

GE Energy

ADRE[®] System

Bently Nevada[™] Asset Condition Monitoring





The ADRE System – The Professional’s Choice

In 1980, we had a revolutionary idea. What if the methods for collecting machinery and process data on tape and then tediously turning it into plots could be automated? It would mean a dramatic reduction in the time needed to diagnose machinery conditions, allowing engineers to spend less time reducing data and more time interpreting it. We called it the ADRE* System – Automated Diagnostics for Rotating Equipment – and it truly revolutionized the industry.

More than 25 years and five successful product generations later, the ADRE System is globally recognized as the tool of choice for professionals tasked with assessing machinery conditions in the field and on the test stand. It has become the standard against which all others are measured when it comes to on-demand, flexible, field-rugged multi-channel machinery data acquisition.

Today, GE Energy is pleased to introduce our latest generation of the ADRE System. Far more than just incremental improvements to its predecessors, our all-new ADRE System reflects a complete redesign culminating in entirely new hardware and software. The result is everything you’ve come to expect from the world’s premier data acquisition system while exponentially boosting its power and performance.

Flexible

The ADRE System is designed to handle a broader range of data acquisition tasks than ever before. Whether you are collecting data from control valves to understand process dynamics, studying the electromagnetic behavior of locomotive motors on a test stand, or collecting start-up data on the rotor dynamics of a recently overhauled steam turbine, the flexibility of the ADRE System makes it a perfect fit. Whatever your parameter of interest, if it is available as an electrical signal, the ADRE System can handle it, allowing it to be used for more applications and in more industries than ever before. And, unlike many generic data acquisition systems that – although feature-rich – are difficult to configure and use, you won’t spend hours configuring the ADRE System. You can go from “out of the box” to “collecting data” in as little as ten minutes.

It’s All About the User

For a quarter century, customers just like you have been continually helping us refine the ADRE System to be everything it needs to be. In fact, it’s the tool used by our own machinery diagnostics field engineers around the world – “power users” who rely on ADRE Systems every day to do their job. It’s also the tool used by the field engineers of many leading machinery manufacturers and consultants around the world. It’s found in plants, research labs, test stands, and academic institutions. But no matter where ADRE Systems are found, its users have this in common: they insist upon the very best capabilities and the very best value. In the ADRE System, they’ve found it.

Applications

Continuous and Discrete Processing Industries	<ul style="list-style-type: none"> • Pulp & Paper • Cement • Food & Pharmaceutical • Water/Wastewater • Mining • Machine Tools
Transportation	<ul style="list-style-type: none"> • Aerospace • Automotive
Consulting	<ul style="list-style-type: none"> • Rotor Dynamics • Bearing Design • Predictive Maintenance • Machinery Diagnostics
Power Generation	<ul style="list-style-type: none"> • Fossil Fuel • Hydro • Wind • Nuclear • Geothermal
Oil & Gas	<ul style="list-style-type: none"> • Refining • Offshore Platforms • Pipelines • LNG • Chemical/Petrochemical Processing
Original Equipment Manufacturers & Repair Facilities	<ul style="list-style-type: none"> • Test Stands • Research & Development • Balancing Stands • Field Engineering • Start-up Assistance • Remote and On-Site Troubleshooting

An Instrument and An Analyzer

The ADRE System's design philosophy was to provide fully parallel, real-time signal processing of not just every channel, but every configured parameter as well. Unlike devices that rely extensively on recording raw data and then post-processing that data for the parameters of interest, the ADRE System is different. It works as a real-time instrument allowing you to stream not just raw data, but processed data *so you can see changes as they happen – not after the fact.* With the ADRE System, you don't sacrifice post-processing flexibility either. It delivers both. Data can be manipulated and processed in many different ways, as needed.

