

Issue 443

PS

October
1989

TB 43-PS-443

THE PREVENTIVE MAINTENANCE MONTHLY



COLD WEATHER

TO GET A WARM
START ON **COLD WEATHER**,
ORDER THESE **PUBS**
AND **POSTERS**:

PUBS/POSTERS	SUBJECT
DA Pam 360-843	Commanders Call—Cold Injuries Films
FM 1-202	Environmental Flight
FM 9-207	Operation and Maintenance of Ordnance Materiel in Cold Weather (0°F to -65°F)
FM 31-70	Basic Cold Weather Manual
FM 31-71	Northern Operations
SB 9-16	Personnel Heater, Winterization Kit Policy (Construction and Materiel Handling Equipment)
SB 11-6	Primary Battery Supply Data
SB 11-30	Primary Battery Management Data
SB 11-576	Cold Weather Batteries for AN/PRC Radios and Cold Weather Cable Assemblies for AN/PRT-4 Transmitting Set and AN/PRR-9 Receiving Set
TB Med 81	Prevention, Symptoms and Treatment of Cold Injuries
TB 750-651	Use of Antifreeze Solutions and Cleaning Compounds in Engine Cooling Systems
TC 11-6	Grounding Techniques
TC 21-3	Soldiers Handbook for Individual Operations and Survival in Cold Weather Areas
TM 9-247	Materials Used for Cleaning, Preserving, Abrading and Cementing Ordnance Materiel
TM 9-2540-205-24&P	Personnel Heaters for Combat Vehicles
TM 9-6140-200-14	Lead-Acid Batteries
TM 750-254	Cooling Systems—Tactical Vehicles
DA Poster 750-71	Engine Coolant Up-To-Snuff?
DA Poster 750-76	Give Your Batteries a Full Life

PUBS & POSTERS

FOR
POSTERS,
HAVE YOUR
PUBS PERSON
SEND IN A
DA FORM
4569.



THE
PREVENTIVE
MAINTENANCE
MONTHLY

TB 43-PS-443, The Preventive Maintenance Monthly, is an official publication of the Department of the Army, providing information for all soldiers assigned to combat and combat support units and all soldiers with unit maintenance and supply duties. All information published has been reviewed and approved by the agency responsible for the equipment, publication or policy discussed. Application of the information is optional with the user.

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You are invited to send PS your ideas for improving maintenance procedures, questions on maintenance and supply problems, questions or comments on material published in PS. Just write to:

MSG Half-Mast
The Preventive Maintenance Monthly
Lexington, KY 40511-5101

By Order of the Secretary of the Army:

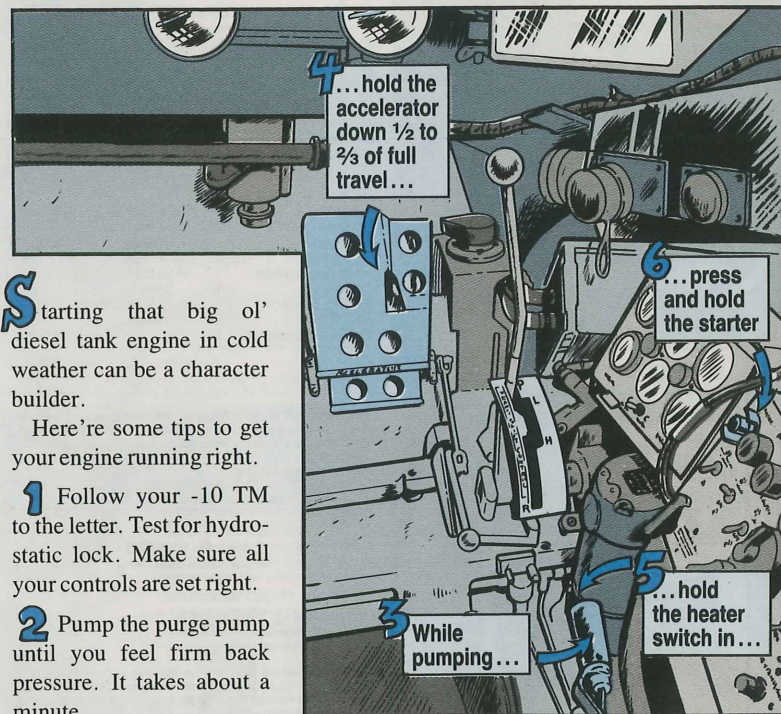
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It's the Start That Counts



Starting that big ol' diesel tank engine in cold weather can be a character builder.

Here're some tips to get your engine running right.

1 Follow your -10 TM to the letter. Test for hydrostatic lock. Make sure all your controls are set right.

2 Pump the purge pump until you feel firm back pressure. It takes about a minute.

7 If the engine starts, keep pumping the purge pump with steady strokes, holding the manifold heater switch and the engine starter button until the tachometer reads 450–500 RPM.

(NOTE: As long as you use the manifold heater switch and the primer pump, you must continue to hold the starter switch. That's because the starter electrical circuit controls the manifold heater's current.)

Once the engine is running smoothly at about 700 RPM, stop pumping. Release the heater manifold switch and starter button, and increase RPM to 1,000–1,200 for the warmup period.



During warmup and afterward, don't idle at less than 700 RPM. Low-RPM idling causes engine cooling, not heating. When you idle your engine for long periods, use high idle—1,500–1,600 RPM.

If you must idle at a lower speed, watch the exhaust. If you see white smoke, increase RPM to 1,500–1,600. If the engine misfires or blows heavy blue-white smoke, you'll have to blow out the induction and exhaust systems.

To do that, increase RPM to 1,600–1,800 for about 30 seconds to one minute. CAUTION: Stop the engine fast if the power plant warning light comes on.

If the engine won't start, stop cranking after 15 seconds. Wait 3–5 minutes and try again. If it still won't start, don't grind away on the starter. It'll burn up and you don't need that.

Follow the -10 TM troubleshooting procedures to get the tank started. If that doesn't work, call your mechanic.

START 'EM AND



1 Start and stop your M1 tanks by the book. The -10-2 TM's have the info you need to prevent needless starter damage and reduce fuel nozzle coking.

Here's how the good words will save your tank:

- Pay attention to the starting instructions to save your starter.

If the engine won't start on the second attempt, wait one minute. Then:

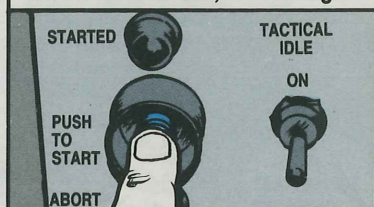
1 Set and hold the **STARTER ONLY** switch to the **ENGAGED** position for 20–30 seconds, then let it go.



2 Wait until the engine stops turning (RPM gage will read 0).



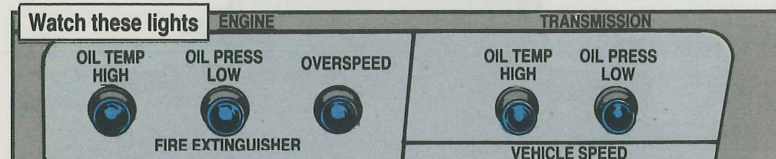
3 Press and hold the starter button for 1–3 seconds, then let it go.



If the engine still won't start, trouble-shoot it. Never grind and grind on the starter.

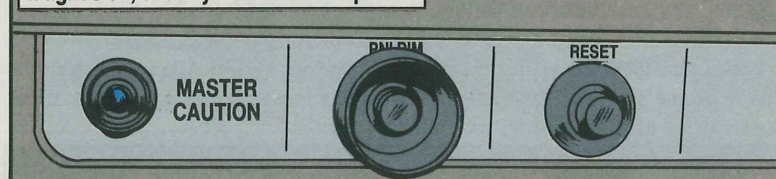
STOP 'EM RIGHT

At shutdown, you follow the TM's again to save your engine. Pay attention to the warning lights for the engine and transmission. Also watch the fire light. If any of them are lit, you've got work to do now, not later.



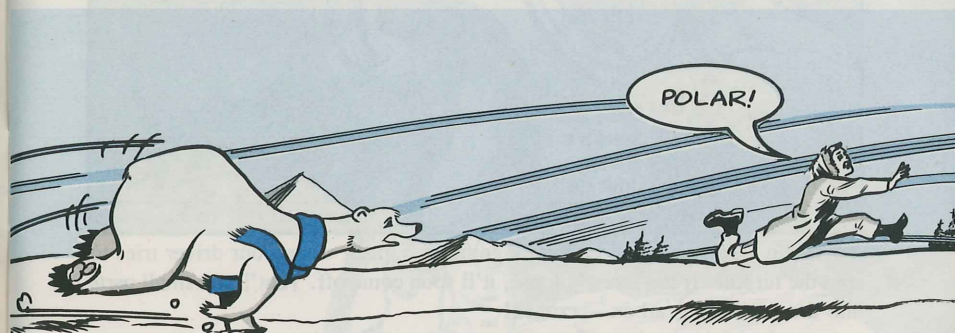
Check the **MASTER CAUTION** light. If it's lit, see where the problem is on the instrument panel and follow TM instructions to fix it.

If light's on, check your instrument panels

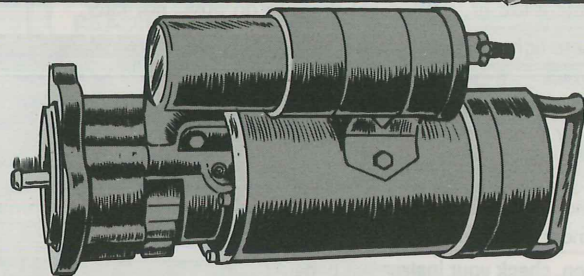


But most of all, let the turbine engine idle for two minutes before shutdown. Never play the "park fast and cut it off" game at shutdown. Idling gives the engine time to cool off enough to prevent heat "soak-back", which can ruin an engine.

More close to home, idling helps prevent coking on the fuel nozzle, which means your tank will start faster and perform better. If the coking is bad enough, your tank won't start—period.

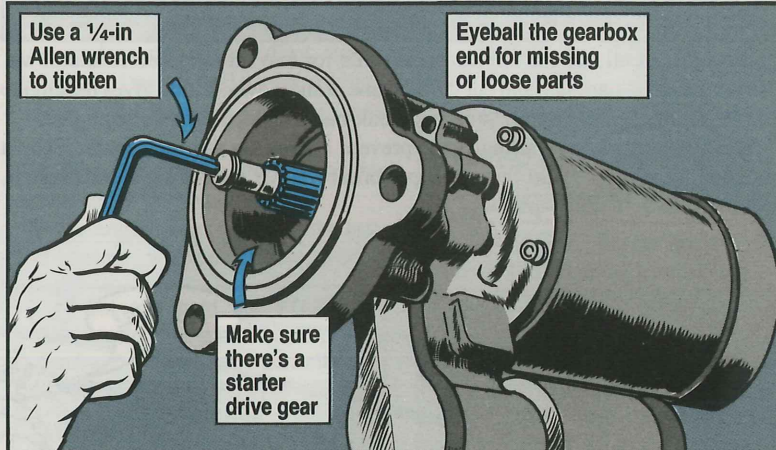


Check New Starter For Parts



Before you install that new or rebuilt starter, NSN 2990-01-276-5733, on your M1-series tank, eyeball the gearbox end for missing or loose parts.

Make sure there's a starter drive gear. If so, put a 1/4-in Allen wrench in the screw on the shaft and try to tighten it. If it's loose enough to turn, or if the starter drive gear is missing, return the starter.



Use a 1/4-in Allen wrench to tighten

Eyeball the gearbox end for missing or loose parts

Make sure there's a starter drive gear

Without a starter drive, nothing's going to happen when your driver tries to start the turbine. If the screw's loose, it'll soon come off. That'll put small parts into the auxiliary gearbox—crunch!

A word to the wise is sufficient... and these things have happened.

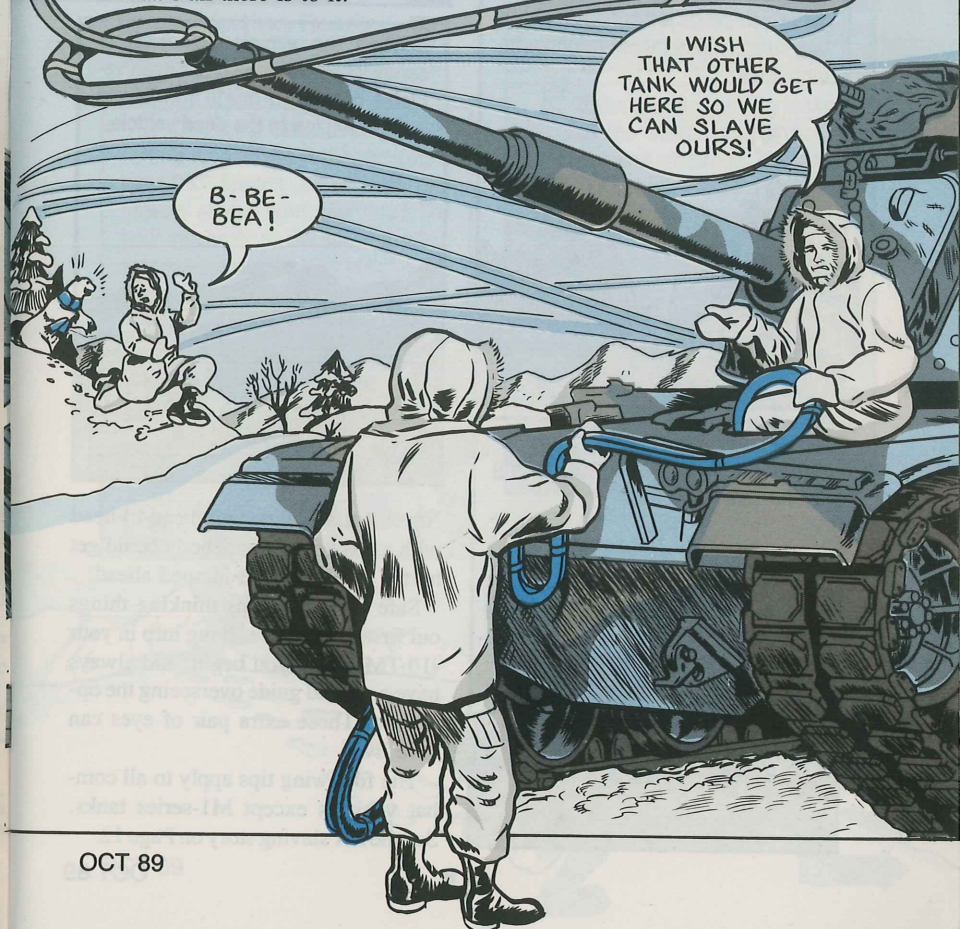
Get It By the Piece

NATO slave cable parts can be ordered as Class IX supply items. This is good news for those units not authorized a Common No. 1 or No. 2 shop set, but who need a cable to slave start vehicles.

Slave cables are safer to use than jumper cables—cables with alligator clips—to help start combat and tactical vehicles with 24-volt electrical systems.

To make a slave cable, order Class IX item NSN 6150-01-022-6004 (a cable with end connectors) and NSN 5935-00-322-8959 (the 2-pin adapter for pre-NATO receptacles—you need 2 of 'em).

That's all there is to it.



