CSI 2130 Machinery Health Analyzer

- Data collection, vibration analysis, alignment and balancing in a single unit
- Compact, rugged design holds up to any plant environment
- Intuitive operation shortens the learning curve for faster implementation
- Intelligent design speeds operation to maximize productivity
- Embedded intelligence unlocks powerful technology solutions
- Modular format offers a clear expansion path to protect your investment

The Route application in the CSI 2130 uses pre-defined settings to provide instant feedback about machinery health in an easy-to-read color bar graph.

Overview

Maintenance departments today are asked to run with fewer staff and smaller budgets than ever before. In this do-more-with-less environment, maintenance personnel can't afford to continuously chase the next breakdown. They need to quickly and accurately identify developing faults and then get to the root cause of the machinery problem so that it can be fixed once and for all. An effective technology solution must be simple to operate - reducing training requirements - while providing fast actionable information to prioritize maintenance activities. Emerson developed the CSI 2130 Machinery Health Analyzer with these requirements in mind.
The CSI 2130 stands alone as the fastest and most powerful vibration data collector, but its capabilities also include:

- Advanced vibration analysis
- Cross Channel Analysis
- Transient Analysis
- Dynamic balancing
- Laser shaft alignment
- Motor Monitoring

Routine data and corrective maintenance jobs can be uploaded to the companion AMS™ Suite: Machinery Health Manager software for analysis and reporting. Condition alarms can generate alerts in Emerson’s PlantWeb® digital architecture, which can be viewed via the AMS Suite: Asset Portal. AMS Asset Portal provides a single, unified view of predictive maintenance and equipment performance on the mechanical equipment, electrical systems, process equipment and intelligent field devices in your facility.

**Fastest Route Data Collection**

As shown below, data collection time can be reduced by as much as 70% compared to the CSI 2120, and even more when compared to other instruments. Faster data collection translates into more machines being monitored and more time dedicated to the important task of machinery analysis.

**Single and Dual Channel**

The CSI 2130 is available with either one or two channels of vibration analysis. The two channel version not only enables advanced analysis options—it also brings significant efficiency improvements. Emerson’s patented dual channel data collection technique slashes measurement time by an additional 20% to 45%. This increase in productivity frequently justifies the investment within the first year.
**Portable and Durable**
The physical attributes of this unit make it ideal for field work in a wide variety of industrial applications. Since its release in January 2003, the CSI 2130 has established itself as the premiere instrument for vibration analysis thanks to an impressive list of capabilities:

- Large Color Display: backlit VGA display for use anywhere.
- Small and Lightweight: easily carried on long routes
- In-Field Reports: color-coded alarm report for each point.
- Industrial Design: IP-65 rated with optional safety rating.

**Easy Operation**
The CSI 2130 is designed to be easy to use, so only minimal training is required for effective operation. More than just collecting data, the analyzer converts data into actionable information about machinery health. For example, it can automatically distinguish between imbalance and a bearing fault. The user is instantly notified about the nature of developing faults at the time of measurement, so that he can focus his attention on critical machine issues immediately.

**Embedded Intelligence**
The ability to perform additional tests at the machine site transforms simple data collection into an effective machinery health program. In today’s demanding work environment, however, it is difficult to find the time to acquire these skills. That’s why Emerson developed and patented the ‘Analysis Expert’ as an integral part of the CSI 2130. Embedded diagnostics enable even a novice user to conduct sophisticated tests with the touch of a button. The bottom line impact is that users can quickly harness the full power of the CSI 2130 in the field.

**Bearing and Gear Analysis**
Detecting imbalance or misalignment is easy with any instrument, but the CSI 2130 makes child’s play out of detecting developing faults on bearings and gears as well. Emerson’s patented PeakVue® processing applies digital technology to detect stress waves - the earliest sign of bearing and gear wear. In comparison, demodulation and other analog technologies typically can not detect such faults until much later – and sometimes not at all.

PeakVue processing not only offers the earliest warning of developing faults; it also provides an indication of severity. Measurements can be reliably trended to determine the optimal timing for maintenance.

With PeakVue, machinery faults are clearly visible in the waveform, opening up important new options for fault detection and diagnosis.
Add Prediction to Online Monitoring

Many online monitoring systems installed in plants today serve as nothing more than a shutdown switch in case a catastrophic condition develops. By feeding the signals from these systems into the CSI 2130, it is possible to add predictive capabilities by identifying faults before a catastrophe occurs. Orbit plots can be generated to identify problems such as misalignment and shaft rubs. Trending data also provides valuable insight into developing cracks and other types of structural faults.

