



TECH TIMES

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KGIS ENHANCED SEARCH

Kia University is pleased to introduce an all new way of searching for service information: "KGIS Enhanced Search". This feature due to be released by mid-December, will enable Kia service technicians to find related service information easily and more effective.

To take full advantage of the new KGIS Enhanced Search feature, simply refer to the new search fields located below the KGIS Enhanced Search banner (Fig 1). Fill out the information for the vehicle you are working on, then type your search criteria including your search topic and click "Search" button.

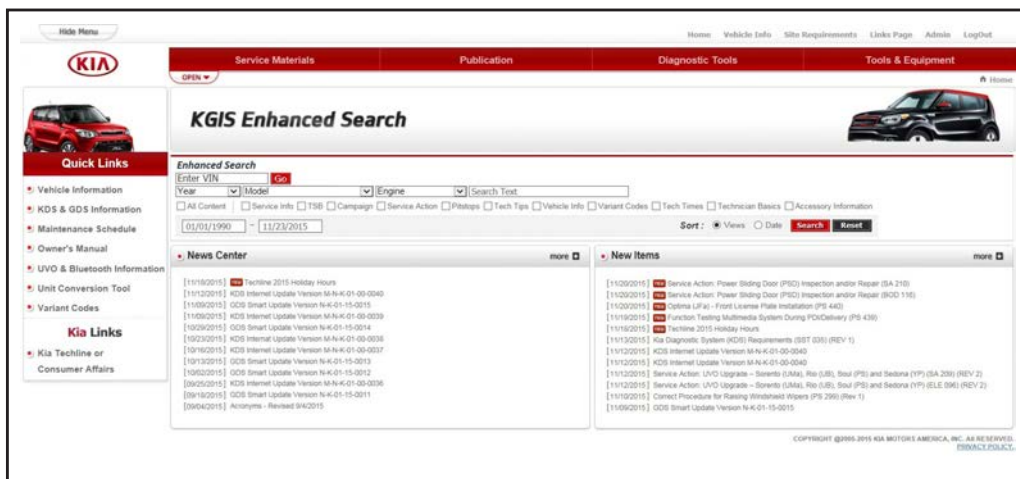


Fig. 1

Below are a few examples of the new updated KGIS features.

KGIS Enhanced Search:

- The New "Enhanced Search" and "Hit List" results will be based on actual Table of Contents (TOC) with auto expansion of service information.
- Incorporating the Service Information table of contents and selected page will be synced to the table of contents.
- Search results hit list will include model and engine type for easy identification.
- Improved search performance with the new auto populated keyword list, helps to eliminate spelling errors.
- New window page view will include the auto selected table of contents from the target pages.

TECHLINE FAQs

QUESTION	ANSWER
Q: Why hasn't my engine PWA case been approved yet?	A: Approvals to PWA cases can be delayed if the Engine Core Data Form (WRTY143) was not attached to the case, or does not have both the Service Managers and the Technicians signatures. It can also occur when the required Removed Part and Serial Numbers and/or Installed Part and Serial Numbers information is missing on the form or if there is not enough information to make an informed decision. Please be sure to complete this form in its entirety and put all the relevant information in the case during creation.
Q: Where do I find the WRTY143 Core Data Form for engine PWA warranty cases?	A: The printable version of the PDF file for the WRTY143 Core Data Form can be found at KDealer.com by clicking Fixed Ops on the top navigation panel, then scroll down to Warranty Forms and select WRTY143 Engine Techline PWA Form.
Q: I have a PWA case that was authorized and now my Warranty Administrator is asking for the PWA authorization number. How do I obtain this information?	A: The PWA number is automatically generated by the Web-DCS system once the PWA is authorized. It is attached to the vehicle VIN and will be automatically attached to the warranty claim when submitted by your Warranty Administrator.
Q: What is the best way to locate an electrical component when it is not clear in the service information?	A: Look up the component under system wiring diagram and then click on the connector number. It will show you a picture of the location of the component.

LATEST TECHNICAL SERVICE BULLETINS, SERVICE ACTIONS AND CAMPAIGNS

SC 125	Steering Gear Assembly Pinion Plug (2014 - 2016MY PS, 2016MY PS EV)
SA 212	Service Action: Inaccurate Reading From Fuel Gauge (2016MY JFA)
SA 098	Service Action: Base Audio Head Unit Replacement (2016MY JFA)
ELE 095	Sirius XM Satellite Radio Troubleshooting (All Models w/ Sirius)
SA 210	Service Action: Power Sliding Door (PSD) Inspection and/or Repair (2015 - 2016MY YP)
SST 035r1	Kia Diagnostic System (KDS) Requirements (All Models)
SA 209r2	Service Action: UVO Upgrade (2016MY UMA, UB, PS, YP)
BOD 119	Combined TSB/Service Action: Fuel Filler Door Adjustment (SA202) (2015 - 2016MY YP)

 CAUTION

Vehicle servicing performed by untrained persons could result in damage to the vehicle.

 WARNING

- Vehicle servicing performed by untrained persons could result in injury to those persons or to others.
- Always take proper and necessary safety precautions when performing any type of service on a vehicle.
- The Kia technician newsletter (Tech Times) is intended for use by professional Kia automotive technicians only. It is written to inform technicians of conditions that may occur on some vehicles. Trained Kia technicians have the equipment, tools, safety instructions, publications and expertise to help perform the job correctly.

NOTICE

The topics covered in this newsletter are designed to assist you with the diagnosis and repair of specific vehicle conditions. Just because a condition is described in this newsletter, do not assume that it applies to your vehicle, or that your vehicle will have that condition. In all cases, the procedures in the applicable Service Manual and/or Electrical Troubleshooting Manual or on KGIS should be performed first.

