SHOP TIPS

Autolite Ford

VOL. 8, NO. 4 DECEMBER, 1969

EMERGENCY...
STARTING...PUSHING...TOWING

See Center Insert for Timely Promotions!

EMERGENCY . . .

Has your phone been ringing more often lately? If not, it probably will very shortly. Because cold weather invariably brings an increasing number of emergency service calls. If you were to keep records, "starting" and "tire problems" would no doubt top the list. Either, of course, could require towing service. Another large percentage of vehicles need a wrecker for simply being "stuck" in mud, ice or snow. Based on past history, it's estimated that these three types of emergencies will total somewhere between 50- and 60-million calls in the U.S. during the next year. That can be a host of unhappy motorists, if they're not given fast efficient service.

Naturally, an owner with an inoperative car is irritated to begin with. The last thing you want to do is further his discontent . . . by compounding his problems. You can quickly get a customer's car running again by not treating road service calls in a routine manner. Instead, be aware of certain precautions and specific procedures that have proven successful.

THE CALL

You can get off on the right foot by getting all possible information on the nature of the emergency. Obviously, for vehicles that are "stuck" or have a flat tire this is quite simple. However, in the case of starting problems (particularly with women) this may present some difficulty. Nevertheless, it should be possible to determine certain basic information. For instance:

- Does the engine crank? (If not, it's probably the battery or cable connections.)
- Does the engine crank but not start? (If so, it's probably the carburetion or ignition system.)

Armed with this type of information, it's generally a relatively easy task to diagnose and correct the problem where the car is disabled. Failing this, of course, it will be necessary to push or tow the car in to your service station or garage to correct the problem. (See Towing and Pushing sections for procedures.)

DIAGNOSING AND CORRECTING "STARTING" PROBLEMS

Weak or defective batteries and related electrical failures account for a whopping 44% of all road service calls according to an AAA Survey. Most of these involve some type of starting problem. The diagnostic charts (Pages 3-8) show how to troubleshoot several types of starting difficulties. They cover:

- STARTER WILL NOT CRANK ENGINE
- ENGINE CRANKS SLOWLY, BUT WILL NOT START
- ENGINE CRANKS NORMALLY, BUT WILL NOT FIRE
- ENGINE FIRES, BUT FAILS TO KEEP RUNNING
- ENGINE CRANKS NORMALLY, BUT STARTS HARD – COLD WEATHER
- ENGINE STALLS WHEN IDLING – ENGINE COLD (OK WHEN HOT)
- ENGINE STALLS WHEN IDLING – ENGINE HOT (OK WHEN COLD)

Each diagnosis procedure lists all the probable causes, with the MOST probable first. Descriptions are based on words customers ordinarily use to report them. Pay particular attention to the "Engine Stalls When Idling" charts on page 8. Although these are technically performance conditions rather than starting problems, they're frequently associated with "hard start" conditions.

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Be sure and file this and future bulletins for ready reference. If you have any suggestions for additional information that you would like to see included in this publication, please write to: Autolite-Ford Parts Division of Ford Motor Company, Merchandising Services Dept., P.O. Box 3000, Livonia, Michigan 48151.

The descriptions and specifications contained in this book were in effect at the time the publication was approved for printing. The Ford Motor Company, whose policy is one of continuous improvement, reserves the right to discontinue models at any time, or to change specifications or design without notice and without incurring obligation.

Autolite Ford

VOL. 70 MSD 17 LITHO IN U.S.A.

STARTING . . . PUSHING . . . TOWING

STARTING TIPS

STARTER WILL NOT CRANK ENGINE

Most Probable Cause	Diagnosis Procedure	Action to Repair
1 Corroded battery cables or connections.	Place a heavy jumper wire in parallel with the battery to starter relay cable and then in parallel with the battery to engine (ground) cable. If the starter now cranks the engine, the battery cable is at fault.	Clean battery connections or replace battery cables and try to start.
	IF OK ↓	
2 Battery low in charge.	Perform a battery capacity test by loading the battery to three times its ampere hour rating for 15 seconds. If total battery voltage is less than 9.6 volts, check specific gravity of each cell. If less than 50 points between cells, battery is low in charge.	Charge battery and check charging system.
	IF OK ↓	
3 Failed battery.	If specific gravity test shows more than 50 points between cells, battery has failed.	Replace battery and check charging system.
	IF OK ↓	
4 Failed starter relay.	Connect a jumper from the battery positive terminal to the S terminal of the starter relay. If the starter will not crank the engine, the starter relay is not operating.	Replace starter relay.
	IF OK ↓	
5 Failed starter drive.	Operate ignition switch and listen for starter noise. If starter rotates or makes a distinct clunk but will not crank the engine, the drive is malfunctioning.	Replace starter drive.
	IF OK ↓	
6 Failed starter.	Temporarily connect heavy jumper from battery positive terminal to starter terminal of starter relay. If starter will not crank the engine, the starter needs repair.	Repair or replace starter.
	IF OK ↓	
7 Maladjusted neutral start switch (if used).	Apply brakes and attempt to start the engine while moving the transmission selector lever through all ranges. If the engine cranks when selector is anywhere but at N or P, the neutral start switch is out of adjustment.	Adjust neutral start switch.
	IF OK ↓	
8 Inoperative neutral start switch (if used).	Place selector lever in N or P and set brakes. Remove the neutral start switch connector block and connect a jumper between the two red-blue stripe wires. If the engine will now crank, the neutral start switch is not operating.	Replace neutral start switch.
	IF OK ↓	
9 Failed ignition switch.	Remove the connector block from the ignition switch and connect a jumper wire between the yellow and red-blue stripe wire terminals. If the engine cranks, the ignition switch needs replacing.	Replace ignition switch.
	IF OK ↓	
10 Failed wiring from ignition switch through neutral start switch (if used), to starter relay.	Make a starter control circuit test by substituting a jumper wire for the wires from the ignition switch to the starter relay. If the starter cranks, the wires are shorted or broken.	Replace failed wire.
	IF OK ↓	
11 Hydrostatic lock.	Remove spark plugs. Remove coil high tension lead wire at distributor and ground it to the engine. Try to crank engine with starter. If engine cranks, it indicates that water is leaking into cylinders.	Remove the cylinder head(s) and inspect the gasket(s) and head(s) for leaks and cracks. Examine the cylinder block for cracks. Repair or replace damaged engine components.
	IF OK ↓	
12 Engine has seized-pistons or bearings.	With spark plugs removed and coil to distributor high tension lead grounded to engine, attempt to crank engine with starter. If engine does not crank or cranks very slowly, a seized engine is indicated.	Remove engine oil pan. Check for water in lubrication system. If water is found, remove cylinder head(s) and check for combustion chamber leaks. Check for seized pistons, rings and bearings. Clean, repair or replace damaged engine components.

EMERGENCY. . .STARTING

ENGINE CRANKS NORMALLY, BUT WILL NOT FIRE

Most Probable Cause	Diagnosis Procedure	Action to Repair
1 No fuel.	Turn on ignition key and check fuel gauge for adequate fuel supply. **IF OK** ↓	Add fuel.
2 Ignition system not operating properly.	Perform a spark intensity test by disconnecting a spark plug wire and observing spark across a gap (see Note 1). **IF OK** ↓	Perform ignition primary and secondary tests.
3 Ignition primary circuit.	Perform ignition primary circuit test with a voltmeter or oscilloscope to determine if voltage drop across the battery, coil and starting ignition circuit is excessive. **IF OK** ↓	Repair or replace defective parts or connections.
4 Ignition secondary circuit.	Perform ignition secondary circuit tests. Check the secondary (high tension) wires for excessive resistance and open circuits. Check the spark plugs and distributor for damage or improper adjustment. **IF OK** ↓	Repair or replace parts or connections as needed.
5 Ignition timing incorrect.	Check the ignition initial timing with the distributor vacuum line disconnected, or check initial timing on an oscilloscope. **IF OK** ↓	Adjust.
6 Choke not operating correctly.	Check the automatic choke thermostatic spring housing and choke plate pulldown clearance for improper adjustment. Check the choke linkage and plate for binding. **IF OK** ↓	Adjust, repair or replace as required.
7 Carburetor accelerating pump inoperative or no fuel to carburetor.	Perform accelerating pump discharge test. Remove the air cleaner and observe fuel flow from accelerating pump discharge nozzles while pumping accelerator. **IF OK** ↓	Check fuel supply to carburetor before repairing accelerator pump.
8 Insufficient fuel supply to carburetor.	Perform fuel pump pressure and volume tests with a pressure gauge connected to the carburetor fuel inlet port. **IF OK** ↓	Clean or replace parts as required.
9 Carburetor fuel level or float set incorrectly.	Check carburetor for incorrect wet fuel level or float setting. **IF OK** ↓	Adjust fuel level or float setting to specifications.
10 Low or erratic compression.	Perform an engine compression test to isolate sticking valves and low or erratic compressions (see Note 2).	Adjust or repair as required.

