YOUR PRODUCT DEVELOPMENT PARTNER

CAN-bus Keypads for Off-Highway Vehicles

Grayhill 3K Series Keypads are ideal for off-highway vehicles, such as those used in agriculture, construction, forestry, material handling, etc. Rugged and sealed with a single-piece silicone overlay, they can be deployed in open cabs exposed to vibration, UV, extreme temperatures in wet and dirty environments.

These keypads use industry standard J1939 protocol to send signals to vehicle systems on the CAN-bus network. They also receive CAN-bus messages to manage the three LED status indicators on each key. Because of this, 3K Series Keypads can replace rows of mechanical switches with one integrated electronic device.

3K Series Keypads are designed for quick and cost effective customization. Contact Grayhill to discuss options.

3K SERIES KEYPADS

Grayhill will customize with your key legends. Choose from a library of ISO standard legends or create new symbols.

- Available with standard legend sets, targets or blank keytops
- SAE-J1939 compliant CAN-bus communication
- CAN-bus controllable LED status indicators and backlit legends
- Support for detection of multiple key combinations
- Dashboard or armrest mountable
- Rugged and sealed for outdoor use

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

Agriculture

Construction

Select Specifications

ELECTRICAL

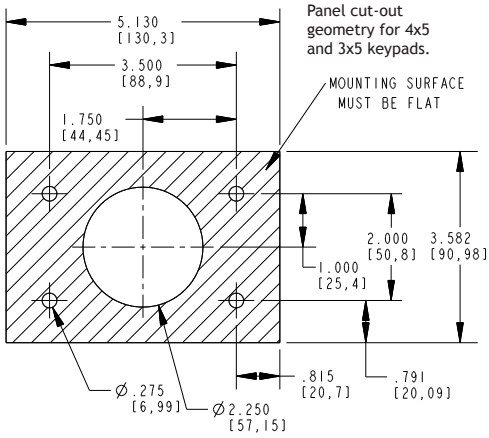
Power: 8 to 32 VDC at 2 amps maximum
Starting Profile: 12 VDC for class B, 24 VDC for class A
EMC: 100 V/m using twisted pair J1939-11 and J1939-15
ESD: +/- 25kV for 10 pulses, 5 of each polarity
Communication: CAN 2.0 part B compliant J1939 standard

MECHANICAL

Operational Life: greater than 1 million key cycles
Surface Material: UV resistant black silicone-based elastomer
Key Backlighting: dimmable green LED behind each keytop
Indicators: 3 dimmable amber LEDs on each key

ENVIRONMENTAL

Seal Rating: IP67 (1 meter submersion for 30 minutes)
Operating Temperature: -40°C to +85°C
Humidity Tolerance: 96% at 35°C for 240 hours
Chemical Resistance: ISO 16750-5 EP 455 (5.8.2)



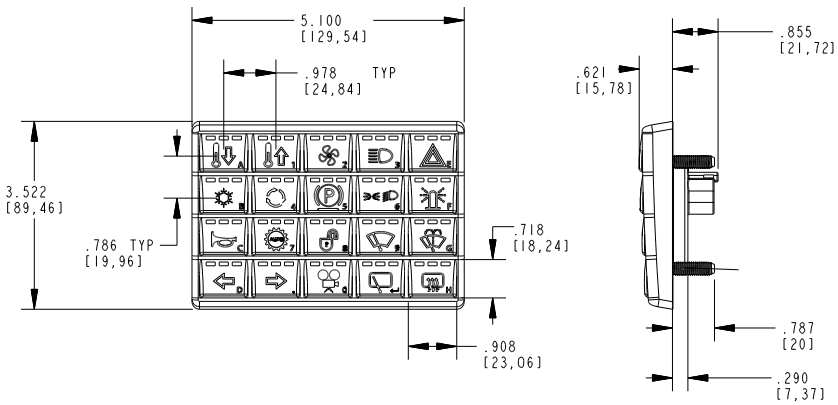
CONNECTION
4 pin Deutsch DT Connector.
Power with 8V to 32V vehicle type inputs.

