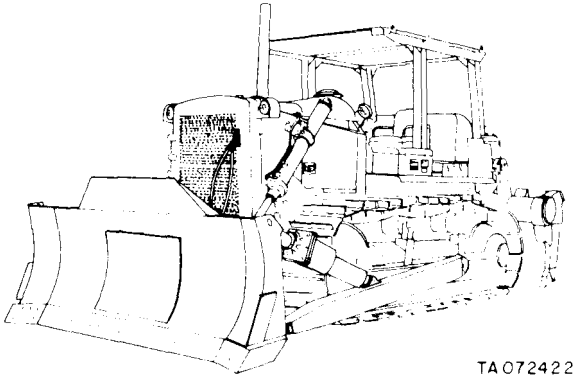
Paragraph 1-3 is superseded as follows:

1-3. Reporting Errors and Recommending improvements

You can help improve this manual. If you find any mistakes or if you know of a way to improve the procedures, please let us know. Mail your letter or DA Form 2028 (Recommended Changes to Publications and Blank Forms) direct to: Commander, US Army Tank-Automotive Materiel Readiness Command, ATTN: DRSTA-MBP, Warren, MI 48090. A reply will be furnished direct to you.

Page 1-2, paragraph 1-4, the third sentence. Change “The center section contains the power source and the operator’s controls” to read “The center section contains the power source, the operator’s controls, and the roll over protective structure. ”

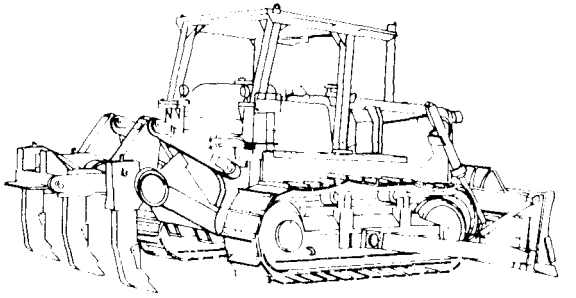
Page 1-3, Figure 1-1.1 is added as follows:



TA072422

Figure 1-1.1. Left front, 3/4 view, w/ROPS.

Page 1-4, Figure 1-2.1 is added as follows:



TA072421

Figure 1-2.1 Right rear, 3/4 view w/ROPS.

Page 1-7.

Paragraph l-5b is superseded as follows:

b. Tractor Characteristics.

Length w/ripper . . . . . .287 in.
Length over dozer (w/winch) . . . . . .232 in.
Width, w/moldboard . . . . . .133 in.
w/o moldboard . . . . . .105 in.
Ground clearance . . . . . .14.7 in.
Height w/ROPS . . . . . .131 in.
w/o ROPS and stack . . . . . .93 in.

Operating weight, w/fuel and lubricants
w/winch, ROPS, and dozer . . . . . .49,400 lb
w/winch only, ...47,700 lb
w/ripper, ROPS, and dozer . . . . . .54,870 lb
W/ripper only. . . . . .50,800 lb

Paragraph 1-5c is added as follows:

c. Winch.

(1) *Drum Size*

Barrel diameter . . . . . .12 in.
Flange diameter . . . . . .22.5 in.
Barrel length, ...12.37 in.

(2) Cable Capacity

l-inch cable . . . . . .293 ft
$^{7}/_{8}$-inch cable (optional) . . . . . 382 ft

Page *2-1.* Immediately following chapter 2 title, add the following:

WARNING

Operation of this equipment presents a noise hazard to personnel in the area. The noise level exceeds the allowable limits for unprotected personnel. Wear ear muffs or ear plugs which were fitted by a trained professional.

Page 2-2, figure 2-1 (Controls and instruments (sheet 1 of 5)).

Change "SAFETY LOCK CONTROL, LEVER" to "SPEED SELECTOR LEVER".

Change "SPEED SELECTOR LEVER" to "SAFETY LOCK CONTROL LEVER".

Page 2-9. Paragraph 2-2a(7) is superseded as follows:

CAUTION

When making gear and directional shifts at full engine speed, use deceleration and braking to avoid damaging power train components.

(7) Make gear and directional shifts at full engine speed as follows:

(a) Decrease engine speed by pushing governor control or decelerator.

(b) Push both brake pedals.

(c) Move transmission control lever to desired travel direction gear.

(d) Release brake pedals.

(e) Increase engine speed by pulling governor control or releasing decelerator.

NOTE

Do not use brake pedals as foot rests.

Page 3-1 through 3-6. Section II is superseded as follows:

Section II. PREVENTIVE MAINTENANCE CHECKS AND SERVICES

3-0. Maintenance Forms and Records.

Every mission begins and ends with the paperwork. There isn't much of it, but you have to keep it up. The forms and records you fill out have several uses. They are a permanent record of the services, repairs, and modifications made on your equipment; they are reports to organizational maintenance and to your commander; and they are a checklist for you when you want to know what is wrong with the equipment after its last use, and whether those faults have been fixed. For the information you need on forms and records, see TM 38-750.

3-0.1. Preventive Maintenance Checks and Services.

a. Do your (B) PREVENTIVE MAINTENANCE just before you operate the equipment. Pay attention to the CAUTIONS and WARNINGS.

b. Do your (D) PREVENTIVE MAINTENANCE during operation. (During operation means to monitor the tractor and its related compenents/systems. while they are actually being operated.

c. Do your (A) PREVENTIVE MAINTENANCE right after operating the equipment. Pay attention to the CAUTIONS and WARNINGS.

d. Do your (W) PREVENTIVE MAINTENANCE weekly.

e. Do your (M) PREVENTIVE MAINTENANCE once a month.

f. If something doesn't work, troubleshoot it with the instructions in this manual or notify your supervisor.

g. Always do your preventive maintenance in the same order, so it gets to be a habit. Once you've had some practice, you'll spot anything wrong in a hurry.

h. If anything looks wrong and you can't fix it, write it on your DA Form 2404. If you find something seriously wrong, report it to organizational maintenance RIGHT NOW.

i. When you do your preventive maintenance, take along the tools you need to make all the checks. You always need a rag or two.

WARNING

Drycleaning solvent, SD-2, used to clean parts, is potentially dangerous to personnel and property. Do not use near open flame or excessive heat. Flash point of solvent is 138°F.

(1) *Keep it clean.* Dirt, grease, oil, and debris only get in the way and may cover up a serious problem. Clean as you work and as needed. Use drycleaning solvent (SD-2) to clean metal surfaces. Use soap and water when you clean rubber or plastic material.

(2) *Bolts, nuts, and screws.* Check that they are not loose, missing, bent, or broken. YOU can't try them all with a tool, of course, but look for chipped paint, bare metal, or rust around bolt heads. If you find one loose, tighten it or report it to organizational maintenance.

(3) *Welds.* Look for loose or chipped paint, rust, or gaps where parts are welded together.

If you find a bad weld, report it to organizational maintenance.

(4) *Electric wires and connectors.* Look for cracked or broken insulation, bare wires, and loose or broken connectors. Tighten loose connectors and make sure the wires are in good condition.

(5)Horses and fluid lines. Look for wear, damage, and leaks. Make sure clamps and fittings are tight. Wet spots show leaks, of course, but a stain around a fitting or connector can also mean a leak. If a leak comes from a loose fitting or connector, tighten it. If something is broken or worn out, report it to organizational maintenance.

j. It is necessary for you to know how fluid leakage affects the status of your equipment. The following are definitions of the types/classes of leakage you need to know to be able to determine the status of your equipment. learn and be familiar with them and REMEMBER-When in doubt, notify your supervisor!

Leakage Definitions for Operator/Crew PMCS

CLASS I Seepage of fluid (as indicated by wetness or discoloration) not great enough to form drops

CLASS II Leakage of fluid great enough to form drops but not enough to cause drops to drip from item being checked/inspected.

CLASS III Leakage of fluid great enough to form drops that fall from the the item being checked / inspected.

CAUTION

Equipment operation is allowable with minor leakage (Class I or II). Of course, consideration must be given to the fluid capacity in the item/system being checked/inspected. When in doubt, notify your supervisor.

When operating with Class I or II leaks, continue to check fluid levels as required in your PMCS.

Class III leaks should be reported to your supervisor or to organizational maintenance.

Equipment operation is not permitted with any type of fuel leak (Class I, II, or III).

Table 3-1. Operator/Crew Preventive Maintenance Checks and Services

B-Before D-During A-After W- Weekly M-Monthly

Item no.	Interval B	D	A	W	M	ITEM TO BE INSPECTED Procedure: Check for and have repaired, filled, or adjusted as needed	Equipment is not ready/ available if:
						PERFORM WEEKLY AS WELL AS BEFORE PMCS'S IF: *a.* You are the assigned driver but have not operated tractor since the last weekly. *b.* You are operating the tractor for the first time.	
1						**MAKE THE FOLLOWING WALK AROUND CHECKS:** (Exterior of Tractor)	
	●					*a.* Check for evidence of leakage (oil, fuel, hydraulic fluid, or coolant) on or under tractor.	Class III leakage is evident. No fuel leakage allowed. Cracked welds, buckled or split seams. loose or missing mounting bolts.
	●					*b.* Check roll over protective structure (ROPS) for damage or loose mounting.	
	●					*c.* Check for loose, missing, or damaged parts	
	●					*d.* Check lift and tilt hydraulic cylinders for evidence of leaks (at packing gland or fittings) or damage (nicks or scoring).	Class III leakage is evident.

