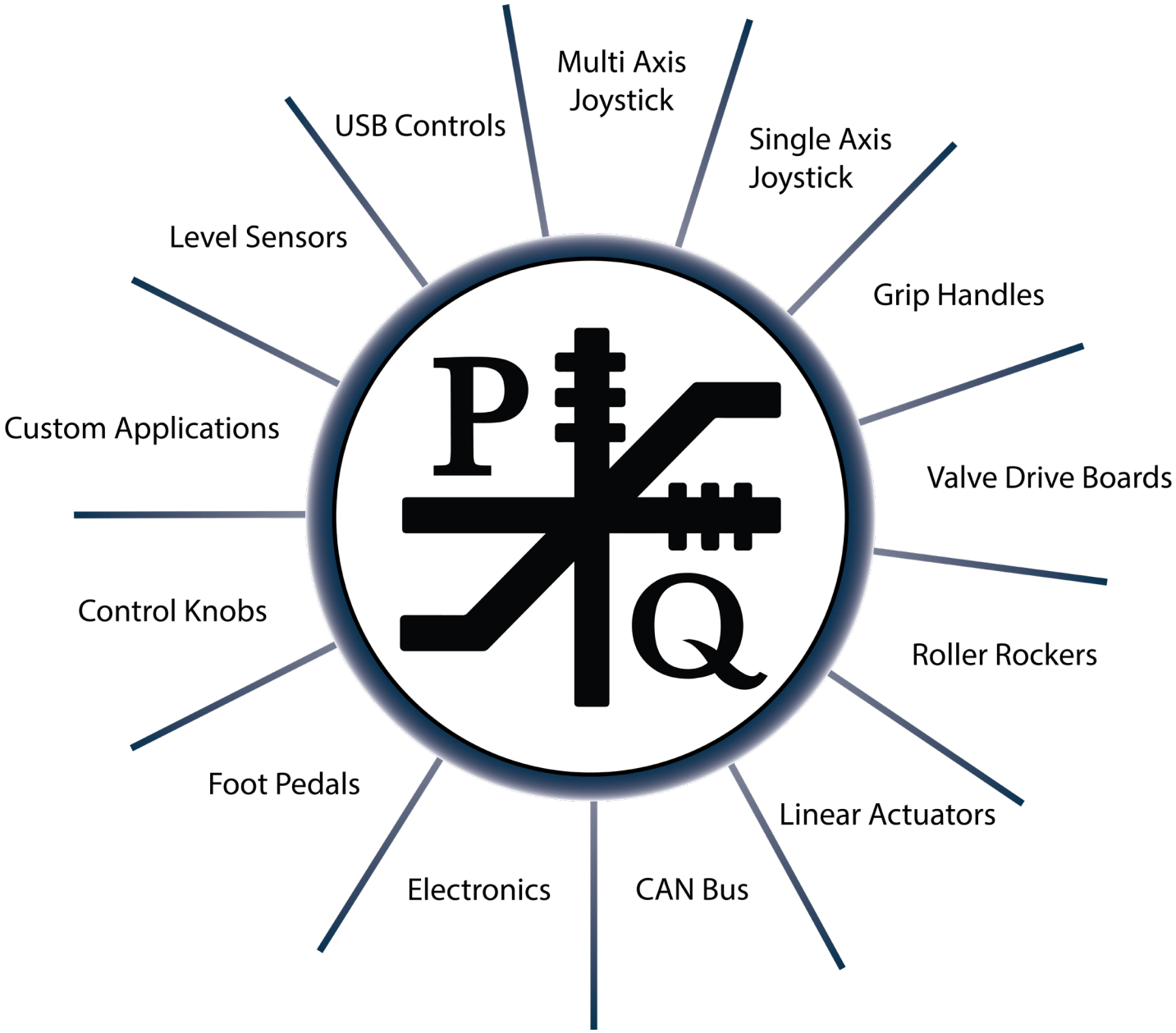
Proudly Made in the USA

PQ CONTROLS

Global Excellence in Industrial Controls

50+ years of Industry Innovation

Innovative Designs with Full Engineering Support
Engineered to Perform and Designed to Last
100% End of Line Testing
Superior Components and Materials



World Wide Shipping

World Wide Support

Company Profile

PQ controls has been an industry leader in the outdoor / off-highway controls market. From the large OEM to the end user, the company's diverse product portfolio and expert engineering services continue to supply the world's market of heavy duty joysticks and controls. Typical applications include; mining, construction, aerial lifts, refuse, fire apparatus, forestry, and simulators.

PQ Controls was established in 1973 as a producer and supplier of industrial joysticks and controls, and has since grown into one of the largest manufacturers of its kind. Today, PQ Controls continues its record of steady annual growth, allowing us to serve a greater array of equipment manufacturers. Our long-standing history in the design of contactless solid-state sensing, has allowed us to improve our products over time to near-perfect quality, giving us a marked Advantage over our competition. The result for the end-user is quite simple: When you buy from PQ Controls, you are not simply buying a product. You are buying a product that is the result of over 40 years of engineering development.

Our pioneering efforts in developing Inductively Coupled, Hall Effect and other contactless controls have earned us the industry's leadership position. In fact, PQ controls holds an exclusive patent for the Inductively Coupled Contactless control, and are throughout the industry for expertise in both Inductive and Hall Effect technologies.

The New Generation of Technology in HALL EFFECT

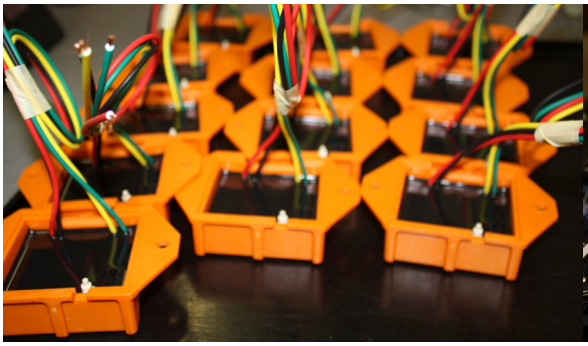
PQ Controls began research and development in Hall Effect technology in the mid 1980's. What this means, is for the past 30 years, PQ Controls has invested ample time and research into improving and perfecting this technology. When you buy from PQ Controls, you can be sure that our products are field proven for long-term outdoor use under virtually any environment conditions.

Application Engineering and Design Assistance - Built-in Superiority

PQ Controls has the expertise to meet your current specifications. We allow you the flexibility to improve and upgrade your equipment without re-inventing the wheel. Our CAD system assures precision products to solve the toughest control problems and facilities later modifications or improvements without expensive re-engineering.

You can count on PQ Controls' engineers to work closely with you to design, modify or develop new applications for specialized controls. Our experts will interpret requirements for controlling or monitoring your equipment and help you achieve peak performance for any application.

Our experienced design engineers are continually seeking ways to improve performance and develop new products. Working with the most advanced and sensitive electronic measuring instruments, they are creating cutting edge controls with an eye toward the future. From initial contact, through design and manufacturing, to providing post installation maintenance troubleshooting - our engineering team is committed to your needs.

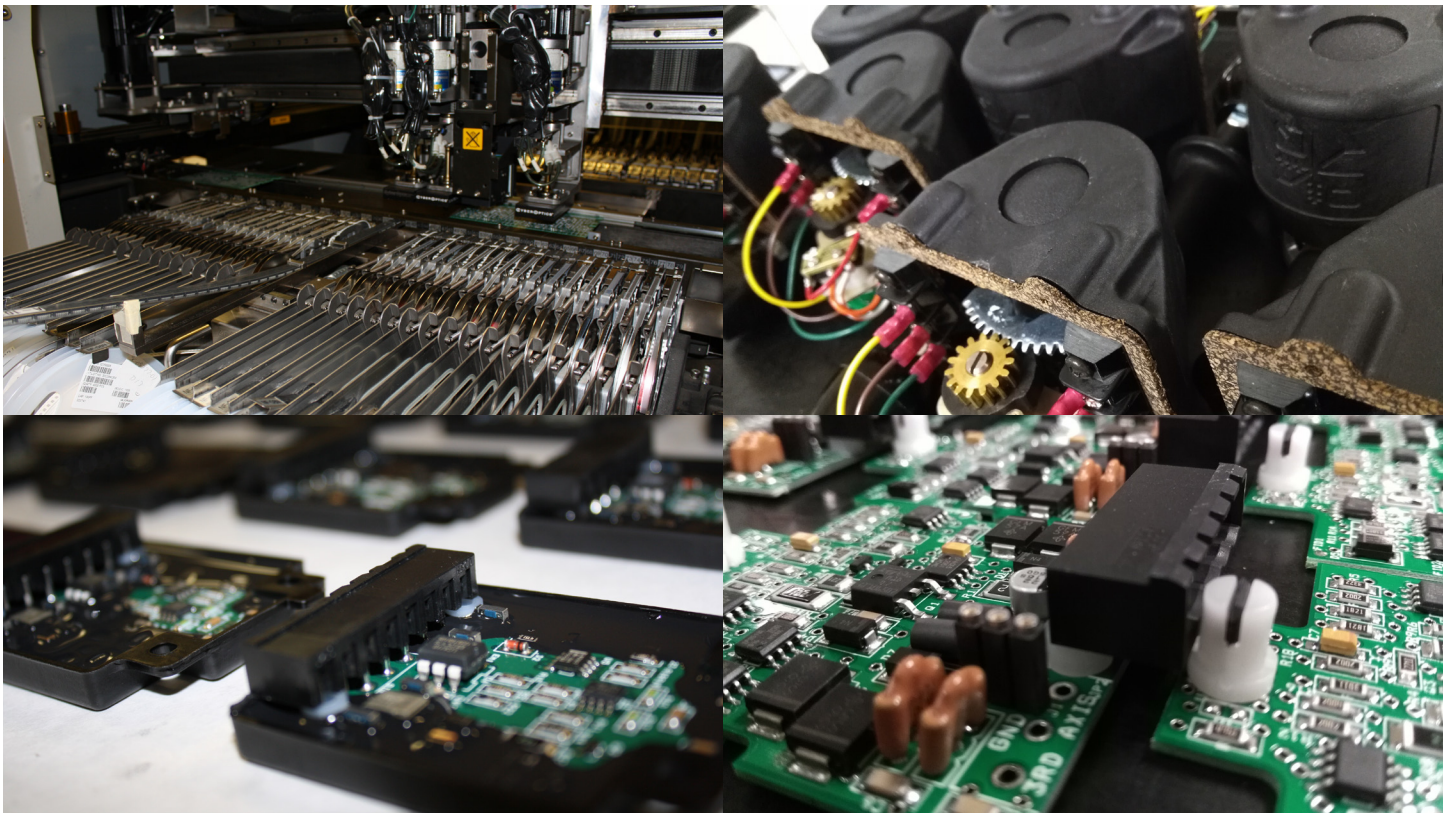


Quality Assurance

All products designed by PQ Controls have undergone extensive testing to insure a robust end-product that will meet the most demanding applications. That is why we have invested heavily in an anechoic chamber and TEM cell equipment. Using this equipment we can insure our products meet strict CE regulations for electromagnetic interference immunity.

This engineering expertise has established PQ Controls as a trusted supplier for rugged products designed to last the life of their machine. Customers who are seeking a no-maintenance plug-and-play solution may look no further than PQ Controls as a reliable source for all their control needs.

- ◊ Compliant to ISO 9001 standards
- ◊ Superior design and manufacturing minimize service and maintenance
- ◊ Stringent manufacturing standards ensure long service and trouble-free performance
- ◊ Excellence in serving high volume customers and meeting special service requirements
- ◊ Trouble-shooting diagnostics to head off problems and reduce downtime



ON-TIME SHIPPING PQ Control's production line is capable of meeting the requirements of any order, from bulk quantities for large OEM's, to single-piece orders from end-users. Our excellence in service has earned PQ Controls a reputation in the industry for short lead times. Additionally, we understand that sometimes our customers may require a rapid build on a bulk order, which is why we offer a three-day expedite service. PQ Controls is also equipped with staff on call to work extra shifts if necessary.

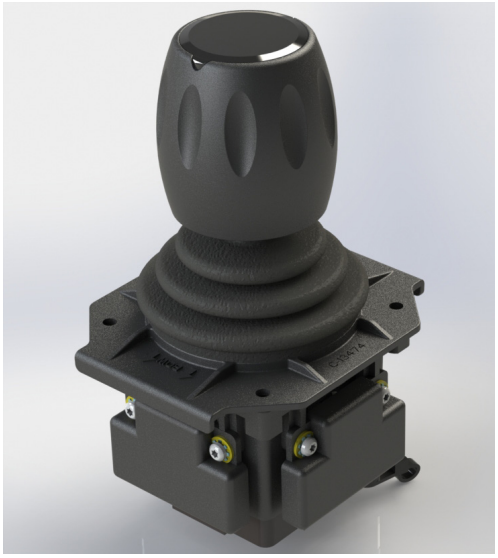
Services

PROTOTYPING SERVICE

Our in-lab rapid prototyping printer is capable of prototyping 3-dimensional plastic parts directly to CAD models. Fused Deposition Modeling (FDM) is an ideal solution for quickly producing functional types for initial design qualifications, without the cost of other time-consuming methods.

DESIGN SERVICES

Let PQ Controls help develop proprietary designs for your fleet, and put all of our new product development and engineering experience to work for you. You will have access to the same innovative team of dedicated engineers that helped PQ Controls become the leading supplier of all controls.



Data Sheet Index

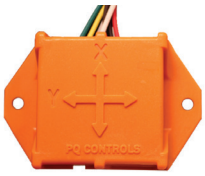
Joysticks

Grips

Footpedals

Rotary Hall Knobs

Level Sensors



Data Sheet Index

Angular Display Readout

Valve Drive Boards

CANbus

Linear Actuators

Roller Rockers

Note - items in the index that are not represented with a page number are presented through the part number of the existing item.

MODEL 100
Throttle Joystick

- ◊ **Compact Weather-Resistance Design**
- ◊ **Positive Spring Center or Friction Drive**
- ◊ **Mechanical Safety Lock**
- ◊ **Auxiliary Switch Contacts**
- ◊ **Multi-Position Handle Orientation**
- ◊ **Electrical Quick Disconnect**
- ◊ **Stackable**
- ◊ **Corrosion Resistant**

The Model 100 valve controller is ideal for converting the manual input of any equipment operator to an electrical output signal which will drive electrically operated flow control valves or electrohydraulic transmission strokers. The controllers sturdy, well-sealed design and construction make it suitable for the tough outdoor environments which mobile equipment is required to work. The housing and cover are heavy wall aluminum casting. The cover has a grove in it which accepts a die cut composition gasket. All external openings are fully sealed with composition gaskets. The electrical components are wired in series with an MS electrical connector.

SHOWN WITH
BALL KNOB GRIP

Electrical Data	
Supply Voltage	Potentiometer-based (determined by config)
Output	Porportional or switched (specify)
Mechanical Data	
Mechanical Life	10,000,000 cycles maximum (sinusoidal)
Travel	Bi-Directional ± 33.5°, Uni-Directional +67°
Environmental Data	
Operating Temperature	-40 - 85 degrees (C)
Protection	Heavy Duty High Cycle Life V3 Switches
	Optional Sealed Versions Available
Environment Resistance	Humidity, Rain/Water, Sun/UV Exposure
	Engine oil, Coolant, Phosphate Cleaners

MODEL 105
Compact Paddle Joystick

- ◊ **Moisture Resistant**
- ◊ **Operating Temp Range**
- ◊ **EMI & RFI Resistant**
- ◊ **Contactless Hall Effect Technology**
- ◊ **Robust Weather Resistant Construction**
- ◊ **Single Axis Switched/Proportional Joystick**
- ◊ **Springs back to center position**

The Model 105 is a weather resistant, heavy duty paddle type joystick which converts hand motion into an electrical output and provides extremely sensitive output over its reliable, extended life operation. Control paddle movement is sensed by a contactless hall sensor.
The elimination of resistive wiping elements also improves position accuracy due to finer resolution per degree of paddle motion.

Electrical Data	
Supply Voltage	5-15 VDC regulated; ripple free (1%)
	10-60 made specify 6 or 12 VDC
Sensor	Hall Effect and Switched Output
Protection	Reverse Polarity, Short circuit to power/ground
	Broken power or ground protection
Output Voltage	(-) 20% of V input
Supply Voltage	(+) 80% of V input
Output	1K OHMS
Handle Centered	(-) 50% of V input

Mechanical Data	
Mechanical Life	10,000,000 cycles maximum (sinusoidal)
Travel	Bi-Directional ± 30°
Torque	Bi-Directional Spring: 2 to 4 in-lb
Sealing	Up to IP67
Operating Temperature	-40° to 70°C
EMC Immunity Level (V/M)	100 V/M
Weather and Environmental Resistance	Control is weather tight when mounted to panel
	using gasket supplied.
	This board is conformlly coated
Adjustments	3 adjustments avaliable - Null, High A and High B

MODEL 105
Compact Paddle Joystick

MODEL 105 PART NUMBERING
For special configurations, please call for assistance

M105	02	42	05

MODEL
M105 Paddle Control

MECHANICAL OPTION
M105 (Bi-directional spring centered)

VOLTAGE SUPPLY
05 (5 VDC)
06 (6 VDC)
12 (12 VDC)
15 (15 VDC. 8-15 VDC for Output Option 53 only.)
24 (10 - 24 VDC for Output Option 61 only)
30 (Use with Switched Output Options **SW**)

If you do not see your electrical option, please call for special configuration.

ELECTRICAL OUTPUT
42 (NEUTRAL 50% VS, 30% SIGNAL SWING, MATE-N-LOCK CONNECTOR)
51 (NEUTRAL 50% VS, 30% SIGNAL SWING, NO CONNECTOR)
53 (NEUTRAL 2.5 VDC, FULL POSITIVE 4 VDC, FULL NEGATIVE 1 VDC.
USE VOLTAGE SUPPLY OPTION **15**.)
52 (NEUTRAL 50% VS, 25% SIGNAL SWING, MATE-N-LOCK CONNECTOR)
61 (NEUTRAL 2.5 VDC, FULL POSITIVE 4.5 VDC, FULL NEGATIVE .5 VDC. USE VOLTAGE SUPPLY OPTION **24.**)
SW (SWITCHED OUTPUT. USE VOLTAGE SUPPLY OPTION **30**.)

If you do not see your electrical option, please call for special configurations.