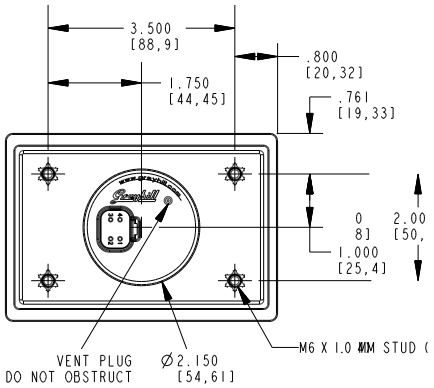
Pin 4: CAN L
Pin 3: CAN H

Pin 1: Power
Pin 2: Ground

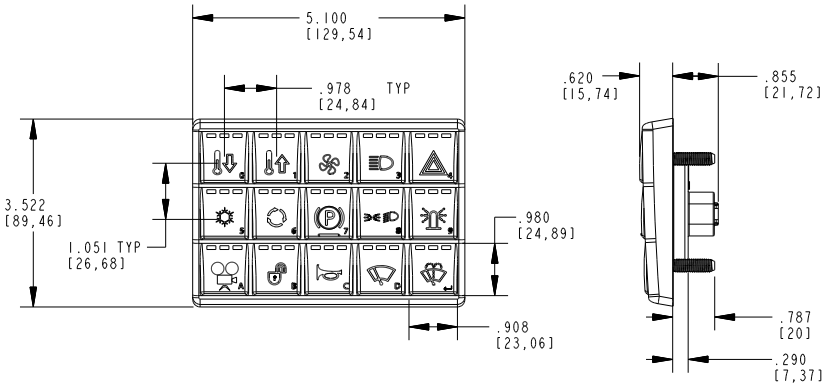
DIMENSIONS in inches (and millimeters)

