

How to build a fixture for use with the Agilent Cover-Extend Technology

Application Note

Cover-Extend Technology (CET) is Agilent's latest limited access solution for in-circuit test (ICT). The Agilent *Medalist* VTEP v2.0 Powered suite now consists of Cover-Extend Technology, VTEP, iVTEP and Network Parameter Measurement (NPM). For Cover-Extend Technology implementation, additional hardware and changes to the fixture are required.

This paper documents the necessary information for a fixture vendor to build a Cover-Extend fixture.

All previous best practices in building a standard ICT fixture still applies.

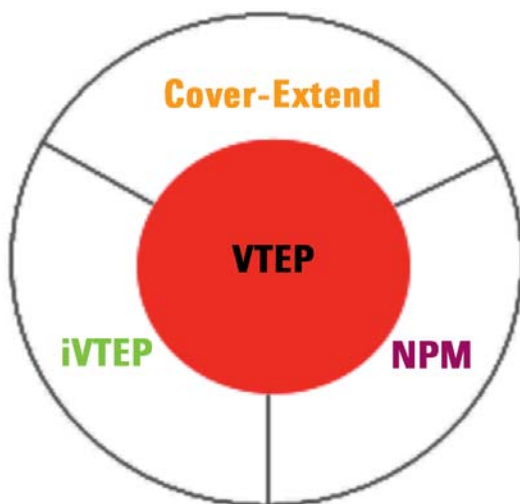


Table of Contents

Hardware Requirement	3
Physical Dimensions	5
CET Pin Layout	6
CET USB Signals	7
Transfer Pins	8
Fixture File	9
CET Power and Control Signals	11
CET Connection Model with USB Interface Kit	12
CET Connection Model without USB Interface Kit	13
Additional Information (for Testers without USB Interface Kit) ...	14
Using Customized Sensor Plates	15
Proximity of Sensor Plate to Probe	16
Important Points to Remember	17
Warranty Information	Back cover
Contact Agilent	Back cover

Hardware Requirement

To build a Cover-Extend fixture, Cover-Extend Ready (CE Ready) VTEP mux card and Cover-Extend signal condition card (CET card) are needed.

The normal VTEP Mux card WILL NOT work for Cover-Extend. Only the Cover-Extend Ready VTEP mux card identified with the VTEP v2.0 Powered! Ready label (on the flex cable connector located in the middle of the Mux Card) will work for Cover-Extend.

The Cover-Extend Ready VTEP mux card looks exactly the same as a normal VTEP mux card; the difference lies with the upgraded firmware for Cover-Extend.

Figure 3 shows the flex cable connection on the mux card in a typical fixture (without Cover-Extend). Take note of the orientation on the how the flex cable is inserted into the 2 by 5 connector.



Figure 1. VTEP v2.0 Powered! Ready mux card



Figure 2. Cover-Extend signal condition card (CET card)



Figure 3. Flex cable connection on mux card

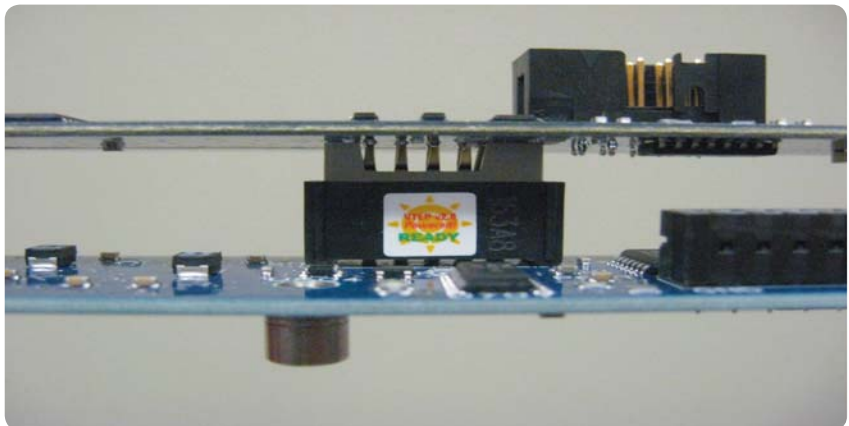


Figure 4. Front view of CET card stacked on top on CE Ready mux card

Hardware Requirement

The CET card will need to be inserted into the 2 x 5 connector on the CE Ready mux card. The CET card must be directly connected onto the CE Ready Mux Card.

Do not use ribbon cable to connect the two cards.

The CET card is stacked on top of the CE Ready mux card at an offset. This offset is to allow for the wiring of the VTEP amplifier (twisted-pair) to the respective port on the CE Ready mux card.

The flex cable will have to be inserted into the 2 by 5 connector on the CET card. Take note of the orientation of the flex cable; it is now positioned at a 180-degree turnaround; ensure enough allowance is given to the length of the flex cable.

The wiring on the other end of the flex cable is as per Agilent recommended best practice; that is to wire them directly to BRC resources on the ASRU and control cards without the use of transfer pins.

The CET card address should be set to the same address as the CE Ready mux card to which it is plugged into. The address information will be listed in fixture/vtep_mux file. *(This will be discussed later in the paper.)*

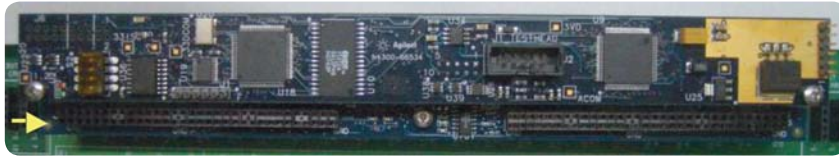


Figure 5. Top view of CET card stacked on top of CE ReadyMux card



Figure 6. Flex cable connection on CET card

Physical Dimensions

With the CET card stacked on top of CE Ready mux card, the total height is 1.46 inches, total width is 1.4 inches and length is 9.0 inches.

A height clearance of 1.5 inches is recommended.

Take note of these dimensions when designing the fixture top cover; as well as when CET card is mounted on the bottom side. The lid for the top cover must have enough clearance to

allow for mounting of the CET card. For mounting the CET card inside the fixture (bottom side), fixture vendors will have to *mill the probe plate* so that the cards can sink in to achieve sufficient clearance.

Previously, fixture vendors would usually use the mounting post (*location A*) to hold the Mux card in place. Now, this mounting post is used to hold the CE Ready Mux card and CET card in place.