Monitoring Trouble Spots

The CSI 2130 also serves as a temporary on-line monitor. It can automatically acquire and store data such as the overall vibration, fault frequencies associated with specific fault types, or even the complete spectrum over an extended period of time. With line power, it is possible to monitor machine health for longer spans up to a month (e.g. to capture the break-in period for new equipment or to ensure that a machine with a known fault can make it to the next outage).

Full Spectrum of Measurement

Another unique feature of the CSI 2130 is its exceptional frequency range. Using Emerson’s patented Slow Speed Technology (SST), the analyzer can accurately measure signals on critical low speed equipment that would be out of range for other vibration analyzers. On the other end of the spectrum, the CSI 2130 also boasts the highest frequency range available. It can measure signals up to 80,000 Hz, which is important for accurate diagnosis of centrifugal compressors and other high speed machinery.

Variable Speed Analysis

Variable speed analysis is essential to any effective machinery health program because most critical pieces of equipment must be operated at varying speeds to accommodate the changing production demands. While most vibration systems do not take variable speed into account during data collection, the CSI 2130 automatically adapts all of its diagnostic tools to variable turning speeds during routine data collection. This provides an accurate evaluation of developing problems in the field.
Capture Machine Shutdowns
For analysis of transient events, the CSI 2130 is able to collect a series of 'snapshots' of machine vibration during start-up, coast-down or process changes. These spectra can then be viewed individually or in a Cascade plot.

Correlate Vibration and Process Variables
Use the dual channel feature of the CSI 2130 to correlate machinery vibration with process variables. This is accomplished by inputting the process information as a volt signal into one channel, while monitoring vibration on the other.

Unsurpassed Versatility
The CSI 2130 incorporates a modular design so that it can be configured to specifically address your current situation. As your needs evolve, it can be easily and affordably expanded to enhance your capabilities while protecting your initial investment. This versatile unit can be purchased as a single- or dual channel analyzer – with or without route measurement capability, as a dedicated field balancer, or as a laser alignment calculator. Put together any combination of capabilities to match your requirements. Additional modules are also available for transient and structural analysis.

Advanced Cross-Channel Analysis
Standard data collection serves as an excellent base for identifying developing machinery faults, but often times cross-channel analysis is required to identify the root cause of the fault. Expand the vibration analysis application with the cross channel module to determine the actual movement of the shaft during operation and to identify structural faults such as cracks and resonances. While the dual-channel CSI 2130 comes standard with the ability to display orbits for turbo machinery analysis, the optional Advanced Cross-Channel application expands these capabilities to include impact testing and other types of cross-channel analysis. As a further enhancement, the ODS/Modal application (Operational Deflection Shapes) makes short work out of structural analysis by automatically configuring the required series of cross-channel tests.

Cross-channel data can also be analyzed in the VibPro module of the AMS Machinery Manager application, or exported to specialized ODS/Modal analysis software.
The Advanced Transient application records the vibration signature from machine start-up, coast-down or during process disruptions for advanced analysis.

Transient Analysis
The Advanced Transient Analysis application expands the power of any single or dual channel analyzer to record the raw vibration signal over a prolonged period of time for post-processing and analysis. This is essential for diagnostics of turbomachinery, start-up and coast-down, or machines with short, repetitive duty cycles. This data can be examined directly on the CSI 2130 Analyzer or with the VibPro module in AMS Machinery Manager.

Field Balancing
The Advanced Balancing application transforms the CSI 2130 into a powerful field balancer. This application combines advanced technology with simple, straightforward operation for a fast, effective solution to your balancing problems. The graphical user interface automatically guides the user through the balance checklist so that only minimal training is required for effective operation.

The program offers a basic mode for simple one- or two-plane balancing, and an advanced mode for more complex jobs. Full job documentation can be sent directly to a printer or stored on a PC using the UltraMgr module of AMS Machinery Manager.

The Advanced Balancing application offers two new solutions to the challenge of field balancing:

Vector Averaging - This technique systematically removes background vibration that would otherwise contaminate the calculated solution.

Balancing Watchdog - this patented technology automatically checks the vibration data on the machine while the user performs the balance job. The Watchdog is able to identify and alert the user to severe structural faults (such as looseness or resonance) that would otherwise make the job difficult or impossible to complete. The user can take corrective action to remove the structural fault, balance the rotor, and leave the machine in reliable operating condition.
Motor Current Analysis
Together with the MotorView module in AMS Machinery Manager, the CSI 2130 performs non-intrusive analysis of the rotor and stator condition in induction motors. This can be accomplished with a standard current clamp or Emerson's patented flux monitoring.

