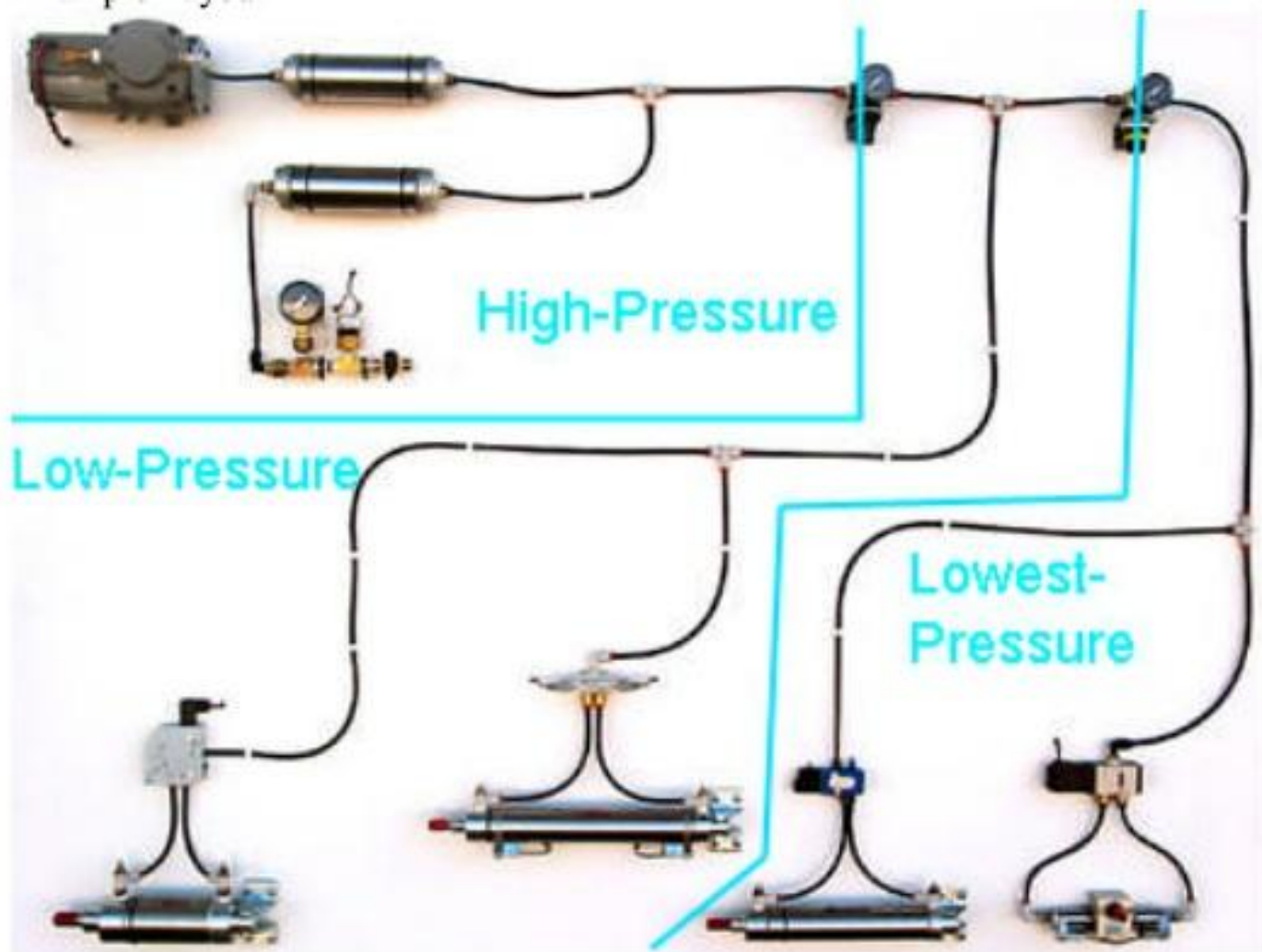


The Hawk Collective 2890

Pneumatics 2 - Purpose and Construction

<https://firstfrc.blob.core.windows.net/frc2017/pneumatics-manual.pdf>



Pneumatics Control Module

This is “little brain” of the pneumatics system. It controls all the safety parts of the system independently of the RIO.



