# Huntron ProTrack I
Test, Inspection and Repair of Electronic Printed Circuit Assemblies

PCA Troubleshooting for Manufacturing, Rework and Service

Since 1976, Huntron has been developing a range of test instrumentation specifically designed for component level troubleshooting on PCAs (printed circuit assemblies) in rework, repair, and re-manufacturing. Huntron® Trackers® utilize the power off testing methodology of Tracker Signature Analysis. The development of the Huntron ProTrack® I has taken power off troubleshooting to a new level.
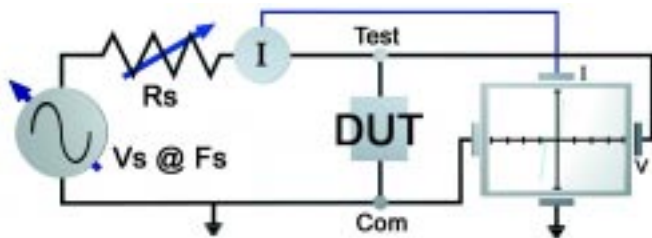

The combination of voltage (Vs), resistance (Rs) and frequency (Fs) form the basis for a Huntron Tracker test range

Huntron® Tracker® Signature Analysis

A current-limited AC signal is applied across two points of an electronic component or circuit. The resulting current/voltage waveform is displayed on a CRT using vertical deflection for current and horizontal deflection for voltage giving a unique signature that represents the overall "health" of the DUT (device under test).

Basic Tracker Signatures

Tracker signatures can be categorized into four basic types based on four basic component types. These signatures are **resistive**, **capacitive**, **inductive** and **semiconductive** signatures. All signatures will exhibit at least one of these characteristics but more often include combinations that are referred to as **composite** signatures.
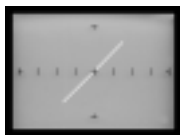

1. **Resistive** signatures have a linear response with the angle of the trace determined by the value of resistance.

2. **Capacitive** signatures have an elliptical response with the width of the trace determined by the value of capacitance.

3. **Inductive** signatures have an elliptical response. The trace width is determined by the value and the angle by component resistance. Inductors often exhibit a distorted shape.
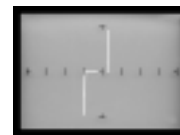
4. **Semiconductive** signatures show the conducting and non-conducting states. Approximate breakover voltages can be determined using the horizontal graticule.

The Benefits of Power Off Testing
- Troubleshoot circuitry that cannot be powered due to a catastrophic failure
- Test without the risk of accidental shorting that could cause further damage
- Work effectively on PCAs with mixed technology, i.e. digital *and* analog components
- Perform preventative diagnosis by seeing component flaws that could lead to premature failures

Getting Down to Basics

Comparing Tracker signatures can be accomplished manually or with the aid of a computer for signature storage using the Huntron Workstation for Windows® software. All Huntron Trackers utilize dual channel interfaces for easy side-by-side comparison of good versus suspect circuit boards. Using this **comparison method**, suspect components can be quickly identified.

The curved portion of the zener diode signature on the right indicates slow biasing
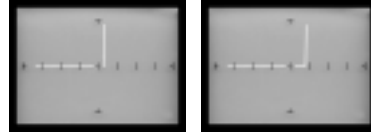
This signature comparison shows the diode on the right conducting at the wrong voltage

The signature of the capacitor on the right is showing resistance indicating current leakage

These signatures from good and bad comparator ICs show that damaged PN junctions are easily recognizable

All ProTrack systems come with the Huntron Workstation for Windows software thus eliminating the need to have a known good reference board available for comparison. Signature comparisons are made automatically with the failed signatures displayed for interpretation.

Looking for Differences

Troubleshooting with Tracker signatures is possible without the use of documentation or known good circuit boards. This is accomplished by searching for patterns in the signatures that are displayed on like pins of a component or bus.