MODEL 112
Single Axis Joystick

- ◊ **Different Handle Designs Avaliable**
- ◊ **Optional Push Buttons**
- ◊ **Optional Roller Rockers**
- ◊ **Contactless Hall Effect Technology**
- ◊ **Corrosion & Weather Resistant materials**
- ◊ **EMI & RFI resistant**

The Model 112 series provides a robust, weather resistant joystick for usage in many different environments. This model uses Hall effect sensing, which eliminates wearing contacts between moving electrical parts, while improving overall precision and resolution. The 112 comes with many other hand grip styles to fit your operating needs.

SHOWN WITH RSTG STYLE

Electrical Data	
Supply Voltage	10-30 VDC (electrical options - Page 25-29)
Current Consumption Max	Varies with Board, Call us for help
Sensor	Hall Effect
Protection	All inputs and outputs
Output Voltages	Max (+) Travel 4.0 VDC
	Min (-) Travel 1.0 VDC
Output Impedance	220 OHMS
Return to Center Voltage (No Load)	2.5 VDC
	Potted in Epoxy or silicone dipped

Mechanical Data	
Mechanical Life	10,000,000 cycles maximum (sinusoidal)
Travel - Angle of Movement	Bi-Directional ± 30°
	Uni-Directional ± 60°
Sealing	Up to IP67
Operating Temperature	-40° to 85°C (-40° to 185° F)
EMC Immunity Level (V/M)	100 V/M
Weather and Environmental Resistance	Control is weather tight when mounted to panel
	using gasket supplied.
	Material is UV protected
Operating Force	Light spring: 1.73 lb, Standard Spring: 3.92 lb
	Heavy spring: 4.88 lb

MODEL 115
Single Axis Joystick

- ◊ **Custom Labeling**
- ◊ **Optional Push Buttons**
- ◊ **Optional Triggers**
- ◊ **Contactless Hall Effect Technology**
- ◊ **Robust Weather Resistant Construction**
- ◊ **EMI & RFI resistant**
- ◊ **Friction options avaliable**

The Model 115 series provides a robust, weather resistant joystick for usage in many different environments. This model uses Hall effect sensing, which eliminates wearing contacts between moving electrical parts, while improving overall precision and resolution. The 115 comes with many other hand grip styles to fit your operating needs.

SHOWN WITH
BALL KNOB GRIP

Electrical Data	
Supply Voltage	10-30 VDC (electrical options - Page 25-29)
Current Consumption Max	Varies with Board, Call us for help
Sensor	Hall Effect
Protection	All Inputs and Outputs
Output Voltage	Max (+) Travel 4.0 VDC
	Max (-) Travel 1.0 VDC
Output Impedance	220 OHMS
Return to Center Voltage (No Load)	2.5 VDC
	Potted in Epoxy or silicone dipped

Mechanical Data	
Mechanical Life	10,000,000 cycles maximum (sinusoidal)
Travel - Angle of Movement	Bi-Directional ± 30°
Torque	Uni-directional ± 60°
Sealing	Up to IP67
Operating Temperature	-40° to 85°C (-40° to 185° F)
EMC Immunity Level (V/M)	100 V/M
Weather and Environmental Resistance	Control is weather tight when mounted to panel
	using gasket supplied.
	Material is UV protected
Operating Force	Light Spring: 1.73 lb, Standard Spring: 3.92 lb
	Heavy Spring: 4.88lb

MODEL 115
Single Axis Joystick

MODEL 115 PART NUMBERING *(Half effect only)*

For special configurations or potentiometer applications, please call for assistance

M115	SL	15	F	56	- 504	- UNI

MODEL

M115 Single Axis Joystick

CENTER LOCK

SL Small (Slide Lock)
NL Large (No Lock)
DL Large (Defeated Lock)
**defeated lock may be removed in-field*

GRIP STYLE

05 = 2-AXIS, NO HANDGRIP
10 = 2-AXIS, PALM GRIP W/ SLIDELOCK
15 = 2-AXIS, PALM GRIP
PALM GRIP (STYLES 10 & 15) AVAILABLE IN: BLACK (Standard)
ORANGE (ADD –OR AT THE END OF THE PART NUMBER)
YELLOW (ADD –YL AT THE END OF THE PART NUMBER)
28 = 2-AXIS, RSG GRIP (ROCKER: LEFT, RIGHT)
29 = 2-AXIS, RSG GRIP (ROCKER: PUSH-BUTTON)
30 = 2-AXIS, RSTG ROCKER GRIP
31 = 2-AXIS, RSTG ROCKER GRIP W/ SIDE PUSH-BUTTON
32 = 2-AXIS, RSTG NO ROCKER, TRIGGER ONLY
33 = 2-AXIS, RSTG NO ROCKER, TRIGGER & SIDE PUSH-BUTTON
35 = 2-AXIS, RSTG NO ROCKER, TRIGGER & TOP PUSH-BUTTON
38 = 2-AXIS, TRS GRIP
39 = 2-AXIS, RSTG, NO ROCKER, TRIGGER, TOP & SIDE BUTTON TOGGLE
41 = 2-AXIS, RSTG, ROCKER, TRIGGER & MAINTAINED LEFT SIDE PUSH-BUTTON
43 = 2-AXIS, MSG, 3 TOGGLE SWITCHES
44 = 2-AXIS, MSG, 4 TOGGLE SWITCHES
46 = 2-AXIS, MSG, 6 PUSH-BUTTONS
48 = 2-AXIS, MSG, 3 PUSH-BUTTONS
49 = 2-AXIS, MSG, 4 PUSH-BUTTONS
50 = 2-AXIS, TRS, NO ROCKER SWITCHES (PLASTIC CAP)

See the rest of the grip list on pages # 30-32

UNIDIRECTIONAL

UNI = Output swing is from neutral to full positive output [2]
UFS = Output swing is from full negative to full positive [3]

INTEGRATED VALVE DRIVER

504 Valve Drive Board
For valves without integrated electronics. 504 is pre-programmed to customers valve [1] Must use electrocal Option 58

ELECTRICAL OPTION

MECHANICAL OPTION

S (Spring to center)
F (Friction hold)
FD (Friction hold w/ center detent)

ELECTRICAL OPTIONS

56 = 10-30VDC, 2.5V NEUTRAL ± 1.5V, 1.5 AMP DIRECTION AUX OUT
57 = 10-30VDC, 2.5V NEUTRAL ± 1.25V, 1.5 AMP DIRECTION AUX OUT
58 = 5VDC, ± 30%, NO DIRECTIONAL AUX OUT
59 = 5VDC, ± 40%, NO DIRECTIONAL AUX OUT
60 = 18-60VDC, SEVCON, 1.5 AMP DIRECTION AUX OUT
61 = 10-30VDC, 2.5V NEUTRAL ± 2.0V, 1.5 AMP DIRECTION AUX OUT
62 = 10-30VDC, DANFOSS
63 = 10-30VDC, 0.0V NEUTRAL + 10.0V, 1.5 AMP DIRECTION AUX OUT
64 = 10-30VDC, 2.5V NEUTRAL ± 1.5V, 1.5 AMP 50% DIRECTION AUX OUT
65 = 18-60VDC, POWER PACK SEVCON, 0.2 AMP SINK DIRECTION AUX OUT
67 = 10-30VDC, 0.0V NEUTRAL + 5.0V, 1.5 AMP DIRECTION AUX OUT
68 = 10-30VDC, 2.5V NEUTRAL ± 2.0V, 1.5 AMP 50% DIRECTION AUX OUT
69 = 5VDC, ± 10%, NO DIRECTIONAL AUX OUT
70 = 5VDC, ± 25%, NO DIRECTIONAL AUX OUT

See the rest of the grip list on pages # 25-29

MODEL 120
Throttle Joystick

- ◊ **Designed for Rugged outdoor use**
- ◊ **Positive Spring to Center or Friction drive**
- ◊ **Mechanical Safety Lock Standard**
- ◊ **Corrosion Resistant**
- ◊ **Over 1,000 variations available**

Commonly used for throttling applications, the Model 120 joystick may be also used in any application where single axis control is required.

SHOWN WITH BALL KNOB GRIP

Electrical Data	
Supply Voltage	Hall Effect And Potentiometer Based
Output	Porportional or Switched (specify)
Mechanical Data	
Mechanical Life	10,000,000 cycles maximum (sinusoidal)
Travel	Bi-Directional ± 33.5°, Uni-Directional +67°
Environmental Data	
Operating Temperature	-40 - 85 degrees (C)
Protection	Heavy Duty High Cycle Life V3 Switches
	Optional Sealed Versions Available
Environmental Resistance	Humidity, Rain/Water, Sun/UV Exposure
	Engine Oil, Coolant, Phosphate Cleaners

MODEL 205
Mini Joystick

- ◊ **Weather Resistant**
- ◊ **Compact Design**
- ◊ **EMI & RFI Resistant**
- ◊ **Contactless Hall Effect Technology**
- ◊ **Soft smooth feel for ease of operation**
- ◊ **Above or below mounting**
- ◊ **Programmable electronics**

The Model 205 is a miniature-sized dual axis joystick designed for high cycle-life and outdoor use. The key to the 205's longevity is its Hall effect technology, which utilizes contactless position sensors, as opposed to the mechanical wipers employed by conventional potentiometer-based designs.

Electrical boards for conversion of signal output to a ramped pulse width modulated output are also avaliable.

Electrical Data	
Input Voltage	5 VDC Contactless Hall Effect
EMI Protected	30 V/M
Sensor	Hall Effect
Output Voltage	2.5V Neutral
	30% +/- 1.5V (Option 58)
	40% +/- 2V (Option 59)
	10% +/- .5V (Option 69)
Maximum Load Current	25 mADC Continuous
Mechanical Data	
Mechanical Life	Tested to 5,000,000 cycles maximum
Operating Temperature	-40° to 85°C (-40° to 185° F)
Sealing	Up to IP67
Resistances	Weather Resistant Packaging
	RFI Resistant
	EMI Resistant
Adjustments	Can be purchased with valve drive boards
	(504, 509. and 511 Valve Drive Boards)

MODEL 205
Mini Joystick

MODEL 205 PART NUMBERING
For special configurations, please call for assistance

M205	S	01	58

MODEL
M205 = Mini Joystick

MECHANICAL OPTION
S = (Spring Centered)

KNOB OPTION
01 = Standard Knob
XX = Custom Knob

ELECTRICAL OPTIONS
58 = 5VDC, ± 30%, NO DIRECTIONAL AUX OUT
59 = 5VDC, ± 40%, NO DIRECTIONAL AUX OUT
69 = 5VDC, ± 10%, NO DIRECTIONAL AUX OUT
70 = 5VDC, ± 25%, NO DIRECTIONAL AUX OUT

If you do not see your option listed, please call for assistance. Valve Drive Board may be required to control hydraulic valves (Sold separately)

MODEL 212
Multi-Axis Joystick

- ◊ **Suitable for Most Outdoor Applications**
- ◊ **Contactless Hall Effect Technology**
- ◊ **Corrosion & Weather Resistant materials**
- ◊ **EMI & RFI resistant**

The Model 212 series provides a robust, weather resistant joystick for usage in many different environments. This model uses Hall effect sensing, which eliminates wearing contacts between moving electrical parts, while improving overall precision and resolution. The 212 comes with many other hand grip styles to fit your operating needs.

Electrical Data	
Supply Voltage	5-60 VDC (electrical options - Page 25-29)
Current Consumption Max	Varies with Board, Call us for help
Sensor	Hall Effect
Protection	Reverse polarity, Over-Voltage, Open/Shorted
	Voltage. Sealed in Epoxy potting.
Output Impedance	Varies with Boards, Call us for help
Return to Center Voltage (No Load)	See Electrical Options for Details (Page 25-29)
Output Voltage	See Electrical Options for Details (Page 25-29)
Mechanical Data	
Mechanical Life	10,000,000 cycles maximum (sinusoidal)
Travel - Angle of Movement	On Axis ± 20°, between axis + 27°
	also avaliable are single axis, No diagonals ("+")
Sealing	Up to IP67
Operating Temperature	-40° to 85°C (-40° to 185° F)
EMC Immunity Level (V/M)	100 V/M
Weather and Environmental Resistance	Sun/UV Exposure, Water/Rain, Humidity, Engine
	Oil, Engine Coolant, Salt water/De-icer fluid,
	Phosphate washdown fluid
Operating Force	Varies on Grip Style

MODEL 215
Multi-Axis Joystick

- ◊ **Controls up to fourteen on/off functions in one joystick**
- ◊ **Industrial quality high current switches standard**
- ◊ **Positive spring centering with off axis feel**
- ◊ **Corrosion Resistant**
- ◊ **Designed for rugged outdoor use**

Switched joystick allows operator to control multiple On/Off functions with one hand. Ideal for application where simultaneous output usability is required.

SHOWN WITH RSG GRIP

Electrical Data	
Switch Output ("Bang Bang")	Normally Open (N.O.) Or Normally Closed (N.C.)
Switch Rating 0-15 VDC, 15-30 VDC	5-60 VDC (determined by electrical option)
Switch Approvals	ENEC, UL, cUL, CSA
Mechanical Data	
Switch Life	50,000,000 Cycles Maximum (sinusoidal)
Environmental Data	
Operating Temperature	-40 - 85 degrees (C)
Protection	Heavy Duty High Cycle Life V3 Switches
	Optional Sealed Versions Available
Environmental Resistance	Humidity, Rain/Water, Sun/UV Exposure
	Engine oil, Coolant, Phosphate Cleaners

MODEL 215
Multi-Axis Joystick

MODEL 215 PART NUMBERING
For special configurations, please call for assistance

M215	S	05SW	30

MODEL
M215 Multi Axis Joystick

SPRING
L Light
S Standard (for most applications)
H Heavy

Ordering non-standard spring may increase lead time

GRIP STYLE
05 = 2-AXIS, NO HANDGRIP
10 = 2-AXIS, PALM GRIP W/ SLIDELOCK
15 = 2-AXIS, PALM GRIP
PALM GRIP (STYLES 10 & 15) AVAILABLE IN: BLACK (Standard)
ORANGE (ADD –OR AT THE END OF THE PART NUMBER)
YELLOW (ADD –YL AT THE END OF THE PART NUMBER)
28 = 2-AXIS, RSG GRIP (ROCKER: LEFT, RIGHT)
29 = 2-AXIS, RSG GRIP (ROCKER: PUSH-BUTTON)
30 = 2-AXIS, RSTG ROCKER GRIP
31 = 2-AXIS, RSTG ROCKER GRIP W/ SIDE PUSH-BUTTON
32 = 2-AXIS, RSTG NO ROCKER, TRIGGER ONLY
33 = 2-AXIS, RSTG NO ROCKER, TRIGGER & SIDE PUSH-BUTTON
35 = 2-AXIS, RSTG NO ROCKER, TRIGGER & TOP PUSH-BUTTON
38 = 2-AXIS, TRS GRIP
39 = 2-AXIS, RSTG, NO ROCKER, TRIGGER, TOP & SIDE BUTTON TOGGLE
41 = 2-AXIS, RSTG, ROCKER, TRIGGER & MAINTAINED LEFT SIDE PUSH-BUTTON
43 = 2-AXIS, MSG, 3 TOGGLE SWITCHES
44 = 2-AXIS, MSG, 4 TOGGLE SWITCHES
46 = 2-AXIS, MSG, 6 PUSH-BUTTONS
48 = 2-AXIS, MSG, 3 PUSH-BUTTONS
49 = 2-AXIS, MSG, 4 PUSH-BUTTONS
50 = 2-AXIS, TRS, NO ROCKER SWITCHES (PLASTIC CAP)

See the rest of the grip list on pages # 30-32

EXTRA OPTIONS
19 Single Axis, Y-axis
20 2 Stage Trigger
24 Plus (+) Gate Plate
30 Standard Option
66 10 Degree Gate Plate
67 Single Axis, X-axis
68 Single Axis, 10 degree (Y-axis)

MODEL 220
Inductively Coupled Joystick

- ◊ **Digitally calibrated**
- ◊ **Weather resistant construction**
- ◊ **Up to 4-axis proportional in one joystick**

The Model 220 uses patented inductive technology which eliminates the wiping contacts of potentiometric joysticks to provide an extremely hi-cycling product.
The 220 has a double compression spring centering mechanism that also extends its life cycle and enhances on-axis feedback.

SHOWN WITH PISTOL GRIP

Electrical Data	
Supply Voltage	5 - 15 VDC (please specify when ordering)
Mixed Configuration	Tramming of tracked or dual-wheel drive
Sensor	Inductive technology
Typical Output (% of Vsupply)	Neutral 50%
	Full Positive 80%
	Full Negative 20% (30% signal Swing Typical)
Protection	Reverse polarity, Over-voltage, Open/Shorted
	Signal leads, EMI/RFI hardened, Transient VS
Mechanical Data	
Travel	On-axis ± 20°
	Between Axis + 28°
Double Compression Spring	
Gating*	"+", single axis, limited travel, custom, etc.
Protection	Circuitry sealed in Epoxy Potting (Black)
Operating Temperature	-40° to 85°C (-40° to 185° F)
Environmental Resistance	Humidity, Rain/Water, Sun/UV Exposure
	Engine oil, Coolant, Phosphate Cleaner

MODEL 225
Multi-Axis Joystick

- ◊ **Contactless Hall Effect Technology**
- ◊ **Robust Over-engineered weather-resistant construction**
- ◊ **Utilizes High cycle life torsion springs**
- ◊ **Friction Brake option available**
- ◊ **EMI & RFI resistant**

The Model 225 provides a heavy duty multi axis, weather resistant mechanism, to convert operator's manual commands into an electronic output over an extended life of operation. What makes the Model 225 unique is that it was specifically over-engineered to provide far more strength and durability than any outdoor application could warrant. It also utilizes four high cycle-life torsion springs (two per axis), which provides a smooth on/off axis "feel", while still maintaining longevity. As an added option, the Model 225 also is available with an advanced friction clutch brake to provide frictional control in the Y axis. A choice of several other hand grip styles are also available.

