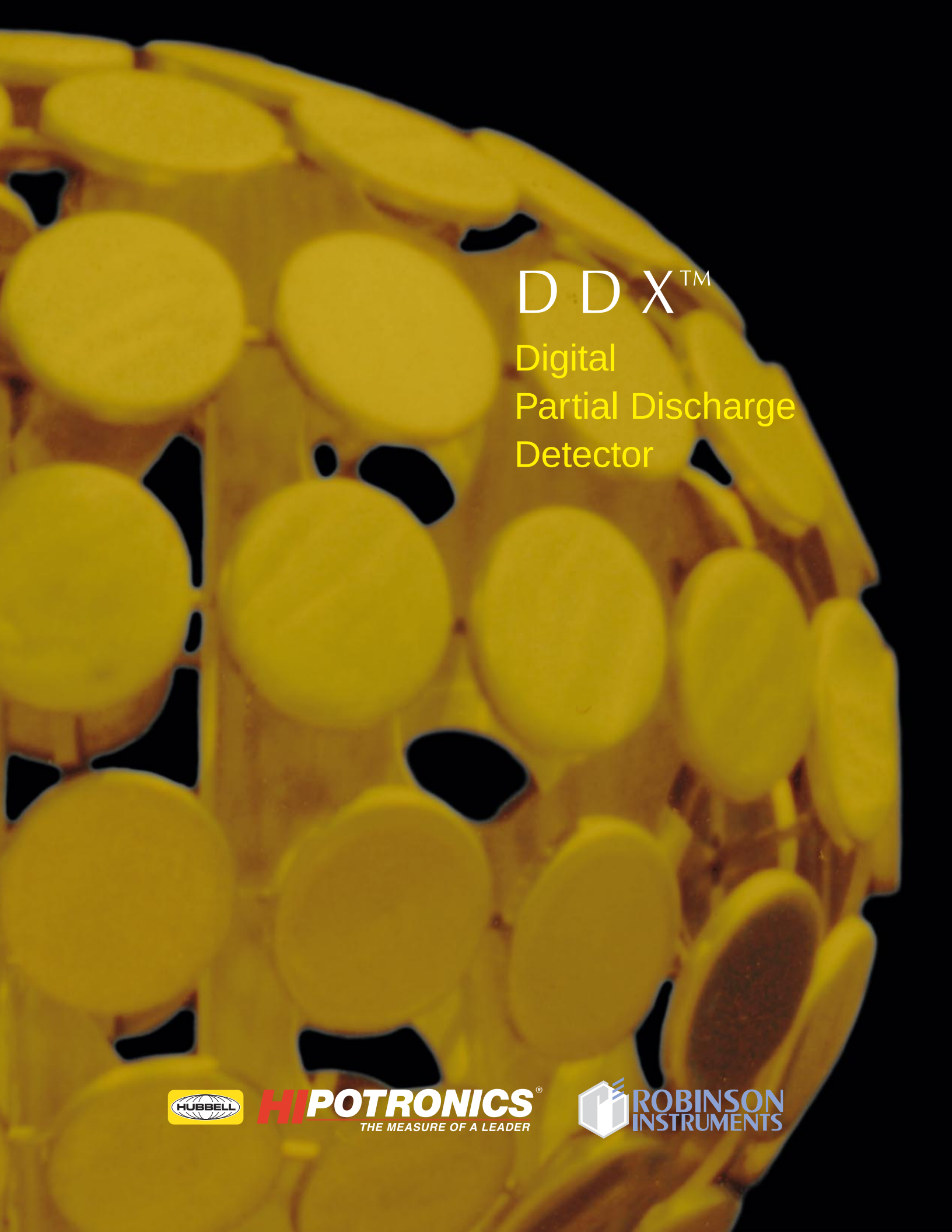


DDX™

Digital Partial Discharge Detector

HUBBELL

HIPOTRONICS®

THE MEASURE OF A LEADER

ROBINSON INSTRUMENTS

You've always heard about the best

Here is the newest generation of partial discharge testing technology. The technology to get more done, more accurately, and more easily.

The Hipotronics®/Robinson DDX™ Digital Partial Discharge Detector offers the high accuracy and flexibility of digital technology, plus the real-time display and easy operation of an analog instrument. It is everything you want in a digital system with everything you know from an analog system... truly the best of both worlds.

The DDX Detector provides the most intuitive and easiest to use operator interface of any available digital PD testing system. Data analysis is fast, easy and requires little training. Its Windows™-based software allows flexible test recording and data export to Word™, Excel™ and other Windows programs. In addition, only the DDX Detector provides a completely open-architecture hardware and software solution through the use of the fastest processors, Microsoft Windows and Microsoft ActiveX™ technology. Therefore, as additional capabilities are created, they can be easily added to your existing equipment.

The Hipotronics/Robinson DDX Detector can also automate your entire PD testing process, from voltage source control to calibration to test report generation.

In summary, it's everything you want in a digital system and everything you know from an analog system.

The best of all worlds.

Your wish list. Done and delivered.

Two years of research, hundreds of hours of listening to customers, and countless dialogs with our engineering team have created the partial discharge detector of the future. One that delivers everything you need in today's testing environment.

