CDS Air Bag Systems Glossary and Component Guide.

- **Air Bag Module; AKA "(SRS) Supplemental Restraint Module" "(RCM) Restraint Control Module" "(ORC) Occupant Restraint Module" "(CSM) Crash Safety Module" "(MRS) Multiple Restraint System Module".**
  This is the Main Box (ECU) or controller of the Airbag system; it is usually located under a seat or center console and is mounded directly to the body floor. Most Airbag modules have built in impact sensors and may or may not use external peripheral impact sensors for impact zone inputs to the module.
  <mark>WARNING!</mark> This module should not be worked on, removed, installed, connected, disconnected or jarred by any means without first disabling the airbag system by specific manufacture instructions and/or disconnecting the battery after ignition is turned off for 10 minutes prior. (Some of these modules can retain and store enough energy to deploy an air bag for up to 30 minutes after battery power is removed.)

- **Impact Sensor**
  Many Vehicles are equipped with several separate inputs to the main air bag module from impact sensors mounted in various areas of the vehicle. On some vehicles the impact sensing is internal and integrated into the module. "Satellite" impact sensors can be used in the front, sides and even possibly the rear of some vehicles. <mark>WARNING!</mark> These sensors should not be worked on, removed, installed, connected, disconnected or jarred by any means without first disabling the airbag system by specific manufacture instructions and/or disconnecting the battery after ignition off for 10 minutes prior or inadvertent air bag deployment may occur. (Modules these are connected to can retain and store enough energy to deploy an air bag for up to 30 minutes after battery power is removed.)

- **Rollover Sensor**
  This is another Input to the module that basically tells the module which side is supposed to be up. This can be a separate sensor on the vehicle or integrated into the air bag module or from another system on the vehicle such as Stability control. The air bag module programming will use this data to deploy head/curtain air bags when an impeding rollover is detected.

- **Air Bag Light (Malfunction Indicator)**
  This is the main Airbag Indicator (light) used to alert a vehicle operator of a system fault and basic system operation check. This Light is normally located in the Main Drivers Instrument display. Normal operation of this light during a system initial check at "key on" or start up is to blink 3-7 times then go off. This lets the operator know the system is functional. If the light remains illuminated after the initial check there is a fault detected by the module and it must be scanned to retrieve the diagnostic trouble code(s) before diagnostic decisions can be made. If the Airbag light does not present self-check (blink 3-7 times then go off) during initial key on this also indicates the system needs to scanned and diagnosed.

- **Passenger air bag indicator (light)**
This is another air bag indicator and is usually located in the center of the dash or on the dash pad on the front passenger side. This light(s) indicates whether the passenger side deployment loop is "on" or "off". Inputs from the passenger seat weight sensors, position sensors, seat belt buckle status and correct calibration of system will determine whether to "arm" the passenger side system or not. Some vehicles also have a passenger side on-off switch the vehicle operator can set manually using the vehicles ignition or door lock key. The Indicator should show passenger air bag is "on" when occupied, or simulated occupied passenger seat condition are met. When the seat is unoccupied, or occupied by a child seat or a small statured person (usually under 100 lbs.), the passenger side light should indicate "off".

- **Deployment loop**
This is a single deployment output circuit from the air bag module that contains 2 wires to a deployment device. A small voltage is always output on the circuits for system self-tests functions. These circuits are continuously monitored whenever the ignition is on. If the circuit is open/shorted, or there is a defective deployment device, the self-test function within the air bag module will trigger a diagnostic trouble code and turn on the airbag light.

- **Deployment Device**
This is any device that can be triggered to deploy by the Air Bag Module Via output command. Also referred to as a "SQUIB". This is contained within a deployment loop.

- **Deployment Stage**
Many newer Vehicle air bags have variable deployment levels known as stages. This is most common with front airbags that are dual stage with 2 squibs within an air bag assembly. Depending on the force of collision, the position of the occupants and the seat belt status the module can command stage 1, stage 2, or both stages of deployment, each resulting in an increase of deployment force and speed as determined by the programming in the module. Regardless of the stage of deployment the entire bag assembly must be replaced. Any non-deployed stages of the bag assembly must be triggered (fired) manually before the bag assembly can be discarded.

