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**CONFIDENTIAL**

## Technical Data Sheet

# Smart Programmable Switch (SPS) Panels

**Project#: 109342, 109343, 109344**

**REV: 1.00 06/15/2004**

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*IDEX – Class 1*
*06 February, 2003*

## 1. Revision Log

| Rev | Date | Changes |
|---|---|---|
| **1.00** | 06-15-04 | Initial requirements |

## 2. Module Overview

The Smart Programmable Switch Panels (SPS), ES-Key™ module p/n's 109342, 109343 & 109344 utilize a new multiplexing switch technology.

Using the SPS can eliminate the role of classic Rocker Switches. The design is based on a sealed silicone-molded top cover with a modern look. Switch functionality is obtained by metal switch domes placed underneath the silicone.

The SPS assembly has integrated electronics to interpret the switch signals (functions as a multiplex Input Module) and distributes these on the CAN SAE J1939 databus. The operator receives visual feedback on the switch status (functions as a multiplex Output Module) by LED's located underneath the silicone.

Every switch can be custom programmed to function as one of the 24 predefined switch modes. Assigning switch modes can be conveniently done wirelessly through the Infrared port with a supported Pocket PC or through the Can bus using Es-Key Professional Software version 1.13.5 or later.

Custom labels, which are backlit, can be inserted above and aside each individual switch to indicate the switch function. The switch contour is backlit to enhance visibility during nighttime.

Switch modules are available with 2, 4 or 8 "rocker style" switches. Modular switch stacking is possible.

The SPS can either operate within a fully multiplexed ES-KEY network or function as a ***Peer-to-Peer*** network (without a USM).

The module reports the state of the inputs to the network and will activate the outputs on command from the network.

### 2.1. 3 Digital Inputs

The device has 3 digital inputs. An input is considered to be active under the following conditions:

| POLARITY | INPUT REQUIREMENTS |
|---|---|
| GROUND | INPUT "ON" WHEN $V_{INPUT}$ < 40% $V_{IGNITION}$ |
| POSITIVE | INPUT "ON" WHEN $V_{INPUT}$ > 60% $V_{IGNITION}$ |

(The 3 inputs are for DIMMER, PARK BRAKE & LOAD MANAGEMENT ENABLE)

## 2.2. Device Address Selection

P/N's 109342, 109343 & 109344 can be added into the ES-Key™ Network through the ES-Key™ Professional development software package. The module is reported as having 16 network inputs (input addresses 0 -15) and 16 network outputs (output addresses 0-15). Each module that resides in the network must have a unique device address.

### 2.2.1. Initial Selection of Device Address (IMPORTANT- PLEASE READ)

**If a panel has never had a device address set, it will flash when powered up. You can set the address by simply cycling the power while holding down one of the switches on the panel. When the panel powers back up, continue to hold the button for a few seconds and the address will be set.**

***The following chart shows the address that corresponds to each switch.***


### 2.2.2. Changing the Device Address

After the device has been set to an address it can be changed by three methods.

**Method # 1:**
Start the Smart Panel Application on a supported Pocket PC. Select the "Panel Settings" tab and change the setting under "Panel Address" to a value between 0 and 15. Remember that each module that resides in the network must have a unique device address. Select "OK" to accept the change and then use "Beam" and "Set Panel Data" to update the SPS Panel via the IrDA port.

**Method # 2:**
Start the Es-Key Professional development software on a PC and connect to the CAN bus. Make sure that you have a SPS Panel added as a device on the network. Enter edit mode for the SPS Panel and change the "Device Address" option. Apply the change and then "Upload" the data to the SPS Panel.

**Method # 3:**
Using a password can change the panel device address. The password is activated by a sequence of selections on the panel. This is a convenient method if you do not have access to ES-Key Pro software or a PDA. Follow this procedure

- With Power on the panel, simultaneously hold the upper and lower inputs of Switch 1
- At the same time, enter the following combination on Switch 2 (L=Lower, U=Upper)
- U L U U L U L L x x x x (Where xxxx corresponds to the Address number in binary code)
  - L L L L = 0
  - L L L U = 1
  - L L U L = 2
  - L L U U = 3
  - L U L L = 4
  - L U L U = 5
  - L U U L = 6
  - L U U U = 7
  - U L L L = 8
  - U L L U = 9
  - U L U L = 10
  - U L U U = 11
  - U U L L = 12
  - U U L U = 13
  - U U U L = 14
  - U U U U = 15

## 2.3. Switch Panel Mode

After the device has been set to an address it can also be toggled between Network (Es-Key) Mode and Peer-To-Peer Mode. This can be accomplished by one of two methods.

