

# The Bonding Strip

**NCRS National Convention  
July 24-28 2022  
Mobile, AL**



**SOUTHERN  
CALIFORNIA  
CHAPTER**












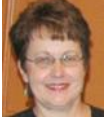




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# SCC/NCRS 2022 Board of Directors

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**Many thanks to Photo Contributors: GM, National Aviation Museum, Beverly LeGate, Vinnie Peters and Ed Vignone who contributed photos for this publication.**

**Vette Brakes & Products, Inc. has notified the chapter that they give 10% off retail when buying direct from VBP to all Corvette Club members. 800.237.9991 [VBP - Vette Brakes and Products \(tumblr.com\)](https://www.vettebrakes.com)**

# 2022 CALENDAR



[10-01-2022 - 10-02-2022 Indiana Chapter 2022 Road Tour](#)



[10-07-2022 - 10-08-2022 Southeast Chapter Southeast NCRS Fall Color Tour](#)



[10-07-2022 - 10-08-2022 Northern California Chapter 2022 NCC Fall Judging Meet](#)



[10-14-2022 - 10-15-2022 Arizona Chapter Fall 2022 Meet](#)



[10-15-2022 Nebraska Chapter Fall Road Tour](#)



[10-15-2022 Heartland Chapter 's Fall Meet](#)



[10-15-2022 - 10-16-2022 Pittsburgh Tri-State Chapter PITTSBURGH NCRS 2 DAY JUDGING MEET](#)



[10-20-2022 - 10-22-2022 Texas Chapter 2022 Lone Star Regional](#)



[11-17-2022 - 11-18-2022 Illinois Chapter MCACN IL. Chapter Flight Judging](#)

## Welcome New Members



David Kahn, Mark McIntyre,  
Craig Clark, Darwin and Patricia Ludi

## Chairman's Message

Ted Wilm



Hope everyone is enjoying the summer months and you are out and about driving those beautiful Corvettes. The NCRS National Convention in Mobile Alabama is now in the books with several of our Southern California chapter members in attendance. The Southern California road tour to the National Convention was a success, lead by Beverly and John LeGate in their 1972 Corvette, as this year's convention honored the 1972 model year. Thanks to all of the Southern California members who contributed their time and talents to making the 2022 National Convention a success. Many of us are already circling the 2023 National Convention on our calendars.

Closer to home, we can not wait to be together again for our Fall Chapter Judging meet to be held at American Motoring Memories in Culver City, CA on Friday and Saturday, September 16 and 17, 2022. We have some great cars that are registered and a few that will need to be held over to our Spring Judging meet, because we are at capacity. If you plan to attend its a great time to volunteer to judge or be an observer judge, as this is going to be a 5 point judging meet. Please be sure to sign up if you plan to attend.

In addition to events being held by our neighboring chapters in California and Arizona that you will find on the NCRS website, your board is hard at work seeking to provide another social gathering and a technical session later this Fall. As our plans come together we will be sure to keep you informed. We also hope that you mark your calendars to attend our annual holiday brunch that will be held on December 11, 2022 at San Juan Hills Golf Club in San Juan Capistrano, CA. More information about how to sign up and costs will come out closer to the event.

For those of you that have 1963 and 1964 Corvettes, Dave Brigham, the NCRS National Judging Chairman recently announced that Joe Scafidi has been appointed as the 1963-1964 National Team Leader. See Dave's next Restorer column for additional coverage

We hope to see you and your Corvette at all of our upcoming events. If you have any ideas or would like to contribute your efforts to a future Chapter event, please do not hesitate to contact me or any of your board members.

**This edition of the Bonding Strip has been designed for Internet optimization. There are links to Pages in the "TOC" (Table of Contents), email addresses and webpages. For Microsoft OS, CTRL click or just click on the link. For the Mac OS simultaneously click with left & right Mouse buttons on the link.**

## We are SCC/NCRS

The Southern California Chapter represents members of the National Corvette Restorer's Society from the Central California border to the Mexican border. It was formed over forty years ago in 1981 and we currently have over 130 members.

Any membership inquiries and change of address should be sent to: Membership Chairman, Jerry Louer 425 Atwood Drive Corona CA 92879 951.734.9818 [pnjlouer@sbcglobal.net](mailto:pnjlouer@sbcglobal.net)

For National NCRS profile changes to avoid missing Chapter news. Here is a link to your member profile: <https://www.ncrs.org/forums/register/change-address.php>

Opinions stated herein are those of the authors and do not represent those of NCRS, Inc. or the NCRS/ Southern California Chapter.

Email is the method used to notify members of calendar changes and events that take place between issues of the Bonding Strip.



## LINKS

[Corvette's Founding Fathers, Pt 1 of 6 – Designer Extraordinaire, Harley J. Earl - Corvette Report](#)

[Florida Corvette Driver Somehow Makes it Through Flood Waters Up to Windshield \(yahoo.com\)](#)

[Here's How GM Will Allocate 2023 Corvette Z06 To Dealers \(gmauthority.com\)](#)

[Zora Arkus-Duntov - Wikipedia](#)

[Remake of Roger Penske's first winning Corvette returns to Daytona \(news-journalonline.com\)](#)

[2023 Chevrolet Corvette E-Ray Will Be All Ate Up With Vette Firsts \(motortrend.com\)](#)

[More Than 120 Corvettes Are Headed To the Crusher | CorvSport.com](#)

[UPDATE: CA Advances Resolution Celebrating Automobile Cruising's History and Culture to Senate \(p2a.co\)](#)

[Google News - News about Corvette - Overview](#)



# Birth of the NCRS Convention Road Tour

By John Amgwert, Member #2

The idea for a National Road happened in 1981 when Ed Gurdjian from MI drove his 1960 to Lincoln, picked me up in my 1978, and we met Chuck Green & Joe Miller in Chuck's 1962 at Kremmling CO on our way to an NCRS event in San Mateo CA. We each had CB radios and it was a ball.

The first NCRS National Road Tour was 1982 from Boulder CO to Bend OR with an NCRS meet at the Inn of the 7th Mountain. We had about 50 cars.

1983 was Solvang, CA to Bend OR for another NCRS event. Originally planned to take the Pacific Coast Hwy it got washed out and was impassable, and we changed the route. There was also an unofficial tour that year from Bloomington to Bowling Green KY and the new assembly plant.

1984 was the flyer you attached from Boulder NV to Copper Mountain CO. I believe (but could be incorrect) that Copper was the first NCRS event referenced as "National Convention."

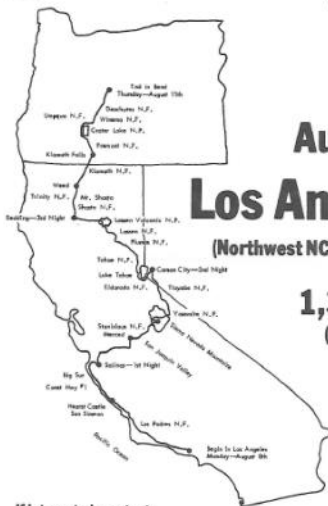
I handled almost all the road tours and conventions in those days. About that time the idea of a single Natl. Convention and various "Regional" events came to be. The idea of having multiple tours from various parts of the country was hatched by Dennis Clark, Pres. Rick Ried and I in the 1990s while on the road somewhere in Ohio.

