Grayhill

The Grayhill Difference

Engineering Expertise

Vertical Integration

Products & Solutions

Market Focus

New Products

Touch Encoder

Our newest Touch Encoder combines the functionality of conventional touch displays, keypads and rotary switches that can support multiple languages and end product configurations. The Grayhill Software team developed an intuitive app available on Apple App Store that allows the user to easily create projects on an iPad.

see page 6

Second Generation 3J Controllers

Grayhill's Generation 2 MMI Controllers are well suited for ISO 13849 Safety Rated Vehicles while featuring self-diagnostics functions include supply voltage monitoring, indicator "LED On" verification, and button malfunction detection. These MMI Controllers require just a simple front-mount, snap-in installation.

see page 8

Second Generation 3K Keypads

Grayhill's Generation 2 trendsetting CANbus keypads offers a low profile snap-in mounting scheme, wide viewing angle LED indicators, built-in diagnostics capabilities and 2 I/O pins (except for 6 button variants). The legends on this keypad will exceed the stringent Off-Highway requirements for Abrasion, UV and Chemical Resistance. Available in various form factors (6, 8, 12 and 15 button) supporting both the J1939 and CANOpen protocols. These IP 67 sealed keypads can be customized (artwork, LED Backlight/Indicator colors).

see page 8

3D70 CANbus Display

The new 7-inch versatile display utilizes a scratch-resistant, anti-glare window that optically bonds to the LCD to ensure visibility under strong sunlight. The flush mounted displays can blend with any vehicle cab seamlessly and provide a modern look and feel to your design. The display supports Qt by default and offers an additional CODESYS application development option.

see page 7

2

CT Scanner Interface

Ultrasound Control Panel

Solutions: Healthcare

Grayhill always focuses on creating a reliable user interface solution for the end user, no matter the application. In the case of medical professionals, our products aim to provide excellent tactile and audible feedback during critical situations. We design with minimal crevices and durable materials in order to meet cleaning and disinfection requirements commonly seen in healthcare applications.

Patient Bed Controls

Rugged, Low Profile
Rotary Switch

Custom Radio HMI and Rotary Switches

Solutions: Military

Grayhill delivers custom human interface solutions that meet the needs of our warfighters in the field. Grayhill can customize our extensive offering of rotary switches and encoders by changing form factor, electrical termination or adding shaft/panel seals to providing custom populated flex subassemblies that our customers can install in their final assemblies.

Grayhill also provides custom military HMI solutions that can contain Keypads, Wide Temperature Displays, Electronics with custom firmware that can contain MIL-STD-3009 compliant NVIS lighting. Having been a military component supplier for more than 75 years, Grayhill has the expertise to deliver products that reliably meet the rugged military environmental requirements while providing the high quality haptics expected by soldiers when using our products. Grayhill is AS9100 Rev D and ITAR Compliant.

Handheld Radio Keypad

Solutions: Off-Highway Vehicles

Grayhill understands the human interface requirements of farmers and construction workers. Because operators of off-highway vehicles spend long days in the driver's seat, engineers at Grayhill look beyond basic functionality to improve operator efficiency and comfort.

We specialize in creating user interface devices that communicate via CAN-bus (J1939 and CANopen protocol) to control on-board systems. A standard range of keypads, joystick/encoders and displays are offered as base products ready for quick, cost-effective customization. These products simplify mechanical installation into the vehicle cab and electrical integration with the vehicle's control units. Grayhill can also deliver intuitive user interface for your vehicle application.

Custom Controls Console

Custom Keypad and
Joystick Controller

Custom Armrest

Touch Encoder

Reimagining the User Experience

Key Features

- Replaces many traditional user input devices (such as switches, keypads, pushbuttons, displays, etc.) with a simple and intuitive device
- Supported gestures: Tap + Swipe + Turn
- High resolution display: 330 PPI (320 X 300)
- Quick user interface development
  - Intuitive tablet based development platform
 - Library of configurable standard widgets
- Optimal front panel footprint
- Stores hundreds of screens (32MB memory)
- Incorporates pictures: PNG, JPEG, etc.
- Field upgradable application and firmware
- Robust: sealed to IP67, high impact strength, chemical resistant
- 1,000,000 encoder cycles
- USB 2.0 or CAN J1939 communications with host device

Touchscreen/Display

Optically Bonded Display and Touchscreen for Excellent Sunlight Readability
Touchscreen Construction: High Resolution PCAP ITO

Knob Diameter	Position	Output	Connector Style	Knob Style
2.22In [56.4mm]	32 Positions, 11.5° Angle of Throw	• USB 2.0 • CANJ1939	• M12 • PCB	• Diamond Knurl, 304 SS • Brushed Finish, 304 SS • Diamond Knurl, Black Chrome, 304 SS • Brushed Finish, Black Chrome, 304 SS • Rubber Overmolded

Create Countless Widget Configurations by using the Touch Encoder app free to download in Apple App Store
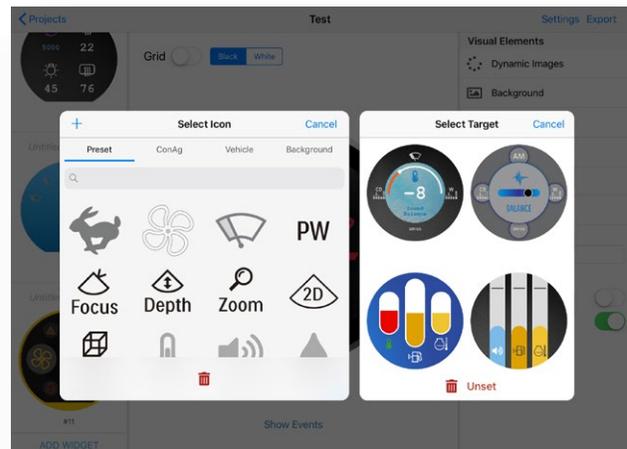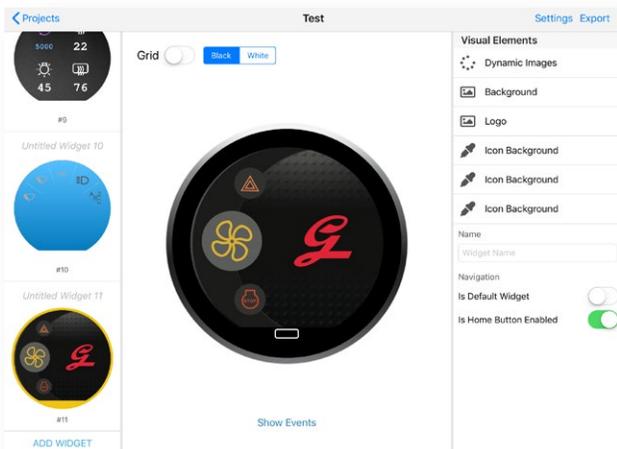
CANbus Displays, Controllers, and Keypads

