

ID BPC100 Guide



ID BPC100

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Item List

DESCRIPTION	QTY
ID BPC 100 Controller	1
TI Automotive E5LM Screw Pump	1
Pump Filter Sock	1
Pump Connector	1
IO Cable – 20 foot (6.1m) 15 pin male DB15	1
Mounting Hardware	
M5x55 Socket head cap screw	4
M5 Nyloc nuts	4
M5 Flat washers	4
Electrical Hardware	
4 AWG Ring terminal	2
M6x8 Socket head cap screw	2
M6 Lock washer	2
M6 Flat washer	2
12 AWG Ring terminals	4
M4x6 Socket head caps screw	4

DESCRIPTION	QTY
M4 Lock washers	4
M4 Flat washers	4

Installation

Mounting

- Do not mount this unit in the engine bay or anywhere exposed to water, debris or extreme heat.
- Do not use the mounting fastener holes as drill guides as this may force metal debris into the controller causing failure and/or fire.
- Any mounting orientation is acceptable as long as there is 1 inch (25mm) of clearance on both sides of the controller (the fan side and the opposing side). Mounting with less than 1" of clearance may result in overheating.

Wiring

Main Power and Ground Wire Requirements

- Use high quality, pure copper 4 AWG wire with a temperature rating of at least 90° C (194° F).
- Do **not** use copper-clad aluminum wire, it is considerably less conductive than pure copper wire and can result in significant voltage drop. Tin plated copper wire is acceptable.
- The included power and ground terminal lugs must be securely terminated using a heavy-duty lug crimping tool.
- Use the supplied fasteners and terminal lugs to ensure sufficient fastener engagement and electrical contact.

Main Power

- Use a 4 AWG wire to connect between your vehicle's positive battery terminal and the BPC battery connection (labeled +).
- This wire **MUST** be fused for safety using a 150 amp fuse or circuit breaker within 18 inches (46cm) of the battery.
- Many vehicles employ small wires between the alternator positive connection and the battery positive terminal which can cause excessive voltage drops during periods of high current draw.
- It may be necessary to upgrade this wire to 4 AWG.

Main Ground

- The BPC ground connection (labeled -) will need to connect directly to the ground post of the vehicle battery with 4 AWG wire using a terminal lug or ring terminal.

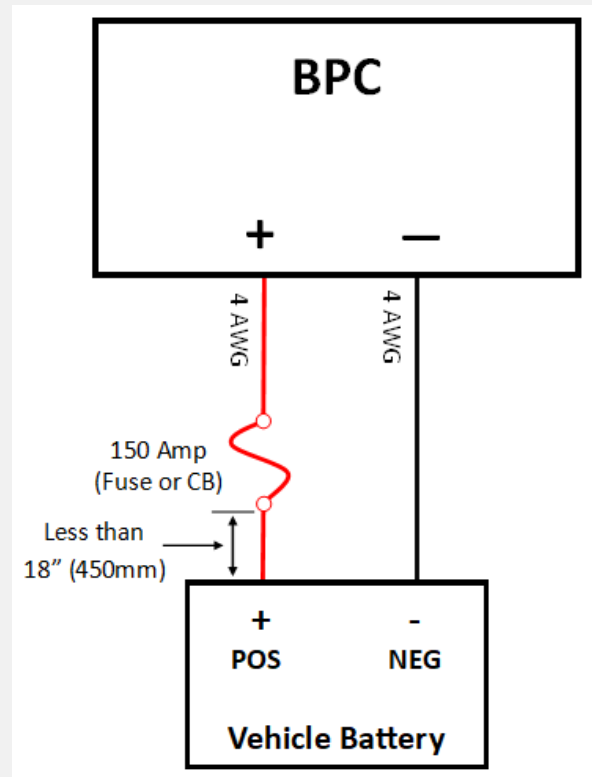


Figure 1: Main Power and Ground Connections.

On/Off

- The BPC uses two wires to turn on and will do so when the ON/OFF wire has at least 7 volts and the ON/OFF Ground wire is grounded. Ensure the voltage source used for the ON/OFF wire has voltage during cranking, otherwise the BPC will turn off during cranking.

- Using an ignition (or ECU) switched power or ground will ensure the BPC turns off while the vehicle is not in use. Both high and low side switching options are shown.

IO Cable Wiring

SIGNAL	WIRE COLOR	IO CABLE PIN	DESCRIPTION
ON/OFF	Red	1	Ignition switched, battery + hot during cranking, 7 vdc (min), Turns on Controller
ON/OFF Ground	Black	9	Ground for turning on controller

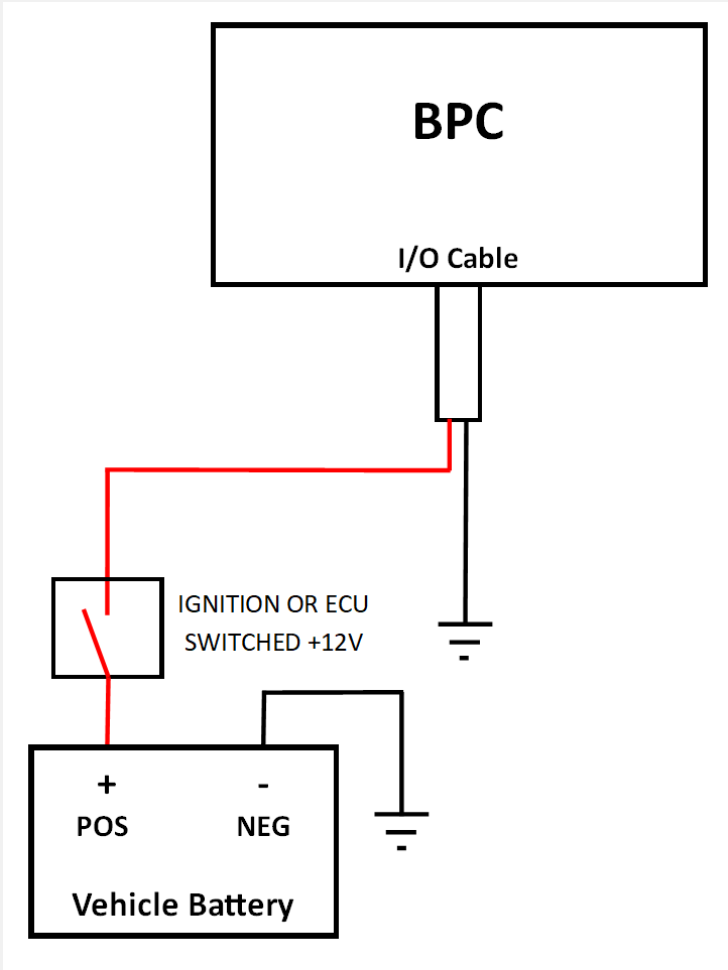


Figure 2 : ON/OFF High side switching.

