Staying Out Of The Rabbit Hole

The Path To Profitable Diagnostics

What We Will Cover In This Class:

- What Is The Rabbit Hole?
- Why Do We Go Down The Rabbit Hole?
- How Do We Figure Out We Are In The Rabbit Hole?
- How Do We Get Out of The Rabbit Hole?
- And Most Importantly.....

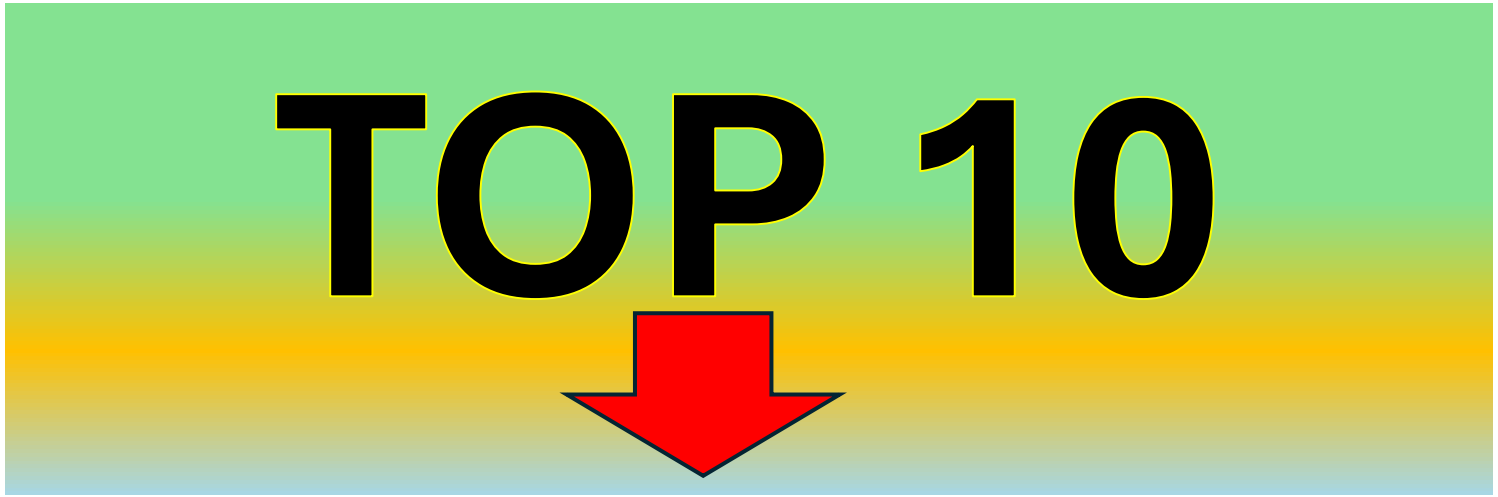
How Do We Stay Out Of The Rabbit Hole!!!!!!

What is The Rabbit Hole?

- The Rabbit Hole is a place we get lost when we go down the wrong diagnostic path. When we get stuck here, it costs us time and money. When we are in The Rabbit Hole our stress levels go up and our logical brain goes offline. We start grasping at straws, we get deeper in the hole, our mistakes start to compound, we may start throwing parts at the car…..And may throw some tools across the shop!!

Why Do We Go Down The Rabbit Hole?

There are many reasons we go down The Rabbit Hole but I will list, what I believe, are the top 10.



Number 10

We don’t have good notes from the vehicle owner. When this happens we could spend a lot of time diagnosing a problem that the vehicle owner doesn’t know about or doesn’t care about. This is more common with noise and vibration complaints but can happen with driveability concerns also.

Whose job is it to get all relevant information from the vehicle owner?

How Do We Figure Out We Are In The Rabbit Hole?

This one is, unfortunately, difficult for us to figure out. The only real way is once we turn in our diagnosis, or worse, once the client picks up the vehicle.

Without proper notes how could we know?

We Can’t!!

How Do We Get Out Of The Rabbit Hole?

Start from scratch on the problem the client wants us to fix.

How Do We Stay Out Of The Rabbit Hole?

Here we can actually come up with solutions to this problem.

We must talk to the person responsible for talking the clients when the vehicle is dropped off or the appointment is made. This person MUST get good information from the vehicle owner, so we do not waste our time diagnosing the wrong problem.

Number 9

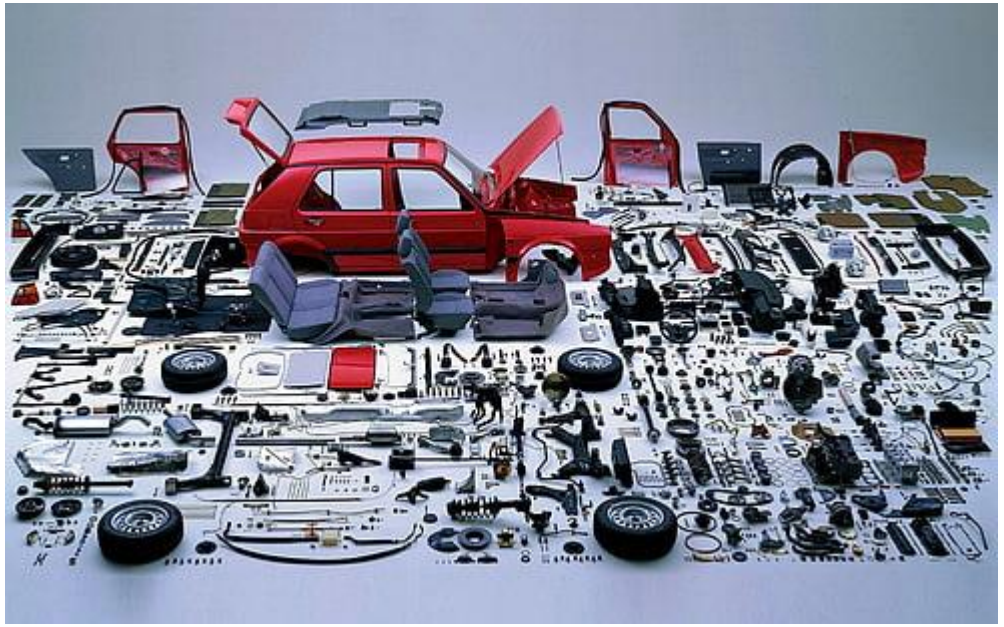
We

Throw parts at it.

How Do We Figure Out We Are In The Rabbit Hole?

Easy:

Count the parts we've installed trying to fix the problem.



How Do We Get Out Of The Rabbit Hole?

Stop everything. Back away from the parts catalog slowly.

Think:

What problem am I trying to fix? Have I run any tests? What results did I get? Where the tests that I ran pertinent to the problem I am trying to fix?

If the tests were relevant then go over your findings. Maybe you overlooked something.

If the tests were not relevant thn make a new game plan.

How Do We Stay Out Of The Rabbit Hole?

Do not install a part on a vehicle unless you can prove that the part is bad AND will cause the symptom you are trying to fix.

Number 8

We already **THINK** we know what is wrong with it and we work very hard to prove ourselves right.

How Do We Figure Out We Are In The Rabbit Hole?

- You will have to be very honest with yourself!
- Did you make a diagnostic assumption before you did any tests?
- Were the tests you ran meant to lead you to the actual problem or to proving what you assumed was the problem to be correct?
- Are you spending time testing but haven’t done research on the system or the problem?

How Do We Get Out Of The Rabbit Hole?

- Start from the beginning.
- Let the test results lead you to the next logical step.
- Proceed until you have determined the problem.
- Is really is that simple. I DID NOT say easy, but just a simple process.

How Do We Stay Out Of The Rabbit Hole?

- NEVER make an assumption about what a problem is going to be!!!!
- Always let the test results show you the logical path.
- It’s ok to hypothesize AFTER you have gathered some data.
- It’s NOT ok to try to “PROVE” the hypothesis correct.
- You must let the data lead you to the conclusion of the diagnosis, whatever that may be.
- Maybe your “Guess” was correct, maybe it wasn’t. Who cares? At the end of the day all we want is a fixed vehicle!

Number 7

We use Silver Bullets.

How Do We Figure Out We Are In The Rabbit Hole?

Another easy one:

We looked up on the internet that 342,000 Mass Air Flow sensors caused this problem, so we threw one on the car.

Then the depression set in.....

How Do We Get Out Of The Rabbit Hole?

Take the part off the vehicle and do some actual testing.

How Do We Stay Out Of The Rabbit Hole?

Use the “Silver Bullet” sites, mainly Identifix, correctly.

I actually have no problem with someone using Identifix. As long as they are using the site to learn about the common problems on a vehicle that pertain to what they are trying to fix. THEN do the actually testing on the component BEFORE anything gets condemned.

I feel this is no different than TSB’s from manufactures.

Number 6

- There are multiple codes, and we don’t know which ones are pertinent to the problem we are trying to fix.

How Do We Figure Out We Are In The Rabbit Hole?

This one can be tough to figure out. The easiest sign is that we are pinpoint testing a component that will not cause the problem we are trying to fix.

Maybe we have found a bad part(s) (that we actually tested and it was a failed part) and replaced the part(s) but the problem wasn’t fixed.

Or we are going down several different paths jumping from code to code.

How Do We Get Out Of The Rabbit Hole?

Look at all the codes and start to separate out the ones that are obviously not pertinent.

Once those are out of you mind, research the other codes and see if any of those need to be taken off of your list.

Once the list is narrowed down you can start making a logical diagnostic plan.

We will get a better understanding on how to determine which codes are important later in this list.

How Do We Stay Out Of The Rabbit Hole?

Let’s leave this until we get a bit further on in our list.

Number5

- The part we replace doesn’t fix the problem. Is the part defective? Did we misdiagnose it? How do we prove it one way or the other?

How Do We Figure Out We Are In The Rabbit Hole?

- You tested the part.
- Proved it was bad
- Installed a replacement part.
- The problem is the same.

How Do We Get Out Of The Rabbit Hole?

- Go back over your data
- Does the data show that the part was bad, or did we misread it?
- If we misread it then start your testing from that point, determine what the next logical test is and continue
- If we did NOT misread it then ……

We Really Only Have Two Options:

- Either the part we replaced wasn't the cause of the problem we are trying to fix, even though it was a bad part.
- Or the part we installed is defective.
- Now we have to prove one of these correct.
- The easiest way to do this is run the test(s) that proved the original part bad on the replacement part.
- If the part tests bad than trust your data.
- JUST BE SURE YOUR INFORMATION IS CORRECT. You'll see an example later on in a case study.

How Do We Stay Out Of The Rabbit Hole?

- Make sure you are confident in your tests and in your analysis of the data you get from the tests
- Try to purchase the best parts you can. (This is not always easy and, even if they are OE, does NOT mean they are “good”)

Number 4

We don’t have the proper tools for the job.

Let’s Look At Some Examples

Is the Scan Tool, you have available, able to get into all the system necessary to diagnose the problem?

Is the Data on the Scan Tool Reliable?

If you are dealing with an electrical circuit or sensor; do you have a a scope? Is it able to show the signals you need to see (Speed, Definition etc)?

Do you have the information sources (Service Information) that have all the necessary information for the system you are working on?

How Do We Figure Out We Are In The Rabbit Hole?

- If we don’t have an actual tool than you should be able to see that pretty quickly.
- If we are using a tool that isn’t the best option for the job AND the results we are getting don’t make sense.
- If our Service Information is giving us obvious wrong information.
- If our Service Information is giving us NOT so obvious wrong information. This one is a very bad situation!!!

How Do We Get Out Of The Rabbit Hole?

- Only one way:

- Get the proper tooling for the job at hand!

How Do We Stay Out Of The Rabbit Hole?

- See the last slide.

Number 3

We don’t spend the time to pinpoint test the necessary components.

We get in a hurry, or we get LAZY!

How Do We Figure Out We Are In The Rabbit Hole?

- We sit in the drivers seat, staring at a scan tool for a very long time.
- We stand in front of the car staring at the engine bay for a very long time
- We try everything we can NOT to take something apart to gain access to the component that we know needs to be tested.
- We test 15 things that don’t matter so we don’t have to test the thing that does matter.

How Do We Get Out Of The Rabbit Hole?

- Just BUCK UP and get to the component, that the data has lead you too, so you can test it.

How Do We Stay Out Of The Rabbit Hole?

- Have the understanding that sometimes we will have to take things apart to gain access for testing.
- IF it is going to take more time than you have been allotted then let the client know you will need additional time to gain access.
- How would we charge for that?

Number 2

We don’t understand the data that we are analyzing.

How Do We Figure Out We Are In The Rabbit Hole?

- What I see here are guys staring at the screen, either scan tool or scope, for a while.
- Sometimes is does take a bit for us to see the problem in scan or scope data BUT usually we should see if fairly quickly.
- If you are struggling to determine if the results of a test are good or bad than that is a sign you don’t have a good grasp on what the data should look like.
- If we know what good looks like than bad usually pops out pretty quickly

How Do We Get Out Of The Rabbit Hole?

- We might have to enlist some help to look at the data and give us a direction. There is nothing wrong with this!
- We may have to look on sites for known good data to compare.
- Do we have a similar vehicle on the lot we can get known good from?

How Do We Stay Out Of The Rabbit Hole?

- We must test on known good vehicles. I cannot stress this enough!
- If we only ever look at bad vehicles we will ALWAYS struggle.
- Rental vehicles are a good option.
- After we repair a vehicle run the tests again so you can capture good data. Always save this data.
- SAVE ALL GOOD AND BAD DATA. Keep it organized in files.

And Finally….Number 1

We don’t understand the system we are working on!!!!

How Do We Figure Out We Are In The Rabbit Hole?

- This is, BY FAR, the most common problem I see.
- We have no diagnostic direction.
- We jump from test to test without any logical pattern.
- Many of the previous items will manifest themselves because of this problem:

We will not understand the data. We will sit and stare at screens or the car. We will throw parts at the car. We will replace the same part several times, etc.

How Do We Get Out Of The Rabbit Hole?

- We must go to our Service Information and read how the system functions. We can find this in Description and Operation.
- Then we must understand how each component functions inside that system. That may be in the same location or we may have to look deeper into the component Description/Operation.
- If we are diagnosing electrical components we must analyze a wiring diagram and understand it.
- WE MUST READ about all the systems that are involved. It could be several.

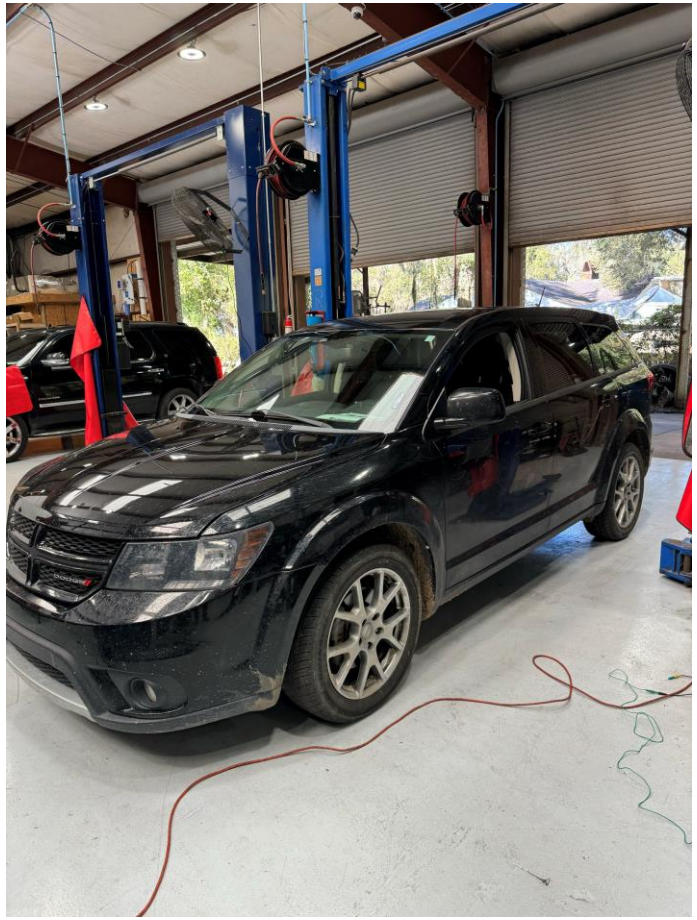
How Do We Stay Out Of The Rabbit Hole?

- Doing all the thins that are listing on the previous slide BEFORE you go digging into the problem
- Figure out the system you are working on and do research on that system. And all the other systems that could interact and cause the condition you are trying to fix.
- Do NOT think that because you have worked on a similar vehicle before that the systems will function the same way.
- When you have multiple codes, understanding the system will help you determine which codes are pertinent to the problem you are trying to fix.


Any
Questions

CASE STUDIES

2017 Dodge Journey



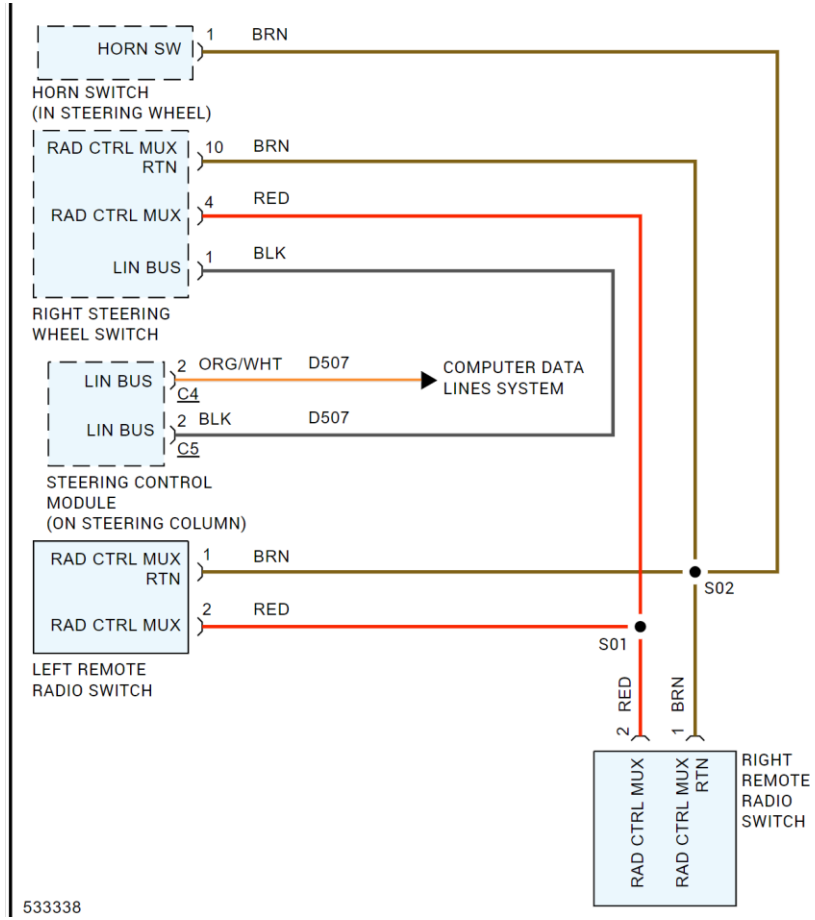
2017 Dodge Journey

- Client states that the steering wheel controls for radio, cruise control and center dash display do not function.
- Miscommunication in the shop caused the clockspring to be replaced. We really don’t know if any diagnosis was performed.
- After clockspring was replaced the problem was not fixed.
- Further testing was done, a tech support line was called also, and the right side steering wheel control switch was replaced.
- After this was replaced the problem still was not fixed.

