

CELEBRATING 46 YEARS

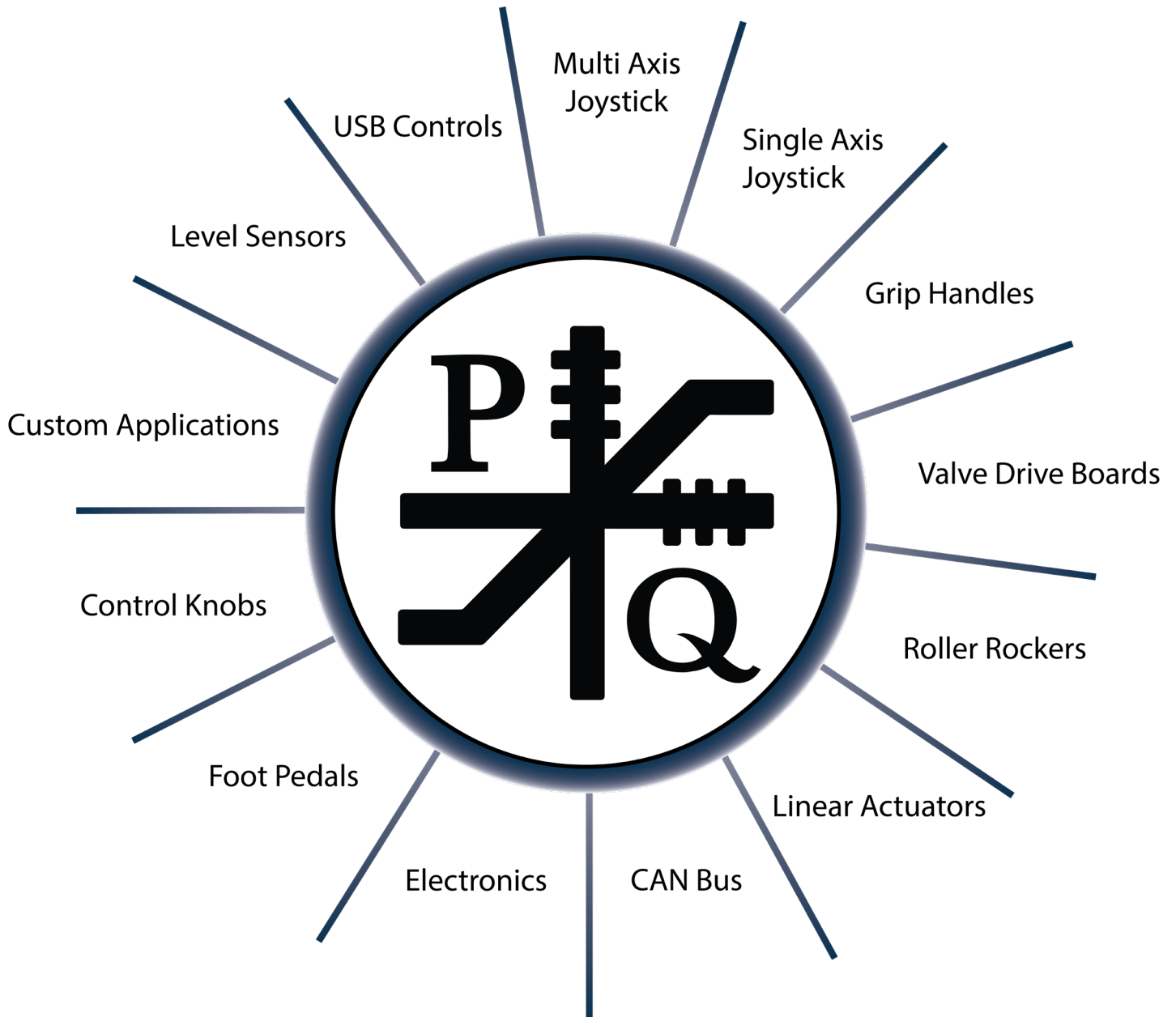
Proudly Made in the USA



PQ CONTROLS
Global Excellence in Industrial Controls

46 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



Marketing Focus

World Wide Shipping

World Wide Support





Company Profile

For the last 46 years, 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**

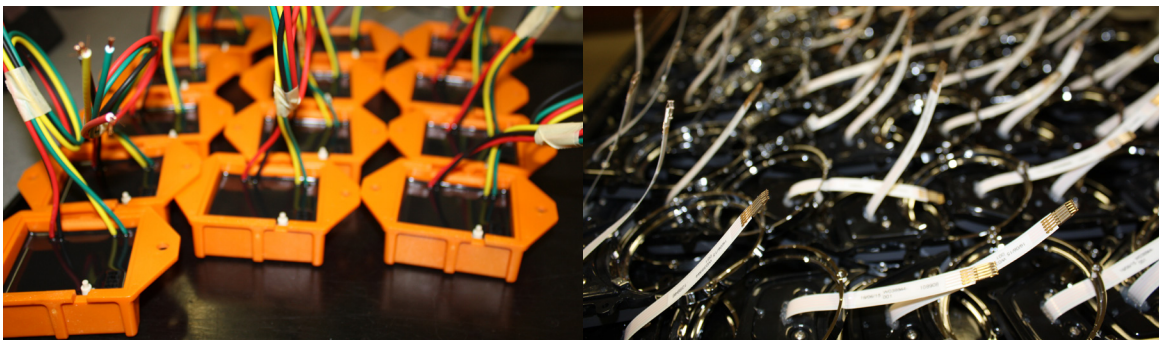
PQ Controls began research and development in Hall Effect technology in the mid 1980's. What this means, is for the past 30 years, PQ Controls has invested ample time and research into improving and perfecting this technology. When you buy from PQ Controls, you can be sure that our products are field 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 facilitates 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.

