



The Thermo Scientific ECAT Lightning Test System (LTS) is a modular test platform, which tests to the lightning simulator requirements of RTCA DO-160 Section 22. The system is expandable to meet Boeing, Airbus, EUROCAE and other avionic standards.

## Thermo Scientific ECAT Lightning Test System (LTS)

Modular lightning test system platform for testing to multiple avionic standards



### Features

- Safe
- Quick Test Setup
- Simple User Interface
- Waveforms 1, 2, 3, 4, 5A, 5B and 6
- Levels 1, 2, 3, 4 and 5+
- Single Stroke, Multiple Stroke, Multiple Burst and Pin Injection from the same front panel
- Modular architecture

### When Failure is Not an Option

With its fully-automated test operations, the Thermo Scientific ECAT Lightning Test System (LTS) yields reliable, repeatable and accurate test results to avionics lightning simulator requirements of RTCA DO 160 Section 22. It is easily expandable to meet Boeing, Airbus, EUROCAE and other requirements.

Building on the legacy of proven ECAT field-upgradeable modular technology, featuring fast test set-up, intuitive programming and front panel and remote computer control. On-site calibration and field service is available worldwide.

### System Description

The ECAT LTS is configured as a basic test system, available as a Level 3, Level 4, or Level 5 tester. All test systems feature single-stroke, multiple-stroke, pin injection and multiburst test capability, integral to the system controls, without any external connections.

The system is composed of a Frame that contains the power and control for the system. Waveforms are produced from the modules inserted into the Frame. Both the Frame and modules can be purchased separately. Owning multiple frames allow increased capability by "swapping" modules between frames, and testing with each frame simultaneously.

### The Total System

The Thermo Scientific Lightning Test System (LTS) provides a modular test platform based on the lightning simulator requirements of RTCA DO-160 Section 22, EUROCAE, Boeing, Airbus and others. Based on the proven modular construction of the Thermo Scientific ECAT System, the LTS can be upgraded in the field by the user or in the factory as requirements change by the addition or replacement of individual modules.

The LTS can perform Pin Injection, Cable Bundle and Ground Injection testing with Single Stroke, Multiple Stroke and Multiple Burst modes from the same module. The system can be expanded as test requirements evolve. Purchase of additional frames allows the operator to double his capacity using existing modules, without purchasing another system.

### Turn-key Testing

With the advent of the Thermo Scientific LTS, lightning testing of avionics comes of age and provides an easy to use, turn-key solution for test engineers and technicians.

Until recently, the availability of commercial equipment for testing to lightning standards for avionics, such as RTCA DO-160, has been limited. Most test equipment used in the industry was home made: difficult and time consuming to set-up and awkward to use, requiring skilled engineers for their operation and maintenance.

Testing with the LTS insures repeatable, reproducible test results while virtually eliminating tester set-up time. Waveforms and functions are selected with the push of a button rather than by reconfiguring test equipment and wiring. The LTS can significantly reduce total test time resulting in significant cost savings.

### Versatile, Modular Architecture

LTS waveform simulators are completely modular, using plug-in modules that provide all the waveforms required to meet the lightning test requirements of RTCA DO-160, EUROCAE, Boeing, Airbus and others.

Any Thermo Scientific LTS simulator can be readily expanded, at any time, for testing to new or modified standards. These modules can be added or replaced by the operator, without requiring a field service engineer, or shipping to the factory. Rather than purchasing or constructing a new tester, replacement or addition of plug-in modules saves time and money. Upgrades are considerably less expensive than individual instruments, and what's more, LTS modular systems are totally open-ended and will be able to handle future requirements, whatever they may be.

Thermo Scientific's plug-in architecture protects you when standards are changed or superseded as the industry understanding of lightning threats to aircraft avionics evolves, and as industry standards evolve.

