The Pi-loton Project

The Pi-loton project is about my long time bucket wishlist . My wish is to make or code a speedometer for my bicycle. I never intend to compete on the existing peloton stationary bicycle, the title project seems fitting whether if I'm successful or not. The goal of this project is to implement an existing raspberry pi weather project, specifically on the anemometer aspect to IBM's Node red platform (Raspberry Pi, N.D.). I am repurposing and reusing a contact switch from a home security system. I have notice that the simple reed switch and the running code could be useful as a starting point in my speedometer project.

Start small go Lego:

To test the hardware and software, I assembled some Lego gears with motor to try out the reed switch and the anemometer python code. The raspberry pi weather station educational guide was pretty straight forward. On the hardware side, the reed switch was not complicated. The components of the reed switch are the ground, signal terminal, and a magnet. On the other hand the python code and guide was very simple to understand. The functions and variables are in human readable language. The Lego contraption was a basic Lego gears, axle and motor. The Lego was used to simulate or capture the rotation per minute of the gear. The hardest part of this implementation was to attached or glue a piece of magnet to a Lego gear. Other than that the build was easy. See attached schematic picture at the next page.

Going Node Red:

The implementation was a success and I was very happy about it. Since the first phase was successful, now its time to implement it to IBM's Node Red visual programming language. There were a lot of personal reasons why I have chosen Node Red. One, visual programming was very convenient in both coding and debugging. On top of it, the dashboard is readily available and viewable in every web browser. For me, this is a great news and approach so that I could allocate more time in the debugging and fine tuning aspects of my project.

Interval length node:

I tried to sketch some simple data flow from the python code so that I can break it down and implement it to Node Red. I am so lucky that Node Red has a great community that make flows and nodes. I admit I am not good in making functions, the only thing I got is my simple built-in human brain imagination. The Node Red community had made a lot of basic and advanced nodes through java script NPM. With this in mind, I will give credits to the maker of Interval Length node (Bartbutenears).

In this point I assumed that the readers of this project are familiar with the raspberry pi's GPIO's node in Node Red's palette. Below is a screenshot of the flow
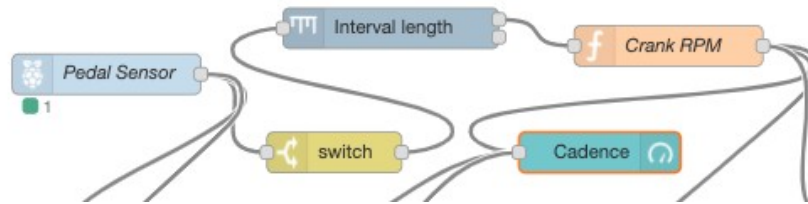
List of Material:

Raspberry pi 3 b+ complete kit
Honeywell Magnetic Contact 945T-WH
Low voltage solid wire
duck tape
zip ties

Operating System :Raspbian Strecth
Programming Language used: Node Red and Python 3
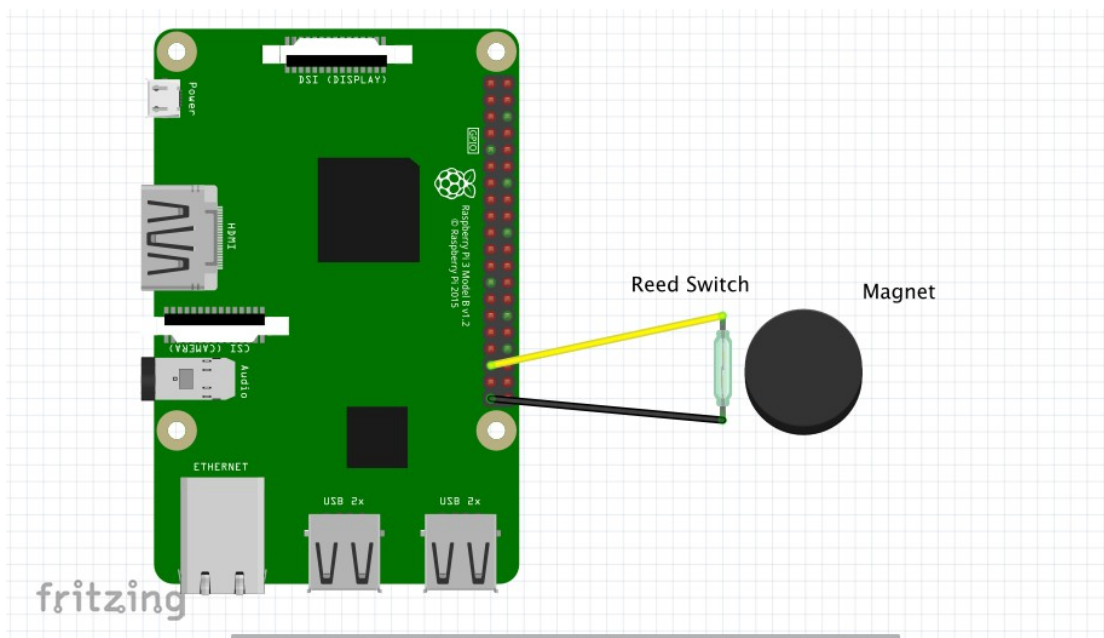
Above: Raspberry Pi GPIO Reed Switch schematic connection

After several mistakes and debugging I finally got the rounds per minute values. The flow has only five nodes to run the RPM.

Copy and paste the Json flow to check :

[{"id":"5a5ea2f2.e652dc","type":"rpi-gpio in","z":"eee72f37.6dc038","name":"Pedal Sensor","pin":"35","intype":"up","debounce":"25","read":false,"x":187,"y":224,"wires": [["4d5a13de.9b38ec","e7ea3d50.4b1b6","ee89f341.369cf"]]}, {"id":"4d5a13de.9b38ec","type":"switch","z":"eee72f37.6dc038","name":"","property":"payload","pro pertyType":"msg","rules": [{"t":"eq","v":"0","vt":"num"}],"checkall":"true","repair":false,"outputs":1,"x":356,"y":282,"wires": [["a686b3b8.402338"]]},{"id":"a686b3b8.402338","type":"interval- length","z":"eee72f37.6dc038","format":"mills","bytopic":false,"minimum":"","maximum":"","windo w":"","timeout":false,"msgTimeout":"","minimumunit":"msecs","maximumunit":"msecs","windowunit ":"msecs","msgTimeoutUnit":"msecs","reset":false,"startup":false,"msgField":"payload","timestampFi eld":"timestamp","repeatTimeout":false,"name":"","x":398,"y":190,"wires":[["8dee18cb.3647e"],[]]}, {"id":"8dee18cb.3647e","type":"function","z":"eee72f37.6dc038","name":"Crank RPM","func":"var x = msg.payload;\nvar rev = (60000/x);// milliseconds in a minute\nvar msg1 = {payload:rev};\nreturn msg1;","outputs":1,"noerr":0,"x":604.0000152587891,"y":203.0000343322754,"wires": [["abbe2edb.a4f88","e68dbde5.97eb8","14efbe31.a9bad2"]]}, {"id":"abbe2edb.a4f88","type":"ui_gauge","z":"eee72f37.6dc038","name":"","group":"df423369.1e76" ,"order":2,"width":"4","height":"4","gtype":"gage","title":"Cadence","label":"RPM","format":"{{value | number: 1}}","min":0,"max":"200","colors": ["#00b500","#e6e600","#ca3838"],"seg1":"","seg2":"","x":552.9999923706055,"y":282,"wires":[]}, {"id":"df423369.1e76","type":"ui_group","z":"","name":"Bicycle Crank and Wheel Sensors","tab":"b12ebccc.218e98","disp":true,"width":"12","collapse":false}, {"id":"b12ebccc.218e98","type":"ui_tab","z":"","name":"Speedometer and RPM Test Project","icon":"dashboard","disabled":false,"hidden":false}]

List of node used:

1. GPIO output is for the signal and ground wire from the reed switch.
      As seen above, the physical wire are connected from GPIO 19 to reed switch and a ground wire
      from reed switch to raspberry GPIO Ground. (see schematic diagram above)
2. Switch node is set only to acknowledge "0" message.
3. Interval Length node
4. Dashboard node

above is the Dashboard in Chrome Web Browser screenshot

Edit rpi-gpio in node

Delete   Cancel   Done

⚙ Properties   ⚙ ▤ 回

● Pin

3.3V Power - 1 ○	○ 2 - 5V Power
SDA1 - GPIO02 - 3 ○	○ 4 - 5V Power
SCL1 - GPIO03 - 5 ○	○ 6 - Ground
GPIO04 - 7 ○	○ 8 - GPIO14 - TxD
Ground - 9 ○	○ 10 - GPIO15 - RxD
GPIO17 - 11 ○	○ 12 - GPIO18
GPIO27 - 13 ○	○ 14 - Ground
GPIO22 - 15 ○	○ 16 - GPIO23
3.3V Power - 17 ○	○ 18 - GPIO24
MOSI - GPIO10 - 19 ○	○ 20 - Ground
MISO - GPIO09 - 21 ○	○ 22 - GPIO25
SCLK - GPIO11 - 23 ○	○ 24 - GPIO8 - CE0
Ground - 25 ○	○ 26 - GPIO7 - CE1
SD - 27 ○	○ 28 - SC
GPIO05 - 29 ○	○ 30 - Ground
GPIO06 - 31 ○	○ 32 - GPIO12
GPIO13 - 33 ○	○ 34 - Ground
GPIO19 - 35 ◉	○ 36 - GPIO16
GPIO26 - 37 ○	○ 38 - GPIO20
Ground - 39 ○	○ 40 - GPIO21

↕ Resistor?   pullup ∨   Debounce 25 mS

Above is the screenshot of what is inside of the Raspberry pi's GPIO node.

Properties

Delete   Cancel   Done

⚙ Properties   ⚙ ▤ 回

🏷 Name   [Name   ]

••• Property   ▼ msg. payload

≡ == ∨   ▼ %₉ 0   → 1 ✕

➕ add

Above: Inside Switch node screenshot

Above: Inside Interval Length node screenshot

Above: Inside Crank Function node screenshot

Above: Inside Dashboard node screenshot

High Rotational Speed Problem:
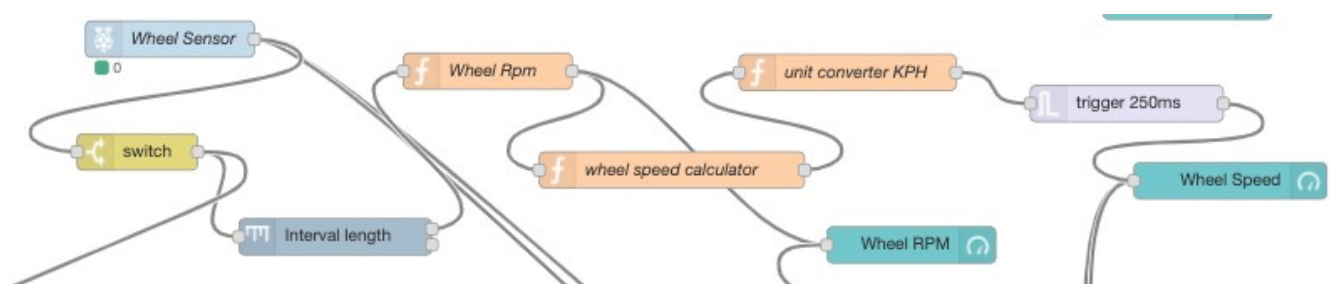
Above : Wheel Sensor data flow screenshot

The problem came upon in implementing a similar set up in measuring the wheel's rpm. I noticed that the wheel dashboard output goes crazy above 400 rpm. Signal gets lost beyond 400 rpm. It took me some time to debug this problem. So I went back to the anemometer python script and check if the code will work at high rotational speed. In deed it worked. This gives me confidence that both hardwares and the pi and reed switch were perfectly fine.

Yes, I took the hardest way. I should have check the reed switch documentation first. Anyway the problem was not on the Interval Length node nor on the Wheel Function node. The problem was in the Raspberry Pi GPIO's node, named the "Wheel Sensor". Going back as to what is inside the Pedal sensor node, the node has a "debounce" and the default field value was set to 25 milliseconds. With my stubbornness and desperation I was curious to change the values. And there it was, the fix to my problem , so I changed the debounce value to 1 milliseconds inside the Wheel Sensor node.

Above: Inside Wheel Sensor Node screenshot

Problem:

Now that I have set the debounce value to 1ms , I can get a signal but the signal or message is not stable. The Interval Length node is reading a null message. Since I do not have an oscilloscope to check its signal, I tried to graph the wheel's rpm using the Chart dashboard node. The result was, the timeline on the chart will log a certain value then drops to zero when the value is null. This is a very challenging problem again, how can I debug this problem. There was a saying "if you want to learn fast, read , but if you want to learn faster, observe. "

The internet has a limited information regarding home made or DIY speedometer implemented in Node Red. So there were no option left but to observe. I check our cars wheel and observe that there 6 pieces the size of the Honeywell reed switch magnets along the rims. I hate to assume but my guts were pretty sure it must be a magnet inclosed in a none magnetic enclosure.

The First Prototype.