Easy Operation Ease of use was the mandate to our engineering and design teams. The DDX Detector uses the worldwide standard Windows operating system and an intuitive control and display panel to allow even inexperienced operators to learn quickly with minimal training. All the features you're used to with an analog scope, such as real-time bipolar pulse display, display graticules, analog readout, simple adjustment, etc., are built-in. In addition, advanced features such as higher accuracy, automated calibration, data analysis, and customized test recording, are standard. Use as much or as little as you like.

Automated Testing The DDX Detector can automate your entire PD testing process. Automated calibration simplifies setup. The DDX Detector can work with any HV source. However, when interfaced with other suitably equipped Hipotronics/Robinson control systems for AC sources, control of the entire HV source is provided through the DDX Detector and test reports contain complete data on all aspects of the test.

# of both worlds. Finally, you're seeing it.

Customized Report Generation Standard reports cover many QC/QA, process control and product certification needs. In addition, the DDX Detector software provides all the advantages of a Windows program. You will never again have to take photographs, cut and paste paper documents, or waste valuable time creating professional, customized test reports. The Hipotronics/Robinson DDX Detector allows transfer of pulse displays and data into commonly used word processors and spreadsheets such as Microsoft Word and Excel. Enhance your competitive edge and customer impression by providing the data your customers want in the format they want it in.

Advanced Analysis Capability The DDX Detector possesses the most flexible analysis tools of any digital partial discharge detector. Pulse capture can be achieved against phase or time. There is full control over gating (vertical and horizontal) of pulses so that the effects of interference can be reduced. Optional software and hardware modules add capability for partial discharge site location, external pulse discrimination, noise suppression, three dimensional plots, calculation of IEC integrated quantities, and discharge pattern fingerprinting. Consult Hipotronics/Robinson sales for more information.

Open-Architecture Design The DDX Detector has intentionally been designed with an open hardware and software architecture that eliminates obsolescence. Not only is this PD measuring instrument the most advanced instrument available, it will stay the most advanced well into the future, evolving and adapting to incorporate new, emerging technology and to meet changing testing needs. Microsoft ActiveX technology even allows third party developers to write new data recording, processing, and analysis modules for the system.

Applications

- Power Cable
- Distribution and Power Transformers
- MV and HV Switchgear
- Power Circuit Breakers
- Gas Insulated Switchgear
- Bushings
- Shunt Reactors
- Potential Transformers and Current Transformers
- Power Factor Correction Capacitors
- Line Insulator Products
- Lightning Arrestors
- High Voltage Laboratories
- HV Components
- Insulating Materials of All Types

Everything you want in digital. Everything you know from analog.

Training

Is it important for your operators to learn quickly? The DDX™ Detector imitates the look and feel of an analog detector. If your operators can use a conventional analog detector, they can use the DDX Detector with minimal training.

Interpretation

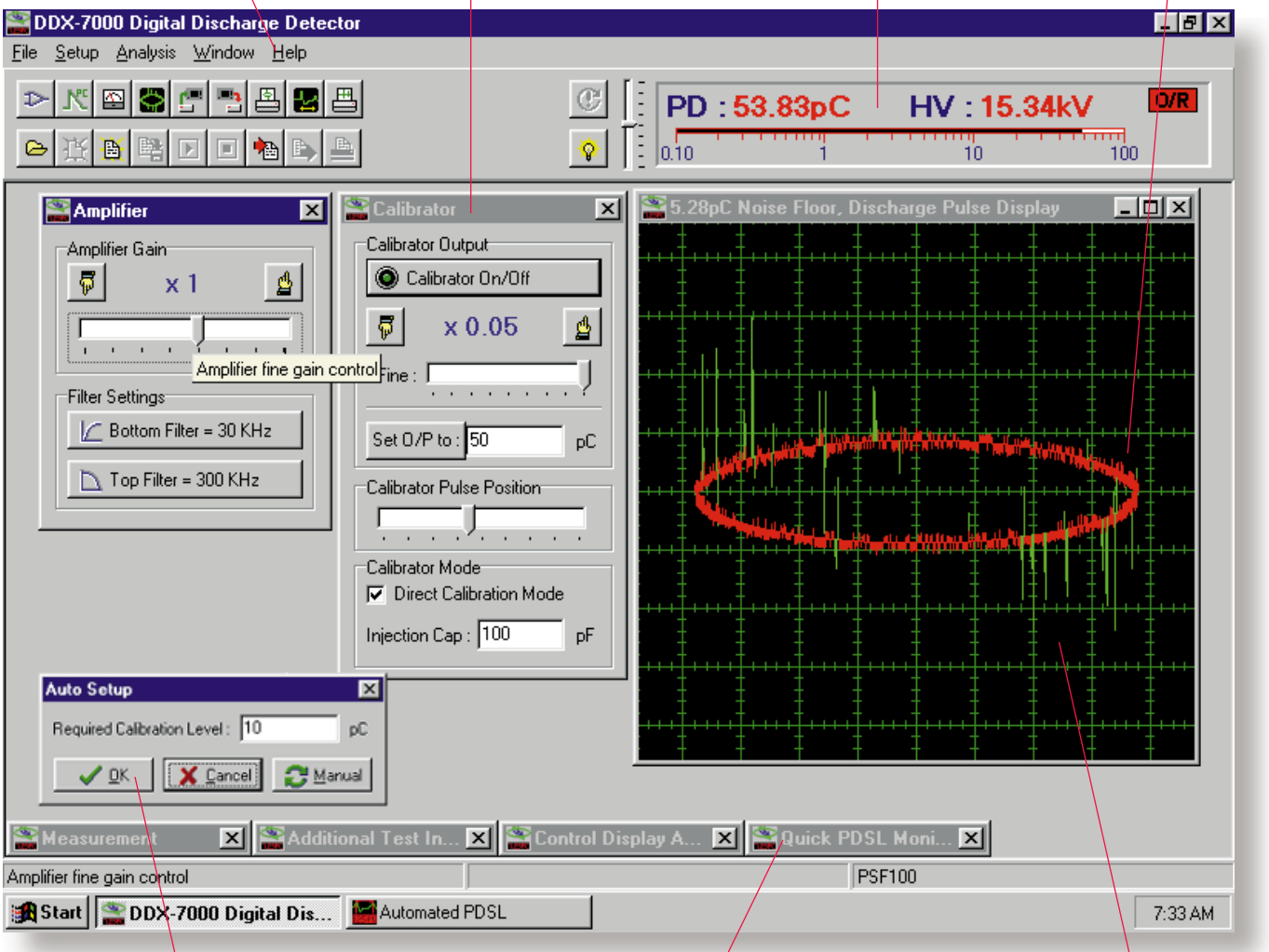
How easily can you interpret results? The DDX Detector provides a color, bipolar pulse display that is easy to read and interpret. Calibration pulses and zero markers are clearly displayed and pulses are easily viewed. Display update is fast (25 times/second), so there is no guesswork.