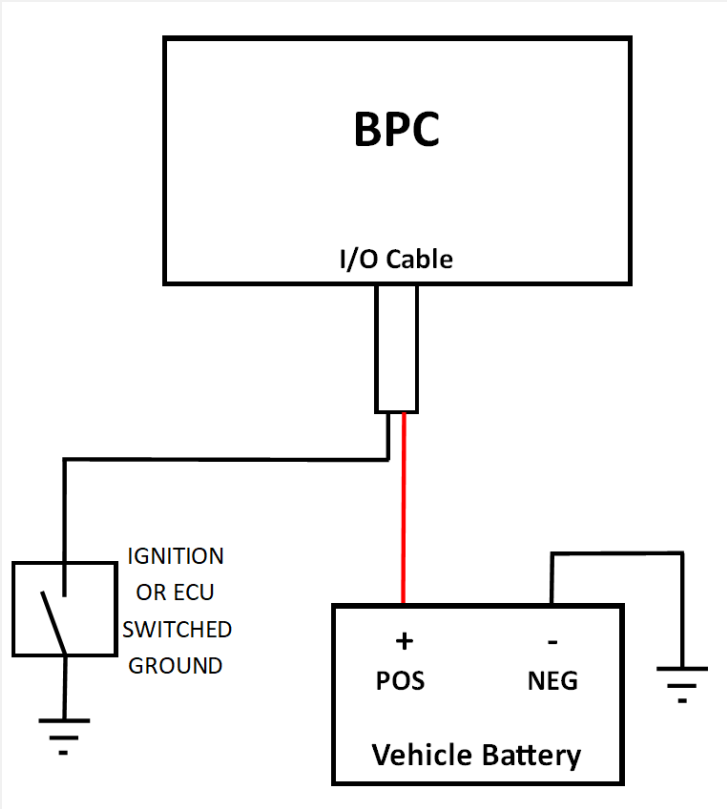


Figure 3 : ON/OFF Low side switching.

Pump Wiring

- Use high quality, pure copper 12 AWG wire (tin plated copper is acceptable).
- Any butt connectors in use must be copper conductor (tin plated copper is acceptable).
- Any connectors, terminals or wiring in use must be rated for 25 amps continuous.
- An 18 AWG (minimum) pump ground is REQUIRED to be connected to a chassis ground. It is typically easiest to loop from the pump ground connection (labeled GND) to the BPC main ground connection (labeled —). Alternatively, a local chassis ground using solid, bare sheet metal and a ring terminal is acceptable.
- Use the supplied fasteners and terminal lugs to ensure sufficient fastener engagement and electrical contact.

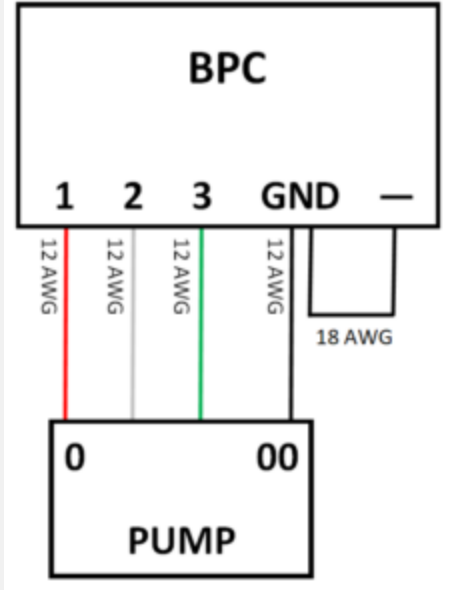


Figure 4: Pump output wiring.

Mode Specific Wiring

Each mode of operation may require specific wiring. Please see the Control Mode section for specific wiring instructions.

Pump Installation

- This pump is designed only for submerged (in-tank) applications, do not use externally.
- **Fuel lubrication is required** because this pump achieves higher flowrates at greater pressures than the original design intent. Lubricating the fuel decreases current draw and increases service life by 20x at elevated flowrates and pressures.
- We recommend [Klotz Uplon \(KL-107\)](#) at the following ratios.

Ethyl/Methyl Alcohols	170:1 (0.75 oz/Gal)
Gasoline	256:1 (0.50 oz/Gal)

Plumbing

- Because this pump has flowrates and pressure capabilities similar to a mechanical fuel pump, proper diameter plumbing is critical. Fuel systems with undersized supply lines, reduced diameter adapters or small radius bends will have a significant pressure drop between the fuel pump and fuel pressure regulator. This will, at minimum, cause additional fuel heating, current draw and pump wear.
- Use a minimum of -8AN (1/2" diameter tubing) for both supply and return.
- Use a fuel pressure regulator sized appropriately for -8AN, capable of bypassing 1000+ lph without excessive fuel pressure increase.
- Use a fuel filter designed to flow 1200lph with minimal pressure drop. We recommend using the [ID F1250](#) inline fuel filter.
- Limit the number of undersized fittings, 90 degree and small radius bends.

Control Modes

Overview

The BPC has three modes of operation; PWM, MAP and Constant flow.

1. **PWM mode** allows complete control of the fuel pump flowrate.
 - The flowrate is commanded by a user-defined input signal, from an ECU or a logger/dash with a pulse width modulated (PWM) auxiliary output.
 - This mode does not use the onboard dials.

2. **MAP mode** controls the fuel pump flowrate based on intake manifold pressure.
 - The manifold pressure is measured via a dedicated MAP sensor referenced to the intake manifold. Users define the maximum fuel pump flowrate and the manifold pressure when the maximum flowrate is reached by adjusting two dials onboard the controller.
 - This mode allows pump flowrate control without the use of an ECU/logger/dash but requires the installation of a dedicated MAP sensor.
3. **Constant flow mode** keeps the fuel pump flowrate constant.
 - The fuel pump flowrate is adjusted using a dial onboard the controller.

PWM Mode

Operation

- PWM mode controls the fuel pump flowrate based on a user-controlled PWM input signal.
- This allows the user complete control by setting up the ECU (or logger/dash) output as a function of other parameters (i.e. engine fuel flow, engine speed, manifold pressure, etc.).
- The pump flowrate is scaled linearly with PWM input duty cycle; the minimum flow rate is achieved at 10% duty cycle and maximum flowrate at 90% duty cycle.

