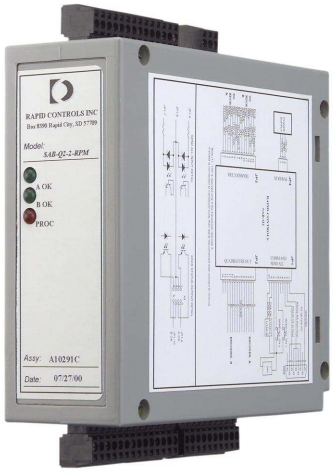
RAPID CONTROLS

Product Specification for SAB-P-D2



The SAB-P-D2 Parallel Interface module measures magnetostrictive transducer position, scales and offsets this position and presents the value as a 24 bit Binary or BCD format parallel output. The 24 outputs are open collector sinking outputs (optionally TTL). The board can function with Start-Stop, Pulse Width Modulated (PWM) or SSI output sensors. The board continually measures the transducer position and updates the latched outputs. A setup mode allows setting of recirculations, transducer length, output format, etc via the RS232/RS485 port. An optional analog output provides position or velocity information in an analog form. Transducer position information is also made available to the host via the RS232/RS485 interface using Modbus ASCII protocol.

Features

- 24 bit Magnetostrictive transducer position, 0.005 mm (0.00019685 in) resolution in Start/Stop mode
- Provides interrogation but can work with asynchronous (internally interrogated) PWM sensors
- Fast operation, outputs can be updated as often as 5000 times per second
- Dip-switch selectable use with Start/Stop, Pulse Width or SSI transducers.
- Twos Complement binary, sign-magnitude binary, BCD or Gray-code output format
- Setup of scale, direction, offset, recirculations and output type is done via a simple serial menu.
- Data ready output active during strobe of new data
- Sensor is electrically isolated from the host connections
- RS232 or RS485 multi-drop communications at 9600, 19200, 38400 or 57600 baud
- Analog Option provides 16 bit D/A converter for position or velocity output
- Single +12 to +28 VDC power input
- Status LEDs indicate sensor and host state
- Supports subset of Modbus ASCII
- Watch dog timer for reset upon software failure
- EEPROM for nonvolatile storage of setup parameters.

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Specifications

- 24 bit Magnetostrictive transducer measurement
- Sensor is electrically isolated from host communications
- PWM, Start/Stop or SSI are Dip Switch Selectable
- Provides differential interrogation but can work with (internally or host interrogated) PWM sensors
- 26 open collector position and status outputs. Max 50V and 500 ma. Pull-ups installed.
- 34 Pin IDC header for status and 24 bit binary/BCD output.
- Data ready output goes low for 60 microseconds to indicate busy during update of the output. Data is actually latched 35 microseconds after Data Valid goes low and 25 microseconds before it returns high.
- Basic measurement resolution of 0.005 mm (0.00019685 Inch) with one recirculation Start/Stop
- Update rate: 125 to 5000 updates per second.
- 28 MHz 89C450 Processor with 64K Flash and 1K local RAM and Watchdog Timer.
- Power: +12V to +28 VDC at < 400 ma.
- DIN Rail Mount occupies 1.5 inches of rail space.
- Analog Output Option:
  - Output represents Forced value, Position or Velocity
  - Output ranges: +/- 10V, +/- 5V, +/- 2.5V , 0 - +5V and 0- +10V).
  - 16 bit DAC resolution
  - Polarity and Scale are setup options.

Mechanical Specifications

- 45 mm (1.77 in) wide by 137.5 mm (5.41 in) deep and 118 mm (4.65 in) high

Ordering:

Model Number SAB-P-D2-xxx-y

Where xxx = digital output type
xxx = omit or SNK for current sinking output drivers
xxx = TTL for Bipolar TTL output drivers
y = omit or N for no analog output
y = A for analog retransmission output

MK292 Replacement

The SAB-P-D2 Parallel Interface module can be used to replace the MK292 module in most applications.. Please contact Rapid Controls for assistance configuring the SAB-P-D2 for this.

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The SAB-P-D2 is comprised of a base board with processor, serial communications and the sensor interface. A daughter board is installed with the parallel output drivers and the optional analog output.

Base board

Baseboard Dip Switch

Dip Switch S1 controls elementary setup for the SAB-P. Further setup items are available in the serial menu.

Dip Switch S1- S3 select the Node ID for Modbus ASCII Communications

S1	*S2*	*S3*	*Node ID*
Off	Off	Off	0
On	Off	Off	1
Off	On	Off	2
On	On	Off	3
Off	Off	On	4
On	Off	On	5
Off	On	On	6
On	On	On	7

Dip Switch S4- S5 select the Baud Rate for serial Communications

S4	*S5*	*Baud rate*
Off	Off	9600
On	Off	19200
Off	On	38400
On	On	57600

Dip Switch S6 selects the SSI Clock Speed (When SSI is selected)

S6	*SSI Clk Speed*
Off	173 KHz
On	86.5 KHz

Dip Switch S7- S8 select the Transducer Type

S7	*S8*	*Transducer Type*
Off	Off	Start Stop
On	Off	PWM
Off	On	SSI 24 Bit
On	On	SSI 25 Bit

Baseboard LED indicators:

There are three LEDs on the front panel of the SAB-P-D2 labeled ‘PROC’, ‘MODB’ and ‘XDCR’

The red LED labeled ‘Proc’ blinks to indicate that the board is active and running. The rate of the blink is controlled by the update rate of the sensor. The red LED is on steady and does not blink while in the setup mode.

The green LED labeled ‘MODB’ toggles between lit and dark each time a valid Modbus message is received.

The green LED labeled ‘XDCR’ indicates the status of the transducer. A steady lit LED indicates a good transducer. This light should be on solid without flickering.

Baseboard Jumpers:

X1: Jumper X1 should be removed unless instructes by the factory to re-program the micro-controller.

X2: Jumper X2 selects the serial communications receive interface.
X2 1-2 RS485.
X2 2-3 RS232

X3: Jumper X3 connects RS485 line termination
X3, 1-2 and 3-4 should be installed on the last device on an RS485 network. These jumpers should be removed for all but the last device.

