TB 9-2300-419-10

TECHNICAL BULLETIN

FILTER FACTS FOR TANK COMBAT: FULL-TRACKED, M60, M60A1, M48A3 AND COMBAT ENGINEERS VEHICLE: FULL-TRACKED, M728

HEADQUARTERS, DEPARTMENT OF THE ARMY

05 OCTOBER 1973

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, DC, 5 *October* 1973

TB 9-2300-419-10, is published for the use of all concerned.

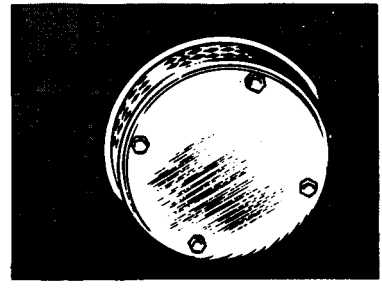
The filters, screens and breathers on your tank vehicles can't do it all alone. They need maintenance follow-through from you.

So here's a handy, by-the-numbers guide to help you take care of the air, fuel and oil filters on these vehicles. All checks and services are done by the crew unless otherwise noted.

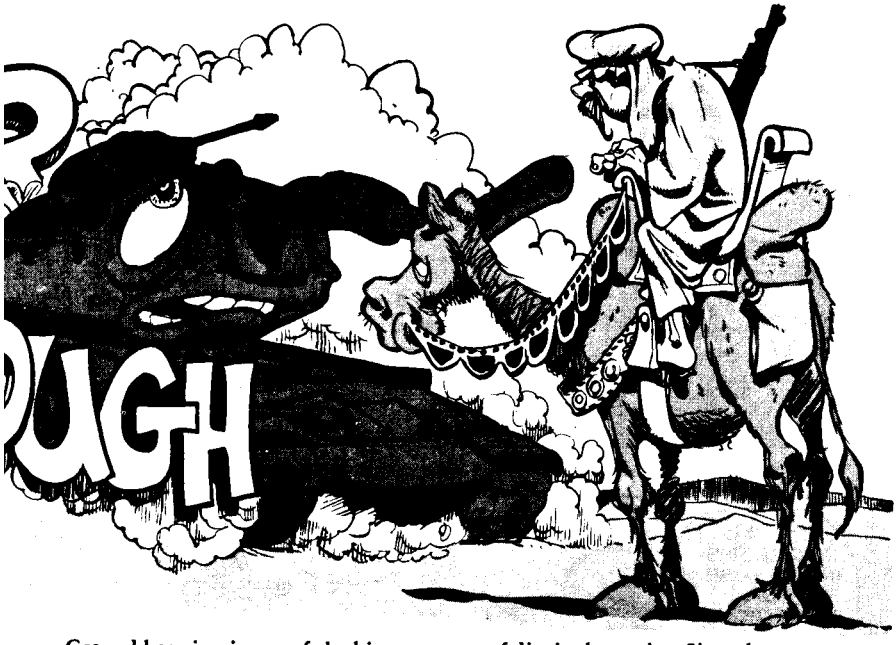
ORGANIZATIONAL MAINTENANCE ONLY

AIR CLEANERS

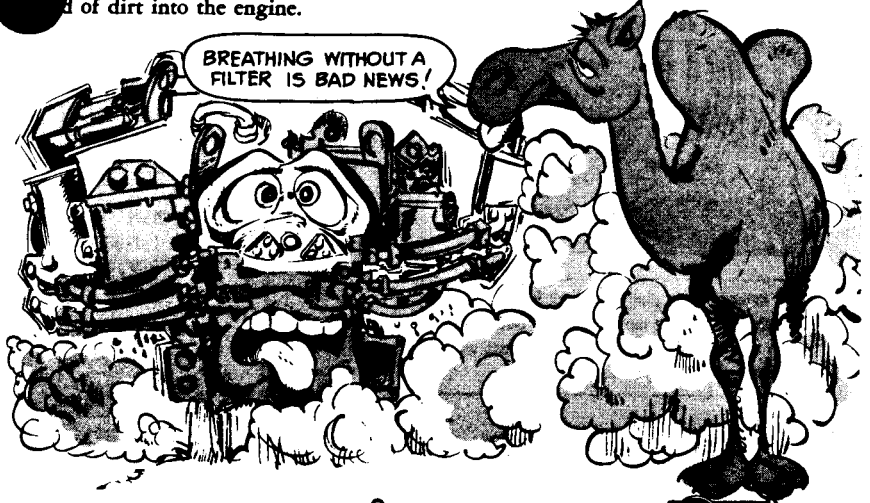
1. Make sure the covers for the air intake screens — both left and right — are installed and the passageways open.



Reason: Dirt and debris can get into the air intake system if the covers are off. It takes less than half a pound of dirt to completely ruin a tank engine.

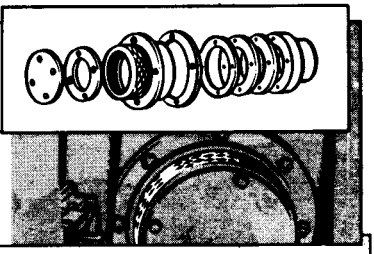


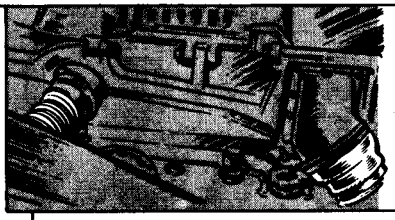
Ground-hopping is one of the biggest causes of dirt in the engine. Since the engine is without air cleaners to filter the air during ground-hopping, you should do as little of it as possible and even that little in as dust-free an area as you can find. It takes 15 minutes of ground-hopping in a dusty area to draw that half cup of dirt into the engine.



