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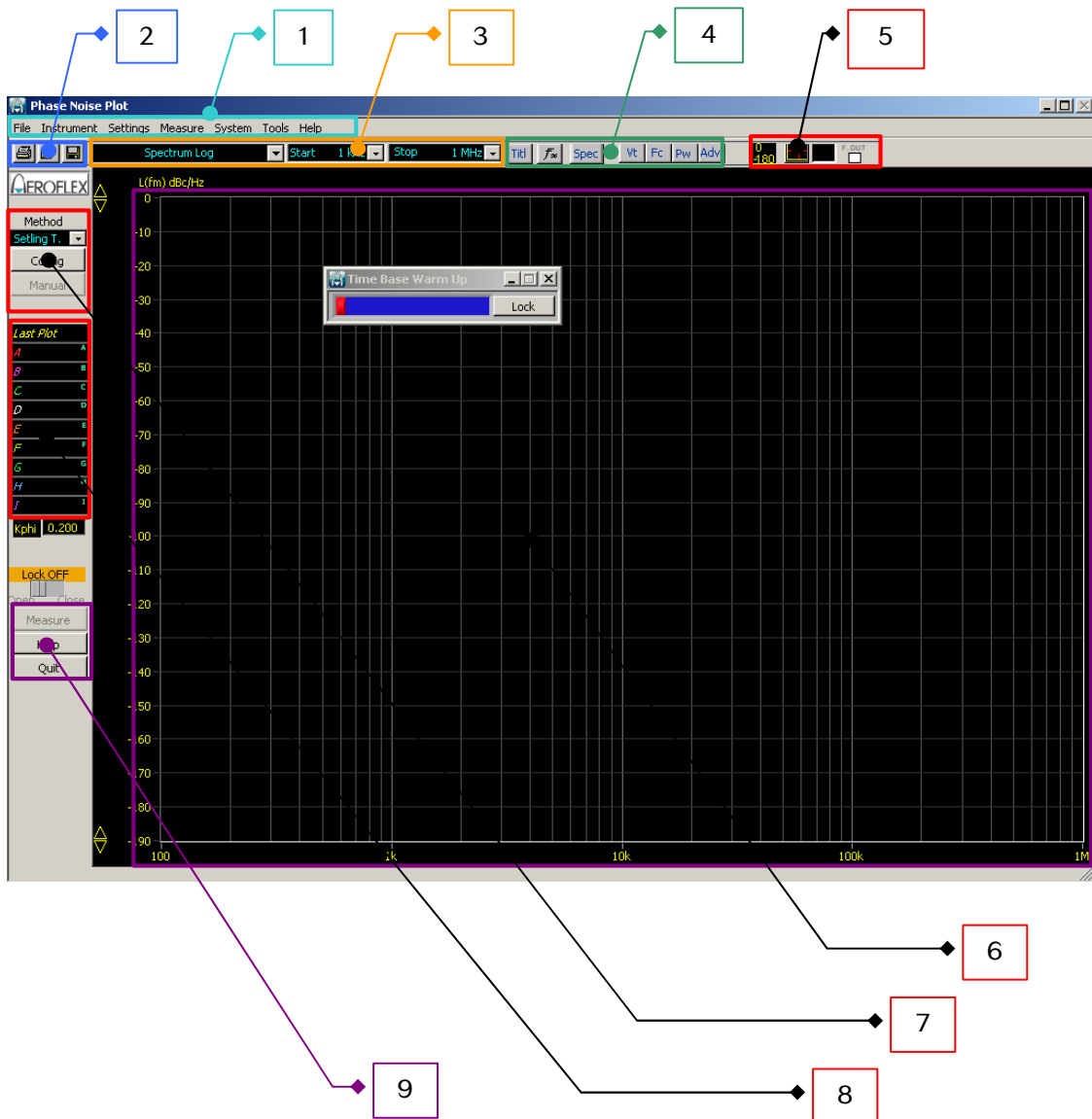
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1

WPN9000 MAIN DISPLAY

1 – WPN9000 Interface

Main WPN9000 screen.



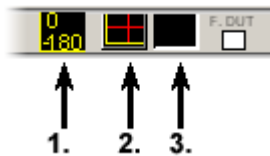
- 1: Top Menu (All Access functions).
- 2: Files Managements (Open, Save, Print Files).
- 3: Range and Display scales environment.
- 4: Shorts cuts usually functions.
- 5: Range and display functions.
- 6: Curves Display zone.
- 7: Methods and configurations measurements mode.
- 8: Memory emplacements.
- 9: Help access, shorts cuts Measurement and Quit WPN9000 application.

Top Bar Display

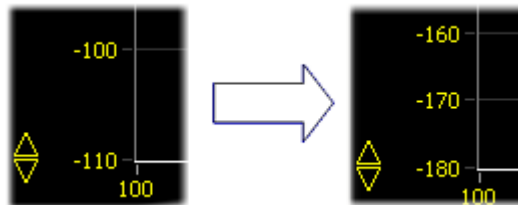
DISPLAY SCALE



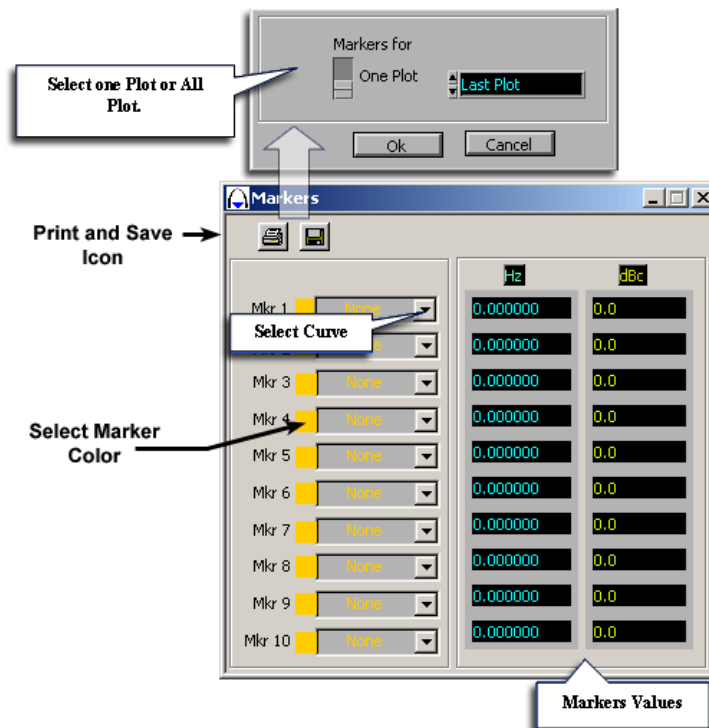
Selection of display windows: Time domain, Spectrum with Log scale, Spectrum with Log scale + Time Domain, Spectrum with Linear scale, Spectrum with Linear scale+ Time Domain.
 Selection of the start and stop scale: Start, Stop. To modify Scale click in Start or Ending Value in X Scale.
 Title: To enter a curve title.



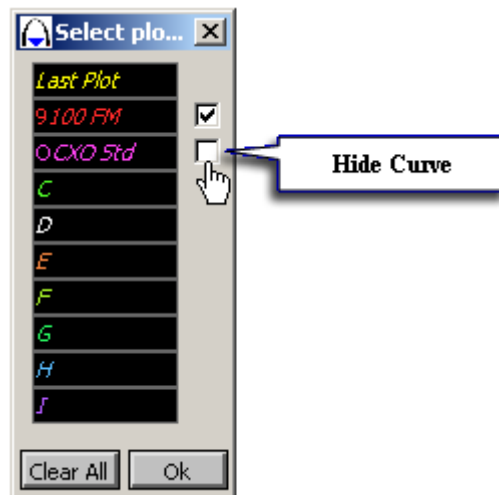
1.) 0 -180: Set reference scale = 0dBc/Hz max / -180dBc/Hz min.



2.) Red Cross: Sets the markers.
 - Select the curve "Last plot, A B C to apply the markers 1 or 2.
 - Then move the markers with the "mouse"



3.) Black Box: The user can select the curves he wants to clear. But they will not be erased.



SHORT CUT BAR



f_x Short cut for the math tools, see [Tools](#) in WPN9000 Manual for more informations.

Spec Short cut for the menu specline, see [Specline](#) in WPN9000 Manual for more informations.

Vt Short cut for the menu TuneVoltage, see [Tune Voltage](#) in WPN9000 Manual for more informations.

Fc Short cut for the menu Frequency counter, see [Frequency Counter](#) in WPN9000 Manual for more informations.

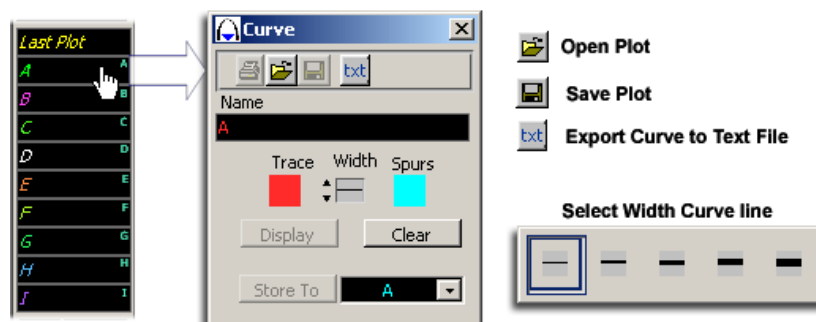
Pw Short cut for the menu Power meter, see [Power Meter](#) in WPN9000 Manual for more informations.

Adv Short cut for the menu Advanced, see [Advanced](#) in WPN9000 Manual for more informations.

Left Bar Menu

Memory:

There are ten direct memories to store the current curves. After a measurement was run, the curve is stored in the first memory, called "Last Plot". This memory can be stored in the nine other memories from A to I.



When opening the menu of each memory, the user can change the name, display the curve, clear the memory, and store a memory into another one. He can change these parameters when he selects "Trace", "Width", "Spurs".

