

ENGINEERING REPORT

2021+ Ford Bronco 2.7L Direct-Fit Performance Intercooler Piping Kit | SKU: MMICP-BR27-21

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REPORT AT A GLANCE

- **Goal:** Create a direct-fit performance intercooler piping kit that uses the largest piping size possible and fits with the stock intercooler, Mishimoto stock location intercooler, and Mishimoto high mount intercooler.
- **Results:** The Mishimoto hot-side intercooler piping is 23.6% less restrictive than the stock hot-side intercooler piping. The Mishimoto cold-side intercooler piping is 34.2% less restrictive than the stock cold-side intercooler piping. The Mishimoto Intercooler Piping Kit produced max power gains of 5.4 hp and 6.1 ft-lbs of torque when tested with the stock intercooler. When tested with the Mishimoto Stock Location Intercooler, the Mishimoto Intercooler Piping Kit produced max power gains of 7.1 hp and 10.2 ft-lbs of torque. When tested with the Mishimoto High Mount Intercooler, the Mishimoto Intercooler Piping Kit produced max power gains of 3.6 hp and 3.5 ft-lbs of torque.
- **Conclusion:** The Mishimoto Performance Intercooler Piping Kit is a great upgrade for anyone looking to get the most performance out of their Ford Bronco.

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DESIGN OBJECTIVES

- Create a direct-fit performance intercooler piping kit that uses the largest piping size possible and fits with the stock intercooler, Mishimoto stock location intercooler, and Mishimoto high mount intercooler.
- Mishimoto Performance Intercooler Piping Kit must outflow the stock intercooler piping.

DESIGN AND FITMENT

We began the R&D process by evaluating the diameter of the stock intercooler piping as well as the available space throughout the engine bay, which allowed us to choose the appropriate piping sizes to create our design. The Mishimoto hot-side intercooler piping is 23.6% less restrictive compared to the stock hot-side intercooler piping, while the Mishimoto cold-side intercooler piping is 34.2% less restrictive compared to the stock cold-side intercooler piping. Figures 1 and 2 below show the flow bench data recorded for the stock and Mishimoto intercooler piping.

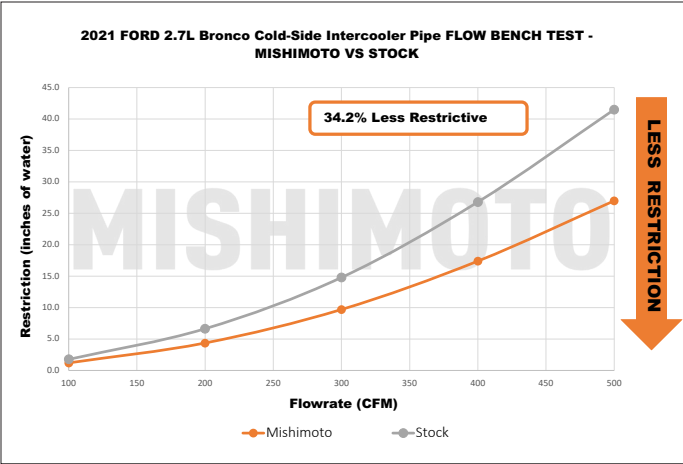


Figure 2: The Mishimoto cold-side intercooler piping is 34.2% less restrictive compared to the stock cold-side intercooler piping.