Help

You will probably never need it because the DDX Detector is so easy to use. But it's there if you need it.

Readout

How do your operators interpret data? With the DDX Detector, they can read directly in pC, look at the analog bar graph, or interpret from the pulse display. All without changing windows or functions.



Ease of Use

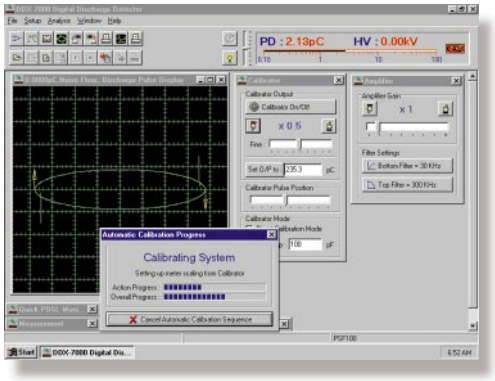
How easy does your setup calibration need to be? The DDX Detector allows you to automate your calibration. Just type in the value and the DDX Detector does the rest. Manual calibration (as with conventional, analog detectors) can also be performed.

Noise Suppression

What gating and noise suppression features do you need? The DDX Detector provides complete control over horizontal and vertical gating (windowing). Make use of it when the conditions require you to.

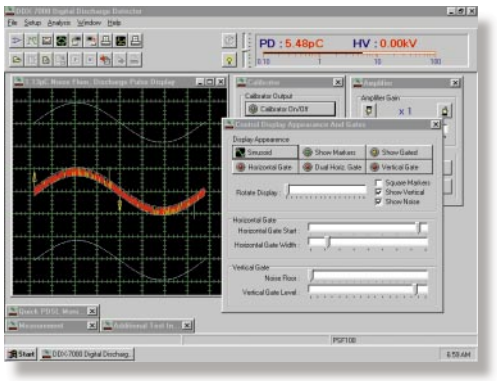
Flexibility

How flexible does your detector need to be? Windows makes the DDX Detector easy to use and makes it easy to access other parts of the DDX Detector program. Additional, optional programs are quickly loaded and utilized. Just open a window! No confusing function keys to remember and no moving around through layers of the program.



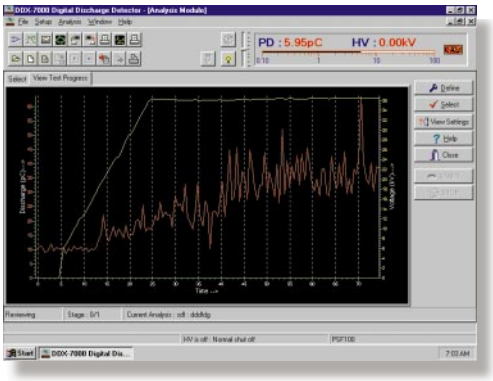
Automatic Calibration

The DDX detector has a unique, built-in routine that allows calibration to be performed automatically. The automated calibration routine ranges over each amplifier range and calibration pulse setting to minimize background and amplifier noise. Once automated calibration is completed, the system calculates and displays a noise floor and allows amplifier ranges to be changed without affecting the system calibration in any way. Of course, manual calibration may also be performed using amplifier adjustment to a specified pC/cm.



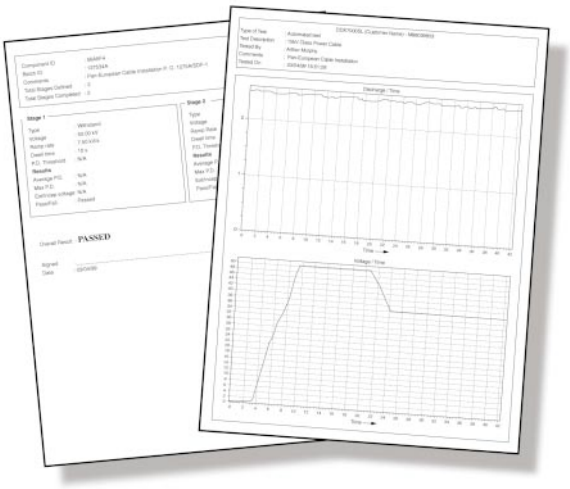
Pulse Display and Measurement

The operator has complete control over the pulse display. Depending on the user's preference, the pulse display can be set to either an ellipse, straight line, sinewave, or sine loop. Full single or dual gating is included, with complete control allowed over gate width and position. In addition, the ellipse can be rotated. The operator also has the capability to select different measurement methods, such as Peak Hold, Average, Force Slow Decay (to simulate an analog meter) and Measure with Corrections to IEC-270 Section 4.3.3.