So this is what the first Pi-loton prototype looks like. It's composed of ugly recycled cat 5 wires, Lego bricks for spacers, painters and duck tape, zip ties, terminal blocks, old bicycle and rusty bike trainer.
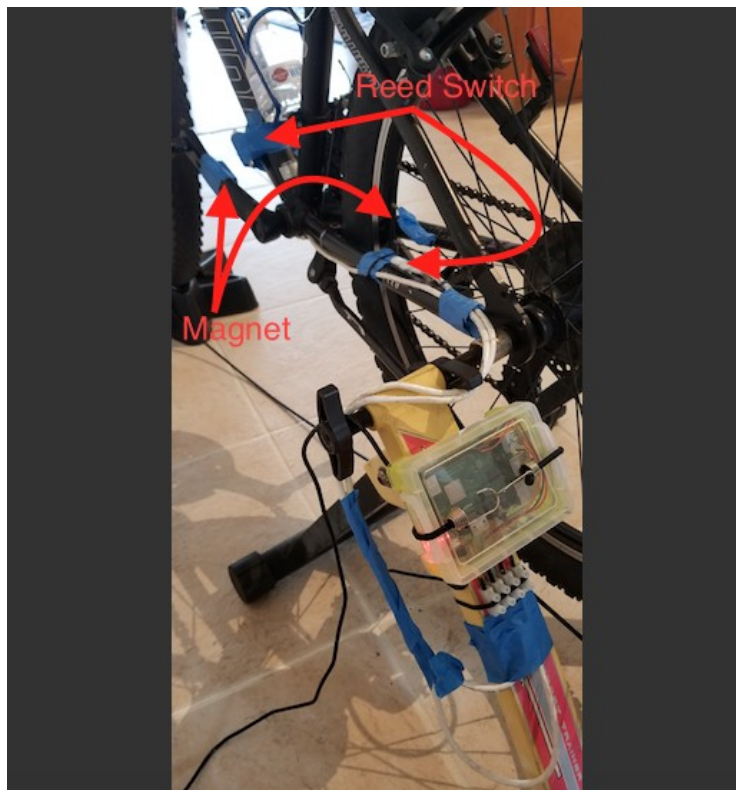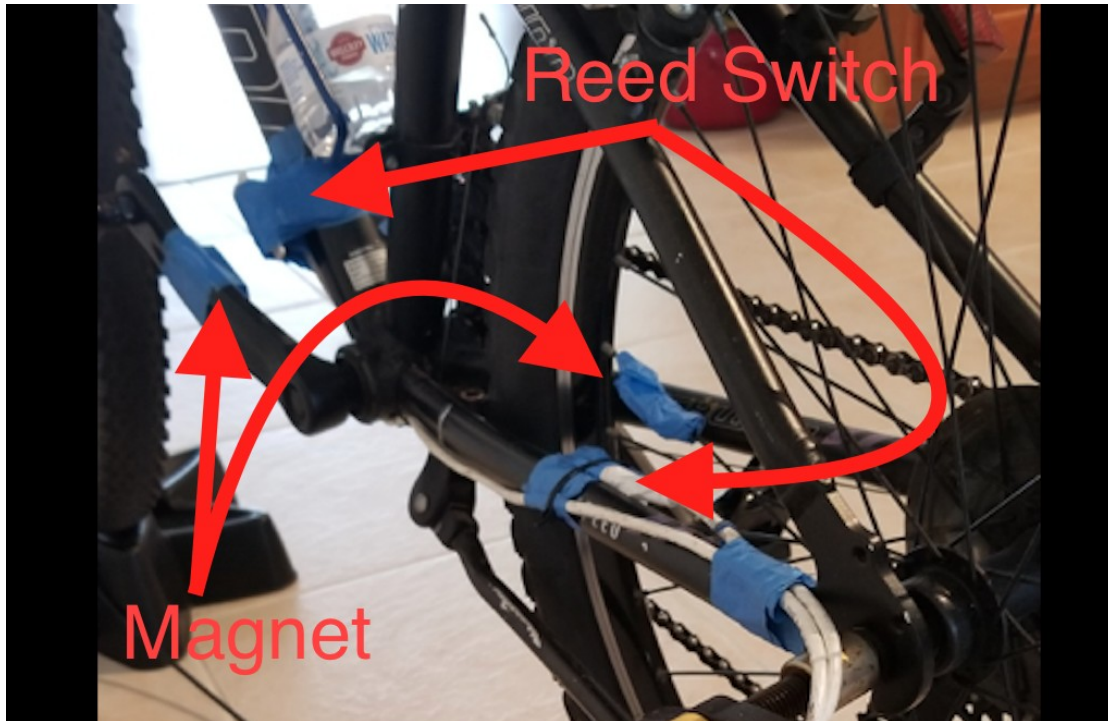
Additional Magnet:

What if I'll add an additional magnet at my spoke instead of one. So I tried to add another magnet at the spoke at the rear wheel. To be honest I believe its not the right solution but at least at some point it compensate and solves the problem.   Of course one solution that could fix a problem could lead to another problem.

This time the Speed Calculator function node goes crazy. I am aware that in every mathematical solution a logical reason should correspond. This time a magical adjustment was made at the Wheel RPM function node. The message payload from the Interval Length Node was divided to 10 as seen below.
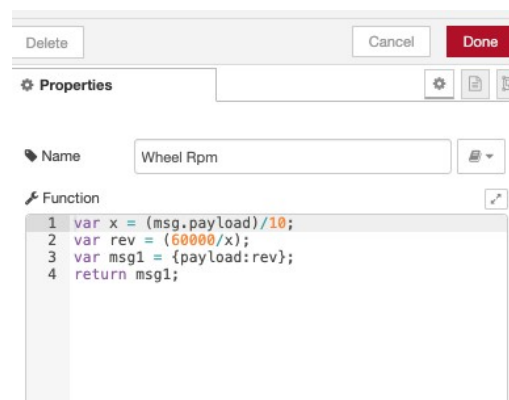
For those of you who had some reaction or feedbacks on this approach. I would like to ask, to please be kind and be civil in criticizing at my amateur approach.
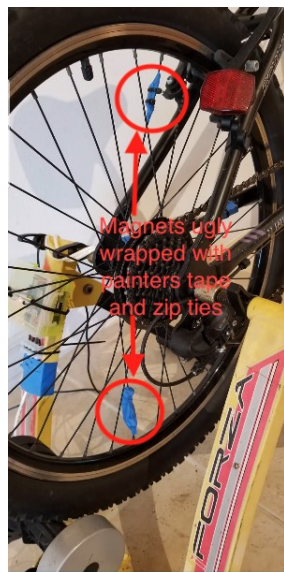
The picture above shows two magnets attached at the rear wheel's spoke.

There are available Cateye bicycle computer replacements magnets available at Amazon for less than 10 dollars. I just utilized the Honeywell cylindrical magnets.

Calibration and Validation:

The question to be fulfilled, are the Crank and Wheel RPM values are correct?

In my very own experience and testing, I am tempted to say that the Crank RPM values are 96 percent correct. With plus or minus two percent margin of error, errors are allocated for the bounce and debounce error and smoothing. But this is not how science works. I somehow need a tachometer to validate it.

I believe much of the work in this project were applied in data validation and calibration. The task was not easy specially that I do not have any major electronic background and sophisticated tester and tools. So what I did , I had to do a side by side comparison by running two programs at the same time. I compared the velocity of the Wheel Speed Dashboard to the print output of the anemometer python script that was written by Raspberry Pi's Educational Foundation (Raspberry Pi, N.D.).

 A second prototype was also made in order to compare the Wheel Speed Dashboard and my bicycle computer app at my road bike.

The spin off of this calibration and data validation was that, I in turn had made a measuring tool to compute distance or odometer. So to simplify the calibration and validation I had to base it on the wheel's circumference and number of complete turn it can make.

Circumference = 2*pi*radius

Based on this formula, if I can count the reed switch signals every time the wheel completes a 360 turn and multiply it to the wheels circumference then I think I can determined the distance covered based on how many complete turn the wheel has made.

So this is the propose flow I made for the Odometer.
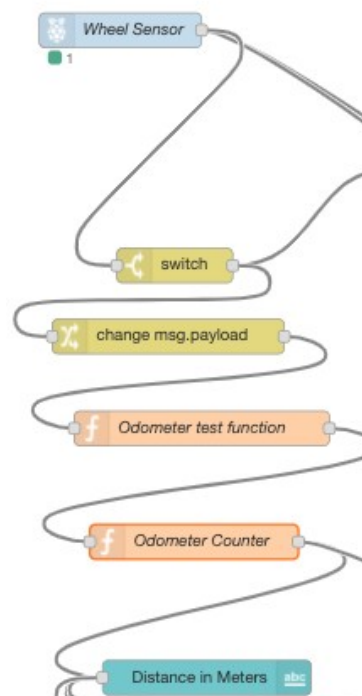
Instead of passing the message first to the Interval Length node, the message was directly passed to the Odometer Function node. The Odometer counter then divides it by 2 each time a value is passed because there were two magnets that were attached at the wheels spokes.

Adjustments:

I think it is safe to say that this project's and its data output are not dead accurate. This is just an estimates. Both the crank and wheel's rpm values are just estimated values considering electrical noise, debounce, smoothing , mathematical formula error and bugs.

The take away of this project was that I did not just made a speedometer and odometer , I did make an iOT bicycle trainer. Hence the Pi-loton pun was born. Of course I added some bicycling training programs, and the 90 second progressive ride from GCN (Global Cycling Network, 2019).

Prototype 2: Modified wire routing and raspberry pi enclosure inside a recycled water bottle:
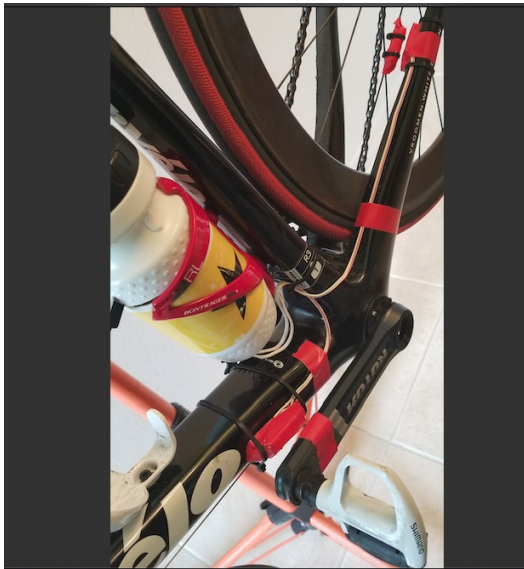
Conclusion:

In conclusion, I would like to thank the Raspberry Pi Foundation and to the Raspberry pi community for its generosity in giving ideas and guidelines about this build. To Node-Red and to Node-Red node contributors, thank you. This project would not be possible if not through the open source principle and ideas.

This experiment are subject for peers review. Since this is not a dead accurate measuring tool, I am hoping that by sharing this project to my peers, enthusiast could contribute ideas to further improve this test case. I learned that when I added the statistics node for the estimated average speed, the crank rpm values is not smooth (Raff, 2019). I mean the values fluctuates as seen in the RPM chart. A data log or data log management will be the next step on this project. I am happy that the reused and repurposed door contact switch works well and had enable me to do such wonderful experiences. I also documented my mistakes and learning curves. The calibration aspects of this project needs a lot of improvement. In terms of my physical health, I manage to shed more than 10 pounds in cranking the pedals for testing purposes.

I am also glad that my family and I are now eager to spin at least 6 mins or with an estimated distance of 1.2 miles a day. Thank you for reading this document and I am open to receive any feedbacks and recommendation on how can I and others improve this concept and project.
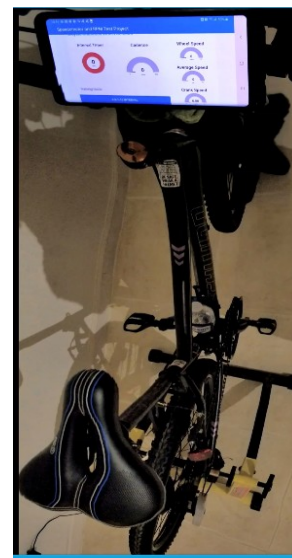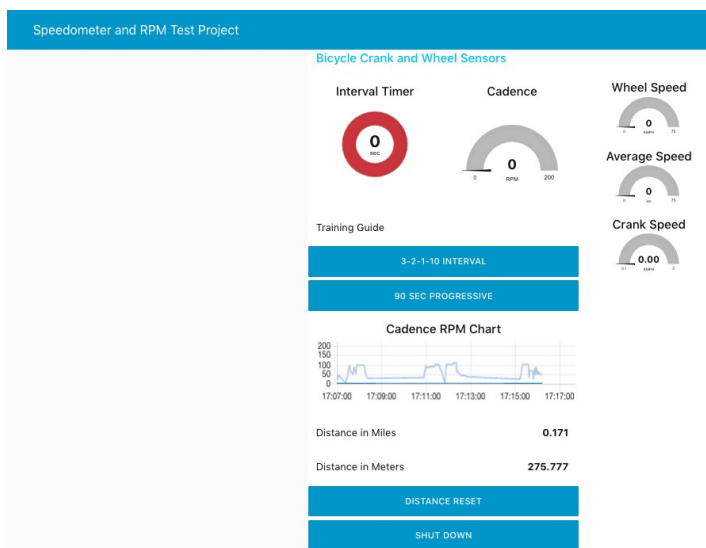
Dashboard pictures

Below are the reference guide and complete json file for the bicycle speedometer and odometer node red flow.

