

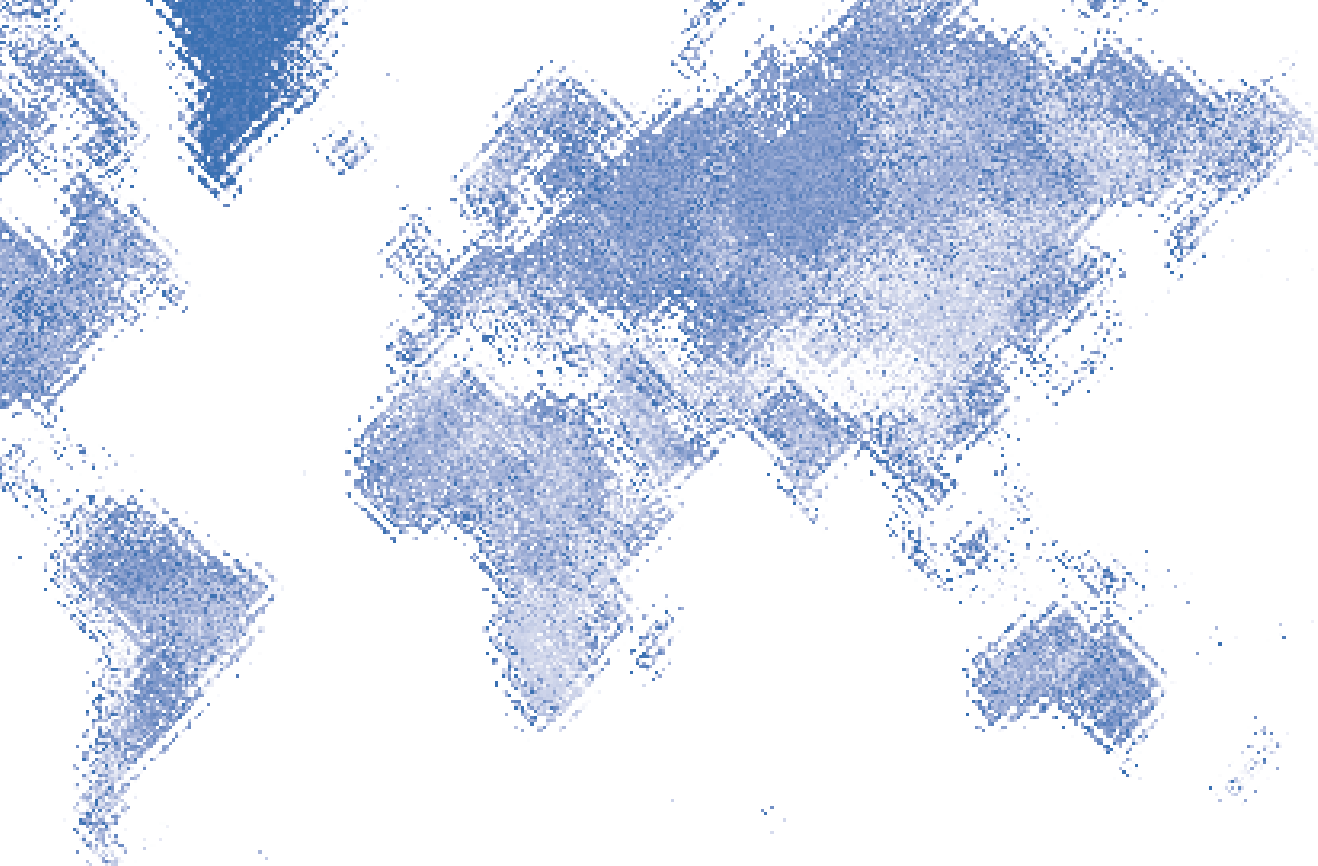
# Rhythm

Unique Multi-Modality Software Platform



GE imagination at work

A global leader in  
technology-driven  
inspection solutions  
that deliver productivity,  
quality and safety to  
our customers



## Industry Focus with Broad Experience

No matter what your inspection or testing challenge is, we can help.

At GE Inspection Technologies, we are proud to continue the long legacy of leadership and innovation that we inherit as a member of the GE family of companies. Founded by Thomas Edison in 1878 as the Edison Electric Co., GE is known around the world for its excellence, innovation and imagination. Its rich heritage includes the development of non-destructive testing (NDT) and inspection technologies.

