



# The Intersection of Automation & Augmentation: Where AR Fits into the Equation

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# Introductions



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The Manufacturing Millennial



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# Industry is Changing Rapidly



## Industry 1.0 – 3.0

1900s- 1990's  
Mechanization  
Mass Production  
Global  
Competition

Smart Sensors  
CRM & MES Systems  
Automation

Internet of Things  
(IOT)  
Connected  
Networks  
Cloud Data Storage

## Industry 4.0

Big Data Analytics  
Machine Learning  
Artificial Intelligence  
Cyber Security

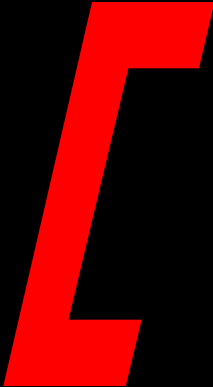
Augmented Reality  
Virtual Reality  
Mixed Reality



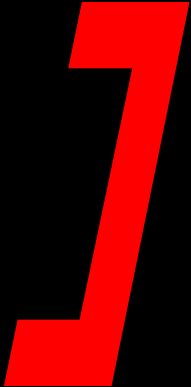
*AR is not only part of the next generation of Industry 4.0, but it is changing manufacturing entirely*



- Forbes



*By 2025, it's estimated that industrial AR will reach a market value of \$70 billion.*



*- ABI Research*

## We Must Work Differently Now

As the workforce ages, tribal knowledge is disappearing.

Digital natives entering the workforce demand new technologies to perform their jobs.

Proactive deployment of **Industry 4.0** technologies, like **Augmented Reality**, ensure agility and resilience.

72%\* of factory tasks  
are performed by  
humans

\*Source: The State of Human Factory Analytics, Kearney, 2018



# Current Work Instructions Don't Work

## Old Work Instructions Waste Billions in Manufacturing Profitability

Productivity & quality suffers

Only one language

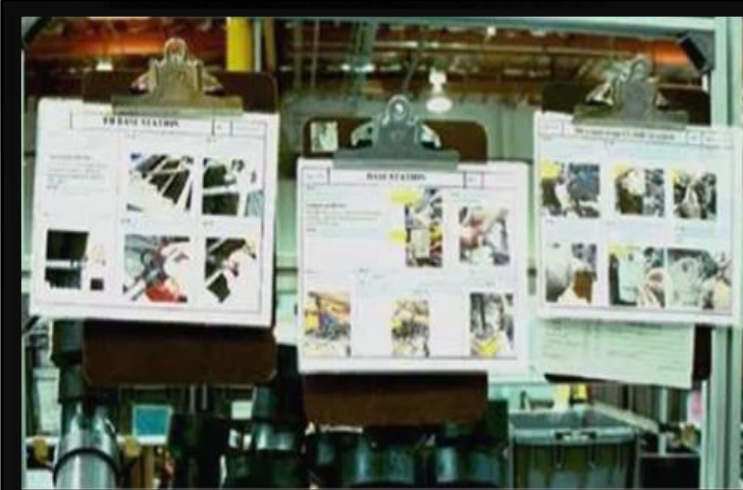
Information & location is wrong

Reduced safety

No standardization or consistent updates

Cannot handle high variation

**Practical and Proven Augmented Reality  
Solves This Global Problem**



Paper Based



Monitor Based



## Before GPS, We Knew This Problem Well

Paper Maps =  
Wrong Information/Wrong Place/Wrong Time





# Digital, Real-time, GPS-enabled Maps

Digital GPS =  
Right Information  
Right Place  
Right Time



# Summary of AR Technologies



## Tablet

For general, short-term guidance needs, tablet-based AR is the best option to integrate into operations.

It is an affordable option that is easy to use because of its applications in the consumer world as well as the industrial world.

However, it is important to consider the scale of an operation and if use time or the need to be hand-held will hinder production.



## Wearable

Mobile operations, such as field servicing, are best suited to wearable AR.

The necessity to move work instructions quickly to different areas increases efficiency, putting the instructions closer to the operation and making the instructions hands-free.

But, like tablet-based AR, manufacturers' knowledge of their application will determine if a disruptive Internet connection, lengthy charging times, or safety concerns will adversely affect their operations.