Reference:

Raspberry Pi (N.D.). Build your own weather station. Retrieve from https://projects.raspberrypi.org/en/projects/build-your-own-weather-station

Node-Red (N.D). Node-Red. Retrieve from https://nodered.org/

Bartbutenears (N.D.). Interval length node.Retrieve from https://flows.nodered.org/node/node-red-contrib-interval-length

Node-red-contrib-countdown. Retrieve from https://flows.nodered.org/node/node-red-contrib-countdown

Global Cycling Network (January 28,2019). Quick Progressive Effort 20 minute Workout | Climb The Passo Gardena with GCN. Retrieve from https://www.youtube.com/watch?v=SZRk3OY2RAY

Raff, Sebastian (2019). Node-Red-Contrib-Combine. Retrieve from https://flows.nodered.org/node/node-red-contrib-combine

Complete crank and wheel rpm with speedometer and odometer json file :

[{"id":"5a5ea2f2.e652dc","type":"rpi-gpio in","z":"eee72f37.6dc038","name":"Pedal Sensor","pin":"35","intype":"up","debounce":"25","read":false,"x":187,"y":224,"wires": [["4d5a13de.9b38ec","e7ea3d50.4b1b6","ee89f341.369cf"]]}, {"id":"a54fb71.5e264c8","type":"debug","z":"eee72f37.6dc038","name":"","active":true,"tosidebar":true,"console":false,"tostatus":false,"complete":"true","targetType":"full","x":1564.714942932129,"y":681.0001125335693,"wires":[]},{"id":"98c086d6.6dbd08","type":"rpi-gpio in","z":"eee72f37.6dc038","name":"Wheel Sensor","pin":"40","intype":"up","debounce":"1","read":false,"x":103.05561065673828,"y":506.1389865875244,"wires":[["945935de.4bd0e8","bbce5d39.5bd04","fda24ec1.8c0dc"]]}, {"id":"4d5a13de.9b38ec","type":"switch","z":"eee72f37.6dc038","name":"","property":"payload","propertyType":"msg","rules": [{"t":"eq","v":"0","vt":"num"}],"checkall":"true","repair":false,"outputs":1,"x":356,"y":282,"wires": [["a686b3b8.402338"]]},{"id":"a686b3b8.402338","type":"interval-length","z":"eee72f37.6dc038","format":"mills","bytopic":false,"minimum":"","maximum":"","window":"","timeout":false,"msgTimeout":"","minimumunit":"msecs","maximumunit":"msecs","windowunit":"msecs","msgTimeoutUnit":"msecs","reset":false,"startup":false,"msgField":"payload","timestampField":"timestamp","repeatTimeout":false,"name":"","x":388.00001525878906,"y":138.57143592834473,"wires":[["8dee18cb.3647e"],[]]}, {"id":"8dee18cb.3647e","type":"function","z":"eee72f37.6dc038","name":"Crank RPM","func":"var x = msg.payload;\nvar rev = (60000/x);// milliseconds in a minute\nvar msg1 = {payload:rev};\nreturn msg1;","outputs":1,"noerr":0,"x":605.4285659790039,"y":153.00003242492676,"wires": [["abbe2edb.a4f88","e68dbde5.97eb8","14efbe31.a9bad2"]]}, {"id":"abbe2edb.a4f88","type":"ui_gauge","z":"eee72f37.6dc038","name":"","group":"df423369.1e76","order":2,"width":"4","height":"4","gtype":"gage","title":"Cadence","label":"RPM","format":"{{value | number: 0}}","min":0,"max":"200","colors": ["#00b500","#e6e600","#ca3838"],"seg1":"","seg2":"","x":552.9999923706055,"y":282,"wires":[]}, {"id":"e7ea3d50.4b1b6","type":"trigger","z":"eee72f37.6dc038","op1":"","op2":"0","op1type":"nul","op2type":"num","duration":"2","extend":false,"units":"s","reset":"0","bytopic":"all","name":"","x":253,"y":351,"wires":[["abbe2edb.a4f88","e68dbde5.97eb8","d7a539ee.7d5758"]]}, {"id":"ee89f341.369cf","type":"trigger","z":"eee72f37.6dc038","op1":"","op2":"1","op1type":"nul","op2type":"num","duration":"2","extend":false,"units":"s","reset":"1","bytopic":"all","name":"","x":265,"y":387,"wires":[["abbe2edb.a4f88","e68dbde5.97eb8","d7a539ee.7d5758"]]}, {"id":"88a44ce4.9e933","type":"ui_gauge","z":"eee72f37.6dc038","name":"","group":"df423369.1e76","order":11,"width":"4","height":"2","gtype":"gage","title":"Wheel Speed","label":"KMPH","format":"{{value| number:0 }}","min":0,"max":"75","colors": ["#00b500","#e6e600","#ca3838"],"seg1":"","seg2":"","x":1086.2503204345703,"y":621.1669549942017,"wires":[]},{"id":"abd42eb2.0c93e8","type":"interval-length","z":"eee72f37.6dc038","format":"mills","bytopic":false,"minimum":"","maximum":"","window":"","timeout":false,"msgTimeout":"","minimumunit":"msecs","maximumunit":"msecs","windowunit":"msecs","msgTimeoutUnit":"msecs","reset":false,"startup":false,"msgField":"payload","timestampField":"timestamp","repeatTimeout":false,"name":"","x":420.33333587646484,"y":625.4167404174805,

"wires":[["49f7f80e.6f7f38"],[]]},
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{"id":"4307b027.66a52","type":"function","z":"eee72f37.6dc038","name":"Odometer Counter","func":"var x = msg.payload;\nvar local=flow.get('data') || {};\nif (local.count===undefined)//test exists\n{\n local.count=0;\n}\nlocal.count += x/2; // change to distance \nflow.set('data',local);\nvar msg1 = {payload: local.count};\nreturn msg1;\n","outputs":1,"noerr":0,"x":166.66668319702148,"y":947.9999866485596,"wires": [["7d06f4fc.898a3c","c80fca23.dbd388"]]},
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{"id":"c80fca23.dbd388","type":"ui_text","z":"eee72f37.6dc038","group":"df423369.1e76","order":7," width":"8","height":"1","name":"","label":"Distance in Miles","format":"{{(value)/1609.3 | number: 3}}","layout":"row-spread","x":868,"y":1183.6666259765625,"wires":[]},

{"id":"e68dbde5.97eb8","type":"ui_chart","z":"eee72f37.6dc038","name":"","group":"df423369.1e76", "order":6,"width":"8","height":"3","label":"Cadence RPM Chart ","chartType":"line","legend":"false","xformat":"HH:mm:ss","interpolate":"linear","nodata":"","dot":false,"ymin":"0","ymax":"200","removeOlder":"20","removeOlderPoints":"","removeOlderUnit":"60","cutout":0,"useOneColor":false,"colors": ["#1f77b4","#aec7e8","#ff7f0e","#2ca02c","#98df8a","#d62728","#ff9896","#9467bd","#c5b0d5"],"useOldStyle":false,"outputs":1,"x":601.6667098999023,"y":360.666711807251,"wires":[[]]},
{"id":"e634acdc.d7123","type":"ui_gauge","z":"eee72f37.6dc038","name":"","group":"df423369.1e76 ","order":12,"width":"4","height":"2","gtype":"gage","title":"Ave Pace m/s","label":"ms","format":"{{value| number:0 }}","min":0,"max":"30","colors": ["#00b500","#e6e600","#ca3838"],"seg1":"","seg2":"","x":1269.8611145019531,"y":765.2223415374756,"wires":[]},
{"id":"fda24ec1.8c0dc","type":"switch","z":"eee72f37.6dc038","name":"","property":"payload","propertyType":"msg","rules": [{"t":"eq","v":"0","vt":"num"}],"checkall":"true","repair":false,"outputs":1,"x":149.99999618530273,"y":709.3333377838135,"wires":[["abd42eb2.0c93e8","7dd5e471.f23b3c"]]},
{"id":"b6989342.d7b2e","type":"trigger","z":"eee72f37.6dc038","op1":"","op2":"","op1type":"nul","op2type":"payl","duration":"600","extend":false,"units":"ms","reset":"","bytopic":"all","name":"","x":1000.472354888916,"y":557.3890018463135,"wires":[["88a44ce4.9e933"]]},
{"id":"14efbe31.a9bad2","type":"function","z":"eee72f37.6dc038","name":"crank speed calculator","func":"var rpm = (msg.payload);\nvar radius = 15.24; // crank base in cm\nvar cm_in_m= 100000;\nvar sec_in_an_hour = 3600;\nvar circumference_cm = (2* Math.PI) * radius;\n\nvar dist_km = (circumference_cm * rpm)/ cm_in_m;\nvar km_per_sec =dist_km /3600; \n//var km_per_hour = (km_per_sec * sec_in_an_hour * 1.8);\n//var msg1 = {payload: km_per_hour};\nvar msg1 = {payload: km_per_sec};\nreturn msg1;","outputs":1,"noerr":0,"x":836,"y":335.66667127609253,"wires": [["50b759df.009678","a86600a7.83585"]]},
{"id":"50b759df.009678","type":"function","z":"eee72f37.6dc038","name":"unit converter KPH","func":"var x = msg.payload*10;\n//var z = x*6.485;\n//var msg1 = {payload:z};\n//return msg1;\nvar kmps_to_kmph = 3600;\nvar adjustment = 1.999;\nvar z = (kmps_to_kmph * adjustment) * x;\nvar msg1 = {payload:z};\nreturn msg1;","outputs":1,"noerr":0,"x":876.7500076293945,"y":405.75000762939453,"wires": [["d7a539ee.7d5758"]]},
{"id":"d7a539ee.7d5758","type":"ui_gauge","z":"eee72f37.6dc038","name":"","group":"df423369.1e76", "order":13,"width":"4","height":"2","gtype":"gage","title":"Crank Speed","label":"KMPH","format":"{{value| number:2 }}","min":"0.1","max":"3","colors": ["#00b500","#e6e600","#ca3838"],"seg1":"","seg2":"","x":1050.7777786254883,"y":472.7778015136719,"wires":[]},{"id":"a86600a7.83585","type":"function","z":"eee72f37.6dc038","name":"estimated force at 15 newton","func":"var meters_per_sec = msg.payload;\nvar estimated_force = 15; //newton\nvar power = estimated_force * meters_per_sec\nvar msg1 = {payload: power};\nreturn msg1;","outputs":1,"noerr":0,"x":1169,"y":402.6666717529297,"wires":[[]]},
{"id":"2d270dc0.249862","type":"function","z":"eee72f37.6dc038","name":"Odometer test function","func":"var rpm = msg.payload;\nvar radius = 30.48; // Wheel base\nvar cm_in_m= 100;\nvar sec_in_an_hour = 3600;\nvar circumference_cm = (2* Math.PI) * radius;\n\nvar dist_m = (circumference_cm * rpm)/ cm_in_m;\n//var meters_per_sec =dist_m /60; \nvar msg1 = {payload: dist_m};\nreturn msg1;","outputs":1,"noerr":0,"x":173.33338928222656,"y":850.0000324249268,"wires": [["4307b027.66a52"]]},
{"id":"7dd5e471.f23b3c","type":"change","z":"eee72f37.6dc038","name":"","rules":

[{"t":"change","p":"payload","pt":"msg","from":"0","fromt":"num","to":"1","tot":"num"}],"action":"","property":"","from":"","to":"","reg":false,"x":144.3798828125,"y":770.6103515625,"wires":[["2d270dc0.249862"]]},
{"id":"7f4e6b32.a80f44","type":"function","z":"eee72f37.6dc038","name":"Average Speed Test","func":"var x = msg.payload;\nvar mstokph = 3.6;\nvar z = (x * mstokph);\nvar msg1 = {payload:z};\nreturn msg1;","outputs":1,"noerr":0,"x":422.26564025878906,"y":881.0898942947388,"wires":[[]]},
{"id":"74eae5f3.60d65c","type":"trigger","z":"eee72f37.6dc038","op1":"","op2":"","op1type":"nul","op2type":"payl","duration":"600","extend":false,"units":"ms","reset":"","bytopic":"all","name":"","x":808.7656555175781,"y":728.500036239624,"wires":[["e634acdc.d7123"]]},
{"id":"5412e31f.ea58dc","type":"change","z":"eee72f37.6dc038","name":"","rules":[{"t":"set","p":"payload","pt":"msg","to":"topic","tot":"msg"}],"action":"","property":"","from":"","to":"","reg":false,"x":1088.75390625,"y":1016.7421875,"wires":[[]]},
{"id":"df423369.1e76","type":"ui_group","z":"","name":"Bicycle Crank and Wheel Sensors","tab":"b12ebccc.218e98","disp":true,"width":"12","collapse":false},
{"id":"b12ebccc.218e98","type":"ui_tab","z":"","name":"Speedometer and RPM Test Project","icon":"dashboard","disabled":false,"hidden":false}]

complete 321-10 bicycle training program json file:

[{"id":"7f35fdc6.49ba34","type":"countdown","z":"239e9d38.7c5862","name":"","topic":"","payloadTimerStart":"true","payloadTimerStartType":"bool","payloadTimerStop":"false","payloadTimerStopType":"bool","timer":"181","resetWhileRunning":false,"setTimeToNewWhileRunning":true,"startCountdownOnControlMessage":false,"x":438.3333435058594,"y":296.00000762939453,"wires":[["11371672.29063a"],["d5dcf162.a470b","4164dbab.0308d4"]]},
{"id":"4c50a396.75360c","type":"inject","z":"239e9d38.7c5862","name":"","topic":"","payload":"","payloadType":"date","repeat":"","crontab":"","once":false,"onceDelay":0.1,"x":110.33334732055664,"y":196.0000400543213,"wires":[["7f35fdc6.49ba34"]]},
{"id":"d5dcf162.a470b","type":"ui_gauge","z":"239e9d38.7c5862","name":"","group":"df423369.1e76","order":1,"width":"4","height":"4","gtype":"donut","title":"Interval Timer","label":"sec","format":"{{value}}","min":"180","max":"0","colors":["#00b500","#e6e600","#ca3838"],"seg1":"","seg2":"","x":708.3333358764648,"y":471.00000190734863,"wires":[]},
{"id":"4d15f058.b4531","type":"countdown","z":"239e9d38.7c5862","name":"","topic":"","payloadTimerStart":"true","payloadTimerStartType":"bool","payloadTimerStop":"false","payloadTimerStopType":"bool","timer":"121","resetWhileRunning":false,"setTimeToNewWhileRunning":true,"startCountdownOnControlMessage":false,"x":480.6666564941406,"y":395.6666564941406,"wires":[["60b07c07.11cd44"],["d5dcf162.a470b","da028d14.7cd0e"]]},
{"id":"b69899db.073be8","type":"trigger","z":"239e9d38.7c5862","op1":"1","op2":"","op1type":"str","op2type":"date","duration":"22","extend":false,"units":"s","reset":"","bytopic":"all","name":"","x":191.3333511352539,"y":93.16667461395264,"wires":[[]]},
{"id":"d8e0333.c89c7d","type":"countdown","z":"239e9d38.7c5862","name":"","topic":"","payloadTimerStart":"true","payloadTimerStartType":"bool","payloadTimerStop":"false","payloadTimerStopType":"bool","timer":"61","resetWhileRunning":false,"setTimeToNewWhileRunning":true,"startCountdownOnControlMessage":false,"x":475.6666564941406,"y":495.3333435058594,"wires":[["1529105b.1de5a"],["d5dcf162.a470b","57bd8ac2.9c7834"]]},
{"id":"cb7be469.b514f8","type":"ui_button","z":"239e9d38.7c5862","name":"","group":"df423369.1e76","order":4,"width":"8","height":"1","passthru":false,"label":"3-2-1-10 Interval","tooltip":"","color":"","bgcolor":"","icon":"","payload":"true","payloadType":"bool","topic":"","x":415.3333435058594,"y":108.66667366027832,"wires":[["34824c6e.d2b184"]]},
{"id":"11371672.29063a","type":"switch","z":"239e9d38.7c5862","name":"","property":"payload","propertyType":"msg","rules":[{"t":"true"},
{"t":"false"}],"checkall":"true","repair":false,"outputs":2,"x":119.33332824707031,"y":411.00000762939453,"wires":[[],["45f6779e.e1b318"]]},
{"id":"f6e6873.34ab578","type":"debug","z":"239e9d38.7c5862","name":"","active":true,"tosidebar":true,"console":false,"tostatus":false,"complete":"true","targetType":"full","x":593.5556182861328,"y":237.22222805023193,"wires":[]},
{"id":"60b07c07.11cd44","type":"switch","z":"239e9d38.7c5862","name":"","property":"payload","propertyType":"msg","rules":[{"t":"true"},
{"t":"false"}],"checkall":"true","repair":false,"outputs":2,"x":143.66668319702148,"y":524.666704177