Industrial Ratings
Designed for use in industrial environments, the CSI 2130 has received an IP 65 rating certifying that it is dust- and splashwater tight. It is also certified to comply with international safety standards in the United States, Canada and Europe for hazardous areas.

Laser Alignment
The Advanced Laser Alignment application offers a graphically-driven user interface and wireless operation to quickly and easily complete alignment jobs. Emerson's advanced laser system uses built-in dual inclinometers to automatically determine the shaft position, so the user simply rotates the shaft and the solution is plotted on the screen. The live move option then updates the change in alignment condition during the machine move. Full job documentation is available using the UltraMgr module in AMS Machinery Manager.

The Laser Alignment Expansion Pak adds this important capability to any CSI 2130 analyzer.

Accessory Options

Speed Detection
Accurate detection of the shaft turning speed is critical to effective machinery health analysis. The CSI 430 Laser Speed Sensor provides the industry-leading method to determine shaft speed without requiring reflective tape or any specific markings on the machine.

Triaxial Accelerometer
The Model A0643TX is a revolutionary new triaxial sensor. Using Emerson's patented design, this sensor can be magnet mounted and still provide high quality readings in all three directions.

Proximity Probe Connections
To measure orbits on a protection system, use BNC-type cables and the dual volt adapter. The phase reference can be input using the generic tach cable.

Structural Analysis
For advanced structural analysis, use a modally-tuned hammer.

See pages 10 -12 for additional accessory listings.
General Specifications

Physical Data
- Color Display:
  - Transflective (for indoor or outdoor use)
  - Liquid crystal display, built-in backlight, 640 x 480 pixel
- Key Pad:
  - Oversized, easy to press keys, 12 soft function keys, context sensitive help key
- Height: 8" (203 mm)
- Depth: 1.88" (48 mm)
- Width: 10.25" (260 mm)
- Weight: 4.5 lbs (2.04 kg)

Operating Conditions
- Moisture: Sealed enclosure, IP-65 rated
- Temperature: 15 to 113 ºF (-10 to 45 C)

Power Supply
- Battery: NiMH
- Capacity: 4.5 amp hours
- Voltage: 7.2 V
- Battery Life: Over 8 hours typical use (longer with backlight off)
- Charger: "Smart Charger". Also functions as a continuous power supply.
- Recharge Time: 3 hours

Quality Assurance
- NIST Traceable calibration. Safety rated versions available, approved to Class I, Division II rating for Groups A, B, C, & D. Performance specifications for safety rated version are identical to standard model.

Analyze & Route Specifications

Analysis Experts
- Interactive data acquisition setups for the following analysis types:
  - High Frequency, High Resolution, Bearing/Gear Fault analysis, Low Frequency, Order Tracking, Synchronous Time Averaging, Bump Test (on and off-line), Coastdown (peak-hold and peak/phase), Turning Speed Detection (vibration and laser), Rotor Fault Detection, Cross Channel Phase*, and Orbit Analysis*.

Data Analysis Speed:
- 400 line / 1000 Hz spectrum
  - 0.14 sec/avg
- 1600 line / 1000 Hz spectrum
  - 0.5 sec/avg

Analysis Capabilities:
- Noise Floor:
  - Less than 0.2 micro-volts per root Hz over 1,000 Hz frequency range.
- PeakVue:
  - Built in, with selectable filters
- Demodulation:
  - Built in, with selectable filters
- SST:
  - Built in Low Frequency processing
- Dual-Channel*:
  - Fully matched, independently configurable. Simultaneous dual channel collection. Filtered Orbit analysis.
- Cross-Channel*:
  - Synchronized cross channel Phase and Coherence (Full Spectrum or Single Frequency)

Dynamic Analysis:
- Overall, Spectra, Waveform, 12 analysis parameters, 1/3 Octave, A-weighting, Phase, Bode/Nyquist

Signal Range:
- Autoranging maintains optimum dynamic range. 16 bit A/D Converter has 96 dB Dynamic Range, (coupled with analog integration provides better than 120 dB for typical applications).

Frequency Range:
- 740 ranges from DC-10 Hz to DC-80 kHz.

Low Frequency Response:
- DC coupling on non-powered inputs allows flat response to DC for non-integrated signals.

Resolution:
- 1/3 Octave, 100, 200, 400, 800, 1600, 3200, 6,400, 12,800 lines. True Zoom provides effective resolution of up to 300,000 lines.

Number of Averages:
- 5,000 in route mode, 10,000 in Job mode, unlimited in Monitor mode

Integration:
- None, Single, Double (Analog or Digital)

Trigger:
- Vibration level, Pretrigger, Tach, Pretach

Anti-Aliasing:
- Filters attenuate all alias components to below noise floor.