SHOWN WITH PISTOL GRIP

Electrical Data	
Supply Voltage	5 - 60 VDC (electrical options - Page *25-29*)
Hydraulic Valve/Solenoid Control*	See Optional Valve Drive Boards
Sensor	Hall Effect
Proportional Output	Max (+) Travel: 4.0 VDC
	Min (-) Travel: 1.0 VDC / Centered 2.5 VDC
Output Impedance	220 OHMS
Auxilary ("Switched") Outputs*	2.5 amps (two per axis) activates @
	Out-of-Neutral (20% Deadband)
Mechanical Data	
Travel	On-axis ± 20°
	Between Axis + 27°
Mechanical Life	10,000,000 Cycles (Linear Actuation)
Gating*	"+", single axis, limited travel, custom, etc.
Friction Module*	60 in-lbs. actuation force, with Center Detent
Operating Temperature	-40° to 85°C (-40° to 185° F)
Environmental Resistance	Humidity, Rain/Water, Sun/UV Exposure
	Engine oil, Coolant, Phosphate Cleaner

MODEL 112, 212, 225
Part Numbers

For special configurations, please call for assistance

212	S	15	S	56	56	F

MODEL
212 Multi-Axis
212+ Gated "+" *(no diagonals)*
112 Single Axis
125 Single Axis
225 Multi Axis Joystick

BEZEL TYPE
S Small (for below-panel mounting)
L Large (for above-panel mounting)
See installation drawings (datasheet) cut-out dimensions. Model 225 must use Small Bezel.

GRIP STYLE
05 = 2-AXIS, NO HANDGRIP
10 = 2-AXIS, PALM GRIP W/ SLIDELOCK
15 = 2-AXIS, PALM GRIP
PALM GRIP (STYLES 10 & 15) AVAILABLE IN: BLACK (Standard)
ORANGE (ADD –OR AT THE END OF THE PART NUMBER)
YELLOW (ADD –YL AT THE END OF THE PART NUMBER)
28 = 2-AXIS, RSG GRIP (ROCKER: LEFT, RIGHT)
29 = 2-AXIS, RSG GRIP (ROCKER: PUSH-BUTTON)
30 = 2-AXIS, RSTG ROCKER GRIP
31 = 2-AXIS, RSTG ROCKER GRIP W/ SIDE PUSH-BUTTON
32 = 2-AXIS, RSTG NO ROCKER, TRIGGER ONLY
33 = 2-AXIS, RSTG NO ROCKER, TRIGGER & SIDE PUSH-BUTTON
35 = 2-AXIS, RSTG NO ROCKER, TRIGGER & TOP PUSH-BUTTON
38 = 2-AXIS, TRS GRIP
39 = 2-AXIS, RSTG, NO ROCKER, TRIGGER, TOP & SIDE BUTTON TOGGLE
41 = 2-AXIS, RSTG, ROCKER, TRIGGER & MAINTAINED LEFT SIDE PUSH-BUTTON
43 = 2-AXIS, MSG, 3 TOGGLE SWITCHES
44 = 2-AXIS, MSG, 4 TOGGLE SWITCHES
46 = 2-AXIS, MSG, 6 PUSH-BUTTONS
48 = 2-AXIS, MSG, 3 PUSH-BUTTONS
49 = 2-AXIS, MSG, 4 PUSH-BUTTONS
50 = 2-AXIS, TRS, NO ROCKER SWITCHES (PLASTIC CAP)

See the rest of the grip list on pages # 30-32

FRICTION MODULE
F Friction *(Y-Axis only)*
Available on Model 125/225 only.

ELECTRICAL OPTION *(Y-Axis)*

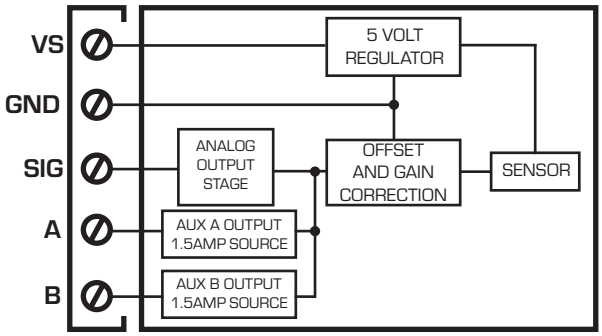
ELECTRICAL OPTION *(X-Axis)*

SPRING
L Light
S Standard (for most applications)
H Heavy
Ordering non-standard spring may increase lead time

ELECTRICAL OPTIONS
56 = 10-30VDC, 2.5V NEUTRAL ± 1.5V, 1.5 AMP DIRECTION AUX OUT
57 = 10-30VDC, 2.5V NEUTRAL ± 1.25V, 1.5 AMP DIRECTION AUX OUT
58 = 5VDC, ± 30%, NO DIRECTIONAL AUX OUT
59 = 5VDC, ± 40%, NO DIRECTIONAL AUX OUT
60 = 18-60VDC, SEVCON, 1.5 AMP DIRECTION AUX OUT
61 = 10-30VDC, 2.5V NEUTRAL ± 2.0V, 1.5 AMP DIRECTION AUX OUT
62 = 10-30VDC, DANFOSS
63 = 10-30VDC, 0.0V NEUTRAL + 10.0V, 1.5 AMP DIRECTION AUX OUT
64 = 10-30VDC, 2.5V NEUTRAL ± 1.5V, 1.5 AMP 50% DIRECTION AUX OUT
65 = 18-60VDC, POWER PACK SEVCON, 0.2 AMP SINK DIRECTION AUX OUT
67 = 10-30VDC, 0.0V NEUTRAL + 5.0V, 1.5 AMP DIRECTION AUX OUT
68 = 10-30VDC, 2.5V NEUTRAL ± 2.0V, 1.5 AMP 50% DIRECTION AUX OUT
69 = 5VDC, ± 10%, NO DIRECTIONAL AUX OUT
70 = 5VDC, ± 25%, NO DIRECTIONAL AUX OUT

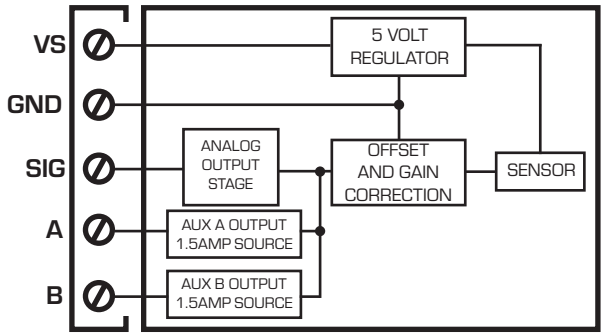
See the rest of the electrical options list on pages # 25-29

Electrical Options List



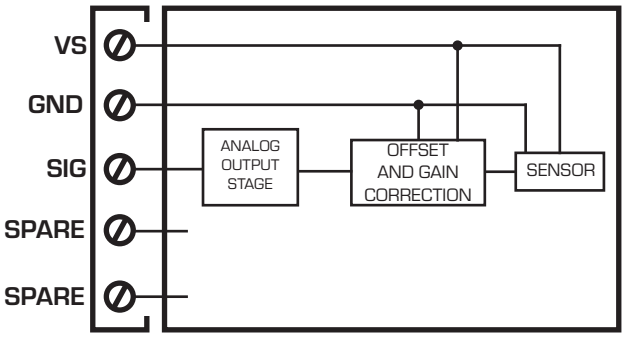
OPTION 56 (30%) EQUIVALENT OUTPUT

Notes:
1) Voltage supply is to be 10-30VDC.
2) Current Consumption: 20 mA @ 12VDC.
Output: Centered - 2.50V ± 0.05V.
Full Positive Deflection - 4.00V ± 0.15V.
Full Negative Deflection - 1.00V ± 0.15V.
3) Aux A output switches on @ approx. 2.82V with the positive analog outputs (X+, Y+). Aux B output switches on @ approx. 2.2V with the negative analog outputs (X-,Y-).



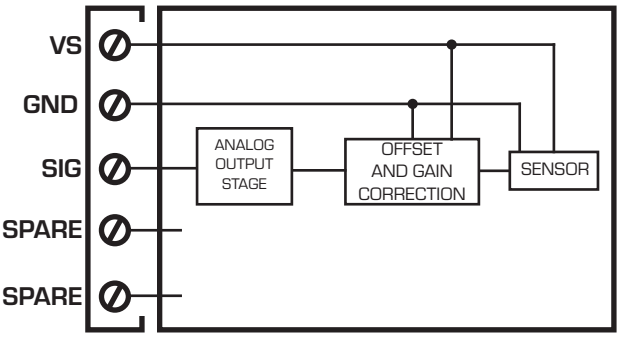
OPTION 57 (25%) EQUIVALENT OUTPUT

Notes:
1) Voltage supply is to be 10-30VDC.
2) Current Consumption: 20 mA @ 12VDC.
Output: Centered - 2.50V ± 0.05V.
Full Positive Deflection - 3.75V ± 0.12V.
Full Negative Deflection - 1.25V ± 0.12V.
3) Aux A output switches on @ approx. 2.82V with the positive analog outputs (X+, Y+). Aux B output switches on @ approx. 2.2V with the negative analog outputs (X-,Y-).



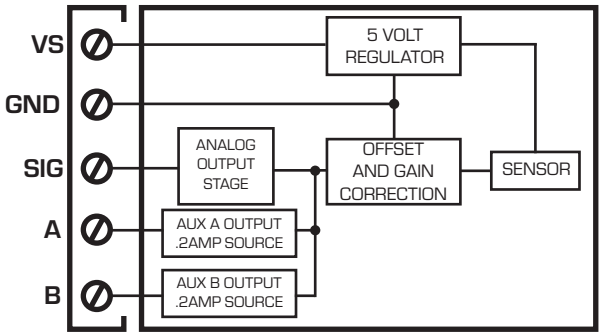
OPTION 58 (30%) EQUIVALENT OUTPUT

Notes:
1) Voltage supply is to be 5VDC.
2) Current Consumption: 14 mA @ 5VDC.
Output: Centered - 2.50V ± 0.05V.
Full Positive Deflection - 4.00V ± 0.15V.
Full Negative Deflection - 1.00V ± 0.15V.



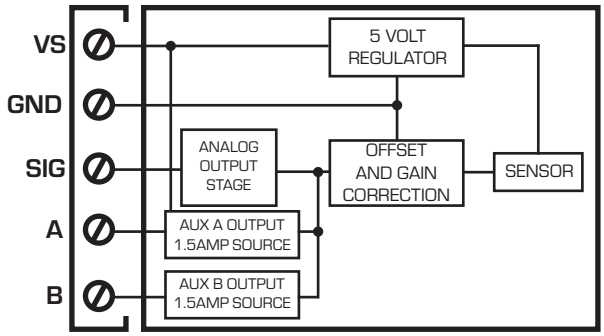
OPTION 59 (40%) EQUIVALENT OUTPUT

Notes:
1) Voltage supply is to be 5VDC.
2) Current Consumption: 14 mA @ 5VDC.
Output: Centered - 2.50V ± 0.05V.
Full Positive Deflection - 4.50V ± 0.2V.
Full Negative Deflection - 0.50V ± 0.2V.



OPTION 60 (SEVCON) EQUIVALENT OUTPUT

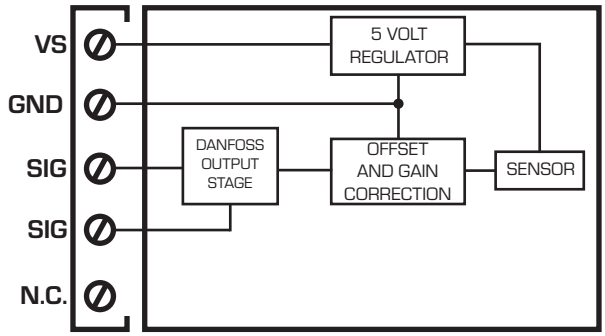
Notes:
1) Voltage supply is to be 18–60VDC.
2) Current Consumption: 20 mA @ 12VDC.
Output: Centered - 4.05V ± 4.35V.
CW & CCW TRIP - 3.3 – 3.6VDC.
CW & CCW MAX - 0.0VDC.
3) Aux A output switches on with the positive analog outputs (X+, Y+). Aux B output switches on with the negative analog outputs (X-,Y-).



OPTION 61 (40%) EQUIVALENT OUTPUT

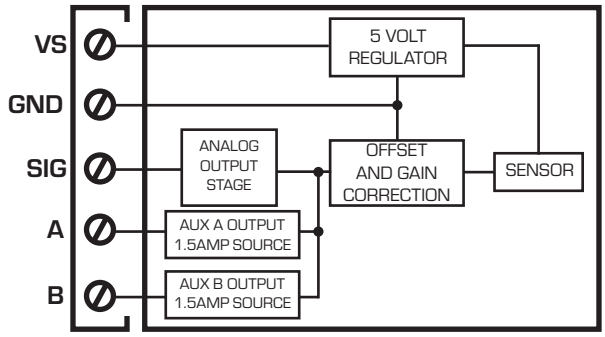
Notes:
1) Voltage supply is to be 10-30VDC.
2) Current Consumption: 20 mA @ 12VDC.
Output: Centered - 2.50V ± 0.05V.
Full Positive Deflection - 4.50V ± 0.2V.
Full Negative Deflection - 0.50V ± 0.2V.
3) Aux A output switches on VS –0.7VDC @ approx. 2.82V with the positive analog outputs (X+,Y+). Aux B output switches on VS –0.7VDC @ approx. 2.2V with the negative analog outputs (X-,Y-).

Electrical Options List



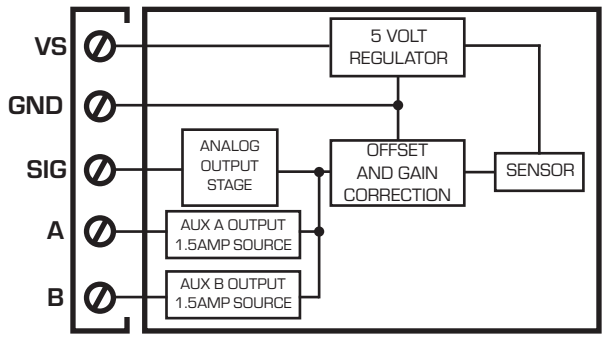
OPTION 62 (DANFOSS) EQUIVALENT OUTPUT

Notes:
1) Voltage supply is to be 10-30VDC.
2) SIG = Normal Output SIG = Inverted Output.
3) Current Consumption: 20mA @ 12VDC.
Output: Centered - 50% of VSupply.
Full Positive Deflection – 75% of Vsupply.
Full Negative Deflection – 25% of Vsupply.



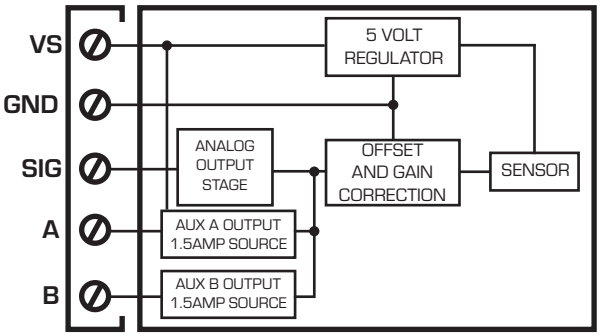
OPTION 64 (30% SWING, 50% AUX) OUTPUT

Notes:
1) Voltage supply is to be 10 – 30VDC.
2) Current Consumption: 20mA @ 12VDC.
Output: Centered - 2.50V ± 0.05V.
Full Positive Deflection - 4.00V ± 0.15V.
Full Negative Deflection - 1.00V ± 0.15V.
3) Aux A output switches on @ approx. 3.25V with the positive analog outputs (X+,Y+). Aux B output switches on @ approx. 1.75V with the negative analog outputs (X-,Y-).



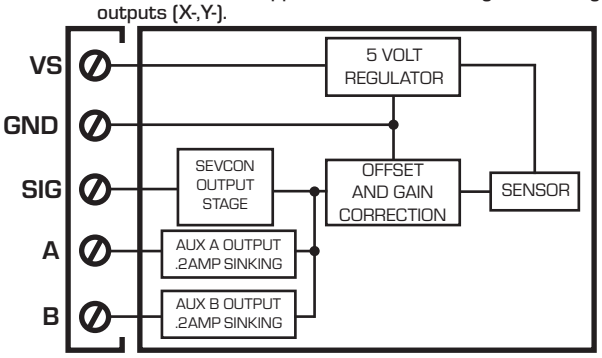
OPTION 67 EQUIVALENT OUTPUT

Notes:
1) Voltage supply is to be 10 – 30VDC.
2) Current Consumption: 20mA @ 12VDC.
Output: Centered - 0.00V ± 0.25V.
Full Positive Deflection - 5.00V ± 0.50V.
Full Negative Deflection - 5.00V ± 0.50V.
3)Aux A output switches on @ approx. 1.00V with the positive analog outputs (X+,Y+). Aux B output switches on @ approx. 1.00V with the negative analog outputs (X-,Y-).



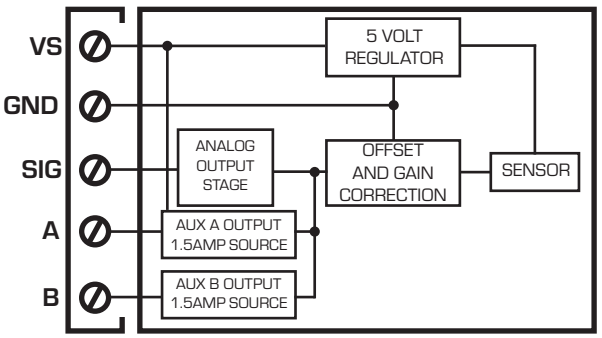
OPTION 63 EQUIVALENT OUTPUT

Notes:
1) Voltage supply is to be 10-30VDC.
2) Current Consumption: 20 mA @ 12VDC.
Output: Centered - 0.00V ± 0.5V.
Full Positive Deflection - 10.00V ± 1.00V.
Full Negative Deflection - 10.00V ± 1.00V.
3) Aux A output switches on VS –0.7VDC @ approx. 2.82V with the positive analog outputs (X+,Y+). Aux B output switches on VS –0.7VDC @ approx. 2.2V with the negative analog outputs (X-,Y-).



OPTION 65 (PWR PAK) EQUIVALENT OUTPUT

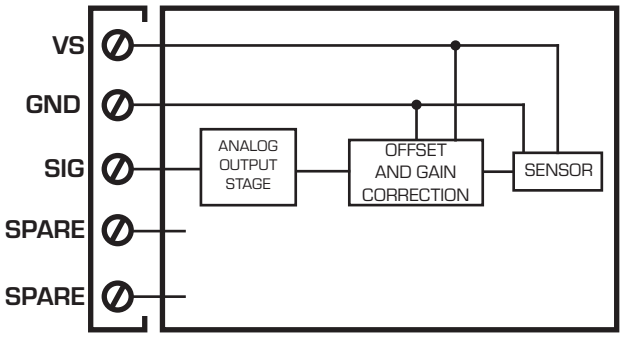
Notes:
1) Voltage supply is to be 18 - 60VDC.
2) Current Consumption: 20mA @ 12VDC.
Output: Centered - 4.05V ± 4.35V.
CW & CCW TRIP - 3.3 – 3.6VDC
CW & CCW MAX - 0.0VDC.
3) Aux A Output switches on with the positive analog outputs (X+,Y+). Aux B Output switches on with the negative analog outputs (X-,Y-).



