

FMTV LMTV Common Issues & Fixes

Here are some things to check on an FMTV, some fixes for them, and a few upgrades. In no particular order.

[Driveline Vibrations - Broken Water Pump, Alternator, or other Extremity Engine Accessories](#)

[Stiff gas pedal](#)

[Loose air compressor bracket: Oil tube broken](#)

[Tire bouncing](#)

[Electrical Connector Replacement](#)

[Fan clutch always engaged](#)

[Engine speed sensor problems](#)

[WTEC II/III Transmission and Throttle Position Sensor Calibration](#)

[Setting off automatic traffic light sensors](#)

[Reading Tire Date Codes](#)

[CTIS System & Troubleshooting \(CURRENTLY UPDATING\)](#)

[Components of the System](#)

[CTIS Basic Sequence of Operation](#)

[Manual CTIS](#)

[Building a Manual CTIS ECU replacement](#)

[Air / Hydraulic Unit Repair](#)

[Part Numbers](#)

[Disassembly, Repair, & Reassembly Tips](#)

[Air / Hydraulic Flush](#)

[Greasing Stubborn Chassis Joints](#)

[Aftermarket Light Material Handling Crane \(LMHC\)](#)

[Rear Cargo Cover Frame](#)

[Battery Wiring & Disconnect Switches](#)

[Self-Canceling Turn Signal Adjustment](#)

[Parking Brake Not Activating](#)

[Paint - CARC \(Chemical Agent Resistant Coating\)](#)

[Gun Ring Turrets That Fit FMTV](#)

[Spare Tire Lift Cylinder Replacement](#)

[Timeline of Changes to Truck Models](#)

[Guidance Regarding Replacement of 100A Alternator](#)

[Tow Bars Suitable Available for FMTV](#)

[Ether Start System Troubleshooting & Maintenance:](#)

[Troubleshooting:](#)

[Maintenance:](#)

[Transmission Info \(Allison MD3070PT\)](#)

[Concept of Clutch Operation](#)

[Gear Ratios](#)

[Parts and Information Sources:](#)

[*** Unfinished/Suggested Topics ***](#)

Driveline Vibrations - Broken Water Pump, Alternator, or other Extremity Engine Accessories

1. If you bought a new FMTV, take the driveshafts to be balanced, have the u-joints replaced, and have the cardboard "tube deadener" in the rear shaft removed (or replaced). Use thread locking adhesive (e.g. Loctite blue) and install safety tab washers on all the u-joint bolts, while torquing them to 17-24 ft*lb. I would recommend thread locking adhesive on the alternator, starter, and air compressor bolts too, since once they loosen it beats itself apart.
2. If you break an extremity engine accessory (e.g. water pump, alternator bracket, starter mount, air compressor / front engine cover, fan clutch / blade, etc.) in a mechanically violent way (e.g. it cracks or breaks off, as opposed to wearing through, rusting, or losing a rubber seal / hose), keep a close eye on it, and you are wise to have your driveshafts balanced as soon as possible.
3. If you break multiple extremity engine accessories within a very short amount of time (e.g. a tank of gas = 250 miles), stop all driving over 30 MPH until the driveshafts can be balanced. Don't risk the cost of replacing an engine and/or transmission (in the neighborhood of \$7000 out of pocket).

Since the FMTV was first introduced, it has been found that they are very sensitive to driveline vibrations. The original military engineering reports found that driveshafts would quickly get slop in the splines, resulting in increased runout and imbalance, and thus vibration. (Allowed runout is <0.005", but numbers as high as 0.055" have been found.) This vibration would destroy drivetrain components. The engineers recommended switching to Rzeppa style u-joints (if a few issues, such as waterproofing, could be improved) with a short term workaround of upgrading to heavier duty shafts and u-joints. The Army chose to upgrade all FMTVs to the heavier duty shafts and joints in the late '90s (indicated by a "D" stamped on the dash data plate), but never proceeded with the Rzeppa style joint upgrades. The military found that the heavy duty components survived well enough for them in a 6000 mile durability test, where they

quickly degraded to 0.015" runout in the course of a couple hundred miles, but only further degraded 0.0015" further (to 0.0165") in the remainder of the test.

This runout caused by loosening of the splines is also referred to as "lateral movement" by commercial drivetrain companies, and "hinging" in the military documents (TM 9-2320-365-20-3, 9-3. DRIVE SHAFT HINGING INSPECTION, p. 715). Commercial drivetrain specialists have stated that the military's 0.005" limit is far too much, and that anything more than zero is intolerable.

Civilian FMTV owners have started to see component failures that closely mimic the results of the military experiences and controlled tests. The most common manifestation is cracking of the water pump, breakage of the alternator mounting brackets or cast ears, or loosening of any of the bolts related to these. Other common failures further include any extremity engine accessories (e.g. starter breaking off at the nose, fan clutches coming apart, fan blades breaking off, transmission cooler hard lines fracturing, air compressors cracking the front engine cover, etc.).

If obvious violent mechanical failures of these components, especially the water pump and alternator, occur, the prudent immediate first step is to remove the driveshafts and have them balanced and straightened with the truck's u-joints still installed in the shaft (so they can be tested too). This service typically runs ~\$100/shaft, with additional repairs (e.g. yoke replacement) running an additional ~\$250, and replacement u-joints costing ~\$50/each. Typical total costs ~\$300-500/shaft are being reported to have a common damaged shaft brought back to spec. If driveshaft removal is not immediately possible, at least check that u-joint caps and bolts are tight, and that there is no detectable play/slop/movement in the u-joints or yokes, and keep driving speeds under 30MPH (as the military reports suggest).

Many of the FMTV drive shafts also have a cardboard tube insert, called a "tube deadener" that is intended to reduce vibrations. The tube deadeners are commonly present in the rear driveshaft, but it's unclear how often in the front. Over time the cardboard deforms and deteriorates, making the shaft difficult to balance in the shop, and allowing it to sometimes unbalance itself in the field as the cardboard rotates and flops around. Some driveshaft shops report that the tube deadeners should be removed, as they are more appropriate for much (e.g. 20") longer shafts or shafts with very thin walls (e.g 0.090" vs. the 0.340" wall of the military shaft).

Tube Deadeners



Several FMTV owners have tried only to address the symptoms they are experiencing (e.g. replacing cracked water pumps, reinstalling or improving the strength of alternator brackets, etc.), but in many cases experience another related failure almost immediately (<50 miles). Continuing to ignore the driveline problems has resulted in catastrophic drivetrain failure (e.g. ripping the back off the transfer case, cracking the engine block, etc.) for at least a few people. While driveshaft service is precautionary when only one component has failed, it becomes more imperative when two or more of these seemingly disconnected engine components have had issues. New owners of FMTVs should also have the driveshafts and u-joints checked, since the consequences of having an issue can be so severe.

One likely scenario for how the failures occur is that:

1. The shaft becomes unbalanced or wear causes lateral movement in the splines. This creates vibrations.
2. The vibrations further increase the lateral movement of the splines, damages the u-joints, vibrates the cap bolts and caps out of the u-joints, and wallow out the ears of the yokes until they are no longer press-fit for the caps. These increased movements of the driveline components allow extreme resonant vibrations in the driveline.
3. Extreme driveline vibrations act on the axles on one end, and the transmission/engine on the other. The axles are generally designed to take the abuse of violent bouncing, so damage typically isn't seen. The engine, especially its extremity accessories, are often heavy and not mounted in ways to withstand such shaking, and begin to fail. Any small problems that were present before the vibrations (e.g. loose bolts, the ability to wiggle components) is amplified to failure.

With this scenario in mind, here are recommendations in addition to having the driveshafts balanced and straightened:

- Use paint markers to mark the positions of bolt heads on the water pump, alternator brackets, air compressor brackets, and u-joint cap bolts.
- Periodically check that the bolts on the water pump, alternator brackets, air compressor brackets, and u-joint caps are tight (to torque spec), or have not moved from their markings. Check that u-joints have no movement side to side, and that the driveshaft splines have no lateral movement detectable by hand.

- Use medium strength (blue) Loctite on all the bolts on the water pump, alternator brackets, air compressor brackets, and u-joint caps. Use lock nuts in place of any regular nuts.
- Use u-joints that have safety tab washer plates (e.g. Neapco 4-0279) that prevent loosening of the cap bolts. Install the safety tab plates with the bolts, and then bend one of the tabs up against each bolt, saving the second tab for a future reinstallation. These safety tabs may be available alone, or could be made from sheet metal.



- Make sure the driveshafts are “phased” correctly. The yokes at both ends of the shaft should be aligned (e.g. if you point the hole in one yoke straight down, the other end yoke should point straight down too). Many shafts are put back together incorrectly by previous mechanics, causing increased vibrations. If the ends are not aligned, take them to be balanced (since there is no way to tell which 180-degree direction it was previously aligned when balanced).
- The low pinion driveshaft (standard on A0 LMTVs) has an overall length of 150.11 centimeters (fully compressed), while the top feed variant (standard on A1R LMTV's, and later) is 141.22 centimeters, and the MTV driveshaft from transfer case to intermediate axle is 135.64 centimeters. If swapping a top feed variant axle into an earlier LMTV, the driveshaft will need to be shortened accordingly.

Reference threads:

- <https://www.steelsoldiers.com/showthread.php?142145-LMTV-early-years-before-1996-first-contracts-quot>
- <https://www.steelsoldiers.com/showthread.php?171407-My-new-LMTV-is-blowing-water-pumps-and-loosing-alternator-brackets!>
- <https://www.steelsoldiers.com/showthread.php?174867-LMTV-Alternator-Disaster-engine-now-catastrophic>
- <https://www.steelsoldiers.com/threads/m1078-cracked-block.216493/post-2532903>
- Do an online search for the reports below (these documents are also sprinkled throughout the posts above, and others).
 - A416038 - Investigation of Driveline Incidents of M1078 LMTV - Dec1998
 - ADA366822 - Test and Evaluation of the LMTV Driveline - 1998
 - ADA416765 - Evaluation of Alternative Driveshaft Configurations for FMTV - 8Nov2002

Stiff gas pedal

Often the throttle cable is the leading cause of stiffness. Sometimes it is routed with a tight bend in the engine bay, and moving it so it's sitting with a more subtle curve helps. At the rubber boot by the fuel pump, temporarily put a hose clamp on the bracket side of the boot. Spray silicone lube into the boot, take an air compressor with a small nozzle tip, stick it in the pump side of the boot, hold it with your hand and use only a little air at a time or you will blow the boot out. You can blow lube all the way thru the throttle cable. This helps alot with stiff throttle cables. - Suprman