Baseboard Connectors:

Connector JP1 (DB9F serial connector)

JP1-1	RS485-
JP1-2	RS232 Receive from the Host.
JP1-3	RS232 Transmit to the Host.
JP1-4	RS232 DTR In (Unused except when reprogramming the microconroller)
JP1-5	Logic ground
JP1-6	N/C
JP1-7	N/C
JP1-8	N/C
JP1-9	RS485+

Connector JP2 (Transducer Connector)

JP2-1	Transducer Ground	(Electrically Isolated from the power supply ground)
JP2-2	Interrogate + to the transducer	(Clk+ for SSI)
JP2-3	Interrogate - to the transducer	(Clk- for SSI)
JP2-4	Gate + from the transducer	(Data+ for SSI)
JP2-5	Gate - from the transducer	(Data- for SSI)

Note: If it is desired to power the board from the transducer power supply jumper wires must be installed external to the board connecting JP2-1 to JP3-8 and JP3- 7 to the sensor power supply.

Connector JP3 (Input power and status)

JP3-1:	N/C reserved
JP3-2:	N/C reserved
JP3:3:	N/C reserved
JP3:4:	N/C reserved
JP3-5:	Status relay contact 1 (Dry Relay contact) Closed when transducer is good
JP3-6:	Status relay contact 2 (Dry Relay contact) Closed when transducer is good
JP3-7:	24V (+12 to 25 VDC power input to the board)
JP3-8:	24V COM (Power common)

Open Collector (Sinking) Parallel Output Daughter board

LEDs

The Hold LED Indicates the state of the Data Hold input. If this LED is lit the data will not be updated on the outputs. The D8 LED must not be lit for the outputs to be updated.

The TriState LED Indicates the state of the Output Enable input. If this LED is not lit the outputs are tri-stated and will not pull low. The D3 LED must be lit for the outputs to actively driven.

Daughter board jumpers

X5: Data Hold Input polarity

X5 1-2 for a low Data Hold signal
X5 2-3 for a high Data Hold signal.

X6: Bypass Data Hold polarity diode

X6 Installed bypasses the Data Hold input polarity diode. Typically used when a TTL output is driving the data hold input and 5V is applied to VIN.
X6 Removed places a diode in series with the Data Hold input.

X7: Output Enable polarity

X7 1-2 for a High Output Enable signal
X7 2-3 for a Low Output Enable signal.

X8: Bypass Output Enable polarity diode

X8 Installed bypasses the Output Enable input polarity diode. Typically used when a TTL output is driving the Output Enable input and 5V is applied to VIN.
X8 Removed places a diode in series with the Output Enable input.

X9: External Start polarity

X9 1-2 for a High External Start signal
X9 2-3 for a Low External Start signal.

X10: Bypass External Start polarity diode

X10 Installed bypasses the External Start input polarity diode. Typically used when a TTL output is driving the External Start input and 5V is applied to VIN.
X10 Removed places a diode in series with the External Start input.

JP6 Optional Analog output connector

JP6-1 Analog output
JP6-2 Analog common
JP6-3 N/C

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JP4 Parallel output connector (34 pin IDC) for sinking outputs

JP4 - 1: 2^0	BCD digit 1 (least significant)
JP4 - 2: 2^1	
JP4 - 3: 2^2	
JP4 - 4: 2^3	
JP4 - 5: 2^4	BCD digit 2
JP4 - 6: 2^5	
JP4 - 7: 2^6	
JP4 - 8: 2^7	
JP4 - 9: 2^8	BCD digit 3
JP4 - 10:2^9	
JP4 - 11:2^10	
JP4 - 12:2^11	
JP4 - 13:2^12	BCD digit 4
JP4 - 14:2^13	
JP4 - 15:2^14	
JP4 - 16:2^15	
JP4 - 17:2^16	BCD Digit 5
JP4 - 18:2^17	
JP4 - 19:2^18	
JP4 - 20:2^19	
JP4 - 21:2^20	BCD Digit 6
JP4 - 22:2^21	
JP4 - 23:2^22	
JP4 - 24:2^23	Polarity or Sign Bit in Sign/Magnitude binary mode (High indicates negative)
JP4 - 25	Data Ready Output (Latch Pulse). When low outputs are changing. Low for approximately 60 usec. Data Changes after 30 usec. The rising edge can be used to strobe data to the host.
JP4 - 26	Error output. When low indicates loss of feedback or that the update time is too short for the number of recirculations. When high no errors are present.
JP4 - 27	Data hold input (Latch Inhibit). When High inhibits data from updating.
JP4 - 28	Tri-State Input. When high the outputs are tri-stated.
JP4 - 29	DC Common
JP4 - 30	Reserved for future use.
JP4 - 31	Kickback Protect Power supply. For inductive loads this point terminates the reverse voltage diodes present on the 5801 output drivers. For sinking applications connect to the positive load power supply. This may be left unconnected for non-inductive loads. See below for more information.
JP4 - 32	Vin (5-24 VDC) System voltage used to pull up the outputs.
JP4 - 33	Kickback protect supply (see 31)
JP4 - 34	Vin (5-24 VDC) System voltage used to pull up the outputs.

Kickback Protection

Snubbers are frequently used in electrical systems with an inductive load, such as relays or coils. The sudden interruption of current flow often leads to a sharp rise in voltage across the device. This sharp rise in voltage is a transient and can damage and lead to failure of the controlling device. A spark may be generated, which can cause electromagnetic interference in other circuits. The snubber prevents this undesired voltage by conducting transient current around the device. Diodes are often used for this snubber effect in DC circuits.

The diode snubbers are often wired directly across the inductive load but the SAB-P module provides a built in snubber diode for each output pin. These are present in the 5801 drivers used. The anode of these diodes must be connected to the positive power supply that is powering the inductive device. The SAB-P provides two pins for this function JP4-31 and JP4-33.

It is only necessary to connect pin JP4-31 and/or JP4-33 when and inductive load such as a relay is being driven by the SAB-P and the load does not have an in-built snubber diode.