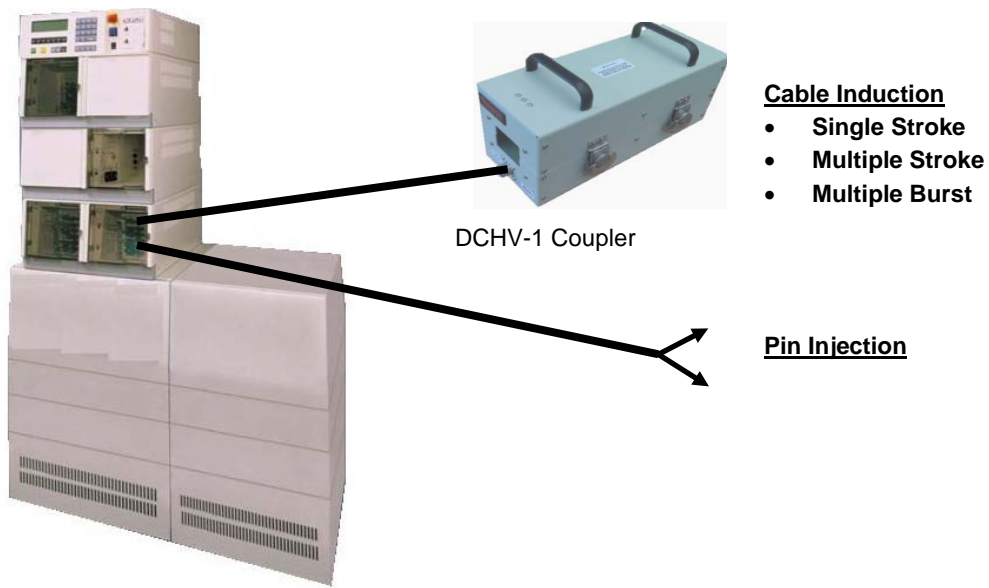
### Currently available LTS Modules

Waveform	Pin Injection	Single Stroke	Multiple Stroke	Multiple Burst	Description	Plug-in Module
WF1		♦	♦		6.4 us x 69 us Current Wave	D561, D566
WF2	♦*	♦	♦		≤100 ns x 6.4 us Voltage Wave	D562
WF3 - 1 MHz	♦	♦	♦	♦	1 MHz Oscillatory Voltage Wave	D563
WF3 - 10 MHz		♦	♦	♦	10 MHz Oscillatory Voltage Wave	D563
WF4	♦	♦	♦		6.4 us x 69 us Voltage Wave	D561, D566
WF5A	♦	♦	♦		40 us x 120 us Current Wave	D561, D567
WF5A <small>Airbus / Boeing</small>		♦	♦		40 us x 120 us Voltage & Current Wave	D568
WF5B	♦	♦	♦		50 us x 500 us Current Impulse	D564
WF6				♦	0.25 us x 4.0 us Current Impulse	D569

### One example of the multiple standards supported for WF3 Multiple Burst Test Mode

LTS Display	Standards Compliance	Min Applic Time	Max # Trans	Max # Bursts	Time Between Bursts	Time Between Transients
DO160	DO160 Boeing D6-16050-5 Airbus ABD0100.1.2-F Airbus ABD0100.1.2-G	3 sec	20	3	30-300 ms	50-10,000 us
Airbus/E	Airbus ABD0100.1.2-E	15 sec	500	1	-----	10-10,000 us
Boeing-4	Boeing D6-16050-4 NH-90	3 sec	20	24	10-200 ms	10-50 us

**Example Test Setup for WF3 Single-Stroke, Multiple-Stroke, Multiple-Burst and Pin Injection from the same module front panel**



**Controller Front Panel Programming for above example**



1. Select Test Type: Pin Injection, Single Stroke, Multiple Stroke or Multiple Burst
2. Select Waveform type, voltage levels and timing



**It doesn't get any easier than this!**

## Specifications

### Model F- LTS

LTS Frame/Controller for the operation of individual modules

#### General Specifications

System Voltage	190-230 VAC, 50/60 Hz, 3Ø Wye 30 Amax (Optional 190-230 VAC, 50/60 Hz, 1Ø 50 Amax)
Test Types	Single Stroke Multiple Stroke: 1-24 pulses; 10 – 200 ms fixed, random or irregular 1 <sup>st</sup> pulse and subsequent pulse spacings Multiple Burst: 1-500 pulses; 50 – 1000 us fixed, random or irregular pulse spacing; 1-24 bursts; 30 – 300 ms fixed, random or irregular burst spacing Pin Injection
Number of Tests	1 to 999
Test Repetition Rate	3 s to 255 s (at maximum level, min rep rate may be >3 s)

#### Control Interface

Display	8x40 character LCD
Remote	USB, RS232, Fiber-optic

#### Safety Features

Emergency Off switch
External Interlock for users (mats, curtains, etc)
Lockout/Tagout capability

#### Module Bays

3 Full-width / 4 Half-width plug-in module capability
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#### Environmental Operating Conditions