Our focus at GE Inspection Technologies covers a broad range of industries and applications. So, whether it's simple or highly complex, we are the world's proven, reliable resource for NDT. We are setting best practices today and are constantly exploring the next generation of NDT solutions, all in an effort to keep our customers at the front edge of quality, safety and inspection productivity.

# Rhythm

## Matching the Beat of the Digital Age



Today, there are no areas of industry and commerce which remain untouched by the digital evolution. This is especially true of the NDT field, where developments in automated Ultrasonics, Remote Visual Inspection and Radiography have been made possible only by significant advances in digital technology. These have allowed advances in the ways that inspection data is shared, analyzed, reported and stored.

To date, collection, display and processing of digital data has been carried out by a wide range of proprietary systems, using various, often also proprietary, protocols. This has meant that information sharing between different systems has not been possible, which, in turn, has led users to worry about the longevity and integrity of their collected data.

With the introduction of the Rhythm software platform, the enormous benefits offered by the digital evolution can now be realized in full.

Rhythm uses off-the shelf hardware an industry standard data communication protocol to ensure that inspection data can now be acquired, reported, analyzed, stored and shared, on a stable platform of scalable architecture, which will allow users to assimilate future NDT software capabilities with no danger of the information becoming obsolete.

### DICONDE – The Language of Rhythm

All data displayed by all the modalities of NDT is displayed essentially in terms of images, be this a radiograph in Radiography, a C-scan in Ultrasonics (Ultrasonic or a visual snap shot in Remote Visual Inspection). DICONDE (Digital Imaging and Communication in NDE) is the accepted standard that provides a way for manufacturers and users of NDT equipment to share image data and the associated ASTM Standard for Radiography and Ultrasonic was created in 2004. It is a non-proprietary format, developed from the well-proven DICOM system used throughout the medical sector, but incorporating many features which are purely NDE-focused. Essentially, it is a dictionary that describes all the necessary syntax, attributes and data elements to allow users to acquire, store, archive, transmit and receive image data in a way that is universally compatible. It is a system that allows images to be saved with context, in that all the technique information and information on location, date and time and inspector is saved with the image. Such information can then be included in any report generated, while its inclusion with the image into databases means that queries can be carried out on a variety of criteria.





## Rhythm A Total and Flexible Software Solution

The Rhythm suite of user-friendly software allows a total and flexible solution to the gathering, reporting, management, analysis and archiving of NDT imaging data. It is modular and allows users to build Rhythm solutions to meet their specific needs.

### The modules of Rhythm

#### Rhythm Acquire

Rhythm Acquire acquires digital images and image data, creating a DICONDE file. The DICONDE file can then be sent to Rhythm Review for expert review and analysis or Rhythm Archive for storing and global NDT data management.

#### Rhythm Report

Rhythm Report offers automated and rapid standardized reporting capability, incorporating DICONDE-tagged images and their contextual information. This information can be technique specifications for Radiography, location description for Visual and scan plan details for Ultrasonic.

#### Rhythm Review

To increase the functionality, Rhythm Review can be added. This accepts acquired pixel data from the Rhythm Acquire module as well as data from other relevant sources such as other, networked Review workstations and removable CD or DVD media. It features application tools for image analysis, enhancement and measurement. Its connectivity allows remote expert review and analysis, as information can be shared between networked Review workstations and there is no limit to file size. The Rhythm

Review module also provides some data storage capacity, on the hardware hard disc or on near-line CD.

#### Rhythm Archive

For users who generate large volumes of inspection data, which needs to be safely stored over long periods, Rhythm Archive offers the perfect solution. This can accept upwards of 300 million images from any number of LAN-connected remote Rhythm workstations and stores these using various compression techniques to save storage space without sacrificing image quality. It can interface with a wide range of cutting-edge, long term data storage solutions. The extremely robust software features built-in disaster-recovery plans and user IP addresses for data security.

#### Saving Time and Improving Quality with Rhythm Archive

The Rhythm solution changes the world of inspection data management – and allows even better asset management.

Pre-inspection planning is faster and more focused, as inspection history can be rapidly reviewed so that meaningful and effective plans are developed and previously identified high risk, areas can be targeted.

Faster and more accurate identification of quality issues means that post-inspection analysis is more efficient, as there is rapid access to all previous, consistently reported inspection data and expert review is carried out on “in context” results.

Even “ad hoc” checks are more efficient and effective.

## Working with Rhythm ...



# ... in Radiography

## Rhythm Radiography

Rhythm Radiography can acquire image data from computed radiography sources, digital radiography sources or from film digitizers. This data can be displayed on the monitor of a standard PC.