An example would be to compare all of the input pins on an inverter IC with each other and compare all of the output pins of the inverter with each other looking for variances in the signature patterns. The input and output pins should compare favorably with similar pins. Any deviations in the pattern could indicate a real problem. This same technique can be applied to address and data bus lines and circuit boards that have duplicated circuitry such as multi-channel boards.
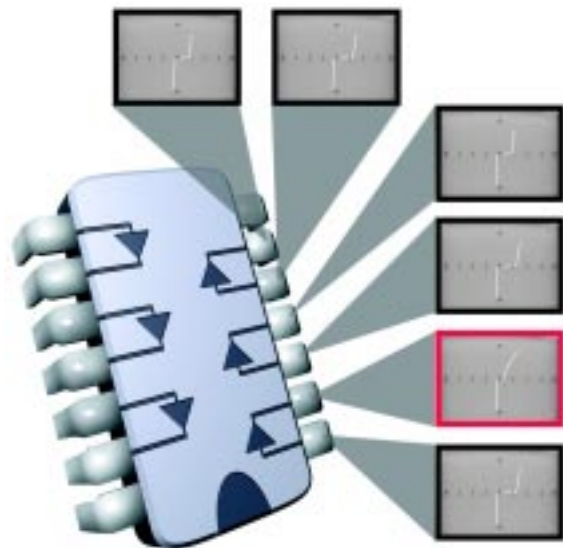
The Benefits of Tracker Signature Analysis
- Troubleshoot without the use of documentation or a known good board
- Quickly locate problems with digital IC protection circuitry by comparing similar pins
- Effectively search for component failures regardless of the overall board function

The Huntron ProTrack I

The ProTrack I Model 20 enables the user to set the applied voltage, frequency and source resistance to best match the circuit characteristics and display the optimum Tracker signature. Connecting to a personal computer will allow for creation of complete test routines and signature storage.


The Huntron ProTrack I

Huntron ProTrack I Features

- CRT with graticule overlay
- LCD for range and menu display with menu selection buttons
- Encoder for range and menu control
- A and B channel connections with channel selection controls
- Built-in Pulse Generator for biasing switched devices

The Value of Variable Test Ranges (V + R + F)

Three variables make up a Tracker test range: voltage (V), internal Tracker resistance (R) and AC sinewave frequency (F). By adjusting any of these three variables, either individually or in combination, characteristics of the Tracker signature can changed. The examples below show a simple circuit made up of a diode, resistor and capacitor in parallel. Note how the Tracker range parameters are varied to bring different aspects of the signature into focus.
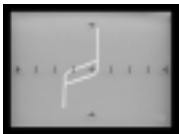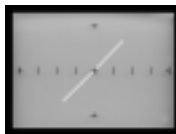

Voltage: 15V
Resistance: 10KΩ
Frequency: 100Hz
Effects from all of the components are shown in the signature shape

Voltage: 200mV
Resistance: 10KΩ
Frequency: 200Hz
Using a voltage below 600mV eliminates the diode from the signature
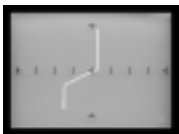
Voltage: 15V
Resistance: 10KΩ
Frequency: 20Hz
By changing frequency, only the diode and resistor affect the signature shape

Voltage:200mV
Resistance: 10KΩ
Frequency: 20Hz
Adjusting the frequency reduces the capacitive effect in the signature
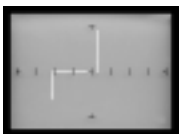
Voltage: 10V
Resistance: 100Ω
Frequency: 60Hz
Changing the resistance removes the resistive effect from the signature

Voltage: 200mV
Resistance: 1KΩ
Frequency: 5KHz
Changing the resistance reduces the effect of the resistor in the signature
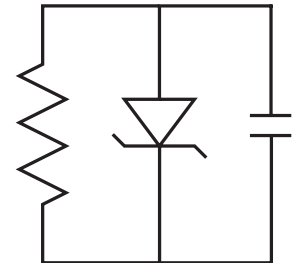
Component values:
Zener Diode: 5.1V
Resistor: 10KΩ
Capacitor: .047µF

The creation of ProTrack test ranges involves selecting a voltage initially based on the component source voltage. Resistance is selected based on circuit impedance. Frequency is set depending on the presence and value of reactive components.

Using the Huntron ProTrack Pulse Generator

The Huntron ProTrack I has a built-in pulse generator for triggering gate-fired devices such as SCRs (silicon controlled rectifiers), TRIACs, optocouplers and relays. By driving the control input of the device under test while using the ProTrack I to monitor the signature of the outputs, a dynamic test of the component can be performed. Gate-fired components can effectively be turned on and off to check their functionality.
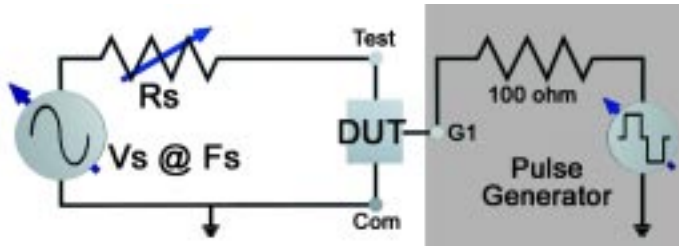

The gate output of the pulse generator is connected to the gate of the device. The device output terminals are connected to the ProTrack I test and common leads. The pulse generator voltage is then increased until the device turns on. The example below shows the **off** and **on** state of a common SCR.

