

Issue 42

PS

1956 Series

THE  
PREVENTIVE  
MAINTENANCE  
MONTHLY



# LEND ME YOUR EARS

**T**here comes a time every once in a while when it's a good idea to talk about a thing seriously. When some guys start violating good principles and working habits, that time is now.

Before a customer starts a job, he's got to be clear in on his tools—what they are, what and how to use them, and when you've got to mess with them. If he fails up, it's almost sure his tools the right way—because the good that he'll miss is out of business.

Wishes the same way with the guys who drive vehicles, but with these guys it could be a matter of life-or-death—if they fish up and don't use the tools they have to work with the right way, chances are that they are well be out of business—most probably for good.

When talking about "tools" for vehicle drivers, I don't mean those wrench, hammers, screw drivers, power guns, a guy uses to maintain his vehicles, with they're direct important—I'm talking about all those gadgets, knobs and levers you use to control and operate your vehicle. Unless a guy knows what they're used for, how to use them and when to use them, he may find himself having a sleep instead of a sleep.

In, it all boils down to this—get stuff in before handling. If you don't know, find out—find out what the gadgets and things-and-bobs are before find out when to use them—and use how to use them.

Many equipment is getting more-complexed each day. The people who make this equipment know this and make provisions for it by writing publications and training people to train other people so that they can take care of other people. It's a smart man who takes advantage of these. It's a foolish man who messes around without knowing. He's the one who will mess them likely retail up with a statement of charges over in a plus ten.

Your TM is your key. Make sure you have one. More important than that, make sure you know what's in it. Read it and study it and show you're those that read it and study it some more. It tells you just what those gadgets-on your truck are for—and why you have to use them.

Your TM is your L-I-F-E Insurance, that is—when driving your truck.



## PS MAGAZINE

ISSUE 176, 88

1984, October

**PUBLISHED BY THE DEPARTMENT OF THE ARMY FOR THE INTEREST OF AN ORGANIZATIONAL CONCERNANCE AND UNDER AUTHORITY OF DISTRIBUTION IS MADE THROUGH SEVERAL ADDRESSES THROUGHOUT THE UNITED STATES OF AMERICA AND THROUGHOUT THE WORLD. POSTAGE AND FREIGHT CHARGES WILL BE PAID BY THE DEPARTMENT OF THE ARMY. POSTMASTER: SEND ADDRESS CHANGES TO PS MAGAZINE, 1000 ARMY AVENUE, WASHINGTON, D.C. 20315.**

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Setting  
Clad On

## HOW TO CHECK OUT YOUR 24-VOLT ELECTRICAL SYSTEM

Here's the lowdown for you, 24-volt electrical mechanics on using your low-voltage diagnostic tools on selected vehicles.



Your truck's 24-volt electrical system's a topnotcher. When it's getting out just right, your truck gets to like a contented pony.

But there's a time when even the best equipment can go phoney. In your truck, it's when one of the gadgets in your electrical system starts cutting up. When the happens, your truck won't have the best it needs to need.

That's where you come in. You've got to make sure your truck's getting the best by testing its battery, starter, generator, regulator, wiring and grounds. These tests will tell you if these separate gadgets are working right.

Seeing that electrical testing is important for the maintenance of your vehicles, Cadence realizes that you must have a method of testing with or without a man-



uals resistor (Cad Truck No. 17-6-228P). This article tells you how to do it if you haven't got a resistor.

EM-9-0000 on the 1/2-ton 402' truck tells you how to check out your 24-volt system with the variable resistor.

To give you all the help you need, you've got a low-voltage distributor (Cad Truck No. 17-1-5075-80, P/N 4615-155-8880) and a set of solenoid (Cad Truck No. 17-6-2190, P/N 4610-206-7311) in your Tool Set, Organizational Maintenance (annual edition) Kit No. 1 Supplemental (41-T-5028-84-0). Now, if you'll follow along, you'll see just how to use this equipment and what results you should get.





**FIG. 1—Get ready. Get you disconnect your battery ground cable before jacking your engine in? Don't forget to back that cable up again after the engine is sitting in their slot.**

## TO GET SET

There are a few things you have to know and do before going into the tests. First, before making any test on your generator, changing circuits or regulator, make sure your fan belt's in good shape and adjusted like your '86 says. Where your truck up on your electrical system's getting out like it would on a regular run.

When you hook up your meters and the needles show wild and crazy readings, you've got the wrong plug in the wrong hole. Better reverse those leads before your circuit tester gets mad and starts burning up. (On your meter, the red lead is positive and the black negative.)

There's one other point that's plenty important. Always disconnect your battery ground cable before installing or removing the voltmeter, cables or cable connections. Given the odds if you don't, sparks can start flying and if there's any stray gasoline around—bye-bye battery.

If you find any gadget in your system that's not working right, all you do is remove the part, return it to supply and get a new one. No messing around with the stuff inside. It's strictly taboo for the driver and self mechanics.

When you check your batteries and find that one's bad, it's always best to take them to for another go. Batteries have to work in matched pairs—matching 'em is a job for your shop. When you turn both batteries in, it doesn't necessarily mean they're going to be

scrapped. The ones that are questionable will be checked, matched and rebalanced in pairs.

Before testing out your entire 12-volt system, it'd be best to hook up your meters and adapters according to Fig. 1. Then you'll have everything ready for the whole series of tests and won't have to stop to fix mistakes to make a correction.

## YOUR BATTERY COMES FIRST

The things to look for when checking out your battery are how it heats on the outside, how it acts on the inside and how it puts out.

HERE'S WHAT TO LOOK FOR ON THE INSIDE



There are things that'll run a tight battery like a deadhead. If you notice any of these do them, do them up again. If you can't fix them on the fly, you have both batteries in for another pair.