Series	Description	Configurations	Features	
3D2104	10.4-in XGA Display	Optional touchscreen	• J1939 compliant CAN interface • 7 soft keys • IP67 sealed • Four video inputs • Optional Touchscreen • 800 MHZ i.MX6 Dual Core Processor • Excellent sunlight readability • 600-nit backlight intensity	 3D2104 Series Display
Series	**Description**	**Configurations**	**Features**	
3D70	7-inch WVGA Display	Optional touchscreen	• Flush panel-mount module can be built into dashboards and armrest assemblies • Responsive touch screen works with bare or gloved fingers even in wet/dirty enviroments • Optically bonded display for excellent sunlight readablility • J1939, CANopen, CoDeSys, or QT interface • Bright, 1000-nit display	 3D70 Series Display
Series	**Description**	**Configurations**	**Features**	
3D50	5-inch WVGA Display	Optional touchscreen	• Flush panel-mount module can be built into dashboards and armrest assemblies • Responsive touch screen works with bare or gloved fingers even in wet/dirty enviroments • Optically bonded display for excellent sunlight readablility • J1939, CANopen, CoDeSys, or QT interface • Bright, 700-nit display	 3D50 Series Display

Series	Description	Configurations	Features
3D32	3.2 inch Transflective Monochrome LCD	CANbus, I/O, Heater	• Easily display custom graphic icons, text boxes and active gauge elements. • Controlled via J1939 PGNs • Rated for off-highway vehicles • Extended operating temperature range: -50° C to +85°C (with heater) • Protected against the ingress of liquids and dust: IP67 rated seal • Anti-glare display

3D32 Series Display

Series	Description	Configurations	Features
3JG2	Newest MMI Controller	3 options for center knob - Optical Rotary Encoder - Encoder with Pushbutton - Proportional Joystick with optional Pushbutton	• Modern flush styling • No-tool snap-in front mounting • Designed for ISO 13849 safety rated Vehicles • Self-diagnostics included • Low current sleep mode • Custom legends and configurations

3J Gen 2

Series	Description	Configurations	Features
3KG2	Newest CANbus Keypads	5 standard sizes (R x C) - 15 keys (3 x 5) - 12 keys (4 x 3) - 8 keys (4 x 2) - 8 keys (2 x 4) - 6 keys (2 x 3)	• Modern flush styling • No-tool snap-in front mounting • Designed for ISO 13849 safety rated Vehicles • Self-diagnostics included • Low current sleep mode • Custom legends and configurations • 2 configurable I/O pins

3K Gen 2

Series	Description	Configurations	Features
3J	Legacy Vehicle Display Controller	3 options for center knob - Optical Rotary Encoder - Encoder with Pushbutton - Joysticking Encoder with Pushbutton	• 500,000 encoder cycles • 1,000,000 cycles per key • J1939 and CANopen versions • Sealed to IP67 for outdoor use • Vibration and impact resistant • Operating temp: -40°C to +85°C • Designed for 12/24 volt systems • Custom legends and configurations

3J Series

Series	Description	Configurations	Features
3K	Legacy CANbus Keypads	6 standard sizes (R x C) - 20 keys (4 x 5) - 15 keys (3 x 5) - 12 keys (4 x 3) - 8 keys (4 x 2) - 8 keys (2 x 4) - 6 keys (2 x 3)	• 1,000,000 cycles per key • J1939 and CANopen versions • Sealed to IP67 for outdoor use • Vibration and impact resistant • Operating temp: -40°C to +85°C • Designed for 12/24 volt systems • Custom legends and configurations • 0-3 indicator LED's per key

3K Series

Rotary Switches

Grayhill is the leading manufacturer of single and multi-deck rotary switches with extremely rugged construction and virtually limitless configurations. Many of our rotary switches are MIL qualified to exacting electrical, mechanical and environmental standards. We offer many options including isolated positions, spring returns, adjustable stops, concentric shaft switches and configurable keylock switches. Contact a Grayhill representative early in your design process to discuss your application. In many cases, we can meet your requirements with a standard option or a simple modification.

Product Selection Chart - Single Deck

Series	Features	Life Cycles	Poles	Angles of Throw (°)	Rating (Max)	Switch Diameter inches [mm]	Behind Panel Depth inches [mm]	Termination Options
19	UL Recognized, High Current	6,000	1	30	15A	2.000 [50,80]	0.950 [24,13]	Solder Lug, Faston
24	Long Operational Life at 1 Amp	100,000	1	36	1A	1.000 [25,40]	0.20 [5.08] to 1.015 [25.78]	PC Mount, Solder Lug
50	MIL-Qual Available Process Seal Available	25,000	1-2	36, 45, 60, 90	200mA	0.500 [12,70]	0.698 [17,72]	PC Mount, Solder Lug
51	Same as Above, Up to 16 Positions	25,000	1-4	22.5, 30	200mA	0.562 [14,27]	0.698 [17,72]	PC Mount, Solder Lug
56	Compact Format	25,000	1, 2, 4	30, 36	200mA	0.500 [12,70]	0.355 [9,02]	PC Mount, Solder Lug
75	Minimal Diameter, Flush or Knob Shaft	10,000	1-2	36	200mA	0.300 [7,62]	0.550 [13,97]	PC Mount
77	Minimal Depth Behind Panel	25,000 Max (Non-shorting)	1-2	36	200mA	0.500 [12,70]	0.180 [4,57]	PC Mount

Typical applications include:
- Two-way radio frequency selection
- Industrial controls, test and measurement tools
- Security systems with keylock controls
- Military radios, transmitters and receivers
- Ground and airborne vehicle controls

Customization can include:
- Fixed stop, adjustable stop or continuous rotation
- Multiple termination and cabling options
- Custom detents (clicks) and tactile feel
- Special operations such as pull-to-turn
- Modified shaft lengths and flats

19   24   56   77   75   50/51

58   44L   71J, L
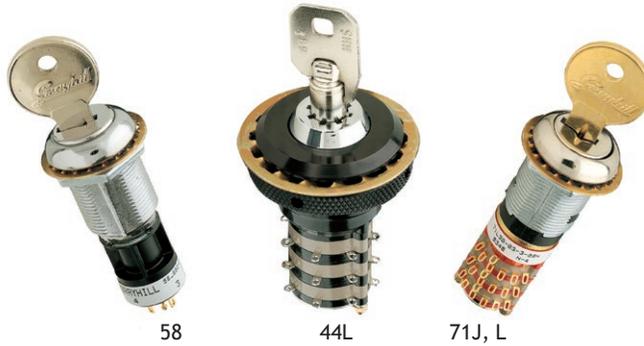
Keylocks

Series	Features	Life Cycles	Decks	Poles	Angles of Throw (°)	Rating (Max)	Switch Diameter inches [mm]	Behind Panel Depth inches [mm]	Termination Options
44L	8-Pin Round Key	25,000	1-6	1-4	45	5A	1.170 [29,72]	1.556 [29,52] to 3.536 [89,81]	Solder Lug
58	In-Panel Key Recoding	25,000	1	1-2	36, 45, 60, 90	200mA	0.900 [22,86]	1.857 [47,17] to 1.957 [49,71]	PC Mount, Solder Lug
71J,L	5-Plates, 1-Sided Key	25,000	1-12	1-6	30, 36	250mA	0.900 [22,86]	1.339 [34,01] to 4.247 [107,87]	Solder Lug

