

Agilent Technologies
DC Power Analyzer
Model N6705A

Service Guide



Agilent Technologies

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General

Do not use this product in any manner not specified by the manufacturer. The protective features of this product may be impaired if it is used in a manner not specified in the operation instructions.

Before Applying Power

Verify that all safety precautions are taken. Make all connections to the unit before applying power. Note the instrument's external markings described under "Safety Symbols"

Ground the Instrument

This product is a Safety Class 1 instrument (provided with a protective earth terminal). To minimize shock hazard, the instrument chassis and cover must be connected to an electrical ground. The instrument must be connected to the ac power mains through a grounded power cable, with the ground wire firmly connected to an electrical ground (safety ground) at the power outlet. Any interruption of the protective (grounding) conductor or disconnection of the protective earth terminal will cause a potential shock hazard that could result in personal injury.

Fuses

The instrument contains an internal fuse, which is not customer accessible.

Do Not Operate in an Explosive Atmosphere

Do not operate the instrument in the presence of flammable gases or fumes.

Do Not Remove the Instrument Cover

Only qualified, service-trained personnel who are aware of the hazards involved should remove instrument covers. Always disconnect the power cable and any external circuits before removing the instrument cover.

Do Not Modify the Instrument

Do not install substitute parts or perform any unauthorized modification to the product. Return the product to an Agilent Sales and Service Office for service and repair to ensure that safety features are maintained.

In Case of Damage

Instruments that appear damaged or defective should be made inoperative and secured against unintended operation until they can be repaired by qualified service personnel.



















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.

WARNING

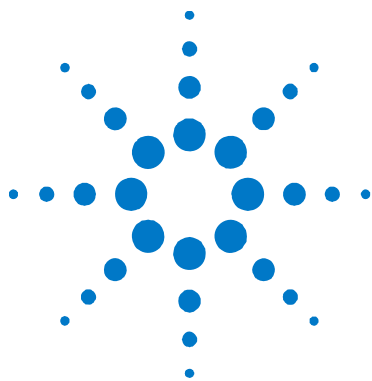
A **WARNING** notice denotes a hazard. It calls attention to an operating procedure, practice, or the like that, if not correctly performed or adhered to, could result in personal injury or death. Do not proceed beyond a **WARNING** notice until the indicated conditions are fully understood and met.

Safety Symbols

	Direct current
	Alternating current
	Both direct and alternating current
	Three phase alternating current
	Earth (ground) terminal
	Protective earth ground terminal.
	Frame or chassis terminal
	Terminal is at earth potential.
	Neutral conductor on permanently installed equipment
	Line conductor on permanently installed equipment.
	On supply
	Off supply
	Standby supply. Unit is not completely disconnected from ac mains when switch is off
	In position of a bi-stable push switch
	Out position of a bi-stable push switch
	Caution, risk of electric shock
	Caution, hot surface
	Caution, refer to accompanying description

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Introduction

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This manual discusses the verification and calibration procedures for the Agilent N6705A DC Power Analyzer mainframe.

No procedures are provided for troubleshooting individual modules - other than identifying if a specific module is defective. If you have a defective module, you can return it to Agilent Technologies for repair or replacement. Refer to the following note.

NOTE

You can contact Agilent Technologies at one of the following telephone numbers for warranty, service, or technical support information.

In the United States: (800) 829-4444

In Europe: 31 20 547 2111

In Japan: 0120-421-345

Or use our Web link for information on contacting Agilent in your country or specific location: www.agilent.com/find/assist

Or contact your Agilent Technologies Representative.

The web contains the most up to date version of the manuals. Go to <http://www.agilent.com/find/N6705> to get the latest version of the manuals.

Returning an Instrument

Before returning your instrument to Agilent Technologies for service or repair, perform the “Preliminary Checkout” procedures (see page 70).

Warranty Repair

If your instrument fails during the warranty period, Agilent Technologies will replace or repair it free of charge. After your warranty expires, Agilent Technologies will replace or repair it at a competitive price. The standard repair process is “assembly level repair” for the mainframe and “whole unit exchange” for the DC power supply modules. The replacement units are fully refurbished and are shipped with new calibration certificates.

Contact your nearest Agilent Technologies Service Center. They will arrange to have your instrument repaired or replaced.

Repackaging for Shipment

If the unit is to be shipped to Agilent Technologies for service or repair, be sure to:

- Attach a tag to the unit identifying the owner and indicating the required service or repair. Include the model and serial number.
- Place the unit in its original container with the appropriate packaging material and secure the container with strong tape or metal bands.

If the original shipping container is not available, place your unit in a container that will ensure at least 4 inches of compressible packaging material around all sides for the instrument. Use static-free packaging materials to avoid additional damage to your unit.

Agilent Technologies suggests that you always insure shipments.

Instrument Identification

Serial Number

Agilent N6705A mainframes are identified by the serial number located on the back of the instrument.

The serial number consists of a 10-character number such as MY24D00013. The first two characters indicate the country of manufacture, and the last five digits are a sequential number assigned to each mainframe.

Additional Information

For Agilent N6705A mainframes, you can query the model number, serial number, firmware revision, backup and active firmware.

For power modules, you can query the model number, serial number, installed options, voltage, current and power rating.

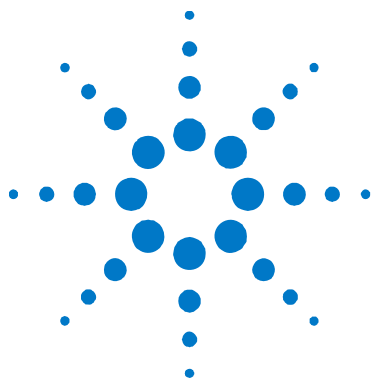
Front Panel:	SCPI Command:
Press the [Settings] key, then select the Ratings button on the bottom of the screen.	For mainframe information: *IDN? For information about the power module in channel 1: SYST:CHAN:MOD? (@1) SYST:CHAN:OPT? (@1) SYST:CHAN:SER? (@1)

Firmware Upgrade

You can query the instrument's firmware revision either from the front panel or over the remote interface as previously described under "Additional Information".

To upgrade your instrument with the latest firmware revision, go to <http://www.agilent.com/find/N6705firmware>. The upgrade procedure consists of the following three steps:

- Download and install the Agilent N6705 Firmware Update Utility from the Web.
- Download and unzip the Agilent N6705 Firmware Update file from the Web.
- Run the Agilent N6705 Firmware Update Utility and update the firmware on your instrument.



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Performance Verification

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The verification procedures described in this chapter verify that the Agilent N6705A DC Power Analyzer is operating normally and is within published specifications.

NOTE

Perform the verification tests before calibrating your DC Power Analyzer. If the DC Power Analyzer passes the verification tests, the unit is operating within its calibration limits and does not need to be re-calibrated.

Verification Description

Verification procedures perform two primary functions:

Performance Tests These tests verify that the DC Power Analyzer is operating normally and meets the specifications published in Appendix A in the User's Guide.

Calibration Tests These tests verify that the DC Power Analyzer is operating within its calibration limits.

If the DC Power Analyzer fails any of the tests or if abnormal test results are obtained, try calibrating the unit. If calibration is unsuccessful, return the unit to an Agilent Technologies Service Center.

Equipment Required

The equipment listed in the following table, or the equivalent to this equipment, is required for the performance tests and for calibration. Test record sheets are included at the back of this section.

Type	Specifications	Recommended Model
Digital Multimeter	Resolution: 10 nV @ 1V; Readout: 8 1/2 digits Accuracy: 20 ppm	Agilent 3458A or equivalent
Current Monitor	15 A (0.1 ohm), TC=4ppm/°C (all models exc. N6741B) 30 A (0.1 ohm), TC=4ppm/°C (model N6741B only)	Guildline 9230A/15R Guildline 9230A/30
Load Resistors	25 Ω , 250 W, 1%, TC<100 ppm/°C (calibration) 4 Ω , 250 W, 1%, TC<100 ppm/°C (calibration) 3.8 Ω , 250 W, 1%, TC<100 ppm/°C (cal; N6704A only) 7.6 Ω , 250 W, 1%, TC<100 ppm/°C (cal; N6704A only)	Vishay NH-250-25 Ω -1% Vishay NH-250-4 Ω -1%
Electronic Load	100 V, 20 A minimum, with transient capability and a slew rate of 833 kA/s or better.	Agilent N3300A mainframe, with N330xA module
GPIB Controller	Full GPIB capabilities	Agilent 82350B or equivalent
Oscilloscope	Sensitivity: 1 mV Bandwidth Limit: 20 MHz Probe: 1:1 with RF tip	Agilent Infiniium or equivalent
RMS Voltmeter	True RMS Bandwidth: 20 MHz Sensitivity: 100 μ V	Rhode and Schwartz Model URE3 or equivalent
Differential Amplifier	Bandwidth: 20 MHz	LaCroy 1855A, DA1850A, or equivalent
Terminations	1 – 50 Ω BNC termination 2 – 50 Ω , 1/8 W termination resistors	
Variable-voltage Transformer or AC source	Adjustable to highest rated input voltage range. Power: 500 VA	Agilent 6813B or equivalent

Measurement Techniques

Voltmeter

To ensure that the values read by the voltmeter during both the verification procedure and the calibration procedure are not affected by the instantaneous measurement of the AC peaks of the output current ripple, several DC measurements should be made and averaged.

If you are using an Agilent 3458A DMM, you can set up the voltmeter to do this automatically. From the instrument's front panel, program 100 power line cycles per measurement.

Press NPLC 100 ENTER.

Current-Monitoring Resistor

The 4-terminal current shunt is used to eliminate output current measurement error caused by voltage drops in the load leads and connections. It has special current-monitoring terminals inside the load connection terminals. Connect the voltmeter directly to these current-monitoring terminals.

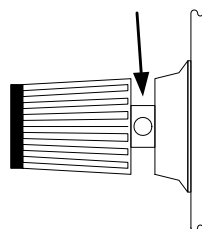
Electronic Load

Many of the test procedures require the use of a variable load capable of dissipating the required power. If a variable resistor is used, switches should be used to connect, disconnect, or short the load resistor. For most tests, an electronic load can be used. The electronic load is considerably easier to use than load resistors, but it may not be fast enough to test transient recovery time and may be too noisy for the noise (PARD) tests.

Fixed load resistors may be used in place of a variable load, with minor changes to the test procedures. Also, if computer controlled test setups are used, the relatively slow (compared to computers and system voltmeters) settling times and slew rates of the DC Power Analyzer may have to be taken into account. "Wait" statements can be used in the test program if the test system is faster than the DC Power Analyzer.

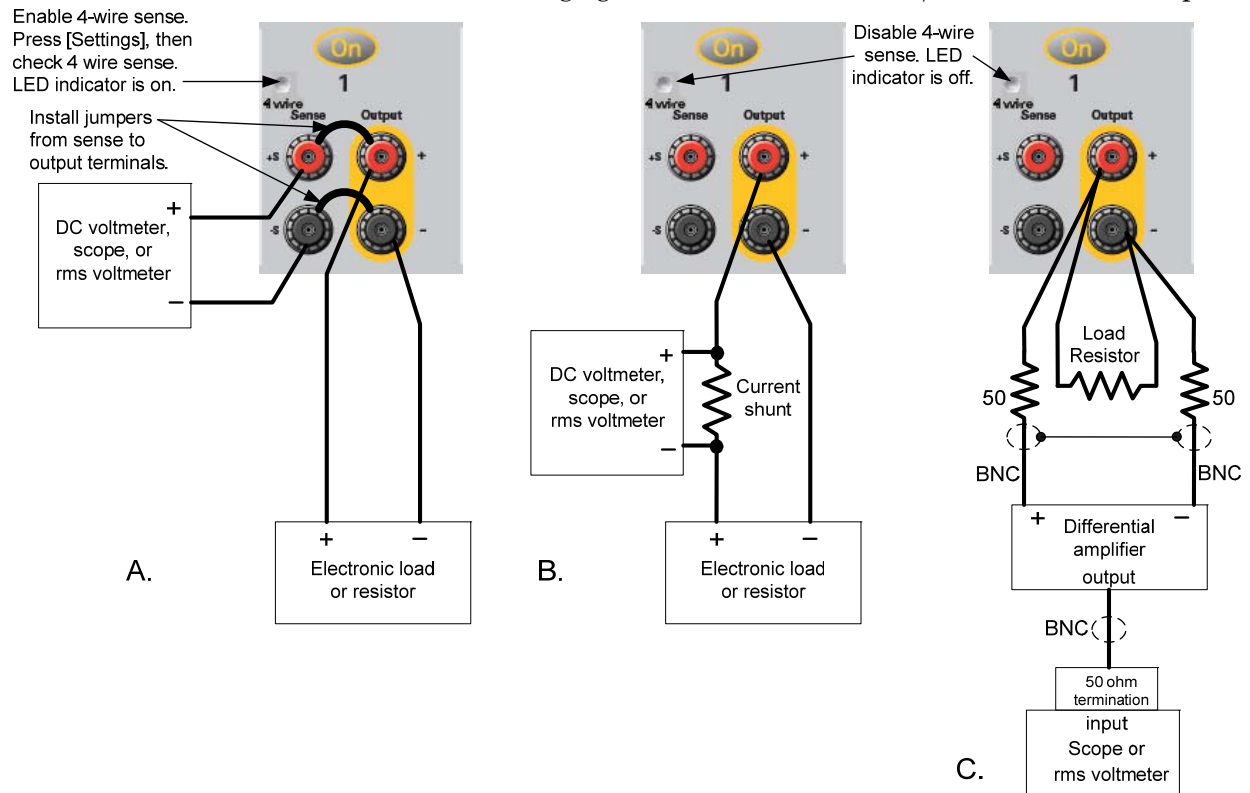
Front Panel Connections

Unless instructed otherwise, do not connect anything to the Sense terminals. Also make sure that 4 wire sensing is disabled (4 Wire LEDs not lit). If any 4 Wire LEDs are lit, press [Settings], then uncheck the 4 Wire Sense box. Connect all leads to the Output terminals as shown in the following figure:



Verification Test Set-up

The following figure shows the verification/calibration test set-ups.



Verification Procedure

Constant Voltage Tests

NOTE

Test each output channel individually. Refer to the appropriate test record form for the instrument settings of the model you are checking.

Voltage Programming and Readback Accuracy

Test category = performance, calibration

This test verifies that the voltage programming and measurement functions are within specifications.

- 1 Turn off the DC Power Analyzer and connect a DMM directly across the output (see Test Setup A). Do not connect a load.
- 2 Turn on the DC Power Analyzer and program the instrument settings as described in the test record form under “Voltage Programming & Readback, Min Voltage” with the load off. The output status should be “CV” and the output current should be close to zero.
- 3 Record the output voltage reading from the DMM and the voltage measured over the interface. The readings should be within the limits specified in the test record form for the appropriate model under “Voltage Programming & Readback, Min Voltage”.
- 4 Program the instrument settings as described in the test record form under “Voltage Programming & Readback, High Voltage”.
- 5 Record the output voltage reading from the DMM and the voltage measured over the interface. The readings should be within the limits specified in the test record form for the appropriate model under “Voltage Programming and Readback, High Voltage”.
- 6 *For Agilent Models N6761A and N6762A only.* Set both the voltage programming and the voltage measurement functions to the low range. Repeat steps 4 - 5 for the low voltage ranges. Program the instrument settings as described in the test record form under “Voltage Programming & Readback, Low Voltage”. The readings should be within the limits specified in the test record form for the appropriate model under “Voltage Programming and Readback, Low Voltage”.

CV Load Effect

Test category = performance

This test measures the change in output voltage resulting from a change in output current from full load to no load.

- 1 Turn off the DC Power Analyzer and connect a DMM and an electronic load (see Test Setup A).

- 2 Turn on the DC Power Analyzer and program the instrument settings as described in the test record form under “CV Load Effect”.
- 3 Set the electronic load for the output channel’s current as described in the test record form under “CV Load Effect”. The output status should be “CV”. If it isn’t, adjust the load so that the output current drops slightly.
- 4 Record the output voltage reading from the DMM.
- 5 Open the load. Record the voltage reading from the DMM again. The difference between the DMM readings in steps 4 and 5 is the load effect, which should not exceed the value listed in the test record form for the appropriate model under “CV Load Effect”.

CV Source Effect

Test category = performance

This test measures the change in output voltage that results from a change in AC line voltage from the minimum to maximum value within the line voltage specifications.

- 1 Turn off the DC Power Analyzer and connect the ac power line through a variable voltage transformer or an AC source.
- 2 Connect a DMM and an electronic load (see Test Setup A). Set the transformer or AC source to nominal line voltage.
- 3 Turn on the DC Power Analyzer and program the instrument settings as described in the test record form under “CV Source Effect”.
- 4 Set the electronic load for the output channel’s current as described in the test record form under “CV Source Effect”. The output status should be “CV”. If it isn’t, adjust the load so that the output current drops slightly.
- 5 Adjust the transformer or AC source to the lowest rated line voltage (86 VAC).
- 6 Record the output voltage reading from the DMM.
- 7 Adjust the transformer or AC source to the highest rated line voltage (264 VAC).
- 8 Record the output voltage reading on the DMM. The difference between the DMM reading in steps 6 and 8 is the source effect, which should not exceed the value listed in the test record form for the appropriate model under “CV Source Effect”.

CV Ripple and Noise

Test category = performance

Periodic and random deviations in the output combine to produce a residual AC voltage superimposed on the DC output voltage. This residual voltage is specified as the rms or peak-to-peak noise in the frequency range specified in Appendix A in the User's Guide.

- 1 Turn off the DC Power Analyzer and connect the load resistor, differential amplifier, and an oscilloscope (ac coupled) to the output (see Test Setup C). Use an appropriate load resistor to keep the DC Power Analyzer at the instrument setting specified in the test record form under "CV Ripple and Noise".
- 2 As shown in the diagram, use two BNC cables to connect the differential amplifier to the + and – output terminals. Each cable should be terminated by a 50 Ω resistor. The shields of the two BNC cables should be connected together. Connect the output of the differential amplifier to the oscilloscope with a 50 Ω termination at the input of the oscilloscope.
- 3 Set the differential amplifier to multiply by ten, divide by one, and 1 Megohm input resistance. The positive and negative inputs of the differential amplifier should be set to AC coupling. Set the oscilloscope's time base to 5 ms/div, and the vertical scale to 10 mV/div. Turn the bandwidth limit on (usually 20 or 30 MHz), and set the sampling mode to peak detect.
- 4 Program the DC Power Analyzer to the settings indicated in the in the test record form for the appropriate model under "CV Ripple and Noise" and enable the output. Let the oscilloscope run for a few seconds to generate enough measurement points. On the Agilent Infiniium scope, the maximum peak-to-peak voltage measurement is indicated at the bottom of the screen on the right side. Divide this value by 10 to get the CV peak-to-peak noise measurement. The result should not exceed the peak-to-peak limits in the test record form for the appropriate model under "CV Ripple and Noise, peak-to-peak".

NOTE

If the measurement contains any question marks, clear the measurement and try again. This means that some of the data received by the scope was questionable.

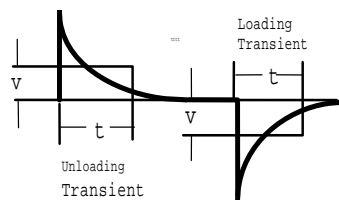
- 5 Disconnect the oscilloscope and connect an rms voltmeter in its place. Do not disconnect the 50 ohm termination. Divide the reading of the rms voltmeter by 10. The result should not exceed the rms limits in the test record form for the appropriate model under "CV Ripple and Noise, rms".

Transient Recovery Time

Test category = performance

This test measures the time for the output voltage to recover to within the specified value following a 50% change in the load current.

- 1 Turn off the DC Power Analyzer and connect the output as in Test Setup A, with the oscilloscope across the sense terminals.
- 2 Turn on the DC Power Analyzer and program the program the instrument settings as described in the test record form under "Transient Response".
- 3 Set the electronic load to operate in constant current mode. Program its load current to the lower current value indicated in the test record form under "Transient Response".
- 4 Set the electronic load's transient generator frequency to 100 Hz and its duty cycle to 50%.
- 5 Program the load's transient current level to the higher current value indicated in the test record form under "Transient Response", and turn the transient generator on.
- 6 Adjust the oscilloscope for a waveform similar to that shown in the following figure.
- 7 The output voltage should return to within the specified voltage at the specified time following the 50% load change. Check both loading and unloading transients by triggering on the positive and negative slope. Record the voltage at time "t" in the performance test record form under "Transient Response".



Constant Current Tests

NOTE

Test each output channel individually. Refer to the appropriate test record form for the instrument settings of the model you are checking.

Current Programming and Readback Accuracy

Test category = performance, calibration

This test verifies that the current programming and measurement functions are within specifications.

- 1 Turn off the DC Power Analyzer and connect the current shunt directly across the output terminals. Connect the DMM directly across the current shunt (see Test Setup B). Note that the electronic load is not used in this portion of the test.

- 2 Turn on the DC Power Analyzer and program the instrument settings as described in the test record form under “Current Programming & Readback, Min Current”. The output status should be “CC”, and the output voltage reading should be about zero.
- 3 Divide the voltage drop (DMM reading) across the current shunt by the shunt resistance to convert to amps and record this value (I_{out}). Also, record the current measured over the interface. The readings should be within the limits specified in the test record form for the appropriate model under “Current Programming and Readback, Min Current”.
- 4 Program the instrument settings as described in the test record form under “Current Programming & Readback, High Current”.
- 5 Divide the voltage drop (DMM reading) across the current shunt by the shunt resistance to convert to amps and record this value (I_{out}). Also, record the current reading measured over the interface. The readings should be within the limits specified in the test record form for the appropriate model under “Current Programming and Readback, High Current”.
- 6 *For Agilent Models N6761A and N6762A only.* Set both the current programming and the current measurement functions to the low range. Repeat steps 4 - 5 for the low current ranges. Program the instrument settings as described in the test record form under “Current Programming & Readback, Low Current”. The readings should be within the limits specified in the test record form for the appropriate model under “Current Programming and Readback, Low Current”.

