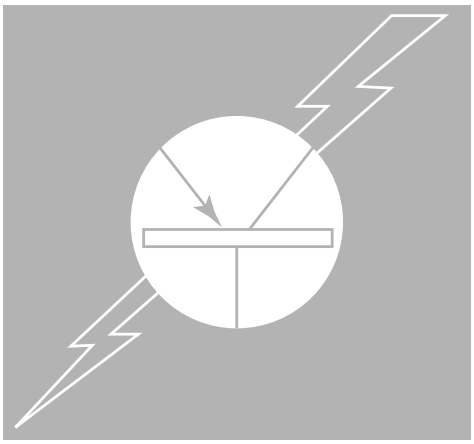
SERVICE TRAINING COURSE 682
ADVANCED JAGUAR ELECTRICAL SYSTEMS



REVISION SUMMARY

This publication has been revised from its previous printing as follows:

- A new Section, "JAGUAR ELECTRICAL SYSTEMS", has been added.
- The "XJ / XK" Section has been revised.
- The "S-TYPE" Section has been revised.
- A new Section, "X-TYPE", has been added.

DATE OF ISSUE: 02/15/2002

This publication is intended for instructional purposes only. Always refer to the appropriate Jaguar Service publication for specific details and procedures.

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JAGUAR

Publication T682/02
DATE OF ISSUE: 02/15/2002
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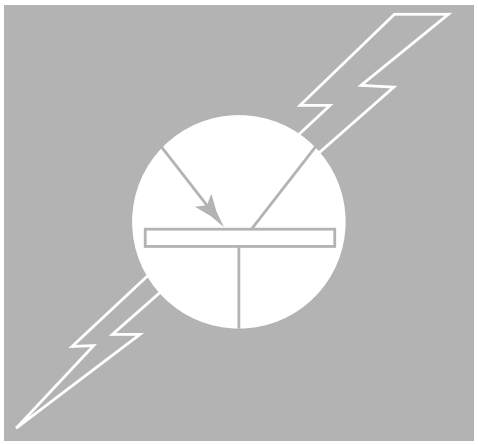
PRINTED IN USA

ADVANCED JAGUAR ELECTRICAL SYSTEMS



JAGUAR

Service Training Course T682
DATE OF ISSUE: 02/15/2002

GENERAL INFORMATION

Glossary

A	Ampere (measure of electrical current)
ABS/TCCM	Anti-lock Braking and Traction Control Control Module
A/C	Air Conditioning
A/CCM	Air Conditioning Control Module
ACP	Audio Control Protocol
ADCM	Adaptive Damping Control Module
Airbag/SRS	Airbag Supplementary Restraint System
B+	Battery voltage
Baud	Data bit transmission rate
Binary	Numbering system based on the number two
Bit	A single binary code data signal (1 or 0)
BPM	Body Processor Module
BPS	Bits per second
Bus	Simple network where modules are connected in series; Also used to refer to a network
Byte	Eight bits (makes up two alphanumeric characters)
CAN	Controller Area Network
Cyclical	A recurring succession of events
D2B	Fiber Optic Network
DDCM	Driver Door Control Module
Decimal	Numbering system based on the number 10
DI	Direction Indicators
DIN	German Institute for Standardization
DLC	Data Link Connector
DRDCM	Driver Rear Door Control Module
DSCCM	Dynamic Stability Control Control Module
DSCM	Driver Seat Control Module
DTC	Diagnostic Trouble Code
ECM	Engine Control Module
EGR	Exhaust Gas Recirculation
FPCM	Fuel Pump Control Module
Gateway	A language or protocol translator between two different systems
GECM	General Electronic Control Module
Hexadecimal	Numbering system based on the number 16
IC	Instrument Cluster
ICE	In-Car Entertainment System
INST	Instrument Pack
ISO	International Standards Organization
ISO 9141	The Serial Data Link (ISO Standard)
JGM	J-Gate Module
kΩ	Kilo Ohms
Kbps	Kilobauds per second
km/h	Kilometers per hour
KTM	Key Transponder Module
LED	Light-Emitting Diode
mA	Mega Amps (million Amps)
Micro	Millionth

mm	Millimeter
mph	Miles per hour
ms	Milliseconds
Multiplex	An electrical circuit that carries multiple signals
MY	Model year
N/A	Normally Aspirated
NAS	North American Specification
NC	Normally closed
Network	Connecting modules to share data
NO	Normally open
Node	An individual device in a network
PASCM	Power Assisted Steering Control Module
PATS	Passive Anti-Theft System
PCM	Powertrain Control Module
PDCM	Passenger Door Control Module
PRDCM	Passenger Rear Door Control Module
Protocol	The “language” used for modules to communicate
PSCM	Passenger Seat Control Module
PWM	Pulse Width Modulated
Quiescent	At rest
RCM	Restraints Control Module
RECM	Rear Electronic Control Module
RF	Radio Frequency
ROW	Rest of World
SAE	Society of Automotive Engineers
SAE J 1978	An SAE standard for electronic communications
SC	Supercharged
SCP	Standard Corporate Protocol Network
SLCM	Security and Locking Control Module
Star	Network where modules are connect to a common point or points
TC	Traction Control
TCM	Transmission Control Module
Token	An identity symbol
V	Volt (measure of electrical potential)
VAS	Vehicle Alarm System
VID Block	Vehicle Identification Block
W	Watt (measure of electrical power
WDS	World Diagnostic System
˚C	Degrees Celsius
˚F	Degrees Fahrenheit
Ω	Ohms (measure of electrical resistance)
<	Less than
>	Greater than

GENERAL INFORMATION

What This Book Contains

This book covers the advanced electrical systems on the following models:

- XJ and XK*
- S-Type
- X-Type

* Although there are slight differences in some of the electrical systems between the XJ and XK, the electrical system architecture and operational logic is basically the same.

This book is divided into six sections, three of which contain model-specific information needed to understand the individual electrical systems and know the difference between each model range. The three model-specific sections are further broken down as follows:

- Electrical distribution systems
- Control modules
- Multiplexing
- Body systems
- Security systems

NOTES

Jaguar Electrical Systems

A new concept in electrical system design, data bus communications, was first introduced within Jaguar with the 1997 MY XK8. The new electrical system design concept points the way to future models. Jaguar electrical systems will continue to evolve to support added functionality, but the basic concepts governing the design of the power distribution and electrical protection circuits, harness design and layout, and component control and communications will remain constant. As new vehicles are introduced, the design similarities to existing vehicles will help to make electrical and electronic diagnostics and repair an easier task for the trained technician.

Electrical system benefits

For the customer

- Increased functionality
- Increased reliability
- Increased on-board diagnostic capabilities with driver fault notification
- Lighter vehicle weight and increased performance

For the technician

- Increased diagnostic capabilities
- Reduced number of components
- Standardization of components across model lines
- Common diagnostic and repair procedures across model lines

For the manufacturer

- Increased functionality and reliability
- Reduced amount of wiring, connectors and components
- Increased component compatibility among model lines and variants
- Increased ability to add / delete features without major revision
- Reduced build complexity

NOTES

GENERAL INFORMATION

Diagnostic Strategy

Problem diagnosis can be time consuming and sometimes frustrating. However, the job will be easier if you apply a logical approach to the task, called a Diagnostic Strategy. The following outlines a Diagnostic Strategy that will help ensure that none of the information necessary for accurate diagnosis is overlooked.

1. **Verify the complaint.**

   Check the accuracy and detail of information on the repair order.

   Confirm the complaint.

   Gather information about the complaint. Identify all of the symptoms – what is working and what isn't, check for MILs, warning lights and driver information display messages.

   Look for additional symptoms.

2. **Analyze the system(s) and identify probable causes.**

   Determine what controls the faulty function.

   Determine if the failure is in the multiplex network or if an input / output to the network failed.

   Determine the data messages that control the function and establish which modules transmit and which modules use the messages.

   Determine if any of the messages are required for other functions.

   Perform functional tests to eliminate probable causes.

3. **Inspect, test and pinpoint the fault.**

   Visually inspect the vehicle and look for obvious faults first.

   Test the circuits and components using WDS or a DVOM as appropriate. Start with the circuits or components that are the most likely cause and the easiest to test.

   Be aware that intermittent faults or symptoms may require recreating the fault conditions while testing: hot condition, cold condition, or "wiggle" test.

4. **Perform the repair.**

   Follow the recommended service procedures.

   To avoid a repeat failure, ensure that wiring, connectors, and grounds are in good condition before fitting new components.

   Replace defective components.

   NOTE: After the repair, perform a "hard reset" of the control modules.

5. **Evaluate the results.**

   Verify that the customer complaint is resolved and that all of the original symptoms have disappeared.

   Confirm that no new conditions were created by performing operational tests of any other systems that are related to the complaint or that were disturbed during the repair.

NOTES

Circuit Failure Testing (Consumer / Function Operates Intermittently)

Because the failure is not always present, intermittent failures can be the most difficult to diagnose. If the system is electronically controlled and its control module is capable of storing DTCs, extract any DTCs as a guide to diagnosis.

It is also vital to gather the following information about any intermittent failure:

- When does the function fail?
- Are any other functions affected?
- Were any other functions in operation at the time of failure?
- Is the failure related to a vibration or bump occurrence?
- Does the failure occur at any specific temperature, time of day, engine or transmission operating condition?

Try to recreate the failure by operating the vehicle under the conditions reported. If the failure can be recreated, follow the general diagnostic procedures.

If the failure cannot be recreated, apply the reported failure conditions to the symptoms in order to determine the probable causes of the failure. Then, carefully examine each of the probable causes. Start with the circuit areas or system components that are the most probable causes of the failure and thoroughly test each one. Apply the "wiggle" test while following the general diagnostic procedures.

Professional Electrical Practices

When testing electrical circuits it is important to access the circuits carefully to avoid damaging insulation, conductors, contacts or components. Measurements should be performed carefully. Ensure that the tester is connected to the correct pins. If measurements are not consistent with the expected values, always double check that the tester is correctly connected.

✗ **Back probing sealed electrical connectors** will damage the seal allowing moisture or other contaminants to enter the connector causing corrosion.

✗ **Piercing the insulation of conductors** when performing measurements will damage the conductor, increase the conductor resistance, and allow moisture or other contaminants to enter the connector causing corrosion.

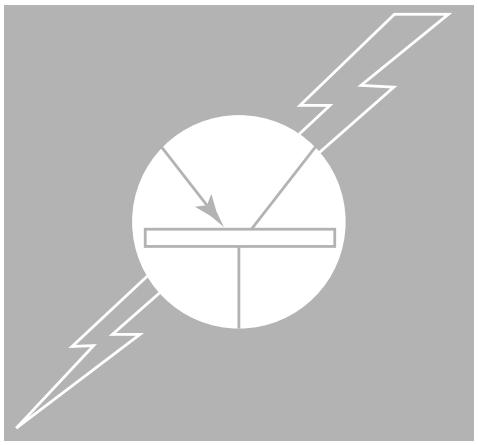
✗ **Circuit powered or self-powered test lights or circuit testers may cause damage to sensitive components.** The best rule is to use only a high impedance digital multimeter when measuring any electrical circuit in the vehicle.

✓ **Periodically calibrate test equipment** and check the resistance of the test leads and adapters to assure that measurements are accurate.

✓ **Use the correct testing adapters** when performing measurements. Using incorrect adapters or probing connectors may damage the plating on the contacts, causing corrosion and increased resistance.

NOTES

ADVANCED JAGUAR ELECTRICAL SYSTEMS



JAGUAR

Service Training Course T682
DATE OF ISSUE: 02/15/2002

JAGUAR ELECTRICAL SYSTEMS: ELECTRICAL DISTRIBUTION SYSTEMS

A vehicle's electrical distribution system distributes the power from the battery to electrically operated devices located all throughout the vehicle. It also has to transmit data, as well as a variety of digital and analog signals from switches and sensors, on several data networks.

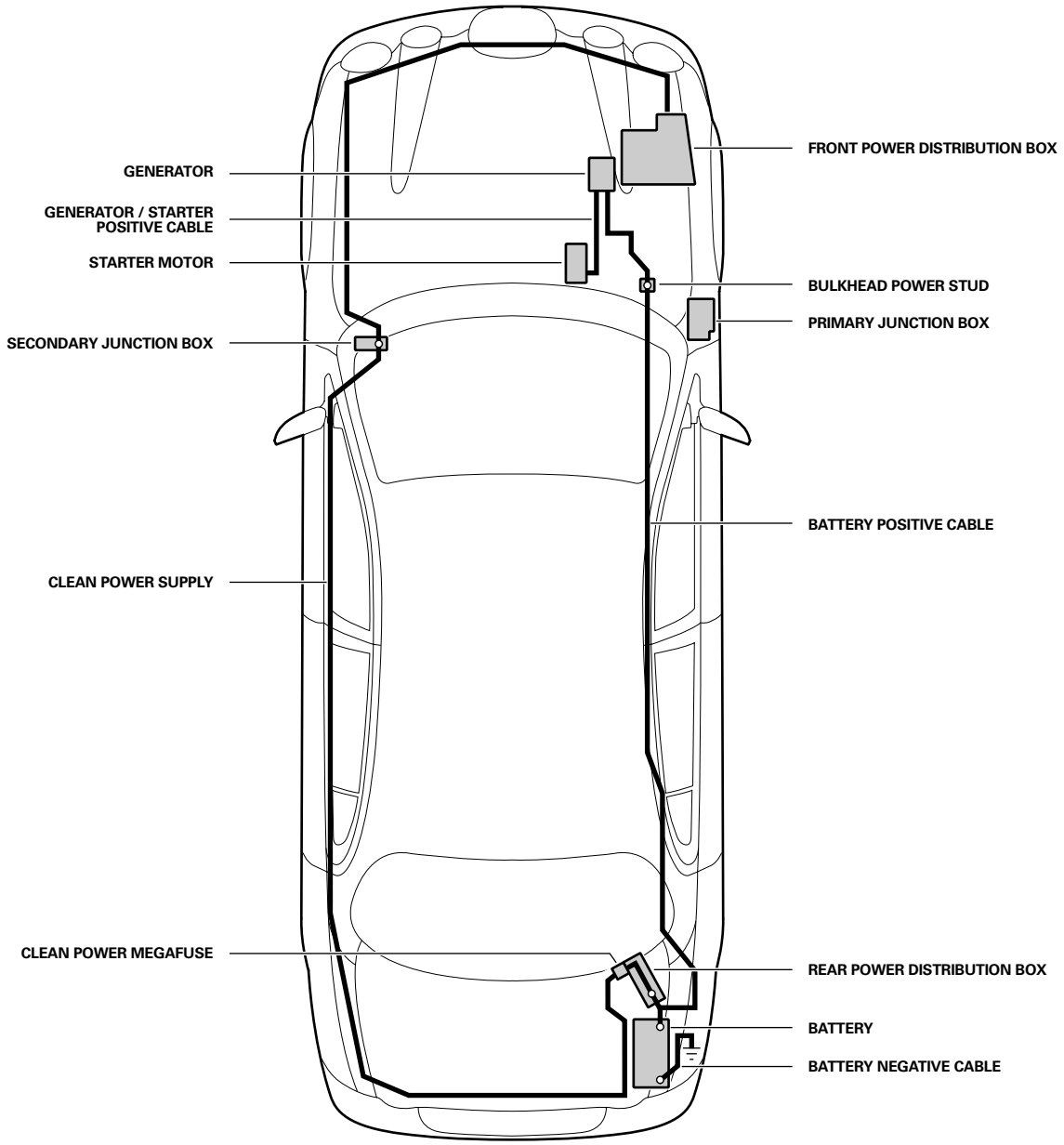
This means that there are many different types of wires in a Jaguar. Some wires that transmit signals from switches or sensors carry almost no current and those that provide power to large electrical consumers, which need to carry heavy current loads. You will also notice that models fitted with the D2B network, carry light instead of electrical signals.

As you study each model's electrical distribution system, you will notice that there are several minor differences in the whole range of models. For example, the XJ/XK are fitted with as many as 5 fuse boxes while the X-TYPE is fitted with only 2. Another example is the location of the battery, while on the X-TYPE the battery is located in the engine compartment; all other models have the battery located in the trunk.

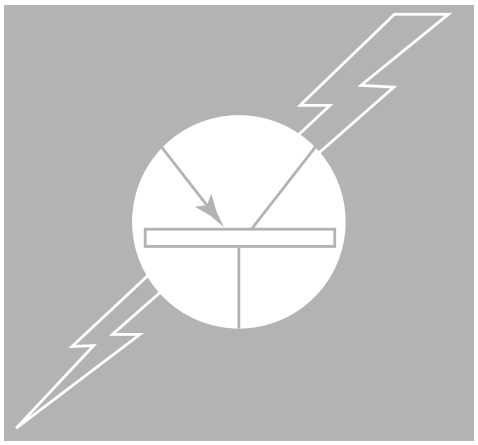
To summarize, the electrical distribution system is the nervous system of the vehicle and it is important that you know each model's uniqueness to successfully diagnose and service all the advanced electrical systems covered in this Student Guide.

NOTES

BATTERY AND FUSE BOX POWER DISTRIBUTION (S-TYPE SHOWN)



ADVANCED JAGUAR ELECTRICAL SYSTEMS



Service Training Course T682
DATE OF ISSUE: 02/15/2002

JAGUAR ELECTRICAL SYSTEMS: CONTROL MODULES

Control modules are computers. As such, they are very complex electrical components. We will discuss control module operation only as it applies to our purposes as automotive service technicians.

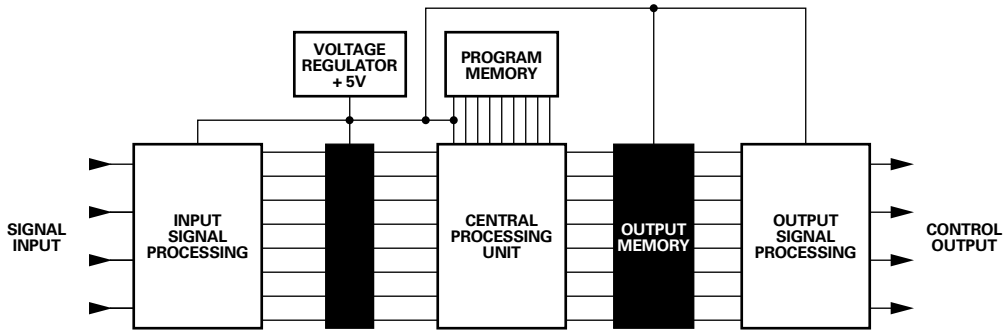
Control modules can only process digital DC voltage signals. Input signals must be converted to digital signals before the microcomputer portion of the control module can interpret the information.

Once input signals are properly converted, the information is directed to the microcomputer's memory. There the microcomputer compares and evaluates the information against its own programming.

This comparison and evaluation process allows the microcomputer to select the best possible choices for system control. It should be noted that the process of filtering and processing input signals, storing and analyzing information and making decisions happens in a fraction of a second – as quickly as 1/1000 of a second (one millisecond).

The memory sections within the microcomputer are the controlling factors in logical processing of input information.

INFORMATION FLOW THROUGH A CONTROL MODULE



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Each year, vehicles seem to get more and more complicated. For example, the X-TYPE can be fitted with as many as 23 control modules depending on the model. Although this high number of control modules will likely make you think that working with them will make your job harder, the fact is that they actually make it easier to service and diagnose the vehicle.

Some of the reasons for this increase in the number of control modules are:

- The need for sophisticated engine controls to meet emissions and fuel-economy standards
- Advanced diagnostics
- Simplification of the manufacture and design of cars
- Reduction of the amount of wiring in cars
- New safety features
- New comfort and convenience features

For example, one of the most important modules is the instrument cluster. The instrument cluster gathers and displays data from various parts of the vehicle. Other modules in the car already use most of this data. For instance, the PCM knows the coolant temperature and engine speed. The transmission controller knows the vehicle speed. The controller for the anti-lock braking system (ABS) knows if there is a problem with the ABS.

Over the last decade, we've seen safety systems such as ABS and airbags become standard equipment across the whole Jaguar model range. Other safety features such as traction-control and stability-control systems are starting to become common as well. Each of these systems adds a new module to the car, and this module contains multiple microprocessors. In the future, there will be more and more of these modules all over the car as new electronically-controlled systems need their own computer controlled device to operate accordingly.

Each of these systems requires more processing power, and is usually packaged in its own electronics module. But it doesn't end there, meaning that you, the technician, have to be aware of how today's modules operate and are serviced.

As you will see in the following model-specific chapters, knowing all the specific modules used on each model line and also how to service and program them, will make your job much easier.

Inputs, Processing, Outputs (IPO)

Understanding IPO and how it fits into today's electrical systems will help you decipher and understand systems more easily. Below are some components that are attributed to inputs, processing, outputs:

Input = a switch, a sensor, another control module

Processing = microprocessor

Output = a motor, a solenoid, another control module, a bulb

NOTES

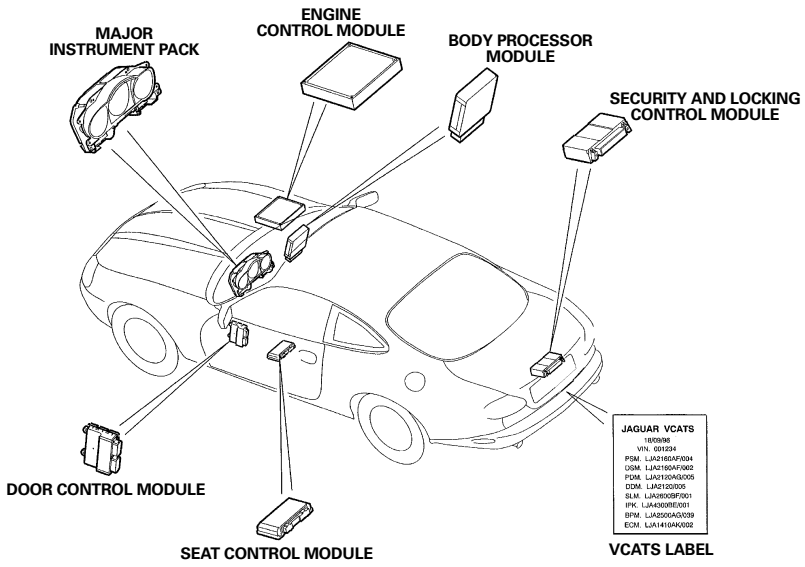
JAGUAR ELECTRICAL SYSTEMS: CONTROL MODULES

Control Module Configuration

To cover the many variations in vehicle specification, which are available in various markets, information is programmed into the Control Modules (CM) during vehicle manufacture, which in many cases may be specific to a very limited number of vehicles within a single market.

For example, the Security and Locking Control Module (SLCM) of a coupe does not contain the control system for the power-operated convertible top. The ICE and VCM on an X-TYPE have to be configured when other components are added to the D2B network.

TYPICAL PROGRAMMABLE CONTROL MODULES



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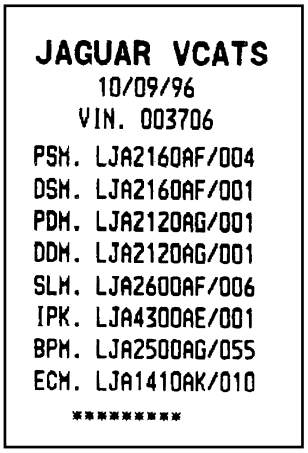
Vehicle Configuration and Test System (VCATS)

On XJ/XK and S-TYPE vehicles, the VCATS data has to be supplied to Jaguar for some control module market specific configurations. The data is added to the Control Module at the factory. VCATS matches hardware part numbers with the correct software; therefore care must be taken when exchanging control units from another vehicle for diagnosis.

TYPICAL VCATS LABEL



ABBREVIATIONS:

PSM	Passenger Seat Control Module
DSM	Driver Seat Control Module
PDM	Passenger Door Control Module
DDM	Driver Door Control Module
SLM	Security and Locking Control module
IPK	Major Instrument Pack
BPM	Body Processor Module
ECM	Engine Control Module

T682.04

Should a similar, but not identical, CM from one vehicle be installed in a second vehicle, this may result in various malfunctions in the second vehicle. Since the CM may then 'learn' information from the second vehicle, incorrect data would then be transferred back to the first vehicle when the CM is transferred back to its original location. This is particularly applicable in the case of the Engine Control Module (ECM).

With the increasing number of control units on a given vehicle, it is becoming less cost effective to have replacements pre-programmed at the factory, also the space required to store all market configurations becomes prohibitive. In view of these facts Jaguar is now supplying blank (un-programmed) units (for X-TYPE on) that must be configured at point of sale at the retailer. WDS is the main tool for programming and with the latest CD updates it will include the latest software for the vehicles control units (the CD release notes should be read to see the scope of programming and what vehicles it affects).

NOTES

JAGUAR ELECTRICAL SYSTEMS: CONTROL MODULES

Control Module Configuration (continued)

How Programming Affects Diagnosis

When diagnosing electrical malfunctions, assume that no defect exists in the relatively robust CM hardware in the vehicle. Since a defect is more likely in connectors or switches initial diagnosis should concentrate on these components. Inputs and outputs can be monitored via the diagnostic equipment, if these are proven to have no fault the failure must lie with the control unit.

There are two malfunctions of a control unit:

- A hardware problem
- A software problem (Programming).

Approximately 80% of all control units that are replaced have a software problem that can be either corrected by performing a hard reset (disconnection of the battery power supply) or reprogramming of the hardware. It is suggested before any modules are replaced a hard reset and/or reprogramming should be carried out. Several options are available with WDS: Program New Module, Program Existing Module, Dealer options, Setup and configuration.

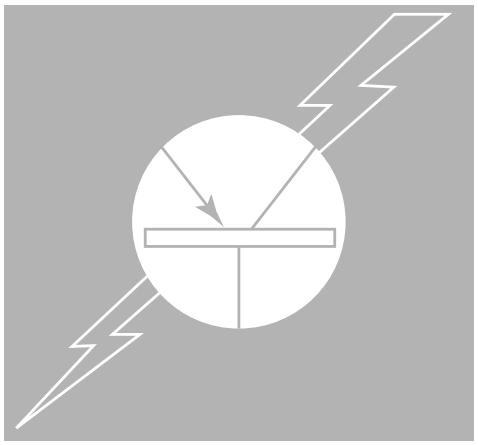
On vehicles that cannot be programmed via the diagnostic equipment, note the 3 conditions below before interchanging control modules between identical vehicles to confirm diagnosis.

1. Refer to the illustration on page 2.2.5, which shows a typical VCATS label, located on the floor of the luggage compartment of XK8 models. Each label is specific to each individual vehicle, and lists the VIN of the vehicle along with the part numbers of the CMs originally fitted to the vehicle during manufacture.
2. In the example on page 2.2.5, the part number of the Body Processor Module is identified as: LJA2500AG/1055. In the illustration, the basic part number LJA2500AG has been programmed during vehicle manufacture for the specific market and features of the vehicle concerned, and is identified as 1055. This would be the complete part number for a replacement BPM for the vehicle concerned if it were necessary to order one from Jaguar Parts Operations. Note that the suffix 1055 (in the example above) does not appear on the label on the CM concerned. This number appears only on the VCATS label of the vehicle.
3. It is permissible to **temporarily** interchange a CM from another vehicle for testing purposes, only if:
    a. The full vehicle history of both vehicles is available
    b. The history of both vehicles indicates that the CM in question has not previously been replaced by a CM from another vehicle or by a replacement part
    c. The VCATS label information for the full part number of the CM in question on **both donor and recipient** vehicle is **identical**, as illustrated above.
    d. The donor vehicle is known to have no electrical defect.

Always disconnect the battery **first**, and reconnect it after connecting the replacement CM. The possibility exists, particularly for control modules that control the movement of door windows or power operated convertible tops, for inadvertent uncontrolled operation of these systems if the battery remains connected during such operations. This can result in injury to persons working on the vehicle.

NOTES

ADVANCED JAGUAR ELECTRICAL SYSTEMS



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DATE OF ISSUE: 02/15/2002

JAGUAR ELECTRICAL SYSTEMS: MULTIPLEXING

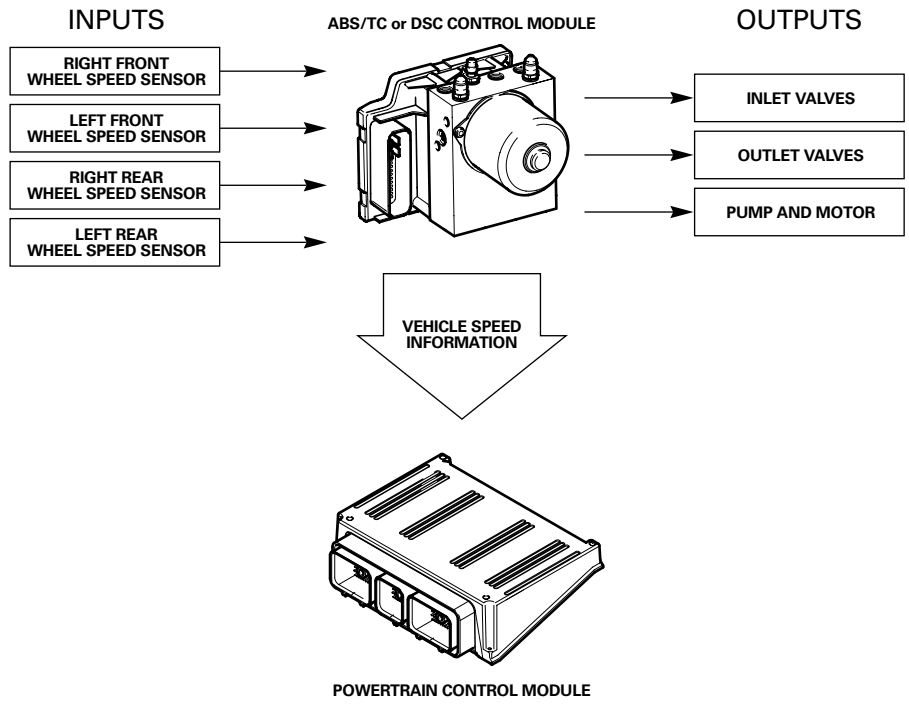
Today's cars use electronic modules to control everything from the engine and transmission to the radio and brakes. Many of these controllers require the same INPUT information to operate efficiently. For example, seemingly unrelated systems like the transmission and anti-lock brakes both require vehicle speed information. If both systems could get vehicle speed information from the same INPUT, it would reduce the number of sensors and the amount of wiring on the vehicle.

Jaguar vehicles have this ability to share information through the use of NETWORKS. A network refers to the control modules and wiring that allow information to be sent or received, using an electrical or electronic medium. Some networks allow electronic modules to share input information. Networks can enable multiple modules to act together to perform complex vehicle operations. Improved vehicle diagnostic capabilities also result from the use of networks.

Jaguar uses 5 types of different networks depending on the model:

- The Controller Area Network (CAN)
- The Standard Corporate Protocol Network (SCP)
- The Serial Data Link (ISO 9141)
- The Audio Control Protocol Network (ACP)
- The Digital Data Bus Network (D2B)

NETWORK CONTROL MODULES CAN SHARE INFORMATION



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Electronic control modules connected to a network allow controllers to “work together” to coordinate the operation of vehicle systems. This allows for the best operation and provides the ability for many complex vehicle functions.

For example, some networked vehicles with traction control use two control modules to maintain vehicle traction.

- Below a certain speed and engine load the Anti-Lock Braking / Traction Control (ABS/TC) Control Module may prevent wheel spin by pulsing the drive wheel brakes ON and OFF. At the same time the PCM may retard ignition control to reduce engine torque.

However, above that speed and engine load only the PCM will take action to prevent wheel spin by reducing engine torque. This is done by retarding ignition control, controlling fuel injection or reducing throttle angle.

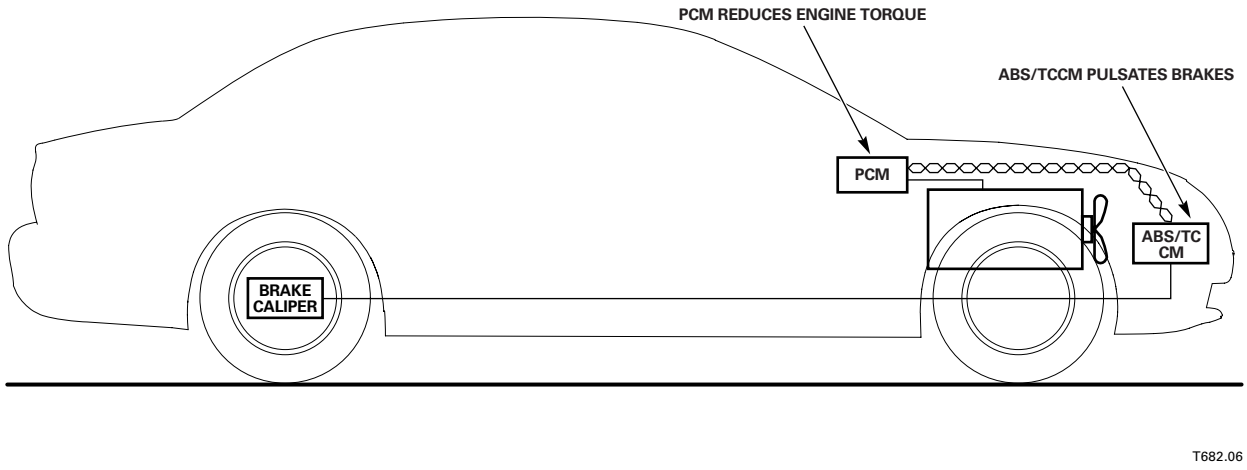
In this system the communication between the two electronic control modules provides the best vehicle operation to prevent wheel spin.

There is common information each of these systems needs:

- vehicle speed
- wheel rotation speed
- engine load

Without a network, PCM and ABS/TC modules require their own sensors to provide this information. Some networks allow input information to be shared by all the modules on the network, eliminating the need to provide individual sensors for each module.

COMPLEX FUNCTIONS USING A NETWORK FOR ABS OPERATION



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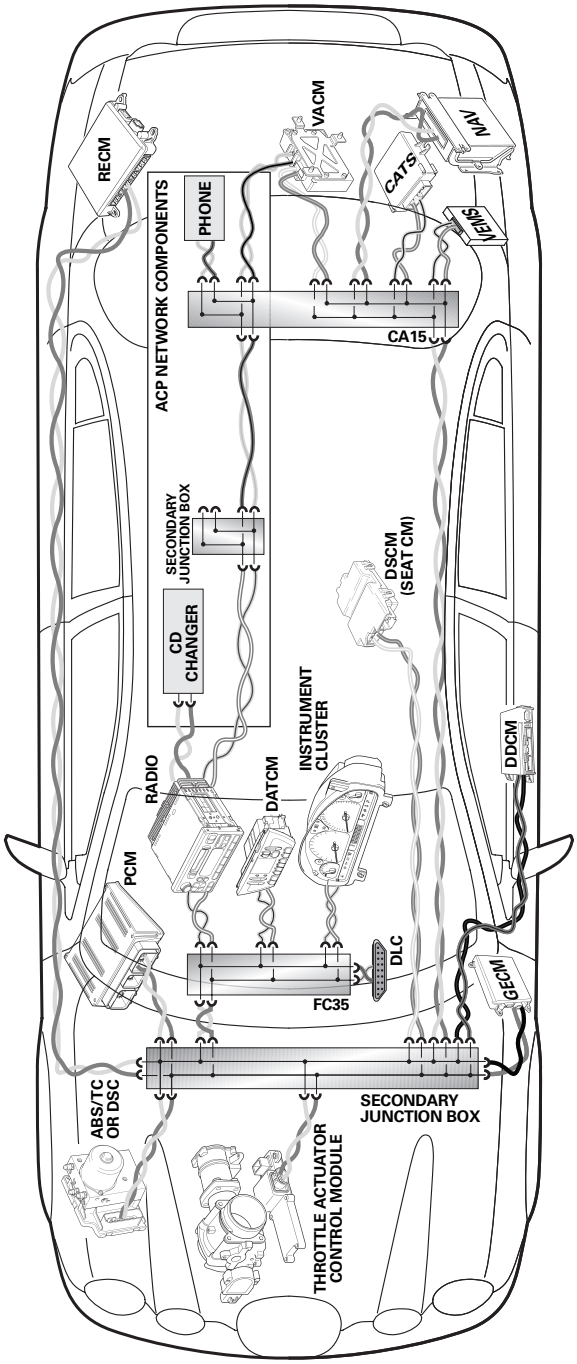
JAGUAR ELECTRICAL SYSTEMS: MULTIPLEXING

SCP NETWORK (S-TYPE)

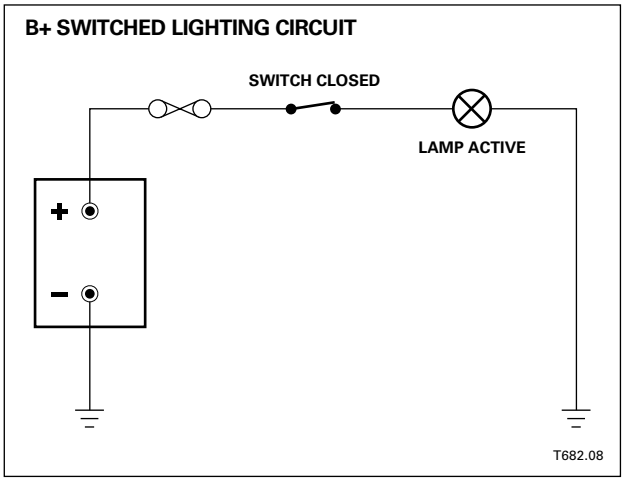


T682.07

Control Circuits

The purpose of a conventional electrical or a multiplex control circuit is to activate or control a function in response to an input. The input can be an operator command such as pressing a switch, an electrical input from a sensor such as wheel speed, or a signal from another control module such as engine speed.

The following circuits are examples of some inputs and outputs that control vehicle systems.

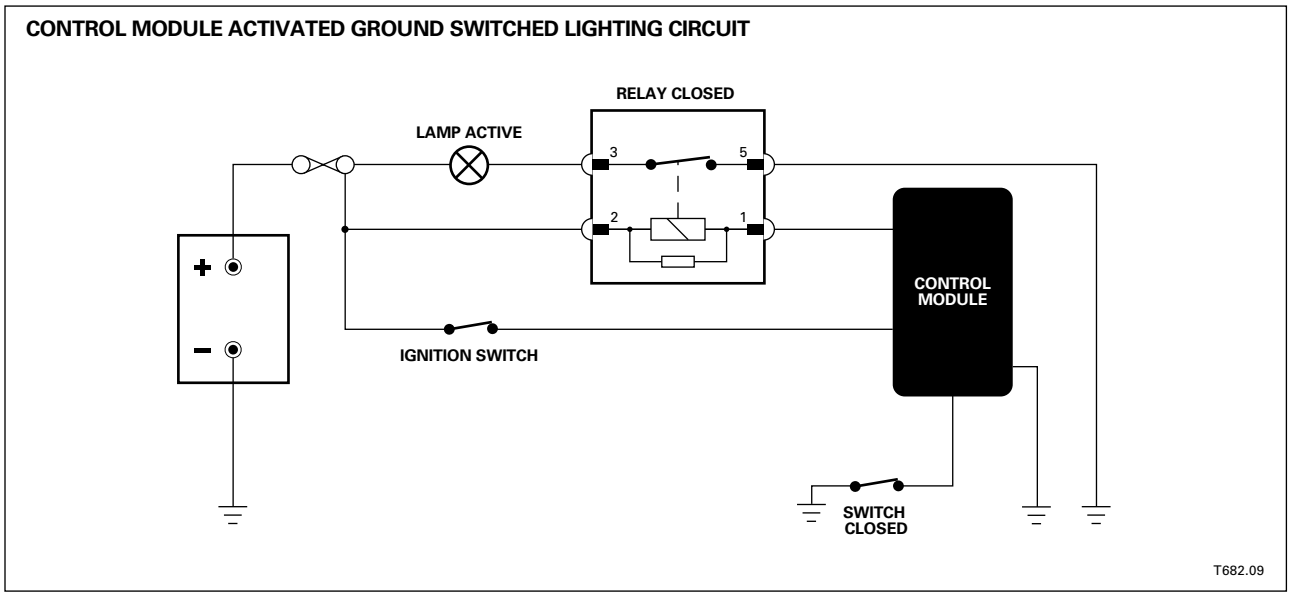


B+ Switched Lighting Circuit

In this circuit, the input is the closing of a switch. The output is a voltage signal that results in activating the lamp.

Control Module Activated Ground Switched Lighting Circuit

In this circuit, more than one input and output can be required to activate the lamp. The first input is closing a switch that inputs a ground signal to the control module. The control module outputs a ground signal to the relay coil causing the relay contacts to close. The relay outputs (provides) the ground to activate the lamp.



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JAGUAR ELECTRICAL SYSTEMS: MULTIPLEXING

Non-multiplexed Signal Distribution

The circuit on the facing page demonstrates how a vehicle without multiplexing distributes a vehicle speed signal output using the inputs from the four wheel speed sensors. The ABS CM transmits one wheel speed sensor signal to the instrument pack to be used as the vehicle speed signal for the speedometer and for distribution to other vehicle systems.

Control component	**Function**
INST (instrument pack)	Speedometer
TCM (transmission control module)	Transmission shift control
ICE (radio / cassette head)	ICE volume
A/CCM (air conditioning control module)	Climate control blower speed
ECM (engine control module)	Engine control
PASCM (power assisted steering control module)	Variable assist power steering
SCCM (speed control control module)	Cruise control
BPM (body processor control module)	Wiper speed control
SLCM (security and locking control module)	Locking and security functions

Each of the components receives its vehicle speed input via a separate (hard wired) circuit.

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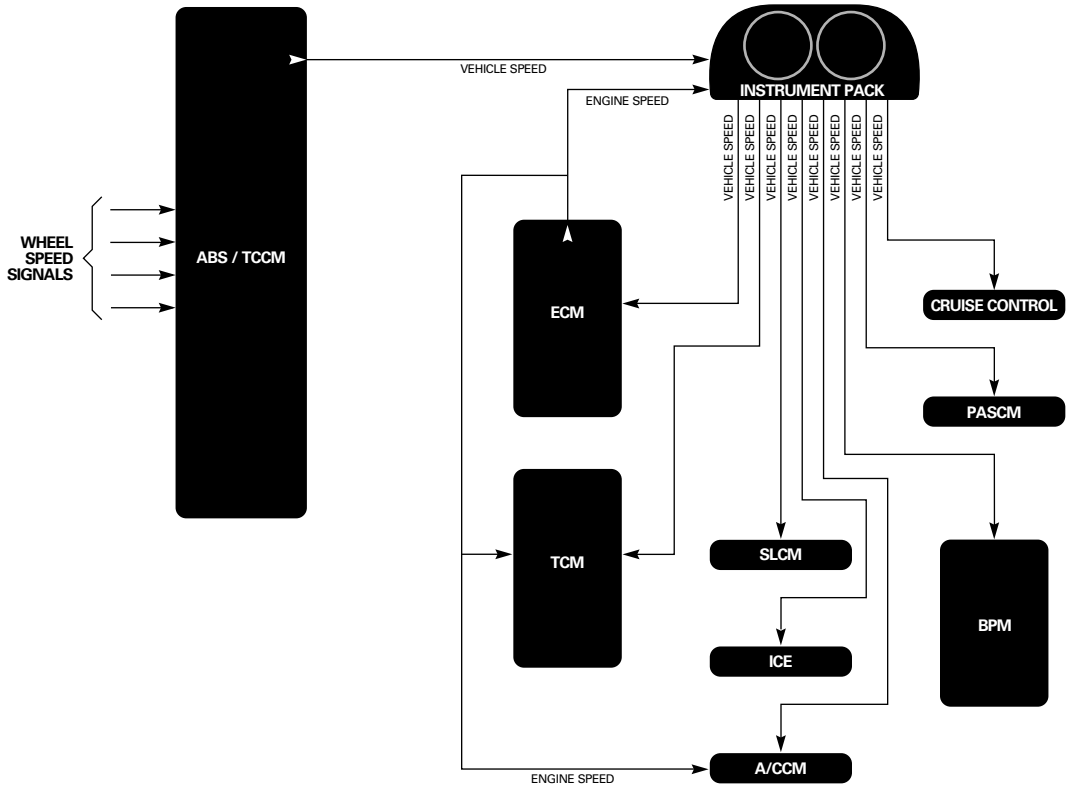
NON-MULTIPLEXED WHEEL AND VEHICLE SPEED SIGNAL DISTRIBUTION (95 – 97 MY XJ)



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JAGUAR ELECTRICAL SYSTEMS: MULTIPLEXING

Multiplex Controlled Functions

Inputs

Multiplexed control modules use conventional inputs from the sensors or switches that are directly connected to them (hard wired). The control modules also use data message inputs from other control modules connected to the multiplex circuit.

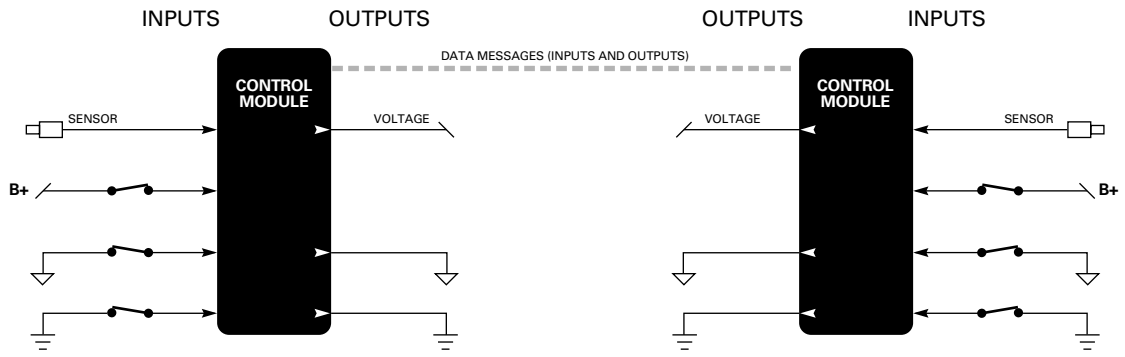
Outputs

The control modules output conventional voltage signals (via individual hard wires) to directly control components. They also output data messages to the network that are used by other control modules.

Shared Function Control

Because control modules can transmit data messages to each other over the shared network, they can share control functions. One module can activate a function based on inputs received from one or a number of other modules.

EXAMPLES OF MULTIPLEX INPUTS AND OUTPUTS

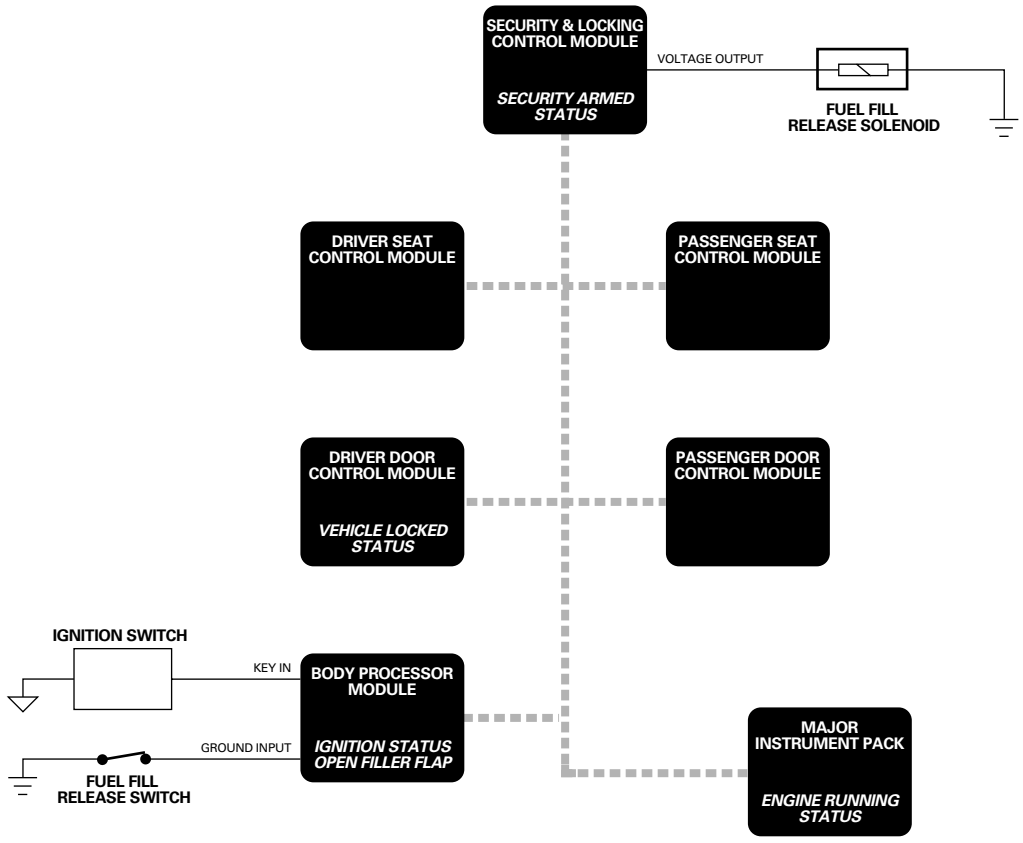


NOTES

Multiplex Controlled Fuel Filler Flap Circuit

In the circuit shown below, a ground input from the fuel filler flap release switch triggers the body processor module to broadcast an open fuel filler flap data message on the SCP multiplex network. In response to the data message, the security and locking control module (the closest module to the filler flap) outputs a voltage to activate the filler flap release solenoid. If other data messages on the network indicate that the engine is running, the security system is armed, the vehicle is either locked or the key is not in the ignition, then the open fuel filler flap data message is inhibited.

MULTIPLEX CONTROLLED FUEL FILLER FLAP (97 MY XK)



NOTES

JAGUAR ELECTRICAL SYSTEMS: MULTIPLEXING

Multiplexed Signal Distribution

The circuit on the facing page demonstrates how a vehicle speed signal is distributed via multiplex circuits.

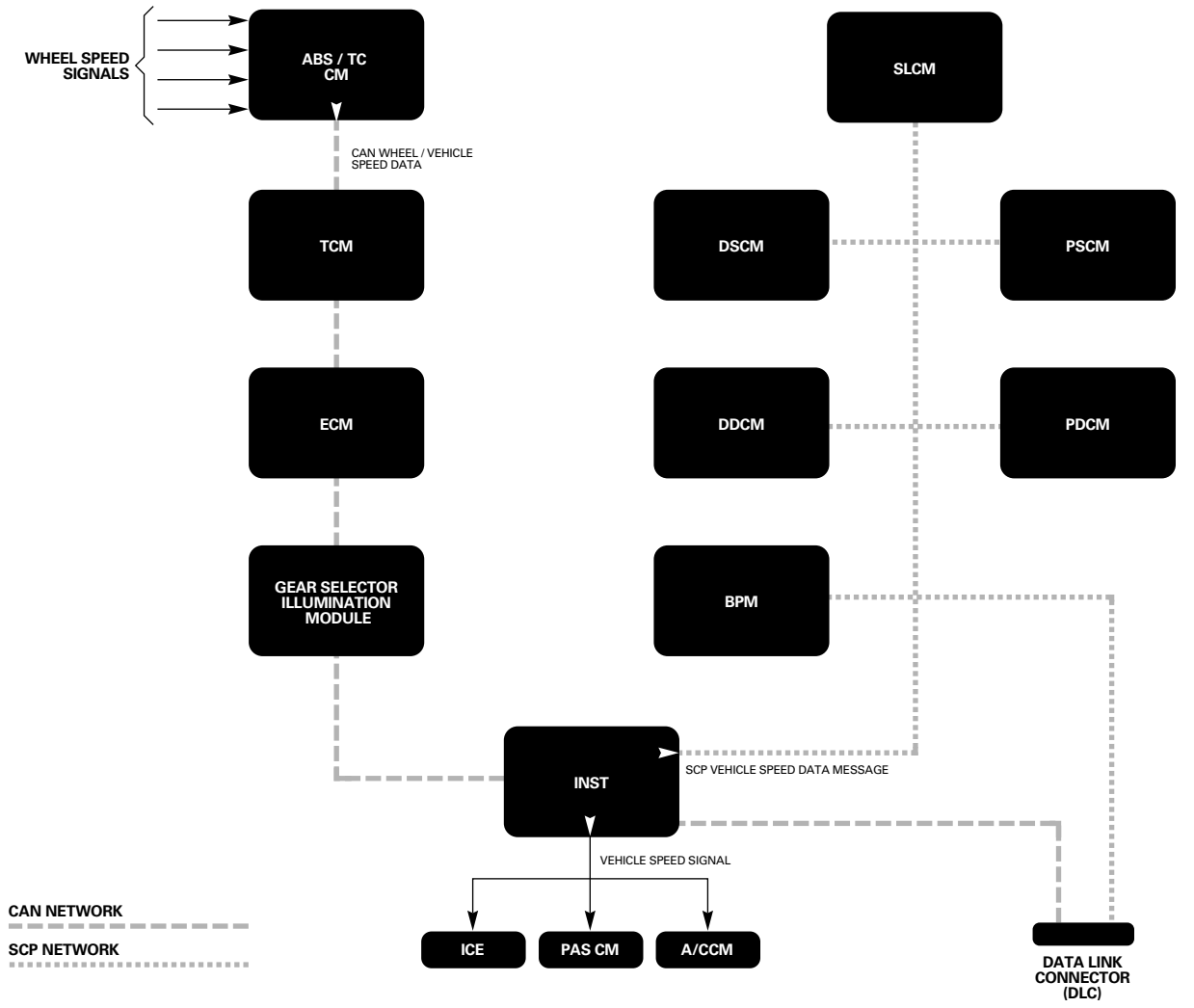
The four wheel speed signals are used by the ABS / TCCM to provide anti-lock braking and traction control. The ABS / TCCM communicates a data messages on the CAN multiplex network. The messages contains data for the four individual wheel speeds plus the vehicle speed. The TCM and ECM are connected to the CAN multiplex circuit and use the wheel and vehicle speed data for control of their functions. The INST (instrument pack) is also connected to the CAN network and converts the vehicle speed data message for use by the speedometer, SCP (body systems) multiplex circuit and nonmultiplexed components.

Control component	Function
TCM (transmission control module)	Transmission shift control
ECM (engine control module)	Engine control, cruise control
INST (instrument pack)	Speedometer
BPM (body processor control module)	Convertible top
SLCM (security and locking control module)	Locking and security functions
ICE (radio / cassette head)	ICE volume
A/CCM (air conditioning control module)	Climate control blower speed
PASCM (power steering control module)	Variable assist power steering

All modules connected to the multiplex circuits share the same message data using only the network wiring and connectors. Modules not connected to the networks (ICE, PASCM and A/CCM) receive the vehicle speed signal via separate hard wires.

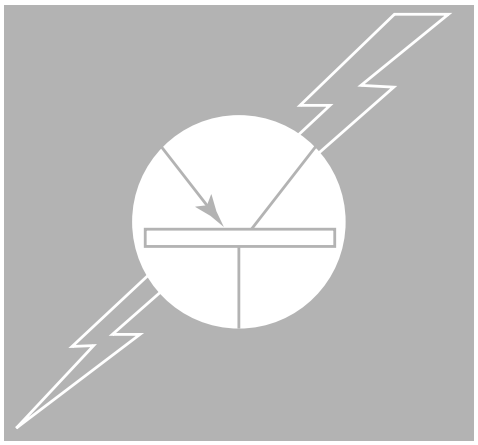
NOTES

MULTIPLEXED WHEEL AND VEHICLE SPEED SIGNAL DISTRIBUTION (97 MY XK)



NOTES

ADVANCED JAGUAR ELECTRICAL SYSTEMS



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JAGUAR ELECTRICAL SYSTEMS: SECURITY

Security systems are more advanced than ever before. The security system controls several systems such as the door locks, vehicle alarm and anti-theft systems.

Between the keyless entry systems and conventional locks, some cars have 2 or 4 different ways to unlock the doors. The locking system must be very reliable because it is going to unlock the doors tens of thousands of times over the life of the vehicle.

Here are some of the ways that you can unlock a vehicle's doors:

- With a key
- By pressing the unlock button inside the car
- By pulling the lever on the inside of the door
- With a keyless-entry remote control

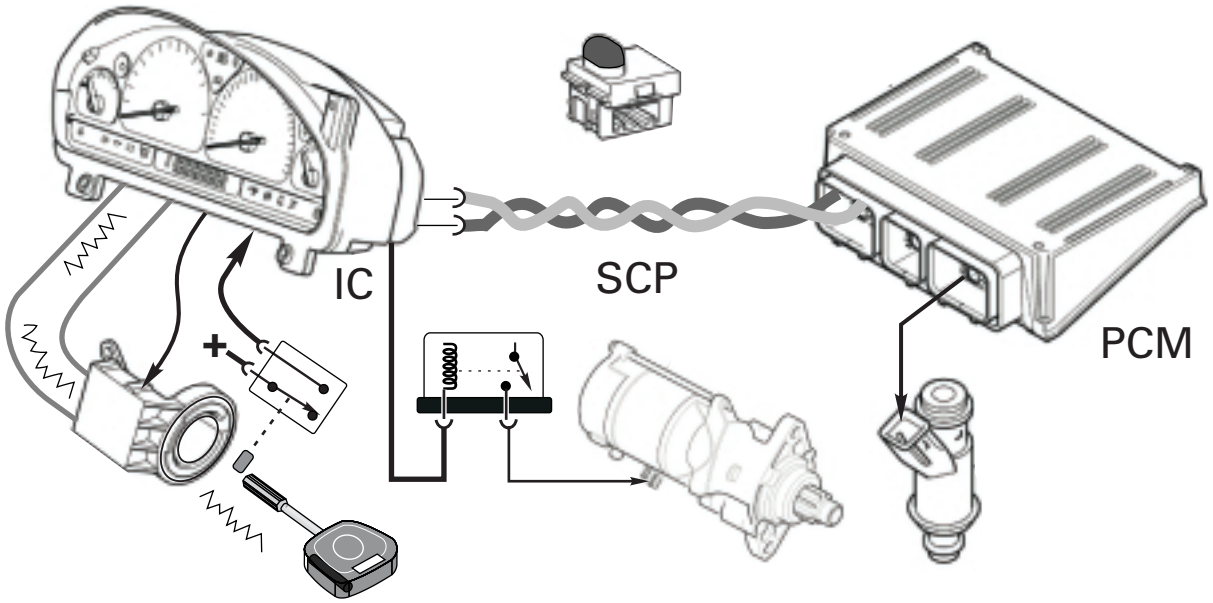
One of the most important modules on a vehicle is the "body controller" module. XJ/XK main body systems are controlled by the Body Processor Module (BPM) and by the Security and Locking Control Module (SLCM). Other lesser body modules (seats, doors, etc.) interface with the main body modules to make up the body system. The S-TYPE main body modules are the General Electronic Control Module (GECM) and the Rear Electronic Control Module (RECM). The X-TYPE uses only a GECM. These modules / systems take care of a lot of the little things that make a car user friendly – for instance, it makes sure the interior lights stay on until you start the car, and it gongs at you if you leave your headlights on or leave the keys in the ignition. In the case of power door locks, the body controller monitors all of the possible sources of an "unlock" or "lock" signal. It monitors a radio frequency and unlocks the doors when it receives the correct digital code from the radio transmitter in the key fob, and also monitors the switches inside the car. When it receives a signal from any of these sources, it provides power to the actuator that unlocks or locks the doors.

The Passive Anti-Theft System or "PATS" in the S- and X-TYPES is one of the most advanced anti-theft systems available today. It is a very effective system that does its job without the vehicle owner having to think about it or to modify his/her usual routine.

Regardless of the system, Jaguar's security systems are designed to protect the vehicle in case of theft or unauthorized entry. Today's Jaguar customers expect more and more features in their vehicles. The security system is an integral part of the vehicle; it is essential that you the technician know how these systems operate and how they are serviced.

NOTES

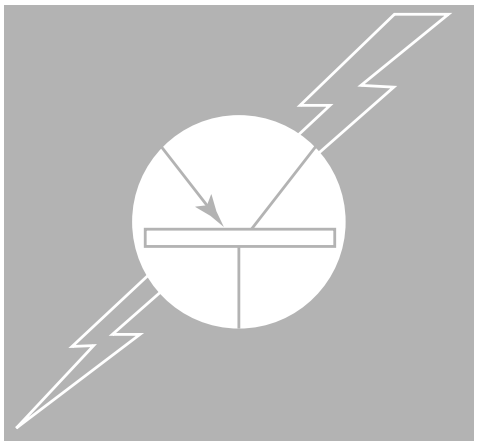
PASSIVE ANTI-THEFT SYSTEM (S-TYPE)



T682.14

NOTES

ADVANCED JAGUAR ELECTRICAL SYSTEMS



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JAGUAR ELECTRICAL SYSTEMS: REVERSE PARKING AID

Reverse Parking Aid System

All Jaguar models can be equipped with a Reverse Parking Aid System.

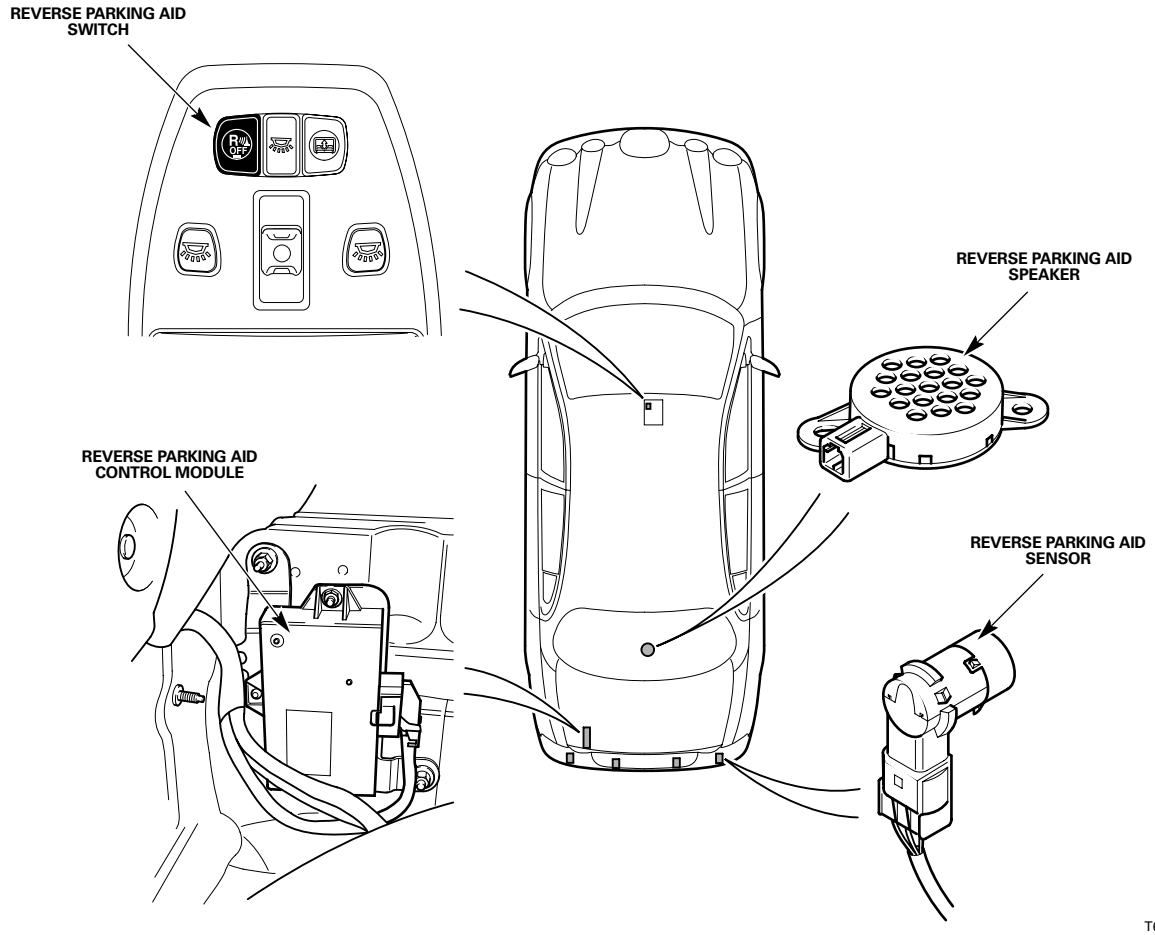
The reverse parking aid system operates through four ultrasonic sensors, located in the rear bumper, that transmit scanning beams covering the area behind the vehicle. These beams are reflected by obstructions behind the vehicle and reflected back to the sensors. The sensors provide input signals to the parking aid control module (PACM), which processes the signals to calculate the distance to the obstruction.

The sounder is then progressively activated by the PACM to gives an appropriate warning signal starting from an intermittent beep at approximately 0.8 meter (32 inches) up to a continuous STOP tone at approximately 0.2 meter (8 inches).

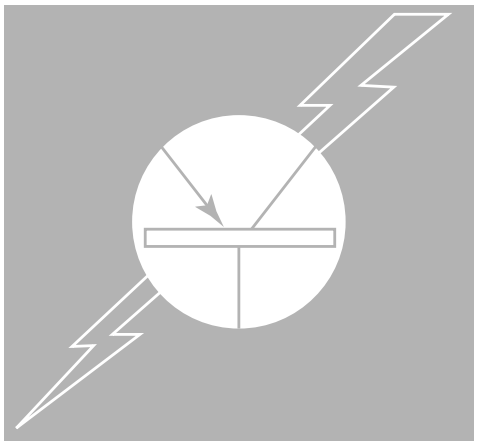
Reverse parking aid is enabled when the reverse lamps are activated by the RECM via a hardwired parallel circuit. The system can be switched OFF by pressing the switch in the roof console. The indicator in the switch illuminates when the system is switched OFF. The system is reset to ON each time the ignition is cycled.

If a system fault occurs, the switch indicator lamp will be continuously illuminated (S-TYPE only). Faults are flagged in the PACM as DTCs (B and C Codes) and can be retrieved using WDS.

REVERSE PARKING AID COMPONENTS (S-TYPE)



ADVANCED JAGUAR ELECTRICAL SYSTEMS



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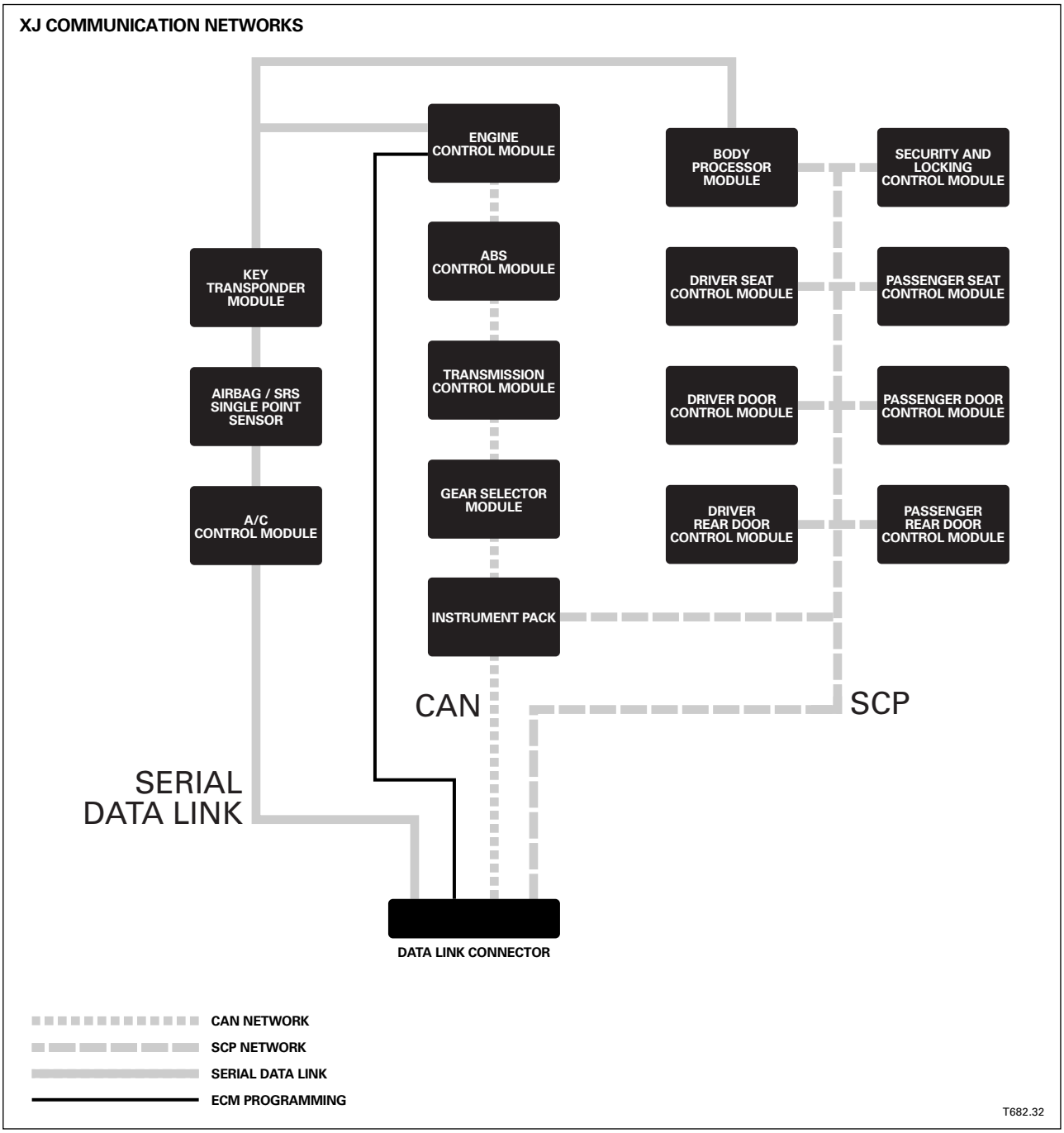
XJ / XK ELECTRICAL DISTRIBUTION SYSTEM

Electrical System Architecture

The XJ / XK vehicle electrical system is a ground side switched system. The ignition switch switches ground circuits on / off to complete system circuits and apply power. Circuits that require ignition switch position control are supplied with “ignition switched grounds”. Both power grounds (high current consumers) and logic grounds (electronic switching circuits) are used throughout the system.

Three data networks are employed: a high speed Controller Area Network (CAN) for the engine, drive train and related systems, a Standard Corporate Protocol network (SCP) for the body systems, and an Audio Control Protocol network (ACP) for certain In-Car Entertainment and Telephone functions. Any vehicle subsystem with the CAN or SCP included uses data derived from the network, or transmits data via the network to achieve control. In addition to the two networks, the vehicle uses a Serial Data Link (ISO 9141) for diagnostics and for the programming of certain control modules.