OPTION 68 (40% SWING, 50% AUX) OUTPUT

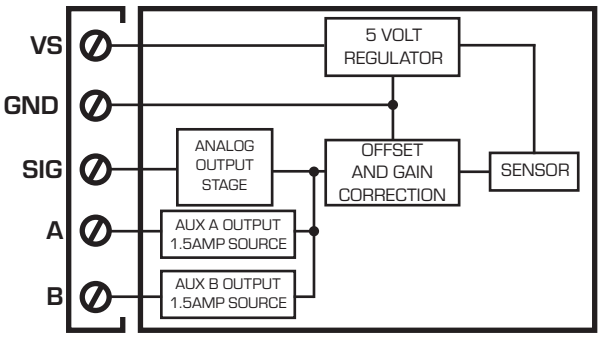
Notes:
1) Voltage supply is to be 10-30VDC.
2) Current Consumption: 20 mA @ 12VDC.
Output: Centered - 2.50V ± 0.05V.
Full Positive Deflection - 4.50V ± 0.2V.
Full Negative Deflection - 0.50V ± 0.2V.
3) Aux A output switches on VS –0.7VDC @ approx. 3.30V with the positive analog outputs (X+,Y+). Aux B output switches on VS –0.7VDC @ approx. 1.70V with the negative analog outputs (X-,Y-).

Electrical Options List



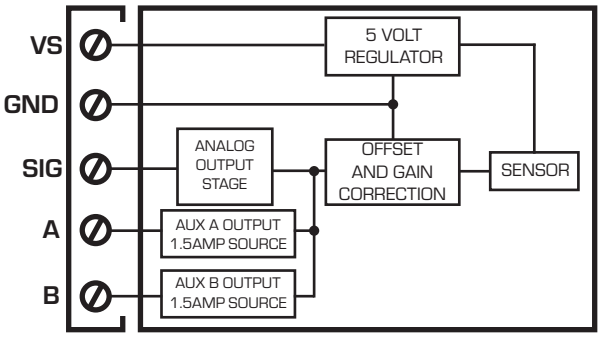
OPTION 69 (30%) EQUIVALENT OUTPUT

Notes:
1) Voltage supply is to be 5VDC.
2) Current Consumption: 14 mA @ 5VDC.
Output: Centered - 2.50V ± 0.05V. (2.45–2.55)
Full Positive Deflection - 3.00V ± 0.05V.
Full Negative Deflection - 2.00V ± 0.05V.



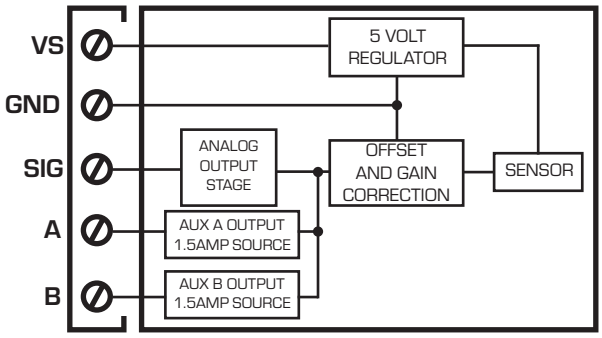
OPTION 72 EQUIVALENT OUTPUT

Notes:
1) Voltage supply is to be 10-30VDC.
2) Current Consumption: 20 mA @ 12VDC.
Output: Centered - 12.0mA ± 0.4mA.
Full Positive Deflection - 20.0mA ± 0.8mA.
Full Negative Deflection - 4.0mA ± 0.8mA.
3) Aux A output switches on @ approx. 13.8mA with the positive analog outputs (X+, Y+). Aux B output switches on @ approx. 10.2mA with the negative analog outputs (X-,Y-).



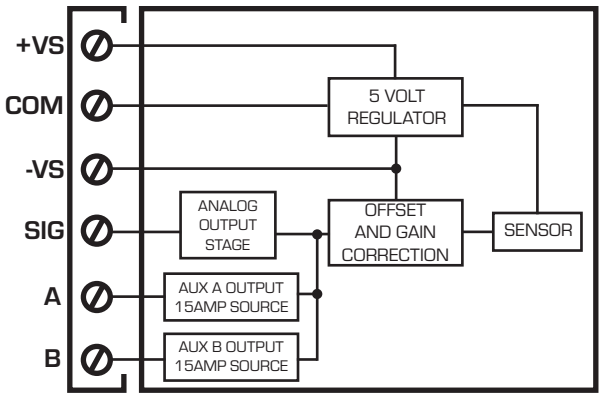
OPTION 74 EQUIVALENT OUTPUT

Notes:
1) Voltage supply is to be 10 - 30VDC.
2) Current Consumption: 20 mA @ 12VDC.
Output: Centered - 5.00V ± 0.25V.
Full Positive Deflection - 10.00V ± 0.5V.
Full Negative Deflection - 0.00V ± 0.5V.
3) Aux A output switches on @ approx. 6V with the positive analog outputs (X+, Y+). Aux B output switches on @ approx. 4V with the negative analog outputs (X-,Y-).



OPTION 71 EQUIVALENT OUTPUT

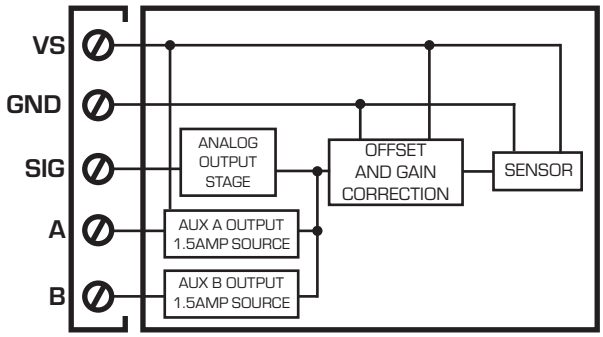
Notes:
1) Voltage supply is to be 10-30VDC.
2) Current Consumption: 20 mA @ 12VDC.
Output: Centered - 4.0mA ± 0.8mA.
Full Positive Deflection - 18.4mA ± 1.6mA.
Full Negative Deflection - 18.4mA ± 1.6mA.
3) Aux A output switches on @ approx. 7.2mA with the positive analog outputs (X+, Y+). Aux B output switches on @ approx. 7.2mA with the negative analog outputs (X-,Y-).



OPTION 73 EQUIVALENT OUTPUT

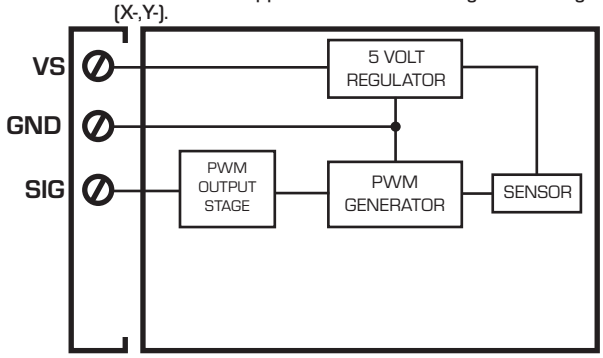
Notes:
1) Voltage supply is to be ±10VDC to ±15VDC.
2) Current Consumption: 20 mA.
Output (±10VS): Centered: 0.0V ± 0.5V.
Full Positive Deflection: 10VDC ± 1.0VDC.
Full Negative Deflection: –10VDC ± 1.0VDC.
3) Aux A output switches on @ approx. 2.0VDC with the positive analog outputs (X+, Y+). Aux B output switches on @ approx. –2.0VDC with the negative analog outputs (X-,Y-). Aux outputs are sourcing @ 15mADC MAX.

Electrical Options List



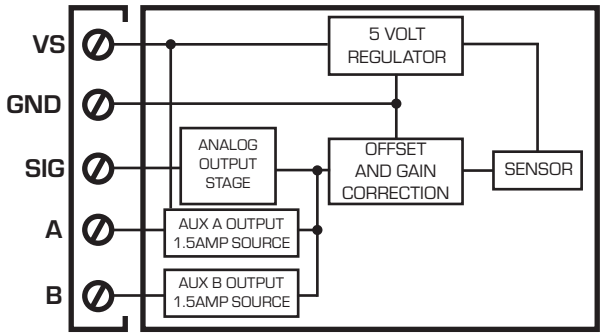
OPTION 76 (40%) EQUIVALENT OUTPUT

Notes:
1) Voltage supply is to be 5VDC.
2) Current Consumption: 14mA @ 5VDC.
Output: Centered - 2.50V ±0.05V.
Full Positive Deflection – 4.50V ± 0.15V.
Full Negative Deflection – .50V ± 0.15V.
3) Aux A output switches on VS -0.7VDC @ approx. 2.82V with the positive analog outputs (X+,Y+). Aux B output switches on VS -0.7VDC @ approx. 2.2V with the negative analog outputs (X-,Y-).



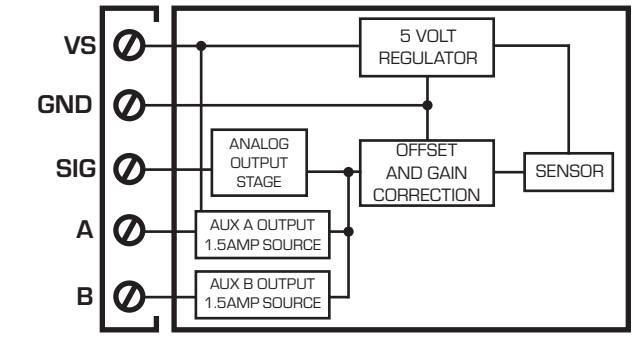
OPTION 79 EQUIVALENT OUTPUT

Notes:
1) Voltage supply is to be 10 – 30VDC.
2) Current Consumption: 20mA @ 12VDC.
Output: Centered - 50% +/– 4% PWM Duty Cycle.
Full Positive Deflection - 90% +/– 2% PWM Duty Cycle
Full Negative Deflection - 10% +/– 2% PWM Duty Cycle
3) Frequency is approx. 500Hz



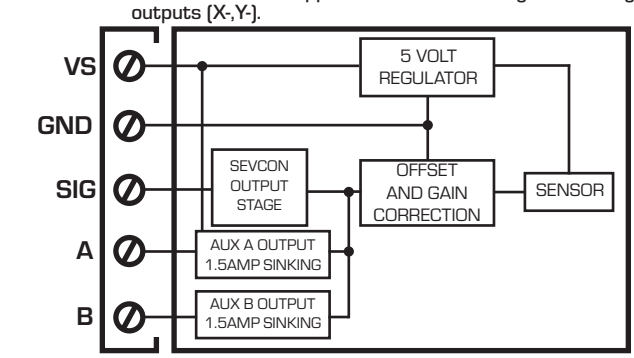
OPTION 82 EQUIVALENT OUTPUT

Notes:
1) Voltage supply is to be 10 – 30VDC.
2) Current Consumption: 20mA @ 12VDC.
Output: Centered - 5VDC ± 0.1VDC.
Full Positive Deflection - 9.5VDC ± 0.10VDC.
Full Negative Deflection - 0.50VDC ± 0.10VDC.
3)Aux A output switches on VS –0.7VDC @ approx. 5.9VDC with the positive analog outputs (X+,Y+). Aux B output switches on VS –0.7VDC @ approx. 4.1VDC with the negative analog outputs (X-,Y-).



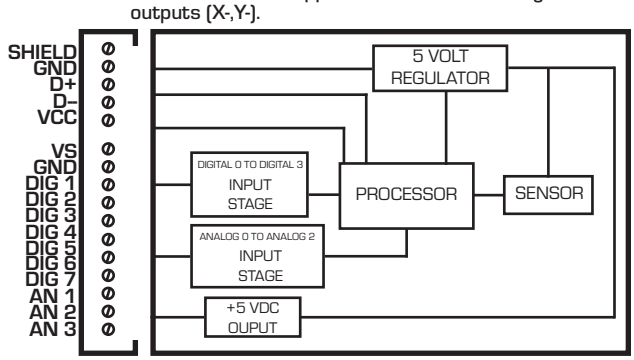
OPTION 78 EQUIVALENT OUTPUT

Notes:
1) Voltage supply is to be 10-30VDC.
2) Current Consumption: 20 mA @ 12VDC.
Output: Centered - 0.00mA ± 0.5mA.
Full Positive Deflection - 20mA ± 0.05V.
Full Negative Deflection - 20mA ± 0.05V.
3) Aux A output switches on VS –0.7VDC @ approx. 4mA with the positive analog outputs (X+,Y+). Aux B output switches on VS –0.7VDC @ approx. 4mA with the negative analog outputs (X-,Y-).



OPTION 80 EQUIVALENT OUTPUT

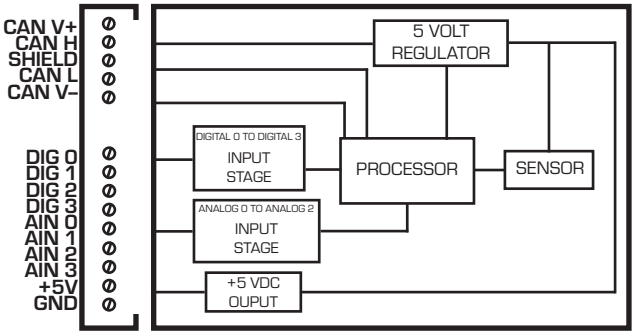
Notes:
1) Voltage supply is to be 10 - 30VDC.
2) Current Consumption: 20mA @ 12VDC.
Output: Centered - 4.0mA ± 0.8mA.
Full Positive Deflection - 20mA ± 1mA.
Full Positive Deflection - 20mA ± 1mA.
3) Aux A output switches on VS –0.7VDC @ approx. 7.2mA with the positive analog outputs (X+,Y+). Aux B output switches on VS –0.7VDC @ approx. 7.2mA with the negative analog outputs (X-,Y-).



OPTION 83 EQUIVALENT OUTPUT (USB)

Notes:
1) Voltage supply is to be 5VDC.
2) Current Consumption: 20 mA @ 12VDC.
Output: Centered - 2.50VDC ± 0.075VDC.
Full Positive Deflection - 4.0VDC ± 0.15VDC.
Full Negative Deflection - 1.0V ± 0.15VDC.
3) Max Voltage for the analog and digital inputs: 5 VDC
4 analog inputs including on board sensor
7Digital Inputs

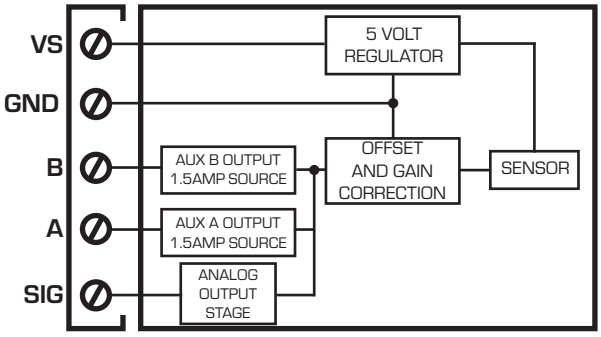
Electrical Options List



OPTION 84 EQUIVALENT OUTPUT

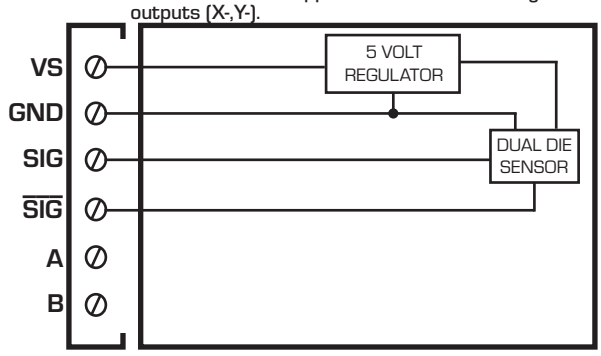
CAN/J1939 MCB200 BOARD ADDRESS = 33 (STANDARD)

Notes:
1) Voltage supply is to be 10 - 30VDC.
2) Current Consumption: 20mA @ 12VDC.
3) Sensor CAL: Centered - 2.50V ± 0.075V.
Full Positive Deflection - 4.00V ± 0.15V.
Full Negative Deflection - 1.00V ± 0.15V.
4) Max Voltage for the analog and digital inputs: 5 VDC
4 analog inputs including on board sensor
4 digital inputs



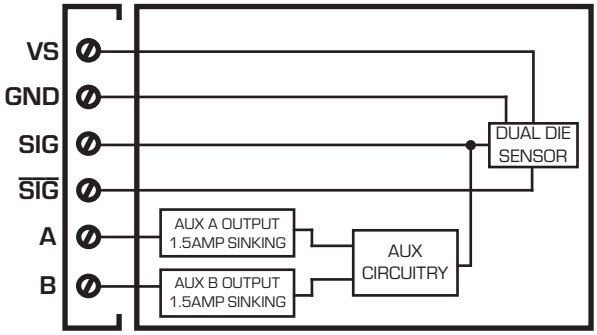
OPTION 87 EQUIVALENT OUTPUT

Notes:
1) Voltage supply is to be 10-30VDC.
2) Current Consumption: 20 mA @ 12VDC.
Output: Centered - 2.50V ± 0.05V. (2.45–2.55)
Full Positive Deflection - 5.00V ± 0.2V(4.8–5.2)
Full Negative Deflection - 0.0V ± 0.20V. (-0.2–0.2)
3) Aux A output switches on VS –0.7VDC @ approx. 2.82V with the positive analog outputs (X+,Y+). Aux B output switches on VS –0.7VDC @ approx. 2.20V with the negative analog outputs (X-,Y-).