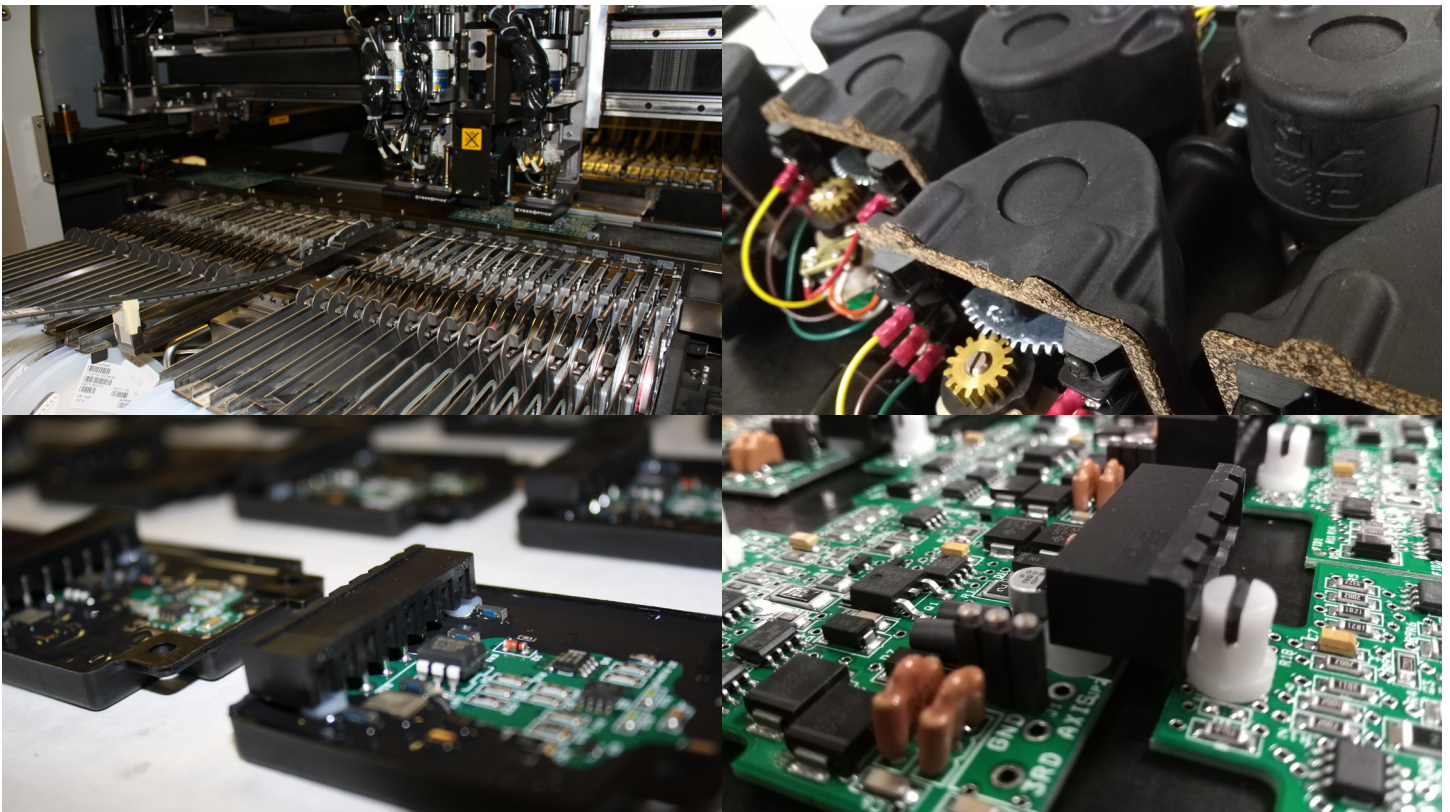


Quality Assurance

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.

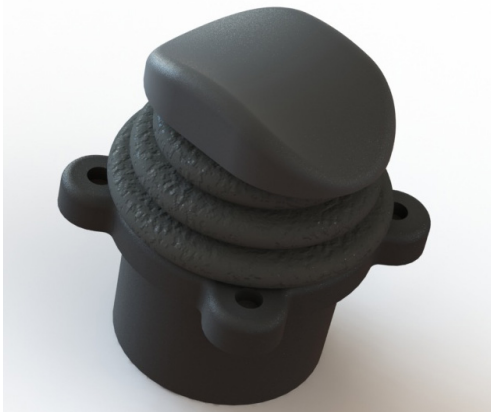
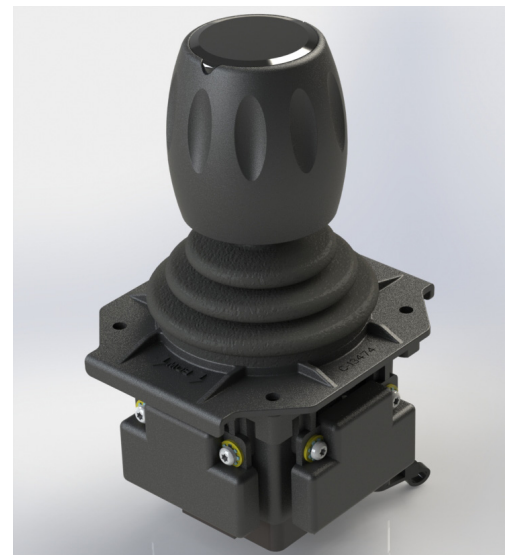
Services

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.



Joysticks



| | |
|--|----|
| M100 Fully Closed Proportional Control | 9 |
| M105 Compact Throttle Paddle Control | 10 |
| M112 Proportional Hall Effect Joystick | 12 |
| M115 Below-Panel Mounted Joystick | 13 |
| M120 Above-Panel Mounted Joystick | 15 |
| M205 Miniature Hall Effect Joystick | 16 |
| M212 Contactless Hall Effect Joystick | 18 |
| M215 Switched (“bang bang”) Joystick | 19 |
| M220 Inductively Coupled Joystick | 21 |
| M225 Contactless Hall Effect Joystick | 22 |

Grips



| | |
|-------------------|----|
| Ball Knob | 33 |
| Chrome Knob | |
| Ergo Grip | |
| Lever Knob | |
| Palm Grip | 34 |
| Palm Ergo | |
| Pistol Grip | |
| MSG | |
| MSG 2.0 | 35 |
| RSG | |
| RSTG | |
| TRS | |



Footpedals

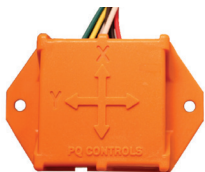
| | |
|--|----|
| M110 Proportional Hall Effect Foot Pedal | 36 |
| M111 Electrical Hall Effect Foot Pedal | 38 |



Rotary Hall Knobs

| | |
|--|----|
| RH112 Rotary Hall Effect Control Knob 175° | 40 |
| RH113 Rotary Hall Effect Control Knob 270° | |

Level Sensors



| | |
|---|----|
| M400 Omni-Directional Level Sensor | 42 |
| M410 Single Area Platform Leveler | |
| M420 Di-Axial Level Sensor | |
| M425 Proportional Di-Axial Level Sensor | |
| A400 Omni-Directional Sensing | 44 |
| A410 Single Axis Sensing | |
| A420 Omni-Directional Sensing | |
| A450 Omni-Directional Sensing | |

Data Sheet Index



Angular Display Readout

M830 Angular Readout 46



Valve Drive Boards

M504 Adjustable Valve Drive Board 47
 M509 Programmable Valve Drive Board 50
 M511 Adjustable Apitec Valve Drive Board 49
 M509/M519 Mini-Programmable Valve Drive Board 50



CANbus

USB Headwired Input Controller Board 51
 MCB200 Headwired Input Controller Board 52
 MCB900 Headwired Input Controller Board 53



Linear Actuators

M750 54
 M751



Roller Rockers

No Tab 55
 Locked Tab
 Forward/Neutral Tab

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 groove 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 $\pm 33.5^\circ$, Uni-Directional $+67^\circ$ |
| 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

JOYSTICKS

- ◆ **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 $\pm 30^\circ$ |
| 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 available - Null, High A and High B |

MODEL 105 PART NUMBERING

For special configurations, please call for assistance



MODEL

M105 Paddle Control

MECHANICAL OPTION

M105 (Bi-directional spring centered)

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.

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.

MODEL 112

Single Axis Joystick

JOYSTICKS

- ◇ Different Handle Designs Available
- ◇ 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 $\pm 30^\circ$ Uni-Directional $\pm 60^\circ$ |
| 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 available

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 $\pm 30^\circ$ |
| Torque | Uni-directional $\pm 60^\circ$ |
| 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

JOYSTICKS

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 \pm 1.5V, 1.5 AMP DIRECTION AUX OUT
57 = 10-30VDC, 2.5V NEUTRAL \pm 1.25V, 1.5 AMP DIRECTION AUX OUT
58 = 5VDC, \pm 30%, NO DIRECTIONAL AUX OUT
59 = 5VDC, \pm 40%, NO DIRECTIONAL AUX OUT
60 = 18-60VDC, SEVCON, 1.5 AMP DIRECTION AUX OUT
61 = 10-30VDC, 2.5V NEUTRAL \pm 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 \pm 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 \pm 2.0V, 1.5 AMP 50% DIRECTION AUX OUT
69 = 5VDC, \pm 10%, NO DIRECTIONAL AUX OUT
70 = 5VDC, \pm 25%, NO DIRECTIONAL AUX OUT

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

- ◆ 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 $\pm 33.5^\circ$, Uni-Directional $+67^\circ$ |
| 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

JOYSTICKS

- ◆ 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 available.