B-Before D-During A-After W-Weekly M-Monthly

Item no.	Interval B	D	A	W	M	ITEM TO BE INSPECTED Procedure Check for and have repaired, filled, or adjusted as needed	Equipment is not ready/ available if:
2				●		**RADIATOR** Check coolant level. Fill to the overflow.	
3				●		**BELTS** Inspect fan and generator belts for frayed condition or deterioration.	Belt missing or broken.
4				●		**BATTERIES** Check level of electrolyte. Fill with clean water (distilled if possible) to the split ring as necessary. In freezing weather, run engine at least 15 minutes after adding water.	
5					●	**FUEL TANK** Open furl tank drain valve and drain off any water or sediment.	
6		●				**AIR CLEANER SERVICE INDICATOR** During engine warmup/operation, visually check indicator for indication of air flow restriction. If red flag is up, have air cleaner serviced.	
7						**INSTRUMENTS** Check for normal operating readings for the instruments as follows:	Gages not within ranges specified.

B-Before D-During A - After W - Weekly M-Monthly

Item no.	Interval B	D	A	W	M	ITEM TO BE INSPECTED Procedure: Check for and have repaired, filled, or adjusted as needed	Equipment is not ready/ available if:
		●				*a.* **ENGINE OIL PRESSURE** **LOW IDLE**..... 38 to 58 psi	
		●				*b.* **ENGINE WATER TEMP..** 20 psi min	
		●				*c.* **TRANSMISSION OIL** 140° to 217°F **PRESSURE** ..... 250 to 400 psi	
		●				*d.* **TORQUE CONVERTER** **TEMP** ..... 150° to 250°F	
		●				*e.* **AMMETER.**..... Slight + Charge	
		●				*f.* **FUEL PRESSURE** ..... Green normal range	
8		●				**LIGHTS** Position light switches to ON position. Check for operation.	
9		●				**WINCH** Inspect cable for broken wire strands. evidence of burns or abrasions, or lack of lubrication.	
10		●				**SERVICE BRAKES** During operation: check brakes for stopping ability; pulling, grabbing, or other abnormal operation.	Improper operation is evident

Figure 3-1 is superseded as follows:

KEY

LUBRICANTS	CAPACITY	EXPECTED TEMPERATURES		
		Above + 32°F (0°C	+ 30°F to 10°F (+ 5°C to 23°C)	0°F to 65°F (- 18°C to 54°C)
OE HDO Lubricating Oil, Engine				
[illegible]	[illegible]	OE HDO	OE HDO 10	OE [illegible]
Oil Can Points				
Hydraulic System	[illegible]	OE HDO 10		
OES Oil, Engine Sub Zero				
Fuel Devices	[illegible]	OE HDO 5	OE HDO 30	
GAA Grease, Automotive and Artillery		ALL TEMPERATURES		

NOTES:

1. OPERATION OF EQUIPMENT IN TEMPERATURES BELOW –10 F. Remove *lubricants* for temperatures above -10 F and replace with lubricants for temperatures below -10 F as indicated in KEY.

2. LUBRICANTS. The following is a list of lubricants with the Military Symbols and applicable Specification numbers.

OE HDO MIL-L-2104 OES MIL-L-10295
GAA MIL-G-10924

3. Intervals given are in hours of normal operation.

4. ENGINE OIL LEVEL. Check oil level with engine running of idle speed, oil warm and transmission in neutral. Maintain oil level between FULL and ADD mark on ENGINE RUNNING side of gage.

TA1

Figure 3-1. Lubrication instructions.

Page 3-6, Table 3-2. Deleted.

Page A-1, paragraph A-2. Add the following:

TB MED 251, Noise and Conservation of Hearing.

Page B-1, appendix B.

Federal Stock Number column. Add "4210-00-889-2221".

Name column. Add "FIRE EXTINGUISHER".

Quantity column. Add "1"

By order of the Secretary of the Army:

E. C. MEYER
General, United States Army
Chief of Staff

Official:

J. C. PENNINGTON
Major General, United States Army
The Adjutant General

Distribution:

To be distributed in accordance with DA Form 12-25B, Operator's Maintenance requirements for Tractor Tracked: Medium.

Technical Manual

No. 5-2410-233-10

HEADQUARTERS
DEPARTMENT OF THE ARMY
Washington, D.C.
28 November 1972

OPERATOR'S MANUAL

TRACTOR, FULL TRACKED; LOW SPEED; DED; MEDIUM DRAWBAR PULL; OSCILLATING TRACK, 78-IN. GAGE (CATERPILLAR MODEL D7F) WITH RIPPER; FSN 2410-177-7283 WITH WINCH; FSN 2410-177-7284

*This manual supersedes TM 5-2410-233-10, 8 March 1971.

CHAPTER 1

INTRODUCTION

Section 1. GENERAL

1-1. Purpose and Scope

This manual is for use in operating and maintaining the Caterpillar Model D7F tractor which is issued with a winch (FSN 2410-177–7284) or with a ripper (FSN 2410-177-7283) .

1-2. Maintenance Forms and Records

Maintenance forms and records you are to use are explained in TM 38–750.

1-3. Recommending Improvements

You can improve this manual by recommending improvements, using DA Form 2028 (Recommended changes to Publications) or a letter, and mail direct to Commander, U.S. Army Mobility Equipment Command, ATTN: AMSME–MPP, 4300 Goodfellow

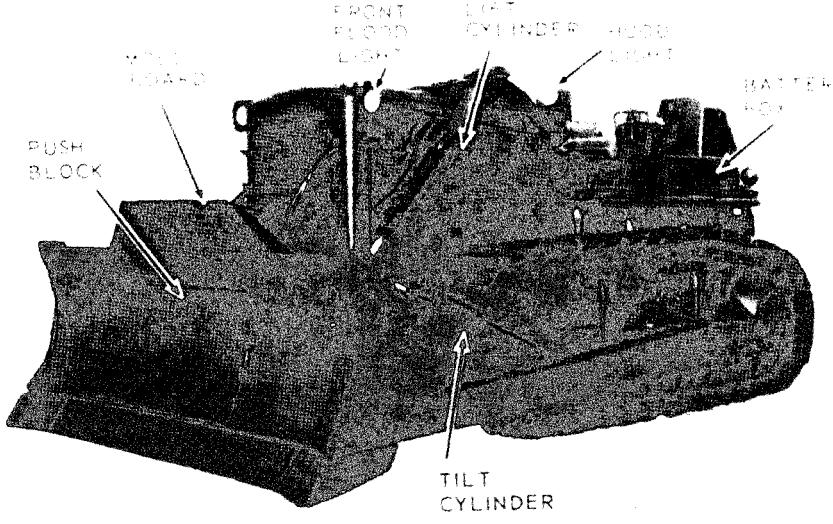
Boulevard, St. Louis, Mo. 63120. A reply will be furnished direct to you.

Section II. DESCRIPTION AND DATA

1-4. Description

a. The tractor (fig. 1–1 thru 1–3) is a full-tracked, low speed, medium-drawbar-pull tractor powered by a 6-cylinder, turbo-charged, model D333CT diesel engine. The three major assemblies of the tractor are a center section and two side section. The center section contains the power source and the operator's controls. The two side sections consist of track frames extending approximately the full length of the tractor. Full-tracked tractors serve many purposes, such as prime movers for pushing and pulling loads, power units for winches and hoists, and moving mounts for dozer blades and rippers. TM 5-331A contains a more complete description of the purposes and uses for which the tractor is designed, The tractor can operate in muck or water as deep as the height of the tracks. Operation in deeper water is possible for short periods of time if the tractor is properly waterproofed.

b. The hydraulically operated power units consist of a hydraulic pump mounted on the transmission, hydraulic lines leading to and from the control valves,



ME 2410-233-10 1-1

Figure 1–1. Left-front, ¾ view.

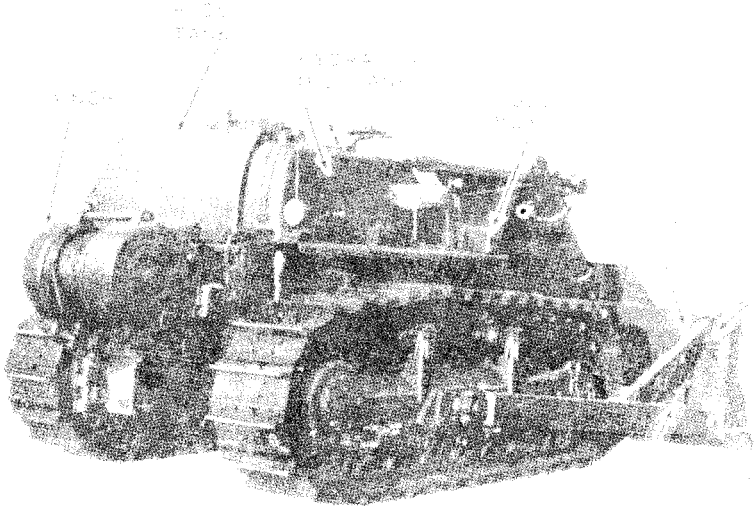
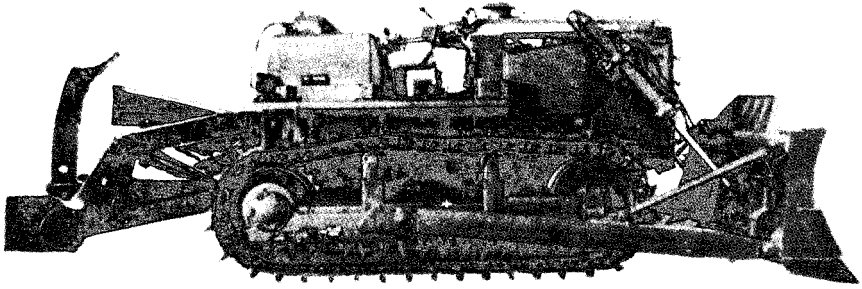


Figure 1–2. Right-rear, ¾ view, w/winch.