The pulse generator can apply either a DC voltage or a pulsed square wave to the gate-fired device. The amplitude is variable and can be controlled manually or using the Huntron Workstation for Windows software.
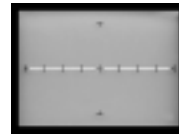
The **OFF** state of the SCR shows an open signature
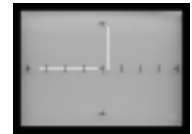
The **ON** state of the SCR shows a diode signature as the device is triggered

Huntron ProTrack Scanner I

The Huntron ProTrack Scanner I accessory allows the testing of components using standard IC clips and cables. This combination allows for faster testing by scanning up to 128 pins.

The ProTrack Scanner I consists of two 64 pin channels with IDC headers for cable connections and ZIF (zero-insertion force) sockets for testing discrete ICs. The ProTrack I Model 20 and ProTrack Scanner I combination can be used as a stand-alone system to make quick comparisons between two PCAs. When connected to a personal computer running Huntron Workstation for Windows® software, the ProTrack I and Scanner I can scan and store component signatures for later reference when testing suspect boards.

The Benefits of the ProTrack Scanner
- Connect to PCA connectors for a quick "first pass" test
- The standard IDC headers simplify connecting external fixtures such as a bed-of-nails
- Screen ICs in the ZIF socket prior to PCA insertion

Huntron Robotic Probers

Huntron supplies Robotic Probers for use in automated test development. Automatic probing has been demonstrated to significantly reduce test times over manual test methods.

No expensive fixtures are required and most complex SMT devices can be accessed. Huntron Probers act as a universal fixture and, because of it's fast time to test, can be used in first article test applications before the permanent fixture is built.
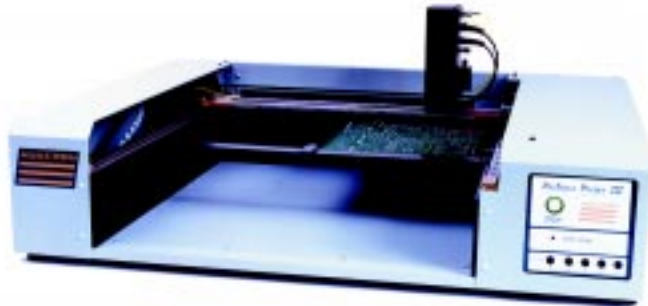

Huntron ProTrack Prober II   Huntron ProTrack Prober III

Huntron Robotic Probers come in two sizes depending on the circuit board size. The Huntron Prober II is designed for board sizes up to 14 by 14 inches. The Huntron Prober III can handle circuit boards up to 22 by 23 inches.

Robotic Probers utilize a built-in camera system to target component pins for testing. Component positions are referenced to alignment points selected at the beginning of the test creation. Teaching package types such as dual-inline, single-inline, quad and multi-row is made easy by targeting on-screen cross hairs on component pins or pads. Key points on the component such as the first, last and diagonal pins are used to quickly locate and teach the remaining pins.

Components can be scanned individually or by entire sections. The component signatures are stored for comparison for use when scanning suspect circuit boards.
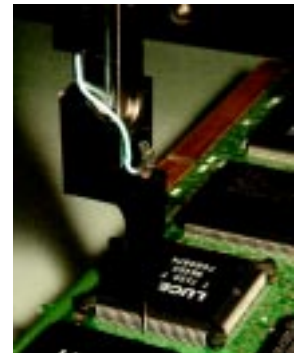
The Benefits of ProTrack Robotic Probers
- Interface to components down to 20 mils (0.020") lead spacing
- Significantly decrease test development and run times compared to manual methods
- Standard BNC connectors enable the use of external test equipment such as oscilloscopes
- Extend the testing capabilities by combining with a Huntron ProTrack Scanner for interface to additional reference points, i.e. bed-of-nails, PCA connectors