## HYDROMETER TEST

To find out how your batteries are on the inside, you first make a hydrometer test. Check each cell in each battery this way—



A difference of .030 points points between any of the cells of a battery means they ain't it. In fact, they ain't for nothing else but it.

When you get the specific gravity of all six cells for each battery, add them up and divide by six. This'll give you the average specific gravity for that battery. Do the same thing for the other battery. If there's more than .020 difference between the average of the first and the average of the second battery, something's wrong. So, don't ask questions. Turn both batteries in for another pair.

Other things to look for when making the hydrometer test are—

1. The specific gravity of each cell. If the specific gravity is 1.225 or below, give the old box a charge. After charging, if she doesn't go above 1.225, turn your batteries in for another pair.

2. If the electrolyte is dirty or discolored, turn your batteries in for another pair.



**FIG. 2—**Hookup for battery-capacity test. **Be sure you're engine up before making these connections!**



The specific gravity reading of any battery will change as the temperature changes. In your hydrometer there's a thermometer which records the temperature of the electrolyte. You can read the hydrometer straight if the temperature scale reads 80 degrees. For every 10 degrees below 80, subtract .004 from the reading your hydrometer gives you. For every 10 degrees above 80, add .004 to the hydrometer reading.

For example, let's say your hydrometer reads 1.265, but the thermometer in your hydrometer records the temperature of the electrolyte as 85-degrees. Your raw hydrometer reading, then, would be 1.271—.004 added for every 10 degrees above 80. You've got a temperature reading of 10 degrees above 80, so you'll add .004.

### BATTERY CAPACITY TEST

The first test you make on your battery is the battery-capacity test. This tells you whether your battery is getting out the right amount of current. Hook up your low-voltage ammeter-tester like battery of a final according to Fig 2.

Now crank your engine with the ignition switch off for not longer than 30 seconds. If you get a voltmeter reading of 9.8 volts—no sweat—your battery's cranking with gas. Do the same thing for the other battery. Readings between batteries should be within .2 volt. If they're more, your batteries aren't working right together. So, get them back to supply and get another peek.

For example, if one of your batteries should read 9.8 and the other 9.4, you're OK.

If you get a reading below 9.8 exchange your batteries.

## TESTING THE BATTERY CABLES

Now that you've made sure your terminals are in good shape, your next step is to test the cables. These cables are your "streams of supply," and you've got to check them out to make sure the juice from your battery gets to the parts that need it.

Test these three cables—

- The starter-circuit cable
- The battery-jumper cable
- The ground-circuit cable

You'll also check out your starter ground, there's how they're hooked—



## STARTER CABLE

To test the starter-circuit cable, first make a set of test jacks—about lengths of  $\frac{1}{4}$  in. welding rod or six penny nails ground to a long, clean point. Now drive one into your battery (+) post with a light hammer. This maintains the voltage right at the post and will show up a loose or dirty cable clamp.

Now, make your hookup according to Fig. 3.



**FIG. 3—**Hookup the starter-circuit cable test. Notice that the negative lead is in the 30-amp hole. That's to insure that you're getting a lot of resistance in the line past indicator—won't hurt to get trying to connect it. If you get no reading in the 30-amp hole, take the test around and put it in the 15-amp hole. That'll be the system for the rest of the cable test.



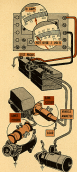


FIG. 4. Hookup for battery-jumper cable test. If you get no reading on the 10 volt scale, take the test set out and get it for the 1 volt test.



Crank the engine with the ignition switch off for not more than 30 seconds. If your voltmeter moves to more than 1 volt while cranking, take off the cables, clean and inspect it, clean all grease and corrosion from the battery post and put the cables back on—tight. Then retest.

... IF THE READING ON THIS 10 VOLT TEST SET GETS UP TO ONE VOLT, TAKE THE CABLES OFF AND CLEAN THEM UP.



### BATTERY-JUMPER CABLE

For both test grids to work—one in the plus pole and one in the negative to which your jumper cable is hooked. Now, hookup your tester according to Fig. 4.

You'll use this test just like the power-circuit cable test. Crank the engine with the ignition off for not more than 30 seconds. The voltmeter shouldn't read more than 1 volt. If it does, take the cables off, clean and inspect it, clean the battery posts, put the cables back on and make sure the terminals are tight. Then retest. Will you get more than 1 volt reading? Get a new cable and retest to make sure it's a good one.



## GROUND- CIRCUIT CABLE

To test the starter-ground-circuit cable, use this hookup—but get your ground to first like it shows in Fig. 2.

You'll do this test the same way as the last two.



Check your angles. If you get a reading of more than .1 volt, take off the cable,



clean it, look it over, clean the battery post, put the cable back on and tighten both connections. Then repeat. If the voltmeter reads more than .1 volt again, get a new cable and repeat.

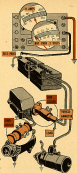
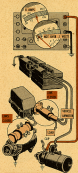


FIG. 2—Hooking the ground-circuit cable up. If you get no reading at the test cable, make the test set and get it in the .1-volt test.



# STARTER PROBLEM



**FIG. 2—** Makeup for starter ground test. If you get no reading in the 10-volt test, make the ground test and get 1 on the 1-volt test.



Make this hookup like it shows you in Fig. 4, but before you start, here are a few things to remember.

Your voltmeter positive lead will be hooked to the starter frame. Don't hook it to the starter attaching bolts or the fan-washer assembly.

Your voltmeter negative lead will be attached to the engine block—to a bare spot. If you can't find a bare spot, scrape some paint off the block.

Of course you'll start by sticking your voltmeter negative lead into the 10-volt scale, like you did for the rest of the test. If you get no reading, drop the lead to the 1-volt scale.

Crank your engine with the ignition switch off for no longer than 20 seconds. You should have less than .1 voltage drop. If you get more, remove the starter and clean both the motor flange and the engine block real well—no paint, no grease, no dirt. Then, put the starter back and tighten it. Repeat the test.



