Keysight N8262A P-Series Modular Power Meter

KEYSIGHT TECHNOLOGIES

Service Guide

Notices

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A CAUTION notice denotes a hazard. It calls attention to an operating procedure, practice, or the like that, if not correctly performed or adhered to, could result in damage to the product or loss of important data. Do not proceed beyond a CAUTION notice until the indicated conditions are fully understood and met.

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A WARNING notice denotes a hazard. It calls attention to an operating procedure, practice, or the like that, if not correctly performed or adhered to, could result in personal injury or death. Do not proceed beyond a WARNING notice until the indicated conditions are fully understood and met.

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Keysight Technologies certifies that this product met its published specifications at the time of shipment. Keysight further certifies that its calibration measurements are traceable to the United States National Institute of Standard and Technology (formerly National Bureau of Standards), to the extent allowed by that organization's calibration facility, and to the calibration facilities of other International Standards Organization members.

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Safety Summary

The following general safety precautions must be observed during all phases of operation of this instrument. Failure to comply with these precautions or with specific warnings elsewhere in this manual violates safety standards of design, manufacture, and intended use of the instrument. Keysight Technologies assumes no liability for the customer's failure to comply with these requirements.

Safety Notices

WARNING A WARNING notice denotes a hazard. It calls attention to an operating procedure, practice, or the like that, if not correctly performed or adhered to, could result in personal injury or loss of life. Do not proceed beyond a WARNING notice until the indicated conditions are fully understood and met.

CAUTION A CAUTION notice denotes a hazard. It calls attention to an operating procedure, practice, or the like that, if not correctly performed or adhered to, could result in damage to the product or loss of important data. Do not proceed beyond a CAUTION notice until the indicated conditions are fully understood and met.

Safety Symbols

The following symbols on the instrument and in the documentation indicate precautions which must be taken to maintain safe operation of the instrument.

	Direct current (DC)		Alternating current (AC)
	Off (mains supply)		On (mains supply)
	Caution, risk of electric shock		Caution, risk of danger (refer to this manual for specific Warning or Caution information)
	Earth (ground) terminal		Frame or chassis (ground) terminal
	Protective earth (ground) terminal		Equipment protected throughout by double insulation or reinforced insulation
	Both direct and alternating current		Out position of a bi-stable push control
	Caution, hot surface		In position of a bi-stable push control
	This symbol indicates the operating switch for 'Stand-by' mode. Note, the instrument is NOT isolated from the mains when the switch is pressed. To isolate the instrument, the mains coupler (mains input cord) should be removed from the power supply.		Three-phase alternating current.
	Equipotentiality		

Safety Considerations

Read the information below before using this instrument.

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 violates safety standards for design, manufacture, and intended use of the instrument. Keysight Technologies assumes no liability for the customer's failure to comply with these requirements.

WARNING Before this instrument is switched on, make sure it has been properly grounded through the protective conductor of the ac power cable to a socket outlet provided with protective earth contact. Any interruption of the protective (grounding) conductor, inside or outside the instrument, or disconnection of the protective earth terminal can result in personal injury.

CAUTION Any adjustments or service procedures that require operation of the instrument with protective covers removed should be performed only by trained service personnel.

General Safety Information

This is a Safety Class I instrument (provided with a protective earthing ground, incorporated in the power cord). The mains plug shall only be inserted in a socket outlet provided with a protective earth contact. Any interruption of the protective conductor inside or outside of the instrument is likely to make the instrument dangerous. Intentional interruption is prohibited.

WARNING

- DO NOT operate the product in an explosive atmosphere or in the presence of flammable gases or fumes.
- DO NOT use repaired fuses or short-circuited fuseholders: For continued protection against fire, replace the line fuse(s) only with fuse(s) of the same voltage and current rating and type.
- DO NOT perform procedures involving cover or shield removal unless you are qualified to do so: Operating personnel must not remove equipment covers or shields. Procedures involving the removal of covers and shields are for use by service-trained personnel only.
- DO NOT service or adjust alone: Under certain conditions, dangerous voltages may exist even with the equipment switched off. To avoid dangerous electrical shock, service personnel must not attempt internal service or adjustment unless another person, capable of rendering first aid and resuscitation, is present.
- DO NOT operate damaged equipment: Whenever it is possible that the safety protection features built into this product have been impaired, either through physical damage, excessive moisture, or any other reason, REMOVE POWER and do not use the product until safe operation can be verified by service-trained personnel. If necessary, return the product to a Keysight Technologies Sales and Service Office for service and repair to ensure the safety features are maintained.
- DO NOT substitute parts or modify equipment: Because of the danger of introducing additional hazards, do not install substitute parts or perform any unauthorized modification to the product. Return the product to a Keysight Technologies Sales and Service Office for service and repair to ensure the safety features are maintained.

CAUTION

- Applying excessive voltage or overloading the device will cause irreversible damage to the circuitry.
- Use the device with the cables provided.

Environmental Conditions

The N8262A is designed for indoor use and in an area with low condensation. The table below shows the general environmental requirements for this instrument.

Environmental condition	Requirement
Temperature	Operating condition – 0 °C to 55 °C Storage condition – –30 °C to 70 °C
Humidity	Operating condition – Min: 15% RH at 40 °C (non-condensing) – Max: 95% RH at 40 °C (non-condensing) Storage condition – Max: 90% RH at 65 °C (non-condensing)
Altitude	Operating condition – 3,000 meters (9,840 feet) Storage condition – 15,420 meters (50,000 feet)

Regulatory Information

The N8262A complies with the following safety and Electromagnetic Compatibility (EMC) compliances:

Safety compliance

- EN61010-1: 2001/IEC 1010-1:2001
- EN 55011:1991
- EN 55011:1991
- IEC 61326-1:1997+A1:1998/EN 61326-1:1997+A1:1998
- CISPR 11:1990/EN 55011:1991
- Canada: CSA C22.2 No. 61010- 1:2004
- USA: UL: 61010- 1:2004

EMC compliance

- Complies with the requirements of the EMC Directive 89/336/EEC

Regulatory Markings

ISM GROUP 1 CLASS A	Industrial, Scientific and Medical Equipment does not exceed 400GHz.	C SA US	The CSA mark is a registered trademark of the Canadian Standards Association.
	The RCM mark is a registered trademark of the Australian Communications and Media Authority.	**ICES/NMB-001**	ICES/NMB-001 indicates that this ISM device complies with the Canadian ICES-001. Cet appareil ISM est conforme a la norme NMB-001 du Canada.
	This instrument complies with the WEEE Directive (2002/96/EC) marking requirement. This affixed product label indicates that you must not discard this electrical or electronic product in domestic household waste.		

Waste Electrical and Electronic Equipment (WEEE) Directive 2002/96/EC

This instrument complies with the WEEE Directive (2002/96/EC) marking requirement. This affixed product label indicates that you must not discard this electrical or electronic product in domestic household waste.

Product category

With reference to the equipment types in the WEEE directive Annex 1, this instrument is classified as a “Monitoring and Control Instrument” product.

The affixed product label is as shown below.

Do not dispose in domestic household waste.

To return this unwanted instrument, contact your nearest Keysight Service Center, or visit http://about.keysight.com/en/companyinfo/environment/takeback.shtml for more information.

Sales and Technical Support

To contact Keysight for sales and technical support, refer to the support links on the following Keysight websites:

- www.keysight.com/find/powermeter
  (product-specific information and support, software and documentation updates)
- www.keysight.com/find/assist
  (worldwide contact information for repair and service)

Table of Contents

Certification 3
Limitation of Warranty 3
Exclusive Remedies 3
Safety Summary 4
Safety Notices 4
Safety Symbols 5
Safety Considerations 6
General Safety Information 7
Environmental Conditions 9
Regulatory Information 10
Safety compliance 10
EMC compliance 10
Regulatory Markings 11
Waste Electrical and Electronic Equipment (WEEE) Directive 2002/96/EC 12
Product category 12
Sales and Technical Support 12

1 Specifications

Introduction 24
Specification Definitions 25
Conditions 26
General Features 27
P-Series Modular Power Meter and Sensor 28
Key system specifications and characteristics 28
P-Series Modular Power Meter Specifications 30
P-Series Wideband Power Sensor Specifications 32
Maximum SWR 32
Sensor Calibration Uncertainty 33

Physical characteristics . . . 33
1 mW Power Reference . . . 34
Front panel inputs/outputs . . . 34
Rear panel inputs/outputs . . . 35
Remote programming . . . 35
Measurement speed . . . 35
Physical characteristics . . . 36
System Specifications and Characteristics . . . 37
Characteristics Peak Flatness . . . 38
Noise and drift . . . 39

2 Performance Tests

Introduction . . . 42
Complete Equipment List . . . 43
1 mW Power Reference Level Test . . . 45
Description . . . 45
Equipment . . . 45
Test method . . . 45
Output Standing Wave Ratio (SWR) Test . . . 46
Description . . . 46
Equipment . . . 46
Test method . . . 47
Time Base Frequency Accuracy . . . 48
Description . . . 48
Equipment . . . 48
Test method . . . 48
Zero Set (Average Path) . . . 49
Description . . . 49
Equipment . . . 49
Test Method . . . 49
Zero Set (Peak Path) . . . 50
Description . . . 50
Equipment . . . 50

Test method 50
Linearity (Average Path) 51
Description 51
Equipment 51
Test method 51
Absolute Accuracy Test (Average Path) 52
Description 52
Equipment 52
Test method 53
Linearity (Peak Path) 56
Description 56
Equipment 56
Test method 56
Rise/Fall Time (Peak Path) 57
Description 57
Equipment 57
Test method 57

3 Adjustments

Introduction 60
Power Reference Level Adjustment 61
Equipment 61
Test method 61

4 Theory of Operation

PPMC Assembly 64
Mother Board Assembly 65
Measurement Board Assembly 66
Calibrator Assembly 67
Front Panel Assembly 68
PSU Assembly 69

5 Troubleshooting Guide

Introduction 72
Power-Up Problems 73
Basic external checks 73
Basic internal checks 73
Possible faults 73
Instrument Self-Test 74
Extended Self-Test 76
Performance Test 77
Power Reference Level Adjustment Problems 78
Possible faults 78
Communication Interface Failures 79
Additional Diagnostic Tests 80

6 Repair Guide

Introduction 82
Replaceable Parts 83
Front panel assembly 83
Mother board assembly 86
PPMC (processor PCI mezzanine) assembly 86
Measurement board assembly 87
PSU (power supply unit) 88
Calibrator assembly 89
Required Torque Values for Fasteners 90
Disassembly Instructions 91
Location of replaceable parts 91
Front panel disassembly instructions 93
Calibrator disassembly instructions 102
Power supply disassembly instructions 104
Mother board, measurement board, and PPMC board disassembly instructions 107
Reassembly Instructions 113
Additional Repair Notes 115
Replacing a sensor flex assembly: 115

Replacing the PPMC Assembly 116

7 Contacting Keysight Technologies

Introduction 118

Contacting Keysight Technologies 118

Before Calling Keysight Technologies 119

Check the Basics 120

Instrument Serial Numbers 121

Returning Your Power Meter for Service 122

Useful Web Pages 124

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List of Figures

Figure 1-1 Measured rise time percentage error versus signal under test rise time 29
Figure 1-2 N192XA error in peak-to-average measurements for a two-tone input (High, Medium, Low, and Off filters) . 38
Figure 2-1 Absolute accuracy test setup 53
Figure 6-1 Overview of the main assemblies 91
Figure 6-2 Overview of the replaceable parts 92
Figure 6-3 Overview of the front panel assemblies 92
Figure 6-4 Creating a sharp bend 115

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List of Tables

Table 1-1 Dynamic response - rise time, fall time, and overshoot versus video bandwidth settings 37

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1 Specifications

Introduction 24
Specification Definitions 25
General Features 27
P-Series Modular Power Meter and Sensor 28
P-Series Modular Power Meter Specifications 30
P-Series Wideband Power Sensor Specifications 32
Sensor Calibration Uncertainty 33
1 mW Power Reference 34
System Specifications and Characteristics 37
Characteristics Peak Flatness 38

This chapter lists the power meter's specifications and describes how to interpret these specifications.

Introduction

This chapter details the power meter's specifications and supplemental characteristics

Specifications describe the warranted performance and apply after a 30 minute warm-up. These specifications are valid over the power meter's operating and environmental range unless otherwise stated and after performing a zero and calibration.

Supplemental characteristics, which are shown in *italics*, are intended to provide information useful in applying the power meter by giving typical, but non warranted performance parameters. These characteristics are shown in italics or denoted as "attributes", "nominal" or "approximate".

For information on measurement uncertainty calculations, refer to *Keysight Application Note 64-1A, "Fundamentals of RF and Microwave Power Measurements", Literature 5965-6630*.

Specification Definitions

There are two types of product specifications:

Warranted specifications are specifications which are covered by the product warranty and apply over 0 to 55½ ^{O}C unless otherwise noted. Warranted specifications include measurement uncertainty calculated with a 95% confidence.

Characteristic specifications are specifications that are not warranted. They describe product performance that is useful in the application of the product. These characteristic specifications are shown in *italic*s.

Characteristic information is representative of the product. In many cases, it may also be supplemental to a warranted specification. Characteristic specifications are not verified on all units. There are several types of characteristic specifications. These types can be placed in two groups:

One group of characteristic types describes 'attributes' common to all products of a given model or option. Examples of characteristics that describe 'attributes' are product weight, and 50 Ω input Type-N connector. In these examples product weight is an 'approximate' value and a 50 Ω input is 'nominal'. These two terms are most widely used when describing a product's 'attributes'.

The second group describes 'statistically' the aggregate performance of the population of products.

These characteristics describe the expected behavior of the population of products. They do not guarantee the performance of any individual product. No measurement uncertainty value is accounted for in the specification. These specifications are referred to as 'typical'.

Conditions

The power meter and sensor will meet its specifications when:

- stored for a minimum of two hours at a stable temperature within the operating temperature range, and turned on for at least 30 minutes;
- the power meter and sensor are within their recommended calibration period; and
- used in accordance to the information provided in the *N8262A P-Series Modular Power Meter User's Guide*.

General Features

Number of channels	Dual channel
Frequency range	N1921A P-Series Wideband Power Sensor, 50 MHz to 18 GHz N1922A P-Series Wideband Power Sensor, 50 MHz to 40 GHz
Measurements	Average, peak and peak-to-average ratio power measurements are provided with free-run or time gate definition. Time parameter measurements of pulse rise time, fall time, pulse width, time to positive occurrence, and time to negative occurrence are also provided.
Sensor compatibility	Keysight P-Series modular power meter is compatible with all Keysight P-Series wideband power sensors, E-Series sensors (except E9320 range), and 8480 Series power sensor[a].

