

# INTRODUCING V-MUX POWERED BY DTD Software

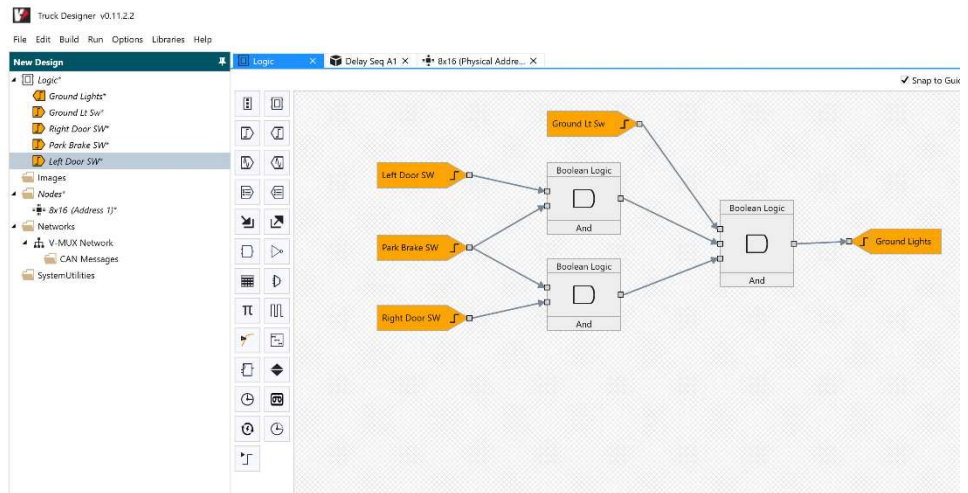
Requests we received from vehicle electrical system designers:

- **Easier software** and only one software program needed for all functions
- **Faster development** and throughput
- **Use of existing** familiar V-MUX and ES-Key modules
- **UltraView touchscreen displays** as standard

How Digital Truck Designer Software addresses these requests:

**Easier software to manage**

- Visual drag-and-drop design language.
- More intuitive and understandable workflow.



**Only one software program for all tasks**

- Programming
- Reporting
- Loading
- Diagnostics
- Display programming

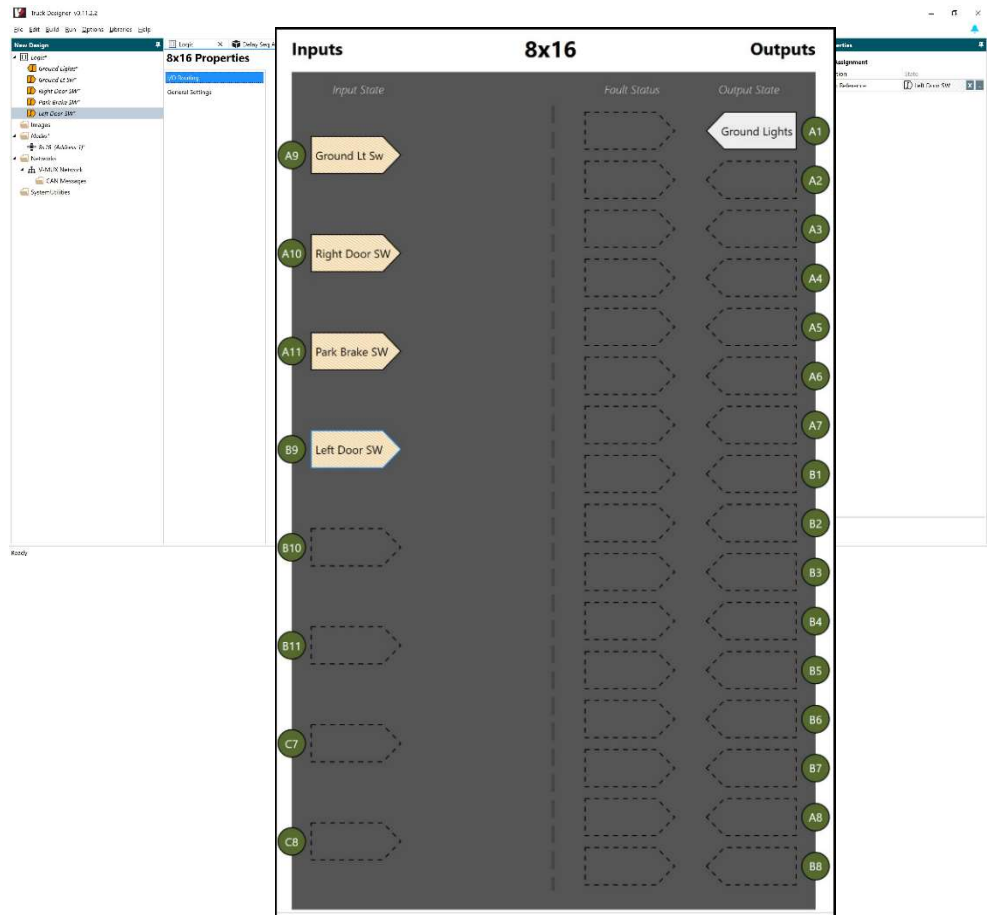
Name	State	Node	Pin	Location
Down	OFF	8x16 (Physical Address: 1)	A10	Not Deployed
Reset	OFF	8x16 (Physical Address: 1)	A11	Not Deployed
Up	OFF	8x16 (Physical Address: 1)	A9	Not Deployed