CC Load Effect

Test category = performance

This test measures the change in output current resulting from a change in output voltage from full scale to short circuit.

- 1 Turn off the DC Power Analyzer and connect the current shunt, DMM, and electronic load (see Test Setup B). Connect the DMM directly across the current shunt.
- 2 Turn on the DC Power Analyzer and program the instrument settings as described in the test record form under “CC Load Effect”.
- 3 Set the electronic load for CV mode and program it to the output channel’s voltage as described in the test record form under “CC Load Effect”. The output status should be “CC”. If it isn’t, adjust the load so that the output voltage drops slightly.
- 4 Divide the voltage drop (DMM reading) across the current monitoring resistor by its resistance to convert to amps and record this value (I_{out}).

- 5 Short the electronic load. Divide the voltage drop (DMM reading) across the current monitoring resistor by its resistance to convert to amps and record this value (I_{out}). The difference in the current readings in steps 4 and 5 is the load effect, which should not exceed the value listed in the test record form for the appropriate model under “CC Load Effect”.

CC Source Effect

Test category = performance

This test measures the change in output current that results from a change in AC line voltage from the minimum to maximum value within the line voltage specifications.

- 1 Turn off the DC Power Analyzer and connect the ac power line through a variable voltage transformer or AC source.
- 2 Connect the current shunt, DMM, and electronic load (see Test Setup B). Connect the DMM directly across the current shunt. Set the transformer or AC source to nominal line voltage.
- 3 Turn on the DC Power Analyzer and program the instrument settings as described in the test record form under “CC Source Effect”.
- 4 Set the electronic load for the output channel’s voltage under “CC Source Effect”. The output status should be “CC”. If it isn’t, adjust the load so that the output voltage drops slightly.
- 5 Adjust the transformer or AC source to the lowest rated line voltage (86 VAC).
- 6 Divide the voltage drop (DMM reading) across the current monitoring resistor by its resistance to convert to amps and record this value (I_{out}).
- 7 Adjust the transformer or AC source to the highest rated line voltage (264 VAC).
- 8 Divide the voltage drop (DMM reading) across the current monitoring resistor by its resistance to convert to amps and record this value (I_{out}). The difference between the DMM reading in steps 6 and 8 is the source effect, which should not exceed the value listed in the test record form for the appropriate model under “CC Source Effect”.

Test Record Forms

Test Record Form – Agilent N6751A and N6752A

Agilent N6751A and N6752A	Report No _____	Date _____
Description	Model	Minimum Specs. Results Maximum Specs.
Constant Voltage Tests		
Voltage Programming & Readback		
Minimum Voltage Vout	Both	+ 1 mV _____ + 39 mV
Voltage measured over interface	Both	Vout – 20 mV _____ Vout + 20 mV
High Voltage Vout	Both	49.951 V _____ 50.049 V
Voltage measured over interface	Both	Vout – 45 mV _____ Vout + 45 mV
CV Load Effect	Both	– 2 mV _____ + 2 mV
CV Source Effect	Both	– 1 mV _____ + 1 mV
CV Ripple and Noise		
peak-to-peak	Both	N/A _____ + 4.5 mV
rms	Both	N/A _____ + 0.35 mV
Transient Response		
Voltage at 100 μ s	Both	– 75 mV _____ + 75 mV
Voltage at 100 μ s with Option 761	N6752A	– 125 mV _____ + 125 mV
Constant Current Tests		
Current Programming & Readback		
Minimum Current Iout	Both	– 10 mA _____ + 30 mA
Current measured over interface	Both	Iout – 4 mA _____ Iout + 4 mA
High Current Iout	N6751A	4.975 A _____ 5.025 A
	N6752A	9.970 A _____ 10.030 A
Current measured over interface	N6751A	Iout – 9 mA _____ Iout + 9 mA
	N6752A	Iout – 14 mA _____ Iout + 14 mA
CC Load Effect	Both	– 2 mA _____ + 2 mA
CC Source Effect	Both	– 1 mA _____ + 1 mA
Instrument Settings		
Test Description	N6751A	N6752A
Voltage Programming & Readback, Min Voltage	20 mV, 5 A	20 mV, 10 A
Voltage Programming & Readback, High Voltage	50 V, 1 A	50 V, 2 A
CV Load Effect, Source Effect, Ripple and Noise	50 V, 1 A	50 V, 2 A
Transient Response	50 V, from 0.5 A to 1 A	50 V, from 1 A to 2 A
Current Programming & Readback, Min Current	10 mA, 50 V	10 mA, 50 V
Current Programming & Readback, High Current	5 A, 10 V	10 A, 8.5 V
CC Load Effect, Source Effect	5 A, 10 V	10 A, 8.5 V

Test Record Form – Agilent N6754A

Agilent N6754A	Report No	Date
Description	Model	Minimum Specs. Results Maximum Specs.
Constant Voltage Tests		
Voltage Programming & Readback		
Minimum Voltage Vout	0 mV	+ 50 mV
Voltage measured over interface	Vout – 25 mV	Vout + 25 mV
High Voltage Vout	59.939 V	60.061 V
Voltage measured over interface	Vout – 55 mV	Vout + 55 mV
CV Load Effect		
	– 2 mV	+ 2 mV
CV Source Effect		
	– 1 mV	+ 1 mV
CV Ripple and Noise		
peak-to-peak	N/A	+ 6 mV
rms	N/A	+ 1 mV
Transient Response		
Voltage at 100 μ s	– 90 mV	+ 90 mV
Voltage at 100 μ s w/Option 760/761	– 350 mV	+ 350 mV
Constant Current Tests		
Current Programming & Readback		
Minimum Current Iout	+ 8 mA	+ 32 mA
Current measured over interface	Iout – 8 mA	Iout + 8 mA
High Current Iout	19.968 A	20.032 A
Current measured over interface	Iout – 28 mA	Iout + 28 mA
CC Load Effect		
	– 5 mA	+ 5 mA
CC Source Effect		
	– 2 mA	+ 2 mA
Test Description N6754A Setting		
Voltage Programming & Readback, Min Voltage	25 mV, 20 A	
Voltage Programming & Readback, High Voltage	60 V, 20 A	
CV Load Effect, Source Effect, Ripple and Noise	60 V, 20 A	
Transient Response	60 V, from 10 A to 20 A	
Current Programming & Readback, Min Current	20 mA, 60 V	
Current Programming & Readback, High Current	20 A, 60 V	
CC Load Effect, Source Effect	20 A, 60 V	

Test Record Form – Agilent N6761A and N6762A

Agilent N6761A and N6762A Description	Report No Model	Minimum Specs.	Date Results	Maximum Specs.
Constant Voltage Tests				
High Range Voltage Prog. & Readback				
Minimum Voltage Vout	Both	+ 9 mV		+ 21 mV
Voltage measured over interface	Both	Vout – 6 mV		Vout + 6 mV
High Voltage Vout	Both	49.986 V		50.014 V
Voltage measured over interface	Both	Vout – 14 mV		Vout + 14 mV
Low Range Voltage Prog. & Readback				
Low Voltage Vout	Both	5.4976 V		5.5024 V
Voltage measured over interface	Both	Vout – 2.4 mV		Vout + 2.4 mV
CV Load Effect	Both	– 0.5 mV		+ 0.5 mV
CV Source Effect	Both	– 0.5 mV		+ 0.5 mV
CV Ripple and Noise				
peak-to-peak	Both	N/A		+ 4.5 mV
rms	Both	N/A		+ 0.35 mV
Transient Response				
Voltage at 150 μ s	Both	– 75 mV		+ 75 mV
Constant Current Tests				
High Range Current Prog. & Readback				
Minimum Current Iout	Both	+ 0.8 mA		+ 1.2 mA
Current measured over interface	Both	Iout – 160 μ A		Iout + 160 μ A
High Current Iout	N6761A	1.4992 A		1.5008 A
	N6762A	2.9986 A		3.0014 A
Current measured over interface	N6761A	Iout – 0.76 mA		Iout + 0.76 mA
	N6762A	Iout – 1.36 mA		Iout + 1.36 mA
Low Range Current Prog. & Readback				
Low Current (Full Scale) Iout	Both	0.099945 A		0.100055 A
Current measured over interface	Both	Iout – 45 μ A		Iout + 45 μ A
CC Load Effect	Both	– 65 μ A		+ 65 μ A
CC Source Effect	Both	– 30 μ A		+ 30 μ A

Test Description	Instrument Settings	
	N6761A	N6762A.
Voltage Programming & Readback, Min Voltage	15 mV, 1.5 A	15 mV, 3 A
Voltage Programming & Readback, High Voltage	50 V, 1 A	50 V, 2 A
Voltage Programming & Readback, Low Voltage	5.5 V, 1.5 A	5.5 V, 3 A
CV Load Effect, Source Effect, Ripple and Noise	50 V, 1 A	50 V, 2 A
Transient Response	50 V, from 0.5 A to 1 A	50 V, from 1 A to 2 A
Current Programming & Readback, Min Current	1 mA, 50 V	1 mA, 50 V
Current Programming & Readback, High Current	1.5 A, 33 V	3 A, 33 V
Current Programming & Readback, Low Current	0.1 A, 50 V	0.1 A, 50 V
CC Load Effect, Source Effect	1.5 A, 33 V	3 A, 33 V

Test Record Form – Agilent N6731B and N6741B

Agilent N6731B and N6741B	Report No	Date		
Description	Model	Minimum Specs.	Results	Maximum Specs.
Constant Voltage Tests				
Voltage Programming & Readback				
Minimum Voltage Vout	Both	– 4 mV		+ 34 mV
Voltage measured over interface	Both	Vout – 20 mV		Vout + 20 mV
High Voltage Vout	Both	4.976 V		5.024 V
Voltage measured over interface	Both	Vout – 25 mV		Vout + 25 mV
CV Load Effect	Both	– 5 mV		+ 5 mV
CV Source Effect	Both	– 1 mV		+ 1 mV
CV Ripple and Noise				
peak-to-peak	N6731B	N/A		+ 10 mV
	N6741B	N/A		+ 11 mV
rms	Both	N/A		+ 2 mV
Transient Response				
Voltage at 200 μ s	N6731B	– 80 mV		+ 80 mV
	N6741B	– 100 mV		+ 100 mV
Constant Current Tests				
Current Programming & Readback				
Minimum Current Iout	Both	+ 40 mA		+ 80 mA
Current measured over interface	Both	Iout – 20 mA		Iout + 20 mA
High Current Iout	N6731B	9.965 A		10.035 A
	N6741B	19.95 A		20.05 A
Current measured over interface	N6731B	Iout – 35 mA		Iout + 35 mA
	N6741B	Iout – 50 mA		Iout + 50 mA
CC Load Effect	Both	– 2 mA		+ 2 mA
CC Source Effect	Both	– 1 mA		+ 1 mA
Instrument Settings				
Test Description	N6731B	N6741B		
Voltage Programming & Readback, Zero Voltage	15 mV, 10 A	15 mV, 20 A		
Voltage Programming & Readback, High Voltage	5 V, 10 A	5 V, 20 A		
CV Load Effect, Source Effect, Ripple and Noise	5 V, 10 A	5 V, 20 A		
Transient Response	5 V, from 5 A to 10 A	5 V, from 10 A to 20 A		
Current Programming & Readback, Zero Current	60 mA, 5 V	60 mA, 5 V		
Current Programming & Readback, High Current	10 A, 5 V	20 A, 5 V		
CC Load Effect, Source Effect	10 A, 5 V	20 A, 5 V		

Test Record Form – Agilent N6732B and N6742B

Agilent N6732B and N6742B	Report No	Date		
Description	Model	Minimum Specs.	Results	Maximum Specs.
Constant Voltage Tests				
Voltage Programming & Readback				
Minimum Voltage Vout	Both	– 4 mV		+ 34 mV
Voltage measured over interface	Both	Vout – 20 mV		Vout + 20 mV
High Voltage Vout	Both	7.973 V		8.027 V
Voltage measured over interface	Both	Vout – 28 mV		Vout + 28 mV
CV Load Effect				
	Both	– 6 mV		+ 6 mV
CV Source Effect				
	Both	– 2 mV		+ 2 mV
CV Ripple and Noise				
peak-to-peak	Both	N/A		+ 12 mV
rms	Both	N/A		+ 2 mV
Transient Response				
Voltage at 200 μ s	N6732B	– 80 mV		+ 80 mV
	N6742B	– 100 mV		+ 100 mV
Constant Current Tests				
Current Programming & Readback				
Minimum Current Iout	Both	– 20 mA		+ 60 mA
Current measured over interface	Both	Iout – 10 mA		Iout + 10 mA
High Current Iout	N6732B	6.2206 A		6.2794 A
	N6742B	12.46 A		12.54 A
Current measured over interface	N6732B	Iout – 19.37 mA		Iout + 19.37 mA
	N6742B	Iout – 29 mA		Iout + 29 mA
CC Load Effect				
	Both	– 2 mA		+ 2 mA
CC Source Effect				
	Both	– 1 mA		+ 1 mA
Instrument Settings				
Test Description	N6732B		N6742B	
Voltage Programming & Readback, Zero Voltage	15 mV, 6.25 A		15 mV, 12.5 A	
Voltage Programming & Readback, High Voltage	8 V, 6.25 A		8 V, 12.5 A	
CV Load Effect, Source Effect, Ripple and Noise	8 V, 6.25 A		8 V, 12.5 A	
Transient Response	8 V, from 3.125 A to 6.25 A		8V, from 6.25A to 12.5A	
Current Programming & Readback, Zero Current	40 mA, 8 V		40 mA, 8 V	
Current Programming & Readback, High Current	6.25 A, 8 V		12.5 A, 8 V	
CC Load Effect, Source Effect	6.25 A, 8 V		12.5 A, 8 V	

Test Record Form – Agilent N6733B and N6743B

Agilent N6733B and N6743B	Report No	Date		
Description	Model	Minimum Specs.	Results	Maximum Specs.
Constant Voltage Tests				
Voltage Programming & Readback				
Minimum Voltage Vout	Both	+ 10 mV		+ 50 mV
Voltage measured over interface	Both	Vout – 20 mV		Vout + 20 mV
High Voltage Vout	Both	19.96 V		20.04 V
Voltage measured over interface	Both	Vout – 40 mV		Vout + 40 mV
CV Load Effect				
	Both	– 9 mV		+ 9 mV
CV Source Effect				
	Both	– 2 mV		+ 2 mV
CV Ripple and Noise				
peak-to-peak	Both	N/A		+ 14 mV
rms	Both	N/A		+ 3 mV
Transient Response				
Voltage at 200 μ s	N6733B	– 200 mV		+ 200 mV
	N6743B	– 300 mV		+ 300 mV
Constant Current Tests				
Current Programming & Readback				
Minimum Current Iout	Both	– 10 mA		+ 30 mA
Current measured over interface	Both	Iout – 5 mA		Iout + 5 mA
High Current Iout	N6733B	2.4762 A		2.5237 A
	N6743B	4.9725 A		5.0275 A
Current measured over interface	N6733B	Iout – 8.75 mA		Iout + 8.75 mA
	N6743B	Iout – 12.5 mA		Iout + 12.5 mA
CC Load Effect				
	Both	– 2 mA		+ 2 mA
CC Source Effect				
	Both	– 1 mA		+ 1 mA
Instrument Settings				
Test Description	N6733B	N6743B		
Voltage Programming & Readback, Zero Voltage	30 mV, 2.5 A	30 mV, 5 A		
Voltage Programming & Readback, High Voltage	20 V, 2.5 A	20 V, 5 A		
CV Load Effect, Source Effect, Ripple and Noise	20 V, 2.5 A	20 V, 5 A		
Transient Response	20 V, from 1.25 A to 2.5 A	20 V, from 2.5 A to 5 A		
Current Programming & Readback, Zero Current	10 mA, 20 V	10 mA, 20 V		
Current Programming & Readback, High Current	2.5 A, 20 V	5 A, 20 V		
CC Load Effect, Source Effect	2.5 A, 20 V	5 A, 20 V		

Test Record Form – Agilent N6734B and N6744B

Agilent N6734B and N6744B	Report No	Date		
Description	Model	Minimum Specs.	Results	Maximum Specs.
Constant Voltage Tests				
Voltage Programming & Readback				
Minimum Voltage Vout	Both	+ 5 mV		+ 75 mV
Voltage measured over interface k	Both	Vout – 35 mV		Vout + 35 mV
High Voltage Vout	Both	34.93 V		35.07 V
Voltage measured over interface	Both	Vout – 70 mV		Vout + 70 mV
CV Load Effect				
	Both	– 11 mV		+ 11 mV
CV Source Effect				
	Both	– 4 mV		+ 4 mV
CV Ripple and Noise				
peak-to-peak	Both	N/A		+ 15 mV
rms	Both	N/A		+ 5 mV
Transient Response				
Voltage at 200 μ s	N6734B	– 200 mV		+ 200 mV
	N6744B	– 300 mV		+ 300 mV
Constant Current Tests				
Current Programming & Readback				
Minimum Current Iout	Both	– 15 mA		+ 25 mA
Current measured over interface	Both	Iout – 4 mA		Iout + 4 mA
High Current Iout	N6734B	1.47775 A		1.52225 A
	N6744B	2.9755 A		3.0245 A
Current measured over interface	N6734B	Iout – 6.25 mA		Iout + 6.25 mA
	N6744B	Iout – 8.5 mA		Iout + 8.5 mA
CC Load Effect				
	Both	– 2 mA		+ 2 mA
CC Source Effect				
	Both	– 1 mA		+ 1 mA
Instrument Settings				
Test Description	N6734B	N6744B		
Voltage Programming & Readback, Zero Voltage	40 mV, 1.5 A	40 mV, 3 A		
Voltage Programming & Readback, High Voltage	35 V, 1.5 A	35 V, 3 A		
CV Load Effect, Source Effect, Ripple and Noise	35 V, 1.5 A	35 V, 3 A		
Transient Response	35 V, from 0.75 A to 1.5 A	35 V, from 1.5 A to 3 A		
Current Programming & Readback, Zero Current	5 mA, 35 V	5 mA, 35 V		
Current Programming & Readback, High Current	1.5 A, 35 V	3 A, 35 V		
CC Load Effect, Source Effect	1.5 A, 35 V	3 A, 35 V		

Test Record Form – Agilent N6735B and N6745B

Agilent N6735B and N6745B	Report No	Date		
Description	Model	Minimum Specs.	Results	Maximum Specs.
Constant Voltage Tests				
Voltage Programming & Readback				
Minimum Voltage Vout	Both	+ 10 mV		+ 130 mV
Voltage measured over interface	Both	Vout – 60 mV		Vout + 60 mV
High Voltage Vout	Both	59.88 V		60.12 V
Voltage measured over interface	Both	Vout – 120 mV		Vout + 120 mV
CV Load Effect				
	N6735B	– 13 mV		+ 13 mV
	N6745B	– 16 mV		+ 16 mV
CV Source Effect				
	Both	– 6 mV		+ 6 mV
CV Ripple and Noise				
peak-to-peak	Both	N/A		+ 25 mV
rms	Both	N/A		+ 9 mV
Transient Response				
Voltage at 200 μ s	N6735B	– 400 mV		+ 400 mV
	N6745B	– 500 mV		+ 500 mV
Constant Current Tests				
Current Programming & Readback				
Minimum Current Iout	Both	– 17.5 mA		+ 22.5 mA
Current measured over interface	Both	Iout – 4 mA		Iout + 4 mA
High Current Iout	N6735B	0.7788 A		0.8212 A
	N6745B	1.5776 A		1.6224 A
Current measured over interface	N6735B	Iout – 5.2 mA		Iout + 5.2 mA
	N6745B	Iout – 6.4 mA		Iout + 6.4 mA
CC Load Effect				
	Both	– 2 mA		+ 2 mA
CC Source Effect				
	Both	– 1 mA		+ 1 mA
Instrument Settings				
Test Description	N6735B	N6745B		
Voltage Programming & Readback, Zero Voltage	70 mV, 0.8 A	70 mV, 1.6 A		
Voltage Programming & Readback, High Voltage	60 V, 0.8 A	60 V, 1.6 A		
CV Load Effect, Source Effect, Ripple and Noise	60 V, 0.8 A	60 V, 1.6 A		
Transient Response	60 V, from 0.4 A to 0.8 A	60 V, from 0.8 A to 1.6 A		
Current Programming & Readback, Zero Current	2.5 mA, 60 V	2.5 mA, 60 V		
Current Programming & Readback, High Current	0.8 A, 60 V	1.6 A, 60 V		
CC Load Effect, Source Effect	0.8 A, 60 V	1.6 A, 60 V		

