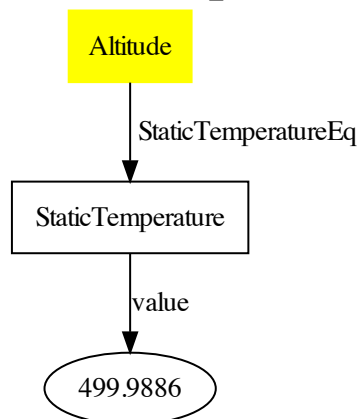# Calibration queries

Here we walk through a demonstration of calibration queries. These are simply queries where the system is able to assemble a model for the variables in the query, but relationship between the variables is reversed, that is, the variables that are given values in the query can be computed from the variables whose value we are querying. We again demonstrate queries from simpler to more complex.

1. We start with a simple query:

   ```
   what is the ^value of Altitude when the ^value of StaticTemperature is 500?
   CM: "'Model','Variable','Mean','StdDev'
   'CG_1554174198250','StaticTemperature','499.9886007961313','0.12302808970890519'
   'CG_1554174198250','Altitude','5227.921124682249','34.55845216542331'".
   ```

The query looks just like a prognostic query, but looking at the visualization of the model, we immediately see that with respect to the model found, the query asks for the value of a model output given an input:
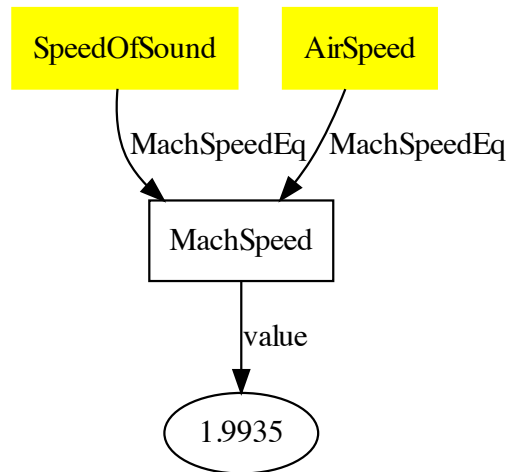

Assembled Model CG_1554174198250

Behind the scenes, the system determines that it needs to run a calibration query to the DBN execution framework, because the value of Altitude cannot be directly computed from Static Temperature. It then creates a DNB input specification for a calibration task using the found model.

2. Now consider the more complicated:

   ```
   what is the ^value of AirSpeed when the ^value of MachSpeed is 2?
   CM: "'Model','Variable','Mean','StdDev'
   'CG_1554175845130','MachSpeed','1.9935980900725367','0.04772609427483874'
   'CG_1554175845130','AirSpeed','813.5860953956526','23.799773728263443'".
   ```

Looking at the visualization of the model used:

Assembled Model CG_1554175845130

We can see that answering the query requires calibration for AirSpeed using the given value of Mach speed and also sampling values of Speed of sound, which the found model also takes as input.

3. Finally, let's try a query that uses almost all the equations in the knowledge repository to compute Altitude given Total pressure:

```
what is the ^value of Altitude when the ^value of TotalPressure is 20000?
CM: "'Model','Variable','Mean','StdDev'
'CG_1554176485768','StaticTemperature','488.389612541597','0.005125356438989'
'CG_1554176485768','StaticPressure','1543.520045301234','0.08513670661847343'
'CG_1554176485768','SpeedOfSound','1083.8241075251585','0.005687055382375754'
'CG_1554176485768','MachSpeed','2.322643065138936','0.00017362866711785683'
'CG_1554176485768','TotalPressure','19996.540630512573','6.320551937867378'
'CG_1554176485768','Altitude','8486.063892809816','1.4397068648885922'".
```


Assembled Model CG_1554176485768