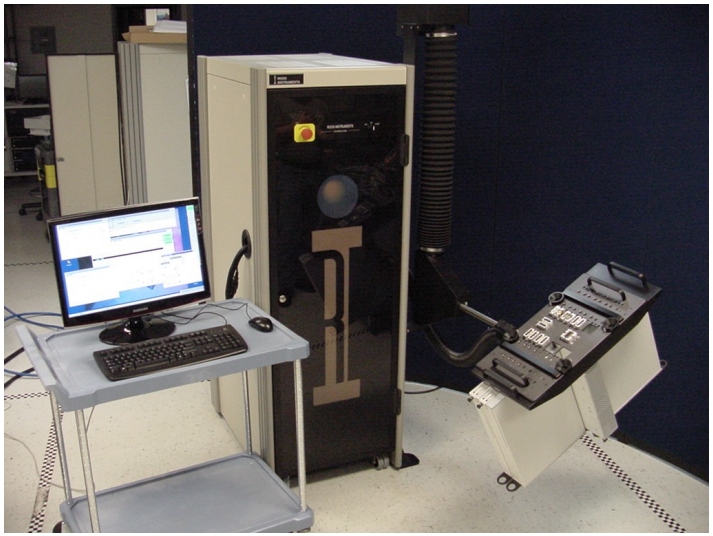
CASSINI RF/ Microwave ATE System Application Development by Example



LNA Tests

- DC Currents & Beta
- S11, S21, S12 & S22
- Noise Figure
- P1dB
- Intermodulation Distortion
- Harmonics

Search Measurements

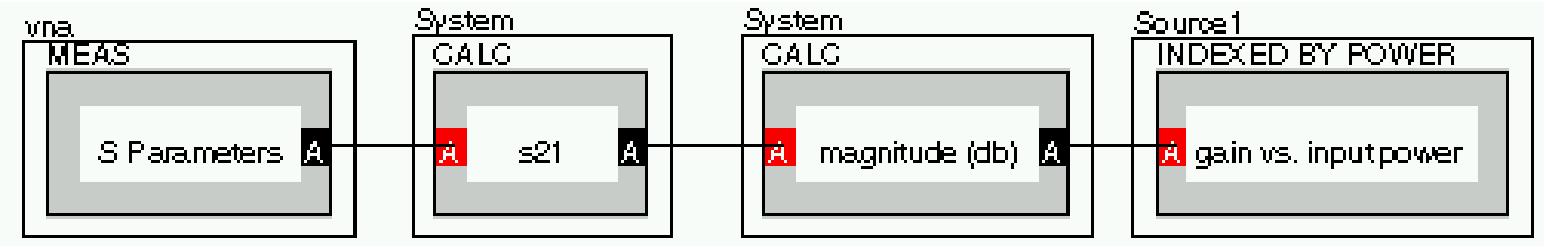
- Dependent and Independent Variable
- Collect appropriate data
- Curve fit
- Find desired dependent condition
- Retrieve associated independent stimulus

P1dB, Step 1 and 2

- Measure the small signal gain, in this case 10 dB
- Subtract 1 from the value to establish the "target compression gain" in this case 9 dB

P1dB Step 3

- Measure gain at a number of Source 1 input power levels, saving the measured gains, indexed by Source 1 Power.



P1dB Step 3 (Continued)

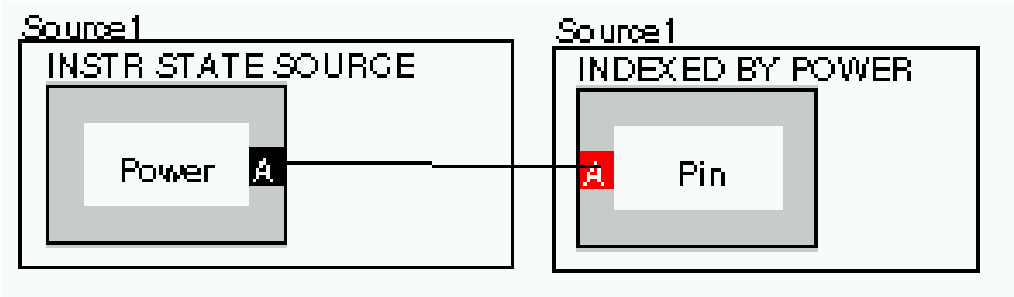
- The index value is actually not the Source 1 power value, It is the "N" as in the Nth value of the Source 1 power used

Index, Gain
1, 10
2, 10
3, 10
4, 10
5, 10
6, 9.7
7, 9.2
8, 8.4
9, 7.5
10, 6.5
11, 5.5

P1dB Step 4

- Save the second array, Source 1 power, also indexed by Source 1 Power

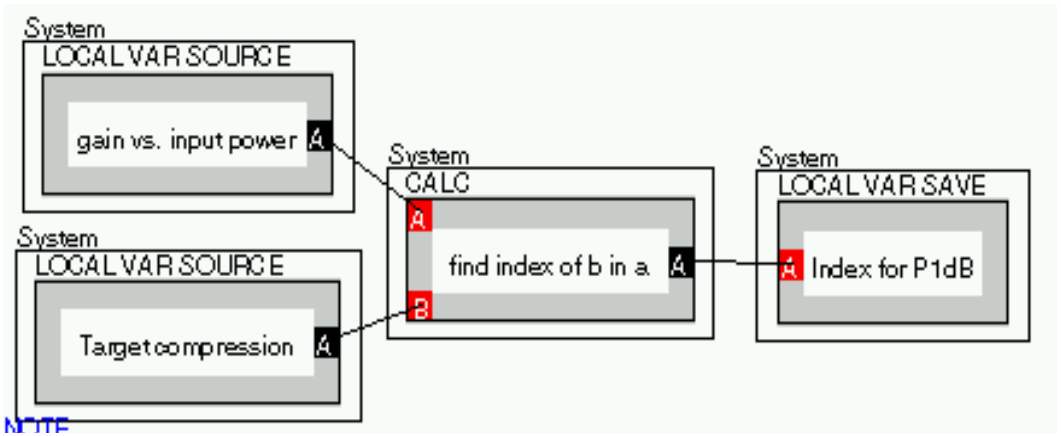
Index	Pin
1	-30
2	-29
3	-28
4	-27
5	-26
6	-25
7	-24
8	-23
9	-22
10	-21
11	-20



P1dB Step 5

- Find fractional index for P1dB (9 dB)
- This is an index of approximately 7.2

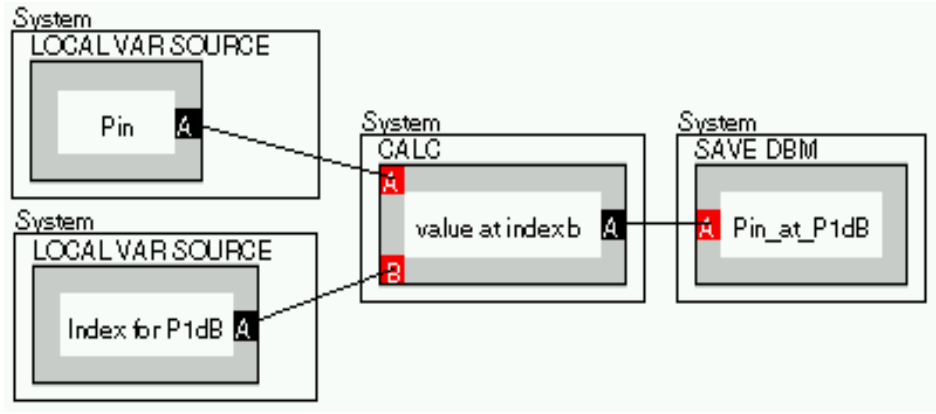
Index, Gain
1, 10
2, 10
3, 10
4, 10
5, 10
6, 9.7
7, 9.2
8, 8.4
9, 7.5
10, 6.5
11, 5.5



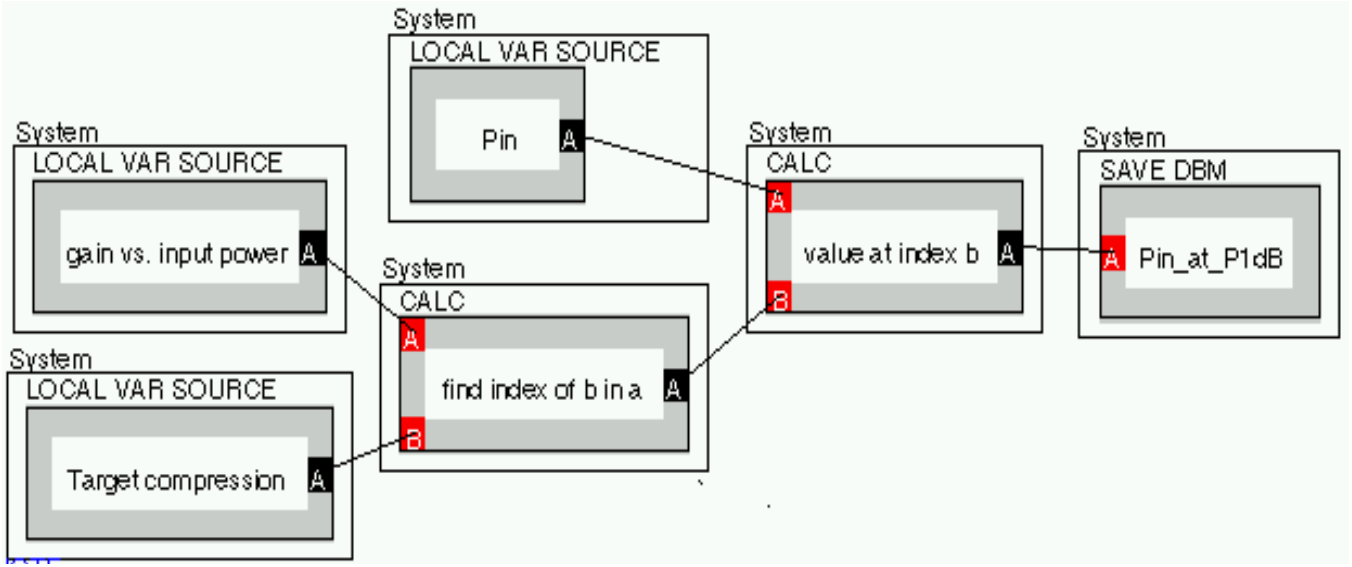
P1dB Step 6

- Extract Pin for that index. (~ -23.8 dBm)

Index	Pin
1	−30
2	−29
3	−28
4	−27
5	−26
6	−25
7	−24
8	−23
9	−22
10	−21
11	−20



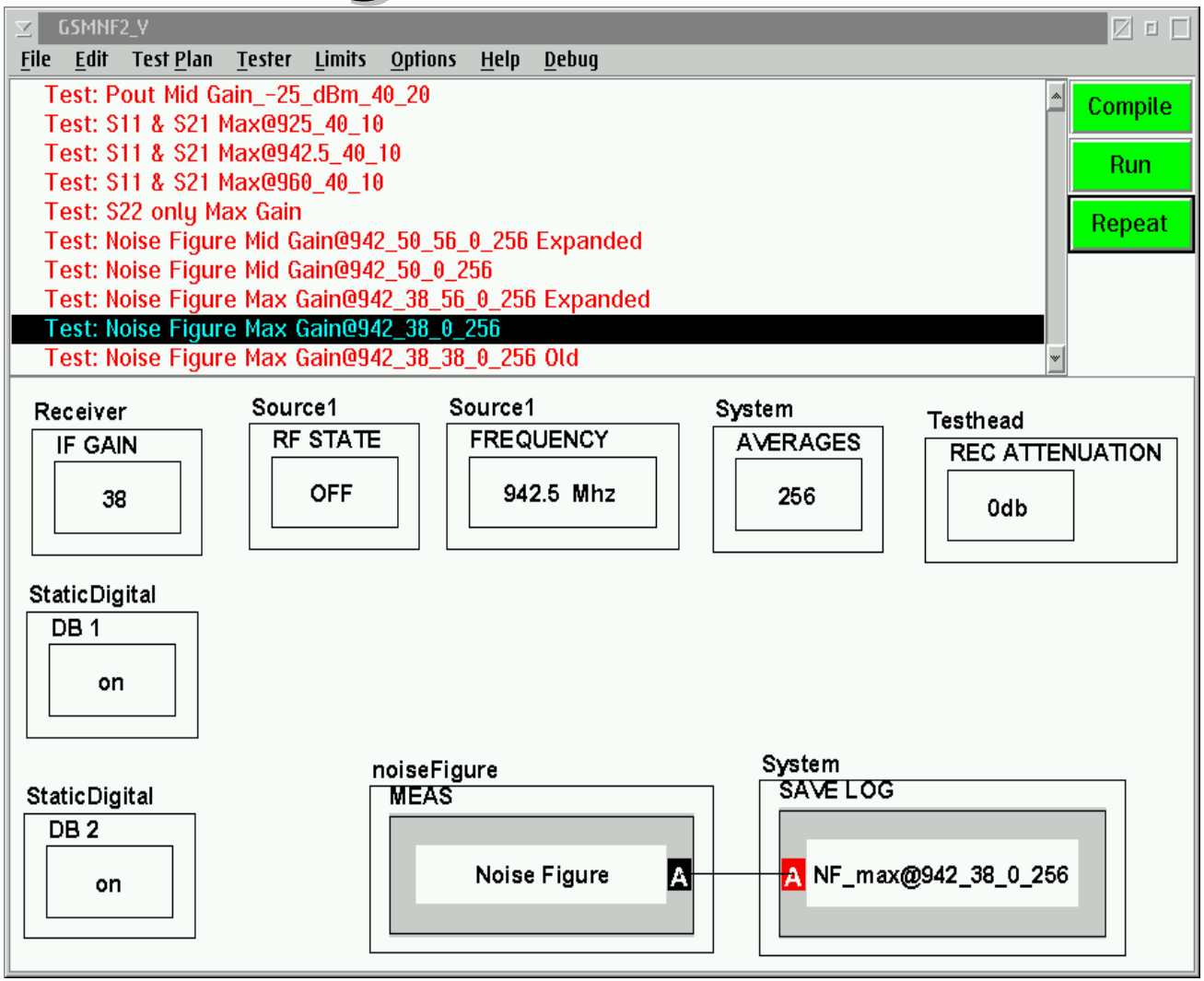
P1db Calculation



Measuring Noise Figure

- Set RF Source 1 to Device Input Freq.
- Set Receive Attenuation to 0 dB
- Set IF Filter Bandwidth to wide/4 MHz
- Set IF Gain for Hot Noise Measurement
  System Automatically sets IF Gain 6 dB Higher for Cold Noise Measurement

Noise Figure Measurement



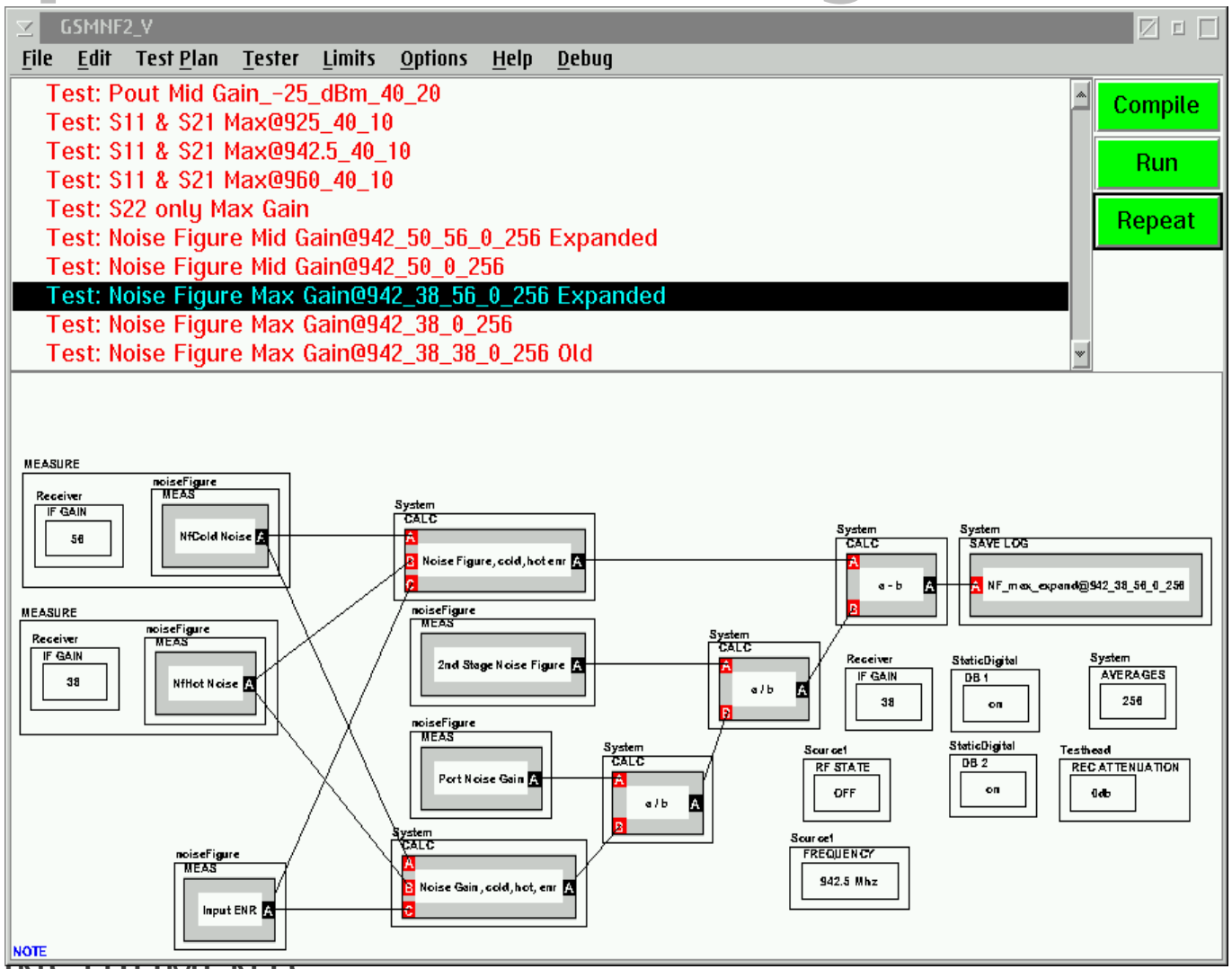
Expanded Noise Figure Measurement

- Set RF Source 1 to Device Input Freq.
- Set Receive Attenuation to 0 dB
- Set IF Filter Bandwidth to wide/4 MHz
- Set IF Gain for Hot Noise Measure
- Set IF Gain **+6**,**+12** or **+18** dB higher for Cold Noise Measurement

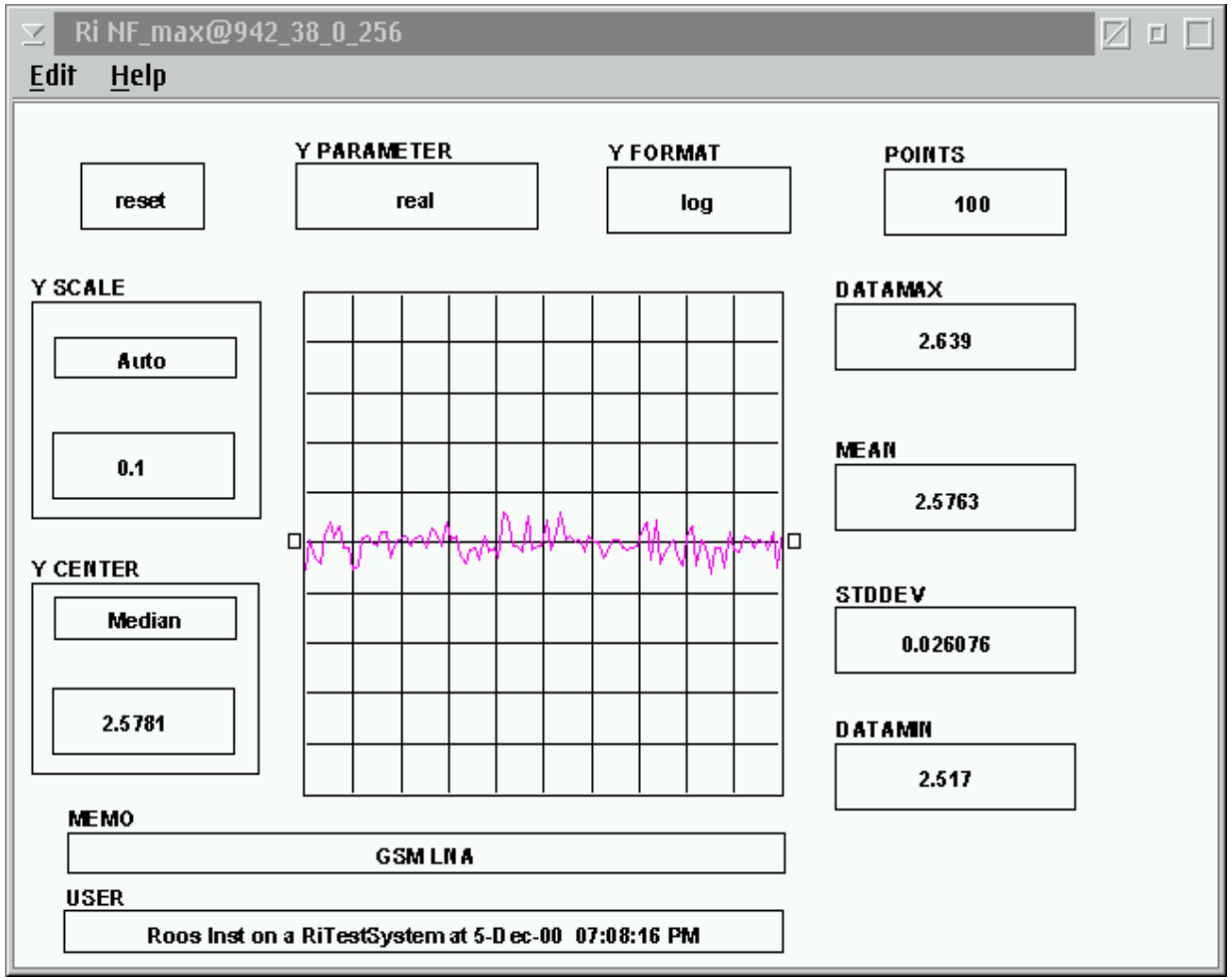
Expanded Noise Figure Calculating Device Noise Figure

- F1 = F12 - (F2 - 1)/G1
- F1 = Device Noise Figure
- F2 = Tester/Second Stage Noise Figure
- F12 = Measured Noise Figure
- G1 = Device Noise Gain