Standard Analysis Mode

This flexible software module displays PD in real-time against voltage and time. The software allows review of PD during any time period while the test is in process. Test results may be stored or printed out as necessary. When used with a Hipotronics/Robinson 970 deluxe control system and HV source, full automatic control of the test sequence can be achieved through the DDX Detector.



Test Reports

Several standard test records are provided. Data can be inserted into any other Windows application for custom report generation. When used with a Hipotronics/Robinson AC source and 970 control system, additional data acquisition and control is possible.

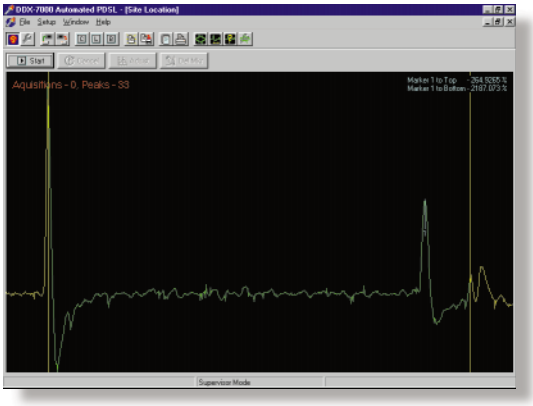
Partial Discharge Site Locator for All Types of Power Cables

Existing international standards require partial discharge measurements on all types of power cables. If partial discharge levels exceed acceptable standards, it is necessary to employ modern, advanced techniques to accurately locate the partial discharge sites so that they can be cut out and the remaining cable shipped to the customer. Older methods of “divide and conquer” (i.e., cutting the cable in half and retesting until the bad section of cable is isolated) waste time and cable.

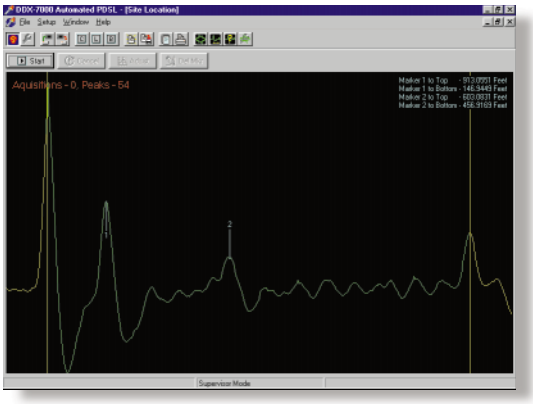
Hipotronics patented APDSL Automated Partial Discharge Site Locator is a significant advance in PD site location. Not only is it extremely easy to use, but its patented real-time display window and data averaging functions allow an operator to optimize the instrument settings and achieve site location on sites that are less than the pass/fail PD level, near the end of cable, or in test areas that are not completely shielded. Depending on PD site magnitude and inception voltage, it is also possible to find multiple sites in a reel of cable.

The patents specifically cover the method of display and the rejection of transients and other interference. These new developments make it very easy for an operator to understand the pulse locations and make it possible to operate the system in a less than ideal environment.

Operation of the system is very easy. The operator enters the length of the cable to be site located, and presses START. The system automatically calibrates itself and allows operator fine adjustment if necessary. The operator applies voltage to the cable until PD incepts, at which point the operator collects data. The entire process is completed in a matter of minutes with on-screen verification of the site location from the top and the bottom end of the cable. The entire site location can be completed using the same Hipotronics Power Supplies, HV Filters, and other HV test components. No reconnection of hardware is generally required to change from PD magnitude measurement to PD Site Location. In some cases, the operator may be required to change calibration points from one end of the cable to the other to achieve optimum results.



This 2452 ft cable had PD measuring 12pC in magnitude. This fault was easily detectable by adjusting the trigger level in the PDSL software program to locate lower level faults. Note that in doing so, a small amount of background noise is displayed. The Hipotronics PDSL found the fault 265 feet from the top of the cable. The customer cut around the PD site. The cable was retested and passed. Further analysis by the customer indicated that the fault was located at 265.5 feet, an accuracy of much better than .1%.

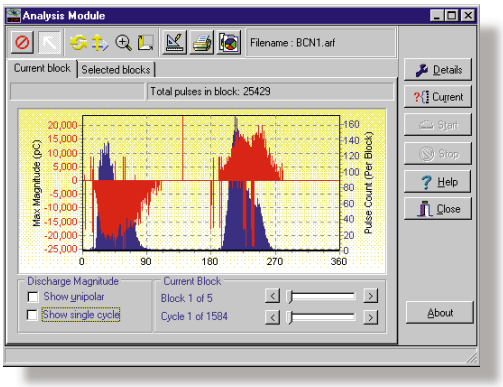


This 1000', 1000MCM cable had PD measuring 30pC at test voltage. The Hipotronics APDSL found two faults in this cable. The customer later cut the cable as indicated (with an additional 3 feet on either side of the site) and found less than 5pC at full voltage during the PD test.