NOTES


XJ COMMUNICATION NETWORKS
ENGINE CONTROL MODULE
BODY PROCESSOR MODULE
SECURITY AND LOCKING CONTROL MODULE
KEY TRANSPONDER MODULE
ABS CONTROL MODULE
DRIVER SEAT CONTROL MODULE
PASSENGER SEAT CONTROL MODULE
TRANSMISSION CONTROL MODULE
AIRBAG / SRS SINGLE POINT SENSOR
DRIVER DOOR CONTROL MODULE
PASSENGER DOOR CONTROL MODULE
GEAR SELECTOR MODULE
A/C CONTROL MODULE
DRIVER REAR DOOR CONTROL MODULE
PASSENGER REAR DOOR CONTROL MODULE
INSTRUMENT PACK
CAN
SCP
SERIAL DATA LINK
DATA LINK CONNECTOR
CAN NETWORK
SCP NETWORK
SERIAL DATA LINK
ECM PROGRAMMING
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XJ / XK ELECTRICAL DISTRIBUTION SYSTEM

XJ Electrical Distribution

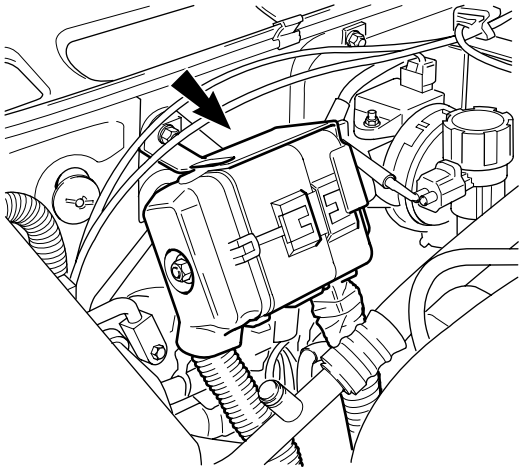
High Power Protection Module

A high power protection module is installed in the trunk, immediately below and to the rear of the fuel tank.

Power Distribution Cables

The power distribution cables accommodate the high power protection module, the engines and the fuse box layout. The power stud terminal at the front firewall is located on the wall of the RH enclosure.

ENGINE HARNESS CONNECTOR (XJ SHOWN)



T682.16

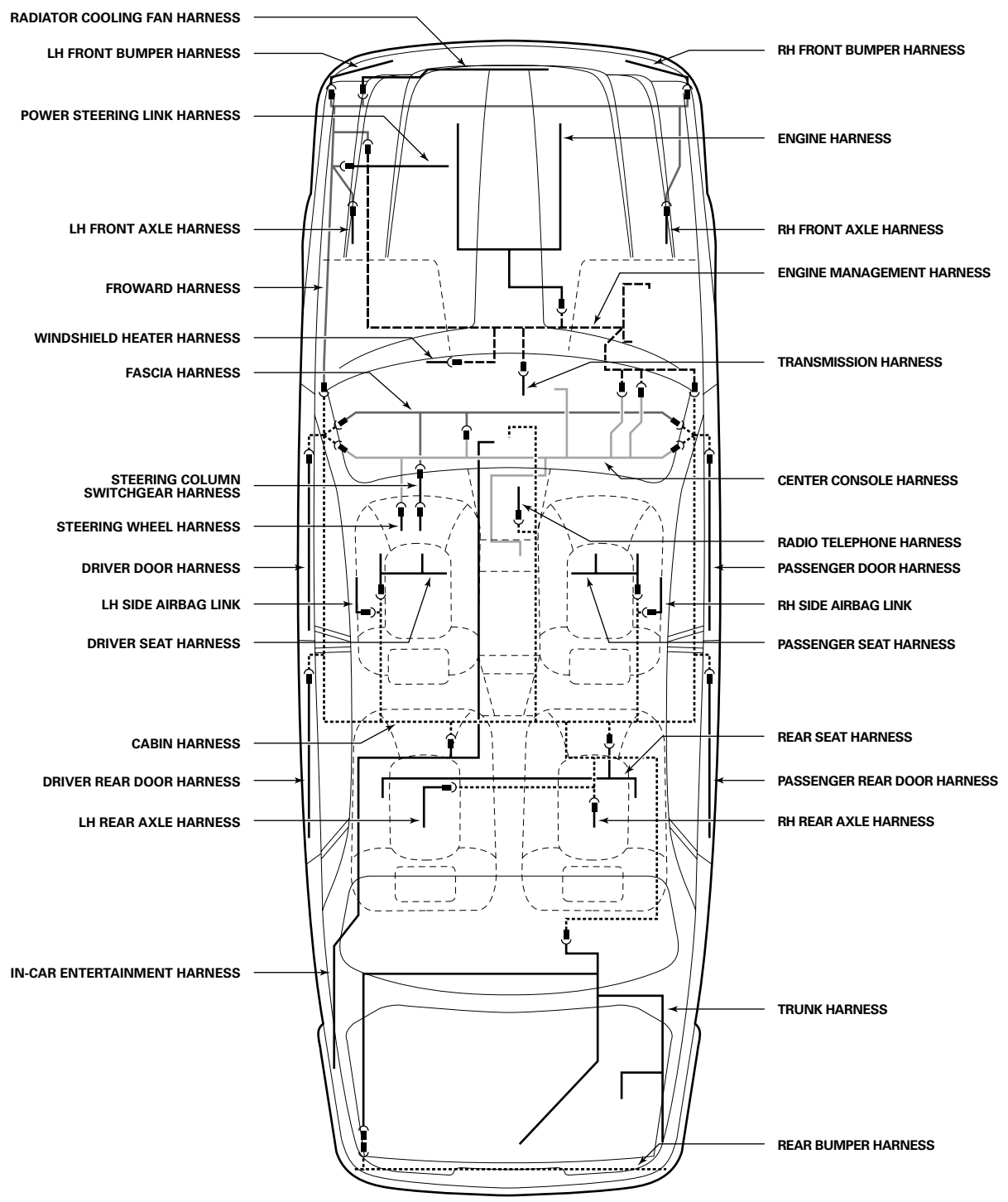
Harnesses

The harness layout accommodates the equipment and communication networks. The through panel connectors are used in unsealed applications; 070 multilock connectors and Augat connectors are used in sealed applications.

In the engine compartment, an engine management harness is installed across the front bulkhead. Connectors attached to the bracket on top of the transmission provide the interfaces with the engine and transmission harnesses.

NOTES

XJ HARNESS LAYOUT



XJ / XK ELECTRICAL DISTRIBUTION SYSTEM

XJ Electrical Distribution (continued)

Fuse Boxes

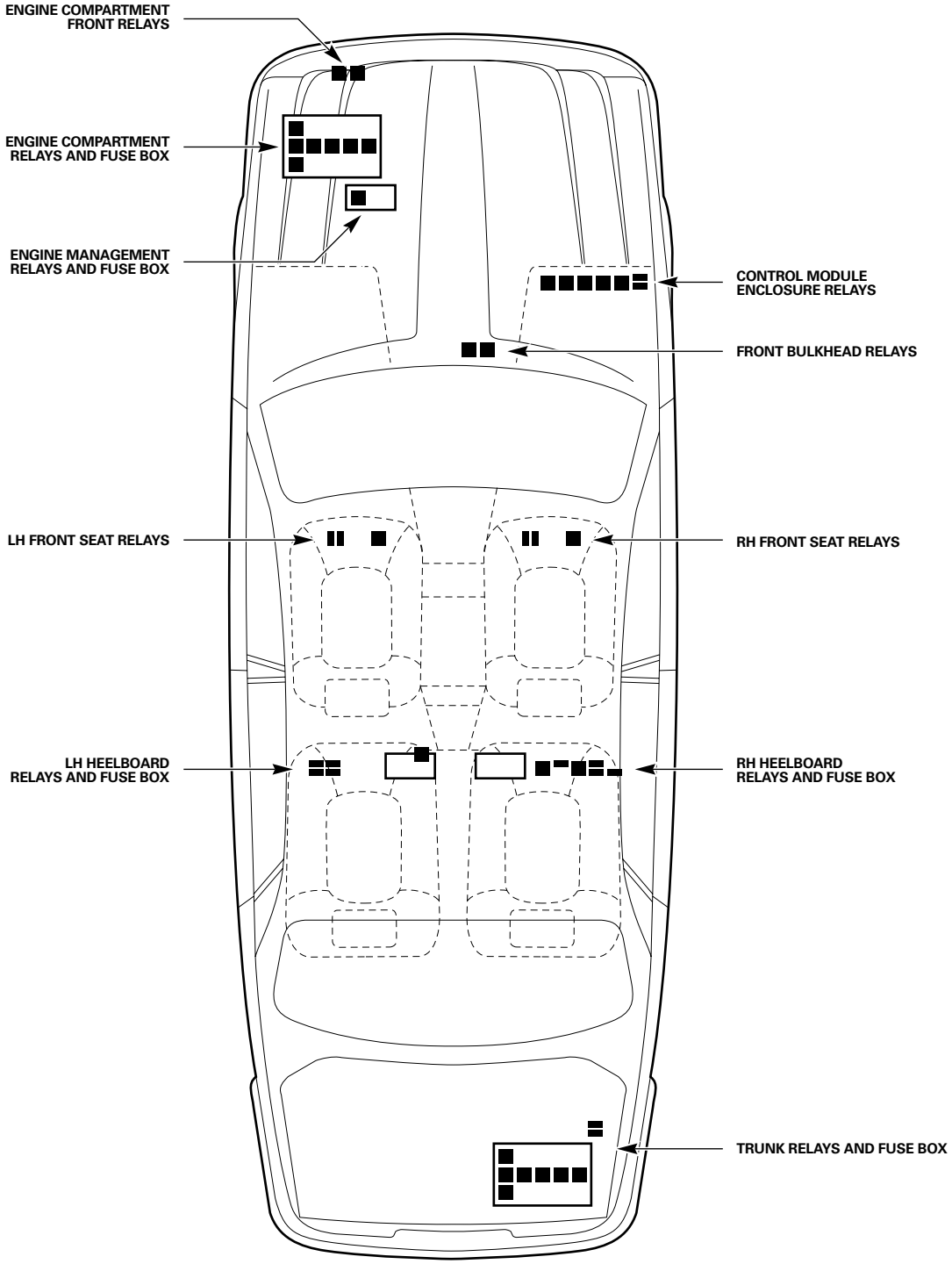
Five fuse boxes contain the protection fuses for all the electrical circuits. The engine compartment fuse box and the engine management fuse box are located on the left side of the engine compartment. The heelboard fuse boxes are located behind the left and right heelboards. The trunk fuse box is installed in the electrical carrier in the trunk.

Electrical Carrier

The electrical carrier is the same as the one installed in XK vehicles. In addition to the trunk fuse box, it contains the SLCM. Spare fuses and a fuse extractor tool are located on the underside of the lid.

NOTES

XJ FUSE BOX AND RELAY LOCATIONS

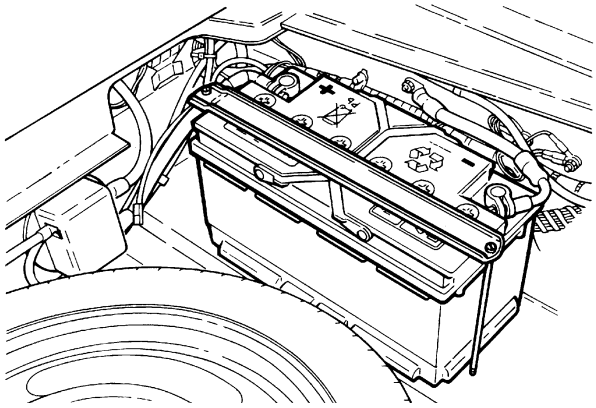


XJ / XK ELECTRICAL DISTRIBUTION SYSTEM

XK Electrical Distribution

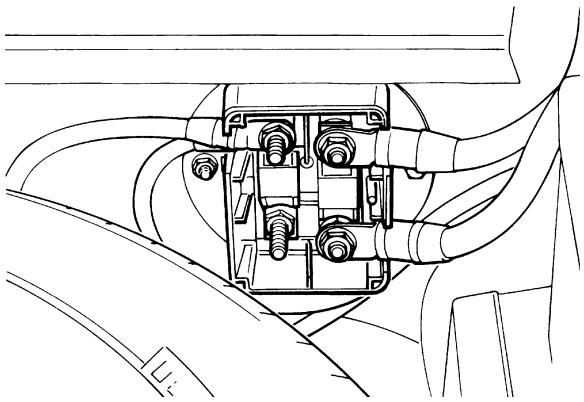
Distribution cables supply battery power through a high power protection module to the starter motor and to five fuse boxes. Harnesses distribute battery, auxiliary and ignition power from fuse boxes to all the user components.

XK BATTERY



T682.19

XK HIGH POWER PROTECTION MODULE



T682.20

Battery

The DIN 88, 92 ampere hour battery is installed on the right side of the trunk floor below the trim.

> **CAUTION: Open both doors, or lower the windows of both doors, before disconnecting the battery. Disconnecting the battery disables the automatic window drop/rise function. Opening a door when the automatic window drop/rise function is disabled and the windows are closed could damage the door seals.**

High Power Protection Module

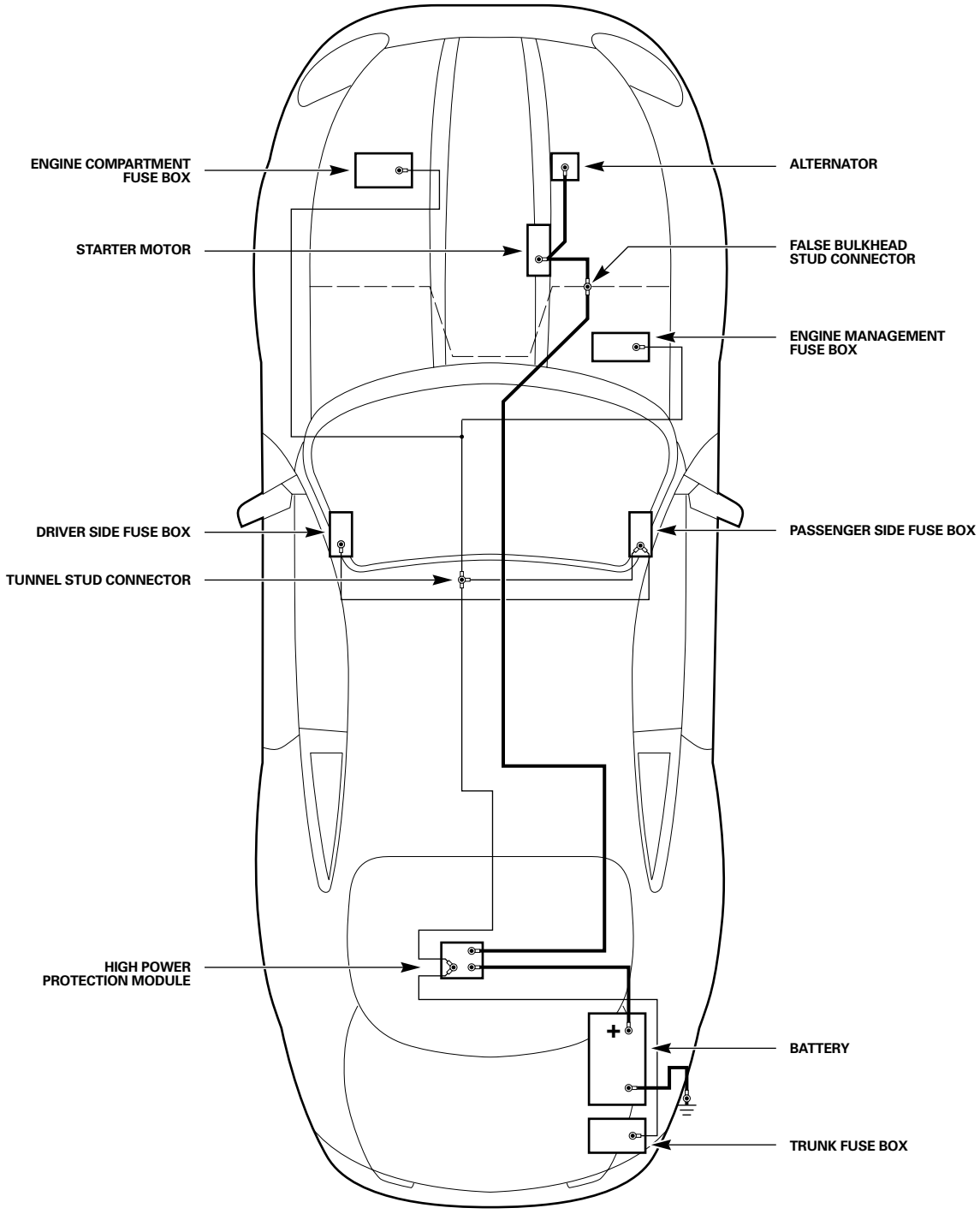
The high power protection module contains three 250 amperes fuses. Two fuses connected in parallel provide 500 amperes protection for the starter supply. The third fuse provides 250 amperes protection for the fuse box supplies.

Power Distribution Cables

Heavy duty power distribution cables connect the battery to the body and the high power protection module, and the high power protection module to the engine starter and the vehicle fuse boxes.

NOTESS

XK POWER DISTRIBUTION



XJ / XK ELECTRICAL DISTRIBUTION SYSTEM

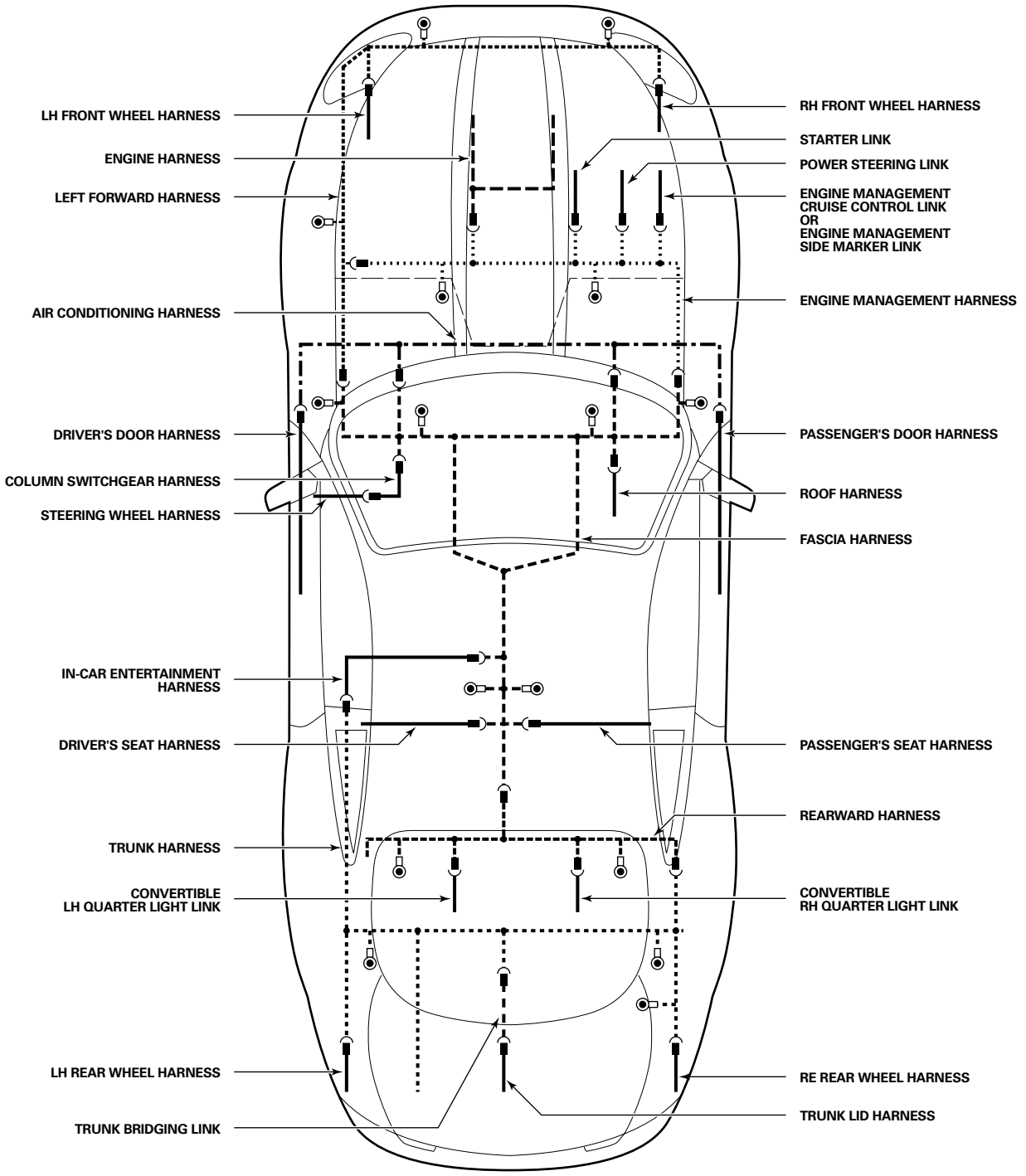
XK Electrical Distribution

Harnesses

The vehicle harnesses plug directly onto components or component flying leads using locking connectors. Extensive use is made of harness securing clips, and the majority of the flying lead and interface connectors are secured to the adjacent structure or component.

NOTES

XK HARNESS LAYOUT



XJ / XK ELECTRICAL DISTRIBUTION SYSTEM

XK Electrical Distribution

Fuse Boxes

Five fuse boxes contain the protection fuses for all the electrical circuits. The engine compartment fuse box is located on the left side of the engine compartment; the control module enclosure fuse box is located in the right hand control module enclosure. The driver and passenger fuse boxes are located on the left and right fascia, respectively. The trunk fuse box is installed in the electrical carrier in the trunk; spare fuses and a fuse extractor tool are installed on the underside of the lid.

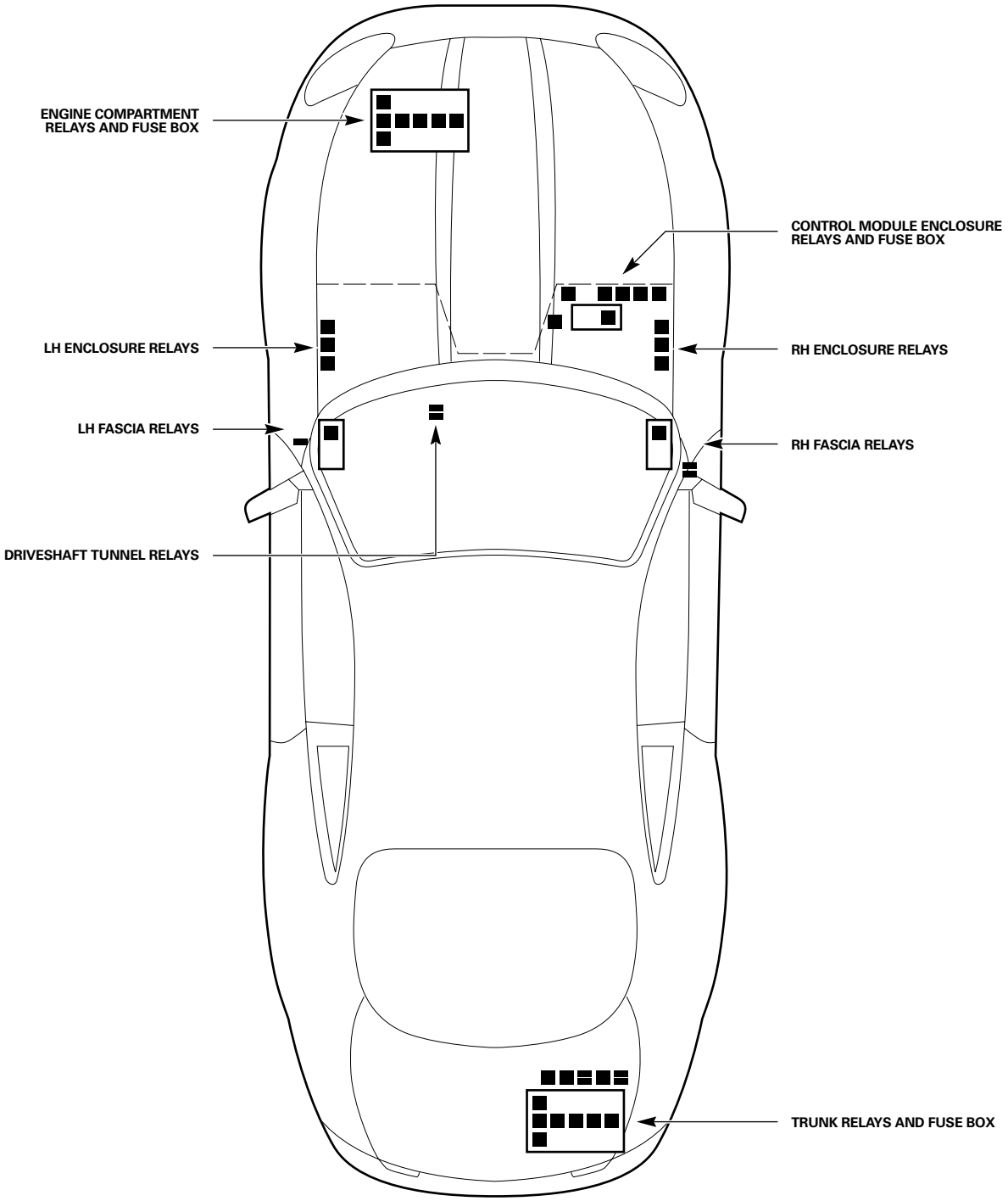
CAUTION: Always replace blown fuses with the same rated fuse.

Relays

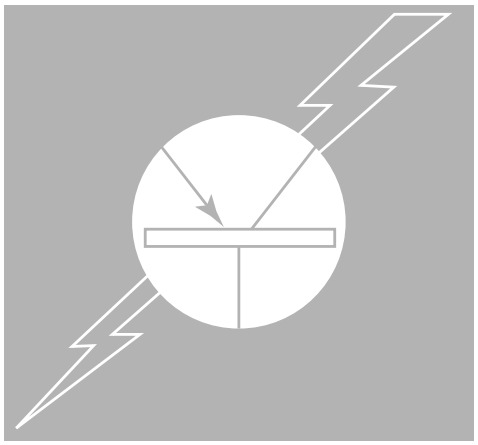
The majority of the relays are located in and around the fuse boxes. Those in the engine compartment enclosures are in groups of three, under protective covers.

NOTES

XK FUSE BOX AND RELAY LOCATIONS



ADVANCED JAGUAR ELECTRICAL SYSTEMS



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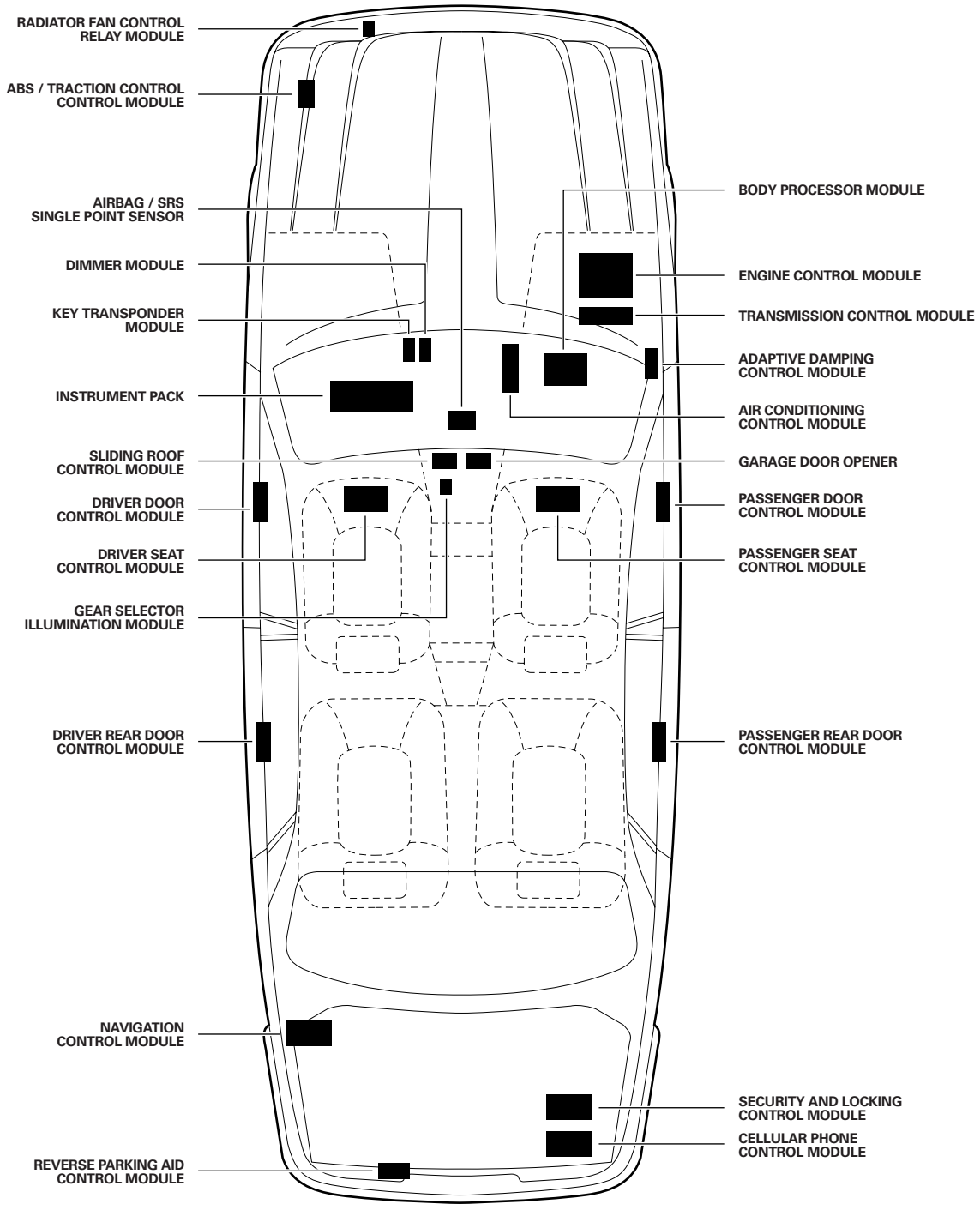
XJ / XK CONTROL MODULES

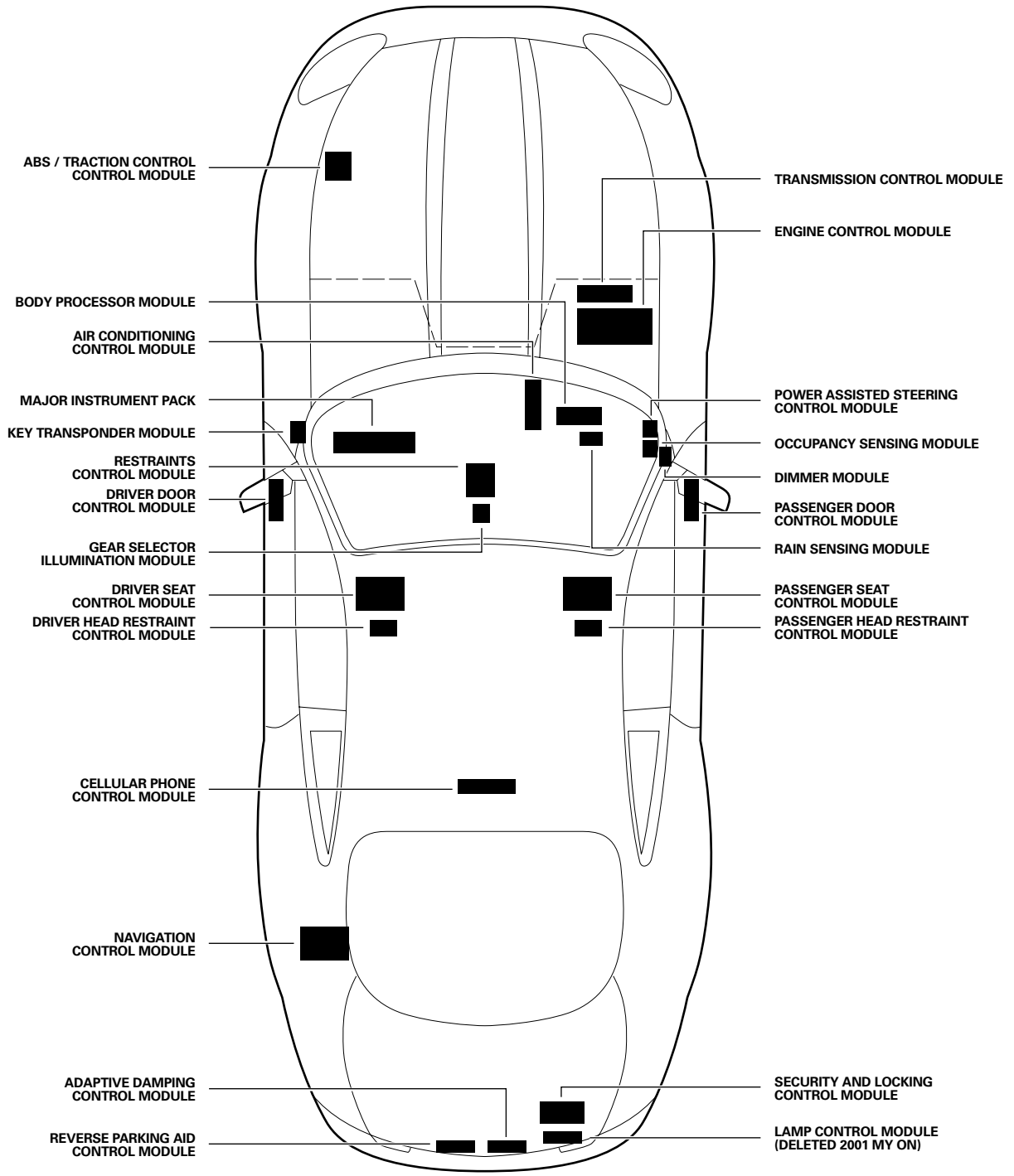
XJ Control Module Locations

XJ CONTROL MODULE LOCATIONS



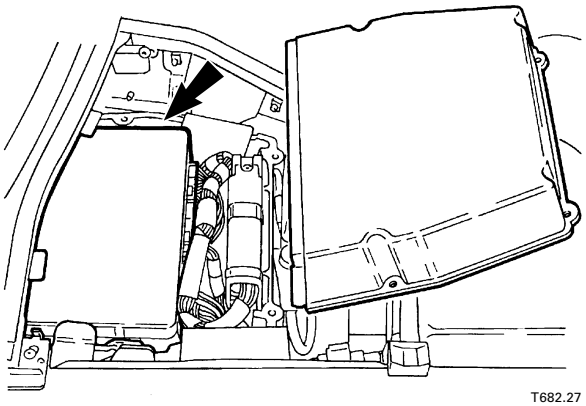
XK Control Module Locations

XK CONTROL MODULE LOCATIONS



XJ / XK CONTROL MODULES

ENGINE CONTROL MODULE



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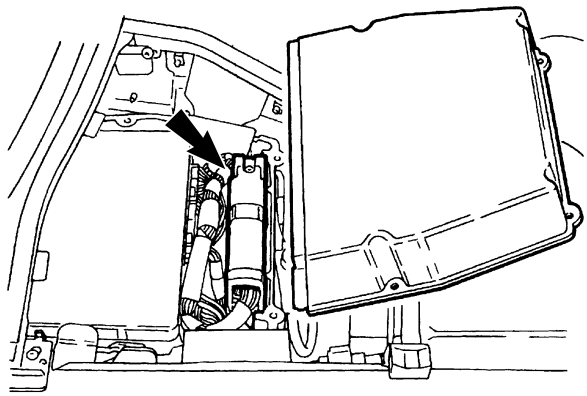
TRANSMISSION CONTROL MODULE



T682.28

Engine Control Module

The engine management system is controlled by the ECM, which is installed in the control module enclosure in the engine compartment. It also incorporates a comprehensive component monitoring and diagnostic capability.

Transmission Control Module

The transmission management system uses both analogue and digital signals, to control the operation of the transmission. Digital signals are processed by the TCM to and from the vehicle multiplex network. Other input/output analogue signals are hardwired tot he TCM. This information is used primarily by the TCM to decide which shift program to implement, which gear to select and for shift energy management. If a fault occurs, the TCM will take default action and inform the driver via the Message Centre and amber warning light.

NOTES

Body Processor Module

The Body Control System consists of a combination of the following modules:

- Body Processor Module (BPM)
- Security and Locking Control Module (SLCM)
- Driver Door Control Module (DDCM)
- Passenger Door Control Module (PDCM)
- Driver Seat Control Module (DSCM)
- Passenger Seat Control Module (PSCM
- Driver Rear Door Control Module (DRDCM)
- Passenger Rear Door Control Module (PRDCM)
- Driver Head Restraint Control Module (DHRCM)
- Passenger Head Restraint Module (PHRCM)

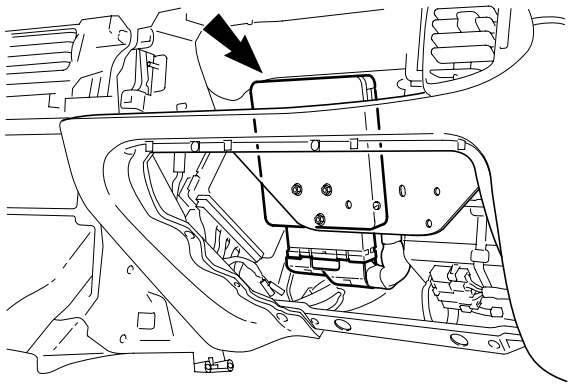
Except for the BPM, the modules are described within the relevant sections of this guide.

On the XK models, the BPM is located in the fascia, mounted on the passenger airbag/SRS bracket, behind and above the glovebox.

The BPM functions are (where fitted):

- Interior and exterior lighting, except for the door puddle lamps and the rear lamp bulb failure
- Windshield wash/wipe and headlamp power wash
- Steering column memory
- Action alarm lights and sounders and inhibits engine crank
- Gearshift and ignition key interlocks
- Various switches, for example: convertible top, trunk release, fuel filler flap release
- Various audible and visual alarms, for example: sidelight on warning, convertible top operating, seat belt status.

XJ BODY PROCESSOR MODULE



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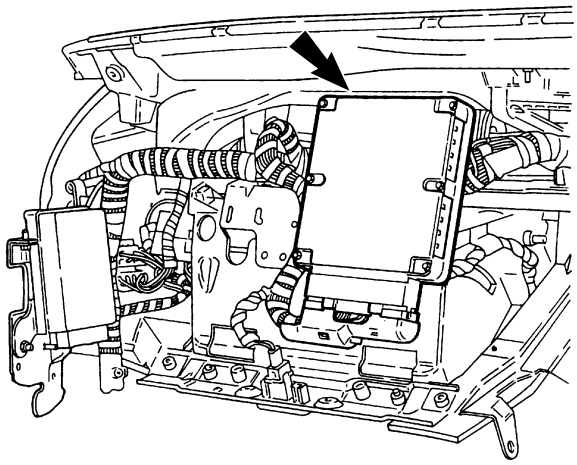
XK BODY PROCESSOR MODULE



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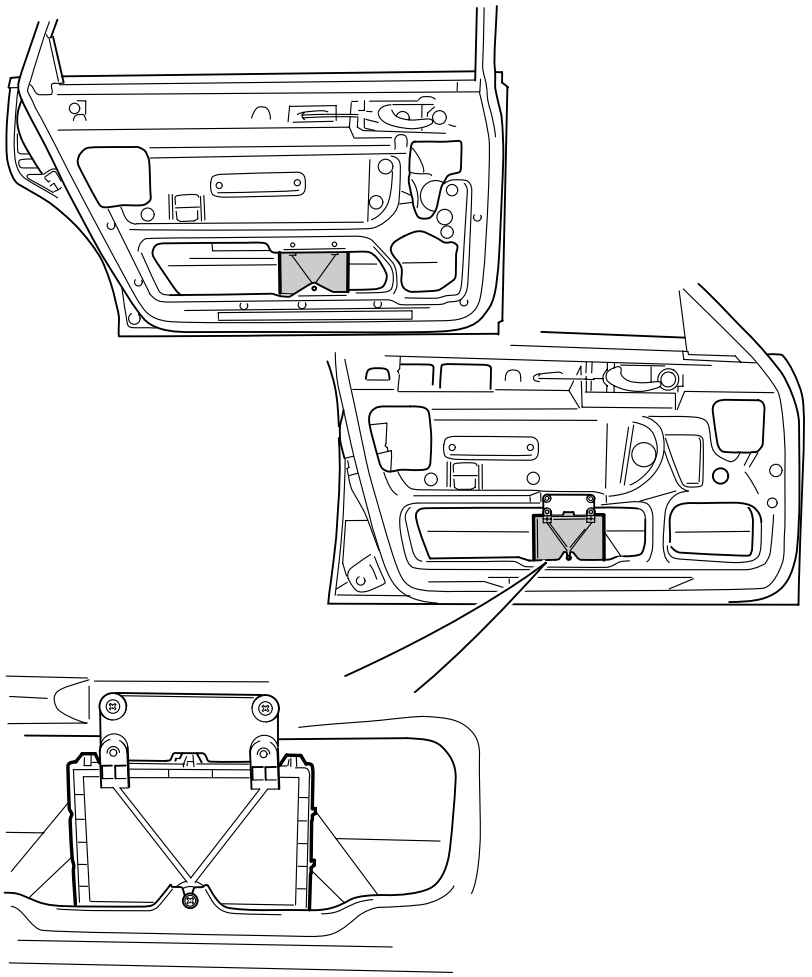
NOTES

XJ / XK CONTROL MODULES

XJ Door Control Modules

The door control modules operate the windows, the door unlock, the door guard lamps and, on the front doors, the door mirrors. They also produce SCP outputs for operation of the courtesy lights, the central locking system and the security system.

XJ DOOR CONTROL MODULES



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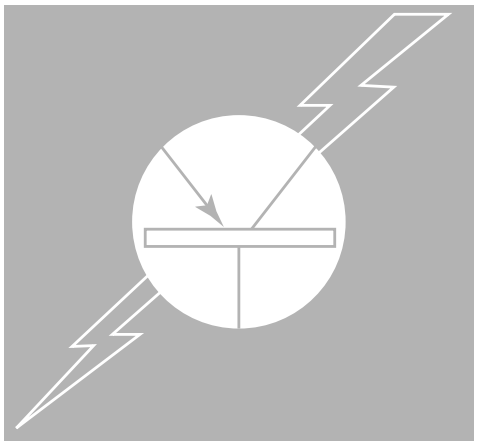
NOTES

ADVANCED JAGUAR ELECTRICAL SYSTEMS



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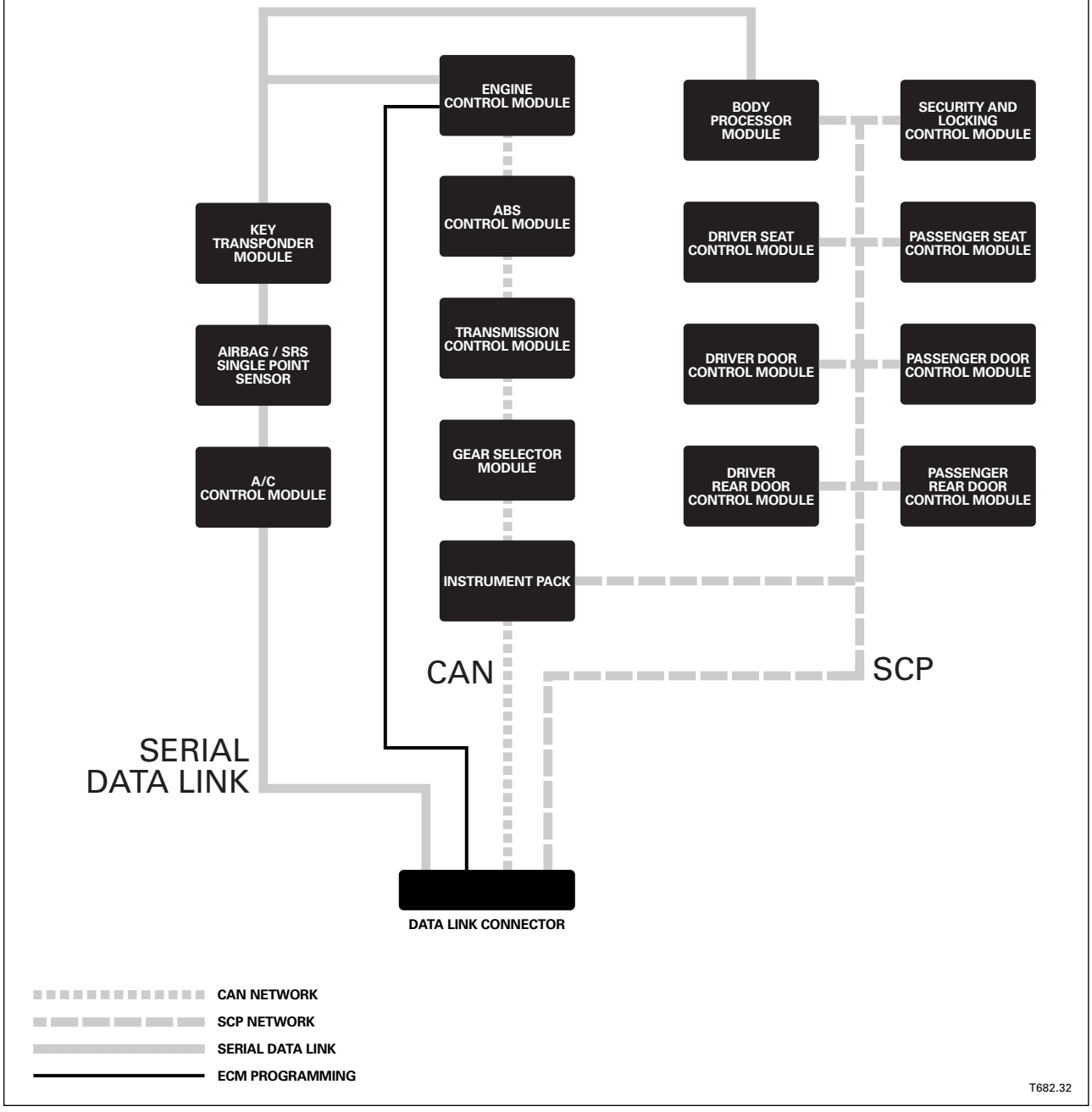
XJ / XK MULTIPLEXING

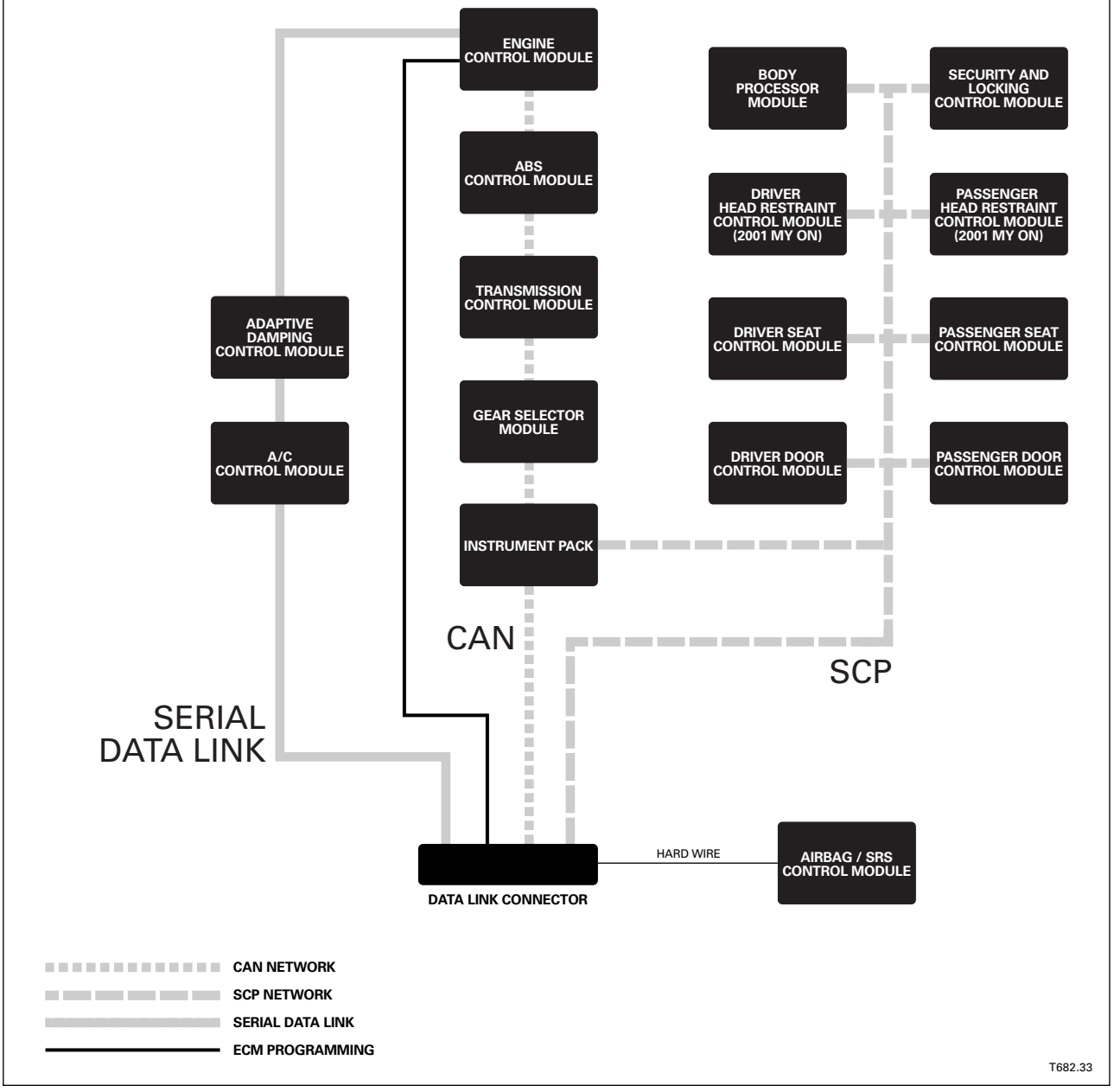
Communication Networks

The XJ vehicles have CAN, SCP and Serial Data Link (ISO 9141) multiplex systems similar to those on XK vehicles. Although the networks operate in the same way as on XK vehicles, the inputs, outputs and functions of the individual control modules are unique to XJ vehicles.

XJ COMMUNICATION NETWORKS



XK COMMUNICATION NETWORKS



XJ / XK MULTIPLEXING

Communication Networks (continued)

MULTIPLEX CONTROL MODULES: XJ		MULTIPLEX CONTROL MODULES: XK	
Powertrain (CAN) modules		**Powertrain (CAN) modules**	
Control module	**Acronym**	**Control module**	**Acronym**
Engine control module	ECM	Engine control module	ECM
Transmission control module	TCM	Transmission control module	TCM
Gear selector illumination module	None	Gear selector illumination module	None
Instrument pack	INST	Instrument pack	INST
Anti-lock brake / traction control control module	ABS/TCCM	Anti-lock brake / traction control control module	ABS/TCCM
Body systems (SCP) modules		**Body systems (SCP) modules**	
Control module	**Acronym**	**Control module**	**Acronym**
Body processor module	BPM	Body processor module	BPM
Passenger door control module	PDCM	Passenger door control module	PDCM
Passenger seat control module	PSCM	Passenger seat control module	PSCM
Passenger rear door control module	PRDCM	Passenger head restraint control module	PHRCM
Security and locking control module	SLCM	Security and locking control module	SLCM
Driver door control module	DDCM	Driver door control module	DDCM
Driver seat control module	DSCM	Driver seat control module	DSCM
Driver rear door control module	DRDCM	Driver head restraint control module	DHRCM
Instrument pack	INST	Instrument pack	INST

Performing a Hard Reset

A “hard reset” restores the control modules to their default conditions assuring that network communications are synchronized.

XJ Vehicles

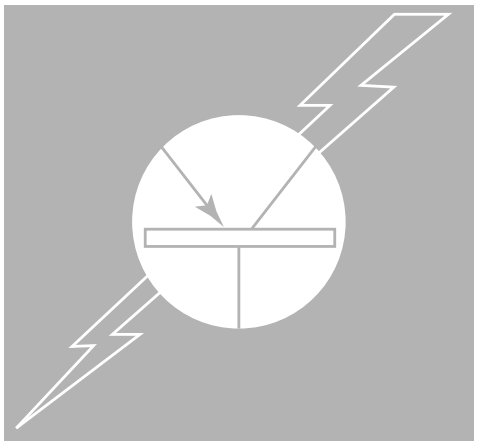
- Disconnect the negative cable of the battery for at least 60 seconds
- Reconnect the battery negative cable

XK Vehicles

- Open one window fully or open a door
- Disconnect the negative cable of the battery for at least 60 seconds
- Reconnect the battery negative cable
- Reset the window position memory for the driver and passenger door windows

NOTES

ADVANCED JAGUAR ELECTRICAL SYSTEMS



JAGUAR

Service Training Course T682
DATE OF ISSUE: 02/15/2002

XJ / XK BODY SYSTEMS

Power Windows

The door windows are controlled by the DDCM with input from the 4 window switches in the driver door switch pack. Manual operation is enabled in ignition position I and II. In addition, when the ignition is switched off, manual operation is still available until any door is opened. When a passenger door window is operated by the driver door switch pack, the DDCM transmits an SCP message to the selected door control module, which drives the window. The passenger door switch pack inputs directly to the PDCM for passenger operation of the window. Single switches on the passenger doors control the passenger window only.

If one-touch window operation is enabled, the window fully opens when the switch is active for between 50 and 250 milliseconds. If the switch is active for greater than 250 milliseconds, window operation stops when the switch becomes inactive.

Window drop (XK only)

The door windows are programmed to drop 12 mm (0.47 in.) before the doors open to prevent seal damage. The door handle switch is mechanically connected to the inner and outer door handle. If a window is closed when the door handle switch becomes active, the window opens 12 mm (0.47 in.). If the window is within 12 mm from the closed position when the door ajar switch becomes inactive, door is closed, the window closes.

If a window is closed with the door ajar switch active, the window stops 12 mm (0.47 in.) from the closed position.

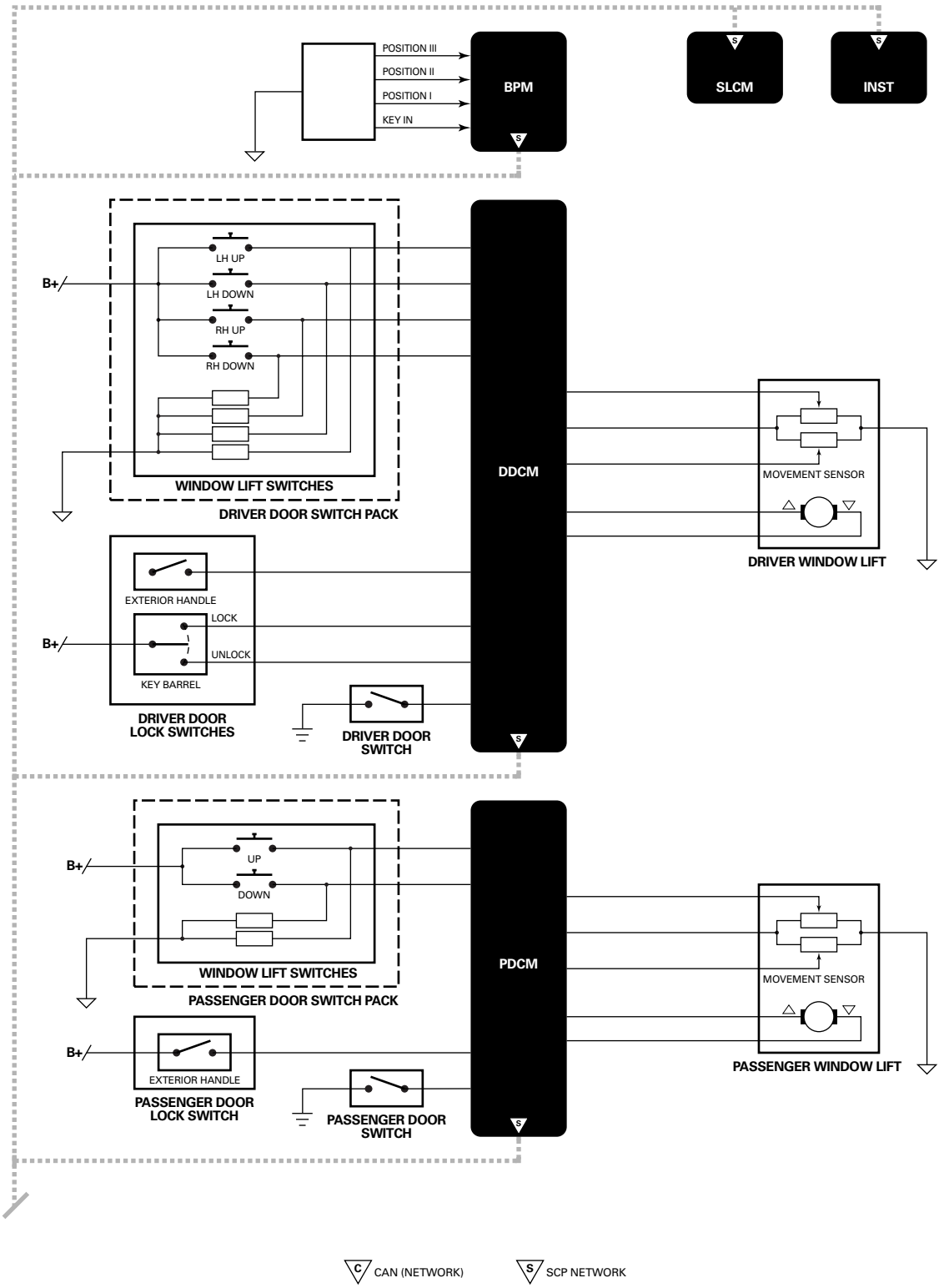
Door window position memory (XK only)

Door window open and closed positions are retained in door control modules volatile memory. If power is interrupted to a door control module the window positions must be reprogrammed. To reprogram windows after power is restored, perform the following procedure (with door closed!):

- Fully open the window and continue to hold the open switch active for 5 seconds
- Fully close the window and continue to hold the close switch active for 5 seconds

NOTES

XK POWER WINDOW CIRCUITS



XJ / XK BODY SYSTEMS

Convertible Top and Quarter Windows (XK only)

The convertible top is hydraulically raised and lowered and incorporates a hydraulically operated header latch. An electric motor provides the hydraulic power. The BPM and SLCM control the top's automatic operation using inputs from the convertible top switch, five microswitches and SCP data messages. Three of the microswitches are located in the header rail and two are located on the right side hydraulic cylinder.

Four microswitches connect to the BPM:

Switch	Location	Function
Top raised switch	Top of hydraulic cylinder	signals top is raised over center
Top ready-to-latch switch	Header rail	signals top is in contact with latch
Top latch closed switch	Header rail	signals top is engaged in latch
Top closed switch	Header rail	signals top is closed and fully latched

One microswitch connects to the SLCM:

Switch	Location	Function
Top down switch	Bottom of hydraulic cylinder	signals top is fully down

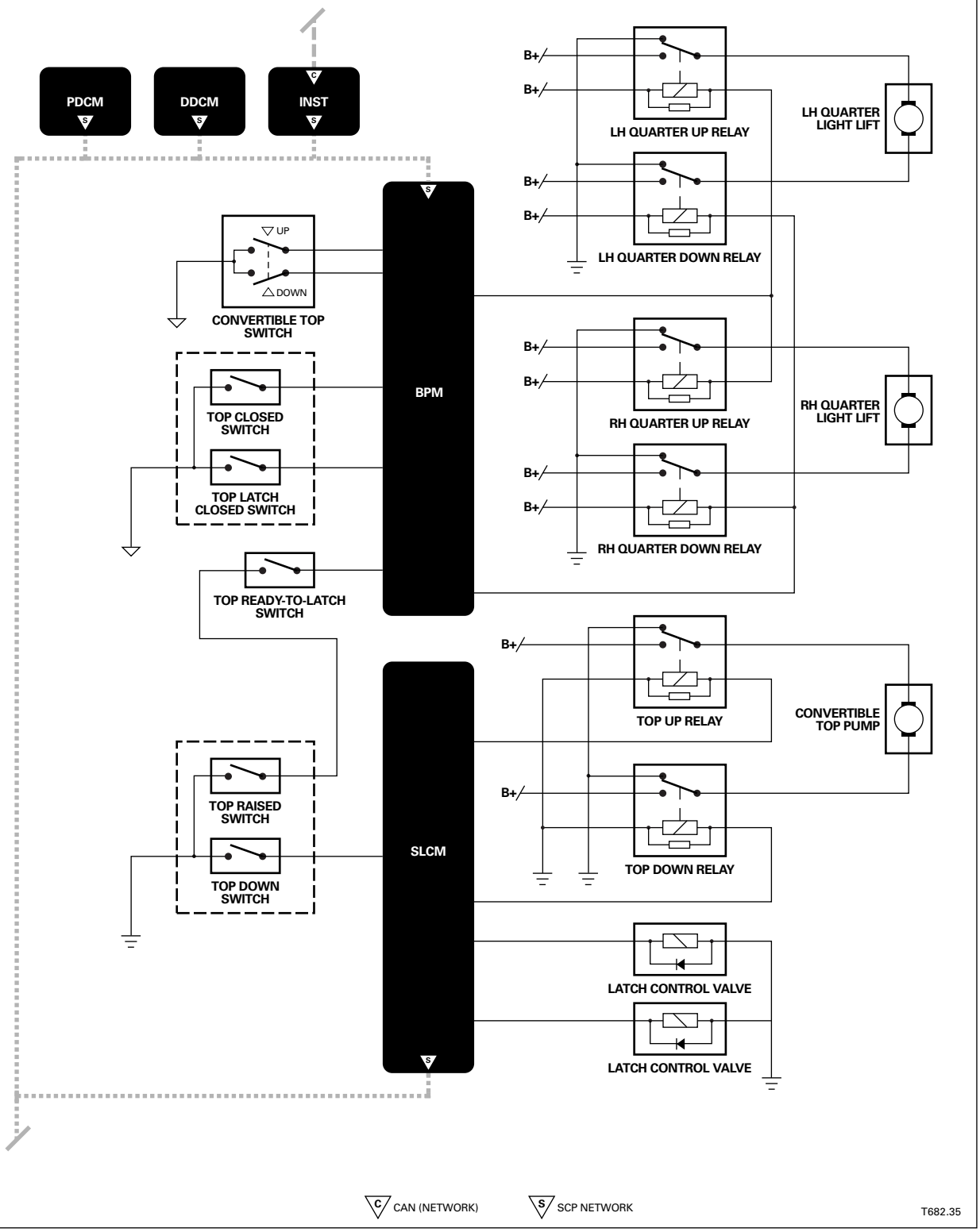
Top Operation

The top is operated by the convertible top switch when the ignition is in position I or II and the vehicle speed is below 10 mph (16 km/h). The convertible top switch must be held active throughout the raise or lower operation.

The top can also be operated using the global open / close functions of the door key lock.

NOTES

XK CONVERTIBLE TOP AND QUARTER WINDOW CIRCUITS



XJ / XK BODY SYSTEMS

Interior Lighting

Interior lighting is controlled by the BPM and the door control modules in response to control signal inputs from various switches. All timing functions are controlled by the BPM.

- The trunk lamp, glove box lamp and vanity lamps are driven by the BPM and enabled by their individual switches.
- The footwell lamps and interior lamp are controlled by the BPM.
- The roof console interior / map lamps and E post reading lamps, individually switched for manual control, are controlled by the BPM.

Interior Lighting Operation

Interior lighting is divided into two functions: illumination enable and fade. The illumination enable circuit provides constant intensity illumination. The fade circuits provide timed fade up, fade off illumination intensity.

Illumination enable circuit
The BPM illumination enable circuit is active with the ignition in position II. When the ignition is switched OFF, the illumination enable circuit will remain active for fifteen minutes after the last input from the door ajar switch, the trunk switch, or ignition switch position I.

The illumination enable circuit powers the following lamps:

Lamp	Control	Lamp	Control
Trunk lamps	Trunk switch	Vanity lamps	Vanity lamp switches
Glove box lamp	Glove box lamp switch	Map / reading lamps	Map / reading lamp switches

Illumination fade circuits
The BPM fade circuits are activated and timed as described below. The fade circuits power the following lamps:

- Map / reading lamps
- Footwell lamps
- Vanity lamps
- Courtesy lamps

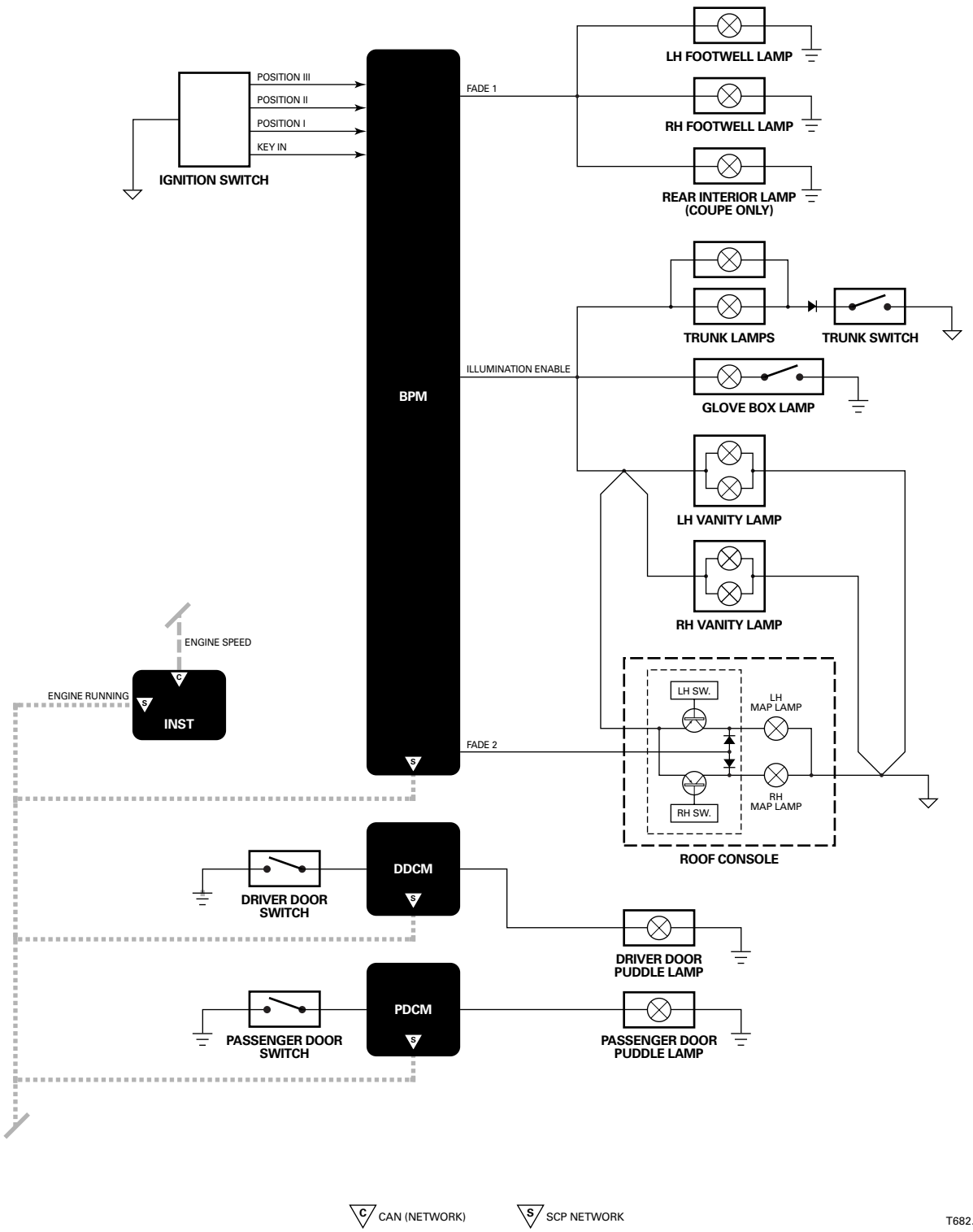
The BPM fade circuits activate in the following manner:

- **Vehicle unlocked with key or remote transmitter** The 2 minute timer is set and the lights fade up to 75% of their power. The lights fade up to full power when a door is opened.
- **Engine not running and door opened** The lights fade up and fade off after 2 minutes. If the lights are on when the last door closes, the 2 minute timer is reset and a 15 second timer is set. The lights will fade off when the first of the timers runs out. If the lights are off when the last door is closed, the lights fade up and only the 15 second timer is set.
- **Ignition switched to position 3 (crank)** All interior lights switch off.
- **Engine running and door opened** The lights fade up and fade down when the last door is closed.
- **Ignition key removed from ignition** The lights fade up and the 15 second timer is set.
- **Ignition key not in ignition and doors closed and locked** The lights fade off.

Door puddle lamps
The door puddle lamps are controlled by the door control modules with input from the door switches. When a door is opened, its puddle lamp is activated for 5 minutes or until the door is closed.

Locate Illumination
Locate illumination is conventionally controlled by the dimmer module and the dimmer control switch when the side markers are active.

XK INTERIOR LIGHTING CIRCUITS



XJ / XK BODY SYSTEMS

Exterior Lighting

Headlamps, Side Markers, Tail Lamps and Front Fog Lamps

The BPM controls all front exterior lighting and the rear side markers, tail, and number plate lamps using inputs from the lighting switches. Front fog lamps require the side markers to be active and the front fog lamps selected. The front fog lamps are deactivated when the main (high) beams are active.