Input PWM (%)	Pump Flow Rate (lph)
10	300
90	1100

Setup

- Fuel pump flowrate is controlled via PWM input signal using the PWM + and PWM – inputs.
- PWM uses a fixed frequency square waveform with a varying duty cycle. The PWM frequency must be between 80 and 1000 Hertz with at least +5 volts (between PWM + and PWM –).
- If the ECU (or logger/dash) has minimum and maximum duty cycle limits, set them to 10% and 90%, respectively. Setting these limits ensures the controller will never unexpectedly shut down or change operation modes from an improper PWM input.
- If the controller receives a 100% input duty cycle, the operation mode will change to constant flow and will revert back to PWM mode when the duty cycle is less than 100%.
- The controller calculates input duty cycle via negative polarity, which is based on the time the PWM signal is low. This means an input duty cycle of 10% would be high 90% of the time and low 10%. If the controller is wired to be high side switching, the PWM duty cycle may be inverted.(depending on the ECU)

PWM Mode High Side Switching Wiring

SIGNAL	WIRE COLOR	IO CABLE PIN	DESCRIPTION
PWM +	Red / White	2	PWM pulsed positive input, 5 vdc (min), Used to control pump speed.
PWM –	Black / White	10	Local chassis ground

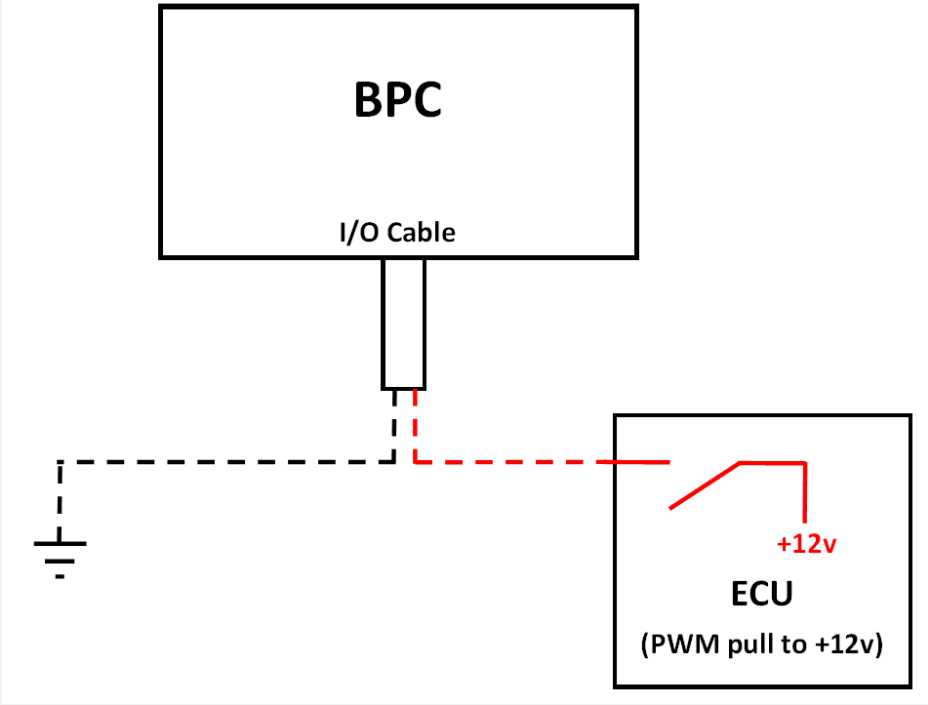


Figure 5: PWM Mode high side switching wiring.

PWM Mode Low Side Switching Wiring

SIGNAL	WIRE COLOR	IO CABLE PIN	DESCRIPTION
PWM +	Red / White	2	Connected to Battery, 7-17 VDC,
PWM –	Black / White	10	PWM pulsed ground, Used to control pump speed

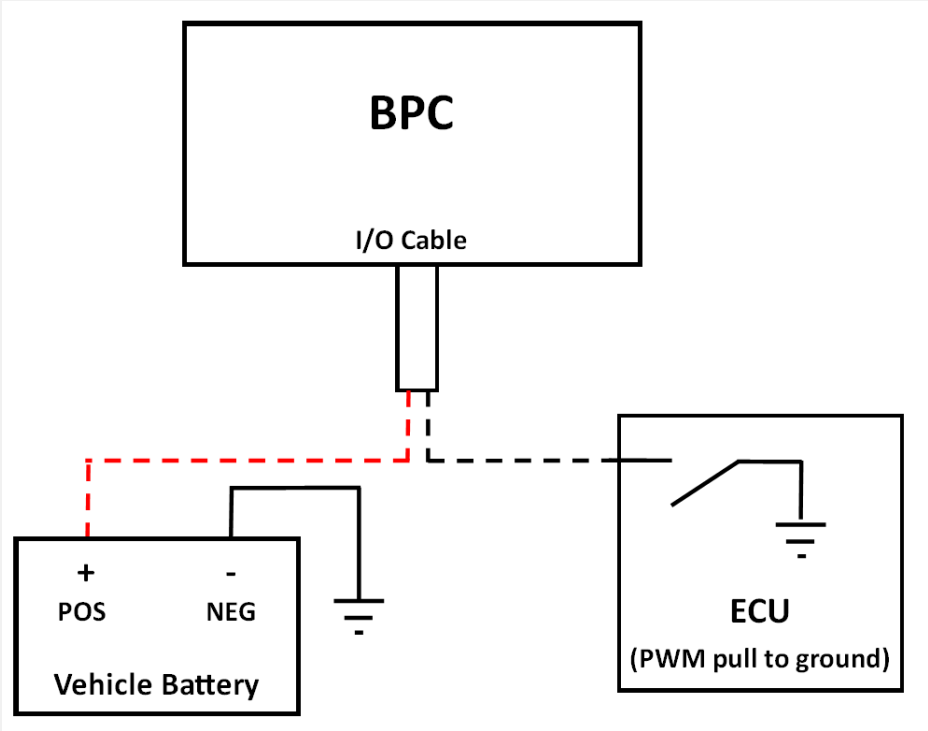


Figure 6: PWM Mode low side switching wiring.

MAP Mode

Operation

MAP mode controls the fuel pump flowrate based on intake manifold absolute pressure (MAP). Because engine fuel flow requirements typically increase with increasing MAP pressure, the pump flowrate will also increase.

Setup

- This mode **REQUIRES** the installation and use of a 7 bar (or 100psi) absolute, ratiometric (0.5-4.5vdc output) MAP sensor with a current draw less than 20mA. **DO NOT** use an existing ECU/Engine MAP sensor.
- There is onboard +5vdc power (orange wire, pin 15) and ground (green wire, pin 14) for the dedicated MAP sensor.
- The MAP sensor should be installed in or use a line from the engine side of the throttle body from a common plenum, not a single runner.

Adjustment dials

- The MAX, MAP and SPEED dials only rotate 210°, from the minimum indicator (~8 o'clock), clockwise to the max indicator (~4 o'clock). Do not force them past these positions.
- Use the provided jewelers screw driver to avoid damage.



Figure 7: MAP Mode Adjustment Dials.