CAN ID	Name	Data 1	Data 2	Data 3	Data 4	Data 5	Data 6	Data 7	Data 8	Cycle Time	Message Counter
0x501		01	01	33	33					999 ms	58
0x501		00	00	33	33	33				1998 ms	21
0x801										2998 ms	17

## Easy to map logic input/output to node pins.

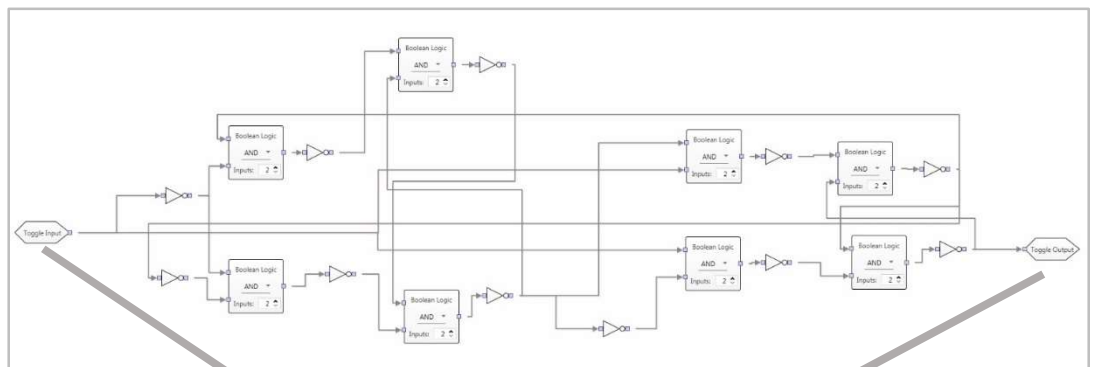
- Pin-to-logic associations can be easily remapped.
- Pin location highlighting indicates where a logic I/O can be connected.
- CAN assignments are just as easy by utilizing the Network Deployment tab.



## Faster development

- Take complex functions and encapsulate into a custom logic block.
- Custom blocks can be easily saved, shared, and re-used, saving time on future development projects.

## Complex design function...



...saved as a custom, re-usable logic block.



## How the Equipment supports:

### Uses existing modules



- All modules use CAN SAE J1939 proprietary protocol.
- Past Weldon branded modules have been updated to be used in the new V-MUX multiplex system.
- Current and past ES-Key modules can be used as is.
- Minimal to no impact – existing harnesses and modules can be used with legacy Es-Key modules and updated Weldon modules.
- Broadens the module portfolio by allowing mix and match modules from both updated V-MUX and Legacy ES-Key.
- Classic V-MUX and ES-Key systems will continue to be supported for units in the field.



### Uses UltraView touch screen displays

- Modern look, large format displays with latest generation Projective Capacitive touchscreen technology with glove-touch capability.
- More memory, more storage.



**UltraView 1200**  
(12.3")



**UltraView 1100**  
(10.6")



**UltraView 780**  
(7.0")



**UltraView 800**  
(7.0")



**UltraView 500**  
(5.0")



**UltraView 450**  
(4.3")

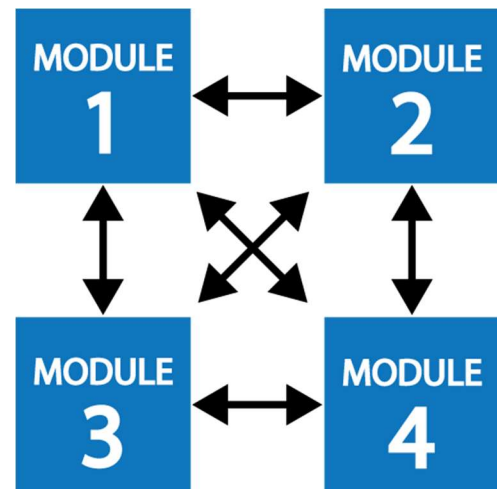
## About the Network:

The new network is an advanced **Hybrid or Multi-master** architecture that runs on a J1939 proprietary CAN Bus.

The legacy V-Mux system used a **peer-to-peer** architecture as described and depicted below:

### Peer-to-peer (Legacy V-MUX)

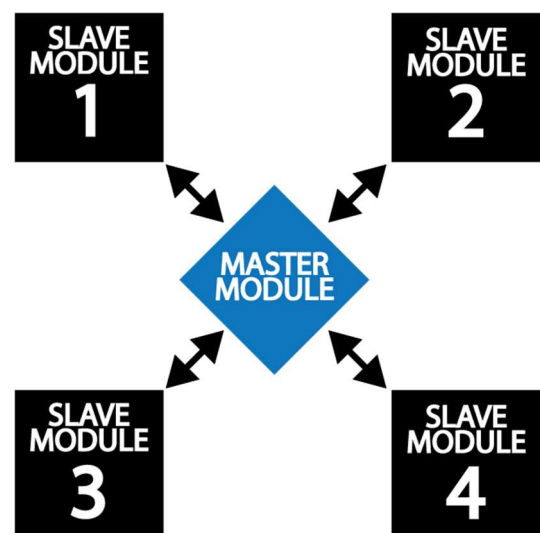
- Each module contains its own system file database
- Each module only communicates with its peer modules