ME 2410-233-10/1-3

Figure 1–3. Right side w/ripper

and hydraulic cylinders attached to the blade and ripper. The winch is powered by a power takeoff shaft from the tractor transmission.

c. The dozer consists of the moldboard, cutting edges, and bits, and blade arms which connect the dozer to the tractor. Back-rip scarifiers (fig. 1–4) are

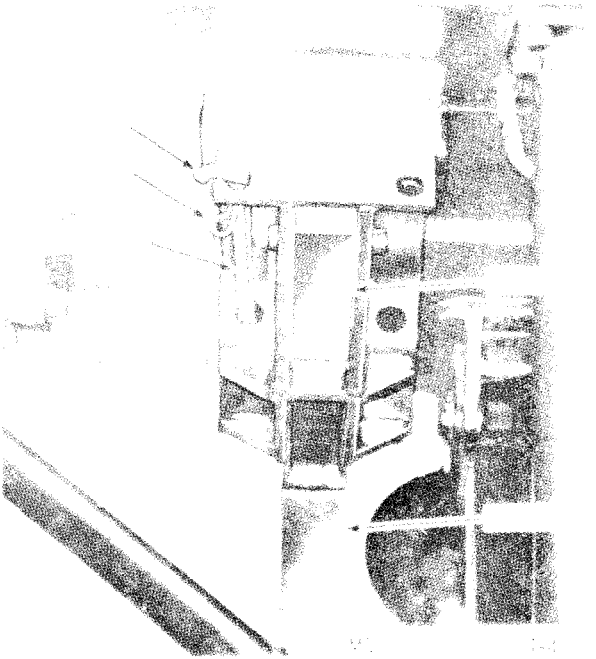


Figure ***1-4. Scarifies.***

attached to the back of the blade and can be lowered and locked in place with pins for scarifying. The blade can be angled for digging by use of the tilt cylinder and the tilt and diagonal braces.

d. The rear mounted ripper maybe used with one or more shanks mounted on a bar hinged to the rear of the tractor. Hydraulic pressure is used to raise and lower the ripper in order to load the ripper with enough tractor weight to provide the necessary ripping depth. The ripper may be raised high enough at the rear of the tractor so as not to interfere with operation of the dozer.

1-5. Tabulated Data

a. Component Capacities (Approx.)

Radiator	48 qt.
Engine crankcase (incl. filters)	29 qt.
Fuel tank	115 gal.
Transmission, steering clutches, and hake	148 qt.
Final drive	36 qt. ea. side
Hydraulic system	112 qt.
Winch	38 qt.

b. Tractor Characteristics.

Length over dozer (w/winch)	232 in.
Width, w/moldboard	133 in.
w/o moldboard	105 in.
Under clearance	14 in.
Height	124 in.
Height, w/o stack	93 in.
Operating weight, w/fuel and lubricants	
w,win	47, 700 lb.
w/ripper	50,800 lb.

CHAPTER 2

OPERATING INSTRUCTIONS

Section 1. OPERATING PROCEDURES

2-1. Starting the Tractor

a. Perform the daily preventive maintenance procedures described in table 3-1.

b. Refer to figure 2–1 and start the engine as follows:

(1) Apply brakes and lock with brake-lock lever.

(2) Lock speed selector lever in NEUTRAL with safety lock.

(3) Turn disconnect switch ON (located to left side of operator's seat, behind battery box).

(4) Pull the governor control lever back until it snaps over detents to open fuel injection pumps.

(5) Push in and turn heat-start switch to HEAT position for time indicated below if required.

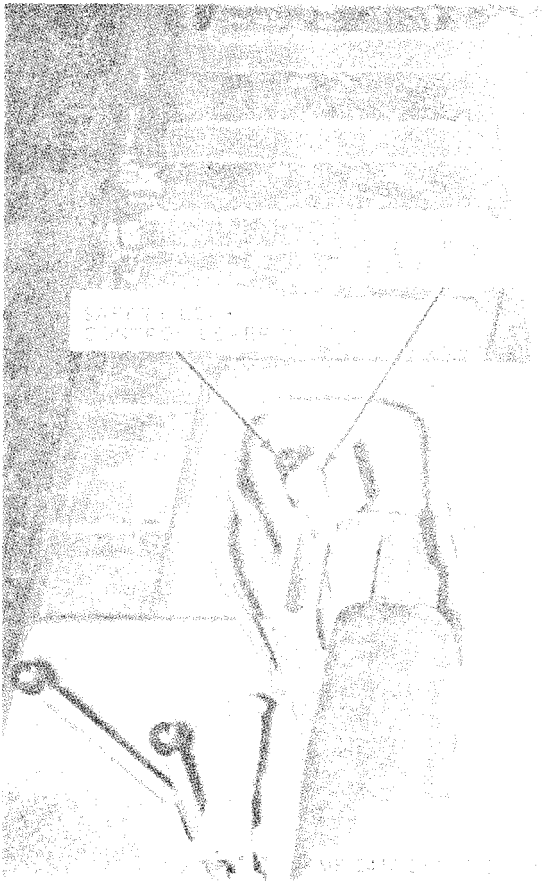


Figure 2–1. Controls and instruments (sheet 1 of 5)

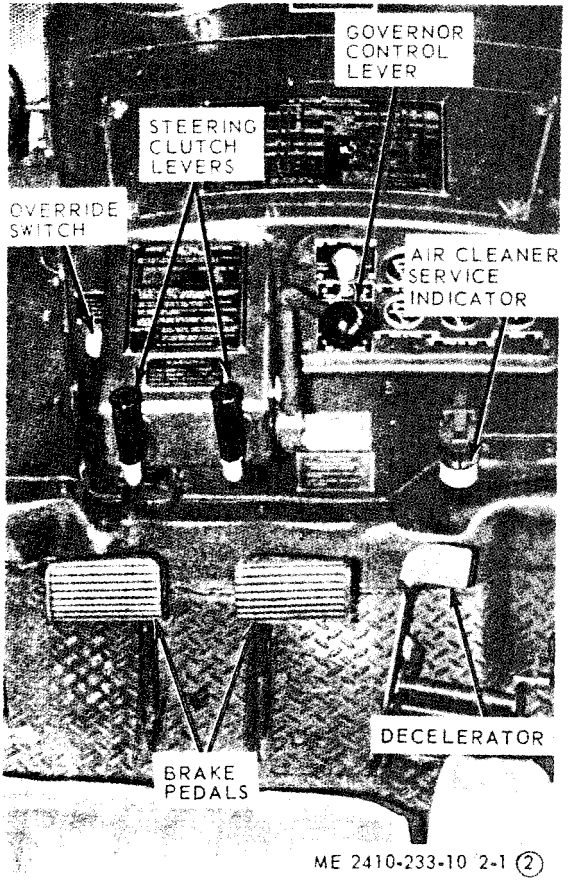


Figure 2–1. Controls and instruments (sheet 2 of 5)

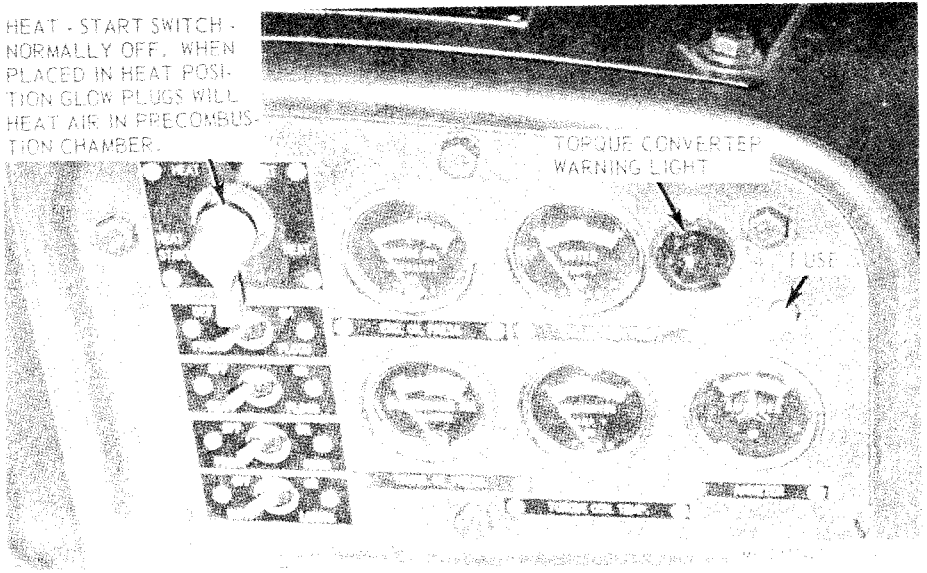


Figure 2–1. Controls and instruments (sheet 3 of 5)