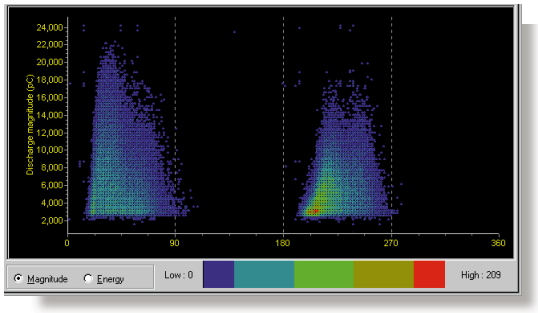
Due to various different types of cable constructions, insulating materials, insulation wall thicknesses, background noise levels, etc., it is difficult to quote absolute PD Site Location accuracy; however, experience has shown accuracies in the range of 0.1% for 15kV/220mil wall thickness XLPE “commodity” utility cable. Accuracy can be expected to be somewhat less for cables with higher characteristic impedance.

To measure PD site locations in very short lengths of cable (< 800'/250m), Hipotronics can supply an optional PDSL-CART that changes the inductance of the cable at the termination point, thereby changing the “ringing” frequency of the PD pulse as it travels through the cable.

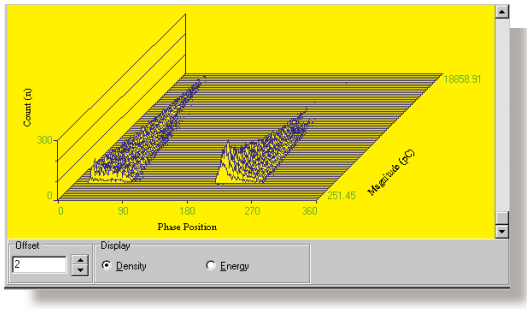
Advanced Analysis Software Package



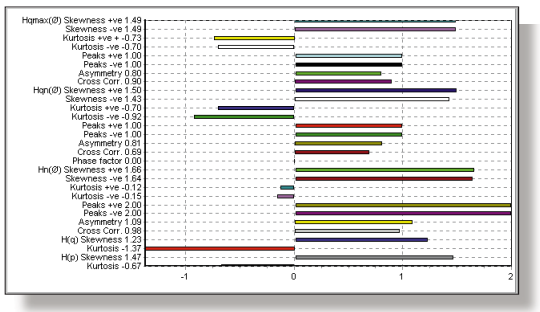
PD Value vs. Phase



Intensity



Fractal Chart



Fingerprint

The DDX-DA3 is a powerful, optional software package that is used with the Hipotronics DDX™ Partial Discharge Detectors. The DDX-DA3 Software Package is an ideal tool for research and development or evaluation laboratories. It allows a user to collect data on partial discharge activity and display it in several different formats for easy analysis and comparison. Multiple blocks of data can be stored, with the option upon recall of viewing one, several or all of the blocks. Allowable displays include PD Value vs. Phase, PD Value vs. Time, Fingerprint, Intensity, and Fractal Chart.

PD Value vs. Phase

Displays the number of PD pulse occurrences, maximum PD magnitude, and average PD magnitude as a function of phase.

PD Value vs. Time

Displays maximum and average PD magnitude, power, repetition rate, current, and quadratic rate as a function of time.

Intensity

Displays the relative intensity of PD pulses as a function of phase and either PD magnitude or energy. The mouse can be used to identify the intensity level of a given point on the chart.

Fractal Chart

An alternative view of the data shown in the intensity chart. The Z axis represents discharge magnitude, the X axis phase, and the Y axis intensity.

Fingerprint

Displays a collection of 29 statistical operators performed on the PD data, made up skewness, asymmetry, cross correlation, and phase factor. Fingerprint data can be compared to previous test data to determine cause of PD.

DDX-8003 Digital Partial Discharge Detector

In factory tests, electrical interference noise can seriously affect sensitive partial discharge measurements. Traditionally, the method of eliminating this noise has been to screen the test area. In some cases, the use of a screened room limits testing flexibility and impedes the free flow of products during manufacture.

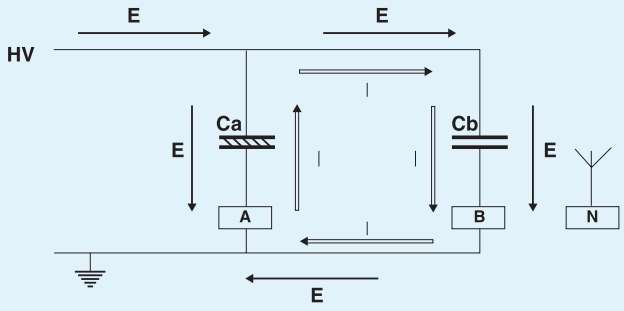
The DDX™-8003 Pulse Discrimination PD Detection System electronically rejects interference noise, allowing complete flexibility of testing together with a flow of production. Widely used in factory testing of cables, this system also satisfies IEC 2-pulse test requirements.

Principles of Operation

There are a number of different ways in which interference noise can enter a partial discharge detection circuit in a typical industrial test environment. Noise can come from conduction through the mains voltage supply, airborne pick-up, and transient coupling.