Huntron Hardware Specifications

ProTrack I Model 20

Electrical
Open Circuit Voltage (Vs: 24 selections of peak voltage):
    200mV, 400mV, 600mV, 800mV
    1V to 20V in 1V steps
    including 10V (Low), 15V (Med 1), 20V (Med 2)
Source Resistance (Rs: 16 selections of resistance):
    10Ω, 20Ω, 50Ω, 100Ω, 200Ω, 500Ω, 1kΩ, 2kΩ, 5kΩ, 10kΩ, 20kΩ,
    50kΩ, 100kΩ, 54Ω (Low), 1.2kΩ (Med 1), 26.7kΩ (Med 2)
Maximum Current: 200 mApk (Vs/Rs; short circuit current)
Frequency (Fs: 36 selections of frequency):
    20Hz to 190Hz in 10Hz steps
    200Hz to 1.9kHz in 100Hz steps
    2kHz to 5kHz in 1kHz steps
Channels
    Number   2
    Display modes   A, B, Alt, A+B
    Overvoltage Protection   Circuit breaker

Pulse Generator
    Level   0 to ±10V
    Width (pulse mode)   2% to 50% duty cycle
    Source resistance   100Ω
    Short circuit current   100mA max.
Displays
    CRT   monochrome, 2.8" (7cm) diagonal
    LCD   full graphic, 128 x 64 pixels
Power Requirements
    Line Voltage/Freq.   90VAC to 250VAC / 47Hz to 63Hz
    Power   30W

GENERAL
Dimensions   11.6" W x 4.5" H x 15" D
    (30cm W x 11.5cm H x 38cm D)
Weight   10 lbs. (4.5kg)

Warranty   All ProTrack products, 1 year limited

ProTrack Scanner I

Electrical
Channels
    Number   2
Pins
    Test   64 per channel
    Common   64 per channel
Connectors
    IDC   64 pins each channel
    ZIF   40 pins each channel

Power Requirements
    Line Voltage   100VAC to 250VAC
    Frequency   47Hz to 63Hz
    Power   10W

GENERAL
Dimensions   12" W x 3" H x 19.5" D
    (30.5cm W x 7.6cm H x 49.5cm D)
Weight   5 lbs 8 oz. (2.5kg)

Warranty   All ProTrack products, 1 year limited

Huntron Robotic Probers

Maximum Board-Under-Test Size
    ProTrack Prober II   14" x 14" (35.6cm x 35.6cm)
    ProTrack Prober III   22" x 23" (56cm x 58cm)

Maximum Board-Probing Area
    ProTrack Prober II   12" x 14" (30.4cm x 35.6cm)
    ProTrack Prober III   22" x 19" (56cm x 48cm)

Maximum Allowable Component Height on Board Under Test
    ProTrack Prober II   2.375" (6cm)
    ProTrack Prober III   4" (10cm)

Minimum Probe Speed   4 inches/second (10cm/second)

Accuracy
    ProTrack Prober II   ±0.004" (0.01cm) over 10 inches (30cm)
    ProTrack Prober III   ±0.004" (0.01cm) over 6 inches (30cm)

Minimum Resolution
    ProTrack Prober II   0.001" (0.002cm)
    ProTrack Prober III   0.002" (0.005cm)

Maximum Z Travel
    ProTrack Prober II   3" (7.6cm)
    ProTrack Prober III   3" (7.6cm)

Vision System   CCD 192 x 165 pixels

Light Source   660nm LED w/max 1000 mcd

Light Filtering   Narrow bandpass 660nm ±10nm

Lens System   10.7mm focal length

Focus Adjustment   Manual w/5" (12.7cm) depth of field

Power Requirements
    Line Voltage   115VAC or 230VAC
    Power   200W

Dimensions
    ProTrack Prober II   20" W x 12" H x 24" D
    (50cm W x 30cm H x 60cm D)
    ProTrack Prober III   36" W x 14" H x 29" D
    (91cm W x 36cm H x 74cm D)
Weight
    ProTrack Prober II   45 lbs (21kg)
    ProTrack Prober III   190 lbs (86kg)

Warranty   All ProTrack products, 1 year limited

Test Creation using the Huntron Workstation for Windows® Software

Huntron Workstation for Windows software is designed to bring a high level of efficiency and flexibility to board troubleshooting.