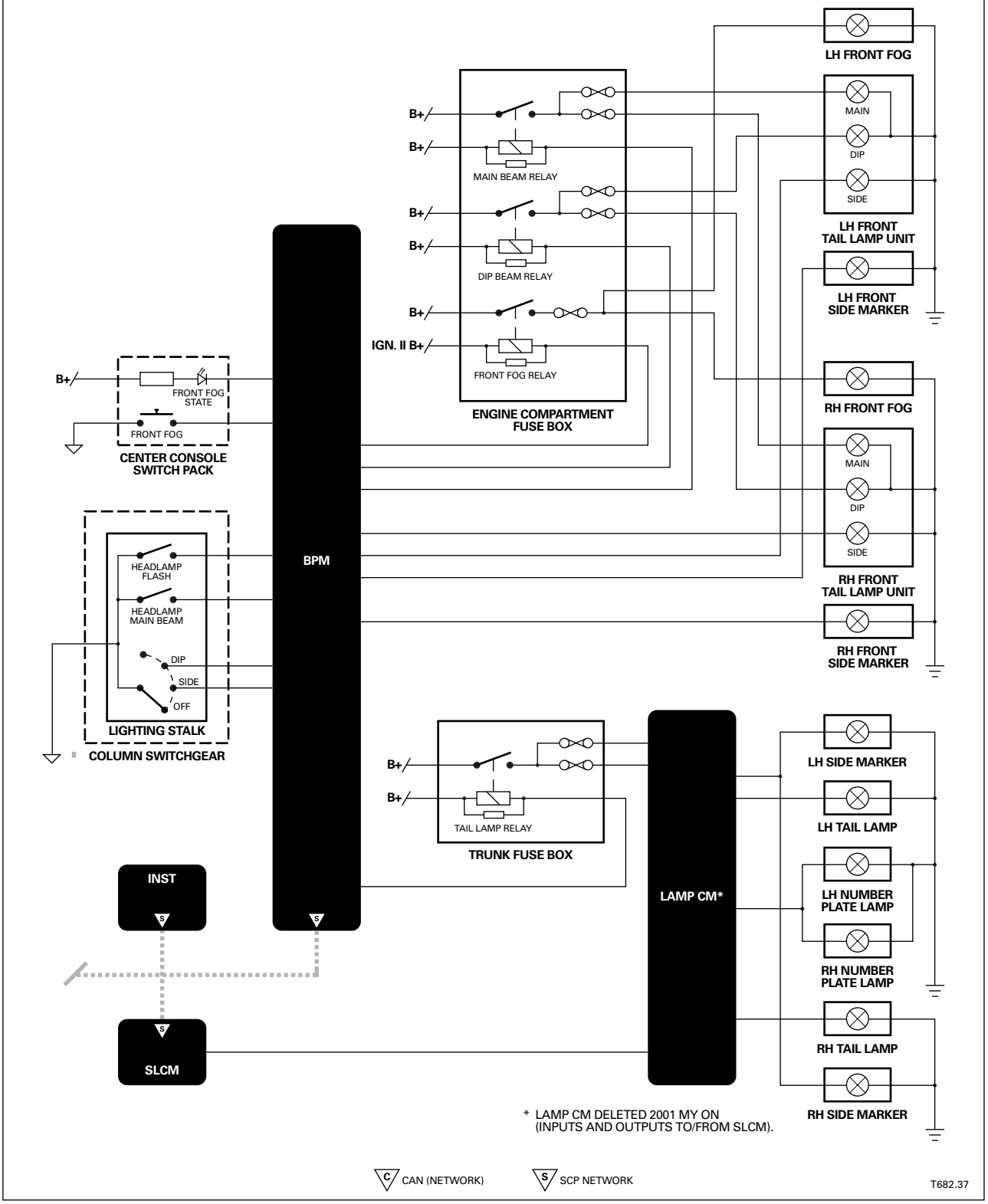
Front side marker and head lamps
The front side marker power is supplied directly from the BPM. The headlamp main (high) and dip (low) beam lamps are supplied with power via separate relays that are activated by the BPM. There is no bulb fail monitoring for the front lamps.

Rear side markers, tail and number plate lamps
The rear side markers, tail, and number plate lights are supplied with power via the tail lamp relay through the lamp control module (on XK vehicles from 2001 MY on, the lamp control module is deleted and the rear lamps are controlled by the SLCM). The lamp control module monitors the state of the lamps. If a bulb failure is detected in the tail lamps, the lamp control module outputs a hard wired signal to the SLCM, which transmits the SCP *REAR BULB FAIL* data message on the network.

Front fog lamps
The front fog lamps are supplied with power from the front fog relay. The BPM activates the relay when the side markers or dip beams are active and a enables the front fog light function. The front fog state LED is driven by the relay coil circuit. Front fog lights are disabled by a second momentary ground signal from the front fog switch.

NOTES

XK HEADLAMP, SIDE MARKER, TAIL LAMP AND FRONT FOG LAMP CIRCUITS



XJ / XK BODY SYSTEMS

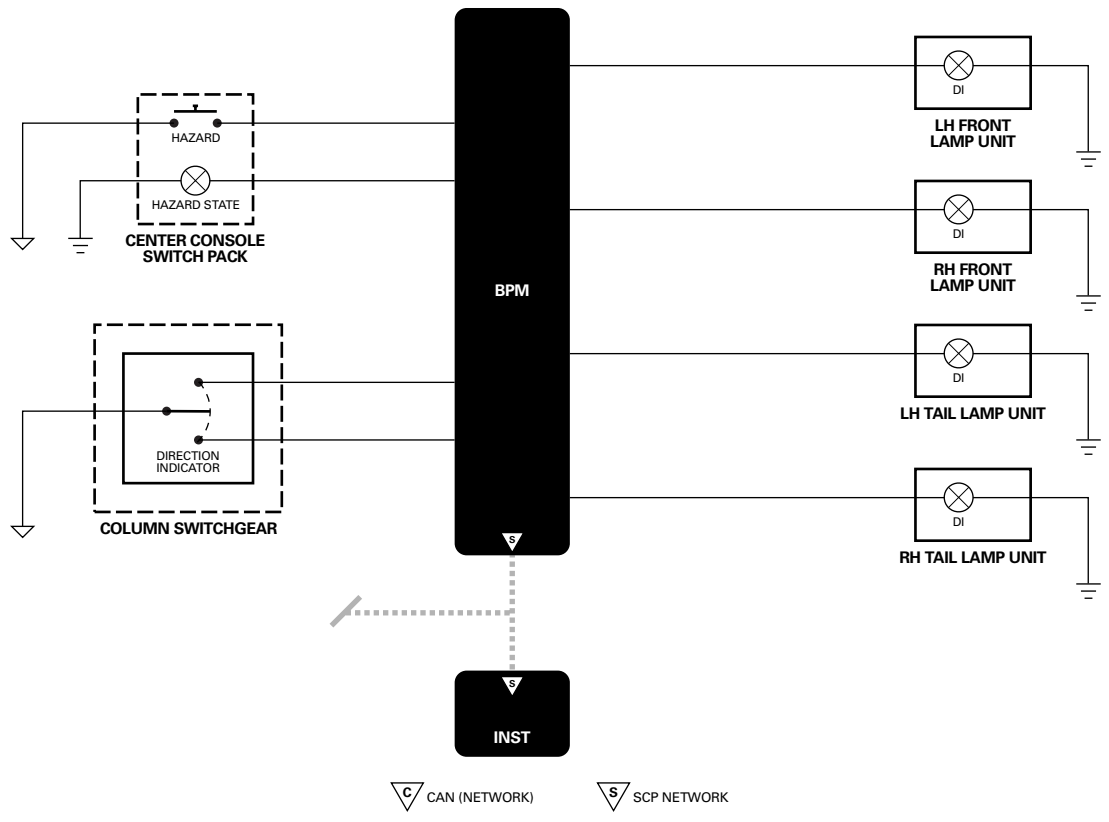
Exterior Lighting (continued)

Directional Indicators and Hazard Warnings

Directional indicators and hazard warnings are directly controlled by the BPM using inputs from the hazard and directional switches. The BPM operates the directional indicator lamps at 75 cycles per minute via hard wired connections. The INST directional signal indicators are also operated by the BPM via SCP data messages to the INST. If the BPM detects a bulb failure, it operates the INST directional signal indicator at 144 cycles per minute. The exterior indicator lamps continue to operate at 75 cycles per minute. The directional indicator audible warning is a BPM generated audio signal to the column switch gear speaker. The audible warning tone cycles with the INST indicator lights.

The ignition must be in position II for the directional indicators to activate. The hazard warning lamps operate in any ignition position.

XK DIRECTIONAL INDICATORS AND HAZARD WARNINGS



NOTES

Stop and Reverse Lamps

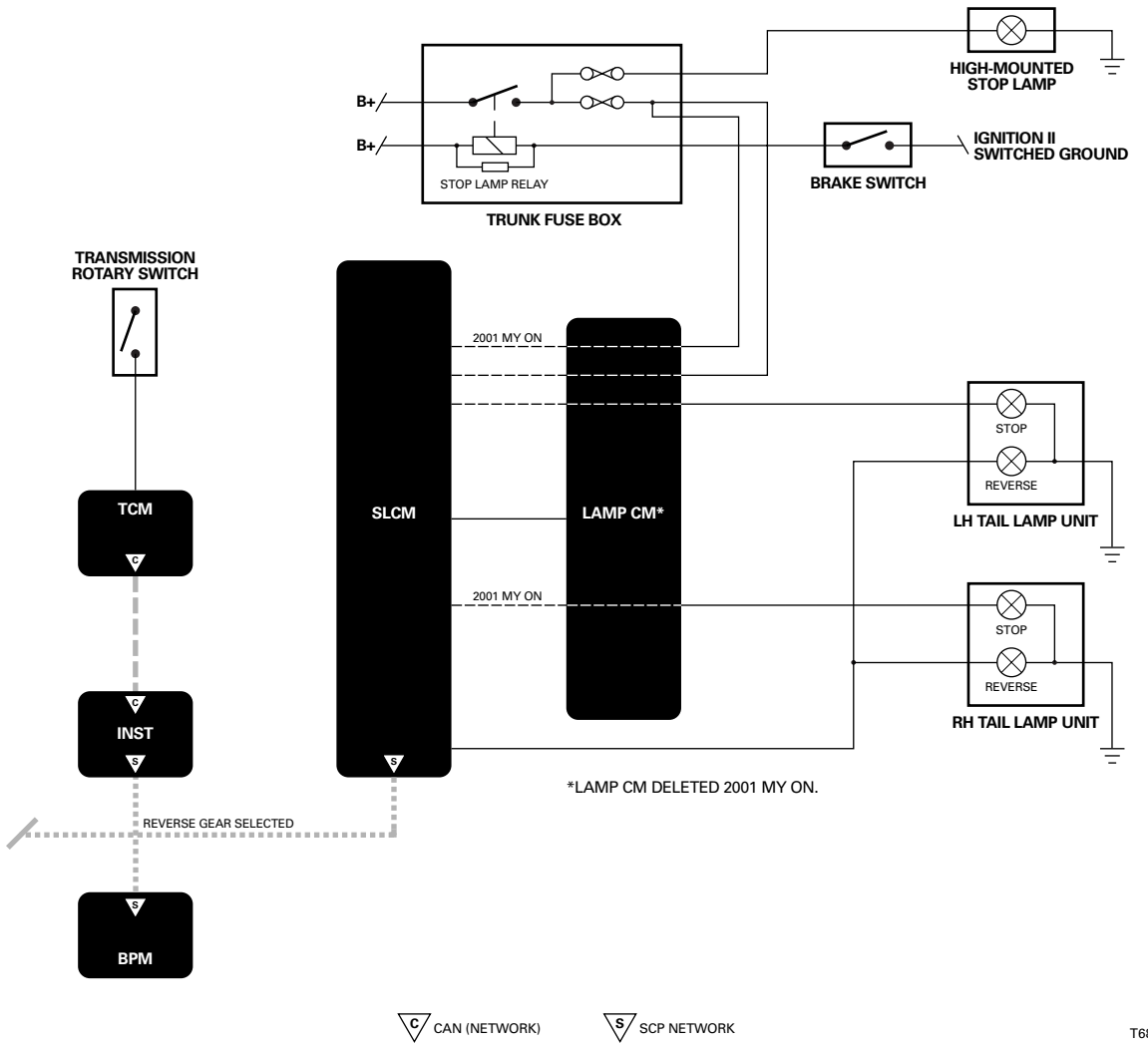
Stop lamps

Stop lamps are controlled by the brake switch ground signal, which activates the stop lamp relay. The relay supplies B+ voltage to the stop lamps via the lamp control module (or by the SLCM, XK 2001 MY on). If the lamp control module detects a stop lamp bulb failure it outputs a hard wired signal to the SLCM, which transmits the SCP rear bulb fail data message on the network. The high mount stop lamp is powered directly from the stop lamp relay and is not monitored for bulb failure.

Reverse lamps

Reverse lamp power is supplied directly from the SLCM. The SLCM activates the reverse lamps when the INST *REVERSE GEAR SELECTED* SCP message is on the network. The INST determines reverse gear selection from CAN data provided by the TCM. The transmission rotary switch provides the hard wired gear position signal to the TCM.

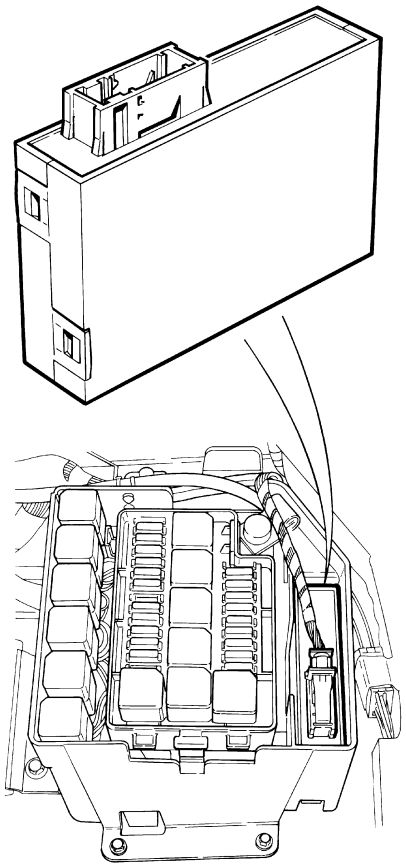
XK STOP AND REVERSE LAMP CIRCUITS



XJ / XK BODY SYSTEMS

Exterior Lighting (continued)

XK LAMP CONTROL MODULE (THROUGH 2000 MY)



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Rear Lamp Monitoring

XK lamp control module (through 2000 MY)
A lamp control module is installed in the trunk electrical carrier along with the SLCM, trunk fuses and relays. The lamp control module monitors the state of the rear side markers, tail lamps and brake lamps. The high mounted stop lamp is not monitored for bulb failure.

If the lamp control module detects a bulb failure a signal is sent to the SLCM, which transmits a *REAR BULB FAILURE* SCP message to the INST. The INST activates the AMBER MIL and displays the BULB FAIL REAR driver message.

All XJ; XK 2001 MY ON
XJ vehicles do not use a separate bulb failure module to monitor the rear lamps. The brake lamps are monitored by a bulb fail function in the SLCM. A bulb fail function in the BPM monitors the tail lamps. Rear side markers and number plate lights are driven by the BPM and are not monitored for bulb failure.

If the SLCM detects a brake lamp failure it transmits a *STOP LAMP FAIL* SCP message to the INST. The INST activates the AMBER MIL and displays the STOP LAMP FAIL driver message.

If the BPM detects a tail lamp failure it transmits a *TAIL LAMP FAIL* SCP message to the INST. The INST activates the AMBER MIL and displays the TAIL LAMP FAIL driver message.

If the SLCM detects a short circuit in either the tail lamp circuit or the tail lamp assembly, it will shut off the tail lamps and front marker lamps. When the headlamp switch is cycled off/on, lamps that are not short-circuited will be flashed rapidly by the SLCM. This will occur each time the headlamp switch is cycled for as long as the short circuit(s) are present.

NOTES

Windshield Wash / Wipe and Headlamp Power Wash

Wash / wipe functions are controlled by the wash / wipe stalk in the column switch gear with input from the lighting stalk switch for headlamp power wash. Control inputs are hard wired to the BPM, which directly operates the windshield washer pump. The power wash pump and wiper motor are controlled by the BPM via relays.

Two-Speed Wipers

When the slow or fast wipe switch is active, the BPM activates the wiper run / stop relay coil. The stop / run relay supplies B+ voltage to the fast / slow relay. The BPM controls the coil ground of the fast / slow relay depending on the position of the wiper speed switches. The fast / slow relay supplies the B+ voltage to operate the wiper motor. If ignition position II or the wipe switches become inactive, the stop / run circuit remains active until the wiper motor park switch open circuits. If the wipers are operating at fast speed when they are switched off, they default to low speed during the period from switch off to park.

Intermittent wipe

When the intermittent wipe switch is active, the wipers operate once at slow speed, pause in the park position for the selected delay period and operate once again. This cycle continues until the wipers are switched off, switched to another mode or ignition position II becomes inactive.

Wiper delay position	Delay time	Wiper delay position	Delay time
1	2 seconds	4	11 seconds
2	4 seconds	5	15 seconds
3	7 seconds	6	20 seconds

Flick wipe

When flick wipe is activated, the wipers operate once at slow speed and return to the park position. Flick wipe does not cancel intermittent wipe. After the flick wipe cycle is complete, the wiper delay timer is reset and intermittent wipe continues.

Programmed wash / wipe

If the windshield washer fluid level is low, programmed wash wipe is inhibited. When the wash / wipe switch is held active for less than 1.2 seconds, the windshield wash pump is activated for 1.2 seconds and the wipers operate at slow speed. The wipers continue operation for 3 additional sweeps after the pump becomes inactive. If drip wipe is enabled and fast / slow or intermittent wipe is not selected, the wipers perform 1 additional sweep 4 seconds later.

If the wash / wipe switch is held active for more than 1.2 seconds, the pump operates for 20 seconds or until the switch becomes inactive. The wipers operate at slow speed while the pump is active. When the pump becomes inactive the wipers will continue for three additional sweeps plus the drip wipe cycle as described above. Programmed wash / wipe does not cancel intermittent wipe. After the programmed wash / wipe cycle is complete, the wiper delay timer is reset and intermittent wipe continues.

Headlamp power wash

If the windshield washer fluid level is low, headlamp power wash is inhibited. Headlamp power wash is activated by the wash / wipe switch when the headlamps are on dip (low) beam.

When the switch is held active for more than 48 milliseconds, the headlamp power wash pump activates for 800 milliseconds followed by a 6 second pause and another 800 millisecond activation. If the switch is still active after the second pump activation, the cycle will continue for 20 seconds or until the wash / wipe switch is inactive.

Once the wash wipe switch is released, power wash is inhibited for the next 5 wash / wipe operations.

XJ / XK BODY SYSTEMS

Rain Sensing

The rain sensing system provides an automatic wiper action when rain is detected on the windshield. Different amounts of rain can be detected, causing a corresponding variation in wiper speed from slow intermittent to maximum continuous rate. The facility is selected at the wiper stalk by the driver and does not replace normal manual control of the wipers. The system is a common, optional feature for XJ and XK vehicles but note that while it is functionally similar to that fitted on the S-TYPE sedan, different components are used.

The system consists of the rain sensor, a separate rain sensing control module (RSCM) and the wiper stalk selector switch.

Operation

The rain sensor is an optical transducer which senses changes to infrared light caused by the refractive effects of water droplets on the windshield. The sensor is fixed to the inside of the windshield with the sensing elements looking outwards through the glass (see figure on facing page). The sensor elements consist of two groups of light emitting diodes (LED) which alternately produce the infrared light, and a photodiode which receives the infrared reflections from the windshield. With no moisture on the windshield, all of the infrared light is reflected back and the sensor produces a constant 5V output.

Any rain drops falling on the sensing area of the windshield cause some of the light to be refracted and scattered via the droplets and produce a reduction and imbalance in the light received by the photodiode. These signals are analyzed in the sensor and output as a pulsed signal. Pulse duration is a measure of droplet size and number of pulses is related to the number of droplets. The output from the rain sensor is taken to the rain sensing control module.

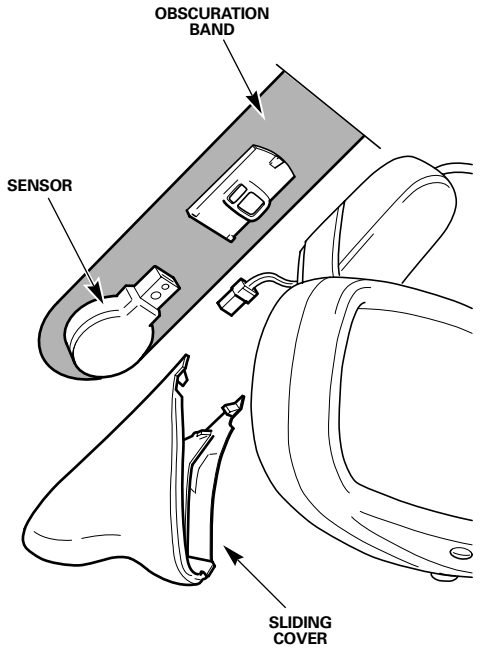
The rain sensor is an active device and incorporates the optical elements and electronic control and processing circuits. A B+ power input is supplied from the rain sensing control module. The output signals from the rain sensor are processed in the rain sensing control module to mimic the column switchgear. The module output signals are spliced to the wires from the stalk switch positions and input to the body processor module (BPM). The BPM therefore ‘sees’ no difference in wiper speed requests between the manual controls and the rain sensor signals.

Rain Sensor

The rain sensor is fixed to the windshield by adhesive but can be easily removed if it is to be replaced. The sensor must be located within the clear circle in the obscuration band. The mirror assembly is modified and now has a sliding cover to enclose the rain sensor.

NOTES

RAIN SENSOR



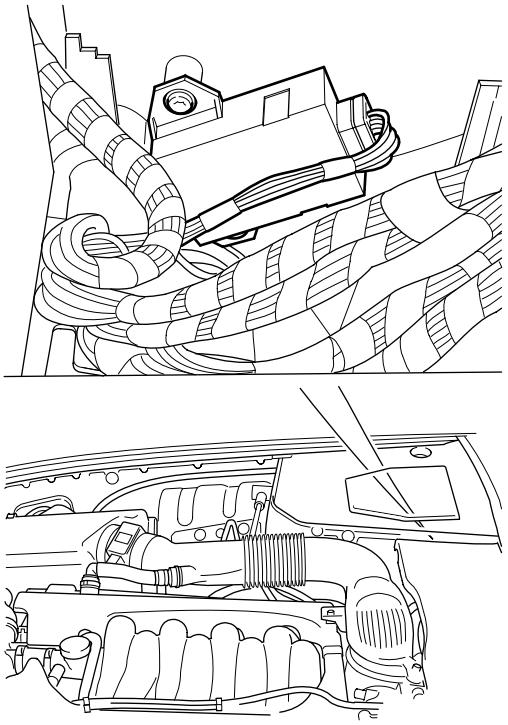
XJ / XK BODY SYSTEMS

Rain Sensing (continued)

Rain Sensing Control Module

The rain sensing control module (RSCM) is a non-serviceable electronic unit with connections to the rain sensor and the body processor module (BPM). On XJ vehicles, the module is fitted inside the engine bay cool box. On XK vehicles, the module is mounted on the passenger side dash panel.

XJ RAIN SENSING CONTROL MODULE



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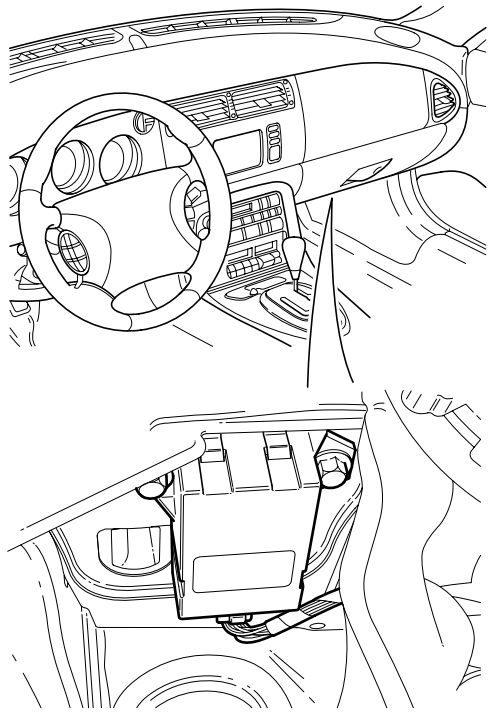
XK RAIN SENSING CONTROL MODULE



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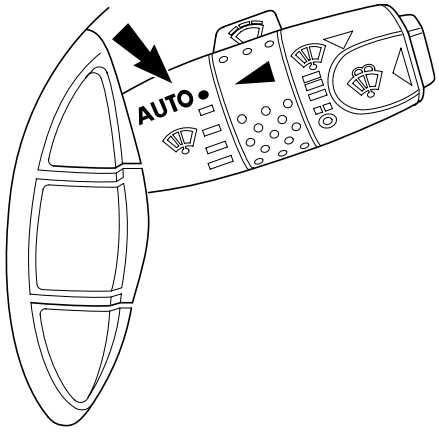
COLUMN STALK RAIN SENSING SETTING



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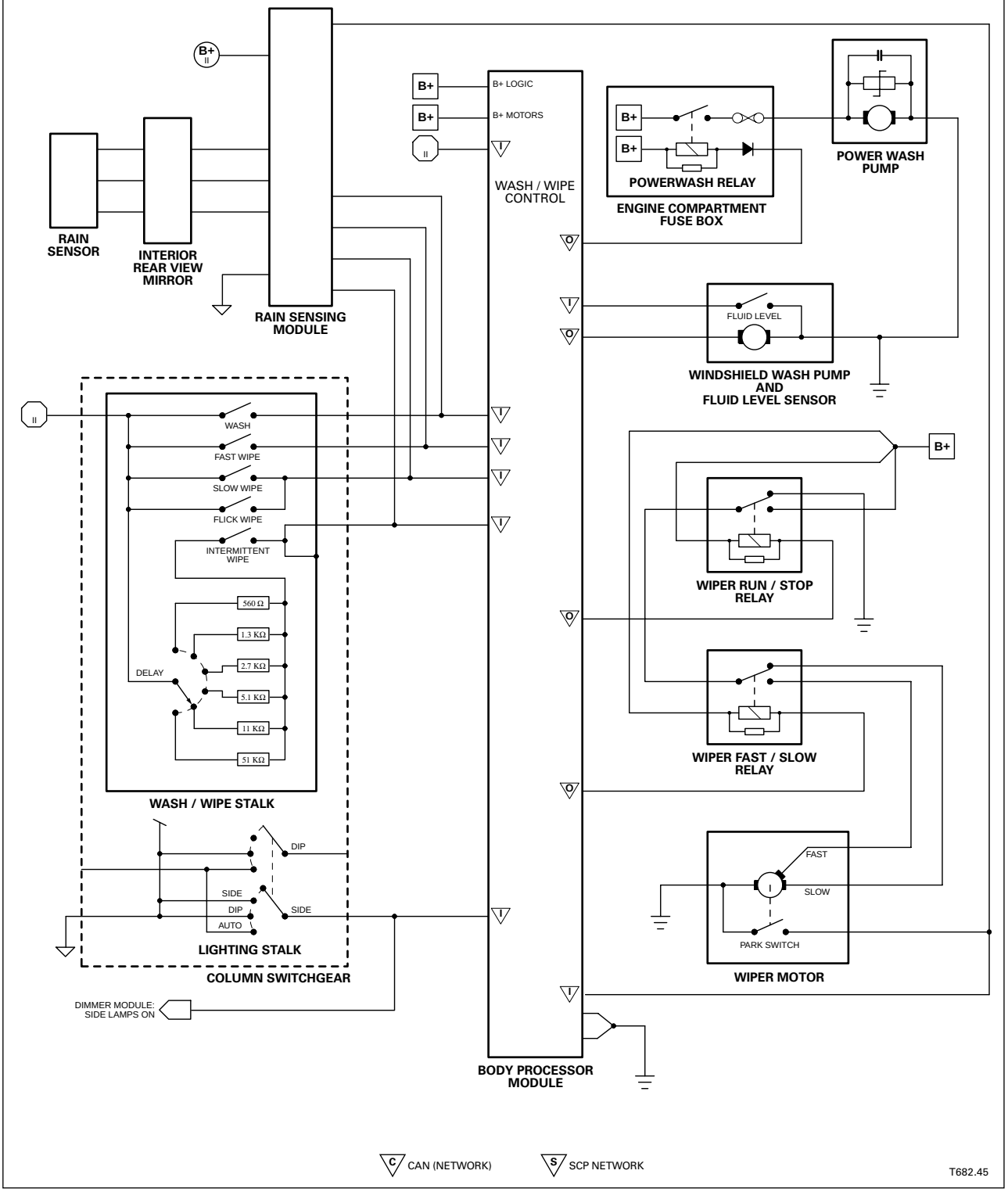
Column Stalk

The rain sensing feature is identified on the column stalk by the marked AUTO position which takes the place of the first intermittent wipe position on vehicles without rain sensing.

NOTES

XJ WINDSHIELD WASH / WIPE, HEADLAMP POWER WASH AND RAIN SENSING CIRCUITS



XJ / XK BODY SYSTEMS

Seats

The power seats are controlled by their respective seat switches via the seat control module. Power seat adjustment is available during the following conditions:

- Ignition is in position I or II
- If the associated door is open or has been close within 30 seconds

Only one of the seat motor outputs can be driven at a time.

If the gear selector is not in P or N, seat operation is enabled for 2 seconds only. The seat movement switch must be pressed again to get an additional 2 seconds of movement. This function prevents continuous seat movement while the vehicle is being driven.

Seat heater switch inputs are processed by the BPM and transmitted to the respective seat control module, which controls the heaters via hard wires.

Memory Driver Seat

The lumbar support and all seat movement functions are controlled by the driver seat switch pack switches via the DSCM. The switch pack and seat are both hard wired to the module. In addition, the driver seat belt activates the seat belt switch, the DSCM transmits an SCP seat belt tell tale ON or OFF message to the INST and an SCP seat belt chime ON or OFF to the BPM.

Non-Memory Driver Seat

The non-memory seats function the same as the memory seats with the exception of the memory functions.

Memory Control

Mirror memory positions are stored in the respective door modules. Driver seat memory positions are stored in the DRDCM (XJ) or the DSCM (XK) and steering column memory positions are stored in the BPM.

When memory is recalled, the driver door switch pack memory buttons activate the DDCM to transmit the SCP recall memory 1 or recall memory 2 SCP message. The BPM, PDCM and DSCM respond by recalling the stored position data and driving the steering column, passenger door mirror and driver seat position to their positions. The DDCM drives the driver door mirror to its position. As feedback tells each module that the stored position has been achieved, the module transmits an SCP memory recalled message, which is received by the BPM.

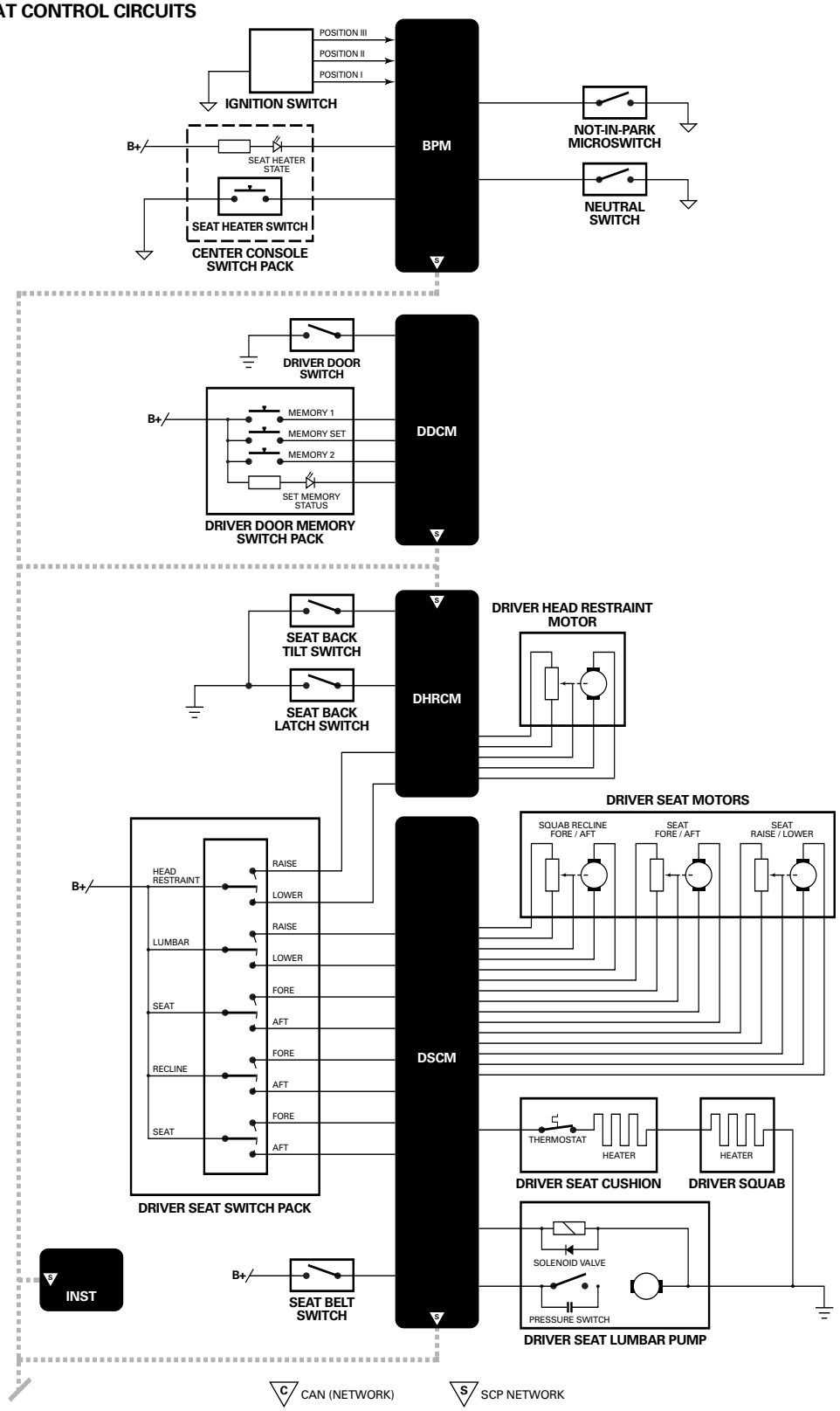
Adjustable Head Restraint System (XK 2001 MY on)

As of 2001 MY, the head restraints are adjustable, for occupant safety and comfort. Due to the limited head room and confined area in an XK the head restraints have to be lowered when the seat back is moved forward to gain access to the rear seat area.

Four hardwire inputs control the functionality of the head restraint.

Two inputs (up/down) from the seat switch pack are used to control occupant requests. The seat back tilt switch input is active when the seat back lever is raised or lowered and commands the head restraint control module (HRCM) to move the head restraint to the “full down” position prior to seat back movement. This input overrides the 2 switch pack inputs. The seat back latch switch input is active when the seat back is in the “forward/unlatched” position and commands the HRCMs to keep the head restraints in the fully lowered position regardless of the seat switch pack or the seat back tilt switch inputs.

XK DRIVER SEAT CONTROL CIRCUITS



XJ / XK BODY SYSTEMS

Steering Column

Steering Column Movement

Steering column movement is accomplished by two motors (tilt and reach) that are driven by the BPM. The driver side fuse box supplies power to the column switch gear joy stick. Four switches route the joy stick control voltage inputs to the BPM through resistors. The BPM interprets the voltage inputs to determine the required column movement direction.

The auto tilt switch enables automatic column movement for entry and exit. When the auto tilt switch is active, a logic ground is provided directly to the BPM.

Auto tilt memory recall adjustment is enabled under the following conditions:

- Ignition in position I or II or
- Within 30 seconds of driver door close or
- Within 30 seconds of ignition key in

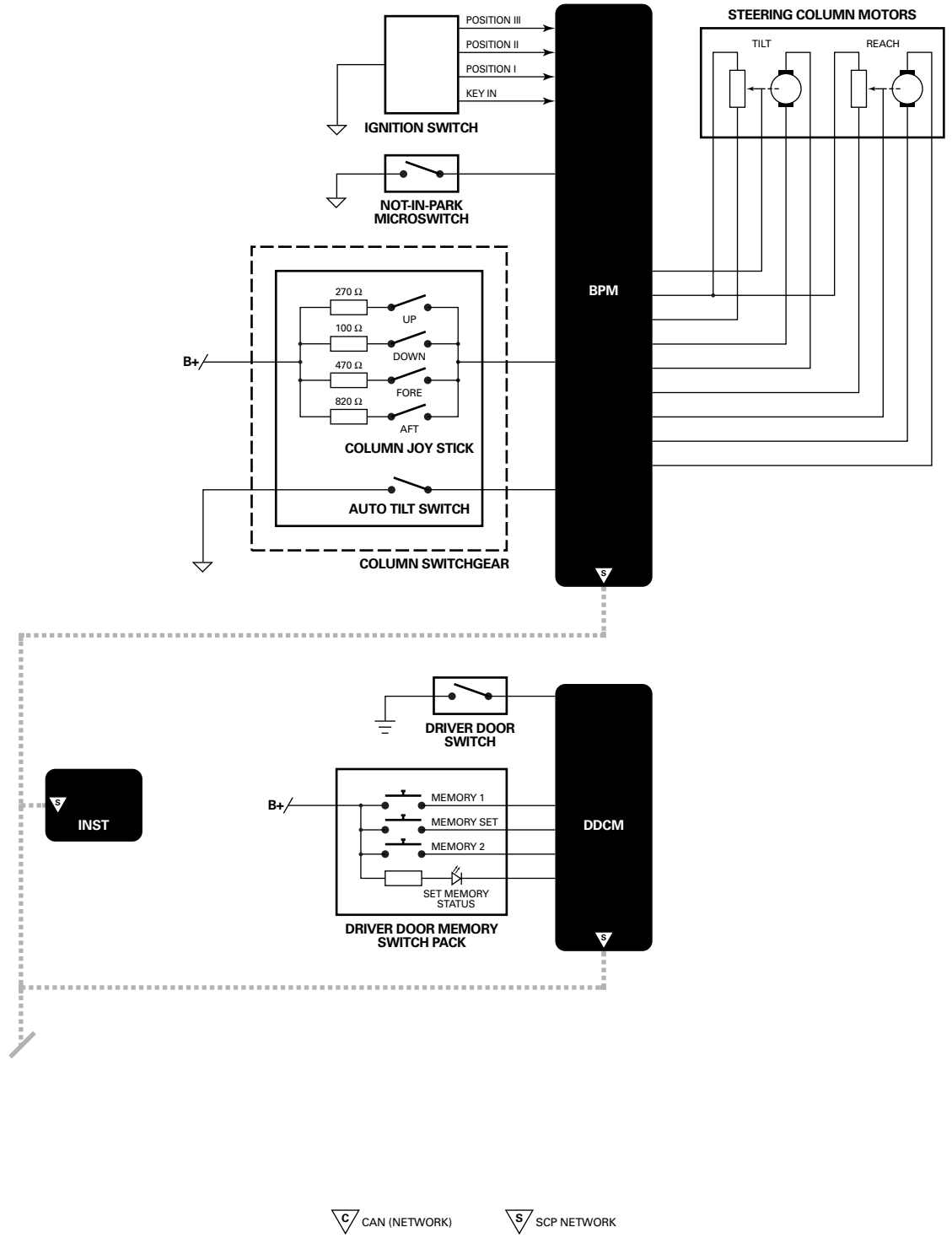
Column movement is canceled when the 30 second timer expires.

When the ignition is switched to position III (crank) the timer is canceled and movement is canceled. The steering column can be adjusted from the switch at any time with the ignition key on.

Tilt away steering
400 milliseconds after the ignition key is removed, with the gear selector in park, the steering column will move up and away from the driver. When the ignition key is inserted, the column will revert to its last memory position. Refer to Seat Memory Control on page 3.4.18.

NOTES

XK STEERING COLUMN MOVEMENT CIRCUITS



XJ / XK BODY SYSTEMS

Door Mirrors

Manual Control

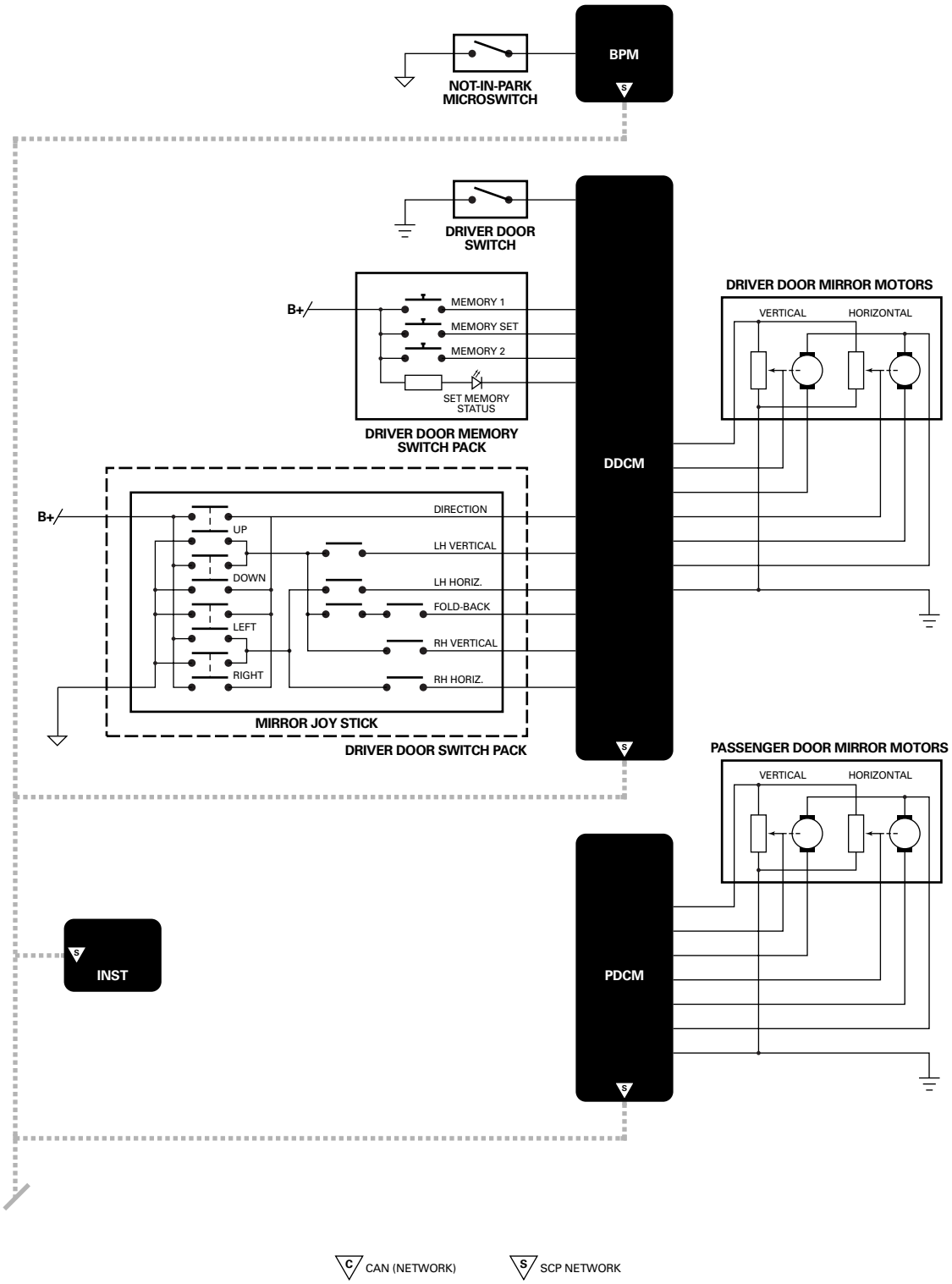
Door mirror position control is enabled by the driver door switch pack via the DDCM and the PDCM. The switch pack provides a logic ground to the DDCM indicating the mirror to be controlled and the movement direction required. If the ignition is in position I or II or the driver door is open, the selected mirror is driven in response to the switch pack inputs. The DDCM drives the driver door mirror motors via hard wires. Commands for the passenger mirror are transmitted as SCP messages to the PDCM, which is hard wired to the passenger door mirror motors.

Mirror tilt

The passenger door mirror can be tilted down 7 degrees from its present position. Mirror tilt is accomplished by activating the mirror down switch with reverse selected and the ignition in position II. The mirror returns to its previous position when reverse gear is deselected, the mirror up switch is activated or the ignition is switched out of position II. Left and right mirror switch commands are ignored while the mirror is tilted down.

NOTES

XK DOOR MIRROR MOVEMENT CIRCUITS



XJ / XK BODY SYSTEMS

Instrumentation

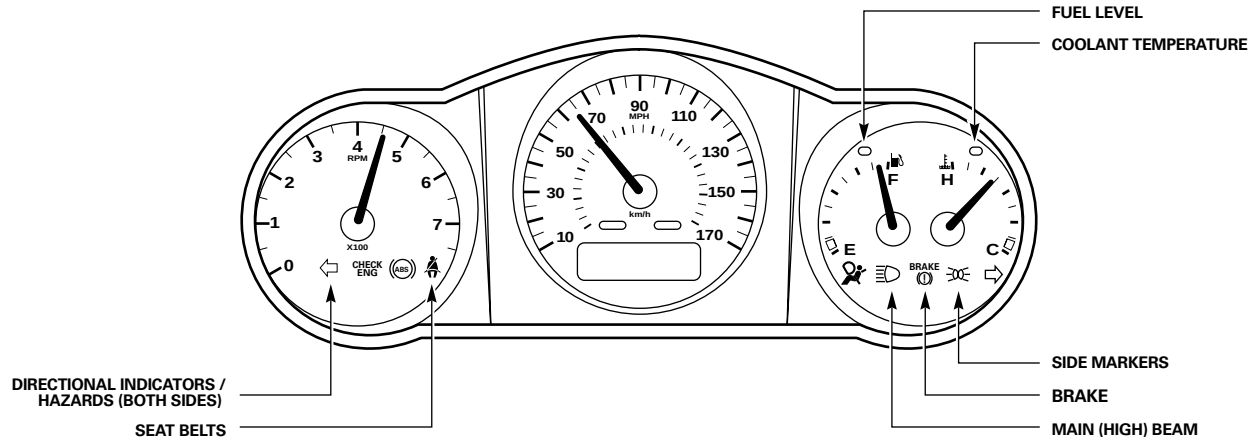
Vehicle instrumentation is contained in the major instrument pack (INST) and the minor instrument pack. Inputs and outputs to the minor instrument pack are supplied by the INST.

NOTE: XJ vehicles do not use a minor instrument pack.

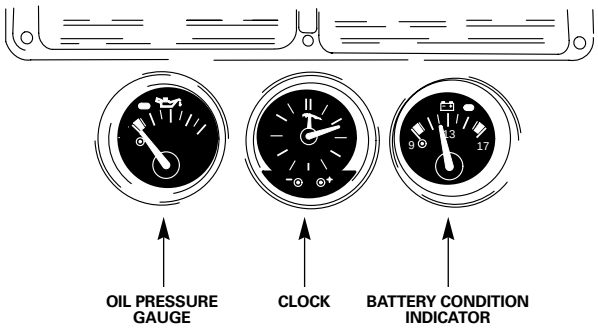
Instrument pack (INST)

The INST is a microprocessor-controlled module that is connected to both the CAN and SCP networks. The INST performs a number of functions in addition to displaying information for the driver.

XJ INSTRUMENT PACK / XK MAJOR INSTRUMENT PACK



XK MINOR INSTRUMENT PACK



Additional INST functions include the following:

Multiplex network "gateway"
The INST translates certain data messages to allow communications between the SCP and CAN networks.

Data message conversion
Nonmultiplexed modules (PASCM, ICE, A/CCM) receive required data from the networks via hard wired connection to the INST. The INST converts the required data to a form that can be read by the nonmultiplexed modules.

Driver for the minor instrument pack (XK only)
The INST provides power, control and ground signals to the XK minor instrument pack. If the minor instrument pack, containing the clock, battery condition gauge and the oil pressure gauge is disconnected from the INST, it should be reconnected before battery power is restored to allow the INST to initialize and calibrate the gauges.

Lamp Replacement

Background illumination, directional indicator and main (high) beam indicator lamps are replaceable. The side lamps / headlamps ON indicator is not replaceable. All other indicator and warning lights are LEDs and are non-replaceable.

Warnings

Audible warnings

Audible warnings are driven by BPM control of the audible warning speaker located in the steering column switch gear.

Warning	Condition
Directional and hazard indicators	Directional or hazard indicators active
Side markers ON	Ignition OFF and driver door open
Ignition key in	Ignition in position 0 or I and driver door open
Seat belt	Ignition in position 2 and driver seat belt not buckled
Airbag / SRS fault	Fault in airbag / SRS system
Not-in-park warning	Ignition switched from position II to position I with gear selector not in park
Memory	Memory position set or recalled
Valet mode	Valet switch pressed with trunk closed or trunk release pressed while in valet mode
Convertible top movement	Top switch activated and top ready to open / close
Top movement cycle complete	Top up or down cycle completed
Park brake ON	Park brake ON and vehicle speed

Visual warning lamps

Visual warning lamps are driven by the INST with input from CAN, SCP or hard wires.

Warning	Condition	Source
Engine oil pressure (XK8 only)	Oil pressure below specification	Oil pressure switch
Charge indicator (XK8 only)	Charge rate below specification	Generator
Directional left and right	Ignition in position II and directional indicator active	BPM
Hazard indicator	All ignition positions and hazard indicator active	BPM
Fuel level low	Fuel level below minimum	Fuel level sensor
Coolant temperature high	Coolant temperature above specification	ECM
Seat belt warning	Ignition switched to position II and driver seat belt unbuckled	DSCM
Main beam indicator	All ignition positions and main (high) beam active	BPM
Side marker status	Side markers or low beams active	BPM
Brake	Park brake ON; low brake fluid	ECM; ABS / TCCM

Two additional warning lamps above the message center, the AMBER MIL and the RED MIL, activate to call the driver's attention to text in the message center. The RED MIL is used for high priority messages and the AMBER MIL is used for lower priority messages.

XJ / XK BODY SYSTEMS

Instrumentation (continued)

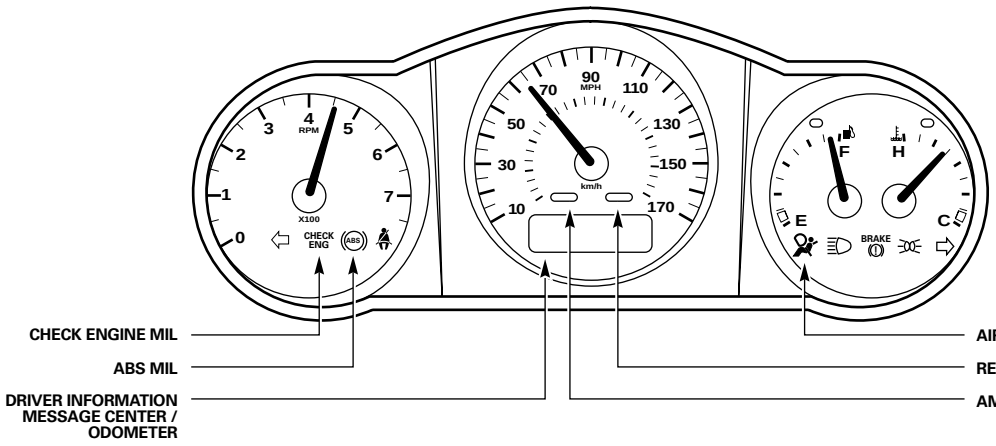
Malfunction Indicator Lamps (MILs)

The following MILs display to alert the driver to vehicle faults. Refer to the literature explaining the individual vehicle systems for descriptions of MIL parameters. An active MIL indicates that a DTC or DTCs are stored in the module memory. Certain DTCs are stored without activating a MIL. The ECM acts as the "host" for all OBD II DTCs and stores OBD II DTC data from the other modules. OBD II DTCs are indicated by the CHECK ENGINE MIL.

MIL	Fault
CHECK ENG MIL	EMS or OBD II fault
ABS MIL	ABS, Traction / ASC fault
Airbag / SRS MIL	Airbag SRS fault

Two additional MILs are located in the speedometer. The RED or AMBER MIL will activate to alert the driver of vehicle faults depending on the type and priority of the fault.

MALFUNCTION INDICATOR LAMPS AND DRIVER INFORMATION CENTER



T682.52

NOTES

Driver Information Message Center

The driver message center, located in the speedometer, displays the odometer, trip computer data, and driver warning / information messages. The display is a 12 character LCD that is active when the ignition or interior lights are ON. When the interior lights are active the display is bright and when the exterior lights are switched ON the display is dimmed. The interior light dimmer switch will also dim the message center display but has no effect on the other warning lights.

Odometer

The odometer displays in the message center at ignition ON and after the lamp check cycle. It also displays when the ignition is OFF if the side lamps or interior lamps are active.

Driver warning / information messages

If a vehicle fault occurs, a driver warning / information text message is immediately displayed on the message center. Either the RED or AMBER MIL activates with most warning / information messages. The RED MIL is active for high priority messages, indicating that the vehicle should be stopped as soon as possible to investigate the cause of the message.

Pressing the trip computer CLEAR button hides one displayed message. The MIL remains active. If more than one message is stored, the CLEAR button must be pressed again to clear each message. Further presses cycle the display through trip information, odometer and back to the warning / information message. Refer to Trip Computer, page 3.4.28. If a message is hidden and the fault remains at the next ignition ON cycle, the message will be redisplayed.

NOTES

XJ / XK BODY SYSTEMS

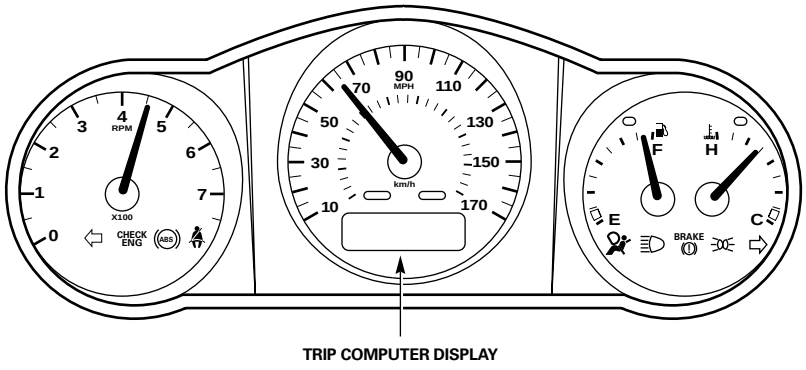
Instrumentation (continued)

Trip Computer

The trip computer uses two separate memory sites to store data for a trip or a series of trips until it is reset to zero. Trip data is displayed on the driver message center when the ignition is in position II.

The two memory sites (A and B) allow data from trips to be stored separately. The memory sites are useful if the driver wishes to track business usage mileage and personal mileage at the same time. All trip data except for Range and Current Fuel Usage are prefixed by the letter A or B depending on the which trip memory site is selected.

TRIP COMPUTER DISPLAY



T682.53

The following data are available:

- **Odometer** Total vehicle distance traveled.
- **Trip Distance** Distance traveled since the last memory reset (maximum trip distance is 9999.9 miles [16090 kilometers]). The computer resets to zero if the maximum trip distance is exceeded.
- **Range** Distance that the vehicle could travel in miles (kilometers) on the remaining fuel if the average speed and fuel consumption remain constant.
- **Fuel Used** The amount of fuel used in gallons (liters) since the last memory reset.
- **Average Fuel** Average fuel consumption in miles per gallon (liters /100 km) since the last memory reset.
- **Current Fuel Usage** The “at the moment” fuel consumption in miles per gallon (liters /100 km) calculated over a three second period and continuously updated.
- **Average Speed** The average speed in mph (km/h) for the distance traveled since the last memory reset.

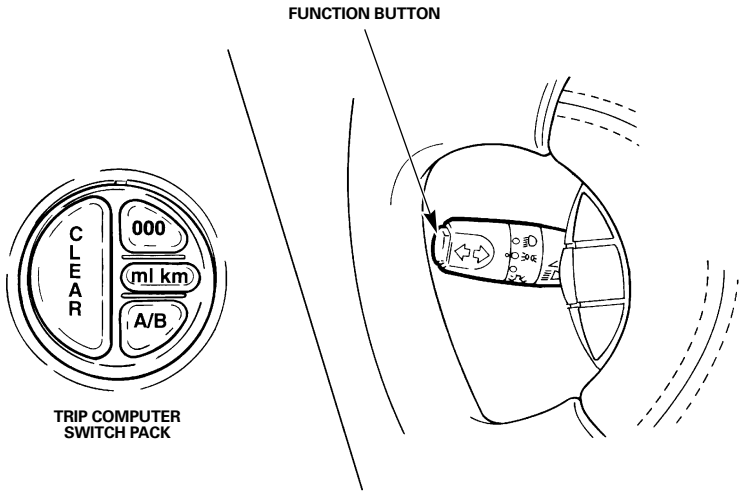
NOTES

Trip computer controls

The computer is controlled by the fascia switch pack and the function button on the end of the left steering column stalk.

- **Function button** Pressing the function button cycles the data displayed in the order listed on the facing page.
- **Switch pack 000** Sets the selected trip to zero.
- **A/B** Selects the A or B memory site.
- **mi km** Selects the metric or USA display.
- **CLEAR** Cycles between the trip computer, odometer and driver message displays.

TRIP COMPUTER CONTROLS



T682.54

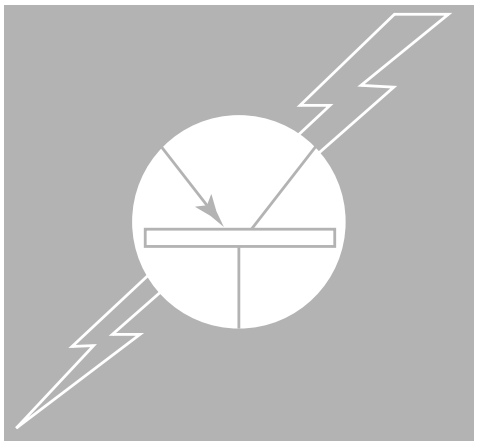
Setting the trip computer

- Press the function button to select a computer function, the display will show either trip A or trip B information.
- Press the A/B switch to select the desired memory site.
- Press the 000 switch and hold for 3 seconds.

NOTE: Warning and driver information messages have priority over trip data. Any messages will display when the ignition is ON. To hide the messages and display trip data, press CLEAR. More than one message may be active. Pressing CLEAR hides one message at a time. Only the data in the selected memory site will be cleared.

NOTES

ADVANCED JAGUAR ELECTRICAL SYSTEMS



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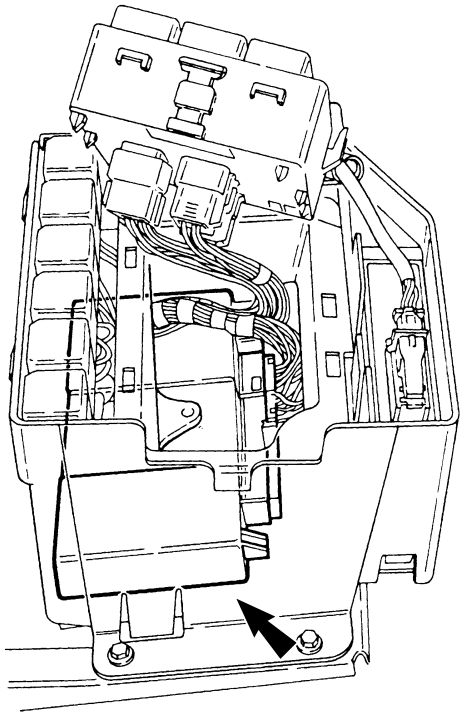
XJ / XK SECURITY SYSTEMS

Introduction

SECURITY AND LOCKING CONTROL MODULE



T682.55

The following security features are available:

- Panic alarm (dealer option)
- Passive arming (dealer option)
- Audible warnings
- Security LED in gear selector surround
- Drive away door locking
- Key and remote transmitter locking/unlocking
- Remote headlamp convenience
- Remote trunk open

The security and locking systems involve the SLCM, BPM, DDCM and PDCM all connected via the SCP network.

The SLCM is located in the electrical carrier below the fusebox, in the trunk. The BPM is mounted off the passenger airbag bracket, behind and above the glove box. DDCM and PDCM are located in the doors.

An inertia switch is located in the left-hand fascia fuse compartment and when activated unlocks the doors.

The in-car audible warning speaker is located in the column underscuttle.

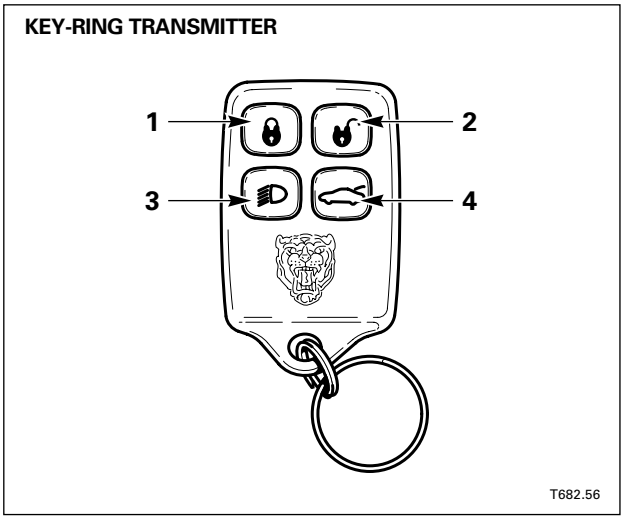
All vehicle modules are pre-programmed during build.

With the transit relay fitted Security cannot be armed during transit and the car must be mechanically locked. The SLCM controls all convertible top movement operations.

NOTES

Key-ring Transmitter

A four-button, rolling code, key-ring transmitter gives remote control of the system. Two key-ring transmitters are supplied with each vehicle.



Button functions are as follows (numbers correspond to those in the illustration at right):

1. **Locks and arms the vehicle.**
   One press will lock both doors and the trunk and will set the alarm system. One signal will be heard and the direction indicators will flash once. The LED in the gear selector surround will continually flash whilst the vehicle is armed.

2. **Unlocks and disarms the vehicle.**
   If the car is in a locked state, at the first press of the button the driver's door only unlocks and the interior lights fade on. A second press unlocks the passenger door.

3. **Switches on the headlamps and starts the panic alarm.**
   One press switches on the dipped headlamps which remain on for 25 seconds or until the button is pressed a second time or until the key is inserted in the ignition switch. Three presses within three seconds starts the panic alarm. The alarm will sound for a full period and can only be stopped by inserting the key into the ignition and turning to positions I or II. The transmitter cannot be used to cancel the panic alarm.

4. **Releases the trunk lock.**
   One press releases the trunk lock, without disarming the system.

The key-ring transmitter will only work if the vehicle's doors, hood and trunk are closed and the key is not in the ignition. Dealers are required to obtain proof of ownership before issuing a replacement transmitter. Batteries for the transmitter are CR 2016.

Key-ring Transmitter Programming (Manual Procedure)

- Insert Ignition Key
- Hold Headlamp Stalk Switch active (headlamps ON)
- Turn Ignition Key to position 1 (Auxiliary)
- Flash Headlamp Switch: 3 times for 1997 MY vehicles or 4 times for 1998 MY vehicles
- Confirmation chirp will sound and LED will flash once to indicate "Learn Mode" has been entered
- Activate each Remote Transmitter by pressing any button on the transmitter once – a chirp will sound for each Remote Transmitter signal received (LED will flash); allow 15 seconds maximum between each press
- Switch ignition off – confirmation chirp will sound to indicate "Learn Mode" has been exited (system will automatically "time out" after 15 seconds)

XJ / XK SECURITY SYSTEMS

Central Locking Functions

The vehicle can be locked and unlocked by activating the driver door key barrel switch, the driver or passenger interior door locks, or the remote transmitter. If drive away locking is enabled, the doors lock when the gear selector is moved from park to not-in-park for more than 1 second.

If a door lock actuator is driven more than 10 times within 40 seconds, a 20 second time out is set to allow the actuator to cool off. Other key barrel lock functions continue to operate during the lock actuator cool off period.

If the driver door key barrel lock switch is active for more than 30 seconds, the signal is ignored until the switch becomes inactive. Lock actuator protection does not occur if the unlock signal comes from the inertia switch.

If activated, the inertia switch unlocks the doors while the ignition is in position 2. Doors unlocked by inertia switch activation can be relocked by activating central locking.

If one door is locked and the other unlocked, and the inertia switch or key barrel lock / unlock switches are inactive, the locks cycle until both locks are in the same state. Lock cycling is disabled after three cycles, when the inertia switch is active, or when the ignition is switched to position II. When disabled, the locks are left in the last valid locking request position.

Lock / unlock

The vehicle may be centrally locked or unlocked using the driver door key lock or the remote transmitter. A door key lock global lock / unlock function activates the locks, windows and convertible top or sunroof.

Holding the door key lock in the active position for more than 1.5 seconds when the ignition is not in position II or III activates the global lock / unlock function. The global function activates the locks, windows, and convertible top or sunroof. If the key is released, global open / close operation immediately stops.

Trunk release

The trunk is opened using the interior trunk release switch, the trunk key lock or the remote transmitter. The interior trunk release switch activates the trunk solenoid under the following conditions:

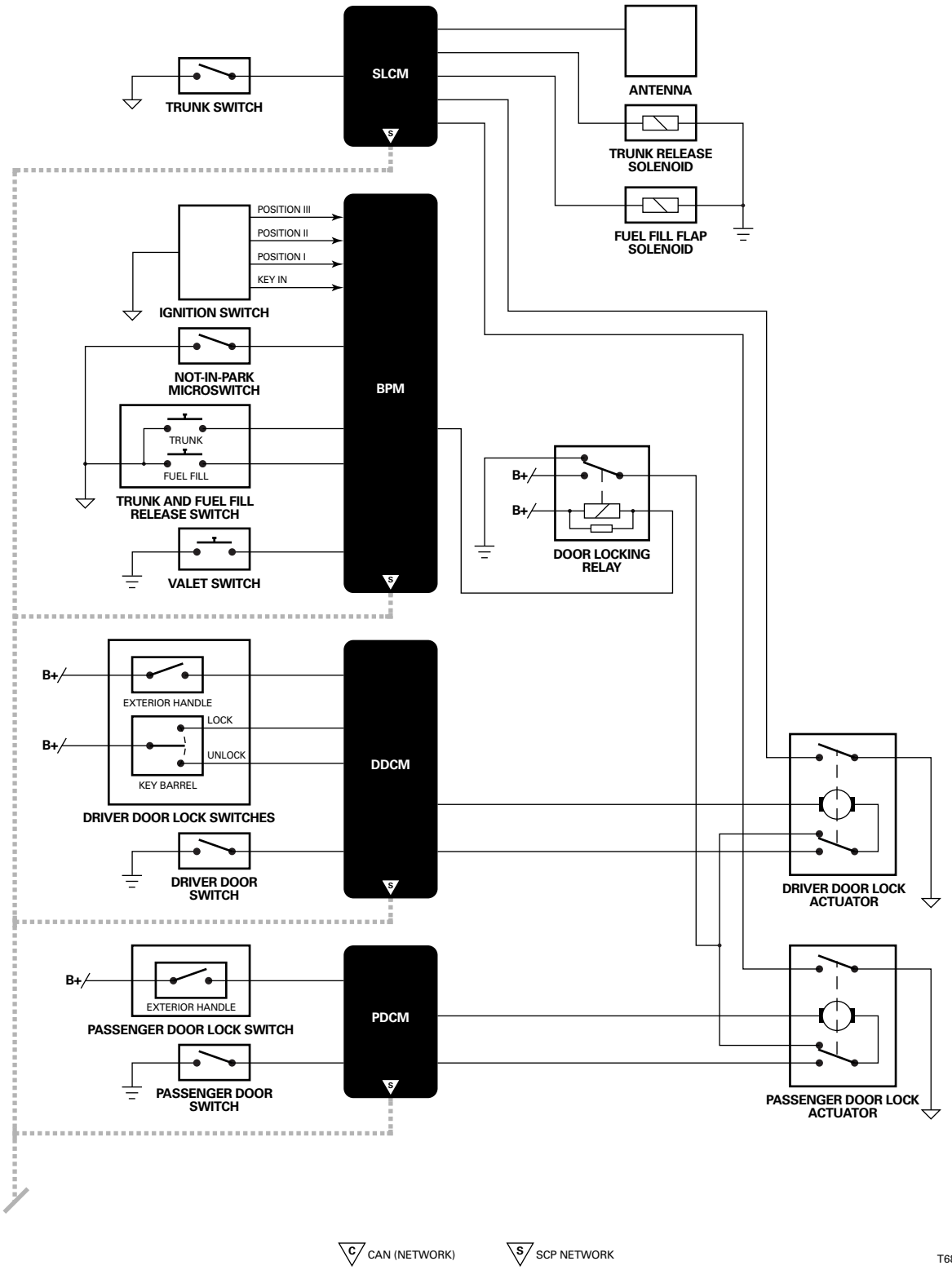
- Valet mode inactive
- Security disarmed
- Vehicle unlocked or key in the ignition

Valet mode (trunk release inhibit)

Valet mode is activated by pressing the valet switch when the trunk is closed. Valet mode is deactivated by disarming the security system or unlocking with the key.

NOTES

XK SECURITY AND LOCKING CONTROL CIRCUITS



XJ / XK SECURITY SYSTEMS

Security Functions

Locking

Locking the vehicle with the ignition key, if the security door locking function is enabled, or with the remote transmitter activates the security system.

Unlocking the vehicle with the ignition key if the security door locking function is enabled, or with the remote transmitter, disarms the security system.

Two stage unlocking
If two stage locking is enabled, one press of the remote transmitter unlocks the driver door and fades up the interior lights. A second press unlocks the passenger door.

Remote convenience features

All remote features require that the key not be in the ignition (key not-in-ignition switch inactive).

Remote headlamp
If remote headlamps are enabled, one press of the remote transmitter headlamp button activates the headlamps for 25 seconds.

Remote trunk release
If remote trunk release is enabled, one press of the trunk release button activates the trunk release solenoid.

Remote panic alarm
If remote panic alarm is enabled, three presses of the remote transmitter headlamp button within 3 seconds disarms and unlocks the vehicle, and full alarm is activated for one cycle. The alarm is canceled by turning the ignition switch to position I or II.

Security receiver shutdown

To reduce SLCM quiescent drain, the transmitter receiver portion of the security system will shut down 28 days after the body systems enter the sleep state. Any body systems activity, such as unlocking the vehicle with the key, will reactivate the receiver.

NOTES

Anti-Theft System

Full Alarm

Once armed any of the following circumstances will create a full alarm state and the sounder will operate (if fitted):

- Opening a door (after seven seconds)
- Opening the trunk with the key (after seven seconds)
- If the ignition key is turned to position I
- Pressing the key-ring transmitter headlamp button three times - Panic Alarm
- Opening the hood
- Glass breakage (if sensor is fitted).

