



INTUITIVE HUMAN INTERFACE SOLUTIONS

CAN-bus Keypads for Off-Highway Vehicles

- Five standard keypad form factors available
- J1939 and CANopen versions
- Dimmable LED indicators and legends
- Sealed to IP67
- Vibration and impact resistant
- Operating temp: -40°C to +85°C
- Long life: 1,000,000 cycles per key
- Support for multiple key press combinations
- Designed for 12/24 volt systems
- Custom legends and configurations available



3K SERIES KEYPADS CUSTOM OPTIONS

Contact Grayhill to build your custom part number

- Custom keytop legends
- Up to 3 LED indicators per key
- Indicator colors:
Red, Amber, Green, Blue
- Custom backlight colors:
Red, Amber, Green
- Factory configured parameters

Your Experts in Cab Controls

Grayhill specializes in the design, development and production of human interface controls, including:

- Cab user interface design
- Customized control panels
- CAN-bus interface devices

www.grayhill.com

Agriculture

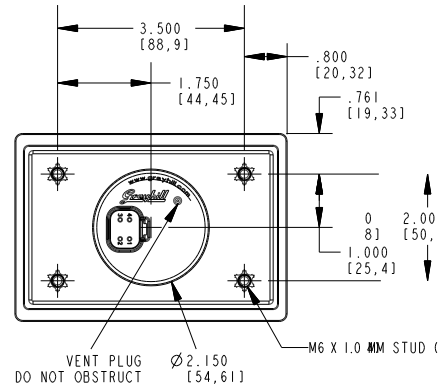
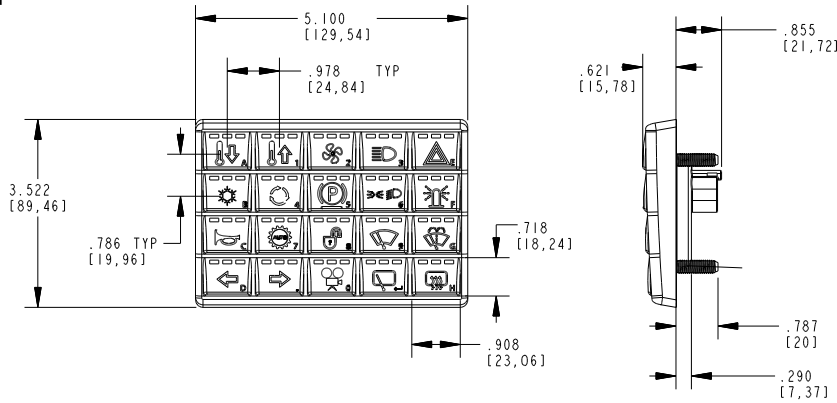


Construction

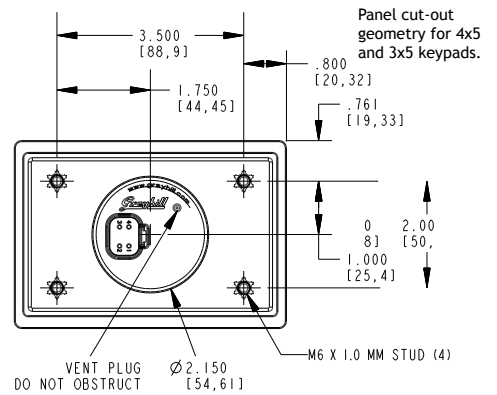
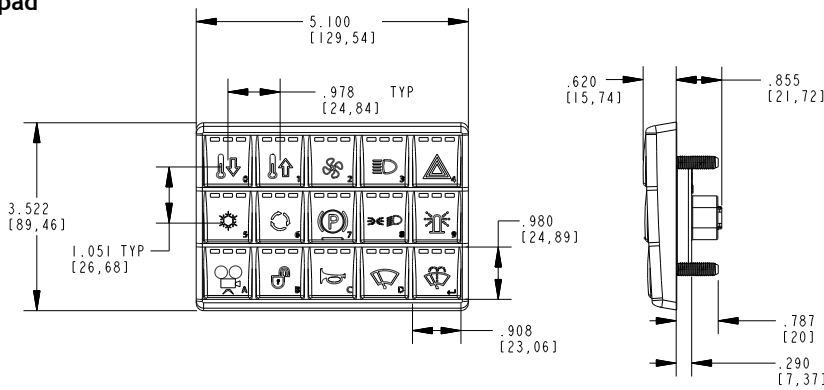


