

PS
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**THE
PREVENTIVE
MAINTENANCE
MONTHLY**

1953 Series

ISSUE 14



**BULLDOG
EDITION**



Let's face it men, this is another new vehicle made to take you and to get to wherever you'll need to shoot at somebody who's shooting at you.

If you gotta go, get in the first shot, and get back in time for dinner, you'll have to keep your M48's well fed, well groomed, and in general good health. You take the best care of yourself when you take care of conditions that affect you.

This, as President Eisenhower said a few weeks back, is the sort of thing we call "enlightened self-interest."

This special issue of PE Magazine is to help you take care of some of those conditions. As your newspapers and newsmagazines tell you what goes on in the world by the day and week, PE is your month-to-month technical newsmagazine of what's happening with your equipment between issues of TMs, TRs and other references.

Nearly all of what's in this issue is new since 15 SEP50 (June 21). In fact, there's so much new during all the time a vehicle like the M48 is proving itself out in practice. Ordnance is ready to give you all kinds of help when and where you may need it.

Wherever there's a M48 you'll most likely find Ordnance Corps Technicians, Ordnance Inspector-Inspectors, and/or Cadillac service representatives who are ready, willing, and anxious to answer your questions, get you service or parts that may not be listed in the Supply Catalog you have on hand, and keep you posted on special tools and equipment you'll need for special situations.

It's up to you to take full advantage of all this help. Read what's here before you ride. Be selfish. Be enlightened. Learn how to get where you're going and get back again.

attention major unit commanders

This issue of PE Magazine is devoted entirely to the Light Tank Family of vehicles and will be of greatest use to units whose mission will include some relationship with the 41 series chassis. Others will find the issue useful for maintenance only. You'll want to plan

a special distribution to get the most copies to where they will do the most good. Each crew member should have a copy for ready reference, and one of the special data cards should be kept handy for use when starting and running tanks.

KEEP OUT OF TROUBLE

Avoid walking on linkage—they bend

Avoid stepping on battery covers—they short circuits

Avoid stepping on engine fan shroud—you'll hit the fan

Listen to spin transmission cover doors, it's not so much your fingers

Listen to spin battery cover doors, it's not so much your fingers

Drive the fuel filter line a meter—you don't want fuel and fire in the bilge

Adjust air cleaner doors to avoid fire and low air-pressure for you

Keep a run-up when the boat's running—you'll both breathe easier

Stand by with an extinguisher when the tank's being gassed

Stand by with extinguisher when the tank's started



TANK NUMBER

First thing to get acquainted with is the number on your tank. Most of what you'll do with this tank and its B, in operation and maintenance, will depend in some way on what it was made and what's already been done at the factory, in the field, or in the modification depot. Most situations you'll get will deal with groups of tanks in the same family, by blocks of numbers.

The early models #1 thru #227 (if not yet modified) have the number on the outside hull, behind the right handloop.

Later model numbers are stamped on a 2x4 plate mounted at the top-right of the star hull plate. The number on the top-right is the manufacturer's number.

TURRET

HOW THE T41E1 TURRET OPERATES

THE T41E1 turret is very similar to the M47. You can traverse the turret by hand or by power, but the gun can only be elevated by operating a hydraulic pump.

Here's a run-down on how your turret should be operated:

1. If the gun is in the DOWN position, before you try to raise anything first unlock the gun-travel lock. (Remove the wing nut and turn the upper half of the lock from through barrel, then rotate inside the barrel inside the gun to clear the lock, then

slide the lock over, tighten the wing nut, and swing the scale down until it's engaged in the spring-loaded notch.)

2. Check the oil in the oil-gauge reservoir. The filler cap with attached dipstick is under the command-mat seat (Fig. 2); it should be up to the (H.L.) mark at all times.

3. Check the turret-brake lock. Turn the handle clockwise to unlock. (After locking the turret, use either the turret-brake lock or the gun-travel lock—never both at the same time because neither leads to lugging up the traversing-gear teeth.)

4. Turn on the master switch in the driver's compartment.

5. Before operating the turret by power, remember: The batteries won't last long if the turret is operated without one of the engines running. If for training purposes, use the auxiliary engine. If you're going to shoot the tank with a short time, start the main engine and keep it turned up to 1000-rpm. Also be sure the vehicle is located where the turret can be traversed without the gun coming into something.

6. Now look at the traverse safety-switch on the turret calling forward of the radio. It must be ON (Fig. 2) if it's on when the red light is lit. This switch is for the radio to cut the turret's traversing power whenever it needs to go behind the gun to get ammunition from the hull.

7. Turn on the AUTOMATIC switch located on the



the control box, or the indicator to the right of the gunner (Fig. 2). A green light above the control lights when the switch is on. The automatic switch and the inverse valve-pump must be on to start the traversing motor.)

3. For emergency control of the turret the gunner's handle is the FIRST position. Now you're back to your inverse the turret.

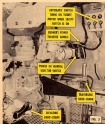
4. To turn the turret left, rotate the gunner's handle hand-to-hand (to the left); go right, rotate the handle right. The amount the handle is moved regulates the speed of the turret.

To go from power to manual operation, all you have to do is to flip the toggle switch from POWER to MANUAL and traverse the turret with the hand crank. (When in this manual position—only the gunner can traverse

the turret—the commander's handle is dead as far as operating the turret, but it still has the power to fire the gun.)

Elevation is controlled by the hand-cranking pump. To elevate the gun, crank the handle clockwise—to lower the 76, crank it counter-clockwise. If the elevating-pump handle works springy and doesn't control the gun effectively, put more pressure into the system by pumping the hand supercharge-pump that's located to the right of the gunner's seat. Two or three strokes is usually enough. While pumping, run the hand-elevating pump at the same time as you can "feel" when the gun elevates OK. Never overcharge the system or you'll blow the elevators out of the pump. You can tell overcharging when the elevating pump handle begins to freeze up.

The commander's override handle lets the commander traverse the turret only when the gunner is in POWER control. By operating the switch on the back of the handle the commander takes control away from the gunner, and he rotates the handle to traverse the turret. The commander cannot traverse manually or elevate and depress the gun—only the gunner can do this.



A Word About

HYDRAULIC ACCUMULATOR-PRESSURE

Hydraulic accumulator pressure must be kept up to 900 psi*. When you first get your tank, stroke and depress your gun a couple times. If the flow is slow, stroke the hand supercharge pump that's located to the right of the gunner's seat. If the pump doesn't help much, chances are the accumulator pressure is down.

Have Ordnance regulate the accumulator pressure, and then keep your eye on the pressure for a few weeks until the system is broken in—need to make sure no leaks develop.

Then Navy Ordnance checks the pressure every month thereafter.

*Pounds per square inch.

Bleeding Gun-Elevating Hydraulic-System

All in the line of the hydraulic gun-elevating system causes jolts when in raising and lowering the gun and stationary gun position. Correct this by bleeding the line in the system.

Here's how it's done:

1. Use the hand bleeding pump, stroke the gun transmission-control bar to right against the stop, and lock in this position.

2. Open the valves on each side of the elevated valve and the bleed valve on top of the bleeding cylinder (Fig. 4).

3. Pump the hand supercharge pump until a good stream of oil without air spurts comes through all three valves. (Bleed lines should be used if you can get them, so that oil can be caught in a container instead of spilling all over the fighting compartment.)

Note Don't stroke gun being bled.

4. Close all three valves when pumping hand pump.

5. Stroke and depress the gun several times with

the hand bleeding pump, spring sufficient supercharge pressure to raise the gun to maximum elevation and maximum direction.

6. If the gun continues to move erratically, there's still air in the system. Repeat the bleeding process and test again.

Note Doing the bleeding operation of level in the nearest available port is preferred.



T41E1 turret trouble-shooting

SYMPTOM

TROUBLE	REASONS OR CAUSES				
	1	2	3	4	5
1. Turret will not tilt down	1	2			
2. Turret will tilt in one way only	2	3	4	5	1
3. Overhaul on one side	1	2	3	4	5
4. Gears in trouble	1	2	3	4	5
5. Gears or links in line	1				
6. Large backlash (slop)	1				
7. Low resistance or high resistance loading rate	1				
8. One side freewheel with gear on it	1	2	3	4	5
9. Slop which is normal turret design	1				
10. Hand freewheel handle spins	1				

REASON

TROUBLE	REASON OR CAUSE				
	1	2	3	4	5
1. One down	1	2	3	4	5
2. Turret overhauling pump ineffective	1	2	3	4	5
3. Free lines of overhauling	1	2	3	4	5
4. One cylinder not free to rotate	1	2	3	4	5
5. One pump cylinder sticks after rough turret operation	1	2	3	4	5
6. (1) Not in hand overhauling pump in top after rough turret operation	1	2			

TROUBLE CHECK

1. Look over on signal order. (Check connections.)
2. Test handle pump. (Check connections.)
3. Low pressure signal. (Test pump and adjust.)
4. Measure handle pressure. (Replace handle.)
5. Check gear-tooth clear. (Replace teeth or check clearance for tightness and add lub. oil when it is needed.)
6. Turret rotation. (Start off turret's safety switch, leave firing switch in 00 position, check to see if individual system is operative.)
7. Isolate trouble between overhauling and reference system by operating turret with hand crank shaft only — if OK, trouble is isolated to hand crank shaft.

REASON CHECK

1. Check differential pressure > 5-10 psig range index.
2. Check stroke length. If it exceeds normal.
3. Adjust overhauling.
4. Check handle bar.
5. Free up stuck or bind. (Following gear check-off test.)
6. Relief valve is overadjustment on low line. (Line is higher pressure.)
7. Test gear in handle oil, in handle.
8. Measure nut up in handle.
9. Insure oil is clean.
10. Turret gear's handle.
11. Turret controller's handle.
12. Replace signal water transfer. (Send by hand-off-turret's safety switch and turning in clockwise circle. Move gear's handle to right and left. Listen for signal water on pump line. If OK, signal water can be used to operate in both directions.)

FUNCTION CHECK

1. Isolate overhauling system for check of cylinder seals.
2. Isolate overhauling system without relief valve. Check calibration.
3. Isolate low failed after check of A1 and B1. (Replace.)
4. Check valve is stuck — check out or replace.
5. Relief line tested (Replace.)
6. Check system.
7. Operating pressure is low — check hand overhauling pump.
8. Hand overhauling line failed.
9. Accumulator pressure (A₂) is low — replace filter and change.
10. Accumulator line has failed.
11. Hand overhauling pump has failed (Replace.)
12. Check relief points on overhauling system. (Replace or adjust.)
13. Adjust seal calibration.
14. Check signaling equipment for response.
15. Check for spurious lines in rate correction.

Note: Naturally, learn behavior of the system that are out of your control.

how the T41E2 turret operates

The only difference between the T41E1 and the E1 is the turret-control system. It's known as the Cadillac turret control (covering and elevating system)—designed for simpler operation and maintenance, and to give you more ammunition space in the turret.

Here's how it should be operated. As with the E1, the locks must be released before the turret can be moved. The travel lock is the same as the E1's, but the turret lock has been changed. It's in front of the gunner, ahead of the traverse-gear box (Fig. 1). To unlock the turret, pull the handle out, disengage the splines, turn the handle to the left about 45-deg., and re-engage the handle into the splines. To lock the turret, turn the handle to the right and do the same. If the teeth don't engage, rattle slightly with the hand crank until they do. As with the E1—the turret lock and the gun travel-lock should not be used at the same time.

Before traversing, make sure the engine grill-doors are closed, and that any loose gauges around the basket are out of the way. And it's a good idea to hand crank the turret before power traversing—just to make sure the turret isn't locked. The turret turn is the same direction as the crank.

To power traverse, follow these steps:

Turn ON the master switch and start one of the engines. The traverse motor is only 1½ horse, but it will draw enough amps from the batteries to war-

ren't easily recharging.

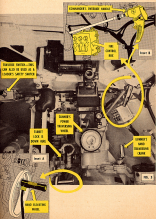
Turn on the traverse switch (located on the turret ceiling above the gun barrel) to start the traverse motor. This switch also acts as the leader's safety switch so he can cut the power when he needs to.

Now, turn the gunner's power-traverse wheel, which is mounted on the traverse box in front of the gunner. Turn the wheel to the left to traverse the turret to the left. Turn right to traverse right. When you turn the wheel slightly, the turret will barely creep. The more you turn the wheel from its neutral point, the faster the turret will traverse.

