

# **Agilent 16442B Test Fixture**

## **User's Guide**

# Notices

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16442-90100

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Product Category: With reference to the equipment types in the WEEE Directive Annex I, this product is classed as a "Monitoring and Control instrumentation" product.

Do not dispose in domestic household waste.

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## Safety Summary

The following general safety precautions must be observed during all phases of operation, service, and repair of this instrument. Failure to comply with these precautions or with specific warnings elsewhere in this manual may impair the protections provided by the equipment. In addition, it violates safety standards of design, manufacture, and intended use of the instrument. Agilent Technologies, Inc. assumes no liability for customer's failure to comply with these requirements.

- *GROUND THE INSTRUMENT*

This is Safety Class I instrument. To minimize shock hazard, the instrument chassis and cabinet must be connected to an electrical ground. The power terminal and the power cable must meet International Electrotechnical Commission (IEC) safety standards.

- *DO NOT OPERATE IN AN EXPLOSIVE ATMOSPHERE*

Do not operate the instrument in the presence of flammable gases or fumes. Operation of any electrical instrument in such an environment constitutes a definite safety hazard.

- *KEEP AWAY FROM LIVE CIRCUITS*

Operation personnel must not remove instrument covers. Component replacement and internal adjustments must be made by qualified maintenance personnel. Do not replace components with power cable connected. Under certain conditions, dangerous voltages may exist even with the power cable removed. To avoid injuries, always disconnect power and discharge circuits before touching them.

- *DO NOT SERVICE OR ADJUST ALONE*

Do not attempt internal service or adjustment unless another person, capable of rendering first aid and resuscitation, is present.

- *DO NOT SUBSTITUTE PARTS OR MODIFY INSTRUMENT*

Because of the danger of introducing additional hazards, do not install substitute parts or perform any unauthorized modification to the instrument. Return the instrument to a Agilent Technologies Sales and Service Office for services and repair to ensure that safety features are maintained.

- *DANGEROUS PROCEDURE WARNINGS*

Warnings, such as example below, precede potentially dangerous procedures throughout this manual. Instructions contained in the warnings must be followed.

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### WARNING

**Dangerous Voltage, capable of causing death, are present in this instrument. Use extreme caution when handling, testing, and adjusting.**

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## Safety Symbols

The general definitions of safety symbols used on equipment or in manuals are listed below.



Instruction manual symbol: the product will be marked with this symbol when it is necessary for the user to refer to the instruction manual in order to protect against damage to the instrument.



Indicates dangerous voltage and potential for electrical shock. Do not touch terminals that have this symbol when instrument is on.



Protective conductor terminal. For protection against electrical shock in case of a fault. Used with field wiring terminals to indicate the terminal which must be connected to ground before operating equipment.



Frame or chassis terminal. A connection to the frame (chassis) of the equipment which normally includes all exposed metal structures.



Indicates earth (ground) terminal.



Alternating current.



Direct current.



ON (Supply).



OFF (Supply).



STANDBY (Supply).

CAT 1 Means INSTALLATION CATEGORY I. Measurement terminals on the rear panel comply with INSTALLATION CATEGORY I.

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### WARNING

The warning sign denotes a hazard. It calls attention to a procedure, practice, condition or the like, which, if not correctly performed or adhered to, could result in injury or death to personal.

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### CAUTION

The caution sign denotes a hazard. It calls attention to an operating procedure, practice, condition or the like, which, if not correctly performed or adhered to, could result in damage to or destruction of part or all of the product.

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# **User's Guide**



## User's Guide

Agilent 16442B test fixture (B1500A-A5F) is designed for testing electronic devices. You mount the suitable socket module on the 16442B, which allows you to easily connect various devices (DUTs) to measurement units.

The 16442B has thirteen channels:

- Six source/monitor unit (SMU) channels  
Up to three channels can be connected to SMUs by Kelvin connections.
- Two voltage source unit (VSU) channels
- Two voltage monitor unit (VMU) channels
- Two pulse generator unit (PGU) channels
- One ground unit (GNDU) channel

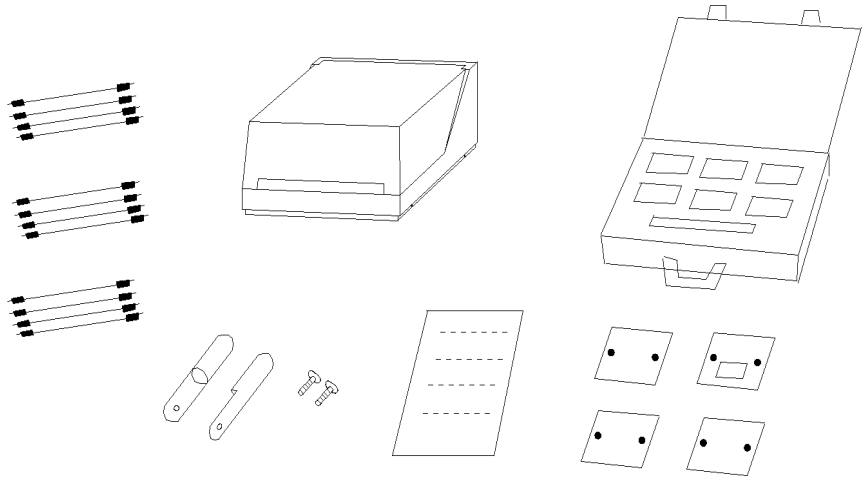
This manual contains the following sections:

- “Introduction”
- “Operation”
- “Installation”
- “Maintenance”
- “Specifications”
- “Options”



## Introduction

Agilent 16442B test fixture (B1500A-A5F) contains the following accessories:



Description	Agilent Part Number	Quantity
Test fixture	16442-60011	1
Stabilizer set (with flathead screws)	16442-60002	1
Carrying case for socket modules	16442-60142	1
Miniature banana to pin plug connection cable (black)	16442-61600	4
Miniature banana to pin plug connection cable (red)	16442-61601	4
Miniature banana to pin plug connection cable (blue)	16442-61602	4
Pin plug to pin plug connection cable (black)	16442-61603	3
Pin plug to pin plug connection cable (red)	16442-61604	3
Pin plug to pin plug connection cable (blue)	16442-61605	3