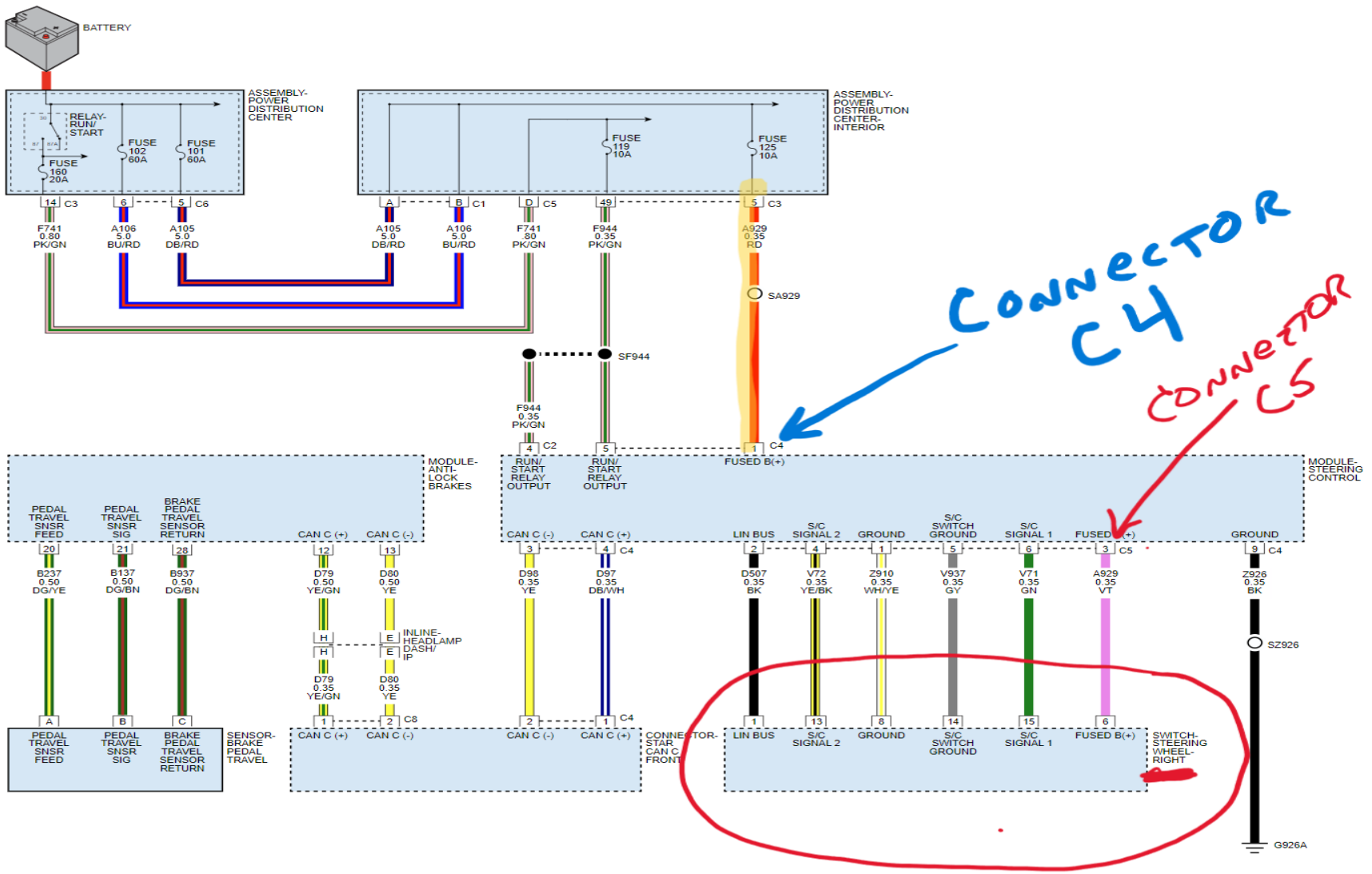
I was called to get involved.

- Questions I asked:
- Why did the clockspring get replaced?
- Miscommunication with a tech that was leaving.
- Why did we replace the right side switch/module?
- We had LIN bus activity at the switch but it would not control anything. Tech support representative confirmed switch was the problem.

Ok, now I have a basic understanding of the problem. Let's get into it.



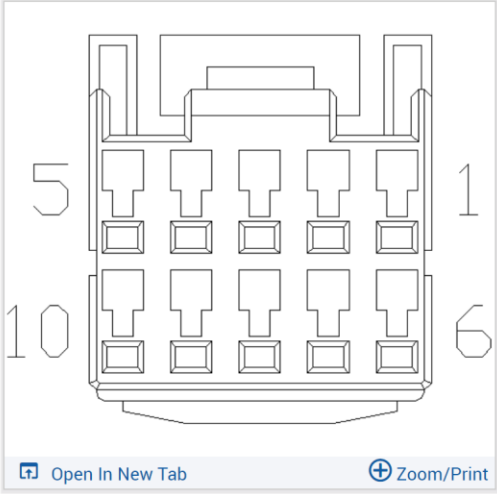
SPEED CONTROL SYSTEM



This connector is at the base of the clockspring.

MODULE-STEERING CONTROL C4

Harness Family: IP
Cavities: 9
Color:
Gender: FEMALE
Part Description: 316988-6
Engineering Name: Mod_Ctrl_Steering_W_EVIC
Connector No: D3816D
Option: Standard

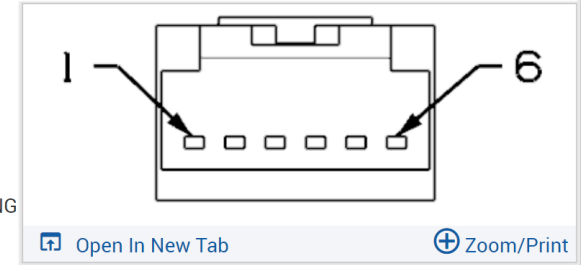


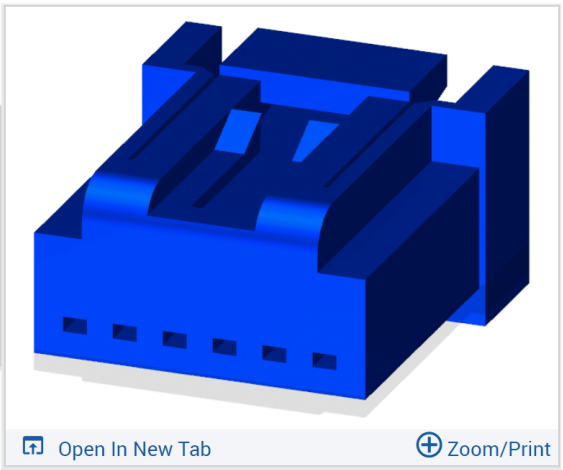
Pin	Circuit	Wire Color	Gauge/Size	Function	Option
1	A929	RD	0.35	FUSED B(+) GOOD B+ HERE	
2	D507	OG/WH	0.35	LIN BUS	
3	D98	YE	0.35	CAN C (-)	
4	D97	DB/WH	0.35	CAN C (+)	
5	F944	PK/GN	0.35	RUN/START RELAY OUTPUT	
6	V71	VT/OG	0.35	S/C SIGNAL 1	
7	V72	OG/VT	0.35	S/C SIGNAL 2	
8	V937	VT/BN	0.35	S/C SWITCH GROUND	
9	Z926	BK	0.35	GROUND	

This is the connector at the top of the clockspring. Under steering wheel.

MODULE-STEERING CONTROL C5

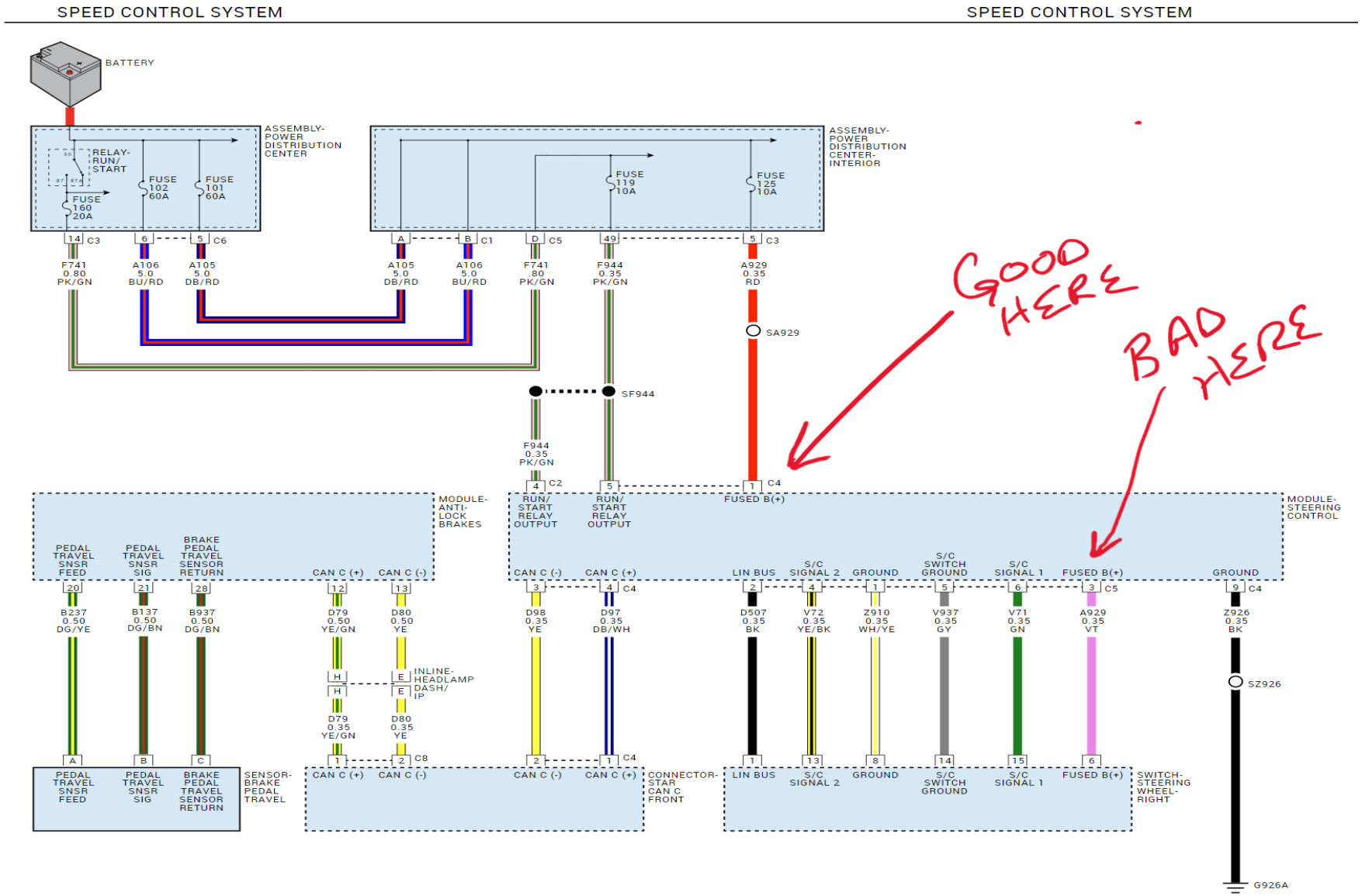
Harness Family: Steering_Wheel
Cavities: 7
Color:
Gender: FEMALE
Part Description: 638100-1
Engineering Name: Mod_Ctrl_Steering_MOD_CTRL_STEERING
Connector No: D3816E
Option: Standard



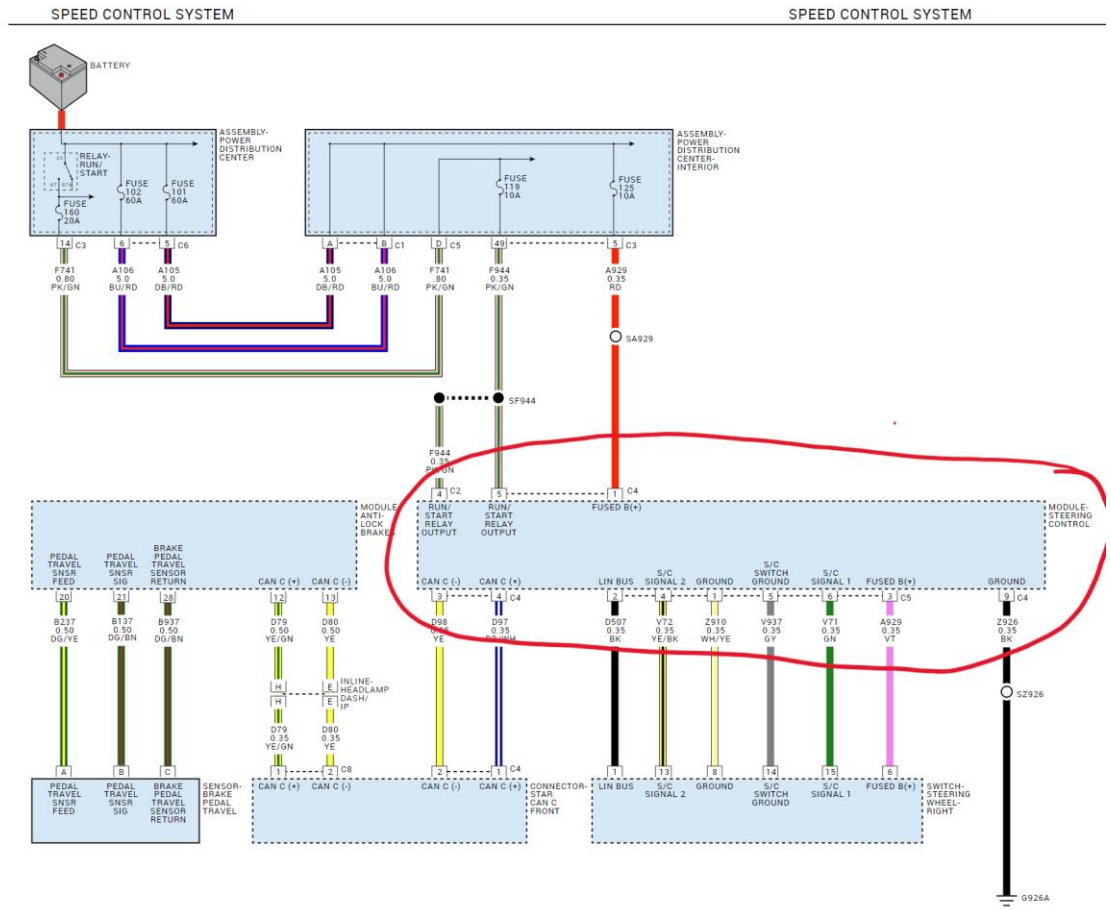


Pin	Circuit	Wire Color	Gauge/Size	Function	Option
1	Z910	WH/YE	0.35	GROUND	EXCEPT HEATED STEERING WHEEL
1	Z926	WH/YE	0.35	GROUND	HEATED STEERING WHEEL
2	D507	BK	0.35	LIN BUS	
3	A929	VT	0.35	FUSED B(+)	NO B+ HERE
4	V72	YE/BK	0.35	S/C SIGNAL 2	
5	V937	GY	0.35	S/C SWITCH GROUND	
6	V71	GN	0.35	S/C SIGNAL 1	

So what's the problem?



Clockspring was condemned.



New Clockspring was installed.

- What was the result?.....

Same problem! What now?!!

- So that is two brand new clocksprings from Chrysler.
- They were different part numbers than original.
- Could they have been updated and now have this problem?
- Could we have gotten two bad ones?
- Should we get a used one?
- I ran a jumper from the lower connector C4 B+ to the upper connector C5 B+. Everything functions normally.

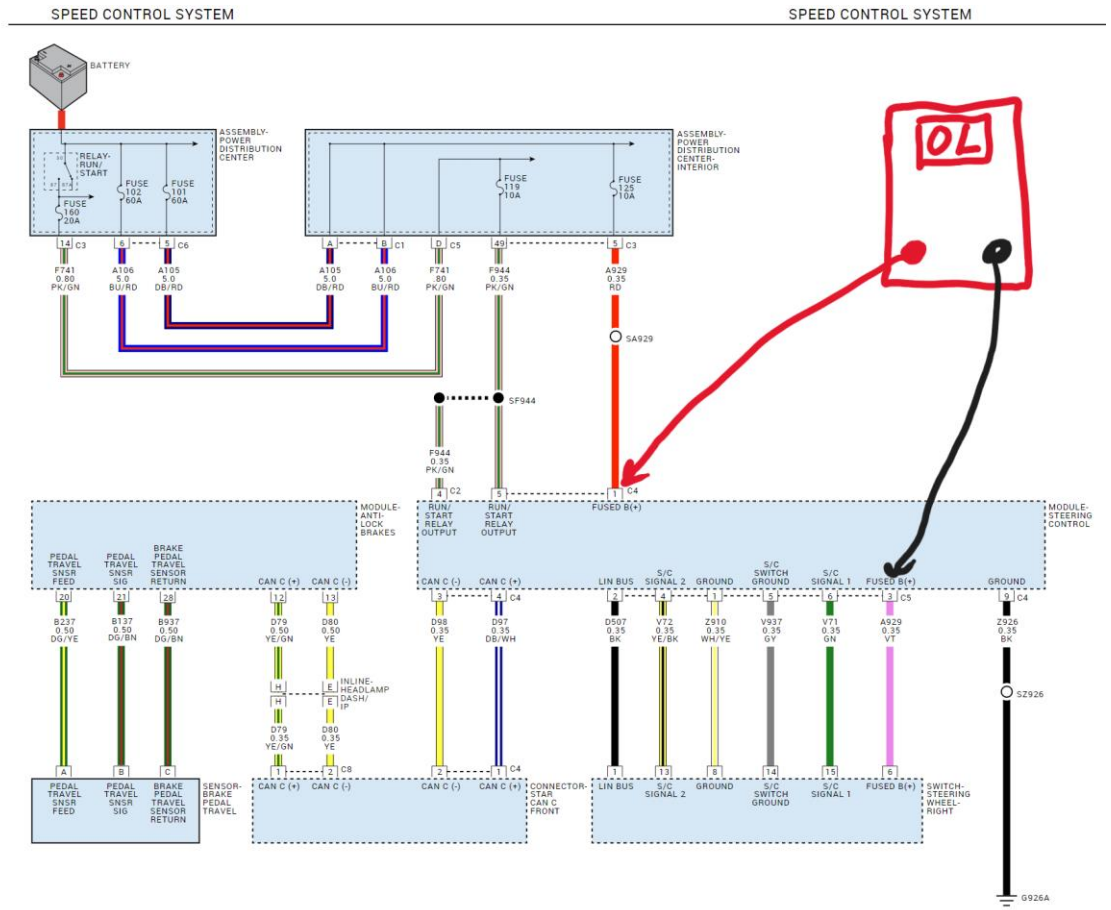
- AT THIS POINT LET ME SHOW YOU WHAT HAPPENED…….

THIS!!

So what did we do?

- We ordered a used clockspring.
- Our thought was the new ones have to be updated and they are wired incorrectly.
- While we were waiting for the used unit I performed a continuity test……

Of course there was no continuity.



So this just proves the clockspring is bad right?

When the new used clockspring came in I performed the same test.

- And guess what?.....

THE SAME RESULT!!!!

Are we down The Rabbit Hole?

- Yeah, we’ve been in it for a while.
- Time to find our way out……

What is a logical path out?

- We know we have no power to the right side steering wheel switch/module.
- We know when we do have power to it everything works.
- I worked backwards from that point. I tested for continuity from the connector C5 B+ to every pin on the lower part of the clockspring.
- What did I find?

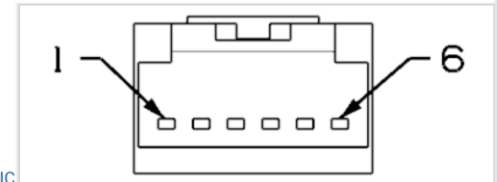
Continuity to connector C1 Pin 3.

2017 Dodge or Ram Truck Journey FWD L4-2.4L 3C4PDCGB8HT548371

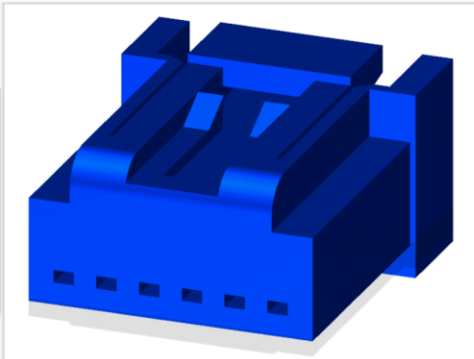
STEERING CONTROL MODULE C1

MODULE-STEERING CONTROL C1

Harness Family: IP
Cavities: 6
Color:
Gender: FEMALE
Part Description: 638100-1
Engineering Name: Mod_Ctrl_Steering_W_EVIC
Connector No: D3816A
Option: Standard



Open In New Tab Zoom/Print



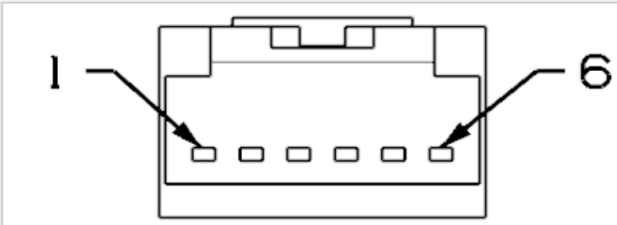
Open In New Tab Zoom/Print

Pin	Circuit	Wire Color	Gauge/Size	Function	Option
1	Z926	BK	0.35	GROUND	
2	D507	OG/WH	0.35	LIN BUS	
3	A929	RD	0.35	FUSED B(+)	
4	V72	OG/VT	0.35	S/C SIGNAL 2	
5	V937	VT/BN	0.35	S/C SWITCH GROUND	
6	V71	VT/OG	0.35	S/C SIGNAL 1	

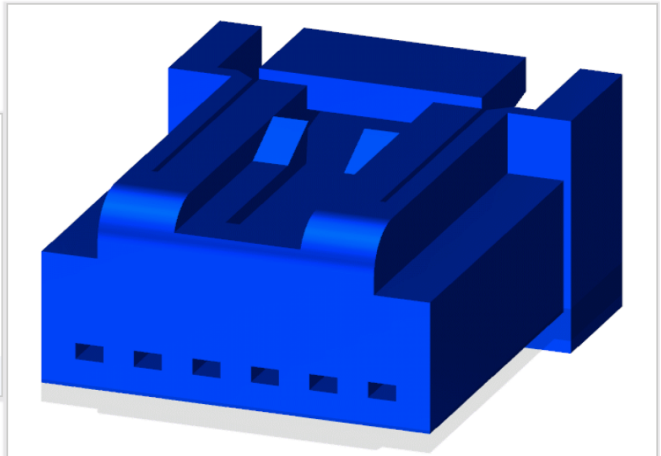
So I tested for B+ at that Pin on the vehicle.

