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User's Guide

Agilent 16442A Test Fixture



Agilent Technologies

Agilent Part No. 16442-90000
Printed in Japan January 2000
Edition 3

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User's Guide

Agilent 16442A User's Guide, Edition 3

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

The 16442A has thirteen channels:

- 6 source/monitor unit (SMU) channels

  Up to 3 channels can be connected to SMUs by Kelvin connections.
- 2 voltage source unit (VSU) channels
- 2 voltage monitor unit (VMU) channels
- 2 pulse generator unit (PGU) channels
- 1 ground unit (GNDU) channel

This manual provides the following information.

- Introduction
- Operation
- Installation
- Maintenance
- Specifications

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- **Certification**

  Agilent Technologies Inc. certifies that this product met its published specifications at the time of shipment from the factory. Agilent further certifies that its calibration measurements are traceable to the National Institute of Standards and Technology (NIST), to the extent allowed by the Institute's calibration facility, and to the calibration facilities of other International Standards Organization members.

- **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.

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- *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.

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.

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.

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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- **Herstellerbescheinigung**

  GEÄUSCHEMISSION

  Lpa < 70 dB

  am Arbeitsplatz

  normaler Betrieb

  nach DIN 45635 T. 19

- **Manufacturer's Declaration**

  ACOUSTIC NOISE EMISSION

  Lpa < 70dB

  operator position

  normal operation

  per ISO 7779

Printing History

Edition 1: February 1994

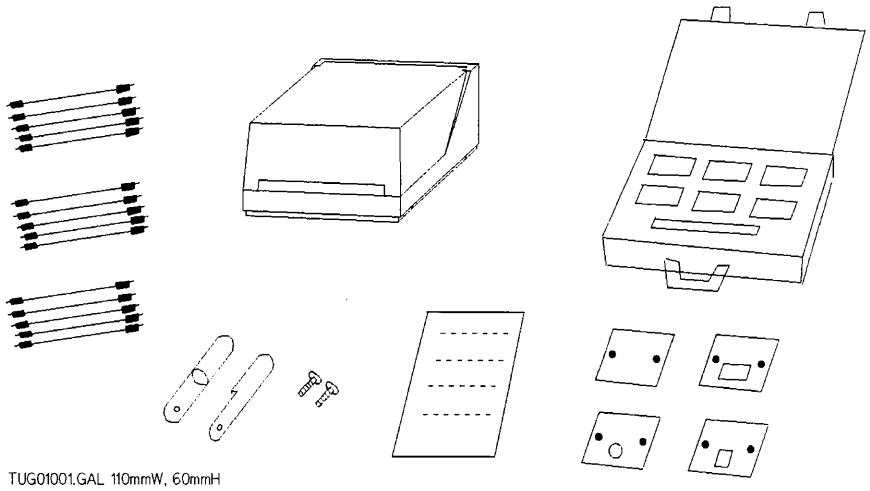
Edition 2: August 1997

Edition 3: January 2000

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Introduction

Agilent 16442A test fixture contains the following accessories:



TUG01001.GAL 110mmW, 60mmH

	Description	Agilent Part Number	Quantity
1	test fixture	16442-60001	1
2	stabilizer (with two flathead screws)	16442-60002	2
3	carrying case for socket modules	16442-60101	1
4	miniature banana to pin plug connection cable (black)	16442-61600	4
5	miniature banana to pin plug connection cable (red)	16442-61601	4
6	miniature banana to pin plug connection cable (blue)	16442-61602	4
7	pin plug to pin plug connection cable (black)	16442-61603	3
8	pin plug to pin plug connection cable (red)	16442-61604	3

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	Description	Agilent Part Number	Quantity
9	pin plug to pin plug connection cable (blue)	16442-61605	3
10	miniature banana to miniature clip connection cable (black)	16442-61606	3
11	miniature banana to miniature clip connection cable (red)	16442-61607	3
12	miniature banana to miniature clip connection cable (blue)	16442-61608	3
13	miniature banana to miniature banana connection cable (black)	16442-61609	3
14	miniature banana to miniature banana connection cable (red)	16442-61610	3
15	miniature banana to miniature banana connection cable (blue)	16442-61611	3
16	blank Teflon™ board	16058-60004	1
17	dual-in-line package socket module (28-pin)	16088-60002	1
18	axial lead package socket module	16088-60009	1
19	TO-package socket module (12-pin)	16088-60006	1
20	*User's Guide* (this document)	16442-90000	1

NOTE

Inspecting the 16442A upon Receiving

When the 16442A 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.

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Operation

This section is organized into the following two sections:

- Attaching a socket module onto the 16442A.
- Mounting and wiring DUT on the socket module.

Select the proper environment to execute the measurements. Place the 16442A on a flat surface. The 16442A 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 16442A, then measure the dc characteristics by using the connected measurement units.

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

WARNING **Do *not* operate the 16442A 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.**

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

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

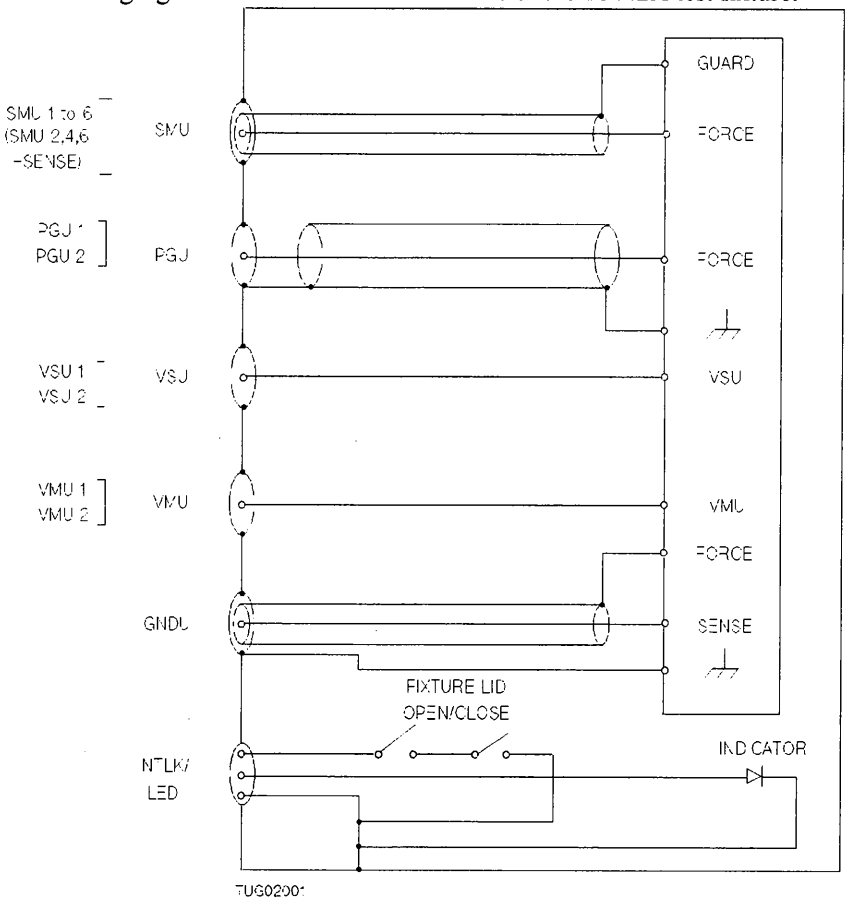
CAUTION *Do not* touch any metal surface that is in the circuit path. Oil, perspiration, and dirt prevent good electric contact and degrade measurement accuracy.