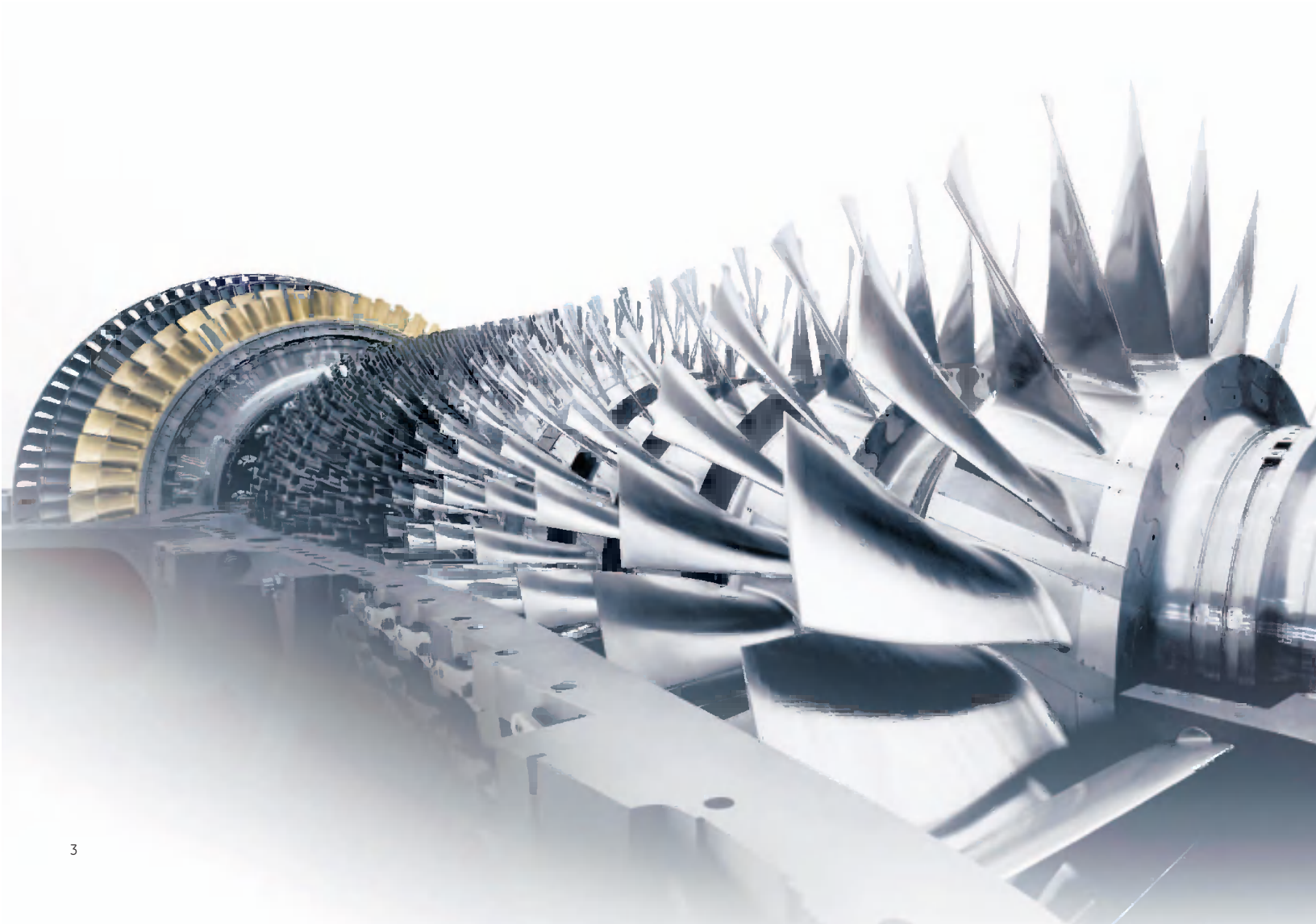
One Device Does It All

With the ADRE System, gone are the days of lugging separate instruments – oscilloscope, spectrum analyzer, analog or digital tape recorder, vector filters, signal conditioners, and amp racks. Skeptical? Don't be. Dramatic advances in digital signal processing make it possible to truly capture all the data, just as if you were armed with analog tape. No more carrying reels, cassettes, and recorders "just in case." No more compromises between data resolution and storage capacity. The ADRE System truly liberates you to the freedom of a *single instrument that's easy to use and easy to transport – without sacrificing any of the data.*

Enhancing Your Productivity

Your value is in interpreting data. The less time spent gathering and reducing that data, the more time you have to solve problems and deliver information. We understand. Everything about the ADRE System has been designed with this in mind, *allowing you to get the data – all the data – quickly, easily, and even remotely when required.*

- **Collaborate Easily**
Simultaneous data sharing via client/server architecture
- **Reduce Travel**
Full remote operation via LAN/WAN – even through corporate firewalls
- **Save Time**
"Out of the box" to data acquisition in minutes
- **Lighten Your Load**
Everything you need is in one, easy-to-carry, integrated instrument



ADRE 408 DSPi Hardware

Convenient User Interface

A menu-drive front panel user interface allows you to operate the instrument using pre-configured settings without connecting to a computer – particularly useful for field jobs where connection to a laptop is inconvenient, impractical, or impossible.