**Method # 1:**
Start the Smart Panel Application on a supported Pocket PC. Select the "Panel Settings" tab and change the setting under "Network Settings" to either "ES-Key" or "Peer to Peer". Select "OK" to accept the change and then use "Beam" and "Set Panel Data" to update the SPS Panel via the IrDA port.

**Method # 2:**
Start the Es-Key Professional development software on a PC and connect to the CAN bus. Make sure that you have a SPS Panel added as a device on the network. Enter edit mode for the SPS Panel and change the "Network Mode" option under the "Panel" tab. Apply the change and then "Upload" the data to the SPS Panel.

## 2.4. Configuring the SPS Panel for Network (ES-Key) Mode

### 2.4.1. New Installations

The SPS Panels (PN's 109342, 109343 & 109344), by default, are set to device type 5.

In order for the USM to recognize this new device type, it had to have a software change. This software version (5.0) was released at the end of June 2004. In addition, an upgrade has been made to the Es-Key Professional software so that the panels can be added as a new device type ("SPS Panel"). The required version of this software is V1.13.8 or later.

**Requirements:**
USM V 5.0 (or Later)
Es-Key Pro V 1.13.8 (or Later)

**Configuration:**

1) Make all required connections and power up the Es-Key system.
2) The SPS panels should all flash until they have been given an address. (See "Section 2.2 Device Address Selection" for instructions)
3) Using Es-Key Pro V1.13.8 or later, add the SPS Panel devices to the configuration.
4) For each SPS Panel, set the address and configure the function of each switch (i.e. momentary, dimmer, bi-stable, etc)
5) Establish multiplex logic
6) Upload to the USM, including all the SPS Panels.

### 2.4.2. Retrofitting an existing Es-Key Installation

The SPS Panels (PN's 109342, 109343 & 109344), by default, are set to device type 5. However, in order for USM older than V5.0 (such as V4.6) to recognize these panels they must be set as input modules which have a device type of 4. The SPS panel software has a password-protected function that allows the OEM to reconfigure it to device type 4 (I/O module).

- With Power on the panel, simultaneously hold the upper and lower inputs of Switch 1
- At the same time, enter the following combination on Switch 2 (L=Lower, U=Upper)
- U L U U  L U L U  L U L L
- To change back to device type 5, enter the same sequence except change the last L to a U

**Requirements:**
USM V 4.6 (or earlier)
Es-Key Pro (any version)
Pocket PC (with SPS Panel Application)
SPS Panels (reconfigured to Device Type 4)

**Configuration:**

1) Make all required connections and power up the Es-Key system.
2) The SPS panels should all flash until they have been given an address. (See "Section 2.2 Device Address Selection" for instructions)
3) Use the Pocket PC to configure the function of each switch (i.e. momentary, dimmer, bi-stable, etc). This is the same procedure as configuring a Peer-to-Peer system except that you will not assign outputs with the Pocket PC application. Make sure that you have gone to the

"Settings/Panel Settings" screen and changed "Network Settings" to Es-Key, which disables the output option on the main screen.

4) Using Es-Key Pro, add the SPS Panels as "Input/Output Module" devices.
5) Establish Multiplex Logic
6) Upload the configuration to the USM

