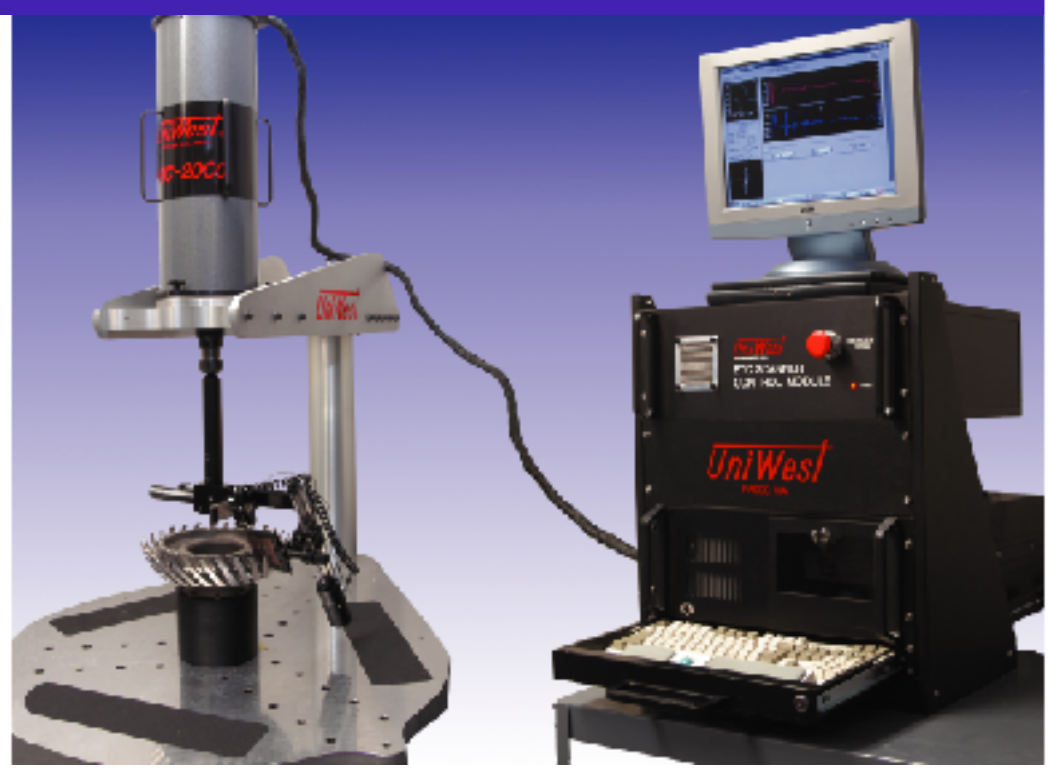
ETC-2000 Automated Scanner



This project was a cooperative effort between UniWest and the Engine Titanium Consortium which includes the FAA, General Electric, Honeywell, Iowa State University and Pratt & Whitney.

System Qualifications

- UniWest QCP 6272
- Pratt & Whitney support equipment operations application procedure SEO-106
- Pratt & Whitney NDIP-986, JT8 engines
- Honeywell fan disk attachment slot eddy current inspection TFE731-5
- GE computer controlled eddy current inspection system specification #NDT 174
- Snecma Moteurs CFM56 engine inspection SPM 70 38 1 1

Technical Specifications

Electrical Specifications

- Input power requirements: 85/265 vac, 47-63 Hz, single phase
- Recommend using at least a 1500 watt uninterruptible power supply with the ETC-2000 scanner system

Signal path specifications

- Operating temperature range: 0ºc to +50ºc
- Frequency range: 100 Hz to 10 MHz
- Probe drive

- Input resistance: 900 ohm to 1 100 ohm
- Output resistance: 7 ohm to 12 ohm
- Maximum input voltage: 8 volts peak to peak with 50 ohm to 1 k ohm load
- Gain: -0.1 dB to –2.1dB

- Buffered probe drive

- Input resistance: 900 ohm to 1 100 ohm
- Output resistance: 145 ohm to 172 ohm
- Maximum input voltage: 8 volts peak to peak with 50 ohm to 1 k ohm load
- Gain: -0.1 dB to –2.1dB

- Receive signals (receive 1 and receive 2)