## IS YOUR STARTER IN TOP SHAPE?

Only one test is needed to test out your starter—the starting-motor amperage-draw test. This test will tell you if your starter's in the kind of shape it's supposed to be. If it can't make it off your track, get it back to supply and get a new one.

To make this test, use the external circuit board in every low-voltage circuit tester kit. Fig 7 shows how the hookup for the test is made.

Crack the engine with the ignition switch off for not longer than 30 seconds. A good starter will make your ammeter read anywhere from 45 to 60 amps steady. But it may kick up to 90 amps until the engine starts to turn. If the amperage stays at less than 45 or more than 60 amps, replace the starter.

## THE GENERATOR AND REGULATOR

When it comes to testing out your generator and regulator systems, there's five tests to make—

- The generator-output test
- The charging-circuit-resistance test
- The charging-circuit-ground-resistance test
- The generator-voltage-regulator test
- The reverse-current test

All your tests for the generator and regulator are made right at the generator.



Fig 7—hookup to test motor amperage test.



## GENERATOR- OUTPUT TEST

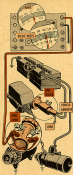


FIG. 2—Setup for generator output test.



This test, just like it's called, tells you whether your generator is putting out or not. If your meters don't read right, all you've got to do is take your generator off and get a new one. You don't fuss around with the thing, trying to discover why it won't work.

Make your hookup according to Fig. 2. After you've got the hookup, do the next step easy, very carefully.

Start your engine—and slowly, but very slowly—increase your speed—no gearing. If you do it too fast, there's a good chance you'll burn up your generator and have your meter pins oxidized like a nut.

Feed the meter. Your voltmeter should be getting out of about 30 volts. When this reading has been reached, or maybe a little beyond, cut your engine fast.

**Never let your engine speed increase to a point where your output is over 50 volts.**

If you can't get this reading, you know something's wrong with your generator—it's not putting out enough juice. So, get a new one.

The next two tests—the charging-circuit-resistance test and the charging-ground-circuit-resistance test—will tell you whether your connections to and from the generator and regulator are in good shape.

## CHARGING-CIRCUIT RESISTANCE TEST

WOW! IT'S HOT! HOT!



For this test, the charging-circuit resistance test, you've got to discharge your battery a bit so they'll accept a charge. You do this by cranking the engine with the ignition off for three periods of 30 seconds each, allowing 2 to 3 minutes between periods to let the engine cool.

Start your engine with the multimeter negative lead disconnected from the voltmeter and led outside where it cannot ground on the truck. When your ammeter indicates charge, bring the multimeter negative lead up and touch the 50-millivolt scale. You should show no appreciable voltage. Then, drop the leads to the 1-volt scale.

If your voltage reads over .2 volt, you've got to check for clean pins and tight connections in the charging circuit. When everything is clean and tight, check again. If you still read over .2 volt, get yourself a new generator or regulator cable. If that doesn't do it, replace the regulator, put the old cable back on and test again.

Here's a word of caution: You must start the engine and show a charge on your ammeter before connecting the multimeter when making this test, because you've got to get the contact closed on the current-circuit relay in your regulator. If you don't, you'll have a 34-volt current running rearward through your voltmeter—*Statement of Charges*, too.



FIG. 76—Testing for charging-circuit resistance too. Don't connect the multimeter negative lead to the voltmeter terminal until engine's running and current starts charging. Or you'll get a 34-volt reverse current through your voltmeter.



## CHARGING CIRCUIT LOADS - DISTANCE TEST

Make your hookup the way it shows in Fig 12.

Discharge your batteries some more by cranking with the ignition off—then start your engine. Let the throttle so the generator shows some charge. Your voltmeter should read no more than .2 volt. If it does, check and clean the generator to engine mounting and the battery ground cable to frame connection. Are the ends of connections in shape? If not, change them. Then run the test again. If you still get more than a .2 volt drop, take your truck back to Orlinco.

Your generator's the gift that can really go wild in your electrical system. While running, it just keeps pouring out juice and must be regulated before it suffices a heart attack from overwork. That's where your regulator comes into play. If the regulator isn't operating the way it should, your generator'll just keep producing until pop goes the wheel.



**FIG 12—**Hookup for charging-circuit ground-test. Also test if you get no reading in the .2-volt bulb, take the bulb out and put it in the 1-volt bulb.



## GENERATOR-VOLTAGE TEST

This test will tell you whether your regulator is controlling your generator and if your voltage regulator unit in the regulator box is operating as it should. Fig. 11 shows the way to make this hookup. Loosen your regulator-control link clamp and insert your angles. Then open the link.



Then idle through your speed slowly and notice your voltmeter reading.



Your voltmeter should read between 27 and 28 volts and hold steady as you increase the speed of your engine. If the reading is above or below this or if the needle waves back and forth, get yourself a new regulator.



FIG. 11—hookup for voltage-regulator test.



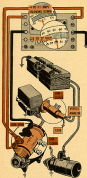


FIG. 12: Hook up for current-relay test.



## REVERSE-CURRENT-RELAY TEST

This is the last test on your 24-volt system. It'll tell you whether your cut-out relay points are operating properly in your regulator. Make the hookup according to Fig. 13.

Start your engine and reduce the idle speed by the carburetor idle-speed-adjusting screw until your cut-out relay points open (your ammeter will read zero). Increase your engine speed and watch your voltmeter. When it hits 25 to 27 volts, your relay points should close, and your ammeter needle jump up off zero.

Reduce the speed gradually and read your ammeter at the instant the points open again. The points should open when the ammeter reads 4 to 11 amperes discharge (beyond zero). If you don't get these readings, change your regulator.

It may happen that you can't get your engine down slow enough to make your generator cut out. Don't worry—so long as your ammeter shows anywhere up to 11 amperes discharge and then comes back to zero, you're OK. But if it doesn't come back to zero, get the ammeter lead off the regulator quickly. It'll arc on you. Then, change the regulator.

