Howard Power Center Steering® System

GM/Chevrolet • Master Kit

P32 Chassis

Leaf Spring Suspension

Hydraulic Brakes

Kit: 01K010

INSTALLATION

NOTE: FAILURE TO FOLLOW THE INSTALLATION INSTRUCTIONS IN THIS MANUAL, OR FAILURE TO INSTALL THE COMPLETE KIT FOR EACH SPECIFIC CHASSIS WITH ACCEPTABLE WORKMANSHIP, MAY RESULT IN VOIDING THE HOWARD POWER CENTER STEERING SYSTEM WARRANTY.

Master Installation Overview illustrated on Pages 16 -17

01K010 Master Kit Pick List

PART	QTY	PART NUMBER	R DESCRIPTION SI	HIP/REC"
	1 EA.	10A001-7	CYLINDER-7", ASS'Y W/ HORIZONTAL ROD ENDS	
	1 EA. 1 EA. 1 EA.	20A004 50A024 50A025 50A026 50A027	ACCUMULATOR/COMPRESSOR ASS'Y WIRNG HARNESS ASS'Y WIRING HARNESS ASS'Y WIRING HARNESS ASS'Y WIRING HARNESS ASS'Y	
G • B &	1 EA.	30K001-R	CONTROL PANEL KIT W/ MOUNT PLATE	
	1 EA.	50A004	POWER STEERING PRESSURE SENSING SWITCH ASS'Y	
	1 EA.	50K002	VENT RESERVOIR KIT	
	1 EA.	40K013	CENTER LINK MOUNT KIT W/ ATTACHIN U-BOLTS AND HARDWARE	
	1 EA.	40K015	A-FRAME MOUNT KIT W/ MISC HARDWAI	RE
		52K001 52K003	INSTALLATION KIT W/ COMPRESSOR DOCUMENT KIT, R.V.	

PRE-INSTALLATION INSPECTION:

To ensure the proper operation of the *Howard Power Center Steering System*, it is recommended that a thorough inspection of the following items be completed before proceeding with the installation, checking for:

- Correct Front Tire Pressure & Abnormal Tire Wear
- Front Wheel Lug Nuts Tight
- Steering Gear adjustment loose or binding condition
- Worn Front End Parts (Idler Arms, Idler Arm Ends, etc.)
- Loose U-bolts and Broken Front Spring Leaves
- Steering Input Shaft, U-joints & couplings checking for excessive "play"
- Loose/worn Wheel Bearings
- Upper & Lower Ball Joints checking for excessive "play"
- Toe-In set to 1/8" positive for achieving best results

Note 1: For a more detailed front-end inspection guideline, consult Red Tab #1, Installation Section of Installation & Service Manual (Orange), page 2.

Align, repair, or replace worn parts <u>only</u> as necessary after obtaining the vehicle Owner's authorization to do so*.

*Note 2: High Mileage vehicles should be inspected by a qualified Front End Specialist prior to installation.

Refer to your Orange Installation Manual, Red Tab Section Page No.: I/S-01-2, for complete Pre-Installation Inspection Guidelines covering the Front-end, Suspension, and Steering Box components.

CE PLATE assembly (Figure 2 next page) into STAND-OFF

continued...

I/S - 2A.

GENERAL CONTROL PANEL INSTALLATION:

STEP 1: Locate a position in the cockpit near the driver for the SYSTEM CONTROL PANEL (Figure 1). This panel needs to be located such that the TRIM button can easily be reached without the driver having to lean over. The less moving the driver has to do - the more proficient he/she becomes at trimming.

NOTE:

- 1) If located on the dash, be sure that the CONTROL PANEL can be seen through the steering wheel.
- 2) Route the Control Panel's wire bundle for the least exposure to ABRASION from sharp edges and VISIBILITY from the cockpit.

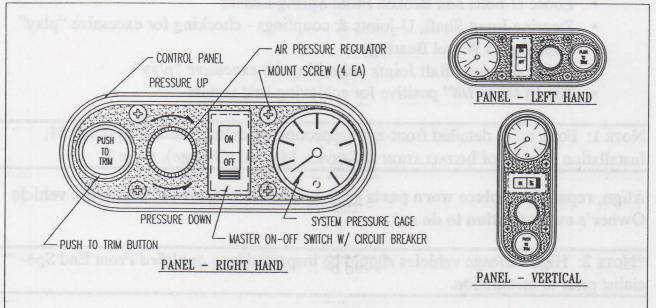
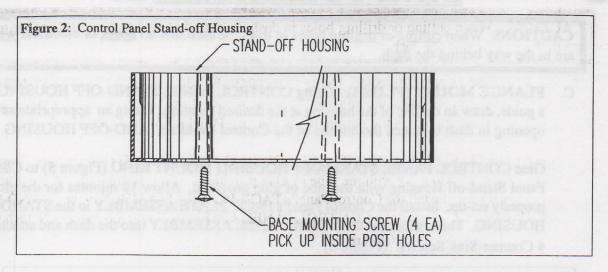