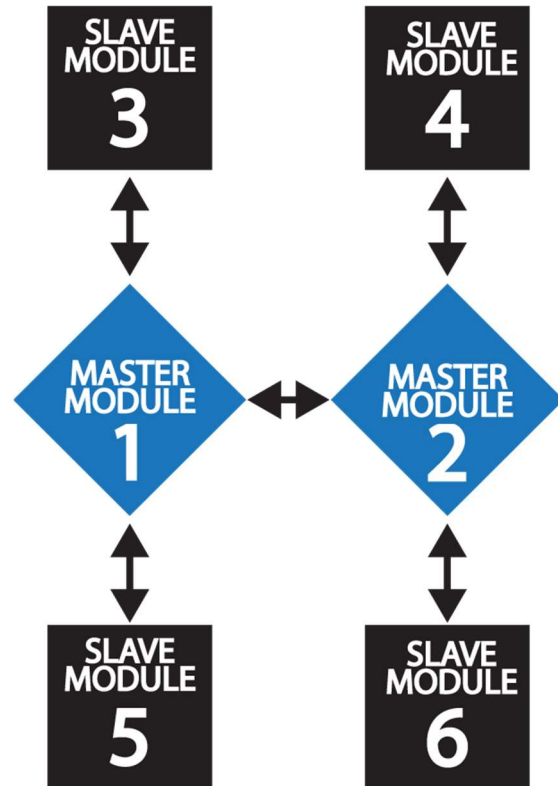
The legacy ES-Key system used a **master/slave** network as explained and shown below:

### Master/slave (Legacy ES-Key)

- Only the master module contains the system file (database)
- Each module communicates only with the master module

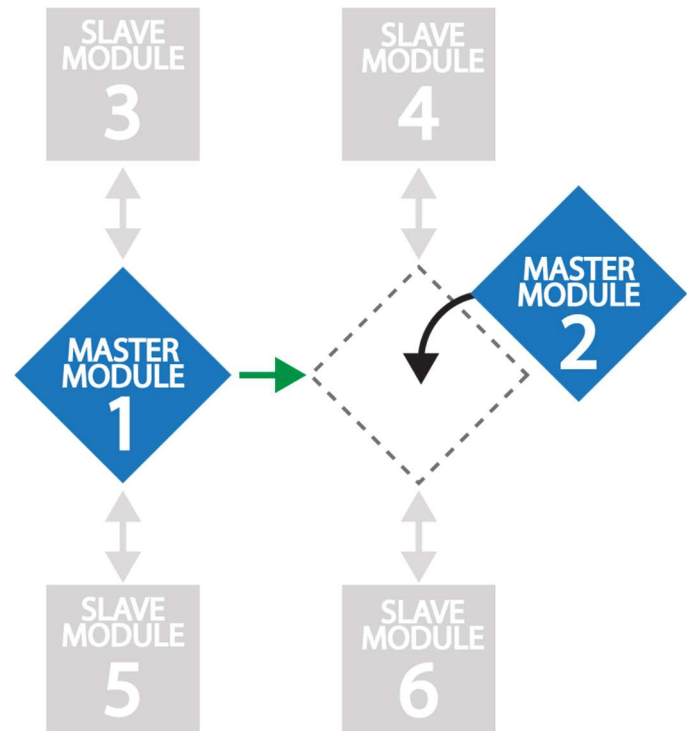


**V-MUX Powered by DTD** uses an advanced Hybrid or Multi Master topology allowing the designer to select the preferred network technology.



### Self-healing capability

- Each Master-capable module will contain the full design file
  - Master-capable modules are:
    - Hercules HC
    - Hercules VI
    - 8x16
    - Supernode III
- If a Master-capable module is replaced, then another Master-capable module can re-load its design file
  - Regardless of the topology chosen: master/slave, peer-to-peer, or hybrid (multi-master)



## Network CAN Bus details

- Baud rate is 250K for the V-MUX bus.
  - *The secondary buses can be set to run at 125k, 250k, 500k, or 1M.*
- V-MUX uses a SAE J1939 proprietary 11-bit protocol for standard messaging.
  - 29-bit is used for design transfers, datalog transfers, and handshake ACKs.
- V-MUX messages are priority managed on First In First Out basis.
- All commands/variables are packaged into individual message frames.
- Messages are transmitted with a required message acknowledgement transmitted by the receiving node(s). When a message acknowledgement is not received, the message is retransmitted every 5ms until the acknowledgement is received.
- All nodes are physically addressed by the builder/installer.
- Diagnostic mode utilizes proprietary 11-bit messaging, except for design file transmission which utilizes J1939 TP.

## Hardware information

### Nodes

With some exceptions, all node configurations used in legacy V-MUX and ES-Key systems have been updated for use in the new V-MUX Powered by DTD environment.

- Where nodes with the same Input/Output counts or function were duplicated, one node prevailed over the other.
- This allows choice of nodes from either legacy multiplexing systems, providing many different:
  - I/O combinations
  - User interface options
  - Current handling capabilities
  - Multifunction Input (MFI) capabilities

Note: (in most cases) legacy customers **will not be** required to use different hardware configuration options than used in the past. Legacy V-MUX customers can continue to use the hardware in similar configurations by replacing with DTD capable nodes.

- Nodes have been updated to support the DTD environment including:
  - Addition of CAN bus to nodes that did not have it prior resulting in minimal harness changes
  - Common power supply and microprocessor circuits
  - Common code bases (firmware/Operating Systems) where possible

The nodes in the table below have been updated or are compatible with the new DTD configuration software.