Either make use of the corner holes (*location B*) on the CE Ready Mux card to hold it in place or use a longer screw which will go through the standoff (*location C*) all the way from the top of the CET card to the mounting post, then to the fixture itself.

Use standoff of 0.55 inches at location C.

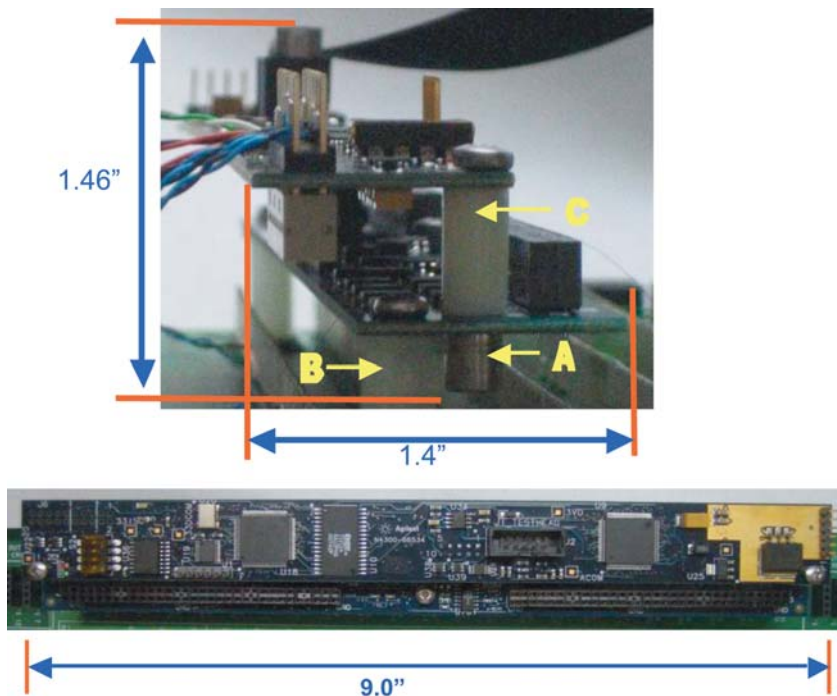


Figure 7. Dimensions of CET card stacked on top of CE Ready Mux card

CET Pin Layout

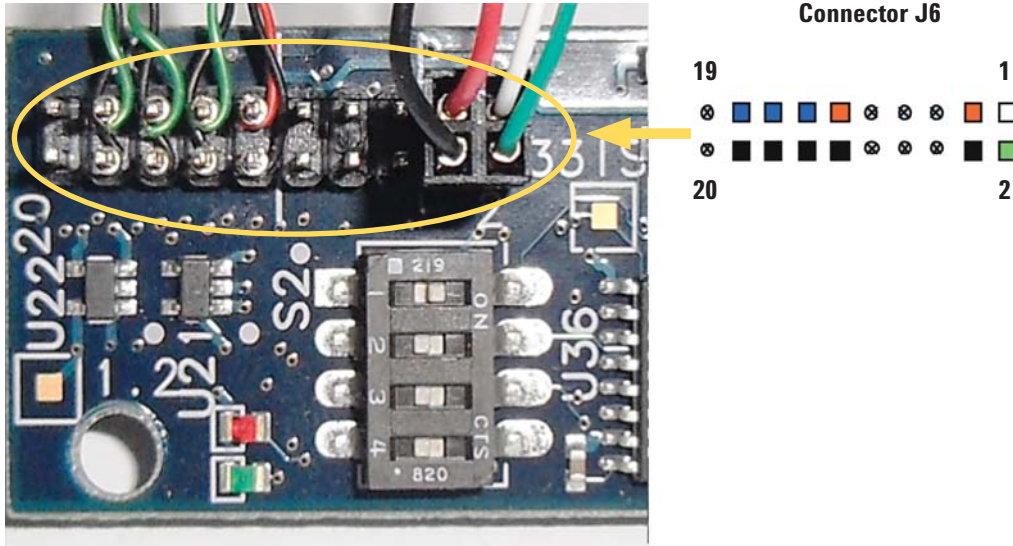


Figure 8. Connections on CET card (J6 connector)

Table 1. Pin layout of J6 connector on CET card

Cover-extend card (J6 connector)	Wire color	Wire type	Remarks
Pin 1	White	Boxed Header	USB D –
Pin 2	Green		USB D+
Pin 3	Red		USB +
Pin 4	Black		USB –
Pin 5	Not wired		For further use
Pin 6	Not wired		For further use
Pin 7	Not wired		For further use
Pin 8	Not wired		For further use
Pin 9	Not wired		For further use
Pin 10	Not wired		For further use
Pin 11	Red AWG28 wire	Twisted pair	CET Card Supply (+)
Pin 12	Black AWG28 wire		CET Card Supply (GND)
Pin 13	Blue AWG28 wire	Twisted pair	node “~LEM_A~”
Pin 14	Black AWG28 wire		CET GND
Pin 15	Blue AWG28 wire	Twisted pair	node “~LEM_R~”
Pin 16	Black AWG28 wire		CET GND
Pin 17	Blue AWG28 wire	Twisted pair	node “~LEM_M~”
Pin 18	Black AWG28 wire		CET GND
Pin 19	Not wired		For further use
Pin 20	Not wired		For further use

CET USB Signals

USB signals wiring must be permanently connected to the BRC resources. Wiring for the USB signals from the top CET card will be permanently connected to the BRC resources through a standard compliance USB cable as shown in Figure 9.

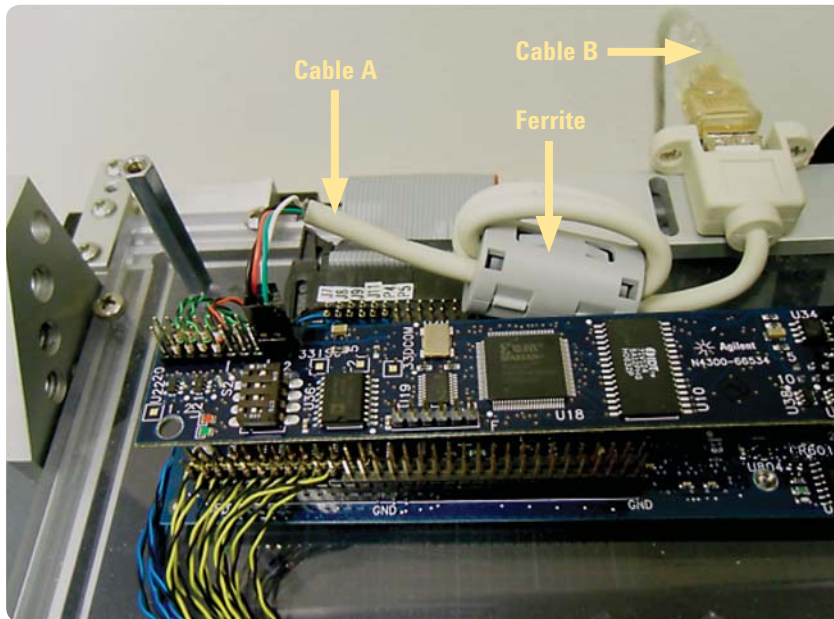
Do not use transfer pins. Transfer pins are unreliable for 'always on' connections.