Product Selection Chart - Multi-Deck

Series	Features	Life Cycles	Decks	Poles per Deck	Angles of Throw (°)	Rating (Max)	Switch Diameter inches [mm]	Behind Panel Depth inches [mm]	Termination Options
08	MIL-S-3786/13	25,000	1-12	1-2	36	250mA	0.687 [17,45]	1.228 [31,19] to 4.158 [105,61]	PC Mount, Solder Lug
09	MIL-S-3786/13	25,000	1-12	1-6	30, 45, 60, 90	250mA	0.750 [19,05]	1.228 [31,19] to 4.158 [105,61]	PC Mount, Solder Lug
42, 44	MIL-S-3786/4, SR04-1	100,000	1-12	1-6	30, 36, 45, 60, 90	1A	1.000 [25,40] to 1.162 [29,51]	1.025 [26,04] to 5.081 [129,06]	PC Mount, Solder Lug
43, 54	MIL-S-3786/4, SR04-2	100,000 Max	1-3	1-2	30, 36	1A	1.000 [25,40] to 1.162 [29,51]	0,974 [24,74] to 3.451 [87,66]	Solder Lug
53 57 59	Smallest Switch with this many positions	25,000	1-12	1-9 1-8 1-9	15 22.5 18	250mA 250mA 250mA	1.281 [32,54] 1.125 [28,58] 1.125 [28,58]	0.916 [23,27] to 4.829 [122,66]	Solder Lug Solder Lug Solder Lug
71	MIL-S-3786/39	25,000	1-12	1-6	30, 36	250mA	0.500 [12,70] to 0.750 [19,05]	0.761 [19,33] to 4,274 [108,56]	PC Mount, Solder Lug

08/09   53/57/59   71   42/43/44/54

Optical Encoders

Grayhill specializes in human interface optical encoders that provide excellent tactile feedback to the user. The greatest advantage of optical encoders is their non-contact switching technology which results in an exceptionally high operational life. Although the end-product may vary, typical applications measure speed, distance and/or rotational angle.

61A   61K/R, 63K/R   61L   62A/62AG   62B   62C   62F   62HR

Product Selection Chart

Series	Features	Life Ratings (cycles)	Resolution	Body Size inches [mm]	Behind Panel Depth inches [mm]	Integrated Pushbutton
61A	Absolute Coding	1,000,000	8, 16, 24, 32 PPR	0.875 [22,22] sq.	0.525 [13,33]	No
61K	4-Pin Termination, High Resolution	10,000,000	25, 32, 50, 64, 100, 128, 256 CPR	1.250 [31,75] dia.	0.500 [12,70]	No
61R	5-Pin Termination, Polarized Connection	10,000,000	25, 32, 50, 64, 100, 128, 256 CPR	1.250 [31,75] dia.	0.500 [12,70]	No
61L	One quadrature cycle per detent	1,000,000	24 CPR	0.650 [16,51] sq.	0.590 [14,99]	Yes, optional
62A	Small Package	1,000,000	12 16, 20, 24, 32 PPR	0.500 x 0.540 [12,70 x 13,72]	0.525 [13,34]	Yes, optional
62AG	Price Competitive 62A	1,000,000	16, 20, 24, 32 PPR	0.500 x 0.580 [12,70 x 14,73]	0.532 [13,51]	Yes, optional
62B	Push & Pull to Select	1,000,000	16, 32 PPR	0.687 [17,45] dia.	1.080 [27,43]	Yes, push and pull
62C	Concentric Shaft	1,000,000	12, 16, 20, 24, 32 PPR	0.500 x 0.580 [12,70 x 14,73]	0.933 [23,69]	Yes, optional
62D	High Torque (3.5in-oz)	1,000,000	12 16, 20, 24, 32 PPR	0.500 x 0.580 [12,70 x 14,73]	0.525 [13,34]	Yes, optional
62F	Knob Illumination	1,000,000	16, 20, 24, 32 PPR	0.500 x 0.540 [12,70 x 13,72]	0.657 [16,68]	Yes, optional
62H	High Torque, Concentric Shaft	1,000,000	8, 12, 16 PPR	0.740 x 0.750 [18,80 x 19,05]	0.878 [22,30]	Yes, optional
62HN	High Torque Non-Turn Concentric Shaft	1,000,000	8, 12, 16 PPR	0.740 x 0.750 [18,80 x 19,05]	0.785 [19,94]	Yes, optional
62HR	High Torque, Redundant Output	1,000,000	8, 12 16 PPR	0.740 x 0.750 [18,80 x 19,05]	0.845 [21,46]	Yes, optional

Typical applications include:

- Medical electronics, including patient monitors, ventilators and imagers
- Communication systems, including two-way radios and software defined radios
- Navigation devices for ground vehicles and avionic systems
- Precision test and measuring equipment
- Sound mixing and editing consoles
- Automotive climate control and entertainment systems

62HS 62M 62N 62R 62S 62V

Customization can include:

- Custom detents (clicks) and tactile feel
- Modified shaft lengths and flats
- Multiple termination and cabling options 62T
- Custom electronics for unique outputs
- Special packaging such as custom mounts

62AG/62VG 62SG 62NG 62T

Product Selection Chart (continued)

Series	Features	Life Ratings (cycles)	Resolution	Body Size inches [mm]	Behind Panel Depth inches [mm]	Integrated Pushbutton
62HS	High Torque, Minimal Behind Panel	1,000,000	8, 12, 16 PPR	0.650 x 0.750 [16,50 x 19,05]	0.530 [13,46]	Yes, optional
62M	Magnetic Detent	3,000,000	24 PPR	1.100 [27,94] dia.	0.725 [18,42]	Yes, optional
62N	Low Torque Non-Turn Concentric Shaft	1,000,000	12, 16, 24, 32 PPR	0.500 x 0.540 [12,70 x 13,72]	0.670 [17,02]	Yes
62NG	Price Competitive 62N	1,000,000	16, 20, 24 PPR	0.580 x 0.550 [14,73 x 12,70]	0.532 [13,51]	Yes
62R	Redundant Output	1,000,000	12, 16, 24 PPR	0.500 x 0.540 [12,70 x 13,72]	0.933 [23,69]	Yes, optional
62S	Minimal Depth Behind Panel	1,000,000	8, 12, 16, 20, 24, 32 PPR	0.500 x 0.540 [12,70 x 13,72]	0.290 [7,37]	Yes, optional
62SG	Price Competitive 62S	1,000,000	16, 24, 32 PPR	0.500 x 0.580 [12,70 x 14,73]	0.292 [7,42]	Yes, optional
62SR	Sealed Encoder and Cable Assembly	1,000,000	12, 16, 20, 24 PPR	1.000 x 0.870 [25,40 x 22,10]	0.550 [13,97]	Yes, optional
62T	Thumbwheel	1,000,000	16 PPR	0.780 x 1.758 [19,81 X 44,65]	0.650 [16,51]	Yes, optional
62V	3.3Vdc Input	1,000,000	12 16, 20, 24, 32 PPR	0.500 x 0.540 [12,70 x 13,72]	0.525 [13,34]	Yes, optional
62VG	3.3Vdc Input	1,000,000	16, 20, 24, 32 PPR	0.500 x 0.540 [12,70 x 13,72]	0.532 [13,51]	Yes, optional

*CPR - Quadrature Cycles per Revolution
 PPR - Pulse per Revolution

Mechanical Encoders

Grayhill mechanical encoders combine the feel of our rotary switches with a digital output. They provide an economical way of obtaining Octal, Binary Coded Decimal, Hexadecimal and Gray code output from a rotary switch. Standard products include offerings with concentric shafts, isolated positions and adjustable stops.