[a] Information contained in this document refers to operation with P-Series sensors. For specifications when used with 8480 and E-Series sensors (E4410 and E9300 range), refer to Lit Number 5965-6382E.

P-Series Modular Power Meter and Sensor

Key system specifications and characteristics

Maximum sampling rate	*100 Msamples/sec, continuous sampling*
Video bandwidth	*≥30 MHz*
Single shot bandwidth	*≥30 MHz*
Rise time and fall time	≤13 ns (for frequencies ≥500 MHz)[a], see Figure 1-1
Minimum pulse width	*50 ns*[b]
Overshoot	*≤5%*[a]
Average power measurement accuracy	*N1921A: ≤±0.2 dB or ±4.5%*[c] *N1922A: ≤±0.3 dB or ±6.7%*
Dynamic range	*–35 dBm to +20 dBm (>500 MHz)* *–30 dBm to +20 dBm (50 MHz to 500 MHz)*
Maximum capture length	*1 second*
Maximum pulse repetition rate	*10 MHz (based on 10 samples per period)*

[a] Specification applies only when the Off video bandwidth is selected.

[b] The Minimum Pulse Width is the recommended minimum pulse width viewable on the power meter, where power measurements are meaningful and accurate, but not warranted.

[c] Specification is valid over –15 to +12 dBm, and a frequency range 0.5 to 10 GHz, DUT Max. SWR <1.27 for the N1921A, and a frequency range 0.5 to 40 GHz, DUT Max. SWR <1.2 for the N1922A. Averaging set to 32, in Free Run mode.

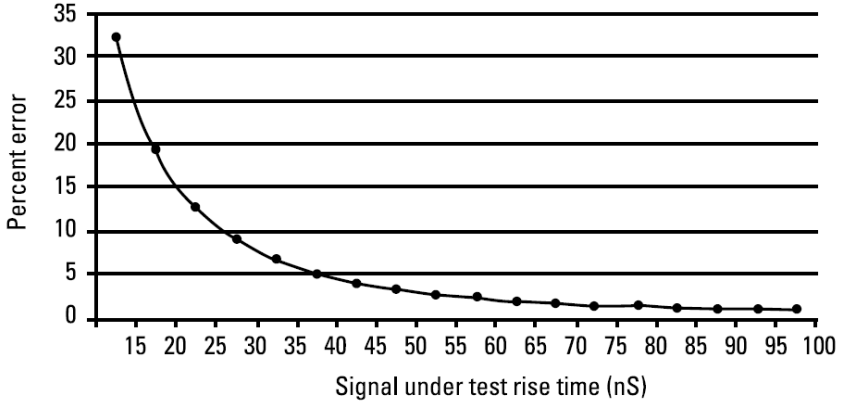

Figure 1-1 Measured rise time percentage error versus signal under test rise time

Although the rise time specification is ≤13 ns, this does not mean that the P-Series modular power meter and sensors combination can accurately measure a signal with a known rise time of 13 ns. The measured rise time is the root sum of the squares (RSS) of the signal under test rise time and the system rise time (13 ns):

Measured rise time = $\sqrt{((\text{signal under test rise time})^2 + (\text{system rise time})^2)}$, and the % error is:

% Error = ((measured rise time – signal under test rise time)/signal under test rise time) × 100

P-Series Modular Power Meter Specifications

Meter uncertainty	
Instrumentation linearity	±0.8%

Timebase	
Timebase range	*2 ns to 100 msec/div*
Accuracy	±10 ppm
Jitter	*≤1 ns*

Trigger	
Internal trigger	
Range	*–20 to +20 dBm*
Resolution	*0.1 dB*
Level accuracy	*±0.5 dB*
Latency[a]	*160 ns ± 10 ns*
Jitter	*≤5 ns RMS*
External TTL trigger input	
High	*>2.4 V*
Low	*<0.7 V*
Latency[b]	*90 ns ± 10 ns*
Minimum trigger pulse width	*15 ns*
Minimum trigger repetition period	*50 ns*
Impedance	*50 Ω*
Jitter	*≤5 ns RMS*

Trigger	
External TTL trigger output	**Low to high transition on trigger event**
High	*>2.4 V*
Low	*<0.7 V*
Latency[c]	*30 ns ± 10 ns*
Impedance	*50 Ω*
Jitter	*≤5 ns RMS*
Trigger delay	
Delay range	*±1.0 s, maximum*
Delay resolution	*1% of delay setting, 10 ns maximum*
Trigger hold-off	
Range	*1 µs to 400 ns*
Resolution	*1% of selected value (to a minimum of 10 ns)*
Trigger level threshold hysteresis	
Range	*±3 dB*
Resolution	*0.05 dB*

[a] Internal trigger latency is defined as the delay between the applied RF crossing the trigger level and the meter switching into the triggered state.

[b] External trigger latency is defined as the delay between the applied trigger crossing the trigger level and the meter switching into the triggered state.

[c] External trigger output latency is defined as the delay between the meter entering the triggered state and the output signal switching.

P-Series Wideband Power Sensor Specifications

The P-Series wideband power sensors are designed for use with the P-Series power sensor only.

Sensor model	Frequency range	Dynamic range	Damage level	Connector type
N1921A	*50 MHz to 18 GHz*	*–35 to +20 dBm (500 MHz)* *–30 to +20 dBm (50 to 500 MHz)*	*+23 dBm (average power);* *+30 dBm (<1 μs duration) (peak power)*	*Type N (m)*
N1922A	*50 MHz to 40 GHz*	*35 to +20 dBm (500 MHz)* *–30 to +20 dBm (50 to 500 MHz)*		*2.4mm (m)*

Maximum SWR

Frequency band	N1921A/N1922A
50 MHz to 10 GHz	1.2
10 GHz to 18 GHz	1.26
18 GHz to 26.5 GHz	1.3
26.5 GHz to 40 GHz	1.5

Sensor Calibration Uncertainty[1]

Definition: Uncertainty resulting from non-linearity in the sensor detection and correction process. This can be considered as a combination of traditional linearity, cal factor and temperature specifications, and the uncertainty associated with the internal calibration process.

Frequency band	N1921A	N1922A
50 MHz to 500 MHz	4.5%	4.3%
500 MHz to 1 GHz	4.0%	4.2%
1 GHz to 10 GHz	4.0%	4.4%
10 GHz to 18 GHz	5.0%	4.7%
18 GHz to 26.5 GHz	5.9%	
26.5 GHz to 40 GHz	6.0%	

Physical characteristics

Dimensions *(Length x Width x Height)*	N1921A N1922A	*135 mm × 40 mm × 27mm* *127 mm × 40 mm × 27 mm*
Weights with cable	Option 105 Option 106 Option 107	*0.4 kg* *0.6 kg* *1.4 kg*
Fixed sensor cable lengths	Standard Option 106 Option 107	*1.5 m (5-feet)* *3.0 m (10-feet)* *10 m (31-feet)*

[1] Beyond 70% humidity, and additional 0.6% should be added to these values.

1 mW Power Reference

NOTE The 1mW power reference is provided for calibration of E-Series (E4410 and E9300) and 8480 Series Sensors. The P-Series sensors are automatically calibrated do not need this reference calibration.

Power output	1.00 mW (0.0 dBm) - Factory set ±0.4% traceable to the National Physical Laboratory (NPL) UK
Accuracy (over 2 years)	±1.2% (0 to 55 °C) ±0.4% (25 to 10 °C)
Frequency	50 MHz nominal
SWR	1.08 (0 to 55 °C) *1.05 typical*
Connector type	Type N (f), 50 Ω

Front panel inputs/outputs

Recorder outputs[a]	Analog 0 to 1 V, 1 kΩ output impedance, SMB connector. There are two recorder outputs with SMB connector.
Trigger input	Input has TTL compatible logic levels and uses a SMB connector.
Trigger output	Output provides TTL compatible logic levels and uses a SMB connector.

[a] Two recorder outputs are available on the N8262A P-Series modular power meter.

Rear panel inputs/outputs

10/100 BaseT LAN	Interface allow communication with an external controller.
Ground	Binding post, accepts 4 mm plug or bare-wire connection.

Line power	
Input voltage range	100 to 120 V ± 10% 220 to 240 V ± 10%
Input frequency range	50 to 60 Hz ± 10% (all voltages) 400 to 440 Hz ± 10% (100 to 120 V)
Power requirement	50 VA (30 watts) not exceeding 75 VA (50 watts)

WARNING A 3 kV, 100 kHz transient in the power line may cause the instrument to reset.

Remote programming

Interface	10/100 BaseT LAN interface
Command language	SCPI standard interface commands

Measurement speed

Measurement speed via remote interface	*≥1500 readings per second*

Physical characteristics

Dimensions	The following dimensions exclude front and rear panel protrusions: 44.2 mm H × 212.6 mm W × 420.3 mm D (1.75 in H × 8.5 in W× 19.63 in D)
Net weight	*≤3.5 kg (7.7 lb) approximately*
Shipping weight	*≤7.7 kg (17.0 lb) approximately*

System Specifications and Characteristics

The video bandwidth in the meter can be set to High, Medium, Low, and Off. The video bandwidths stated in the table below are not the 3 dB bandwidths, as the video bandwidths are corrected for optimal flatness (except the Off filter). Refer to Figure 1-2 for information on the flatness response. The Off video bandwidth setting provides the warranted rise time and fall time specification and is the recommended setting for minimizing overshoot on pulse signals.

Table 1-1 Dynamic response - rise time, fall time, and overshoot versus video bandwidth settings

	Video bandwidth setting				
Parameter	**Low**	**Medium**	**High**	**Off**	
	5 MHz	**15 MHz**	**30 MHz**	**<500 MHz**	**>500 MHz**
Rise time/ fall time[a]	*<56 ns*	*<25 ns*	*<13 ns*	*<36 ns*	*<13 ns*
Overshoot[b]				*<5%*	*<5%*

[a] Specified as 10% to 90% for rise time and 90% to 10% for fall time on a 0 dBm pulse.

[b] Specified as the overshoot relative to the settled pulse top power.

NOTE For option 107 (10 m cable), add 5 ns to the rise time and fall time specifications.

Characteristics Peak Flatness

The peak flatness is the flatness of a peak-to-average ratio measurement for various tone-separations for an equal magnitude two-tone RF input. Figure 1-2 refers to the relative error in peak-to-average ratio measurements as the tone separation is varied. The measurements were performed at –10 dBm with power sensors with 1.5 m cable lengths.

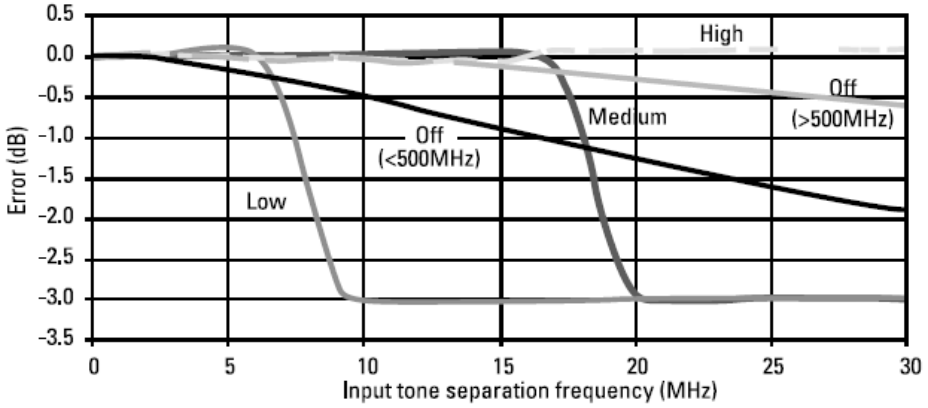

Figure 1-2 N192XA error in peak-to-average measurements for a two-tone input (High, Medium, Low, and Off filters)

Noise and drift

Sensor model	Zeroing	Zero set		Zero drift[a]	Noise per sample	Measurement noise (free run)[b]
		<500 MHz	>500 MHz			
N1921A/ N1922A	No RF on input	200 nW	200 nW	100 nW	2 μW	50 nW
	RF present	550 nW	200 nW			

[a] Within 1 hour after a zero, at a constant temperature, after 24 hour warm up of the power meter. This component can be disregarded with Auto zero mode set to ON.

[b] Measured over a one minute interval, at a constant temperature, two standard deviations, with averaging set to 1.

Measurement average setting	1	2	4	8	16	32	64	128	256	512	1024
Free run noise multiplier	*1*	*0.9*	*0.8*	*0.7*	*0.6*	*0.5*	*0.45*	*0.4*	*0.3*	*0.25*	*0.2*

Video BW setting		Low 5 MHz	Medium 15 MHz	High 30 MHz	Off
Noise per sample multiplier	<500 MHz	*0.5*	*1*	*2*	*1*
	>500 MHz	*0.45*	*0.75*	*1.1*	*1*

Effect of video bandwidth setting

The noise per sample is reduced by applying the meter video bandwidth filter setting (High, Medium, or Low). If averaging is implemented, this will dominate any effect of changing the video bandwidth.

Effect of time-gating on measurement

The measurement noise on a time-gated measurement will depend on the time gate length. 100 averages are carried out every 1 μs of gate length.

The Noise per Sample contribution in this mode can approximately be reduced by √(gate length/ 10 ns) to a limit of 50 nW.

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2 Performance Tests

Introduction 42
Complete Equipment List 43
1 mW Power Reference Level Test 45
Output Standing Wave Ratio (SWR) Test 46
Time Base Frequency Accuracy 48
Zero Set (Average Path) 49
Zero Set (Peak Path) 50
Linearity (Average Path) 51
Absolute Accuracy Test (Average Path) 52
Linearity (Peak Path) 56
Rise/Fall Time (Peak Path) 57

This chapter contains procedures which allow you to test the power meter's electrical performance to it's specifications.

Introduction

The performance tests described in this chapter test the power meter's electrical performance against the specifications detailed in Chapter 1. They are used for incoming inspection, the calibration cycle (also called periodic maintenance), or after repairs have been made.

NOTE

- This document does not provide a complete breakdown for these tests; it only gives a brief overview of each, in line with Keysight's recommendation that the Keysight N7832A calibration software should be used at all times.
- Performance Testing is limited to the measurement and verification of warranted specifications.
- Some tests cannot be performed manually, and so the N7832A calibration software is essential.
- Measurement uncertainty will not be addressed in this document (this is handled by the N7832A software).

