ELECTRO-LEVEL AIR SUSPENSION SYSTEM
GMC MOTORHOMES

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The optional Electro-Level System provides the ability to level the vehicle at campsite or parking area where the surface is not level. This system can raise or lower the rear of the vehicle approximately four inches from normal ride height.

NORMAL OPERATION:

The controls consist of three rocker switches that function to automatically or manually level the vehicle. The center rocker switch (TRAVEL) is used for an automatic or hold mode, and the two outer rocker switches (RAISE-LOWER) are used to raise or lower the vehicle.

DRIVING:

A reminder light in the dash panel is designed to light momentarily any time the engine is running and the transmission selector lever is moved to "D" (Drive Range). The normal position for the RAISE-LOWER switches should be placed in the middle position "OFF". The TRAVEL switch should be moved to "AUTO"

CAMPSITE OR PARKING AREA:

The two RAISE-LOWER switches may be used as necessary to raise or lower the vehicle. When using Electro-Level at a campsite, the vehicle engine need not be running to operate the system; however, the ignition switch must be in the "ON" or "ACCESSORY" position.

"RAISE" - With a rocker switch in this position, the appropriate side of the vehicle will raise to any desired position, up to a maximum of approximately four inches above normal ride height. When desired height is reached, return rocker switch to "OFF" position.

"LOWER" - With a rocker switch in this position, the appropriate side of the vehicle will lower a maximum of approximately four inches below the normal ride height. In order to maintain a desired height, return rocker switch to "OFF" position.

NOTE: It is possible that the air compressor may operate for a short period when a rocker switch is in "LOWER" position.

IMPORTANT: When both sides of the vehicle have been leveled, be sure the TRAVEL switch is moved to "HOLD" and turn ignition switch to "OFF".

COMPONENTS AND THEIR OPERATION: (See Attached Electro-Level Air System Schematic)

The hardware for the system is basically the same as the former system with the addition of six electrically actuated air solenoids. These solenoids give positive air flow or stoppage; whichever is called for. Four of the solenoids (two per side) are three-way and two (one per side) are two-way.

All components except the control panel, air bellows and height control valves, (located as before) are located in the lower cabinet of the closet module. The assembly consisting of the air compressor, pressure switch, check valve, wet tank connecting fittings, and solenoids is referred to as the air control module.

AIR FLOW:

The main function of this system is to provide air to the bellows, and maintain a proper height with a minimum possibility of a leak-down. This is accomplished by the two-way solenoids, "E" and "F". The purpose of these solenoids in a normal operating condition; i.e. while the vehicle is operating and the "TRAVEL" switch is in "HOLD" with the "RAISE-LOWER" switches in the center "OFF" position is to remain closed, trapping air in the bellows and isolating the bellows from the rest of the system. This means the only possible areas of leakage will be the bellows themselves, the fitting on the bellows, the fittings at the solenoids or the air line running between. The rest of the system is not in any way functional. This same air flow situation exists when the vehicle is parked and the key is off.

When the vehicle is operating with the "TRAVEL" switch in "AUTO", solenoids "E" and "F" are open. This allows air to flow from the compressor through the height control valve and further through solenoids "A", "C" and "E" on the left side. On the right side, it will flow through solenoids "B", "D" and "F" to the bellows. Height of the vehicle in the "AUTO" mode will simply be regulated by the height control valves. The three-way solenoids will allow air to pass from the No. 3 port to the No. 2 port. This is the normal air flow of these valves when they are not energized.

If a vehicle is put in the "RAISE" position by use of the "RAISE-LOWER" switch, air flow is a little different. System pressure air no longer goes through valves "A" or "B" from the No. 3 port to the No. 2 port. Instead, this passage is closed and air flows from the No. 1 port to the No. 2 port. This means the height control valve is now taken out of the system and air going through solenoids "A" or "B" is regulated only by the rocker switch on the dash panel. Air will continue through solenoids "C" and "E" to the left side or "D" and "F" on the right side.

To lower the system, the "RAISE-LOWER" switches on the dash will be set in the "LOWER" position energizing solenoids "C" or "D" which causes the normal passage of air between the No. 3 port to the No. 2 port to be altered. Instead, the solenoid opens the passage between the No. 2 and No. 1 ports which goes to the atmosphere allowing the vehicle to lower by expelling air.

OFF-ROAD OPERATION:

In order to gain maximum ground clearance both "RAISE-LOWER" switches should be placed in the "RAISE" position. It is recommended that a speed of 15 mph should not be exceeded since the air suspension in this position has maximum pressure supplied.

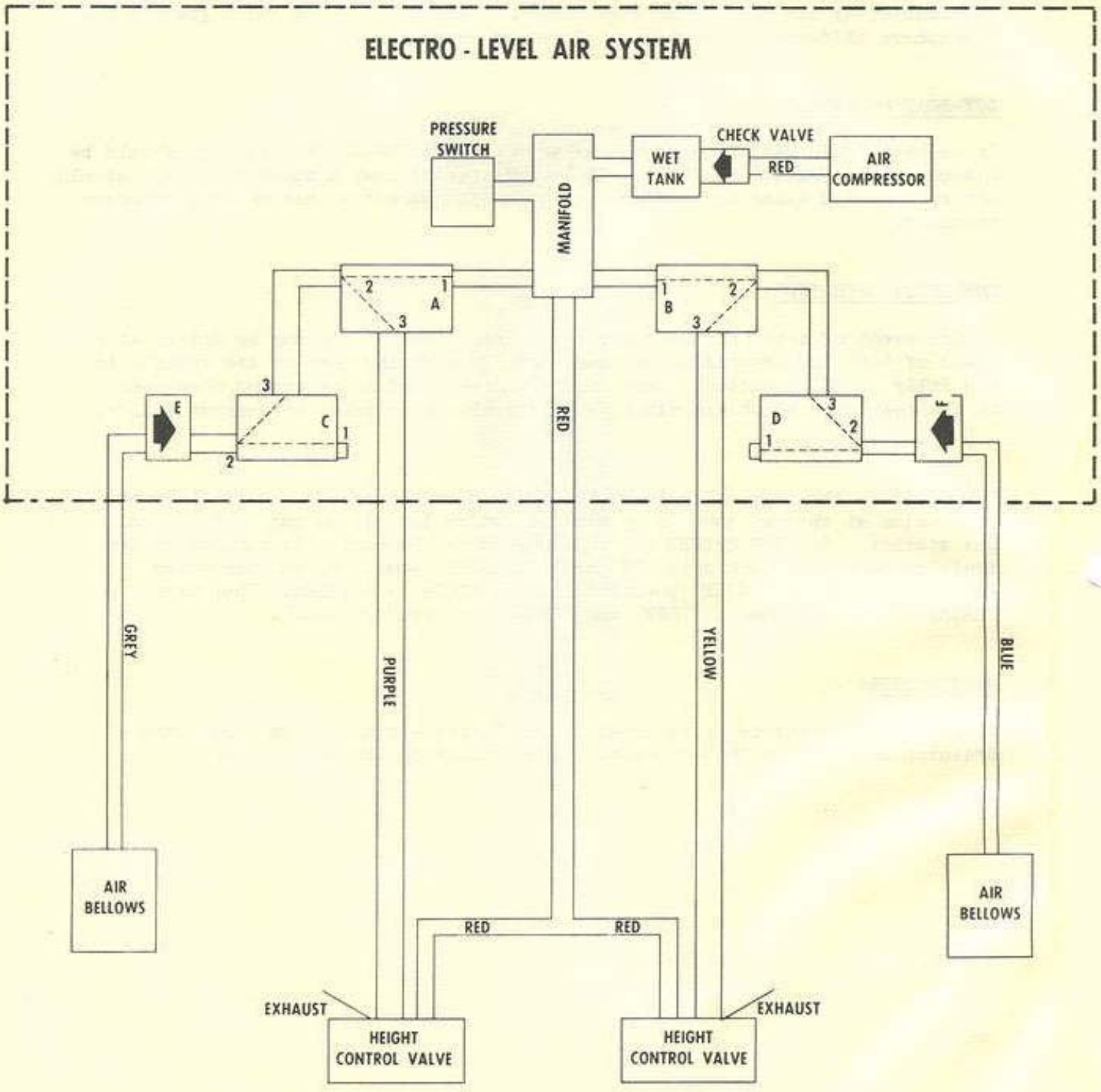
EMERGENCY OPERATION:

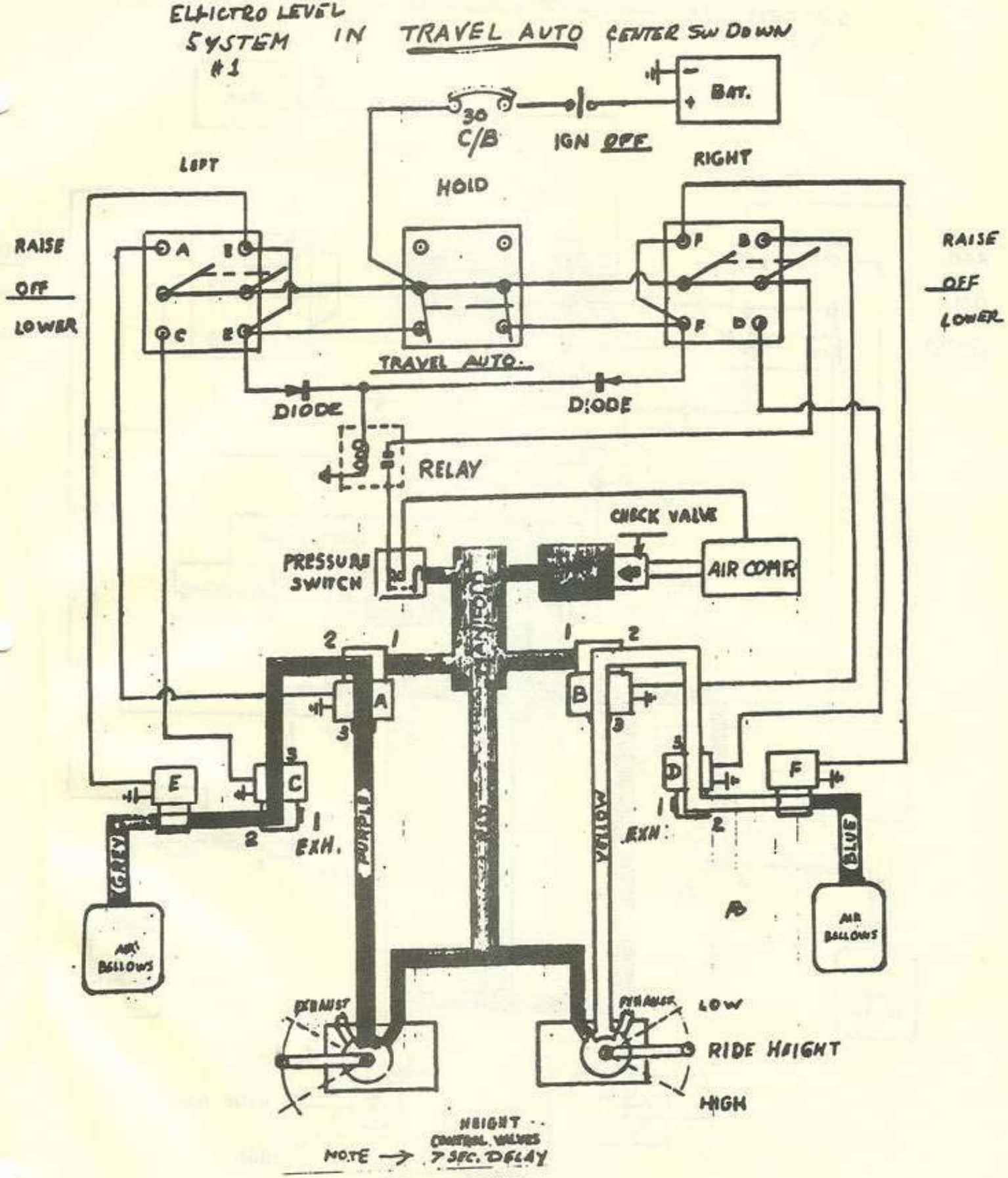
In the event of total air loss for any reason, the vehicle may be driven at a speed of 5-15 mph (depending on road surface) with the rear of the vehicle in the fully "DOWN" position. Care should be exercised since ground clearance at the rear will be at a minimum. Vehicle should be taken to nearest dealer.

Depending on the type of failure, it may be possible to add air to the rear suspension at the wet tank (shop air fill valve located on tank) at a local gas station. (DO NOT EXCEED 120 PSI). Be sure the engine is running or the ignition switch is turned to "ON" or "ACCESSORY" position, and the outer rocker switches in "RAISE" position until vehicle is leveled. Then move "RAISE-LOWER" switches to "OFF" and "TRAVEL" switch to "HOLD".

MAINTENANCE:

No routine maintenance is required on the Electro-Level System other than draining moisture in the wet tank. Expell moisture into cup or rag.