Compressor

A motor moves a piston that uses one way valves to move air out of the output. The system most often compresses the gas into a more dense state at higher pressure than standard atmospheric pressure



Accumulator

This acts a reservoir for the air to “build up” in. The more of these you have onboard the fewer times your compressor has to turn on and off.



Air Pressure Switch

Senses the pressure nearest the compressor (high pressure side) turning off the compressor when the pressure reaches a certain level. FRC=120PSI



Safety Relief Valve

Mechanical relief valve designed to fail, at a specific pressure venting excess pressure . FRC requires it to mounted as close to output of the compressor as possible.



Gauge

Shows the pressure in that part of the system. A single system can have many gauges.



Pounds per Square Inch

PSI indicates how much pressure there is in the circuit or acting upon a specific part.

Regulator

Used to lower the pressure (pushing force) between two segments of the pneumatic circuit.





Pressure Vent Plug

Used to vent/purge
the pneumatic
system rendering it
safe to work on.



Flow Control

Used to “slow down” air moving through an element (like a cylinder) by restricting the amount of air that is allowed to pass through it. This has the effect of making a piston move slower in the direction that flow controller is attached.



Solenoids

Signals from the RIO tell the PCM to send electricity down the red(+) and black(-) wires to allow the air to pass from one side of the device to the other or switch the way air flows in or out of the device.





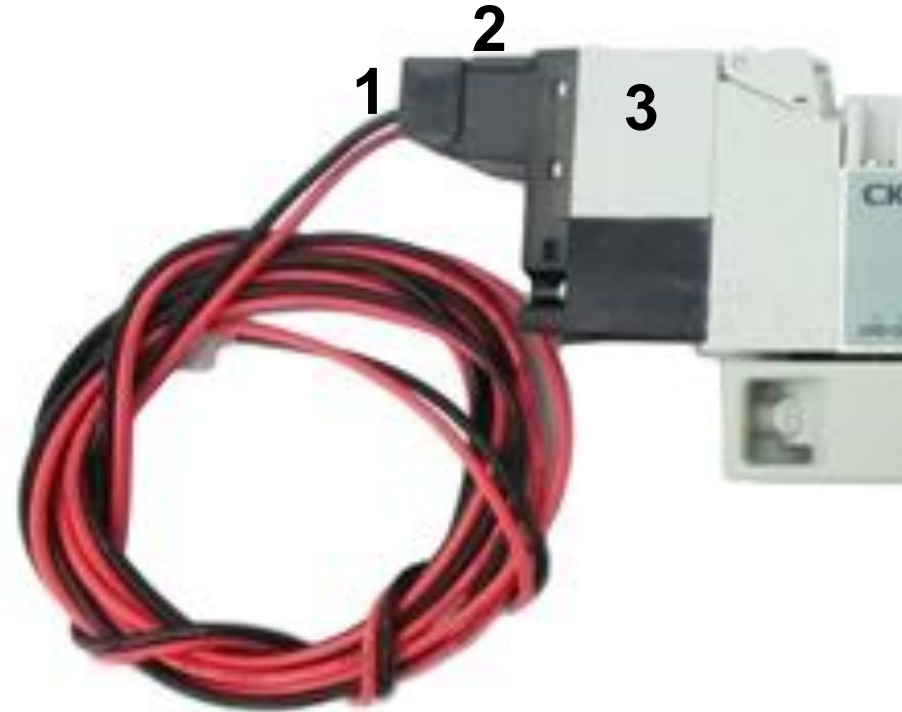
Solenoids

There are 3 parts to most FRC solenoids.

1-Wire & connector

2-Coil Assembly (12v or 24v)

3-Solenoid Body





Solenoids

To manually activate solenoids find the circular buttons behind the coil assembly. It is often a different color than the rest of the solenoid. Press it with a blunt object to temporarily activate it. Use a small slotted screwdriver inserted into the slot to press and twist the switch to lock it open.





Cylinder

Uses air to move a rod in and out of the cylindrical body. They come in many styles, and sizes.

Typically they are designated by their bodys diameter (bore) and how far the piston moves when activated (stroke).

There are also mounting and end connector options as well as the ability to add a magnetic sensor to tell the Rio where that the moving part of the piston is at a specific location.

Also known as a piston.