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TECHLINE 2015 - 2016 HOLIDAY HOURS

CHRISTMAS	
Monday, December 21	5:00AM to 4:30 PM PST
Tuesday, December 22	5:00AM to 4:30 PM PST
Wednesday, December 23	5:00AM to 4:30 PM PST
Thursday, December 24	Closed
Friday, December 25	Closed
Saturday, December 26	7:00 AM to 2:00 PM PST
NEW YEARS	
Monday, December 28	6:00AM to 3:00PM PST*
Tuesday, December 29	6:00AM to 3:00PM PST*
Wednesday, December 30	6:00AM to 3:00PM PST*
Thursday, December 31	Closed
Friday, January 1	Closed
Saturday, January 2	7:00 AM to 2:00 PM PST

*Note: Techline staff will be limited during holiday hours. Business hours will resume to normal (5:00AM to 4:30PM PST) January 4, 2016. Schedule subject to change without notice

ELITE TECHNICIAN CERTIFICATION

Are you certified yet? You have less than a month to attain your certification achievement. You only need to complete your online web-based courses to be certified for Maintenance Technician and Professional Level Elite Certification.

Time is running out so don't wait until the certification deadline on **December 31, 2015** to complete your certification for 2016 calendar year.

As a reminder, you'll need to achieve at least your Professional Elite Certification to qualify for all the fantastic awards in both the Kia Elite Certification and Kia Service Elite Program. To check your certification status, follow these steps below:

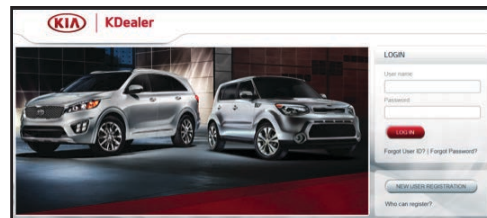
- Go to www.KDealer.com and enter your login information.
- Click on the Kia University icon, then KiaUniversity.com.
- Click on the Certification progress bar on the top left menu bar under "My Performance" and this will take you to your Certification Attainment Report.

HIGHER LEVEL = BIGGER AWARDS!

PROFESSIONAL ELITE → SENIOR ELITE → MASTER ELITE

elite CERTIFIED

Watch your awards grow as you get smarter!
See program guide for more details.



Certification Attainment Report

COURSE	TITLE	STATUS
CERT15-TEC-MTN	Maintenance Elite	
TEC-01-020-1	Web: Pre-Delivery Inspection Technician Test	Completed
TEC-01-020-1	Web: Kia Auto Trans Maintenance Course & Test	Completed
TEC-01-023-1	Web: Intro to GDS VE Course & Test	Completed
TEC-01-021-1	Web: Engaging the Kia Brand Perception Gap (Technical)	Completed
TEC-01-027-1	Web: Intro to iVVO eServices Course & Test	Completed
CERT15-TEC-PRO	Professional Elite	
TEC-01-021-1	Web: Intro to On-Board Diagnostic Course & Test	Completed
TEC-01-020-1	Web: Intro to Engine Management Systems	Completed
TEC-01-015-1	Web: Intro to Mechanical Diagnosis Course & Test	Completed
TEC-01-028-1	Web: Air Conditioning Diagnosis Update Course & Test	Completed
TEC-01-024-1	Web: Intro to Kia Auto Electrical Course & Test	Completed
TEC-01-021-1	Web: Intro to Kia Circuit Diagram Analysis Course & Test	Completed

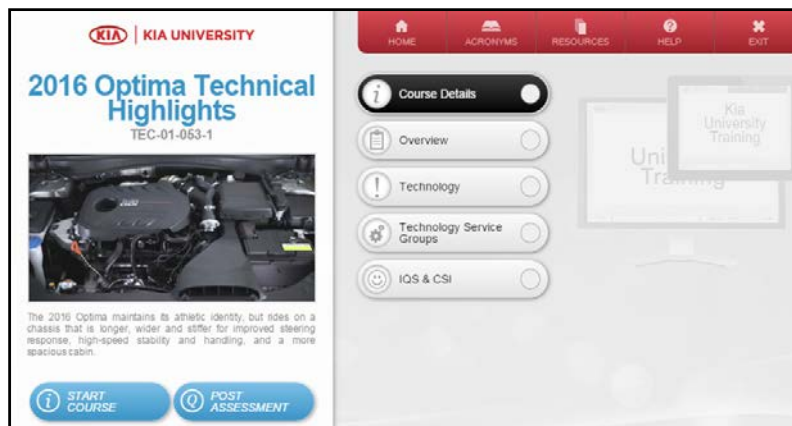
NEW 2016 OPTIMA TECHNICAL HIGHLIGHTS AVAILABLE ON KIA UNIVERSITY WEB SITE

Kia University is pleased to announce the all-new 2016 Optima Technical Highlights web course available for dealership personnel at Kdealer.com. Click the Kia University Link to access this web-based course, which is required for Service Technician's certification.

With the 2016 Optima Technical Highlights web course (TEC-01-053-1), service technicians will learn about new technologies and key features including:

- 1.6L Turbo powertrain service
- 7 speed Dual Clutch Automatic Transmission (DCT) service
- Autonomous Emergency Braking (AEB) operation
- Wireless Power Charging (WPC) process
- Safety and Convenience systems operation

With these new technologies please consider taking this course at your earliest convenience.



UNDERSTANDING WHEN TO OPEN A TECHLINE PWA CASE

Greetings Kia Technicians!

