Contents

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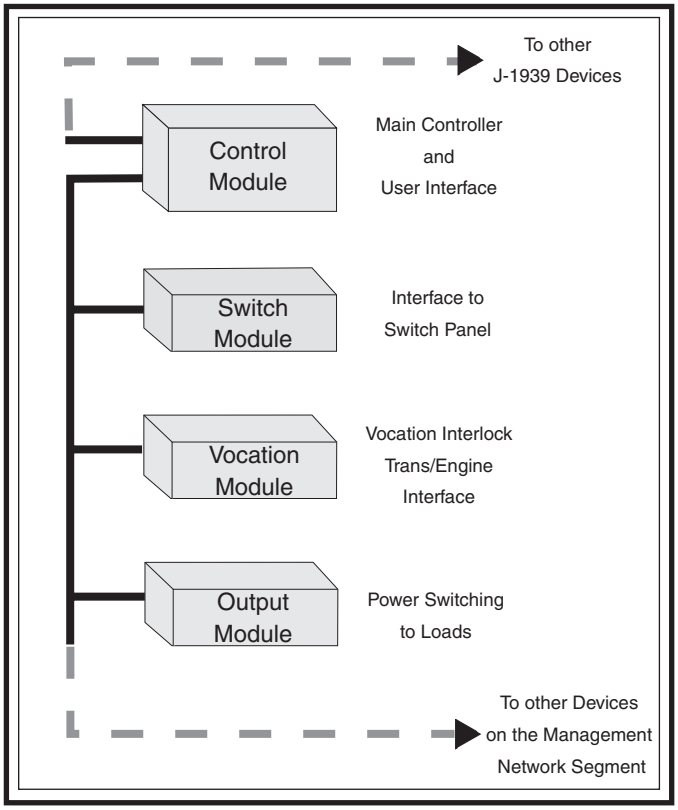
USM Network

The ***Class1*** *ES-Key™ System* consists of several components that can be used in a vehicle electrical system. The system is multiplexed using the Controller Area Network bus and the SAE J-1939 protocol. An electrical database is used by the Control Module to operate the vehicle electrical system. The *ES-Key™ Express* software allows you to create, read or modify this database. Troubleshooting of the system is also accomplished with the software.

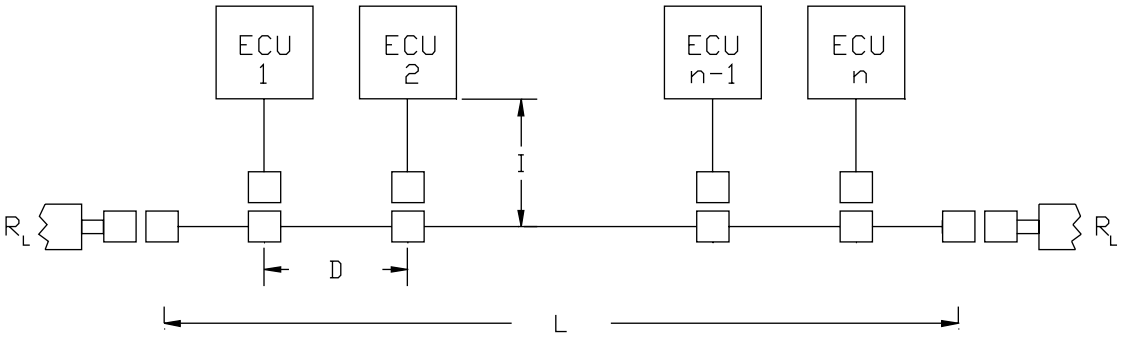
The Controller Area Network (CAN) has specific requirements that should be met for maximum reliability.



Network modules communicate with each other through the J-1939 Controller Area Network.

Wiring Network Topology

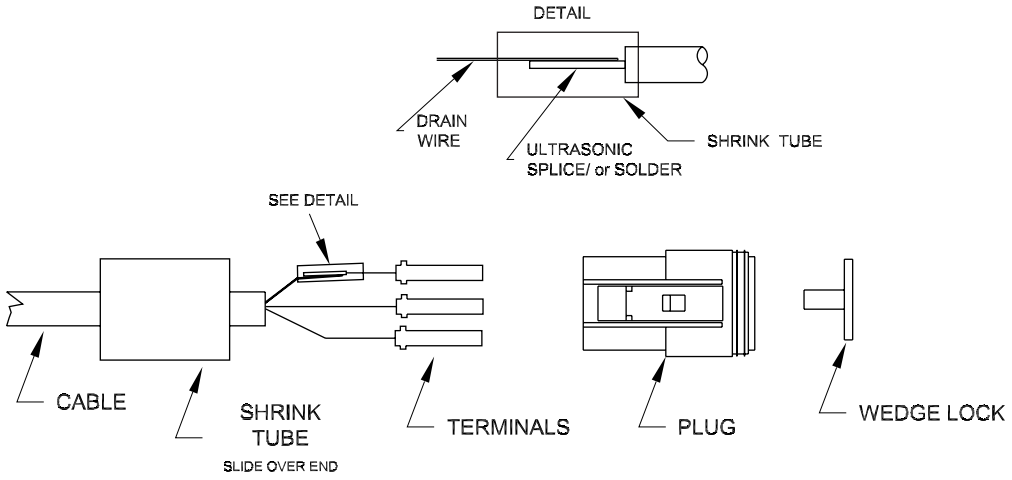
The wiring topology for this CAN based network should be as close as possible to a linear structure in order to avoid cable reflections. In practice, it may be necessary to connect short cable tails to a main backbone cable, as shown in the figure below. To minimize standing waves, nodes should not be placed equally spaced on the network and cable tails should not all be the same length.



WIRING NETWORK TOPOLOGY

Where: n= # modules in network/ ***30 maximum per network***
L= Bus length
D= Node distance
I= Cable tail length
R_L=Terminating resistor = 120Ω*
* Class 1 offers this resistor built into a harness connector DT06-3S-P006

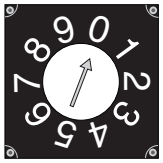
- **Recommended Cable Termination Procedure:**



RECOMMENDED CABLE TERMINATION PROCEDURE

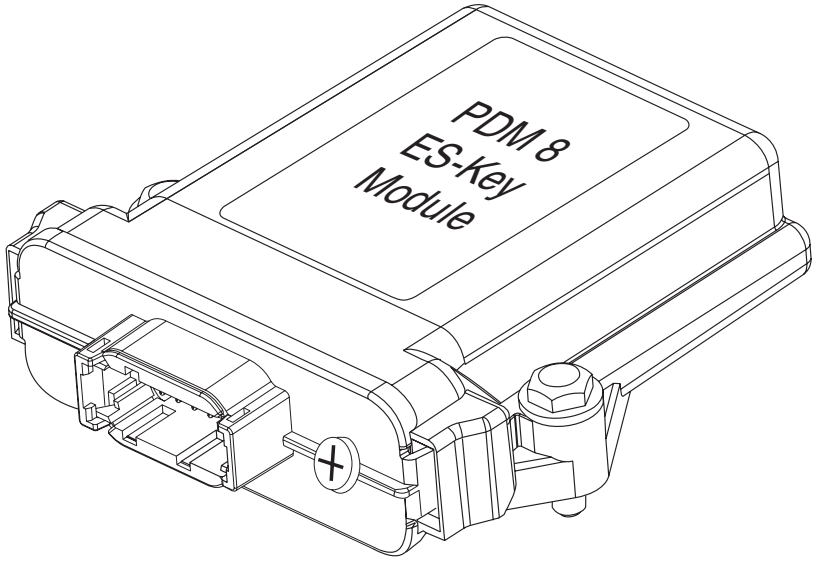
Hardware

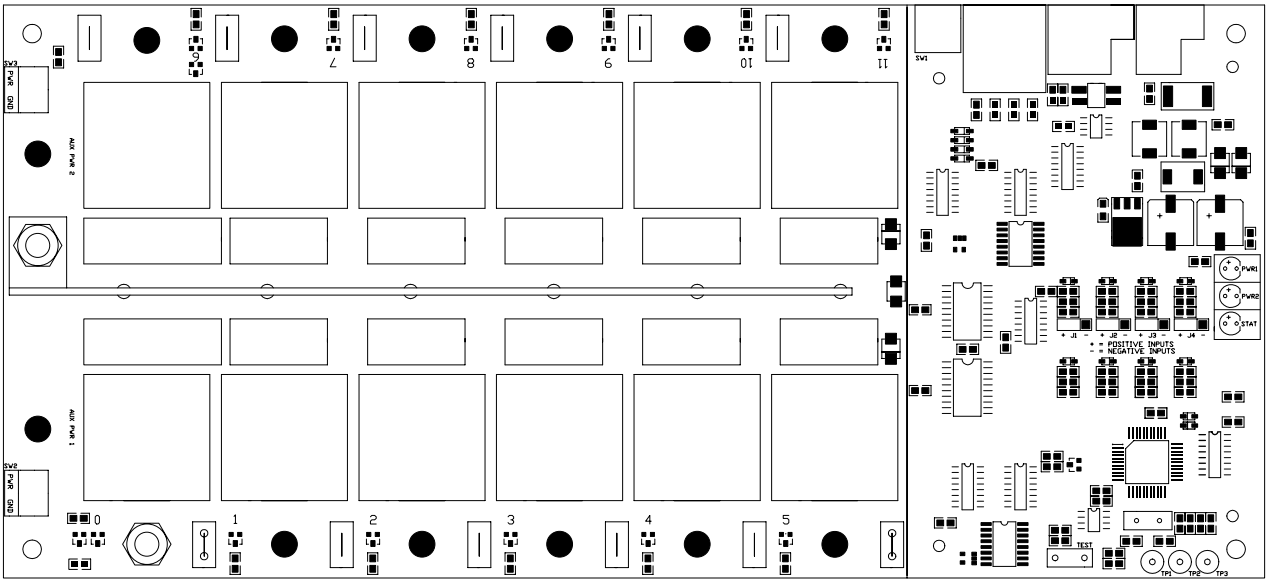
The ES-Key System utilizes a variety of modules to perform various functions. With the exception of the USM Control Module, Display and Data Logger, there can be up to 16 of each type module. They are addressed in the system by device type and number. For instance, a Power Distribution Module can exist at address 0 through F (15) and a Switch Input Module could be set at the same address since it is a different type. The address is set on each module with either a Binary Coded Decimal (BCD 0-9) switch or a Hexadecimal Encoded (Hex 0-F) switch.
Modules 10-15 are encoded as modules A-F respectively.
A=10, B=11, C=12, D=13, E=14 and F=15.



