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GE  
Sensing & Inspection Technologies

# Apollo™

Multi-Channel/Multi-Frequency  
Eddy Current System



## Elevating Productivity

Decrease inspection turn-around-time and increase productivity with Apollo™—GE Sensing & Inspection Technologies' multi-channel/multi-frequency eddy current testing system.



# Technical Specifications

| Power                 |  |  |
|-----------------------|--|--|
| Voltage               | 100 to 240 VAC   |  |
| Frequency             | 50 to 60 Hz Self Switching   |  |
| Size and Weight       |  |  |
| Size                  | 300 mm W x 290 mm H x 249 mm D<br>(11.8 in W x 11.4 in H x 9.8 in D) |  |
| Weight                | 8.7 kg (19.2 lb)   |  |
| Operating Environment |  |  |
| Operating Temperature | 5°C to 40°C (41°F to 104°F)  |  |
| Storage Temperature   | -20°C to 70°C (-4°F to 158°F)  |  |
| Relative Humidity     | 90%, no condensation   |  |
| Computer Interface    |  |  |
| Ethernet Speed        | 10/100Mbps   |  |
| Encoders              |  |  |
| Numbers               | 6 outputs (A,B,C)  |  |
| Level                 | LVTTL  |  |
| Type                  | Incremental with A & B signals                                       |  |
| Digital Inputs        | Number   | 8  |
|                       | Level  | LVTTL                                      |
|                       | Modes  | Input Bit, Enable ACQ, Trigger             |
|                       | Width  | Programmable                               |
| Digital Outputs       | Number   | 8  |
|                       | Level  | LVTTL                                      |
|                       | Modes  | Output Bit, Alarm, ACQ, Trigger, Time-Slot |
|                       | Width  | Programmable                               |
| Analog Inputs         | Number   | 2  |
|                       | Range  | +/- 15V                                    |
|                       | Bandwidth  | 20 kHz                                     |
|                       | Analog Outputs   | Number                                     |
| Range                 |  | +/- 10V                                    |
| Bandwidth             |  | 20 kHz                                     |

| Eddy Current Inspection       |   |
|-------------------------------|---|
| Probe Inputs                  | 8   |
| Channels                      | Up to 256; Expandable to 1024 channels      |
| Number of Frequencies         | 32  |
| Frequency Range               | 1 Hz to 10 MHz                              |
| Generators                    | 2   |
| Generator Output              | (2) direct outputs and (16) 100-Ohm outputs |
| Generator Injection Mode      | Multiplex and Simultaneous                  |
| Drive Voltage                 | 0 to 24 V peak-to-peak                      |
| Gain                          | Manual and Automatic                        |
| Gain Range                    | 0 to 40 dB                                  |
| Sampling Rate                 | 50,000 samples/sec                          |
| Remote Field Inspection       |   |
| Probe Inputs                  | 8   |
| Channels                      | 8 simultaneous                              |
| Number of Frequencies         | 4   |
| Eddy Current Array Inspection |   |
| Probe Inputs                  | 8   |
| Channels                      | Up to 256; Expandable to 1024 channels      |
| Number of Frequencies         | 32  |
| Frequency Range               | 1 Hz to 10 MHz                              |
| Generators                    | 2   |
| Generator Output              | (2) direct outputs and (16) 100-Ohm outputs |
| Generator Injection Mode      | Multiplex and Simultaneous                  |
| Drive Voltage                 | 0 to 24 V peak-to-peak                      |
| Gain                          | Manual and Automatic                        |
| Gain Range                    | 0 to 40 dB                                  |
| Sampling Rate                 | 50,000 samples/sec                          |
| Probe Balancing               | Electronic probe balancing (hardware null)  |
| Multiplexer                   | Compatible with external multiplexer        |

# High-Quality Probes

## Tubing Inspection Probes for Power Generation, Oil & Gas, and HVAC

GE Sensing & Inspection Technologies tubing probes are designed to meet the stringent inspection needs of Balance-of-Plant applications in the Power Generation, Oil & Gas, and Air Conditioner industries for non-ferrous and ferrous tubing. GE is a dedicated manufacturer, providing customers with high-quality and cost-effective probes for their inspection needs.