NOTE 1. Perform the spark intensity test as follows:

A. Disconnect a spark plug wire. Check the spark intensity of one wire.

B. Install a terminal adapter in the terminal of the wire to be checked. Hold the adapter approximately 3/16 inch from the exhaust manifold and crank the engine with a remote starter switch. The spark should jump the gap regularly.

C. If the spark intensity is satisfactory, the ignition is satisfactory with the possible exception of ignition timing, spark plugs and distributor advance.

NOTE 2. On engines equipped with a Thermactor exhaust emission control system, disconnect the Thermactor emission control system before performing engine diagnosis procedures. Disconnect the anti-backfire valve vacuum sensing line and air supply line (air gulp type) at the intake manifold connections. Plug the manifold connections to preclude leakage. Normal engine diagnosis can then be performed. Upon completion of the engine diagnosis procedures, unplug the manifold connections and connect the vacuum sensing line and air supply line (air gulp type) at the intake manifold connections and check for leaks.

. . . PUSHING . . . TOWING

Continued

ENGINE FIRES, BUT FAILS TO KEEP RUNNING

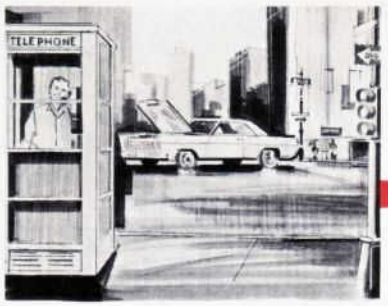
Most Probable Cause	Diagnosis Procedure	Action to Repair
1 Ignition system not operating properly.	Perform a spark intensity test by disconnecting a spark plug wire and observing spark across a gap (see Note 1). **IF OK** ↓	Perform ignition primary and secondary tests.
2 Ignition primary circuit.	Perform ignition primary circuit test with a voltmeter or oscilloscope to determine if voltage drop across the battery, coil and starting ignition circuit is excessive. **IF OK** ↓	Repair or replace parts or connections as needed.
3 Ignition secondary circuit.	Perform ignition secondary circuit tests. Check the secondary (high tension) wires for excessive resistance and open circuits. Check the spark plugs and distributor for defects or improper adjustment. **IF OK** ↓	Repair or replace parts or connections as needed.
4 Choke not operating correctly.	Check the automatic choke thermostatic spring housing and choke plate pull-down clearance for improper adjustment. Check the choke linkage and plate for binding. **IF OK** ↓	Adjust, repair or replace mechanism as required.
5 Carburetor accelerating pump inoperative or no fuel to carburetor.	Perform accelerating pump discharge test. Remove the air cleaner and observe fuel flow from accelerating pump discharge nozzles while pumping accelerator. **IF OK** ↓	Check fuel supply to carburetor before repairing accelerator pump.
6 Insufficient fuel supply to carburetor.	Perform fuel pump pressure and volume tests with a pressure gauge connected to the carburetor fuel inlet port. **IF OK** ↓	Clean or replace parts as required.
7 Idle fuel mixture, fast idle or curb idle speed are out of adjustment.	Check the carburetor idle fuel mixture and idle speed screws for proper initial adjustment. **IF OK** ↓	Adjust initial idle fuel mixture and idle speed to specification.
8 Carburetor fuel level or float set incorrectly.	Check carburetor for incorrect wet fuel level or float setting. **IF OK** ↓	Adjust fuel level or float settings to specifications.
9 Carburetor contains dirt or foreign material or has wrong jet(s).	Remove the carburetor, disassemble as necessary and clean it. Inspect all parts for wear or damage.	Replace improper, worn or damaged parts. Adjust carburetor to specifications.

NOTE 1. Perform the spark intensity test as follows:

A. Disconnect a spark plug wire. Check the spark intensity of one wire at a time.

B. Install a terminal adapter in the terminal of the wire to be checked. Hold the adapter approximately 3/16 inch from the exhaust manifold and crank the engine with a remote starter switch. The spark should jump the gap regularly.

C. If the spark intensity of all the wires is satisfactory, the ignition is satisfactory with the possible exception of ignition timing, spark plugs and distributor advance. If the spark is weak at some wires, check the ignition secondary circuit. If the spark is weak or non-existent at all plugs, check the ignition primary circuit.



EMERGENCY...STARTING

ENGINE CRANKS SLOWLY, BUT WILL NOT START

Most Probable Cause	Diagnosis Procedure	Action to Repair
1 Corroded battery cables.	Place a heavy jumper wire in parallel with the battery to starter relay cable and then in parallel with the battery to engine (ground) cable. If the starter now cranks the engine, the battery cable is at fault.	Clean battery connections or replace battery cables and try to start.
	IF OK ↓	
2 Battery low in charge.	Perform a battery capacity test by loading the battery to three times its ampere hour rating for 15 seconds. If total battery voltage is less than 9.6 volts, check specific gravity of each cell. If less than 50 points between cells, battery is low in charge.	Charge battery and check charging system.
	IF OK ↓	
3 Failed battery.	If specific gravity test shows more than 50 points between cells, battery has failed.	Replace battery and check charging system.
	IF OK ↓	
4 Failed starter relay.	Connect a heavy jumper wire from the battery terminal of the starter relay to the starter terminal of the relay.	Replace relay.
	IF OK ↓	
5 Failed starter.	Make a Starter Load Test, Starter No Load Test, Armature Open Circuit Test and Armature Ground Circuit Test to determine which part of the starter is not working.	Repair or replace starter.
	IF OK ↓	
6 Incorrect viscosity engine oil in crankcase.	Examine dipstick for congealed engine oil. Check car owner regarding viscosity and grade of oil in crankcase.	Drain crankcase and install proper viscosity engine oil. Change oil filter, if required.
	IF OK ↓	
7 Pistons or bearings partially seized.	Check for partially seized pistons or bearings. Remove oil pan. Check for water in lubrication system. If water is found, remove cylinder head and check for combustion chamber leaks. Check for seized pistons, rings and bearings.	Clean, repair or replace damaged engine components.

COLD WEATHER STARTING TIPS

The diagnostic charts (pages 3-8) give definite step-by-step procedures for solving "hard start" problems for seven different conditions. However, experience shows that most often one of the following problems usually causes the starting difficulty. They are relatively simple and generally occur during extremely cold weather in vehicles that operate satisfactorily in warmer weather. For instance, temperatures below zero drastically reduce available battery power and greatly increase the difficulty of igniting the air/fuel mixture. In other words, these conditions are specifically caused by COLD weather. Many other items may be at fault, and are covered in detail in each chart. You can often save some time, however, by being aware of these problem areas.

Engine Cranks (slow) — Doesn't Start

1. *Weak Battery or Corroded Cables* — If engine turns over slowly, a discharged battery or excessive resistance due to bad cables is most likely. Outside chance of starter malfunction.
2. *Oil Viscosity* — The lower the temperature, the more sticky and molasses-like the crankcase oil becomes which takes more power to turn the crankshaft. 10W-30 or 10W-40 multi-viscosity oils are okay down to −10°F, *if battery is in good shape*. 5W-30 may be required at lower temperatures.

Engine Cranks (fast) — Doesn't Start

1. *Ignition* — Remove plug wire and hold ¼-inch from ground while cranking engine. No spark indicates problem up the line, probably points or condenser. If weather is also damp, check inside distributor cap for moisture and carbon tracking. If spark occurs trouble can be isolated as spark plugs or fuel.
2. *Fuel* — To assure against fuel-line "freeze-up" check for flow by pumping the accelerator rod and observing main venturi nozzles. Carbon deposits tend to cause sticky automatic choke operation. Choke (butterfly) plate should be completely closed after depressing accelerator.
3. *Starting Procedure* — Excessive pumping of accelerator floods engine. See page 7 for "Cold Weather Starting Procedures."

Engine Will Not Crank

1. *Discharged Battery or Loose Cables* — If starter relay doesn't click when ignition is turned to "Start," a dead battery or bad cables are indicated. If relay clicks, the battery still may not be strong enough to turn engine, or cables may be too loose to pass sufficient current. However, most likely the starter, or starter circuit is defective.