Test Record Form – Agilent N6736B and N6746B

Agilent N6736B and N6746B	Report No	Date		
Description	Model	Minimum Specs.	Results	Maximum Specs.
Constant Voltage Tests				
Voltage Programming & Readback				
Minimum Voltage Vout	Both	0 mV		+ 200 mV
Voltage measured over interface	Both	Vout – 100 mV		Vout + 100 mV
High Voltage Vout	Both	99.8 V		100.2 V
Voltage measured over interface	Both	Vout – 200 mV		Vout + 200 mV
CV Load Effect				
	N6736B	– 20 mV		+ 20 mV
	N6746B	– 30 mV		+ 30 mV
CV Source Effect				
	Both	– 10 mV		+ 10 mV
CV Ripple and Noise				
peak-to-peak	Both	N/A		+ 30 mV
rms	Both	N/A		+ 18 mV
Transient Response				
Voltage at 200 μ s	N6736B	– 500 mV		+ 500 mV
	N6746B	– 1000 mV		+ 1000 mV
Constant Current Tests				
Current Programming & Readback				
Minimum Current Iout	Both	– 8.5 mA		+ 11.5 mA
Current measured over interface	Both	Iout – 2 mA		Iout + 2 mA
High Current Iout	N6736B	0.4893 A		0.5107 A
	N6746B	0.9885 A		1.0115 A
Current measured over interface	N6736B	Iout – 2.75 mA		Iout + 2.75 mA
	N6746B	Iout – 3.5 mA		Iout + 3.5 mA
CC Load Effect				
	Both	– 2 mA		+ 2 mA
CC Source Effect				
	Both	– 1 mA		+ 1 mA
Instrument Settings				
Test Description	N6736B	N6746B		
Voltage Programming & Readback, Zero Voltage	100 mV, 0.5 A	100 mV, 1 A		
Voltage Programming & Readback, High Voltage	100 V, 0.5 A	100 V, 1 A		
CV Load Effect, Source Effect, Ripple and Noise	100 V, 0.5 A	100 V, 1 A		
Transient Response	100 V, from 0.25 A to 0.5 A	100 V, from 0.5 A to 1 A		
Current Programming & Readback, Zero Current	1.5 mA, 100 V	1.5 mA, 100 V		
Current Programming & Readback, High Current	0.5 A, 100 V	1 A, 100 V		
CC Load Effect, Source Effect	0.5 A, 100 V	1 A, 100 V		

Test Record Form – Agilent N6773A

Agilent Model N6773A	Report No _____	Date _____
Description	Model	Minimum Specs. Results Maximum Specs.
Constant Voltage Tests		
Voltage Programming & Readback		
Minimum Voltage Vout	+ 10 mV	_____ + 50 mV
Voltage measured over interface	Vout – 20 mV	_____ Vout + 20 mV
High Voltage Vout	19.96 V	_____ 20.04 V
Voltage measured over interface	Vout – 40 mV	_____ Vout + 40 mV
CV Load Effect		
	– 13 mV	_____ + 13 mV
CV Source Effect		
	– 2 mV	_____ + 2 mV
CV Ripple and Noise		
peak-to-peak	N/A	_____ + 20 mV
rms	N/A	_____ + 3 mV
Transient Response		
Voltage at 250 μ s	– 300 mV	_____ + 300 mV
Constant Current Tests		
Current Programming & Readback		
Minimum Current Iout	– 30 mA	_____ + 90 mA
Current measured over interface	Iout – 15 mA	_____ Iout + 15 mA
High Current Iout	14.9175 A	_____ 15.0825 A
Current measured over interface	Iout – 37.5 mA	_____ Iout + 37.5 mA
CC Load Effect		
	– 6 mA	_____ + 6 mA
CC Source Effect		
	– 1 mA	_____ + 1 mA
Test Description N6773A Setting		
Voltage Programming & Readback, Min	30 mV, 15 A	
Voltage Programming & Readback, High	20 V, 15 A	
CV Load Effect, Source Effect, Ripple and Noise	20 V, 15 A	
Transient Response	20 V, from 7.5 A to 15 A	
Current Programming & Readback, Min	30 mA, 20 V	
Current Programming & Readback, High	15 A, 20 V	
CC Load Effect, Source Effect	15 A, 20 V	

Test Record Form – Agilent N6774A

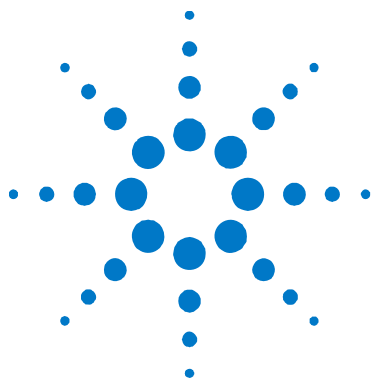
Agilent Model N6774A	Report No _____	Date _____
Description	Model	Minimum Specs. Results Maximum Specs.
Constant Voltage Tests		
Voltage Programming & Readback		
Minimum Voltage Vout	+ 5 mV	_____ + 75 mV
Voltage measured over interface	Vout – 35 mV	_____ Vout + 35 mV
High Voltage Vout	34.93 V	_____ 35.07 V
Voltage measured over interface	Vout – 70 mV	_____ Vout + 70 mV
CV Load Effect		
	– 16 mV	_____ + 16 mV
CV Source Effect		
	– 4 mV	_____ + 4 mV
CV Ripple and Noise		
peak-to-peak	N/A	_____ + 22 mV
rms	N/A	_____ + 5 mV
Transient Response		
Voltage at 250 μ s	– 300 mV	_____ + 300 mV
Constant Current Tests		
Current Programming & Readback		
Minimum Current Iout	– 45 mA	_____ + 75 mA
Current measured over interface	Iout – 12 mA	_____ Iout + 12 mA
High Current Iout	8.42725 A	_____ 8.57275 A
Current measured over interface	Iout – 24.75 mA	_____ Iout + 24.75 mA
CC Load Effect		
	– 6 mA	_____ + 6 mA
CC Source Effect		
	– 1 mA	_____ + 1 mA
Test Description N6774A Setting		
Voltage Programming & Readback, Min	40 mV, 8.5 A	
Voltage Programming & Readback, High	35 V, 8.5 A	
CV Load Effect, Source Effect, Ripple and Noise	35 V, 8.5 A	
Transient Response	35 V, from 4.25 A to 8.5 A	
Current Programming & Readback, Min	15 mA, 35 V	
Current Programming & Readback, High	8.5 A, 35 V	
CC Load Effect, Source Effect	8.5 A, 35 V	

Test Record Form – Agilent N6775A

Agilent Model N6775A	Report No _____	Date _____
Description	Model	Minimum Specs. Results Maximum Specs.
Constant Voltage Tests		
Voltage Programming & Readback		
Minimum Voltage Vout	+ 10 mV	_____ + 130 mV
Voltage measured over interface	Vout – 60 mV	_____ Vout + 60 mV
High Voltage Vout	59.88 V	_____ 60.12 V
Voltage measured over interface	Vout – 120 mV	_____ Vout + 120 mV
CV Load Effect		
	– 24 mV	_____ + 24 mV
CV Source Effect		
	– 6 mV	_____ + 6 mV
CV Ripple and Noise		
peak-to-peak	N/A	_____ + 35 mV
rms	N/A	_____ + 9 mV
Transient Response		
Voltage at 250 μ s	– 500 mV	_____ + 500 mV
Constant Current Tests		
Current Programming & Readback		
Minimum Current Iout	– 52.5 mA	_____ + 67.5 mA
Current measured over interface	Iout – 12 mA	_____ Iout + 12 mA
High Current Iout	4.9325 A	_____ 5.0675 A
Current measured over interface	Iout – 19.5 mA	_____ Iout + 19.5 mA
CC Load Effect		
	– 6 mA	_____ + 6 mA
CC Source Effect		
	– 1 mA	_____ + 1 mA
Test Description N6775A Setting		
Voltage Programming & Readback, Min	70 mV, 5 A	
Voltage Programming & Readback, High	60 V, 5 A	
CV Load Effect, Source Effect, Ripple and Noise	60 V, 5 A	
Transient Response	60 V, from 2.5 A to 5 A	
Current Programming & Readback, Min	7.5 mA, 60 V	
Current Programming & Readback, High	5 A, 60 V	
CC Load Effect, Source Effect	5 A, 60 V	

Test Record Form – Agilent N6776A

Agilent Model N6776A	Report No _____	Date _____
Description	Model	Minimum Specs. Results Maximum Specs.
Constant Voltage Tests		
Voltage Programming & Readback		
Minimum Voltage Vout	0 mV	_____ + 200 mV
Voltage measured over interface	Vout – 100 mV	_____ Vout + 100 mV
High Voltage Vout	99.8 V	_____ 100.2 V
Voltage measured over interface	Vout – 200 mV	_____ Vout + 200 mV
CV Load Effect		
	– 45 mV	_____ + 45 mV
CV Source Effect		
	– 10 mV	_____ + 10 mV
CV Ripple and Noise		
peak-to-peak	N/A	_____ + 45 mV
rms	N/A	_____ + 18 mV
Transient Response		
Voltage at 250 μ s	– 1000 mV	_____ + 1000 mV
Constant Current Tests		
Current Programming & Readback		
Minimum Current Iout	– 25.5 mA	_____ + 34.5 mA
Current measured over interface	Iout – 6 mA	_____ Iout + 6 mA
High Current Iout	2.9655 A	_____ 3.0345 A
Current measured over interface	Iout – 10.5 mA	_____ Iout + 10.5 mA
CC Load Effect		
	– 6 mA	_____ + 6 mA
CC Source Effect		
	– 1 mA	_____ + 1 mA
Test Description N6776A Setting		
Voltage Programming & Readback, Min	100 mV, 3 A	
Voltage Programming & Readback, High	100 V, 3 A	
CV Load Effect, Source Effect, Ripple and Noise	100 V, 3 A	
Transient Response	100 V, from 1.5 A to 3 A	
Current Programming & Readback, Min	4.5 mA, 100 V	
Current Programming & Readback, High	3 A, 100 V	
CC Load Effect, Source Effect	3 A, 100 V	



3 Calibration

Calibration Description	34
Calibration Procedure	35

This chapter includes calibration procedures for the Agilent N6705A DC Power Analyzer. Instructions are given for performing the procedures from either the front panel or a controller over the GPIB.

Refer to the “Equipment Required” section in chapter 2 for a list of the equipment required for calibration. Also refer to “Measurement Techniques” for information about connecting the voltmeter and current shunt.

NOTE

Perform the verification tests before calibrating your DC Power Analyzer. If the DC Power Analyzer passes the verification tests, the unit is operating within its calibration limits and does not need to be re-calibrated.

Calibration Interval

The recommended calibration interval for Agilent N67xxA/B power modules is one year. Agilent N6705A DC Power Analyzer mainframes do not require calibration.

Calibration Description

Refer to the “Equipment Required” section in chapter 2 for a list of the equipment required for calibration. Also refer to “Measurement Techniques” for information about voltmeter and current shunt connections. Additional information about calibration follows:

- The correct password is required to enter the Administrative Tools menu, which contains the calibration function. The password is factory-set to 0 (zero). You can change the password once calibration mode is entered to prevent unauthorized access to the calibration mode. Refer to “Change the Calibration Password” at the end of this section.
- Calibrate only ONE output channel at a time. When using the SCPI calibration commands, you can only enter a single channel number for the channel parameter.
- When calibrating the unit using SCPI commands, most steps involve sending a *OPC? query to synchronize with the DC Power Analyzer’s command completion before proceeding. The response from the instrument must be read each time *OPC? is given. In some steps, it may take up to 30 seconds for *OPC? to respond.
- **Once started, you must perform the complete calibration procedure in its entirety.** As each calibration section is completed, the instrument calculates new calibration constants and begins using them. However, these constants are not saved in nonvolatile memory until a SAVE command is explicitly given at the end of the calibration procedure.
- Exit the calibration mode either by logging out of the Administrative Tools menu or by sending CAL:STAT OFF. Note that any output channels that were calibrated but not saved will revert to their previous calibration constants.

Calibration Switches

Two switches control the access to calibration commands. The switches are on the BNC board and are accessible by removing the side cover. Refer to “Accessing the Calibration switch” in chapter 4 for settings information.

Calibration Procedure

Warm-up Period for Agilent Models N6761A and N6762A

Agilent Models N6761A and N6762A require a 30-minute warm-up period in the reset (*RST) state before starting calibration.

Enter Calibration mode

Front Panel:	SCPI Command:
Press [Menu], then select Utilities, Administrative Tools, Administrator Login. Enter your numeric password in the PIN field and select Login. Then select the Calibration menu, which is now accessible.	CAL:STAT ON, <password>

Voltage Programming and Measurement Calibration

Unless instructed otherwise, do not connect anything to the Sense terminals.

Step 1. Connect the DMM's voltage input to an output channel.

Step 2. Select the full-scale voltage programming and measurement range. The following example selects the 50 volt full-scale range of output 1. The value entered must be the maximum voltage of the range.

Front Panel:	SCPI Command:
From the Calibration menu, select Voltage, High Range Prog and Meas. Then select Start.	CAL:VOLT 50, (@1)

Step 3. Select the first voltage calibration point.

Front Panel:	SCPI Command:
The first calibration point is automatically selected. "Enter P1 measured data" should be displayed.	CAL:LEV P1 *OPC?

Step 4. Measure the output voltage with the DMM and enter the data.

Front Panel:	SCPI Command:
Enter the value from the external DMM into the data field and then select Next.	CAL:DATA <data>

Step 5. Select the second voltage calibration point.

Front Panel:	SCPI Command:
The second calibration point is automatically selected. "Enter P2 measured data" should be displayed.	CAL:LEV P2 *OPC?

Step 6. Measure the output voltage with the DMM and enter the data.

Front Panel:	SCPI Command:
Enter the value from the external DMM into the data field and then select Next. Press Close to finish calibration.	CAL:DATA <data>

Low Range Voltage Programming Calibration

This only applies to Agilent Models N6761A and N6762A.

Step 7. Select the low-voltage programming range. This example selects the 5 volt programming range of channel 1. The value to program a range must be the maximum voltage of the range.

Front Panel:	SCPI Command:
From the Calibration menu, select Voltage, Low Range Programming. Then select Start.	CAL:VOLT 5, (@1)

Step 8. Select the first voltage calibration point.

Front Panel:	SCPI Command:
The first calibration point is automatically selected. "Enter P1 measured data" should be displayed.	CAL:LEV P1 *OPC?

Step 9. Measure the output voltage with the DMM and enter the data.

Front Panel:	SCPI Command:
Enter the value from the external DMM into the data field and then select Next.	CAL:DATA <data>

Step 10. Select the second voltage calibration point.

Front Panel:	SCPI Command:
The second calibration point is automatically selected. "Enter P2 measured data" should be displayed.	CAL:LEV P2 *OPC?

Step 11. Measure the output voltage with the DMM and enter the data.

Front Panel:	SCPI Command:
Enter the value from the external DMM into the data field and then select Next. Press Close to finish calibration.	CAL:DATA <data>

Low Range Voltage Measurement Calibration

This only applies to Agilent Models N6761A and N6762A.

Step 12. Select the low-voltage measurement range. This example selects the 5 volt measurement range of channel 1. The value to program a range must be the maximum voltage of the range.

Front Panel:	SCPI Command:
From the Calibration menu, select Voltage, Low Range Measurement. Then select Start.	CAL:VOLT:MEAS 5, (@1)

Step 13. Select the first voltage calibration point.

Front Panel:	SCPI Command:
The first calibration point is automatically selected. "Enter P1 measured data" should be displayed.	CAL:LEV P1 *OPC?

Step 14. Measure the output voltage with the DMM and enter the data.

Front Panel:	SCPI Command:
Enter the value from the external DMM into the data field and then select Next.	CAL:DATA <data>

Step 15. Select the second voltage calibration point.

Front Panel:	SCPI Command:
The second calibration point is automatically selected. "Enter P2 measured data" should be displayed.	CAL:LEV P2 *OPC?

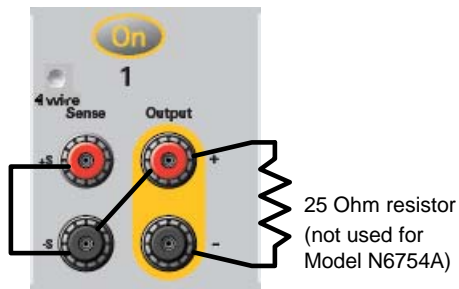
Step 16. Measure the output voltage with the DMM and enter the data.

Front Panel:	SCPI Command:
Enter the value from the external DMM into the data field and then select Next. Press Close to finish calibration.	CAL:DATA <data>

Voltage Common Mode Rejection Ratio Calibration

This only applies to Agilent Models N6751A, N6752A, N6754A, N6761A, and N6762A.

Step 17. For this step only, make the connections shown in the following figure. Connect an external jumper between the +sense and the –sense terminals. Connect a second jumper from the +output to the –sense terminal. Connect a 25 ohm load resistor across the +output and –output terminals (the resistor is not needed for Model N6754A).



This procedure is automatic and only takes a few seconds.

Front Panel:	SCPI Command:
From the Calibration menu, select Common Mode Rejection Ratio. Then select Start. Then select Close.	CAL:VOLT:CMRR (@1) *OPC?

After completion, disconnect all jumpers and resistors and disable 4 wire sensing. Press [Settings], then uncheck the 4 Wire Sense box.

Current Programming and Measurement Calibration

Unless instructed otherwise, do not connect anything to the Sense terminals.

The output voltage may go negative at some point during this procedure on units that have polarity reversal relays (option 760).

Step 18. Connect a precision shunt resistor to the output. The shunt resistor should be able to measure at least 120% of the output's rated full-scale current. Connect the DMM across the shunt resistor.

Step 19. Select the full-scale current programming range. The following example selects the 10 amp full-scale current programming and measurement range of channel 1. The value to program a range must be the maximum current of the range.

Front Panel:	SCPI Command:
From the Calibration menu, select Current Range Prog and Meas. Then select Start.	CAL:CURRE 10, (@1)

Step 20. Select the first current calibration point.

Front Panel:	SCPI Command:
The first calibration point is automatically selected. "Enter P1 measured data" should be displayed.	CAL:LEV P1 *OPC?

Step 21. Calculate the shunt current ($I=V/R$) and enter the data.

Front Panel:	SCPI Command:
Enter the calculated value into the data field and then select Next.	CAL:DATA <data>

Step 22. Select the second current calibration point.

Front Panel:	SCPI Command:
The second calibration point is automatically selected. "Enter P2 measured data" should be displayed.	CAL:LEV P2 *OPC?

Step 23. Calculate the shunt current ($I=V/R$) and enter the data.

Front Panel:	SCPI Command:
Enter the calculated value into the data field and then select Next. Press Close to finish calibration.	CAL:DATA <data>

Downprogrammer Calibration

This step is not required for Agilent Model N6754A.

Step 24. Remove all loads from the output. This procedure is automatic and takes a few seconds.

Front Panel:	SCPI Command:
From the Calibration menu, select Downprogrammer. Then select Start. Then select Close.	CAL:DPRog (@1) *OPC?

Low Range Current Measurement Calibration

This only applies to Agilent Models N6751A, N6752, N6761A, and N6762A.

Step 25. Connect only the current measurement terminals of the Agilent 3458A to the output terminals.

Step 26. Select the low-current measurement range. The following example selects the 0.1 amp low-current measurement range of channel 1. The value to program a range must be the maximum current of the range.

Front Panel:	SCPI Command:
From the Calibration menu, select Current, Low Range Measurement. Then select Start.	CAL:CURR:MEAS 0.1, (@1)

Step 27. Select the first current calibration point. Then wait a minimum of 5 minutes for the internal temperature to stabilize.

Front Panel:	SCPI Command:
The first calibration point is automatically selected. "Enter Measured Current" should be displayed.	CAL:LEV P1

Step 28. Measure the current with the Agilent 3458A and enter the value.

Front Panel:	SCPI Command:
Select the Measured Data field. Enter the data from the external DMM. Press Next when done.	CAL:DATA <data> *OPC?

Step 29. Disconnect the Agilent 3458A from the output terminals. Then select the second current calibration point.

Front Panel:	SCPI Command:
The second calibration point is automatically selected. "Disconnect Meter" should be displayed. Press Next when done.	CAL:LEV P2

Step 30. Wait a minimum of 5 minutes for the internal temperature to stabilize. Then select the third current calibration point.

Front Panel:	SCPI Command:
The second calibration point is automatically selected. "Wait 5 minutes, press Next" should be displayed. Press Next when done. Then press Close.	CAL:LEV P3 *OPC?

Low Range Current Programming Calibration

This only applies to Agilent Models N6761A and N6762A.

Step 31. Connect only the current measurement terminals of the Agilent 3458A to the output terminals.

Step 32. Select the low-current programming range. The following example selects the 0.1 amp low-current programming range of channel 1. The value to program a range must be the maximum current of the range.

Front Panel:	SCPI Command:
From the Calibration menu, select Current, Low Range Programming. Then select Start.	CAL:CURR 0.1, (@1)

Step 33. Select the first current calibration point. Wait a minimum of 5 minutes for the output current to stabilize.

Front Panel:	SCPI Command:
The first calibration point is automatically selected. "Enter P1 measured data" should be displayed.	CAL:LEV P1 *OPC?

Step 34. Measure the current with the Agilent 3458A and enter the value.

Front Panel:	SCPI Command:
Enter the value from the external DMM into the data field and then select Next.	CAL:DATA <data>

Step 35. Select the second current calibration point. Then wait 30 seconds for the output current to stabilize.

Front Panel:	SCPI Command:
The second calibration point is automatically selected. "Enter P2 measured data" should be displayed.	CAL:LEV P2 *OPC?

Step 36. Measure the current with the Agilent 3458A and enter the value.

Front Panel:	SCPI Command:
Enter the value from the external DMM into the data field and then select Next. Press Close to finish calibration.	CAL:DATA <data>

Peak Current Limit Calibration

Steps 37 through 41 only apply to Agilent Models N6751A, N6752A, N6754A, N6761A and N6762A.

Step 37. Connect the 25 ohm load resistor across the output terminals (see the equipment list in chapter 2). For Model N6754A, attach a 3.8 ohm load, which includes the load and lead resistance. Alternatively, connect a 10.5A constant current load across the output.

Step 38. Select peak current limit calibration.

Front Panel:	SCPI Command:
From the Calibration menu, select Peak Current Limit. Then select Start.	CAL:CURR:PEAK (@1)

Step 39. Select the first current calibration point.

Front Panel:	SCPI Command:
The calibration is automatic.	CAL:LEV P1 *OPC?

Step 40. Replace the 25 ohm resistor with the 4 ohm load resistor (see equipment list in chapter 2). For Model N6754A, attach a 7.6 ohm load, which includes the load and lead resistance. Alternatively, connect a 5.25A constant current load across the output.

Step 41. Select the second current calibration point.

Front Panel:	SCPI Command:
Select Next. The calibration is automatic. Then select Close.	CAL:LEV P2 *OPC?