NOTE After setting up the 16442A and DUT, confirm that the connections are correct. Shut lid of the 16442A to close switches of the interlock (Intlk) terminal.

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Circuit Schematic of the 16442A

The following figure shows the circuit schematic of the 16442A test fixture.



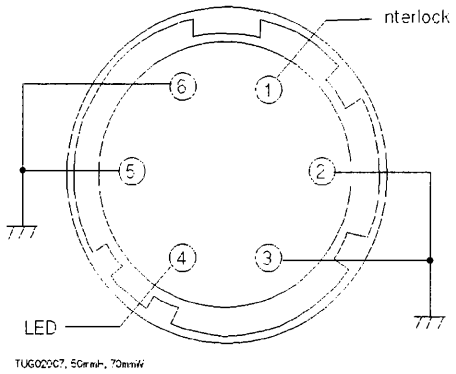
The 16442A is equipped with an interlock (Intlk) terminal, which prevents the user from getting an electric shock during operation.

If more than 40 V will be forced to the 16442A, be sure to connect Intlk terminal of the 16442A to Interlock terminal of measurement instrument using an Interlock/LED cable (the 16493J option 001 for 1.5 m, the 16493J option 002 for 3.0 m).

When the lid of the 16442A is open, two switches of the Intlk terminal are open. The instrument recognizes that the lid of the 16442A is not closed and does not output high voltage (more than ±40 V).

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The following figure shows pin assignment of the Intlk terminal.



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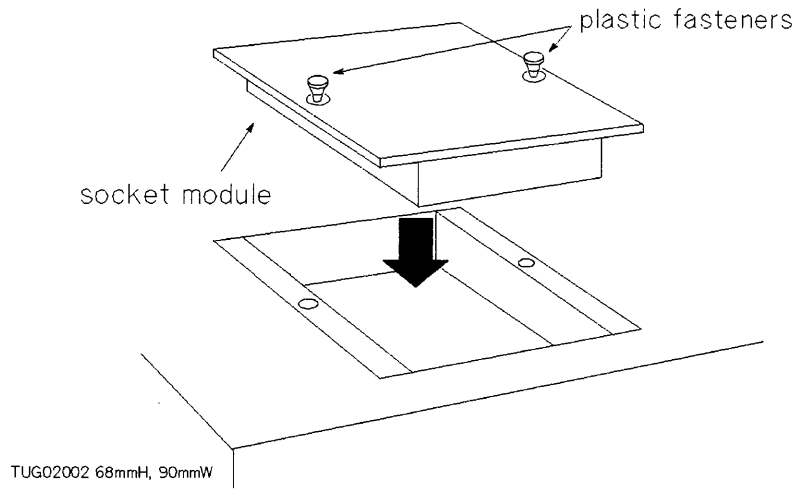
Attaching a Socket Module onto the 16442A

After choosing correct socket module for DUT, install the socket module into the 16442A. The following figure shows how to attach socket module to the 16442A. Use the following procedure to attach the socket module:

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

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

1. Confirm that voltage or current is *not* forced to the 16442A.
2. Open the lid of the 16442A.
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 16442A.



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Mounting and Wiring the DUT on the Socket Module

Thirteen types of socket modules are available for mounting the DUTs:

- Three socket modules for power devices.
- Six socket modules for small signal devices.
- Three universal socket modules and a blank Teflon board module for uniquely shaped devices.

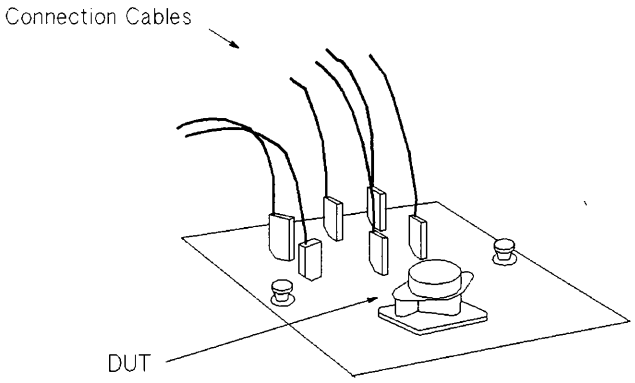
Non-Kelvin Connections

Use connection cables to connect the FORCE terminals on the 16442A to the FORCE terminals on the socket module.

Kelvin Connections

- Socket Modules for Power Devices

  The three socket modules for power devices have separate FORCE and SENSE terminals for Kelvin connections. As shown in the example in the following figure, use miniature banana to miniature banana connection cables to connect the FORCE and SENSE terminals of the 16442A to the FORCE and SENSE terminals on the socket module.

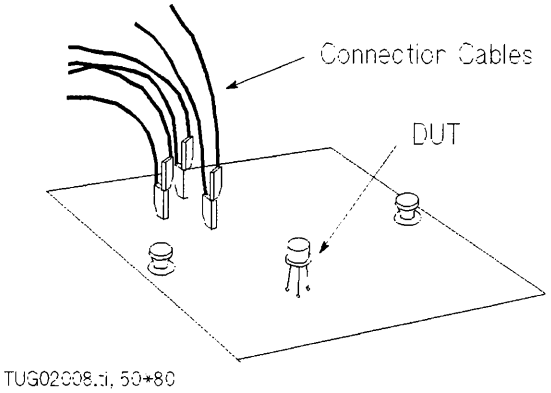


TUG02003, 80*50

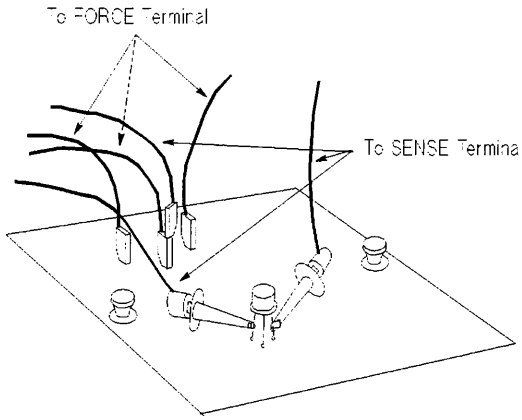
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- Socket Modules for Small Signal Devices

  The six socket modules for small signal devices have FORCE terminals only. Up to 3 SMU channels can be connected to DUT by Kelvin Connection. As shown in the example in the following figure, use miniature banana to pin plug connection cables to connect both FORCE and SENSE terminals of the 16442A to the FORCE terminal on the socket module as follows: insert one pin plug into the FORCE terminal of the socket module, then insert the other pin plug into the tail hole of the inserted pin plug.