## Remote Field Probes (RFT) for Ferrous Tubing

Designed for inspection of ferrous tubing in the Oil & Gas and Petrochemical industries

- All probes encased in a stainless steel sleeve.
- Probe diameters from 0.312 inch (7.92 mm) to 0.750 inch (19.1 mm).
- Probes available with standard poly shaft length of 65 ft (19.8 m).
- Probes come with three- and six-pin Amphenol® connectors.

## Enhance Durability and Lifespan

Probes are manufactured using superior wear-resistant materials to achieve extended overall probe life and added durability. All probes are constructed with our proprietary kink-resistant shafts.



## Non-Ferrous Tubing Probes for Balance-of-Plant

Designed for inspection of non-ferrous tubing in balance-of-plant applications in the Oil & Gas and Power Generation industries.

- Probe diameters from 0.380 inch to 1.5 inch (9.65 mm to 38.1 mm) in 0.010 inch (0.254 mm) increments.
- Small diameter probes also; diameters from 0.270 inch (6.86 mm) to 0.370 inch (9.40 mm); probes on 0.25 inch poly shaft in 50 ft length.
- Probes available with standard poly shaft lengths of 65 ft, 80 ft, 100 ft & 120 ft (19.8 m, 24 m, 30.5 m & 36.5 m).

## Dedicated Manufacturing Facility Provides Rapid Turnaround

We manufacture all ID tubing probes in our Lewistown, PA, USA facility. We have a dedicated manufacturing cell designed to enable high quality and rapid manufacturing with short delivery times. Many common probe sizes are stocked for quick delivery. For probe sizes not in inventory, GE Sensing & Inspection Technologies offers rapid turnaround time for orders of up to ten probes.

## Features and benefits

- ID tubing probes are made with high performance materials and adhesives for excellent abrasion resistance and long life.
- Proprietary long-life kink resistant poly shafts increase probe life, improve durability, and ensure inspection ease.
- Many common eddy current and remote field probe are on the shelf and ready for shipment; rapid turn-around time for orders of up to 10 probes.



## Probes for Air Conditioner Tubing

Designed for inspection of non-ferrous tubing in industrial HVAC units.

- All probes are encased in a stainless steel sleeve.
- Cross-wound coil design for detection of omni-directional defects.
- Probe sizes: 0.409 inch (10.4 mm) to 0.800 inch (20.32 mm)
- Probes available with standard poly shaft length of 35 ft (10.7 m).
- Probes come with standard 4-pin Amphenol connectors.

## Custom Builds and Special Applications

Our facility contains an in-house applications lab to provide custom solutions for special applications. Backed by more than 75 years of experience, our talented Applications team can provide solutions for standard tubing and surface inspection applications with traditional eddy current or eddy current array technologies.

# Eddy Current Solution from the Ground Up

## Demanding Solutions

Apollo™ was developed to take on the most demanding heat exchanger inspections. It supports industry standard eddy current (ET) and remote field (RFT) tubing probes as well as surface scanning arrays.

## Flexibility for Multiple Applications

Apollo can operate in either multiplexed or simultaneous injection modes meeting the eddy current tubing inspection needs for the power utility, petrochemical, pulp & paper, chemical processing, pharmaceutical, and food & beverage industries.

The multi-channel/multi-frequency capabilities of Apollo can also solve a vast array of surface solutions. These solutions include, but are not limited to aerospace airframe and engine inspection, automotive in-line testing for bar, tube and wire, and any application that requires high-speed inspection with multiple probes and frequencies.

## Advanced Software

Combined with field proven acquisition and analysis software, Apollo is suited for a wide range of inspections from smaller two-man operations to scope of work requiring multiple testers and data rooms.



## Features and benefits

- 100% digital data acquisition ensures full signal capture
- Configurable up to 1024 channels and 256 frequencies for tubing inspection and array applications
- Supports multiplexed, simultaneous injection, and context switching inspection modes
- Wide frequency range of 1 Hz to 10 MHz and automatic gain control

## Dedicated Customer Support

GE Sensing & Inspection Technologies continues to invest in technology and people so we can solve customer problems through our innovation and our customer support. When investing in Apollo, organizations are receiving more than a world class eddy current solution. Each organization is also purchasing a full support system that includes personnel that have years of eddy current application experience.

Through local customer and sales support located around the world, GE Sensing & Inspection Technologies demonstrates its commitment to providing each customer with the service and support necessary to ensure our solutions are exceeding customer expectations.