MODULE-STEERING CONTROL C1

Harness Family: IP
Cavities: 6
Color:
Gender: FEMALE
Part Description: 638100-1
Engineering Name: Mod_Ctrl_Steering_W_EVIC
Connector No: D3816A
Option: Standard



Open In New Tab Zoom/Print



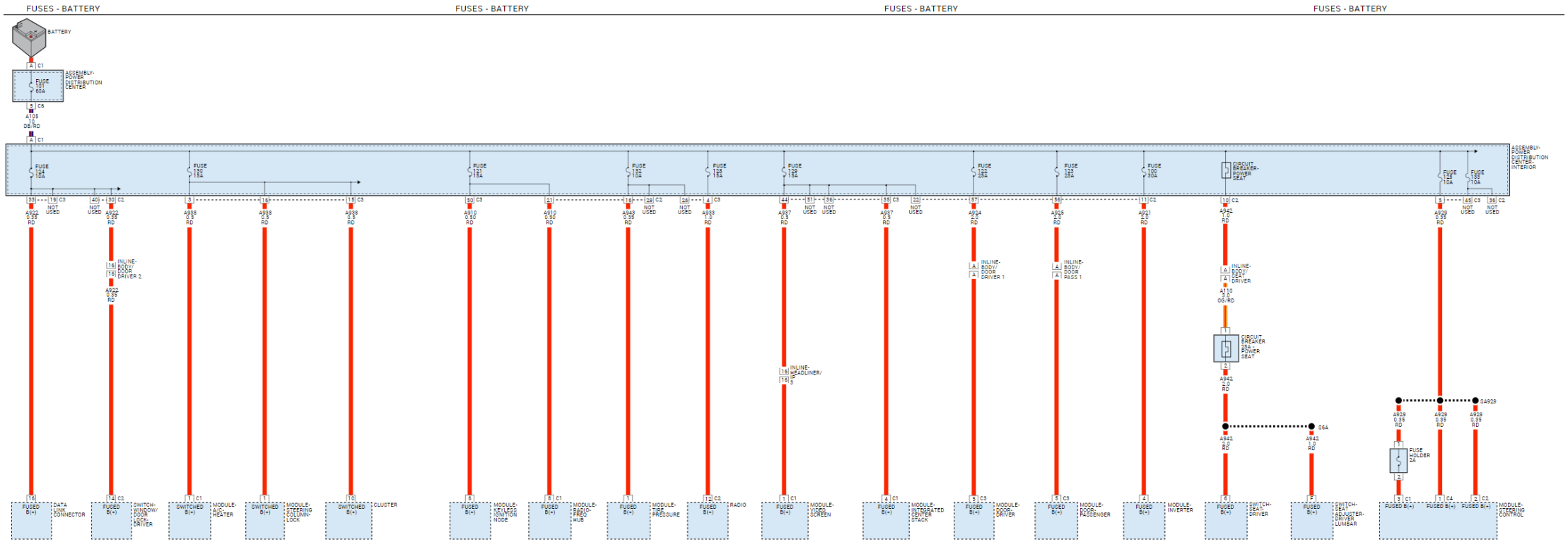
Open In New Tab Zoom/Print

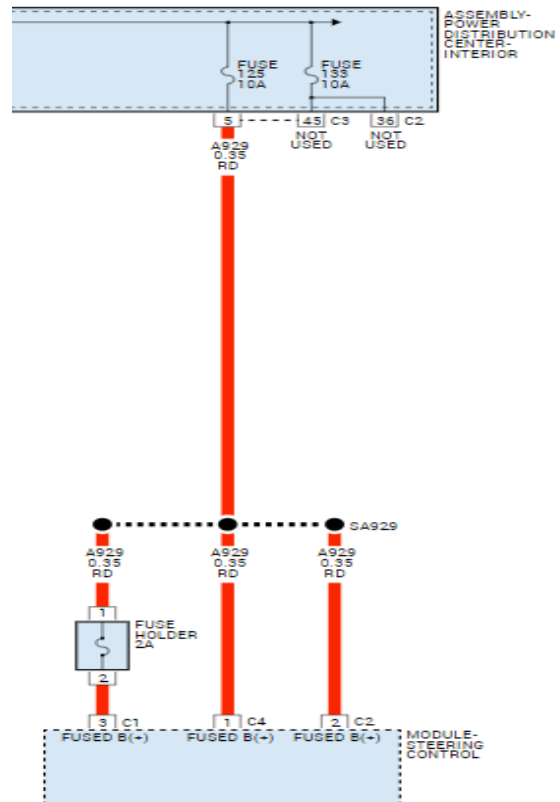
Pin	Circuit	Wire Color	Gauge/Size	Function	Option
1	Z926	BK	0.35	GROUND	
2	D507	OG/WH	0.35	LIN BUS	
3	A929	RD	0.35	FUSED B(+) NO B+ HERE	
4	V72	OG/VT	0.35	S/C SIGNAL 2	
5	V937	VT/BN	0.35	S/C SWITCH GROUND	
6	V71	VT/OG	0.35	S/C SIGNAL 1	

I jumped power to that pin and everything functions normally.

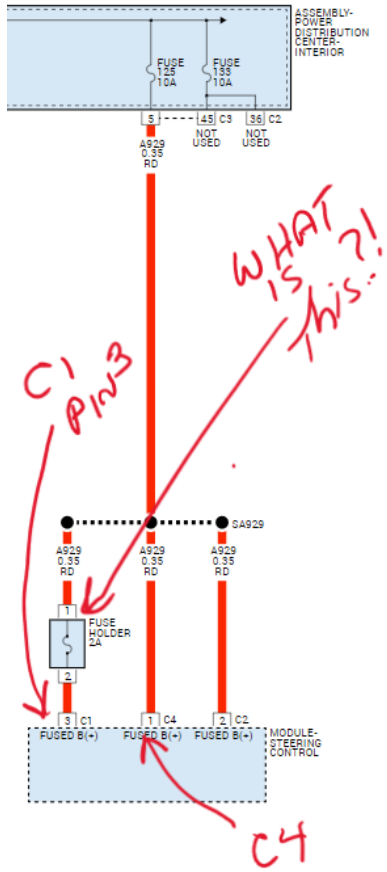
- Now I have to find out why we have no power at connector C1 Pin 3.
- Unfortunately that connector is not listed on any wiring diagram for the steering column. Not that I could find anyway.
- I checked Alldata, Prodemand, Motologic and Chrysler OE.
- The only thing I could find on connector C1 was a pinout for the connector itself.

I couldn’t give up so I kept looking at wiring diagrams and finally I found this…

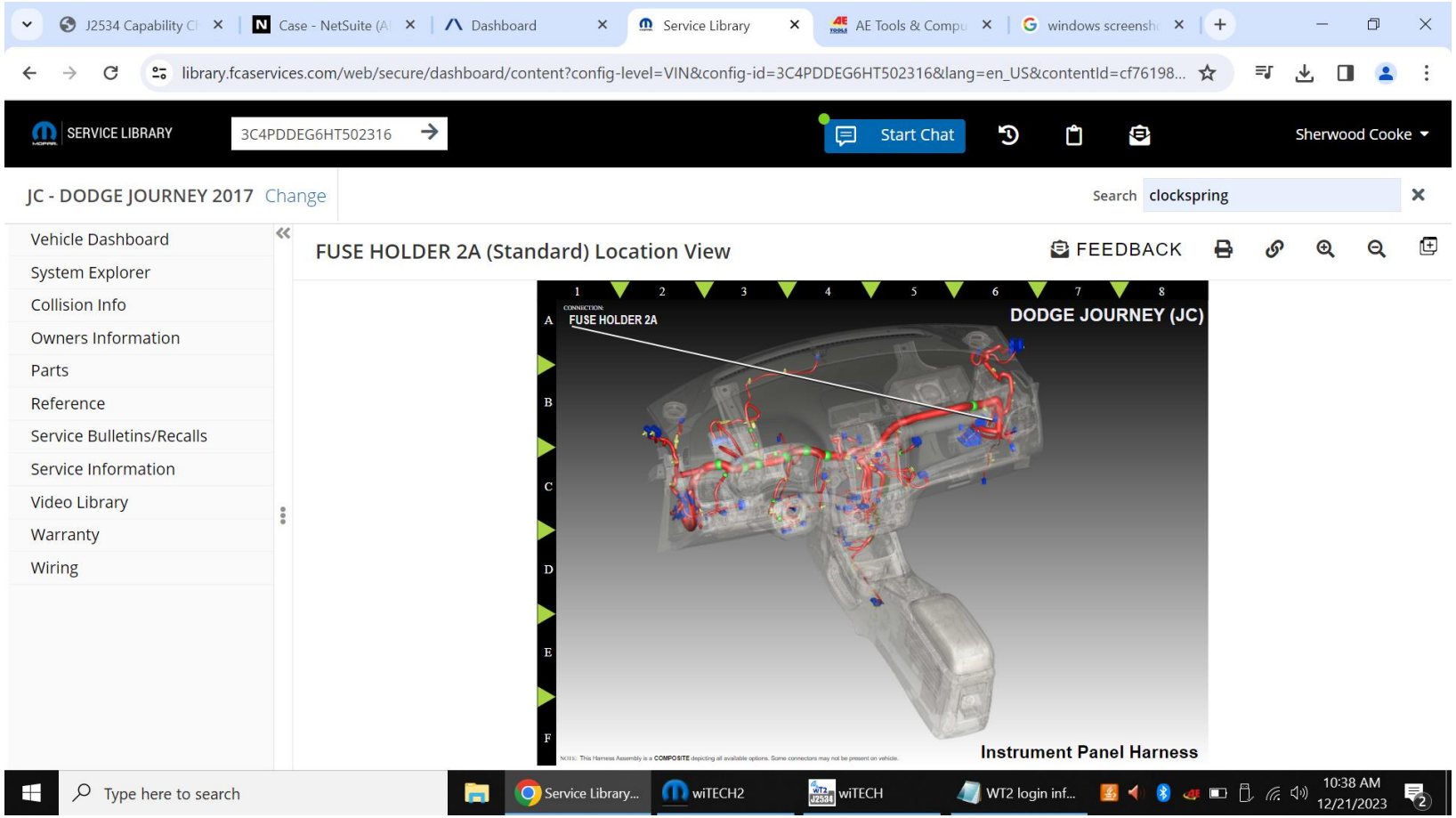


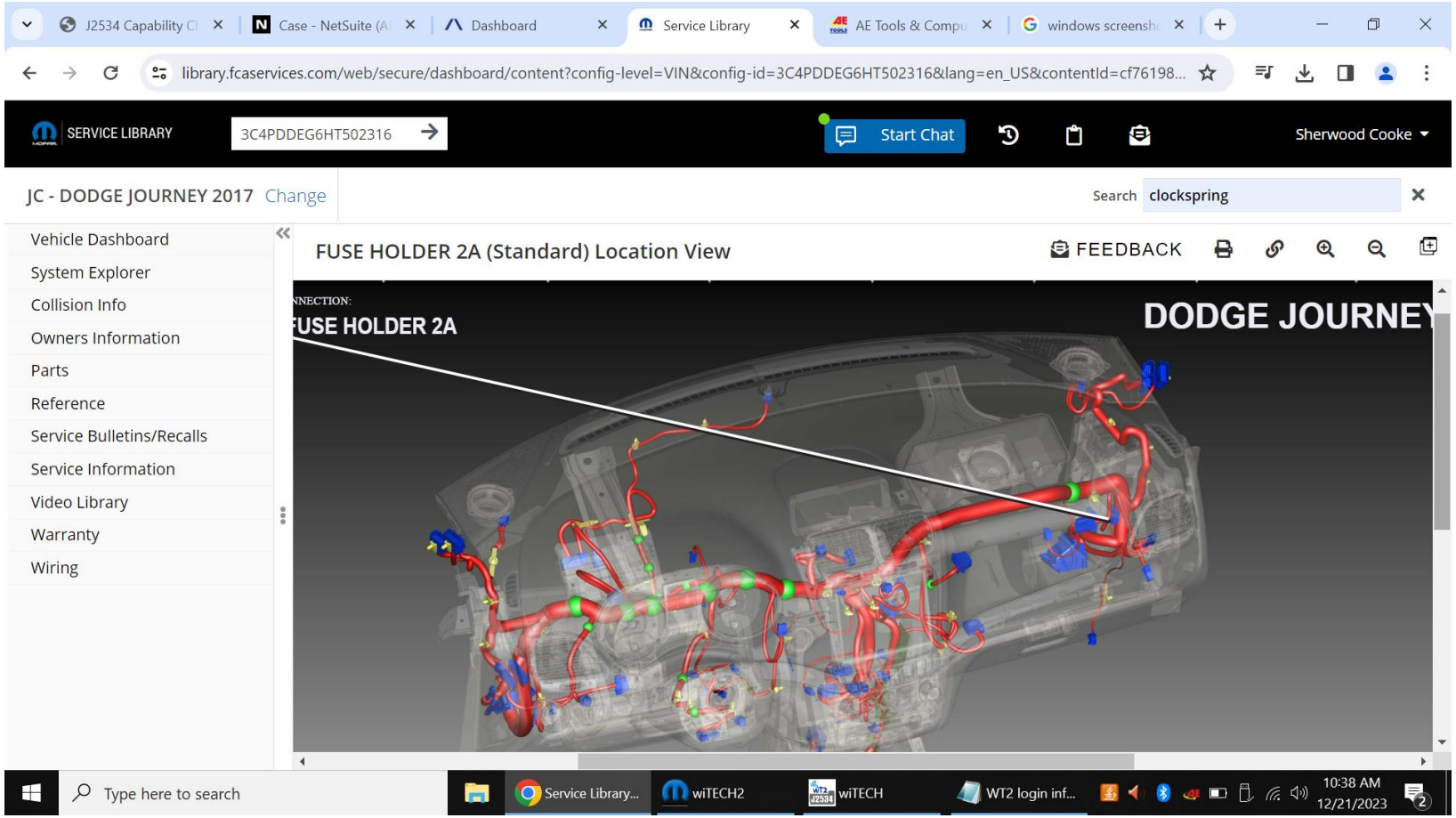

ASSEMBLY-
POWER
DISTRIBUTION
CENTER-
INTERIOR
FUSE
125
10A
FUSE
133
10A
5
45 C3
NOT
USED
36 C2
NOT
USED
A929
0.35
RD
SA929
A929
0.35
RD
A929
0.35
RD
A929
0.35
RD
1
FUSE
HOLDER
2A
2
3 C1
FUSED B(+)
1 C4
FUSED B(+)
2 C2
FUSED B(+)
MODULE-
STEERING
CONTROL

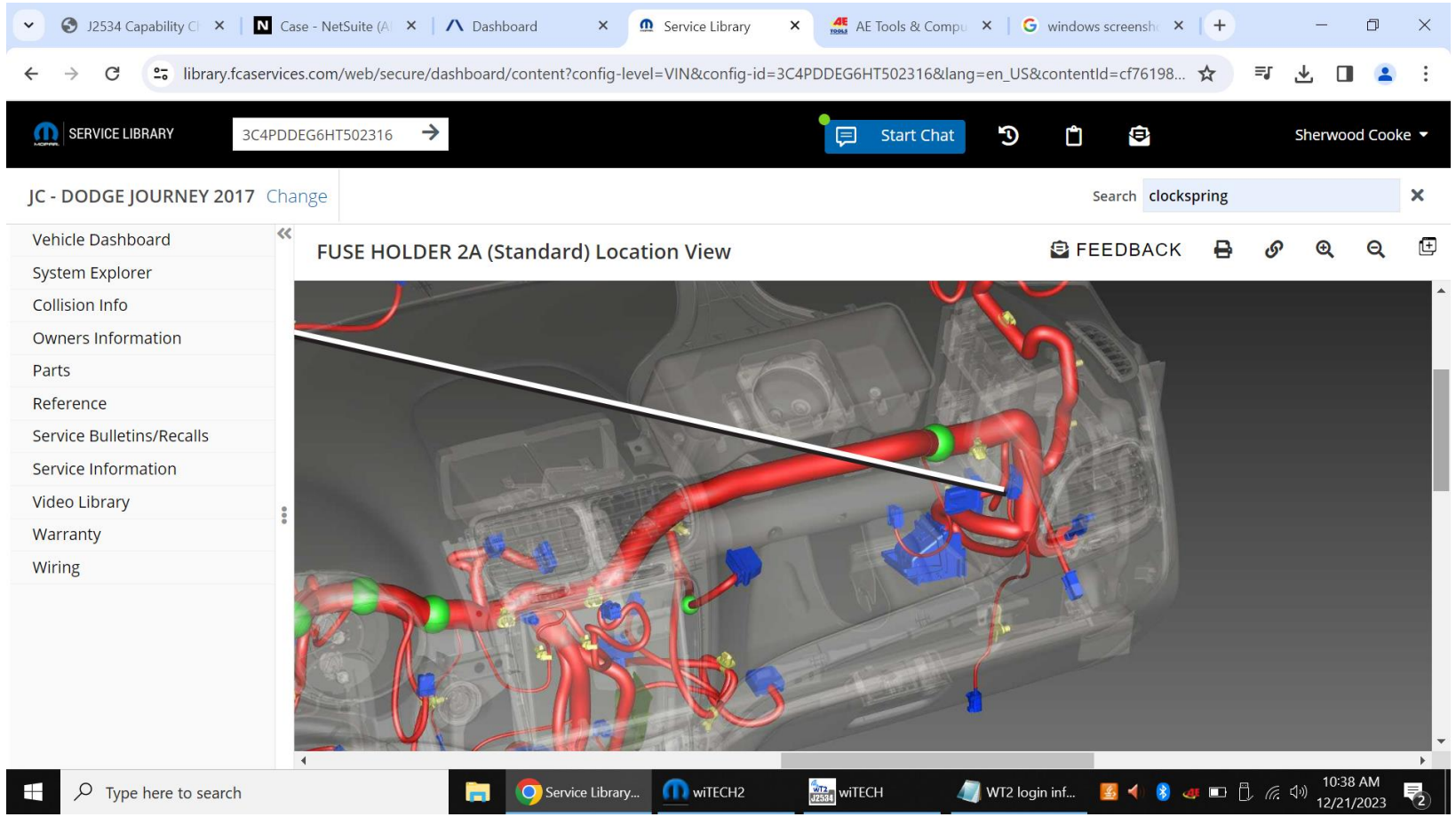
Oh MY Goodness!!! Could this be the problem?



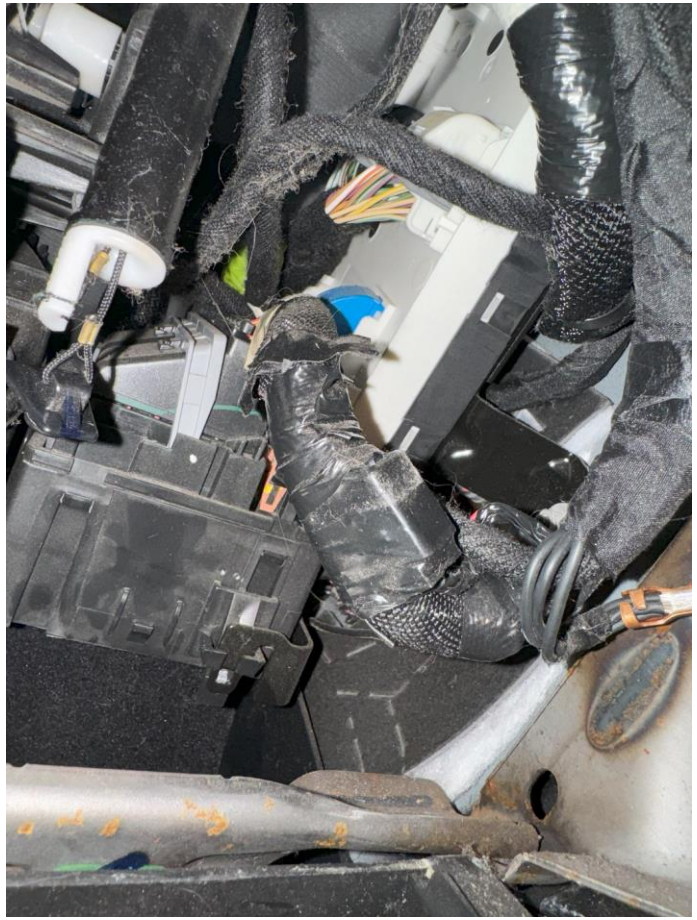
Now we have to find that 2 amp fuse.