Kphi Measurement

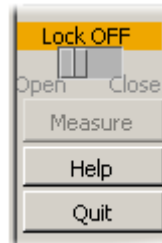


For more informations see: [Demodulation Factor](#).

Measurement

After selecting the measurement menu (either Manual or Auto mode), the user has a direct access to the main commands to run a measurement:

- Run the calibration: OdB Ref.



Lock OFF (Open/Close): Open or Close the Loop.

Measurement: Run a measurement.

Help: Open WPN9000 help file.

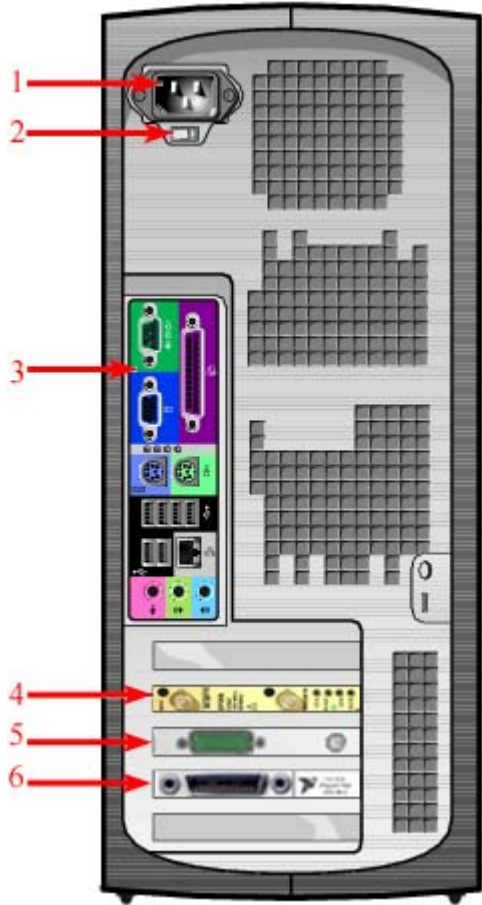
For these processes, calibration lock measurement, use the parameters defined in Manual mode.

Quit: Exit WPN9000 software.

2

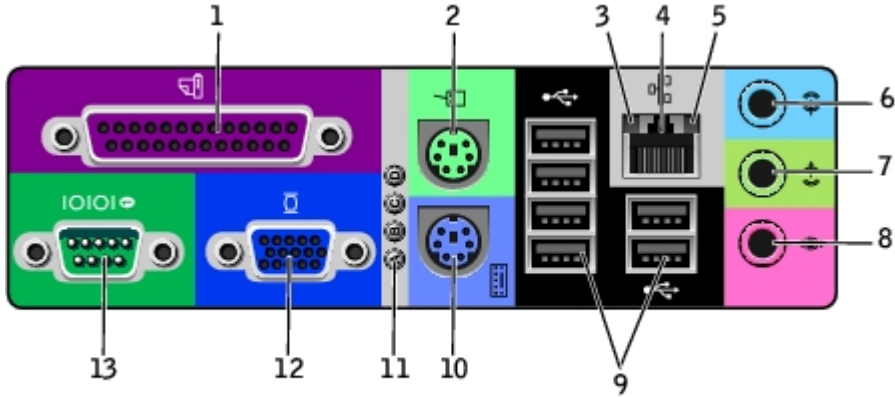
CABLINGS SYSTEM AND PN9000 PHASE NOISE TEST SET

DELL Computer Back



- 1. Power connector
- 2. Voltage selection switch (may not be available on all computers)
- 3. CPU Motherboard and other devices
- 4. Second Sampling Board (Optional for HR and PN9500)
- 5. First Sampling Board version)
- 6. GPIB Card

CPU Motherboard and other devices



1. Parallel connector	Connect a parallel device, such as a printer, to the parallel connector.
2. Mouse connector	Plug a standard mouse into the green mouse connector. Turn off the computer and any attached devices before you connect a mouse to the computer.
3. link integrity light	<ul style="list-style-type: none"> • Green – A good connection exists between a 10-Mbps network and the computer. • Orange – A good connection exists between a 100-Mbps network and the computer. • Yellow – A good connection exists between a 1-Gbps (or 1000-Mbps) network and the computer. • Off – The computer is not detecting a physical connection to the network.
4. network adapter connector	<p>To attach your computer to a network, connect one end of a network cable to either a network jack or your network device. Connect the other end of the network cable to the network adapter connector on the back panel of your computer. A click indicates that the network cable has been securely attached.</p> <p>On computers with a network connector card, use the connector on the card.</p> <p>It is recommended that you use Category 5 wiring and connectors for your network. If you must use Category 3 wiring, force the network speed to 10 Mbps to ensure reliable operation.</p>
5. network activity light	Flashes a yellow light when the computer is transmitting or receiving network data. A high volume of network traffic may make this light appear to be in a steady "on" state.
6. line-in connector	Use the blue line-in connector (available on computers with integrated sound) to attach a record/playback device such as a cassette player, CD player, or VCR.
7. line-out connector	Use the green line-out connector (available on computers with integrated sound) to attach headphones and most speakers with integrated amplifiers.
8. microphone connector	Use the pink microphone connector (available on computers with integrated sound) to attach a personal computer microphone for voice or musical input into a sound or telephony program.
9. USB 2.0 connectors (6)	Use the back USB connectors for devices that typically remain connected, such as printers and keyboards, and for bootable USB devices.
10. keyboard connector	If you have a standard keyboard, plug it into the purple keyboard connector. If you have a USB keyboard, plug it into a USB connector.
11. diagnostic lights	Use the lights to help you troubleshoot a computer problem based on the diagnostic code. For more information, see DELL Documentation.

12. video connector	Plug the cable from your VGA-compatible monitor into the blue connector.
13. serial connector	Connect a serial device, such as a handheld device, to the serial port. In system setup, the default designation is COM1.

Cabling DELL Devices

HOW TO CONNECT MOUSE AND KEYBOARD TO COMPUTER:

Turn off your computer and unplug its power cable.

(Keyboard and Mouse graphic is for illustration only. Product appearance may vary.)



HOW TO CONNECT MONITOR TO COMPUTER:

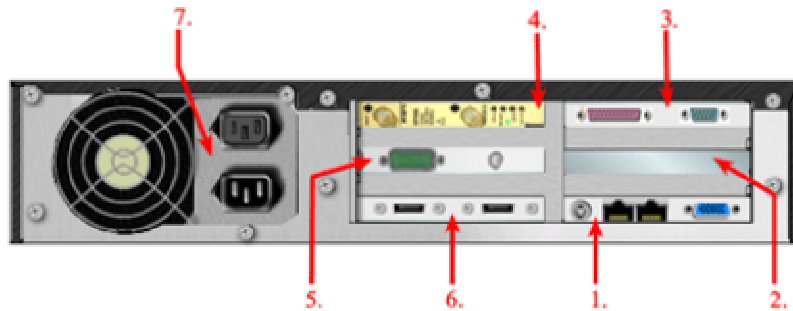
Turn off your computer and unplug its power cable.

Connect the blue (analog D-sub) display connector cable to the corresponding video port on the back of your computer.

(Monitor graphic is for illustration only. Product appearance may vary.)

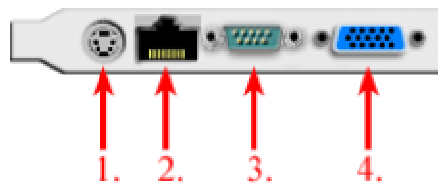
- | |
|--|
| 1. Power Cord, plugs into monitor and wall receptable |
| 2. 15-pin D-sub signal cable(Used for analog video and is detachable) |
| 3. DVI cable(Used for digital video and is detachable) <i>[Not Used]</i> |

Back Computer Back



1.	CPU Motherboard and other devices
2.	GPIB Card
3.	Serial and Parallel Ports
4.	Second Sampling Board (Optional for HR and PN9500 version)
5.	First Sampling Board
6.	USB ports Bracket (may not be available on all computers)
7.	Power Supply

1.) Cabling CPU Motherboard



1.	Mini Din Connector Keyboard/Mouse (with Y Cable)
2.	10/100 Mbts LAN Port (RJ45)
3.	Serial Port (COM1)
4.	D-SUB 15 Video Connector (SVGA)

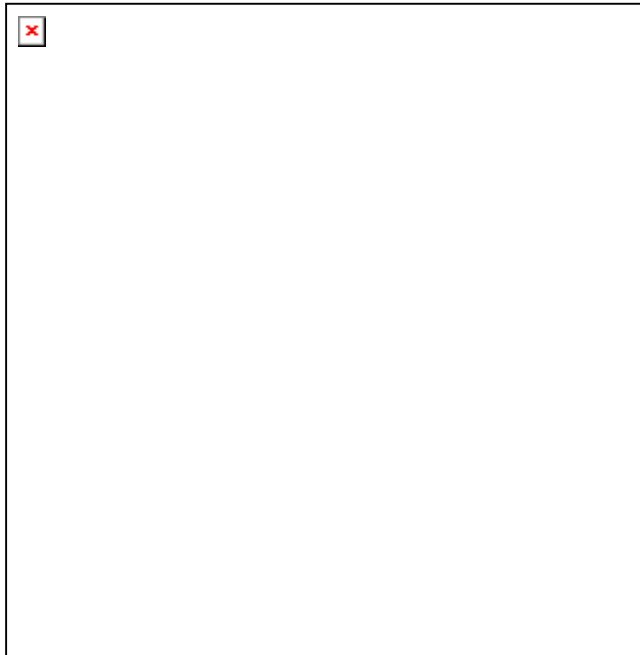
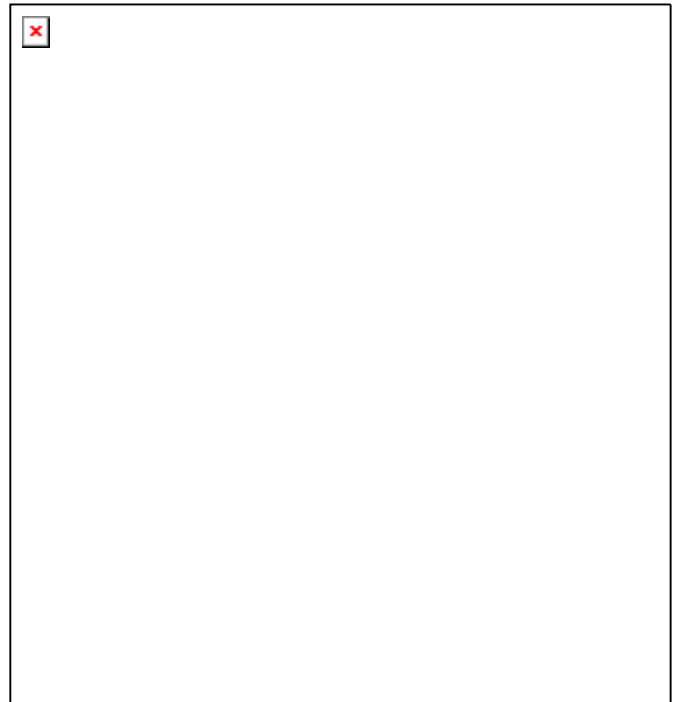


1.	Mini Din Connector Keyboard/Mouse (with Y Cable)
2.	10/100 Mbts LAN Port 1 (RJ45)
3.	10/100 Mbts LAN Port 2 (RJ45)
4.	D-SUB 15 Video Connector (SVGA)

HOW TO CONNECT MOUSE AND KEYBOARD TO COMPUTER:

Turn off your computer and unplug its power cable.