Enter a Calibration Date

Front Panel:	SCPI Command:
From the Calibration menu, select Date. Enter the date in the format "yyyy/mm/dd". Then select Insert Date. Then select Close.	To enter a calibration date: CAL:DATE "<date>", (@1)

Save and Log out of Calibration Mode

CAUTION

Storing calibration constants overwrites the existing ones in non-volatile memory. If you are not sure you want to permanently store the new constants, do not Save the data when you exit the calibration mode. The calibration will then remain unchanged.

Front Panel:	SCPI Command:
From the Calibration menu, select Save. Then select Save Calibration for all Outputs. Select Close.	To save calibration data: CAL:SAVE
Go [Back] to the Administrative tools menu and select Administrator Login/Logout. Select Logout, then Close	To exit calibration mode: CAL:STAT OFF

Change the Admin/Calibration Password

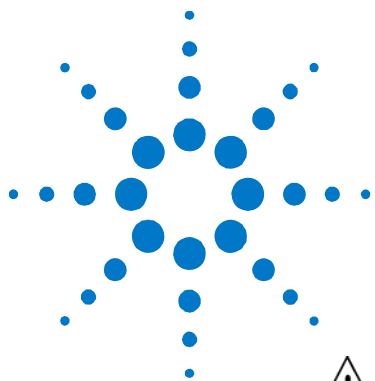
The password must be numeric, and can be up to 15 digits in length. After it has been changed, you can only enter the calibration mode by providing the correct password.

If the password is lost or forgotten, access can be restored by setting an internal switch that resets the password to “0” (zero) (refer to “Accessing the Calibration switch” in chapter 4). Once you have set the password to “0” (zero) with the switch, you can enter a new password using Administrative Tools menu or using the CAL:PASS command. The new password will become active when you log out of the Admin Menu or send CAL:STAT OFF. After you have returned the switches to the normal position, you can assess the Administrative Tools menu with the new password.

Front Panel:	SCPI Command:
Press [Menu], then select Utilities, Administrative Tools, Administrator Login.	Enter calibration mode using the original password CAL:STAT ON, <password>
Enter the original password (or zero if the switches have been set) in the Password field and press Select.	To change the password: CAL:PASS <NRF>
In the Administrative Tools menu, select Change Password. Enter the new password in the PIN field and press Close.	To exit calibration mode and activate the password: CAL:STAT OFF
Logout of the Admin menu to activate the password.	

NOTE

If the message “Locked out by internal switch setting” or “Calibration is inhibited by switch setting” appears, the internal switch is set to prevent the password from being changed (refer to “Accessing the Calibration switch” in chapter 4).



4

Disassembly

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This chapter discusses the disassembly procedures for troubleshooting and repairing Agilent N6705A DC Power Analyzer mainframes.

Electrostatic Discharge (ESD) Precautions

Almost all electrical components can be damaged by electrostatic discharge (ESD) during handling. Component damage can occur at electrostatic discharge voltages as low as 50 volts. The following guidelines will help prevent ESD damage when servicing the instrument or any electronic device.

- Disassemble instruments *only* in a static-free work area.
- Use a conductive work area to reduce static charges.
- Use a conductive wrist strap to reduce static accumulation.
- Minimize handling.
- Keep replacement parts in original static-free packaging.
- Remove all plastic, foam, vinyl, paper, and other static-generating materials from the immediate work area.



Disassembly Procedures

WARNING

SHOCK HAZARD. FAN HAZARD. Turn off the mainframe and disconnect its power cord before attempting any of the following procedures.

Required Disassembly Tools

Tool	Use
T10 Torx driver	All Disassemblies
T20 Torx driver	Removing Top Chassis, AC Module, Bulk Supply and Calibration
7/32 in. nut driver	Removing Ground Nut
1/4 in. nut driver	Removing Binding Post Assembly
11/32 in. nut driver	Removing Bulk Supply Cable
5/8 in. nut driver	Removing Trigger Assembly
Flat Blade driver	Replacing Battery and Calibration
Diagonal cutters	Removing top and bottom backplanes
Philips pozidrive	Removing side cover without handle

Removing/Installing Modules

Step 1. Remove the top (or bottom) covers.

Loosen the thumbscrews to remove the covers. Turn the unit upside-down to remove the bottom cover.

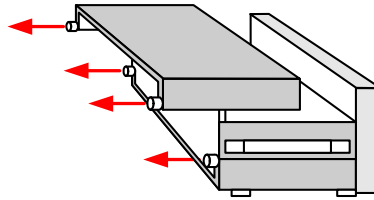


Figure 4-1

NOTE

For ease while removing and installing modules, replace the top cover before removing the bottom cover.

CAUTION

Backplane connector pins are exposed in empty module slots. Use extra caution whenever the covers (top or bottom) are removed to protect the pins from damage.

Step 2. Remove the power modules.

First, remove the connector from the end of the module.

Then remove the two fastening screws at either end of the module. Grasp the module at the ends (near the fan and the output connector), and lift it straight up out of the mainframe.

Step 3. Install the power modules.

Align the module over the pins and push it down onto the connector.

Using a T10 Torx driver, install the two screws at each end of the module. Turn the unit upside-down to install more modules.

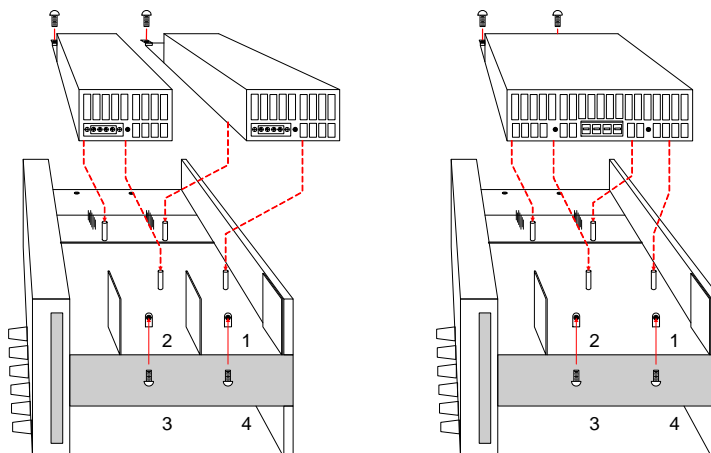


Figure 4-2

NOTE

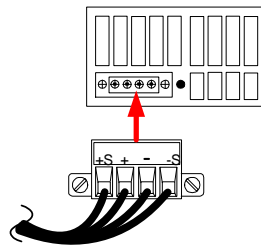
If you are installing a double-wide power module, you must first remove the center deflector. Use a T10 Torx to remove the top deflector; use a 5.5 mm hex to remove the bottom deflector. Install the deflector in the storage location on the opposite end of the module in case you need to re-use it in the future.

Step 4. Connect the output cables.

Push the harness connector into the power module. Use the correct size connector and channel for the power module (see Figure 4-2 for channel locations).

Tighten the locking screws on the small connectors.

Secure the unused cables in the plastic clip ring located between the modules and the front panel.

**Figure 4-3****NOTE**

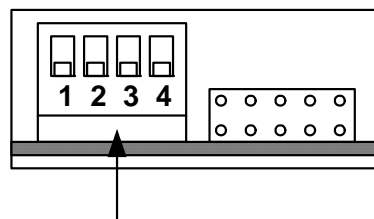
For double-wide power modules, connect the output 1 cable in the top chassis; connect the output 3 cable in the bottom chassis.

Step 5. Install the top and bottom covers.

Slide the top (or bottom) cover into place and tighten the thumbscrews.

Accessing the Calibration switch**Step 1. Remove the right side cover (side with handle).**

Remove the two screws with a Philips pozidrive along the right side of the unit. Then remove the screw at the back of the side panel using a T10 driver. Remove the panel. The calibration switches are visible through the cutout.

**Figure 4-4**

Step 2. The calibration switch is visible through the cutout.

To change the calibration switch settings, use a small screwdriver to move the switches. See Chapter 3 for detailed Calibration procedures.

CAUTION

Do not use a pencil to move the switches. Any graphite dust that accumulates on the switches will conduct electricity.

Switches 1 and 2 set the calibration configuration as follows:

	Switch 1	Switch 2	Description
Normal	DOWN	DOWN	This is the default or as-shipped switch setting. The calibration functions are accessible after entering a numeric password. The default password is 0 (zero).
Clear password	UP	DOWN	The password is reset to 0 when the instrument is turned on. Use this setting if you have forgotten the password.
Inhibit calibration	UP	UP	All calibration commands are disabled. This is useful where calibration access is guarded by instrument seals.

Step 3. Replace the side cover when finished.

Replacing the Battery

The internal battery is used to power the real-time clock. The primary function of the clock is to provide a time stamp for the internal file system. If the battery fails, the clock and time stamp function will not be available. No other instrument functions are affected.

Under normal use at room temperature, the lithium battery has a life expectancy between seven and ten years. Note that battery life will be reduced if the instrument is stored for a prolonged period at temperatures above 40 degrees C.

The part number of the battery is Panasonic CR 2032.

Step 1. Remove the top cover.

Loosen the thumbscrews to remove the top cover. The battery is located right behind the front panel assembly.

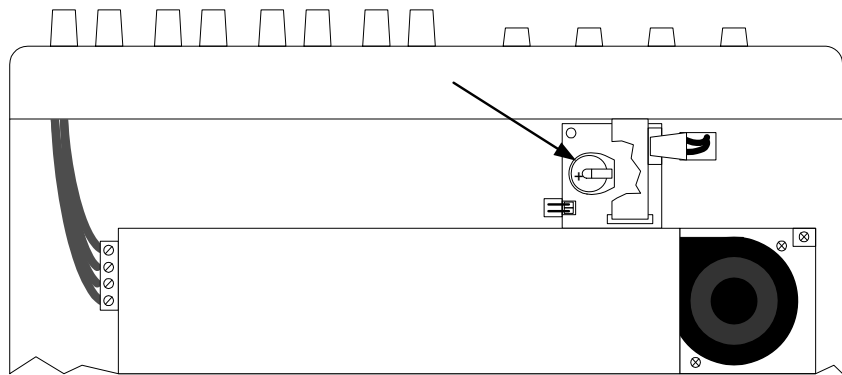


Figure 4-5

Step 2. Lift the clip and remove the battery.

Use a small flat-blade screwdriver and carefully lift the clip. Remove the battery.

Step 3. Install the new battery.

Insert the new battery. Make sure that the positive side (+) is facing up. Release the clip.

Step 4. Reset the date and time.

Reassemble the unit and turn it on. Access the Utilities menu, select User Preferences, then Clock Setup. Set the date and time.

CAUTION

Properly dispose of the old battery in accordance with local laws and regulations.



Removing/Installing Flat Flexible Cables (FFC)

To remove flat flexible cables (FFC), gently lift up on the tabs located on the short ends of the plastic connector until the cable is released. Remove cable. To install a flat flexible cable, insert the cable into the slot in the connector. Using a small screwdriver or your fingers, apply gentle, even pressure to the tabs until the connector clicks and locks the cable into place. After installation, ensure the cable is straight and securely aligned within the connector.

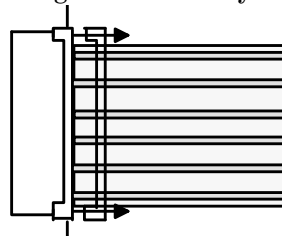


Figure 4-6

Removing/Installing the Top Chassis

Step 1. Remove the top cover and any modules as previously described.

Step 2. Remove the two side panels.

The handle side requires a T20 driver (see Figure 4-7). The other side panel requires a Philips pozidrive head (see Figure 4-8). There is also a screw (T10) that needs to be removed from the rear of each side panel.



Figure 4-7. Right Side Panel

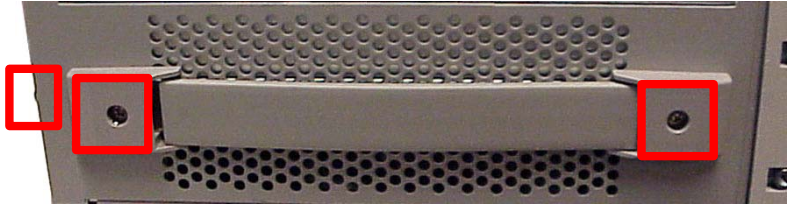


Figure 4-8. Left Side Panel

Step 3. Remove three screws using a T10 driver from the rear panel.

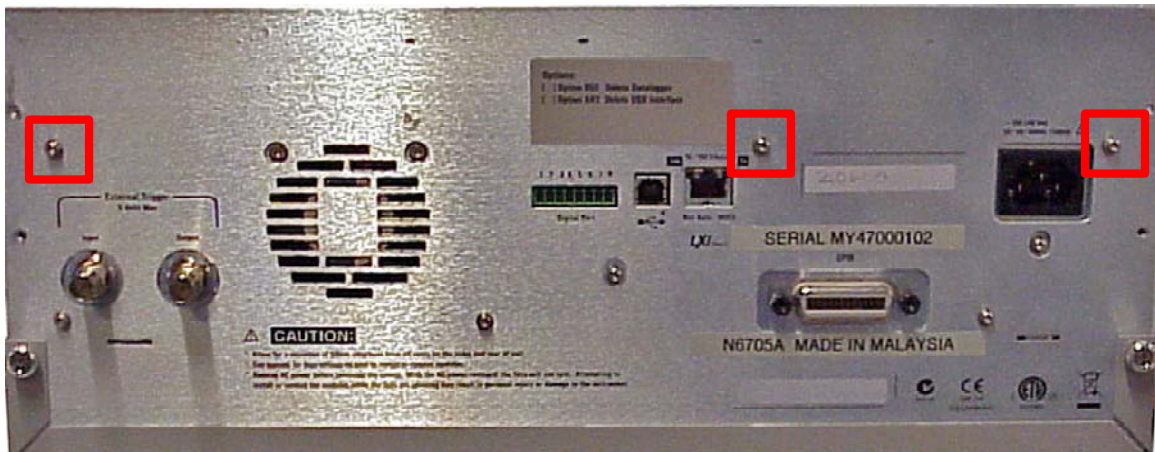


Figure 4-9

Step 4. Remove three screws using a T10 driver from the front panel sub assembly.



Figure 4-10

Step 5. Disconnect the three cables from the backplane assembly.

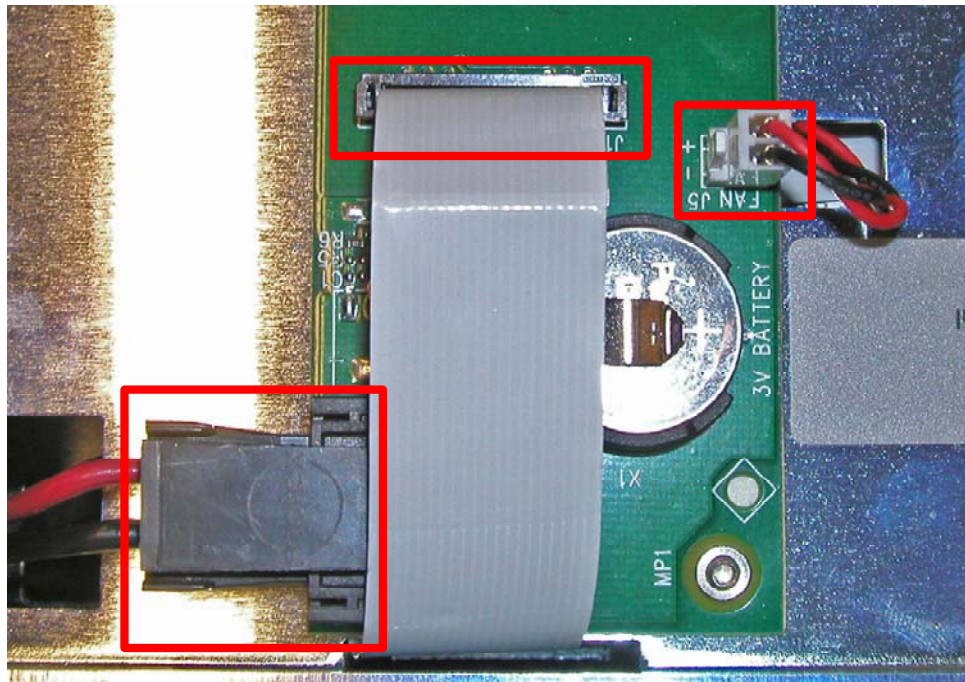


Figure 4-11

Step 6. Remove the top chassis.

Angle the top chassis so you can maneuver around the fin attached to the rear panel.

Step 7. To install the top chassis, perform steps 1-6 in reverse order.

Be sure to tuck all cables in before replacing the top chassis.

Removing/Installing the Bias PCA

Step 1. Remove the top chassis as previously described.

Step 2. Remove three screws using a T10 driver and disconnect two cables.

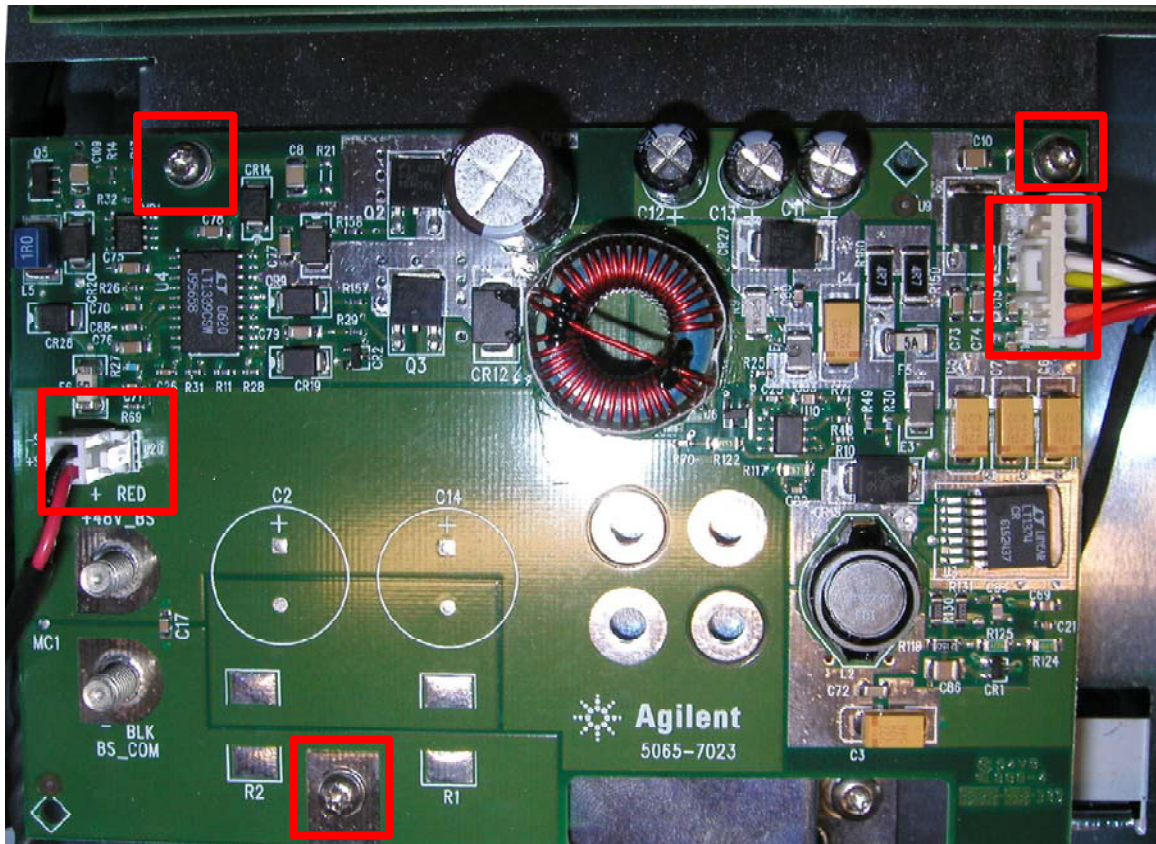


Figure 4-12

Step 3. Remove the bias PCA.

Step 4. To install the bias PCA, perform steps 1-3 in reverse order.

Removing/Installing the PPMC (Interface) PCA

Step 1. Remove the top chassis as previously described.

Step 2. Disconnect seven cables and remove six screws using a T10 driver.

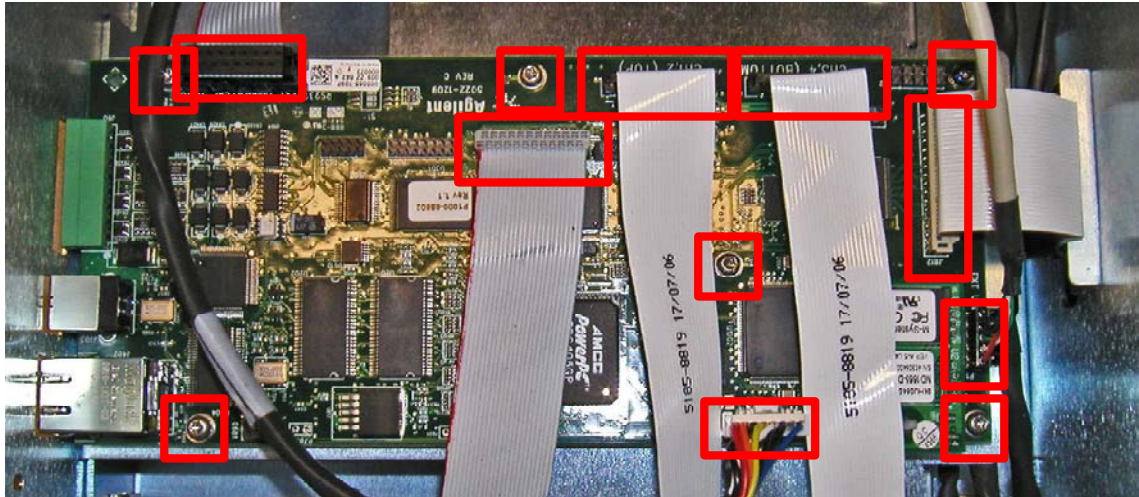


Figure 4-13

Step 3. Remove the PPMC PCA by sliding forward and lifting.

