M+P INTERNATIONAL CODA SOFTWARE MONITORS LIFTING OF JSWT

Real-time monitoring of forces with m+p Coda software made possible the safe lifting and mating of components for NASA's large James Webb Space Telescope

NASA recently used an m+p international's Continuous Online Data Acquisition (m+p Coda) software system to monitor the critical lifting and mating of the Optical Telescope Element and Integrated Science Instrument Module (OTIS) for the James Webb Space Telescope (JWST) to its vibration test fixture. Typically engineers would monitor all the signals during the loading and verbally relay the current load values. With the OTIS system there are just too many critical load points to monitor effectively without confusion.

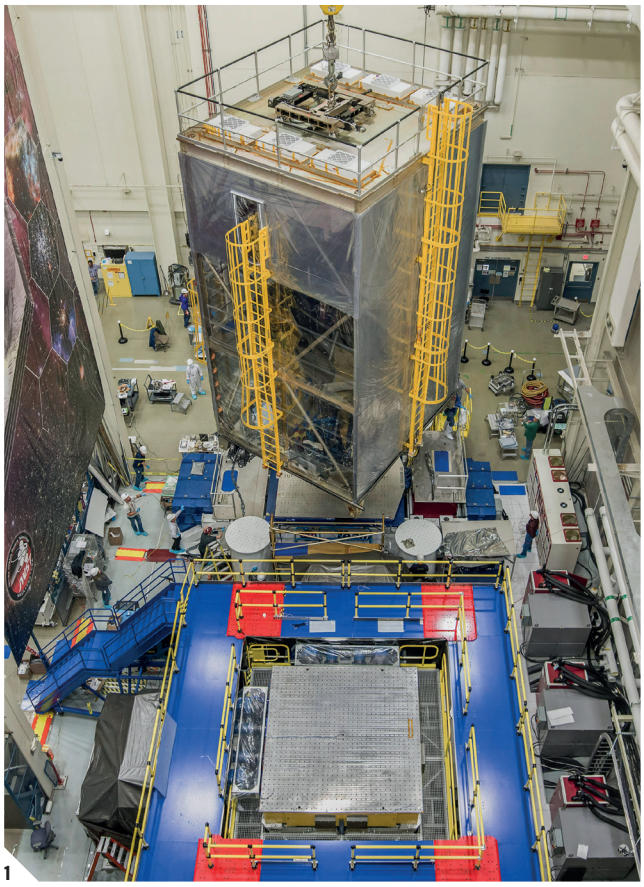
The monitoring system was based on 20-channel analog/digital converter m+p VibRunner measurement hardware with externally summed force sensors. The scope of the operation was to minimize the stress on the OTIS while moving it into position and to monitor vertical and shear static forces to determine correct alignment of the structure to the fixture. Force washers, each capable of measuring forces in three axes, were installed at six locations between the telescope and the vibration test fixture mounting fasteners. Some of the forces were summed using analog equipment before being connected to the m+p VibRunner measurement hardware suite.

During the lifting operation all forces were constantly measured by the m+p Coda software and verified against user-defined force limits, ensuring that stresses on the structure were minimized. When operators maneuvered the spacecraft, m+p Coda measured the in-axis (vertical) and shear (horizontal) forces and the values were displayed in real time.

A custom graphical user interface designed by m+p international displayed color codes to assist the operator in determining if the measured forces were within set limits. If one group of forces was under range, the measurement field in the user interface lit up green; when within range, the field was yellow; and when over range, the field turned red. These color codes gave the operator instant feedback on how the landing was progressing and safeguarded the spacecraft while being mounted on the test fixture.

Given the complexity, enormous size and weight of the OTIS structure with its test fixture, the m+p Coda-based measurement and monitoring system permitted a stable overview of the forces between the spacecraft and the mounting fixture while reducing the risk of misalignment during installation in preparation for vibration tests.

m+p Coda's versatility and vast application capability made it a good fit for this project and, thanks to m+p international US operations, the system was quickly adapted and delivered in under a week to provide NASA a monitoring solution without the need for extensive design work or expensive custom development. \\



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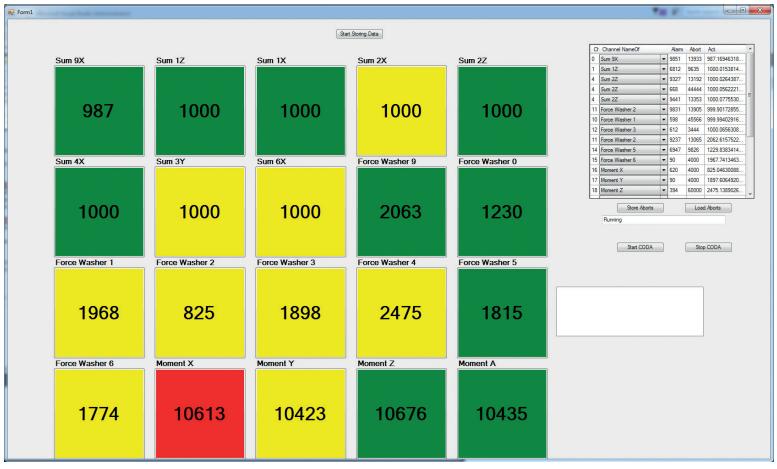

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1 // JWST being lifted onto the OTIS structure. (Photo: NASA)

2 // Large real-time display with color indicators for loading conditions

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