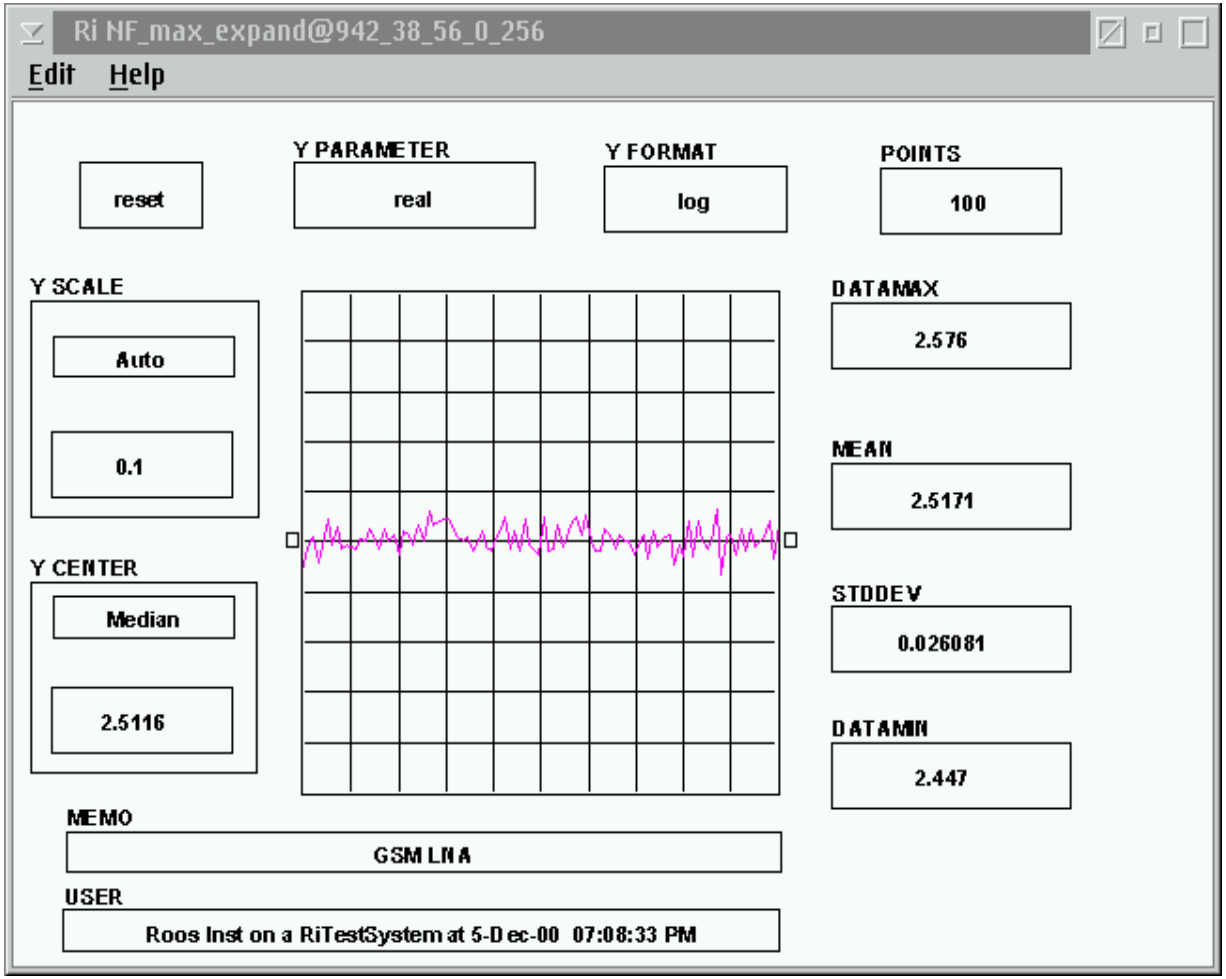
Expanded Noise Figure



Noise Figure Measurement IF Gain +6 dB higher for Cold

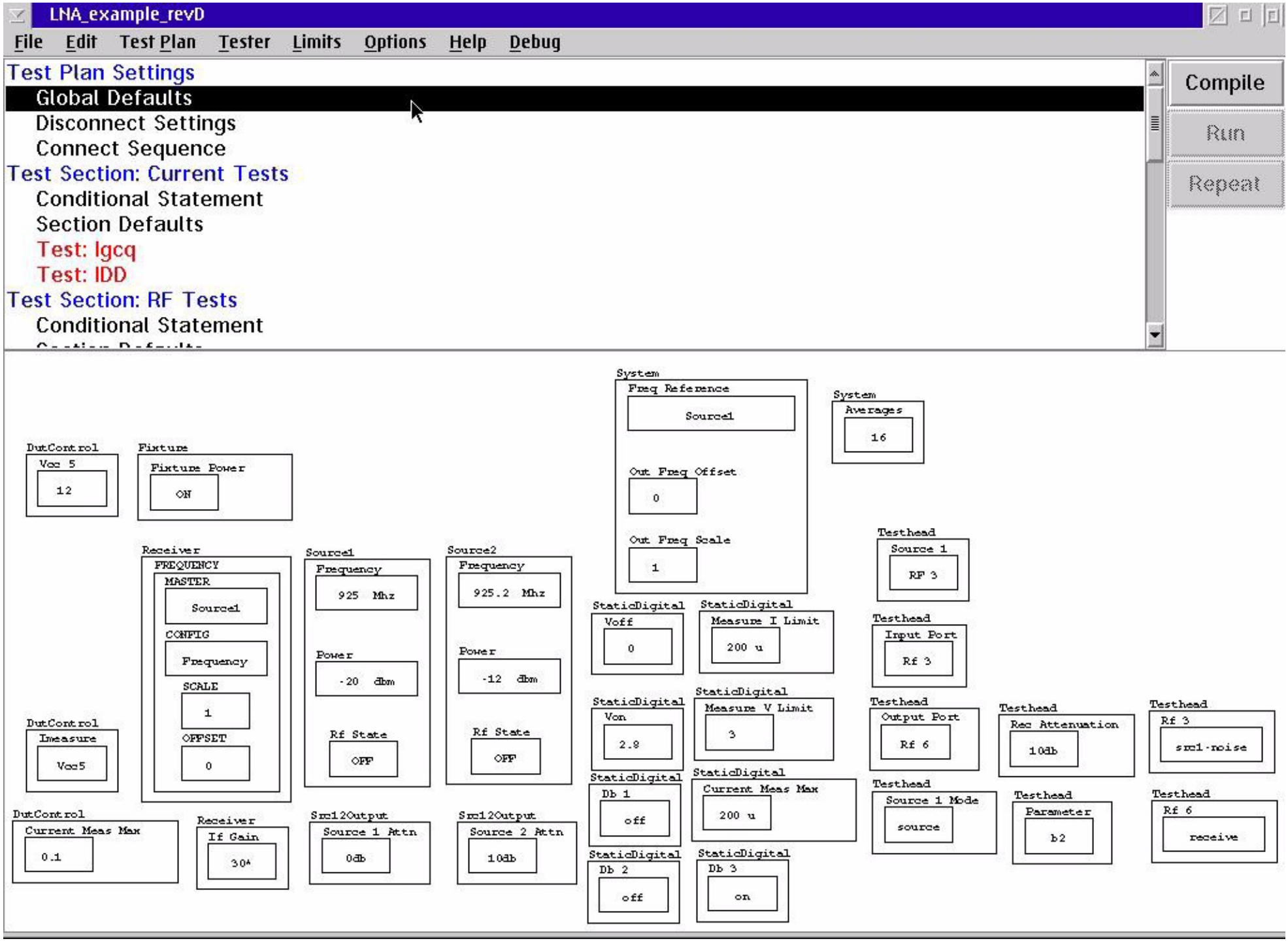


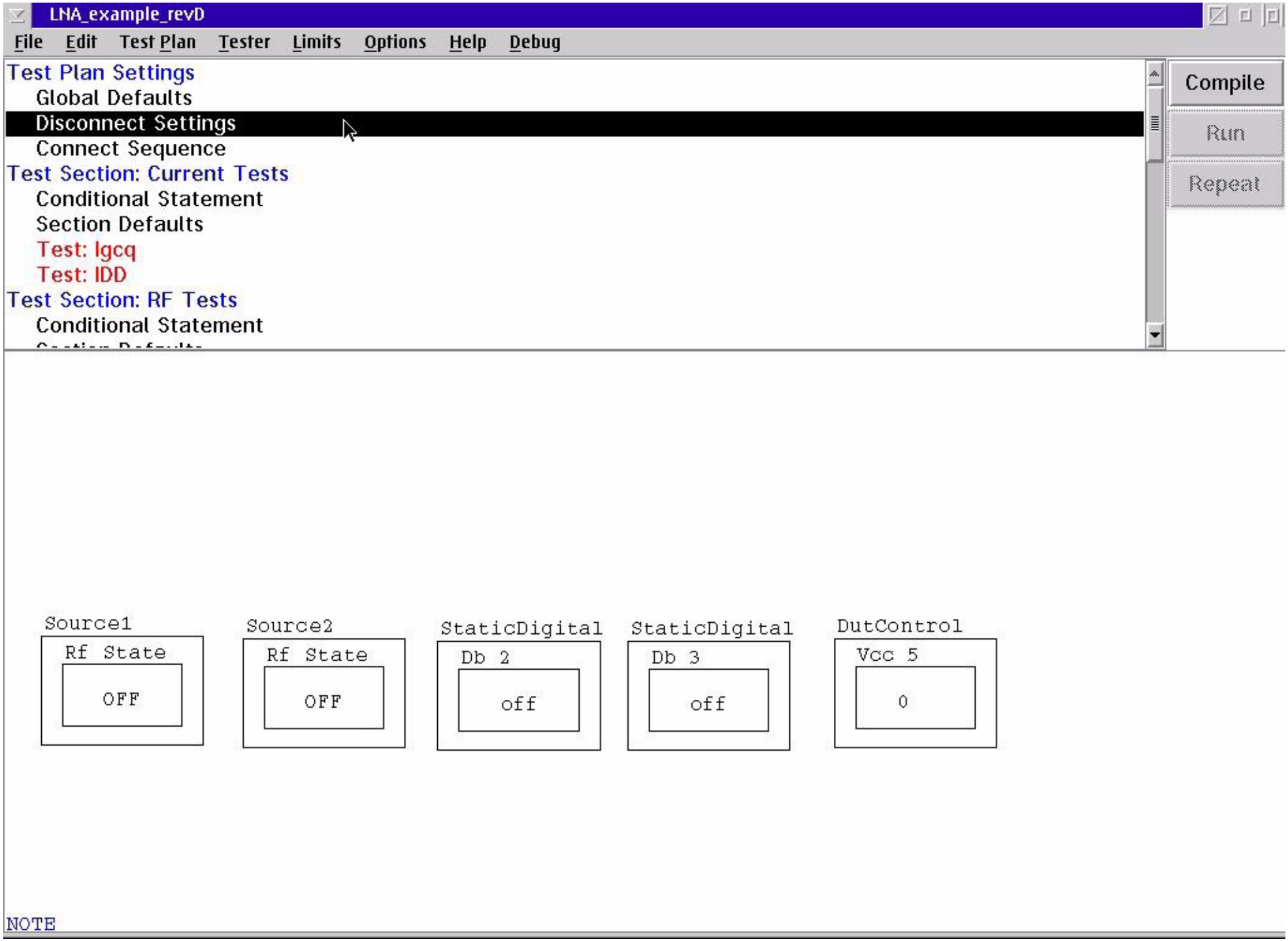
Expanded Noise Figure
IF Gain set for Hot & Cold



Example LNA Test Plan

CASSINI Simulator - Examine Test Plan


LNA_example_revD
File
Edit
Test Plan
Tester
Limits
Options
Help
Debug
Test Plan Settings
Global Defaults
Disconnect Settings
Connect Sequence
Test Section: Current Tests
Conditional Statement
Section Defaults
Test: Igcq
Test: IDD
Test Section: RF Tests
Conditional Statement
Compile
Run
Repeat
System
Freq Reference
Source1
Out Freq Offset
0
Out Freq Scale
1
System
Averages
16
DutControl
Vcc 5
12
Fixture
Fixture Power
ON
Receiver
FREQUENCY
MASTER
Source1
CONFIG
Frequency
SCALE
1
OFFSET
0
Source1
Frequency
925 Mhz
Power
-20 dbm
Rf State
OFF
Source2
Frequency
925.2 Mhz
Power
-12 dbm
Rf State
OFF
Testhead
Source 1
RF 3
StaticDigital
Voff
0
StaticDigital
Measure I Limit
200 u
Testhead
Input Port
Rf 3
StaticDigital
Von
2.9
StaticDigital
Measure V Limit
3
Testhead
Output Port
Rf 6
Testhead
Rec Attenuation
10db
Testhead
Rf 3
src1-noise
DutControl
Imeasure
Vcc5
StaticDigital
Db 1
off
StaticDigital
Current Meas Max
200 u
Testhead
Source 1 Mode
source
Testhead
Parameter
b2
Testhead
Rf 6
receive
DutControl
Current Meas Max
0.1
Receiver
If Gain
30
Src12Output
Source 1 Attn
0db
Src12Output
Source 2 Attn
10db
StaticDigital
Db 2
off
StaticDigital
Db 3
on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Edit
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Tester
Limits
Options
Help
Debug
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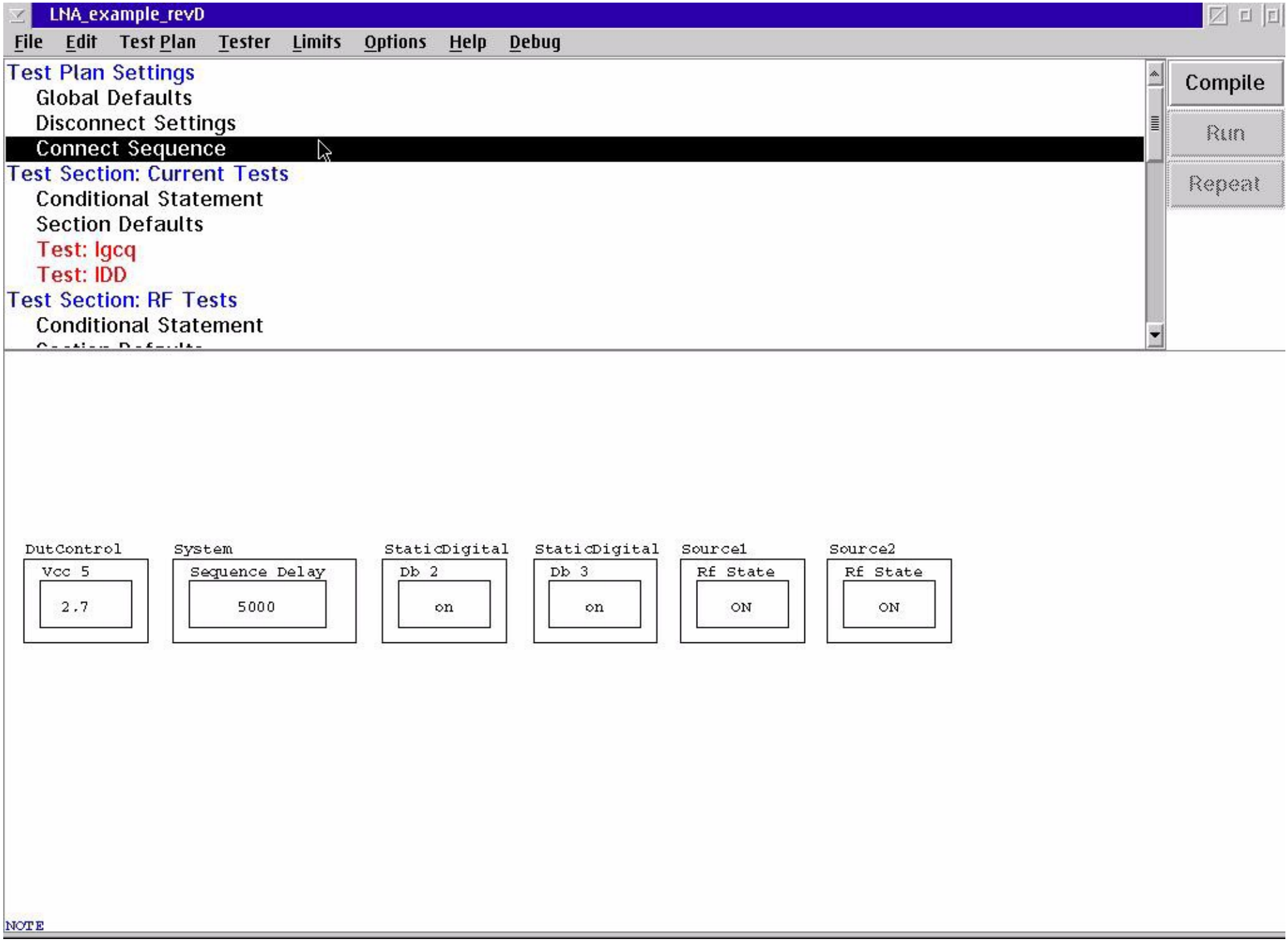
Global Defaults
Disconnect Settings
Connect Sequence
Test Section: Current Tests
Conditional Statement
Section Defaults
Test: Igcq
Test: IDD
Test Section: RF Tests
Conditional Statement
Compile
Run
Repeat
Source1
Rf State
OFF
Source2
Rf State
OFF
StaticDigital
Db 2
off
StaticDigital
Db 3
off
DutControl
Vcc 5
0
NOTE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Options
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Test Plan Settings
Global Defaults
Disconnect Settings
Connect Sequence
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Conditional Statement
Section Defaults
Test: Igcq
Test: IDD
Test Section: RF Tests
Conditional Statement
Compile
Run
Repeat
DutControl
Vcc 5
2.7
System
Sequence Delay
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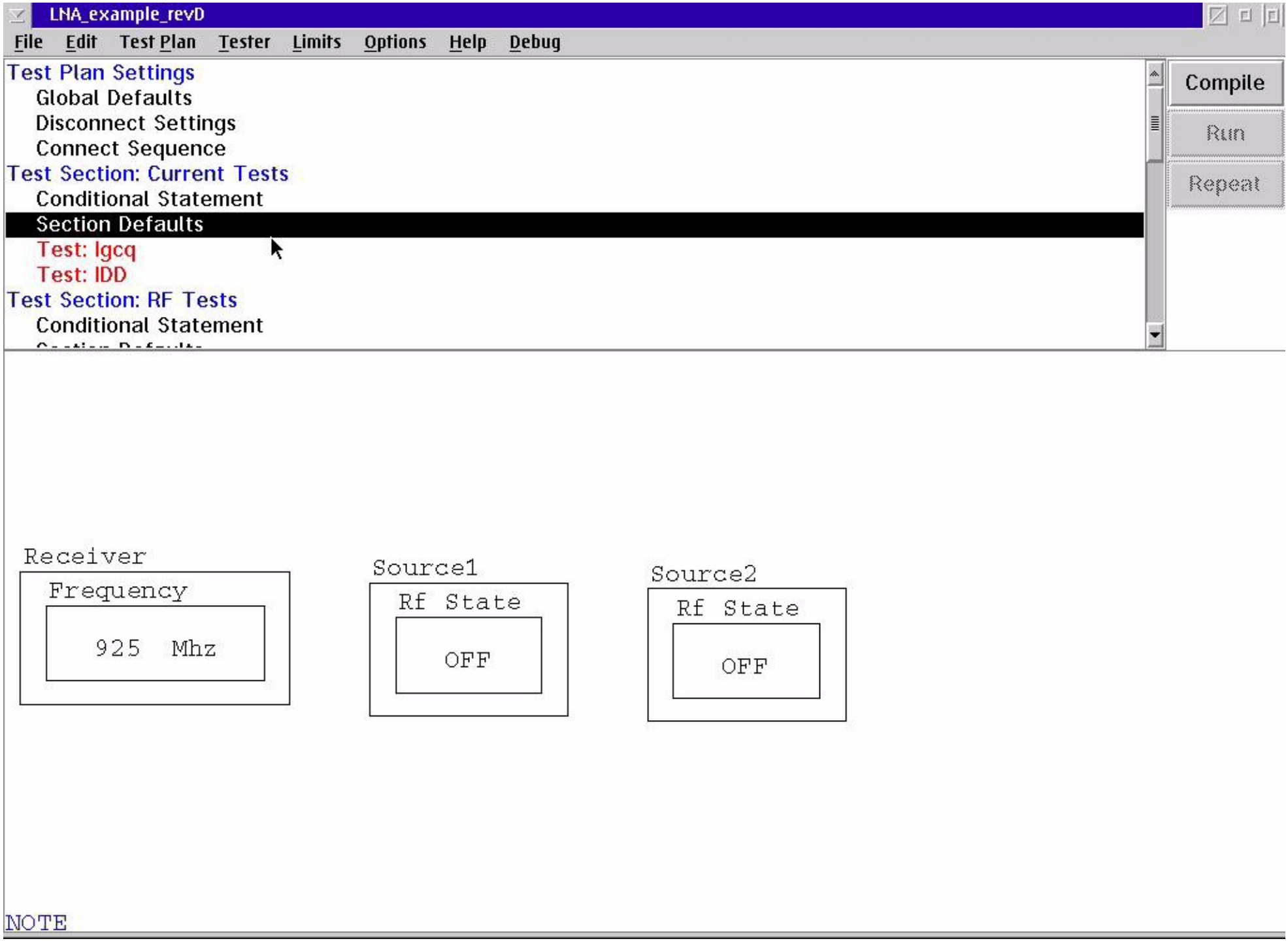
StaticDigital
Db 2
on
StaticDigital
Db 3
on
Source1
Rf State
ON
Source2
Rf State
ON
NOTE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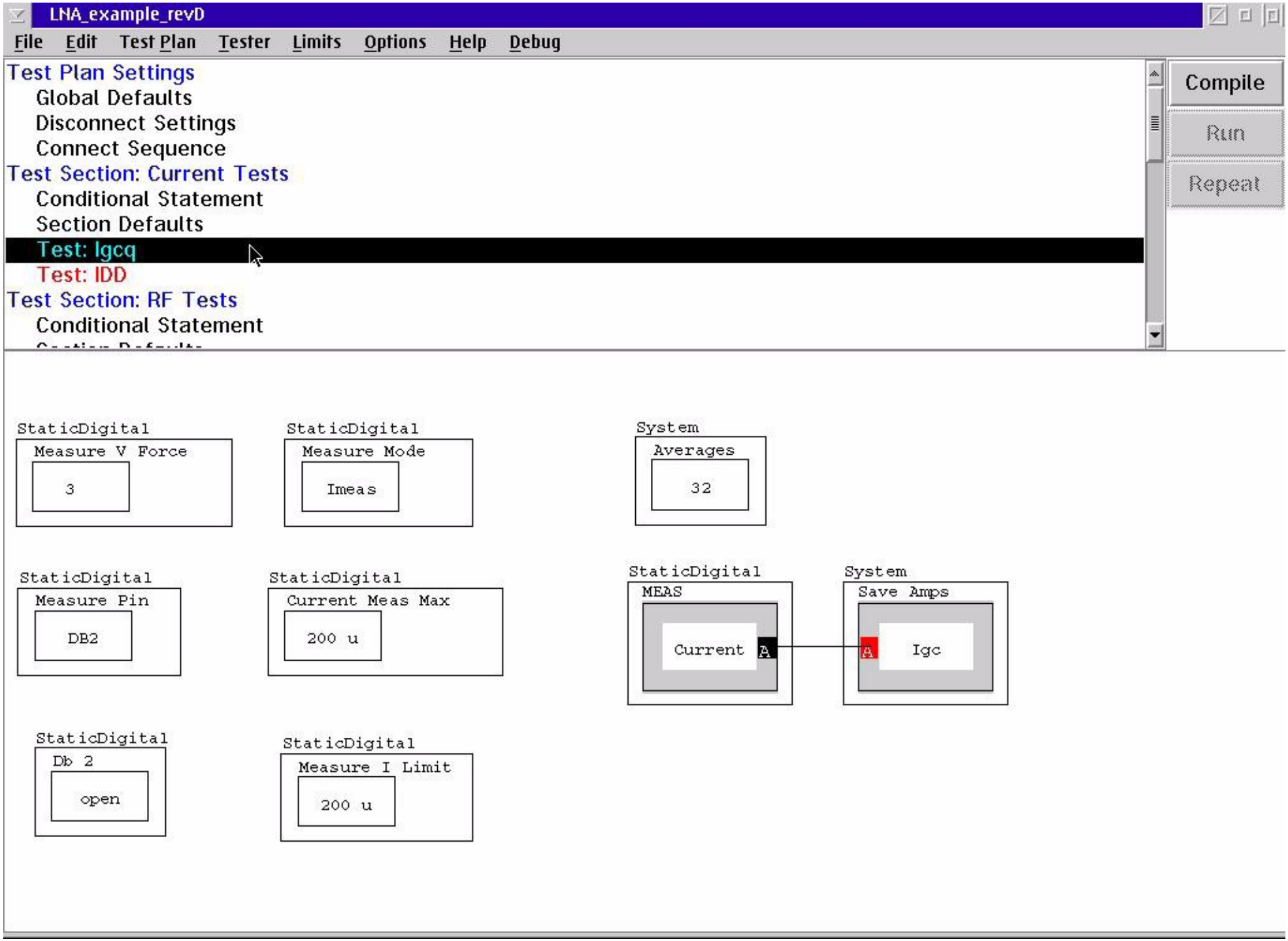
Tester
Limits
Options
Help
Debug
Test Plan Settings
Global Defaults
Disconnect Settings
Connect Sequence
Test Section: Current Tests
Conditional Statement
Section Defaults
Test: Igcq
Test: IDD
Test Section: RF Tests
Conditional Statement
Compile
Run
Repeat
Receiver
Frequency
925 Mhz
Source1
Rf State
OFF
Source2
Rf State
OFF
NOTE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Options
Help
Debug
Test Plan Settings
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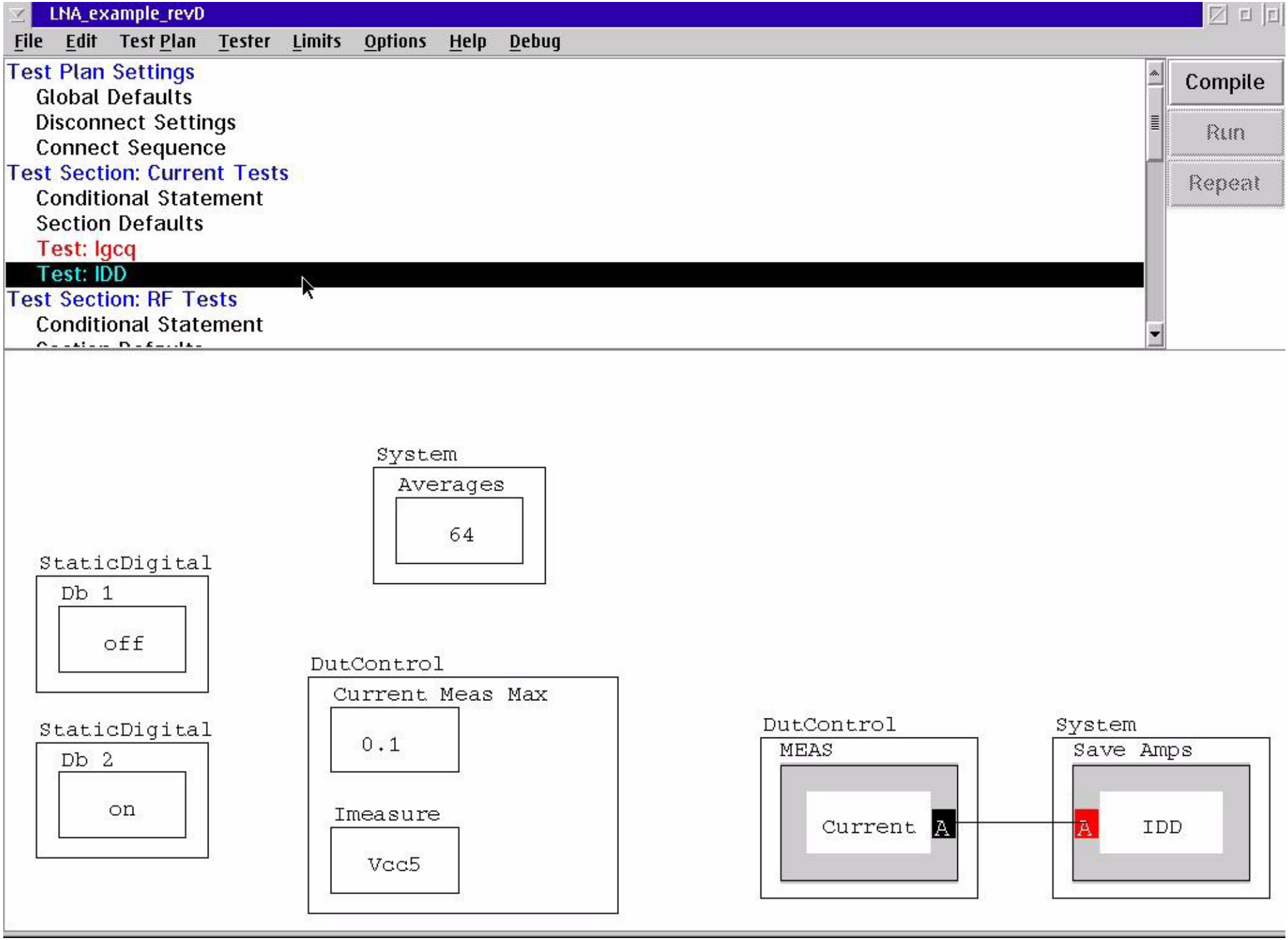
Disconnect Settings
Connect Sequence
Test Section: Current Tests
Conditional Statement
Section Defaults
Test: Igcq
Test: IDD
Test Section: RF Tests
Conditional Statement
Compile
Run
Repeat
StaticDigital
Measure V Force
3
StaticDigital
Measure Mode
Imeas
System
Averages
32
StaticDigital
Measure Pin
DB2
StaticDigital
Current Meas Max
200 u
StaticDigital
MEAS
Current
A
System
Save Amps
A
Igc
StaticDigital
Db 2
open
StaticDigital
Measure I Limit
200 u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Edit
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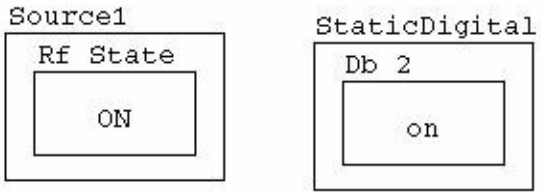
Limits
Options
Help
Debug
Test Plan Settings
Global Defaults
Disconnect Settings
Connect Sequence
Test Section: Current Tests
Conditional Statement
Section Defaults
Test: Igcq
Test: IDD
Test Section: RF Tests
Conditional Statement
Compile
Run
Repeat
System
Averages
64
StaticDigital
Db 1
off
StaticDigital
Db 2
on
DutControl
Current Meas Max
0.1
Imeasure
Vcc5
DutControl
MEAS
Current
A
System
Save Amps
A
IDD

LNA_example_revD

File Edit Test Plan Tester Limits Options Help Debug

Conditional Statement
Section Defaults
Test: Igcq
Test: IDD
Test Section: RF Tests
Conditional Statement
Section Defaults
Test: Gain and Input Return Loss
Test: S22 only
Test: Gain Flatness
Test: Calc Gain Flatness

Compile
Run
Repeat



LNA_example_revD

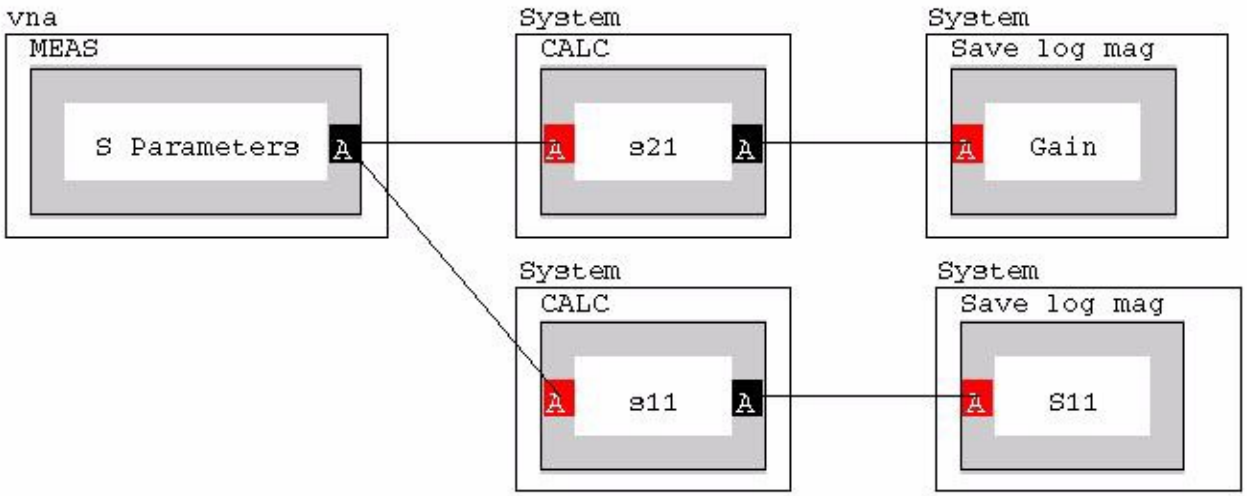
File Edit Test Plan Tester Limits Options Help Debug