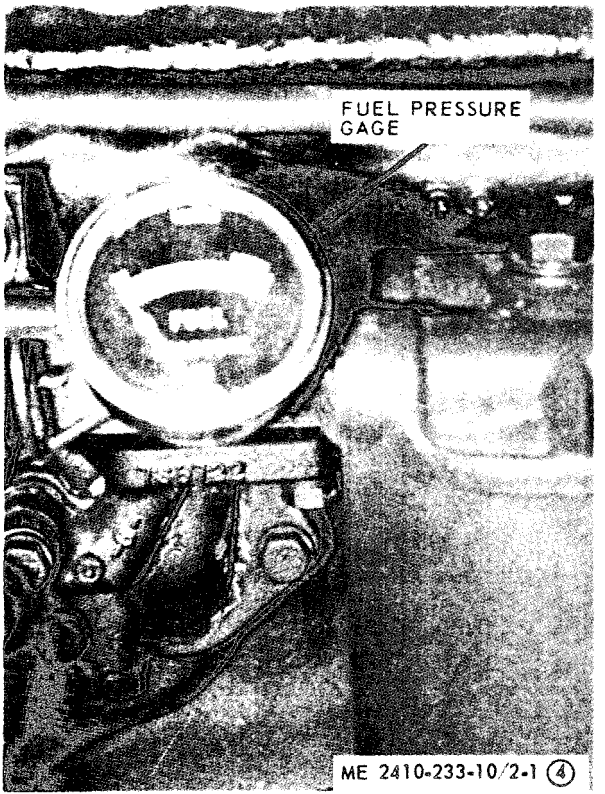


Figure 2-1. Controls and instruments (sheet 4 of 5)

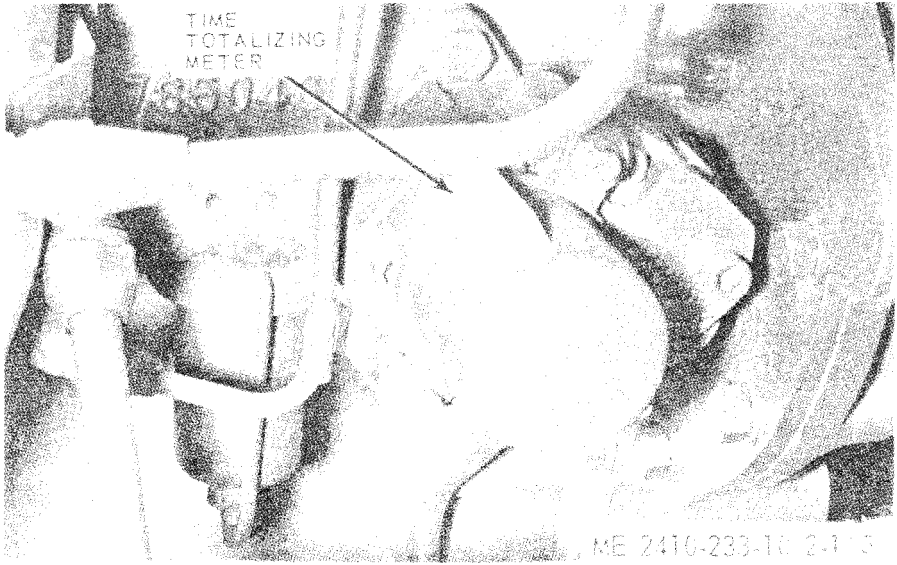


Figure 2–1. Controls and instruments (sheet 5 of 5)

Glow Plug Heating Time

Starting temperature range---------	Heat-Start witch ON.
Above 60°F----------	None.
60 °F to 32°F----------	1 Minute.
32 °F to 0°F----------	2 Minutes.
Below 0°F----------	3 Minutes.

(6) Push in and turn heat-start switch to START position to crank engine.

CAUTION

Never operate electric starter more than 30 seconds at a time. Allow 2 minutes for cooling before using starter again.

(7) When engine starts, return heat-start switch to HEAT position (when temperature is below 60°F) until engine runs smoothly. If engine does not start after 10 seconds, turn heat-start switch to HEAT for 30 seconds; then repeat starting procedure. A safety device to protect the starter bendix is controlled by an oil pressure switch. When oil pressure is 8- to 12-lbs., the oil pressure switch activates the automatic disconnect switch and breaks the flow of electrical current to the starter. A manual override button (on left-side of console) is provided to by-pass the automatic disconnect system when cranking to start the engine and oil pressure builds up to the cut-off limits.

NOTE

The manual override button should not be pushed when engine is running.

CAUTION

Run engine at low r.p.m. during initial start to allow lubrication oil to reach turbo charger. Do not turn heat-start switch to HEAT position while engine is warm and running. Never turn battery disconnect switch OFF when engine is running. Damage to generator, regulator, and lights may result.

(8) Before applying load, allow engine to warm by running engine 5 minutes with governor control in $^{1}/_{4}$- to $^{1}/_{2}$-speed position.

(9) Check the gages and instruments to be sure they register in the normal operating range.

2-2. Operating the Tractor

a. Tractor Controls.

(1) Move governor control lever to position that will provide desired engine speed.

(2) Disengage brake lock by depressing both brake pedals; this will allow brake lock to release.

(3) Using the appropriate control levers, raise attachments prior to moving transmission safety-lock control lever.

(4) Move safety-lock control lever to OFF position; then move speed selector lever to desired direction and speed.

(5) To steer tractor, use hand levers to operate steering clutches (release clutch by pulling back on lever) and use brake pedals to operate steering clutch brakes.

(6) Use decelerator pedal to reduce engine speed without disturbing the governor control lever setting.

(7) Shifting speeds or directions is permissible at any speed and under any load condition. The decelerator may be depressed to reduce engine speed when making a directional change.

CAUTION

Place safety-lock lever in ON position when tractor is allowed to stand with engine running. The safety lock prevents accidental engagement of the transmission.

b. Dozer Operation.

(1) To raise the moldboard, pull lever back (fig. 2-2) .

(2) To lower moldboard, push lever forward.

(3) To hold moldboard in position, allow lever to return to center (NEUTRAL) position.

(4) To allow moldboard to “float”, push lever all the way forward past the “LOWER” position. This allows the moldboard to follow the surface contour without using pressure.

(5) To tilt moldboard to the RIGHT or LEFT, move the lever in the direction desired.

NOTE

When the hydraulic cylinder pistons have reached the limit of their stroke, either raised or lowered, release control lever to stop oil by-passing the valves and also to reduce oil heat and valve wear.

(6) *Moldboard adjustment.*

(a) The digging angle of the moldboard can be changed by adjusting the length of tilt and diagonal braces and using the tilt cylinder.

(b) To lengthen tilt brace (fig. 1-3) turn adjusting bar clockwise, to shorten brace turn counter-clockwise. After adjustment, lock tilt brace by inserting end of adjusting bar in locking loop at rear of moldboard.

NOTE

The tractor should never be operated as a dozer with more than $^{1}/_{2}$ inch of the threads of the tilt brace screw exposed.

(7) When dozing, a trench is formed from material spilled on each side of the moldboard after the first few passes. If possible, work tractor within the trench for maximum possible loads. Cut sections, where

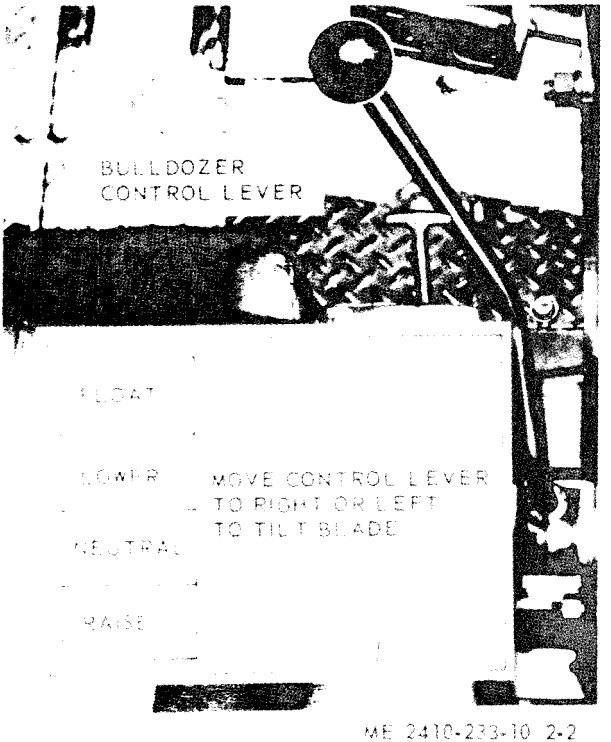


Figure 2–7. Dozer control lever.

possible, should be made with narrow uncut sections between. These narrow uncut sections can then be removed by normal dozing.

(8) When going down-grade with tractor pushing load, operate steering clutches in usual manner. If load is pushing tractor, operation of steering clutches is reversed. For example, to turn right, release left steering clutch, do not brake. This allows left track to travel faster while right track is held back by the engine.

(9) When running over an obstruction such as a log or a ditch bank, both clutches may be released slightly until tractor balances on top of obstruction. One clutch may be engaged gradually so that tractor moves forward at an angle, over and down. If tractor is being operated without a load, it may be necessary to use brakes.

(10) When removing brush and small trees, lower cutting edge into ground enough to strike and cut roots. The tractor is normally operated in first or second gear when clearing brush and small trees.

(11) When removing heavier trees, raise moldboard to higher position to gain leverage and push trees to ground. Lower moldboard to ground and cut roots with lifting and pushing action.

CAUTION

When removing trees, precautions must be taken to avoid injury to personnel and

damage to equipment. Units should never work close together as one may push a tree over on the other. Care should be taken not to follow too closely when a tree starts to fall as the root-ball may catch under the front of the tractor which will then require assistance to back off and the bottom of the tractor maybe damaged.