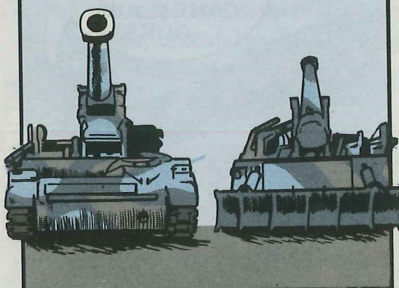
Slave 'Em Right and Safely

Slave-starting tracked vehicles demands that you be very careful. You can be seriously injured or killed when slaving.

The key to slaving is safety—in positioning, in preparation, in hook-up, in starting and in disconnecting.

Positioning

1 For self-propelled howitzers, park 'em side by side facing in opposite directions.



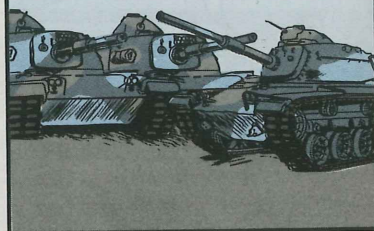
2 For tanks and all other tracked vehicles, park them side by side, facing in the same direction.



WHEN IT COMES TO SLAVING YOUR TRACKED VEHICLE...



3 When the vehicle you want is sandwiched between other dead vehicles, put the live one in front of and at right angles to the dead vehicle.



Never put a live vehicle head-to-head with a dead one—somebody could get hurt if either vehicle jumped ahead.

Safe slaving means thinking things out first. Study the slaving info in your -10 TM before you begin, and always have a ground guide overseeing the operation. Those extra pair of eyes can save lives.

The following tips apply to all combat vehicles except M1-series tanks. See the M1 slaving story on Page 12.

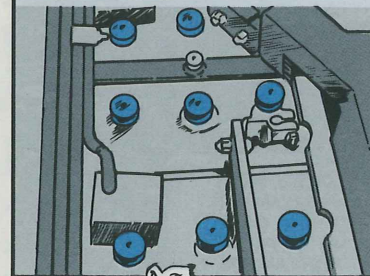
...SAFETY IS THE KEY!



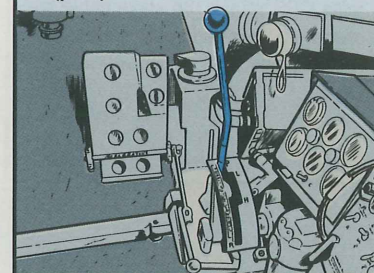
Getting Ready

There are three things you must do before you hook up the cable:

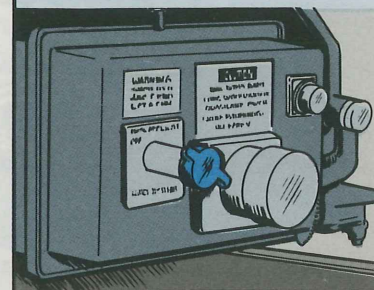
1 Check the batteries of the dead vehicle for damage. Is the electrolyte level OK? Are the cables, leads and ground straps tight and firm? Get your mechanic on the scene to make any needed repairs.



2 Make sure both vehicles are in P (park).



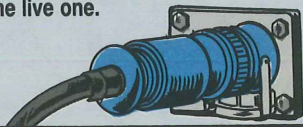
3 Make sure the parking brake is set and the master switch and all electrical and electronic equipment switches in both vehicles are OFF.





Hook-Up

With master switches in both vehicles OFF, attach the slave cable securely to the dead vehicle first, then the live one.



If you have time, charge the batteries in the slaved vehicle for 15 minutes before you try to start it. Do it this way:

1 With the slave cable installed, start the live vehicle and set the engine idle to 1,000–1,200 RPM.

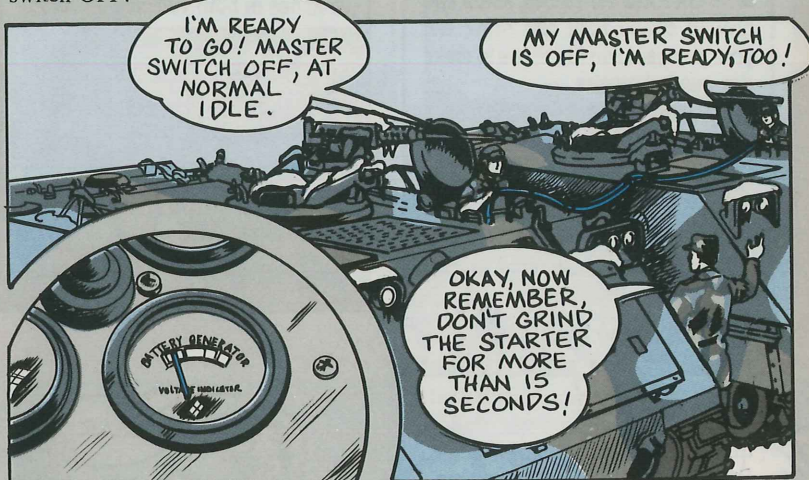
2 Leave the master switch OFF in the dead vehicle during this time.

Starting

Ready to start?

1 Run the engine in the live vehicle at normal idle with the master switch OFF. Turn the master switch in the dead vehicle ON and press the start button.

2 If the vehicle starts, get the engine running smoothly, then turn the master switch OFF.



3 If it doesn't start within 15 seconds, release the start button. Check the battery-generator indicator. If the needle's in the red, recharge the batteries and try to start again. If the needle's in the yellow or green, wait 3–5 minutes and start again.

4 Do not grind on the starter for more than 15 seconds at a time or you'll burn it up. If your vehicle won't start after three tries, call in your mechanic.



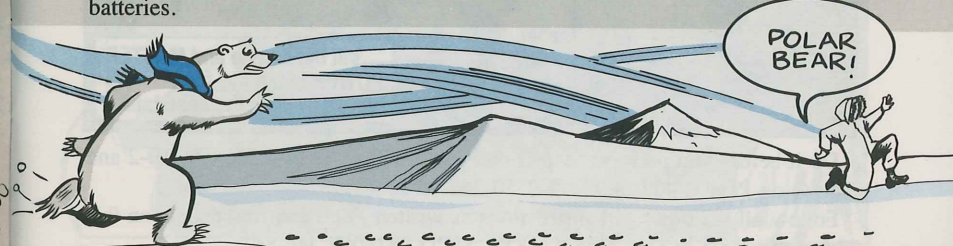
Disconnecting

Once the dead vehicle has been started and is running OK, you've still got to be careful in disconnecting the slave cables.



1 Switch the master switches in both vehicles OFF before you remove the cables. If you don't, you may damage the slave cable connectors and your electrical systems.

2 Once the cables are disconnected, turn the master switches on again. Run both engines at 1,000–1,200 RPM to stabilize generators and build up run-down batteries.



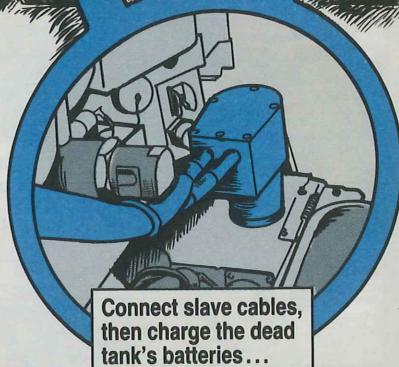
Slave it Right, Save the Generator



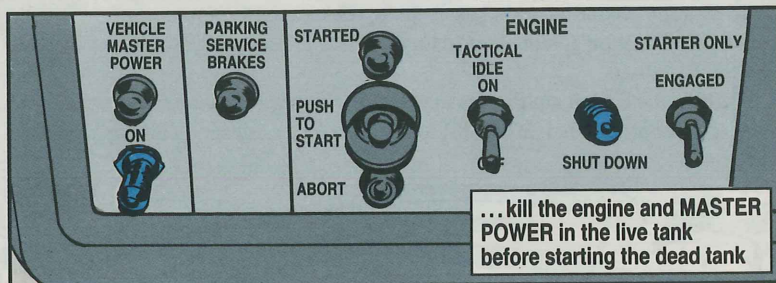
When you get down to it, what separates the best from the rest is performance.

How you perform slave starting procedures on your M1 can put you in that "best" class if you follow the information found in your -10-2 TM's and do this:

☁ Shut down the engine and turn off the master switch in the live tank before starting the dead tank. It'll cut down on generator drive shaft failure.



Connect slave cables,
then charge the dead
tank's batteries...



... kill the engine and MASTER POWER in the live tank before starting the dead tank

Do it before you perform Step O on Page 2-377 of TM 9-2350-255-10-2 and Step O on Page 2-402 of TM 9-2350-264-10-2.

Follow all the other TM instructions as written. You can find details on this TM change in TACOM Msg AMSTA-MCD 281400Z Jan 86.

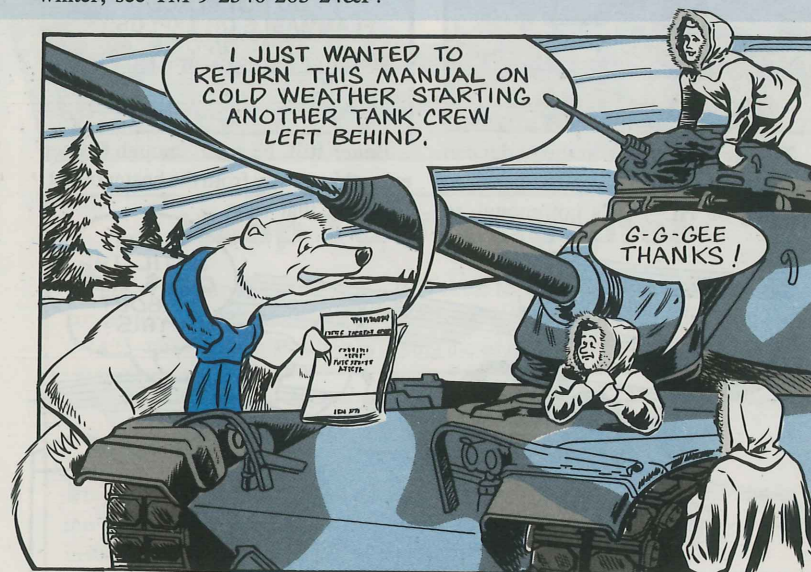
Personnel Heater Igniter NSN's

Check now to see if your combat vehicle's personnel heater needs a new igniter or glow plug.

Here's a handy cross-reference of igniter/glow plug to heater model:

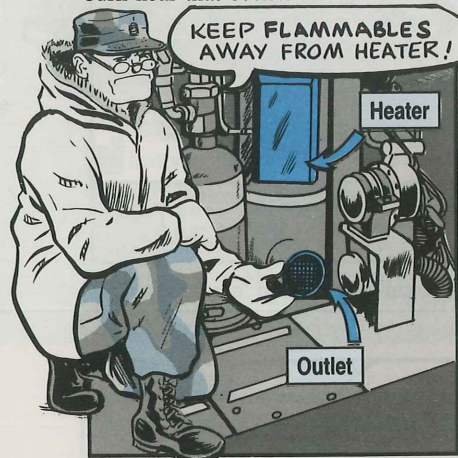
Igniter/glow plug	Heater	
4520-00-790-8417	Stewart-Warner 8460C24	
4520-00-217-5782	Stewart-Warner 10560C, 10560M, 10560M24B1	
2540-01-115-1805	Hupp MF510A, MF510B	
2540-01-167-7248	Hupp MF510C	
2540-12-167-3599	ESPAR V7S	

For more information on personnel heaters and how to keep 'em burning this winter, see TM 9-2540-205-24&P.



Keep the FIRE Inside

You can warm your hands, your backside and your feet near the outlet of your combat vehicle's personnel heater, but never, ever dry powder or store ammo or anything else that can burn near that outlet.



The air temperature at the outlet can reach nearly 300°F when the heater is running on HI. That's hot enough to

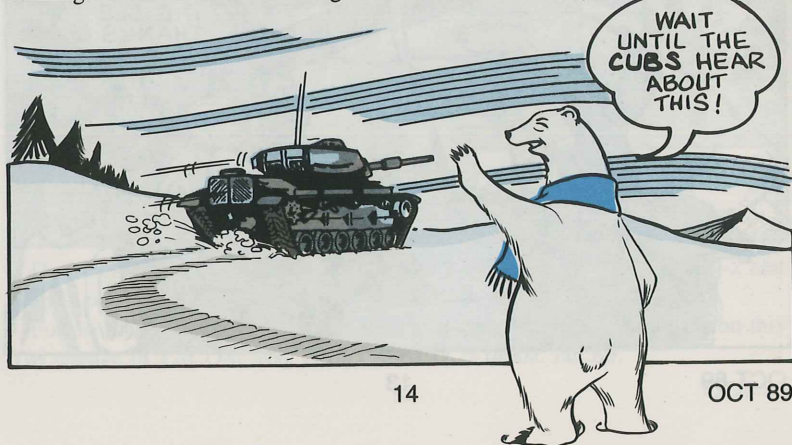
burn most everything in a combat vehicle. And it's definitely hot enough to burn clothes, ammo and powder bags!

'Course, some people have to be convinced, and a couple of M109-series SP howitzer and M992 ammo carrier crews have been taken by surprise when they put stuff that burned or exploded on or near the heater outlet.

There's no reason the rest of you combat vehicle crewmen have to learn the hard way. Pay attention to that new decal at the vehicle operator's controls and the warning in your -10 TM's.

WARNING
DO NOT PLACE
FLAMMABLE OR EXPLOSIVE
MATERIAL ON OR NEAR
VEHICLE PERSONNEL HEATER

Better still, be smart enough to keep everything away from the heater outlet. It's safer that way.



Rubbing Out Corrosion

Dear Editor,

For small spots of corrosion on pistols and machine guns, I've found you can often just rub the spots away with a pencil eraser. That removes corrosion without removing bluing. Then put a little CLP on the spot to keep corrosion from coming back.

SPC Brian Scott
APO San Francisco

(Editor's note: Ah, corrosion! But there's the rub.)



Keep TOW 2 Adapter

Before you turn in the TOW 2's 2W1 cable for repair, unscrew and keep the connector adapter. You won't get the adapter with the new cable. Fig 40 in TM 9-1425-450-24P is misleading in saying the adapter comes with the cable.

Forget M2 Cotter Pin

If your M2 machine gun is missing the cotter pin that goes in the end of the belt holding pawl pin, don't worry about it. As long as the pawl pin's installed right, the cotter pin's not needed.

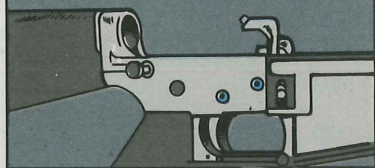
The road to the M16 graveyard is paved with good intentions.

Some soldiers not only clean their rifles like TM 9-1005-319-10 tells them to, but try to help their rifles more by doing extra cleaning. That help hurts.

For instance:

DISASSEMBLING the lower receiver and the firing mechanism for better cleaning. If you push out the receiver pins with the wrong tool, you enlarge the holes. The holes can't hold the pins. The receiver's ruined. If the

Leave receiver pin holes alone



firing mechanism's put together wrong, the rifle can fire automatic when it's not supposed to.