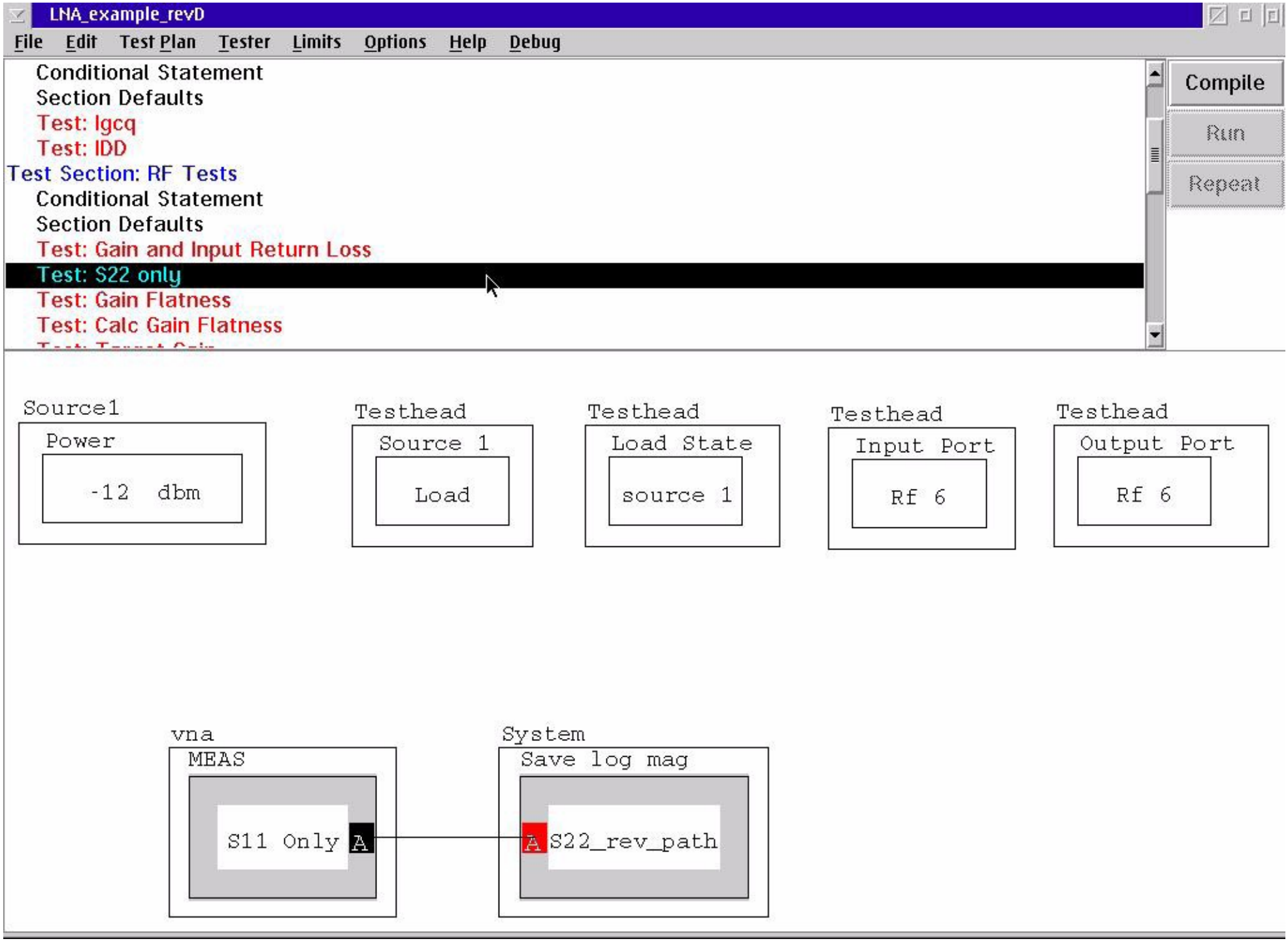
Compile

Run

Repeat

Conditional Statement
Section Defaults
Test: Igcq
Test: IDD
Test Section: RF Tests
Conditional Statement
Section Defaults
Test: Gain and Input Return Loss
Test: S22 only
Test: Gain Flatness
Test: Calc Gain Flatness




LNA_example_revD
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Edit
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Tester
Limits
Options
Help
Debug
Conditional Statement
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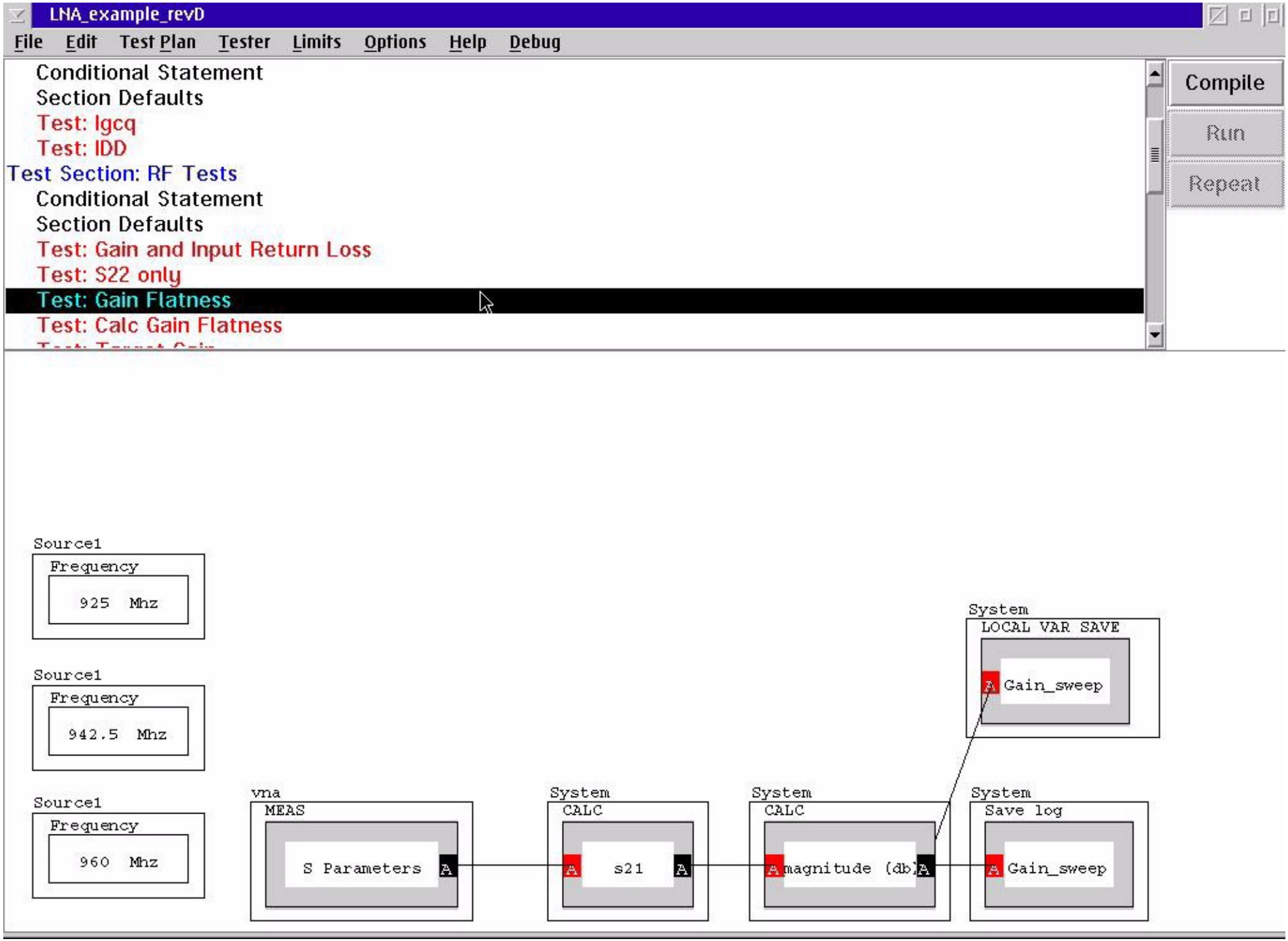
Test: Igcq
Test: IDD
Test Section: RF Tests
Conditional Statement
Section Defaults
Test: Gain and Input Return Loss
Test: S22 only
Test: Gain Flatness
Test: Calc Gain Flatness
Compile
Run
Repeat
Source1
Power
-12 dbm
Testhead
Source 1
Load
Testhead
Load State
source 1
Testhead
Input Port
Rf 6
Testhead
Output Port
Rf 6
vna
MEAS
S11 Only A
System
Save log mag
A S22_rev_path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Edit
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Limits
Options
Help
Debug
Conditional Statement
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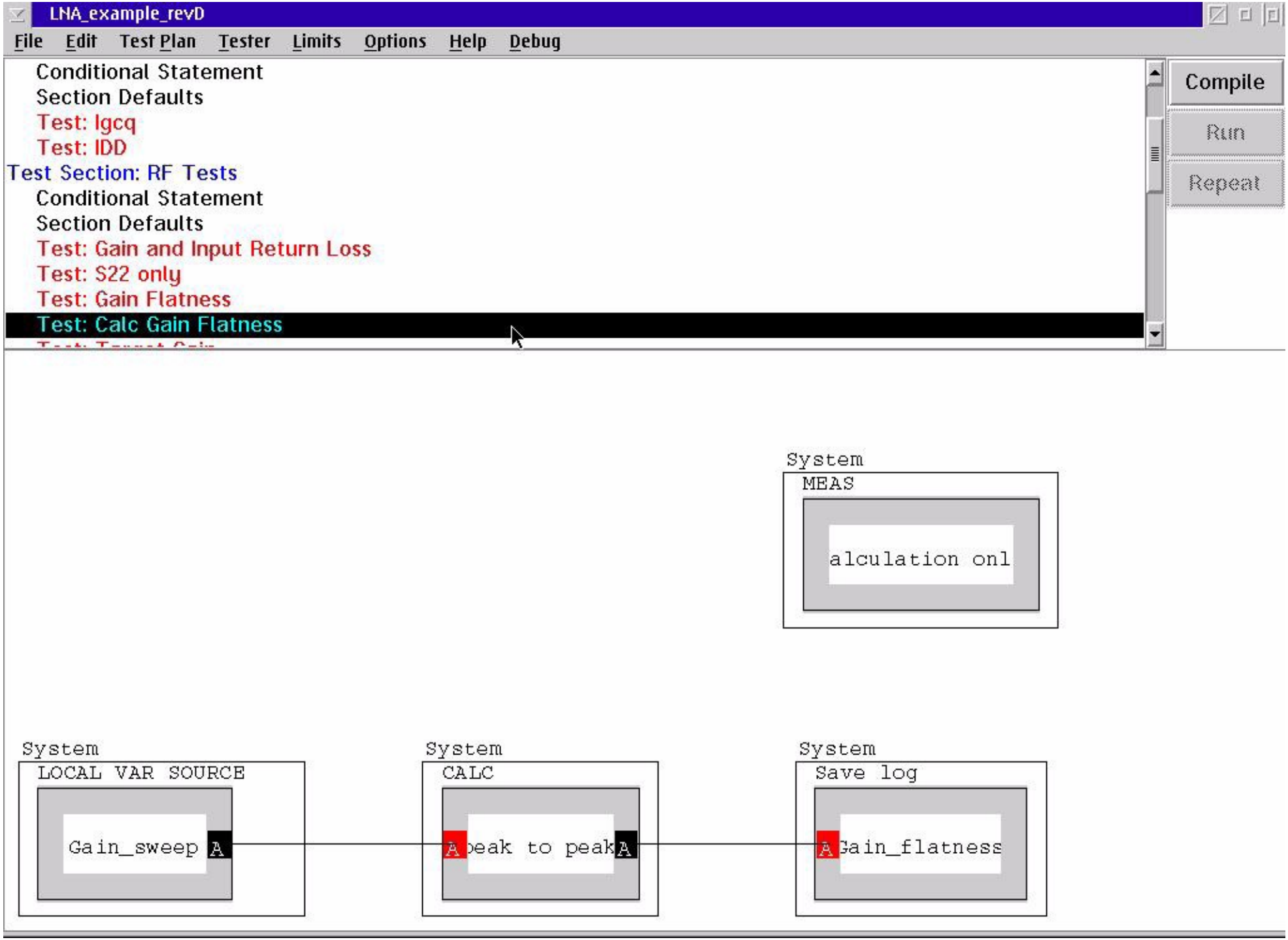
Test: Igcq
Test: IDD
Test Section: RF Tests
Conditional Statement
Section Defaults
Test: Gain and Input Return Loss
Test: S22 only
Test: Gain Flatness
Test: Calc Gain Flatness
Compile
Run
Repeat
Source1
Frequency
925 Mhz
Source1
Frequency
942.5 Mhz
Source1
Frequency
960 Mhz
vna
MEAS
S Parameters
A
System
CALC
A
s21
A
System
CALC
A
magnitude (db)
A
System
Save log
A
Gain_sweep
System
LOCAL VAR SAVE
A
Gain_sweep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Edit
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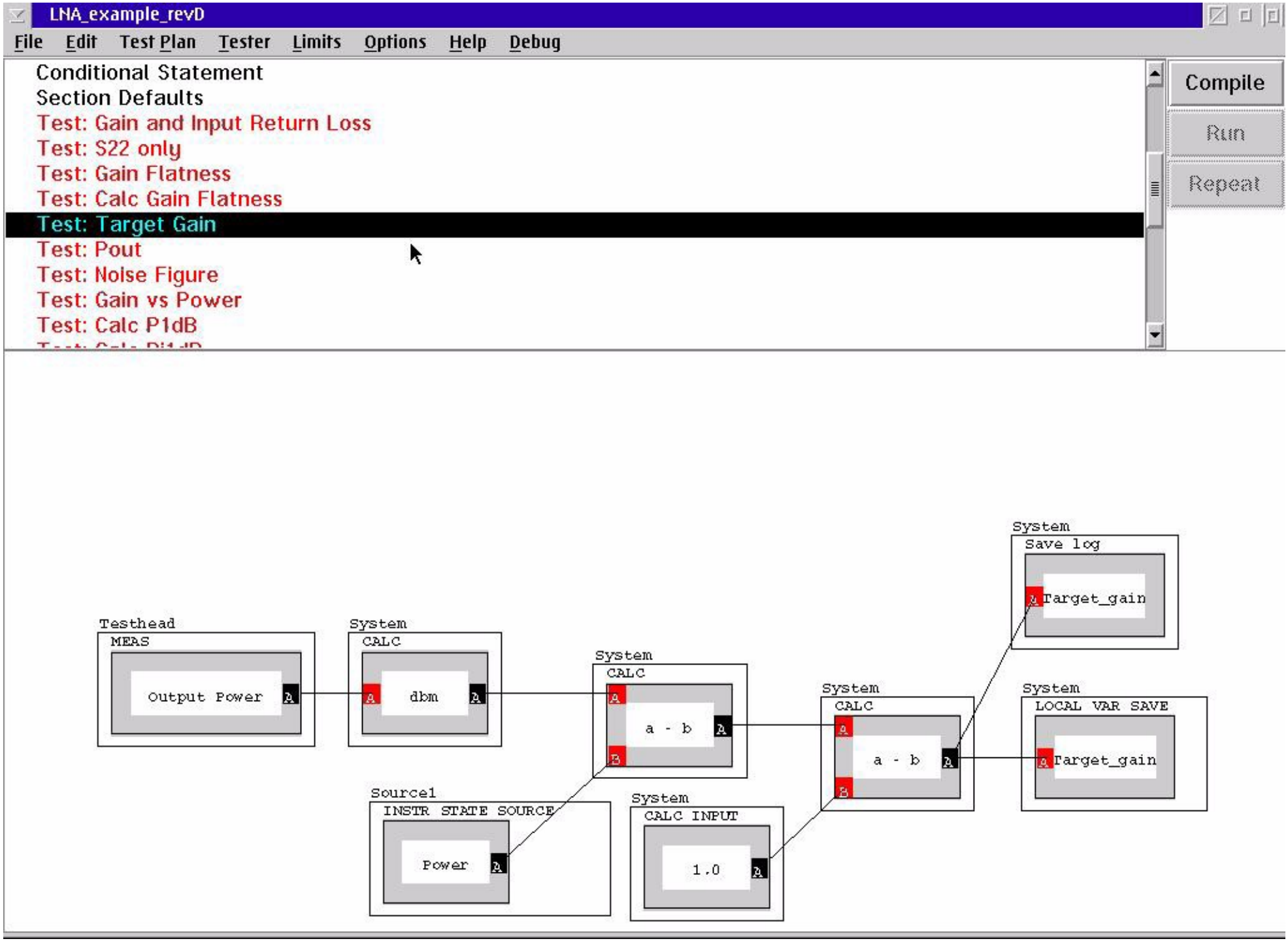
Limits
Options
Help
Debug
Conditional Statement
Section Defaults
Test: Igcq
Test: IDD
Test Section: RF Tests
Conditional Statement
Section Defaults
Test: Gain and Input Return Loss
Test: S22 only
Test: Gain Flatness
Test: Calc Gain Flatness
Compile
Run
Repeat
System
MEAS
alculation onl
System
LOCAL VAR SOURCE
Gain_sweep
A
System
CALC
A
eak to peak
A
System
Save log
A
Gain_flatness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Edit
Test Plan
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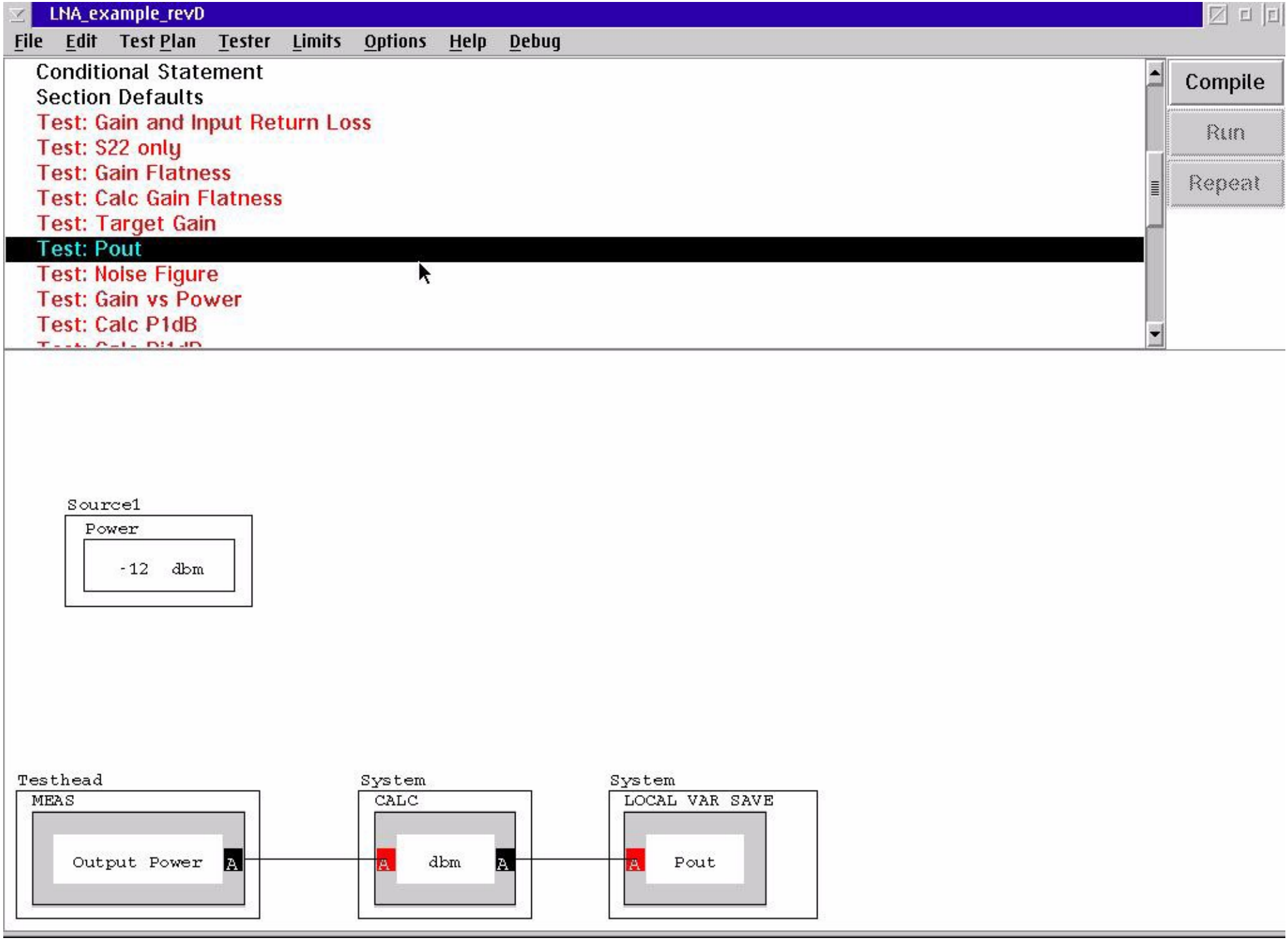
Limits
Options
Help
Debug
Conditional Statement
Section Defaults
Test: Gain and Input Return Loss
Test: S22 only
Test: Gain Flatness
Test: Calc Gain Flatness
Test: Target Gain
Test: Pout
Test: Noise Figure
Test: Gain vs Power
Test: Calc P1dB
Compile
Run
Repeat
Testhead
MEAS
Output Power
A
System
CALC
dbm
System
CALC
a - b
B
Source1
INSTR STATE SOURCE
Power
System
CALC INPUT
1.0
System
CALC
a - b
B
System
Save log
Target_gain
System
LOCAL VAR SAVE
Target_gain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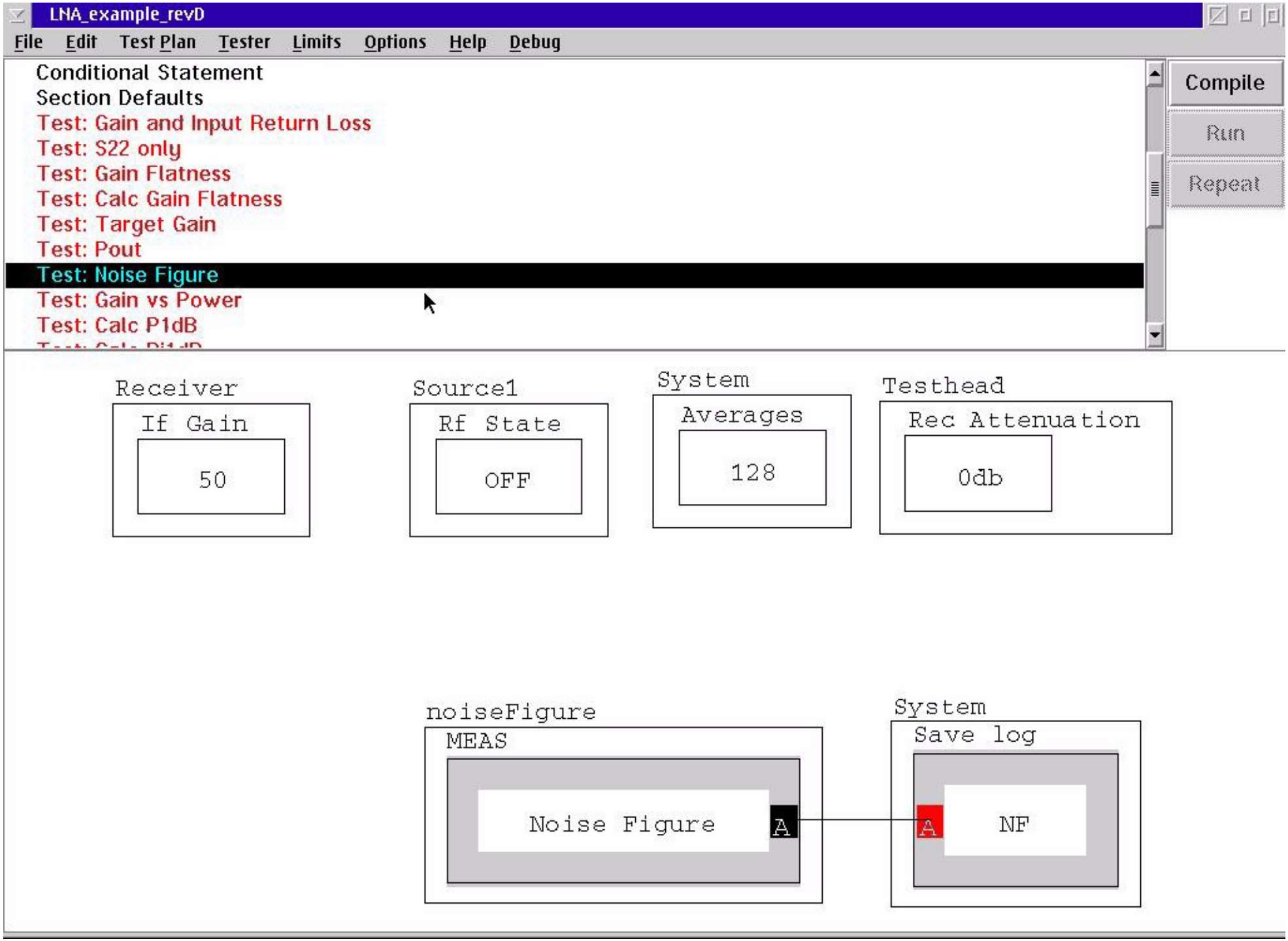
Edit
Test Plan
Tester
Limits
Options
Help
Debug
Conditional Statement
Section Defaults
Test: Gain and Input Return Loss
Test: S22 only
Test: Gain Flatness
Test: Calc Gain Flatness
Test: Target Gain
Test: Pout
Test: Noise Figure
Test: Gain vs Power
Test: Calc P1dB
Compile
Run
Repeat
Source1
Power
-12 dbm
Testhead
MEAS
Output Power
A
System
CALC
A
dbm
A
System
LOCAL VAR SAVE
A
Pout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File
Edit
Test Plan
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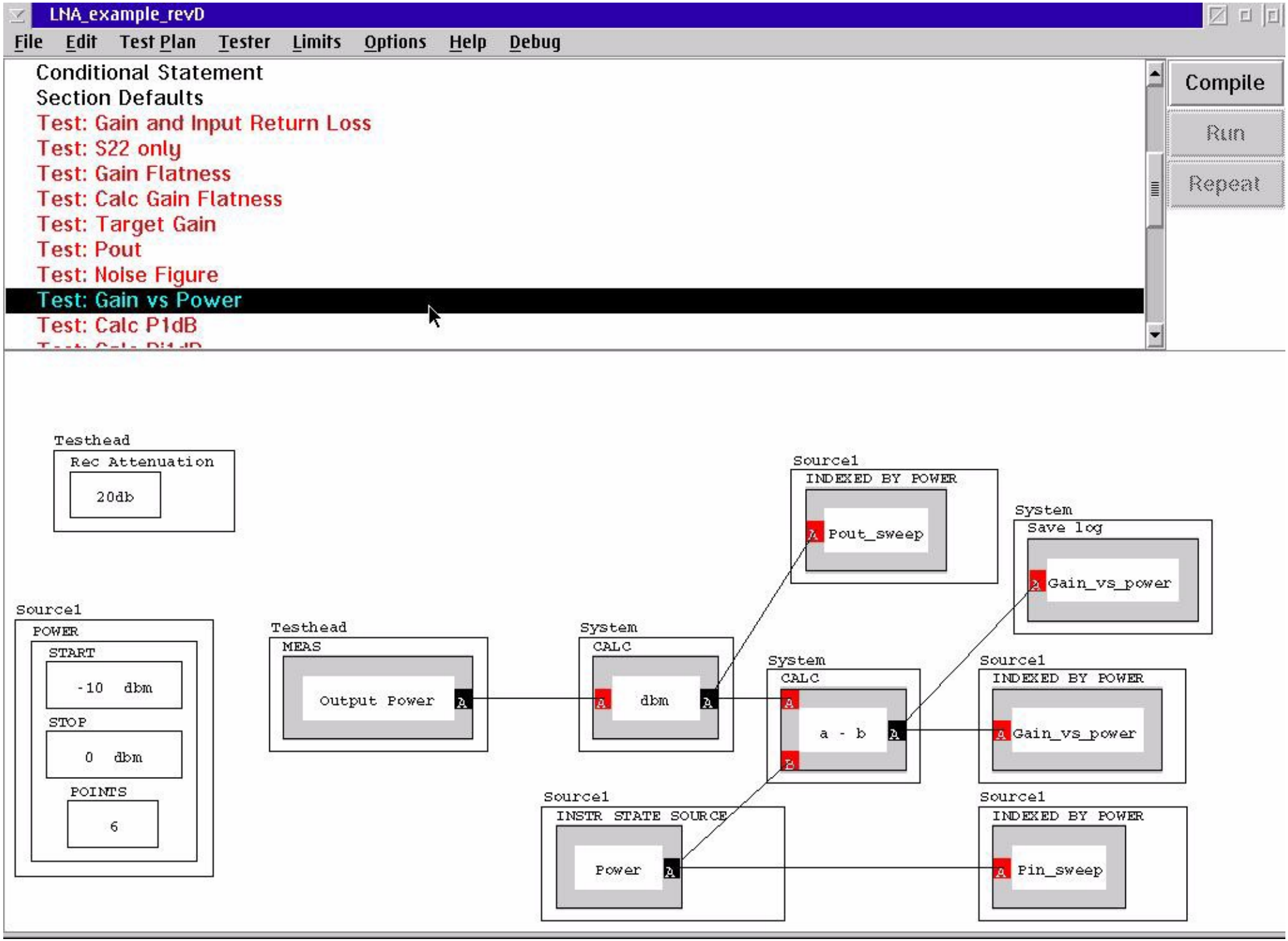
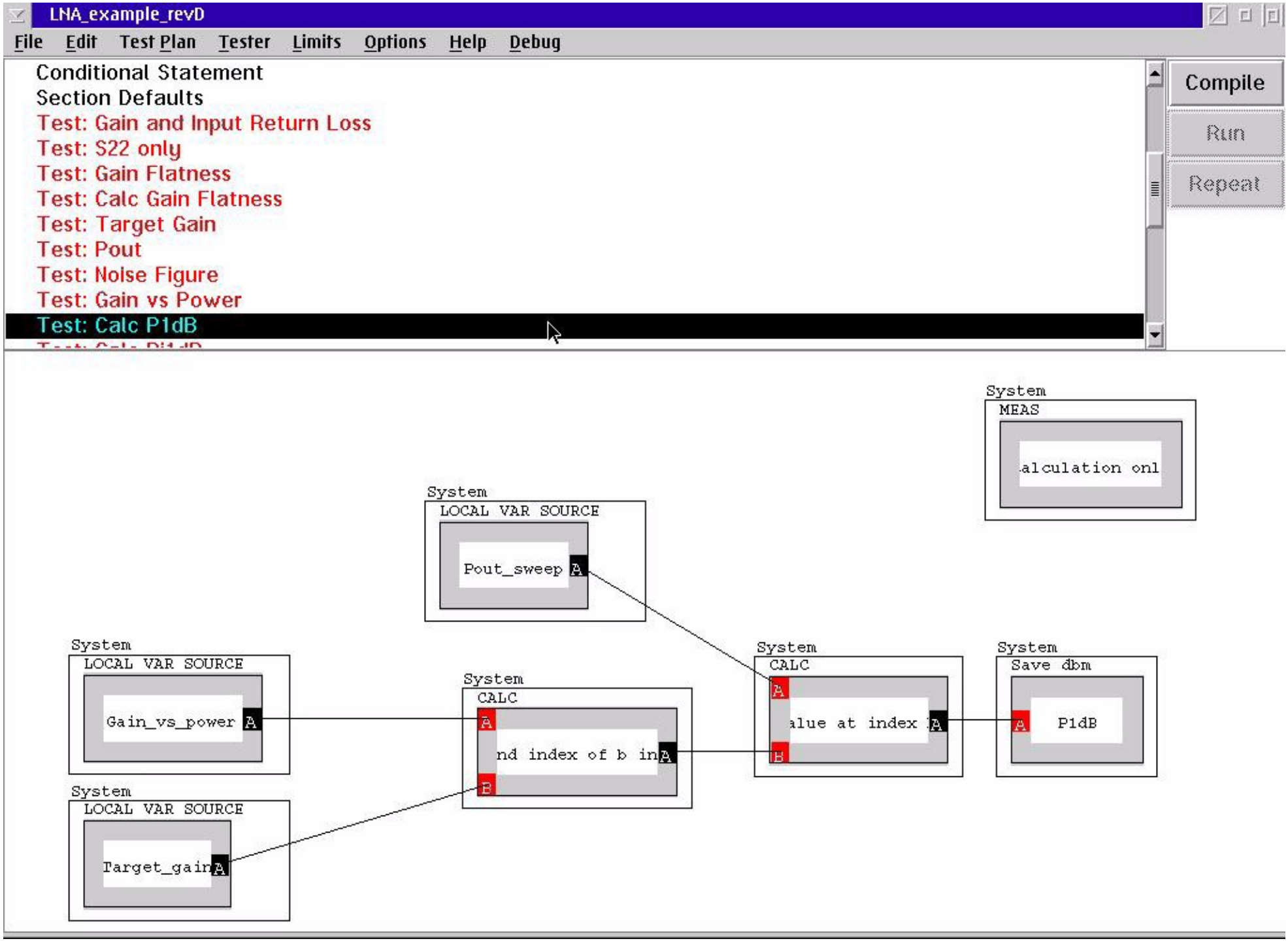
Limits
Options
Help
Debug
Conditional Statement
Section Defaults
Test: Gain and Input Return Loss
Test: S22 only
Test: Gain Flatness
Test: Calc Gain Flatness
Test: Target Gain
Test: Pout
Test: Noise Figure
Test: Gain vs Power
Test: Calc P1dB
Compile
Run
Repeat
Receiver
If Gain
50
Source1
Rf State
OFF
System
Averages
128
Testhead
Rec Attenuation
0db
noiseFigure
MEAS
Noise Figure
A
System
Save log
A
NF