Description	Agilent Part Number	Quantity
Miniature banana to miniature clip connection cable (black)	16442-61606	3
Miniature banana to miniature clip connection cable (red)	16442-61607	3
Miniature banana to miniature clip connection cable (blue)	16442-61608	3
Miniature banana to miniature banana connection cable (black)	16442-61609	3
Miniature banana to miniature banana connection cable (red)	16442-61610	3
Miniature banana to miniature banana connection cable (blue)	16442-61611	3
Blank PTFE board	16058-60004	1
Dual-in-line package socket module (28-pin)	16088-60042	1
Universal socket module, 0.075 inch pitch	16442-60051	1
Universal socket module, 0.05 inch pitch	16442-60052	1
Connection pin set (10 ea.)	16088-60013	2
User's Guide (this document)	16442-90100	1

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**NOTE****Inspecting the 16442B upon Receiving**

When the 16442B test fixture (B1500A-A5F) arrives at your site, make sure that nothing is missing or damaged. Unpack the carton, then check the contents against figure and table above. For details about furnished and optional accessories, refer to "Specifications".

If anything is missing or damaged, contact your nearest Agilent Technologies sales office.

## Connection Cables

- Miniature Banana - Pin Plug

Reference data: Residual Resistance: 20 m $\Omega$  typical

Black: 16442-61600

Red: 16442-61601

Blue: 16442-61602



- Pin Plug - Pin Plug

Reference data: Residual Resistance: 20 m $\Omega$  typical

Black: 16442-61603

Red: 16442-61604

Blue: 16442-61605



User's Guide  
Introduction

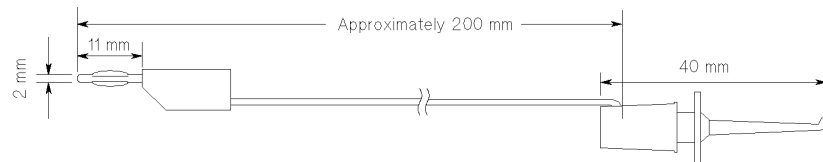
- Miniature Banana - Miniature Clip

Reference data: Residual Resistance: 20 m $\Omega$  typical

Black: 16442-61606

Red: 16442-61607

Blue: 16442-61608



- Miniature Banana - Miniature Banana

Reference data: Residual Resistance: 20 m $\Omega$  typical

Black: 16442-61609

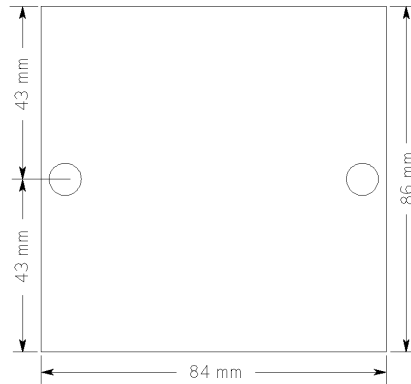
Red: 16442-61610

Blue: 16442-61611



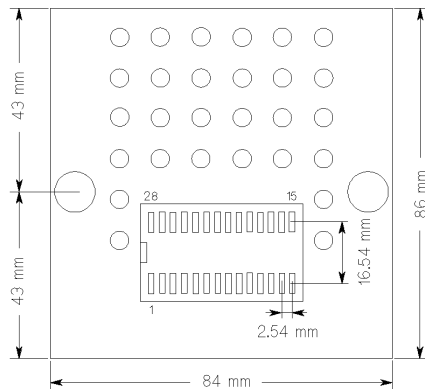
## Socket Modules

- Blank PTFE Board (16058-60004)



This insulation board has minimal leakage current, and so is good for extremely low current measurements.

- Dual-In-Line Packages (28-pin, 16088-60042)



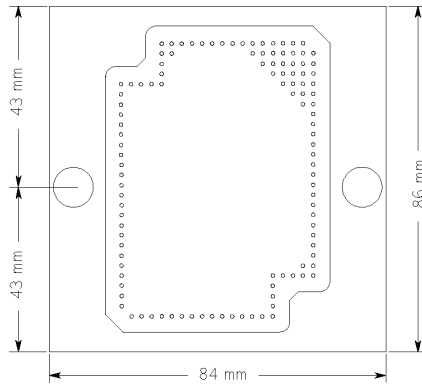
This socket module has a 28-pin dual-in-line socket.

Maximum Voltage: 230 V

## User's Guide

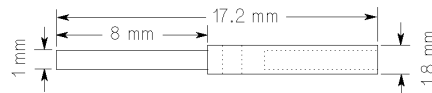
### Introduction

- Universal socket module  
0.1 inch pitch: 16088-60050, Option  
0.075 inch pitch: 16442-60051  
0.05 inch pitch: 16442-60052



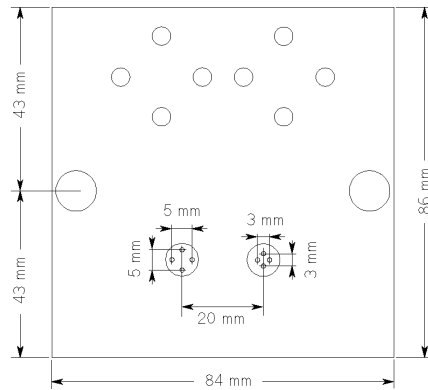
This socket module is for measurement of virtually any device--component, DIP IC, or small-scale circuit.

### Connection pin



This connection pin is used with a universal socket module.

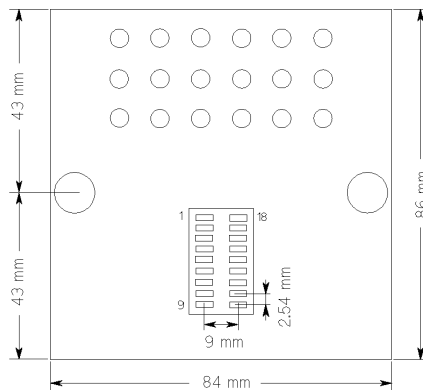
- TO-package (4-pin, 16088-60041, Option)



This socket module has two transistor sockets for measurement of three lead or four lead bipolar transistors and FETs.