- **Squib**
A squib is a miniature explosive device used in a wide range of industries. A squib generally consists of a small tube filled with an explosive substance, with a detonator running through the length of its core, similar to a stick of dynamite. This is connected by a wire to a remote electronic trigger (the air bag module). Squibs are used in emergency mechanisms where gas pressure needs to be generated quickly in confined spaces, while not harming any surrounding persons or mechanical parts.

- **Air Bag**
  This is an inflatable type of deployment device located anywhere in the vehicle from the steering wheel, passenger dash pad, door panels, seats, knee bolsters, roof rails and even A,B,C, pillars. These can also be referred to as "SQUIBs". Actually a SQUIB is contained within them.

- **Side Curtain (Head curtain)**
  This is a type of inflatable airbag is usually located along the vehicle roof line interior at the edges of the headliner and or windshield. Curtain type air bags can also be located in the upper portions of the vehicles pillars.

- **Side Air bag**
  This another inflatable air bag located either in seat backrest side portion, lower portion of the B pillar or in the door panels, some vehicle have rear side air bags in addition to the driver's and passenger side airbags.

- **Pre-tensioner (buckle)**
  This is another type of deployment device (SQUIB) and is built into the buckle side of the lap portion of seat belt. It can be challenging to determine if these have been deployed. Different manufactures have different types, the best way to know if one of these have deployed is by performing a system scan with an OEM scan tool. If you are familiar with a certain system you can tell by close visual inspection. If one of these has deployed or has a circuit fault the Airbag Light will be illuminated (stay on) after bulb check

- **Pre-Tensioner (Anchor)**
  Part of the seat belt system also and is used for the lap portion of the seat belt. The anchor retractor is located at the floor mounting of the lap portion retractor. Some vehicles will be equipped with this pre-tensioner retractor type in place of a buckle side retractor seat belt system. Vehicles with this configuration may require the entire seat belt system with shoulder and anchor pre-tensioner belt retractors to be replaced if either has deployed.

- **Pre-tensioner (Retractor)**
  Same as a buckle/anchor pre-tensioner except it is on seat belt shoulder retractor side of the seat belt system. Some vehicles have retractor only, some buckle/anchor only, and some have both. Some vehicles are also equipped with these in the 2nd and 3rd row rear seats. The only way to know for sure what the vehicle is equipped with, and if these have deployed, is by scanning the system with an OEM Scan tool

- **Head restraint**
  This is the headrest portion of the seat. Some vehicles contain a deployable head restraint which kicks the headrest forward during a collision for additional head support to reduce whiplash

type injuries. Some of these are mechanical systems that can be re-set and code cleared and some contain non-reusable charge devices (SQUIBs) that must be replaced after a head restraint deployment.

- **Passenger Presence Module**
  This module works in conjunction with the main air bag module to input critical data pertaining to the position and size of an occupant in the passenger seat or the presence of a child car seat. This data input to the main module is used to determine if and how to deploy passenger restraints.

- **Passenger Presence Sensor**
  There are several types of seat sensors used today, these vary from individual sensors on each seat mounting point, to pad or mats imbedded into the seat cushion with an array of built in sensors that input data to the passenger presence module. Some PPS systems are integrated into one assembly within a seat cushion that contains all the sensors and module together.

  These sensors input occupant weight data and must be calibrated for accuracy. Most manufactures require a calibration of this system whenever the vehicle has been involved in a collision of any kind, the main airbag module or passenger presence module has been replaced, or if the seat has been removed or dis-mounted from the vehicle.