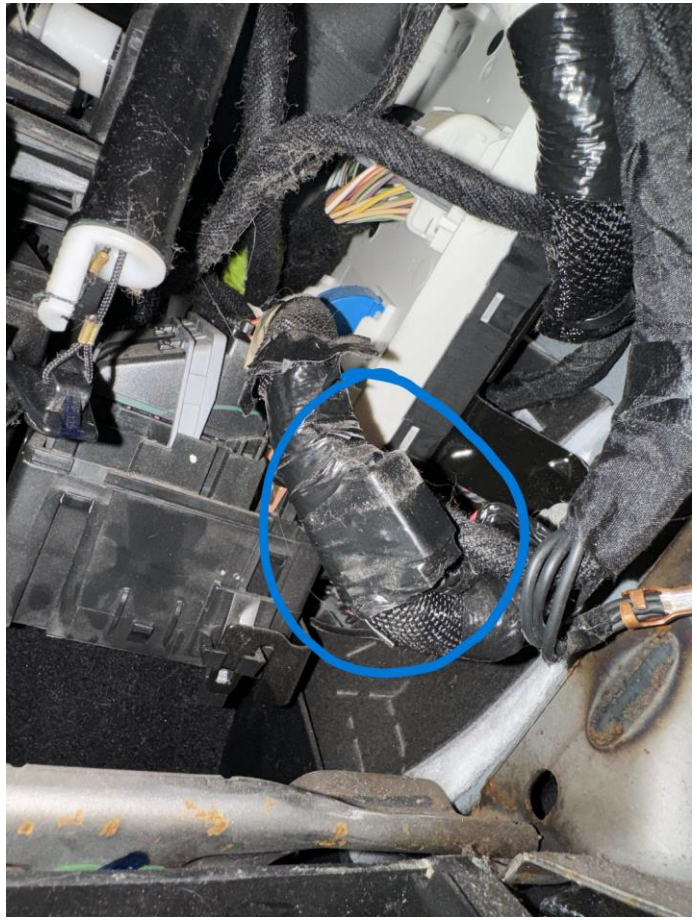

J2534 Capability Cl
Case - NetSuite (A
Dashboard
Service Library
AE Tools & Compu
windows screensh
library.fcaservices.com/web/secure/dashboard/content?config-level=VIN&config-id=3C4PDDEG6HT502316&lang=en_US&contentId=cf76198...
SERVICE LIBRARY
3C4PDDEG6HT502316
Start Chat
Sherwood Cooke
JC - DODGE JOURNEY 2017 Change
Search clockspring
Vehicle Dashboard
System Explorer
Collision Info
Owners Information
Parts
Reference
Service Bulletins/Recalls
Service Information
Video Library
Warranty
Wiring
FUSE HOLDER 2A (Standard) Location View
FEEDBACK
NNECTION:
FUSE HOLDER 2A
DODGE JOURNEY
Type here to search
Service Library...
wiTECH2
wiTECH
WT2 login inf...
10:38 AM
12/21/2023


J2534 Capability Cl
Case - NetSuite (A
Dashboard
Service Library
AE Tools & Compu
windows screensh
library.fcaservices.com/web/secure/dashboard/content?config-level=VIN&config-id=3C4PDDEG6HT502316&lang=en_US&contentId=cf76198...
SERVICE LIBRARY
3C4PDDEG6HT502316
Start Chat
Sherwood Cooke
JC - DODGE JOURNEY 2017 Change
Search clockspring
Vehicle Dashboard
System Explorer
Collision Info
Owners Information
Parts
Reference
Service Bulletins/Recalls
Service Information
Video Library
Warranty
Wiring
FUSE HOLDER 2A (Standard) Location View
FEEDBACK
Type here to search
Service Library...
wiTECH2
wiTECH
WT2 login inf...
10:38 AM
12/21/2023

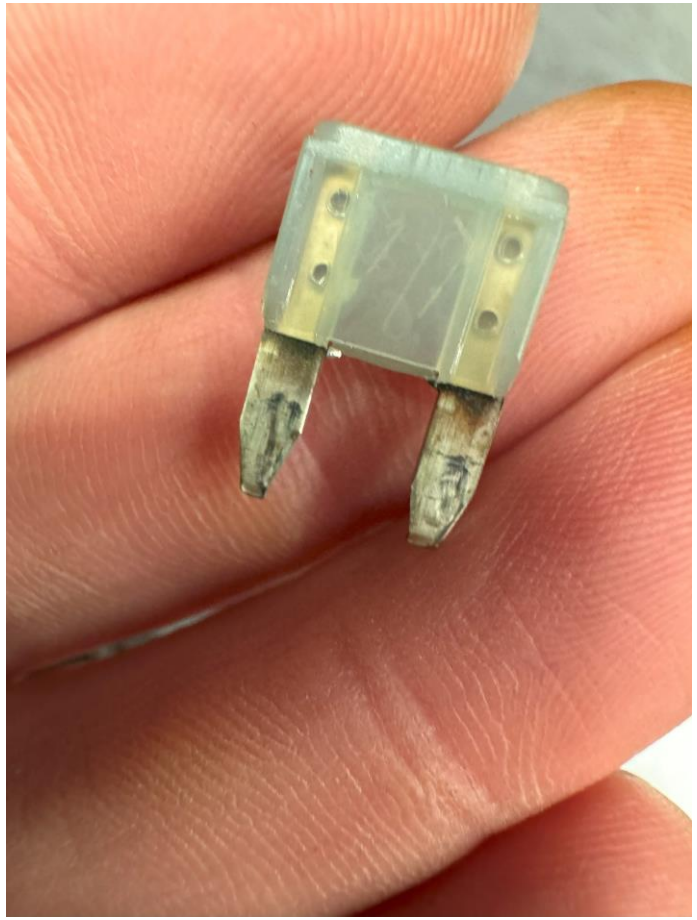
Do you see it?



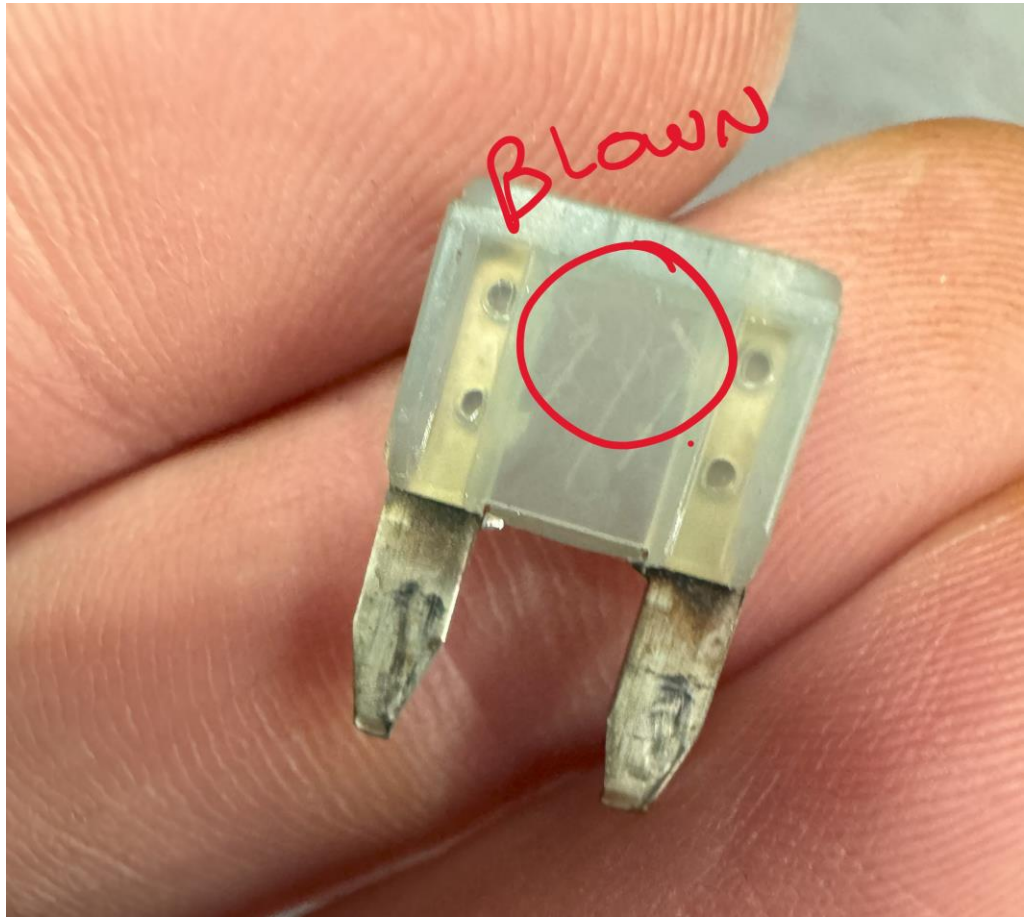
How about now?



We cut the tape away.



HECK YEAH!!!!!



So we replaced the fuse.

- After replacing the fuse everything functioned normally.
- We kept the new clockspring in the vehicle (The client did NOT pay for it).
- We could not find why the fuse blew. It could have been a problem with the original clockspring but we could not prove that.
- We activated everything we could and turned the wheel vigorously trying to find a problem with the circuit but never could find a problem.
- The vehicle was reassembled and driven for a few days with no problems.
- It was returned to the client and they have had no problems since the repair was performed.

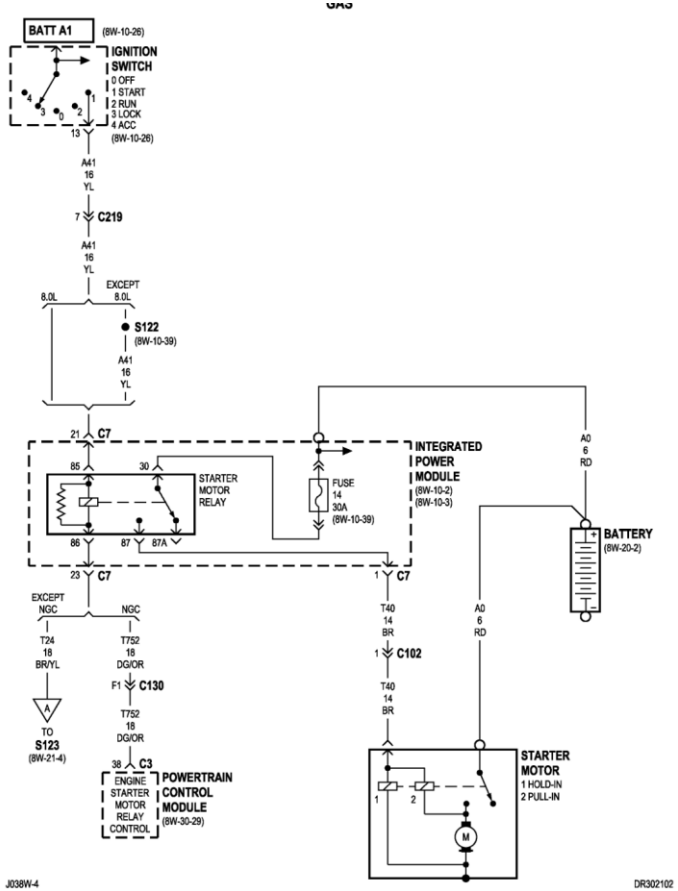
2003 Dodge Ram 4.7L Automatic

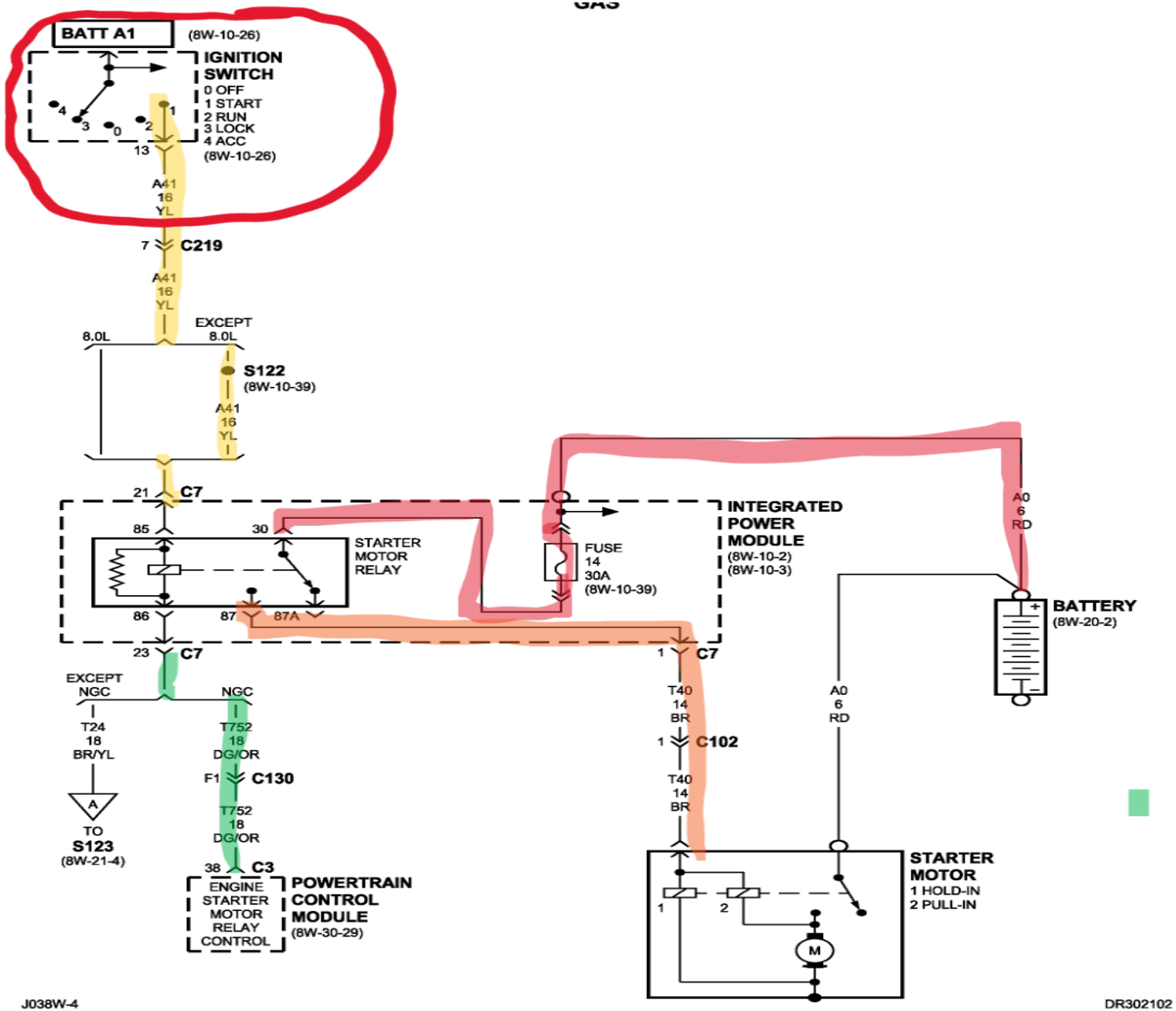
Starter will engage and engine will start when ignition switch is turned to RUN position.

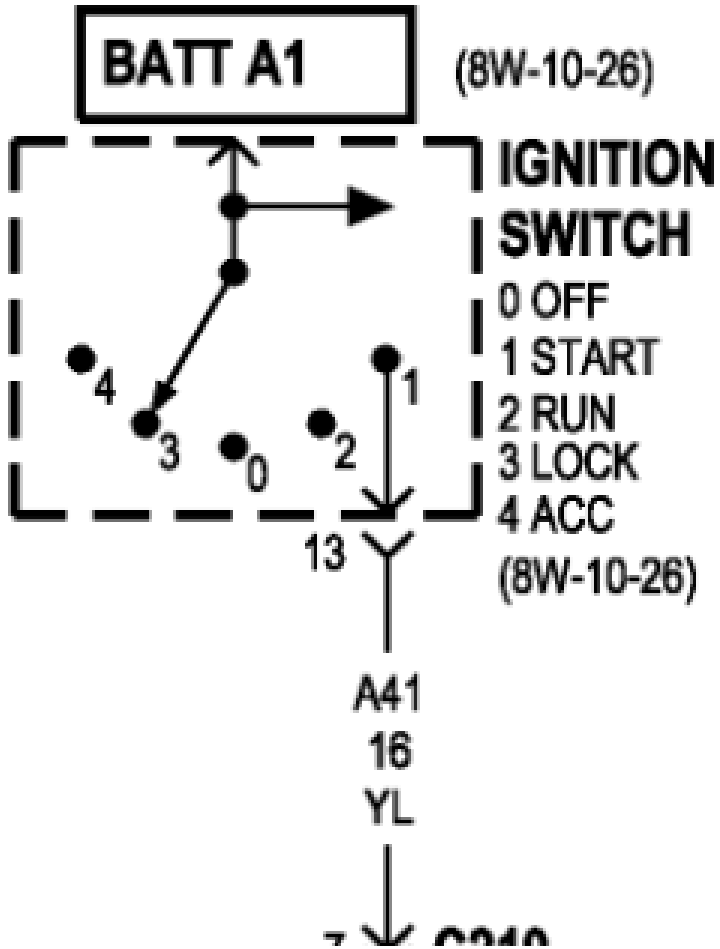
Ignition switch was replaced to fix this problem.

- New ignition switch was a Standard Motor Products.
- After switch was installed the vehicle still has the problem.
- Let’s go over the tests that were performed.

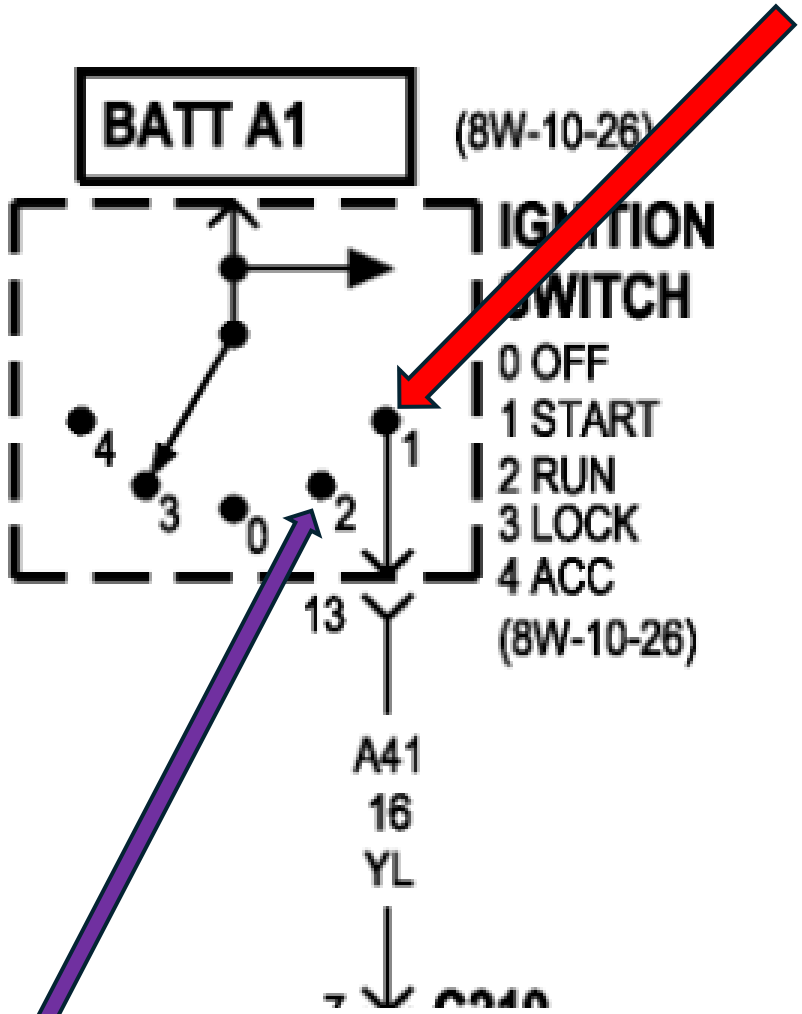
Starting System Wiring Diagram




BATT A1
(8W-10-26)
IGNITION SWITCH
0 OFF
1 START
2 RUN
3 LOCK
4 ACC
(8W-10-26)
A41
16
YL
C219
EXCEPT 8.0L
8.0L
S122
(8W-10-39)
C7
STARTER MOTOR RELAY
INTEGRATED POWER MODULE
(8W-10-2)
(8W-10-3)
FUSE
14
30A
(8W-10-39)
A0
6
RD
BATTERY
(8W-20-2)
EXCEPT NGC
NGC
T24
18
BR/YL
T752
18
DG/OR
C130
TO
S123
(8W-21-4)
C3
ENGINE STARTER MOTOR RELAY CONTROL
POWERTRAIN CONTROL MODULE
(8W-30-29)
T40
14
BR
C102
STARTER MOTOR
1 HOLD-IN
2 PULL-IN
J038W-4
DR302102


BATT A1
(8W-10-26)
IGNITION
SWITCH
0 OFF
1 START
2 RUN
3 LOCK
4 ACC
(8W-10-26)
4
3
0
2
1
13
A41
16
YL

STARTER SHOULD ENGAGE HERE



BUT IT IS ENGAGING HERE!

How Could it NOT be the Ignition Switch?!

Let’s see if we can find an ignition switch wiring diagram that’s more comprehensive.

We have an automatic transmission.