Tubing

FRC uses $\frac{1}{4}$ tubing. The $\frac{1}{4}$ (0.25) refers to the tubings outside diameter. Typically the inside diameter is closer to 0.15 inch. There can be pressure losses over long runs or if the tubing is deformed in some way such as being bent at too tight of an angle, pinched between two bodies, or wrapped too tightly around an immovable object.





1/4 inch
Tube



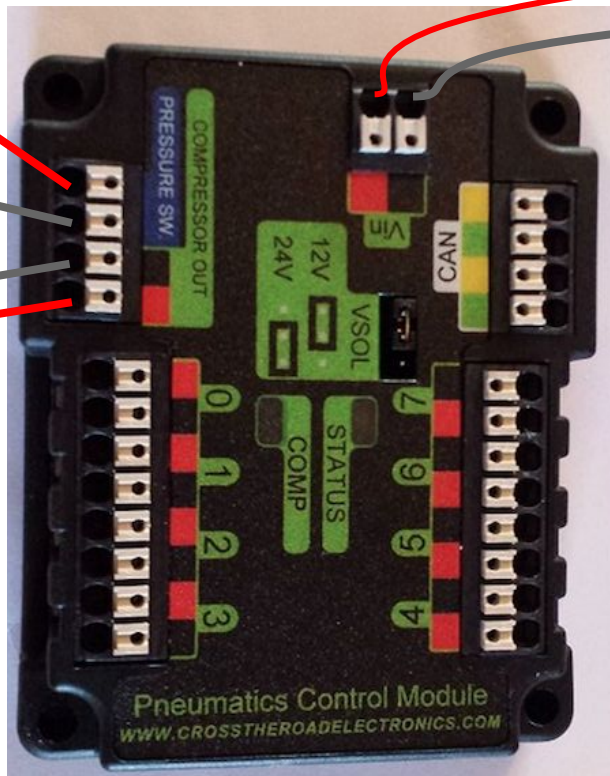
Press fit Connectors

Press fit connectors come in many sizes colors and shapes. The 1/4 inch tubing used on the robot can be pressed in with little effort. If the End of the tube is PERPENDICULAR (square) to the length, it will make an air tight fit. If the end has been smashed or is not “square” the seal will be suspect and possibly leak or fall out under pressure.

To remove the tube push in on the tubing, depress the plastic collar, and pull gently on the tubing.