To elevate or depress the gun, there's a handwheel mounted on the side of the gun cradle (Fig. 1—line A). Turn it clockwise to lower the gun and counter-clockwise to raise it. (Fusion fuses on the wheel let you get the fuses you need to operate the gun up or down.)

The gunner's firing trigger is located on the elevating handle. Before pulling the trigger to fire, flip on the 15-amp or cut .58 switch on the fire control box to the OFF position.

Since the commander has a better view of the enemy-side than the gunner, he's provided with a set of controls that let him override the gunner's controls either in elevation or traverse if he spots a target that the gunner can't see. The commander's controls are all incorporated in a single photo-type



handle mounted on the rolling forward of his back (Fig. 3—Item B).

Here's how it works:

To override the gunner in elevation, the elevation switch must be up; in azimuth, the ELEVATION switch on the fire control has must be on. The turret will reverse in the direction the handle is moved—reverse speed depends on the distance you move the handle. The mechanical linkage from this handle to the gunner's wheel is designed so the gunner will know he's being overridden—he will feel the force of the override in the action of his turret wheel. On the B1,

the override makes the gunner's controls powerless, but with this mechanical override on the B2, the gunner is instantly aware of the commander's action and can more readily follow the new situation. He must "dead-weigh" trailing and momentary confusion about "what happens!" Even when the gunner is cranking or elevating with the hand crank, the commander can override in power without losing the manual controls.

To override the gunner in direction, or to elevate the gun, move the same handle forward to elevate and backward to depress. Commander's elevation control has one constant speed.

AUTOMATIC BLEED ON REPLENISHER CYLINDER

On tanks with Manufacturer's Model 1300 and under, you'll need to keep an eye on your gun-replenisher-cylinder bleed-hole. It's located on the cylinder between the rear mounting-strap and the oil-service instructions, as shown in the oil service instructions should be (Fig. 4).

This hole must be open at all times

to let all out when too much oil pressure develops. When it's plugged, surplus oil stays in the cylinder, causing excessive pressure and interfering with the gun recoil action. So watch it if you're swinging a point back in this vicinity and in case somebody else has painted over the hole, open it with a piece of wire.



REPLENISHER-CYLINDER INDICATOR-TAPE

This tape chart located at the rear of the replenisher is your guide as to how much oil is in your refill space. Markers have been put on at markings so it can keep you posted even in the dark—just feel it, and it'll tell you where you stand. That is, if you know what the markers mean. If your tank doesn't have an instruction plate on its replenisher cylinder, paste this strip on (Fig. 7) so you can be kept posted.

If you don't have enough oil, first remove the filler plug from the replenisher, and the needle from your filler gun. Fill the filler gun with OIL, screw the hose on the filler gun into the filler-plug hole loosely, push the plunger

slightly to force the oil out, screw the hose tight and force the fluid into the replenisher.

If you have too much fluid in the system, remove the filler plug on the replenisher. Hold a rag under the filler-plug hole and let the rag absorb the oil being drained. Push in on the ball valve in the filler-plug hole with the needle of the filler gun so the fluid will flow out of the replenisher, and use gradual pressure on the ball valve to control the amount of oil flow. Or work with Manufacturer's Serial No. 1588 and up, a valve was added to the top of the replenisher cylinder. To bleed, just open the valve and watch the oil.

REPLENISHER INDICATOR TAPE

Long needles on both sides

BLEED—Don't use it's meant to show the correct oil.

Small on both sides

FULL—System has too much oil, but still no leaks—inspect and open the bleed valves to ease the pressure (and hole isn't working).

ALL TO ONE

WHEN FILING

Needle on one side only

DRIPPING BLEED—The right amount of oil is in the system.

NO NEEDLE IN BOTH SIDES

EMPTY—Don't use gas in this condition. Oil cylinder is past between the ball and opening (right side).

FIG. 7

Compression Fittings

It's a natural urge to take a wrench and tighten a fitting when you notice it's leaking—but keep your muscles off the tube fittings in the newer hydraulic systems. These are not like gas-line fittings. These are compression-type fittings that you should pull up only $\frac{1}{4}$ turn per snug when you put 'em on. If you see one leaking, tighten it finger-tight and then no more than $\frac{1}{4}$ turn. If it still leaks, all the tightening in the world won't stop it—you'll need to make a new connection (if the tube's long enough) or replace the tube.

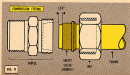
You can use the compression-type fitting over and over again without losing its sealing qualities if you'll only use it properly. Only its seal (shoulder) should be replaced. If you've got to replace a piece of tube to stop a leak, first remove the old tubing and remove the fitting carefully. Then cut off the un-bolted ferrule (if you're going to use the same piece of tubing).

Next, get a nipple part of a compression fitting and grip it in a smooth-jaw vice. This is a device to prevent all your compression ferrules in the right plane on the tubing. Keep in mind—the same nipple can be used as a fixture for pre-tuning up on six sleeves, but then it should be used for a final assembly in the turret because more than six "settings" may distort the seat in the nipple.

Now place the nut and the ferrule on the tubing so that the shoulder end of the sleeve is facing the threaded end of the nut (Fig. 8). Cut the tubing off square and remove all burrs.

Lubricate tubing and ferrule with light-weight oil. Next, slide the tube into the nipple (shoulder to the flange) and turn the nut finger-tight. Then press the tubing into the fitting firmly so that the ferrule and the nut shoulder meet evenly.

Tighten the nut with a wrench, but no more than $\frac{1}{4}$ to $\frac{1}{2}$ turn. That'll



pass the ferrule on the tubing. Then tighten the nut, remove the tubing from the fitting, and check the ferrule's distance from end of tube. The distance should be approximately $1/4"$, but not less than $1/16"$ (Fig. 9). If it's on OK, it's ready to be put into the tank.

When working in case the nipple in the tank, tighten the nut on the fitting only hand tight. Then, using an open-end wrench, tighten the nut no more than an additional $1/4$ turn.



HAND-FIRING HANDLE ON THE 76mm

One of the quirks on some of these tanks is that the hand-firing control handle on the 76mm gun often in the FIRE position, it should always return to the OPEN position.

To stay on the safe side, before firing your piece check up on the handle and make sure it returns to OPEN as it should. If it has a hard time to stick, or if the cam doesn't slide the follower when in released position, you'll need to move the cam on the handle as shown in Fig. 18. Here's how to do it:

1. Remove the cap-screws that hold the control handle to the gun cradle and take off the handle.

2. Now remove the snap ring from the handle.

3. Next remove the cam from the handle serrations and move the cam two serrations (21° clockwise [looking from the cam end]) from its original position.

4. Put back the snap ring.

5. Position the handle on the gun cradle, put back the screws and tighten them to about 25 ft. lbs. torque.

When you've done all this, try the gun again and see if the handle works.



SUSPENSION

OIL, NOT GREASE

The late order is TH 9-130 (June 11) says to take the suspension with grease...but a revision to improve the truck's suspension changed this. Be glazing with Manufacturer's No. 301, all the suspension-bearing components and the suspension-bearing mounting hold oil instead of grease. Plugs replaced the Zerk grease fittings. The road-wheel hubs and support rollers are dressed with two plugs so that one plug is usually on top. Now, instead of poking around the suspension with your grease gun like the late order says, you'll have to use a 1/4" Allen wrench to remove the filler plugs and fill the cavities with OE.

On trucks with Manufacturer's No. 1113 and up, the Allen plugs were changed to hex-head plugs, so you'll need a wrench.

When pouring oil into the hubs, particularly the track-support-roller hubs, give the oil enough time to fill all the cavities because the clearances are close enough to cause some oil restriction. Each road wheel takes about 13 ounces. Compensating-wheel hub, compensating-lever and suspension-bearing mounting each hold 18 ounces. The track-support-roller hubs take 4 ounces each.

The oil in these pockets should be checked every 500 miles to be sure it's kept at plug-hole level. In the double-plug hubs, always remove the plug that's on top for your check. If no oil comes out, rotate the wheel to get the plugs on a line horizontal with the ground. If oil still doesn't come out, rotate the wheel till the open plug is on top again and add OE oil to run out.

Know & Keep From & Oily

Cast your eye around the central areas of the bearings every so often and note the amount of oil seepage. If you see a little oil, it doesn't mean the seals need to be replaced. Here's a guide as to how much oil you can lose and still be on the safe side.

Run the truck a while, then stop and put a piece of paper under the leaky seals. Let it sit for three minutes. The puddle on the paper must not be bigger than 4" across (on concrete 655⁷) when you have it under the road wheels, suspension bearings or cone-pushing units. And a puddle 3" across (on concrete 114⁷) under the track-top post rollers. If your puddles are larger than that, the seals should be replaced.

If it's your rough luck to inherit one of those leaky old seals, acquisition your replacement seals and spacers by the numbers is ORD 7 SNE 6291 and also by marking the truck's Manufacturer's Serial Number on your requisition. You get the hub and one of the assemblies with a drift and hammer after reaming the assemblies.

To install these new face-type seals, the tools you'll need are listed on pages 682 and 685.

TRACK ADJUSTMENT

The track for the T41 is the M-1000 T51E2 track—and for proper adjustment, the sag between the first and second track-support rollers should be $\frac{3}{4}$ " to 1".

It's checked this way: Drive forward, and coast to a stop without using the brakes. Then place a straight-edge on the track and measure the sag midway between the rollers (Fig. 11).



If the sag is more than 1", the track needs adjusting. Loosen the adjusting-nut stop (at this point, it's a good idea to clean the mud and dirt from the nut threads and give 'em a smear of grease), then turn the adjusting-nut either clockwise to tighten the track, or counter-clockwise to loosen the track. When you think it's about right, drive the tank forward, coast to a stop, and retighten the sag. Keep this up until you've got that $\frac{3}{4}$ " to 1" adjustment. After you've got it, place the nut stop back in its original position—make sure the locking plane is well seated against the adjusting screw—and tighten the bolt.

Now take a look at the clearance between the adjusting nut and the eyebolt (Fig. 12). It should be 1/8" or

more. If it isn't, the adjusting nut will make loose, get caught in the track, and all hell will break loose. This 1/8" minimum clearance is a must—to keep tightening the nut until you get it.

On new tracks, the sag may be less than the $\frac{3}{4}$ " minimum is—keep-the-eyebolt from scratching the adjusting nut. But running new tracks tight isn't harmful—they usually stretch to proper sag after a few miles of operation.

And to ease you're wondering: Having more shoes in one track than the other will not affect the operation of the tank in any way as long as each track is adjusted right.

Another tip that'll keep-the-adjusting-nut-and-eyebolt from being a trouble in one spot: Out in the classroom (and you leave Marmar, boy) the nut and bolt get an edge to nut and sick, making track adjustments a bit difficult. So every time the track is broken, loosen the adjusting-nut stop, back off the nut and push nut and threads with grease (Fig. 12). Take care not to fill the nut or bolt that the expansion plug gets pushed out when it's turned back on the eyebolt.



TRACK PIN INSTALLATION

WHEN connecting track shoes, be warning loose the right-angled wooden pin from trying your usual. Maybe you're using the wrong method, or the wrong track-jacks.

It's possible to install track shoes at several different angles because of their octagon-shaped bushings. Only one angle is correct... the one shown in Fig. 11. And this angle is necessary to keep stresses and wear to a minimum—it also cuts down hard work when you connect and disconnect the track.



This is the best way to placement the track:

1. Release track tension.
 2. Install two track-jacks (Part No. 41-F-2986-00) to the inside of the track, between the compensating and front end-shoes.
 3. Saw out a straight edge on the sheet along-side the jack.
 4. Draw track together until the center of the "V" is 16" from the straight edge (Fig. 12).
 5. Remove safety nuts and washers at each end of the pin between jacks.
 6. Screw adapter of pulley (41-F-2987-00) on pin through and pull pin from track.
- To connect track the right way:
1. Install two track-jacks to track.
 2. Draw the track together until you get the 16" measurement.
 3. You're now ready to drive the bar connecting-pin in place. There's no tin-bushings, the pin must go

through. Use a 12" crescent wrench to rotate and drive the pin at one corner to each bushing... the old "use a bigger hammer" idea will rub one or two shoes at each of a pin. As the pin is driven in and reaching the next bushing, rotate the pin with the wrench, get it lined up with bushing, then tap it lightly with the pulley or hammer.