Amplitude Units:
- Metric or English, acceleration, velocity, displacement, or user programmable

Frequency Units:
- Hz, CPM, Orders

Scaling:
- Linear or Log, both X and Y axes

Windows:
- Hanning or Uniform

Cursor:
- Single, Harmonic, Moving Harmonic, Sideband

Memory:
- 80 MB total. 32 MB for programs and data storage (expandable with off-the-shelf Flash RAM cards). 16 MB for operating system.

Signal Input
- Powered Inputs:
  - (2 mA, +20 V ICP power supply)
  - +/- 15 V

Non-Powered Inputs:
- +/- 24 V range

Input Impedance:
- greater than 125 k ohms

Tach:
- TTL input, built in conditioning for non-TTL signals, adjustable trigger

Pseudo tach:
- Generates tach pulses for hidden shafts

Triaxial:
- Internal multiplexer for automatic sequencing of triaxial measurements

Output:
- Communication with Host Computer with USB, Ethernet, Serial, or E-mailable data files

*applies to dual channel models
Basic Mode offers:
- Pre-configured jobs for single and two plane balancing
- Full calculator mode

Advanced Mode adds:
- Up to 4 planes
- Up to 8 sensor inputs
- Up to 6 different speeds
- Automatic unit conversion
- Automatic weight splitting
- Trial weight estimation

Special Features:
Vector Averaging
- Eliminates background vibration

Balancing Watchdog
- Automatically detects secondary machinery faults

Graphic User Interface
- Provides data stability indicator
- Displays live imbalance vector
- Eliminates confusion about weight placement

Basic Mode offers:
- Auto sweep (includes partial sweep)
- Manual 4 point
- Soft foot detection
- Thermal growth compensation
- Live machine moves
- Jackshaft applications
- Record notes and observations
- Store and recall jobs

Advanced Mode adds:
- QuickSpec alignment checker
- Manual sweep
- Dual pass mode (uncoupled shafts)
- Vertical machine alignment
- C-face alignment
- Straightness measurement
- Enhanced soft foot detection
- Data averaging
- Custom machine configuration
- Custom tolerance values
- Additional live move options
- Upload jobs to software

CSI Laser Heads

Communication:
- Standard via cables
- Cableless measurement
- Optional RF (where permitted)

Special Features:
- Dual built-in inclinometers
- Dual axis position sensors
- On-board signal processing
- Better than 1 µ precision

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Description</th>
<th>Applications</th>
<th>Vib.</th>
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## Part Number Description

### CSI 2130 Packages:
- **A2130A1** 1-channel CSI 2130 with std accessories
- **A21301Q** 1-channel safety-rated CSI 2130 with std accessories
- **A2130A2** 2-channel CSI 2130 with std accessories
- **A21302Q** 2-channel safety-rated CSI 2130 with std accessories
- **A8130Z1** 1-channel vibration only with std. accessories
- **A8130Z2** 2-channel vibration only with std. accessories
- **A8130B1** 1-channel balance only with std. balance accessories
- **A8130EZ-IN** Basic Laser Align Package with 8215 cabled heads
- **A8130EZ** Basic Laser Align Package with 8215 RF heads
- **A813015-IN** Advanced Laser Align Package with 8215 cabled heads
- **A813015-CU** Advanced Laser Align Package with 8215 RF heads
- **A813025-IN** Advanced Laser Align Package with 8225 cabled heads
- **A813025-CU** Advanced Laser Align Package with 8225 RF heads

### Firmware Applications:
- **A2130S0** Route/Analyze/Cascade applications
- **A2130S2** Analyze application
- **A2130S3** Advanced Analyze application
- **A2130S4** Advanced Transient application
- **A2130S5** ODS/Modal application
- **A2130S7** Advanced Balancing application
- **A2130S8** Basic Laser Alignment application
- **A2130S9** Advanced Laser Alignment application

### Standard Accessories:
- **D24642** 2130 Protective rubber jacket
- **A063902** USB communications cable
- **D24899** 2130 hand strap - qty 2
- **D24834** 2130 hand pad - qty 2
- **D24933** Shoulder strap for vibration meters
- **D24892** Hardshell carrying case
- **93140** Power Supply
- **65010** Power Cord
- **91413** Screen protector starter pack - Reorder using P/N 91411

### Vibration Measurement Accessories:
- **A0760GP** Accelerometer
- **A090835** Magnet
- **A6121BL** Cable, 2-pin MIL to BNC, blue, 4’
- **A6121RD** Cable, 2-pin MIL to BNC, red, 4’
- **D24844** Coiled accelerometer cable, 2-pin to Turck, 8’ extended
- **A06280A** Dual-channel accel adapter, 25-pin to 2 BNC