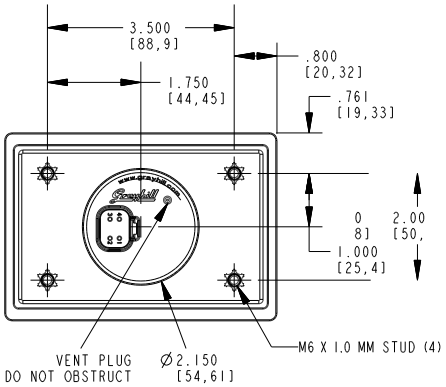
4 x 5 Keypad





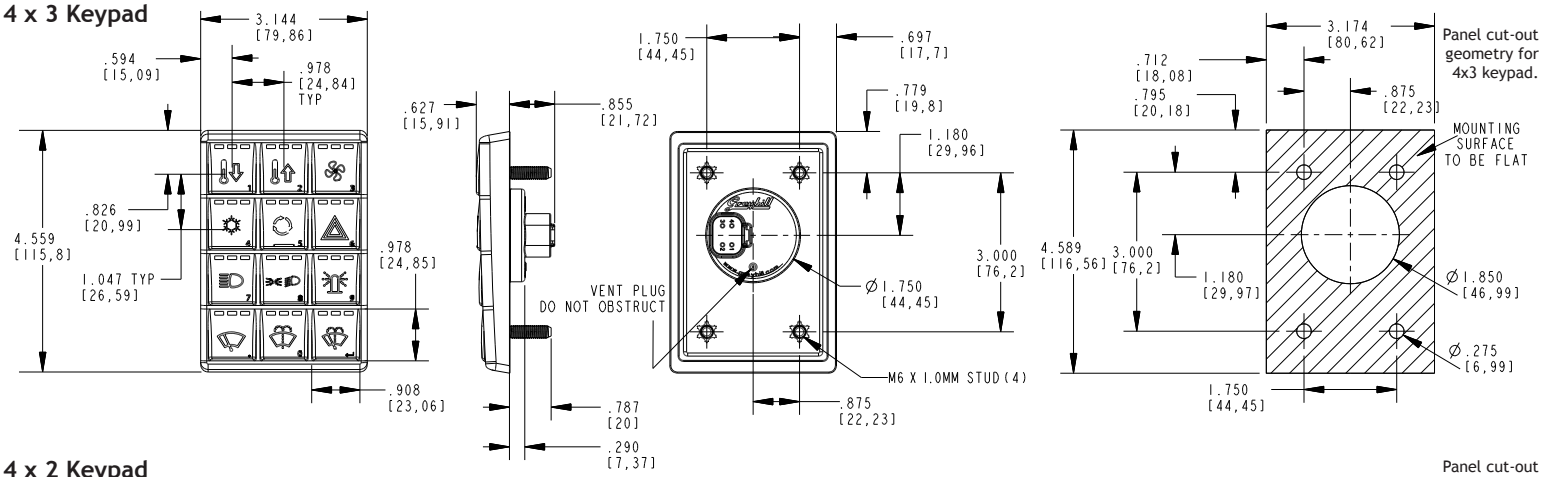
3 x 5 Keypad



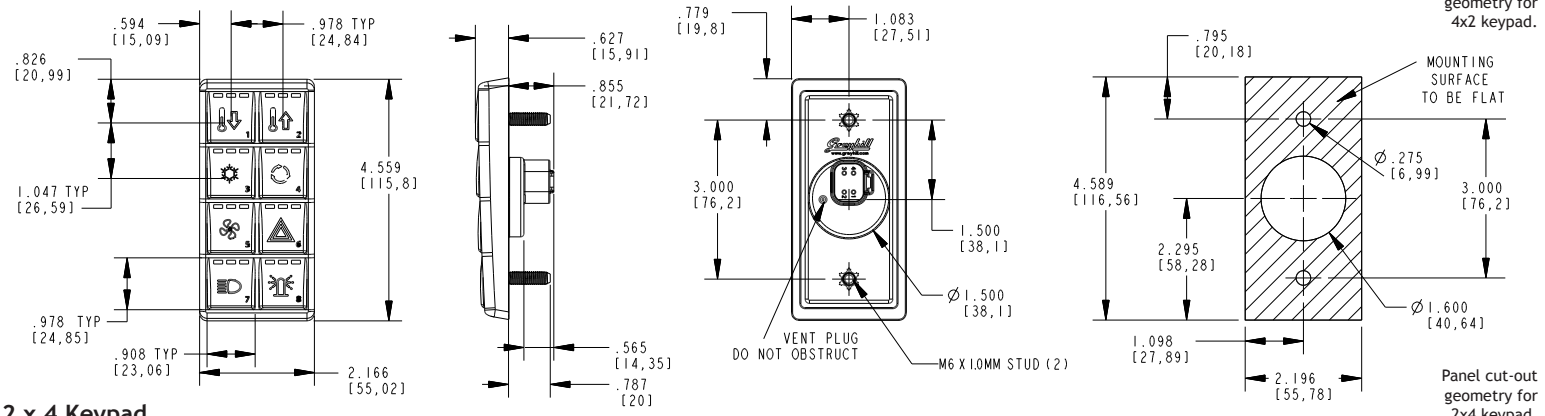


DIMENSIONS in inches (and millimeters)