Noise can be caused by pulse interference generated by thyristor controllers, pulse interference from other sources, or continuous radio frequency transmissions. The Pulse Discrimination System will attenuate or eliminate each source and type of noise.

DDX-8003 HV Circuit



Pulse Interference

Three complementary techniques for suppressing unwanted pulse interference are included in the DDX-8003 detector:

Pulse Discrimination

A source of external interference will introduce a pulse into the circuit that follows the solid path E. This pulse flows through the two measuring input units A and B in the same direction—giving a detected pulse in each that has the same polarity.

The Type 8003 detector receives these two pulses simultaneously and compares their polarities. If the pulse polarities are the same, then the pulse is defined as an external interference. If the two pulses have opposite polarities, then the source of the pulse is defined as within the test circuit, i.e., C_a or C_b. The operator can choose to view and measure either all the pulses detected regardless of source, only those pulses that originate within the test circuit, or only those pulses that are external interference.

The Type 8003 is also able to separate those internal pulses that are caused by partial discharges in C_a from any pulses originating in C_b, thus allowing two objects to be tested at the same time.

Radio Interference

Some radio broadcast frequencies may fall within the measuring bandwidth of the detection system, reducing the sensitivity of the partial discharge test. The DDX-8003 includes a radio frequency suppressor to improve operation under such conditions.

The 8003 operates on the principal that the radio signals are coupled to the high voltage line and flow to earth through the measuring input units following the path E. The detected radio signals on A and B will be in-phase with each other and an analog subtracter is used to attenuate these signals. In this way, the actual sensitivity of a test can be significantly improved.

Transient Suppression

The use of the 8003 is applicable when the intermittent pulses of interference are caused by the switching of heavy machinery in close proximity to the test area (such as overhead cranes).

The interference, likely to be radiated through the air, can be detected by the High Voltage test circuit. A simple antenna (measuring unit N) placed closed to the test circuit detects any radiated pulses. By selecting this function, the Type 8003 will reject pulses detected at A and B while there is also an interference pulse detected on the antenna channel N.

Ordering Information

The Hipotronics/Robinson DDX™-7000 is shown in an installation with a Hipotronics 600kV Series Resonant Test Set. The DDX Detector is mounted in a control cabinet with our 970SR control system. The combination of these two devices allows complete control of the Series Resonant Test Set through the DDX Detector software program. In addition, all data from both the Series Resonant Test Set and DDX Detector is logged onto one test report. Any of Hipotronics/ Robinson DDX Detector systems can be configured in this way.

All catalog numbers require a case type and input voltage code. Reference chart at bottom.

Complete Units

DDX-7000 Standard Digital PD Detector, includes standard software package that includes setup, measurement and display routines, and report generation. Includes 15m (50') of interconnecting cables to coupling capacitor and calibration injection capacitor.

DDX-7000SL Digital PD Detector, optimized for Power Cable testing with built-in Site Location hardware and software.

DDX-7000XF Digital PD Detector, optimized for Transformer testing with additional 3-phase multiplexing hardware and software modules.

DDX-8003 Digital PD Detector with Pulse Discrimination.

DDX-8003/906 Digital PD Detector with Pulse Discrimination and amplifier module designed to work with Hipotronics/Robinson 906 input units.

Various calibrators, coupling capacitors, calibration injection capacitors, cables, and HV sources are also available. Contact Hipotronics/Robinson for more information.

Add the following to the DDX catalog numbers:

CASE CODE	INPUT VOLTAGE
–C (Shielded Instrument Case)	**–A** (115V)
–R (Rack-Mounted Shielded Instrument Case)	**–B** (230V)

Hardware and Software Upgrades

DDX-DA3 Software package to allow three-dimensional plots, calculation of IEC integrated quantities, and discharge pattern fingerprinting. Usable with all versions of the DDX detector.

DDX-PDSL-UPG Hardware Module and Software Module upgrade to add PD Site Location capability to DDX-7000 detector (turns that detector into a DDX-7000SL).

DDX-XFORM-UPG Hardware Module and Software Module upgrade to add 3-phase Transformer Testing capability to DDX-7000 detector (turns that detector into a DDX-7000XF).

DDX-906-UPG Replacement amplifier module for DDX-8003 to allow use with 906 Fiber Optically-Isolated Input Unit.

Accessories

800517	PSF Drawer to replace drawer used with Hipotronics CD077 Detector, slide in/slide out replacement with BNC connection.
380223	500VA Isolation Box. Accepts 115/230V Input at 50/60Hz. Output is 115V isolated to ground for 25kVdc. Should be used to power DDX and printer *if* printer is connected to DDX.
DDX-XYP	X-Y Plotter Output Module. Allows connection of X-Y plotter to DDX, with 0-10Vdc signals for voltage and PD magnitude. May also be used for any application requiring analog output from a DDX for voltage or PD magnitude.
22162	Rack-mount kit to convert standard instrument case to 19" rack mount.

DDX-7000 and DDX-8003 Technical Specifications

The DDX™ Detector Series utilizes a worldwide standard, common hardware and software platform with an Intel™ (or equivalent) processor and a flat panel, liquid crystal color display. A standard mouse and keyboard are used for operator input. Hard and floppy disk drives are used for data and program storage. Standard serial and parallel interfaces are used for communication to printers and other peripherals.