Maximum Voltage: 200 V

- Dual-In-Line package (18-pin, 16088-60043, Option)



This socket module has an 18-pin dual-in-line socket.

Maximum Voltage: 230 V

## Operation

This section is organized into the following sections:

- “Circuit Schematic”
- “Attaching Socket Module”
- “Mounting and Wiring DUT on Socket Module”

Select the proper environment to execute the measurements. Place the 16442B test fixture (B1500A-A5F) on a flat surface. The 16442B shields from electromagnetic interference, but Agilent Technologies recommend that the measurement is performed in as noiseless environment as possible for more stable and accurate measurement results.

You place the DUT into the provided socket modules in the 16442B, then measure the DC characteristics by using the connected measurement units.

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**WARNING**

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**To prevent electric shock, be sure to connect the cable between the interlock (Intlk) terminals of measurement instrument and the 16442B before performing measurements.**

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**WARNING**

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**Do *not* operate the 16442B while the High Voltage indicator is lit. Dangerous voltages of up to 200 V may be present on the connection between measurement units and DUT.**

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**WARNING**

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**Do *not* get connection cables caught in the lid of the 16442B during measurements. Dangerous voltage of up to 200 V may be present on the connection cables.**

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**CAUTION**

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To prevent damage to instrument or DUT, *do not* remove or attach DUT in the 16442B when voltage or current is present.

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**CAUTION**

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*Do not* touch any metal surface that is in the circuit path. Oil, perspiration, and dirt prevent good electric contact and degrade measurement accuracy.

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**NOTE**

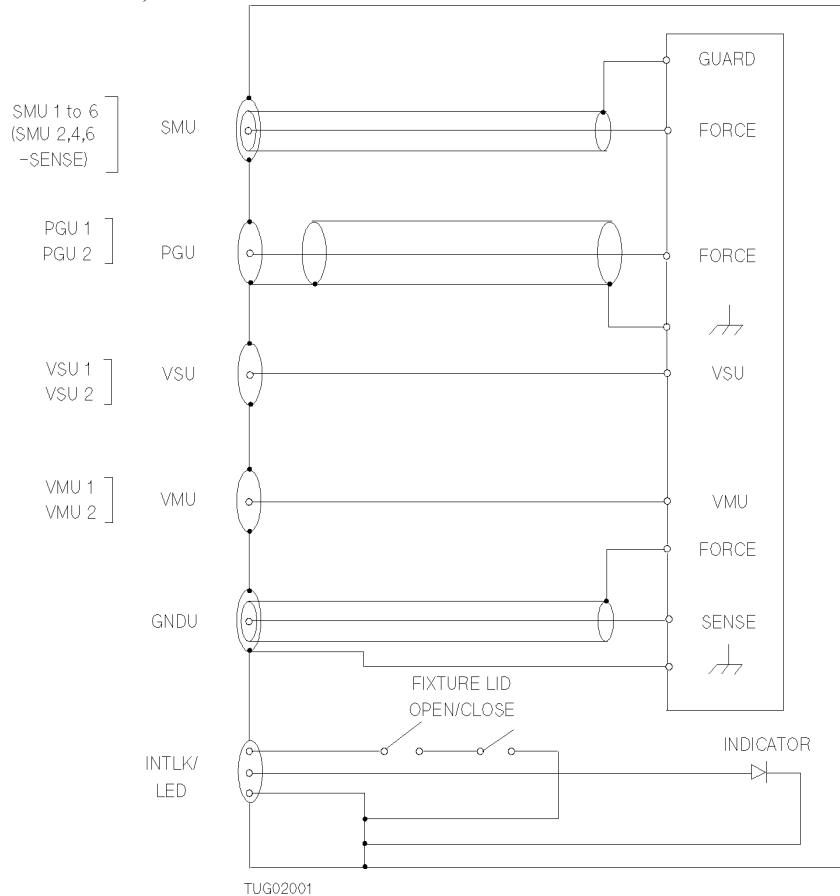
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After setting up the 16442B and DUT, confirm that the connections are correct. And shut the lid of the 16442B to close the interlock switches.



## Circuit Schematic

The following figure shows the circuit schematic of the 16442B test fixture (B1500A-A5F).



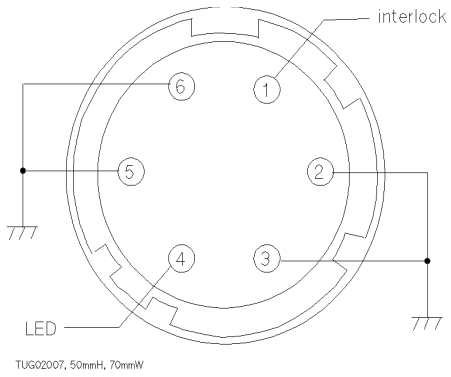
The 16442B is equipped with an interlock (Intlk) terminal, which prevents the user from getting an electric shock during operation.

If more than  $\pm 40/42$  V, depends on the instrument, will be forced to the 16442B, be sure to connect Intlk terminal of the 16442B to Interlock terminal of measurement instrument such as the Agilent 4155/4156 and E5270 using an Interlock/LED cable (16493J-001 for 1.5 m, 16493J-002 for 3.0 m).

When the lid of the 16442B is open, two interlock switches are open. The instrument recognizes that the lid of the 16442B is not closed and does not output high voltage (more than  $\pm 40/42$  V).