The following performance tests are described in this chapter:

- 1 mW Power Reference Level Test
- Output Standing Wave Ratio (SWR) Test (Power Reference Output)
- Time Base Frequency Accuracy
- Zero Set (Average Path)
- Zero Set (Peak Path)
- Linearity (Average Path)
- Absolute Accuracy Test (Average Path)
- Rise/Fall Time (Peak Path)

Complete Equipment List

Instrument	Critical specifications	Recommended Keysight model number	Alternative Keysight model number
Analyzers			
Network analyzer		N3383A	N3381A N3382A 8753ES/ET
Counters			
Universal counter	Frequency: 10 MHz Gate time: 10 seconds	53132A	53131A
Meters			
Power meter	Dual channel Absolute accuracy: ±0.5% Power reference accuracy: ±0.9%[a]	E4419B	E4419A
Power sensor (two required)	Frequency: 50 MHz Amplitude range: –70 dBm to –20 dBm SWR: ≤1.15 at 50 MHz	8481D	
Power sensor	Frequency: 50 MHz Amplitude range: –30 dBm to +20 dBm SWR: ≤1.1 at 50 MHz	8482A	
Attenuators			
20 dB fixed attenuator	Type-N (m,f)	8491A (Option 020)	
30 dB fixed attenuator	Type-N (m,f)	11708A	

Instrument	Critical specifications	Recommended Keysight model number	Alternative Keysight model number
Miscellaneous Devices			
10 MHz frequency standard			
Pulse/Data generator 81131A output modules (required)		81130A	
Power splitter (required)	Frequency: DC to 6 GHz Insertion loss: 6 to 7 dB, ≤3 GHz SWR: – <1.1 at 10 MHz to 2 GHz – <1.3 at 2 GHz to 3 GHz	11667A (Option 001)	
SMB (f) to BNC (m) cable	Frequency: DC to 10 GHz 50 Ω Coax 120 cm (48 in)		
Calibration test cable		N1912-61017	
Sensor cable (required)		11730A	
N-type calibration kit		85032B	
Assorted accessories (cables and adapters) (required)			

[a] A best capability measurement is required for the power reference output - the power level must be accurately measured, and the uncertainty of this measurement must also be known.

1 mW Power Reference Level Test

Description

The 1 mW power reference is used for the calibration of 8480 Series and E-Series power sensors, and is traceable to national standards. This test uses an 8482A power sensor to transfer the power measured on an accurately calibrated E4419B or E4417A power meter to the DUT reference.

Equipment

Required test equipment: 1 unit of E4419B or E4417A dual channel power meter, 1 unit of 8482A power sensor. Either of these E4419B or E4417A power meters can be used. This specific power sensor model must be used.

Test method

1. Enter the recorded measurement uncertainty of the E4419B or E4417A 1 mW power reference.
2. Using the E4419B or E4417A power meter and the 8482A sensor, measure the 1 mW power reference of the E4419B or E4417A.
3. Using the E4419B or E4417A power meter and the 8482A sensor, measure the 1 mW power reference of the DUT.
4. Using all of these values, the N7832A software will calculate the power reference level of the DUT.

NOTE

- **The 1 mW reference of the E4419B or E4417A power meter must be precisely calibrated at a standards accredited lab, and the uncertainty of this measurement known.**
- **Anyone who has a basic understanding of metrology should be able to perform this test manually; it is simply the transfer of known power level with a known calibration uncertainty to the DUT.**
- **An adjustment is available for this test if it fails (see Chapter 3, "Adjustments").**

Output Standing Wave Ratio (SWR) Test

Description

Connector mismatch is the largest single contributor to measurement uncertainty, so this specification must be warranted to provide assurance of instrument accuracy. The 1 mW power reference level test must be carried out prior to this test, as the VSWR specification is only valid at 1 mW. This test measures VSWR by equating relative powers (measured by the test system power meter and its sensors) when the power reference is exercised under different load conditions.

Equipment

- Required test equipment:
  - 1 unit of 8753ES/ET network analyzer
  - 1 unit of 85032B type-N calibration kit
  - 1 unit of E4419B or E4417A dual channel power meter
  - 2 units of 8481D power sensor
  - 2 units of 11667A #001 power splitter
  - 1 unit of 20 dB pad, male to female (e. g. 8491A)
  - 1 unit of 30 dB pad (e.g. 11708A reference attenuator)
- An alternative network analyzer can be used, as long as it can measure S11 in the 45 to 55 MHz range
- Either of the E4419B or E4417A power meter can be used
- The specific models of power sensors and power splitters listed above must be used
- Any type of pad can be used (as long as there are no additional mating connections or differing pad values)
- 1 unit of 11667A, 1 unit of 8481D, and the 30 dB pad combine to create the ‘Calibration System’
- 1 unit of 11667A, 1 unit of 8481D, and the 20 dB pad combine to create the ‘Measurement System’

Test method

1. Obtain the S11 parameter of the Calibration System.
2. Connect the Measurement System to the Calibration System and obtain its S21 (load) and S21 (open) parameters.
3. Using only the Measurement System, terminated with the OPEN connector from the 85032B calibration kit, measure the 1 mW power reference level of the DUT.
4. Remove the OPEN connector from the Measurement System, terminate it with the 50 R load from the 85032B calibration kit, and repeat the 1 mW power reference level measurement.
5. Using all of these values, the N7832A software will calculate the VSWR of the power reference output.

NOTE

- **This test cannot be performed manually, due to the complexity of the equipment calibration procedure and the complexity of the measurement algorithm.**
- **No adjustment is available for this test if it fails (see Chapter 5, "Troubleshooting Guide").**

Time Base Frequency Accuracy

Description

The accuracy of the 100 MHz sample clock determines the accuracy of all measurements that are based on samples taken over time. This test measures the time base by dividing the sample clock by 10 (within the meter) and feeding it out of the trigger output connector, where it can be directly measured by a frequency counter.

Equipment

- Required test equipment:

  1 unit of 53132A frequency counter

- An alternative frequency counter can be used, as long as it has the appropriate bandwidth (>10 MHz)

Test method

1. Enable the path that routes the time base signal to the trigger output connector.
2. Using the 53132A, measure the frequency of the signal at the trigger output connector.

NOTE

- This test can be configured manually via the command `SERV:BIST:TBAS:STAT ON`, which enables the 10 MHz feed to the trigger output connector (refer to the *Programming Guide* for further details on the use of this command).
- This test can also be configured manually via the front panel; access the Service menu, select Self Test, and select Time Base to enable the 10 MHz feed to the Trigger Output connector.
- No adjustment is available for this test if it fails (see Chapter 5, "Troubleshooting Guide").

Zero Set (Average Path)

Description

Zero set is defined as the amount of residual offset error that is present following a zero operation. This offset error is caused by contamination from several sources, including circuit noise. This test measures the effectiveness of zero set by performing 15 back-to-back zero operations of the average path (with no sensor attached), after which the standard deviation of the results is calculated and returned as the measured value.

Equipment

- No test equipment required

Test Method

1. Execute the internal zero set measurement procedure for Channel A.
2. Read back the result of the measurement from the DUT.
3. Repeat this procedure for Channel B.
4. The test will take a few minutes to complete.
5. The measurement result should be less than 0.0000175. The smaller the measurement result, the smaller the amount of residual offset error.

NOTE

- This test can be performed manually via the commands:

  `SERV:BIST:PEAK[1|2]:ZSET`

  `SERV:BIST:CW[1|2]:ZSET:NUM?`

  (Refer to the *Programming Guide* for further details on the use of these commands)

- No adjustment is available for this test if it fails (see Chapter 5, "Troubleshooting Guide").

Zero Set (Peak Path)

Description

Zero set is defined as the amount of residual offset error that is present following a zero operation. This offset error is caused by contamination from several sources, including circuit noise. This test measures the effectiveness of zero set by performing 15 back-to-back zero operations of the peak path (with no sensor attached), after which the standard deviation of the results is calculated and returned as the measured value.

Equipment

- No test equipment required

Test method

1. Execute the internal zero set measurement procedure for Channel A.
2. Read back the result of the measurement from the DUT.
3. Repeat this procedure for Channel B.
4. The test will take a few minutes to complete.
5. The measurement result should be less than 0.015. The smaller the measurement result, the smaller the amount of residual offset error.

NOTE

- This test can be performed manually via the commands:

  `SERV:BIST:PEAK[1|2]:ZSET`

  `SERV:BIST:PEAK[1|2]:ZSET:NUM?`

  (Refer to the *Programming Guide* for further details on the use of these commands)

- No adjustment is available for this test if it fails (see Chapter 5, "Troubleshooting Guide").

Linearity (Average Path)

Description

Linearity over the full input voltage range of the measurement path is warranted to provide assurance of instrument accuracy. This test measures Linearity by using a calibration DAC and a calibration ADC (built into the DUT) to stimulate and compare performance of the Average Path against the measurement ADC, returning the worst case percentage error.

Equipment

– No test equipment required

Test method

1. Execute the internal linearity measurement procedure for Channel A.
2. Read back the result of the measurement from the DUT.
3. Repeat this procedure for Channel B.
4. The test will take a few minutes to complete.
5. The measurement result should be less than 0.5 and greater than –0.5. The optimum measurement result for this test is 0.

NOTE

– This test can be performed manually via the commands:

```
SERV:BIST:CW[1|2]:LIN 0
```

```
SERV:BIST:CW[1|2]:LIN:PERR?
```

(Refer to the *Programming Guide* for further details on the use of these commands)

– No adjustment is available for this test if it fails (see Chapter 5, "Troubleshooting Guide").

Absolute Accuracy Test (Average Path)

Description

The absolute accuracy test checks the ability of the power meter to accurately measure the power sensor voltage and display the appropriate power level.

Equipment

- Required test equipment:
  - 1 unit of 3458A digital multimeter
  - 1 unit of 33250A function generator
  - 1 unit of 11683A (Option H01) range calibrator
  - 1 unit of 11730A power sensor cable
  - 2 units of 10503A BNC cable
  - 1 unit of BNC T-joint connector (BNC female, male, female)
  - 1 unit of BNC (female) to dual banana connector

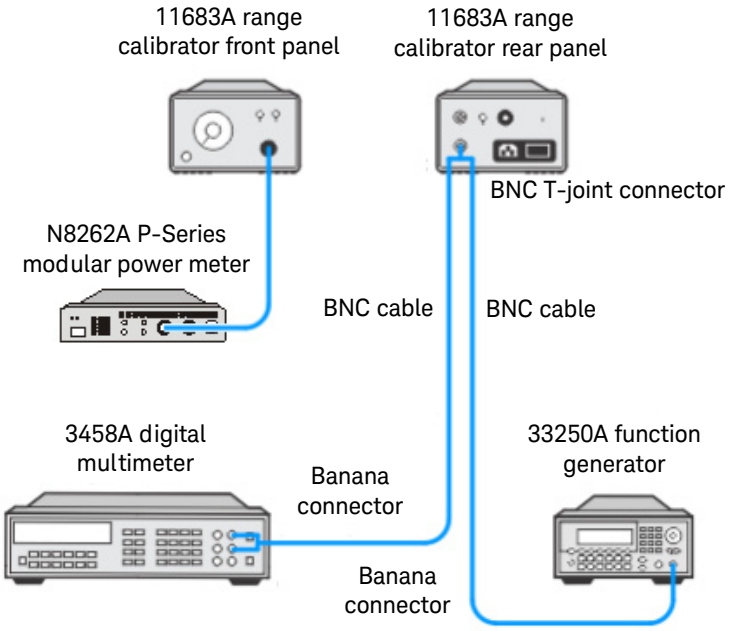

Figure 2-1 Absolute accuracy test setup

NOTE For the Keysight N8262A P-Series modular power meter, the equivalent key presses should be performed on both channels.

Test method

1. Connect the equipment as shown in Figure 2-1.
2. Unplug the power cord from the range calibrator. Eliminate ground loops to enable the 11683A (Option H01) range calibrator to operate properly.

Disconnect the power cord to stop the operation of the range calibrator as the range calibrator will continue to operate with no power applied.

NOTE When switching the range calibrator to STANDBY, allow enough time for the range calibrator to settle to its zero value before attempting to zero the Keysight N8262A P-Series modular power meter. This settling would appear on the Keysight N8262A P-Series modular power meter display as downward drift. When the drift has reached minimum, (typically less than 60 seconds), the range calibrator is settled.

3 Turn on the voltmeter and allow it to warm up for 4 hours.

4 Turn on the DC source and allow it to warm up. Set the output voltage to 0 V.

5 Turn on the DUT and allow it to warm up for 30 minutes.

6 Ensure the range calibrator is not plugged-in or powered on.

7 Connect the range calibrator to the DUT using the power meter interconnect cable.

8 Connect the DC source to the range calibrator external voltage input and the voltmeter using cables and a BNC T-joint connector at the range calibrator.

9 Configure the DUT as shown below.

Parameter	Value
Filter/Averaging	On
Filter Mode/Measurement Average	Manual
Filter Length/Average Number	16
Resolution	4 digits

NOTE All other settings use the default setup settings. The *RST command sets the default setup.

10 Configure the voltmeter using the default setup settings.

11 Perform a power meter zero on the DUT. The voltage of the range calibrator is assumed to be 0 V.

12 Set the DC voltage to 89.6056 mV as measured by the voltmeter.

13 Perform a power meter calibration on the DUT.

14 Measure and record the absolute accuracy of the N8262A in a table as shown below.

Effective power	DC voltage	Voltmeter range	Power meter filter / voltmeter NRDNS	CH A % error	CH B % error	Specification
-12 dBm	0.00565 V	0.1 V	256			±0.5%
-5 dBm	0.02834 V	0.1 V	64			±0.5%
5 dBm	0.28400 V	1 V	64			±0.5%
8 dBm	0.56700 V	1 V	16			±0.5%
10 dBm	0.90100 V	1 V	16			±0.5%
12 dBm	1.43500 V	10 V	16			±0.5%
14 dBm	2.29000 V	10 V	16			±0.5%
16 dBm	3.66700 V	10 V	16			±0.5%
17 dBm	4.65200 V	10 V	16			±0.5%
18 dBm	5.91500 V	10 V	16			±0.5%
19 dBm	7.53000 V	10 V	16			±0.5%
20 dBm	9.62300 V	10 V	16			±0.5%

Linearity (Peak Path)

Description

Linearity over the full input voltage range of the measurement path is warranted to provide assurance of instrument accuracy. This test measures linearity by using a calibration DAC and a calibration ADC (built into the DUT) to stimulate and compare performance of the Average Path against the measurement ADC, returning the worst case percentage error.