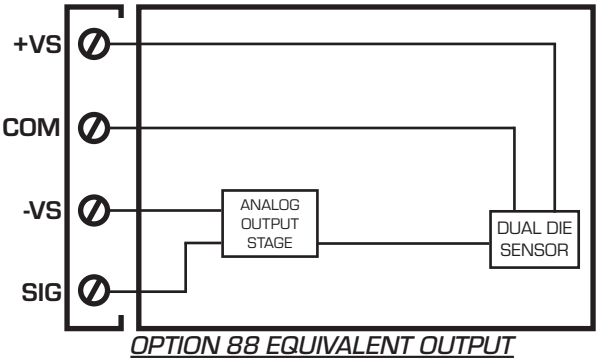
OPTION 89 EQUIVALENT OUTPUT

Notes:
1) Voltage supply is to be 10 - 30VDC.
2) SIG = Normal Output $\overline{SIG}$ = Inverted Output.
3) Current Consumption: 16 mA @ 5VDC.
Output: Centered - 5.00V ± 0.25V. (2.25-2.55)
Full Positive Deflection - 4.50V ± 0.10V. (4.40-4.60)
Full Negative Deflection - 0.50V ± 0.10V. (0.40-0.60)



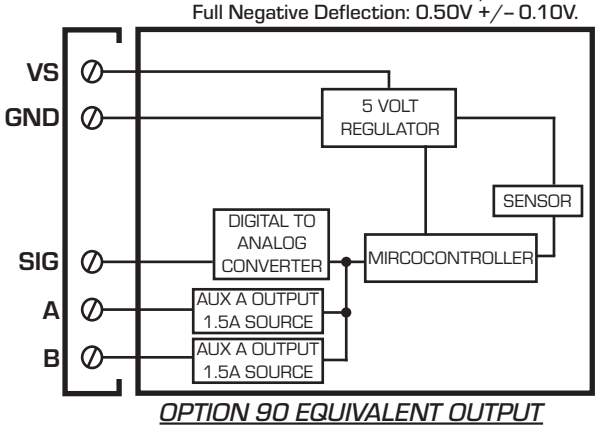
OPTION 86 EQUIVALENT OUTPUT

Notes:
1) Voltage supply is to be 5VDC.
2) SIG = Normal Output $\overline{SIG}$ = Inverted Output.
3) Current Consumption: 16mA @ 5VDC.
Output: Centered - 2.50V +/- 0.05V (2.45–2.55)
Full Positive Deflection - 4.50V +/- 0.10V. (4.40–4.60)
Full Negative Deflection - 0.50V +/- 0.10V. (0.40–0.60)
4) Aux A output switches on when the SIG is @ approx. 2.9VDC.
Aux B output switches on when the SIG is @ approx. 2.1VDC.



OPTION 88 EQUIVALENT OUTPUT

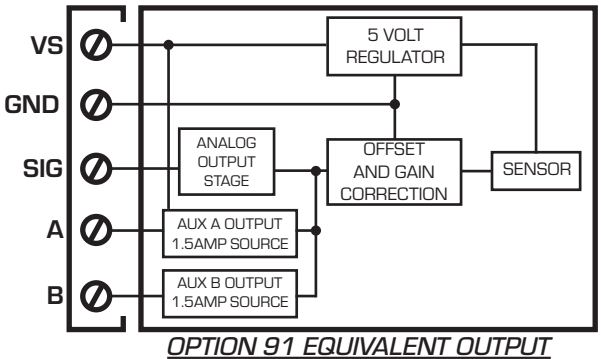
Notes:
1) Sensor only board, with Dual Die Sensor.
2) Voltage supply is to be 5VDC.
3) SIG = Normal Output $\overline{SIG}$ = Inverted Output.
4) Current Consumption: 16mA @ 5 VDC.
5) Output: Centered - 2.50V +/– 0.05V
Full Positive Deflection: 4.50V +/– 0.10V.
Full Negative Deflection: 0.50V +/– 0.10V.



OPTION 90 EQUIVALENT OUTPUT

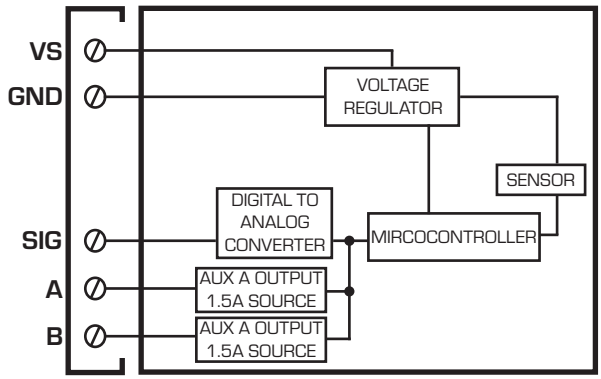
Notes:
1) Voltage supply is to be 12 - 30VDC.
2) Current Consumption: 73 mA @ 12VDC.
Output: Centered - 0.00VDC ± 0.20VDC. (–0.20 to +0.20)
Full Positive Deflection: +10V ± 0.20V. (+9.80 to +10.20)
Full Negative Deflection: – 10V ± 0.20V. (-9.80 to -10.20)
3) Aux A output switches on @ approx. +2.0V with the positive analog outputs (X+, Y+). Aux B output switches on @ approx. –2.0V with the negative analog outputs (X-,Y-).

Electrical Options List



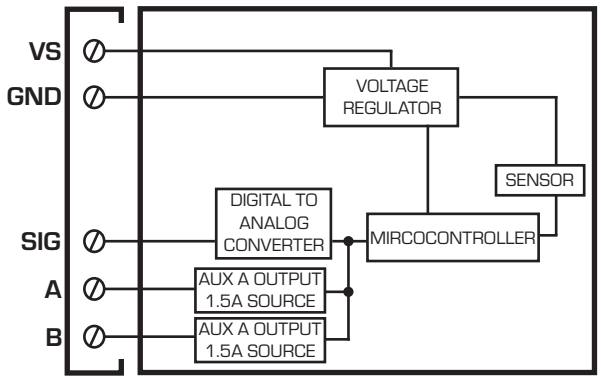
OPTION 91 EQUIVALENT OUTPUT

Notes:
1) Voltage supply is to be 10 - 30VDC.
2) Current Consumption: 20mA @ 12VDC.
Output: Centered - 0.00VDC ± 0.5VDC. (–0.5 to +0.5)
Full Positive Deflection: +10V ± 1.00V. (9.0 - 11.0)
Full Negative Deflection: – 10V ± 1.00V. (9.0 - 11.0)
3) Aux A output switches on VS -0.7VDC @ aprrox. 0.50V with the positive analog outputs (X+,Y+). Aux B output switches on VS -0.7VDC @ approx. 0.50V with the negative analog outputs (X-,Y-).



OPTION 93 EQUIVALENT OUTPUT

Notes:
1) Voltage supply is to be 12 - 30VDC.
2) Current Consumption: 73mA @ 12VDC.
Output: Centered - 0.00VDC ± 0.20VDC. (–0.20 to +0.20)
Full Positive Deflection: +10V ± 0.20V. (+9.80 to +10.20)
Full Negative Deflection: – 10V ± 0.20V. (–9.80 to –10.20)
3) Aux A output switches on @ approx. +0.5VDC with the positive analog outputs (X+,Y+). Aux B output switches on @ approx. –0.5VDC with the negative analog outputs (X-,Y-).



OPTION 92 EQUIVALENT OUTPUT

Notes:
1) Voltage supply is to be 12 - 30VDC.
2) Current Consumption: 73mA @ 12VDC.
Output: Centered - 0.00VDC ± 0.20VDC. (–0.20 to +0.20)
Full Positive Deflection: +5V ± 0.20V. (+4.80 to +5.20)
Full Negative Deflection: – 5V ± 0.20V. (–4.80 to –5.20)
3) Aux A output switches on @ approx. +1.0VDC with the positive analog outputs (X+,Y+). Aux B output switches on @ approx. –1.0VDC with the negative analog outputs (X-,Y-).

Grip Options List

05 = 2-AXIS, NO HANDGRIP
10 = 2-AXIS, PALM GRIP W/ SLIDELOCK
15 = 2-AXIS, PALM GRIP
PALM GRIP (STYLES 10 & 15) AVAILABLE IN: BLACK (Standard)
ORANGE (ADD –OR AT THE END OF THE PART NUMBER)
YELLOW (ADD –YL AT THE END OF THE PART NUMBER)
28 = 2-AXIS, RSG GRIP (ROCKER: LEFT, RIGHT)
29 = 2-AXIS, RSG GRIP (ROCKER: PUSH-BUTTON)
30 = 2-AXIS, RSTG ROCKER GRIP
31 = 2-AXIS, RSTG ROCKER GRIP W/ SIDE PUSH-BUTTON
32 = 2-AXIS, RSTG NO ROCKER, TRIGGER ONLY
33 = 2-AXIS, RSTG NO ROCKER, TRIGGER & SIDE PUSH-BUTTON
35 = 2-AXIS, RSTG NO ROCKER, TRIGGER & TOP PUSH-BUTTON
38 = 2-AXIS, TRS GRIP
39 = 2-AXIS, RSTG, NO ROCKER, TRIGGER, TOP & SIDE BUTTON TOGGLE
41 = 2-AXIS, RSTG, ROCKER, TRIGGER & MAINTAINED LEFT SIDE PUSH-BUTTON
43 = 2-AXIS, MSG, 3 TOGGLE SWITCHES
44 = 2-AXIS, MSG, 4 TOGGLE SWITCHES
46 = 2-AXIS, MSG, 6 PUSH-BUTTONS
48 = 2-AXIS, MSG, 3 PUSH-BUTTONS
49 = 2-AXIS, MSG, 4 PUSH-BUTTONS
50 = 2-AXIS, TRS, NO ROCKER SWITCHES (PLASTIC CAP)
51 = 3-AXIS, MSG, 6 TOGGLE SWITCHES
52 = 2-AXIS, MSG, 4 TOGGLE & 2 PUSH BUTTON SWITCHES
53 = 2-AXIS, PISTOL, TRIGGER, PUSH-BUTTON ON TOP
54 = 3-AXIS, PISTOL, TWIST, TRIGGER W/ PUSH BUTTON ON TOP
55 = 5&1/2-AXIS, MFHG, TWIST, MINI-JOYSTICK, PROPORTIONAL TRIGGER.
56 = 5&1/2-AXIS, MFHG, PUSH-PULL, MINI-JOYSTICK, PROPORTIONAL TRIGGER
57 = 3-AXIS, PISTOL, TRIGGER, SWITCH ROCKER & PROPORTIONAL TWIST
58 = 2-AXIS, MFHG, HALL TRIGGER
59 = 3-AXIS, PISTOL, TRIGGER, PROPORTIONAL TWIST
60 = 4-AXIS, PISTOL, TRIGGER, PROPORTIONAL ROCKER & TWIST
61 = 3-AXIS, PISTOL, TRIGGER, PROPORTIONAL ROCKER
62 = 2-AXIS, PISTOL, TRIGGER & SWITCHED ROCKER
63 = 2-AXIS, PISTOL, TRIGGER, NO PUSH-BUTTON ON CAP
64 = 3-AXIS, ERGO, TRIGGER & PROPORTIONAL ROCKER
65 = 2-AXIS, PISTOL, TRIGGER & SWITCH ROCKER, 2 PUSH-BUTTONS (L)
66 = 3-AXIS, PISTOL, TRIGGER & PROPORTIONAL ROCKER, 2 PUSH-BUTTONS (L/R)
67 = 2-AXIS, PISTOL, TRIGGER & SWITCH SEP COMMONS, ROCKER, 2 PUSH-BUTTONS (L)
68 = 2-AXIS, MULTI-SWITCH GRIP W/ 2 TOGGLE AND 4 PUSH-BUTTONS
69 = 3-AXIS, PLASTIC PISTOL GRIP TRIGGER & PROPORTIONAL ROCKER W/TWO SIDE PUSH-BUTTONS, BOTH PUSH-BUTTONS ON LEFT SIDE OF GRIP
70 = 4-AXIS, PLASTIC PISTOL GRIP, TRIGGER , PROPORTIONAL ROCKER & PROPORTIONAL TWIST W/TWO SIDE PUSH-BUTTONS, BOTH PUSH-BUTTONS ON LEFT SIDE OF GRIP
71 = 2 AXIS, RSG W/ YELLOW P9 PUSH BUTTON SWITCH
72 = 2 AXIS, RSG NO ROCKER
73 = 2 AXIS, MULTI-SWITCH GRIP W/ 5 PUSH-BUTTONS AND 1 TOGGLE
74 = 2 AXIS, LEFT HANDED ERGO GRIP W/ SWITCHED ROCKER
75 = 2-AXIS, ERGO GRIP W/ SWITCHED ROCKER
76 = 2-AXIS, ERGO GRIP TRIGGER & SWITCHED ROCKER W/ TWO SIDE PUSH-BUTTONS, BOTH PUSH-BUTTONS ON LEFT SIDE OF GRIP
77 = 2-AXIS, TRS GRIP W/ P9 OTTO PUSH BUTTON SWITCH
78= 3-AXIS, PLASTIC PISTOL GRIP, TRIGGER, SWITCHED ROCKER & PROPORTIONAL TWIST W/TWO SIDE PUSH - BUTTONS, BOTH PUSH-BUTTONS ON LEFT SIDE OF GRIP
79 = 3-AXIS, LEFT HANDED ERGO GRIP, PROPORTIONAL ROCKER
81 = 3-AXIS, PLASTIC PISTOL GRIP, TRIGGER, PROPORTIONAL PUSH PULL
82 = 3-AXIS, PLASTIC PISTOL GRIP, TRIGGER, PROPORTIONAL PUSH PULL W/ PUSH-BUTTON ON TOP COVER
83 = 3-AXIS, PLASTIC PISTOL GRIP, TRIGGER, PROPORTIONAL PUSH PULL W/ SWITCHED ROCKER
84 = 4-AXIS, PLASTIC PISTOL GRIP, TRIGGER, PROPORTIONAL PUSH PULL W/ PROPORTIONAL ROCKER
85 = 3-AXIS, ERGO GRIP, TRIGGER & PROPORTIONAL ROCKER W/TWO SIDE PUSH-BUTTONS, BOTH PUSH-BUTTONS ON LEFT SIDE OF GRIP
86 = 2-AXIS, PLASTIC PISTOL GRIP TRIGGER & SWITCHED ROCKER W/TWO SIDE PUSH-BUTTONS, ONE ON LEFT AND ONE ON RIGHT
87 = 3-AXIS, TWIST KNOB GRIP, PROPORTIONAL TWIST
88 = 2-AXIS, MULTI-SWITCH GRIP W/ 3 TOGGLE & 2 PUSH BUTTON SWITCHES
89 = 4-AXIS, PLASTIC PISTOL GRIP, TRIGGER, PROP. ROCKER & PROP. TWIST, W/ 2 SIDE PUSH-BUTTONS ONE ON LEFT AND ONE ON RIGHT
90 = 2-AXIS, MULTI-SWITCH GRIP W/ 1 PUSH BUTTON

Grip Style Options List

91 = 3-AXIS, LEFT HANDED ERGO GRIP, PROPORTIONAL ROCKER W/2 SIDE PUSH-BUTTONS ONE ON LEFT AND ONE ON RIGHT
92 = 2-AXIS, MULTI-SWITCH GRIP W/ 6 TOGGLE SWITCHES
93 = 2-AXIS, RSTG NO ROCKER TRIGGER & MAINTAINED SIDE PUSH-BUTTON
94 = 2-AXIS, LEFT HANDED ERGO GRIP, SWITCHED ROCKER, W/2 SIDE PUSH-BUTTONS ONE ON LEFT AND ONE ON RIGHT
95 = 2-AXIS, MULTI-SWITCH GRIP W/ 3 TOGGLE & 3 PUSH BUTTON SWITCHES
98 = 2-AXIS, MULTI-SWITCH GRIP W/ 1 TOGGLE & 2 PUSH BUTTON SWITCHES
99 =N/A (ALREADY USED)
100 = 2-AXIS, MULTI-SWITCH GRIP W/ 2 TOGGLES & 1 PUSH BUTTON SWITCHES
101 = 2-AXIS, MSG 2.0 W/ 5 PUSH BUTTON SWITCHES & CAPACITIVE SENSOR (NO TRIGGER)
102 = 3-AXIS, PLASTIC PISTOL GRIP, TRIGGER, PROP. TWIST, SWITCHED ROCKER, W/ 2 SIDE PB's 1 LEFT & 1 RIGHT (C-14934)
103 = 2-AXIS, METAL PISTOL GRIP TRIGGER & SWITCHED ROCKER W/TWO SIDE PUSH-BUTTONS, BOTH PUSH-BUTTONS ON LEFT SIDE OF GRIP
106 = 5-AXIS, MSG 2.0 WITH 3 PROPORTIONAL ROLLER ROCKERS & CAPACITIVE SENSOR (NO TRIGGER)
107 = 3-AXIS, MSG 2.0 W/ 1 PROPORTIONAL ROLLER ROCKER ON LEFT SIDE, 2 PUSH BUTTONS & TRIGGER
108 = 2-AXIS, RSTG NO ROCKER, TRIGGER W/ MAINTAINED TOP & LEFT SIDE PUSH-BUTTONS
109 = 2-AXIS, MULTI-SWITCH GRIP W/ 4 MAINTAINED PUSH-BUTTONS
110 = 4-AXIS, MSG 2.0 W/ 1 DUAL AXIS MINI-JOYSTICK ON LEFT SIDE, 2 PUSH BUTTONS & TRIGGER
111 = 3-AXIS, MSG 2.0 W/ 1 PROPORTIONAL ROLLER ROCKER IN CENTER, 2 PUSH BUTTONS (1 LEFT & 1 RIGHT) & TRIGGER
112 = 2-AXIS, MSG 2.0 W/ 2 TOGGLES, 3 PUSH BUTTONS
113 = 2-AXIS, MSG 2.0 W/ 1 TOGGLES, 5 PUSH BUTTONS
114 = 2-AXIS, MSG 2.0 W/ 2 TOGGLES, 5 PUSH BUTTONS
115 = 2-AXIS, MSG 2.0 W/ 6 PUSH BUTTON SWITCHES
116 = 2-AXIS, MSG 2.0 W/ 2 ROLLER ROCKERS
117 = 2-AXIS, MSG 2.0 W/ 4 TOGGLES, 2 PUSH BUTTONS
118 = 2-AXIS, MSG 2.0 W/ TRIGGER & 4 PUSH BUTTON SWITCHES
119 = 2-AXIS, MSG 2.0 W/ TRIGGER, 2 PUSH BUTTONS & 2 TOGGLES
120 = 3-AXIS, TWIST KNOB GRIP, PROPORTIONAL TWIST W/ PUSH BUTTON
121 = 2-AXIS, MSG 2.0 W/ TRIGGER, PROPORTIONAL. MINI-JOYSTICK, 3 PUSH BUTTONS & 1 TOGGLES
123 = 2-AXIS, MSG 2.0 3 MAINTAINED TOGGLES
124 = 3-AXIS, MSG 2.0 W/ 1 PROPORTIONAL ROLLER ROCKER IN CENTER, 4 PUSH BUTTONS (2 LEFT & 2 RIGHT) & TRIGGER
125 = 2-AXIS, RSTG NO ROCKER, TRIGGER W/ 5 SIDE PUSH-BUTTONS
126 = 2-AXIS, MSG 2.0 W/ 4 SWITCHED ROCKERS (TOGGLES
127 = 2-AXIS, MSG 2.0 W/ 5 SWITCHED ROCKERS (TOGGLES)
128 = 2-AXIS, RSTG NO ROCKER TRIGGER & TOP MAINTAINED PUSH-BUTTON
129 = 2-AXIS, MSG 2.0 WITH 1 TOGGLE, 3 PUSH BUTTONS, AND TRIGGER
131 = 3-AXIS, PALM GRIP 2.0 PROPORTIONAL TWIST, PUSH-BUTTON ON LEFT
134 = 3-AXIS, PALM GRIP 2.0 PROPORTIONAL TWIST, 2 PUSH BUTTON ON LEFT
135 = 2-AXIS, MSG 2.0 W/ 3 TOGGLES, 4 PUSH BUTTONS
136 = 2-AXIS, MSG 2.0 W/ 1 TOGGLES, 6 PUSH BUTTONS
137 = TWIST KNOB GRIP 2.0, PROPORTIONAL TWIST (***PROTOTYPE GRIP***)
138 = 2-AXIS, RSG ROCKER GRIP W/ SIDE PUSH BUTTON
139 = 3-AXIS, MSG 2.0 W/ 1 PROPORTIONAL ROLLER ROCKER & TRIGGER
140 = 2-AXIS, MSG 2.0 W/ 2 TOGGLE SWITCHES