The direct USB connection from the top CET card to the bottom resources of ASRU (2nd row) is done through two USB cables (Cables A and B) as shown in Figure 9.

The USB cable (cable A) is required to be passed through a ferrite core with at least 2 turns to minimize electrical noise which may affect the CET performance. Ferrite cores with an internal diameter of 10 mm will allow sufficient wire turns through the core.

Cable A is an A-Type 'receptacle' USB cable with one end cut out. The red and black (USB Vcc and Gnd) will fit into a 2-pins female connector; the green and white (USB D+ and D-) will fit into another 2-pin female connector. These female connectors will then insert into the 20-pin header pins. The other Type-A Receptacle end will be secured onto the top cover (Figure 9).

Cable B is an A-Type 'plug' USB cable; one end will mate with Cable A (Figure 9), and the other end will go down to bottom side of fixture.



Recommended Ferrite Core	
Manufacturer	MPN
TDK	ZCAT2132-1130

Figure 9. Top side – USB connection from top CET card to bottom resources of ASRU (2nd row)



A-Type receptacle

A-Type plug

Figure 10. A-Type 'receptacle' and A-Type 'plug' USB cable

CET USB Signals

On the other end of the standard compliant USB cable that runs from top CET card to bottom side of the fixture, solder AWG28 wire wrap wires onto the respective colors. The white and green wires should be twisted-pair with each other. Heat shrink should also be used to protect wires from touching each other.

For the CET card which is mounted on the *bottom side* (inside the fixture), fixture vendors should also use standard compliant USB cable with both ends soldered with white-green twisted-pair wiring (AWG28) for USB DPlus and DMinus connections and red and black wiring (AWG28) for USB Vcc and Gnd connections.

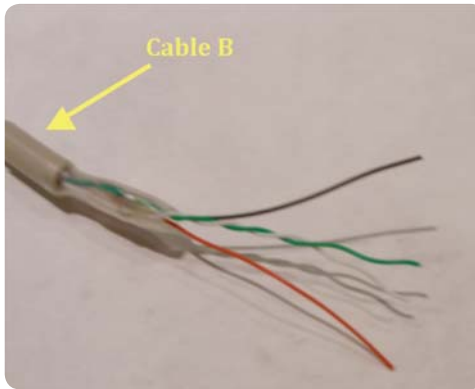
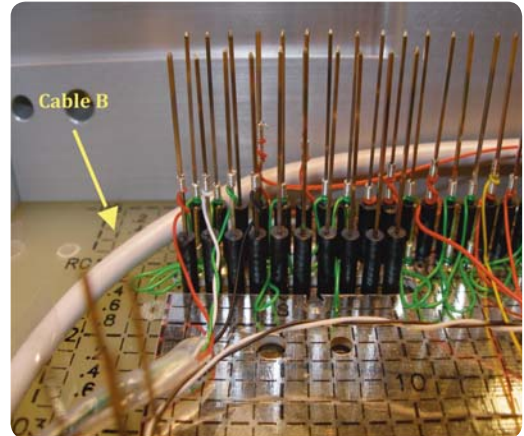
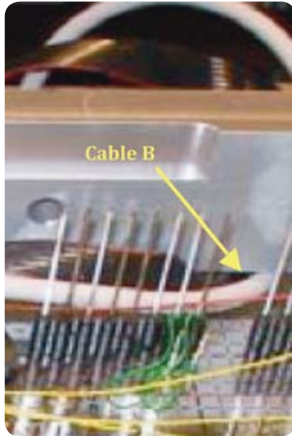


Figure 11. Bottom side – solder AWG28 wire wrap wires onto USB following the respective colors

CET Control Signals

Regardless of where the CET card is located, it is recommended that the CET control signals are permanently connected to their respective BRCs like the USB signals. The use of transfer pins is NOT recommended because they provide unreliable and inconsistent contact each time.

If CET card mounted on the top side (in top cover), the control signals can be routed to a transfer connector and in turn be connected down to the bottom side of the fixture via a short length of flat cable. This is similar to the direct connection of the 10 pin mux card cable. The control signals required only 4 twisted pairs (8pins), leaving another 2 pins of the 10pin connector as spare.

Fixture vendors should keep twisted-pair wiring (AWG28) as short as possible; and keep the open end short. Fixture vendors should also follow standard wire color coding, blue-black twisted-pair for the 3 sets of CET control signals & red-black twisted pair for CET power.

Note: Always place the transfer connector nearer to the Cover-Extend card location at the top side and also to the bottom BRC Personality pins so that the twisted pair wiring will be the shortest possible for signal integrity

Fixture File

The CET card address should be set to the same address as the CE Ready mux card it is plugged into. In this case, both CET and CE Ready mux cards should be set to address 0001.

For Cover-Extend fixture, flex cable connection J1.9 is no longer wired to Control Card Gnd (Pin 18), instead it is wired to ASRU Switch Gnd (Pin 64 to 67).

Note: For projects without Cover-Extend test, IPG will assign flex cable connection J1.9 to the Control Card Gnd (Pin 18).

CET wiring information will also be presented in the fixture/vtep_mux file. J6.1 to J6.4 are for CET USB connections; notice that it is actually wired to the second row of ASRU card (module 2 in this case).

J6.11 and J6.12 are for CET power supply wiring; note that they are also wired to the second row of the ASRU card (module 2 in this case).