(Keyboard and Mouse graphic is for illustration only. Product appearance may vary.)



HOW TO CONNECT MONITOR TO COMPUTER:

Turn off your computer and unplug its power cable.

Connect the blue (analog D-sub) display connector cable to the corresponding video port on the back of your computer.

(Monitor graphic is for illustration only. Product appearance may vary.)

- | |
|--|
| 1. Power Cord, plugs into monitor and wall receptable |
| 2. 15-pin D-sub signal cable(Used for analog video and is detachable) |
| 3. DVI cable(Used for digital video and is detachable) <i>[Not Used]</i> |

Computers Common Cablings

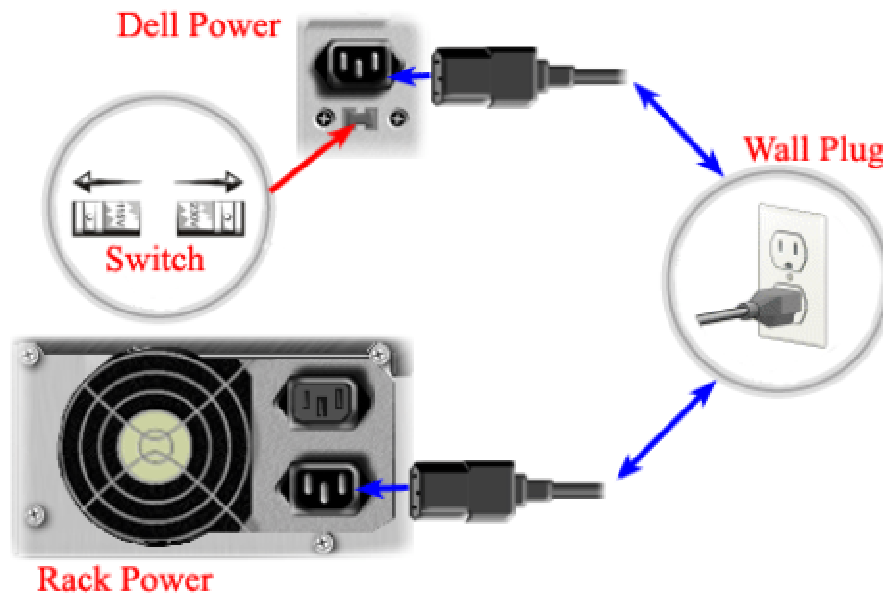
Cabling PC Power Supply

Insert the power cable.

Your computer is equipped with either an auto-sensing voltage selector or a manual voltage selection switch.

Computers with an auto-sensing voltage selector (PC Rack Power supply) do not have a voltage selection switch on the back panel and can automatically detect the correct operating voltage.

To help avoid damaging a computer with a manual voltage selection switch, set the switch for the voltage that most closely matches the AC power available in your location.

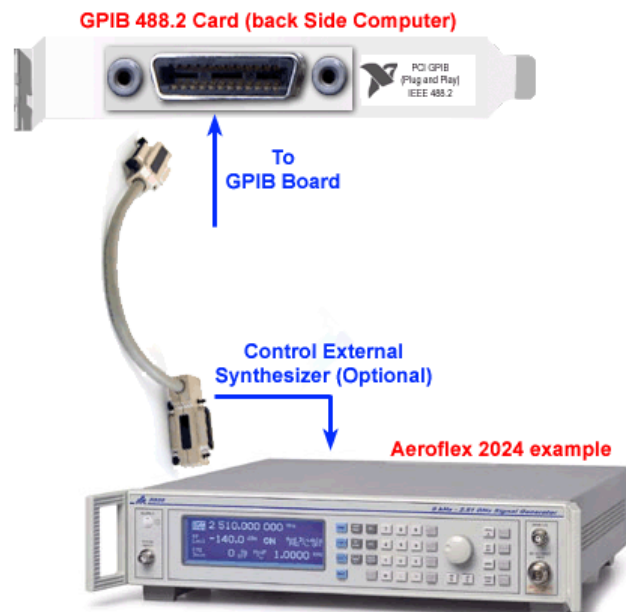


NOTICE: The voltage selection switch must be set to the 115-V position even though the AC power available in Japan is 100 V.

Connect GPIB 488.2 Computer Card

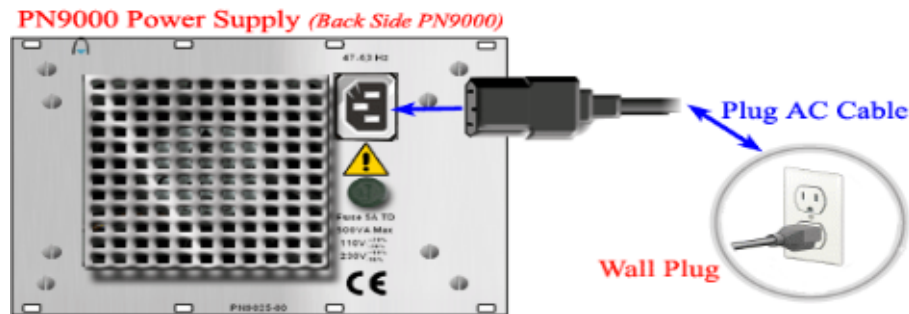
With Option PN9.

For Control External GPIB Synthesizer, Connect Internal GPIB computer card to Synthesizer.



PN9000 Cablings

Cabling PN9000 Power Supply



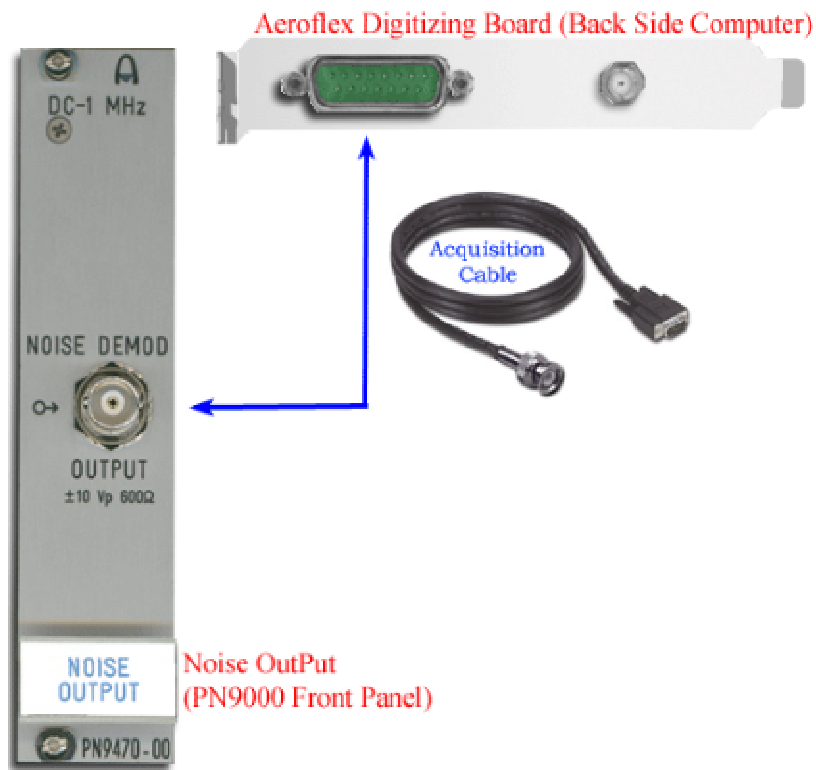
Insert the power cable.

Your PN9000 is equipped with either an auto-sensing voltage selector or a manual voltage selection switch.