Equipment

- No test equipment required

Test method

1. Execute the internal linearity measurement procedure for Channel A.
2. Read back the result of the measurement from the DUT.
3. Repeat this procedure for Channel B.
4. The test will take a few minutes to complete.
5. The measurement result should be less than 0.8 and greater than –0.8. The optimum measurement result for this test is 0.

NOTE

- This test can be performed manually via the commands:

  ```
  SERV:BIST:PEAK[1|2]:LIN 0
  ```

  ```
  SERV:BIST:PEAK[1|2]:LIN:PERR?
  ```

  (Refer to the *Programming Guide* for further details on the use of these commands)
- No adjustment is available for this test if it fails (see Chapter 5, "Troubleshooting Guide").
- For external traceability of the peak path linearity verification please refer to the *Keysight N7832A Test Management Environment (TME) Software* in http://cal.software.keysight.com/ for further information.

Rise/Fall Time (Peak Path)

Description

Linearity over the full input voltage range of the measurement path is warranted to provide assurance of instrument accuracy. This test measures linearity by using a calibration DAC and a calibration ADC (built into the DUT) to stimulate and compare performance of the peak path against the measurement ADC, returning the worst case percentage error.

Equipment

- 1 unit of 81130A pulse/data generator mainframe
- 2 units of 81131A output modules (installed in 81130A)
- 2 units of N1912-61017 calibration test cable

Test method

1. Capture a train of 10 pulses with very fast rise/fall times.
2. Combine the sample data to create an equivalent pulse with 10 units of the sample resolution of the DUT.
3. Analyze the equivalent pulse to determine the 10% and 90% voltage levels of the rising/falling edges.
4. Analyze the equivalent pulse to determine when the 10% and 90% crossover points occur for both edges.
5. Using the times obtained for the 10% and 90% crossovers, the N7832A software will calculate the rise/fall time performance of the DUT.

NOTE

- **This test cannot be performed manually, due to the complexity of the pulse analysis algorithm.**
- **No adjustment is available for this test if it fails (see Chapter 5, "Troubleshooting Guide").**

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3 Adjustments

Introduction 60
Power Reference Level Adjustment 61

This chapter contains checks and adjustments that ensure proper performance of the power meter.

Introduction

This chapter attempts to correct the power reference level if the performance test has failed. The power reference level is controlled by the coarse and fine settings of a digital potentiometer. Adjustment of the coarse and fine settings can only be carried out via remote commands. Adjustment can be carried out without having to remove the outer covers from the DUT.

Power Reference Level Adjustment

Equipment

As per the test equipment list for the 1 mW Power Reference Level Test

Test method

1. Set: Coarse = 834, Fine = 550
2. Measure the power ref. level as per the performance test:
   - **a** If the result is >1 mW, then increment COARSE by 1.
   - **b** If the result is <1 mW, then decrement COARSE by 1.
3. Repeat step 2 until the result crosses the 1 mW boundary (in either direction).
4. Measure power ref. level as per the performance test:
   - **a** If the result is >1 mW, then decrement FINE by 1.
   - **b** If the result is <1 mW, then increment FINE by 1.
5. Repeat step 4 until the result crosses the 1 mW boundary (in either direction).
6. The adjustment is completed.

NOTE

- This adjustment can be performed manually via the commands:

  ```
  SERV:CAL:ADJ:COUR <Value>
  SERV:CAL:ADJ:COUR?
  SERV:CAL:ADJ:FINE <Value>
  SERV:CAL:ADJ:FINE?
  ```

  (Refer to the *Programming Guide* for further details on the use of these commands)
- COARSE and FINE values are valid in the range of 0 to 1023
- If adjustment is not possible, then a fault may be present in the DUT (see Chapter 5, "Troubleshooting Guide").

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4 Theory of Operation

PPMC Assembly 64
Mother Board Assembly 65
Measurement Board Assembly 66
Calibrator Assembly 67
Front Panel Assembly 68
PSU Assembly 69

This chapter describes how each of the power meter's individual assemblies operate.

PPMC Assembly

Purpose

- Provides the main processor and memory for the power meter
- Provides external interfaces for LAN
- Stores the power meter firmware in Flash EEPROM
- Stores the power meter serial number and option data

Inputs

- Power supplies [from PSU, via mother board]
- Control and data lines [from mother board and measurement board(s)]
- LAN communications [from external equipment]

Outputs

- Control, address, and data lines [to mother board and measurement board(s)]

Mother Board Assembly

Purpose

- Provides the average measurement path(s)
- Provides the peak measurement path(s) to the measurement board(s)
- Provides external trigger input/output and recorder output(s)
- Provides signal routing between the PPMC and measurement board(s)

Inputs

- Power supplies [from PSU]
- Sensed power level(s) [from sensor flex(s)]
- Trigger input [from external equipment]
- Control, address, and data lines [from PPMC]

Outputs

- Processed average path measurement [to PPMC]
- Unprocessed peak path measurement samples [to measurement board(s)]
- Trigger output and recorder output(s) [to external equipment]
- Control and data lines [to PPMC]

Measurement Board Assembly

Purpose

- Provides data acquisition and processing for the peak measurement path of a channel

Inputs

- Power supplies [from PSU, via mother board]
- Unprocessed peak path measurement samples [from mother board]
- Control, address, and data lines [from PPMC]

Outputs

- Processed peak path measurement data [to PPMC, via mother board]
- Control and data lines [to PPMC, via mother board]

Calibrator Assembly

Purpose

- Provides a 1 mW (0 dBm) power reference level at 50 MHz

Inputs

- Power supplies [from PSU, via mother board]
- Control, address, and data lines [from PPMC]

Outputs

- 1 mW (0 dBm) power reference [to external equipment]
- Control and data lines [to PPMC, via mother board]

Front Panel Assembly

Purpose

- Provides mounting for the channel A and B sensor flex, rocker switch, LED, recorder output, trigger in/out, and power reference connector

Inputs

- Power supplies [from PSU, via mother board]
- Front panel board assembly

Outputs

- Control and data lines [to PPMC, via mother board]

PSU Assembly

Purpose:

- Provides various DC power supplies

Inputs:

- 100 Vac ~ 240 Vac, 50 Hz ~ 60 Hz, 150 VA max [from an external source]
- Control lines [from front panel, via mother board]

Outputs:

- +12 Vdc [to mother board]
- +5 Vdc [to mother board]
- –5 Vdc [to mother board]
- –12 Vdc [to mother board]

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5 Troubleshooting Guide

Introduction 72
Power-Up Problems 73
Instrument Self-Test 74
Extended Self-Test 76
Performance Test 77
Power Reference Level Adjustment Problems 78
Communication Interface Failures 79
Additional Diagnostic Tests 80

This chapter contains troubleshooting flow charts designed to isolate faults in the LAN interface port.

Introduction

This chapter enables qualified service personnel to diagnose suspected faults with the power meter LAN interface port.

If there is a problem when attempting to use the LAN interface function, consult the *User's Guide* and confirm that all the user setups are correct before proceeding with the following fault finding flowcharts.

Power-Up Problems

Basic external checks

- Check that the mains power source is live
- Check the mains cable for any obvious damage

Basic internal checks

- Check/reseat the cable between the line module and the PSU
- Check/reseat the cable between the PSU and the mother board
- Green LED DS1: If this is off, then the PSU may be faulty
- Green LED DS4: This should come on when the power button is pressed
- Green LEDs DS2/DS3: These will flash on and off during normal operation

Possible faults

- PSU
- Mother board
- Rocker switch defect
- Loose front panel board ribbon cable

Instrument Self-Test

Instrument	Purpose	Debug tips	Possible faults
Test point voltages	Checks that all of the supply voltages are present	Replace the PSU to see if this clears the faults	– PSU (low probability) – Mother board (high probability)
Calibrator	Verifies that the calibrator is working (Note: This test does not check that the calibrator meets its specifications)	– Check/reseat that cable between the calibrator assembly and the mother board – Attempt to adjust the 1 mW power reference level	– Calibrator assembly (high probability) – Mother board (low probability)
Fan	Verifies that the fan is working	– Check/reseat the cable between the fan assembly and the mother board – Check visually to see whether or not the fan is working	– Fan assembly (high probability) – Mother board (low probability)
Battery	Checks that the lithium manganese battery on the mother board is working	Replace the battery to see if this clears the fault	– Lithium manganese battery (high probability) – Mother board (low probability)
ChA peak path	Verifies that the peak path of channel A is working (Note: This does not prove that the peak path meets its specifications)	Replace the measurement board assembly for channel A to see if this clears the fault	– Measurement board assembly, channel A (low probability) – Mother board (high probability)
ChA CW path	Verifies that the average path of channel A is working (Note: This does not prove that the average path meets its specifications)	Not applicable	Mother board

Instrument	Purpose	Debug tips	Possible faults
ChA measurement board check	Executes an internal self-test procedure on the measurement board assembly for channel A	Replace the measurement board assembly for channel A to see if this clears the fault	– Measurement board assembly, channel A (high probability) – Mother board (low probability)
ChB peak path	Verifies that the peak path of channel B is working (Note: This does not prove that the peak path meets its specifications)	Replace the measurement board assembly for channel B to see if this clears the fault	– Measurement board assembly, channel B (low probability) – Mother board (high probability)
ChB CW path	Verifies that the average path of channel B is working (Note: This does not prove that the average path meets its specifications)	Not applicable	Mother board
ChB measurement board check	Executes an internal self-test procedure on the measurement board assembly for channel B	Replace the measurement board assembly for channel B to see if this clears the fault	– Measurement board assembly, channel B (high probability) – Mother board (low probability)

Extended Self-Test

Instrument	Purpose	Debug tips	Possible faults
Time base	Provides a means to measure time base frequency accuracy	– Check that the SMB cable being used is not damaged – Check that the SMB is connected to 'Trig Out', not 'Trig In'	Mother board

Performance Test

Type of failures	Debug tips	Possible faults
1 mW power reference level failures	Attempt to adjust the 1 mW Power Reference Level	Calibrator Assembly (high probability) Mother Board (low probability)
VSWR failures	Not applicable	Calibrator Assembly
Time base frequency accuracy failures	– Check that the SMB cable being used is not damaged – Check that the SMB is connected to 'Trig Out', not 'Trig In'	Mother Board
Zero set (average path) failures	Not applicable	Mother Board
Zero set (peak path) failures	Not applicable	Mother Board
Linearity (average path) failures	Not applicable	Mother Board
Linearity (peak path) failures	Replace the measurement board assembly for the channel to see if this clears the fault	– Measurement board assembly (low probability) – Mother board (high probability)
Rise/Fall time (peak path) failures	Check/reseat the sensor flex RF connections	– Sensor flex assembly (low probability) – Measurement board assembly (low probability) – Mother board (high probability)

Power Reference Level Adjustment Problems

Possible faults

- Calibrator assembly (high probability)
- Mother board (low probability)

Communication Interface Failures

Type of communication	Debug tips	Possible faults
LAN communication	Check visually to see whether or not the connector is obstructed/ damaged	PPMC assembly

Additional Diagnostic Tests

Type of functionality	Reason	Recommended test method	Possible faults
Sensor functionality	The N7832A software does not prove both paths of the sensor flex assembly	Connect an E4412A sensor to the DUT and ensure it can be zeroed/calibrated	Sensor flex assembly

6 Repair Guide

Introduction 82
Replaceable Parts 83
Required Torque Values for Fasteners 90
Disassembly Instructions 91
Reassembly Instructions 113
Additional Repair Notes 115
Replacing the PPMC Assembly 116

This chapter details the power meter's replaceable parts. It also explains how to assemble and disassemble the power meter.

Introduction

This chapter contains details of some of the higher level components and assemblies, which can be ordered from Keysight Technologies. It also details how to assemble and disassemble the power meter for repair. The contents included are:

1. Replaceable Parts
2. Required Torque Values for Fasteners
3. Disassembly Instructions
4. Reassembly Instructions
5. Additional Repair Notes
6. Replacing the PPMC Assembly

To order parts contact your local Keysight Technologies Sales and Service Office.

To return your power meter for servicing at a qualified service center refer to Chapter 7, "Contacting Keysight Technologies".

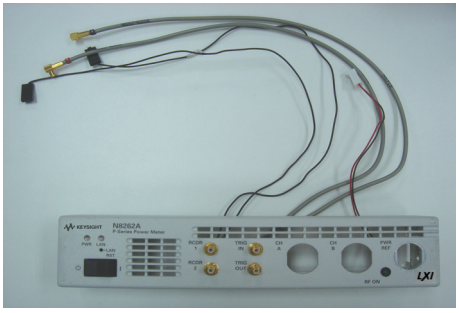
Replaceable Parts

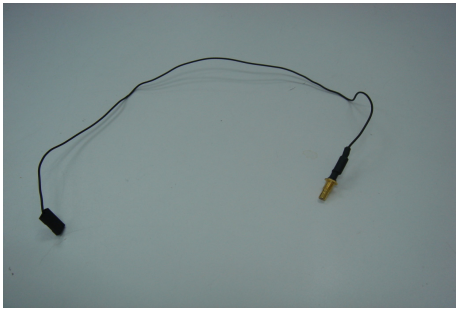
Front panel assembly

Front panel assembly can be available

Main assembly

The standard P-Series modular power meter has the reference calibrator (semi-rigid reference cable), rocker switch, recorder cable, trigger in/out cable, channel A/B sensor flex assembly at the front panel.

Keysight part number	Description	Visual
N8262-60107	Front panel assembly	
N8262-20201	Front frame	

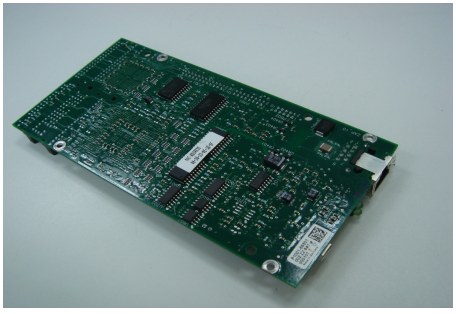
Keysight part number	Description	Visual
N8262-63002	Front panel board assembly	
N8262-60206	Channel A and B sensor flex assembly **Note:** The same assembly is used for all two sensor positions. The sensor flex assembly is supplied straight, and so it must be folded to match the assembly being replaced (see "Additional Repair Notes" on page 115). Channel A and B sensor flex assembly is not included with front panel assembly, part number N8262-60107; if this is required, it is available as a separate item.	
N8262-60209	Recorder cable	

Keysight part number	Description	Visual
N8262-60208	Trigger in/out cable	
N8262-20101	Power reference input **Note:** Power reference input is not included with front panel assembly, part number N8262-60107; if this is required, it is available as a separate item.	