### Rhythm Reporting for Radiography

Rhythm Reporting for Radiography offers standardized reporting capability in easy-to-understand formats, with DICONDE-tagged images. Information is presented in a form that is easy to understand, allowing fast historical comparison and meaningful comparison of reports from different inspectors. Reporting is quick and easy, which can provide inspection time savings of up to 70%.

The tagging of inspection images ensures that they correlate precisely to specific assets and also allows ease of any subsequent data base searching.

CAD drawings can also be imported to assist in inspection site identification and to aid image interpretation.

### Rhythm Review for Radiography

Rhythm Review can be connected to a Rhythm Radiography module or networked to a number of modules to achieve in-depth data analysis and data management.

Data analysis is provided by a wide range of application tools, designed to increase inspection efficiency. These include:

- A wall thickness measurement tool offers two methods of accurately establishing wall thickness. By using a computed tomographic simulation to calculate the position of the inner and outer edge of the pipe. A highly accurate, proprietary algorithm eliminate guesswork and inconsistency between operators.

Or by using penetrating radiation, where an intensity reference, such as a local reference body or the nominal thickness of the double pipe wall, is taken in the image.

- A defect and material loss tool. Allows users to measure material loss in the radiographic beam direction. This is similar to wall thickness penetration measurement but shows material loss instead.
- An area measurement and calculation tool. This allows users to select an area around a porosity indication and automatically calculate the loss of material or the two-dimensional size of the defect.
- A reference radiograph comparison tool. This allows comparison with reference radiographs, such as ASTM radiographs for A1 castings. The radiographs are loaded side by side and the images can be locked together at the same display level, so that all image enhancements are synchronized to both displays.

Rhythm Review also allows image data to be shared between networked Review workstations, so that inspection data can be sent to remote, quality control locations for expert assessment. Unlike many internet-based solutions, there is no limit to the file size which can be transmitted over a network.

Data management is an important feature of the Rhythm Review module.

The software provides on-line storage, on its hardware hard disc, and near-line storage, by easily accessible hard disc or removable media.

# Working with Rhythm ...

## ... in Remote Visual Inspection

### Rhythm Visual

Rhythm Visual can acquire image data from rigid and flexible borescopes, pan, tilt and zoom (PTZ) cameras and other digital cameras.



user formats. Typical data can include details of inspector, inspection location, item being inspected and the relevant date and time. Additional notes can also be incorporated.

Reports generated by Rhythm Reporting can also incorporate the stereo, shadow and comparison measurements taken at the borescope or camera. Consequently, reports can be used for historical review and to assist in condition-based maintenance programs.

### Rhythm Review for Visual

Rhythm Review can be connected to a Rhythm Visual module or networked to a number of modules to achieve in-depth data analysis and data management.

Rhythm Review allows efficient data management of any individual RVI examination or series of examinations. As with all Rhythm Review modules, it provides on-line storage, on its hardware hard disc, and near-line storage, by easily accessible hard disc or removable media.

### Rhythm Reporting for Visual

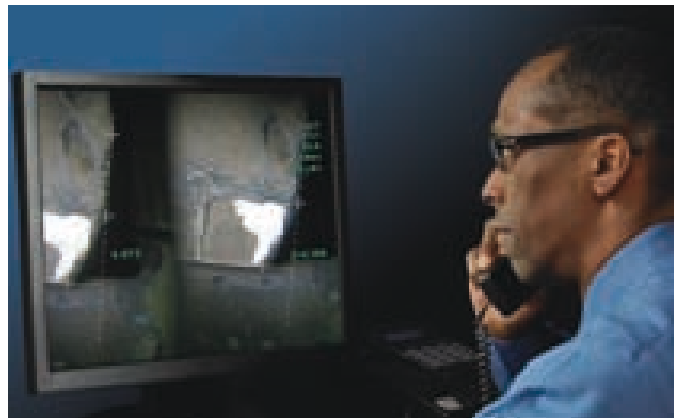
Rhythm Reporting for Visual generates on-site, standardized reports with DICONDE-tagged images.

It makes reporting easier and images can be specifically correlated with particular assets or components being inspected.

Reports can incorporate measurements, so that RVI can be used as a quantitative tool and not merely as a qualitative technique.

Images such as CAD drawings and original equipment photographs can be imported to assist in inspection decision making.