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 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.



SHOWN WITH
PALM GRIP 131

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 $\pm 20^\circ$, between axis $+ 27^\circ$ also available 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 |

- ◆ 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

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)

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

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 $\pm 20^\circ$ Between Axis $+ 28^\circ$ |
| 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

JOYSTICKS

- ◆ **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 |
| Auxiliary ("Switched") Outputs* | 2.5 amps (two per axis) activates @ Out-of-Neutral (20% Deadband) |

Mechanical Data

| | |
|--------------------------|---|
| Travel | On-axis $\pm 20^\circ$ 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 |

For special configurations, please call for assistance



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

FRICITION MODULE

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

ELECTRICAL OPTION (Y-Axis)

ELECTRICAL OPTION (X-Axis)

SPRING

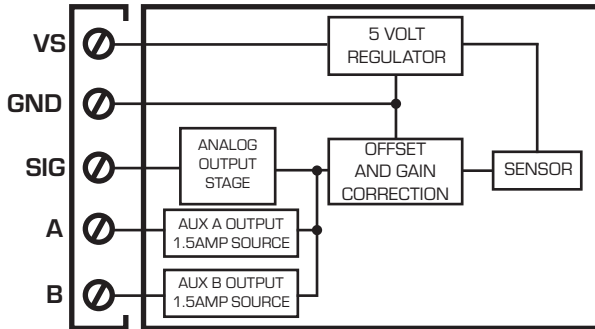
- L** Light
- S** Standard (for most applications)
- H** Heavy

Ordering non-standard spring may increase lead time

ELECTRICAL OPTIONS

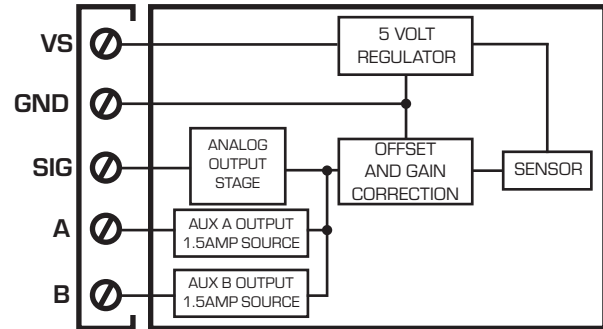
- 56** = 10-30VDC, 2.5V NEUTRAL ± 1.5V, 1.5 AMP DIRECTION AUX OUT
- 57** = 10-30VDC, 2.5V NEUTRAL ± 1.25V, 1.5 AMP DIRECTION AUX OUT
- 58** = 5VDC, ± 30%, NO DIRECTIONAL AUX OUT
- 59** = 5VDC, ± 40%, NO DIRECTIONAL AUX OUT
- 60** = 18-60VDC, SEVCON, 1.5 AMP DIRECTION AUX OUT
- 61** = 10-30VDC, 2.5V NEUTRAL ± 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



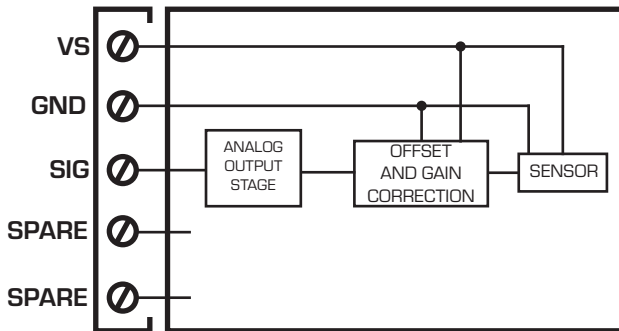
OPTION 56 (30%) EQUIVALENT OUTPUT

- 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-].



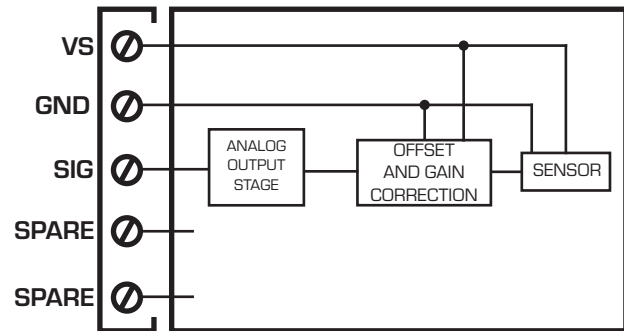
OPTION 57 (25%) EQUIVALENT OUTPUT

- 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-].



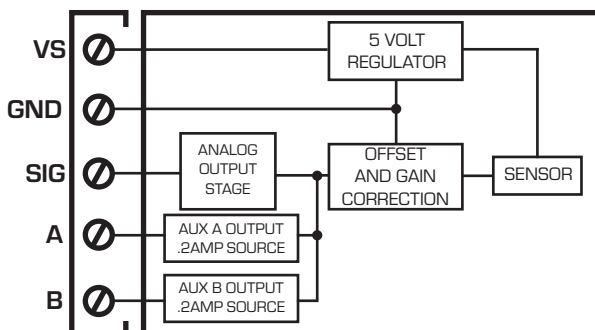
OPTION 58 (30%) EQUIVALENT OUTPUT

- 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.



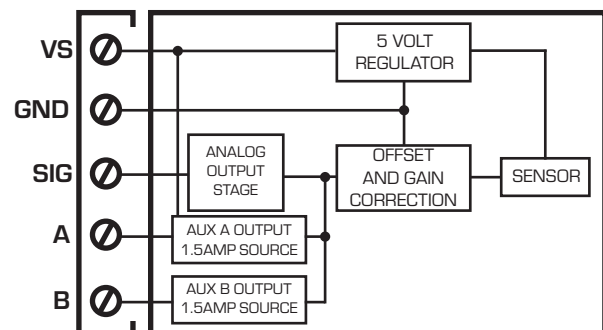
OPTION 59 (40%) EQUIVALENT OUTPUT

- 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.



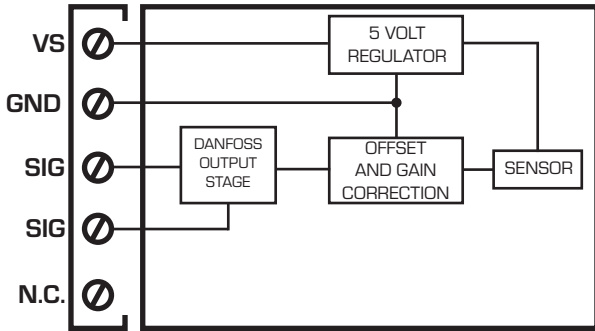
OPTION 60 (SEVCON) EQUIVALENT OUTPUT

- 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-].