## Editors Note:

*I was able to retrieve the original flyers for the 2nd and 3rd National Road Tours, however I could not locate the first Road Tour flyer. If anyone has it I would appreciate a copy.*

*Ed Vignone Editor #5815, [vignone@ieee.org](mailto:vignone@ieee.org)*

## 1983 NCRS National Corvette Scenic Road Tour



August 8-11  
**Los Angeles to Bend**  
(Northwest NCRS Chapter Meet — August 11-13)

**1,300 Miles in 4 Days**  
(310 miles average per day)

The Second Annual NCRS National Corvette Scenic Road Tour will depart from the Los Angeles area on Monday morning, August 8th. This leisurely trip will cover 1,300 miles in four days and you'll see some of the most scenic areas that California, Nevada and Oregon have to offer. Forget about those four-lane expressway banquets, this tour will travel mainly two-lane highways along the Pacific Coast, through magnificent mountains, lush National Forests, and three spectacular National Parks. Then, we'll arrive in Bend, Oregon, for the start of the Northwest NCRS Chapter Meet on August 11th. This unforgettable trip is open to all NCRS members, regardless of the type of vehicle you plan to drive. Not bring your Corvette, you'll have more fun!

If interested, contact:

**John Amgwert**  
P. O. Box 81663  
Lincoln, NE 68501-1663  
402/483-1404



## 1984 NCRS National Corvette Scenic Road Tour

August 11 - 15  
From Hoover Dam to the  
1984 NCRS Convention  
in Copper Mountain



Covering 1,300 Miles of the Scenic Southwest  
Featuring: Hoover Dam/Lake Mead Bryce Canyon National Park  
Zion National Park The Grand Canyon Monument Valley  
Navajo Indian Country Durango The Rocky Mountains  
Mesa Verde National Park The Black Canyon of the Gunnison  
(325 miles average per day)

The Third Annual NCRS Corvette Scenic Road Tour will gather at Boulder City, Nevada, site of mighty Hoover Dam just 25 miles from Las Vegas, on Saturday, August 11th. The tour leaves early Sunday morning on a leisurely trip that will cover 1,300 miles in four expressive hours and beyond. This tour will travel mainly two-lane highways that were made for a Corvette. If you've never visited this area, then you've never experienced the unmatched beauty that the Southwest United States has to offer. We'll finally arrive on Wednesday at Copper Mountain, Colorado, for the start of the 1984 NCRS National Convention. This unforgettable trip is open to all NCRS members, regardless of the type of vehicle you plan to drive. But bring your Corvette, you'll have more fun.

To receive registration information, contact:  
**John Amgwert, NCRS Road Tour Chairman**  
P. O. Box 81663 Lincoln, NE 68501-1663  
Phone: 402/421-1953  
Register by July 15th



**Trailers are for Horses,  
Corvettes should be Driven!**  
Hosted by the NCRS Southwest Chapter



## Southern California Road Tour to Mobile, Alabama - Friends For Life!

By Beverly LeGate NCRS #10983

Which is better? Restoring our '72 for the NCRS Mobile Alabama National? Or, driving 2,130 miles in the '72 in a heat spell across country WITH NO AIR CONDITIONING? OR, having my '72 flight judged after driving 2k+ miles? You be the judge.

The last time I drove my car was in 2005. We'll that's the last license sticker she had. This was the Year of the '72 and we were determined to drive the road tour and to celebrate this fifty-year old car.

Jim and Robin Truffa of the Northern California Chapter were our first road tour participants meeting us in Chino, CA in their 2006 Corvette #1

The drive from California to Tucson Arizona just became hotter and hotter and reaching 110 degrees outside in Tucson, I watched my temperature gauge just below the red line the whole way. #2 Relaxing was not going to happen. I was hoping for a 200-mile gas tank IT'S NOT HAPPENING. It appears to be 150 miles max and 14 miles a gallon average for each tank fill up and that is stretching it

We arrived at the Embassy Suites to meet our third couple Keith and Shary Kolerus of the Arizona Chapter. The Kolerus drove their truck with all kinds of fix it items. A nice Embassy reception of drinks and appetizers was a nice plus.

Breakfast at 6am and on the road at 7am. #3 This was our long day and we were also losing two hours heading East. We met up with our fourth couple Jay and Jan Cockrum also of the Arizona Chapter and Northwest Chapter in their 2003 Corvette.

At this point, I had NO AIR CONDITIONING. It seemed to be getting hotter because IT WAS! But the good news the temperature gauge was at a normal temperature.

A quick lunch at Rudy's BBQ in Las Cruces, New Mexico and on to a tour of the Al Knoch Interiors facility and Antique Store in Canutillo, Texas. #4 Phillip and Amber of Al Knoch led our group all around and showed us the interior materials of every make, model and fabric of our Corvettes. What a huge operation. My 72 has an Al Knoch convertible top, panels, seat covers and carpets.

After cooling off and leaving the interior guru, we headed to Van Horn, Texas to a historical hotel called the El Capitan Hotel. It was well kept and the restaurant meant we didn't have to go outside. I recommend for your next trip going thru Texas.

The next morning, we were off again heading to Fredericksburg, TX when a phone call from the Truffa's alerted us that my center cap just rolled in front of them and into the center divider. GO BACK I WANT MY CENTER CAP!! This was not going to happen. But I need it, John! Dana Richard, our SoCal member was going to meet up with us in a few days and he contacted NCRS member Tim Gilmore who stepped in and gave Dana a



#1 Robin & Jim Truffa 2006



#2 My Temp Gauge in 110 degrees weather in Tucson



#3 Leaving Tucson going to Tex-



center cap for my flight judging. Thank you NCRS member Tim Gilmore of Texas, friends for life. Nice meeting you at the National.

By this time, my traveling with (did I say NO AIR CONDITIONING) the word had gotten out thru the National Facebook page and the Southern California Facebook page. What a nice response of advice and comments we received. In comes Brad Hillhouse of the Nebraska Chapter. Brad's willingness to help a fellow NCRS member whose R-12 had evaporated causing the no ac problem brought to me, in Mobile, three cans of R-12 and gauges. I never could have made the trip home without Brad's help. Friends for life.

In the morning we departed #5 for Fredericksburg, Texas for our next evening. This German town was filled with German treasures and food. #7 our dinner found us dining at an authentic German Beer Garten complete with beers and atmosphere. The Peach Tree Inn was cute one-bedroom with kitchenettes where we could park our cars right in front of our rooms. I liked that.

On leaving Fredericksburg, we had breakfast at a very popular German Bakery called The German Bakery! #6



#6 German dinner in Fredericksburg



#4 Al Knoch Interiors Tour Canutillo, TX



#5 DQ lunch and ice cream stop leaving Van Horn going to Fredericksburg, TX



#7 Breakfast at a German Bakery

Our four families were about to go see the Natural Bridges Caverns in Sonora, TX. #8 & #9

I was hoping for a cooling of the body. It was a bit better but not the freezing I wanted. Off again to meet up with our fifth traveler, Dana Richard who was trailering his 1966 Duntov candidate. We had a wonderful lunch including cat fish and hush puppies at Clear

Springs Restaurant in New Braunfels, TX. Next stop BUC-EE'S known for being the largest convenience store in the world. So glad stopped it was huge! Tex-does have a flair for BIGGER IS BETTER. Our



#8& 9 Natural Bridges Caverns Sonora, TX



#10 Our last tour participant Shaun & Kelly Primeaux in a 82

we as



fourth and final night found five families in Lake Charles, Louisiana. We all enjoyed the Mulberry Hotel. #10



The next morning, we are off to meet up with Shaun Primeaux in his 1982 Corvette. Grabbing lunch in Covington, Louisiana we met Shaun and headed to the Last Night Out dinner where all road tours from across the country come together for the last night out.. #11 This year I really liked that we actually were in Mobile, Alabama at the host hotel and we didn't have to change hotels for the National Convention kicking off on Sunday.