(12) To remove rocks or boulders, tilt the blade, place a corner of moldboard under rock, and work it up and down while pushing on rock. Disengage clutch opposite the point of moldboard under the rock. This will aid in preventing tractor from stalling.

(13) On winch equipped tractors, when operating the winch, nomally only the selector lever is used (fig. 2-3); move lever toward operator to pull in cable, push lever away to release cable. Brake is automatically applied when selector lever is in NEUTRAL position. The selector lever also has a BRAKE-OFF position which allows the cable to be released as required. Vary cable speed by throttling engine. Low idle is recommended for reverse. For inching a load, operate brake lever. Selector lever must be in NEUTRAL for gradual brake-off. Ease selector lever into NEUTRAL to hold a tight cable.

NOTE

When winching, keep the cable in line with the longitudinal axis of the tractor as much as

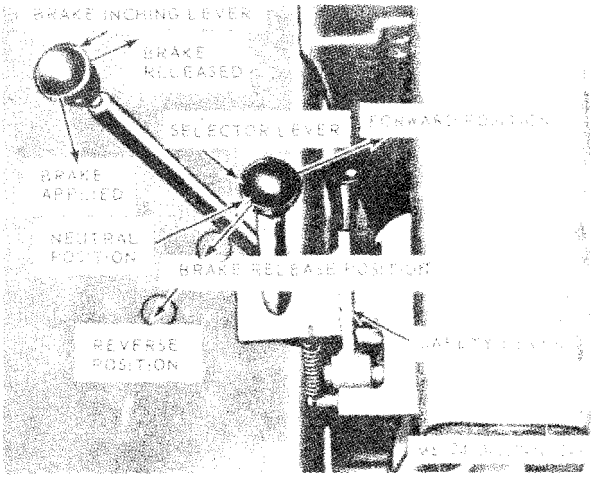


Figure 2–3. Winch operating levers

much as possible. Do not directly winch any objects at angle greater than 5° to either side.

(14) On ripper equipped tractors, when operating the ripper, the control lever (fig. 2–4) is used to raise, lower, and hold the ripper in the desired position. Pull ripper straight into material, shift transmission to first gear, and lower ripper gradually to desired depth as tractor moves forward. It may be necessary to raise and lower ripper to keep tractor from stalling and to properly break up material. Adjust shank length to provide necessary depth penetration (fig. 2–5).

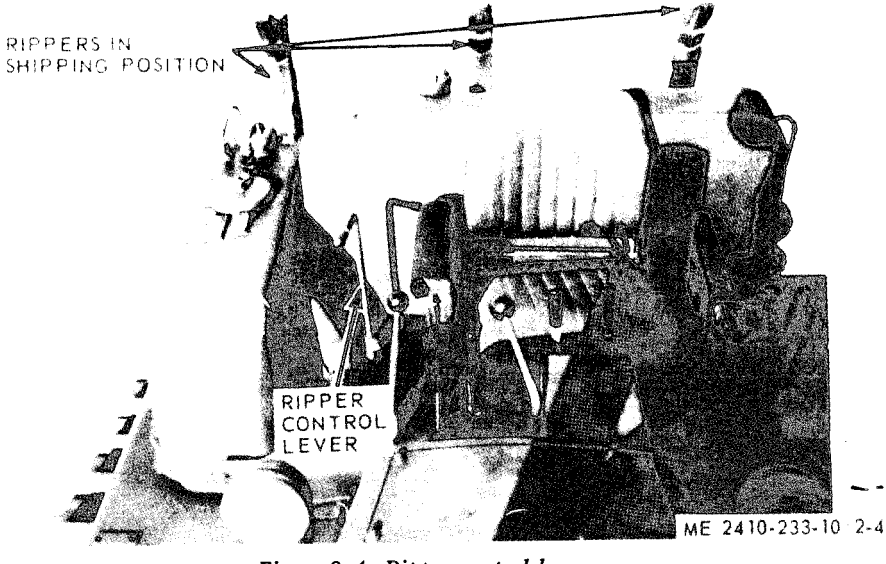


Figure 2–4. Ripper control lever.

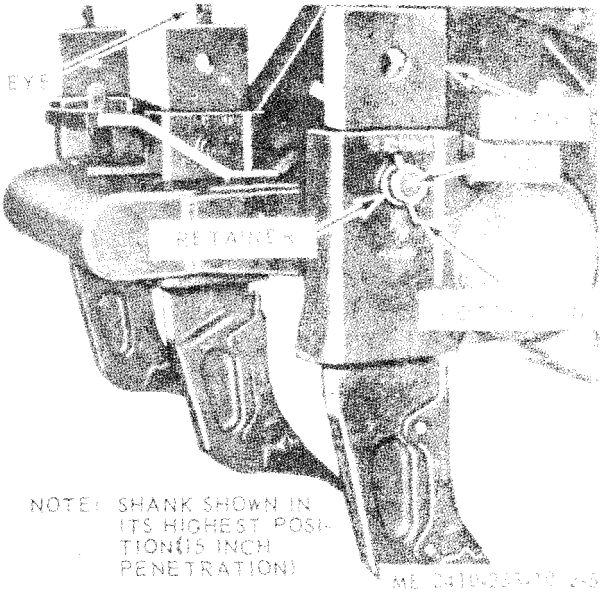


Figure 2–5. Ripper adjustment.

CAUTION

Do not turn tractor abruptly or reverse direction while shanks are in ground. Damage to shanks and tips could result from twisting action when turning.

2-3. Stopping the Tractor

CAUTION

Allow engine to idle for 5 minutes with governor control lever at half-speed position.

NOTE

Shutdown procedures are to be followed to allow turbo-charger to cool down before shutting engine off.

a. Decelerate engine to idle speed.

b. Apply brakes and lock with brake lock control.

c. Move speed selector to NEUTRAL and lock with safety lock.

d. Reduce engine speed to low idle and allow engine to run for 30 seconds.

e. Stop engine by moving governor control lever to shut-off position.

f. Turn disconnect switch (located to left side of operator's seat, behind battery box) to OFF position.

Section II. OPERATING UNDER UNUSUAL CONDITIONS

2-4. Operating Under Unusual Conditions

a. Cold Temperature Operation.

(1) Use correct grade of lubricants for all points of lubrication. Drain and refill where necessary with proper grade lubricant for cold weather operation.

(2) Make sure fuel filters and tank are water free. Drain water from filters and tank at end of days operation. Fill fuel tank after each days operations to prevent condensation.

(3) Winterize the cooling system with proper mixture antifreeze to prevent damage from freezing. Operate engine for 15 minutes after coolant reaches operating temperature to mix coolants.

NOTE

If antifreeze is not available, drain the cooling system after operation. Leave drain cock open until ready to refill system.

(4) Keep batteries fully charged in order to provide sufficient power for cranking engine in cold weather.

(5) Clean mud or snow from tracks after operation, run tractor onto planks, for parking, and cover to protect engine, accessories, and controls from ice and snow. Park in sheltered place if possible.

CAUTION

If mud or snow collects on tracks during operation and is allowed to freeze solid while tractor is idle, or if tracks freeze solidly to ground, apply heat to loosen frozen materials or tracks. Do not attempt to break tractor

loose under engine power or do not move tractor with large frozen lumps of material in tracks.

b. Hot Weather Operation.

(1) Maintain full coolant and lubricating systems in order to prevent overheating.

(2) Keep air, fuel, and hydraulic filters and breathers clean and unrestricted. Drain off condensate from fuel tank and filters. Fill tank to FULL mark at end of each day's operation.

c. Dusty or Sandy Area Operation.

(1) Keep air cleaners and filters as clean as possible. Report to organizational maintenance if air cleaner indicator is showing red.

(2) Keep radiator core free of dust, leaves, and any obstructions to passage of air.

d. Deep Mud or Water Operation. Inspect oil in final drives frequently for mud or water. Drain, wash, and refill if oil shows presence of mud or water. Mud or water in final drives or oil leakage indicates need for repairs or seal replacement. In salt water operating areas, keep the tractor as clean as possible. After operations, wash tractor with fresh water if available.

e. *High Altitude Operation.* The fuel rack and high idle speed settings for maximum turbocharger speed have been adjusted to permit the engine to be operated

at the altitude marked on the warning plate on the dash. The engine can be operated at lower altitudes without changing the adjustment, but with slightly less than maximum performance.

WARNING

Serious injury to personnel or damage to equipment may result from turbocharger overspeeding if engine is operated at an altitude higher than marked on the warning plate.

CHAPTER 3

MAINTENANCE INSTRUCTIONS

Section 1. LUBRICATION

Lubrication of the tractor is the responsibility of organizational maintenance personnel. The operator will perform those lubrication services necessary to keep the tractor in operation. Figure 3-1 locates the check points and lubricants to be used.