Error Tone

The sounder gives a short, high-pitched warble if an attempt is made to secure the vehicle and one of the following conditions is present:

- The trunk is not closed when an attempt is made to arm the security system
- The key is in the ignition switch when a transmitter button is pressed
- If there is a failure within the alarm system the error tone will sound when the vehicle is disarmed
- If any door or the hood is open when an attempt to arm the security system is made.

Audible Signals

An audible signal will sound when:

- The Valet switch is pressed with the trunk closed, signifying that valet mode is active
- In Valet mode and the interior trunk release switch is pressed
- Opening a door when security is armed (door unlock warning and audible ticking).

Active Arming of the Anti-Theft System

Active arming, arm on central lock and key barrel arm are programmable features. If doors, hood, or trunk are closed, the key is not in the ignition and active arming is enabled, the security system can be armed by either the key barrel or remote transmitter. Arming will be prevented if door, hood or trunk lid are open and/or the key is in the ignition; an error tone will sound.

Arming when Centrally Locked

The vehicle will arm when it is centrally locked via the remote transmitter or from the key barrel. If a door, hood or the trunk lid is open an error tone is emitted.

On arming the direction indicators give a short flash and a single audible chirp will be emitted, if so programmed. The status LED in the gear selector surround will illuminate and then flash to indicate perimeter sensing. If deadlock and arming occur at the same time then the direction indicators will give a long flash and a second audible chirp.

Active Disarming of the Anti-Theft System

The anti-theft system will be disarmed and the alarm stopped if the remote transmitter is used.

Arming and Disarming from the Key Barrel

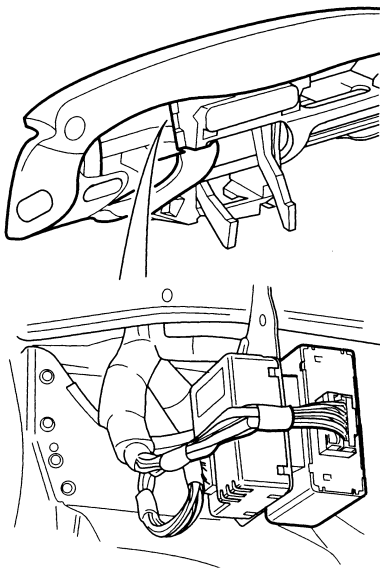
To arm, the key is turned to the unlocked position and then to the locked position within 3 seconds.

NOTES

XJ / XK SECURITY SYSTEMS

Anti-Theft System (continued)

KEY TRANSPONDER MODULE



T682.58

Key Transponder Module

The key transponder module forms an integral part of the body system immobilization and security functions. The module is not directly connected to the multiplex network although the functionality requires several signals to be exchanged between the key transponder and BPM. If the key transponder is enabled the system will be disarmed when the key is inserted and the ignition is switched to position I. When disarming the direction indicators give two short flashes and two audible chirps will be heard. The status LED will also be switched off.

The engine immobilizer ensures the engine can only be started using a valid ignition key.

Passive Arming: Vehicles with Key Transponder Module (KTM)

Engine cranking and starting are controlled by the ignition switch, ECM, BPM, P / N signal, key transponder module, ignition key reader exciter in the ignition switch, ignition key transponder and the gear selector not-in-park switch.

Cranking and starting are accomplished in the following manner:

Ignition key switched from the OFF position

- KTM receives a signal from the ignition switch position I as the key is turned
- KTM energizes the reader / exciter, which causes the key transponder to broadcast its security code
- If the key transponder code matches the programmed KTM code, the KTM outputs an OK TO START signal to the ECM via a serial data link
- ECM receives OK TO START signal and transmission P / N signal (hard wired from transmission), and enables fueling and ignition
- ECM outputs a SECURITY ACKNOWLEDGE signal to the BPM via a serial data link
- BPM receives a park signal from the gear selector not-in-park switch and enables cranking if the security system has been disarmed

Ignition switch to position III (CRANK)

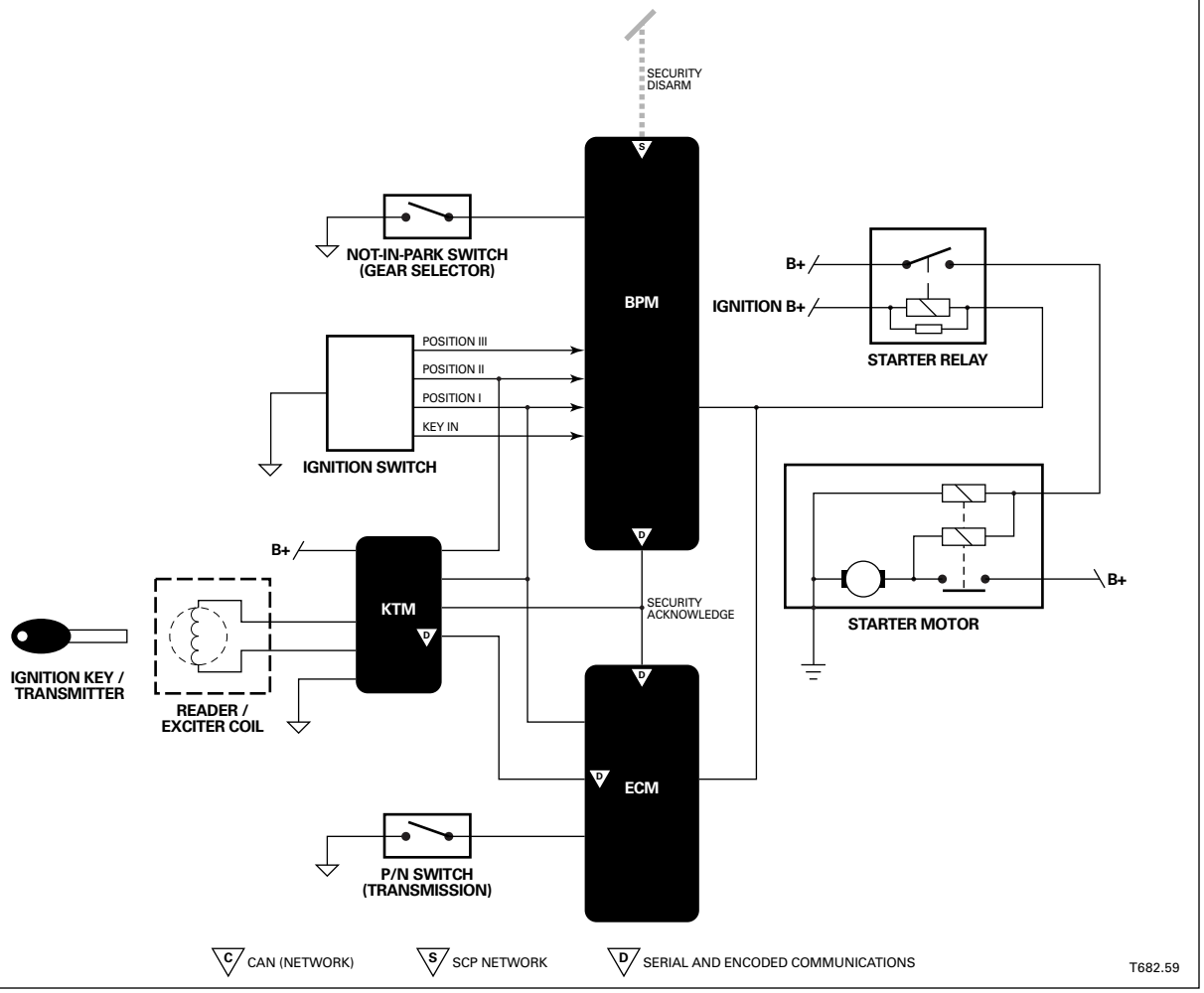
- Ignition position III crank signal is received by the BPM
- BPM grounds starter relay coil to energized starter motor
- ECM receives starter relay coil signal and sets engine starting values

Ignition Key Transponder Programming Using WDS

If the KTM is replaced, all keys must be programmed at the same time. No more than 5 keys can be programmed to any one vehicle. If only the ECM is replaced, key transponder programming is not necessary.

1. Ensure all of the vehicle's keys are available for this procedure. No more than 5 keys can be programmed to one vehicle.
2. Load the latest software for the vehicle into WDS.
3. Access Vehicle Setup.
4. Select Security System Setup.
5. Select Program New Transponders.
6. Ensure that only the key being programmed is in the ignition. (Remove key from a ring with other keys. If other Jaguar keys are near the reader exciter, they may also be detected, which will cause the KTM to interpret this condition as an invalid signal.)

XK STARTING CIRCUITS – WITH KEY TRANSPONDER MODULE



XJ / XK SECURITY SYSTEMS

Anti-Theft System (continued)

Vehicles without Key Transponder Module (KTM)

Engine cranking and starting are controlled by the ignition switch, ECM, BPM, transmission rotary switch P / N switch and the gear selector not-in-park switch.

Cranking and starting are accomplished in the following manner:

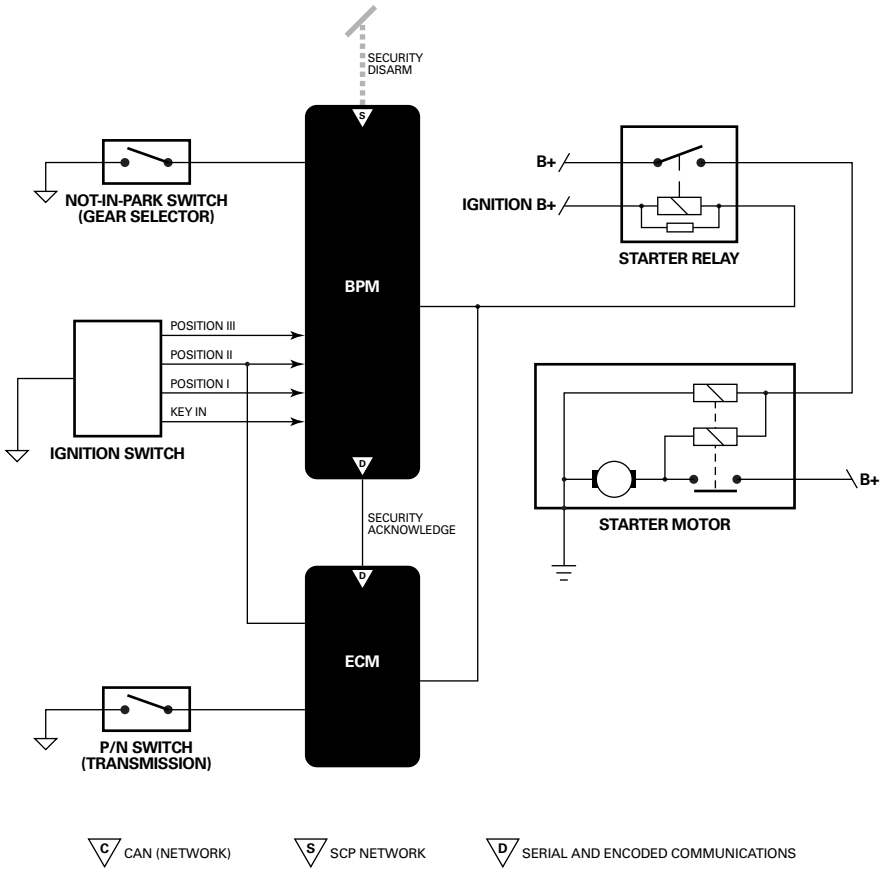
Ignition switch to position II

- Ignition position II and transmission P / N signal (hard wired) are received by the ECM
- ECM enables fueling and ignition and outputs a SECURITY ACKNOWLEDGE signal via a serial data link to the BPM
- BPM receives a park signal from the gear selector not-in-park switch and enables cranking if the security system has been disarmed

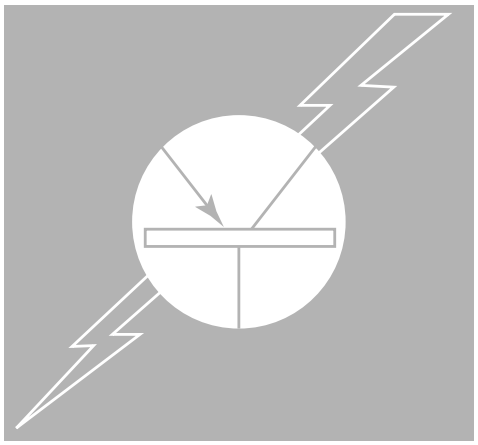
Ignition switch to position III (CRANK)

- Ignition position III crank signal received by BPM
- BPM grounds starter relay coil to energized starter motor
- ECM receives starter relay coil signal and sets engine starting values

XK STARTING CIRCUITS – WITHOUT KEY TRANSPONDER MODULE (N/A SHOWN)



ADVANCED JAGUAR ELECTRICAL SYSTEMS



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S-TYPE ELECTRICAL DISTRIBUTION SYSTEM

Electrical System Architecture

The Jaguar S-TYPE electrical system is a supply-side switched system. The ignition switch directly carries much of the ignition switched power supply load. Power supply is provided via three methods: direct battery power supply, ignition switched power supply, and switched system power supply.

The switched system power supply is controlled via the GECM and the RECM from SCP messages. After ignition ON, four relays are activated by either the GECM or the RECM for as long as SCP messages remain on the SCP network. The relays will remain activated after ignition OFF, until all SCP messages are removed.

Engine management and transmission control are combined into a single Powertrain Control Module eliminating the need for a controller area network. The Jaguar S-TYPE employs an SCP network for all powertrain, chassis and body systems interface / control. An ACP network is employed for audio and communications systems interface / control.

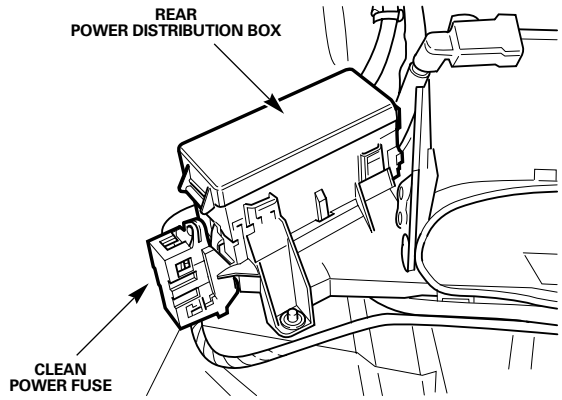
Circuit ground connections are made at body studs located throughout the vehicle. There are no separate power and logic grounding systems.

The electrical harness incorporates hard-wired front and rear power distribution boxes and a serviceable primary junction box. All fuses and relays (except the trailer towing accessory kit) are located in the two power distribution boxes and the primary junction box.

NOTES

S-TYPE ELECTRICAL DISTRIBUTION SYSTEM

CLEAN POWER FUSE



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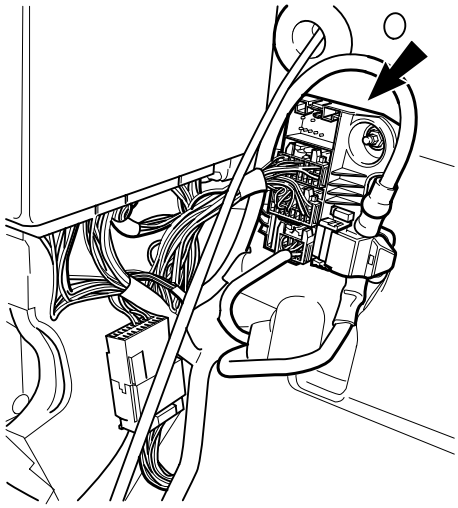
SECONDARY JUNCTION BOX



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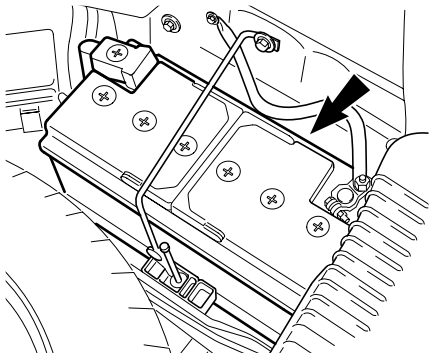
BATTERY



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Power Distribution

Distribution cables supply battery power through to the starter motor and to three power distribution/fuse boxes. Harnesses distribute battery, auxiliary and ignition power from the fuse boxes to all the user components. The front power distribution/fuse box clean power is fed via a clean power 175 ampere fuse (megafuse) which is located next to the rear power distribution box/fusebox.

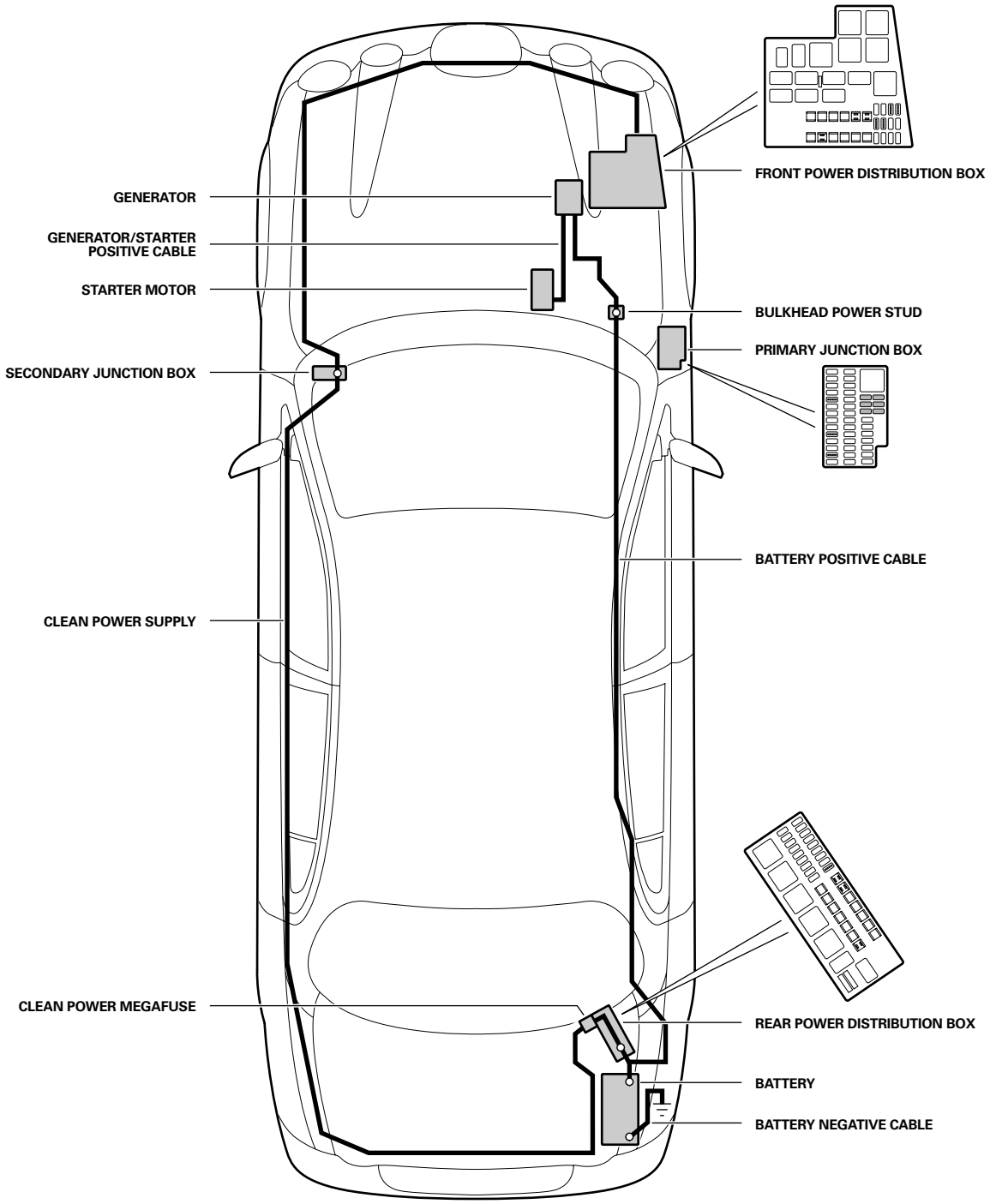
The secondary junction box is located on the bulkhead in the LH side of the cabin near the 'A' post. It acts as a splice header to avoid having numerous splices in the harness.

Battery

The low maintenance DIN 88, 90 ampere hour battery is installed on the RH side of the luggage compartment floor below the trim.

NOTES

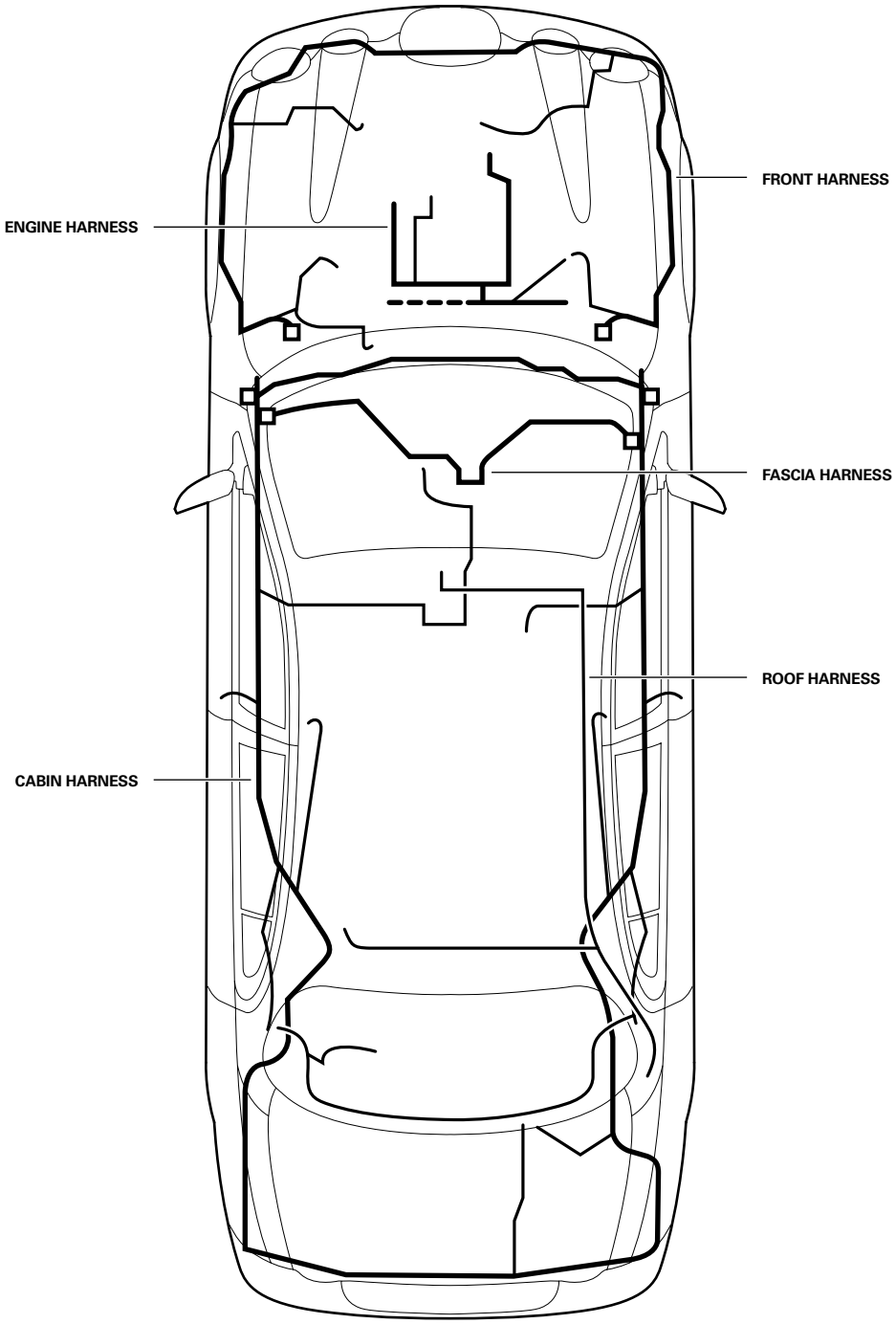
S-TYPE MAIN POWER DISTRIBUTION



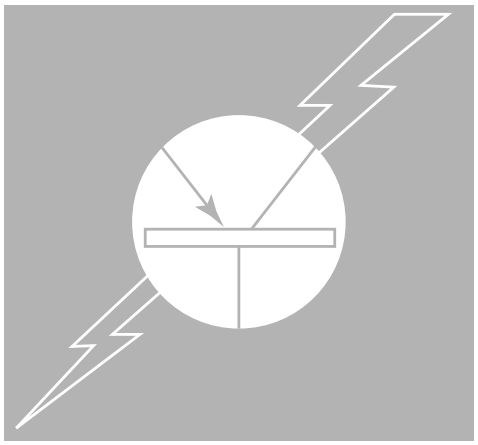
S-TYPE ELECTRICAL DISTRIBUTION SYSTEM

Harness Layout

S-TYPE HARNESS LAYOUT



ADVANCED JAGUAR ELECTRICAL SYSTEMS



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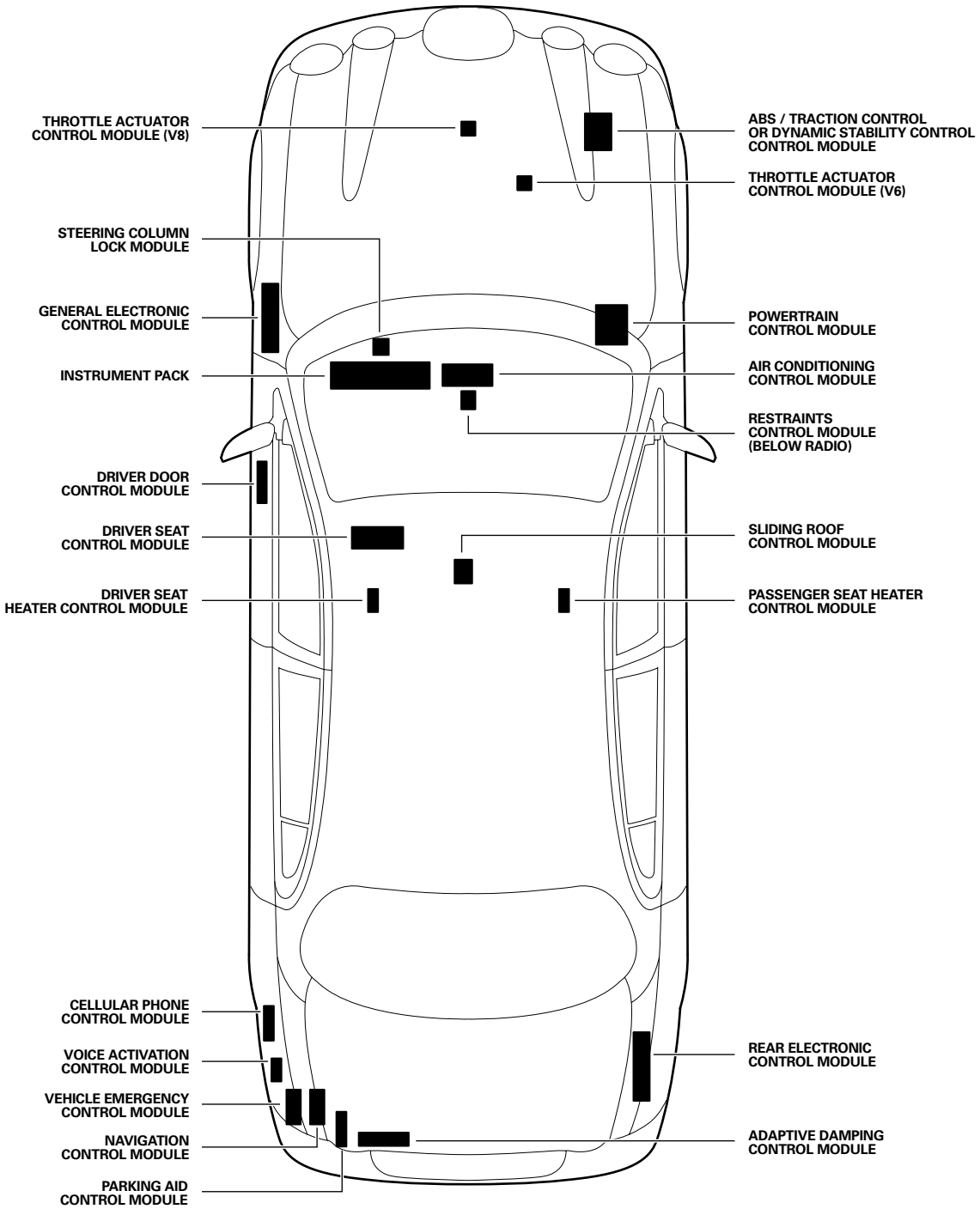
S-TYPE CONTROL MODULES

S-TYPE CONTROL MODULE LOCATIONS



Control Module Configuration

Most S-TYPE control modules require configuration when replaced. Configuration sets up the control module to correctly function in the vehicle in which it is installed. If configuration is not carried out, one or more difficulties will occur:

- The engine will not start
- Incorrect operation may occur
- Certain features may not function

Configuration is performed using WDS and is carried out by performing the following steps:

- Select the “Vehicle Configuration” main tab
- Highlight “Configure New Modules”
- Select the appropriate module and follow on-screen prompts

Powertrain Control Module (PCM)

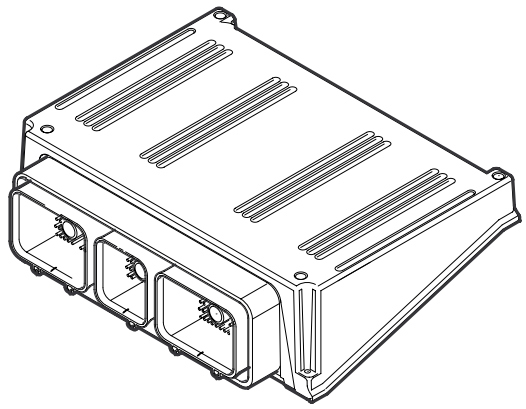
NOTE: Once a PCM is configured to a vehicle, it cannot be reconfigured to another vehicle.

After a PCM is replaced and the battery reconnected, connect WDS. WDS will perform the configuration during which you will be prompted to enter the Vehicle Identification Number.

During configuration WDS writes vehicle identification information into a section of the PCM memory called the VID Block (Vehicle Identification Block). Once the VID Block space is occupied, it can be overwritten with a re-flash. The VID Block stores data pertaining to certain other vehicle control modules. For example, the instrument pack identification data.

The VID Block has no effect on vehicle operation and is accessible in the future via WDS. The intent of the VID Block is to give Jaguar technicians information on the programmed status of control modules, in the event of a problem.

POWERTRAIN CONTROL MODULE



T682.67

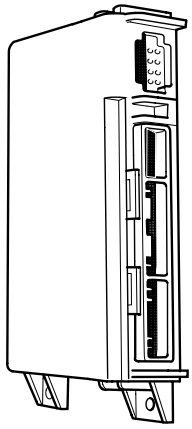
NOTE: The PCM must be configured to the instrument pack as part of the security system set up. If this is not carried out, the engine will not start. Refer to “Instrument Pack” on page 4.2.6.

NOTES

S-TYPE CONTROL MODULES

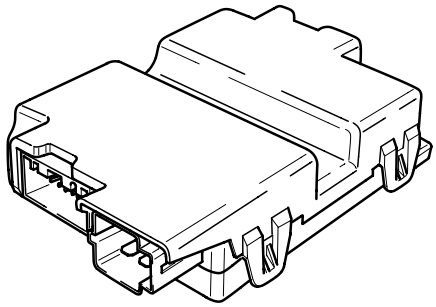
Control Module Configuration (continued)

DDCM



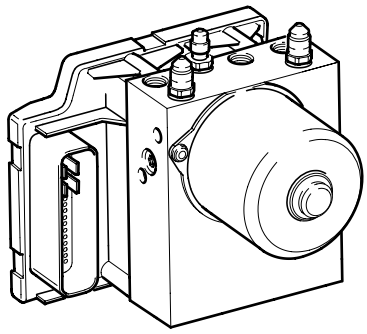
T682.68

DSCM



T682.69

DSCCM



T682.70

Driver Door Control Module (DDCM)

The DDCM contains the antenna for the ignition key fob transmitters and must be configured to accept the transmitted signals.

Driver Seat Control Module (DSCM)

NOTE: The DSCM is only fitted to vehicles with memory-operated devices.

The DSCM must be configured to know the range of seat and steering column travel for correct memory operation. If the DSCM, seat motors, or column motors are replaced, perform module configuration. Failure to carry out this operation will result in failure of all memory-operated devices.

CAUTION: Ensure that there are no obstructions and that the seat is not occupied during this operation.

Dynamic Stability Control Control Module (DSCCM)

The DSCCM requires configuration if it is replaced, or if either the Lateral Accelerometer or Yaw Velocity Sensor are replaced. In addition the DSCCM requires configuration if either of the DTCs relating to the Steering Angle Rate Sensor have been flagged.

If any of the DSC system components are replaced, configuration of the module will be required. If the DSC indicator light is flashing, configuration is necessary.

NOTES

Air Conditioning Control Module (A/CCM)

Replacement A/CCMs require configuration for several vehicle options and vehicle variants.

Correct heated wiper park function and heater operation are required on V8 models. These two systems will not operate if the module is not properly configured.

> **NOTE:** Canadian specification vehicles have heated windshields. The on/off strategy differs from the heated wiper park.

Radio Head Unit

Replacement radios require configuration for vehicle audio and telematics options.

This module should be configured in line with whichever additional systems are fitted to the vehicle, such as CD Autochanger, Navigation, Voice Activation and VEMS (JaguarNet).

VEMS (JaguarNet)

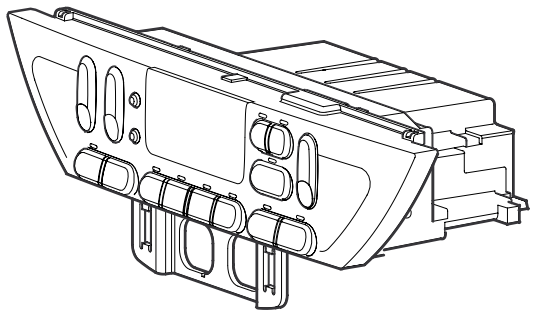
The VEMS module (part of the Luxury Communications package) must be configured with the vehicle VIN number. Otherwise the on-screen warning of assist failure and the red LED in the "eye" button will be illuminated.

Failure to program the VIN will result in incorrect vehicle identification to the VEMS telephone operator.

VEMS is only available in the US.

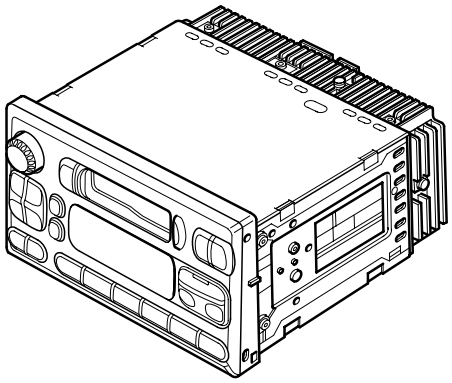
NOTES

A/CCM



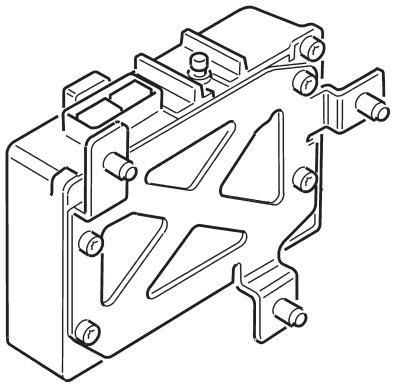
T682.71

RADIO HEAD UNIT



T682.72

VEMS (JaguarNet) MODULE



T682.73

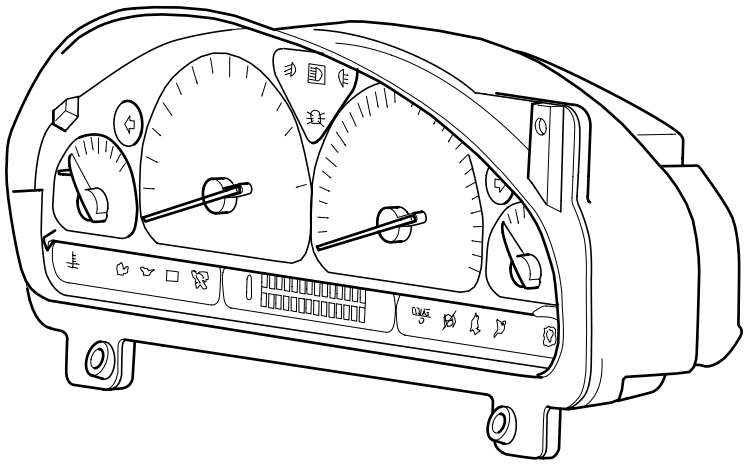
S-TYPE CONTROL MODULES

Control Module Configuration (continued)

Instrument Pack

The instrument pack must be configured to the PCM. If a replacement instrument pack is a new unit, this procedure can be carried out without using WDS. After a new instrument pack is installed and the battery reconnected, the instrument pack reads the VID Block of the PCM via the SCP network and automatically configures itself based on the VID Block data.

INSTRUMENT PACK



T682.74

Ignition Key Programming
After instrument pack configuration is complete, the ignition keys can be programmed manually, or using WDS. A minimum of 2 keys are required.

Manual key programming is as follows:

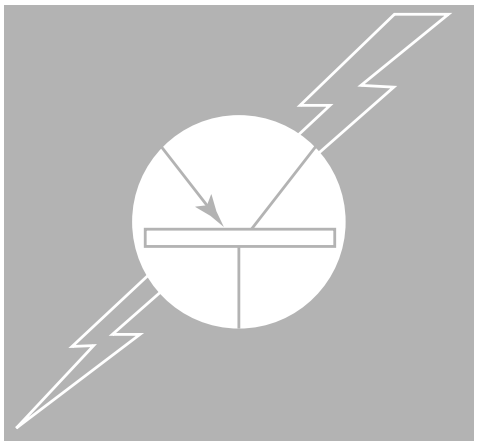
1. Insert the first key and switch the ignition to II (RUN). Remove the key within 5 seconds from switching to II.
2. Within 5 seconds from the first key removal, insert the second key and switch the ignition to II (RUN). Remove the key within 5 seconds from switching to II.
3. If additional keys are to be programmed, insert the remaining keys within 10 seconds from the proceeding key removal. Switch the ignition to II (RUN). Remove the key within 5 seconds from switching to II.

WDS Key Programming:
All vehicle keys should be available as this operation will clear any previously programmed keys from the instrument pack memory.

After connecting WDS, select Guided Diagnostics from the Main Menu followed by Vehicle Set Up and Vehicle CM Set Up / Configuration. Follow the onscreen prompts for key programming.

> **NOTE:** During this operation, the Message Center language can also be changed. Message Center language change can also be accomplished manually using the trip computer buttons as per XJ / XK.

ADVANCED JAGUAR ELECTRICAL SYSTEMS



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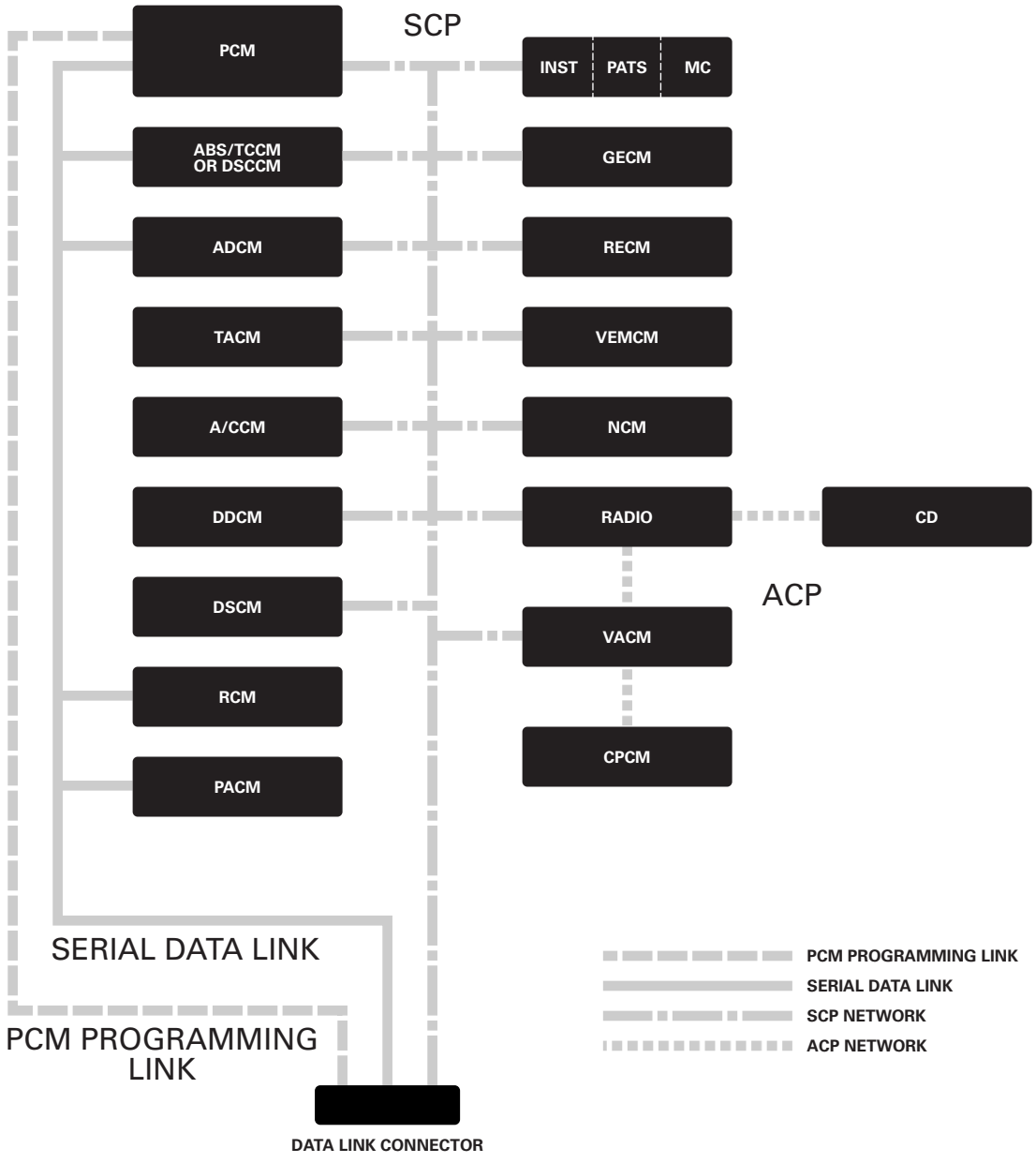
S-TYPE MULTIPLEXING

Multiplex Networks

The S-TYPE has three module communications networks. The first is the Standard Corporate Protocol (SCP) Network (J1850 SAE Standard), which is a twisted pair of cables: data bus plus and data bus minus. The second is the Serial Data Link (ISO 9141), which is a single wire network. The third is the Audio Control Protocol (ACP) Network, which, like the SCP, uses a twisted pair of wires. ACP is used only for the audio system. Both the SCP Network and the Serial Data Link can be connected to WDS by the data link connector (DLC), located under the instrument panel between the steering column and the audio unit.

S-TYPE NETWORKS



S-TYPE MULTIPLEXING

Multiplex Networks (continued)

Serial Data Link (ISO 9141)

The Serial Data Link does not permit inter-module communications. When WDS communicates to modules on the Serial Data Link, WDS must ask for all information; the modules initiate communications.

Standard Corporate Protocol (SCP) Network

The Standard Corporate Protocol (SCP) Network is the only communication network controlling the driveability of the vehicle and vehicle body systems. SCP is able to replace the faster Controller Area Network (CAN) for powertrain control because both engine management and transmission control are combined into a single Powertrain Control Module (PCM).

SCP differs from CAN in that not all "messages" have to be "event driven".

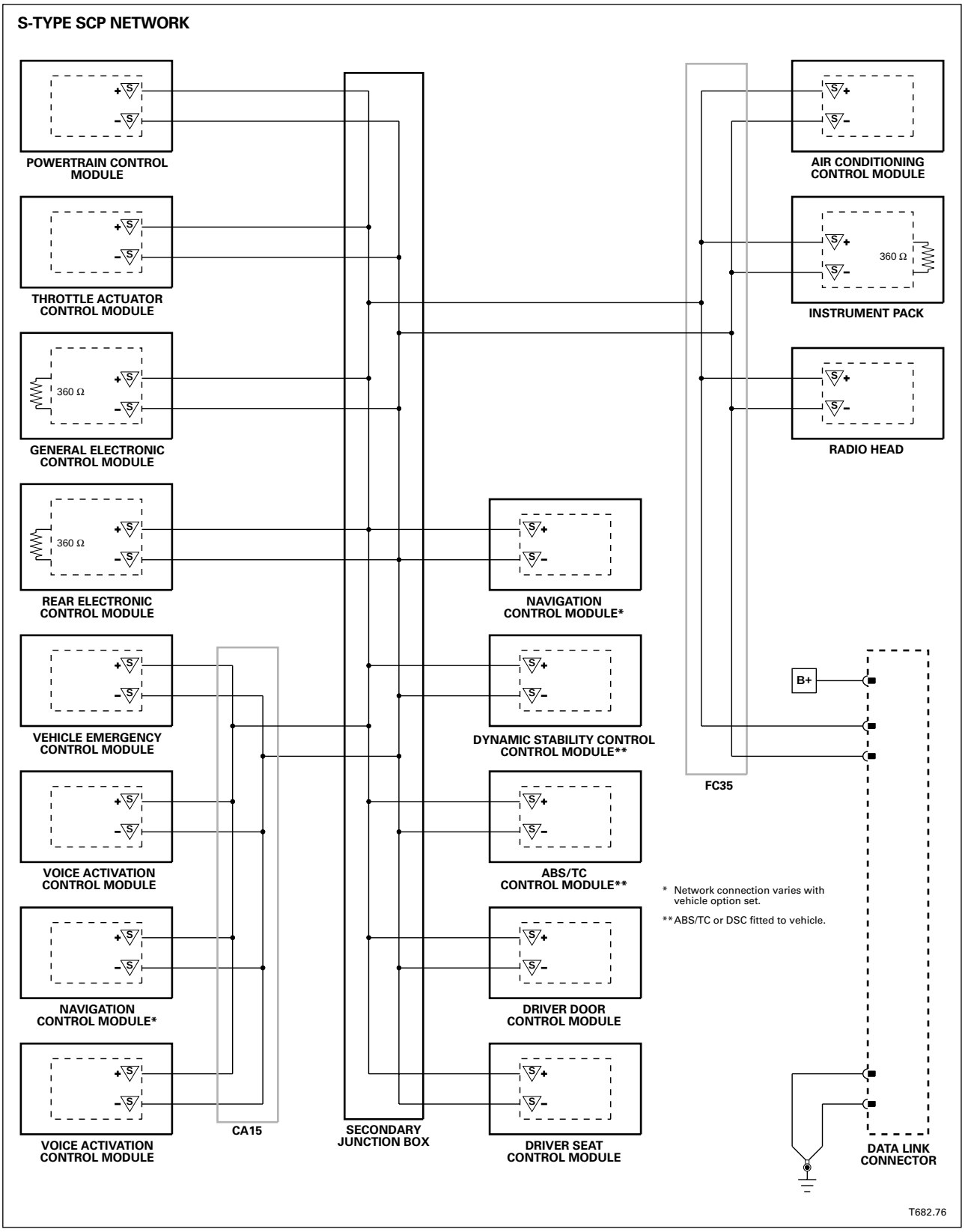
Cyclic messages
Some messages, such as those relating to engine management, are "cyclic". Cyclic messages are broadcast repeatedly at a frequency of 50 ms.

Periodic event messages
Other messages are broadcast repeatedly only until a particular result is acheived. For example, during traction control operation, the ABS/TC control module may request a reduction in engine torque. The control module will continue to broadcast this request until it receives the message that the engine torque has been reduced.

Network connection from module to module consists of pairs of twisted wires, similar to previous Jaguar vehicles. 2000 MY vehicles had portions of the network wires are shielded to prevent interference. The primary wire colors are slate (+) and blue (–).

The network will remain operational if one of the bus wires is open circuit, short circuit to ground or short circuit to B+ voltage. In addition, the network will remain operational if some, but not all, control module termination resistors have failed.

NOTES


S-TYPE SCP NETWORK
POWERTRAIN CONTROL MODULE
THROTTLE ACTUATOR CONTROL MODULE
360 Ω
GENERAL ELECTRONIC CONTROL MODULE
360 Ω
REAR ELECTRONIC CONTROL MODULE
VEHICLE EMERGENCY CONTROL MODULE
VOICE ACTIVATION CONTROL MODULE
NAVIGATION CONTROL MODULE*
VOICE ACTIVATION CONTROL MODULE
CA15
SECONDARY JUNCTION BOX
NAVIGATION CONTROL MODULE*
DYNAMIC STABILITY CONTROL CONTROL MODULE**
ABS/TC CONTROL MODULE**
DRIVER DOOR CONTROL MODULE
DRIVER SEAT CONTROL MODULE
AIR CONDITIONING CONTROL MODULE
360 Ω
INSTRUMENT PACK
RADIO HEAD
FC35
B+
DATA LINK CONNECTOR
* Network connection varies with vehicle option set.
** ABS/TC or DSC fitted to vehicle.
T682.76

S-TYPE MULTIPLEXING

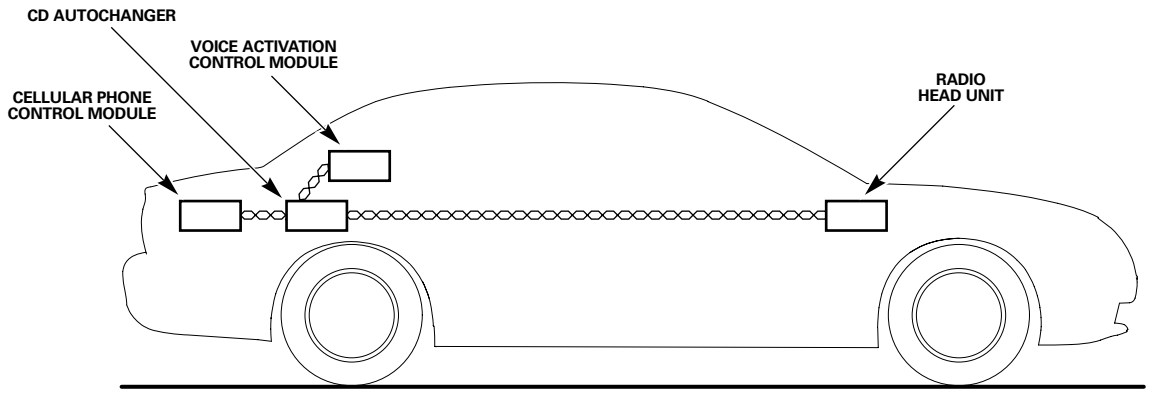
Multiplex Networks (continued)

Audio Control Protocol (ACP) Network

The Audio Control Protocol (ACP) network is used only on the S-TYPE audio, voice and cell phone systems.

This network consists of the Radio Head Unit acting as the control module, with various other audio system-related modules. These are connected by a twisted pair data bus.

S-TYPE ACP NETWORK



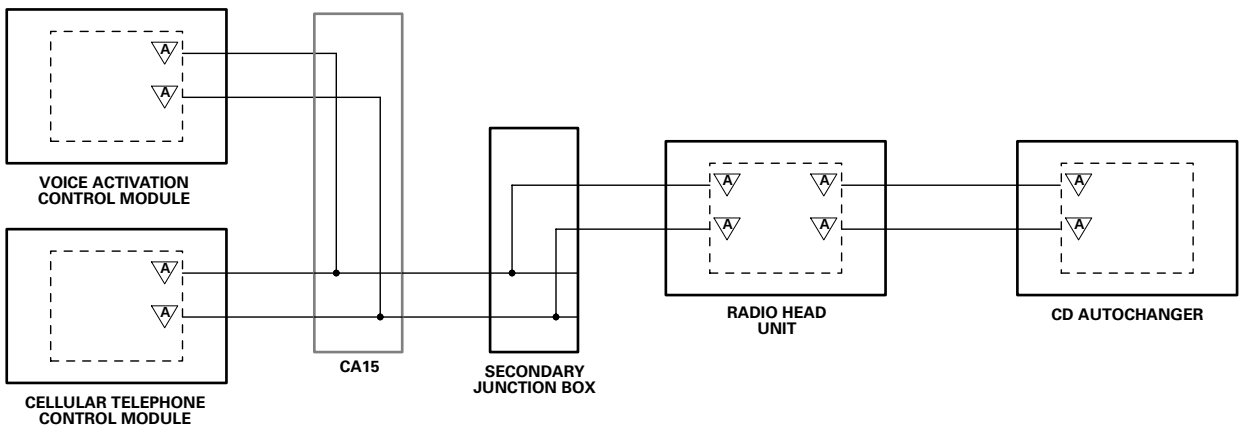
Operation

The control module communicates with other network modules by sending and/or receiving electronic messages on the data bus. The ACP data bus consists of a pair of wires twisted to help prevent radio frequency interference.

> **NOTE**: Be aware that unlike the SCP Network, if either of the data bus wires are open or shorted, the ACP network will not operate.

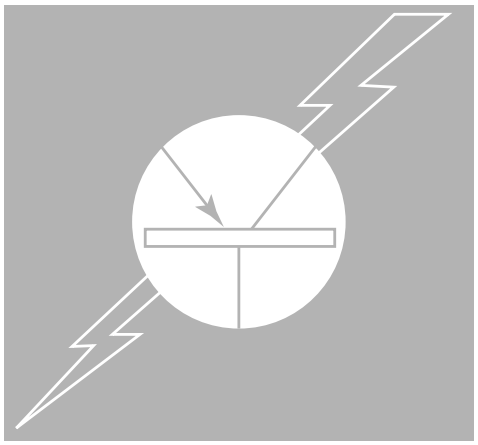
NOTES

S-TYPE ACP NETWORK



NOTES

ADVANCED JAGUAR ELECTRICAL SYSTEMS



JAGUAR

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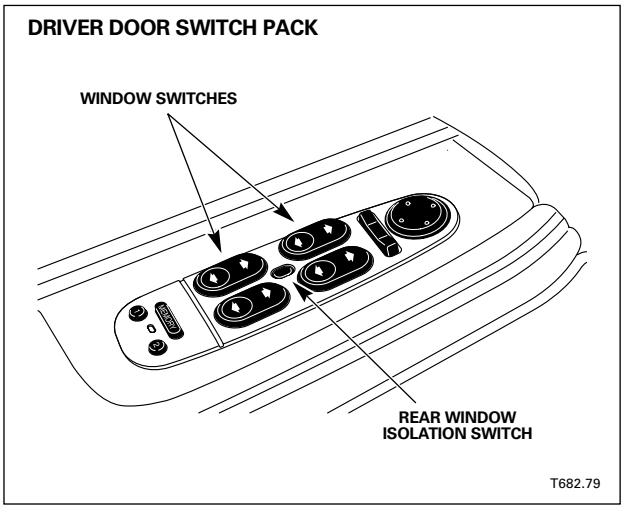
S-TYPE BODY SYSTEMS

Power Windows

S-TYPE window lifts feature driver "one-touch" control and rear window isolation (lock out). The window lift circuit combines hardwire control and activation, with SCP network control and hardwire activation. The individual door window lift switches input to their respective control modules, which in turn, activate the window lift motor(s):

- Driver door window switch pack / DDCM / driver door window motor
- Passenger door switch / GECM / passenger door window motor
- LH and RH rear door switches / RECM LH and RH rear door window motors

When controlling windows (other than the driver door) from the driver door switch pack, or using the global close / open central locking function, the DDCM broadcasts SCP – Window Open / Close Command to the GECM and the RECM.



Global Closing / Opening

- Using the key in the driver's door, lock the vehicle and hold in this position to close all the windows (and sliding roof, if fitted).
- Press and hold the key-ring transmitter unlock button, or use the key to unlock the vehicle and hold in this position to open all the windows (and sliding roof, if fitted).

Driver door switch pack window switch inputs
Window switch signals are provided to the DDCM. All window switch circuits are normally open. When the circuits are completed, B+ is sensed at the control module.

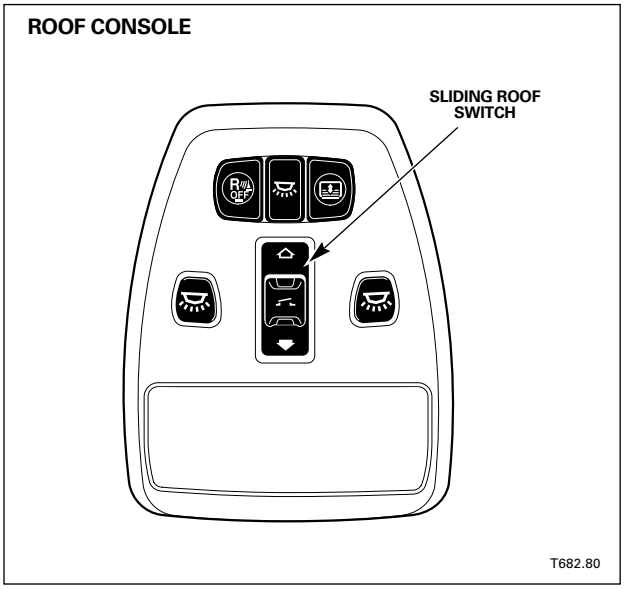
Passenger window switch inputs
Window switch UP / DOWN signals are provided to the GECM. The circuits are normally open referenced to B+ (provided from the RECM). When the circuits are completed, B+ is sensed at the control module.

LH and RH rear window switch inputs
Window switch UP / DOWN signals are provided to the RECM. The circuits are normally open. When the circuits are completed, B+ is sensed at the control module.

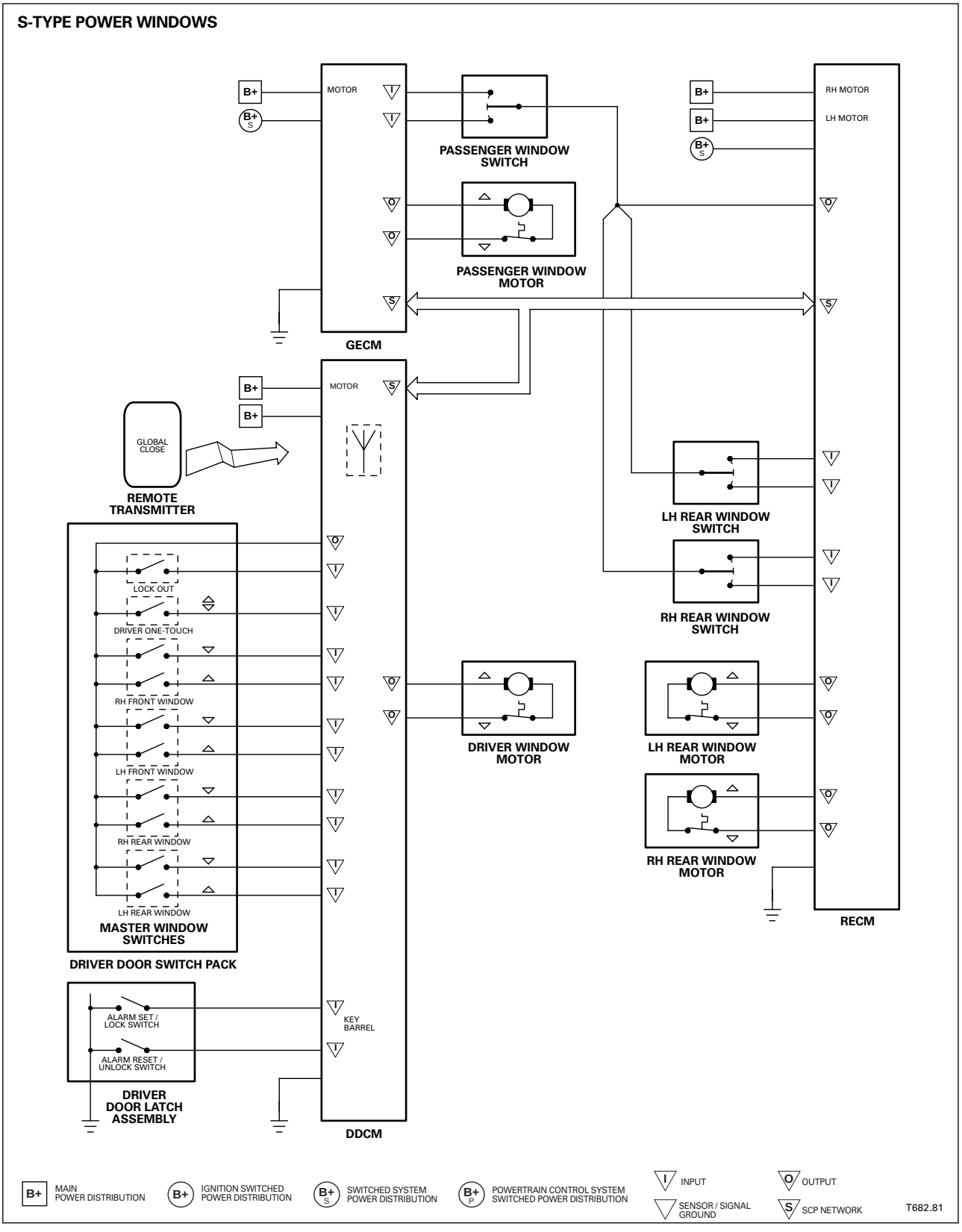
Window lift motor operation
The window lift motor(s) are driven by the control module by applying B+ ground to the pairs of window lift motor circuits.

Sliding Roof

The sliding roof system operates independently from the window lift system, except in the case of global open / close. The sliding roof control module is not part of the SCP network. The RECM signals the sliding roof control module to globally open / close via a hardwired circuit. The sliding roof can be positioned opened, closed, partially open, or tilt.



S-TYPE POWER WINDOWS



S-TYPE BODY SYSTEMS

Interior Lighting

Interior lighting is controlled in multiple ways:

- Manual interior lamp activation
- Automatic interior lamp activation
- Automatic / manual interior lamp activation

Most of these activation modes are controlled by switch inputs to control modules.

Master Interior Lighting Switch / Instrument Pack

Input from the master interior lighting switch, located in the roof console. When the switch is pressed, the circuit is completed.

The instrument pack outputs SCP – *ALL COURTESY LAMP SWITCH STATUS*.

DTC B1246 will be flagged if the switch circuit becomes open circuit or short to ground.

Driver and Passenger Door Switches / GECM

The driver and passenger door switches provide ground inputs to the GECM when the doors are opened.

GECM outputs
SCP – *DRIVER FRONT DOOR AJAR SWITCH STATUS*
SCP – *PASSENGER FRONT DOOR AJAR SWITCH STATUS*

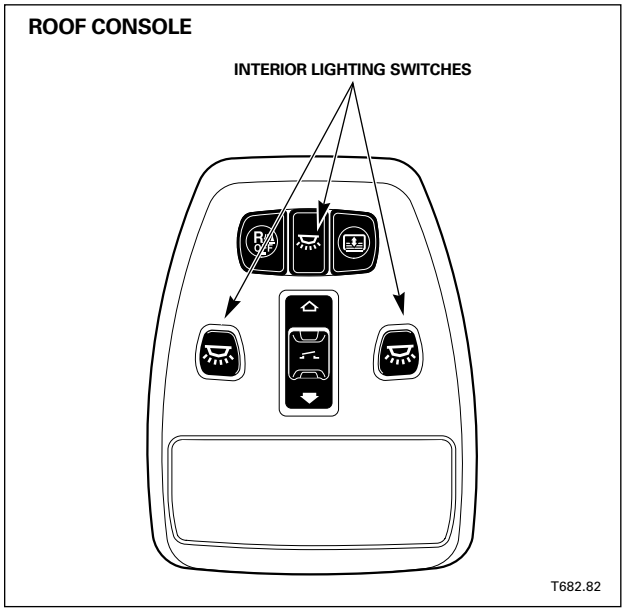
Rear Door and Trunk Switches / RECM

The LH and RH rear door switches and the trunk switch provide ground inputs to the RECM when the doors are opened.

RECM outputs
SCP – *DRIVER REAR DOOR AJAR SWITCH STATUS*
SCP – *PASSENGER REAR DOOR AJAR SWITCH STATUS*
SCP – *TRUNK LID DOOR AJAR SWITCH STATUS*

Switched System Power Supply

All interior lamps are supplied with B+ V from "switched system power supply". This power supply is GECM / RECM controlled as a "battery saver" function. Power is available whenever an SCP network message is present.



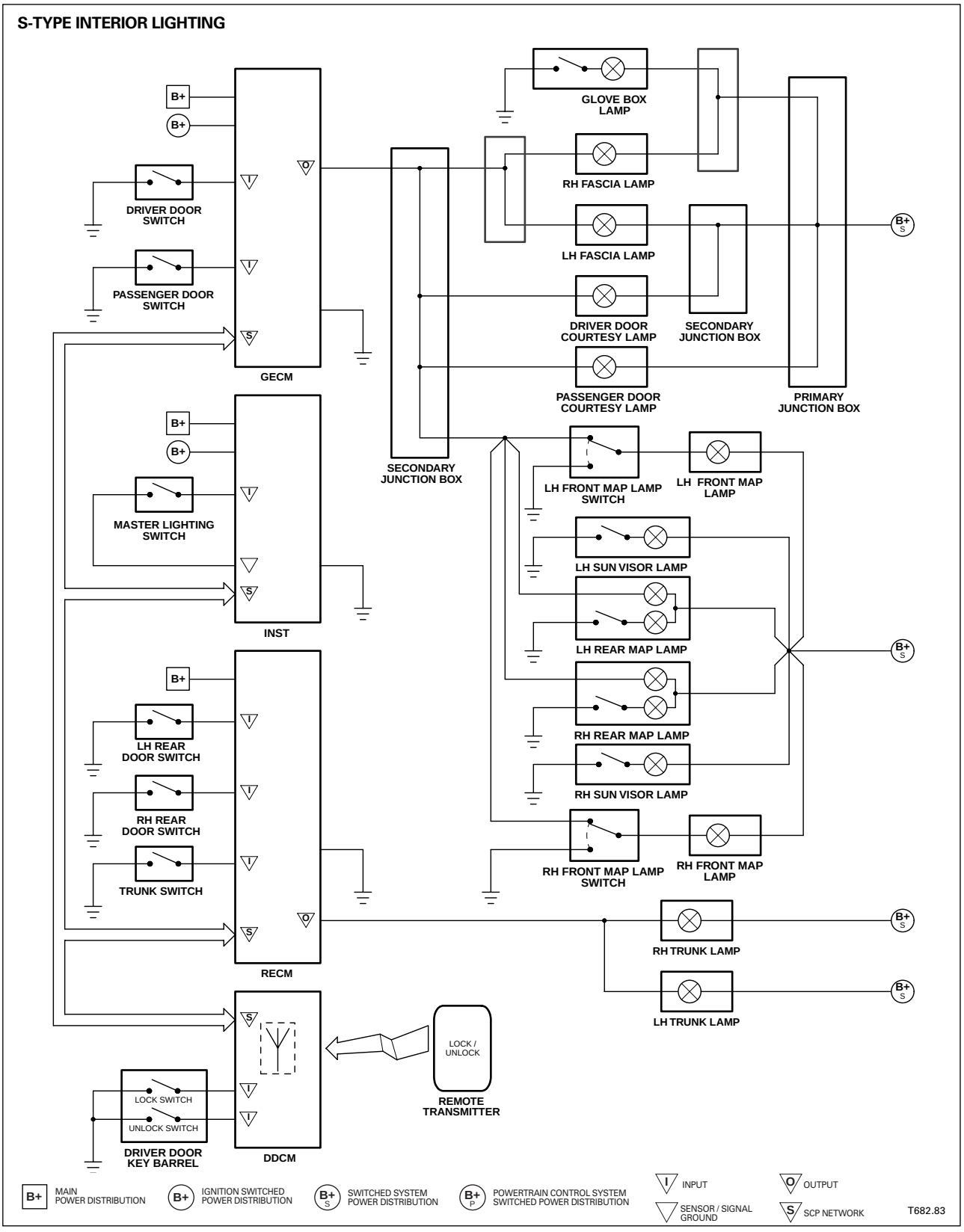
For example: Before the ignition is switched ON – when the vehicle is unlocked by the key barrel (SCP message Driver Front Door Lock State Status); after the ignition is switched OFF – SCP messages remain on the network for approximately 40 minutes.

Interior Lamps Operational Overview

Master interior lighting switch
Press the master interior light switch to switch all interior lamps from automatic to ON. When the switch is in the ON position, if any doors are open, none of the individual interior lamps can be turned OFF. In the automatic position, when the interior lamps have faded off, certain lamps can be switched ON or OFF by pressing the associated individual switch.

Illuminated Entry / Exit
When the vehicle is unlocked, the fascia courtesy lamps will gradually illuminate and remain on for 20 seconds. When the vehicle is locked with the remote or key and the fascia courtesy lamps are ON, they will fade OFF.