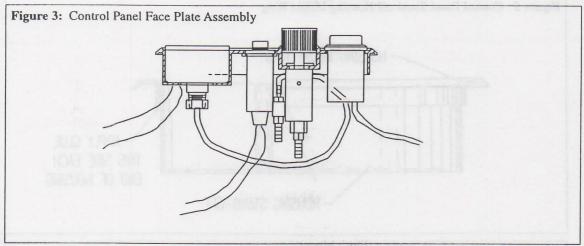
Figure 1. Power Center Steering Control Panel (As shown, Control Panel Orientation may vary with: - R = RIGHT HAND ORIENTATION; - V = VERTICAL ORIENTATION; - L = LEFT HAND ORIENTATION)

STEP 2: Mounting the DRIVER'S CONTROL PANEL can be accomplished in one of three (3) ways:

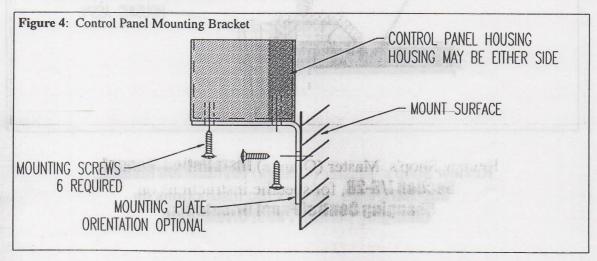
A. STANDARD MOUNT: Position the Control Panel STAND-OFF HOUSING (Figure 2) in the desired location and attach by using #8 self-tapping screws - or drill holes and use standard Hex Bolts and Nuts with Lock Washers. Install Control Panel FACE PLATE assembly (Figure 2 next page) into STAND-OFF HOUSING and attach.

continued...





B. BRACKET MOUNT: Bend Bracket (Figure 4) along bend line to desired angle (90° maximum). Mount CONTROL PANEL STAND-OFF HOUSING with standard Hex Bolts and Nuts with Lockwashers. Position the BRACKET in the desired location and attach with #8 self-tapping screws - or drill holes and use standard Hex Bolts and Nuts with Lockwashers.

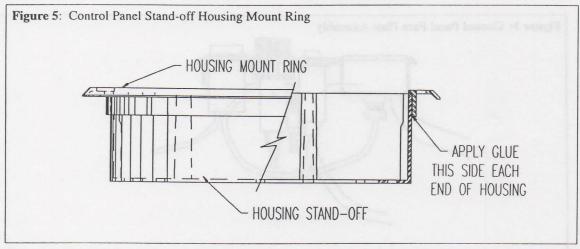


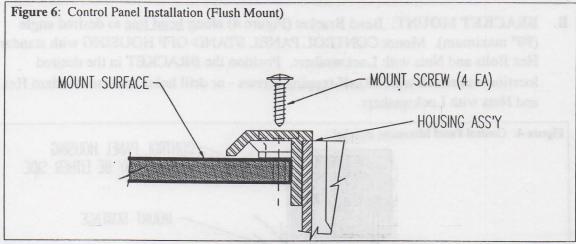
Driver's Control Panel (3rd)

CAUTION!: When <u>cutting</u> or <u>drilling</u> holes in dash, be sure that no <u>hoses</u> or electrical <u>wires</u> are in the way behind the <u>dash</u>.

C. FLANGE MOUNT (FLUSH): Using CONTROL PANEL STAND-OFF HOUSING as a guide, draw an outline of the housing at the desired location. Using an appropriate saw, cut opening in dash to match the outline of the Control Panel's STAND-OFF HOUSING.

Glue CONTROL PANEL STAND-OFF HOUSING MOUNT RING (Figure 5) to Control Panel Stand-off Housing with the tube of glue provided. Allow 10 minutes for the glue to properly set-up. Install the Control Panel's FACE PLATE ASSEMBLY in the STAND-OFF HOUSING. Then install the CONTROL PANEL ASSEMBLY into the dash and attach with 4 Counter-Sink Screws. (Figure 6)



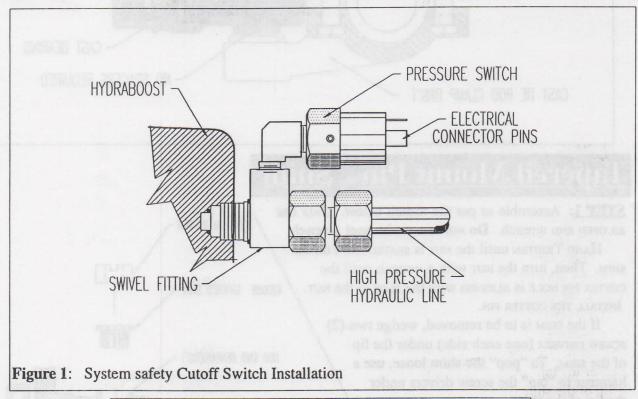


Review Shop's Master (Orange) Installation Manual, Section I/S-2B, for specific instructions on Changing Control Panel Orientation.

NOTE: Power Steering Fluid will be escaping during this step - be prepared!!!

STEP 1: The POWER STEERING CUT-OFF SWITCH is supplied assembled.

