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TECHNICAL PRODUCT DATASHEET

ES-KEY

High Density I/O Node

(Super Node II)

P/N 119890 and P/N 119891 (with MODEM)

PRELIMINARY

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TECHNICAL DATA SHEET

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DATE	5/14/2010				
PRODUCT GROUP	ES-KEY	P/N	119890 and 119891 w/ MODEM	REV	1.00
PRODUCT	High Density I/O Node (Super Node II)			BY	AMS

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1. Revision Log

Rev	Date	Approved	Changes
1.00	5-14-2010	AMS	Initial requirements

2. Module Overview

The ES-Key™ High Density I/O Node (Super Node II p/n 119890 and p/n 119891 with MODEM) consolidates functions of multiple ES-Key™ modules to reduce node count and simplify addressing. The Super Node II is well suited for applications where a centralized node location is required.

2.1. Features

• **18** positive polarity solid state outputs (13 Amps each)	section 3
• **6** ground polarity solid state outputs (2 Amps each)	section 4
• **8** positive polarity digital inputs	section 5
• **16** ground polarity digital inputs	section 5
• Digital Circuit Breakers on all positive polarity outputs	section 3.2
• Output “open load” detection	section 3.5
• Input and output LED status indicators	section 15
• Output PWM control *(on certain outputs)*	section 3.3
• Output FLASH control *(on certain outputs)*	section 3.4
• Incorporated data logger (*for Super Nodes addressed 0)*	section 10
• Incorporated Universal System Manager (*for Super Nodes addressed 0)*	section 9
• Programmable special utilities (timers, delays, etc)	section 8
• SAE J1939 CAN engine message reception and ES-Key I/O association	section 7.3.1
• ES-Key MODEM for remote diagnostics (p/n 119891 only)	section 11
• USB port for database transfer and diagnostics	section 12

3. Positive Polarity Solid State Outputs

Positive polarity output channels (0 through 17) of the Super Node II utilize solid state, fully protected high-side drivers that feature current limitation and open load detection. These output drivers replace the requirement of a relay and circuit breaker.

Output	Max Current	Digital circuit breaker	PWM capable	Output "open load" detection	FLASH capable
0 - 7	13 Amps	YES (slow blow)	NO	YES	YES
8 - 9	13 Amps	YES	NO	YES	YES
10 - 17	13 Amps	YES	YES	NO	YES

3.1. Current Rating

Each of the eighteen (18) high current outputs is capable of supplying 13 Amps continuously at an ambient temperature of up to 85º Celsius (185º Fahrenheit).

3.2. Digital Circuit Breakers

The "digital circuit breaker" feature will automatically turn OFF an output within 0.5 seconds when the sourced current exceeds 14 Amps. The Super Node II will attempt to reconnect the output to the load twice more at 5 second intervals, if the output is still overloaded the Super Node II will maintain the output OFF.
Outputs 0 – 7 have a "digital circuit breaker - slow blow" which dynamically adjusts the time frame the output stays active when the load exceeds 13 Amps. This feature synthesizes the opening of a standard fuse when reacting to overload conditions. A load of 13.5 A will automatically turn OFF after approximately 12 seconds, and a load of 26 Amps will automatically turn OFF after approximately 3 seconds.
The "digital circuit breaker" feature can be reset (or reinitialized) by de-activating the output through the ES-Key™ network. When the output is turned back ON, the over current tests will be initiated.
When an output switch is in an over current situation, a fault is logged to the USM and data logger functions of the Super Node II.

3.3. Pulse Width Modulation/Current Control

Outputs 10 through 17 can be Pulse Width Modulated to control loads at reduced power. PWM can also be used as a lighting dimming function. An output with its PWM function enabled will drive its load at 60% (default), 50%, 40%, 30%, 20%, or 10% duty cycle, 400 Hz. See ***Setting an output with PWM*** in section 7.4.2.

3.4. Output Flash Control

Outputs 0 through 17 can be flashed with two available rates (75ppm and 150ppm). Alternating flash patterns are also easily configured for use with "wig-wag" lights. See ***Setting an output with FLASH*** in section 7.4.3.

3.5. Circuit Activation Detection/Diagnostics

Each of the outputs has an output LED associated. When an output is physically ON the corresponding output LED will be illuminated. See ***Diagnostic LEDs*** in section 15.
Outputs 0 through 9 have "open load" detection circuitry. When an open load condition is detected the system will generate a network tag to indicate "open load" for the specific output. The tag can be used by the ES-Key network for diagnostics or indication. See ***Configuring an output for open load detection*** in section 7.4.1.
During an over current shutdown condition a tag will be active for the particular output. See ***Network input space*** in section 7.3.

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4. Ground Polarity Solid State Outputs

Ground polarity output channels (18 through 23) of the Super Node II utilize solid state, fully protected low-side drivers.

4.1. Current Rating

Each of the 8 low current outputs is capable of supplying 2 Amp continuously at an ambient temperature of up to 85º Celsius (185º Fahrenheit).

5. Digital Inputs

The Super Node II has twenty-four (24) digital inputs.

- Inputs 0 through 7 are positive polarity.
- Inputs 8 through 23 are ground polarity.

6. Device Address Selection

The Super Node II's physical address is selected by connecting one of the three addressing inputs to ground.

- Not using any pins sets the Super Node to address 0.
- Placing ground on pin 8 (40-pin connector) sets the Super Node to address 1.
- Placing ground on pin 37 (40-pin connector) sets the Super Node to address 2.
- Placing ground on pin 27 (40-pin connector) sets the Super Node to address 3.

	ADDRESS				
PIN	**0**	**1**	**2**	**3**	**Database disabled**
8	OPEN	**GND**	OPEN	OPEN	**GND**
37	OPEN	OPEN	**GND**	OPEN	**GND**
27	OPEN	OPEN	OPEN	**GND**	OPEN

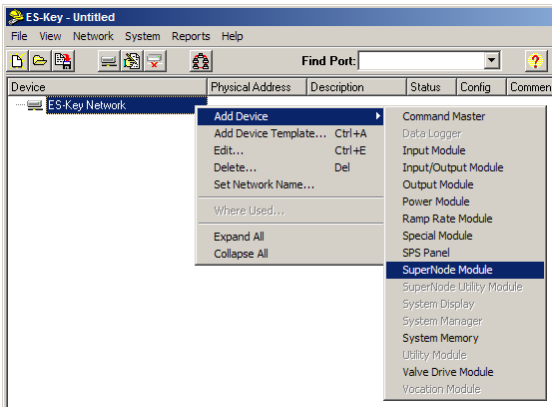
Grounding pins 8 and 37 simultaneously will disable the network database. The database must be reloaded for the Super Node II to function.

7. ES-Key Network Detail

7.1. Adding a Super Node Module to the ES-Key network database

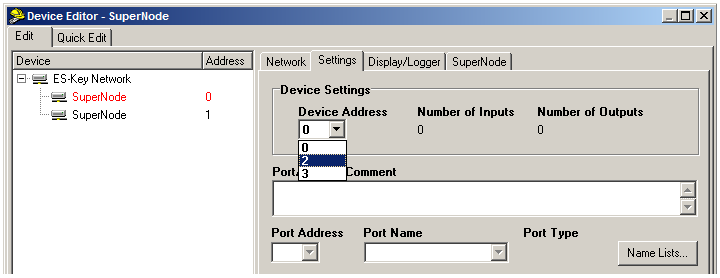
An ES-Key network can contain up to four (4) Super Nodes and each must have a unique address. See ***Device Address Selection*** in section 6.

Add a Super Node module to the ES-Key network by right-clicking on the “ES-Key Network” block, select “Add Device”, and select “SuperNode Module”. The first Super Node added will be assigned address 0, the second will be assigned address 1, etc.