8564,"wires":[[],["32de8e89.aece62"]]},
{"id":"45f6779e.e1b318","type":"change","z":"239e9d38.7c5862","name":"","rules":
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n":"","property":"","from":"","to":"","reg":false,"x":130.33333587646484,"y":459.33333683013916,"
wires":[["4d15f058.b4531"]]},
{"id":"32de8e89.aece62","type":"change","z":"239e9d38.7c5862","name":"","rules":
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res":[["d8e0333.c89c7d"]]},
{"id":"4fac37d2.c2d688","type":"countdown","z":"239e9d38.7c5862","name":"","topic":"","payloadTi
merStart":"true","payloadTimerStartType":"bool","payloadTimerStop":"false","payloadTimerStopType
":"bool","timer":"11","resetWhileRunning":false,"setTimeToNewWhileRunning":true,"startCountdown
OnControlMessage":false,"x":488.1666564941406,"y":648.3333683013916,"wires":
[["ba990ab5.547a48"],["d5dcf162.a470b","996d43c.a91aec"]]},
{"id":"1529105b.1de5a","type":"switch","z":"239e9d38.7c5862","name":"","property":"payload","pro
pertyType":"msg","rules":[{"t":"true"},
{"t":"false"}],"checkall":"true","repair":false,"outputs":2,"x":154.6666717529297,"y":633.3333129882
812,"wires":[[],["eba11e35.6c7b8"]]},
{"id":"eba11e35.6c7b8","type":"change","z":"239e9d38.7c5862","name":"","rules":
[{"t":"change","p":"payload","pt":"msg","from":"false","fromt":"bool","to":"true","tot":"bool"}],"actio
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res":[["4fac37d2.c2d688"]]},
{"id":"de4bd7cf.a483a8","type":"ui_text","z":"239e9d38.7c5862","group":"df423369.1e76","order":3,
"width":"8","height":"1","name":"","label":"Training
Guide","format":"{{msg.payload}}","layout":"row-
spread","x":1811.9166564941406,"y":1262.416838645935,"wires":[]},
{"id":"34824c6e.d2b184","type":"countdown","z":"239e9d38.7c5862","name":"","topic":"","payloadTi
merStart":"true","payloadTimerStartType":"bool","payloadTimerStop":"false","payloadTimerStopType
":"bool","timer":"12","resetWhileRunning":false,"setTimeToNewWhileRunning":true,"startCountdown
OnControlMessage":false,"x":480.33333587646484,"y":178.33335399627686,"wires":
[["7d6baddd.6ec4b4"],["54109196.8f6f4"]]},
{"id":"7d6baddd.6ec4b4","type":"switch","z":"239e9d38.7c5862","name":"","property":"payload","pro
pertyType":"msg","rules":[{"t":"true"},
{"t":"false"}],"checkall":"true","repair":false,"outputs":2,"x":146.6666717529297,"y":289.6666564941
406,"wires":[[],["d5e672b1.ebc4b"]]},
{"id":"d5e672b1.ebc4b","type":"change","z":"239e9d38.7c5862","name":"","rules":
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wires":[["7f35fdc6.49ba34"]]},
{"id":"54109196.8f6f4","type":"switch","z":"239e9d38.7c5862","name":"1","property":"payload","pro
pertyType":"msg","rules":[{"t":"eq","v":"10","vt":"num"},{"t":"eq","v":"5","vt":"num"},
{"t":"eq","v":"3","vt":"num"},{"t":"eq","v":"2","vt":"num"},{"t":"eq","v":"1","vt":"num"},
{"t":"eq","v":"0","vt":"num"}],"checkall":"true","repair":false,"outputs":6,"x":702.3333740234375,"y"
:136.00001907348633,"wires":[["6c8ba9b1.b03318"],["a0ff71a5.58b05"],["d92f5e51.00557"],
["2ed58e40.afd242"],["e9497f97.c4883"],["b4893f4e.f9161"]]},
{"id":"6c8ba9b1.b03318","type":"change","z":"239e9d38.7c5862","name":"","rules":
[{"t":"change","p":"payload","pt":"msg","from":"10","fromt":"num","to":"please prepare to do an easy
ride or 60
rpm","tot":"str"}],"action":"","property":"","from":"","to":"","reg":false,"x":952.3333358764648,"y":3

6.66667079925537,"wires":[["de4bd7cf.a483a8","9384cd60.128f8"]]},

{"id":"9384cd60.128f8","type":"ui_audio","z":"239e9d38.7c5862","name":"","group":"df423369.1e76
","voice":"","always":"","x":1945.5833358764648,"y":1137.166748046875,"wires":[]},

{"id":"a0ff71a5.58b05","type":"change","z":"239e9d38.7c5862","name":"","rules":
[{"t":"change","p":"payload","pt":"msg","from":"5","fromt":"num","to":" do an easy ride or 60 rpm
in","tot":"str"}],"action":"","property":"","from":"","to":"","reg":false,"x":957.6666717529297,"y":98.
6666669845581,"wires":[["9384cd60.128f8","de4bd7cf.a483a8"]]},

{"id":"e9497f97.c4883","type":"change","z":"239e9d38.7c5862","name":"","rules":
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[["9384cd60.128f8","de4bd7cf.a483a8"]]},

{"id":"d92f5e51.00557","type":"change","z":"239e9d38.7c5862","name":"","rules":
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roperty":"","from":"","to":"","reg":false,"x":956.6666717529297,"y":175.66667652130127,"wires":
[["9384cd60.128f8","de4bd7cf.a483a8"]]},

{"id":"2ed58e40.afd242","type":"change","z":"239e9d38.7c5862","name":"","rules":
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[["de4bd7cf.a483a8","9384cd60.128f8"]]},

{"id":"b4893f4e.f9161","type":"change","z":"239e9d38.7c5862","name":"","rules":
[{"t":"change","p":"payload","pt":"msg","from":"0","fromt":"num","to":" easy ride or 60
rpm","tot":"str"}],"action":"","property":"","from":"","to":"","reg":false,"x":971.0000076293945,"y":3
64.6666669845581,"wires":[["9384cd60.128f8","de4bd7cf.a483a8"]]},

{"id":"4164dbab.0308d4","type":"switch","z":"239e9d38.7c5862","name":"2","property":"payload","p
ropertyType":"msg","rules":[{"t":"eq","v":"10","vt":"num"},{"t":"eq","v":"5","vt":"num"},
{"t":"eq","v":"3","vt":"num"},{"t":"eq","v":"2","vt":"num"},{"t":"eq","v":"1","vt":"num"},
{"t":"eq","v":"0","vt":"num"}],"checkall":"true","repair":false,"outputs":6,"x":976.3333129882812,"y"
:513.6666870117188,"wires":[["608f6cca.d492c4"],["7bb0ceb5.3b21a"],["bfe64e5b.320aa"],
["5bb4861b.9df148"],["e92e31e4.3a0e"],["56e5fc3.745d104"]]},

{"id":"608f6cca.d492c4","type":"change","z":"239e9d38.7c5862","name":"","rules":
[{"t":"change","p":"payload","pt":"msg","from":"10","fromt":"num","to":"please prepare to do
medium ride or 90
rpm","tot":"str"}],"action":"","property":"","from":"","to":"","reg":false,"x":1226.3332748413086,"y":
414.3333387374878,"wires":[["9384cd60.128f8","de4bd7cf.a483a8"]]},

{"id":"7bb0ceb5.3b21a","type":"change","z":"239e9d38.7c5862","name":"","rules":
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6.3333349227905,"wires":[["9384cd60.12
8f8","de4bd7cf.a483a8"]]},

{"id":"e92e31e4.3a0e","type":"change","z":"239e9d38.7c5862","name":"","rules":
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{"id":"bfe64e5b.320aa","type":"change","z":"239e9d38.7c5862","name":"","rules":
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{"id":"5bb4861b.9df148","type":"change","z":"239e9d38.7c5862","name":"","rules":
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rpm","tot":"str"}],"action":"","property":"","from":"","to":"","reg":false,"x":1244.9999465942383,"y":
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{"t":"eq","v":"0","vt":"num"}],"checkall":"true","repair":false,"outputs":6,"x":981,"y":922.333312988
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{"id":"df3c476.ee10ab8","type":"change","z":"239e9d38.7c5862","name":"","rules":
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ride or 110
rpm","tot":"str"}],"action":"","property":"","from":"","to":"","reg":false,"x":1246.000015258789,"y":8
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{"id":"96222dc4.0d37a","type":"change","z":"239e9d38.7c5862","name":"","rules":
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rpm","tot":"str"}],"action":"","property":"","from":"","to":"","reg":false,"x":1249.666633605957,"y":1
150.999960899353,"wires":[["9384cd60.128f8","de4bd7cf.a483a8"]]},
{"id":"57bd8ac2.9c7834","type":"switch","z":"239e9d38.7c5862","name":"4","property":"payload","pr
opertyType":"msg","rules":[{"t":"eq","v":"10","vt":"num"},{"t":"eq","v":"5","vt":"num"},
{"t":"eq","v":"3","vt":"num"},{"t":"eq","v":"2","vt":"num"},{"t":"eq","v":"1","vt":"num"},
{"t":"eq","v":"0","vt":"num"}],"checkall":"true","repair":false,"outputs":6,"x":930.3333129882812,"y"
:1324.3333740234375,"wires":[["216a9bc.ad44d64"],["6234006f.dbdf8"],["1ebd1aba.30a585"],
["ce5053e1.b968d"],["202e8a80.f7f826"],["3b5cc1d8.2864ce"]]},
{"id":"216a9bc.ad44d64","type":"change","z":"239e9d38.7c5862","name":"","rules":
[{"t":"change","p":"payload","pt":"msg","from":"10","fromt":"num","to":"please prepare to do a
maximum
effort","tot":"str"}],"action":"","property":"","from":"","to":"","reg":false,"x":1201.9999542236328,"y"
:1251.666642665863,"wires":[["9384cd60.128f8","de4bd7cf.a483a8"]]},
{"id":"6234006f.dbdf8","type":"change","z":"239e9d38.7c5862","name":"","rules":