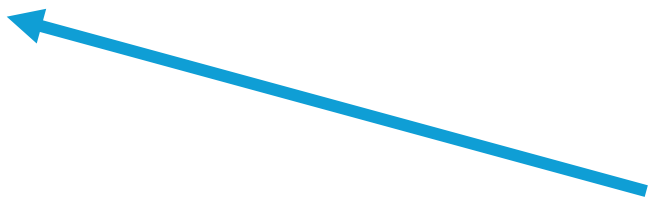
2003 Dodge or Ram Truck RAM 1500 Truck 2WD V8-4.7L VIN N 1D7HA18N13S363900

Electrical - Interactive Color (Non OE)

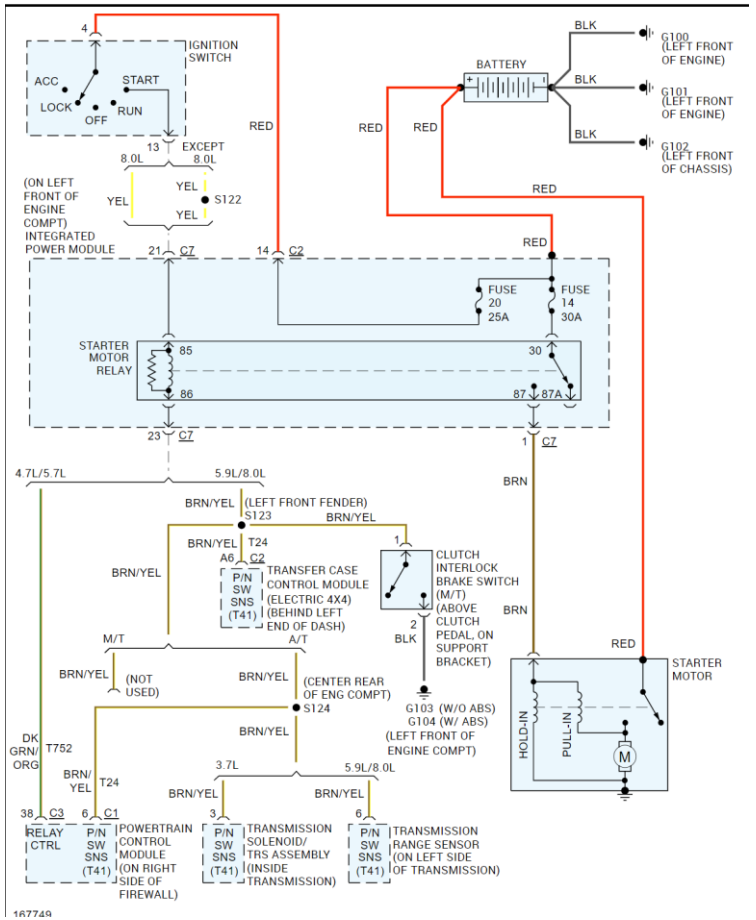
Vehicle > Starting and Charging > Diagrams > Electrical - Interactive Color (Non OE)

ELECTRICAL - INTERACTIVE COLOR (NON OE)

Starting/Charging - Charging Circuit
Starting/Charging - Starting Circuit
W/Manual Transmission

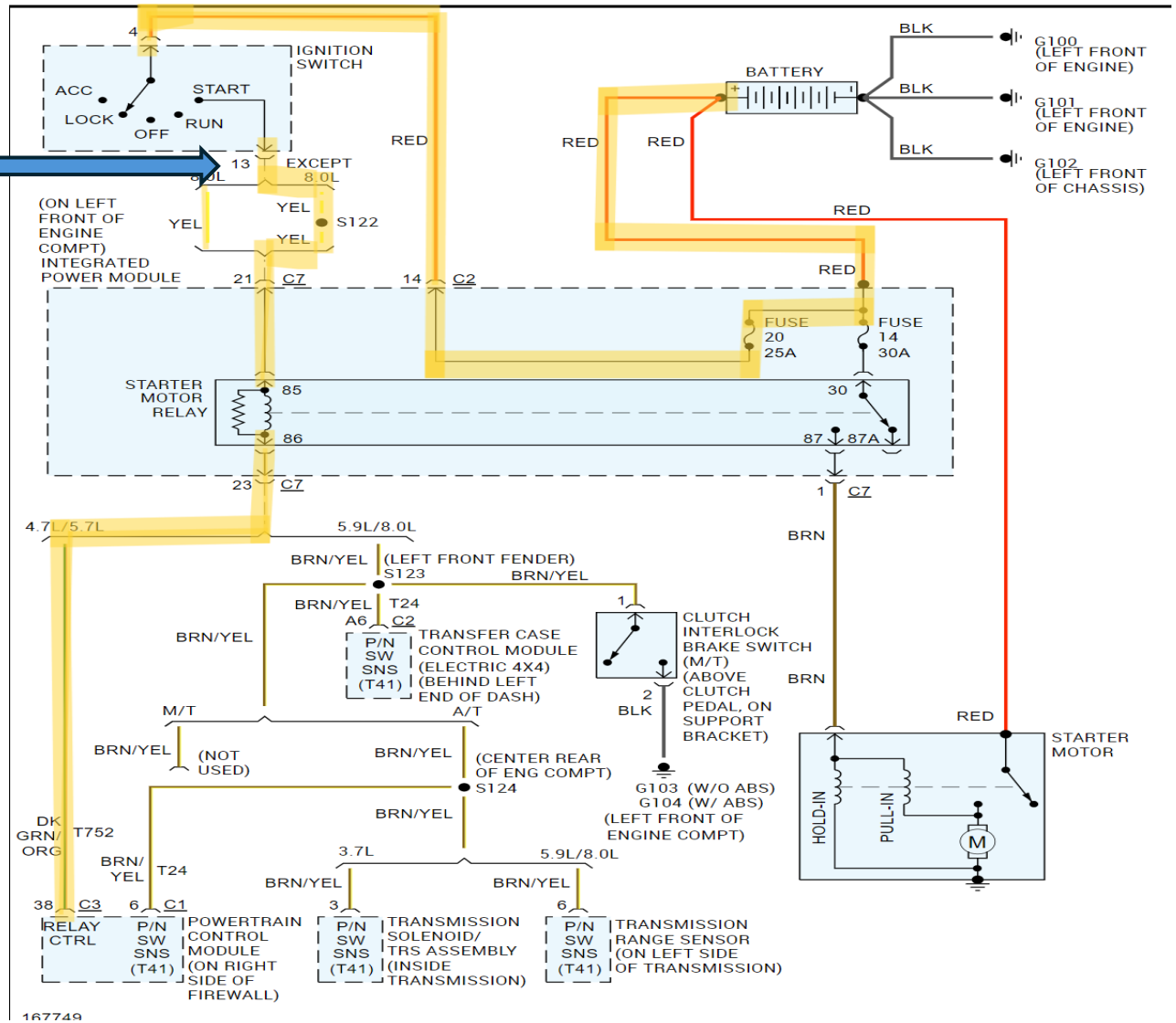


It’s the only option we have so we will take a look.

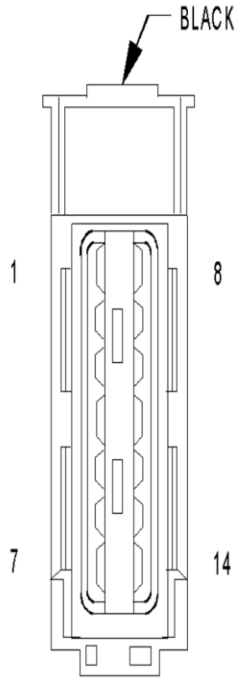


Exactly what we had before, just more stuff to confuse us.

Remember Pin13



Ignition Switch Pinout

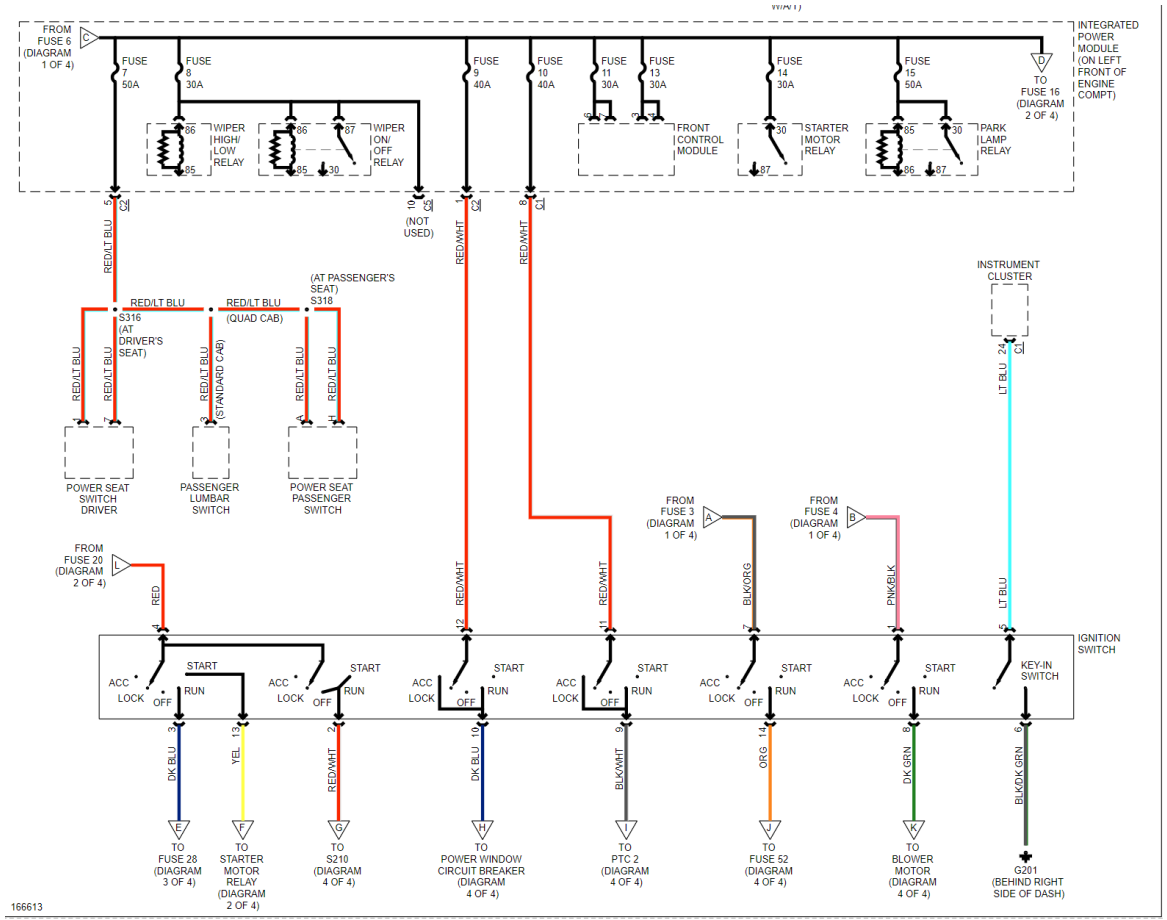


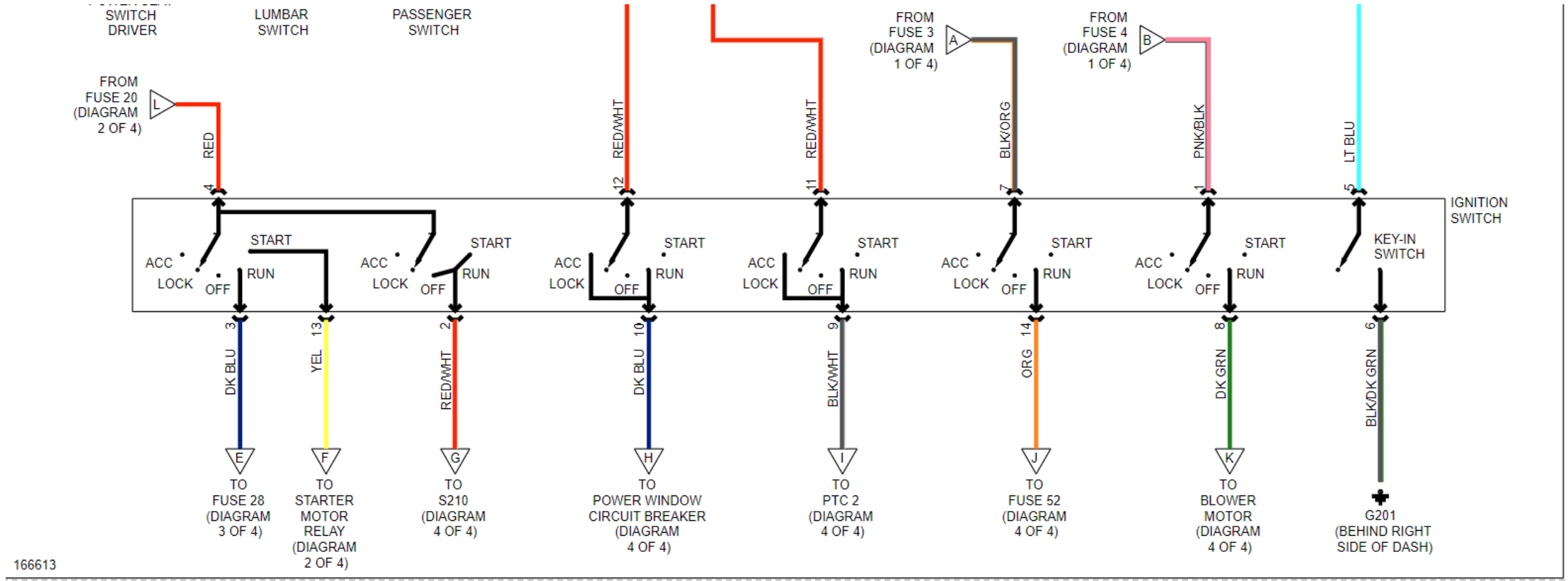
IGNITION SWITCH

IGNITION SWITCH - BLACK 14 WAY

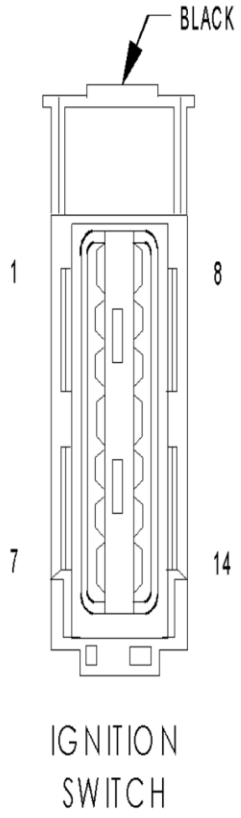
CAV	CIRCUIT	FUNCTION
1	A2 12PK/BK	FUSED B(+)
2	A51 16RD/WT	FUSED B(+)
3	A21 16DB	FUSED IGNITION SWITCH OUTPUT (RUN-START)
4	A1 16RD	FUSED B(+)
5	G26 20LB	KEY-IN IGNITION SWITCH SENSE
6	Z42 20BK/DG	GROUND
7	A22 16BK/OR	FUSED B(+)
8	C1 12DG	BLOWER MOTOR FEED
9	A31 14DB	FUSED IGNITION SWITCH OUTPUT (RUN-ACC)
10	F1 10BR/RD	FUSED IGNITION SWITCH OUTPUT (RUN-ACC)
11	Y131 14RD/WT	FUSED B(+)
12	A30 10CK/WT	FUSED B(+)
13	A41 16YL	FUSED IGNITION SWITCH OUTPUT (RUN-START)
14	A38 16OR	FUSED IGNITION SWITCH OUTPUT (RUN)

Motologic had the ignition switch diagram I needed.




SWITCH
DRIVER
LUMBAR
SWITCH
PASSENGER
SWITCH
FROM
FUSE 20
(DIAGRAM
2 OF 4)
L
RED
4
RED/WHT
12
RED/WHT
11
FROM
FUSE 3
(DIAGRAM
1 OF 4)
A
BLK/ORG
7
FROM
FUSE 4
(DIAGRAM
1 OF 4)
B
PNK/BLK
1
LT BLU
5
IGNITION
SWITCH
ACC
LOCK
OFF
RUN
START
KEY-IN
SWITCH
3
DK BLU
13
YEL
2
RED/WHT
10
DK BLU
9
BLK/WHT
14
ORG
8
DK GRN
6
BLK/DK GRN
E
F
G
H
I
J
K
TO
FUSE 28
(DIAGRAM
3 OF 4)
TO
STARTER
MOTOR
RELAY
(DIAGRAM
2 OF 4)
TO
S210
(DIAGRAM
4 OF 4)
TO
POWER WINDOW
CIRCUIT BREAKER
(DIAGRAM
4 OF 4)
TO
PTC 2
(DIAGRAM
4 OF 4)
TO
FUSE 52
(DIAGRAM
4 OF 4)
TO
BLOWER
MOTOR
(DIAGRAM
4 OF 4)
G201
(BEHIND RIGHT
SIDE OF DASH)
166613

Using the Motologic diagram I marked up the pinout of the ignition switch.



IGNITION SWITCH - BLACK 14 WAY

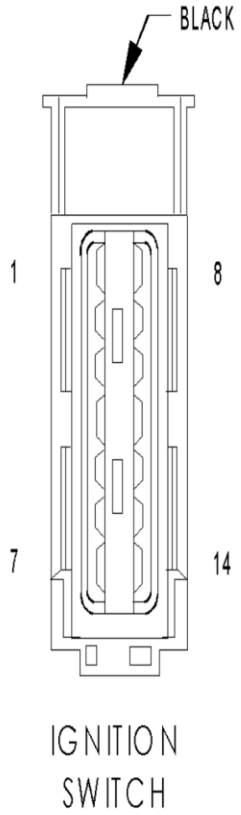
CAV	CIRCUIT	FUNCTION
1	A2 12PK/BK	FUSED B(+)
2	A51 16RD/WT	FUSED B(+)
3	A21 16DB	FUSED IGNITION SWITCH OUTPUT (RUN-START)
4	A1 16RD	FUSED B(+)
5	G26 20LB	KEY-IN IGNITION SWITCH SENSE
6	Z42 20BK/DG	GROUND
7	A22 16BK/OR	FUSED B(+)
8	C1 12DG	BLOWER MOTOR FEED
9	A31 14DB	FUSED IGNITION SWITCH OUTPUT (RUN-ACC)
10	F1 10BR/RD	FUSED IGNITION SWITCH OUTPUT (RUN-ACC)
11	Y131 14RD/WT	FUSED B(+)
12	A30 10CK/WT	FUSED B(+)
13	A41 16YL	FUSED IGNITION SWITCH OUTPUT (RUN-START)
14	A38 16OR	FUSED IGNITION SWITCH OUTPUT (RUN)

RADIO, CIGARETTE POWER WINDOW

ABS, TRANS ETC

I removed the starter relay so engine would not crank/start while I was running through the next steps

I jumpered Pin 1 (Power In) to Pins 2 & 3 (Powers Out to PCM). I monitored Pin 13 (Power out to starter relay).



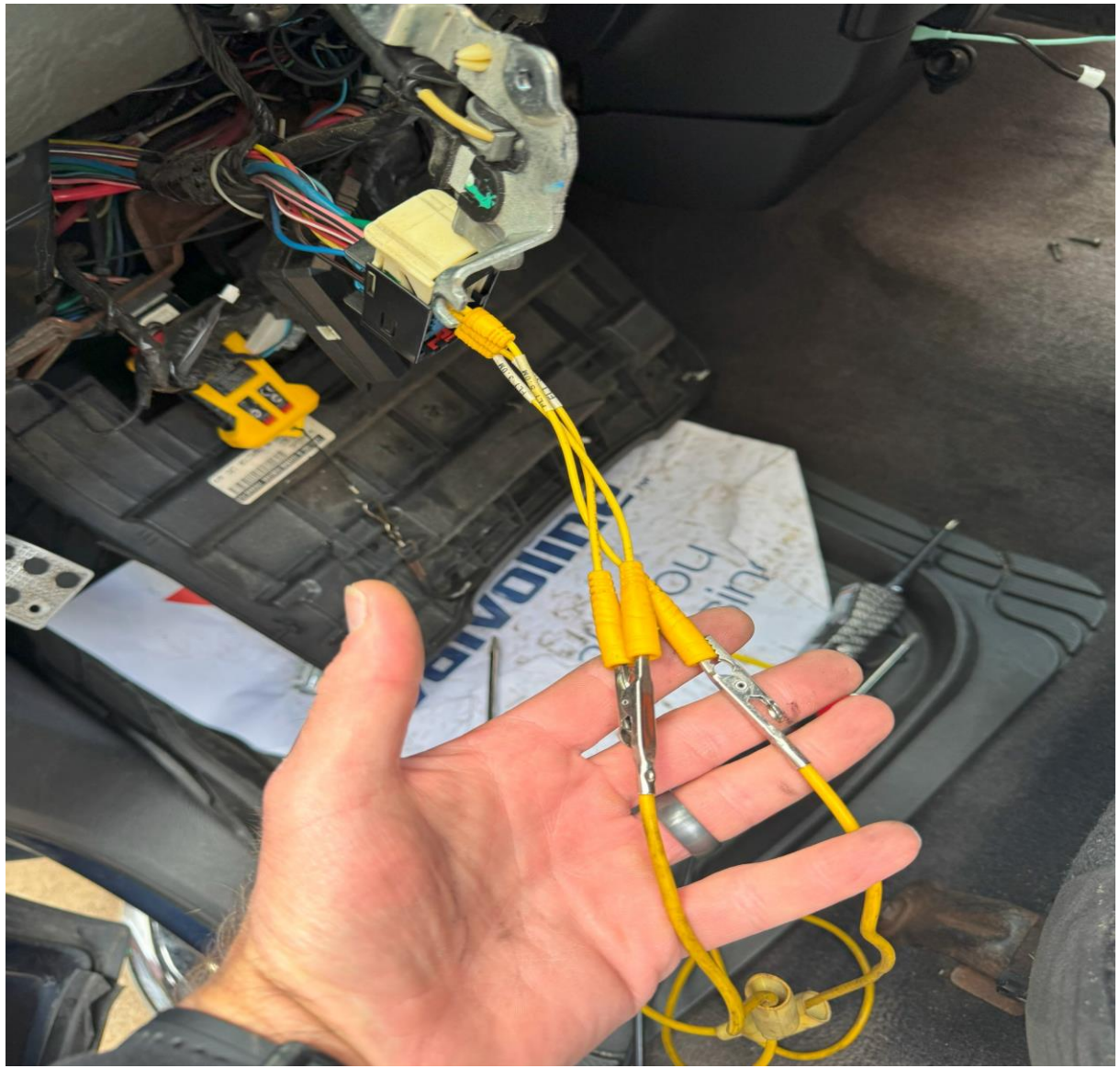
IGNITION SWITCH

IGNITION SWITCH - BLACK 14 WAY

CAV	CIRCUIT	FUNCTION
1	A2 12PK/BK	FUSED B(+)
2	A51 16RD/WT	FUSED B(+)
3	A21 16DB	FUSED IGNITION SWITCH OUTPUT (RUN-START)
4	A1 16RD	FUSED B(+)
5	G26 20LB	KEY-IN IGNITION SWITCH SENSE
6	Z42 20BK/DG	GROUND
7	A22 16BK/OR	FUSED B(+)
8	C1 12DG	BLOWER MOTOR FEED
9	A31 14DB	FUSED IGNITION SWITCH OUTPUT (RUN-ACC)
10	F1 10BR/RD	FUSED IGNITION SWITCH OUTPUT (RUN-ACC)
11	Y131 14RD/WT	FUSED B(+)
12	A30 10CK/WT	FUSED B(+)
13	A41 16YL	FUSED IGNITION SWITCH OUTPUT (RUN-START)
14	A38 16OR	FUSED IGNITION SWITCH OUTPUT (RUN)