Step 4. To install the PPMC PCA, perform steps 1-3 in reverse order.

Removing/Installing the AC Module

Step 1. Remove the top chassis as previously described.

Step 2. Remove the screw using a T10 driver from the rear panel located beneath the AC receptacle.



Figure 4-14

Step 3. Disconnect the two connections and remove two screws using a T20 driver from the AC Module.

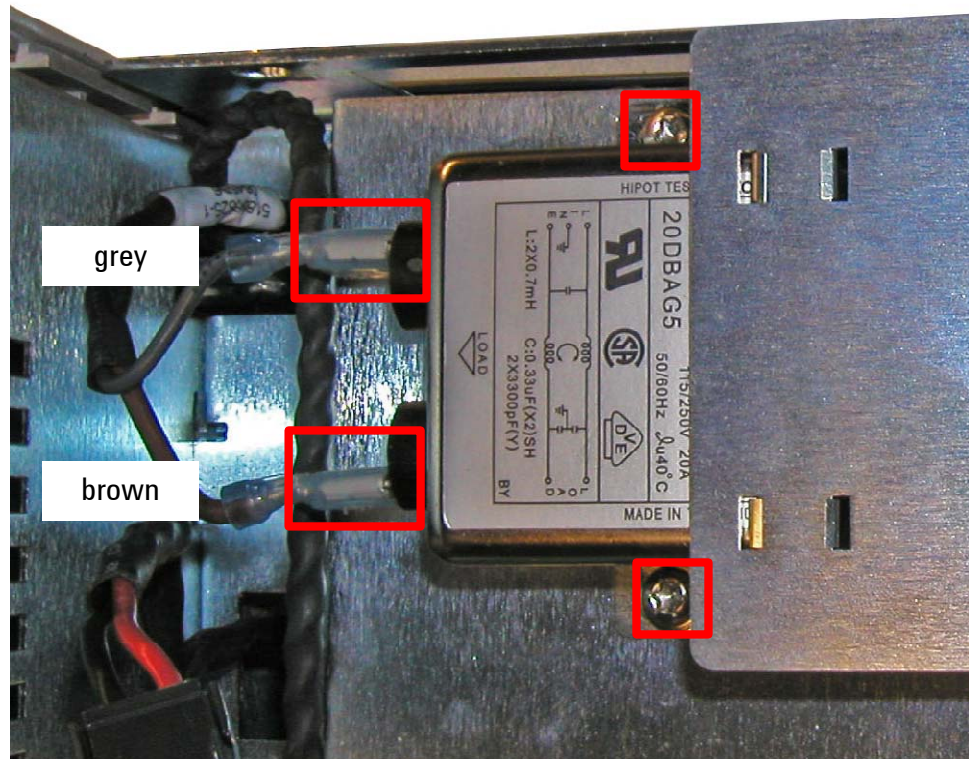


Figure 4-15

Step 4. Remove the AC Module.

Step 5. To install the AC Module, perform steps 1-4 in reverse order.

Removing/Installing the Bulk Supply

Step 1. Remove the top chassis, PPMC PCA, Bias PCA, and AC Module as previously described.

Step 2. Remove one screw using a T10 driver from the rear panel.

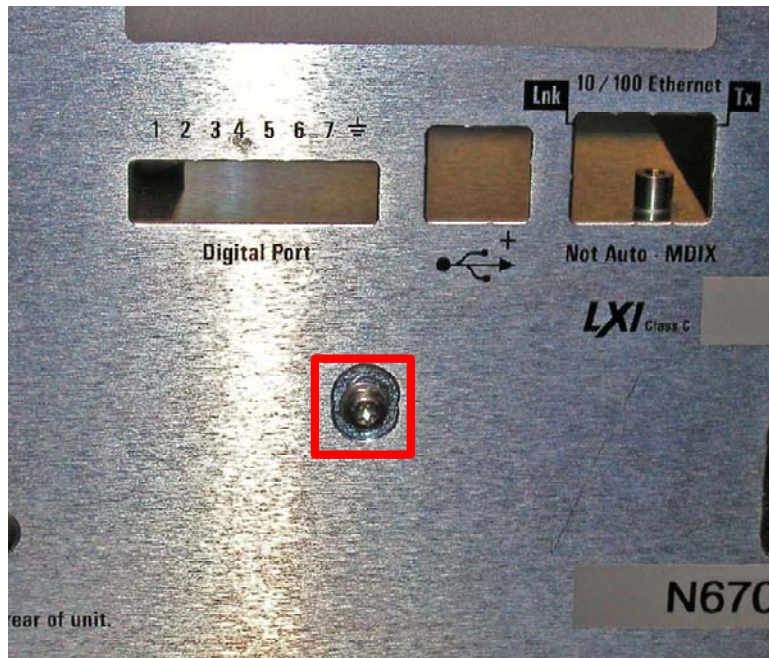


Figure 4-16

Step 3. Unhook the cable tie and remove four screws using a T20 driver.

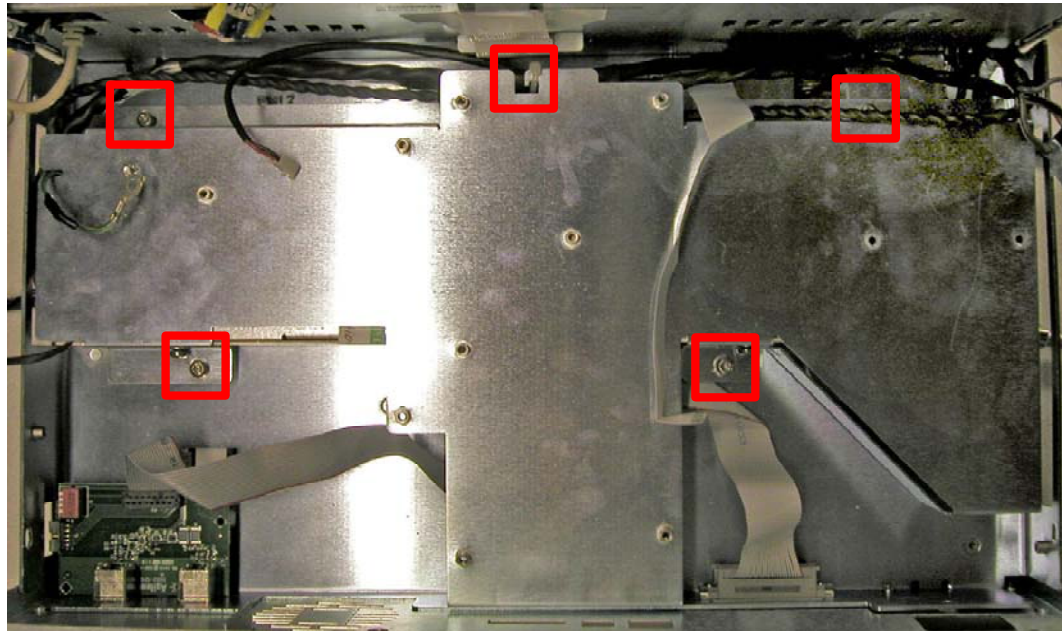


Figure 4-17

Step 4. Remove four screws using a T20 driver from the sides of the bulk shroud and remove the bulk shroud.



Figure 4-18



Figure 4-19

Step 5. Disconnect four connections and remove two 11/32 in. nuts from the bulk supply.

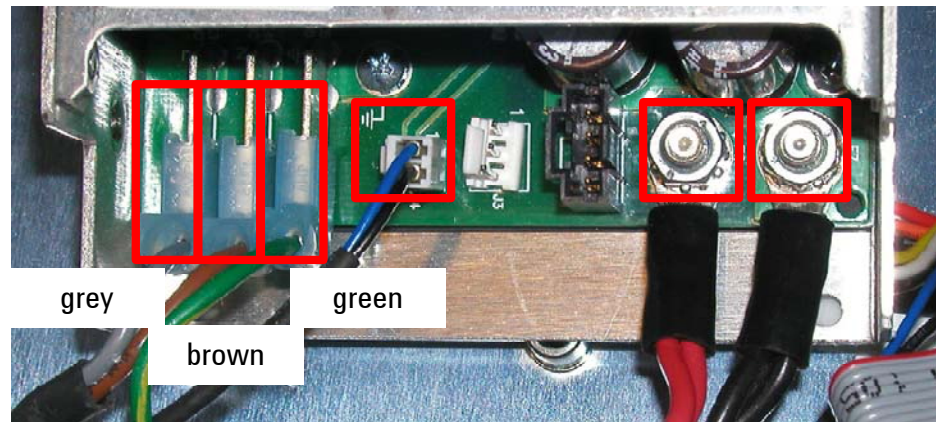


Figure 4-20

Step 6. Remove the bulk supply.

Step 7. To install the bulk supply, perform steps 1-6 in reverse order.

Removing/Installing the Trigger Assembly

Step 1. Remove the top chassis as previously described.

Step 2. Remove the two 5/8 in. nuts from the binding posts.



Figure 4-21

Step 3. Remove the trigger assembly.

Step 4. To install the trigger assembly, perform steps 1-3 in reverse order.

Removing/Installing the Top Backplane PCA

Step 1. Remove the top chassis as previously described.

Step 2. Remove three screws using a T10 driver from the chassis on the side opposite to the backplane PCA.



Figure 4-22

Step 3. Disconnect the fan cable and cut off two push-on retainers using diagonal cutters.



Figure 4-23

Step 4. Remove the top backplane PCA.

Step 5. To install the top backplane PCA, perform steps 1-4 in reverse order. New push-on retainers can be purchased separately.

Removing/Installing the Bottom Backplane PCA

Step 1. Remove top chassis as previously described.

Step 2. Remove bottom cover as previously described.

Step 3. Remove two screws using a T10 driver from the back panel. (one to the AC module and the other to the bulk shroud).



Figure 4-24

Step 4. Disconnect five cables from the PPMC PCA and the two contacts to the AC module.

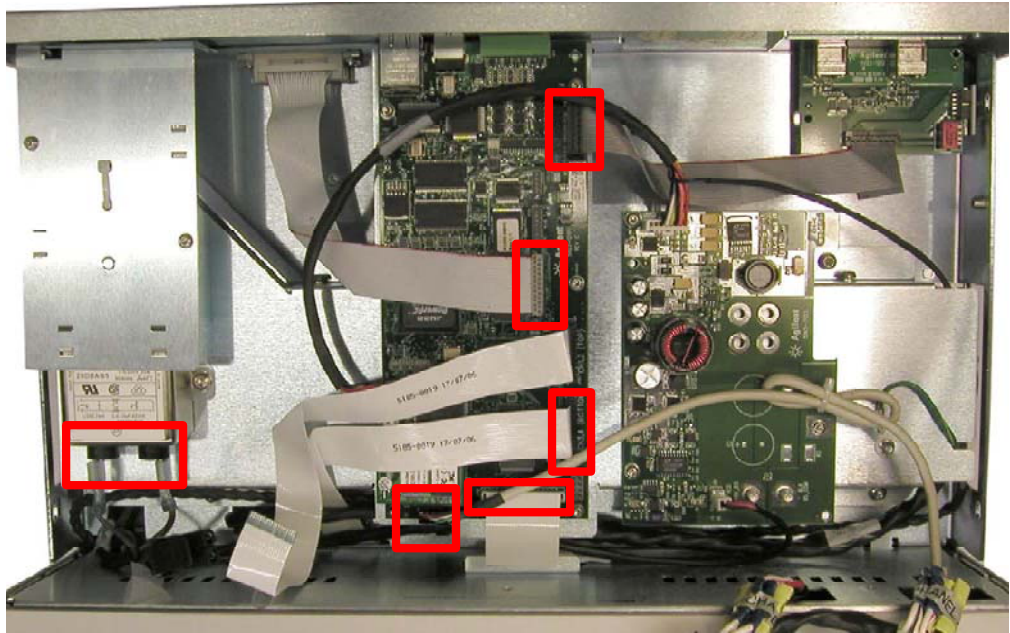


Figure 4-25

Step 5. Unhook the cable tie from bulk shroud and remove four screws using a T20 driver. (Figure shows PCA boards removed for clarity)

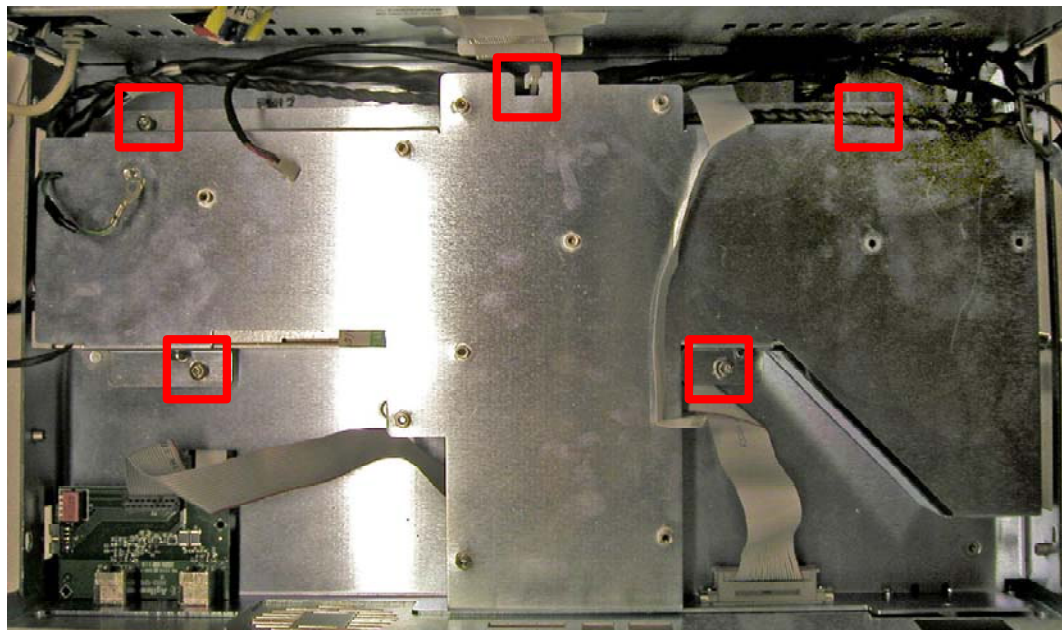


Figure 4-26. Boards removed for clarity

Step 6. Gently lift bulk shroud out of mainframe and place on right side of mainframe (non-handle side - right side when viewed from front)

Step 7. Carefully stand mainframe on its right end and remove three screws using a T10 driver from the side opposite to the backplane assembly.



Figure 4-27

Step 8. Disconnect three cables from the backplane PCA and cut off two push-on retainers using diagonal cutters.



Figure 4-28

Step 9. Remove the backplane PCA.

Step 10. To install the bottom backplane PCA, perform steps 1-9 in reverse order. New push-on retainers can be purchased separately.

Removing/Installing the Sub Panel

Step 1. Remove the top chassis as previously described.

Step 2. Remove the bottom cover as previously described.

Step 3. Remove three screws using a T10 driver from the rear panel and remove the rear panel.



Figure 4-29

Step 4. Disconnect the USB Cable and front panel to PPMC FFC.

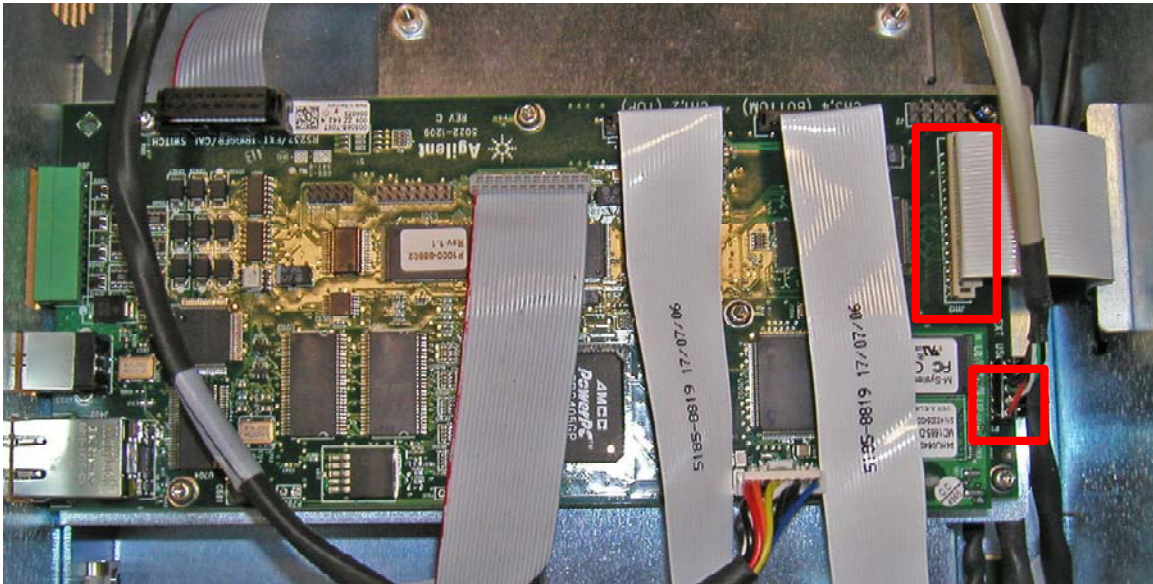


Figure 4-30

Step 5. Disconnect all cables to the AC switch on the rear bottom chassis, remove three screws using a T10 driver, and separate mainframe from front panel.

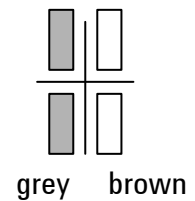
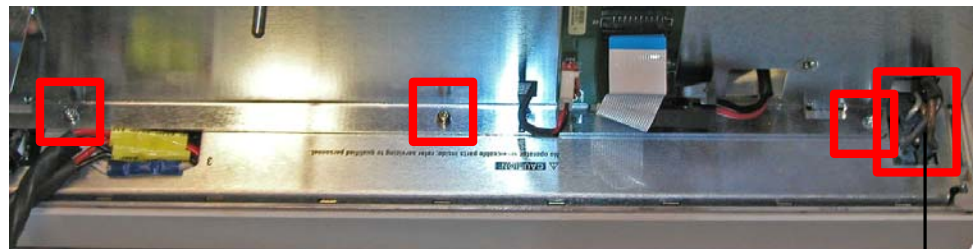


Figure 4-31

Step 6. Remove two screws using a T10 from each side of the front panel.



Figure 4-32

Step 7. Remove the sub panel.

Step 8. To install the sub panel, perform steps 1-7 in reverse order.

Removing/Installing the Display

Step 1. Remove the sub panel as previously described.

Step 2. Disconnect two cables and remove two screws using a T10 driver.

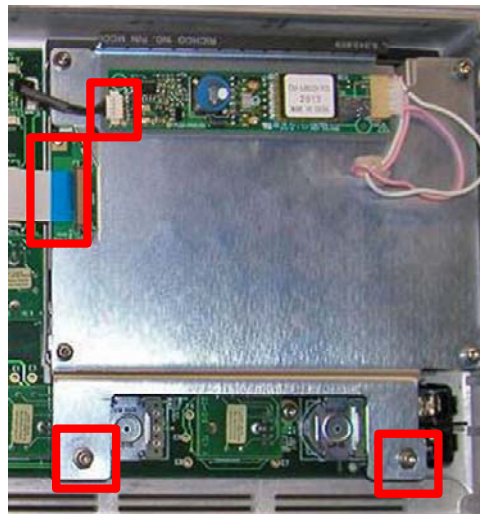


Figure 4-33

Step 3. Disconnect one cable and remove four screws using a T10 driver to remove display from bracket.

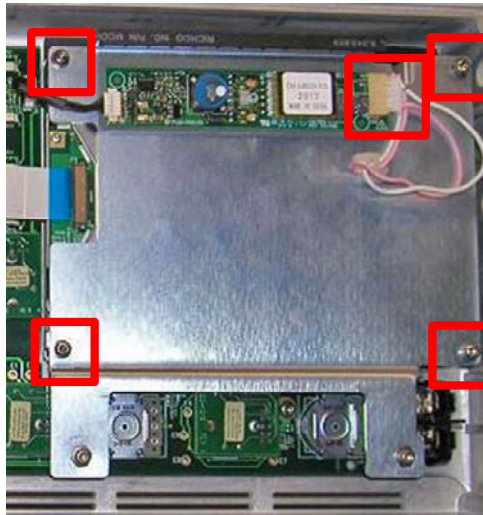


Figure 4-34

Step 4. To install the display, perform steps 1-3 in reverse order.

Removing/Installing the Binding Post PCA

Step 1. Remove the sub panel as previously described.

Step 2. Disconnect the binding post PCA to front panel PCA ribbon cable and remove sixteen 1/4 in. nuts from the assembly.

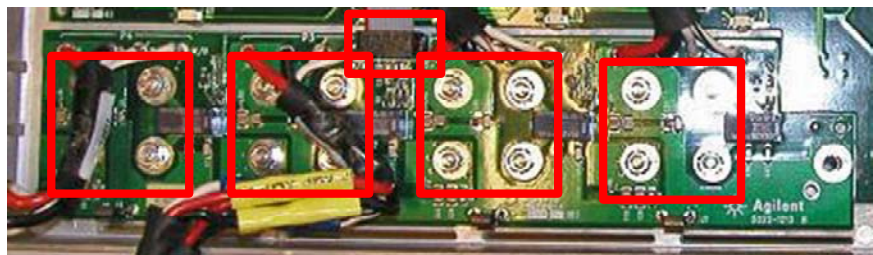


Figure 4-35

Step 3. Remove the binding post PCA.

Step 4. To install the binding post PCA, perform steps 1-3 in reverse order.

Removing/Installing the Front Panel PCA

Step 1. Remove the sub panel as previously described.

Step 2. Remove the display as previously described.