DIMENSIONS in inches (and millimeters)
ISO Symbols shown in dimensional drawings

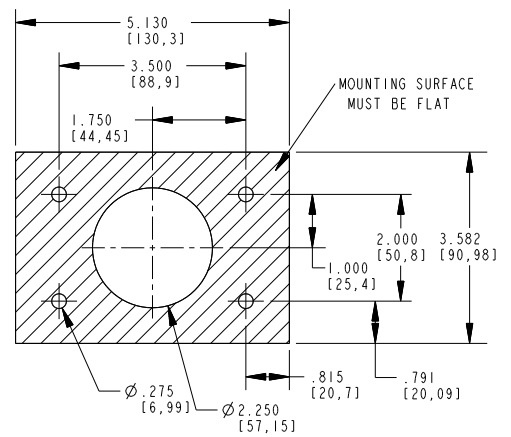
4 x 5 Keypad



3 x 5 Keypad



MOUNTING INFO
Use M6 Nut (1mm pitch)
Max Torque 25 in-lbs



STANDARD LEGEND SETS



3K115-3RC3AG



3K112-4RC3AG



3K108-4RC3AG



3K208-4RC3AG



3K120-4RC3AG



3K108-2RC3AG



3K208-2RC3AG

CONNECTION

4 pin Deutsch DT Connector.
Power with 8V to 32V vehicle type inputs.

