

I. Electronics

A. Encoder

1. Used to measure distance
2. Connect through talons
3. Counts by using a series of ticks, which the value of ticks is sent to the code
 - a) 1 tick = 1° of rotation of the motor
4. Quad Encoders
 - a) Give more accurate results by constantly hitting spikes on the encoder to count ticks
 - b) Breaks more easily
 - c) Usually used with drive talons
5. Mag Encoders
 - a) Gives less accurate results since it uses magnetic forces to give the value of ticks
 - b) More durable
 - c) Usually used with mechanisms that don't require as exact results or are easily adjustable in teleop (Ex: 2018 lift)
6. Ticks per Inch
 - a) A variable in the code that gives us a conversion from the amount of inches to the amount of ticks
 - b) Calculated by dividing 360 by a distance traveled in one rotation of the motor (in inches)
 - c) Used in code when giving a value of distance to traveled (input inches * ticks per inch)
7. Functions to use in code
 - a) `talon.configSelectedFeedbackSensor(RemoteFeedbackDevice feedbackDevice, int pidIdx, int timeoutMs)` is used to configure an encoder to a specific talon
 - (1) `feedbackDevice` is the type of encoder used (quad or mag)
 - (a) `FeedbackDevice.CTRE_MagEncoder_Relative` for mag encoder
 - (b) `FeedbackDevice.QuadEncoder` for quad encoder
 - (2) `pidIdx` should always be 0 since 0 is the primary closed loop
 - (3) `TimeoutMs` is the amount of time (in milliseconds) before the function gives up on performing the task because of an excess of time (usually set to 1000)
 - b) `talon.setSelectedSensorPosition(int sensorPos, int pidIdx, int TimeoutMs)` is used to set the position of the encoder
 - (1) `sensorPos` is the value you want to set the encoder to
 - c) `talon.getSelectedSensorPosition(int pidIdx)` is used to get the value of the encoder

B. Sensors

1. Limit Switches



- a) A switch that returns true when pressed and false when not pressed
 - b) Usually used before hard stops to tell something to not move past a point
 - c) To get the value of the limit switch, use [limitswitch.get\(\)](#)
- ### 2. Ultrasonic Sensors
- a) A sensor that gives a true or false value by detecting if an object is within a certain range away from the sensor
 - b) More information:
 - c) <https://wpilib.screenstepslive.com/s/currentCS/m/java//599715-ultrasonic-sensors-measuring-robot-distance-to-a-surface>
- ### 3. Gyro Sensor
- a) A sensor that is able to get the angle of rotation of the robot
 - b) Usually used in autonomous to turn
 - c) To get the value of the gyro sensor, use [gyro.getAngle\(\)](#)
- ### 4. Camera
- a) Camera is used to display a view of the robot from the screen
 - b) Usually placed in the front of the robot to get a first person view for the driver
 - c) The camera is also used with vision

II. Pneumatics

A. Solenoids



1. Valves used in pneumatics that are programmed to tell the amount of pressure to be used
2. Usually used with pistons and gearboxes

3. Double solenoids are solenoids that can allow pistons or gearboxes to work in both directions
4. Use `doublesolenoid.set(DoubleSolenoid.Value.kForward)` to push the solenoid forward and `doublesolenoid.set(DoubleSolenoid.Value.kReverse)` to push the solenoid in reverse
5. More information:
<https://wpilib.screenstepslive.com/s/currentCS/m/java//599708-operating-pneumatic-cylinders-solenoids>

B. Compressor



1. Used to pressurize the pneumatics system
 - a) Caps out at 120 psi
2. Ex code: `compressor.start()` will start the compressor and `compressor.stop()` will turn off the compressor

III. Gearboxes

- A. Gear mode controlled by double solenoid
- B. High gear
 1. Uses smaller gear for turning
 2. Gives less torque but more speed
- C. Low gear
 1. Uses bigger gear for turning
 2. Gives less speed but more torque