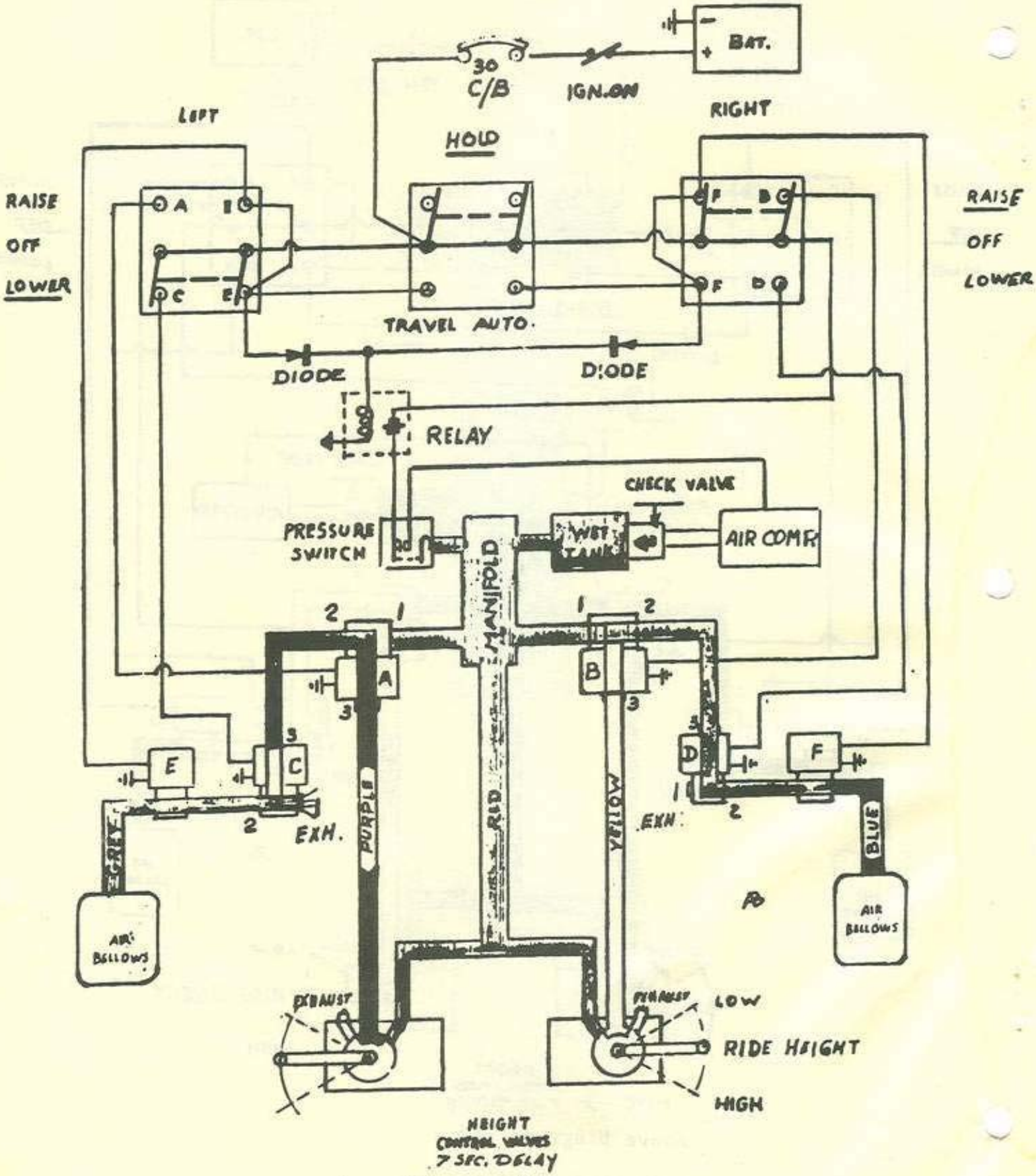

ELECTRO - LEVEL AIR SYSTEM
PRESSURE SWITCH
MANIFOLD
WET TANK
CHECK VALVE
RED
AIR COMPRESSOR
A
B
C
D
E
F
RED
GREY
PURPLE
YELLOW
BLUE
AIR BELLOWS
AIR BELLOWS
RED
RED
EXHAUST
EXHAUST
HEIGHT CONTROL VALVE
HEIGHT CONTROL VALVE



Above Diagrams Per

Alex Birch F-18104

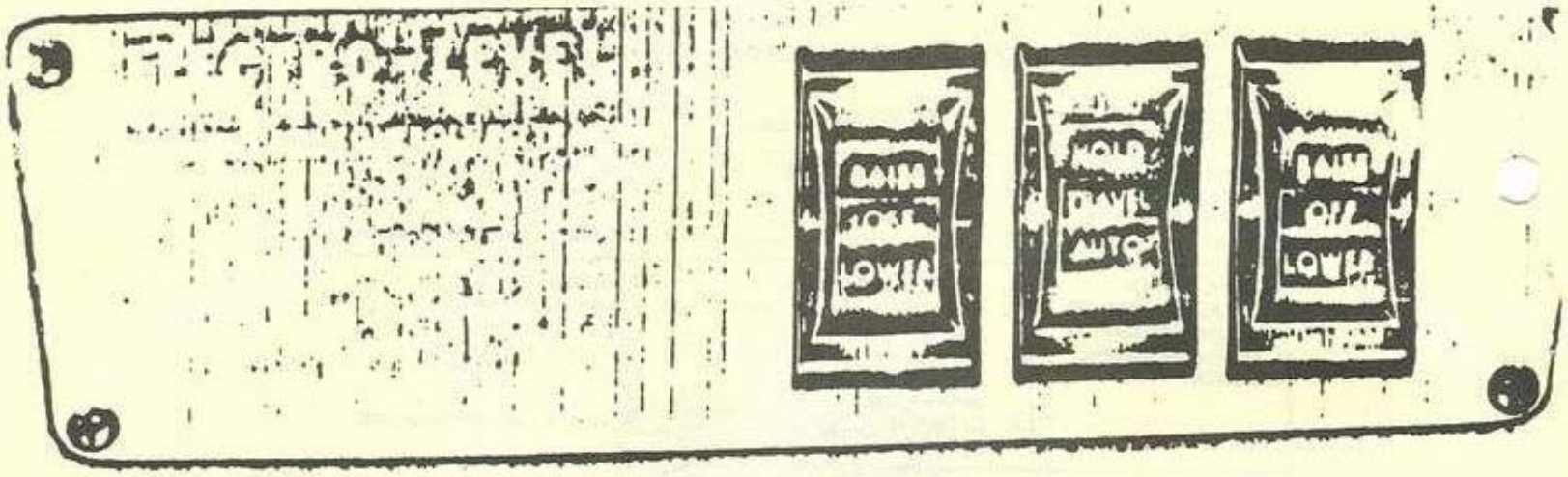
ELECTRO LEVEL SYSTEM #1 IN HOLD - TO LOWER OR RAISE CENTER SW UP