## Projection

Projection-based AR is ideal for nearly every combination of high mix/low mix and high volume/low volume operations across most industries and applications.

Because projection-based AR keeps the work instructions directly on the work surface and delivers them at precisely the right time, previously complex operations become simple and intuitive even at high levels of variation.

While projection-based AR is not yet a well-known technology, its versatility provides a practical advantage for manufacturing applications.

**Download this guide  
to determine which  
type of AR is right for  
your factory**



lightguidesys.com

# With Projected AR the Digital Twin Meets the Physical World

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The **digital twin** merges the **virtual model of a process** with how the **actual process** is implemented on the factory floor, creating a real-time comparison of how the manufacturing **process** is functioning **within** the required tolerances and metrics.

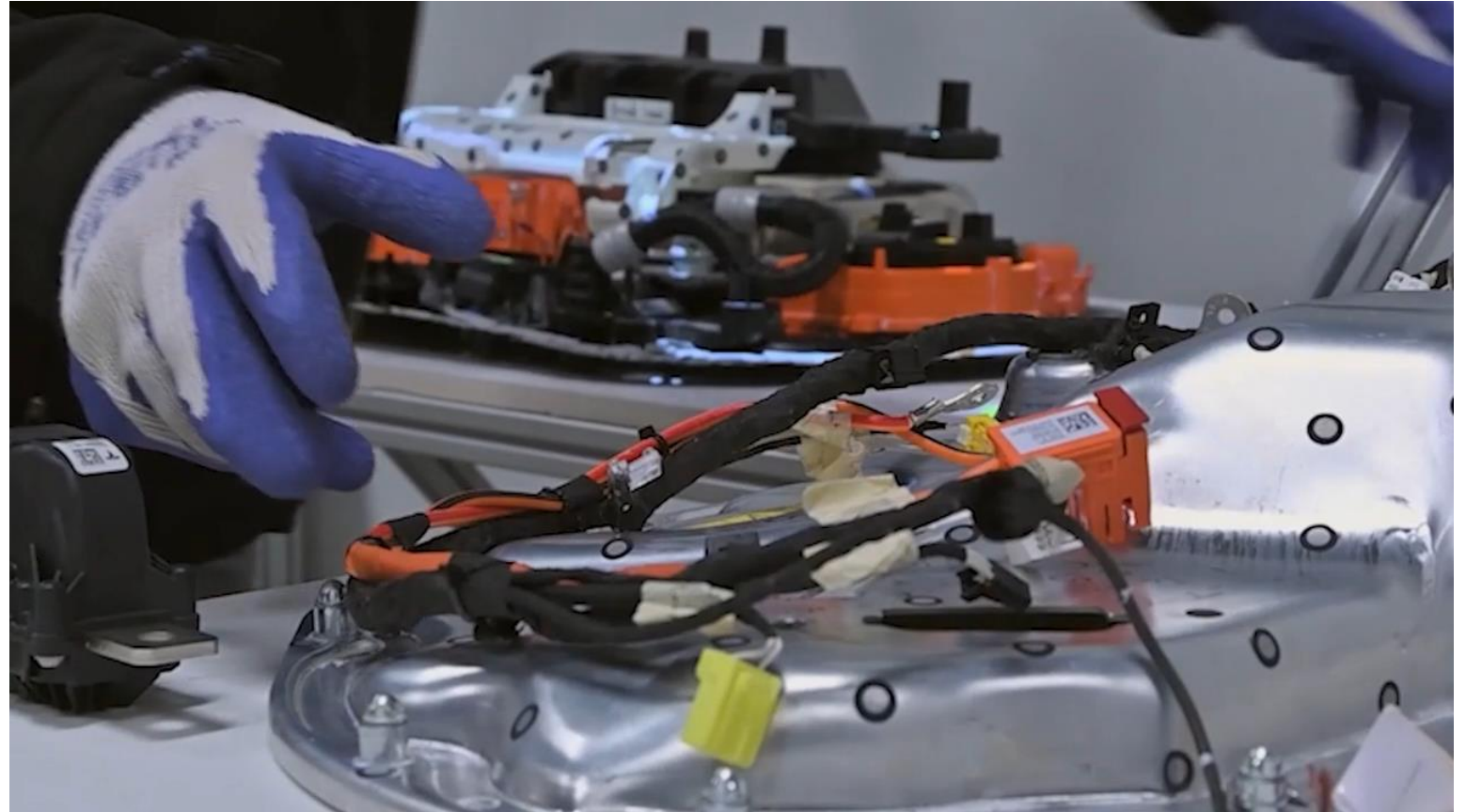
**Work instructions are projected** directly on the workflow:

In any language

For any process

With any employee

Driving flexible and flawless operations





# Key Applications of Projected AR on the Factory Floor

## Assembly & Inspection



## Training



## Part Picking & Kitting



## Maintenance & Remote Support



## Distributed Manufacturing



## Digital Work Instructions



Product Assembly  
Tooling and  
Changeovers  
Gauging Operations  
Templating &  
Alignment  
Quality Inspections

Training of New  
Employees,  
Products, and  
Processes

Part Picking, Kitting  
& Sequencing  
Product Packaging  
Shipping/Receiving

Preventative  
Maintenance  
Inspection and  
Testing

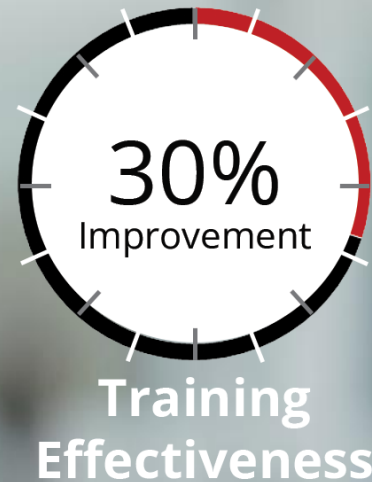
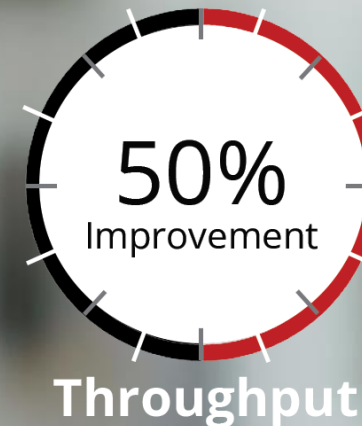
Small, Precision Piece  
Work and Assembly  
Work From Home  
Simulation / Training

Projected, digital work  
instructions create a  
no fault forward  
production  
environment

# Augmented Reality for Training



# LightGuide Delivers Immediate Results



The ability to evaluate performance and processes within a specified time period, or under certain conditions, means you can isolate opportunities for improvement, and introduce measures designed to optimize workflow one step at a time.



# Assembly with Projected Augmented Reality



# Smart Companies are Powered by LightGuide

1000+ Systems across 200+ Customers in 34+ Countries are Powered by LightGuide



# LightGuide Delivers Immediate Results



"This technology, being proven in many areas in production at Ford globally, has helped us improve our current projects. Our SMEs running deployments are [using LightGuide] to take care of error-proofing, manage complexities, reduce errors, or aiding operators at stations with very long cycle times without having to remember the entire operation sequence."

Sr. Process Engineer, Ford Motor Co.