Section II. PREVENTIVE MAINTENANCE CHECKS AND SERVICES

To insure that the tractor is ready for operation at all times, it must be inspected systematically so that defects may be discovered and corrected before they result in serious damage or failure. The daily checks and services to be performed are listed in table 3-1; the weekly checks and services are listed in table 3-2. Defects discovered during operation of the tractor will be noted for future correction. Stop operation immediately if a defect is noted that would damage the equipment if operations were continued. All deficiencies will

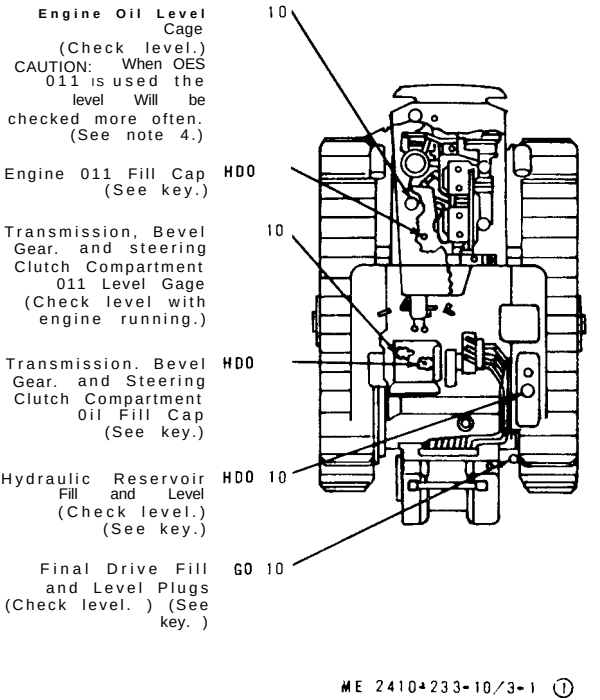


Figure 3-1. Lubrication instructions (sheet 1 of 2).

be recorded, with corrective action taken, on DA Form 2404 (Equipment Inspection and Maintenance Worksheet) at the earliest possible opportunity.

-KEY-

LUBRICANTS	CAPACITY	EXPECTED TEMPERATURES		
		Above +32°F	+40°F to -10°F	0°F to -65°F
HDO-OIL, Engine, Heavy Duty		HDO 30	HDO 10	OES
Transmission Bevel Gear	148 qt			
Steering Clutch				
Engine Crankcase	22 qt			
Hydraulic reservoir	96 qt	HDO 10		
OES-OIL, Engine Sub-zero				
GO-LUBRICATING OIL, Gear		GO 140	GO 90	
Final Drives	36 qt			

NOTES:

1. **FOR OPERATION OF EQUIPMENT IN PROTRACTED COLD TEMPERATURES BELOW - 10° F.** Remove lubricants prescribed in the key for temperatures above - 10° F. Relubricate with lubricants specified in the key for temperatures below - 10° F.

2. **LUBRICANTS.** The following is a list of lubricants with the Military Symbols and applicable Specification numbers.

HDO MIL-L-2104C OES MIL-L-10295
GO MIL-L-2105

3. Intervals given are on hours of normal operation.

4. Engine oil Level. Check oil level with engine running at idle speed, oil warm and transmission in neutral. Maintain oil level between full and add marks on ENGINE RUNNING side of gage.

ME 2410-233-10/3-1 (2)

Figure *3-1. Lubrication instructions (sheet 2 of 2).*

Table 3–1. Preventitive maintenance checks and services (Daily)

B—Before operation B—During operation A—After operation

Interval and sequence No.			Item to be inspected procedure
B	D	A	
1			RADIATOR Check level, add coolant as required, (para. 3-3).
2			FUEL TANK Drain off water and sediment. (fig. 3-8).
		1	Check level, add fuel as required.
3			HYDRAULIC TANK Check level, add fluid as required (para. 3-6).
4			LIGHTS Move light switches to ON position. Visually check lights for operation. Report any failure.
5			ENGINE With engine running and lube oil warm, check level. Add oil as required.
6			TRANSMISSION With engine running and transmission oil war m, check level. Add oil as required.
7			LOOSE OR MISSING PARTS Look for loose or missing nuts, bolts, and/or damaged parts.

Table 3-1. *Preventive maintenance checks and services (Daily)—Con.*
B--Before operation B--During operation A—After operation

Interval and sequence No.			Item to be inspected procedure
B	D	A	
	1		CONTROLS AND INSTRUMENTS With engine running, look for improper gage readings. Gages should register in normal operating range.
	2		AIR CLEANER SERVICE INDICATOR Visually check indicator with engine running for indication of air flow restriction. If red indicator shows, report to maintenance personnel.

Table 3–2. Preventive Maintenance Checks and Services (Weekly)

D—Daily W—Weekly

Internal sequence and No.		Item to be inspected procedure
D	W	
	1	BATTERIES Check level of electrolyte. Level should be $^{3}/_{8}$ inch above plates. Inspect cases for cracks and leaks. Inspect terminals and cables for secure mounting and deterioration, paragraph 3-4.
	2	FAN AND GENERATOR BELTS Inspect belts for frayed condition, deterioration, and proper adjustment of $^{3}/_{4}$ inch deflection when pressure of 25 lbs. is applied mid-way between pulleys.
	3	HOSES AND LINES Inspect hoses and lines for evidence of leaks, abrasions, kinked or restricted areas, and insecure suspension mountings.
	4	FINAL DRIVE Inspect for proper oil level and evidence of water or mud in housing, paragraph 3–7.
	5	WINCH Inspect cable for broken wire strands, lubrication, and evidence of burns and abrasions.

Section III. TROUBLESHOOTING

a. This section contains troubleshooting information for locating and correcting most of the operating troubles which may develop in the tractor. Each malfunction is followed by a list of tests or inspections which will help you to determine probable causes and corrective actions to be taken.

b. This manual cannot list all possible malfunctions that may occur, or all tests or inspections and corrective actions. If a malfunction is not listed (except when malfunctions are obvious) or is not corrected by listed corrective actions, notify organizational maintenance personnel.

Table 3–3. Troubleshooting

MALFUNCTION TEST OR INSPECTION	CORRECTIVE ACTION
1. ENGINE FAILS TO CRANK WHEN SWITCH TURNED TO START	
Step 1. Check battery disconnect switch for ON position.	Turn battery disconnect switch "ON".
Step 2. Check circuit breaker reset button on instrument panel.	**Push circuit breaker reset button on instrument panel.**
Step 3. Check to see if electrolyte level in batteries is over plates.	**If electrolyte level is below top of plates, add distilled or clean water until level is 3/8-inch above tops of plates. Recharge battery.**
Step 4. Inspect for loose, corroded, or broken battery cables or terminals.	**Clean corroded cables, tighten loose connections at battery, ground, switch, or starter. Have defective components replaced by organizational maintenance.**

2. ENGINE FAILS TO START WHEN ENGINE CRANKS

Step 1. Check for empty fuel tank.

Fill tank if empty or low. Use proper grade for temperature range during operation.

Step 2. Check fuel rack linkage by operating governor control lever.

Report to organizational maintenance for tightening of hardware and adjustment of levers and rods.

3. ENGINE HARD TO START OR STALLS FREQUENTLY

Step 1. Check air cleaner for obstructions.

Loosen wingnuts and remove and clean air filter.

Step 2. Clogged fuel filter.

Check filter pressure indicator. Report to organizational maintenance for filter servicing.

Step 3. Check for low fuel supply.

Fill tank with proper grade fuel.

Table 3–3. Troubleshooting—Continued

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION
4. ENGINE OVERHEATS
Step 1. Check coolant and engine oil levels.
Allow engine to cool, then remove radiator fill cap and add coolant. Fill lubricating oil to FULL mark on dipstick.
Step 2. Check fan belt for wear and tension.
Report to organizational maintenance for replacement or adjustment.
Step 3. Check radiator core for obstructions, dirt, leaves, etc.
Back flush core with water under pressure to clean core. Straighten bent core fins.

5. LOW ENGINE POWER

Step 1. Check air cleaner for obstructions.

Loosen wingnuts and remove and clean filter.

Step 2. Inspect for clogged fuel filter.

Check filter pressure indicator. Report to organizational maintenance for filter servicing.

Step 3. Check fuel rack operation by operating governor control lever.

Report to organizational maintenance for tightening of hardware and adjustment of levers and rods.

Step 4. Check exhaust for excessive smoke.

Report to organizational maintenance for turbocharger check out.

6. ENGINE RUNS ERRATICALLY AND VIBRATES

Step 1. Check for clogged fuel filter.

Check filter pressure indicator. Report to organizational maintenance for filter servicing.

Table 3-3. Troubleshooting—Continued

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION
6. ENGINE RUNS ERRATICALLY AND VIBRATES—Continued
Step 2. Check fuel rack operation by operating governor control lever.
Report to organizational maintenance for tightening of hardware and adjustment of levers and rods.
Step 3. Inspect for defective injectors.
Report to organizational maintenance for replacement of injectors.
7. GENERATOR OUTPUT LOW, UNSTEADY, OR NOT CHARGING
Step 1. Check for loose or broken drive belts.
Report to organizational maintenance for adjustment or replacement of belts.

Step 2. Check to see that generator regulator is not defective.

Report to organizational maintenance for adjustment or replacement.

Step 3. Check to see that brush spring tension is not too low.

Report to direct support maintenance for repair.

Step 4. Check for worn or dirty commutator.

Report to organizational maintenance for replacement of generator.

8. TRACTOR WILL NOT MOVE

Step 1. Check transmission oil level.

Fill to FULL mark on dipstick with proper transmission fluid.

Step 2. Check shifting levers and linkages.

a. Report to organizational maintenance for linkage and lever adjustments.
b. Report to direct support maintenance for testing of transmission.

Step 3. In cold weather, make sure tractor is not frozen in mud.

Refer to paragraph 2–4a(5) before trying to move tractor.

Step 4. Check transmission oil pressure gage for normal reading.

Report to organizational maintenance for filter service.

Table 3-3. Troubleshooting—Continued

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

9. WINCH FAILS TO OPERATE OR OPERATES SLOW

Step 1. Check oil level in winch transmission.

Fill transmission to check level with proper grade oil.

Step 2. Check adjustment of levers.