Removing the buttstock can cause problems for the takedown pin



REMOVING the buttstock to clean the lower receiver extension. The takedown pin spring's easily damaged. If the takedown pin spring and detent're not put back right, the takedown pin

HELP THAT HURTS

I WAS JUST TRYING TO GIVE YOU A LITTLE EXTRA!



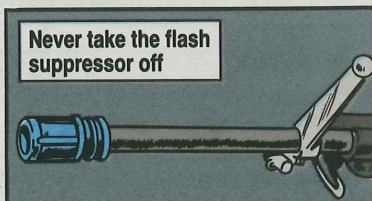
won't lock in and your rifle won't stay together.

If you take the firing mechanism apart, you may get a rifle that fires automatic onSEMI



REMOVING the flash suppressor to clean the barrel. The suppressor has special torque requirements. If it's screwed on too tight, the barrel threads... and the barrel... are ruined. If it's not screwed on tight enough, it can vibrate off.

Never take the flash suppressor off



HELP THAT HURTS

BELIEVE ME, YOU'VE DONE ENOUGH!



GIVING the M16 a bath. Water trapped in tight places corrodes metal parts like the bolt carrier key and forward assist spring.

Trapped water ruins the bolt carrier key



If you want to give your rifle the right kind of help, clean it like Pages 16 thru 34 in TM 9-1005-319-10 (M16A2) or Pages 3-28 through 3-40 in TM 9-1005-249-10 (M16A1) say. Then stop!

If something like the firing mechanism needs special cleaning, tell your armorer.

M9 Pistol...

Stretch to Fit

The M7 is the only shoulder holster available for the M9 pistol. But to make the holster fit the pistol, you'll need to stretch the safety strap like this:

- Soak the strap in warm, soapy water for five minutes.
- Stretch the strap $\frac{3}{8}$ to $\frac{1}{2}$ inch.



Dip strap in warm soapy water to stretch

Put the M9 in the holster. Place a piece of plastic between the strap and the pistol. Snap the safety strap shut.



Let the holster dry overnight with the pistol strapped in

- Seal the strap with neat's-foot oil so it'll stay elastic.



A LITTLE STRETCH WILL DO.

PM Solutions to Cold Problems

PM matters to your mortar in the cold. Without cold protection, your mortar is snowed under by cold problems. Make your mortar matter in the cold like this:

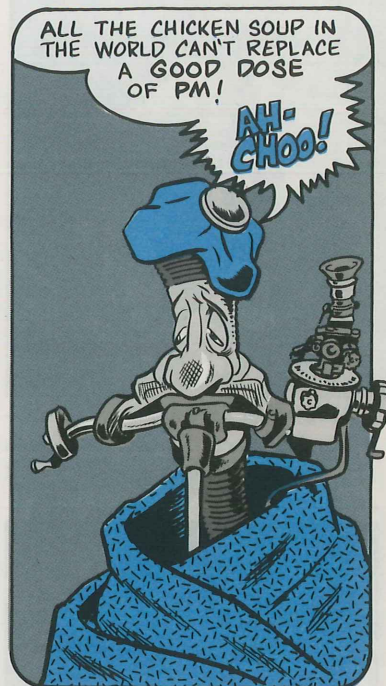
Lube with LAW instead of GPL when the temperature drops below 10°F. LAW stands up to cold better.

Wipe the inside of the bore dry before you go into the cold.



Cover cartridges until they're ready to be fired. That stops ice from coating them.

Keep fire control instruments in their cases. The cases cushion the instruments' delicate optics against the shock of the cold.



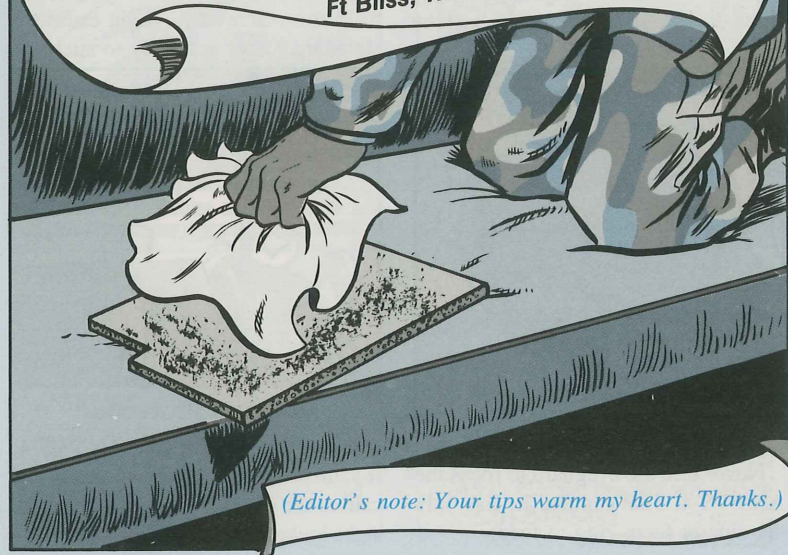
Never bring fire control instruments directly from the cold into someplace warm. That cracks optics and lets condensation form inside the instruments. Leave the instruments someplace sheltered but unheated where they can gradually warm before you bring them inside.

When you bring your mortar inside from the cold, wait at least an hour before cleaning and lubing it. By then the mortar will have stopped sweating from condensation and you can get rid of all moisture.

Hot Tips for Cold Weather

Dear Editor,
Freezing weather puts our Patriot launcher and Engagement Control System (ECS) out of business. Ice clogs the air intake filters and then the launcher and ECS can't get enough air. That shuts down the launcher and causes the ECS computer to crash. We've come up with a simple solution. Every 2 to 4 hours in freezing weather, replace the filters. Warm the used filters inside a truck or some other warm place. As the filters warm up, pat them dry with a rag or sponge. When the filters are dry, they're ready to be used again. Here's another tip: The computer tape for the KG30-124 loader loses its stiffness in wet weather. Then it's impossible to load. We've found that if you warm the tape for 15 seconds on a vehicle dashboard with the defrost on, the tape becomes rigid enough to use.

WO1 Kevin Hargens
WO1 David Stuart
Ft Bliss, TX



(Editor's note: Your tips warm my heart. Thanks.)

Thru a Glass

SEEING CLEARLY IS WHAT IT'S ALL ABOUT WHEN IT COMES TO YOUR NIGHT VISION SIGHT. HERE ARE SOME IDEAS FOR USING AND TAKING CARE OF THE SIGHT.

Guard the daylight cover. Without the cover, sunlight damages the image intensifier tube. One way to keep the daylight cover from disappearing is to put it in your pocket any time you remove it.

If the cover face is hard to move—or moves by itself—tell maintenance. The cover nut needs adjusting. Never force the face to move. You'll bust the cover's stops and seals.

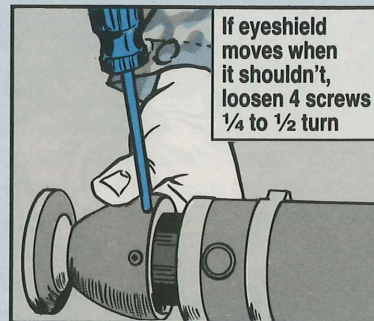


Eyeshield

Never turn the eyeguard to focus the AN/PVS-4. That can tear it. Use only the diopter focus ring to focus.



If the eyeguard moves as you focus, loosen the eyeguard's four screws $\frac{1}{4}$ to $\frac{1}{2}$ turn. Screws too tight cause the eyeguard rotary assembly to stick.



Moisture Protection

Water is poison to your AN/PVS-4. It shorts out electrical components and causes the eyeguard to rot. Protect the sight by keeping it in its case as much

—Clearly

as possible. Be sure to set the case down so its latches point down. That helps the case seal out water better.



If you've been out in the rain, pull the case inserts and look for moisture before you turn in the sight. Mop up any water. Tell your repairman so he can let the case air dry.



M249 MG Bracket

The bracket for mounting the AN/PVS-4 night sight on the M249 machine gun comes with NSN 3040-01-233-0352. Make a note until the NSN is added to TM 11-5855-213-10.

Batteries

If your sight has a weak image or none at all, eyeball the battery assembly for dirt before you call a repairman. Dirt prevents a good contact. Wipe the cap and spring clean. Clean the sight and battery contacts with an eraser.



Always remove the batteries before you turn in the sight. Batteries can leak and damage the sight.



Mounting Bracket NSN

The NSN for the M2 mounting bracket assembly for your AN/TVS-5 night vision sight is in TM 11-5855-214-10-HR, but not in -24&P. Get the bracket with NSN 5855-01-045-5482.



This is a selected list of recent pubs of interest to organizational maintenance personnel. This list was made from a computer print-out provided by the Adjutant General.

TM 9-1005-306-10 Jun M24 sniper weapon
TM 9-1427-475-23P Jun AH-64A helicopter Hellfire missile equipment
TM 9-1430-1528-24P Jun AN/MPQ-55 radar set
TM 9-1450-645-24P Sep MLRS carrier
TM 9-4933-259-14&P Apr M26A1 muzzle boresight and M27A1 muzzle boresight
TM 11-2300-475-13&P-6 Jul 88 MK-2541/GRC-193A installation kit

AMCCOM SOU-MSG-89-12—Operational, Warnings and procedures when M1A1 tank units fire the 120MM main gun, AMSMC-DSM-MG 302020Z Jun 89.

TACOM SOU-MSG-89-43—Advisory, Technical/Maintenance, Halon fire extinguisher valve and bottle assembly maintenance on M1-series tanks, M2 and M3-series FVS and M992 FASV, AMSTA-M 221030Z Jun 89.

TACOM SOU-MSG-89-31—Advisory, Technical/Maintenance, Correct tire pressure for the M931A1, M932A1 5-ton tractors and M929A1 5-ton dump, AMSTA-M 261230Z Jun 89.

TACOM SOU-MSG-89-48—Advisory, Technical/Maintenance, Follow-up to TACOM SOU Messages 89-40 and 89-44, M871 22 1/2-ton semitrailer, AMSTA-M 071600Z Jul 89.

TM 11-5820-950-20P Jul MK-2316/VRC installation kit
TM 11-5825-278-12-3 Nov 88 AN/PRD-1 radio receiver direction finder set
TM 11-5840-355-10-3 Apr AN/TPQ-37(V)1,2,4,5,6 radar sets
TM 55-4920-432-13&P May AVUM and AVIM RPSTL
TB 55-1520-238-20-51 May Replacement life change of canopy removal system components and change to emergency egress procedures for AH-64A
TB 55-1520-242-20-42 May Inspection of NAS1785-8-44 bolts all UH-1H/V and EH-1H/X
SC 5180-99-A01 Jul Tool kit, general mechanics, NSN 5180-00-323-4692 5(LIN W30949)
SC 5180-99-A06 Jul Tool kit, electrical repairer's: Army aircraft NSN 5180-00-323-4915 (LIN W36703)

SC 5180-99-A07 May Tool kit, power plant, aircraft (NSN 5180-00-323-4944) (LIN W38073)
SC 5180-99-A09 Jul Tool kit, aircraft inspection: Technical (NSN 5180-00-323-5114) (LIN W30812)
SC 5180-99-A13 Jul Tool kit, powertrain: aircraft (NSN 5180-00-003-5267) (LIN W49238)

AUDIO-VISUAL STUFF Available at battalion or Post Learning Center

Films, TV Tapes
TVT 9-157 SUSV - Small unit support vehicle M-973 - unit PMCS
TVT 9-158 Snowmobile operator maintenance
TVT 9-144 Remove/install/adjust M1A1 tank zero degree elevation switch

Maintenance & Safety-Of-Use Messages

TACOM SOU-MSG-89-50—Advisory, Technical/Maintenance, Inspection procedures for steering linkage on M60-series tanks, M48A5 tank, M728 CEV, M60A1 and M48A5 AVLB, and M88A1 recovery vehicle, AMSTA-M 122100Z Jul 89.

TACOM SOU-MSG-89-36—Advisory, Technical/Maintenance, Maintenance procedures for M172A1 semitrailer, NSN 2330-00-317-6448, AMSTA-M 211200Z Jul 89.

TROSCOM Maintenance Advisory MSG 89-34—Replacement round-head bolt NSN for the type V cargo air delivery platform, AMSTR-MES 211315Z Jul 89.

TROSCOM Maintenance Advisory MSG 89-30—Disposition instructions on the arming wire, NSN 4010-00-431-8490, used on the M-1 and M-2 cargo parachute release, AMSTR-MES 121330Z Jun 89.

TROSCOM Maintenance Advisory MSG 89-31—Disposition of the clevis, NSN 4030-00-432-2516, used on air delivery cargo parachute, AMSTR-MES 121345Z Jun 89.

TROSCOM SOU-MSG-18-89—Operational, Equipment failure on closed circuit refueling (CCR) nozzle, NSN 4930-01-194-2625, on FARE (part of CH-47C and CH-47D), AMSTR-MES 271315Z Jul 89.

Your Direct Support or Logistic Assistance Office (LAO) can provide you with more information.

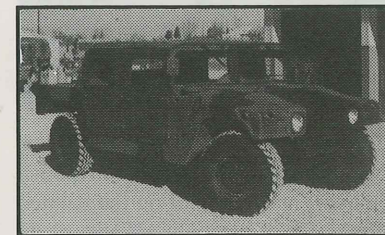
CARC SPOT PAINTING

More and more equipment is being painted with Chemical Agent Resistant Coating (CARC). It has big advantages over the older alkyd paint.

It lasts up to four times longer than alkyd paint if put on properly. Similar polyurethane paints are used on your car, commercial machinery and bridges—anywhere a tough, durable finish is needed.

It provides a surface that resists the penetration of chemical agents. They just bead up on it, like water on a newly waxed car. That makes for quick, complete decontamination and shorter times at MOPP-4!

The main word to remember is RESISTANT. CARC resists chemical agents. It does not soak up chemical agents the way alkyd paint does.



It is as easy to apply as alkyd paint. Both require similar surface preparation.
 It is as safe to use as any other paint when you take the appropriate safety measures. CARC's topcoat is like paint that's been used by private industry for years.

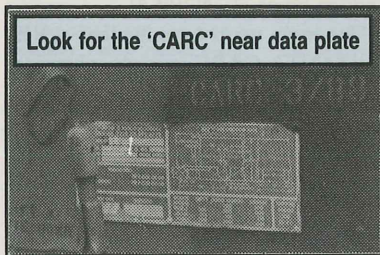


CARC—The System

The CARC system is a combination of pretreatments, primers and topcoats. After surface preparation and pretreatment, exteriors of vehicles are painted with an epoxy primer, then with a polyurethane topcoat. The interior of hull-type vehicles gets an epoxy enamel over the epoxy primer.

Most equipment painted in the new 3-color camouflage pattern wears CARC. Equipment painted with CARC should have "CARC" stenciled near the data plate.

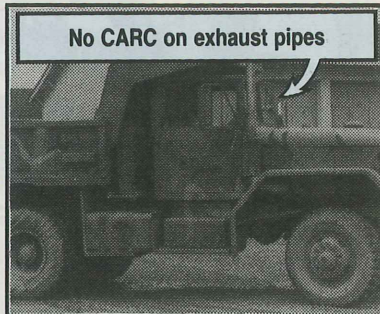
Look for the 'CARC' near data plate



If you don't see it stenciled, wet a cloth with acetone (fingernail polish remover) and rub hard on the painted surface for 10 seconds. Wet a clean corner of the cloth with acetone and rub another 10 seconds in the same spot. If no paint comes off the second time, it's CARC. (The first wipe may remove overspray and make you think it's not CARC.)