STEP 2: Remove HIGH PRESSURE SIDE supply hose from Hydraboost and install POWER STEERING SWITCH and fittings between the hose and the Hydraboost as quickly as is possible. (Figure 1)

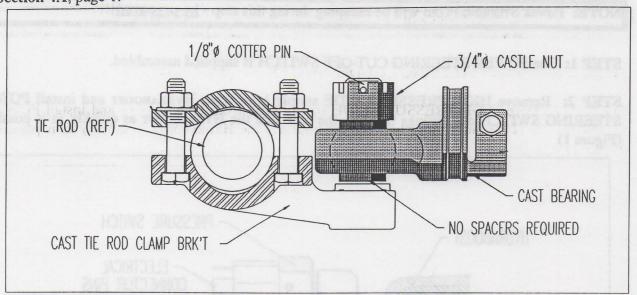


Above from Orange Installation Manual, Section 3B, page 1.

continued ••

The Cast Bearing

The Cast Bearing on the Cylinder End (Figure 2, shown installed) requires no Spacers or Washers when attaching to the provided Tie Rod Clamp. Reference Orange Installation Manual, Red Tab Section 4A, page 1.



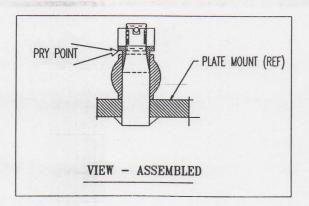
Tapered Mount Pin & Shim

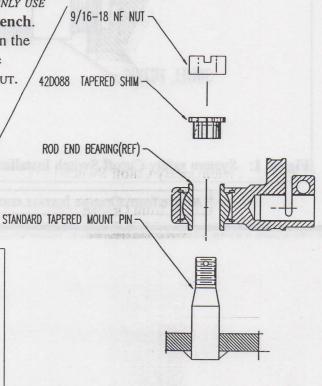
STEP 1: Assemble as per the sketch below. Only use an open end wrench. Do not use an impact wrench.

HAND TIGHTEN until the NUT is SEATED SNUG on the SHIM. Then, turn the NUT with a wrench until the COTTER PIN HOLE IS ALIGNED with the SLOT in the NUT.

INSTALL THE COTTER PIN.

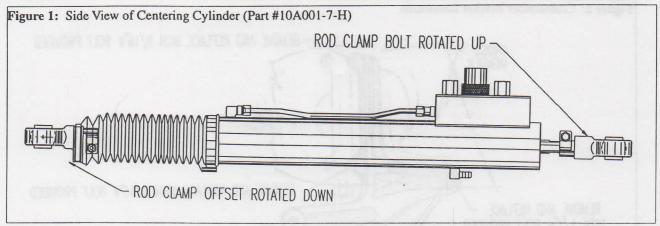
If the SHIM is to be removed, wedge two (2) SCREW DRIVERS (one each side) under the lip of the SHIM. To "pop" the shim loose, use a hammer to "tap" the screw drivers under the lip of the shim.

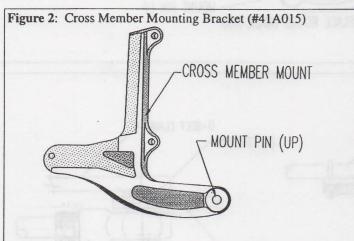


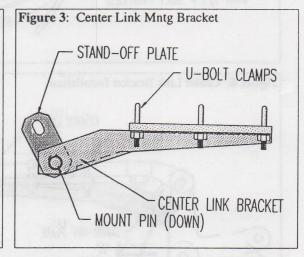


VIEW - EXPLODED

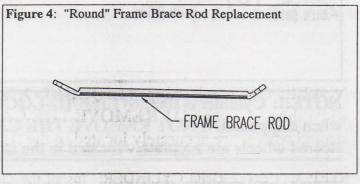
The Centering Cylinder and Cylinder Mounting Hardware include a 7-inch stroke Cylinder Assembly and (Figure 1) to accommodate center link travel, a bolt-on Cross Member Mounting Bracket (Figure 2), a Center Link Mounting Bracket (Figure 3), and a round Frame Brace Rod Replacement (Figure 4).







STEP 1: CROSSMEMBER MOUNT BRACKET: Remove the INBOARD Front & Rear Bolts and Nuts from the DRIVER'S side Lower "A" Frame. Remove existing ROUND FRAME BRACE ROD on the DRIVER's side where it is connected at the crossmember. Replace with ROUND FRAME BRACE ROD furnished.

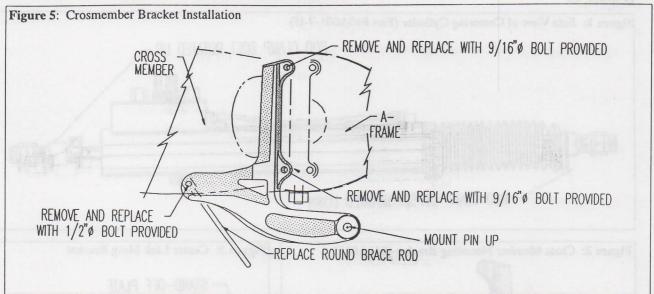


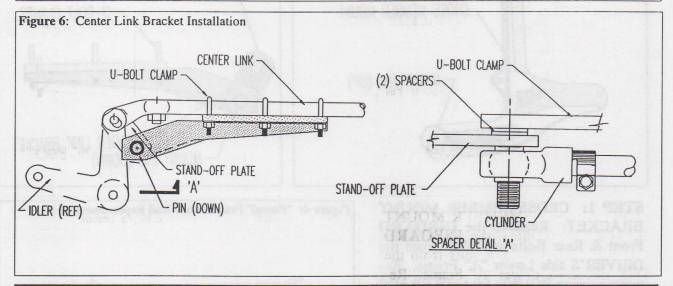
Using the NEW 9/16" bolts provided, attach the CROSSMEMBER BRACKET so that the pin is to the LEFT and POINTED UP at the Front of the crossmember. Install the FRAME BRACE ROD with the longer 1/2" bolt provided. Tighten all Bolts and Nuts to manufacturer's specifications. (Figure 5 shown on page 11)