- **MAX DIAL** – Sets the max pump flowrate. For a max flow of approximately 500 lph turn full counterclockwise, max flow of 1100 lph is full clockwise.
- **MAP DIAL** – Sets the MAP pressure at which maximum flowrate is reached. For max flow at 2 bar turn full counterclockwise, max flow at 7 bar is full clockwise.
- **SPEED DIAL** – The SPEED dial is not used in MAP mode but should be set to max(full clockwise) as a safety precaution in the case of a MAP sensor failure or disconnection. If the MAP sensor fails low (zero volt signal) or is unplugged, the controller will revert to constant flow mode.
- The pump minimum flowrate is fixed at 300 lph from 0 kPa through 50 kPa. After 50 kPa the pump flowrate will increase linearly based on the MAX and MAP dial settings.

Wiring

For this operation mode, the PWM + and PWM – wires may be wired with (electrically connected to) the ON/OFF and ON/OFF Ground wires, respectively. By wiring these together, the controller turns on and into MAP Mode when the PWM + and ON/OFF wires are both at +12V, the PWM – and ON/OFF Ground wires are grounded and the MAP Signal wire has at least +0.25 volts.

SIGNAL	WIRE COLOR	IO CABLE PIN	DESCRIPTION
PWM +	Red / White	2	Ignition switched, battery + hot during cranking, 5 vdc (min)
PWM –	Black / White	10	Local chassis ground
MAP Ground	Green	14	Ground output to MAP sensor

SIGNAL	WIRE COLOR	IO CABLE PIN	DESCRIPTION
MAP Power	Orange	15	+5 vdc output to MAP sensor, 20mA max
MAP Signal	Purple	8	MAP sensor signal input, 0.5 to 4.5 vdc

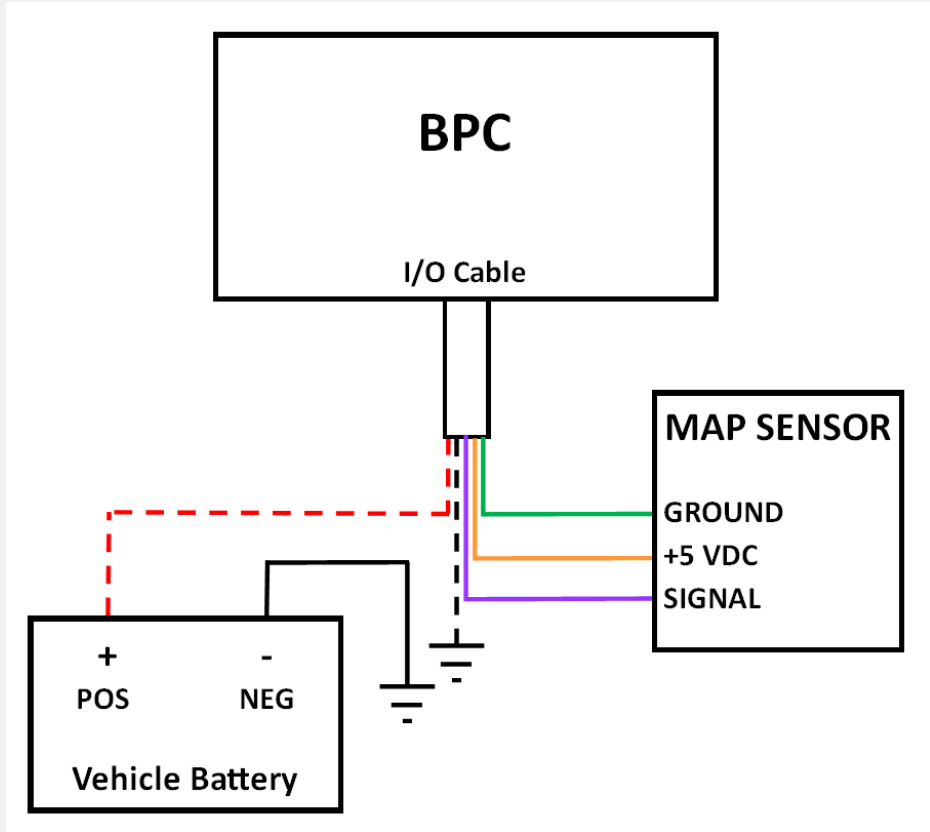


Figure 8: MAP Mode specific wiring.

Constant Flow Mode

Operation

Constant speed mode runs the pump at a fixed flowrate. This can be useful for initial fuel system priming, leak checking or troubleshooting.

Setup

Adjustment dials

- The MAX, MAP and SPEED dials only rotate 210°, from minimum indicator (~8 o'clock), clockwise to max indicator (~4 o'clock). Do not force them past these positions.
- Use the provided jewelers screw driver to avoid damaging them.
- **SPEED DIAL** – The flowrate is adjusted by the SPEED dial. Set to full clockwise (1 on dial) for maximum flowrate and full counterclockwise (0 on dial) for minimum flowrate.

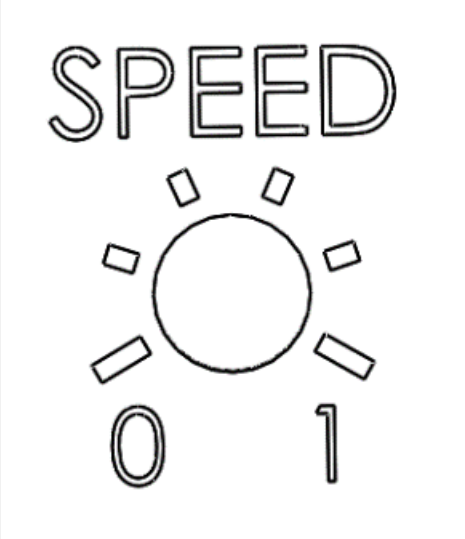


Figure 9: Constant Flow Mode Adjustment Dial.

Wiring

For this operation mode, the PWM + and PWM – wires may be wired with (electrically connected to) the ON/OFF and ON/OFF Ground wires, respectively. By wiring these together, the controller turns on and into Constant Flow Mode when the ignition is on.

Alternatively, the PWM+ and PWM- wires may be wired using a fuel pump enable wire (which typically switches to ground). When the PWM + and ON/OFF wires are both at +12V and the PWM – and ON/OFF Ground wires are grounded, the controller will be in Constant Flow Mode. This is a low current input and does not require a relay.