BCD

HEX





Hardware

There are several modules available to perform various tasks in the system.

The Universal System Manager (**USM**) is the control module and performs load management, logic and main communications functions of the system. The USM contains the database for the system. Currently, there can be only one control module in a system.

A system can contain a Digital Display Module (**Display**). Four pages (4 lines by 20 characters) of greetings messages and 50 pages of extended messages can be stored in the display. In addition, live information about active and inactive circuits can be displayed and it can be used as an interface to the system.

A Modem Module (**MODEM**) can be added to any circuit and will allow the system to be accessed remotely by Express Software through a serial port or modem.

There can be up to 16 Power Distribution Modules (**PDM**) in a system. The PDM's control the loads in a circuit. They come in two basic types, electromechanical (relay boards) and electronic (solid state). They can handle from 7.5 amps up to 40 amps dependent on the exact module specified. One of these modules is configured as an 8 input, 8 output, 4 motor driver (H-bridge). A low current (250 mA) 16 Output Module is available for use in indicator or driver circuits. The 16 output module comes in a variety of lowside and highside driver configurations. (Power or Ground outputs)

There can also be up to 16 Switch Input Modules (**SIM**) in a system. These come in either 16 positive input or 16 polarity selectable input versions. Any switch or input in the system needs to be tied to an input circuit on a module in the system.

Vocation Modules are available for interlocking and engine control tasks. These are engine-transmission specific and there can only be one in a system.

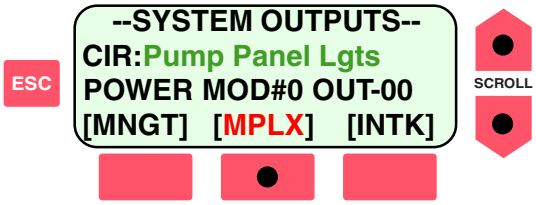
A data logger is available that stores system fault and interlock information. It can aso be configured to log specified circuit information. It will store 200 system faults and 6,000 events before it loops around and overwrites the oldest data. These events are all dated and time stamped to the nearest second. Up to 32 circuits can be tied to the data logger for troubleshooting or information purposes. It is also a true time clock and a temperature sensor can be wired into it. The time is displayed on the data logger. The temperature and time are displayed on the Display Module.

There are variations of some of the above modules available.

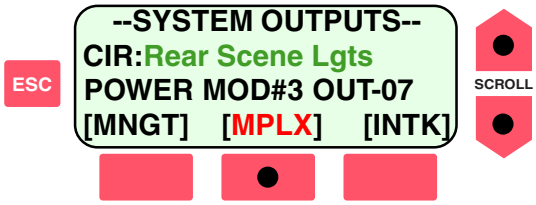
Addresses

Every INPUT and every OUTPUT in the system has a unique address.
That address consists of a device type, a module number and a port on that device.

As an example, the first output on the first **P**ower **D**istribution **M**odule would be addressed as PDM 0, Output 0.
In a typical system, it would be labelled for the load that is connected to it. If it were the Pump Panel Lights connected to the first output, then a name (tag or label) indicating Pump Panel Lights could be assigned to PDM 0, Output 0 and the operator would use the tag name instead of PDM 0, Output 0 when referring to that circuit.

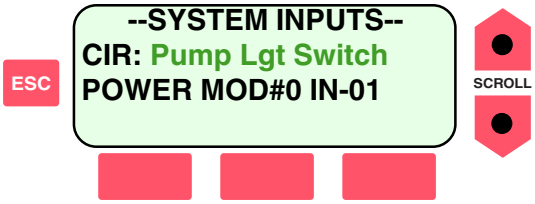


Each device type in the system that can have multiple devices has an address that is set by either a hexadecimal (hex) or binary coded decimal (bcd) switch. Each module of the same device type must have a unique address (0-F). A power distribution module (PDM) located in the pump panel could be set to address 3 and would be accessed by the system as PDM 3. Any output or input on that PDM would be known as PDM 3 and it's port number and function (Input/Output).
PDM module addresses are 0-F, Output Ports 0-11 and Input Ports 0-7.



As an example, an 8 input, 8 output relay board with its address switch at position 3 would have input ports 0-7 and output ports 0-7.
The inputs would be PDM 3, Input 0 through Input 7 and the outputs would be PDM 3, output 0 through output 7.
Each of these inputs and outputs can be and usually are named for the circuit or function that they are connected to.

Each circuit must have a unique name (limited to 16 characters) and be tied to a device type, address and port.

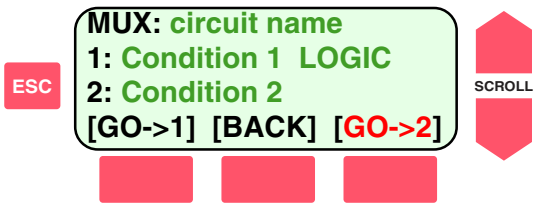


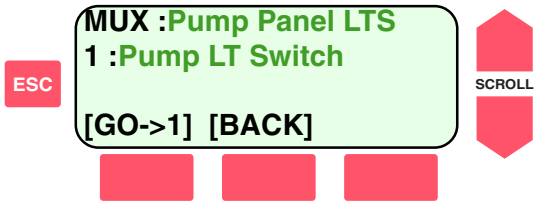
Logic

Each output is operated by the logic associated with it in the database.

There are three types of logic for each circuit.

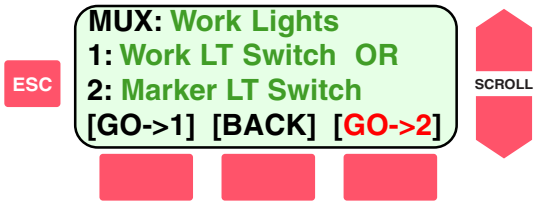
AND All the conditions associated with the circuit must be ON for the circuit to be ON.
OR Any of the conditions associated with the circuit can be ON for the circuit to be ON.
NOT The associated condition must be OFF or false for the circuit to turn ON.



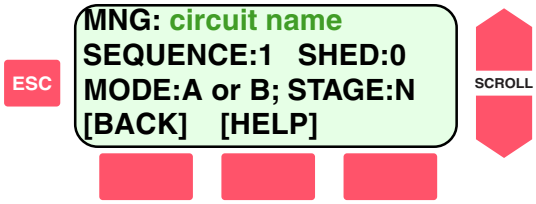


Further there are three logic conditions that apply to every output.

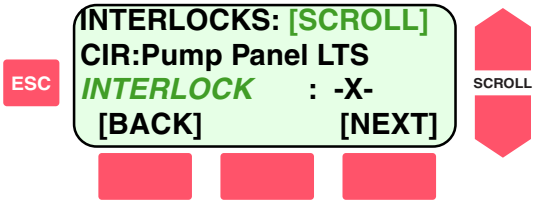
Multiplex Logic ties an output to two conditions, these can be **AND**'ed, **OR**'ed or Inverted (**NOT**). The default condition is false or OFF. The conditions can be inputs or outputs



Load Management Logic allows each output circuit to be sequenced on, shed (turned off below a specific priority or voltage level), tied to either of two operational modes (A or B) and be staged (controlled by a discrete input). The default condition is true or ON.



Vocation Logic is available when a vocation module is installed. Each output can be tied to any or all of several interlocks. The output can also be controlled by a NOT interlock, the circuit will only be operated if the interlock is OFF.
The default condition for vocation logic is true (no connection).



All three of the above logic conditions apply to every output and they are ANDed together. They all must be true for a circuit to operate.

Example

Example 1:

Pump Panel Lights	Assigned to PDM 3 Output 0
Pump Panel Switch	Assigned to PDM 3 Input 0
Marker Light Switch	Assigned to SIM 0 Input 0

The Pump Panel Lights are set to come on with the Pump Panel Switch or the Marker Light Switch.

Multiplex ***Logic***
ON whenever the Pump Panel Switch is ON ***OR*** the Marker Light Switch is ON.

Management ***Logic*** defaults to true.

Vocation ***Logic*** defaults to true.

Whenever the **Marker Light Switch** or the **Pump Panel Switch** is turned on, the **Pump Panel Lights** will turn ON.

Example 2:

The Pump Panel Lights are set to come on with the Pump Panel Switch OR the Marker Light Switch AND in Scene Mode.

Multiplex ***Logic***
ON whenever the Pump Panel Switch is ON ***OR*** the Marker Light Switch is ON.
AND
Management ***Logic*** set to mode B (Scene Mode).
AND
Vocation ***Logic*** defaults to true.

Whenever the **Marker Light Switch** or the **Pump Panel Switch** is turned on, the **Pump Panel Lights** will turn ON *as long as the Park Brake is set*.