. #11 Last Night Out

John and I learned a lot doing the road tour. The members Jim & Robin Truffa, Keith & Shary Kole-rus, Jay & Jan Cockrum, Dana Richard and Shaun Primeaux have the patience of a saint as they stopped every 150 miles for our gas guzzler. Thank you all for being on our road tour and making memories with John and I. We are friends for life!

## Post Script

This was for us a once in a life time trip for the Year of the '72 Award. But what I learned most is we are not alone. We were never alone on this road tour. So many members came up to me at the National and said "you're the lady that drove across WITHOUT AIR. Friends for life! Especially our new friends on the road tour.



Friends For Life! Brad Hillhouse – my hero! Tim Gilmore I am so sorry I did not grab a picture and a hug. Thanks for the center cap loan!



Saying goodbye to Dana Richard as we parted our ways.



John LeGate, Dana Richard and Wayne Yurtin were up at 5:30AM fixing the AC for the trip home. IT WORKED!! I was freezing!

These five men exemplify **NCRS Gold Standards**. I think that would be a new great new award for NCRS to consider. They went out of their way to not only help a fellow member but they all made sure that member was safe, and secure and made it home SAFE because of THEIR personal effort and contribution.

## 2022 SCC Awards at NCRS National Convention

John LeGate	Red Hat Award
Beverly LeGate	Year of the 72, Top Flight & Master Tabulator
Dennis Lombardo	Red Hat Award & Dave Hill Mark of Excellence
Mike McGue	300 Club
Dave Perry	Founders & Longest Driven
Gary Craig	400 Club
Dana Richard	Duntov Award & Longest Distance Trailered

### Convention Tabulators

Pat Louer  
Beverly Legate  
Beth Bartow

### Judges

Allen Tremain  
Tom Barr  
John LeGate  
Dave Perry  
Gary Mion  
Ed Hoffman



**John LeGate Red Hat Award**

**Dennis Lombardo Red Hat Award**





**Beverly LeGate, Master Tabulator**



**Gary Craig, 400 Club**



**Dennis Lombardo, 1996 Grand Sport,  
Dave Hill Mark of Excellence**



**Dennis Lombardo 1996 Grand Sport**



**Beverly LeGate, 1972 Top Flight**







**Dave Perry, 1990, Founders Award**



**Dana Richard, 1966, Duntov Award,**



**Dave Perry, Longest Driven**



**Dana Richard, Longest Distance Trailered**



# National Aviation Museum Tour

By Ed Vignone

At the NCRS National Convention Jerry Louer and I went on a tour of the National Aviation Museum and possibly a close up observation of the Blue Angles 2022 practice. After an hour ride from the Convention Center in Mobile, AL we arrived at the Naval Air Station, Pensacola, FL and after entering the Gate we were advised that they had operations issues and the Blue Angles weren't going to practice. That left the rest of the day to visit the National Naval Aviation Museum. Once we entered the Museum we realized it would take more than a day to thoroughly view the museum. The Museum followed the evolution of Naval Aviation and allowed you to experience hands-on history. They had historic aircraft, cockpits, simulators, interactive exhibits and a vast collection of artifacts.

The following are just of a few images of the museum exhibits. It would take a number of days to experience all that the museum has to offer.



*Just before we about to leave the museum I noticed a full wall display of the "1000 TRAP CLUB" This is a listing all the Naval Aviators that completed over a 1000 Aircraft Carrier landings. I knew that Jerry Palmer a California Chapters member was a Retired Navy Captain and had in the area of 2000 Carrier Landings.*

*"His Name was There" You can see his name in the image pop-out "CAPT Jerry D. Palmer".*

*Jerry Thank Your for your Service!!*



Naval Air Station



A-1 TRIAD



SPIRIT OF NAVAL AVIATION



F3F-2





BLUE ANGELS  
F/A- 18 HORNETS



RR-5 TRI-MOTOR



F9F-2 PANTHER



F4F-3 WILDCAT



SOPWITH CAMEL



A-4 SKYHAWKS



FG-1D CORSAIR



# JUDGES NEEDED!

## NCRS FALL FLIGHT JUDGED MEET

Hosted By Jeff Reade

### American Motoring Memories

11375 Playa Street, Culver City CA 90320

FRIDAY & SATURDAY - SEPTEMBER 16TH & 17TH, 2022

Registration, Judging, Judging Schools will be held at American Motoring Memories.

Registration will open Friday, September 16th at 2PM.

Event & Judging Questions Beverly & John LeGate Co-Judging Chairs 408-981-1200

**THIS IS A FIVE-POINT TWO-DAY JUDGED EVENT!**

**REGISTRATION OPENS JULY 15, 2022 online at the NCRS National Webpage.**

Cars must be in place by **8:00 AM Saturday**, with a OWNER'S Meeting at 8:15 AM followed by a JUDGE'S MEETING. OWNERS MUST BE PRESENT FRIDAY AND SATURDAY TO MEETS END

We do request that you register **ON-LINE** or mail in the registration form on or before September 10th, 2022. No refunds after September 10th 2022.

Online Registration Link: <https://www.ncrs.org/> | [Event Registration Forms](#)

Flight Judge,  Observer Judge,  Tabulate **JUDGING CERTIFICATE YES OR NO!** \_\_\_\_\_

Build Date \_\_\_\_\_ Paint Code \_\_\_\_\_ Trim Code \_\_\_\_\_ Body No. \_\_\_\_\_ .

Convertible,  Coupe,  Corvette Driven,  Corvette Trailered,  Need trailer parking Miles driven \_\_\_\_\_

I would like to help with:

Flight Judge,  Observer Judge,  Tabulate **JUDGING CERTIFICATE YES OR NO!** \_\_\_\_\_

Name \_\_\_\_\_

Judging 1st Choice \_\_\_\_\_ 2nd Choice \_\_\_\_\_ 3rd Choice \_\_\_\_\_

Ops Interior Exterior Mech or Chassis (circle two)

Spouse \_\_\_\_\_ Guest \_\_\_\_\_

I would like to help with:

Flight Judge,  Observer Judge,  Tabulate **JUDGING CERTIFICATE YES OR NO!** \_\_\_\_\_

Name \_\_\_\_\_

Judging 1st Choice \_\_\_\_\_ 2nd Choice \_\_\_\_\_ 3rd Choice \_\_\_\_\_

Ops Interior Exterior Mech or Chassis (circle two)



Address \_\_\_\_\_

City \_\_\_\_\_ State \_\_\_\_\_ Zip \_\_\_\_\_

E-mail: \_\_\_\_\_ Chapter Affiliation (if any): \_\_\_\_\_

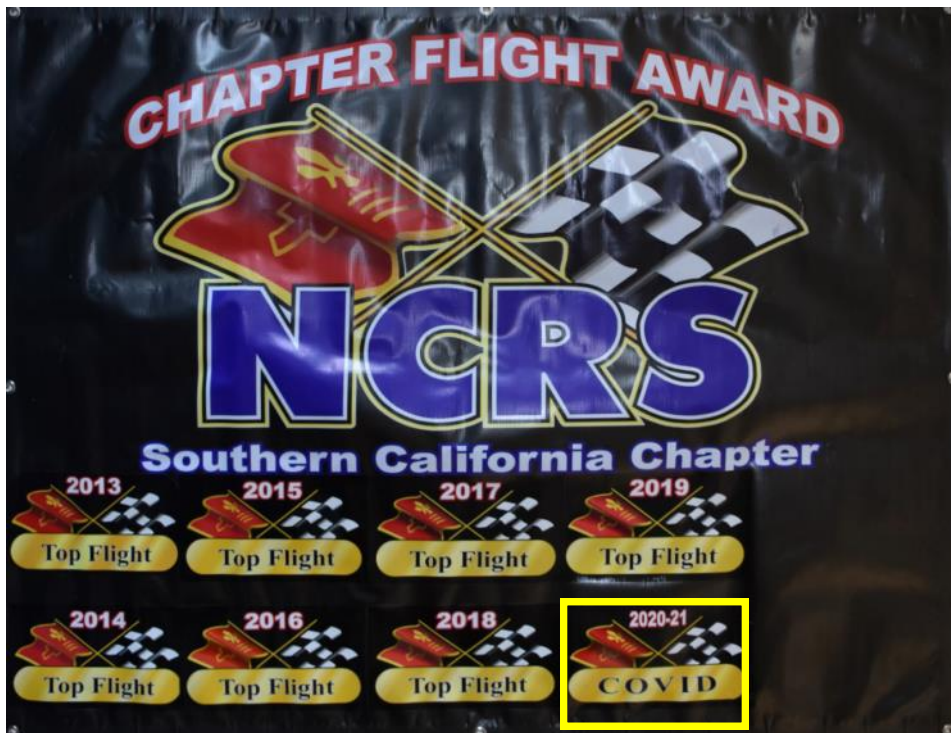
Phone (Home): \_\_\_\_\_ Work: \_\_\_\_\_ Cell: \_\_\_\_\_