- **Passenger (Seat) Position Sensor**
  This is a little different than a presence sensor and is not used on all cars. Vehicles equipped with multi position memory seat will have these. Seat position, recline, etc. data is input to the airbag module via data network. Some vehicle without memory seats or seat modules will have a direct input of seat position to the airbag module for the driver position. Passenger seat position is usually input to the passenger presence module and relayed to the Main airbag module VIA data network.

- **Clock spring; AKA Spiral cable, Steering Wheel Coil, Slip Ring**
  This is the wire harness in the steering column that feeds the driver's frontal airbag deployment signal. This part does not always need to be replaced after deployment. It depends on the vehicle's manufacturer. Some manufactures require an inspection of the connectors for burning or discoloration making the replacement conditional. Manufacture instructions should be referred to when determining whether or not to replace this part. We recommend that if the clock spring or connectors show any sign of damage, or if in doubt, to replace this part in conjunction with a deployed driver's front airbag. (Tip, if steering wheel controls and/or horn are inoperative after a deployment this is a good indication that the clock spring was damaged)

- **Connector assurance pin**
  These are contained within the airbag system's connectors at the module, inline connectors, clock spring connectors and deployment device connectors; they are usually red or yellow in color and may be a small lever type device or a push in/pull out slide. These latch the air bag circuits' connectors together and release the shorting bars. If a connector assurance device is not fully seated, a hard or intermittent fault with airbag will result. A scan with trouble code will identify the deployment loop where this fault could be occurring.

- **Shorting bar**
  These are also contained in the connectors and are released by the connector assurance pins. A shorting bar bridges the deployment circuit together at the connector to prevent un-intended current from passing through a deployment circuit and causing an unintended device deployment. A damaged or bent shorting bar within a connector will set a code for the deployment loop affected.

- **Data link connector (DLC) AKA OBDII connector**
  This is the point of connection for a scan tool to access vehicle data. A 16-pin connector with pins arranged in two rows of 8, numbered 1 to 8 and 9 to 16. The DLC is D-shaped, and is located within a mandated distance from the driver's steering wheel, usually located just beneath the knee bolster, or in the dash panel area. Some vehicles have an access door or cover over the connector.

- **Scan tool**
  Scan tools come in many shapes, sizes, configuration and capabilities. These can be simple code readers without data reading capabilities to completely functional Manufacturer OE scan tools that include programming, coding, and calibration capabilities. A general rule of thumb for scan tools is that the more vehicles it can cover the less it can do for each vehicle (Make Model Year). OEM scan tools are limited to the manufacturer of origin, but have the complete suite of capabilities. The best scan tool to use for airbag systems diagnostics and repairs is the scan tool made for that type of car (OE manufacturer scan tool). CDS uses OE manufacture scan tools and scan tools made for specific vehicle with the most functions and capabilities available.

- **Scan**
  This procedure, using a scan tool, to communicate directly with any system on the automotive computer network the scan tool is capable of. A scan can consist of code reading and clearing, reading sensor and module data, performing input and output tests, performing calibrations, resets, and minimum maximum learn values. A scan cannot always tell you specifically what is wrong with a vehicle but it does make the needed data available to a diagnostic technician who determines what the failure possibilities are based on codes, symptoms and live data.

- **Battery Support**
  This is obtained by connecting a suitable battery charger, battery voltage maintainer or a fully charged jump box to the vehicle while in KOEO mode and is especially critical during programming routines. A combination battery charger /maintainer with a "programming" setting is the best tool for this, especially for programming. This tool allows you to charge a discharged battery back to a useful state and/or be set to maintain a voltage level even under moderate loads with key on almost indefinitely. A standard charger can introduce voltage fluctuations or over voltage conditions that will interrupt programming or skew diagnostic results. A Jump box provides a nice even voltage level for a longer period than the vehicle battery alone, but it will begin to drop as its charge is depleted. This is a usable method as long as extended programming sessions do not overrun the stored jump box capacity. If you use the jump box method, I recommend a minimum of 2 so one is charging while one is discharging. When vehicle voltage levels fall below normal levels, diagnostic results are no longer relevant and programming can fail.