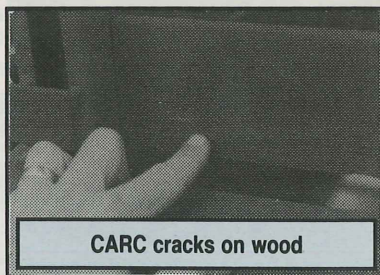
Use only CARC when you have to spot paint equipment painted with CARC. Likewise, use only CARC for adding unit identification markings (bumper markings). Using alkyd paint for this gives you areas where chemical agents will be retained.

No CARC on exhaust pipes



CARC is NOT used on fabric, metals that have anodized or parkerized finishes (like weapons) or hoses or other flexible surfaces. It is not used on exhaust pipes, turbochargers, cooling fins or other surfaces that conduct heat or get above 400°F. If you're not sure whether to use CARC on a particular surface, check with your local Logistics Assistance Representative at the Logistics Assistance Office.

CARC cracks on wood



CARC won't protect wood. Wood expands and contracts with weather changes. CARC does not. It isn't flexible enough to move with the wood, so it cracks and can peel off. Follow the word in Para 3-5e of TM 43-0139 to protect wood.

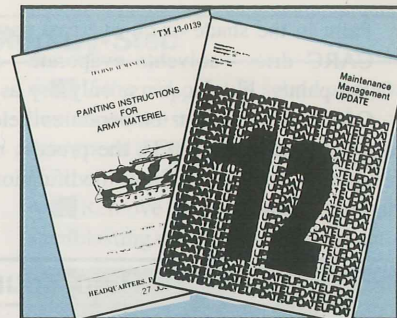
The Word

The word on using CARC is in Para 3-41 of AR 750-1 in Maintenance Management UPDATE 12. Camouflage pattern painting is covered by Para 4-1d of TM 43-0139.

The AR limits unit-level painting to touch-up or spot painting using a brush or roller—no complete repainting! That goes for all paints, not just CARC.

Complete repainting—using any kind of paint—is only done at General Support and depot level maintenance facilities with paint booths meeting OSHA standards.

When you're touching up a camouflaged surface, try to repaint using the original camouflage pattern. The pattern was designed to best camouflage the equipment.



Pubs You Need

TM 43-0139, Painting Instructions for Army Materiel, explains each of the primers and topcoats available and how to mix and use them.

You need a copy of Technical Guide 144, Guidelines for Controlling Health Hazards in Painting Operations. It covers health precautions needed when using any paints. Get a copy from:

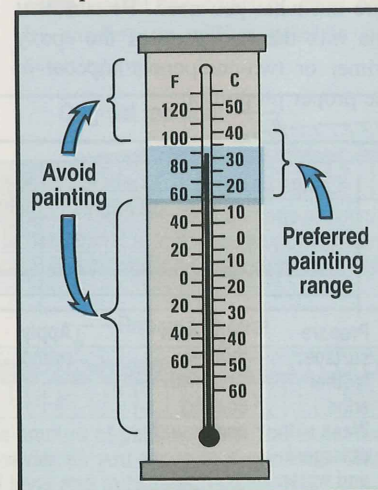
Commander
USA Environmental Hygiene Agency
ATTN: HSHB-CI-O
Aberdeen Proving Ground, MD
21010-5422

For more pubs, see pages 37 and 38.

Check with the Preventive Medicine office, too. They can advise you on hazards involved in painting operations and precautions to take.

Conditions for Painting

Paint when the temperature is between 60° and 100°F. The ideal temperature is 75-80°F with a humidity of 45-50 percent.



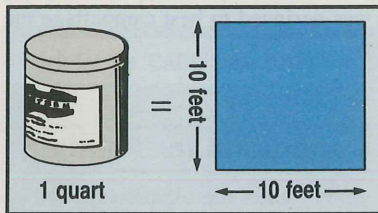
Paint in the shade or on overcast days, never in the sun.

CARC dries—solvents evaporate—and then cures—a chemical reaction. Other paints, like lacquers, only dry as the solvent evaporates.

CARC will cure at temperatures below 50°F, but it takes much longer. At temperatures over 100°F, the process must be modified so the solvents don't evaporate too fast. Without modification, the CARC won't stick, and you have to start all over.

Plan Your Painting

Mix up only as much paint as you need. A quart of polyurethane topcoat, epoxy primer or epoxy enamel will cover about 100 square feet.



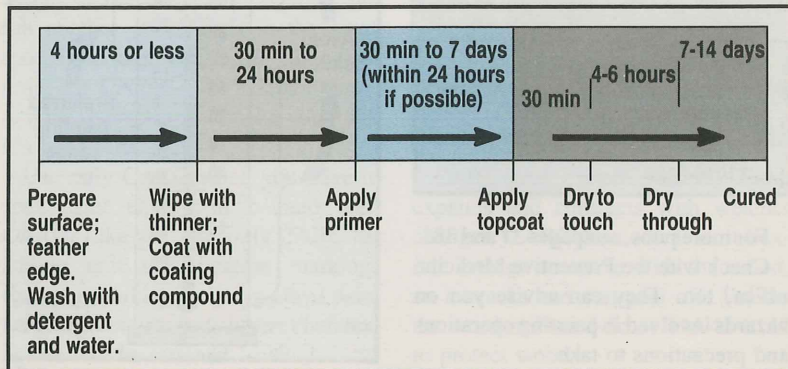
If you're painting less than that, stir each component thoroughly, then measure out what you need. Be sure that you mix the two parts of the epoxy primer or two-component topcoat in the proper proportion.

Use the one-part polyurethane topcoat for spot painting. There's no mixing of components—but you still have to stir it well.

Once you mix the epoxy primer or two component topcoat, they start hardening—curing—and nothing can stop them. You have about 15 hours for the epoxy or 8 hours for the topcoat to use them after mixing.

Don't start unless you have time to finish. Otherwise, the mixed paint you don't use will be wasted.

Here's a timeline showing how long each step takes to cure, how long you've got until the next step must be started and the maximum time allowable between steps.



Touchup Step-by-Step

There are a number of steps to follow when you apply CARC. If you skip a step or take a shortcut, you'll end up with a coating that peels off easily or bubbles up and falls off.

You can apply CARC over old CARC as long as the old paint is clean and sound. Clean off all rust, corrosion, oil, grease, moisture, dirt, and loose or blistered paint.

When you sand any paint, use the wet sanding method. Older paints may contain lead, chromates or other toxic material. Using wet or dry sandpaper, wet down the area before you start. Keep the sandpaper wet as you sand. This will keep down paint dust.

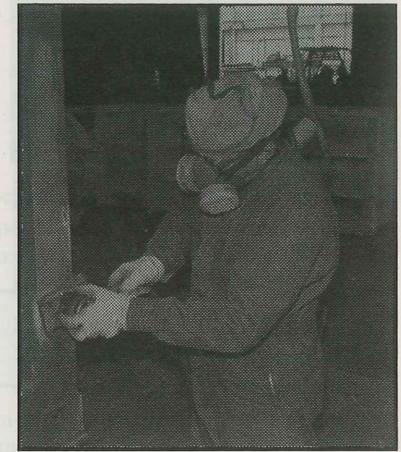
Use a respirator, when required, and gloves and eye protection any time you're working with paint or thinner.

Prepare ferrous metal (steel and iron) or aluminum surfaces like so:

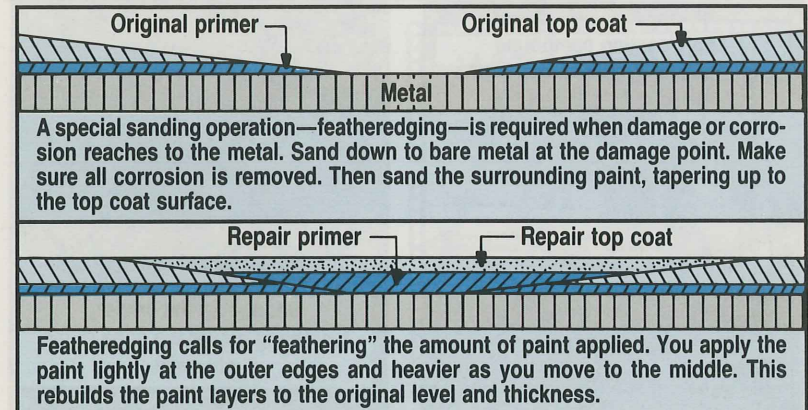
Wash with liquid detergent, NSN 7930-00-282-9699, and water; rinse with fresh water and let the area dry.

If the old paint is sound and you don't have to sand to bare metal, you don't need the pretreatment and primer. You still need to feather the edges.


Remove all loose paint by light sandblasting or with an orbital sander.

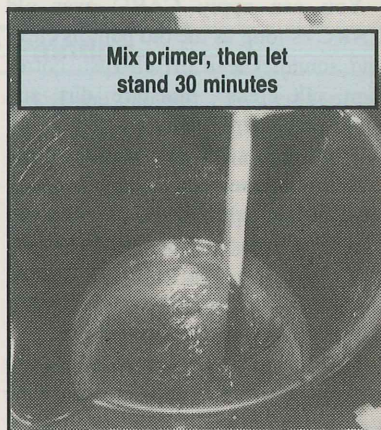


Feather the edges of good paint by sanding or with a stainless steel scouring pad.

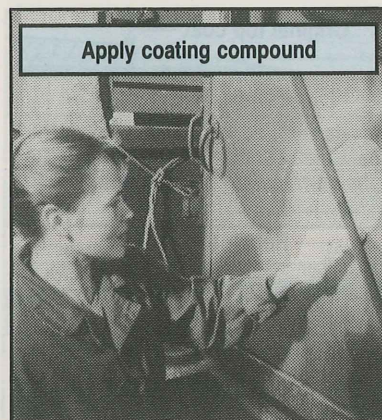




 After the coating is dry—at least 30 minutes but no more than 24 hours—paint it with primer, NSN 8010-01-193-0516. Stir each component separately until uniform. Mix the two parts well, then let stand 30 minutes before you use the primer. Don't



save any mixed primer overnight because it will harden in the pot within 15 hours.



➡ After application, the primer will be dry hard in 30 to 90 minutes and you can add the CARC topcoat. Use single part CARC. Stir it thoroughly, though, before use. Here are NSN's for quart quantities:

Black	NSN 8010-01-229-7540	Green 383	NSN 8010-01-229-7546
Brown 383	8010-01-229-7543	Sand	8010-01-234-2934

The topcoat will be dry to the touch in 30 minutes. It will be dry through in 4 to 6 hours. It'll be cured enough to withstand impact—like walking on it—in 6 to 8 hours. Complete curing takes 7 to 14 days.

Leftover Paint

Treat any leftover paint as hazardous waste. That goes too for polyurethane component "B" if it goes bad in the can. It should be clear to pale yellow. If it's thickened or crystalline in consistency, seal it back up and get rid of it.

HAZARDOUS WASTE

FEDERAL LAW PROHIBITS IMPROPER DISPOSAL
IF FOUND, CONTACT THE NEAREST POLICE, OR
THE U.S. ENVIRONMENTAL PROTECTION AGENCY

FORMER D O I
DISPOSING AGENCY State of Michigan (USE FOR NAME) 1263

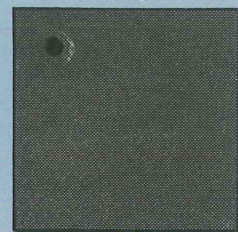
DISPOSITOR INFORMATION
NAME Michigan Dept
ADDRESS 1435
CITY Ann Arbor STATE MI
ZIP 48106
PHONE 313-763-2222 FAX 313-763-2222
EFFECT DATE 9-4-88 RECEIPT NO. 1263

HANDLE WITH CARE!
CONTAINS HAZARDOUS OR TOXIC WASTES
at - up date - 9-9-88

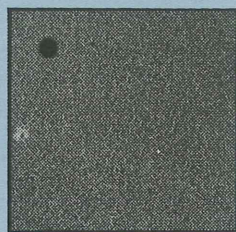
Paint

There are a number of reasons that CARC—or any other paint—fails soon after application. Some reasons are:

• The surface was not prepared properly. There was loose or blistered paint, sanding dust, grease or oil, diesel fuel, or even fingerprints on the surface. Wash it down, let dry and wipe with the thinner used with your paint.



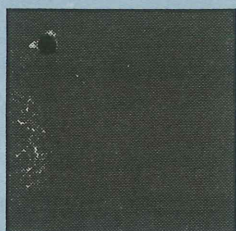
TOP COAT OVER
UNCURED (WET) PRIMER



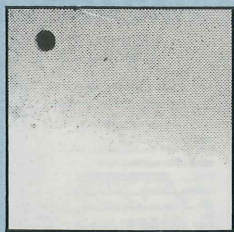
TOP COAT OVER
UNCURED (WHITE) ALKYD



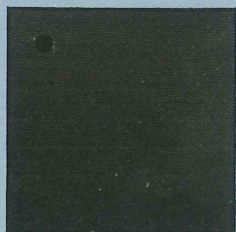
DRY SPRAYED



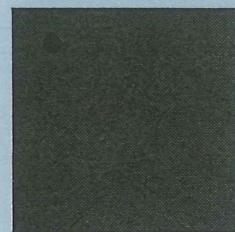
TOP COAT OVER OIL



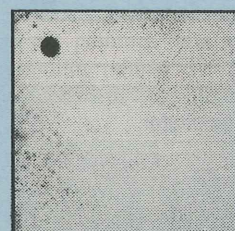
EPOXY PRIMER –
METAL TOO COLD



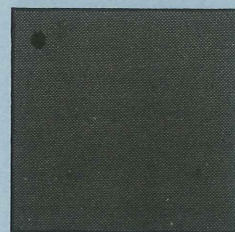
TOP COAT – EXCESS
THINNER (GLOSSY)



TOP COAT OVER
UNCURED (RED) LACQUER



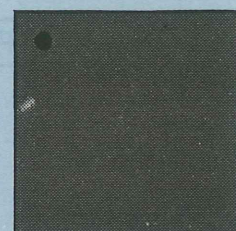
EPOXY PRIMER OVER OIL



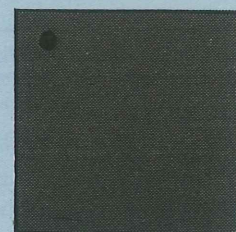
TOP COAT – RUNS, SAGS



TOP COAT OVER
WATER



TOP COAT – METAL TOO COLD



PROPERLY PAINTED

Failures

• No pretreatment or primer was used. Topcoat was applied directly to the bare metal.

• The primer did not have time to dry (flash off solvent) before the next coat was applied.

• The surface was too hot or cold.

Welding CARC-Painted Surfaces

Never weld or cut on CARC-painted material. Welding or cutting painted surfaces releases toxic gases, vapors and metal fumes.

So before applying any heat, sand or grind off the paint down to bare metal on an area four inches on either side of where you plan to apply heat.

If the other side of the metal is painted remove the paint from it, too.

When grinding or sanding, use a high efficiency respirator and eye protection, just like you would for any grinding operation.