# LightGuide Delivers Immediate Results

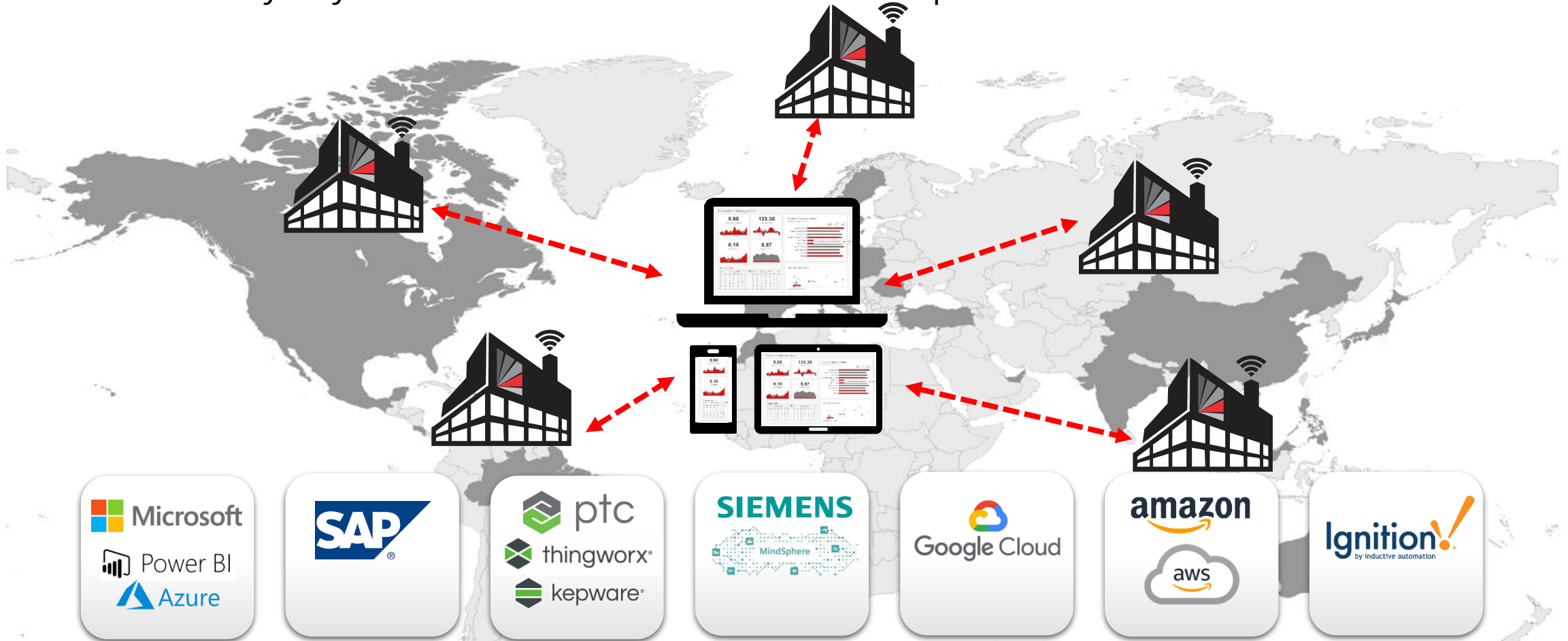


“LightGuide has been a great asset for us. [It allows] us to examine variability in the build process and identify root causes. They’ve helped us understand our process better, and even help streamline it by asking the right questions about our order of operations.”

Engineering Manager,  
L3Harris

# Unmatched Global Visibility into Manual Work

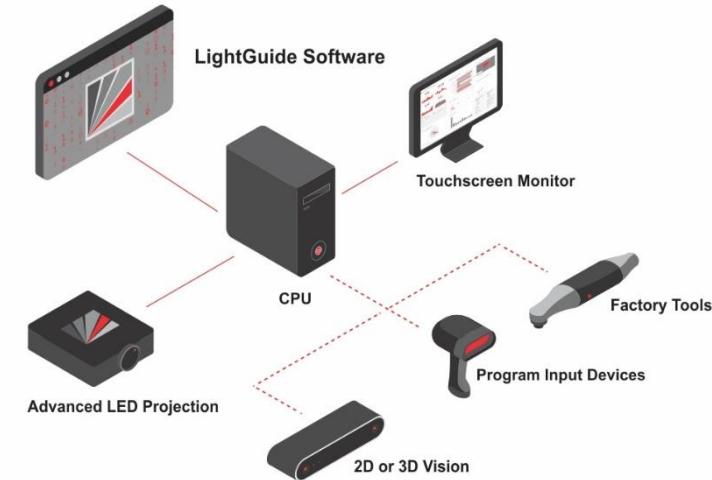
The first and only way to track manual work across the enterprise



One central dashboard provides analytics for all LightGuide powered manual workstations globally, providing unparalleled visibility, verification and data mining for assembly, inspection, part kitting, and training

# Introducing our new smartAR™ Workstation

- Pre-configured with all the hardware and software you need to harness the power of projected AR
- Redefines how AR is deployed on factory floors
- Harnesses LightGuide's digital projection technology, displaying step-by-step work instructions onto a mobile, ergonomic production area.
- Delivers immediate impacts on quality and productivity, streamlining and error-proofing manual manufacturing processes.





## THE GLOBAL LEADER IN PROJECTED AUGMENTED REALITY

LightGuide is the world's premiere visual guidance platform creating smarter, safer, and more efficient factory floors.