Techline is now approving certain Prior Warranty Authorization requests (TL-PWA) for non-DSA dealers (Automatic Transmissions and Engines as of 10/5/2015). Whenever a customer comes into your dealership with a concern with one of these components, it is very important to make sure the vehicle has any/all open service campaigns and updates performed. After you have verified that this has been completed, you can begin your diagnosis of the concern. If assistance with diagnosis is needed, you will need to create a Techline Repair Assistance (RA) case so we can assist you with diagnosing the concern. If you don't need any assistance with diagnosis and determine an engine or transmission needs to be replaced or repaired, you will need to open a TL-PWA case so you can get the necessary approval to proceed PRIOR to actually replacing/repairing the engine or transmission. Here are some simple guidelines to follow when creating your TL-PWA cases to avoid unnecessary delays and confusion.

- Techline must approve TL-PWA cases PRIOR to commencing the repairs. Any TL-PWA cases that are created after the vehicle has already been repaired will be denied. Techline decisions on TL-PWA cases are sent via email, so it is very important to make sure your contact information is up to date. If updates are needed, please notify KDealer.
- It is critical to make sure during your TL-PWA case creation process, that you review and understand all case creation questions prior to selecting your answers, particularly the final statement regarding maintenance records, photos, etc. If you are unable to check the box to certify that you have agreed to the final statement confirming vehicle maintenance, you should not proceed with creating the TL-PWA case as this process is used for warranty situations only.
- If you are working on an ENGINE concern and find evidence of sludge, you must ask your Service Advisor to contact the customer so they can be asked to provide the proper maintenance records. If the customer is unable to provide maintenance records, the engine failure would not be a warrantable item since it was caused by a lack of maintenance. In this case, you DO NOT open a TL-PWA case.

- If you are working on an ENGINE concern and find evidence of sludge and the Service Advisor has contacted the customer and the customer was able to produce all their maintenance records, you would then open a TL-PWA case, select the appropriate answers to all the questions during the case creation process, provide a detailed accurate description of the issue including your diagnosis, and complete and attach the core worksheet WRTY-143 (separately from any other attachments). The Techline agent handling the case will review the information provided in order to make an authorization decision. The Techline agent will then immediately close the case after making their decision and you will receive that decision via email.
- ALL TL-PWA requests for engines must have the WRTY-143 core data form completed, signed by both the Technician and the Service Manager, and attached to the TL-PWA case where the final disposition is a warranty repair.

Following these simple guidelines will ensure there is no delay in the handling of your TL PWA cases and as a result, you will be able to resolve your customers concerns more quickly resulting in higher CSI scores and customer retention.

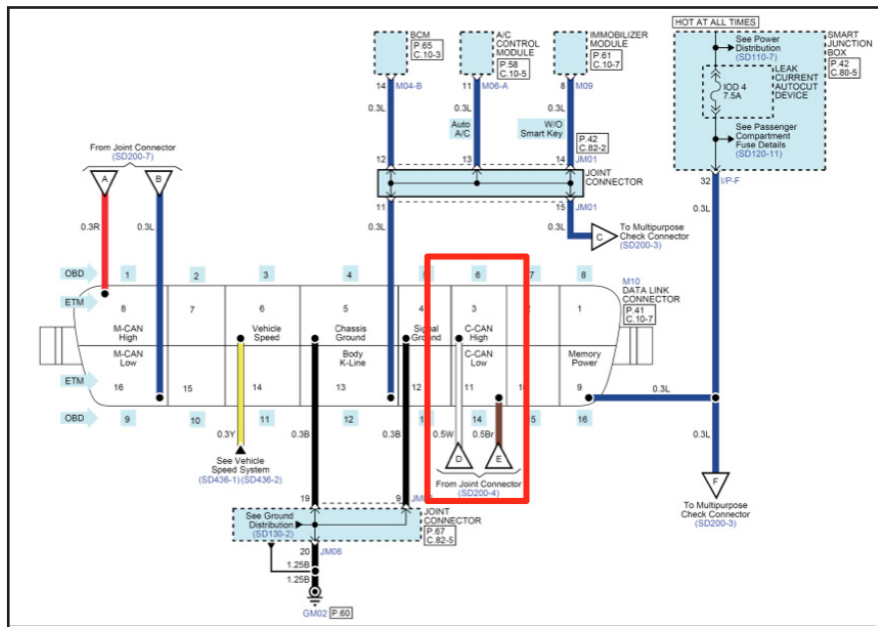
Best Regards,

Tony Cartagena
Techline Communications Manager -
Kia Motors America

JOE'S CORNER: A MAP, A MAP! MY TOOLBOX FOR A MAP!

Welcome back to Joe's Corner.

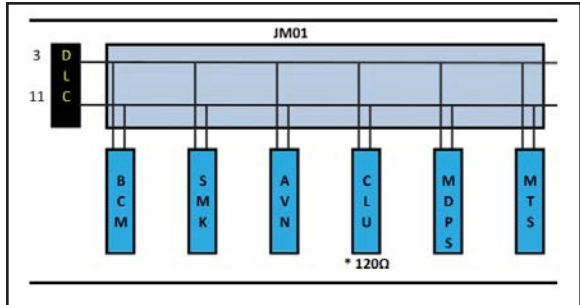
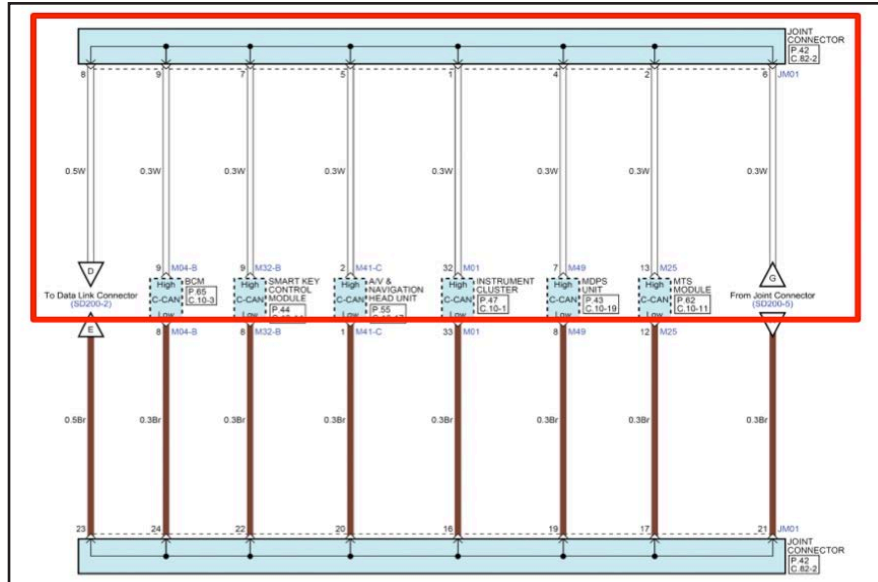
Diagnosing a CAN Line fault is much easier if you have a map. Building a Topology map will show you which modules are on the bus and how they are connected.