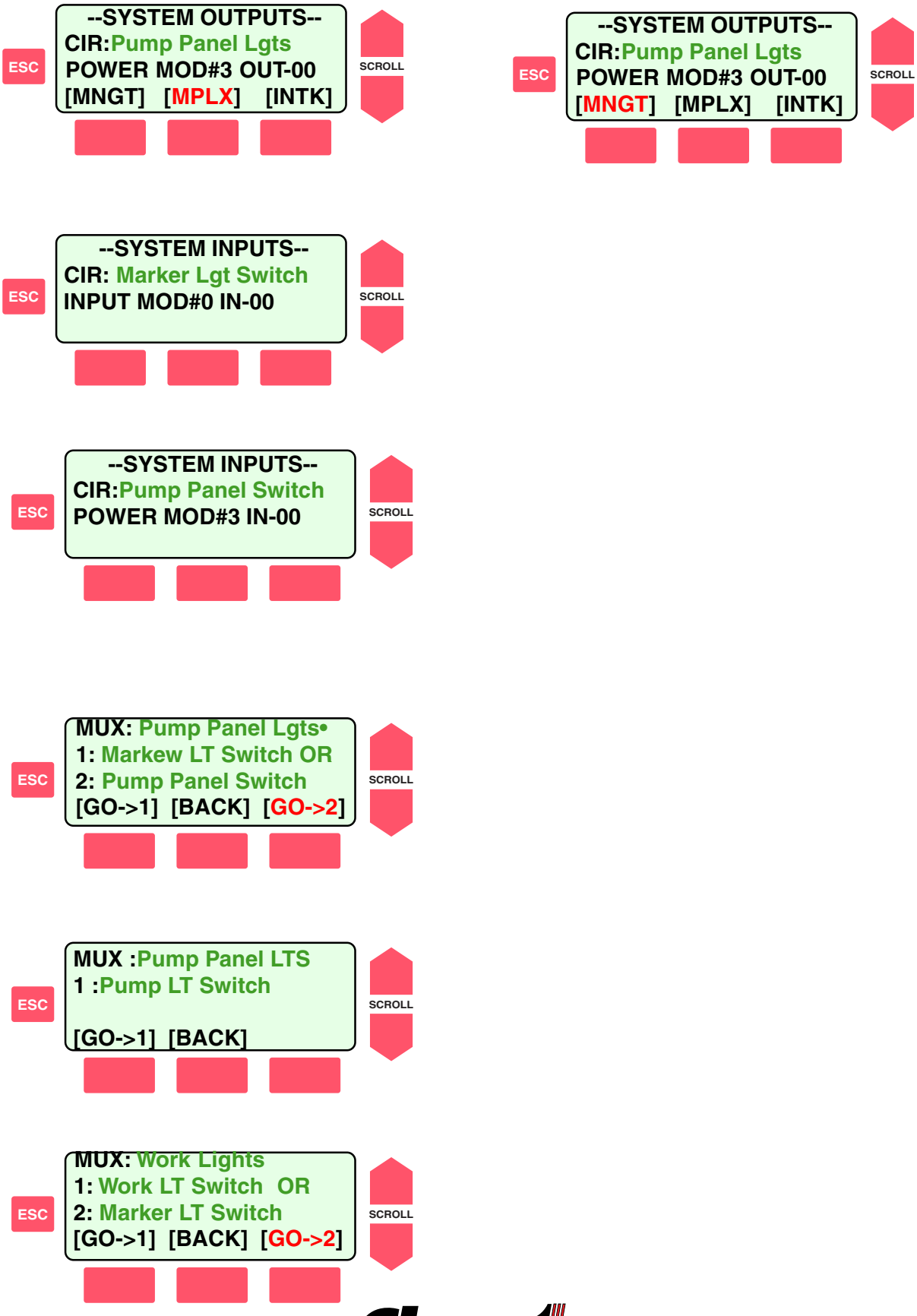
Example 3:

The Pump Panel Lights are set to come on with the Pump Panel Switch OR the Marker Light Switch AND in Scene Mode if it is Okay to Pump.

Multiplex ***Logic***
ON whenever the Pump Panel Switch is ON ***OR*** the Marker Light Switch is ON.
AND
Management ***Logic*** set to mode B (Scene Mode).
AND
Vocation ***Logic*** set to Okay to Pump.

Whenever the **Marker Light Switch** or the **Pump Panel Switch** is turned on, the **Pump Panel Lights** will turn ON *as long as the Park Brake is set* AND the pump is engaged and the transmission is in high range lockup.

Example


--SYSTEM OUTPUTS--
CIR:Pump Panel Lgts
POWER MOD#3 OUT-00
[MNGT] [MPLX] [INTK]
ESC
SCROLL
--SYSTEM OUTPUTS--
CIR:Pump Panel Lgts
POWER MOD#3 OUT-00
[MNGT] [MPLX] [INTK]
ESC
SCROLL
--SYSTEM INPUTS--
CIR: Marker Lgt Switch
INPUT MOD#0 IN-00
ESC
SCROLL
--SYSTEM INPUTS--
CIR:Pump Panel Switch
POWER MOD#3 IN-00
ESC
SCROLL
MUX: Pump Panel Lgts•
1: Markew LT Switch OR
2: Pump Panel Switch
[GO->1] [BACK] [GO->2]
ESC
SCROLL
MUX :Pump Panel LTS
1 :Pump LT Switch
[GO->1] [BACK]
ESC
SCROLL
MUX: Work Lights
1: Work LT Switch OR
2: Marker LT Switch
[GO->1] [BACK] [GO->2]
ESC
SCROLL

Power Modules

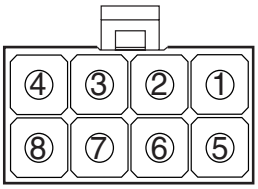
The ES-Key System uses Power Distribution Modules (PDM's) to supply current to electrical loads. Currently these are available in two basic styles and there can be up to 16 of them in the system.

Relay Modules use standard 30/40 Amp automotive relays and are available in 8 and 12 relay configurations. Both relay boards have two relays that the common terminal can be set to discrete inputs. The power to the board must be OFF any time that the switch for these outputs is changed. The rest are common bussed to system voltage. Both boards have eight inputs, 4 of which are polarity selectable and the other 4 are ground inputs. Each output has a feedback circuit to identify to the system it's current status (OFF or ON). If an output is supposed to be on, but has no feedback, a fault is generated that can be easily traced. Whenever a PDM is installed or replaced, it is essential that the address switch be positioned correctly for it's function in the system. Each load is turned on by device type, address and port. Relay #1 on relay board #1 would be addressed as PDM #1, Port #1 and most likely be named for the load that is connected to it. Any PDM whose address switch is at number 1 will respond to a turn on or off command unless there is an address conflict.

Connector Information
Amp Mini Universal Mate-N-Lok

Power	Amp 172165-1	1) Power	2) Ground		
CAN	Amp 172166-1	1) Can HI	2) CAN LO	3) CAN Shield	
Input	Amp 770579-1	1) Input 0	select	5) Input 4	ground
		2) Input 1	select	6) Input 5	ground
		3) Input 2	select	7) Input 6	ground
		4) Input 3	select	8) Input 7	ground

Amp Socket Terminals
Tin 101535
Gold 103374



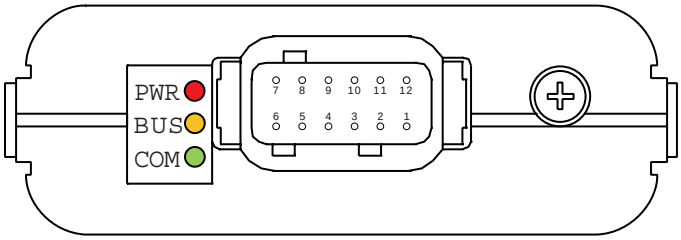
Power Modules

Solid State Modules use an integrated circuit driver to supply current to its loads. Outputs are common bussed to system power and can deliver up to 7.5 Amps. Current levels above two (2) amps can be used to indicate whether an output is ON or OFF. These modules use a Hex switch for addressing and come in three (3) styles.

104434 Eight (8) output PDM-8
104528 Six output Two input PDM-(6/2)
104529 Four output Four input PDM-(4/4)

Solid State Modules with inputs have polarity selectable inputs.
Any output can be made to flash, the first four inputs flash at one instance and the second four flash at the opposite instance (anti-flash).
The flash rate can be configured to 75 FPM or 150 FPM.

Connector Information
DTM06-12SA Lock WM-12S
Deutsch 20 Ga Sockets
1062-20-0122 for 16-10 Ga wire
0462-201-20141 for 18-24 Ga wire
0462-201-2031 Gold Contacts 18-24 Ga wire



Eight Output		Six OUT/Two IN		Four OUT/Four IN	
1	Output 0	1	Output 0	1	Output 0
2	CAN HI	2	CAN HI	2	CAN HI
3	CAN Shield	3	CAN Shield	3	CAN Shield
4	Output 2	4	Output 2	4	Output 2
5	Output 4	5	Output 4	5	Input 3
6	Output 6	6	Input 1	6	Input 1
7	Output 7	7	Input 0	7	Input 0
8	Output 5	8	Output 5	8	Input 2
9	Output 3	9	Output 3	9	Output 3
10	Output 1	10	Output 1	10	Output 1
11	CAN LO	11	CAN LO	11	CAN LO
12	Ground	12	Ground	12	Ground

Power Stud 10-32 thread/#10 Ring

Motor Control

The ES-Key Motor Control Module (PDM) is a solid state module capable of providing up to 15 Amps per output. It has 8 polarity selectable inputs, 8 positive outputs and 4 motor control circuits (H-bridge).

Connector Information

Power, Ground CAN	DT06-6SA Lock W-6S
Inputs	DT06-8SA Lock W-8S
Outputs	DT06-8SB Lock W-8S
Motors	DT06-8SC Lock W-8S

Deutsch 16 Ga Sockets

1062-20-0122 for 16-10 Ga wire

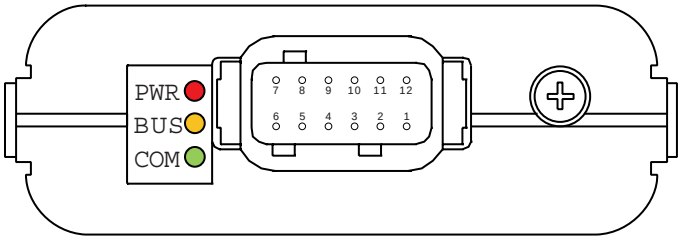
Output (Black)		Input (Grey)		Motor Control (Green)			PWR,GND,CAN (Grey)
1	Output 0	1	Input 0	1	Motor 1	1	12 VDC
2	Output 1	2	Input 1	2	Motor 2	2	Ground
3	Output 2	3	Input 2	3	Motor 3	3	NC
4	Output 3	4	Input 3	4	Motor 4	4	CAN HI
5	Output 4	5	Input 4	5	Motor 4	5	CAN LO
6	Output 5	6	Input 5	6	Motor 3	6	CAN shield
7	Output 6	7	Input 6	7	Motor 2		
8	Output 7	8	Input 7	8	Motor 1		

Solid State PDM

Solid State Modules use an integrated circuit driver to supply current to it's loads. Outputs are common bussed to system power and can deliver up to 7.5 Amps. Current levels above two (2) amps can be used to indicate whether an output is ON or OFF. These modules use a Hex switch for addressing and come in three (3) styles.