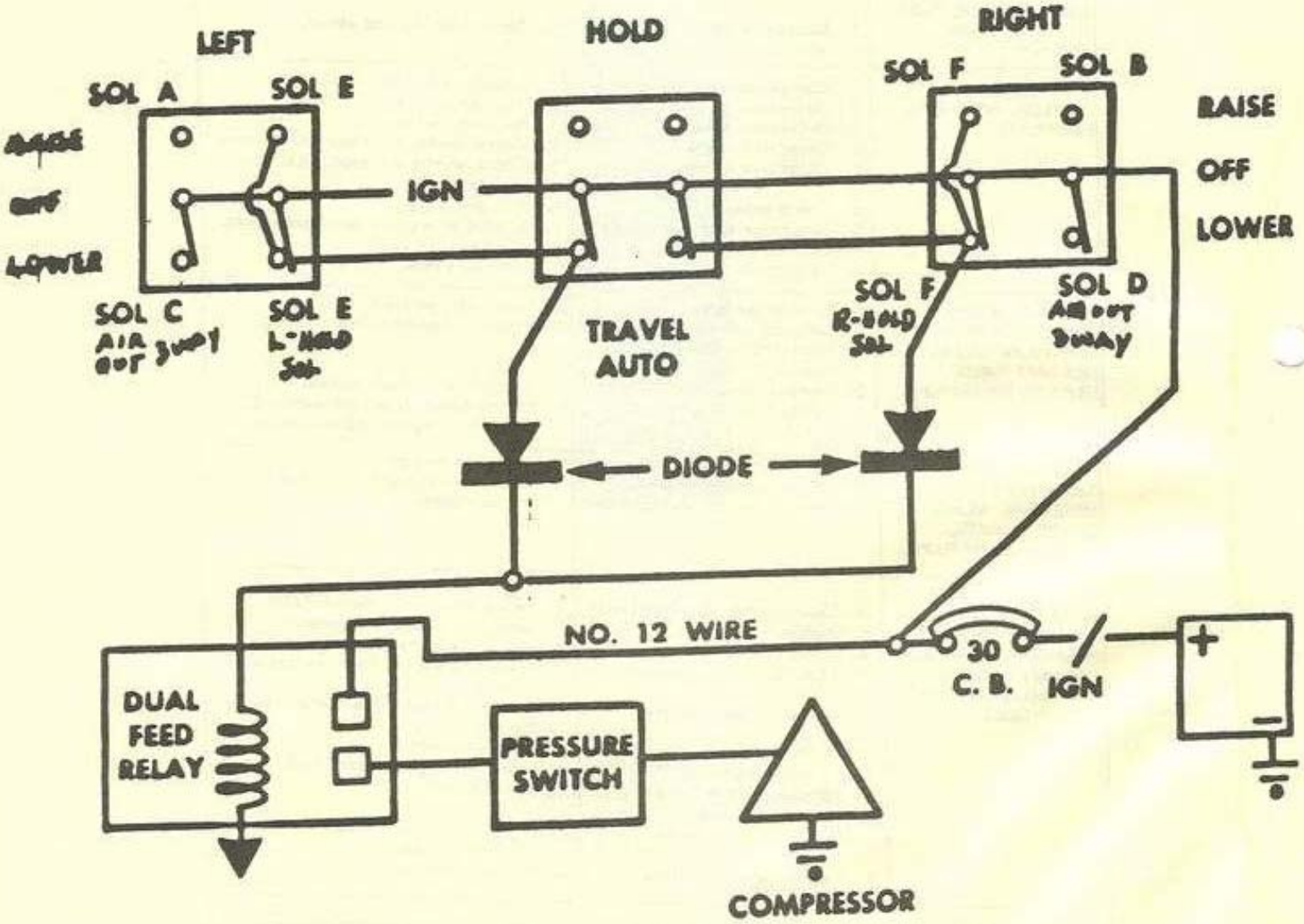


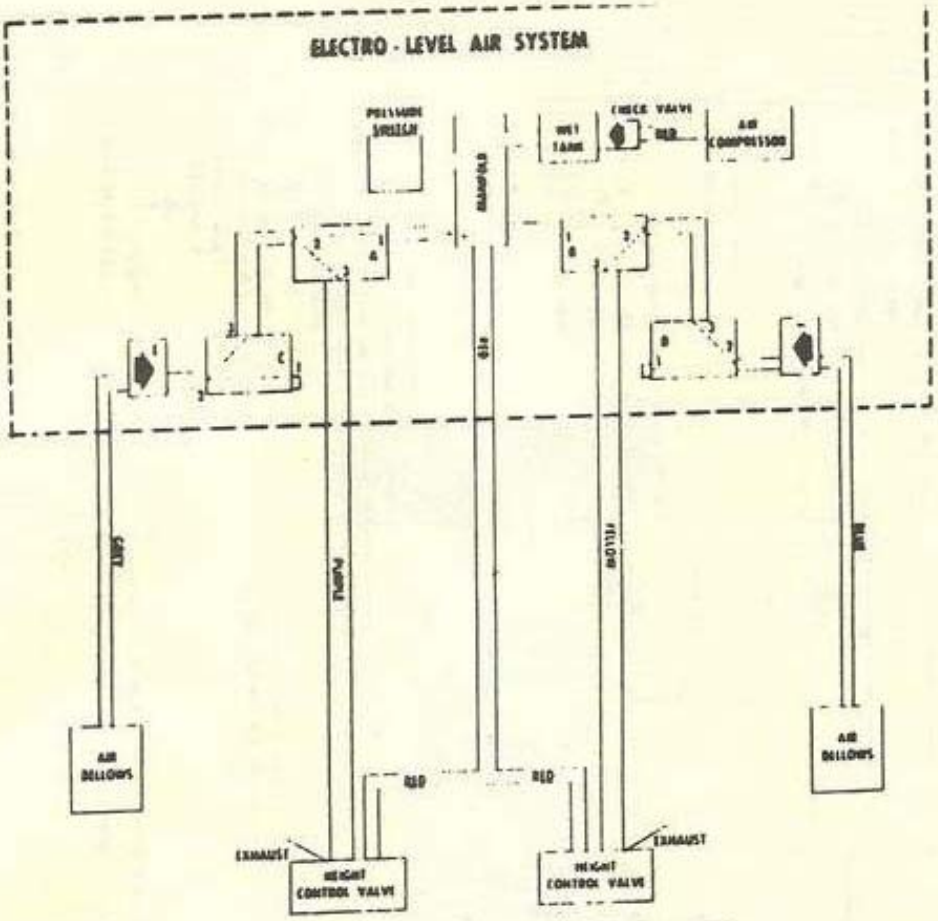
Above Diagrams Per
Alex Birch F-18104

ELECTRO-LEVEL CONTROLS TROUBLE DIAGNOSIS CHART

PROBLEM	POSSIBLE CAUSE	CORRECTION
COMPLETE OR PARTIAL LOSS OF AIR WITH TRAVEL SWITCH IN "HOLD".	1. Leak in air bellows. 2. Leak at air lines between bellows and solenoid. 3. Leak in 2-way solenoid.	1. Eliminate air leak. 2. Eliminate air leak. 3. Service or replace solenoid.
COMPLETE OR GRADUAL LOSS OF AIR OVERNIGHT AT CAMPSIGHT WITH IGNITION OFF.	1. Leak at air bellows. 2. Leak in air line between solenoid and bellows. 3. Leak at fitting between solenoid and air line or bellows and air line. 4. Defective 2-way solenoid valve.	1. Eliminate air leak. 2. Eliminate air leak. 3. Eliminate air leak. 4. Service or replace solenoid.
COMPLETE OR PARTIAL LOSS OF AIR WITH TRAVEL SWITCH IN "AUTO", IGNITION ON. (COMPRESSOR RUNS TOO FREQUENTLY).	1. Air leak in system. 2. Defective height control valve.	1. Eliminate air leak. Note: Vehicle should be operated with travel switch in 2. Service or replace valve.
TRAVEL SWITCH IN "AUTO". NOTHING HAPPENS.	1. Compressor not operating. 2. Defective control switch. 3. Defective pressure switch. 4. Defective diode. 5. Defective wiring. 6. Check relay. 7. Defective solenoid valves. 8. Leak at air bellows. 9. Leak in air lines.	1. Check feed at ground wire. 2. Replace switch. 3. Replace switch. 4. Check diode. Replace as required. 5. Check wiring and electrical connections. 6. Replace relay. 7. Service or replace solenoid valves. 8. Eliminate air leak. 9. Eliminate leak.
LEFT OR RIGHT SWITCH IN "RAISE" POSITION. VEHICLE DOESN'T RAISE. COMPRESSOR RUNS.	1. Leak in air lines. 2. Solenoid valves plumbed incorrectly. (RAISE solenoids.) 3. Faulty HOLD solenoid valves 4. Faulty RAISE solenoid.	1. Eliminate air leak. 2. Properly install solenoid valve. 3. Service or replace valves. 4. Follow bench check of solenoid. Service or replace as necessary.
LEFT OR RIGHT SWITCH IN "RAISE" POSITION. VEHICLE DOESN'T RAISE. COMPRESSOR RUNS.	5. Faulty control switch. 6. Defective wiring between control switch and solenoid.	5. Replace switch. 6. Check wiring and electrical connections.