05SW = TWO AXIS, NO HANDGRIP, M215 SWITCHED
15SW = TWO AXIS, PALM GRIP, M215 SWITCHED
21SW = THREE AXIS, PISTOL GRIP TRIGGER, SWTICHED ROCKER & PROPORTIONAL TWIST, M215 SWITCHED
25SW = TWO AXIS, PISTOL GRIP TRIGGER, M215 SWITCHED
27SW = TWO AXIS, PISTOL GRIP TRIGGER & SWITCHED ROCKER, M215 SWITCHED
28SW = TWO AXIS, RSG GRIP, M215 SWITCHED
29SW = TWO AXIS, RSG PUSH-BUTTON GRIP, M215 SWITCHED
30SW = TWO AXIS, RSTG ROCKER GRIP, M215 SWITCHED
31SW = TWO AXIS, RSTG ROCKER GRIP W/ SIDE PUSH-BUTTON, M215 SWITCHED
32SW = TWO AXIS, RSTG NO ROCKER TRIGGER ONLY, M215 SWITCHED
33SW = THREE AXIS, RSTG NO ROCKER TRIGGER & SIDE PUSH-BUTTON, M215 SWITCHED
34SW = THREE AXIS, PISTOL GRIP PROPORTIONAL TRIGGER W/ PUSH-PULL SWITCHED, M215 SWITCHED
35SW = TWO AXIS, RSTG NO ROCKER TRIGGER & TOP PUSH-BUTTON, M215 SWITCHED
36SW = 2-AXIS, RSTG ROCKER GRIP W/ PUSH-BUTTON ON RIGHT SIDE OF GRIP

Grip Style Options List

(***36 WAS: TWO AXIS, MULTI-SWITCH GRIP (BOXED-SHAPED) W/ 4 PUSH-BUTTONS, M215 SWITCHED -*** OBSOLETE)
38SW = TWO AXIS, TRS GRIP, M215 SWITCHED
39SW = TWO AXIS, RSTG NO ROCKER TRIGGER, TOP & SIDE PUSH-BUTTONS, M215 SWITCHED
40SW = THREE AXIS, PISTOL GRIP W/ SWITCHED PUSH PULL, M215 SWITCHED
41SW = TWO AXIS, RSTG ROCKER & MAINTAINED SIDE PUSH-BUTTON ON LEFT SIDE OF GRIP, M215 SWITCHED
42SW = TWO AXIS, MULTI-SWITCH GRIP W/ 4 PUSH-BUTTONS (SW1 RED, SW2 YELLOW, SW3 GREEN, SW4 BLACK)
43SW = TWO AXIS, MULTI-SWITCH GRIP W/ 3 TOGGLE SWITCHES, M215 SWITCHED
44SW = TWO AXIS, MULTI-SWITCH GRIP W/ 4 TOGGLE SWITCHES, M215 SWITCHED
45SW = THREE AXIS, MULTI-SWITCH GRIP, PROPORTIONAL TWIST, W/ 4 PUSH-BUTTONS, M215 SWITCHED
46SW = TWO AXIS, MULTI-SWITCH GRIP W/ 6 PUSH-BUTTONS, M215 SWITCHED
47SW = THREE AXIS, MULTI-SWITCH GRIP, PROPORTIONAL TWIST, W/ 6 PUSH-BUTTONS, M215 SWITCHED
48SW = TWO AXIS, MULTI-SWITCH GRIP W/ 3 PUSH-BUTTONS, M215 SWITCHED
49SW = TWO AXIS, MULTI-SWITCH GRIP W/ 4 PUSH-BUTTONS, M215 SWITCHED
50SW = TWO AXIS, TRS GRIP W/ NO ROCKER SWITCHES (PLASTIC CAP), M215 SWITCHED
51SW = THREE AXIS, MULTI-SWITCH GRIP, PROPORTIONAL TWIST, WITH 6 TOGGLE SWITCHES, M215 SWITCHED
52SW = TWO AXIS, MULTI-SWITCH GRIP W/ 4 TOGGLES & 2 PUSH BUTTON SWITCHES, M215 SWITCHED
53SW = 2-AXIS, PLASTIC PISTOL GRIP TRIGGER W/ PUSH-BUTTON ON TOP COVER, M215 SWITCHED
54SW = 3-AXIS, PLASTIC PISTOL GRIP TWIST, TRIGGER W/ PUSH-BUTTON ON TOP COVER, M215 SWITCHED
55SW = 5&1/2-AXIS, MULTI FUNCTION GRIP, TWIST, DUAL AXIS MINI-JOYSTICK, PROPORTIONAL TRIGGER M215 SWITCHED
56SW = 5&1/2-AXIS, MULTI FUNCTION GRIP, PUSH-PULL, DUAL AXIS MINI-JOYSTICK, PROPORTIONAL TRIGGER M215 SWITCHED
57SW = 3-AXIS, PLASTIC PISTOL GRIP TRIGGER, SWITCHED ROCKER & PROPORTIONAL TWIST, M215 SWITCHED
58SW = 2-AXIS, MULTI-FUNCTION (HALL TRIGGER) HAND GRIP, FIXED IN PLACE (NO MOTION) M215 SWITCHED
59SW = 3-AXIS, PLASTIC PISTOL GRIP TRIGGER, PROPORTIONAL TWIST, M215 SWITCHED
60SW = 4-AXIS, PLASTIC PISTOL GRIP TRIGGER, PROPORTIONAL ROCKER & PROPORTIONAL TWIST, M215 SWITCHED
60SW = 4-AXIS, PLASTIC PISTOL GRIP TRIGGER, PROPORTIONAL ROCKER & PROPORTIONAL TWIST, M215 SWITCHED
61SW = 3-AXIS, PLASTIC PISTOL GRIP TRIGGER, PROPORTIONAL ROCKER, M215 SWITCHED
62SW = TWO AXIS, PLASTIC PISTOL GRIP TRIGGER & SWITCHED ROCKER, (SIM TO -27) M215 SWITCHED
63SW = TWO AXIS, PLASTIC PISTOL GRIP TRIGGER NO PUSH-BUTTON ON CAP (-25) M215 SWITCHED

Note: New Grip styles are created all the time so if you'd like a custom style call us or visit our website for inquiry.

Grip Overview

BALL KNOB

The Ball Knob Grip can be ordered with or without the pull up trigger and comes in glass reinforced nylon.
Resistant to Weather and Corrosion
Private labeling avaliable

CHROME KNOB

The Chrome Grip comes with a rubberized grip that rotates from right to left. The chrome is a added feature for vehicles that require more style.
Resistant to Weather and Corrosion
Private labeling avaliable

ERGO GRIP

The Ergo Grip comes with many different button configurations and comes in glass reinforced nylon. Left handed ergo grips also avaliable
Resistant to Weather and Corrosion
Private labeling & Button Color avaliable

LEVER KNOB

The lever knob grip is made of heavy duty phenolic. Rugged design for outdoor use. UV Stabilized prevents discoloration due to sunlight.
Resistant to Weather and Corrosion
Different material types avaliable for the knob.

Grip Overview

PALM GRIP

The Palm Grip comes with many different button configurations and comes in glass reinforced nylon.
Resistant to Weather and Corrosion
Private labeling & Button Color avaliable

PISTOL MSG GRIP

A combination of the popular pistol grip and the variety of the MSG grip. The top redesigned to improve ergonomics with the pistol grip.
Resistant to weather and Corrosion
Private Labeling & Button Color avaliable

PISTOL GRIP

The Pistol Grip comes with many different button configurations and comes in glass reinforced nylon and aluminum.
Resistant to Weather and Corrosion
Private labeling & Button Color avaliable

MULTI-SWITCH GRIP

The MSG Grip comes with many different button, switch, and RR configurations and comes in glass reinforced nylon.
Resistant to Weather and Corrosion
Private labeling & Button Color avaliable

Grip Overview

MSG 2.0

The MSG 2.0 Grip comes with a more ergonomic grip and many different button configurations and comes in glass reinforced nylon.
Resistant to Weather and Corrosion
Private labeling & Button Color avaliable

RSG

The RSG Grip come with many different button configurations and comes in glass reinforced nylon.
Resistant to Weather and Corrosion
Private labeling & Button Color avaliable

RSTG

The RSTG Grip comes with many different button & trigger configurations and comes in glass reinforced nylon.
Resistant to Weather and Corrosion
Private labeling & Button Color avaliable

TRS

The TRS Grip comes with many different button & trigger configurations and comes in glass reinforced nylon.
Resistant to Weather and Corrosion
Private labeling & Button Color avaliable

MODEL 110
Foot Controller

- ◊ **Contactless Hall Effect Technology**
- ◊ **Precise Single-Axis Proportional Control**
- ◊ **Totally Enclosed Construction**
- ◊ **EMI & RFI Resistant**

The Model 110 has proven itself as an industry leader in foot pedal technology, with decades of use in the field from high-end OEM companies. The housing is rugged cast aluminum material with adjustable mechanical stops, which provide an independent external control of the limits of travel. This unit mounts via a 4-bolt pattern, identical to hydraulic output foot controls made by the United States and European manufacturers for ease of interchangeability. The centering spring is a multi-coil high-cycle-life torsion spring, which provides the return force of the unit.

Electrical Data	
Supply Voltage	5-60 VDC
Potentiometric Rating	2 Watts
Sensor	Hall Effect/Potentiometer/Switched Outputs
Output: Hall (Typical)	Max (+) Travel: 4.0 VDC
	Min (-) Travel: 1.0 VDC
Output Impedance	220 OHMS
Centered	2.5 VDC
PWM (Pulse Width Modulated)	0-95% V in (both extremes adjustable)
	22 Watts Maximum
Switch Rating	5A Inductive to 15V
	1.5 A Inductive to 30V

Mechanical Data	
Travel - Angle of Movement	Bi-directional: ± 10° or ± 15°
	Uni-directional: ± 20°
	25-31 in-lbs.
Sealing	25-37 in-lbs.
Operating Temperature	-40° to 85°C (-40° to 185° F)
Weather Tight	Electronics sealed in epoxy

MODEL 110
Foot Controller

MODEL 110 PART NUMBERING
For special configurations, please call for assistance

M110	S	BD	FT	CS	56

MODEL
110 Foot Pedal

SPRING
S (Standard)
H (Heavy)

ordering non-standard spring may increase lead time

MECHANICAL OPTIONS
BD (Bi-directional)
UD (Uni-directional)

TREADLE
FT (Full Treadle)
HT (Half Treadle)
NT (No Treadle)
AT (Angled Treadle)

CASE OPTIONS
NC (No Case)
CS (Case w/ Strain Relief & Deutsch conn.)
CT (Case w/ terminal block)

ELECTRICAL OPTION

ELECTRICAL OPTIONS

56 = 10-30VDC, 2.5V NEUTRAL ± 1.5V, 1.5 AMP DIRECTION AUX OUT
57 = 10-30VDC, 2.5V NEUTRAL ± 1.25V, 1.5 AMP DIRECTION AUX OUT
58 = 5VDC, ± 30%, NO DIRECTIONAL AUX OUT
59 = 5VDC, ± 40%, NO DIRECTIONAL AUX OUT
60 = 18-60VDC, SEVCON, 1.5 AMP DIRECTION AUX OUT
61 = 10-30VDC, 2.5V NEUTRAL ± 2.0V, 1.5 AMP DIRECTION AUX OUT
62 = 10-30VDC, DANFOSS
63 = 10-30VDC, 0.0V NEUTRAL + 10.0V, 1.5 AMP DIRECTION AUX OUT
64 = 10-30VDC, 2.5V NEUTRAL ± 1.5V, 1.5 AMP 50% DIRECTION AUX OUT
65 = 18-60VDC, POWER PACK SVCN, 0.2 AMP SINK DIRECTION AUX OUT
67 = 10-30VDC, 0.0V NEUTRAL + 5.0V, 1.5 AMP DIRECTION AUX OUT
68 = 10-30VDC, 2.5V NEUTRAL ± 2.0V, 1.5 AMP 50% DIRECTION AUX OUT
69 = 5VDC, ± 10%, NO DIRECTIONAL AUX OUT
70 = 5VDC, ± 25%, NO DIRECTIONAL AUX OUT
71 = 10-30VDC, 4-20mADC (4mADC NEUTRAL, 20mADC ENDS) 1.5 AMP DIRECTION AUX OUT
72 = 10-30VDC, 4-20mADC (12mADC NEUTRAL, 4 AND 20mADC ENDS) 1.5 AMP DIRECTION AUX OUT
73 = SPLIT SUPPLY INPUT (0 VDC NEUTRAL, POSITIVE VS & NEGATIVE VS @ ENDS) 15mAMP DIRECTION AUX OUT
74 = 10-30VDC, 5.0V NEUTRAL ± 5.0V SWING, 1.5 AMP DIRECTION AUX OUT
75 = 18-60VDC, 0.0V NEUTRAL ± 5.0V SWING, 1.5 AMP DIRECTION AUX OUT
76 = 5VDC, 40% SIGNAL SWING, 1.5 AMP DIRECTION AUX OUT
77 = 5VDC, 25% SIGNAL SWING, NO DIRECTIONAL AUX OUT
78 = 10-30VDC, 0-20mADC (0 mADC NEUTRAL, 20mADC ENDS) 1.5 AMP DIRECTION AUX OUT
79 = 10-30VDC, PWM OUT SIGNAL 50% DUTY CYCLE NEUTRAL 10% AND 90% ENDS, NO DIRECTION AUX OUT
80 = 10-30VDC, 4-20mADC (4mADC±1mA NEUTRAL, 20mADC±1mA ENDS) 1.5 AMP DIRECTION AUX OUT
81 = 10-30VDC, CAN BOARD 2.5V NEUTRAL ± 1.5V SWING
82 = 10-30VDC, 5V NEUTRAL ± 4.5V SWING

If you do not see your option listed, please call for assistance. Valve Drive Board may be required to control most hydraulic valves (sold separately)

MODEL 111
Wall Mounted Foot Controller

- ◊ **Fully Epoxy Encapsulated Hall Effect Sensing**
- ◊ **Multiple Analog and Digital Output Options**
- ◊ **USB, CANBUS, & PWM Outputs**

The Model 111 foot pedal provides mechanical linkage to convert foot motion into an electronic or electrohydraulic system input over an extended life of operation.

This model is a firewall mounted gas pedal equipped with Hall effect sensing technology, which eliminates any contact between moving electrical parts, providing virtually unlimited electrical cycle life while further improving overall signal output precision and repeatability.