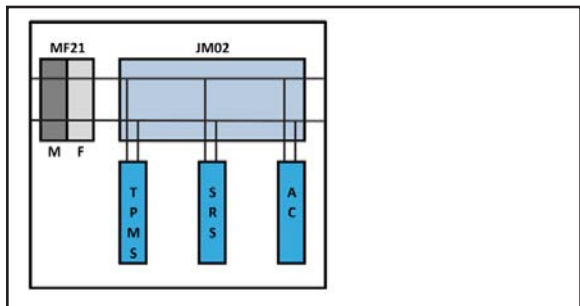
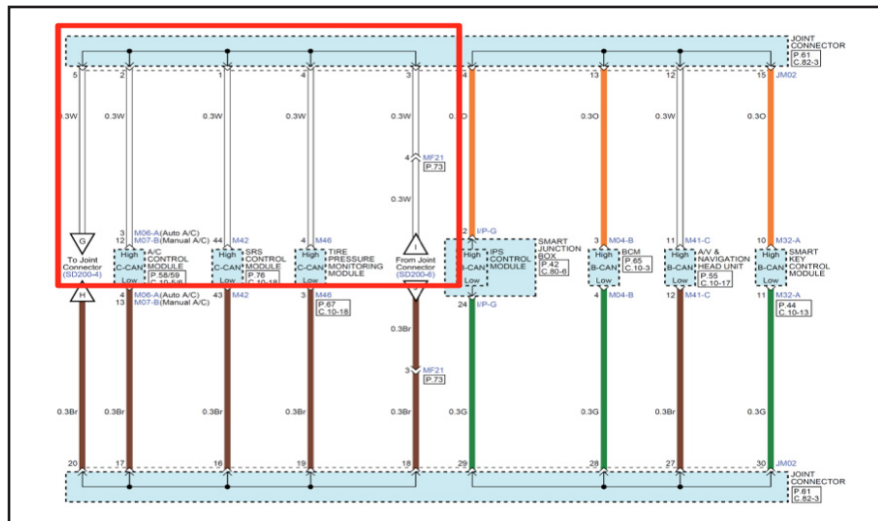
TOPOLOGY: The way which parts are interrelated or arranged.

In this article, I will show you how to build a topology map using the data-link detail schematics. First, print all the schematics related to the C-CAN.

First we will start at the Data Link Connector (DLC). To make it easier we will use only the C-CAN High Line. In this example the High Line goes to a Joint Connector that is indicated by the D in the Arrow Symbol.



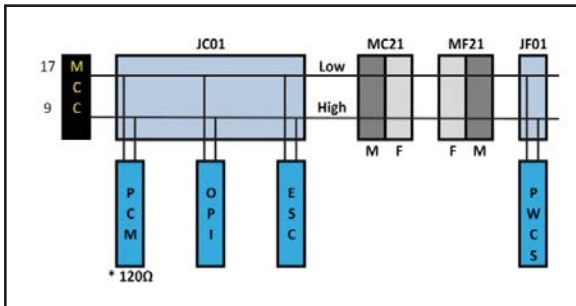
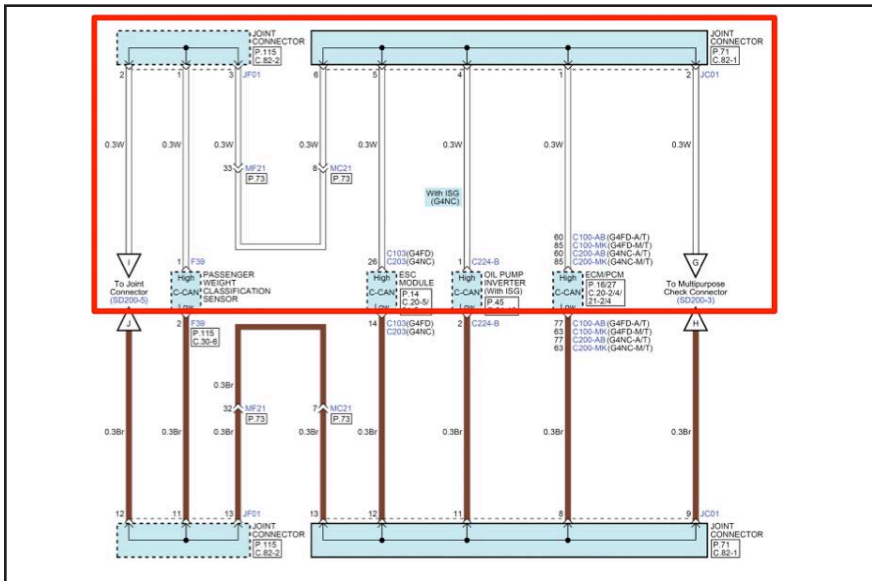
This section has only one (1) Joint Connector JM01 which has eight terminals. D is from the DLC and G goes to Joint Connector JM02