LEFT OR RIGHT SWITCH IN "RAISE" POSITION. VEHICLE DOESN'T RAISE. COMPRESSOR NOT OPERATING.	1. Open circuit in compressor motor. 2. Defective relay. 3. Open in pressure switch. 4. Battery undercharged. 5. Defective diode. 6. Defective wiring. (Compressor feed at ground wire not connected.) 7. Open circuit breaker. 8. Faulty control switch.	1. Motor brushes or commutator worn out. Replace motor. 2. Clean contacts or replace relay. 3. Pitted contacts. Replace pressure switch. 4. Charge or replace automotive battery. 5. Replace diode. 6. Check wiring and electrical connections. 7. Check for cause of open circuit breaker. Reset. 8. Replace switch.
LEFT OR RIGHT SWITCH IN "LOWER" POSITION. VEHICLE DOESN'T LOWER.	1. LOWER solenoid valves incorrectly plumbed. 2. Undercharged battery. 3. Defective wiring. 4. Open circuit breaker. 5. Defective solenoid valves. 6. Defective control switch.	1. Correctly install solenoid valves. 2. Charge or replace battery. 3. Check wiring and electrical connections. 4. Find cause for open circuit breaker. Reset. 5. Service or replace solenoid valves. 6. Replace switch.



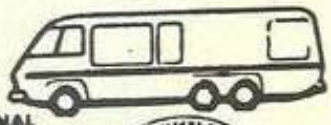

LEFT
HOLD
RIGHT
SOL A
SOL E
SOL F
SOL B
RAISE
OFF
LOWER
IGN
SOL C
SOL E
TRAVEL
AUTO
SOL F
SOL D
DIODE
NO. 12 WIRE
30
C. B.
IGN
DUAL
FEED
RELAY
PRESSURE
SWITCH
COMPRESSOR



From the desk of

BASIL BICKEL

GMC MOTORHOMES INTERNATIONAL



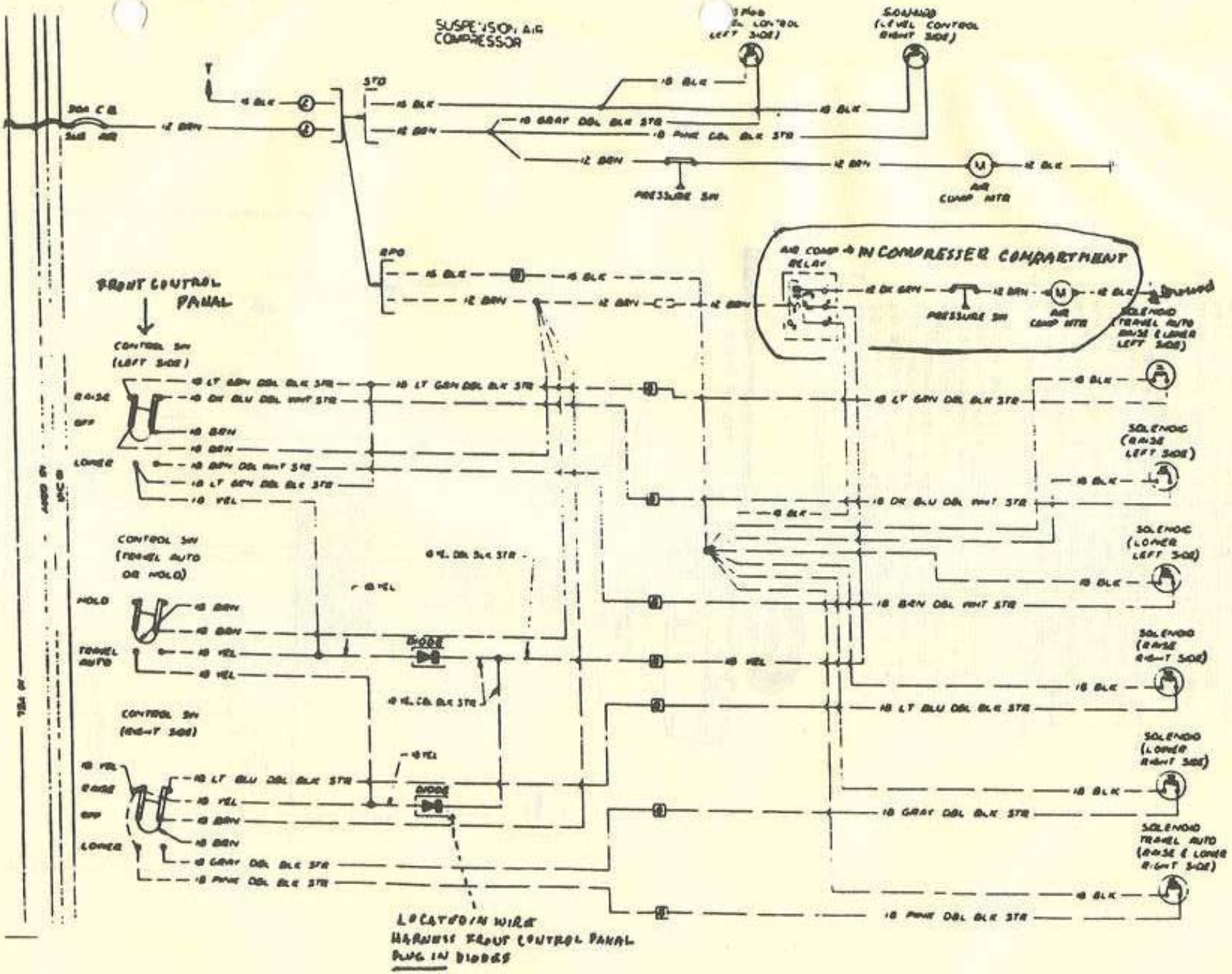
ELECTRO-LEVEL 1 HINTS

1. Raise or lower position in HOLD puts 12 Volts + thru either Diode into Relay to supply 12*DC to Pressure Switch,in Pressure regulater,for Compresser to Run. Thus Compresser will not run if one or both DIODES are open or reversed. Voltage only goes one way thru DIODE so be sure when repaceing DIODE they are installed in the proper direction.

2. Be sure that voltage at relay(in compppeeeer compartant) is 12v+ under load as Air solenoids will not open under 12V+. Check Voltage at Solenoid connecter With Volt-Meter it must be 12V+ with Solenoid in-gaged. Compresser must be running with this test to load 12V+ supply. Also check Voltage at the center contacts of the Raise or Lower Switchs.