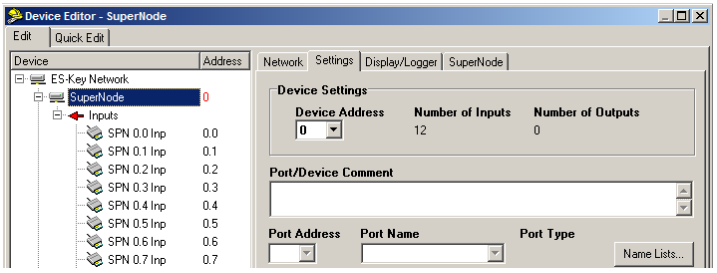
7.2. Assigning a Super Node Module an address in the ES-Key network database

A unique address (0-3) will be assigned automatically by the ES-Key Professional software, but the address can easily be changed in the network by double clicking on the “SuperNode” to open the “Device Editor”, highlighting (clicking on) the desired SuperNode, then open the “Device Address” drop down box and select the desired address. (The drop down box will only contain the unique addresses available).



7.3. Network input space

The Super Node can have up to 64 network inputs assigned to the ES-Key network database. Use the ES-Key Professional software to add network inputs by double clicking on the "SuperNode" to open the "Device Editor" and then pressing **CTRL+I** on the keyboard to create each input (up to 64).



The first 24 inputs are the physical inputs which have a direct connection through the Super Node's connector to the real world (0-7 are the positive polarity inputs, 8-23 are the ground polarity inputs). The remaining 40 inputs (24-63) are virtual inputs that relay information concerning the Super Node's digital circuit breaker feedback states and engine message association.

Input	Description
0	Input 0 (positive)
1	Input 1 (positive)
2	Input 2 (positive)
3	Input 3 (positive)
4	Input 4 (positive)
5	Input 5 (positive)
6	Input 6 (positive)
7	Input 7 (positive)
8	Input 8 (ground)
9	Input 9 (ground)
10	Input 10 (ground)
11	Input 11 (ground)
12	Input 12 (ground)
13	Input 13 (ground)
14	Input 14 (ground)
15	Input 15 (ground)
16	Input 16 (ground)
17	Input 17 (ground)
18	Input 18 (ground)
19	Input 19 (ground)
20	Input 20 (ground)
21	Input 21 (ground)
22	Input 22 (ground)
23	Input 23 (ground)
24	J1939 stop engine
25	J1939 check engine
26	J1939 water temp HIGH
27	J1939 oil PSI LOW
28	Not defined
29	Not defined
30	Not defined
31	Not defined

Input	Description
32	Output 0 OL feedback*
33	Output 1 OL feedback*
34	Output 2 OL feedback*
35	Output 3 OL feedback*
36	Output 4 OL feedback*
37	Output 5 OL feedback*
38	Output 6 OL feedback*
39	Output 7 OL feedback*
40	Output 8 OL feedback*
41	Output 9 OL feedback*
42	Output 0 OC feedback*
43	Output 1 OC feedback*
44	Output 2 OC feedback*
45	Output 3 OC feedback*
46	Output 4 OC feedback*
47	Output 5 OC feedback*
48	Output 6 OC feedback*
49	Output 7 OC feedback*
50	Output 8 OC feedback*
51	Output 9 OC feedback*
52	Not defined
53	Not defined
54	Not defined
55	Not defined
56	Output 10 OC feedback*
57	Output 11 OC feedback*
58	Output 12 OC feedback*
59	Output 13 OC feedback*
60	Output 14 OC feedback*
61	Output 15 OC feedback*
62	Output 16 OC feedback*
63	Output 17 OC feedback*

**OL = open load, OC = over current*

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7.3.1. Stop and Check Engine Message network input space

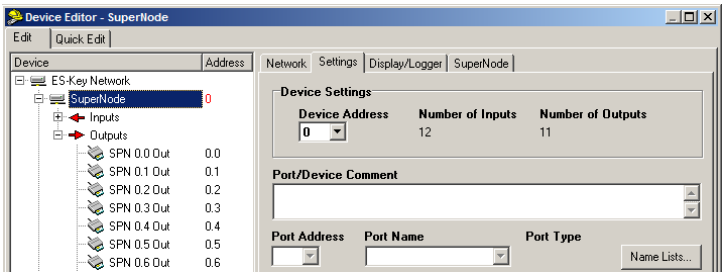
The Super Node associates the check and stop engine lights that are broadcast in the SAE J1939 DM1 message to its ES-Key network input space.
A stop engine message causes the Super Node to activate input 24 of its network input space.
A check engine message causes the Super Node to activate input 25 of its network input space.
Stop/check engine is received from the engine ECU via SAE J1939 PGN 65226.

7.3.2. High water temperature and Low oil pressure Message network input space

The Super Node associates high water temperature (greater than 200 ºF) and low oil pressure (less than 5 PSI) into its ES-Key network input space.
A high water temperature causes the Super Node to activate input 26 of its network input space.
A low oil pressure causes the Super Node to activate input 27 of its network input space.
Engine water temperature is received from the engine ECU via SAE J1939 PGN 65262.
Engine oil pressure is received from the engine ECU via SAE J1939 PGN 65263.

7.4. Network output space

The Super Node can have up to 64 network outputs assigned to the ES-Key network database. Use the ES-Key Professional software to add network outputs by double clicking on the "SuperNode" to open the "Device Editor" and then pressing **CTRL+O** on the keyboard to create each output (up to 64).



The first 24 outputs are the physical outputs which have a direct connection through the Super Node's connector to the real world (0-17 are the positive polarity outputs, 18-23 are the ground polarity outputs). The remaining 40 outputs (24-63) set the special functions of the physical outputs (flash, flash rate, PWM).

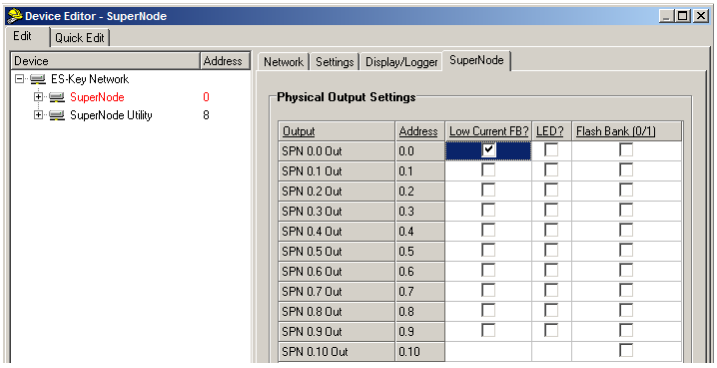
Output	Description
0	Output 0 (positive)
1	Output 1 (positive)
2	Output 2 (positive)
3	Output 3 (positive)
4	Output 4 (positive)
5	Output 5 (positive)
6	Output 6 (positive)
7	Output 7 (positive)
8	Output 8 (positive)
9	Output 9 (positive)
10	Output 10 (positive)
11	Output 11 (positive)
12	Output 12 (positive)
13	Output 13 (positive)
14	Output 14 (positive)
15	Output 15 (positive)
16	Output 16 (positive)
17	Output 17 (positive)
18	Output 18 (ground)
19	Output 19 (ground)
20	Output 20 (ground)
21	Output 21 (ground)
22	Output 22 (ground)
23	Output 23 (ground)
24	Bank 0 flash rate
25	Bank 1 flash rate
26	Low current test enable
27	PWM outputs set to 10%
28	PWM outputs set to 20%
29	PWM outputs set to 30%
30	PWM outputs set to 40%
31	PWM outputs set to 50%

Output	Description
32	Flash output 0
33	Flash output 1
34	Flash output 2
35	Flash output 3
36	Flash output 4
37	Flash output 5
38	Flash output 6
39	Flash output 7
40	Flash output 8
41	Flash output 9
42	Not defined
43	Not defined
44	Not defined
45	Not defined
46	Not defined
47	Not defined
48	Flash output 10
49	Flash output 11
50	Flash output 12
51	Flash output 13
52	Flash output 14
53	Flash output 15
54	Flash output 16
55	Flash output 17
56	PWM output 10
57	PWM output 11
58	PWM output 12
59	PWM output 13
60	PWM output 14
61	PWM output 15
62	PWM output 16
63	PWM output 17

7.4.1. Configuring an output for open load detection

Positive outputs 0 through 9 of the Super Node can be configured to check for open loads. This is a useful feature that can be incorporated into the ES-Key network to warn an operator that an output is not operating because of a dead lamp, etc. The open load detection method pulses the output on for a very short amount of time (less than a millisecond) to check the output's state.