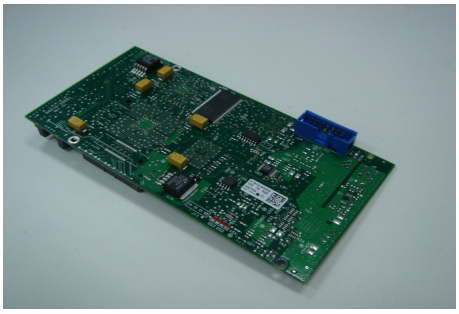
Mother board assembly

Keysight part number	Description	Visual
N8262-63001	PCA, mother board assembly	

PPMC (processor PCI mezzanine) assembly

Keysight part number	Description	Visual
N8200-60002	PPMC assembly **Note:** Refurbished PPMC assemblies are not available. The PPMC assembly must be programmed once it has been installed (see "Additional Repair Notes" on page 115)	

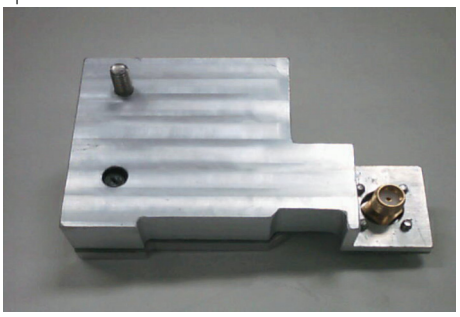
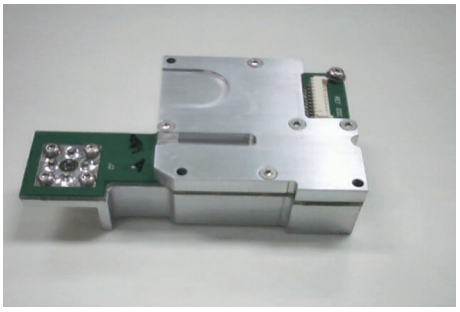
Measurement board assembly

Keysight part number	Description	Visual
N1912-60004	Measurement board **Note:** There are two identical measurement board in the N8262A P-Series modular power meter.	

PSU (power supply unit)

Keysight part number	Description	Visual
0950-5146	PSU **Note:** Refurbished PSUs are not available.	
N8262-60202	Power supply cable assembly	

Calibrator assembly

Keysight part number	Description	Visual
N1911-61002	Calibrator assembly	Top view  Bottom view 
N8262-6021	Calibrator cable assembly	

Required Torque Values for Fasteners

Required tools and torque values for fasteners are listed below:

Item	Description/Default	Range of values
– Fit mother board to chassis – Fit front frame to chassis – Fit cover to rear panel	T20 Torx screwdriver bit	21 in lbs
– Fit fan guard to fan assembly – Fit front panel board assembly to chassis – Fit bumper foot to cover – Fit power supply to chassis	T10 Torx screwdriver bit	9 in lbs
– Fit calibrator to bottom chassis	T6 Torx screwdriver bit	3 in lbs
– Fit mother board to chassis – Fit measurement board to mother board – Fit PPMC board to mother board	T8 Torx screwdriver bit	6 in lbs
– Fit recorder output to front frame – Fit trigger in/out to front frame	1/4” socket	6 in lbs
– Fit channel A/B to front frame	ODU socket	6 in lbs
– Fit power reference input cable to calibrator	5/16” socket	10 in lbs
– Fit power reference input cable to front frame	19 mm socket	18 in lbs

NOTE

- The ODU Socket is a special tool, which is orderable using P/N N1912-21012.
- This socket is used in conjunction with a 1/4” drive torque wrench, calibrated to 6 in lbs.

Disassembly Instructions

The guidelines in this section describe the disassembly of four major assembling in the Keysight N8262A P-Series modular power meter.

- Front panel disassembly
- Calibrator disassembly
- Power supply disassembly
- Mother board, measurement board, and PPMC board disassembly

Location of replaceable parts

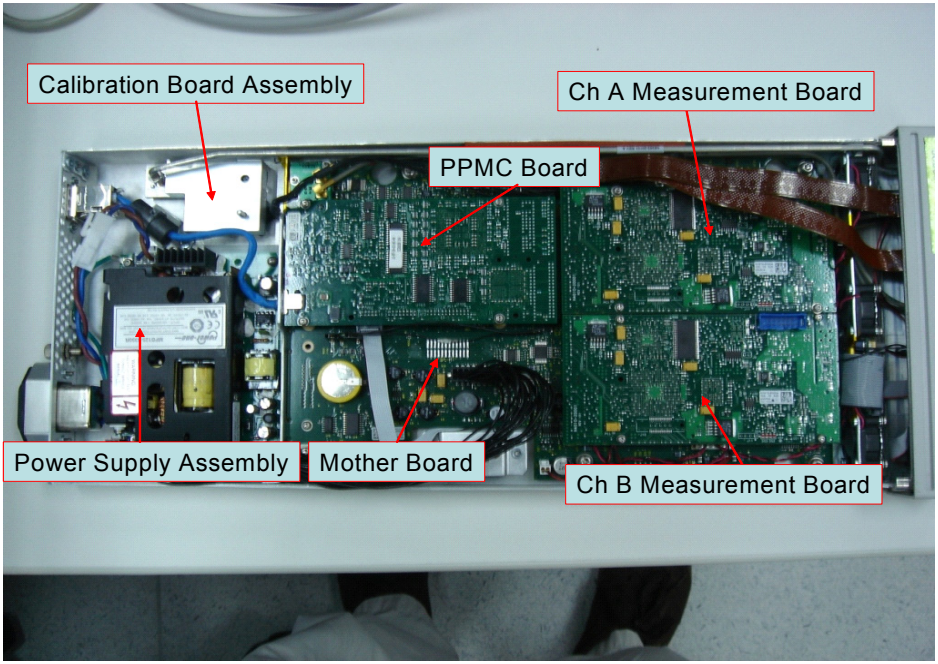


Figure 6-1 Overview of the main assemblies

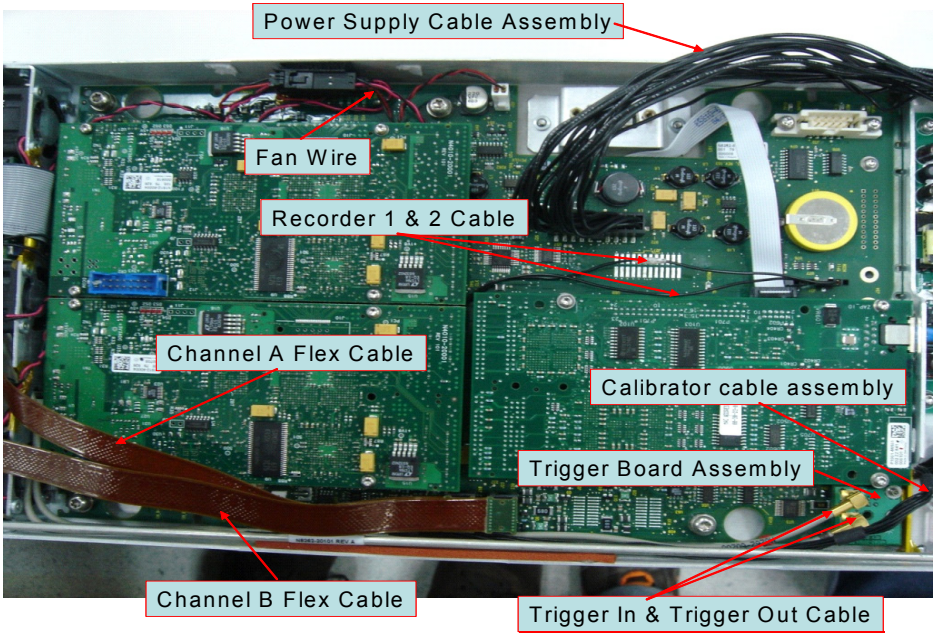


Figure 6-2 Overview of the replaceable parts

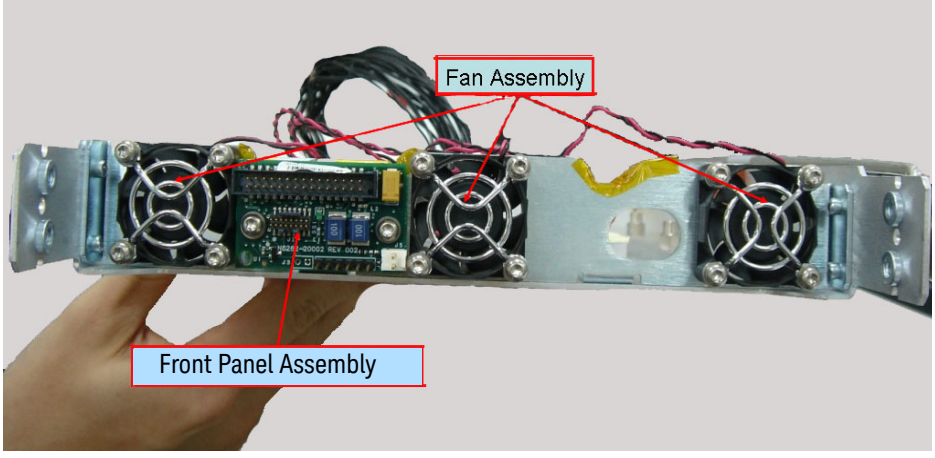
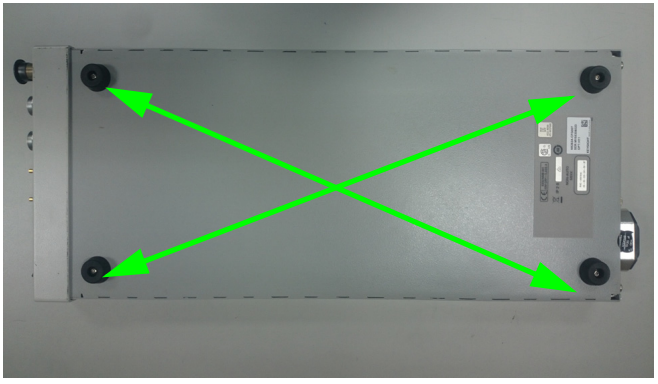
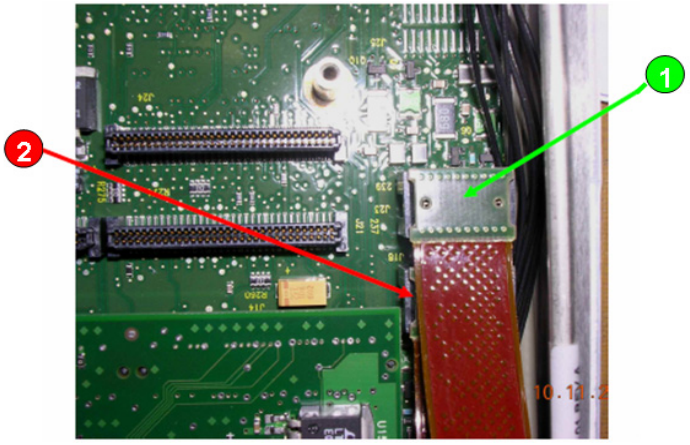
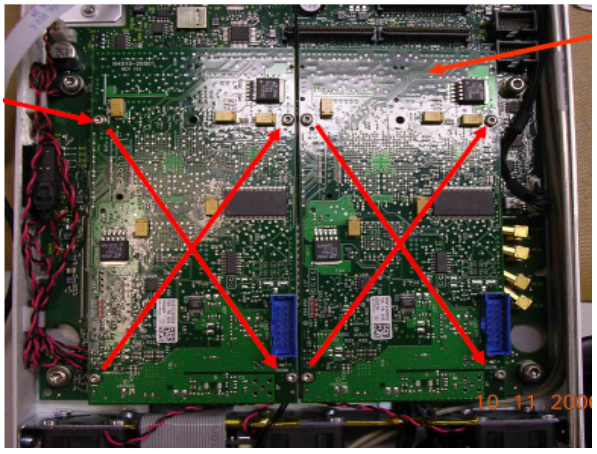
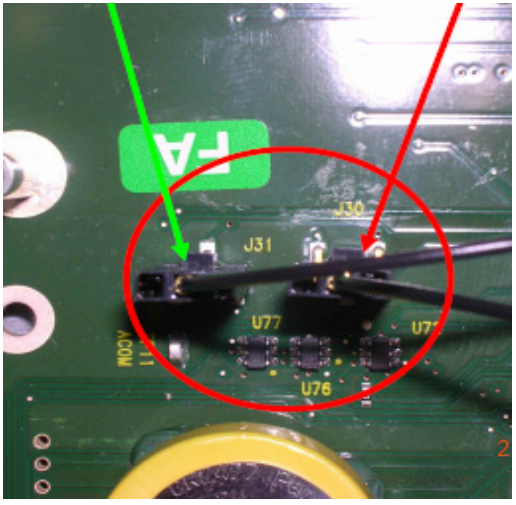


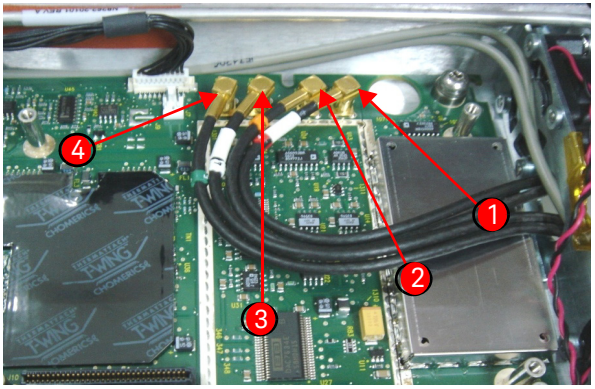
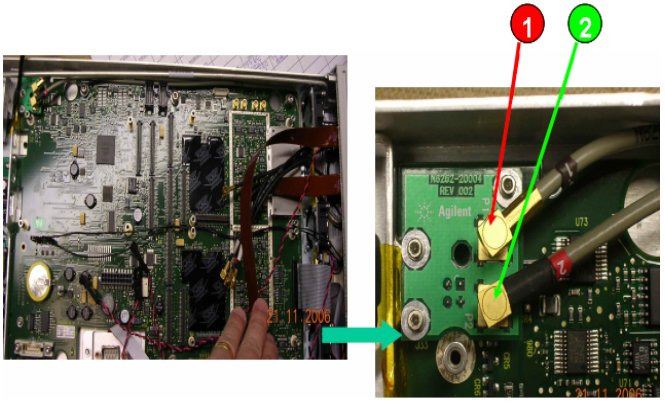
Figure 6-3 Overview of the front panel assemblies