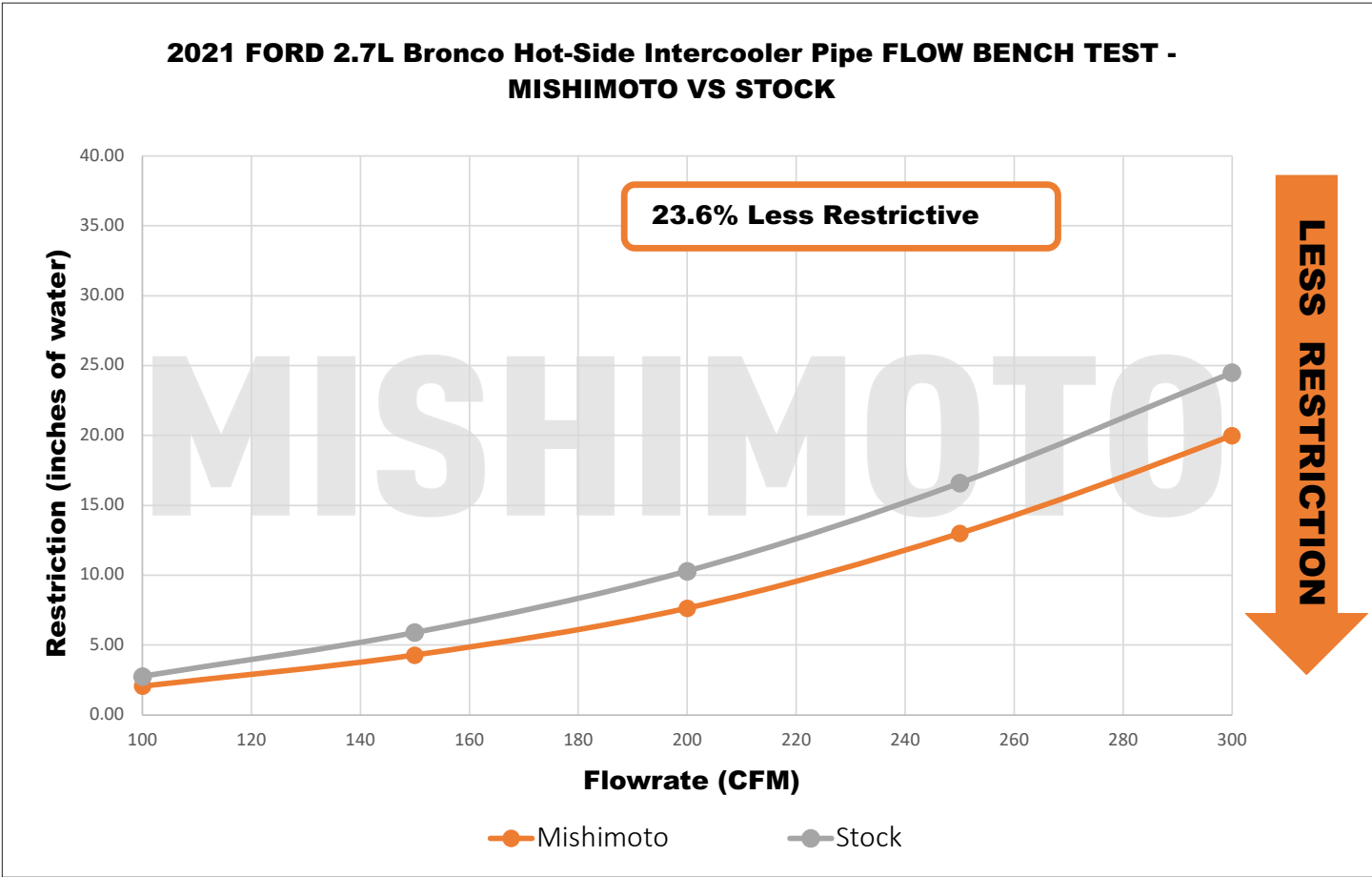


Figure 1: The Mishimoto Hot-Side Intercooler Piping is 23.6% Less Restrictive Compared to the Stock Hot-Side Intercooler Piping.

APPARATUS

For hardware, Mishimoto chose to use the AEM AQ-1 driven by the AQ-1 Data Acquisition System.

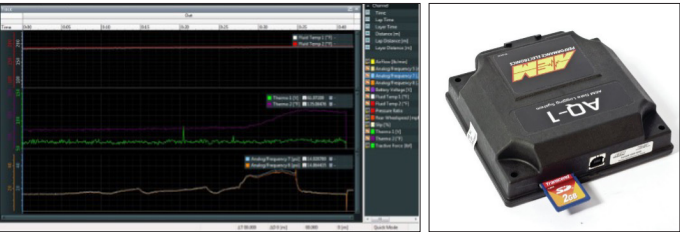


Figure 3: AEM AQ-1 Data Logging System

Air temperatures were taken with AEM intake air temperature sensors from the inlet and outlet of the Mishimoto intercooler. Boost pressure was also measured to ensure that no dramatic pressure drop will occur when installing the Mishimoto intercooler. A baseline of the temperature and pressure was recorded before the Mishimoto intercooler was installed. This allowed us to see how well the intercooler performed.

PERFORMANCE TESTING

A 2021 Ford Bronco was used to test each intercooler piping setup. The ambient temperature on the day of testing was approximately 75°F (23.9°C). To test the performance of the intercooler piping, a DynoJet dynamometer was used to conduct consistent ramp tests.



Figure 5: A DynoJet dynamometer was used for testing.

The Ford Bronco was brought to an operating temperature of 190°F (88°C) by idling it on the dyno. Once the vehicle was at operating temperature, multiple dyno runs were conducted until consistent figures were recorded. The vehicle was kept idling between runs to maintain a consistent engine coolant temperature for each run.



Figure 4: Pressure and Temperature Sensors Installed in the Cold-Side Intercooler Piping

The configurations we tested on each Bronco were:

Configuration 1: Stock intercooler with stock intercooler piping

Configuration 2: Stock intercooler with Mishimoto intercooler piping

Configuration 3: Mishimoto stock location intercooler with stock intercooler piping

Configuration 4: Mishimoto stock location intercooler with Mishimoto intercooler piping

Configuration 5: Mishimoto high mount intercooler with stock intercooler piping

Configuration 6: Mishimoto high mount intercooler with Mishimoto intercooler piping

The reduced flow restriction of the Mishimoto Performance Intercooler Piping Kit yielded max power gains of 5.4 hp and 6.1 ft-lbs of torque when tested with the stock intercooler. Max power gains of 7.1 hp and

10.2 ft-lbs of torque were recorded when tested with the Mishimoto stock location intercooler. When tested with the Mishimoto high mount intercooler, max power gains of 3.6 hp and 3.5 ft-lbs of torque were recorded.