Additional "plug-in" data acquisition and software modules allow the user to customize the system for a wide range of applications such as Partial Discharge Site Location and remote control of HV test equipment.

The operating system is Windows™ as supplied by Microsoft, Inc. The special software for the control of the DDX Detector runs as an application within the environment. Startup is similar to any standard PC. The system is compliant with all relevant sections of the IEC-270, IEC-60, IEEE-4, IEC-855 and AEIC/ICEA.

PD Measurement System

PD measurement range 0-99999pC in standard notation, higher readings in scientific notation

PD measurement resolution 9 Bits plus sign

PD phase resolution 0.35 degrees

PD magnitude display Analog-style bar graph and digital display

Measurement function selection between "Largest repeatedly occurring pulse (IEC270)"; "average discharge magnitude"; "peak pulse magnitude"; or "mimic analog meter movement"

Partial Discharge Site Locator (Optional)

Time resolution 12.5ns (80MHz sampling rate)

Capture memory depth 256 cycles, 256+ samples

Amplitude capture accuracy Better than 1%

Amplifier ranges 12 switched 5dB ranges

Amplifier frequency range 100KHz to 5MHz

Voltage Measurement System

Voltage measurement range 0-99999KV Peak Scaled RMS and true RMS measurement modes

Voltage measurement resolution 11 bits plus sign

Voltage measurement accuracy better than 0.5% at I/P Socket

Voltage frequency sync range 5Hz to 500 Hz

Voltage measurement input 10VPk input, transient protected, high impedance. Can be used with capacitive divider, resistive divider or voltmeter resistor. The system can support up to 16 different voltage sensor calibrations to allow it to be moved around different test installations.

Internal Calibrator System

Calibrator output set directly in pC, output always read out in pC

Calibrator maximum output 10V step (1000pC into 100pF)

Calibrator output range 1mV to 10V in 13 ranges (0.1pC to 1000pC into 100pF)

Calibrator fine adjustment 0 to range voltage in 256 steps

Calibrator output rise time less than 25nS into 100pF, slower in higher capacitance

Calibrator operating modes direct and indirect (transfer) modes supported

Amplifier Systems

PD amplifier ranges 6 switched 20dB ranges

PD amplifier fine adjustment 10:1 in 200 steps

PD amplifier gain linearity <1% over whole range

PD amplifier frequency range 20KHz to 500KHz

PD amplifier filter settings
High Pass: 20KHz, 30KHz, 50KHz, 60KHz, 80KHz
Low Pass: 100KHz, 200KHz, 300KHz, 400KHz, 500KHz

Discharge Display

Selectable as:
Ellipse
Straight line
Sine Wave Base
Sine loop

Discharge Refresh Rate up to 25/second

Synchronization Frequency Range: 5Hz - 500 Hz

Display Expansion up to full screen

Window Gating can be used to eliminate measurement at 1 or 2 defined positions on the cycle

Expanded Pulse Display (Quick PDSL)

A section of the cycle can be captured at 80MHz and displayed on a separate window. This display can then be expanded for detailed examination of individual signals.

Print Options

All printing made through the Windows default printer selected (Black/White or Colour)

Functions to be printed:
Discharge Pulse Display (Ellipse or Sine wave, etc.)
Expanded Pulse Display
Test Report pC and kV vs. time;
Test Report pC vs. kV

Further print options available with optional DDX-DA3 discharge analysis software.

Data Processing System

Windows-based system using standard keyboard and trackball

Intel Pentium™(or equivalent) Processor,

200MHz or faster

16MB of RAM

1.44MB floppy disk drive, 1.7GB hard disk drive

SVGA (800 x 600) active matrix thin film 10.4" color LCD monitor

Parallel printer port, one available
serial port (COM2)

Note: Hipotronics reserves the right to make changes in specifications at any time.

DDX-7000 and DDX-8003 Technical Specifications (continued)

Physical Characteristics

Power supply 115V or 230V AC, ± 10%, 50Hz or 60Hz, < 250VA

Operating temperature range 10°C to 35°C

Operating humidity range 35% to 80% non-condensing

System carries CE mark

DDX DETECTOR-7000 Size
17.5" W x 10.5" H x 18"D, 40 lbs.
(445mm x 270mm x 460mm, 18 kg)
6U, 19" standard case

DDX DETECTOR-8003 Size
17.5" W x 10.5" H x 18" D, 50 lbs.
(445mm x 270mm x 460mm, 23 kg)
6U, 19" standard case

DDX-8003 Additional Technical Specifications

Amplifier Systems

2 main discharge measurement amplifiers

Gain control either independent or linked

Amplifier and measurement calibration are maintained when amplifier gain is changed

Calibrator System

Compatible with both High Voltage input unit (906) or with low voltage input units

Direct calibration through 100pF capacitor
or
Indirect calibration through input unit (HV or LV)

Automatic Calibration routine in system software

Pulse Discrimination

This feature designed to eliminate common mode pulse interference

Discrimination resolution: 2 pulses
20µ 109\f µ\s 10}s apart

Circuit Capacitance ratio: NON-CRITICAL but generally between 10:1 and 1:1

Displayed / measured selections available:
Input Signal Channel 1
Input Signal Channel 2
Input Signal Antenna
Recognized INTernal and EXTernal pulses
INTernal partial discharges from the test circuit components
INTernal partial discharges from test component 1 only
INTernal partial discharges from test component 2 only
EXTernal pulses only