. . . PUSHING . . . TOWING

Continued

ENGINE CRANKS NORMALLY, BUT STARTS HARD — COLD WEATHER

Most Probable Cause	Diagnosis Procedure	Action to Repair
1 **Improper starting procedure.**	Check car owner regarding starting procedure used, for example: setting choke, accelerator position, and accelerator pumping.	* Advise car owner of proper starting procedure.
	IF OK ▼	
2 **Fast (cold engine) idle speed and/or fuel mixture improperly adjusted.**	With the engine at normal operating temperature, check the carburetor idle fuel mixture, curb idle and fast idle speeds.	Adjust as required.
	IF OK ▼	
3 **Choke not operating correctly.**	Check choke mechanism for improper adjustment or binding in linkage or plate.	Adjust, repair or replace choke mechanism as required.
	IF OK ▼	
4 **Choke thermostatic spring housing improperly adjusted.**	Check choke thermostatic spring housing for proper adjustment.	Adjust thermostatic spring housing.
	IF OK ▼	
5 **Ignition primary circuit.**	Perform ignition primary circuit test with a voltmeter or oscilloscope to determine if voltage drop across the battery, coil and starting ignition circuit is excessive.	Repair or replace parts or connections as needed.
	IF OK ▼	
6 **Ignition secondary circuit.**	Perform ignition secondary circuit tests on an oscilloscope. Check the secondary (high tension) wires for excessive resistance and open circuits. Check the spark plugs and distributor for defects or improper adjustment.	Repair or replace parts or connections as needed.
	IF OK ▼	
7 **Initial ignition timing incorrect.**	Check the ignition initial timing with the distributor vacuum line disconnected.	Adjust ignition timing.
	IF OK ▼	
8 **Insufficient fuel supply to carburetor.**	Disconnect fuel line at carburetor and pump fuel into a clean glass container. Inspect fuel for water contamination.	If water accumulation is excessive, remove and flush fuel tank, thaw ice restrictions, flush and blow out fuel lines. Clean or replace fuel filter, if required.
	IF OK ▼	
9 **Carburetor fuel level or float set incorrectly.**	Check carburetor for incorrect wet fuel level or float setting.	Adjust fuel level or float setting to specifications.
	IF OK ▼	
10 **Uneven engine compression or intake vacuum leak.**	Perform engine dynamic compression test on an oscilloscope to isolate defective cylinder(s). Check intake manifold and carburetor spacer for vacuum leaks (see Notes 1 and 2). If no vacuum leak is indicated, problem indicated by dynamic compression test is due to low engine compression (see Note 3).	Repair or replace worn or damaged parts.

NOTE 1. On engines equipped with a Thermactor exhaust emission control system, disconnect the thermactor emission control system before performing engine diagnosis procedures. Disconnect the anti-backfire valve vacuum sensing line and air supply line (air gulp type) at the intake manifold connections. Plug the manifold connections to preclude leakage. Normal engine diagnosis can then be performed. Upon completion of the engine diagnosis procedures, unplug the manifold connections and connect the vacuum sensing line and air supply line (air gulp type) at the intake manifold connections and check for leaks.

NOTE 2. Check for vacuum leaks at the intake manifold and carburetor gaskets. Also check for leaks at all connections and lines used with vacuum-power units, if the car is so equipped. To isolate a vacuum leak, proceed as follows:

Start engine and allow it to idle.

Squirt kerosene or light engine oil around areas of possible vacuum leaks. A noticeable change in engine idle when solution is squirted on a given point indicates a vacuum leak at that point. CAUTION: Use care while squirting to prevent a fire.

NOTE 3. After it is determined that there are no other contributing factors to the starting problems, recommend to the owner that the compression problem must be corrected before normal starting can be expected. Low or uneven compression can be attributed to leaking cylinder head gasket(s), valve train component malfunction, pistons and/or rings.

*COLD WEATHER STARTING PROCEDURES

Cold weather starting problems often can be traced directly to drivers not knowing how to properly start their cars. Many pump the accelerator pedal furiously if the engine doesn't start right away. A couple of pumps in extremely cold weather helps, but too much extra gas in the combustion chamber usually floods the engine and makes starting more difficult. Owners should be advised to use one of the following procedures.

Automatic Choke (Engine Cold)

1. Turn ignition switch on. Depress accelerator to floor and release. This engages the automatic choke. If properly adjusted, it is calibrated to create the proper "rich" carburetor air/fuel mixture to start the engine in cold weather. NOTE: If the outside temperature is very cold (below zero) or the vehicle has been idle for several days, it may be helpful to depress the accelerator pedal 2 or 3 times before attempting to start the engine.
2. Turn ignition switch to "Start" position and release when the engine starts. *If engine falters in starting, be sure the starter stops spinning before re-engaging it, otherwise the starter may be damaged.*
3. After starting engine and allowing it to run for a few seconds, depress accelerator pedal slightly and release it to reduce engine speed. The engine will continue to run at a faster than normal idle speed until the engine is warm and the automatic choke disengages and becomes fully open.

Automatic Choke (Engine Warm)

1. If the engine has been stopped for only a short time and is still relatively warm, don't push the accelerator pedal all the way to the floor. You may flood the warm engine with too much gas and prevent it from starting. Instead, depress accelerator pedal about ¼ way down and hold in this position. *Do not pump the pedal.*
2. Turn the ignition key to the "Start" position until engine catches and starts. Then release key to "On" position.

Manual Choke

Starting an engine with a manual choke takes a little experience to know how far to pull out the choke, depending on how warm the engine is. If very cold, the choke must be pulled all the way out. If relatively warm, such as outside temperature above 70°F, it may not be necessary to use the choke at all.

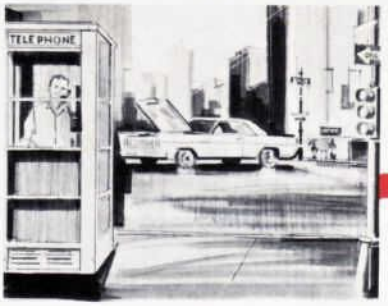
1. To start a cold engine, depress accelerator pedal all the way to the floor.
2. Pull the choke out and release the accelerator pedal.
3. Turn ignition switch to "Start" position, and release when engine starts.
4. As engine warms up, push choke in to a position that keeps the engine running smoothly. When the engine reaches normal operating temperatures, the choke should be all the way in.

Starting Flooded Engine

If accelerator has been pushed to the floor when starting warm engine, or pumped when starting cold engine, it is possible to flood the engine (usually evident with smell of gasoline). To start a flooded engine:

1. Push accelerator pedal to floor and hold it there. This opens throttle plates in carburetor and lets in more air.
2. While holding accelerator pedal on floor, turn ignition key to "Start" position and hold it there until engine starts. This may take a few seconds until the extra air dilutes the gas and forms a suitable air/fuel mixture for starting.
3. As soon as the engine starts, let up on the accelerator pedal to hold a normal fast idle speed.

NOTE: If the engine doesn't start within 30 seconds, turn off ignition key and wait for a few seconds before cranking the engine again. *Do not release accelerator pedal.* This will prevent starter from overheating and give battery time to build up power.



EMERGENCY. . .STARTING

ENGINE STALLS WHEN IDLING — ENGINE COLD (OK WHEN HOT)

Most Probable Cause	Diagnosis Procedure	Action to Repair
1 Fast (cold engine) idle speed set too low.	With the engine at normal operating temperature, use a tachometer to check the carburetor, idle fuel mixture and fast idle speed for conformance to specified engine rpm. **IF OK** ↓	Adjust fast (cold engine) idle speed.
2 Carburetor icing.	Remove air cleaner and check for ice formation on booster venturi and/or throttle plates. **IF OK** ↓	Thaw carburetor. Adjust, repair or replace air intake duct valve (if so equipped). Recommend fuels containing de-icing additives.
3 Choke not operating correctly.	Check choke mechanism for improper adjustment or binding in linkage or plate. **IF OK** ↓	Adjust, repair or replace, as required.
4 Choke thermostatic spring housing improperly adjusted.	Check choke thermostatic spring housing for proper adjustment. **IF OK** ↓	Adjust thermostatic spring housing.
5 Choke-plate (pull-down) setting incorrect.	Check carburetor choke plate (pull-down) clearance. **IF OK** ↓	Adjust choke plate (pull-down) clearance to specifications.
6 Water contaminated fuel system.	If temperature is below freezing, check for water in fuel lines, fuel filter, fuel pump or carburetor which may have frozen, thereby restricting the flow of fuel. Disconnect fuel line at carburetor and pump fuel into a clean glass container. Inspect fuel for water contamination.	Thaw ice restrictions. If water accumulation is excessive, remove and flush fuel tank. Flush and blow out fuel lines. Clean or replace fuel filter, if required.

ENGINE STALLS WHEN IDLING — ENGINE HOT (OK WHEN COLD)

Most Probable Cause	Diagnosis Procedure	Action to Repair
1 Engine (hot) idle speed set too low.	With engine at normal operating temperature, use tachometer to check engine idle speed. **IF OK** ↓	Adjust engine (hot) idle speed.
2 Engine idle fuel mixture improperly adjusted.	With engine at normal operating temperature, check idle mixture screw(s) for proper adjustment. **IF OK** ↓	Adjust engine idle fuel mixture. Adjust engine idle speed as required.
3 Choke not operating correctly.	Check for stuck or binding carburetor choke plate or linkage and proper choke operation. Check choke heat tube and air inlet tube for restriction. **IF OK** ↓	Adjust, repair or replace, as required.
4 Distributor breaker point dwell incorrect or excessive point resistance.	Perform ignition system tests on oscilloscope to check breaker point dwell and point resistance. **IF OK** ↓	Clean and adjust or replace breaker points.
5 Carburetor fuel level or float set incorrectly.	Check carburetor for incorrect wet fuel level or float setting. **IF OK** ↓	Adjust fuel level or float setting to specification.
6 Carburetor external vent plugged.	Visually check vent for accumulation of dirt or foreign material.	Clean vent and/or adjust vent valve (if so equipped).