**All can be used in V-MUX Powered by DTD networks and can be mixed and matched as required.**

Device Type	Part Number	Description
Large I/O	6760-0000-00	Hercules High Content 2
	6700-0000-00	Hercules 6
	610-00092-001	Supernode III
Medium I/O	6730-0000-00	8x16-2
	120727-001	HDPDM
High current I/O	610-00046-001	HCPDM
Small I/O (load handling)	610-00035-001	PDM 12 Out
	610-00034-001	PDM 8 Out
IOM (low current)	610-00030-001	18/3 IOM
	610-00031-001	16 SOM
Specialty I/O	610-00041	H-Bridge
	610-00033	Dual A2D with accelerometer
	610-00029	Climate Control Module
VDR	610-00094	VDR
Switch Panels	610-00061-004	SmartTOUCH, 4 position switch
	610-00061-008	SmartTOUCH, 8 position switch
	610-00061-012	SmartTOUCH, 12 position switch
	610-00061-016	SmartTOUCH, 16 position switch
	610-00061-005	SmartTOUCH, 5 position switch
	610-00081-003	SmartROCKER, 3 position rocker switch
	610-00081-004	SmartROCKER, 4 position rocker switch
	610-00081-006	SmartROCKER, 6 position rocker switch
	610-00081-008	SmartROCKER, 8 position rocker switch
	610-00061-080	SmartTOUCH, 10 position switch surround for UV800 display
Displays	610-00060-120	UV1200, UltraView 12.3" PCAP touch-only display
	610-00060-110	UV1100, UltraView 10.6" PCAP touch-only display
	610-00060-080	UV800, UltraView 7.0" PCAP touch-only display
	610-00060-080-ST	UV800, UltraView 7.0" PCAP touch display with 10-button SmartTOUCH surround
	610-00060-050	UV500, UltraView 5.0" PCAP touch-only display
	2070-053-BP-CL1-FMK	UV780, UltraView 7.0" PCAP touch with 14-button display [Enhanced PCAP] (includes bezel and label)
	2070-053-BP-CL1	UV780, UltraView 7.0" PCAP touch with 14-button display [Enhanced PCAP] (does not include bezel or label)

## Pin configurations

The goal during system design was to minimize required changes to harness designs. However, there are some instances where harness changes are necessary.

In the information below you will notice some additional circuits that may not be familiar.

- **Address lines. This is how the nodes get addressed.**

ADDR	PIN 1	PIN 2
1	---	---
2	GND	---
3	---	GND
4	GND	GND
5	POS	---
6	---	POS
7	POS	GND
8	GND	POS
9	POS	POS

- **Multi-Function Inputs (MFI).**
  - Digital Input configured for either positive or ground input (see section 3.2).
  - Analog input with a range of 0 - 5 volts.
  - Analog input with a range of 0 - 30 volts.
  - Analog input with a range of 4 - 20 mA.
  - Analog input as a Thermistor input.
  - Frequency input
- **0-12 VDC analog outputs**
  - The HC2 and the Supernode III each have two circuits that are capable of either a digital input or an analog 0-12VDC output.



## New alternative equipment for Legacy V-MUX (with specifications)



Hercules High  
Content Node



Hercules High Content  
Node 2

- (2) CAN Bus connections
  - (1) V-MUX CAN, SAE J1939 Proprietary, 250 kbits/S
  - (1) Auxiliary CAN 125, 250, 500 kbits/S or 1 Mbits/S
- Sealed to meet IP67
- Aluminum heat sink designed for 120 amps of current
- Operating temperature of -40°C to +85°C
- 9 to 32 VDC
- 32 outputs
  - 16 Positive, 13 Amps max
  - 12 Positive, 4 Amps max
  - 4 Negative, 4 Amps max
  - Adjustable current limits
  - Output open load detect
  - PWM capable
- 20 Inputs
  - 16 - polarity selectable
  - 2 - 0-5 VDC analog
  - 2 - MFI Analog



Hercules 4/5



Hercules 6

- (2) CAN Bus connections
  - V-MUX CAN, SAE J1939 Proprietary, 250 kbits/S
  - Auxiliary CAN 125, 250, 500 kbits/S or 1 Mbits/S
- Operating temperature of -40°C to +85°C
- 9 to 32 VDC
- 26 outputs
  - 16 – positive, 10.5 Amps max
  - 8 - positive, 4 Amps max
  - 4 – Negative, 4 Amps max
  - Adjustable current limits
  - Output open load detect
  - PWM capable
- 19 Inputs
  - 16 - polarity selectable inputs
  - 3 – Analog
    - 2 – MFI Analog
    - 1 – 0-5 VDC



8 X 16



8 X 16 - 2

- (2) CAN Bus connections
  - (1) V-MUX CAN, SAE J1939 Proprietary, 250 kbits/S
  - (1) Auxiliary CAN 125, 250, 500 kbits/S or 1 Mbits/S
- Operating temperature of -40°C to +85°C
- 9 to 32 VDC
- 16 Outputs
  - 14 – Positive, 10.5 Amps max
  - 2 – Negative, 4 Amps max
  - Adjustable current limits
  - Output open load detect
  - PWM capable
- 8 Inputs
  - 6 – polarity selectable inputs
  - 2 – MFI Analog



Mini Node



PDM 12

- (1) V-MUX CAN, SAE J1939 Proprietary, 250 kbits/S
- Operating temperature of -40°C to +85°C
- Sealed to IP67
- 9 to 32 VDC
- 12 Outputs
  - Outputs 0 through 7 are positive, 7.5 Amps max
  - Outputs 8 through 11 are configurable as follows
    - Positive, 7.5 Amps max
    - Negative, .25 Amps max
    - Polarity selectable inputs
- 4 MFI inputs