Use the ES-Key Professional software to configure open load detection by double clicking on the "SuperNode" to open the "Device Editor", then select the "SuperNode" folder tab, and then check the box of the desired load under the "Low Current FB?" column.



The open load detection can be set to look for incandescent or LED type lamps. If the output is attached to an LED type lamp then check the box next to the desired output under the "LED?" column.

The output(s) configured for open load detection will not begin testing for an open load until the Super Node's output 26 (low current test enable in the network output space) is activated. This output can be networked to a switch or a condition in the ES-Key database so that the checks only occur during vehicle power-up, etc.

The new data must be saved to the Super Node by using the ES-Key Professional software or the changes will not take affect (see section 8.16).

7.4.2. Configuring an output with PWM

Positive outputs 10 through 17 of the Super Node can be configured for Pulse Width Modulated operation (PWM). This feature drives the selected output at the configured duty cycle and can be used as a dimming feature for lamps. Outputs 56 through 63 of the Super Node's network output space control the PWM of physical outputs 10 through 17. When the physical output and its associated PWM output are turned on the physical output will be Pulse Width Modulated.
The standard PWM duty cycle is 60% (when output memory spaces 27-31 are not active). Five other duty cycles (10%, 20%, 30%, 40%, and 50%) can also be selected by activating the associated output memory space (outputs 27-31). For example, if memory space output 29 is activated all active PWM outputs will be set to 30% duty cycle. In the event that more than one of the PWM output memory spaces (27-31) is active the lower number will take precedence (see section 7.4).

7.4.3. Configuring an output with FLASH

All of the positive outputs (0 through 17) of the Super Node can be configured for FLASH operation (PWM). This feature flashes the selected output at the configured rate (75 or 150 pulses per second). This is useful for setting up warning lights, wig-wags, etc.

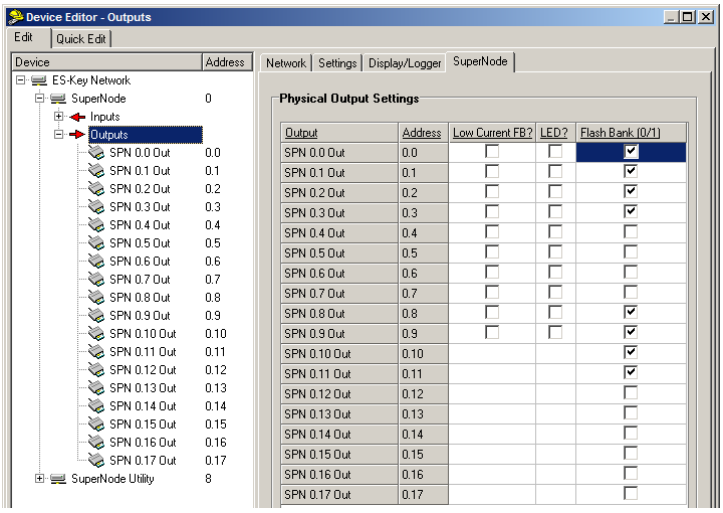
A physical output will begin flashing when its associated flash output is activated in the Super Node's network output space. For example, if output 33 is activated then physical output 1 will begin flashing.

An alternate flash can be set up by turning on the physical output along with its associated output in the Super Node's network output space. By using this method along with the standard flash a wig-wag can be configured. For example, physical outputs 0 and 1 are connected to lamps where a wig-wag is desired. Turn on output 32, output 33, and output 1 in the Super Node's network output space. Physical outputs 0 and 1 will now alternate flashing.

A. *CONFIGURING THE OUTPUT FLASH RATE*

The Super Node allows two different flash rates: 75 and 150 pulses per second. The rates are controlled within the Super Node's network output space 24 (bank 0) and 25 (bank 1). The two banks allow outputs to use different flash rates and be changed "on the fly" through ES-Key network associations. Activate a bank output to set the flash rate to 150 pulses per second and de-activate a bank output to set the flash rate to 75 pulses per second.

Use the ES-Key Professional software to set the output(s) to the desired bank by double clicking on the "SuperNode" to open the "Device Editor", then highlight (click on) the "Outputs" section, then select the "SuperNode" folder tab, and then check the box of the desired output under the "Flash Bank 0/1" column. Checking the box associates the output with bank 0 and clearing the box associates the output with bank 1.



The new data must be saved to the Super Node by using the ES-Key Professional software or the changes will not take affect (see section 8.16).

8. Special Utilities

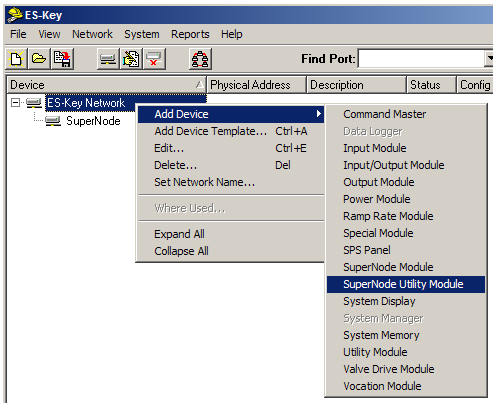
The Super Node contains many special utilities for allowing unique operation. These special utilities are only available for a Super Node set to address 0.

- Delays (8.4)
- Bi-stable triggers (8.5)
- Timers (8.6)
- Counters (8.7)
- Voltage trip points (8.8)
- Oil pressure trip points (8.9)
- Engine RPM trip point (8.10)
- Water temperature trip points (8.11)
- Flash rates (8.12)
- Sequencers (8.13)
- Transmission temperature trip point (8.14)
- Transmission (neutral, reverse) and engine (wait to start, water in fuel) warning association (8.15)

8.1. Adding a Special Utility Module to the ES-Key network database

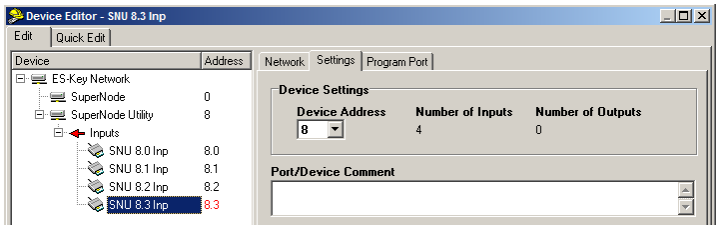
The special utilities are available to the ES-Key network by adding a “Super Node Special Utility Module” with the ES-Key Professional software. The Super Node Utility Module is a virtual device that resides in the memory of the Super Node. A Super Node must be added to the network before a Super Node Utility Module can be added.

Add a SuperNode Utility to the ES-Key network by right-clicking on “ES-Key Network”, select “Add Device”, and select “SuperNode Utility Module”.

