

MUNRO



**2022 RIVIAN R1T
LAUNCH EDITION
COST ASSESSMENT**

MUNRO & ASSOCIATES

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RIVIAN R1T LAUNCH EDITION DESCRIPTION

- The Rivian R1T is one of the first off-road capable all electric trucks produced in Normal, Illinois for the US market. The pick-up truck is equipped with Quad-Motor AWD that is comprised of two dual-motor drive units.
- The front drive unit powers the front axle with a 415 hp and 413 ft lbs of torque. The rear drive unit delivers 420 hp and 495 ft lbs of torque for a total of 835 hp and 907 ft lbs of torque.
- The battery pack offers 135kWh with fast charging rates of up to 160kW.
- The R1T is equipped with Level 3 autonomy for highway driving capability and has several self-driving aids including cameras, lidar, radar, ultrasonic and high precision GPS and high-definition maps.

General Specifications	2022 Rivian R1T
	Launch Edition
Seating	5
Cameras / Radars / Ultrasonic Sensors	11 / 5 / 12
Max Height (with antenna)	78.2 inches
Length	217.1 inches
Wheelbase	135.8 inches
Width (side mirrors folded)	81.8 inches
Approach Angle	34 degrees
Departure Angle	29.3 degrees
Ramp Breakover	25.7
Max Ground Clearance	14.2 inches
Water Fording Depth	39 inches



RIVIAN R1T COST ASSESSMENT REPORTS

These reports provide a comprehensive vehicle cost analysis that are highly advantageous for OEMs or Tier Suppliers looking to effectively compete the EV marketplace.

Each report is a consolidation of Munro's technical findings related to cost, features, performance, and technology implementation including Executive Summaries, Eye-Catching Features and Quick Cost Estimates.

Several Rivian reports are available for purchase.

ZONE 1-4 REPORTS

- Zone 1 Body and Chassis \$24,000
- Zone 2 Controlling Electronics (LV) \$28,500
- Zone 3 Interiors and Safety \$22,500
- Zone 4 Powertrain and Battery Pack, HV Cables \$33,750

Purchase Zones 1 – 4 for \$97,500 to receive a 12% discount

FOCUSED REPORTS

- Electric Drive Module (Motors, Gearbox and Inverters) \$35,000
- Thermal Systems (Cooling & Heating) \$15,000
- High & Low Voltage Electronics \$35,000
 - Selections from Zones 1-4, plus additional content including Communication Architecture and ECU details

NOTE

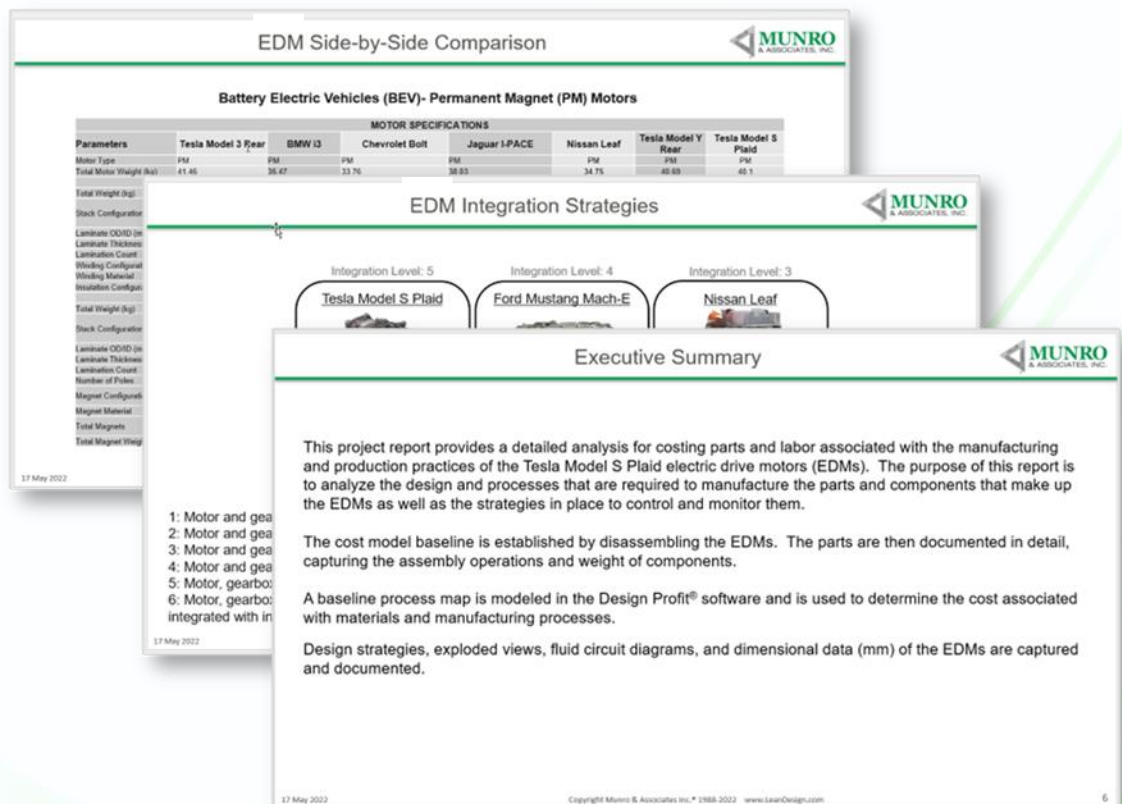
- Additional report bundling options are available at a reduced purchase price
- Custom reports are available upon request
- Please direct purchase inquiries to sales@leandesign.com

