

Issue 65

**PS**  
★

1998 Edition

# THE PREVENTIVE MAINTENANCE MONTHLY



**SUCCESS! CHANGING COURSE!**  
See Page 28





The electrical system and charging circuit of the M48A1 main tank often with 100-ampere generator) can be reset with the Model 128 low voltage circuit tester and load bank. But you're going to need, say, control on your feet over the main. Because that load bank has a capacity of 100 amperes, should. And cranking up a 500-ampere output on your generator with the field circuit can send it phasing!

Well, you can send a boy to do a man's job if you can give the boy some help. That's what you do here.

Think a minute about your tank's electrical system. Starting with the regulator generator "5071 Jot" the only thing the unit does is D/T for electricity is check the output. If anything is wrong you pull the whole rig out and send it to your support unit. So, all you've gotta check is the voltage.

On the main engine charging circuit, however, you've gotta check the generator, the regulator assembly, and the recharging/boosting combination. You replace any one of these that's defective.

Low voltage tester Model 128 FM 482-9715



## Tank Electrical Testing DON'T

Your tank's electrical system needs repair. Let us help you get it in top condition.

## BLOW YOUR BOX



Are you worried about blowing your box? We can help you get it in top condition.



To run your tank, naturally, you need the tank. We'll assure that you have extra capacity to insure that the charging system can run working correctly. After you've noticed the warning lights indicating "Generator not charging" or your battery set are starting charged.

Then you need your low voltage circuit tester, with the load bank and field circuit. This will be your Model 128, FM 482-9715. It comes equipped with the leads and clips you'll need.

In order to get safely into the circuit you'll need a set of adapters to connect to the Breaker connection in your tank. Since there are none now listed, you look in your kit, repair, Breaker replacement connector set. Your work room should have the large kit, FM 1019-109-1280.

Among the substitutes you need by way of adapter is three pins, one in the center in your clean workshop, (Pin, center, main, electrical connector, No. 8 4870, FM 1000-148-4811), one in its generator charging circuit, (Pin, center, main, electrical connector, No. 8 4870, FM 1000-771-0114) and one in its generator field circuit, (Pin, center, main, electrical connector, No. 12 4870, FM 1000-741-7855). However, you can get out from there with field and generator to make your adapters as easy as you like. The point is this: Do not attempt to touch anything except the proper pins into your circuit, you'll likely blow up the machine.

If you can't locate a replacement connector repair kit, get your Ordnance support. Checkers are they have either the kit or some voltage connectors being around.



And, of course, you'll need your regular mechanic's tool kit and the tank square wrench, FM 5128-445-0115, from the normal cabinet No. 1 Connector set on. (This is to insure the Breaker connection in the tank.)

## TESTING

Testing this tank will be much easier if two men work together on it. However, it is possible for one man to make the checks. It's just a bit tricky.

Since you will be testing temporary voltage of fairly high voltage, you must be sure that all the electrical equipment in the tank is turned off. This includes the dome lights. Be inside your tank when you are being in a sleep lamp or use hot light from an outside source to work by. Take your meter down into the turret basket and open it up. The best test location for the meter, with wires connected, is on the ammunition hoist under the tank commander's footrest. Hold the hoist and lean the meter back at such an angle that you can see the dial and reach the leads from the driver's seat.



## AUXILIARY GENERATOR TEST

Obviously, to test L71 Joe, you must be able to run it. If the batteries are charged enough to start the auxiliary generator, you have no problems. If not, you can handstart it, or draw it from another tank. This presents a problem, since you'll be hooking up your test leads at the hot (positive) side of the slave receptacle. However, if you follow this procedure exactly, no arcing will result when you hook up with L71 Joe running.

First, start your auxiliary generator, either with the tank's own batteries, the hand crank, or a slave cable from another tank. Careful, if using the slave cable be sure your engine why switch is off. When the generator is running smoothly, remove the slave cable, if used.

Connect the NEGATIVE test lead from your meter to the -100 post of your ammeter, and to a good ground on the tank, one that can absorb 80 amps. Connect the NEGATIVE reference lead from your meter from the -100 post to a good ground on the tank. Then connect the



POSITIVE common lead to the 24- volt post of the load bank. (The bottom post on the right-hand side) and be sure your three leads in the load bank posts are closed. Next, bring the POSITIVE reference lead around from the voltmeter + post on the wire, and clip it onto the 24-volt post of the load bank. (The same post you have the common POSITIVE lead attached to.) This sets you up to make a voltage reading on the left Joe output, and also to draw 100 amperes from left Joe without changing your hookup, and with only one clip in contact to the three outputs.



Now for the test:

<p>1. With wire the meter's lead wires to all.</p>	<p>2. Load control knob turned counterclockwise (increased) and it moves back.</p> <p>Control knob has to be all the way out for ... by both ways. Don't force.</p>	<p>3. Meter output you see positive load of three outputs.</p> <p>Clip meter's positive lead over it.</p>	<p>4. Voltmeter will indicate reading greater voltage than you want "open-circuit" voltage. meter why with meter be turned off.</p>	<p>5. Meter shows voltage should be 27.5 or a bit either way.</p> <p>With the dial to left or</p>
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Now, watch this more slowly. Lower here's where you can pop the load bank if you get careless.

<p>1. Load bank extra.</p>	<p>2. Wire three load control knob (clockwise) clockwise.</p> <p>With meter on positive side</p>	<p>3. Meter voltage indicates between 40 and 50 volts</p>	<p>4. Adjust load control knob</p>	<p>5. Meter load extra.</p>
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This is all you can do by way of testing the auxiliary generator with the equipment you have at hand. True, 100 amperes is only a third of the rated output for this generator, but it's all you can safely pull through this load bank. And the fact is, if you get 100 amperes, and the voltage doesn't fall more than  $\frac{1}{2}$  volt below the open circuit voltage, the chances are that LTI fuel is OK.

Of course, if you can't get at least 26.5 volts at 100 amperes from the auxiliary generator, or if it falls more than  $\frac{1}{2}$  volt under load, you swap the unit for a good one and send it back for a complete check at Delco-Remy. (First being sure your engine is properly tuned and putting out adequate revs.)

## MAIN GENERATOR TESTS

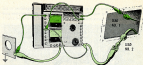


The next unit you'll want to test is your main engine generator. You'll use the same setup as the meter that you did for LTI fuel, or just modify the ammeter positive lead from the slave stepdown and remove the pin from the positive socket.

Over on the right of the tank, approximately below the blower switch, you'll find the traditional wiring-disconnect plugs. To get at 'em, you'll have to . . .



You lower your auxiliary pin into the socket for No. 1 lead, checking the little metal identification clip on the lead to be sure you do get lead No. 1 and not lead No. 11B, which also comes to this plug. To this No. 1 pin you clip one of the leads from the field circuit on your meter, (internal meter switch open).



Then put your middle-sized pin into the socket for lead No. 2, the generator's ground lead. To this pin you clip your sensitive POSITIVE lead, which is still connected to the 24-volt part of your lead bank. Be very sure that the pins and clips are not grounding on the table.

Connect the second lead from the field booster on your tower to the generator's primary circuit. Probably the best place to do it is at the sensitive POSITIVE part of the armature. You will then have a sort of Transformer-to-Generator hookup, since the generator's output current will be coming up the heavy lead to the 24-volt part on the lead bank, then over the voltmeter POSITIVE lead to the positive part of the voltmeter, and then over still a third lead to the field booster. However, this hookup is simple, and the chances of shorting are reduced. If you prefer, you can hook the field booster lead to the clip already on the 24-volt part of the lead bank.

To use ...

<p>1. Turn your lead bank until it opens to left ...</p>	<p>1. Field booster lead is set for at all pin connections ...</p>
<p>2. Test second lead is connected.</p>	<p>2. Short output of lead booster to give about 100-200 mA good light tube or tube not equipped with transformer.</p>
<p>3. Turn field booster till you get indication of sub-optimal voltage.</p>	<p>3. Field booster is turned fully clockwise ... and its voltage is indicated on voltmeter ... and then read on pin.</p>

It sometimes happens that a generator has lost its residual magnetism, or has been flashed the wrong way. To correct this, you remove the cover plate over the brushes from the motor-generator line. Then...



This time you should get an indication of voltage when you run the engine and turn the field rheostat clockwise. In the event that you don't, put the field rheostat lead back on the battery and start your main engine, then turn the field rheostat clockwise a third time. If you do not get an indication of voltage at this point, you probably have a defective generator, and the main power pack will have to come out to change it. However, now and then a harness will fail, so before going to all the work involved in putting the power pack, it will pay you to go to the rear of the motor and remove the access plate which lets you get to the engine junction plate. Repeat your test here, with the field rheostat lead on the battery positive post. If you do not get a voltage indication now, the power pack has to come out. Check the easy thing in. If you do get voltage indicated here, but can't get it at the bulkhead junction box, the whole power pack has to come out for the replacement of the defective harness! But, of course, you first check all the connections carefully to be sure they are clean and tight, then try again at the forward junction, and then return like a trapped hyena for Ordnance support.



However, 50 times out of 100, you will find an indication of voltage when you make your tests at the built-in dimensions.

You're hooked up, now...



That's more, you have only drawn a fraction of the output of the generator. However, you have established the fact that it will charge, and by drawing your 60 amps, you have shown that there are no real glancing faults in it. Later you'll draw this one up to full output for just a brief second, using your vehicle battery as almost the load.