Temperature	+15°C to +35°C
Humidity	10-75%, non-condensing

#### Physical Specifications

Height	160 cm (63 in)
Width	107 cm (42 in)
Depth	69 cm (27 in)
Weight	360 kg (800 lb) fully configured

#### Options Available

LTS-CASTERS	Add-on base for LTS with large 5" casters to facilitate high threshold and/or aggressive ramp installations. Increases LTS caster ground clearance from 1.5" to >5".
LTS-1PHASE	Adds power converter to accept 190-230 VAC, 50/60 Hz, 1Ø 50 Amax to power the LTS

#### CE Marking

Safety and EMC Directives
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### Model D567-Lx

LTS Module for WF5A (x indicates level 3, 4 or 5)

For Cable Induction use Model DCI-1 Cable Induction Coupler

#### General Specifications

WF5A (CI,GI)	Single Stroke , 40/120 µs, 50-10000 A, 1300 Voc Multiple Strokes, 40/120 µs, 30-1500 A
WF5A Pin Injection	40/120 µs, 50-1800 Voc/50-1800 Asc = 1 Ohm

#### Safety Features

Door Interlocks
Safety Sockets
Outputs only connected during Transient
Active Module indicator LED
Voltage Present indicator LED

#### Environmental Operating Conditions

Operating temperature	+15°C to +35°C
Humidity	10-75%, non-condensing

#### Physical Specifications

Full-width ECAT plug-in module
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#### CE Marking

Safety and EMC Directives
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### Model D561-Lx

LTS Module for WF1, 4, 5A (x indicates level 3, 4 or 5)

For Cable Induction use Model DCI-1 Cable Induction Coupler

#### General Specifications

WF1 (CI,GI)	Single Stroke , 6.4/69 µs, 50-3800 A, 2000 Voc Multiple Strokes, 6.4/69 µs, 25-1200 A
WF4 (GI)	Single Stroke , 6.4/69 µs, 25-2000V, 2100 Asc Multiple Strokes, 6.4/69 µs, 10-600 V
WF4 Pin Injection	6.4/69 µs, 50-2000 Voc/10-400 Asc = 5 Ohm
WF5A (CI,GI)	Single Stroke , 40/120 µs, 50-10000 A, 1300 Voc Multiple Strokes, 40/120 µs, 30-1500 A
WF5A Pin Injection	40/120 µs, 50-1800 Voc/50-1800 Asc = 1 Ohm

#### Safety Features

Door Interlocks
Safety Sockets
Outputs only connected during Transient
Active Module indicator LED
Voltage Present indicator LED

#### Environmental Operating Conditions

Temperature	+15°C to +35°C
Humidity	10-75%, non-condensing

#### Physical Specifications

Full-width ECAT plug-in module
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#### CE Marking

Safety and EMC Directives
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### Model D566-Lx

LTS Module for WF1, 4 (x indicates level 3, 4 or 5)

For Cable Induction use Model DCI-1 Cable Induction Coupler

#### General Specifications

WF1 (CI,GI)	Single Stroke , 6.4/69 µs, 50-3800 A, 2000 Voc Multiple Strokes, 6.4/69 µs, 25-1200 A
WF4 (GI)	Single Stroke , 6.4/69 µs, 25-2000V, 2100 Asc Multiple Strokes, 6.4/69 µs, 10-600 V
WF4 Pin Injection	6.4/69 µs, 50-2000 Voc/10-400 Asc = 5 Ohm

#### Safety Features

Door Interlocks
Safety Sockets
Outputs only connected during Transient
Active Module indicator LED
Voltage Present indicator LED

#### Environmental Operating Conditions

Temperature	+15°C to +35°C
Humidity	10-75%, non-condensing

#### Physical Specifications

Full-width ECAT plug-in module
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#### CE Marking

Safety and EMC Directives
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## Model D562-Lx

LTS Module for WF2 (x indicates level 3, 4 or 5)  
For Cable Induction use Model DCV-1 Cable Induction  
Coupler (use 2 for Level 5)

### General Specifications

WF2 (CI,GI) Single Stroke , 0.1/6.4  $\mu$ s, 25-1920 V, 1700 Asc  
Multiple Strokes, 0.1/6.4  $\mu$ s, 25-1200 V

WF2 Pin Injection Coming soon on new module

### Safety Features

Door Interlocks  
Safety Sockets  
Outputs only connected during Transient  
Active Module indicator LED  
Voltage Present indicator LED