Report to organizational maintenance for lever adjustment.

10. RIPPER FAILS TO RAISE OR LOWER

Step 1. Check oil level in reservoir.

Fill tank to proper level with hydraulic oil.

Step 2. Inspect for defective oil pump.

Report to organizational maintenance for pump and valve test.

Step 3. Inspect for defective control valve.

Report to direct support maintenance for valve replacement.

Section IV. MAINTENANCE PROCEDURES

3-1. Crankcase Oil Level

(Fig. 3-2)

In order to obtain a near accurate measurement of the level of oil in the crankcase, with the oil warm and the engine at idle speed, withdraw the dipstick from the tube, and wipe clean. Reinsert dipstick all the way and then remove for a reading. Reading is taken from side of dipstick marked “ENGINE IDLE”. The crankcase fill plug is removed by turning T-handle counterclockwise until plug can be removed from fill pipe. Add oil as necessary to bring oil level Up to FULL mark on stick. In cold weather sludge formation will increase and oil changes may be required more frequently to eliminate contamination.

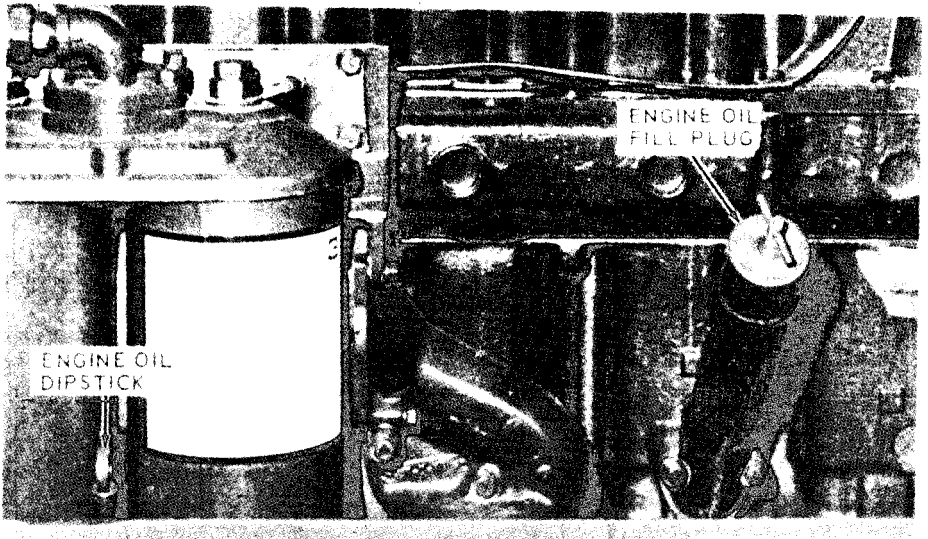


Figure 3–2. Engine crankcase fill and dipstick.

3-2. Engine Air Cleaner

(Fig. 3-3)

The dry type air cleaner has a primary and a secondary element. Report to Organizational Maintenance for replacement or service of the primary element when the red indicator of the air cleaner service indicator, located at the foot of the dashboard, indicates obstruction, or when there is excessive exhaust smoking or loss of power occurs.

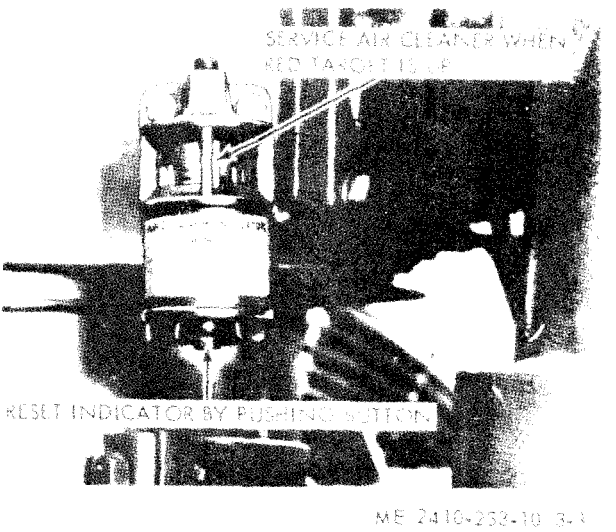


Figure 3–3. Air cleaner service indicator.

3-3. Radiator

Check the coolant level in the radiator. Level should be l-inch from the bottom of the fill neck. Use a mixture of equal parts water and glycol-base antifreeze when replenishing coolant. Check the area of the water pump and along the edges of the cylinder for evidence of leaking. Refer to organizational maintenance for corrective action.

3-4. Batteries

Refer to figure 3-4 and service the batteries.

WARNING

Do not smoke or have open flame in the area of the batteries when servicing. Batteries emit poisonous and explosive gas and can cause death or injury by explosion. Check the electrolyte level weekly. Add distilled water if necessary to mantain electrolyte level $^{3}/_{8}$-inch above separators. Refer to TM 9-6140-200-15 for more specific servicing instructions.

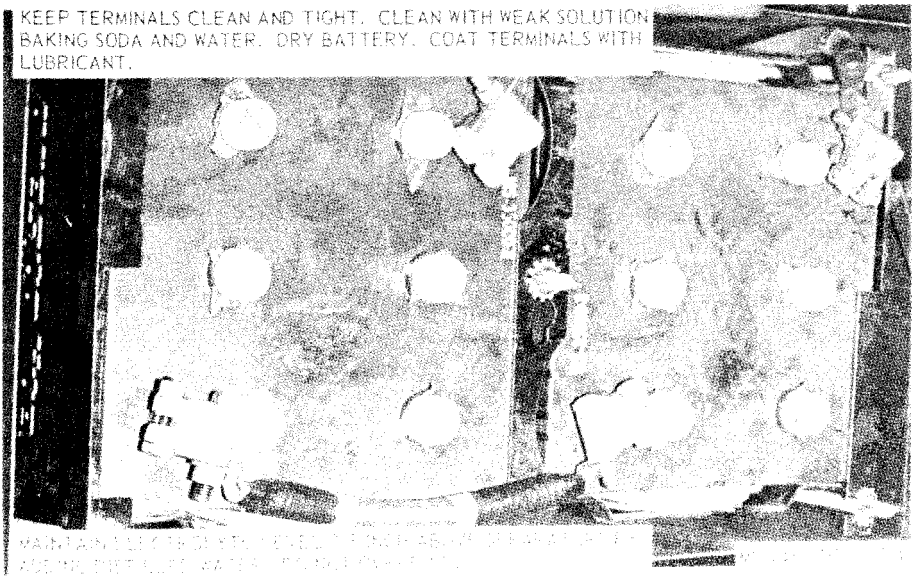


Figure 3–4. Battery servicing.

3-5. Transmission

(Fig. 3-5)

The transmission oil level dipstick is located in the right rear of the compartment under the operator's seat. With the engine running at idle and the transmission in neutral, withdraw the dipstick and check the fluid level. Add fluid through the fill opening to bring the level up to the FULL mark on the dipstick. Refer to the lubrication instructions for the correct fluid to use.

3-6. Hydraulic Tank

(Fig. 3-6)

The hydraulic tank oil level dipstick is located under the filler cap of the tank. Withdraw the dipstick and check the fluid level. Add fluid through the fill opening to bring the level up to the FULL mark on the dipstick. Refer to the lubrication instructions for the correct fluid to use.

3-7. Final Drive Compartments

(Fig. 3-7)

After working in water and mud, remove the final drive fill plugs and check for water and oil level in the final drives. If water or mud is present, remove drain plugs and allow contaminated oil to drain. Reinstall

Figure 3–5. Transmission fill and gage.

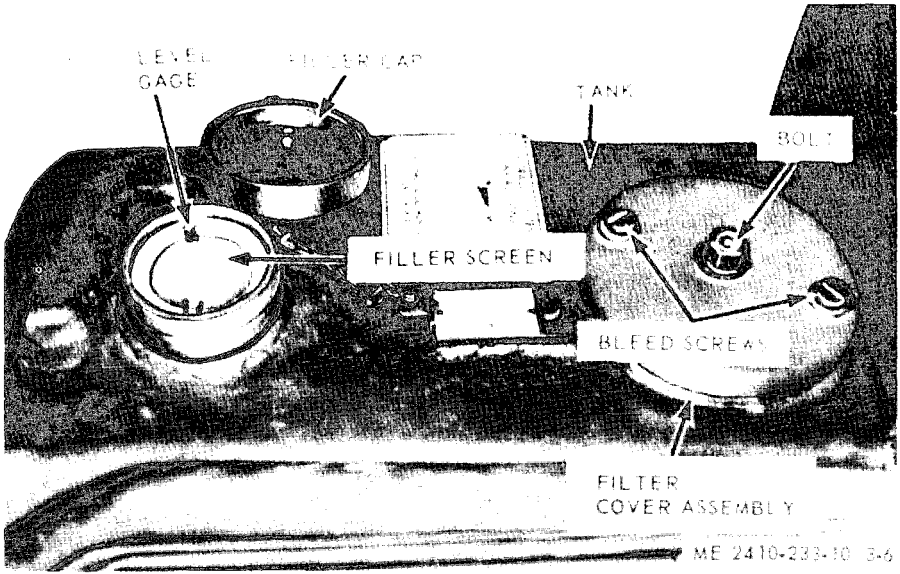


Figure 3–6. Hydraulic tank fill and dipstick.