4. Tighten pin nuts to 100-200 ft lbs torque (Always tighten pin nuts before removing jacks)

5. Remove track-jacks and adjust track for 1/2" to 1" sag between front and center track-support rollers. Incidentally, track-jack 41-F-2986-00 is a new design. It's different than the one shown in Fig. 12. If you're saving around any other type than what's mentioned here, regardless a new set, don't use get you new set, use track-jack 41-F-2986-00...it's the one used on the M5.

Make after the first few miles of operation, tighten pin nuts to at least 100 ft lbs torque. This'll hold track pins.

COMPENSATING WHEEL WEAR

A major preventive check done while the track's off is switching the compensating-wheel shoes. The track's inner guide-chains (the water-disc guide-flange and make its wear occur rapidly than the inner-disc flange (Fig. 14). And any distortion of the compensating wheel or linkage will rack the wheel, increasing the wear on the inner disc.

To get the most use out of the compensating wheel, it's smart to equalize this wear. Put "inner" shoe on "outer" side, and vice versa, every 1000 miles.



TORSION BARS and ANCHORS

When replacing a broken torsion bar, the mating anchor should always be replaced because the bar and anchor often rub each other's shape while they're mated. For this reason, the serrations on a new torsion bar won't always mate properly with those of the used anchor. Also, the anchor is usually damaged some, even though you may not see it.

Torsion bars are marked with an arrow and a part number for identification. Plus, to cut down hushbackers, the bars are now also being marked with a dab of color on the outer ends (Fig. 11).

To quote a gentleman in the *Jed Crowley*: "You don't have to beat a gat to install a torsion bar. Some guys don't change the anchor and don't index the blank space on the bar with the square notch in the anchor, then they wonder why it takes compare wheels with a 18 lb. sledge to run her home."

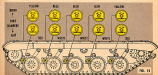
He goes on to inform us, "Here's the extent and also the correct way. First,

replace the anchor and keep its plate level. This'll allow for any misalignment of the support mounting.

"Next, make sure you've got the right bar, then grease the serrations at each end and shove the bar thru the support and spring and into the neck. Turn the bar so the lower serration's blank notch is on top (it's black) and lines up with the anchor's blank notch. Push the bar lightly until these serrations just meet.

"Then index the support and until its blank notch lines up with the bar's upper serration's blank notch. When they're aligned, the bar should slip home and seat itself with a push of the hand. If you're a little weak on the push, tap the bar lightly with a piece of wood. When the bar's in place, keep the suspension well supported until the cap and retaining bolts are installed.

"When handling bars avoid scarring them—scratches and burrs cause 'nose concentrations' which in turn mean premature failures, which in turn mean more work."



Wheel Bearing Adjustment

There's been a change in the bearing adjustment as it was originally given in TM 9-150 (June 50). Here are the new specifications, by the numbers.

With a torque wrench:

1. Raise wheel off ground.
2. Remove hub cap, grease, main spring and cone pin.
3. Tighten the nut to 100 ft-lbs torque.
4. Back off nut to zero.
5. Tighten the nut to 75 ft-lbs torque. If parts are old—80 ft-lbs, if new.
6. If you ring at the pin hole—pin in; if not, back off to nearest center-pin hole.
7. Insert cone pin, main spring, grease and hub cap.

Without a torque wrench:

1. Tighten nut good and tight.
2. Back off nut till wheel spins freely.
3. Spin wheel and tighten nut till wheel drags slightly.
4. Loosen cone-pin hole, then back off nut till hole is clear.
5. Insert cone pin, main spring, grease and hub cap.

Speaking of a torque wrench . . . you'll get accurate torque readings only from free-running, lubricated threads. If threads are galled, bogged, or seized, your reading can be as much as 20% wrong—and usually is. Clean and oil the threads.

pairing-up bearing cones and caps

You can get a failure in road wheels, final drives, track support rollers, road wheel support, and compensating wheels when bearing cones and caps are not checked to be sure they pair up (Fig. 15).

For best service, bearing-cone-and-cap combinations should be put together from bearing cones and caps made by the same manufacturer. For example, use Hyst bearing-cones with Hyst caps, New Departure bearing-cones with New Departure caps, and Timken bearing-cones with Timken caps. You'll see their name stamped on the parts.

This should be standard practice when installing old bearings because of the possibility that there might be a slight difference between parts.



Fig. 15

REPLACING ROAD WHEELS

When using wheel lites H1 and H2, 308.

1. Loosen, but don't remove, the wheel nuts.
2. Install the lites with lower lock-wash facing the front of the tank and upper end snug against the main-wheel support arms.
3. Drive the tank forward slowly. Both ends must engage properly. Stop tank when lites are vertical. **Gentle!** Make sure you and everyone else are clear of the lites—if both ends aren't engaged properly, the thing will come flying out from under like a hot out of Hades.
4. Now take off the hub nuts and remove the wheel.
5. Put on the replacement wheel, in-

stall the nut but don't tighten.

6. Drive tank backward until it's free of the lites. Now tighten the hub nuts to 210-220 ft-lbs torque. (If a torque wrench isn't available, tighten the nuts till they're good and tight, back off about two turns, then retighten.)

When wheel lites aren't available:

1. Cut yourself a piece of 2x4 about a foot long.
2. Place it next to the lower edge of the tank, under the support arm of the wheel to be removed.
3. Place a completely lowered top-shoulder-pak on the 2x4 so it'll be in the center of the arm when wheels are up.
4. From here on, do like you'd do if you'd had a lites to begin with.

sensitive track-static-wires

The M1's track has a 14-gauge static-grounding wire to snuff track boogie to ground the track pins. This prevents radio interference caused by track static electricity (Fig. 17).

If you do any electric welding on the tank, avoid using the track for the ground connection—electric welding often involves current as high as 150 amperes which will burn out 14-gauge,

0.080" diameter wire. And when doing any welding on the turret, never connect your ground to the hull—this would cause arcing of current from the turret race and supporting ball-bearings.

Put yourself some unpainted surface as close as possible to the area being welded, and make your ground connection there. But **please** don't use the track.



ENGINE



Continental AOS-895-3 engine data

FABRICATION DATA

1. Maximum of rated speed (2800 rpm)..... 2800 RPM
2. Engine governed speed—full load..... 2800 RPM
3. Engine governed speed—no load..... 2900 rpm
4. Engine idle speed (see page 425)..... 1000 rpm
5. Number of cylinders..... 4
6. Cylinder cooling..... Air
7. Crankshaft rotation—clockwise from accessory end..... Clockwise
8. Crankshaft rotation—clockwise from accessory end..... Counter-clockwise
9. Marking of cylinder from accessory end
Right side (Crank's left side)..... 1-2-3
Left side (Crank's right side)..... 3-4-2
10. Ring side..... 1-2-3-4-4
11. Valve clearance—both valves
Intake..... .001"
Exhaust..... .001" 1.001" under valve adjuster
12. Spark plug gap..... .017"-.019"
13. Oil capacity..... 7.1 gallons
14. Oil pressure at 2800 rpm (full load)
Oil 10 at 180° F..... 40 to 70 psi
Oil 10 at 160° F..... 45 psi minimum
15. Oil pressure at idle
Oil 10 at 180° F..... 30 to 50 psi
Oil 10 at 160° F..... 35 psi minimum
16. Maximum oil temperature into engine
Operating with..... 180° F
17. Normal oil temperature..... 160 to 180° F
18. Oil specifications (ambient air temperature)
- 30° F to + 120° F..... MIL-15
0° F to + 40° F..... MIL-15
- 30° F to + 0° F..... Arctic

19. Oil consumption maximum at 2800 rpm
Full load..... 2.0 gals. per hour
Oil 10 (oil side engine)..... 2.0 gals. per hour
20. Fuel specifications—engine
130-A-130-1..... 80 Octane
21. Normal cylinder compression at cranking speed..... 70 to 80 psi
22. Max. oil speed..... 2000-2200 rpm

OPERATING LIMITS

DESCRIPTION	REMARKS
1. Oil pressure crank side	Indicate oil flow to maintain pressure at 70 to 100 psi using Oil 10 oil at 180° F.
2. Oil filter by-pass valve	When open indicates oil is by-pass of filter at a differential pressure of 100 psi.
3. Spring/relieved oil valve by-pass valve	When open indicates valve by-pass of valve at a differential pressure of 100 psi.
4. Thermostatic oil valve by-pass valve	When closed at 180° F and below valve passes through valve. When open indicates oil is by-pass of valve at a differential pressure of 80 psi.
5. Variable fuel control valve and	Control flow of fuel and gear pump through fuel jet controlled to prevent fuel-related engine. Fueling stops at 180° and lower air temperatures.
6. Fuel pump	Full pump pressure, 70 to 110 psi at 1800 to 2000 engine RPM. Fuel pump capacity 10" of viscosity of 750 cps.

Check Cylinder Compression

If the engine operation is not normal, check the compression pressure this way:

1. Try to start the engine. If it starts, run it for 15 minutes, at 1000 rpm, with transmission in NEUTRAL, to distribute oil throughout the engine. Then stop the engine. If it won't start, try step 2.

2. Remove one spark plug from each cylinder. If the engine has not run as in (1) above, squirt a small amount of engine oil into the spark plug holes to wet the rings.

3. Start the auxiliary engine—to keep the batteries up, crank engine with

main motor (normal cranking speed is about 50 rpm with a fully charged battery) with compression gage on each cylinder in turn until you get a reading. Then repeat on the first cylinder tested to cut down the chance of a false **WATER**. Let motor cool for 5 minutes after each 30 seconds of continuous operation.

Normal compression pressure should be from 70 to 80 psi. If any cylinder is more than 1 lb. lower than the average, it means worn piston rings, worn cylinders, damaged pistons, poorly seated or poorly timed valves.

ENGINE-COOLING-FAN HOUSING

People are inclined to use the main-engine-cooling-fan housing and air-curtain vanes as a step or platform during service operations. This'll damage the fan, fan duct, or clutch and restrict air circulation. The housing and vanes are to protect the fan from foreign matter (logs, leaves, rocks, etc.) and to increase fan efficiency. They won't do either if they get beat up.

To pass the word along, and maybe even paint **NO STEP** on the center of the housing or a vane (Fig. 18).



FIG. 18

FUEL-FILTER CARE

A plugged fuel-filter element will reduce gas flow to the carburetor, thus lowering the gas level in the carburetor's float bowl. This starves the engine and leaves an explosive mixture in the bowl; should the engine backfire or the gas mixture leaks out, it would backfire into the floatbowl and splash the floor.

This is why it's a good idea to drain the fuel filter before taking the tank out for a spin. Skip this little chore and one day you'll be late to your own beer party.

Drain the filter by working the engine-compartment door from the right-hand compartment. Drain about one pint of gas to wash out all the gunk in the

filter bowl. As for the gas, drain it into a can or some sort of container. It's bad business to let gas flood into the engine-compartment bilge. And what's intended in a fire?

If gas is accidentally spilled into the bilge when draining the fuel filter or filling the gas tanks or whatever, don't operate the bilge pump unless your right without waffer is cool. The pump's outlet is right near to this waffer, and if the waffer's next operating temperature, you'll ignite the spilled gasoline.

When and how to drain the fuel filter is one thing—cleaning it is another. The filter should be disassembled and cleaned weekly, like it says in your EM,

TROUBLE SHOOTING

with the engine oil filter

Besides keeping the engine oil clean, the filter can be used as an aid in engine trouble-shooting. If you suspect your main engine trouble is due to some gunk breaking down within the engine (like a bearing, oil pump, piston rings, etc.), the first place to look is at the oil-filter plug. Any metal particles in the oil stream will get caught in the filter, but the heavier ones will settle to the bottom and attach themselves to the filter's magnetic drainplug (Fig. 17).

If the plug is clean, replace it and troubleshoot elsewhere—but if you find metal bits, from the looks of the pieces you should have an idea what's causing the trouble.



main-engine-carburetor idling-speed adjustment

TO GET a uniform main engine idling speed, fuel-air mixture, and carburetor and governor linkage timing, it's important to make accurate speed adjustments on the two main-engine carburetors. Belowhand, make sure:

1. The throttle-plate pins of both carburetors meet in a exact position with each other at idle (flaps and low throttle position).
2. The carburetor-throttle-plate-shut levers, governor mechanism and throttle lever meet exact their respective stops simultaneously at wide open throttle.