Resistor Packs Z1, Z2, Z3

Resistor packs Z1, Z2 and Z3 are installed to pull the outputs up to the system voltage brought to the board on JP4. The default value of these pull-ups is 3.3K, which works well for most applications. If the outputs of a SAB-P-D2-SNK are going to be used with 5 Volt TTL inputs, then these resistor packs can be changed to increase the speed. A value of 390 or 470 ohms will optimize the rise time of the outputs. When driving optically isolated inputs these resistor packs can usually be removed to decrease power consumption.

TTL Parallel Output Daughter board

LEDs

The Hold LED Indicates the state of the Data Hold input. If this led is lit the data will not be updated on the outputs. The D8 LED must not be lit for the outputs to be updated.

The TriState LED Indicates the state of the Output Enable input. If this led is not lit the outputs are tri-stated and will not pull low. The D3 LED must be lit for the outputs to actively driven.

Daughter board jumpers

X5: Data Hold Input polarity

X5 1-2 for a low Data Hold signal
X5 2-3 for a high Data Hold signal.

X6: Bypass Data Hold polarity diode

X6 Installed bypasses the Data Hold input polarity diode. Typically used when a TTL output is driving the data hold input and 5V is applied to VIN.
X6 Removed places a diode in series with the Data Hold input.

X7: Output Enable polarity

X7 1-2 for a High Output Enable signal
X7 2-3 for a Low Output Enable signal.

X8: Bypass Output Enable polarity diode

X8 Installed bypasses the Output Enable input polarity diode. Typically used when a TTL output is driving the Output Enable input and 5V is applied to VIN.
X8 Removed places a diode in series with the Output Enable input.

X9: External Start polarity

X9 1-2 for a High External Start signal
X9 2-3 for a Low External Start signal.

X10: Bypass External Start polarity diode

X10 Installed bypasses the External Start input polarity diode. Typically used when a TTL output is driving the External Start input and 5V is applied to VIN.
X10 Removed places a diode in series with the External Start input.

JP6 Optional Analog output connector

JP5-1 Analog output
JP5-2 Analog common
JP5-3 N/C

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JP4 Parallel output connector (34 pin IDC) for TTL outputs

JP4 - 1: 2^0	BCD digit 1 (least significant)
JP4 - 2: 2^1	
JP4 - 3: 2^2	
JP4 - 4: 2^3	
JP4 - 5: 2^4	BCD digit 2
JP4 - 6: 2^5	
JP4 - 7: 2^6	
JP4 - 8: 2^7	
JP4 - 9: 2^8	BCD digit 3
JP4 - 10:2^9	
JP4 - 11:2^10	
JP4 - 12:2^11	
JP4 - 13:2^12	BCD digit 4
JP4 - 14:2^13	
JP4 - 15:2^14	
JP4 - 16:2^15	
JP4 - 17:2^16	BCD Digit 5
JP4 - 18:2^17	
JP4 - 19:2^18	
JP4 - 20:2^19	
JP4 - 21:2^20	BCD Digit 6
JP4 - 22:2^21	
JP4 - 23:2^22	
JP4 - 24:2^23	Polarity bit in the Sign/Magnitude mode (high indicates negative)
JP4 - 25	Data Ready Output (Latch Pulse). When low outputs are changing. Low for approximately 60 usec. Data Changes after 30 usec. The rising edge can be used to strobe data to the host.
JP4 - 26	Error output. When low indicates loss of feedback or that the update time is too short for the number of recirculations. When high no errors are present.
JP4 - 27	Data hold input (Latch Inhibit). When High inhibits data from updating.
JP4 - 28	Tri-State Input. When high the outputs are tri-stated.
JP4 - 29	DC Common
JP4 - 30	Reserved for future use.
JP4 - 31	N/C
JP4 - 32	Vin 5V out.
JP4 - 33	N/C
JP4 - 34	Vin 5V out

Resistor Packs Z1, Z2, Z3

Not installed.

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Operation

At power on, the board immediately retrieves the setup values from the Dip-Switch and EEPROM memory and begins normal operation. Normal operation consists of interrogating the transducer each update time and outputting the scaled and offset value to the parallel and optional analog outputs along with status information. The board also allows host communications at any time.

Setup Mode

The SAB-P-D2 module ships from the factory with default values installed. The default setup is as follows:

Units = inches
Gradient = 9.0 usec per inch
Resolution = .001 inch
Measured Stroke Length = 100 inches
Update Time = 2.0 milliseconds
Direction = Increases
Offset Value = 0
Output Format = Binary
Output Type = True
Optional Analog = Forced to 0 volts (Note that Analog Output is an option.)

Setup is accomplished with a terminal or computer connected to the serial communication interface via the 9 pin DSUB connector. To enter the 'Setup Mode' type 3 ESCAPE characters within 2 seconds at the dip-switch selected baud rate. The board will acknowledge with the setup menu. The board is then in the 'Setup Mode' and the red LED will be on steady. Setup values are stored in a nonvolatile EEPROM memory device on the board. Exiting the main setup menu returns the board to the operation mode.

The Main Setup Menu:

```
Rapid Controls SAB-P SSI to Parallel converter Jan 26 2007
SSI Clock Speed 173 KHz
U - Units: inches
R - Resolution: 0.001000 inches
T - Update Time: 2.0 msec Forced
G - Gradient: 9.0000000
C - Scale: 1.00000000
O - Offset: 0.000000
M - Measured Stroke Range: 101.000000
D - Direction: Decreases
Y - Output Type: True
B - Output Format: Binary
Z - Zero at current position
S - Save to EEPROM
L - Restore from EEPROM
F - Factory Defaults
V - View sensor position
Q - Quit Menu


Select [URTGCOMDYBZSLEFVAQ]
```

The Main Setup menu allows changing all parameters except the optional analog output settings. Select the desired menu item by pressing the appropriate key as listed. You will be prompted for the input data. The input takes effect immediately but will not be saved to the EEPROM until the save key is pressed. You may retrieve the stored setup values at any time or default to Factory settings.

Main Menu Items

U- Units

Inches or millimeters

This value cycles between inch and mm each time you press the key.

R- Resolution

Enter the measured resolution of the sensor in the selected units.