  To connect sense terminals as near as possible to the DUT, connect the SENSE terminals of the 16442A directly to the DUT with the miniature banana to miniature clip connection cables as shown in following figure.



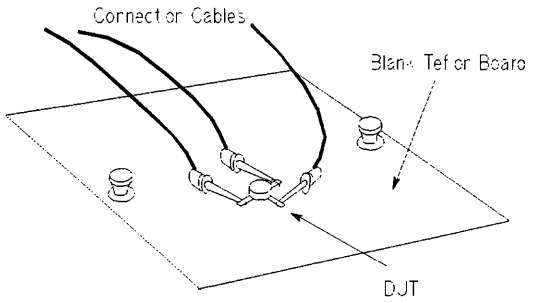
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Connections for a Uniquely Shaped Device

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

Blank Teflon Board

Connect all the terminals directly to the DUT on the blank Teflon 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 Teflon board.

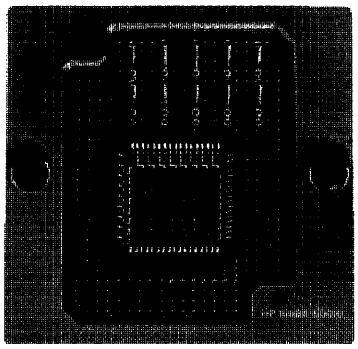


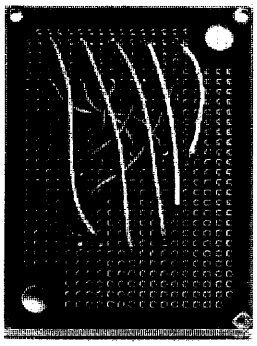
Universal Socket Module

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.

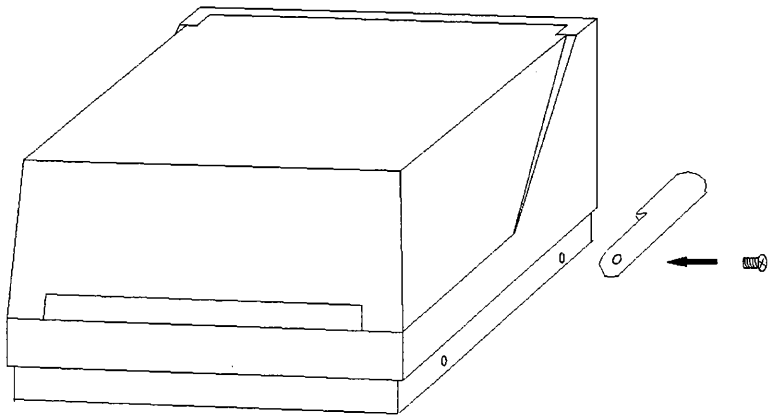




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Installation

You can make the 16442A 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.

NOTE When you attach the 16442A to Agilent 16440A SMU/Pulse Generator Selector 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 selector or R-Box.

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Maintenance

This section provides the following maintenance information:

- Cleaning
- Performing test
- Servicing

Cleaning the 16442A Test Fixture

To maintain high performance, the 16442A 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 16442A.
  2. Disconnect all cables from the 16442A.
  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 16442A.
  2. Disconnect the connection cables from the 16442A.
  3. Dip lint-free paper into alcohol and gently wipe the metal contacts of the connection cables.

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Performing the Interlock Circuit Test

To confirm that interlock circuit test, do as follows:

1. Connect the **Intlk** terminal of Agilent 4155/4156 to your interlock circuit.
2. Press **System** front-panel key, then select CALIB/DIAG primary softkey to display the SYSTEM: SELF-CALIBRATION/DIAGNOSTICS page.
3. In the CALIB/DIAG field, select DIAG secondary softkey.
4. In the CATEGORY field, select I/O PERIPH secondary softkey.
5. Move pointer to the `403 (INT.) Interlock LED` field.
6. Select EXECUTE secondary softkey.
7. Confirm the following:
   - LED turns on within 1 sec from when interlock circuit is shorted.
   - LED turns off within 1 sec from when interlock circuit is open.
8. To stop the interlock test, select STOP secondary softkey.

Servicing the Test Fixture

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

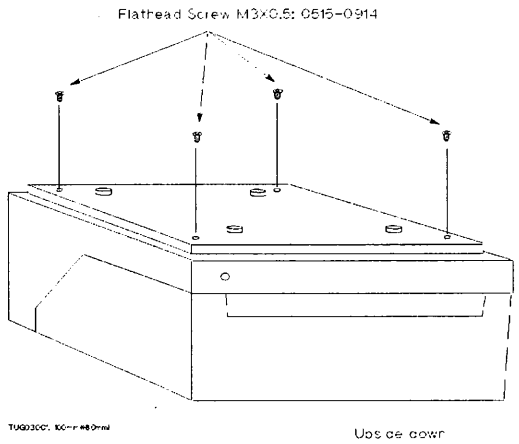
"Replaceable Parts" provides the Agilent part numbers of replaceable parts. When a part needs to be replaced, order the parts from the nearest Agilent Technologies Sales and Service Office.

WARNING

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.

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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.