Electrical Data	
Supply Voltage	5 - 60 VDC
Protection	All Inputs and Outputs
Sensor	Hall Effect
Output: Hall (Typical)	Max (+) Travel: 4.5 VDC
	Min (-) Travel: 0.5 VDC
Output Impedance	220 OHMS
PWM (Pulse Width Modulated)	0 - 95% V in (both extremes adjustable)
	22 Watts Maximum
Centered	2.5 VDC
Mechanical Data	
Pedal Travel	14°
Actuation Force	97.5 ± 4 in-lb (Standard)
	129.6 ± (Heavy)
Operating Temperature	-40° to 85°C (-40° to 185° F)
Spring Options	Standard
	Heavy
Connection Options	D (Wired to Deutsch Connector)
	P (Phoenix Style Header)

MODEL 111
Wall Mounted Foot Controller

MODEL 111 PART NUMBERING
For special configurations, please call for assistance

111	S	D	56

MODEL
111 Foot Pedal

SPRING
S (Standard)
H (Heavy)

CONNECTION OPTIONS
D Light
P Standard (for most applications)

ELECTRICAL OPTION

ELECTRICAL OPTIONS

56 = 10-30VDC, 2.5V NEUTRAL ± 1.5V, 1.5 AMP DIRECTION AUX OUT
57 = 10-30VDC, 2.5V NEUTRAL ± 1.25V, 1.5 AMP DIRECTION AUX OUT
58 = 5VDC, ± 30%, NO DIRECTIONAL AUX OUT
59 = 5VDC, ± 40%, NO DIRECTIONAL AUX OUT
60 = 18-60VDC, SEVCON, 1.5 AMP DIRECTION AUX OUT
61 = 10-30VDC, 2.5V NEUTRAL ± 2.0V, 1.5 AMP DIRECTION AUX OUT
62 = 10-30VDC, DANFOSS
63 = 10-30VDC, 0.0V NEUTRAL + 10.0V, 1.5 AMP DIRECTION AUX OUT
64 = 10-30VDC, 2.5V NEUTRAL ± 1.5V, 1.5 AMP 50% DIRECTION AUX OUT
65 = 18-60VDC, PWR PAK SVCN, 0.2 AMP SINK DIRECTION AUX OUT
67 = 10-30VDC, 0.0V NEUTRAL + 5.0V, 1.5 AMP DIRECTION AUX OUT
68 = 10-30VDC, 2.5V NEUTRAL ± 2.0V, 1.5 AMP 50% DIRECTION AUX OUT
69 = 5VDC, ± 10%, NO DIRECTIONAL AUX OUT
70 = 5VDC, ± 25%, NO DIRECTIONAL AUX OUT
71 = 10-30VDC, 4-20mADC (4mADC NEUTRAL, 20mADC ENDS) 1.5 AMP DIRECTION AUX OUT
72 = 10-30VDC, 4-20mADC (12mADC NEUTRAL, 4 and 20mADC ENDS) 1.5 AMP DIRECTION AUX OUT
73 = SPLIT SUPPLY INPUT (0 VDC NEUTRAL, POS. VS & NEG. VS @ ENDS) 15mAMP DIRECTION AUX OUT
74 = 10-30VDC, 5.0V NEUTRAL ± 5.0V SWING, 1.5 AMP DIRECTION AUX OUT
75 = 18-60VDC, 0.0V NEUTRAL ± 5.0V SWING, 1.5 AMP DIRECTION AUX OUT
76 = 5VDC, 40% SIGNAL SWING, 1.5 AMP DIRECTION AUX OUT
77 = 5VDC, 25% SIGNAL SWING, NO DIRECTIONAL AUX OUT
78 = 10-30VDC, 0-20mADC (0 mADC NEUTRAL, 20mADC ENDS) 1.5 AMP DIRECTION AUX OUT
79 = 10-30VDC, PWM OUT SIG 50%DUTY CYCLE NEUTRAL 10% AND 90% ENDS, NO DIRECTION AUX OUT
80 = 10-30VDC, 4-20mADC (4mADC±1mA NEUTRAL, 20mADC±1mA ENDS) 1.5 AMP DIRECTION AUX OUT
82 = 10-30VDC, 5V NEUTRAL ± 4.5V SWING
83 = 5VDC, USB BOARD
84 = 10-30VDC, CANBUS (J1939) BOARD
85 = SPLIT SUPPLY INPUT (0 VDC NEUTRAL, POSITIVE VS & NEGATIVE VS @ ENDS) 15mAMP 5% DIRECTION AUX OUT
86 = 5VDC ± 40% WITH INVERTED OUT, 1.5 AMP SINKING DIRECTION AUX OUT
87 = 10-30VDC, 2.5V NEUTRAL ± 2.5V SWING, 1.5 AMP DIRECTION AUX OUT
88 = 5VDC, DUAL DIE SENSOR, INVERTED OUTPUT, 40% SWING, NO AUX
89 = 10-30VDC, DUAL DIE SENSOR, INVERTED OUTPUT, 40% SWING, NO AUX
90 = 12-30VDC, 0.0 V NEUTRAL +10V/-10V ENDS, 1.5AMP DIRECTION AUX OUTPUT
91 = 10-30VDC, 0.0 V NEUTRAL ± 10.0V SWING, 1.5 AMP DIRECTION AUX AT +/-0.5V
92 = 12-30VDC, 0.0 V NEUTRAL +5V/-5V ENDS, 1.5AMP DIRECTION AUX OUTPUT
93 = 12-30VDC, 0.0 V NEUTRAL +10V/-10V ENDS, 1.5AMP DIRECTION AUX OUTPUT AT +/-0.5V
94 = 10-30VDC, 40% SWING, SINKING DIRECTION AUX OUTPUTS

If you do not see your option listed, please call for assistance. Valve Drive Board may be required to control most hydraulic valves (sold separately)

ROTARY HALL 112
Control Knob

- ◊ **Hall Effect Technology**
- ◊ **Weather Resistant Construction**
- ◊ **EMI & RFI resistant**
- ◊ **Single-axis proportional control**
- ◊ **Compact operating package with "Pure Touch" knob**
- ◊ **Contactless Position-sensing**

The Rotary Hall Knob provides a weather resistant, heavy-duty mechanism to convert operators manual commands into electrical output over an extended life of operation.
The key to the Rotary Hall's long life is the elimination of potentiometers and their wiping electrical contacts. Rotary motion is instead sensed by a hall sensor, which eliminates any contact between moving electrical parts. The elimination of resistive wiping elements also improves position accuracy due to finer resolution per degree of rotary motion. The elimination of internal gears and traverse linkages further adds to the reliability and extended service of this control. The spring action detent mechanism provides a long lasting locking actuation with a smooth out-of-detent feel. Optionally included is a "Pure Touch" knob.

Electrical Data	
Supply Voltage	5 VDC or 10-30 VDC Contactless Hall Effect
Protection	All Inputs and Outputs
Centered Output	2.5 VDC
Output: Hall (Typical)	Max (+) Travel: 4.0 VDC
Protection	Min (-) Travel: 1.0 VDC
Output Impedance	220 OHMS
Mechanical Data	
Travel	Bi-directional ±87.5°
	Uni-directional + 175°
Operating Force	Detent 3.2 in-lbs.
	Running 0.7 in-lbs.
Optional "Pure Touch" Knob	The Pure Touch knob fits onto standard 1/4"
	shaft. See attached installation drawing for more
	details. Other options avaliable.
Operating Temperature	-40° to 85°C (-40° to 185° F)
Weather Resistant Packaging	All electronics potted in epoxy

ROTARY HALL 112
Control Knob

ROTARY HALL PART NUMBERING
For special configurations, please call for assistance

RH112	BD	58	P	RP

MODEL
RH112 (175 Degree Travel)
RH113 (270 Degree Travel)

MECHANICAL
BD (Bi-Directional, Center Detent)
CW (Uni-Directional Clock-Wise)
CCW (Uni-Directional Counter-Clockwise)
ND No Detent, Uni-Directional Clockwise*

Uni-Directional options begin at neutral electrical position (ex. RH112CW56P begins at 2.5V in fully CCW position, and swings to 4V in fully CW position.). If a full swing is required, please call for special configuration number.

BOARD STYLE
BLANK Standard Potting Cup
RP Round Potting Cup

KNOB
N No Knob
P Standard Knob, 1.5" dia.
L Spinner Knob, 2.0" dia.
S Spinner Knob, 1.5" dia.
C Raised Notch Knob, 1.38" dia.

ELECTRICAL OPTIONS
56 = 10-30VDC, 2.5V NTRL ± 1.5V, 1.5 AMP DIR. AUX OUT
57 = 10-30VDC, 2.5V NTRL ± 1.25V, 1.5 AMP DIR. AUX OUT
58 = 5VDC, ± 30%, NO DIRECTIONAL AUX OUT
59 = 5VDC, ± 40%, NO DIRECTIONAL AUX OUT
60 = 18-60VDC, SEVCON, 1.5 AMP DIR. AUX OUT
61 = 10-30VDC, 2.5V NTRL ± 2.0V, 1.5 AMP DIR AUX OUT
62 = 10-30VDC, DANFOSS
63 = 10-30VDC, 0.0V NTRL + 10.0V, 1.5 AMP DIR AUX OUT
64 = 10-30VDC, 2.5V NTRL ± 1.5V, 1.5 AMP 50% DIR. AUX OUT
65 = 18-60VDC, PWR PAK SVCN, 0.2 AMP SINK DIR. AUX OUT
67 = 10-30VDC, 0.0V NTRL + 5.0V, 1.5 AMP DIR AUX OUT
68 = 10-30VDC, 2.5V NTRL ± 2.0V, 1.5 AMP 50% DIR. AUX OUT
69 = 5VDC, ± 10%, NO DIRECTIONAL AUX OUT
70 = 5VDC, ± 25%, NO DIRECTIONAL AUX OUT
71 = 10-30VDC, 4-20mADC (4mADC NTRL, 20mADC ends) 1.5 AMP DIR. AUX OUT
72 = 10-30VDC, 4-20mADC (12mADC NEUT, 4 and 20mADC ends) 1.5 AMP DIR. AUX OUT
73 = SPLIT SUPPLY INPUT (0vdc NEUT, POS. VS & NEG. VS @ ENDS) 15mAMP DIR. AUX OUT
74 = 10-30VDC, 5.0V NEUTRAL ± 5.0V SWING, 1.5 AMP DIR AUX OUT
75 = 18-60VDC, 0.0V NEUTRAL ± 5.0V SWING, 1.5 AMP DIR AUX OUT
76 = 5VDC, 40% SIGNAL SWIING, 1.5 AMP DIR AUX OUT
77 = 5VDC, 25% SIGNAL SWING, NO DIRECTIONAL AUX OUT
78 = 10-30VDC, 0-20mADC (0 mADC NEUT, 20mADC ends) 1.5 AMP DIR. AUX OUT
79 = 10-30VDC, PWM out sig 50%duty cycle NEUTRAL 10% and 90% ends, no DIR. AUX OUT
80 = 10-30VDC, 4-20mADC (4mADC±1mA NEUT, 20mADC±1mA ends) 1.5 AMP DIR. AUX OUT
82 = 10-30VDC, 5V NEUTRAL ± 4.5V SWING
83 = 5VDC, USB board
84 = 10-30VDC, CANbus (J1939) board
85 = SPLIT SUPPLY INPUT (0vdc NEUT, POS. VS & NEG. VS @ ENDS) 15mAMP 5% DIR. AUX OUT
86 = 5VDC ± 40% WITH INVERTED OUT, 1.5 AMP SINKING DIR AUX OUT
87 = 10-30VDC, 2.5V NEUTRAL ± 2.5V SWING, 1.5 AMP DIR AUX OUT
88 = 5VDC, DUAL DIE SENSOR, INVERTED OUTPUT, 40% SWING, NO AUX
89 = 10-30VDC, DUAL DIE SENSOR, INVERTED OUTPUT, 40% SWING, NO AUX
90 = 12-30VDC, 0.0 V NEUTRAL +10V/-10V ENDS, 1.5AMP DIR. AUX OUTPUT
91 = 10-30VDC, 0.0V NEUTRAL ± 10.0V SWING, 1.5 AMP DIR. AUX AT +/-0.5V
92 = 12-30VDC, 0.0 V NEUTRAL +5V/-5V ENDS, 1.5AMP DIR. AUX OUTPUT
93 = 12-30VDC, 0.0 V NEUTRAL +10V/-10V ENDS, 1.5AMP DIR. AUX OUTPUT AT +/-0.5V
94 = 10-30VDC, 40% SWING, SINKING DIR. AUX OUTPUTS
If you do not see your option listed, please call for assistance. Valve Drive Board may be required to control most hydraulic valves (sold separately)

Raised Notch Knob

Standard Knob

Spinner Knob

M400 SERIES
Level Sensor

- ◊ **Omni-Directional Sensing: Provides sensing in 360 degrees of movement**
- ◊ **Reverse polarity and short circuit protection**

Model 425 is an inductively coupled pendulous level sensor which can provide a voltage proportional to degree of tilt for both its major axis. The maximum angle is ±6° from true level.
There are only four wires necessary for connecting the M425: Power, Ground, and "X"' and "Y" Outputs. The Model 425 is viscously damped and minimizes flutter of output when the sensor is mounted on a vibrating machine.

The Model 425 Angle Sensor can also be used with a P-Q valve drive board for automatic proportional re-leveling of one axis or both axis.

Electrical Data	
Supply Voltage	6 VDC
Current at 6 VDC	20 mADC
Full Signal	± 6° (Adjustable Gain)
Output Range	3 VDC neutral, ± 1.8 VDC Swing
Hysteresis	0.3°
Output Temperature	-40° C to + 70° C
Neutral (0°)	3.0 VDC (±0.03)
Full Tilt (+6°)	3.6 VDC (±0.18)
Full Tilt (-6°)	2.4 VDC (±0.18)

M400 SERIES
Level Sensor

LEVEL SENSOR PART NUMBERING

Example: M400B-30-20TR
Normally closed, Sourcing, 3° trip angle, 2 sec time delay on reset with Bubble Level

M400	B	30	20	TR

TYPE OF TIME DELAY

NONE	Delay on trip (Standard)
R	Delay on reset
TR	Delay on trip & reset

DURATION OF TIME DELAY

05	0.5 seconds
10	1.0 seconds
15	1.5 seconds
etc	Range = 0-5 sec

TRIP ANGLE (M420 X axis)

15	1.5°
20	2.0°
25	2.5°
etc....	Range = 1.5 - 8.0°

TRIP ANGLE (A420 Y AXIS)

15	1.5°
20	2.0°
25	2.5°

OUTPUT TYPE

BLANK	Sourcing
G	Sinking
B	Bubble
F	Fixed Time Delay

MODELS

M400	Normally closed
M401	Normally open
M404	Normally Closed, Fixed Time Delay
M405	Normally Open, Fixed Time Delay
M406	Dual Trip, NC
M407	Dual Trip, NO
M410	Platform Leveler
M420	Di-axial Level Sensor, NC
M421	Di-axial Level Sensor, NO
4E0X	Custom Products

M425	42	6VDC

MODELS

M415	X Axis
M425	X & Y Axis

SIGNAL SWING *

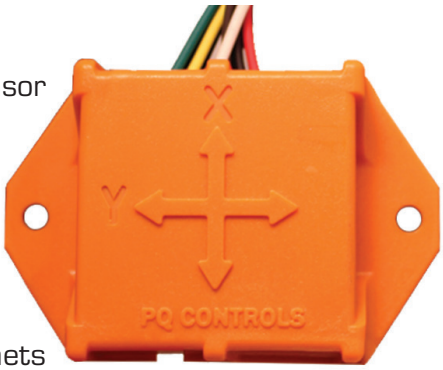
30	10%
42	30% (Standard)

SUPPLY VOLTAGE

A400 SERIES
Level Sensor

- **Omni-Directional Sensing: Provides sensing in 360 degrees of movement**
- **Reverse polarity and short circuit protection**

The Purpose of the model A450 omni-directional level sensor is to monitor the level condition of a platform. A signal is provided to the operator whenever the base upon which the sensor is mounted is out of level in any direction. Typical applications include manlifts, cranes and mobile platforms. Improvements in digital accelerometer devices permit the design of a level sensor with a higher degree of sensitivity and reliability while reducing end user cost and simplifying field applications. The PQ model was developed with a micro controller interface which allows fewer peripheral componenets and a smaller control footprint. A new "Zero button" has been added to allow further factory or field customization. The new level sensor can be configured in digital or CANbus output, with a wide range of calibrated settings up to an 80° tilt.



Electrical Data	
Supply Voltage	5 VDC or 10-30 VDC Contactless Hall Effect
Current Consumption	All Inputs and Outputs
CANbus Protocol	2.5 VDC
Digital Output	Max (+) Travel: 4.0 VDC
Firmware: CANbus Software	Min (-) Travel: 1.0 VDC
	220 OHMS
Mechanical Data	
Node ID	0 x 33
PDO	0 x 1B3
Sampling Rate of Gyroscope	100hz
Zero Sensor at Current Position	Hold for 5 seconds
Revert Back to Factory Settings	Hold for 10 seconds
Trip Angle Range	0.5 to 45° - Factory preset to 45°
Time Delay Range	0 to 25 seconds - Factory Preset to 1.0 sec
Reset Delay Range	0 to 25 seconds - Factory Preset to 0 sec
Sensor Output Filter	Max Trip angle + .05

A400 SERIES
Level Sensor

LEVEL SENSOR PART NUMBERING

Example: A400G-30-20TR
Normally closed, Sinking, 3° trip angle, 2 sec time delay on trip & reset with fixed time delay

A400	G	30	20	TR

TYPE OF TIME DELAY

NONE	Delay on trip (Standard)
R	Delay on reset
TR	Delay on trip & reset

DURATION OF TIME DELAY

05	0.5 seconds
10	1.0 seconds
15	1.5 seconds
etc	Range = 0-25 sec

TRIP ANGLE (A420 X axis)

15	1.5°
20	2.0°
25	2.5°
etc....	Range = 0.3 - 80.0°

TRIP ANGLE (A420 Y AXIS)

15	1.5°
20	2.0°
25	2.5°

OUTPUT TYPE

BLANK	Sourcing
G	Sinking

MODELS

A400	Normally closed
A401	Normally open
A410	Platform Leveler, NO
A411	Platform Leveler, NC
A420	Di-axial Level Sensor, NC
A421	Di-axial Level Sensor, NO
A450*	CANbus output (J1939, CANopen, etc.)

A425	58

MODELS

A415	X Axis
A425	X & Y Axis

SIGNAL SWING *

56	9-60VDC, 2.5V Neutral ± 1.5V Swing
58	5VDC, 30% Signal Swing
59	5VDC, 40% Signal Swing
61	9-60VDC, 2.5V Neutral ± 2.0V Swing

MODEL 800 SERIES
Angular Display

- ◊ **Visual accuraccy for X - Y angles**
- ◊ **Reverse polarity and short circuit protection**
- ◊ **Unit is suitable for use with M425, PQ Dual Axis joysticks, or Dual command potentiometers**
- ◊ **Output magnitudes are factory adjusted to command input**

Model 830 is an angular display which accepts DC supply power from a 10-30 VDC source, a built-in regulator keeps the supply power to its electronics and the output power to the sensor at a constant voltage.

The Model 830 comes with a bar display. In each quadrant the LED's will light and stay lit in proportion to angular tilt.

The Model 830 Angular Display can also be used with a P-Q joystick control to give an indication of operation. A power-on light in the center of the display indicates when the angular readout is ready for operation. A power-on switch can be provided which gives either a momentary (60 seconds) or continuous "on" power. The momentary switch is particularly useful when using a battery supply, keeping discharge to a minimum. When powered from a continuously available power supply, the switch would not be necessary.

Electrical Data	
Supply Voltage	10 - 30 VDC
Current at 12 VDC	175 mADC
Centered	230 mADC One Bar Full-on
	290 mADC Two Bars Full-on
Idle Current Draw	Current at 6 VDC: 20 mADC
Output Temperature	-40° - 85° C
Protection	Conformally Coated Circuitry
Weather Resistance	Humidity, Water/Rain, Sun/UV Exposure

MODEL 504 SERIES
Valve Drive Board

- ◊ Adjustable RAMP & PWM Frequency
- ◊ Independent Low-High current adjustment
- ◊ Dual Output Range (Mid/Hi)
- ◊ Swap Feature
- ◊ RAMP duration between MID and HI Ranges
- ◊ Current sourcing w/feedback outputs
- ◊ 2.5 amp FET on/off outputs
- ◊ Over-signal protection
- ◊ Short circuit protection
- ◊ Reverse Polarity Protection
- ◊ Voltage Supply Transient Protection
- ◊ EMI & RFI Resistant

The Model 504 series of valve drive boards are an electronic interface between a command source (potentiometer, joystick, footpedal, etc.) and an electro-hydraulic valve or pump. The board receives analog signals from the command source, and provides Pulse Width Modulated Output (PWM) to drive most electrically modulated valves and pumps available today. The board also provides On/Off outputs and other features to smoothly stroke a valve or pump with greater control and flexibility over conventional hydraulic components. The 504 family of valve boards are designed for use on mobile equipment where extreme environments (Both weather and electrical) are encountered.