That's all there is to it. Your electrical system is all checked out. Everything should now be firing on all 24 volts, hot 'n'.



# REVERSE POLARITY



Ever think what'd happen if the world suddenly flipped over so the north pole was where the south pole is and vice versa? Believe it or not, there's a lot of people who are always getting their jobs crossed and causing a pretty messy, upside-down, crazy, mixed-up, haphazard world.

There's the people who check out a vehicle's electrical system, trying to keep it in top shape, and then have the vehicle drop dead on them.

What happened? That old standby Reverse Polarity went to work on the generator, regulator and battery. One new electrical system coming up.

Reverse polarity is nothing more than getting your poles mixed. In most circumstances it shows off in opposite directions with the result being that those little bugsger's get it the wrong place at the wrong time. Then, you're left holding the bag for a new generator, a new regulator or a new battery—or maybe all three.



When either the generator has the wrong polarity or the battery's been connected backward, the regulator relay poles will want to put on the blink and burn out the regulator.

With your regulator burned out and not working, your generator can really



go to work and start producing. It dips its lid and starts burning out current like mad. And, then, it suffers a heat stroke from overwork and cools out. With your generator not working, your battery has to do all the work. This poor little boy isn't built to put out so much without being charged so it also starts to buckle. So, where are you? No where, man—nowhere.



Reverse polarity begins right as your generator or as your battery. The polar-

ry of a generator is changed by sending current through the field in the direction opposite to the way it normally flows. Battery polarity is changed by hooking the battery cables up backwards.



Here's the most common way generator polarity is reversed.



1 Using a test lamp to check the field for ground or continuity.



2 Using an ohmmeter to check field resistance.



3 Connecting leads backwards.



4 Reversing or reversing the battery backwards.



5 Heavy cable connections reversed.



6 Failing to correctly polarize the generator after it has been repaired or tested before putting it back into the vehicle.

The way to be safe and make sure your polarity isn't reversed is a simple operation. You can be on the lookout for the things mentioned above, but you'll only be half-safe.

The best thing to do after doing any work on the electrical system here is install a generator adapter (such as adapter kit 17-A-1458) into the generator output elbow (you've got to unhook your generator-ignition cable to do this). Make sure the field and negative leads of the adapter are open. Then attach one end of a jumper cable (any piece of wire) to the master terminal. With the other end, touch the field post of the adapter. This is what is called "flashing your field."



That's all there is to it and you're in business. The mechanical work are where they should be—and never the weak child seat.

You'll want to remember through the TBI for your own vehicle.



### *Get used*

It's been a long while, drag-out fight trying to get some guys to believe that too-much oil in a crankcase isn't bad as we thought.

You all know what happens when you take an too-much note.

It's pretty much the same way with flooding oil into your crankcase until you hit over the FULL mark. A crankcase needs a certain amount of room to breathe, and when it's too full it starts choking. The crankcase vent system gives relief to just too-much excess oil. What's left finds another route of escape—past the intake valves and rings, where it ends up as carbon. And carbon is as bad as an oiler.

Some guys think they've found the right wonder of the world when they discover that their oil level has gone down a pint and says there. Not a wonder—it just means they've overfilled their crankcase from the start and that excess oil has escaped by their means or foul. A good thing to remember is that the crankcase will hold on to what it needs and no more.

So, give your TBI and ECU a guide to see what the correct amount of oil is for your vehicle—and go by it.



## Where is it?

A "now you see it, now you don't" spark when you connect the battery ground cable to the battery's negative post on H-cou cracks and jumps has been causing a lot of peeling heads on many bikes.

It all has to do with the dual-line (VBC 4000 BT) regulator.

The snag is that this regulator has a filter in its base which is there for radio-wave suppression. The conductive part of the filter is pretty large and is connected to the hot side of the stator coil.

What causes the "disappearing/reappearing" spark is a drain on the battery caused by this filter conductor "charging up."

When the filter gets its charge, that does it — no more drain.

By now you're probably wondering: if this spark causes your batteries to go kaput, doesn't that the slight drain is not enough to discharge a battery over the life span you get at best may seem strong.



## A case of change

Let's take the case of that non-rotating key on your 2078 and 2078A1 keys for a minute. The key has a chamfered end so it'll fit snug with the chamber on the non-rotating.

Next time you put your non-rotating assembly back together, make sure you put the halves on the side shaft before you put the key in. If not, strange things can happen, like your key getting jammed up your shaft so it throws the halves out of the oil and then.

The way to do it is to put your half in place, lining up the keyway in the side shaft with the keyway in the hub. Then, put your key in, making sure the chamfer goes in first and is facing down toward the keyway in the side shaft. Now, tap the hub and key into place on the shaft. Strange things can then be avoided. TSS 9-8274 (page 118) tells you all about this.



# JOE'S DOPE

HOW TO KEEP  
YOUR TRUCK  
RODING ON AIR

WELL, DOWN WITH  
THEE DEARITY!

AND  
THEY  
ARE GOING!

WELL, NOT  
THEY, MA,  
BECAUSE THEY  
ARE THE REAL  
GUY!





**1** WASH YOUR TIE'S WORK DONE TO WASH IT'S AT THE POINT OF BEING UNLACE, CHANGE IT QUICK AND MAKE SURE YOUR TIE FITS THE HOLE THE OK. NO TWINKLES. IT'S A GOOD IDEA TO



**6** KEEP THOSE VALVE CAPS ON THE SAFE STING TIGHT. THIS WILL KEEP DIRT OUT, GREASE AWAY AND A SECONDARY AIR LEAK.



**7** WHEN YOU GO TO FILL THE TUBE WITH AIR, MAKE SURE YOU CLEAR THE END OF THE VALVE FIRST... SLUGS CAN GET OUT IN THE LINE AND HOLD THE CORE OFFER, CAUSING A SLOW LEAK.