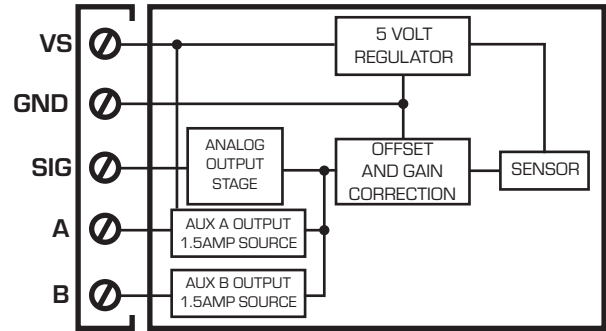
OPTION 61 (40%) EQUIVALENT OUTPUT

- 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-].



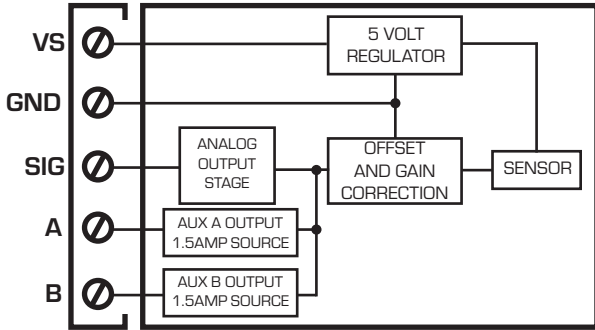
OPTION 62 (DANFOSS) EQUIVALENT OUTPUT

- 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.



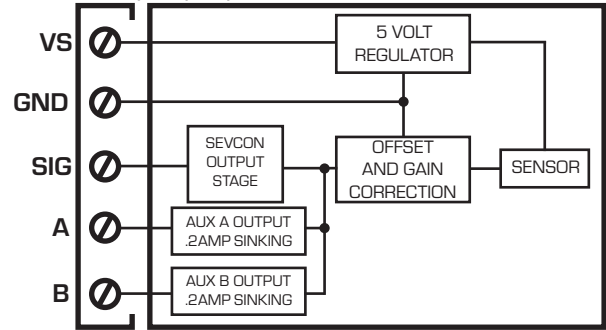
OPTION 63 EQUIVALENT OUTPUT

- 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-).



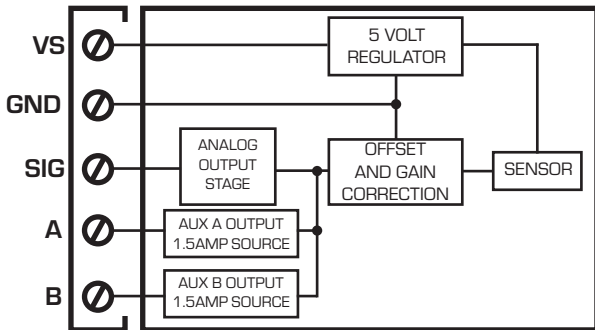
OPTION 64 (30% SWING, 50% AUX) OUTPUT

- 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-).



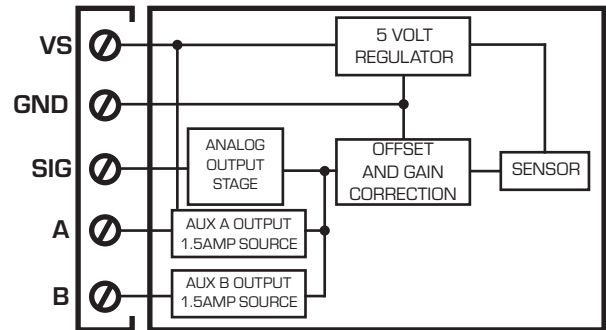
OPTION 65 (PWR PAK) EQUIVALENT OUTPUT

- 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-).



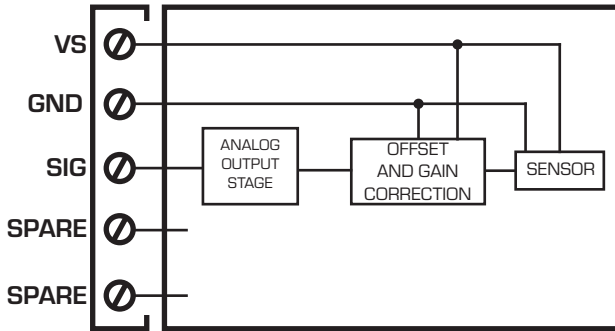
OPTION 67 EQUIVALENT OUTPUT

- 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-).



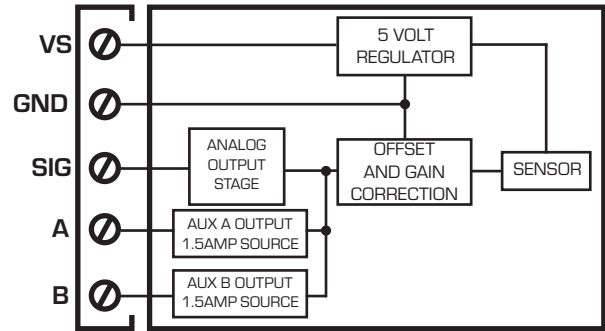
OPTION 68 (40% SWING, 50% AUX) OUTPUT

- 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-).



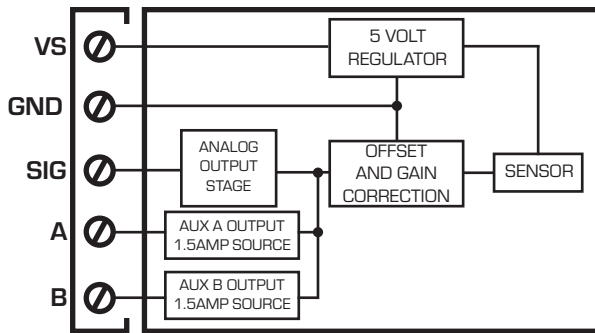
OPTION 69 (30%) EQUIVALENT OUTPUT

- 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.



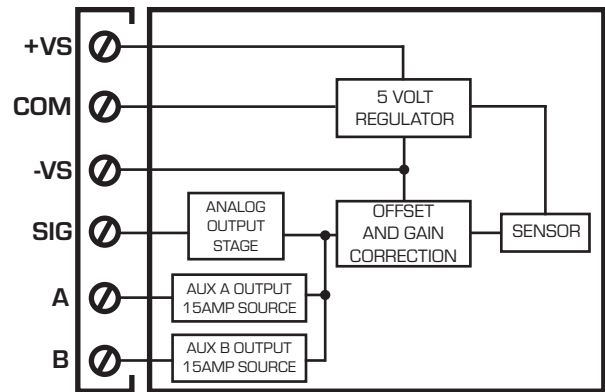
OPTION 71 EQUIVALENT OUTPUT

- 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-).



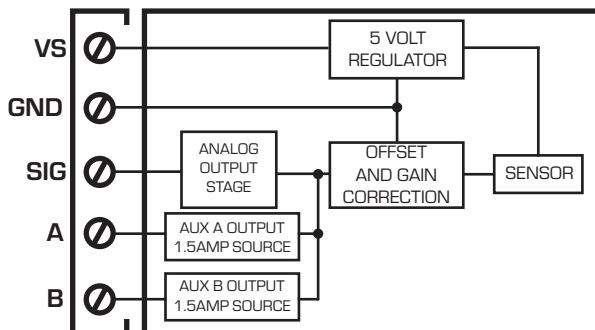
OPTION 72 EQUIVALENT OUTPUT

- 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-).