Rhythm Visual is easy to operate and is menu-driven. The image and associated data are first entered into a set menu, which can be customized to suit specific



# ... in Ultrasonic Inspection

## Rhythm Ultrasonic



Rhythm Ultrasonic is currently under development and will be able to acquire image data from standard flaw detectors, corrosion mappers, multiplexed systems and phased array equipment.

As ultrasonic imagery has progressed from the simple A-scan, to the ubiquitous C-scan and, finally, to the complex sector scan offered by phased array technology, it has become increasingly important that ultrasonic images should be able to be captured, processed and managed, effectively, efficiently and reliably.

Rhythm Ultrasonic will be able to interface with automated ultrasonic systems and will make more intelligent.

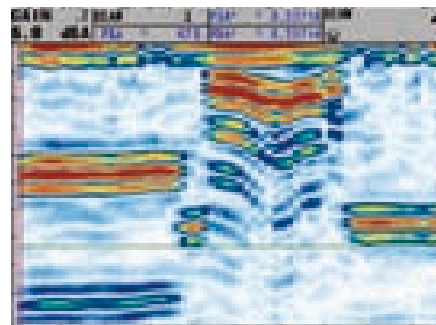
### Rhythm Reporting for Ultrasonic

Rhythm Reporting for Ultrasonic will generate on-site, standardized reports with DICONDE-tagged images and can include information such as details of scan plans.

### Rhythm Review for Ultrasonic

By adding a Rhythm Review module to Rhythm Ultrasonic, users will be able to enjoy the full benefits of the digitization of Ultrasonic techniques. Images can be manipulated on- and off-line and analysis carried out using powerful application specific tools. These will include measurement tools and data processing tools, as well as tools which can effect some control over the specific ultrasonic technique being applied.

The data management features of Rhythm Review are also important in ultrasonic inspection. The ability to store ultrasonic imagery on local hard disc or on CD/DVD and the option of sharing data over a Review network with interested parties is important in ensuring both correct and qualified sentencing and traceability of inspection results.



Laminar defects in metallic or composite materials are easily viewed in the Phased-Array mode.

# Getting to Grips with Rhythm ...



# ... Storing Large Volumes of Data, with Easy Access

## Rhythm Archive

Rhythm Archive is a comprehensive solution to the management and archiving of large volumes of inspection information. It is robust, secure and flexible. It features quick and easy input and retrieval of information, as its simple DICONDE-based tagging system eliminates the need for the complex image file naming conventions often associated with high volume, information storage.

Rhythm Archive accepts images from any number of LAN-connected, remote Rhythm Review workstations and stores these using various compression techniques to save storage space without sacrificing image quality. Furthermore, Rhythm Archive not only stores the raw inspection data but also any enhanced images developed at a Rhythm Review workstation.

Rhythm Archive can be integrated with cutting-edge, long-term storage solutions, such as those from Plasmon, IBM, HP and EMC. Some of these use UDO (Ultra-Density Optical Discs) to guarantee more than 50 years of data availability.

As the software is totally DICONDE-based, you can be assured that your inspection data will never become obsolete or inaccessible because of changes in image transfer protocols. DICONDE is the non-proprietary, universal standard and its first version was released by ASTM International in 2004.

### Productivity Benefits of Rhythm Archive

Rhythm Archive also offers significant inspection productivity benefits.

- It allows more efficient data searching, as all information from all Rhythm Review workstations in the network is available at one central repository.

- It can control image information workflow so that data can be routed to other Rhythm Review workstations for further analysis.
- It can afford productivity improvements by as much as 50%, as pre-inspection plans can now be formulated more efficiently by taking actual inspection history into account.
- A similar order of productivity improvement can also be achieved in post-inspection, as only relevant inspection data needs to be sent for further analysis.



### Realizing the Potential of a Total Data Management Software Platform

Rhythm Archive is much more than a data storage and management system. When used with the other modules in the Rhythm suite, it can provide a powerful tool to help you increase the efficiency of your inspection regimes, to share inspection data and to improve the management of in-service assets.



## Regional Contact Information

### **GE Inspection Technologies**

50 Industrial Park Road  
Lewistown, PA 17044  
USA  
+1 717 242 0327

### **GE Inspection Technologies**

Robert Bosch Strasse 3  
50354 Huerth  
Germany  
+49 2233 6010

### **GE Inspection Technologies**

5F, Hongcao Building  
421 Hongcao Road  
Shanghai 200233  
China  
+86 800 820 1876 (China toll free)  
+86 21 3414 4620 (ext. 6029)



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