PS MORE

2. Gaskets seated right? Air intake openings must be set to draw air from crew compartment except in cold weather. Doing it this way you have a settling chamber that lets the air cleaners run about 50 times longer before clogging up. Clean any leaves or dirt from around the intake screen.

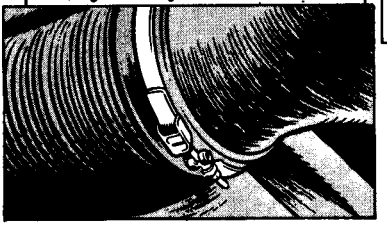




3. If any of the 4 hoses (2 air cleaner-to-air intake; 2 air cleaner-to-turbosupercharger) is cut, torn or deteriorated, replace it. If you're not sure, have your mechanic check it out.

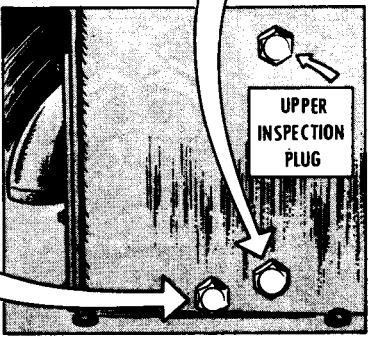
4. Packing on both ends of each hose must make air-tight contact. Replace if it's defective.

5. Hose clamps tight? Replace if any's missing or damaged.



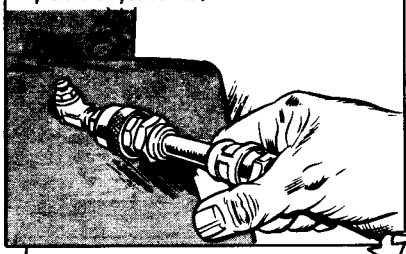
6. Remove drain plug and check for moisture. (Note: On this and the next 2 plugs be careful not to strip the threads, and lightly lube threads with GAA before putting plug back.)

7. Screw out lower dust inspection plug, shine light into hole and check for dust or water. (If there is none, skip next step.)

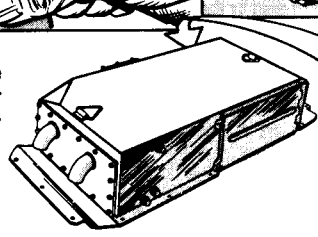


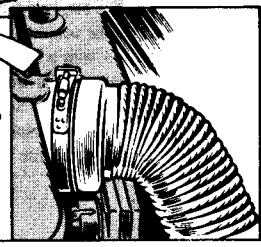
AIR RESTRICATOR MISSING

8. Take out upper inspection plug. Put a compressed air hose into this hole to blow dust/moisture out thru lower hole. (Note: The filter must be in place when you do this.)



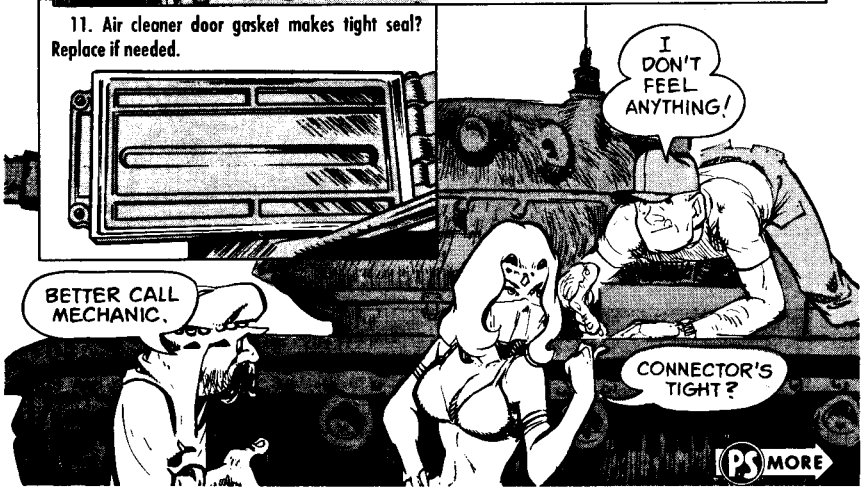
9. With the engine running, check for air leaks at elbow and air intake flange.



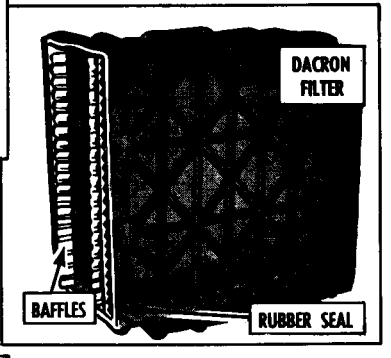


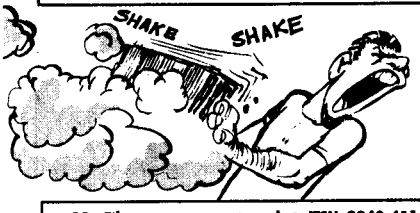
10. With your hand over blower outlet, feel if there is an air blast. If motors are not operating, check the electrical connections. Tell your company mechanic if you can't locate the trouble, or if the connections are tight and there is still no air.