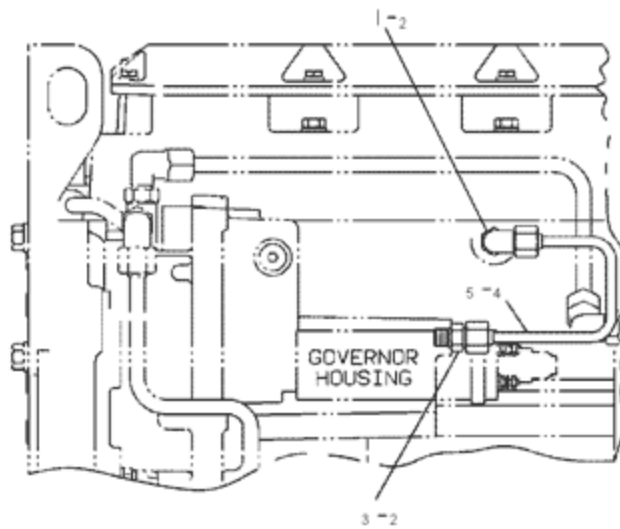
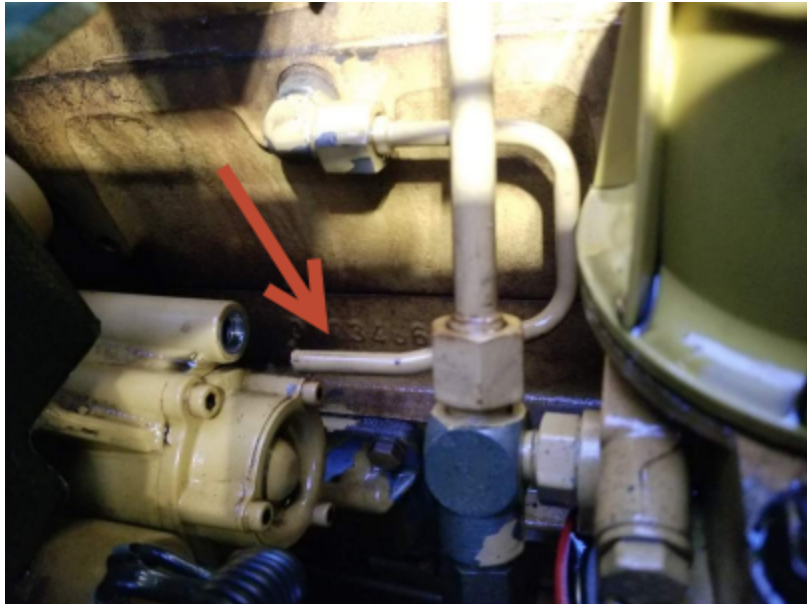
Loose air compressor bracket; Oil tube broken

Check the air compressor bolts on the front housing and look for the bracket that holds the air compressor and power steering pump up from the rear (that's not attached to the front housing). Loose bolts here cause the front housing to crack and/or the oil tube to break from supporting all the weight of the air compressor and power steering pump combo, and is quite an ordeal to fix. An additional suggestion is to remove the front plate, not totally but just enough to get to the nut on air compressor, and change to a nylon lock nut. The OEM nut will back off letting the gear come forward and you will lose air and power steering. There's no keyway on shaft, it's just tapered.

There is a rear support bracket on the back of the air compressor that sometimes comes loose, and the vibration can break the hard oil line nearby (see image below). If that oil line breaks, you'll pump all the oil out of the engine and destroy it. - Suprman

For 3116 engine (~\$40):

- Governor oil line: CAT# 7W-0367
- O-rings: CAT# 4J5477 & 3J-7354



LEFT SIDE VIEW

Tire bouncing

If the tires bounce at speed, they might be out of round. You can have a tire shaver true them to within $\frac{1}{4}$ " diameter, or even use a grinder to buff high spots yourself. Balancing can help too. If using dynamic balancing (e.g. ball bearings - be sure to use something that won't clog the CTIS), a ratio of 1oz to every 13lb of tire works well.

Reference thread:

<https://www.steelsoldiers.com/showthread.php?159554-FMTV-LMTV-Tire-balancing>

Electrical Connector Replacement

Many of the rubber connectors are dry and splitting after a couple decades in military service. Replacements are available from McMaster-Carr if you search for the phrase "Chemical-Resistant Push-In Signal/Power Connector Sets". They are rumored to be made by ITT, but I can't seem to find them on their website: <https://www.ittcannon.com>

Fan clutch always engaged

The clutch's resting position is engaged. With the truck aired up, engine below ~200°F, power on, engine off, the clutch should be released and turn easily. Above ~200°F engine temp, and the power on, it should kick on the solenoid (under the dash kick panel) and engage the fan. First troubleshoot by taking the air line to the fan clutch off, and seeing if it turns on/off with temperature and the fan fording switch on the dash. Air pressure off = fan engaged, air pressure on = disengaged. The fan clutch has 3 friction pads inside, that sometimes fuse to the housing. You can hit the front of the clutch with a hammer with the fan taken off, or the back of the clutch with a long pry bar or rebar with the fan in place. This may break the clutch free, and allow it to turn again. There is a troubleshooting process in the manual.



Reference thread:

<https://www.steelsoldiers.com/showthread.php?145266-Checking-the-FMTV-fan-system>

Engine speed sensor problems

Most of these Transducer, Motional, are about the same. About the only difference is the diameter of the shaft, and the plug. Normally you screw them in, bottom it out, and back it out 1/3 turn, (at least) Lock it in place. Turn the engine over, (without starting!!!!!!) and measure at the plug, AC volts. Between 2.5 and 3 volts AC is good. The closer to 3 the better. If the volts are low, turn in the transducer. If it is higher then 3, turn it out. High volts is bad. That means you are about ready to see all those tiny wires hanging out. Always better to see low voltage. The general rule for the thing is, if it works, don't fool with it. 99% of the non-op parts, is due to someone " checking it" or fooling with it.

WTEC II/III Transmission and Throttle Position Sensor Calibration

WTEC II TEPSS requires calibration after replacement. Procedure found in TM 20-3, page 8-5 (p 637). Procedure for WTEC III is similar, and is in the manual on page 8-7 (p 639) immediately following the WTEC II procedure. The Throttle Position Sensor procedure is also the same, and found on page 4-18 (p 114).

1. Position master power switch to on and wait for Neutral (N) indication from WTEC II TEPSS (TM 9-2320-365-10).
2. Position master power switch to off (TM 9-2320-365-10).
3. Perform steps (1) and (2) four more times.
4. Position master power switch to on and depress accelerator pedal all the way to cab floor (TM 9-2320-365-10).
5. Start engine (TM 9-2320-365-10).
NOTE: Transmission shifting may be rough until WTEC II TEPSS determines proper shift points. Operating vehicle through each gear range several times will allow WTEC II TEPSS to determine proper shift points.
6. [From WTECIII procedure only] Check VOLTS gage for charge indication (TM 9-2320-365-10).
7. Operate vehicle through all gear ranges several times (TM 9-2320-365-10).
8. Shut down engine (TM 9-2320-365-10).

Setting off automatic traffic light sensors

FMTVs, and other large vehicles, are often too high to trigger the sensor loops placed in the pavement to trigger automated traffic lights. A quick fix is to attach a large neodymium rare

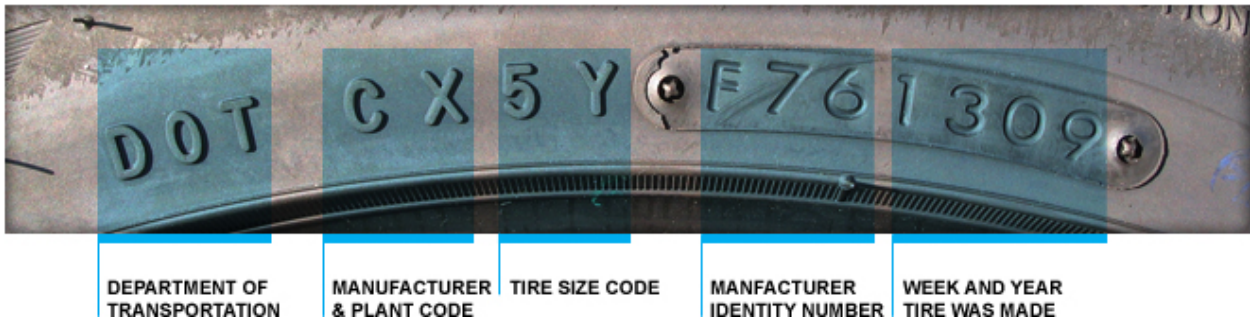
earth magnet to the bottom of the differential. You can buy these online cheap (<https://smile.amazon.com/dp/B01C5QR4HS/>), or harvest them from unwanted mechanical computer hard drives. Be sure to stop in, and not drive past, the sensor loop or the light might think you pulled through and aren't waiting, or perhaps install a magnet on the rear differential too.



(Picture is from another military vehicle.)

Reading Tire Date Codes

Highway tires have a DOT code stamped on them. The last 3-4 digits indicate when the tire was manufactured. Before 2000, tires only had a 3 digit code, where the first two digits were the week of the year (e.g. 13th), and the last digit was the year of the decade (e.g. 9th, but could be 1979, 1989 or 1999). After 2000, they switched to a 4 digit date, where the first two digits are still the week of the year (e.g. 13th), and the last 2 digits are the year (e.g. 2009). DOT only requires the information be branded into one sidewall, so some tires have what looks like an incomplete first few digits of a code on one side - just flip the tire and look on the other side for the complete code. The military replaces tires after 3 years typically. Tires over 10 years old should be replaced for safety reasons.

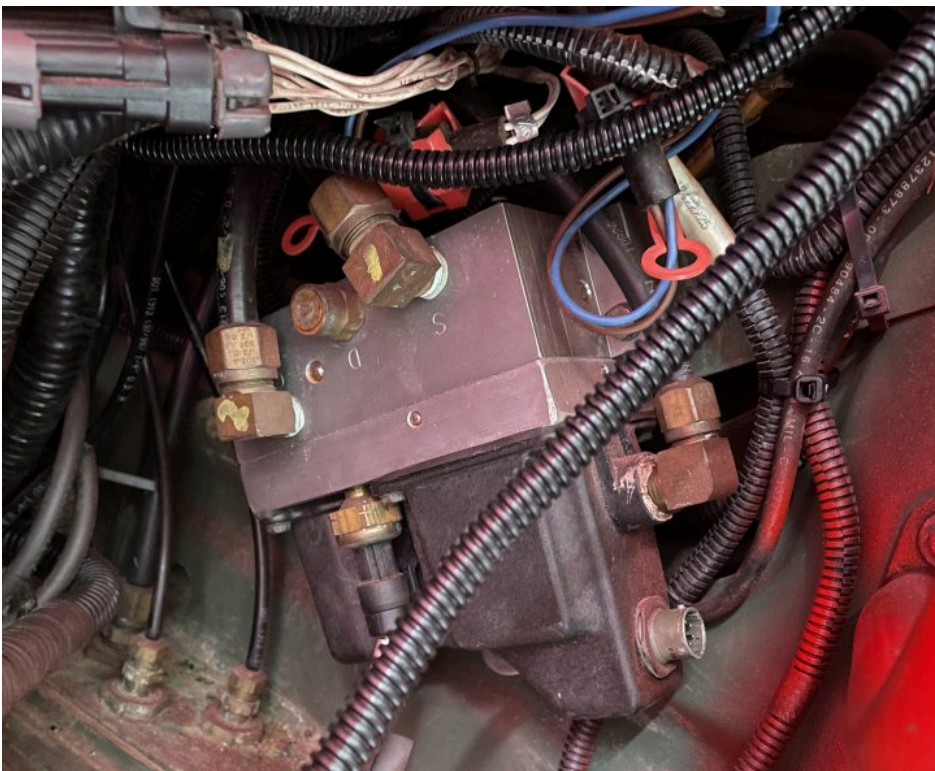


(Image not from a military tire.)

CTIS System & Troubleshooting (CURRENTLY UPDATING)

Components of the System

- Pressure Control Unit (PCU): The pressure control unit is the manifold that the controller manipulates to control the system. It is located under the passenger dash, and is an aluminum block with hoses connected to it with a black plastic cover on the bottom. It has 3 solenoid valves under that plastic cover. The PCU also has a few connectors.