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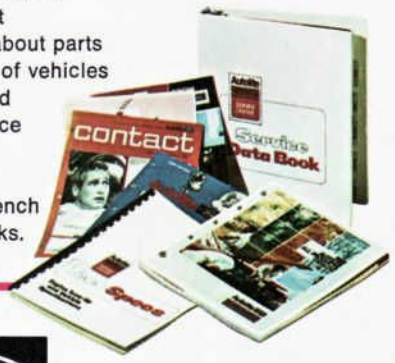

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Autolite
TUNE-UP KIT
TKF-1
PC 198
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ELECTRICAL TUNE-UP KIT CERTIFICATE
1/2 Pacemaker Prize Point
Tune-Up Kit Instruction Sheet
1. Removal of Distributor Cap
Autolite & Chrysler Type
• With a screwdriver pry loose the two spring retaining clips on each side of the cap.
• Lift cap and swing out of way.
• Remove rotor by pulling straight up.
Delco-Remy External Contact Adjustment Type
• With a screwdriver press down on retaining latches on each side of cap and swing out of way.
• Lift cap and rotate 90°.
• Loosen two screws that secure rotor and remove.
2. Removal of Old Contact Points and Condenser
(Caution) Notice position of condenser lead terminal and primary lead terminal before disassembly. Their position on the contact point attaching terminal is important for reassembly.
• Remove condenser lead and primary lead from contact set.
• Loosen condenser attaching screw and remove condenser.
• Loosen contact attaching screw(s) and remove.
• Use a clean cloth and wipe the surface of the distributor plate clean of any dirt or grease.
• Apply a small amount of lubricant to the distributor cam from cam lube packet provided in kit.

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Everything you need for a tune-up

Here is an idea from Autolite that will save you time and money. It's the Autolite Tune-Up Kit, which puts everything needed for a complete, professional tune-up together in a single, protective, attention-getting sealed metal container.

Included are a set of 6 or 8 spark plugs, point set, condenser, cam lube, feeler gauge, and easy-to-read installation instructions. And this kind of convenience costs no more than if each part were purchased separately.

And, to make it even more value-packed, a One-Half Pacemaker Prize Point Certificate is included in each kit.

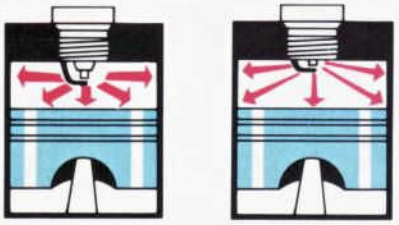
Save time and money...

No need to research three application charts for spark plugs, point sets, and condensers or search through bins for three separate parts. One Tune-Up Kit part number covers all of the component parts needed to perform an ignition tune-up. Autolite Tune-Up Kits reduce your spark plug inventory! Stock only the exact number of parts needed; keep them factory-fresh; prevent loss or pilfering.

All-Make Assortment Covers Most Popular Applications

With the ATK-1000 Assortment, you stock the five most popular spark plug numbers . . . and get twelve Autolite Tune-Up Kits for the price of eleven. That's right! The most popular GM 8 cylinder application kit is **YOURS ABSOLUTELY FREE!**

The ATK - 1000 Assortment provides coverage for approximately 64% of all American cars on the road . . . gives you the broadest possible coverage for the smallest inventory investment. The assortment is attractively packaged in colorful countertop display carton and contains an application chart for ease of use.



Autolite POWER TIP

Autolite Power Tip Spark Plugs give all cars more power, improved acceleration and better gas mileage! How? The Power Tip, a design originated by Autolite, ignites the fuel in the optimum combustion chamber location for complete, economical combustion. And Autolite Power Tip Spark Plugs are self-cleaning . . . assuring easier starts, smoother idle, day-after-day, mile-after-mile!

Keep your service customers happier with the spark plug designed to give them peak performance under all driving conditions . . . Autolite Power Tip, another exclusive feature of the Autolite Tune-Up Kit.

Autolite Ford

Comebacks can be beautiful...!

A "Comeback" can be beautiful when a regular customer reports, "It runs great!" . . . or comes back for other services.

If it's a Ford-built car or truck, there's one easy way to be sure the job is always right. Replace with Authorized Remanufactured Ford Parts. Every replacement part is remanufactured to Ford standards of reliability . . . not just "rebuilt." They're 100% performance tested, not just spot checked . . . and they carry a *new-part warranty.*

Use the "Beautiful Comeback" parts from your Ford, or Lincoln-Mercury dealer.

NATIONAL WARRANTY

Every Remanufactured Ford Part is warranted nationally by the Remanufacturer to be free of defects in materials and workmanship for 90 days or 4000 miles from date of installation, whichever occurs first. Complete OHV engine assemblies are warranted for 12 months or 12,000 miles on passenger vehicles, and 6 months or 12,000 miles on trucks, whichever occurs first. This Warranty includes parts replacement plus related labor.

Ford and Lincoln-Mercury dealers will honor this warranty anywhere in the country.

Remanufactured

Ford

Engines · Parts

. . . PUSHING . . . TOWING
Continued

PUSHING PRECAUTIONS

"Pushing" once was an accepted method to start a car. Today, however, it shouldn't be done except as a last resort. In fact, it isn't even possible to start a 1965 or later model Ford Motor Company car with an automatic transmission by pushing. That's because they only use ONE transmission pump. It rotates with the input shaft and is turned by engine torque. If the engine doesn't run, there's no hydraulic pressure developed to apply the clutches that couple the input shaft to the output shaft to drive the rear wheels (figure 1).

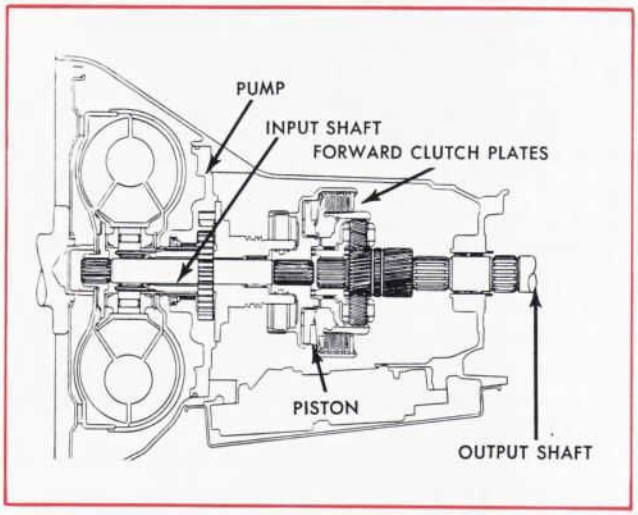


Figure 1—Pump Operation Necessary to Couple Input and Output Shafts

Conversely, if the car is pushed and the rear wheels are driving the output shaft, there's no oil pressure to couple the output shaft to the input shaft and turn the engine. So not only will the engine not even turn over, but the transmission may be damaged because of the lack of oil pressure to adequately lubricate the operating parts (figure 2) if the car is pushed too fast or too long. For these reasons, pushing is not recommended and restrictions exist when cars are towed.

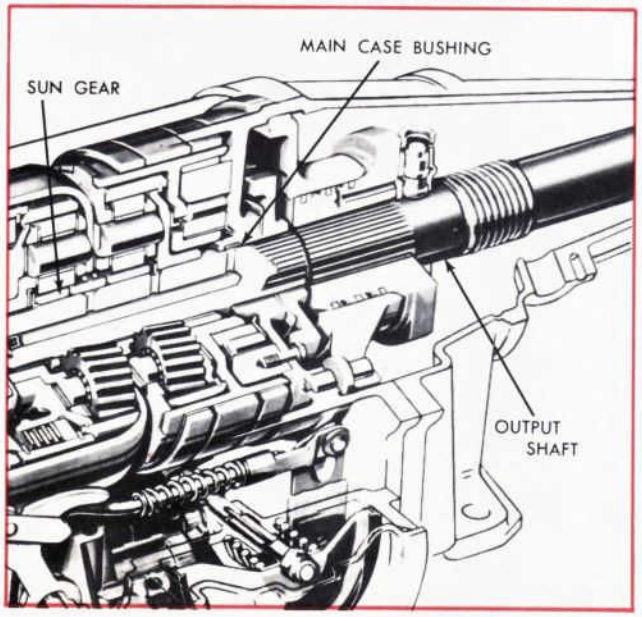


Figure 2—Pump Operation Necessary to Lubricate Transmission

NOTE:

1964 and earlier model Ford-built cars with automatic transmissions have a front AND rear pump. They can be started by pushing . . . as of course, can manual transmission cars.

If absolutely necessary to push a vehicle equipped with power steering or power brakes, and the owner is behind the wheel, advise that there will be *no* power assist until the engine starts. This is particularly important with women because of the extra effort required to steer and apply brakes.

However, pushing should be discouraged because it is illegal to push a car in some states (except to remove it from traffic lanes to the shoulder) and is shortly expected to be the law in additional states. Now is the time to quit the practice of pushing cars. It can be dangerous in certain situations, and confusion can exist over the type of transmission in the vehicle. If it appears the car has a weak battery, use jumper cables and a booster battery to start the car.