Step 3. Disconnect the binding post PCA to front panel PCA ribbon cable and remove seven screws using a T10 driver.

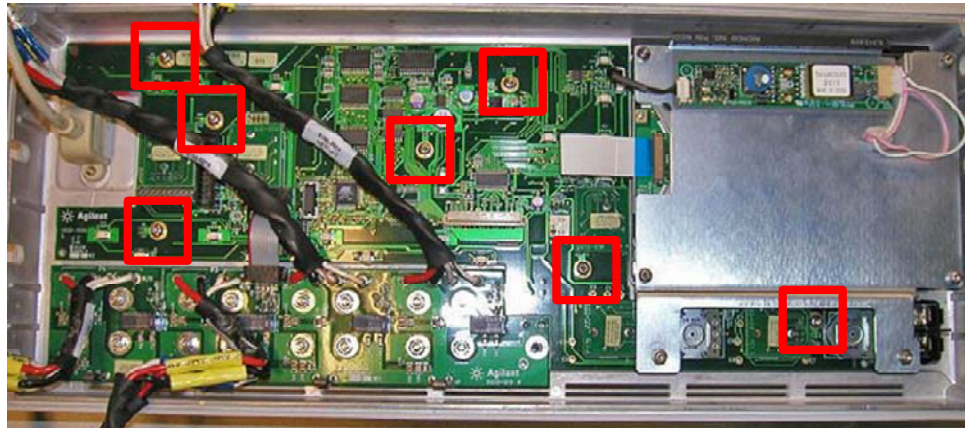


Figure 4-36

Step 4. Remove the six knobs from the front panel.

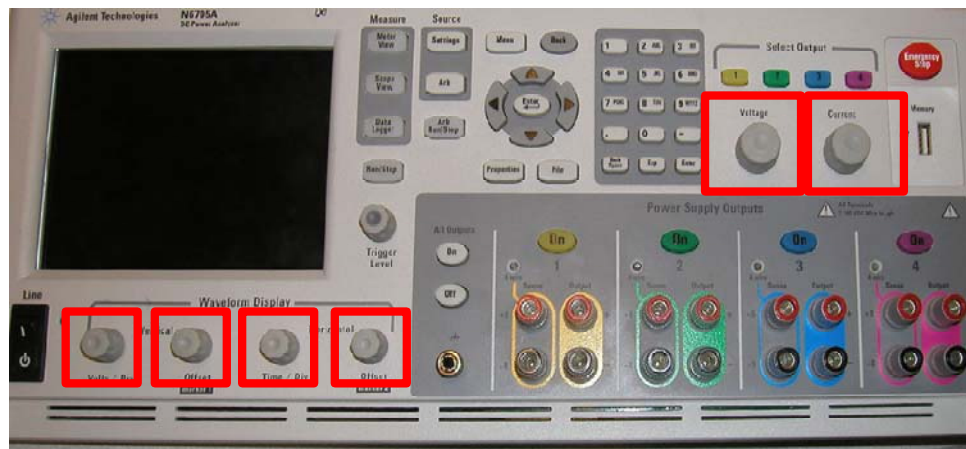
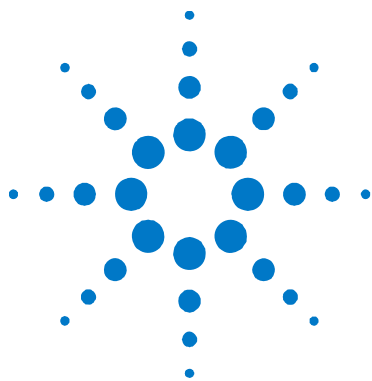


Figure 4-37

Step 5. Remove the front panel PCA.

Step 6. To install the front panel PCA, perform steps 1-5 in reverse order.



5 Troubleshooting

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Preliminary Checkout

Is the instrument inoperative?

- Verify that the AC power cord is connected to the instrument.
- Verify that the front-panel On/Standby switch has been pushed.

Is the display working?

- If the display is hard to read, but the front-panel “line” LED is lit and the fans are working, the display contrast setting may be too light or too dark. Use the front panel menu to set the display contrast.

Does the instrument fail selftest?

- Remove all external connections to the instrument.
- Check that modules are installed next to each other, starting with slot 1. If there are any empty slots (or filler modules) *between* the power modules, the power system will not operate.
- Check that the mainframe has the latest firmware installed.
- Turn off the unit and cycle power to run selftest again.

If the supply passes selftest and there are no obvious faults, perform the verification procedures in Chapter 2 to determine if any functions are not calibrated, or are not operating properly.

Self-test Error List

The following table documents the self-test error messages. Refer to Appendix A for other error messages.

Selftest Errors (these errors set Standard Event Status register bit #3)	
202	Selftest Fail Aux Adc 0 expected <n1> to <n2>, measured <n3>, chan <n4> Auxiliary ADC failed. n1 and n2 are the expected limits. n3 is the measured value. n4 is the channel location of the failed module.
202	Selftest Fail DACs 0 expected <n1> to <n2>, measured <n3>, chan <n4> Both voltage and current DACs are at zero. n1 and n2 are the expected limits. n3 is the measured value. n4 is the channel location of the failed module.
202	Selftest Fail DACs 1 expected <n1> to <n2>, measured <n3>, chan <n4> Voltage DAC is at zero; current DAC is at full scale. n1 and n2 are the expected limits. n3 is the measured value. n4 is the channel location of the failed module.
202	Selftest Fail DACs 2 expected <n1> to <n2>, measured <n3>, chan <n4> Voltage DAC is at full scale; current DAC is at zero. n1 and n2 are the expected limits. n3 is the measured value. n4 is the channel location of the failed module.
202	Selftest Fail DACs 3 expected <n1> to <n2>, measured <n3>, chan <n4> Both voltage and current DACs are at full scale. n1 and n2 are the expected limits. n3 is the measured value. n4 is the channel location of the failed module.

General Troubleshooting

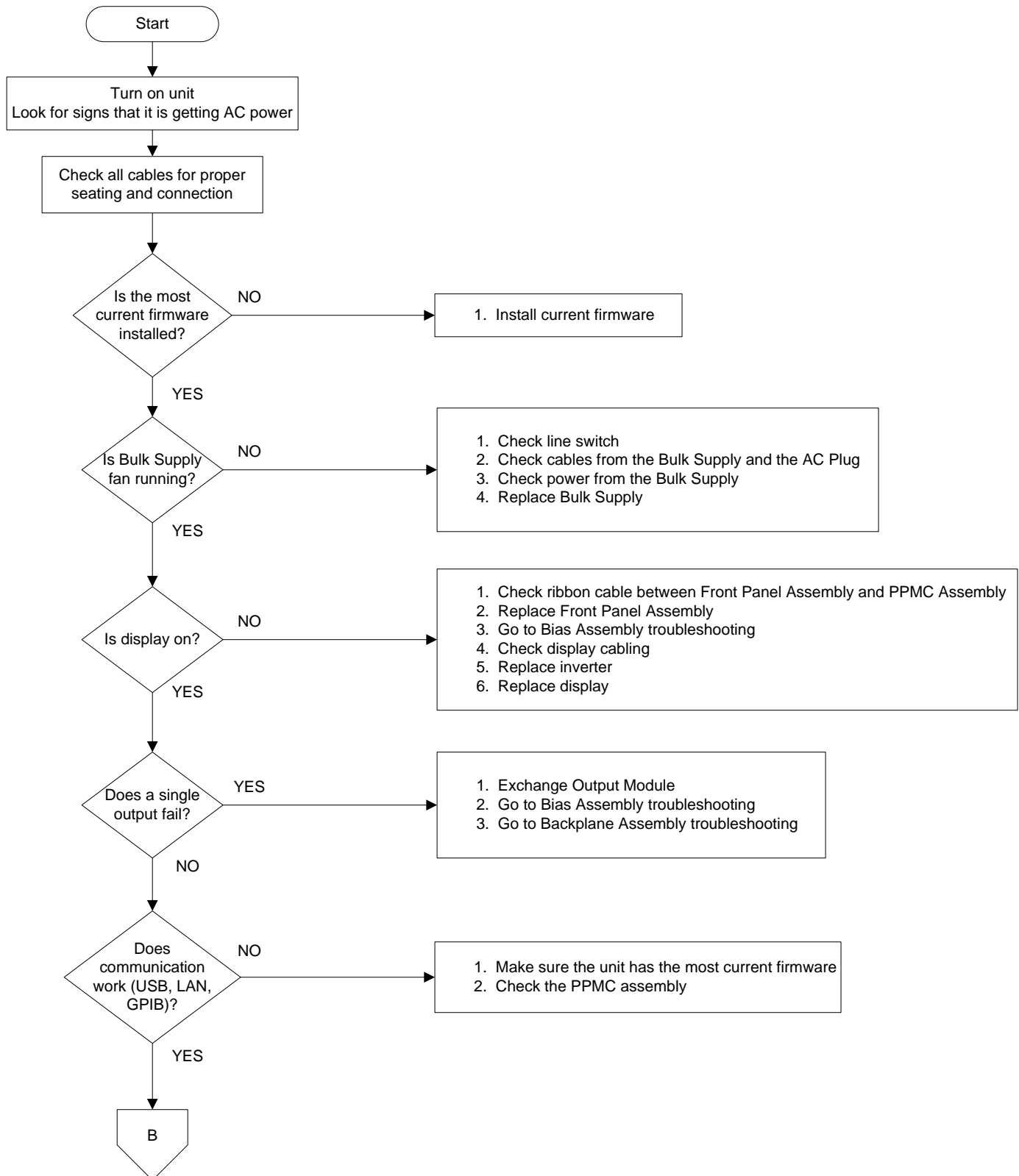


Figure 5-1. General Troubleshooting Sheet 1

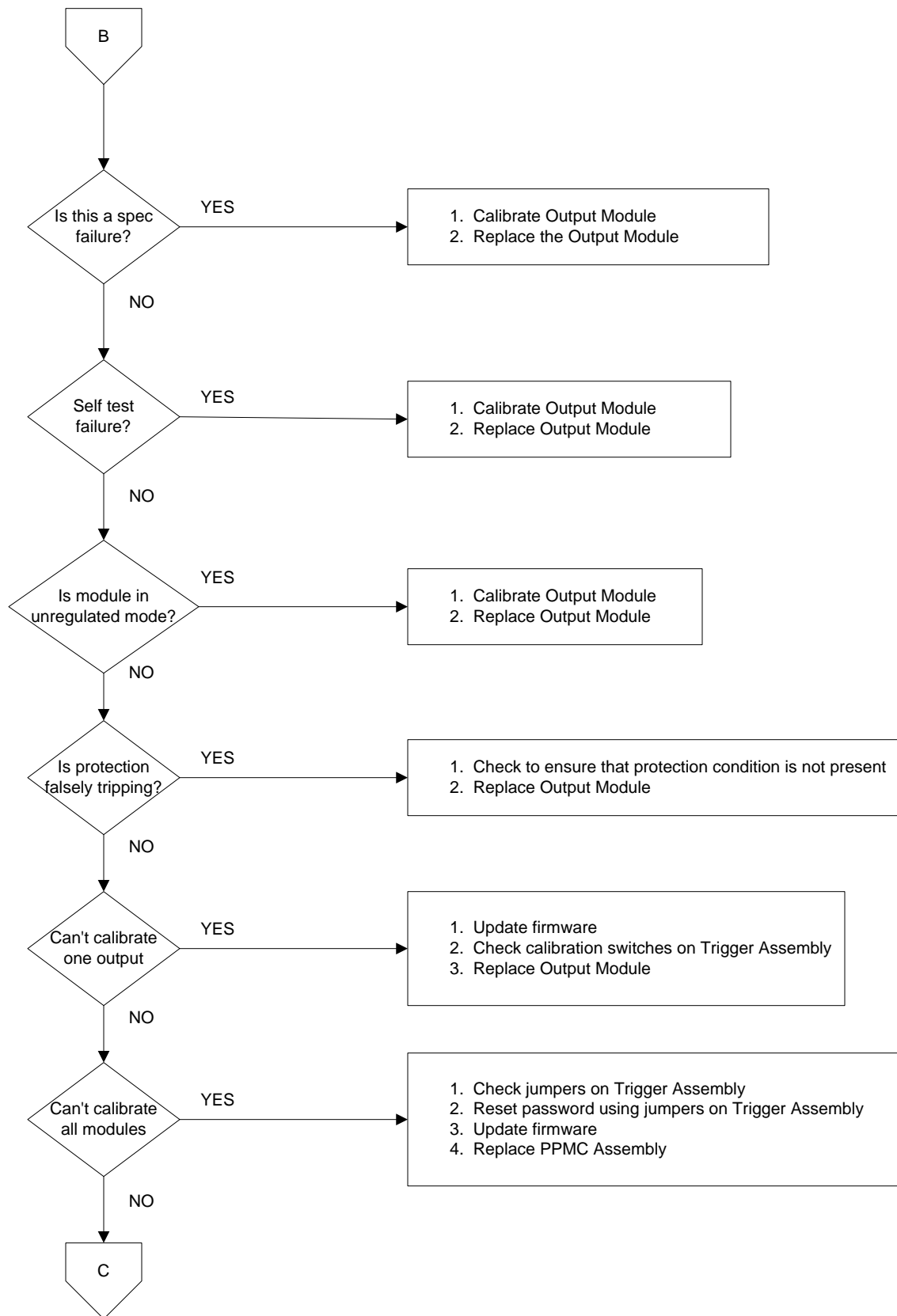


Figure 5-1. General Troubleshooting Sheet 2

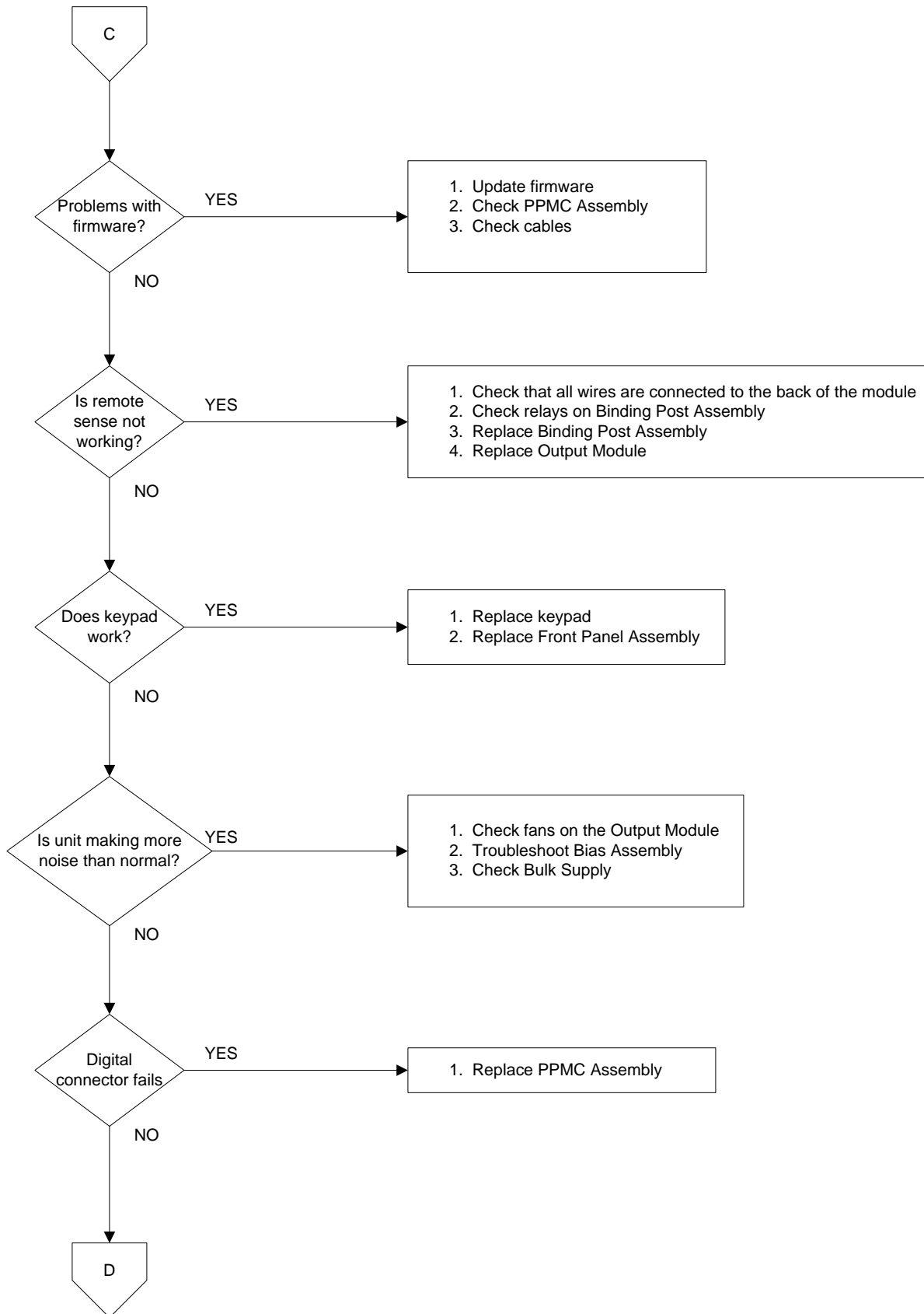


Figure 5-1. General Troubleshooting Sheet 3

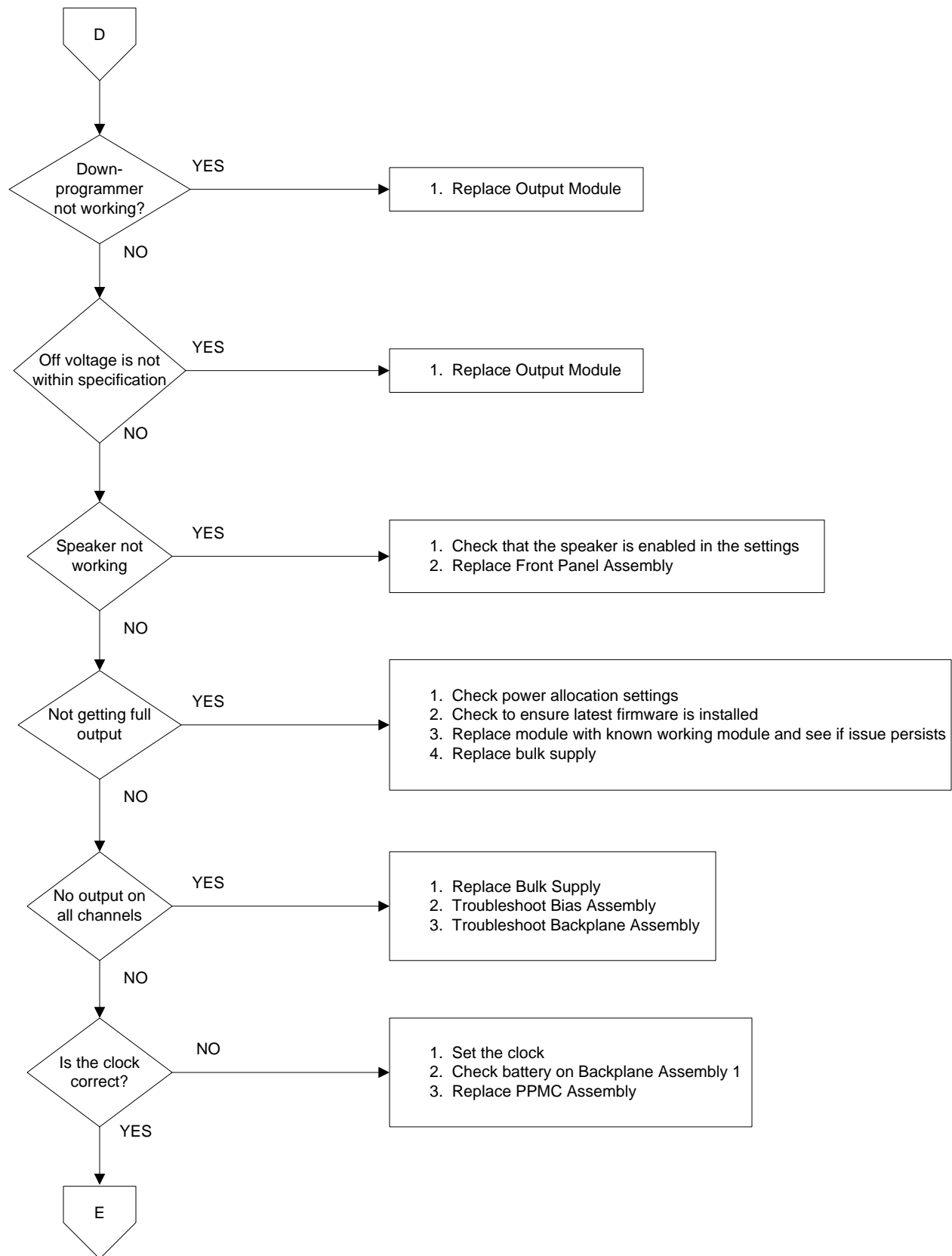


Figure 5-1. General Troubleshooting Sheet 4

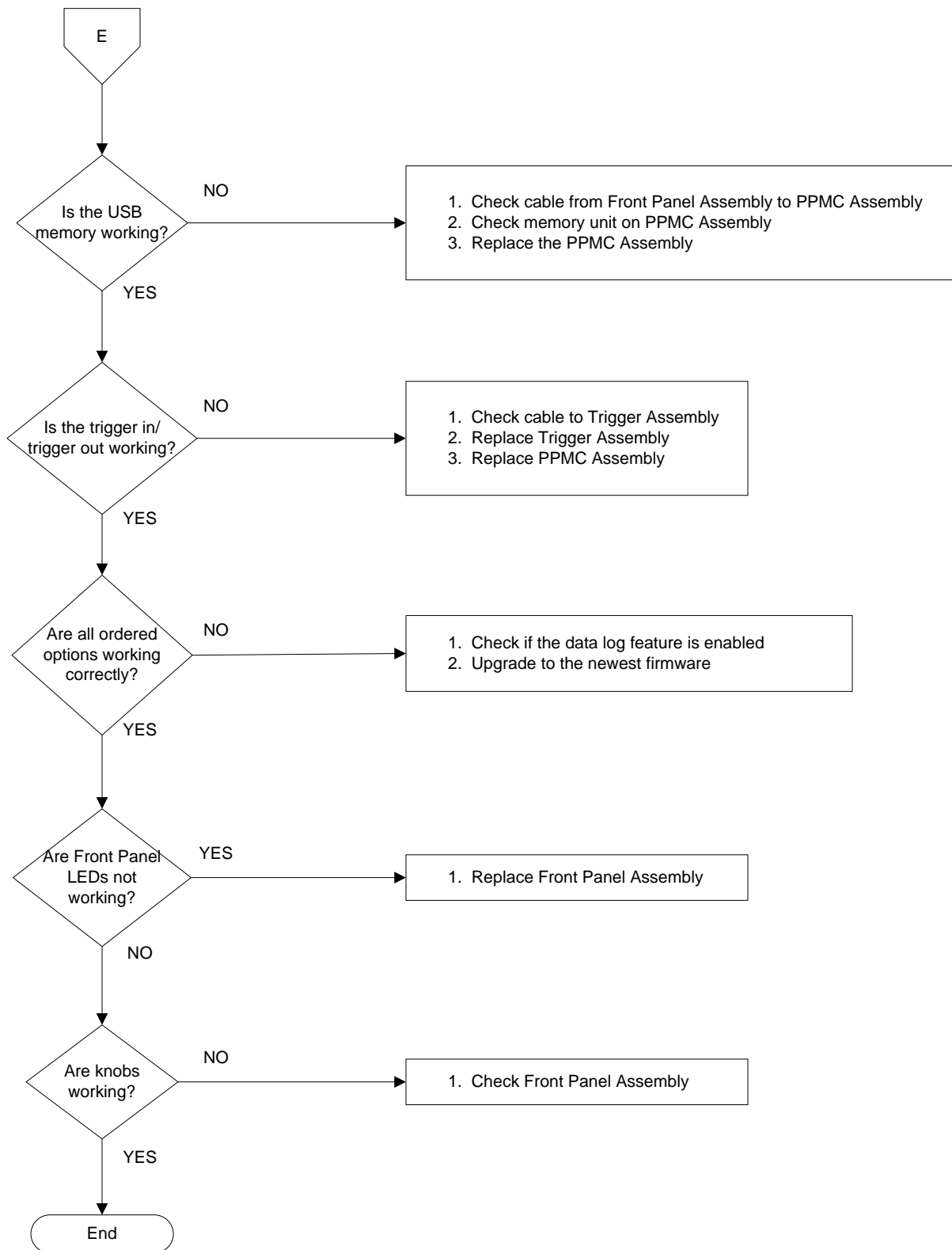


Figure 5-1. General Troubleshooting Sheet 5

Bias PCA Troubleshooting

Troubleshooting the bias board involves checking for the presence of the correct bias voltages on the board. Refer to the following table and figures.