In the case of an SSI sensor this value is predetermined at the factory and can be read from the model number.

In the case of an Start/Stop or PWM sensor this is the 'desired' measurement resolution. When using a scale of 1.0 this will be the value or weight of the least significant bit of the output binary word. For PWM or Start/Stop sensors this value must be greater than or equal to the basic resolution of .005 mm (0.00019685039 inches).

The resolution is also used for part of the analog output calculation. For accurate analog output with an SSI transducer, the resolution must be set to the resolution marked on the side of the transducer.

H- SSI Sensor Output Coding

SSI sensors with binary output coding and SSI sensors with Gray coding are supported by the SAB-P-D2. Select 'Binary' for binary output sensors; select 'Graycode' for Gray Code output sensors.

P- PWM Recirculations (PWM sensors only)

A PWM sensor can be recirculated, or measured multiple times in quick succession, to increase the effective resolution. The sensor must be programmed at the factory to support recirculation internally. Set the number of internal recirculations the sensor is using (1-8). This setting has no effect for sensor types other than PWM.

T- Update Time

This menu item allows adjustment of the sensor update time. The sensor update time must be long enough to accommodate the length of the transducer, which requires approximately 9 microseconds per inch. If it is a PWM sensor it requires 9 microseconds per inch per recirculation. Use the +/- keys to adjust this value by 200 microsecond intervals. Or you may alternatively select the 'A' key to have the update time calculated automatically. You will be prompted for the stroke length of the transducer.

For a Start/Stop transducer with a stroke of 48 inches the minimum allowable update time will be (9 * (48 +4)) or 468 microseconds. Set the update time to the nearest value that is greater than the calculated update time, 600 microseconds.

G- Gradient

Enter the gradient value from the transducer label. It is entered in microseconds per inch regardless of the units type selected.

NOTE: When the SSI Type is selected, the gradient is not used.

C- Scale

Enter a value to scale the measured sensor data. This value defaults to 1.0 but can be used to scale the output to a value other than the measured value. For instance, if an SSI transducer has a resolution of 5

microns and the desired value of an output bit is 10 microns set the scale to 0.5. Although you may enter a scale value greater than 1.0 the actual resolution is not increased.

O- Offset

The offset value is entered in units and is subtracted from the position value before it is output over the parallel interface.

M- Measured Stroke Range

This value is used when the direction is set to decreasing and allows offset values to be positive. Enter the maximum operational length of the sensor in the selected units. This does not have to be the sensor length but can be the maximum extended position of the magnet. Set this value after the units and resolution have been entered. Default = 100.00.

D- Direction

This value toggles between Increases and Decreases each time the key is pressed. Increases means the value of the count will increase as the magnet moves away from the head of the transducer. Decreases means the value of the count will decrease as the magnet moves away from the head of the transducer.

Y- Output Type

This value toggles between True and Complemented each time the key is pressed. The meaning of this varies with the output hardware.

Hardware	True	Complemented
Sinking	0 is high and 1 is low	0 is low and 1is high
TTL	0 low and 1 is high	0 is high and 1 is low

This setting affects only the 24 data bit outputs and does not affect the control inputs or status outputs, which remain consistent as described in the JP4 connector description.

B- Output Format

This value toggles between 2's complement binary, Sign Magnitude Binary, BCD and Graycode each time the key is pressed. In the BCD mode the maximum value is 999,999 * resolution. For example if 0.001 is the resolution then the maximum span is 999.999 inches. There is no sign bit for BCD.

In 2's complement binary format the output is 2's complement and 2^23 is the sign bit. The range of values possible is (-8,388,608 to 8,388,607) * resolution. For example: If the resolution is set to 0.001 inches the range is –8,388.608 inches to 8,388.607 inches.

In Sign Magnitude binary format bits 2^0 through 2^22 are always the magnitude and 2^23 indicates the sign. Bit 23 is high when the value is less than 0 and low when the value is greater than 0.

In Graycode, the output will be output using reflected binary coding, or Gray code.

Z- Zero at current position

This will set the offset so that the current position is 0.

S- EEPROM Save

Press this key to save the setup values, currently in effect, to the EEPROM memory.

L- EEPROM Restore

Press this key to restore the values from the EEPROM. They will take effect immediately.

F- Factory Defaults

Press this key to change the setup values, currently in effect, to the factory defaults.

V- View Sensor Data

This menu item allows you to view the sensor position information as it comes from the sensor and as it will be presented on the binary outputs. While the data is being printed you may press the 'Z' key to zero the position at the current location or the 'M' key to show a maximum and a minimum value. Pressing 'M' again will reset the maximum and minimum values. Press the 'Q' key to return to the main menu.

A- Analog Menu

When the optional Analog hardware is installed the Analog menu item will appear. Press this key to enter the Analog Output submenu. See below for a description of the Analog Output submenu.

Q- Quit

Press this key to quit the menu and return to normal operation.

The Analog Output Menu (Only present when the Analog Option is installed)

H- Analog Hardware Output Range

Toggle between the possible Analog Hardware Output ranges that the board can produce. The following table summarizes the output ranges.

Output Range	Analog Start	Full Scale
0 to 5V	0	5V
0 to 10V	0	10V
-5V to +5V	-5V	5V
-10V to _ 10V	-10V	+10V
-2.5V to + 2.5V	-2.5V	+2.5V

S- Analog Output Source

Toggle between the three possible Analog Output sources, Force, Position and Velocity. The menu will change based on the selection.

The Velocity Analog menu

```
Analog Menu
H- Hardware range 0 to +10V
S- Analog Source:  Velocity
   T- Analog Velocity Update Time 100.0 msec
   V- Analog Velocity Full Scale 1.000000 inches/sec
Q- Return to the main menu

Select [HSTVQ]
```

V- Analog Velocity Full Scale

Enter the velocity represented by full-scale analog output.

T- Analog Velocity Time-base

Enter the time over which the velocity is measured. This must be set in increments of the update time and will always be forced to these increments.