ZONE REPORTS

Zones 1 – 4 provide a system by system break down of the Rivian R1T. Each report contains detailed cost information down to the component level and supporting technical information as outlined below.

EXECUTIVE SUMMARIES

- The Executive Summary highlights the points of each report including Munro’s observations and cost summaries.
- Side by Side comparisons highlight prominent EVs and their associated specifications, features, integration strategies and other relevant data.



EDM Side-by-Side Comparison

Battery Electric Vehicles (BEV)- Permanent Magnet (PM) Motors

Parameters	MOTOR SPECIFICATIONS							
	Tesla Model 3 Rear	BMW i3	Chevrolet Bolt	Jaguar I-PACE	Nissan Leaf	Tesla Model Y Rear	Tesla Model S Plaid	
Motor Type	PM	PM	PM	PM	PM	PM	PM	
Total Motor Weight (kg)	41.46	36.47	33.76	38.83	34.75	45.69	40.1	

EDM Integration Strategies

Integration Level: 5: Tesla Model S Plaid
 Integration Level: 4: Ford Mustang Mach-E
 Integration Level: 3: Nissan Leaf

Executive Summary

This project report provides a detailed analysis for costing parts and labor associated with the manufacturing and production practices of the Tesla Model S Plaid electric drive motors (EDMs). The purpose of this report is to analyze the design and processes that are required to manufacture the parts and components that make up the EDMs as well as the strategies in place to control and monitor them.

The cost model baseline is established by disassembling the EDMs. The parts are then documented in detail, capturing the assembly operations and weight of components.

A baseline process map is modeled in the Design Profit® software and is used to determine the cost associated with materials and manufacturing processes.

Design strategies, exploded views, fluid circuit diagrams, and dimensional data (mm) of the EDMs are captured and documented.



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EYE-CATCHING FEATURES

- Munro has identified specific observations of interest which are called "Eye-Catching Features." These observations represent advantages and/or disadvantages in cost, weight, feature content, or performance as related to design, material choices, assembly or manufacturing process selection.


 Eye-Catching Features 



Carbon Fiber Rotor Wrap




 Eye-Catching Features 



Inverter Phase Lead Squib




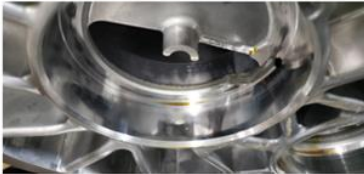
 Eye-Catching Features 

Capacitor Bank Potting



 Eye-Catching Features 

Rear Motor Housing Bearing Surface Finish

Description:

- Bearing surface on motor housing casting has been machined to achieve a high surface finish

Advantages:

- Improved surface finish of bearing mating surface helps to optimize bearing performance, extending lifespan

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Description:

- Carbon fiber rotor wrap
- Carbon fiber magnets
- This design is

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Description:

- All three inverter
- between the inverter
- mechanism in

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Description:

- Capacitor bank
- (TIM) in
- Model Y

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QUICK COST ESTIMATES

- The Rivian is broken down into systems and components for Quick Cost Estimating (QCE.) QCE is Munro's proprietary methodology developed in response to the need for speed-driven results and is quickly gaining popularity. Quick Cost estimates rapidly provide the customer with approximate versus detailed costs, which are more expensive and time consuming to generate. This level of accuracy provides OEMs and Suppliers the ability to make sound comparisons and directional decisions.