- Control Solenoid: It is normally open, to vent the manifold. The controller must energize it to close it and seal the system. It vents the manifold into the black plastic cover, which has a hose that connects it to a port on the floor to vent the air outside the cab.
- Supply Valve (marked "S"): When the controller energizes it, it lets in supply air from the wet tank to pressurize the system, and inflate the tires.
- Deflate Valve (marked "D"): When energized it connects the manifold to a small 6.5 PSI pressure relief valve on the side of the manifold block. This vents the system down to that point, which is just enough to keep the wheel valves open. Since the pressure in the tires is greater, air tries to flow back from the tires to the

manifold. This reversal in flow causes the dump valves (remote pressure regulators) to vent the tire air rapidly.

- Port C (marked "C"): Connects down to the dump/quick release valves and wheel plumbing.
- The small device with the electrical connector is the pressure sensor.
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CTIS Basic Sequence of Operation

1. Initialization Phase:
 - a. After the engine is started, the compressor starts filling the tanks.
 - b. Once the CTIS wet tank reaches 117 PSI, the switch closes the circuit.
 - c. The CTIS controller closes the control solenoid valve on the PCU to seal the system.
 - d. Then the controller briefly opens the PCU supply solenoid valve, and gives a shot of air to pressurize the system.
 - e. Pressure in the system over about 6-7 PSI opens the wheel valves and the system pressure will stabilize at the tire pressure.
2. Fill/Deflate to Set Pressure:
 - a. The controller then reads the pressure sensor on the PCU. It is looking at pressure and that it is NOT changing, which would indicate a leak or a large tire imbalance. IF IT DOES NOT SEE A STABLE PRESSURE IT WILL FAULT, to tell the operator to fix the system... If it has a steady pressure it compares that with the programmed pressure for the selected mode. If it is high or low it will deflate or inflate as needed and the selected mode light will flash indicating it is working on reaching that mode. As it does so it will check the pressure change at intervals till it reaches its programmed pressure. If it is deflating or inflating and it doesn't see an expected change at one of its checks(bad sensor), it will fault.

when it has reached it's comanded pressure, it will open the control solenoid, vent the system which closes all the wheel valves, and it gives you a steady mode lite for the selected mode. It will repeat this process every 15 minutes and adjust(or fault) as necessary.

Basically you are riding on some air filled bombs. For safety, the pea brain in the controller with one sensor and a pressure switch will fault at the drop of a hat unless it is absolutely sure it has complete control of the process...

With a little observation you can determine what actions the controller has taken before it faulted which will help you find the issue. This is easier to observe if you remove the passenger kick panel to get to the PCU manifold.

if you start the truck and nothing happens then after a while the unit shifts to 5flash, your air system isn't going over 117 PSI in the wet tank or the wet tank switch is bad.

When the supply switch closes at 117 PSI you should be able to hear the processor close the control solenoid and give a shot of air at the PCU. If it faults after that, it probably measured unstable air pressure so you have a leak or the tires are at different pressures and their trying to equalize causes an unstable pressure reading. Yes, it will fault if the tire pressures are not the same...

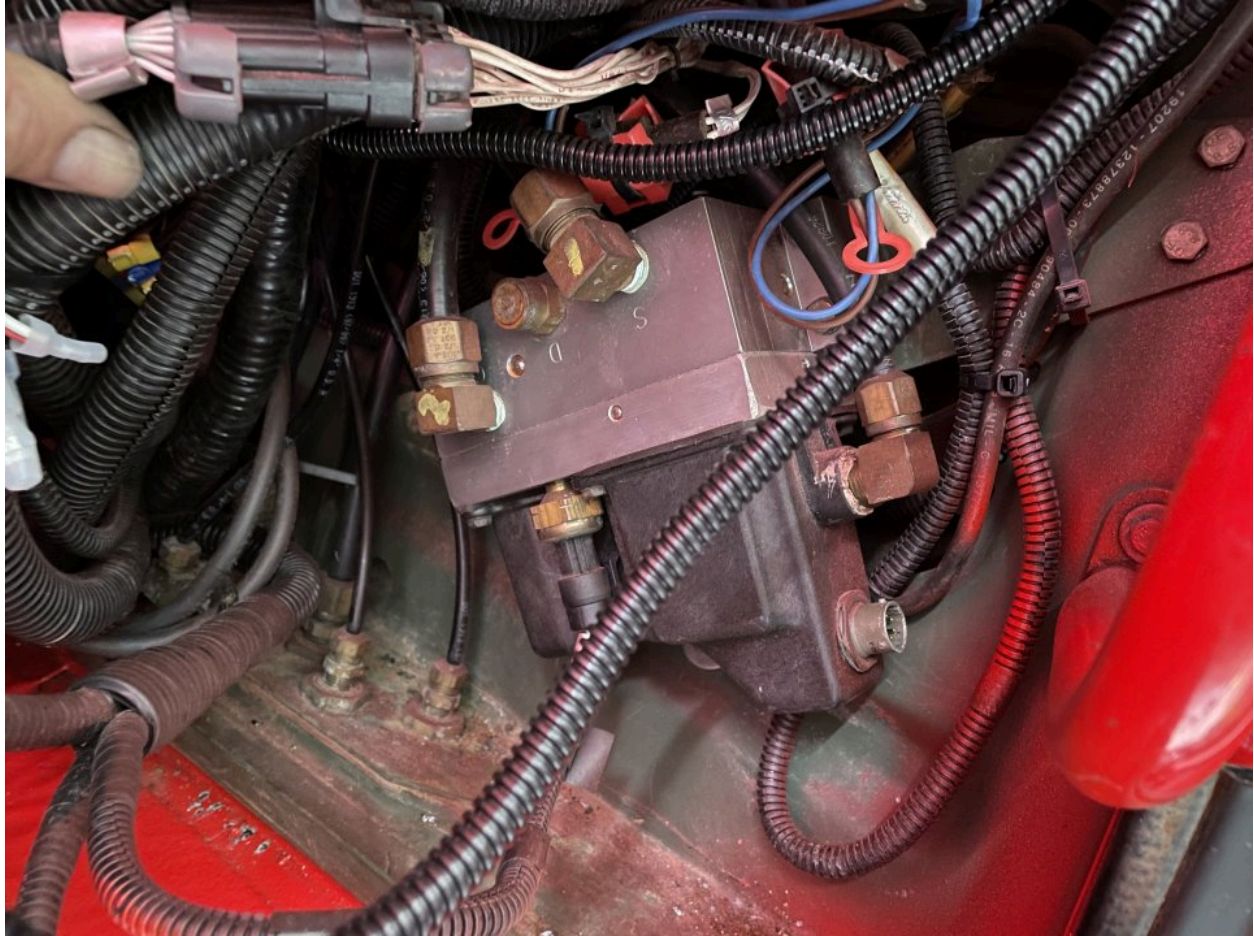
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The stable pressure it is looking for is the combined tire and system pressure. When the system is sealed and the wheel valves are open the tires should all equalize at the same pressure. If one or two tires are at a different pressure this can take a while to equalize thru the plumbing and the controller may fault Because the pressure is changing.

The only place to really sample the manifold pressure, already has the pressure transducer installed there. You can monitor the pressure at the tire Schrader valves... if you can get it to fill then it was probably faulting because not all the tire pressures were the same initially and it takes a while to equalize them. If low, 30 minutes to fill at idle sounds about right, they take a huge ammount of air. When low, the tires will empty a 120 PSI wet tank down to its 85psi cutoff in 3 seconds...

Finding leaks is a problem on the system as it only pressurizes in pulses and the engine is running. The easiest way is to disconnect the controller connector and jumper 28v to the control solenoid and momentarily jumper 28v to the supply solenoid to pressurize the system(as long as the wet tank is full). the system should then set at tire pressure as long as the control solenoid remains energized and you can look for leaks without the engine running...

...



The other connector does connect to the 3 solenoid valves under the cover and its pinout is in the schematic found near the back of each tech manual. I find it easier to control the valves manually using the CTIS controller connector and a pair of jumpers as there is 24v in that connector already(see attached pic).

In the controller connector H is 24v When the main switch is on. Pin R feeds the control solenoid, B feeds the Supply solenoid and C feeds the deflate solenoid. Start the truck, fill the air tanks and shutdown. I take 2 jumper wires and twist one end of each together into a "V" Put the point of the V jumper wire in H. Turn on the main switch and Put the other end of one wire into R. You should hear the control solenoid close. Take the other jumper and briefly(1 second) place it into B. You will hear the supply solenoid open and air flow. This will open all the wheel valves and the system should set at tire pressure as long as the H to R jumper supplies power to the control solenoid. Now leaks are easily located without the engine running... with a full wet tank, you can do this at least 4 times before you have to recharge the airtanks...

Wheel valves: the tire line is connected to the tiny center port. The truck side line feeds the whole rest of the face of the diaphragm. On the other side of the diaphragm is a spring and atmospheric pressure. High tire air pressure on that center port cant make enough force to lift the diaphragm so the tire port stays closed. When you put only about 6 PSI on the truck side port it can push on the entire diaphragm face and pushes it open easilly, so any more than 6PSI on the truck side = open wheel valve.

Dump Valves: they are a remote pressure regulator. Whatever pressure you apply to the inlet, they try and maintain on the outlet, either by feeding air from inlet to outlet, or by feeding air back to inlet or dumping air from the outlet side to the vent till the outlet matches the inlet. Same type of valve is used on the brakes. Step on the pedal, air flows and brakes are applied, release the pedal and you hear air vented under the truck to quickly release the brake pressure at the wheels.

When you briefly apply air from supply(and the control/vent is closed) that pressure is copied by the dump valves and applied to the wheel valves. Over 6PSI the wheel valves open and everything stabilizes at the average wheel pressure. Or if you continue to supply air, it flows thru the dump valves and thru the wheel valves to flow into the tires...

Remember that little brass relief valve in the D port on the PCU? When you open the deflate solenoid, it connects the manifold to that port and that relief dumps everything above 6.5 PSI(acts like a regulator). That 6.5 PSI left in the manifold is then mimicked by the dump valves and applied to the wheels. Since it is more than 6PSI, the wheel valves stay open, but the tire pressure is far greater, so air flows out of the tires trying to fill that lower pressure line, but the dump valves have 6.5PSI on their input side so will dump any excess air provided by the tires to the vent, to match the 6.5 PSI on their inlet...

Removing the H-R jumper(or shutting off the main switch), opens the control solenoid and vents the PCU manifold to 0PSI. The dump valves copy this on their outlet side, and the wheel valves going below 6PSI close the tire ports...