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The Position Analog Menu

```
Analog Menu
H- Hardware range 0 to +10V
S- Analog Source:  Position
   D- Analog Direction Increases
   R- Analog Position Span 10.000000inches
   B- Analog Position Start 5.000000inches
Q- Return to the main menu

Select [HSDRBQ]
```

D- Analog Direction

Toggles the analog direction between Increases and Decreases. When set to Increases the analog value increases as the position increases. When set to Decreases the analog value has an inverse relationship to the position value, decreasing as the position increases.

R- Analog Position Span

Enter the position value to be represented by the full-scale analog output. In the Bipolar ranges this would be the stroke represented by –2.5V to +2.5V, –5V to +5V or –10V to +10V. In the Unipolar ranges this is the stroke represented by 0 to +2.5V, 0 to +5V or 0 to +10V.

B- Analog Position Start

Enter the position value to be used as the start of the analog span. This is the position represented by 0 volts.

O- Analog offset

Enter a value to offset the position information with, before applying it to the DAC. This value is subtracted from the scaled and offset position information before it is scaled for the D/A output. For example: If you would like the D/A output minimum value to start at 11.000 inches and increase from there, enter 11.000.

The Forced Analog Menu

```
Analog Menu
H- Hardware range -10 to +10V
S- Analog Source:  Forced Value
   F- Forced Analog output Percent 100.000000
Q- Return to the main menu

Select [HSFQ]
```

F- Forced Analog output Percent

Enter the percentage of the full-scale voltage that you would like to set the analog output to. In the bipolar ranges you may enter –100 to + 100%. In the Unipolar ranges 0 to 100%.

Setup Considerations

Start/Stop

For Start/Stop transducers, the basic measurement resolution is 0.005 mm (0.00019685039 inches). This is the minimum value that can be represented by bit 2^0 (JP4-1). With a Scale of 1.0 the 2^0 bit output at JP4-1 will have this weight. The weight of bit 2^0 can be increased (less resolute) by using a scale less than 1.0. For example a scale of 0.5 will result in a weight of 0.01 mm (0.00039370079)

PWM

For PWM sensors, recirculations are used to increase resolution. The number of recirculations is controlled in the transducer. The number of recirculations and the gradient will determine both the resolution and the time required for the update of the transducer. A single recirculation is the time it takes for the propagation of the signal from the magnet to the head of the transducer. This is nominally 9 microseconds for each inch. Using more than one recirculation allows greater measurement resolution and provides averaging as well but also requires more time. To calculate the number of time required add 4 inches to the useable length, multiply by 9 and multiply again by the number of recirculations, then add a safety factor of 50. When the PWM type is selected you must enter a recirculations value. The following table indicates the approximate resolution and time versus the number of re-circulations.

Re-circulations	32 inch transducer	100 inch transducer
1	0.4 msec	1.0 msec
2	0.8 msec	1.8 msec
4	1.4 msec	3.8 msec
8	2.8 msec	7.6 msec
16	5.4 msec	N/A

SSI

The SSI transducer returns position information to the SAB-P as a digital value. Because of this, the gradient setting is not used when the SAB-P is configured for an SSI sensor. The scale can be used to alter the SSI resolution if required.

RS485 Communications and Turn Around Delay

The RS-485 turnaround delay is fixed at 3 milliseconds

Host Communications

The module communicates via the RS232 or RS485 serial interface. In normal operation the module will respond to Modbus ASCII queries however the module can be placed in the Setup mode anytime by entering 3 ASCII escape characters within 2 seconds.

The board communicates to a host computer via RS232 or RS485 using a limited subset of the MODBUS protocol. See *Modbus Protocol Reference Guide*.

Read holding Registers: ":XX0300YY00ZZCS[CR]"

Where XX is the hexadecimal slave ID of the desired board.
YY is the hexadecimal starting address of the register.
ZZ is the hexadecimal number of registers to read.
CS is the hexadecimal twos complement checksum.

Register Numbers supported:
0 High word of unscaled position.
1 Low Word of unscaled position.
2 High word of scaled and offset position.
3 Low Word of scaled and offset position.
4 16 bit value of the Digital to analog converter (0 if no analog hardware is present)

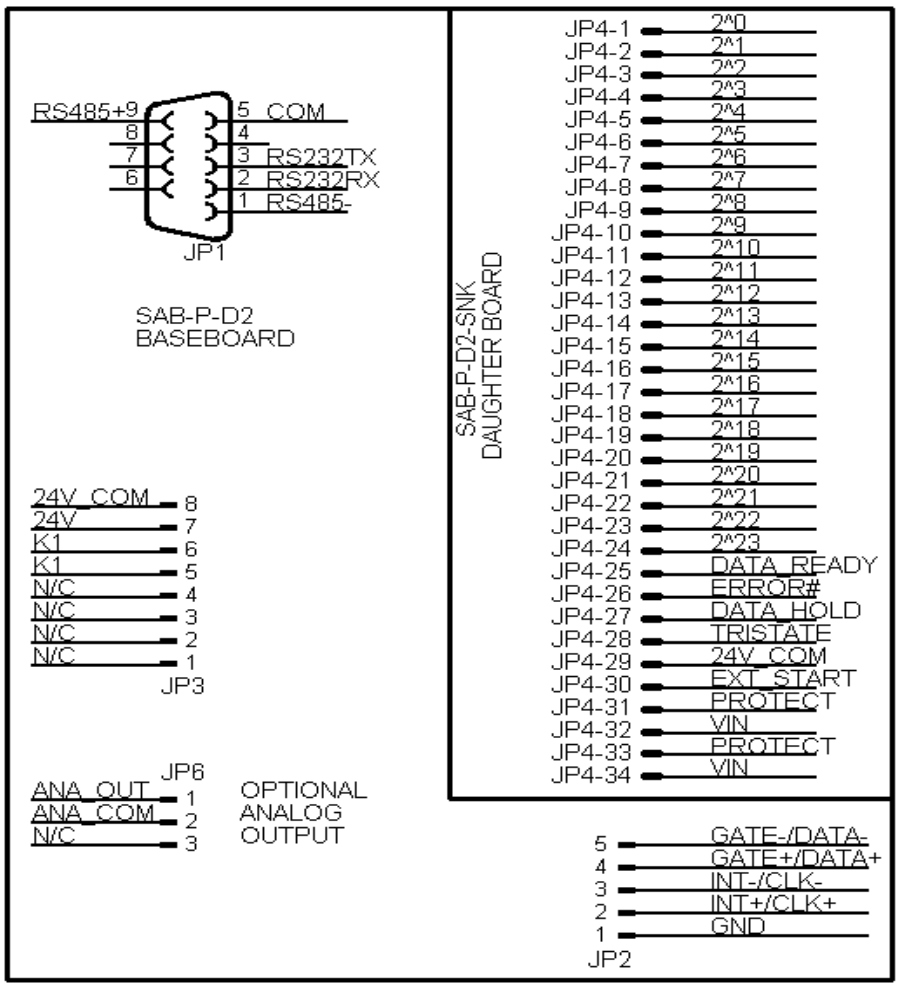
Read Status Coils: ":XX07CS[CR]"