[{"t":"change","p":"payload","pt":"msg","from":"5","fromt":"num","to":" do a maximum effort in","tot":"str"}],"action":"","property":"","from":"","to":"","reg":false,"x":1194.0000457763672,"y":1307.0000629425049,"wires":[["9384cd60.128f8","de4bd7cf.a483a8"]]},
{"id":"202e8a80.f7f826","type":"change","z":"239e9d38.7c5862","name":"","rules":[{"t":"change","p":"payload","pt":"msg","from":"1","fromt":"num","to":"1","tot":"str"}],"action":"","property":"","from":"","to":"","reg":false,"x":1188.6666107177734,"y":1486.000020980835,"wires":[["9384cd60.128f8","de4bd7cf.a483a8"]]},
{"id":"1ebd1aba.30a585","type":"change","z":"239e9d38.7c5862","name":"","rules":[{"t":"change","p":"payload","pt":"msg","from":"3","fromt":"num","to":"3","tot":"str"}],"action":"","property":"","from":"","to":"","reg":false,"x":1184.6666107177734,"y":1364.0000314712524,"wires":[["9384cd60.128f8"]]},
{"id":"ce5053e1.b968d","type":"change","z":"239e9d38.7c5862","name":"","rules":[{"t":"change","p":"payload","pt":"msg","from":"2","fromt":"num","to":"2","tot":"str"}],"action":"","property":"","from":"","to":"","reg":false,"x":1195.9999465942383,"y":1430.000033378601,"wires":[["9384cd60.128f8","de4bd7cf.a483a8"]]},
{"id":"3b5cc1d8.2864ce","type":"change","z":"239e9d38.7c5862","name":"","rules":[{"t":"change","p":"payload","pt":"msg","from":"0","fromt":"num","to":"maximum effort","tot":"str"}],"action":"","property":"","from":"","to":"","reg":false,"x":1198.9999465942383,"y":1553.0000219345093,"wires":[["9384cd60.128f8","de4bd7cf.a483a8"]]},
{"id":"996d43c.a91aec","type":"switch","z":"239e9d38.7c5862","name":"5","property":"payload","propertyType":"msg","rules":[{"t":"eq","v":"5","vt":"num"},{"t":"eq","v":"3","vt":"num"},{"t":"eq","v":"2","vt":"num"},{"t":"eq","v":"1","vt":"num"},{"t":"eq","v":"0","vt":"num"},{"t":"false"}],"checkall":"true","repair":false,"outputs":6,"x":1036.3890228271484,"y":1789.7221755981445,"wires":[["f74714f8.0517d8"],["7d412c88.49c394"],["8d773a74.1a5c58"],["c9e5a577.505cd8"],["6560d12b.481ef"],[]]},
{"id":"f74714f8.0517d8","type":"change","z":"239e9d38.7c5862","name":"","rules":[{"t":"change","p":"payload","pt":"msg","from":"5","fromt":"num","to":" hang on...","tot":"str"}],"action":"","property":"","from":"","to":"","reg":false,"x":1465.0555610656738,"y":1632.388952255249,"wires":[["9384cd60.128f8","de4bd7cf.a483a8"]]},
{"id":"c9e5a577.505cd8","type":"change","z":"239e9d38.7c5862","name":"","rules":[{"t":"change","p":"payload","pt":"msg","from":"1","fromt":"num","to":"1","tot":"str"}],"action":"","property":"","from":"","to":"","reg":false,"x":1417.2221603393555,"y":1798.8888939023018,"wires":[["9384cd60.128f8","de4bd7cf.a483a8"]]},
{"id":"7d412c88.49c394","type":"change","z":"239e9d38.7c5862","name":"","rules":[{"t":"change","p":"payload","pt":"msg","from":"3","fromt":"num","to":"in 3","tot":"str"}],"action":"","property":"","from":"","to":"","reg":false,"x":1423.2220611572266,"y":1694.3889226913452,"wires":[["9384cd60.128f8","de4bd7cf.a483a8"]]},
{"id":"8d773a74.1a5c58","type":"change","z":"239e9d38.7c5862","name":"","rules":[{"t":"change","p":"payload","pt":"msg","from":"2","fromt":"num","to":"2","tot":"str"}],"action":"","property":"","from":"","to":"","reg":false,"x":1402.0555267333984,"y":1750.3888320922852,"wires":[["9384cd60.128f8","de4bd7cf.a483a8"]]},
{"id":"6560d12b.481ef","type":"change","z":"239e9d38.7c5862","name":"","rules":[{"t":"change","p":"payload","pt":"msg","from":"0","fromt":"num","to":"Congratulations... you made it..","tot":"str"}],"action":"","property":"","from":"","to":"","reg":false,"x":1425.0554122924805,"y":1870.888864517212,"wires":[["9384cd60.128f8","de4bd7cf.a483a8"]]},
{"id":"74cb3cf0.a96c34","type":"change","z":"239e9d38.7c5862","name":"","rules":[{"t":"change","p":"payload","pt":"msg","from":"0","fromt":"num","to":"","tot":"str"}],"action":"","property":"","from":"","to":"","reg":false,"x":1671.250015258789,"y":2110.00004196167,"wires":[["de4bd7cf.a483a8","9384cd60.128f8"]]},{"id":"d9de0c5d.05038","type":"link

in","z":"239e9d38.7c5862","name":"training guide link","links":
["dd191dae.894a7"],"x":2073.0156249999995,"y":1343.8359374999998,"wires":
[["de4bd7cf.a483a8"]]},{"id":"3a24fc38.7cdc14","type":"link
in","z":"239e9d38.7c5862","name":"timer link","links":
["cf13e412.cc7ab8"],"x":887.5048828125,"y":733.6474609375,"wires":[["d5dcf162.a470b"]]},
{"id":"7617afa5.bb4db","type":"countdown","z":"239e9d38.7c5862","name":"","topic":"","payloadTi
merStart":"true","payloadTimerStartType":"bool","payloadTimerStop":"false","payloadTimerStopType
":"bool","timer":"5","resetWhileRunning":false,"setTimeToNewWhileRunning":true,"startCountdown
OnControlMessage":false,"x":461.53125,"y":822,"wires":[[],["ddf354c0.136158"]]},
{"id":"ba990ab5.547a48","type":"switch","z":"239e9d38.7c5862","name":"","property":"payload","pro
pertyType":"msg","rules":[{"t":"true"},
{"t":"false"}],"checkall":"true","repair":false,"outputs":2,"x":128.03126525878906,"y":806.999944686
8896,"wires":[[],["6af1c74d.931698"]]},
{"id":"6af1c74d.931698","type":"change","z":"239e9d38.7c5862","name":"","rules":
[{"t":"change","p":"payload","pt":"msg","from":"false","fromt":"bool","to":"true","tot":"bool"}],"actio
n":"","property":"","from":"","to":"","reg":false,"x":155.0312614440918,"y":8
50.9999465942383,"wires":[["7617afa5.bb4db"]]},
{"id":"ddf354c0.136158","type":"switch","z":"239e9d38.7c5862","name":"","property":"payload","pro
pertyType":"msg","rules":
[{"t":"eq","v":"0","vt":"num"}],"checkall":"true","repair":false,"outputs":1,"x":626.9999999999999,"y
":1931.4921874999995,"wires":[["74cb3cf0.a96c34"]]},
{"id":"df423369.1e76","type":"ui_group","z":"","name":"Bicycle Crank and Wheel
Sensors","tab":"b12ebccc.218e98","disp":true,"width":"12","collapse":false},
{"id":"b12ebccc.218e98","type":"ui_tab","z":"","name":"Speedometer and RPM Test
Project","icon":"dashboard","disabled":false,"hidden":false}]

safe shut down json file:

[{"id":"ed1f3282.ddae6","type":"exec","z":"85670302.d8697","command":"sudo init 0","addpay":false,"append":"","useSpawn":"false","timer":"","oldrc":false,"name":"","x":418,"y":368,"wires":[[],[],[]]},
{"id":"7c68b874.cecad8","type":"ui_button","z":"85670302.d8697","name":"","group":"df423369.1e76","order":10,"width":"8","height":"1","passthru":false,"label":"Shut Down","tooltip":"","color":"","bgcolor":"","icon":"","payload":"","payloadType":"date","topic":"","x":238,"y":248,"wires":[["ed1f3282.ddae6"]]},
{"id":"df423369.1e76","type":"ui_group","z":"","name":"Bicycle Crank and Wheel Sensors","tab":"b12ebccc.218e98","disp":true,"width":"12","collapse":false},
{"id":"b12ebccc.218e98","type":"ui_tab","z":"","name":"Speedometer and RPM Test Project","icon":"dashboard","disabled":false,"hidden":false}]

90 seconds progressive workout json file:

[{"id":"c2e91cb6.122ef","type":"countdown","z":"4d41a8b2.37da58","name":"Counter 1","topic":"","payloadTimerStart":"true","payloadTimerStartType":"bool","payloadTimerStop":"false", "payloadTimerStopType":"bool","timer":"12","resetWhileRunning":false,"setTimeToNewWhileRunnin g":true,"startCountdownOnControlMessage":false,"x":499.5963363647461,"y":160.79058742523193," wires":[["195590fd.1b38ff"],["257c2b1.6e8ecd4","cf13e412.cc7ab8"]]},
{"id":"6158bc96.a47554","type":"countdown","z":"4d41a8b2.37da58","name":"Counter 2","topic":"","payloadTimerStart":"true","payloadTimerStartType":"bool","payloadTimerStop":"false", "payloadTimerStopType":"bool","timer":"90","resetWhileRunning":false,"setTimeToNewWhileRunnin g":true,"startCountdownOnControlMessage":false,"x":496.67321014404297,"y":228.5287308692932," wires":[["ed1aa8fb.72bfc8"],["1283f14c.ca45ff","cf13e412.cc7ab8"]]},
{"id":"7736f5a9.96d19c","type":"countdown","z":"4d41a8b2.37da58","name":"Counter 2","topic":"","payloadTimerStart":"true","payloadTimerStartType":"bool","payloadTimerStop":"false", "payloadTimerStopType":"bool","timer":"90","resetWhileRunning":false,"setTimeToNewWhileRunnin g":true,"startCountdownOnControlMessage":false,"x":489.59637451171875,"y":294.76566648483276, "wires":[["44a9b331.077f0c"],["8ed272e6.af375","cf13e412.cc7ab8"]]},
{"id":"5ab47a9a.59bc94","type":"countdown","z":"4d41a8b2.37da58","name":"Counter 3","topic":"","payloadTimerStart":"true","payloadTimerStartType":"bool","payloadTimerStop":"false", "payloadTimerStopType":"bool","timer":"90","resetWhileRunning":false,"setTimeToNewWhileRunnin g":true,"startCountdownOnControlMessage":false,"x":482.93621826171875,"y":371.8490266799927," wires":[["b1ac9b78.46b7b8"],["c8f62953.0c2f68","cf13e412.cc7ab8"]]},
{"id":"ffd713a4.ab3d7","type":"countdown","z":"4d41a8b2.37da58","name":"Counter 4","topic":"","payloadTimerStart":"true","payloadTimerStartType":"bool","payloadTimerStop":"false", "payloadTimerStopType":"bool","timer":"90","resetWhileRunning":false,"setTimeToNewWhileRunnin g":true,"startCountdownOnControlMessage":false,"x":480.01953125,"y":454.36199855804443,"wires ":[["27492e5b.84bdd2"],["e74aaa7e.caf868","cf13e412.cc7ab8"]]},
{"id":"131cf547.bbd53b","type":"countdown","z":"4d41a8b2.37da58","name":"Counter 5","topic":"","payloadTimerStart":"true","payloadTimerStartType":"bool","payloadTimerStop":"false", "payloadTimerStopType":"bool","timer":"90","resetWhileRunning":false,"setTimeToNewWhileRunnin g":true,"startCountdownOnControlMessage":false,"x":479.58340072631836,"y":529.3489532470703," wires":[["92cbd007.f871d"],["b9c9d29d.13d17","cf13e412.cc7ab8"]]},
{"id":"ed1aa8fb.72bfc8","type":"switch","z":"4d41a8b2.37da58","name":"","property":"payload","pro pertyType":"msg","rules":[{"t":"true"},
{"t":"false"}],"checkall":"true","repair":false,"outputs":2,"x":152.9427032470703,"y":335.4166831970 215,"wires":[[],["c63900df.4e66b"]]},
{"id":"44a9b331.077f0c","type":"switch","z":"4d41a8b2.37da58","name":"","property":"payload","pro pertyType":"msg","rules":[{"t":"true"},
{"t":"false"}],"checkall":"true","repair":false,"outputs":2,"x":163.52606964111328,"y":447.833372116 08887,"wires":[[],["cc69ac9e.26526"]]},
{"id":"c63900df.4e66b","type":"change","z":"4d41a8b2.37da58","name":"","rules": [{"t":"change","p":"payload","pt":"msg","from":"false","fromt":"bool","to":"true","tot":"bool"}],"actio n":"","property":"","from":"","to":"","reg":false,"x":162.69271087646484,"y":386.2500047683716,"wi res":[["7736f5a9.96d19c"]]},

{"id":"cc69ac9e.26526","type":"change","z":"4d41a8b2.37da58","name":"","rules":
[{"t":"change","p":"payload","pt":"msg","from":"false","fromt":"bool","to":"true","tot":"bool"}],"actio
n":"","property":"","from":"","to":"","reg":false,"x":184.27606201171875,"y":489.3333501815796,"wi
res":[["5ab47a9a.59bc94"]]},
{"id":"b1ac9b78.46b7b8","type":"switch","z":"4d41a8b2.37da58","name":"","property":"payload","pr
opertyType":"msg","rules":[{"t":"true"},
{"t":"false"}],"checkall":"true","repair":false,"outputs":2,"x":142.02605438232422,"y":543.999946594
2383,"wires":[[],["d6e37f56.76096"]]},
{"id":"d6e37f56.76096","type":"change","z":"4d41a8b2.37da58","name":"","rules":
[{"t":"change","p":"payload","pt":"msg","from":"false","fromt":"bool","to":"true","tot":"bool"}],"actio
n":"","property":"","from":"","to":"","reg":false,"x":152.7760467529297,"y":592.999963760376,"wire
s":[["ffd713a4.ab3d7"]]},
{"id":"195590fd.1b38ff","type":"switch","z":"4d41a8b2.37da58","name":"","property":"payload","pro
pertyType":"msg","rules":[{"t":"true"},
{"t":"false"}],"checkall":"true","repair":false,"outputs":2,"x":180.2760467529297,"y":224.0833053588
8672,"wires":[[],["885b9690.51e258"]]},
{"id":"885b9690.51e258","type":"change","z":"4d41a8b2.37da58","name":"","rules":
[{"t":"change","p":"payload","pt":"msg","from":"false","fromt":"bool","to":"true","tot":"bool"}],"actio
n":"","property":"","from":"","to":"","reg":false,"x":191.27605438232422,"y":272.41663455963135,"
wires":[["6158bc96.a47554"]]},
{"id":"92cbd007.f871d","type":"switch","z":"4d41a8b2.37da58","name":"","property":"payload","prop
ertyType":"msg","rules":[{"t":"true"},
{"t":"false"}],"checkall":"true","repair":false,"outputs":2,"x":144.609375,"y":800.4166259765625,"wir
es":[[],["1c4bd9d5.55a836"]]},
{"id":"64b888fc.eccda8","type":"switch","z":"4d41a8b2.37da58","name":"","property":"payload","pro
pertyType":"msg","rules":[{"t":"true"},
{"t":"false"}],"checkall":"true","repair":false,"outputs":2,"x":157.6927375793457,"y":909.0833463668
823,"wires":[[],["15b23adb.6cfcd5"]]},
{"id":"1c4bd9d5.55a836","type":"change","z":"4d41a8b2.37da58","name":"","rules":
[{"t":"change","p":"payload","pt":"msg","from":"false","fromt":"bool","to":"true","tot":"bool"}],"actio
n":"","property":"","from":"","to":"","reg":false,"x":148.10939025878906,"y":842.4999380111694,"wi
res":[["5f1922d4.01360c"]]},
{"id":"15b23adb.6cfcd5","type":"change","z":"4d41a8b2.37da58","name":"","rules":
[{"t":"change","p":"payload","pt":"msg","from":"false","fromt":"bool","to":"true","tot":"bool"}],"actio
n":"","property":"","from":"","to":"","reg":false,"x":160.9427261352539,"y":954.3333625793457,"wir
es":[["b9eb971a.5d3de8"]]},
{"id":"73eb30f4.b1c2d","type":"switch","z":"4d41a8b2.37da58","name":"","property":"payload","prop
ertyType":"msg","rules":[{"t":"true"},
{"t":"false"}],"checkall":"true","repair":false,"outputs":2,"x":179.94271850585938,"y":1022.74993133
54492,"wires":[[],["79f4183f.e04e28"]]},
{"id":"79f4183f.e04e28","type":"change","z":"4d41a8b2.37da58","name":"","rules":
[{"t":"change","p":"payload","pt":"msg","from":"false","fromt":"bool","to":"true","tot":"bool"}],"actio
n":"","property":"","from":"","to":"","reg":false,"x":206.9427146911621,"y":1066.7499332427979,"wi
res":[["b95f60bf.a1ece"]]},
{"id":"27492e5b.84bdd2","type":"switch","z":"4d41a8b2.37da58","name":"","property":"payload","pr
opertyType":"msg","rules":[{"t":"true"},
{"t":"false"}],"checkall":"true","repair":false,"outputs":2,"x":128.19271850585938,"y":662.833263397
2168,"wires":[[],["2780d2f3.5416ae"]]},
{"id":"2780d2f3.5416ae","type":"change","z":"4d41a8b2.37da58","name":"","rules":