11. Air cleaner door gasket makes tight seal? Replace if needed.

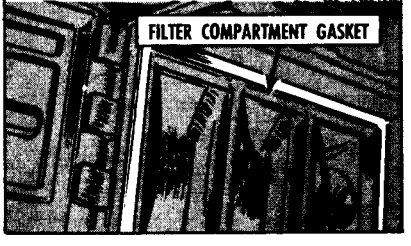


12. Take out filter assembly element and make sure both the dacron filter port and the rubber seal surface are clean and in good shape. Replace if damaged. Order a new one as Element, air cleaner filter, FSN 2940-678-4701. Before taking out the baffles, examine the element carefully for small holes. With the baffles out, hold the element by the gasket end and shake out the dust. Remove the remaining dust either with a low-pressure air hose or by washing. Warm or cold water can be used, either alone or mixed with a non-sudsing detergent. Be sure element is completely dry before reassembling. Never steam clean the element.

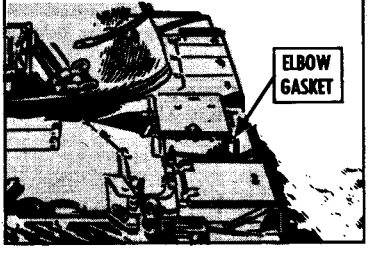




13. Filter compartment gasket (FSN 2940-411-2060) loose or damaged? Replace if needed.



14. Check for air leaks around elbow gasket.

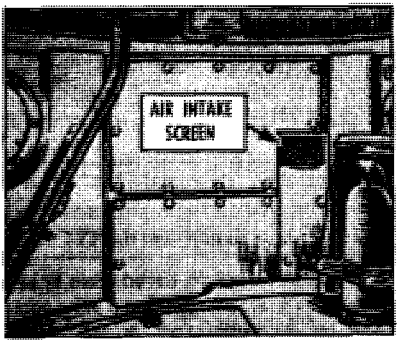


TRAVERSING GEAR BOX

Breather vent — Remove, clean and inspect the breather on your traversing gear box quarterly. It is FSN 4730-591-3405. See your LO for the way to do this.

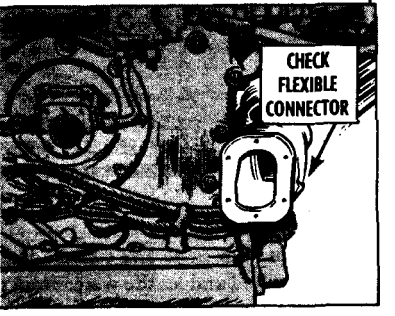
GENERATOR AIR INTAKE

Check your generator blower every time you start your engine.

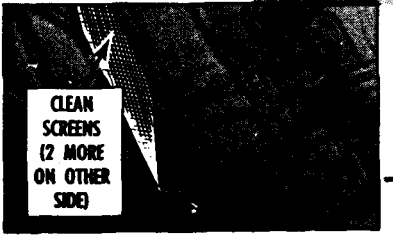


1. Hold a piece of cloth or paper in front of the air intake screen. If the material is not sucked against the screen, stop the engine and call your mechanic. That way you'll save your generator from overheating and burning out when the generator blower has quit on you.

2. If the mechanic should forget to reconnect the flexible connector of the generator duct after a power pack has been replaced, the blower motor could be running, drawing in dirt and dust even though there'd be no suction on the air intake screen. The blower would overheat and fail, and the generator would burn up, too. So, even in that case, the fact that there was no suction at the generator air-intake screen would tell you something was wrong . . . so, call the mechanic and save your generator.



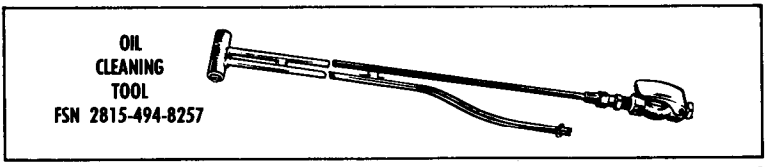
RADIATORS AND SCREENS



Clean the 4 oil cooler radiators and screens as often as you need to. In dusty conditions this may be weekly or even daily if you are operating where there are tall weeds with lots of seed pods. Quarterly (Q) service cleaning is just not often enough to hack it.

PS MORE

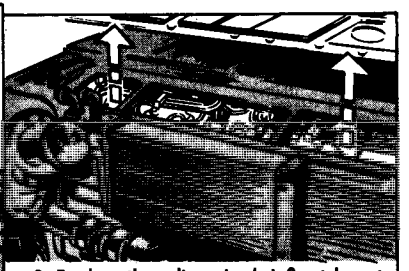
Use steam or water under pressure the way it says on page 2-213 of TM 9-2350-215-20 (Feb 65) making sure no water or crud gets in the oil cooler openings. Better yet, use oil cleaning tool, FSN 2815-494-8257.



Remember, these coolers take care of all the heat from the transmission and half of the heat from the engine so they need plenty of tender lovin' care.