Our patented Augmented Reality (AR) technology lights the way to higher human and factory performance.

# THANK YOU!

LightGuide, Inc.

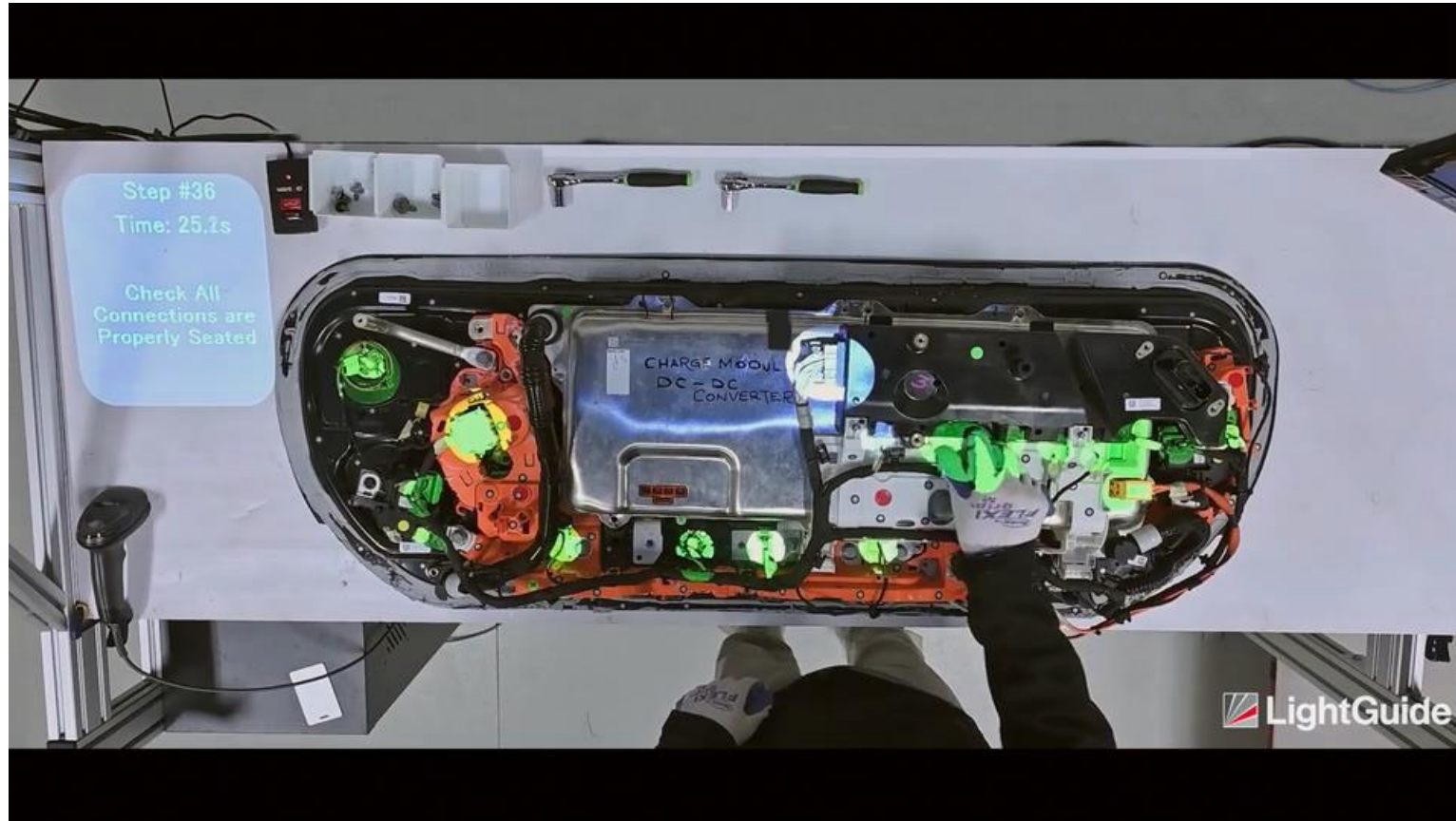
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# APPENDIX

# Augmented Reality for Assembly





## Data and Analytics Collected with Projected Augmented Reality



# Augmented Reality for Training



# Electronics Assembly with Projected Augmented Reality