### Environmental Operating Conditions

Operating temperature +15°C to +35°C

Humidity 10-75%, non-condensing

**Physical Specifications** Half-width ECAT plug-in module

**CE Marking** Safety and EMC Directives

## Model D564-Lx

LTS Module for WF5B (x indicates level 3, 4 or 5)  
For Cable Induction use Model DCI-1 Cable Induction Coupler

### General Specifications

WF5B (CI,GI) Single Stroke , 50/500  $\mu$ s, 150-6000 A, 900 Voc  
Multiple Strokes, 50/500  $\mu$ s, 30-1500 V

WF5B Pin Injection 50/500  $\mu$ s,50-1800 Voc/50-1800 Asc = 1 Ohm

### Safety Features

Door Interlocks  
Safety Sockets  
Outputs only connected during Transient  
Active Module indicator LED  
Voltage Present indicator LED

### Environmental Operating Conditions

Operating temperature +15°C to +35°C

Humidity 10-75%, non-condensing

**Physical Specifications** Full-width ECAT plug-in module

**CE Marking** Safety and EMC Directives

## Model D568-L5

LTS Module for WF5A for Airbus/Boeing specifications.  
For Cable Induction up to 1500V/1500A use 2 Model DCVI-1  
Cable Induction Couplers.  
2000V/2000A requires 3 DCVI-1 couplers.

### General Specifications

WF5A (SS, MS) 40/120  $\mu$ s, 50-2000 voltage & current.  
Output impedance =1 Ohm

### Safety Features

Door Interlocks  
Safety Sockets  
Outputs only connected during Transient  
Active Module indicator LED  
Voltage Present indicator LED

### Environmental Operating Conditions

Temperature +15°C to +35°C

Humidity 10-75%, non-condensing

**Physical Specifications** Full-width ECAT plug-in module

**CE Marking** Safety and EMC Directives

## Model D563-Lx

LTS Module for WF3-1 MHz and 10 MHz (x indicates level 3, 4  
or 5)  
For Cable Induction use Model DCHV-1 Cable Induction  
Coupler

### General Specifications

WF3 (CI,GI) Single Stroke , 1 MHz, 25-4000 V, 160 Asc  
Multiple Strokes, 1 MHz, 25-2400 V  
Multiple Burst, 1 MHz, 25-2300V  
Single Stroke , 10 MHz, 25-4000 V, 60 Asc  
Multiple Strokes, 10 MHz, 25-2400 V  
Multiple Burst, 10 MHz, 25-2300V

WF3 Pin Injection 1 MHz, 30-4000 Voc/1.2-160 Asc = 25 Ohm

### Safety Features

Door Interlocks  
Safety Sockets  
Outputs only connected during Transient  
Active Module indicator LED  
Voltage Present indicator LED

### Environmental Operating Conditions

Operating temperature +15°C to +35°C

Humidity 10-75%, non-condensing

### Physical Specifications

Full-width ECAT plug-in module

### CE Marking

Safety and EMC Directives

## Model D569-Lx

LTS Module for WF6 (x indicates level 3, 4 or 5)  
For Cable Induction use Model DCHV-1 Cable Induction  
Coupler

### General Specifications

WF6 (CI,GI) Multiple Burst, 0.25/4.0  $\mu$ s, 5-160 A, 4500Voc

### Safety Features

Door Interlocks  
Safety Sockets  
Outputs only connected during Transient  
Active Module indicator LED  
Voltage Present indicator LED

### Environmental Operating Conditions

Operating temperature +15°C to +35°C

Humidity 10-75%, non-condensing

### Physical Specifications

Full-width ECAT plug-in module

### CE Marking

Safety and EMC Directives



**Accessories**



**Model DCI-1**

Cable Induction Coupler for WF1, 4, 5A, 5B

**General Specifications**

WF1	6.4/69 $\mu$ s, >2000 Vlimit, >5000 Atest
WF4	See Technical Note #201
WF5A	40/120 $\mu$ s, >1200 Vlimit, >10,000 Atest
WF5B	50/500 $\mu$ s, >900 Vlimit, >6000 Atest

**Safety Features**

Double Insulated
Safety Sockets

**Physical Specifications**

Height	21.6 cm (8.5 in)
Width	28.3 cm (11.1 in)
Depth	34.3 cm (13.5 in)
Aperture	3.8 cm x 7.6 cm (1.5 in x 3 in)
Weight	48 kg (106 lb)