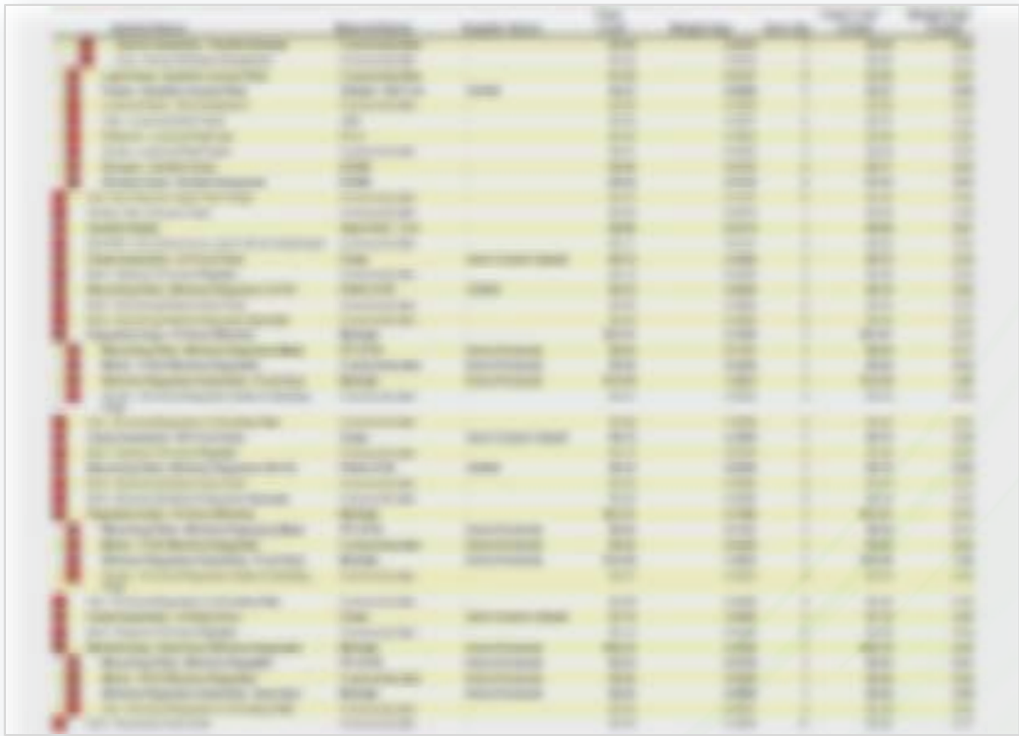
RICHMAN FROM EPA

"Munro is recognized as being technically competent, highly experienced, knowledgeable and creative in benchmarking and lean engineering of automotive and non-automotive systems. Costing models are thorough covering all elements of total production cost."



COSTED BILL OF MATERIAL

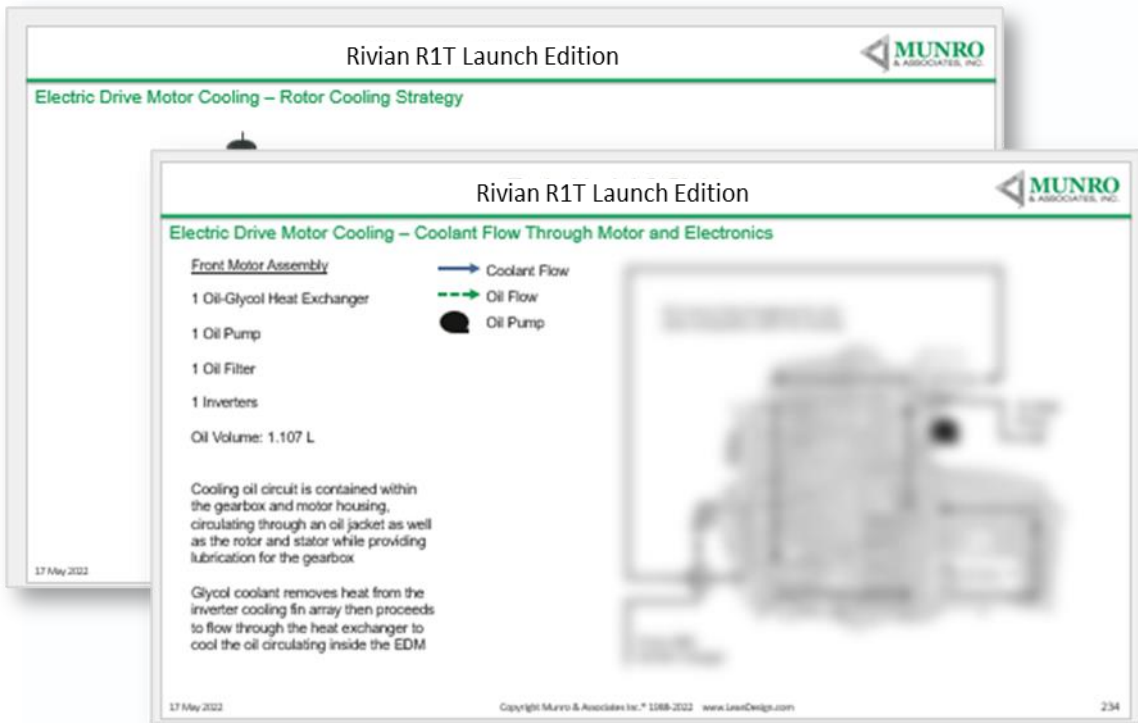
- The Summary Costed Bill of Material (CBOM) is a consolidated view of the information presented in the complete vehicle report or an individually purchased Zone report.
- The CBOM is in an indented format and includes:
 - Part name
 - Material
 - Supplier (as available)
 - Total Cost
 - Weight
 - Quantity
 - Total Weight