## REGULATOR TESTS

At this point you are ready to check the functions of your generator regulator. The regulator has three basic jobs in a work cycle.

First, it must determine when the generator has begun to put out and connect it to the battery as soon as the output voltage rises above battery voltage, disconnecting it as soon as the generator output voltage falls below battery voltage for any reason.

Second, the regulator must regulate the generator charging voltage.

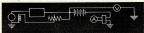
Third, in the case of two-generator systems, it must make the two generators work together and each one pull a fair share of the load.

With the equipment you have, you'll only be able to get a good check on the first two of these functions, and get an estimate of the third one. However, that's enough to locate most of your problems for you, and in any case, you replace the entire regulator, usually if any part of it is defective.

To hook up for the regulator test, take the medium adapter pin out of the No. 2 or generator output lead and insert the lead back in the bulkhead connector. One lead from your field rheostat is still attached to the pin adapter in the No. 1 or generator field circuit, the other field rheostat lead goes to the battery positive post. The voltmeter POSITIVE lead runs from the battery positive post to the voltmeter "common" post on the meter. The voltmeter NEGATIVE lead runs from the -15v post of the meter to a good ground on the tank. Remove the ammeter leads and move them.

From the driver's seat you reach under the edge of the current holder, and with a No. 10 screw remove the cap screw which retains the eyes of the battery ground cables on the grounding stud. Take the 500-ampere clamp assembly from the meter and clamp the POSITIVE clip on the end of both battery ground cables. The NEGATIVE clip is clamped on the grounding stud or lead from which you just removed the ground cables.

Be sure the positive clamp is not grounded on the hull of the tank. There is no danger of arcing, but your ammeter won't indicate if it is. The lights flash from the removed clamp go to the appropriate posts on the meter. Be sure to get the polarity right—positive lead to positive post.



Now you're ready to run. With the field rheostat turned fully counterclockwise you start your main engine. Your voltmeter, of course, will show battery voltage. Your ammeter will drop into the negative side of the scale to about 150 amps when your starter is cranking the engine, and return to zero when you release the starter switch.

With your engine running above 1200-RPM again, advance the field rheostat carefully watching both meter dials. The voltmeter will come up above battery voltage as you advance the field rheostat. Somewhere around 20 volts the ammeter hand should jump over from zero to a positive indication of charge. The exact figure here doesn't matter, and they'll vary with each engine and each condition of battery. What matters is that somewhere above battery voltage, the main line switch in the regulator has closed and connected the generator to the battery.



Always hold rheostat fairly steady. Continued, excessive needle swing will bring light up on the fuse. Take it up to 150 amperes, and immediately take it back (approximately) to zero.

Here's where you get help for your load bank by using the battery board. You will not burn your batteries, nor create a hazard if you swing this heavy charge through them lightly. You will cause overheating, excessive gassing and possibly water evaporation, if you maintain this high rate for longer than it takes you to read the meter and cut it back.

You have now determined that the main line switch and its controlling relay are working on a forward current. You have also determined that the generator will put out at least its rated 100 amperes. Now slowly cut the field rheostat back, counterclockwise, again watching the ammeter. As the generator output dies out, the ammeter will pass through zero and indicate a discharge—current going in reverse from the battery to the generator. As this reverse current increases, the ammeter should suddenly return to zero. This shows you that the reverse current relay function of the box is working correctly to disconnect the generator when it is discharging. Once more, the exact figure is not so important, the point is that the generator must be disconnected when it is discharging.

**NOTE:** Do not exceed the 100 amp. limit shown here on the battery board. The battery board is not designed to carry more than 100 amp. and may get very hot. The meter you have a definite number, and the pointer should fall back to zero.

Stop your engine after this run.

Now you have checked generator maximum output and both sides of the control or reverse current circuit. Disconnect the field rheostat leads first from the battery and then from the adapter pin in No. 1 circuit. Remove the pin from the socket and reconnect the field circuit to the battery and generator. Start your engine

and so for about 1200-RPM. Your voltmeter should show you somewhere around 17.5 volts, and your ammeter should indicate some change. If you do not get any output from this test, the probable trouble is in the field circuit, either in your regulator box, or most likely in the external voltage adjusting potentiometer. Disconnect the ammeter from this test, flash No. 800 and see a test light or a voltmeter with one electrode in contact inside the housing. If not, remove the voltage adjusting plug and cycle the adjusting screw back ways a couple of times, trying to stop approximately where you found it. Test again. (This will sometimes clean the slider and wires and restore the current path.) If still not good, replace the voltage adjustment unit and test again. If, on the other hand, there is a good current path through the external voltage adjustment unit, but the generator will show's no output, replace the regulator box and test again.



When you do have the generator putting out while the field circuit is all in one piece, lift your engine and take the ammeter short clip loose from the grounding rod. With your test checks, run your engine up slowly to at least 2000-RPM and let it back to idle. Your voltage indication should remain steady at close to 17.5-18 volts.

## VOLTAGE ADJUSTMENT

Back when you tested the auxiliary generator you were told that 27.5 was the preferred voltage, but that a volt either way was allright. Now, in order to make the job of your paralleling circuit as easy as possible, you must set the open circuit voltage of your main generator as close to that of your auxiliary generator as you can. So now you refer to the test you made of the auxiliary voltage, and, with the main engine running at about 1200-RPM and the ammeter short removed from ground, you adjust the main generator to this same voltage, using a screwdriver down the hole of the external voltage adjustment unit. When set, replace the plug.



## PARALLELING CIRCUIT

Once more, you would need more elaborate testing equipment, including two ammeters, to get a complete check on your paralleling circuit. However, you can make a satisfactory partial check. Like so ...



With the main engine still running, start LFI fuel. Observe the voltage again about LFI fuel has warmed up a little and settled down to smooth running. Let LFI fuel run and shut off your main engine. Read the voltage again. If this voltage stays within a volt or two of the same figure with main engine only, both engines, and LFI fuel only, your paralleling circuit is OK. On the other hand, if your voltage fluctuates more than a couple of volts, or if the auxiliary engine keeps stalling or hesitating for more than a couple of minutes, you'd better get your instructor to come check it with you.

Well, that's it. These checks are about the best you can do with the equipment now in your hands. They should find defective units for you, so you'll know what to replace to keep your charging system working. **REMEMBER:** Take it easy on those generator load tests. Don't draw more than 80 amperes through your load bank, and shut down the minutes you read the meters.

**DO NOT** perform jobs, attempt to test a load generator according to the loading on page 3 of the manufacturer's instruction booklet that comes with your load. You'll have it out next!

By the way, when you remove your load bank after testing, never let the load connect back to the generator until there is enough pressure on the carbon pile to keep the plates from bouncing around and possibly touching while the load bank is being hooked around.





Here's your rubber, pal! Think enough! Congratulations, sir! Then are the questions you pose ask yourself when looking at your shoe and wondering whether they need mopping?

Just to help you along in mopping, here are a few points to keep in mind when mopping shoes:



When the tread ridge is small and deep, it will wear out quickly, and being worn out, it will not be able to mop.



A tread that is too wide will not be able to mop, and being too wide, it will not be able to mop.



Dear Mr. [Name],

My major shoe problem has been the loss of my rubber soles. Commercial-type shoe soles. What's the authority that says it won't last, unless it's made?

G. D. R. P.



Of course, if you take care of your shoes, you won't be able to get a mopping. If the same rubber, if you take it off your feet, the road body may be so badly injured, or the shoe so the road, that it may still be so mopping. So, get on eye cap, wash your eyes out and think carefully.



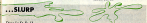
When the tread ridge is small and deep, it will wear out quickly, and being worn out, it will not be able to mop.



A tread that is too wide will not be able to mop, and being too wide, it will not be able to mop.



But please don't forget to be sure you're getting what you need for your shoe's ready for mopping. It's called mopping, P.M. 11 15 557. 1991, in available for your Test for Organization/Relationship, Second Edition, for Mr. J. G. [Name], P.M. 1 185 794 6884. Keep your eyes open for it. If you don't come along soon, you'll be a mopping. So, do.



Dear G. D. R. P.,

There's no doubt, sir, that you can't get the best of Army relations with the police—and it won't be: you, the, coming a light to the road, or by water the money and after the shoe so double job when you do. [Name]

Actually, the only thing that's required is to keep the shoe clean. This can be done when washing the shoes.

Of course, if your CD had done the work that shoe will be polished—you'll just have to polish.

[Signature]



## PLUG OUT...NO, IN... NO, OUT... NO, ETC.

And, as it goes, day in and day out—everybody guessing, and nobody sure whether the drain plug in the flywheel housing of their vehicle stays in or comes out.

The rule is: if you're driving a manual wheelbed vehicle that has a clutch, and they all do except the GPM-series 150-cc truck, that plug stays out of the flywheel housing except when you're loading or operating in real muddy country. This is the law laid down by TR-Decl 114 (7 Reg. 16).

The reason is to get rid of bits that become trapped in the flywheel housing—bits which can do harm to your clutch plates. If the plug was left in, so the bits can't flow out, you'd be in for a case of clutch slippage and failure.

The drain plug comes out of the flywheel housing of those series vehicles: GPM and GPH Jeeps, GT4 1/2-ton trucks, GMI 1 1/2-ton trucks, GT4 5-ton trucks and GPM 18-ton trucks. Keep the plug in your glove compartment, so you'll have it for loading and road operations.

Now, as far as the drain plug on the GT48 150-cc Hydra-Matic truck—that's different. Because they don't have clutches. The drain plugs for these trucks stay in the flywheel housing all the time.