True Client/Server Architecture

Multiple ADRE Sxp software clients can access a single 408 simultaneously, or connect to multiple 408s operating independently. Each client has completely independent access to data, just as with any true server.

Versatile Packaging

The 408 DSPi is equally at home machine-side or in the lab via its standard carrying handles or 19-inch EIA rack-mount options.

WAN/LAN Enabled

Specially engineered to work across corporate firewalls and networks, allowing you to Move Data, Not People' easily between a 408 server and multiple ADRE Sxp software clients located anywhere on the globe.

Dynamic Input Cards

Each card accepts up to 8-channels of dynamic waveform inputs and/or static inputs. Up to 32 inputs per 408 DSPi.

Modular

Each 408 DSPi chassis has 4 slots for signal input cards, allowing you to mix 3-channel phase/speed input cards and 8-channel dynamic input cards for the specific channel counts and types needed for each application. Populate your 408 with only what you need.

Convenient Certification

Individual signal input cards can be returned to us for factory metrology certification, without the need to return the entire 408 DSPi unit, allowing you to keep working with reduced channel capacity or – if you have spare input cards – full capacity.

Flexible Speed/Phase Inputs

The 408 accepts conventional proximity probe, magnetic pickup, and optical sensors for phase and speed measurements. It even provides the necessary power. Also, with the 408's advanced on-board signal conditioning, there's no longer a need for bulky external devices to multiply/divide or condition signals.



Large Internal Storage Capacity

An on-board 130 GB hard drive captures days – even weeks – of high-resolution data. When even larger capacity is needed, a convenient port is provided for connection to off-the-shelf external hard disk arrays.

Integrated Display

The 408's vacuum fluorescent display is bright, easy to see, and features a wide viewing angle, making it visible under varied lighting conditions.

Stand-Alone Operation

Record all data in "stand-alone" mode without the need for an externally connected computer, making it far easier to leave system machine-side for hours, days or weeks while it captures data, limited only by available storage capacity. Ideal for temporary real-time surveillance of problem machines.

Scalable†

Up to four 408 DSPi instruments can be interconnected in master/slave configuration, providing as many as 6 phase reference and 120 dynamic/static inputs.

†Connecting up to four 408 DSPi instruments will be supported after first release. All required hardware is currently in place.

Industry-Standard Connectors

Robust, convenient SMA connectors are used for all signal inputs, providing compatibility with cabling used in the majority of today's test and measurement devices.

Differential Inputs

Channel pairs can be easily configured for true differential measurements.

Keyphasor* Inputs

Up to two Keyphasor cards can be introduced to one (or an array) of 408 DSPi instrument(s). Each Keyphasor card accepts as many as three inputs, for a total of six phase reference signals. Up to six simulated Keyphasor signals can also be provided in addition to six physical signals.

Discrete Trigger Inputs

External contact closures, such as from an alarm, machine start, process condition, or other parameter can be used to automatically initiate data acquisition or change from one acquisition mode to another. Two inputs are provided, each independently configurable.



Move Data, Not People

No matter where your ADRE 408 DSPi instruments are located, you have complete and secure access to their data and complete control over their operation. That's because the 408 DSPi is a true server, allowing multiple ADRE Sxp software clients to connect simultaneously, each viewing different data - whether real-time or archived. The result is virtually unlimited flexibility in where and how you can connect your ADRE hardware and software.



● A 408 DSPi is placed on an offshore platform in the Gulf of Mexico to collect data on a machine with intermittent problems. The instrument communicates over a network in the platform's control room, gathering data completely unattended for several months while being viewed securely at the company's headquarters in Mexico via their corporate WAN. Partway through the investigation, the team at headquarters suspects that the problems may be process-induced and remotely re-configures the 408 DSPi to trigger high-resolution data capture when certain process conditions occur.