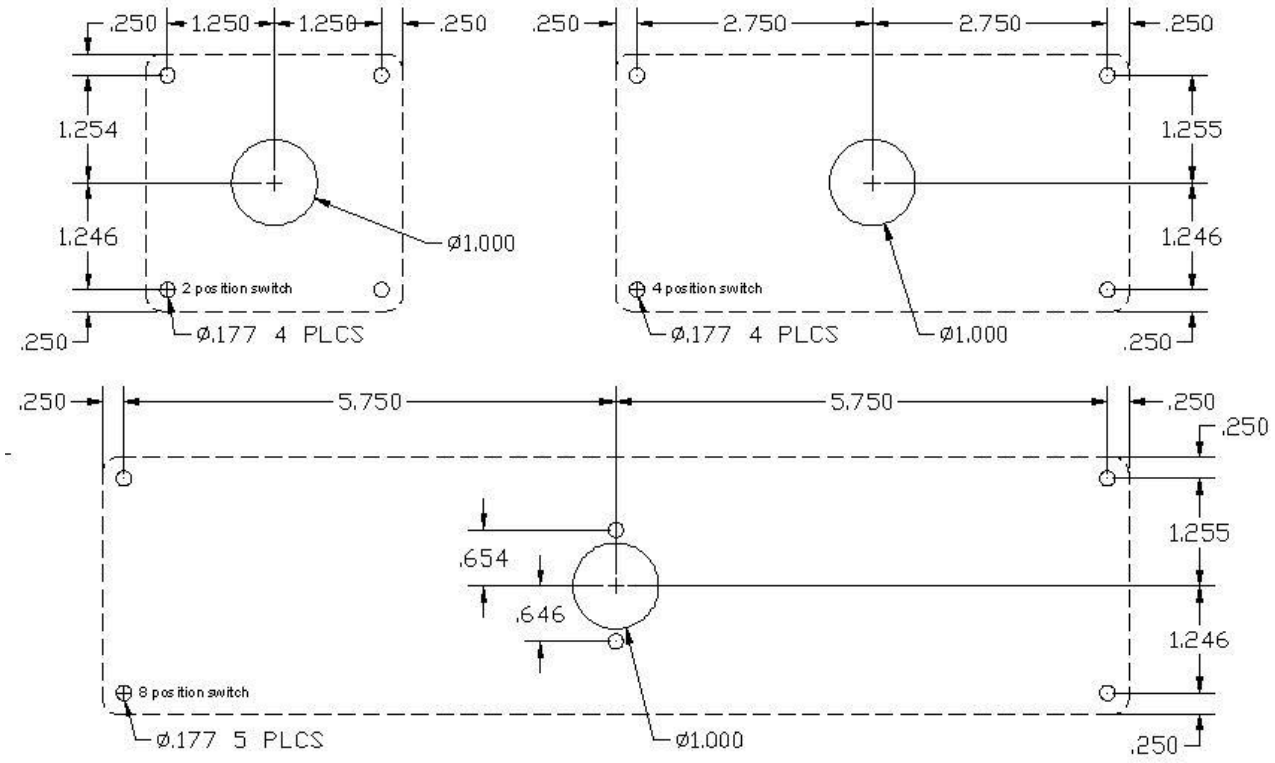
## 3. SWITCH CONFIGURATIONS

| MODE NAME | DESCRIPTION |
|---|---|
| **MOMENTARY - A**<br>**NO FUNCTION - B** | Switch A will be activated as long as the switch A is depressed. It will be deactivated whenever the switch is not pressed. Switch B remains no function in any case of switch press A or B. |
| **NO FUNCTION - A**<br>**MOMENTARY – B** | Switch B will be activated as long as the switch B is depressed. It will be deactivated whenever the switch is not pressed. Switch A remains no function in any case of switch press B or A. |
| **MOMENTARY ON A/B** | Switch A will be activated as long as the switch A is depressed and It will be deactivated whenever the switch is not pressed. Switch B will be activated as long as the switch B is depressed and it will be deactivated w henever the switch is not pressed. |
| **ROCKER**<br>**ON – A, OFF - B** | Classic Rocker switch with ON in the A (lower) switch position, and OFF in the B (upper) position. Switch A will be activated when depressed, and will remain activated until Switch B is depressed. |
| **ROCKER**<br>**ON – B, OFF - A** | Classic Rocker switch with ON in the B (upper) switch position, and OFF in the A (lower) position. Switch B will be activated when depressed, and will remain activated until Switch A is depressed. |
| **BISTABLE - A**<br>**BISTABLE – B** | ON/OFF push button switch in both the A and B positions. The state of the Switch A will change (toggle state) and maintain with each push of Switch A. The state of the Switch B will change and maintain with each push of Switch B. The state of the complimentary switch does not change, i.e. Switch A does not affect Switch B and vice versa. |
| **BISTABLE – A**<br>**NO FUNCTION – B** | ON/OFF push button switch for the A position. The state of the Switch A will change (toggle state) and maintain with each push of Switch A. Switch B has no function. |
| **NO FUNCTION – A**<br>**BISTABLE – B** | ON/OFF push button switch for the B position. The state of the Switch B will change (toggle state) and maintain with each push of Switch B. Switch A has no function. |
| **EXCLUSIVE BISTABLE A/B** | Same as “Bi-stable A/B” except that the state of the complimentary switch is turned off when a switch is pressed. Pressing Switch A will toggle the state of Switch A and will also force the state of Switch B to OFF; similarly, pressing Switch B will toggle the state of Switch B and will also force the state of Switch A to OFF |
| **DIMMER** | Pressing the Dimmer switch in the B position will increase the panel brightness by 10% and pressing the switch in the A position will decrease the panel brightness by 10%. |
| **BISTABLE - A**<br>**MOMENTARY - B** | ON/OFF push button switch in the A position, and momentary ON in the B position. The state of the Switch A will change (toggle state) and maintain with each push of Switch A. The state of the Switch B will be on only while pressed. |
| **BISTABLE - B**<br>**MOMENTARY - A** | ON/OFF push button switch in the B position, and momentary ON in the A position.. The state of the Switch B will change (toggle state) and maintain with each push of Switch B. The state of the Switch A will be on only while pressed. |
| **MASTER ENABLE SW** | When pressed in the B position, this switch will enable any panel switches that have been associated with the master switch. This is equivalent to a bank of switches being wired in series with a first master switch. Note that an associated bank switch will activate only if that switch is in the “ON” position. When the A side of the switch is pressed, the master enable will be turned OFF. |