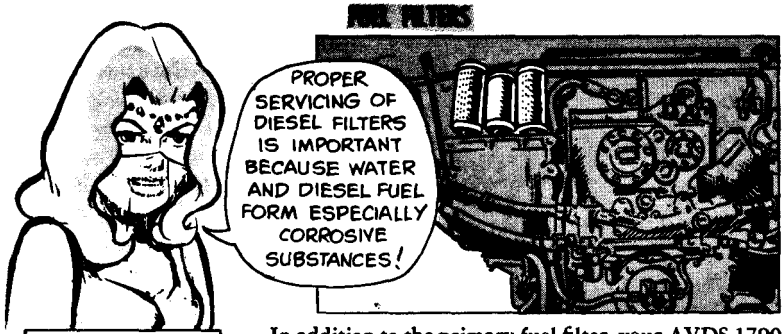
Here's how to give 'em the TLC they need:

1. Take off the radiator (cooler) screen by unscrewing the 4 cap screws and clean it with a paint brush and drycleaning solvent, or soapy water. (Note: If you let the screen get clogged, then dust and dirt pass through the space between the screen and the cooler, and the cleaning job is tougher.)



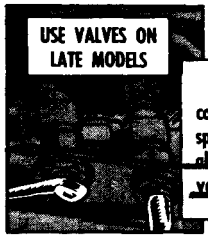
2. To clean the radiator (cooler) fins take out the access plates — one behind each cooler — in the cooling shroud. Using steam or high pressure water, hose down the cooler from the engine side. The best time to do this is when you have the power pack out for the quarterly PM services.

If you're doing it with the pack in place, you need to take off the engine compartment floor plate and run the front roadwheels up on a ramp. This will raise the front end and let the water from the washing drain out the floor plate hole.



In addition to the primary fuel filter, your AVDS 1790 engine will have either a 2-element secondary fuel filter or the newer 3-element fuel/water separator filter. It will also have a manifold heater fuel filter and a fuel injector pump filter.

Daily draining of fuel filters can prevent fuel system damage. (If you drain before operation, all the droplets of water will have a chance to settle out of the fuel, but if you drain right after operation some of the water will still be suspended in the fuel.)



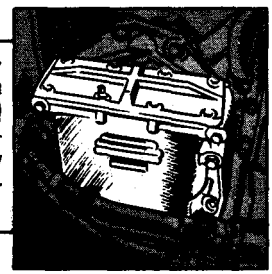
1. Primary Fuel Filter — Drain daily, drawing the water and dirt into a container until the fuel runs clean. Use the drain cock on early models and spring-loaded valve on late models. If MWO 9-2300-382-20 (Jan 68) has not already been applied, get your friendly tracked vehicle mechanic to do it for you. This gives drain lines for both primary and secondary fuel filters.

- He will also help with quarterly (Q-service) or 750 mile filter cleaning and reassemble brass disk filters with a new gasket. After the initial issue brass disk element becomes damaged, it's replaced with the disposable element that comes in filter parts kit, FSN 2815-808-2407.

2. Secondary Fuel Filter — Service like primary. The filter parts kit is FSN 2910-967-9870. . . .

OR . . .

Fuel/Water Separator Filters — Drain daily thru the drain tube. Replace 2 outer elements quarterly (Q-service) or 750 miles. Parts kit is FSN 2910-801-1152. Replace center element annually . . . FSN 2815-808-2421 . . . organizational service.

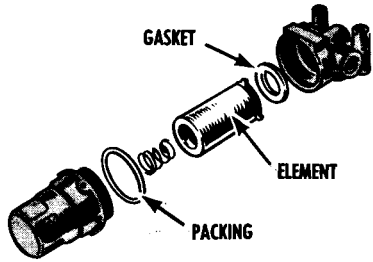


PS MORE

When all elements of the fuel/water separator have been removed for replacement, remove fuel line and clean the inside of the filter housing with dry-cleaning solvent or mineral spirits paint thinner and a brush. If any sludge or gum has accumulated, scrape it off.

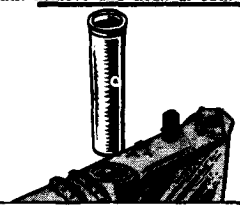
3. **Manifold heater fuel filter** — Service quarterly. Clean bowl, element and spring with mineral spirits paint thinner or drycleaning solvent. Blow dirt out of element with compressed air. Replace element if damaged.

Element is FSN 2910-203-3322. If a new element is used or the old element is cleaned and replaced, you'll need a new preformed packing, FSN 5330-265-1089. The gasket is issued with a new element and has no FSN of its own. So, if you re-use an old element, save its gasket.



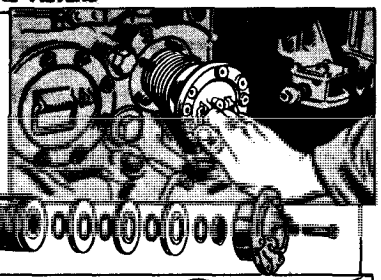
4. **Fuel primer filter** — If you have an M48A3 tank with serial number from 601w to 726w you'll have a filter on the fuel primer line that will be identical with the manifold heater fuel filter. Service it the same way. This applies only to the M48A3. The other vehicles don't have this extra filter.

5. **Fuel tank strainers** — Metal screen strainers, FSN 2910-886-5854, in left and right fuel tank filler necks. Remove and clean at each O-service.