LNA_example_revD
File
Edit
Test Plan
Tester
Limits
Options
Help
Debug
Conditional Statement
Section Defaults
Test: Gain and Input Return Loss
Test: S22 only
Test: Gain Flatness
Test: Calc Gain Flatness
Test: Target Gain
Test: Pout
Test: Noise Figure
Test: Gain vs Power
Test: Calc P1dB
Compile
Run
Repeat
Testhead
Rec Attenuation
20db
Source1
INDEXED BY POWER
Pout_sweep
System
Save log
Gain_vs_power
Source1
POWER
START
-10 dbm
STOP
0 dbm
POINTS
6
Testhead
MEAS
Output Power
System
CALC
dbm
System
CALC
a - b
Source1
INDEXED BY POWER
Gain_vs_power
Source1
INSTR STATE SOURCE
Power
Source1
INDEXED BY POWER
Pin_sweep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File
Edit
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Limits
Options
Help
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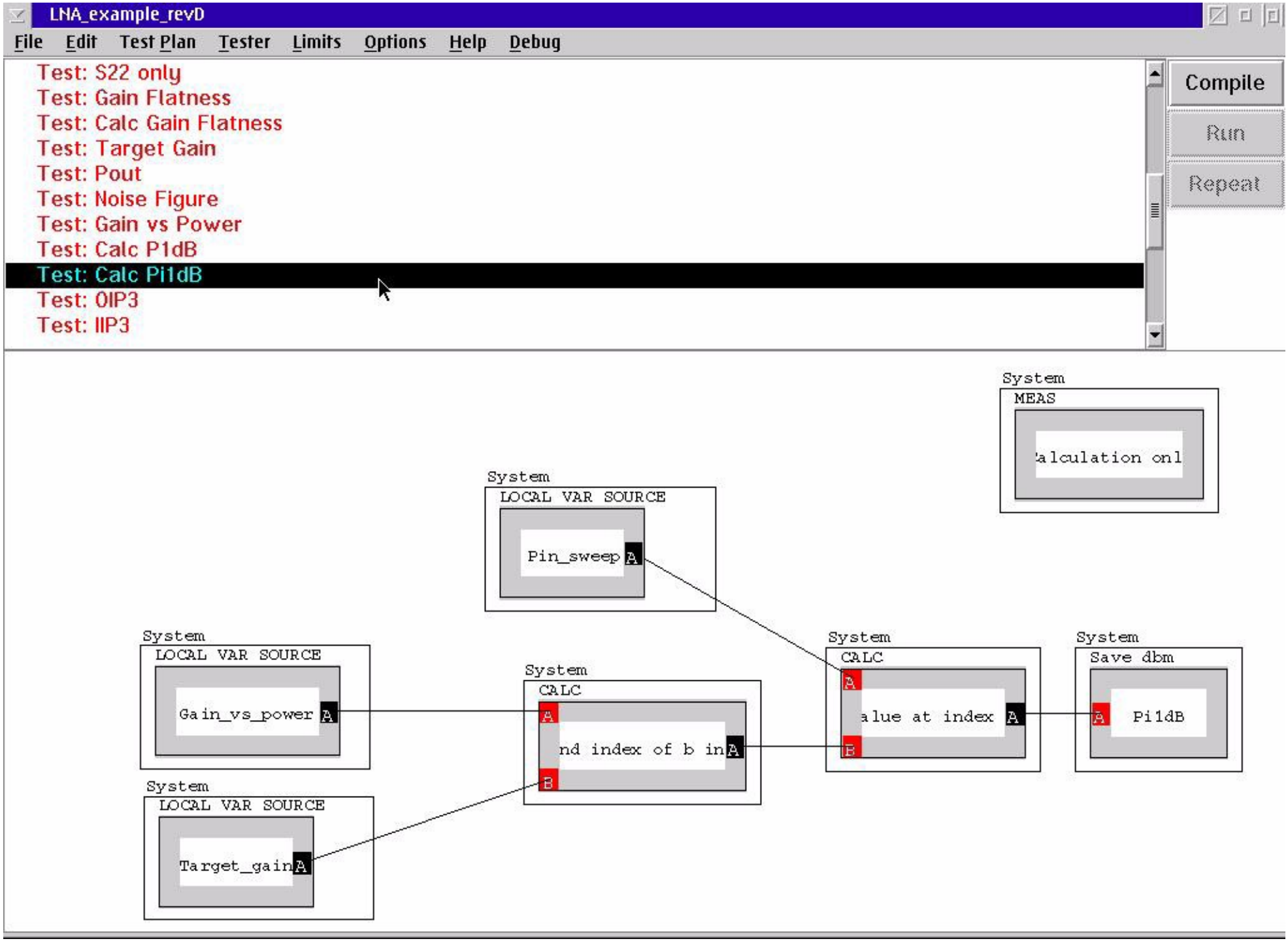
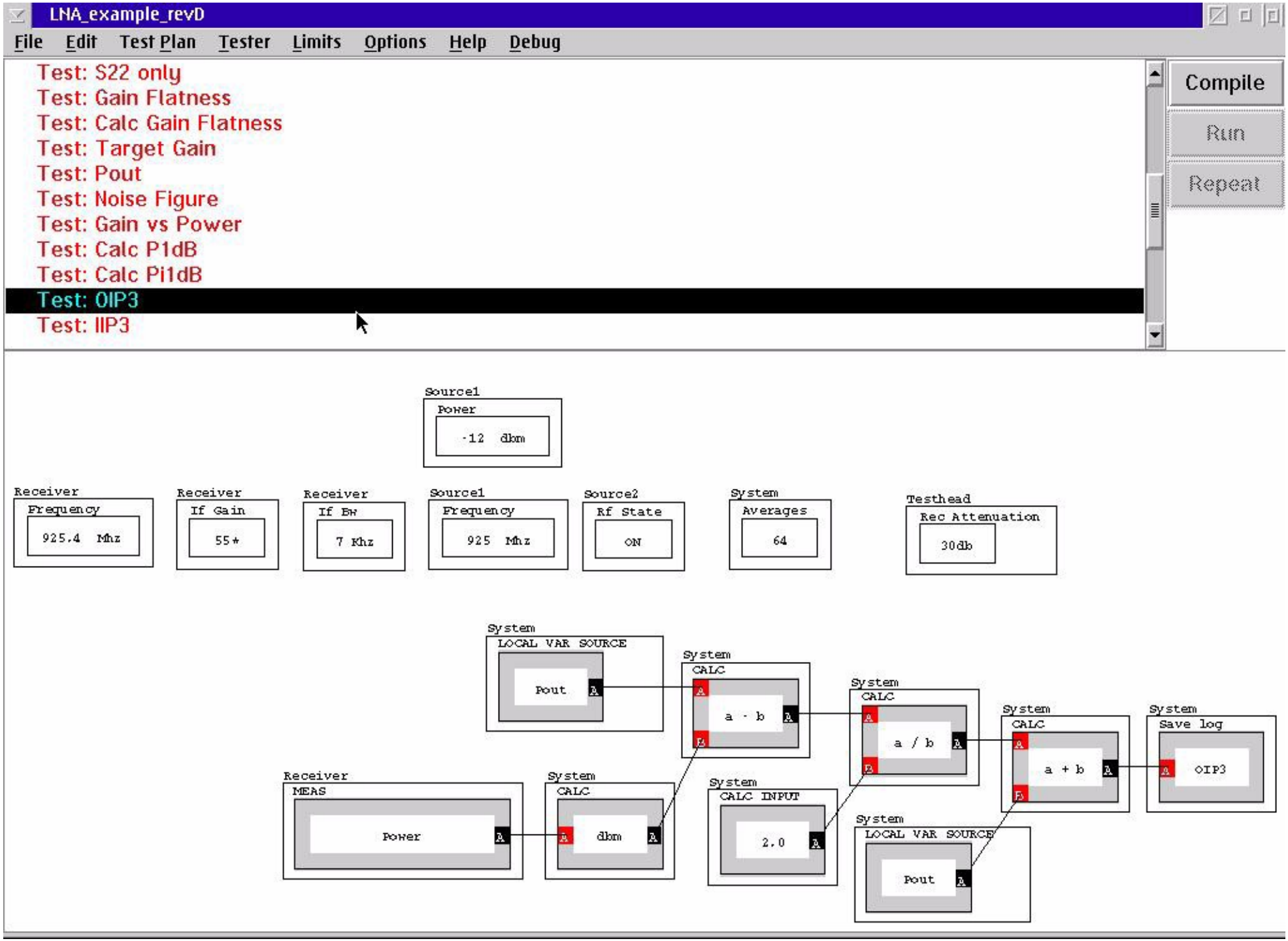
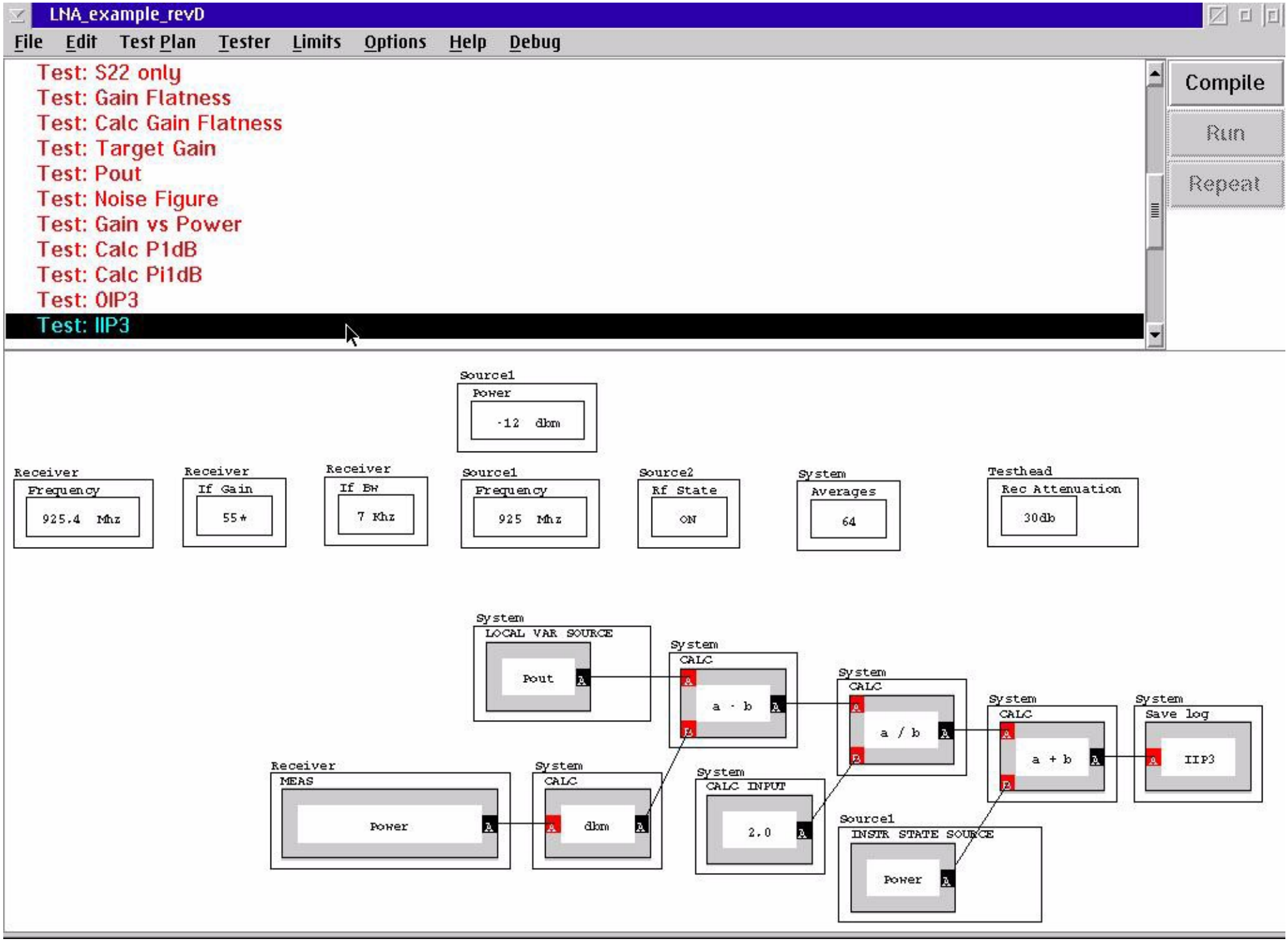
Test: S22 only
Test: Gain Flatness
Test: Calc Gain Flatness
Test: Target Gain
Test: Pout
Test: Noise Figure
Test: Gain vs Power
Test: Calc P1dB
Compile
Run
Repeat
System
MEAS
alculation onl
System
LOCAL VAR SOURCE
Pout_sweep
A
System
LOCAL VAR SOURCE
Gain_vs_power
A
System
LOCAL VAR SOURCE
Target_gain
A
System
CALC
A
nd index of b in
A
B
System
CALC
A
alue at index
A
B
System
Save dbm
A
P1dB


LNA_example_revD
File
Edit
Test Plan
Tester
Limits
Options
Help
Debug
Test: S22 only
Test: Gain Flatness
Test: Calc Gain Flatness
Test: Target Gain
Test: Pout
Test: Noise Figure
Test: Gain vs Power
Test: Calc P1dB
Test: Calc Pi1dB
Test: OIP3
Test: IIP3
Compile
Run
Repeat
System
MEAS
alculation onl
System
LOCAL VAR SOURCE
Pin_sweep
A
System
LOCAL VAR SOURCE
Gain_vs_power
A
System
CALC
A
nd index of b in
A
B
System
LOCAL VAR SOURCE
Target_gain
A
System
CALC
A
lue at index
A
B
System
Save dbm
A
Pi1dB


LNA_example_revD
File
Edit
Test Plan
Tester
Limits
Options
Help
Debug
Test: S22 only
Test: Gain Flatness
Test: Calc Gain Flatness
Test: Target Gain
Test: Pout
Test: Noise Figure
Test: Gain vs Power
Test: Calc P1dB
Test: Calc Pi1dB
Test: OIP3
Test: IIP3
Compile
Run
Repeat
Source1
Power
-12 dbm
Receiver
Frequency
925.4 Mhz
Receiver
If Gain
55*
Receiver
If Bw
7 Khz
Source1
Frequency
925 Mhz
Source2
Rf State
ON
System
Averages
64
Testhead
Rec Attenuation
30db
System
LOCAL VAR SOURCE
Pout
System
CALC
a - b
System
CALC
a / b
System
CALC
a + b
System
Save log
OIP3
Receiver
MEAS
Power
System
CALC
dbm
System
CALC INPUT
2.0
System
LOCAL VAR SOURCE
Pout


LNA_example_revD
File
Edit
Test Plan
Tester
Limits
Options
Help
Debug
Test: S22 only
Test: Gain Flatness
Test: Calc Gain Flatness
Test: Target Gain
Test: Pout
Test: Noise Figure
Test: Gain vs Power
Test: Calc P1dB
Test: Calc Pi1dB
Test: OIP3
Test: IIP3
Compile
Run
Repeat
Source1
Power
-12 dbm
Receiver
Frequency
925.4 Mhz
Receiver
If Gain
55*
Receiver
If Bw
7 Khz
Source1
Frequency
925 Mhz
Source2
Rf State
ON
System
Averages
64
Testhead
Rec Attenuation
30db
System
LOCAL VAR SOURCE
Pout
System
CALC
a - b
System
CALC
a / b
System
CALC
a + b
System
Save log
IIP3
Receiver
MEAS
Power
System
CALC
dbm
System
CALC INPUT
2.0
Source1
INSTR STATE SOURCE
Power

Writing a LNA Test Plan - Lab D

- Get into Groups of Three
- Each will take turns performing the lab
- One types, one reads, one uses mouse

LNA Test Plan Lab
Develop 3rd Harmonic

- RF Input Level = -5 dBm
- RF Input Frequency = 960 MHz
- 3rd Harmonic Spec. Approx. -35 dBc
- Device Gain Approx. +10 dB
- Calc 3rd Harmonic in dBc
- Extra Credit:
  Find 3rd Harmonic at +5 dBm Out

PA Tests

- DC Current & PAE
- S11, S21, S12 & S22
- Noise Figure
- P1dB
- Intermodulation Distortion
- Harmonics
- ACPR @ Specified Output Power

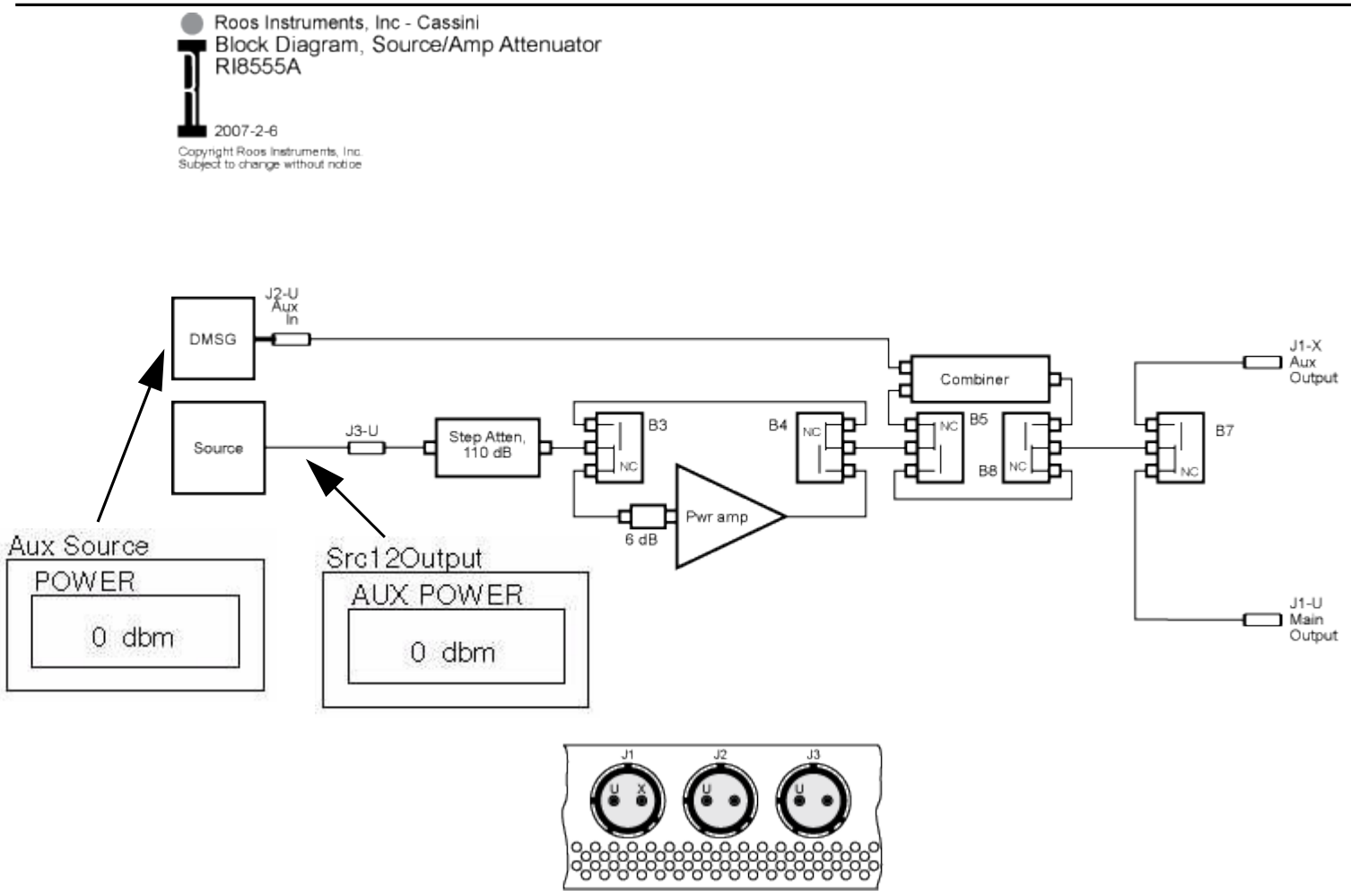
PA Test Plan Measurements

- Gain
- P1dB
- Fixed Pout
- IM3
- Leakage Current
- ACPR/ACLR
- Efficiency

PA Test Considerations

- Set Up DMSG in Global Defaults
- Use SRC12/Aux Pwr not Aux SRC/Pwr for sweep
- SRC12/Aux Pwr is Actually Attenuation
- Use RMS Power for Modulated Tones
- Characterize Noise BW of IF Filters for Modulation Type
- Use DB Line for Leakage Current Measurement