Pneumatics Controller



16 Gauge

CAN IN and OUT

It does not matter

Which is which

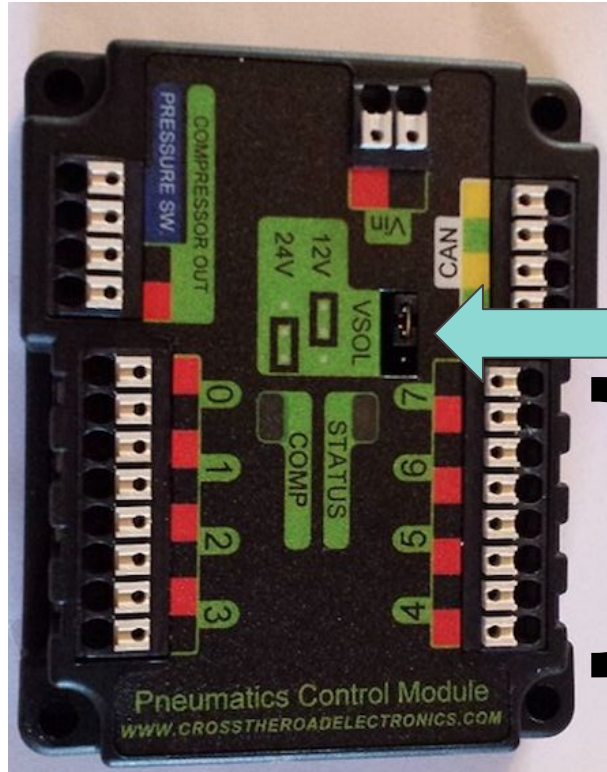
Just match the colors



Pneumatics Controller

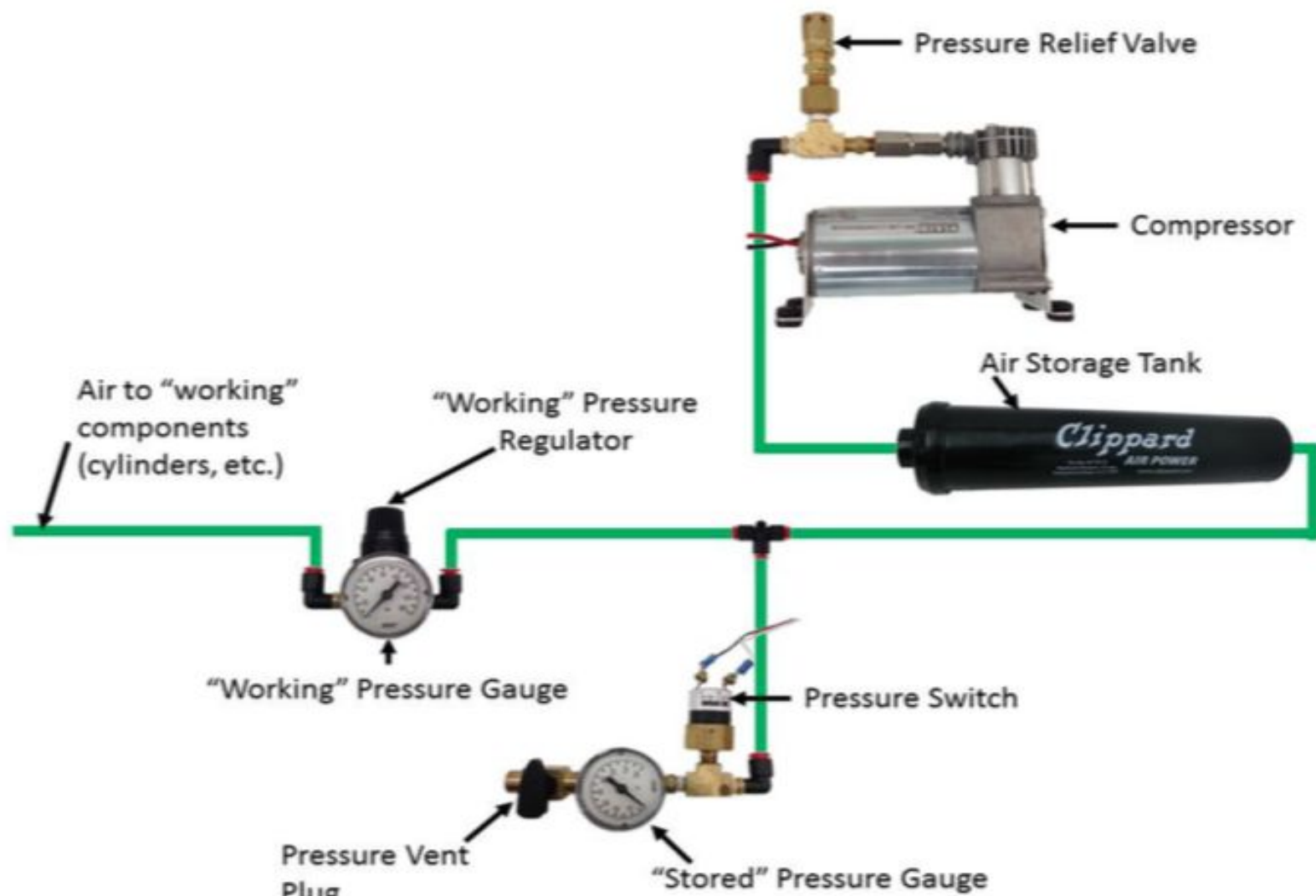
Solenoids can operate at 12 volts or 24 volts. The controller is Common Positive (+, HOT). The Negative (-, LOW) is the side that is switched on or off. The CAN bus sends the signals to an onboard controller that does the switching.

Outputs 0-3



Outputs 4-7

12 or 24 Volt Jumper
(One or the other)



כונן



To achieve Pneumatics Technician Level

2

1. Complete Level 1
2. Pass Pneumatics 2 pre-test with 100%
3. Assemble a complete functioning pneumatics board with one double action Solenoid and a double action cylinder.
4. Achieve 95% or better on Pneumatics Level 2 Test.

Pneumatic Technician Level 3

1. Troubleshooting a Pneumatics system
2. Pass Pneumatics 3 Test with 95% or better.
3. Calculating volume, recharge rate, piston power, strokes per charge.
4. Force at end of actuator.