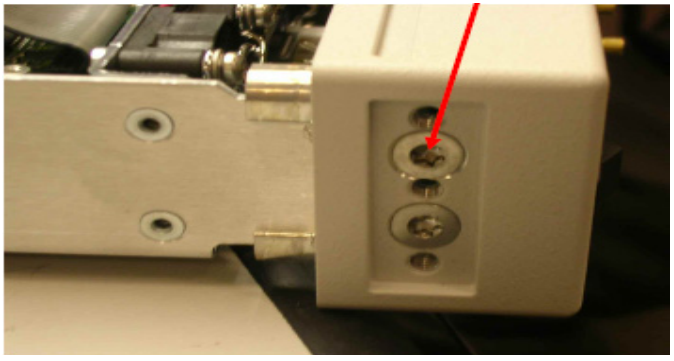
Front panel disassembly instructions

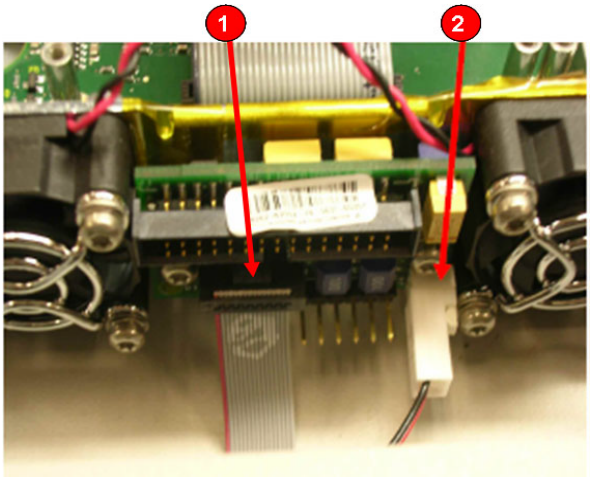
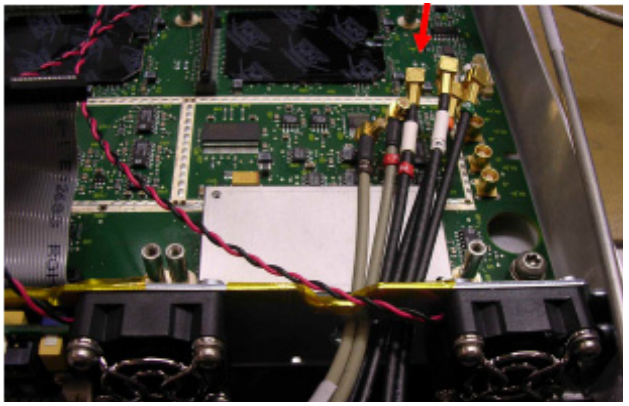
Instructions	Visual
Use the T10 Torx screwdriver bit to remove the four captive screws and remove the bumper foot. **Note:** You need to remove the bumper foot first before removing the cover.	

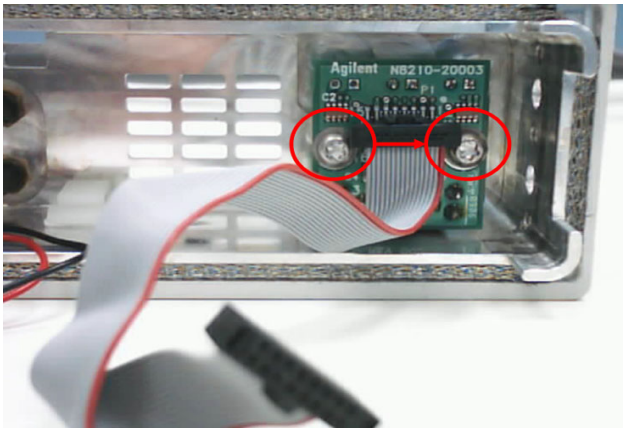
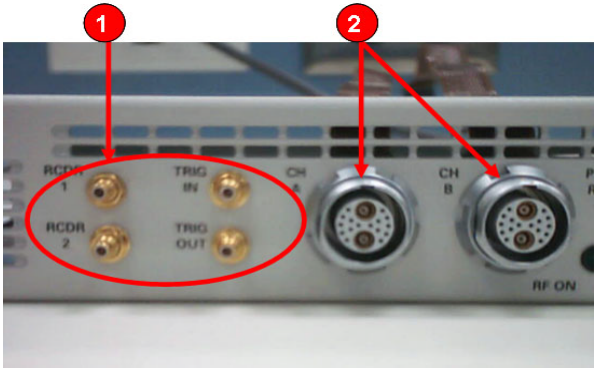
Instructions	Visual
– Use a T20 Torx screwdriver bit to remove the four screws located at the rear panel. – Pull and remove the cover at the rear panel. See the figure to the right for more details.	
– Step 1: Lift and remove channel B sensor flex cable from J23. – Step 2: Lift and remove channel A sensor flex cable from J18.	

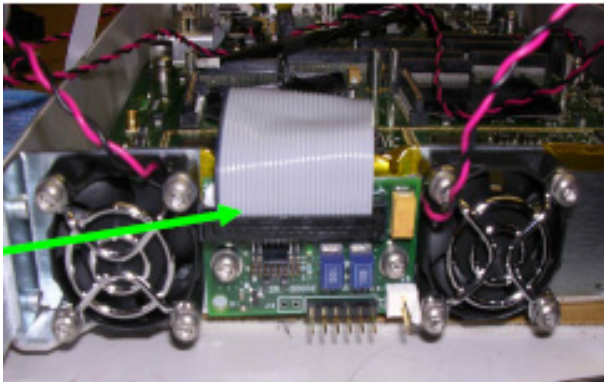
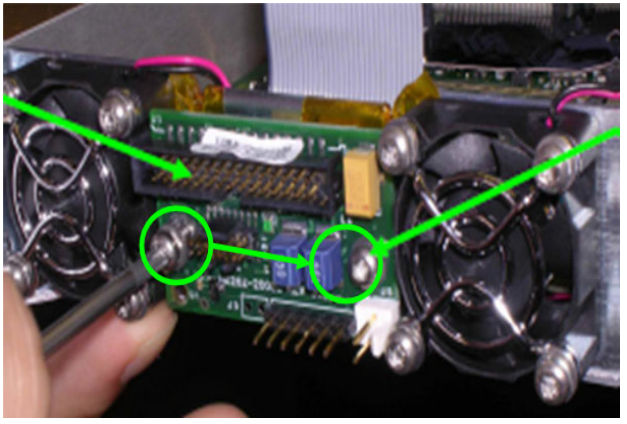
Instructions	Visual
– Use a T8 Torx screwdriver bit to remove the eight screws, which holds the measurement board assembly. See the figure to the right for more details. – Lift and remove the measurement board assembly.	
Lift and remove recorder 1 cable and recorder 2 cable from J31 and J30 respectively on the mother board assembly.	

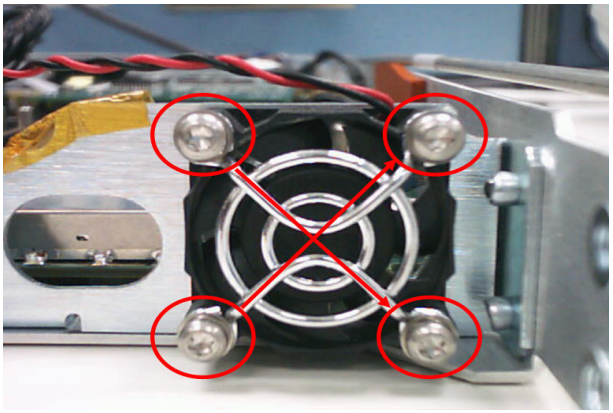
Instructions	Visual
– Step 1: Lift and remove the top coaxial cable labeled 2 (channel B) from J2. – Step 2: Lift and remove the bottom coaxial cable labeled 3 (channel B) from J3. – Step 3: Lift and remove the top coaxial cable labeled 4 (channel A) from J4. – Step 4: Lift and remove the bottom coaxial cable labeled 5 (channel A) from J5. **Note:** These coaxial cables originally routed under the measurement board assembly.	
– Step 1: Lift and remove the coaxial cable labeled 1 (trig. in) from P1. – Step 2: Lift and remove the coaxial cable labeled 2 (trig. out) from P2. **Note:** These coaxial cable are originally routed on the right side of the chassis along the wall. See the figure to the right for more details.	

Instructions	Visual
– Remove the power reference input connector (see the figure to the right): – Use the 19 mm socket to remove the nut on the power reference input connector on the front panel.	
Use a T20 Torx screwdriver bit to remove the four screws (located at both side of the front panel), which holds the front frame to the chassis.	

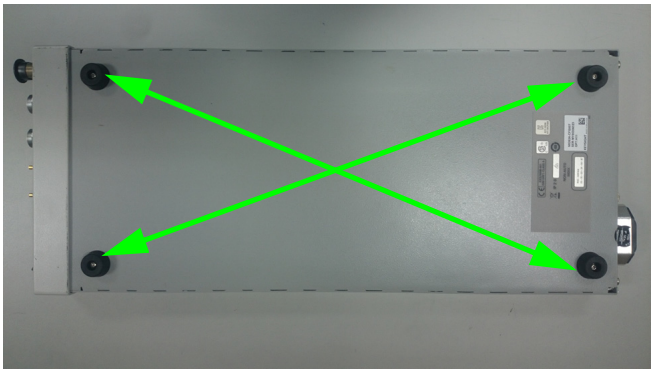
Instructions	Visual
– Step 1: Disconnect the ribbon cable, which connects the front panel board assembly to the rocker switch. – Step 2: Pull and remove the LED wire from the front panel board assembly.	
Take out the six coaxial cables through the hole in the chassis carefully. **Note:** During this step, you will be able to take out the front panel assembly, which is inclusive of channel A and B sensor flex assembly, recorder output cables, and trigger in/out cables.	

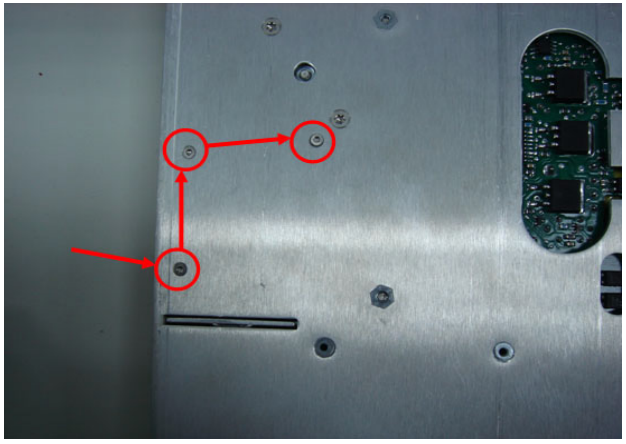
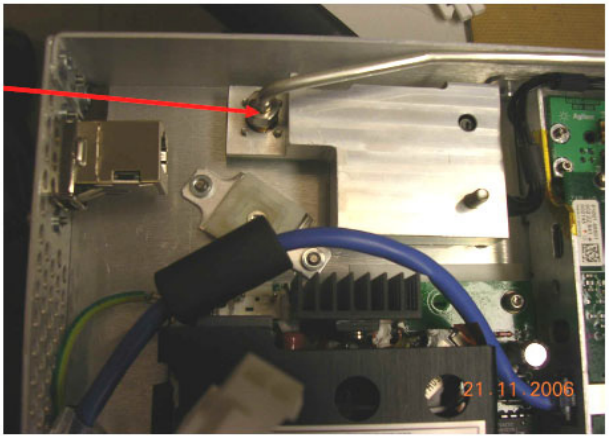
Instructions	Visual
Use a T10 Torx screwdriver bit to remove the two screws (as shown in the figure to the right), which holds the rocker switch board assembly. **Note:** You will be able to take out the rocker switch assembly during this step.	
– Step 1: Use the 1/4" socket to remove the nuts. Remove the trigger in/out cables, and the recorder output cables. – Step 2: Use the ODU socket to remove the nut of channel A and B's sensor flex assembly. **Note:** You are not require to remove all the nuts and sockets unless you wish to remove the front frame. You may remove the nuts or sockets for parts that need to be disassembled.	

Instructions	Visual
Disconnect the ribbon cable, which connects the mother board assembly and front panel board assembly.	
Use a T10 Torx screwdriver bit to remove the two screws, which holds the front panel board assembly to the chassis. **Note:** You will be able to remove the front panel board assembly during this step.	

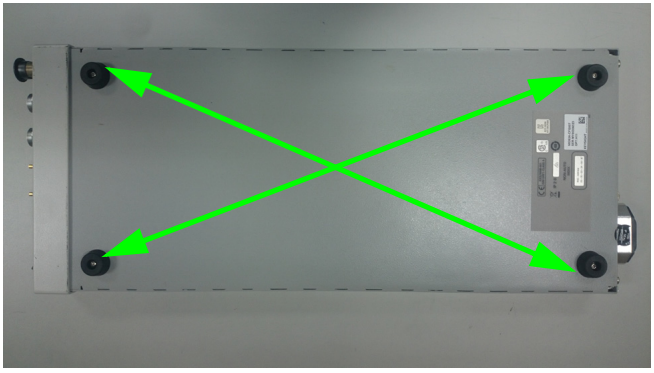
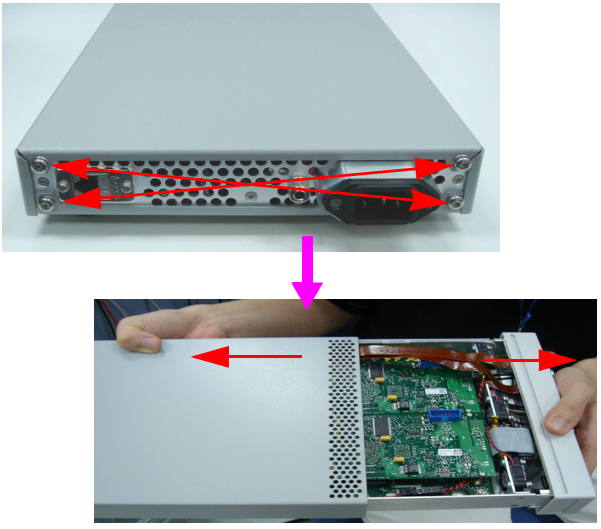
Instructions	Visual
– Disconnect the fan assembly (as shown in the figure to the right) – Use a T10 Torx screwdriver bit to remove the four screws, remove the fan guard, and disconnect the fan assembly. **Note:** You may use the same method to disconnect all the fan assemblies.	

