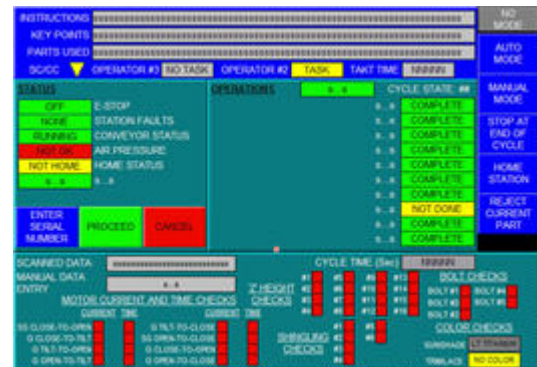


## PROJECT SUMMARY

<b>Project Name:</b>	Sunroof Test Cell
<b>Total Value:</b>	\$319,690
<b>Hours:</b>	Over 1,800
<b>Engineers:</b>	One (1) – Electrical Design One (1) – Mechanical Design Two (2) – Software Design Two (2) – Commissioning
<b>Market:</b>	Automotive
<b>Manufacturing/Process:</b>	Assembly Automation
<b>PLC:</b>	Rockwell – ControlLogix
<b>SCADA:</b>	Rockwell – RSView ME
<b>High End:</b>	Visual Basic



OTI was contracted by an automotive sunroof manufacturer to provide a turn-key solution for a single-station test cell to perform all the necessary test functions and data collection for a new sunroof module.

### Introduction:

OTI subcontracted the mechanical design and build to two (2) subcontractors and managed this phase of the project by providing design reviews and conceptual layouts.

All pneumatic, electrical, and software design was performed in-house by OTI engineers.

OTI's focus in this project was to provide a completely assembled and tested station, utilizing production parts, to allow for seamless installation and commissioning on the end user's floor.

### Objectives:

To provide the end user with the ideal solution at a cost-sensitive price, OTI utilized standard drawing and software templates from previous projects to reduce the overall engineering cost.

The end user also requested a thorough solution for presenting the statistical

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analysis results of the sunroof test procedure. OTI was asked to provide the necessary software to automatically generate test reports on all sunroof modules outlining not only test variables but  $C_{pk}$ , X-Bar, and R charts.

Finally, a detailed operations and training manual was created that provided over 150 pages of information detailing the equipment and operation of all facets of the system.

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### **Mechanical and Pneumatic Overview:**

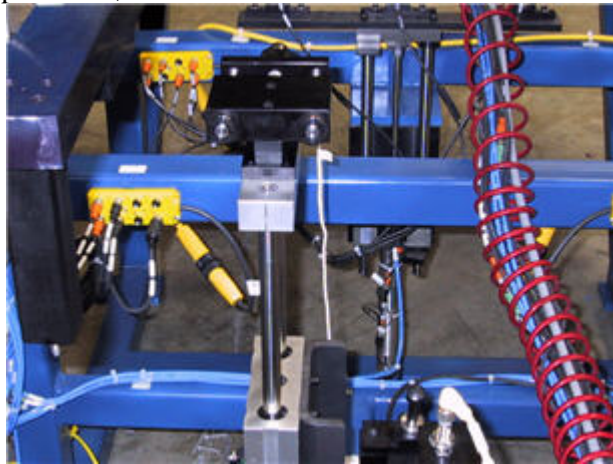
OTI conceptualized the entire mechanical and electrical system and subcontracted the mechanical design and build. OTI engineers participated in customer design reviews for this process and coordinated information between the mechanical design and build subcontractors. OTI engineers also performed all necessary pneumatic design for the system, including drawing creation and part specification.

Complete mechanical and pneumatic design and assembly drawings were provided to the end user, as well as lists of all purchased equipment.