This plug gives you the chance to check the internal condition of the Hydra-Matic's flywheel housing. At every 1,000 miles (3,000-cc) and every time after loading—you take this plug out, so water and oil can drain out. You must oil means you have a leak somewhere up that housing, and you'd better check it out to see what it's all about. Ask anyone at your MWD Decl 107-40-79.25 (24 Mar 56) tells your Ordnance outfit or up this plug into your flywheel housing if your truck hasn't got one.

In, so more guessing. Your GPH 2 1/2-ton Hydra-Matic trucks—plugs in all the time. Your other M-series manual wheelbed vehicles—plugs out all the time, except when loading and operating in mud.

If your regulator leaks out, check the pressure too. For any in-leakage for...

## LOOSE COMMUTATOR BARS

The problem of loose commutator bars on the DeLiax/Bony 24-volt water-pump generator is still rising up to haunt people.

Nobody knows all the answers on this one yet, and the designers are still looking for a final solution. But, what they do know: It is possible for some regulator failures to loose up the generator, and first on, a commutator bar may rise up on you and chew up the brushes.

It works like this: Any time you have a weak reverse current relay in your regulator, either because someone connected the batteries backwards (wrong polarity) or because a bar or job made the contact close and stick, you get a high current back through the generator. This current can range around 600 amperes at times, and makes for much heat and smoke.

Generally the regulator burns out first, and as you replace it, the generator then works OK, apparently, and the truck goes back to work. But, if the heat of that heavy current loosens the brushes and commutator bar bound the commutator above the locking temperature at which it was made, it is possible for the binder material in the slots to soften. Subsequent running of the generator causes centrifugal force to lift a commutator bar, which causes arcing, brush wear, and will may have. Give a shot generator.

Now, if you do have a regulator failure involving stuck relay points or reverse current, when you replace the regulator, please to send the generator back to DeLiax with it. Then they'll open it up and check the commutator.

Strapping generators only takes a minute, and may save you from a long walk home. Also, of course, it is far cheaper to have DeLiax check the commutator and replace it if needed than to walk until a bar or two come loose and chew up your brush ring.





## Concise Rodd's

"DON'T GET OFF!"



### Plug it right

Just in case you didn't get your plugs in Change 1-15 June 68) on TM 9-8814 on your M16A1 plugs, here's a bit of important information you'd better make a note of.

This change deals with the right way of hooking up your spark plug cables from your distributor. This picture shows you which cable goes into which hole.



### Clean your

One good reason you may have of looking up around the transmission shift lever on your M16 and M16A1 plugs is because of clogged up vent holes. These should be cleaned out at every 8 service and every time after you operate in water and mud—on any M16 or M16A1 of both LD 9-8812 and LD 9-8814.

Doing it like this will keep these vent holes unlogged, and will keep any pressure from building up and blowing the oil out around the shift lever.

Of course, to keep oil away, also make sure that transmission is never over-filled. Make sure the hole's open plug level when cold.

Oil leaking from here? Check these vent holes.



## Warning notice

When it comes to opening your M8A1 cargo carrier's generator hoist, the most important thing you've gotta remember is to uncouple both the right and left generator frame hold-downs from the generator frame before you start to lift. Trouble can break loose unless you do.

**WARNING**  
BE CERTAIN THAT BOTH RIGHT AND LEFT GENERATOR FRAME HOLD-DOWNS ARE UNCOUPLED FROM GENERATOR FRAME BEFORE ACTUATING THE CONTROL HANDLE.



No, just to make sure this is in its full view so you won't forget, here's what to do:

Open the hoist valve access door. Then, using red pliers and a screwdriver to its advantage, put a notice right below the hoist control valve instruction panel like the picture shows.

By the way, just to make sure you have the whole operation of how to handle that generator hoist under your thumb, read through page 62 of TM 9-7410 (Jan 55) a few times.



## Scrap... thing

Everything in the oil line leading to the oil pressure gauge of your 1966 1½-ton Chevy pickup (Model 980-series) can start causing flats pretty soon now, unless you reveal weaknesses that wouldn't read and make sure everything's jake.

You could find that the oil line going to the oil pressure gauge, as it passes under the seat without four inches back from the rear of the instrument panel—is getting scraped by the left windshield wiper arm and/or when you see the wipers. One rainy day that flat can start looking as hairy as an oil filter cartridge.

And, you won't go far, either, if this happens—guess it'll mean to look from that line. The first sign of this happening would be an oil drop right as your tire lifts as you're driving.

To fix 'er up—if it's happening—lead the oil line down about ¼ inch away from the wiper arm. In other words, give her lots of clearance.



## Round that square

There've been cases of the inner and outer sections of the G-744-series 3-ton truck's fuel-tank filler-cap becoming separated when the cap's base twisted while seated in the filler-neck.

It's been happening on some of the trucks which have a square corner at the end of the filler-neck outer surface.

It's this corner that causes the lug on the fuel tank cap's inner section to jam in the filler-neck cross-slot. When you rotate the inner section of the cap—and because the inner and outer sections are held by one small cross-rod-link, separation.



Now, if you come across this, just handle the corner of the filler-neck cross-member just enough to get rid of the square point. Before filling, tho, better lay a clean cloth-covered with clean grease in the filler-neck—just so't your mud filings will fall down into that fuel tank.

## Save the bottles



Most tall of equilibrium lined bottles bearing on the M53 115-mm self-propelled gun and the M55 8-in self-propelled howitzer.

Items after firing... the used primers drop through the hole in the cap that's above the bottles.

You can call a halt to these bottles by getting your support unit to tickle a piece of wire across across the hole. The "hardware cloth" is listed under PWS 5011-281-4895.



## Step-along

Hey you! Yes, you with the plan that do happen. You may have installed combi boots, but that still doesn't mean you can tramp with your buddies all over the leader's rear position on the 674-series tracks.

When you climb in or out of the turret, pull-back on something else as a step-like the bracket that holds the leader's rear on. It's just as handy and much less wearing on a piece of the tank's equipment than your leader may consider vital to his personal well-being.



## Cracked tracks



Cracks along the leaders of your G74-series 3-ton tracks, where the leaders bolt to the running boards, may be giving you a pain in the neck. If so, they're easy enough to fix.

Just look at TB 9-457-5 (1 April 53). It'll tell you how to weld the crack and how to use some cardboard and a thin board to keep it from cracking, because of vibration.

Checking to be careful of, too. First tighten those spring-loaded bolts and rubber washers to a point where their shock absorbing action will be cancelled out.



WATCH OUT FOR THESE...

## PIT-FALLS

Keeping your 110cc air hydraulic cylinder in tip-top shape is a winning battle with valves, oil, switches, seals, and lots of other gear.

You've gotta keep in sharp eye for pitfalls in the pit that're waiting to trip up the operation. But your eye sees these to make sure you don't already have 'em ... or be ready to fix 'em as the double if they happen to you.

### ALL SHOOK UP

When either motor gets an overload, it tips the thermo-overload valve in the diaphragm block. Every second leaves there's a reset button on the cabinet to reset the thermo-overload valve. But don't get all shook up and start twisting the cabinet apart if the motor won't run after you reset the overload switch and hit an UP or DOWN button.

The motor won't run because the overload valve does more than shut off the juice. It also causes the auxiliary relay in the 110-volt circuit to be energized, opening the contacts in the auxiliary relay circuit. The contacts that're usually closed in that circuit pop open, and the open wires close ... which completes a holding circuit to the auxiliary relay coil.

To put those contacts back where they should be—and break that holding circuit—you can do two things: Hit STOP button ... or blow the 110-volt switch off and then right back on again. Either way, you put the contacts in the auxiliary relay circuit back where they were before the thermo-overload tripped.

So, after you reset the thermo-overload ... hit a STOP button or blow the 110-volt switch off and on. Do it that way, and you'll get either when you hit an UP or DOWN button.



## IN THE PIT

### RUST ON YOUR PISTON

Your piston shouldn't be seized or scored ... and it shouldn't be dripping with oil. The finger tap is the best way to see if you've got the packing gland on the main cylinder adjusted right.

Run your finger up the piston for about three feet. There should be enough oil on your finger to form a drop, but not a big enough drop to drip off. Another tip-off is wrong packing gland adjustment in the pit that runs off



the upper ring over the cylinder bearing. With good adjustment, the oil film amounts to a half pint per day during normal operation.

You reach or too little oil on the cylinder bearing calls for adjusting the packing gland. Remember:

ALWAYS USE A 1/4-IN. FEELER GAGE BETWEEN THE PISTON AND THE PACKING GLAND WHEN ADJUSTING.

Try to do the job within the hole you and you could end up with a scored piston and with the gland in a seized position, so get a second piece.



## NOT THE PANIC BUTTON



Don't hit the panic button if the elevator won't stop when you hit the STOP button. Stop her by pressing the UP and DOWN buttons at the same time. Tap the STOP button a couple more times. If it doesn't work right, holler for field maintenance.

## DRIPPY DOORS

Water dripping between the doors when they're closed tells for a check on which door closes when. The door without the seal should close a little ahead of the other door. That way, the seal is squeezed up in the air and keeps out water.

If the door without the seal closes first, the seal is squeezed down. That makes a trough where water can collect—and run down into the pit. Adjust the latching valves to make the door with the seal close first.



## BOUNCING BARS

Be quick on the upstroke if the latching bars bounce while they engage. Puffs to the hydraulic cylinders can give 'em a quick air blast. That'll keep things moving right ... and could save a guide rail.