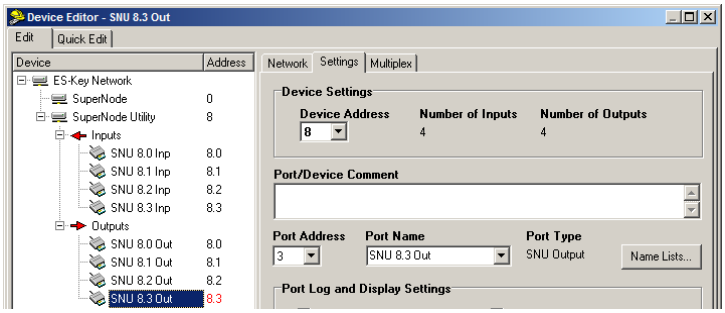


8.2. Creating a special utility in the Special Utility Module

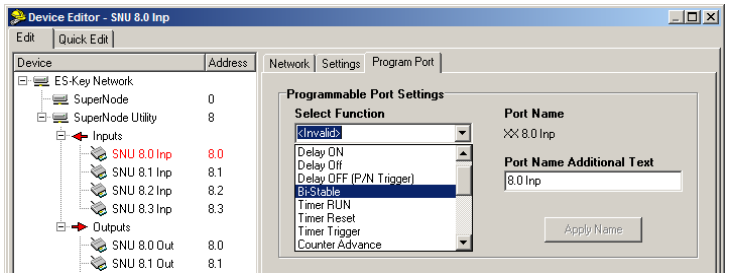
All special utilities are added to the network input space of the Special Utility Module. You must first create the desired number of inputs (up to 32) to the Special Utility Module by double clicking on the "SuperNode Utility" to open the "Device Editor" and then pressing **CTRL+I** on the keyboard to create each input.



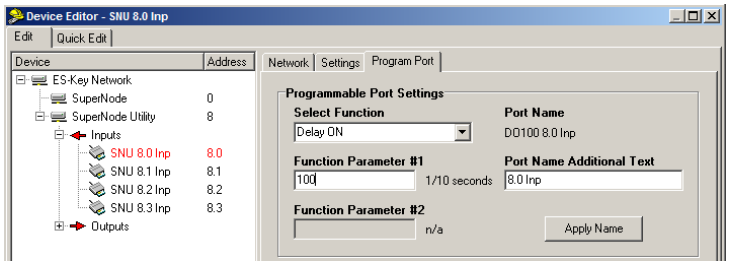
Add the desired number of outputs (up to 32) to the Special Utility Module by pressing **CTRL+O** on the keyboard to create each output.



Highlight (click on) the desired SuperNode Utility input and assign a special utility function by selecting the "Program Port" folder tab and then clicking on the down arrow to open the "Special Function" list box. Select the desired special utility.

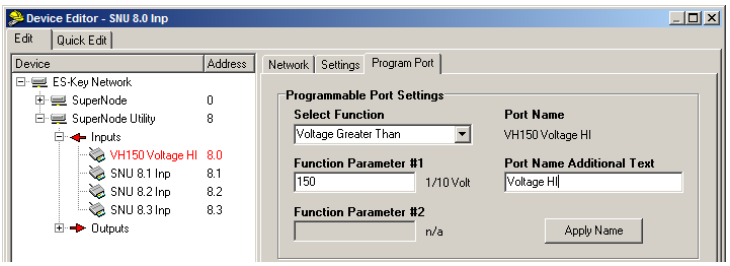


If the selected special utility requires an additional parameter the "Function Parameter #1" text box will be enabled so that the value can be entered. Timer trigger and counter trigger special utilities require an additional value to be entered into the "Function Parameter #2" text box.



8.3. Special utility naming syntax

The ES-Key professional software will automatically name the selected special utility port with the correct syntax. *(The details of the default syntax structure are found in each of the special utility description sections).*
The ES-Key professional software adds extra text (the input port number) to the core naming syntax, but this extra text can be removed and personalized text added in the "Port Name Additional Text" box to make the special utility port easier to identify. For example, below we have created a "Voltage Greater Than" trip point with a "Function Parameter" of 150 (15.0 volts), and the additional text was re-named "Voltage HI".
The ES-Key Professional software only allows port names to be 16 characters long (including the core syntax) and truncates names that exceed 16 characters (spaces count as a character).



8.4. Programmable delays

The Super Node has four types of programmable delays: delay ON, delay OFF, delay OFF after transition, and delay OFF after number of minutes. A delay is created by using the ES-Key Professional software to name an input with the delay naming syntax in the SuperNode Utility (SNU) space.
The delay naming syntax consists of DX####. The D indicates delay, X is the type of delay (O = ON, F = OFF, B = OFF after transition, M OFF after minutes), #### is the time of the delay in tenths of a second (101 = 10.1 seconds). For example, DO15 is a delay ON for 1.5 seconds.

8.4.1. Delay ON

Delay ON causes the designated SuperNode Utility (SNU) input to turn ON after the associated SuperNode Utility (SNU) output is activated and the designated delay time is met.
For example, if SuperNode Utility (SNU) input 2 is labeled DO125 (delay ON after 12.5 seconds), when SuperNode Utility (SNU) output 2 is turned ON then DO125 (SuperNode Utility (SNU) input 2) will turn ON after 12.5 seconds.
Resolution: minimum 1 (0.1 seconds), maximum 9999 (999.9 seconds).

8.4.2. Delay OFF

Delay OFF causes the designated SuperNode Utility (SNU) input to turn ON with the associated SuperNode Utility (SNU) output and then turn OFF after the designated delay time.
For example, if SuperNode Utility (SNU) input 2 is labeled DF300 (delay OFF after 30.0 seconds), when SuperNode Utility (SNU) output 2 is turned ON then DF300 (SuperNode Utility (SNU) input 2) will turn ON and then turn OFF after 30.0 seconds.
Resolution: minimum 1 (0.1 seconds), maximum 9999 (999.9 seconds).

8.4.3. Delay OFF after transition

Delay OFF after transition causes the designated SuperNode Utility (SNU) input to turn ON after the associated SuperNode Utility (SNU) output is transitioned (On to OFF, or OFF to ON) and then turn OFF after designated delay time is met.
For example, if SuperNode Utility (SNU) input 2 is labeled DB55 (delay OFF after transition after 5.5 seconds), when SuperNode Utility (SNU) output 2 is turned ON or OFF then DB55 (SuperNode Utility (SNU) input 2) will turn ON after 5.5 seconds.

Resolution: minimum 1 (0.1 seconds), maximum 9999 (999.9 seconds).

8.4.4. Delay OFF after minutes

Delay OFF after minutes causes the designated SuperNode Utility (SNU) input to turn ON with the associated SuperNode Utility (SNU) output and then turn OFF after the designated delay time.
For example, if SuperNode Utility (SNU) input 2 is labeled DM60 (delay OFF after 60 minutes), when SuperNode Utility (SNU) output 2 is turned ON then DM60 (SuperNode Utility (SNU) input 2) will turn ON and then turn OFF after 60 minutes.
Resolution: minimum 1 minute, maximum 100 minutes.

8.5. Bi-stable trigger

The Super Node has two bi-stable trigger functions (standard and power-up ON). The standard bi-stable trigger changes the state of a SuperNode Utility (SNU) input with the activation of the associated SuperNode Utility (SNU) output. The power-up bi-stable trigger turns ON when the Supernode is initialized and then acts the same as a standard bi-stable trigger. The naming syntax is BS (standard bi-stable) and BO (power-up ON bi-stable). Additional text should be added after the naming syntax to create unique identifiers.

8.5.1. Standard bi-stable trigger

A standard bi-stable trigger is created by using the ES-Key Professional software to name an input BS (bi-stable trigger naming syntax) in the SuperNode Utility (SNU) space.
For example, if SuperNode Utility (SNU) input 2 is labeled BS, when SuperNode Utility (SNU) output 2 is turned ON then BS (SuperNode Utility (SNU) input 2) will change states.

8.5.2. Power-up ON bi-stable

A power-up ON bi-stable trigger is created by using the ES-Key Professional software to name an input BO (bi-stable power-up ON trigger naming syntax) in the SuperNode Utility (SNU) space.
For example, if SuperNode Utility (SNU) input 2 is labeled BO, when SuperNode Utility (SNU) output 2 is turned ON then BO (SuperNode Utility (SNU) input 2) will change states.

8.6. Timer functions

The Super Node has four 1/10 hour timers. Each timer can be enabled/reset independently and can record a maximum of 16,666.6 hours. The timers only run when the vehicle power is applied and the associated timer run port is enabled.
The timer functions are created by using the ES-Key Professional software to name an input with the timer function naming syntax in the SuperNode Utility (SNU) space.