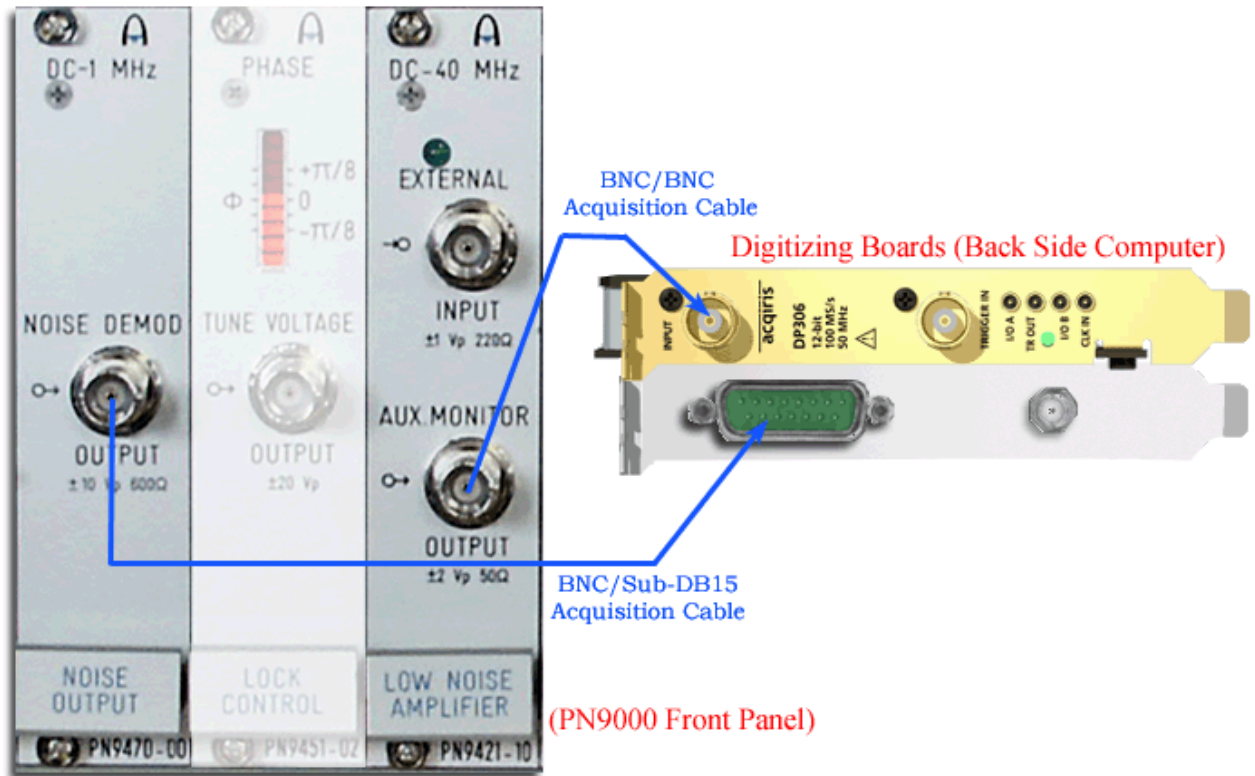
PN9000 with an auto-sensing voltage selector (PN9025-00 for example) do not have a voltage selection switch on the back panel and can automatically detect the correct operating voltage.

Cabling First Sampling Board (PN9650, PN9655, PN9656, DP306)

Cabling Acquisition board for WPN9000 Standard:

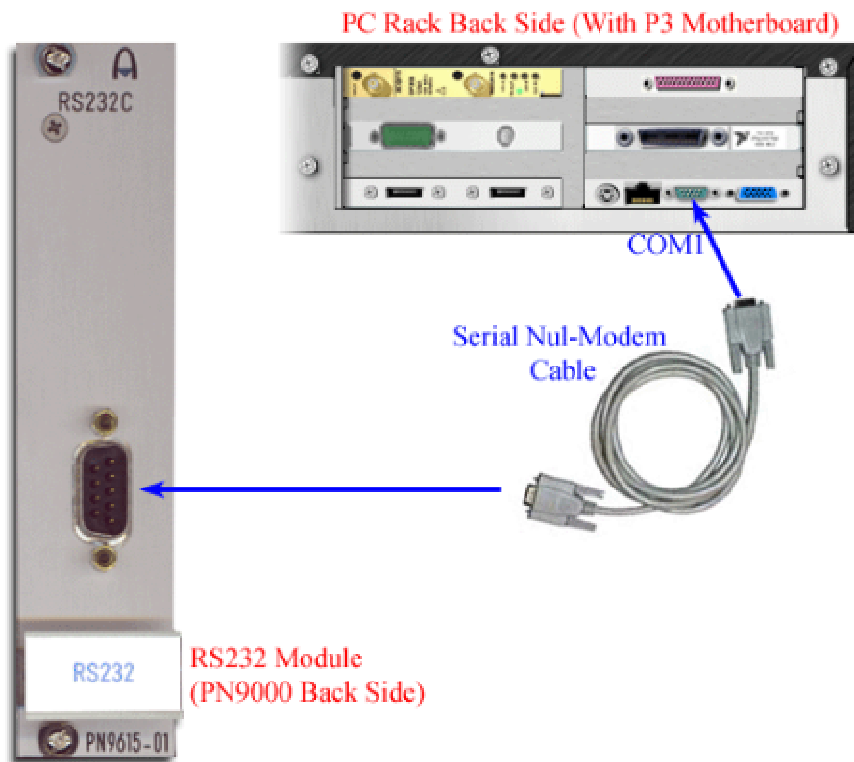


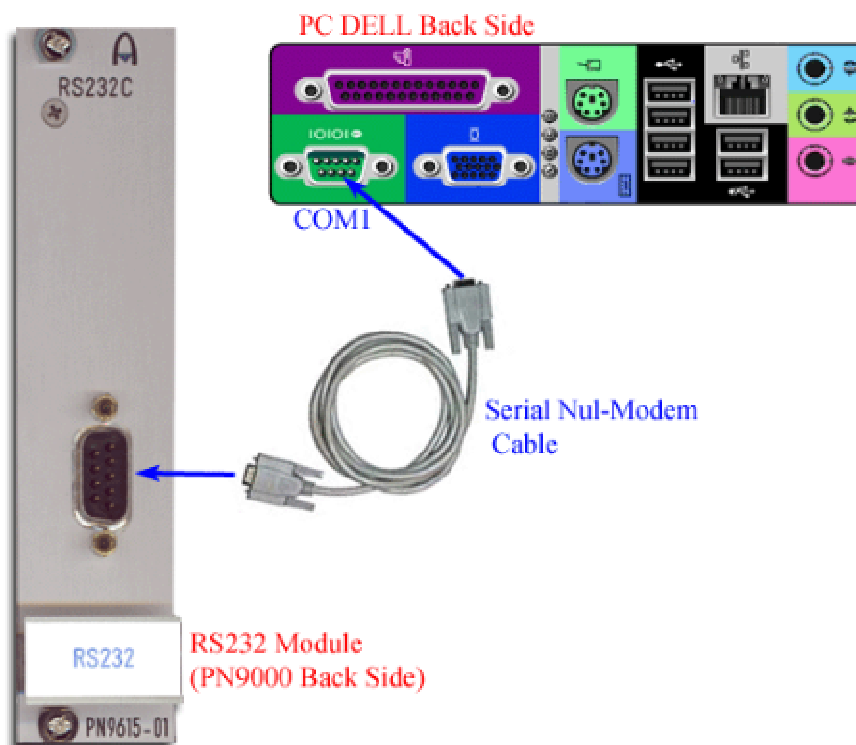
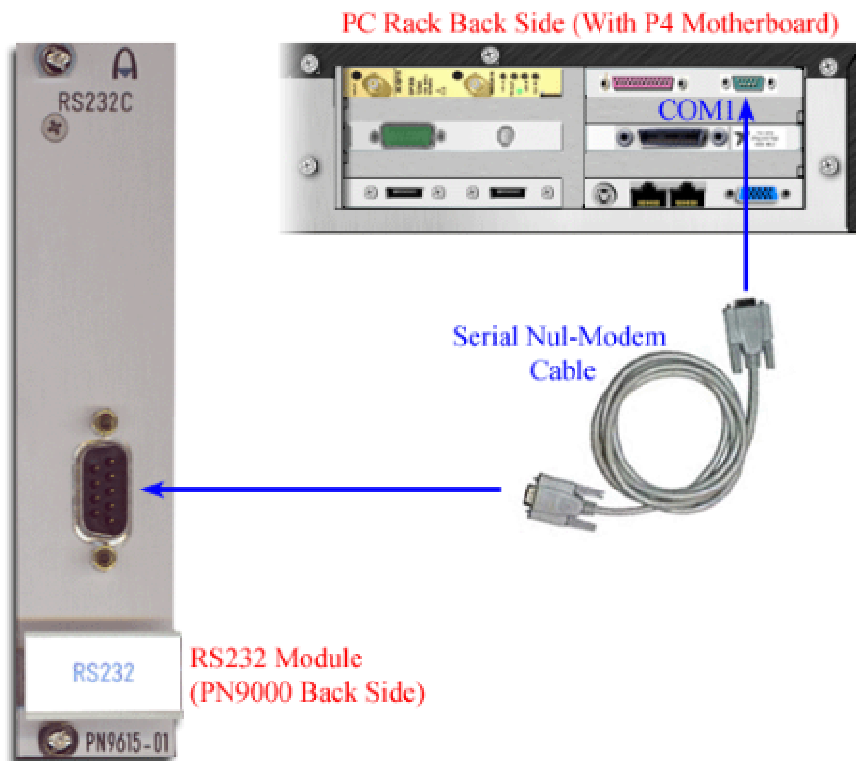
Cabling Acquisition board for WPN9000 HR:



Cabling Serial Control PN9000 (PN9615)

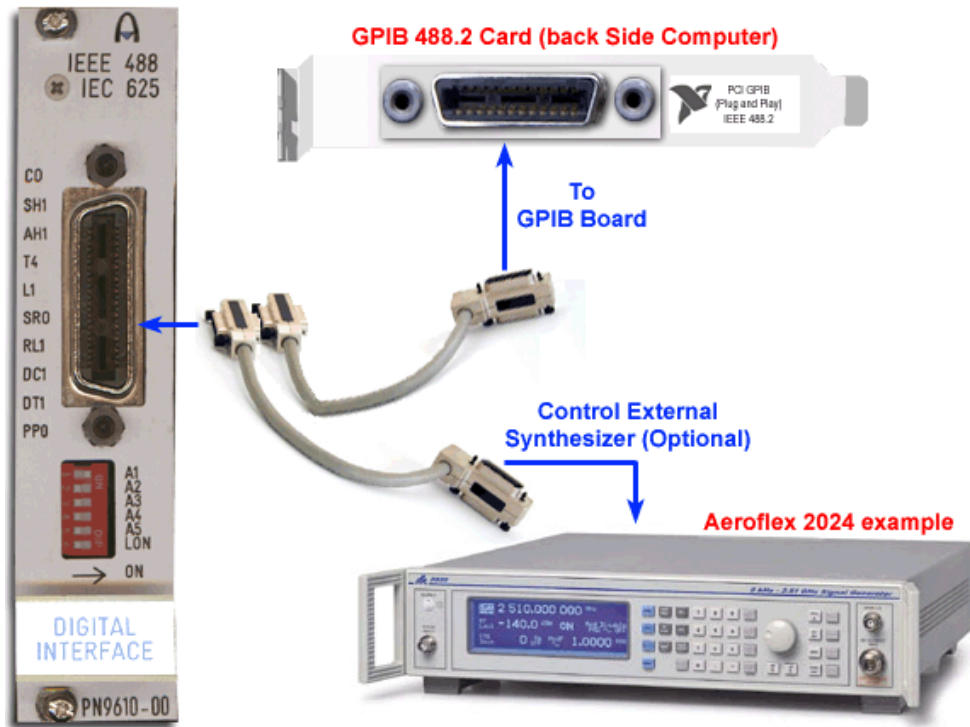
If your PN9000 have option PN9615 only.
 Connect the serial Nul-Modem cable from COM1 computer to PN9000 module.