Source Threads:

- <https://www.steelsoldiers.com/threads/diagnosing-ctis-m1078.200074/>
- <https://www.steelsoldiers.com/threads/ctis-and-arduino.181972/>
- <https://www.steelsoldiers.com/threads/ctis-pressure-settings-increase-no-programming-transducer-or-module-required.216446/>

Manual CTIS

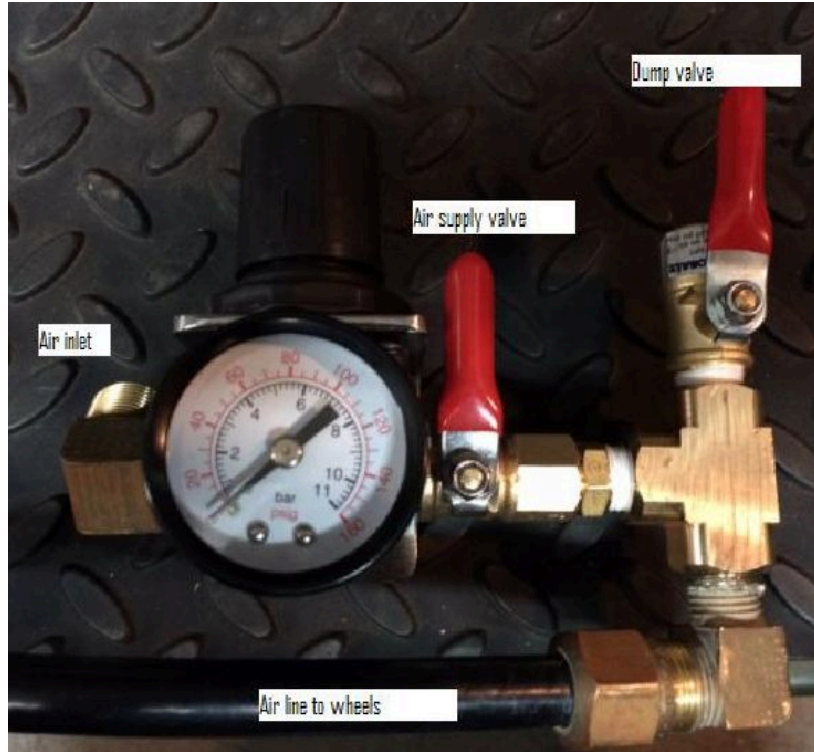
I have completed the installation of my manual CTIS system. After several discussions with all of you I tried out different theories discussed and here are my results. With regulator / tires set at 55 psi, air supply valve (ASV) open, dump valve (DV) closed; the tires didn't start to deflate until the regulator was reduced to 41 psi.

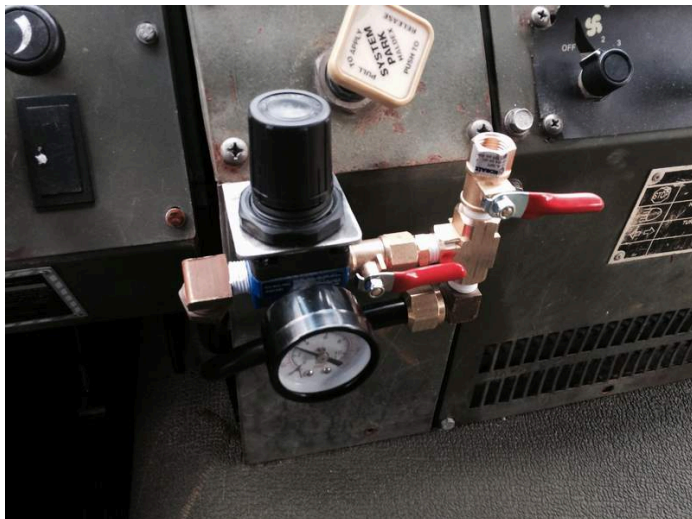
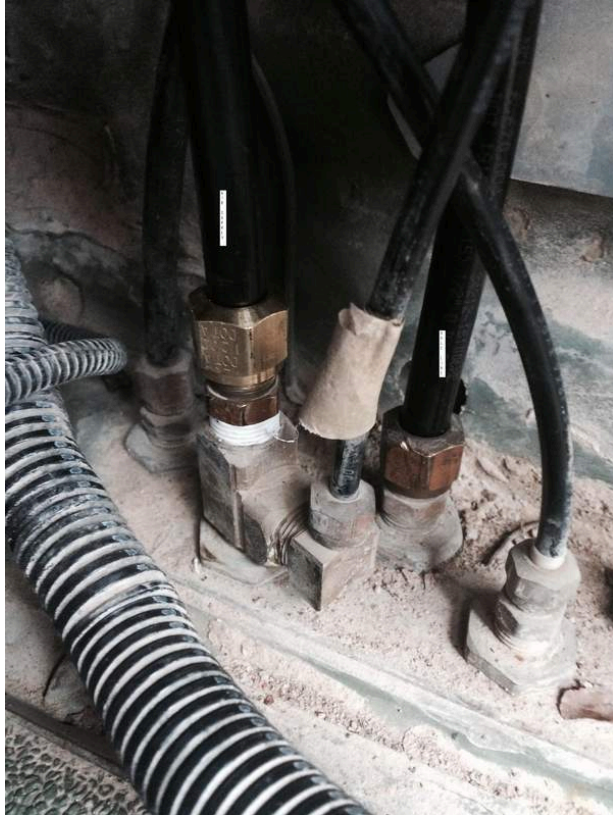
I reduced the regulator to 20 psi and the tires deflated to the 20 psi, quick release valves (QRV) closed and tire psi was equal. I closed the ASV and opened the DV to release the air from the axles. I did the same test from 55 psi to 30 psi and got the same results. I am very satisfied with the system, no electrical gremlins to deal with. I removed the control box in the cab, valve behind the right kick panel and the wiring between both.

As to the water fording, my conclusion is the regulator should be set to the same psi as the tires, ASV open and DV closed to insure steady psi on the axle seals until you are out of the water. Lower psi than the tires could open the QRVs.

Reference threads:

- <https://www.steelsoldiers.com/showthread.php?152581-Manual-CTIS-Conversion-for-M-1078>
- <https://www.steelsoldiers.com/showthread.php?182033-Manual-CTIS-electric-over-pneumatic>





Building a Manual CTIS ECU replacement

There is something you can do to replace the ECU completely. Build a switch box with power and ground wires to the truck, connect power to one side of the switches and the other side out to the PCU solenoids. Bring the PCU ground wires back to the switch box ground. (Supply) (Control) (Deflate) I like to wire the box so (Control) has to be "On" to provide power to the

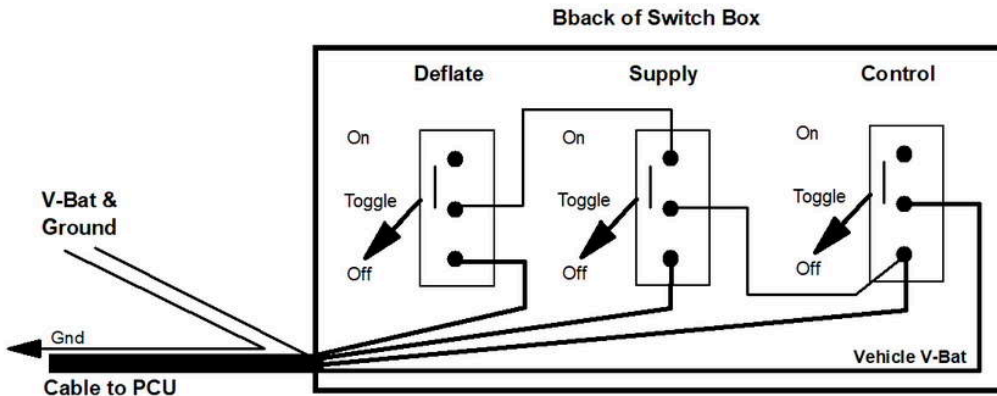
(Supply) switch, this way Supply can not be energized without control on. High pressure air would blow out the PCU. You could connect the box the ECU connector but those 26 way are more expensive than the 6 way PCU connector. >1.5 amp switches. Some engineers like to see fly-back or clamping diodes in the circuit but larger 10 amp switches will not fail.

1. Tap a pressure gauge 0-125 psi on the PCU channel line so you can read the tire pressures.
2. Control On, then Supply on for 3 seconds the Off = "Tire Pressure Read", Supply back on = "Inflate"
3. Control On, then Supply on for 3 seconds the Off = "Tire Pressure Read" , Supply of, Deflate on = "Deflation"
4. Read deflated tires: Turn off Deflate Switch, back to (step 2.)

This switch box is for Troubleshooting CTI system issues only it is not intended for vehicle operation.

NOTE: Inflating and deflating past the normal software values will cause the system to malfunction and could be Dangerous!

Follow the 2018 CTIS Troubleshooting Guide for connections.



Notes: The ground goes from the Vehicle directly to the PCU ground pins
V-bat, Ground, and PCU pins are all at the ECU connector, but \$\$
18 Gage Wire, 10a Switches

Source Threads:

- <https://www.steelsoldiers.com/showthread.php?162326-LMTV-CTIS-Question&p=2172452&viewfull=1#post2172452>
-

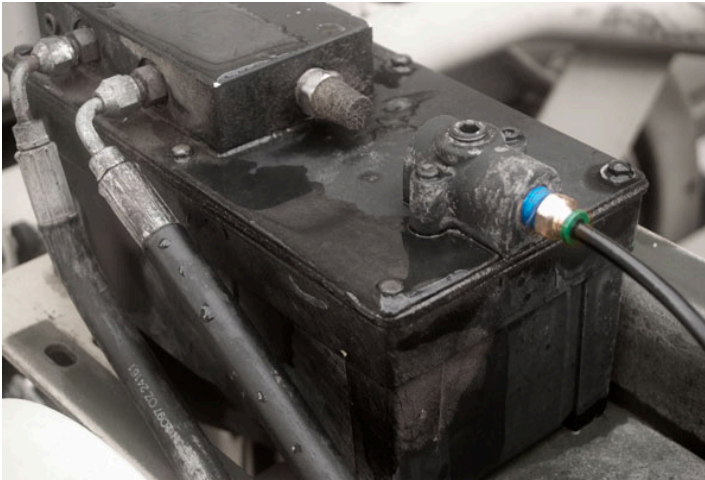
Air / Hydraulic Unit Repair

The air / hydraulic units used to lift the cab and lower the spare often have issues as the seals fail. The pumps seem to have a high failure rate in general.



1. There is a manual backup pump, to the right of the control box and tool box, that can be used if the air / hydraulic unit is inoperable.
2. The power pack is made by SPX Fluid Power, the pump is a part of SPX's line of portable power packs, and parts are available online from MROsupply.com (poor customer service reported) and others. SPX's customer support is very helpful, though they need your serial number. SPX does not sell directly, only through distributors. SPX will often recommend Fastenal as a distributor, but some people have had issues getting Fastenal to be interested in ordering parts, so it may be prudent to ask for alternative local distributors.
3. Normal pumping speed is a couple pumps per second (~2/sec). It's not super fast, but should make enough hydraulic pressure to raise the cab slowly but steadily. If it needs a seal it won't work efficiently, and it will fight itself a bit.
4. If "white smoke" can be seen coming from the unit while pumping, and you are losing fluid, it needs to be rebuilt. It's not really smoke - the pump is blowing hydraulic fluid out the air vent, which comes out atomized in puffs. Some vapor is normal, however it can be exacerbated if the main pump seal is bad, and compressed air used to run the pump is leaking past the seal and into the hydraulic reservoir. Some owners feel that when the pump seal is failing the unit will blow hydraulic fluid out the vent in clearly visible puffs, but good pump units will not have any visible puffing when standing at the hydraulic controls.
(The Army PS Magazine had one posting that said if you saw mist coming out then rebuild it. They came back about a year later and said the manufacturer said that's normal venting and as long as you weren't losing fluid the unit was fine.)
5. It is recommended that an in-line lubricator be installed. An inexpensive workaround is to replace compression air fitting at the unit with a Push-Loc air connector, so a few drops of lubricant can be added once in a while, to help with the wear of the seals.