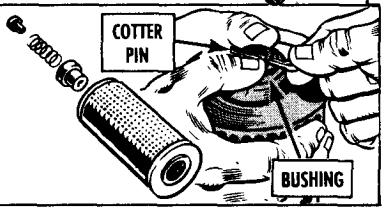


ENGINE OIL FILTERS

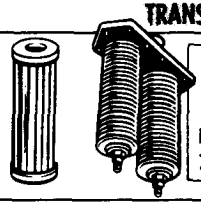
1. **Main oil filter** — Wash in drycleaning solvent or mineral spirits paint thinner. Dry metal screens (elements) with low-pressure compressed air at the O-service. Individual metal screens can be ordered as FSN 2940-939-7123. You need a spacer between each metal screen. FSN 5340-737-4145 gets you one.



2. **Auxiliary oil filter** — When you take this apart for replacing the element and clean-up of the other parts be real careful because the spring is up tight and the bushing will shoot out when you pull the cotter pin. Change the oil filter element quarterly. FSN 2940-884-4801 gets you the parts kit for the job.

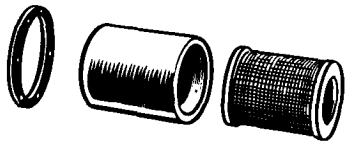


TRANSMISSION OIL FILTERS



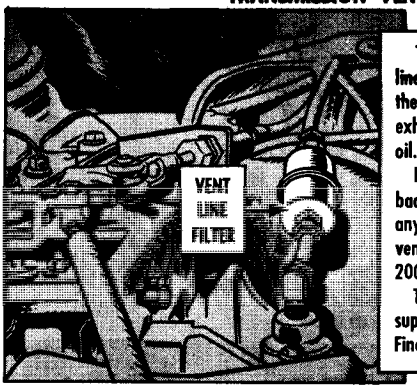
1. **Main oil filter** — Remove and clean quarterly. You may have the metal mesh type FSN 4330-770-7862 issued with the vehicle or the new reusable replacement filter FSN 2520-761-1983. Only the new type can now be ordered for the CD 850-series transmissions.

2. **Side Oil Screen** — Clean and inspect this whenever the power pack is removed and the transmission drained. If you need a new one ask for FSN 2520-679-4499. This includes most of the necessary gaskets, but not gasket FSN 2520-102-3651 of which you'll need 2.



PS MORE

TRANSMISSION VENT FILTER



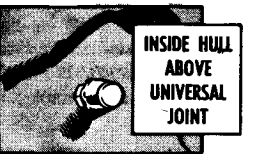
1. Some M60A1 tanks have a filter on the vent line that runs from the top of the transmission to the engine exhaust. This was designed to keep exhaust carbon from getting into the transmission oil.

However, if the filter gets plugged up it causes back pressure on the transmission. If it is giving you any trouble, replace the line and filter with ordinary vent line without filter. Bulk vent line is FSN 4710-200-0277.

The filter is neither required nor stocked in the supply system. If it is doing good work for you . . . Fine! If not, replace it with ordinary vent line.

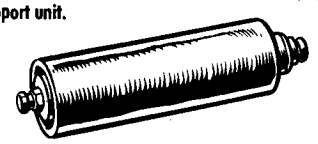
FINAL DRIVE BREATHERS

Clean the breather valve on both final drives every O-service. If you need a new one, it's FSN 4820-537-8931.



HYDRAULIC POWER PACK

1. **Filter** — Reservoir oil filter assembly, FSN 2520-566-3841, is cleaned when the power pack is disassembled for repair or overhaul by your support unit.



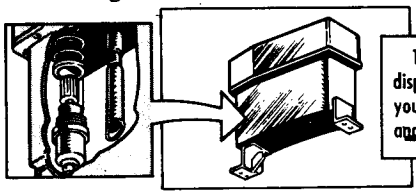
2. **Strainer** — You clean the metal mesh hydraulic power pack strainer, FSN 2590-566-3816, when it needs it.

BULLDOZER KIT?

If your M60/M60A1 tank is equipped with the M9 bulldozer kit, (or your M48A3 tank has the M48A3 bulldozer kit) it means one more thing to check. On the M60/M60A1 tank with M9 bulldozer, there is a filter, FSN 2590-806-1127, in the reservoir. The M48A3 tank with M8A3 bulldozer has a screen assembly, FSN 2590-656-3615, instead of a filter. Whether you have a filter or a screen it is cleaned annually or whenever the hydraulic fluid reservoir is drained.

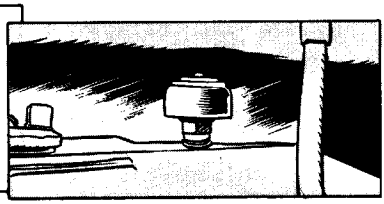
M728 COMBAT ENGINEER VEHICLE

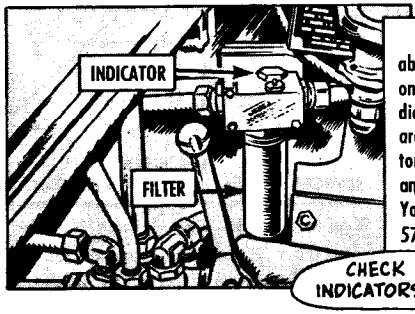
If you've got an M728, everything you've read so far applies, plus you have these extra goodies . . .



