Full DOE Model Analysis Summary

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Full Model Performance Metrics

Metric	Value
R^2 (Coefficient of Determination)	0.3897
Adjusted R^2	0.3718
F-statistic	21.72
P-value (F-test)	<0.001 (highly significant)
Residual Standard Error	1.3208 °C
Number of Parameters	820
Residual Degrees of Freedom	7426

Full Model ANOVA (Type I - Sequential)

Source	DF	Sum of Squares	Mean Square	F-stat	p-value
Transceiver Mfr	9	3416.87	379.65	217.44	<0.001
Rack Unit	40	420.47	10.51	6.02	<0.001
Fan Speed Range	1	1.65	1.65	0.95	0.331
Mfr × Rack Unit	360	4773.00	13.26	7.59	<0.001
Mfr × Fan Speed	9	25.91	2.88	1.65	0.099
Rack Unit × Fan Speed	40	82.57	2.06	1.18	0.200
Mfr × Rack × Speed	360	4773.94	13.27	7.60	<0.001
Residual	7426	12965.94	1.746	N/A	N/A

Lack-of-Fit Test (Full Model)

Source	DF	Sum of Squares	Mean Square	F-statistic	p-value
Lack of Fit	0	0.00	N/A	0	1.0 (Perfect Fit)
Pure Error	7382	12869.75	1.743	N/A	N/A
Total Error	7382	12869.75	1.743	N/A	N/A

Model Interpretation

• **Model Significance:** The full model is highly significant ($F = 21.72$, $p < 0.001$), indicating that the factors have a significant effect on Interface Temperature.

• **Primary Effects:** Transceiver Manufacturer is the most significant factor ($F = 217.44$), followed by the interaction between Manufacturer and Rack Unit ($F = 7.59$).

• **Model Fit:** $R^2 = 0.3897$ indicates that approximately 39% of the variance in Interface Temperature is explained by the model factors and their interactions.

• **Lack of Fit:** The perfect fit ($F = 0$, $p = 1.0$) indicates the model is capturing the systematic relationships in the data with no significant lack of fit against pure error.

• **Interactive Effects:** The significant Manufacturer × Rack Unit interaction suggests that the effect of transceiver manufacturer on temperature depends on the rack unit location.