Cabling GPIB 488.2 Control Chassis and/or Control External Synthesizer (PN9610)

If your PN9000 have option PN9610 only, the PN9000 system is controlled by GPIB. Connect the GPIB cable from GPIB card on your computer to PN9000 module. If you have synthesizer drivers, it is possible to control External source.



PN9000 Digital Interface
(Back Side PN9000)

3

CABLINGS PN9000

Getting Started with PN9000

A) CONNECTING THE SYSTEM

- Switch the right Voltage range on the back of the PN9000 chassis. The computer is automatically switched to the right Voltage range.
Connect the computer and the PN9000 chassis to the Line.
- Connect the computer to the PN9000 chassis using :
 - An IEEE cable (PN9000 address should be : 1)
 - A "dedicated" coaxial cable from the PN9000 NOISE OUTPUT module to the digitizing board on the back of the computer.
- Connections of the others coaxial cables depend on the measurement method see the user interface menu: Device type/Config, showing the cabling for each method.

B) STARTING THE SYSTEM UP

- The PN9000 chassis has to be switched on few seconds before launching the software. After loading the software the red Bar Graph should be lighted on all the way up to the "0" guide mark. The Blue led of the status module, Remote Led, should be lighted. By acting the "Lock on/Lock off" command, bottom left of the main screen, the Bar Graph must change from several bars to one bar display. This command tests if the chassis is right controlled through IEEE by the computer.

C) STARTING A MEASUREMENT

- Select first the right type of Device under test: menu " Method ".
- There are three main configurations :
 - Stable source (PLL, Synthesizer, Crystal) measured with a remote controllable synthesizer as reference, with the PLL method.


➡ See method PLL ["Phase noise method PLL measurement"](#)

- Stable source (Crystal) measured with a Crystal oscillator as reference, with the PLL method.

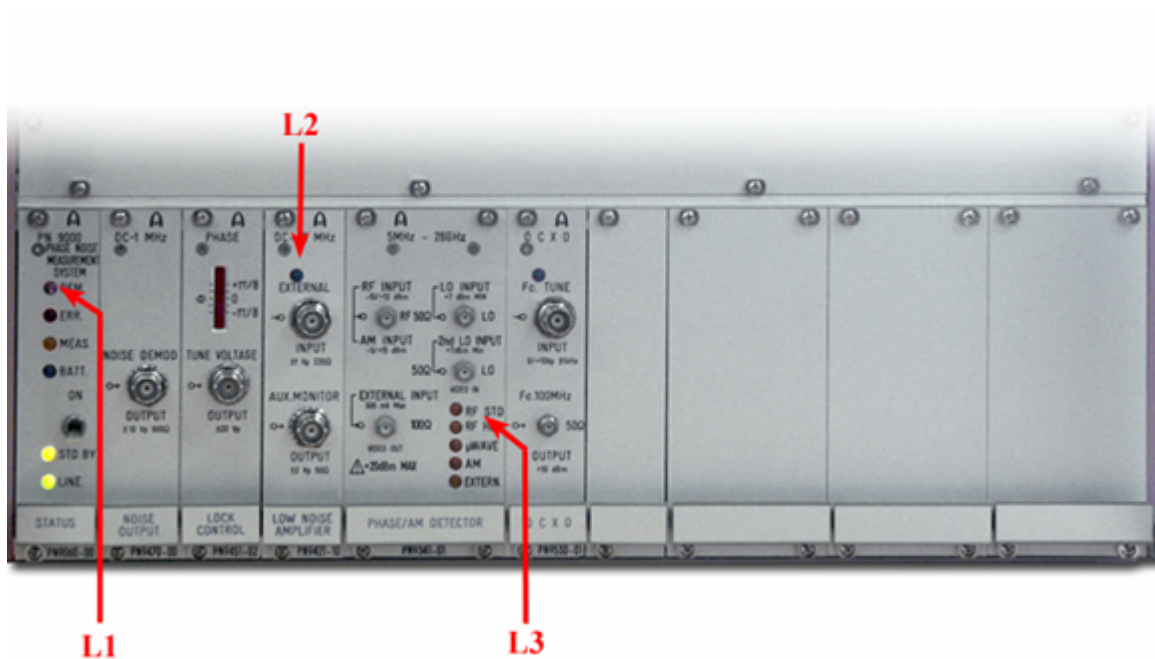
➡ See method Crystal ["Phase noise method Crystal measurement"](#)

- Unstable source (VCO) measured with the delay line method.

➡ See method VCO ["Phase noise method VCO measurement "](#)

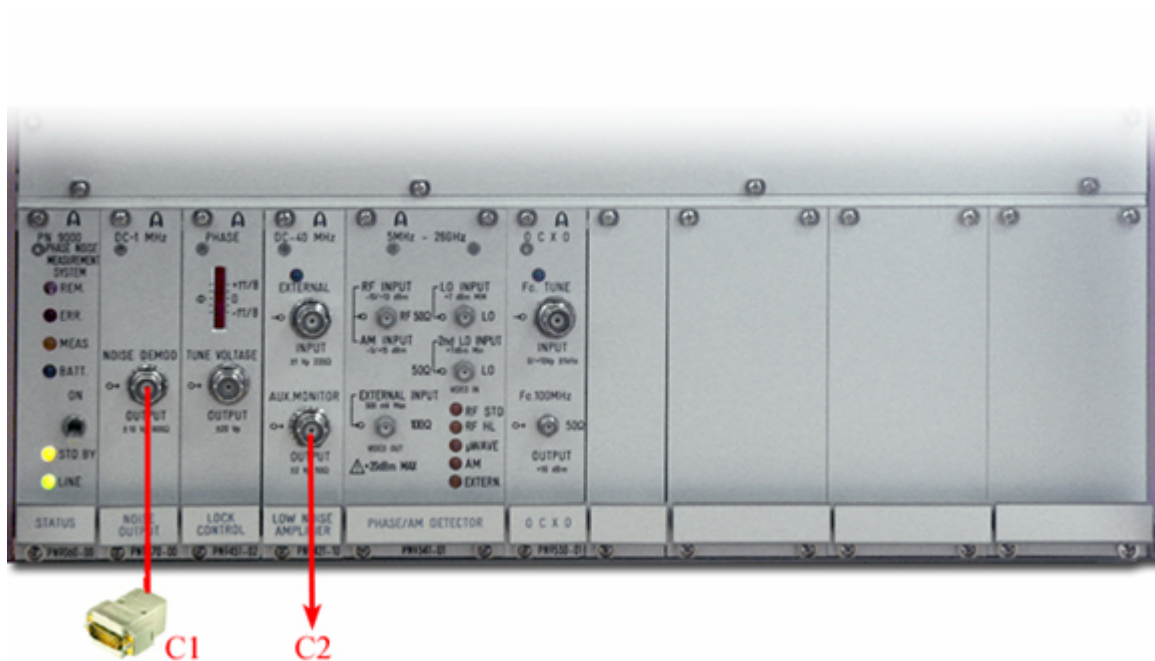
 There are two ways of running a measurement: manual or automatic:
The manual mode allows the operator to run the measurement step per step: calibration , lock , spectral analysis.
The automatic mode run all the measurement in one step.

D) LED INDICATOR



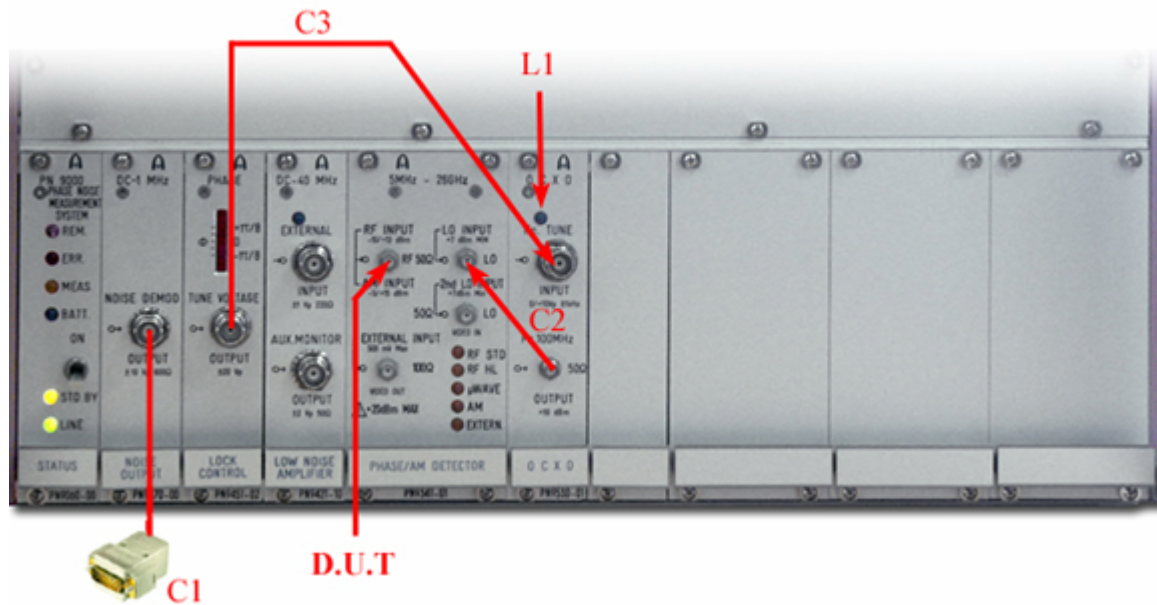
- L1: Status led:
 - REM: remote control always lighted-on.
 - ERR: error control lighted-on in case of measurement error.
 - MEAS: lighted-on during the spectral analysis.
 - BATT: not used.
- L2: Noise channel indicator: External input (lighted-on) or internal phase detector (lighted-off).
- L3: Phase detector selection indicator.
- L4: 10 MHz / 100 MHz OCXO power indicator.
- L5: PN 9100 power indicator (Present softawre version, always on).
- L6: Microwave DRO lock indicator, locked = lighed-on.
Always lighed-on excepted for the 2GHz and off position.
- L7: Time Base lock indicator. An internal 100 MHz is locked on a 10 MHz OCXO.. Always on.