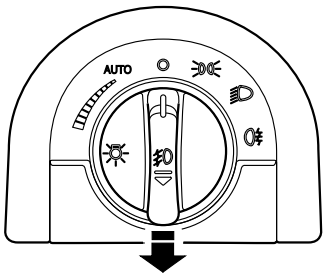
NOTES


S-TYPE INTERIOR LIGHTING
B+
B+
DRIVER DOOR SWITCH
PASSENGER DOOR SWITCH
I
I
S
O
GECM
GLOVE BOX LAMP
RH FASCIA LAMP
LH FASCIA LAMP
DRIVER DOOR COURTESY LAMP
PASSENGER DOOR COURTESY LAMP
SECONDARY JUNCTION BOX
PRIMARY JUNCTION BOX
B+ S
SECONDARY JUNCTION BOX
B+
B+
MASTER LIGHTING SWITCH
I
S
INST
LH FRONT MAP LAMP SWITCH
LH FRONT MAP LAMP
LH SUN VISOR LAMP
LH REAR MAP LAMP
RH REAR MAP LAMP
RH SUN VISOR LAMP
RH FRONT MAP LAMP SWITCH
RH FRONT MAP LAMP
B+
LH REAR DOOR SWITCH
RH REAR DOOR SWITCH
TRUNK SWITCH
I
I
I
S
O
RECM
RH TRUNK LAMP
LH TRUNK LAMP
B+ S
S
I
I
LOCK SWITCH
UNLOCK SWITCH
DRIVER DOOR KEY BARREL
DDCM
LOCK / UNLOCK
REMOTE TRANSMITTER
B+ MAIN POWER DISTRIBUTION
B+ IGNITION SWITCHED POWER DISTRIBUTION
B+ S SWITCHED SYSTEM POWER DISTRIBUTION
B+ P POWERTRAIN CONTROL SYSTEM SWITCHED POWER DISTRIBUTION
I INPUT
O OUTPUT
SENSOR / SIGNAL GROUND
S SCP NETWORK
T682.83

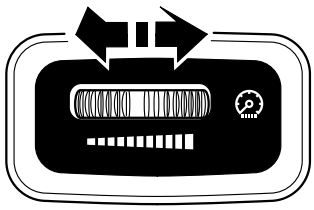
S-TYPE BODY SYSTEMS

Dimmer-Controlled Lighting

LIGHTING AND DIMMER SWITCHES



LIGHTING SWITCH



DIMMER SWITCH

T682.84

The instrument pack will illuminate with Sidelights ON. Instrument pack decodes the position of the dimmer switch and the lighting switch, and then broadcasting *SCP – BACKLIGHTING INTENSITY AND DIMMING CURVE WITH HEADLAMPS COMMAND* to the following:

- Message Center
- AUDIO (Radio Head Unit)
- A/CCM
- GECM

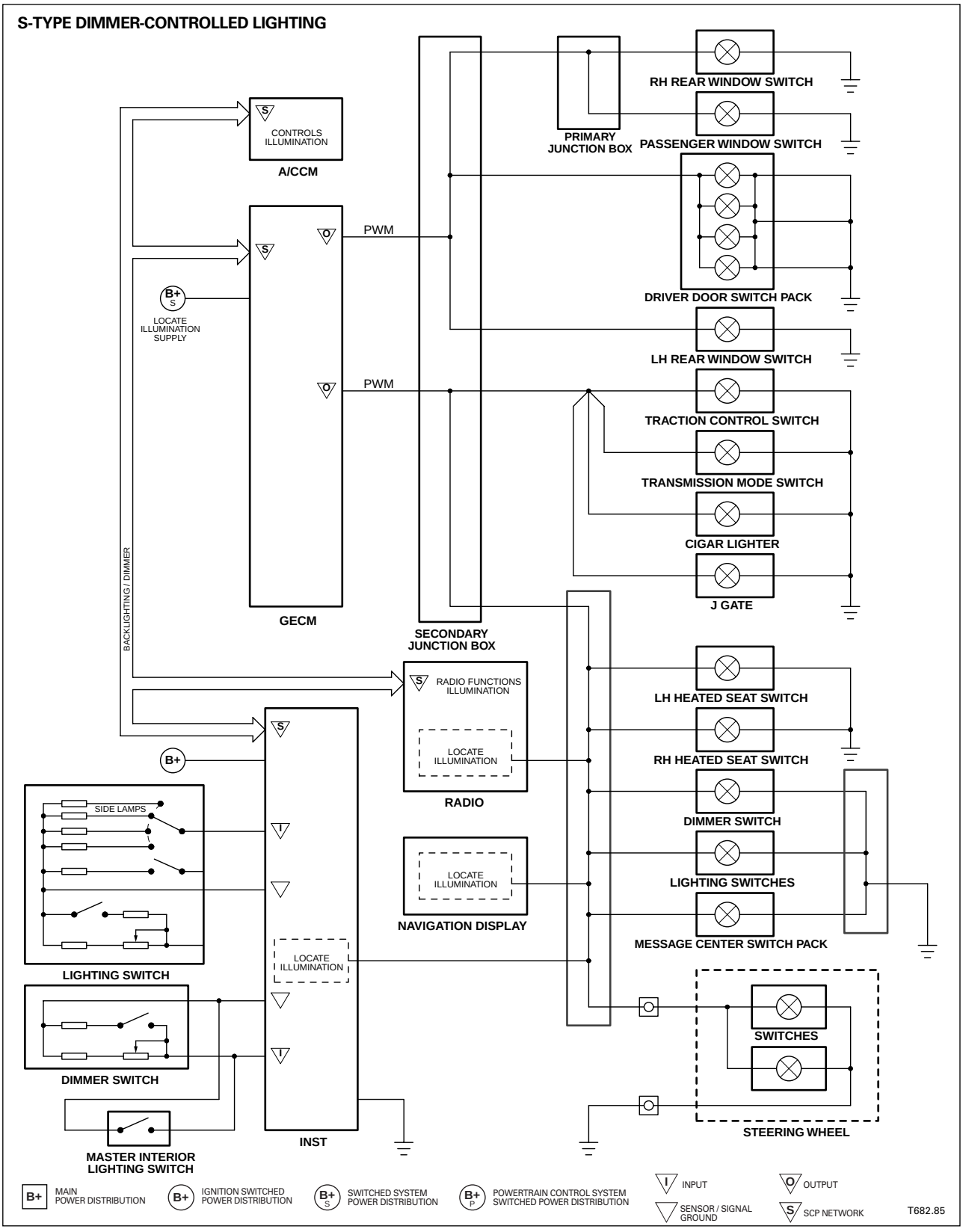
The message center, radio, and air conditioning control module (climate control panel) illumination are internally switched ON to the correct level when the SCP message is received. In the event of a message center warning message being active, the message center display will go to maximum night time brightness. If the dimming level is set to maximum brightness the message center will go into daylight override mode and display everything at full daytime brightness.

> **NOTE:** If the interior lamps master switch (roof console) is switched ON while the message center illumination is dimmed, the display will go to maximum night time brightness.

The GECM converts the SCP message into a PWM drive signal, which is used for vehicle “locate” illumination (Dimmer–Controlled Lighting). The instrument pack illumination “level” is controlled by this input.

Switch input
The dimmer switch input signal is provided; this signal is referenced (sensor supply). The signal is a variable resistance across the inputs in the range of 1 kΩ to 11 kΩ.

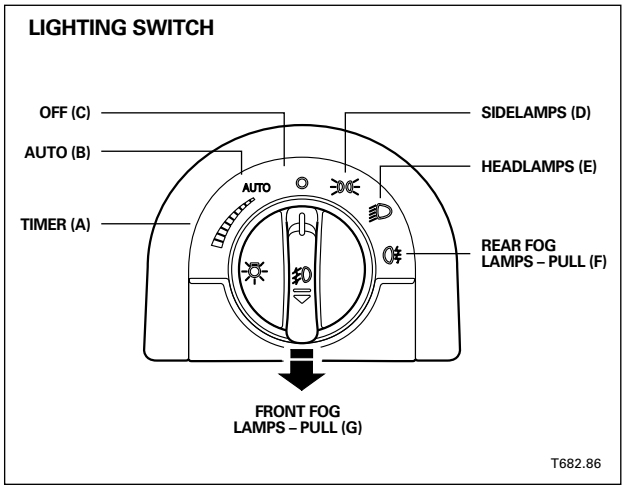
NOTES


S-TYPE DIMMER-CONTROLLED LIGHTING
CONTROLS ILLUMINATION
A/CCM
PWM
PWM
LOCATE ILLUMINATION SUPPLY
GECM
BACKLIGHTING / DIMMER
PRIMARY JUNCTION BOX
SECONDARY JUNCTION BOX
RH REAR WINDOW SWITCH
PASSENGER WINDOW SWITCH
DRIVER DOOR SWITCH PACK
LH REAR WINDOW SWITCH
TRACTION CONTROL SWITCH
TRANSMISSION MODE SWITCH
CIGAR LIGHTER
J GATE
RADIO FUNCTIONS ILLUMINATION
LOCATE ILLUMINATION
RADIO
LH HEATED SEAT SWITCH
RH HEATED SEAT SWITCH
DIMMER SWITCH
LIGHTING SWITCHES
MESSAGE CENTER SWITCH PACK
SIDE LAMPS
LIGHTING SWITCH
LOCATE ILLUMINATION
NAVIGATION DISPLAY
LOCATE ILLUMINATION
DIMMER SWITCH
MASTER INTERIOR LIGHTING SWITCH
INST
SWITCHES
STEERING WHEEL
MAIN POWER DISTRIBUTION
IGNITION SWITCHED POWER DISTRIBUTION
SWITCHED SYSTEM POWER DISTRIBUTION
POWERTRAIN CONTROL SYSTEM SWITCHED POWER DISTRIBUTION
INPUT
OUTPUT
SENSOR / SIGNAL GROUND
SCP NETWORK
T682.85

S-TYPE BODY SYSTEMS

Exterior Lighting Control

Exterior lighting is driver controlled by the fascia mounted rotary lighting switch and the steering column left hand stalk switch.



Lighting Switch

The lighting switch has 7 functions:

OFF
All exterior lighting OFF (except Canada daytime running lamps)

Autolamps
The autolamp sensor, located on top of the fascia, monitors exterior light levels and automatically switches the side lamps and headlamp dip beams ON or OFF. When light fades to the non-adjustable preset level, the side lamps and headlamps switch ON automatically. As light increases to the preset level, the sidelights and headlamps switch OFF automatically.

Autolamps delayed exit
This feature leaves the headlamps turned ON after the ignition has been switched OFF, allowing the driver and passengers increased visibility on leaving the vehicle. The feature is set using the lighting switch to input the desired delay time to the instrument pack. Moving the switch from OFF counterclockwise varies the delay time from 3 seconds up to 3 minutes. After adjustment, the newly set delay time will be displayed on the message center.

Sidelamps
Switches ON: front side marker lamps, tail lamps, license plate lamps. When this position is selected, vehicle "locate" lighting is switched ON.

Headlamps
Switches ON headlamp dipped beams. (Sidelamp function remains ON.)

Rear fog lamps
Turn the switch to headlamps ON; pull the switch and then turn to position Rear Fog Lamps ON. Turning on the rear fog lamps will also turn on the front fog lamps.

Front fog lamps
Pull the switch in positions (A), (B), (D) or (E) to switch ON the front fog lamps. Push to turn OFF. If the rotary switch is turned exterior lamps OFF, the switch will be retracted to its normal position and the fog lamps will be turned OFF.

NOTES

Daytime Running Lights (Canada only)

Canada daytime running lights (Side lamps and Headlamp dipped beams) are switched ON automatically by the GECM with the following conditions:

- Ignition switch position II
- Lighting switch OFF or Headlamps ON
- Gear selector not in P (automatic transmission)
- Parking brake released

Battery Saver Feature

If the dipped or main beam headlamps are switched ON and the ignition is switched to OFF, or the key is removed, the lamps will automatically turn OFF after 10 minutes. The sidelights will remain ON.

Bulb Failure Monitoring

The tail and brake lamp bulbs are monitored for failure and a corresponding message is shown in the message center. For example: LEFT TAIL LAMP FAILED. Additionally, the AMBER secondary warning will be on.

There are two tail lamp bulbs in each tail lamp. The message that a tail lamp has failed indicates that both bulbs in that cluster have failed. The message will be shown, even after a bulb is replaced, until the next time the bulb is switched on.

Exterior Lighting Control Functions and Diagnostics

All lighting inputs, except the brake switch, are received by the instrument pack from the lighting and column stalk switches, and the autolamp sensor. The instrument pack decodes the state of the hardwired lighting switch and broadcasts SCP messages for exterior lighting activation by the GECM – front exterior lighting, or the RECM – rear exterior lighting.

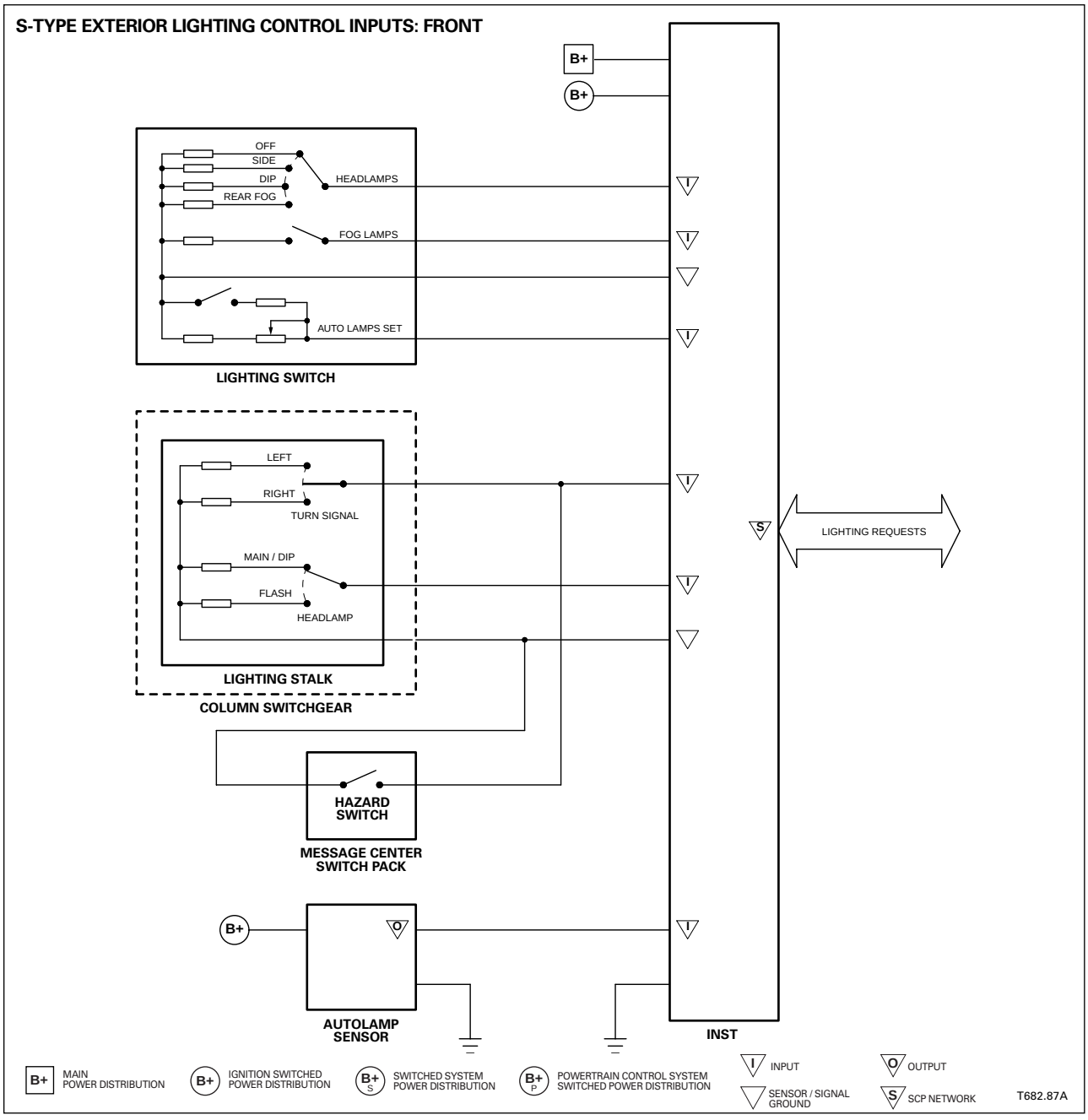
NOTES

S-TYPE BODY SYSTEMS

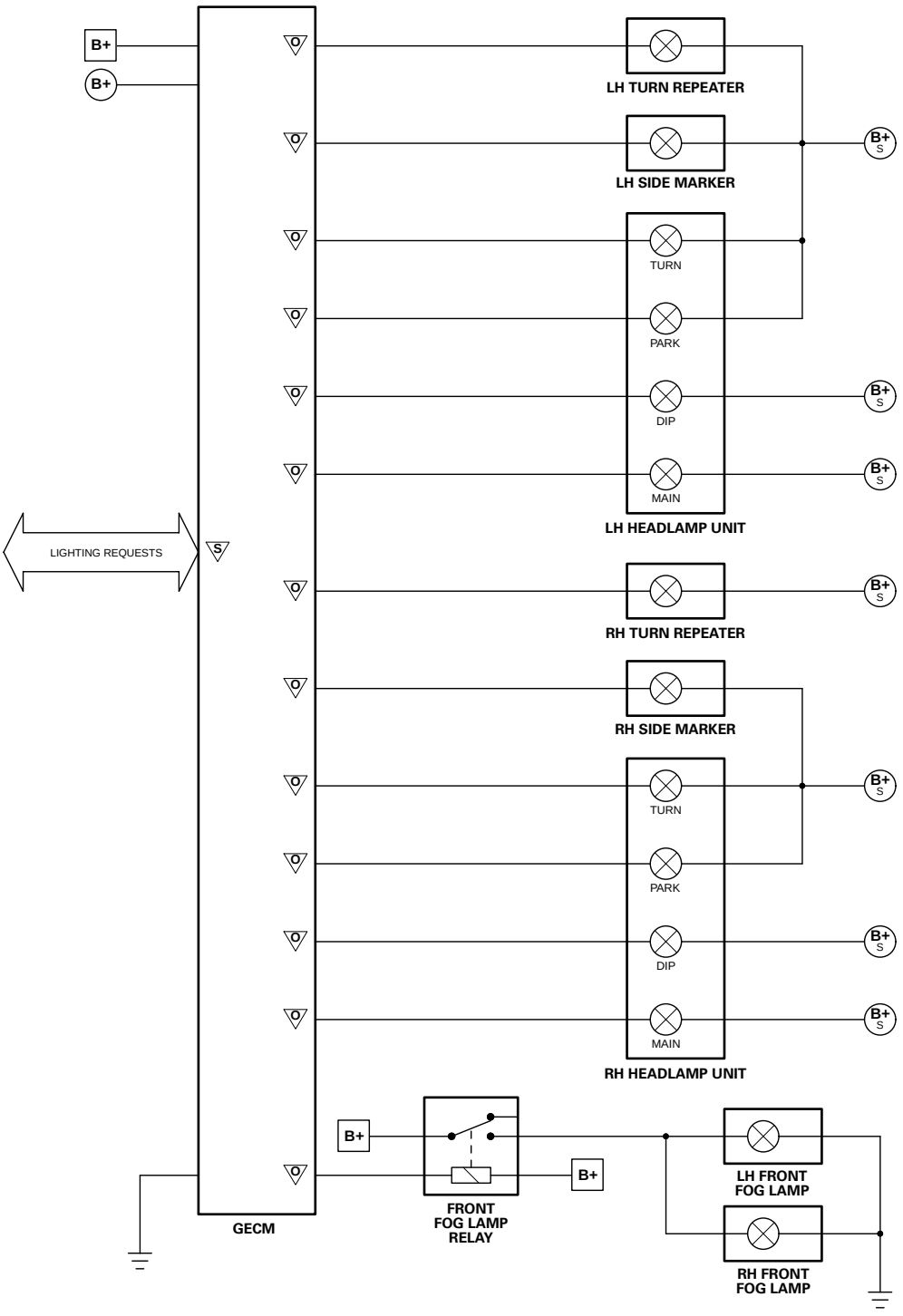
Exterior Lighting: Front

Exterior lighting inputs are decoded by the instrument pack and broadcast as SCP messages to the GECM and the RECM. The GECM activates all front exterior lighting circuits. When the messages are received by the GECM, it activates the specified lighting circuit(s).

All circuits, except the fog lamp circuit, are activated by the GECM via direct ground side switching. The front fog lamps are activated via the front fog lamp relay. The GECM completes the relay coil circuit to ground to activate the relay, which switches the supply side of the front fog lamp circuit.



S-TYPE EXTERIOR LIGHTING: FRONT

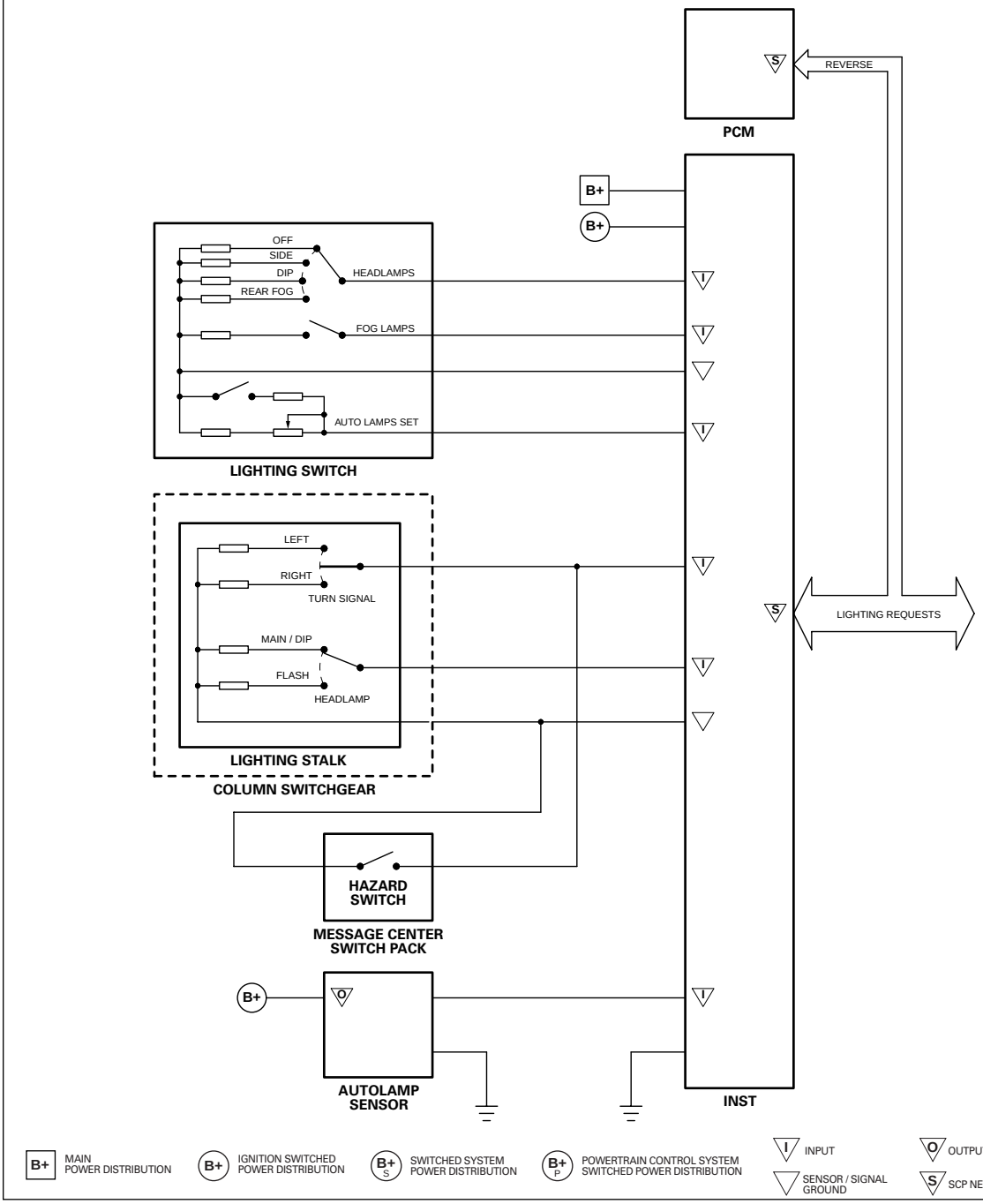


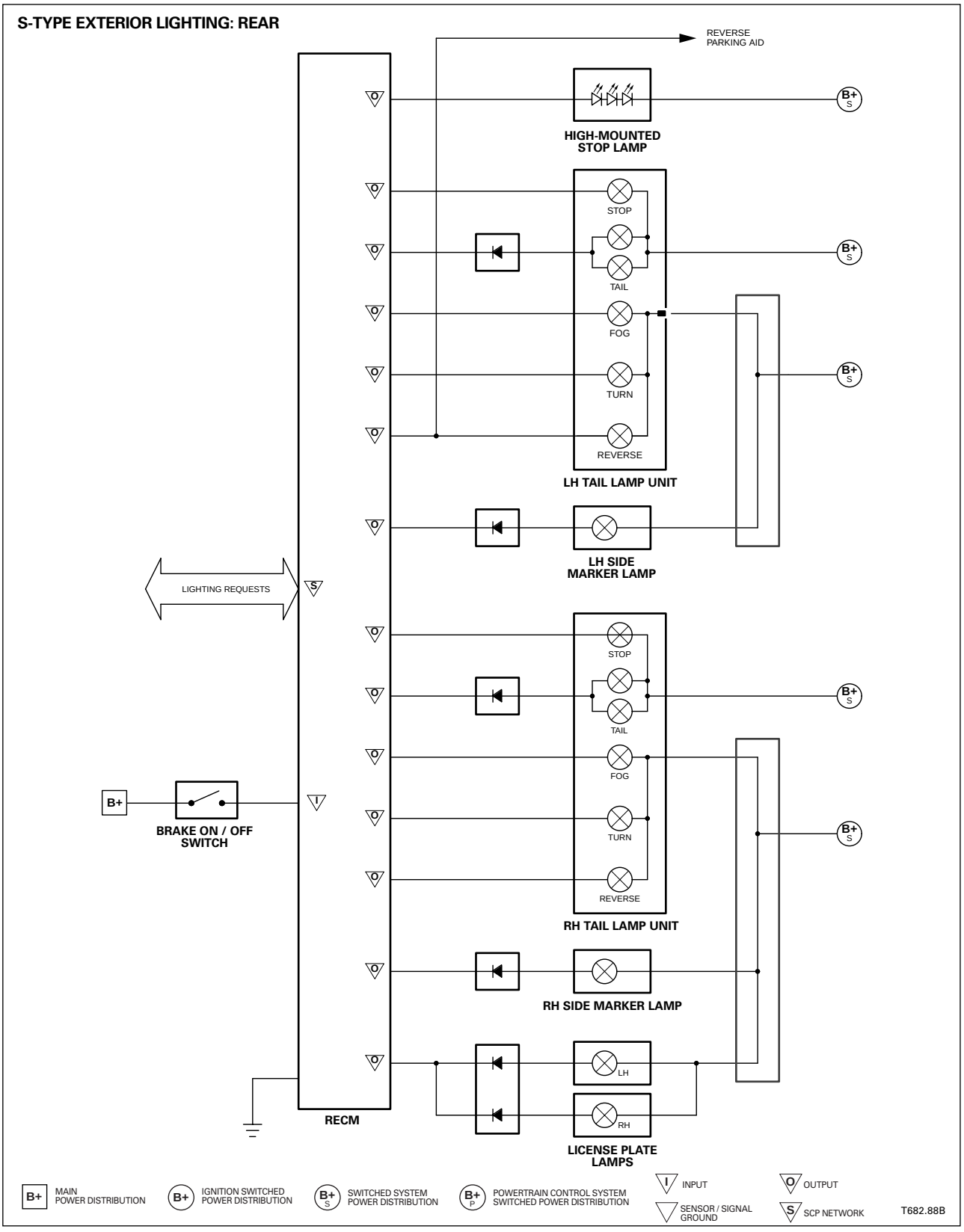
S-TYPE BODY SYSTEMS

Exterior Lighting: Rear

Exterior lighting inputs are decoded by the instrument pack and broadcast as SCP messages to the GECM and the RECM. The RECM activates all rear exterior lighting circuits. When the messages are received by the RECM, it activates the specified lighting circuit(s) (except the stop lamp circuits). All circuits are activated by the RECM via direct ground side switching.

S-TYPE EXTERIOR LIGHTING CONTROL INPUTS: REAR




S-TYPE EXTERIOR LIGHTING: REAR
REVERSE PARKING AID
HIGH-MOUNTED STOP LAMP
STOP
TAIL
FOG
TURN
REVERSE
LH TAIL LAMP UNIT
LH SIDE MARKER LAMP
LIGHTING REQUESTS
BRAKE ON / OFF SWITCH
RH TAIL LAMP UNIT
RH SIDE MARKER LAMP
LH
RH
LICENSE PLATE LAMPS
RECM
B+ MAIN POWER DISTRIBUTION
IGNITION SWITCHED POWER DISTRIBUTION
SWITCHED SYSTEM POWER DISTRIBUTION
POWERTRAIN CONTROL SYSTEM SWITCHED POWER DISTRIBUTION
INPUT
OUTPUT
SENSOR / SIGNAL GROUND
SCP NETWORK
T682.88B

S-TYPE BODY SYSTEMS

Windshield, Backlight, and Door Mirror Heaters

NOTE: Glass heaters operate only while the engine is running. System (battery) voltage must be above a predetermined level for heater operation.

Heated Windshield; Heated Windshield Wiper Park

Vehicles are fitted with either heated windshield wiper park or heated windshields. Heated windshields have two (LH and RH) heating elements with two control and activation circuits. Heated wiper park windshields have one heating element in the wiper park area. The heated wiper control and activation circuit is the same circuit used for the RH windshield heater. The circuits incorporate relays located in the front power distribution box.

Heated windshield control
The A/CCM activates the windshield heaters for a four-minute time period when either heated windshield or defrost is selected on the control panel. If low battery voltage is sensed by the A/CCM, the windshield heaters will be disabled.

Heated wiper park control
The A/CCM activates heated wiper park either automatically or manually.

- If the ambient temperature is below 4 ˚C (40 ˚F) at engine start, the A/CCM will automatically activate heated wiper park.
- If while engine operating, the ambient temperature falls below 1 ˚C (34 ˚F), the A/CCM will automatically activate heated wiper park, provided it did not activate previously during the ignition cycle.
- As long as the ambient temperature remains at or below 5 ˚C (41 ˚F), heated wiper park operates; however, the voltage threshold for disengagement moves up after the first ten minute period.
- If while heater operating, the ambient temperature rises above 5 ˚C (41 ˚F), the A/CCM will automatically disengage heated wiper park.
- If heated wiper park is disengaged manually, automatic engagement is disabled until the next ignition cycle.
- If heated wiper park is manually engaged or disengaged, then the ignition switched OFF, the selection will be stored in memory for ten minutes in case of restart.

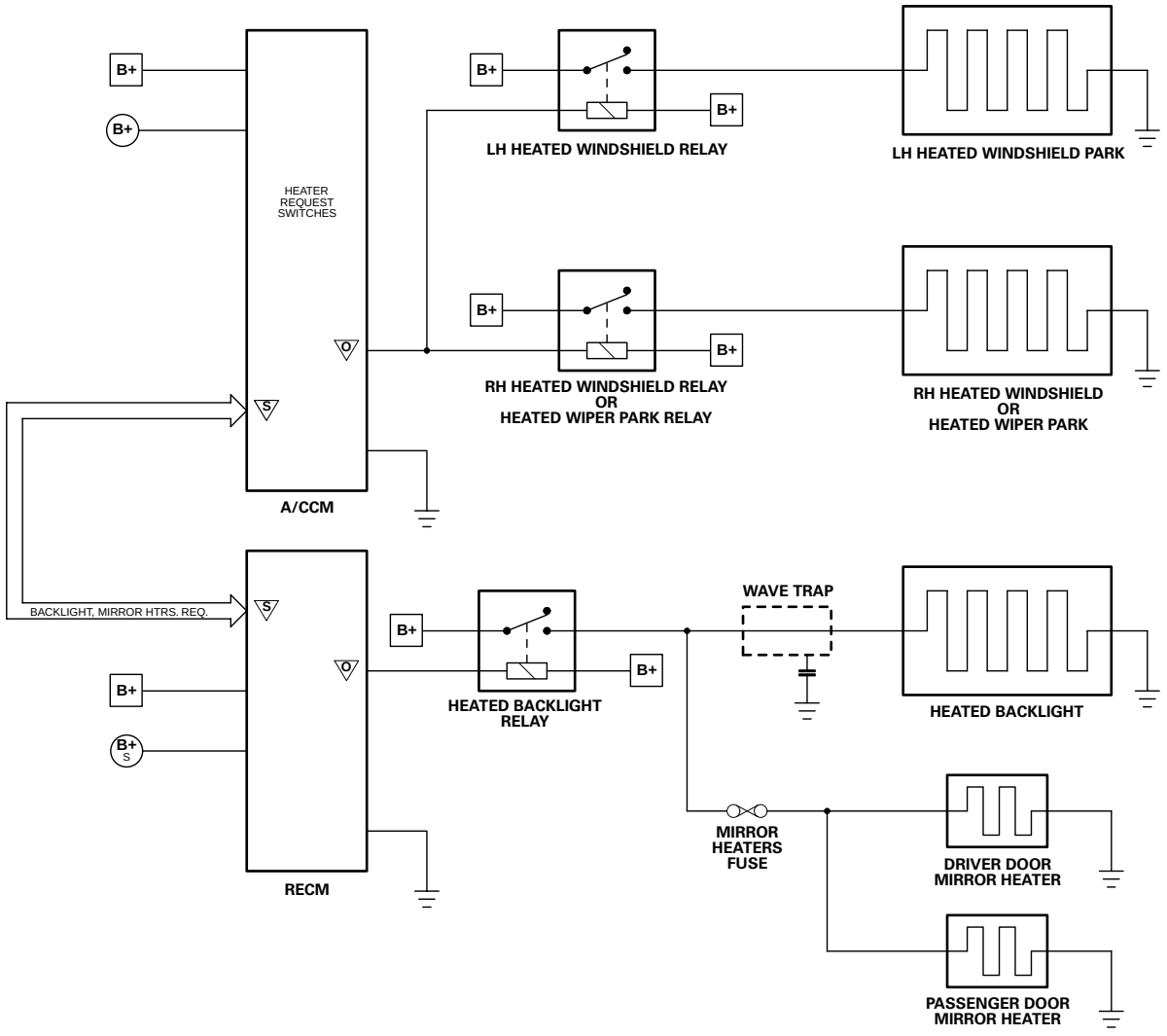
Heated Backlight and Rear View Mirrors

The heated backlight and mirror heaters operate simultaneously and are directly controlled by the rear electronic control module (RECM) upon receipt of an SCP heaters ON request from the A/CCM. The heater circuit incorporates a relay located in the rear power distribution box.

Heated backlight and rear view mirrors control
The A/CCM activates the heaters either automatically or manually using the same inputs and control as the heated wiper park.

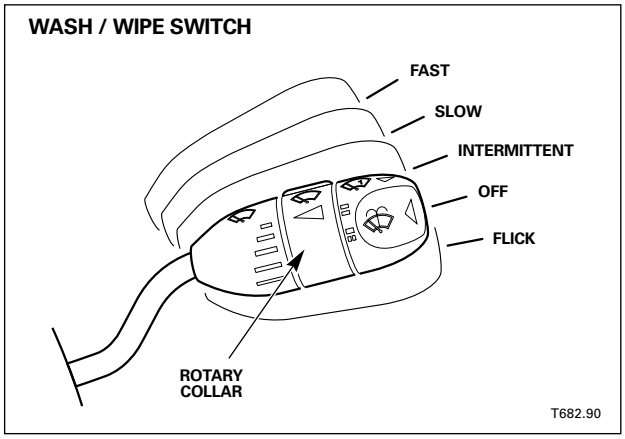
NOTES

S-TYPE WINDSHIELD, BACKLIGHT AND DOOR MIRROR HEATERS



S-TYPE BODY SYSTEMS

Wash / Wipe System



The wash / wipe system is entirely hardwire controlled and activated. All of the driver controlled inputs are to the GECM from the column stalk switch. The GECM directly activates the wash / wipe components.

Wash / wipe switch inputs

The switch input signals are provided on two circuits and referenced to a common reference circuit. All switch position signals (except WASH) are resistance signals made up from the combination of modes and delay settings. The WASH circuit is normally open – completed when WASH is selected.

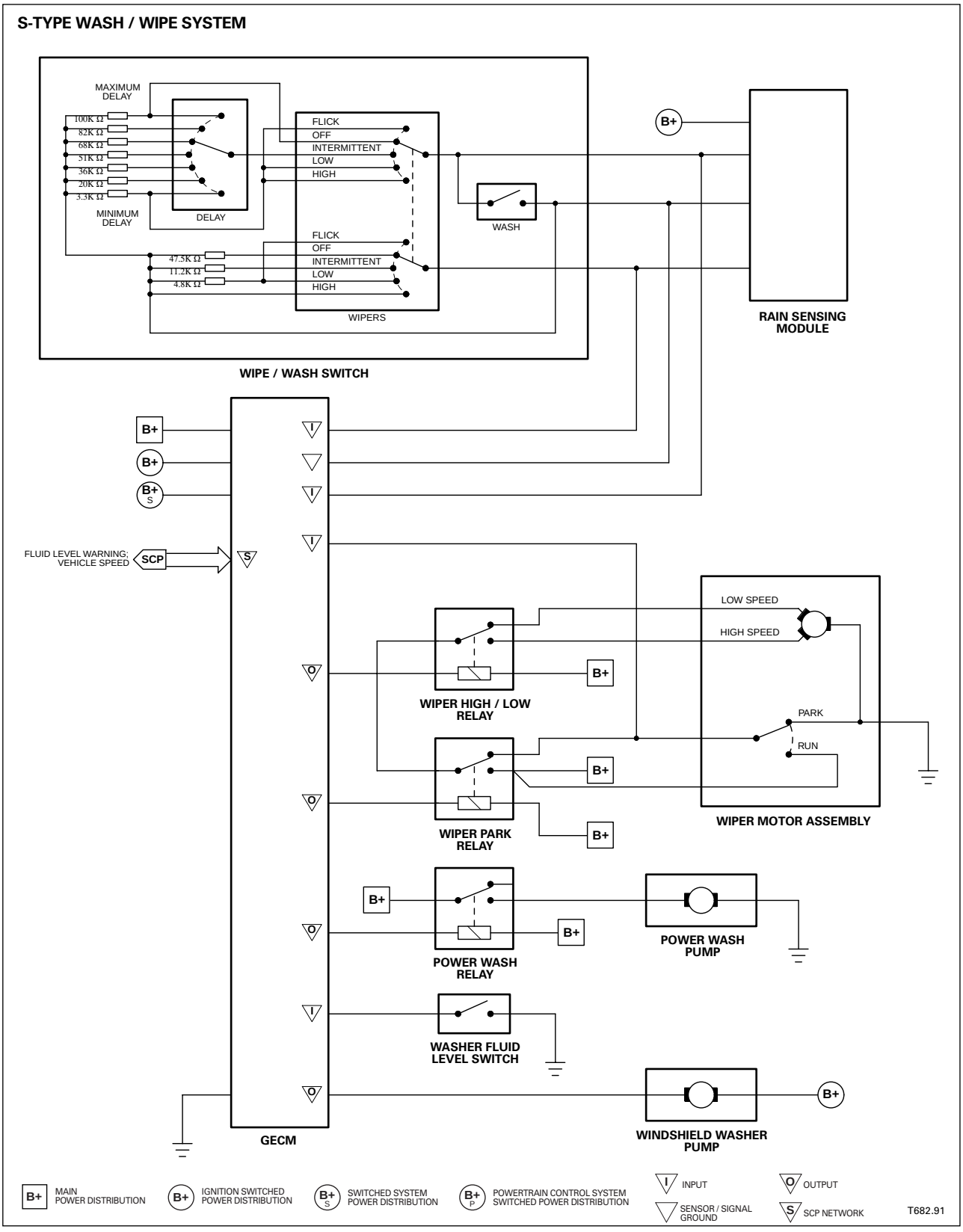
Intermittent Wipe

Intermittent wipe will normally vary the wiper time delay from approximately 3 to 18 seconds. As the vehicle speed increases, the wipers will operate faster.

Rain Sensing (Optional)

The rain sensing module, located in front of the interior rear view mirror, has a 3-wire circuit in parallel with the column stalk switch circuit. If AUTO and INTERMITTENT are selected on the column stalk switch, the module will activate the windshield wipers when rain falls on the windshield.

NOTES


S-TYPE WASH / WIPE SYSTEM
MAXIMUM DELAY
100K Ω
82K Ω
68K Ω
51K Ω
36K Ω
20K Ω
3.3K Ω
MINIMUM DELAY
DELAY
FLICK
OFF
INTERMITTENT
LOW
HIGH
WASH
47.5K Ω
11.2K Ω
4.8K Ω
WIPERS
B+
RAIN SENSING MODULE
WIPE / WASH SWITCH
B+
B+
B+ S
FLUID LEVEL WARNING; VEHICLE SPEED
SCP
S
I
O
LOW SPEED
HIGH SPEED
PARK
RUN
WIPER HIGH / LOW RELAY
WIPER PARK RELAY
WIPER MOTOR ASSEMBLY
POWER WASH RELAY
POWER WASH PUMP
WASHER FLUID LEVEL SWITCH
WINDSHIELD WASHER PUMP
GECM
MAIN POWER DISTRIBUTION
IGNITION SWITCHED POWER DISTRIBUTION
SWITCHED SYSTEM POWER DISTRIBUTION
POWERTRAIN CONTROL SYSTEM SWITCHED POWER DISTRIBUTION
INPUT
OUTPUT
SENSOR / SIGNAL GROUND
SCP NETWORK
T682.91

S-TYPE BODY SYSTEMS

Memory System

The memory system is split into two areas of operation. These are:

- Memory management
- Memory retention

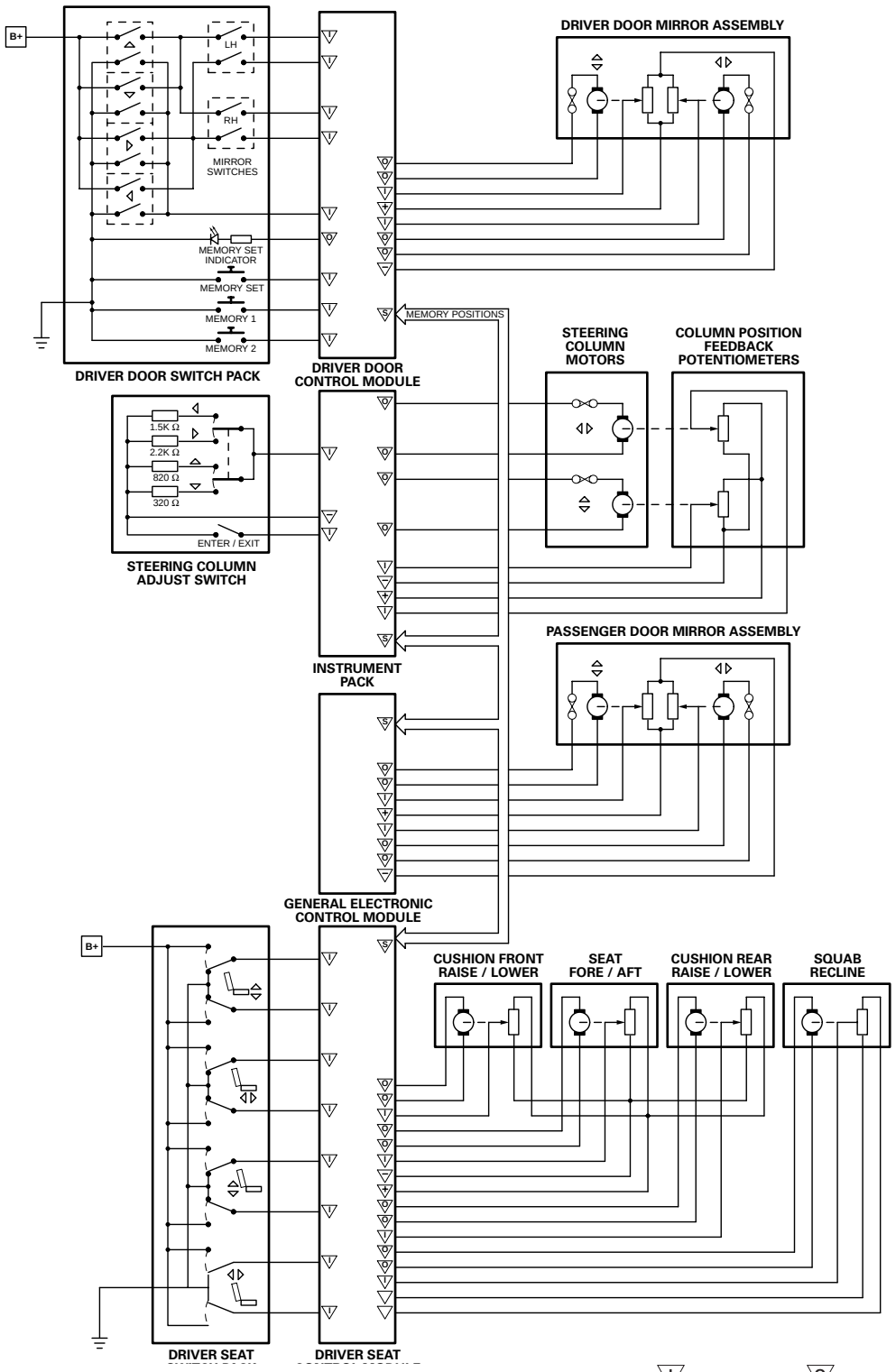
Memory management is handled by the drivers door control module (DDCM). Memory retention is the responsibility of any module hardwired to potentiometers. The DDCM will correlate all memory modules to remember their individual motor positions when the memory set button is depressed.

These memories will then be assigned as position 1 or position 2 depending on driver selection. When the recall button is later pressed, the DDCM will broadcast a generic command to the specific modules to position their individual motors to their remembered positions.

For example, if the GECM module is replaced with a GECM from another vehicle, the passenger's door mirror will default to the previously programmed position from the donor vehicle. Therefore it is advisable not to swap modules from one vehicle to the other.

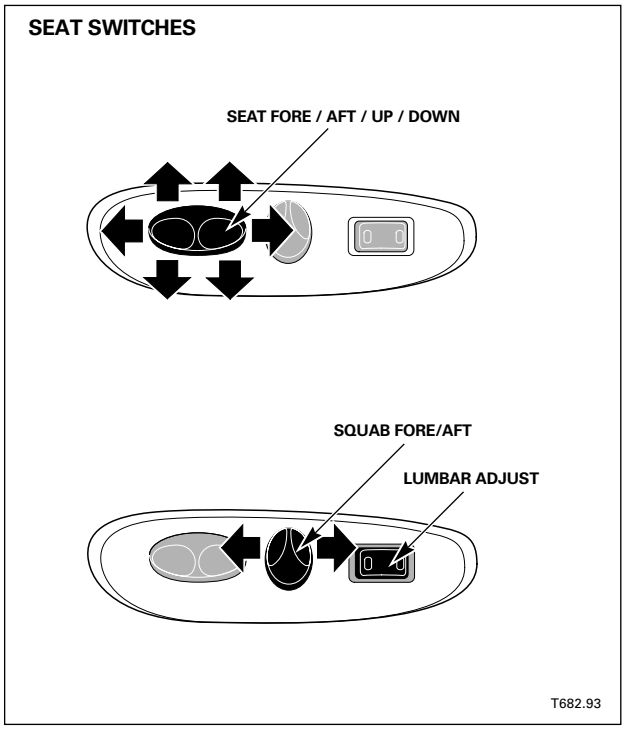
NOTES

S-TYPE MEMORY SYSTEM



S-TYPE BODY SYSTEMS

Seat Movement and Heaters



Seat positions are adjusted from the individual seat switch packs. Non memory seats are controlled directly from the B+ ground drive signals provided from the seat switch packs. The driver memory seat is controlled via the driver seat control module (DSCM). The switch packs and outputs are identical for both the driver and passenger non memory seats and the driver memory seat. The seat position motors are identical for both non memory and memory, except that memory motors have position feedback potentiometer circuits.

Seat heaters are powered and controlled via separate circuits incorporating: a seat heater switch with "state" illumination, seat heater control module, and seat heater elements.

Two-position memory
The positions of the steering column, driver seat, and the door rear view mirrors can be set in memory. Memory positions 1 and 2 are set using the switches on the driver door switch pack. This switch inputs to the DDCM, which broadcasts SCP – *MEMORY FEATURES MESSAGES*.

Memory recall using the key transmitter
The key transmitter will recall a memory position when the Unlock button is pressed, if it has been programmed as follows:

1. Adjust the seat, column and mirrors to the desired positions. Set the memory (1 or 2).
2. Within 5 seconds, press any button on the key transmitter.
3. Press door switch pack memory button 1 or 2.
4. Repeat the process for the remaining memory button.

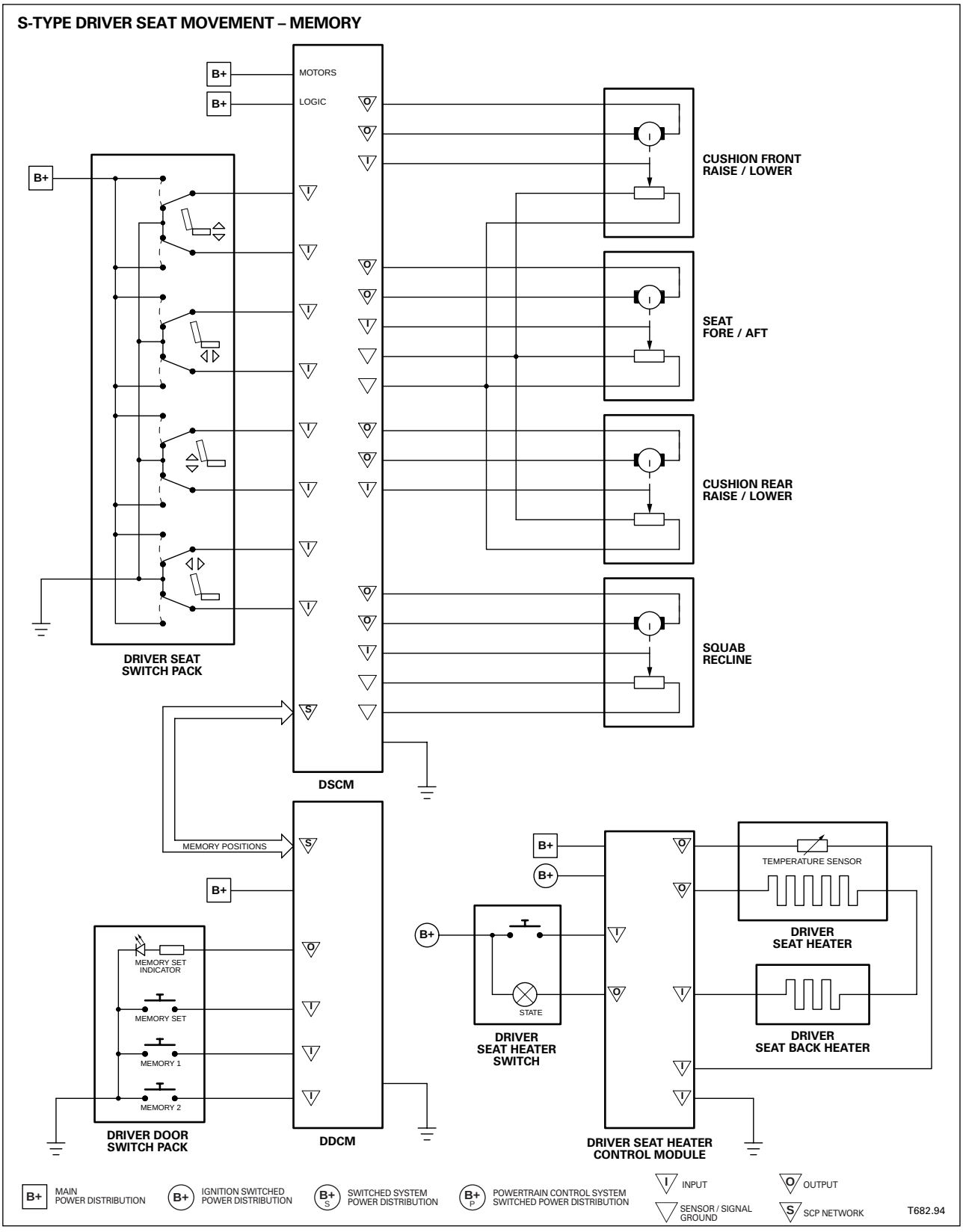
To cancel:

1. Press the memory button (1 or 2)
2. While the "memory set" indicator is ON, press any button (except the panic button) on the key transmitter.
3. Press the memory button again.

Inputs (memory seat)
The seat switch pack switches input to the DSCM. The signals are either B+ or ground, depending on the request being made. The DSCM decodes the inputs drives the seat motors to achieve the desired positions.

DSCM Outputs
Seat movement motors are driven by the DSCM by applying B+ ground to the pairs of seat motor circuits.

The motor position feedback potentiometer inputs allow the DSCM to know the seat adjustment positions by measuring the voltage ratios.

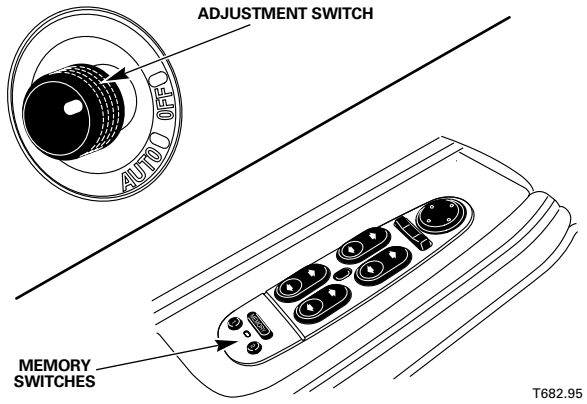

S-TYPE DRIVER SEAT MOVEMENT – MEMORY
B+
MOTORS
LOGIC
CUSHION FRONT RAISE / LOWER
SEAT FORE / AFT
CUSHION REAR RAISE / LOWER
SQUAB RECLINE
DRIVER SEAT SWITCH PACK
DSCM
MEMORY POSITIONS
MEMORY SET INDICATOR
MEMORY SET
MEMORY 1
MEMORY 2
DRIVER DOOR SWITCH PACK
DDCM
TEMPERATURE SENSOR
DRIVER SEAT HEATER
STATE
DRIVER SEAT HEATER SWITCH
DRIVER SEAT BACK HEATER
DRIVER SEAT HEATER CONTROL MODULE
MAIN POWER DISTRIBUTION
IGNITION SWITCHED POWER DISTRIBUTION
SWITCHED SYSTEM POWER DISTRIBUTION
POWERTRAIN CONTROL SYSTEM SWITCHED POWER DISTRIBUTION
INPUT
OUTPUT
SENSOR / SIGNAL GROUND
SCP NETWORK
T682.94

S-TYPE BODY SYSTEMS

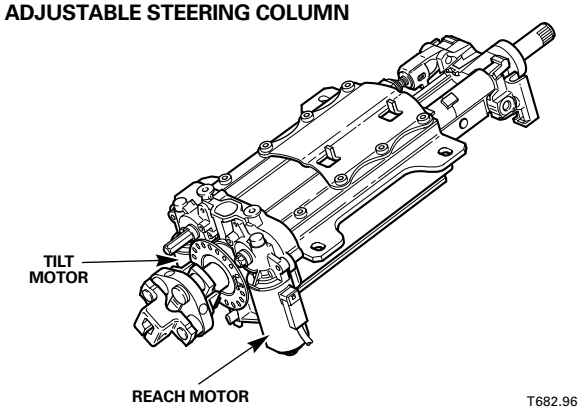
Steering Column Adjustment

The powered upper steering column assembly provides adjustment for 16˚ of steering wheel tilt and 50mm (2 in.) of reach (telescoping movement). Memory vehicle features automatic wheel tilt on driver entry / exit. A combined joystick and ON / OFF switch located on the side of the column, controls the tilt and reach movements.

STEERING COLUMN ADJUSTMENT / MEMORY SWITCHES



ADJUSTABLE STEERING COLUMN



Two-Position Memory

The positions of the steering column, driver seat, and the door rear view mirrors can be set in memory. Memory positions 1 and 2 are set using the switches on the driver door switch pack. This switch inputs to the driver door control module, which broadcasts SCP – *MEMORY FEATURES MESSAGES*.

- The tilt and reach motors have integral gearboxes which directly drive screw actuators via flexible shafts.
- The tilt and reach position feedback potentiometers are combined in a single component with linear sliders, which are directly driven by the moving actuators.
- The retractor box, mounted on the underside of the lower extrusion, houses the column wiring harness and connectors with sufficient cable to allow for column telescopic movement.

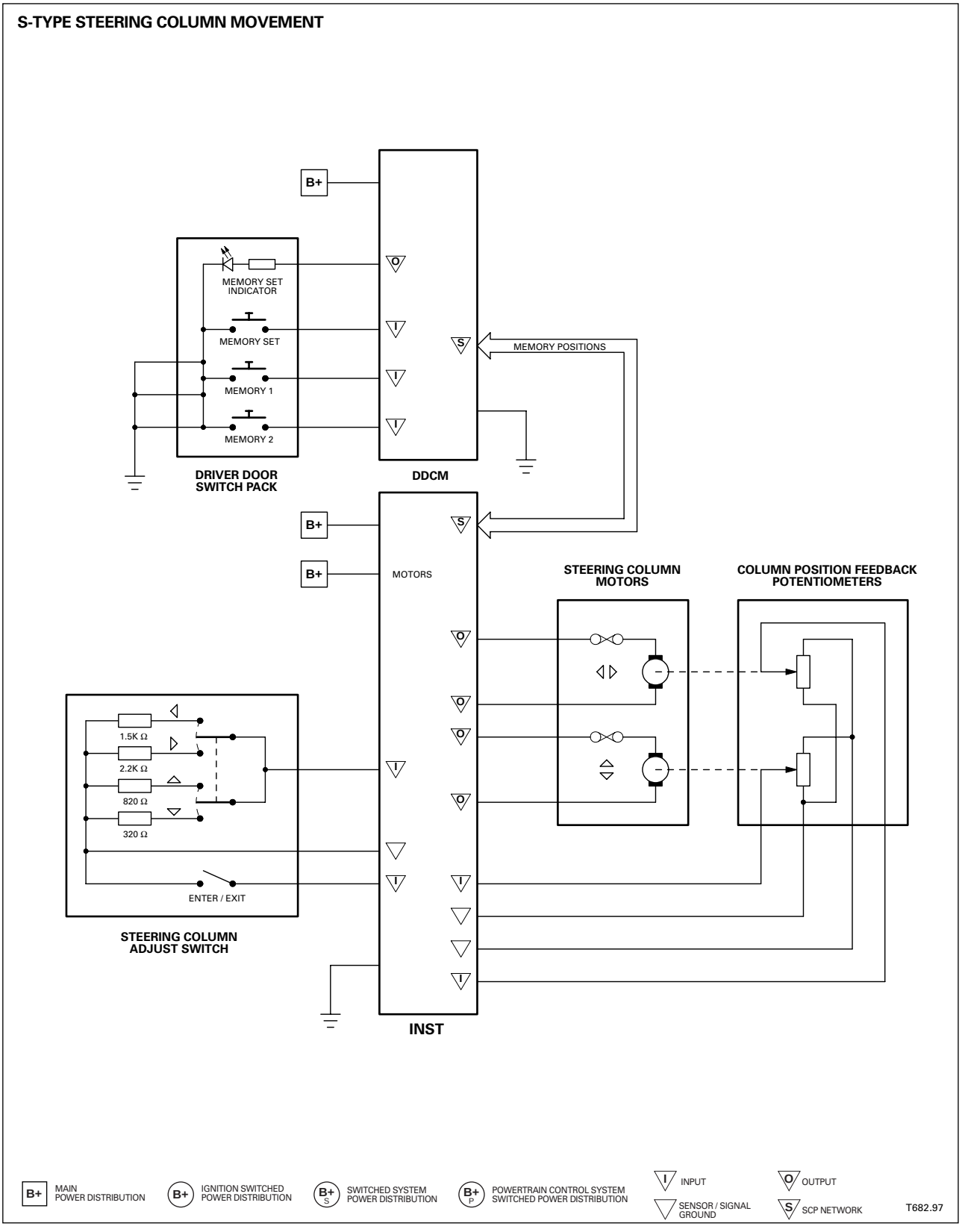
Entry / exit mode (memory vehicles)
Entry / exit mode is selected by setting the steering column adjustment switch to the AUTO position. When the key is removed from the ignition switch, the steering column will move to the tilt away position, which is its uppermost tilt and innermost reach position. The seat will move rearwards. When the ignition key is next inserted in the ignition switch, the steering column and seat will move to their programmed memory position.

Column Adjustment System Operation and Diagnostics

The instrument pack has a dedicated B+ power supply for column motors. The instrument pack decodes the inputs from the steering column adjust switch and the column position feedback potentiometers, and outputs direct to the column motors. The instrument pack also protects for current over-load and motion faults detected during column operation.

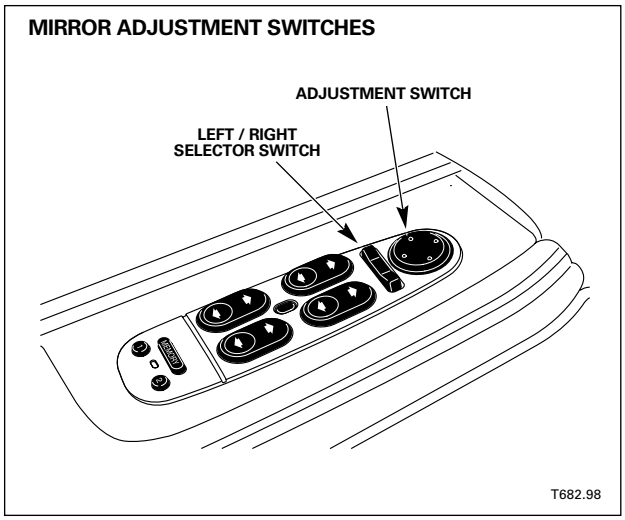
NOTES

S-TYPE STEERING COLUMN MOVEMENT



S-TYPE BODY SYSTEMS

Door Mirror Movement



Both door mirrors are adjusted from the driver door switchpack. The four-way adjustment button moves the mirrors to the required position. The selector switch selects the mirror to be moved, left for the left side mirror and right for the right side mirror. When the selector is in the center position, adjustment to either mirror is inhibited. All inputs are provided to the driver door control module (DDCM); however, the driver door mirror is driven by the DDCM where as the passenger door is driven by the GECM.

Two-position memory

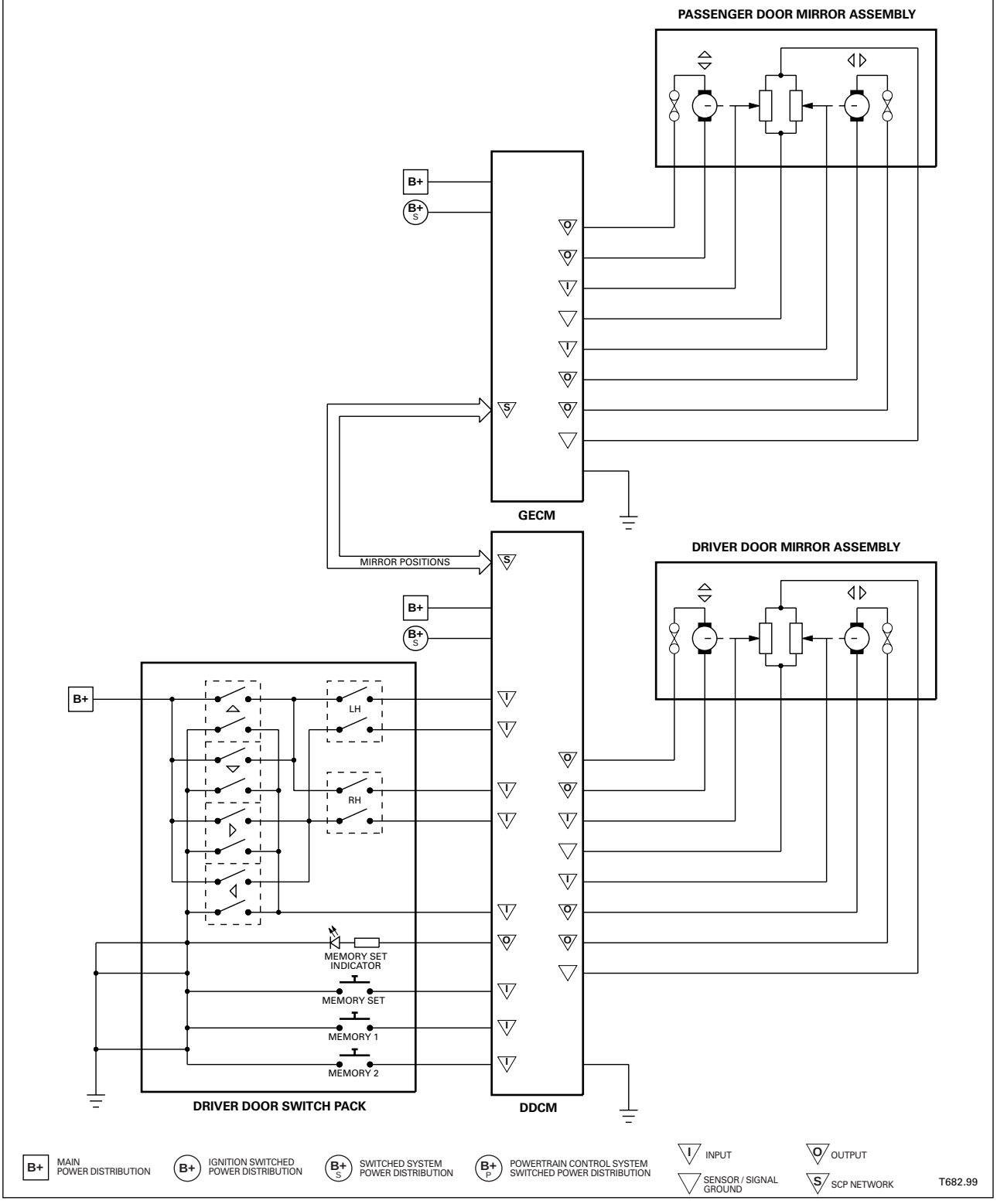
The positions of the steering column, driver seat, and the door rear view mirrors can be set in memory. Memory positions 1 and 2 are set using the switches on the driver door switch pack.

Inputs

The driver door switch pack mirror and memory switches input to the DDCM. The signals are either B+ or ground, depending on the request being made.

NOTES

S-TYPE DOOR MIRROR MOVEMENT



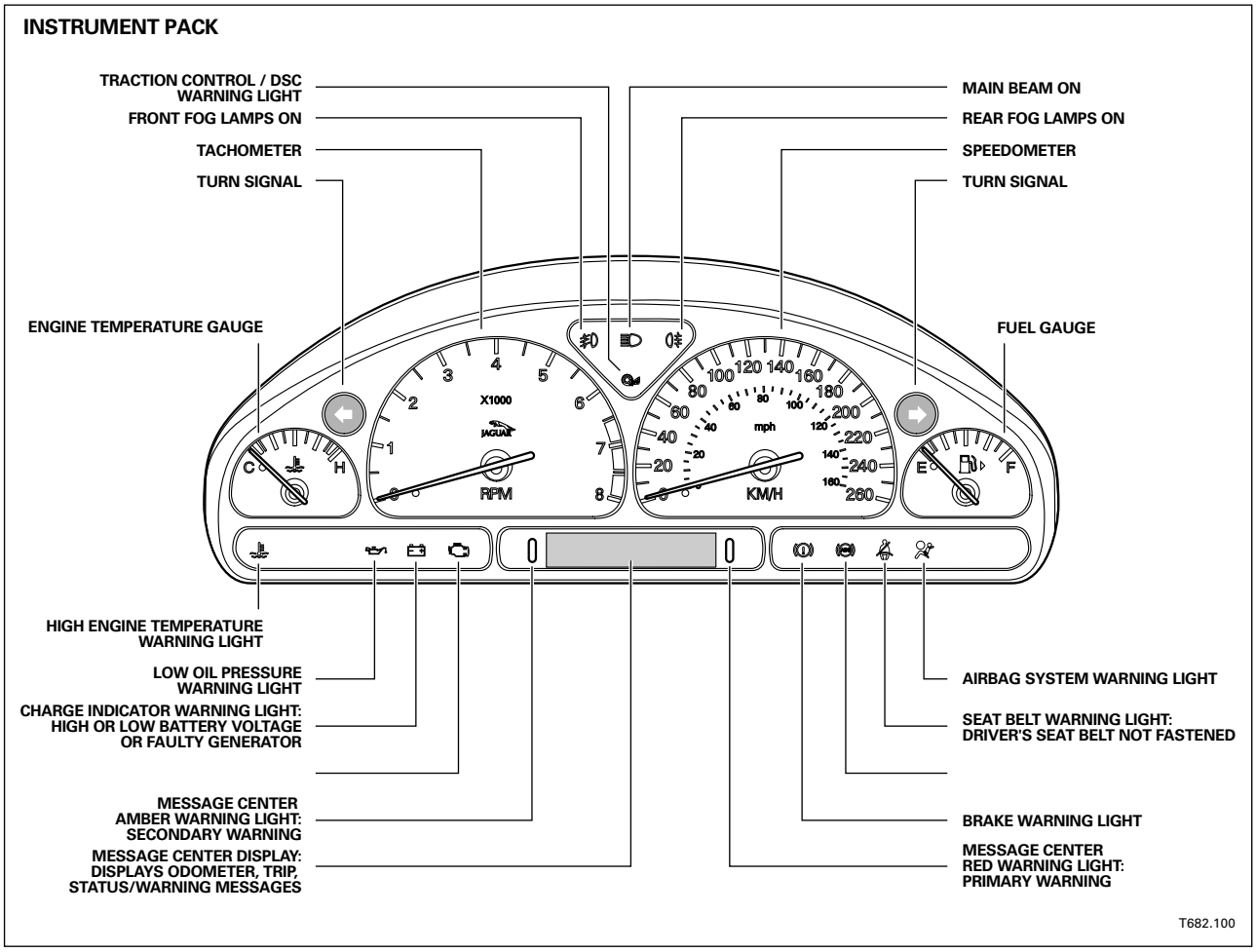
S-TYPE BODY SYSTEMS

Instrument Pack

All vehicle instrumentation is contained in the instrument pack on the fascia. The calibration of the odometer and speedometer, the language of the message center and the composition of the indicator lamps (Tell-tales) are tailored to suit individual Jaguar markets. The instrument pack provides multiple functions:

- Vehicle instrumentation and Tell-tale display
- Vehicle Message Center
- Vehicle monitor for audible and visual warnings
- Passive Anti-Theft System
- Vehicle lighting interface
- Steering column movement interface and drive

INSTRUMENT PACK



NOTES

Instrument Pack Warning Lamps: Operation and Diagnostics

Sixteen warning lamps are provided for warning and tell-tale purposes. These are arranged in strips of 5 either side of the Message Center display, a group of 4 in between the major gauges and 1 above each minor gauge.

- The “RED” lamps are for primary warnings.
- The “AMBER” lamps are for secondary warnings.
- The “GREEN” lamps are for system status.

Additionally there are two warning lights located directly to the right and left of the message center display. These two warning lights, one RED and one AMBER indicate the status (PRIMARY or SECONDARY) of the warnings provided by the message center display.