8.6.1. Timer run

The timer run naming syntax consists of TA# (where TA = timer advance, and # = timer number 0, 1, 2, or 3).
Create a timer by naming a SuperNode Utility (SNU) input with TA#.
When the associated SuperNode Utility (SNU) output is ON the timer will be advancing.
For example, if SuperNode Utility (SNU) input 2 is labeled TA2 (timer advance number 2), when SuperNode Utility (SNU) output 2 is turned ON then timer 2 will be running.

8.6.2. Timer reset

The timer reset naming syntax consists of TR# (where TR = timer reset, and # = timer number 0, 1, 2, or 3). Create a timer reset function by naming a SuperNode Utility (SNU) input with TR#. .
When the associated SuperNode Utility (SNU) output is turned from OFF to ON the timer will be reset.

For example, if SuperNode Utility (SNU) input 2 is labeled TR2 (timer reset number 2), when SuperNode Utility (SNU) output 2 is turned from OFF to ON then timer 2 will be reset. Reset only occurs at the transition from OFF to ON of the associated SuperNode Utility (SNU) output.

8.6.3. Timer trigger

The timer trigger naming syntax consists of TT#,xxxx (where TT = timer trigger, # = timer number 0, 1, 2, or 3, and xxxx = trigger time). Create a timer trigger function by naming a SuperNode Utility (SNU) input with TT#,xxxx.
When the associated timer has reached the designated time the SuperNode Utility (SNU) input will turn on.
For example, if SuperNode Utility (SNU) input 2 is labeled TT2,500 (timer trigger number 2 at 50.0 hours), when timer 2 reaches 50.0 hours the SuperNode Utility (SNU) input 2 will be turned ON.
Resolution: minimum 1 (0.1 hours), maximum 99999 (9999.9 hours).

8.7. Counter functions

The Super Node has four event counters. Each counter can be incremented, enabled, and reset independently and can record a maximum of 9999 events.
The counter functions are created by using the ES-Key Professional software to name an input with the counter function naming syntax in the SuperNode Utility (SNU) space.

8.7.1. Counter advance

The counter advance naming syntax consists of CA# (where CA = counter advance, and # = counter number 0, 1, 2, or 3). Create a counter by naming a SuperNode Utility (SNU) input with CA#.
The counter will advance with the activation of the associated SuperNode Utility (SNU) output.
For example, if SuperNode Utility (SNU) input 2 is labeled CA1 (counter advance number 1), when SuperNode Utility (SNU) output 2 is turned ON then counter 1 will increment once.

8.7.2. Counter reset

The counter reset naming syntax consists of CR# (where CR = counter reset, and # = counter number 0, 1, 2, or 3).
Create a counter reset function by naming a SuperNode Utility (SNU) input with CR#.
Turn the associated SuperNode Utility (SNU) output from OFF to ON to reset the counter.
For example, if SuperNode Utility (SNU) input 2 is labeled CR1 (counter reset number 1), when SuperNode Utility (SNU) output 2 is toggled from OFF to ON then counter 1 will be reset. Reset only occurs at the transition from OFF to ON of the associated SuperNode Utility (SNU) output.

8.7.3. Counter trigger

The counter trigger naming syntax consists of CT#,xxxx (where CT = counter trigger, # = counter number 0, 1, 2, or 3, and xxxx = counter value). Create a counter trigger function by naming a SuperNode Utility (SNU) input with CT#,xxxx.
The counter trigger SuperNode Utility (SNU) input will turn ON when the associated timer has reached the designated time.
For example, if SuperNode Utility (SNU) input 2 is labeled CT1,500 (counter trigger number 1 at 500 events), when counter 1 reaches 500 events the SuperNode Utility (SNU) input 2 will be turned ON.
Resolution: minimum 1 event, maximum 9999 events.

8.8. Voltage trip points

The Super Node allows configuring of high and low voltage trip points. The voltage trip points are created by using the ES-Key Professional software to name an input with the voltage trip point naming syntax in the SuperNode Utility (SNU) space.
System voltage is evaluated from the voltage potential between pins 10 (supply +) and 20 (supply -).

Resolution: minimum 1 (0.1 volts), maximum 300 (30.0 volts).

8.8.1. High voltage trip point

The high voltage trip point naming syntax consists of VH### (where VH = voltage high, ### = voltage in tenths). Create a high voltage trip point by naming a SuperNode Utility (SNU) input with VH###.
The high voltage trip point SuperNode Utility (SNU) input will turn ON when the system voltage has exceeded the designated voltage level.
For example, if SuperNode Utility (SNU) input 2 is labeled VH150 (voltage high at 15.0 volts), when the system voltage exceeds 15.0 volts the SuperNode Utility (SNU) input 2 will be turned on.

8.8.2. Low voltage trip point

The low voltage trip point naming syntax consists of VL### (where VL = voltage low, ### = voltage in tenths). Create a low voltage trip point by naming a SuperNode Utility (SNU) input with VL###.
The low voltage trip point SuperNode Utility (SNU) input will turn ON when the system voltage has dropped below the designated voltage level.
For example, if SuperNode Utility (SNU) input 2 is labeled VL119 (voltage low at 11.9 volts), when the system voltage drops below 11.9 volts the SuperNode Utility (SNU) input 2 will be turned on.

8.9. Oil pressure trip points

The Super Node allows configuring of high and low oil pressure trip points. The oil pressure trip points are created by using the ES-Key Professional software to name an input with the oil pressure trip point naming syntax in the SuperNode Utility (SNU) space.
Engine oil pressure is received from the engine ECU via SAE J1939 PGN 65263.
Resolution: minimum 1 PSI, maximum 999 PSI.

8.9.1. High oil pressure trip point

The high oil pressure trip point naming syntax consists of OH### (where OH = oil pressure high, ### = pressure in PSI). Create a high oil pressure trip point by naming a SuperNode Utility (SNU) input with OH###.
The high oil pressure trip point SuperNode Utility (SNU) input will turn ON when the system voltage exceeds the designated pressure level.
For example, if SuperNode Utility (SNU) input 2 is labeled OH80 (oil pressure high at 80 PSI), when the engine oil pressure exceeds 80 PSI the SuperNode Utility (SNU) input 2 will be turned ON.

8.9.2. Low oil pressure trip point

The low oil pressure trip point naming syntax consists of OL### (where OL = oil pressure low, ### = pressure in PSI). Create a low oil pressure trip point by naming a SuperNode Utility (SNU) input with OL###.
The low oil pressure trip point SuperNode Utility (SNU) input will turn ON when the engine oil pressure has dropped below the designated pressure level.
For example, if SuperNode Utility (SNU) input 2 is labeled OL20 (oil pressure low at 20 PSI), when the engine oil pressure drops below 20 PSI the SuperNode Utility (SNU) input 2 will be turned ON.

8.10. Engine RPM trip points

The Super Node allows configuring of engine RPM trip points. The engine RPM trip points are created by using the ES-Key Professional software to name an input with the engine RPM trip point naming syntax in the SuperNode Utility (SNU) space.
The engine RPM trip point naming syntax consists of R#X## (where R = engine RPM, #### = engine RPM). Create an engine RPM trip point by naming a SuperNode Utility (SNU) input with R####.

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The engine RPM trip point SuperNode Utility (SNU) input will turn ON when the engine RPM reaches or exceeds the designated RPM level.
Engine RPM is received from the engine ECU via SAE J1939 PGN 61444.

8.11. Water temperature trip points

The Super Node allows configuring of high and low water temperature trip points. The water temperature trip points are created by using the ES-Key Professional software to name an input with the water temperature trip point naming syntax in the SuperNode Utility (SNU) space.
Engine water temperature is received from the engine ECU via SAE J1939 PGN 65262.

8.11.1. High water temperature trip point

The high water temperature trip point naming syntax consists of TH### (where TH = water temperature high, ### = temperature in ºF). Create a high water temperature trip point by naming a SuperNode Utility (SNU) input with TH###.
The high water temperature trip point SuperNode Utility (SNU) input will turn ON when the engine water temperature exceeds the designated temperature level.
For example, if SuperNode Utility (SNU) input 2 is labeled TH250 (water temperature high at 250 ºF), when the engine water temperature exceeds 250 ºF the SuperNode Utility (SNU) input 2 will be turned ON.