Wet sanding, using wet-or-dry sandpaper and water, will keep the dust down.



Use approved spray booth

Personal Protection

Under some conditions you may need to use a respirator. The most common respirator used is NSN 4240-00-022-2524.

It's part of the No. 1 Supplemental and No. 2 Common shop sets. It's also authorized by Chapter 18 of CTA 50-909.

You'll get either a single or dual respirator.

The single comes with 25 cartridges—which filter out organic vapors—and 50 prefilters, which protect you from paint spray or mists. The dual version comes with 50 cartridges and 100 prefilters.

You can't get the cartridges or prefilters separately. When you've used up those that come with the kit, order a



Use respirator

new respirator.

If your shop has a paint spray booth, it may be equipped with airline respirators. It doesn't have cartridges or prefilters to clean, but you need to check it and clean it like a cartridge respirator.



In Use

Use your respirator only in well-ventilated areas where plenty of oxygen is available.

Leave the area immediately if breathing becomes difficult, you get dizzy or you taste or smell paint.

Never alter or modify your respirator.

Make sure your mask is fitted properly, and that there are no leaks.

NEVER use your chemical protective mask. It works for what it's designed for, but it's no protection against paint fumes.

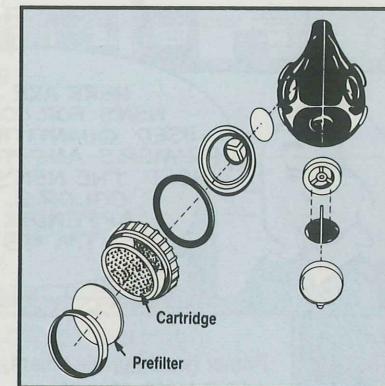
When spray painting, wear clothing—like coveralls—that'll cover as much skin as possible.

Use rubber gloves on your hands when painting, mixing the paint, or handling thinner.

Use splash goggles or a face shield or safety glasses with side shields when mixing paint or thinner.

Replace the cartridge in your mask at the first sign of paint odor while you're wearing it. Unscrew the cartridge to

replace it. Be sure the rubber gasket is evenly seated in the filter holder.



Replace the prefilter when breathing becomes difficult. Remove the prefilter retaining ring from the front of the cartridge. Put the replacement prefilter in the retainer and replace the entire assembly on the cartridge front.

Before storing your respirator, make sure it's clean. Store it in a cool, dry area free of airborne contamination. Be sure to check it again before using it.

Cleaning

Clean your respirator after each day's use like so:

Remove the filters, headbands and valves from the rubber facepiece.

Immerse all parts—except the cartridges and prefilters—in a warm (140-160°F) solution of a germ cleaner like calcium hypochlorite, NSN 6860-00-270-6225. That's in the capsules used in your water purification kit.

Scrub the rubber parts of the mask gently, using a soft brush.

Rinse thoroughly in clean water and let dry.

When dry, reassemble the respirator and store it in a closed plastic bag.



NSN's for

HERE ARE THE
NSN'S FOR COMMONLY
USED QUANTITIES OF **CARC**
PRIMERS AND TOPCOATS. IF YOU
NEED THE NSN'S FOR OTHER
COLORS, CHECK
APPENDIX B OF
TM 43-0139.

	1 1/4 Qt kit	1 1/4 Gal kit	5 Gal kit
Primer (wash) pretreatment, DOD-P-15328, 8030-00-	850-7076	281-2726	165-8577

Primers

Epoxy-Polyamide, MIL-P-23377

(Contains chromates. For use on non-ferrous surfaces)

Color	Size	NSN 8010-
Deep yellow	1 Pint kit	00-229-4813
Deep yellow	1 Qt kit	00-142-9279
Deep yellow	2 Qt kit	00-935-7080
Dark green	2 Gal kit	00-082-2450
Deep yellow	2 Gal kit	01-048-6539
Deep yellow	10 Gal kit	00-082-2477

Epoxy, MIL-P-52192

(Contains lead and chromate. Rust inhibiting for ferrous surfaces)

Size	NSN 8010-00-
1 1/4 Qt kit	264-8866
1 1/4 Gal kit	082-1714

Epoxy coating, MIL-P-53022

(Corrosion inhibiting. Lead- and chromate-free.
For ferrous and non-ferrous surfaces)

Color	Size	NSN 8010-01-
White	1 1/4 Qt kit	193-0516
White	1 1/4 Gal kit	193-0517
White	5 Gal kit	187-9820

Supplies

Epoxy, Water reducible, MIL-P-53030

(Lead- and chromate-free. For ferrous and non-ferrous surfaces)

Color	Size	NSN 8010-01-
Reddish-brown	1 1/4 Qt kit	193-0519
Reddish-brown	1 1/4 Gal kit	193-0520
Reddish-brown	5 Gal kit	193-0521

Epoxy, VOC compliant, MIL-P-85582

(Lead-free, contains chromates. Water-reducible)

Color	Size	NSN 8010-01-
Light green	1 Qt kit	218-0856
Light green	1 Gal kit	218-7354

CARC Single Component Topcoat, MIL-C-53039, NSN 8010-01-

Color	1 Qt can	1 Gal can	5 Gal can
Green 383	229-7546	229-9561	229-7547
Brown 383	229-7543	229-7544	229-7545
Black	229-7540	229-7541	229-7542
Sand	234-2934	234-2935	234-2936
Aircraft Green	246-0717	246-0718	246-0719

CARC Two-Component Topcoat, MIL-C-46168, Type II, NSN 8010-01-

Color	1 1/4 Qt kit	1 1/4 Gal kit	5 Gal kit
Green 383	160-6741	162-5578	160-6742
Brown 383	160-6744	160-6745	160-6746
Black	141-2419	131-6254	131-6261
Sand	141-2416	130-3347	131-6259

CARC Two-Component Topcoat, MIL-C-46168, Type IV, (High solids, Low VOC) NSN 8010-01-

Color	1 1/4 Qt kit	1 1/4 Gal kit	5 Gal kit
Green 383	260-7481	260-0911	260-0912
Brown 383	260-7482	260-0916	260-0917
Black	260-0913	260-0914	260-0915
Sand	260-0921	260-0922	260-7483

Thinner, MIL-T-81772, NSN 8010-

Type	1 Gal can	5 Gal can	55 Gal drum
(Used with ...)			

I (Polyurethane)	00-181-8080	00-181-8079	00-280-1751
II (Epoxy)	01-200-2637	01-212-1704	01-168-0684

Complete Repainting

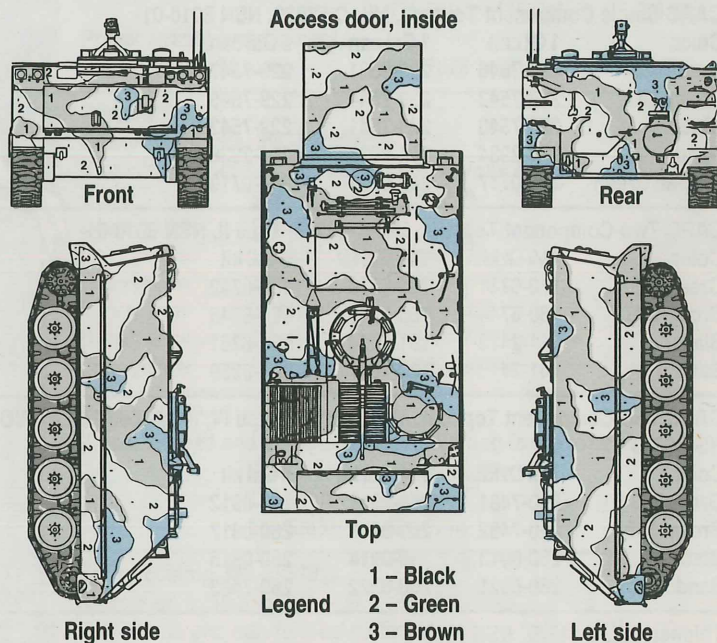
Complete repainting of equipment is only authorized at General Support and Depot maintenance levels. Even then, spray painting is only allowed in paint spray booths meeting OSHA requirements.

With spray painting involved, respiratory protection and other personal protective equipment is required. Get with the Preventive Medicine office for details on the exact requirements.

Use protective gear when sanding

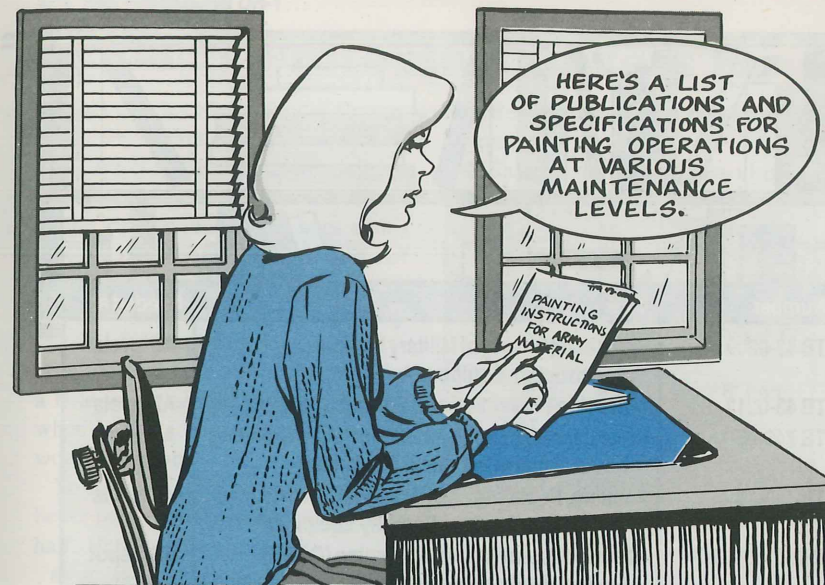


ARMORED PERSONNEL CARRIER FULL TRACKED M113

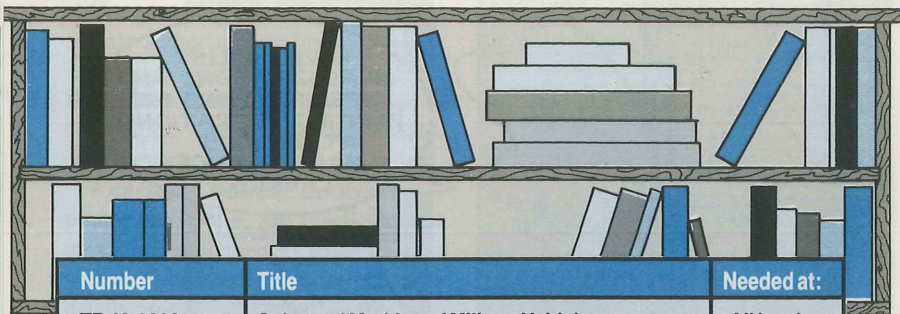


Applying camouflage patterns is an exacting art. The patterns for a piece of equipment must be applied exactly as specified. Details on pattern application and inspection are in Chap 4 of TM 43-0139.

Publication Library



Number	Title	Needed at:
TM 43-0139	Painting Instructions for Army Materiel	All levels
TM 55-1500-345-23	Painting and Marking of Army Aircraft	All levels
T.G. 144	Guidelines for Controlling Health Hazards in Painting Operations Order this from: Commander US Army Environmental Hygiene Agency ATTN: HSHB-CI-O Aberdeen Proving Ground, MD 21010-5422	All levels
TB MED 502	Occupational and Environmental Health Respiratory Protection Program	All levels
TB 43-0118	Field Instructions for Painting and Preserving Electronics Command Equipment	All levels
TB 43-0144	Painting of Vessels	All levels
TB 43-0147	Color, Marking and Camouflage Patterns used on Military Equipment	All levels
TVT 3-40	Chemical Agent Resistant Coating (CARC)—The Real Story (Available at TASC)	All levels



Number	Title	Needed at:
TB 43-0209	Color and Marking of Military Vehicles, Construction Equipment	All levels
TB 43-0213	Corrosion Prevention and Control	All levels
TB 746-95-1	Color, Marking and Camouflage Pattern Painting for Armament Command Equipment	All levels
TB 750-10	Painting, Replating and Preserving Instructions for Communications Security Equipment	All levels
MIL-C-53072	Chemical Agent Resistant Coating (CARC) System Application Procedures and Quality Control Inspection	GS/Depot
MIL-T-704	Treatment and Painting of Materiel	GS/Depot
MIL-STD-171	Finishing of Wood and Metal Surfaces	GS/Depot
MIL-STD-186	Protective Finishing for Army Missile Weapon Systems	GS/Depot
MIL-STD-193	Paint Procedures and Marking for Vehicles, Construction Equipment and Material Handling Equipment	GS/Depot
MIL-STD-194	System for Painting and Finishing Fire-Control Material	GS/Depot
MIL-STD-642	Identification Marking of Combat and Tactical Transport Vehicles	GS/Depot
MIL-STD-1473	Standard General Requirements for Color and Marking of Army Materiel	GS/Depot
MIL-C-46168	Coating, Aliphatic Polyurethane, Chemical Agent Resistant	GS/Depot
MIL-C-53039	Coating, Aliphatic Polyurethane, Single Component, Chemical Agent Resistant	GS/Depot

If you need copies of the specifications for a specific paint or solvent, check Appendix A of TM 43-0139.



UH-1...

Protective Covers Fix

CW3 Charles McConkey of Columbus, OH, submitted a good idea as a Tool Improvement Program Suggestion (TIPS).

The ziplock seal on the bags of his Huey's protective covers would not stay sealed in real cold weather.

He tried using safety wire to keep the seal from opening, but the procedure took too much time. He'd make a hole in the plastic with an awl, but when he pulled out the awl, the hole would close up.

So he made a tool that works much better than an awl and cuts the time in half. Here's what you need:

- A 1/4-in diameter bolt 6 inches long

- A 3/32-in diameter roll pin

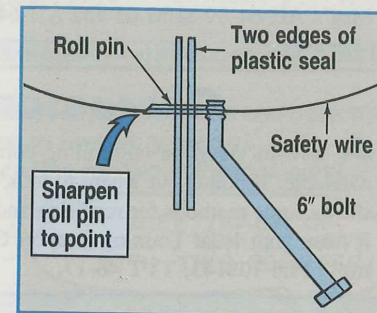
Here's how you make it:

- Drill a 3/64-in diameter hole near the end of the bolt.

- Insert the roll pin.

- Bend the end of the bolt about 45 degrees.

- Sharpen the end of the roll pin.



To use the tool, hold the seal together and push the roll pin through both pieces of plastic.

Insert a 6-in piece of safety wire through the center of the roll pin and pull out the tool, leaving the wire through the plastic. Twist the wire tight.

No more problems with the seals!

CH-47D Authority Covers

There's more to replacing integrated lower control actuators on your CH-47D's than meets the eye in Task 7-102 of TM 55-1520-240-23-6. Any time you replace actuators, you have to remove the authority covers from the old actuators and install them on the new ones. Removing and reinstalling authority covers is explained in Task 7-86.

Apache Engine Louvers

Peeling paint on your Apache engine's cooling louvers is no longer cause for alarm. It does not affect the airworthiness of your bird. No need to repair peeling areas until the next scheduled phase maintenance cycle. Procedures for replacing or repairing the louver assembly area are in AVSCOM Msg's AH-64-89-MIM-03 and AH-64-MIM-05.