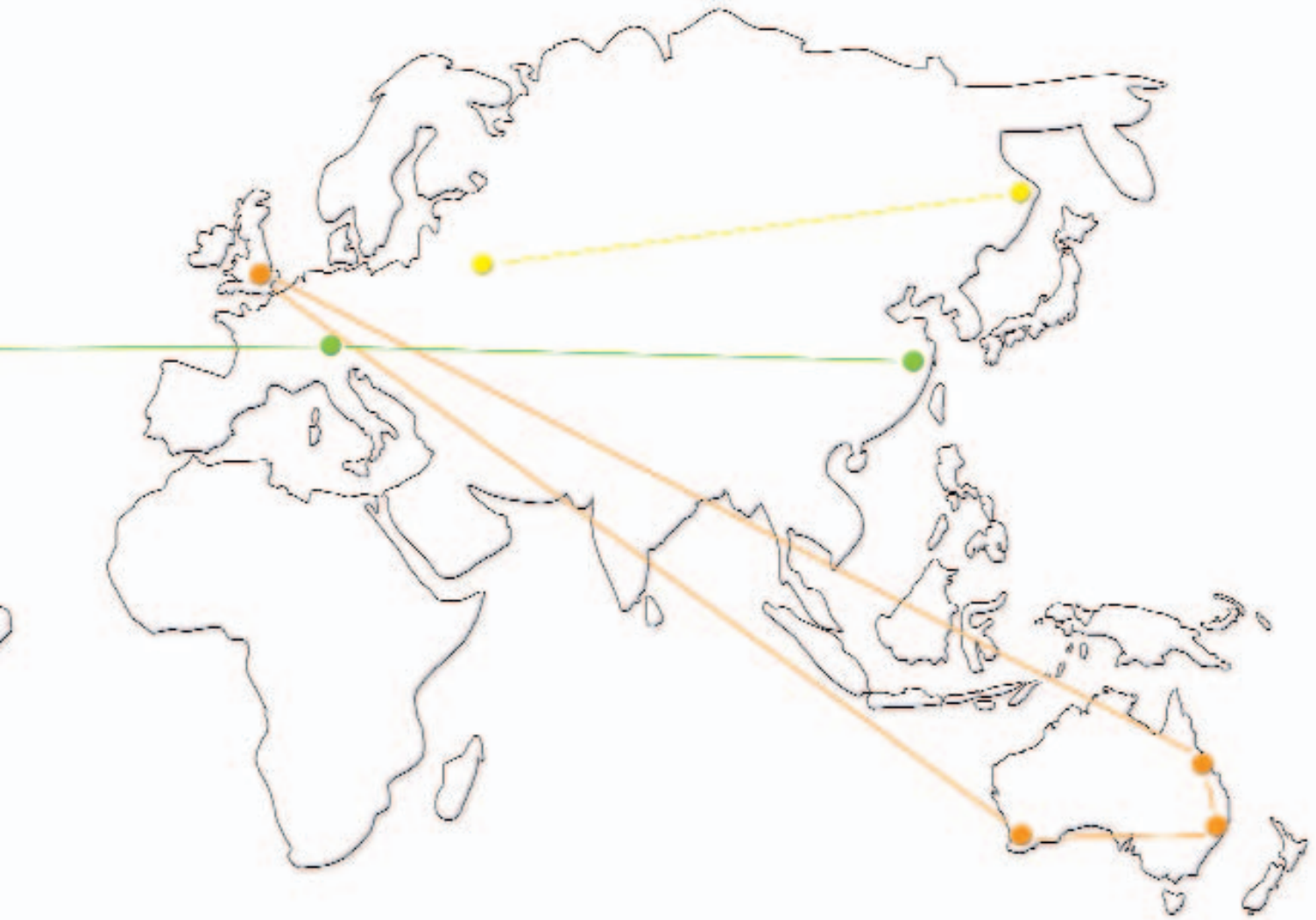


● A large hydro unit in Colombia needs to be balanced. Plant personnel connect a 408 DSPi to the machine's transducers and a Bently Nevada machinery diagnostics engineer connects remotely via secure VPN to remotely configure the instrument. The machine OEM in North America views the collected data, uses Bently BALANCE* software to compute an optimal balance solution, and provides recommended balance weights and locations back to the customer site. The OEM and the Bently Nevada machinery diagnostics engineer collaborate in real-time to verify the data and the recommended balance shots.