(Source: Terry at SPX, Oct2015)

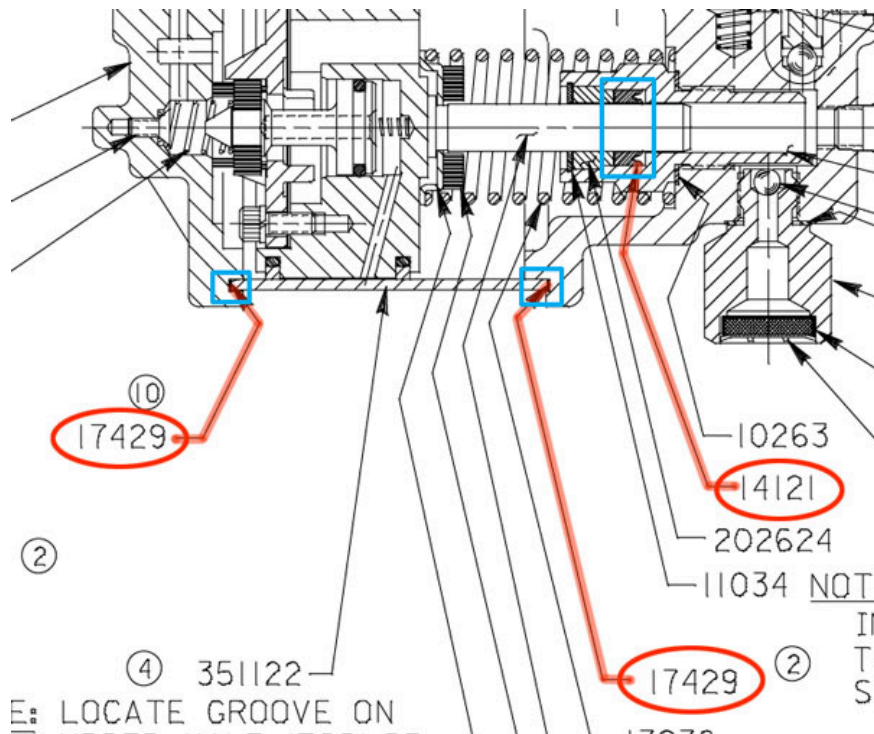


6. Reference thread:

<https://www.steelsoldiers.com/showthread.php?137274-FMTV-Air-Hydraulic-Unit-Repair>

Part Numbers

The parts TM has a full breakdown of the unit, and lists all the part numbers. Because this unit was a special sized piston kit for this truck family, they don't have a one-source total rebuild kit available, but are available individually. The most common parts that need replacing are the:



1. U-cup seal - P/N 14121 (QTY 1): This gets destroyed by the fluid and falls apart. The open end of the u-shaped plunger should face the hydraulic oil so the pressure expands

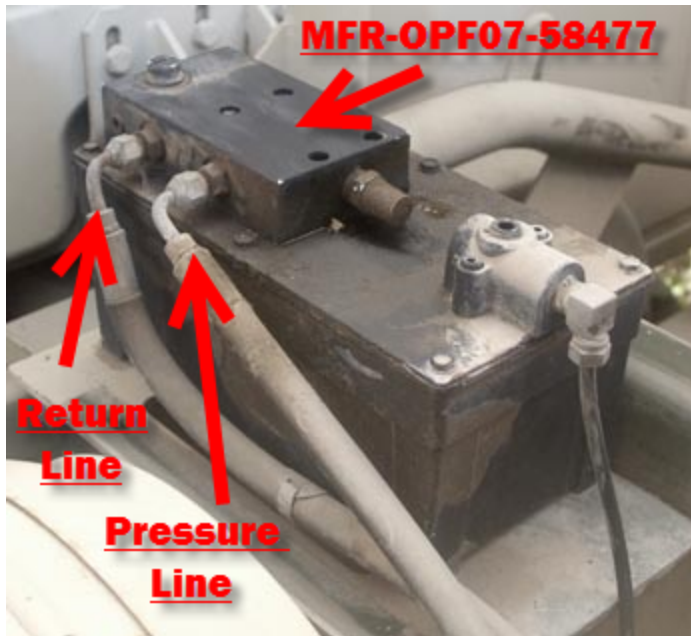
it. This is the only way the seal will function, so make 100% sure it's seated correctly.



2. P/N 17429 (QTY 2): Recommended to be replaced by SPX.
3. Rubber "bumper" washer - P/N 202613 (QTY 1): Located on the end of the plunger. Sometimes it appears after disassembly that the bumper is missing, but it was there at manufacturing and disintegrated in use. The pump will not function without the bumper.

Disassembly, Repair, & Reassembly Tips

1. Be sure to mark the hoses prior to disassembly, as it will not function if they are reversed.

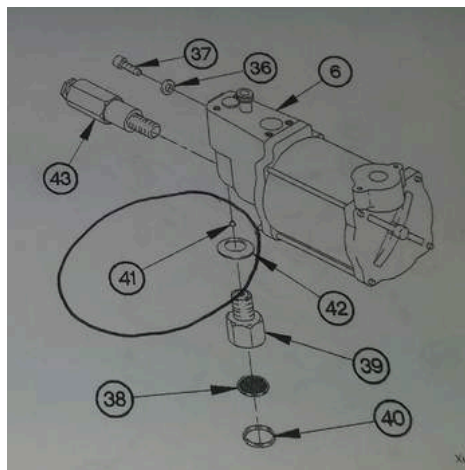
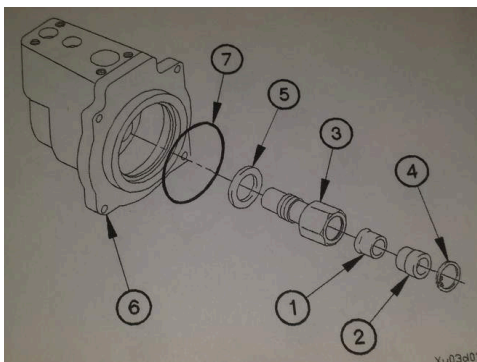


2. Cap all air and hydraulic lines while disassembled, to prevent insects and debris from obstructing them.
3. Many fasteners on the pump appear to be metric, with exceptions such as the nut on the spring clamp piston which is a 1" SAE.
4. The pump is under a fair amount of spring pressure. After taking out the four bolts holding the pump housing together, it will want to shoot across the work area, scattering pieces everywhere.
5. Thoroughly clean all parts while it is disassembled (it will probably be very dirty).

6. Inspect and clean the seats of the ball check valves, even if everything inside looks to be in very good condition. The seats where the check balls seat can become corroded, and allow small amounts of fluid to pass. Special tools to clean the seats exist, and leave them very clean and smooth again, but there may be alternative methods. Some owners have reported this solved lingering mystery issues, even after they previously replaced bad seals.
7. The big piston has a plunger inside as well. Test that it actually produces pressure, or the pump still won't work.
8. There is a port on the pump that does nothing, and terminates into the gasket under the top cover. Don't be concerned about it.



9. If the unit is rebuilt upside down, there is a check ball pitfall to avoid. After the air chamber is out of the way, the cylinder (3) must be unscrewed, which has the packing in it. There is a ball check (41) that is in the pickup (39), with the screen in it. When removing the cylinder (3) with the packing, that ball (41) will fall out of the pickup (39) if the unit is upside down. The ball (41) will end up inside of part 43, and the pump won't pick up any fluid after putting it back together and reinstalling it in the truck. So, remove the pickup (39) and ball (41), and reinstall them AFTER the packing and housing are put in. This assures that the ball is where it is supposed to be.



10. Reassemble the pump exactly as it came apart - many people have had issues with incorrect reassembly.

11. Trying to compress the spring by hand, enough to get the pump bolts started, can send pieces flying in all directions. To aid reassembly, get two 1/4"x20 6" long bolts. Lightly compress the spring and start the longer bolts then alternate tightening each one down until the it gets close enough to put 2 of the pump bolts back in. Continue tightening all 4 until the canister is seated then just take the 2 longer bolts out and replace with the pump bolts.



12. The system uses regular MIL-PRF-5606 hydraulic fluid, which is very common on aircraft. It's not expensive (<\$30/gal) or hard to get. Some users on the forum have used jack fluid, power steering fluid, or industrial hydraulic fluid. It's a simple system, so it is probably not very sensitive, but the decision is yours.
13. It's typically not necessary to bleed the repaired (or new) pump, and they should be able to be swapped without issue. If it is believed that there is some air in there, and it needs to be bled, take off the pump return line and put it into a container, to see if the pump will purge the system. (First, make sure the two hydraulic lines weren't accidentally switched.)
14. Brand new pumps have been reported to occasionally be stuck (at time of receipt), possibly from sitting on a shelf. Disassemble the brand new pump, note that the air chamber is so new and tight that it won't slide back and forth. Force the issue manually a few times and reassemble, bench tested, and install.

Air / Hydraulic Flush

Many FMTVs have water in the hydraulic fluid that will cause internal corrosion in the system, or have been filled with generic tractor hydraulic oil (or similar) which does not contain the anti-corrosion additives of the military 5606A / 5606H fluids. Ideally, the system should be flushed and refilled with 5606A / 5606H, which costs about \$7/qt. An elaborate flush is detailed in the TMs, however a simple flush can be performed as follows:

1. Raise the cab.
2. Disconnect the hydraulic line from the back of the cab latch, and put it into a container. (System holds ~3qt, so use a suitably sized container or empty it a few times.)
3. Continue to pump the "raise cab" setting, until the no more fluid discharges into the container (~2qt).
4. Reconnect the hydraulic line.
5. Refill the reservoir with ~2qt of hydraulic fluid. (Approximately equal to what you pumped out. This will probably overfill the reservoir a bit.)
6. Start the engine (with the cab raised, to keep air pressure in the pumping system, or use the manual pump).
7. Lower and raise the spare twice.
8. Lower and raise the cab twice.
9. Repeat steps 2-4.
10. Stop the engine.
11. Refill the reservoir to the proper level. (~1.5qt. Put the dipstick in, without screwing it in, and the level should be between the marks.)

This works because the pump is constantly trying to pressurize the cab latch to unlock it while pumping to raise the cab.

Greasing Stubborn Chassis Joints

The leaf spring bushings will often not take grease. Usually it is not because of clogged zerk fittings, but because the hole in the pin, at the center of the bushing where the grease is supposed to come out, is frozen with rust. There haven't been any surefire methods of getting grease in, but here are some ideas that users have reported helped.

- Try an IPA Grease Joint Rejuvenator, ~\$50, available online and at local retailers like Tractor Supply. <http://www.ipatools.com/products/ipa-7862.html> It's basically a metal syringe that you fill with penetrating oil (e.g. Kroil) and hit with a hammer, to forcefully drive lubricant into the joint. It was able to get about 1/2 of them unstuck, before the hammering destroyed the 2 zerk joint couplers that it came with. Order extra couplers (<http://www.ipatools.com/products/ipa-7902.html>). Pretty neat tool overall.

- Sometimes flexing the springs with a load, or (like the civilian mechanics would do) bouncing it down a bumpy road, is enough to free up the corrosion to get grease in there.
- Putting a bottle jack in between the leaf spring and the frame rail and jacking it up to relieve pressure on the joint can allow grease to flow into an otherwise stuck joint. It also gets the grease into the upper half of the joint, where it is needed most, as opposed to the lower half which is where it commonly flows.

Reference videos: https://youtu.be/h_-VlusO4n4?t=8m14s and <https://www.youtube.com/watch?v=JZyMz0bNA1Q>



Aftermarket Light Material Handling Crane (LMHC)

The trucks were designed to be compatible with a LMHC for lifting items in and out of the bed. The military LMHC is pretty rare, mounts into one of the four 4" square pockets in the corners of the bed, and has a power cord that connects to the 24V slave receptacle on the battery box. Several FMTV owners have made their own cranes, based on various commercial products.