- **Diagnostic Trouble Code(DTC)**
  These are obtained during a vehicle scan. DTCs are specific to module functions and outputs. A diagnostic trouble code does not indicate a specific component has failed, but that there is trouble within the component or its particular electrical circuit. Some trouble codes indicate a certain calibration has not been performed and some trouble codes indicate a malfunction. All trouble codes should be cleared from vehicle and a road test completed before delivery back to a vehicle operator. The absence of a malfunction indicator (dash warning light) is not a definite indication that no codes are present. It can only be confirmed by performing a scan.

- **Latched Codes**
  This is a code that sets in a module which that cannot be cleared and requires replacement of the module. This type of code is dependent on the manufacturer of the vehicle and the severity of the deployment. A scan of the airbag system is necessary to determine if a code is latched within a module, whether or not a deployment occurred. If a latched code is present the air bag light will be on, if it is functioning correctly. To determine if a code is latched the vehicle must be scanned before airbag repairs are made, all codes stored must be recorded and deployed components identified. After this the" crash detected" or "deployment commanded" codes can be cleared by the scan tool. If they return, module replacement is necessary. If they do not return airbag system repairs can be made without replacement of the module.

- **Fault**
  This is used to describe something not working on the vehicle as designed. System and circuit faults that are
  monitored by the module will result in a diagnostic trouble code being set as long as the fault on the vehicle being analyzed by the module programming is outside of the expected results. Faults

that set trouble codes may or may not produce a symptom (something not working or working improperly or a dash warning light). Faults that do not set trouble codes may not be systems monitored by a module and must be diagnosed differently. Like reproducing the symptom or performing close visual inspections of suspected fault areas. Last but not least the warning light and the DTCs stored are symptoms, not the actual fault.

- **Hard fault**
  This is a fault that is continuously monitored and is present at the current time of scan (code will not clear)
  When a hard fault is encountered the fault must be located and repaired before the code can be cleared or any additional module set up, programming, calibrations etc. can be completed.

- **Intermittent fault**
  This type of fault can be continuous monitored or conditionally monitored. The fault may be conditionally present or intermittently creating symptoms. Intermittent faults, if monitored, will store a failure code but might not turn on a malfunction indicator (dash warning light). These types of faults are usually caused by loose or corroded connectors, low system voltages, or poor ground connections. These can be the most difficult faults to locate and correct. Close visual inspection, and sometimes disassembly, is needed to find and correct these.

- **Continuous Monitoring**
  This is a diagnostic trouble code check description. Some circuits and conditions are continuously monitored
  Which means a code can be set if a fault is present at any time the key is on or engine running. Many of these codes can be checked for a re-occurrence from a simple key cycle. Most air bag monitored faults are continuous monitored.

- **Conditional Monitoring**
  This describes a type of diagnostic code setting that requires a road test. Certain conditions must be met for the module to run a system function check. Some of these types of DTCs require multiple road tests to complete but are usually in systems outside of the Airbag system

- **Live Data**
  This is obtained during a scan using a compatible scan tool for the vehicle and system being scanned.
  Live data is actual sensor input values, circuit resistance values, and module output states that are displayed on the scan tool screen for the technician to interpret. Data that does not look normal or is out of range for the vehicle state warrants further investigation into the condition depending on the fault or malfunction that needs to be corrected.

- **Freeze Frame Data (Failure Records)**
  This the data module will store when a diagnostic trouble code is set due to a system fault. The amount and type of data stored is dependent on the programming the manufacture supplies for any given module. Some modules give very specific data such as time, mileage, speed, and inputs that were present at the time of fault.
  Technicians use this data to help determine the conditions of fault, and to help recreate the fault conditions if the fault is intermittent and not current.

- **Program**
  This is a procedure that must be done to most replacement modules in an automotive computer network and is the first part of setting up a replacement airbag module for many manufactures. Many new replacement airbag modules come with generic base software that is not capable of operating in any specific vehicle until the program file (instructions for the module to operate in the vehicle it is going into) is complete.