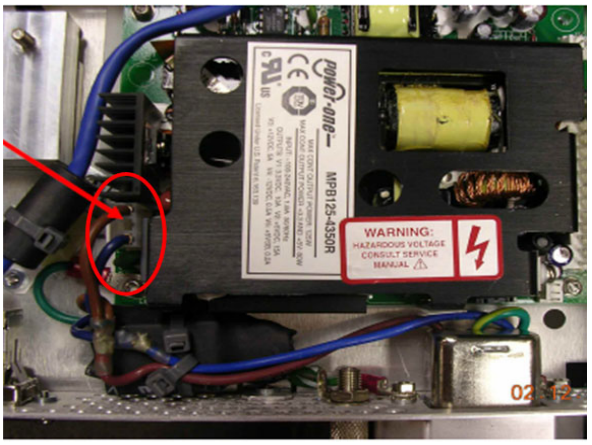
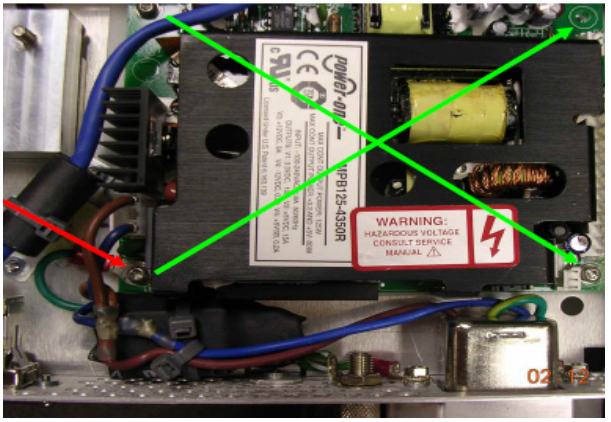
Calibrator disassembly instructions

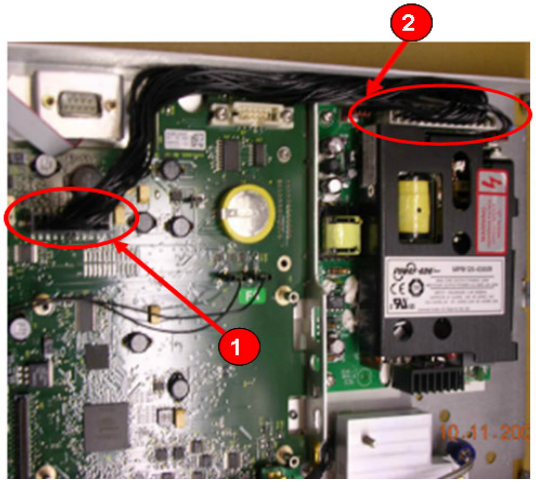
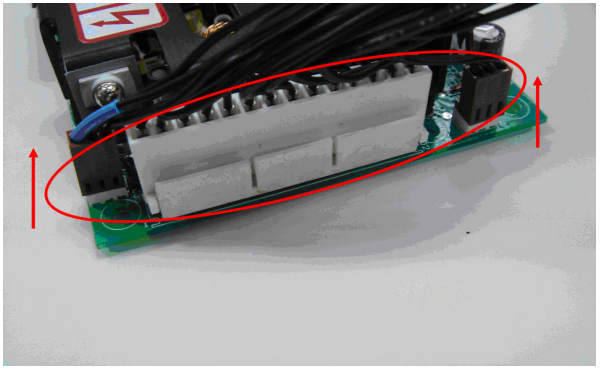
Instructions	Visual
Use a 10 Torx screwdriver bit to remove the four captive screws and remove the bottom feet. **Note:** You need to remove the bumper foot first before removing the cover.	
– Use a T20 Torx screwdriver bit to remove four screws located at the rear panel. – Pull and remove the cover at the rear panel. See the figure to the right for more details.	

Instructions	Visual
Use a T6 Torx screwdriver bit to remove the three screws located on the bottom of the chassis.	
Use the 5/16” spanner to disconnect the power reference input from the calibrator assembly. **Note:** You will be able to remove the calibrator assembly at this step.	

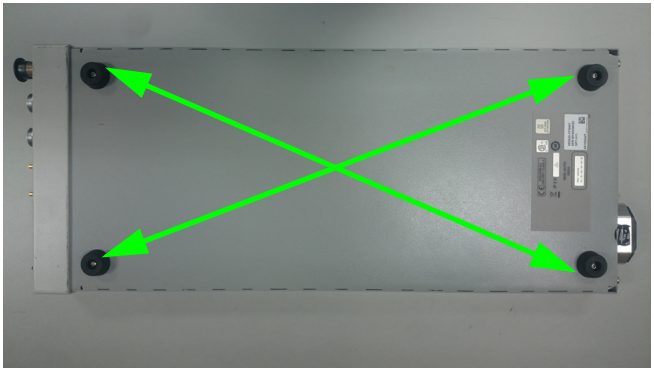
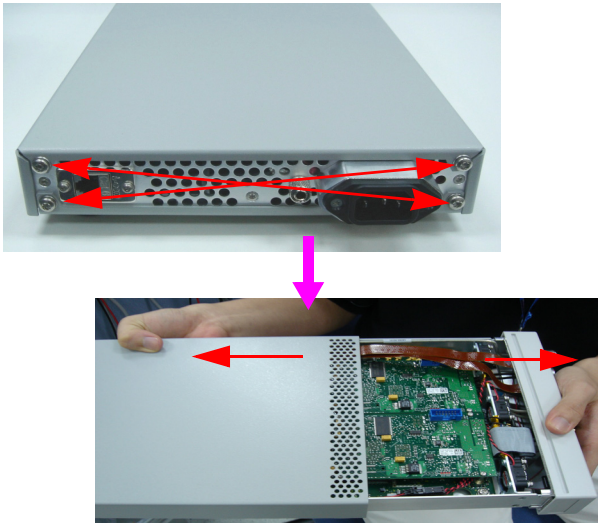
Power supply disassembly instructions

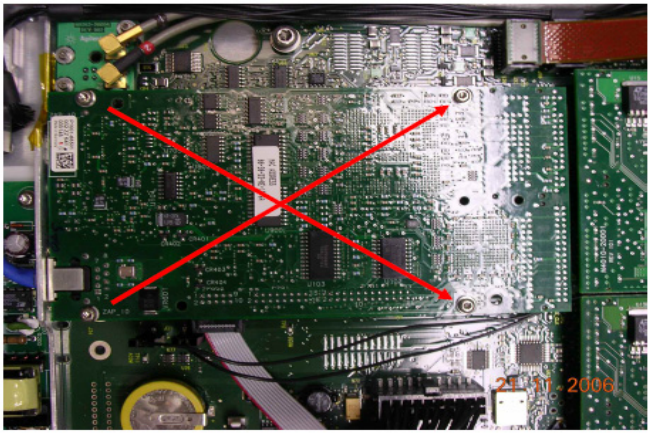
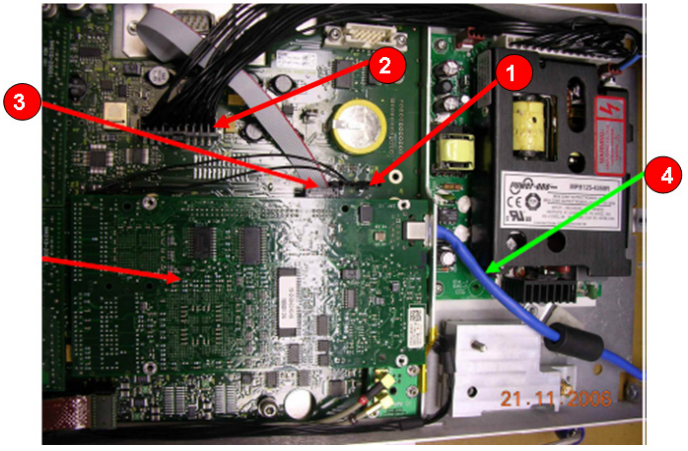
Instructions	Visual
Use a T10 Torx screwdriver bit to remove the four captive screws and remove the bumper foot. **Note:** You need to remove the bottom feet first before removing the cover.	
– Use a T20 Torx screwdriver bit to remove four screws located at the rear panel. – Pull and remove the cover at the rear panel. See the figure to the right for more details.	

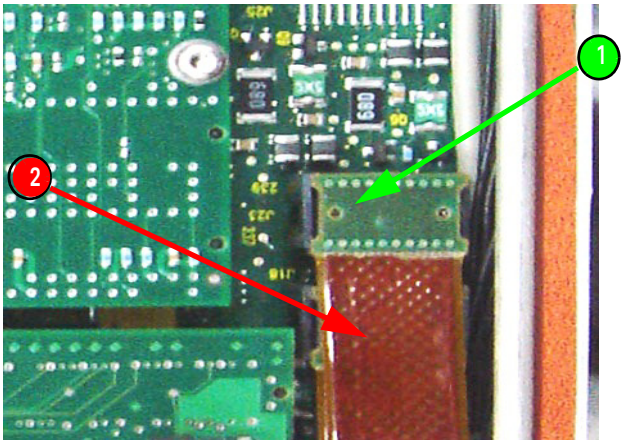
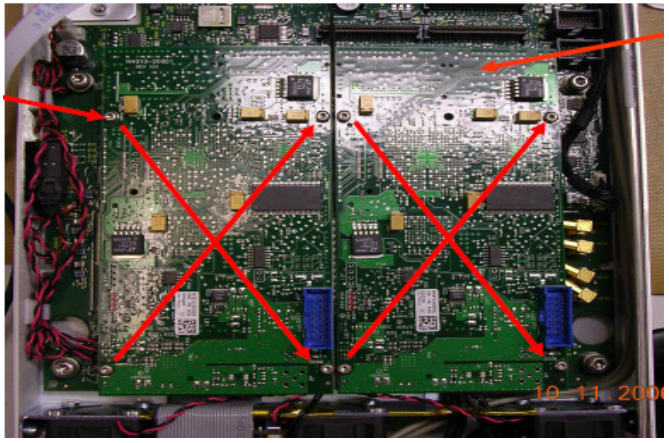
Instructions	Visual
Lift and remove the line module from the power supply unit. See the figure to the right for more details.	
– Use a T10 Torx screwdriver bit to remove the screw, and remove the lug from the power supply unit. – Use the same tool to remove the three remaining screws.	

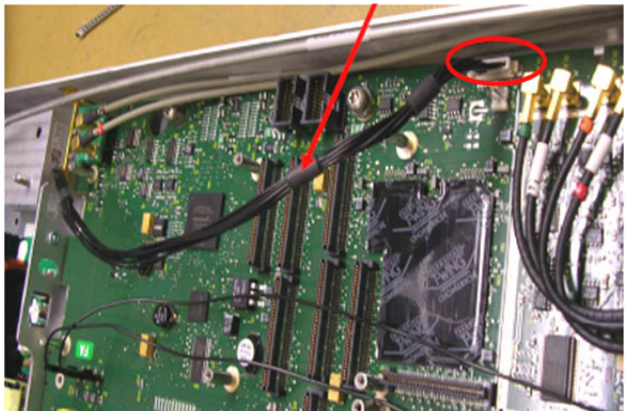
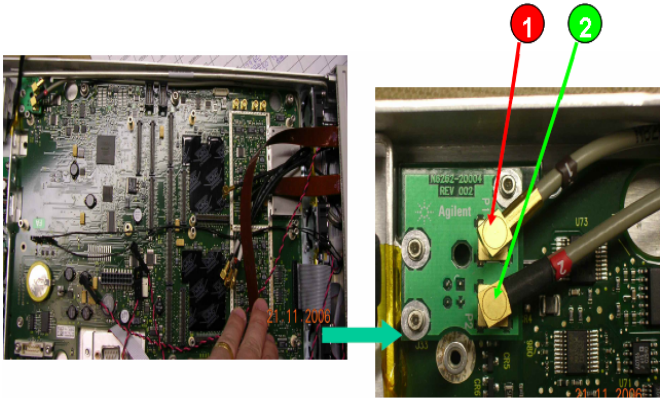
Instructions	Visual
– Step 1: Lift and remove the power supply cable assembly from the mother board assembly. – Step 2: Lift and remove the power supply unit. Disconnect the power supply cable assembly from the power supply unit.	
Lift and remove the power supply cable assembly from the power supply.	