**8** WHEN WORKING THE TUBE DON'T BLOW IT UP TO WHERE IT STARTS BUBBLING. IT'LL STRAIN THE RUBBER. IT CAN ONLY STAND A FEW INCHES OF AIR BEFORE IT'S OUT OF THE TUBE.



# JOE'S Dope Sheet

**I**f you want to keep rolling on air,  
Pay attention to tire-and-tube care.  
Keep your air pressure right —  
Check 'em close, day and night —  
All these tricks will cut down wear and tear.



**WE HAVE THE WORLD'S BEST EQUIPMENT... Take care of it**



**JOE'S  
POPE**

# Crane Man's Pledge

THE CRANE  
MAN'S  
PLEDGE  
TO SAFETY  
AND  
GOOD  
WORK



**1** I'LL ALWAYS WEAR MY SAFETY HAT AND MY SAFETY GOGGLES.



**2** WHEN MY SHOES ARE WORN OUT, I'LL BUY IT OR HAVE IT REPAIRED ABOUT EVERY OTHER DAY.



**3** WHEN I'M ON THE JOB, I'LL WEAR MY SAFETY GOGGLES AND MY SAFETY HAT.

**4** IN THE WORKING, I'LL HAVE ALL TOOLS AND SAFETY DEVICES REPAIRED AND ALL LIGHTS AND SIGNALS REPAIRED.



**5** I'LL NEVER BE DRIVING UNDER INFLUENCE.



**6** I'LL NEVER BE DRIVING ON PUBLIC HIGHWAYS THAT IS.



CRANE  
MAN'S  
PLEDGE

WHY TAKE THE RISK? I'LL ALWAYS WEAR MY SAFETY HAT AND MY SAFETY GOGGLES.



**NOW  
...THE  
CRANE  
RIGGERS  
PLEDGE!**



**1** YOU ALWAYS BE SURE THE HOOK'S CLASS AND PART'S MARK NUMBER MEET THE A SPEC.



**2** YOU MUST ALWAYS WEAR PROTECTIVE SHOES AND USE FINGER, ELBOW, KNEE, AND WRISTING GUARDS.



**3** YOU SHOULD TAKE CARE FOR THE SAFETY LEVELS OF THE EQUIPMENT.



**4** BEFORE A LIFT YOU MUST ALWAYS INSURE WITH THE CRANE OPERATOR ... BUT ONLY WHEN CALLED ONLY!



**5** YOU MUST ALWAYS TAKE CARE TO ALWAYS CHECK A GOOD THE LOAD AND YOU MUST MAKE SURE WITH THE USE OF SHOCKE BLOCKS.



**6** YOU SHOULD ALWAYS EQUIPMENT TO BE OPERATED AS LONG AS A RIGGERS IS



1. It's the **CRANE** operator who **SAVES** the **ALL** construction **TEAM**...

2. It's the **OPER** **AWAY** on the **JOB** to **MAKE** the **JOB** **GO** **RIGHT** **AWAY**...

3. It's the **OPER** who **LOOKS** **FOR** the **RIGHT** **LOADING** **CONDITIONS**...

10. It's the **OPER** who **LET** the **CRANE** **DO** the **WORK** **FOR** the **TEAM**...

11. It's the **OPER** who **MAKES** the **CRANE** **DO** the **WORK** **FOR** the **TEAM**...

It's the **OPER** who **MAKES** the **CRANE** **DO** the **WORK** **FOR** the **TEAM**...

**A GOOD CRANE OPERATOR PLUS A GOOD RIGGER MAKE A TERRIFIC TEAM**



### WHY BUSH A GOOD THING?

Dear Half-Mast,

I'm just getting mad, so I thought I'd get this thing off my chest before I bust it out.

What to do with that temporary parking brake in the M113-series JH-type tanks. Most of us old drivers know how to use it the right way. But it's the rookies who are causing this god-awful situation.

These warhounds start playing with that brake and before any one has a chance to bust their heads—when we, the oldies, are sitting all over the place.

We've done something so deep some poor guy from getting killed, but we're wondering if it's legal. We've gotten the Old Man's permission to either disconnect the brake altogether or to take the whole dash off. Is there any alternative on this, Sarge, which makes it an authorized fix for a training vehicle?

Sgt R. M. G.

Dear Sgt R. M. G.,

This problem's been a pain for some time. But what's there to say—if that parking brake wasn't needed, it wouldn't be on the truck. It's a good thing, but only if it's handled right.

There's always a couple of inexperienced right-balls who can't keep their minds off things until they've been taught



to use them. There've been tales of trucks overturning because this switch was flipped on at the wrong time.

No-doubt-it's not telling you to disconnect that switch or to take the brake

off. But AR 750-3 (15 January 1955) does say that "It is the responsibility of the commanding officer to prevent the abuse of material under his command. But abuse of abuse will be investigated and corrective action taken. Some common abuses are:

"(1) Improper, careless, or negligent use or operation of material."



This OI passage could be interpreted different ways. Some people could say that the CO is an total govt when he orders these vehicle limits taken off so that service brake disintegrated during training periods. After all, this is "corrective action." The thing wrong with that is that it may prevent an accident or two on the one hand, but may start a fire on the other—that brake is really a friend to have around when you need it, especially in hills, mountainous terrain where it's supposed to be used.

The quote from AR 750-3 could also mean that the CO will see to it that careful and complete instruction is given in the use of this parking brake before the vehicle steps into the creek. This also is "corrective action."

No need to tell you that if a man knows what it's all about, he'll only use that brake when he has to. This is the



kind of guy that'll use the instruction to get the right way.

But how about some of those jokers who just don't believe the jeep the instructor is putting on—the guys who love to find out things for themselves and usually end up going to the hospital of the post, innocent sick they delivered?