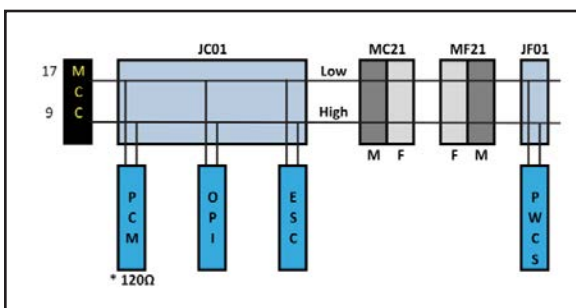
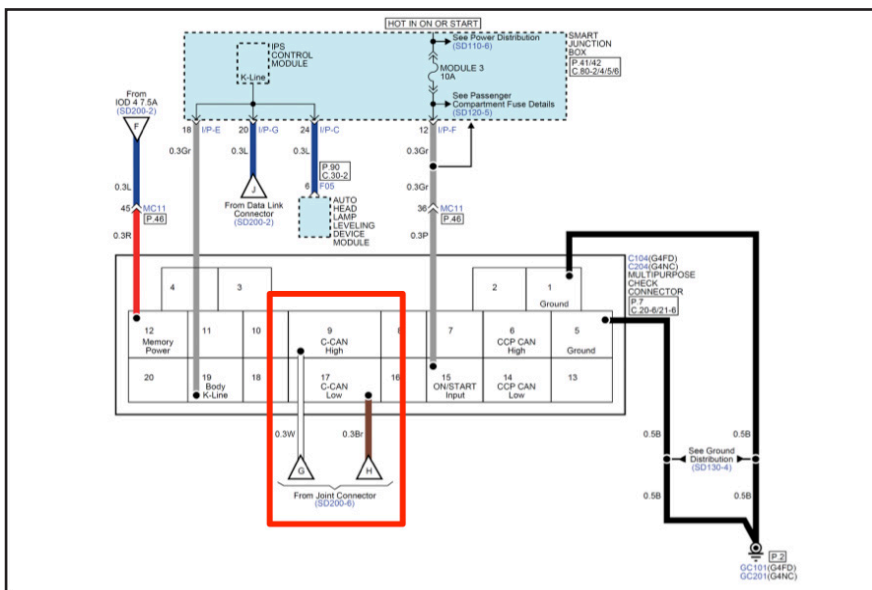
This section has only a portion of Joint Connector JM02 with five (5) terminals and one (1) harness connector MF21

(Continued next page)

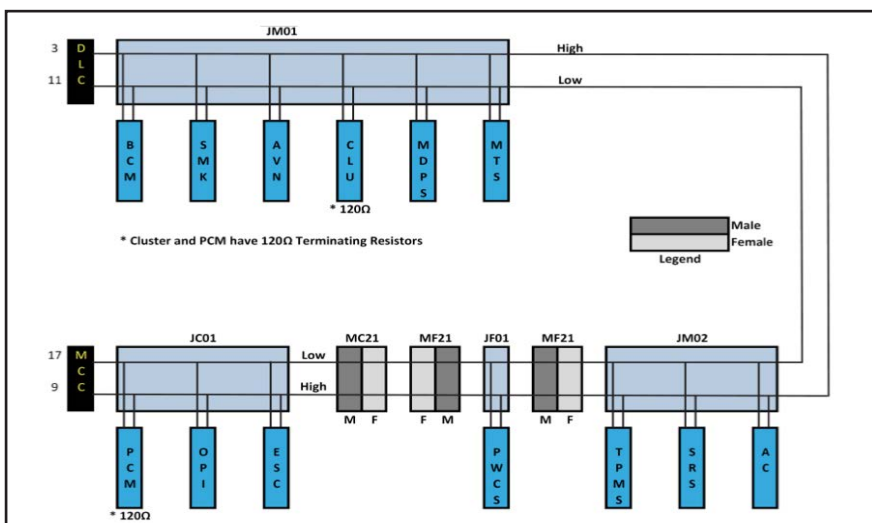
JOE'S CORNER: A MAP, A MAP! MY TOOLBOX FOR A MAP! (CONTINUED)



This section has two Joint Connectors JF01 and JC01. It also has two (2) harness connectors MF21 and MC21



G from Joint Connector JC01 goes to the Multipurpose Check Connector MCC



When you put it all together, it should look like this. Now in this configuration, you can visually determine where and what you can disconnect to reduce the amount of time to diagnose a C-CAN fault.

In the next issue, I will show you how to use the oscilloscope to diagnose C-CAN faults. "To See What Condition My Condition Is In." (Kenny Rogers & the First Edition) What the Scope can tell you about a C-CAN fault.

TEST YOUR TECH TIMES KNOWLEDGE

Test your knowledge of the articles in this issue of Tech Times; unscramble each word on the right using the clues on the left.

1. Currently select Android™ and iPhone® devices are the only devices compatible with the full suite of UVO?

R V E E I S C S E

2. When opening a Techline case for connector issues, it is recommended that you include connector number, pin location & number, concern along with?

U R I P C E T

3. The 2016 JFA Optima SVM module is located under this seat?

N O S S G E P A F E R T N R (two words)

4. Depending on the type of fuel delivery system, injectors have a different pulse width?

A O I T O E M P T R I N E (two words)

5. The approval of PWA cases can be delayed if this data form is not attached to the Techline case?

I G O R N E N C E E (two words)

6. Disconnecting a large vacuum hose will create this condition?

N F U A L E L E (two words)

7. A film build-up on inside windows from new vehicles maybe caused by?

S G A N S I O G U T (two words)

8. Using this auto populated list, will help eliminate spelling errors?

O E R Y D K W

9. Improper component operation and/or CAN codes can occur when using this type of equipment?

M R E A K T E R F T A

10. A lean condition will cause the PCM to adjust the injector PWM?

R E H G H I

11. One of the new JFA Optima features is the use of this emergency braking operation?

T O S U O A O N U M

12. Building this type of map will help technicians diagnose CAN line faults easier?

O O L P Y G O T

SIMPLIFIED UVO eSERVICES ACTIVATION PROCEDURE

This article outlines the simplified activation procedure for vehicles equipped with UVO eServices.