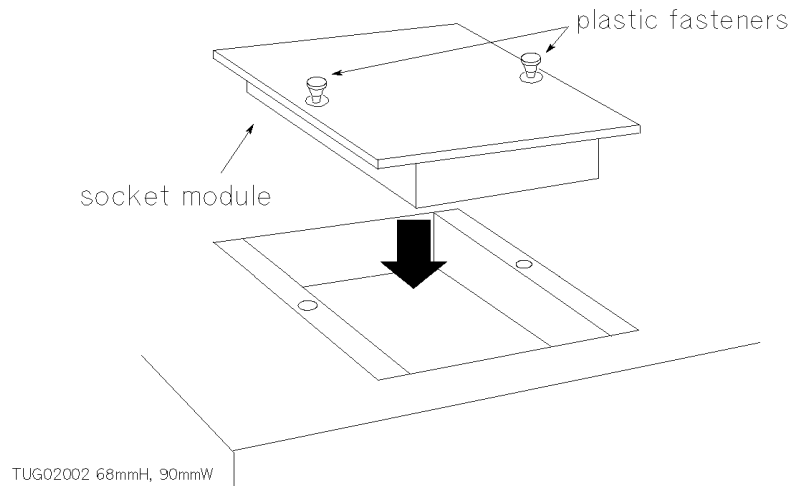
## User's Guide Operation

The following figure shows pin assignment of the Intlk terminal.



## Attaching Socket Module

After choosing correct socket module for DUT, install the socket module into the 16442B test fixture (B1500A-A5F) . The following figure shows how to attach socket module to the 16442B.



Use the following procedure to attach the socket module:

1. Confirm that voltage or current is *not* applied to the 16442B.
2. Open the lid of the 16442B.
3. Check that the black plastic fasteners of the socket module are unlocked (pulled up).
4. Push the socket module onto the 16442B.
5. Press the black fasteners down to lock the socket module into place.

Use the following procedure to remove a socket module from the 16442B:

1. Confirm that voltage or current is *not* forced to the 16442B.
2. Open the lid of the 16442B.
3. Disconnect the connection cables.
4. Pull up the black plastic fasteners on both sides of the socket module.
5. Lift the socket module from the 16442B.

## Mounting and Wiring DUT on Socket Module

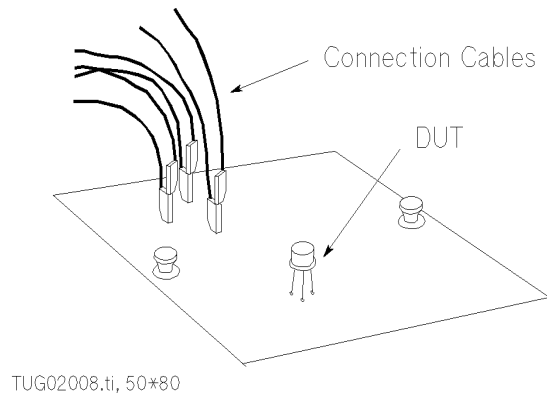
Mount and wire the DUTs as shown below:

### Non-Kelvin Connections

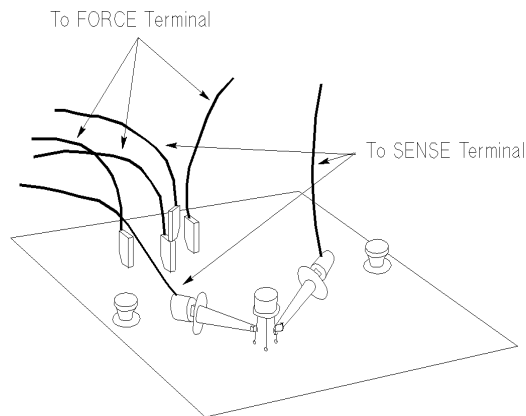
Connect the miniature banana to pin plug cables between the FORCE terminals on the 16442B and the disired terminals on the socket module.

### Kelvin Connections

Connect a miniature banana to pin plug cable between the FORCE terminal on the 16442B and the disired terminal on the socket module, and then connect additional miniature banana to pin plug cable between the SENSE terminal and the hole of the pin plug connected to the terminal. The 16442B enables to use the Kelvin connections for maximum of three SMU channels.



To extend the sense line as near as possible to the DUT, connect a miniature banana to miniature clip cable between the SENSE terminal and the DUT lead.

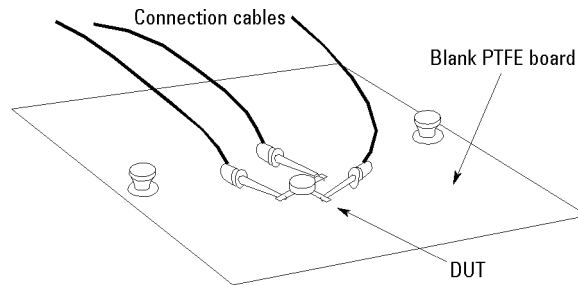


## Connections for a Uniquely Shaped Device

If there is no socket module suitable for a uniquely shaped DUT, you can connect the device by using the blank PTFE board or the universal socket module:

### Blank PTFE Board

Connect all the terminals directly to the DUT on the blank PTFE board with the miniature banana to miniature clip connection cables, as shown in the following figure. Make sure to place the DUT on the blank PTFE board.

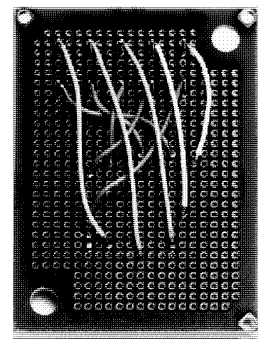
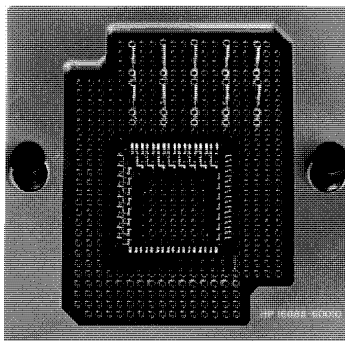


### Universal Socket Module

The following figure shows an example of a universal socket module. You solder the connection pins into the universal socket, then insert the pin plug of the connection cable into the connection pin.

Note that hydrochloric acid residue deposited by solder may cause electrical problems. Agilent Technologies recommend that you solder the wiring on the universal board using *low* hydrochloric acid solder (Agilent part number: 8090-0433).