- Input resistance: 900 ohm to 1 100 ohm
- Output resistance: 55 ohm to 67 ohm
- Maximum input voltage: 4 volts peak to peak with 50 ohm to 1 k ohm load
- Maximum dif ference voltage between receive 1 and receive 2 is 300 millivolts
- Gain: -0.1 dB to –2.1 dB

Computer Specifications

- Minimum 20 Gb hard drive
- Minimum 1.8 GHz Pentium processor or equivalent
- 64 Mb video card
- 128 Mb memory
- Windows 98
- CD read/writer
- CD ROM
- 1.44 Mb floppy drive
- 15 inch LCD flat screen color monitor
- Rack-mounted capability
- Rack-mounted keyboard
- Track-ball
- All software necessary for scanner operation, data acquisition, data storage and display

Mechanical specifications

Ranges and capacities (horizontal positioning, usable inches including translation axis)

ETC 4004 Large interface module:

- Maximum diameter – 52 inches
- Minimum diameter – 1 inch

ETC-4003 Small interface module:

- Maximum diameter – 32 inches
- Minimum diameter – 1 inch

Vertical positioning:

- ETC-4004 Large interface module:

- 32 inches usable including translation axis

- ETC-4003 Small interface module:

- 22 inches usable including translation axis

- Vertical translation axis X-axis: 17 inches
- Radial translation R axis:5.7 inches configurable at different zero offset points

Multiple axis actuator, M-axis

- Inspects vertical, horizontal, and angled

- Bolt hole
- Dovetail broach slots

- Compatible with new tooling designs for future inspections
- Model ETC-2236 provides 9 inches of translation
- Model ETC-2225 provides 21 inches of translation

Rotational C axis

- Rotational speed – continuously variable and guaranteed to 12 rpm

Interface modules, weight and range capabilities:

ETC-4004 Large interface module:

- Work Piece usable diameter – 52 inches
- Work Piece maximum weight – 800 pounds

ETC-4003 Small interface module:

- Work Piece usable diameter – 32 inches
- Work Piece maximum weight – 200 pounds

Accuracy

- Translation axes X, R and M positioning:
  - Vertical axis – +/- 0.005"/foot
  - Radial axis – +/- 0.005"/foot
- Resolution
  - Vertical axis – 0.001"
  - Radial axis – 0.001"
- Backlash
  - Vertical axis – <0.001"
  - Radial axis – <0.001"
- Repeatability
  - Vertical axis – 0.005"
  - Radial axis – 0.005"
- Straightness
  - Vertical axis – < 0.010"/foot
  - Radial axis – < 0.010"/foot
- Rotational C axis
  - Vertical axis perpendicularity - +/- 0.010"/foot
  - Angular positioning accuracy - < +/-0.1∞/revolution
  - Angular repeatability - < +/- 0.1∞
  - Backlash - < 0.1 ∞
  - Horizontal axis parallelism +/- 0.010"/foot
  - Resolution – 0.01∞

Data Acquisition

- 16 single channel inputs or 8 differential channel inputs
- X and Y channels sample at up to 50,000 samples/second and provide 16 bit resolution for each channel

Displays

- Bolt hole: the display used for bolt hole inspections
- Dasmulti: the display used for web and bore inspections

- PS display: a general use display routine

Control and Display Software

- Motion Control for the X, C, R and M axis, looping, scanning, analysis, commenting, messaging, and external program control.
- Find X enhances system intelligence to find a specific surface and stop.
- Drive allows drives to be enabled or disabled eliminating unwanted jog movements
- Windowing is a post-procession algorithm that scans data for thresholds exceeding scan-plan parameters
- Command lines include motion control for X, C, R and M axis, looping, scanning, analysis, commenting, messaging, and external program control
- ETC software is compatible with external post processing programs that may be used for data analysis and decision modeling
- Software Enabling allows off-line personnel training, analysis of data, and scan plan development

Premium Software Not Included

- Auto Calibration integrates fully automated system calibration
- Return-to-Indication re-scans regions previously found to have exceeded threshold parameters. This tool automatically shows the locale of any found indication regions in scans for bores, webs, slots, and bolt-holes.
- SBindicate analyzes slot and broach scan data for indications. It incorporates threshold, nominal length, and edge neglect parameters. Edge Neglect improves edge detection for slot inspections.

These specifications are configured to UniWest's ETC-2000 Automated Scanner and US-450 eddy current instrument systems delivered after January 1, 2003