## EYES WRONG

The adjusting eyeballs on the stabilizing assembly should be flat so they won't trip limit switches. Once you turn the eyes right, keep 'em flat way. Put one look out on the eyeball above the anchor plate and another look out below the plate. That'll keep you from getting eyes wrong. With just one eye-out-above or below the anchor plate—the eyeball can turn. It takes two.



## ROCK 'N' ROLL MISSILE

A missile riding the rock 'n' roll on the elevator arrives on the loading bars means stop the music. First run a quick check to see if the rollers have been adjusted right as the elevator is level. Look in your manual for this. If the platform is twisted while resting on the roller bars, fix it up first. (Refer to Field Maintenance if you need help.) Then adjust the stabilizing assembly on the elevator platform like all four locking bars at the same time. Here's how:



Level the equalizing cables by locking all the nuts on the cables.



Remove the roller bars and side of the guide rails.

Run the elevator up on the locking bars. With these rollers out, the elevator will automatically center itself on the bars as it pushes through the weather seal.

Measure the clearance between each roller and its guide rail. Compare with that measurement, because it tells you how much shim you need to leave a  $\frac{1}{8}$ -in. clearance between each roller and its guide rail.

Finally, if you get  $\frac{1}{8}$ -in. clearance between the roller and its guide rail with the shim removed, you need  $\frac{1}{2}$ -in. width of shim to leave a  $\frac{1}{8}$ -in. clearance between each roller and guide rail with the shim installed.



Tighten all the equalizing cables equally until they are 4 1/2 inches below the U-bolts on the B-type elevator and 4 3/4 inches below the beam on the C-type elevator.

Raise the elevator and watch the platform as it settles on the locking bars. If it doesn't hit all four bars at once, keep playing the cable game. The rule for adjusting these cables goes like this: To tighten an end of a cable, you first loosen the opposite cable the same amount you want to tighten the first one.

Example: Let's say the left-front locking bar is the last one getting contact with the elevator. That means the left front part of the platform is high. To lower it, you loosen the top-left cable and tighten the bottom-left cable the same amount by turning the eye-bolt nuts on each the same number of turns. Use the same routine on all the cables until the platform hits all four locking bars at the same time.

Keep an eye on those pit-balls and your pit won't fall down on the job when she's needed most.

# KEEP YOUR POP-UPS DOWN

If the awning roll for your Hilti-Alex's No. 1 awning bracket has developed a pop-up condition—that is, if it's raised up back or up beyond what it should be to be even with the rest of the side racks—you've got a little adjusting to do.

The pop-up condition is apt to happen when the hydraulic power automatically shuts off too soon, causing the roll to settle in the down-lift position as long as the miracle's on it. But, when the miracle's removed, the roll that's trapped in the system causes the awning roll to pop up when it's not supposed to. Then, next time you go to roll a miracle onto the awning roll, the wheels and rollers'll be hunkin', and the transporter-roll miracle-bracket combination'll be given a good job.

To correct a pop-up condition once you've got it, here's how to do the job.



Roll the awning roll.



Use all your power, and the safety's wire, on a flat or other piece of wood to hold the awning roll while you're working on it.



Use a metal screw and secure the top cover on the adjusting end of the down-lift cable.

Carefully roll straight out with your fingers. Swivel and tighten on second roll for top wire.



Make sure you're making the hole where you started to punch it do the trick. Once you have your piece, you'll have to test each hole separately until you find the right one.



Turn pin and lock nut—swivel from where it was to begin with.

Replace the pin and the top cover, turn the power back on and work the down-lift cable to see if the roll settles all the way down. If it doesn't, you'll have to go back and make the pin and cover hole counter-drill and try it again. Top cover bolts may be the pin a couple more times before you fit it.



## UNH, UNH, DON'T TOUCH

Maybe you've got a blond who isn't on the ball, and maybe he makes it a habit of passing all over the apparatus layout on the PMA vehicle. And maybe he tries to use the lanyard to pull himself on top of the vehicle whenever he's got some PMA to do. And maybe, one of these days, your CO'll be sending the guy's dog tags to his next-of-kin.

Could be, if all the conditions are just right. A good punk on that lanyard and your whole outfit could be sleeping the blues—with a golden hoop in the background.



You know the set-up ... the lanyard is connected to the power plant pressure regulator valve and the fitting on the shock structure. There's a spring loaded pin on the vehicle above the valve. Comes a good punk on the lanyard and it'll pull the retaining pin at the forward end of the rail from the hole in the spring loaded retaining pin of the pressure regulator valve.

When that happens, the vehicle'll start to pressurize itself, and if the overhead dump port isn't open to let the pressure out ... whooah! One mighty big bang from that vehicle.

So, in for on the safe side, be real careful to keep from hanging or pulling on the lanyard.

## KEEP 'EM COATED



As every good maintenance-minded Joe knows, coating battery and cable terminals with a thin layer of grease helps keep 'em from corroding. A battery that's gloopy is often worse than no battery at all.

Some folks treat for the B&B's/AJ batteries in your PMA-Apis vehicles. You've got to make sure they stay clean and free from grit all the time. Try putting a real thin coat of Insulating Compound, electrical, PMA 5876-124-5E77 (I call IC-4 for instance) on the cable terminals and battery posts and cell connectors—it'll do the job just fine.

## KEEP 'ER FULL

How long has it been since you filled the pump motor on your M4s-Alex loader combined hydraulic power package? If you've been loading poles, the pieces of metal bearing each other to life, it's been too long. Since a relay pump motor usually means one thing—no oil.

To keep your motor packing, check it every month when you service your loader—then you'll be sure the oil supply in the reservoir is up to you. Be sure to use M4S-0-0000, like it says on the motor panel, until it overflows. The oil'll go from the reservoir to the tank and your motor'll be able to do its job.

Calling some for this oil is Lubricating oil, gear—FD4 91 92-222-41 20 gets you 1 gallon of medium grade.

If you wait until your motor's really dry before adding any oil, you might have to get a whole new motor—and that means hot, more sweat than just adding oil.



## DERRICK DOINGS

The pages toward the end of FM 44-304—the ones that start at paragraph 150—should be looked at long and hard when you M4S FCS and M4s-Alex guys start to use the capillary column derrick.

A lot of things can go wrong with the derrick when you're setting up the antenna unless you keep shooting look-overs at the RR.

If the derrick sets up when you do everything according to the FM and Sergeant Doyle ... then's the time to fire away with a UCR.



# Joe's DOPE

## LUMINOUS

FACTS ABOUT  
BLACKOUT DRIVING

WANT TO SAVE YOUR EYES AND EARN MONEY? THE ANSWER IS TO DRIVE AT NIGHT WITH YOUR HEADLIGHTS OFF. IT'S CALLED "BLACKOUT DRIVING" AND IT'S THE BEST WAY TO MAKE MONEY.

There's nothing as profitable as driving at night with your headlights off.



Make an investment... you'll see more money than you can count on.

It's a simple idea... you turn off your headlights and drive at night. It's called "blackout driving" and it's the best way to make money.



BETTER COMPANY THAN... IN THE STATE OF... THE ANSWER IS TO DRIVE AT NIGHT WITH YOUR HEADLIGHTS OFF. IT'S CALLED "BLACKOUT DRIVING" AND IT'S THE BEST WAY TO MAKE MONEY.



WANT TO MAKE AS MUCH AS YOU CAN? THERE'S NOTHING AS PROFITABLE AS DRIVING AT NIGHT WITH YOUR HEADLIGHTS OFF. IT'S CALLED "BLACKOUT DRIVING" AND IT'S THE BEST WAY TO MAKE MONEY.



FOR THIS REASON ALL NEW VEHICLES ARE EQUIPPED WITH BLACKOUT LIGHTS AND MARKERS.



BLACKOUT DRIVING IS YOUR BEST FRIEND IN 21 OR IN COMBAT 20—KEEP THIS IN MIND WHEN YOU'RE READY TO TAKE OFF!

**1** IT'S ROUGH ON HIGHWAYS... BE READY FOR STOPPING.



**2** IF YOU HAVE FOUR WHEELS YOU MAY WANT EXTRA CARE!



**3** WATCH FOR PEOPLE WALKING AROUND... YOU MAY NOT SEE 'EM 'TIL THEY'RE TOO CLOSE FOR SAFETY!



**4** TAKE CARE FROM THE ROAD SIDE! YOU'LL NEED IT!



YOUR OLD FRIENDS, THE ROAD SIGNS, WILL BE INVOLVED NEXT TIME!

**5** CARENA... CARENA... CARENA! KEEP YOUR SPEED DOWN! STAY ON THE BAG—DANGER OF ACCIDENTS IS WORST UNDER BLACKOUT CONDITIONS!



**6** YOUR GREATEST FRIENDS ARE THE BLACKOUT DRIVING OR COMBAT EQUIPMENT! ARE YOUR BLACKOUT MARKER LIGHTS, BRACE AND BAGS?



## HERE'S HOW TO READ B.O. MARKERS...

FIRST, REMEMBER THAT THEY'RE NOT DESIGNED TO LIGHT UP THE ROAD... JUST PINPOINTS OF LIGHT TO GUIDE YOU... THEY'RE YOURS UP TO 800 FT. AWAY.



THEY'RE MADE SO PLANE REFLECTORS ADD UP TO ABOUT 100 FT. ABOVE YOU CAN'T SEE 'EM...