NCRS National Membership # (see mailing label on your Driveline or Restorer): \_\_\_\_\_

**REGISTRATION OPENS FRIDAY AT 2PM.**

### Covid Chapter Award

The Chapter Top Flight awards are usual presented in conjunction with National Convention at the annual membership meeting. Because of the Covid pandemic the award had been canceled for 2000 & 2021. To the surprise of the attendees it was announced that a presentation would be made. The award presented was a 2020-2021 Covid decal (see adjacent Award Photo).



### Photo after the NCRS Annual Membership Meeting





## SCC/NCRS BOARD MEETING

May 9, 2022

The Zoom Meeting was opened at 6:10 pm by Board Vice-Chairman John Piovesan.

BOARD IN ATTENDANCE: John Piovesan, Verity Hobbs, Joe LeMay, Jerry Louer, Pat Louer, Barbara Vignone, Ed Vignone

Guests: Steve Hucik

SECRETARY'S REPORT: Moved by Jerry, second by Ed to approve. Report approved.

TREASURER'S REPORT: We are solvent. The report was accepted. Verity will again send a copy of the check to the Red Cross to Barbara for inclusion in the Chapter of the Year report.

ADDITIONAL OFFICERS' REPORTS:

MEMBERSHIP: Jerry reported we have 6 additional members. Some have reactivated their membership.

JUDGING CO-CHAIRS: John P. reported for Bev and John L. that we made a profit of more than \$900 and made \$330 for Charity.

OLD BUSINESS:

Spring Meet: John P. received comments thanking him for hosting the meet at his Ranch. Members enjoyed the meet.

There was a lengthy discussion on improving judging including training for Judges and Team Leaders, having a post-meet meeting for judges to share comments and suggestions, put emphasis on the importance of vin tags and trim tags (possibly using a photo for clarity as it would be helpful for judges to have photos of real and forged tags), create a check sheet for Team Leaders.

Charitable Donation: Ed moved that we increase the charitable donation to the Second Harvest Food Bank to \$400 from the \$330 raised at the Spring Meet. The motion was approved. Verity will send a check.

Chapter of the Year Activities: We have completed at least 5 Required Activities and 7 of the Variable Activities after the Spring Meet. Once we receive the final report, we can update our numbers.

NCRS PRESIDENTIAL ELECTION: A petition to

change the NCRS National Bylaws was available at the Spring Meet for anyone interested in signing. Barbara will forward the signed petition to Mike Ingham for presentation to the National Board.

NEW BUSINESS:

Joe suggested a Judging School on '56, '57 mechanical and chassis on Zoom. A date to be decided.

Jerry moved and John provided a second to adjourn the meeting. The Board Meeting was adjourned at 6:57 PM

The next SCC Board meeting will be on **June 13<sup>th</sup> at 6 p.m.** Zoom Time.

Respectfully submitted,

Barbara Vignone, Secretary

## SCC/NCRS BOARD MEETING AND GENERAL MEETING

June 6, 2022

The Zoom Meeting was opened at 6:10 pm by Board Vice-Chairman John Piovesan.

BOARD IN ATTENDANCE: John Piovesan, Gary Hiltunen, Verity Hobbs, Bev LeGate, John LeGate, Joe LeMay, Jerry Louer, Pat Louer, Barbara Vignone, Ed Vignone, Ted Wilm

Guests: Steve Hucik, Art McNay, Glorie McNay, Rich Anderson

SECRETARY'S REPORT: Moved by Bev, second by Verity to approve as corrected. Report approved.

TREASURER'S REPORT: We are solvent. Verity sent a copy of the donation to the Second Harvest Food Bank to Barbara for inclusion in the Chapter Award program. Verity inquired about Vette Brakes and Products being included in the ads. They provide members a discount; perhaps they would like to take out an ad.

MEMBERSHIP: Jerry reported we have 129 members.

OLD BUSINESS:

Spring Meet: Very successful.

Fall Meet: The Fall Meet will be held on September 17 and 18 at Jeff Reed's Garage in Culver

City. It will be limited to 5 Cars for judging due to space constraints. Planning is continuing.

Charitable Donation: Thanks to Verity for managing our contributions and verifying receipt of checks.

Chapter of the Year Activities: We have completed 6 of the 9 Required Activities. We need to schedule a Technical Seminar. Joe LeMay said he could put one together for September or October. We can schedule a Holiday Brunch for December. Barbara will contact the San Juan Hills Golf Course to determine availability for December 11<sup>th</sup> for a social event. John Piovesan suggested having a cars and coffee at his ranch.

Ted Wilm will do the final activity which is the IRS filing.

We have completed 8 of the 9 Variable Activities.

#### NEW BUSINESS:

New Members: A lengthy discussion was held on possible ways to attract new members. Jerry

is currently contacting members joining National from our area and sending them literature. Other suggestions were made distributing flyers or business cards, holding social events, attend other car meets and seek members. John P. will look into Cruisin' the Grand as a way to find new members. Bev suggested forming a committee to develop ideas. Jerry will chair and include John P. Steve H., and Bev.

Change in Board: Jerry suggested that since he has become an active participant at Board Meetings Steve Hucik could assume the position of Secretary as Barbara now has two jobs. Ed provided a second. After a discussion, the motion was tabled until the next meeting.

CLOSE MEETING: Jerry moved, and Ed seconded. The meeting was adjourned at 7:30. The next SCC Board meeting will be on **AUGUST 8TH at 6 p.m.** Zoom Time.

Respectfully submitted,

Barbara Vignone, Secretary

**40<sup>th</sup> Anniversary  
Challenge Coin or Clip  
Type Chapter Badge**  
Coin \$5 mailed.  
Badge \$10 if mailed.  
Badge \$5 if picked up  
at an Event.  
Contact: Jerry Louer  
425 Atwood Drive  
Corona, CA 92879  
[pjnlouer@sbglobal.net](mailto:pjnlouer@sbglobal.net)  
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# Driveline Angles and Vibration

Joe LeMay in Joe's Garage

There are several items on a car that can cause vibration. Some of those items are wheel/ tire balance, bent wheel, rear bearings worn out, driveshaft imbalance, and a worn transmission shaft. Items that are not well understood are, transmission, driveshaft, and pinion angles. What are those angles, and why would they cause vibration?

The engine/ transmission output is usually set higher than the rear axle pinion shaft input to allow ground clearance between the road and the bottom of the oil pan. The rear axle is set at a height above the road equal to  $\frac{1}{2}$  the height of the tires. The drive shaft connects the transmission output shaft yoke to the companion flange on the pinion shaft (figure 1).