Note that if the bias voltages at test points 2 - 4 in the following table are not present, it could be caused by a defect in the power module or interface board that is pulling the bias voltage low.

Test Point	Location	Voltage	Action
TP 1	+ RED	+48 V	Output of bulk supply. If not present, replace the bulk supply.
TP 2	+ C4	+12 V	If biases at TP 2, TP 3, or TP 4 are not present, disconnect the backplane and interface board cable assemblies and recheck. If biases are still not present, replace the bias board.
TP 3	U9 - 2	+5 V	Same as above.
TP 4	+ C3	+3.3 V	Same as above.
Common	- BLK	Common	

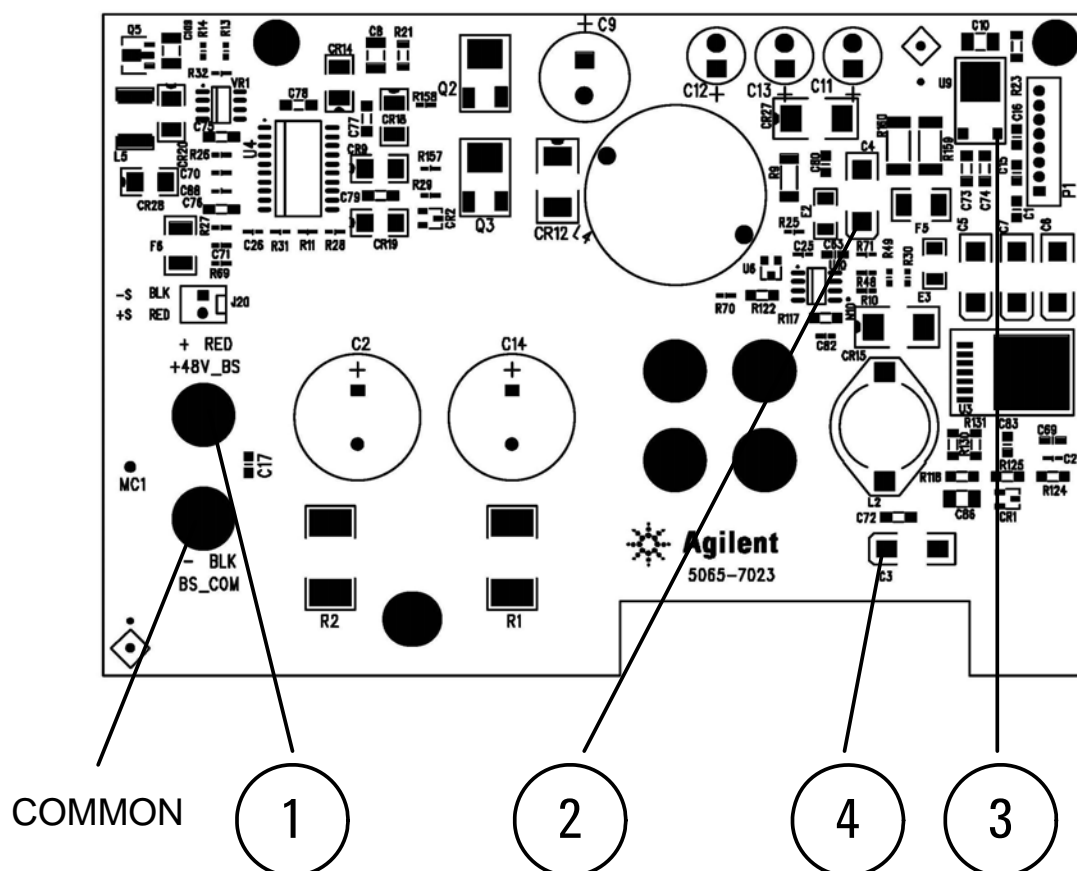


Figure 5-2. Bias Board Test Points

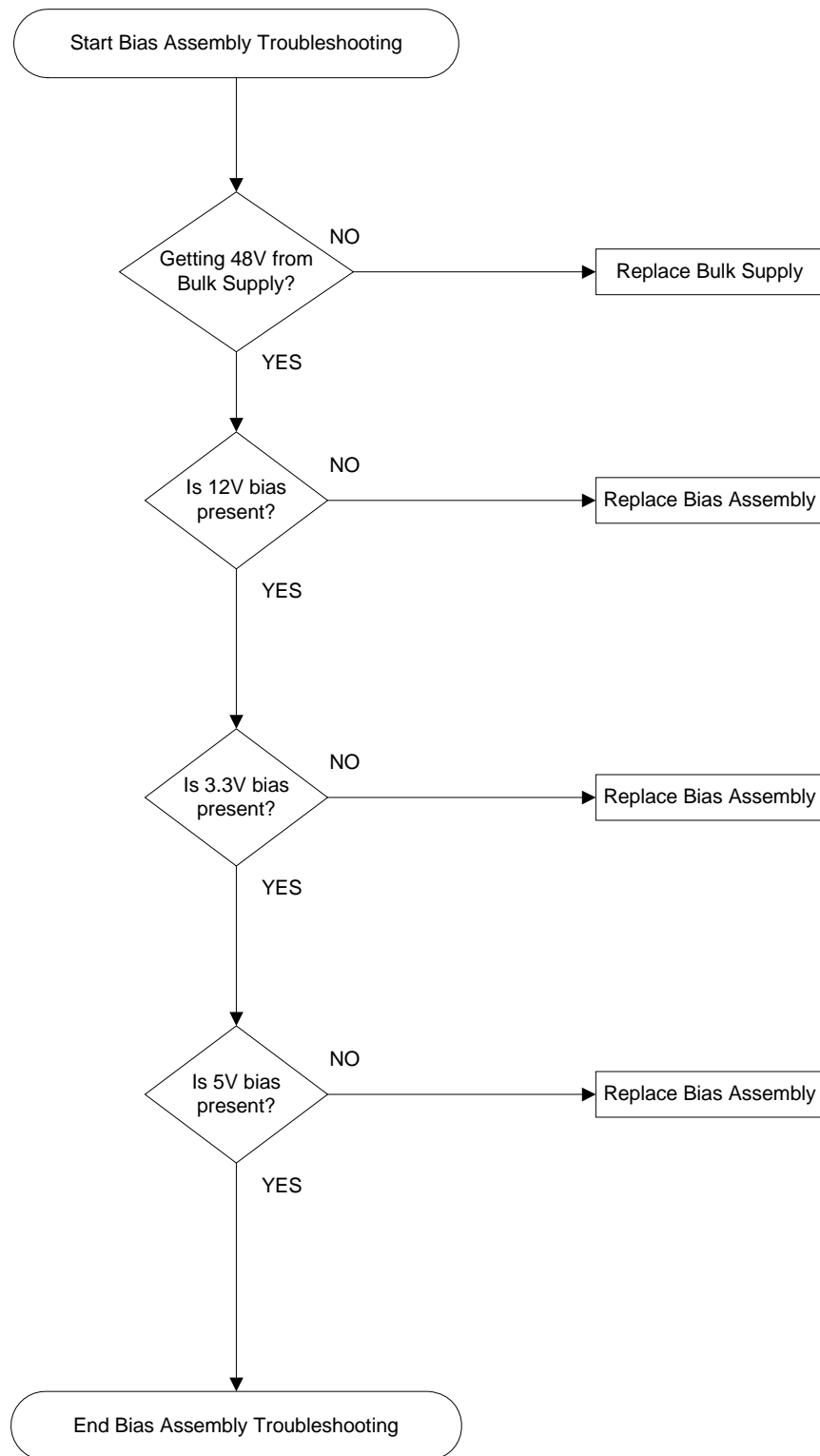


Figure 5-3. Bias PCA Troubleshooting Sheet 1

Backplane PCA Troubleshooting

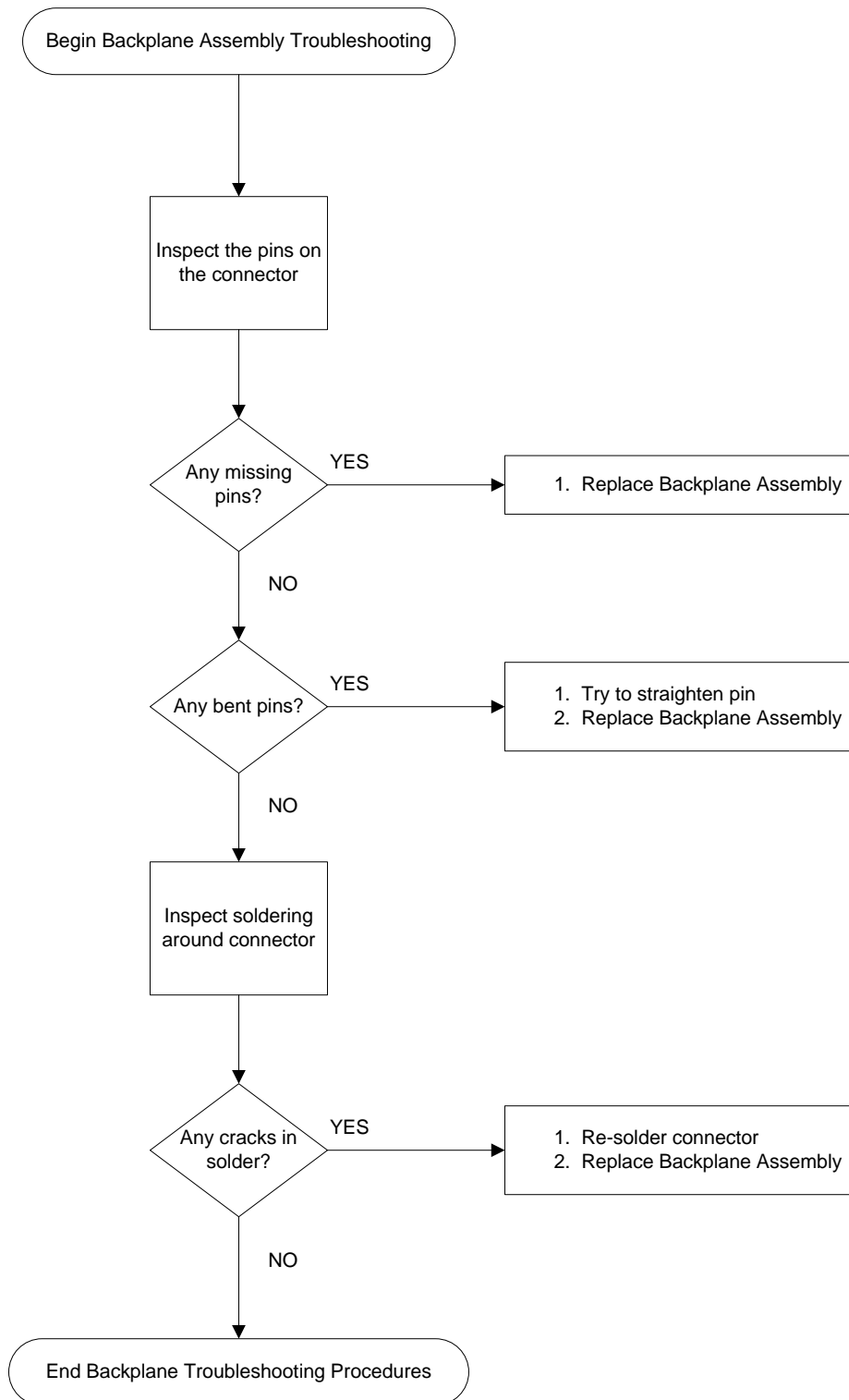


Figure 5-4. Backplane PCA Troubleshooting Sheet 1

Calibration and Passwords

Calibration is not required after the mainframe has been repaired. All calibration information is module-specific and resides in each power module.

However, if the PPMC PCA board that contains the calibration switches has been replaced, any calibration password that has been set will be lost. Passwords that are used to prevent access to the front panel Admin menu will also be lost.

The calibration password will automatically be reset to the factory default, which is zero (0). Front panel access to the Admin menu will be unrestricted unless a password is set.

Refer to the User's Guide for information on setting the calibration password as well as the Admin menu password.

Initialization

The power system's model number, serial number, and other constants that are required to program the instrument are stored in an EEPROM on the PPMC PCA board. If this board is replaced, the instrument must be re-initialized.

To initialize the power system, you must send the following information to the power system over the interface:

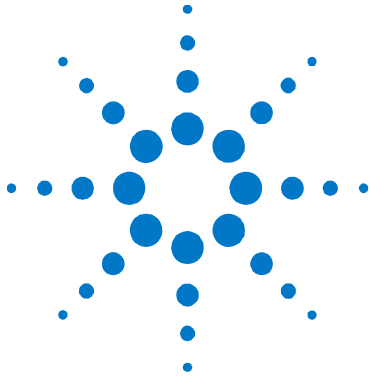
```
DIAGnostic:FRAME:ATTRibute "ModelNumber", "value"
```

where "value" is the model number, e.g. N6705A.

```
DIAGnostic:FRAME:ATTRibute "SerialNumber", "value"
```

where "value" is the serial number located on top of the interface cover.

At power-up, the power system will go through the turn-on self test sequence. All other parameters will be set to the factory defaults. The mainframe is now initialized.



6 Replaceable Parts

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The following table documents the replaceable assemblies and parts.
The diagrams show the location of the parts.

Parts List

Reference Designator	Part number	Description
Electrical Assemblies		
A1	N6705-60101	Tested PPMC large PCA for the N6705A
A2	N6705-60102	Tested Bias PCA for N6705A
A3	N6705-60103	Tested Front Panel PCA for N6705A
A4	N6705-60104	Tested Binding Post PCA for N6705A
A5	N6705-60105	Tested PWR-SPLY 1200W SINGLE-OUTPUT
A6	N6705-60106	Tested PPMC w/o USB PCA for the N6705A
Individual Parts		
1	5002-2853	Side cover (qty 2)
2	5002-2855	Bottom cover
3	5002-2856	Top cover
4	5040-1741	Window
5	5040-1745	Keypad
6	54801-47401	12mm grey knob (qty 5)
7	54801-47402	18 mm grey knob (qty 2)
8	E3631-20011	Red biding post (qty 8)
9	E3631-20012	Black binding post (qty 8)
10	3101-4076	AC switch
11	54810-03702	Tilt stand
12	54810-61001	Foot assembly (qty 4)
13	5002-2851	Rear panel
14	5002-2852	Sub panel
15	1253-7050	AC plug
16	5002-2850	Chassis top
17	5002-2857	Deflector (qty 4)
18	5040-1742	Insulator backplane (qty 2)
19	5065-7094	Backplane 1 PCA
20	5065-7095	Backplane 2 PCA
21	5067-2520	Fan assembly
22	5040-1740	Bulk shroud
23	5040-1744	Top AC shroud
24	5185-8830	AC Shroud
25	5002-2849	Chassis bottom
26	5067-2522	Trigger PCA
27	5067-2562	ASSY-Inverter PCA and Bracket
28	2090-0943	Display
29	5040-1743	Front frame
30	0510-1350	Push-on retainer

Reference Designator	Part number	Description
Cables		
31	5185-8809	AC in cable
32	E5810-61605	GPIO and Cable
33	5185-8811	Rail cable
34	5185-8812	Sense cable
35	5185-8813	Bias to P1000 cable
36	5185-8819	FFC cable (qty 2)
37	5185-8821	FFC Cable (front panel to display)
38	5185-8810	Bulk to switch cable
39	5185-8823	FFC Cable (front panel to PPMC)
40	N1912-61002	Backlight cable assembly
41	5185-8824	Bulk ground wire
Handle Assembly and Label		
42	E4400-40018	End cap
43	E6601-21033	Handle retainer
44	N6705-60002	Strap handle
45	N6705-60003	Strap insert
46	N6705-80001	Mainframe label