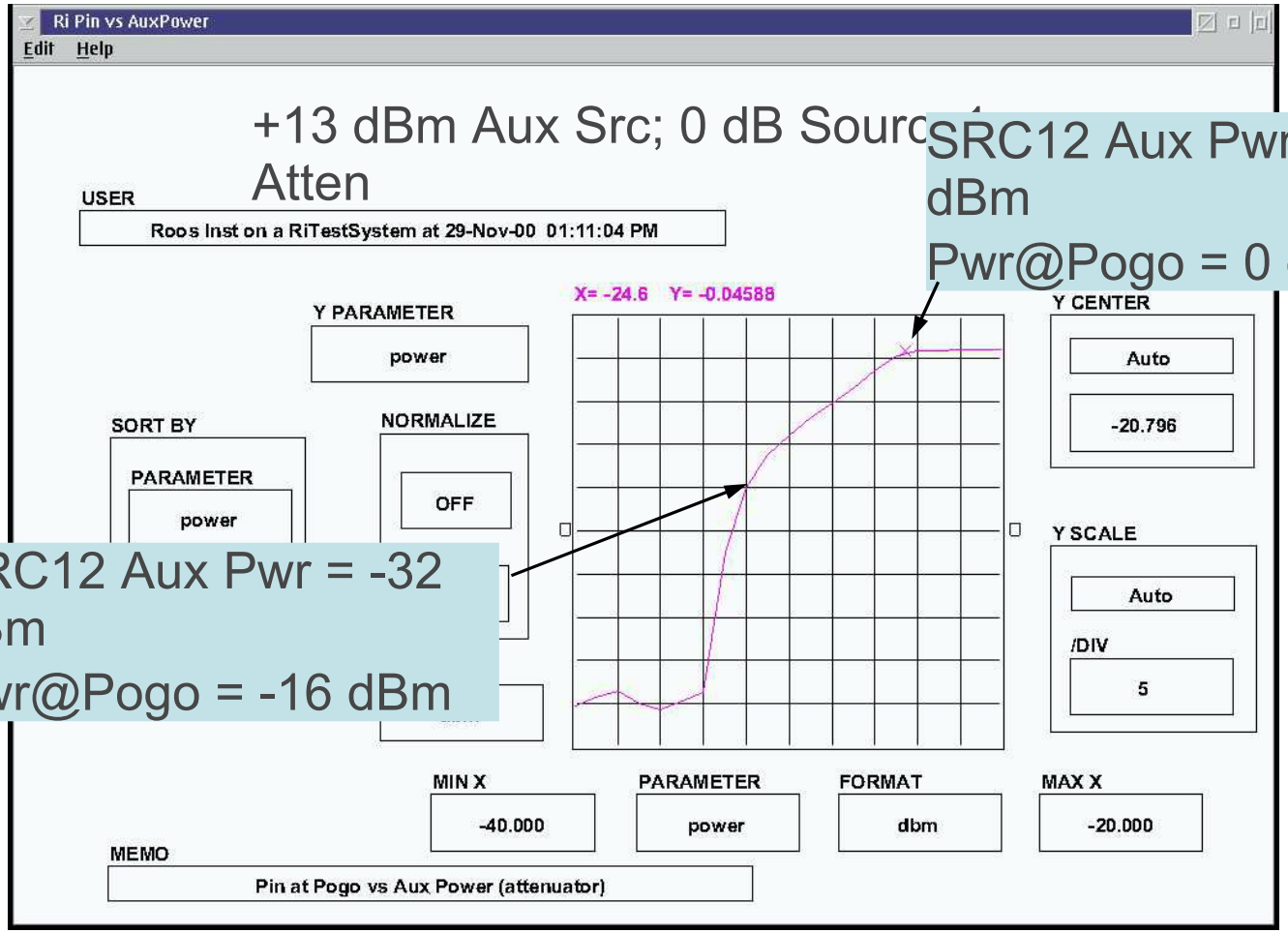
Aux Attenuator Path



Src12 Aux Power

- Attenuator not Power
- Logarithmic Attenuation
- Approximately 13 dB Path Loss in 0 dB Attenuation State (DMSG to Pogo Ring)
- Effective Settings: SRC12/AuxPwr
  - -24 dBm = 13 dB path loss = 0 dB atten
  - -32 dBm = 29 dB path loss = 16 dB atten

Available vs. Src12/AuxPower



Aux Source Capabilities

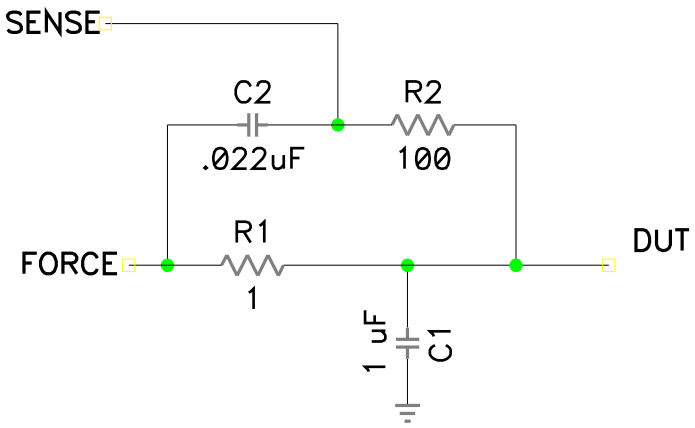
- Anritsu MG3671B; +13 dBm max.
- Aux Src Only: 0 dBm @ Pogo
- With SRC1 Amp: Approximately +20 dBm @ Pogo
- CDMA, TDMA, PDC, GSM, TETRA, DECT

VI Loading

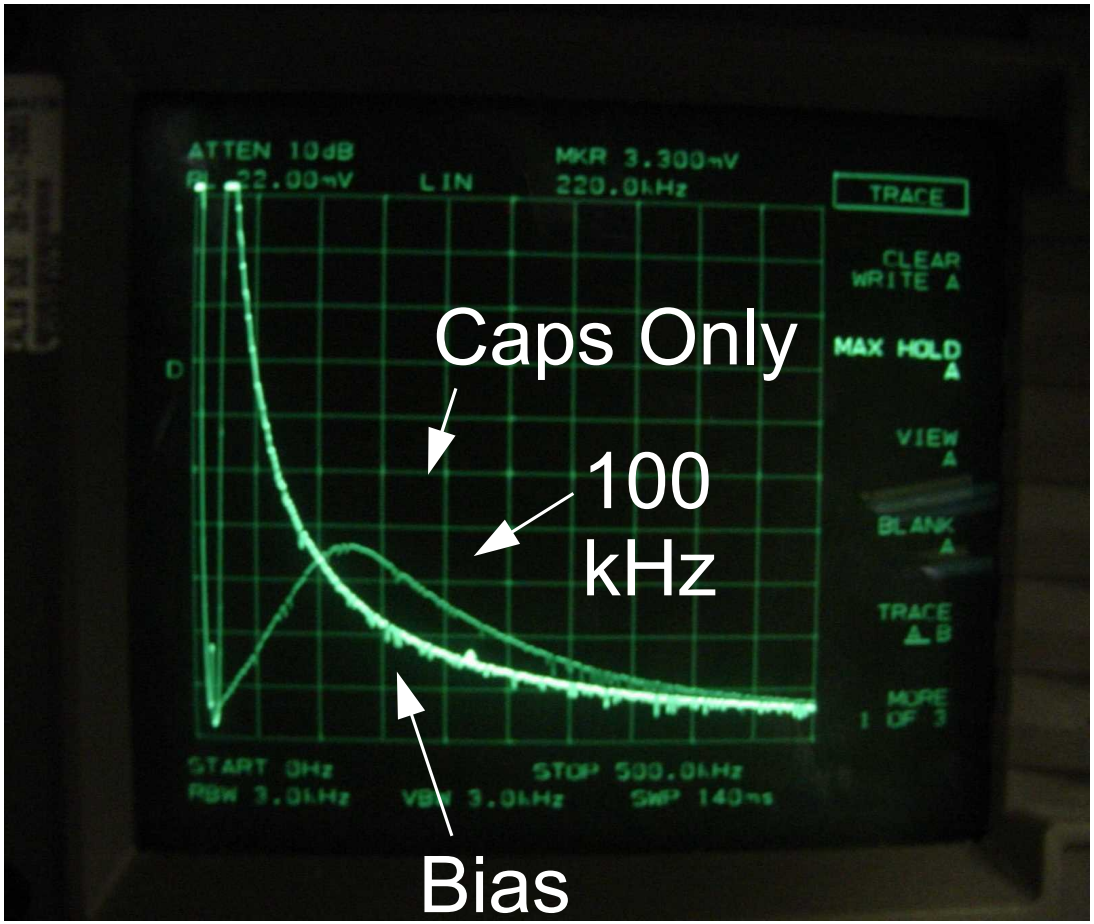
- Power VIs designed for <0.1uF
- 3 uSec settling, Faster than bench
- Some PA eval boards have higher values
- Design Dut boards appropriately
- If Dut must have >1uF cap use following method

Loading Circuit

- C1 must be Ceramic (low R)
- R1, high watt; isolates Cap from VI

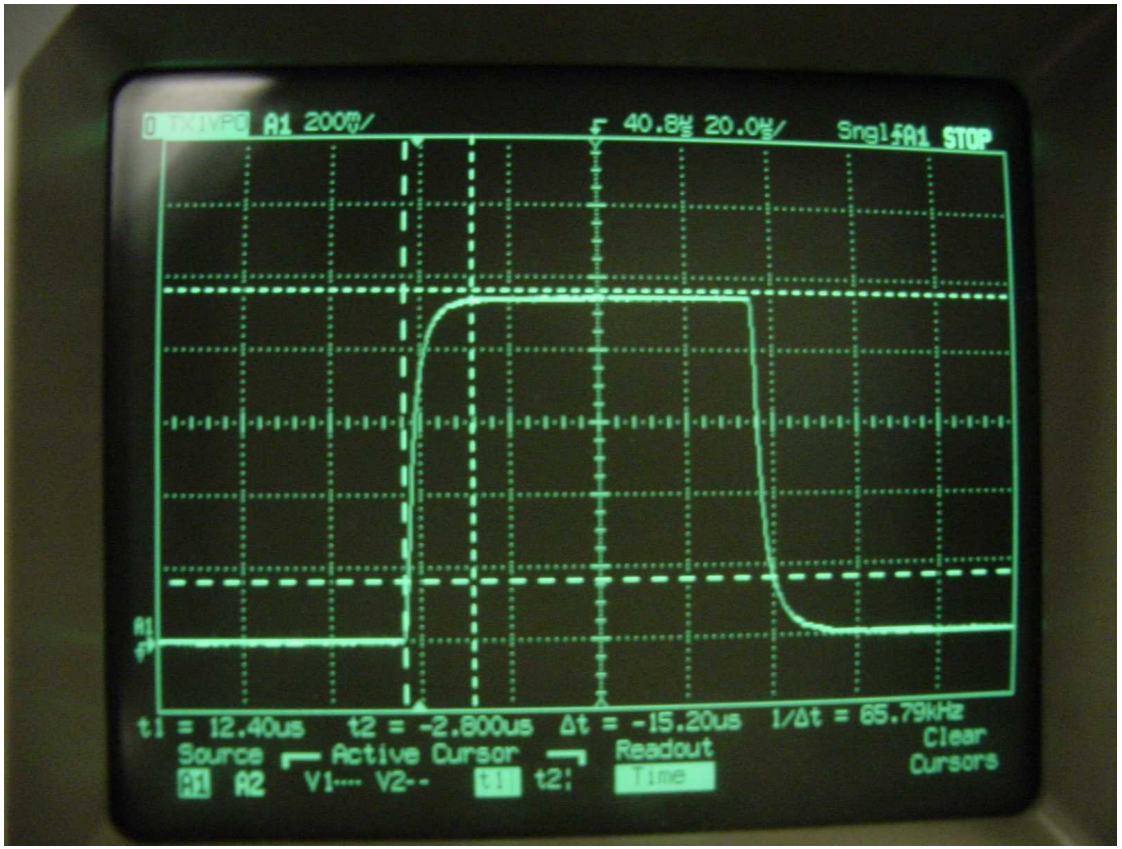


Circuit Frequency Response



Circuit Time Response

- 15 uSec Settling



Switching DC Supplies

- RI Supplies "Break before Make"
- Supplies for Special Measurements
- Power VI; High Current
- DB; Leakage Current
- Concerns:
  - Device Memory
  - Decoupling Capacitance
  - Test Order

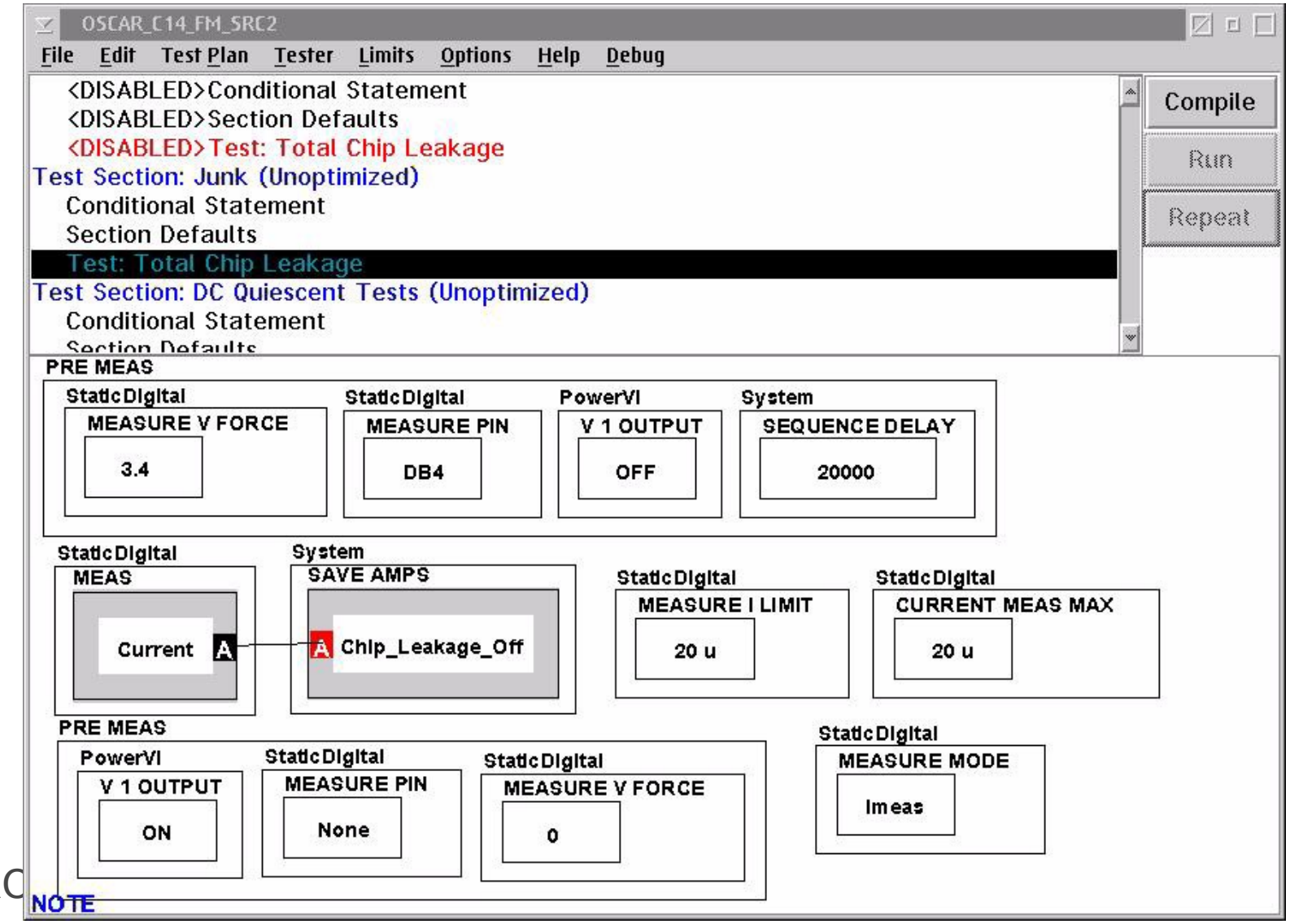
Switching Mechanism

- DB 4 x 8 Matrix
  - Von
  - Voff
  - Open
  - Parametric Measure
- VI
  - On
  - Off

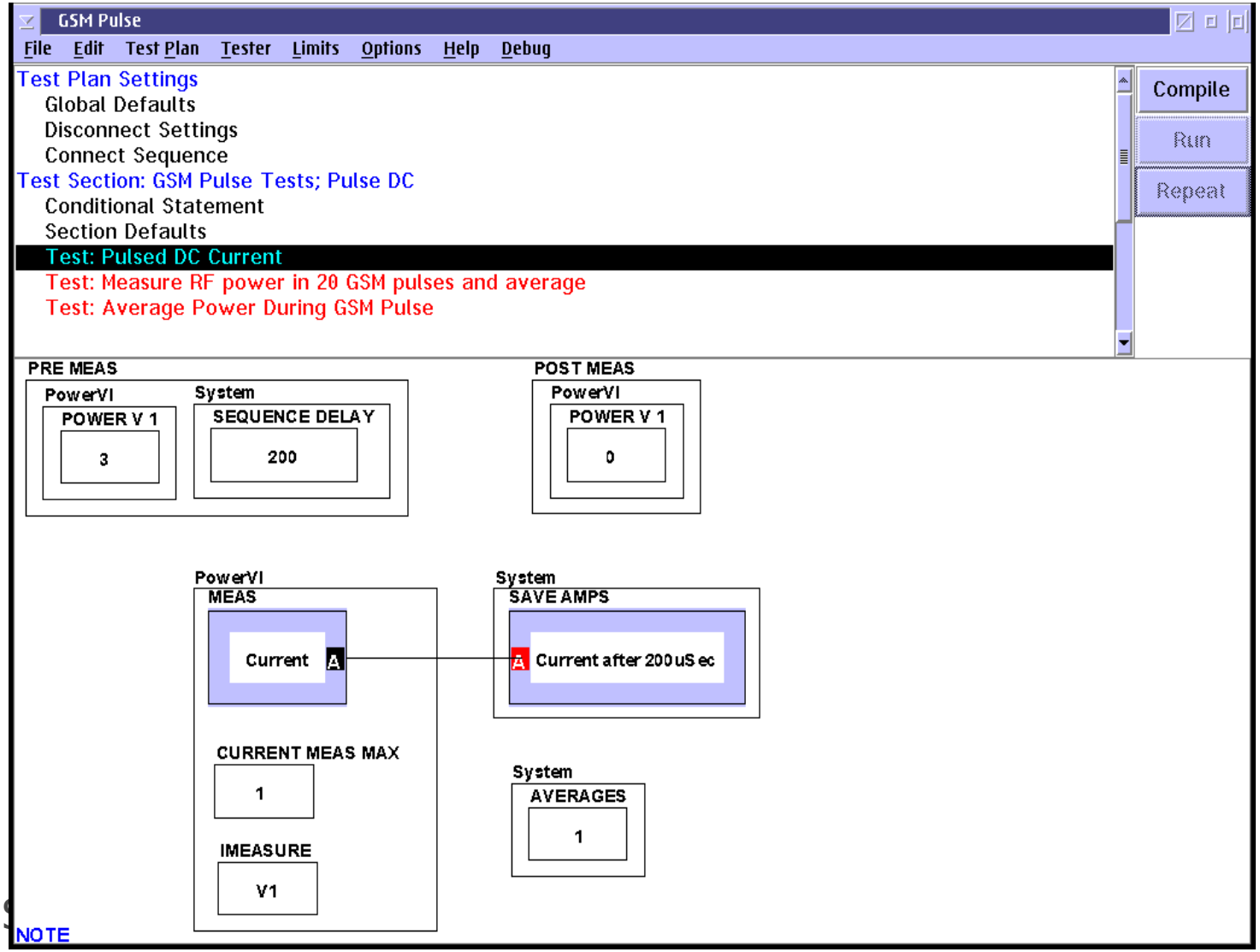
Make before Break

- Connect Two Supplies at a Time
- DB Compliance
  - Mode Switching
  - Current Limit Applies
- VI Compliance
  - Drop Voltage to Limit Current
- Pre and Post Measure Group

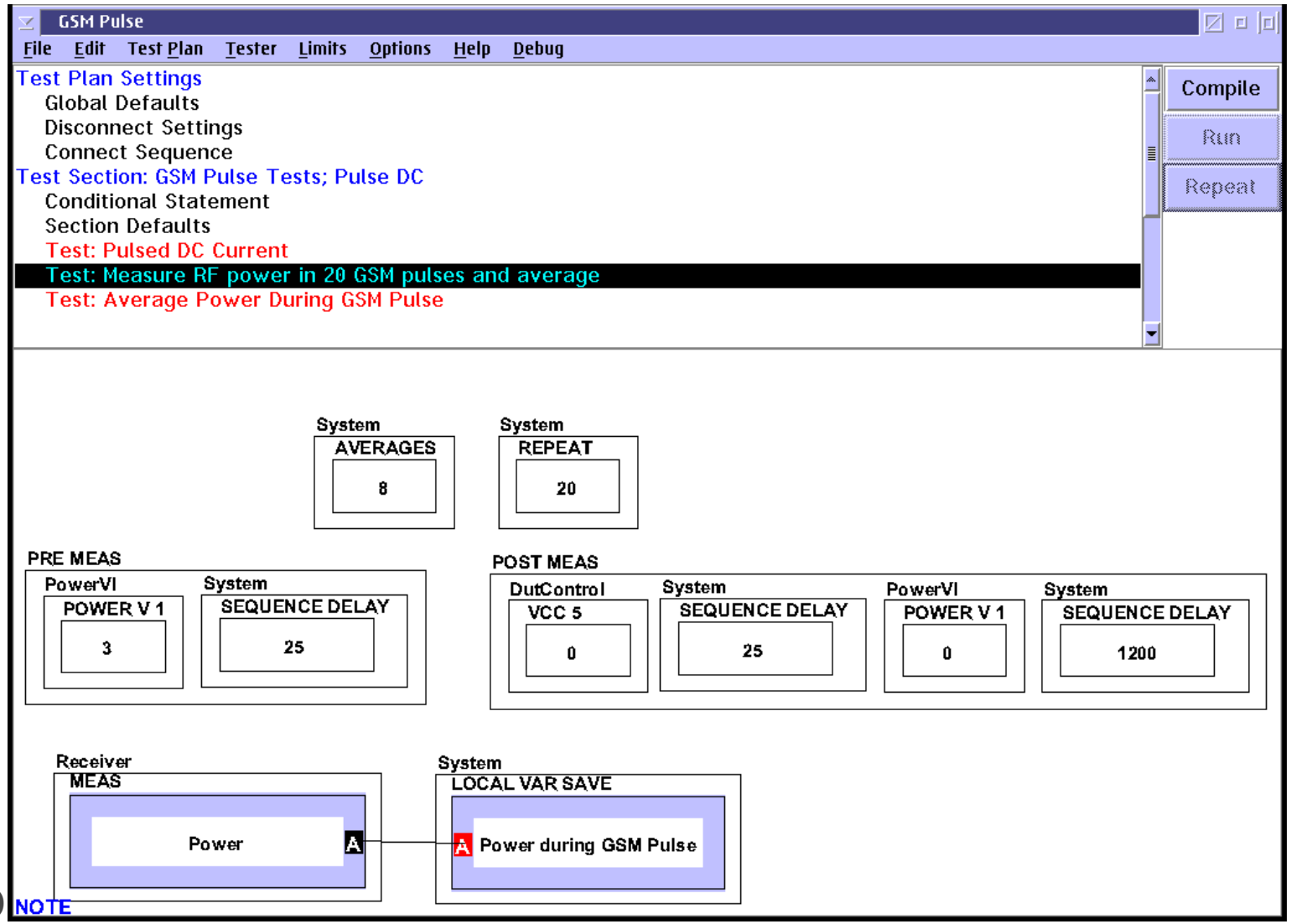
Leakage Current Measurements



Pulsed DC Measurements



Pulsed RF Measurements



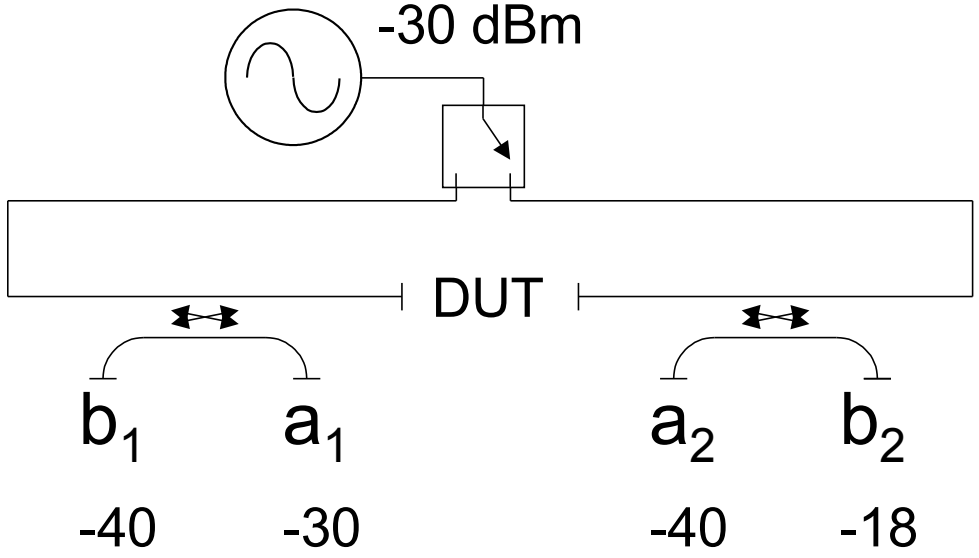
RO NOTE

High Dynamic Range Devices

- Wave variation > 30 dB (approx.)
- Waves are a1, a2, b1, b2

Typical Device; LNA

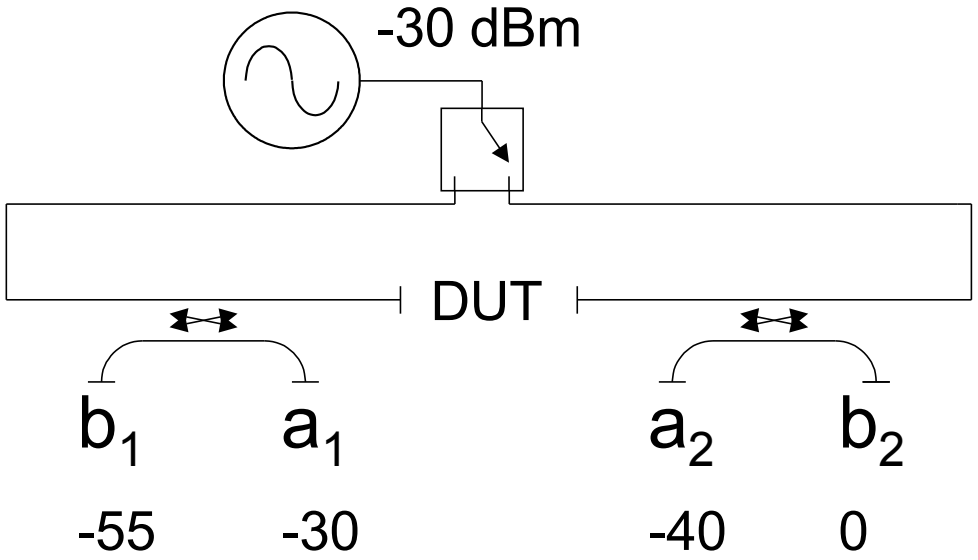
- S21 12 dB
- S11 10 dB
- S12 15 dB
- S22 10 dB



Total Variation 22 dB

High Dynamic Range Device; PA

- S21 30 dB
- S11 10 dB
- S12 25 dB
- S22 10 dB



Total Variation 55 dB

Example HD Devices

- Multi-stage amplifier
- PA
- Limiter
- Filter
- Log Amplifier
- GPS Amplifier

Tester Methods; VNA

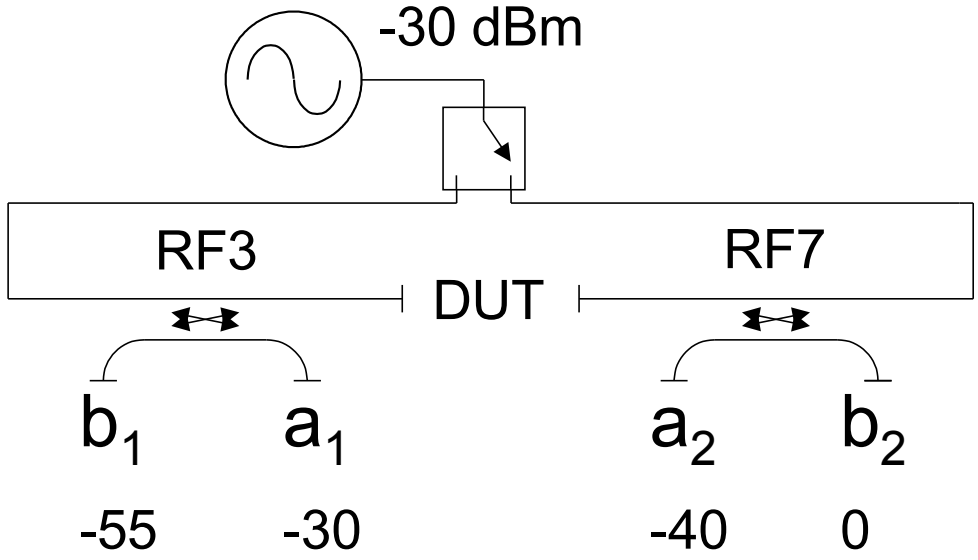
- Measures all four waves
- Same Conditions
  - IF Gain
  - Receive Attenuation
- All waves are used to calculate each S-parameter
- Low dynamic range parameters will be influenced by non-optimized ones