If you can't get rid of all oscillations in throttle-plate position, adjust it to meet at wide open throttle-position and not at idle position.

Keeping these two basic requirements in mind, here is the proper throttle linkage adjustment.

HOW TO ADJUST THROTTLE LINKAGE

1. Loosenen throttle control-rod-assembly (C) and carburetor control shaft to governor rod.
2. Tighten idle-speed adjusting screws.
3. Give butterfly valves and screws in idle-speed adjusting screw until it contacts the stop.
4. Loosenen throttle-control-rod assembly, and adjust so that both carburetors shut fully, also check wide open position of throttle levers. Be careful to note position of vehicle control lever.
5. Loosenen carburetor control-shaft to governor rod then adjust for —
 - a. Exact position of throttle levers.
 - b. Wide open position of throttle levers.
 - c. Exact-governor-plate fully, and exact position of throttle levers. (Throttle levers must be in nearly closed position.)
6. Tighten all pins nuts.
7. Check angles and adjust idle-control screws, set idle adjusting screws for desired RPM speed.

IDA-ADJUSTING SCREWS

THROTTLE CONTROL-ROD ASSEMBLY (C)



1500 RPM (CLOCKWISE)

1500 RPM (COUNTER-CLOCKWISE)



1500 RPM (UP)



1500 RPM (DOWN)



1500 RPM (CLOCKWISE)



1500 RPM (COUNTER-CLOCKWISE)



1500 RPM (CLOCKWISE)

IDA-ADJUSTING SCREW

THROTTLE CONTROL ROD

THROTTLE-CONTROL-ROD ASSEMBLY (C)

CARBURETOR-CONTROL-ROD ASSEMBLY (D)

CARBURETOR-CONTROL-ROD ASSEMBLY (D)

THROTTLE CONTROL-ROD ASSEMBLY (C)

IDA-ADJUSTING SCREW

1500 RPM (CLOCKWISE)

1500 RPM (UP)

1500 RPM (DOWN)

Know your

OIL WEIGHTS and TEMPERATURES

Instructions given in the TM and LO often specify that oil used in TALL engine should be OE 50 for temperatures above $+32^{\circ}\text{F}$. For temperatures below $+32^{\circ}\text{F}$ or in the range from $+40^{\circ}\text{F}$ to -10°F , OE 30 should be used.

Pay close attention to the 8°F overlap between the two temperature ranges. Oil changes should be figured according to the **expected temperatures**, and changes from OE 30 to OE 50 should be made as soon as the outside air reaches $+32^{\circ}\text{F}$. This is an answer having a

lighter weight oil in the engine whenever the mercury drops below $+32^{\circ}\text{F}$. It's not necessary to switch back to OE 50 unless the **expected temperature** will be in the $+32^{\circ}\text{F}$ to $+40^{\circ}\text{F}$ range for extended periods.

Always, of course, start an engine with OE 50 in it when its temperature is below $+32^{\circ}\text{F}$. If you do, it'll be ready to go no matter how far the overhead drops. The light-weight oil can't possibly flow through the works in time to prevent scuffing of many friction surfaces.

air-cleaner-hose leaks

Engines'll run longer and run better if their air is clean too.

Look for:

1. **Bad air-cleaner outlets**—from using a screwdriver or other tools as a prybar when working on the hoses. Once the outlet's bent out of round, it's almost impossible to make it air tight. Best way is to replace the necks.

2. **Hoses incorrectly installed**. To seal right—squarely space the carburetor inlet and blower outlet and set the clamps behind their beaded edge.

3. **Hose clamps not tight**.

4. **Pin holes in the hoses**, believed caused by wear or interfering objects. The trick is to keep from being drilled into the run-ward—keep a watchful paw handy where air hoses are connected.

air-cleaner oil

The preliminary Lake Oakes 9-7-60 note tells you to inspect air-cleaner pans daily and replace or level level with OE, crankcase grade. But it's been found that the heavier oil got too heavy too quick when there's a lot of dust flying around.

Now it's SOP to inspect and fill the pans daily with OE 30 in temperatures down to -10°F . Below -10°F , use OE (Arctic). Make a note on your LO.

When reinstalling the cleaner's oil pan after an oil change, make sure the pan is seated all the way home and the clamping ring has a snug hold on the pan. And after tightening the locking screw for the clamping ring, it's a good idea to secure the screw with safety wire to keep it from working loose.

Operating the bulldozer...
the right way!

HOW TO START



1 Be sure main switch is off... and all other accessories are off at their source.



MAIN SWITCH



FUEL VALVE



IGNITION SWITCH



LIGHTS



AIR CONTROL SWITCHES



TURRET TRAVEL SWITCH

2



Fuel level must read 100%.

3



Get psi! Check right tire gaps.

4



Get in! Adjust, Tight.

5

Starting bar must
be in START.

6

Get parking brake... by
pulling back brake down

7

Turn on master switch.

8

If tank has been sitting for more
than 48 hours or in temperatures
below freezing start L.O. for first...

**9**

Open throttle completely. Turn starter only to
ON position. Magnets will ON. Turn engine
over at least 5 revolutions to clear cylinders of
excess gas vapor.

Before there's reason to believe new gas or water
is in any cylinder, before turning engine over to
clear cylinders, tickle the starter and feel up the
engine for hydraulic lock. If you feel lock, or
more one spark plug from each cylinder has plug
wrench described on Page 402, and turn over the
engine till all liquid is removed.

10

Now open hand throttle
about one inch beyond free
travel... for good starting
RPM.

11

Start, with magnets to
START ON position. De-
press handle and starter
together to ON position.

12

While engine's turning, con-
tinue pump primer until engine
kicks off, then stop pumping.

12 Pumping primer without the engine having run doesn't do any good... the primer valves are located under the intake ports... which means the gas can't get into the cylinders until the valve is open... Furthermore, it just wastes the oil off the cylinder walls.

13

When engine starts... release master switch and booster switch at the same time. Booster switch is only needed to start the engine... its life expectancy is 5 minutes of continued use... to go easy on it!



14



Pump fuel primer to have engine running... avoid flooding by controlling intake until engine starts out.

If the batteries are run down and too weak to make a normal start, turn off the master-relay switch and start the main engine by means of a slave cable from another tank. Plug in the cable first, and be sure you have a positive to positive and negative hook up. (When you get a minute, look up P.8, P.7, page 273.) Start the other tank, run it at a high RPM then start your tank. Disconnect the slave cable when your engine gets up to about 1100-rpm and then turn on the master-relay switch.



To start with "Little Joe", leave the master switch off and turn off all light switches, however when you start "Little Joe" you may turn on the lights that are on. Then hand crank the auxiliary engine, let it run a while. When it's warmed up and ready to get out a good flow, flip on the master-relay switch, and let your batteries charge for about 45 minutes. Then start your main engine.

In an extreme emergency and when the weather isn't below freezing you can start direct from "LI Joe" without first charging batteries. When you do this, leave master switch off until main engine gets up to 1100-rpm.



now your engine is running...



Adjust bleed screws if engine runs between 1000 and 1100 rpm.



Check all pressure gauges for proper pressure.



All other lights on lines too should go off 30 seconds after starting.



If this light comes on at low rpm (600 rpm) but goes out at 1500 rpm, everything's hot's needed, turn it off!



Adjust bleed screws to 1000-rpm and set for three!



When main magnets switch to 1 position and compare RPM reading with original 1000.



Now, look to 1000 RPM until engine is again running at 1000-rpm (this decelerates).



Now, move switch to 4 position and again watch for a drop in RPM's from original 1000.



Again, controls back to 5-1000 RPM position and watch for the tach to come back to 1000 rpm.

If it drops more than 100-rpm with magnets switch to 4 or 5, you get trouble with the ignition system.



RPM's run engine more than 20 seconds with switch in either 4 or 5 positions.

RECOMMENDATION:
DON'T USE
MAGNETS TO
START CAR.

20

When your engine is running smoothly...



then head throttle, engine should drop to 1000-rpm.

In case you need a push or pull to start...

Start and what way... pull with tow bar using recovery vehicle or winch. Or, if you only have it's around, push with tow bar... but don't pull with tow bar—will break the tow path.



But if a towbar isn't around, next best is pulling with your tow cables. Hook the cables to the towing legs tied to the pulley and have them long enough so you won't chink your links on the towing hook.



Push on towbar handle.



Push on engine switch.



When pulling towbar... must be careful that you'll be careful not.



When possible to moving of 1 mph will be best.

Keep in mind while in control... keep your feet off the brake... if you step on it—you'll set the parking brake and the "T" bar will lock in neutral, killing your start.

SHIFTING



TIPS—Here's a tip on shifting from low to high gear . . . Pull lever straight back . . . It will ride over the small bump almost without effort. This way there's no chance at all of accidentally moving into reverse.

TIPS—To shift into any given range from a stop: Apply brakes, reduce engine speed to low idle (1000 rpm), then shift.

NEUTRAL PARK—Levered from all the way forward out to right. When range selector control lever is in neutral park and foot brake is applied, brakes are locked and "P" bar will lock in neutral position. To release parking brakes, move lever to neutral down and they will automatically release.

NEUTRAL STOP—Control lever held to the left, is used only to give gear or to release parking brake.

LOW—Control lever is first notch back from neutral. Spring on lever will pull lever to right, holding it in LOW down.

MID—Control lever back one notch from low. Pull lever straight back, it will ride over the bump at range control bar.

HIGH—Firsting which is dead stop. Shift to low, gear, then move lever left, up/back. The foot/ing may now get the transmission—see 1111.



BRAKING



A REMINDER—Moving the selector lever into neutral park doesn't automatically set the brakes—the brake pedal must be jammed down after the lever is put into neutral park.



STEERING

When steering, don't grab it around. Gently pressure it all around . . . light and even don't force!

PULL-ON-FORWARD—Keep both hands straight . . . *anytime* a turn.



RIGHT TURN—Pull back on right handle grip.



LEFT TURN—Pull back on left handle grip.



The amount of turn depends on how far back you pull the "T" bar.

STOP . . . before going into a pivot . . . and don't pivot more than 180° or you'll make yourself track trouble. To pivot . . . push or pull handle as far as she'll go.



To a left pivot, hold shift lever in control seat and pull back on left handle grip.



To a right pivot, hold shift lever in control seat and push forward on left handle grip.

To go in **REVERSE STOP** before shifting... or after.
 Before backing... get it guided!



**BACKING
TO LEFT**

1. Shift to reverse...
2. Pull levers on right-hand side.

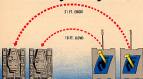


**BACKING
TO RIGHT**

1. Shift to reverse...
2. Pull levers on left-hand side.



the bulldog's turning radius



Down shift into low when manipulating a lever... or you'll be sure to have maximum steam.

DRIVING the BULLDOG



REVERSE BRAKING

To use reverse as a brake or not to use reverse as a brake is one of those questions with two or more answers. Some say the practice is OK—others say it's not. Here are the facts... you be your own judge because it's your tank and your work.

It's dangerous because:

1. Steering is reversed, which can confuse even the best of drivers.
2. Transmission overheat, causing internal transmission damage.
3. Reverse torque might stall the engine.

But, in places where hills are steep and a long way to the bottom, holding low back with low gear and brakes may not do the trick because your brakes may be shot before you reach the bottom. In cases like this, the only thing you can do is use reverse as a brake.

To use reverse as a brake you must:

1. Stop before shifting into reverse.
2. Keep perfect control of the tank. Remember, the steering is opposite from normal.
3. Use enough engine power to control the descent and keep from stalling the engine.
4. Keep an eye on the transmission-temperature warning-light. If it comes on, stop the tank, hold it up with your brakes, shift into neutral, and run the engine at 1700 rpm until the warning light goes out.

COASTING

**KEEP HER
IN GEAR**

LEADS

YOU

TO

**SUICIDE
ALLEY**
(only several miles)

DON'T get your engine with foot floater... always increase engine speed gradually!

OR ELSE you might miss the cooling fan shaft!

DON'T race your engine and jam interlocks to preselected holes... get her in low... give her the gun-slice if you!