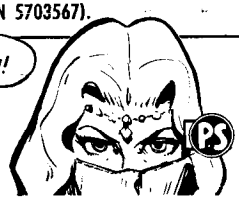
1. **Equilibrator manifold filter** — Change this disposable filter annually. FSN 1650-554-7430 gets you a new one. See Note 14 in LO 9-2350-222-12 and Page 2-597, (fig 2-322), in TM 9-2350-222-20.

2. **Hydraulic reservoir breather** — There's nothing in your TM 9-2350-222-20 about this breather and no service interval is listed anywhere. However, the breather should be cleaned annually or coordinated with the seasonal reservoir oil change. See note 15 in LO 9-2350-222-12 (June 69) for services on the reservoir.





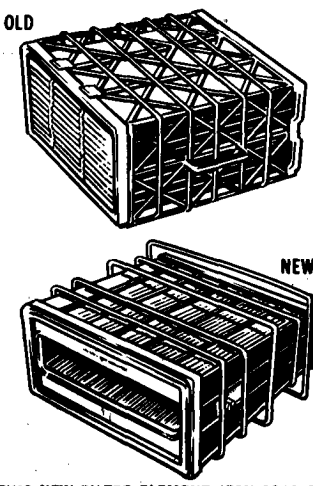
3. **Hydraulic line filters** — These are 2 disposable filters, one for forward hydraulic lines and one for rear hydraulic lines. You check the red indicator at top of each filter daily. (If the indicators are up, reset. Operate the system and if the indicator won't go down, service the filter.) At time of annual hydraulic reservoir drain, replace the filters. You'll need parts kit, filter element, FSN 2590-229-5723 (P/N 5703567).



NEW TANKS... NEW AIR CLEANERS

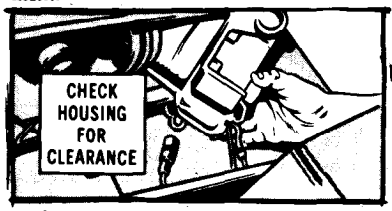
M60A1 tanks, M728 CEV's and bridge launchers now coming off the assembly line have a different air cleaner.

The filter element, FSN 2940-070-1112 is built in one piece, comes out through the top instead of the side, and is bigger than the present side-loader air cleaner.

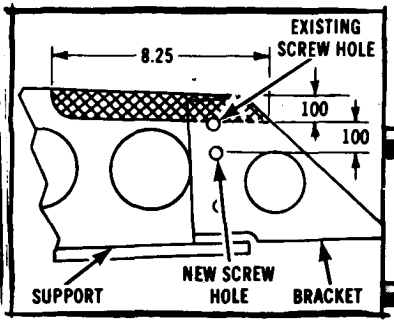


THIS NEW FILTER ELEMENT (FSN 2940-070-1112) WON'T BE READY AS A REPAIR PART TILL JULY 1972

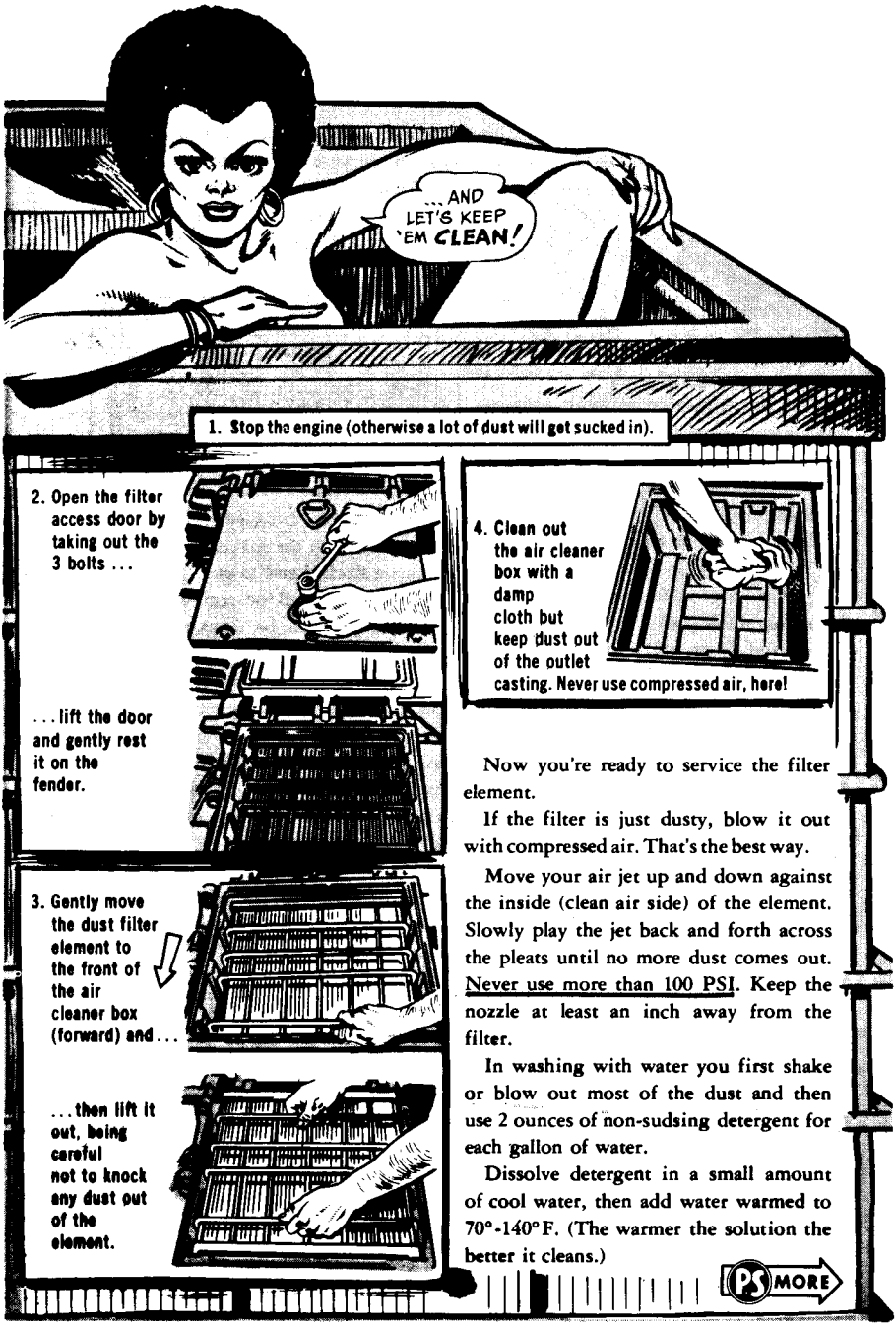
With the bigger filter, the blower motor (the same one you have now) sometimes hits the top inside edge of the cleaner housing and the top of the fender support when removing it for replacement.