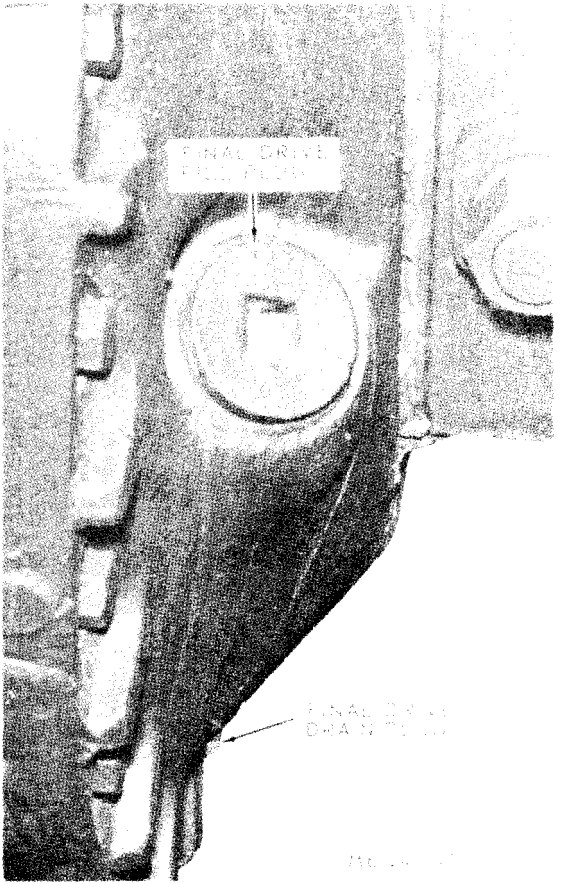


Figure 3–7. *Final drive fill and drain plug.*

the drain plugs and fill the compartments to proper level with kerosene or clean diesel fuel. Drive the tractor back and forth for 5 minutes. Drain, reinstall the plugs, and fill to proper level with fresh lubricant as specified in the lubrication instructions.

3-8. Priming the Fuel System

If a fuel line is opened or filter is serviced, air will enter the fuel system and the system must be primed. Air in the fuel system will cause hard starting or engine misfiring. Prime the system as follows:

a. Be sure the fuel line valve on the bottom of the tank is open (fig. 3-8).

b. Move governor control lever to stop position so fuel injection pumps are closed.

c. Loosen knurled handle of fuel priming pump so plunger may be operated.

d. Open the petcock on the top of the fuel pump.

e. Operate plunger up and down to provide fuel pressure. When a flow of fuel from the petcock is continuous and contains no air bubbles, close the petcock. Open and close the petcock several times while pumping to be sure all air is bled from the system.

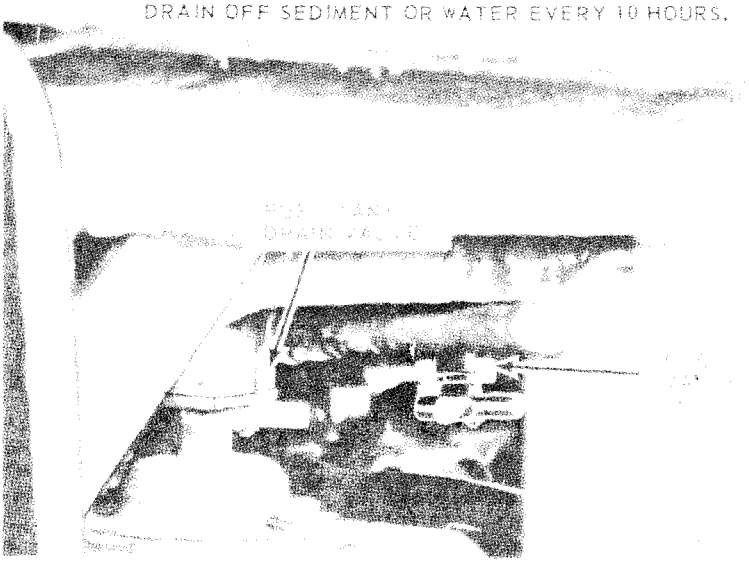


Figure 3–8. Fuel tank drain and line valve

APPENDIX A

REFERENCES

A-1. Lubrication

LO 5–2410-233-12/1,/2__ Lubrication order for Tractor, Full Tracked, Caterpillar Model D–7F.

C9100IL _____ Fuels, Lubricants, Oils, and Waxes.

A-2. Maintenance

TM 9-6140-200-15_____ Lead-Acid Type Batteries.

TM 5-33lA_____ Earthmoving, Compaction, Grading, and Ditching Equipment.

TM 38-750 _____ The Army Maintenance Management System.

APPENDIX B

BASIC ISSUE ITEMS LIST AND ITEMS TROOP INSTALLED OR AUTHORIZED LIST

Federal Stock Number	Name	Quantity
7520-559-9618___	CASE, Maintenance and Operation Manuals.	1

By Order of the Secretary of the Army:

CREIGHTON W. ABRAMS
General, United States Army
Chief of Staff

Official:

VERNE L. BOWERS
Major General, United States Army
The Adjutant General

Distribution:

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THE METRIC SYSTEM AND EQUIVALENTS

'NEAR MEASURE

. Centimeter = 10 Millimeters = 0.01 Meters = 0.3937 Inches
1 Meter = 100 Centimeters = 1000 Millimeters = 39.37 Inches
1 Kilometer = 1000 Meters = 0.621 Miles

'VEIGHTS

Gram = 0.001 Kilograms = 1000 Milligrams = 0.035 Ounces
1 Kilogram = 1000 Grams = 2.2 lb.
1 Metric Ton = 1000 Kilograms = 1 Megagram = 1.1 Short Tons

LIQUID MEASURE

1 Milliliter = 0.001 Liters = 0.0338 Fluid Ounces
1 Liter = 1000 Milliliters = 33.82 Fluid Ounces

SQUARE MEASURE

1 Sq. Centimeter = 100 Sq. Millimeters = 0.155 Sq. Inches
1 Sq. Meter = 10,000 Sq. Centimeters = 10.76 Sq. Feet
1 Sq. Kilometer = 1,000,000 Sq. Meters = 0.386 Sq. Miles

CUBIC MEASURE

1 Cu. Centimeter = 1000 Cu. Millimeters = 0.06 Cu. Inches
1 Cu. Meter = 1,000,000 Cu. Centimeters = 35.31 Cu. Feet

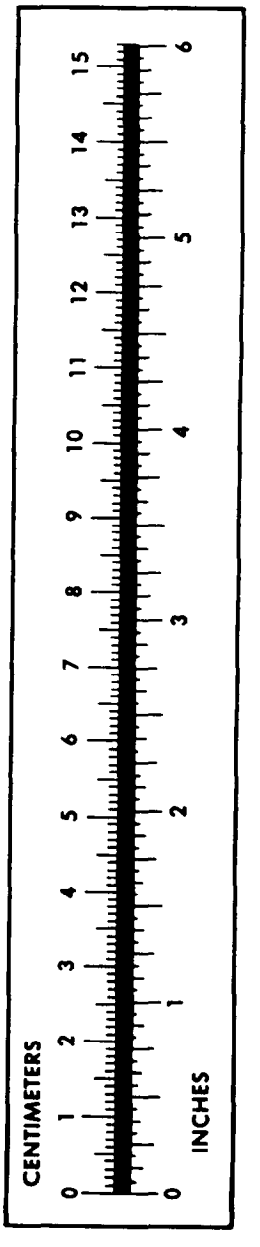
TEMPERATURE

5/9(°F - 32) = °C
212° Fahrenheit is evuivalent to 100° Celsius
90° Fahrenheit is equivalent to 32.2° Celsius
32° Fahrenheit is equivalent to 0° Celsius
9/5C° + 32 =°F

APPROXIMATE CONVERSION FACTORS

TO CHANGE	TO	MULTIPLY BY
Inches	Centimeters	2.540
Feet	Meters	0.305
Yards	Meters	0.914
Miles	Kilometers	1.609
Square Inches	Square Centimeters	6.451
Square Feet	Square Meters	0.093
Square Yards	Square Meters	0.836
Square Miles	Square Kilometers	2.590
Acres	Square Hectometers	0.405
Cubic Feet	Cubic Meters	0.028
Cubic Yards	Cubic Meters	0.765
Fluid Ounces	Milliliters	29.573
ıts	Liters	0.473
arts	Liters	0.946
allons	Liters	3.785
Ounces	Grams	28.349
Pounds	Kilograms	0.454
Short Tons	Metric Tons	0.907
Pound-Feet	Newton-Meters	1.356
Pounds per Square Inch	Kilopascals	6.895
Miles per Gallon	Kilometers per Liter	0.425
Miles per Hour	Kilometers per Hour	1.609

TO CHANGE	TO	MULTIPLY BY
Centimeters	Inches	0.394
Meters	Feet	3.280
Meters	Yards	1.094
Kilometers	Miles	0.621
Square Centimeters	Square Inches	0.155
Square Meters	Square Feet	10.764
Square Meters	Square Yards	1.196
Square Kilometers	Square Miles	0.386
Square Hectometers	Acres	2.471
Cubic Meters	Cubic Feet	35.315
Cubic Meters	Cubic Yards	1.308
Milliliters	Fluid Ounces	0.034
Liters	Pints	2.113
Liters	Quarts	1.057
ers	Gallons	0.264
ms	Ounces	0.035
ograms	Pounds	2.205
Metric Tons	Short Tons	1.102
Newton-Meters	Pounds-Feet	0.738
Kilopascals	Pounds per Square Inch	0.145
lometers per Liter	Miles per Gallon	2.354
meters per Hour	Miles per Hour	0.621



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