STEP 2: <u>CENTER LINK BRACKET</u>: Using the three (3) U-bolts provided, attach the CENTER LINK BRACKET to the CENTER LINK with the Bracket Pin toward the passenger side and pointed

10 CENTERING CYLINDER: GM P-32 (2nd)

down. <u>Leave the U-bolts loose</u>. Remove the Nut from the CENTER LINK IDLER ARM connection point on the PASSENGER side, and slip the BRACING PLATE onto the IDLER ARM CONNECTING POINT. The other end connects to the CENTER LINK BRACKET PIN. Reinstall the IDLER ARM/CENTER LINK Nut and <u>leave loose</u>. (Figure 6)





NOTE!!: Cylinder is shipped **LIQUID-LOCKED** in the centered position at both ends when shipped. **DO NOT REMOVE THE CAPS** until the cylinder is mounted and the steered wheels are <u>accurately located in the straight-ahead position</u>.

STEP 3: <u>CENTERING CYLINDER</u>: Install the TRIM BOX END (Figure 7 on page 12) of the cylinder to the CROSSMEMBER BRACKET with the TRIM BOX in the "up" position. Attach the <u>other</u> end of cylinder to the CENTER LINK Bracket. Now move the CENTER LINK BRACKET as necessary until the ROD END of the cylinder will slide onto the pin. Install and tighten the two (2) 3/4" castle nuts provided and then install the two (2) 1/8" cotter pins. Tighten the CENTER LINK/IDLER ARM Nut and then tighten all three U-bolts on the CENTER LINK BRACKET.

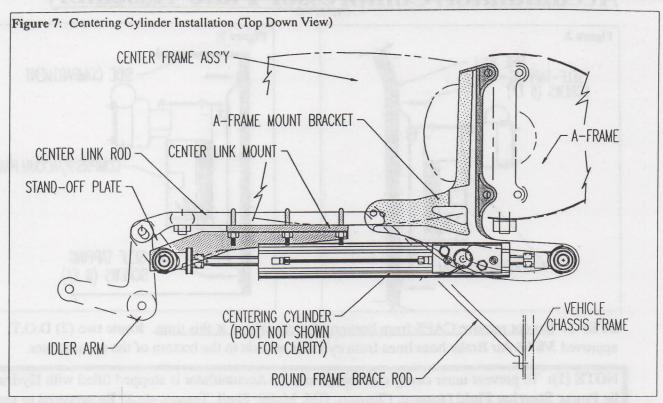
CENTRE LINK with the

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arting based as seen side and point



Remember: The cylinder is <u>liquid locked</u> from the factory and will not lengthen or shorten for adjustment until installation is finished. Make sure that the steering axle tires are pointed as straight ahead as possible gauging by eyesight before tightening the Tie Rod (reference Section 12: Centering -- Setting the Trim).

HEAT RESISTANT LOOM REQUIREMENT

Mandatory Requirement:

The use of Heat Resistant Loom Material is required when routing looms in the proximity of High Heat Sources (such as Catalytic Converters and other Exhaust Components) on Gasoline Powered Vehicles.

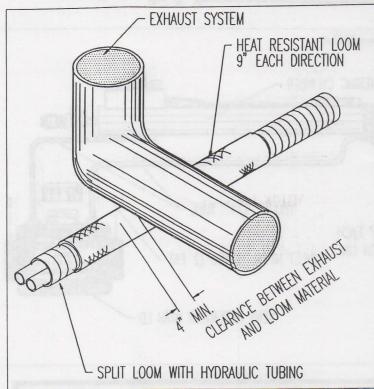
Included in ALL HOWARD POWER CENTER STEERING SYSTEM Kits for Gasoline Powered Vehicles is an 18" long piece of Heat Resistant Loom Material.

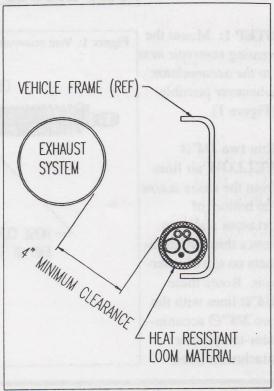
Install this Loom at the point where the Hydraulic Lines are routed *closest* to the Exhaust Components. Position this material so that 9" runs in <u>each direction</u> from the <u>closest point</u>. It is <u>recommended</u> that the Loom be routed <u>AT LEAST</u> 4" from the Exhaust Components.

Note: Heat Resistant Loom Material usage is shown in Figures 8 & 9 on page 13.