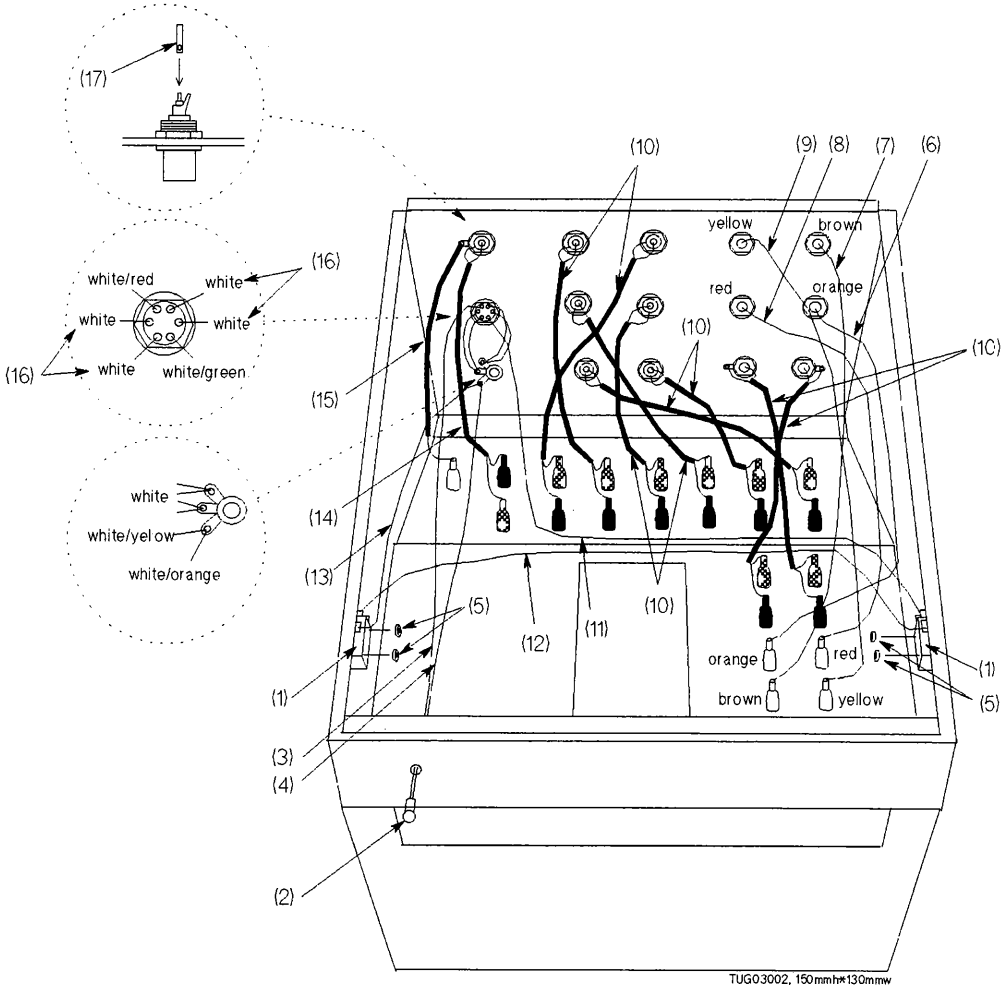
When wiring the test fixture and socket modules, use low hydrochloric acid solder (Agilent part number: 8090-0433) to prevent the flux in the solder from spreading unnecessarily. When soldering, make sure the terminals do not make contact with each other. After soldering, make sure that there are no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

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Replaceable Parts



: terminals connected to outer shield

: terminals connected to center conductor

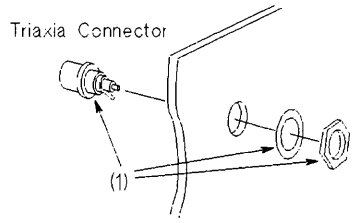
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Reference Designation	Agilent Part Number	Quantity	Description
(1)	3101-3241	2	Sense Switch
(2)	1450-0641	1	LED
(3)	8150-0459	40cm×1	Wire 24 White/Red
(4)	8150-0460	40cm×2	Wire 24 White/Orange
(5)	0535-0031	4	Nut
(6)	8150-4684	32cm×1	Wire 24 Orange
(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

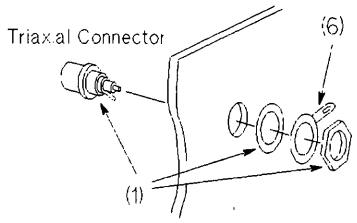
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Installing Triaxial and BNC Connectors:

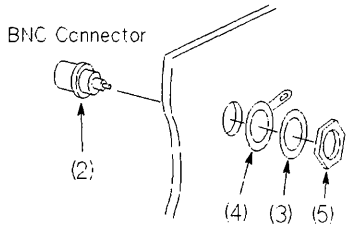
For SMU Connectors



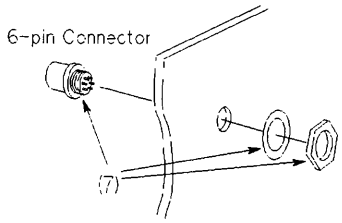
For GNDU Connector



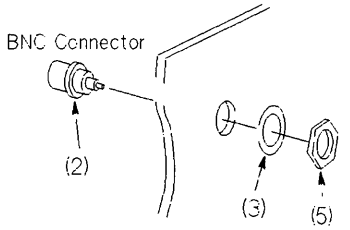
For PGU Connectors



For Intlk Connector



For VMU and VSU Connectors

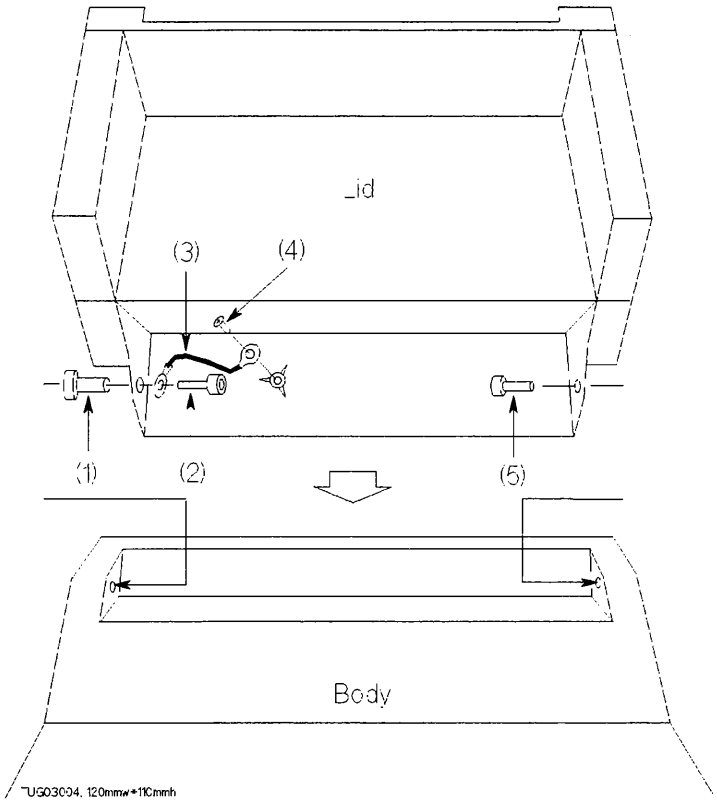


TUG03003, 120mm*120mm

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

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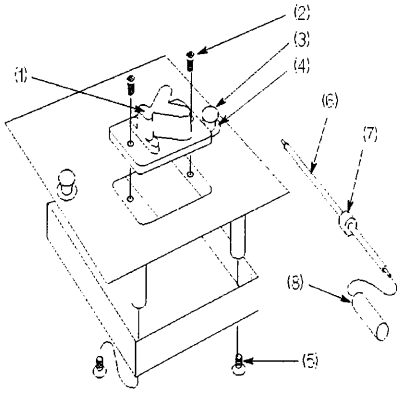
Connections between Lid and Body:



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

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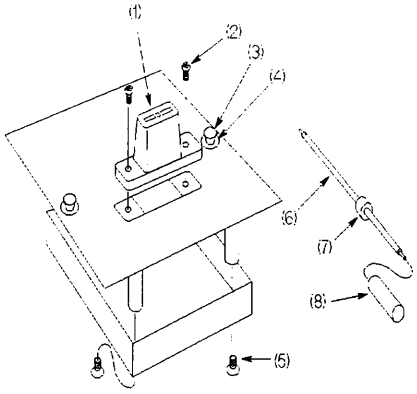
TO-3 or TO-66 Package Socket Module



Reference Designation	Agilent Part Number	Quantity	Description
(1)	1200-1420	1	TO-3 or TO-66 Socket
(2)	0515-2058	2	Plastic Screw
(3)	1390-0365	2	Snap-In Plunger
(4)	1390-0366	2	Snap-In Grommet
(5)	2360-0190	3	Flathead Screw 6-32
(6)	8150-5053	5cm×2 6.5cm×4	Wire 24 Black
(7)	9170-1501	6	Ferrite Bead
(8)	0890-1496	1cm×12	Heat-Shrink Tube

TUGC3005, 127mm×50mm

In-Line Package Socket Module

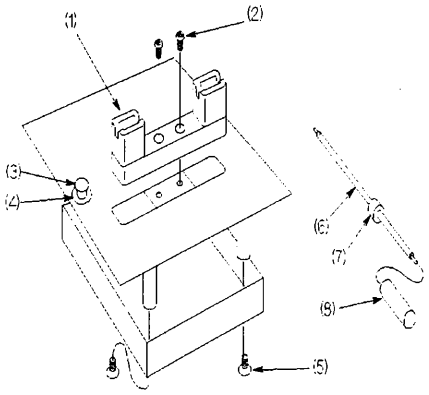


Reference Designation	Agilent Part Number	Quantity	Description
(1)	5040-3344	1	In-Line (3-Pin) Socket
(2)	0515-2058	2	Plastic Screw
(3)	1390-0365	2	Snap-In Plunger
(4)	1390-0366	2	Snap-In Grommet
(5)	2360-0190	3	Flathead Screw 6-32
(6)	8150-5053	4.5cm×3 7.5cm×3	Wire 24 Black
(7)	9170-1501	6	Ferrite Bead
(8)	0890-1496	1cm×12	Heat-Shrink Tube

TUGC3006, 130mm×50mm

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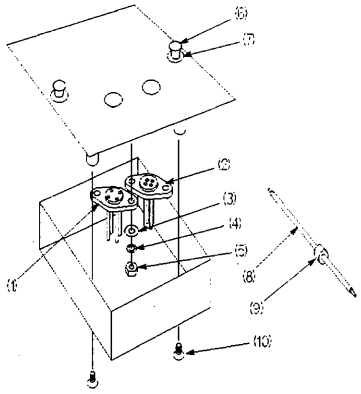
Axial Lead Package Socket Module



Reference Designation	Agilent Part Number	Quantity	Description
(1)	1200-1422	1	Axial Lead Socket
(2)	0515-2058	2	Plastic Screw
(3)	1390-0365	2	Snap-In Plunger
(4)	1390-0366	2	Snap-In Grommet
(5)	2360-0190	3	Flathead Screw 6-32
(6)	8150-5053	7cm × 2 5cm × 2	Wire 24 Black
(7)	9170-1501	4	Ferrite Bead
(8)	0890-1495	2cm × 4	Heat-Shrink Tube

TUG03007, 127mm×50mm

TO- (4-pin) Package Socket Module

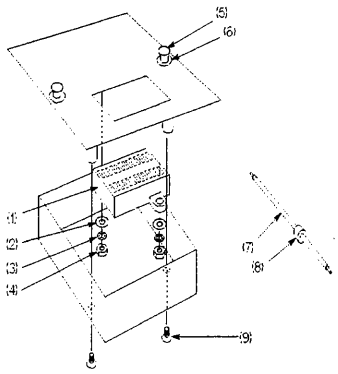


Reference Designation	Agilent Part Number	Quantity	Description
(1)	1200-0976	1	TO (4-Pin Large) Socket
(2)	1200-0977	1	TO (4-Pin Small) Socket
(3)	3050-0229	4	Flat Washer
(4)	2190-0913	4	Lock Washer
(5)	2260-0002	4	Nut
(6)	1390-0365	2	Snap-In Plunger
(7)	1390-0366	2	Snap-In Grommet
(8)	8150-4687	6cm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

TUG03006, 135mm×50mm

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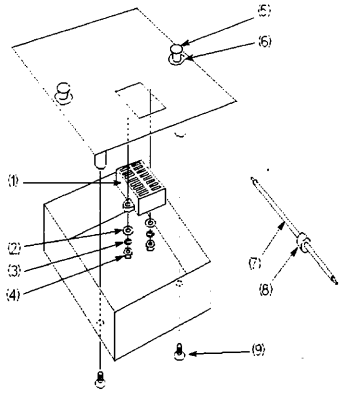
Dual-In-Line (28-pin) Package Socket Module



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)	8150-4685	10cm × 3	Wire 24 Black
	8150-4685	4cm × 4 12cm × 2	Wire 24 Yellow
	8150-4686	5cm × 4	Wire 24 Green
	8150-4687	6cm × 4	Wire 24 Blue
	8150-4688	7cm × 3	Wire 24 Purple
	8150-4689	8cm × 3	Wire 24 Gray
	8150-4690	9cm × 5	Wire 24 White
(8)	9170-0029	28	Core-Magnetic Bead
(9)	2360-0190	3	Flathead Screw