FOCUSED REPORTS

ELECTRIC DRIVE MODULE (MOTORS, GEARBOX AND INVERTERS) REPORT

- The Electric Drive Module (EDM) cost assessment includes the Front Motor, Rear Motor, Inverter, Front Gear Box, Rear Gear Box, and several technical details of the motor design.



Rivian R1T Launch Edition

Electric Drive Motor Cooling – Rotor Cooling Strategy

Rivian R1T Launch Edition

Electric Drive Motor Cooling – Coolant Flow Through Motor and Electronics

Front Motor Assembly

- 1 Oil-Glycol Heat Exchanger
- 1 Oil Pump
- 1 Oil Filter
- 1 Inverters

Oil Volume: 1.107 L

Coolant Flow (solid blue arrow)
 Oil Flow (dashed green arrow)
 Oil Pump (black circle)

Cooling oil circuit is contained within the gearbox and motor housing, circulating through an oil jacket as well as the rotor and stator while providing lubrication for the gearbox

Glycol coolant removes heat from the inverter cooling fin array then proceeds to flow through the heat exchanger to cool the oil circulating inside the EDM

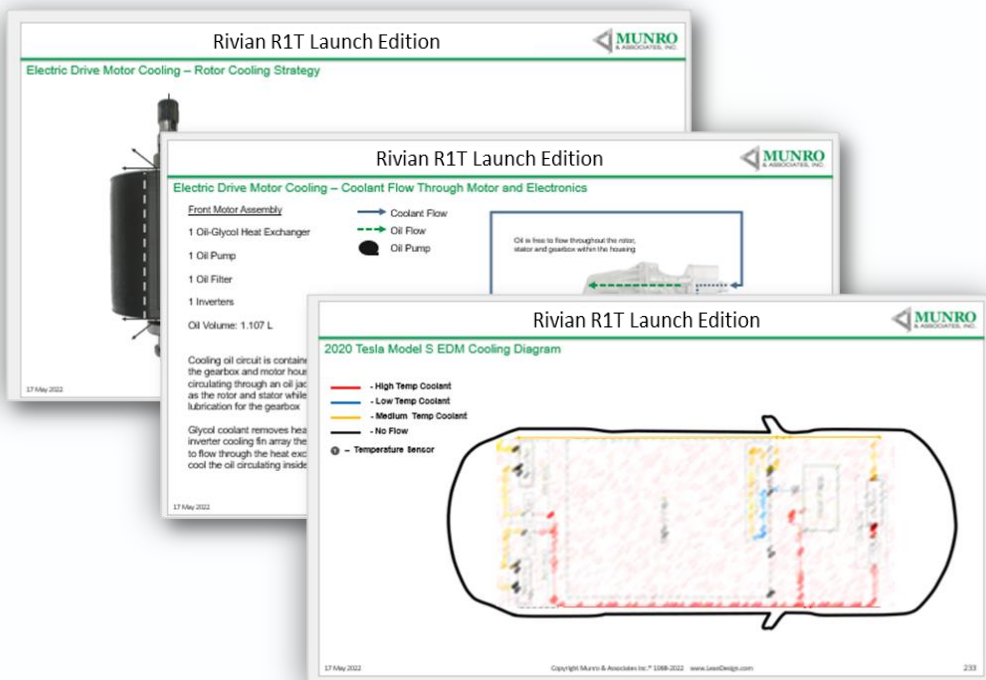
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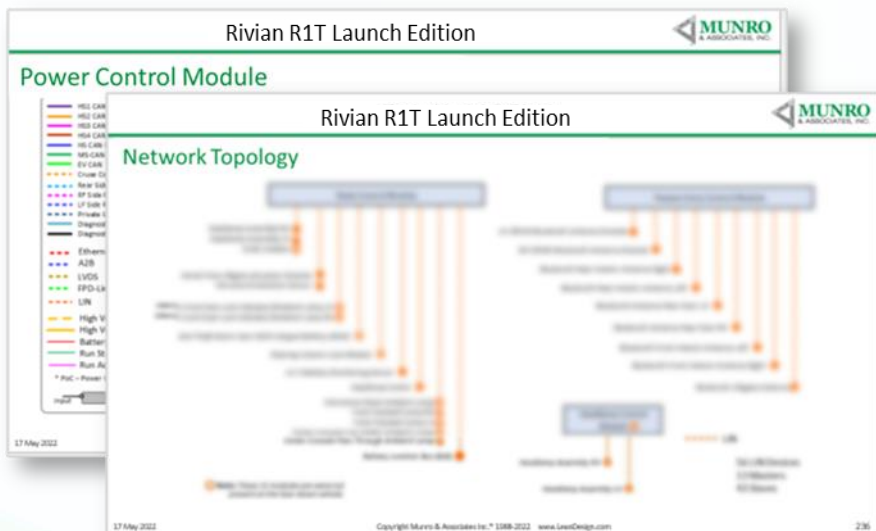
THERMAL SYSTEMS (COOLING & HEATING) REPORT