Using Booster Battery and Jumper Cables

To start a car with a "rundown" battery, hook the jumper cables to the booster battery first. Be sure to connect the positive (+) terminals of the batteries through one cable (usually red) and the negative terminals through the other (figure 3). *Any other procedure will damage the charging system and could result in personal injury caused by electrolyte squirting out of the vents.*

Keep fire away from the top of open battery cells. Combustible gas is always present.

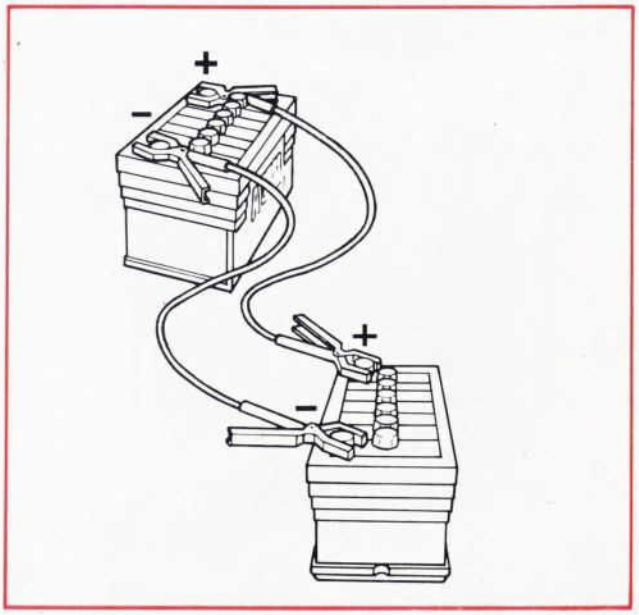


Figure 3—Correct Hook-up of Booster Battery Cables

EMERGENCY. . .STARTING

TOWING TIPS

Before towing a vehicle, be sure:

1. The parking brake is off.
2. The transmission operates properly and is in *Neutral.*
3. The rear axle operates correctly.

If the above conditions are met, the vehicle may be towed with the rear wheels on the ground. *Do not exceed 30 mph, or a distance of 15 miles.* To do so may damage the transmission, especially automatics, as explained under "Pushing Precautions" on page 9.

If the axle is inoperative, the rear wheels must be raised before towing.

If the transmission is inoperative, the rear wheels must be raised or the driveshaft disconnected before towing; whichever is more convenient. Either one of these methods should also be used if the car must be towed more than 15 miles or faster than 30 mph.

NOTE: To tow a vehicle with steering column and transmission locked and no ignition key available, lift vehicle from rear with wheels locked straight ahead. If wheels are locked in a turned position, they must be supported with a dolly suitable for towing. If rear axle is operative, disconnect drive shaft and tow with front wheels off ground.

Safe Towing Cautions

1. Do not allow riders in car being towed.
2. Do not tow at speeds inconsistent with road, weather and traffic conditions. In other words "take it easy."
3. If possible, have two men in the tow truck so one can check mirrors and keep an eye on the disabled vehicle.
4. If towing a vehicle on the front wheels (rear wheels raised), tie the steering wheel or otherwise secure it so the wheels will track in the straight-ahead position.
5. Late model cars often have body overhang that requires checking during lifting to prevent scraping.
6. On cars equipped with a front end spoiler, the spoiler must be removed when the car is towed from either the front or rear.
7. Always use towing slings to prevent damage to sheet metal or bright metal.

Towing Slings

Special wide-belt towing slings used with extreme care should always be used to prevent metal to metal contact and possible damage to chrome or lower body panels. Figures 4 through 11 show typical examples for 1970 Maverick, Cougar, Mustang and Torino models. These models are shown because one or more 4" x 4" wood block spacers are required to insure there is no lifting stress on the lower body panels. Always be sure and position the spacers as shown for proper vehicle support for these models. And as a precaution, always check other models to be sure they don't require some type of support or protection to avoid damaging the body panels, depending on the lifting equipment used.