[{"t":"change","p":"payload","pt":"msg","from":"false","fromt":"bool","to":"true","tot":"bool"}],"action":"","property":"","from":"","to":"","reg":false,"x":165.4427261352539,"y":707.4166226387024,"wires":[["131cf547.bbd53b"]]},
{"id":"a03fc4a8.512088","type":"switch","z":"4d41a8b2.37da58","name":"","property":"payload","propertyType":"msg","rules":[{"t":"true"},
{"t":"false"}],"checkall":"true","repair":false,"outputs":2,"x":154.609375,"y":1272.9166259765625,"wires":[[],["9d51bce6.c0b47"]]},
{"id":"4e410c75.2419c4","type":"switch","z":"4d41a8b2.37da58","name":"","property":"payload","propertyType":"msg","rules":[{"t":"true"},
{"t":"false"}],"checkall":"true","repair":false,"outputs":2,"x":178.94272994995117,"y":1386.5833225250244,"wires":[[],["1aa38f94.4c09c"]]},
{"id":"9d51bce6.c0b47","type":"change","z":"4d41a8b2.37da58","name":"","rules":
[{"t":"change","p":"payload","pt":"msg","from":"false","fromt":"bool","to":"true","tot":"bool"}],"action":"","property":"","from":"","to":"","reg":false,"x":165.60938262939453,"y":1321.2499551773071,"wires":[["67eb30c4.13b0d"]]},
{"id":"1aa38f94.4c09c","type":"change","z":"4d41a8b2.37da58","name":"","rules":
[{"t":"change","p":"payload","pt":"msg","from":"false","fromt":"bool","to":"true","tot":"bool"}],"action":"","property":"","from":"","to":"","reg":false,"x":205.9427261352539,"y":1430.583324432373,"wires":[["f90bf643.d96328"]]},
{"id":"b521f665.f1ebd8","type":"switch","z":"4d41a8b2.37da58","name":"","property":"payload","propertyType":"msg","rules":[{"t":"true"},
{"t":"false"}],"checkall":"true","repair":false,"outputs":2,"x":221.19272232055664,"y":1508.9999752044678,"wires":[[],["fac22dc6.e5a56"]]},
{"id":"fac22dc6.e5a56","type":"change","z":"4d41a8b2.37da58","name":"","rules":
[{"t":"change","p":"payload","pt":"msg","from":"false","fromt":"bool","to":"true","tot":"bool"}],"action":"","property":"","from":"","to":"","reg":false,"x":219.44271850585938,"y":1595.4999141693115,"wires":[["191dc1c1.534e8e"]]},
{"id":"d31f6e8c.e4a48","type":"switch","z":"4d41a8b2.37da58","name":"","property":"payload","propertyType":"msg","rules":[{"t":"true"},
{"t":"false"}],"checkall":"true","repair":false,"outputs":2,"x":181.94271850585938,"y":1151.5832748413086,"wires":[[],["170ecc7e.902904"]]},
{"id":"170ecc7e.902904","type":"change","z":"4d41a8b2.37da58","name":"","rules":
[{"t":"change","p":"payload","pt":"msg","from":"false","fromt":"bool","to":"true","tot":"bool"}],"action":"","property":"","from":"","to":"","reg":false,"x":192.9427261352539,"y":1199.9166040420532,"wires":[["bf099d7f.bbcbb"]]},
{"id":"5f1922d4.01360c","type":"countdown","z":"4d41a8b2.37da58","name":"Counter
6","topic":"","payloadTimerStart":"true","payloadTimerStartType":"bool","payloadTimerStop":"false",
"payloadTimerStopType":"bool","timer":"90","resetWhileRunning":false,"setTimeToNewWhileRunning":true,"startCountdownOnControlMessage":false,"x":473.14453506469727,"y":593.7500095367432,"wires":[["64b888fc.eccda8"],["138d629b.08dcbd","cf13e412.cc7ab
8"]]},{"id":"b9eb971a.5d3de8","type":"countdown","z":"4d41a8b2.37da58","name":"Counter
7","topic":"","payloadTimerStart":"true","payloadTimerStartType":"bool","payloadTimerStop":"false",
"payloadTimerStopType":"bool","timer":"90","resetWhileRunning":false,"setTimeToNewWhileRunning":true,"startCountdownOnControlMessage":false,"x":461.47137451171875,"y":664.1668071746826,"wires":[["73eb30f4.b1c2d"],["8c4fdbbe.8e82a8","cf13e412.cc7ab8"]]},
{"id":"b95f60bf.a1ece","type":"countdown","z":"4d41a8b2.37da58","name":"Counter
8","topic":"","payloadTimerStart":"true","payloadTimerStartType":"bool","payloadTimerStop":"false",
"payloadTimerStopType":"bool","timer":"90","resetWhileRunning":false,"setTimeToNewWhileRunning":true,"startCountdownOnControlMessage":false,"x":463.1446533203125,"y":720.4036884307861,"

wires":[["d31f6e8c.e4a48"],["ae4a48c5.e5cf48","cf13e412.cc7ab8"]]},
{"id":"bf099d7f.bbcbb","type":"countdown","z":"4d41a8b2.37da58","name":"Counter 9","topic":"","payloadTimerStart":"true","payloadTimerStartType":"bool","payloadTimerStop":"false","payloadTimerStopType":"bool","timer":"90","resetWhileRunning":false,"setTimeToNewWhileRunning":true,"startCountdownOnControlMessage":false,"x":471.48445892333984,"y":783.7371244430542,"wires":[["a03fc4a8.512088"],["1a75fa71.c67a46","cf13e412.cc7ab8"]]},
{"id":"67eb30c4.13b0d","type":"countdown","z":"4d41a8b2.37da58","name":"counter 10","topic":"","payloadTimerStart":"true","payloadTimerStartType":"bool","payloadTimerStop":"false","payloadTimerStopType":"bool","timer":"90","resetWhileRunning":false,"setTimeToNewWhileRunning":true,"startCountdownOnControlMessage":false,"x":508.5677795410156,"y":1152.5000247955322,"wires":[["4e410c75.2419c4"],["c84664c7.34bfa8","cf13e412.cc7ab8"]]},
{"id":"f90bf643.d96328","type":"countdown","z":"4d41a8b2.37da58","name":"counter 10","topic":"","payloadTimerStart":"true","payloadTimerStartType":"bool","payloadTimerStop":"false","payloadTimerStopType":"bool","timer":"90","resetWhileRunning":false,"setTimeToNewWhileRunning":true,"startCountdownOnControlMessage":false,"x":510.63156509399414,"y":1269.9869860410069,"wires":[["b521f665.f1ebd8"],["ad8821a9.58db8","cf13e412.cc7ab8"]]},
{"id":"191dc1c1.534e8e","type":"countdown","z":"4d41a8b2.37da58","name":"Cool Down","topic":"","payloadTimerStart":"true","payloadTimerStartType":"bool","payloadTimerStop":"false","payloadTimerStopType":"bool","timer":"90","resetWhileRunning":false,"setTimeToNewWhileRunning":true,"startCountdownOnControlMessage":false,"x":505.8945541381836,"y":1460.3750944137573,"wires":[["a66c0ab6.ea44b8"],["cf13e412.cc7ab8","f176e93f.d72ca8"]]},
{"id":"257c2b1.6e8ecd4","type":"switch","z":"4d41a8b2.37da58","name":"1","property":"payload","propertyType":"msg","rules":[{"t":"eq","v":"10","vt":"num"},{"t":"eq","v":"5","vt":"num"},{"t":"eq","v":"3","vt":"num"},{"t":"eq","v":"2","vt":"num"},{"t":"eq","v":"1","vt":"num"},{"t":"eq","v":"0","vt":"num"}],"checkall":"true","repair":false,"outputs":6,"x":1109.1785507202148,"y":106.03572463989258,"wires":[["84b1177.3c32fe8"],["e93dc2a2.2811a"],["c38c1b7a.f654d8"],["37cb84c8.1d7b1c"],["97ed16ed.9f7e58"],["980822d9.07867"]]},
{"id":"1283f14c.ca45ff","type":"switch","z":"4d41a8b2.37da58","name":"2","property":"payload","propertyType":"msg","rules":[{"t":"eq","v":"0","vt":"num"}],"checkall":"true","repair":false,"outputs":1,"x":912.7010040283203,"y":221.4285888671875,"wires":[["457fe63c.935598"]]},
{"id":"8ed272e6.af375","type":"switch","z":"4d41a8b2.37da58","name":"2","property":"payload","propertyType":"msg","rules":[{"t":"eq","v":"0","vt":"num"}],"checkall":"true","repair":false,"outputs":1,"x":902.5223426818848,"y":268.21428871154785,"wires":[["d9c47143.8e407"]]},
{"id":"c8f62953.0c2f68","type":"switch","z":"4d41a8b2.37da58","name":"3","property":"payload","propertyType":"msg","rules":[{"t":"eq","v":"0","vt":"num"}],"checkall":"true","repair":false,"outputs":1,"x":899.6652221679688,"y":311.0714416503906,"wires":[["32441629.ac9b4a"]]},
{"id":"e74aaa7e.caf868","type":"switch","z":"4d41a8b2.37da58","name":"4","property":"payload","propertyType":"msg","rules":[{"t":"eq","v":"0","vt":"num"}],"checkall":"true","repair":false,"outputs":1,"x":895.3794555664062,"y":349.6428527832031,"wires":[["cb8f0889.c07d18"]]},
{"id":"b9c9d29d.13d17","type":"switch","z":"4d41a8b2.37da58","name":"5","property":"payload","propertyType":"msg","rules":[{"t":"eq","v":"0","vt":"num"}],"checkall":"true","repair":false,"outputs":1,"x":892.5223388671875,"y":393.9285888671875,"wires":[["dc37aeca.c49e5"]]},
{"id":"138d629b.08dcbd","type":"switch","z":"4d41a8b2.37da58","name":"6","property":"payload","propertyType":"msg","rules":