In a C1 there is a lot of ground clearance, and the engine/ transmission output shaft was set much higher than the rear pinion shaft. The driveshaft is also shorter. Therefore, the drive shaft forms a large angle with respect to the transmission yoke and the pinion shaft companion flange.

## Driveline Phase Angle

For the purposes in this discussion, the "transmission angle" is the angle between the transmission's tail shaft and the driveshaft. The "pinion angle" is the angle between the driveshaft and the rear end's pinion shaft. Together, the angles between the transmission shaft and the pinion shaft form the "driveline phase angle."

Look at each driveline section. See the illustration (fig. 2) for the angle from the transmission to the driveshaft, and the angle from the driveshaft to the pinion. If the angle from one section points down to the next section, the angle is positive. If the angle from one section points up to the next section, the angle is negative. Add the two values and get the driveline phase angle. The tip of the transmission output shaft points down to the driveshaft (positive), and tip of the driveshaft points up to the pinion shaft (negative).

There is an exact setup that is ideal for a vibration free drivetrain: a 0-degree driveline phase angle. If the transmission angle and the pinion angle are the same, they form a 0-degree driveline phase angle. The driveline phase angle can make the difference between a smooth ride, or a noisy and vibrating ride. Driveline phase angles more than a couple of degrees and especially positive phase angles cause exceptionally large vibrations. We will discuss why this occurs later.

## Pinion Angle

The pinion angle is also the U-joint operating angle. The pinion angle is the difference between driveshaft angle and pinion shaft angle (fig. 2). Pinion angles, like driveline phase angles, can also make the difference between a smooth ride, or a noisy and vibrating ride. An acceptable pinion angle is also particularly important to the life of your U-joints.

A driveline will work with 0-degree pinion angle, but the U-joints need a slight angle for proper joint movement and lubrication. If a U-joint is dead straight, the needle bearings in the U-joint caps do not move and will always bear against the same place on the cross shaft trunnion and cup, resulting in localized wear. To spread the wear over the surface of the joint would require the needle bearings to rotate during each shaft revolution. A pinion angle of around 3 degrees seems to provide a good compromise to allow the needle bearings to move and to not be in a static location.

## Universal Joints

I covered U-joints in a prior article. The only item I want to bring forward here is there are two families of U-joints- Single Cardan and Double Cardan.

**Single Cardan:** Single Cardan is a term for a driveshaft with one universal joint at each end of the assembly. So, there are two single cardan joints in a single cardan drive shaft.

**Double Cardan:** Double Cardan is a term used when describing a one-piece driveshaft with three (or more) universal joints. Normally a Double-Cardan (a.k.a. Constant Velocity or CV) style driveshaft is used in applications where it is not possible or practical to properly align the ends of a driveshaft for a single-cardan setup. It is commonly used in front wheel drive vehicles, where both up and down motion is present from suspension travel as well as rotation about a vertical axis due to steering action.

## U-Joint Life Expectancy

U-joint life expectancy can be predicted from the pinion angle. Basically, a U-joint is rated for specific, continuous operating load @ 3000 RPM for 5000 hrs. with a 3-degree joint angle, and assuming proper periodic maintenance. If you double the angle, you halve the life, halve the load & double the life. Since a driveline seldom sees a constant load, U-joint life becomes a difficult number to calculate. While 5000 hrs. may not seem like much, it is roughly equal to driving 8 hours a day, 5 days a week for 2 $\frac{1}{2}$  years. That is a lot of driving.

While U-joints can operate at a high pinion angle (usually up to 30\* degrees), the speed or RPM at which the shaft moves provides a practical limit to the angle. Most manufacturers recommend a maximum pinion angle of 7 degrees.

Try this experiment: From your toolbox, take a socket U-joint and add extensions at both ends. Flex and rotate one of the extensions and see the rotation and movement of the other end. The back-and-forth motion of the U-joint cross as it rotates, causes the cross in the U-joint to accelerate and decelerate. You can see and feel the jerky action. You may think the U-joint is binding, but it is the change in rotational speed that causes this. The extension that is free, is increasing and decreasing in speed as it rotates.

A large pinion angle and high RPM is the worst combination, resulting in reduced U-joint life. Too large a pinion angle causes vibrations and contribute to U-joint, transmission and differential problems. At a large pinion angle, driveline components must flex and distort to allow for this motion. This repetitive flexing will fatigue these components and cause premature failure.

For better U-joint life, the angles should be near the same at both ends; at the transmission to driveshaft and at the driveshaft to pinion shaft.

## Measuring Transmission, Driveshaft & Pinion Angles

To measure transmission, driveshaft, and pinion angles, the vehicle should be checked with all the vehicle weight resting on the suspension and on a level surface. For the best accuracy, place weight in the driver's seat to simulate the driver, if possible.

Start by lifting the vehicle either on a drive-on style vehicle lift, on ramps of equal height, or by lowering the vehicle onto blocks long enough to roll the vehicle front to back a foot or two, to allow the suspension to fully settle. This will keep the suspension under uniform load and allow for correct measurements.

There are a couple of ways of measuring the angles. The measuring tool will need to have a resolution of ½ degree to have meaningful measurements. I used a protractor with a string and weight, and have also used the level built into my cell phone. Cell phones normally have 1-degree increments. There may be a better app with ½ degree. Machinist level protractors and digital level protractors that have higher resolution. See fig. 3 for measurement methods.

The transmission angle can be measured from several locations:

- The output yoke (or flange if you have a flange instead of a yoke.
- The valve cover;
- The cartridge oil filter bottom; or
- The bottom of the bellhousing at the clutch cover (fig. 3).

The driveshaft is the simplest measurement and measured directly (fig. 3).

The pinion angle is measured from the pinion flange or yoke. You can remove the driveshaft from the pinion flange and place the angle finder on the flange.

## Driveline Vibrations- Pinion Angle and Driveline Phasing

Now we will discuss where driveline vibrations come from and why these conditions exist. We mentioned the pinion angle and the desire to have a small pinion angle (<10 degrees). We also mentioned there was the driveline phase angle and the need to have the angle near 0 degrees.

**Pinion Angle- Driveshaft Vibrations:** We are going to have to visualize the driveline rotating. If the transmission and pinion angles are 0 degrees (in a straight line), it is obvious the entire assembly is rotating at constant speed.

However, the assembly does not rotate at a constant speed when there is a pinion angle. Have a vision of a very large pinion angle, about 45 degrees for this purpose. The transmission yoke is connected to one cross of the U-joint and rotates at constant speed. The other cross of the U-joint is connected to the driveshaft and turns the driveshaft in a circular motion. The driveshaft cross also moves forward and backward during rotation. Go back to the U-joint socket extensions illustration to see this.

With the transmission rotating at constant speed, the rotational speed of the driveshaft changes during the revolution! I will not discuss the math, but it has to do with the cosine of an angle.

**Driveline Phase Angle- Driveline Vibrations:** Driveline phase angle is the difference between the transmission angle and the pinion angle. Here is a demonstration that shows how driveline phase angle works. Picture three large degree wheels like the kind used for camshaft timing and fix one to the transmission yoke, one to the driveshaft, and one to the pinion companion flange, so the angle of rotation of each component can be compared as the driveline revolves through one complete revolution.

For the first part of our demonstration, the transmission, driveshaft, and pinion are all in a straight line. The transmission output is slowly rotated, and readings are taken from the three-degree wheels. Not surprisingly all the degree wheels register the same reading throughout the full rotation indicating the whole assembly is turning in unison.

*Continued Next Page*





For the second test the differential is lowered so the driveshaft falls 5 degrees. There is a 5-degree transmission angle, but the pinion and driveshaft remain in a straight line (a 0-degree pinion angle). This is a driveline phase angle of 5 degrees. The gearbox output shaft is rotated, and the three-degree wheel readings are recorded.