Corrosion Control

A how-to video on controlling corrosion on the AH-64 Apache is now available. It points out where to look for corrosion, how to identify it, and shows some methods for repairing and preventing corrosion damage. Order it from your local Training Support Center under "AH-64 Corrosion Control," PIN 708143, VVT 46-17.

Aviation Messages

If your unit has not received a message you have an interest in, check with your next higher headquarters.

CAT 1 EIR Phone:
AUTOVON 693-2066
(24 HOURS)

UH-1-89-06, SOF, Technical, Replacement of NAS1785-8-44 bolts and NAS 1758L8 nuts, 012130Z Jun 89.

AH-64-89-10, SOF, Maint Mandatory, Inspection of tail rotor swashplate bearing, 051530Z Jun 89.

AH-1-89-07, SOF, Maint Mandatory, Addendum to revision/change of selected component lives, 081630Z Jun 89.

UH-60-89-05, SOF, Maint Mandatory, Inspection of wire strike protection system, 121930Z Jun 89.

GEN-89-03, SOF, Operational, Protecting aircraft from severe storm and wind damage, 172200Z Jun 89.

OH-6-89-01 and OH-58-89-02, SOF, Maint Mandatory, Engine data plate inspection and records check concerning torque meter gear, 222200Z Jun 89.

CH-47-89-06, SOF, Technical, all CH-47D, Engine cross shaft in-

spection, 231930Z Jun 89.

OH-58-89-03 and OH-6-89-02, SOF, Technical, OH-6A and OH-58A aircraft with T63A-700/T63-A-5A engines, Records check concerning tolerance between the 7-12 seal and the third stage wheel, 301930Z Jun 89.

AH-64-89-MIM-04, Maintenance Information Message, AH-64A, Tracking the electro slag remelt (ESR) steel parts (rod end bearings) with a 1260 day life limit, 081830Z Jun 89.

CH-47-89-MIM-10, Maintenance Information Message, CH-47D aircraft periodic information update, 122130Z Jun 89.

UH-60-89-MIM-06, Maintenance Information message, UH-60A helicopters, Lifting of cabin roof tie-down assy operational restrictions, 131725Z Jun 89.

GEN-89-MIM-06, Maintenance Information Message, MSD fielding

of AN/ARC-186 radio and AN/ARC-164 radio, 132030Z Jun 89.

AH-1-89-MIM-06, Maintenance Information Message, AH-1 aircraft, Packing seal/retainer, plain encased P/N 410122H19, NSN 5330-00-402-0106, 152030Z Jun 89.

OH-58-89-MIM-02, Maintenance Information Message, OH-6A and OH-58A/C aircraft, Maintenance instructions for operations for the Casey heater system, 271930Z Jun 89.

OH-6-89-MIM-02, Maintenance Information Message, OH-6A and OH-58A/C aircraft, Maintenance instructions for operations for the Casey heater system, 271930Z Jun 89.

AH-1-89-MIM-07, Maintenance Information Message, AH-1 aircraft, Revision of torque (AN320-9 nut) on K747 drag strut bolt, 282030Z Jun 89.

Security...

Key Control Register

Dear Editor,

Keeping up with all the vehicle keys in our motor pool is a big headache.

The pain reliever we use is a locally reproduced key control register.

The register identifies each key, current location and custody of each key. It's also used as an inventory record.

We use the bumper number of the vehicle as the lock number.

SGT James Scanlan
Ft Bragg, NC

KEEP TRACK OF
ALL YOUR VEHICLE KEYS
WITH THIS REGISTER!

KEY CONTROL REGISTER/INVENTORY (AR 190-11/AR 190-51)									
1. UNIT		2. LOCATION		3. DATE: FROM: TO:					
In accordance with AR 190-11/AR 190-51 a key with lock inventory by serial number was conducted on all assigned keys (a) and lock(s) as follows:									
Key Serial Number	Key Location	Key Serial Number	Key Location	Key Serial Number	Key Location				
84 978H	4	Motor Pool							
84 5446C	4	"							
84 4628A	4	"							
84 6124E	4	"							
84 4501C	4	"							
84 3127A	4	"							
84 6440D	4	"							
84 7377H	4	"							
84 8243C	4	"							
84 5137E	4	"							
9. REMARKS.									
The undersigned verifies that a serial number inventory of the above keys was conducted on the date indicated. (Explain any deficiencies in "Remarks" above).									
Signature of key and lock custodian: Date: 3 Mar 89									
Sgt Michael D. Scanlan									

Back of form

(Editor's note: Thanks for sharing your form. For key control of other things, such as storage buildings, racks, etc., check out AR 190-11.)

JUMP-STARTING



There's a right way and a wrong way to use jumper cables. If you hook 'em up right, you put new life in a dead vehicle. If you hook 'em wrong, you'd better take cover.

The battery can explode like a grenade and shower you with acid and bits of battery. The blast is a quick indication that you've done something wrong. But other things can happen, too, that're not so noisy—like a burned-up alternator or blown fuses in the vehicle's electrical system.

Jumper cables are all you can use to help start some vehicles. Many older trucks do not have a slave hook-up.

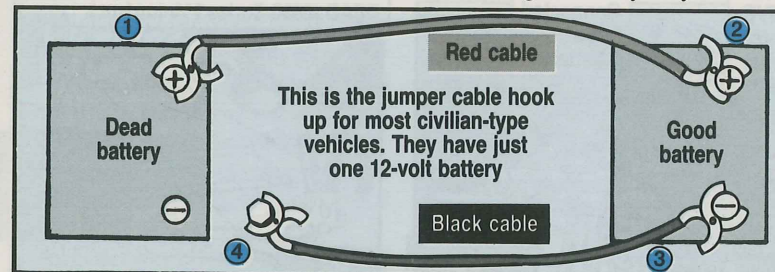
Hooking up jumper cables the right way is as simple as 1-2-3-4. The main thing to remember is red goes to the positive (+) posts and black to the negative (-).

MADE EASY



SINGLE 12-VOLT SYSTEM

- * Clip one end of the red cable to the positive (+) post of the dead battery and the other end to the positive post on the live battery.
- * Hook up the black cable last. Clip one end of the black cable to the negative (-) post of the live battery, but do not connect the other end to the dead battery. Instead, clip the cable to the dead vehicle on any bare metal that's at least a foot away from the dead battery. That way, any spark from the hookup won't explode the gases that build up around the battery. Also, don't smoke while hooking up the cables, or the ashes that fall to the ground may be your own.

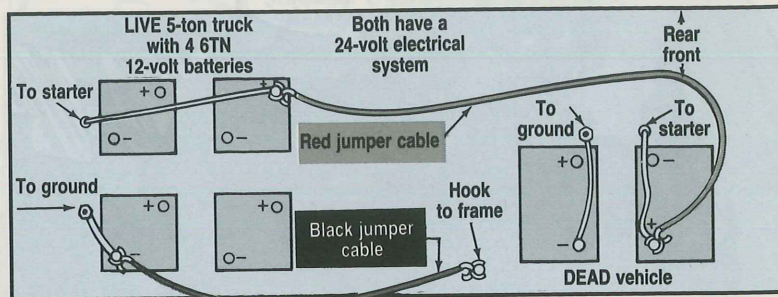


Unhook the cables in reverse order, 4, 3, 2, 1, after the engine starts. Be sure to unhook both ends of the black cable before you touch the red cable.

24-VOLT SYSTEMS

Most military-design trucks have 2 or 4 batteries. Each battery puts out 12 volts, but they're set up so the vehicle has a 24-volt system. Each battery has a positive (+) and a negative (-) post.

So, how do you hook up the two cables? Find the positive post on both vehicles that feeds directly to the starter. Hook the red cable to that post on both vehicles like so:



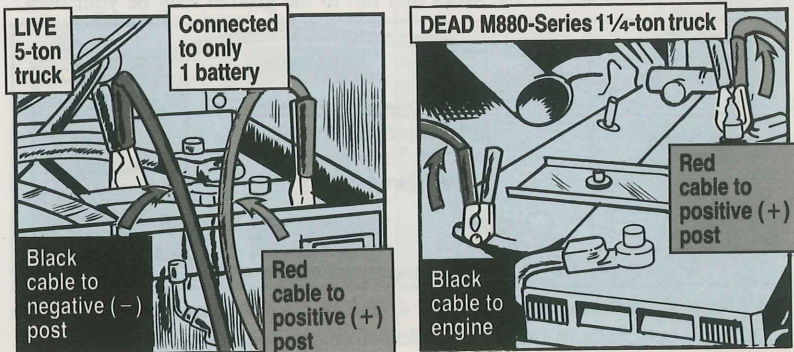
Next, hook the black cable to the negative post that goes to the ground on the live vehicle. Hook the other end to anything metal on the dead vehicle that's at least a foot away from the batteries.

24-VOLT TO 12-VOLT

You can jump-start a 12-volt system—like the M880-series 1¼-ton truck—from a vehicle with a 24-volt system. But don't try it the other way around. The single battery does not have enough juice to get the 24-volt system going.

When you jump from a 24- to a 12-volt system, use only one of the batteries. This will give you all the power you need to start the 12-volt vehicle without burning up any of the electrical system.

Do it like this:



Picture Perfect Jump Starting



Here's How To—

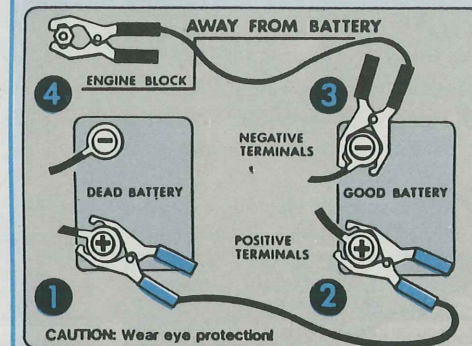
JUMP START

- Batteries same voltage
- Both negative posts grounded
- Check fluid, check for freezing
- Cars not touching
- Ignitions off, accessories off, gears in "park" or "neutral," brakes on
- Attach clamps in order shown, remove in exact opposite order

Stop cable connection confusion when you use jumper cables with a 4½-in by 5½-in red and white stick-on label. To get 'em, call the Army Safety Center, AUTOVON 558-3014 or -2062, or write to:

U.S. Army Safety Center
ATTN: CSSC-M
Ft Rucker, AL 36362-5363

Put the decal near the battery so it's easy to see.



Tactical and Combat Vehicles...

NATO Slave Receptacle Cover Saver

The plastic cover on the NATO slave receptacle is a sticky rascal, especially in cold weather. It sometimes sticks tighter than bark on a tree when you need to slave start the vehicle.

Some soldiers pry off the cover with a screwdriver. That gets it off, but it breaks the cover.

An easier way is smear a thin layer of waterless hand cleaner, NSN 8520-00-965-2109, on the inside of the cover.



It does not dry out or hurt the plastic, and it keeps the cover slip-sliding in hot or cold weather.

Below freezing temperatures suck the life out of batteries like a vampire bite. Engine oil thickens, which makes an engine's moving parts stiff and slow. A couple of cranks of the starter is often all it takes to finish off weakened batteries.

Charge some life in the dead batteries with the help of a "live" vehicle and a slave cable.

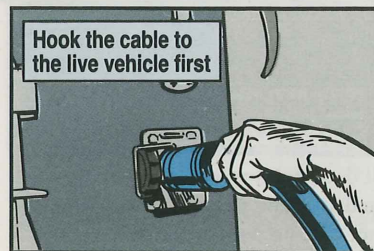
Here's how to do it right:

⚡ Familiarize yourself with the slave starting instructions in your vehicle's -10 TM.

⚡ Make sure the electrolyte level in all cells of the batteries are up to snuff.



⚡ Set the parking brakes on both vehicles and then shift their transmissions to neutral. Keep the live vehicle's engine running.

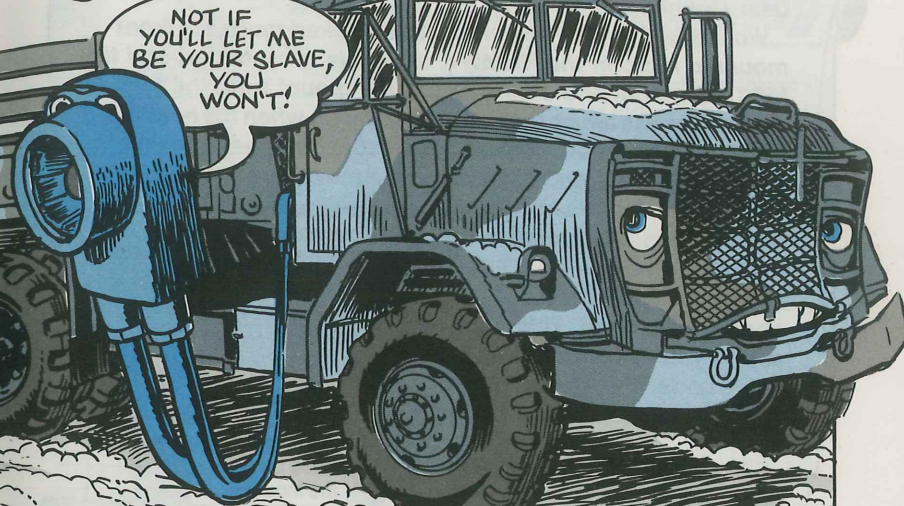


Then, with one firm push, shove the other connector into the dead vehicle's slave receptacle.

If either vehicle has the old 2-pin receptacle, be careful. The hook-up is a little tricky. Fireworks explode if you touch the outer shell of the slave receptacle to the pins on the NATO cable adapter. Arcing burns the connectors, receptacles and any fingers or other flesh that's in range.

This problem is easily avoided. Just push the NATO 2-pin adapter on the

Starting



vehicle's slave receptacle, then connect the cable to the adapter. Make sure the connection is tight.

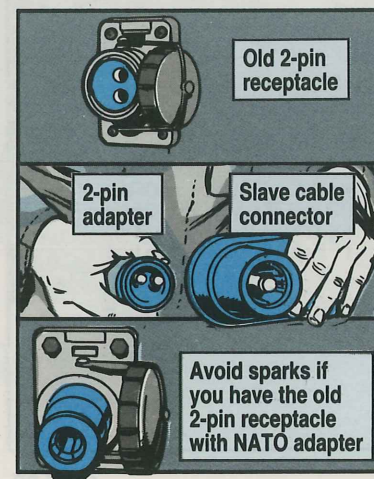
⚡ Try to start the dead vehicle. Follow the starting instructions in the vehicle's TM.

Always step on the clutch pedal if the vehicle has a manual transmission. This helps the vehicle start easier by cutting down on engine drag. If the vehicle fails to start after three tries—stop. The vehicle has problems that slaving won't solve.

⚡ Keep the cable connected until the vehicle starts. Never unhook a slave cable while the starter is engaged, or you'll see fireworks like the 4th of July.

⚡ Let the engine run at fast idle after it cranks.

⚡ Once you see the dead vehicle is going live, pull the cable off that vehicle and then remove it from the live one.



Under Mount Connection

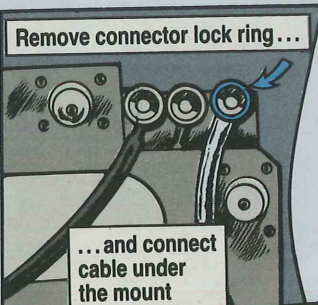
Dear Connie,

When the CX-4720 power cable is hooked up to the front mounted radio in the HMMWV, the cable is routed around the MT-1029 mount and connected to the mount from the rear.