● A jet engine manufacturer runs a prototype design for the first time. Employees at the test stand location observe data related to engine efficiency. Military personnel in the South U.S. witness the test remotely. Simultaneously, design engineers at the OEM's west coast office study blade dynamics and ask test stand technicians to prolong the test duration while they remotely adjust tracking filter settings.

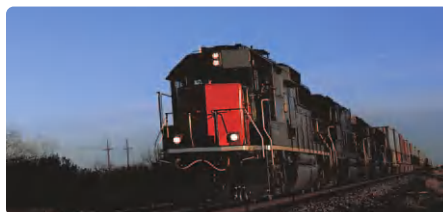
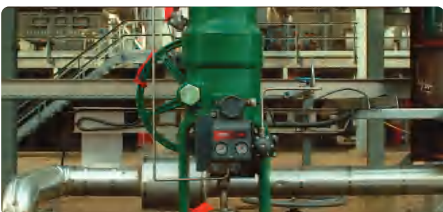




● A customer in China troubleshoots unwanted process dynamics thought to be related to poorly tuned loops and excessive valve stroking. The valve manufacturer in Europe observes real time test data by connecting to the customer's network using the world wide web and VPN technology. Simultaneously, the customer's process control specialist at a US location connects via the corporate WAN, examining dynamic flow and pressure data, collaborating with the valve manufacturer and site personnel.

● A locomotive manufacturer conducts studies of problems in an engine's electric drive units for a customer in eastern Russia. A 408 is carried on-board the engine as it travels, using the railway's WAN infrastructure to provide real time data to the OEM's field office in Moscow where engineers diagnose the problem.

● Engineering specialists at a central office support colleagues at two remote plant sites, collaborating in real-time to assist with reviewing start-up data after planned outages on large steam turbine generators. An additional specialist from the company's UK headquarters is consulted to share data from a similar machine that has been archived. The parties collaborate in real-time, each connecting to the same ADRE hardware from four distinct locations.

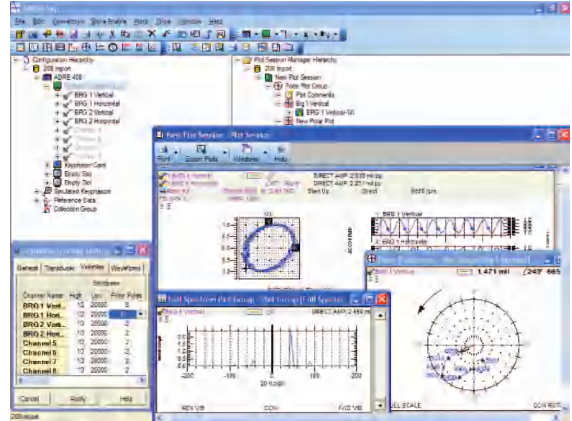


ADRE Sxp Software

Totally Powerful

ADRE Sxp software gets the job done by providing the extensive plot, import/export, and analysis tools you need. ADRE Sxp software is industrial strength, built by people who solve machinery problems every day in settings ranging from the lab to the test stand to the turbine deck.

And it's not just data analysis and reduction tools that make ADRE software powerful. It's the extensive attention to detail in its configuration environment, allowing you to spend less time setting up, and more time solving problems. Fast, intuitive, flexible, powerful. That's ADRE Sxp Software.