Parts Location Diagrams

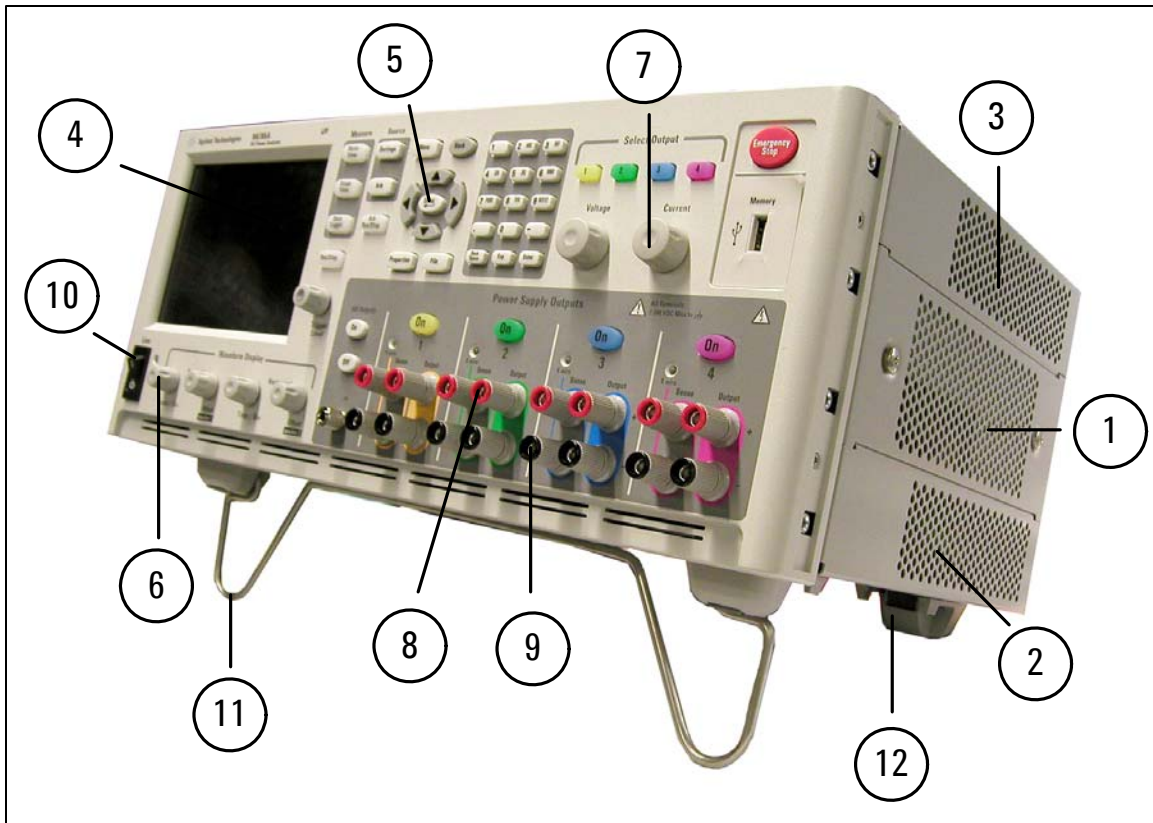


Figure 6-1. External Parts

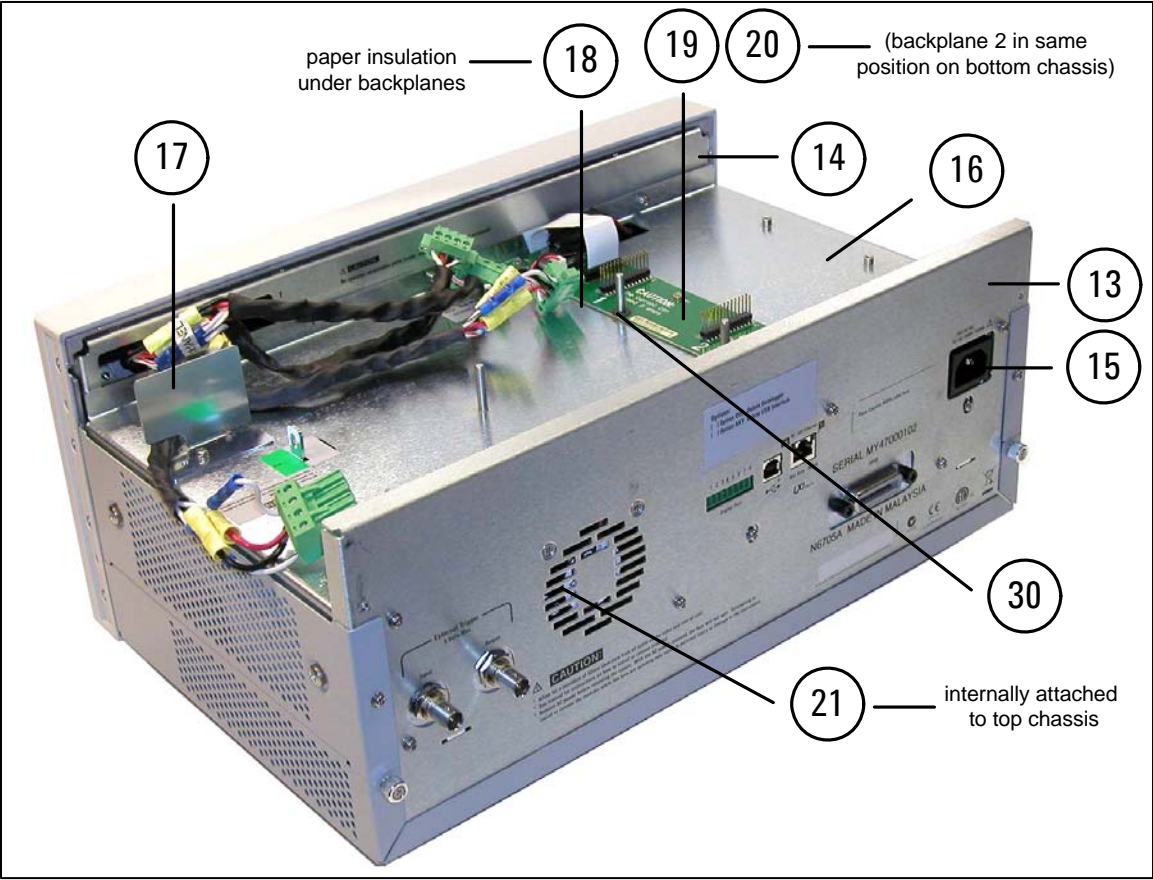


Figure 6-2. Top Cover Removed

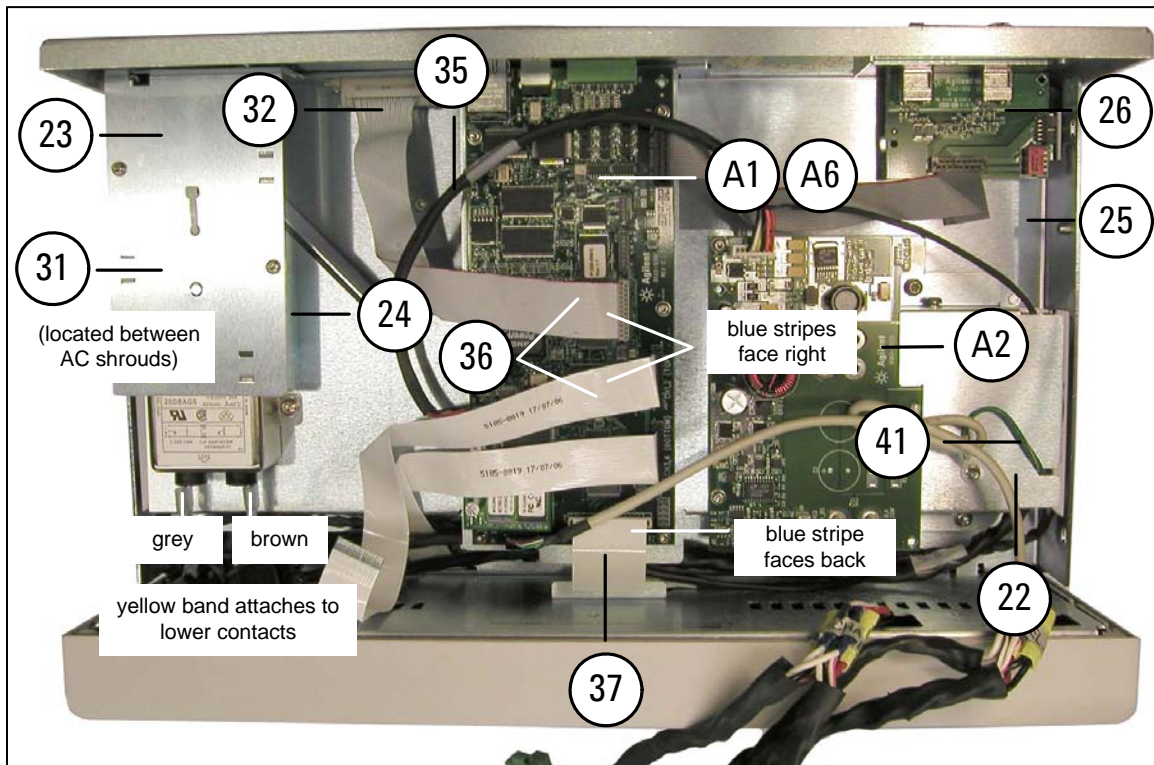


Figure 6-3. Top Chassis Removed

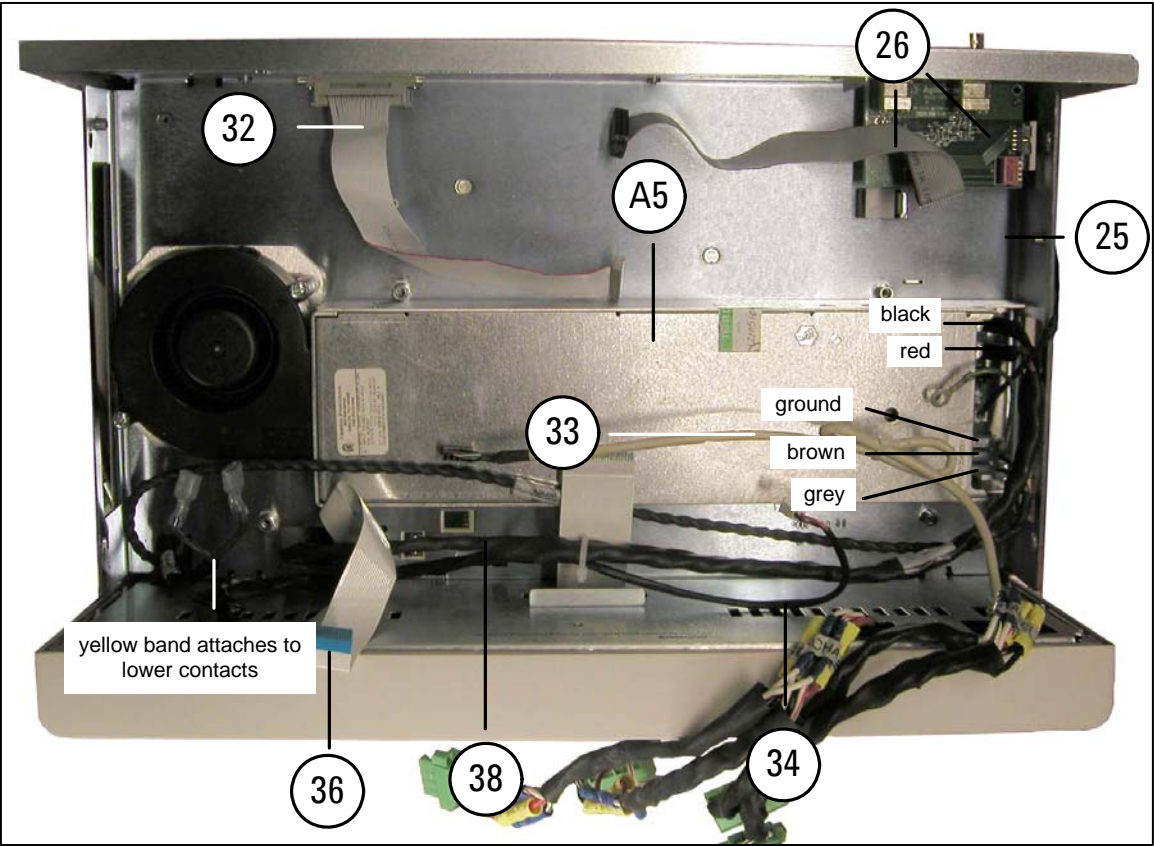


Figure 6-4. Bulk Shroud Removed

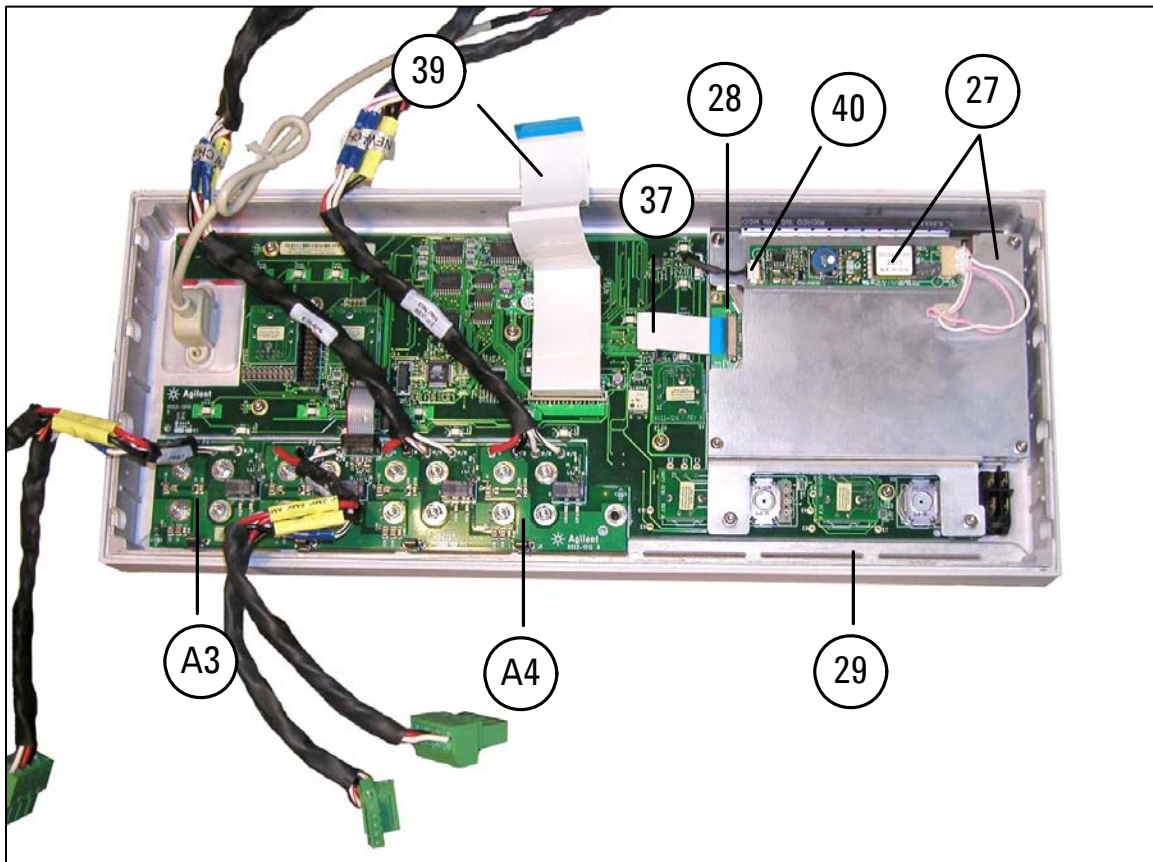


Figure 6-5. Front Panel

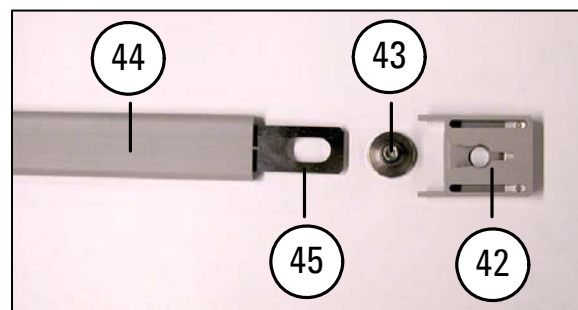
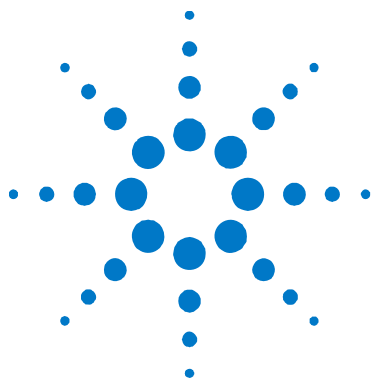


Figure 6-6. Handle Assembly



Appendix A

Error Messages

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Error List	90

This appendix gives the error numbers and descriptions that are returned by the Agilent N6705 DC Power Analyzer.

Error messages can be displayed on the front panel and also read back programmatically.

Displaying Error Messages

The instrument beeps each time a command syntax or hardware error is generated. The front-panel **ERR** annunciator turns on when one or more errors are currently stored in the SCPI error queue.

Front Panel:	SCPI Command:
Press the Error key.	SYST:ERR?
If errors appear, use the navigation keys to scroll through the list.	

Errors are cleared as they are read. When all errors have been read, the **ERR** annunciator turns off and the error queue is cleared.

Error List

Error	Device-dependent Errors (these errors set Standard Event Status register bit #3)
0	No error This is the response to the ERR? query when there are no errors.
100	Too many channels You have specified more channels than are installed in the mainframe.
101	Calibration state is off Calibration is not enabled. The instrument will not accept calibration commands.
102	Calibration password is incorrect The calibration password is incorrect.
103	Calibration is inhibited by switch setting Calibration mode is locked out by the calibration switch.
104	Bad sequence of calibration commands Calibration commands have not been entered in the proper sequence.
105	Unexpected output current The measured output current is outside the acceptable range.
106	Zero measurement out of range error The "zero" measurement value is outside the acceptable range.
107	Programming cal constants out of range The programmed calibration constant is outside the acceptable range.
108	Measurement cal constants out of range The measurement calibration constant is outside the acceptable range.
109	Over voltage cal constants out of range The over voltage calibration constant is outside the acceptable range.
110	Wrong V+I The instrument was unable to set the correct voltage or current value.
111	Aux vloc cal constants out of range Calibration constants on the internal auxiliary local ADC are outside the acceptable range.
112	Aux vrem cal constants out of range Calibration constants on the internal auxiliary remote ADC are outside the acceptable range.
113	Aux imon cal constants out of range Calibration constants on the internal auxiliary imon ADC are outside the acceptable range.

Device-dependent Errors (continued)	
200	Hardware error channel <channel> A hardware error has occurred on the specified channel.
201	Invalid configuration, empty slots There is an empty slot between modules. This configuration is not allowed.
202	Selftest Fail A selftest failure has occurred. See selftest failure list for details.
203	Compatibility function not implemented The requested compatibility function is not available.
204	NVRAM checksum error A checksum error has occurred in the instrument's nonvolatile random access memory.
205	NVRAM full The nonvolatile random access memory of the instrument is full.
206	File not found The internal calibration file or the internal channel attribute file was not found in NVRAM.
207	Cal file version error The calibration file was written or read using old firmware. Firmware must be updated.
302	Option not installed The option that is programmed by this command is not installed.
303	There is not a valid acquisition to fetch from There is no valid data in the measurement buffer.
304	Volt and curr in incompatible transient modes Voltage and current cannot be in Step and List mode at the same time.
305	A triggered value is on a different range A triggered value is on a different range than the one that is presently set.
306	Too many list points Too many list points have been specified.
307	List lengths are not equivalent One or more lists are not the same length.
308	This setting cannot be changed while transient trigger is initiated Setting cannot be changed while the instrument is waiting for or executing a trigger sequence.
309	Cannot initiate, voltage and current in fixed mode Cannot initiate the transient generator because either the voltage or the current function is set to Fixed mode.
Command Errors (these errors set Standard Event Status register bit #5)	
-100	Command error Generic syntax error.
-101	Invalid character An invalid character was found in the command string.
-102	Syntax error Invalid syntax was found in the command string. Check for blank spaces.
-103	Invalid separator An invalid separator was found in the command string. Check for proper use of , ; :
-104	Data type error A different data type than the one allowed was found in the command string.
-105	GET not allowed A group execute trigger is not allowed in a command string.

Command Errors (continued)	
–108	Parameter not allowed More parameters were received than were expected.
–109	Missing parameter Fewer parameters were received than were expected.
–110	Command header error An error was detected in the header.
–111	Header separator error A character that was not a valid header separator was found in the command string.
–112	Program mnemonic too long The header contains more than 12 characters.
–113	Undefined header A command was received that was not valid for this instrument.
–114	Header suffix out of range The value of the numeric suffix is not valid.
–120	Numeric data error Generic numeric data error.
–121	Invalid character in number An invalid character for the data type was found in the command string.
–123	Exponent too large The magnitude of the exponent was larger than 32000.
–124	Too many digits The mantissa of a numeric parameter contained more than 255 digits, excluding leading zeros.
–128	Numeric data not allowed A numeric parameter was received but a character string was expected.
–130	Suffix error Generic suffix error
–131	Invalid suffix A suffix was incorrectly specified for a numeric parameter.
–134	Suffix too long The suffix contains more than 12 characters.
–138	Suffix not allowed A suffix is not supported for this command.
–140	Character data error Generic character data error
–141	Invalid character data Either the character data element contains an invalid character, or the element is not valid.
–144	Character data too long The character data element contains more than 12 characters.
–148	Character data not allowed A discrete parameter was received, but a string or numeric parameter was expected.
–150	String data error Generic string data error
–151	Invalid string data An invalid character string was received. Check that the string is enclosed in quotation marks.
–158	String data not allowed A character string was received, but is not allowed for this command.

Command Errors (continued)	
–160	Block data error Generic block data error
–161	Invalid block data The number of data bytes sent does not match the number of bytes specified in the header.
–168	Block data not allowed Data was sent in arbitrary block format but is not allowed for this command.
–170	Expression error Generic expression error
–171	Invalid expression data The expression data element was invalid.
–178	Expression data not allowed Expression data element was sent but is not allowed for this command.
Execution Errors (these errors set Standard Event Status register bit #4)	
–200	Execution error Generic syntax error
–220	Parameter error A data element related error occurred.
–221	Settings conflict A data element could not be executed because of the present instrument state.
–222	Data out of range A data element could not be executed because the value was outside the valid range.
–223	Too much data A data element was received that contains more data than the instrument can handle.
–224	Illegal parameter value An exact value was expected but not received.
–225	Out of memory The device has insufficient memory to perform the requested operation.
–226	Lists not same length One or more lists are not the same length.
–230	Data corrupt or stale Possible invalid data. A new reading was started but not completed.
–231	Data questionable The measurement accuracy is suspect.
–232	Invalid format The data format or structure is inappropriate.
–233	Invalid version The version of the data format is incorrect to the instrument.
–240	Hardware error The command could not be executed because of a hardware problem with the instrument.
–241	Hardware missing The command could not be executed because of missing hardware, such as an option.
–260	Expression error An expression program data element related error occurred.
–261	Math error in expression An expression program data element could not be executed due to a math error.

Query Errors (these errors set Standard Event Status register bit #2)	
-400	Query Error Generic error query
-410	Query INTERRUPTED A condition causing an interrupted query error occurred.
-420	Query UNTERMINATED A condition causing an unterminated query error occurred.
-430	Query DEADLOCKED A condition causing a deadlocked query error occurred.
-440	Query UNTERMINATED after indefinite response A query was received in the same program message after a query indicating an indefinite response was executed.
Selftest Errors (these errors set Standard Event Status register bit #3)	
202	Selftest Fail Aux Adc 0 expected <n1> to <n2>, measured <n3>, chan <n4> Auxiliary ADC failed. n1 and n2 are the expected limits. n3 is the measured value. n4 is the channel location of the failed module.
202	Selftest Fail DACs 0 expected <n1> to <n2>, measured <n3>, chan <n4> Both voltage and current DACs are at zero. n1 and n2 are the expected limits. n3 is the measured value. n4 is the channel location of the failed module.
202	Selftest Fail DACs 1 expected <n1> to <n2>, measured <n3>, chan <n4> Voltage DAC is at zero; current DAC is at full scale. n1 and n2 are the expected limits. n3 is the measured value. n4 is the channel location of the failed module.
202	Selftest Fail DACs 2 expected <n1> to <n2>, measured <n3>, chan <n4> Voltage DAC is at full scale; current DAC is at zero. n1 and n2 are the expected limits. n3 is the measured value. n4 is the channel location of the failed module.
202	Selftest Fail DACs 3 expected <n1> to <n2>, measured <n3>, chan <n4> Both voltage and current DACs are at full scale. n1 and n2 are the expected limits. n3 is the measured value. n4 is the channel location of the failed module.

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