- Auto Crane Econoton II / IIR - ~\$3000-6000:
<http://www.autocrane.com/html/service-cranes-e-econoton.php?expandable=0?hotlinxhdr=0>



- Liftmoore L21W - ~\$5000-7000:
<http://liftmoore.com/dc-powered-cranes/l-21w/>



- Northern Tool Ultra-Tow Hydraulic Pickup Truck Crane With Hand Winch - ~\$400-800:
https://www.northerntool.com/shop/tools/product_200672545_200672545
<https://www.harborfreight.com/8-ton-long-ram-air-hydraulic-jack-94562.html>
https://www.northerntool.com/shop/tools/product_200641740_200641740
<https://www.youtube.com/watch?v=82QaOI-w7xM>



Rear Cargo Cover Frame

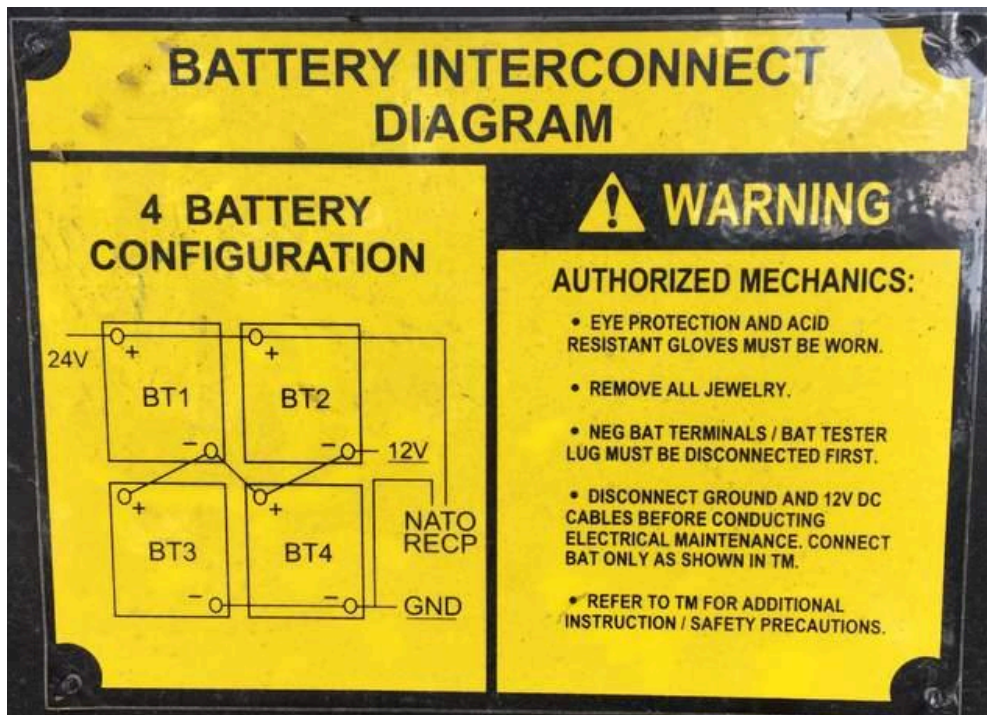
Some rear cargo cover frames are missing components.

- The tubes are 1"ID Schedule 40 steel pipe (1.315"OD), easily sourced from home hardware stores.
- The female tubes will accept up to 1.410"OD replacements.
- The front tubes on an LMTV are 76.25" long.

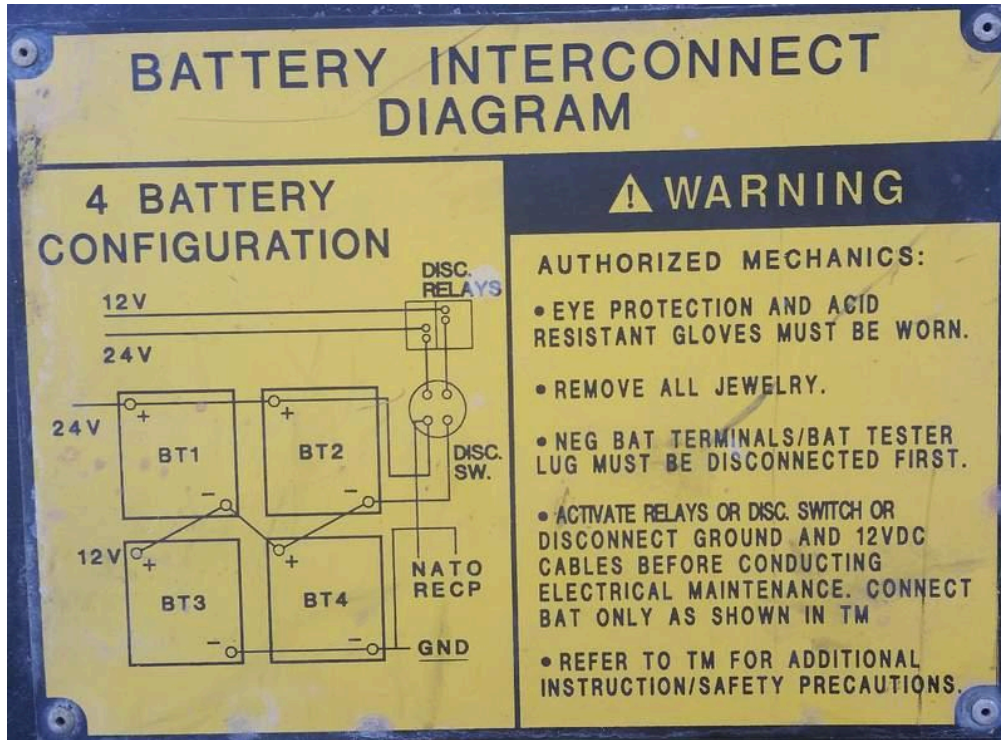
Battery Wiring & Disconnect Switches

Trucks often have issues with the battery wiring, and the factory data plates that showed it are missing. Owners of first-generation FMTVs sometimes want to add battery disconnect switches, which the A1 trucks have are the wiring is listed on the data plate.

- M1078 (first generation):



- M1078A1:



Self-Canceling Turn Signal Adjustment

FMTVs have self-canceling turn signals, though many are out of adjustment and malfunctioning. Reference thread:

<https://www.steelsoldiers.com/showthread.php?174172-LMTV-self-cancelling-turn-signal-adjustment>

1. Tools required: Philips screwdriver, 4mm allen wrench
2. Concept of Operation: There is a notch in a brass spacer underneath the steering wheel. This notch, which needs to be facing correctly to the 9 o'clock position, manipulates a pawl inside the turn signal mechanism.



3. Take the single screw out of the cover on the right side, and remove the cover.

4. Loosen the 2 socket head cap screws enough to allow the whole turn signal assembly to slide.



5. Slide the turn signal assembly up until the cancellation pawl is slightly above the bottom of the steering wheel notched spacer.
6. Tighten the socket head cap screws to secure the turn signal assembly.
7. Replace the cover and screw on the right side.
8. Test operation.

Parking Brake Not Activating

If your parking brake is not activating, the check valve located behind the front bumper under the emergency glad hand may be bad. This check valve sends air to the emergency air chambers from the vehicle's air source, or the pulling vehicles air source through the emergency glad hand. If the valve is stuck open, your parking brake won't work, and if it's stuck closed you can't charge the emergency system through the front gladhand. It is a KN23000 (or equivalent) one-way check valve, and it can be overhauled. It is a common part on civilian trucks and other military trucks (e.g. M939) and should be in stock at vendors. The repair kit is about \$15 and the valve itself is \$35.

This same valve is also bad if you are unable to charge the vehicle's air system through the front emergency glad hand.



Resource thread:

<https://www.steelsoldiers.com/showthread.php?174241-Tech-Tip-of-the-day-Parking-brake-not-activating>

Paint - CARC (Chemical Agent Resistant Coating)

The military uses a special paint, called CARC. It has a distinct texture that is difficult to replicate, even with color-matched CARC-substitutes.

- Info:
 - There are 3 types
 - Type I -2 part base/ hardener (can use thinner)
 - Type II -waterborne (thins with water)
 - And the new type III -moisture cure (can't be thinned)
 - Appropriate manual is TB 43-0213
 - It costs \$100-300 per gallon
 - It takes 2-3 gallons to paint a whole truck
 - The CARC Substitute paints are simply called that to identify them as matching current CARC colors - nothing more. They don't have a 383 Black "CARC Substitute" because their flat black is the same color already. It would have been redundant to call the same paint a different name.
 - All the Gillespie military paints are the same - all non-acrylic alkyd based enamels.
"CARC Substitute" is just a color designation.
 - CARC wants 1.8-2.2 spray tips, but can get good results from 1.4 tip if thinned per instructions

- Federal Standard Color Codes:
 - White...several
 - Desert Tan 686A....33446
 - Sand33303
 - Dark Sandstone.....33510
 - Earth Yellow.....33245
 - Field Drab.....33105
 - Earth Red.....31090
 - Brown 383.....30051
 - Olive Drab.....34088
 - Light Green.....34089
 - Green 383.....34094
 - Dark Green.....34082
 - Forest Green.....34086
 - Black.....37030
 - Aircraft Gray.....36300
 - Aircraft Black.....37031
 - Aircraft Green.....34031
 - Interior Seafoam Green.....24533
- Get Home Depot to match: Tell the Home Depot clerk the list of the FS codes in the HD paint computer is found by going under "Competitor Color look up" and selecting Federal Standard as the manufacturer then have them enter just the five number code.
- Reference Threads:
 - <http://www.steelsoldiers.com/showthread.php?116608-Paint-Information-%28Codes-and-Sources%29>
 - <http://www.steelsoldiers.com/showthread.php?71014-Sherwin-Williams-CARC-383-green-Moisture-Cure>
 - <http://www.steelsoldiers.com/forumdisplay.php?23-Paint-and-Bodywork>
- Sherwin Williams
 - <http://oem.sherwin-williams.com/products/metal/military-coatings>
 - <https://www.paintdocs.com/docs/webPDF.jsp?SITEID=STORECAT&lang=E&doctype=PDS&prodno=F93H118>
 - <https://www.paintdocs.com/docs/webPDF.jsp?SITEID=STORECAT&lang=E&doctype=PDS&prodno=F93G504>
 - Colors:
 - Brown 383 - F93N505
 - Green 383 - F93G504
 - Tan 686A - F93H504
 - Black - F93B505
 - and the Catalyst is V93V502.
 - You have to call the product finishes division to order. They will ship.
- Supply

- <http://www.aktionsupply.com/>
- Stencils, brass: <http://www.chanson.com/stencilsBrass.html>



Gun Ring Turrets That Fit FMTV

There are a number of traversable gun ring turrets designed to fit in the FMTV.

NOTE: Some of this information may be incorrect, but it is currently the best that has been pieced together, and will be updated if new or corrected info is found. It should be enough to get an understanding though, and get moving in the right direction.

- M66: The FMTV was designed to take the Vietnam-era M66 turret. This turret bolts in directly, is the heaviest of the manual turrets available, and it has a stiffer bearing. This turret doesn't have a hatch door, and instead uses a canvas cover which tends to leak a lot.