Huntron Workstation for Windows Features

- Create custom test routines for low volume manufacturing and rework applications

- Support of optional utilities for conversion of CAD data for test creation

- Easily store and modify test databases

- View, print and store test results immediately

- Transfer test information between Huntron workstations

- Support for Windows 95/98/ME and Windows NT/2000

The Huntron Workstation for Windows Main Interface
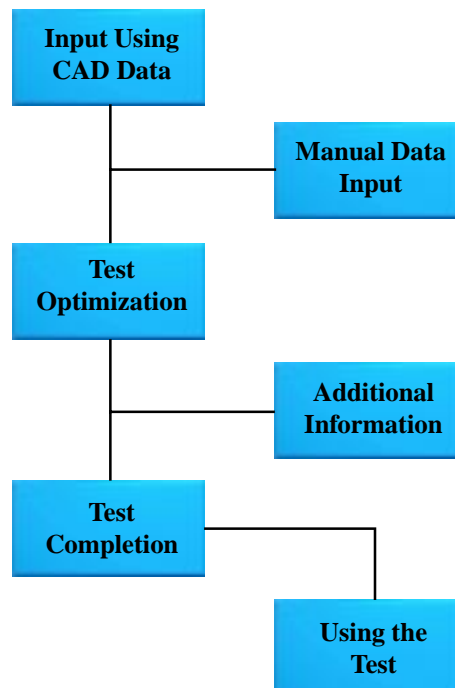
Test Creation Overview

Input Using CAD Data
Data from board layout packages can be used to create Huntron board tests.

Input Using CAD Data

Manual Data Input

Manual Data Input
Test databases can be created without board documentation.

Test Optimization
Signatures are stored and modifications are made to optimize the test parameters.

Test Optimization

Additional Information

Additional Information
Optional test information, such as board layout graphics can be added.

Test Completion
Additional signatures are stored, optional scan orders are created and the test is verified.

Test Completion

Using the Test

Using the Test
Boards are scanned and results are viewed and analyzed.

Huntron Workstation for Windows Software
Create Tests Using CAD Data or Input Manually

- Export CAD data from PCB layout packages

- Translate CAD data into a Huntron import file

- Huntron Workstation for Windows software uses the import files to create a component or net test

- View the board layout and multiple component interconnections to assist in fault location
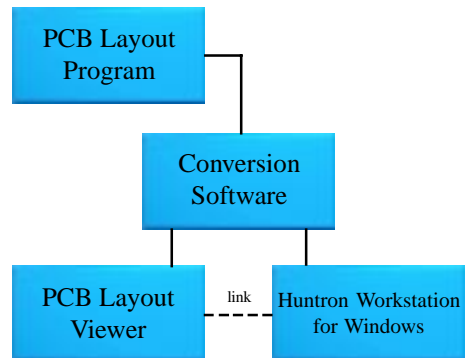

- Create a component by entering Name, Package Type and Number of Pins

- Component Type, Replacement and Supplier information can be added and is shown on the Bill of Materials report

- Specific instructions relating to the board, section and component can be entered

- To maximize flexibility, a component pin or group of pins can be edited

- Choose up to four test range combinations per component pin and select a specific pin or pins to use as the test common

- The pin name can be changed to reflect pin function such as "A0" for an address line or "+5V" for a voltage line

- Use Auto Range to automatically select the best of the indicated test range combinations

- Robotic Prober users can teach component pin locations using a built-in camera system

- Key points on the component such as the first, last and diagonal pins are used to quickly locate and teach the remaining pins
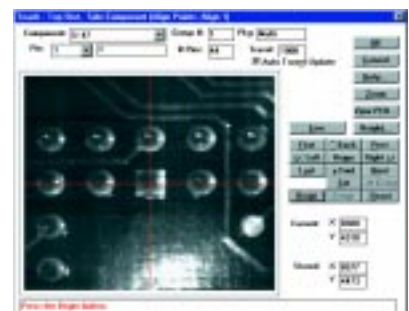
Huntron Workstation for Windows Software
Optimizing and Adding to the Test

- View component signatures on-screen, eight pins at a time

- Verify signatures before storing

- Click on any signature box to zoom in for a closer look

- Use the horizontal and vertical scroll bars to view other ranges and pins
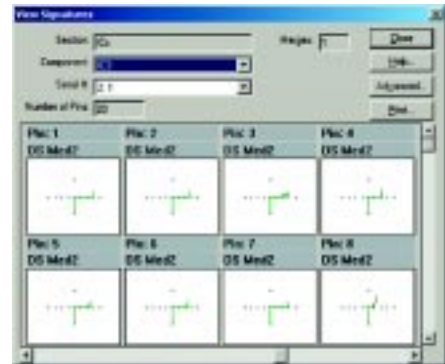
- Operate the Huntron ProTrack and view signatures using on-screen Manual Control