D) INITIAL CABLING



- C1: Connection to the computer. Always connected.
- C2: Auxiliary output can be connected to a scope or a spectrum analyzer.
- C3: Connection to the delay-line 100 / 20 nsec.
- C4: Microwave downconverter reference frequencies.
- C5: Internal 10 MHz Time Base. Always connected.

Crystal oscillator source measured with an internal crystal oscillator as reference

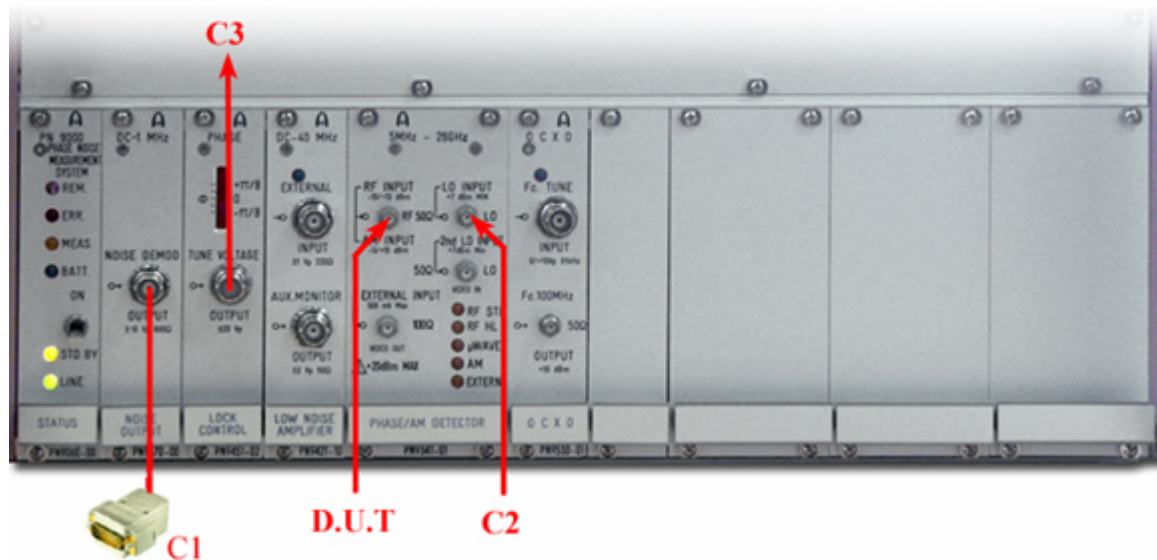


- C1: Connection to the computer.
- C2: 10 MHz or 100 MHz VCXO Reference source (others frequencies are available).
- C3: Reference VCXO locking control.
- L1: The corresponding led 10 MHz/100 MHz should be lighted-on.
- D.U.T : Device Under Test.
 - Should be very stable source.
 - Very close to 10 MHz and 100 MHz.
 - The DUT can be connected to a PN9820 Buffer to adapt the input impedance and Power.

➡ For theory of process see: [Application note PLL](#).

➡ For software menu see: [Operating mode: method VCO](#).

Crystal oscillator source measured with an external crystal oscillator as reference



- C1: Connection to the computer.
- C2: External VCXO Reference source (this source should have a DC frequency control).
- C3: Reference VCXO locking control (DC frequency control).
- D.U.T: Device Under Test.
 - Should be very stable source.
 - Very close to the reference source.
 - The DUT can be connected to a PN9820 Buffer to adapt the input impedance and Power.

➡ For theory of process see: [Application note PLL](#).

➡ For software menu see: [Operating mode: Crystal](#).

PLL, stable source measured with the synthesizer PN9100 as reference

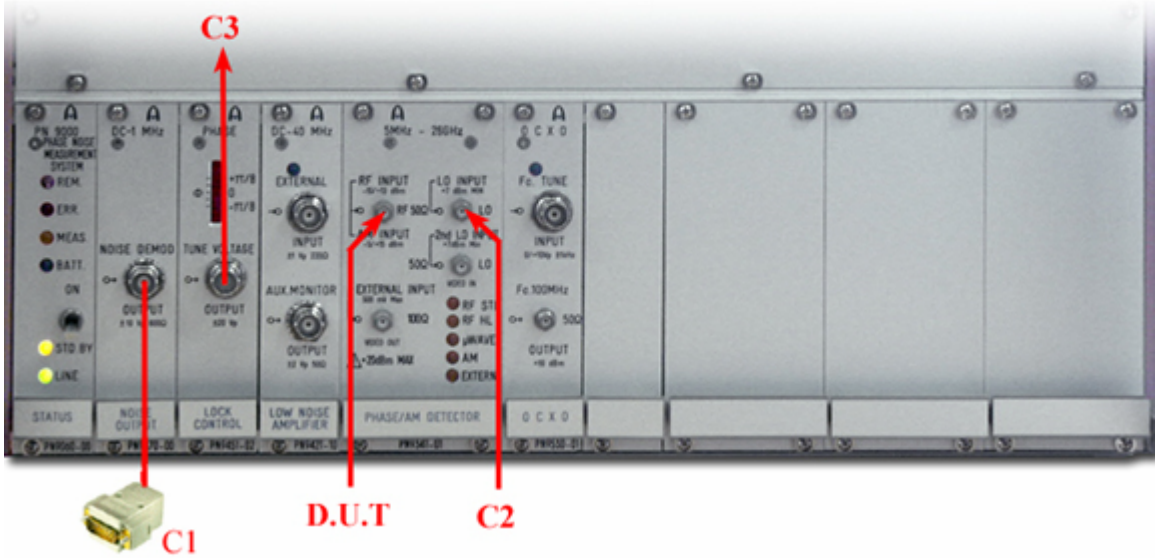


- C1: Connection to the computer.
- C2: PN 9100 Reference source connected to the Phase detector LO port.
- C3: PN 9100 locking control.
- D.U.T: Device Under Test.
 - Should be stable source.
 - The PN 9100 is working up to 4.5 GHz.
 - In the range 5 MHz. 1.8 GHz use the RF Phase detector.
 - In the range 1.8 GHz 4.5 GHz uses the microwave Phase detector.
- L1: PN9100 Power-on led.
- L2: Lock control led should be lighted-on.

➡ For theory of process see: [Application Note PLL](#).

➡ For software menu see: [Operating mode: PLL RF](#).

PLL, stable source measured with an external synthesizer as reference



- C1: Connection to the computer.
- C2: External Reference source (this source should be IEEE compatible).
- C3: Reference locking control (DC frequency control).
- D.U.T: Device Under Test.

➡ For theory of process see: [Application Note PLL](#).

➡ For software menu see: [Operating mode: PLL RF](#).

Microwave PLL, stable source measured with the PN9100 and PN9151/52 doublers options up to 18GHz as reference



- C1: Connection to the computer.
- C2: If no doublers options are installed, the PN 9100 Reference source is connected to the Phase detector LO port. With doubler options the PN9100 is connected to the doublers and the last doubler output is connected to the Phase detector LO port.
- C3: PN9100 locking control.
- D.U.T: Device Under Test.
 - Should be stable source.
 - The PN 9100 is working up to 4.5 GHz , doubler options up 18GHz.
- L1: PN9100 Power-on led.
- L2: Lock control led should be lighted-on.

➡ For theory of process see: [Application Note PLL](#).

➡ For software menu see : [Operating mode: PLL MW](#).

Microwave PLL, stable source measured with a PN925X down converter and the PN9100 as RF reference



- C1: Connection to the computer.
- C2: External Reference source (this source should be IEEE compatible).
- C3: Reference locking control (DC frequency control).
- D.U.T: Device Under Test.

➡ For theory of process see: [Application Note PLL](#).

➡ For software menu see: [Operating mode: PLL RF](#).

Free running source measured with the Delay Line method




- C1: Connection to the computer.

PN9715 type: *This model doesn't include the phase detector.*

- C2: Delay-line output Reference channel connected to the Phase detector, LO port.
- C3: Delay-line output delayed channel, connected to the Phase detector, RF port.

PN9718/9 type: *This model includes the phase detector.*

- C2: Delay-line DC phase detector output connected to Ext port DC coupling.
- C3: Delay-line D.U.T auxiliary output connected to the Phase detector, LO port, for frequency measurement.
- D.U.T: Device Under Test.
 - Method adapted to unstable free running source, such as VCO.

 To improve the residual noise, the DUT can be connected to a frequency doubler PN9908 before the delay line (the DUT is connected to the doubler and the doubler output is connected to the delay line the output doubling frequency should be compatible with the delay line frequency range).

- ➔ For theory of process see: [Application note VCO](#).
- ➔ For software menu see: [Operating mode: method VCO](#).

Microwave Free running source measured with the Delay Line and the VCO Down converter method




- C1: Connection to the computer.

PN9715 type:

- C2: Delay-line output Reference channel, connected to the Phase detector, LO port.
- C3: Delay-line output delayed channel, connected to the Phase detector, RF port.