**For a complete description of the product, please see the M504 Manual.*

Electrical Data	
Supply Voltage	10-30 VDC
PWM Outputs (A,B)	Configurable from 10 - 2500mA
	Regulated Output Current Fixed within 2%
Auxiliary Outputs (A, B, Common*)	2,5 amps
Protection	Reverse Polarity, Over-Voltage, Open/Shorted
	Signal leads, EMI/RFI Hardened, Transient
	Voltage Supply
Regulated Power Out (PT+, PT-)	5 VDC (may be used to power 5V CSource)
Signal Input	1 - 4 VDC, 2.5 Neutral (30% Signal Swing)
Mechanical Data	
Operating Temperature	-40° to 85°C
Protection	Sealed Epoxy Potting (Black)
Environmental Resistance	Humidity, Rain/Water, Sun/UV Exposure

MODEL 504 SERIES
Valve Drive Boards

MODEL - 504 PART NUMBERING
For special configurations, please call for assistance

504	C	5	N	R	C	S	3	– XXX

MODEL
504 = [180-2500mA 45-450Hz]
514 = [180-2500mA 451-1000Hz]
524 = [10-800mA 45-450Hz]
534 = [10-800mA 451-1000Hz]

MID RANGE
N = No Mid Range or Swap
C = Swap w/Common Mid Adjust
S = Swap w/Separate Mid Adjust

COMMAND SOURCE VS
5 = 5VDC Regulated
6 = 6VDC Regulated

INTERNAL RESISTORS
N = No On-board Resistors
1 = 180Ω Padding Resistors
2 = 360Ω Padding Resistors
3 = 18Ω Padding Resistors

RAMP FEATURE
N = No Ramp
R = Ramp Feature (0-5 Second Adj.)
C = Ramp Cancel

LOW RANGE
C = Common LO Trimpot Adjust
S = Separate LO Trimpot Adjust
R = Range Dependent LO

HI RANGE
C = Common HI Trimpot Adjust
S = Separate HI Trimpot Adjust

OUTPUT CONFIGURATIONS
1 = PWM A & PWM B
2 = PWM A&B, Aux A&B
3 = PWM A&B, Com Aux
4 = PWM A&B, Aux A&B, Com Aux
5 = PWMA, Aux A&B, Com Aux (Flow Control Arrangement)
6 = PWM A&B, Aux A&B, Com Aux (Floating connection)

CALIBRATION NUMBER

MODEL 511 SERIES

Apitech Valve Drive Board

- ◊ **Completely Independent Adjustments**
- ◊ **Current Sourcing PWM Outputs**
- ◊ **2 Current Ranges, MID and HI**
- ◊ **1-1500 mA PWM Current Range**
- ◊ **Independent HIA and HIB adjustments**
- ◊ **Adjustable MID and LO currents**
- ◊ **Adjustable Ramp 0-5 seconds**
- ◊ **3 Auxiliary Outputs - 1.5 Amp Current Rating**
- ◊ **Over-Signal and Short Circuit Protected**

The M511 Series Valve Drive Boards are designed specifically to drive Apitech valves. The boards have five adjustments that are factory pre-set to Apitech specifications. These are as follows: Lo, Mid, HiA, HiB, and Ramp. Further adjustments can be made with five trimpots. The adjustments are totally independent of one another, making calibration much easier than on similar products. The M511 series is epoxy encapsulated for superior environmental protection. M511s are compliant with CE labeling requirements.

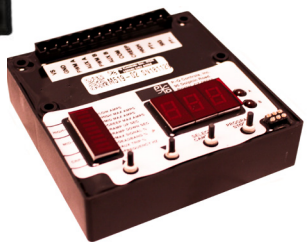
Electrical Data	
Supply Voltage	10 - 30 VDC
PWM Outputs (A, B)	Configurable Proportional Valve
	Regulated Output Current Fixed within 2%
Auxiliary Outputs (A, B, Common*)	2.5 amps
Protection	Reverse Polarity, Over-Voltage, Open/Shorted
	Signal Leads, EMI/RFI Hardened, Transient
	Voltage Supply
Regulated Power Out (PT+, PT-)	5 VDC (may be used to power 5V CSource)
Signal Input	1 - 4 VDC, 2.5 Neutral (30% Signal Swing)
Environmental Data	
Operating Temperature	-40° to 85°C
Protection	Sealed Epoxy Potting (Black)
Resistance	Humidity, Rain/Water, Sun/UV Exposure
Adjustments/Features	
Ramp (Time Delay)*	0 - 5 Seconds
Hi A, B (Full Flow Current)	1 - 1500 mA
Lo A, B (Threshold Current)	1 - 1500 mA
Mid A, B	180 - 2500 mA (defaults to 50% FFC)

MODEL 509/519 SERIES
Valve Drive Boards

- ◊ On-board, on the fly, programming capability
- ◊ On-broard current meter
- ◊ Push Button Programming - No Trimpots!
- ◊ Completely independent adjustments
- ◊ Low Drop MOSFET Outputs
- ◊ Independently adjustable RAMP Rate
- ◊ Adjustable PWM Frequency
- ◊ Three PWM Output ranges
- ◊ Three auxiliary outputs w/ 2.5 Amp current rating
- ◊ RAMP between CRP, MID and HI Ranges
- ◊ Drives both low and high current valves
- ◊ Epoxy Encapsulated Electronics
- ◊ Current sourcing w/feedback outputs
- ◊ Password Protection (M519)
- ◊ Over-signal protection
- ◊ Short circuit protection
- ◊ Broken Lead Protection
- ◊ Reverse Polarity Protection
- ◊ Voltage Supply Transient Protection
- ◊ EMI & RFI Resistant

<— 509 BOARD

519 BOARD —>



The Model 509/519 series of valve drive boards are an electronic interface between a command source (potentiometer, joystick, foot pedal, etc.) and an electrohydraulic valve or pump. The board receives analog signals from the command source, and provides Pulse Width Modulated Output (PWM) to drive most electrically modulated valves and pumps available today. The board also provides solid-state on/off outputs and other features to smoothly stroke a valve or pump with greater control and flexibility over conventional hydraulic components.

**For a complete description of the product, please see the M519 Manual.*

Electrical Data	
Supply Voltage	10-30 VDC
Signal Input	1 - 4 VDC, 2.5 Neutral (30% Signal Swing)
Auxiliary Outputs (A, B, Common*)	2,5 amps
Protection	Reverse Polarity, Over-Voltage, Open/Shorted
	Signal leads, EMI/RFI Hardened, Transient
	Voltage Supply
Regulated Power Out (PT+, PT-)	5 VDC (may be used to power 5V CSource)
PWM Outputs (A,B)	Configurable from 10 - 2500mA
	Regulated Output Current Fixed within 2%

Mechanical Data	
Operating Temperature	-40° to 85°C (-40° to 185° F)
Protection	Sealed Epoxy Potting (Black)
Resistance	Humidity, Rain/Water, Sun/UV Exposure

USB Connection Board

- ◊ **Small, compact package suitable for mobile or handheld controllers**
- ◊ **Uses the universal USB connection for communication**
- ◊ **Can be mounted on our model 112 joystick, model 115 joystick, model 212 joystick, and model 110 foot pedal.**

Electrical Data	
Supply Voltage	5 VDC
Analog Inputs	Up to 4 proportional (0-5VDC)
	When used with onboard sensor.
Digital Inputs	7 on/off (5 VDC)
Signal Transmission	Hardwire
Protection	Reverse Polarity, Over Voltage, Open/Shorted
	Signal Leads, Transient Voltage Supply

Mechanical Data	
Operating Temperature	-40° to 85°C (-40° to 185° F)
Protection	Sealed Epoxy Potting (Black)
Resistance	Humidity, Rain/Water, Sun/UV Exposure

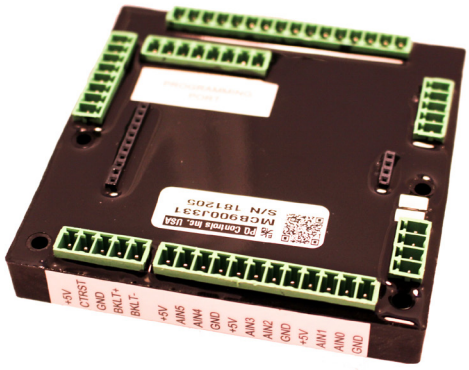
MCB200 SERIES
Valve Drive Boards

- ◊ **Small, compact package suitable for mobile or handheld controllers.**
- ◊ **Can be mounted on our model 112 joystick, model 115 joystick, model 212 joystick, and model 110 foot pedal.**
- ◊ **CANBUS J1939 / CanOpen**

Electrical Data	
Supply Voltage	10-30 VDC
Analog Inputs	4 proportional (0-5VDC) (3 external, 1 Internal)
Digital Inputs	4 on/off (5VDC)
Signal Transmission	Hardwire
Protection	Reverse Polarity, Over-Voltage, Open/Shorted
	Signal leads, EMI/RFI Hardened, Transient
	Voltage Supply
Mechanical Data	
Operating Temperature	-40° to 85°C (-40° to 185° F)
Protection	Sealed Epoxy Potting (Black)
Resistance	Humidity, Rain/Water, Sun/UV Exposure

MCB900 SERIES
Mini CANBUS Input Module

- ◊ **Small, compact package suitable for mobile or handheld controllers**
- ◊ **Option for LCD display with virtually unlimited programming capabilities (Voltage, battery life, automatic sleep mode, position animations, etc.)**
- ◊ **Optional long range radio transmitter, for wireless mobile control**



The MCB900 is an input-only controller board primarily used in CANbus systems that utilize mobile handheld controllers. This board comes with an optional spread spectrum wireless radio transceiver, with a range of up to 7 miles in open outdoor conditions. Other transmitting options include a fiber optic cable configuration and a hardwire conductor configuration.

The MCB900 contains 8 analog inputs and 12 digital on-off inputs. This board also supports additional input options for an LCD display, Backlight/Contrast adjustments, and a 6-button keypad. The modules are avaliable in both J1939 and CAN Open.

Electrical Data	
Supply Voltage	9 -15 VDC
Input	Analog: 0 - 5 VDC (8 Proportional)
	Digital: 12 VDC (on/off)
Protection	Reverse Polarity, Over-Voltage, Open/Shorted
	Signal leads, Transient Voltage Supply
Operating Voltage	9 - 15 VDC
Sensor	Internal Hall Effect
Signal Transmission	Radio Transmitter (900 mHz to 2.4 GHz
	options) Fiber Optic Cable, or Hardwire

Mechanical Data	
Operating Temperature	-40° to 85°C (-40° to 185° F)
Protection	Sealed Epoxy Potting (Black)
Resistance	Humidity, Rain/Water, Sun/UV Exposure

Discontinued / Obsoleted

Linear Actuator for Hydraulic Systems

- ◊ **Economic solution to Electro-proportional Valves**
- ◊ **Retrofitting is easy**
- ◊ **Installs quickly and easily by dealer or user**
- ◊ **Allows continued use of manual levers on values**
- ◊ **When power is removed, it's transparent to your existing system**
- ◊ **Mounts easily, single or ganged with one trunnion bolt**
- ◊ **Models avaliable with both analog and switched input**
- ◊ **90 lbs PUSH or PULL force**
- ◊ **Up to 3 inches of stroke**

The Model 750 Electric Linear Actuator is a compact, self-contained device that provides up to 90 pounds of force (push or pull) for linear distances up to 3 inches. An internal optical encoder provides relative position data as feedback for a proportional control. The actuator is mounted with a single trunnion bolt and is connected with three wires to a power and command source. Selected hardware is required to connect the actuator to the driven device.

The product was designed initially for the direct or indirect actuation of hydraulic valves, as might be done to retrofit cranes for remote operation. Another identified application is a throttle control device.

Three versions are available the M750, M751, and the M752.

Electrical Data	
Supply Voltage	10-30 VDC
Command Source Input (Model 750)	1 - 4 VDC, 2.5 Neutral (30% Signal Swing)
Command Source Input (Model 751)	2,5 amps
Command Source Input (Model 752)	Reverse Polarity, Over-Voltage, Open/Shorted
Protection	Signal leads, EMI/RFI Hardened, Transient
	Voltage Supply
	5 VDC (may be used to power 5V CSource)

Mechanical Data	
Axial Force	90 lbs. (Max)
Stroke Length	3 in.
Protection	Conformally Coated Circuitry
Operating Temperature	-40° - 85°C
Weather Resistance	Humidity, Rain/Water, Sun/UV Exposure

ROLLER ROCKER

Proportional Hall Effect Rocker

- ◊ 3 different style options
- ◊ 4 different outputs available*
- ◊ Spring Return to center
- ◊ Single-axis Bi or Uni-directional proportional control
- ◊ Compact operating package with or without Tab
- ◊ Contactless Position-sensing
- ◊ Electronics sealed in Epoxy
- ◊ One million cycle rotational life
- ◊ Above panel snap-in style mount
- ◊ Weather resistant construction
- ◊ EMI & RFI resistant

Hall Effect Roller Rocker provides a weather resistant, heavy-duty mechanism to convert operators manual command into electrical output over an extended life of operation. Ideal for use in Grips, Armrest and Panel Applications. Also, can be use directly to drive any PQ valve driver board 504 / 509 or 519 series.

The Key to Hall Effect Proportional Roller Rocker's long life is the Hall Effect Sensor, which eliminated any contact between moving electrical parts, which improves position accuracy and finer resolution per degree of motion. The Spring mechanism provides a long-lasting actuation with smooth feeling.

Electrical Data	
Recommended Mating Connector	Amp Receptacle and Socket
Supply Voltage	5 VDC
Current Consumption Max	20 mA @ 5 VDC
Mechanical Data	
Panel Thickness Range	.125 - .150"
Mechanical Angle of Movement	38° Bi-Directional
	76° Uni-Directional

ROLLER ROCKER
Proportional Hall Effect Rocker

ROLLER ROCKER (RR) PART NUMBERING
For special configurations, please call for assistance

RR -	01 -	S -	58	-UNI

MODEL
RR = Roller Rocker

ROCKER OPTION
01 = Roller Rocker without tab
02 = Roller Rocker with Tab
03 = Uni-Roller Rocker with tab

MECHANICAL OPTION
S = (Spring Return)

Electrical Output
58 = 5VDC, 2.50V Centered +/-1.5V Swing (1.0 - 2.5 - 4.0V)
59 = 5VDC, 2.50V Centered +/-2.0V Swing (0.5 - 2.5 - 4.5V)
69 = 5VDC, 2.50V Centered +/-0.5V Swing (2.0 - 2.5 - 3.0V)
70 = 5VDC, 2.50V Centered +/-1.25V Swing (1.25 - 2.5 - 3.75V)

**If you do not see your electrical option, please call for special configuration.*

UNIDIRECTIONAL (OPTIONAL)
UNI = Uni-Directional Output
UFS = Uni-Directional Full Swing Output

Example:
electrical Option 58
UNI= 2.5 to 4.0V output
UFS=1.0 to 4.0V output

Locked Tab Roller

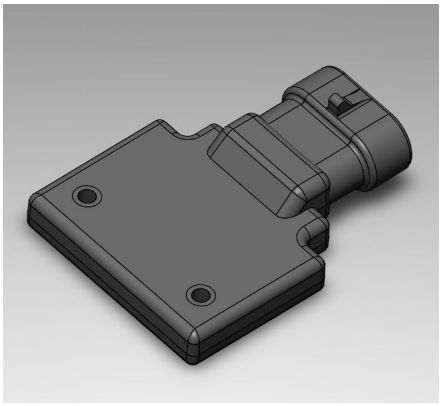
Tabbed Roller

No Tab Roller

Ongoing Design Thinking

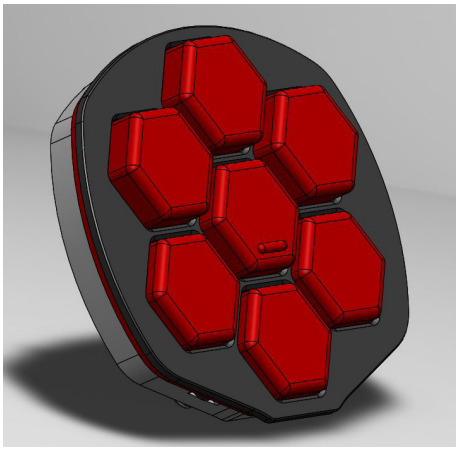
- Maintain same or better proportional performance characteristics, but with new sensors and a smaller overall control foot print.
- Incorporate IP - rated solutions into all new products.
- Enhance control quality, facilitate maintenance, lower assembly and production cost.
- Enhance the comfort of the control through ergonomic design
- Create streamline connections for ease of installation and long-term use.

Ergo Palm Grip



Moldman Connections

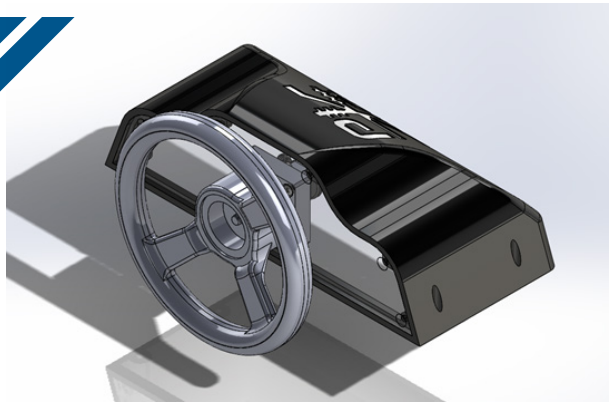
Waterproofing Grip Keypads

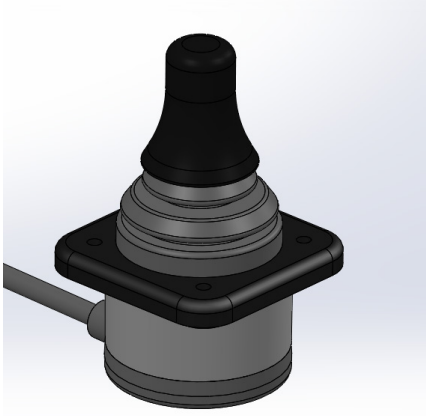


FUTURE CONCEPTS

Propel Lever

Steering Controls





New M205 Paddle Joystick

"Submit a Concept,

We can bring it to life"

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Control the Future

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AUGUST 2019

Product Information in this catalog is accurate as of August 1, 2019.
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