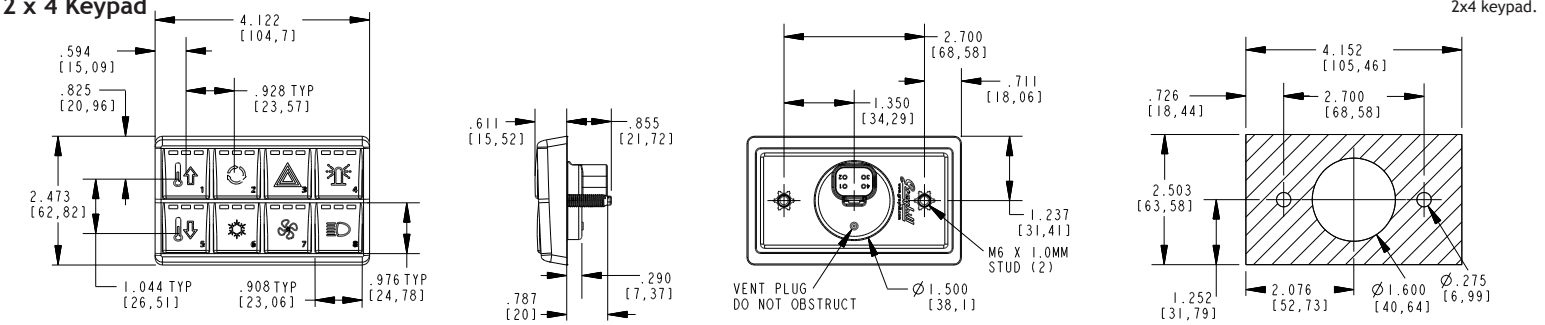
4 x 3 Keypad



4 x 2 Keypad



2 x 4 Keypad



ORDERING INFORMATION standard legends


3K115-3RC3AG


3K112-4RC3AG


3K108-4RC3AG


3K208-4RC3AG


3K120-4RC3AG


3K108-2RC3AG


3K208-2RC3AG

Customization Options

- Custom keytop legends
- Keytop legend and background color
- Backlighting: green (default), red, white yellow, blue
- LED Indicators: amber (default), blue, red, green
- Quantity of LED Indicators: 0, 1, 2, 3 (default)
- CAN-bus Variables: J1939 parameters

Blank Keytops - standard keypads without legends

- 3K020-4RC3AG - keypad 4 rows x 5 columns
- 3K015-3RC3AG - keypad 3 rows x 5 columns
- 3K012-4RC3AG - keypad 4 rows x 3 columns
- 3K008-4RC3AG - keypad 4 rows x 2 columns
- 3K008-2RC3AG - keypad 2 rows x 4 columns

ENVIRONMENTAL TESTING STANDARDS

Operating temperature, High	ANSI/ASEA EP455 5.1.1 Level 2	+85°C for 11 hours
Operating temperature, Low	ANSI/ASEA EP455 5.1.1 Level 2	-40°C for 4 hours
Storage Temperature, High	ANSI/ASEA EP455 5.1.2 Level 2	+85°C 4 hours
Storage Temperature, Low	ANSI/ASEA EP455 5.1.2 Level 2	-40°C 4 hours
Thermal Shock	ANSI/ASEA EP455 5.1.3	-40°C to 70°C at a rate of 4°C/ min (1 hour at extremes)
Altitude (Barometric Pressure)	ANSI/ASEA EP455 5.2	101.3kPa to 18.6kPa
Sand and Dust	ANSI/ASEA EP455 5.3	24 hours with 0.88g/m3
Solar Radiation	ANSI/ASEA EP455 5.4	43 to 75W/m2 UV Radiation (280 to 400nm wavelength) for 300h
Wash Down	ANSI/ASEA 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/ASEA EP455 5.13	96% Humidity at 35°C for 240 hours.
Salt Fog	ANSI/ASEA 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/ASEA 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, CISPR25	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/ASEA 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/ASEA 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/ASEA EP455 5.14	A single 11ms half sine pulse of 490 m/s2 in 3 perpendicular axes.
Drop	ANSI/ASEA 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/ASEA 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/ASEA 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/ASEA EP455 5.11.4	14-300e^(-t/.001)V 1Hz for 300 cycles
+/- mutual coupling	ANSI/ASEA EP455 5.11.6 Level 2	14+200e^(-t/14x10^-6)V 1Hz for 300 cycles
Alternator field decay	ANSI/ASEA 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 distributor in CHINA Tel:(010)6851-9097.