TUG03009, 135mmw×50mmh

Dual-In-Line (18-pin) Package Socket Module

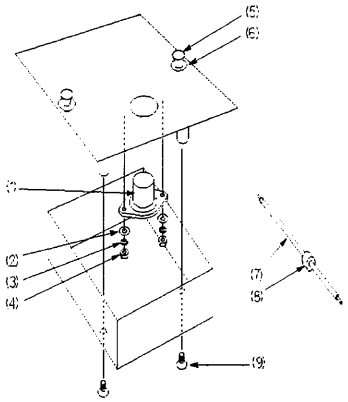


Reference Designation	Agilent Part Number	Quantity	Description
(1)	1200-0975	1	Dual-In-Line (18-Pin) Socket
(2)	3050-0098	2	Flat Washer
(3)	2190-0112	2	Lock Washer
(4)	0610-0001	2	Nut
(5)	1390-0365	2	Snap-in Plunger
(6)	1390-0366	2	Snap-in Grommet
(7)	8150-4685	4cm × 2	Wire 24 Yellow
	8150-4686	5cm × 1	Wire 24 Green
	8150-4687	6cm × 2	Wire 24 Blue
	8150-4688	7cm × 7	Wire 24 Purple
	8150-4689	8cm × 5	Wire 24 Gray
	8150-4690	9cm × 1	Wire 24 White
(8)	9170-0029	28	Core-Magnetic Bead
(9)	2360-0190	3	Flathead Screw

TUG03010, 135mmw×50mmh

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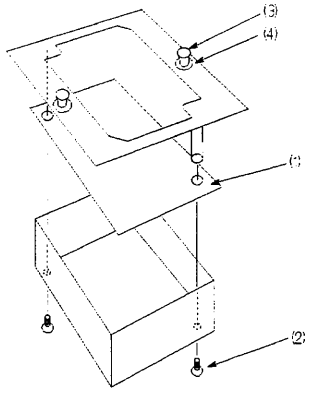
TO- (8-, 10-, and 12-pin) Package Socket Module



Reference Designation	Agilent Part Number	Quantity	Description
(1)	1200-0238	1	TO (8-Pin) Socket
	1200-0239	1	TO (10-Pin) Socket
	1200-0240	1	TO (12-Pin) Socket
(2)	3050-0229	2	Flat Washer
(3)	2190-0913	2	Lock Washer
(4)	2260-0502	2	Nut
(5)	1390-0365	2	Snap-in Plunger
(6)	1390-0366	2	Snap-in Grommet
(7)	8150-4686	--	Wire 24 Green (Units: cm)
	8150-4687	--	Wire 24 Blue (Units: cm)
	8150-4688	--	Wire 24 Purple (Units: cm)
(8)	9170-0029	8/10/12	Core-Magnetic Bead
(9)	2360-0190	3	Flathead Screw

TUG0301, 135mm×50mm

Universal Socket Module



Reference Designation	Agilent Part Number	Quantity	Description
(1)	16088-26503	*	Blank Universal Board (0.1 inch pitch)
	16442-26511	*	Blank Universal Board (0.075 inch pitch)
	16442-26512	*	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

TUG0302, 135mm×50mm

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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 ± 5 °C and 50 % relative humidity.

Functions

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

- 6 SMU channels (when using non-Kelvin connections).

  3 SMU channels (when using Kelvin connections).
- 2 VSU channels.
- 2 VMU channels.
- 2 PGU channels.
- 1 GNDU channel.
- interlock (Intlk) 6-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

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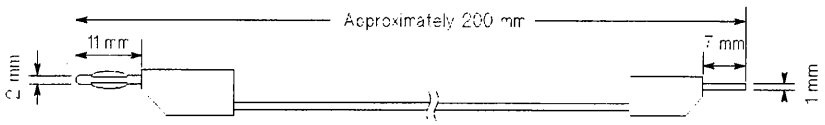
Furnished Accessories

Agilent Part Number	Quantity	Description
16442-60101	1	carrying case for socket modules
16442-60002	2	stabilizer (with two flathead screws)
16442-61600	4	miniature banana – pin plug connection cable (black)
16442-61601	4	miniature banana – pin plug connection cable (red)
16442-61602	4	miniature banana – pin plug connection cable (blue)
16442-61603	3	pin plug – pin plug connection cable (black)
16442-61604	3	pin plug – pin plug connection cable (red)
16442-61605	3	pin plug – pin plug connection cable (blue)
16442-61606	3	miniature banana – miniature clip connection cable (black)
16442-61607	3	miniature banana – miniature clip connection cable (red)
16442-61608	3	miniature banana – miniature clip connection cable (blue)
16442-61609	3	miniature banana – miniature banana connection cable (black)
16442-61610	3	miniature banana – miniature banana connection cable (red)
16442-61611	3	miniature banana – miniature banana connection cable (blue)
16058-60004	1	blank Teflon™ board
16088-60002	1	dual-in-line package socket module (28-pin)
16088-60009	1	axial lead package socket module
16088-60006	1	TO-package socket module (12-pin)
16442-90000	1	*User's Guide* (this document)

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Connection Cables (furnished)

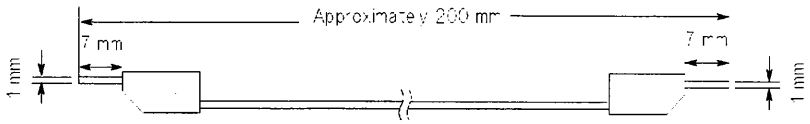
- Miniature Banana – Pin Plug



Part Number: 16442-61600 (black)
Part Number: 16442-61601 (red)
Part Number: 16442-61602 (blue)

Reference data
Residual Resistance: 20 mΩ typical

- Pin Plug – Pin Plug

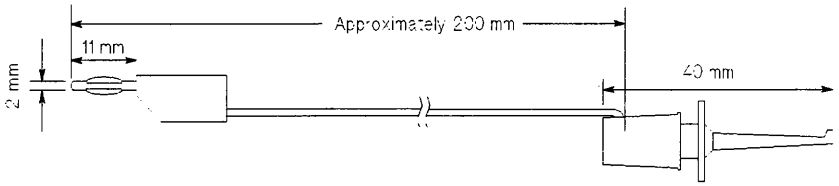


Part Number: 16442-61603 (black)
Part Number: 16442-61604 (red)
Part Number: 16442-61605 (blue)

Reference data
Residual Resistance: 20 mΩ typical

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- **Miniature Banana – Miniature Clip**

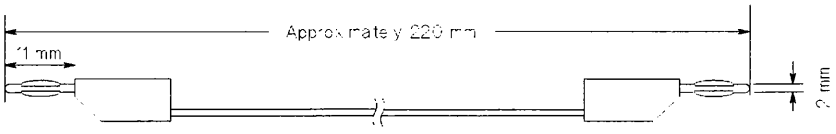


Part Number: 16442-61606 (black)
Part Number: 16442-61607 (red)
Part Number: 16442-61608 (blue)

Reference data

Residual Resistance: 20 mΩ typical

- **Miniature Banana – Miniature Banana**



Part Number: 16442-61609 (black)
Part Number: 16442-61610 (red)
Part Number: 16442-61611 (blue)