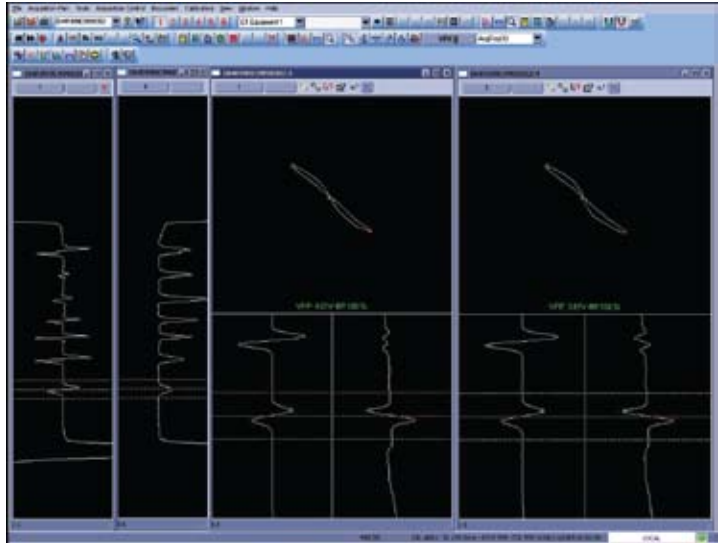
# Advanced Software Technology

## Acquisition Software

The Apollo™ Tester in conjunction with Apollo Acquisition Software has been developed for rapid inspection of tubing.

It allows the user to collect and permanently store eddy current/RFT data to most commercially available recording devices. Recorded data is readily available for data analysis, inspection reports and archive records.

Simultaneous display of user-defined channels and probe configurations are also possible. The presentation's null, span and rotation are all controlled via the computer's mouse. That along with the automatic user-defined system calibration allow for quick setup times and more time available for conducting inspections.

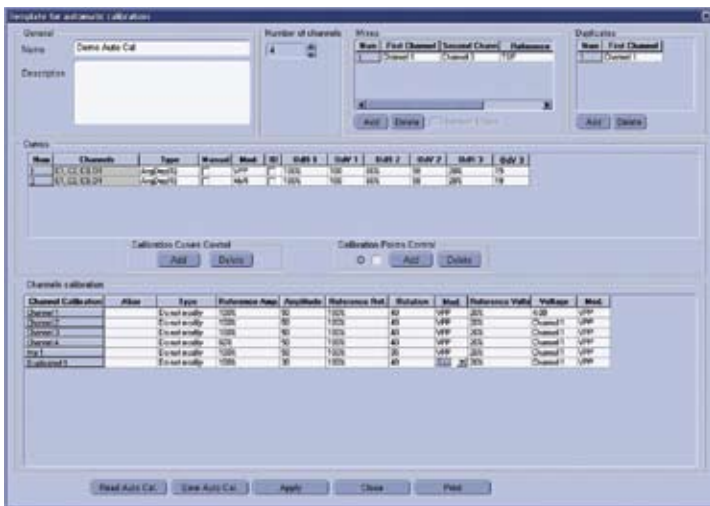


Acquire screen

Test configurations are stored as setups for recall and quick reference during future testing.

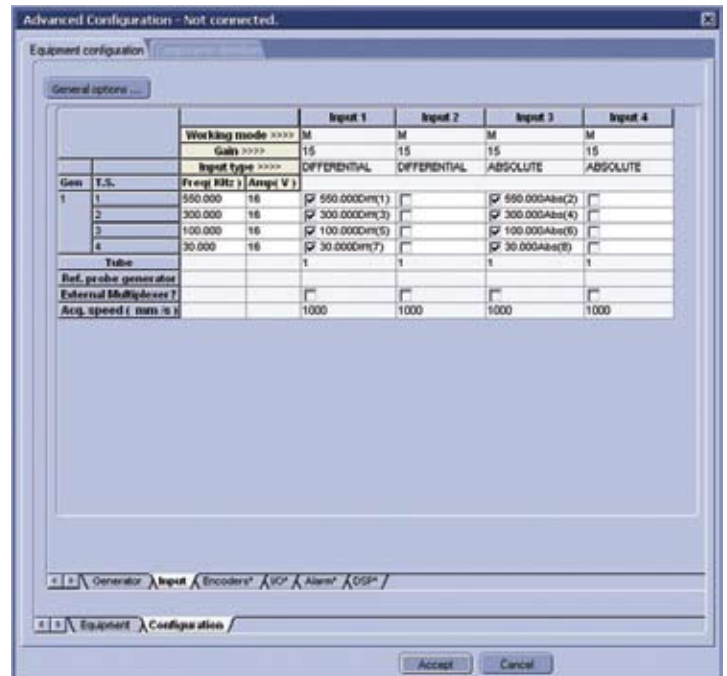
Easy-to-use configuration screens allow the user to select the working mode of the tester: multiplexed or simultaneous injection, number of frequencies required for the exam, as well as desired sample rate.