Now, instead of the whole driveline turning in unison as above, the section after the first U-joint (the drive shaft and pinion shaft) creeps ahead then falls behind, twice during a full revolution. The pinion and axle do not rotate at constant speed.

Consider a vehicle with a 5-degree driveline phase angle powering along in direct gear at an engine speed of 1500 rpm (25 rev. per second). The driveshaft and pinion shaft changes speed. The vibration was caused by the driveline phase angle introduced by the angle of the first U-Joint. Passengers in the vehicle feel a vibration at double the driveshaft speed (50 times per second).

So, we have a driveshaft that is speeding up and slowing down as it rotates. To cancel the driveshaft speed up and slow down, the U-joint at the pinion shaft needs to rotate at an equal but opposite angle in relation to the U-joint at the transmission. What that means is the driveshaft speeds up and slows down but the pinion shaft rotates at a uniform speed with no acceleration or deceleration.

What can be done to improve the situation? Adjust the pinion angle on the previous setup so the angles of both U-Joints are 5 degrees, creating a 0-degree driveline phase angle. The gearbox and pinion are now parallel but not in line. Rotate the gearbox shaft and read off the angles again. The driveshaft speed will vary from 3030 to 2970, and the speed variance of the driveshaft should only cause a small vibration. There will be no speed variation at the pinion and no vibration from that driveline component.



If the driveline phase angle is not 0 degrees, then a pinion shaft speed variation will be apparent in the axle. Within reason, the spring damper assembly in the clutch disc hub (or torque converter in an auto trans), the U-joints, and the differential/ axles may absorb/damp some of this vibration. If the driveline phase angle is too large, a noticeable vibration will be apparent to the driver and passengers.

#### **There is no vibration provided 3 criteria are met:**

The angle of both U-Joints must be equal. This is achieved by having a 0-degree driveline phase angle.

The pinion angle must be small (< 7 degrees).

The driveshaft must be fabricated with the two yokes in correct alignment. The yokes on both ends of the driveshaft (and half shafts with an IRS suspension) are in the same orientation. This is important when assembling a shaft which incorporates a slip joint.

A frequent cause of driveline vibration is assembling a slip joint without ensuring the yokes are oriented the same. Driveshafts can be easily checked in the car using a magnetic level.

## **Changes in Driveline Phase Angles**

There are a few items that need to be considered that cause changes to driveline phase angles and pinion angles. As a car ages, all of these can occur.

First: the axle rotates as power is applied during acceleration and the rear suspension is under load.

Second: pinion angle. It can be changed in a couple of ways. One way is ride height. Lowering the vehicle will reduce the pinion angle. This may also change the driveline phase angle if the axle is rotated when the ride height is changed. This happens when very long rear spring shackles are installed as occurred in the 70's.

Third: height of the transmission at the transmission crossmember. Some vehicles used shims to adjust the height of the transmission tail shaft. Changing the transmission from a Muncie SM318 3-speed/ BW T-10 4-speed, to a Muncie M-20 will require a different shim. All 1962 Corvettes required a transmission shim and earlier Corvettes fitted with a Muncie 4-speed also require a shim. There is also documentation that earlier Corvettes had transmission shims although this is not specified in shop manuals or assem-

bly manuals.

Fourth: The rear springs may be replacements; the springs do not have the same forward and rear curvature. The front spring hanger bracket may be incorrect (53-56 hangers are lower than 57-62), and/ or the fronts of the springs may be deformed from age or spring wrap/ wheel hop.

All these items require one to measure the driveline angles and to adjust angles.

**Rear Suspension Under Load-** An important item we need to discuss is what happens to driveline phase angles during acceleration. As power is applied to the pinion gear, it rotates and tries to climb the ring gear. As it tries to climb, the ring gear rotates causing the car to move forward. The tires in contact with the ground resist this motion, and the leaf springs take up the load and begin to twist into an "S" shape. The leaf springs then spring back, causing wheel hop. The driveline phase angle becomes more positive as the axle and front tip of the pinion shaft rotate up (fig. 4).

The same type of effect on increasing driveline phase angle occurs when a car is under normal load when accelerating up a steep hill or keeping a steady 70 mph on the freeway. There is resistance to forward motion, the axle rotates as it pushes the car, and the driveline phase angle increases.

This effect of acceleration is illustrated in figure 5. You will see in figure 5, the axle pinion and transmission yoke are equal but opposite. The transmission points down 3 degrees, and the axle points up 3 degrees. This is a 0-degree driveline phase angle.

But under acceleration (figure 6), the axle twists up causing the angles to be out of phase. Therefore, you should consider pointing the axle down 1 to 2 degrees for a negative driveline phase angle. This will result in the driveline phase angle coming to 0 degrees when power is being applied.

## Setting Proper Driveline Angles

**Pinion Angle-** In a stock configuration driveline, the pinion angle is going to be set based on the ground clearance, the angle of the transmission, and the length of the driveshaft. There is little that can be done. Since there is a large pinion angle in a C1, there is a definite change in the speed of rotation of the driveshaft. That will have to be lived with. The driveline phase angle can however be adjusted.

If the pinion angle is in the 10-degree (or more) range, consider adding leaf spring shims to reduce it. Other adjustments may be needed at the transmission. It will be based on what you see as the solution.

**Driveline Phase Angle-** For a Corvette C1, and any other leaf spring car, the easiest way to correct the positive phase angle is to shim the transmission at the crossmember. Lowering the transmission (shims between the frame and crossmember) reduces the phase angle. Raising the transmission (shims between the transmission and crossmember) increase the phase angle. This is also dependent on the leaf spring configuration and how much it has changed from the stock condition. Do not believe replacement springs, or re-arched springs have a correct configuration.

If the angle at BOTH ends of the driveshaft are near equal (but opposite) the speed is corrected, and very minor vibration is felt. This is mostly felt on acceleration so the angles should be set equal while the drive train is under a slight/normal load.

How do you dial things in if the angle is off? Let us say you have 3 ½ degrees of transmission angle and -1 degrees of pinion angle. How do you get things adjusted? At the transmission crossmember, start by installing 1/4 or 1/2-inch shims to lower the transmission. It depends on the vehicle and the distance from the engine mounts to the crossmember mount for what angle change you get from adding each shim.

There are two different transmission mounting brackets for C1s. One is for 3-speeds and the other for 4-speeds. They attach between the tailshaft and the transmission crossmember. They are different heights and may allow an adjustment.

On the pinion end, you can add tapered shims between the leaf springs and the axle spring perches. This will alter the pinion angle. See figure 7 for shim illustration.

## Diagnose the Problem

If there is no vibration under normal operating conditions, then the driveline phase angle is correct. Other components such as wheel/ tire balance, bent wheel, rear bearings worn out, driveshaft imbalance, and a worn transmission shaft, are also good and not an issue.

Driveshaft-related vibrations usually occur at roughly engine speed in high gear. Wheel/axle vibrations usually occur at one third to one quarter the engine speed in high gear because of the differential gearing.

**Driveshaft-** If the vibration steadily increases with driveshaft speed (either accelerating or decelerating) the symptom is primarily the result of a driveshaft imbalance or yoke runout. Sometimes the yoke runout problem can be improved by rotating the driveshaft 180 -degrees at the rear U-joint.