SIGNAL	WIRE COLOR	IO CABLE PIN	DESCRIPTION
PWM +	Red / White	2	Ignition switched, battery + hot during cranking, 5 vdc (min), Starts Pump
PWM –	Black / White	10	Local chassis ground for turning on controller

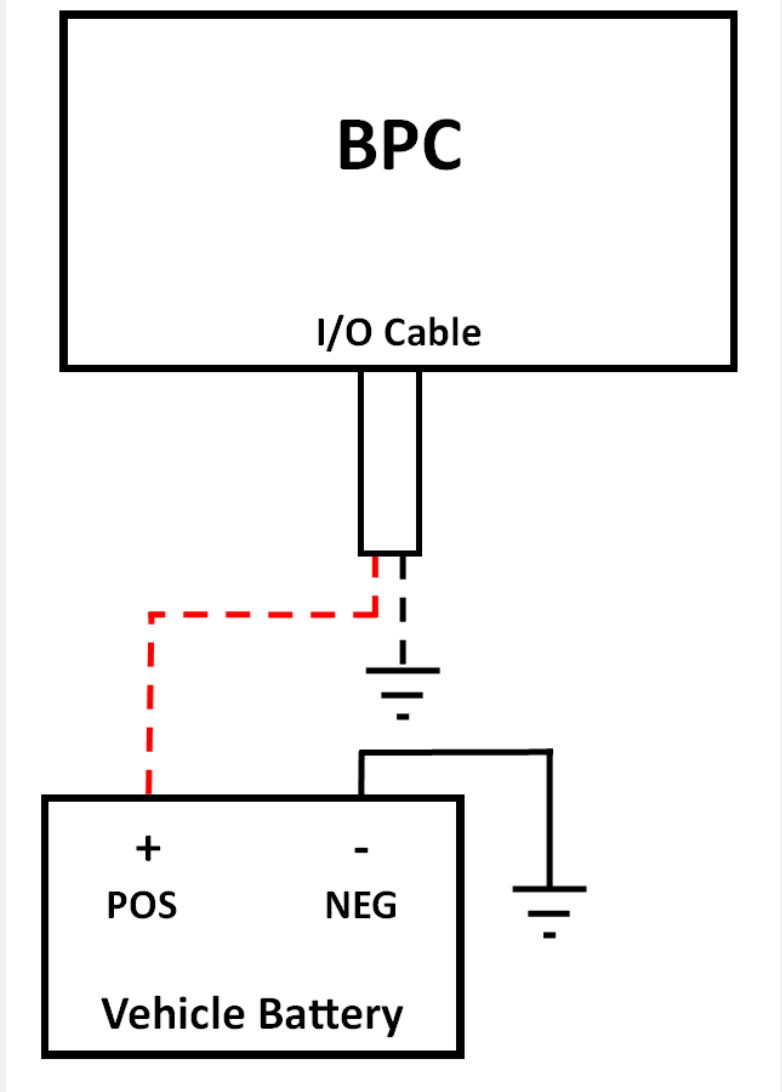


Figure 10: Constant Speed Mode specific wiring.

Outputs

Flowrate

- The pump flowrate can be monitored or logged using the Flowrate Signal and Flowrate Ground wires when CAN logging is not available.
- When the Flowrate Ground (brown) is grounded and the Flowrate Signal (pink) is connected to an ECU digital input with an internal pull-up resistor, the frequency is directly proportional to pump flowrate (i.e.300Hz=300lph).

SIGNAL	WIRE COLOR	IO CABLE PIN	DESCRIPTION
Flowrate Ground	Brown	11	Ground for Flowrate circuit, chassis ground
Flowrate Signal	Pink	4	Digital signal output to logger for flowrate datalogging

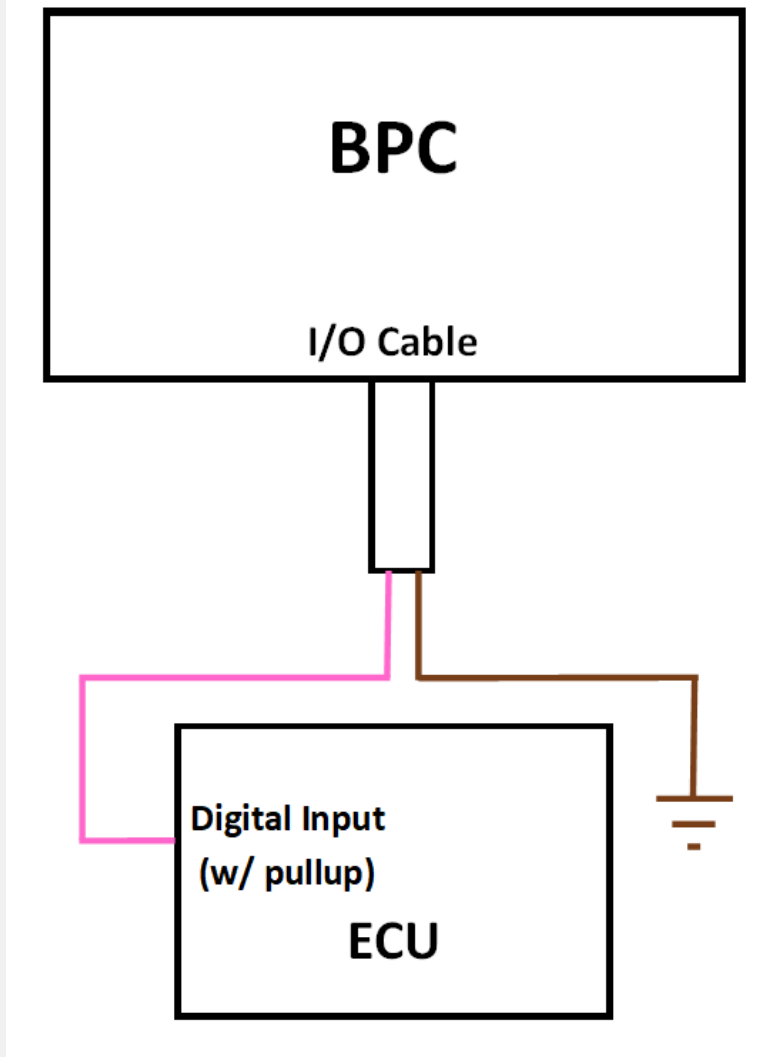


Figure 11: Flowrate output wiring.

CAN

Pump and controller information is broadcast via CAN bus.

CAN Parameters

- DBC File Template – Please visit the [downloads](#) section at the end
- Baud Rate : 1 Mbps
- CAN wiring requires 120 ohm resistors on both ends of the CAN line. Note: These are not additional resistors, only two are required per CAN bus. If using existing CAN wiring, these resistors are likely already in place.