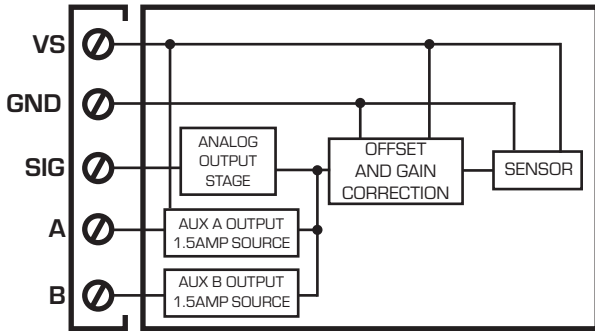
OPTION 73 EQUIVALENT OUTPUT

- 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.



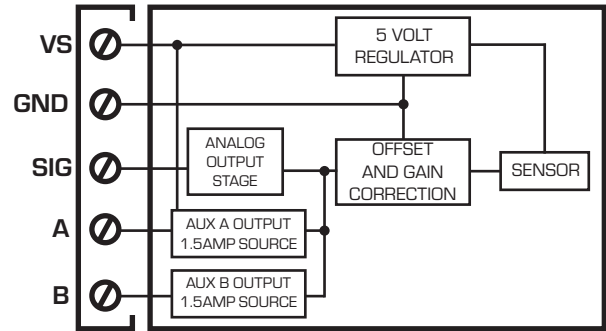
OPTION 74 EQUIVALENT OUTPUT

- 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-).



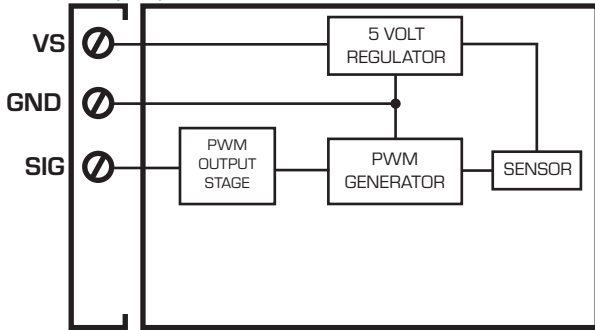
OPTION 76 (40%) EQUIVALENT OUTPUT

- 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-).



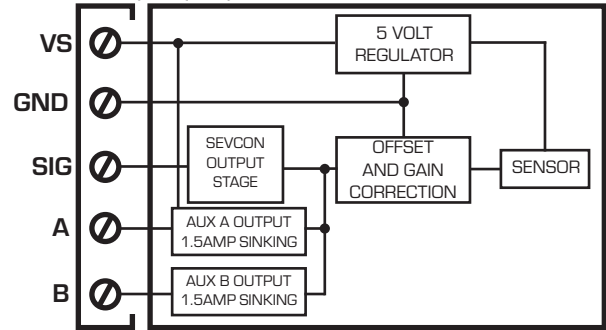
OPTION 78 EQUIVALENT OUTPUT

- 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-).



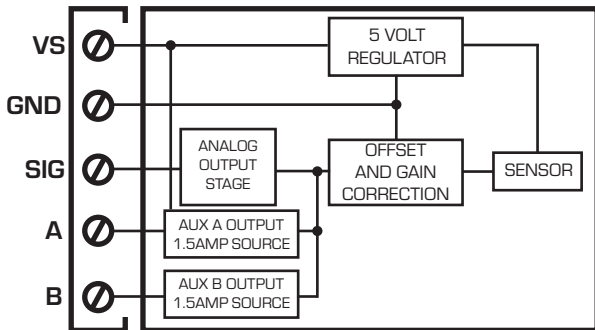
OPTION 79 EQUIVALENT OUTPUT

- 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



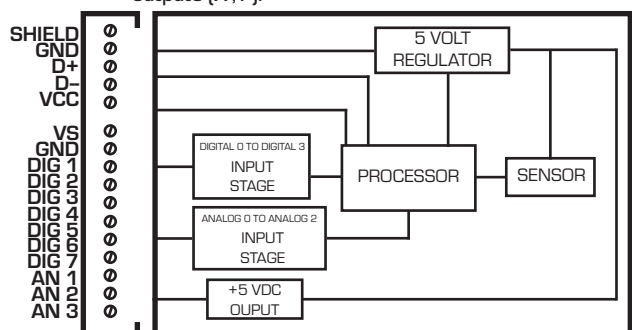
OPTION 80 EQUIVALENT OUTPUT

- 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-).



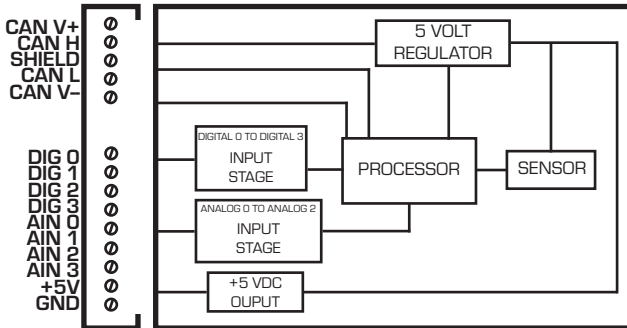
OPTION 82 EQUIVALENT OUTPUT

- 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 83 EQUIVALENT OUTPUT (USB)

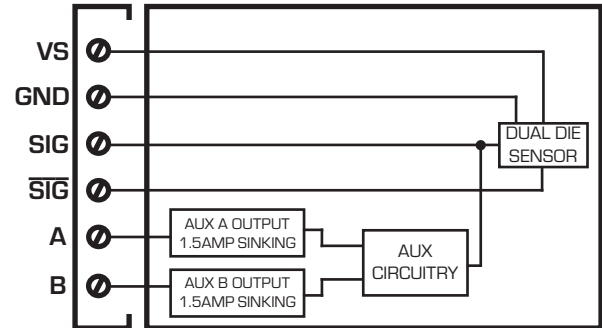
- Notes:
- 1) Voltage supply is to be 5VDC.
 - 2) Current Consumption: 20 mA @ 12VDC.
Output: Centered - 2.50VDC ± 0.075VDC.
Full Positive Deflection - 4.0VDC ± 0.15VDC.
Full Negative Deflection - 1.0V ± 0.15VDC.
 - 3) Max Voltage for the analog and digital inputs: 5 VDC
4 analog inputs including on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



OPTION 84 EQUIVALENT OUTPUT

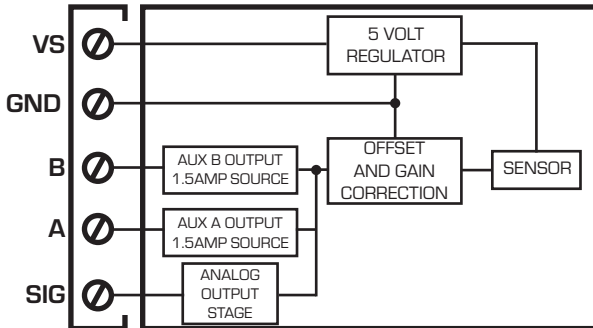
CAN/J1939 MCB200 BOARD ADDRESS = 33 (STANDARD)

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



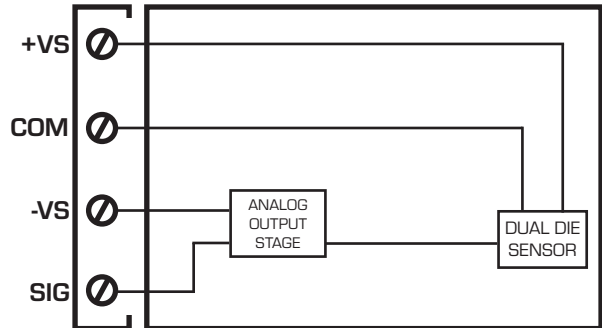
OPTION 86 EQUIVALENT OUTPUT

- Notes:
- 1) Voltage supply is to be 5VDC.
 - 2) SIG = Normal Output SIG = Inverted Output.
 - 3) Current Consumption: 16mA @ 5VDC.
Output: Centered - 2.50V \pm 0.05V (2.45-2.55)
Full Positive Deflection - 4.50V \pm 0.10V. (4.40-4.60)
Full Negative Deflection - 0.50V \pm 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.