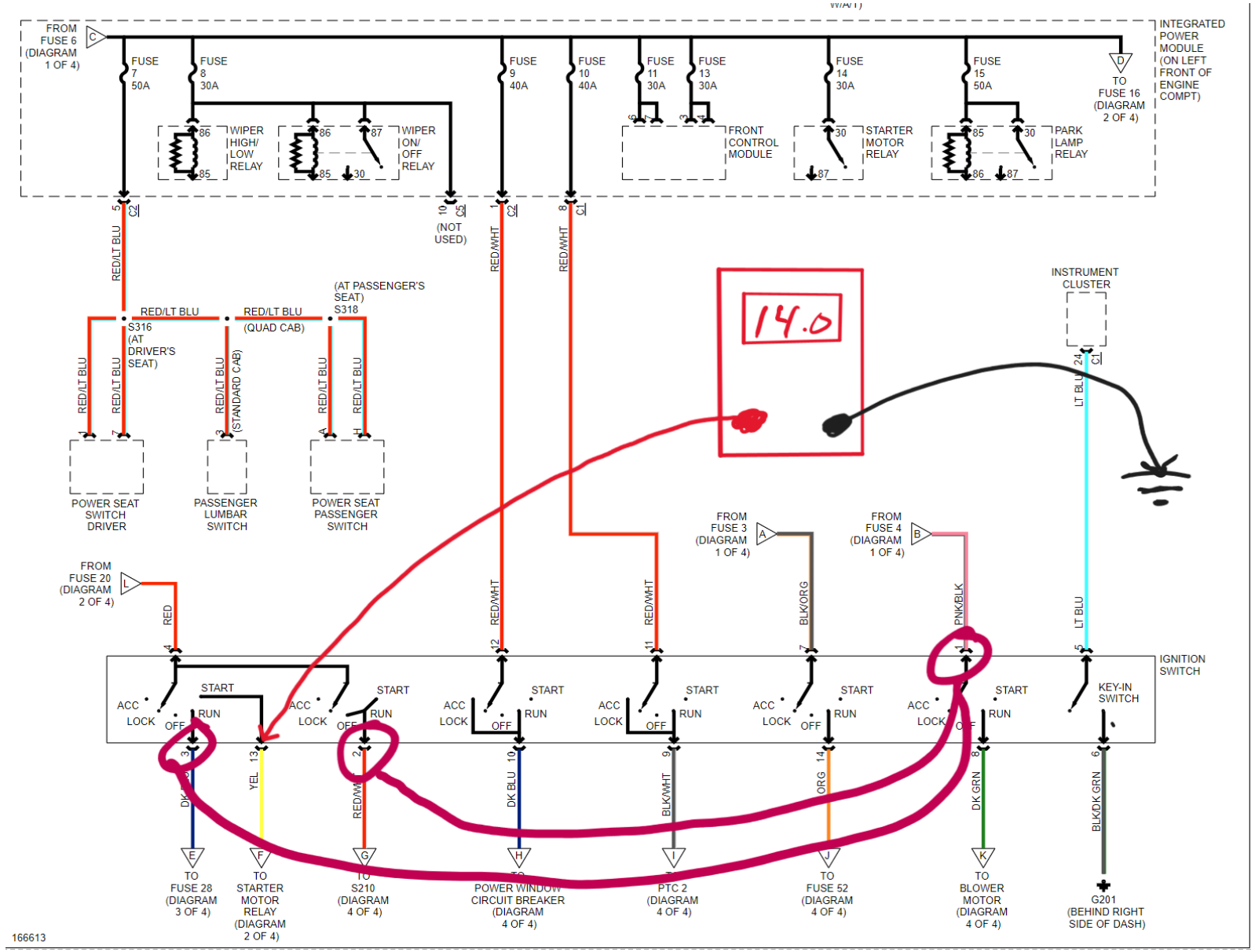
RADIO, CIGARETTE POWER WINDOW

ABS, TRANS ETC



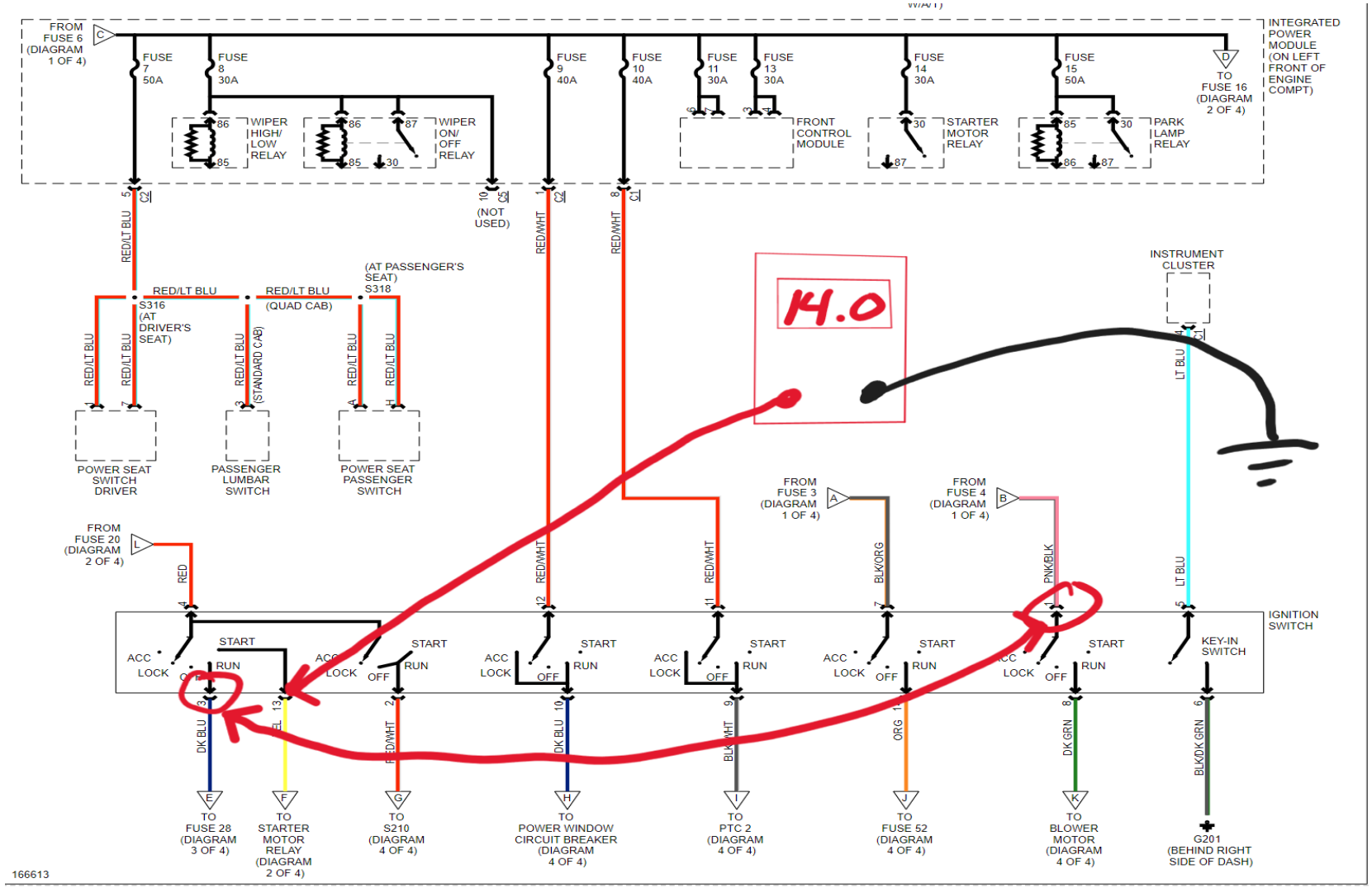
No Good!

STARTER would be ENGAGED.

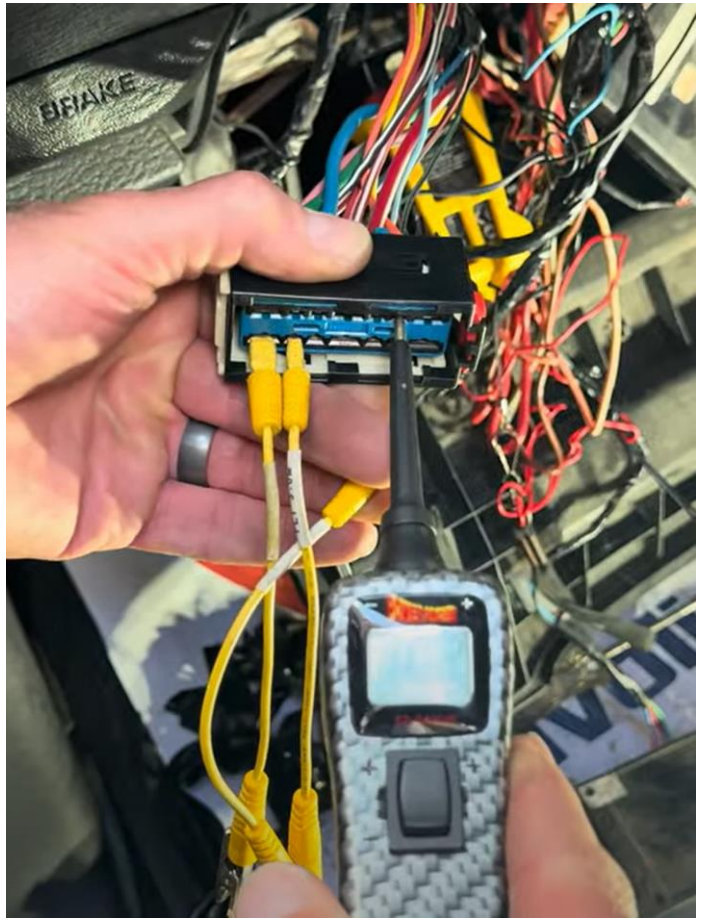



12-24VOlt
9.1

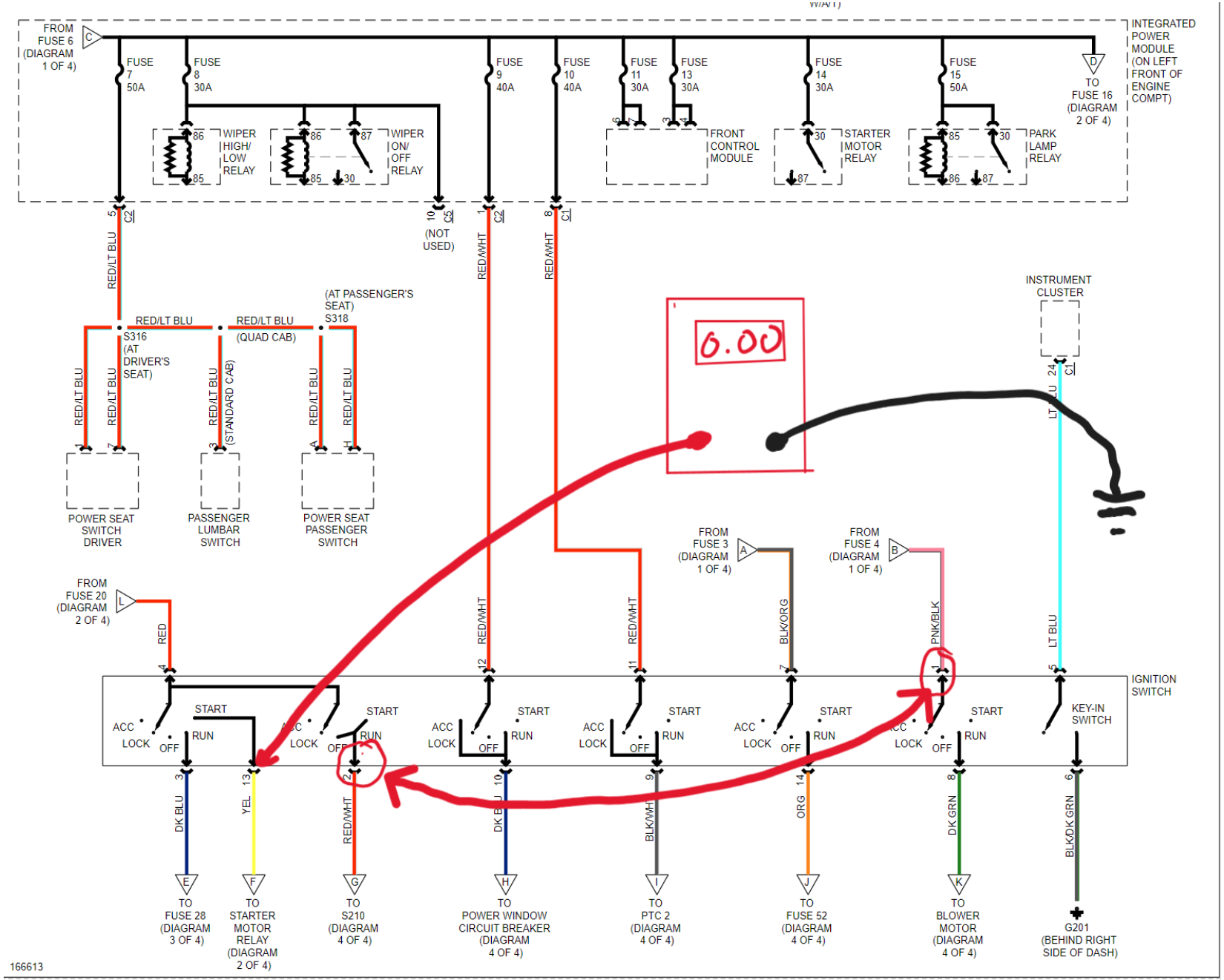
Still
No
Good.



Pin 3 Disconnected. Now we have no voltage. The Power Probe shows 10v but it doesn’t alarm for voltage present. We will get to that in a bit.

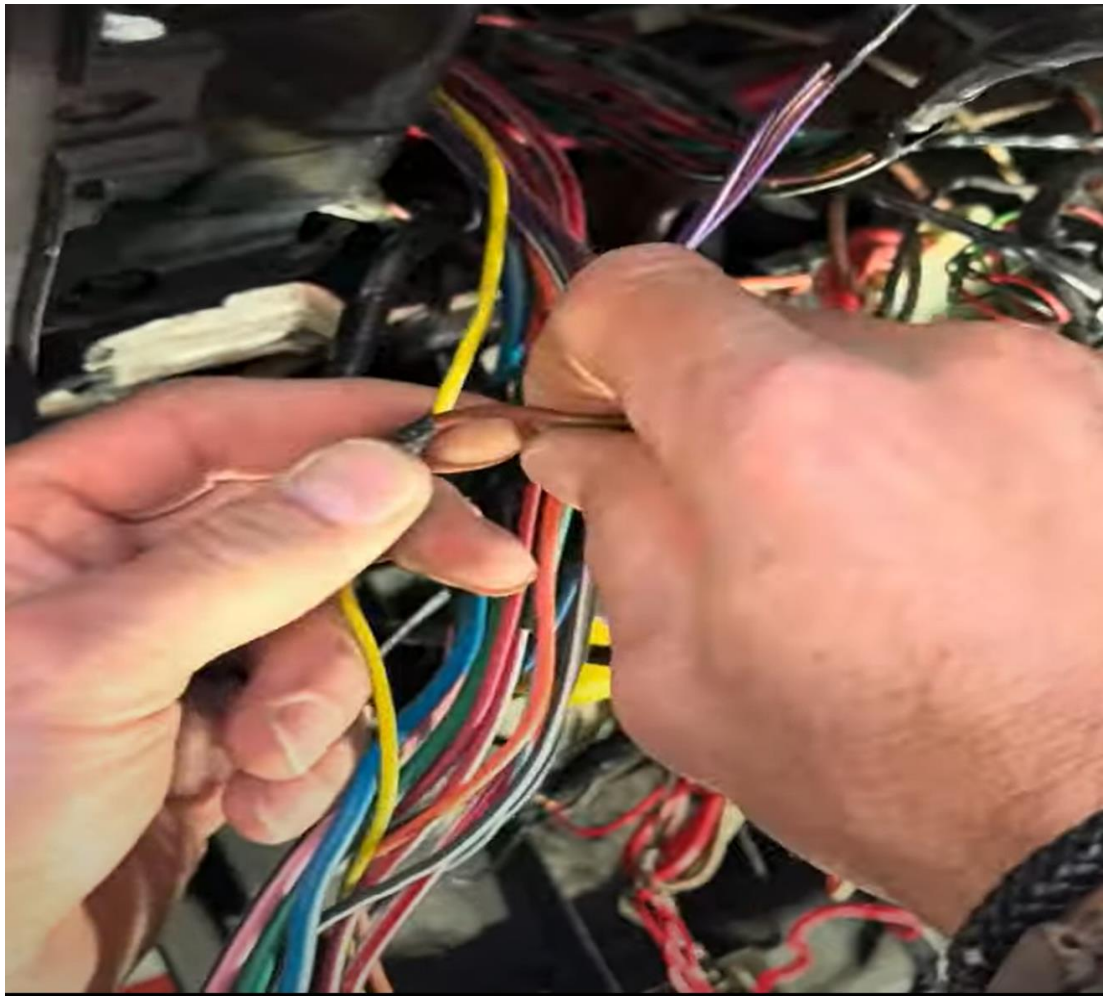


Circuit on Pin 3 (Dk Blue wire) is our problem.



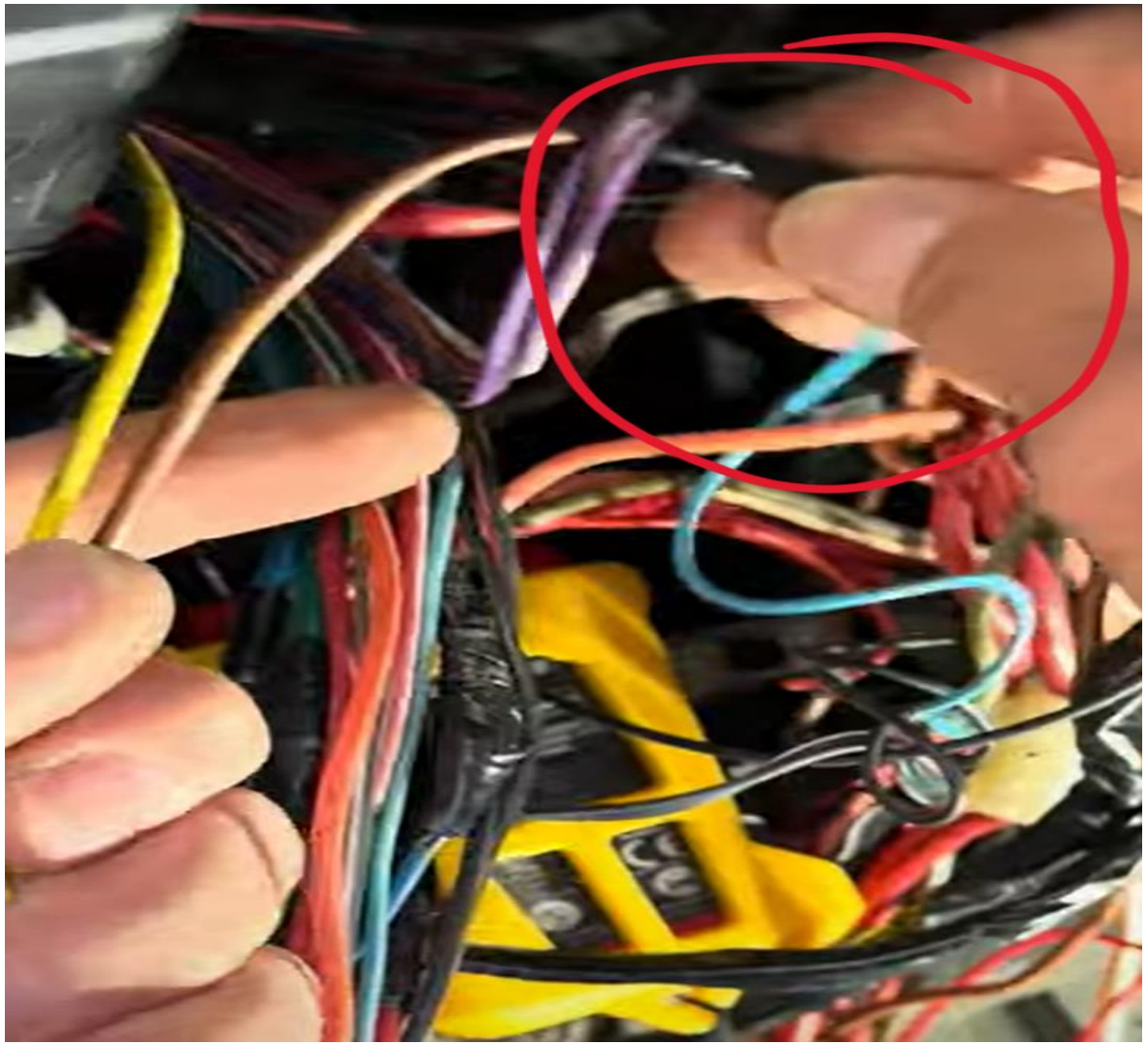
I was going to trace the Dk Blue wire but…

I found the yellow wire from Pin 13 (Starter Relay Wire) spliced into a brown wire.