HDD Strategy

- Group according to power variation
- Separate S21 from S12
- Reduce to relevant waves; i.e. S11 only
  - Valid for high dynamic range device
  - If S12 is small; output will not influence input

High Dynamic Range Device; PA

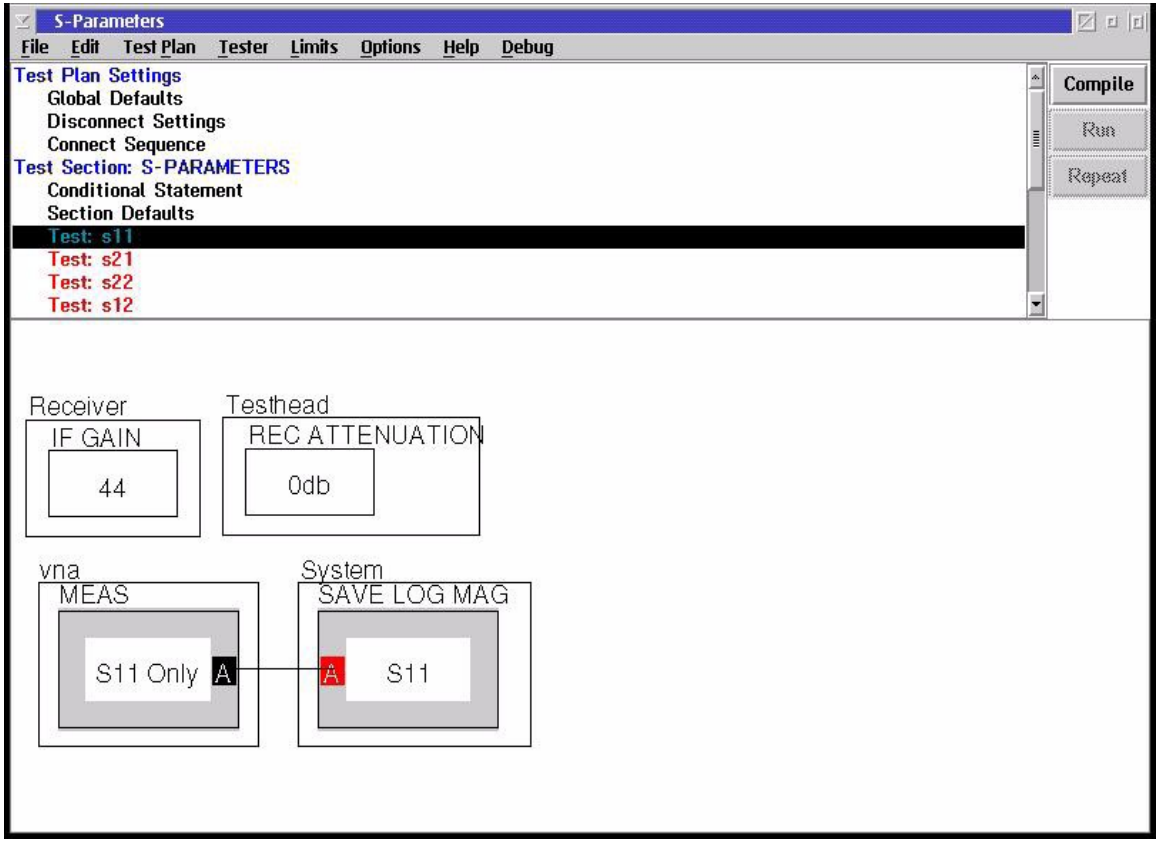
- S21 30 dB
- S11 10 dB
- S12 25 dB
- S22 10 dB



Total Variation 55 dB

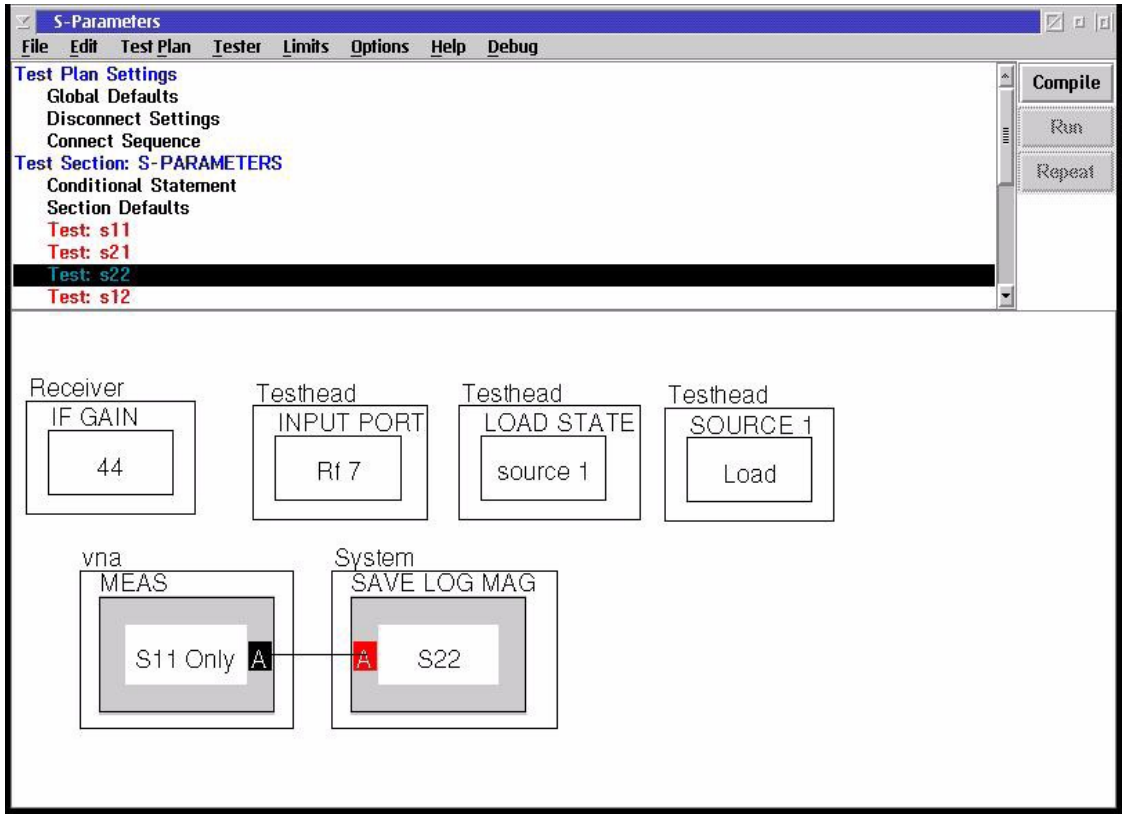
S11

- S11 Only

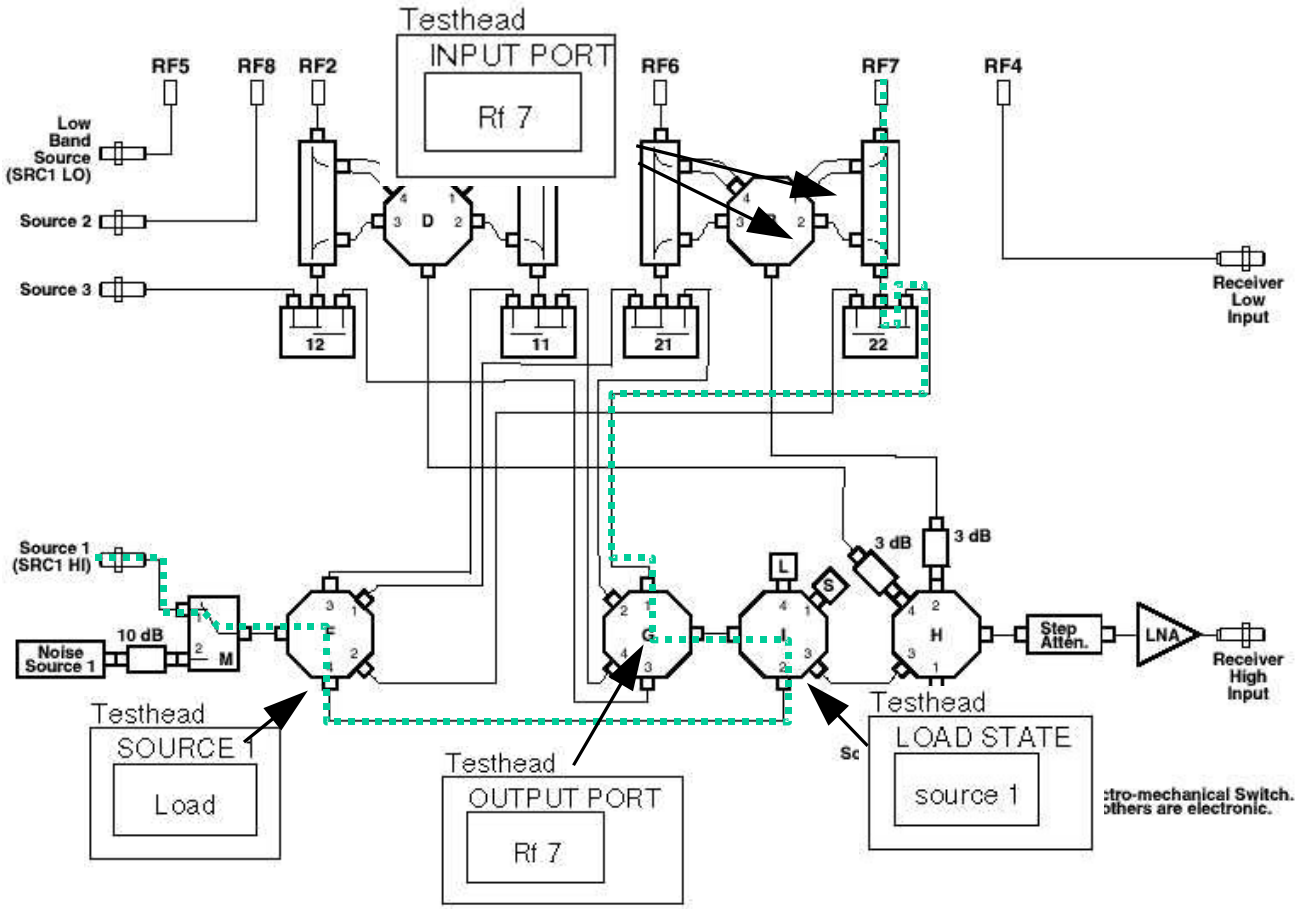

S-Parameters
File Edit Test Plan Tester Limits Options Help Debug
Test Plan Settings
Global Defaults
Disconnect Settings
Connect Sequence
Test Section: S-PARAMETERS
Conditional Statement
Section Defaults
Test: s11
Test: s21
Test: s22
Test: s12
Compile
Run
Repeat
Receiver
IF GAIN
44
Testhead
REC ATTENUATION
0db
vna
MEAS
S11 Only
A
System
SAVE LOG MAG
A
S11