OR ELSE you'll lose the guts out of your transmission!



**N
E
V
E
R**

- try to pivot-steer by racing engine... this is asking for trouble.
- apply intermittent left or right steer to slow tank... use brakes.
- use brakes during a turn... it reduces steering effectiveness. Slow down before you turn.
- leave tank unattended with transmission in gear... not parking brakes.
- fail to make a complete stop before shifting into neutral.
- start without shifting the guards at rear of tank.
- downshift while going above 11 mph... it's deadly.
- back up without a guide (unless someone's shooting at you).

STOPPING and IDLING

When coming to a stop, be sure both wheels are in a fixed stop before shifting into neutral. Because when you're in neutral the T bar will automatically lock in neutral, killing your steering.

If ever you must park with engine running, set hand throttle on engine's run or 100 to 1000-rpm. This'll keep the engine in good shape.

SHIFT INTO
NEUTRAL FIRST

BAR ON
THE BRAKE

THAT'S THE WAY TO STOP RIGHT



If you take delivery don't copy of this book...



OPERATING TIPS

STALL SPEEDS

A good way to know if your T41's engine is in good shape is to have maintenance pull a stall-speed check. Under normal operating conditions the stall speed should be between 2000-rpm and 2400-rpm in high stage. (High altitude and lower areas may drop it to between 1800 and 2000-rpm). Here's a run down on how a stall speed check is made.

First check transmission and engine oil-levels, then start the engine and run it till both engine and transmission are at normal operating temperature. Next, place range-selector-control lever in HIGH and jam down brake on the foot brake. Hold the brake down and gradually increase engine speed with foot accelerator until throttle is wide open. The tachometer needle should level off in the RPM range indicated. Don't keep the throttle open longer than 30 seconds and don't run a stall check in LOW.

If the tachometer needle drops below 2500-rpm (2000-rpm in high altitude areas) with the throttle wide open, the engine is not operating properly. If it goes up to 2800-rpm or against the governor, the transmission is slipping.

2000-rpm indicates carburetion or ignition trouble. At 1500 or 1700-rpm, check for restricted air-flow through air cleaner, or blocked air lines. If the

cleaner and air lines check out OK, trouble could be a broken quill shaft in the supercharger.

Constant stalling and fluctuating at maximum RPM in stall indicates ignition trouble or a sticking barometric-control valve.

2000-rpm could stall when throttle-age trouble. Check to see if the point of the shift indicator is centered on HI dial. If it isn't, the linkage needs adjusting; if it's centered, the transmission is in need of repair.

After the test, let the engine run for a few minutes at 1800-rpm, then park in clearance, close throttle and stop engine.

Incidentally, when in HI STALL, the tank should not creep forward—if it does, the loader need working on.

TOWING

When towing a crippled T41, and you believe the trouble is in the transmission, use a wrecker or a recovery vehicle with a tow bar and disconnect the universal joints on the lower tank to avoid further damage to the power pack. The tow bar gives you control of the towed tank when the joints are disconnected.

If the transmission's OK—you can use new cables, leave the universal joints be, and attach a dolly to the sick tank to raise and stop.

For moving, have him shift into

LTS" (lowering is low in low), and when he's back on the straightaway, have him hold the brake in NEUTRAL-STEER. If you have it in NEUTRAL-PARK, the parking brake will lock if you apply the foot pedal—automatically, the "T" bar will lock in neutral and you'll have no steer. Have him keep the tow tanks in line as much as possible, especially when it is wet and muddy.

Always try to use a wrecker or recovery vehicle with a tow bar, but if you must use a tow cable, use two 30-footers, cross them and connect their

eyes to the two towing-eyes/eyes on the rear of the tank. Be sure to avoid short breaks in the cable because they'll break some of the cable's strands every time and have it weak and dangerous. On the towing tank, position the gun to the front to keep it from snagging the towed tank in case it lurches forward.

Caution Never use a T41E1 with a tow bar to tow another tank because the pin is built on the rear of the T41, isn't designed to pull another tank—it may snap off during the jolt. It's there primarily to pull light stuff like trailers, logs and small trucks.

GAGING YOUR FUEL SUPPLY

Some additions to know about the fuel gage and tanks.

When getting up, park at the fuel shut-off valve located "way down" in the lighting compartment and make sure it's on at the BOTH ON or OFF position. This valve controls the gas flow to the engine and also between both tanks in these two positions. If you're not careful, you could go off fuel locked.

These two positions also apply when reading the fuel gage because the gage's only flow is in the right tank. The LEFT ON and RIGHT ON are used only if one gas tank is damaged.

This fuel-gage reading scale (in the right tank) indicates on the fuel gage the fuel level in both tanks, but only if the fuel-selector switch is turned to the BOTH ON position.

However, due to the slant shape of the fuel tanks, the reading on the fuel gage doesn't indicate the actual amount

of usable gas in both tanks. So, if you want to keep posted in terms of actual gallons of gas you can use, mark your fuel gage like this:



Although the tanks hold 140 gallons, 10 gallons of this gas won't be used because the gas-line outlet is about 2" up off the gas tank's bottom. It's made this way so the dirt and water that usually settles on the bottom isn't drawn into the engine's fuel system. This means when the gage is on "F", you actually have 40 gallons of gas in the tanks, but only 10 gallons are usable.

AIR-CLEANER DUCTS versus PERSONNEL HEATER

Normally, the air-cleaner ducts are adjusted to draw air from the fighting compartment. This is fine for mild or warm weather, but it's not so good in cold weather. The main engine draws so large a volume of air with hatches closed tightly that the air pressure in the fighting compartment may drop to a point where the heater will not burn efficiently.

At this point the crew may also begin to lose efficiency.

Correct the condition by adjusting the air-cleaner ducts so that air is drawn from the engine compartment rather than the fighting compartment. This means moving the duct damper from the rear position to the front position. You do it by turning the lever until the air duct openings in the bulkhead are accessible from the fighting compartment; then rotate the handle to the center of each duct, clockwise, until the damper is all the way to the front of the duct.

That's take approximately 120 turns, but don't get tired turning and leave the damper part way between the two extreme positions—that'll leave an opening in the bulkhead and give you a definite fire hazard.

When warm weather comes, return the damper to the rear position, and be sure to take care of both right and left ducts.

AUXILIARY-ENGINE HAND-STARTER

The auxiliary engine has its hand starter mounted horizontally on the lower left-hand side of the engine, behind the right engine-compartment access door, and is reached from the fighting compartment (Fig. 21).

To start the auxiliary engine by hand, first make sure the master relay and radio switches are off. Next turn power auxiliary-generator control switch to ELEM. If the temperature is low and the engine is cold, pull out the choke to full stroke. With the handle, crank the engine up to compression stroke with a series of short, easy pulls. Then release the handle and let the cable completely rewind. Now pull the handle with a steady, slow, even, long

pull. Let cable rewind before attempting another start.

If the engine doesn't start after three tries, slightly decrease full choke position. And try it again. When pulling, it isn't necessary to spin the engine.



How to use the **AUXILIARY-GENERATOR HEAT-EXCHANGER**

There's a telescopic heat-exchanger incorporated in the exhaust of the auxiliary-generator engine. A fiberglass electric-heat-element is also built into the heat-exchanger duct housing to improve a heat on the auxiliary engine for quicker warm-up. All of this provides warm air for the main-engine compartment, and quick engine-warmup for main starting in extreme cold.

The thing to keep in mind is, with the electric heater ON, only approximately 1½ KW of electrical energy are available from the generator to operate other equipment in the vehicle. Therefore, it's important to know how to use the heat exchanger correctly.

A damper lever, mounted on the back side of the duct, directs the flow of heated air for normal weather operation; set the duct-damper lever to OFF

position (lever to extreme left). This setting draws heated air out of the duct—if air temperatures get above 140° F around the auxiliary-generator engine, it'd cause a vaporlock.

In extreme cold weather, set damper lever to ON position (lever to extreme right). This'll draw heated air into the main-engine compartment.

After the auxiliary-generator engine is started, turn ON electric-heater switch located on the auxiliary-generator installation in the driver's compartment. When the engine compartment is warm enough, turn OFF electric-heater switch.

And remember—use the heater element only when you need to heat down the auxiliary engine for a quick warm-up of the heat exchanger and heater air to the engine compartment.

driver's **BACK-REST ADJUSTER**

In trucks below Manufacturer's No. 1260, the driver's seat—when it's down and off the way back and the driver's leaning against the back-rest—will bump into the turret guard and stop the turret from traveling. If you're a big, heavy driver and must use the extreme position, you'd better limit the degree of adjustment before you get more than a back scratch.

Protect yourself by having Oshkosh make a positive stop for the seat adjuster. The stop (Fig. 21) is ½" square-bar stock, tack-welded to each side of the adjuster assembly, directly over the rear track. It limits the seat adjustment to

allow enough clearance between the back-rest and the turret guard when you're sitting in the seat.



WHO does WHAT and WHEN

Here's a suggested recipe for how the four of you can get organized in the morning, noon, and night to keep your building primed and ready.



COMMON RESPONSIBILITIES

Who	When	What	
X	X	X	All out check sheet during inspection.
X	X	X	Separate inspection needs by job crew members.
X	X	X	Inspect tracks, road wheels, rollers, bumpers, sprockets, and compensating wheels for damage.
X	X	X	Check track adjustment.
X	X	X	Examine tracks for wear or kinking/ridges, loose track-choy-gut rods, track pins, and connections.
X	X	X	Check under the vehicle for oil or fuel leaks.
X	X	X	Determine if lamps and reflectors, horns, the extinguishers, probes, tools, etc., are in the proper place and in good operating order.
X	X	X	Make sure all hatch covers work well. ¹ is easy.
X	X	X	Keep on the lookout for loose bolts or parts.
X	X	X	Check all accessible wiring to be sure it's connected tight and supported, that terminals are crimped or stapled, and that conduits and shielding are in good condition and secure. Report any inaccessible wiring.
X	X	X	Make sure covers cover the secure and accessible.
X	X	X	Try all the lights. Inspect all lenses.
X	X	X	Help power and loader lubricants inspection and all exterior points like it was in IC 11730 . . . See see page 417 for inspection-idea change.
X	X	X	When there's need to change lubricants and special oils to agree with the IC ... see help too, to make sure.
X	X	X	Check for peeling, bare moisture removed from all parts and then get 'em lubricated.
X	X	X	Be alert for uninvolved or conditions.

BE	BE	BE	BE
X	X		
X		X	Check exhaust for excessive black smoke to see if your engine is on the lean.
		X	Check radio and interphone system; security of radio, antenna, and all outside equipment.
		X	Investigate and correct or report any faults noted during inspection. Complete trip report and forward to platform leader, together with request for any second-vehicle maintenance you need.
		X	Help other crew members clean glass, vision devices, inside of truck and wipe or wash off exterior.
		X	Help check gear cases for collection of sludge or water and clean out if need be and will.
		X	See that winter-weather equipment is, except glass and ready for action.
		X	Take care of the oil. JMAA gas—keep it in top stage.
		X	Check head fire-extinguishers and controls.
X			Check vehicle landing links before landing.
	X		Check rate of fire. Watch out that the take doesn't get overhyped by prolonged high rate of fire . . . get operational stand out of an overhyped streamer as it won't "back off" when nobody's expecting it.

DRIVER RESPONSIBILITIES

X		X	Check fuel in tanks and be alert for leaks. Caution: Refuel to 25% from top of fuel-tank, with hose inside engine tank to discharge static electricity. Check the open-fuel containers. Check all levels of engine and transmission and cooling engine—add all if necessary.
X			Check fuel-line filter.
X		X	Check in the engine and driver's compartment for any indication of fuel or oil leaks.
	X	X	Check carburetor air-bowes for holes and loose fits.
X	X	X	With the engine running, check all instruments for normal readings, and the transmission for proper oil level.
	X		Operating Observations: While you're in operation, be alert for unusual noises that may be a sign of trouble. Instruments will-crow, watch for abnormal readings. Every time the brakes are used, gears shifted, or the vehicle turned, consider it a hint and note any unusual or unsatisfactory performance. Stop the engine and investigate immediately if any warning lights come on.
	X		Be alert for unusual power demand when putting vehicle in motion. It indicates either oil lubricant in the fuel lines and injection components. Take care of any malfunctions immediately.
X		X	See that you've got a good percentage spare and tools.
X		X	Check escape hatch, driver's compartment for oil leaks.
X	X	X	Inspect engine compartment for oil leaks, oil-pooler lines, fuel lines, bearings, transmission, etc.
			Inter-crew engine and transmission gas (Q P-780), and get the items in driver's and engine compartments like it says.
			Clear engine and transmission oil filter as required.
X	X	X	Check engine cooling fan for proper operation.
		X	Check battery for water levels, proper charge, corroded terminals, tightness, leaks, and see that it has a coating of grease. If you're parking for a couple of weeks, remove batteries and store in cool place.
			Clear driver's compartment.