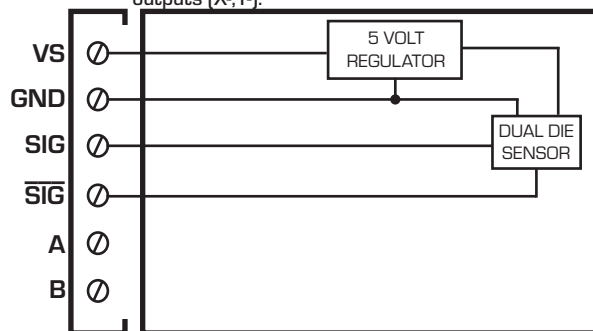
OPTION 87 EQUIVALENT OUTPUT

- Notes:
- 1) Voltage supply is to be 10-30VDC.
 - 2) Current Consumption: 20 mA @ 12VDC.
Output: Centered - 2.50V \pm 0.05V. (2.45-2.55)
Full Positive Deflection - 5.00V \pm 0.2V(4.8-5.2)
Full Negative Deflection - 0.0V \pm 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-).



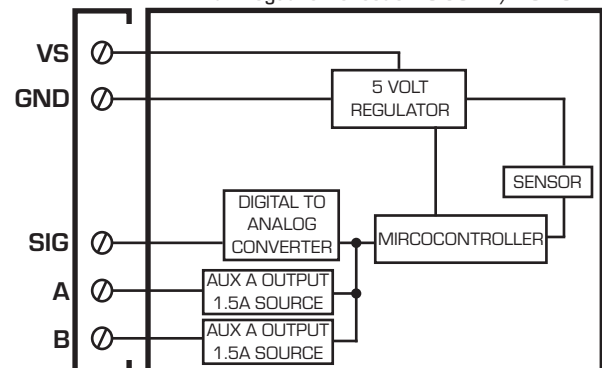
OPTION 88 EQUIVALENT OUTPUT

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



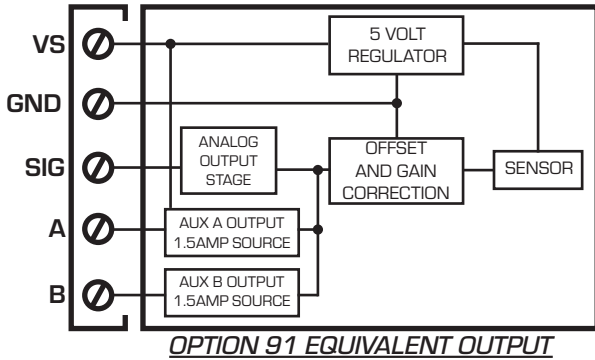
OPTION 89 EQUIVALENT OUTPUT

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



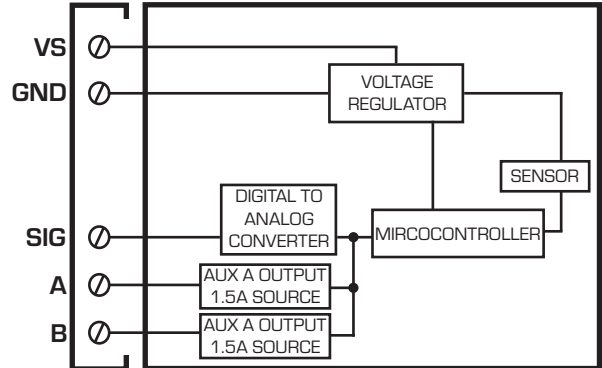
OPTION 90 EQUIVALENT OUTPUT

- Notes:
- 1) Voltage supply is to be 12 - 30VDC.
 - 2) Current Consumption: 73 mA @ 12VDC.
Output: Centered - 0.00VDC \pm 0.20VDC. (-0.20 to +0.20)
Full Positive Deflection: +10V \pm 0.20V. (+9.80 to +10.20)
Full Negative Deflection: - 10V \pm 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-).



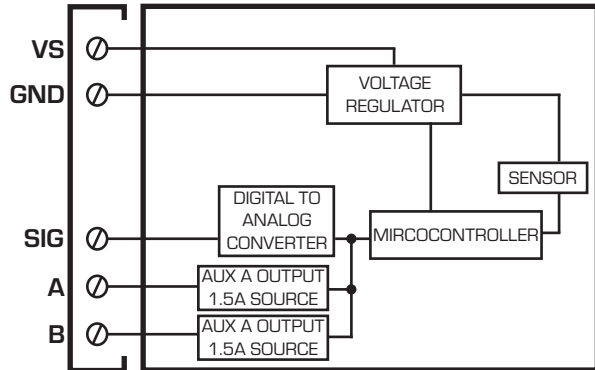
OPTION 91 EQUIVALENT OUTPUT

- Notes:
- 1) Voltage supply is to be 10 - 30VDC.
 - 2) Current Consumption: 20mA @ 12VDC.
Output: Centered - 0.00VDC \pm 0.5VDC. (-0.5 to +0.5)
Full Positive Deflection: +10V \pm 1.00V. (9.0 - 11.0)
Full Negative Deflection: - 10V \pm 1.00V. (9.0 - 11.0)
 - 3) Aux A output switches on VS -0.7VDC @ approx. 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 92 EQUIVALENT OUTPUT

- Notes:
- 1) Voltage supply is to be 12 - 30VDC.
 - 2) Current Consumption: 73mA @ 12VDC.
Output: Centered - 0.00VDC \pm 0.20VDC. (-0.20 to +0.20)
Full Positive Deflection: +5V \pm 0.20V. (+4.80 to +5.20)
Full Negative Deflection: - 5V \pm 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-).



OPTION 93 EQUIVALENT OUTPUT

- Notes:
- 1) Voltage supply is to be 12 - 30VDC.
 - 2) Current Consumption: 73mA @ 12VDC.
Output: Centered - 0.00VDC \pm 0.20VDC. (-0.20 to +0.20)
Full Positive Deflection: +10V \pm 0.20V. (+9.80 to +10.20)
Full Negative Deflection: - 10V \pm 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-).