A lamp check cycle is initiated when the ignition is switched ON and lasts for 3 seconds. If any lamp remains lit after this period, investigate the cause before operating the vehicle.

NOTE: Not all warning lamps / tell-tales are included in the lamp check cycle.

Message Center: Messages and Origin

If a new fault occurs requiring a message to be displayed when in trip computer / odometer mode, it will be displayed immediately and will remain on the display until masked by the CLEAR button.

If a trip computer function is selected while fault messages are being displayed the trip computer function selected will be displayed for a period of 10 seconds or the CLEAR button is pressed, which will re-instate the text message(s) on the display.

The CLEAR button Input signal is provided to the Message Center. This signal is referenced (sensor supply): Circuit normally open; 1.1 kΩ across the inputs when the CLEAR button is pressed.

Messages will only be displayed when the ignition is switched ON.

Message Center Language Selection

If the ML / KM button is held down when the ignition is switched to II (RUN) the message center display will enter the language selection menu. The current language selected will be displayed.

By repeatedly pressing the ML / KM button, the display will cycle through all languages available. To select a language press the A / B button. A confirmation tone will be generated to confirm selection.

The language menu will be terminated after 10 seconds or by pressing the CLEAR button.

Available languages:

- English
- Brazilian Portuguese
- Dutch
- Finnish
- French
- German
- Italian
- Spanish
- Swedish
- US English
- Japanese

S-TYPE BODY SYSTEMS

Instrument Pack (continued)

Audible Warnings and Origin

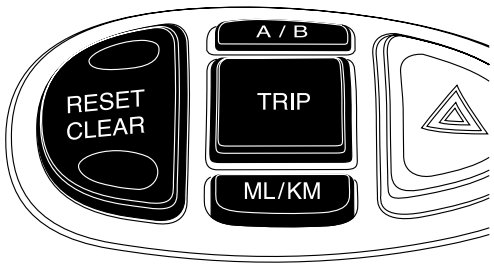
The instrument pack contains the chime for audible warnings. No DTCs apply to audible warnings.

MESSAGE	ORIGIN
Headlamps on reminder	When sidelights are ON and drivers door is open
Key-in reminder	When key is in ignition and drivers door is open
Seat belt reminder	When seat belt is unlatched with ignition ON
Airbag (redundant warning if the Tell-tale has failed)	Hardwired signal from RCM (if Airbag warning Tell-tale has failed)
Failsafe cooling (V6 Only)	SCP message from PCM
Memory set switch depression (confirmation of a memory set)	SCP message from DDCM
Turn signal tick – tock (muted when Voice is in "Listening" mode)	From hardwired input

Horn Function

The instrument pack receives the horn switch input signal and broadcasts an SCP message to the GECM, which activates the horn relay. No DTCs apply to the horn function. The horn is also activated by the GECM for security alarm purposes.

MESSAGE CENTER SWITCH PACK



T682.101

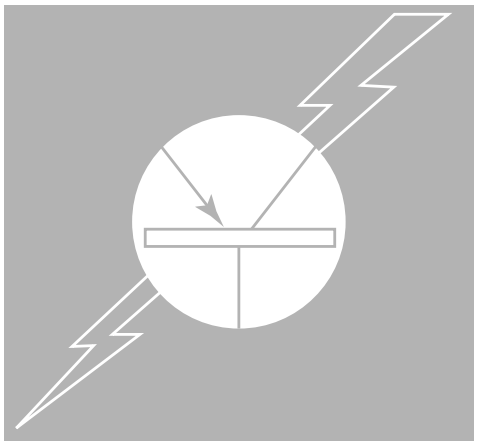
Trip Computer Functions and Diagnostics

The trip computer will only be displayed when the ignition is switched ON.

The cluster has two independent trip computers, referred to as A and B, each having the following functions selectable from the trip cycle switch (part of the message center switch pack), which is situated just to the side of the Instrument pack.

If the message center switchpack goes open circuit or short circuit on the trip cycle and A/B circuit input, or if one of these switches is stuck closed, DTC B1205 – Message center switch pack circuit fault, will be flagged.

ADVANCED JAGUAR ELECTRICAL SYSTEMS



JAGUAR

Service Training Course T682
DATE OF ISSUE: 02/15/2002

S-TYPE SECURITY SYSTEMS

Central Door Locking

The central door locking system incorporates the door latch assemblies and multiple SCP network modules and inputs.

Exterior inputs
The system can be locked / unlocked from the exterior by either the driver door key lock (barrel) switches or the remote transmitter. The DDCM incorporates the antenna and receiver for remote operation.

Interior inputs
The system can be centrally locked / unlocked from either the front driver or passenger door latches. Pressing / pulling the lock / unlock lever activates the lock status switches. The system will also lock / unlock automatically with the "drive away door locking" function.

All inputs from the door latches to the DDCM, the GECM, and the RECM are ground inputs.

Vehicle Locking and Unlocking

To lock the vehicle and set alarm:

- Press the lock button on the key-ring transmitter, or
- Put the key in the driver's door lock, turn the key towards the rear of the vehicle and release. The turn signals will flash once, the security indicator will start flashing and, after 20 seconds, the alarm will be set.

  If a door, the hood or the trunk lid are open and an attempt is made to lock the vehicle, the turn signals will flash 5 times as a warning that the vehicle is not secure.

To unlock the vehicle and disarm the alarm system using a key-ring transmitter:

- Press the unlock button on the key-ring transmitter.

  This action unlocks, after two presses, all doors and trunk and turns on the interior lights for 20 seconds. The turn signals give two flashes as unlocking takes place.

To unlock the vehicle using a key:

- Put the key in the driver's door lock, turn the key towards the front of the vehicle and release.

  NOTE: Unlocking with the key does not disarm the security system. After unlocking the vehicle with a key, if any door other than the driver's door is opened, the vehicle will immediately sound the alarm.

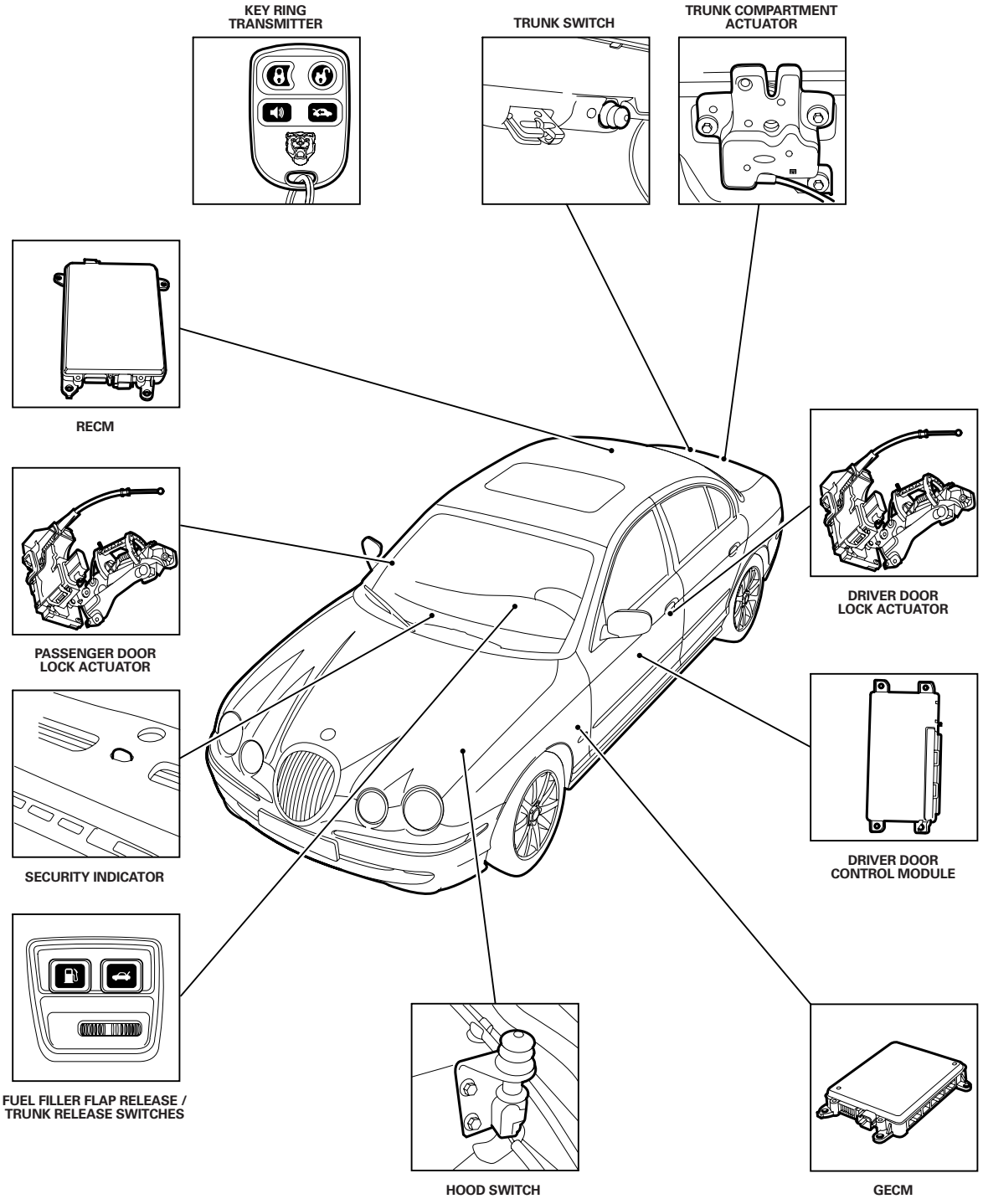
Global closing / opening

- Using the key in the driver's door, lock the vehicle and hold in this position to close all the windows (and sliding roof, if fitted).
- Press and hold the key-ring transmitter unlock button, or use the key to unlock the vehicle and hold in this position to open all the windows (and sliding roof, if fitted).

Internal door locking and unlocking
To centrally lock all doors, press the lever on the driver's or front passenger's door. To lock a rear door, press the lock lever. To unlock a front door, pull the release handle or the lever. To unlock a rear door, pull the lock lever. The driver's or front passenger's door lock lever will unlock all doors.

NOTES

S-TYPE CENTRAL DOOR LOCKING COMPONENTS



S-TYPE BODY SYSTEMS

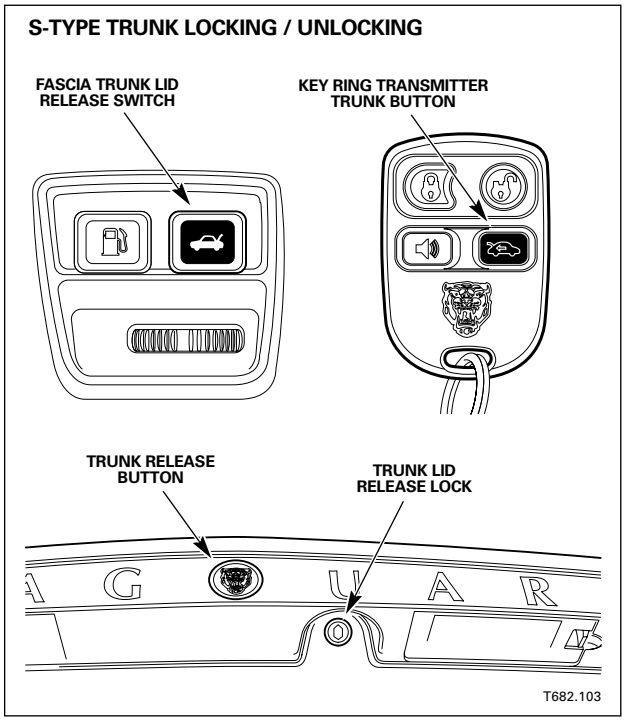
Central Door Locking (continued)

Vehicle Locking and Unlocking

Smart locking
If the driver's door is open and an attempt is made to lock the doors using the driver door interior locking lever, all doors will lock and the driver's door only, will then become unlocked. If the front passenger door locking lever is used to lock the doors then all doors will become locked and then unlocked. The vehicle can then be locked using the key in the driver's door lock or a key-ring transmitter.

Drive-away door locking
For this feature to operate, the ignition switch must be in position 'II', the gear selector lever moved out of the 'P' or 'N', and the vehicle moving forward at a speed above 3 mph (5 km/h).

The doors will remain locked, even when the vehicle is stopped unless the driver or front passenger unlocks a door. If a door is opened during a journey, the doors will automatically lock again when the vehicle starts to move. This feature can be disabled or reinstated using WDS.



Trunk locking / unlocking
To open the trunk:

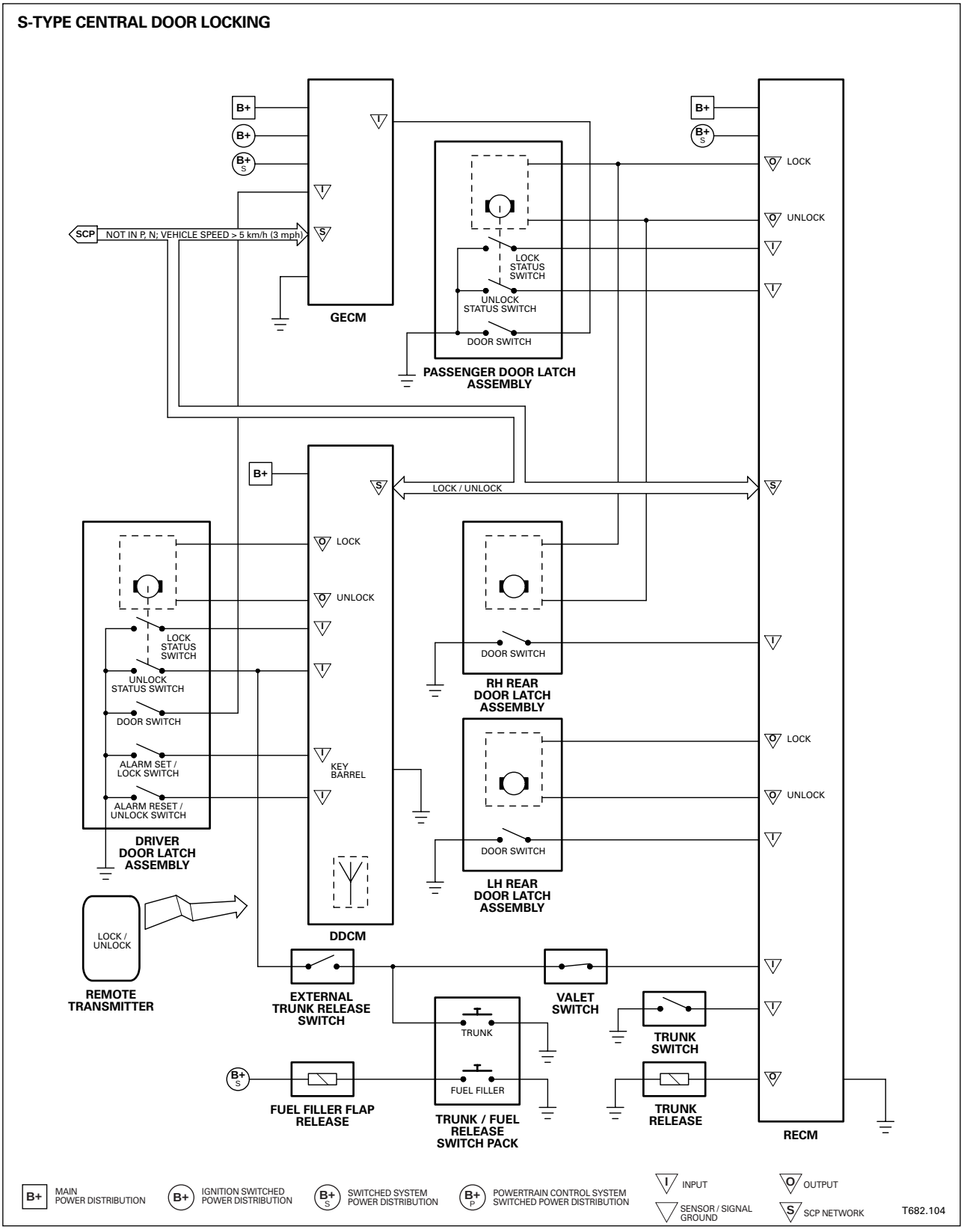
- Press the trunk lid release switch on the fascia switch pack or,
- Press the trunk button on the key-ring transmitter or,
- With the vehicle unlocked, press the release button on the compartment lid.

  NOTE: An ignition key can be used to open the trunk lid release lock, (turn clockwise to release), but opening with the key when the vehicle is armed will cause the alarm to sound.

Use a transmitter, or place the key in the ignition and turn to position 'II', to turn the alarm off if it sounds as a result of opening with a key. If the vehicle alarm system is armed and the trunk is opened using the key-ring transmitter the alarm will not sound. The system will be rearmed when the lid is closed, provided the vehicle has not been disarmed. Neither the trunk lid release switch on the fascia switch pack nor the lid release button will operate when the vehicle is armed.

NOTES

S-TYPE CENTRAL DOOR LOCKING



S-TYPE SECURITY SYSTEMS

Anti-Theft System

The anti-theft system is a vehicle perimeter security system separate from the passive anti-theft system (PATS). Refer to PATS information starting on page 4.5.10. In addition to premier security, the system features limited internal component security monitoring. As with the central locking system, the security system incorporates multiple SCP network modules and inputs.

Battery reconnection
If the battery is disconnected, the alarm system will automatically re-arm as the battery is reconnected. Ensure that a key-ring transmitter or key is available to disarm the alarm system when reconnecting the battery.

Audible Signals and Alarms

Error signal
The turn signals will flash 5 times whenever one of the following conditions is present:

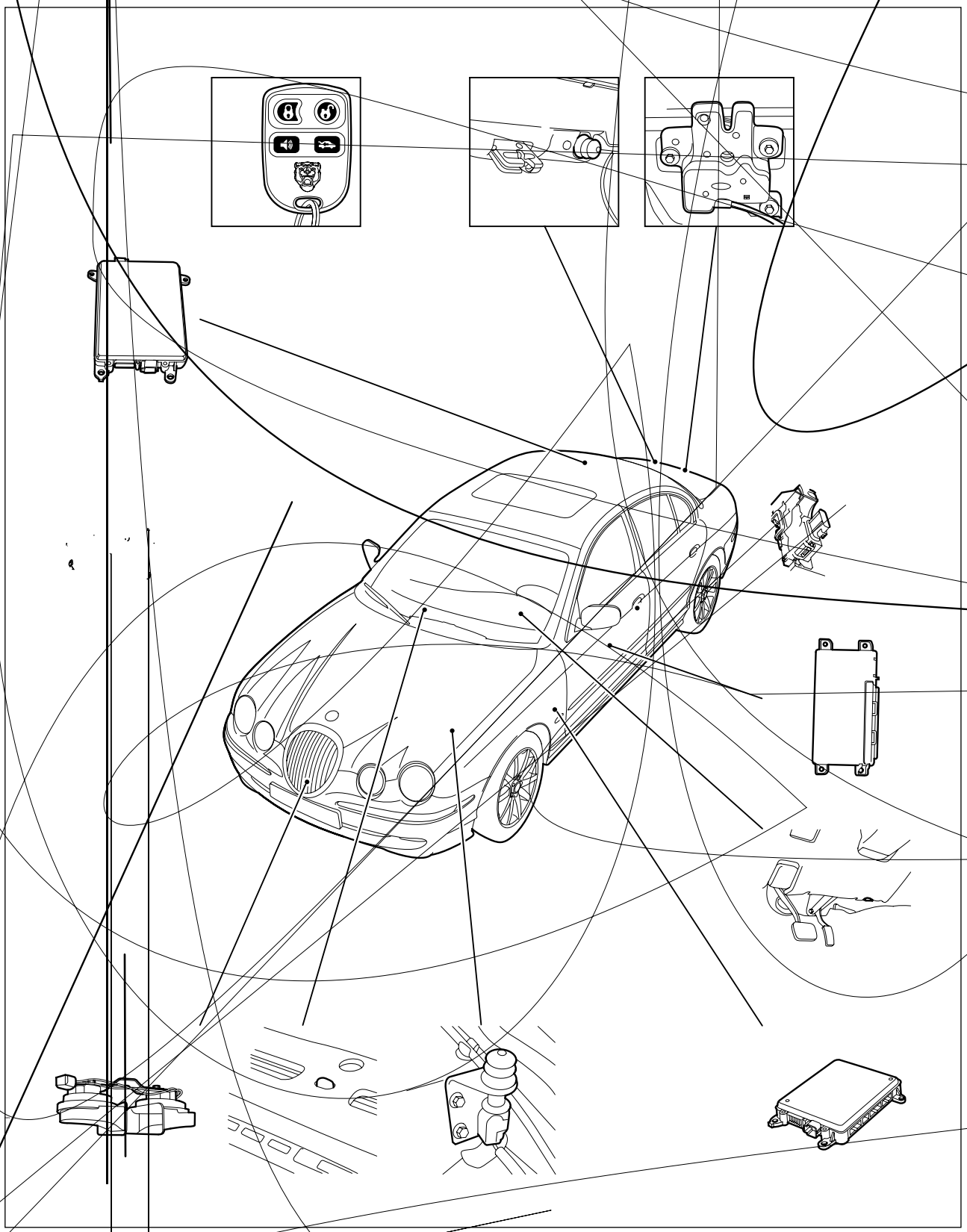
- If any door is open when an attempt to ‘arm’ the security system is made.
- The trunk or the hood is not properly closed when an attempt to ‘arm’ the security system is made.

Full alarm
Once armed, any of the following circumstances will create a full alarm state, sound the horns and flash the turn signals:

- Opening a door, trunk lid (except with transmitter) or hood.
- Using a key in the ignition switch which is not programmed to the vehicle.

Panic alarm
When in or near the vehicle, the alarm can be set off to deter a possible offender. For this feature to operate, the key must not be in the ignition switch. Pressing the panic button on the key-ring transmitter will activate the ‘Panic Alarm’. The Panic Alarm will sound for the normal full alarm period. Putting the key into the ignition switch and turning to position 'II' stops the alarm. The key-ring transmitter can be used to cancel the Panic Alarm by pressing either the panic button or the unlock button.

NOTES



S-TYPE SECURITY SYSTEMS

Anti-Theft System (continued)

The anti-theft system uses hardwired inputs to the DDCM, the GECM and the RECM for security monitoring. Communication between the control modules occurs on the SCP network.

DDCM Inputs
The DDCM receives the door latch ground inputs identical to the central locking system.

GECM Inputs
The GECM receives switched ground inputs from:

- the driver and passenger door latch door switches and
- the hood switch.

In addition, the GECM monitors two components for "presence in the vehicle" (ground sensing):

- the radio presence by a dedicated hardwire ground sensing circuit
- the RECM presence by a dedicated hardwire ground sensing circuit.

If either of these components are removed from the vehicle while the alarm system is armed, the system will be activated.

RECM Inputs
The RECM receives switched ground inputs from:

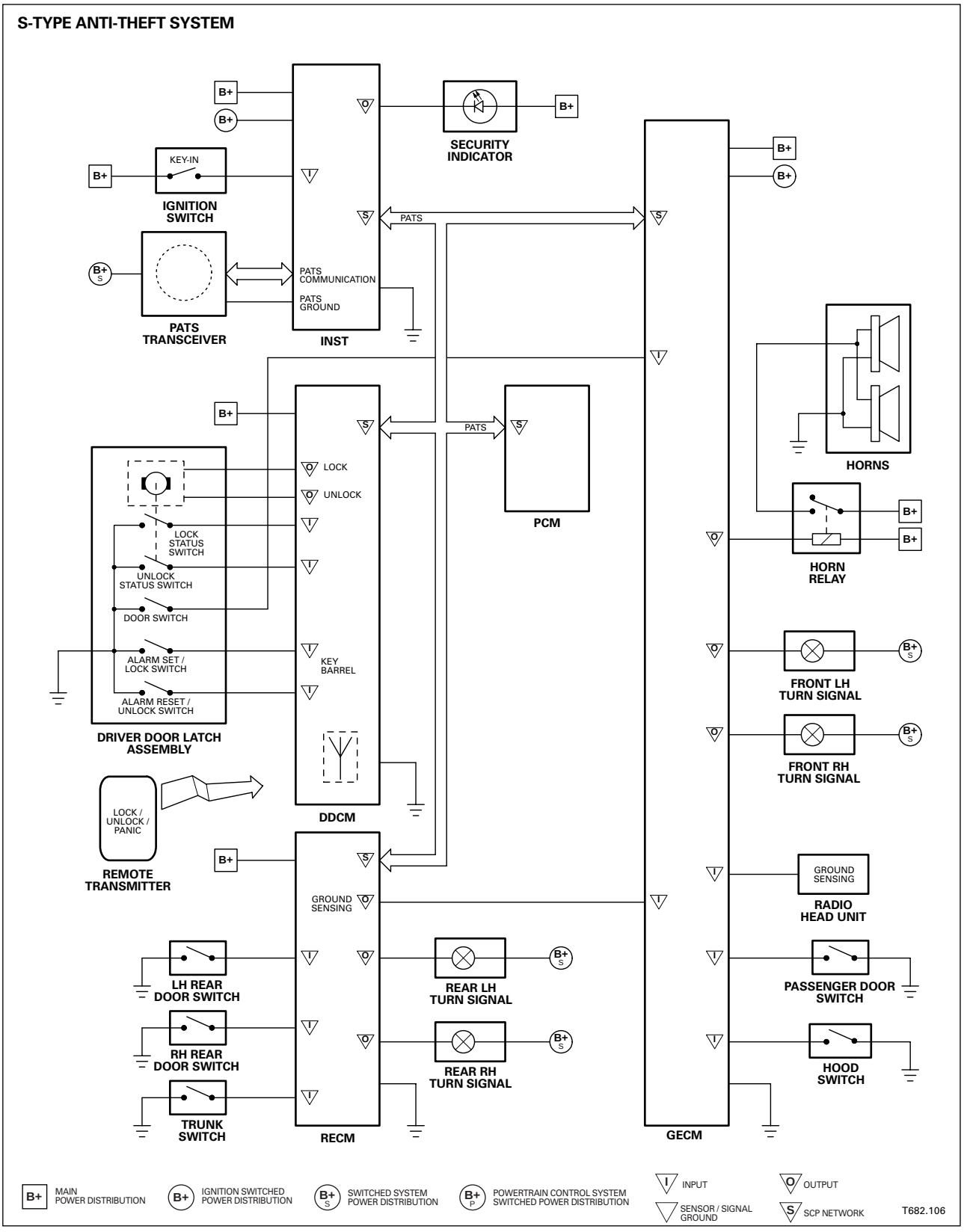
- the LH and RH rear door latch door switches and
- the trunk switch.

Outputs
When the system is armed, the instrument pack activates the security indicator. When the alarm system is activated while armed:

- the GECM activates the horn circuit
- the GECM and the RECM activate the turn signal circuits

NOTES

S-TYPE ANTI-THEFT SYSTEM



S-TYPE SECURITY SYSTEMS

Passive Anti-Theft System (PATS)

The Passive Anti-Theft Module integral with the instrument pack interfaces with the PATS Transceiver to deter vehicle theft.

If a valid ignition key is not read by the instrument pack (PATS) before the key is transitioned to ON, the vehicle will be Immobilized from driving away. Immobilization is accomplished in two ways:

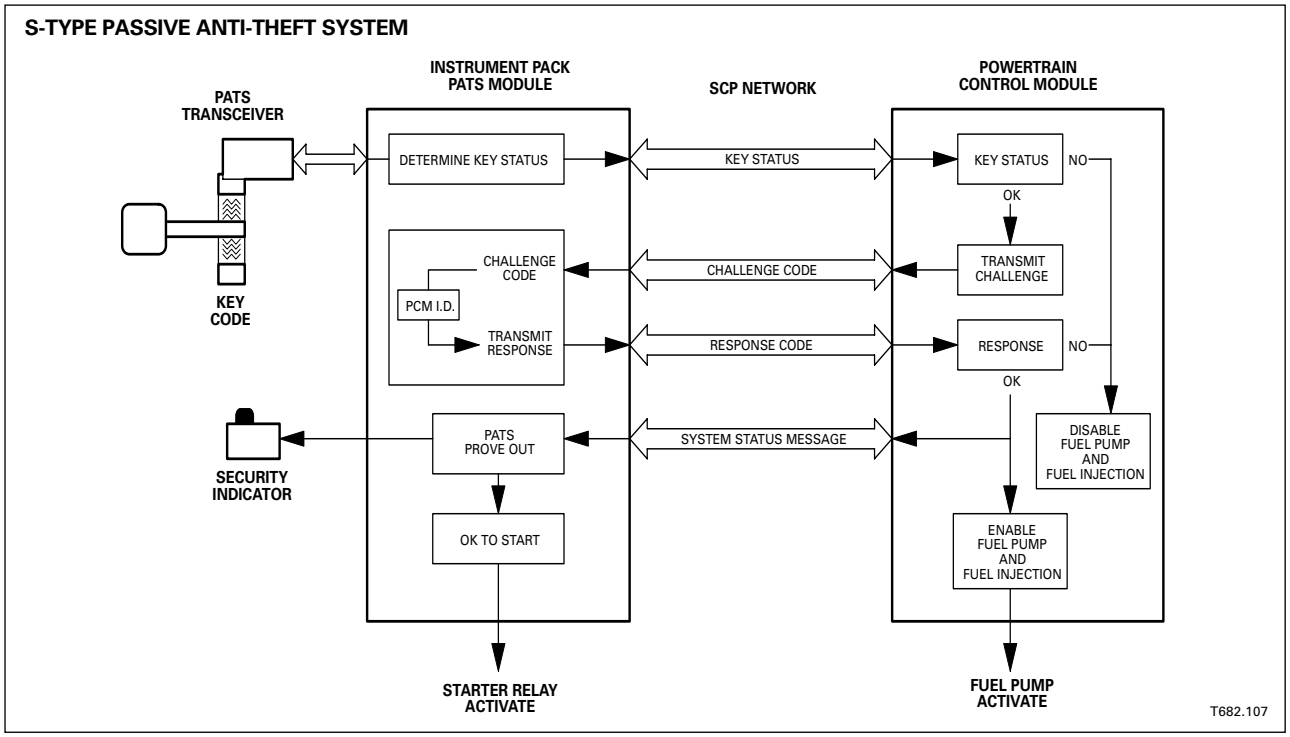
- The instrument pack will not activate the starter relay, preventing engine cranking.
- The PCM will not enable fuel pump operation or fuel injection.

Instrument pack PATS communication to the transceiver is via a serial communication protocol. The PATS transceiver is grounded via the instrument pack. The instrument pack completes this circuit to ground to activate the starter relay.

PATS Communication to the PCM is accomplished via SCP.

NOTES

The Passive Anti-Theft System (PATS) function is split between the instrument pack and the PCM. In order for the engine to crank and start, the instrument pack must have read a valid ignition key code, and the correct information flow must have occurred between the instrument pack and the PCM. Correct PATS operation can be determined by observing the security LED indicator "flash code". The security indicator, situated on top of the fascia, will also flash fault code information.



PATS Operation

When the driver inserts the ignition key into the ignition switch key barrel, the Key-In switch closes and applies B+ voltage to the instrument pack. This signal causes the instrument pack to read the PATS key transponder code stored in the ignition key and compare it with those stored in memory.

The result of this comparison is transmitted to the PCM via the SCP network. If the key code is OK, the PCM will send a challenge code to the instrument pack. If the correct response to the challenge code is received within one second, the PCM will enable fuel pump operation and fuel injection. Simultaneous with the PCM challenge, if the key code is OK, the instrument pack will complete the starter relay coil circuit to ground when the ignition switch is moved to position III (START).

The PCM will not enable fuel pump operation or fuel injection if any of the following conditions exist:

- The ignition key code is not recognized (theft signal).
- A response to a challenge code has not been received within one second.
- An incorrect response to a challenge code has been received.

If any of the three conditions occur, DTC P1260 will be flagged. Additionally, an incorrect challenge code response will cause the PCM to apply an anti-scan strategy whereby the PCM delays 20 seconds before accepting another challenge response from the instrument pack.

S-TYPE SECURITY SYSTEMS

Passive Anti-Theft System (continued)

PATS Diagnostics

Correct PATS operation can be confirmed by observing the security indicator as the ignition key is inserted. The LED should illuminate for 3 seconds when the key is inserted and moved to position II (RUN), then switched OFF. This action will validate all PATS functions:

- The key transponder code matches the key code stored in memory.
- The challenge / response sequence between the instrument pack and the PCM has been successful.
- The fuel pump and fuel injection have been enabled.

Normal PATS communications are completed within 1.4 seconds after key-in or the ignition switch transition from 0 to II or III. If PCM communication problems exist, the time duration can be as long as 2 – 3 seconds and still provide a functional prove out.

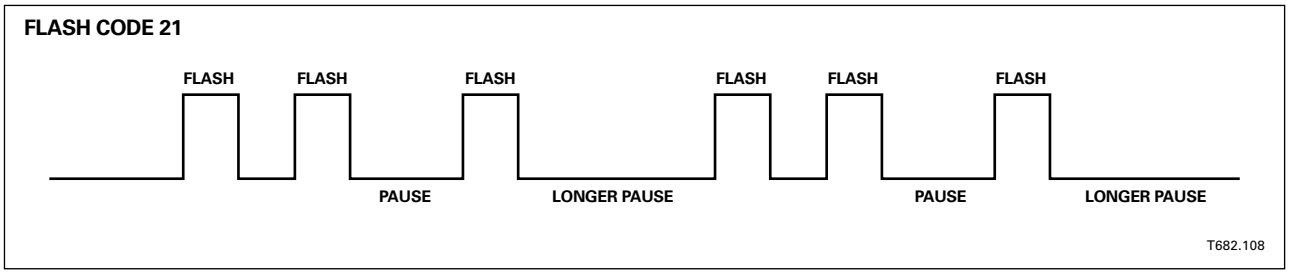
If PATS faults are detected during the maximum 3 second period and a valid ignition key has been used, the security indicator will exit its prove out mode and start to flash. When the ignition key is moved to 0 (OFF), the flashing will terminate and control of the security indicator will shift to the vehicle security system.

PATS Faults

If a PATS fault is detected, the security indicator LED will flash for 60 seconds at 4 Hz with a 50% duty cycle. At the end of this period, the LED will flash a two digit flash code, repeated 10 times. As a general rule, flash codes numbered 15 or less will prevent engine cranking while codes numbered 16 and above result in the engine cranking but not starting (fuel pump and fuel injection disabled).

Flash codes

Each digit of the two digit code is represented by a series of flashes followed by a slight pause. A longer pause indicates the end of the code. For example, flash code 21 is represented by: flash flash (pause) flash (longer pause)...repeat.



Engine fails to crank

If the engine fails to crank, ensure that the gear selector is in P or N. If OK, verify the condition of the starter relay and circuits. Move the ignition key to III (START) to apply voltage to the starter relay coil. Refer to the applicable Electrical Guide and check the following:

- Starter relay condition
- Starter relay battery power supply circuit
- Starter relay coil supply circuit from the ignition switch, fuse, range sensor P, N switch
- Starter relay coil ground circuit to the instrument pack and the instrument pack ground

Engine cranks but will not start
In this case, the PATS has read a valid key code and has enabled the starter relay. However the PCM has disabled the fuel pump and fuel injection. If the PCM or the instrument pack has been replaced, ensure that module configuration has been carried out using WDS. If configuration has been carried out, refer to the applicable Electrical Guide and check the following:

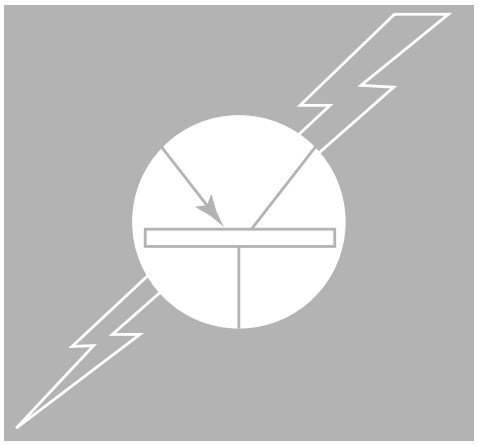
- Fuel pump control circuit between the PCM and the RECM
- Fuel pump relay supply and control circuits
- RECM to fuel pump drive circuits
- Fuel injector ignition switched power supply circuit

PATS Diagnostics Summary

Mode of Operation / Fault	When logged	Ignition Switch position	DTC	Flash Code
Prove-out	n/a	0 (OFF) to II (RUN) / III (START)	n/a	3 seconds – on
Perimeter theft control	n/a	0 (OFF)	n/a	Steady flashing
Anti-scan – Incode	Security access	II (RUN) / III (START)	n/a	None
Transceiver not connected / open circuit (no diagnostic byte received)	Key read	II (RUN) / III (START)	B1681	11
Corrupted diagnostic byte received from transceiver	Key read	II (RUN) / III (START)	B2103	12
Ignition key transponder signal not received	Key read	II (RUN) / III (START)	B1600	13
Ignition key transponder signal invalid	Key read	II (RUN) / III (START)	B1602	14
Ignition key code incorrect	Key read / diagnostic test	II (RUN) / III (START)	B1601	15
SCP Network fault: PCM verify does not match key status	PCM/SCP communications	II (RUN) / III (START)	U1147	16
SCP Network fault: security system status message missing	PCM/SCP communications	II (RUN) / III (START)	U1262	16
Less than 2 keys programmed	Before & after / dealer	II (RUN) / III (START)	B1213	21
PCM ID not in instrument pack non-volatile memory	Before & after / dealer	II (RUN) / III (START)	B2141	22
PCM ID does not match instrument pack	Challenge / response	II (RUN) / III (START)	B2139	23
Transponder programming failure	Key prog.	II (RUN) / III (START)	B2431	13

NOTES

ADVANCED JAGUAR ELECTRICAL SYSTEMS



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X-TYPE ELECTRICAL DISTRIBUTION SYSTEM

Electrical System Architecture

Power Supplies

The Jaguar X-TYPE electrical system is a supply-side switched system. The ignition switch directly carries much of the ignition switched power supply load. Power supply is provided via three methods: direct battery power supply, ignition switched power supply, and "Battery Saver" power supply. The "Battery Saver" power supply circuit is controlled via GECM (General Electronic Control Module) internal timer circuits.

Fuse Boxes

The electrical harness incorporates a hard-wired Power Distribution Fuse Box in the engine compartment and a serviceable Central Junction Fuse Box in the front left-hand foot well. All fuses and relays (except the trailer towing accessory kit) are located in the two fuse boxes.

Vehicle Networks

The Jaguar X-TYPE employs three different networks: a CAN (Controller Area Network) for high-speed powertrain communications, an SCP (Standard Corporate Protocol) network for slower speed body systems communications, and a D2B (Optical) Network for very high-speed "real-time" audio data transfer. The D2B Network is a fiber optic network with a gateway to the remaining vehicle networks via the Audio Unit (Radio Head Unit). Technician access to the three networks and the Serial Data Link is via the Data Link Connector.

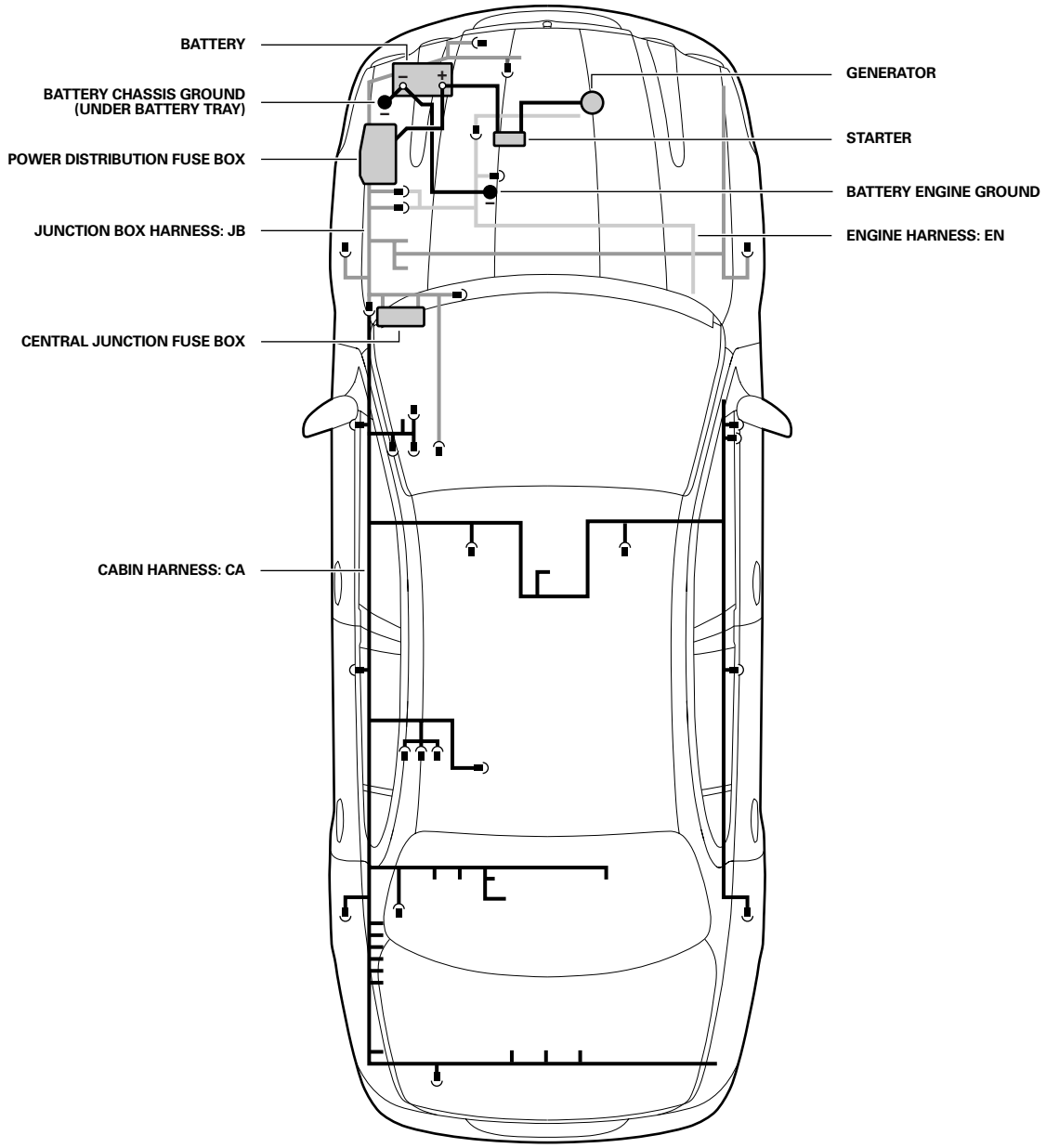
Ground Studs

Circuit ground connections are made at body studs located throughout the vehicle. There are no separate power and logic grounding systems; however, there are a certain number of components that use unique ground points.

NOTES

Main Power Distribution

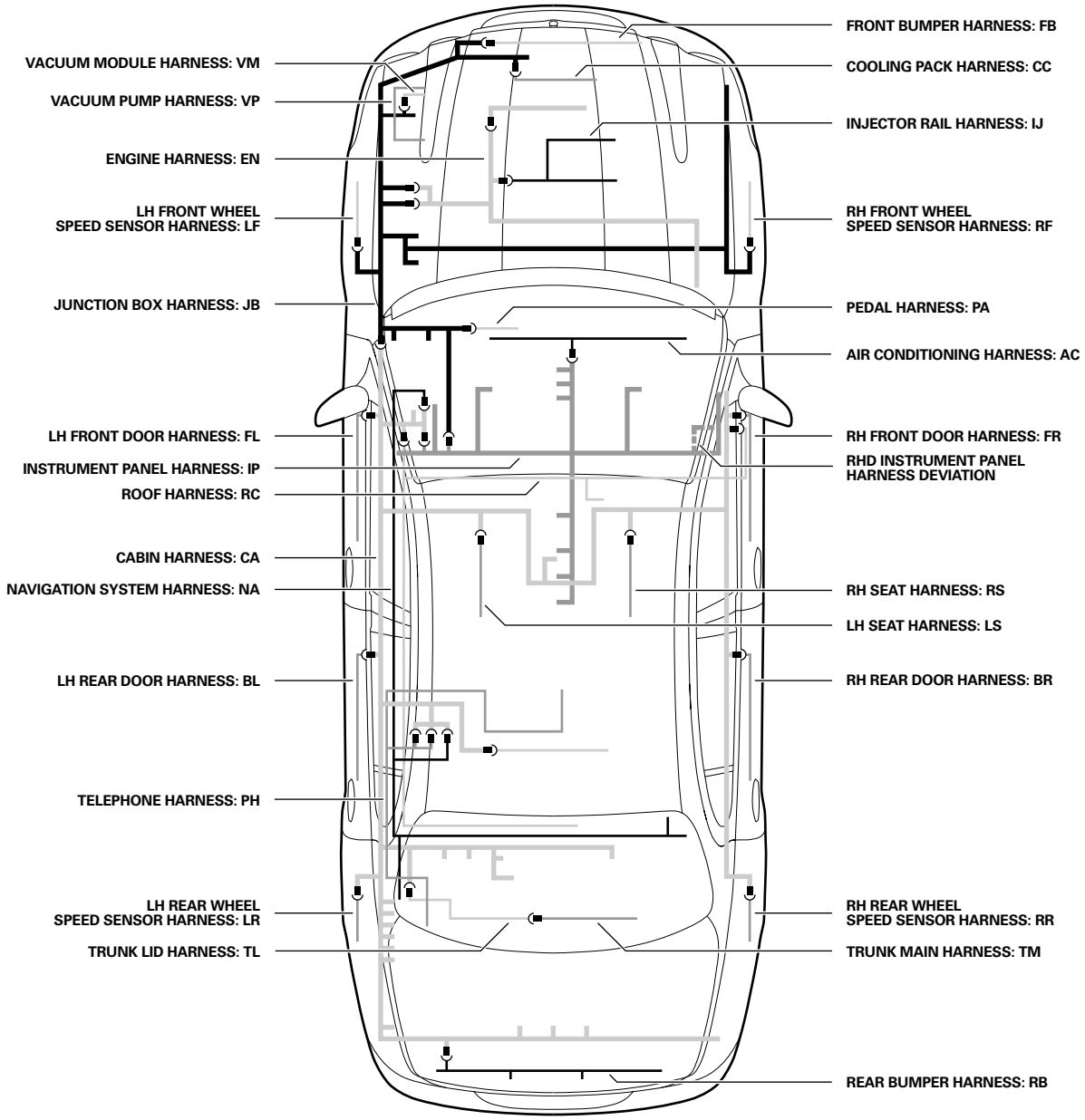
MAIN POWER DISTRIBUTION



X-TYPE ELECTRICAL DISTRIBUTION SYSTEM

Harness Layout

HARNESS LAYOUT



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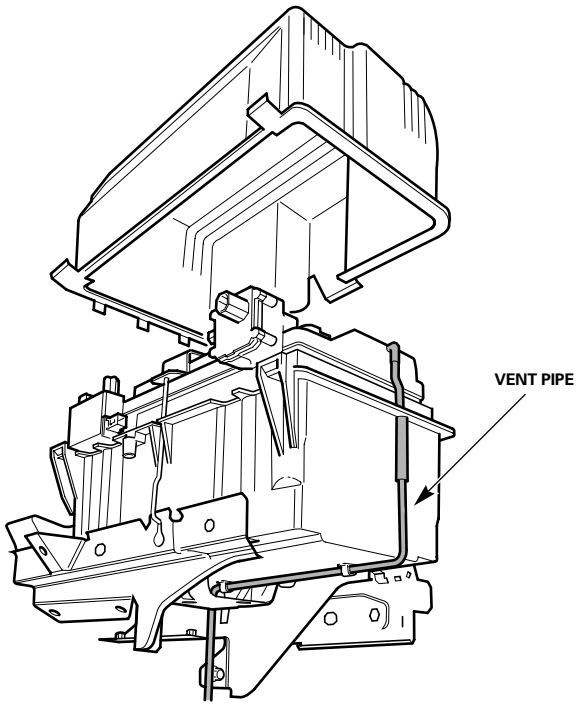
BATTERY BOX AND MOUNTING BRACKETS



Battery and Transit Relay

The X-TYPE battery is located in the front left-hand corner of the engine bay and is unique to the individual model. The battery is rated 80 Ah.

The transit relay is fitted for all models and markets. Its operation is the same as that in current models. While the transit relay is fitted, the battery box lid should be stored in the trunk.

The battery is housed in a box and covered with a lid to provide protection from excessive temperatures.

> **NOTE:** The battery has no special requirements; however, disconnecting the battery will inevitably affect the vehicle's electrical systems. Refer to Effect of Battery Disconnection on the following pages.

SERVICE NOTE: Make sure the battery vent tube is not kinked or crushed.

NOTES

X-TYPE ELECTRICAL DISTRIBUTION SYSTEM

Battery and Transit Relay (continued)

Effect of Battery Disconnection

The effect of battery disconnection on various vehicle electrical systems and the actions that need to be taken following battery reconnection are described here.

Air Conditioning
When the battery is reconnected, the system will automatically calibrate the stepper motor driven doors by powering them from end to end.

On the automatic system, the system will be set to OFF with a stored state of Auto and a stored set temperature of 23 ˚C (73 ˚F).

Audio
If the battery is left disconnected for more than 72 hours, the radio presets will be lost.

Engine Management
When the battery is disconnected, the ECM will lose fueling adaptations, throttle close position value, and idle adaptations. On reconnection, these functions will be set to default values, resulting in a reduction in drive quality.

The ECM will recalibrate itself during the normal drive cycle, but the process can be speeded up by performing the following procedure:

- Stand the vehicle at idle until the engine has reached normal operating temperature.
- Let the vehicle idle for a further 3 minutes.
- Drive the vehicle at constant speeds of approximately 48, 64, 80, 96 and 112 km/h (30, 40, 50, 60, and 70 mph) for about 3 minutes each.

Automatic Transmission
No data or settings are normally lost.

If the battery is disconnected with the ignition switched on or within 5 seconds of the ignition being switched off, DTC P1603 will be logged and the TCM adaptions could be lost. These functions would have to be relearned when the battery is reconnected.

NOTES

Security and Locking
The alarm state upon battery reconnection will be the same as it was when the battery was disconnected.

Trip Computer
When the battery is disconnected, the trip computer loses all recorded trip data; thus, when the battery is reconnected, all trip functions will be reset to zero.

Power Windows
When the battery is disconnected, the one-touch up and antitrap functionality will be lost. It will need to be manually relearned upon battery reconnection.

Battery Quiescent Drain

The following chart shows the target figures for quiescent drain for various vehicle electrical systems:

SYSTEM	mA
Engine management and cruise control	1.5
ICE (standard or premium)	2
Phone	0.5
Perimeter alarm and RF receiver	4
Security LED	1
ABS / DSC	0.5
Instrument cluster	2
Climate control	1
Clock	1
Navigation	2
TV	0.5
Telematics display	0.5
Voice control	1
Maximum quiescent drain (all systems)	**Approximately 30 mA**

NOTES

X-TYPE ELECTRICAL DISTRIBUTION SYSTEM

Generator and Regulator

Electrically, the generator is similar to previous models except for the voltage regulator functionality. The engine control module (ECM) can switch the voltage regulator between two voltages to optimize the charging of the battery:

- The low voltage regulator setting is 13.6 volts
- The high voltage regulator setting is 15.3 volts.

  NOTE: The values, which will decrease with a rise in temperature or current flow, are measured with the generator at 25˚C (77˚F) and charging at a rate of 5 amps.

The ECM:

- Determines the voltage setting of the voltage regulator
- Always selects the high voltage setting once the vehicle has started
- Determines the period of time that the high voltage remains selected

The ECM selects one of three different time periods depending on the operating conditions when the vehicle is started:

- The longest time period is selected if the ECM determined that the vehicles has been “soaking” for sufficient time to allow the engine coolant temperature (ECT) and the intake air temperature (IAT) to fall within 3˚C (37˚F) of each other.
- The intermediate time period is selected when the ECT and the IAT fall below 5˚C (41˚F).
- The shortest time period is the default and is used to provide a short period of boost charge.

At the end of these time periods the voltage is always set to the low voltage setting to prevent the battery from being overcharged. The time periods are variable depending on temperature and battery voltage.

The target voltage of the battery varies between 14 volts and 15 volts depending on ambient temperature and vehicle operating conditions. Once this target voltage has been achieved, providing the vehicle has been operating for at least the shortest time period, the ECM will reduce the voltage regulator to the minimum setting of 13.6 volts.

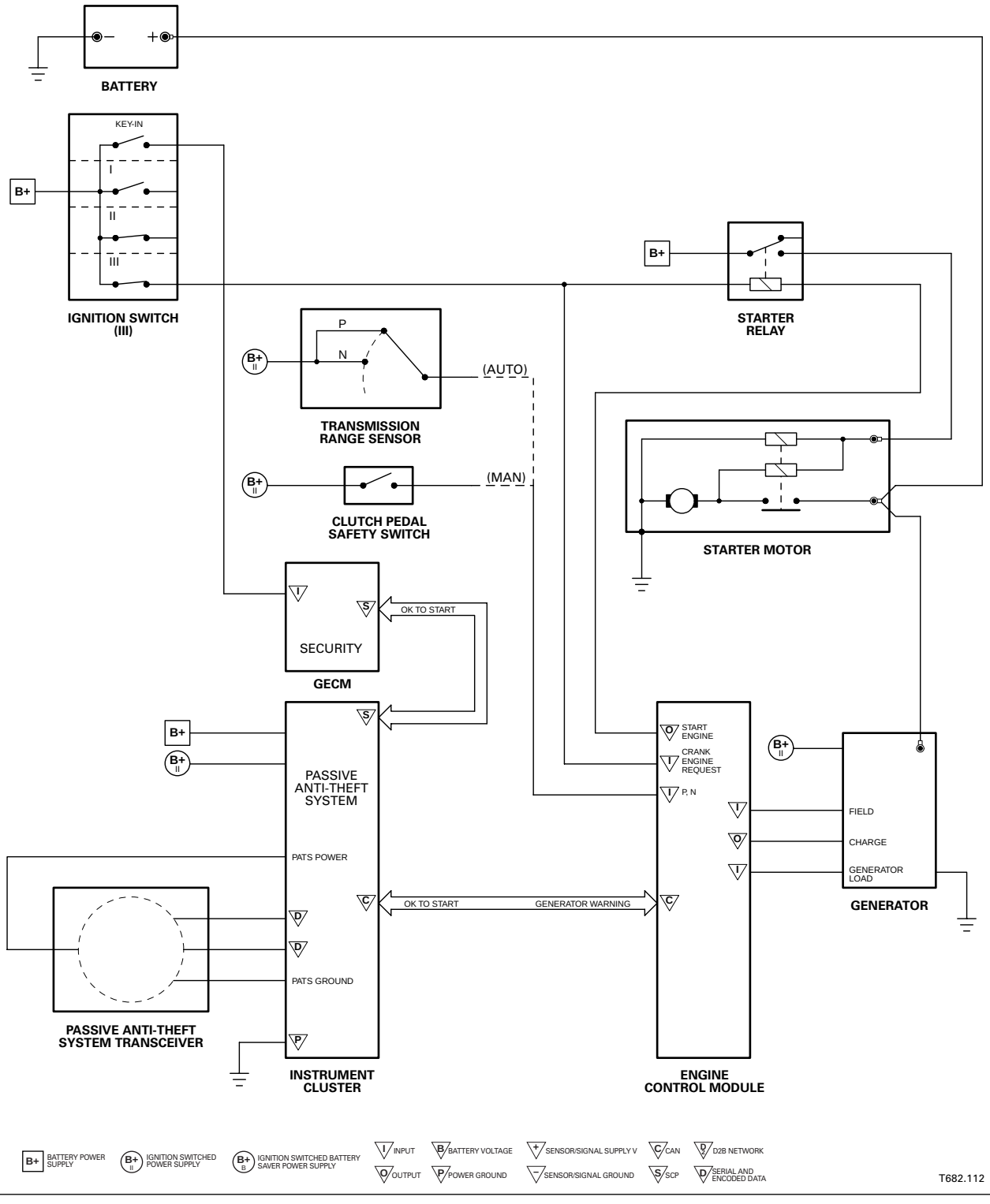
There are three connections between the ECM and the generator; refer to the X-TYPE Electrical Guide for details:

1. The voltage regulator request setting from the ECM to the generator
2. A pulse-width modulated (PWM) signal from the generator to the ECM which enables the ECM to monitor the generator load on the engine
3. A charging system indicator signal wire from the generator to the ECM.

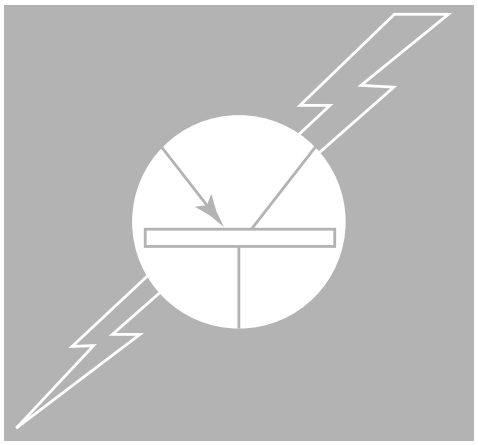
If the voltage regulator request line is open circuit or short circuit to battery voltage, the generator will permanently charge at 15.3 V. If it is short circuit to ground, it will permanently charge at the lower voltage, 13.6 V.

NOTE: A DTC will be generated if a circuit malfunction is detected in any one of the three lines connecting the ECM to the generator or if the connector is disconnected. The charging system indicator will also illuminate.

X-TYPE BATTERY; STARTER; GENERATOR



ADVANCED JAGUAR ELECTRICAL SYSTEMS



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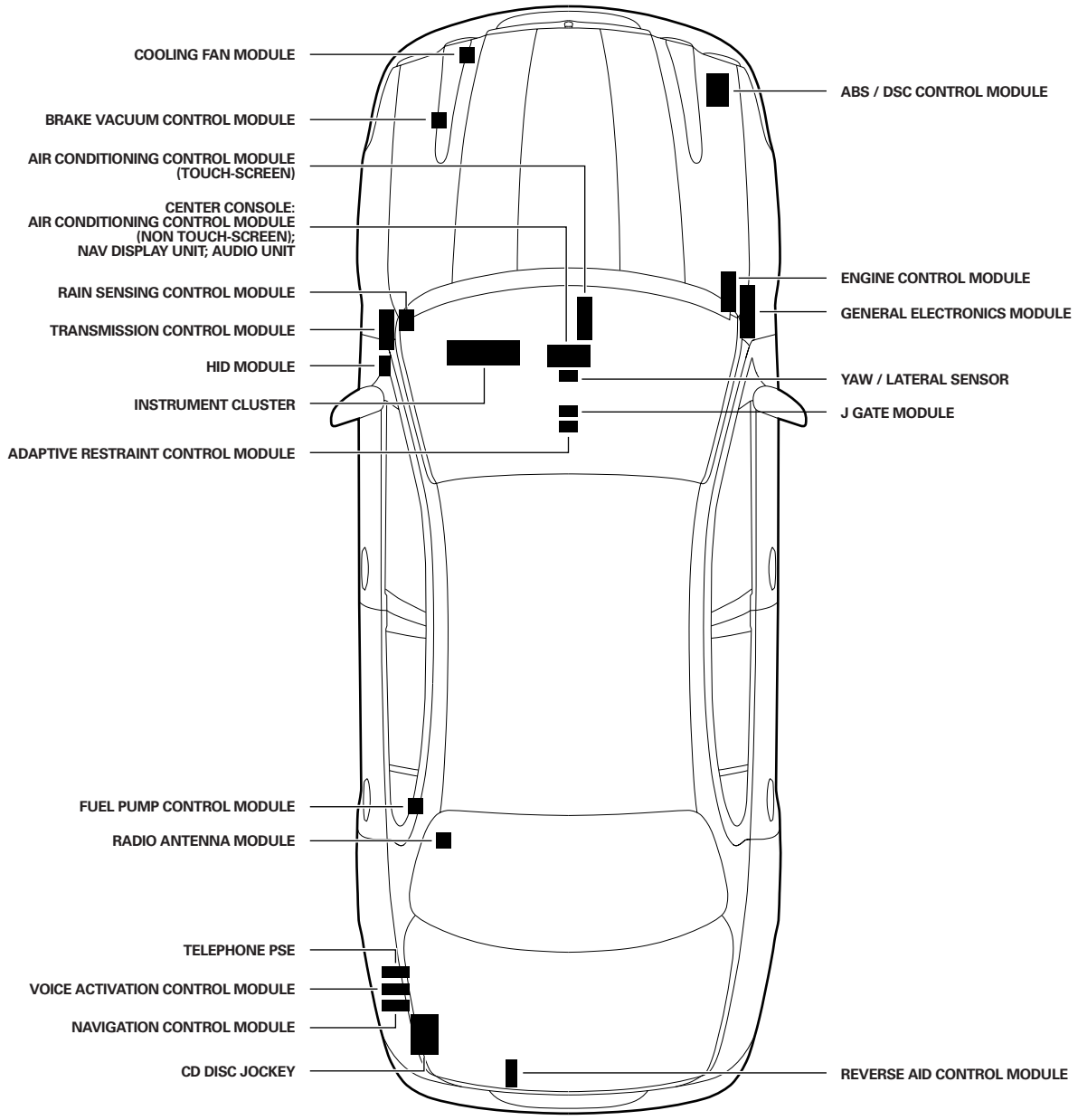
X-TYPE CONTROL MODULES

Control Module Locations

CONTROL MODULE LOCATIONS



Control Module Configuration

Overview

On current vehicles, replacement control modules are programmed at the Unipart distribution centers at Baginton and Mahwah. As the number of vehicle variants increases, the number of different combinations of parameters required to configure a control module is becoming too large to allow all the options to be dealt with as a complete dataset. The system also introduces undesirable delays in repairing a vehicle. With X-TYPE vehicles, WDS software will allow replacement modules to be programmed at the dealership from the vehicle VID block.

Configuration Procedure using WDS

The operator should select the Vehicle Configuration application tab followed by Programme New Module.

- The screen will display a list of configurable modules.
- When the operator selects the appropriate module, the WDS will determine the configuration requirements and read the appropriate data from the vehicle VID block.
- The WDS will then configure the module accordingly.
- The WDS will then display the Dealer Option screen and the operator should complete the configuration by selecting the appropriate dealer fit and customer options.

Configuration of the ECM

The exception to the above procedure is when the VID block itself needs to be reprogrammed. This situation would arise if a new ECM was fitted. The procedure would be as follows:

- The operator should select the Vehicle Configuration application tab followed by Programme New Module and ECM.
- The WDS will check the VIN stored in the Instrument Cluster and compare this with the VIN entered by the operator at the start of the session. If these are different, the operator will be given a VIN mismatch warning and will be asked if the manually entered data should be used.
- If the operator selects No, a keyboard will be displayed and the VIN can be re-entered manually.
- If the operator selects Yes, the calibration files and VCATS data stored by WDS relating to that VIN will be displayed for the operator to check and confirm.
- The calibration procedure will then take place after which the operator will be told to cycle the ignition.
- The appropriate Dealer Option screens will be presented for the operator to select the appropriate dealer fit and customer options.
- Finally, the VID block programming will be carried out where the configuration details from the other modules and the vehicle VIN are stored in the VID block. At this stage, the PATS code alignment to the Instrument Cluster will be carried out without any input required from the operator.

Programming Existing Modules

The Vehicle Configuration application tab gives the operator the option of configuring an existing module as well as a new module. This procedure will only be provided for modules that require flash programming or software updates. If this option is selected, only a list of re-programmable modules will be displayed.

NOTES

X-TYPE CONTROL MODULES

Control Module Configuration (continued)

Module Configuration Requirements

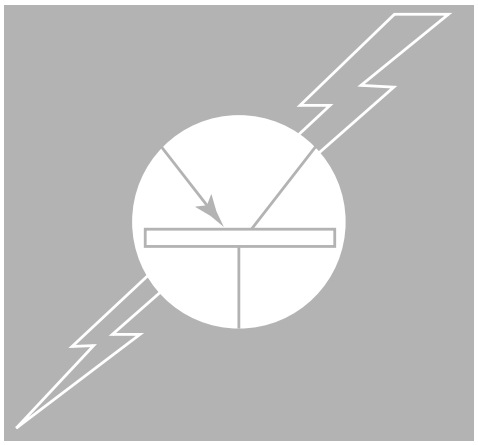
The following table shows which modules require configuration and which have dealer selectable options.

- A configurable module needs to be told the type of vehicle it will be operating in, i.e. X-TYPE, 3.0 liter, automatic etc.
- Dealer options are items such as message center language, drive away door locking etc.
- An example of a module requiring set up would be the HLCM needing to be set up to accept the input from the leveling sensors.

Module	Configurable?	Dealer Options Available?	VIN Storage?	Setup Required for New Module?
ABS / DSC	NO	NO	NO	YES (DSC only)
A/CCM (Automatic)	NO	NO	YES	NO
A/CCM (Manual)	NO	NO	YES	NO
IC	YES	YES	YES	YES
ECM	YES	YES	YES	YES
HLCM	YES	NO	YES	YES
NAV	NO	NO	NO	NO
PSE	NO	NO	YES	NO
ARM	NO	NO	YES	NO
RAM	NO	NO	NO	NO
TCM	YES	YES	YES	NO
VOICE	YES	YES	YES	NO
GECM	YES	YES	YES	YES
AUDIO	YES	YES	YES	NO

NOTES

ADVANCED JAGUAR ELECTRICAL SYSTEMS



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X-TYPE MULTIPLEXING

Module Communications Network

The X-TYPE is the most complex Jaguar vehicle to date in terms of both the number of harness variants and the possible combinations necessary to achieve give vehicle specifications. The most significant deviation from the distribution system used for other Jaguar models is the introduction of optical fiber cables to accommodate the transfer of very high-speed, real-time audio data.

The optical fibers provide an optical network that interfaces to the SCP network via the audio unit. Refer to D2B Network for detailed information.

> **NOTE:** The optical network currently uses a transfer protocol known as D2B. Although this protocol may change in the future, the optical network will be referred to as "D2B" throughout this and other Jaguar technical publications.

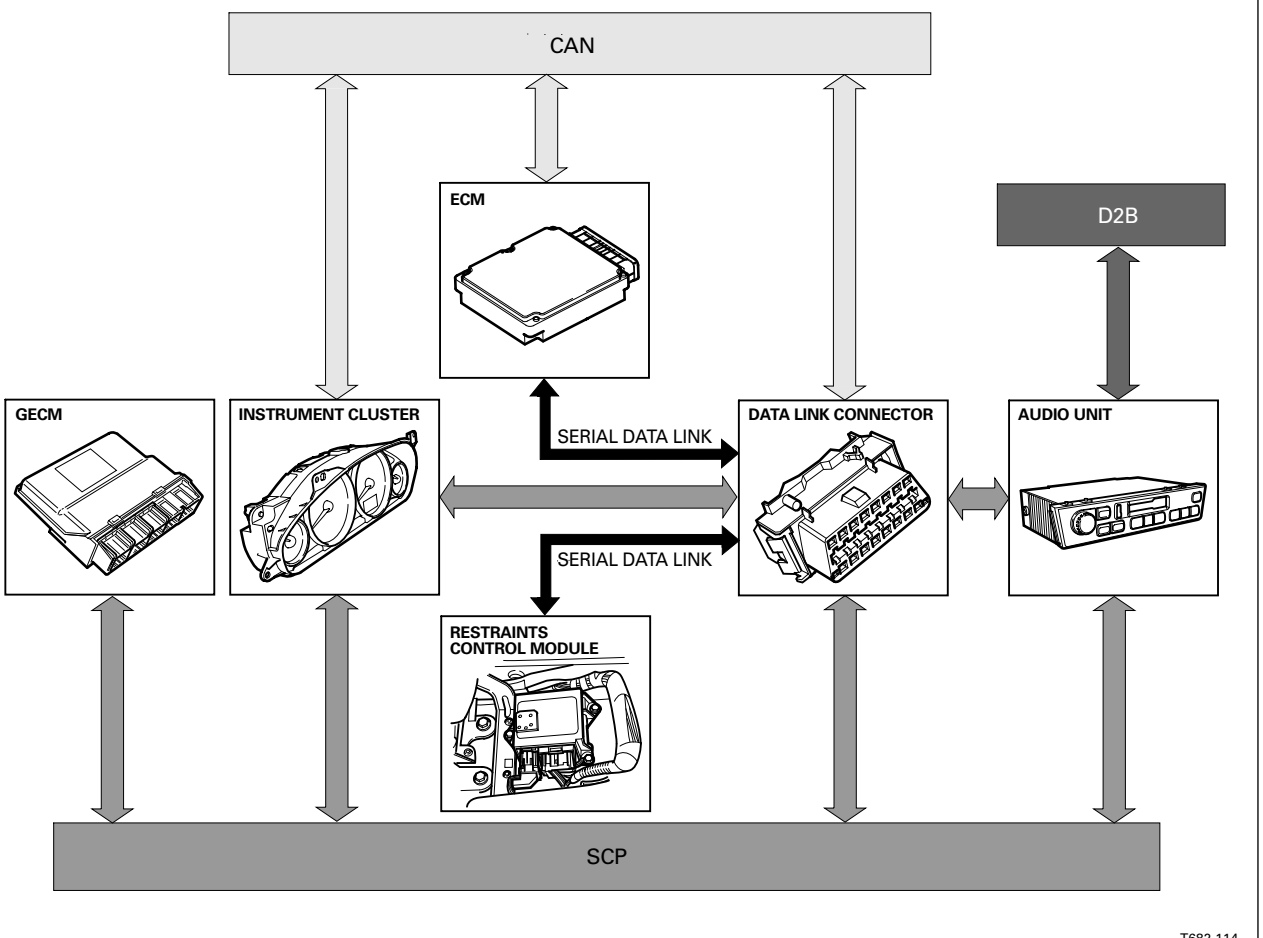
SCP, CAN and Serial Data Link (ISO 9141) Networks

The Standard Corporate Protocol (SCP), Controller Area Network (CAN) and Serial Data Link (ISO 9141) networks are configured in a similar way to current Jaguar models to accommodate different data types and flow rates as required for various vehicle features. Refer to the following table.