Where XX is the hexadecimal slave ID of the desired board.
CS is the hexadecimal twos complement checksum.

The returned string is ":XX07YYCS[CR]"

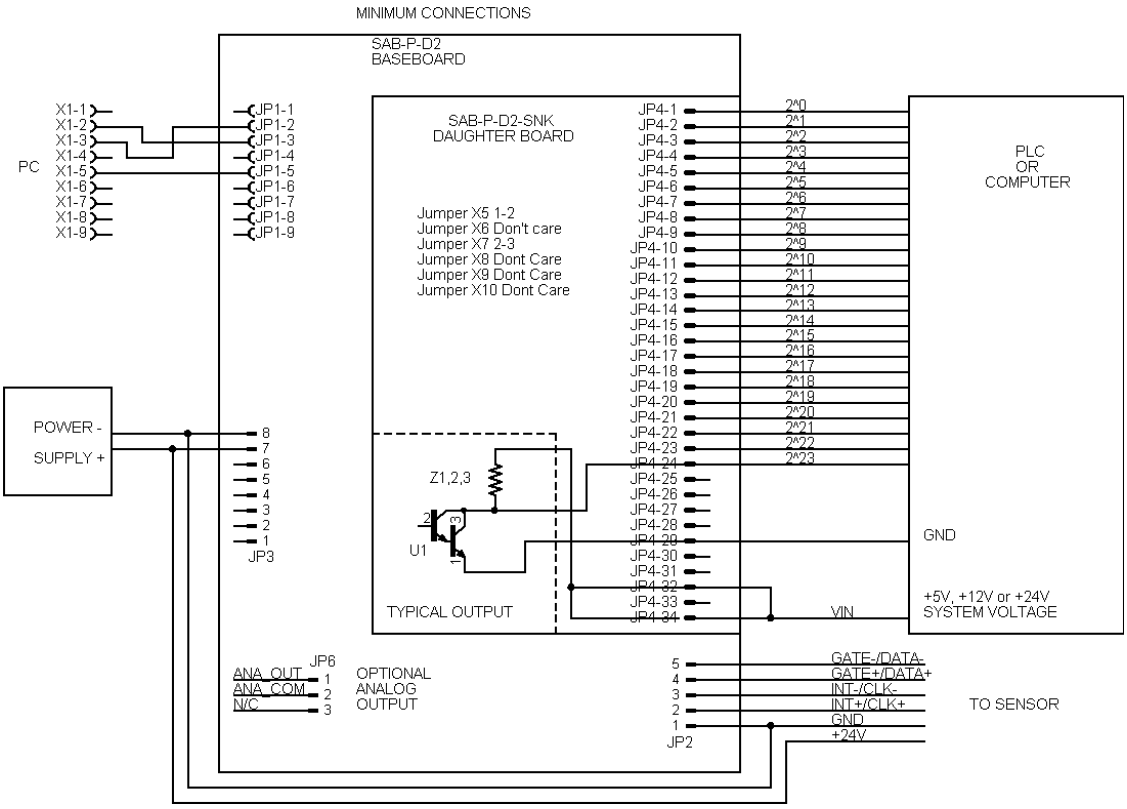
Where XX is the hexadecimal slave ID of the desired board.
YY is the hexadecimal status value:
2^0 If set indicates no magnet or transducer.
2^1 If set indicates update time too short.
2^2 If set indicates analog hardware is present

CS is the hexadecimal twos complement checksum.