8.11.2. Low water temperature trip point

The low water temperature trip point naming syntax consists of TL### (where TL = water temperature low, ### = temperature in ºF). Create a low water temperature trip point by naming a SuperNode Utility (SNU) input with TL###. The low water temperature trip point naming syntax is complete after a space is entered so other text can also be used to identify the input. For example, “TL80 Water Temp Too Low” is a valid name.
The low water temperature trip point SuperNode Utility (SNU) input will turn ON when the engine water temperature has dropped below the designated temperature level.
For example, if SuperNode Utility (SNU) input 2 is labeled TL80 (water temperature low at 80 PSI), when the engine water temperature drops below 80 ºF the SuperNode Utility (SNU) input 2 will be turned ON.

8.12. Flash rate

The Super Node allows configuring of variable flash rates in ¼ second intervals. The flash rates are created by using the ES-Key Professional software to name an input with the flash rate naming syntax in the SuperNode Utility (SNU) space.
The flash rate naming syntax consists of F### (where F = flash, and #### = rate in ¼ second increments). Create a flash rate by naming a SuperNode Utility (SNU) input with F###. The flash rate naming syntax is complete after a space is entered so other text can also be used to identify the input. For example, “F8 Warning Light” is a valid name.
The flash rate SuperNode Utility (SNU) input will flash at the designated rate when the associated SuperNode Utility (SNU) output is activated.
For example, if SuperNode Utility (SNU) input 2 is labeled F8 (flash at rate 8), the SuperNode Utility (SNU) input 2 will toggle ON and OFF in 2 second intervals when SuperNode Utility (SNU) output 2 is activated.

flash rate X 0.25 = time in seconds

e.g. rate 8 X 0.25 = 2 seconds

8.13. Sequencer function

A sequencer function is created by using the ES-Key Professional software to name an input with the sequencer naming syntax in the SuperNode Utility (SNU) space.
The sequencer naming syntax consists of S#,N (where S = sequence, # = number associated with the sequence [0-9], and N = the number of cycles to sequence through [2-9]).
For example, create a sequence function by naming a SuperNode Utility (SNU) input with S0,3 (this states that sequence 0 has 3 steps to cycle through). Then create variable names X1 and X2 in the 2 successive inputs spaces (the three steps will be the inputs S0,3, X1, and X2). Create variables for the “sequencer control”, and “sequencer force off” in the associated output space (in the below example named Seq 0 CONT and Seq 0 OFF. Toggling the

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Seq 0 CONT output causes the sequence to step, and turning Seq 0 OFF forces the configured inputs OFF and resets the sequence.

←Inputs	
S0,3	8.3
X1	8.4
X2	8.5
→Outputs	
Seq 0 CONT	8.3
Seq 0 OFF	8.4

When Output 8.3 (in this example named 'Seq 0 CONT') is toggled from OFF to ON the input space sequences one step. The system initializes with the configured sequence steps all OFF.

First toggle	S0,3 (input 8.3) **ON**, X1 (input 8.4) OFF, X2 (input 8.5) OFF.
Second toggle	S0,3 (input 8.3) OFF, X1 (input 8.4) **ON**, X2 (input 8.5) OFF.
Third toggle	S0,3 (input 8.3) OFF, X1 (input 8.4) OFF, X2 (input 8.5) **ON**.
Fourth toggle	S0,3 (input 8.3) OFF, X1 (input 8.4) OFF, X2 (input 8.5) OFF.
Fifth toggle	S0,3 (input 8.3) **ON**, X1 (input 8.4) OFF, X2 (input 8.5) OFF.
Etc.	

8.14. Transmission temperature trip point

The Super Node allows configuring of high transmission temperature trip point. The transmission temperature trip point is created by using the ES-Key Professional software to name an input with the transmission temperature trip point naming syntax in the SuperNode Utility (SNU) space.
Transmission temperature is received from the transmission ECU via SAE J1939 PGN 65272.

8.14.1. High transmission temperature trip point

The high transmission temperature trip point naming syntax consists of TX### (where TX = transmission temperature high, ### = temperature in ºF). Create a high transmission temperature trip point by naming a SuperNode Utility (SNU) input with TX###.
The high transmission temperature trip point SuperNode Utility (SNU) input will turn ON when the transmission temperature exceeds the designated temperature level.
For example, if SuperNode Utility (SNU) input 2 is labeled TX250 (transmission temperature high at 250 ºF), when the transmission temperature exceeds 250 ºF the SuperNode Utility (SNU) input 2 will be turned ON.

8.15. Transmission (neutral, reverse) and engine (wait to start, water in fuel) warning associations.

The Super Node has four warning association syntaxes. Two for transmission warnings (neutral and reverse) and two for engine warnings (wait to start and water in fuel).
The warning association functions are created by using the ES-Key Professional software to name an input with the function naming syntax in the SuperNode Utility (SNU) space.

8.15.1. Transmission reverse warning

The transmission reverse warning is created by using the ES-Key Professional software to name an input RW (reverse warning) in the SuperNode Utility (SNU) space. When the warning is received from the transmission ECU via SAE J1939 PGN 61445 the associated memory input will be turned ON.

8.15.2. Transmission neutral warning

The transmission neutral warning is created by using the ES-Key Professional software to name an input N (neutral) in the SuperNode Utility (SNU) space. When the warning is received from the transmission ECU via SAE J1939 PGN 61445 the associated memory input will be turned ON.

8.15.3. Engine wait to start warning

The engine wait to start warning is created by using the ES-Key Professional software to name an input WS (wait to start) in the SuperNode Utility (SNU) space. When the warning is received from the engine ECU via SAE J1939 PGN 65279 the associated memory input will be turned ON.

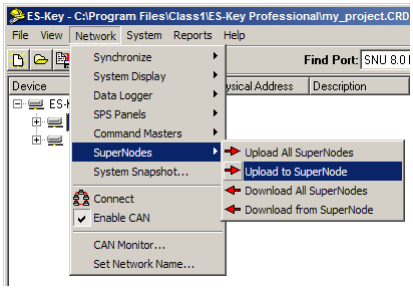
8.15.4. Engine water in fuel warning

The engine water in fuel warning is created by using the ES-Key Professional software to name an input WF (water in fuel) in the SuperNode Utility (SNU) space. When the warning is received from the engine ECU via SAE J1939 PGN 65252 the associated memory input will be turned ON.

8.16. Saving special functions in the Super Node

Flash and open load detect functions will not be saved when performing a standard ES-Key database upload. The new data must be saved to the Super Node by using the "Upload to SuperNode" command in the ES-Key Professional software.

Highlight (click on) SuperNode, then in the top menu Select "Network", in the drop down box select "SuperNodes" in the new drop down box select "Upload to SuperNode".



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9. Universal System Manager Function

A Super Node II configured as address 0 will also function as the ES-Key system Universal System Manager (USM) as long as a standard (stand-alone) ES-Key USM is not in the physical network.

10. Data Logger Function

The Super Node II contains all of the standard features of an ES-Key Data Logger

- Capture events and faults
- Time set and transmission
- Upload/download of events and header data

11. MODEM function (available with p/n 119891 only)

The Super Node II (p/n 119891 only) contains all of the standard features of an ES-Key MODEM.

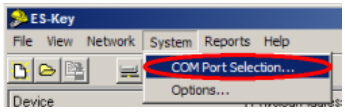
11.1. MODEM wiring

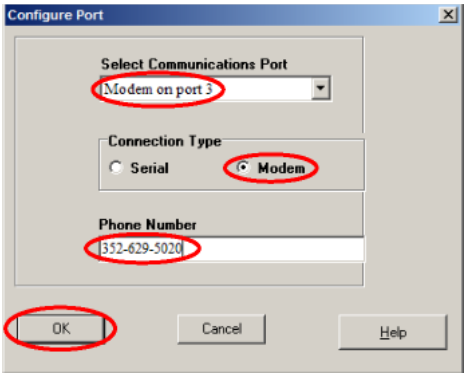
Connect the integrated MODEM to the phone line by properly wiring the MODEM TIP (pin 31 of the 40-pin connector) and the MODEM RING (pin 21 of the 40-pin connector) to a RJ11 connector.