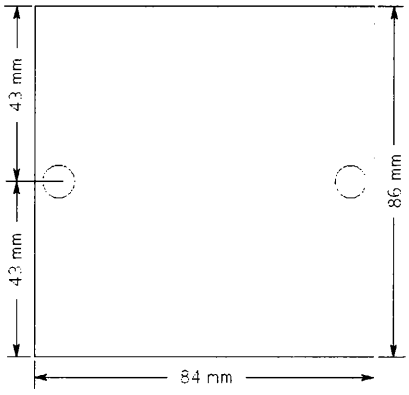
Reference data

Residual Resistance: 20 mΩ typical

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Socket Modules (furnished)

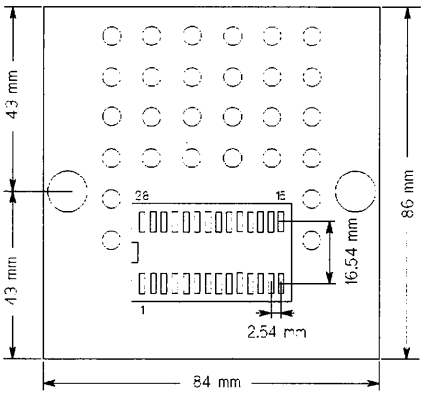
- Blank Teflon Board



Part Number: 16058-60004

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

- Dual-In-Line Packages (28-pin)



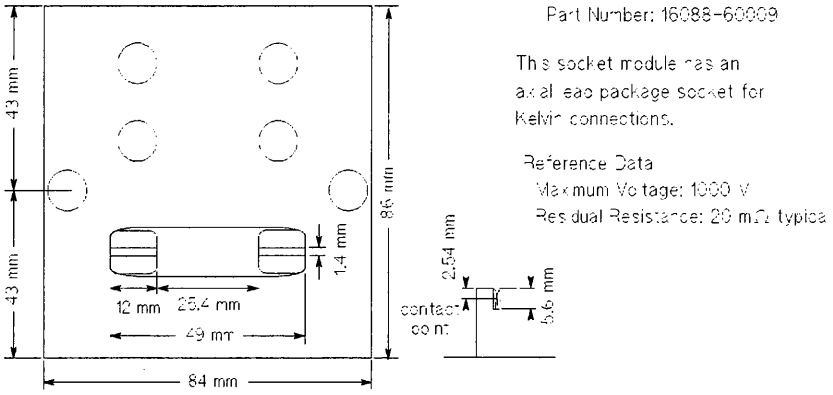
Part Number: 16088-60002

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

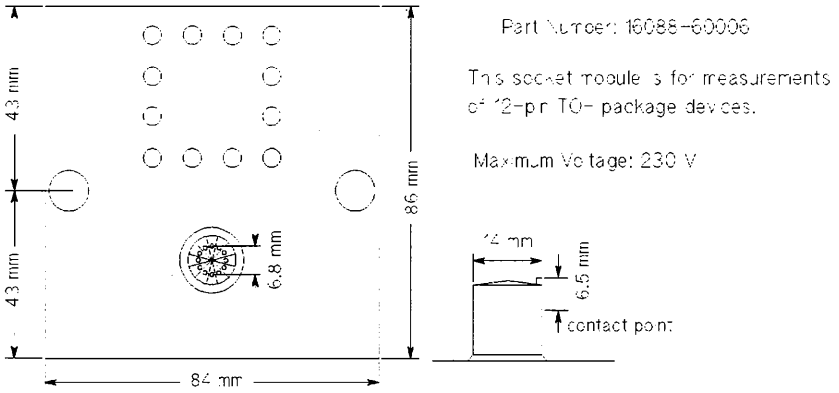
Maximum Voltage: 230 V

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- Axial lead package



- TO-Package (12-pin)



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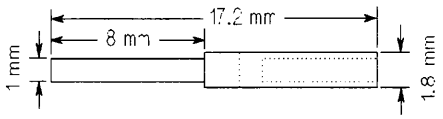
Available Accessories (options)

Option Number	Description
010	adds 1.5 m triaxial cable (16058-61603), 4 ea. and triaxial cap (1250-1708), 4 ea.
011	adds 3.0 m triaxial cable (04145-61622), 4 ea. and triaxial cap (1250-1708), 4 ea.
800	adds blank Teflon™ board (16058-60004)
801	adds universal socket module, 0.1 inch pitch (16088-60010), 1 ea. and connection pin (16088-60013), 10 ea.
802	adds universal socket module, 0.075 inch pitch (16442-60011), 1 ea. and connection pin (16088-60013), 10 ea.
803	adds universal socket module, 0.05 inch pitch (16442-60012), 1 ea. and connection pin (16088-60013), 10 ea.
810	adds connection pin (16088-60013), 10 ea.
811	adds 6 miniature banana pin plug connection cables
	black (16442-61600), 2 ea.
	red (16442-61601), 2 ea.
	blue (16442-61602), 2 ea.
812	adds 6 pin plug pin plug connection cables
	black (16442-61603), 2 ea.
	red (16442-61604), 2 ea.
	blue (16442-61605), 2 ea.
813	adds 6 miniature banana miniature clip connection cable
	black (16442-61606), 2 ea.
	red (16442-61607), 2 ea.
	blue (16442-61608), 2 ea.
814	adds 6 miniature banana miniature banana connection cables
	black (16442-61609), 2 ea.
	red (16442-61610), 2 ea.
	blue (16442-61611), 2 ea.

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Option Number	Description
821	adds TO-packages socket module, 4-pin (16088-60001)
822	adds dual-in-line package socket module, 18-pin (16088-60003)
823	adds dual-in-line package socket module, 28-pin (16088-60002)
824	adds TO-packages socket module, 8-pin (16088-60004)
825	adds TO-packages socket module, 10-pin (16088-60005)
826	adds TO-packages socket module, 12-pin (16088-60006)
830	adds TO-packages socket module, TO-3 or TO-66 (16088-60007)
831	adds in-line packages socket module (3-pin) (16088-60008)
832	adds axial lead package socket module (16088-60009)
890	adds carrying case for socket modules (16442-60101)

Connection pins (optional)

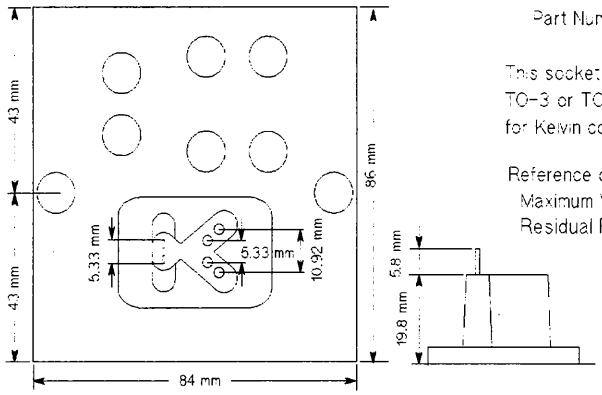


Part Number: 16088-60013

This connection pin is used with a universal socket module.