STEP 1: Download and Set up the UVO eServices Smartphone App

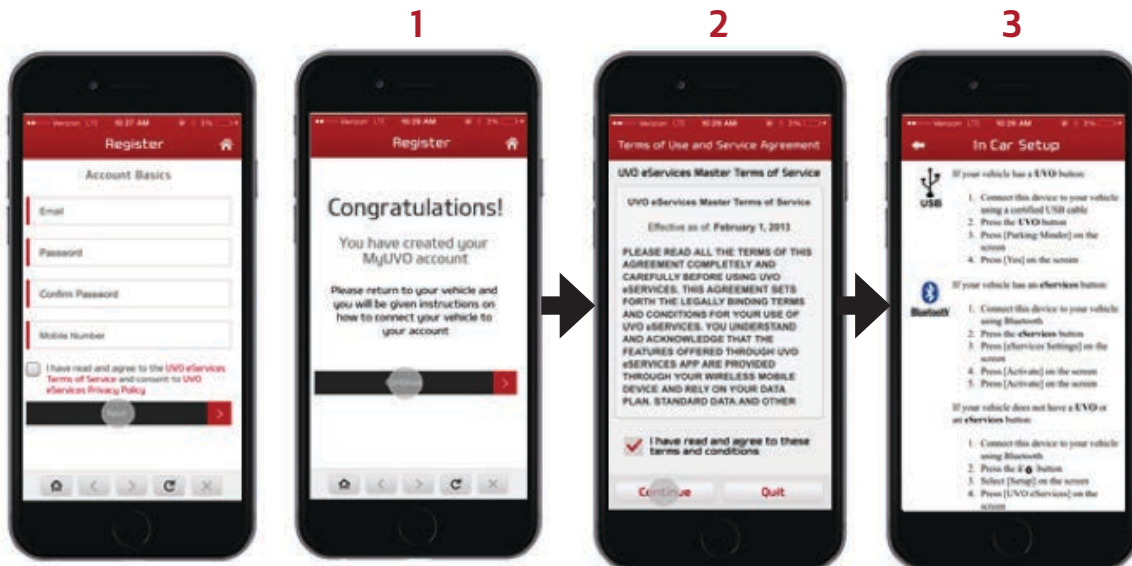
At the time of printing, select Android™* and iPhone®* devices are the only devices compatible with the full suite of UVO eServices*

1. Go to the App StoreSM* on your iPhone®* or Google Play StoreSM* on Android™* and search for "Kia UVO eServices"
2. Select the UVO eServices app* and download it (it's free)



STEP 2: Register on the UVO eServices Smartphone App

1. Open the UVO eServices app* from your smartphone
2. Click on Register
3. Enter the fields then press Next
4. Your account has been created. Press Continue to proceed to steps for activating UVO eServices*



STEP 3: Activate UVO eServices

1. After an account is created from the UVO eServices app*, press Continue to begin the activation steps, or open the UVO eServices app* and log in with a previously created account
2. Accept the "Terms of Use and Service Agreement" and press Continue
3. Follow the steps on the "In Car Setup" screen to activate UVO eServices*

Please refer to PitStop PS428

DISCLAIMERS

Android™: Android™ is a trademark of Google Inc.

Apple®: Apple® is a registered trademark of Apple, Inc.

App StoreSM: App Store is a service mark of Apple Inc. No charge for the UVO eServices app. App runs on your smartphone cellular data service. Normal data rates will apply.

Bluetooth®: The Bluetooth® word mark and logos are registered trademarks owned by Bluetooth SIG, Inc. and any use of such marks by Kia is under license. Other trademarks and trade names are those of their respective owners. A Bluetooth® enabled cell phone is required to use Bluetooth® wireless technology.

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iPhone®: iPhone® is registered trademark of Apple, Inc.

UVO eServices: Apple iPhone® and select Android™ devices only are UVO eServices compatible. No subscription fee for UVO eServices. No charge for the UVO eServices app. App uses your smartphone cellular data service. Normal cellular service rates will apply. Warning: Driving while distracted can result in a loss of vehicle control that may lead to an accident, severe personal injury, and death. The driver's primary responsibility is in the safe and legal operation of a vehicle, and use of any handheld devices, other equipment, or vehicle systems which take the driver's eyes, attention and focus away from the safe operation of a vehicle or which are not permissible by law should never be used during operation of the vehicle.

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2016 OPTIMA SVM MODULE ACCESS

The all new Optima (JFa) is equipped with a different SVM module located under the front passenger seat. A new SVM adaptor has been sent to dealers for this application. Installing the adaptor can be a bit challenging, below are some tips on the procedure.



The adaptor can be installed without removing the seat.

It may help to remove the 2 front bolts ❶ holding the seat in place and leaning the seat back to obtain more room.

There is an area ❷ in the carpet to work a hand in to access the connector.



Seeing the connector is usually not possible at this point.