**CE Marking**

Safety and EMC Directives
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**Model DCV-1**

Cable Induction Coupler for WF2 (use 2 for Level 5)

**General Specifications**

WF2	0.1/6.4 $\mu$ s, >2000 Vtest, >1700 Alimit
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**Safety Features**

Double Insulated
Safety Sockets

**Physical Specifications**

Height	14.2 cm (5.6 in)
Width	12.7 cm (5.0in)
Depth	31.8 cm (12.5 in)
Aperture	3.8 cm x 5.1 cm (1.5 in x 2 in)
Weight	13 kg (29 lb)

**CE Marking**

Safety and EMC Directives
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**Model DCHV-1**

Cable Induction Coupler for WF3, 6

**General Specifications**

WF3/1 MHz	1 MHz, >4000 Vtest, >300 Alimit
WF3/10 MHz	10 MHz, >4000 Vtest, >20 Alimit
WF6	0.2/4 $\mu$ s, >4000 Vlimit, >160 Atest

**Safety Features**

Double Insulated
Safety Sockets

**Physical Specifications**

Height	14.2 cm (5.6 in)
Width	12.7 cm (5.0in)
Depth	31.8 cm (12.5 in)
Aperture	3.8 cm x 5.1 cm (1.5 in x 2 in)
Weight	13 kg (29 lb)

**CE Marking**

Safety and EMC Directives
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**Model D591**

Powered Pin Decoupler Module for Powered Pin Injection

**General Specifications**

Operating AC Voltage	0-244 VAC, 20 A
Operating DC Voltage	0-285DC, 10 A
Operating Frequency	0-400 Hz

**Safety Features**

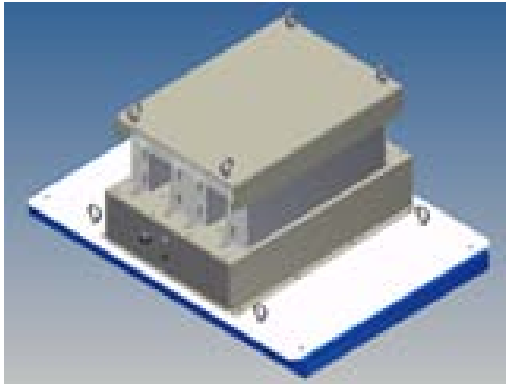
Safety Sockets
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**Physical Specifications**

Half-width ECAT plug-in module
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**CE Marking**

Safety and EMC Directives
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## Model DCVI-1

D568-L5 Cable Induction Coupler for Airbus/ Boeing WF5A specifications. Includes lift and ground plane.

Top is removable to allow cable bundle insertion within the coupler. Top section weight is 180 lb.

Ground Plane is 0.06 AL sheet, 1" perforated overhangs for attachment to adjacent ground planes if needed.

Calibration loop contains 1 turn.

2 DCVI-1 clamps required obtaining waveforms up to 1500V/ 1500A

3 DCVI-1 clamps required obtaining waveforms at 2000V/ 2000A

### General Specifications

WF5A (SS, MS) 40/120  $\mu$ s, 50-2000 voltage & current.

**Safety Features** Double Insulated  
Safety Sockets

### Transformer Physical Specifications

Height	34.3 cm (13.5 in)
Width	41.9 cm (16.5 in)
Depth	45.7 cm (18 in) cable length
Aperture	6.4 cm x 10.9 cm (2.5 in x 4.3 in)
Weight	362 kg (800 lbs)

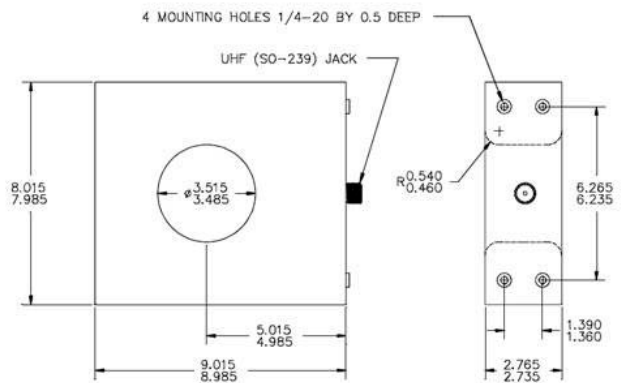
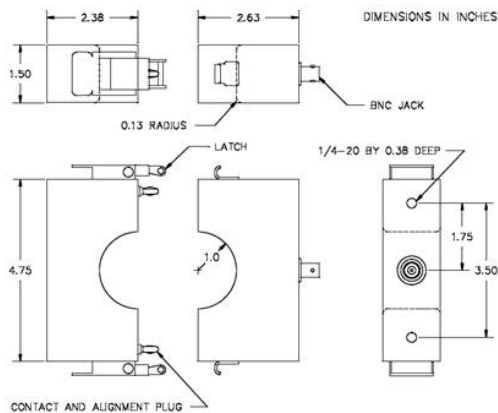
### Cart Physical Specifications