This puts a strain on the cable. And worse, when the heater is used, the cable gets very hot. The cable stretches causing broken insulation and wires which put the radio out of business.

To reduce cable strain, I had my unit repairman remove the lock ring on the J-21 connector and turn the connector around. This allows you to connect the cable under the mount. It also keeps the heat off the cable.

SFC Bruce E. Ballard
APO New York



SOUNDS LIKE YOU'VE FOUND THE ROUTE TO SAVING POWER CABLES. BE SURE YOU DON'T ROTATE THE PIN-BLOCK ASSEMBLY MORE THAN A 1/4 TURN FROM THE CENTER LIKE IT SAYS IN PARA 2-4 OF TM 11-5820-401-20-1.

Water Trailers ...

FREEZE PROTECTION FOR STEEL TANKS

Freezing temperatures can cause the water in an M149-series water trailer to freeze. That damages the lines or the tank itself.

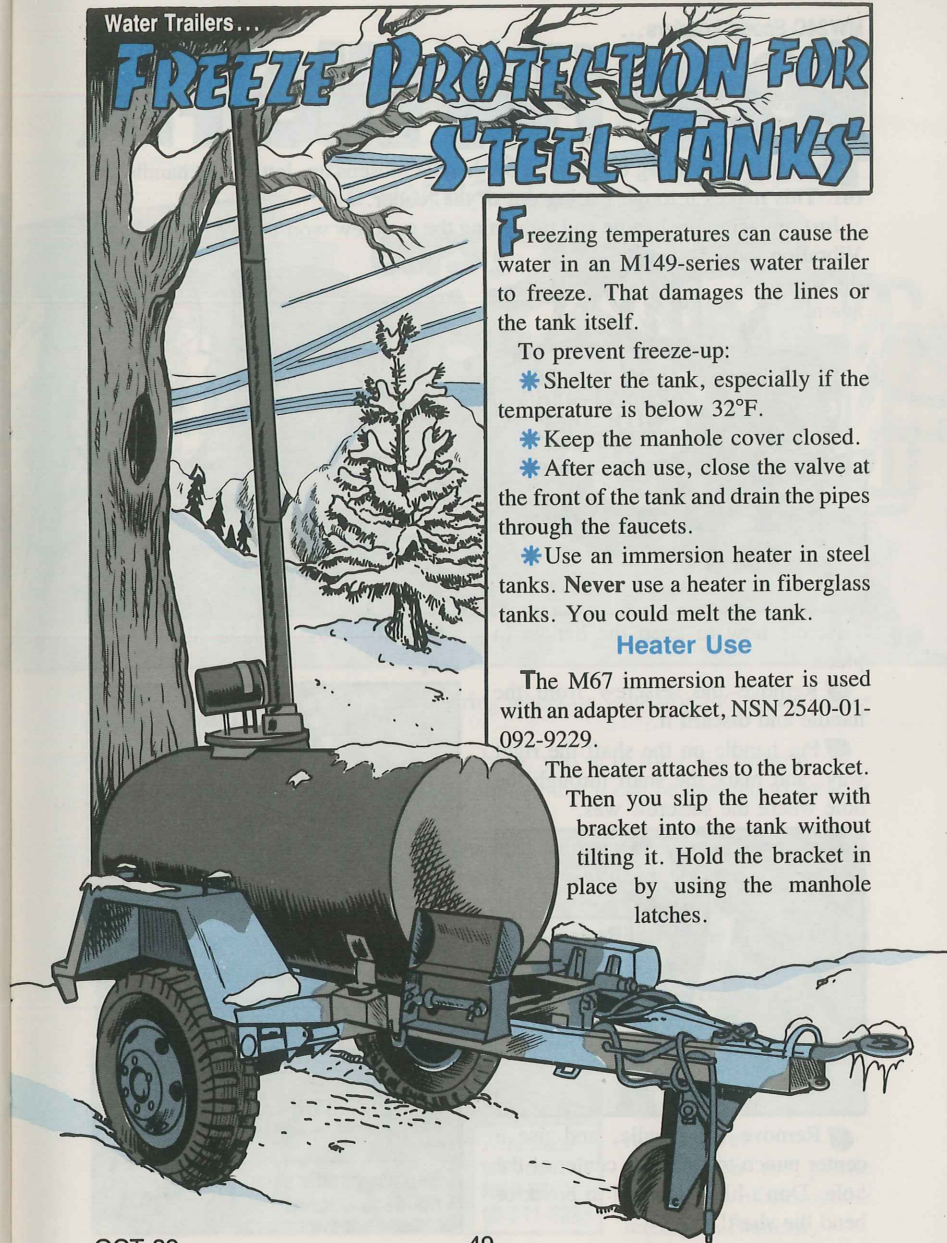
To prevent freeze-up:

- * Shelter the tank, especially if the temperature is below 32°F.
- * Keep the manhole cover closed.
- * After each use, close the valve at the front of the tank and drain the pipes through the faucets.
- * Use an immersion heater in steel tanks. Never use a heater in fiberglass tanks. You could melt the tank.

Heater Use

The M67 immersion heater is used with an adapter bracket, NSN 2540-01-092-9229.

The heater attaches to the bracket. Then you slip the heater with bracket into the tank without tilting it. Hold the bracket in place by using the manhole latches.



Door Handle Fix

The setscrew holding the inside door handle loosens up, letting the handle fall off. This makes it tough getting out of the loader.

Just replacing the handle and tightening the setscrew won't solve the problem. Vibration loosens the screw again.



Here's how to keep the handle in place:

● Remove the setscrew from the handle and discard it.

● Put handle on the shaft the right way, and mark the shaft through the hole where the setscrew was.



● Remove the handle, and use a center punch to mark the center of the hole. Don't hit it so hard to break or bend the shaft!

● Drill a 7/32-in hole about 1/8-in deep.



● Put the handle back on the shaft, apply Loctite, NSN 8030-01-014-5869, to setscrew threads and screw in a cone point setscrew, NSN 5305-01-055-3766. Tighten securely.



Don't Touch That Button!



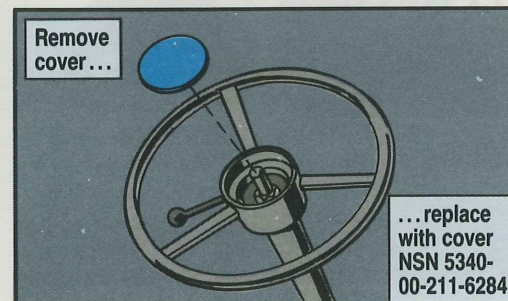
The button in the center of the steering wheel on your MW24C scoop loader is not the horn button.

If you push that button to sound the horn, you're in for a big surprise.

That button releases the steering column so that it can be lowered to let your loader fit inside an aircraft.

If you hit the button to signal someone, the steering wheel drops down instead. It'll hang up on the windshield wiper motor. You won't be able to turn the wheel.

Here's a simple fix you mechanics can make that will keep operators from hitting the release button by accident and dropping the steering wheel.



...replace with cover NSN 5340-00-211-6284

● Order a hard plastic cover with NSN 5340-01-211-6284.

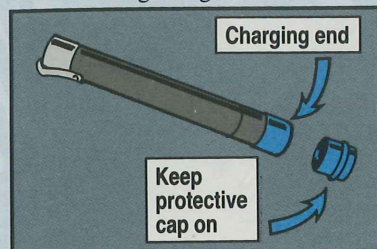
● Pull off the "horn" rubber cover.

● Put on the plastic cover. This blocks out the release mechanism.

Keeping It Sensitive

If you don't protect the IM-93's charging end from dirt and moisture, it won't detect radiation.

That's why you need to keep the charging end capped except when your IM-93's being charged.



If you lose its cap in the field, use clear plastic tape, NSN 7510-00-551-9818, to seal the charging end. Anchor the tape by wrapping it around the dosimeter's barrel.

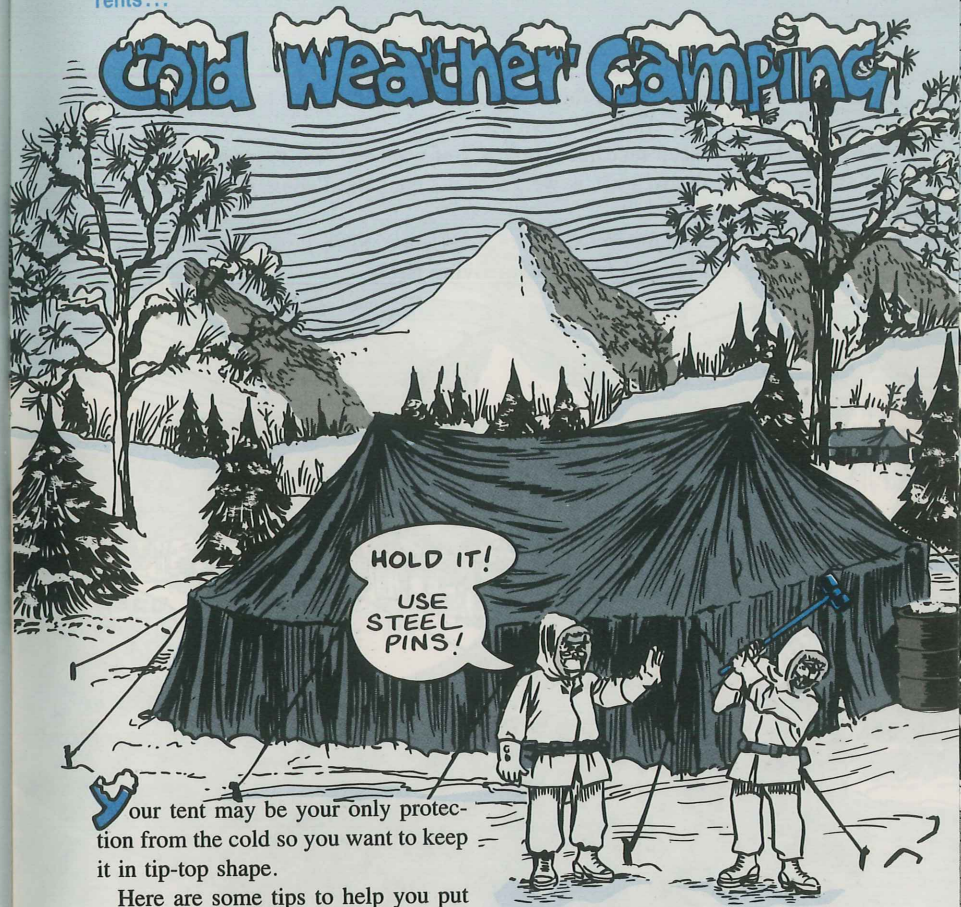


For a replacement cap, use commo binding post boot, NSN 5999-00-869-6263.



If dirt or moisture does get in the charging end, don't try to clean it yourself. Blowing in the charging end causes false readings. Cleaning it with a sharp object damages the charging contact. Your NBC NCO has the right brush to clean it.

Cold Weather Camping



Your tent may be your only protection from the cold so you want to keep it in tip-top shape.

Here are some tips to help you put your tent up and keep it up.

Substitute 12-in steel tent pins, NSN 8340-00-823-7451, for aluminum or wood pins. Use Appendix A of CTA 50-970 as your authority to order them.

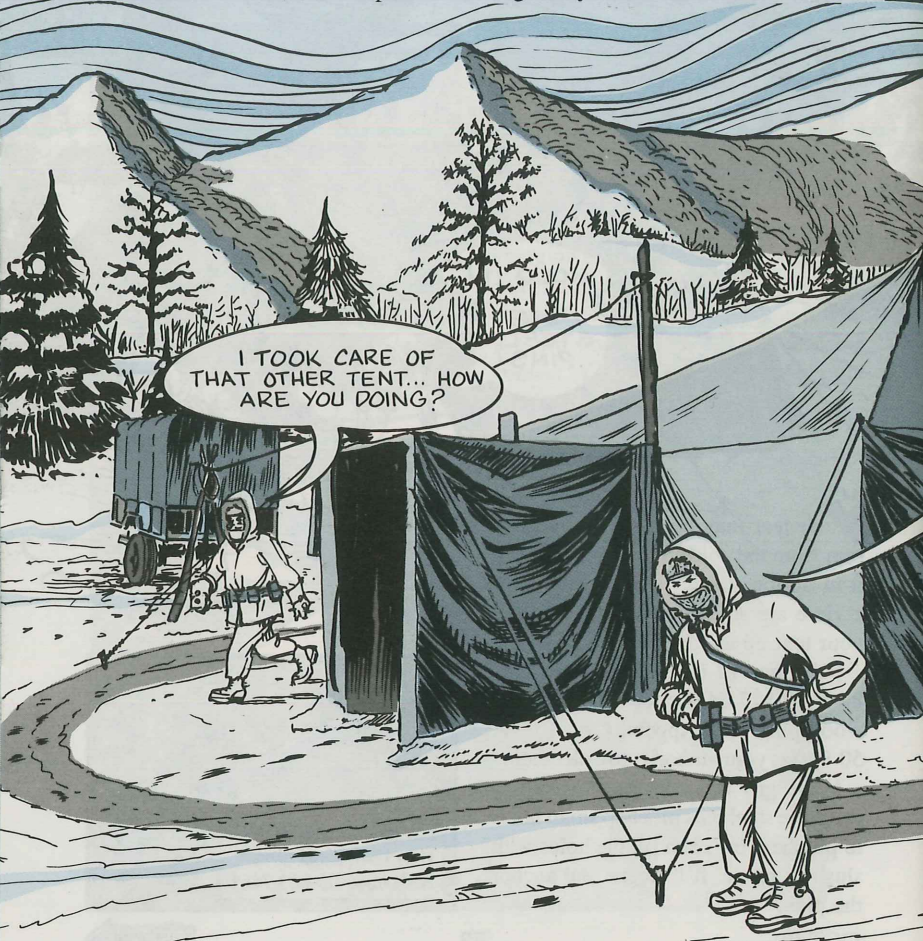
If the ground is frozen too hard to drive the steel pins in, chop small holes to put them in. Then fill the holes with slush or water. It'll freeze and anchor the pins.