CAN MESSAGE 1, 0X300 (EXTENDED)					
BYTE	NAME	FACTOR	OFFSET	UNITS	DESCRIPTION
0	Input Voltage	0.088	0.8	Volts	Main power input voltage
1	Input Current	0.5937	-18.227	Amps	Main power input current
2	Pump Current	0.2144	0	Amps	Pump output current

CAN MESSAGE 1, 0X300 (EXTENDED)

BYTE	NAME	FACTOR	OFFSET	UNITS	DESCRIPTION
3	Flow Rate	4.72441	200	Liters/Hour	Pump flowrate
4	Board Temp	0.588235	0	Celsius	Main board temperature
5	Not Used	–	–	–	–
6	Pump Output DC	0.394	0	%	Pump output PWM duty cycle
7	Status	1	0	–	Pump/Controller Status (See notes below)

CAN MESSAGE 2, 0X301 (EXTENDED)

BYTE	NAME	FACTOR	OFFSET	UNITS	DESCRIPTION
0	Input PWM DC	0.394	0	%	Input PWM duty cycle
1	MAP voltage	0.02	0	Volts	Voltage from MAP sensor signal
2	Phase	1	0	Steps	Electrical phase advance for pump
3	Pump Current AVG	0.2144	0	Amps	Average pump output current
4	Flow Rate AVG	4.72441	200	Liters/Hour	Average pump flow rate
5 & 6	Run Time	1	0	Minutes	Minutes elapsed with pump running
7	Not Used	–	–	–	–



Figure 12: Typical Software Implementation.

CAN Message : Status

When the pump is running the CAN message **Status** will correspond to the active operation mode.

STATUS	OPERATION MODE
1	PWM
2	MAP
3	Constant Speed

When the pump is off and has active errors, the CAN message **Status** will display the Stand By mode.

STANDBY MODE	ERRORS
0	No Errors
10	Input Voltage Low
11	Input Voltage High
12	Input Current High
20	Rail Voltage Range
21	Temperature High
30	Commutation Lost

STANDBY MODE	ERRORS
31	No Tacho
32	Tacho Unstable
33	No Load
34	No Start
35	Output Current High
50	General Error

LEDs

There are five LEDs on the control panel of the BPC, four red LEDs to display errors and one green LED to indicate standby or operating.

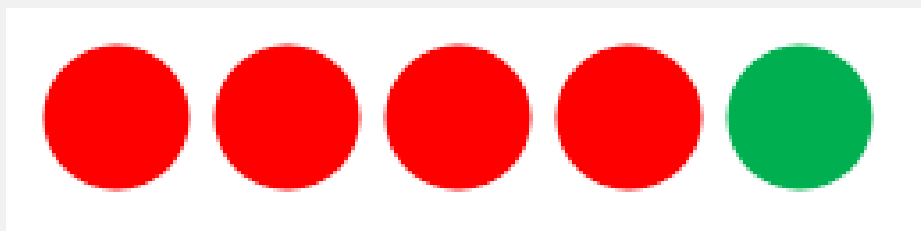


Figure 13: LED's

- **Standby**– When the controller has main and IO cable power but no command to operate the pump, the green LED blinks once every eight seconds.
- **Running**– When the pump is running, the green LED flashes one second on, one second off.
- **Errors**– The four red LEDs are used to view, store and recall past errors codes. When there is an active error code, the green LED will remain illuminated while the red LEDs will flash two seconds on, two seconds off. During an active error the pump remains off. The active error will be reset when the power is cycled or the controller is commanded off.

Please see [Error Codes](#) in the Troubleshooting section for details on viewing and clearing error codes.

Troubleshooting

Error Code Button

The error code button is a red, 2.5mm diameter momentary push button located on the controller display panel that allows viewing and deleting stored error codes using four red LEDs.

Viewing Error Codes– With the controller powered on, when the button is pushed the controller will display the most recent error code for two seconds. Each time the button is pushed the error code is cycled to the next oldest. When all four red LEDs illuminate there are no older stored codes.

Deleting Error Codes– With the controller powered on, press and hold the error code button until all LEDs illuminate, then release the button. The LEDs will illuminate for four seconds then extinguish. Lastly, cycle power to erase all codes.

Error Codes

Error Code Definition	Lights	CAN Status
No Error Normal operation, no error codes exist.		0
Input Voltage Low Input voltage must be greater than 7.5 volts during turn on, 7 volts while operating.		10
Input Voltage High Input voltage must be less than 17.5 volts during turn on, 18.5 volts while operating.		11
Rail Voltage Range - Insufficient current supply, check battery capacity and voltage during cranking. - Cycle power and attempt normal operation.		20
Input Current High - Input current must be less than 120 Amps. - Input voltage is too low for the pump output conditions (flow/pressure). - Increase input voltage by checking for proper power wire size/length and charging system health. - Decrease pump flow rate and/or pressure. - Check for excessive pump wear.		12
Controller Temperature High - Controller internal temperature too high. - Check for blocked inlet or outlet vents, excessive dust buildup or fans that do not spin when pump is running.		21
Commutation Lost Commutation lost during operation, likely from excessive fuel pressure (>12 bar). Check for clogged filter, pump outlet capped or a broken/jammed pump.		30
Tachometer Unstable - Unstable pump feedback. - Check for loose, disconnected or intermittent pump wiring.		32

ERROR CODE DEFINITION	LIGHTS	CAN STATUS
No Start - Pump has exceeded allowed start attempts. - Check for excessive fuel pressure (>10 bar) or a broken/jammed pump.		34
High Output Current - High pump output current. - Reduce pump pressure or speed. - Check for excessive pump wear.		35
Switch Error - Insufficient Required Power - Check battery capacity and voltage during cranking. - Cycle power and attempt operation.		77
General Controller Error All other non-assigned errors.		50

Troubleshooting Table

OBSERVATION	RECOURSE
Pump intermittent/erratic during operation	If the pump turns off momentarily or is erratic, the controller may be switching between operation modes. It is imperative to limit the PWM input duty cycle to 99% or less. If the duty cycle reaches 100%, the controller will engage in a different operation mode. The operation mode can be verified with the CAN channel “Status” and the PWM input duty cycle can be verified via the CAN channel “Input PWM DC” (see CAN output section).
Pump output does not change with changing MAP pressure	If the pump speed changes with the adjustment of the SPEED dial, the controller is not in MAP mode. Alternatively, the operation mode can be verified with the CAN channel “Status” (see CAN output section).

Specifications

Operating Parameters

- Operating Voltage: 7.0 to 17.5 volts DC (w/ Reverse Polarity Protection)
- Over Voltage Protection (Input): 17.5v (from off state), 18.5v (while on)
- Under Voltage Protection (Input): 7.5v (from off state), 7v (while on)
- Over Current Protection (Input): 120 Amps

- Max Operating Input Current: 100 Amps
- Max Standby Current: 100 mA
- Max Off Current: 20 mA
- Max MAP Sensor Supply Current: 20 mA
- Weight: 5.2 lbs. (2.37 kg)
- Maximum Ambient Temperature: 70°C (output loading dependent)
- Minimum Ambient Temperature: -18°C

Input/output pin descriptions

Low-level inputs and outputs are accomplished through a single 15 pin D-Sub cable.