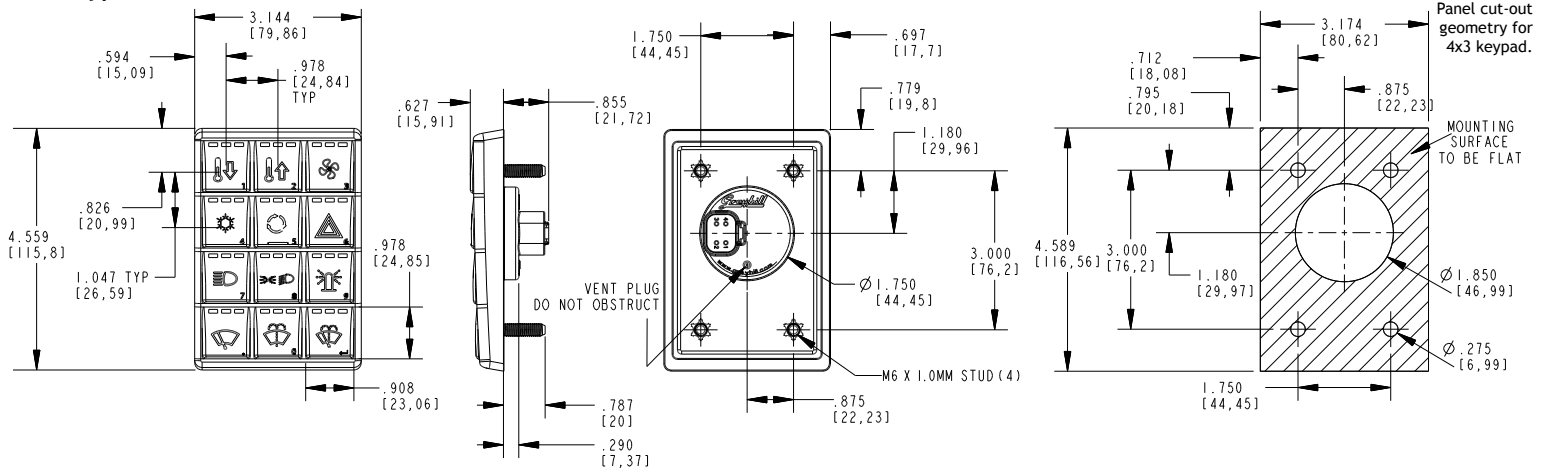
Pin 4: CAN L
Pin 3: CAN H



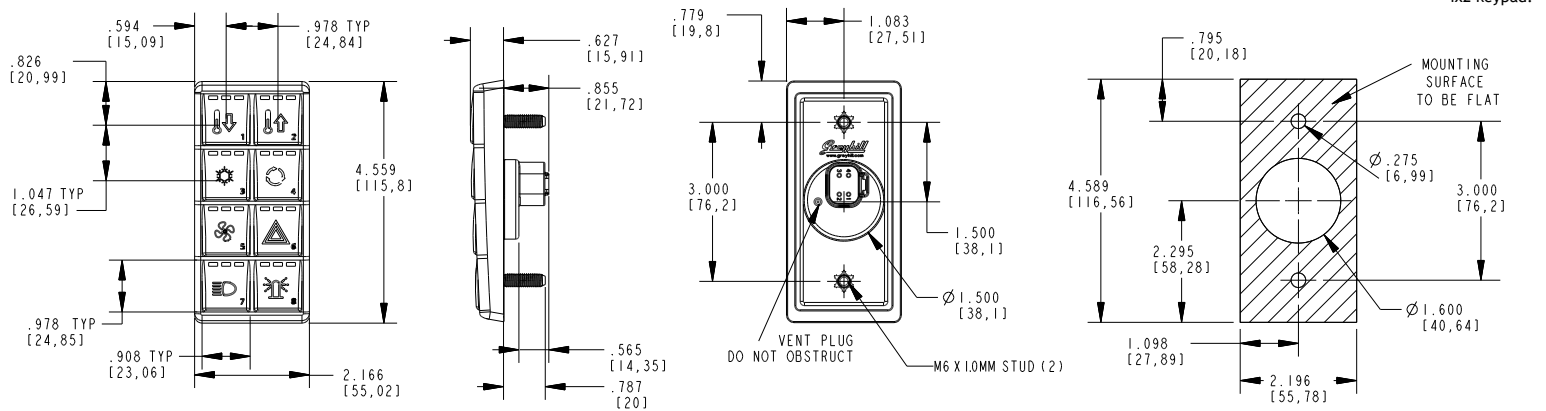
Pin 1: Power
Pin 2: Ground

DIMENSIONS in inches (and millimeters)

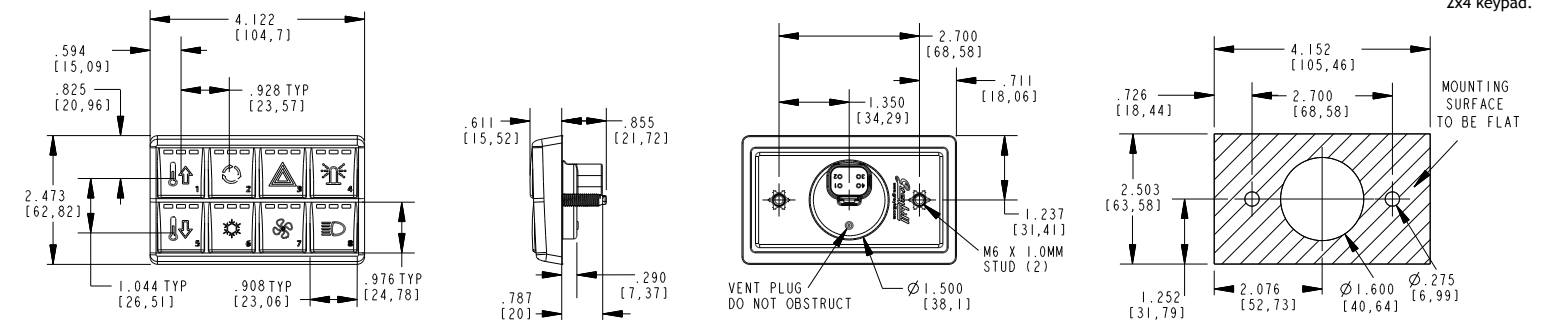
4 x 3 Keypad



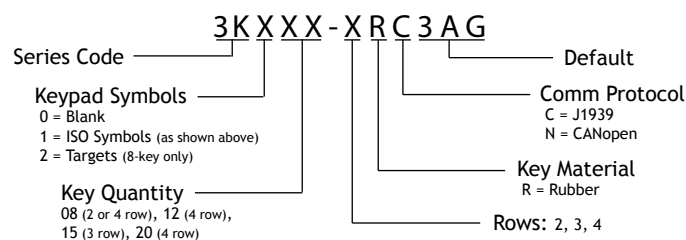
4 x 2 Keypad



2 x 4 Keypad



ORDERING INFORMATION



CUSTOMIZATION OPTIONS

- Contact Grayhill to build your custom part number
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 - Up to 3 LED indicators per key
 - Indicator colors: Red, Amber, Green, Blue
 - Custom backlight colors: Red, Amber, Green
 - Factory configured parameters



INTUITIVE HUMAN INTERFACE SOLUTIONS

ENVIRONMENTAL TESTING STANDARDS

| | | |
|--|------------------------------|--|
| Operating temperature, High | ANSI/SAE EP455 5.1.1 Level 2 | +85°C for 11 hours |
| Operating temperature, Low | ANSI/SAE EP455 5.1.1 Level 2 | -40°C for 4 hours |
| Storage Temperature, High | ANSI/SAE EP455 5.1.2 Level 2 | +85°C 4 hours |
| Storage Temperature, Low | ANSI/SAE EP455 5.1.2 Level 2 | -40°C 4 hours |
| Thermal Shock | ANSI/SAE EP455 5.1.3 | -40°C to 70°C at a rate of 4°C/min (1 hour at extremes) |
| Altitude (Barometric Pressure) | ANSI/SAE EP455 5.2 | 101.3kPa to 18.6kPa |
| Sand and Dust | ANSI/SAE EP455 5.3 | 24 hours with 0.88g/m3 |
| Solar Radiation | ANSI/SAE EP455 5.4 | 43 to 75W/m2 UV Radiation (280 to 400nm wavelength) for 300h |
| Wash Down | ANSI/SAE EP455 5.6 Level 2 | 375 kPa and 8.3 L/min for 10 minutes @ 15°C Water temp |
| Ingress Protection | IP67 | 1 meter submersion for 30 minutes |
| Humidity | ANSI/SAE EP455 5.13 | 96% Humidity at 35°C for 240 hours. |
| Salt Fog | ANSI/SAE EP455 5.9 | 5% aqueous solution of NaCl @ 35°C and a pH between 6.5 and 7.2 for 48 hours |
| Chemical resistance (Resistance to Solvents) | ISO 16750-5 EP 455 (5.8.2) | |
| Thermal Cycling (Change of Temperature) | ISO 16750-4 | -40° to 85°C 2 hours at extremes change rate = 1°C/min (8 hours) repeat for 30 cycles. |