If this happens, get your happy hull mechanic to cut the support and bracket and relocate the bolt like this:



You service the new element like the present filter ... either by blowing out the dust with compressed air or by washing the element in water.



Now you're ready to service the filter element.

If the filter is just dusty, blow it out with compressed air. That's the best way.

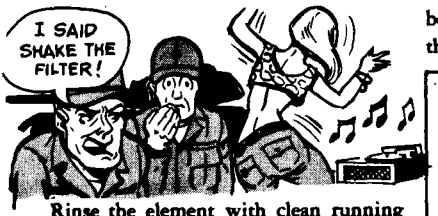
Move your air jet up and down against the inside (clean air side) of the element. Slowly play the jet back and forth across the pleats until no more dust comes out. Never use more than 100 PSI. Keep the nozzle at least an inch away from the filter.

In washing with water you first shake or blow out most of the dust and then use 2 ounces of non-sudsing detergent for each gallon of water.

Dissolve detergent in a small amount of cool water, then add water warmed to 70°-140°F. (The warmer the solution the better it cleans.)

PS MORE

Soak the dust filter element in this solution for 15-20 minutes then gently shake it in the solution 2-3 minutes.

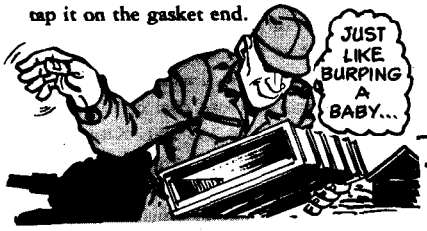


Rinse the element with clean running water directed on the clean air side. (If you use a hose keep the pressure at 40 PSI or below so's not to rupture the filter material.)

The element must be completely rinsed and then thoroughly dried before further use. (Not over 180°F temperature if circulating air is used.)

Soap and water is OK if you can't get detergent but the results won't be as good.

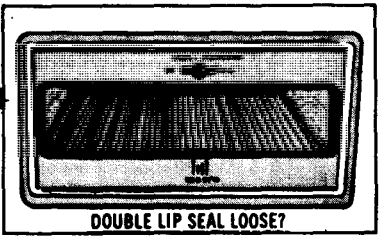
In an emergency, you can give the dust filter a partial cleaning by gently tapping it with the palm of the hand. (The key word is gently.) You don't bang the filter against some solid object and you don't tap it on the gasket end.



Course, like you already know, you never, but NEVER, clean the filter in gasoline or other solvents.

Inspect the filter for damage after cleaning. (A light placed inside the element can help you see if the filter is ruptured.)

Replace the element if you see any holes or ruptures. You also replace it if the double lip seal is loose or damaged because you get rapid engine wear if there's any leakage past this seal.