BE	BE	BE
X		X Check hydraulics all in operation.
X		X Check steering mechanism and firing controls.
X		X Check gun breakdown if up to date.
X		X Check helicopters on machine gun.
X		X See if all gun bolts and spare parts are cleaned and in their places, also periscopes, scope heads and bases, and spare water blocks, direction quadrant, telescope and mount.
X		X Clean chamber and breach mechanism. Dry fire before firing. Dry gun bore after firing.
X		X Make sure the target lock and gun-traveling lock, safety lock . . . and remember, you don't get 'em both at the same time.
X		X See that ammunition in turret's stored properly, in automatic coils, make sure lubricants and special oils agree with IC's specifications.
	X	X Insure commander in checking gun—make the dodge and water, clean and refill if necessary.
X		X Be alert for unusual noise or operation—get at the trouble before it happens something.
X		X Keep tight air cleaner—filled with oil and clean as often as necessary. WARNING: Under extremely dry conditions or blowing sand, it's necessary to service the air filter—keep sand that falls during operation from getting duct to sand into the engine and wearing out engine parts in short order.
	X	X If steering and traveling hand wheels are too stiff, go get Ordinance.
		X Be careful not to overheat gun tube during prolonged high rate of fire, or allow cooled steel to remain in preheated chamber—g "cool-off" 4-5% shrapnel copies.

LOADS RESPONSIBILITIES

X	X	X Clean and coat 15mm gun tube as laid on the lubrication order.
X		X See that the breach and percussion mechanisms work OK.
X	X	X Make sure the recoil mechanism has enough oil and no leaks.
X		X Check adjustment of firing and safety mechanisms.
	X	X Open end of the breach and percussion mechanism.
X		X Check pumps of left outside storage boxes and spare engine oil. Keep boxes clean.
X		X Check all other utility equipment.
X		X Examine the ends of the fire extinguisher control handle, warning control handle, and safety valves. If the seal wires are broken or safety seal is missing, replace with fresh cylinders.
	X	X Clean all the extinguishers, adjust discharge nozzle.
X	X	X Look for loose bolts or parts.
	X	X Check spare hydraulics—refill oil.
X		X Check loader's bench, signal lamp and oil can float.
	X	X Unusual noise or unusual operating conditions—cut fire warning of trouble to come—stop them before they stop you.
X		X Check essential gun and mount and help keep them clean.
X		X Help keep inside of turret clean.
X		X Check and re-establish oil reserve in recoil mechanism.

NO.	DO	BY WH.	REMARKS
	X	X	Polish metal slides.
B	X		Secure or release traveling locks and latches.
B	X	X	During operation, in dusty and sandy terrain, keep metal slides and exposed points dry to prevent rust and lubricant from hardening on alternate points. When it's possible to wash the tank, you help, too.
	X	X	Help gunner check all accessible wiring in the turret and be sure it's snugly connected and supported, that the insulation is not cracked or chafed, and that conductors and shielding are in good condition and secure. Report any accessible wiring.
	X	X	Check to see that all tools and equipment are in good shape and in the right place. Keep 'em clean, too.
B	X	X	Inspect towing hooks and points for looseness, damage, and wear. Test to be sure that loading mechanism closes and latches correctly. See MCT 1st 9-710, 1st 9-100A, and M4 G297 you or hand.
			Help lubricate the suspension and all exterior points.
B	X	X	Help gunner dry the bore and chamber of 75mm gun. Dry the barrel and chamber of cal. .50 Browning machine gun.
	X	X	Help gunner clean weapons.
	X	X	Examine for corrosion, or other damage.
B			Check ammunition for proper storage.
X	B	B	Look for corrosion of bolts in metal mechanism.
	B		Test for smooth operation, length of recoil, and return to battery without shock.
	B		Check rate of fire. Check your shooting—don't allow rate to get over-hot due to prolonged high rate of fire or other control sound to maintain synchronized chamber because of changes of "cock-offs".
			Weekly or after 50 rounds, whichever comes first, remove and clean bore extractor, clean out all carbon deposits and all foreign matter from bores or gun parts.
			Notes: Take care in cleaning, disassembly and handling of the extractor chamber, to avoid damage to the bore and inner lip of the front and rear extractor heads.
B	B	B	Make sure the ventilating blower's in good shape.
X	B	B	Check left air cleaner, fill daily with OE 10 and clean as often as necessary to keep it at top performance.
			Warning: Under extremely dusty conditions or blowing sand, you'll need to service the air cleaner several times daily during operation to prevent dust or sand blowing into the engine. Otherwise engine parts wear out in a short time.
X			When parking in desert or sandy areas, check engine vents and other exposed parts and keep them covered with cloth to prevent entry of dust, sand, or shifting sand.
X	X	X	Clean coats, lin, and mud from all parts of weapons and mounts.
X	X	X	After drive in checking for oil-water line leaks, transmission oil level and engine oil level.
B			Check fuel-shut-off valve. Should be at BOTH-OFF position.



ELECTRICAL



SPARK-PLUG WRENCH

MOST PEOPLE will tell you it's impossible to remove the imbedded spark-plugs while the engine's sub-wrapped in the tank. But it can be done. Although the mechanic isn't mentioned in the latest *TW*, it's been common practice among some crews that have armed themselves with the proper toolset.

The gimmick is a tubular wrench (Fig. 24) that you can wiggle into the cylinder and slide over harness, nut and all, to get the job done. As you, this wrench isn't a stock item, but it's easily made with a $1\frac{1}{2}$ " ID nut, a piece of $\frac{1}{2}$ " ID thin wall tubing 2' long, a piece of $\frac{1}{2}$ " ID tubing $1\frac{1}{2}$ " long and a $\frac{1}{2}$ " hex nut.

You cut off the nut's drive end, then cut the $\frac{1}{2}$ " ID tube and weld it to the nut. Weld the $\frac{1}{2}$ " tubing on the other end of the $\frac{1}{2}$ " tube, then weld the $\frac{1}{2}$ " nut on the naked end of the $\frac{1}{2}$ " tubing.

Use it thusly:

Disconnect the harness nut.

Slip the wrench over the harness nut and then down on the cable.

Then wiggle it down into the engine and work it over the plug. (Push the harness nut down until it rests on the plug.)

The wrench's hex-nut will stick out far enough to get an open-end wrench on it.

The plug and cable come out as one unit, even plugs in 82 cylinders can be easily removed and installed.



FIG. 24

NOTE: NUT WILL BE REMOVED TO ALLOW TUBE TO BE INSERTED IN ENGINE

Voltage Regulator Adjustments

ON THE early model units (Marek Electric's No. 875 and under) you'll find an Eclipse main-engine generator-regulator box. Late model units (876 and up) have a Delta box. These boxes are interchangeable and are located in the same spot, down on the hull under the main floor.

The voltage adjustment can be made with a low-voltage multimeter (CT-T-413-54) that's been recently calibrated. Hook it up to the three receptacle. Then start the main engine and turn on the turbo-cooling blower. Run them for 10 minutes. This 10-minute run is extremely important, never cut it short, it's the only way you'll get the regulator to its operating temperature and ready for setting.

On the Delta box, turn the screw that's located on the side that has two screw-

sals (Fig. 28). Turn the screw one way or the other until the meter reads 27.5 volts on the coast and there it stays.

On the Eclipse box, remove the cover and with an insulated screwdriver turn the voltage-regulator-control set-screw that's located on top of the polarized relay-assembly (Fig. 29) till you get 27.5 volts on your meter. Leave the cover off the box until after you've adjusted the auxiliary-engine regulator because after you set L71 Joe's regulator you must run the paralleling-circuit adjustment screw clockwise as far as it will go.

To set L71 Joe's regulator, run it and the ventilating motor for 30 minutes, then remove the cover plate on the relay box that's located on top of L71 Joe. Now you'll need a long insulated screwdriver to reach down into the box and turn the regulator's adjusting screw (Fig.



3.1) until you again get 3.1 volts on your meter at the slow re-adjustment.

To save time, you can run the main engine and auxiliary engine at the same time to normalize the temperature of the regulator. But when you're actually making the adjustments, only the engine whose regulator you're adjusting should be running.



REGULATORS

REGULATORS on the 11's are voltage-philosophy regulators. Both voltage and current regulators are in the regulator for the main engine. **Never** close either the current relay or the adjusting relay by hand when connected to generator and batteries. The contacts will stick and the very high current will damage the generator and regulator before the circuit can be broken.

The regulator for little Joe does not have a current regulator, but the same caution applies to relay handling.

The voltage setting for regulators should be 3.1 volts. (Only in cold climates, 4° F or below, should the setting be 3.1.)

The setting is to be made on open circuit, batteries and all loads disconnected. But only the engine that drives the generator to be checked.

Engine Generator

It doesn't take much current, passing through the field in the wrong direction, to reverse the polarity. This means that when checking the generator with an ohmmeter or a test light, chances are 50-50 you'll reverse the polarity. So before the checked generator gets back in the rack, flash the field to insure correct polarity.

You do this with a low-voltage dry-cell battery (a minimum voltage). Make a connection between the negative terminal of the battery and the "E" terminal on the generator—then make a momentary connection between the positive terminal of the battery and the "A" terminal on the generator.

LINKAGE

Feederlink linkages are a pain in the spinal column, but they're in your department so you get two choices: APC's or well-adjusted linkages. The expert you can swallow quickly, the linkages take more time.



all about brake adjustments

The brake mechanism itself is a part of the transmission and there's no one working on the transmission-brake cam-ring unless your linkage is well-linked. The first step is to check the brake adjustment at the transmission.

Put a man in the driver's seat to apply and release the foot pedal (pedal should cover his shins). Remove the brake-adjustment covers at the rear of the transmission. There you'll notice two lines on the cam ring: One is marked "A" (Apply), the other is marked "R" (Release) (Fig. 31).

When the brake is released, the metal indicator plate should line up with the "R" line or nearly so, and when the brakes are applied, the indicator should have the same relative position to the "A" line. If this isn't so, then your linkage or adjustment at the transmission is out, but first check the linkage.

Brake Control Linkage

Before you can get a good linkage adjustment, any bent linkage rods must be straightened—get 'em straight, and then adjust the brake linkage like this:





1. Position the brake pedal all the way up.

2. Disconnect the linkage at the base of the foot pedal and behind the parking-brake assembly (Fig. 31).

3. Insert a pin in the indexing holes that are located at the base of the foot pedal and at the base of the parking-brake assembly.

4. Now, adjust the linkage rods so fit snug between the foot pedal and the transmission—avoid pulling forward on the master rod. This'll align the brake discs in the transmission.

5. Now, tighten the linkage nuts and remove the indexing pins.

Brake Cam

To adjust cams in the transmission, use a screwdriver (Fig. 32). Apply the brake pedal, glance at the "A" line—if it isn't opposite the indicator, release the brake pedal and turn the adjusting screw (clockwise to take up the brakes, and counter-clockwise to release) and keep doing this until the "A" line is dead opposite the indicator (Fig. 32). When the pedal is released it should be dead on the "B" line. Always complete the adjustment in a clockwise direction—this'll remove free play from the adjusting mechanism.

When making your final check for adjustment be sure your brake pedal is fully released—if it isn't, your brake cams will drag during the operation—then you'll be back where you started.

When the brackets are set, put the covers back on, but make sure the slot of the adjusting screw is set to take the angle cover's angle plate. This angle plate is what keeps the screw from vibrating out of adjustment.