| **LOAD MANAGE SWITCH** | Incorporating the functions of switch type 10 (Master Enable); when pressed in the A (lower position) will turn load management function on or off. When the Switch A is in the ON position (green LED indicator is lit), the load management override is also ON; when Switch A is in the OFF position, load management features are enabled. |
| **HIGH IDLE SWITCH** | When pressed in the B position the engine high feature will be activated. When pressed in the A position the high idle feature will be deactivated. Note that the engine governor interface module must be installed for this feature to be available. |
| **REMOTE THROTTLE SWITCH** | If the high idle feature is not active (switch is off) and the switch is pressed in the in the B position, the engine high feature will be activated. Subsequent Switch B presses will increase the engine speed and Switch A presses will decrease the engine speed. Simultaneously pressing the A and B switches will deactivate the throttle feature. |

| MODE NAME | DESCRIPTION |
|---|---|
| **HEADLIGHTS MARKER LIGHTS** | Switch A (Lower position) will turn on and off the marker lights. Switch B (Upper position) will turn on and off the headlights, and will turn on the marker lights |
| **WIPER HI - LOW** | Switch B will be an ON/OFF push button. Switch A can be toggled |
| **WIPER INT WASH** | |
| **DUAL OUTPUT A/B** | The state of both Switch A and B will change (toggle state) and maintain with each push of either Switch A or B. |
| **SPARE** | NOT USED |
| **ATTACH TO SW 1** | If you have a SPS 4 or SPS 2, the additional switches that are not present can be set as “virtual” switches. This option tells the “virtual switch to follow the setting of Switch 1 which allows additional outputs to be controlled by Switch 1. |
| **ATTACH TO SW 2** | If you have a SPS 4 or SPS 2, the additional switches that are not present can be set as “virtual” switches. This option tells the “virtual switch to follow the setting of Switch 2 which allows additional outputs to be controlled by Switch 2. |
| **ATTACH TO SW 3** | If you have a SPS 4 or SPS 2, the additional switches that are not present can be set as “virtual” switches. This option tells the “virtual switch to follow the setting of Switch 3 which allows additional outputs to be controlled by Switch 3. |
| **ATTACH TO SW 4** | If you have a SPS 4 or SPS 2, the additional switches that are not present can be set as “virtual” switches. This option tells the “virtual switch to follow the setting of Switch 4 which allows additional outputs to be controlled by Switch 4. |
| **ON/OFF LOW** | Works with the “MED HIGH” switch. Switch B will be an ON/OFF push button. Switch A comes on automatically when Switch B is toggled to “ON”. |
| **MED HIGH** | Works with the “ON/OFF LOW” switch. Switch A and B are Exclusive to each other and to switch A of the “ON/OFF LOW” switch. |
| | |

## 4. MOUNTING AND DIMENSIONS

**Cutout Dimensions for Panels (Dashed Lines represent the profile of the SPS Panel).**




The module should be mounted so that the connector face and seal are not in direct water spray. Wires must be of correct size to properly seal within the mating AMP connector. All unused sockets must be filled with appropriate fill plug. Do not mount the module in an area of excessive heat or vibration.