[{"t":"eq","v":"0","vt":"num"}],"checkall":"true","repair":false,"outputs":1,"x":886.8080444335938,"y":441.0714416503906,"wires":[["9fceaf71.4e9ef"]]},
{"id":"8c4fdbbe.8e82a8","type":"switch","z":"4d41a8b2.37da58","name":"7","property":"payload","propertyType":"msg","rules":
[{"t":"eq","v":"0","vt":"num"}],"checkall":"true","repair":false,"outputs":1,"x":882.5223388671875,"y":481.0714416503906,"wires":[["6608af71.20adb"]]},
{"id":"ae4a48c5.e5cf48","type":"switch","z":"4d41a8b2.37da58","name":"8","property":"payload","propertyType":"msg","rules":
[{"t":"eq","v":"0","vt":"num"}],"checkall":"true","repair":false,"outputs":1,"x":875.3794555664062,"y":528.2142944335938,"wires":[["d301f6fc.667f08"]]},
{"id":"1a75fa71.c67a46","type":"switch","z":"4d41a8b2.37da58","name":"9","property":"payload","propertyType":"msg","rules":
[{"t":"eq","v":"0","vt":"num"}],"checkall":"true","repair":false,"outputs":1,"x":869.6652221679688,"y":579.6428833007812,"wires":[["be127190.018a5"]]},
{"id":"c84664c7.34bfa8","type":"switch","z":"4d41a8b2.37da58","name":"10","property":"payload","propertyType":"msg","rules":
[{"t":"eq","v":"0","vt":"num"}],"checkall":"true","repair":false,"outputs":1,"x":863.950927734375,"y":631.0714111328125,"wires":[["c4d53031.1e585"]]},
{"id":"ad8821a9.58db8","type":"switch","z":"4d41a8b2.37da58","name":"10","property":"payload","propertyType":"msg","rules":
[{"t":"eq","v":"0","vt":"num"}],"checkall":"true","repair":false,"outputs":1,"x":859.6652221679688,"y":681.0714721679688,"wires":[["1611afb3.e4c86"]]},
{"id":"457fe63c.935598","type":"change","z":"4d41a8b2.37da58","name":"ramp 2","rules":
[{"t":"change","p":"payload","pt":"msg","from":"0","fromt":"num","to":"Set to ramp 2 at 80 rpm","tot":"str"}],"action":"","property":"","from":"","to":"","reg":false,"x":1115.3795166015625,"y":279.28570556640625,"wires":[["dd191dae.894a7"]]},
{"id":"d9c47143.8e407","type":"change","z":"4d41a8b2.37da58","name":"ramp 2","rules":
[{"t":"change","p":"payload","pt":"msg","from":"0","fromt":"num","to":"Set to ramp 2 at 85 rpm","tot":"str"}],"action":"","property":"","from":"","to":"","reg":false,"x":1117.5223770141602,"y":328.75000762939453,"wires":[["dd191dae.894a7"]]},
{"id":"32441629.ac9b4a","type":"change","z":"4d41a8b2.37da58","name":"ramp 3","rules":
[{"t":"change","p":"payload","pt":"msg","from":"0","fromt":"num","to":"Set to ramp 3 at 85 rpm","tot":"str"}],"action":"","property":"","from":"","to":"","reg":false,"x":1108.236572265625,"y":366.4285888671875,"wires":[["dd191dae.894a7"]]},
{"id":"cb8f0889.c07d18","type":"change","z":"4d41a8b2.37da58","name":"ramp 4","rules":
[{"t":"change","p":"payload","pt":"msg","from":"0","fromt":"num","to":"Set to ramp 4 at 90","tot":"str"}],"action":"","property":"","from":"","to":"","reg":false,"x":1102.5223388671875,"y":407.8571472167969,"wires":[["dd191dae.894a7"]]},
{"id":"dc37aeca.c49e5","type":"change","z":"4d41a8b2.37da58","name":"ramp 5","rules":
[{"t":"change","p":"payload","pt":"msg","from":"0","fromt":"num","to":"Set to ramp 5 at 90 rpm","tot":"str"}],"action":"","property":"","from":"","to":"","reg":false,"x":1092.5223388671875,"y":449.2857360839844,"wires":[["dd191dae.894a7"]]},
{"id":"9fceaf71.4e9ef","type":"change","z":"4d41a8b2.37da58","name":"ramp 6","rules":
[{"t":"change","p":"payload","pt":"msg","from":"0","fromt":"num","to":"Set to ramp 6 at 90 rpm","tot":"str"}],"action":"","property":"","from":"","to":"","reg":false,"x":1086.80810546875,"y":496.4285888671875,"wires":[["dd191dae.894a7"]]},
{"id":"6608af71.20adb","type":"change","z":"4d41a8b2.37da58","name":"ramp 7","rules":
[{"t":"change","p":"payload","pt":"msg","from":"0","fromt":"num","to":"Set to ramp 7 at 95 rpm","tot":"str"}],"action":"","property":"","from":"","to":"","reg":false,"x":1082.5223388671875,"y":

543.5714111328125,"wires":[["dd191dae.894a7"]]},
{"id":"d301f6fc.667f08","type":"change","z":"4d41a8b2.37da58","name":"ramp 8","rules":
[{"t":"change","p":"payload","pt":"msg","from":"0","fromt":"num","to":"Set to ramp 8 at 95
rpm","tot":"str"}],"action":"","property":"","from":"","to":"","reg":false,"x":1076.80810546875,"y":58
2.1428833007812,"wires":[["dd191dae.894a7"]]},
{"id":"be127190.018a5","type":"change","z":"4d41a8b2.37da58","name":"ramp 9","rules":
[{"t":"change","p":"payload","pt":"msg","from":"0","fromt":"num","to":"Set to ramp 9 at 95
rpm","tot":"str"}],"action":"","property":"","from":"","to":"","reg":false,"x":1069.6651611328125,"y":
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{"id":"c4d53031.1e585","type":"change","z":"4d41a8b2.37da58","name":"ramp 10","rules":
[{"t":"change","p":"payload","pt":"msg","from":"0","fromt":"num","to":"Set to ramp 10 at 95
rpm","tot":"str"}],"action":"","property":"","from":"","to":"","reg":false,"x":1065.3795166015625,"y":
673.5714111328125,"wires":[["dd191dae.894a7"]]},
{"id":"1611afb3.e4c86","type":"change","z":"4d41a8b2.37da58","name":"ramp 10","rules":
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rpm","tot":"str"}],"action":"","property":"","from":"","to":"","reg":false,"x":1058.236572265625,"y":7
21.0714111328125,"wires":[["dd191dae.894a7"]]},
{"id":"4743763b.3f9928","type":"change","z":"4d41a8b2.37da58","name":"cool down","rules":
[{"t":"change","p":"payload","pt":"msg","from":"0","fromt":"num","to":"Set to
 ramp 1 at 70
rpm","tot":"str"}],"action":"","property":"","from":"","to":"","reg":false,"x":1057.8795166015625,"y":
770.7142944335938,"wires":[["dd191dae.894a7"]]},
{"id":"f176e93f.d72ca8","type":"switch","z":"4d41a8b2.37da58","name":"Cool
down","property":"payload","propertyType":"msg","rules":
[{"t":"eq","v":"0","vt":"num"}],"checkall":"true","repair":false,"outputs":1,"x":881.0312805175781,"y
":736.750120639801,"wires":[["4743763b.3f9928"]]},{"id":"dd191dae.894a7","type":"link
out","z":"4d41a8b2.37da58","name":"training guide link","links":
["d9de0c5d.05038"],"x":1455.023401260376,"y":545.4921927452087,"wires":[]},
{"id":"cf13e412.cc7ab8","type":"link out","z":"4d41a8b2.37da58","name":"timer link","links":
["3a24fc38.7cdc14"],"x":1088.4375162124634,"y":983.4375247955322,"wires":[]},
{"id":"e7241c21.b1064","type":"ui_button","z":"4d41a8b2.37da58","name":"","group":"df423369.1e7
6","order":5,"width":"8","height":"1","passthru":false,"label":"90 sec
progressive","tooltip":"","color":"","bgcolor":"","icon":"","payload":"","payloadType":"str","topic":"",
"x":210.6298828125,"y":38.701170921325684,"wires":[["c2e91cb6.122ef"]]},
{"id":"daaf0962.265088","type":"change","z":"4d41a8b2.37da58","name":"reset","rules":
[{"t":"change","p":"payload","pt":"msg","from":"false","fromt":"bool","to":"","tot":"str"}],"action":"",
"property":"","from":"","to":"","reg":false,"x":1199.082046508789,"y":894.375020980835,"wires":
[["dd191dae.894a7"]]},
{"id":"a66c0ab6.ea44b8","type":"switch","z":"4d41a8b2.37da58","name":"","property":"payload","pro
pertyType":"msg","rules":[{"t":"true"},
{"t":"false"}],"checkall":"true","repair":false,"outputs":2,"x":293.76953125,"y":1688.125,"wires":[[],
["49e313bb.127e5c"]]},
{"id":"49e313bb.127e5c","type":"change","z":"4d41a8b2.37da58","name":"","rules":
[{"t":"change","p":"payload","pt":"msg","from":"false","fromt":"bool","to":"true","tot":"bool"}],"actio
n":"","property":"","from":"","to":"","reg":false,"x":292.01952743530273,"y":1774.6249389648438,"
wires":[["f7489231.98b14"]]},
{"id":"f7489231.98b14","type":"countdown","z":"4d41a8b2.37da58","name":"reset","topic":"","payloa
dTimerStart":"true","payloadTimerStartType":"bool","payloadTimerStop":"false","payloadTimerStopT
ype":"bool","timer":"90","resetWhileRunning":false,"setTimeToNewWhileRunning":true,"startCountd

ownOnControlMessage":false,"x":524.7213459014893,"y":1619.5000085830688,"wires":
[["c019e172.ca56f"],["c019e172.ca56f","cf13e412.cc7ab8"]]},
{"id":"c019e172.ca56f","type":"switch","z":"4d41a8b2.37da58","name":"reset","property":"payload","
propertyType":"msg","rules":
[{"t":"false"}],"checkall":"true","repair":false,"outputs":1,"x":1073.457046508789,"y":836.875021934
5093,"wires":[["daaf0962.265088"]]},
{"id":"84b1177.3c32fe8","type":"change","z":"4d41a8b2.37da58","name":"","rules":
[{"t":"change","p":"payload","pt":"msg","from":"10","fromt":"num","to":"please prepare to do a 90
second progressive
ride","tot":"str"}],"action":"","property":"","from":"","to":"","reg":false,"x":1631.5313034057617,"y":
75.49999666213989,"wires":[["dd191dae.894a7"]]},
{"id":"e93dc2a2.2811a","type":"change","z":"4d41a8b2.37da58","name":"","rules":
[{"t":"change","p":"payload","pt":"msg","from":"5","fromt":"num","to":" set to ramp 1 at 70
rpm","tot":"str"}],"action":"","property":"","from":"","to":"","reg":false,"x":1610.8647384643555,"y":
123.5,"wires":[["dd191dae.894a7"]]},
{"id":"97ed16ed.9f7e58","type":"change","z":"4d41a8b2.37da58","name":"","rules":
[{"t":"change","p":"payload","pt":"msg","from":"1","fromt":"num","to":"1","tot":"str"}],"action":"","p
roperty":"","from":"","to":"","reg":false,"x":1631.8645858764648,"y":242.5000057220459,"wires":
[["dd191dae.894a7"]]},
{"id":"c38c1b7a.f654d8","type":"change","z":"4d41a8b2.37da58","name":"","rules":
[{"t":"change","p":"payload","pt":"msg","from":"3","fromt":"num","to":"3","tot":"str"}],"action":"","p
roperty":"","from":"","to":"","reg":false,"x":1633.864646911621,"y":164.49999809265137,"wires":
[["dd191dae.894a7"]]},
{"id":"37cb84c8.1d7b1c","type":"change","z":"4d41a8b2.37da58","name":"","rules":
[{"t":"change","p":"payload","pt":"msg","from":"2","fromt":"num","to":"2","tot":"str"}],"action":"","p
roperty":"","from":"","to":"","reg":false,"x":1641.1979637145996,"y":204.50000190734863,"wires":
[[]]},{"id":"980822d9.07867","type":"change","z":"4d41a8b2.37da58","name":"","rules":
[{"t":"change","p":"payload","pt":"msg","from":"0","fromt":"num","to":" Set ramp 1 at 70
rpm","tot":"str"}],"action":"","property":"","from":"","to":"","reg":false,"x":1638.1978378295898,"y":
285.50001287460327,"wires":[["dd191dae.894a7"]]},
{"id":"df423369.1e76","type":"ui_group","z":"","name":"Bicycle Crank and Wheel
Sensors","tab":"b12ebccc.218e98","disp":true,"width":"12","collapse":false},
{"id":"b12ebccc.218e98","type":"ui_tab","z":"","name":"Speedometer and RPM Test
Project","icon":"dashboard","disabled":false,"hidden":false}]

Modified speedometer and odometer with average speed json file:

[{"id":"5a5ea2f2.e652dc","type":"rpi-gpio in","z":"eee72f37.6dc038","name":"Pedal Sensor","pin":"35","intype":"up","debounce":"25","read":false,"x":187,"y":224,"wires": [["4d5a13de.9b38ec","e7ea3d50.4b1b6","ee89f341.369cf"]]},
{"id":"a54fb71.5e264c8","type":"debug","z":"eee72f37.6dc038","name":"","active":true,"tosidebar":true,"console":false,"tostatus":false,"complete":"true","targetType":"full","x":1564.714942932129,"y":681.0001125335693,"wires":[]},{"id":"98c086d6.6dbd08","type":"rpi-gpio in","z":"eee72f37.6dc038","name":"Wheel Sensor","pin":"40","intype":"up","debounce":"1","read":false,"x":103.05561065673828,"y":506.1389865875244,"wires":[["945935de.4bd0e8","bbce5d39.5bd04","fda24ec1.8c0dc"]]},
{"id":"4d5a13de.9b38ec","type":"switch","z":"eee72f37.6dc038","name":"","property":"payload","propertyType":"msg","rules": [{"t":"eq","v":"0","vt":"num"}],"checkall":"true","repair":false,"outputs":1,"x":356,"y":282,"wires": [["a686b3b8.402338"]]},{"id":"a686b3b8.402338","type":"interval-length","z":"eee72f37.6dc038","format":"mills","bytopic":false,"minimum":"","maximum":"","window":"","timeout":false,"msgTimeout":"","minimumunit":"msecs","maximumunit":"msecs","windowunit":"msecs","msgTimeoutUnit":"msecs","reset":false,"startup":false,"msgField":"payload","timestampField":"timestamp","repeatTimeout":false,"name":"","x":388.00001525878906,"y":138.57143592834473,"wires":[["8dee18cb.3647e"],[]]},
{"id":"8dee18cb.3647e","type":"function","z":"eee72f37.6dc038","name":"Crank RPM","func":"var x = msg.payload;\nvar rev = (60000/x);// milliseconds in a minute\nvar msg1 = {payload:rev};\nreturn msg1;","outputs":1,"noerr":0,"x":605.4285659790039,"y":153.00003242492676,"wires": [["abbe2edb.a4f88","e68dbde5.97eb8","14efbe31.a9bad2"]]},
{"id":"abbe2edb.a4f88","type":"ui_gauge","z":"eee72f37.6dc038","name":"","group":"df423369.1e76","order":2,"width":"4","height":"4","gtype":"gage","title":"Cadence","label":"RPM","format":"{{value | number: 0}}","min":0,"max":"200","colors": ["#00b500","#e6e600","#ca3838"],"seg1":"","seg2":"","x":552.9999923706055,"y":282,"wires":[]},
{"id":"e7ea3d50.4b1b6","type":"trigger","z":"eee72f37.6dc038","op1":"","op2":"0","op1type":"nul","op2type":"num","duration":"2","extend":false,"units":"s","reset":"0","bytopic":"all","name":"","x":253,"y":351,"wires":[["abbe2edb.a4f88","e68dbde5.97eb8","d7a539ee.7d5758"]]},
{"id":"ee89f341.369cf","type":"trigger","z":"eee72f37.6dc038","op1":"","op2":"1","op1type":"nul","op2type":"num","duration":"2","extend":false,"units":"s","reset":"1","bytopic":"all","name":"","x":265,"y":387,"wires":[["abbe2edb.a4f88","e68dbde5.97eb8","d7a539ee.7d5758"]]},
{"id":"88a44ce4.9e933","type":"ui_gauge","z":"eee72f37.6dc038","name":"","group":"df423369.1e76","order":11,"width":"4","height":"2","gtype":"gage","title":"Wheel Speed","label":"KMPH","format":"{{value| number:0 }}","min":0,"max":"75","colors": ["#00b500","#e6e600","#ca3838"],"seg1":"","seg2":"","x":1086.2503204345703,"y":621.1669549942017,"wires":[]},{"id":"abd42eb2.0c93e8","type":"interval-length","z":"eee72f37.6dc038","format":"mills","bytopic":false,"minimum":"","maximum":"","window":"","timeout":false,"msgTimeout":"","minimumunit":"msecs","maximumunit":"msecs","windowunit":"msecs","msgTimeoutUnit":"msecs","reset":false,"startup":false,"msgField":"payload","timestampField":"timestamp","repeatTimeout":false,"name":"","x":420.33333587646484,"y":625.4167404174805,