Parking Brake

The brakes should release when you move the range selector out of NEUTRAL PARK; if they don't, then check the trigger pin in the parking-brake assembly. The trigger pin should have a minimum travel of 7/16" and should operate freely. (The parking brake is locked when the trigger pin's at the rear; free when the trigger is at the front.) If the pin doesn't operate freely, remove the lock cover and check the roller, the quadrant, and the wedge block for wear, corrosion, and dirt. Free them up, if they're not too grimy, replace them. An after-thought . . . before working on the brakes, place the truck on level ground—once it starts to roll, it's hard to stop.

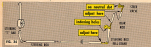
How to adjust the **STEERING CONTROL LINKAGE**

1. Straighten all four linkages.
2. Set the range selector in **NEUTRAL PARK**.
3. Put the steering "T" bar in neutral—angle it to be sure it's locked in neutral.
4. Both in the engine compartment, disconnect the linkage at the balllocks and at the steering-control valve on the transmission (Fig. 24).
5. Insert a pin or nail thru the indexing hole located in the balllock assembly.

6. At this point, the cross-rod indicator should automatically point to the neutral dot. If it doesn't, turn it by hand until it does.

7. Now adjust the linkage to fit snug but too tight or too loose between the balllocks and the cross-rod.

8. When it fits snug, tighten the lock nuts on the sleeves and remove the indexing pin.



How to adjust the **RANGE-SELECTOR-CONTROL LINKAGE**

1. Lock the four wheels—if you find any, straighten them.

2. Set the range selector in **NEUTRAL**.

3. Disconnect the linkage at three places: at the front balllocks just behind the driver's seat, at the rear balllock that's in the transmission compartment and at the shift-control valve on the transmission (Fig. 25).

4. Insert a pin or a nail thru the indexing hole in both balllocks.

5. Make the shift-rod control indicator point to the high dot by hand turning it.

6. Now adjust the control linkage to fit snug between the two balllocks and the selector-control valve. While linkage snug—too tight or too loose will throw you out of adjustment again.

7. Tighten the lock-nuts on the sleeves, when you've made the adjustment, then remove the indexing pin.



SPASMODIC PERSONNEL-HEATERS

If the heat exchanger in your 34-cub-
Foot Wind personnel-heater con-
tinues and causes the overheat switch to
periodically cut-out, as if the heater isn't
functioning like it should, it's because
the burner-pocket baffle has warped and
changed the flow of combustion air and
formed hot-spots. (Illustration above Heater
Serial No. 44991 were modified in pro-
duction.)

Push way up in the Arctic modified
their heaters for maximum efficiency
(Fig. 10), and here's how (Johnson can
modify yours):

1. Remove the air blower motor assembly and the
igniter.
2. Take panel igniter, remove all the inside parts,
and bore a 1/2" hole through the center line of the
igniter shell.

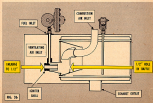
3. Place the drilled-igniter shell in the igniter well,
3/16" in pilot still leading and guide.

4. Drill a 1/2" hole through the baffle plate (it's
about 2" inside the exchanger burner-pocket).

5. Remove the impressed leading guide. Insert a
solid rod (about 1 1/8" in diameter) thru the hole
until it touches the baffle plate, and then tap the
rod with a hammer until the baffle is spring inward
from about 1/4" to 1/2" toward the center of the
exchanger. (A 20" substitute from a 1/2" diameter
rod will do as a substitute for the rod.) The baffle is
tack-welded—do go easy on the tapping. And before
re-assembly, check the walls.

6. To determine the correct distance to move the
baffle, first insert the rod in the hole and mark it
both a correct pencil mark with the edge of the
igniter well. Make another mark about 1/2" out from
the first, then tap the rod until the second mark is
in line with the edge of the igniter well.

7. Reassemble the heater and it'll be extra' large.



RADIO

The radio in your TR-3 consists of a #1 set for standard communication, with an auxiliary receiver and storage up to 10 hours, a #2 set built in front with the landing gear wags in about 10 min.

The procedure here is how to turn it on and operate it during the TR in the storage arrangement that's easier to remember. First, if the radio's to be on for the lengthy period, make sure one of the dials is turned in fairly (preferably the auxiliary). Check the antenna connections, and see that the power lead and control cables are plugged in snug—not too tight or you'll break the pins. Then...

1. Plug MAIN SWITCH at 101-102/103/104 on your radio set.
2. Put amplifier OFF, #1, #2-20 switch on #5.
3. Flip #10 for interphone operation only.
4. Turn FREQUENCY selector on #10 to #10 g/c.
5. On #12 set, turn the FREQUENCY knob up.
6. Turn SIGNAL knob off the way clockwise.
7. If you need the tail lights, turn ON the MAIN SWITCH, then turn on the SIGNAL LIGHT switch if you want to use the lights before the #20.
8. Turn SIGNAL knob until your channel frequency is shown in the window. (Tail frequency are marked in the window; bands are the bands.)
9. Turn center #11 only power knob just off the OFF—(MARKS) #10 switch or (MARKS) #10/11.
10. Then turn the right gear switch to #10B.
11. On #11 set, turn #12-10B/10A/10C up.
12. Turn on MAIN LIGHT if you need it.
13. Turn SIGNAL OFF the way up.
14. Turn the multi-channel water knob to #1.
15. Now set your frequency. Turn the left FREQUENCY knob until frequency (lower or higher as necessary).
16. Turn the right FREQUENCY knob to channel



#10 if frequency you need. (NOTE: In take lands off wheel landing, turn antenna counter-clockwise; looped back or straight, turn clockwise.)

17. Now on the spare receiver. Turn SIGNAL OFF the way up (clockwise).
18. If you have MAIN SWITCH on and you need the tail lights, turn SIGNAL LIGHT knob to #10.
19. Turn FREQUENCY knob about half way up (the third row of lights).
20. Turn FREQUENCY knob 60 your frequency's aligned with the white line in the dial window.
21. Now on the CONTROL BOX. Look the forward switch in RADIO FREQUENCY position.
22. Plug your chord set into the control box.
23. Turn FREQUENCY control knob clockwise or back clear set (see the next volume control, located on control box directly below chord set's plug in socket).
24. Put the SELECTOR CONTROL SWITCH in the center #2 of #10/11 position.
25. If you haven't already turned on the MAIN SWITCH now is the time to

know your angry-3



#5, set all three SIGNAL knobs 1, 2, 3, #10. Turn each one counter-clockwise till you hear a rattling noise, then back off a fraction. This noise indicates your set's functioning. If you back off more than necessary to squinch the noise, you'll lose your signal 5-10-100.

26. Now point on the #11, set the volume knob 4, 10, 100 as all into the good reception.
27. To talk or receive on #1 set and spare receiver, turn control box selector handle counter-clockwise, then press and hold in HOLD AND HOLD buttons on your chord set—release 'em when you're through. With control selector in reception you can also talk and receive over the interphone system by holding in the chord set's HOLD button.
28. To talk or receive on #2 set, turn control box selector counter-clockwise until it's in the HOLD AND HOLD button on your chord set. With control switch in this position you can also talk over the interphone system by holding in #2 button to talk, release to hear.
29. When you're not using any special set, keep

the control box selector switch in the center position. This will give better set of the call, and will let you talk over the interphone.

30. After you're on the air, the only adjustments on the sets that you'll need to face will be the tuning indicator and speaker adjust either of them on the receiver channel.

31. If you want to use the interphone system only, turn the #1-10 switch to #10 (see step 5).
 32. When you're receiving the intercommunication—keep it turned off.
 33. To turn the set off, simply turn off the MAIN SWITCH 101-102/103/104 when you're ready to go on the air again later. Look, and you're all set.
 34. If you're curious about all the other points on the sets, dip out your copy of TR 10-100 and look up a little on the subject—page 14 covers the complete operating procedure.
- The system you always use (your #10/11), the battery, it's a nice thing to have around... the lights and the water tank are on the #1.

TROUBLE SHOOTERS



*Lay that pistol down, Sarge
Don't shoot that show around
That's no simple one, Sarge
Lay that pistol down*



Times have changed — Today's mechanized machines need more than a shot or two. These trouble-shooters listed below will help you get a faster answer to rear-up and go.

TROUBLE

CAUSE

REMEDY

MAN POWER

1. **Fails to work when starter's held on.**



Water switch not turned on, or
fused out.

Stops when lever not
is tested.

Stops when safety switch
activated or fused out.

Water or starter relay
fused out.

Early starting system.

Early battery contact.

Mechanical failure of engine
parts.

Wrong grade of oil.

Switch on, or replace.

Shift into NEUTRAL, STOP.

Replace or replace. (See page 147)

Check and replace. (See page 144)

Check starting system (check circuit).

Test terminals and starting circuit.

Go get help.

Check and add oil per 11 7-72.

2. **Crank, but fails to start.**



Repeats crank out on BBS.

Repeats crank out on.

Fuel tank shut off valve
not open.

Fuel valve empty.

Engine flooded due to over-
priming pump.

Engine extremely cold.

Start on.

Start on.

Start open.

Get gas.

Turn off magnetic switch, push accelerator down
to floor and turn over engine about five times
to exhaust surplus gas. (See page 143)

Additional oil if pump required (pump only
while engine cranking with valve out). Filter
should have about 10 gal remaining; if not,
refill. Check pump flow—if none, pump is
defective or fuel line clogged.



TROUBLE

CAUSE

REMEDY



3. Starts but won't keep running.



4. Loss of power—or doesn't develop full power.



5. Backfiring.



Worn batteries.
Engine oil too heavy.
Fuel not reaching carburetor.
Carved and clogged spark plugs.
Many different factors cause loss of power.



Broken shopping.
Improper ignition timing.
Clogged air cleaner.
Worn timing belt.
Belt-toe linkage out of adjustment.

Willing or still open for long periods.

Low oil level.
Wrong grade of oil.
Faulty cooling fan.
Oil-water mixer clogged or ineffective adjustment.

Defective oil pump.
Faulty timing (valving under load) and not stopping to cool engine.

Engine doesn't rev (revs) correctly.
Transmission slipping.

Engine or charge with auxiliary generator or drive cable.
Range oil according to 20 P-120.
Disconnect carburetor (air-fuel) line, create engine (compressor) off. If low-flow of gas enters out, fuel pump is OK. If not, check fuel system.
Remove spark plug cable, test spark jump. If no spark, check air coil. Is gas there.
Follow quarterly 20 service, or substitute for 20.

Remove spark plug cable and test spark jump (see trouble remedy). If spark won't jump 1/16" gap, or it is irregular, or none at all, cable or magnets in it fault. Inspect all plugs, test compressor. Check ignition timing. Check for low low fuel mixture.

Broken too tight. Inspect.
Check ignition timing.
Clean air cleaner filter.
Noticed by overly exhaust, failed plug, excessive oil consumption, low oil pressure.

Check and adjust throttle linkage.
Idle at 1000-1200 rpm.

Check level and add oil.
Start and still per 20 P-120.
Check fan, repair cable if necessary.

Remove eggs, dirt, leaves, etc., from fan. Check circulation through radiator by removing center fan and working engine.
Check oil pressure. Should be 20-25 psi with 20 P-120.

Check timing. Replace if defective. Operate per instructions 20 P-120. Cool engine by pulling in manual and running at 1750 rpm for few minutes. Allow cooling the block of throttle body.

Check transmission. Gears and input plates should show flow of air around engine.
Check stall speed (should be 1000-1200 rpm in high).

TROUBLE**CAUSE****REMEDY****6. Excessive oil consumption.**

Wrong grade of oil.

Oil leaking.

Worn internal parts.

Check oil for correct viscosity by measuring straightaway temperature. Drain and refill.

Check for leaks—repair 'em.

Method to locate oil leak, loss of power, limited slippage to get tractors.

7. Low oil pressure.

Wrong grade of oil.

Blocked engine oil.

Faulty oil pump.

Bad connecting-rod bearing.

Faulty pressure gauge.

Faulty venting/light switch.

Dirty pressure-control valve seat.

Check oil. Drain and refill if necessary.

Do not overprime. Change oil every 1000 miles or so, unless no conditions require.

Replace it.

Identified by excessive rattling or knocking if noise for tractors.

Check gauge. Replace if necessary.

Check, replace switch or bulb if needed.

Remove and clean valve seat.

8. High oil pressure.

Clogged oil filter.

Improperly adjusted or faulty oil-pressure valve.

Faulty oil-pressure gauge.

Start as per page 671.

Adjust or replace control valve.

Replace gauge.