3. Disconect leads at C or D Solenoids and test Coil to find that it is not open. C is Solenoid with Grey hose to left Bag, D is Solenoid with Blue hose to right Bag. These are to Hold the Air in the Bags when Power is off.

4. In TRAVEL Relay will close(thru either DIODE) to Run Compresser.



ELECTRO LEVEL 1

WIRING DIA.

THEORY AND OPERATION

FRONT-END GEOMETRY

The term "FRONT-END GEOMETRY" refers to the angular relationship between the front wheels, the front suspension attaching parts and the ground. The angle of the knuckle (now called steering axis inclination) away from the vertical, the pointing in or "toe-in" of the front wheels, the tilt of the front wheels from vertical (when viewed from the front of the vehicle) and the tilt of the suspension members from vertical (when viewed from the side of the vehicle) - all these are front end geometry. These items have an effect on steering ease, steering stability riding qualities and tire wear. Each item is covered under a separate heading.

The front suspension consists of control arms, stabilizer bar, shock absorbers and a right and left torsion bar. Torsion bars are used instead of the conventional coil springs. The front end of the torsion bar is attached to the lower control arm. The rear of the torsion bar is mounted into an adjustable arm at the torsion bar crossmember. The carrying height of the vehicle is controlled by this adjustment.

CAMBER (FIGURE 1)

Camber is the tilting of the front wheels from the vertical. When the wheels tilt outward at the top, the camber is said to be positive (+). When the wheels tilt inward at the top, the camber is said to be negative (-). The amount of tilt is measured in degrees from the vertical and this measurement is called the camber angle.

CASTER (FIGURE 1)

Caster is the tilting of the front steering axis either forward or backward from the vertical. A backward tilt is said to be positive (+) and a forward tilt is said to be negative (-). You cannot see caster angle without a special instrument, but if you look straight down from the top of the upper control arm to the ground you would find that the ball joints do not line up (fore and aft) when a caster angle other than "O" is present. If you had a positive caster angle the lower ball joint would be slightly ahead of the upper ball joint center line. In short then: caster is the forward or backward tilt of the steering axis.

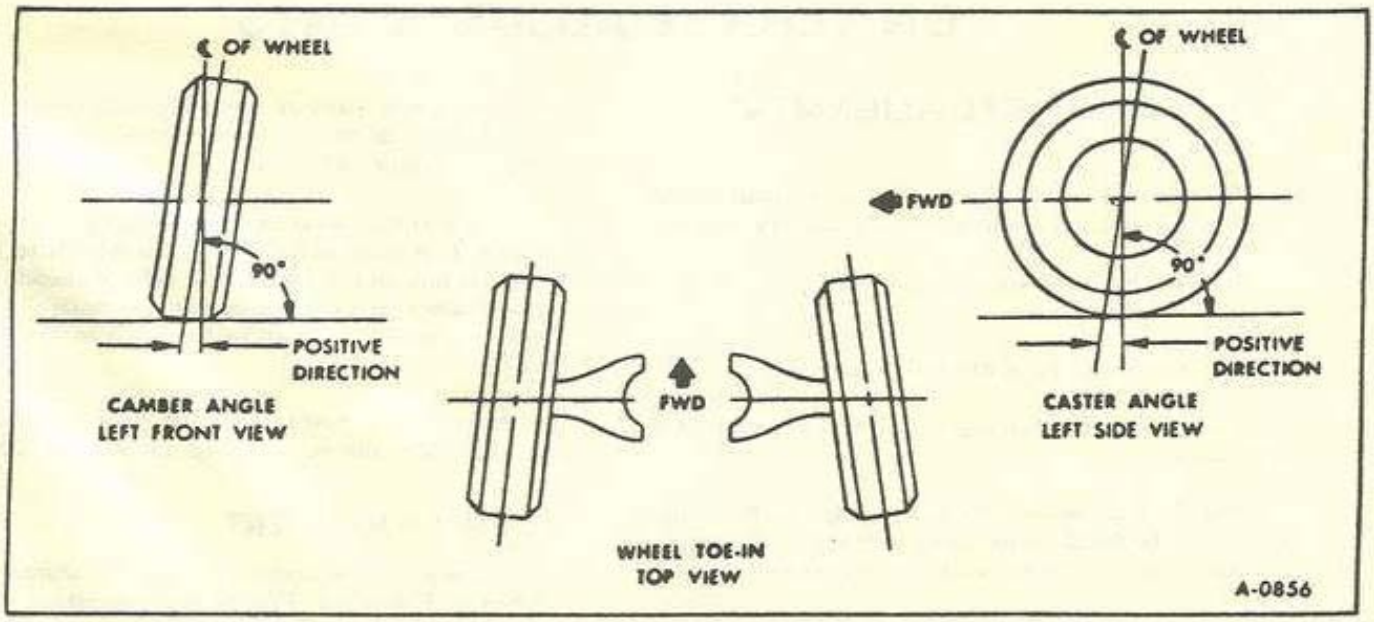


Figure 1—Caster, Camber and Toe-In

STEERING AXIS INCLINATION (FIGURE 2)

Steering axis inclination is the inward tilt (at the top) of the steering knuckle from the vertical. The inward tilt, or inclination, of the knuckle tends to keep the wheels straight ahead. This is desirable because, it helps return the steering wheel straight ahead after a turn. This steering wheel return comes about because the vehicle is actually "lifted" when the wheels are swung away from the straight ahead position. Then the weight of the vehicle tends to return the wheels straight ahead after a turn is completed.

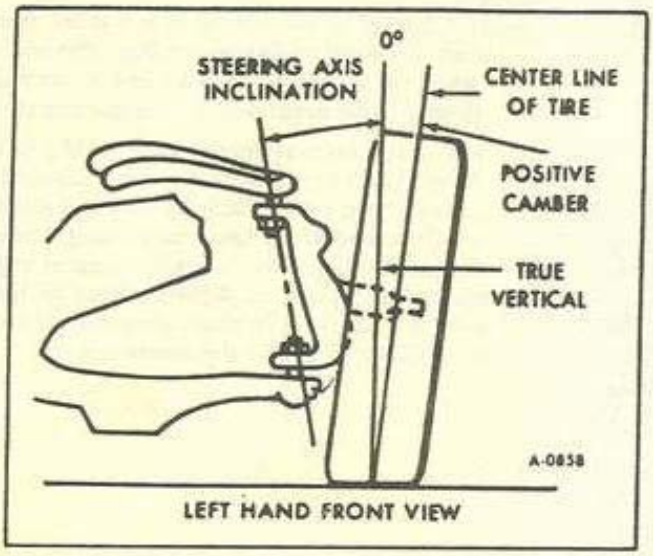


Figure 2—Steering Axis Inclination

TOE ADJUSTMENT (FIGURE 3)

Toe-in is the turning in of the front wheels; toe-out is the turning out of the front wheels. The actual amount of toe-in or -out is only a fraction of an inch. The purpose of the toe adjustment is to ensure parallel rolling of the front wheels. (Excessive toe adjustment will cause tire wear). Toe adjustment also serves to offset the small deflections of the wheel support system which occurs when the vehicle is rolling forward. In other words, even when the wheels are set to toe-in or toe-out slightly when the vehicle is standing still, they tend to roll parallel on the road when the vehicle is moving.