- Manually adjust test range parameters to obtain the most useful signatures

- Connect to components using hand held probes, scanning cable interface or a robotic Prober
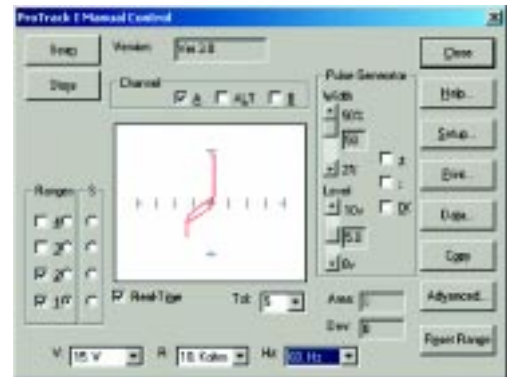
- Create a custom scan order of components called a Section Scan List to improve test efficiency

- Easily assemble a custom Scan List by selecting from the full section list of components

- Use scan lists to adjust the scan order, scan only certain components such as high fatality devices or divide a section into functional blocks

- The Huntron Button feature allows you to run other Windows applications with the click of a button

- Attach to programs such as graphics viewers to display schematic or board layout diagrams, databases for board history information or component pin-out data from a manufacturer's CD-ROM

# Huntron Workstation for Windows Software
Completing and Using the Test

- Store up to 10 signature sets per component by serial number to address possible differences between manufacturers

- Store signatures as a Merge Min/Max set that can be enhanced by subsequent component scans

- Replace and overwrite previously stored signatures

- Scan the entire section of components or one component at a time

- Results are presented in a clear PASSED or FAILED display

- Re-scan a section or component to test for intermittent failures
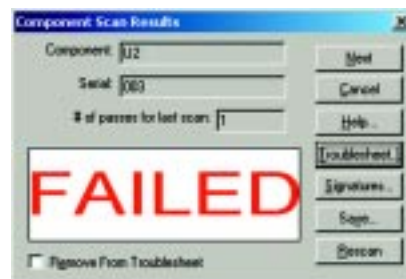
- The Troublesheet shows the signatures of all the different test points with the greatest differences being displayed first

- The current and stored signatures are displayed in contrasting colors for easy comparison

- Export Troublesheet information as an ASCII delimited file for use in an external database or spreadsheet application
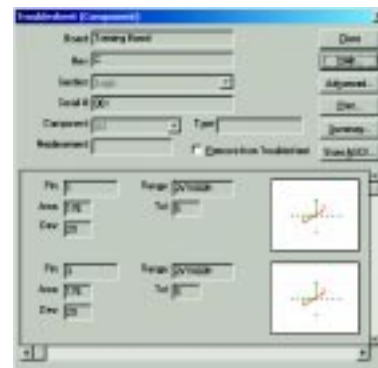
- Get a close real-time look at signature differences with the View Signatures Zoom feature

- Jump to on-screen Manual Control for further analysis

- To assist troubleshooting problem boards, link to a board layout viewer with the click of a button

Customer Services

Huntron staff and representatives are available throughout the pre-sale and post-sale processes of your test equipment purchase. We are ready to assist in the selection process including cost justification, the design process including test program generation, and the installation process including operator training and fine tuning of test procedures.

Training

Send your technicians to Huntron's in-house training facility near Seattle, WA, for an intensive three day program. Our lab is equipped with a full compliment of Huntron products allowing each student the maximum hands-on opportunity. Attendees are required to bring typical circuit boards they are responsible for testing. This allows them to develop test routines and come away with solutions they can apply immediately.

Test Program Generation

Huntron offers custom test programming services to develop base line programs for your printed circuit assemblies. Our Technical Support personnel have many years of troubleshooting experience in real world applications and will provide a good starting point for your test program. All you will need to do is the final adjustments to customize the procedure, thus significantly reducing your test development times.

Service and Support

Huntron products are supported worldwide through our network of sales and service facilities. Whether it is sales questions, hardware repair or technical support, we are ready to get you up and running with a minimum of delay.

Contact our Technical Support group at 1-800-426-9265 for more details of our programming and training services or visit our web site at www.huntron.com.

Huntron products are available worldwide through our network of exclusive Representatives. For the name of the Sales Office near you, call +3010 59 86 179 or visit our web site at www.darlas.gr

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