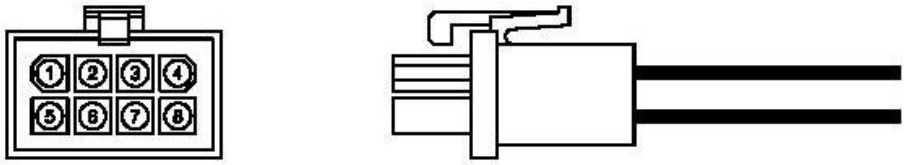
## 5. Connector Description

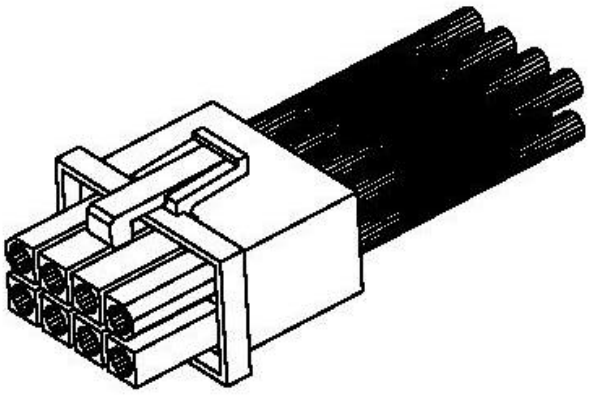
The module has one connector and the following definitions apply:

**CONNECTOR A**

Mating Connector: AMP 794821-1
Seal: AMP 794772-8
Wire Seal: AMP 794758-1
Terminal: AMP 770988-1

| POSITION | CIRCUIT | DESCRIPTION |
|---|---|---|
| 1 | [S+] SUPPLY + | Controller Supply - Vehicle Ignition |
| 2 | [CH] CAN High | Communications |
| 3 | [CL] CAN Low | Communications |
| 4 | [CS] CAN Shield | Communications |
| 5 | DIMMER | Input to toggle panel to predefined backlight level |
| 6 | PARK BRAKE (GND) | Input to toggle between Mode A and Mode B |
| 7 | LOAD MNG ENABLE (GND) | Enables Load Management Functions |
| 8 | [S-] SUPPLY - | Controller Supply - Vehicle Ground |



## 6. DEVICE NETWORK I/O MEMORY SPACE (I/O ADDRESSES)

The module inputs and outputs are reported to the network via the following I/O assignments. These circuit attachments are made by using the ES-Key™ development software.

NOTE: Activating an SPS output with a multiplex equation using Es-Key development software causes the LED in the associated SPS button to flash.

**MODULE INPUTS (REPORTED TO ESKEY NETWORK)**

| INPUT ADDR | DESCRIPTION |
|---|---|
| INPUT 0 | Switch 1, Lower: active when ON |
| INPUT 1 | Switch 1, Upper: active when ON |
| INPUT 2 | Switch 2, Lower: active when ON |
| INPUT 3 | Switch 2, Upper: active when ON |
| INPUT 4 | Switch 3, Lower: active when ON |
| INPUT 5 | Switch 3, Upper: active when ON |
| INPUT 6 | Switch 4, Lower: active when ON |
| INPUT 7 | Switch 4, Upper: active when ON |
| INPUT 8 | Switch 5, Lower: active when ON |
| INPUT 9 | Switch 5, Upper: active when ON |
| INPUT 10 | Switch 6, Lower: active when ON |
| INPUT 11 | Switch 6, Upper: active when ON |
| INPUT 12 | Switch 7, Lower: active when ON |
| INPUT 13 | Switch 7, Upper: active when ON |
| INPUT 14 | Switch 8, Lower: active when ON |
| INPUT 15 | Switch 8, Upper: active when ON |