Suitable IO extension wire: 18-26 AWG

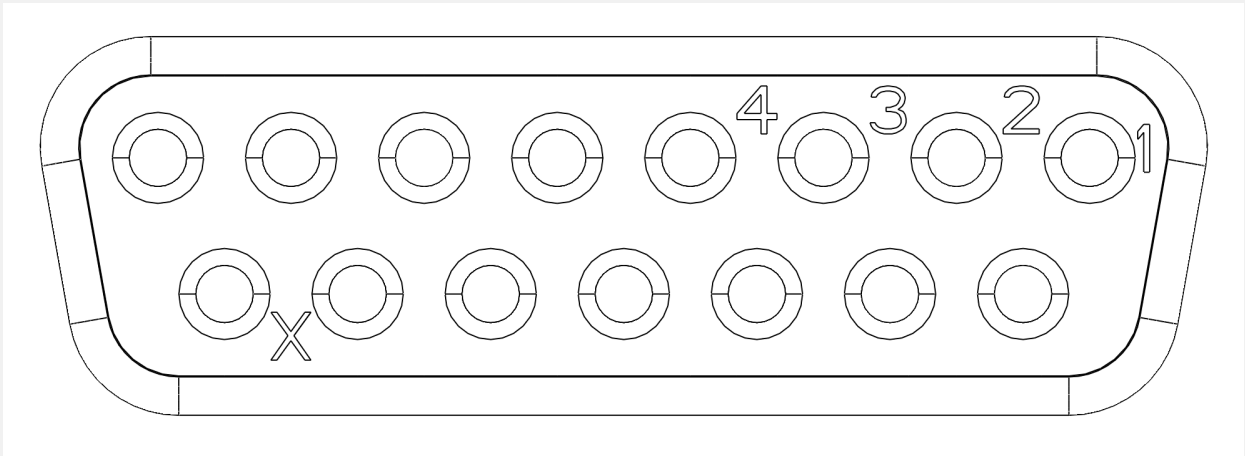


Figure 14: Looking into the controller side of the 15 pin D-sub connector (X indicates pin 15).

SIGNAL	WIRE COLOR	IO CABLE PIN	DESCRIPTION
ON/OFF	Red	1	Ignition switched, battery + hot during cranking, 7 vdc (min)
ON/OFF Ground	Black	9	Ground for turning on controller
PWM +	Red / White	2	PWM positive input, 5 vdc (min)
PWM –	Black / White	10	PWM negative input, ground
Flowrate Power	White	3	Power supply (input) for Flowrate circuit, 5 vdc (min)
Flowrate Ground	Brown	11	Ground for Flowrate circuit, chassis ground
Flowrate Signal	Pink	4	Digital signal output to logger for flowrate datalogging
CAN Hi	Yellow	5	CAN IO Hi
CAN Lo	Blue	6	CAN IO Low
MAP Ground	Green	14	Ground output to MAP sensor

SIGNAL	WIRE COLOR	IO CABLE PIN	DESCRIPTION
MAP Power	Orange	15	5 vdc output to MAP sensor, 20mA max ONLY USE FOR MAP SENSOR
MAP Signal	Purple	8	MAP sensor signal input, 0.5 to 4.5 vdc