Lowered Height	29.8 cm (11.75 in)
Raised Height	92.7 cm (36.5 in)
Length	90.1 cm (35.5 in)
Width	59.69 (23.5 in)
Lift Time	25 strokes
Capacity	498.9 kg (1100 lbs)
Weight	130.2 kg (287 lb)

**DCVI-1 total weight = 493kg 1087 lb)**

**CE Marking** Safety and EMC Directives





### Model D111-1

5 KA Current Probe suitable for all waveforms except WF5B

#### General Specifications

Sensitivity	0.1 Volt/Ampere +1/-0%
Output resistance	50 Ohms
Scope Coupling	1 MΩ DC/AC
Maximum peak current	5,000 Amperes
Useable rise time	25 nanoseconds
Low frequency 3dB point	5 Hz
High frequency 3dB point	15 MHz
Operating temperature	0°C to +65°C

#### Physical Specifications

Output connector	BNC
Weight	1.7 kg (3.7 lb)

### Model D301X

50KA Current Probe suitable for WF5A, 5B

#### General Specifications

Sensitivity	0.01 Volt/Ampere +1/-0%
Output resistance	50 Ohms
Scope Coupling	1 MΩ DC/AC
Maximum peak current	50,000 Amperes
Useable rise time	200 nanoseconds
Low frequency 3dB cut-off	5 Hz
High frequency 3dB cut-off	2 MHz
Operating temperature	0°C to +65°C

#### Physical Specifications

Output connector	UHF (SO-239)
Weight	7.9 kg (17.5 lb)



### Model D5KV

Voltage Probe suitable for all Waveforms to 5KV

#### General Specifications

Max. input voltage	5 kV
Scope Coupling	1 MΩ DC/AC
System attenuation	100:1, +/-2%
System input resistance	50 MΩ
Input capacitance	< 6 pF
System BW (-3 dB)	400 MHz
Operating temperature	0 °C to +50 °C

#### Physical Specifications

Cable length	2 m
Output connector	BNC

### Model DPI-1

Probe accessory kit suitable for all Waveforms to 5KV

#### General Specifications

Safety Socket Dolphin Clips
Safety Socket Crocodile Clips
Safety Socket Pointed Probes
Safety Socket Grabber Probes
Safety Socket Lug Terminals
Safety Socket Clip-On
Safety Socket Cables
Safety Socket Leads
Safety Socket Plugs





### Model E000

ECAT Half-width module bay blank for unused module bay locations (required if no module is present in the bay). Cannot be used in lowest module bays.

**Physical Specifications**

Half-width ECAT plug-in module

**CE Marking**

Safety and EMC Directives



### Model E002

ECAT Full-width module bay blank for unused module bay locations (required if no module is present in the bay).

**Physical Specifications**

Full-width ECAT plug-in module

**CE Marking**

Safety and EMC Directives



### Model LTS-1PHASE

AC converter that allows LTS to operate from a single phase instead of a 3 phase AC source.

**General Specifications**

Input 1 $\emptyset$  208VAC +/-10% 50/60 Hz, 50 Amax

Output 3 $\emptyset$  208VAC +/-10% 50/60 Hz, 30 Amax

**Physical Specifications**

Height 50.8 cm (20 in)

Width 38.1 cm (15 in)

Depth 33 cm (13 in)

Weight 34 kg (75 lb)

**CE Marking**

Safety, EMC Directives and UL listed



### Model LTS-CASTERS

Add-on base for LTS with larger 5" casters to facilitate high threshold and/or aggressive ramp installations. Increases LTS caster ground clearance from 1.5" to 5"

**Physical Specifications**

Height 25 cm (9.8 in)

Width 107 cm (42 in)

Depth 69 cm (27 in)

Weight 34 kg (75 lb)

10/11 Draft. Specifications subject to change

ESD, EMC and TLP Test Systems

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