104434 Eight (8) output	PDM-8
104528 Six output Two input	PDM-(6/2)
104529 Four output Four input	PDM-(4/4)

Solid State Modules with inputs have polarity selectable inputs.
Any output can be made to flash, the first four inputs flash at one instance and the second four flash at the opposite instance (anti-flash).
The flash rate can be configured to 75 FPM or 150 FPM.



The PWR LED indicates whether the system electronics have power or not.
The BUS LED indicates whether or not there is power for the output loads.
The green LED is on steady with good communications.
A slow flash rate indicates that communications are down.
A fast flash rate means that there is an address conflict with another module.
If the LED is off, communications to and from the module are noit present.

Switch Modules

The ES-Key System uses Switch Input Modules (SIM's) to provide switching information to the system. Currently these are available in two basic styles and there can be up to 16 of them in the system.

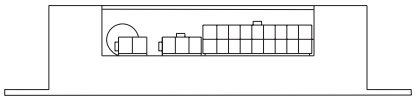
16 Positive (103372) Switch Input Module

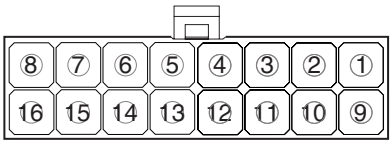
Connector Information
Amp Mini Universal Mate-N-Lok

Power	Amp 172165-1	1) Power	2) Ground	
CAN	Amp 172166-1	1) Can HI	2) CAN LO	3) CAN Shield

Input	Amp 770579-1	1) Input 0	positive	9) Input 8	positive
		2) Input 1	positive	10) Input 9	positive
		3) Input 2	positive	11) Input 10	positive
		4) Input 3	positive	12) Input 11	positive
		5) Input 4	positive	13) Input 12	positive
		6) Input 5	positive	14) Input 13	positive
		7) Input 6	positive	15) Input 14	positive
		8) Input 7	positive	16) Input 15	positive

Amp Socket Terminals
Tin 101535
Gold 103374





Wire Side

Switch Modules

Switch Input Modules have 16 available inputs which are individually polarity selectable. These modules use a Hex switch for addressing and come in three (3) styles.

104508	Sixteen (16) Input	SIM-16
104462	Sixteen Input Three Output	SIM-16/3
10xxxx	Sixteen Input/ One OUT/2 Analog	SIM-16/1/2

All inputs are polarity selectable using DIP switches on the circuit card.

Connector Information

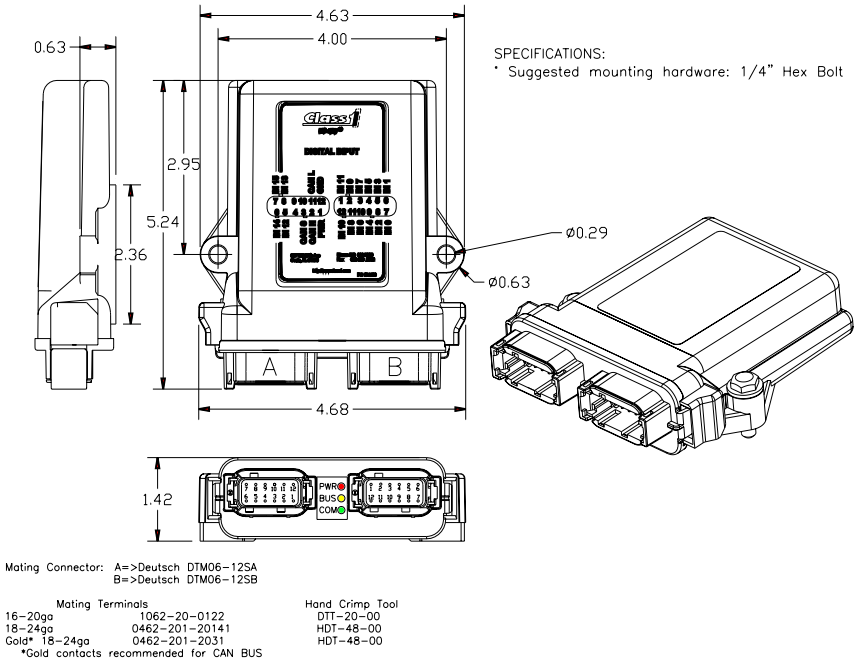
DTM06-12SA Lock WM-12S DTM06-12SB Lock WM-12S

Deutsch 20 Ga Sockets

1062-20-0122 for 16-10 Ga wire

0462-201-20141 for 18-24 Ga wire

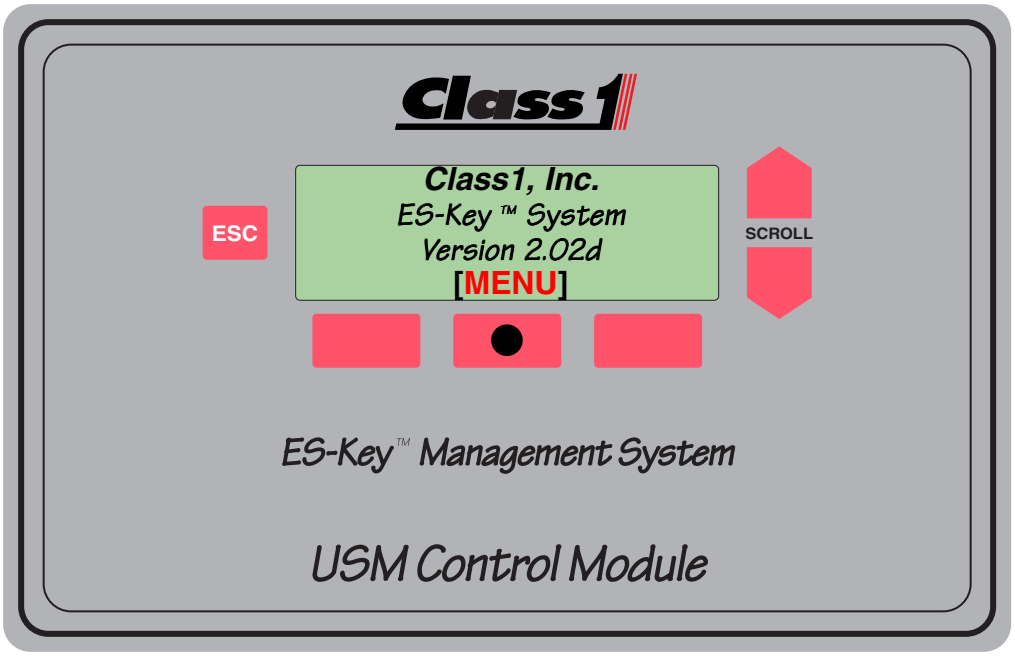
0462-201-2031 Gold Contacts 18-24 Ga wire



	DTM06-12SA		DTM06-12SB
1	Power	1	INPUT 11
2	CAN HI	2	INPUT 9
3	CAN Shield	3	INPUT 7
4	(OUT 2)	4	INPUT 5
5	INPUT 12	5	INPUT 3
6	INPUT 14	6	INPUT 1
7	INPUT 15	7	INPUT 0
8	INPUT 13	8	INPUT 2
9	(OUT 0)	9	INPUT 4
10	(OUT 1)	10	INPUT 6
11	CAN LO	11	INPUT 8
12	Ground	12	INPUT 10

USM Control Module (PN 103383)

The USM Control Module is the primary module in the system. It has an *ES-Key™ Card* reader to transfer information to and from the microprocessor memory as well as the capability to interface with a computer on the CAN bus. Direct access can be made through five switches and a twenty character by four line display on the USM. These are used to access the menu driven information, programming and diagnostic features. All logic and control for the system is handled by the USM Control Module. The menu is the user interface to the system allowing one to view information about the system, diagnose it and program load management functions.



In normal operation, the center switch is active with [menu] being displayed just above it. The escape [ESC] switch is always active when in the menu system and will move up one level each time that it is pressed until the top level is reached.
The [SCROLL] switches are active in certain menus to locate input or output data from a list. The three switches just below the display window are used to control the menu system. They become active and their function identified by text immediately above the switch. No text above a switch indicates that it has no function in that menu.

Press the red switch directly under [MENU] to enter the *ES-Key™ System* menu.
In this section, a pressed switch is indicated by a black dot on the switch.

System Logic

The ES-Key System utilizes an electrical connection database for operation. This database is written by the OEM and contains all the information necessary to operate the ES-Key System for a specific vehicle. The system can be customized to the user's needs without changing the physical wiring or hardware. This database can be 'read' by the user and is an 'as built' wiring diagram that stays with the system.

Each 'output circuit' has three conditions of operation:

Multiplexing:

Two conditions of operation are available for each circuit.

These conditions can be logically 'AND'ed (both conditions must be true) or logically 'OR'ed (either condition can be true) to each other.

Additionally, either or both of these conditions can use 'NOT' logic.

'NOT' logic simply means that the condition must be false for the system to consider it true.

The conditions can be inputs or outputs from anywhere in the system.

Load Management:

Outputs can be load managed to sequence on and sequence off.

Outputs can be load managed to shed at a specific voltage level.

Outputs can be managed to operate in Mode A, Mode B or both.

Fire Service Mode A is typically Response and Mode B is Scene.

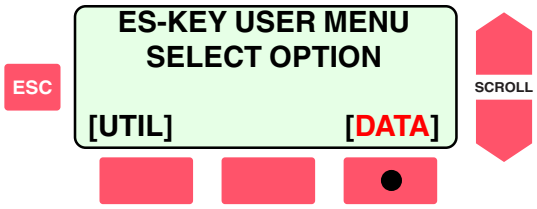
Outputs can be tied to a Staged input.

Staging for the fire service is typically the Warning Master Switch.

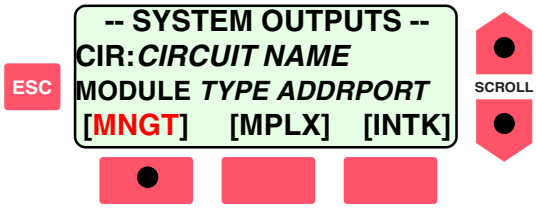
Interlocking:

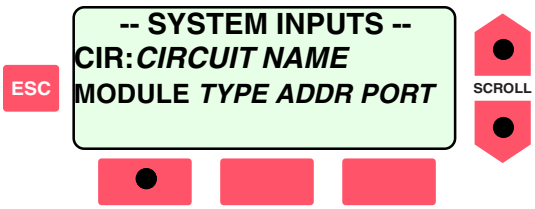
Any output can be tied to any of several interlocks available from an ES-Key Vocation Module.