J6.13 to J6.18 are CET control signals; wired using twisted-pair (to nearest hybrid ground) to CET card. For example, twisted-pair BRC 20202 with nearest hybrid ground BRC20220 (or nearest ground if ground plane is used) to CET card J6.13 and J6.14.

```

basic
Status: 251 lines in workspace.

get "fixture/vtep_mux" text 5540
=====
VTEP MUX CARD ADDRESS SWITCH SETTINGS
=====
Module | Side | Address | 4 3 2 1 ← Note the order
-----|-----|-----|-----
3      | Top  | 1      | 0 0 0 1

For VectorlessEP (N4300A MUX and N4307A MUX+REF cards)
Switch settings are (0 = OFF, 1 = ON)

=====
CET SIGNAL-CONDITIONER CARD ADDRESS SWITCH SETTINGS
=====
Module | Side | Address | 1 2 3 4 ← Note the order
-----|-----|-----|-----
3      | Top  | 1      | 1 0 0 0

Switch settings are (0 = OFF, 1 = ON)

edit | recall | recall | execute | basic | mark | test | pb | store
     | plus   | minus  |         |      |      | consult | qstats | line
  
```

Figure 12. Sample of fixture/vtep_mux file (based on CET card mounted in module 3)

```

basic
Status: 251 lines in workspace.

get "fixture/vtep_mux" text 4676
Module 2 Top side CET Signal-Conditioner 1 card
Pin (2 01.00 32.0) to CET Signal-Conditioner 1 J1.2
Pin (2 06.00 19.0) to CET Signal-Conditioner 1 J1.3
Pin (2 06.00 21.0) to CET Signal-Conditioner 1 J1.4
Pin (2 06.00 23.0) to CET Signal-Conditioner 1 J1.5
Pin (2 01.00 72.0) to CET Signal-Conditioner 1 J1.6
Pin (2 01.00 76.0) to CET Signal-Conditioner 1 J1.7
Pin (2 01.00 75.0) to CET Signal-Conditioner 1 J1.8
Pin (2 01.00 64.0) to CET Signal-Conditioner 1 J1.9
ASRU Switch Gnd
CET wiring
Pin (2 01.50 02.0) to CET Signal-Conditioner 1 J6.1
Pin (2 01.50 03.0) to CET Signal-Conditioner 1 J6.2
Pin (2 01.50 01.0) to CET Signal-Conditioner 1 J6.3
Pin (2 01.50 04.0) to CET Signal-Conditioner 1 J6.4
Pin (2 01.50 09.0) to CET Signal-Conditioner 1 J6.11
Pin (2 01.50 10.0) to CET Signal-Conditioner 1 J6.12
Pin (2 02.00 02.0) to CET Signal-Conditioner 1 J6.13
Pin (2 02.00 01.0) to CET Signal-Conditioner 1 J6.15
Pin (2 02.50 01.0) to CET Signal-Conditioner 1 J6.17

edit | recall | recall | execute | basic | mark | test | pb | store
     | plus   | minus  |         |      |      | consult | qstats | line
  
```

Figure 13. Sample of fixture/vtep_mux file cont (based on CET card mounted in module 2)

Fixture File

In the fixture/fixture file, the ASRU Switch Gnd, located at Pin 64~67, will be drilled with 1 of them socketed. For the Cover-Extend fixture, mux card flex cable J1.9 connection will be wired to this ASRU Switch Gnd as discussed in the previous page.

In the fixture/fixture file, the first 10 pins of the second row of the ASRU card will be drilled and socketed. These 10 pins will be used for the USB kit interface. The CET USB signals and CET Power Supply will be wired to this second row of the ASRU card.

Note: Polarity Check probe can be attached to the Mux card with other VTEP probes which measure CET. The Polarity Check probe can make normal TestJet measurements, but it cannot be used to make CET measurements.

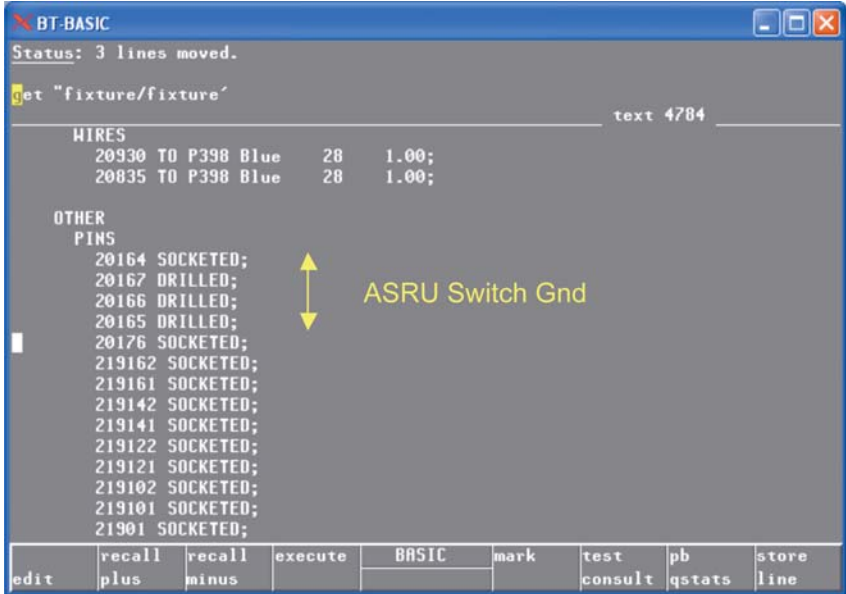


Figure 14. Sample of fixture/fixture file (based on CET card mounted on module 2)

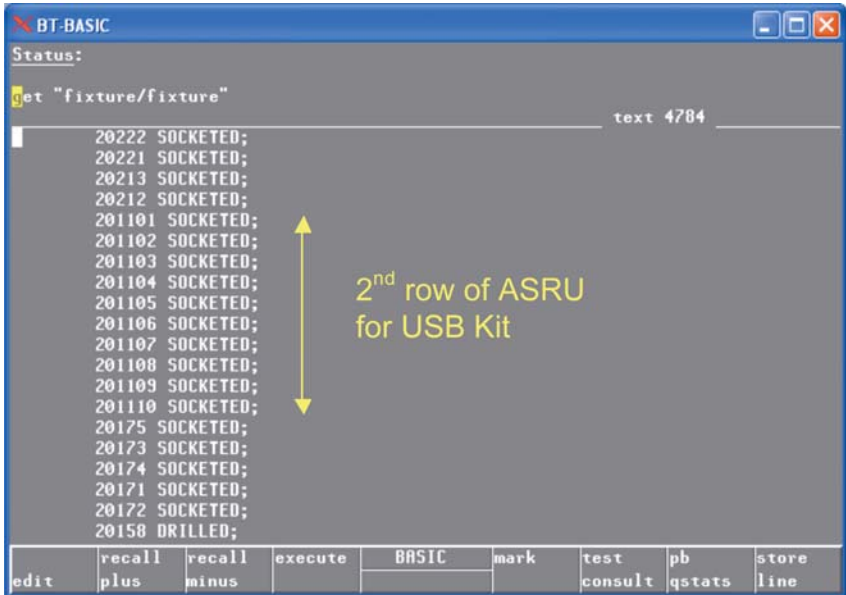


Figure 15. Sample of fixture/fixture file cont (based on CET card mounted in module 2)