S22

- Back Door

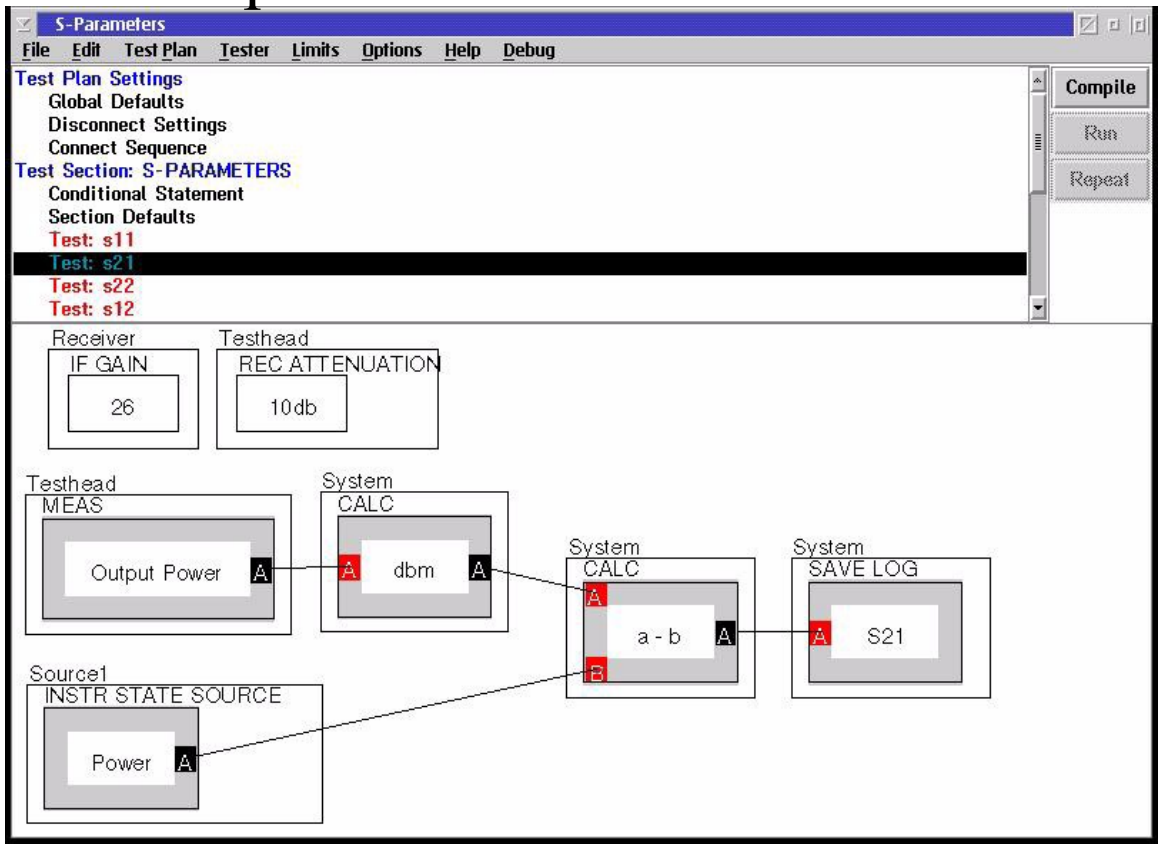


Back Door Path



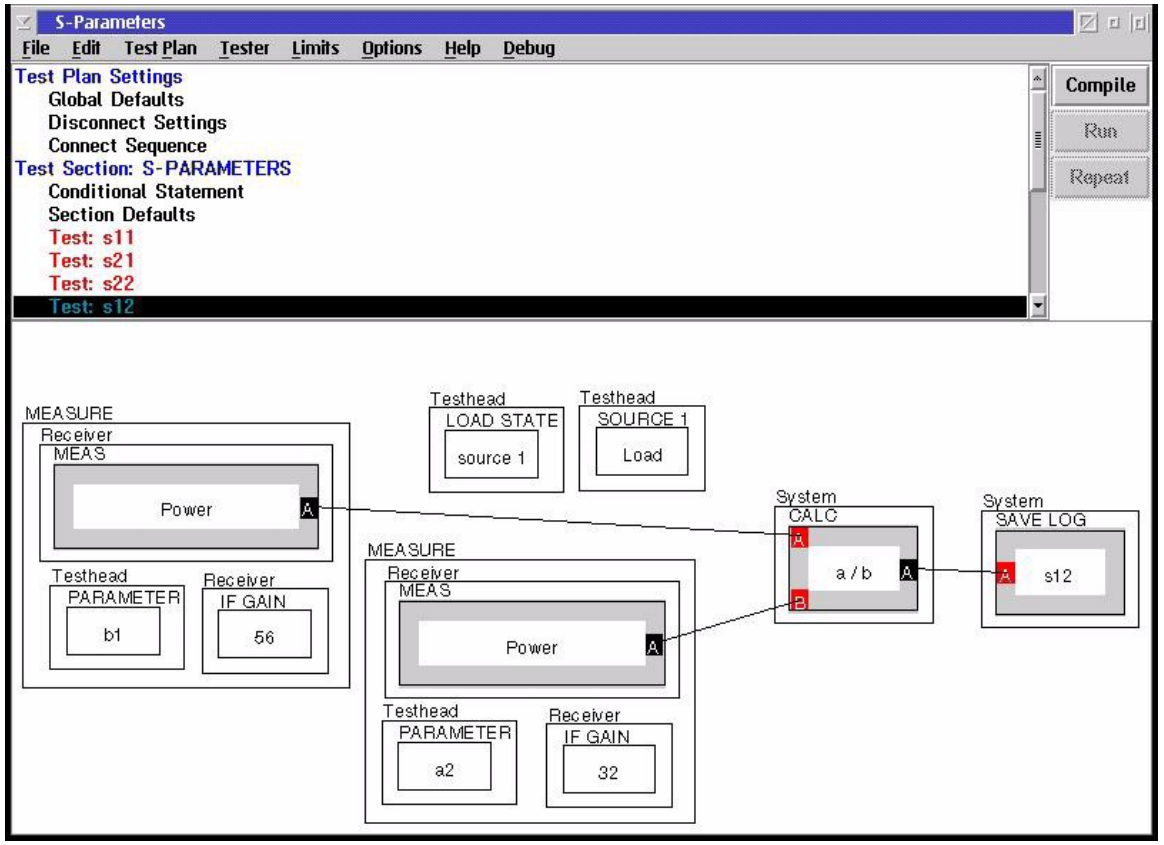
S21

- Only Meas Pout
- Vector Correct for output match

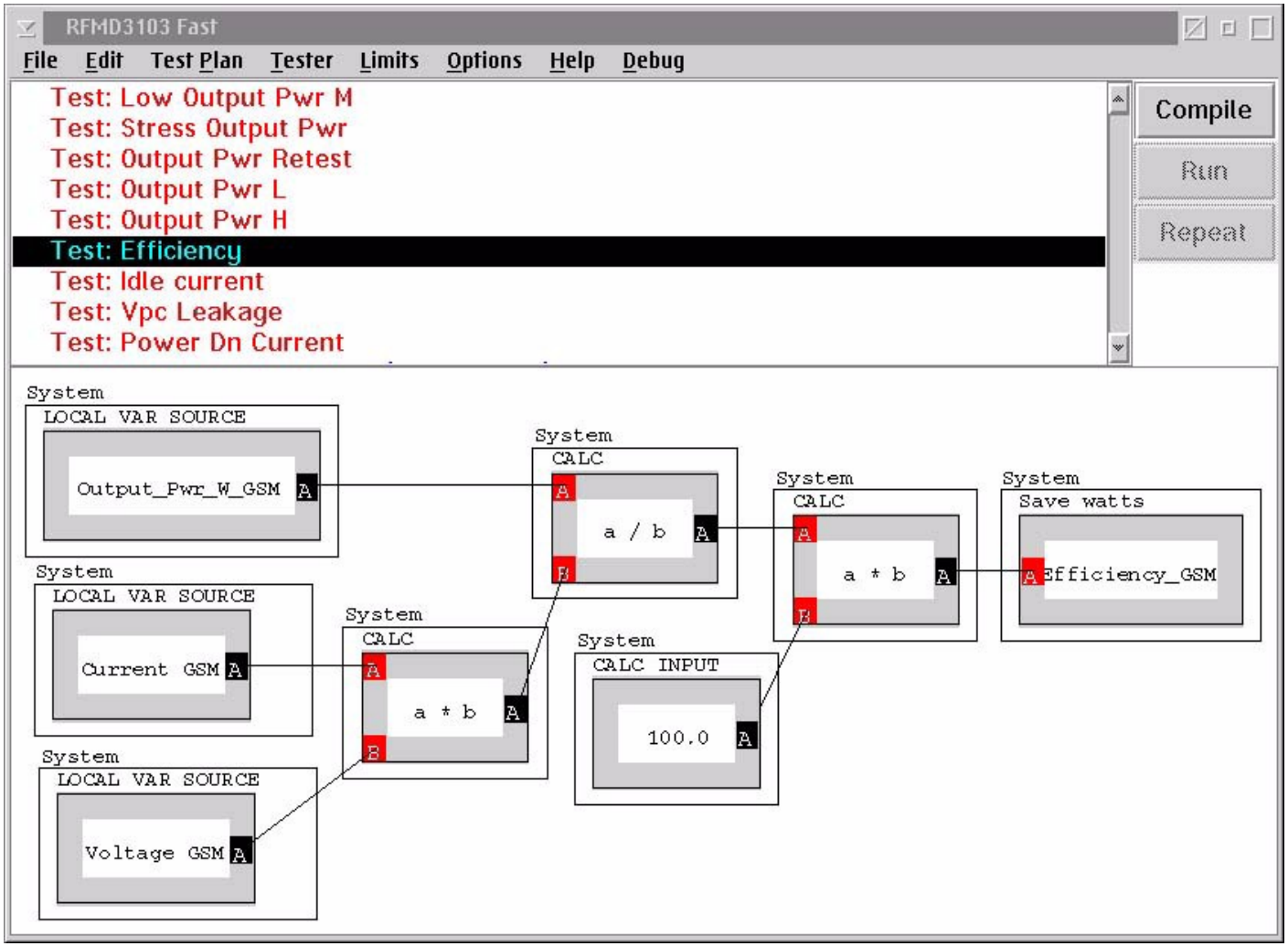


S12

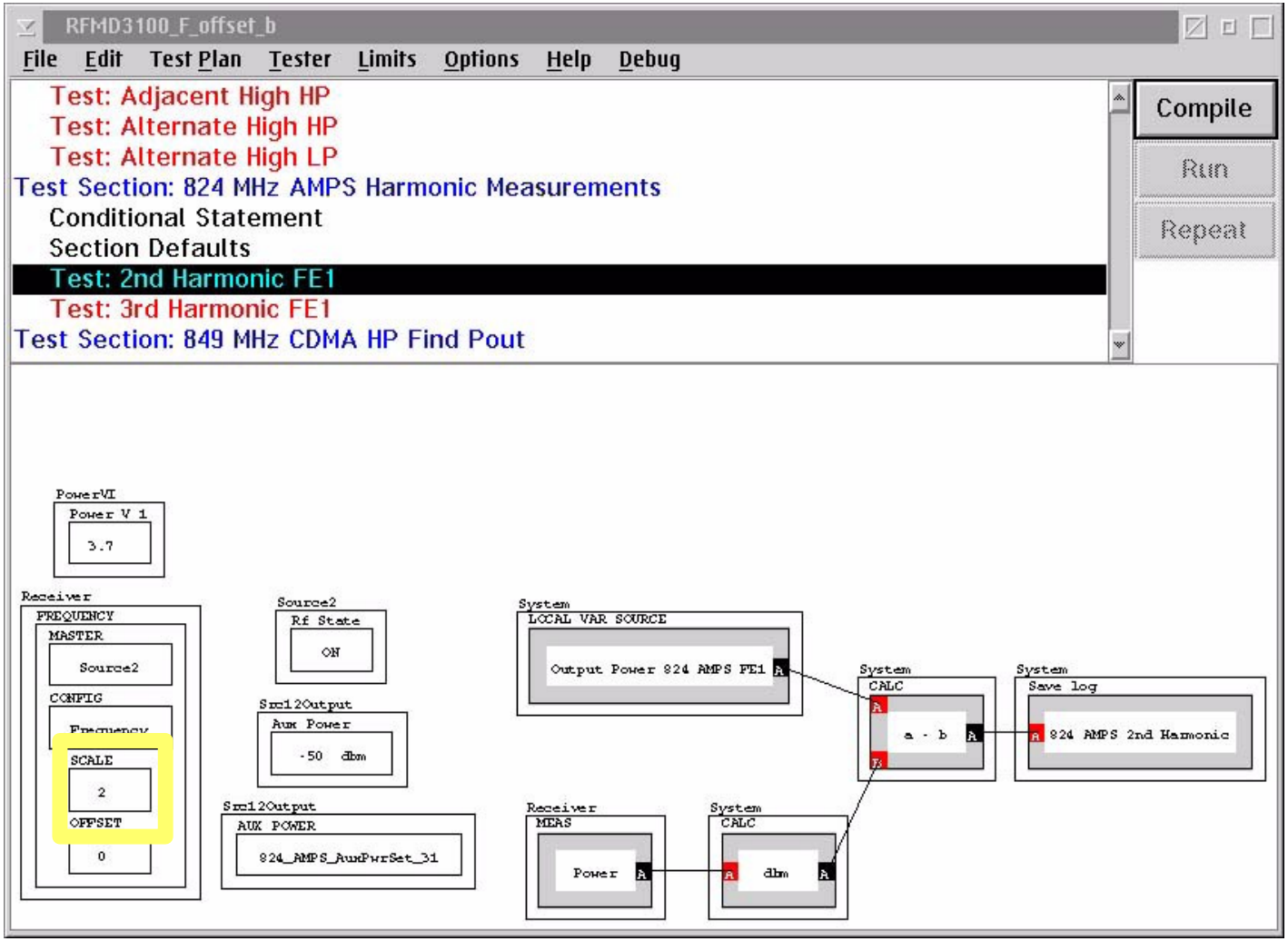
- b1, a2
- back door



PAE: Power Added Efficiency

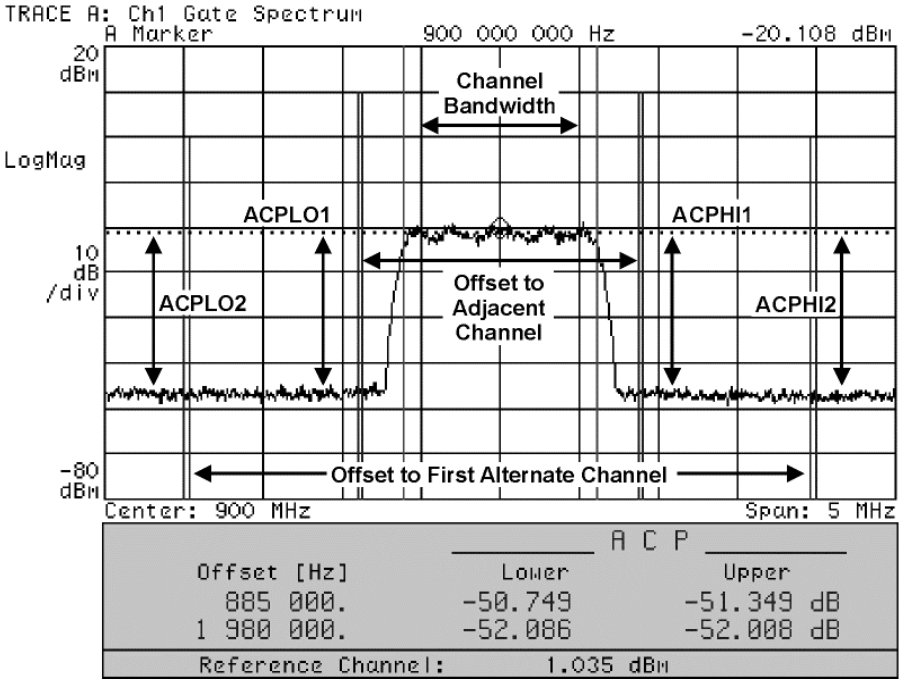


Measure Second Harmonic

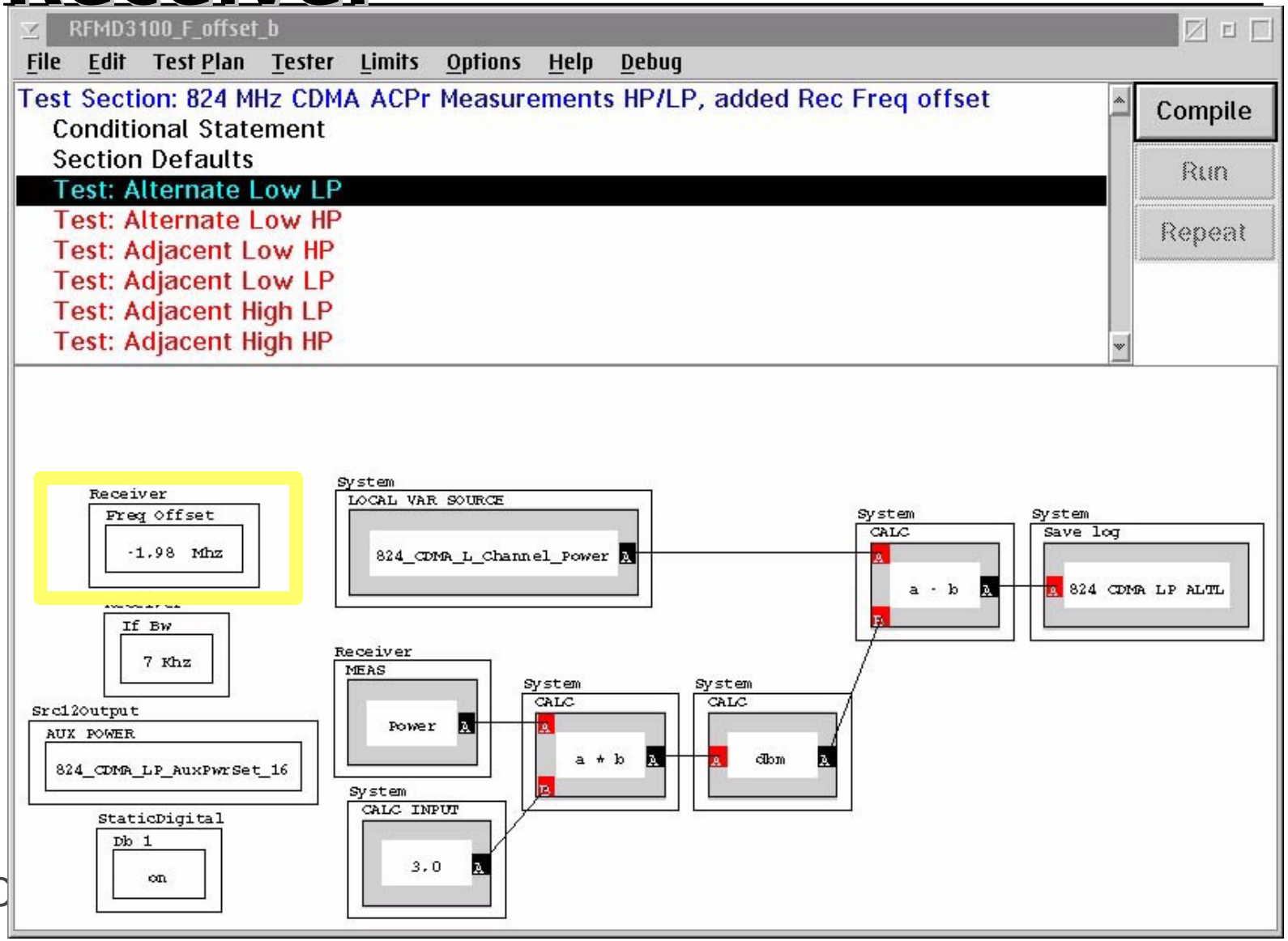


ACPR, ACLR

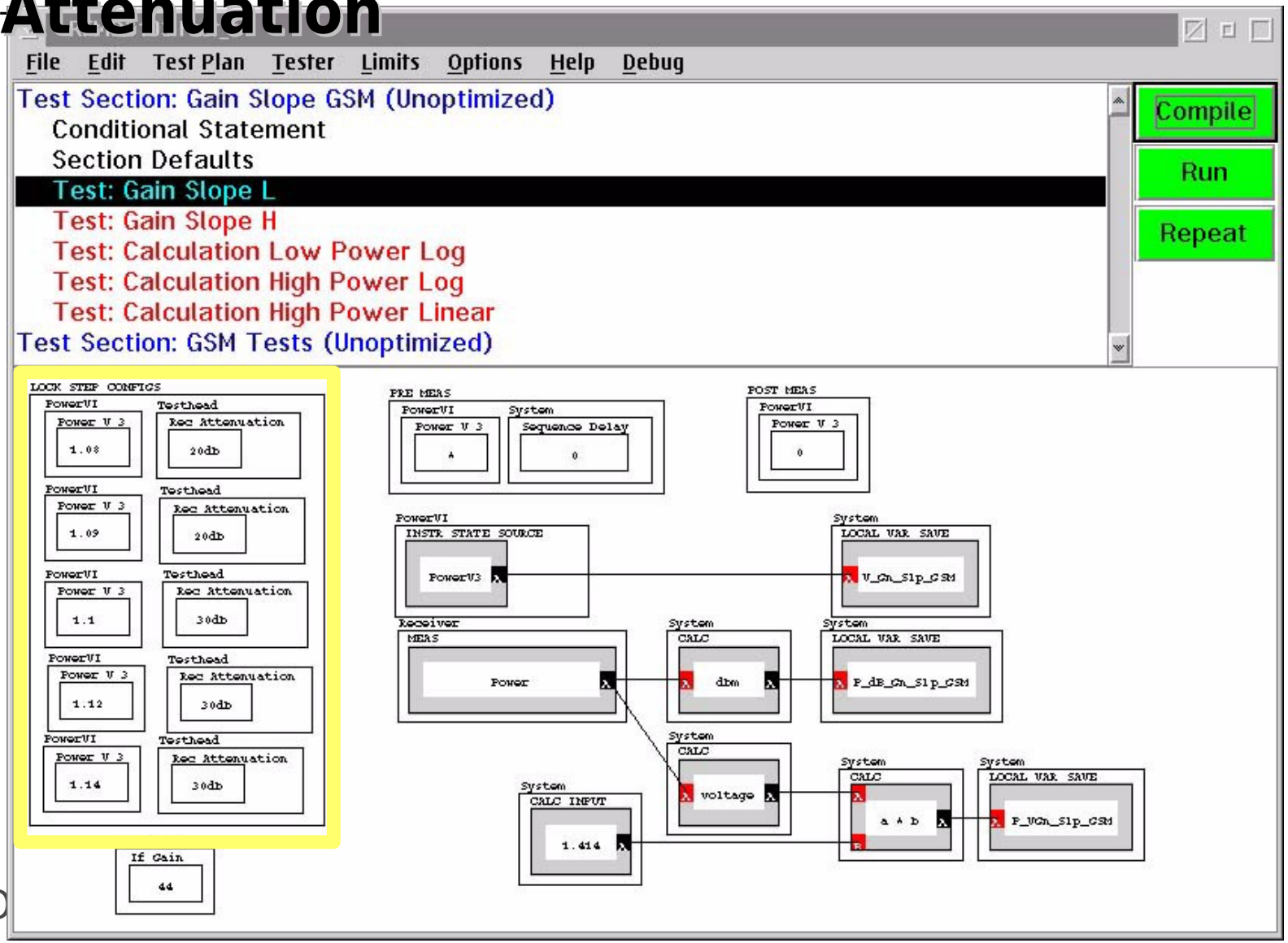
- "Multi-Tone IP3"
- Must Use RMS
- Power in Specified Bandwidth
- Every Standard is Different



Measure ACPR using Receiver

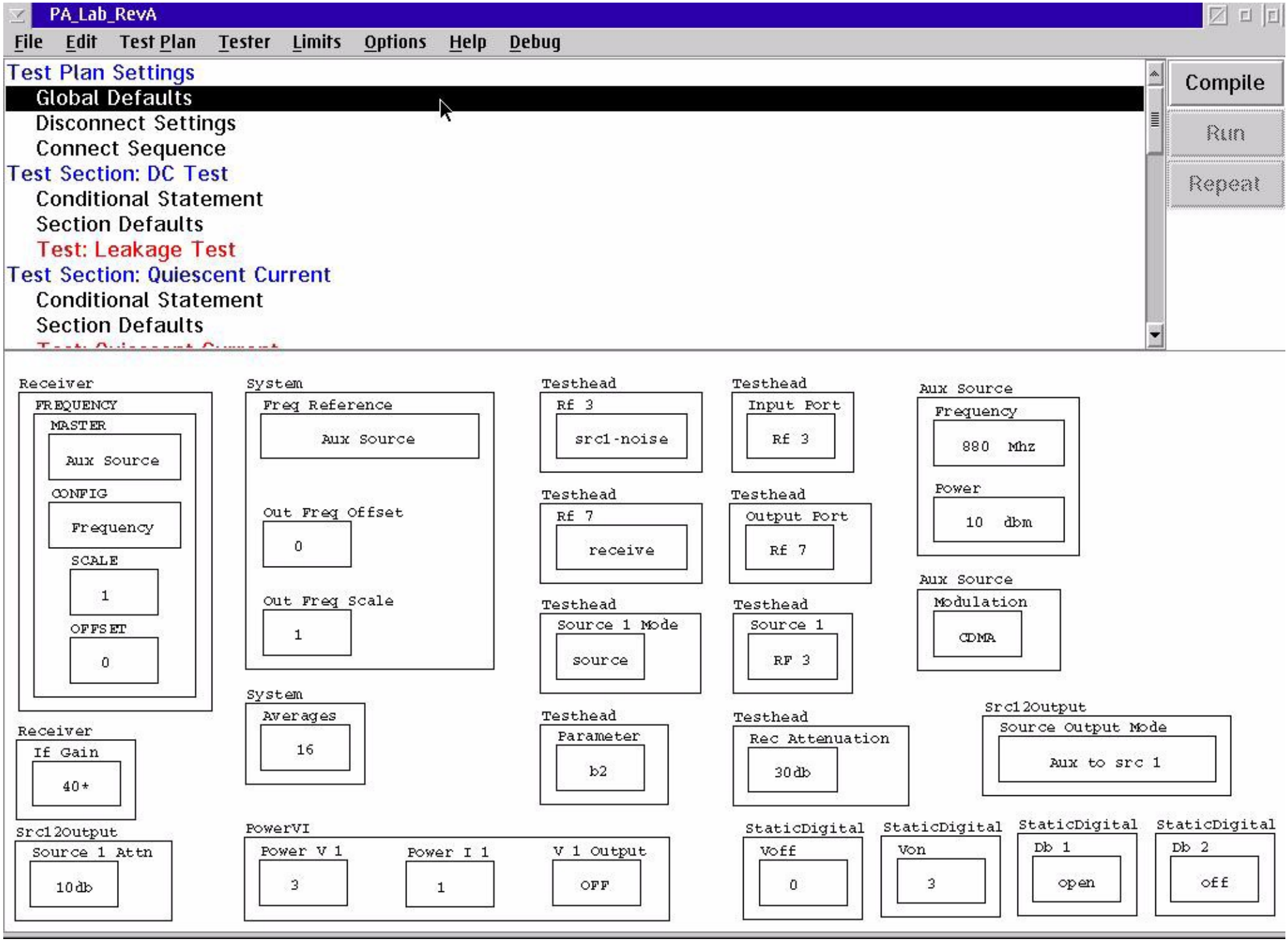


Sweep Power to Find Gain Slope Use Lock Step to Control Receiver Attenuation



PA Test Plan

- Examine Example PA Test Plan


PA_Lab_RevA
File
Edit
Test Plan
Tester
Limits
Options
Help
Debug
Test Plan Settings
Global Defaults
Disconnect Settings
Connect Sequence
Test Section: DC Test
Conditional Statement
Section Defaults
Test: Leakage Test
Test Section: Quiescent Current
Conditional Statement
Section Defaults
Compile
Run
Repeat
Receiver
FREQUENCY
MASTER
Aux Source
CONFIG
Frequency
SCALE
1
OFFSET
0
System
Freq Reference
Aux Source
Out Freq Offset
0
Out Freq Scale
1
Testhead
Rf 3
src1-noise
Testhead
Input Port
Rf 3
Aux Source
Frequency
880 Mhz
Power
10 dbm
Testhead
Rf 7
receive
Testhead
Output Port
Rf 7
Aux Source
Modulation
CDMA
Testhead
Source 1 Mode
source
Testhead
Source 1
RF 3
Receiver
If Gain
40*
System
Averages
16
Testhead
Parameter
b2
Testhead
Rec Attenuation
30db
Src12Output
Source Output Mode
Aux to src 1
Src12Output
Source 1 Attn
10db
PowerVI
Power V 1
3
Power I 1
1
V 1 Output
OFF
StaticDigital
Voff
0
StaticDigital
Von
3
StaticDigital
Db 1
open
StaticDigital
Db 2
off

PA_Lab_RevA

File Edit Test Plan Tester Limits Options Help Debug

Test Plan Settings
- Global Defaults
- Disconnect Settings
- Connect Sequence

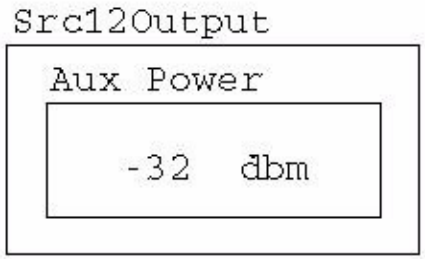
Test Section: DC Test
- Conditional Statement
- Section Defaults
- Test: Leakage Test

Test Section: Quiescent Current
- Conditional Statement
- Section Defaults

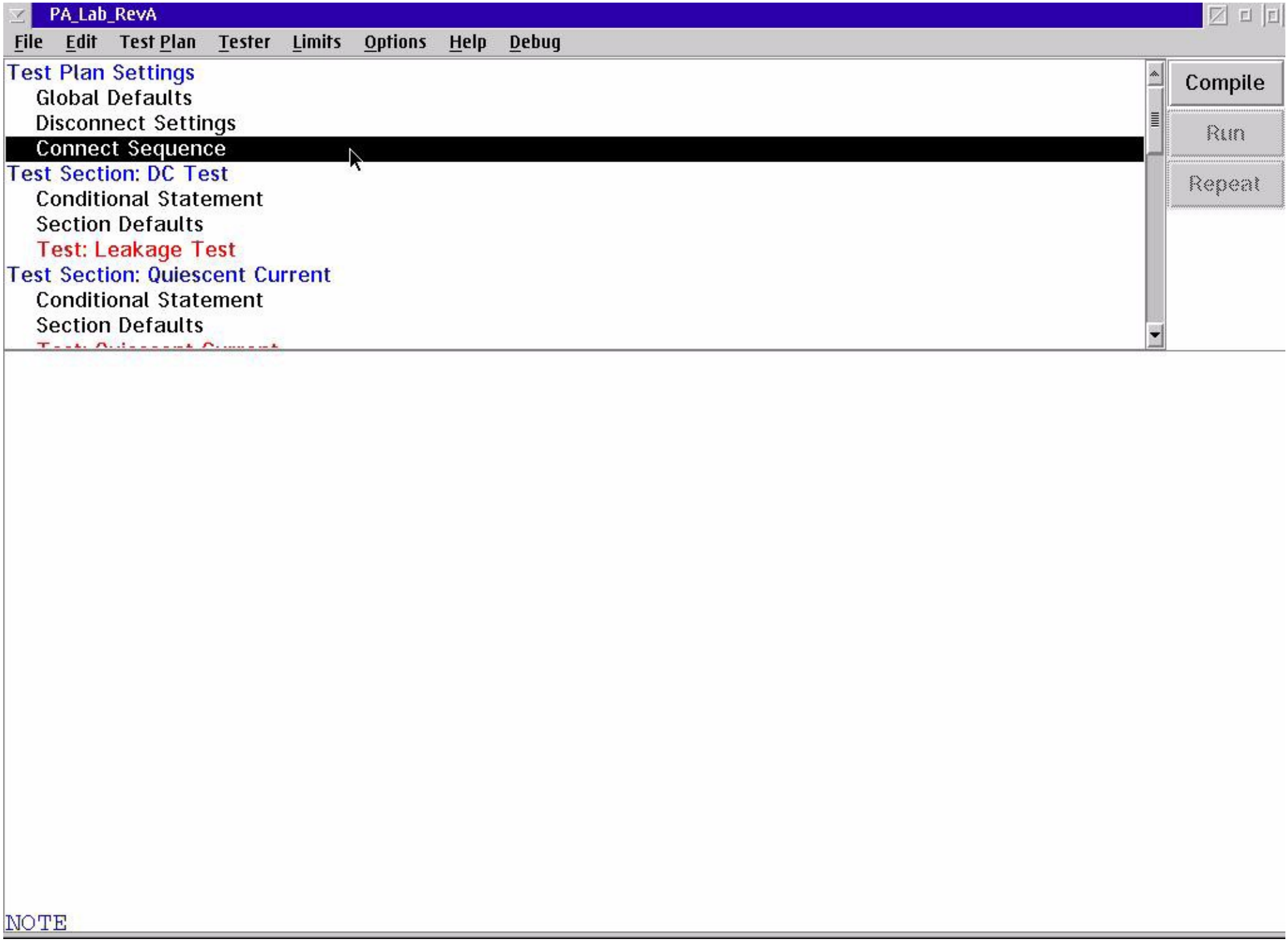
Compile

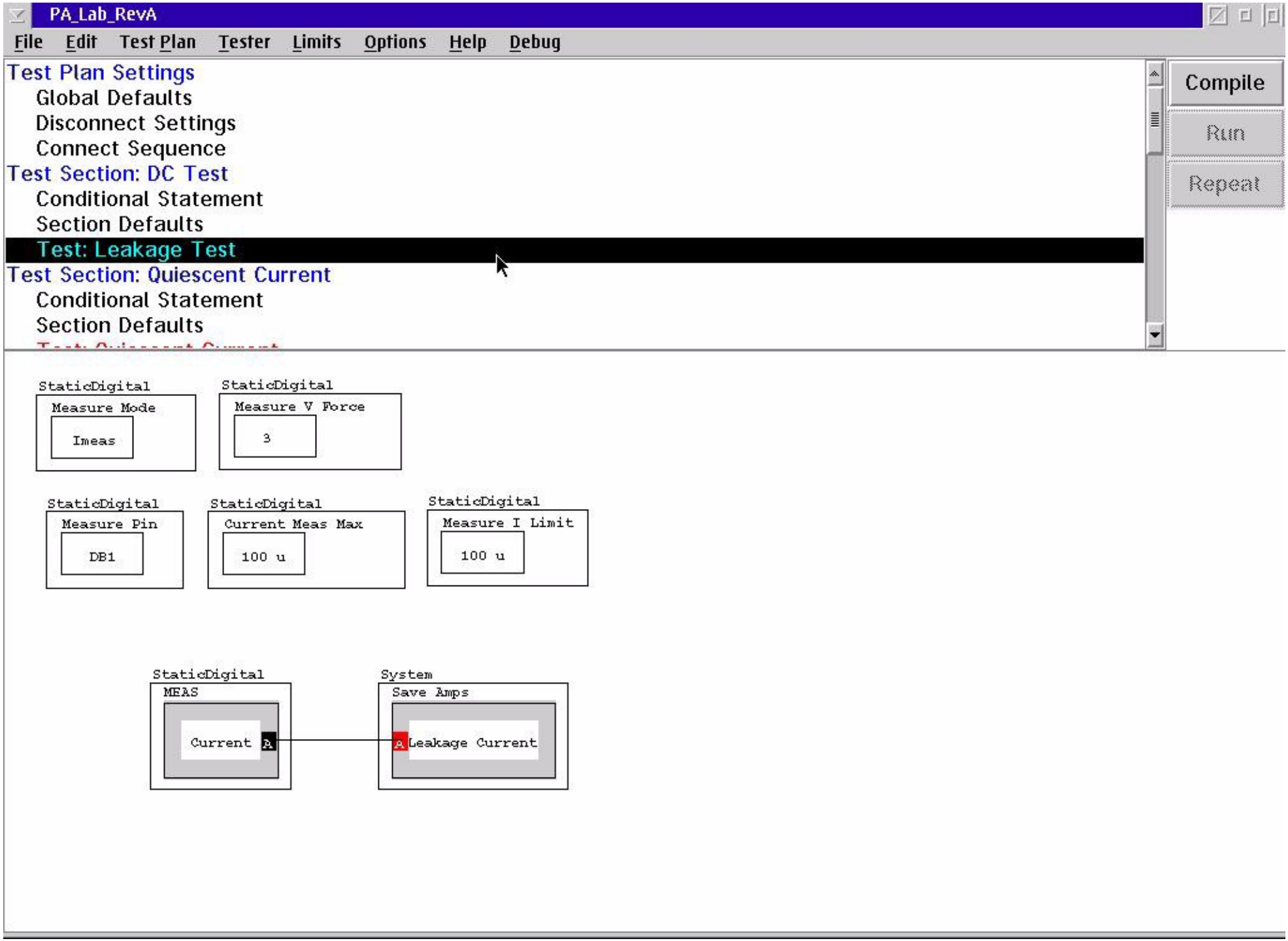
Run

Repeat



NOTE


PA_Lab_RevA
File
Edit
Test Plan
Tester
Limits
Options
Help
Debug
Test Plan Settings
Global Defaults
Disconnect Settings
Connect Sequence
Test Section: DC Test
Conditional Statement
Section Defaults
Test: Leakage Test
Test Section: Quiescent Current
Conditional Statement
Section Defaults
Compile
Run
Repeat
NOTE

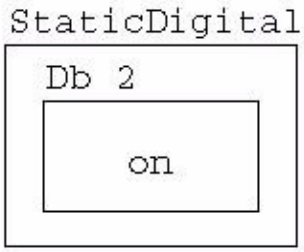

PA_Lab_RevA
File
Edit
Test Plan
Tester
Limits
Options
Help
Debug
Test Plan Settings
Global Defaults
Disconnect Settings
Connect Sequence
Test Section: DC Test
Conditional Statement
Section Defaults
Test: Leakage Test
Test Section: Quiescent Current
Conditional Statement
Section Defaults
Compile
Run
Repeat
StaticDigital
Measure Mode
Imeas
StaticDigital
Measure V Force
3
StaticDigital
Measure Pin
DB1
StaticDigital
Current Meas Max
100 u
StaticDigital
Measure I Limit
100 u
StaticDigital
MEAS
Current
A
System
Save Amps
A
Leakage Current

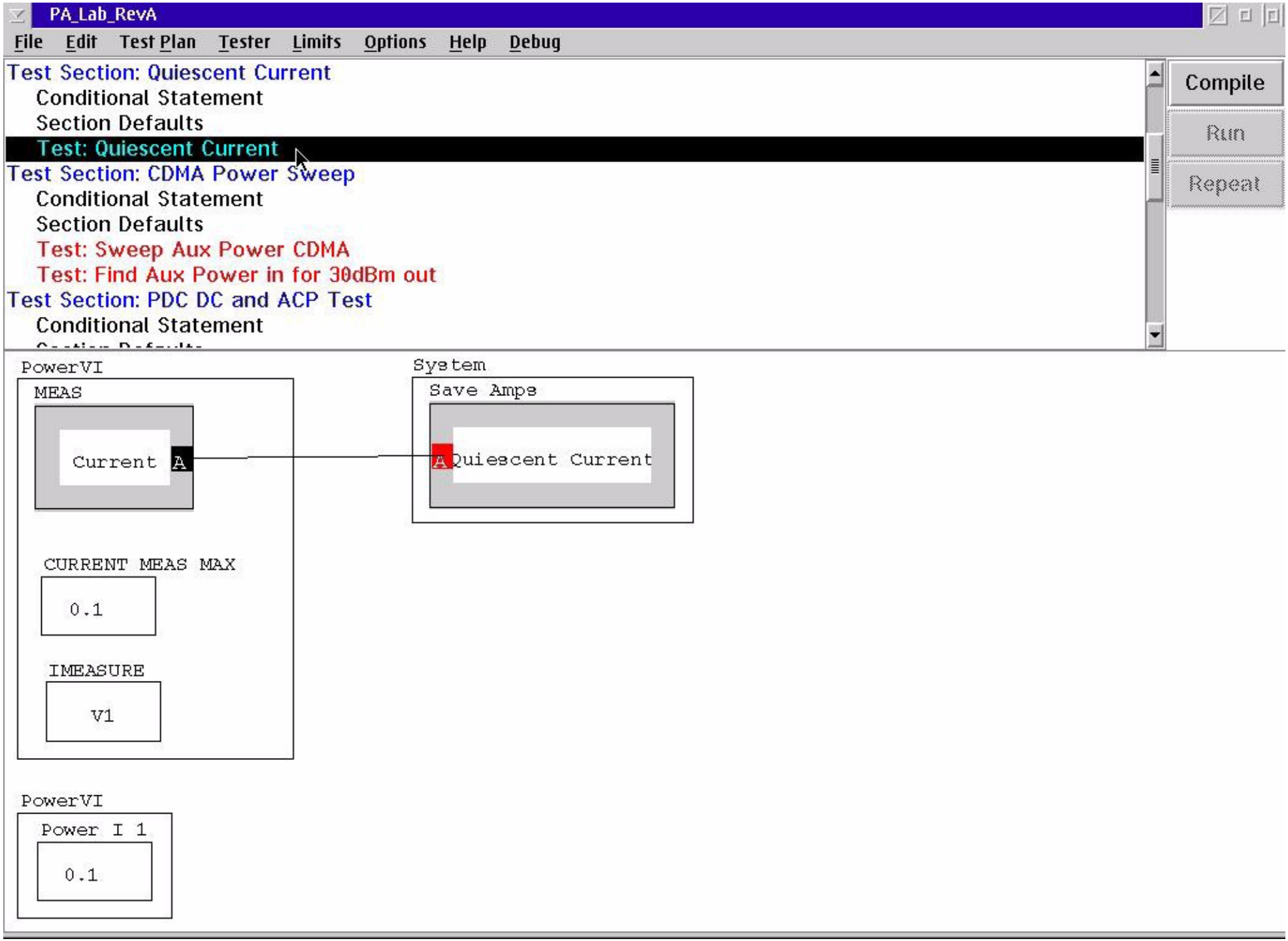
PA_Lab_RevA

File Edit Test Plan Tester Limits Options Help Debug

Test Section: Quiescent Current
  Conditional Statement
  Section Defaults
  Test: Quiescent Current
Test Section: CDMA Power Sweep
  Conditional Statement
  Section Defaults
  Test: Sweep Aux Power CDMA
  Test: Find Aux Power in for 30dBm out
Test Section: PDC DC and ACP Test
  Conditional Statement

Compile
Run
Repeat

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File
Edit
Test Plan
Tester
Limits
Options
Help
Debug
Test Section: Quiescent Current
Conditional Statement
Section Defaults
Test: Quiescent Current
Test Section: CDMA Power Sweep
Conditional Statement
Section Defaults
Test: Sweep Aux Power CDMA
Test: Find Aux Power in for 30dBm out
Test Section: PDC DC and ACP Test
Conditional Statement
Compile
Run
Repeat
PowerVI
MEAS
Current
A
CURRENT MEAS MAX
0.1
IMEASURE
V1
System
Save Amps
A
Quiescent Current
PowerVI
Power I 1
0.1

PA_Lab_RevA

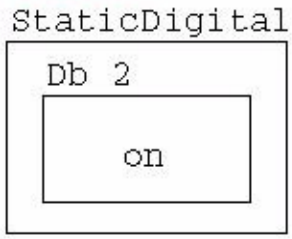
File Edit Test Plan Tester Limits Options Help Debug