16X0 Input Node



18/3/1 IOM

- (1) V-MUX CAN, SAE J1939 Proprietary, 250 kbits/S
- Operating temperature of -40°C to +85°C
- Sealed to IP67
- 9 to 32 VDC
- 3 Outputs Polarity selectable, .25 Amps max
- 19 inputs
  - 18 Polarity selectable
  - 1 Analog, 0-5 VDC or 4 to 20 mA

## Displays



Vista IV



UltraView Family

## UV500



- Display
  - Screen Size: 5-inch (108 mm [H] x 64.8mm [V])
  - Type: LVDS TFT LCD with LED backlight, 24-bit color
  - Resolution: 800 x 480 (WVGA)
  - Contrast Ratio: Typ. 1000:1
  - Brightness: 900 cd/m<sup>2</sup> (900 nits)
  - Surface: Anti-glare
  - Touch Panel: Projected capacitive (PCAP) with glove touch
- Sealed to IP66 and IP67, front and back, for outdoor use
- -30°C to +85°C
- 6 – 36 VDC
- (2) CAN Bus connections
  - (1) V-MUX CAN, SAE J1939 Proprietary, 250 kbits/S (CAN 1)
  - (1) Auxiliary CAN 125, 250, 500 kbits/S or 1 Mbits/S (CAN 2)
- (2) NTSC/PAL Video inputs

## UV780BP 14 Button Touchscreen



- Display
  - Screen Size: 7 inches (178 mm)
  - Type: LVDS TFT LCD with LED backlight, 24-bit color
  - Resolution: 800 × 480 (WVGA)
  - Contrast Ratio: Typ. 600:1
  - Brightness: 1000 cd/m<sup>2</sup>
  - Surface: Anti-glare
  - Touch Panel: Projected capacitive (PCAP) with glove touch
- Keypad: 14 tactile configurable soft keys with white LED backlight
- Sealed to IP66 and IP67, front and back, for outdoor use
- -40°C to +85°C
- 6 – 36 VDC
- (2) CAN Bus connections
  - (1) V-MUX CAN, SAE J1939 Proprietary, 250 kbits/S (CAN 1)
  - (1) Auxiliary CAN 125, 250, 500 kbits/S or 1 Mbits/S (CAN 2)
- (3) NTSC/PAL Video inputs

## UV800 & UV800/ST



- Display
  - Screen Size: 7-inch (178 mm)
  - Type: LVDS TFT LCD with LED backlight, 24-bit color
  - Resolution: 800 x 480 (WVGA)
  - Contrast Ratio: Typ. 600:1
  - Brightness: 1000 cd/m<sup>2</sup>
  - Surface: Anti-glare
  - Touch Panel: Projected capacitive (PCAP) with glove touch
- Optional 10 Button keypad (ST Version Only)
- Sealed to IP66 and IP67, front and back, for outdoor use
- -40°C to +85°C
- 6 – 36 VDC
- (2) CAN Bus connections
  - (1) V-MUX CAN, SAE J1939 Proprietary, 250 kbits/S (CAN 1)
  - (1) Auxiliary CAN 125, 250, 500 kbits/S or 1 Mbits/S (CAN 2)
- (3) NTSC/PAL Video inputs

## UV1100



- Display
  - Screen Size: 10.6 inches (231.36 mm × 138.82 mm)
  - Type: LVDS TFT LCD with LED backlight, 24-bit color
  - Resolution: 1280 × 768
  - Contrast Ratio: Typ. 1000:1
  - Brightness: 1000 cd/m<sup>2</sup>
  - Surface: Anti-glare
  - Touch Panel: Projected capacitive (PCAP) with glove touch
- Sealed to IP66 and IP67, front and back, for outdoor use
- -40°C to +70°C
- 6 – 36 VDC
- (2) CAN Bus connections
  - (1) V-MUX CAN, SAE J1939 Proprietary, 250 kbits/S (CAN 1)
  - (1) Auxiliary CAN 125, 250, 500 kbits/S or 1 Mbits/S (CAN 2)
- (3) NTSC/PAL Video inputs



## UV1200



- Display
  - Screen Size: 12.3 inches (320 mm × 130 mm)
  - Type: LVDS IPS LCD with LED backlight, 24-bit color
  - Resolution: 1280 × 480
  - Contrast Ratio: Typ. 800:1
  - Brightness: 1000 cd/m<sup>2</sup>
  - Surface: Anti-glare
  - Touch Panel: Projected capacitive (PCAP) with glove touch
- Sealed to IP66 and IP67, front and back, for outdoor use
- -40°C to +70°C
- 6 – 36 VDC
- (2) CAN Bus connections
  - (1) V-MUX CAN, SAE J1939 Proprietary, 250 kbits/S (CAN 1)
  - (1) Auxiliary CAN 125, 250, 500 kbits/S or 1 Mbits/S (CAN 2)
- (3) NTSC/PAL Video inputs