1. Press on the release catch ❸
2. Pull the release lever ❹ over the connector - away from the cable.

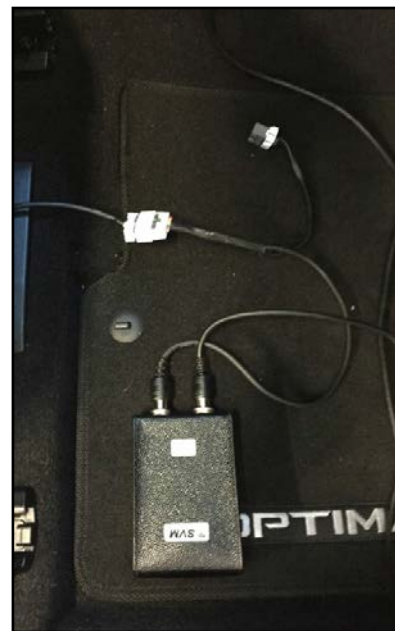


3. Work the vehicle's harness connector out from under the carpet as far as possible
4. Work the adaptor connector under the carpet and connect it to the module. Make sure the release lever is secured and locking the connector into the module



5. Connect the vehicle's harness connector to the other end of the adaptor connector.
6. Connect the small connector on the SVM adaptor to the GIT SVM Module as shown in the image.

The rest of the procedure is the same as other Kia vehicles. Align the targets with "Type B" line.



TESTING OXYGEN SENSORS BY MONITORING AIR/FUEL PARAMETERS

Proper oxygen sensor operation is critical for vehicle emissions, fuel economy and engine performance. Technicians could misdiagnose the performance of an oxygen sensor if not familiar with how it works, or are just reading a Diagnostic Trouble Code (DTC) from KDS/GDS.

Kia uses several engine control systems by different manufacturers.

Along with Fuel trims, Fuel Adaptation and Lambda Sensor Correction Values, Injector pulse width can be used to determine the A/F ratio and the O2 sensors response rate.

Refer to Tech Times article "Fuel Adaptations or Corrections Values" Volume 16, Issue 2 for more information on monitoring fuel commands.

Depending on the type of fuel delivery system, injectors have different pulse width operation times.

- The older fuel return style injection systems average approx. 2.5 - 3.5 millisecond (ms) at idle in closed loop.
- Return-less fuel Multi Port Injection (MPI) engines average approx. 1.8ms to 2.5ms in closed loop.
- Return-less fuel GDI engines average approximately .800 to 1.1ms at idle in closed loop.

NOTE: The above pulse width times are approximate for each system. Many technicians record current data on known good vehicles as a reference. In order to assess the function of the fuel system, the technician will need to "force" the system rich or lean.

A lean fuel condition can quickly be introduced by disconnecting a large vacuum hose (e.g. brake booster hose). A rich fuel condition can be quickly achieved by inducing propane gas into the air intake.

NOTE: Follow all safety precautions when using propane gas to force a "rich" fuel system condition.

With the "forced" condition the injector pulse width should react immediately to these "outside" influences. If the injector pulse width does not change quickly, the O2 sensor(s) may be slow.

In the first example (Fig. 3), in the right hand column the injector pulse width jumps to 6.6 ms when a large intake leak

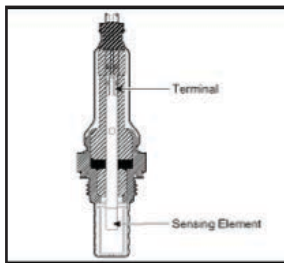
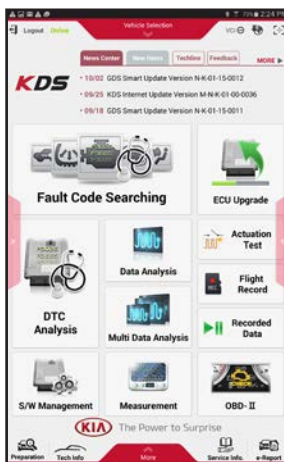


Fig. 1 Oxygen Sensor (O2)



is created. The higher pulse width indicates that the PCM is adjusting fuel to address a lean condition. (see Fig. 3)

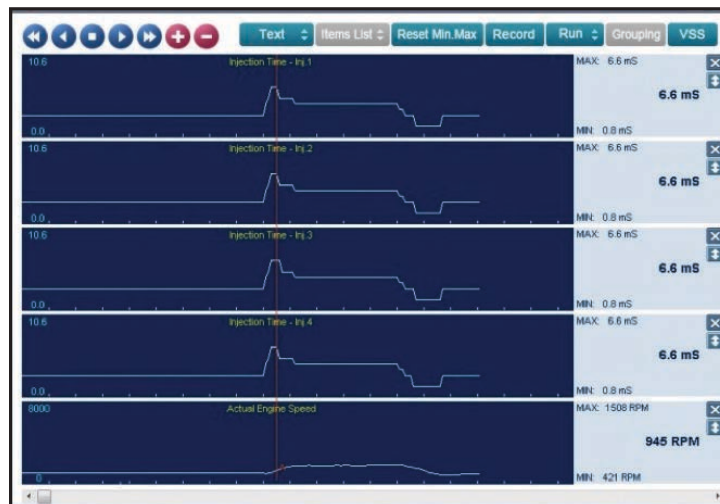


Fig. 3 Injector Pulse width reaction to a lean condition

In this example below the injector pulse width dropped to .8 ms when propane gas was introduced. The lower pulse width indicates that the PCM is adjusting fuel to address a rich condition. (see Fig. 4)



Fig. 4 Injector Pulse width reaction to a rich condition

Depending on the year, model and engine control system, Kia engines can be fitted two types of front (B1S1/B2S1) O2 sensors:

- Binary Type (Narrow Band)
- Linear Type (Wide Band)

For a detailed description and operation of either sensor, refer to Tech Times Volume 14 issue 6 (Narrow Band O2 Sensors), and Tech Times Volume 12 issue 2 (Wide Band linear O2 sensors)

By driving the fuel system to an either a rich or lean condition, the O2 sensor(s) response rate can be monitored. If the O2 sensor does not respond correctly, substitute with known good sensor and re-test.