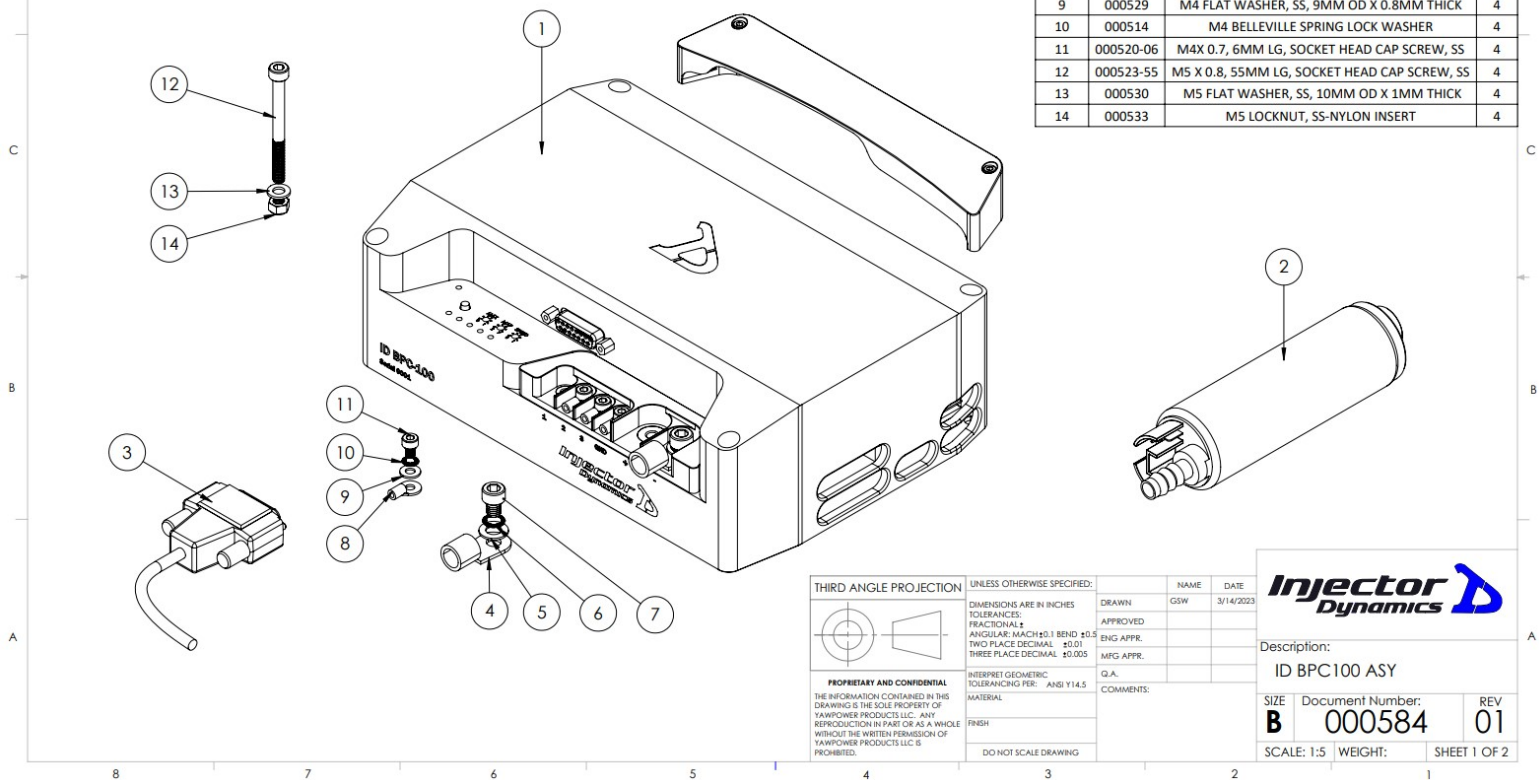
Nominal Current draw

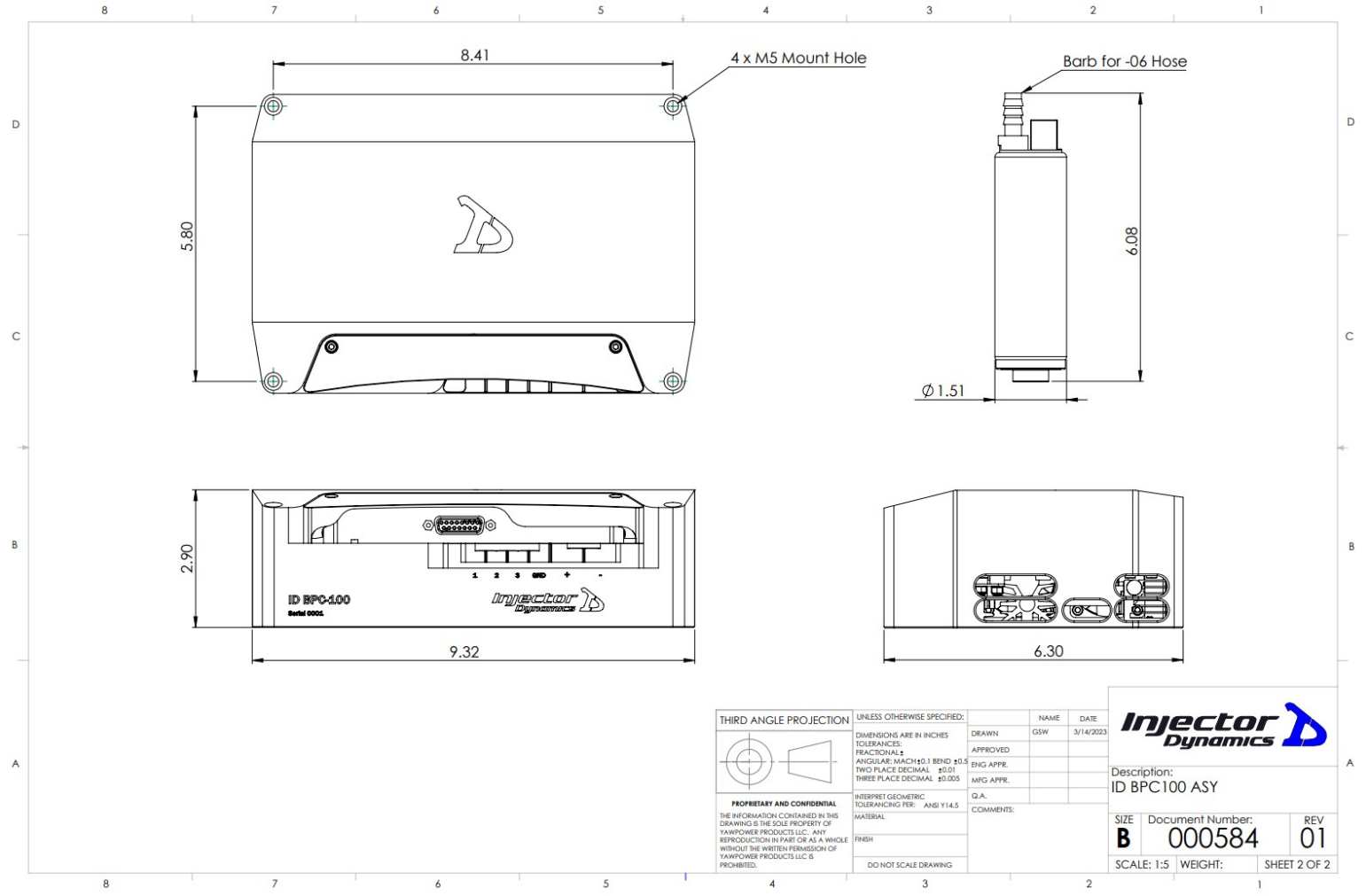
Differential Pressure (bar)	Flow Rate (lph)								Volts
	400	500	600	700	800	900	1000	1100	
3	8	13	18	23	29	34	39	44	8
5	13	20	27	33	40	47	53	60	
7	18	27	35	44	52	61	69	78	
9	30	39	49	58	67	77	86	95	
3	6	10	14	18	22	26	30	34	10
5	10	15	20	25	30	35	40	45	
7	17	23	28	34	40	46	51	57	
9	23	30	37	44	51	58	65	72	
3	6	9	12	15	18	22	25	28	12
5	11	14	18	21	25	28	32	35	
7	15	19	23	28	32	36	40	45	
9	19	24	30	36	41	47	52	58	
3	5	8	11	13	16	19	21	24	14
5	9	12	15	18	21	25	28	31	
7	13	17	20	24	28	32	36	39	
9	17	22	26	31	35	40	44	49	
3	5	7	10	12	14	17	19	21	16
5	8	11	13	16	19	22	25	28	
7	12	16	19	23	26	30	33	36	
9	16	20	23	27	30	34	37	41	
Input Current (Amps)									

Physical Dimensions

Notes:
Enclosure Material : Al 6060-T6, Anodized
ASY Weight : 2.82kg (5.3 lb)

ITEM#	PART#	DESCRIPTION	QTY
1	000584	ID BPC100 BRUSHLESS PUMP CONTROLLER	1
2	000628	TI AUTOMOTIVE ESLM PUMP	1
3	000563	IO CABLE - 15 PIN MALE DB15, 20 FOOT (6.1M)	1
4	000513	4AWG RING TERMINAL	2
5	000525	M6 FLAT WASHER, SS, 11MM OD x 1.5MM THICK	2
6	000515	M6 BELLEVILLE SPRING LOCK WASHER,	2
7	000522-08	M6X 1.0, 8MM LG, SOCKET HEAD CAP SCREW, SS	2
8	000510	12AWG RING TERMINAL	4
9	000529	M4 FLAT WASHER, SS, 9MM OD X 0.8MM THICK	4
10	000514	M4 BELLEVILLE SPRING LOCK WASHER	4
11	000520-06	M4X 0.7, 6MM LG, SOCKET HEAD CAP SCREW, SS	4
12	000523-55	M5 X 0.8, 55MM LG, SOCKET HEAD CAP SCREW, SS	4
13	000530	M5 FLAT WASHER, SS, 10MM OD X 1MM THICK	4
14	000533	M5 LOCKNUT, SS-NYLON INSERT	4





Downloads

- [DBC File Template](#)