ELECTROMAGNETIC COMPATIBILITY STANDARDS

| | | |
|------------------------------|---|---|
| ESD | ANSI/SAE EP455 5.12 | +/- 25kV for 10 pulses, 5 of each polarity |
| Radiated Immunity | ISO14982 6.6 | 10MHz-1000MHz Range 48mA Bulk Current Injection 100V/m |
| Conducted Emissions | SAE J1113-41, Control/Signal lines only | Class 3 for 3K120-4RC3AG, 3K108-2RC3AG. Class 4 for 3K115-3RC3AG, 3K112-4RC3AG, 3K108-4RC3AG |
| Broadband Radiated Emissions | ISO14982 6.4 | 64dB to 54dB, 30MHz-75MHz (linearly decreases) 54dB to 65dB, 75MHz-400MHz (linearly increases) 65dB, 400MHz-1000MHz |

PHYSICAL TESTING STANDARDS

| | | |
|-----------------------|--|---|
| Vibration, Random | ANSI/SAE EP455 5.15.1 | 2 hours each axis @ 52.4 m/s2 RMS overall acceleration and spectral power density of 2m2/s3 from 50Hz to 2000Hz |
| Vibration, Sinusoidal | ANSI/SAE EP455 5.15.2 | A logarithmic sweep from 10Hz to 2000Hz to 10Hz over a period of 20 minutes for 4 hours in each of 3 orthogonal axes with amplitude of 1.5mm from 10Hz to 40Hz and a constant acceleration of 35m/s2 RMS from 40Hz to 2000Hz. |
| Shock / Crash Safety | ANSI/SAE EP455 5.14 | A single 11ms half sine pulse of 490 m/s2 in 3 perpendicular axes. |
| Drop | ANSI/SAE EP455 5.14.2 Level 1 | Drop component 400 mm onto a hardwood benchtop on all practical edges. |
| Shipping integrity | International Safe Transit Agency procedure 3A | |

ELECTRICAL PERFORMANCE STANDARDS

| | | |
|-----------------------------|---------------------------------|--|
| Maximum load | ANSI/SAE EP455 5.1.1 Level 2 | -40°C 4 hours +85°C for 11 hours max load applied |
| Jump start forward voltage | ISO 16750-2 | 36V for 60 minutes |
| Jump start reverse voltage | ISO 16750-2 | -36V for 60 minutes |
| Short circuit protection | ISO 16750-2 | All outputs to ground for 60s |
| Reverse polarity protection | ISO 16750-2 | 28V for 60s |
| Starting profile | ISO 16750-2 | 12V class B, 24V class A |
| Battery-less operation | ANSI/SAE EP455 5.11.3 Level 2 | Apply 6+12.6sin(2*pi*f*t) f is swept from 500Hz to 1.5kHz 5min |
| Load dump | ISO 7637-2 Test Pulse 5b | Class A |
| Switching spikes – negative | ISO 7637-2 Test Pulse 3a | Class A |
| Switching spikes – positive | ISO 7637-2 Test Pulse 3b | Class A |
| Wire harness inductance | ISO 7637-2 Test Pulse 2a and 2b | Class A |
| +/- inductive load pulse | ANSI/SAE EP455 5.11.4 | 14-300e^(-t/.001)V 1Hz for 300 cycles |
| +/- mutual coupling | ANSI/SAE EP455 5.11.6 Level 2 | 14+200e^(-t/14x10^-6)V 1Hz for 300 cycles |
| Alternator field decay | ANSI/SAE EP455 5.11.2 | Class A |

CE COMPLIANCE

| | | |
|--|---------------|-----|
| Agriculture and Forestry Machinery EMC | ISO 14982 | ESA |
| Construction Machinery EMC | EN 13309:2000 | ESA |

Contact Grayhill or your local Grayhill sales representative for more information.

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