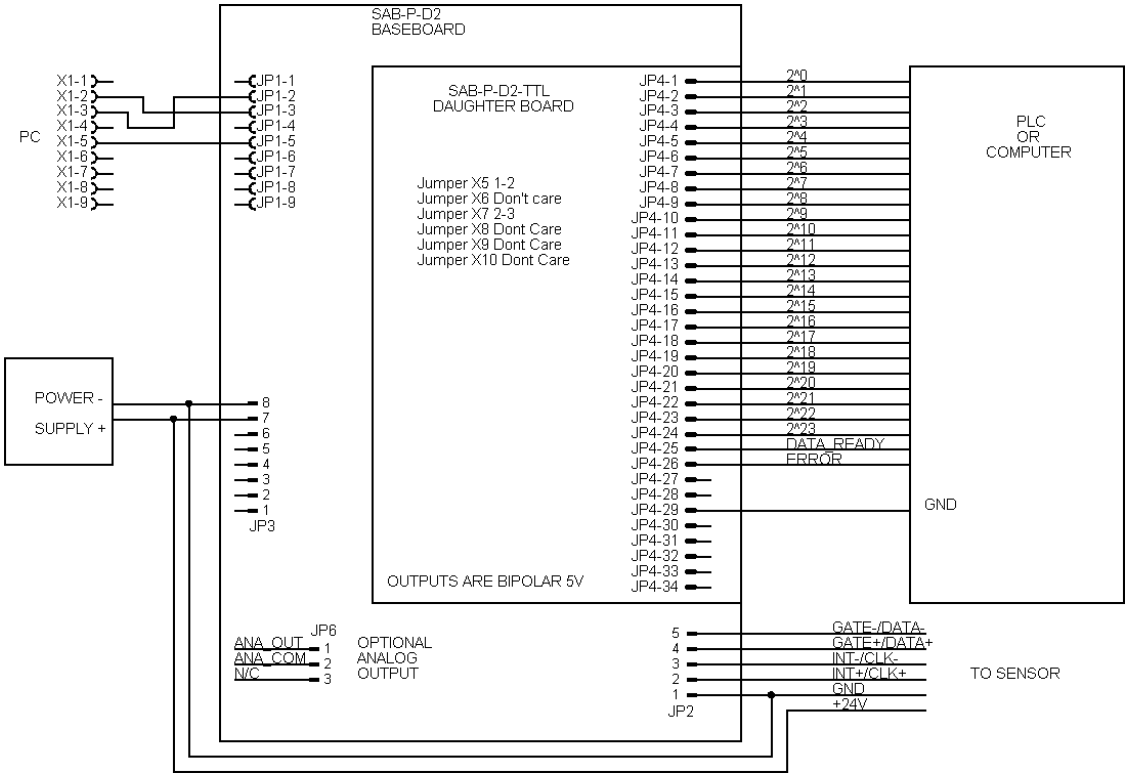
SAB-P-D2 Connections

Minimum Connections



Sensor may be isolated by using a separate power supply.

TTL Connections



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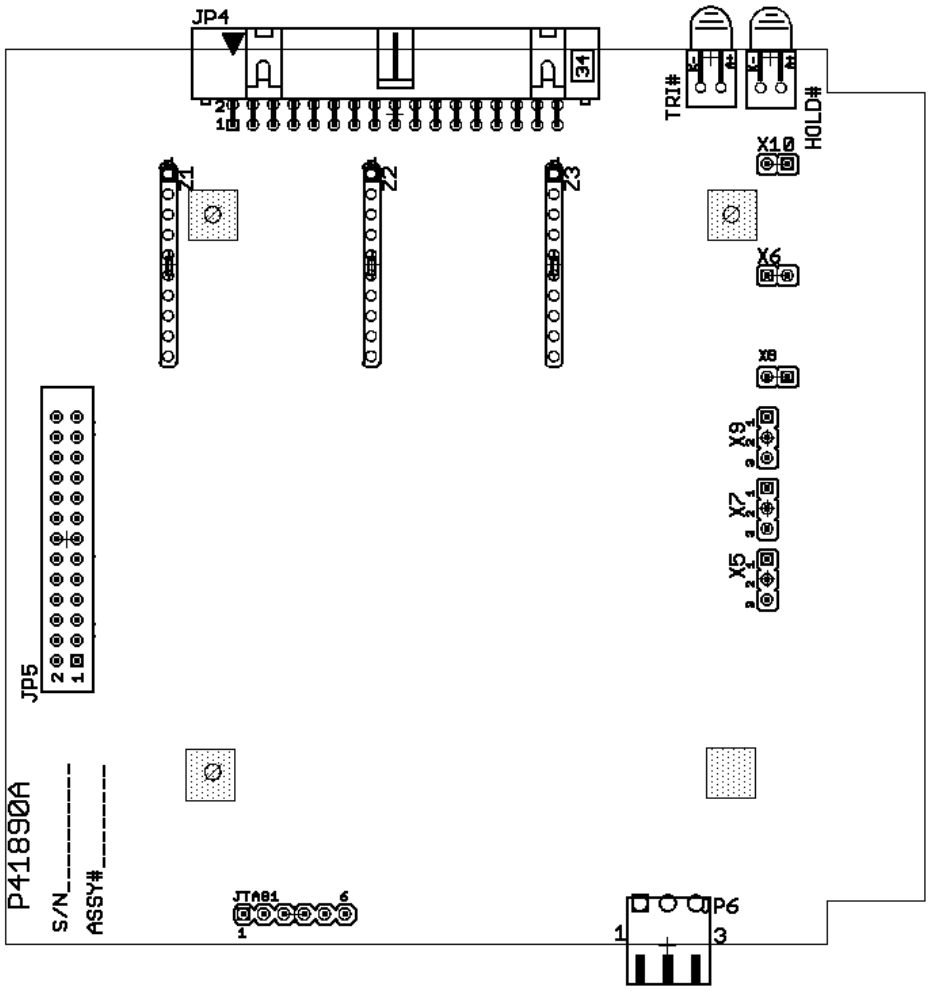
http://www.rapidcontrols.com/ ▪ email: info@rapidcontrols.com

Daughter Board Jumper and Connector Map (SINKING)



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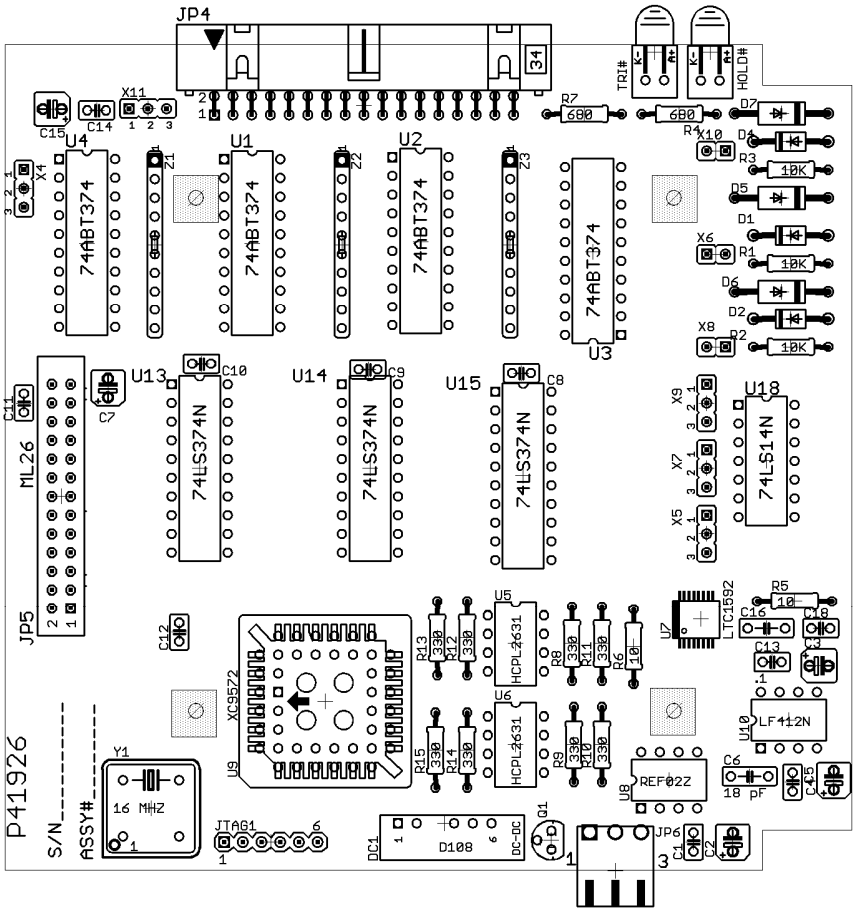
Daughter Board Jumper and Connector Map (TTL)