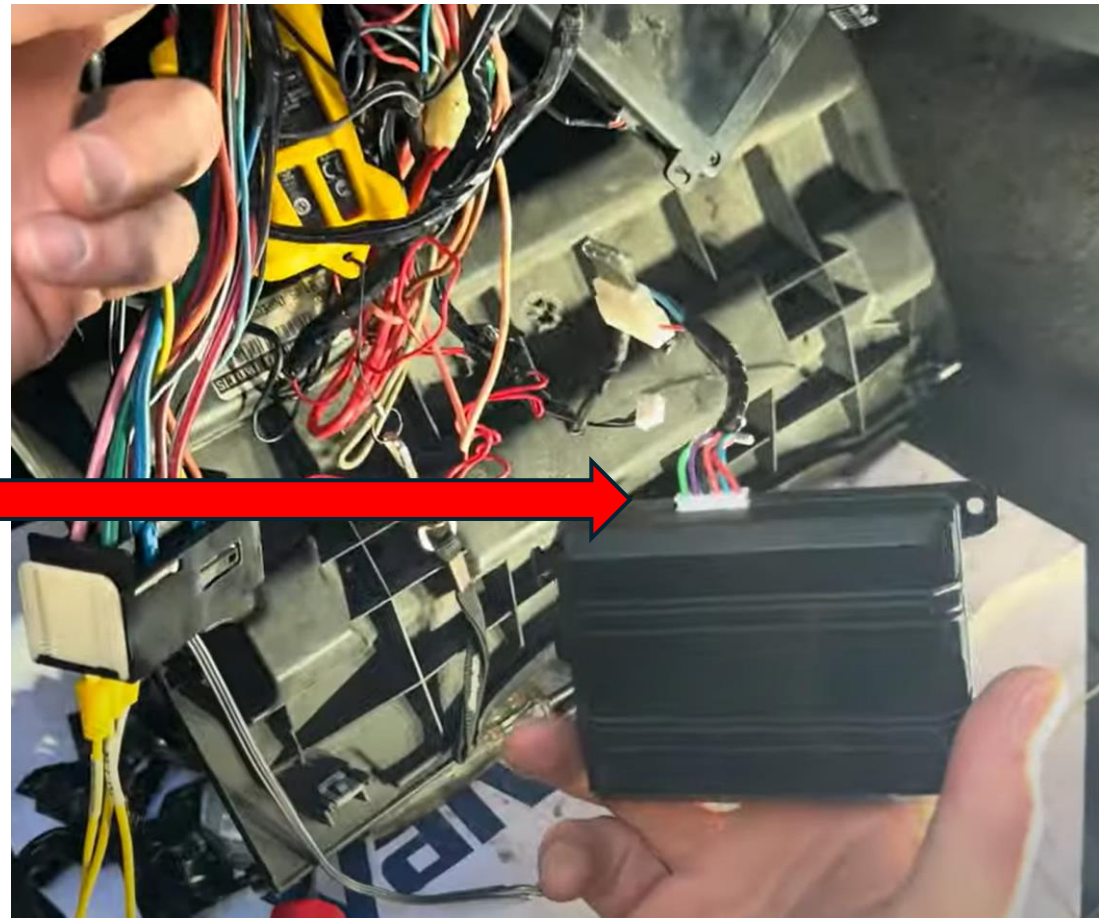
I followed the brown wire…

It was spliced into a small blue wire



So I followed that wire…

- It went to this unknown box. Looks like an alarm.
- I disconnected this connector.

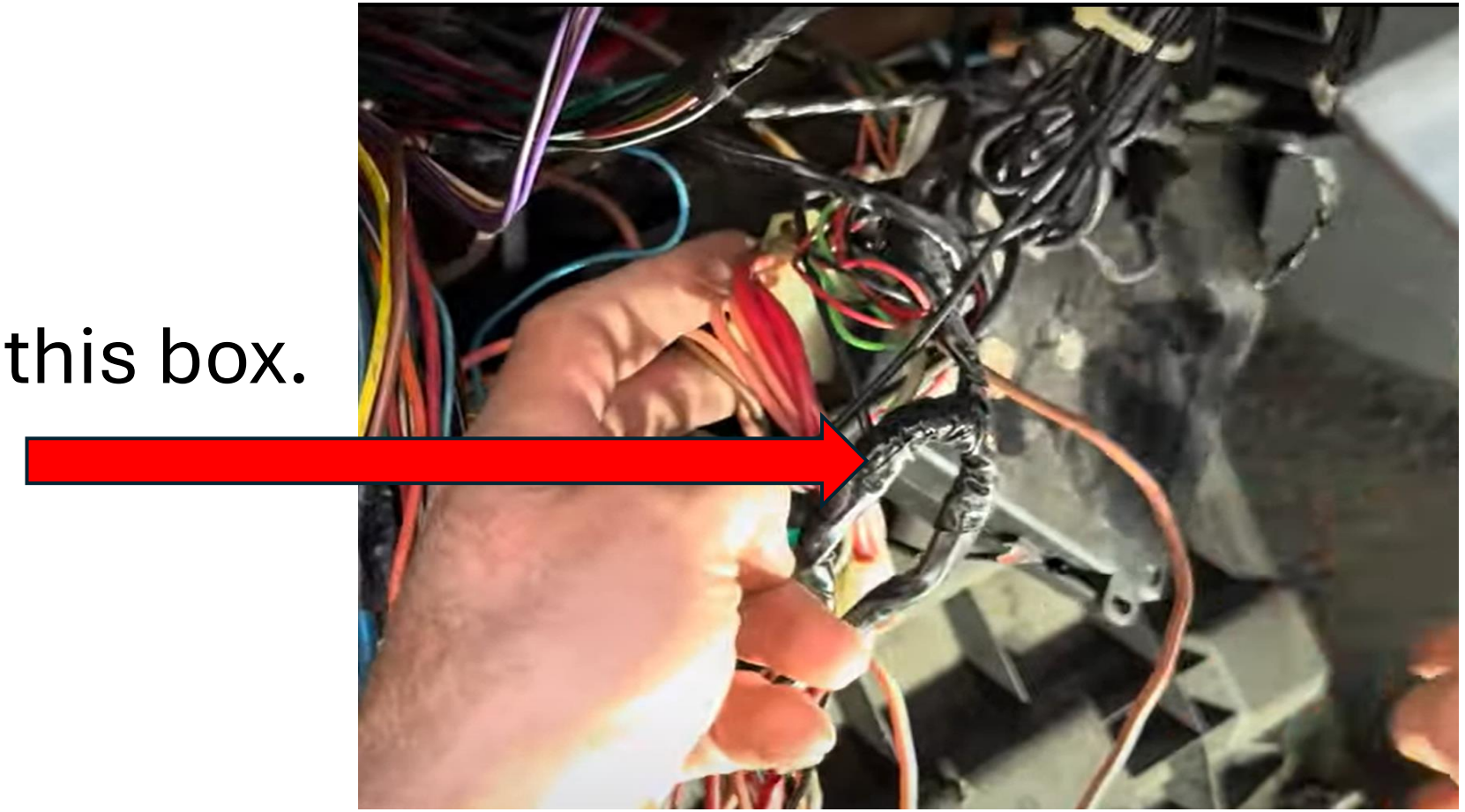


Do I still have power on the yellow wire?

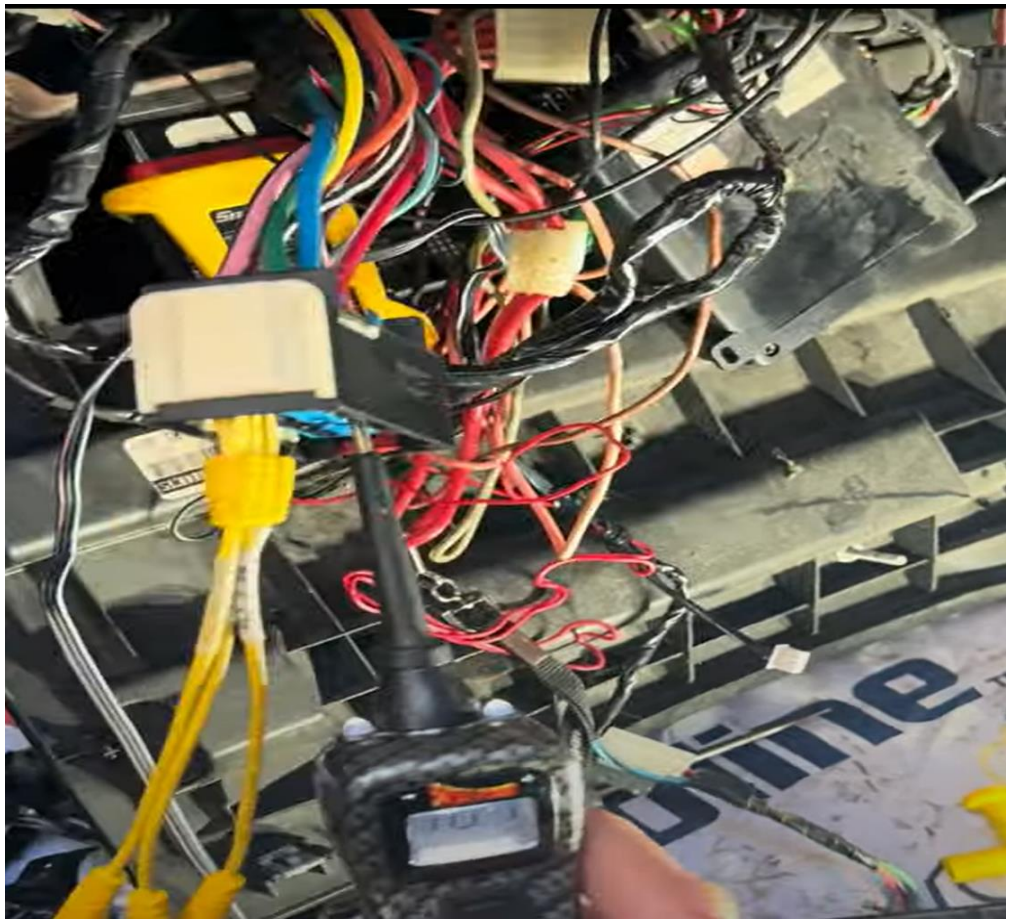
- Yes, I still have the same problem.
- But we are going in the right direction.
- I went back to the brown wire and traced it.

Brown wire goes to a different aftermarket box.

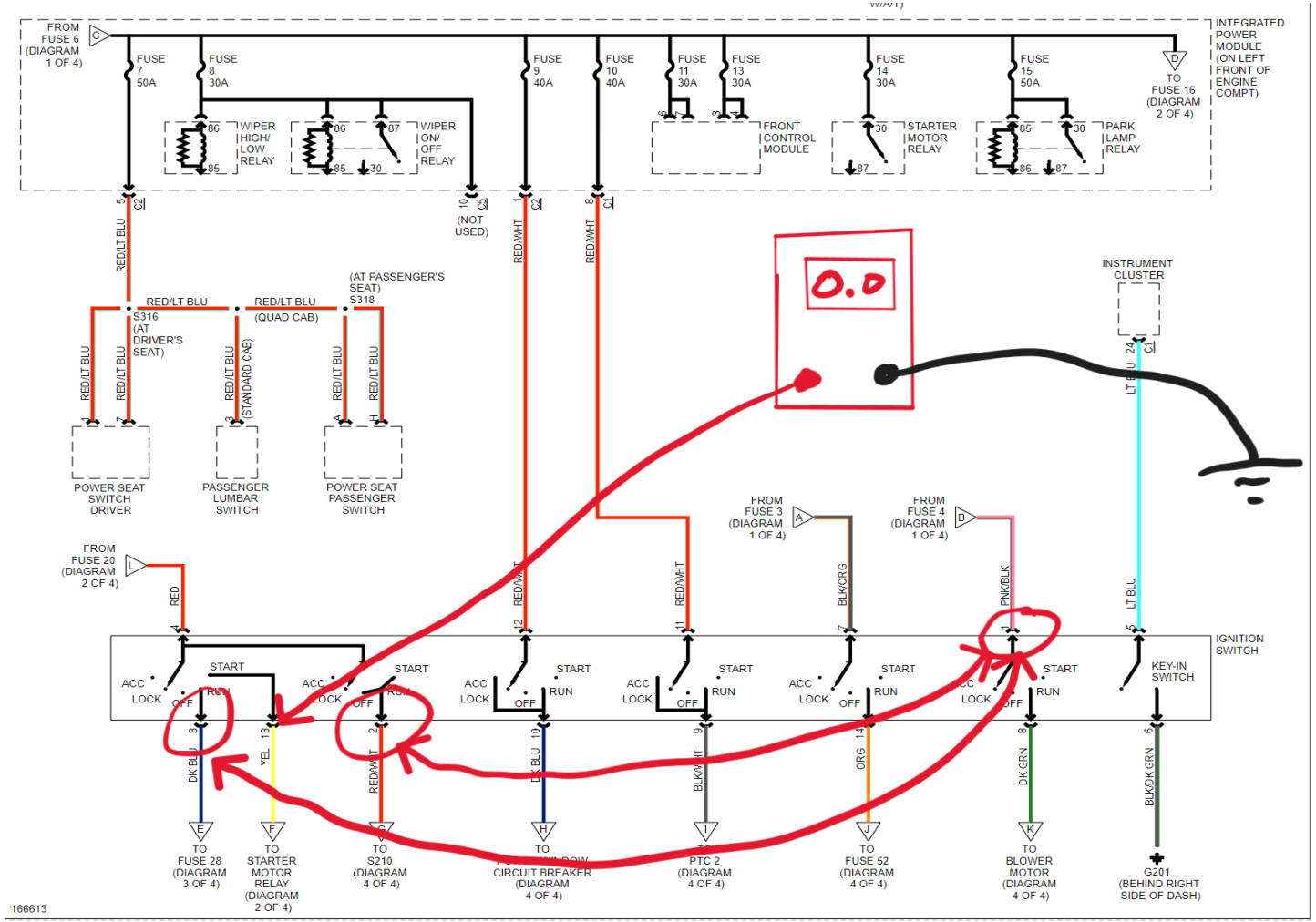
So I disconnect this box.



Power to yellow circuit is gone. It no longer starts with the Dk Blue circuit connected to power.

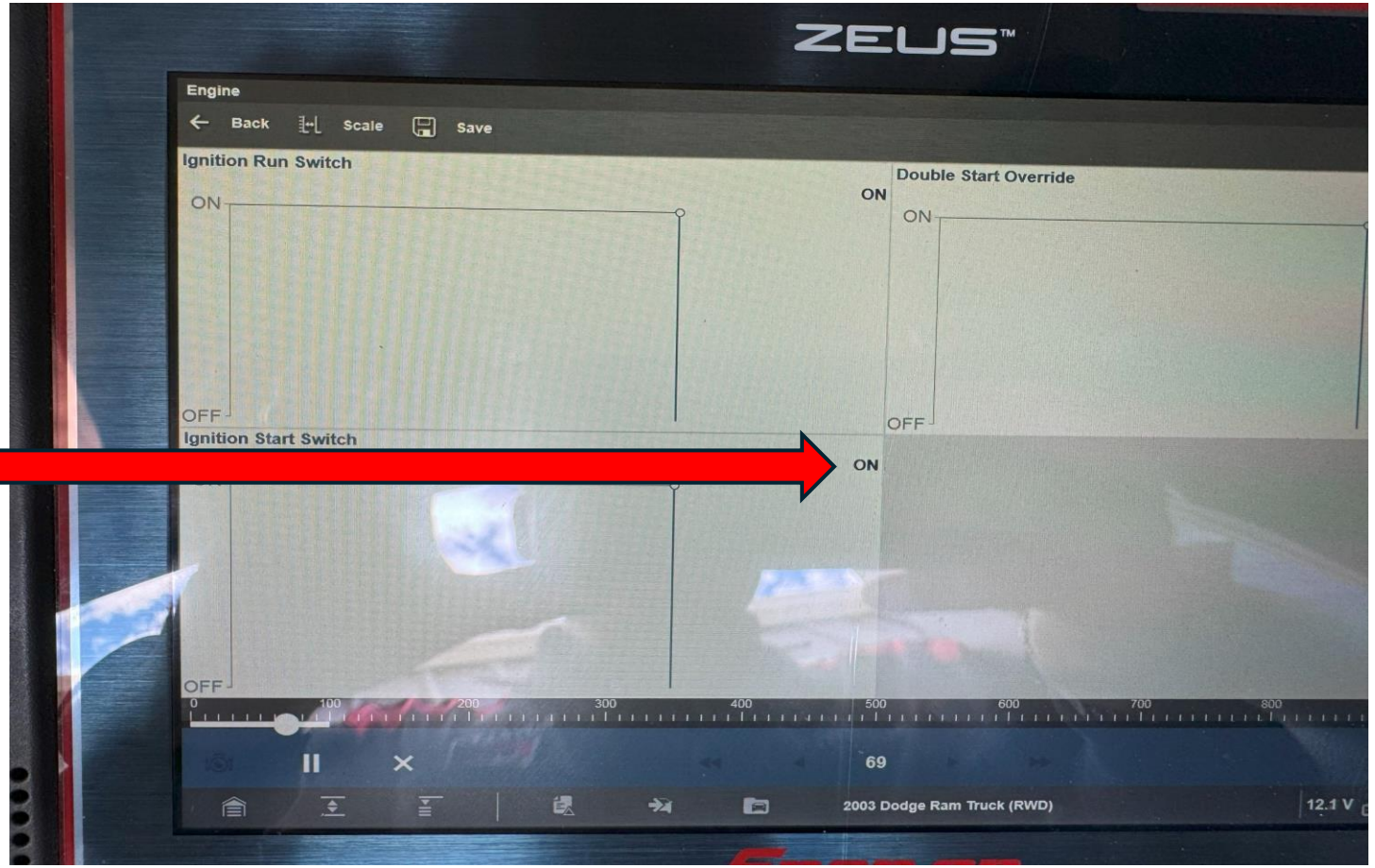


Large aftermarket box disconnected. But not really 0.0v. We are showing 10v but not really power.

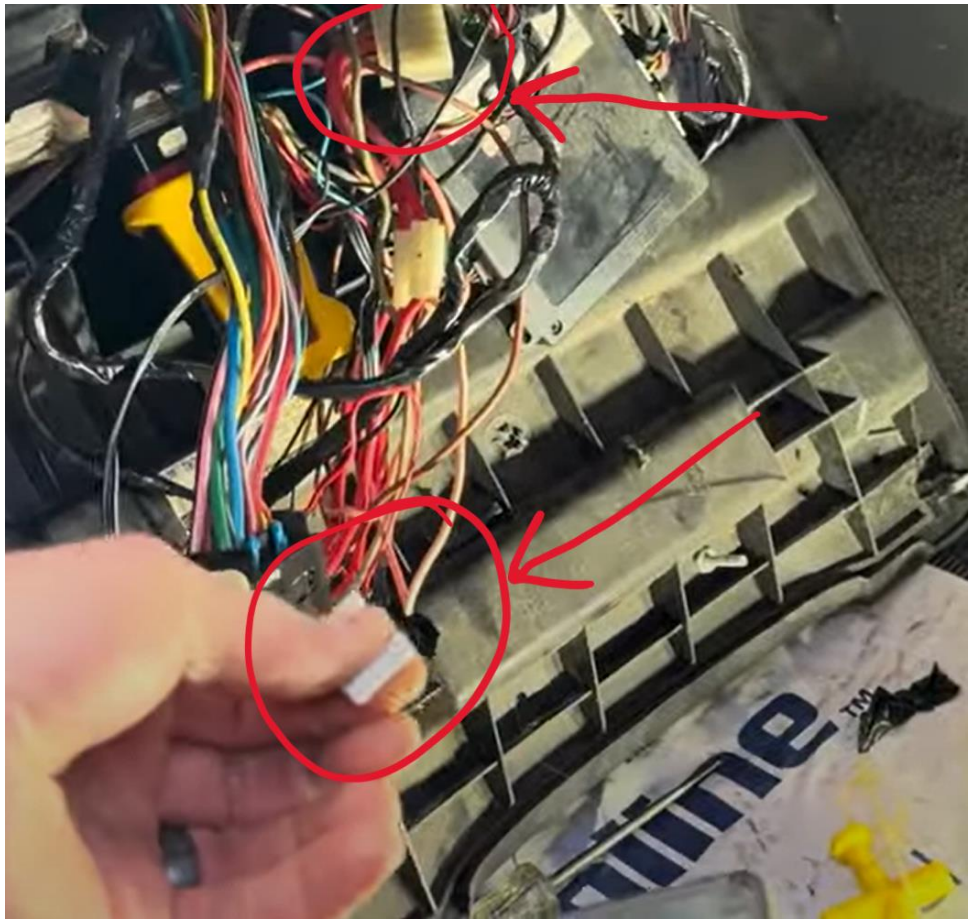


Scan data still shows ignition switch in start position even with yellow circuit disconnected.