SUGGESTED HOOK-UPS 1970 MODELS

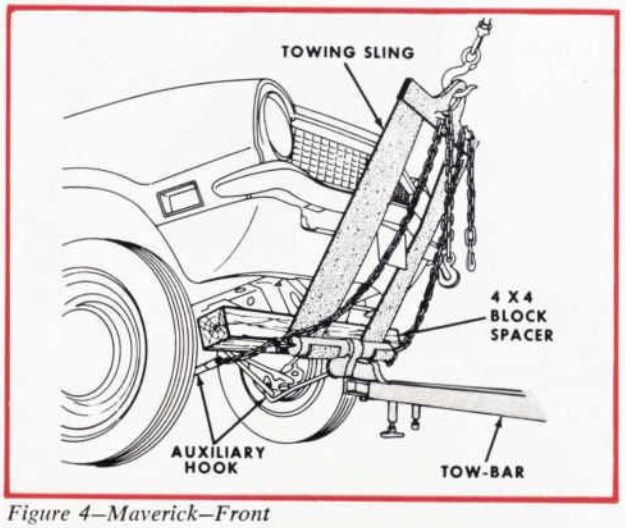


Figure 4—Maverick—Front

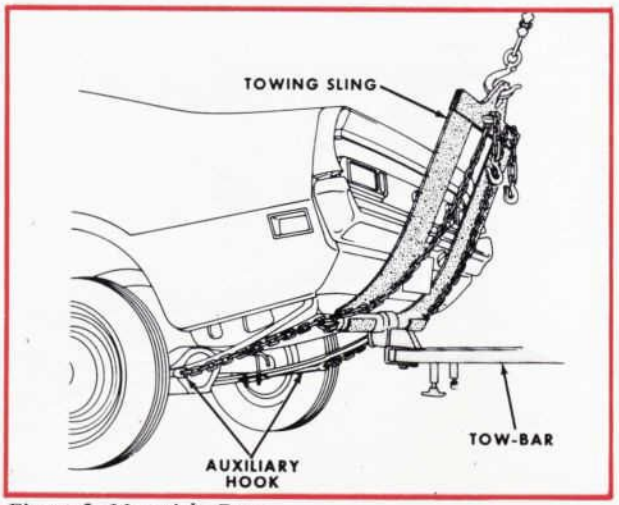


Figure 5—Maverick—Rear

. . . PUSHING . . . TOWING

Continued

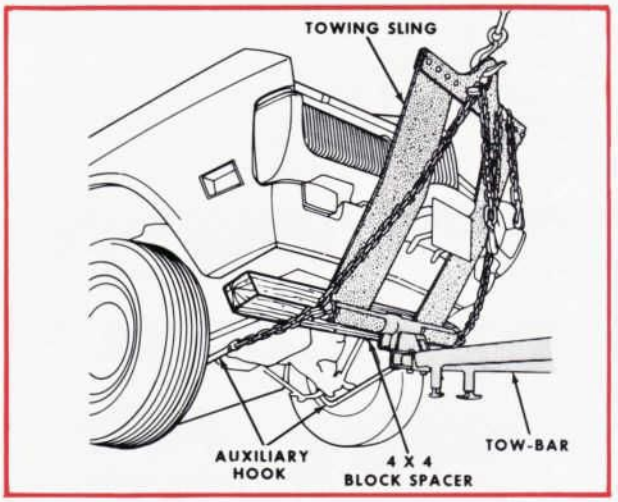


Figure 6–Cougar–Front

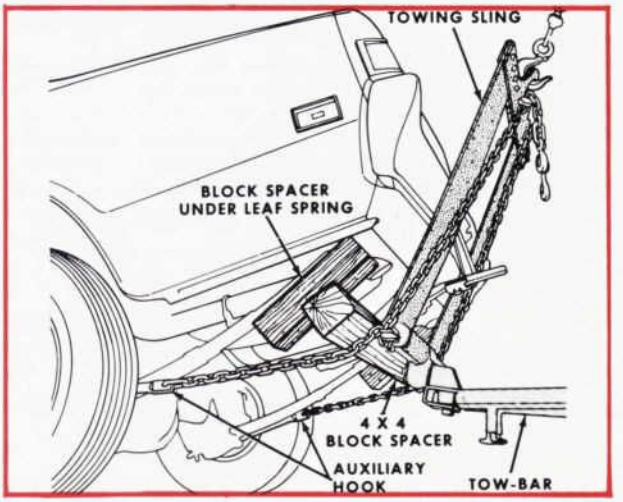


Figure 7–Cougar–Rear

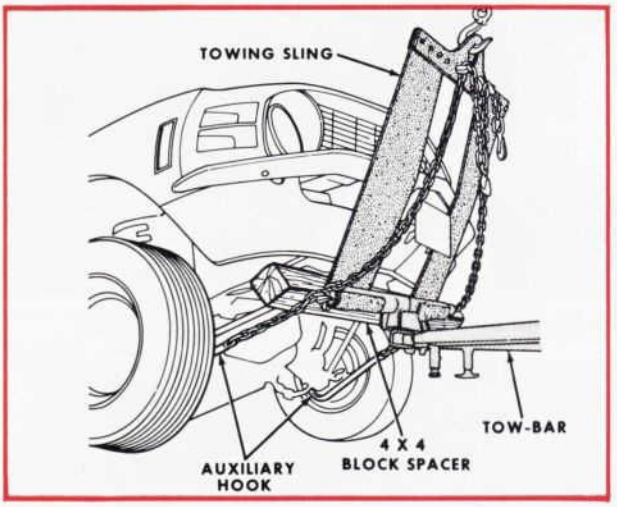


Figure 8–Mustang–Front

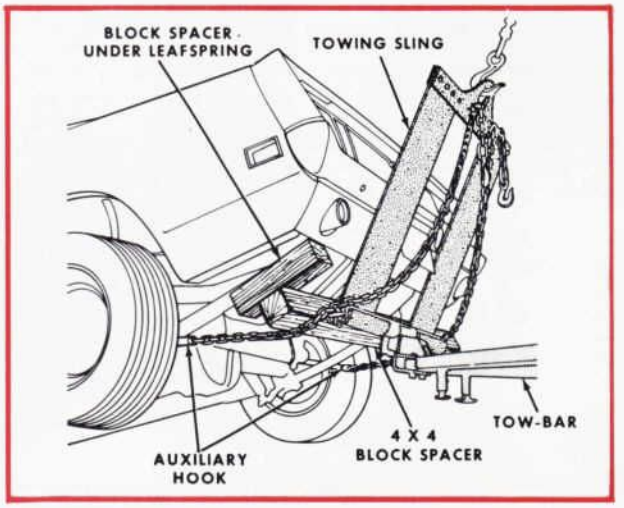


Figure 9–Mustang–Rear

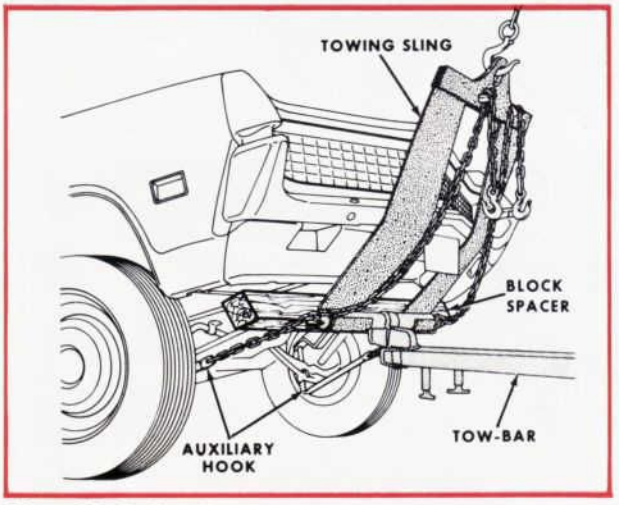


Figure 10–Torino–Front

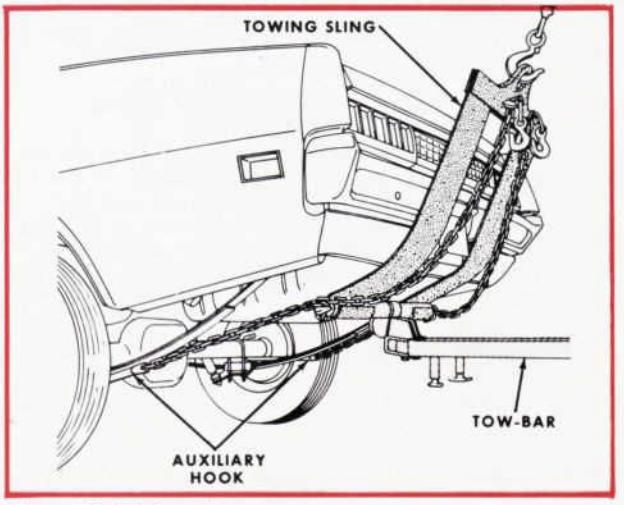


Figure 11–Torino–Rear

TOWING 4-WHEEL-DRIVE VEHICLES

Before towing 4-wheel-drive vehicles, such as the Bronco, certain precautionary steps must be taken to avoid damage to the transmission, transfer case and axles.

Precautionary Steps

First, check the rear axle. If the axle is damaged or not operating properly, follow the procedure under "Towing Backward with Rear Wheels Off Ground."

If the rear axle is ok, use any one of the following three procedures according to the method of towing desired.

Towing Forward with Front Wheels Off Ground

1. Release the parking brake, and shift the transfer case and transmission to neutral position.
2. Disconnect the rear drive shaft from the rear axle, and tie it up. *Do not exceed 30 mph, or a distance of 15 miles with drive shaft connected.*

Towing Backward with Rear Wheels Off Ground

1. Release the parking brake, and shift the transfer case and transmission to neutral position.
2. If the front axle is equipped with free running hubs (Hublok), unlock the hubs from the axle shaft by turning each actuating knob so that it is aligned with the letter "F" on the Hublok. If the front axle is not equipped with free running hubs, disconnect the forward drive shaft from the front axle, and tie it up.
3. Install a locking device to hold the front wheels in the straight-ahead position.

Towing on All Four Wheels

1. Release the parking brake, and shift the transfer case and transmission to neutral position.
2. Disconnect the rear drive shaft from the rear axle, and tie it up.
3. If the front axle is equipped with free running hubs (Hublok) unlock the hubs from the axle shaft by turning each actuating knob so that it is aligned with the letter "F" on the Hublok. If the front axle is not equipped with free running hubs, disconnect the forward drive shaft from the front axle and tie it up.

Lifting and Fastening Towing Chains or Cables

Attach the towing chains or cables to the end of each frame rail where the bumper bracket is attached. Route each chain through the opening in its respective frame rail and under the bottom edge of the bumper. The chains or cables should be covered with shielding where they contact the bumper. Lift the vehicle to the desired height for towing.

BRONCO LIFTING INSTRUCTIONS

Lifting the Bronco on a Hoist Twin Post Hoist

The front post assembly should contact the front bumper. Contact at the front axle could damage the differential and create a safety hazard for the operator (figure 1).

The rear post assembly should contact the rear axle as shown in figure 2.

Frame Contact Hoist

The front contacts should be made at the extreme forward ends of the radius arms (figure 3). Contact farther back could damage the arms.

The rear contacts should be made under the forward spring hanger of each rear spring (figure 4).

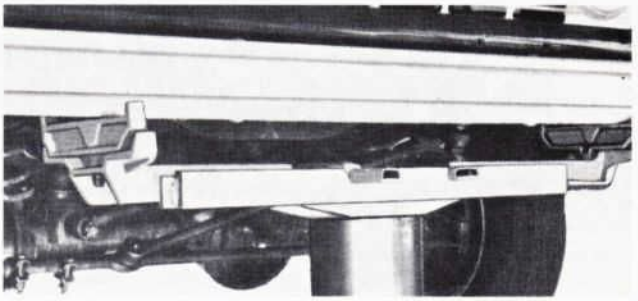


Figure 1—Front Hoist Contact Area

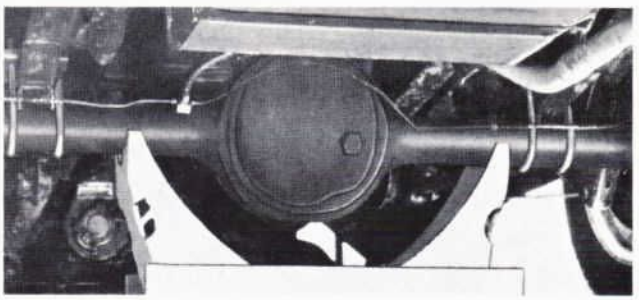


Figure 2—Rear Hoist Contact Area

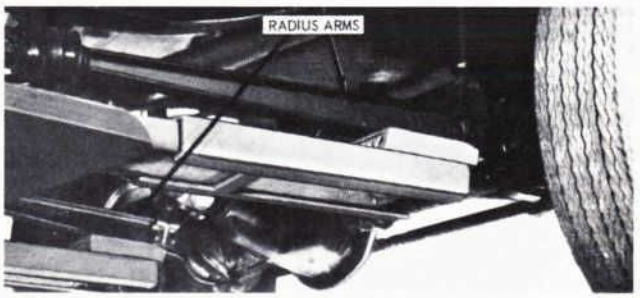


Figure 3—Front Hoist Adapter Pad Position

Figure 4—Rear Hoist Adapter Pad Position

TECHNICAL SERVICE BRIEFS

REPAIRING POWER STEERING OUTLET FITTING LEAKS

Leakage at the pump outlet fitting on all 1965-1969 vehicles with Ford-Thompson pumps and all 1970 vehicles with Ford-Thompson pumps having 5/8" OD fitting usually can be corrected with *Tube Seat 384092-S*. Insert the tube seat between the pump outlet fitting and the hose connector and retorque to specifications.

If the leak still persists, the pump assembly must be removed and repaired.

BOSS 302 MUSTANG TACHOMETER MALFUNCTION

Boss 302 Mustangs use an electronic engine RPM limiter to prevent accidental over-revving. It interrupts the ignition primary circuit from which the tachometer is triggered. Therefore, whenever the limiter is functioning (approx. 6000 rpm) tachometer operation is affected. The tach usually indicates a much lower rpm than actual. This condition is considered normal and no repair should be attempted.