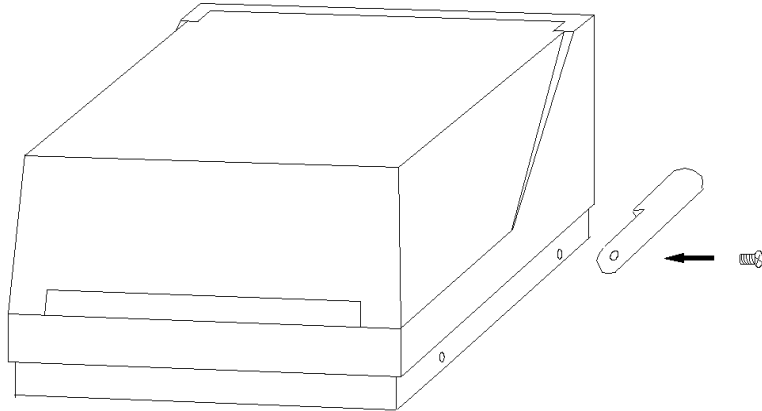
Do not use the universal socket module for low-current measurements (less than 1 nA) that require low leakage current.



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## Installation

You can make the 16442B test fixture (B1500A-A5F) stable by installing stabilizers as shown in the following figure.



TUG01002.GAL 80mmW, 60mmH

1. Put a stabilizer on both sides of test fixture.
2. Screw a flathead screw into hole of each stabilizer.

After installing stabilizers, connect terminals on the rear panel to the desired measurement units.

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### NOTE

When you attach the 16442B to the Agilent 16440A SMU/Pulse Generator Selector (B1500A-A04) or Agilent 16441A R-Box, you do *not need to install stabilizers*. For attaching to selector or R-Box procedure, see the *User's Guide* for the selector or R-Box.

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## Maintenance

This section provides the following maintenance information:

- “Cleaning”
- “Confirming Interlock Circuit”
- “Servicing”

### Cleaning

To maintain high performance, the 16442B test fixture (B1500A-A5F) must be kept clean. Oil, perspiration, hair, dust, and dirt degrade board insulation, which increases leakage current and decreases measurement accuracy.

Agilent Technologies recommend the following cleaning procedure:

- Chassis, lid, inner plate, and socket modules:
  1. Make sure that voltage or current is *not* forced to the 16442B.
  2. Disconnect all cables from the 16442B.
  3. Using lint-free paper, gently wipe the chassis, lid, inner plate, and socket module. For any area that will not come clean, dip the lint-free paper into alcohol and wipe the area gently.
- Connection cables:
  1. Make sure that voltage or current is *not* forced to the 16442B.
  2. Disconnect the connection cables from the 16442B.
  3. Dip lint-free paper into alcohol and gently wipe the metal contacts of the connection cables.

## Confirming Interlock Circuit

Perform the following procedure to confirm that the interlock circuit works correctly.

1. Connect an interlock connection cable between the **Intlk** terminal and the interlock terminal of an instrument such as the Agilent 4155/4156 and E5270.
2. Close the lid of the 16442B.
3. Set all channel output to 0 V.
4. Confirm that the High Voltage LED is turning off.
5. Change a channel output to greater than 42 V. The High Voltage LED has to turn on.
6. Open the lid of the 16442B. The High Voltage LED has to turn off.  
Opening the lid will make the instrument cause an error or change voltage to 0 V.

## Servicing

This section provides information for trained service personnel to repair the test fixture.

“Replaceable Parts” provides the Agilent part numbers of replaceable parts. When a part needs to be replaced, order the parts from the nearest Agilent Technologies Sales and Service Office.

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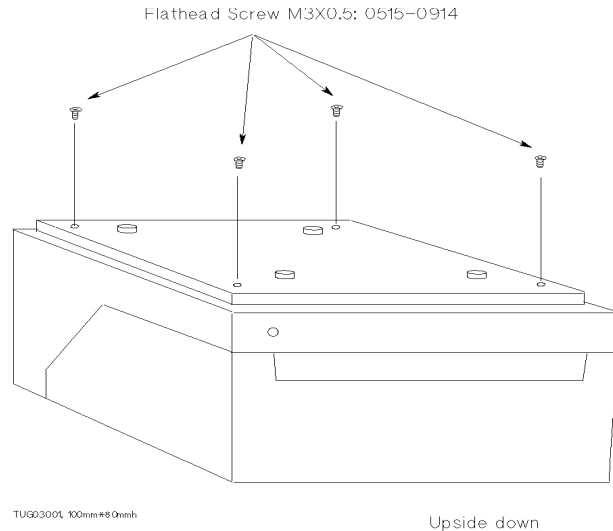
### WARNING

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**High voltages may be present in the test fixture when voltage or current is added to the test fixture. Dangerous voltage may be generated on wires or parts and the danger of electric shock exists.**



Make sure that terminals are not connected to the instruments before you repair the test fixture. When you remove the bottom cover, loosen the four flathead screws using a screwdriver, as shown in the following figure.

