



# Honda: Bumper Paint Ground Checker

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## Customer Background

- The Indiana Auto Plant is an automobile manufacturing facility operated by Honda in Greensburg, Indiana.
- The plant opened in 2008 and produces Honda Civic compact cars, as well as Honda CR-V SUVs since 2017.
- They utilize an advanced electrostatic paint application process for their bumper line
- Plastic components must have a path to ground for static dissipation

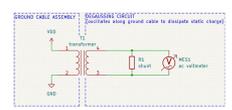
## Problem Statement / Scope of Work

Ensuring compliance with industry standards, the plant adheres to the NFPA 33-11.3.5 regulation, which specifies that bumpers must have a resistance to ground of 1MΩ or less. To meet this requirement, an automated measurement process has been implemented that can accurately measure bumper resistance within 42 seconds. As with any manufacturing process, accuracy and efficiency are crucial components. By prioritizing process flow and innovation, Honda's Indiana Auto Plant continues to stay at the forefront of automotive manufacturing.

## Requirements Matrix

DESIGN REQUIREMENTS	DESIGN TARGETS	VALIDATION
Program for Signal Monitoring	42 sec tact time	Time measurements, Resistance measurements, bumper in place reading
Standards/Protocols	Design within standards	Quality verifies actions, must be 35ft away
System Space availability	Must fit within established production line.	Measurement Class 1 Div. 1
Signal/Power tolerances for safety	Below 5V while running	Measure voltage for gantry
Bumper Resistance Measurement	1 Mega Ohm of Resistance	Measure resistance using megohmmeter
Limited locations for measurement	Measure at certain locations on bumper	Quality verifies actions, must not cause cosmetic damage
Measurement station location	Must happen after IR flash station	Quality verifies actions, paint will be dry for copper wool probe
Must have identification process	IR or barcode scan	Quality verifies actions, reads bumper type for probing sequence

## Experimentation / Concepts Exploration



### Degaussing

- Strengths:**
- High accuracy
  - Reliable consistency
  - Affordable cost
- Weaknesses:**
- Magnetic field interference within the plant

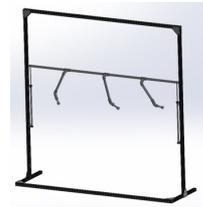
### Probing Gantry

- Strengths:**
- Affordable cost
  - Time efficient
  - Accurate measurements
  - Repeatability

### Copper Tinsel Curtain

- Strengths:**
- Conductive
  - Affordable cost
- Weaknesses:**
- Possible cosmetic damage to bumper paint

## Final Design



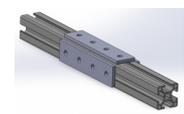
Final Design Gantry



Pneumatic Gantry



Allen Bradley Button Holder



Mounting Plate extrusion extender



PVC Gantry



PVC Mounting Arm



Copper Wool Probe



As-built Bench

## Failure Mode and Effect Analysis

FMEA - Failure Modes and Effective Analysis									
Key Process Step	Potential Failure Mode	Potential Failure Effects	S	O	D	Current Controls	D	A	Actions Taken
Probe Mechanism	Improper contact with bumper	Connect yields an open or a resistance value that is above 1MΩ	9	9	2	Pneumatic cylinders are inaccurate and does not apply proper force	2	2	Shop air is applied to the regulator which sends pressure to the solenoids to activate the gantry
Probe Copper Attachment	Material is not properly conductive	Conductive material does not establish a proper circuit connection	9	9	1	There is paint buildup or debris on copper wool	1	1	Resistance measurement station is after IR flash station
Carrier Sensor	Carrier RFID sensor does not scan	Improper probing sequence on bumper type	6	6	1	RFID code is blocked	1	1	RFID reads code on cartage and send to PLC for proper probing sequence
Grounding System	There is residual static on the bumper	The bumper clip is not properly attached	9	9	2	Placed on a piece of bumper not primed properly	2	2	Ground clip is placed on the same primed piece on each part
False Positive	Oil, no-go allows a part over 1MΩ	The PLC will allow bumper through even if above tolerance	6	6	1	The measurement is taken too close to the ground clip	1	1	Multiple measurement points will be taken, not too close to the ground clip
									Employee attaches ground clip to primed piece on bumper
									Megohmmeter will make contact with bumper primer to read resistance value

## Testing

Air PSI: 45; Humidity ~50  
Copper Wool handles

### Honda Bumper Resistance Test

	Resistance Measurement Passenger Side (MΩ)	Resistance Measurement Middle of bumper (MΩ)	Resistance Measurement Driver Side (MΩ)
Full Front Civic Primed 1	0.5	0.3	0.1
Full Front Civic Primed 2	0.5	0.3	0.1
Full Back Civic Raw 1	overflow	overflow	overflow
Full Back Civic Raw 2	overflow	overflow	overflow
Side Bumper Raw 1	overflow	overflow	overflow
Side Bumper Raw 2	overflow	overflow	overflow
Side Bumper Raw 3	overflow	overflow	overflow
Side Bumper Raw 4	overflow	overflow	overflow

\*ground clip placed in fog lights divit on the driver side