  This requires a proper identification of the vehicle, downloading of the proper programming file from the manufacture, and then transfer of the file into the module. This procedure is very exacting and has specific steps to be completed. This also requires a direct internet connection to the vehicle interface and must **not** be done with a wireless connection (Wi-Fi or cellular). This procedure requires all accessories are turned off on the vehicle, KOEO; battery support is attached to the vehicle (such as a battery stabilizer) and may take 1 or several key on-off cycles. This can take as long as 40 minutes or as little as 5-10 minutes depending on vehicle, module being programmed and internet speed. If any mistakes are made in the sequence, or connection interruptions occur, the module being programmed may be rendered useless.

- **Flash**
  This is another term to describe programming. Flash and programming are used interchangeably.

- **Coding**
  This is similar to calibration or module set up, but not as detailed and critical as programming. Some people interchange the terms programming and coding but the procedures are actually very different. Coding is something that must be entered into modules when a component or module has been replaced or the system reset. This procedure is usually needed on European manufactured vehicles. When a vehicle is scanned before collision repairs, existing coding values can be obtained and recorded for re-entry after vehicle repairs. When the vehicle is complete and codes cleared the module may not recognize replaced or disconnected components that occur during the repair. When this happens the "code" values must be re-entered into the module to tell it what it is connected to, so those components will operate and function properly. A replacement module on European vehicles will require coding at a minimum and possibly programming before coding. If the coding values have not been recorded from the

original module, they will have to be obtained from the manufacture or an aftermarket coding guide chart. This can be quite time consuming to obtain at times so I can't stress the importance of pre-scanning (before repairs are made) to record these values.

- **Calibrate**
  Calibrating is not programming. It is the process of educating a module to predetermined standard set points. Like setting your bathroom scale to "0" before you weight yourself. Calibrations need to be done whether the air bag module was replaced or not, and if there was a deployment or not. Calibrations are done with a compatible scan tool. All codes and faults must be clear and confirmed repaired before a calibration will complete. If the airbag module was replaced , module programming may need to be done first. An example of this is passenger seat calibration. Some vehicles require placing specific amount of weight on the seat during this calibration process and some calibrate to Zero only.

- **Key On Engine Off (KOEO)**
  This would seem to be a pretty simple thing but has become a bit more complex since keyless start and hybrid technology has been introduced to automobiles.
  - ➢ An older style "key type" ignition switch is straight forward. Turn the key to the run position without starting the vehicle. A shop must be aware that this state begins discharging the battery very quickly so <u>vehicle battery support</u> <u>is heavily encouraged</u> here and <u>mandatory for programming routines</u>.
  - ➢ Keyless start systems, also known as push-button start, is a little different and it is easy to think you have the vehicle in the on position but it is actually in "accessory" mode. Over 90% of these achieve KOEO state by pushing the start button 2 times 1-2 seconds apart without pressing the brake pedal. *(the key fob must be in the interior of the car) you can tell you reached this state by the behavior of the instrument cluster. Gauges and warning lights should sweep, warning indicators will bulb check. To turn the vehicle off press the start button one time. To start the vehicle push the start button I time while depressing the brake pedal.
  - ➢ Hybrids can vary, but for KOEO the vehicle must be in ready mode. This state can be accomplished the same way as push button start if the vehicle is equipped.

- **Key On Engine Running (KOER)**
  This exactly what it states, start the car is on with engine running or "ready" mode for hybrids.

- **Key Cycle**
  This is used to describe the vehicle going from "on" to "off" to "on"

- **Drive Cycle**
  This is describing the vehicle cycle usually starting from a cold start (vehicle has been sitting for over an hour).

Start the vehicle, drive through all gears, stop, idle, and shut back off. Many trouble codes and self-checks require a drive cycle before a fault can be detected and trigger a DTC.

We hope this will help with your processes and understanding many terms you will be seeing on system reports and during communications with CDS remote diagnosticians.