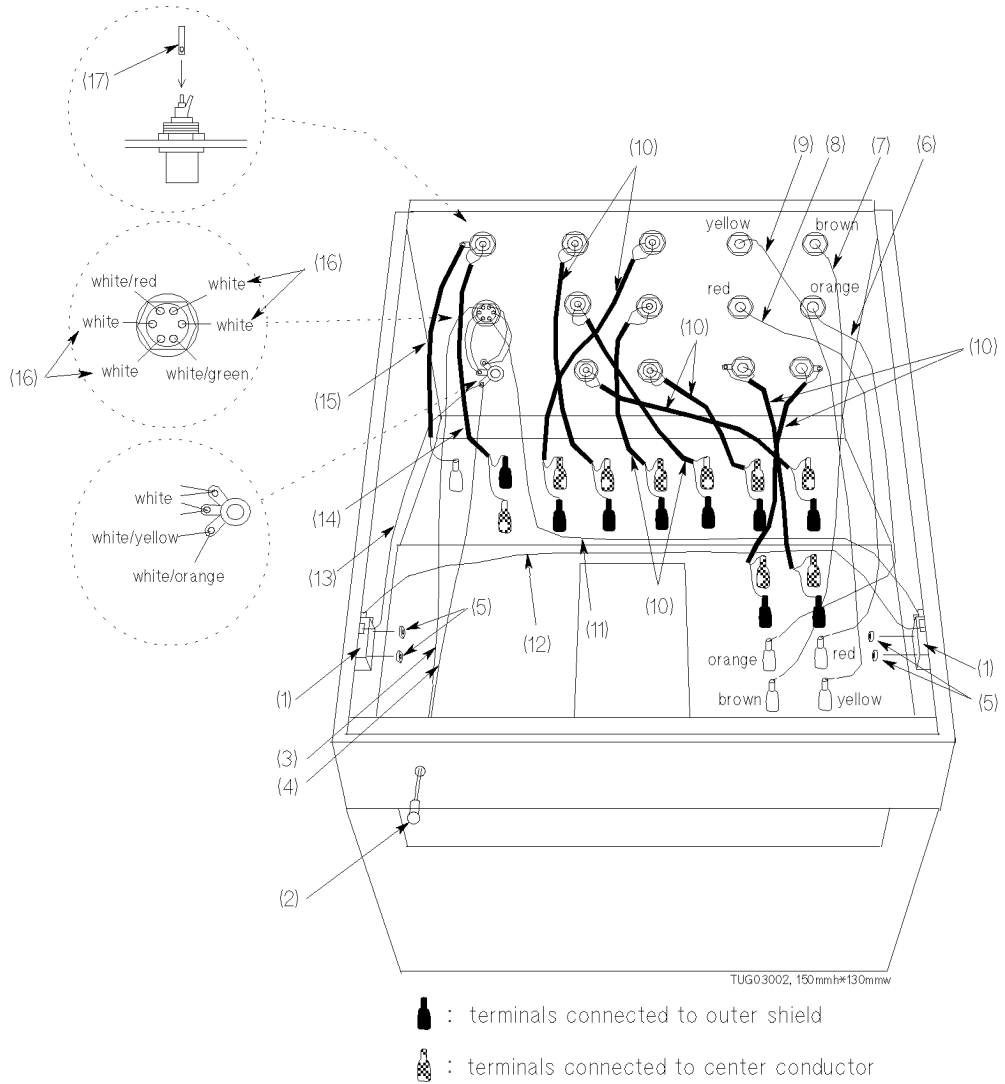


When wiring the test fixture and socket modules, use low hydrochloric acid solder (Agilent part number: 8090-0433) to prevent the flux in the solder from spreading unnecessarily. When soldering, make sure the terminals do not make contact with each other. After soldering, make sure that there are no lint bridges so that leakage current is minimal.

Keep the following items in mind when repairing socket modules:

- Place a ferrite bead at the 8 mm point of the terminal on the socket side and fix the bead using epoxy adhesive.
- Never allow the ferrite beads to make contact with each other.
- For the three socket modules used for power devices, wrap the contact of the wire and socket terminal using heat-shrink tube (Agilent part number: 0890-1496).

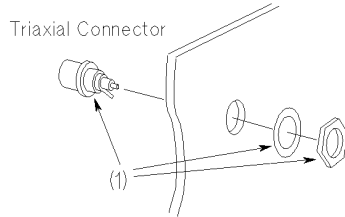
## Replaceable Parts



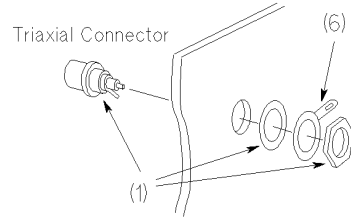
<b>Reference Designation</b>	<b>Agilent Part Number</b>	<b>Quantity</b>	<b>Description</b>
(1)	3101-3241	2	Sense Switch
(2)	1450-0641	1	LED
(3)	8150-0459	40cm×1	Wire 24 White/Red
(4)	8150-0460	40cm×2	Wire 24 White/Orange
(5)	0535-0031	4	Nut
(6)	8150-5680	32cm×1	Wire 24 Orange
(7)	8150-4682	32cm×1	Wire 24 Brown
(8)	8150-4683	32cm×1	Wire 24 Red
(9)	8150-4685	32cm×1	Wire 24 Yellow
(10)	8120-0102	22cm×2, 15cm×6	Coaxial Cable 50 Ω
(11)	8150-0462	40cm×1	Wire 24 White/Green
(12)	8150-0458	30cm×8	Wire 24 White/Brown
(13)	8150-0462	32cm×1	Wire 24 White/Yellow
(14)	8120-0122	16cm×1	Coaxial Cable
(15)	8120-0122	16cm×1	Coaxial Cable
(16)	8150-0456	5cm×4	Wire 24 White
(17)	41422-24099	1	Soldering Pipe