Totally Functional

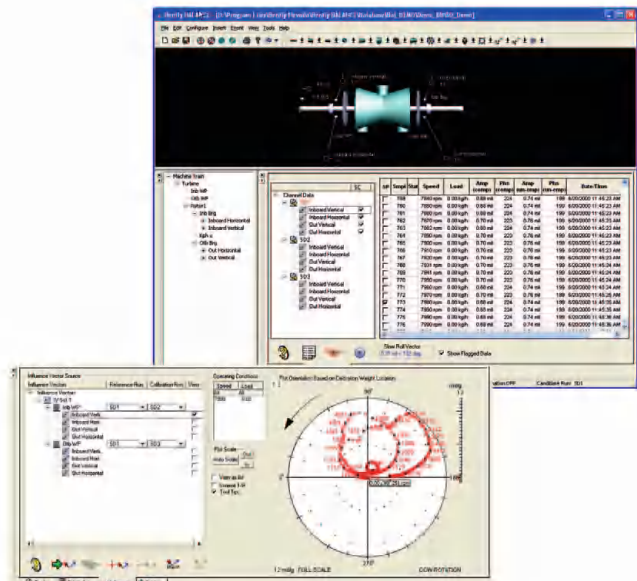
Supported Plot Types	<ul style="list-style-type: none"> • Current Values • Orbit† • Bode • Trend • Cascade/Full Cascade 	<ul style="list-style-type: none"> • Tabular List • Timebase† • X versus Y • Multi-variable Trend • System Event List 	<ul style="list-style-type: none"> • Orbit/Timebase† • Polar • Spectrum/Full Spectrum† • Waterfall/Full Waterfall • Shaft Average Centerline
Graphical display of plots	Virtually Unlimited		
Graphics export	jpg, .bmp, .wmf, .gif (by plot, page, or group)		
Data export	Comma Separated Variable (CSV)		
Client display unit preference	Per-client Simultaneously		
Balancing Software	Bently BALANCE		
View Data From Multiple Runs Simultaneously	Yes – Virtually Unlimited		
Keyphasor Dynamic Display	Per Keyphasor		
LAN/WAN support	Yes; specially designed for firewall management		
Supported Operating Systems	Microsoft® Windows® XP††		
Remote 408 DSPi Operation via LAN/WAN	Yes		

† With option for superposition of baseline data.

†† ADRE Sxp software can be installed on Microsoft Windows 2000. Please contact Technical Support at +1-775-215-1818 for details.