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12 High Heat & Accumulator/Compressor Plate



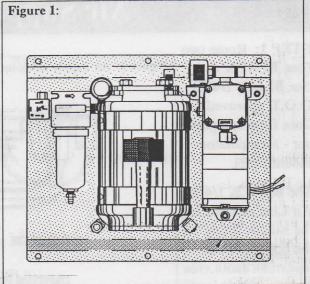


Accumulator/Compressor Plate Assembly

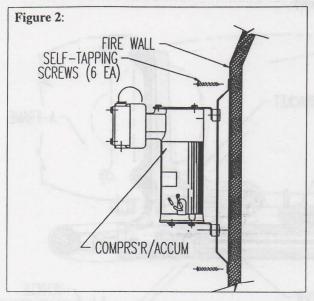
STEP 1: Locate space to mount the COMPRESSOR-ACCUMULATOR mount panel (Figure 1). The ideal location is on the firewall at the front of the coach or in the left outside front compartment. Secondary locations will be any of the other compartments.

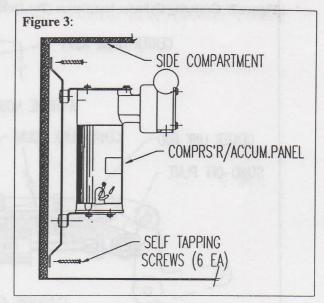
NOTE: Panel size is 12" x 14". Do Not mount in Generator Compartment!!

STEP 2: Mounting the COMPRESSOR-ACCUMU LATOR mount panel (Figure 2 & 3). The COMP RESSOR - ACCUMULATOR mount panel comes with six (6) 5/16" predrilled holes for mounting. Use six (6) 5/16" x 2" long bolts with flat washers and lock nuts to secure the mount panel to the vehicle. Alternate: use (6) 5/16" x 1-1/2" to 2.0" self tapping screws.



continued •





STEP 3: <u>Do not remove CAPS from bottom of accumulator at this time</u>. Route two (2) D.O.T. approved 3/8" Air Brake hose lines from cylinder on axle to the bottom of the accumulator.

NOTE (1): To prevent inner cavity contamination, the Accumulator is shipped filled with **Hydraulic Power Steering Fluid** (Amaco, Chevron, GM, Mobil, Shell, Texaco, etc.). Be prepared to make a QUICK CHANGE in STEP 4 to keep from losing an excessive amount of fluid.

STEP 4: During this step you will lose some fluid. Cut 3/8" place (the ones installed in STEP 3) to proper lengths for your specific installation. Remove CAPS on cylinder and using compression rings and nuts provided - attach both lines to the cylinder. Attach the other ends of the lines to the accumulator. (The System will function properly regardless of straight line or crossed line hook-up.)

STEP 5: Loom lines as necessary to prevent abrasion and secure with tie straps. Assure that full range AXLE MOVEMENT will not interfere with or cut the lines. See Illustration on Page 16-17.

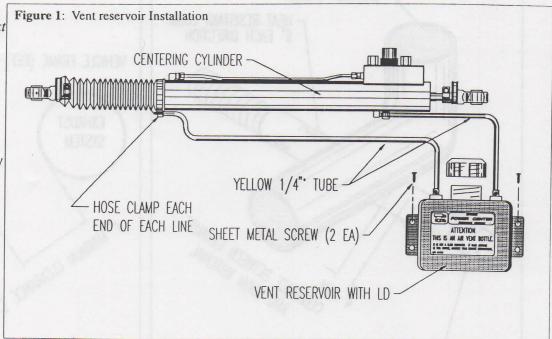
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continued ••

Vent Reservoir & Air Supply

STEP 1: Mount the venting reservoir *next* to the accumulator whenever possible. (Figure 1)

Run two 1/4"Ø
YELLOW air lines
from the BRASS ELBOW
on bottom of
CYLINDER and BOOT
NIPPLE through grommets on top of reservoir. Route these
1/4"Ø lines with the
two 3/8"Ø accumulator-to-cylinder
attachment lines.

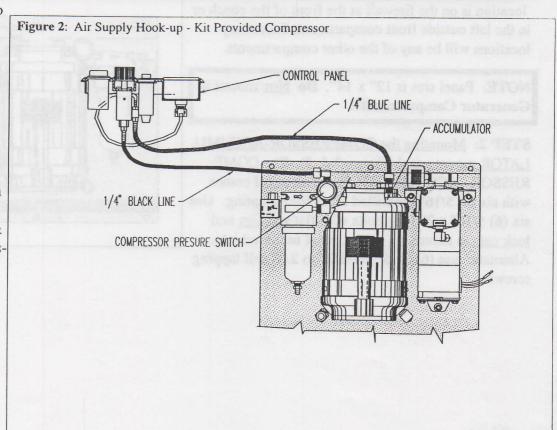


Note: Never ADD fluid to the Vent Reservoir. It acts as a vent receptacle only - not as a fluid source reservoir tank for the system.

Air Supply Hook-Up

STEP 1: Route two (one BLACK and one BLUE) 1/4" D.O.T. approved air lines from compressor - accumulator mount panel.