SO... THE PRIME JOB OF BLACKOUT MARKERS IS TO TELL YOU HOW FAR OR CLOSE YOU ARE TO THE NEXT CURVE... WITHOUT TRYING YOUR HAND TO THE SKY...



## HERE'S WHAT YOUR REAR B.O. LIGHTS MEAN

**1** If you see this



YOU'RE PROBABLY FAR BACK... YOU'VE GOT TO CLOSE

**2**



YOU'RE DEAD... ABOUT 50 FT. AWAY



**3**



BACK... YOU'RE TOO CLOSE FOR COMFORT... DROP BACK NOW...

**4**



WHEN A WHITE SIGNALS UP HERE... STOP! IT'S THE BLACKOUT BRAKE STOP LIGHT!



**Joe's**

## Dope Sheet

**B**lackout driving's a skill and  
an art,  
In warfare-an integral part -  
Keep markers in shape;  
Get hip to flow tape;  
Get the hang of this thing  
fore you start.

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

THESE FRONT BLACKOUT LIGHTS ARE A BIT DIFFERENT, BUT THEY CREATE THE SAME HAZARD... YOU LOOK THEM YOUR BEAR YOUR AHEAD AND CALCULATE DISTANCE LIKE THIS...



**BEFORE TAKING OFF** ON BACKOUT DRIVING, GET YOUR EYES READY FOR IT LIKE THIS



**GET CLUED** ON WHAT'S AHEAD OF YOU



ARE LEFT AND HAVE B.C. MARKED  
BUT THESE MIGHT STICK OUT FURTHER  
TOWARD YOU...

DO THESE LOOK  
ANY DIFFERENT  
FROM THE OTHERS?

THAT'S RIGHT...  
THEY'RE THE  
ONES YOU WANT  
TO STAY CLOSE TO  
YOURSELF AT ALL  
TIMES!



## HOW TO USE AN ASSISTANT DRIVER

WANT YOU SHOULD HAVE ONE FOR B.C. OFFENSE!

NOT IN CONVOY...



SEND HIM AHEAD  
TO LOOK OVER THE  
ROAD-AND-KEEP YOU  
IN CONTACT WITH HIM!

OR GOING INTO AN ASSEMBLY  
AREA HAVE HIM GUIDE YOU IN!

OR OVER NIGHT TERRAIN  
HAVE HIM LOOK FOR HILLS,  
ROCKS, TREES, BOUNDERS  
AND SUCH...



HERE ARE SOME THINGS TOWARD YOUR GUIDE  
VISIBLE ONLY TO YOU...





TONIGHT HOT ON  
 THE ROAD... ON  
 FROM THE GUN!  
 BUT AS LONG AS  
 YOU CAN SEE THAT  
 LIGHT BEHIND THAT  
 YOU'RE BEHIND US.

BUT... IF YOU LOVE  
 IT... STOP YOUR  
 TRUCK AT ONCE...

YES... I WILL,  
 BECAUSE

NOW THAT YOU'RE ALIVE  
 THE BUREAU WANTS  
 TO SEE YOU  
 TODAY... TO GET AN  
 ORDER REPEATED.

YOU'VE GOT TO  
 TAKE  
 ANOTHER  
 TRIP TO A  
 BUREAU.

AAA... I DON'T WANT  
 ANOTHER TRIP.

YOU'VE GOT TO  
 TAKE ANOTHER  
 TRIP TO A  
 BUREAU.

YOU'VE GOT TO  
 TAKE ANOTHER  
 TRIP TO A  
 BUREAU.

YOU'VE GOT TO  
 TAKE ANOTHER  
 TRIP TO A  
 BUREAU.

YOU'VE GOT TO  
 TAKE ANOTHER  
 TRIP TO A  
 BUREAU.

YOU'VE GOT TO  
 TAKE ANOTHER  
 TRIP TO A  
 BUREAU.

YOU'VE GOT TO  
 TAKE ANOTHER  
 TRIP TO A  
 BUREAU.

## QUESTIONS AND ANSWER DEPARTMENT



### PRESERVE YOUR TOP

Dear Half-Mast,

What can we do about preserving the canvas tops for Jeeps? Ours are rotting out in about a year. They get cleaned at least every month, and cleaned good. But they just rot out on us. The sun and wind have their way, and rot them by the end of the year. I think if we rejuvenated them with some kind of solution every time we cleaned 'em they'd last a lot longer.

Sp. E. D. B.

Dear Sp. E. D. B.,

Try Mellow Solvent Compound, P/M 8000-180-1021 (QJRC). This wonder will give you five gallons of the concentrate—which is for 60.

Use a paint brush or spray gun and give it about 24 hours to dry and you'll have a better job. There's some mixing involved, so follow the instructions on the can right down to the last period.

When it's put on right, that compound will put the stamp on rot for many a month.

### WHICH CABLE?



Dear Half-Mast,

What's with the weird cable in the G-741 articles? TM 9-2016 calls for 24-in cable, but that? ENL G-741 dated January 1957 calls for 12-in cable. Which is right?

Mr. C. C.

Dear Mr. C. C.,

You use the 12-in cable. Generally, whenever there's a discrepancy between a TM and ENL, you'll go by the ENL (or the new Parts List when it comes in TM's). On occasions the TM is instructed, but the ENL is the authority for issue. So your support people would have to issue you the 12-in cable—there's no authority to give you 24-in stuff.



## THAT SHE BLOWS

Dear Sgt Dwyer,

The seals in the tail rollers on the body of our bridge tracks, Model F1407 and Parajumper Model 902, are installed with the lips of the seals facing inward. It only takes a little pressure with a grease gun to force these seals from their lips.

Why not turn these seals around so the lips face toward the outside? This way the lubricant can work out past the seals, get dirt from the outside can't get in.

Ms. J. B.



an Oiler's Item. Requisition: Firing, Lubrication, pressure relief type, 1 in M-254, in-CONPTC, extra close seal, PNM 4740-240-2111.

There won't be any blowback if the lubing's done according to Hoyle. Use a hand gun on these rollers, and take it easy. Overlubrication can sometimes mean as much trouble as not enough lube.

Sgt Dwyer



## BY HAND OR BY AIR

Dear Sgt Dwyer,

We had to replace the leather seal on a drive bottom track roller because a new guy lubed it with a compressed-air lubricator. Naturally, he was supposed to pump the lube in with a grease handle. The blowback caused us to start looking around for a publication or direction that tells you where and when to use pressure-lubricators, hand guns, etc. So far, we've found nothing.

Cpl C. T.

Dear Cpl C. T.,

There's no pain in what gun to use on all lubrication fittings. Getting out out would be like losing all the hands: it's possible to get in a grease gun and telling how to play each hand. A real long book.

What you need are pressure-actuated adaptors to pressure down big seals. These these adaptors open automatically when the pressure reaches 500-PSI. Requisition 'em through regular Engineer repair parts supply channels with the manufacturer's part numbers.

Adaptor, pressure-act'd, post bottom head  
 449,722-441

Adaptor, pressure-act'd, stacked bottom head  
 449,722-452



Adaptor, pressure-act'd, hydraulic 449,722-452

For smaller seals, there are two pressure-actuated-type lubrication fittings that open at well less PSI. They're Ordnance items. EOM 47384-558-01 (1) gives you a fitting that automatically opens at 1 to 1 PSI. EOM 47384-565-18-01 is for a fitting that opens at 15-PSI. One 'em to pressure seals that blow easy.

Now, about that lubrication oil which we use what kind of lubricate.



Some of it is in the lubrication sections of heavy equipment TMs. Those sections usually show what parts being lubricated. You can check the pressures and find out which parts to use on each lubrication fitting. Look at TM 5-5044 B, page 16, Ref. 57. It shows a bottom track roller being lubricated with a brush.



But the best thing you have to go on is experience—old hands who know all the in's and out's of lubrication. Every new man in the outfit ought to be trained by them. Naturally, that goes for any maintenance or operating job.



Sgt. Dwyer

## SPACE FOR THE "SPACER"

Dear Mr. Man:

Could you tell me the manufacturers and just how I can replicate the block found between the left rear spring and axle housing on the M41 10-ton ambulance, and where to buy in black and white?

Ed F. H. H.

Dear Specialist F. H. H.:

Here's the dog in a nutshell. Until recently, it was necessary that you have justification to obtain the "spacer" (see block) because it wasn't in the M41's. But now it can be ordered through normal supply channels under: spacer, spring assy, left, front and rear left, FOM 2510-737-4839 HC7411.



This spacer is also used under the left front spring. The spacer set there to compensate for the slight lean in the vehicle body with the added weight of the spare tire on that side.



## HOW TO GET AIR GAUGES

And Other Things You May Need  
For Better Preventive Maintenance



Dear Mr. Man:

Get this—my illustration's cartooned IP vehicles and IP trailers—over 500 times. Get, use TCM calls for just one tire pressure gauge, and that comes in as through our Tool Kit, Organizational Maintenance, 1st Edition, No. 1 Common.

The TM's for every one of my vehicles tell me that they wear the gauges for correct pressure every day (before operation) and at every biweekly service. How far do they expect me the gauge to go?

May L. F. H.

Dear Major L. P. H.,

Yes, you've got a problem, but there's a way you can get around it.

First off, SR 9-118 (28 Mar 71) gives you the authorization to requisition tire pressure gauges for those vehicles that are equipped with a tire inflating hose. The SR tells you to requisition the following for those trucks:

Gauge, tire pressure, self-contained; for general rating air inflated tires, calibrated 0 to 160-psi range, 1-1/2" smallest graduated dial, 90 deg mag angle, dual hose type w/inflator and extension, 2 in lg, in accordance with Federal Specification GG-G-31a Type II, Class A, Style 1, FSN 4910-044-9116.