MNGT Data

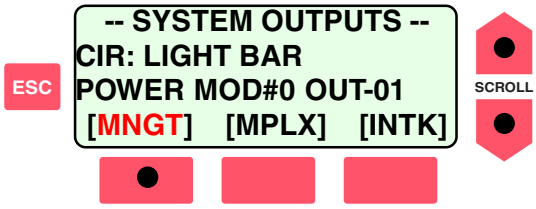


Selecting=x**a^q^**z=presents the system database for review.

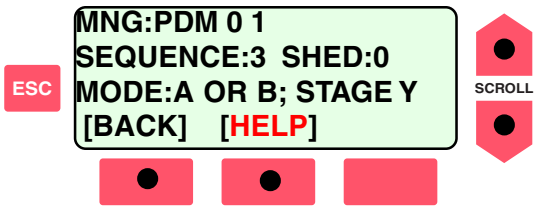




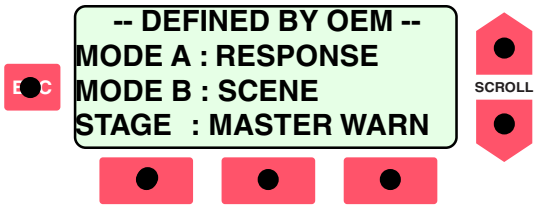
The scroll arrows allow you to see all of the system inputs and outputs.
The top line of the display indicates whether the circuit is an INPUT or OUTPUT.
The second line shows the Circuit Name.
The third line gives the module type, it's address 0-15 and the port on the device that the circuit is assigned to.
The fourth line is only active for OUTPUTS and allows the user to select one of three sub-menus for more information on the circuit.
[MNGT] provides a menu detailing the circuits load management information.
[MPLX] provides a menu detailing the circuits multiplexing information.
[INTK] provides a menu detailing the circuits interlock information.



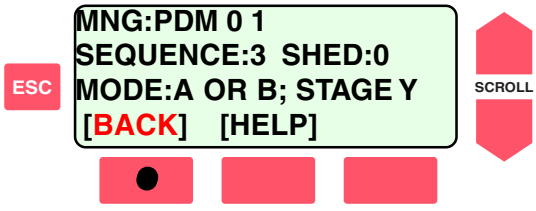
This screen indicates that the circuit 'LIGHT BAR' is an output located on a Power Module addressed as zero (0) and physically is on port one (1) of that module.



The Management screen shows that this output sequences on third, never sheds, will be on in either scene (mode a) or response mode (mode B) and is tied to the Master Warning Switch (staged).

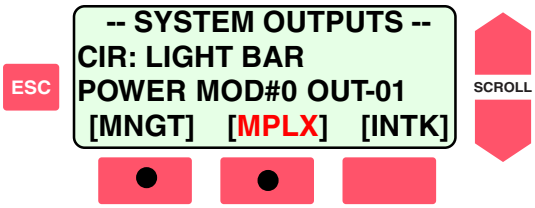


The HELP screen displays the OEM's definition of Mode A and B as well as what the Staged input is.
Press any key to return to the Management Screen.

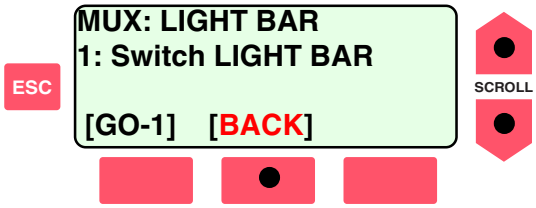


Pressing the BACK Switch returns you to the 'Circuits Menu'

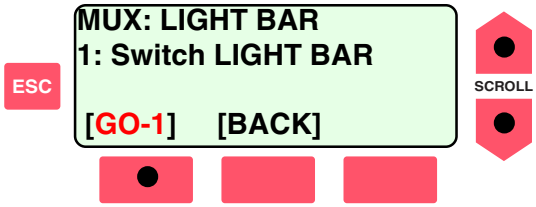
MPLX Data



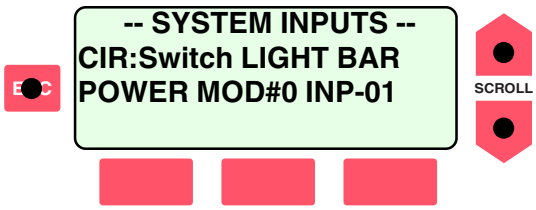
Selecting [**MPLX**] brings up the system multiplex menu.



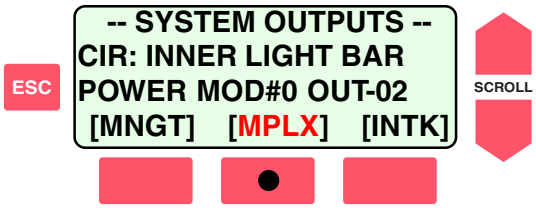
The multiplex information screen shows the arguments that must be true for the circuit to operate. The scroll switches select different circuits. [BACK] returns you to the Circuits Menu.

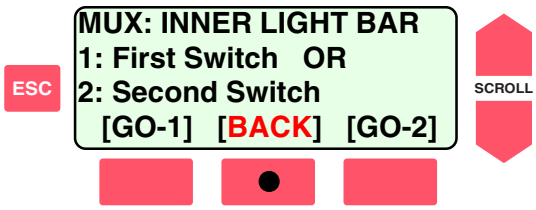


Pressing the [GO-1] switch takes you to the circuit menu for that argument.



The circuit screen shows that condition 1 is the LIGHT BAR Switch and it is located on the power distribution module at address 0 and input #1 on that module. Scroll to the next circuit or escape to a higher level menu.

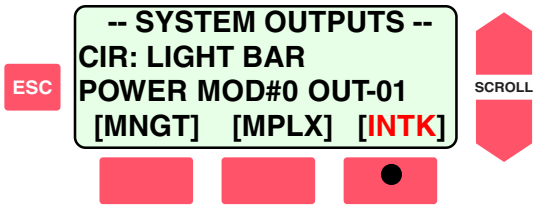




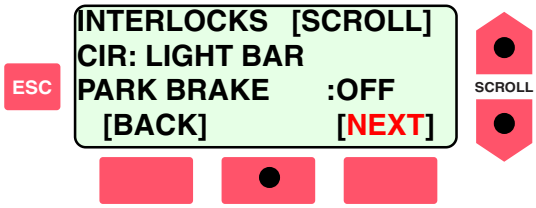
If there are two arguments used, both of them will show on the MPLX screen and either the GO-1 or GO-2 switch can be accessed for information on the arguments.

Pressing the BACK Switch returns you to the 'Circuits Menu'

INTK Data

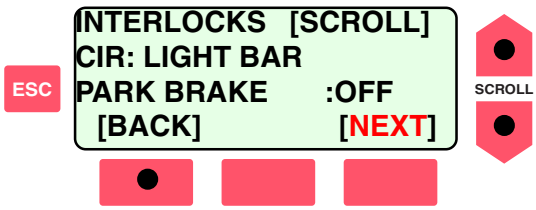


Selecting [**INTK**] brings up the system multiplex menu.



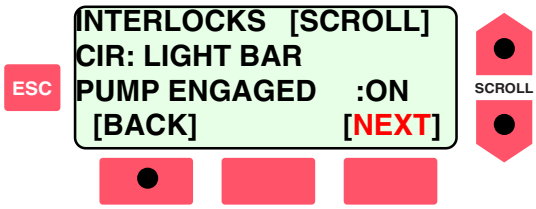
The interlock information screen shows the circuit name and allows you to view each of the interlocks and how it is related to the circuit.

Either -X-, the interlock is not associated with the circuit or OFF or ON indicates whether the interlock must be on or off for the circuit to turn on.

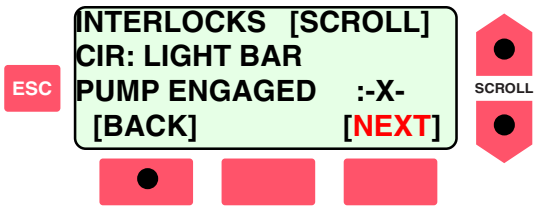


This indicates that the Park Brake must be OFF for the LIGHT BAR to work.

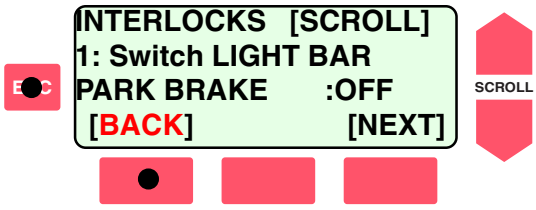
Pressing the [NEXT] switch takes you to the next interlock. Pressing the UP or DOWN arrow selects the next circuit to view in the interlock sub-menu.



This indicates that the pump must be engaged for the LIGHT BAR to work.



This indicates that the circuit LIGHT BAR doesn't care if the Pump is engaged or not.

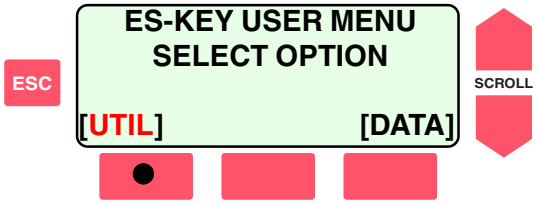


Pressing [BACK] selects the Circuits Menu.

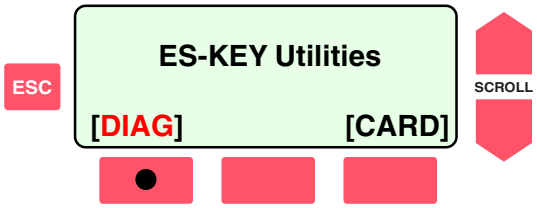
Pressing the BACK Switch returns you to the 'Circuits Menu'

Fault Menu

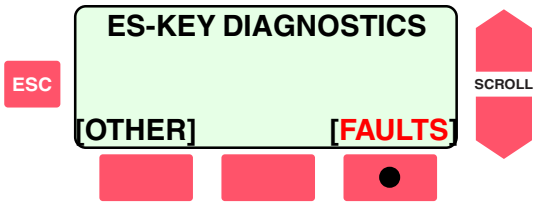
Enter the menu system by pressing the switch immediately below [**MENU**].