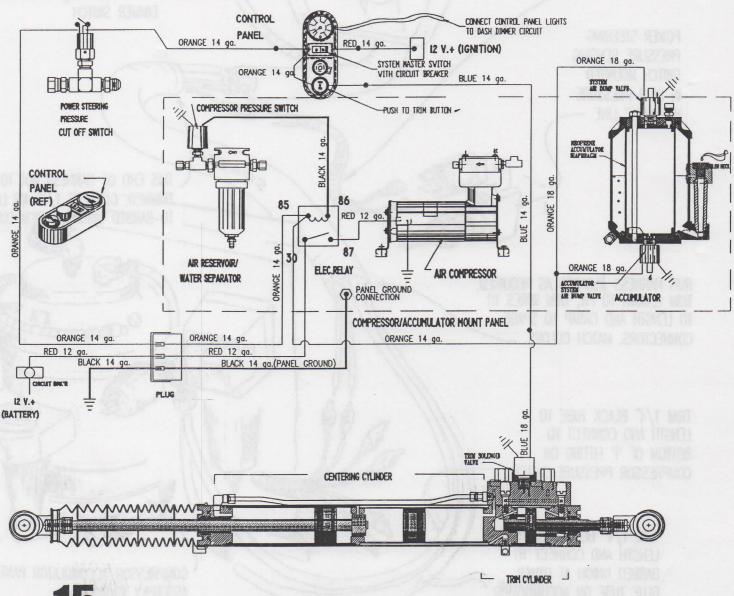
The BLACK 1/4"Ø Air Line attaches to the BARBED fitting on the bottom of the MINIATURE REGULATOR and COMPRESSOR PRESSURE SWITCH. The BLUE 1/4"Ø line attaches to BARBED fitting on side of mini regulator and compression fitting on top of the accumulator. (Figure 2.)



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- STEP 1: Connect Control Panel light wires (one RED 16-gauge wire and one BLACK 16-gauge wire in the wiring loom) to the DASH DIMMER CIRCUIT.
- STEP 2: Route a BLUE 14-gauge wire from the TRIM SOLENOID VALVE to the control panel and connect it to the BLUE wire.
- STEP 3: Route a RED 14-gauge wire from the RED wire on control panel to a terminal on the electrical panel that is "hot" only when ignition switch is on.
- STEP 4: Route one ORANGE 14 gauge wire from the ORANGE wire on the CONTROL PANEL through the POWER STEERING CUT-OFF SWITCH, terminating at the ORANGE wire on the COMPRESSOR/ACCUMULATOR.
- STEP 5: Route a RED 12 gauge wire from the RED wire on the COMPRESSOR/ACCUMULA-TOR mount plate plug through the CIRCUIT BREAKER to the positive (+) side of the 12-volt battery.
- STEP 6: Route a BLACK 14 gauge from the BLACK wire on the COMPRESSOR/ACCUMULA-TOR mount plate plug to a good ground. (See attached System Schematic)

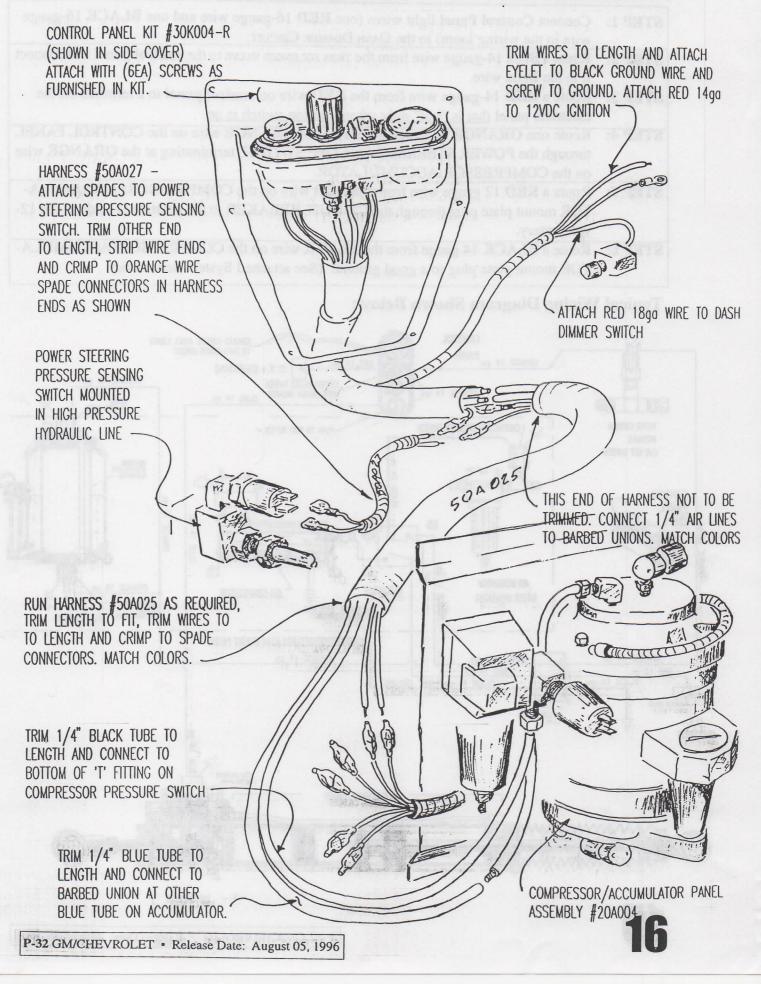
Typical Wiring Diagram Shown Below:



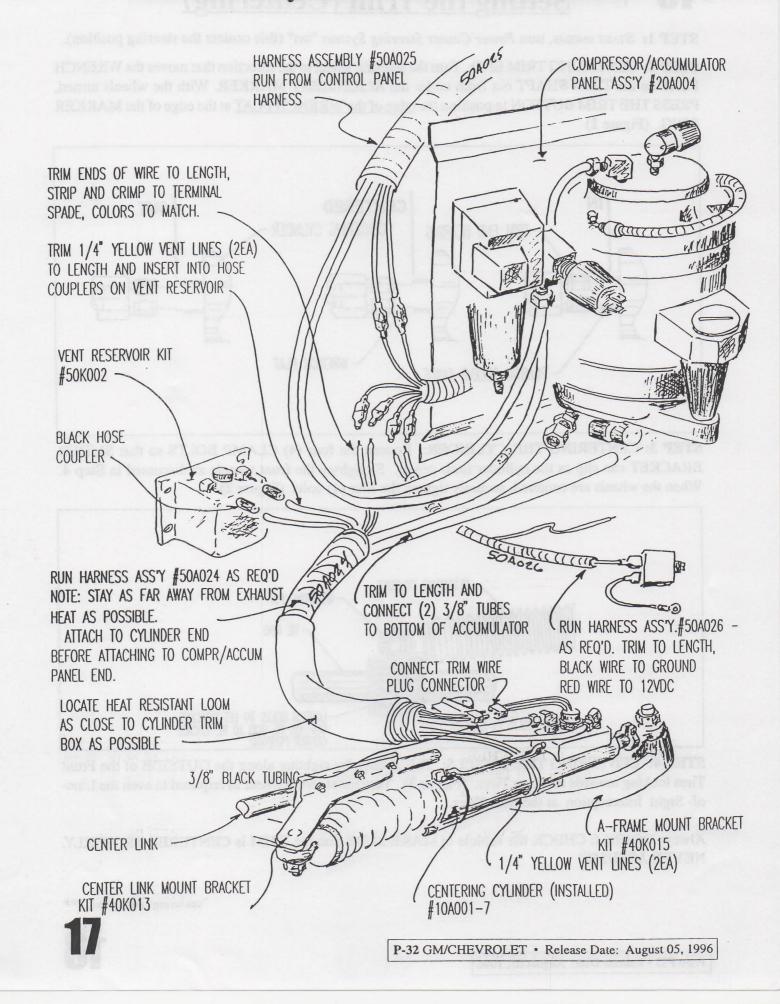
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16 Harness: Control Panel - to - Accumulator

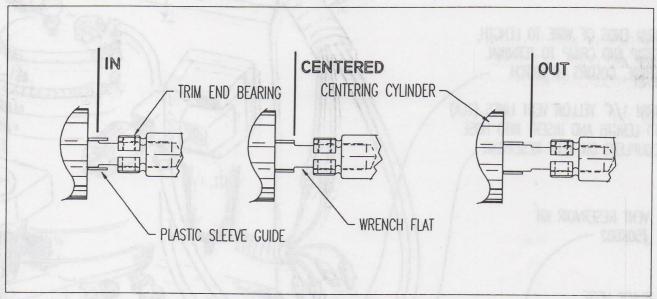


Harness: Cylinder - to - Accumulator

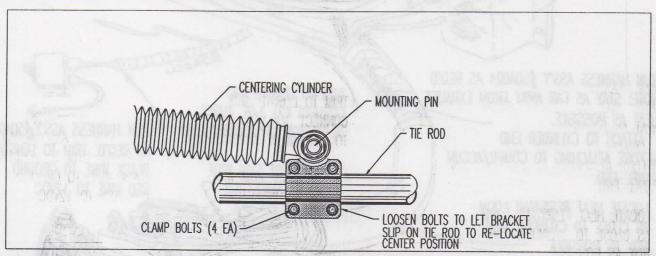


STEP 1: START ENGINE, turn Power Center Steering System "on" (this centers the steering position).

STEP 2: CENTERING TRIM END: Turn the steering wheel to the direction that moves the WRENCH FLAT on the TRIM SHAFT out from under the ALIGNMENT MARKER. With the wheels turned, PRESS THE TRIM BUTTON to position the edge of the WRENCH FLAT at the edge of the MARKER RING. (Figure 1)



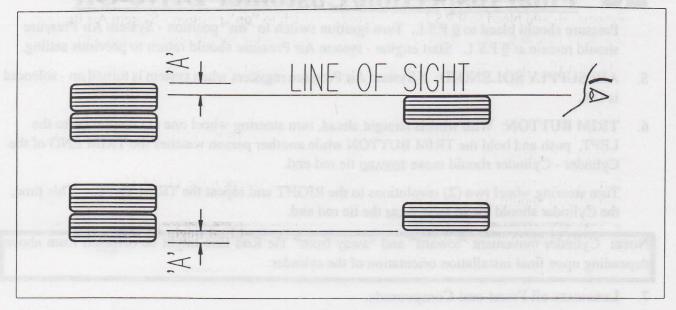
STEP 3: CENTERING THE CYLINDER: Loosen the four (4) CLAMP BOLTS so that SLIDER BRACKET can slip as the cylinder finds center. Straighten the front wheels as discussed in Step 4. When the wheels are centered, securely tighten the four (4) bolts. (Figure 2)



STEP 4: CENTERING THE WHEELS: This is done by sighting along the OUTSIDE of the Front Tires looking towards the Rear Tires. (Figure 3). Turn the steering wheel as required to even the Line-of-Sight Interception at the Rear Tires.