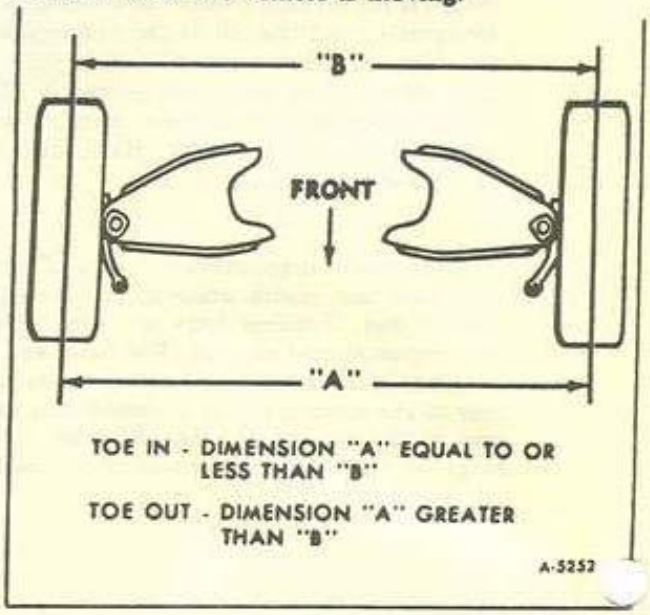


Figure 3—Toe Adjustment

ON-VEHICLE ADJUSTMENTS

REAR WHEEL ALIGNMENT

Proper rear wheel alignment must be maintained to ensure correct handling and satisfactory tire life.

Before checking alignment the following inspections should be made.

1. Check that tires are inflated to 60 psi.

2. Check wheel bearing adjustment and correct if necessary.

NOTE: Rear wheel alignment requires the vehicle to be level while being checked. Full weight must be on wheels with vehicle empty.

TOE-IN MEASUREMENT

Toe-in may be measured from center of tire tread or from inside tires or rims. Measurements at both wheels must be made in same relationship (See "G" and "F," figure 67).

If measurement is to be made from center of tire treads, first hoist vehicle and spin wheels to obtain a center line on tire tread. Roll vehicle ahead several feet to where the inspection is to be made. This will remove any slack caused by looseness in wheel bearings.

Measure at point "F" and "G". The toe-in should follow the relationship: $G = F \pm .06"$.

TOE-IN ADJUSTMENT

If toe-in is not correct it must be shimmed as shown in Figure 68. Follow this procedure for adjustment.

1. Raise vehicle off floor.

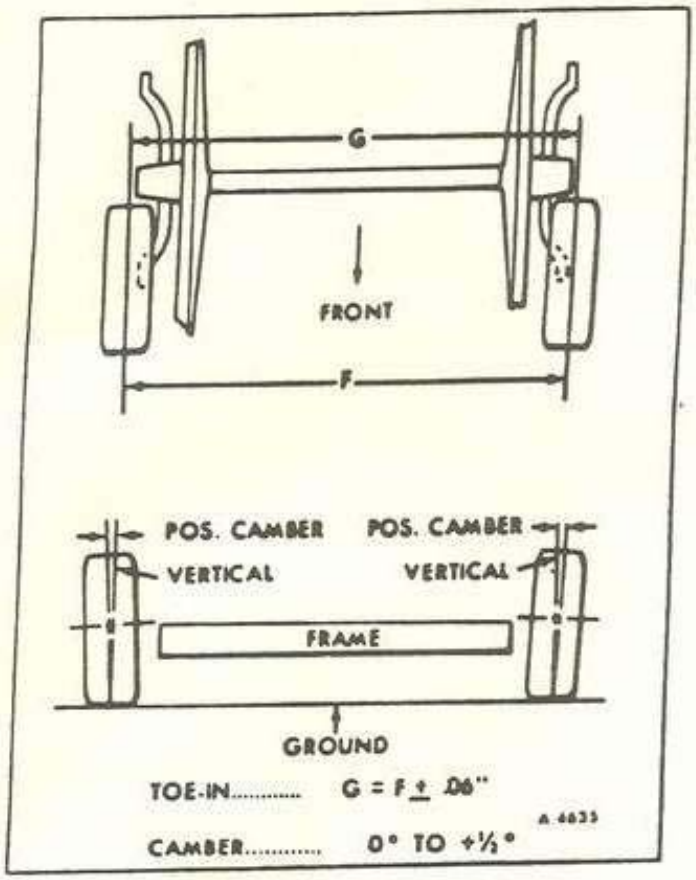


Figure 67—Rear Wheel Alignment Chart

2. Loosen six bolts on mounting bracket.

3. Insert proper shim as shown in Figure 68.

4. Tighten 4 retaining nuts on frame rail to 65-85 ft. lbs. torque. Tighten two retaining nuts on crossmember to 50-60 ft. lbs. torque.

5. Lower vehicle to floor and recheck alignment

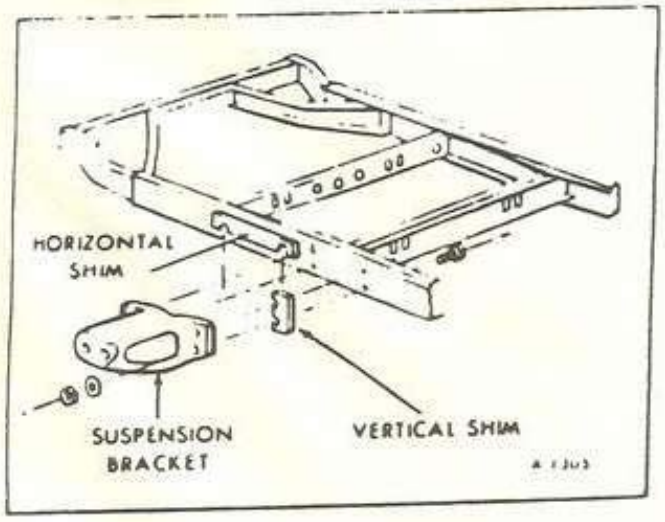


Figure 68—Rear Wheel Shim Location

REAR WHEEL CAMBER

The rear wheels are set with positive camber. Positive camber is outward inclination of wheels at top.

In checking camber, it is recommended that an accurate gauge be used. The camber should be set at 0° to + 1/2° (See figure 67).

Excessive positive camber results in irregular wear of tires at outer shoulder. Negative or reverse camber causes wear at inner shoulders.

Camber is adjusted by shimming as shown in Figure 68. Following the same shimming procedure as that used before to set toe-in.