Grip Options List

GRIPS

- 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, SWITCHED 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 available



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 available

ERGO GRIP

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



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 available 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 available



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 available

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 available



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 available



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 available



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 available

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 available



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 available



MODEL 110

Foot Controller

FOOTPEDAL

- ◆ 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) |
| Switch Rating | 22 Watts Maximum 5A Inductive to 15V 1.5 A Inductive to 30V |

Mechanical Data

| | |
|----------------------------|---|
| Travel - Angle of Movement | Bi-directional: $\pm 10^\circ$ or $\pm 15^\circ$ Uni-directional: $\pm 20^\circ$ |
| | 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 PART NUMBERING

For special configurations, please call for assistance



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)

ELECTRICAL OPTION

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

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

FOOTPEDAL

- ◆ 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



MODEL
111 Foot Pedal

SPRING
S (Standard)
H (Heavy)

ELECTRICAL OPTION

CONNECTION OPTIONS
D Light
P Standard (for most applications)

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 DIRECTIONAL 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 $\pm 87.5^\circ$ 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 available. |
| Operating Temperature | -40° to 85°C [-40° to 185° F] |
| Weather Resistant Packaging | All electronics potted in epoxy |

ROTARY HALL PART NUMBERING

For special configurations, please call for assistance



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

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 $\pm 6^\circ$ 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.



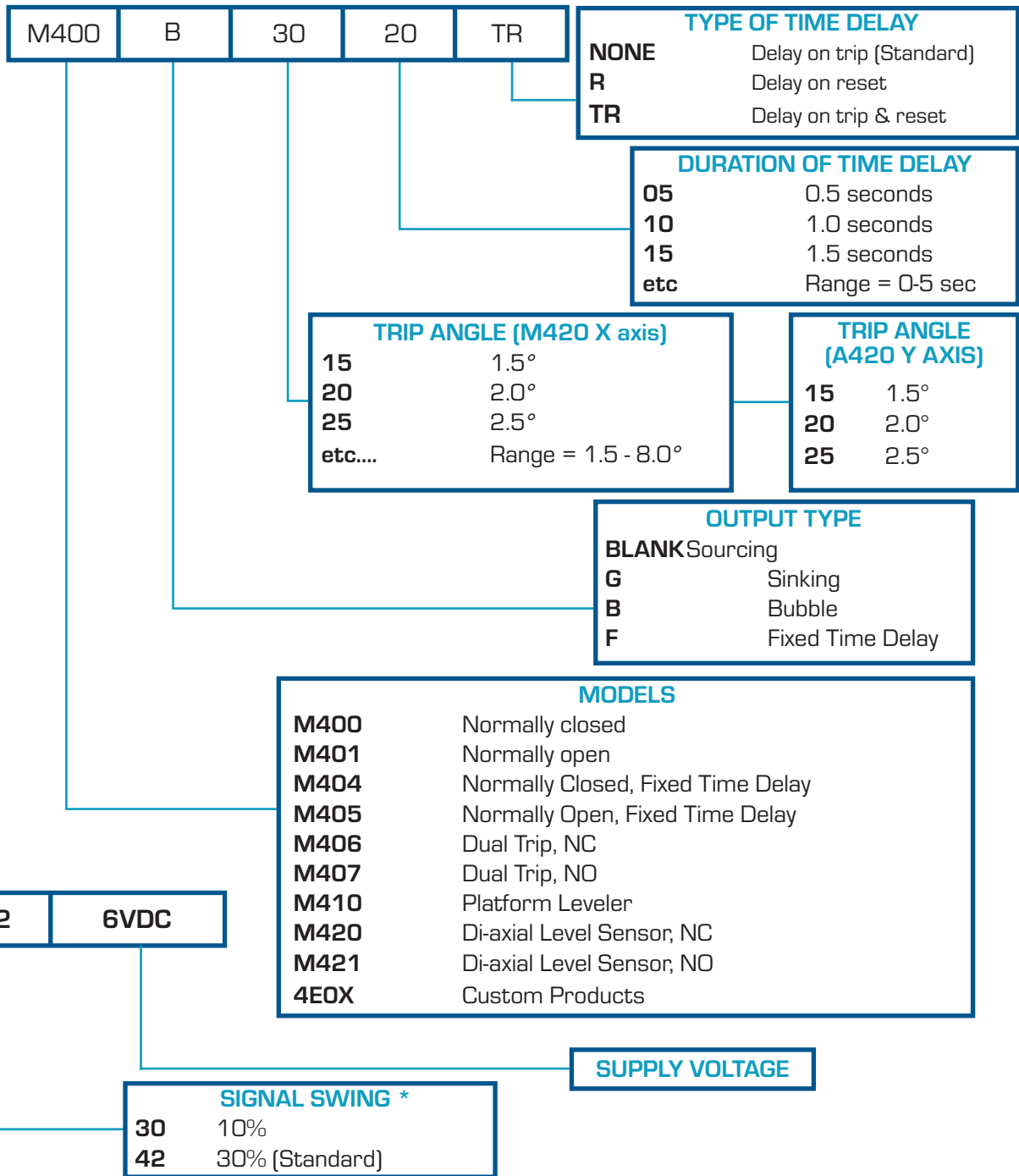
Electrical Data

| | |
|--------------------|------------------------------------|
| Supply Voltage | 6 VDC |
| Current at 6 VDC | 20 mADC |
| Full Signal | $\pm 6^\circ$ (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) |

LEVEL SENSOR PART NUMBERING

Example: M400B-30-20TR

Normally closed, Sourcing, 3° trip angle, 2 sec time delay on reset with Bubble Level



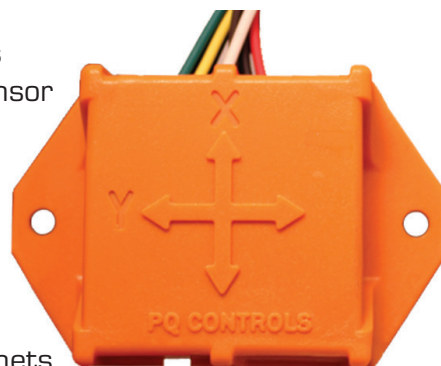
A400 SERIES

Level Sensor

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 components 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 |