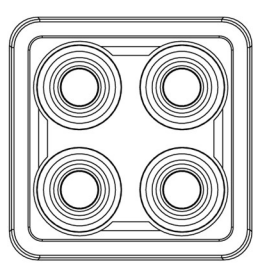
**PODS**



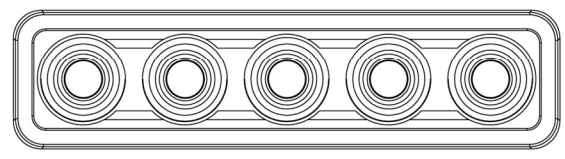
**SmartTOUCH/Smart Rocker**

**SmartTOUCH**

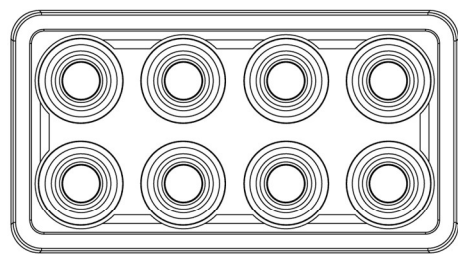
4 position (610-00061-004)



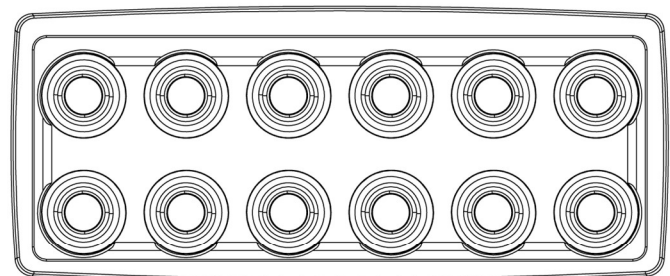
5 position (610-00061-005)



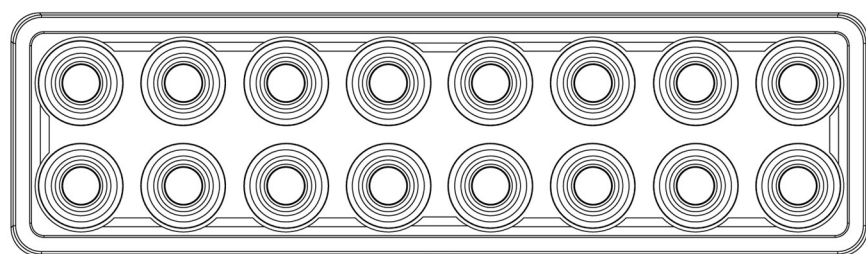
8 position (610-00061-008)



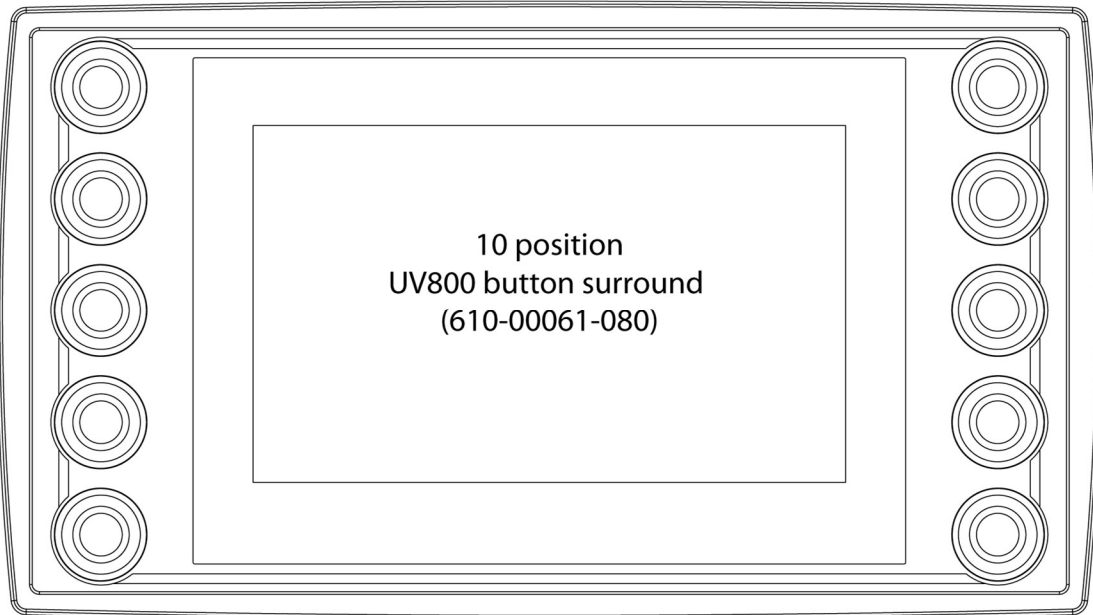
12 position (610-00061-012)



16 position (610-00061-016)



## SmartTOUCH (cont.)



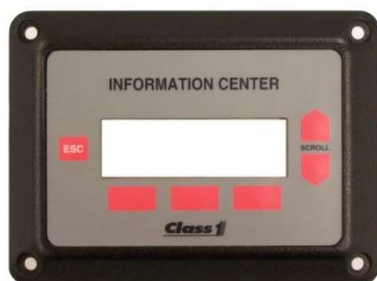
- Backlit switches with laser-etchable switch inserts (black, red, green)
- Dimmable backlighting
- Configurable switches with 6 switch functions (momentary, bi-stable, dimmer, and 3 toggle switch types)
- Switch state indicator LEDs (green and blue)
- ES-Key network and peer-to-peer compatible
- 12 and 24 volt operation
- Sealed to IP68