#### ***Mechanical Equipment:***

- Trimlace Fixture
- Automatic Tester, including:
  - Cylinders for part clamping, “Close” anti-pinch test, “Vent” anti-pinch test, and bolt check

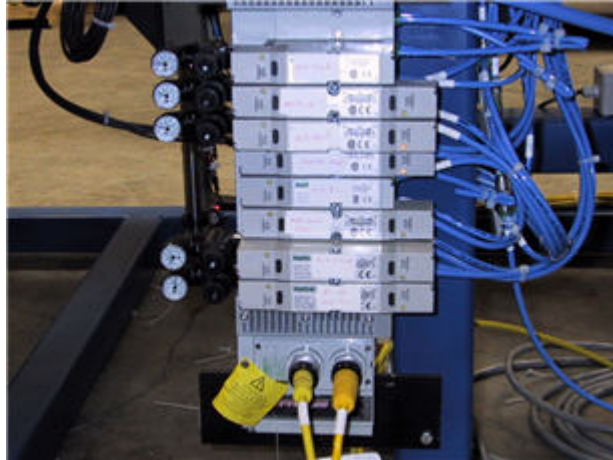
#### **Solution:**



- Manual slide for placing unit in the station

#### ***Pneumatic Equipment:***

- Numatics valve pack to control all cylinders on the Automatic Tester
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#### **Controls Overview:**

OTI design a full controls system for the Automatic Tester, including a control panel and an end-of-line computer workstation.

The entire system was designed to operate via a DeviceNet network, including all PLC I/O, pneumatic valve packs, and serial communication. Furthermore, the PLC performed all system operations, including bar code scanning, label printing, and motor de-initialization / initialization via serial-to-DeviceNet gateways.

The PLC interfaced with the HMI and OTI's custom data collection software to capture and transfer all the necessary test data. This data was utilized by the Crystal Reports reporting software to provide the end user with the necessary reports.

The following tests were performed by the control system:

- Motor de-initialization / initialization / teach
- Bolt check
- Trimlace and sunshade color check
- Glass and sunshade current and time tests
- Glass “vent” and “close” anti-pinch force tests
- Sunshade “close” anti-pinch force test
- Glass height and “shingling” tests

#### **PLC Equipment:**

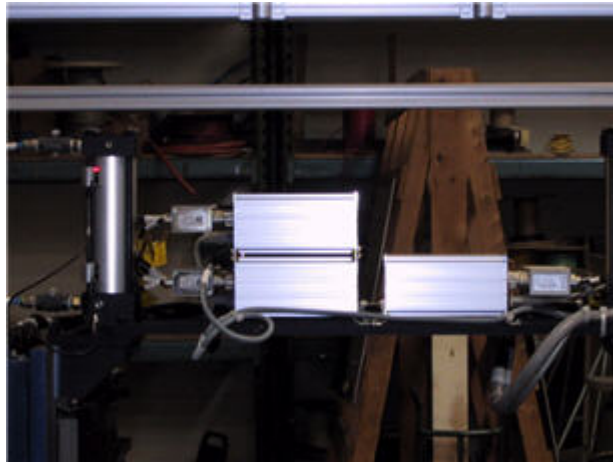
- Rockwell ControlLogix 1756-L62 processor
- Rockwell 1734 DeviceNet Point I/O
- Rockwell 1756-ENBT Ethernet card
- Rockwell 1756-DNB DeviceNet card
- Rockwell RSLogix 5000 programming software

***End-of-Line Workstation Equipment:***

- Dell PowerEdge 1850L server
- Uninterruptible power supply
- Rockwell RSVIEW Machine Edition software
- OTI-custom Visual Basic data collection software
- Crystal Reports XI reporting software

***Field Equipment:***

- Bar code printer
- Bar code scanner
- Photo-eyes and proximity switches
- Light curtains
- Safety gate switches
- E-stop pushbuttons
- Load cells and amplifiers
- Linear gauges and controllers



***Software:***

**PLC**

The ControlLogix software was RSLogix 5000 Version 15. All control and data gathering for the Automatic Tester was performed by this software.

**HMI**

The HMI software was programmed Rockwell RSVIEW Machine Edition. The HMI application showed all pertinent machine characteristics and data, as well as allowed the operator to manual control various machine options and modify test limits.



# **Outbound Technologies**

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<b>Project Outcome:</b>	Through the teamwork of OTI and our subcontractors, the Automatic Tester was fabricated on OTI's shop floor and a full system run-off was accomplished. This allowed for a smooth installation and commissioning on the end user's floor and completion of the project on schedule.
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