Transient Suppressor

This feature designed to eliminate pulse interference detected in the air by an antenna

Antenna Amplifier Input

Fine gain (sensitivity) adjustment
10:1 in 230 digitally controlled steps

Bandwidth 20 - 500kHz

RF Suppressor

This feature designed to attenuate common mode continuous RF signals detected on the amplifier channels 1 & 2

Controls:
Time delay 0 - 1000ns
Amplifier mixer adjustment 0 - 100%

Parts Supplied with Each Unit

DDX-7000 or 8003 Main Unit

Computer Keyboard

Computer Mouse

Computer Line Power Cord

Transient Filter (3-channel)

Coaxial Signal Cable, BNC-BNC, 15m, Red

Coaxial Signal Cable, BNC-BNC, 15m, Green

Coaxial Signal Cable, BNC-BNC, 15m, Blue

Coaxial Signal Cable, BNC-BNC, 2m, Red

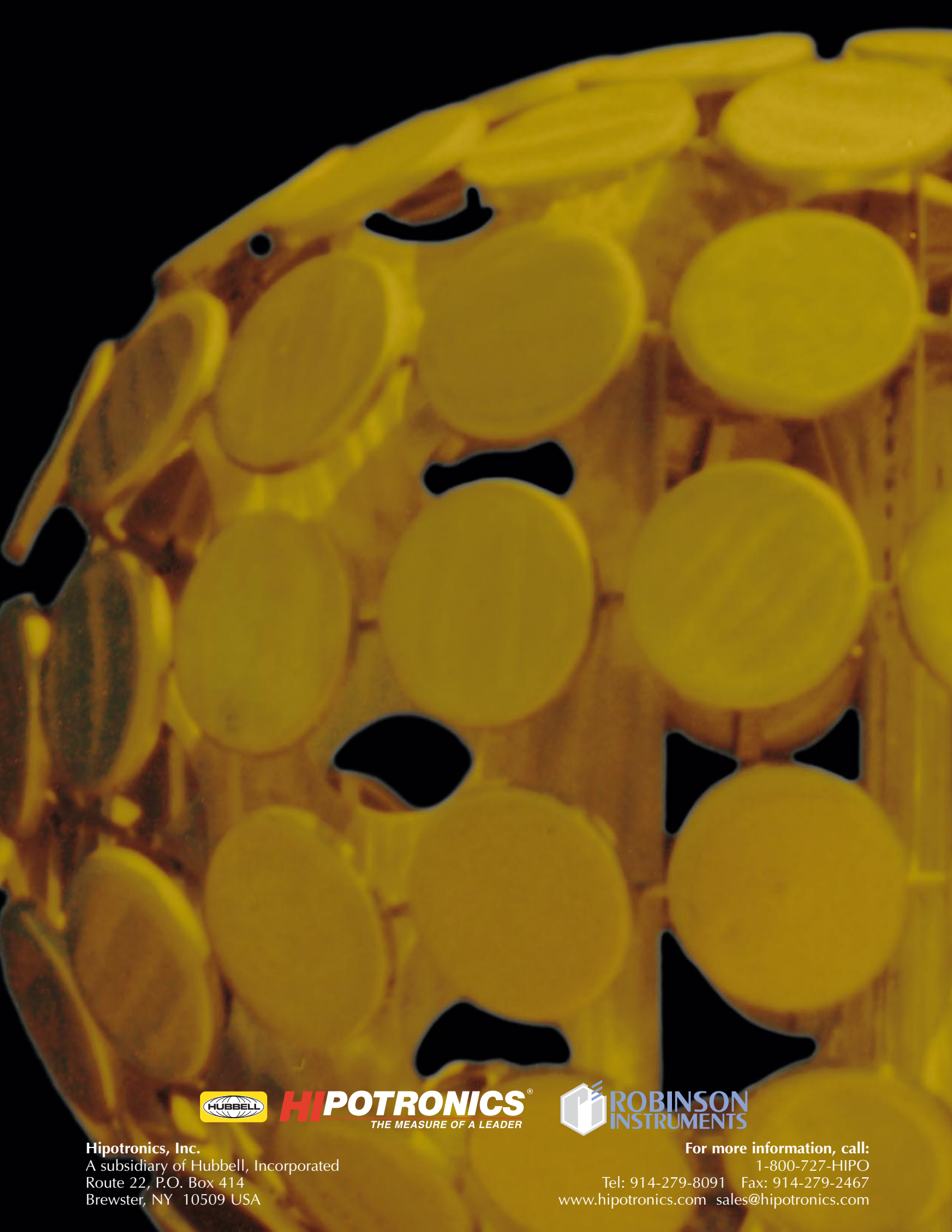
Coaxial Signal Cable, BNC-BNC, 2m, Green

Coaxial Signal Cable, BNC-BNC, 2m, Blue

Connector Terminator, BNC, 50 Ω

Connector T Adapter, BNC

Some additional parts are supplied with DDX-8003



HUBBELL

HIPOTRONICS®
THE MEASURE OF A LEADER

ROBINSON INSTRUMENTS

Hipotronics, Inc.
A subsidiary of Hubbell, Incorporated
Route 22, P.O. Box 414
Brewster, NY 10509 USA

For more information, call:
1-800-727-HIPO
Tel: 914-279-8091 Fax: 914-279-2467
www.hipotronics.com sales@hipotronics.com