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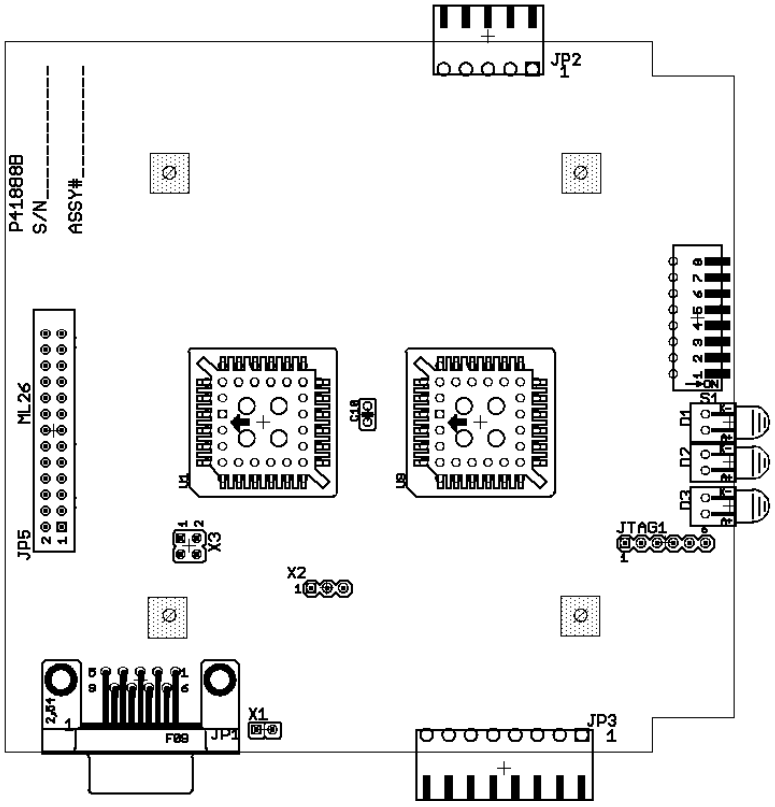
Base Board Connector and Jumper map



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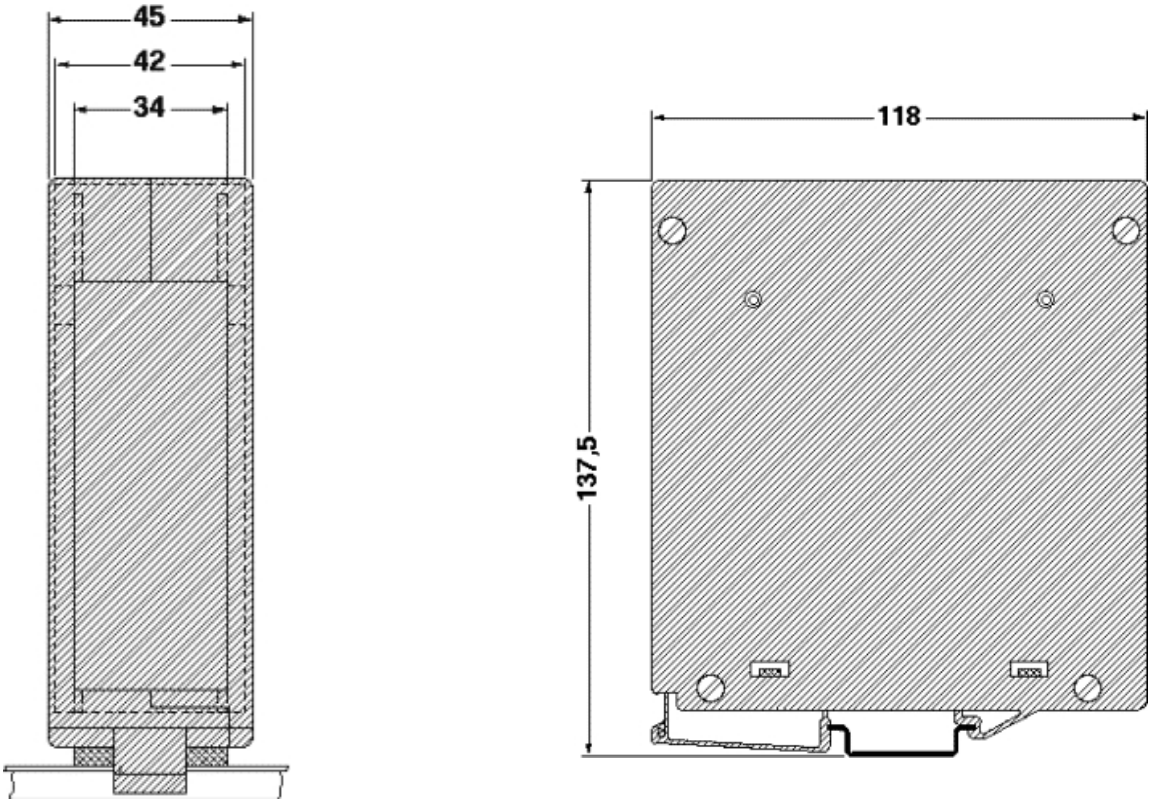
Mechanical information



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