And, then, the CO could make it pretty tough on those guys who insist on making a good thing. This is real, down-to-earth "corrective action."

You might want to take a gander at pages 18 and 19 in THE P-BOOK (Co 14) on using the temporary parking brake.

*Half-Mast*

#### TIGHT NUTS



Dear Half-Mast,

We've been having a heck of a time with those wingnuts on the hydraulic line attachment in the Marine Corps trucks. These nuts are near the dy-

doesn't jump, and they insist on coming lower after awhile. If that still happens, about 1/2 inch are mighty hard to see because the oil supply is shut-off.

We've solved this problem by drilling a hole through the seal, sticking a piece of wire through the hole and tying the ends of the wire to a nearby line.

Tell me, large, is this a good way to keep our men tight?

Half-Meat W. E. W.



Dear Sgt. W. E. W.,

You don't have to do this if you check those memory watches and make sure they're right. Checking 'em every 1000 miles should do it.

Those men are to be tightened by finger only. You just take the nut between your finger and turn it until the wash'er goes any further. Don't use tools on the luggers or else you may find you have a wing-out without any wings.

Half-Meat

## DRY-CHARGED BATTERIES



Dear Half-Meat,

On pages 18 and 19 of PS 13 you claim that dry-charged batteries need charging after you activate 'em and before you put 'em in service. I don't believe you. We have filled lots of dry-charged batteries in my outfit, activated 'em and put 'em right into a vehicle. So far they all work OK. What gives?

Sgt. M. H.

Dear Sgt. M. H.

Must be old Half-Meat is getting so old I just didn't keep up with the times on this one. The older dry-charged batteries generally did have to be given a boost charge before they were used, and putting 'em to work without it was a doubtful move, just like I said.

But I get lots of streams on this one, so I did some more checking. You're right, I'm caught with my headlights down. The new 675 and 1125 batteries which are shipped dry-charged can be put in service without charging and will work all right—unless they show a specific gravity of less than 1.215 after filling or show excessive foaming. If either of those conditions appear, then you've gotta charge 'em. Otherwise put 'em right to work. Progress is wonderful!

Half-Meat

# OIL IN YOUR ENGINE



Guess a time when it's good to stop for a minute and wrap a tired subject up in a nice, tight digestible package, shove a red ribbon around it and file it in the "guy matter" section for future use.

Such a subject is "Oil"—the black, sticky stuff that gushes from Mother Earth's lap of luxury. It's a mighty important liquid—does all sorts of cool and does it well.

But everything else it does takes a back seat to its most important job—this of helping to keep your vehicle rolling. Unless you know something about it—how it works, what its jobs are, what to look for when checking it, how to use it—it can be a vitamin loaded "word of a throat" to read.

## BALLS OF OIL

A glob of oil is made up of a lot of little balls called "molecules." Some of these balls are bigger than others, some fall in the medium class and others are drooping little balls like they're made up of three heavy balls. It's called heavy-oil molecules to give us medium oil and make those little balls not get light oil. The kind of oil you use depends on the kind of job you want done.



# ...NATCHROOLY



Motor oil's got four jobs to do in your engine, too:



Here's how—

## LUBRICATION

A piston has average vehicle runs up and down at about 2,000 feet a minute, rubbing its sides against the cylinder walls. Without the life-giving oil, which coats these walls and keeps the metal-to-metal contact and rubbing out rather than out of it.



But you've got to use the right kind of oil. If the balls of oil are too thick, it won't be able to keep those moving parts apart. And the bigger the balls the tougher it is for it to squeeze into tight places. The right oil is made up of balls that're small enough to get in between the cracks, and yet big enough to take the parts up and hold so they won't wear scratching one another. That's why you have Oil (Engine Oil) 10, 20, 30 and 40 (SAE) (Society)—all different kinds of weights—in the supply system.



There are 1,500 explosions in the average engine every minute—giving off enough heat to cook meat. The coolant in your cooling system can't cool your engine oil by itself—oil has to have that helping hand.

Oil absorbs and carries off a good share of the heat. But if the oil's too light, the balls run over the surface. Oil has got' to get up to meet the heat. When oil's too heavy, there just isn't enough of the balls to carry off the heat fast enough. Dirty oil won't absorb and carry away as much heat as clean oil will.



Keep a weather eye peeled on that temperature gauge. If your oil and coolant are working as a team, that needle should stay normal.

In air-cooled engines, trankol oil does a big job in cooling, lubricating, sealing, and keeps away from oil coolant and air-filter passages.





To keep that piston from the piston part out from smoking down the sides of the cylinder wall between the piston, the right oil looks in. A mixed surface is never perfect, but oil fills in the spaces and seals in power. If the oil is too light, it's not strong enough to hold the blow-by; if it's too heavy, it's not right enough; if it's dirty, the dirt works like an abrasive and wears the walls away.



### CLEANING

That sludge which gets up your engine's parts comes from the fuel, water and gummy stuff left after the oil gets "cooked" by engine heat. The light oil won't give you enough protection against this gunk; if the oil is too heavy, it moves slow and can't get

into those tight spots. They all just add more dirt. But the right oil moves fast, breaks pieces of dirt and carries 'em off to the filter—which should be cleaned or changed when the oil is changed.

There're three rules to follow that'll let the oil do its right kind of job and will keep your engine in top shape—



There, that's a long talk, but your engine'll thank you.

Then, run your vehicle to bright gear, keep the hands tight for the vehicle and take lockers in the proper gear) and

Third, check your oil and water daily and follow the LO as to what kind of oil is best for your vehicle.

### THE COLOR OF OIL

In spite of popular opinion, there's just one way of telling when to change your oil by checking its color. The only way to tell it by engine mileage. Your LO tells you how often to change the oil in your crankcase—usually once every 3,000 miles, unless you're driving under the kind of conditions which require that you change the oil more often—like in sandy terrain.