Customization can include:
- Custom detents (clicks) and tactile feel
- Output codes
- Modified shaft lengths and flats
- Multiple termination and cabling options
- Integration into a custom front panel assembly

Product Selection Chart

Series	Features	Life Ratings (Cycles)	Angles of Throw (Degrees)	Output Code	Body Size inches [mm]	Behind Panel Depth inches [mm]
20	Concentric Shafts	25,000	22, 30, 36, 45	Binary, Gray, Quadrature	0.500 [12,70] sq.	0.659 [16,74]
25	Multi-Deck	50,000	10, 11.25, 12, 15, 18, 22.5, 30, 45, 60, 90	Binary, Gray, Quadrature	0.865 [21,97] sq.	0.450 to 1.050 [11,43 to 26,67]
25L	Price Competitive	100,000	10, 11.25, 15, 18, 22.5, 30, 45	Hexadecimal, Gray, Quadrature	0.865, [21,97] sq.	0.343 [8,71]
26	Small Size	25,000	22.5, 45	Quad, Octal, BCD, Hex, Gray	0.500 [12,70] dia.	0.332 [8,43]
26 PTT	Pull-to-turn (isolated positions)	25,000	22.5	Binary, Gray	0.500 [12,70] dia.	0.600 [15,24]
51	PC Mount, Adjustable Stops	25,000	30	Binary or Binary Complement	0.562 [14,27] dia.	0.537 [13,64]
71	Solder Lugs	25,000	36	Binary	0.687 [17,45] dia.	0.761 [19,33]

Typical applications include:
- Automotive GPS and radios
- Medical equipment
- Audio/visual recording/mixing equipment
- Avionics
- Transportation equipment
- Fitness equipment
- Test and measurement equipment
- Agricultural equipment
- Construction equipment
- Oscilloscopes
- Pulse/signal generators
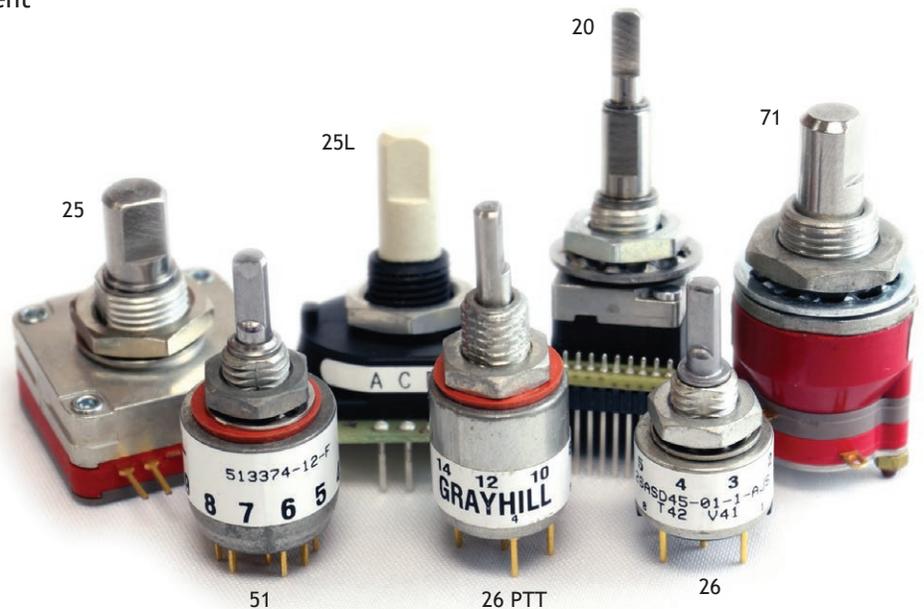
Joysticks

NavCoders™ are a unique human interface device for navigating through on-screen software.

- 4-way or 8-way directional control to navigate through menu options
- Center pushbutton for selecting menu options
- Rotational control for scrolling through many options or adjusting an intensity setting such as volume

60C   60AR   60A   60AD

Joystick Encoders

Series	Features	Life Rating (cycles)	Resolution	Body Size inches [mm]	Behind Panel Depth inches [mm]
60A	2, 4 or 8 Direction Joystick, Rotary Encoder and Pushbutton on Single Shaft	Joystick: 500,000 Rotary: 1,000,000 Push: 1,000,000	20 PPR	1.000 [25,40] dia.	0.598 [15,19]
60AD	Same as 60A plus three levels of joystick/pushbutton force and rotary torque	Joystick: 500,000 Rotary: 1,000,000 Push: 1,000,000	20 PPR	1.000 [25,40] dia.	0.950 [24,13]
60AR	Rugged, 4 or 8 Direction Joystick, Rotary Encoder and Pushbutton, Sealed to IP67	Joystick: 500,000 Rotary: 1,000,000 Push: 1,000,000	20 PPR	1.000 [25,40] dia.	0.950 [24,13]
60C	4 Direction Joystick plus Rotary Encoder and Pushbutton on Concentric Shafts	Joystick: 500,000 Rotary: 500,000 Push: 500,000	16 PPR	1.000 [25,400] sq.	0.661 [16,79]

Discrete Joysticks

Series	Features	Life Rating (cycles)	Electrical Characteristics	Circuitry	Termination	Behind Panel Depth inches [mm]
04J	Rugged & Sealed, Four Directions with Center Pushbutton	100,000	2A resistive at 115 VAC	5PST: NO	Solder Lug PC Mount	0.659 [16,73]
04JT	Great Tactile Feedback Dynamically Sealed when properly mounted	250,000	0.5mA resistive at 5VDC	4PST: NO	Solder Lug PC Mount	0.689 [17,50]

04J

04JT

Hall Effect Switches

Hall-effect technology provides contactless operation, facilitating a long operational life. The Hall-effect sensor magnetically detects the position of another moving part such as the shaft in a joystick or encoder. This relational position can be output from the device in a variety of formats, including I2C, open collector or push-pull output. Hall-effect technology has the advantage of working in low voltage applications and often features a sleep mode to conserve power. Grayhill is introducing this technology across several switch types, including joysticks, paddle/rockers and rotaries.