CET Power and Control Signals

Table 2. CET power and control signals connection table (with USB interface kit)

BRC		Transfer pins	CET	Remark
e.g. USB kit in module 2 BRC 201109	To	e.g. TXXXXX	To J6.11	Red – CET power
e.g. USB kit in module 2 BRC 201110	To	e.g. TXXXXX	To J6.12	Black – CET ground
	To		To J6.13	Blue – “~LEM_A~”
	To		To J6.14	Black – hybrid ground
	To		To J6.15	Blue – “~LEM_R~”
	To		To J6.16	Black – hybrid ground
	To		To J6.17	Blue – “~LEM_M~”
	To		To J6.18	Black – hybrid ground

Test developers should make use of the above table to provide wiring information to the fixture vendor as well as use it as a reference for fixture wiring verification upon receiving the completed fixture.

The transfer pins column is for top-side mounted CET. The table can also be used for bottom-side mounted CET; simply ignore the transfer pins column.

Note: For top-side mounted CET, IPG will not generate transfer pins for CET Power and Control signals. These transfer pins will need to be added manually.

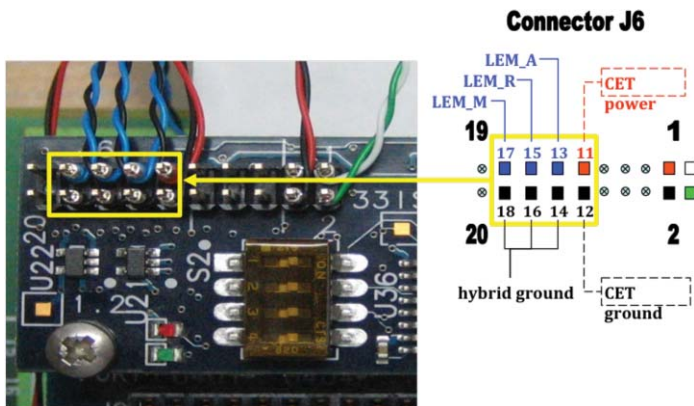


Figure 16. CET LEM_A, LEM_R, LEM_M and Power connector

CET Connection Model with USB Interface Kit

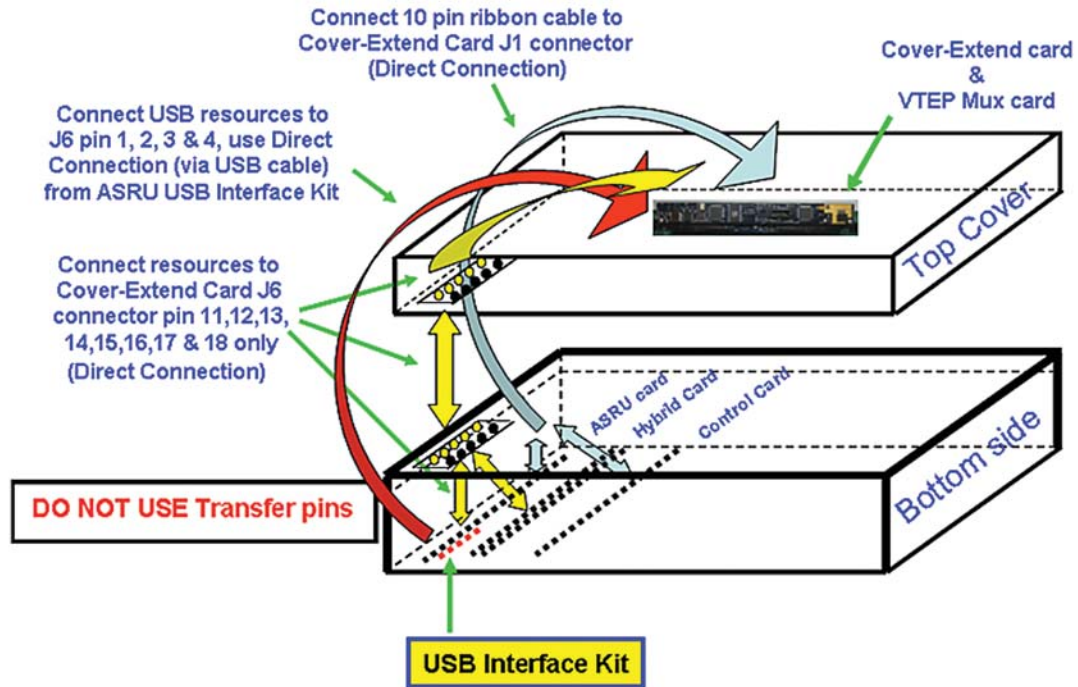


Figure 17. Connection for top side mounted CET (with USB interface kit)

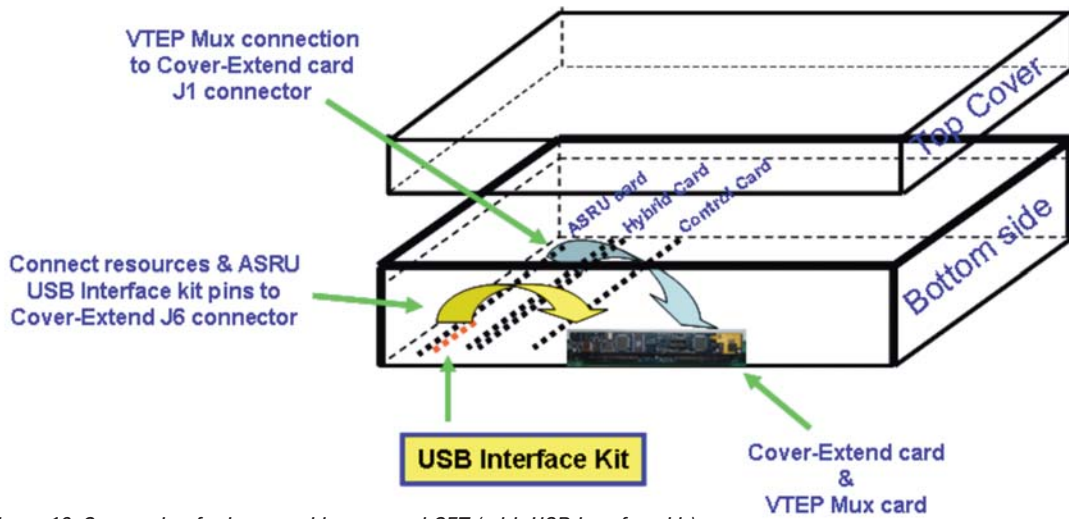


Figure 18. Connection for bottom side mounted CET (with USB interface kit)