The SR authorizes having agencies use issue a tire gauge different from this one, except as units in area weather units, which must get the Style 1 gauge. The other gauge is in release status and is found in line of the Style 1 gauge.

This gauge is—

Gauge, tire pressure, self-contained; dual-hose hose, calibrated 10 to 60-PSI to 1-PSI units and 60 to 100-PSI to 1-PSI units. United States Army specification H-100-5 Type II ESN 4910-260-8918.

Now, in checking the SR, you'll find the measurements a little different. The names above are the latest.

That takes care of your tactical wheeled vehicles with air hoses. Now, there are other ways you can use to get more tire pressure gauges on. For that matter, any other piece of equipment authorized by your TOE but of which you haven't got enough—and must order in excess is what you're authorized by the TOE.

First, ...many TOE's state the following in their instructions:

"This table contains the minimum essential quantities and types of equipment necessary to accomplish the mission of the unit. When additional equipment is required and is not covered by purchase equipment authorization documents, approval must be obtained in accordance with procedures established in SR 721-18-1."

Whether this paragraph appears in your TOE or not, you can still use the provisions of SR 721-18-1, para 526 (2), to order equipment in excess of that given you in the TOE.

That's just about the most, Sr. It's desirable like this that get people the tools and equipment they need to keep their maintenance up to par.



## HYDROMETER



Most of all, reading down your battery—or your engine, either—can change the mixture of water and acid in the cells, and the mixture of water and antifreeze in the coolant. After all, you haven't added anything, nor taken anything away.

But here's the kicker: This means that antifreeze is made of "specific gravity." In other words, you are comparing the weight of an exact volume of your sample with the weight of an exactly equal volume of water. And that's where the need for temperature correction comes in.



## WATER—MORE OR LESS

You see, 8.34 pounds of water equals one gallon at 62° F. That's the accepted standard. But, if you cool that big ol' water down to almost freezing, it'll still weigh 8.34 pounds, but since it contracts with the cold, it'll no longer be exactly one gallon. Same way if you heat it up to just below the boiling point. You'll still have 8.34 pounds, but it'll have expanded and you have a little more than a gallon. In other words, water becomes denser as it cools, thinner what warmed up.

OK, now you know that as either freezing or a liquid will sink down into that liquid until it has pushed aside ("displaced") they will increasingly in new weight of that liquid. So your hydrometer has a float, weighted to hold it vertical, and calibrated to show how far it has sunk into the liquid you're testing.



LIGHTER THAN WATER

## READINGS



Naturally, this float'll sink deeper into a lighter liquid, and ride higher out of a denser liquid.

So here's the kicker: What float will measure the actual density of the solution you float it in, but it won't take the temperature into consideration. This means that if you had a sample of your water at just below boiling point and took it out into a cold shop you would take hydrostatic readings every half hour in the water cooled off, and you'd get a different and higher reading every time. And yet you'd know the sample was the same—only the temperature was different.

## TWO VARIABLES



Now, let's look a little deeper into this problem. When you take a hydrometer reading on a battery you want to know the percentage of free acid in the electrolyte, because that'll give you an indication of the state of charge of the battery. When you sample your radiator coolant you want to know the percentage of antifreeze in the water so you can tell the freezing point of the solution.

In either case, you'll determine this percentage by comparing the density of the mixture to the density of water. Both sulphuric acid and ethylene glycol are denser than water, so your float'll sit higher in the mixture, and the heavier the mixture is—which also means the denser it is—the higher the float'll sit.



Now dead, but you see, you now have two variables that'll make your float ride high. Either you have a strong mixture, or you have a cold mixture. It's possible for a cold, (and therefore denser) weak mixture to float the hydrometer higher than a warm, (and therefore lighter) strong mixture.

All right. With two variables that can affect the reading of your float you must eliminate one of them before the reading means anything. In other words, you must be able to tell whether you are reading from a strong warm mixture or a weak cold mixture before you can decide how strong or how weak the mixture is.

Fortunately, thermometers are handy and cheap enough that one can be built right into the hydrometer assembly. By referring to this thermometer and making the necessary allowance for temperature, you then get a hydrometer reading that allows for density of your sample as compared to water at the same temperature. This is the figure you need, because from it you can tell how much acid or acid-force is in your sample.

Then you have the principle of the thing, and you can see why you must monitor the temperature of the mixture you're testing. Only by allowing for the variation in density caused by temperature can you find the variation in density caused by the strength of the solution, which is what you want to know.

## RADIATOR HYDROMETERS



Before you get all shook up worrying about a lot of calculations for temperature, density, specific gravity, freezing points, etc. Relax. Most of it has already been done for you.

In the case of the radiator hydrometers in particular, your float is generally calibrated in liters. All you have to do is work the thermometer until it settles down, then follow across from the top of the thermometer column until you find the letter that's just above water on your float. Where that temperature line crosses the liter column, you'll find the freezing point of that mixture all figured out for you.





You never have to bother your head about specific gravities, or percentages. In fact, on this one you don't even have to read the measurements in degrees. Just let it point out which line on the chart you should follow. Then you read your answer directly in freezing points—which is what you wanted in the first place.

If the freezing point for the solution is not low enough for the temperature you expect, another handy chart tells you just how much more glycol to add to bring it down where you want it. Nothing to figure out.

## BATTERY HYDROMETERS



With the battery hydrometer, it's a little more complicated, but not much. Your first reads in specific gravities. But its markings are correct only at 80° F.

To correct for temperature you read the thermometer on the hydrometer. Then for every ten degrees below 80°, you subtract four gravity points from the specific gravity reading you get. Or for every ten degrees above 80°, you add four gravity points.

Your float is calibrated to be correct at 80° F, and in a colder solution it rides too high, so you subtract. In a warmer solution it rides too low, so you add.



## APPLYING YOUR CORRECTION

Let's say your battery electrolyte is 60° F, and the float says it has a specific gravity of 1.240. Since 60° is two 10's below 80°, you're going to subtract two 4's, or eight points, which leaves you with a corrected reading of 1.320.





Perhaps you let the battery stand out in the snow on a cold night, and check it again the next morning. This time your electrolyte is down to  $20^{\circ}\text{F}$ , and the hydrometer says you have a specific gravity of 1.244. But when you warm it to  $80^{\circ}\text{F}$  you get six 10's, and six 4's (24) subtracted from 1.294 shows you you will have a corrected gravity of 1.252.

Now let's say the truck gets out on a long hard run on a sunny day, and that the rest of the morning just about balances the charge from the generator. You might find when you checked your battery that the electrolyte was clear up to  $100^{\circ}\text{F}$  and that it indicated a specific gravity of only 1.224. Now, your temperature is now  $10^{\circ}\text{F}$  above  $80^{\circ}\text{F}$  so you add two 4's to the float reading, and there you are again with a corrected gravity of 1.232. Easy.

There's one mistake some guys make when using a battery in winter. They try to correct for the temperature they expect rather than the temperature they actually have. This won't work.

The thing you have to do is determine what shape your battery is in. You do this by taking your reading, then correcting it for the actual temperature of the electrolyte, or the state of the cell, to determine the condition of the battery. Then, you can look at the temperatures you expect are coming and decide how the battery is likely to perform when it gets cold.

**WANT MORE?**

1. THE ENGINE

2. WAX OR GREASE  
WAX CORROSION

**GO ON!**

3. THE WHEELS

## BATTERY FREEZING POINTS



You've got two considerations to deal with. First and most important, of course, is the freezing point of the electrolyte in your battery. In this case, the sulphuric acid acts as an anti-freeze, and the more of it there is in solution, the safer the battery is from cold weather.

USE AN 80  
WATT HOUR IN  
ELECTRICITY AT  
VARIOUS TEMPS  
RATED, AS THE  
EQUIVALENT TO 100%.

#### CRANKING CAPACITY

AT TEMPS TO 100° F.

1,000 times  
1,100  
1,200  
1,300  
1,400  
1,500  
1,600-1,700

#### WATT HOURS AT

100° F.

EQUIVALENT  
+100%  
+100%  
+100%  
-20%  
-40%  
-60% to -80%

## KEEP 'ER CHARGED

It's obvious that the best way to protect your battery from freezing is to keep it fully charged.

Now, once you've made sure that your battery won't freeze and burst in case you're not at home, you'll get to see if it'll be any use to you at all at starting your engine again.

Unfortunately, even with a fully charged battery, at 0° F you only have about 60 percent of the cranking capacity you'd get from the same battery at 60° F. Battery current comes from a chemical reaction, and cold slows down this reaction—nothing you can do about it.

To make matters worse, your engine at 0° F requires about 2½ times as much cranking force as it does at 60° F, assuming a good engine and the proper grade oil is used. Which means, believe it or not, that on a 0° day you're only getting 18 percent of the cranking power you have on an 60° day.

So, the lesson is plain: For cold weather operation, you've got to keep your batteries as near to full charge as you possibly can. Check 'em often.

And remember, the cold that limits a battery's cranking capacity also limits its ability to receive a charge. So, if they have to be taken from a warm shop and fully charged over and over during the winter, it doesn't necessarily mean that either the battery or the charging system of the vehicle is bad. Things're just tough all over.