Typical applications include:

- Off-Highway vehicles
- Material handling equipment
- Medical electronics, including bed and table positioning
- Remote control Belly Box
- Robotic and industrial automation controllers
- Marine GPS and controls
- Security camera positioning

Customization can include:

- Various housing and mounting options
- Multiple termination and cabling options
- Custom electronics and output
- Redundancy
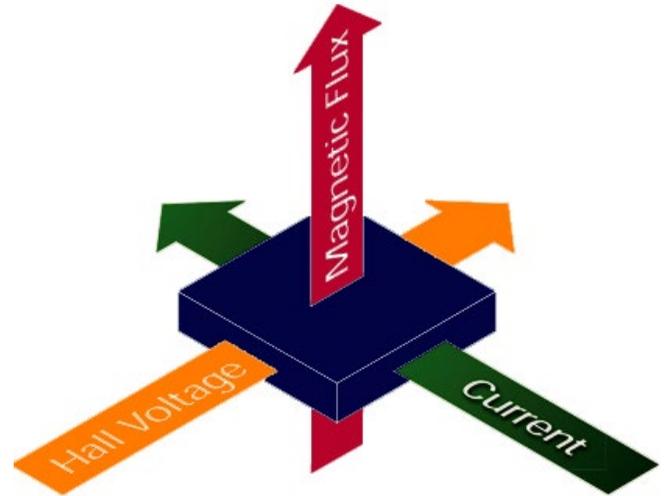
Hall effect sensors detect motion magnetically

Joysticks

These compact joysticks can provide precise cursor control where other pointing devices are impractical, such as on test and measurement equipment or medical electronics. Other applications include CNC positioning, industrial / robotic control and work vehicles / aerial platforms.

Series	Description/Features	Life Rating (cycles)	Range of Movement	Body Size inches [mm]	Behind Panel Depth inches [mm]	Output
67A	Joystick Small Package	1,000,000 Joystick	Shaft travel 20° in any direction	1.300 [33,02] sq	0.727 [18, 47]	I²C Proportional
67B	Joystick with Momentary Rotation & Pushbutton	1,000,000 Rotary, 1,000,000 Pushbutton, 1,000,000 Joystick	Shaft travel 20° in any direction	1.250 [31,75] dia	.629 [15,98]	I²C Proportinal joystick I²C Rotation Mechanical pushbutton
67C	Joystick with 360° Rotation & Pushbutton	1,000,000 Rotary, 1,000,000 Pushbutton, 2,000,000 Joystick	4 sensors, 8 directions	1.000 ± .015 dia	.588 ± .015	Proportional joystick Quadrature Encoder Mechanical pushbutton

67A   67B   67C

Rotary

These rotary switches share the same sensor technology: Hall effect. But their outputs differ substantially. The 68A provides digital quadrature output, similar to other Grayhill encoders. The 68P provides a proportional analog output, similar to a potentiometer. Both benefit from non-contact Hall effect technology.

Series	Description/Features	Life Rating (cycles)	Resolution	Body Size inches [mm]	Behind Panel Depth inches [mm]	Output
68A	Rotary, Optional Redundancy	1,000,000 for rotary & pushbutton	16 PPR	.500 [12, 7] sq	.562 ± .015 [14,26 ± 0,38]	Quadrature rotary mechanical pushbutton
68P	Rotary, Optional Redundancy	7,000,000 for rotary	0.5V - 4.5V every 360°	.500 [12, 7] sq	.503 ± .015 [12,78 ± 0,38]	Proportional

68A   68P

Paddle/Rocker

Series	Description/Features	Life Rating (cycles)	Range of Movement	Body Size inches [mm]	Behind Panel Depth inches [mm]	Output
68B	Paddle Switch, Friction Hold, Latching, and Return to Center Option	200,000 Friction Hold, 200,000 Latching, 2,000,000 Return to Center	Paddle travel 40° both ways Latching angle 36° Detent angle 26°	1.062	.273 ± .005	Proportional PWM

68B Featured with Red, Yellow, Green, Blue, Purple and Black Outline

Keypads

Grayhill offers a full line of customizable keypads. Standard configurations include sealed rubber keypads, vandal-resistant metallic construction, and low-profile or full travel actuation keypads. Switching technologies include conductive rubber and metal dome contacts. Outputs include matrix output and single pole / common bus. All keypads have options for custom legends and many feature backlit keys. Often, a keypad technology is specified for integration into a custom front panel assembly. In these cases, the keypad technology can be deployed in a custom shape to meet the unique requirements of the application.

Product Selection Chart

Image	Series	Features	Life Rating (cycles per key)	Array	Standard Output	Sealed	Backlit
	82	Lightable Modules that Stack in any Configuration, Insertable Legend Sheets	1,000,000	Single Button, 1x2, 1x3, 2x3	SPST, 2PST, 3PST, 4PST	N	Y
	83	Excellent Tactile Feedback from Snap-Dome Contacts, 0.5" [12,7mm] Centers	3,000,000	3x4, 4x4	Matrix or Common Bus	N	N
	84	Excellent Tactile Feedback from Snap-Dome Contacts, 0.75" [19,05mm] Centers	3,000,000	3x4, 4x4	Matrix or Common Bus	N	N
	84BL	Backlit, Sealed, Permanent Legends	3,000,000	3x4, 4x4	Matrix	Y	Y
	84S	Sealed Silicone Rubber, Snap Dome Contacts	3,000,000	Single Button, 3x4, 4x4	Matrix or Common Bus	Y	N
	84LS	Sealed Construction, Snap Dome Contacts	3,000,000	Single Button, 3x4, 4x4	Matrix or Common Bus	Y	N

Image	Series	Features	Life Rating (cycles per key)	Array	Standard Output	Sealed	Backlit
	86	Flange Mounted, 0.5" [12,7mm] Centers	3,000,000	3x4, 4x4, 5x4	Matrix or Common Bus	N	N
	87	Modules Stack in any Configuration	3,000,000	1, 2, 3, 4, 5, 6, 3x4, 4x4	Matrix or Common Bus	N	N
	88	Flange Mounted, Splash Resistant, Low Profile Domes	3,000,000	3x4, 4x4, 5x4	Matrix or Common Bus	N	N
	96	Conductive Rubber Contacts	1,000,000	3x4, 4x4	Matrix	N	Y
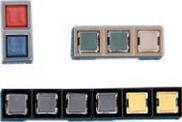
Typical applications include:
- Transportation equipment
- Healthcare equipment
- Fitness equipment
- Avionics
- ATMs and kiosks
- Security systems
- Industrial controls

Customization can include:
- Legends
- Bezel color
- Multiple termination & cabling options
- Custom electronics
- Membrane, dome, or carbon pill switching
- Construction - plastic, silicone rubber, metal, etc.

Pushbuttons

Grayhill's pushbutton switches have been proven as a rugged solution for countless applications. Our pushbuttons employ a variety of contact mechanisms, circuitry, mounting and termination options. With such a wide variety available, it's easy to find one that meets your requirements. But if you require customization, we can offer custom actuation force and travel distance, or custom termination and cabling options.