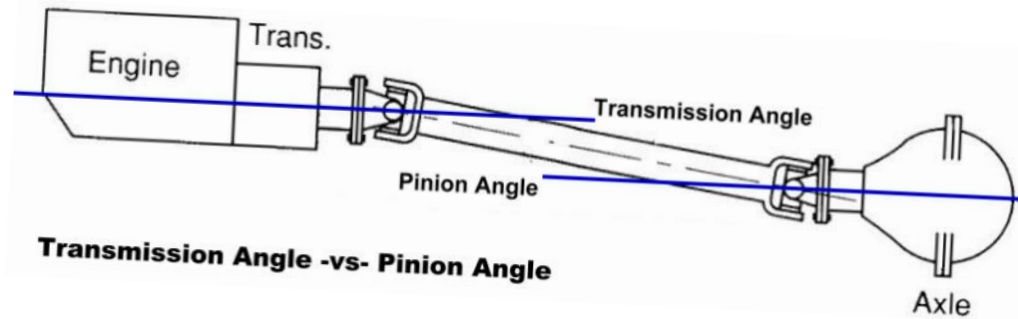
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**Transmission Output Shaft or Pinion-** To determine whether it is the transmission output shaft or the pinion in the differential, change gears when the noise occurs and maintain speed. If the vibration/noise changes in frequency, the source is in the transmission or engine. If the frequency remains the same, it is in the driveline after the transmission.

**Phase Angle-** If there is vibration only under acceleration, you need to decrease the driveline phase angle (lower the transmission crossmember). It is more likely too positive. If the opposite occurs, the vibrations tend to decrease or disappear under acceleration, you need to increase the driveline phase angle (raise the crossmember or raise the transmission output shaft).

Figure 1



Level ground

Figure 2

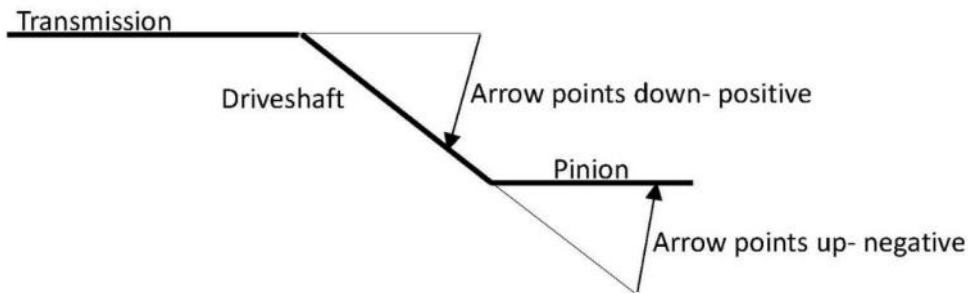


Figure 3



Protractor and string



Machinist level protractor

Figure 4

**SPRING WRAP**

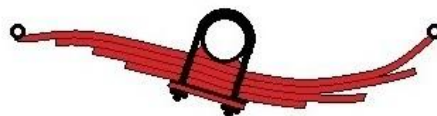


Figure 5



Figure 6



Figure 7

Leaf spring shims



The following article was reprinted with permission from Wisconsin Chapter Newsletter Summer- Volume 22, Issue #3.

## C4 1993 HVAC Control Panel Repair

By Gary Goodyear #66059

This technical article is being written based on my experience with my own car. The General Motors repair procedure will be different than what is described below. On our 1993 Lt1 Base Coupe the HVAC controls would work intermittently. The buttons could be pressed and sometimes they would respond other times nothing. The root cause of this failure was years of buildup on the contacts that complete the circuit to change the operational functions of the HVAC system.

To start this repair, you will need a 7mm socket and ratchet with a 6-inch extension. A T15 torx head screwdriver (very important to have the screw driver and not a T15 torx socket, this is explained later). A 3/16 nut driver. Also handy is a grabber tool if you happen to drop the screws while taking them out. 99.9% of the time the screw will fall into the console in plain sight, however out of reach. Isopropyl Alcohol and Q-tips A nice clean work bench with a towel on it is also recommended for disassembly and reassembly of the HVAC control unit.



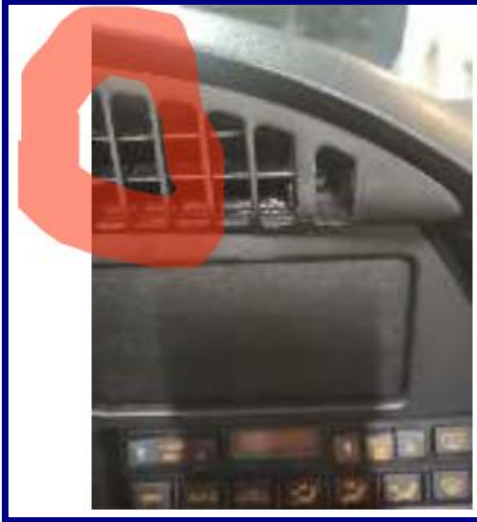
1. Chock your wheels as you will need to put the car in low (ours is an automatic, 6 speed will be a bit different).

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2. Disconnect your battery. Safety first when working on electronic parts.

3. You will need to remove the upper air vent. This vent is held in place with 2 T15 Torx screws. (Highlighted in the red areas below) One on each side of the vent. This is where it becomes important to use the T15 torx screwdriver and not a socket to prevent damage to the vent. The vent is not wide enough for the socket and you will scratch the plastic. This will allow access to the hidden top screw of the HVAC and radio bezel.



4. Next you will need to remove the Center counsel bezel around the shifter. There are 3, 7mm screws that hold it in place. Two of them are located in the center counsel. You will have to lift the liner of the counsel up to access them. The third screw is located in the front cup holder. This is also a 7mm screw.



5. With these screws removed carefully lift the bezel up and slide it back. This will allow you to access the 2 hidden bottom 7mm screws that hold the bottom of the HVAC and radio bezel.

6. Now you can remove the 3, 7mm screws that hold the HVAC/Radio bezel in place. Gently remove the bezel and place in a safe area. There is a 3rd screw that holds the dash corner in place. Remove this screw and it will allow you to move the corner of the dash enough so that you can get to the second screw holding the control module in place.

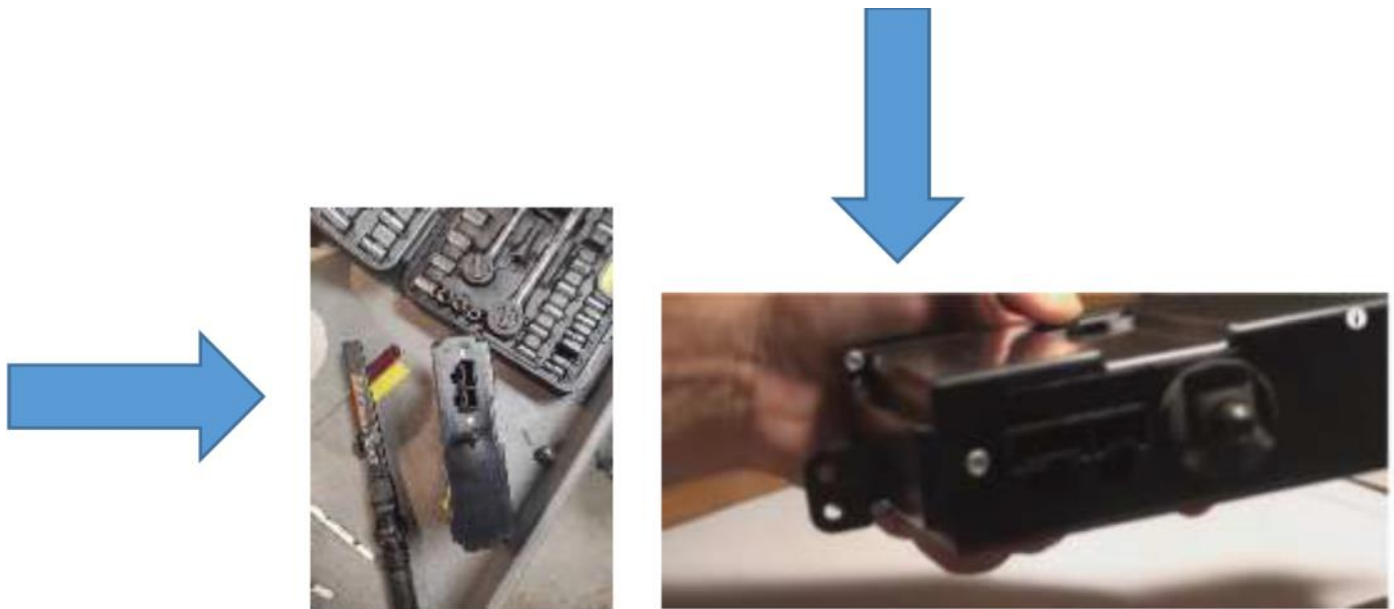


7. There are 2 screws that hold the control module in place. These are also 7mm. Remove the screws and gently work the module out of the dash. Once it is removed enough to gain access to the plug in in the back squeeze the plug together and unplug it.