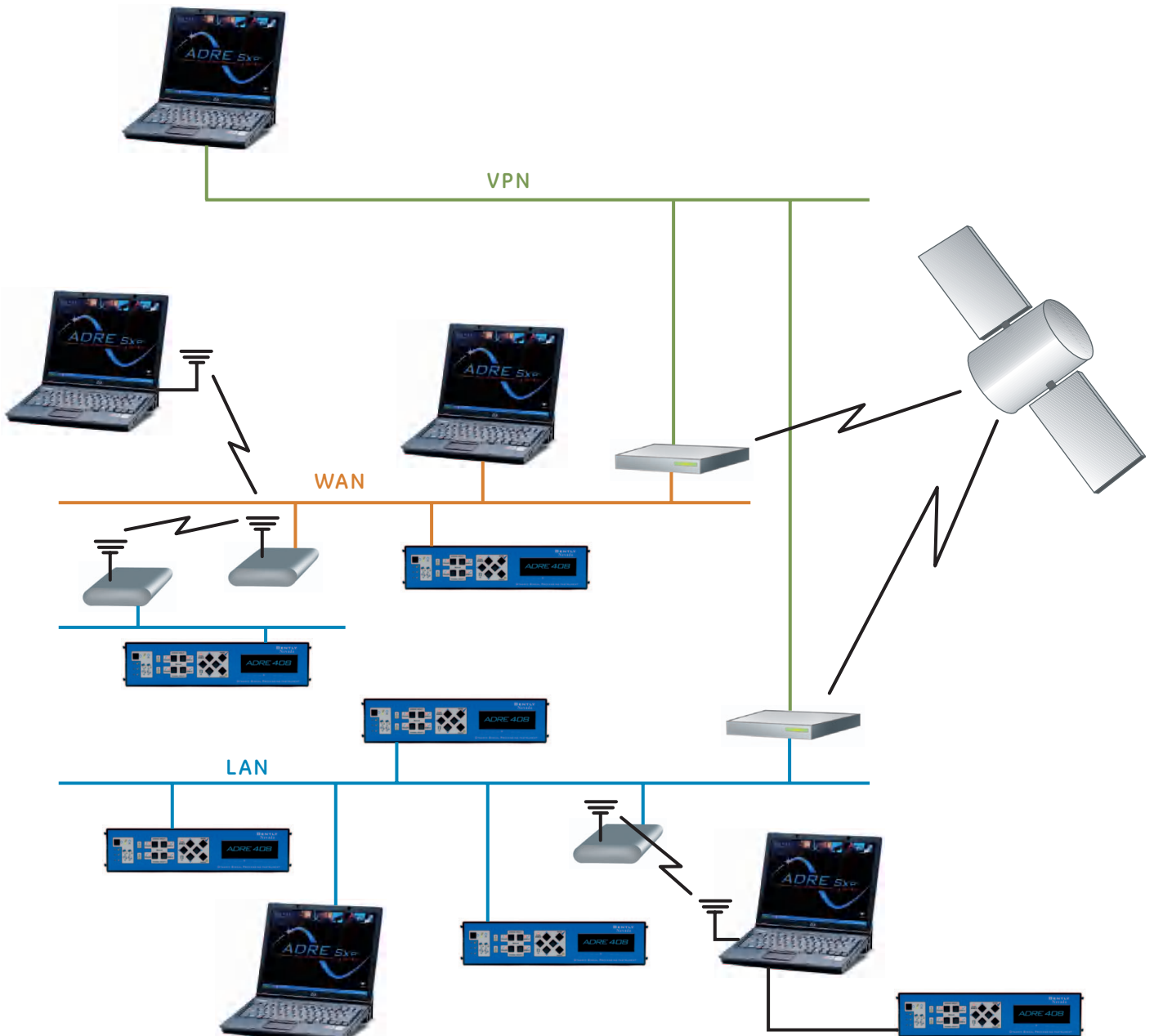
Totally Balanced

ADRE Sxp software is fully compatible with Bently BALANCE*, the industry's most powerful multi-plane balancing software. Specifically designed for your most complex balancing tasks, Bently BALANCE software addresses even the most difficult balancing scenarios, such as finding optimal solutions for multiple speeds and loads – or when the number of measurement planes does not equal the number of balance planes. Data such as 1X vectors, speed, and transducer locations/orientations can easily be downloaded from your ADRE Sxp software to Bently BALANCE, eliminating the tedious, error-prone practice of manually typing data.



Totally Networked

We're connected. You see, the ADRE System was designed with corporate networking in mind, making life easy for both you and your IT department. With integrated 10/100/1000 Mb TCP/IP Ethernet communications, each 408 DSPi can be connected to your LAN or WAN using a variety of topologies and media. We've specifically engineered the client/server architecture of the ADRE System to work within and through the firewalls and other IT infrastructures common in today's enterprises. The result is secure, trouble-free access to your ADRE System whether you're simply connecting via your LAN across the office, or connecting using technologies such as Virtual Private Networking (VPN) from remote locations.





Support

It's not just product quality that has made GE Energy's portfolio of Bently Nevada* Asset Condition Monitoring solutions the world's number one choice for nearly half a century, it's service quality as well. With factory-direct, factory-trained field salespeople, field engineers, and field technicians at more than 100 offices in the principal industrial centers of 40+ countries, we're always there when you need us – in your time zone, speaking your language. Whether it's training, product repair, technical questions, or accessories, you can count us for the support you need, when you need it.

And the Bently Nevada name means far more than just expertise in condition monitoring instruments. It also means machinery diagnostic expertise. With more than 70 highly skilled machinery diagnostic engineers globally, we have gathered and interpreted data for our customers for more than three decades in thousands of jobs spanning many machine types, processes, and industries. Our tool of choice for on-demand data acquisition? The ADRE System. You can confidently draw on the expertise of this team to assist you in acquiring and understanding your own data.

Training

Whether you need product-specific training to get the most from your ADRE hardware and software, fundamentals of data acquisition, or an in-depth foundation for performing machinery diagnostics, and rotor dynamics, GE Energy offers a comprehensive selection of training classes to meet your needs.

Training can be conducted at your location or one of 15 specially-equipped training centers at convenient global locations serving every continent. We are deeply committed to training that focuses on hands-on learning with small student-to-instructor ratios, allowing personalized attention. In addition to standard course offerings, we can also tailor curriculum to address your specific requirements, ensuring that you receive instruction matched to your skill levels, industry, and goals.

You'll find an up-to-date listing of courses in our informative catalog, available by contacting your nearest salesperson or at www.bently.com/service/training/tindex.htm.