Snap Action

Series	Features	Life Rating (cycles)	Electrical Rating	Circuitry	Termination	Behind Panel Depth inches [mm]
7/ 2000	Audible Click, Fast Make-and-Break	25,000	10 Amps at 115 Vac	SPST: NO & NC SPDT: BBM	Faston, Solder Lug	0.796 [20,22]

Wiping Contact Switches

Series	Features	Life Rating (cycles)	Electrical Rating	Circuitry	Termination	Behind Panel Depth inches [mm]
10/ 4000	Momentary Contact, UL-3A Version Available	Up to 100,000	1 Amp at 115 Vac for long life version	SPST: NO & NC	Solder Lug	0.688 [16,97]
23	Momentary Contact, Short travel: 2,41mm	100,000	250mA at 115 Vac	SPST	Solder Lug	0.476 [12,09]
46	High Reliability, Available Sealed	Up to 250,000	250mA at 115 Vac	SPDT: BBM & MBB DPDT: BBM & MBB	Solder Lug or Sealed Wires	0.770 to 1.140 [19,56 to 29,00]
30/46	Decorator Line with Attractive Front Bezel	250,000	250mA at 115 Vac	SPDT: BBM & MBB DPDT: BBM & MBB	Solder Lug	0.992 to 1.448 [25,20 to 36,78]

SMT Key Switches

Series	Features	Life Rating (cycles)	Electrical Rating	Circuitry	Termination	LED Colors
14	Sealed & Illuminated	1,000,000 Max	1 mA at 30 VDC	SPST, DPST	SMT	Red Orange Yellow/Amber Green Blue White

| 7 | 30/46 | 10/4000 | 46 | 23 | 14 |

Customization can include:
- Custom caps and legends
- Custom detents (clicks) and tactile feel
- Multiple termination and cabling options
- Custom electronics
- Integration into a Grayhill custom front panel assembly

Typical applications include:
- Security systems
- Industrial manufacturing equipment
- Casino gaming
- Audio/video equipment
- Avionics
- Fitness equipment
- Test and measurement equipment

Butt Contact Switches

Series	Features	Life Rating (cycles)	Electrical Rating	Circuitry	Termination	Behind Panel Depth inches [mm]
30	Reliable Panel Mount, UL-5A Version Available	Up to 1,000,000	1 Amp at 115 Vac for long life version	SPST: NO & NC	Solder Lug	0.315 to 0.455 [8,00 to 11,56]
30-100	Snap-in Panel Mount	500,000	150mA at 24Vdc	SPST: NO	Solder Lug	0.540 to 0.480 [13,72 to 12,20]
30-200	Threaded Panel Mount	500,000	150mA at 24Vdc	SPST: NO	Solder Lug	0.540 to 0.480 [13,72 to 12,20]
30/46	Decorator Line with Attractive Front Bezel	Up to 1,000,000	1 Amp at 115 Vac for long life version	SPST: NO & NC	Solder Lug	0.710 to 1.204 [18,03 to 30,58]
32	Stackable PCB Mount Switches with LED	100,000	150mA at 28 Vdc	SPST: NO & NC SPDT: BBM	Surface Mount	N/A
38H	Miniature, PCB Mount, Sealed Plunger Option	80,000	0.4VA at 20 Vac or Vdc	SPST: NO SPDT: NO/NC	Surface Mount	N/A
39-2X	Miniature 2 Circuit Switch, Horizontal Mount	500,000	250mA at 115 Vac	SPST: NO & NC SPDT: BBM	Surface Mount	N/A
39-5X	Long Life 0.25-inch Switch	1,000,000	150mA at 28 Vdc	SPST: NO	Surface Mount	N/A
39-LIMIT	Adjustable Location Settings, Plunger Seal	Up to 500,000	500mA at 115 Vac for long life version	SPST: NO & NC	Solder Lug	0.517 to 0.707 [13,14 to 17,96]
39-X	Minimal Behind Panel, Available Sealed	Up to 1,000,000	500mA at 115 Vac for long life version	SPST: NO & NC	Solder Lug	0.215 to 0.429 [5,47 to 10,90]

39-261

39-352

39-101

30-17

30-100 (Snap-in)

39-501

39-351

38H

32LED

30-200 (Threaded)

Tact, Toggle Rocker & Slide Switches

Grayhill Tact Switches are momentary pushbuttons designed for cost-effective user interface switching. They are mounted to a printed circuit board and typically actuated by a decorative keycap. The ultraminiature and lightweight structure of these tact switches make them suitable for high density mounting. Grayhill's Toggle, Rocker, and Slide Switches are available in industry standard designs to allow for easy integration.

| 95C04 | 95C05 | 95C06 | 95C12 | 95CW06 |

Tactile Switches

Series	Features	Life Rating (cycles)	Operating Force (grams)	Height inches [mm]	Termination
95C04	6mm x 3.5mm	50,000	160, 320	0.169 to 0.197 [4,30 to 5,00]	SMT, Thru-Hole
95C05	5mm Square	50,000	160	0.059 [1,49]	SMT
95C06	6mm Square, Non-Washable	Up to 500,000	100, 160, 260, 320, 520	0.169 to 0.512 [4,29 to 13,00]	SMT, Thru Hole, Right Angle
95C12	12mm Square	Up to 500,000	160, 260	0.169 to 0.335 [4,29 to 8,51]	SMT, Thru-Hole
95CW06	6mm Square, Washable	Up to 500,000	160, 180, 260, 360, 520	0.091 to 0.205 [2,30 to 5,20]	SMT, Thru-Hole, Right Angle, J-Lead
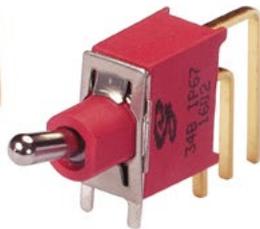
| 34A | 34B | 34C | 34D | 34E |

Toggle Switches

Series	Features	Contact Rating (maximum)	Life Rating (cycles)	Circuitry Options	Termination
34A	Miniature 12,7mm Length	Up to 5A at 125 VAC	40,000	SPDT, DPDT, 3PDT, 4PDT	Solder Lug, PC Mount, Wire Wrap
34B	Miniature, Sealed per IP67	Up to 5A at 125 VAC	30,000	SPDT, DPDT, 3PDT	Solder Lug, PC Mount
34C	Sub-Miniature 8,13mm Length	Up to 3A at 125 VAC	30,000	SPDT, DPDT	Solder Lug, PC Mount
34D	Sub-Miniature, Sealed per IP67	Up to 3A at 125 VAC	30,000	SPDT, DPDT	PC Mount
34E	Sealed Surface Mount per IP67	0.4 VA at 20VAC or DC	30,000	SPDT	Surface Mount

Common Features

- Excellent tactile feedback
- Insert molded terminals on tacts prevents flux buildup during soldering
- Choice of actuators, forces and heights
- Choice of bushings and terminations

Typical applications include:

- Telecommunications
- Industrial products
- Laboratory equipment
- Back-office equipment
- Handsets
- Industrial reset switches