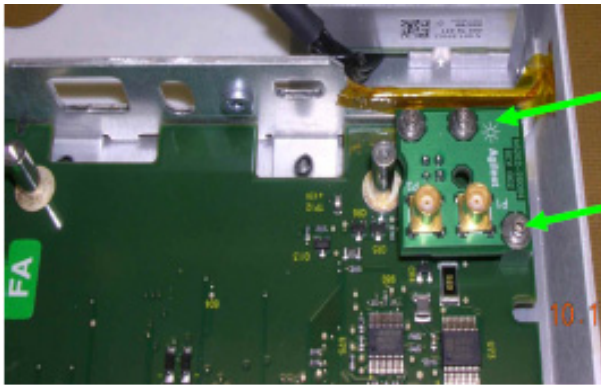
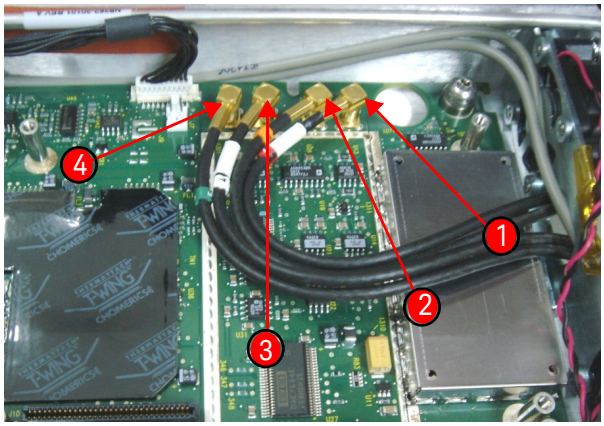
Mother board, measurement board, and PPMC board disassembly instructions

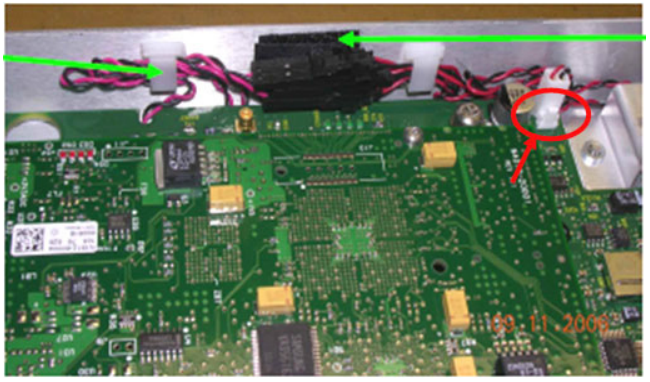
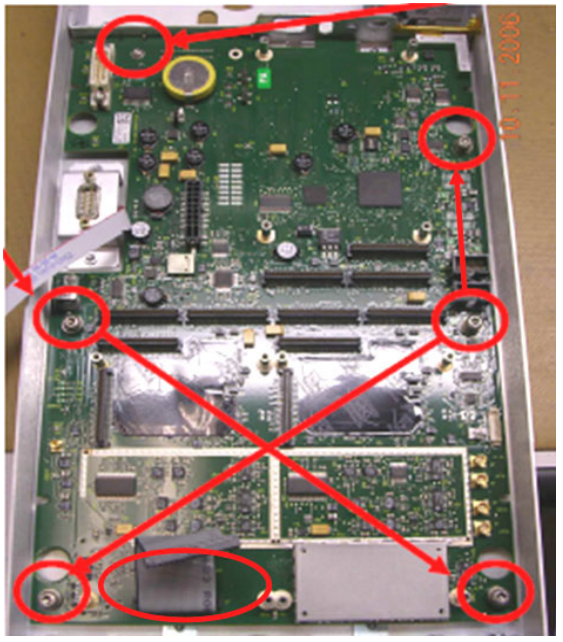
Instructions	Visual
Use a T10 Torx screwdriver bit to remove the four captive screws and remove the bumper foot. **Note:** You need to remove the bumper foot first before removing the cover.	
– Use a T20 Torx screwdriver bit to remove the four screws located at the rear panel. – Pull and remove the cover at the rear panel. See the figure on the right column for more details.	

Instructions	Visual
Use a T8 Torx screwdriver bit to remove the four screws. Lift and remove PPMC assembly from the mother board assembly.	
– Step 1: Lift and remove recorder 1 and recorder 2 from J31 and J30, which are located on the mother board assembly. – Step 2: Lift and remove power supply cable assembly from the mother board. – Step 3: Disconnect the RS-232 ribbon cable from the PPMC assembly. – Step 4: Disconnect the LAN extension cable from PPMC assembly. **Note:** You will be able to remove PPMC assembly at this step.	

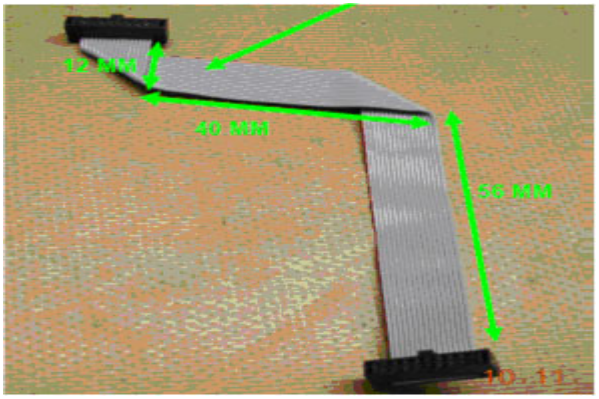
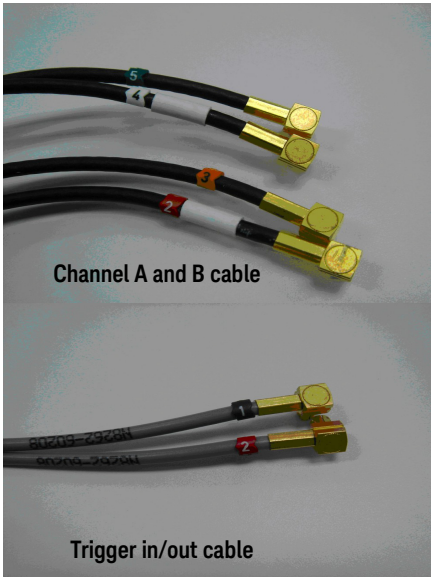
Instructions	Visual
– Step 1: Lift and remove channel B flex cable from J23. – Step 2: Lift and remove channel A flex cable from J18.	
– Use a T8 Torx screwdriver bit to remove the eight screws, which holds the measurement to the mother board. – Lift and remove the measurement board assembly. **Note:** You will be able to remove the measurement board assembly at this step.	

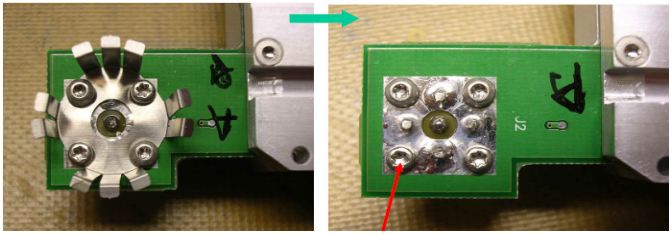
Instructions	Visual
Lift and remove calibrator cable assembly from the mother board assembly at J8.	
– Step 1: Lift and remove the coaxial cable labeled 1 (trig. in) from P1. – Step 2: Lift and remove the coaxial cable labeled 2 (trig. out) from P2. **Note:** These coaxial cable are originally routed on the right side of the chassis along the wall. See the figure to the right for more details.	

Instructions	Visual
Use a 1.5 Hex Allen tool to disconnect the trigger board from the mother board assembly. Remove all the locks and flat washers. **Note:** You will be able to remove the trigger interface board assembly at this step.	
– Step 1: Lift and remove the top coaxial cable labeled 2 (channel B) from J2. – Step 2: Lift and remove the bottom coaxial cable labeled 3 (channel B) from J3. – Step 3: Lift and remove the top coaxial cable labeled 4 (channel A) from J4. – Step 4: Lift and remove the bottom coaxial cable labeled 5 (channel A) from J5. **Note:** These coaxial cables originally routed under the measurement board assembly.	

Instructions	Visual
Disconnect the fan wire connector from the mother board assembly. Lift and remove the fan wire from the chassis wall.	
– Pull and remove the ribbon cable, which is connected from the mother board assembly to the front panel board. – Use a T20 Torx screwdriver bit and T8 screwdriver bit accordingly to remove the six screws, which holds the mother board assembly to the chassis. – Lift and remove the mother board assembly from chassis carefully. **Note:** You will be able to remove the mother board assembly at this step.	

Reassembly Instructions

Instructions	Visual
– The reassembly process is simply the reverse of the disassembly process. However, there are various points to be aware of: – Make sure the ribbon cable is shaped as in the figure to the right when you connect a new front panel board ribbon cable.	
– When connecting a new trigger in/out cable assembly or channel A and B sensor flex cable, you are recommended to label each of the cable as follows: – Channel A top cable labeled with 4 – Channel A bottom cable labeled with 5 – Channel B top cable labeled with 2 – Channel B bottom cable labeled with 3 – Trigger in cable labeled with 1 – Trigger out cable labeled with 2 – See the figure to the right for details.	

Instructions	Visual
– When connecting a new calibrator, make sure that you have remove the metal gasket by removing the attached screws using a T6 Torx screwdriver bit. – After removing the metal gasket, place back the screws to original position. **Note:** The new calibrator comes with a metal gasket.	

Additional Repair Notes

Replacing a sensor flex assembly:

- The Sensor Flex Assembly is supplied straight.
- Create a sharp bend (Figure 6-4): The flex circuit must be bent at a right-angle where it meets the printed circuit board. It can only be bent after heat has been applied to it (i.e. using a hot-air gun or a similar device).

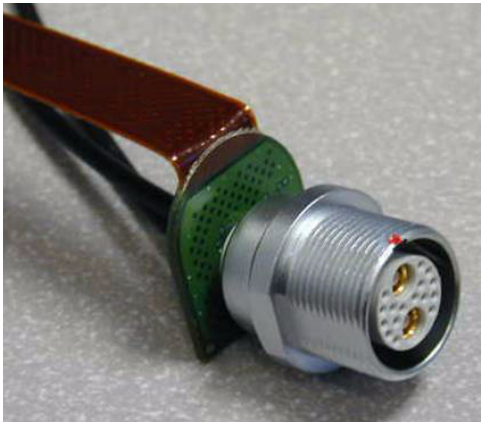


Figure 6-4 Creating a sharp bend

NOTE

- Once this sharp bend has been created, the flex should not be bent at this point again; to do so may break the tracking within the flex.
- Route and connect the sensor flex assembly: once the sensor flex assembly has been attached to the power meter; it should be folded to match the route taken by the assembly being replaced. Heat may be used to assist the folding of the flex.

Replacing the PPMC Assembly

- The PPMC Assembly is pre-programmed with N8262A firmware.
- Always perform a firmware update to the instrument if the PPMC assembly has been replaced.
- Instrument serial number:

  This can be stored in the PPMC assembly via the command:

  `SERV: SNUM <CHARACTER DATA>`
- Instrument option(s):

  This/these can be stored in the PPMC assembly via the command:

  `SERV: OPT "<CHARACTER DATA>"`

Refer to the *Programming Guide* for further details on the use of these commands.

7 Contacting Keysight Technologies

Introduction 118
Before Calling Keysight Technologies 119
Check the Basics 120
Instrument Serial Numbers 121
Returning Your Power Meter for Service 122
Useful Web Pages 124

This chapter details what to do if you have a problem with your power meter.

Introduction

Contacting Keysight Technologies

This section details what to do if you have a problem with your power meter. If you have a problem with your power meter, first refer to the page titled Before Calling Keysight Technologies. This section contains a checklist that helps identify some of the most common problems. If you wish to contact Keysight Technologies to enquire about the N8262A P-Series modular power meter, from service problems to ordering information, refer to "Sales and Technical Support" on page 12. If you wish to return the power meter to Keysight Technologies, refer to the section titled Returning Your Power Meter for Service.

Before Calling Keysight Technologies

Before calling Keysight Technologies or returning the power meter for service, please make the checks listed in "Check the Basics" on page 120. If your power meter is covered by a separate maintenance agreement, please be familiar with the terms.

Keysight Technologies offers several maintenance plans to service your power meter after warranty expiration. Call your Keysight Technologies Sales and Service Center for full details.

If the power meter becomes faulty and you wish to return the faulty instrument, follow the description on how to return the faulty instrument in "Returning Your Power Meter for Service" on page 122.

Check the Basics

Problems can be solved by repeating what was being performed when the problem occurred. A few minutes spent in performing these simple checks may eliminate time spent waiting for instrument repair. Before calling Keysight Technologies or returning the power meter for service, please make the following checks:

- Check that the line socket has power.
- Check that the power meter is plugged into the proper ac power source.
- Check that the power meter is switched on.
- Check that the other equipment, cables, and connectors are connected properly and operating correctly.
- Check the equipment settings in the procedure that was being used when the problem occurred.
- Check that the test being performed and the expected results are within the specifications and capabilities of the power meter.
- Check the power meter display for error message.
- Check operation by performing the self tests.
- Check with a different power sensor.

Instrument Serial Numbers

Keysight Technologies makes frequent improvements to its products to enhance their performance, usability and reliability. Keysight Technologies service personnel have access to complete records of design changes for each instrument. The information is based on the serial number and option designation of each power meter.

Whenever you contact Keysight Technologies about your power meter have a complete serial number available. This ensures you obtain the most complete and accurate service information. The serial number can be obtained by:

- Querying the power meter over a remote interface (via the `*IDN?` command).
- From the serial number label.

The serial number label is attached to the bottom of each Keysight Technologies instrument. This label has two instrument identification entries. The first provides the instruments serial number and the second provides the identification number for each option built into the instrument.

The serial number is divided into two parts: the prefix (two letters and the first four numbers), and the suffix (the last four numbers).

The prefix letters indicate the country of manufacture. This code is based on the ISO international country code standard, and is used to designate the specific country of manufacture for the individual product. The same product number could be manufactured in two different countries. In this case the individual product serial numbers would reflect different country of manufacture codes. The prefix also consists of four numbers. This is a code identifying the date of the last major design change.

The suffix indicates an alpha numeric code which is used to ensure unique identification of each product throughout Keysight Technologies.

Returning Your Power Meter for Service

Use the information in this section if you need to return your power meter to Keysight Technologies.

Packaging the power meter for shipment to Keysight Technologies for service

- Fill in a blue service tag (available at the end of most hardcopy *Keysight Service Guides*) and attach it to the power meter. Please be as specific as possible about the nature of the problem. Send a copy of any or all of the following information:
  - Any error messages that appeared on the power meter display.
  - Any information on the performance of the power meter.

CAUTION **Power meter damage can result from using packaging materials other than those specified. Never use styrene pellets in any shape as packaging materials. They do not adequately cushion the power meter or prevent it from shifting in the carton. Styrene pellets cause power meter damage by generating static electricity and by lodging in the rear panel.**

- Use the original packaging materials or a strong shipping container that is made of double-walled, corrugated cardboard with 159 kg (350 lb) bursting strength. The carton must be both large enough and strong enough to accommodate the power meter and allow at least 3 to 4 inches on all sides of the power meter for packing material.
- Surround the power meter with at least 3 to 4 inches of packing material, or enough to prevent the power meter from moving in the carton. If packing foam is not available, the best alternative is SD- 240 Air Cap TM from Sealed Air Corporation (Commerce, CA 90001). Air Cap looks like a plastic sheet covered with 1-1/4 inch air filled bubbles. Use the pink Air Cap to reduce static electricity. Wrap the power meter several times in the material to both protect the power meter and prevent it from moving in the carton.
- Seal the shipping container securely with strong nylon adhesive tape.

- Mark the shipping container “FRAGILE, HANDLE WITH CARE” to ensure careful handling.
- Retain copies of all shipping papers.

Useful Web Pages

- Main Product Page
  www.keysight.com/find/powermeter

- Performance Test & Calibration Software
  www.cal.software.keysight.com

This information is subject to change without notice. Always refer to the Keysight website for the latest revision.

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