Network	Communication Between	Speed
CAN	Engine, Transmission, Braking System	500 K baud
SCP	Lower speed body systems	41.6 K baud
Serial Data Link (ISO 9141)	Data Link Connector and ECM; Control modules with self-diagnostic capability not connected to CAN or SCP	10.4 K baud
D2B	In-Car Entertainment	5.6 M baud

NOTES

X-TYPE MULTIPLEX NETWORKS



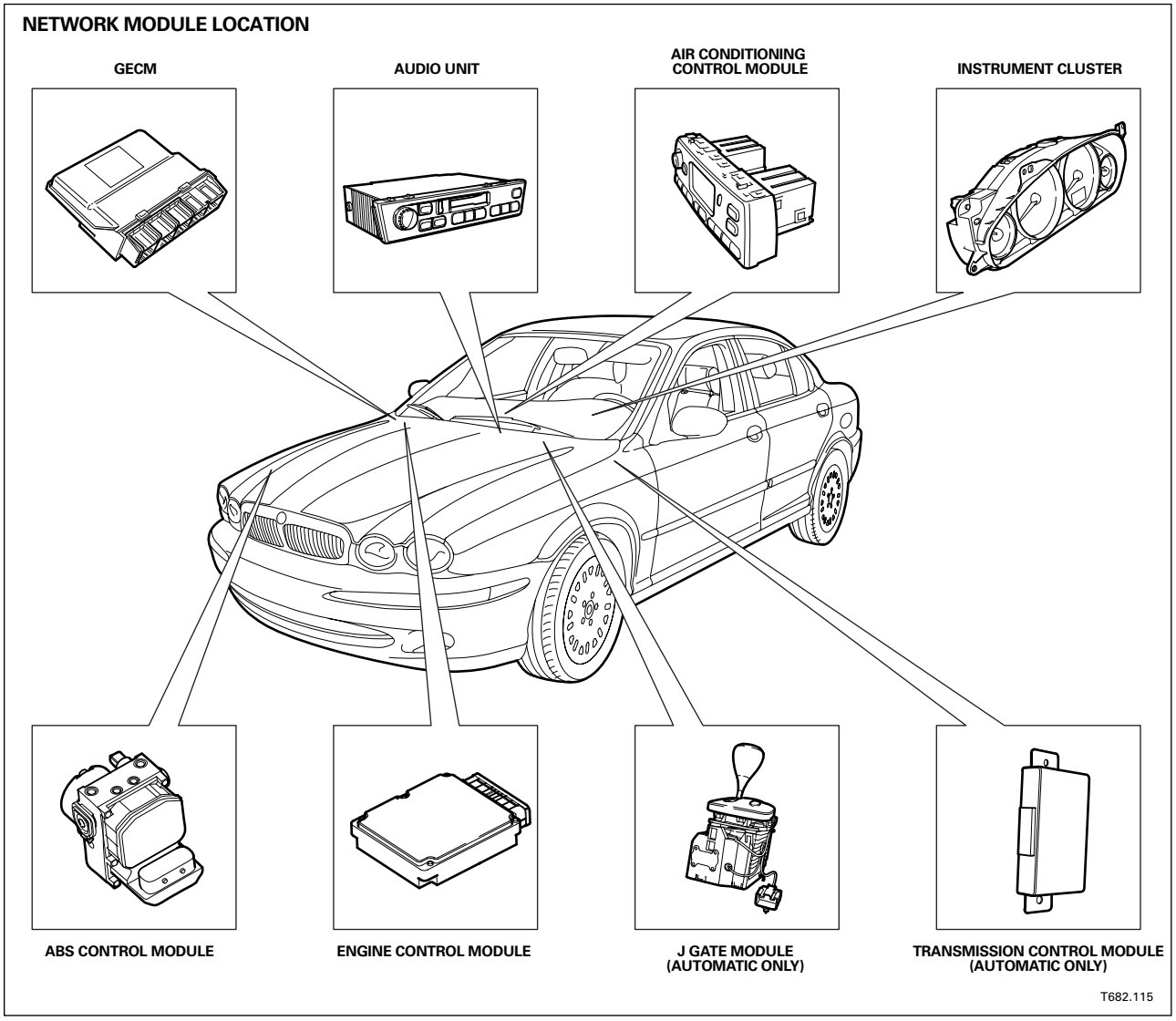
NOTES

X-TYPE MULTIPLEXING

Module Communications Network (continued)

Network Modules

The illustration below shows the main modules and their locations. Refer to the appropriate section in the X-TYPE Electrical Guide for detailed information.



NOTES

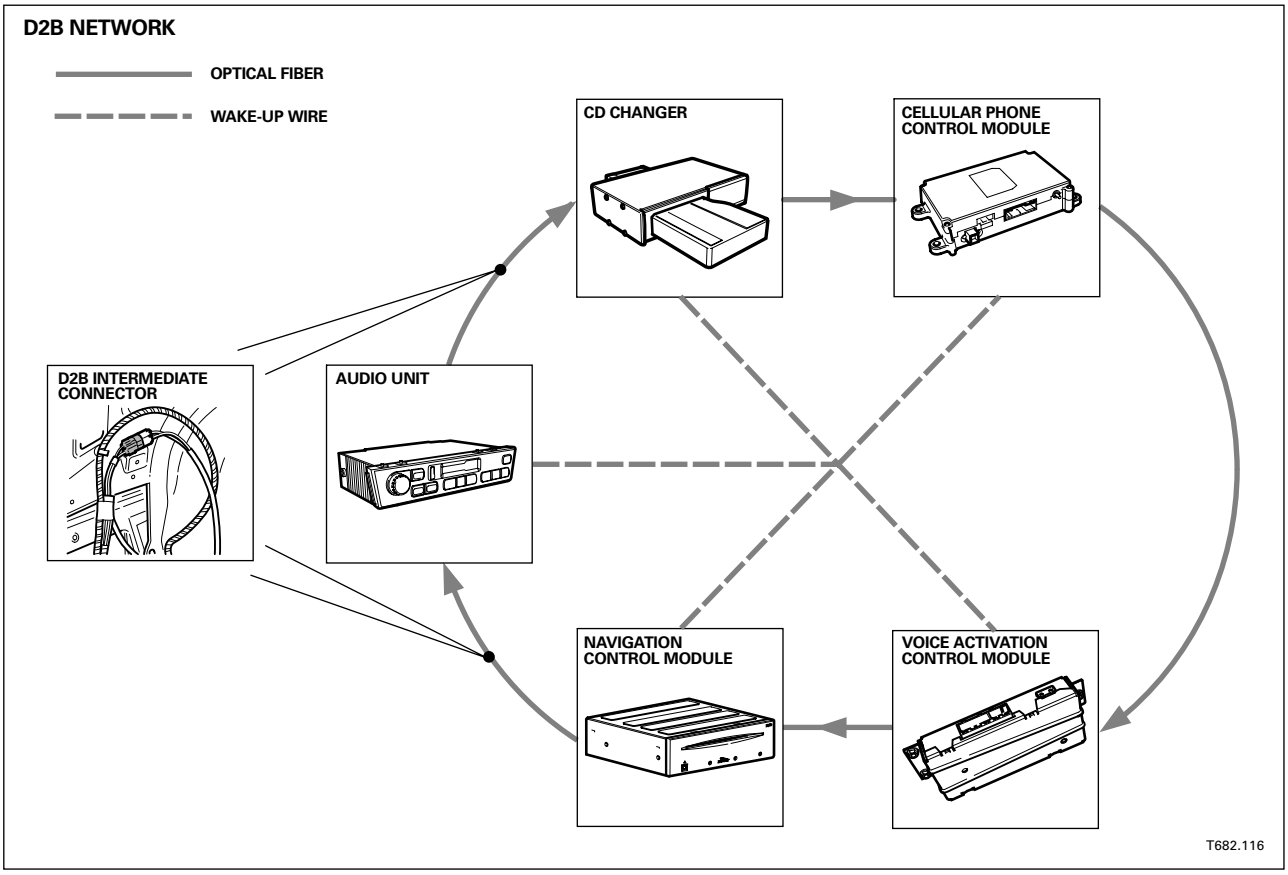
D2B Network

The D2B Network comprises:

- Optical fiber
- Wake-up wire
- Master module (audio unit)
- Slave module(s)
- Intermediate connectors

The network:

- Is structured as a unidirectional ring
- Uses plastic optical fiber to transport data from one module to another in ring order.



NOTES

X-TYPE MULTIPLEXING

D2B Network (continued)

Network Components

Optical fiber

The fiber comprises a 1mm (0.039 in.) polymer core with a 3.5mm (0.137 in.) diameter outer protective jacket. The fiber facilitates the transport of data, in the form of pulses of light which are too fast to be seen by the eye, at a data bit rate of approximately 5.5M bits per second.

Wake-up wire

The wake-up wire comprises copper wire configured in a star-like arrangement that connects to a single pin on each of the modules.

- The audio unit sends a wake-up command (an electrical pulse) via the copper wire to initialize the slave module(s).
- The wake-up pulse is sent when the ignition key is turned to position "I".
- The pulse triggers slave modules to look at the preceding module for a "light signal" (originated by the audio unit) and to participate with the audio unit in network initialization.
- At the end of this initialization procedure, the modules are ready for full network operation.

  NOTE: Any malfunction during the initialization stage will cause a DTC to be stored by the audio unit. The D2B Network will then shut down for the remainder of that key cycle.

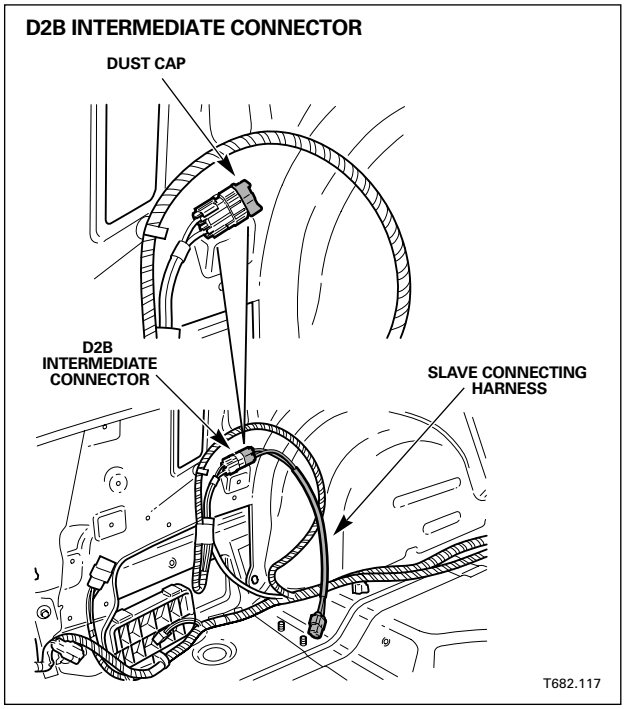
Master module

The master module is the audio unit; it manages the D2B network and provides the gateway to the SCP network.

Slave module(s)

A slave module is any other system module that is connected to the D2B network and includes:

- Navigation control module
- CD autochanger
- Cellular phone control module
- Voice activation control module



Intermediate connector

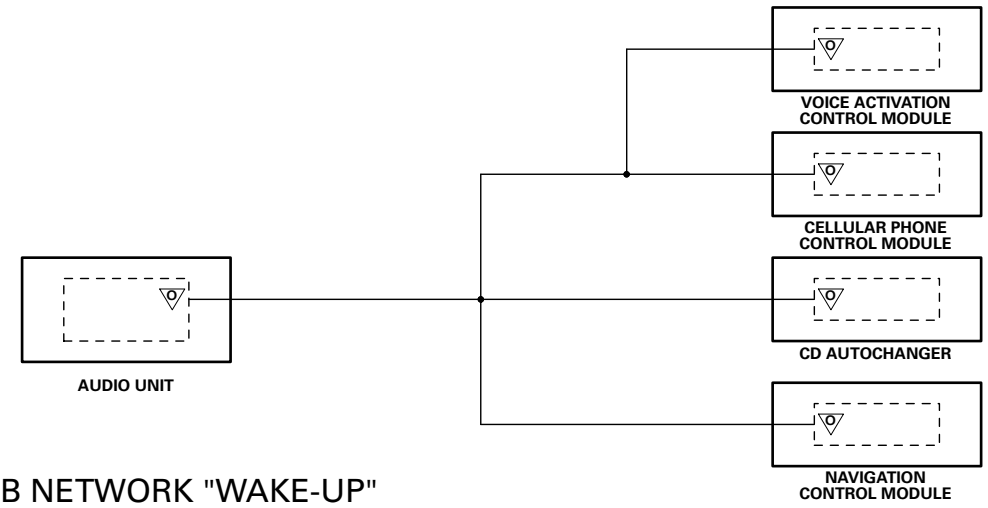
There are two D2B intermediate connectors, one (located at the LH 'A' post) provides harness interconnection only; the other one (located in the trunk to the left-hand side) provides the interconnection point for the slave module(s).

> **NOTE:** For vehicles that have modules already installed that utilize the optical network, the D2B intermediate connector may be accessible only after removing the installed module(s).

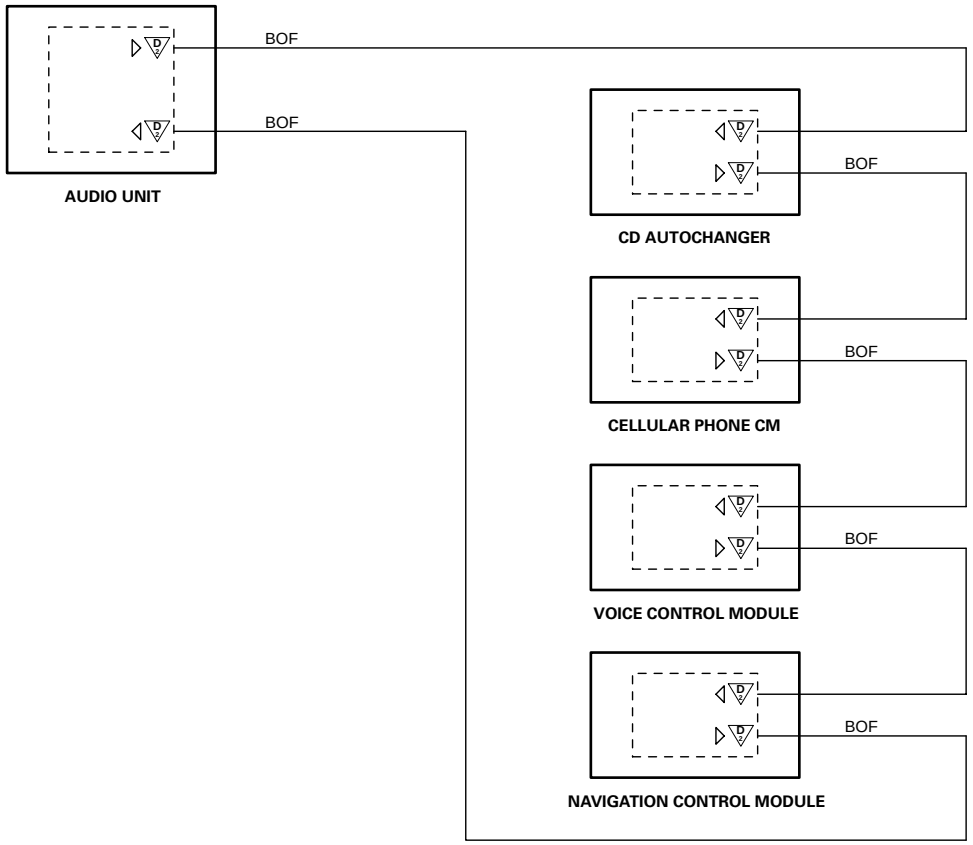
Modules that connect to the D2B network use special optical fiber assemblies which interface with the D2B intermediate connector in the trunk; the assemblies may very depending on the particular combination of modules connected to the network.

> **NOTE:** Optical fibers are incorporated into the instrument panel and cabin harnesses during manufacture to support dealer installation of the CD autochanger, voice control and cellular phone systems.

X-TYPE D2B NETWORK



D2B NETWORK "WAKE-UP"



FIVE MODULE (NODE) D2B NETWORK

NOTE: REGARDLESS OF THE NUMBER OF MODULES ON THE D2B NETWORK, THE SEQUENCE FOR MODULE CONNECTION IS ALWAYS AS SHOWN.

B+ BATTERY POWER SUPPLY
B+ II IGNITION SWITCHED POWER SUPPLY
B+ B IGNITION SWITCHED BATTERY SAVER POWER SUPPLY
I INPUT
O OUTPUT
B BATTERY VOLTAGE
P POWER GROUND
+ SENSOR/SIGNAL SUPPLY V
− SENSOR/SIGNAL GROUND
C CAN
S SCP
D D2B NETWORK
D SERIAL AND ENCODED DATA

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X-TYPE MULTIPLEXING

D2B Network (continued)

Optical Fiber Cables and Connectors

Under normal installation conditions, the system is robust and failures should not occur; however, since the optical fibers convey data using light, it is vital that the passage of light down the fiber is unobstructed. Obstruction of light can be caused by:

- Contamination of the fiber ends
- Damage to the fiber ends
- Bending, kinking or damaging the cable

  NOTE: Fibers damaged by kinking or exposure of the optical core due to abrasion must be replaced.

Handling

Special care should be taken to avoid damage or contamination when handling or working on the vicinity of fiber optical cables and connectors.

NOTE: Damage or contamination includes scratches to the cable ends and pollution caused by dust, dirt or oil.

CAUTION: When handling optical fibers, cleanliness is of paramount importance. The fiber ends should not be touched even with clean bare hands, as the natural oils deposited from the skin may penetrate the fiber or may cause dirt to adhere to the fiber end.

System malfunctions and unnecessary warranty claims can be minimized by following these guidelines:

- After disconnection of any cables, carefully install an appropriate dust cap to protect the mating face of the connectors from damage or contamination.
- Avoid introducing tight bends (less than 25mm radius) or kinks into the optical fiber during service or repair. Tight bends or kinks could:
  - Impair system operation
  - Cause immediate system failure
  - Cause future system failure
- Avoid excessive force, strain or stress on the fibers and connectors, especially permanent stress after reinstallation.

Optical Network Diagnosis

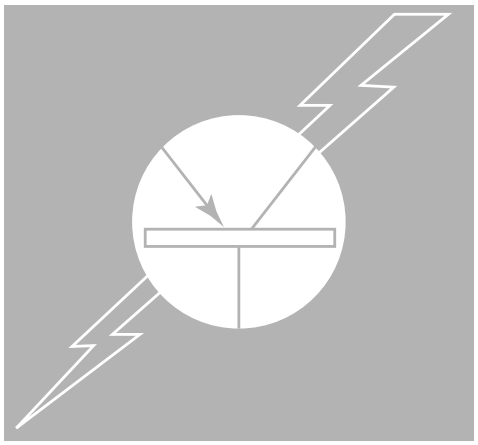
Unlike other networks that communicate with WDS via the data link connector, the optical network interfaces with the data link connector via the audio unit and the SCP network.

NOTE: Diagnosis and testing is quite complex and specific; refer to JTIS for details. A special tool is available (D2B optical bus tester, #415-S003).

DTCs which can be logged by any module

DTC	Description
U2609	D2B electrical wake-up pulse width out of specification. Master and slave modules monitor the wake-up line and log this DTC if the pulse width is outside the specification 50ms – 110ms.
U2601	Wake-up line shorted to ground. Master and slave modules monitor the wake-up line during network initialization and log this DTC if the line is shorted to ground for greater that 1 second.

ADVANCED JAGUAR ELECTRICAL SYSTEMS



JAGUAR

Service Training Course T682
DATE OF ISSUE: 02/15/2002

X-TYPE BODY SYSTEMS

Power Windows

The power window motor electronics each monitor an integral hall effect sensor feedback signal to determine when the normal travel of the motor is limited.

When the vehicle power supply is disconnected, the antitrap and one-touch up features will no longer function when the power supply is restored.

The initialization procedure must be carried out to restore operation.

Power Window Initialization

- Lift and hold the window switch in the up direction until the window seats completely. Continue to hold the switch for a further 2 seconds.
- Release the switch and then lift and hold it again for a further 2 seconds. This procedure ensures that the window is fully seated into the seal.
- Press the window switch to lower the window to its fully open position.
- Verify the operation of the antitrap and one-touch up operation.

  NOTE: This procedure can be carried out either from the individual window switches or from the driver's switchpack.

Thermal Overload

The window motors are protected from overheating by a thermal overload feature. If the windows are operated continuously, the thermal overload feature will operate and the window will no longer respond to the operation of the switch. The number of opening / closing cycles required to implement this feature varies depending on temperature, but it should never be less than 7. One touch up and down operation should be possible within 10 seconds with full operation resuming after a brief rest period.

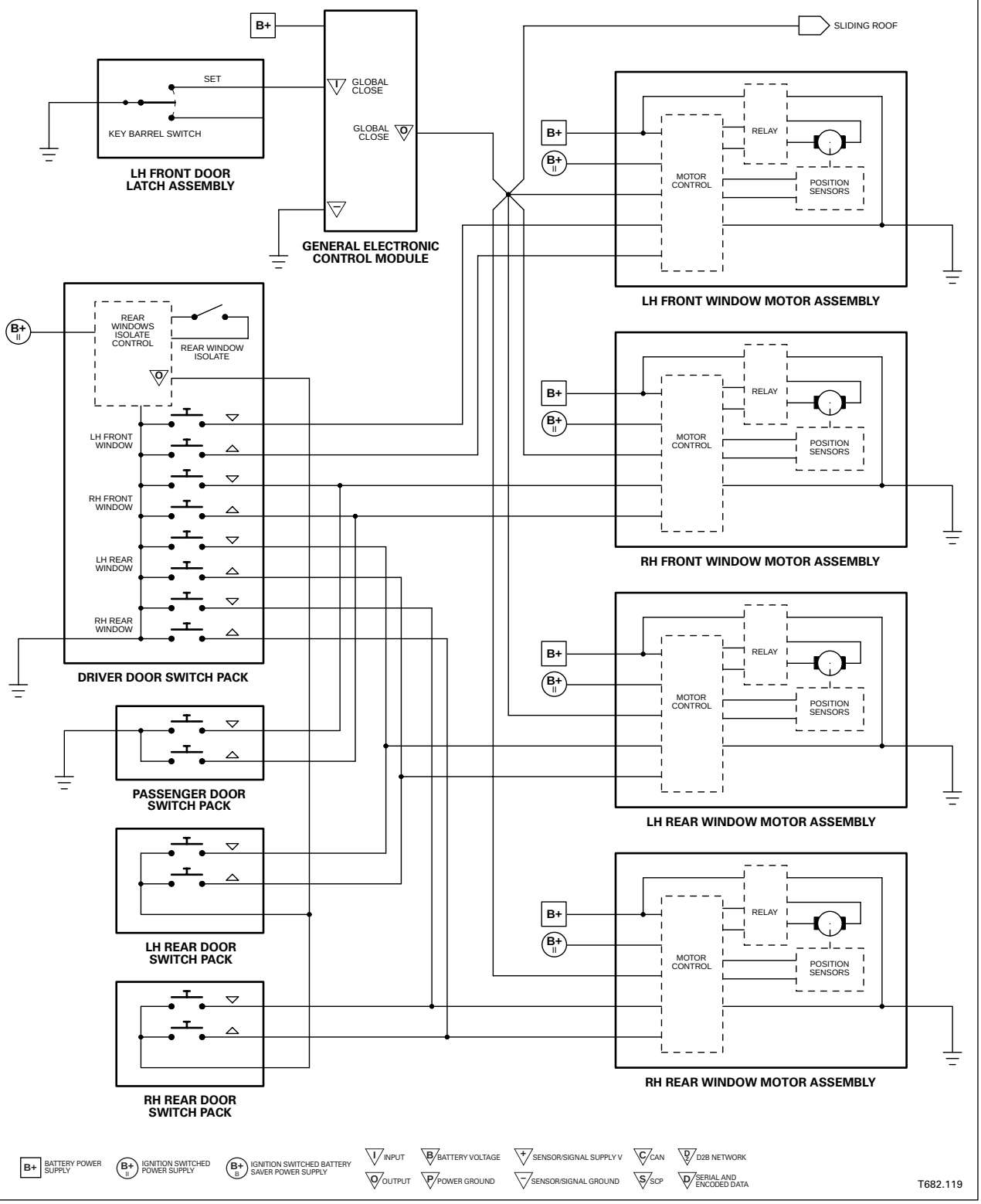
Ice Mode

The windows have an ice mode feature to facilitate the closing of the windows in the event of the glass run channels being obstructed by ice. This feature is activated by the vehicle occupant as follows:

- Raise the window until the obstruction is reached. The antitrap feature will operate, lowering the window to a minimum of 50 mm below the point at which reversing was initiated (or at least 200 mm from the close position).
- Raise the window back up to the obstruction. Again the antitrap feature will operate.
- Within 10 seconds, raise the window a third time to the obstruction. This time the antitrap feature will not operate. Release the switch.
- Lift the switch again within 0.5 seconds. The window motor will now operate at its full force (250 N maximum) for approximately 12 mm of upward travel. This can be repeated several times provided that each time the switch is activated within 0.5 seconds.
- Should the 250 N force be insufficient to clear the obstruction, this insufficient force will be interpreted as system failure and the one-touch up function will be disabled. To relearn the function, the window initialization procedure will have to be performed.

NOTES

X-TYPE POWER WINDOWS



X-TYPE BODY SYSTEMS

Sun Roof (Sliding Roof)

The sun roof motor module monitors an integral hall effect sensor feedback signal to determine when the normal travel of the motor is limited.

The sun roof is not affected by battery disconnection and will not need to be initialized. However, if power is disconnected while the sun roof is actually being operated, then memory will be lost and the following initialization procedure will have to be carried out. This procedure will also have to be carried out if the sun roof motor is changed.

Sun Roof Initialization

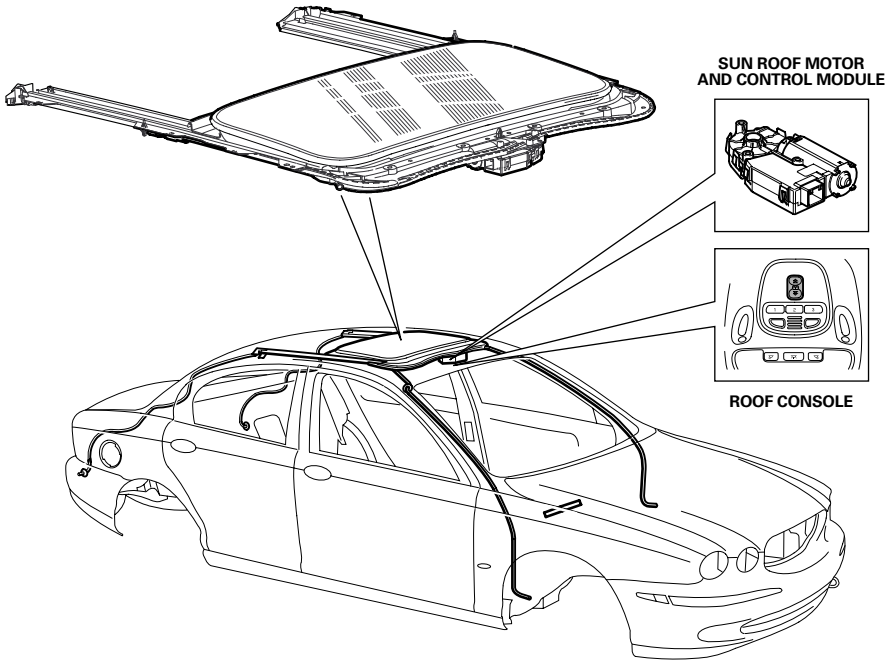
- Press the switch in the tilt position until the roof moves to the fully tilt position and stops.
- Release the switch.
- Within 5 seconds, press and hold the switch in the tilt position again. The roof will travel automatically to the fully open position, back to the fully closed position and stop.
- Verify the operation of the antitrap and one-touch features.

  NOTE: If the antitrap or one-touch features stop working correctly for any reason, the roof can be reinitialized without disconnecting the battery.

To reinitialize without disconnecting the battery, run the roof panel into the tilt position. Release, then press and hold the switch for 20 – 30 seconds. The roof panel will move up and down signaling memory erasure of the previous initialization.

The roof panel can then be reinitialized as described above.

SUN ROOF



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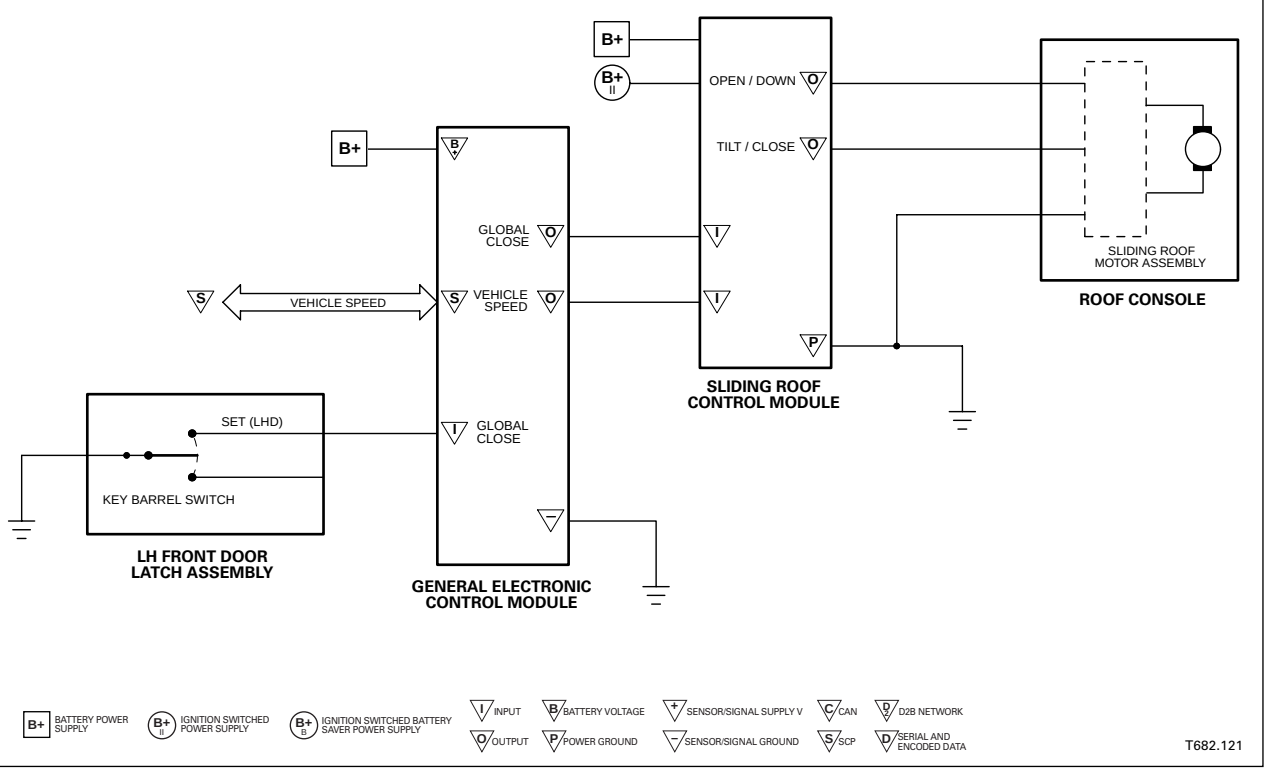
X-TYPE SLIDING ROOF



X-TYPE BODY SYSTEMS

Seats

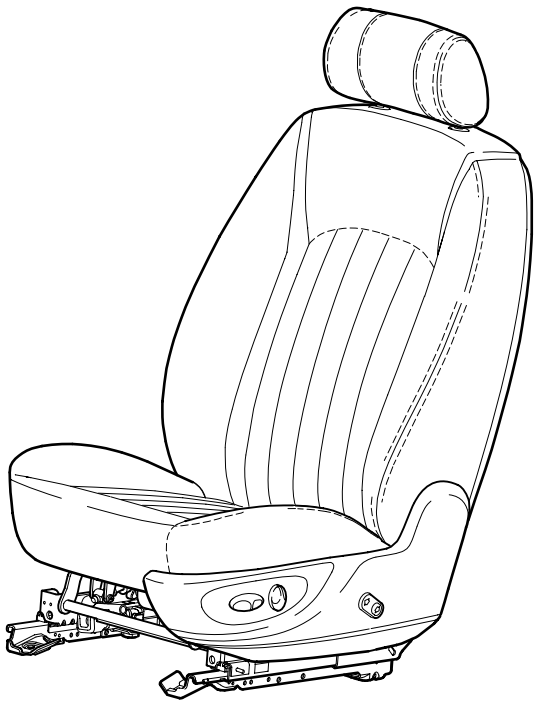
Front Seats

WARNING: Prior to seat removal and before disconnecting the seat harness (which includes airbag connectors) the vehicle battery should be disconnected and a period of at least one minute allowed to elapse. The same amount of care should be taken when handling and storing these seats as would be taken when handling and storing vehicle airbags in isolation.

The driver and passenger seats, although almost identical, have some unique components fitted: the driver's seat has a seat track position sensor and the passenger's seat has a weight-sensing system. In both instances, the components form an integral part of the occupant safety system.

NOTE: The seat cushion is an integral part of the seat weight-sensing system. Individual components of the seat weight-sensing system are not serviceable and must be replaced as a complete unit.

POWER FRONT SEAT



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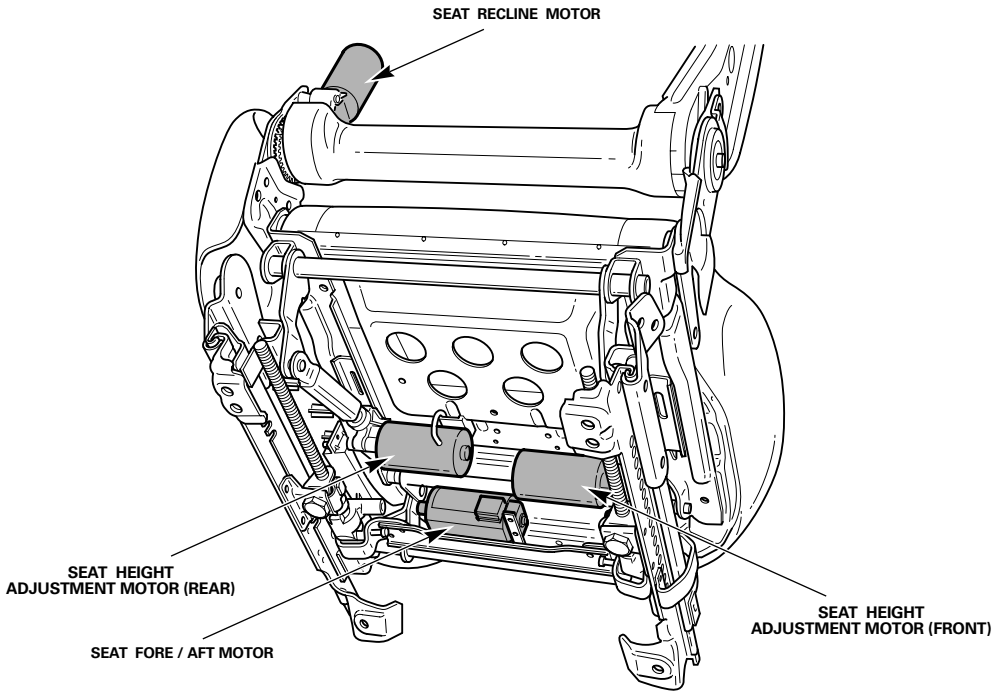
Power front seat
In addition to the standard features, depending on the vehicle specification, one or more of the following options may be available:

- Electrically adjustable seat position
- Heated seat
- Electrically adjustable lumbar support

NOTES

POWER DRIVER SEAT COMPONENT LOCATIONS



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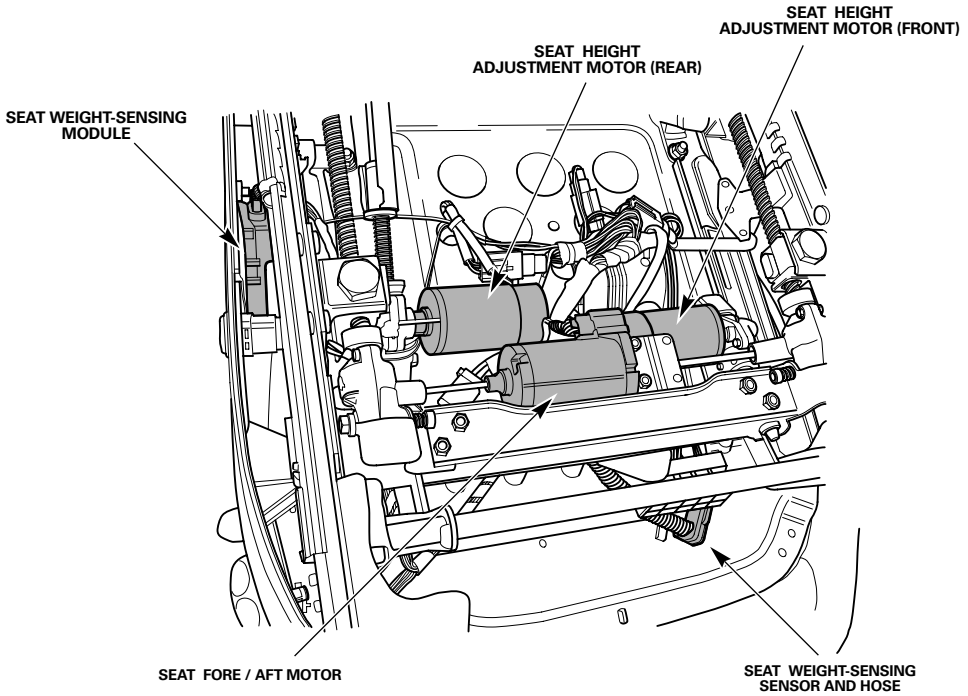
POWER PASSENGER SEAT COMPONENT LOCATIONS



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X-TYPE BODY SYSTEMS

Seats (continued)

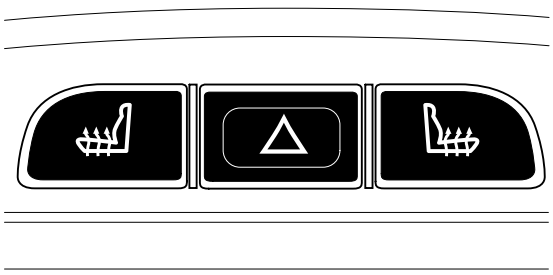
Heated Seats

The heated seat system comprises:

- Heated seat switches
- Seat back heater element
- Heated seat module
- Cushion heater element and thermostat

The heated seat function (when selected) permits the electrical heating of the seat back and cushion on the driver and front passenger seats. The heating system of each seat is selected by separate switches located at the top of the center console.

HEATED SEAT SWITCHES



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Pressing the appropriate switch facilitates the three-stage operation of the heated seat function:

- One press of the switch activates the high setting, providing a seat surface temperature of approximately 42 ˚C (107 ˚F)
- A second press of the switch activates the low setting, providing a seat surface temperature of approximately 37 ˚C (98 ˚F)
- A third press of the switch deactivates the heating function

Once the heated seat function has been activated, it will persist until one of the following conditions have been satisfied:

- A fixed period of time has expired (10 minutes)
- The function is deactivated by pressing the switch for a third time
- The ignition key is not at position II
- A malfunction is detected by the heated seat module

Confirmation that the heated seat function is active is provided by the illumination of the relevant switch:

- A yellow light indicates the low temperature setting
- A red light indicates the high temperature setting

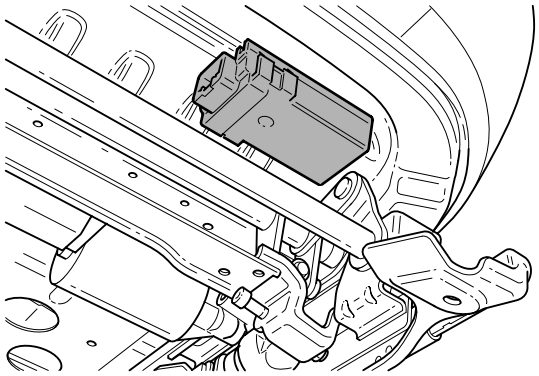
NOTE: The seat heaters are designed to operate at temperatures below a predetermined limit and therefore operation may be inhibited due to storing the vehicle in a heated garage or to body heat or warm ambient temperatures.

NOTES

Heated seat module

The module, located under the front edge of the seat, controls the seat the heating function by providing the appropriate response depending on the status of the heated seat switches. Refer to the X-TYPE Electrical Guide for detailed information.

HEATED SEAT MODULE



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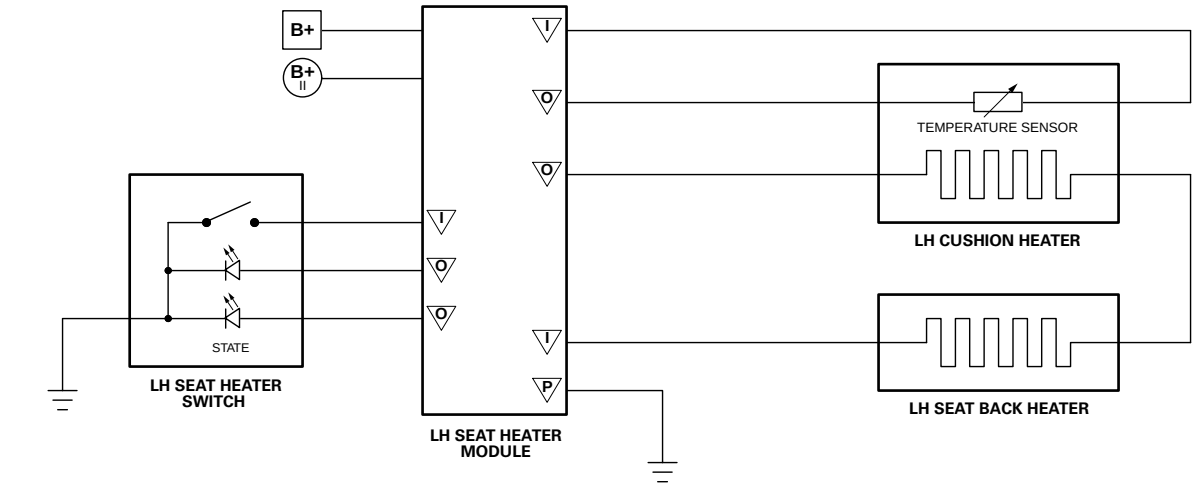
X-TYPE HEATED SEATS



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NOTES

X-TYPE BODY SYSTEMS

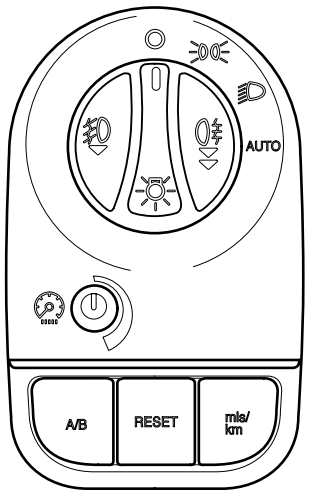
Exterior Lighting

The X-TYPE has only two major deviations from a standard exterior lighting arrangement: autolamp and high-intensity discharge headlamps (complete with automatic headlamp leveling). Exterior lighting is activated by the main lighting switch and, where appropriate, the left-hand column switch (high beam).

> **NOTE:** Due to the "warm-up time" experienced with xenon lamps, the low beam lamp is not used for the headlamp flash feature; the high beam is used instead.

Switching is via allocated fuses and relays, with the exception of the turn signal lamps / hazard warning lamps, which are controlled by the general electronic control module (GECM).

MASTER LIGHTING SWITCH



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Master Lighting Switch

The master lighting switch assembly comprises:

- Rotary switch
- Dimmer switch
- Trip computer switchpack

The rotary switch is used to activate the following:

- Side lamps
- Headlamps
- Autolamps (except Canada)
- Front fog lamps
  - The lamps are activated when the rotary switch is "pulled" to its first position, provided the side lamp or headlamp position is also selected.

  NOTE: The front fog lamps will not operate if main beam is selected.
- Rear fog lamps
  - The lamps are activated when the rotary switch is "pulled" to its second position, provided the rotary switch is not in the OFF position.

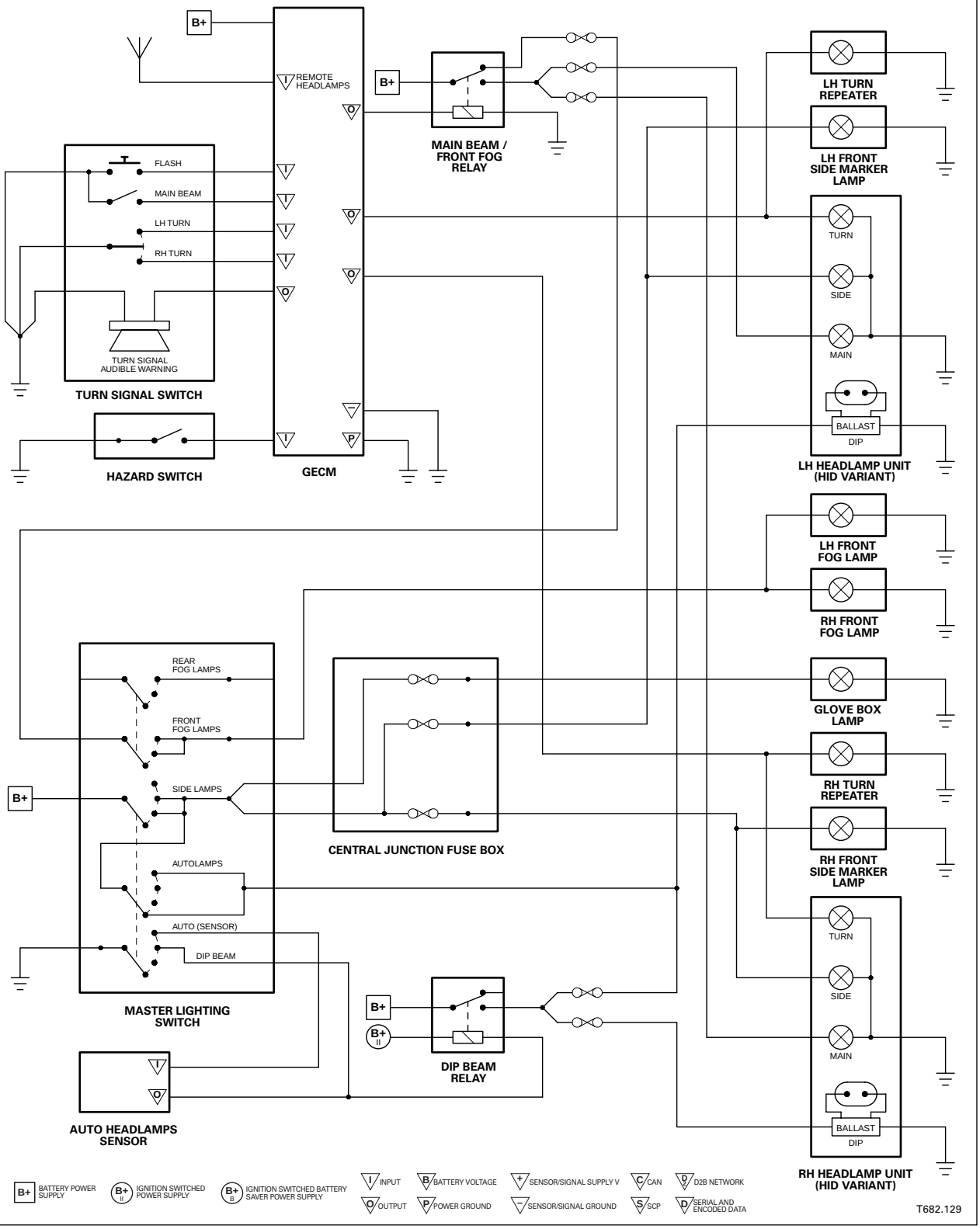
  NOTE: The front fog lamps will operate automatically when the rear fog lamps are selected provided main beam is not selected.

Halogen Headlamps

After approximately 5 minutes, a noticeable fall in light output mat be observed. The effect is due to a voltage boost feature that has been introduced. Refer to Generator and Regulator on page 5.1.8.

NOTES

X-TYPE AUTOLAMPS; HIGH INTENSITY DISCHARGE HEADLAMPS



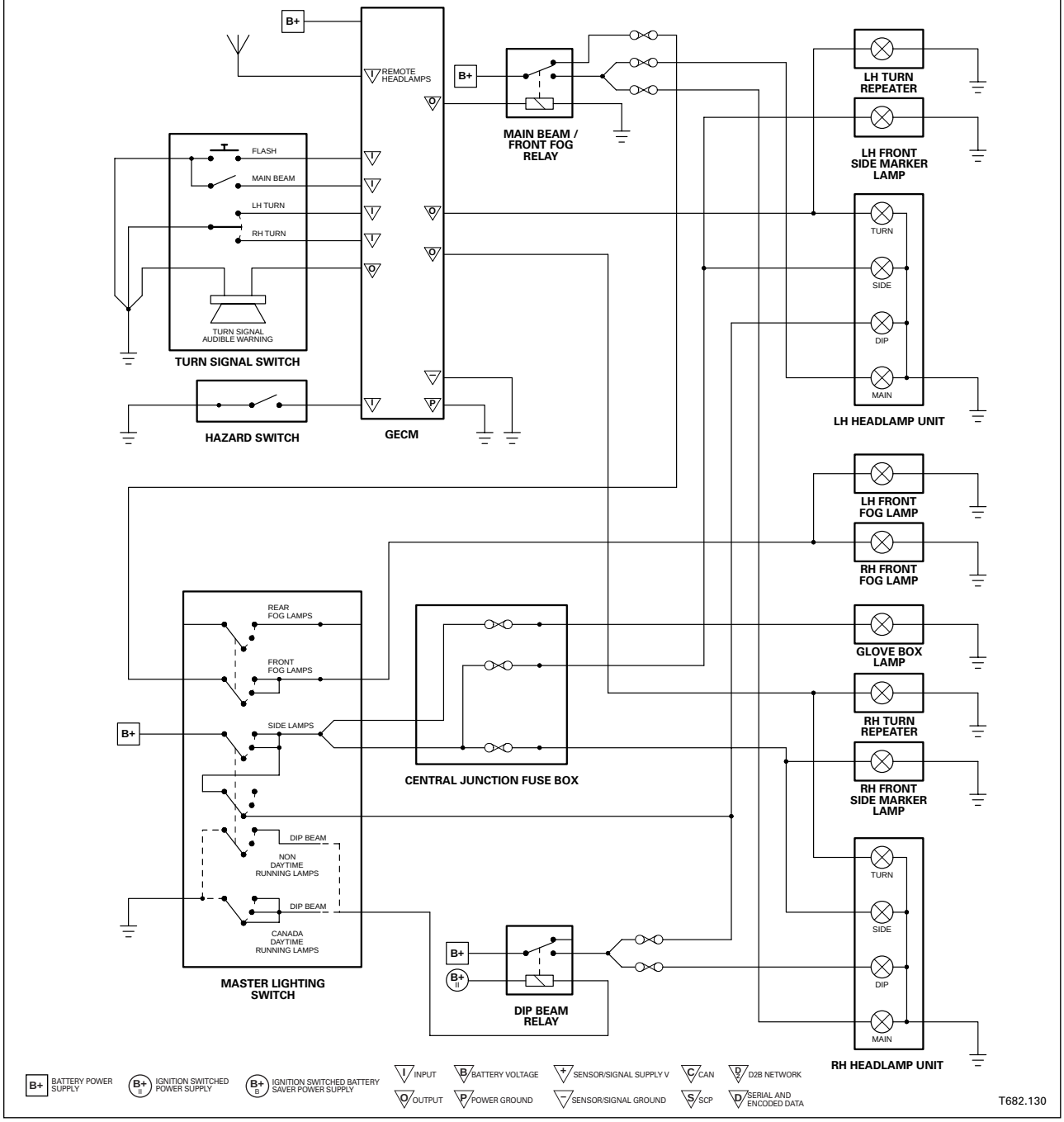
X-TYPE BODY SYSTEMS

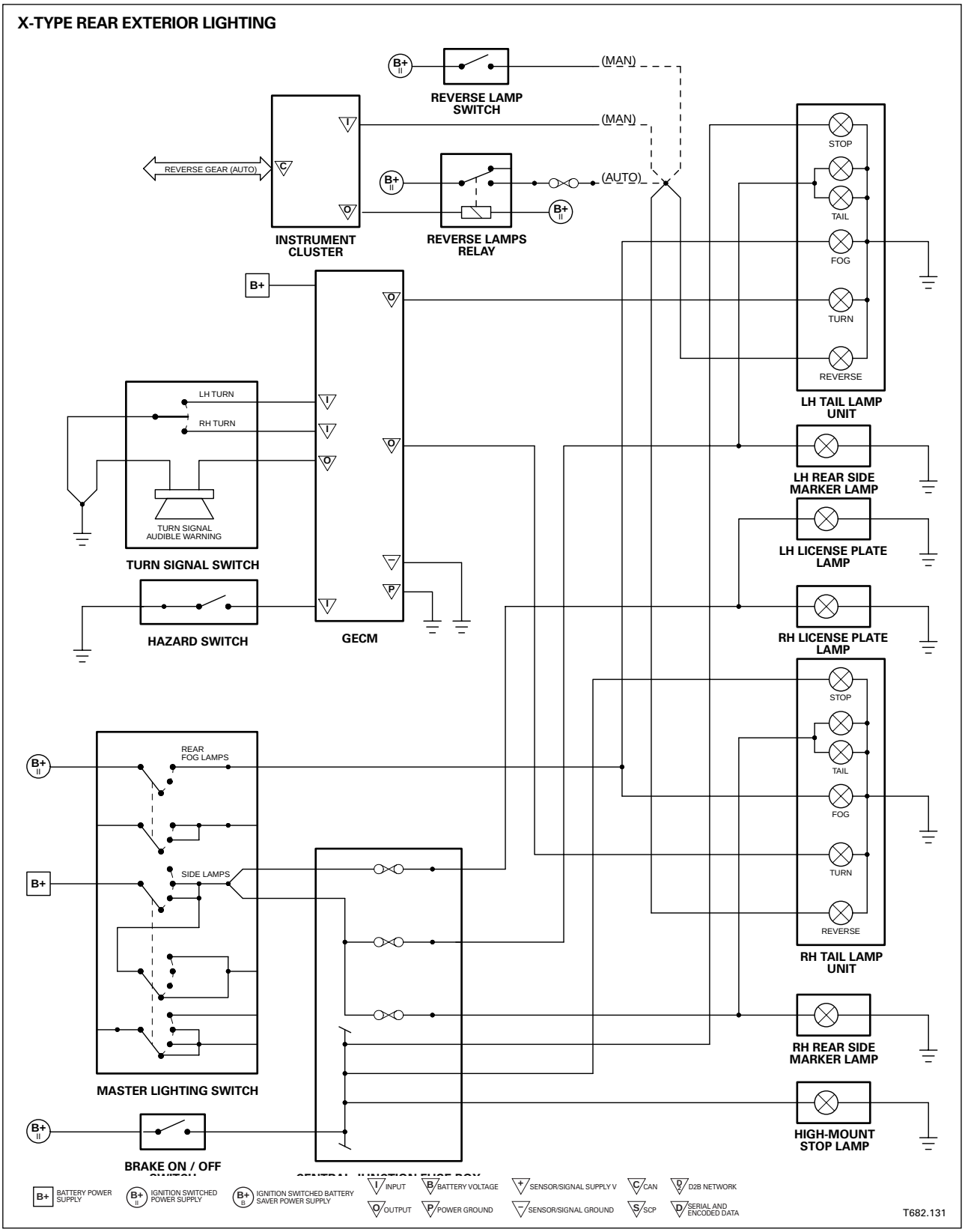
Exterior Lighting (continued)

Canada Daytime Running Lamps

The low beam circuit is used for the daytime running lamps function. All the running lights are activated including display illumination. This feature is hardwired through the master lighting switch and is not programmable using WDS. Autolamps are not available with daytime running lamps.

X-TYPE DAYTIME RUNNING LAMPS




X-TYPE REAR EXTERIOR LIGHTING
B+
II
REVERSE LAMP SWITCH
(MAN)
(MAN)
(AUTO)
REVERSE GEAR (AUTO)
C
I
O
INSTRUMENT CLUSTER
REVERSE LAMPS RELAY
B+
II
B+
B
STOP
TAIL
FOG
TURN
REVERSE
LH TAIL LAMP UNIT
LH TURN
RH TURN
TURN SIGNAL AUDIBLE WARNING
TURN SIGNAL SWITCH
HAZARD SWITCH
GECM
LH REAR SIDE MARKER LAMP
LH LICENSE PLATE LAMP
RH LICENSE PLATE LAMP
RH TAIL LAMP UNIT
REAR FOG LAMPS
SIDE LAMPS
MASTER LIGHTING SWITCH
BRAKE ON / OFF
RH REAR SIDE MARKER LAMP
HIGH-MOUNT STOP LAMP
BATTERY POWER SUPPLY
IGNITION SWITCHED POWER SUPPLY
IGNITION SWITCHED BATTERY SAVER POWER SUPPLY
INPUT
OUTPUT
BATTERY VOLTAGE
POWER GROUND
SENSOR/SIGNAL SUPPLY V
SENSOR/SIGNAL GROUND
CAN
SCP
D2B NETWORK
SERIAL AND ENCODED DATA
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X-TYPE BODY SYSTEMS

High Intensity Discharge (HID) Headlights

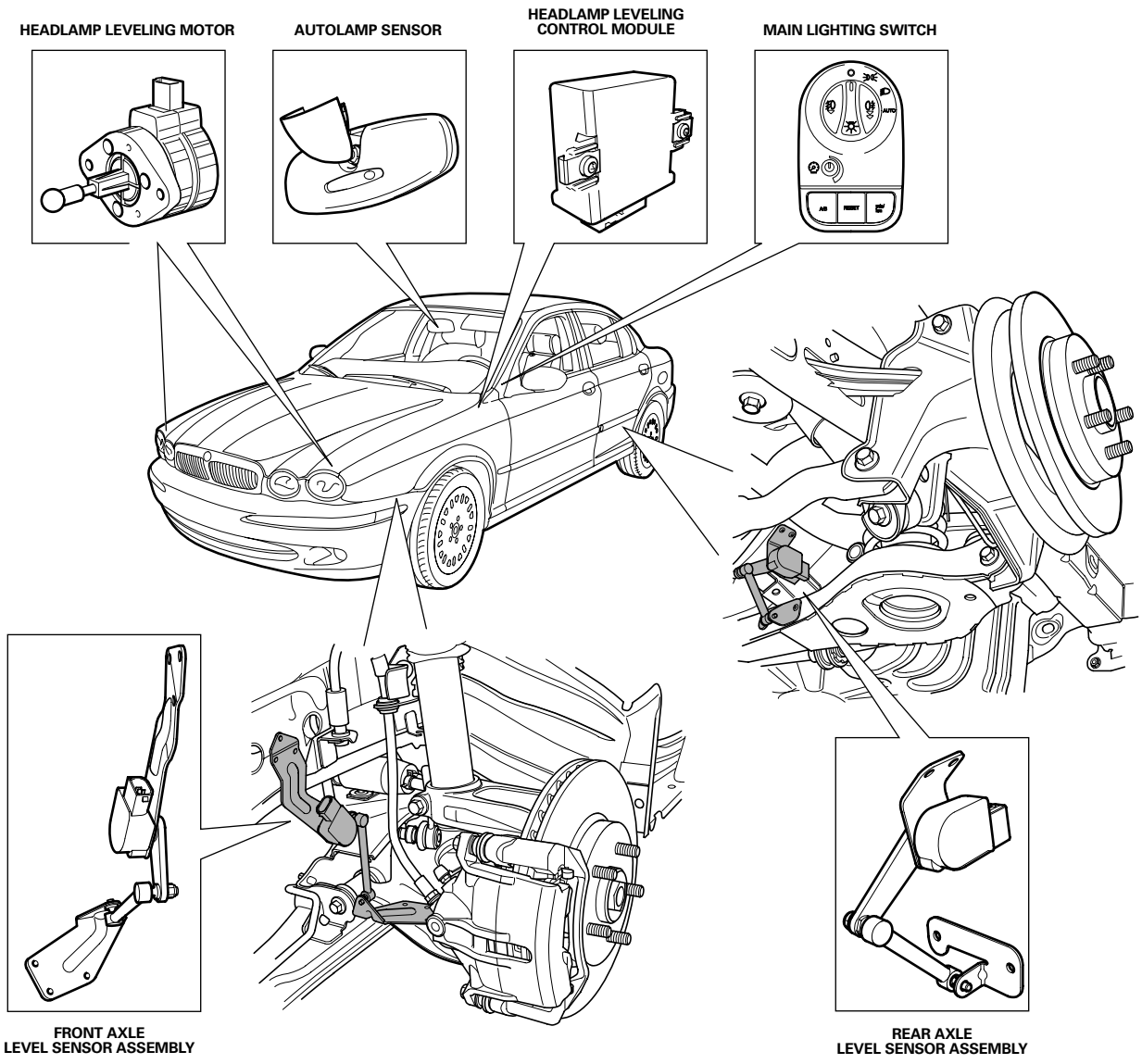
The High Intensity Discharge Headlight System provides illumination approximately twice as bright as a standard H1 halogen bulb. Because of this level of brightness, an automatic headlight leveling system has to be incorporated to prevent dazzling oncoming drivers.

HID headlights are used only for dip beams. Main beams remain halogen bulbs.

The headlight burners consist of a tube filled with xenon gas with an electrode at either end. When the lights are switched on, an electric charge is applied across the electrodes. After a brief high current phase, the lamp output is regulated to 35 W.

NOTES

HEADLAMP LEVELING COMPONENTS



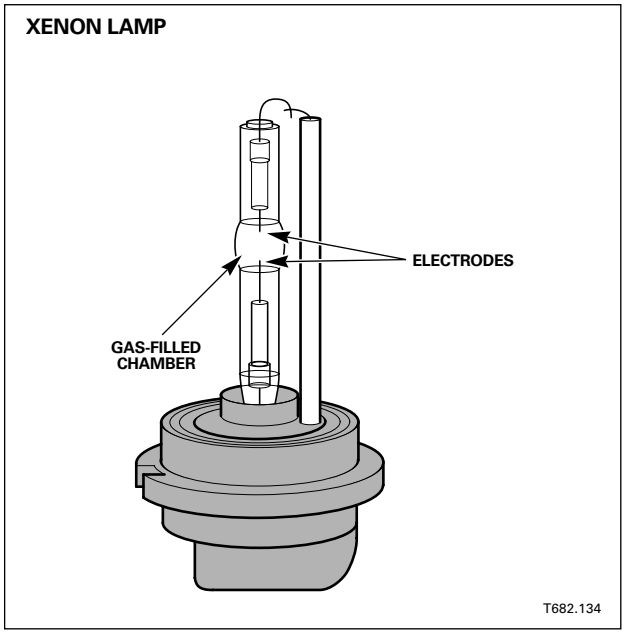
NOTES

X-TYPE BODY SYSTEMS

High Intensity Discharge (HID) Headlights (continued)

Xenon Lamp

WARNING: Electrical voltages of up to 30kV are possible at the xenon lamp; therefore, suitable safety precautions must be observed. Refer to JTIS.



The 35-watt xenon lamp produces a beam with an intensity that is approximately two times that produced by a halogen lamp of the same wattage. The chamber of the bulb contains xenon gas and a mixture of metal halide salts.

High voltage (typically 20kV) ignition is provided by the xenon lamp control module and an arc forms in the chamber as the gap between the two electrodes is bridged. After ignition there is warm-up period of approximately 3 seconds, during which the metal halide salts evaporate. This brief excess-current phase is followed by stabilization of the arc and the regulation of the lamp output at 35W by the ballast control module in each headlamp assembly.

NOTE: Unlike conventional lamps, xenon lamps do not deteriorate and so should last the lifetime of the vehicle. However, as xenon lamps age, the color tone of the light will change from blue to white.

Ballast control module

The module is a complex piece of electronics that in addition to regulating start-up and stabilizing output, provides circuit protection by recognizing malfunction conditions such as:

- Power supply deviations
- Absence of light source
- Short circuits

NOTES

Automatic Headlamp Leveling

Automatic headlamp leveling has been developed to support vehicles fitted with xenon lamps. The feature automatically maintains the headlamps within the legally required angular position to avoid dazzling other drivers as a result of vehicle acceleration, deceleration or variation in terrain.

The system comprises:

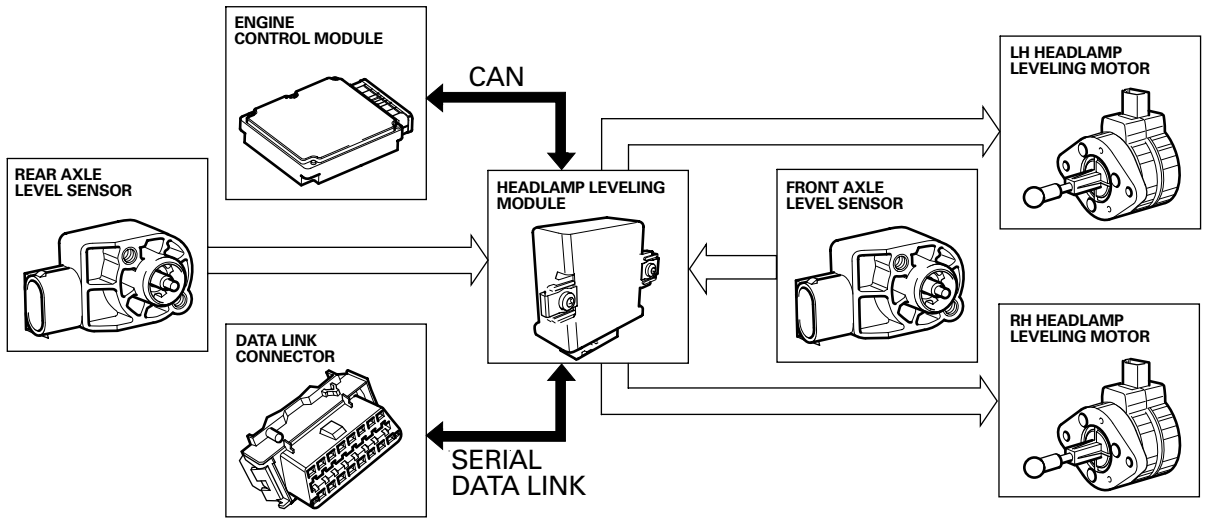
- Front axle level sensor assembly
- Rear axle level sensor assembly
- Headlamp leveling module
- LH Headlamp leveling motor
- RH headlamp leveling motor

Automatic headlamp leveling is operational when the main lighting switch is set to the headlamp, rear fog lamp or autolamp position and the ignition key is at position II. The headlamp leveling module is located at the left-hand side of the instrument panel and is accessible after removing the side and lower panels.

The axle level sensors are inductive devices that respond to the vertical position of the vehicle and supply feedback signals to the module. The module processes the data and supplies appropriate signals tot he headlamp leveling motors, causing the position of the headlamps to be adjusted accordingly.

> **NOTE:** After disconnecting any element of the automatic headlamp leveling system, recalibration will be necessary using WDS.

AUTOMATIC HEADLAMP LEVELING SYSTEM



X-TYPE BODY SYSTEMS

High Intensity Discharge (HID) Headlights (continued)

Automatic Headlamp Leveling System Operation

The control module can select from 12 different response times (filter times) depending on driving conditions such as vehicle velocity and acceleration. The system will still be responding even if the lights are switched off to ensure they are always in the correct position ready for use. The fastest response time is 0.16 seconds.

System Response Modes

Vehicle Movement	Dipped Beam Status	System Reaction Time
Stationary	OFF	Slow
	ON	Fast
Uniform Speed	OFF	Slow
	ON	Fast (reducing at higher vehicle speeds)
Acceleration or Deceleration	OFF	Slow
	ON	Fast (increasing at a higher rate change of velocity)

System Configuration

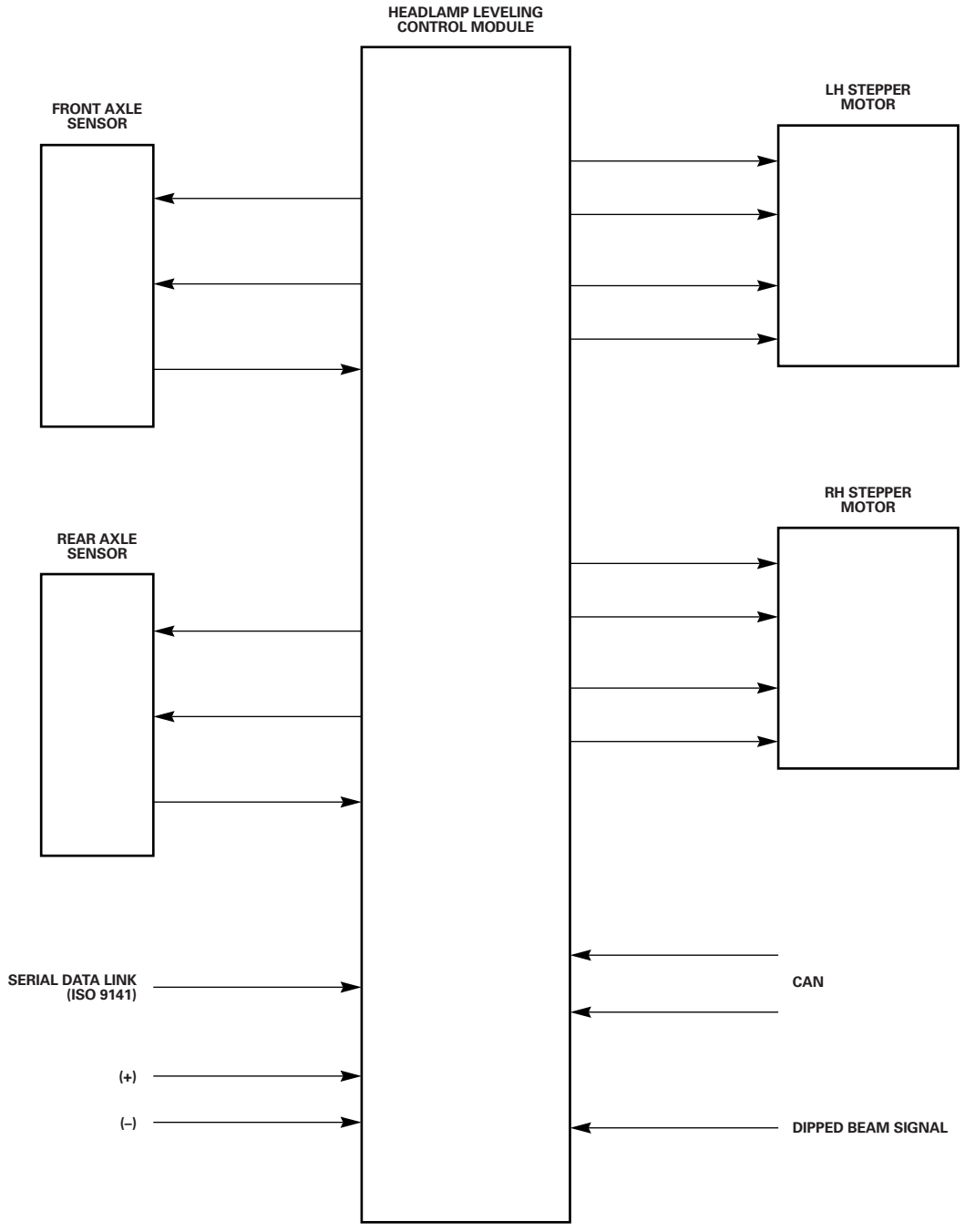
The automatic leveling system controls the inclination of the headlights about a datum position. This datum position represents the vehicle standing, unladen, on level ground. The control module is configured to this condition during vehicle assembly.