### Balancing Accessory Package:
- **A648** 4-channel multiplexer
- **A0404P1** 1 - 20K RPM Infrared Phototach Kit, including:
  - A040801 - Phototach power supply
  - A403 - Reflective tape (3 rolls)
  - 24862 - Phototach cable

- **D24786** Hard shell suitcase
Standard Laser Accessories include:

- D23465 Mounting posts (4)
- A8211 Super fast smart charging station
- A8AA10 Tape Measure
- A821510 Direct connect cable
- 99451 Screwdriver
- D24492 Hard shell suitcase
- A8AA55 Quick mount brackets & chains (2) - Basic Package only
- B821007 Standard mount brackets (2) - Adv. Package only
- B8210-CHN Standard mount chains (2) - Adv. Package only
- 99510 Hex ball driver - Adv. packages only
- B8100-EXT2 Extension Blocks (2) - Adv. packages only
- A8215C2-PM Pass Mode Cable - RF packages only
- B8000RF RF adapter - RF packages only

Expansion Paks:

- A1730B1 Balance Expansion Pak for 2130
- A8730EZ-IN Basic Laser Expansion Pak - 10x10 mm cabled heads
- A8730EZ Basic Laser Expansion Pak - 10x10 mm RF heads
- A873015-IN Adv. Laser Expansion Pak - 10x10 mm cabled heads
- A873015-CU Adv. Laser Expansion Pak - 10x10 mm RF heads
- A873025-IN Adv. Laser Expansion Pak - 20x20 mm cabled heads
- A873025-CU Adv. Laser Expansion Pak - 20x20 mm RF heads

Phototachs, Strobes, and Speed Sensors

- A0430L3 SpeedVue laser speed sensor package for 2130
- A0404B1 404B IR Phototach for 2130
- A0404P1 404B IR Phototach for 2130 with external power
- A444003 Computerized strobe light package for 2130

Special Vibration Sensors

- A0120LF Low frequency accel, top connect, 2 pin
- A0220HF High frequency accel, top connect, 2 pin
- A0222H1 60 kHz high freq. accel, top connect, stud mount
- A0222H2 60 kHz high freq. accel, top connect, epoxy mount
- A0623SS SST kit for low frequency measurements

Triaxial Accelerometer

- A0643TX Triax accelerometer for CSI 2130
- D24826 Mounting pad for A0643TX
- D25064 Cable for A0643TX

Modally-tuned Impact Hammer

- A034701 1 lb Small Modal Force Hammer
- A034703 3 lb Mini-Sledge Modal Force Hammer
- A034712 12 lb Sledge Modal Force Hammer

Adapters

- A06290V Dual-channel volt adapter, 25-pin to 2 BNC
- A06280A Dual-channel accel adapter (Turck connectors)
- A648 4-channel accelerometer input multiplexer for 2130
## Current Clamps

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<tr>
<td>A341B</td>
<td>Clip-on AC current clamp (1.0 to 600 Amp AC)</td>
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<tr>
<td>A341C</td>
<td>Clip-on AC current clamp (50 mA to 150 Amp AC)</td>
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<td>A341D</td>
<td>Clip-on AC current clamp (0.05 mA to 1000 Amp AC)</td>
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## Cables

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<td>D24859</td>
<td>2130 Volts straight cable, BNC to Turck, 4’ long</td>
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<td>D24861</td>
<td>2130 tach cable, 404B connector to blue Turck, 2 m</td>
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<td>D24862</td>
<td>2130 tach cable, BNC to blue Turck, 4’</td>
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<td>D24863-1</td>
<td>2130 SpeedVue cable, LEMO to Turck, 18” long</td>
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<td>D24863-2</td>
<td>2130 SpeedVue cable, LEMO to Turck, 6 ft. long</td>
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<td>D24973</td>
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<td>D24809-2</td>
<td>SpeedVue cable for 2120A (6 ft. long)</td>
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<td>65116</td>
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<td>Ext. cable for Turck Accel connector, 19’ 8”</td>
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## Battery Pack

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## Other Accessories

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<td>91411</td>
<td>2130 Adhesive Screen Protectors (10 pack)</td>
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<td>D24937</td>
<td>SpeedVue mounting strap for 2130</td>
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<tr>
<td>97017</td>
<td>2130 Printed User Manual</td>
</tr>
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Note: Descriptions are for illustrative purposes only. Packages and part numbers subject to change without notice.