Understanding proper oxygen sensor operating and the ability to properly test, will allow technicians to repair customer vehicles quicker and more efficiently.

MAINTAINING CLEAR WINDSHIELD / WINDOW VISIBILITY

Vehicle interiors create the ideal atmosphere for film build-up on the inside of windows. Cigarette smoke, condensation, and dust blend in a closed, hot interior to form a “cloud” that eventually coats the windows (see image). When the weather is hot, the film tends to build-up faster. In addition, in new vehicles, evaporation of materials (used in the manufacturing of various plastic and vinyl interior components) also contributes to quicker film build-up. This phenomenon is known as “out-gassing” and is common to all new vehicles; it’s also what gives a new vehicle that “new-car” smell. As the vehicle ages, the outgassing will diminish. During cooler weather, the film on windows impairs the effectiveness of the defroster. Regular window cleaning is recommended to help the defroster clear up the condensation faster.



REMOVING INTERIOR GLASS FILM BUILD-UP:

Use Kia Glass Cleaner - (P/N UM040 CH006) and a Micro Fiber Cloth to effectively remove the film from the interior window surfaces.

Please refer to PitStop PS434

AFTERMARKET EQUIPMENT CAUSING CAN CODES AND/OR IMPROPER OPERATION

On some vehicles, customers or dealers may choose to install non-Kia aftermarket accessories which, under certain circumstances, may cause improper operation or even damage to components. When diagnosing improper and unusual operation or CAN codes, especially in ABS/ESC, TPMS, NAV head units, ECM, TCM, HVAC, BSD and other systems on the CAN bus, technicians should inspect under the dash, and in engine compartment areas, for any aftermarket equipment that may have been added to the vehicle. Where wires have been spliced, identify the circuit and system before making recommendations for replacement of components/ parts and, temporarily, disconnect the accessory from the vehicle’s electrical system to test and verify it is not the root cause. If confirmed, advise owner of the incompatibility and recommend removal of the aftermarket equipment. Removal costs are considered the responsibility of the owner and should be communicated to the customer BEFORE attempting any repairs. If equipment was dealer installed, the selling dealer may be held accountable for the cost of repairs and any associated warranty claims may be subject to chargeback.



Example of a tracking device which was permanently installed / attached to the DLC port and caused various drivability issues.

NOTE: Examples of aftermarket equipment may include: non-Kia Alarm systems, starter interrupt systems, lighting systems, cellphone chargers, parking assist systems, radar detectors, CB/HAM equipment, LoJack® Modules or similar tracking devices (right), A/V headrests, rear entertainment systems or other equipment. In the example shown above, an aftermarket parking assist module and wires spliced into the CAN system created multiple CAN codes.



Refer to TSB GEN 052 for more information on similar concerns between OE TPMS systems and aftermarket accessories.

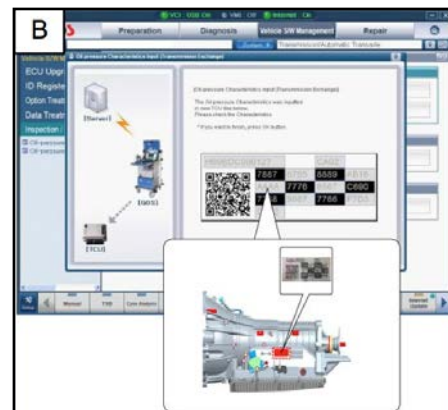
Please refer to PitStop PS399

8-SPEED TRANSMISSION REPLACEMENT REQUIREMENTS

On K900 (KH), the 8-speed transmission (A8TR1) has precise direct solenoid control for the clutch and brake system inside the transmission. Due to hydraulic pressure variance at the time of transmission and solenoid production, shock or shift delay may occur during gear shift after replacement. In response to this pressure variance, the hydraulic pressure is recorded in a bar code format and affixed in the form of two labels (A) on the left side of the transmission. Whenever the TCM and/or 8-speed transmission is replaced, the bar code value must be entered (B) into GDS/KDS by following the procedure outlined on KGIS.



After Transmission Exchange: use GDS/KDS Auto Input Mode. **NOTE: if internet access is not available, enter in Manual Mode. If you cannot access the internet, record the bar code data (oil pressure characteristics) on the automatic transmission case, and then input it manually on GDS/KDS.**



Additionally, make sure to perform the TCM adaptive values learning procedure using the GDS/KDS.

Please refer to PitStop PS430

IMPORTANCE OF PROVIDING ACCURATE INFORMATION REGARDING WIRING HARNESS REPAIRS

In an effort to improve wire harness quality, KMA closely reviews each warranty claim related to wire harness repair. The purpose of this review is to identify connectors with common quality and/or assembly related issues. In order for KMA to effectively communicate these issues to our supplier and manufacturing plant, it is imperative the following be communicated in the warranty claim comments:

- Connector Number - Example: EC11, MF11, EM61, etc.
- Pin location and number - Example: Male or Female, Pin 6, 10, 36, etc.
- Concern - Example: Bent pin, poor pin tension, backed out pin, etc.

If photos of the concern are available, open a Techline case, and add the photos to the attachment section; see sample of an actual photo submitted by a technician on the right.

Please refer to PitStop PS437



TEST YOUR TECH TIMES KNOWLEDGE SOLUTIONS

We hope you gave this issue's word scramble on page 7 a try. In case you need a little help, here are the answers to the word scramble.

- | | | |
|----------------|----------------|--------------------|
| 12. TOPOLOGY | 8. KEYWORD | 4. OPERATION TIME |
| 11. AUTONOMOUS | 7. OUT GASSING | 3. PASSENGER FRONT |
| 10. HIGHER | 6. LEAN FUEL | 2. PICTURE |
| 9. AFTERMARKET | 5. ENGINE CORE | 1. ESERVICES |