47A   47B   47C   47D
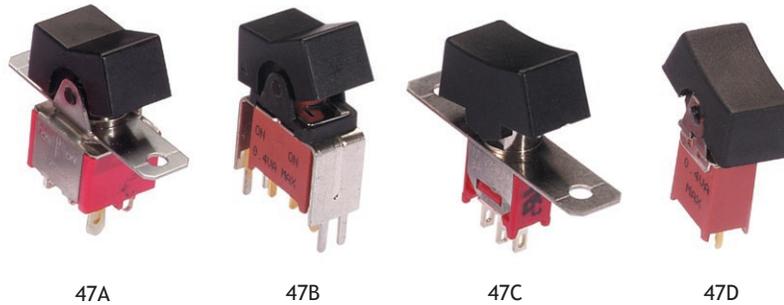
Rocker Switches

Series	Features	Contact Rating (maximum)	Life Rating (cycles)	Circuitry Options	Termination
47A	Miniature 12,7mm Length	Up to 5A at 125 VAC	50,000	SPDT, DPDT, 3PDT, 4PDT	Solder Lug, PC Mount
47B	Miniature, Sealed per IP67	Up to 5A at 125 VAC	30,000	SPDT, DPDT, 3PDT	Solder Lug, PC Mount
47C	Sub-Miniature 8,13mm Length	Up to 3A at 125 VAC	30,000	SPDT, DPDT	Solder Lug, PC Mount
47D	Sub-Miniature, Sealed per IP67	Up to 3A at 125 VAC	50,000	SPDT, DPDT	PC Mount

48A   48B

Slide Switches

Series	Features	Contact Rating (maximum)	Life Rating (cycles)	Circuitry Options	Termination
48A	Miniature 12,7mm Length	Up to 5A at 125 VAC	30,000	SPDT, DPDT	Solder Lug, PC Mount
48B	Sub-Miniature 8,13mm Length	Up to 3A at 125 VAC	30,000	SPDT	PC Mount

DIP Switches

Grayhill is the world leader in DIP switch technology. Consistent high contact pressure is achieved with a spring and ball contact system on select series. Other features include a standard base seal, optional top-tape seal, and can also come in tape and reel packaging. Our DIP switches can be customized for your specific application.

Customization can include:
- Custom printing
- Special packaging
- New designs and form-factors

Surface Mount

Series	Features	Positions	Actuation Type	Circuitry	Life Rating (cycles)
76HP	PIANO_DIP	2, 4, 6, 8, 10	Side Actuated Toggle	SPST	2,000
78H	Standard DIP Package	1 - 5	Top Actuated Slide	SPST, DPST	2,000
90HB	Low Profile	2 - 10	Top Actuated, Recessed Slide	SPST	2,000
97	Half-Pitch	2, 4, 6, 8, 10	Top Actuated, Recessed Slide	SPST	1,000

Thru-Hole

Series	Features	Positions	Actuation Type	Circuitry	Life Rating (cycles)
76	Sealed Base, Spring & Ball, Top Tape Seal Option	2 - 10, 12	Raised/Recessed, Top/Side, Rocker/Toggle/PIANO	SPST, SPDT, DPDT	2,000
78	Sealed Base, Spring & Ball, Top Tape Seal Option	2 - 10, 12	Raised/Recessed, Top, Slide/ Rocker	SPST, 2PST, 3PST, 4PST, SPDT, DPDT	2,000
78C	Right Angle	2 - 10, 12	Raised Slide	SPST	2,000
90B	Machine Insertable MIDIP	2 - 10	Top Actuated, Recessed Slide	SPST	2,000

Rotary

Series	Features	Positions	Actuation Type	Circuitry	Life Rating (cycles)
94H	Sealed with Coded Output	8, 10, 16	Flush or Extended, Top or Side	Octal, BCD & Hexadecimal	10,000
94R	Coded Output with Shaft	8, 10, 16	Side Actuated Shaft	Octal, BCD & Hexadecimal	10,000
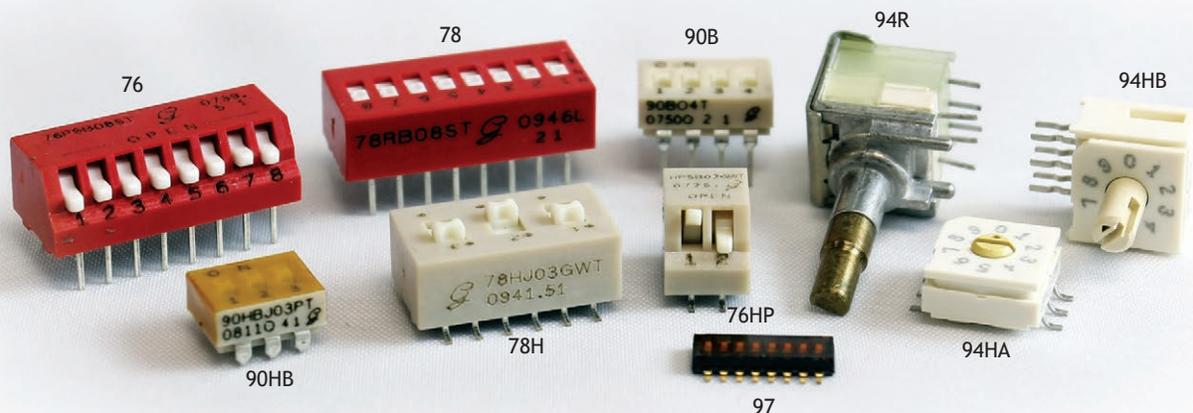
I/O Modules and Racks

Grayhill offers I/O modules in the industry standard sizes of mini, standard and G5. Grayhill also offers its unique Open-Line style I/O module that offers two input/output points per snap-in module. This not only saves space but also offers quick and tool-free assembly and modification. Grayhill's I/O Racks are available in industry standard size as well as a miniature footprint size to save panel space.

Modules

Series	Features	Types	Logic Voltage Rating	Unique Options	Agency Approval
70	Industry Standard pin out	AC In	3-6, 8-18, 15-30	120 or 220 Vac	UL, CSA, TUV
		AC Out	2.5-10, 10-18, 15-30	120 or 220 Vac, heavy inductive load	
		DC In	3.5-6, 3-6, 8-18, 15-30	Polar and non-polar, fast	
		DC Out	2.5-9, 2.5-10, 10-18, 15-30	Electromechanical relay, low leakage	
70M	Saves 35% space	AC In	3-6, 8-18, 15-30	120 or 220 Vac	UL, CSA, TUV
		AC Out	2.5-10, 10-18, 15-30	120 or 220 Vac, heavy inductive load	
		DC In	3.5-6, 3-6, 8-18, 15-30	Polar and non-polar, fast	
		DC Out	2.5-9, 2.5-10, 10-18, 15-30	Electromechanical relay, low leakage	
70G	Fused outputs, integral LED	AC In	4.5-6, 10-18, 17-30	120 or 220 Vac	UL, CSA, TUV
		AC Out	4-6, 8-20, 18-32	120 or 220 Vac, heavy inductive load, manual override	
		DC In	4.5-6, 10-18, 17-30	Polar and non-polar, fast, dry contact	
		DC Out	4-6, 10-20, 18-32	Electromechanical relay, low leakage, manual override	
70L	Two channel fused outputs, integral LED, mix digital and analog	AC In	4.5-28	120 or 220 Vac	UL, CSA
		AC Out	4.5-28	120 or 220 Vac, heavy inductive load	
		DC In	4.5-28	Polar and non-polar, fast	
		DC Out	4.5-28	Electromechanical relay	