**Installing Triaxial and BNC Connectors:**

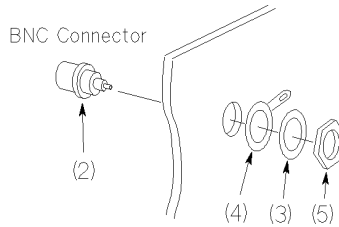
**For SMU Connectors**



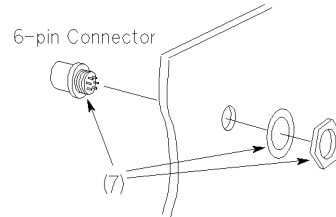
**For GNDU Connector**



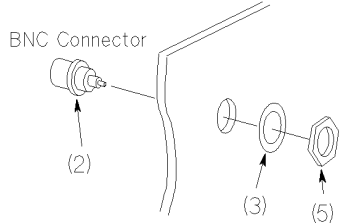
**For PGU Connectors**



**For Intlk Connector**



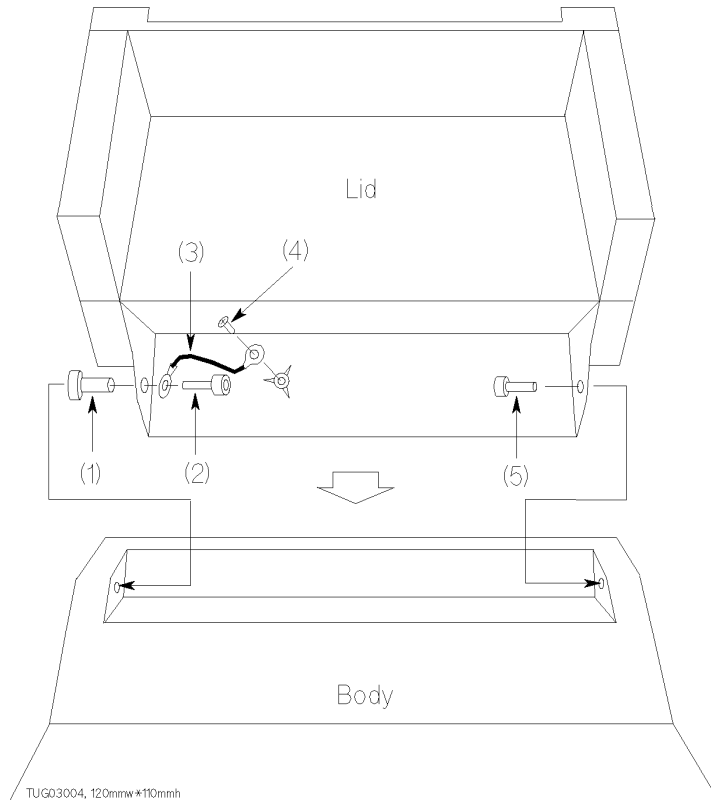
**For VMU and VSU Connectors**



TUG03003, 120mm\*120mm

Reference Designation	Agilent Part Number	Quantity	Description
(1)	1250-1906	7	Triaxial Connector
(2)	1250-0083	6	BNC Connector
(3)	2190-0016	6	Lock Washer
(4)	0360-1190	2	Terminal Washer
(5)	2950-0001	6	Nut
(6)	5000-4218	1	Terminal Washer
(7)	1252-1419	1	6-pin Connector

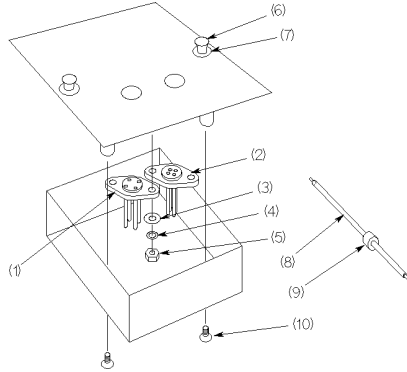
**Connections between Lid and Body:**



Reference Designation	Agilent Part Number	Quantity	Description
(1)	16442-24001	1	Sleeve
(2)	0515-1973	1	Bolt M4
(3)	16442-61624	1	Cable Assy
(4)	0515-1550	1	Screw M3-L 8 P-H
(5)	16442-23001	1	Pin

### Socket Modules

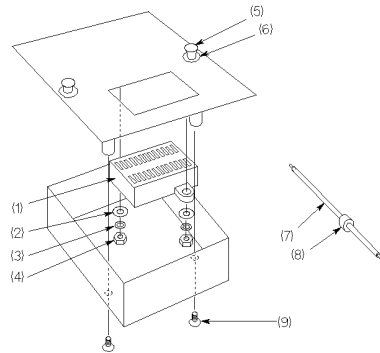
- TO- (4-pin) Package Socket Module (16088-60041)



Reference Designation	Agilent Part Number	Quantity	Description
(1)	1200-0976	1	TO (4-Pin Large) Socket
(2)	1200-0977	1	TO (4-Pin Small) Socket
(3)	3050-0229	4	Flat Washer
(4)	2190-0913	4	Lock Washer
(5)	2260-0002	4	Nut
(6)	1390-0365	2	Snap-In Plunger
(7)	1390-0366	2	Snap-In Grommet
(8)	8150-4687	6cm x 4	Wire 24 Blue
	8150-4688	7cm x 4	Wire 24 Purple
(9)	9170-0029	8	Core-Magnetic Bead
(10)	2360-0190	3	Flathead Screw

TUG03008, 135mmx#50mmh

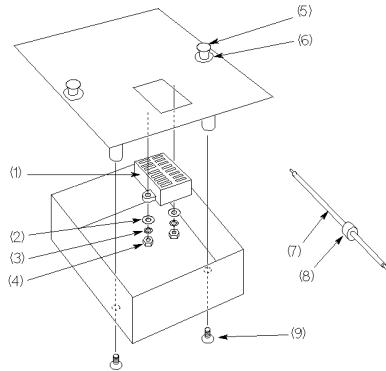
- Dual-In-Line (28-pin) Package Socket Module (16088-60042)



Reference Designation	Agilent Part Number	Quantity	Description
(1)	1200-1152	1	Dual-In-Line (28-Pin) Socket
(2)	3050-0098	2	Flat Washer
(3)	2190-0112	2	Lock Washer
(4)	0610-0001	2	Nut
(5)	1390-0365	2	Snap-In Plunger
(6)	1390-0366	2	Snap-In Grommet
(7)	8150-4681	10cm x 3	Wire 24 Black
	8150-4685	4cm x 4 12cm x 2	Wire 24 Yellow
	8150-4686	5cm x 4	Wire 24 Green
	8150-4687	6cm x 4	Wire 24 Blue
	8150-4688	7cm x 3	Wire 24 Purple
	8150-4689	8cm x 3	Wire 24 Gray
	8150-4690	9cm x 5	Wire 24 White
(8)	9170-0029	28	Core-Magnetic Bead
(9)	2360-0190	3	Flathead Screw

TUG03009, 135mmx#50mmh

• Dual-In-Line (18-pin) Package Socket Module (16088-60043)