9. No oil pressure.

No oil in crankcase.

Clogged oil-inlet tubes.

Faulty oil pump.

Check tank if low.

Go get tractors.

Go get good one.

**FUEL SYSTEM****1. Fuel not reaching carburetor.**

Fuel tank shut-off valve closed.

Fuel tanks empty.

Regulator-valve defective.

Clogged fuel lines or filter.

Fuel leaks.

Get it at 8000 00.

Refill and fix.

Check for shut, replace regulator control if necessary.

Check pump to carburetor line, replace if necessary. Remove and clean fuel filter.

Examine for broken lines, repair or replace.

2. Carburetor leaks.

Too much pumping of carburetor.

Faulty fuel pump.

Leaking carburetor.

Stop pump immediately. Regulate fuel pump accordingly.

Check pump pressure. At 100-psi, minimum 2 1/2 psi. maximum 4 psi. Replace pump if needed.

Fuel adjusted pump or needle valve faulty—replace carburetor.

TROUBLE

1. Fuel system too lean.



2. Fuel not off-carburetor (diaphragm) won't stop engine.



CAUSE

- Carburetor needle adjusting.
Faulty fuel-pump pressure.
Air leaks.
Faulty valve.
Faulty diaphragm.
Faulty float needle.

REMEDY

- Adjust the screws for maximum performance at 2000-rpm. See page 422.
Check pump for 2½ psi at 1000-rpm. Replace if necessary.
Check carburetor and fuel-pipe connections for leaks. Tighten or replace.
Replace valve.
Check diaphragm plate of carburetor for correct. If defective, go get behavior.
Check. Replace if necessary.

TRANSMISSION

1. Excessive bearing light oil.



2. Low oil-pressure light comes on.



3. Tank fails to rise to level or is off range.

Low, or no, oil.

Wrong oil in transmission.
Clogged or dirty oil filter.

Clogged valve cover or lines.
Pan struck, installed wrong.
Faulty warning-light switch.
Transmission slipping.
Belt too tight.
Faulty driving (stalling under load) pull out and stopping in and reaccelerated.

Faulty oil level.

Faulty lubrication of pressure

low oil level.
Faulty light switch.

Relative control linkage out of adjustment.

Transmission slipping.

Check level. Top up to 1000-rpm and reaccelerate at normal operating temperatures. Level should be between MIN (200-250 PSI), and 20-300 PSI, 4000-100-150 marks on 0-200.

Always use 30 W.

Check filter. Always clean it 25 miles after oil change.

Remove and clean.

Check. Strainer should remain throughout.

Check. Replace if necessary.

Check oil grade. See page 426.

Check and adjust belt.

Shift into neutral and run engine at 1700-rpm for two minutes. Look for oil leaks before testing engine.

Check for oil leaks.

Remove low-level pipe plug (at fuel meter), or look at high-range oil-pressure plug or control valve body. Insert 100-lb pressure gauge. With engine running at 1000-rpm, oil pressure should register 30 psi. Pressure 11 psi, go get behavior.

Check. All-out if you need it.

Check. Replace if necessary.

Check 2. See 3 page on page 422.

See oil grade in high range. If behavior is 1000-rpm, go get behavior.

TROUBLE

CAUSE

REMEDY



Shaft of the ground set is adjustable range.

Inefficient all pressure is used.

Check. Pressure should be 175 psi (transmission is low or raised) with engine running at 1800 rpm.

Check. Pressure should be set low that oil psi with engine running at 1800 rpm. If below, oil psi follows.

DRIVE CONTROLS & SHIFTS

1. Gear won't shift.



Range selector control and transmission selector body out of adjustment.

Transmission all pressures not in operating range.

Selective steering linkage.

Transmission manual control lever with transmission selector body.

Check transmission all pressures low. If not in operating range, go per following.

Adjust steering linkage.

2. Gear slips in only one direction.



Steering linkage or roller links improperly adjusted.

Inefficient all pressure in right or left drive wheel.

Roller dragging.

Check and adjust linkage. (See page 101.)

Check. If not in allowable range, go per following.

Check steering linkage adjustment on both sides of transmission. Check and adjust roller linkages.

3. Range selector control lever sticks in neutral or reverse.

Control lever not out of adjustment.

Adjust rod and linkage.

4. Range selector control lever sticks in low reverse gear.



Steering and shifting linkage out of adjustment.

Lever ballistics on shift linkage.

Roller steering and shift control of transmission.

Adjust to eliminate leverage.

Replace connecting parts.

Straighten or replace linkage.

5. Brake won't stop fast.



Linkage out of adjustment.

Brake out of adjustment of transmission.

Check, adjust. Shimstock of play.

Adjust service brake of transmission.

6. Brake dragging.



Brake out of adjustment of transmission.

Linkage that is too tight.

Check and adjust on both sides of transmission.

Check for selective linkage. Straighten or replace what you get.

7. Power brake pump too noisy.



Brake pump line.

Selective pump.

Clogged filter or fuel line to pump.

Check, repair as necessary.

Check, repair, or replace.

Check, repair, or replace.

TROUBLE**CAUSE****REPAIR**

8. Engine won't respond to accelerator or fuel throttle.

Loose or broken throttle linkage.

Check, straighten, repair or replace.

Fuel linkage.

Check, repair or replace as necessary.

TRACKS AND SUSPENSION

1. Both tracks to one side.

Stripped track tension.

Adjust both tracks as they'll be equal.



Worn or distorted drive sprockets or tracks.

Check for worn parts, replace if necessary.

Cracked road.

Drive in the middle, or use Compression of Road, or use your shovel.

2. Loose track.

Inproper string.

Fix string like string!



Worn or excessively loose track.

Adjust or replace track.

Roller compensating idler wheel.

Check lower idler's guide flange for wear, wear interchange idler or replace. (See page 41.)

3. Both ways to one side.

Roller tension bar.

Replace if road wheel can be tilted with your bar.

4. Excessively loose riding.

Loosening track adjuster.

Fix by hand. It should feel loose after crossing bank. Replace if needed.



Roller tension bar.

Replace as per page 41.

ADJUSTMENT DETAILS

1. Sags to one.

Roller tension adjuster or roller string.

Loose manually, if it starts, check string wiring and watch. If it won't, check sprocket width and string.



Worn or failed string.

Remove and clean. Replace if necessary.

Replace broken parts out of adjustment.

Adjust to 1.000" gap when tracks are below.

2. Tracks, but won't keep moving.

Roller that off-center closed.

Open it manually.



Clogged flow or fuel lines.

Remove clogs (and) and clean. Check flow for leaks, leaks, and clogging.

Stripped fuel pump.

If flow from pump's inlets, replace pump.

3. Won't run efficiently at full speed.

Excessive idler pressure adjusted.

Check for final speed adjustment.

Roller string.

Check string, spill plug roller, and sprocket points. If still moving, notify 23.



SPECIAL TOOLS

you'll need for organizational maintenance

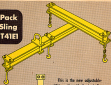
Tool Set, Organizational Maintenance, Special Set A, Basic		17131, 17401	117-254-200	
Tool Set, Organizational Maintenance, Special Set B, Basic		17132, 17402	117-254-200	
		<u>ITEM NUMBER</u>	<u>QUANTITY</u>	<u>SET OF</u>
	<u>Components</u>			
Engine	Kit, valves, electrical cables and fuel line	42-6-85-000		1
	Wrench, adjust, 14 1/16" bypass valve and valve end of pressure-control valve	42-4-173-20		1
	Caps, valve tappet adjusting	42-6-493-075		1
	Light, magnetic timing, front beltcase	42-1-400		1
	Shig. lifting, engine and transmission	42-5-900-20		1
	Wrench, cracked, (piston harness nut)	42-494-7-007		2
	Wrench, cracked, engine timing, front fan	42-494-7-009		1
	Wrench, spline engine timing, front flywheel	42-494-7-010	100000	1
	Wrench, span end of water pump nut	42-491-591-000		1
	Wrench, spark plug, intake	42-491-592-000		1
	Shig. transport, engine and transmission	42-5-900-120		1
	Adapter Set, Electrical Testing Load with Adapter Set 17A-0000		107000	1
	<u>Consists of</u>			
	1 Adapter Circuit			
	1 Adapter Signal			
	1 Adapter Output			
	1 Adapter 0.1 pin			
	1 Adapter Output			
	1 Adapter Output			
	1 Adapter 0.2 pin			
	1 Leads lead			
	1 Box, adapter set			
Transmission	Caps, transmission oil pressure	42-6-117-000		1
	Shig. lifting, transmission	42-5-900-00		1
Assembly	Caps, fuel level (carburetor)	42-6-100-000		1
Exhaust				
Suspension	Adapter, pulley, front wheel assembly	42-4-004		1
	Adapter, pulley, compensating link pin	42-7000	10000	1
	Adapter, pulley, tension bar	700000		1



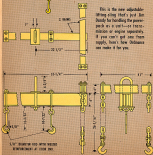
Component	Part Number	Quantity Required	Qty.	Qty.
			A	B
Puller, coverings, shaft diameter and	41-P-2954-07		1	1
Puller, slide hammer (road wheel, arm and) brake bar and compensating link pin—used with 41-4-11-1A.	41-P-2954-08		1	1
Remove and Replace Bearing cap, track support roller hub—used with 41-4-1-295-007 flange.	41-4-2374-02		1	1
Remove and Replace Bearing cap, compensating link and road wheel hub, track—used with 41-4-239-007 flange.	41-4-2374-03		1	1
Remove and Replace Bearing cap, compensating wheel hub and road wheel hub, roller—used with 41-4-1-295-007 flange.	41-4-2374-04		1	1
Replace, oil seal, compensating wheel and road wheel hub.	41-4-239-47		1	1
Replace, oil seal, road wheel and support bearing—used with 41-4-1-295-002 flange.	41-4-239-50		1	
Replace, track support roller hub, oil seal.	41-4-239-52		1	1
Replace, bearing, shock absorber.	41-4-239-62		1	1
Pin, drill, track pin.	41-4-1-1-000		1	1
Pinion, track remaining (7143 track).	41-4-289-200		1	1
Pinion, remove and replace.	41-4-1-00-101		1	1
Pinion, remove and replace.	41-4-239-100		1	1
Remove and Replace, bearing, track wheel and oil compensating link—used with 41-4-239-002 flange.	41-4-237-49		1	
Wrench, socket, road wheel arm spindle nut.	41-4-239-300			1
Wrench, plug, torque bar retaining nut.	41-4-239-301			1
Wrench, road wheel.	41-4-239-302		1	1
Wrench, universal, track tension adjusting.	41-4-671-05		1	1
71 Ref Use 7112 Wrench, adjusting, strong spring bearing.	001-5278-05			
Wrench, slider, ground single end (11-52 R.A. see page 408 TRACKER PUMPER MANUAL).	41-4-1-750-001			
Tool, trackblock removing.	001-721-009			
System, trackblock removing.	001-721-008			
Kit, spline shaft removing (used also for "T" flange with trackblock removing system).	001-723001			
(See also "T" flange and rollers)				
Oil, drilling, oil.	41-4-1-30-000			

END

Power Pack Lifting Sling for the T41E1



This is the new adjustable lifting sling that's just as handy for handling the power pack as a unit—as transmission or engine separately. If you can't get one from supply, Iron's Saw Blades can make it for you.



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*Articles in this issue apply to other vehicles in the Light-Truck family, as indicated above. Code letters show identify the following vehicles:

A. T141 B. T1011 C. 1002 D. T1011 E. T101 F. T104

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how to get what you need by the numbers



ORD 7 and 8 (with changes 1, 2 and 3), and ORD 9, SML G 211, have been distributed. If you don't have your ORD 7 and its three changes, hit your publications section. But take it easy after you get them. They aren't quite up to date because so many parts were changed or superseded after the catalogs were compiled.

To speed up supply and get the right part, make in the regular way, but be sure to write the Manufacturer's Serial Number or the Ordnance Serial Number (all the parts that need the part) on the requisition. That's about the only thing that'll tell the people at the depot which part is right for your tank. It will also tell a straight away to the Cadillac man who'll be at some point in the supply line to help edit each questionable requisition.

Brief yourself again, it's important: The Manufacturer's (or Ordnance) Serial Number must be used for each part requisitioned—and this does **not** mean the USA Number.