11.2. MODEM usage

The MODEM is utilized by “dialing” into the system with the ES-Key Professional software. The MODEM operates at 4800 baud.

- Click on the “System” menu item and then select “COM Port Selection” to configure the port for MODEM operation. The *Configure Port* window will open.





- Click the “Modem” radio button in the ***Connection Type*** section.
- Select the available modem from the ***Select Communications Port*** drop down menu.
- Enter the phone number of the phone line to which the Supernode MODEM is connected.
- Click the “OK” button to begin communications.

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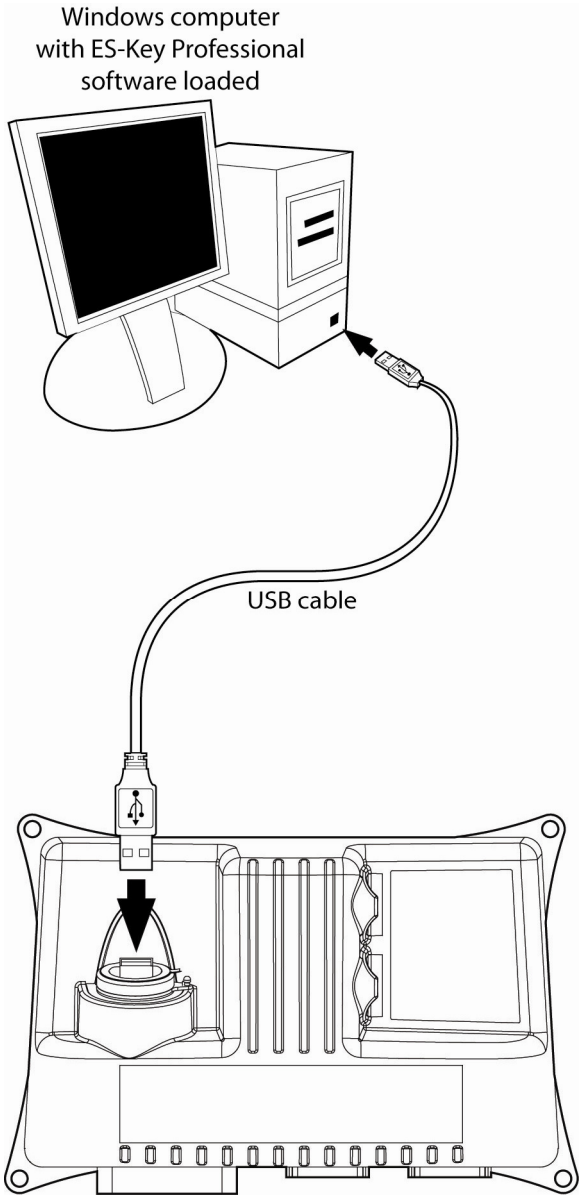
12. USB port

The Super Node II's USB port allows database transfers and diagnostics with the ES-Key Professional software in the same manner as the Serial-to-CAN method, but at a much higher transfer rate.

Use a USB A (male) to USB A (male) cable to connect the Super Node II's USB port to a computer running the ES-Key Professional software.



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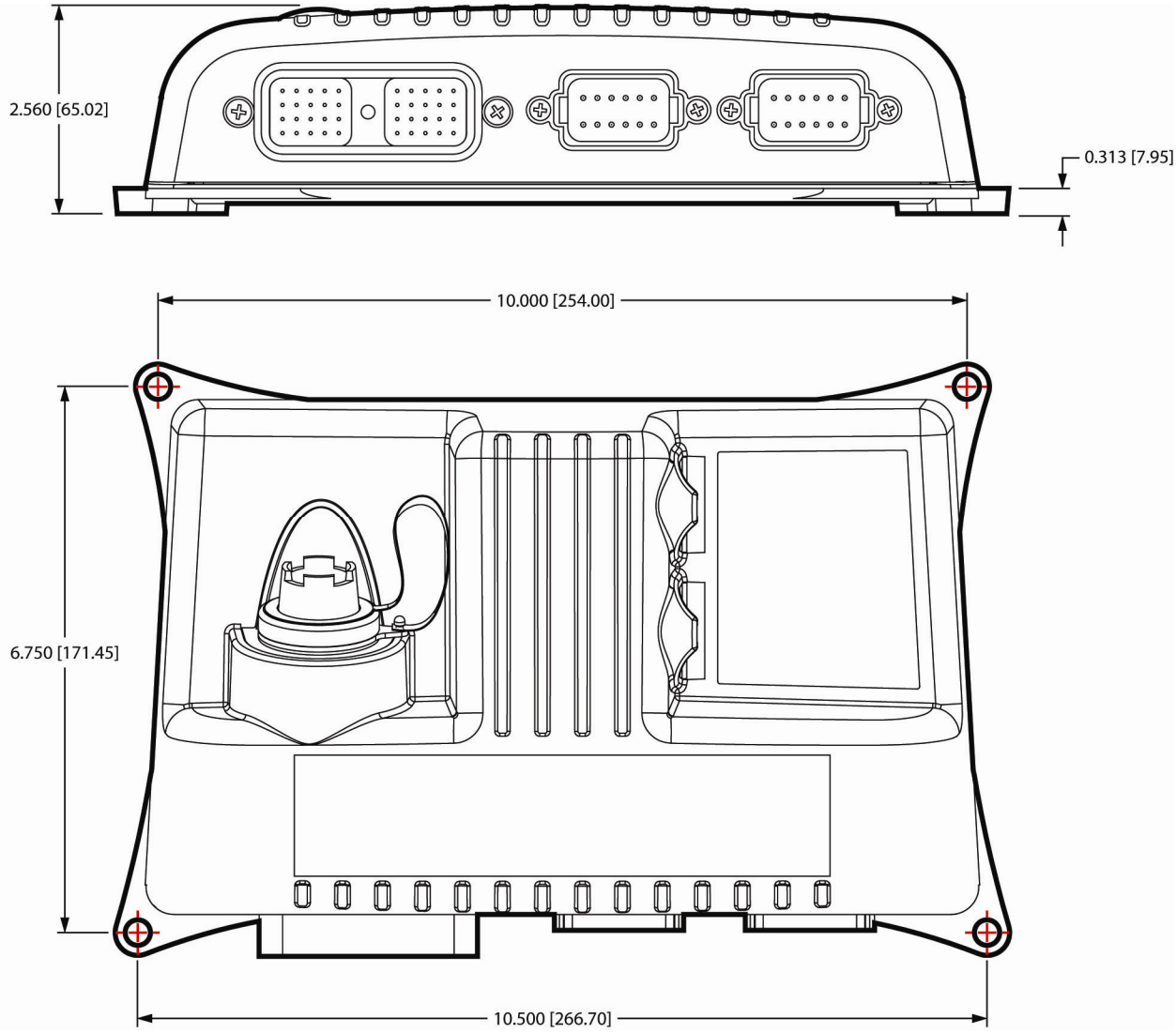
13. Dimensions

The Super Node II is a water tight unit (IP67) and is mounted using four 1/4" or M6 screws.
The overall dimensions are (W x H x D, inches [millimeters]) 11.06" [280.92] x 2.56" [65.02] x 7.31" [185.67].



Dimensions in inches [millimeters].

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14. Connector Descriptions

14.1. Outputs

All outputs are located on the two 12-pin Deutsch connectors (gray and black).