**MODULE OUTPUTS (REPORTED TO ESKEY NETWORK)**

| OUTPUT ADDR | DESCRIPTION |
|---|---|
| OUTPUT 0 | module output 0: Command |
| OUTPUT 1 | module output 1: Command |
| OUTPUT 2 | module output 2: Command |
| OUTPUT 3 | module output 3: Command |
| OUTPUT 4 | module output 4: Command |
| OUTPUT 5 | module output 5: Command |
| OUTPUT 6 | module output 6: Command |
| OUTPUT 7 | module output 7: Command |
| OUTPUT 8 | module output 8: Command |
| OUTPUT 9 | module output 9: Command |
| OUTPUT 10 | module output 10: Command |
| OUTPUT 11 | module output 11: Command |
| OUTPUT 12 | module output 12: Command |
| OUTPUT 13 | module output 13: Command |
| OUTPUT 14 | module output 14: Command |
| OUTPUT 15 | module output 15: Command |

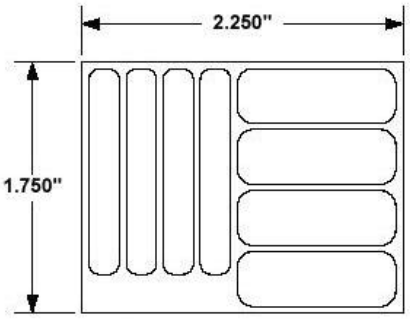
## 7. DIAGNOSTIC LEDS

Each SPS Panel has LED's that can be used as diagnostic indicators. These indicators can be used to determine various conditions of the panel. The following table describes the various conditions of the indicators.

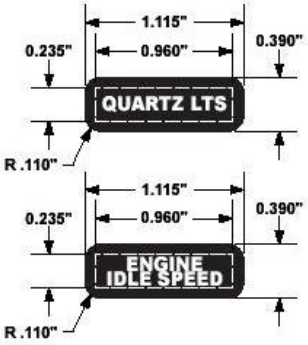

| LED | STATE | DESCRIPTION |
|---|---|---|
| ALL LEDS | FLASH | Factory Setting. No Device Address Set |
| LOGO | ON | CAN communications okay, module active |
| LOGO | FLASH | CAN communications okay, but device not recognized or configured for the network |
| SWITCH 1, LOWER | SINGLE FLASH ON POWERUP | Peer To Peer Mode |
| SWITCH 1, UPPER | SINGLE FLASH ON POWERUP | Network (ES-Key) Mode |
| SWITCH 2, LOWER | SINGLE FLASH ON POWERUP | PANEL SET TO "DEVICE TYPE = 5" |
| SWITCH 2, UPPER | SINGLE FLASH ON POWERUP | PANEL SET TO "DEVICE TYPE <> 5" |

## 8. INSERTABLE LABELS

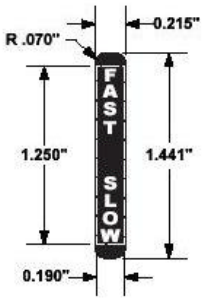
Notes:
1) Recommended font for label text is 10 pt Arial Black at 90% width.
2) Variations of different text and/or graphics must fit in the dashed areas shown, which represents the backlit area.
3) Material: .006" AutoTex UV.
4) Adhesive: 3M9502
5) Colors:
Text: Transparent white - visible
Background: Non-transparent Black
6) Recommended Supplier:
Hallmark Nameplate
1717 East Lincoln Ave.
Mt. dora, Florida 32757
National Sales Manager. John Santiago
jsantiago@hallmarknameplate.com
Phone 1-800-874-9063
Phone 352/383-8142
Fax 352/383-8146
http://hallmarknameplate.com/
7) Below is a layout of tooling we already have with Hallmark that can be used by our customers.




Top and side labels, reference pn 109578




TOP LABELS




SIDE LABELS

## 9. MODULE OPERATING PARAMETERS

| | |
|---|---|
| Voltage Supply…… | 9.5 - 30 VDC |
| Temperature…….. | -40 - +85 C |
| Environment…….. | IEC Standards IP-65 |