INADEQUATE DEFROSTER OPERATION

(1969 Ford and Mercury with Air Conditioning)

Whenever working on the heater/defroster system, always be sure the temperature and defroster controls are properly adjusted. Adjusting turnbuckles (figure 1) are provided to insure a positive seal between each door and inner case of the plenum chamber. If the subject condition is encountered, correct as follows:

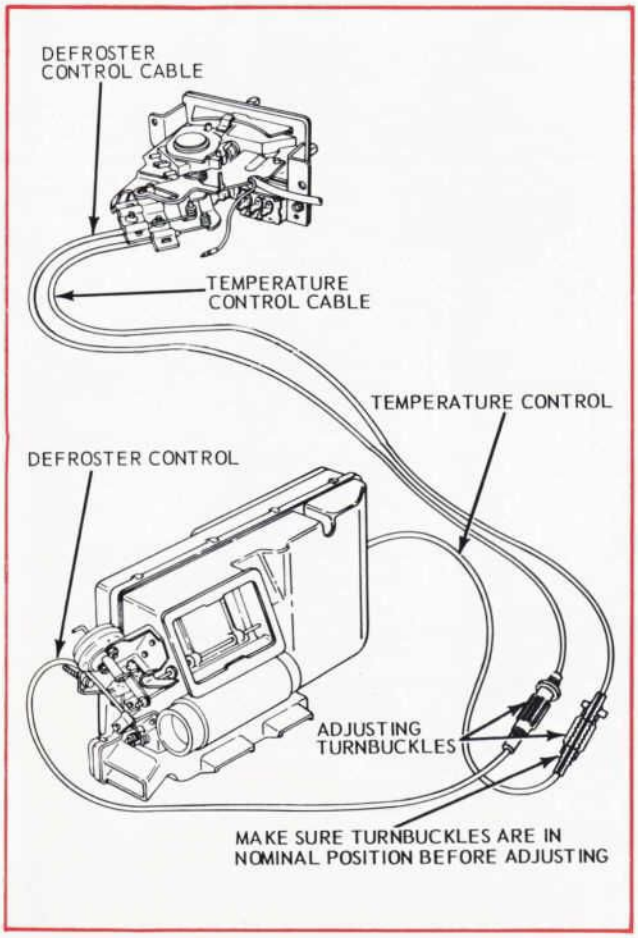


Figure 1–Control Cable Adjusting Turnbuckles

1. The control cables can be adjusted from under the instrument panel. The padding may have to be removed.
2. Prior to adjusting cables, start the engine, set the control in the "Max Defrost" and "Warm" positions with blower on high. Check defroster air velocity nozzle by hand. A reduction in air velocity from the outboard side of the nozzle indicates control cable adjustments are required.
3. Hold defroster control lever in "Max" defrost position and adjust defroster cable turnbuckle until lever bottoms against control housing casting. Readjust turnbuckle to achieve 1/8 inch gap between casting and side of control lever in "Max" defrost position (figure 2).
4. Hold temperature control lever in "Cool" position and adjust temperature cable turnbuckle until lever bottoms against housing casting. Continue holding lever in "Cool" position and readjust turnbuckle until slight pressure is felt against finger. Approximate gap between casting and side of lever should be 1/16 inch (figure 2).

NOTE: For maximum defroster performance the controls must always be set on "Max Defrost" – Warm Position with blower on "High."

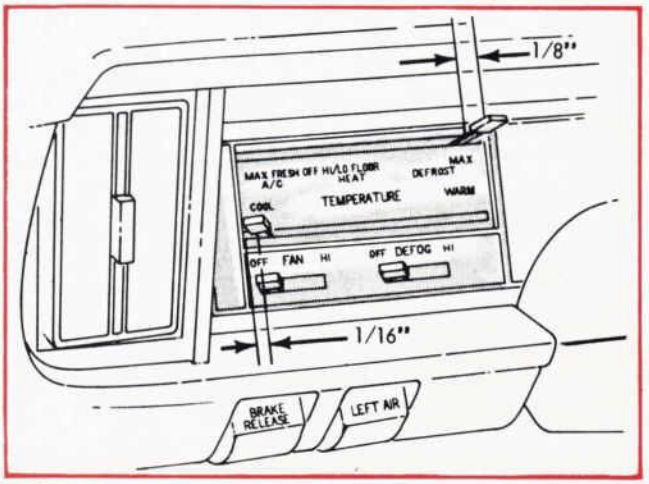


Figure 2–Instrument Panel Controls

THE FUSE LINK

NEW ELECTRICAL FEATURE APPEARS IN 1969-70 FORD-BUILT VEHICLES

A fuse link has been installed in the power circuit wiring of all 1969 passenger cars (except Thunderbird) and light trucks, beginning in April of 1969. The fuse link is used in all 1970 passenger cars and light trucks.

The fuse link is a short length of insulated wire integral with engine compartment wiring harness. It is several wire gauges smaller than the circuit it protects. Production fuse links are all black, and service fuse links are black or green depending on usage. All fuse links have the words FUSE LINK printed in white on the insulation.

To protect the alternator or wiring when heavy current flows—such as when a booster battery is connected incorrectly or a short-to-ground occurs in the wiring harness—the fuse link burns out.

A burned out link may have bare wire ends protruding from the insulation, or it may only have expanded or bubbled insulation with illegible identification. If it is hard to determine if the link is burned out, perform a continuity test as outlined in this article.

1969-70 PASSENGER CAR FUSE LINKS

1969 Passenger Cars Fuse Link Usage

GROUP 1—Fuse Link Failure Affects Charging System Only

Replacement Fuse Link No.	Description	Vehicle Application
C9AZ-14526-D	Green; 14 Gauge	Ford, Fairlane, Falcon, Mercury and Montego w/55- or 65-ampere alternator.

GROUP 2—Fuse Link Failure Affects Entire Electrical System

C9AZ-14526-E	Black; 16 Gauge	Ford, Maverick, Fairlane, Falcon and Cougar. Mercury and Montego w/42-ampere alternator.

1970 Passenger Cars Fuse Link Usage

GROUP 1—Fuse Link Failure Affects Charging System Only

Replacement Fuse Link No.	Description	Vehicle Application
C9AZ-14526-D	Green; 14 Gauge	Ford, Mercury, Meteor, Fairlane, Falcon, Montego and Maverick with 55- and 65-ampere alternator.

GROUP 2—Fuse Link Failure Affects Entire Electrical System

C9AZ-14526-E	Black; 16 Gauge	ALL VEHICLES (Those listed under "Group 1" have a second fuse link in the starter relay-to-alternator circuit.)

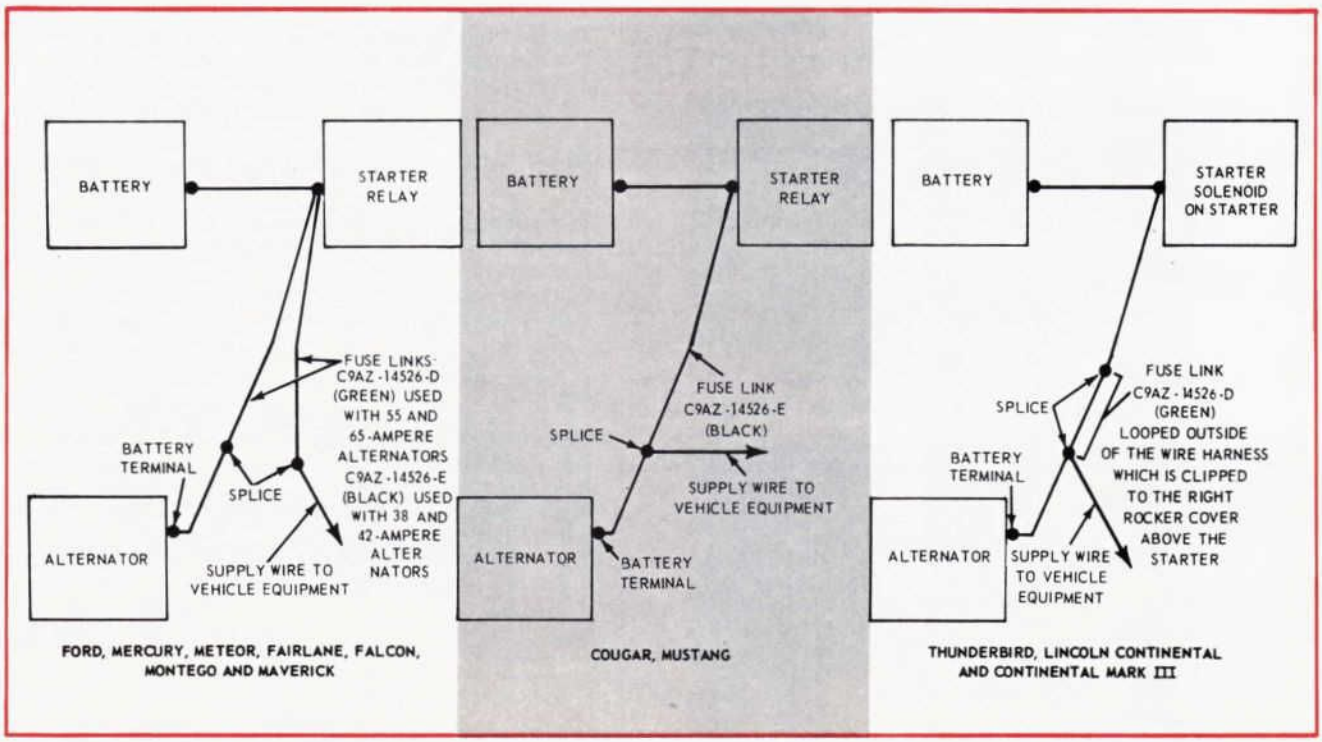
CONTINUITY TEST (1969 CARS)

1. Disconnect the battery ground cable.
2. Disconnect the fuse link from the battery stud of the starter relay.
3. Use an ohmmeter or self-powered test light and check for continuity between the fuse-link eyelet terminal and the BAT terminal on the alternator.