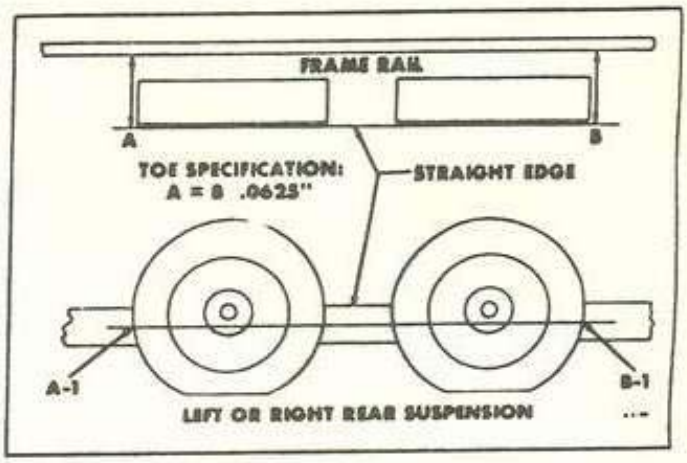


Figure 21—Measuring for Toe at Rear Suspension

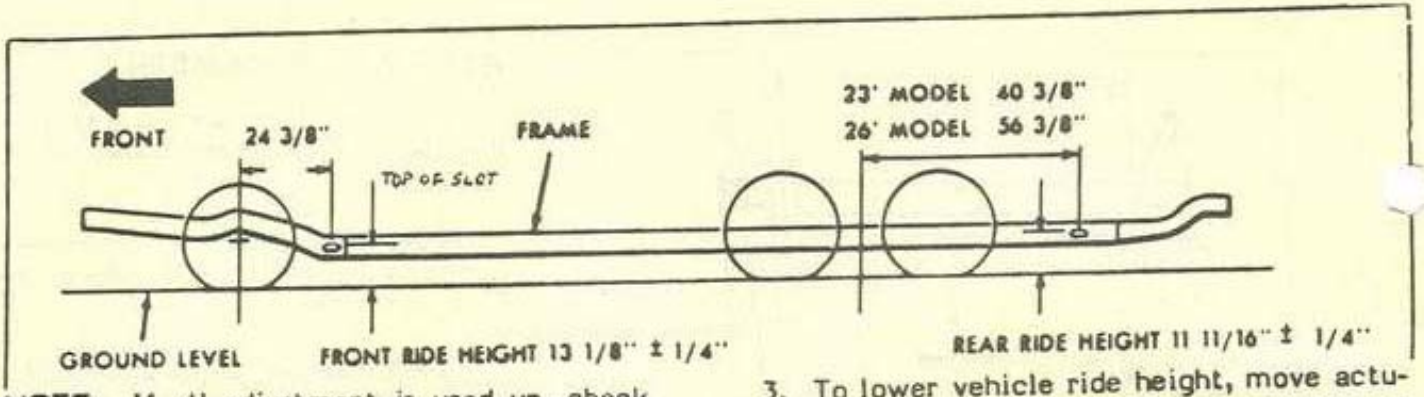
3. Place straight edge across face of wheels as shown in figure 21.

4. Measure distance from straight edge to frame at front tire and rear tire as shown. Toe should be A = B plus or minus .0625".

5. Add toe shims as required. One toe shim changes A = B by .125".

AIR COMPRESSOR PRESSURE SWITCH ADJUSTMENT

The switch is designed to maintain air pressure in the air reservoir between 100 and 120 psi. If the pressure in the reservoir drops to 100 psi the contact points will close and this will complete the circuit supplying electricity to the compressor. If the pressure raises above 120 psi the contact point will open the circuit to the compressor. This setting may be adjusted at the nut which is located on the end of the spring inside the cover, refer to Figure 69. The pressure will rise by tightening the spring. Both the cut-in pressure and the cut-out pressure will be affected by this adjustment. The pressure can be measured at the schrader valve on the reservoir.



NOTE: If all adjustment is used up, check vehicle ride height at frame rail.

3. To lower vehicle ride height, move actuator arm downward and tighten adjustment bolt.

Figure 70—Checking Vehicle Ride Height

RIDE HEIGHT ADJUSTMENT

Measure the rear suspension ride height at the elongated slot on the frame rail. Refer to Figure 70.

To adjust ride height loosen adjustment nut on height control valve (See figure 71). The valve arm has an elongated hole at the adjustment nut. This allows the valve arm to move in relation to the valve itself, and thus allows the ride height to change. Intake and exhaust valves of height control valve can then be operated independently of linkage. When proper ride height is reached tighten nut to 70-80 in. lbs.

Height control valve lever will move 3/16 inch up or down from neutral position (free travel) without causing any valve action. If amount of adjustment required falls within these limits, adjust lever the required amount. However, frame will not raise or lower until load is increased or decreased to actuate height control valve.

If any one of the height control valves does not function properly with the lever correctly adjusted, check for restricted air lines. If valve still does not hold frame at normal ride height with lever properly adjusted, and with no restriction in air line, valve should be overhauled or replaced with a new or rebuilt unit.

HEIGHT CONTROL VALVE INSTALLATION

Before installing height control valve assembly, see that air line fittings are clean and undamaged.

NOTE: DO NOT USE SEALING COMPOUND ON THREADS. Sealer is unnecessary, and if used, may cause valves to stick. Absolute cleanliness is essential when installing height control valves. Dirt and sealing compound must be kept out of valves. Even minute particles of foreign matter may become lodged in valve cores or flapper valves and may seriously affect operation of suspension system.

1. Position height control valve at mounting studs on wheelwell. Attach with two nuts and tighten to 80-120 in. lbs. torque.

2. Connect air supply line to intake adapter, connect bellows air line to outlet adapter. Tighten air line connector nuts firmly.

3. Connect height control valve overtravel lever to valve link and tighten to 60-90 ft. lbs. Build up air pressure in system and test for leaks. Check ride height dimension and adjust if necessary as described later in this section.

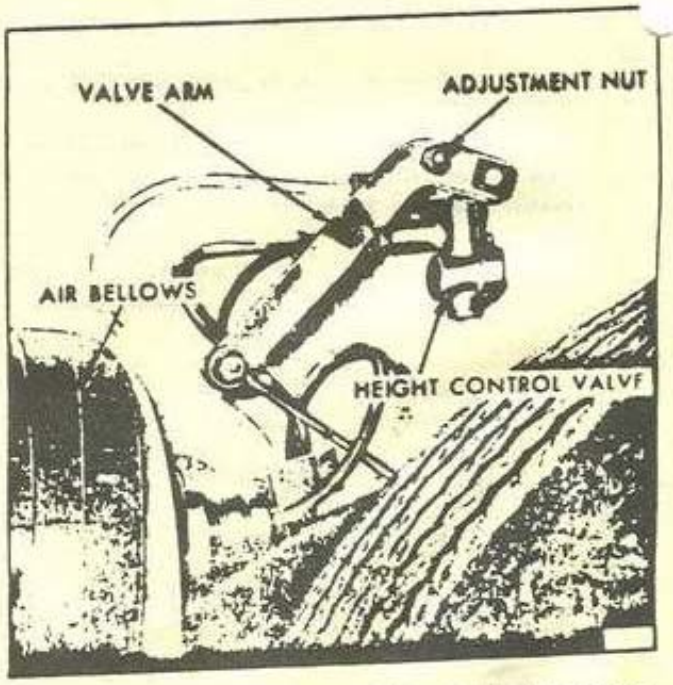


Figure 71—Location for Rear Ride Height Adjustment