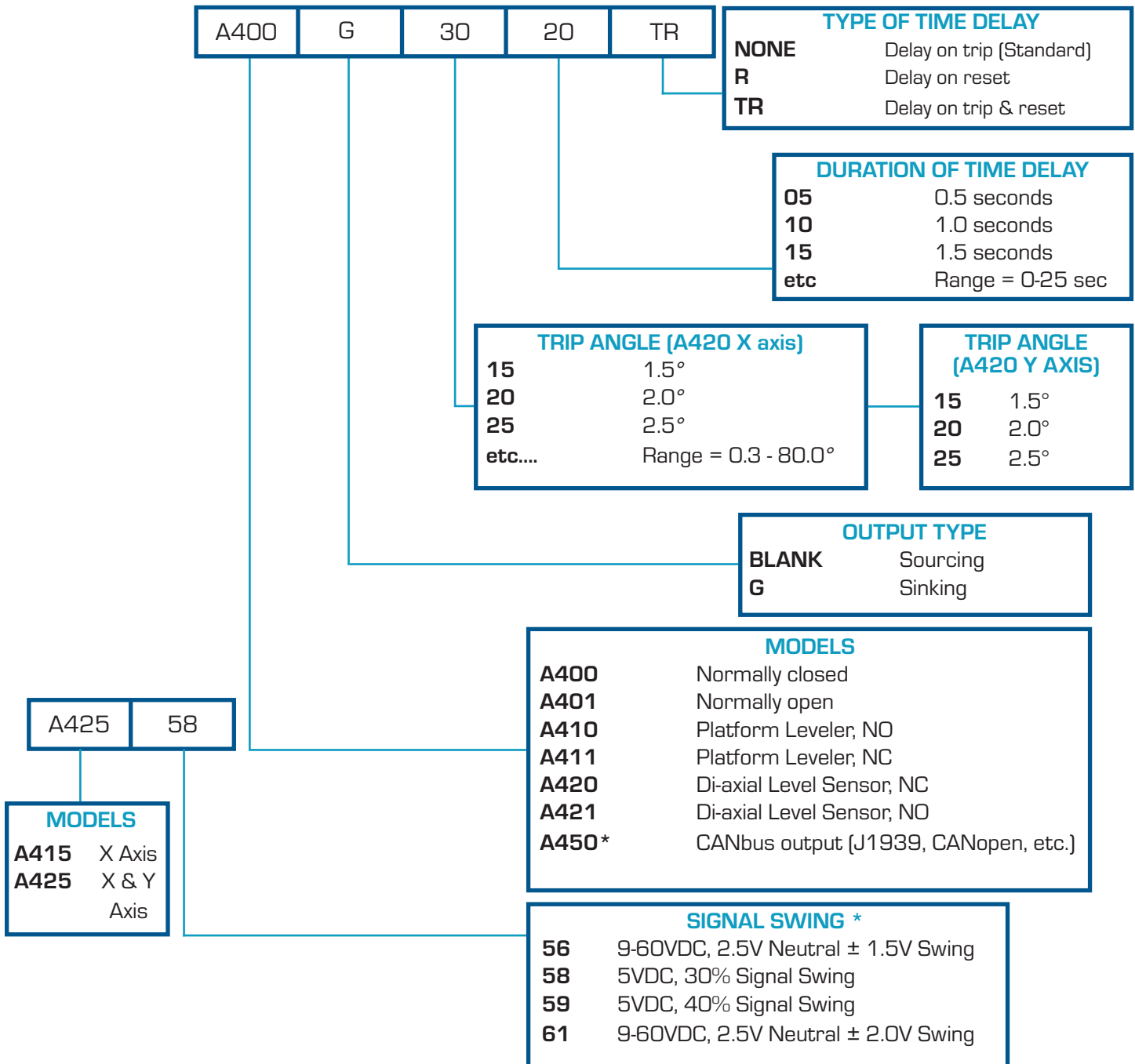
Mechanical Data

| | |
|---------------------------------|---|
| 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 |

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



MODEL 800 SERIES

Angular Display

DISPLAY

- ◇ Visual accuracy 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

VDBOARDS

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

CALIBRATION NUMBER

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
(Flow Control Arrangement)
5 = PWMA, Aux A&B, Com Aux
(Flow Control Arrangement)
6 = PWM A&B, Aux A&B, Com Aux
(Floating connection)

HI RANGE

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

LOW RANGE

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

RAMP FEATURE

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

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 trim pots. 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

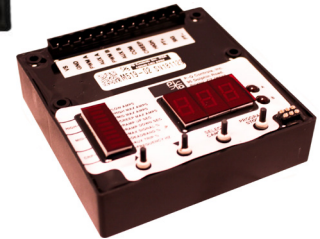
Valve Drive Boards

VDBOARDS

- ◆ On-board, on the fly, programming capability
- ◆ On-board 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 |

- ◆ 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

CANBUS

- ◆ 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 |

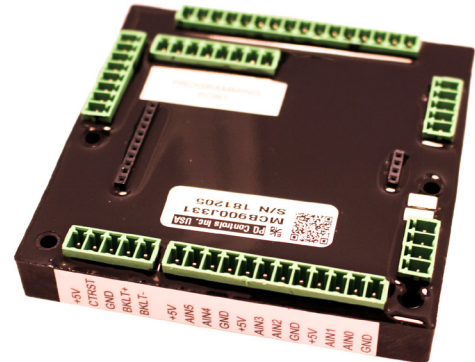
Mechanical Data

| | |
|-----------------------|---------------------------------------|
| 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 available 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 |

MODEL M750/M715

Linear Actuator for Hydraulic Systems

ACTUATORS

- ◇ Economic solution to Electro-proportional Valves
- ◇ Retrofitting is easy
- ◇ Installs quickly and easily by dealer or user
- ◇ Allows continued use of manual levers on valves
- ◇ When power is removed, it's transparent to your existing system
- ◇ Mounts easily, single or ganged with one trunnion bolt
- ◇ Models available 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



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)

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

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.*



Locked Tab Roller



Tabbed Roller

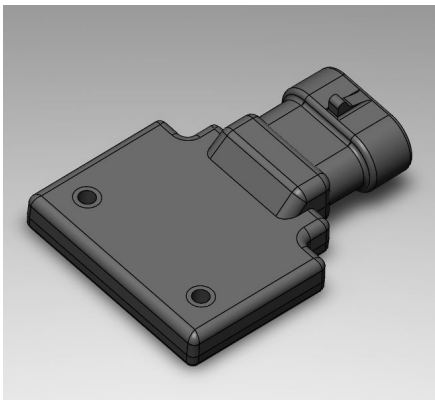


No Tab Roller

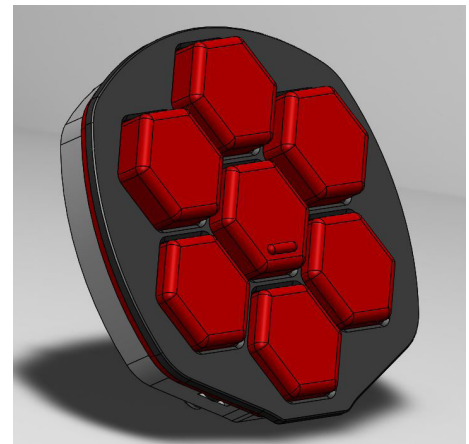
Ongoing Design Thinking

- ◆ 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



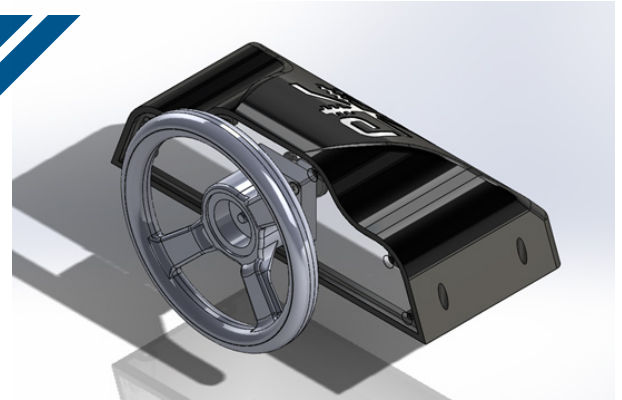
Waterproofing Grip Keypads

FUTURE CONCEPTS

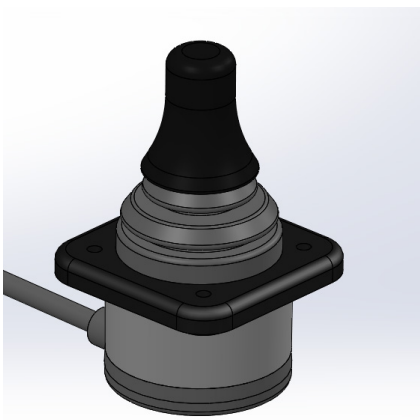


Propel Lever

Steering Controls



New M205 Paddle Joystick



"Submit a Concept,

We can bring it to life"



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PQ CONTROLS

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AUGUST 2019

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