One of your oil's main jobs is to clean. The oil you want—detergent type which does a washing job inside your engine. New and clean oil will look black before you know it. When it runs dark you know it's doing a good job of picking up and carrying out carbon and wear. That oil holds the carbon, dirt and other forms of gunk in suspension. When you're driving on your crankcase and your next, make sure the oil's hot. That way all the gunk that's held in suspension by the oil comes floating out.

On the other hand, if the oil stays clean, it's probably burning off what good inside your engine instead of picking it up and carrying it to the filter.



A lot of oils burn gray shortly after you put them in the engine. The main cause of this is condensation, steam from, or dripping the vehicle at slow speeds, which doesn't allow the engine temperature to get high enough to evaporate water vapor in the crankcase, clogged crankcase ventilating system, sticking the vehicle in a damp place, or a leaky cylinder-head gasket. When you're running your vehicle in a cold area, you have to make sure your cooling-system thermostat are working right. If you're really operating on an iceberg, and radiator and hood blowers in your engine will keep the proper operating temperature of about 140-160 degrees. That'll usually keep your cool down which your fuel oil to burn grey.

## BOES ENGINE OIL WEAR OUT



Yep—it sure does, but not the way you think. Spraying and mechanical files, oil can't wear out, but oil will break down when you use them in very hot or very cold weather. Heat, for example, causes oil to thin out—and if you keep it in heat for a long time, it evaporates some of the oil's parts.

Once oil gets thick with sludge and other gunk, it's no good as a motor lubricant. This sludge is not necessarily bad for engines, but a certain kind of sludge—some of this gunk can be filtered out mechanically by one of the oil lines.

It's other type of sludge—the stuff you can't filter out—that wears down motor oil. When your feet start burning, it throws off acid impurities which dissolve right in the oil. This stuff thickens the oil, and if you leave the oil in your engine long enough, it'll start eating away the metal parts in your engine—after all, it's acid.



### SOME HELPFUL HINTS

Oil gets dirty by itself, so why add any needless gunk to it? A good way to keep gunk out of oil is to wipe the cap and filter tube with a clean rag before pulling out the dipstick. And wash where you lay that dipstick. If you have to add oil, make sure it's clean oil and it's in a clean can.



When you give check your oil, use a clean rag on that dipstick. Keep that rag in your glove compartment—a clean rag always comes in handy.



## ATTACHMENT



### THEY'LL SWITCH

THE 2000-MI.  
D818-5100794



THE 2000-MI.  
D818-5100794



Dear Kelly-Matt,

Basically for the M2 2000 you need for the M1 2000 you look after and vice versa for the interchangeable. However, we're advised that the blocks have different stock numbers and the numbers marked on the blocks themselves are different for the two parts. Can you tell me if they're interchangeable?

Lt. W. L. W.

Dear Lt. W. L. W.,

Basically find Stock No. D818-5100794 for the 2000-Case M2 and find Stock No. D818-5100794 for the 2000-Case M1 and interchangeable. Is it you've got some left over from your M1's production use them on your M2's.

*Kelly-Matt*

### KEEP YOUR DC-4 CLEAN

Dirty DC-4 compound (including Compound, electrical) may be the reason your 1700 and 1700 magnetrons in the PMA system are using up. It prevents correct discharge and arcing when it's clean, but after a while it collects dust and dirt. Then it'll vary faster and cause the magnetron to run away.

Check your work and equipment for issues for DC-4 that's dirty or asked. If it is, clean it off with carbon tetrachloride, wipe it dry, and put a thin film of DC-4 over the glass cathode insulator and metal filament connection.

Remember that using carbon tet is the wrong procedure—dangerous unless you do it right. Be wary of fumes—do it out of doors—follow all safety-line measures.





THEY'VE GOT THE ANSWERS TO ALL YOUR PROBLEMS. ASK THEM FOR HELP. THEY'LL BE THERE FOR YOU. THEY'LL BE THERE FOR YOU. THEY'LL BE THERE FOR YOU.



Our First...

## STARTING-ENGINE IN A SLING



Dear Sgt. Dixon,

We finally got tired of cranking the vertical starting-engines out of Caterpillar track-type tractors. It sure is an embarrassing chore. And using those starting engines up and yanking 'em back in is even worse. By applying brains instead of brawn to the problem, we came up with the handy joint attachment (Fig. 1).

To use the hoist, you first attach the intake manifold assembly and lift it up. Then the joint hooks right into the two studs which hold the intake. When you apply the hoist, make sure the straight side of it is toward the rear of the tractor.

If all this gadget, you can hold the starting engine right out where it's a nuisance. What's more, when you're ready to put it back, you'll find that it balances at just the right angle to and down to slip into place.

Take a look at Fig. 1 to check on the materials and measurements you'll need for the job.

The Engineer Shop Gang  
Fort Monmouth, Missouri

Dear Gang,

You've got a good idea. We doubt about it. While we're on the subject, don't your eyes to Fig. 2. This is the design for a hoist you can use on all later



vertical starting-engines which have three cap-screw holes near the top of the block. With this bracket, the lifting chain clears the manifold or other parts of the diesel engine.

The water-cooled exhaust manifold should be removed before it's applied to the D16 or D17 marine engines.

This bracket holds the starting-engine at its point of balance, and the engine

can be maneuvered in and out of position easily. And what's best, it allows the piston-rod of the starting-engine to be raised or lowered with little effort and easily aligned with the flywheel housing bore. This runs down on hooking and hoisting during installation.

*Soft Dodge*

#### When Lifting Your Caterpillar Tractor

There's one lubrication fitting on Caterpillar track-type tractors equipped with dry-chamber/rod-and-rod-end. It's a bad one to miss, too, because most clutch failures often are the result. It's the lube fitting for the clutch-drive-plate-bearing, and it's mounted on the drive-plate that revolves with the fly-wheel of the engine.