"wires":[["49f7f80e.6f7f38"],[]]},
{"id":"49f7f80e.6f7f38","type":"function","z":"eee72f37.6dc038","name":"Wheel Rpm","func":"var x = (msg.payload)/10;\nvar rev = (60000/x);\nvar msg1 = {payload:rev};\nreturn msg1;","outputs":1,"noerr":0,"x":470.61031341552734,"y":530.6208896636963,"wires": [["910fb33a.eb335"]]},
{"id":"910fb33a.eb335","type":"function","z":"eee72f37.6dc038","name":"wheel speed calculator","func":"var rpm = msg.payload;\nvar radius = 30.48; // Wheel base\nvar cm_in_meters= 100;\nvar sec_in_an_hour = 3600;\nvar circumference_cm = (2* Math.PI) * radius;\n\nvar dist_meters = (circumference_cm * rpm)/ cm_in_meters;\nvar meters_per_sec =dist_meters /3600; \n//var km_per_hour = (km_per_sec * sec_in_an_hour * 1.8);\n//var msg1 = {payload: km_per_hour};\nvar msg1 = {payload: meters_per_sec};\nreturn msg1;","outputs":1,"noerr":0,"x":691.2500038146973,"y":612.2500247955322,"wires": [["d5469fbc.adcaf","74eae5f3.60d65c"]]},
{"id":"d0ec0bcd.af66a8","type":"function","z":"eee72f37.6dc038","name":"Estimated Power Calculator","func":"var x = msg.payload;\nvar power = x*1.092*6480;\nvar msg1 = {payload:power}\nreturn msg1;","outputs":1,"noerr":0,"x":938.1725616455078,"y":1099.2075843811035,"wires":[[]]},
{"id":"4307b027.66a52","type":"function","z":"eee72f37.6dc038","name":"Odometer Counter","func":"var x = msg.payload;\nvar local=flow.get('data') || {};\nif (local.count===undefined)// test exists\n{\n local.count=0;\n}\nlocal.count += x/2; // change to distance \nflow.set('data',local);\nvar msg1 = {payload: local.count};\nreturn msg1;\n","outputs":1,"noerr":0,"x":166.66668319702148,"y":947.9999866485596,"wires": [["7d06f4fc.898a3c","c80fca23.dbd388"]]},
{"id":"b7abe1b9.8ace5","type":"change","z":"eee72f37.6dc038","name":"","rules": [{"t":"delete","p":"data","pt":"flow"}],"action":"","property":"","from":"","to":"","reg":false,"x":495.6 666793823242,"y":1121.000072479248,"wires":[["7d06f4fc.898a3c","c80fca23.dbd388"]]},
{"id":"7d06f4fc.898a3c","type":"ui_text","z":"eee72f37.6dc038","group":"df423369.1e76","order":8," width":"8","height":"1","name":"","label":"Distance in Meters","format":"{{msg.payload | number: 3}}","layout":"row-spread","x":177.66669845581055,"y":1065.3333587646484,"wires":[]},
{"id":"4c80f1f8.7e46e","type":"inject","z":"eee72f37.6dc038","name":"","topic":"","payload":"0","pay loadType":"num","repeat":"","crontab":"","once":false,"onceDelay":0.1,"x":241.6666717529297,"y":1 109,"wires":[["b7abe1b9.8ace5","7d06f4fc.898a3c"]]},
{"id":"d5469fbc.adcaf","type":"function","z":"eee72f37.6dc038","name":"unit converter KPH","func":"var x = msg.payload;\nvar mps_to_kmph = 3.6;\nvar adjustment = 2.9;\nvar z = (mps_to_kmph * adjustment) * x;\nvar msg1 = {payload:z};\nreturn msg1;","outputs":1,"noerr":0,"x":769.0000915527344,"y":531.666784286499,"wires": [["b6989342.d7b2e"]]},
{"id":"90d9c959.9542c8","type":"ui_button","z":"eee72f37.6dc038","name":"","group":"df423369.1e7 6","order":9,"width":"8","height":"1","passthru":false,"label":"Distance Reset","tooltip":"","color":"","bgcolor":"","icon":"","payload":"0","payloadType":"num","topic":"","x" :324.3333282470703,"y":1220,"wires":[["b7abe1b9.8ace5","7d06f4fc.898a3c","c80fca23.dbd388"]]},
{"id":"945935de.4bd0e8","type":"trigger","z":"eee72f37.6dc038","op1":"","op2":"0","op1type":"nul"," op2type":"num","duration":"2","extend":false,"units":"s","reset":"0","bytopic":"all","name":"","x":860. 6666870117188,"y":893,"wires":[["88a44ce4.9e933","e634acdc.d7123"]]},
{"id":"bbce5d39.5bd04","type":"trigger","z":"eee72f37.6dc038","op1":"","op2":"1","op1type":"nul","o p2type":"num","duration":"2","extend":false,"units":"s","reset":"1","bytopic":"all","name":"","x":872.6 666870117188,"y":929,"wires":[["88a44ce4.9e933","e634acdc.d7123"]]},
{"id":"c80fca23.dbd388","type":"ui_text","z":"eee72f37.6dc038","group":"df423369.1e76","order":7," width":"8","height":"1","name":"","label":"Distance in Miles","format":"{{(value)/1609.3 | number: 3}}","layout":"row-spread","x":868,"y":1183.6666259765625,"wires":[]},

{"id":"e68dbde5.97eb8","type":"ui_chart","z":"eee72f37.6dc038","name":"","group":"df423369.1e76","order":6,"width":"8","height":"3","label":"Cadence RPM Chart ","chartType":"line","legend":"false","xformat":"HH:mm:ss","interpolate":"linear","nodata":"","dot":false,"ymin":"0","ymax":"200","removeOlder":"20","removeOlderPoints":"","removeOlderUnit":"60","cutout":0,"useOneColor":false,"colors":["#1f77b4","#aec7e8","#ff7f0e","#2ca02c","#98df8a","#d62728","#ff9896","#9467bd","#c5b0d5"],"useOldStyle":false,"outputs":1,"x":601.6667098999023,"y":360.666711807251,"wires":[[]]},
{"id":"e634acdc.d7123","type":"ui_gauge","z":"eee72f37.6dc038","name":"","group":"df423369.1e76","order":12,"width":"4","height":"2","gtype":"gage","title":"Average Speed","label":"km","format":"{{value| number:0 }}","min":0,"max":"75","colors":["#00b500","#e6e600","#ca3838"],"seg1":"","seg2":"","x":1361.8610763549805,"y":636.2224016189575,"wires":[]},
{"id":"fda24ec1.8c0dc","type":"switch","z":"eee72f37.6dc038","name":"","property":"payload","propertyType":"msg","rules":[{"t":"eq","v":"0","vt":"num"}],"checkall":"true","repair":false,"outputs":1,"x":149.99999618530273,"y":709.3333377838135,"wires":[["abd42eb2.0c93e8","7dd5e471.f23b3c"]]},
{"id":"b6989342.d7b2e","type":"trigger","z":"eee72f37.6dc038","op1":"","op2":"","op1type":"nul","op2type":"payl","duration":"600","extend":false,"units":"ms","reset":"","bytopic":"all","name":"","x":1000.472354888916,"y":557.3890018463135,"wires":[["88a44ce4.9e933","8c6ee7c2.d6cc48"]]},
{"id":"14efbe31.a9bad2","type":"function","z":"eee72f37.6dc038","name":"crank speed calculator","func":"var rpm = (msg.payload);\nvar radius = 15.24; // crank base in cm\nvar cm_in_m= 100000;\nvar sec_in_an_hour = 3600;\nvar circumference_cm = (2* Math.PI) * radius;\n\nvar dist_km = (circumference_cm * rpm)/ cm_in_m;\nvar km_per_sec =dist_km /3600; \n//var km_per_hour = (km_per_sec * sec_in_an_hour * 1.8);\n//var msg1 = {payload: km_per_hour};\nvar msg1 = {payload: km_per_sec};\nreturn msg1;","outputs":1,"noerr":0,"x":836,"y":335.66667127609253,"wires":[["50b759df.009678","a86600a7.83585"]]},
{"id":"50b759df.009678","type":"function","z":"eee72f37.6dc038","name":"unit converter KPH","func":"var x = msg.payload*10;\n//var z = x*6.485;\n//var msg1 = {payload:z};\n//return msg1;\nvar kmps_to_kmph = 3600;\nvar adjustment = 1.999;\nvar z = (kmps_to_kmph * adjustment) * x;\nvar msg1 = {payload:z};\nreturn msg1;","outputs":1,"noerr":0,"x":876.7500076293945,"y":405.75000762939453,"wires":[["d7a539ee.7d5758"]]},
{"id":"d7a539ee.7d5758","type":"ui_gauge","z":"eee72f37.6dc038","name":"","group":"df423369.1e76","order":13,"width":"4","height":"2","gtype":"gage","title":"Crank Speed","label":"KMPH","format":"{{value| number:2 }}","min":"0.1","max":"3","colors":["#00b500","#e6e600","#ca3838"],"seg1":"","seg2":"","x":1050.7777786254883,"y":472.7778015136719,"wires":[]},{"id":"a86600a7.83585","type":"function","z":"eee72f37.6dc038","name":"estimated force at 15 newton","func":"var meters_per_sec = msg.payload;\nvar estimated_force = 15; //newton\nvar power = estimated_force * meters_per_sec\nvar msg1 = {payload: power};\nreturn msg1;","outputs":1,"noerr":0,"x":1169,"y":402.6666717529297,"wires":[[]]},
{"id":"2d270dc0.249862","type":"function","z":"eee72f37.6dc038","name":"Odometer test function","func":"var rpm = msg.payload;\nvar radius = 30.48; // Wheel base\nvar cm_in_m= 100;\nvar sec_in_an_hour = 3600;\nvar circumference_cm = (2* Math.PI) * radius;\n\nvar dist_m = (circumference_cm * rpm)/ cm_in_m;\n//var meters_per_sec =dist_m /60; \nvar msg1 = {payload: dist_m};\nreturn msg1;","outputs":1,"noerr":0,"x":173.33338928222656,"y":850.0000324249268,"wires":[["4307b027.66a52"]]},
{"id":"7dd5e471.f23b3c","type":"change","z":"eee72f37.6dc038","name":"","rules":[{"t":"change","p":"payload","pt":"msg","from":"0","fromt":"num","to":"1","tot":"num"}],"action":"","

property":"","from":"","to":"","reg":false,"x":144.3798828125,"y":770.6103515625,"wires":
[["2d270dc0.249862"]]},
{"id":"7f4e6b32.a80f44","type":"function","z":"eee72f37.6dc038","name":"Average Speed
Test","func":"var x = msg.payload;\nvar mstokph = 3.6;\nvar z = (x * mstokph);\nvar msg1 =
{payload:z};\nreturn
msg1;","outputs":1,"noerr":0,"x":422.26564025878906,"y":881.0898942947388,"wires":[[]]},
{"id":"74eae5f3.60d65c","type":"trigger","z":"eee72f37.6dc038","op1":"","op2":"","op1type":"nul","o
p2type":"payl","duration":"600","extend":false,"units":"ms","reset":"","bytopic":"all","name":"","x":80
8.7656555175781,"y":728.500036239624,"wires":[[]]},
{"id":"5412e31f.ea58dc","type":"change","z":"eee72f37.6dc038","name":"","rules":
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","timeout":0,"distinction":"_msgid","x":1409.1840591430664,"y":889.7066841125488,"wires":
[["e634acdc.d7123"]]},
{"id":"d065b73e.fe77c8","type":"delay","z":"eee72f37.6dc038","name":"","pauseType":"delay","timeo
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{"id":"30fc828a.92fd2e","type":"delay","z":"eee72f37.6dc038","name":"","pauseType":"delay","timeo
ut":"5","timeoutUnits":"seconds","rate":"1","nbRateUnits":"1","rateUnits":"second","randomFirst":"1"
,"randomLast":"5","randomUnits":"seconds","drop":false,"x":1185.265625,"y":1136.75,"wires":[[]]},
{"id":"df423369.1e76","type":"ui_group","z":"","name":"Bicycle Crank and Wheel
Sensors","tab":"b12ebccc.218e98","disp":true,"width":"12","collapse":false},
{"id":"b12ebccc.218e98","type":"ui_tab","z":"","name":"Speedometer and RPM Test
Project","icon":"dashboard","disabled":false,"hidden":false}]