Reference Designation	Agilent Part Number	Quantity	Description
(1)	1200-0978	1	Dual-In-Line (18-Pin) Socket
(2)	3050-0098	2	Flat Washer
(3)	2190-0112	2	Lock Washer
(4)	0610-0001	2	Nut
(5)	1390-0365	2	Snap-In Plunger
(6)	1390-0366	2	Snap-In Grommet
(7)	8150-4685	4cm x 2	Wire 24 Yellow
	8150-4686	5cm x 1	Wire 24 Green
	8150-4687	6cm x 2	Wire 24 Blue
	8150-4688	7cm x 7	Wire 24 Purple
	8150-4689	8cm x 5	Wire 24 Gray
	8150-4690	9cm x 1	Wire 24 White
(8)	9170-0029	28	Core-Magnetic Bead
(9)	2360-0190	3	Flathead Screw

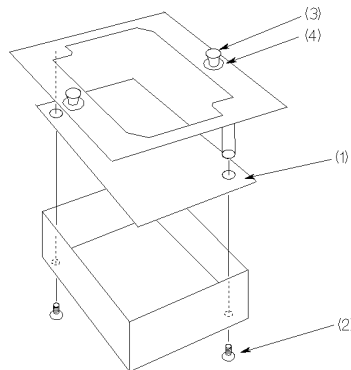
TUG03010, 135mmw\*50mmh

• Universal Socket Module

0.1 inch pitch: 16088-60050

0.075 inch pitch: 16442-60051

0.05 inch pitch: 16442-60052



Reference Designation	Agilent Part Number	Quantity	Description
(1)	16088-26503	1	Blank Universal Board ( 0.1 inch pitch )
	16442-26511	1	Blank Universal Board ( 0.075 inch pitch )
	16442-26512	1	Blank Universal Board ( 0.05 inch pitch )
(2)	2360-0190	2	Flathead Screw
(3)	1390-0365	2	Snap-In Plunger
(4)	1390-0366	2	Snap-In Grommet

TUG03010, 135mmw\*50mmh

## Specifications

The “supplemental information” and “typical” entries, in the following specifications are not warranted, but provide useful information about the functions and performance of the instruments.

The following specifications data is specified at  $23 \pm 5$  °C and 50 % relative humidity.

## Functions

Agilent 16442B lets you test various shaped DUTs. The 16442B has:

- Six SMU channels (when using non-Kelvin connections)  
Three SMU channels (when using Kelvin connections)
- Two VSU channels
- Two VMU channels
- Two PGU channels
- One GNDU channel
- Interlock (Intlk) six-pin connector

## Voltage and current range

Channel	Maximum Voltage	Maximum Current
SMU	200 V	1 A
VSU	40 V	100 mA
VMU	40 V	-
PGU	40 V	200 mA (AC peak)
GNDU	40 V	1.6 A



## General Specifications

- Environment

Operating temperature	5 °C to 40 °C
Storage temperature	−40 °C to 70 °C
Operating Humidity	5% to 80% relative humidity (at no condensation)
Storage Humidity	5% to 90% relative humidity at 65 °C

- Weight

Approximately 2.5 kg

- Dimensions (W × H × D)

260 mm × 140 mm × 260 mm (not including stabilizers)

260 mm × 140 mm × 320 mm (including stabilizers)

## Supplemental Information

The following reference data is specified at  $23 \pm 5$  °C and 50 % relative humidity.

- SMU channel

Leakage Current  
(force or sense to common)      10 pA maximum at 200 V

Stray Capacitance  
(force or sense to common)      15 pF maximum

Stray Capacitance  
(force or sense to other SMUs)      3 pF typical

Residual Resistance (force)      60 mΩ typical

Residual Resistance (sense)      60 mΩ typical

Guard Capacitance (force or  
sense guard)      70 pF maximum

- VSU channel

Residual Resistance      60 mΩ typical

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- VMU channel  
Residual Resistance 60 mΩ typical
- PGU channel  
Characteristic Impedance 50 Ω typical
- GNDU channel  
Residual Resistance (force) 40 mΩ typical  
Residual Resistance (sense) 40 mΩ typical
- Socket Module

<b>Agilent Part number</b>	<b>Description</b>	<b>Max Voltage</b>
16088-60041	4-pin TO (for 2 Tr)	200 V
16088-60042	28-pin DIP	230 V
16088-60043	18-pin DIP	230 V
16088-60050	0.1 inch pitch universal	–
16442-60051	0.075 inch pitch universal	–
16442-60052	0.05 inch pitch universal	–

Connection wire residual resistance : 20 mΩ typical

## Options

Option Item	Description
16442B-010	Add 1.5 m triaxial cable (16058-61603) 4 ea. and triaxial open cap (1250-1708) 4 ea.
16442B-011	Add 3.0 m triaxial cable (04145-61622) 4 ea. and triaxial open cap (1250-1708) 4 ea.
16442B-800	Extra blank PTFE board (16058-60004)
16442B-801	0.1 inch pitch universal socket module (16088-60050) and ten connection pins (16088-60013)
16442B-802	0.075 inch pitch universal socket module (16442-60051) and ten connection pins (16088-60013)
16442B-803	0.05 inch pitch universal socket module (16442-60052) and ten connection pins (16088-60013)
16442B-810	Extra ten connection pins (16088-60013)
16442B-811	Extra connection cables, miniature banana to pin plug
	black (16442-61600), 2 ea.
	red (16442-61601), 2 ea.)
	blue (16442-61602), 2 ea.
16442B-812	Extra connection cables, pin plug to pin plug
	black (16442-61603), 2 ea.
	red (16442-61604), 2 ea.
	blue (16442-61605), 2 ea.

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<b>Option Item</b>	<b>Description</b>
16442B-813	Extra connection cables, miniature banana to miniature clip
	black (16442-61606), 2 ea.
	red (16442-61607), 2 ea.
	blue (16442-61608), 2 ea.
16442B-814	Extra connection cables, miniature banana to miniature banana
	black (16442-61609), 2 ea.
	red (16442-61610), 2 ea.
	blue (16442-61611), 2 ea.
16442B-821	Socket module, 4-pin TO package (16088-60041)
16442B-822	Socket module, 18-pin DIP package (16088-60043)
16442B-823	Socket module, 28-pin DIP package (16088-60042)
16442B-890	Extra carrying case for socket modules (16442-60142)