## ARMY AIRCRAFT



## PIGEONS IN YOUR PYLON?

Some people have been leavin' off without tippin' on the rail cover gear box and blade covers on their Cessnas when the aircraft are standing outside.

This might not be too serious for just an overnight parking, although it has happened that water has been trapped in the rail cover blades, and this is a real no-good way to spend the price of new blades.

TO GET THE AIRCRAFT  
SAFE... MAKE SURE THE



Also, believe it or not, one such feral bird's nest, complete with bird, eggs and other evidence, is the rail pylon of a Cessna that had stood outside for a couple of weeks without the covers.

This mob was getting a fair chunk of the customer reference on their "Birdy" model. Don't stick your neck out, on the cover.

## DIRTY BRAKES

As the man said, "A clean aircraft is not always well maintained—but a well-maintained aircraft is always clean." This goes double for the brakes on your Bird Dog.

Careless about cleaning the brake master cylinders has made 'em stick from dirt and corrosion. Then they don't release fully, and the next thing you know, they're locking.

Located as they are between the rubber pads and the discs, they get hot all the time, get old and rusted, particularly if you're flyin' off a muddy strip. This can't be helped. But since you guard on the pre-flight inspection and have another look when you give the pre-flight.

And have a look at the wheel brakes, too... after every landing if the strip is real muddy.



## GOOZY GAGE RODS

The oil gage rods installed in the G-150-11 and G-150-11-1 engines are some of your Red Dog's L-100's, L-100's and L-150's! Didn't do so good. Some like they said "Full" when there were still 2 quarts or so go.

In TM 1-11-15-1000 (14 March 57) and Supplement TM 1-11-15-1001A (6 June 57) will you to change 'em in the next inspection or within 60 days in any case.



Now, you use a small grinder or a file to remove the existing marks from the gage rod. Now, measure down again, always from the open end of the rod cap, and using a rule calibrated in inches or in feet. Using a small wire-wheel file, an electric cutting pencil or Morse tapering stamps, you make and leave some marks like in this sketch.

That's all there is to it. You replace the gage rod and add oil to bring it up to the full mark.

After being the dispatch, count the feet on EO Form 822-1 (engine).



## UIR DIGEST

Most of you know that there's a way you can tell your troubles to the top men, so far as your equipment is concerned. That is, you can read in *Universal Factory Equipment Reports* (EO Form 460) like it tells you in AR 750-14.

These UIR's go right to the engineers, designers and technicians best able to solve the problems. And they get fast action.

This section is reported to the field each month in the 21-0 series of TE ANW's beginning with TE ANW 21-1-1, dated 1 Oct 1960. Every month using Army



aircraft is on the distribution list for these TB's. Be sure your outfit is getting them, and check it when it comes out.

You may find just the fix you need. And the TB will also tell you what problems have been reported, what's being done, and if any more reports on the same problem are needed.

It's real useful information, don't miss it.

## CANTED BULKHEAD CAN'T TAKE IT

Some of the shroud rings (S 609-41283-10) have been chafing on the engine fan shroud assembly (S 660-80117) at station 75-1 on the H-44A chopper.

OK, so the lower web and the canted bulkhead are a little weak. That is now being fixed in production, and a field fix will fix the others.

You maintenance men can save your outfit a lot of grief by not working on that bulkhead, and not touch' on it when you're cleaning and servicing the clutch compartments. That'll make it harder to work in there, but that's easier than replace' worn parts. Keep your feet off.



## IF YOU GOTTA GO...!

Nobody knows why, but some H-44's have been found with the emergency escape hatches fastened with steel safety wire. This is as foolish as locking the door to a fire escape.



That hatch back will hold and lock without any extra fastenings, and in the all chances that you ever do need it, you'll want to work on pulling out, not pulling wire.

So, if you find any wires or any other extra fastenings on your escape hatches, take 'em off. First of all, you won't lose the hatch, and second, even if you did believe it, it's easier to explain to the maintenance officer why it was not fixed than to tell it. Point why it was too tight.

## BOAT BATTERIES



Batteries on your boat are just as vital to you as the batteries in a shore-side vehicle, only more so. On someone's motorboat it's less, more important to be able to get your engine running at sea than it ever is on shore. A parked motor like all a big shore car makes you real careful if your engine starts up right now.

In everything I've had said about battery care goes double for boaters. And there are a couple of additional points you want to remember. First of all, your battery compartment probably isn't as well ventilated as the hood of a truck, so you've gotta be more careful about fumes. Hydrogen is explosive, and forgetting this can cost you your boat.

Be particularly sure that all the electrical circuits are turned off before recharging battery cables, as there'll be no sparks. And don't, for god's sake, let anybody use hook and alligator clips to power personal radios from your battery. They'll come home with a spark out in rough water.



## HOLLER WHEN YOU'RE HURTIN'

Look now, all of you TC men on the ground or the water, you're loving the Rycoaps and runabouts now away with the shore on UER's.

Now, we know the whittlybirds here have some problems, but to look at the UER's that come in, you'd think they had all the problems. We know better!

All NO-10, as changed, put out the poop on submitting an Unacceptable Equipment Report, and that's the best way in the world to get your equipment shaped up. (You had your insurance run only on the complete 100% of your machinery file? You see, the you'll find that one UER can do more good than a month's hard work, at that.)

So, when you're hurtin', scream! Tell the man what's wrong with your work, truck, or locomotive.



Try This Maneuver And ...



These  
maneuvers  
are easy.

## YOU'RE FIRED

If there's anything less boring than rewiring over a long range all day, it's rewiring over a cold one. Each of five power can be mighty embarrassing, if not downright disastrous.

To keep those 60-1000' field range live wires on the firing line, keep in mind these ingredients for a

### BEFORE OPERATION CHECK

<p>1</p> 	<p><b>REMOVE HOSE</b>—Keep it clean. The hoses that go to the air burner area have to be kept open and free of dirt. The fuel jet gets a thin strip of fabric this purpose, but check one block ground down to it does the job with new fuel used.</p>	
<p>2</p> 	 <p><b>REMOVE CRACKS</b>—It has a kind of getting hot, so make sure you in them, if not, up to a substance all you can get together.</p>	
<p>3</p> 	<p><b>FLUSH THE CAP</b>—The ground surface of the cap and plug—and top of the filler tube—have to be clean or it to give an empty fit. And when you replace the cap, make it snug and secure tight.</p>	
<p>4</p> 	 <p><b>FLUSH THE BURNER &amp; TUBE</b>—Do not use this dirty fuel. Explain the part out and, if necessary, replace the gasoline pump. Check with thread tape to tight—and checked to be sure that threads aren't crossed or stripped. Then, you'll have the valve cleaner's a handy tool. For the drive, replace it better than gasoline. Make sure right side keep an eye on the fuel line for the old, old trouble. The wrong kind on the wrong side, on the wrong side in the wrong side. So what's on that there's the valve line from left to right or surface the burner it's <b>100 ... 1,000 ... 100</b>. It's all give you the steps on the clear difference.</p>	





Now, about the unit: Is one thing that works best under pressure. It's a good idea to. If the pressure drops in the pipe or fan as air goes in, some noisy water around the joints will help you enough for better.

Graphic generator parts the supplier in that, just start a long pipe hole on the joint and tighten it up. A 1/2-in. run of stainless grade Genset, Graphic ESM 9140 100-0912 EQM1 should be plenty for many a month.

And for more you keep your copy of TM 18-70 handy.

## TOE HOLE

Ever notice the M-1138 motor's gas holes in its feet? All three of 'em.

Was good for business, 'course, but it makes some on those little machines. A little bump or push, and over they go. An evening's hot show slips on the sand, or (rough, or whatever).

A nail or two driven through the holes, though, will secure the motor and double its rock 'n' roll.

Course don't turn up and move out—clip the nails into the carrying case 'til next time.





## DON'T LOSE YOUR HEAD

If the fuel stream from your M16/Parafield Flame Thrower starts drifting toward your target like a basketball with the blimps or begins to pump like a sleepy smoker, have you lost a combustion rate or quick loader on the pressure regulator on your weapon.



If the pressure's too high or too low in the pressure regulator, you might as well pack up and go home. Your new weapon won't fly like it should.



When your indicator goes to either the regulator, take it easy in TM 3-115, he keeps an eagle eye on the pressure gauge to see that it stays between 300-400 PSI, and that green needle should tick off in 11-minute steps adjustment.

The disk in the safety head is set to leave when the pressure reaches 120 PSI. But don't walk 'til it flows before something is done about it. At the first sign of faulty pressure, if adjustment doesn't fix the tick, and your indicator has checked out the other trouble-shooting tips in the TM, he should call in your Chemical support unit—they'll pay divine to the regulator's health so you won't have any more trouble.

Remember the trouble, y'see, is caused by the old rubber seal in the pressure assembly, which might have become brittle and split from the time they were installed. If they're not in place, they can cause the needle disk in the safety head to be regulated to blow.

Most units now have the new type device that work, which work better than the old ones. Your support people'll be able to check out your regulator so don't wait 'til the first sign of trouble, here 'til.



## CLICK, CLICK—CRUNCH

Have you been crick in your three-pointers because you clicked your way into a moment of danger with the M2 tripod mount for the .50-cal machine gun?

Maybe you've been right in the direction for you so two other 500-loads, line up a fix. The upper clamping screw was assembly it kinda thing like. In when clamping your weapon near the top frame, call a ball when you feel the assembly tighten up.



You also want to be careful with the same gun on the M3 tripod mount for the .50-cal machine gun. The M3 clamping screw was assembly in a little more rugged than the M2 mount, but it's not built for extending clamping force.