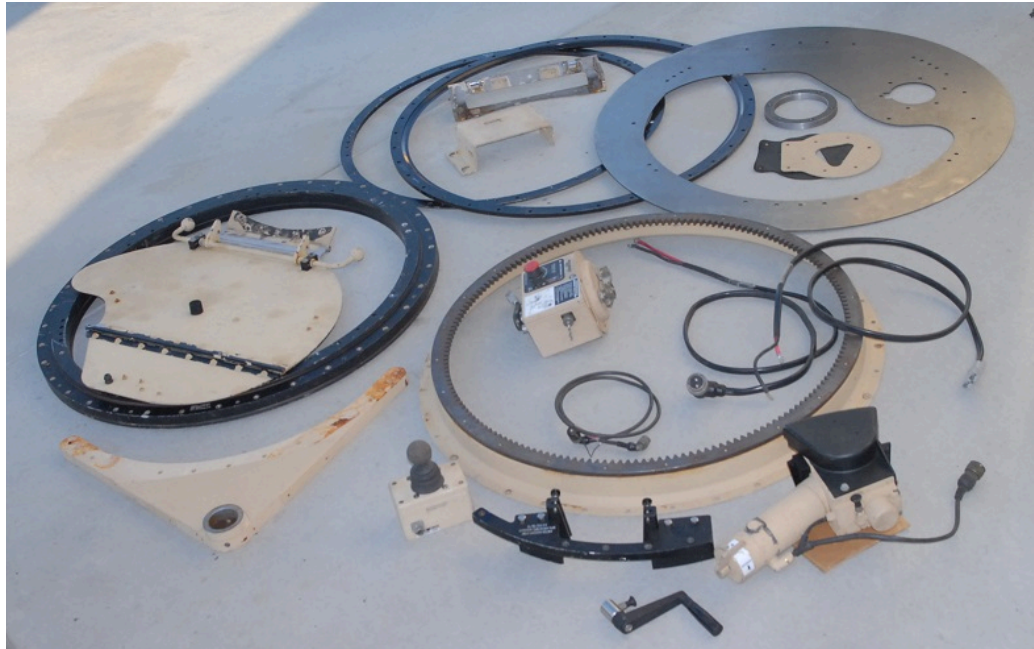


NOTE: The legs pictured are likely not used for mounting an M66 in an FMTV.

- HMMWV Turrets: There are multiple HMMWV turrets with different advantages, but all have doors, are lighter than the M66, and are designed for a gunner protection kit. Since the HMMWV uses a slightly smaller diameter turret than the M66, using any in an FMTV requires an adapter kit - the kits exist but can also be easily fabricated by a plasma/laser/waterjet cutter shop, as they are just a metal ring with a bolt circle.
 - Lightweight Weapon Station (LWS): This is the original unarmored-HMMWV turret.



- Up-armored HMMWV (M1114) Turret: This turret is motorized, and designed for the M1114 HMMWVs. It also includes a manual backup crank.



- Uparmored HMMWV (M1151) Turret: This turret is motorized, and designed for the Air Force's M1151 HMMWVs. This turret is the heaviest of the turrets, but can flip two levers and disconnect the motor so the user can manual crank and swing it by hand like an M66, engage the manual crank and use the crank to turn the turret, or disengage the manual crank and use the joystick to turn.



Resource threads:

- <https://www.steelsoldiers.com/showthread.php?168366-MRAP-seats-amp-motorized-turret-in-a-M1083A1&p=2018531&viewfull=1#post2018531>

- LWS pictures:
<https://www.steelsoldiers.com/showthread.php?22497-M939-Lightweight-Weapons-Station-question&p=711208&viewfull=1#post711208>

Spare Tire Lift Cylinder Replacement

The OEM spare tire lift hydraulic cylinder can be difficult to find a replacement for. Here is a bit beefier of a solution, but overall a workable off-the-shelf retrofit. The increased cylinder volume makes the lifting a little slower, but now there's no worries over those port check valves.

- Use a 2.5" bore Magister tang cylinder with 1.5" rod.
- Install a Prince flow control on the rod end.
- Buy a "top link knuckle", since the off-the-shelf cylinders are rotated 90° on axis vs the original cylinder, and the ports need to face upward. The end-to-end measurement of the knuckle plus 16" stroke cylinder is ~1/2" longer than the original cylinder's retracted length, and the same extended length. A 3" longer chain will let the tire sit in the cradle.
- The original pins work fine since the Magister cylinder has 1" holes. The knuckle needs an additional 1" x 3-5/8" cross pin (listed below).
- The extension hose is required on the rod end, to reach back to the original hydraulic lines.









Total cost (minus shipping) 11Mar2023: \$315

QTY 1 each:

- 1/4" 2-Wire 5000PSI Hydraulic Hose x 18" with one #4 (1/4") FJIC and one #4 (1/4") MJIC fitting
- 3/8 NPT 8 GPM Prince WFC-600 In-Line Flow Control 9-7960-6
- Hydraulic Cylinder Welded Double Acting 2.5" Bore 16" Stroke Tang WTG 2.5x16 (\$200)
- SAE 8 Male x 3/8" NPT Male 90 Degree Elbow 6806-08-06 Adapter 9-6806-8-6
- JIC 4 Male x 3/8" NPT Male Straight 2404-04-06 Adapter 9-2404-4-6
- SAE 8 Male x SAE 4 Female Straight 6410-08-04 Adapter 9-6410-8-4
- QTP Knuckle Hydraulic Top Link 25mm CAT2 #53467
 - Can be hard to find, try <http://farmingparts.com> but can take up to 3 months.
- 1" x 3-5/8" cross pin for Knuckle. Generic, or can be made from 1" shaft of old cylinder

Resource threads:

- <https://www.steelsoldiers.com/threads/cab-and-spare-hydraulics-problems-m1078-lmtv.148665/post-2502466>

Timeline of Changes to Truck Models

There have been a few revisions to the trucks over the years, as well as several changes at various points that were not considered major revisions. It's important to note that while these are the approximate dates a feature started showing up in the trucks, many parts are backward compatible and have since been installed on older trucks as repairs or upgrades.

- 1993 to 1998 was the 3116 engine
- 1999 to mid 2004 had the 3126
- later 2004 to present had the C7
- 1998 to 2005 had the WTECIII trans controller
- Late 2005 had Gen IV trans controller and 3500SP transmission
- 2006+ saw the redesigned battery boxes with stainless steel tray and the battery lift.
- later 2003 had the battery relay disconnect
- 1999 had the improved rust proofed cab
- 2008+ had the fiberglass lower bumper skid plate
- Different bumper
 - 2) Grab handles on the outside of the cab (this is a very nice addition/upgrade)
 - 3) Roof insulation inside the cab
 - 4) ABS
 - 5) Different grab handle on the roof inside the doors (the newer one seems more stout)
 - 6) The front sider markers are on the corners of the bumper, not the doors.
- There are several slight variations of bumper, some had side marker lights, some had the towing electrical cable plug placed in different locations. For the most part the A0 and

3126 A1's had the same bumper. The A1R had a different bumper along with a different front skid plate.

- Not sure on the interior grab handles.
- The A0's had a plastic grab handle and the later trucks A1 possibly had the handles made from cloth strap.
- The A1's also had a door limiting strap which prevented the door from opening too far and damaging the check strap mechanism. My 2000 A1 didn't have it but my 2003 had it.
- ABS was an A1 feature.
- Grab handles were put in place with the C7
- Roof insulation has always been available as retrofit kits, but all the A1 trucks I've gotten had it.

Resource threads:

- <https://www.steelsoldiers.com/showthread.php?178585-Differences-between-1998-and-2008-MTVs>

Guidance Regarding Replacement of 100A Alternator

This info was provided by a unit sometime prior to 11Oct2018.

FMTV 100 AMP Alternator

The FMTV 100 amp alternator NSN 6115-01-504-0680, P/N N1511 will soon become obsolete. Units should convert to the 260 amp alternator NSN 2920-01-559-2715, P/N N1224-1.

FMTVs with a 3126 (serpentine belt) or C7 engine should use the 260 amp alternator conversion kit NSN 6115-01-563-7966, P/N 12423864-001 (kit includes a 260 amp alternator).

FMTVs with a 3126 V-belt or 3116 V-belt engine can continue ordering the 100 amp alternator until exhausted. Once stock is exhausted, units should order NSN 6115-01-563-7969, P/N 12423864-002 (kit includes a 260 amp alternator).

The maintenance procedures can be found in EMS NG IETM 9-2320-391-13&P, dated July 2015 under special purpose kits maintenance work Packages.

Reference thread:

<https://www.steelsoldiers.com/showthread.php?182352-Obsolete-Alternator-Information>

Tow Bars Suitable Available for FMTV

1. Towbar, Motor Vehicle Wheeled (NSN 4910-01-365-9304):



Allowable max gross weight 39,000lb. The “medium tow bar” is the most common, and has adjustable legs that slide through the bar tubes. This bar has 3/4" feet, 1" feet, and the rare Y feet which have both size pin holes made in a Y configuration.

NOTE: This is the replacement for NSN 4910-00-433-7094, which should no longer be used without modification:

https://www.nsncenter.com/Library/PSMAG/PS_678?PageNumber=10

2. Medium heavy bar is a non adjustable bar. About 7 ft long. Has Y feet for both 3/4" and 1in feet. And a 1.5" pin feet setup for big trucks. It's working load limit is 64,000lbs

3. Towbar, Motor Vehicle (NSN 2540-01-496-8356 / P/N SKU: 3428515):



Allowable max gross weight 83,000lb. Commonly called MTRV/LVS bars. They have individual feet for all truck pin sizes. These are starting the show up. They are also not very heavy. See TM 10867A-12&P/A.

4. Ibis Tek (brand) Medium Tow Bar (NSN 2540-01-577-3683 / P/N 2512-100-001):



Allowable max gross weight 44,000lb. A lightweight (65lb) aluminum tow bar, that extends from 40-62.2" in length. They have a shoulder strap, and individual feet for 3/4 or 1in pins.

NOTE: There seems to be some problems, or possibly confusion, in the community over these. Some users have reported catastrophic failures. The brand name, Ibis Tek, also seems to get confused with being the name of the the actual product, which possibly leads to the smaller (17,500lb rated), but similar looking, HMMWV tow bar being used unsuccessfully for larger vehicles.

5. Heavy Duty Tow Bar (NSN 2540-01-267-2912 & NSN 2540-01-434-8595):



Allowable max gross weight 112,000lbs. Has 1 in or 1.5in feet. Weighs about 400lbs. So heavy it has handles.

Source threads:

- <https://www.steelsoldiers.com/showthread.php?182530-Could-someone-explain-tow-bar-differences>
- <https://www.steelsoldiers.com/showthread.php?113114-Catastrophic-Ibis-Tek-tow-bar-failure-snapped-like-a-twig>
- http://www.hdtglobal.com/wp-content/uploads/2015/09/HDT_Tow_Bar_06.pdf
- https://www.ibistek.com/doc/product/13/Tow_Bars.pdf
- https://www.nsncenter.com/Library/PSMAG/PS_725?PageNumber=5
- <https://www.logsa.army.mil/psmag/archives/PS2015/754/754-06-09.pdf>

Ether Start System Troubleshooting & Maintenance:

From the 20-1 service manual:

"Additionally, the vehicle is equipped with an ether quick start system designed for starting the engine when ambient temperatures are below 32°F(0°C). The ether quick start system is composed of an ether cylinder (6), ether valve (7), two ether nozzles (8), and an ether sensor switch (9). The ether sensor switch detects the temperature of the engine coolant and disables the ether valve above 32°F(0°C). The ether valve delivers a controlled charge of ether to the ether nozzles."