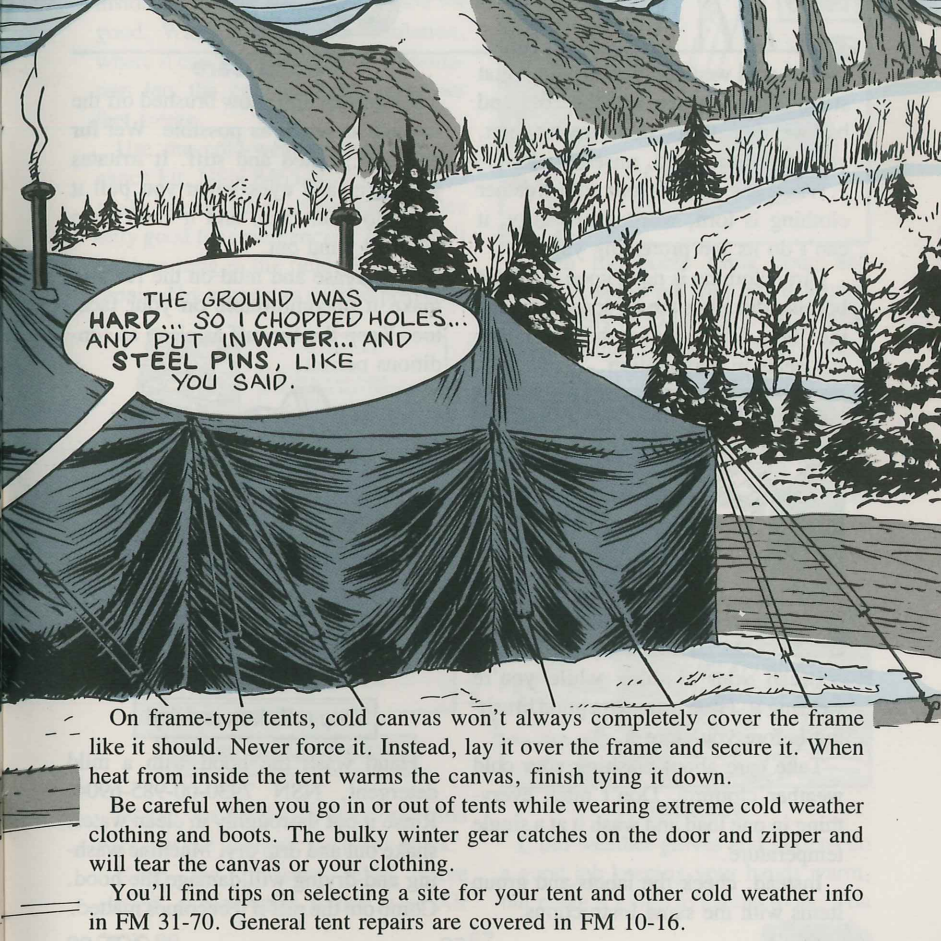
Remove pins from frozen ground by chopping the ground around them until they loosen. Never pound them sideways with a hammer to loosen them. All you'll get for your effort is a bent pin.

You have to keep tent lines tight if you want the tent to stand up to winter storms. When the weather is wet, though, lines need some slack to allow for shrinkage.

Slide fasteners that don't slide are a nuisance. Slide fastener lubricant, NSN 9150-00-999-7548, will keep them moving freely.



I TOOK CARE OF
THAT OTHER TENT... HOW
ARE YOU DOING?



THE GROUND WAS
HARD... SO I CHOPPED HOLES...
AND PUT IN WATER... AND
STEEL PINS, LIKE
YOU SAID.

On frame-type tents, cold canvas won't always completely cover the frame like it should. Never force it. Instead, lay it over the frame and secure it. When heat from inside the tent warms the canvas, finish tying it down.

Be careful when you go in or out of tents while wearing extreme cold weather clothing and boots. The bulky winter gear catches on the door and zipper and will tear the canvas or your clothing.

You'll find tips on selecting a site for your tent and other cold weather info in FM 31-70. General tent repairs are covered in FM 10-16.



Your cold weather clothing is all that stands between you and the cold and bad weather. If you don't treat it right, you're in for a cold, miserable time.

When any part of your cold weather clothing is torn, worn-out or dirty, it can't do its job protecting you.

Dirty clothing is not a good insulator because dirt clogs the air space between the fibers. Dirt damages the fibers, too, and seals in perspiration.



Brush your clothing while you're wearing it. Give it an extra good brushing before you store it.

Take care about washing your cold weather clothing. Don't pitch everything in one load and wash it at a single temperature.

Instead, check the labels and group items with the same instructions.

Hood Care

Keep frost and snow brushed off the fur ruff as much as possible. Wet fur becomes matted and stiff. It irritates your skin and eyes when you pull it close to your face, and it can't keep the cold wind out.

Oil, grease and mud on the fur also make it uncomfortable on your face, too. Keep the fur ruff as clean as conditions permit.



Keep ruff clean and dry!

Hand wash the hood with a mild detergent, NSN 7930-00-985-6904. Rinse it out thoroughly in clean water, shake out and drip dry. Machine washing and drying will damage the hood. Comb out the ruff if it becomes matted.

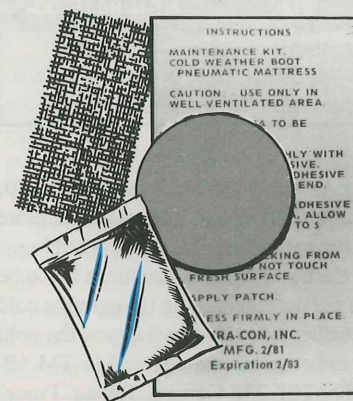
BETWEEN YOU AND THE COLD

Boot Care

One pair of cushion-sole socks is all you need to wear. Carry extra pairs, though, so you can change them often to keep your feet dry.

Punctures, either on the outside or inside, will put them out of action for good. Water gets into the insulation, where it can't be removed. Wet insulation lets the cold through, and your feet freeze.

Use the cold-weather boot maintenance kit, NSN 8465-00-753-6335, to repair small holes. The patches are only good for emergencies. They don't hold up long in the field. So get holes repaired by support as soon as possible.

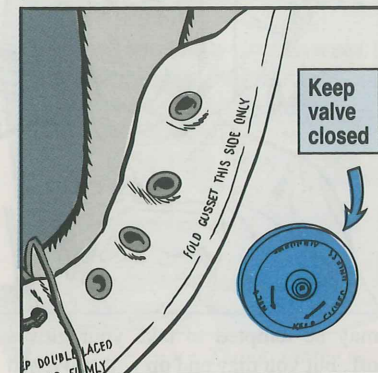


Kit, NSN 8465-00-753-6335

Watch out for things like concertina wire that can puncture the boots quick.

Keep the pressure relief valve closed, except when flying in an Air

Force transport. Moisture can get in if you leave it open all the time.



Clean the boots using soap and water. A spray on/wipe off detergent—like NSN 7930-00-357-7386—takes care of tough stains. Never dry boots near a fire or other heat source. Excessive heat damages the boots.

Finally, turn in the boots to support at least once a year for testing. They'll make sure the boots are still serviceable. If you suspect a leak, though, or one boot is heavier than the other, have them checked.



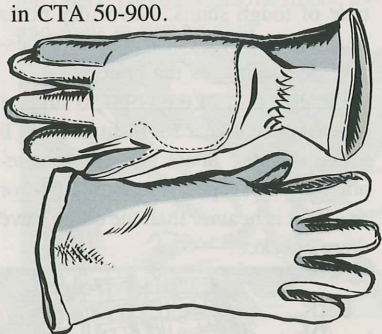
Hand Care

Cold weather gloves and mittens do a good job keeping your hands warm, but make it tough to handle tools. You



may be tempted to take your gloves off, but you may end up with a wrench frozen to your bare hand!

Instead, use anti-contact gloves. They are authorized under LIN J66420 in CTA 50-900.



These cotton gloves have soft deerskin palms, thumbs and fingers to protect your hands from metal burns in temps as low as -60°F.

They're not made to stand up to hours of rough, heavy-duty service. Nor do they protect your hands from the cold for long. Take them off as soon as you can use regular gloves.

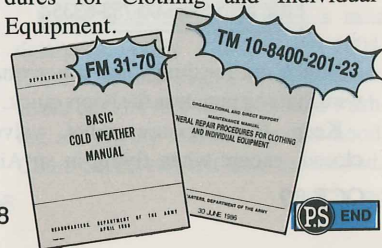
Here're the sizes available:

Size	NSN 8415-00-
Small	227-1220
Medium	227-1221
Large	227-1222

Pubs

Eyeball Chapter 2 of FM 31-70, Basic Cold Weather Manual, for more information on cold weather clothing.

Care and repair instructions for some of the gear, including the extreme cold weather hood and parka, and the cold weather coat, are covered in TM 10-8400-201-23, General Repair Procedures for Clothing and Individual Equipment.



Ski Pole Savings

RING BROKEN?
NSN 8465-00-753-5962
WILL GET YOU
A NEW
ONE!



Dear Editor,
When the snow ring on a ski pole is broken, there's no need to replace the pole. Instead, replace just the ring. Get it with NSN 8465-00-753-5962. It costs \$7.50, just a fraction of the cost of a new pole.

SGT Donald L. Phillips
USMC

(Editor's note: Thanks for the tip!)

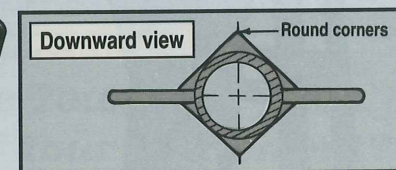
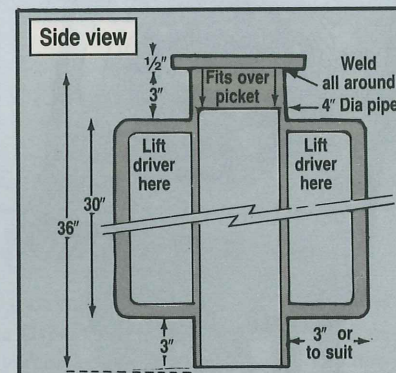
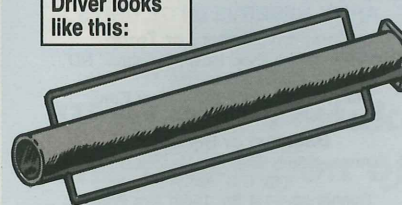
Picket Driver Revised

To build a driver for engineer pickets, you need a larger pipe than called for on Page 54 of PS 433. Pipe, NSN 4710-00-961-9440, won't fit over a 3 1/4-in wide picket.

Instead, use 4-in pipe, NSN 4710-00-277-8680, and make the plate at the top 4 inches square.

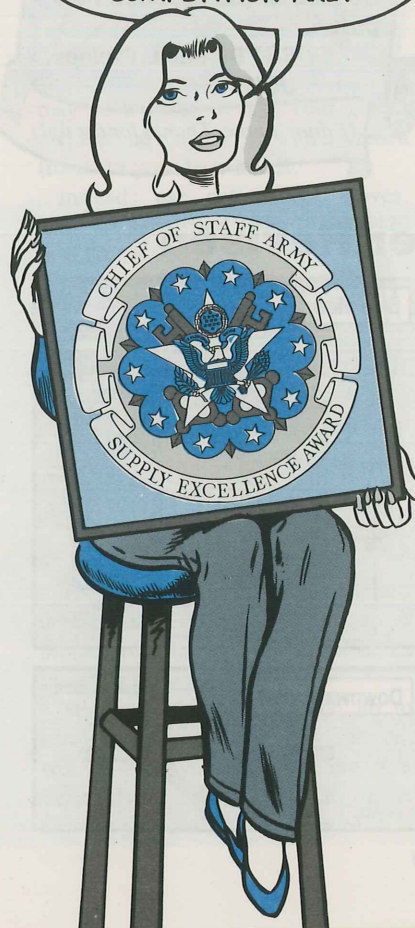
Forget about using NSN 5660-01-248-2406 for a picket driver, too. It's too small for engineer pickets.

Driver looks like this:



★ Supply Excellence Awards ★

WINNERS AND RUNNERS-UP FOR FY89 ARMY CHIEF OF STAFF SUPPLY EXCELLENCE COMPETITION ARE:



ACTIVE ARMY MTOE UNITS

Company, Battery or Troop

Winner—25th Trans Co,
Schofield Barracks, HI (WESTCOM)
Runner-up—HHC, 19th Spt Cmd,
Taegu, Korea (EUSA)

Battalion or Squadron

Winner—3d Bn, 325th Inf Regt,
Vicenza, Italy (USAREUR)
Runner-up—18th Military Intelligence Bn,
Munich, Germany (INSCOM)

ACTIVE ARMY TDA ORGANIZATIONS

Company, Battery or Troop

Winner—Pusan Storage Facility,
Pusan, Korea (EUSA)
Runner-up—Senior ROTC Instructor Group,
Arizona State Univ, Tempe, AZ (TRADOC)

Battalion or Squadron

Winner—10th Area Spt Gp,
Torii Station, Okinawa, Japan (USARJ)
Runner-up—USAMEDDAC, Ft Lee, VA (HSC)

ARMY NATIONAL GUARD MTOE UNITS

Company, Battery or Troop

Winner—D Co, 109th Avn Bn, Boone, IA
Runner-up—1022d Med Det (AA),
Cheyenne, WY

Battalion or Squadron

Winner—2d Bn, 133d Inf Regt (Mech),
Sergeant Bluff, IA
Runner-up—4th Bn, 114th FA, Newton, MS

ARMY RESERVE MTOE UNITS

Company, Battery or Troop

Winner—311th Evac Hosp, Bismarck, ND
(6th U.S. Army)

Runner-up—HHC, 412th Engr Cmd,
Vicksburg, MS (2d U.S. Army)

Battalion or Squadron

Winner—368th Engr Bn, Manchester, NH
(1st U.S. Army)
Runner-up—1st Bn, 158th Avn Regt,
Grand Prairie, TX (5th U.S. Army)



M872 Lug Wrench NSN

NSN 5120-01-077-7725 for the lug wrench shown on Page B-2 in Section III of C4 to TM 9-2330-359-14&P is wrong. It won't fit the lug nuts. You need wrench NSN 5120-00-203-4766. Openings are 1 3/16, 1 3/16, 1 1/4, and 1 1/2 inches.

Chock Block NSN

To make sure your parked truck or trailer stays where you park it, use chock blocks, NSN 2540-00-678-3469. Your CO can authorize them.

Longer NATO Slave Cable

You combat vehicle crews can solve your long-distance slave starting problems using the 50-ft power cable. Get the cable with NSN 6150-00-363-7102. It comes with NATO connectors and connector covers.

Canteen Cup Stand NSN

Get a stand to hold your canteen cup with NSN 8465-01-250-3632. It'll let you use your cup to heat water for MRE's or coffee. The stand fits inside the canteen cover, with the cup nested inside, and canteen nested inside the cup. The basis of issue is one stand per canteen.

Field Desk Stool NSN

Use NSN 7105-00-282-0684 to get a replacement stool for the field desk, NSN 7110-00-267-1999. Use App A of CTA 50-970 as your authority.

Lyster Bag Spigot NSN

Get the spigot for the water sterilization bag with 4510-00-277-9569. The complete bag is NSN 4610-00-268-9890.

Black Hawk MTF Revisited

The story on Page 30 of PS 441 is wrong where it said maintenance test flights (MTF) are required any time UH-60 pitch control rods are disconnected. MTF's are NOT required if you make no adjustments when you disconnect the rod ends. That's the word in Para 3-2C(3) of TM 1-1500-328-25.

Distribution: To be distributed in accordance with DA Form 12-34-C-R, for TB-43-series.

Would You Stake Your Life *right now* on the Condition of Your Equipment?

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NEVER Let Your BATTERIES DOWN



ALWAYS

- ✓ Keep electrolyte over plates
- ✓ Clean off dirt and corrosion.
- ✓ Keep cables and clamps tight.
- ✓ Correct over-charging.
- ✓ Run engine after adding water.

NEVER

- ✓ Overfill.
- ✓ Use wrong tools...hammer, adjustable wrench...on batteries.
- ✓ Pair weak batteries with strong ones.
- ✓ Leave batteries with low charge.