Another thing... make the inside of the mounting slide lock assembly "off line" when you're clamping the mounts. Here, you need only a screwdriver to take the assembly apart. It's even easier to lose the washer and spring from inside. Check your clamping in one of a brush and some solvent.



## WHATZIT?

Your kid's favorite toy? TV's favorite stinging puppet? Your neighbor's favorite? Of course not. It's a very useful, very preventive maintenance pointer... and a good character will know it on the first try. (Answer is on page 28)



SMALL,  
LIGHT  
AND IN  
NEED OF  
CARE ...



## THAT'S YOUR .45-CAL GREASE-GUN

When it comes to parts ... the M1 and M1A1 .45-cal submachine guns are on the short side. But all the parts parts be in good shape if you want the gun to deliver the goods.

Both guns—just as pretty much the same in maintenance as the M1—will work about the same with the M1A1.

This is the way the big differences stack up.

The M1A1 housing assembly has been modified to get rid of the mounting handle assembly, the mounting lever and bracket assembly, reversing lever spring and catch clip. Those gadgets are on the M1.

The bolt has been changed so you can operate it with your finger or with

the weapon.

The stock has a bracket welded at the back-end. The bracket is used as a hand holder for getting ammo into the magazine and also helps keep the stock from going too far into the barrel when you work in the a-foam-and-oil.

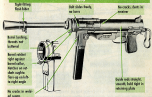
The receiver assembly gets built as off-camera and other in the pistol grip.

And the barrel assembly has two flat eyes on the barrel collar so you can use the stock as a wrench in removing the barrel from the receiver.

Now that you know the differences ... here's what you want to keep checking for. The checks are the same for both guns except where the differences in pointed out.



## M191



## M191T



Level shoulder line of heavy-grip magazine is bent

Mag/trigger not straight



No wear on magazine rack

Lower safety lock not even

Magazine fit assembly, slow to remove, it cracks, dents

Re-battered ends at end of rack (abrasion, long handle post)

Trigger pull is even, correct trigger action

Keep a sharp eye on all springs—the loss of tension. Watch for signs of wear and use on the sling and don't forget other considerations—rust, dirt, carbon, corrosion and lack of lubrication.

## TWO-WAY STRETCH—TOWARD THE MIDDLE



An extra rack full of .30-Cal carbines with tight slings may look sharp, but you're asking for trouble.

Concave-clip weather and the slings'll draw up even tighter. Something's gotta give and it's a good bet that it'll be the front board assembly. And you'll be without the carbines for a spell, 'cause it's an Christmas job (at a cost of more'n a few shakles) to repair or replace the assembly.

So . . . leave a little slack in the sling when the carbines are in a rack.



And don't care the sling stretch out with the slingshot end of the sling will be on the inside at the fore-grip section of the rack. It may look worse, but the end clip on the sling ran clip from the fore-grip will stretch it up.

## KEEP THE DOOR SHUT



Does your Model M1 rifle have the best pistol door bolt?

That is, when you lock the pistol door the door opens out or the inward-facing parting out or fall on the ground?

Your model may be a weak spring in the door. Tell your company officer. He'll replace the best pistol door and all. Speaking about the door ... how you have sawing the stuff that goes behind the door the right way?

The M-16 closing rod goes in the upper storage hole. First, you put the rod in the correct case (P04 1804.7 16 1781) which is new, but is an item of issue.

Make sure you have the tab on the case facing the best pistol door. It's a lot easier to remove the case if you have that tab in good hold. The grease container goes between the closing rod and the best pistol door.

## WHATZIT ANSWER

It's an M16 closing rod properly assembled. The handle goes with the "mouth" and "ears" section next to the rod. And the rod's to be inserted in all the way thru the handle. Assemble the rod any other way and you'll bend the rod and scratch your weapon.

The bottom hole? That's where you put the rifle case and then the cleaning rod handle.



Suppose you haven't been keeping up with the door and you have some "old-fashioned" tools. You may use this way:



With the combination tool, followed by the grease container, in the top hole. And put the rifle case and the cleaning in the bottom hole.



## THE O-RING'S THE THING



A fuel leak into the valve-grip assembly on your Honda Range scooter is one of the worst situations you can have on your scooter. And that's just what you get if the O-ring in the ball-and-socket valve assembly goes bad.

THE O-RING



You end up with a messy assembly, which could get sticky and leave you with a scratched porch . . . among other things.

The O-ring sometimes loses flexibility when a flame streamer is in storage for a long time, because the ring's oxide compression all the time. Or it can get damaged some other way. Sometimes the ball on the ball-and-socket valve assembly wears small and won't fit right. This causes the O-ring to ride too high on the ball. And a high-riding O-ring is not a pleasant thing to see.

So, as the first sign of a fuel leak in the biggest assembly above your five-spoke's brain chamber, make a peek at the ball-and-socket assembly. But before you do, close the pressure tank valve, take off the ignition-cylinder and release the pressure from the fuel tank.

### AND THEN





4. Fit the valve-grip assembly back on.

The chisels and the new O-ring will take care of your leak. If it doesn't, you'll have to replace the whole ball and socket. Here's how:



1. Take the valve-grip assembly off like you did before. Remove the spring retainer from the rear of the valve body.



2. Pull out the spring from the valve body so's to take the tension off the needle-valve.



3. Replace the ball-and-socket assembly (P/N 1148-PS-002) with a new one.



4. Put back the spring, screw on the spring retainer. It's like putting the cover back in your flashlight after you've put a new battery.



5. Fit the spring back on the valve body.



6. Replace the valve-grip assembly and you're finished.



## CONTRIBUTIONS



### FIXED PLUGS

Dear Editor,

We used to have a frustrating time getting our Chevrolet 20-ton truck's differential filler plug out, till this month when we got the right combination.

This number is a wrench handle, FSN 1120-121-7758 mated with a 5-lb extension bar, FSN 1120-140-7126. The bar just fits into that plug with no trouble — and getting it in and out is simple.

It's now stopped a lot of "heads", "fenders" and abused wrenches.

FHC Walter B. Drake, Jr.  
APO DL, New York

(Ed: Note — since you haven't gotten that new adjustable wrench just made for this job. The full name of this wonderful 17-inch adjustable wrench is: "Wrench, open end adjustable (17-in jaw span, 13-lb) FSN 1120-449-8000" — and it's listed in your Oct 1 1961 CATS, April '59. It's to be used with differential plug wrench, FSN 1120-309-1400. It looks just like your extension bar. Your idea's a good one till you get your hands on this adjustable wrench.)



### RUPTURED DUCK

Dear Editor,

Our machine will correct using the ruptured cartridge extender on the sub-caliber device and that it can be made to work if you'll bear the handle about 7/8 inch from the end of the shaft and bend it to 30 degrees like we show in the picture.

OMY B. L. Hynes  
Fort Jackson, S. C.



## HANDY DIPPER

Dear Editor,

As you know, there is no built-in level plug on the winches (winch and bearing housing side) for the GM-10 or the GM-10-2000. If you recall, Sir, since this is a necessary inspection point, I made a handy dipstick to help do the job.

If you do not get a piece of long metal and mold it into shape like so:



**Ed Note** — Looks like your dipstick'll do the trick. Not only will it help keep checking or exploring fingers out of the drag brake adjusting screws, especially with green drivers in the field, but will save on the amount of hole metal — only one pint needed to keep these winches in good shape.

When you go to use the dipstick, be sure to center it on the top front of the fillet hole with the winch clutch lever engaged. You're measuring your hole level from the top and outside of the fillet hole down to the marks etched on the bottom of the dipstick.

By: E. M. Hernandez  
APD 21

San Francisco, Calif.



## SPIN IN A BOOM

Dear Editor,

We found replacing a mag boom coil in an M17, M48 and M80A1 tank while the power pack is in the tank to be a rough, rough job. Taking it out isn't too bad, but the real job comes in when you gotta replace it.

So, what we did was take the brackets off and clear the seal holes. Now, all we do is start the nuts on their way on the rods and then slip the brackets on the rods. Then, just tighten up on the two already named nuts.

SP3 Carl F. White  
Fort Stewart, Ga.



**Ed Note** — Sounds fine. Makes a good idea, tho, to use a couple of external metal lockwashers to make sure the mag boom's won't loosen up.

## SAFETY CHAIN

Dear Editor,

Here's a photograph of a slide lock we use in the master joint of the Combined Extension at Fort Rucker to prevent injury in case a slide headlock should come away while we're loading the slide. We have an old slide chain from a worn out set of 243-mm track slide chains. We wrap this chain around the slide and wheel several times and fasten the end clip.

You can see that if the headlock should fly off, it won't go far enough to do any harm.

CWO D. W. Roberts  
Fort Rucker, Alabama



## CRANKING GOOD IDEA



Dear Editor,

Every so often, we lose a crank off the air mechanism of our Cox EC's. The cranks break loose or get knocked off the piston in break and race.

After replacing a few cranks, we found it's easier—and a lot cheaper—to make 'em ourselves. It takes three pieces of scrap metal, raw with, drilling a hole, and a saw.

All it amounts to is using your own material to make a crank just like the regular part. It takes about one man hour.

Mr. Walter F. Cook  
Aberdeen Proving Ground, Md.



(Ed Note — Nice way to save money.)



# DON'T WORK IN THE DARK



**YOUR TM**

CAN THROW A LOT OF LIGHT IN  
THOSE DARK MAINTENANCE CORNERS