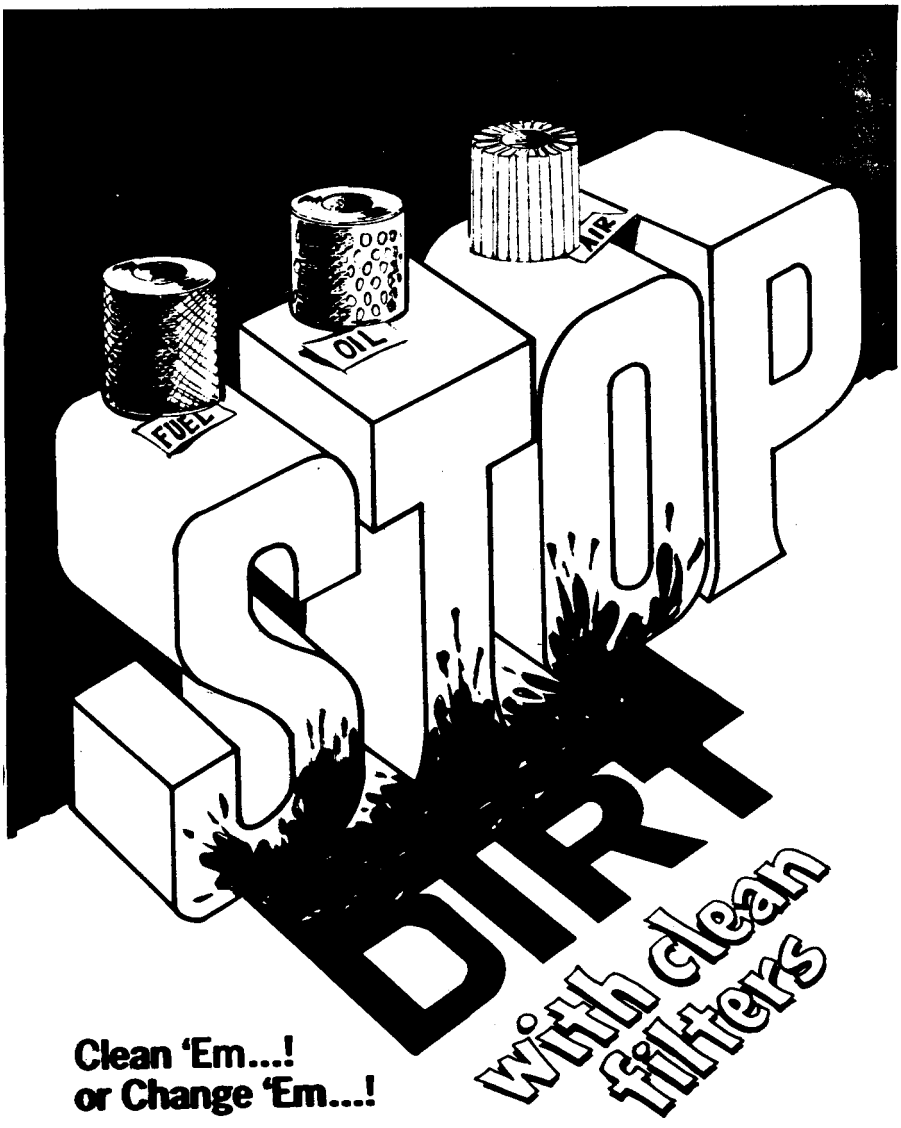
Seals can be damaged if stored or transported with the seal down or if elements are stacked end to end.

When you install or remove the element, the seal can be damaged if it is rubbed against the door seal.

To keep this from happening during installation you lower the element to the bottom of the housing before sliding it toward the door seal, where it must be positioned so the locking arms on the air cleaner door will engage with the filter element pins.

Likewise, when you remove the element, you first slide it back so the element seal and the door seal are no longer in contact.

You service the air filter element quarterly or every 750 miles of tank operation. Do it sooner if you notice loss of engine power or heavy exhaust smoke.



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Distribution:

To be distributed in accordance with DA Form 12-37, Operator maintenance requirements for Tank Combat Full Track, 90MM, M48A3, 105 MM, M60, M60A1 and Combat Engineer Full Track M728.

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RECOMMENDED CHANGES TO EQUIPMENT TECHNICAL PUBLICATIONS

THEN...JOT DOWN THE DOPE ABOUT IT ON THIS FORM. CAREFULLY TEAR IT OUT, FOLD IT AND DROP IT IN THE MAIL.

SOMETHING WRONG WITH PUBLICATION

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PUBLICATION NUMBER	PUBLICATION DATE	PUBLICATION TITLE

BE EXACT PIN-POINT WHERE IT IS

PAGE NO.	PARA-GRAPH	FIGURE NO.	TABLE NO.

IN THIS SPACE, TELL WHAT IS WRONG AND WHAT SHOULD BE DONE ABOUT IT.

PRINTED NAME, GRADE OR TITLE AND TELEPHONE NUMBER	SIGN HERE

TEAR ALONG PERFORATED LINE

DA FORM 1 JUL 79 2028-2

PREVIOUS EDITIONS ARE OBSOLETE.

P.S.--IF YOUR OUTFIT WANTS TO KNOW ABOUT YOUR RECOMMENDATION MAKE A CARBON COPY OF THIS AND GIVE IT TO YOUR HEADQUARTERS.

THE METRIC SYSTEM AND EQUIVALENTS

NEAR MEASURE

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

WEIGHTS

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

LIQUID MEASURE

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

SQUARE MEASURE

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

CUBIC MEASURE

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

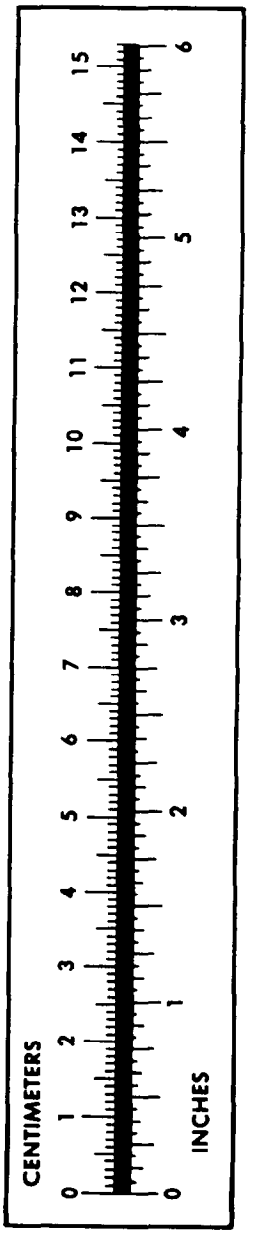
TEMPERATURE

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

APPROXIMATE CONVERSION FACTORS

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

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



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