## SmartTOUCH ROCKER



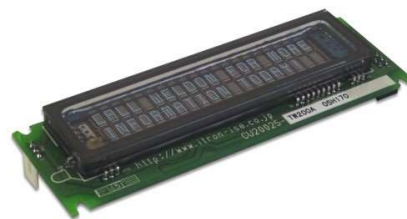
- Available in 4, 6 and 8 switch versions
  - 3 switch version coming soon
- Each LED can be configured with up to four unique system-status colors
- Interchangeable cams create different switch modes
- Laser-etched actuators
- Rocker module uses optical interrupters (no contacts)
- Moisture resistance : IP68
- 10 to 32 VDC
- -40°C to 85°C

## Information center



- 4-line 20 Character display
- Display custom messages
- 3 TTL outputs

## VFD



- 2 Line 20 character display
- Display custom messages

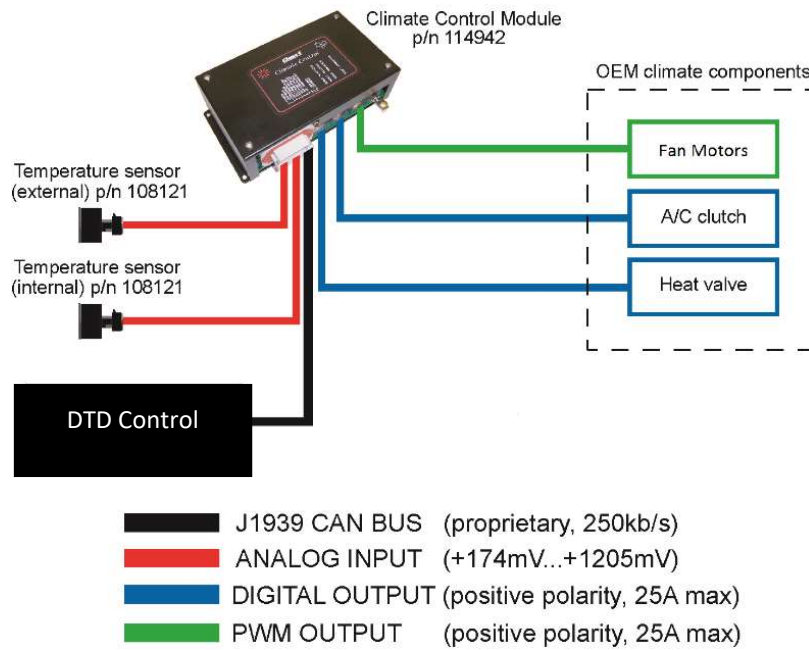


**V-MUX Climate Control**



**Class1 Climate Control**

- AC Clutch output 25 Amps max
- Heater Valve Output 25 Amps max
- 3 – Blower motor outputs 25 Amps each max
- 2 temperature inputs



## Existing equipment for Legacy and DTD enabled ES-Key (with specifications)

### Supernode III



- (2) CAN Bus connections
  - (1) V-MUX CAN, SAE J1939 Proprietary, 250 kbits/S
  - (1) Auxiliary CAN 125, 250, 500 kbits/S or 1 Mbits/S
- Operating temperature of -40°C to +85°C
- Sealed to IP67
- 9 to 32 VDC
- 24 Outputs
  - 18 Positive, 13 Amps max
  - 6 Negative, 2 Amps max
  - Adjustable current limits
  - Output open load detect
  - PWM capable
- 27 Inputs
  - 24 Polarity selectable
  - 2 MFI Analog
  - 1 0-5 VDC analog
- LED Status Indicators
- Integrated VDR/SBW

## HDPDM



- (1) V-MUX CAN, SAE J1939 Proprietary, 250 kbits/S
- Operating temperature of -40°C to +85°C
- Sealed to IP67
- 9 to 32 VDC
- 21 Outputs
  - 20 Positive, 13 Amps max
  - 1 Negative 2 Amps max
  - Adjustable current limits coming soon
  - Output open load detect coming soon
  - PWM capable
- 10 MFI Inputs

## HCPDM



- (1) V-MUX CAN, SAE J1939 Proprietary, 250 kbits/S
- Operating temperature of -40°C to +85°C
- Sealed to IP67
- 9 to 32 VDC
- 8 Positive Outputs, 30 Amps max
  - Adjustable current limits coming soon
  - Output open load detect coming soon
  - PWM capable
- 8 Inputs
  - 4 polarity selectable
  - 4 Polarity selectable or MFI Analog

## 12 PDM



- (1) V-MUX CAN, SAE J1939 Proprietary, 250 kbits/S
- Operating temperature of -40°C to +85°C
- Sealed to IP67
- 9 to 32 VDC
- 12 Outputs
  - Outputs 0 through 7 are positive, 7.5 Amps max
  - Outputs 8 through 11 are configurable as follows
    - Positive, 7.5 Amps max
    - Negative, .25 Amps max
    - Polarity selectable inputs
  - Adjustable current limits coming soon
  - Output open load detect coming soon
  - PWM capable
- 4 MFI inputs

## 8 PDM



- (1) V-MUX CAN, SAE J1939 Proprietary, 250 kbits/S
- Operating temperature of -40°C to +85°C
- Sealed to IP67
- 9 to 32 VDC
- 8 Positive outputs
  - Outputs 0 through 3 are positive, 7.5 Amps max
  - Outputs 4 through 7 are configurable as follows
    - Positive, 7.5 Amps max
    - Negative, .25 Amps max
    - Polarity selectable inputs
  - Adjustable current limits coming soon
  - Output open load detect coming soon
  - PWM capable