- Cost and description of associated thermal system components. Heat exchangers, coolant and AC tubing, cold plates, heat pump, AC compressor, etc..
- Includes coolant tube diagram(s), flow diagram, AC diagram and flow paths for all control valves.
- Electrical diagrams showcase the following components: heat pump (solenoids / sensors / pumps), cabin sensors, component temperature sensors (ADAS, motors, batteries etc.), and network communications



HIGH & LOW VOLTAGE ELECTRONICS REPORT

- Includes selections from Zones 1-4, including Electrical Topology, Communication Architecture and ECU details.
- The report outlines the vehicle's entire electrical system, including part names, materials, suppliers (as available,) weights, photographs, Eye-Catching Features and estimated costs for all high- and low-voltage components. The report contains the following sections:
 - **Communication Systems:** Networking, Antenna Locations, Over-the-Air (OTA) Updates
 - **ECUs**
 - **Integrated Circuit Summary:** Microcontroller, Memory, and Communication ICs identified by ECU
 - **Components by Function:** Antennas, Sensors, Switches, Actuators, Motors, Lighting
 - **Power Distribution & Wiring:** Fusing, Harness Diagrams, Connector Summary





REPORT DELIVERY

- All reports and accompanying deliverables will be made available for easy access through a secure File Transfer Protocol (FTP) site.
- A user-friendly PDF format ensures that subscribers can easily locate a wide range of materials in addition to the reports.
- The large reports feature a linked table of contents, allowing users to easily navigate the report contents and quickly locate specific data.

FREQUENTLY ASKED QUESTIONS

- **Was Rivian involved in the study?**

No. Neither Rivian's proprietary costs nor any of Rivian's suppliers' quoted costs were used in this study.

- **Is there any Rivian proprietary (stolen) IP in this report?**

No. All data was developed through Munro's proven methodologies, analyzing Munro's purchased production-version Rivian R1T.

- **Are the components costed using country-specific costing centers?**

Yes. Munro uses country-specific labor rates, factory floor costs, utilities, taxes, and SG&A for OEM and Tier Suppliers.

- **Is this a Costing or Pricing report?**

This is a Costing Report. Pricing has too many variables.



LEGAL DISCLAIMERS & SALES CONDITION

- **How can I see the sample report before purchasing?**

Please contact sales@leandesign.com and we will provide sample information in digital PDF format. NOTE: Critical data will be blurred in the sample.

- **Is purchaser allowed to reproduce, distribute, disseminate, photocopy, fax, or transmit report content internally within the purchaser's organization?**

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- **If questions arise, is a Munro expert able to visit and explain the report's details?**

Munro will visit customers, if the customer pays for the travel and a daily fee.

- **If there are limited specific questions on the content of the report, is it possible for a Munro representative to support a phone call or e-mail communication?**

Yes, please contact sales@leandesign.com and we will respond with our answers.