CET Connection Model without USB Interface Kit

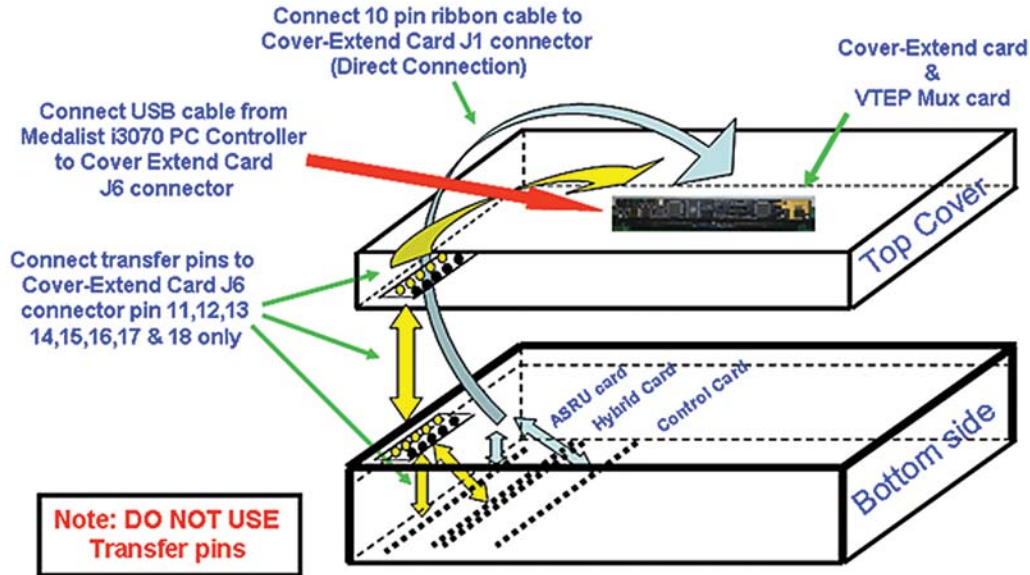


Figure 19. Connection for top side mounted CET (without USB interface kit)

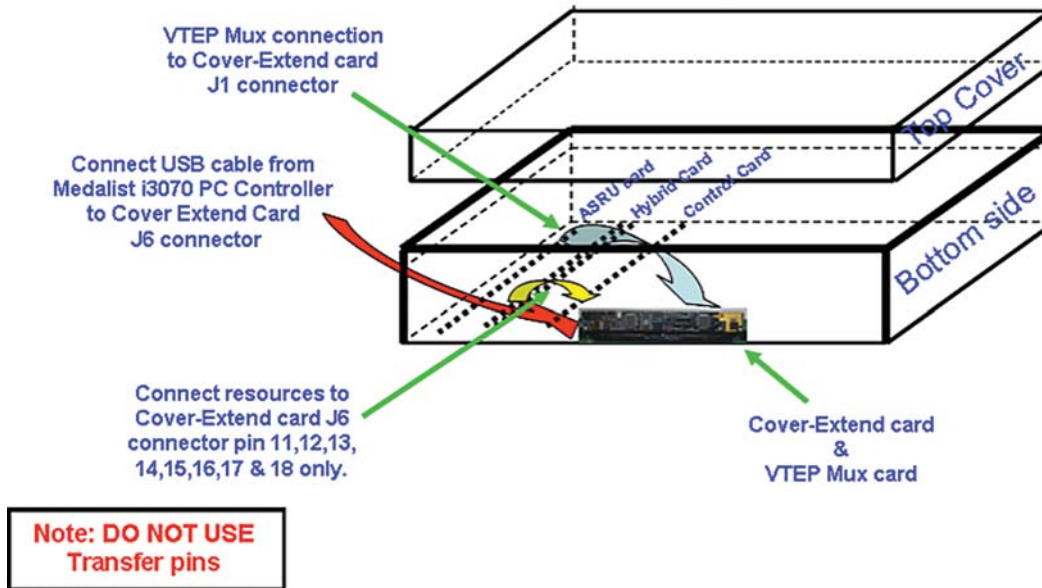


Figure 20. Connection for bottom side mounted CET (without USB interface kit)

Additional Information (for Testers without USB Interface Kit)

So far, all the CET fixturing information shared is based on the assumption that the in-circuit tester comes with a USB interface kit upgrade. For testers without USB interface kit upgrade, all information still apply, with the following two additional changes:

Change #1: Without the USB interface kit, the CET USB signals will have to interface with the PC

controller directly. For *top-side mounted CET*, Cable A is already in place based on the earlier CET fixturing information; unplug Cable B (refer to page 8 of document). An additional USB cable C is required. *Cable C is an A-Type Plug to A-Type Plug USB cable*, one end will mate with Cable A and the other end will be inserted into the USB port on the PC controller (Figure 20).

For *bottom-side mounted CET*, additional cables A & C are needed. Cable A will be connected from the CET card (inside the fixture) *with the USB A-type receptacle end coming out at the rear of the fixture*; one end of Cable C will then mate with Cable A and the other end will be inserted into the USB port on the PC Controller

Change #2: Without the USB interface kit, the CET power will not be supplied by the system card via the P-pin on the second row of the ASRU card. Instead, CET power will have to come from a DUT power supply. This DUT power supply *must* be an isolated power supply which is not used for board power up.