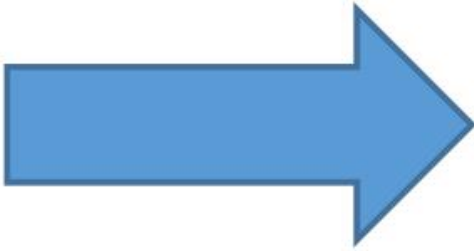
Now that you have the control module out you can either purchase one for \$150.00 to \$450.00 or you can repair your own for about \$3.00 provided that the electronics are still in good shape.

8. Place the control module on a towel face down. It is important to use a towel to prevent scratches on the buttons from a hard surface. There are 6, 3/16 screws that hold the module cover to the face plate and the circuit board. Carefully remove these 6 screws. There is one on each corner and one on each side of the plug in. The rubber grommet has to be removed to access the last screw. Gently lift the cover and slide it off.



9. With the cover removed you will see the ribbon connection from the face plate to the circuit board. Gently removed the ribbon from the circuit board using a small flat screwdriver if needed.





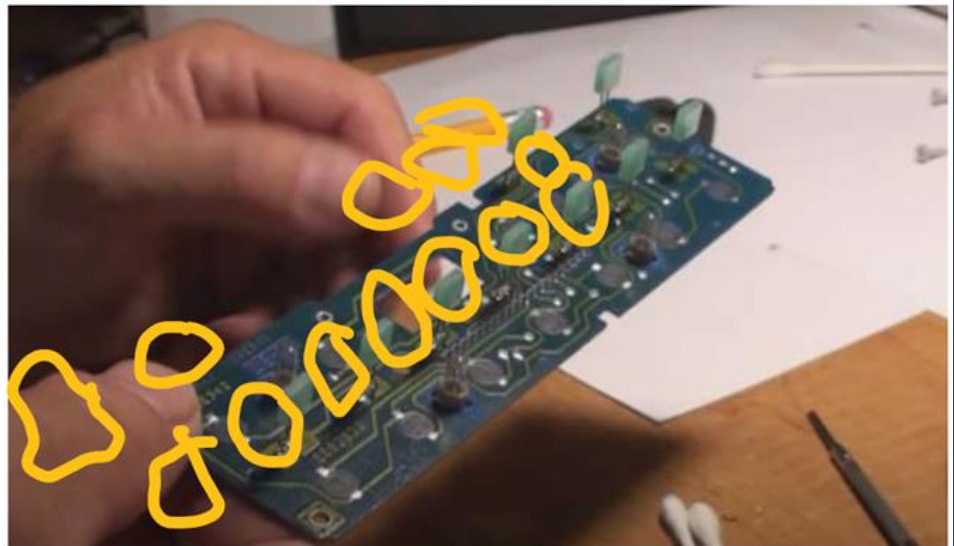
10. With the ribbon removed from the circuit board you will find 2 more 3/16 screws that hold the bottom circuit board to the face plate. You will have to remove the white lens cover to gain access to the second screw.



11. Now remove the circuit board using care not to break the plastic pins that line up the gasket and board to the control panel face. Note that the gasket does have contact pieces inside of it. I used a Q-tip and Isopropyl alcohol to clean the inside of the gasket. The control panel should remain facedown as the buttons are loose at this point. The buttons will come out if the control panel is tipped over. You can carefully remove the gasket from the circuit board. In some cases, the gasket will stay on the control panel.



12. Now you are ready to clean the contacts. This is what has caused the issue in our car. Not all cases will be this simple and may require further repair. Using a simple pencil eraser gently erase the dirt from each contact. Once you have completed cleaning with the eraser of all 13 contacts, take a Q-tip soaked with isopropyl alcohol and gently clean each contact. I have circled the contact points in yellow below. Please note that this picture does not have the second circuit board on it. It is not necessary to separate the two circuit boards.



Once you have completed the cleaning process simply reverse the process to assembly the control module and reinstall into your car. I did note that when putting the black cover over the circuit boards I fought the ribbon. I had to tuck the wires in neatly to install the cover.

Hopefully this tech article has been helpful and once again you are able to enjoy your car!

Thank you, Gary Goodyear #66059



## Advertising Rates for the Bonding Strip

The Official Publication of the Southern California Chapter of the National Corvette Restorer's Society Effective January 1, 2020

Yearly rates are based on a calendar year. All funds payable to SCC/NCRS. Payment terms are net 30 from date of billing. Rates do not include additional artwork services, as required. Photographs should be high resolution at least 300 ppi. Advertising copy should be submitted to the Editor no later than 15 days before the first month of the issue advertising is required to run in. Submit all advertising and payment in full to the editor. Make checks out to: SCC/NCRS.

**Business Card Advertising.** Business cards must be no larger than 3.5 " x 2" . Larger cards will be reduced to fit.

Yearly Rates; SCC members: \$20.00 , non-members: \$30.00

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1/2 Page(7.5" x 4.5")	\$140.00	\$35.00
1/4 Page (3.75 x 2.25")	\$75.00	\$20.00

**Members Classified "Wanted and Parts for Sale" are free. However, they can not be carried over to the next issue unless requested before the Editorial/ Advertising Deadlines.**

### The Bonding Strip Editorial/Advertising Deadlines

Following is a list of Deadlines for submitting material to be printed in future issues

Volume 1. February - April issue: January 10,

Volume 2. May - August issue: April 10,

Volume 3. September - October issue: August 10

Volume 4. November - January issue: October 10

Send editorial contributions and advertising to the Editor at [vignone@ieee.org](mailto:vignone@ieee.org). Preferred media for submissions is by email and attachment, or by mail on computer disk or Flash Drive in MS Word® or its equivalent.



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**Parts for Sale:** NOS never used transparent top. It still has the GM wrap, why it has a C-4 logo ????. The top is in very nice condition. There are some minor scratches on the inside area, the weatherstrip looks very good. Top is located in Southern. California, therefore I prefer local delivery (100 miles). Asking \$1500. Email me for photos or if you have any questions. Gary Hiltunen #3642, [polowhite53@gmail.com](mailto:polowhite53@gmail.com)

**Parts for Sale:** I have a bunch of new 1961 C1 small parts, about \$600. worth at NEW bought from the major Corvette suppliers. Willing to accept a fair offer for the lot.. Too many to list here. Norm Shier #38714 510-703-1620 Desert Hot Springs.

Vette Brakes & Products, Inc. has notified the chapter that they give 10% off retail when buying direct from VBP to all Corvette Club members. 800.237.9991 [VBP - Vette Brakes and Products \(tumblr.com\)](http://VBP - Vette Brakes and Products (tumblr.com))



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