## 18/3/1 IOM



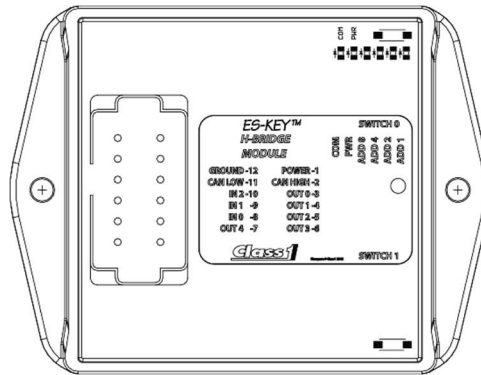
- (1) V-MUX CAN, SAE J1939 Proprietary, 250 kbits/S
- Operating temperature of -40°C to +85°C
- Sealed to IP67
- 9 to 32 VDC
- 3 Outputs Polarity selectable, .25 Amps max
- 19 inputs
  - 18 Polarity selectable
  - 1 Analog, 0-5 VDC or 4 to 20 mA

## 16 SOM



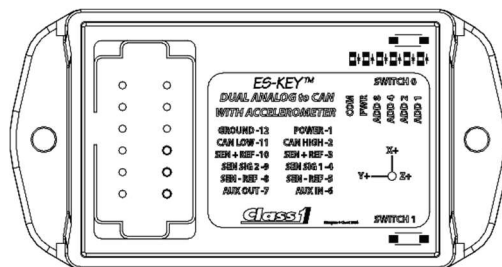
- (1) V-MUX CAN, SAE J1939 Proprietary, 250 kbits/S
- Operating temperature of -40°C to +85°C
- Sealed to IP67
- 9 to 32 VDC
- 16 Outputs Polarity selectable, .25 Amps max

## H-Bridge



- (1) V-MUX CAN, SAE J1939 Proprietary, 250 kbits/S
- Operating temperature of -40°C to +85°C
- Sealed to IP67
- 9 to 32 VDC
- 5 Outputs
  - 2 polarity selectable, 6 Amps max
  - 3 Negative, .5 Amps max
- 3 Polarity selectable Inputs

## Dual A2D w/Accelerometer



- (1) V-MUX CAN, SAE J1939 Proprietary, 250 kbits/S
- Operating temperature of -40°C to +85°C
- Sealed to IP67
- 9 to 32 VDC
- 2 Analog Inputs Configurable as follows
  - 0-5 VDC
  - 0-30 VDC
  - 4-20mA
  - Thermistor
  - One channel can be set to read a frequency
- The module also is an accelerometer that can be used as a inclinometer or impact sensor that reads g-forces in 2 axis and transmit the information to the V-MUX Powered by DTD network.

## Connecting to the network

The P-CAN USB to CAN adapter will allow you to load to and from the network, as well as run diagnostics.

The PCAN-USB Adapter made by PEAK-System Technik connects any laptop computer or PC with a USB connector to a CAN bus. The Peak tool can be purchased online at one of the links below. It can also be used with P-CAN View software allowing you to view, transmit and record CAN data.



[https://phytools.com/products/pcan-usb-adapter?gad=1&gclid=CjwKCAjwjOunBhB4EiwA94JWsHBJp\\_Xm4DhRtsu2EvLhbo9nkadaNwD5tSkK7nCuU4aHoq9PDutntxoCd-MQAvD\\_BwE](https://phytools.com/products/pcan-usb-adapter?gad=1&gclid=CjwKCAjwjOunBhB4EiwA94JWsHBJp_Xm4DhRtsu2EvLhbo9nkadaNwD5tSkK7nCuU4aHoq9PDutntxoCd-MQAvD_BwE)



[https://www.gridconnect.com/products/can-usb-adapter-pcan-usb?utm\\_term=&utm\\_campaign=Text+-+DSA&utm\\_source=adwords&utm\\_medium=ppc&hsa\\_acc=7986939350&hsa\\_cam=2019088077&hsa\\_grp=75483249310&hsa\\_ad=354237856018&hsa\\_src=g&hsa\\_tgt=dsa-19959388920&hsa\\_kw=&hsa\\_mt=&hsa\\_net=adwords&hsa\\_ver=3&gad=1&gclid=CjwKCAjwjOunBhB4EiwA94JWsCu2J8b-XFoQTuZXZwPohz25jXb9lpmazPFoBYGxqrDtZKTnmV5tLRoCy6YQAvD\\_BwE](https://www.gridconnect.com/products/can-usb-adapter-pcan-usb?utm_term=&utm_campaign=Text+-+DSA&utm_source=adwords&utm_medium=ppc&hsa_acc=7986939350&hsa_cam=2019088077&hsa_grp=75483249310&hsa_ad=354237856018&hsa_src=g&hsa_tgt=dsa-19959388920&hsa_kw=&hsa_mt=&hsa_net=adwords&hsa_ver=3&gad=1&gclid=CjwKCAjwjOunBhB4EiwA94JWsCu2J8b-XFoQTuZXZwPohz25jXb9lpmazPFoBYGxqrDtZKTnmV5tLRoCy6YQAvD_BwE)



Pin out chart below:

DB9	
Pin	Circuit
1	
2	CAN LOW
3	CAN SHIELD
4	
5	
6	
7	CAN HIGH
8	
9	

DT06-3S	
Pin	Circuit
A	CAN HIGH
B	CAN LOW
C	CAN SHIELD