Mating connector: Deutsch DT06-12SB BLACK
Mating sockets: 0462-201-16141
Wedge lock: W12S **Recommended wire gage:** 16-18 AWG

PIN	CIRCUIT	DESCRIPTION	FEATURES
1	Output 7	Positive output (13A max)	FLASH, DCB, OOLD
2	Output 1	Positive output (13A max)	FLASH, DCB, OOLD
3	Output 6	Positive output (13A max)	FLASH, DCB, OOLD
4	Output 5	Positive output (13A max)	FLASH, DCB, OOLD
5	Output 2	Positive output (13A max)	FLASH, DCB, OOLD
6	Output 3	Positive output (13A max)	FLASH, DCB, OOLD
7	Output 4	Positive output (13A max)	FLASH, DCB, OOLD
8	Output 8	Positive output (13A max)	FLASH, DCB, OOLD
9	Output 22	Ground output (2A max)	-
10	Output 23	Ground output (2A max)	-
11	Output 9	Positive output (13A max)	FLASH, DCB, OOLD
12	Output 0	Positive output (13A max)	FLASH, DCB, OOLD

Mating connector: Deutsch DT06-12SA GRAY
Mating sockets: 0462-201-16141
Wedge lock: W12S **Recommended wire gage:** 16-18 AWG

PIN	CIRCUIT	DESCRIPTION	FEATURES
1	Output 17	Positive output (13A max)	FLASH, DCB, PWM
2	Output 11	Positive output (13A max)	FLASH, DCB, PWM
3	Output 16	Positive output (13A max)	FLASH, DCB, PWM
4	Output 15	Positive output (13A max)	FLASH, DCB, PWM
5	Output 12	Positive output (13A max)	FLASH, DCB, PWM
6	Output 14	Positive output (13A max)	FLASH, DCB, PWM
7	Output 13	Positive output (13A max)	FLASH, DCB, PWM
8	Output 18	Ground output (2A max)	-
9	Output 19	Ground output (2A max)	-
10	Output 20	Ground output (2A max)	-
11	Output 21	Ground output (2A max)	-
12	Output 10	Positive output (13A max)	FLASH, DCB, PWM

FLASH – output flashing capable, DCB – digital circuit breaker feature, DCB-SB – digital circuit breaker feature with slow blow, OOLD – output "open load" detection, PWM – output pulse width modulation (60% duty cycle)

14.2. Logic power, communications, and inputs

All inputs and communication lines are located on the 40-pin Deutsch connector. Main logic power is supplied to the Super Node II through the 40-pin Deutsch connector (pins 10 and 20).

Mating Connector: Deutsch DRC26-40SA BLACK
Mating sockets: 0462-201-20141
Recommended wire gage: 20-24 AWG

PIN	CIRCUIT	DESCRIPTION
1	Input 23	Digital input (ground polarity)
2	Input 21	Digital input (ground polarity)
3	Input 17	Digital input (ground polarity)
4	Input 13	Digital input (ground polarity)
5	Input 9	Digital input (ground polarity)
6	Input 5	Digital input (positive polarity)
7	Input 1	Digital input (positive polarity)
8	ADDR 1	Addressing input (ground polarity)
9	CAN Low	ES-Key CAN
10	Supply (+)	Module supply (+9VDC…+32VDC)
11	Input 22	Digital input (ground polarity)
12	Input 20	Digital input (ground polarity)
13	Input 16	Digital input (ground polarity)
14	Input 12	Digital input (ground polarity)
15	Input 8	Digital input (ground polarity)
16	Input 4	Digital input (positive polarity)
17	Input 0	Digital input (positive polarity)
18	CAN Low	J1939 CAN
19	CAN High	ES-Key CAN
20	Supply (-)	Module supply (vehicle ground)

PIN	CIRCUIT	DESCRIPTION
21	Modem ring	Modem communication
22	Input 19	Digital input (ground polarity)
23	Input 15	Digital input (ground polarity)
24	Input 11	Digital input (ground polarity)
25	Input 7	Digital input (positive polarity)
26	Input 3	Digital input (positive polarity)
27	ADDR 3	Addressing input (ground polarity)
28	CAN High	J1939 CAN
29	CAN Shield	ES-Key CAN
30	SER GND	Serial communication
31	Modem tip	Modem communication
32	Input 18	Digital input (ground polarity)
33	Input 14	Digital input (ground polarity)
34	Input 10	Digital input (ground polarity)
35	Input 6	Digital input (positive polarity)
36	Input 2	Digital input (positive polarity)
37	ADDR 2	Addressing input (ground polarity)
38	CAN Shield	J1939 CAN
39	SER TX	Serial communication
40	SER RX	Serial communication

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14.3. Driver power

Output driver power is supplied through the two power connectors (6 AWG wire recommended). Power connector A supplies power for outputs 0-9 and the power connector B supplies power for outputs 10-17.

Mating Connector: Deutsch DTHD-06-1-4-S BLACK Mating sockets: 0462-203-04141 Recommended wire gage: 6 AWG		
CIRCUIT	**DESCRIPTION**	
DRIVER PWR A	Driver power for outputs 0-9	(+9VDC…+32VDC)
DRIVER PWR B	Driver power for outputs 10-17	(+9VDC…+32VDC)

Use power wires that are able to handle the maximum desired current:

- Maximum current on power stud 1 is 100 Amps (see Technical details in section 16).
- Maximum current on power stud 2 is 80 Amps (see Technical details in section 16).

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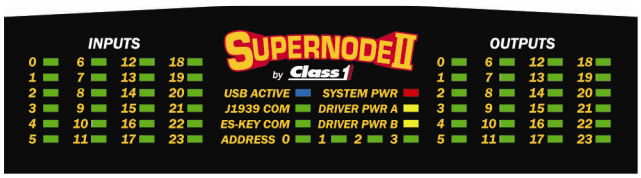
15. Diagnostic LEDs

The Super Node has 58 LEDs located on its front panel. There are 6 LEDs for power and communication status, 4 LEDs for address indication, and 48 LEDs for output and input indications.



ES-Key COM LED	Description
ON solid	Super Node online
Flashing slow (1 Hz)	CAN okay, not configured for network
Flashing fast (4 Hz)	CAN has physical problem

J1939 COM LED	Description
ON solid	Receiving J1939 data
Flashing	Not receiving J1939 data, configured
Flashing fast (4 Hz)	Not receiving J1939 data, not configured

Address 0 LED	Description
ON solid	Address 0 selected
OFF	Address 0 not selected
Flashing slow (1 Hz)	USM detects system fault
Flashing fast (4 Hz)	USM is not loaded with database

Address LEDs ON	Description
0	Address 0 selected
0 and 1	Address 0 selected, modem equipped (p/n 119891)
1	Address 1 selected
2	Address 2 selected
3	Address 3 selected

USB ACTIVE LED	Description
ON	USB port connected and ACTIVE
OFF	USB port not connected

INPUT LEDs	Description
ON	Input is ON
OFF	Input is OFF

OUTPUT LEDs	Description
ON	Output is ON
OFF	Output is OFF
Flashing	Output is in current limit condition

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16. Technical details

Product category	ES-Key network
Voltage range	+9VDC…+32VDC
Power consumption	Logic supply+ input (pin 10 of 40-pin Deutsch connector)
@13.8VDC	500mA
@27.6VDC	350mA
Output power	13A per positive polarity output 2A per ground polarity output
Temperature range	-40ºC…+85ºC
Environmental range	IP 67
CAN specification	SAE J1939 proprietary, 250 Kbits/second
LEDs	54 green LEDs, 1 red LED, 1 blue LED, and 2 yellow LEDs for output status, input status, , power status, and communication status
Protection	Internal thermal fuse (2500mA on pin 10 of 40-pin connector) Reverse voltage protection (pins 10 and 20 of 40-pin connector) CAN buses protected to 24V ESD voltage protected to SAE J1113 specification for heavy duty trucks (24V) Transient voltage protected to SAE J1113 specification for heavy duty trucks (24V) Load dump voltage protected to SAE J1113 specification for heavy duty trucks (24V) Outputs protected for short circuit and thermal overload
Dimensions (W x H x D) in inches [mm]	11.06 [280.92] x 2.56 [65.02] x 7.31 [185.67]