Racks

Series	Features	Channels	Agency Approvals
70	Industry standard foot print	4, 8, 16, or 24 Channel	UL, CSA
70M	Miniature foot print	4, 8, 16, or 24 Channel	UL, CSA
70G	Fuses and LEDs on modules	4, 8, 16, 24 or 32 Channel	UL, CSA
70L	Highest Density	4, 8, 16, or 24 Channel	UL, CSA

Process Control & Production Consistency

Product Life Testers

In-Process Haptics Validation
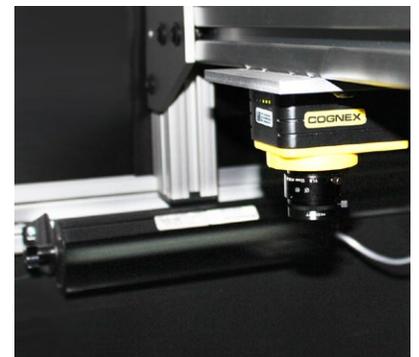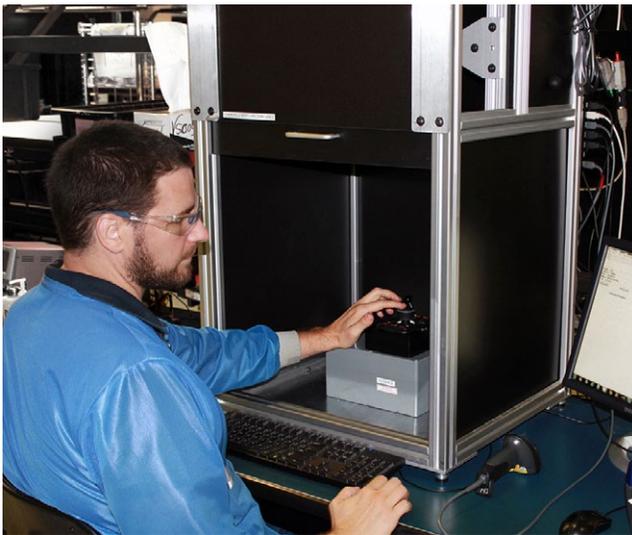
End Product Calibration and Verification

Customization Examples

25 Series Multi-Deck Rotary Switches: Customization Options

Grayhill's Mission

To be instrumental to our customers' success by delivering intuitive human interface solutions that make life simpler, safer and more efficient.

About Grayhill

Grayhill, Inc. designs and manufactures a broad line of intuitive human interface components and custom solutions that make life simpler, safer and more efficient. We understand the importance of the haptics, ergonomics and styling of your product. As importantly, we understand the evolving needs and expectations of end-product users in our target markets: Medical electronic devices, Military applications and MMIs for Off-Highway Vehicles.

Standard products include optical encoders, rotary switches, keypads, joysticks and pushbuttons. Our components can be customized for your application or integrated into a complete front panel solution. Grayhill specializes in creating custom operator interface panels and portable product shells that integrate our components, displays and wired or wireless communications into an ergonomic, user-friendly device. This allows Grayhill to design solutions that provide an intuitive interface between your technology and your users.

With headquarters just outside of Chicago, and multiple state-of-the-art facilities around the world, Grayhill's team has the engineering, development and manufacturing expertise to deliver both standard and customized products quickly and cost-effectively. Select one of our dependable standard products, or let our team design, qualify and manufacture the perfect solution for your needs.

AS9100D Certificates: La Grange, McCook, Carpentersville

ISO9001:2015 Certificates: All Facilities

ISO14001:2015 Certificates: McCook, Shenzhen

Grayhill
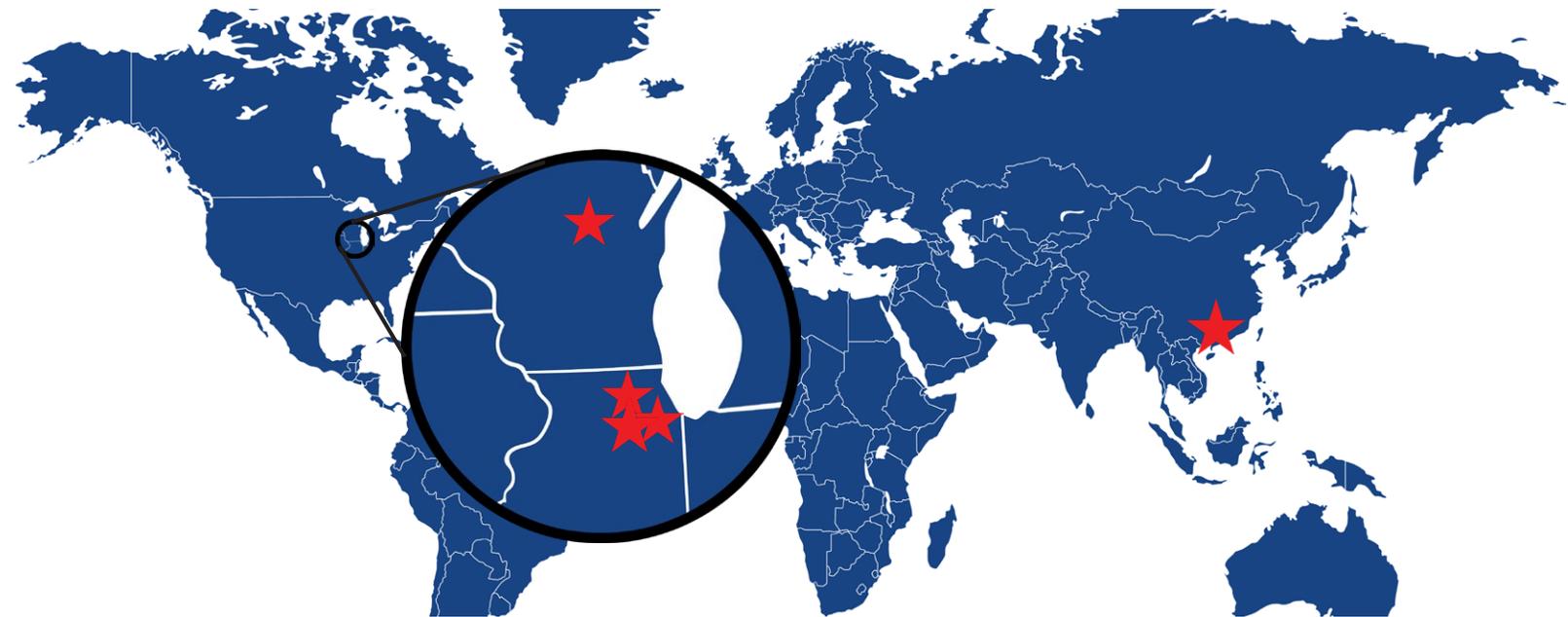
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