If any of the system components are replaced (headlights, sensors or control module) the system will have to be configured using WDS. For the control module, this would be done by selecting Configure New Modules from the Vehicle Configuration Main Menu. For the sensors or the headlights, this would be done by selecting Set Up and Configuration from the Vehicle Configuration Main Menu.

If the HLCM is not configured, the auto leveling function is disabled and a DTC is flagged.

NOTES

AUTOMATIC HEADLAMP LEVELING SYSTEM SCHEMATIC



X-TYPE BODY SYSTEMS

Interior Lighting

The interior lighting comprises:

- Footwell lamps
- Front interior lamp and switch
- Map lamps and switches
- Vanity mirror lamps and switches Rear interior lamp and switch
- Puddle lamps
- Luggage compartment lamp and switch
- Glovebox lamp and switch

Except for the glovebox lamp, which receives battery supply voltage only when the main lighting switch is active, all lamps receive battery supply voltage via the battery saver relay (located in the central junction fuse box).

The glovebox lamp and luggage compartment lamp have direct ground returns. The courtesy lamps have a separate ground return via the GECM. All other interior lights receive a ground return via the GECM in the form of a controlled signal that provides progressive illumination and deactivation during normal operation. Refer to the X-TYPE Electrical Guide for detailed connection information.

Battery Saver

A timer function within the GECM controls the battery saver relay:

- The timer is initialized when the ignition key is turned to position ‘O’ or ‘I’.
- After a 30-minute period, the GECM will deactivate the battery saver relay, which will remove the battery voltage from all interior lighting and the warning chime feature.

The GECM will reactivate the battery saver relay when:

- The ignition key position is changed
- Any door (including the trunk lid) becomes ajar or is opened
- An external unlock is activated using either the door lock cylinder or the key fob transmitter.

Courtesy Lighting

The courtesy lamps are controlled by the general electronic control module in the following circumstances:

- Any of the vehicle’s doors are open
- An external unlock is activated using either the door lock cylinder or the key fob transmitter

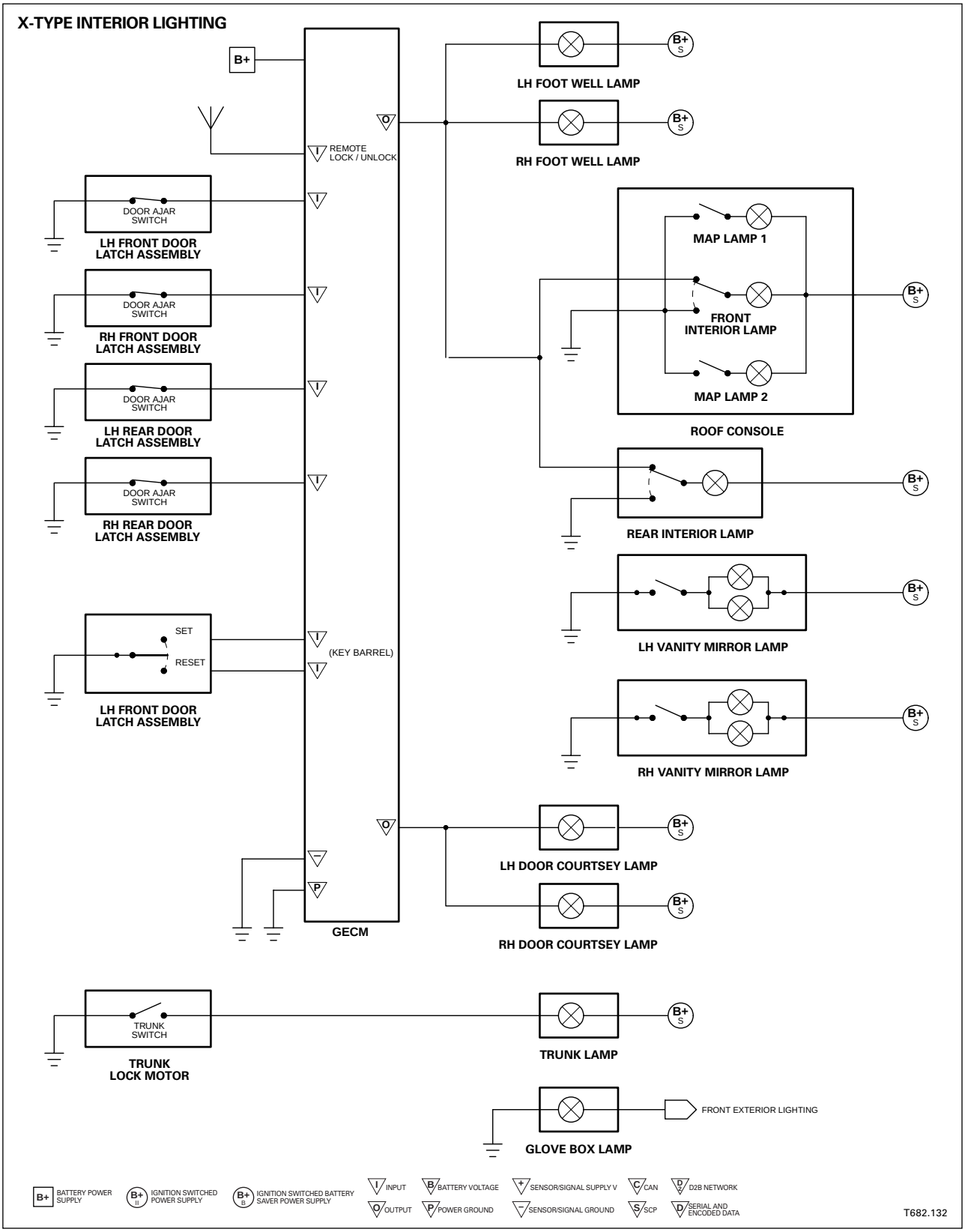
The courtesy lighting feature extinguishes the courtesy lamps when all the vehicle’s doors are closed and any of the following occurs:

- Twenty-five seconds has elapsed since either an external unlock or the last door has closed, whichever occurs last.
- The ignition key is turned from position ‘I’ or ‘O’ to position ‘II’ or ‘III’
- An external lock is activated using the door lock cylinder or the key fob transmitter

In addition, the courtesy lighting feature extinguishes the courtesy lamps when the battery saver relay timer has expired.

During normal operation (but not when switched manually) the courtesy lamps:

- Progressively illuminate when activated
- Progressively extinguish when deactivated


X-TYPE INTERIOR LIGHTING
B+
GECM
REMOTE LOCK / UNLOCK
DOOR AJAR SWITCH
LH FRONT DOOR LATCH ASSEMBLY
RH FRONT DOOR LATCH ASSEMBLY
LH REAR DOOR LATCH ASSEMBLY
RH REAR DOOR LATCH ASSEMBLY
SET
RESET
(KEY BARREL)
LH FRONT DOOR LATCH ASSEMBLY
TRUNK SWITCH
TRUNK LOCK MOTOR
LH FOOT WELL LAMP
RH FOOT WELL LAMP
MAP LAMP 1
FRONT INTERIOR LAMP
MAP LAMP 2
ROOF CONSOLE
REAR INTERIOR LAMP
LH VANITY MIRROR LAMP
RH VANITY MIRROR LAMP
LH DOOR COURTSEY LAMP
RH DOOR COURTSEY LAMP
TRUNK LAMP
GLOVE BOX LAMP
FRONT EXTERIOR LIGHTING
BATTERY POWER SUPPLY
IGNITION SWITCHED POWER SUPPLY
IGNITION SWITCHED BATTERY SAVER POWER SUPPLY
INPUT
OUTPUT
BATTERY VOLTAGE
POWER GROUND
SENSOR/SIGNAL SUPPLY V
SENSOR/SIGNAL GROUND
CAN
SCP
D2B NETWORK
SERIAL AND ENCODED DATA
T682.132

X-TYPE BODY SYSTEMS

Instrumentation

Instrument Cluster

The instrument cluster:

- Provides multiplex network gateway functionality for CAN and SCP. Refer to Multiplexing.
- Includes the PATS control functions.
- Processes the speed-sensitive steering inputs.

The instrument cluster comprises four gauges, warning lamps and a dot-matrix message center.

Vehicles fitted with the message center have two warning lamps – one red, the other amber – located above the message center. The warning lamps alert the driver to the status of the warning message simultaneously displayed:

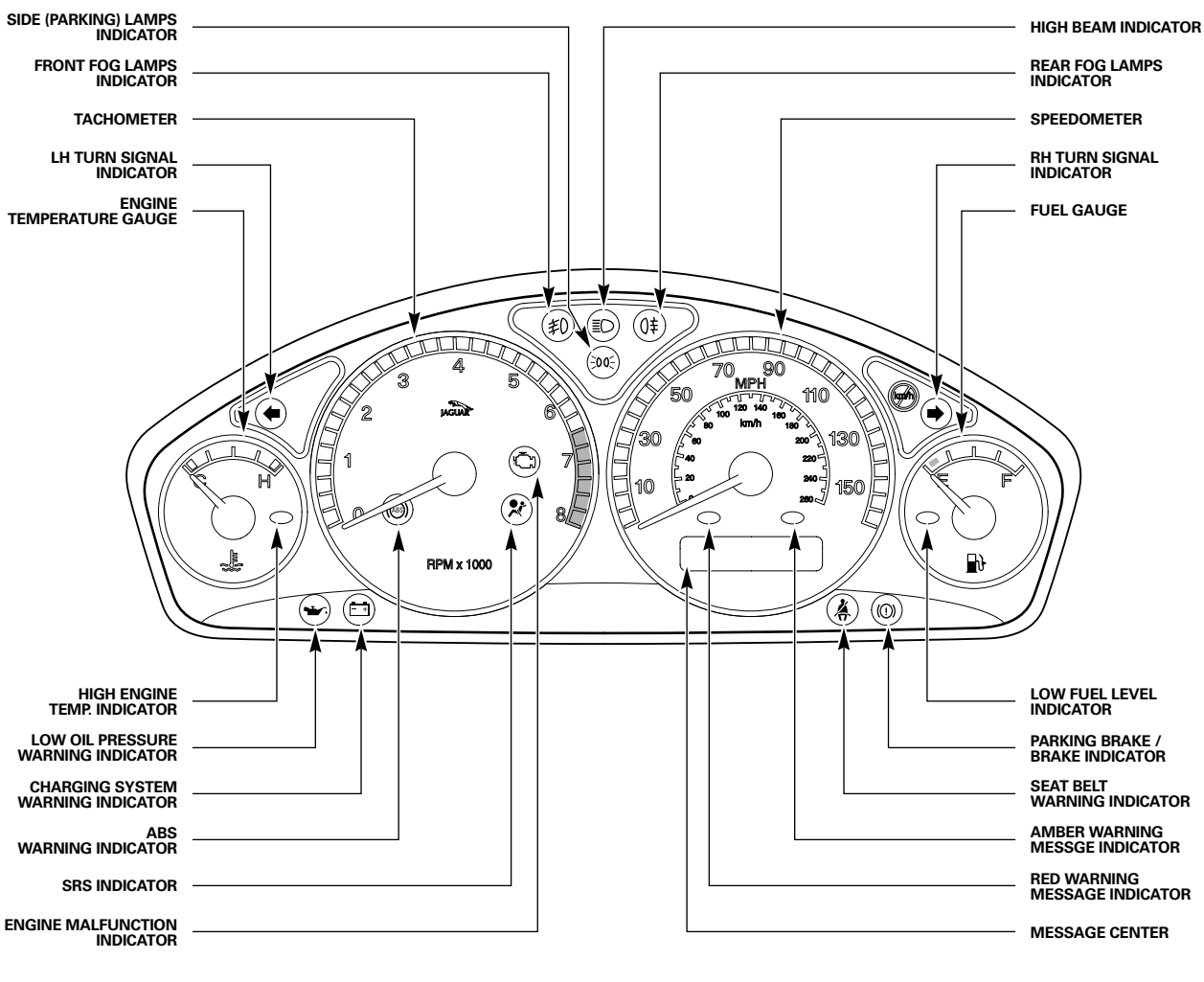
- The 'RED' warning lamp indicates a primary warning message that requires immediate investigation by the driver or a Jaguar Dealer.
- The 'AMBER' warning lamp indicates a secondary warning message requiring:
  - Appropriate response by the driver
  - The reporting of any associated malfunction to a Jaguar Dealer at the earliest opportunity.

The following warnings do not illuminate indicators on the instrument cluster, but instead display the appropriate text via the message center:

- Transmission fault
- Door ajar warnings
- Low washer fluid
- Traction control warning
- Cruise control
- Low outside temperature (latched and unlatched)

NOTES

INSTRUMENT CLUSTER



NOTES

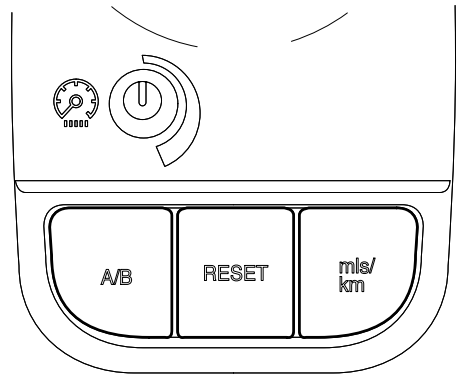
X-TYPE BODY SYSTEMS

Instrumentation (continued)

Odometer

Odometer readings will be displayed by the message center. The trip reading is reset by pressing the switch at the end of the LH column stalk for longer than 2 seconds.

TRIP COMPUTER CONTROL SWITCHES



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Trip Computer (where applicable)

The trip computer is an integral part of the instrument cluster and is controlled by the three switches located at the bottom of the main lighting switch.

Selection of A or B switches permits the tracking of two separate journeys. The following calculations and readings are possible for both journeys:

- Trip distances
- Average fuel economy
- Average speed
- Range

Pressing the switch at the end of the LH column stalk will cycle the trip computer information and messages. The reset button is used to reset/clear the currently displayed trip computer.

NOTES

Information and Message Center

The message center (where fitted) is a dot-matrix type comprising 14 lines in 2 character rows with each character consisting of 5 x 7 dots.

NOTE: The message center is an integral part of the instrument cluster and cannot be serviced separately.

The primary function of the message center is to provide the driver with text messages including:

- Warnings
- Temporary alerts
- General information

The message center also displays messages for the benefit of the service technician.

Multiple messages will cycle in order of priority until they either expire or are cleared (temporary alerts) from the display. Warning messages are suppressed temporarily while the message center is cycling.

Warning Devices

The warning device system uses the GECM to control audible and visual warnings for the benefit of the driver and occupants. Warnings are associated with the following:

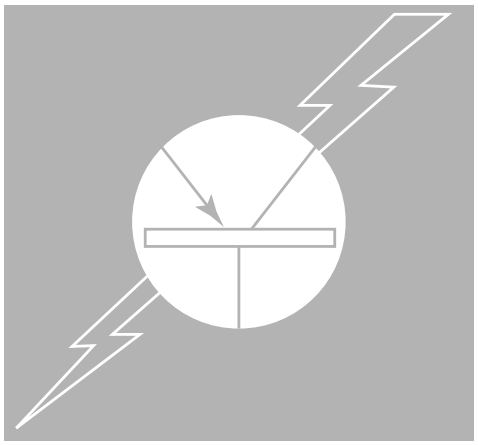
- Key-in ignition warning switch
- Door ajar switches (including trunk and engine compartment)
- Seat belt sensor
- Headlamp switch
- SRS malfunctions
- J-gate park switch (where applicable)

The driver audible warnings sounder is integral to the GECM.

The visual warnings, where appropriate, are displayed via the instrument cluster using illuminated icons or the message center. Refer to Instrument Cluster.

NOTES

ADVANCED JAGUAR ELECTRICAL SYSTEMS



Service Training Course T682
DATE OF ISSUE: 02/15/2002

X-TYPE SECURITY SYSTEMS

Security System Configuration

Feature	Note
Horn chirp confirmation	Standard – Dealer programmable using WDS
Drive away door locking	Standard – Dealer programmable using WDS
Auto re-locking	Optional – Dealer programmable using WDS

Locking Functions

NOTE: If the door latches are activated more than 16 times in a 20 second period, or the trunk latch is activated more than 8 times in a 20 second period, all power locking will cease for 20 seconds to prevent latch overheating.

Central Locking

The central locking locks all the doors so that they cannot be opened from outside the vehicle. The central locking feature can be activated when one of the following events occurs when the ignition key is out and all the doors are closed:

- The driver's door lock cylinder is rotated to the lock position.
- The lock button on the remote keyhead is pressed once. (The key must be out of the ignition.)

Central locking can also be activated by pushing the front interior door handle (paddle) to the lock position, independent of the ignition switch position.

If one of the doors is ajar when the central locking feature is activated via the interior door handle, then all doors will become unlocked. If one of the doors is ajar when the central locking feature is activated via the driver's door lock cylinder, then all doors will become locked. No locking / unlocking occurs if a door is ajar and the remote control is used. Five flashes of the direction indicators and 2 horn chirps will signal a closure is ajar.

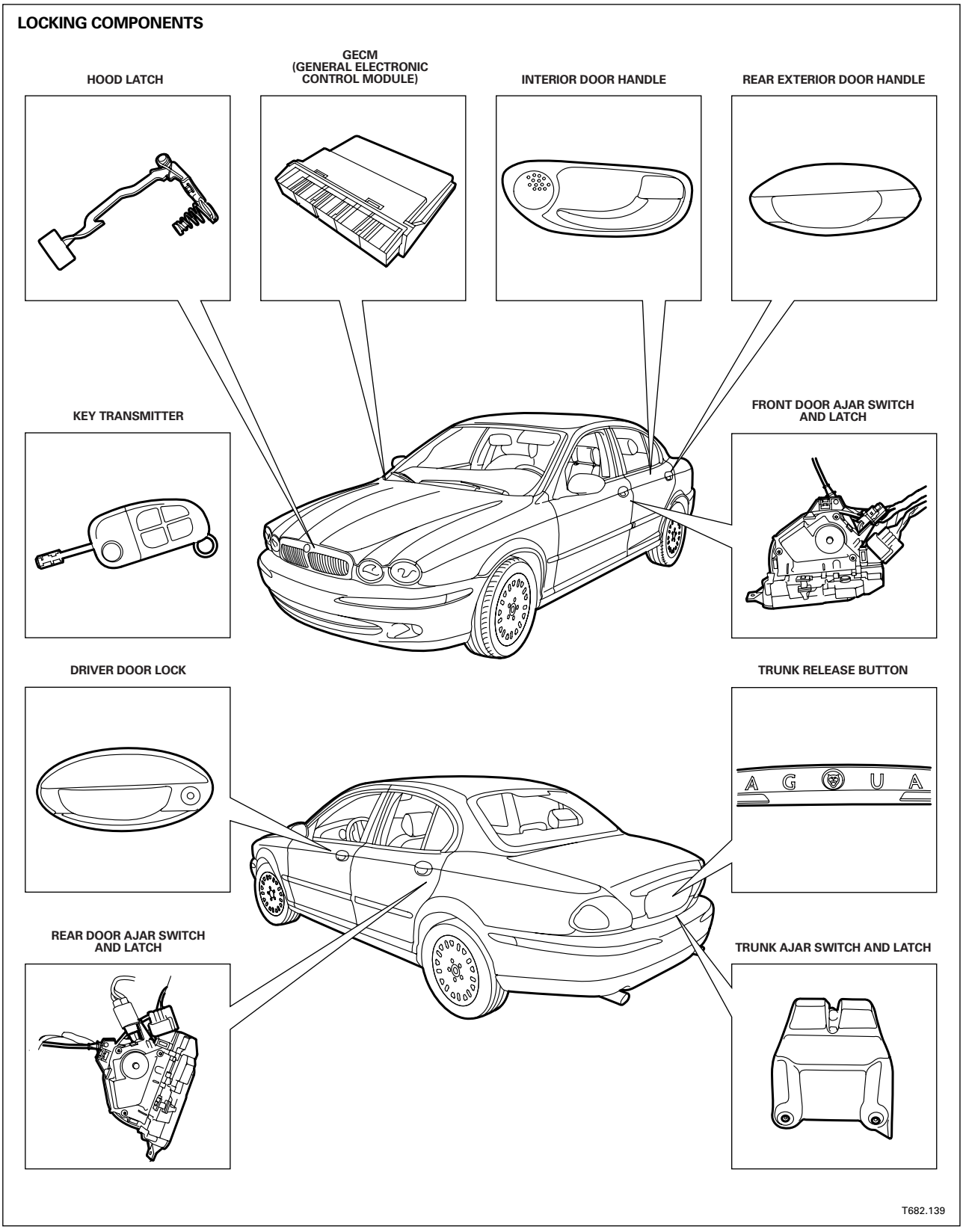
Auto Locking (Drive-Away Locking)

The auto locking feature automatically central locks the vehicle if the ignition is in run or start. All doors must be closed and the vehicle speed must exceed 7 km/h (5 mph) (via CAN and SCP) for the feature to operate. If the customer unlocks the car this feature would only auto lock the car again after:

- Ignition was turned off and on again, or
- A door is opened and closed.

This feature is the same for manual and automatic transmission vehicles.

NOTES


LOCKING COMPONENTS
HOOD LATCH
GECM
(GENERAL ELECTRONIC
CONTROL MODULE)
INTERIOR DOOR HANDLE
REAR EXTERIOR DOOR HANDLE
KEY TRANSMITTER
FRONT DOOR AJAR SWITCH
AND LATCH
DRIVER DOOR LOCK
TRUNK RELEASE BUTTON
REAR DOOR AJAR SWITCH
AND LATCH
TRUNK AJAR SWITCH AND LATCH
T682.139

X-TYPE SECURITY SYSTEMS

Locking Functions (continued)

Central Unlocking

The central unlocking feature automatically unlocks all of the vehicle's doors when the following occurs:

- The door lock cylinder is rotated to the unlock position twice, if single door unlocking is enabled or once, if single door unlocking is disabled.
- The unlock button on the remote keyhead is pressed twice within 3 seconds, if single door unlocking is enabled, or once if single door unlocking is disabled.
- A front interior door handle is pulled to the unlock position, only if the vehicle was central locked.

  NOTE: If a rear door handle is pulled, the vehicle is not centrally unlocked; only that door is unlocked.

  NOTE: The customer can change between central unlocking and single door unlocking (and back again when necessary) by pressing the lock and unlock buttons on the remote keyhead simultaneously for 4 seconds. Acknowledgment is provided by 2 flashes of the turn signal indicators.

Auto Relocking

The system automatically central locks the vehicle (and consequently arms the antitheft feature) following a remote control unlock if no door was opened or if the ignition remained in the off position for 45 seconds.

Trunk Lid Release

The trunk can be released by using the exterior trunk release button or the release button on the remote control keyhead when:

- The remote keyhead trunk release button is pressed twice (only with ignition in off or accessory) when the vehicle speed is less than 7 kph (5 mph).
- The exterior trunk release button on the trunk lid is pressed when the car is unlocked, security is disarmed and the vehicle speed is less than 7 kph (5 mph).

There is no valet mode.

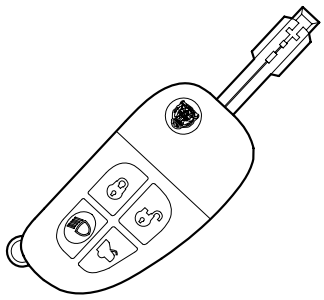
NOTES

Remote Control Keyhead

The remote control keyhead is operational when the key is removed from the ignition. The remote control feature allows the customer to activate a number of vehicle features remotely, including:

- Unlocking the vehicle doors (single or central unlock).
- Locking the vehicle doors (central locking).
- Trunk lid release.
- Panic button.
- Headlight convenience feature.

REMOTE CONTROL KEYHEAD



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The Radio frequency (RF) operation is suspended 22 days after the last valid RF signal is received. This is reactivated by the change of state of any of the latch switches (for example, door ajar, lock / unlock, and so on.). After 22 days the customer can not use any RF feature until the RF operation is reactivated.

NOTE: Changing the remote control's battery will not affect its operation.

Panic Button

When the remote keyhead transmitter headlight convenience button is pressed 3 times within 3 seconds, with the ignition off, the vehicle alarm will trigger giving audible and visual warnings. The vehicle alarm will continue until the normal alarm cycle has been completed.

NOTE: The vehicle doors will not automatically unlock, if previously locked, when the panic button is activated.

If the headlight convenience button is pressed again 3 times within 3 seconds, the ignition key is turned to Run / Start or the unlock button on the remote transmitter is pressed, or the sounding period is completed, the alarm will cease.

Headlight Convenience

When the remote keyhead transmitter headlight convenience button is pressed with the ignition off, the high beam will be driven until either 30 seconds has passed or the headlamp convenience button is pressed again.

NOTES

X-TYPE SECURITY SYSTEMS

Locking Functions (continued)

Global / Remote Closing

Global closing of windows and sunroof (sunroof) will be initiated from the driver's door lock and the remote key-head with the key out of the ignition. To initiate global close, the operator will turn the key in the driver's door lock to the "lock" position and hold it for longer than 1.5 seconds. The windows and sunroof will then begin their closing operation.

The global close operation will continue until:

- The operator releases the key in the driver's door lock from the lock position or moves the key to the unlock position.
- A stall or pinch condition is detected, causing the affected window / sunroof to cease movement.

During a global close operation, should a window / sunroof fully close or an obstacle be detected, power will be removed from the window / sunroof, causing movement to cease. The remaining windows / sunroof will continue to close.

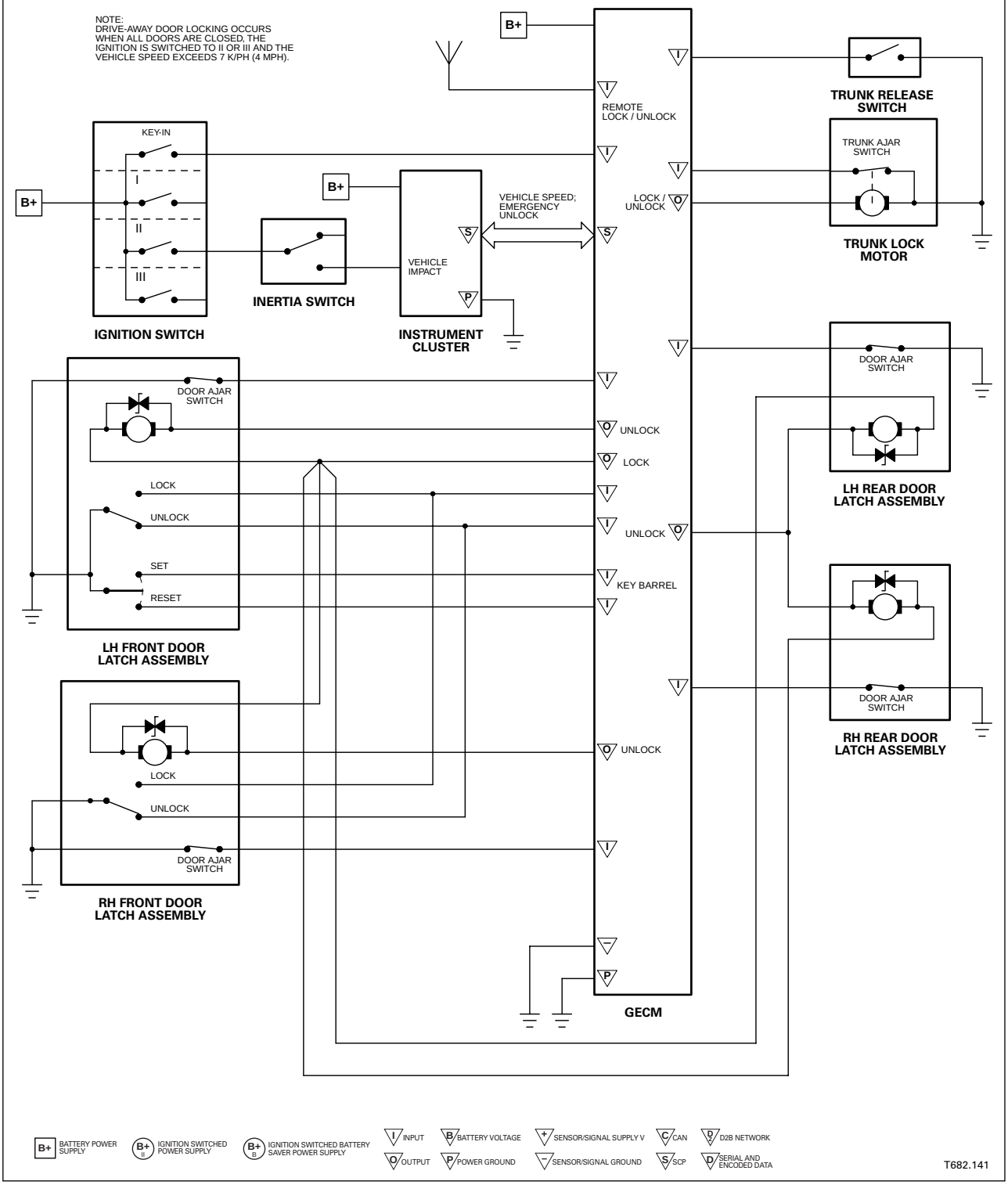
Remote global close will be initiated from the key fob where the "lock" button should be pressed and held for 1.5 seconds to initiate global close. To stop global close before the windows / sunroof are fully closed, release and press the lock button again.

Global / Remote Opening

This facility is not available.

NOTES

X-TYPE LOCKING



X-TYPE SECURITY SYSTEMS

Anti-Theft System Operation

The antitheft feature provides an audible and visual alarm at the exterior of the vehicle when unauthorized access to the vehicle via the doors, hood, or trunk is detected, the radio is removed, or the ignition transitions to run or start without a valid PATS key, while the system is armed. The visual alarm consists of the vehicle's exterior turn / hazard lamps (direction indicators). The audible alarm utilizes the vehicle horn.

The anti-theft system contains the following functions:

- Arming the anti-theft system.
- Disarming the anti-theft system.
- Alarm activation.
- Security status indicator / PATS.
- Security horn.

General Requirements

If a full alarm is in progress and an additional alarm trigger becomes "active," it will be ignored.

The cause of the last eight full alarms are stored in a non-volatile memory for diagnostic purposes (via WDS).

When the battery is connected (or it is disconnected then reconnected), the anti-theft system immediately enters the armed state that it was in when the battery was disconnected and assumes normal functionality.

Arming the Anti-Theft System

If the anti-theft system is in normal operation mode, the anti-theft system will enter a "prearm" phase if the ignition is not in the Run or Start position and the vehicle is locked (central lock or double lock) either via the door key barrel or the RF transmitter.

The prearm phase is a 20 second delay period that allows the customer time to open and close any door, hood, or trunk lid without triggering an alarm.

The anti-theft system will fully arm after the prearm phase. At this point, each input that is in the secure state (for example, driver's door closed) is armed and capable of triggering an alarm. Any input (doors, trunk, hood) which is NOT in the secure state (for example, passenger door is ajar) will be suspended and will not be capable of activating an alarm. Once a suspended input returns to its secure state (for example, passenger door transitions from ajar to closed), it becomes armed and ready to trigger the alarm.

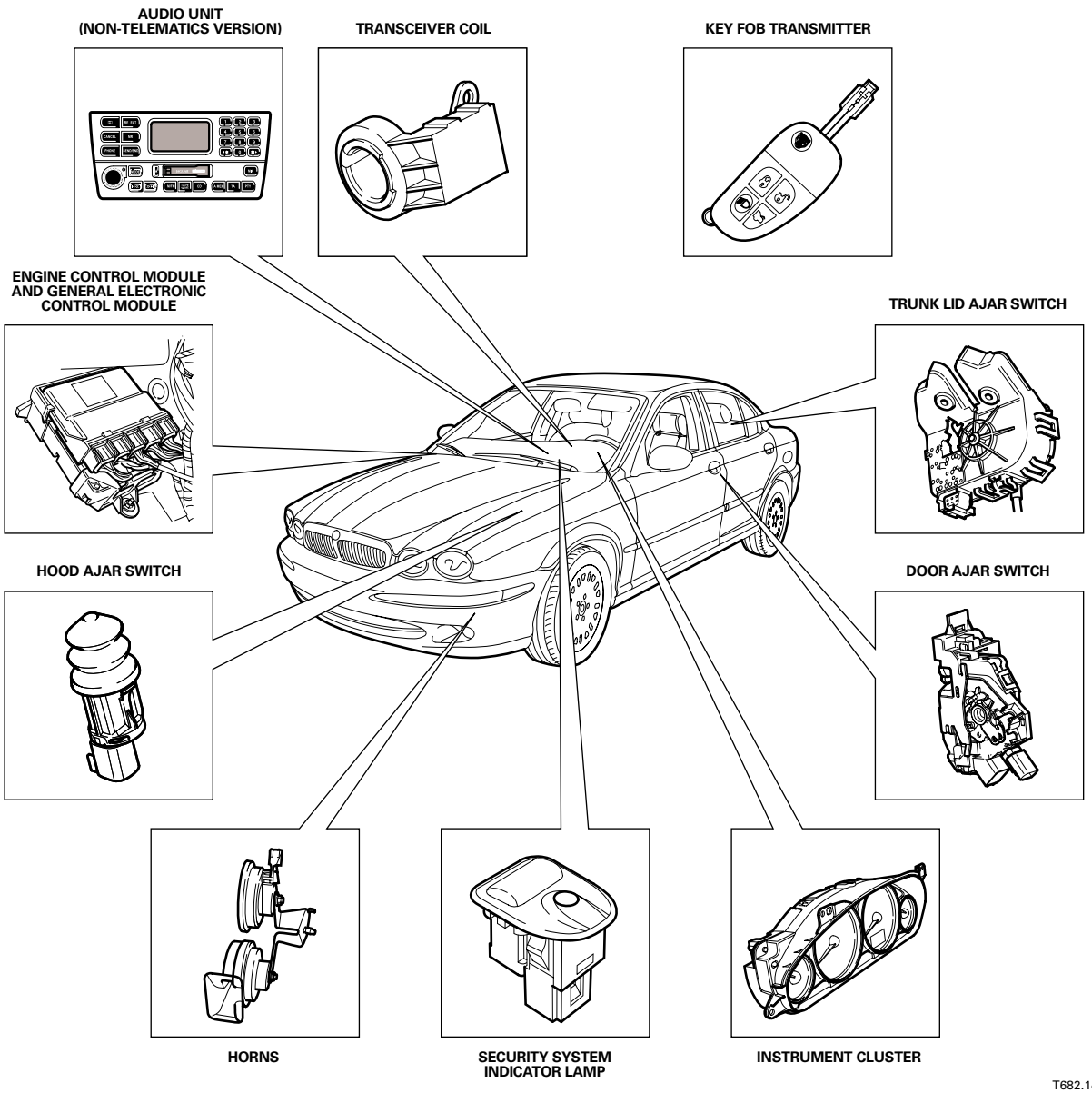
Audible and visual feedback is provided to the customer on arming of the anti-theft system, depending on the security status.

If the vehicle is central locked (vehicle doors, trunk, hood, radio, and ignition switch are the only active alarm triggers), the turn signal indicators will flash on for 250 ms. If the lock button of the transmitter is pressed a second time, there will be a short chirp from the vehicle horns (this feature is dealer selectable).

If any closure (door, trunk or hood) is ajar when the anti-theft system arms, then the security arm error visual indications will be generated (5 short flashes – 250 ms – of the turn signal indicators and two short horn chirps). Subsequently, when the last closure is closed, the security arm flash will be generated to indicate a secure vehicle, as it did previously.

The security LED will flash at 0.6 Hz (5% duty cycle) when the anti-theft system is prearmed or armed.

ANTI-THEFT SYSTEM COMPONENTS



NOTES

X-TYPE SECURITY SYSTEMS

Anti-Theft System Operation (continued)

Disarming the Anti-Theft System

When prearmed, armed, or active, the security system will disarm when one of the following events occur:

- The RF transmitter unlocked button is pressed to unlock at least one door.
- A valid PATS transponder is read in the ignition barrel when the key is turned to the Run position.
- A door key barrel requests at least one door to unlock (if door barrel disarming is enabled).

The interior door paddles will not disarm the anti-theft system. Upon disarming, any audible or visual warning associated with full alarm or panic alarm will be stopped and the security LED will stop flashing. When the anti-theft system is disarmed, all the turn signals will give two short flashes.

Trunk Lid Disarm

If the trunk lid is released via the RF transmitter trunk release button, the trunk ajar input to the security system will be suspended and interior scanning turned off. The trunk must be closed and the 20 second prearm timer expired before the trunk input and interior scanning system become armed and again ready to trigger the alarm. When the trunk is released in this fashion, the security LED functionality will not be affected.

Alarm Activation

When the anti-theft system is in the armed state, it will generate a full alarm sequence when one of the following alarm causes becomes active:

- Any door, the trunk, or the hood becomes ajar (except as described in trunk disarm).
- The radio is removed; that is, radio sense changes from radio present to radio not present.
- A valid PATS transponder is not read within one second of the ignition position becoming RUN.
- Diagnostic access is attempted.

If the same alarm cause is active when the full alarm period completes, then the anti-theft system will generate repeated full alarm cycles separated with a pause of ten seconds.

The maximum number of successive repeats that can be generated for a maintained cause is nine (ten full alarms in total).

If the alarm cause becomes inactive during a repeat full alarm, then that full alarm cycle will run to conclusion, unless the anti-theft system is disarmed, and no further repeats will be generated from that particular event. If the cause becomes inactive during a ten second pause, then the repeat sequence will cease.

If another alarm cause becomes active during the repeat alarm sequence, it will be ignored, even if it remains active after the nine repeats conclude. This definition is an extension to the requirement to ignore additional alarm causes when a full alarm is in progress.

An exception to this definition exists when the option for Door Key Barrel Disarming is disabled from the security options. In this case there is a 15 second delay from the time that the driver's door is opened before the full alarm is generated if the vehicle was unlocked via the driver's door key barrel. During the 15 seconds, the anti-theft system can be disarmed via the remote entry device or a valid read of the PATS transponder. If any passenger door is opened before the driver's door, after the driver's key barrel is used to unlock the vehicle, then the alarm will sound immediately. During the 15 seconds, an entry delay audible warning will sound.

When the PANIC feature is activated, the audible and visual alarms will both be driven a full alarm cycle. Disarming or operating the PANIC feature for a second time will stop the panic alarm.

Programming a Radio Frequency Transmitter

The ignition must be cycled between Run and Accessory four times. It is important to end the cycle in the Accessory position. This procedure starts the programming mode, which is indicated by a chime from the GECM.

The key must be removed from the ignition. After it is removed, press any button on the RF transmitter within 10 seconds. If the RF transmitter has been accepted, the GECM emits a chime. To program further RF transmitters, press any button on the RF transmitter concerned within 10 seconds of the previous entry. Up to 4 RF transmitters can be programmed to the GECM.

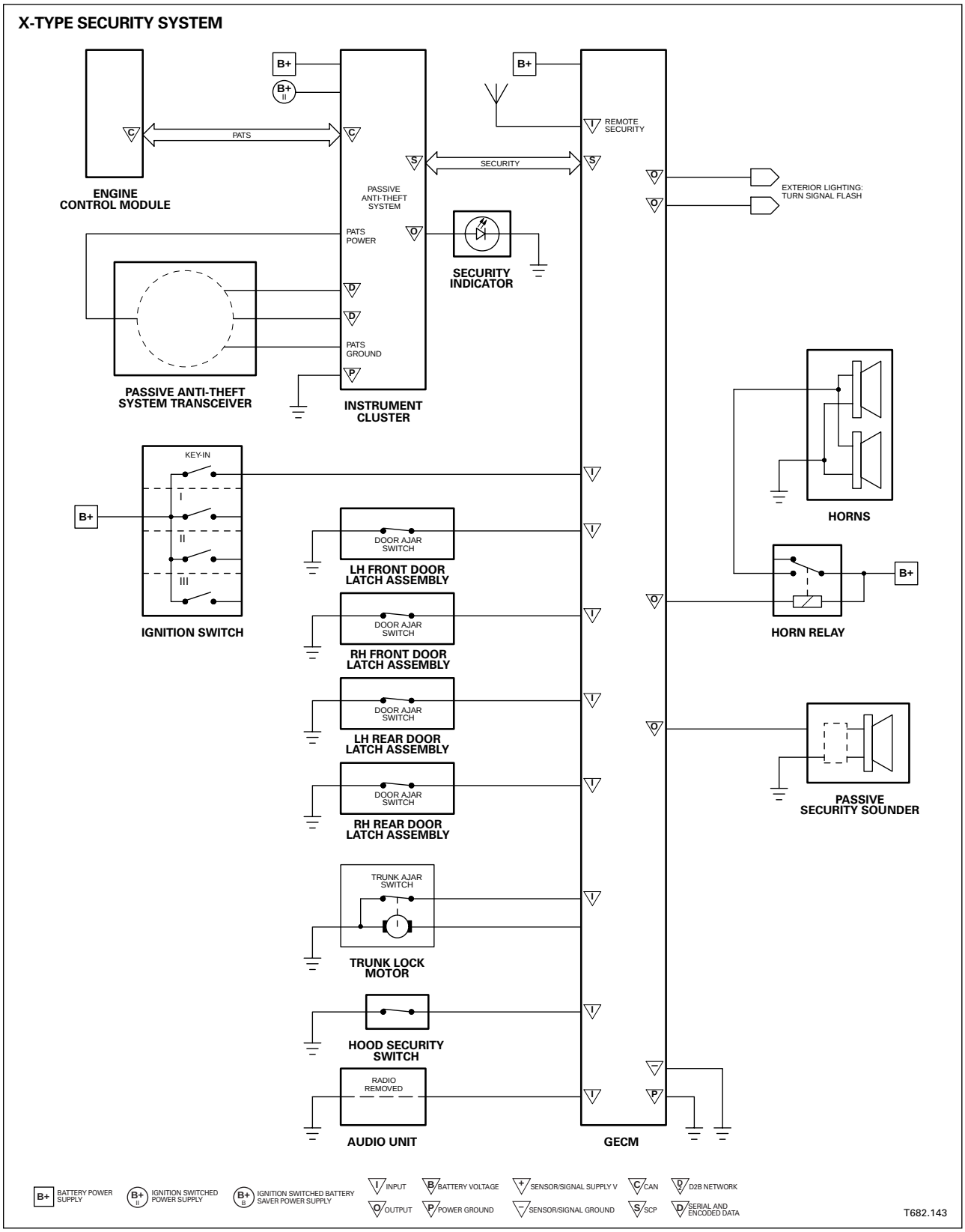
The programming mode is terminated when any of the following occurs:

- The ignition is switched to Run.
- No further RF transmitters are programmed within 10 seconds.
- An attempt is made to program more than 4 RF transmitters.

Once the GECM has dropped out of RF transmitter programming mode, restarting the process and programming another RF transmitter will erase all previous RF transmitters programmed to the GECM.

NOTES

X-TYPE SECURITY SYSTEMS



Passive Anti-Theft System (PATS)

Overview

The Passive Anti-Theft System (PATS) prevents the vehicle from being driven away by unauthorized persons. PATS consists of electronically coded ignition keys, a transceiver device by the ignition switch, and a control unit interface to the engine control module (ECM).

The PATS system is standard on the entire X-TYPE vehicle range. It is based around the instrument cluster and engine control module (ECM). Generically, the immobilizer system implementation and functionality is carried over from the Jaguar S-TYPE vehicle program; it is described briefly here, as follows:

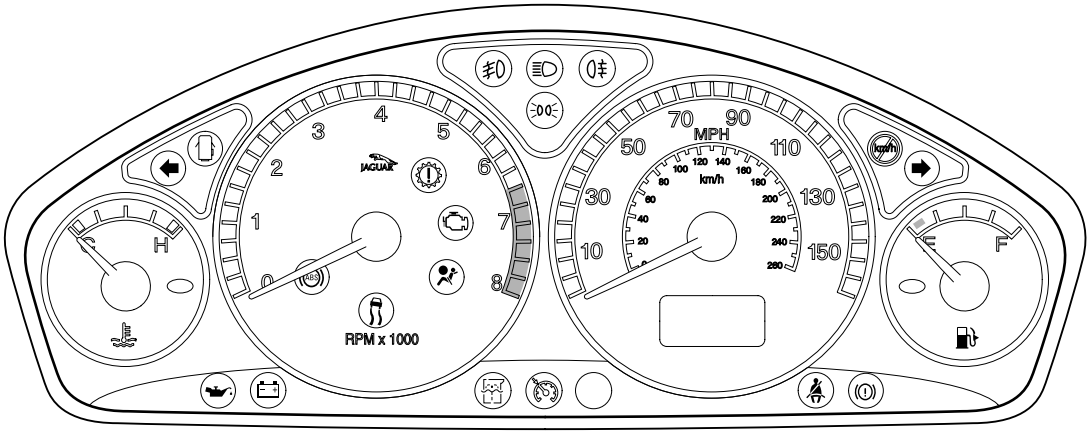
- Key in ignition, turned to the accessory position.
- Data transfer between instrument cluster and key transponder to confirm valid key.
- Ignition turned to Run position.
- “Key valid” message sent to the ECM from the instrument cluster.
- Data transfer between the ECM and instrument cluster to confirm encrypted code correct.
- Engine start.

On the X-TYPE, data transfer between the ECM and instrument cluster will take place over the CAN network. On the S-TYPE, this data transfer takes place over the SCP network. However, in essence, the process is identical.

Instrument Cluster

- Contains gateway for SCP / CAN networks.
- Drives Security LED.
- Drives PATS transceiver coil.
- Communicates with the ECM and key transponder (stores PATS key codes).

INSTRUMENT CLUSTER



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X-TYPE SECURITY SYSTEMS

Passive Anti-Theft System (PATS) (continued)

PATS Operation

The PATS function is split between the instrument cluster (IC) and the engine control module (ECM). In order for the vehicle engine to crank and start, the IC must have read a valid key and the correct information flow must have occurred between the IC and the ECM:

When a key is inserted in the ignition barrel and turned to the Accessory position, a hardwired input is supplied to the IC. This action triggers the IC to read the PATS keycode stored in the key and compare it with one that has been previously stored. If the ignition key is subsequently turned to the Run position, the result of this comparison is transmitted to the ECM via the CAN network.

Assuming the key status message received from the IC is valid, the ECM will send a challenge code to the IC. The IC will, after encryption, send a response code. If this response code matches one that the ECM has calculated, the fuel injectors, ignition coils, fuel pump drive, and starter will be enabled.

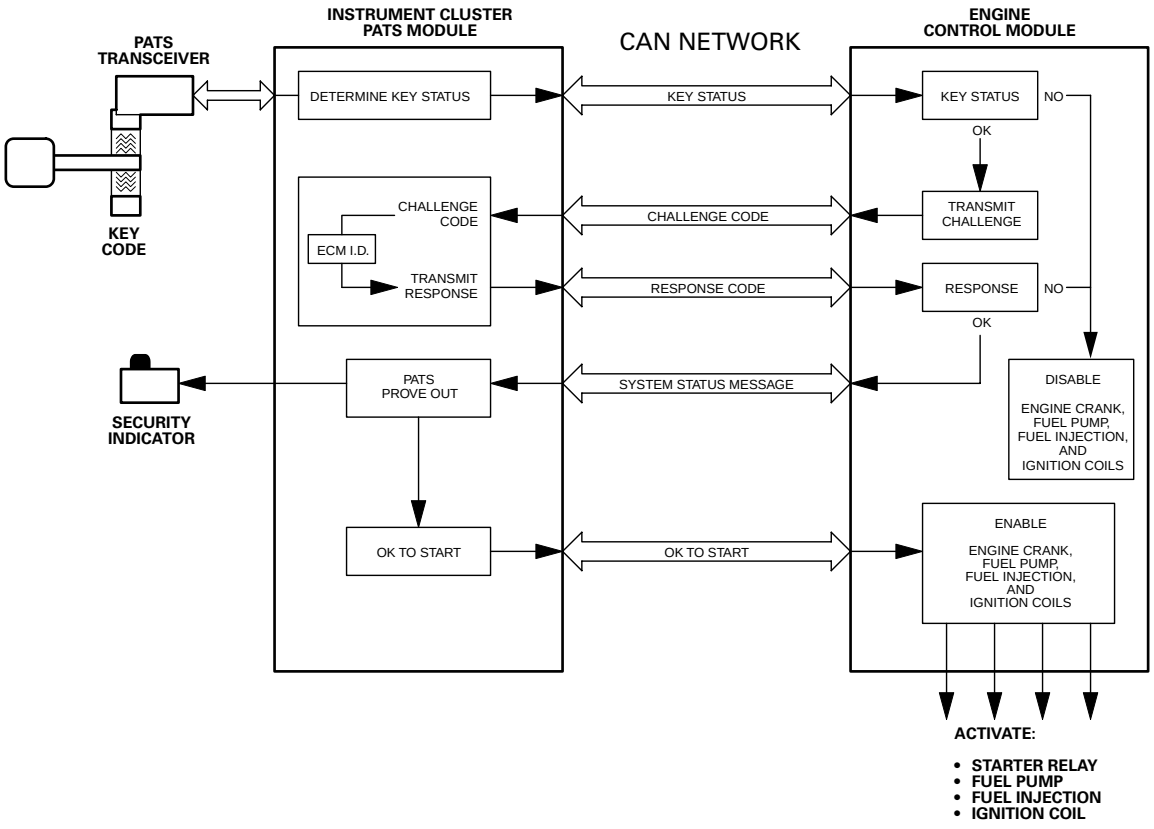
The ECM will disable the fuel injectors, ignition coils, fuel pump driver, and starter if any of the following conditions apply:

- A theft signal has been received from the IC; that is, the keycode has not been authenticated.
- A challenge code has been transmitted to the IC, but no response code has been received.
- A challenge code has been transmitted to the IC, and an incorrect response has been received.

If any of the above cases apply, the ECM will log DTC P1260. Additionally, the IC will log DTCs if the failure was a result of the key read.

NOTES

PASSIVE ANTI-THEFT SYSTEM



X-TYPE SECURITY SYSTEMS

Passive Anti-Theft System (PATS) (continued)

System Diagnostics

The best method to confirm the correct operation of PATS is to check the LED (located in the DSC switch, behind the J-gate). The LED should illuminate solid for 3 seconds when the key is turned to Ignition Run position and then extinguish. This action validates all PATS functions; that is, the key transponder matches a keycode stored; the challenge / response sequence between the IC and ECM was successful, resulting in the ECM being enabled.

Engine Fails to Crank
If a PATS fault is detected, the LED will flash for 60 seconds at 4Hz with a 50% duty cycle. At the end of this period, the LED will flash a 2 digit code. This code is repeated 10 times. The meaning of these fault codes, along with the frequency of flashing, is given in the accompanying table. As a general rule a fault code of 16 or less will cause the vehicle not to crank. Additionally, WDS should be used to check the DTC stored in the IC.

The most regular occurrence for failing to crank is due to the P & N start switches; that is, gearshift not in Park or Neutral. The Start circuit is as follows: Low side of relay coil - Switched directly from the ECM (if conditions are correct). High side of relay coil - Direct from ignition start position.

Another likely cause may be that the CAN network is malfunctioning; that is, the CAN circuit is open / short. This situation would mean that the cluster and ECM would be unable to communicate, resulting in no challenge being performed to enable the ECM.

On manual vehicles the additional of a clutch switch has been included in the starting circuit (direct input to ECM). This switch takes the place of the Park / Neutral switch (automatic transmission). The switch activates at end of travel (clutch fully depressed).

Engine Cranks but Will Not Start
If the Engine is cranking, it means that the ECM is enabled with respect to PATS. If PATS was disabled, the ECM would not engage the starter. This situation could be confirmed by verifying the PATS LED prove out (illuminated solid for 3 seconds) or by reading DTCs from the IC and ECM.

In this case, the fuel pump circuit should be verified. A fuel pump module, which is controlled by the ECM, supplies the fuel pump.

In all cases of suspected PATS non-start issues, the most logical failure modes should be eliminated first.

Check all relevant supplies and grounds to the cluster and ECM. Check that the starter relay has a permanent 12 V supply. Check that the relay has a 12 V supply and ground across the coil while the ignition is in the Crank position.

> **NOTE:** The ECM supplies the ground for the starter relay. If the inertia switch has tripped, the starter relay coil will not receive its ground and the engine will not crank.

NOTES

PATS Diagnostics Summary

Mode of Operation / Fault	When logged	Ignition Switch position	DTC	Flash Code
Prove-out	n/a	0 (OFF) to II (RUN) / III (START)	n/a	3 seconds – on
Perimeter theft control	n/a	0 (OFF)	n/a	Steady flashing
Anti-scan – Incode	Security access	II (RUN) / III (START)	n/a	None
Transceiver not connected / open circuit (no diagnostic byte received)	Key read	II (RUN) / III (START)	B1681	11
Corrupted diagnostic byte received from transceiver	Key read	II (RUN) / III (START)	B2103	12
Ignition key transponder signal not received	Key read	II (RUN) / III (START)	B1600	13
Ignition key transponder signal invalid	Key read	II (RUN) / III (START)	B1602	14
Ignition key code incorrect	Key read / diagnostic test	II (RUN) / III (START)	B1601	15
CAN Network fault: ECM verify does not match key status	ECM/CAN communications	II (RUN) / III (START)	U2511	16
CAN Network fault: security system status message missing	ECM/CAN communications	II (RUN) / III (START)	U1900	16
Less than 2 keys programmed	Before & after / dealer	II (RUN) / III (START)	B1213	21
ECM ID not in instrument pack non-volatile memory	Before & after / dealer	II (RUN) / III (START)	B2141	22
ECM ID does not match instrument pack	Challenge / response	II (RUN) / III (START)	U2510	23
Transponder programming failure	Key prog.	II (RUN) / III (START)	B2431	13
Key already programmed	Diagnostic test	II (RUN) / III (START)	B2492	None

ECM fault code P1260

Mode of Operation / Fault	When logged	Ignition Switch position	Mode 12, Frame #02, PID 1248
PATS sequence time-out	Challenge	II (RUN) / III (START)	04
ID Transfer – challenge error	Before & after / service	II (RUN) / III (START)	03
Challenge / response error	Challenge	II (RUN) / III (START)	01
Invalid key data received	Challenge	II (RUN) / III (START)	02

NOTES

X-TYPE SECURITY SYSTEMS

Passive Anti-Theft System (PATS) (continued)

For the various PATS modes / faults listed in the above table, the cluster will store a DTC and indicate this to the customer during the detection period defined in the "When Logged" column, by illuminating the indicator as described for 60 seconds and then flashing the LED 10 times as appropriate. The indication will stop immediately when the ignition is turned to Off any time during the fault indication sequence. Up to 4 DTCs can be stored per key read sequence (1-10 read attempts). No DTCs will be stored until all retry attempts are complete. Only the highest priority fault code will be flashed.

The PATS LED will be commanded on as shown under "indication." Normal PATS operations are complete within 400 ms of the ignition switch transition from Off to Run or Start. Worst case for ECM communication problems will be <2 seconds. If PATS is not complete during the 2 seconds, the ECM will terminate PATS and await the next ignition run / start event. During this time, if a valid key is used the indicator will be in prove-out mode. PATS faults will be indicated via the LED as soon as possible and will terminate the LED prove-out. At Key Off, all previous flashing will cease and the perimeter theft system will control the LED when the vehicle is locked and armed.

Manual Process for Programming Additional PATS Keys

To enter the programming process you need all the customer's keys (minimum of 2). If there is only one available, you can only add keys using WDS.

- Insert first key, turn to Run (Position II) for a maximum of 5 seconds, turn to Off, and remove key.
- Within 10 seconds of removing the first key, insert the second key, turn to Run for a maximum of 5 seconds, turn to Off, and remove the key.
- To program the third key, insert and turn to Run within 20 seconds of removing the second key, leave the key in the run position and allow the PATS LED to prove out (solid for 3 seconds); this procedure will confirm successful storage.

For programming subsequent keys – 8 in total:, you will need to have turned 2 valid keys to Run and to Off as above prior to programming the fourth and fifth keys, and so on.You can use any 2 valid keys.

To program the fourth key, follow the sequence as above.

- After removing the third key, insert key 1 or 2 and turn through Run and back to Off, then remove.
- Insert the fourth key, turn through Run and back to Off and remove.

To program the fifth key:

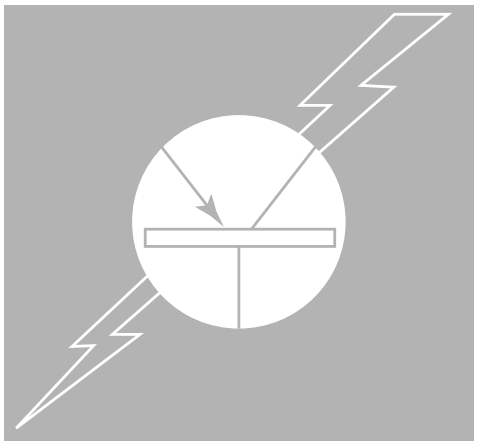
- After removing the fourth key, insert key 1, 2 or 3 and turn through Run to Off and remove.

This process can be repeated until a maximum of 8 keys have been programmed.

> **NOTE:** If the time scale is not adhered to, the process will terminate and you will need to start the process again (a DTC may also be logged).

NOTES

ADVANCED JAGUAR ELECTRICAL SYSTEMS



Service Training Course T682
DATE OF ISSUE: 02/15/2002

TASK SHEET 1A

Vehicle type _____ VIN _____ Production date _____

System being tested _____ Electrical Guide Figure _____

With the aid of the correct Electrical Guide Figure, check the system circuits using WDS or a DVOM and compare the results with the information you have entered in the "Expected Values" column. Write in all the information gathered from the vehicle and look at the Electrical Guide to determine system function.

CM connector #, pin #, I/O	How and where measured?	Expected Values V, A, Ω, Hz or %	Actual Values V, A, Ω, Hz or %

Component or system _____

Operating volts _____ V

Connector #, pin #, color _____

Circuit tested _____

Input or Output? _____

Is this circuit diagnostic capable? _____

If so, how? (Feedback signal, potentiometer, resistance, etc. _____

_____

_____

Any DTCs for this circuit/component? _____

_____

Parameters for DTC to set (if any) _____

_____

Test points: from _____ to _____

Type of signal? _____

When is signal present? _____

Are there any other types of signal on this circuit? i.e. AC volts, Freq (Hz), Pulse Duty Factor (%) _____

Type of signal? _____

When is signal present? _____

How is signal produced? _____

_____

TASK SHEET 1A (continued)

WDS Status Display Indication when signal is present (inputs)_____

Can a WDS test module activate the circuit / component? (OSC - Output Stage Control) _____

If this circuit / component were shorted to ground, what would be the symptom?_____

_____

If this circuit / component were open circuit, what would be the symptom? _____

_____

Can any other types of tests or checks be performed on this circuit / component? _____

Mechanical, hydraulic, pneumatic tests (type, description):_____

_____

_____

WDS Oscilloscope Patterns:

Oscilloscope Setup

Test connection_____ Trigger source _____

Type of measurement_____ Trigger edge _____

Measuring range _____ Channel A or B_____

Frequency range _____ Red or black cable _____

Demonstrates Competence: Instructor Signature_____ Date _____

TASK SHEET 1B

Vehicle type _____ VIN _____ Production date _____

System being tested _____ Electrical Guide Figure _____

With the aid of the correct Electrical Guide Figure, check the system circuits using WDS or a DVOM and compare the results with the information you have entered in the "Expected Values" column. Write in all the information gathered from the vehicle and look at the Electrical Guide to determine system function.

CM connector #, pin #, I/O	How and where measured?	Expected Values V, A, Ω, Hz or %	Actual Values V, A, Ω, Hz or %

Component or system _____

Operating volts _____ V

Connector #, pin #, color _____

Circuit tested _____

Input or Output? _____

Is this circuit diagnostic capable? _____

If so, how? (Feedback signal, potentiometer, resistance, etc. _____

_____

_____

Any DTCs for this circuit/component? _____

_____

Parameters for DTC to set (if any) _____

_____

Test points: from _____ to _____

Type of signal? _____

When is signal present? _____

Are there any other types of signal on this circuit? i.e. AC volts, Freq (Hz), Pulse Duty Factor (%) _____

Type of signal? _____

When is signal present? _____

How is signal produced? _____

_____

TASK SHEET 1B (continued)

WDS Status Display Indication when signal is present (inputs)_____

Can a WDS test module activate the circuit / component? (OSC - Output Stage Control) _____

If this circuit / component were shorted to ground, what would be the symptom?_____

_____

If this circuit / component were open circuit, what would be the symptom? _____

_____

Can any other types of tests or checks be performed on this circuit / component? _____

Mechanical, hydraulic, pneumatic tests (type, description):_____

_____

_____

WDS Oscilloscope Patterns:

Oscilloscope Setup

Test connection_____ Trigger source _____

Type of measurement_____ Trigger edge _____

Measuring range _____ Channel A or B_____

Frequency range _____ Red or black cable _____

Demonstrates Competence: Instructor Signature_____ Date _____

TASK SHEET 1C

Vehicle type _____ VIN _____ Production date _____

System being tested _____ Electrical Guide Figure _____

With the aid of the correct Electrical Guide Figure, check the system circuits using WDS or a DVOM and compare the results with the information you have entered in the "Expected Values" column. Write in all the information gathered from the vehicle and look at the Electrical Guide to determine system function.

CM connector #, pin #, I/O	How and where measured?	Expected Values V, A, Ω, Hz or %	Actual Values V, A, Ω, Hz or %

Component or system _____

Operating volts _____ V

Connector #, pin #, color _____

Circuit tested _____

Input or Output? _____

Is this circuit diagnostic capable? _____

If so, how? (Feedback signal, potentiometer, resistance, etc. _____

_____

_____

Any DTCs for this circuit/component? _____

_____

Parameters for DTC to set (if any) _____

_____

Test points: from _____ to _____

Type of signal? _____

When is signal present? _____

Are there any other types of signal on this circuit? i.e. AC volts, Freq (Hz), Pulse Duty Factor (%) _____

Type of signal? _____

When is signal present? _____

How is signal produced? _____

_____

TASK SHEET 1C (continued)

WDS Status Display Indication when signal is present (inputs)_____

Can a WDS test module activate the circuit / component? (OSC - Output Stage Control) _____

If this circuit / component were shorted to ground, what would be the symptom?_____

_____

If this circuit / component were open circuit, what would be the symptom? _____

_____

Can any other types of tests or checks be performed on this circuit / component? _____

Mechanical, hydraulic, pneumatic tests (type, description):_____

_____

_____

WDS Oscilloscope Patterns:

Oscilloscope Setup

Test connection_____ Trigger source _____

Type of measurement_____ Trigger edge _____

Measuring range _____ Channel A or B_____

Frequency range _____ Red or black cable _____

Demonstrates Competence: Instructor Signature_____ Date _____

TASK SHEET 2 – XJ / XK CONTROL MODULE LOCATION

Acronym	**Module**	**Location**	**Color**	**No.**
ECM	Engine Control Module			
TCM	Transmission Control Module			
ABS/TCCM	Antilock Brake System / Traction Control Control Module			
BPM	Body Processor Module			
SLCM	Security and Locking Control Module			
INST	Instrument Pack			
SRS / RCM	SRS Single Point Sensor (XJ) Restraints Control Module (XK)			
RSM	Rain Sensing Module			
DDCM	Driver Door Control Module			
PDCM	Passenger Door Control Module			
PSE	Portable Support Electronics (Phone)			
NCM	Navigation Control Module			
VACM	Voice Activation Control Module			
RPACM	Reverse Parking Aid Control Module			
A/CCM	Air Conditioning Control Module			
DRDCM	Driver Rear Door Control Module			
DSCM	Driver Seat Control Module			
CD	CD Autochanger			
PRDCM	Passenger Rear Door Control Module			
KTM	Key Transponder Module			

Demonstrates Competence: Instructor Signature _____ Date _____

TASK SHEET 3 – S-TYPE 2001 MY CONTROL MODULE LOCATION

Acronym	**Module**	**Location**	**Color**	**No.**
PCM	Powertrain Control Module			
TACM	Throttle Actuator Control Module			
ABS/TCCM or DSCCM	Antilock Brake System / Traction Control Control Module or Dynamic Stability Control Control Module			
GECM	General Electronic Control Module			
RECM	Rear Electronic Control Module			
IC	Instrument Cluster			
RCM	Restraints Control Module			
RSM	Rain Sensing Module			
ICE	Audio Unit (In-Car Entertainment)			
PSE	Portable Support Electronics (Phone)			
NCM	Navigation Control Module			
VACM	Voice Activation Control Module			
RPACM	Reverse Parking Aid Control Module			
A/CCM	Air Conditioning Control Module			
VECM	Vehicle Emergency Control Module			
ADCM	Adaptive Damping Control Module			
DSCM	Driver Seat Control Module			
CFCM	Cooling Fans Control Module			
RA	Radio Antenna Module			

Demonstrates Competence: Instructor Signature _____ Date _____

TASK SHEET 4 – X-TYPE CONTROL MODULE LOCATION

Acronym	**Module**	**Location**	**Color**	**No.**
ECM	Engine Control Module			
TCM	Transmission Control Module			
ABSCM or DSCCM	Antilock Brake System Control Module or Dynamic Stability Control Control Module			
GECM	General Electronic Control Module			
IC	Instrument Cluster			
RCM	Restraints Control Module			
RSM	Rain Sensing Module			
FPCM	Fuel Pump Control Module			
AUDIO	Audio Unit (In-Car Entertainment)			
CPCM	Cellular Phone Control Module			
NCM	Navigation Control Module			
VACM	Voice Activation Control Module			
PACM	Parking Aid Control Module			
A/CCM	Air Conditioning Control Module			
HLCM	Headlamp Leveling Control Module			
JGM	J-Gate Module			
CD	CD Autochanger			
CFCM	Cooling Fans Control Module			
RA	Radio Antenna Module			

Demonstrates Competence: Instructor Signature _____ Date _____

TASK SHEET 5 – XJ / XK SECURITY SYSTEM

Remote Transmitter Coding – Manual Procedure

1. Insert ignition key.
2. Hold headlamp stalk switch to Main Beam flash function.
3. Turn ignition key to position I (AUX).
4. Flash switch 3 times (for 97 MY) or 4 times (98 MY on).
5. Learn-Mode confirmation chip will be heard (If sounder is installed).
6. LED will flash once at the same time as above chirp.
7. Press any remote button once and a chirp will sound for each remote transmitter signal received. (15 seconds maximum between each press.)
8. Turn ignition key OFF to complete coding. The system will time-out after 15 seconds, or chirp is emitted to indicate "learn-mode off".

Demonstrates Competence: Instructor Signature_____ Date _____

TASK SHEET 6 – X-TYPE POWER WINDOWS AND SUNROOF

Power Windows

1. Disconnect and reconnect the vehicle battery. Check the operation of the one-touch up, one-touch down and anti trap features. Which, if any, of these features still operate?

   _____

   _____

   _____

2. Reinitialize all the windows. Which, if any, of these features operates now?

   _____

   _____

   _____

Sunroof

1. Erase the system memory. Which, if any, of the automatic features still operate?

   _____

   _____

   _____

2. Reinitialize the roof panel. Which, if any, of these features operates now?

   _____

   _____

   _____

Demonstrates Competence: Instructor Signature _____ Date _____

TASK SHEET 7 – X-TYPE SECURITY

1. When locking the doors with the transmitter or the key, the turn signals will flash how many times?

   _____

2. If a door or the hood is open or there is a faulty ajar switch, and the vehicle is locked the turn signals will flash how many times? _____

3. If configured, auto relocking operates after how long? _____

4. If configured, drive-away locking operates at? _____

5. Pressing and holding the lock and unlock buttons on the transmitter for at least 4 seconds will change what?

   _____

   _____

6. How many transmitters is it possible to program? _____

7. After locking the vehicle, how long will it be before it is fully armed? _____

8. When the PATS system is functioning correctly the LED will do what?

   _____

   _____

   _____

9. If there is a PATS fault the Security Indicator LED will do what?

   _____

   _____

   _____

10. How many PATS keys is it possible to program? _____

Demonstrates Competence: Instructor Signature _____ Date _____

TASK SHEET 8 – PROGRAM NEW PATS TRANSPONDER

Vehicle type _____ VIN _____ Production date _____

Using WDS, program a new ignition key transponder to the vehicle.

List the steps required to program a key transponder.

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____
10. _____
11. _____
12. _____
13. _____
14. _____
15. _____
16. _____
17. _____
18. _____

Demonstrates Competence: Instructor Signature _____ Date _____

TASK SHEET 9 – PROGRAM NEW REMOTE TRANSMITTER (X-TYPE)

VIN _____ Production date _____

Manual Procedure:

1. Cycle ignition between II and I 4 times, then remove the ignition key.
2. When in programming mode the GECM will chime. Within 10 seconds of entering mode, press any button on the remote, GECM will chime.
3. To programme further RF transmitters press any button within 10 seconds of previous entry.
4. Up to 4 transmitters can be programmed.

Demonstrates Competence: Instructor Signature _____ Date _____

TASK SHEET 10 – PROGRAM VEHICLE FUNCTIONS

Vehicle type _____ VIN _____ Production date _____

Program the vehicle functions assigned by your instructor and write in the missing information below.

Using WDS Identify 7 programmable systems (program new control module and or reprogram control module).

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____

List the dealer programmable options that come "standard" from the factory:

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____
10. _____
11. _____

Demonstrates Competence: Instructor Signature _____ Date _____