That means the fitting also revolves when the engine's running. For this reason, you can only give it lube when she's stopped. So here's what you do:

Stop the engine. Turn the main-clutch-drive-plate by hand until the lubrication fitting is in the top position. You can reach the fitting easily when it's like this. Current lubrication orders call for this fitting to be greased daily—but sparingly. Too much lube'll cause grease to get into the clutch-plate-plates. That'll cause slippage and additional wear on the clutch bearings.

Later model Cat track-type tractors—and motor graders, too—are equipped with oil clutches. But on those earlier machines with the dry clutch, be sure and watch this lube point.

#### DON'T MISS THIS





## STAGGERING OPERATION

Nobody expects you of having a load and your tractor stagger on an extreme slope operation. These track-type habits are geared for all kinds of terrain and rugged conditions, but when you have unusual operating conditions, you've gotta make terrain allowances.

Increasing steel and other types of soft terrain presents no problem. The tracks give you plenty of traction. The engine is also powerful enough to allow the tractor to go up and down steep grades. And the seals, greases and other things protect your equipment from wear and tear on its working parts when working in adverse conditions.

But let's get back to those unusual operating conditions. That's when you gotta use a little extra care.

Many tractors—the Caterpillar D3, D4, D5 and D6 for example—have a splash lubrication system for the transmission and final gear compartments. When these machines are operated on steep slopes, the transmission and final bearings get less lubrication.

If you're gonna be operating on a steep slope for an extended period of time, all you gotta do is turn your tractor at right and left 90° angles every 100 to 1,000 feet on your way up or down. This'll give those transmission bearings longer life. Even tractors like the Caterpillar D3, with a heavy duty lubrication system in the transmission, need either more lube or slower operation when they are operated down steep slopes for a long time.



When you're operating up or down an unusually steep slope, use a little extra care when making your turns, because a tractor'll sure wear some at a track.

Sound like a good idea? Give it a try the next time you're working on a steep slope. Your tractor'll be thanking you.

Engineer UER's...

## SEND 'EM TO EMTO

In case you've missed it, there's a new AER out dealing with DA Form 486, Unavailability Equipment Report. It's AR 700-58, dated 1 May 83. It's especially important to users of Engineer equipment.

The Engineer UER's are now sent in duplicate direct to:

**Engineer Maintenance Interval Office  
Route 65, Engineer Depot  
Route 65, Bldg  
ATTN: 88888-88**

There're also new reporting points for Signal and Medical equipment, too. You can check 'em in the AER. All UER's on other equipment will continue to go directly to the head of the responsible tech service except communication, dragg and biological.

By the way, do you remember the new DA Form 486? It's dated 1 Oct 83. It's handy and compact and replaces all previous editions of the form.

## WOOPS—A GOOF



That was from what you got on page 24 of *EM Magazine* issue 28. We were talking about UER's and told you that you'll get 16 of AR 710-20 under EO's mandatory mail users of Engineer equipment.

There's no doubt that the UER's are mandatory and have to be physically attached to the equipment at all times. But there's just one problem with AR 710-20. It should've read AR 210-20. That's the one you'll find the right slope in.

## DIRTY BREATHER PLUG



There's a breather on the Model 90-11 Austin-Western motor grader that runs over large rocks. It's located on the right rear axle next to the engine case

partition. This drawing will show you just exactly where the breather is. Just imagine you're standing on the right rear axle and looking down.

When this rear plug (Part No. P22-0184) isn't cleaned, it generally gets clogged up with dirt and mud. Before you know it, you've got a blow-by ahead as a result of the partition that's built up. And that really is a tough one to explain.

In case you've been forgetting, take a gasket on that breather plug the next time you get ready to run your Austin-Western grader. If it's dirty, clean 'em up and then keep 'em that way. You'll head off a big job replacing an oil seal.

# CONTRIBUTIONS



## NO SWEAT & TALK

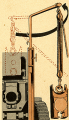
Dear Editor,

Removing the bench block from a 120-mm gun is a tough two-man job even for Turkus and his wife. And after climbing around and getting the bench block out, there's always the chance you'll slip or drop it or both.

This demonstrable, two-woman hoist will make it a simple, one-man operation. With this device you can lift the block, swing it around with the eye secured on the dark chain, and lower the block on the gun platform with no sweat.

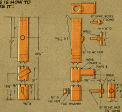
It's fastened to the elevation rack of the weapon by passing a hole through the lightning hole at the bottom of the rack, and hooking the angled hook over the flat spot on the top end of the elevation quadrant. The drawing shows how we made it.

Wm. Maintenance Shop  
Washington National Guard



(Ed Note — Good equipment in our hands.

**THIS IS HOW TO  
MAKE IT:**



2" WIRE  
BLOCK CUT  
TO 8" X 8" X  
ANGLE BEND  
OR 1/4" WIRE IN  
CENTER THEN  
WELD IN  
PLACE.



NO STRAIN

Dear Editor,

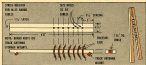
The major MIL-STD-compliance problem at cable junctions with respect to has been solved in our units with a "no-strain" device."

It's real simple, as this drawing shows you. Relieving the strain also kills the danger of the rubber covering separating from the plug and allowing moisture to enter the cable.

Capt William L. Roesslein  
Camp Harbord, Washington



(Ed Note—Smart method. The cables are being redesigned. Your stress reliever is a good thing to use the strain until the new ones are available.)





# POWERHOUSE of KNOWLEDGE



TM'S CAN LIGHTEN YOUR LOAD ... SUPPLY THE DAILY FUND OF  
PROPER INFORMATION YOU NEED ... GIVE YOURSELF A BREAK ...  
BROWSE THRU THEM OFTEN.

**TM'S PAY OFF FOR YOU**