Socket modules (optional)

- TO-package (TO-3 or TO-66)



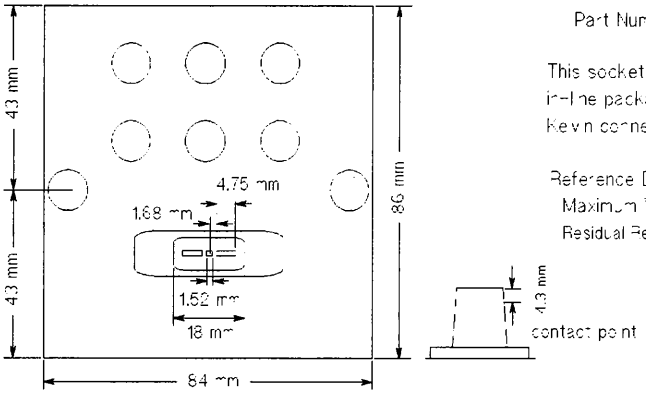
Part Number: 16088-60007

This socket module has a TO-3 or TO-66 package socket for Kelvin connections.

Reference data
Maximum Voltage: 1000 V
Residual Resistance: 20 mΩ typical

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- In-Line package (3-pin)

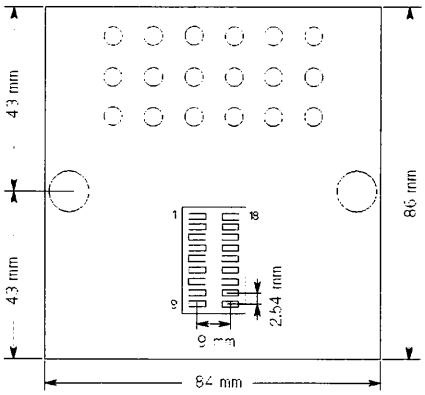


Part Number: 16088-60008

This socket module has an in-line package socket for Kelvin connections.

Reference Data
Maximum Voltage: 1000 V
Residual Resistance: 20 mΩ typical

- Dual-In-Line package (18-pin)



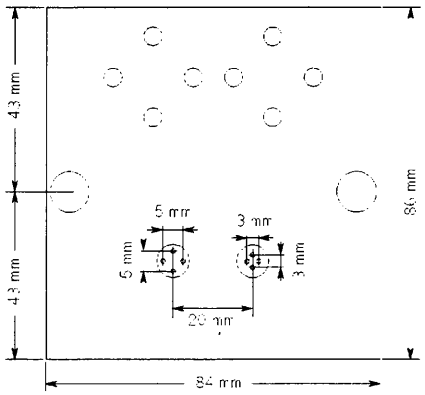
Part Number: 16088-60003

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

Maximum Voltage: 230 V

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- TO-package (4-pin)

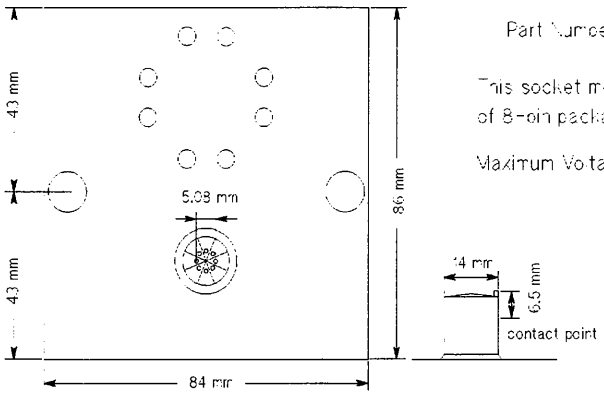


Part Number: 16088-60007

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

Maximum Voltage: 200 V

- TO-package (8-pin)



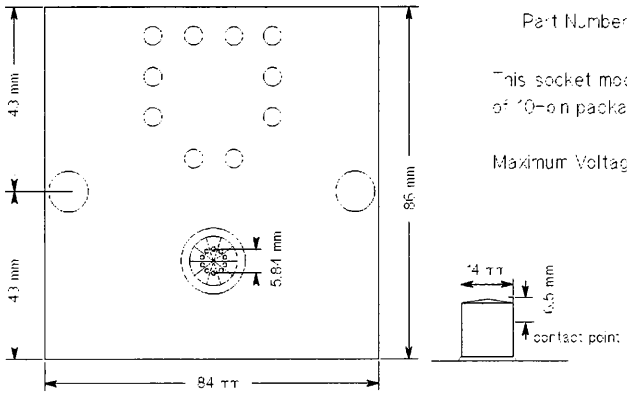
Part Number: 16088-60004

This socket module is for measurements of 8-pin package devices.

Maximum Voltage: 230 V

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- TO-package (10-pin)

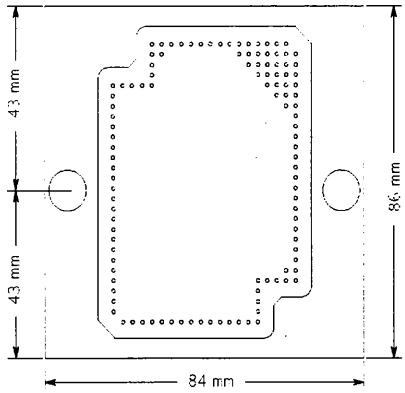


Part Number: 16088-60005

This socket module is for measurements of 10-pin package devices.

Maximum Voltage: 230 V

- Universal socket module



Part Number: 16088-60010 (0.1 inch pitch)
Part Number: 16442-60011 (0.075 inch pitch)
Part Number: 16442-60012 (0.05 inch pitch)

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

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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)

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Supplemental Information

The following reference data is specified at 23 ± 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

- 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

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- Socket Board

Agilent Part number	Description	Max Voltage	Residual Resistance
16088-60001	2 Tr	200 V	
16088-60002	28pin DIP	230 V	
16088-60003	18pin DIP	230 V	
16088-60004	8pin TO	230 V	
16088-60005	10pin TO	200 V	
16088-60006	12pin DIP	230 V	
16088-60007	TO-3,TO-66	1000 V	20 mΩ
16088-60008	3pin Kelvin	1000 V	20 mΩ
16088-60009	axial Kelvin	1000 V	20 mΩ
16088-60010	Universal module		
16442-60011	Universal module		
16442-60012	Universal module		

Connection wire residual resistance : 20 mΩ typical

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