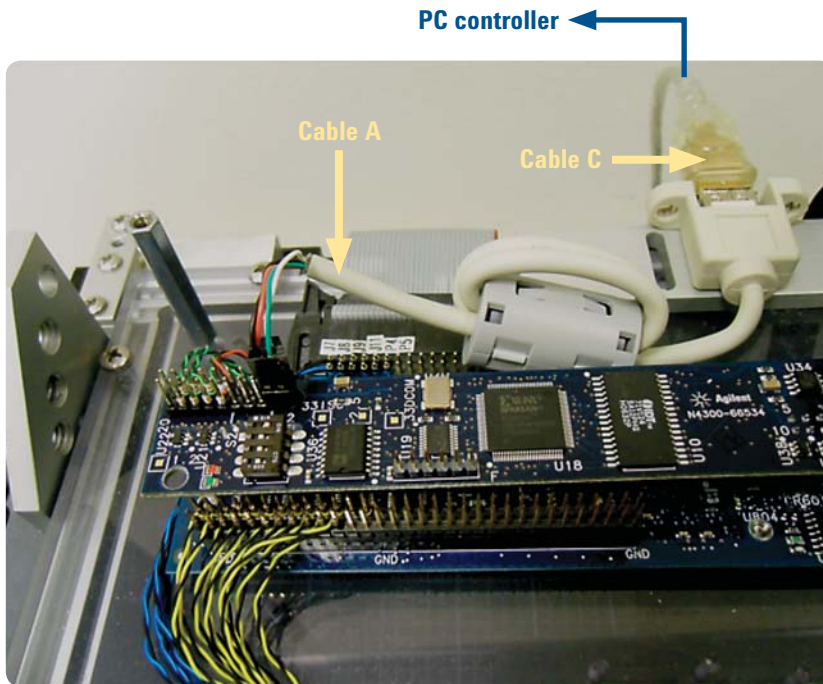


Figure 21. Direct connection from CET card to PC controller (via an A-type Plug to A-type Plug USB cable)

The fixture vendor will have to remove existing wiring between P-Pins (Pin #9 and #10) on the second row of the ASRU card and CET card (J6.11 and J6.12); thereafter, the necessary wiring from the specified DUT power supply BRCs to CET card (J6.11 and J6.12) will have to be made. That means shorting Low, Low to Sense Low, and shorting High, High to Sense High, then twisted-pair (AWG28) from Sense Low and Sense High to CET card J6.11 and J6.12.

Table 3. CET power and control signals connection table (without USB interface kit)

BRC		Transfer pins		CET	Remark	
e.g. power supply #8 BRC 20124	To	e.g. TXXXXX	To	J6.11	Red – CET power	Twisted-pair (AWG28)
e.g. power supply #8 BRC 20123	To	e.g. TXXXXX	To	J6.12	Black – CET ground	
	To		To	J6.13	Blue – “~LEM_A~”	Twisted-pair (AWG28)
	To		To	J6.14	Black – hybrid ground	
	To		To	J6.15	Blue – “~LEM_R~”	Twisted-pair (AWG28)
	To		To	J6.16	Black – hybrid ground	
	To		To	J6.17	Blue – “~LEM_M~”	Twisted-pair (AWG28)
	To		To	J6.18	Black – hybrid ground	

Using Customized Sensor Plates

Fabricating custom sensor plates is an acceptable practice but careful attention must be given to preserving signal integrity. The VTEP amplifier board must be mounted directly to the sensor plate. Additional mounting hardware can be used to increase sensor stability, levelness and support but they MUST NOT be connected to the sense side of the sensor plate. Figure 21 shows an incorrect implementation of a custom sensor

while Figure 22 shows a properly fabricated custom sensor.

More details regarding VTEP probe assembly are discussed in a technical paper named *Maximizing Test Coverage with Agilent Medalist VTEP and iVTEP* (Literature Number 5989-5339EN) which is available on the Agilent website.

(<http://cp.literature.agilent.com/litweb/pdf/5989-5339EN.pdf>)

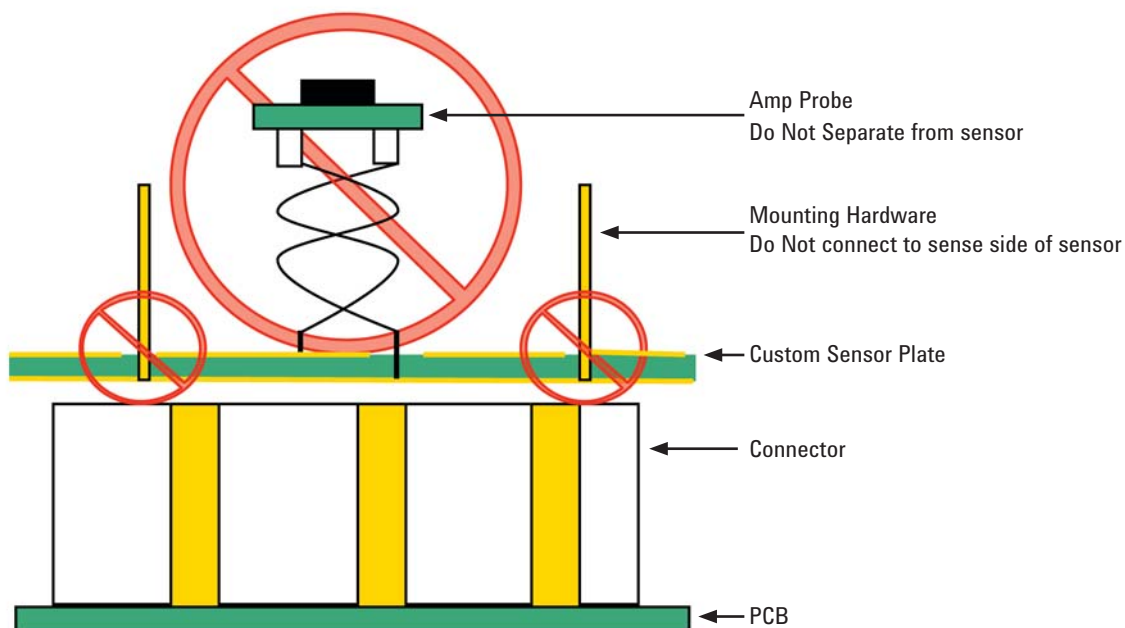


Figure 22. Mounting post must not be connected to the signal layer of sensor plate and amp probe must be mounted directly