Always DOUBLE CHECK the vehicle to MAKE SURE that the TRIM is CENTERED PROPERLY. NEVER ASSUME!

"centering" continued...



To check for proper TRIM ALIGNMENT RANGE while driving the vehicle, turn the steering wheel to the LEFT about one half (1/2) turn and press the TRIM BUTTON down for about 20 seconds. Then, steer straight - there should be pull to the left. Turn the steering wheel to the RIGHT and press the TRIM BUTTON down for about 30 seconds. Then, steer straight ahead- there should be a pull to the right.

After checking both directions, steer straight ahead and hold the TRIM BUTTON down for a few seconds to retrim to straight ahead.

Final Installation Inspection

- ACCUMULATOR: START ENGINE. Turn PCS System "on" and straighten the steered wheels. TURN ENGINE "off". Check the Accumulator Sight Glass. No Air Gap should be visible. Check for leaks (Air or Fluid).
- CYLINDER: Check mounting bolts and pins for looseness or missing cotter keys. Check routing of electric wiring and hydraulic hoses for interference with suspension moving parts. Check for leaks (Fluid). Turn wheels left and right, Lock to Lock, to Check Cylinder clearances. Make sure that the steering stops on the spindle are contacting the axle before the cylinder bottoms out internally.

Also assure that the TIE ROD CLAMP does not interfere with the TIE ROD TUBE travel (i.e.: shock mounts, sway bars, etc.).

NOTE: If the Tie Rod Tube contacts the centering cylinder in a full left-hand turn, then backoff left side steering stop on spindle one (1) turn and lock. RECHECK for contact.

- CONTROL: TURN THE Power Center Steering System "off" AIR GAUGE should bleed to **Q** P.S.I.. Turn system back "on" - rotate regulator clockwise to stop. Maximum pressure should not exceed 170 P.S.I.. Turn regulator counterclockwise to stop. System Air Pressure Gauge should bleed to O P.S.I.. RESET SYSTEM PRESSURE back to 100 P.S.I.
- POWER STEERING SWITCH: Check for leaks (Fluid). Turn Engine "off". System Air

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20 Final Inspection/Customer Drive-Off

Pressure should bleed to $\underline{0}$ P.S.I.. Turn ignition switch to "on" position - System Air Pressure should remain at $\underline{0}$ P.S.I.. Start engine - system Air Pressure should return to previous setting.

- 5. **AIR SUPPLY SOLENOID**: If System Air Pressure registers when system is turned on solenoid is OK.
- 6. **TRIM BUTTON**: With wheels straight ahead, turn steering wheel one (1) revolution to the LEFT, push and hold the TRIM BUTTON while another person watches the TRIM END of the Cylinder Cylinder should move <u>TOWARD</u> tie rod end.

Turn steering wheel two (2) revolutions to the RIGHT and repeat the TRIM TEST. This time, the Cylinder should move AWAY FROM the tie rod end.

Note: Cylinder movement "toward" and "away from" Tie Rod End might be reversed from above depending upon final installation orientation of the cylinder.

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7. Lubricate all Front-end Components.

Customer Dive-on				
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d had				
Market Sections Control and				
100000 10000 1000 1000 1000 1000 1000				
	R.O. No.:			

- 1. Show owner accumulator location and explain how to check fluid.
- 2. Show owner accumulator/compressor circuit breaker and how to reset if coach is so equipped.

DRIVER'S CONTROL PANEL

- 3. Explain the operation of the Driver's Control Panel and the proper function of each control before starting vehicle.
- 4. Explain how to check the Automatic Shutoff System for proper operation.
- 5. Explain the three (3) ways the system can be shut "off".

THE DRIVE-OFF DEMONSTRATION (with the Installer Driving)

6. Demonstrate how the <u>steering wheel returns to center</u>. This is also a good time to demonstrate that a rise in Air Pressure during "left" and "right" turns is <u>normal</u>.

- 7. Demonstrate how to properly use the trim button to Power Center the Steered Wheels to a "straight ahead" position and at the same time removing all steering wheel pull.
- 8. Explain and demonstrate how the Pressure Regulator is used to adjust the Centering Pressure on the steered wheels, noting that as speed is increased, driving in crosswinds and/or towing a vehicle, that a higher centering pressure is usually required.

9. While demonstrating the Pressure Regulator demonstrate how the Pressure Gauge reacts to the change in air pressure.

10. Demonstrate the difference in the coach's handling with the system "on" and "off" by turning the Driver's Control Panel on/off switch to the "off" position.

THE OWNER'S DRIVE-OFF (with Customer Driving!)		
11. Now repeat steps Six (6) through Ten (10) with the owner driving.		
Customer's Comments:		