As is the case with many intercooler piping kits, power levels increased slightly. However, this does open the door for better tuning capabilities in the future. Adding more volume and less flow restriction means the whole system has the capabilities to be pushed further with additional upgrades and a tune. Being made from a mixture of aluminum tubing and castings, this intercooler piping kit is much stronger than the stock plastic piping. All these factors make this piping kit a great addition to the 2021+ Ford Bronco.

TESTING DONE BY:

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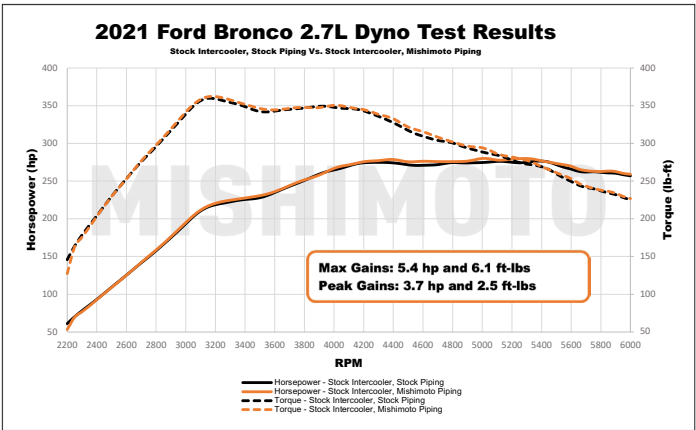


Figure 6: The Mishimoto intercooler piping yielded a max gain of 5.4 hp and 6.1 ft-lbs of torque when paired with the stock intercooler.

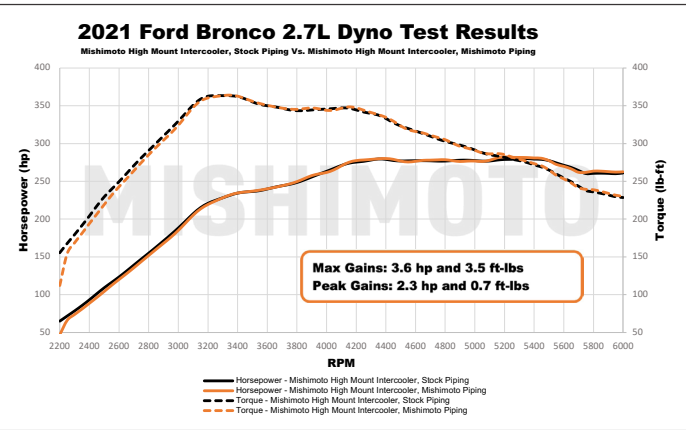


Figure 7: The Mishimoto intercooler piping yielded a max gain of 7.1 hp and 10.2 ft-lbs of torque when paired with the Mishimoto stock location intercooler.

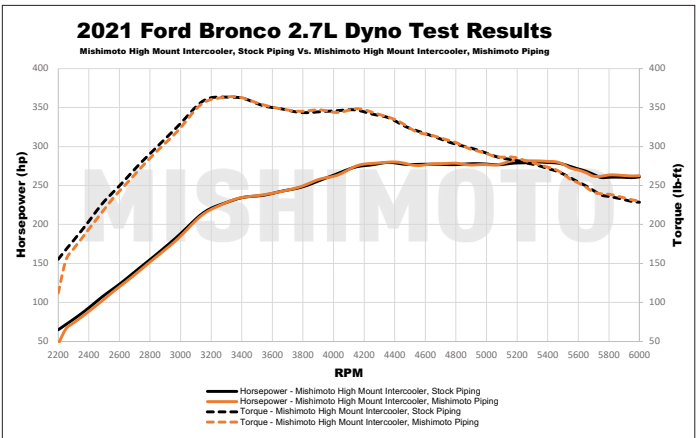


Figure 8: The Mishimoto intercooler piping yielded a max gain of 3.6 hp and 3.5 ft-lbs of torque when paired with the Mishimoto high mount intercooler.

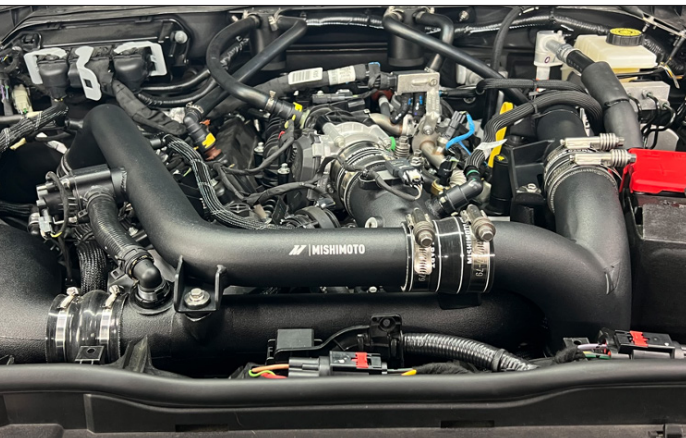


Figure 9: Mishimoto intercooler piping installed the Bronco.

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