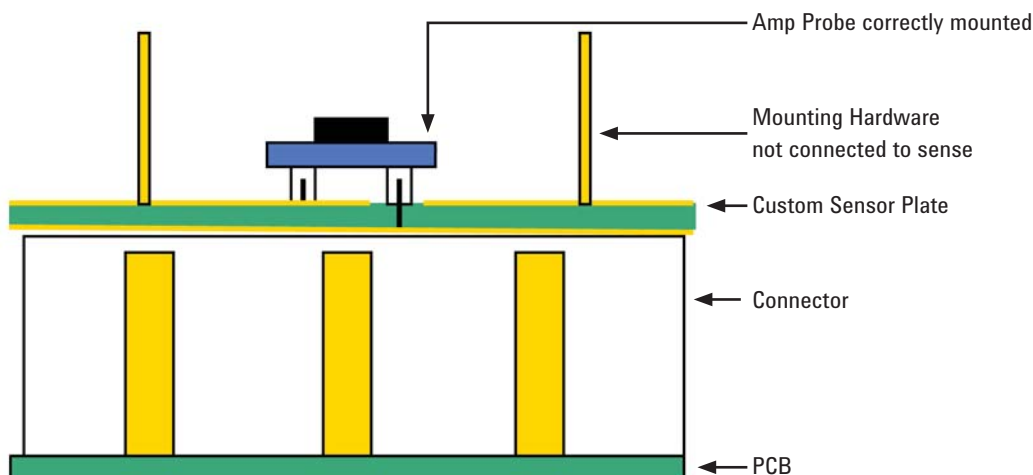


Figure 23. Properly mounted sensor and amp

Proximity of Sensor Plate to Probe

Increasing board density puts a premium on design for testability(DFT) to ensure test pads are separated by a pre-defined distance. VTEP and CET have a similar requirement to separate sensor plate to sensor plate and sensor plate to probe.

Shorting two neighboring sensor plates will make the CET or VTEP test ineffective. Shorting a sensor plate to a neighboring probe will not only make the CET or VTEP test ineffective, it also poses a risk of damaging the CET and VTEP Mux cards.

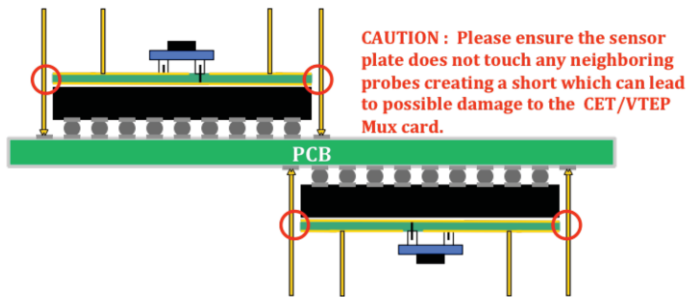


Figure 24: Ensure all sensor plates do not touch any probes

Important Points to Remember

1. Cover-Extend Ready VTEP mux card and Cover-Extend signal condition card are required.
2. Take note of the dimensions of the CET card stacked on top of the CE Ready mux card. For top-side CET, ensure that the lid for the top cover has enough clearance. For bottom-side CET, ensure milling of probe plate is done to sink in for enough clearance.
3. ASRU switch ground (whichever module CET card is assigned to) will be drilled and socketed.
4. First 10 pins of second row of ASRU card (whichever module CET card is assigned to) will be drilled and socketed.
5. Additional 20 (2 x 10) transfer pins will be installed for top-side mounted CET.
6. For Cover-Extend fixture, mux card flex cable J1.9 is wired to ASRU switch ground.
7. CET card must be directly connected onto the CE Ready mux card. Do not use ribbon cable to connect.
8. VTEP amplifier must be directly connected onto the VTEP sensor plate for CET to work. Do not separate amplifier from sensor plate.
9. Incorrect USB, power supply and CET wiring will cause hardware damage. Please double-check on the wiring.
10. Unplug USB cable from PC controller before disconnecting, connecting or wiring CET card. It is "hot" (carry +5 V) even when the vacuum is off and the fixture unlocked. Failure to do so will cause hardware damage.
11. For the top-side CET, wiring for the USB signals must be permanently connected to the personality-pins through a standard compliance USB cable. Do not use transfer pins.



Agilent Email Updates

www.agilent.com/find/emailupdates

Get the latest information on the products and applications you select.



www.axistandard.org

AdvancedTCA® Extensions for Instrumentation and Test (AXIe) is an open standard that extends the AdvancedTCA for general purpose and semiconductor test. Agilent is a founding member of the AXIe consortium.



www.pxisa.org

PCI eXtensions for Instrumentation (PXI) modular instrumentation delivers a rugged, PC-based high-performance measurement and automation system.

Agilent Channel Partners

www.agilent.com/find/channelpartners

Get the best of both worlds: Agilent's measurement expertise and product breadth, combined with channel partner convenience.



Agilent Advantage Services is committed to your success throughout your equipment's lifetime. To keep you competitive, we continually invest in tools and processes that speed up calibration and repair and reduce your cost of ownership. You can also use Infoline Web Services to manage equipment and services more effectively. By sharing our measurement and service expertise, we help you create the products that change our world.

www.agilent.com/find/advantageservices



www.agilent.com

www.agilent.com/find/limitedaccess

For more information on Agilent Technologies' products, applications or services, please contact your local Agilent office. The complete list is available at:

www.agilent.com/find/contactus

Americas

Canada	(877) 894 4414
Brazil	(11) 4197 3500
Mexico	01800 5064 800
United States	(800) 829 4444

Asia Pacific

Australia	1 800 629 485
China	800 810 0189
Hong Kong	800 938 693
India	1 800 112 929
Japan	0120 (421) 345
Korea	080 769 0800
Malaysia	1 800 888 848
Singapore	1 800 375 8100
Taiwan	0800 047 866
Other AP Countries	(65) 375 8100

Europe & Middle East

Belgium	32 (0) 2 404 93 40
Denmark	45 70 13 15 15
Finland	358 (0) 10 855 2100
France	0825 010 700*
	*0.125 €/minute
Germany	49 (0) 7031 464 6333
Ireland	1890 924 204
Israel	972-3-9288-504/544
Italy	39 02 92 60 8484
Netherlands	31 (0) 20 547 2111
Spain	34 (91) 631 3300
Sweden	0200-88 22 55
United Kingdom	44 (0) 131 452 0200

For other unlisted countries:

www.agilent.com/find/contactus

Revised: June 8, 2011

Product specifications and descriptions in this document subject to change without notice.

© Agilent Technologies, Inc. 2010, 2011
Published in USA, June 24, 2011
5990-3656EN



Agilent Technologies