   On those vehicles that have two wires connected to the fuse-link eyelet, cut the additional wire from the eyelet before checking the fuse link continuity. Attach a new eyelet to the additional wire before connecting it back on the starter relay terminal.
4. A good fuse link will light the test light or show zero resistance on the ohmmeter.
5. Connect all wires and the battery ground cable if the fuse link is OK.

CONTINUITY TEST (1970 CARS)

1. On the Cougar, Mustang, Thunderbird, Lincoln Continental and Continental Mark III, make certain first that the battery is OK, then turn on the headlights or any



1970 Fuse Link Applications (Passenger Car Only)

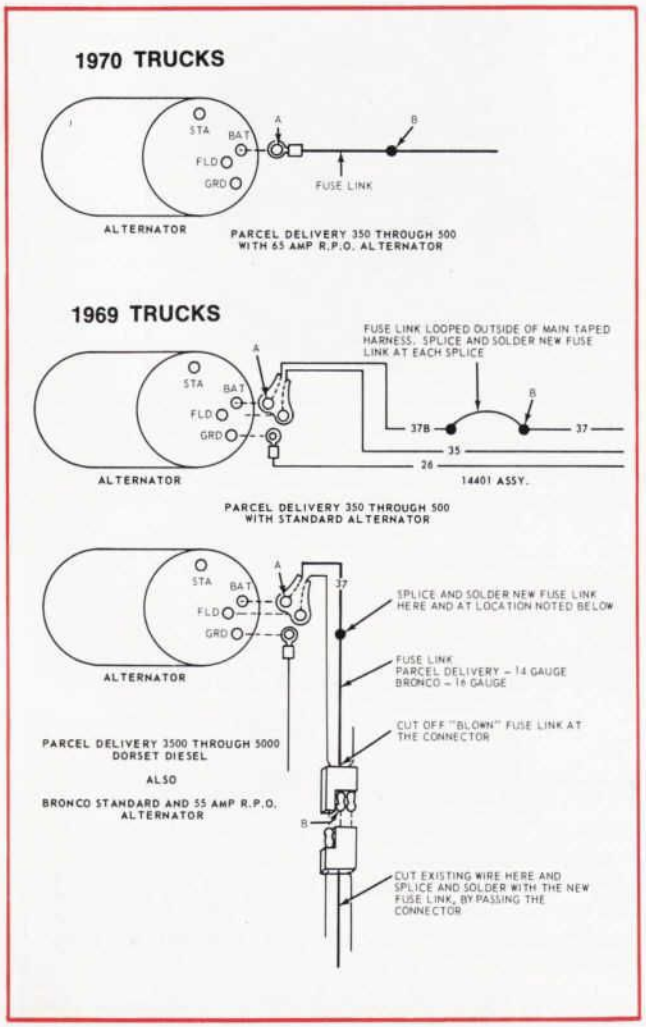
accessory. If the headlights or accessory do not operate, the fuse link is probably burned out.

2. On the Ford, Mercury, Meteor, Fairlane, Falcon, Montego and Maverick, there are two fuse links. Use the same procedure as in step 1 to test the fuse link that protects the vehicle equipment.

   To test the fuse link that protects the alternator, make certain that the battery is OK then check with a voltmeter for voltage at the BAT terminal of the alternator. No voltage indicates that the fuse link is probably burned out.

FUSE LINK REPLACEMENT (ALL CARS)

1. Procure the proper service fuse link for the vehicle being repaired. The two fuse links shown have an eyelet terminal for a 5/16-inch stud on one end. When the terminal is not required, cut off the fuse link as close to the terminal as possible and strip approximately 3/8-inch of insulation from the cut end.
2. Disconnect the battery ground cable.
3. Disconnect the fuse link and/or fuse-link eyelet terminal from the battery terminal of the starter relay. On the Thunderbird, Lincoln Continental and the Continental Mark III, the fuse link is looped outside of the wire harness behind the point at which the harness is clipped to the right rocker cover above the starter.
4. Cut the fuse link and the splice(s) from the wire(s) to which it is attached.



1969-70 Fuse Link Bronco, Parcel Delivery and Light Truck

5. Splice and solder the new fuse link to the wire(s) from which the old link was cut. Use rosin core solder. Wrap the splice(s) completely with vinyl electrician's tape.
6. Securely connect the eyelet terminals (if any) to the battery stud on the starter relay.
7. Install the repaired wiring as before using existing clips if provided.
8. Connect the battery ground cable.

1969-70 BRONCO, PARCEL DELIVERY AND LIGHT TRUCKS

Fuse Link Usage

GROUP 1—Fuse Link Failure Affects Charging System Only

Replacement Fuse Link No.	Description	Vehicle Application
C9AZ-14526-D	Green; 14 Gauge	1969-70 Parcel Delivery

GROUP 2—Fuse Link Failure Affects Entire Electrical System

C9AZ-14526-E	Black; 16 Gauge	1969-70 Bronco and all other light trucks w/38-, 42-, 45-ampere alternator.

CONTINUITY TEST

1. Disconnect the battery ground cable.
2. Disconnect the fuse link from the battery stud of the starter relay. On the Parcel Delivery, disconnect the wires from the BAT terminal of the alternator.
3. On all vehicles except the Parcel Delivery, use an ohmmeter or self-powered test light, and check for continuity between the fuse-link eyelet terminal and the BAT terminal on the alternator.

   On those vehicles that have two wires connected to the fuse-link eyelet, cut the additional wire from the eyelet before checking the fuse link continuity. Attach a new eyelet to the additional wire before connecting it back on the starter relay terminal.
4. On the Parcel Delivery, use an ohmmeter or a self-powered test light and check for continuity between points A and B.
5. A good fuse link will light the test light or show zero resistance on the ohmmeter.
6. Connect all wires and the battery ground cable if the fuse link is OK.

FUSE LINK REPLACEMENT

1. Procure the proper service fuse link for the vehicle being repaired (C9AZ - 14526 - D (green) Parcel Delivery; C9AZ - 14526 - E (black) all light trucks including Bronco). The two fuse links listed have an eyelet terminal for a 5/16-inch stud on one end. When the terminal is not required, cut off the fuse link as close to the terminal as possible and strip approximately 3/8-inch of insulation from the cut end.
2. Disconnect the battery ground cable.
3. Disconnect the fuse-link terminal at the starter relay (alternator for the Parcel Delivery).
4. Remove the complete fuse link at the splice(s) and, when applicable, remove the old terminal from the battery stud of the starter motor relay.
5. Cut out the original splice(s), then splice and solder the new fuse link in its place. Use rosin core solder.

   Wrap the splices completely with vinyl electrician's tape. On those vehicles that have two wires connected to the original fuse-link eyelet, cut the fuse link from the eyelet and position the second wire with eyelet back on the starter relay terminal.
6. Securely connect the eyelet terminals (if any) to the battery stud on the starter relay or on the alternator (Parcel Delivery).
7. Install the repaired wiring as before using existing clips if provided.
8. Connect the battery ground cable.

COMPLIMENTS OF

YOUR SOURCE FOR GENUINE FORD AND AUTOLITE ORIGINAL EQUIPMENT PARTS

Autolite gives you a fast, convincing method to build more PCV system business

USE THIS SENSATIONAL NEW AUTOMATIC TESTER

- Show your customers the condition of their PCV system under actual operating conditions
- Fits in your pocket
- Use it when you check the oil

It takes just seconds. Place tester over oil filler opening when engine is idling. A moveable ball instantly indicates if system is okay. Only one moving part—no clumsy boxes, hoses or adapters. Ruggedly constructed for long service life. A "must" for every service station and garage to provide customers with visual proof as to whether or not their PCV system is in good shape to prevent rough idling, poor gas mileage, oil contamination and oil consumption. Available where Autolite parts are sold under Part No. EV-44.

. . . AND WHEN IT'S TIME FOR A NEW PCV VALVE

Keep Ford original equipment quality in Ford-built vehicles . . . and other makes too

INSTALL AUTOLITE PCV VALVES

- Automatic self-cleaning action prevents sludge build-up and clogging between service periods.
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- Close tolerance machining of plunger and orifice provides optimum valve performance and efficiency.

All Autolite PCV valves 100% inspected for compliance with Ford specifications and State and Federal requirements.