Specifications

Physical	
Weight @ 32 channels	7.5 kg (16.5 lbs) per 408 DPSi Unit (32 channels w/power supply)
Environmental	0° to 50° C; 0 to 95% relative humidity (non-condensing)
Mounting	Benchtop or optional 19" EIA rack mounting kit
Channel Status LEDs	Per channel: Over-range, NOT OK
Power Requirements	110 to 240V 50-60 hz
Inputs	
Number of Dynamic Channels	8/16/24/32 per chassis – expandable to 128 (4 chassis linked together [†])
Throughput Rate	Up to 50 MB/sec per channel
Transducer Inputs	Displacement/Velocity/Acceleration/Phase Reference/Speed
Differential Inputs	Selectable: True differential or single-ended
Process Inputs	Programmable: +4 to +20 mA; 0 to +10 Vdc; -12 to +12 Vdc; -25 to +25 Vdc
Voltage Input Range	Programmable lower and upper values from -25 Vdc to +25 Vdc
Gain Selections	Auto Gain between -25 Vdc and +25 Vdc
Input Impedance	> 700 k Ω
Signal to Noise Ratio (Dynamic Range)	110dB
Frequency Span (All Channels)	Up to 50 kHz – All Channels Simultaneously
Speed Range	1 – 120k RPM
Speed/Trigger Input Sources	Proximity probes, optical sensors, magnetic pickups
Speed Input Capacity	3/6 physical, 6 simulated (internal)
Trigger Sources	Multiple "OR" voting of Speed/Time/Amplitude/External Contacts
Keyphasor Multiplier/Divider/Conditioner/Power	Integrated (per speed input)
AC/DC coupling	Yes; Configurable per channel
Channel Bandwidth	Up to 50 kHz (simultaneous, all channels)
Software	
Required Software	ADRE Sxp, real-time and post-processing
View Data From Multiple Runs Simultaneously	Yes – Unlimited
Keyphasor Dynamic Display	Per Keyphasor
Instrument Mode Display Update	100 ms/sample (max)
Communications	Integrated 10/100/1000 Mb Ethernet TCP/IP
LAN/WAN Support	Yes; specially designed for firewall management
Remote Operation via LAN/WAN	Yes
Security	Administrative/Read Only/No Access
Signal Conditioning	
A to D Resolution	24 bit
Filtering	High-/Low-Pass: selectable; Bandpass: 2-, 4-, 6-, 8-pole selectable
Tracking Filters	Realtime; up to 6 nX per channel
Tracking Filter Bandwidth	Configurable: 1.2/12/120 CPM; constant bandwidth auto-switching
Auto Switching Tracking Filters	Selectable
Sub-Synchronous nX Tracking	Configurable: 0.1 to nX (in .01X increments)
nX Vectors	Configurable – up to four different vectors
Sampling	<ul style="list-style-type: none"> • Simultaneous Processed and Raw Data (All Channels) • Multiple Simultaneous Sampling Rates (Synch and Asynch) • Delta Sampling for RPM, Time, or Amplitude^{††} • Synchronous Sampling configurable for 2 Rates Per Channel • Continuous and Discrete (configurable) • Realtime simultaneous synchronous and asynchronous
Synchronous Sampling Rates	16/32/64/128/256/360/512/720/1024 samples per revolution
Anti-Aliasing	FIR Filter (passband @ 50 kHz, – 100 dB @ 64 kHz)
Waveforms	4 per channel simultaneously (user-configurable) + Raw
Spectral Resolution	Configurable – up to 6400 lines (all channels simultaneously)
True Zoom Capabilities	Yes
Recording	
Data Storage Capacity	Internal: up to 130 GB; External: unlimited via external drive arrays
Pre- and Post-Event Data Capture	Yes; configuration dependant
Vector-to-Waveform Storage Ratio	n:1 configurable
Continuous Digital Recording	Yes; internal
Outputs	
Speed/Trigger Outputs	3/6 Digital and Analog Conditioned

[†] Multi-chassis interconnection not available until after first release. All required hardware is currently in place.

^{††} Delta amplitude sampling not available at initial release.

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Learn more about ADRE online at:
www.gepower.com/o&c/ADRE

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