The tester input screen determines the type of tests to be performed. Inputs used are determined by the probe adaptor that is connected. Gain and drive voltages for each channel are also identified on this page.



Auto calibration screen

The auto calibration feature allows the user to populate and store calibration information for several components and then copy that information to other testers, resulting in reduced errors. The auto calibration is also capable of creating mixes, duplicate channels, calibrations curves (if used), as well as setting the spans, rotations and voltages for all channels required for a specific exam.



Instrument configuration screen

## Analysis and Documentation Software

Apollo™ offers powerful software with the flexibility you desire. The Apollo Analysis software combines the most advanced eddy current data analysis and documentation capabilities available with a user-friendly Windows®-based interface.

The software is composed of easy-to-use display screens. Indications can be measured with respect to any user defined landmark table or structures. An option is available to allow the system to identify the structure automatically (measurements are in data points between landmarks in this situation) in situations when landmarks cannot be used.

## Signal Processing

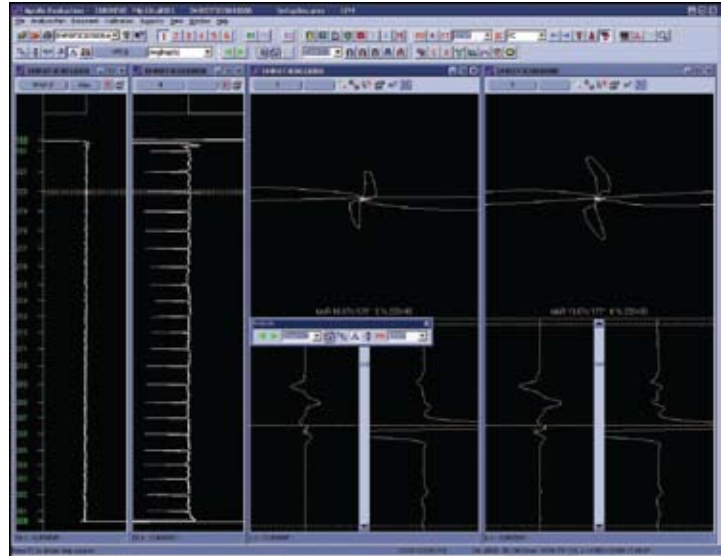
The Apollo Analysis programs flexible signal processing features allow the user to create numerous two-channel differential or absolute mixes to permit increased reliability of detection of indications located around structures. Several filter options are also available as part of this software. All information on the lissajous and strip charts update automatically.

## Indications Table

The Apollo software has also been designed to use a user defined indications table. In this table the user defines the name of the indications, associated three letter code for each indication, which indications may require a secondary review, as well as those indications where only the tube information and three letter codes are required.



Analysis auto-calibration screen



Main analysis presentation

## Calibration

Calibration of the software can be performed in one of two methods, or as a combination of both—manual and auto-calibration routines.

The auto calibration feature allows the user to populate and store calibration information for several components and then copy that information to other testers, resulting in reduced errors. The auto calibration is also capable of creating mixes, duplicate channels, calibration curves (if used) and span, rotations and voltage setup for all channels required for the specific exam.



Analyst configured indication codes

## Report Editor

The Apollo Report editor offers several features for the user. All entries for tubes currently in analysis are populated in the current tube report window. All entries may be edited and upon completion of the tube analysis pushed to a final report with a simple button press. The final report contains numerous user definable options that can display as little or as much information about the analyzed tubes as required. Both the current tube and final report contain the *Recall Flaw* feature that allows the recall of the indication selected to show the measurement dots in the exact location used to make the inspection decision.