PN9718/9 type:

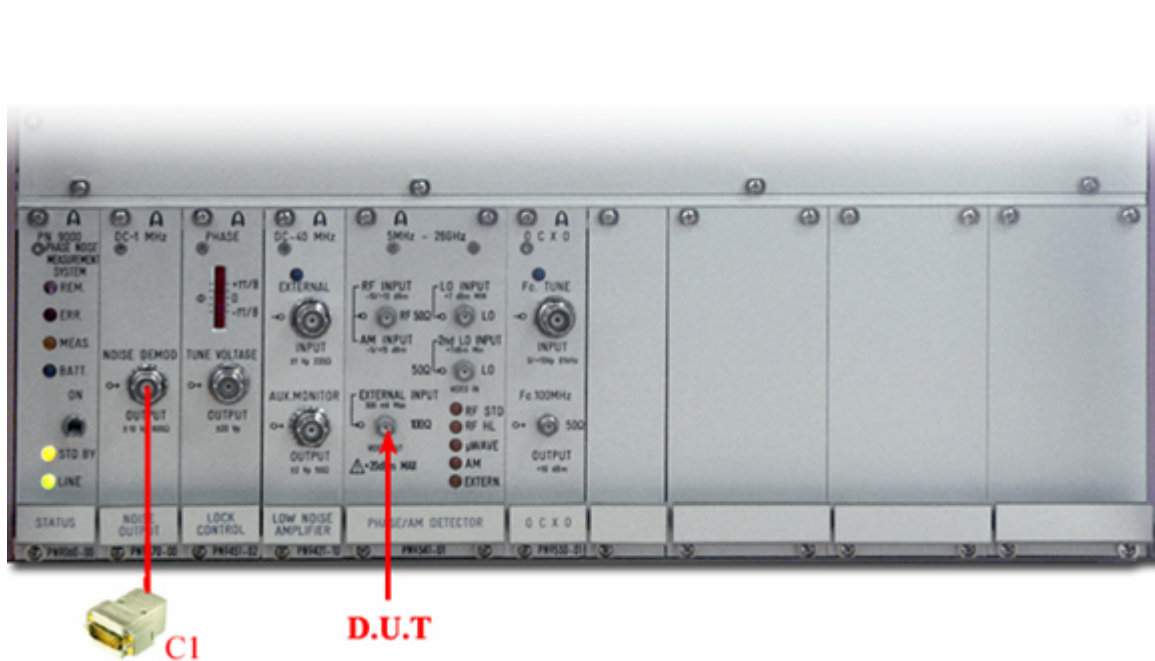
- C2: Delay-line output connected to the Phase detector, Ext port.
- D.U.T: Device Under Test, microwave range $> 2\text{GHz}$.
 - Method adapted to unstable free running source, such as VCO.

 The microwave VCO is down converted with an internal low noise free run reference source. Intermodulations can occur between these two input frequencies, so spurs can disturb the measurement, mainly in the 40MHz span. In this case: move the VCO under test by few MHz.

➡ For theory of process see: [Application note VCO](#).

➡ For software menu see: [Operating mode: VCO](#).

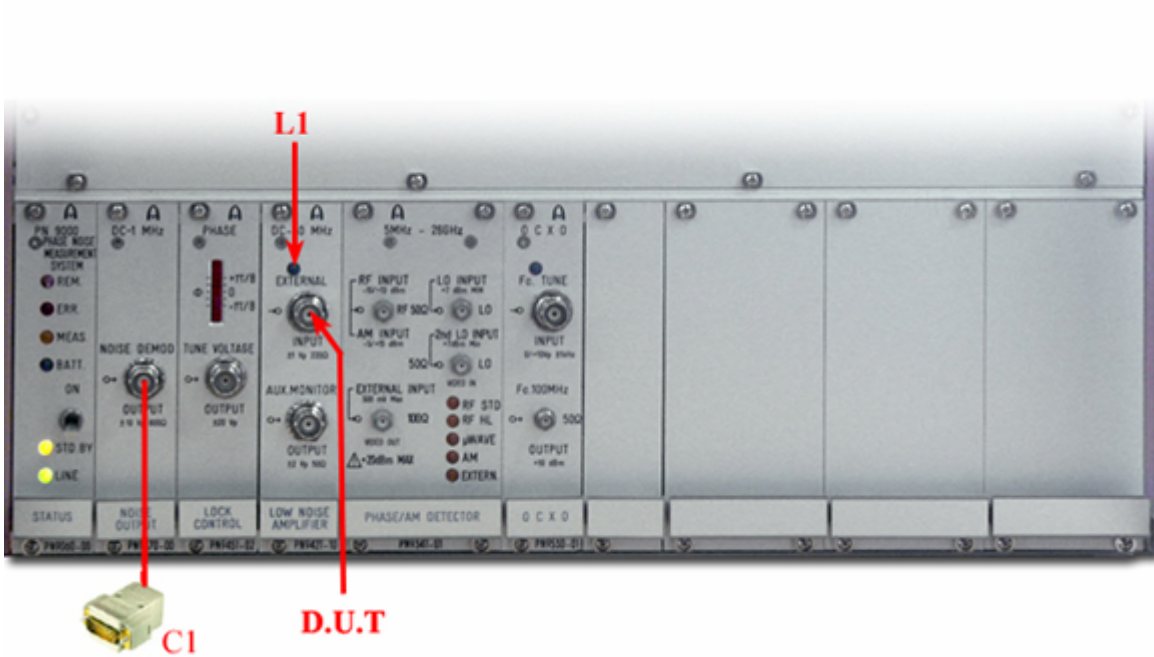
Noise voltage measurement external:



- C1: Connection to the computer.
- D.U.T: External Noise Source Under Test (input impedance = 100 Ohms).

The internal connecting point is just after the RF/Microwave phase detector.
The coupling can be DC or AC, see menu.
This entry is lower noise than the External LNA input.

Noise voltage measurement Low Noise Amplifier (LNA)



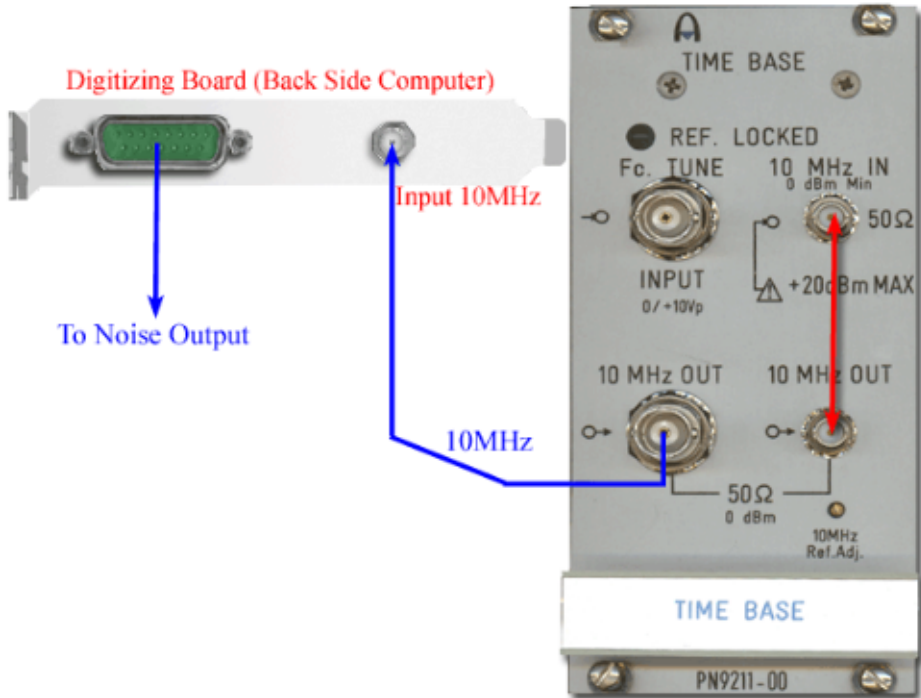
- C1: Connection to the computer.
- L1: Noise Amplifier Power-on led.
- D.U.T: External Noise Source Under Test (input impedance = 200 Ohms).

The internal connecting point is an input buffer just before the low noise amplifier chain. The coupling is DC. Because the input buffer, this entry is higher noise than the External input from the Phase detector module.

Frequency Stability Measurement



- C1: Connection to the computer.
- 10 MHz Out: Output 10 MHz Time Base; connect to 10 MHz Input Digitizing board.
- C2: LO input Stab source. (PN9100 or External Ultra Stab Source)
- D.U.T : Device Under Test

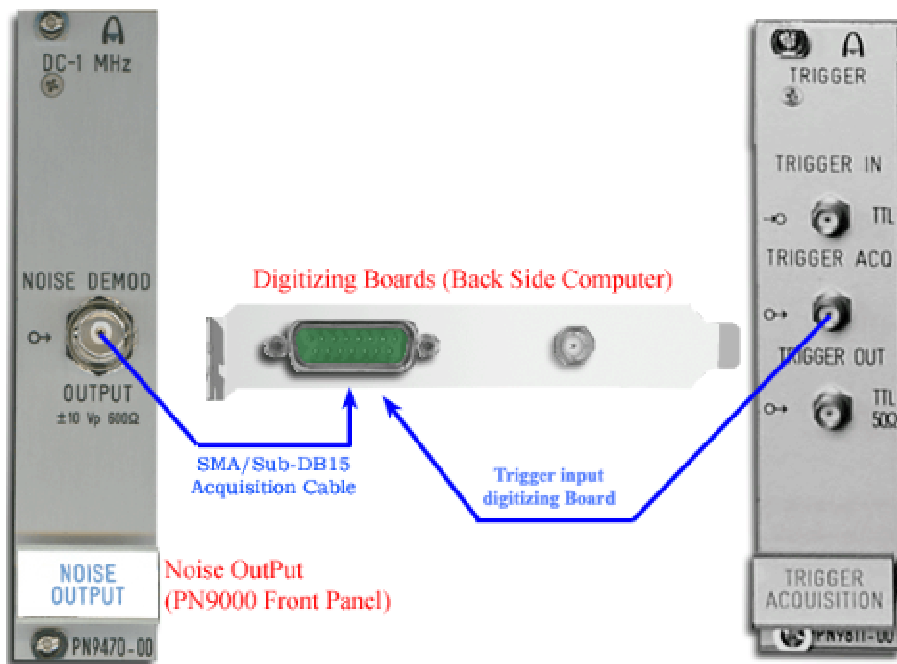


➡ For more information method measurements see: [Method Frequency Stability Measurement](#).