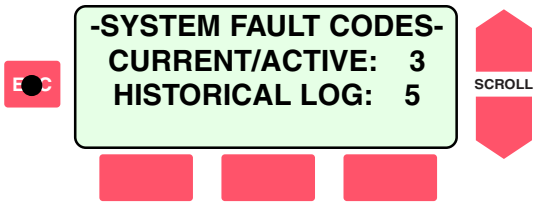
The two main sub-menu sections are utilities and data.
Select [**UTIL**]



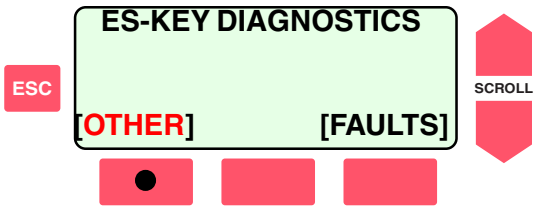
Under the utilities menu are three areas that can be accessed:
diagnostics, data logger (if it exists in the system) and card.
Select [**DIAG**]



Under ES-Key Diagnostics, a [**FAULTS**] Menu and an [**OTHER**] Menu is available.
Select [**FAULTS**]



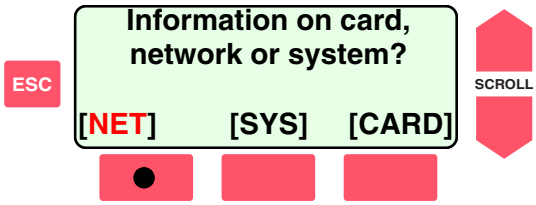
Displayed will be the number of current faults and the number of historical faults.
Pressing ESC returns you to the ES-Key Diagnostics selection menu.



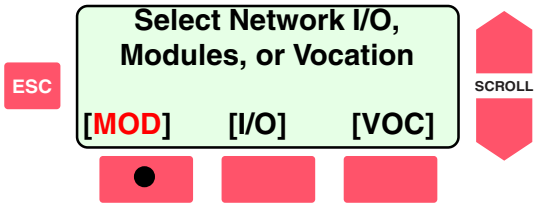
Selecting [**OTHER**] will take you to the Information on card, network or system selection menu.

Pressing [**ESC**] returns you to the Select [**ES-Key DIAGNOSTICS**] menu

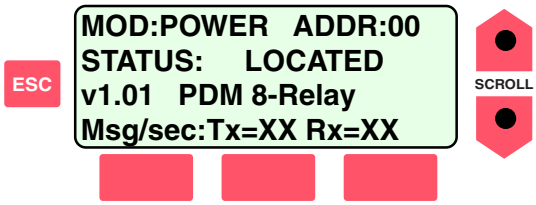
Module Menu



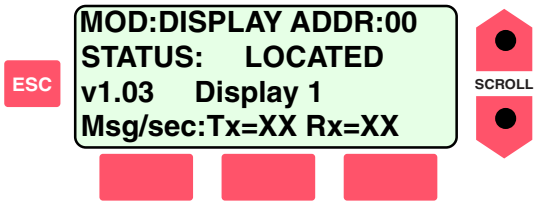
The [**NET**] menu opens a selection window for information on the network modules, inputs, outputs or the vocation module.

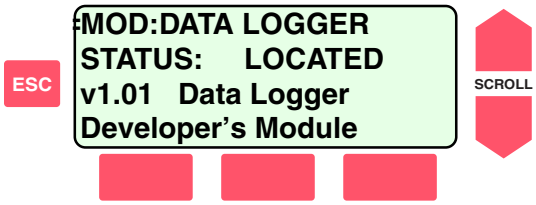


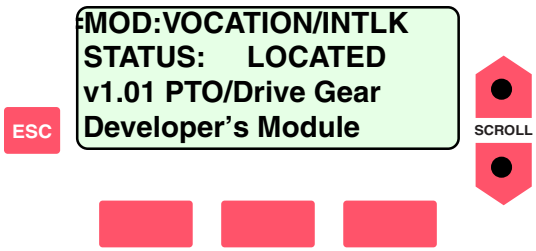
Pressing [**MOD**] allows individual modules to be queried and module information to be displayed.



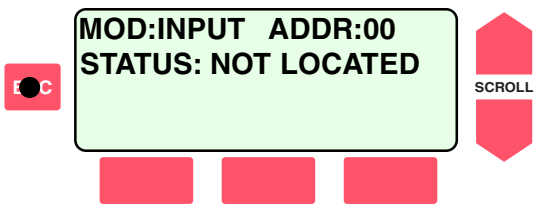
The display will indicate the Device Type, it's address, communications status, software version, module type and the number of messages per second sent and received.
Scroll through all the modules in the database to verify that they are on-line.





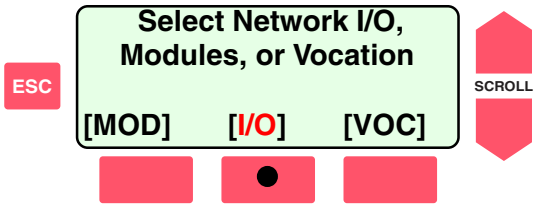


NOTE 1: THE CONTROL MODULE WILL ONLY LOOK FOR DEVICES THAT ARE CONTAINED IN THE ACTIVE DATABASE. ANY MODULE WITH A **STATUS: NOT LOCATED** SHOULD BE INVESTIGATED. IF AN UNKNOWN MODULE APPEARS, THE DATABASE IS MORE THAN LIKELY CORRUPT.

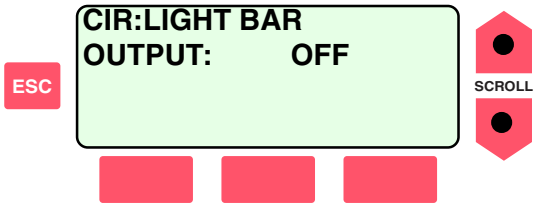


Pressing [ESC] will display the Select Network I/O, Modules or Vocation Select Menu.
Locating all the modules in the system can let you know if there are any communications problems and where they might be located.

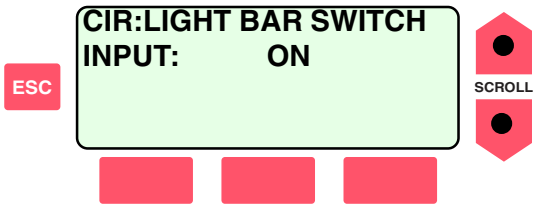
I/O-VOC Menu



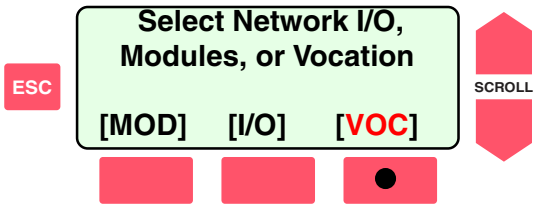
Selecting **[I/O]** brings up the input and output circuits page.



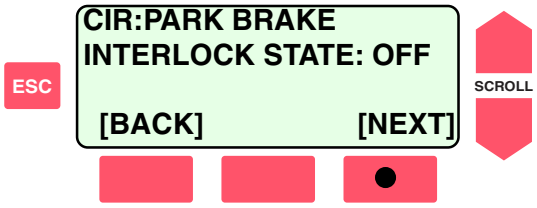
Each circuit on the vehicle can be looked at by using the up and down arrows to scroll through the circuits.
The screen will show whether the circuit is an INPUT or an OUTPUT and whether it is ON or OFF.



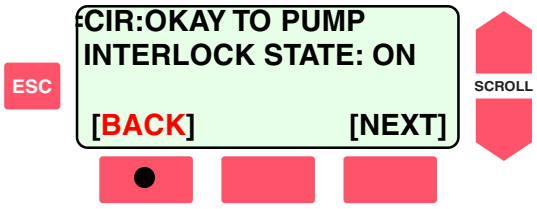
Pressing **[ESC]** returns you to the Select Network I/O, Modules or Vocation menu.



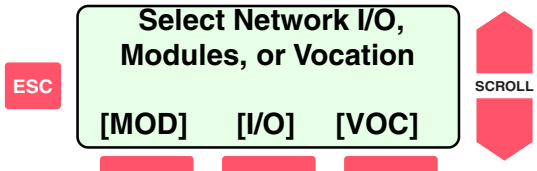
Selecting **[VOC]** brings up the Interlock Status Screen.



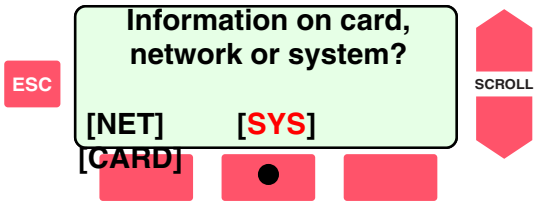
Each of the interlocks on the vocation module can be scrolled to using the **[NEXT]** switch. It's state will be shown as either ON or OFF.



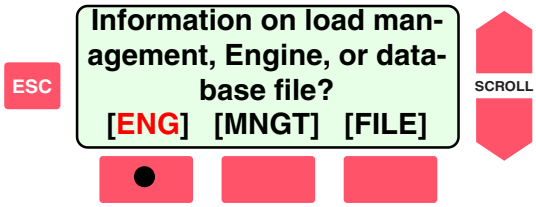
Pressing the **[BACK]** or the **[ESC]** switch brings you back to the Select Menu.



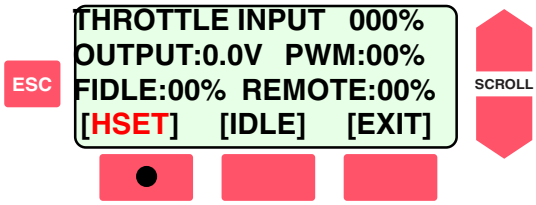
ENG Menu



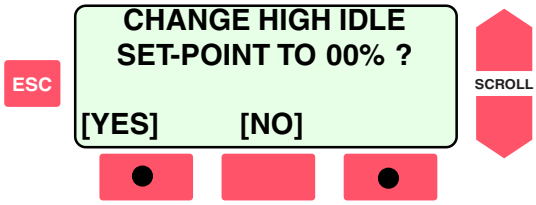
The [**SYS**] menu opens a selection window for information on Load Management, Engine or the database file.