The ether start system appears to be made by QuickStart.

Troubleshooting:

1. Check the cylinder content. An empty cylinder will weigh 17 ounces. A full cylinder will weigh approximately 37 ounces. It is our recommendation that a cylinder with 20% of its contents or less be replaced. It is not recommended that you try to test for pressure.
2. Before replacing the cylinder you must verify the QS1182 gasket is in place. DO NOT activate the system without the gasket in place.
3. Check the cylinder for a hand tight connection.
4. If you still have a problem getting ether, disconnect the tubing from the precision flow control fitting, activate the valve and a fine flow of ether should be coming from the fitting.
5. If not, check that the valve is receiving the correct voltage.
6. If valve still does not inject ether, remove the control fitting, and with a clean air supply, blow out the fitting in the opposite direction of the ether flow.
7. If you cannot clear the blockage, replace the flow control fitting with a new one.
8. Repeat this process at each connection point through the system after the valve, including the atomizer.

Maintenance:

1. Every 2-3 months apply a drop or two of light weight silicone oil and let it run down the actuating shaft and into the valve.
2. When the cylinder is not attached to the valve, make sure that a dust cap is in place to prevent dirt and other types of debris from entering the system.

References:

- <http://quickstart-ether.com/support/>

Transmission Info (Allison MD3070PT)

The MD3070PT 7-speed automatic transmission is based on a 3060 6-speed transmission which the MD3070PT uses for 2nd-7th gears, with the addition of a 4x4 transfer case which adds the seventh gear (low 1st gear), and a fixed 1:20 additional ratio multiplier to the six upper gears (2nd - 7th).

Concept of Clutch Operation

The low first gear comes from the C6 clutch located in the transfer case, but it does its magic inside the core transmission.

The output of the transmission comes from the P3 planetary gear carrier. The splined output shaft on the P3 carrier plugs into and drives the top gear in the transfer case via an adapter. That P3 carrier spline, the adapter and the transfer case primary drive gear are hollow. Thru them runs the transmission main shaft which has the P2 and P3 sun gears on it. That mainshaft runs from C1 at the front in the rotating clutchpack thru all the planetaries and the transfer case to reach the C6 clutchpack. The combination of stopping the mainshaft with C6 and applying drive from the rotating clutchpack via C3 gives you that very low 1st gear ratio.

Gear Ratios

Gear	Base 3060 Ratio	Transfer Case Ratio	Final MD3070PT Ratio	Clutches Engaged In This Gear
1st	N/A	N/A	6.93:1	C3-C6
2nd	3.49:1	1.20:1	4.18:1	C1-C5
3rd	1.86:1	1.20:1	2.24:1	C1-C4 + LU
4th	1.41:1	1.20:1	1.69:1	C1-C3 + LU
5th	1:1	1.20:1	1.20:1	C1-C2 + LU

6th	0.75:1	1.20:1	0.90:1	C2-C3 + LU
7th	0.65:1	1.20:1	0.78:1	C2-C4 + LU
Reverse	-5.09	N/A	-5.00:1	C3-C5

Parts and Information Sources:

Here is a list, though definitely not exhaustive, of places to get more parts and information. Think of it as a list of “useful links”:

- Grigsby Trucks - Custom upgrades and parts for the FMTV
<https://www.grigsbytrucks.com/product-category/all-products/>
- <https://www.easternsurplus.net/> - General surplus truck parts
(NOTE: Search function is terrible, and often fails to find items when they are searched for by their exact name. Either browse, or call.)
- Allison transmission error codes:
http://www.beamalarm.com/Documents/allison_transmission_codes_manual.html
- M1078 LMTV Parts Spreadsheet (w/ CAT 3116)
<https://docs.google.com/spreadsheets/d/15EAAAnbRXqh4LJuFsBxOPNgC-ICHeJdeFltiSmE5jjSc/edit?usp=sharing>
- FMTV Truck Sales - Claims to have connections with many of the OEM suppliers to Stewart & Stevenson / BAE.
<http://stores.ebay.com/fmtvtrucks/>
<https://fmtvtrucks.com/>
<http://www.aceatruck.com/>
- Discount Caterpillar parts:
<https://www.offroadeq.com/>
- Equipment Parts Sales: Surplus parts
<https://equipmentpartssales.mysimplestore.com/t/m1078>
- \$20 for Caterpillar 3116 service manuals (PDFs)
<https://www.barringtondieselclub.co.za/caterpillar/cat-3114-3116-3126-manuals.html>
- Belmetric: Huge selection of metric fasteners
<https://www.belmetric.com/>
- Double-Alt: Custom 225A dual-voltage replacement/upgrade for original Niehoff alternator.
<http://double-alt.com/military.html>
- Parts, custom upgrades:
<http://www.thosemilitaryguys.com>

- Transmission ECU and Keypad Rebuilding:
<http://www.transmissioninstruments.com>
- “Helmet Hardtops” for LMTV:
<http://amtechcorp.com/lmtv25.php>
- SECO
<https://secoparts.net/collections/lmtv-fmtv-parts?page=1>
- Rome Truck Parts: Dash switches
<http://www.rometruckparts.com>
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*** Unfinished/Suggested Topics ***

1. Replacing 6TL batteries with Group 31's: <https://builtmfg.com/2016/11/14/batteries/>
2. Battery tending: NOCO chargers, Solargizer
3. Driveshaft alignment phase, TigerTool
4. CARC Paint
5. Transmission change to ATF:
<https://www.steelsoldiers.com/showthread.php?149271-LMTV-M1078-Transmission-Fluid-Change-To-ATF-Write-Up>
6. Door handles normally open up but are often swapped to open down. Aernan to provide more details on how to repair them including swapping the lock cylinders.
7. Bad Batteries. Aernan called to the Hawker US rep and got a pile of info on lifespan, date codes and min cranking amps and getting them tested. I have also just purchased the flooded cells from NAPA.
8. Sourcing bolts that fall off. Links to suppliers and recommended sizes.
9. Decoding the tires. I have the XZL and I now wish I had the road going tires. Wow the noise. Also info on run flats and where to get the internal seals and CTIS valves.
10. Sourcing and replacing the windshield. Aernan is about to do this. I have been told you can reuse the seal and push out with your feet.
11. Cab air Spring Repair.
12. Common loose bolts guide
13. Setting up planetary hubs
14. Original FMTV history, driveline problems, serial numbers, inspection marks
<https://www.steelsoldiers.com/showthread.php?142145-LMTV-early-years-before-1996-first-contracts-quot>
15. Cab Hydraulic Push Button Rebuild:
<https://www.steelsoldiers.com/showthread.php?155350-Coolant-Took-A-Vacation/page4>
16. New style air dryer swap:
Need ¼” OD tube compression to ¼” MIP/NPT fitting (e.g. Watts LFA-30), or a bushing to bump up the original thread size on the control fitting (⅛” NPT?) to ¼” MIP/NPT.
<https://www.steelsoldiers.com/showthread.php?155736-M1078-old-to-new-style-air-dryer-install>

17. Oil Pressure Switch Failing and Preventing Cranking
To shed some light on the oil pressure switch causing the no crank issue the switch opens with oil pressure opening the ground for the starter relay. The end of the ground wire is fastened to the ground on the generator. Typically the switches fail and prevent cranking. Jump the two pins on the harness to quickly determine if the switch is the problem if you find yourself in a no crank situation and you know your batteries are good. Failure of the switches was pretty common, I have a jumper that I made from a plug off an old pressure switch that I carried with me to get the 3126 powered trucks to start when I worked for the FMS shop.
<https://www.steelsoldiers.com/showthread.php?173414-FMTV-engine-won%92t-start-engine-oil-pressure&p=2087412#post2087412>
18. Cab latch repair:
<https://www.steelsoldiers.com/showthread.php?130222-Critical-FMTV-PM-not-covered-in-TMs&highlight=latch>
19. Towing plans
<https://www.steelsoldiers.com/showthread.php?174950-Yearly-Tow-Plans-for-your-FMTV-and-other-vehicles>
20. Cold starting
<https://www.steelsoldiers.com/showthread.php?152882-Working-on-the-M1078-LMTV&p=2092084#post2092084>
21. Tire explosions:
<http://www.ini.wa.gov/Safety/Research/Files/TireExplosionHazardAlert.pdf>
22. LED Marker Lights Changeover
<https://www.steelsoldiers.com/showthread.php?175282-Fmtv-led-marker-light-install>
23. Essential Tools & Spares to take along
<https://www.steelsoldiers.com/showthread.php?152218-Essential-Tools-to-have-for-an-FMTV-Add-your-02>
<https://www.steelsoldiers.com/showthread.php?152218-Essential-Tools-to-have-for-an-FMTV-Add-your-02&p=2041794&viewfull=1#post2041794>
24. Air brake chamber diaphragm replacement
<https://www.steelsoldiers.com/showthread.php?176915-Thoughts-on-rear-air-brake-chamber-assemblies>
25. Cab cot:
<https://www.steelsoldiers.com/showthread.php?177494-FMTV-Cab-Cot>
26. Having keys made
<https://www.steelsoldiers.com/showthread.php?116926-FMTV-door-handle-Lock-How-to-make-Keys-or-have-the-proper-ones-made>
27. Removing Run Flats:
<https://www.steelsoldiers.com/showthread.php?182444-Tire-shops-that-will-install-run-flats-on-395-s-Hutchinson-split-rim>
Machine for HMMWV run flats: <https://www.youtube.com/watch?v=NoWC-Qyd4kA>
Manual Removal: https://www.youtube.com/watch?v=UAitx_rHe00
28. Tire o-rings: <https://www.steelsoldiers.com/showthread.php?181641-LMTV-Tire-O-Rings>

29. Recommended upgrades/updates

- high pressure line to turbo
- water pump
- thermostat
- alternator bracket bolts + locktite
- fan clutch loose bolts
- air drier
- Universal battery disconnect (A0 - A1)
- Sound deadening

30. I've been looking for all the studs lately, part numbers and whatnot and figured I'd share with the group if anyone is needing them in the future.

a. LHT Wheel Stud:

<https://www.finditparts.com/products/3653997/euclid-e10201l>

b. RHT Wheel Stud:

<https://www.finditparts.com/products/3653998/euclid-e10201r>

c. Faceplate Stud-Long: <https://www.wbparts.com/rfq/5306-01-554-6111.html>

d. Faceplate Stud-Short: <https://www.wbparts.com/rfq/5306-01-369-8892.html>

e. AH HA! I tracked down the CTIS wheel studs, looks like \$58 each so make sure not to cross thread that one 😬

f. LHT:

https://www.meritorpartsxpress.com/webapp/wcs/stores/servlet/ProductDisplay?urlRequestType=Base&catalogId=10001&categoryId=&productId=27680&urlLangId=-1&langId=-1&top_category=&parent_category_rn=&storeId=10154

g. RHT:

https://www.meritorpartsxpress.com/webapp/wcs/stores/servlet/ProductDisplay?urlRequestType=Base&productId=27679&catalogId=10001&categoryId=&errorViewName=ProductDisplayErrorView&urlLangId=-1&langId=-1&top_category=&parent_category_rn=&storeId=10154

h. The elbow on the back of the CTIS stud is an export controlled part apparently, but the number for it is 2297P3838

31. Replacing cab bushings:

<https://www.steelsoldiers.com/threads/easiest-way-to-swap-bushings.213888/>