Phase Acquisition Measurement

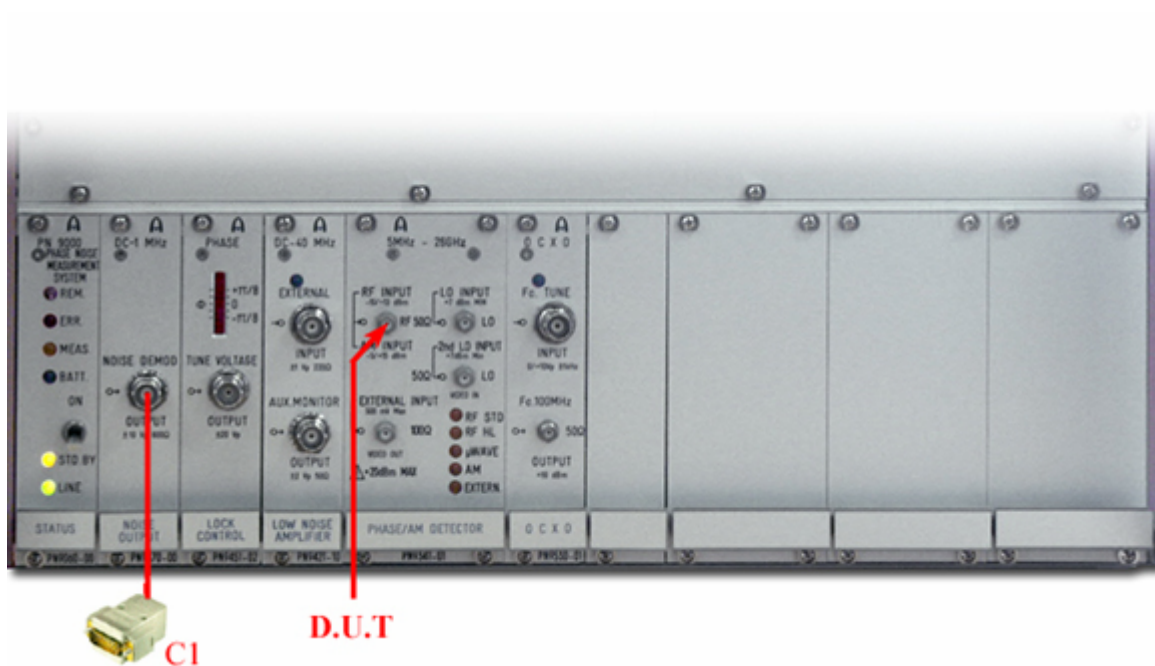


- C1: Connection to the computer.
- Trigger Input: External Trigger input.
- Trigger ACQ: Trigger output, for start acquisition.
- D.U.T : Device Under Test



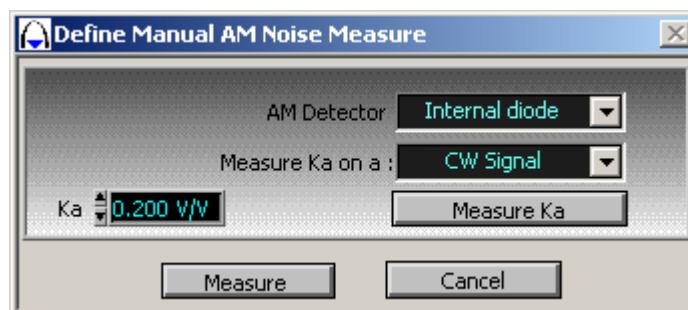
➡ For more information method measurements see: [Method Phase Acquisition Measurement](#).

AM measurement



- C1: Connection to the computer.
- D.U.T: Device Under Test, 10MHz to 18GHz, Power range -5dBm to +15dBm.

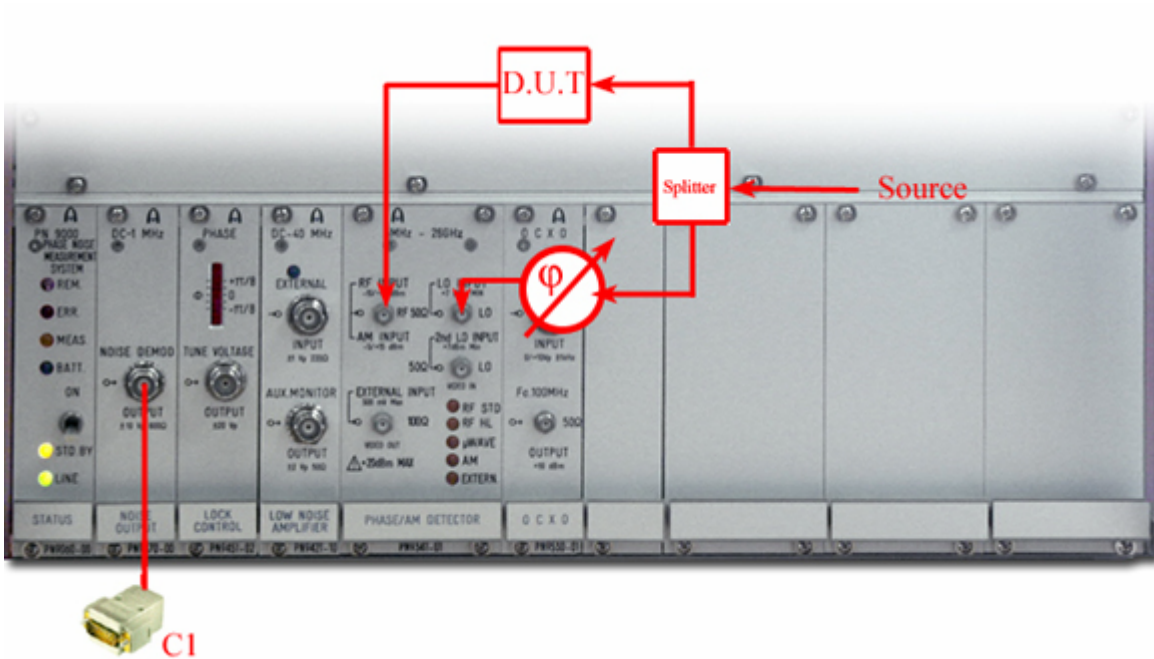
AM Noise Method



With the internal AM detector, to test a source with no AM modulation capability:

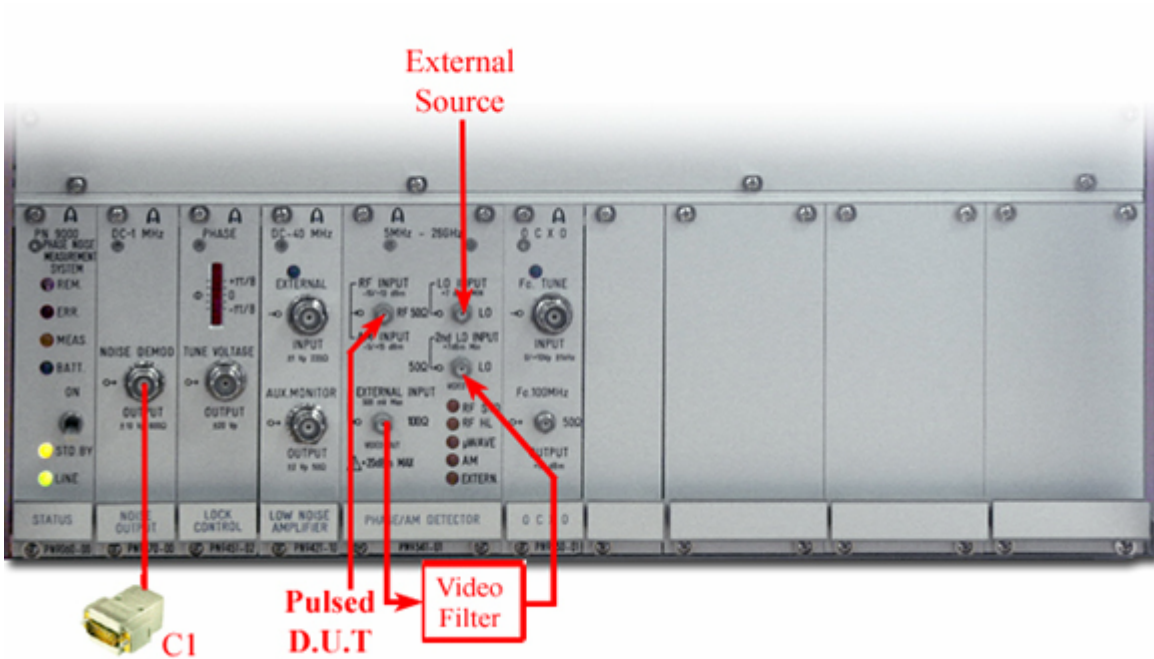
- 1) Connect the source to the RF port of the phase detector module .The frequency range is 10MHz to 18GHz.
- 2) Select internal diode and CW Signal.
- 3) Press the key "Measure Ka" : the system measures the demodulation factor and reports the value in the parameter box "Ka", expressed in Volt/Volt.
- 4) Press the key "Measure" to run the spectral analysis. The low frequency range is limited to 10Hz.

Added Noise Measurement



- C1: Connection to the computer.
- C2 & C3: Other connections.
- D.U.T: Device Under Test.

Pulse Measurement



- C1: Connection to the computer.
- C2 & C3: Other connections.
- D.U.T: Device Under Test.

Option(s) Module:



- C1: Connection to the computer.
- C2: PN9100 as reference source, the low frequency phase detector includes a frequency divider (1/10 and 1/100), see selection in the menu.
- C3: PN9100 Locking control.
- D.U.T: Device Under Test.



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