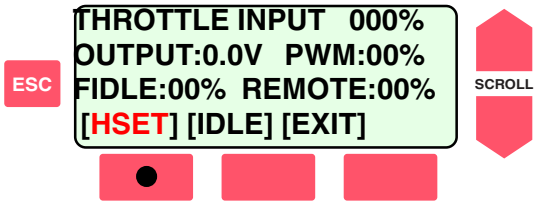
Pressing [**ENG**] brings up the Engine Fast Idle and Throttle Menu. This menu is used in conjunction with a Vocation Module. The engine will be controlled if the proper interlocks are present.



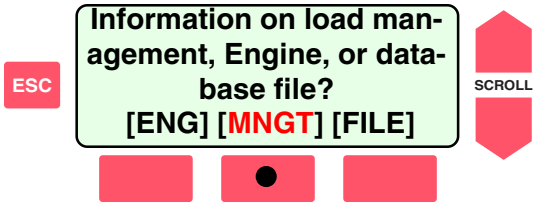
THROTTLE INPUT: displays the panel throttle position. OUTPUT: displays the analog engine control signal voltage. PWM: indicates the PWM engine control signal. FIDLE: displays the percentage of full throttle that a high idle signal will command. REMOTE: is the Throttle percentage commanded by the UP and DOWN switches.



With the proper interlocks, the engine can be operated to a desired RPM. Once this is accomplished, pressing [**HSET**] brings up the menu to set the current RPM as the HIGH IDLE RPM.

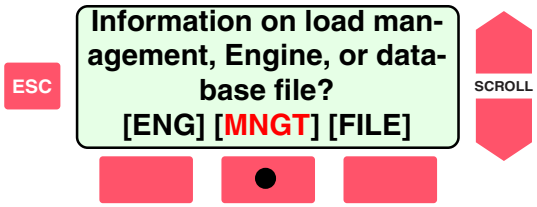


Pressing YES or NO returns you to the Engine Menu. IDLE brings the engine to curb idle and EXIT returns you to the System Select Menu.

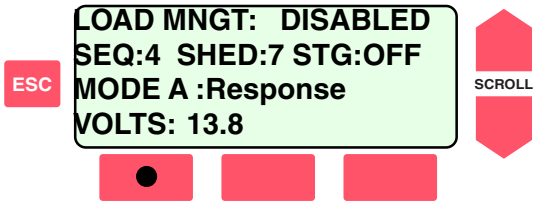


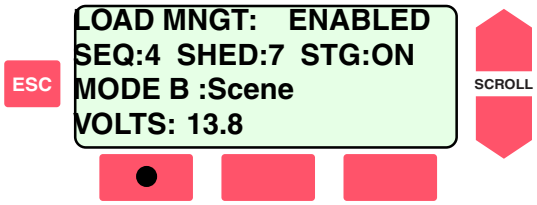
Pressing Management [**MNGT**] brings you to the Load Management Display Screen.

MNGT Menu

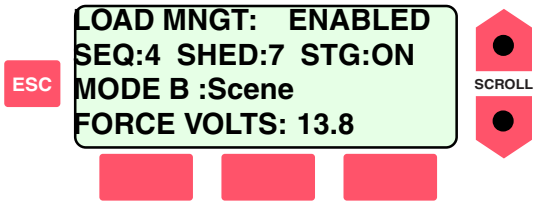


The [**SYS**] menu opens a selection window for information on Load Management, Engine or the database file.

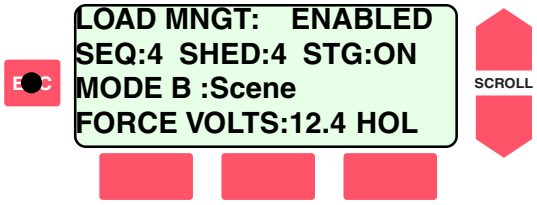




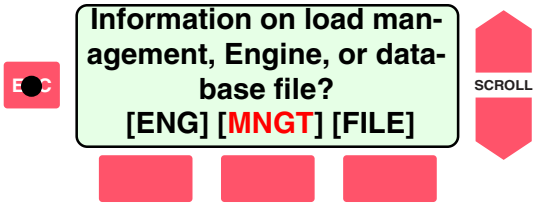
Pressing [**MNGT**] brings up the Load Management View. The system Load Management data is presented. The sequence level, shed level and system voltage are displayed. The stage and mode conditions are shown as well as whether load management is enabled or disabled.



Using the UP and DOWN arrows results in a diagnostic mode where the voltage display is changed by 0.1 VDC per switch press. The system will act as if this were the actual system voltage. Range is 10.0 VDC to 13.8 VDC.

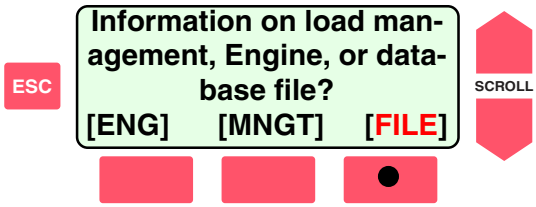


There are three Letters that can appear in the Bottom Right of the display.
H indicates that a High Idle output is active.
O means that a High Idle Override input is active.
L indicates that the system Low Voltage Alarm is active. to the System Select Menu.

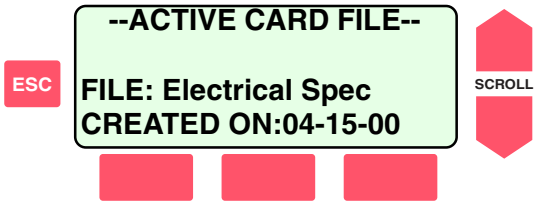


Pressing [**ESC**] returns you to the System Select Menu.

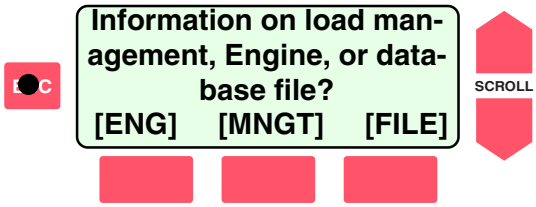
FILE Menu



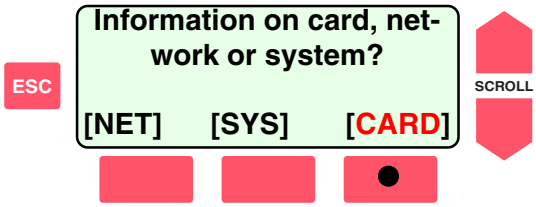
The [**SYS**] menu opens a selection window for information on Load Management, Engine or the database file.



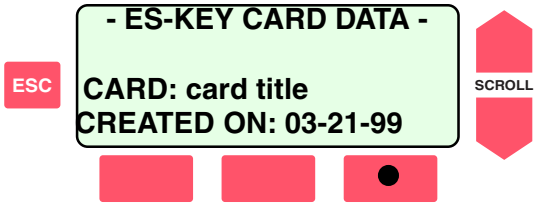
Pressing [**FILE**] brings up a display that shows the file name and the date it was created.



Pressing any key returns you to the System Selection Menu.

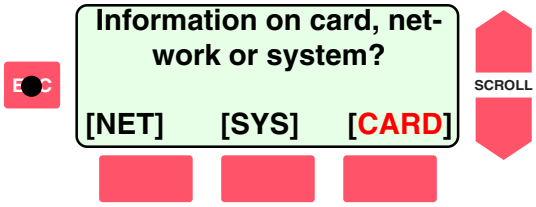


Pressing ESC to return to the Card, Network or System selection menu.

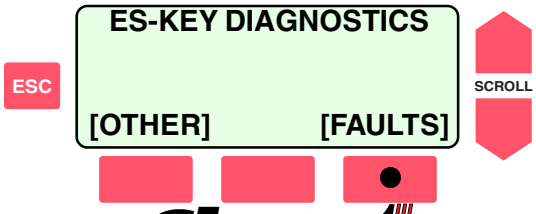


Press CARD to see information on a card that has been inserted into the card reader.

Press ESC to return to the Card, Network or System selection menu.

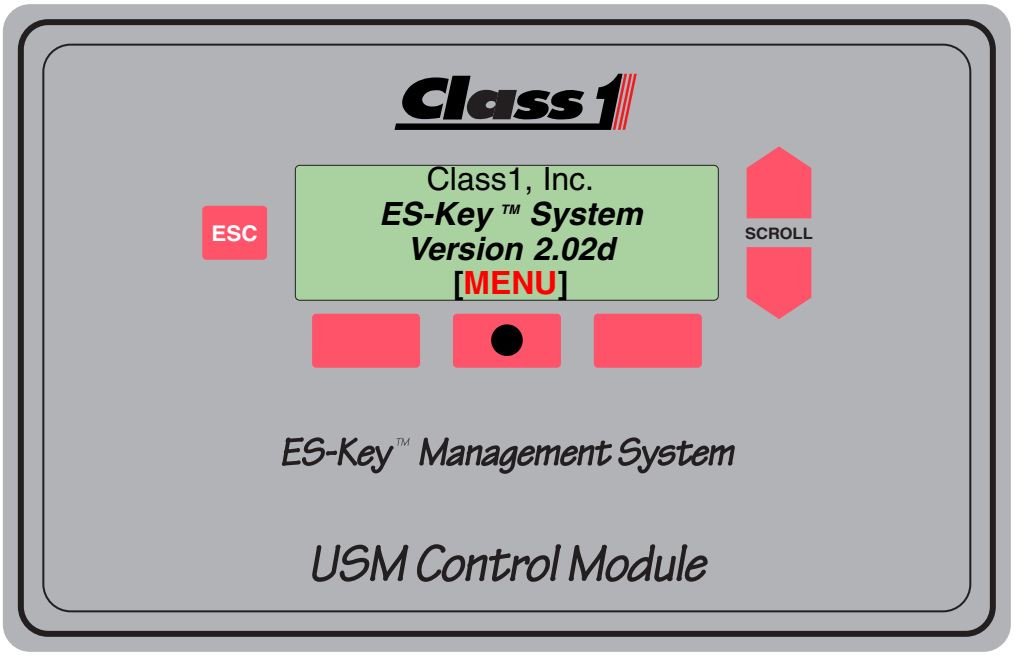


Pressing [**ESC**] returns you to the ES-Key Diagnostics Menu.