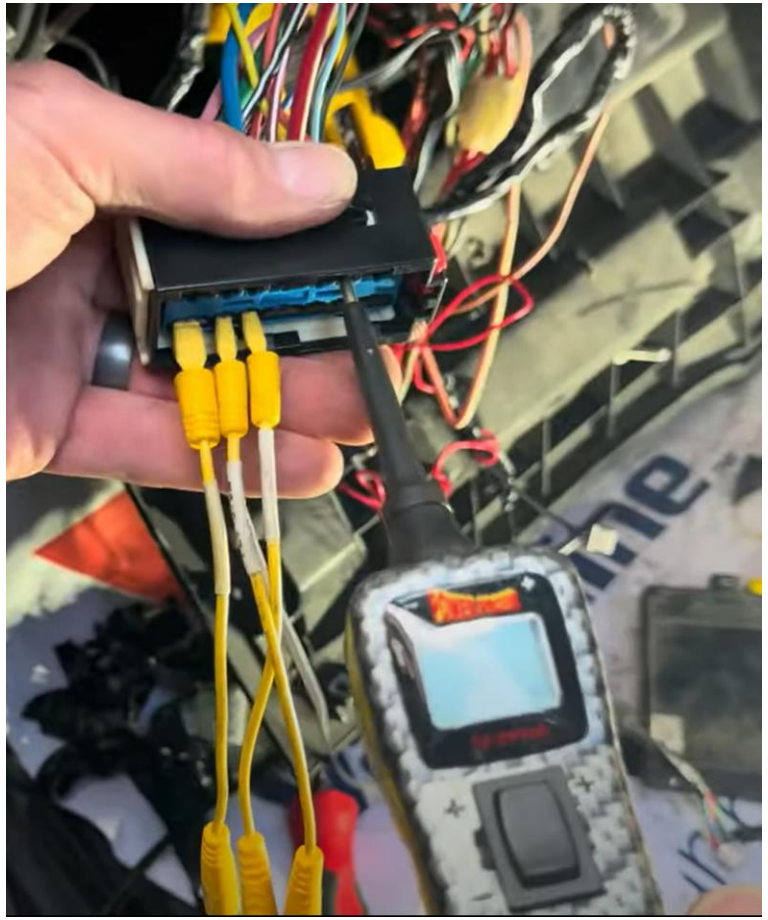
Remember we still have 10v “Ghost” voltage.



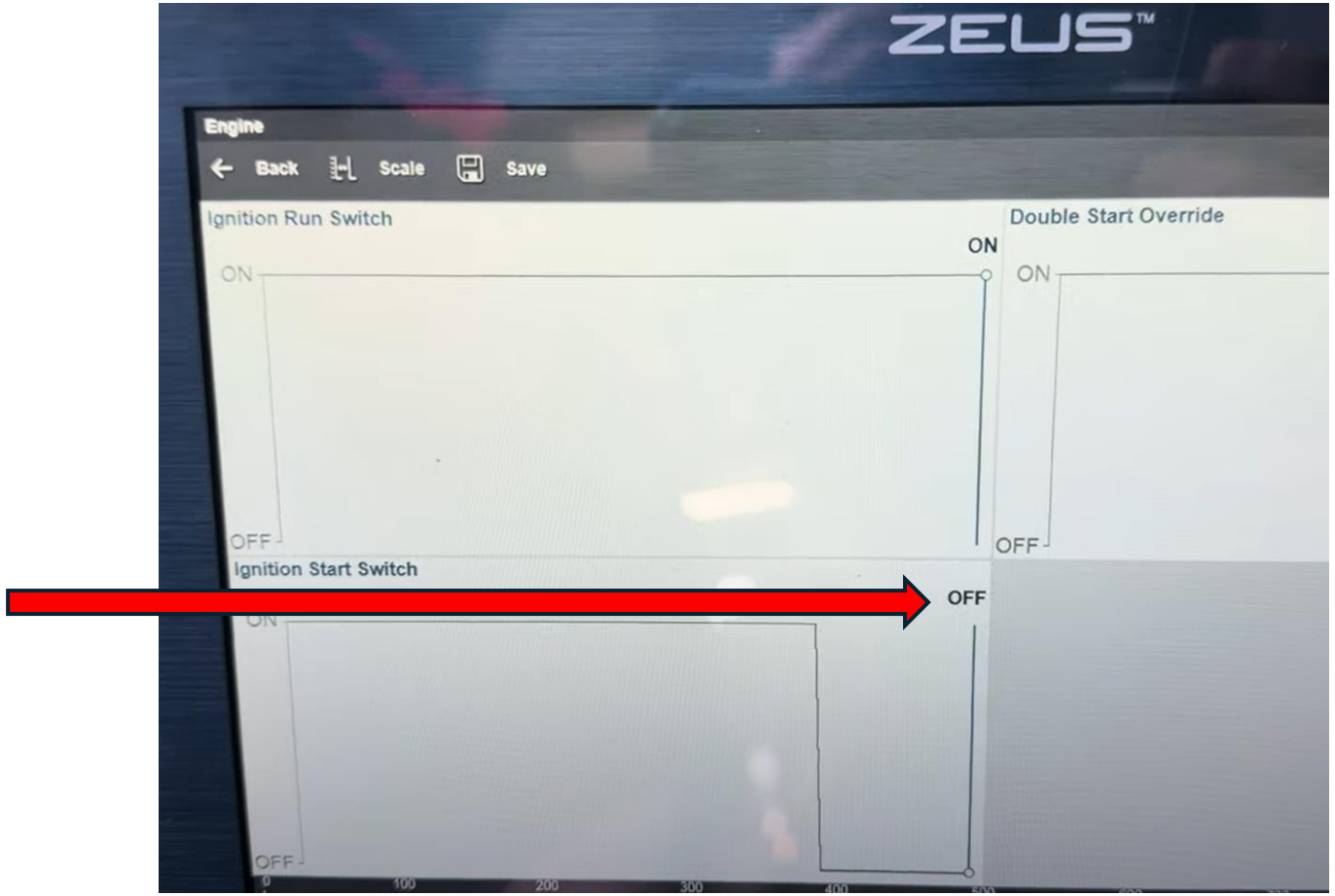
I went back and disconnected the small aftermarket box. So both boxes are now disconnected.



Now we have NO Voltage on yellow starter relay circuit.



And scan data is now correct...



I did find some other splices into the Dk Blue wire.

- At this point the client needed the vehicle.
- I showed him what we did and explained the process.
- I told him I could just leave the boxes disconnected and it would start normally.
- He opted to bring the vehicle back in the future to have all the wiring repaired and brought back to normal.

The original ignition switch was reinstalled and vehicle was reassembled.

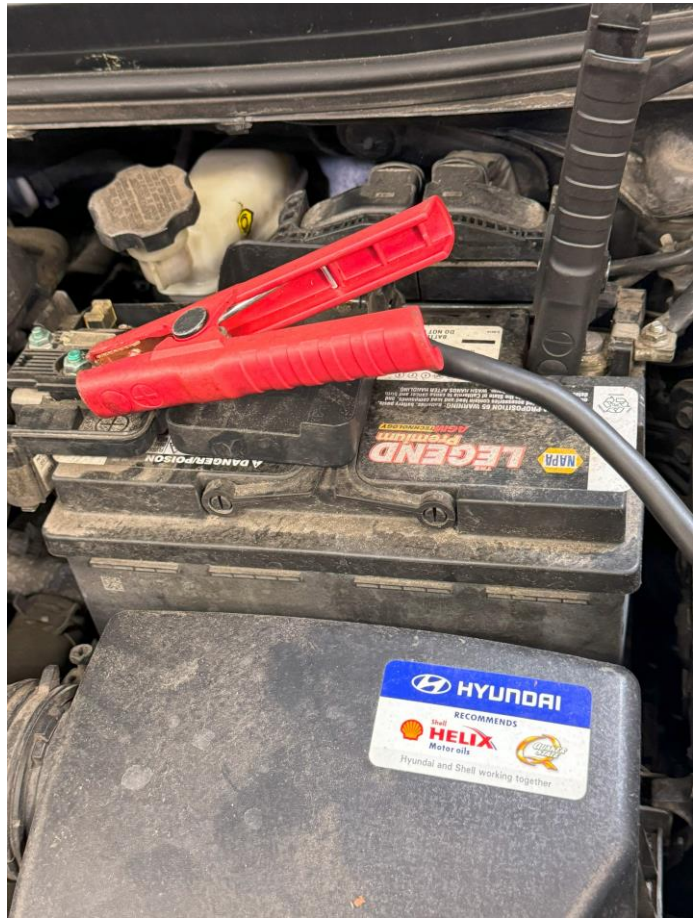
- Engine started normally and client was happy.

2012 Hyundai Elantra 1.8L

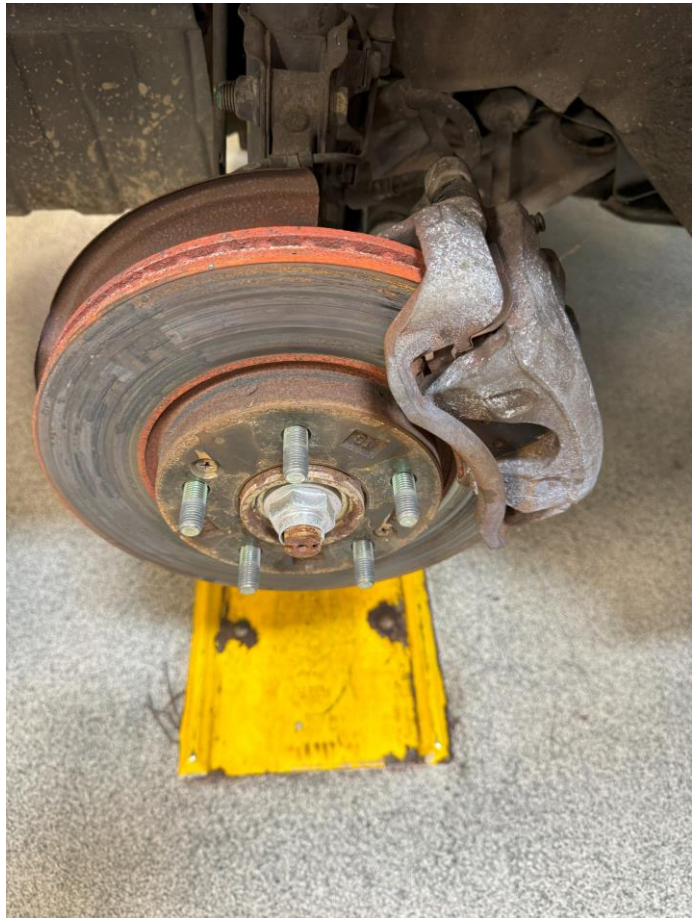
Client States Front Brakes “Caught on Fire”.

The first thing we noticed was we had to boost the battery to start the vehicle.

Who cares, we are just working on the brakes…….Right?



Both front brakes have been extremely hot BUT they are not binding now.



Rear brakes look normal and do not look like they’ve been hot.

So what do we do?

- Just replace the front brake pads, rotors, hoses and calipers?
- Does it need all those replaced?
- I’d say yes due to the signs of heat.
- Do we know that this will fix the problem?
- Let’s look a bit deeper.

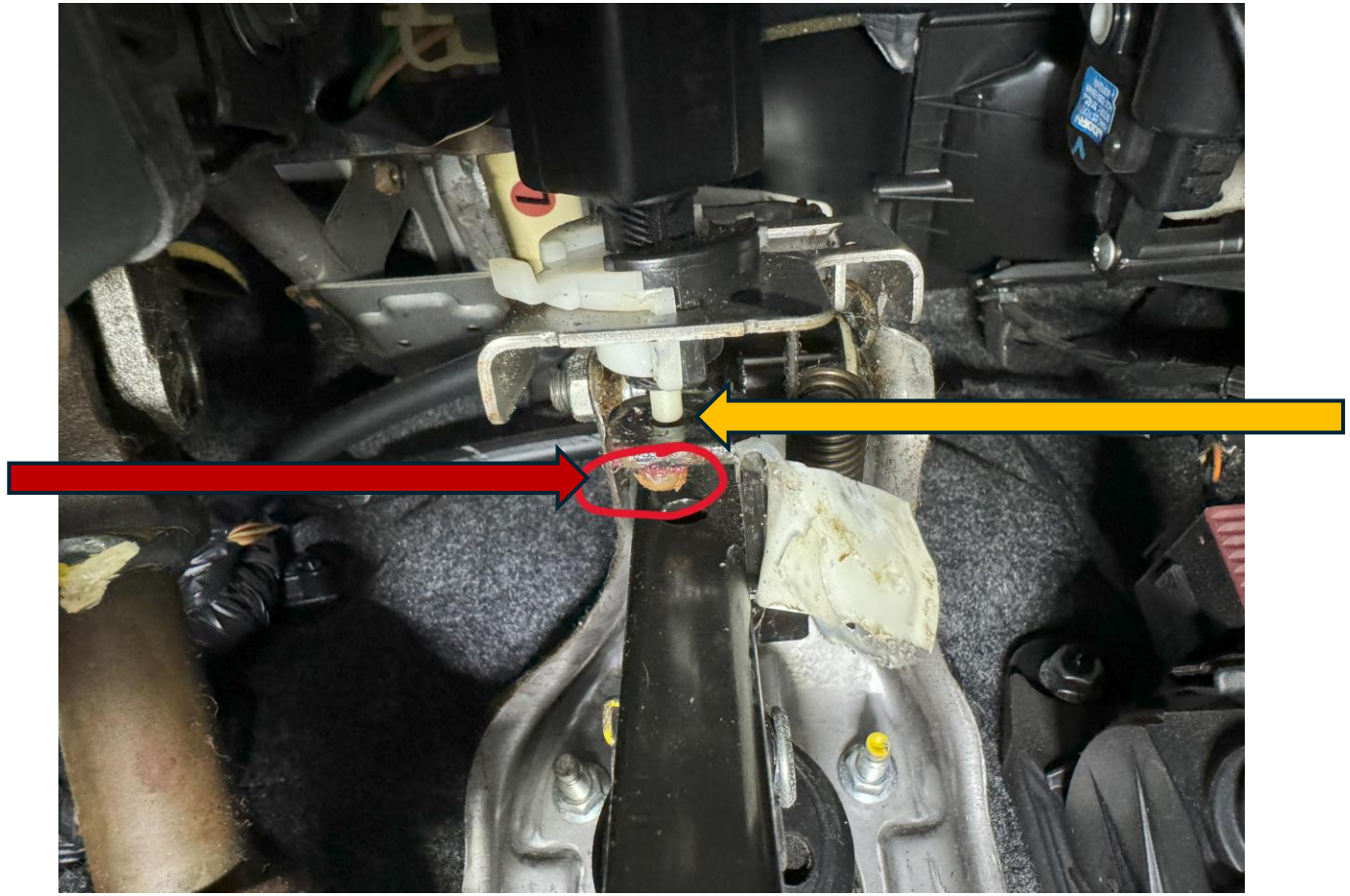
Here are the rear brake lights with the battery boosted.

Brake pedal is NOT depressed.

Could this cause the front brakes to bind?

I looked at brake switch and found this…

Piece of broken insert.

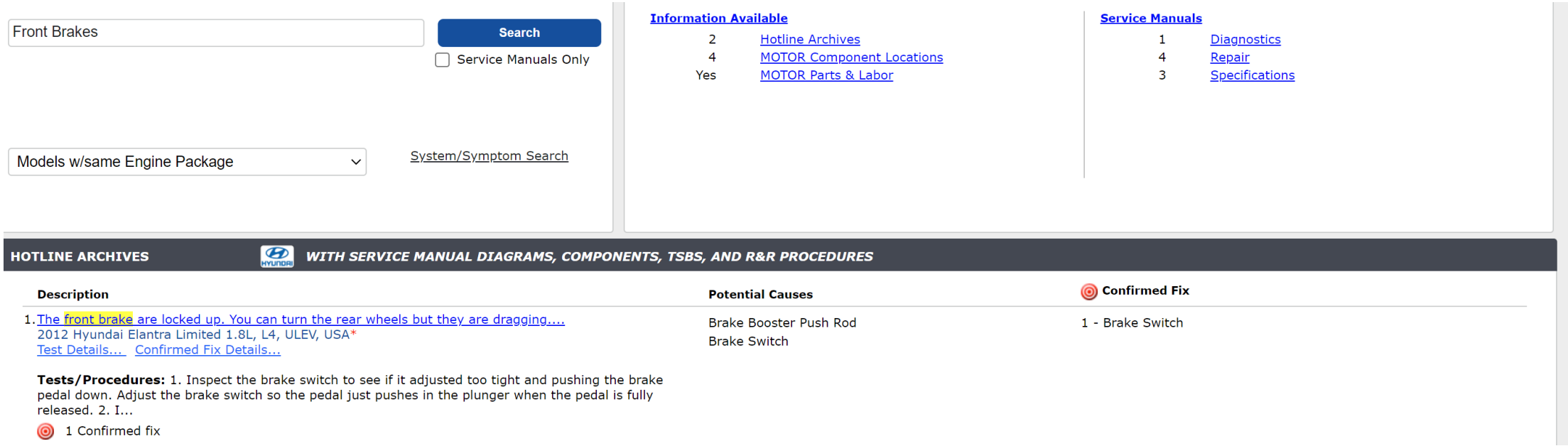


Opening for Insert.

So we found why the battery is dead and the brake lights are stuck on.

- But can this cause the front brakes to bind?
- Let’s do some research.

One Identifix Archive.



At least we have some information that a brake light switch can cause this condition.

2012 Hyundai Elantra GLS 1.8L, L4, PZEV, USA/Canada — Sherwood Cooke - Royalty Auto Service

Hotline Archive — ***With Service Manual diagrams, components, TSBs, and I*** — << | Bookmark | Print Preview ▼ | Print ▼

Number:	638621
Vehicle Application:	2012 Elantra 1.8
Customer Concern:	The front brake are locked up. You can turn the rear wheels but they are dragging.
Average Reported Mileage:	0
Tests/Procedures:	1. Inspect the brake switch to see if it adjusted too tight and pushing the brake pedal down. Adjust the brake switch so the pedal just pushes in the plunger when the pedal is fully released. 2. If the brake switch isn't keeping the brakes applied, loosen the master cylinder mounting nuts and pull the master cylinder away from the booster. If the brakes release, adjust the push rod in the brake booster so it is not keeping the brakes applied.
Author:	Robert Johnson
Potential Causes	***With Service Manual diagrams, components, TSBs, and R&R procedures*** ⊞ Brake Booster Push Rod ⊞ Brake Switch
Confirmed Fix Summary **Confirmed Fix**	***With Service Manual diagrams, components, TSBs, and R&R procedures*** ⊞ 1 - Adjusted Brake Switch

Confirmed Fix Details

	Tech	Reported Fix Details	Confirmed Fix
1	David Allen September 19, 2022	2013 Hyundai Elantra, GLS 1.8L, L4, ULEV, USA * Brake Switch - *Incorrectly installed brake light switch causing pedal to stick slightly*	Adjusted Brake Switch

I installed a new insert in the brake pedal.

- After this was installed we could not get the brakes to bind.
- I felt like the Brake Light Switch bound up and caused the insert to break.
- I recommended a new Brake Light Switch and all front brake components as well as a Brake Fluid Flush.
- I also recommended a new battery.
- All repairs were authorized.
- After this was performed the brakes functioned normally.

Why did I include this case study?

- When we go to Case Study classes they are usually filled with crazy diagnostics. Every vehicle seems like some wild rollercoaster ride with all kinds of testing and digging.
- They are fun to see, especially since we didn’t have to actually live through it!
- BUT is there a downside to this?

NOT EVERY VEHICLE IS SOME CRAZY CASE STUDY!

- There is a reason that a lot of instructors will pay for a well documented case study. They can be few and far between.
- We have to remember that the vast majority of vehicles we work on are just normal problems.
- If we follow a logical diagnostic approach we will get to the answer quickly and efficiently.
- Don’t over complicate what should be simple diagnostics.
- NO, That tail light bulb is not causing a number 4 misfire!

And One Last Time...

Stay Out of The Rabbit Hole My Friends!


Thank
You