USM Control Module (PN 103383)

The USM Control Module is the primary module in the system. It has an *ES-Key™ Card* reader to transfer information to and from the microprocessor memory as well as the capability to interface with a computer on the CAN bus. Direct access can be made through five switches and a twenty character by four line display on the USM. These are used to access the menu driven information, programming and diagnostic features. All logic and control for the system is handled by the USM Control Module. The menu is the user interface to the system allowing one to view information about the system, diagnose it and program load management functions.



In normal operation, the center switch is active with [menu] being displayed just above it. The escape [ESC] switch is always active when in the menu system and will move up one level each time that it is pressed until the top level is reached.
The [SCROLL] switches are active in certain menus to locate input or output data from a list. The three switches just below the display window are used to control the menu system. They become active and their function identified by text immediately above the switch. No text above a switch indicates that it has no function in that menu.

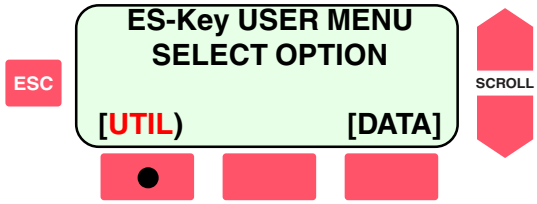
Press the red switch directly under [MENU] to enter the *ES-Key™ System* menu.
In this section, a pressed switch is indicated by a black dot on the switch.

Make Card

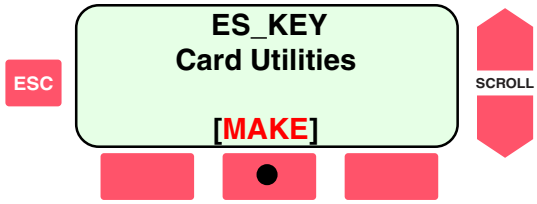
The ES-Key Card is a memory module that contains the database for system operation. This database is written by the OEM and contains all the information necessary to operate the ES-Key System for a specific vehicle. This database can be 'read' by the user and is an 'as built' wiring diagram that stays with the system. The database can be transferred to an ES-Key Card from the USM. A simple menu driven routine allows you to perform this function.

Select: [MENU]

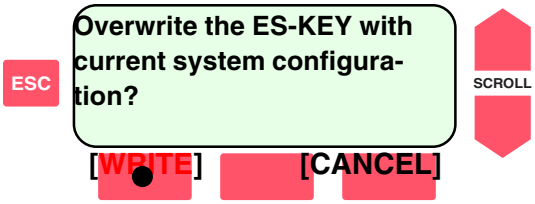
Select: [UTIL]

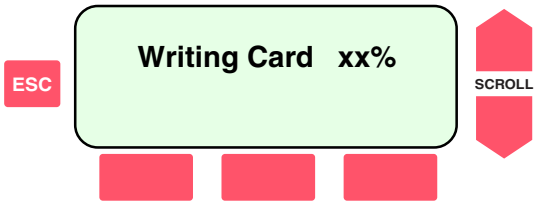


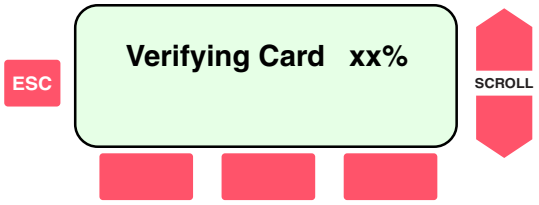
Select: [MAKE]

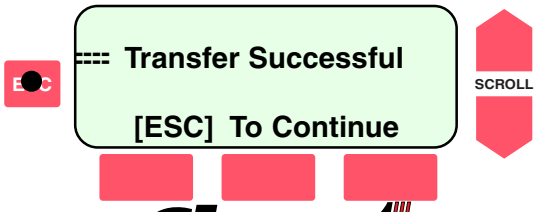


Select: [WRITE]

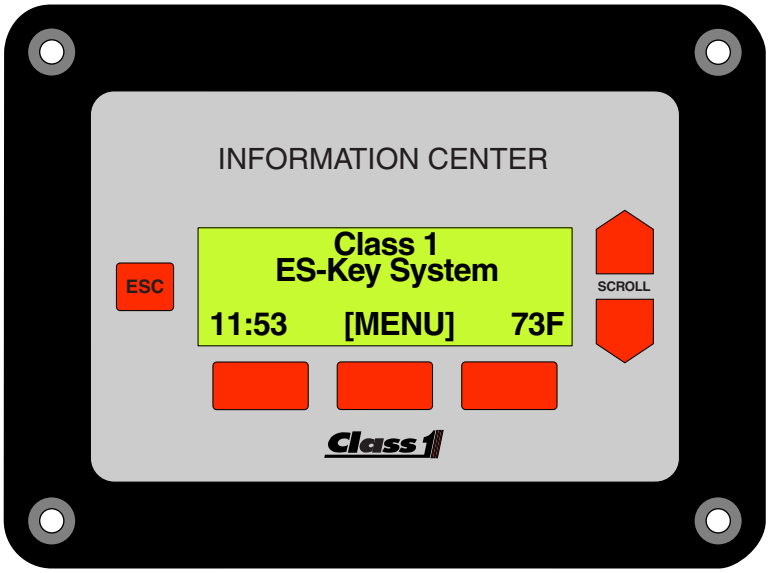


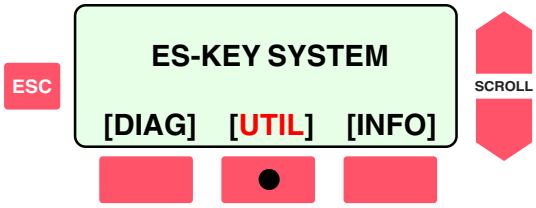




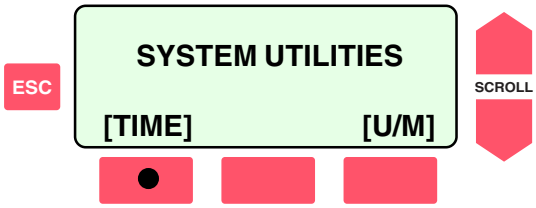


Display

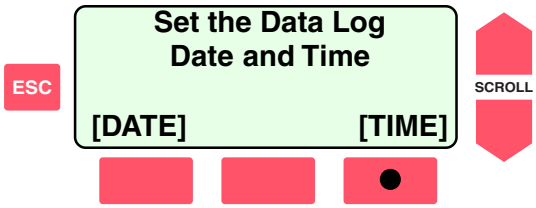




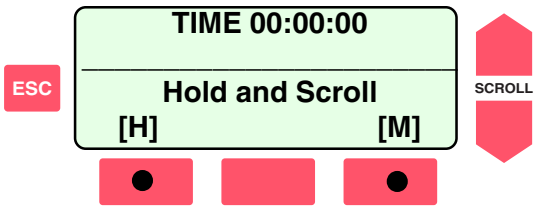
Pressing the switch under UTIL brings up the System Utilities Menu.



The Data Logger clock and the system units of measurement can be changed at the System Utilites Sub-menu.

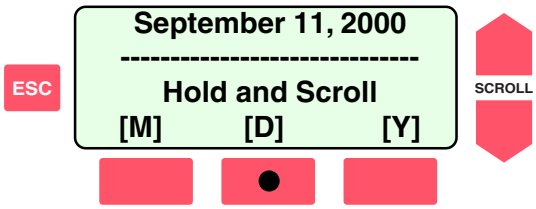


Select either date or time for a menu that will allow you to set either the time or date.



Hold the switch for either hours or minutes and use the scroll arrows to change the time setting as desired.

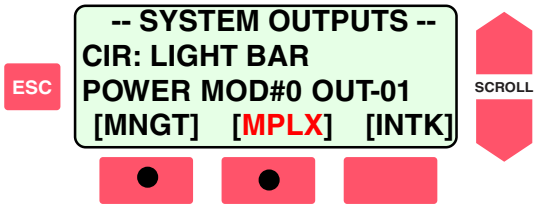
NOTE: If no time is displayerd at the top level and the time in the settings window is 00:00:00, then there is no datalogger in the system.

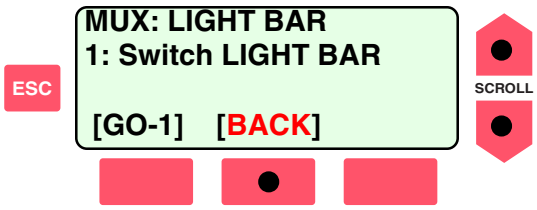


Operation to set the date is the same as for time. Hold the desired function while scrolling up or down.

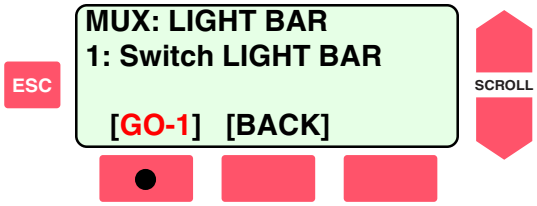
Class 1

Display

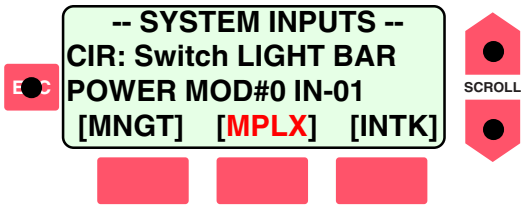




The multiplex information screen shows the arguments that must be true for the circuit to operate. The scroll switches select different circuits. [BACK] returns you to the Circuits Menu.



Pressing the [GO-1] switch takes you to the circuit menu for that argument.



The circuit screen shows that condition 1 is the LIGHT BAR Switch and it is located on the power distribution module at address 0 and input #1 on that module. Scroll to the next circuit or escape to a higher level menu.

If there are two arguments used, both of them will show on the MPLX screen and either the GO-1 or GO-2 switch can be accessed for information on the arguments.