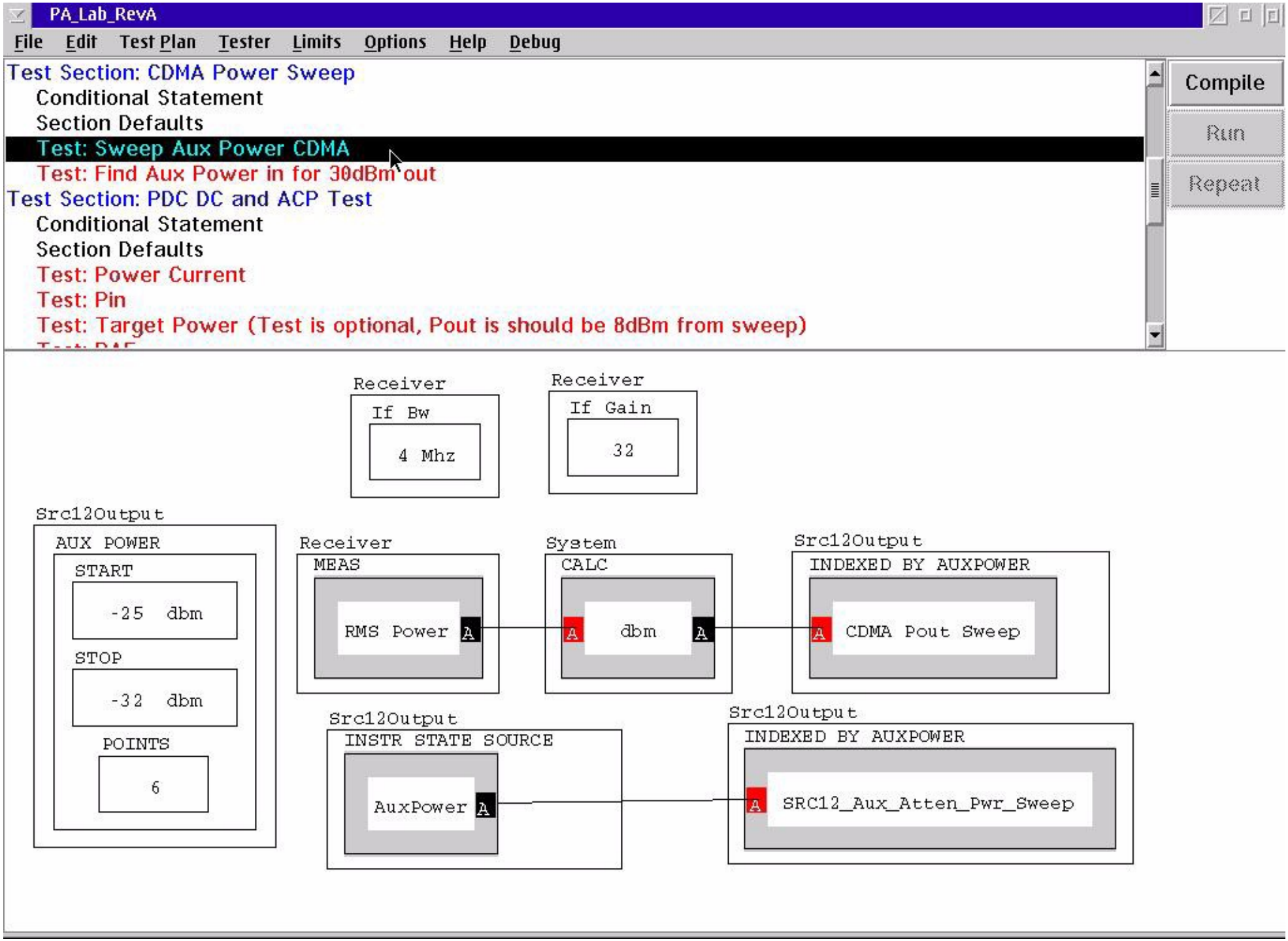
Test Section: CDMA Power Sweep
  Conditional Statement
  Section Defaults
  Test: Sweep Aux Power CDMA
  Test: Find Aux Power in for 30dBm out
Test Section: PDC DC and ACP Test
  Conditional Statement
  Section Defaults
  Test: Power Current
  Test: Pin
  Test: Target Power (Test is optional, Pout is should be 8dBm from sweep)

Compile

Run

Repeat




PA_Lab_RevA
File
Edit
Test Plan
Tester
Limits
Options
Help
Debug
Test Section: CDMA Power Sweep
Conditional Statement
Section Defaults
Test: Sweep Aux Power CDMA
Test: Find Aux Power in for 30dBm out
Test Section: PDC DC and ACP Test
Conditional Statement
Section Defaults
Test: Power Current
Test: Pin
Test: Target Power (Test is optional, Pout is should be 8dBm from sweep)
Compile
Run
Repeat
Receiver
If Bw
4 Mhz
Receiver
If Gain
32
Src12Output
AUX POWER
START
-25 dbm
STOP
-32 dbm
POINTS
6
Receiver
MEAS
RMS Power
A
System
CALC
A
dbm
A
Src12Output
INDEXED BY AUXPOWER
A
CDMA Pout Sweep
Src12Output
INSTR STATE SOURCE
AuxPower
A
Src12Output
INDEXED BY AUXPOWER
A
SRC12_Aux_Atten_Pwr_Sweep

PA_Lab_RevA

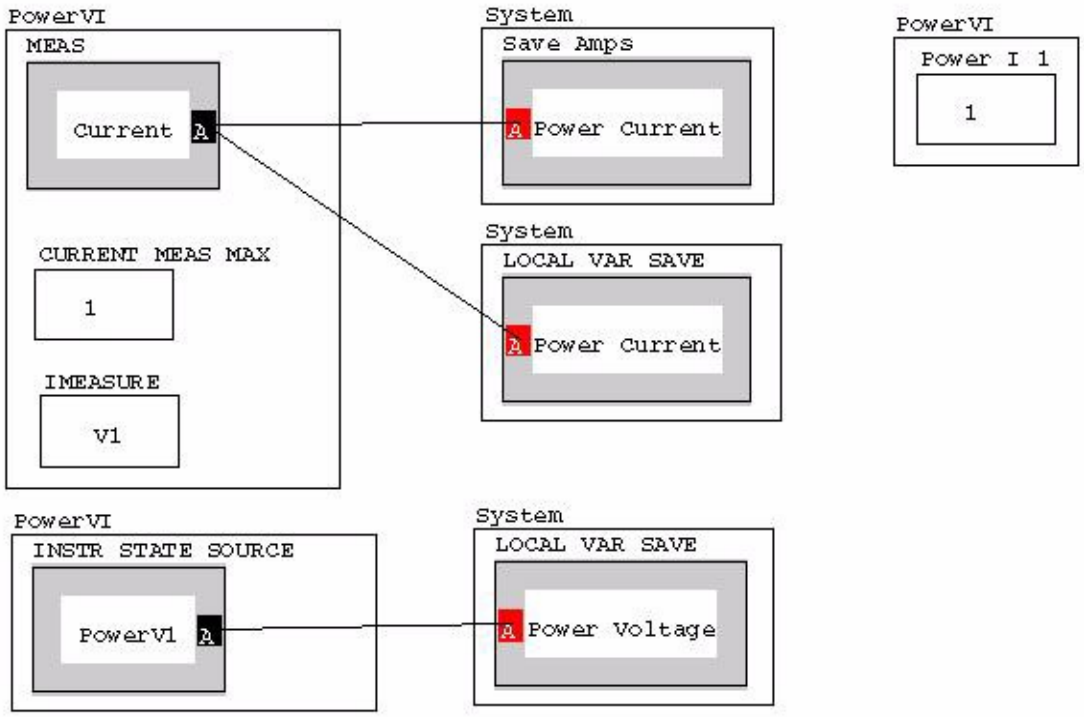
File Edit Test Plan Tester Limits Options Help Debug

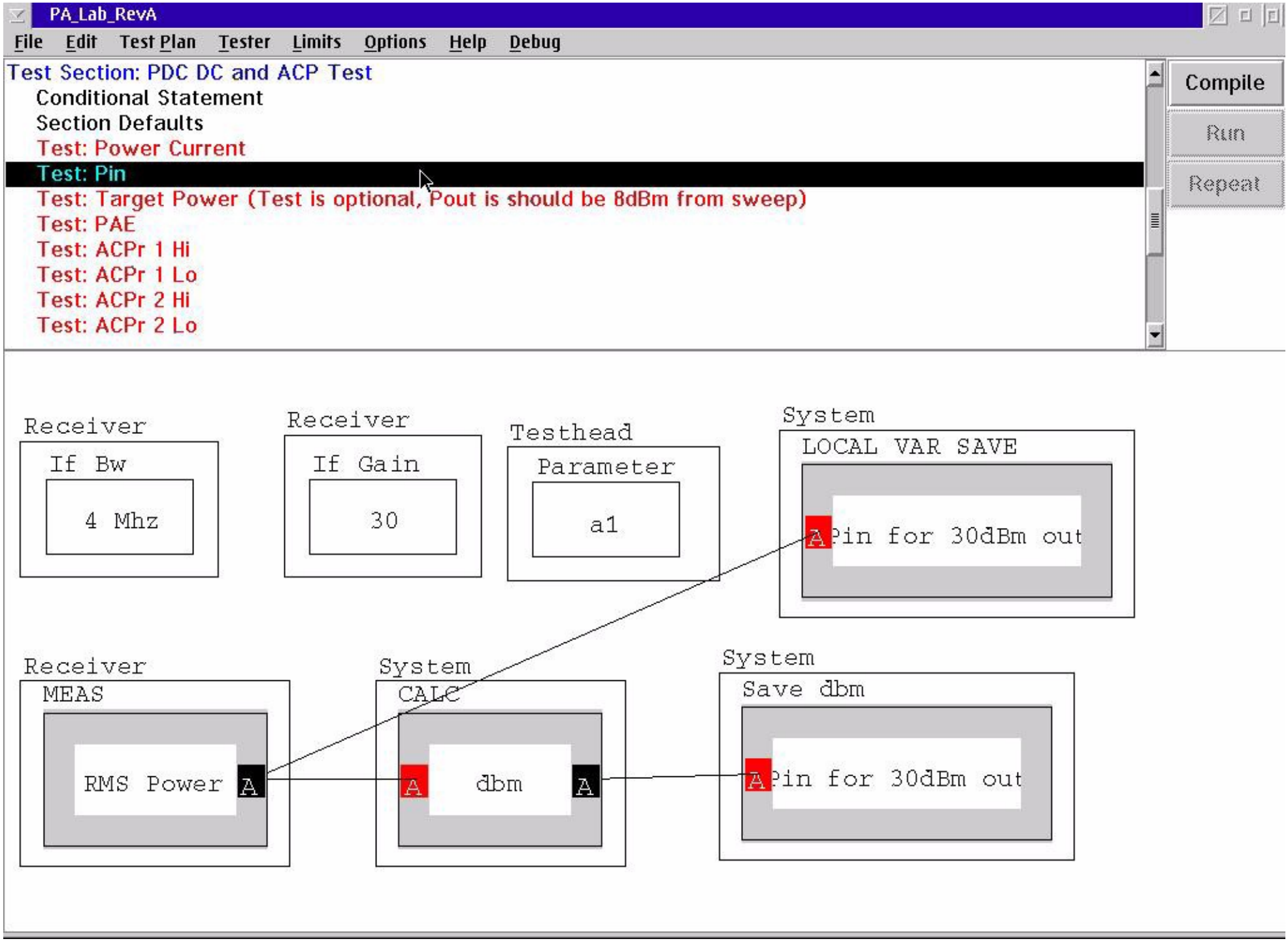
Test Section: PDC DC and ACP Test
- Conditional Statement
- Section Defaults
- Test: Power Current
- Test: Pin
- Test: Target Power (Test is optional, Pout is should be 8dBm from sweep)
- Test: PAE
- Test: ACPr 1 Hi
- Test: ACPr 1 Lo
- Test: ACPr 2 Hi
- Test: ACPr 2 Lo

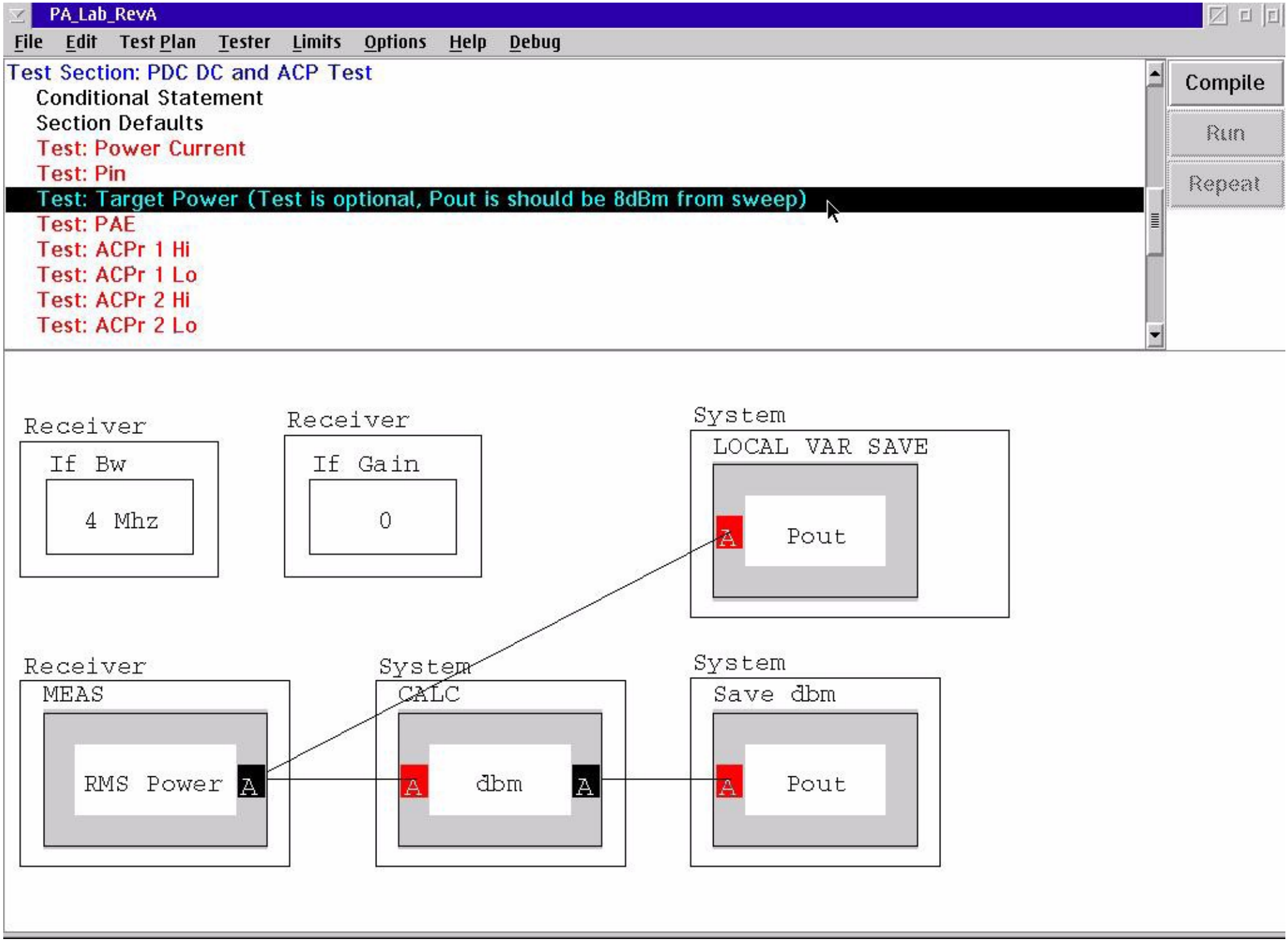
Compile

Run

Repeat




PA_Lab_RevA
File Edit Test Plan Tester Limits Options Help Debug
Test Section: PDC DC and ACP Test
Conditional Statement
Section Defaults
Test: Power Current
Test: Pin
Test: Target Power (Test is optional, Pout is should be 8dBm from sweep)
Test: PAE
Test: ACPr 1 Hi
Test: ACPr 1 Lo
Test: ACPr 2 Hi
Test: ACPr 2 Lo
Compile
Run
Repeat
Receiver
If Bw
4 Mhz
Receiver
If Gain
30
Testhead
Parameter
a1
System
LOCAL VAR SAVE
A Pin for 30dBm out
Receiver
MEAS
RMS Power
A
System
CALC
A
dbm
A
System
Save dbm
A Pin for 30dBm out


PA_Lab_RevA
File Edit Test Plan Tester Limits Options Help Debug
Test Section: PDC DC and ACP Test
Conditional Statement
Section Defaults
Test: Power Current
Test: Pin
Test: Target Power (Test is optional, Pout is should be 8dBm from sweep)
Test: PAE
Test: ACPr 1 Hi
Test: ACPr 1 Lo
Test: ACPr 2 Hi
Test: ACPr 2 Lo
Compile
Run
Repeat
Receiver
If Bw
4 Mhz
Receiver
If Gain
0
System
LOCAL VAR SAVE
A
Pout
Receiver
MEAS
RMS Power
A
System
CALC
A
dbm
A
System
Save dbm
A
Pout

PA_Lab_RevA

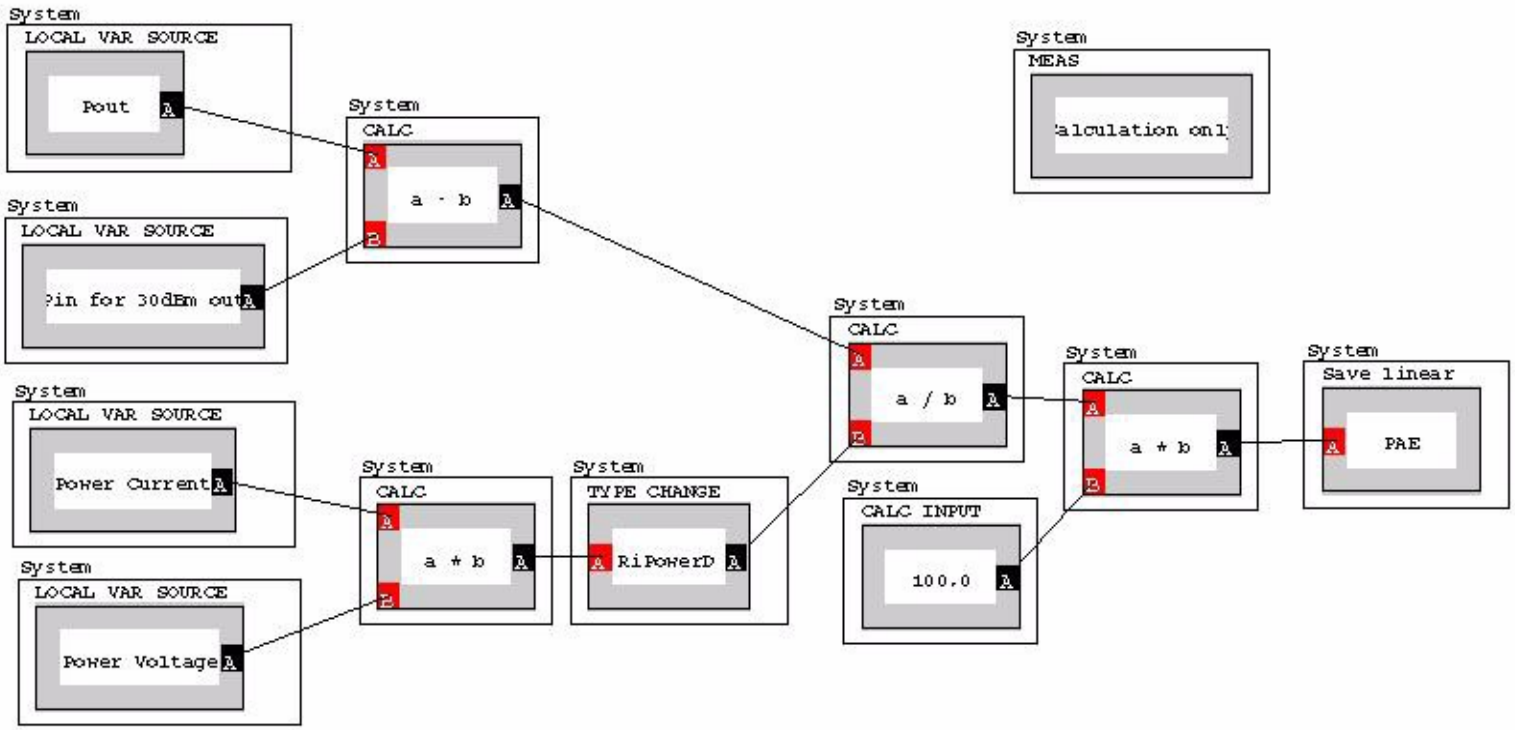
File Edit Test Plan Tester Limits Options Help Debug

Test Section: PDC DC and ACP Test
- Conditional Statement
- Section Defaults
- Test: Power Current
- Test: Pin
- Test: Target Power (Test is optional, Pout is should be 8dBm from sweep)
- Test: PAE
- Test: ACPr 1 Hi
- Test: ACPr 1 Lo
- Test: ACPr 2 Hi
- Test: ACPr 2 Lo

Compile

Run

Repeat

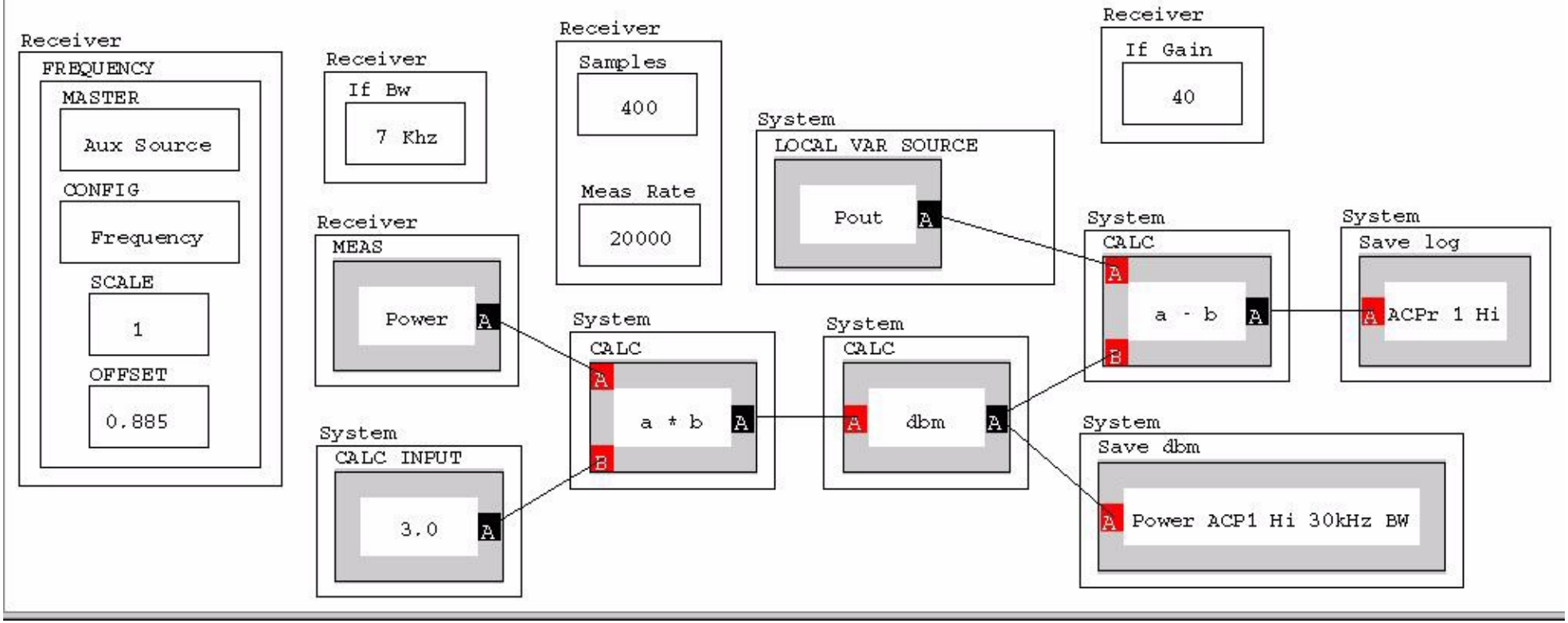


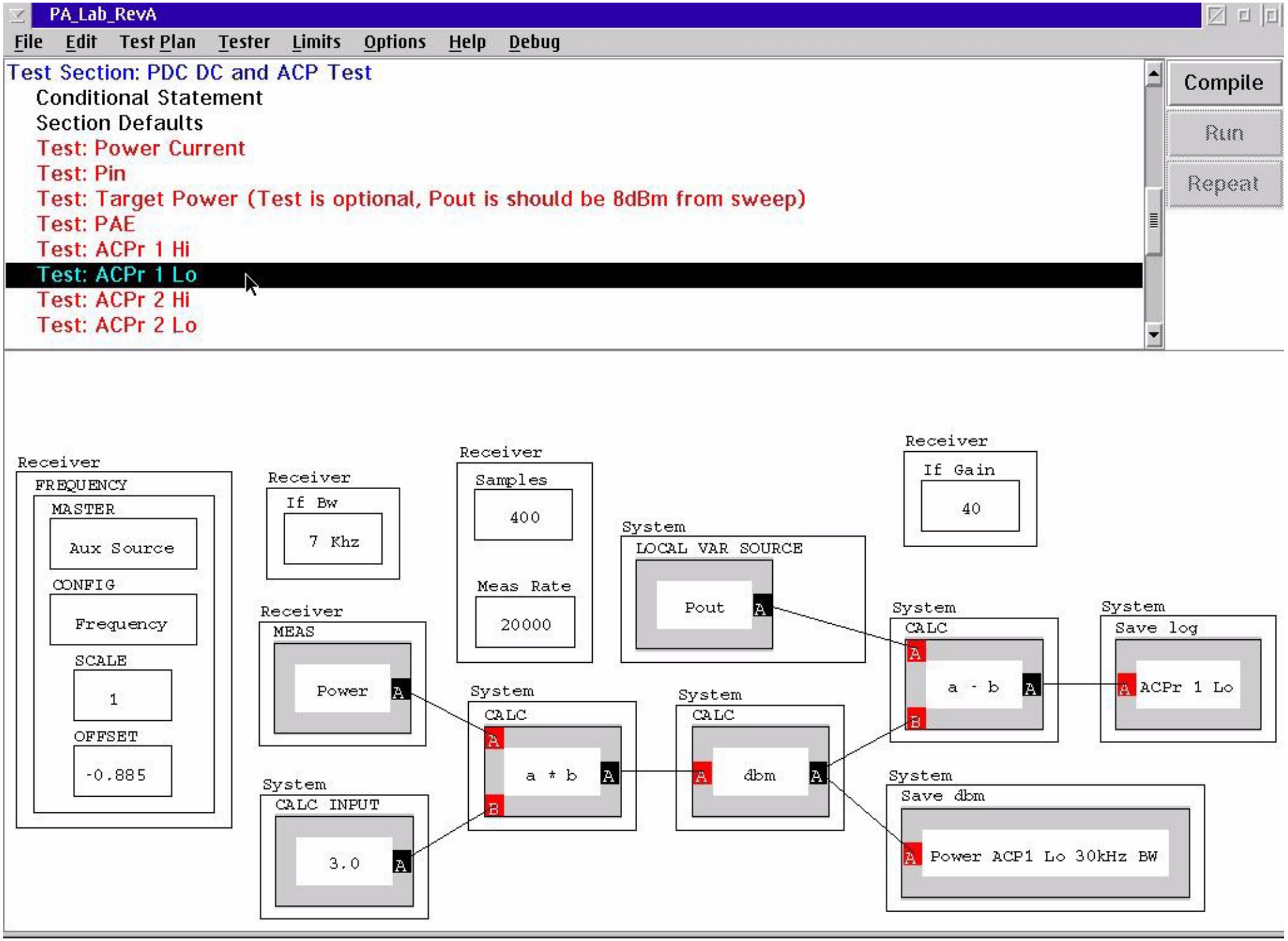
PA_Lab_RevA

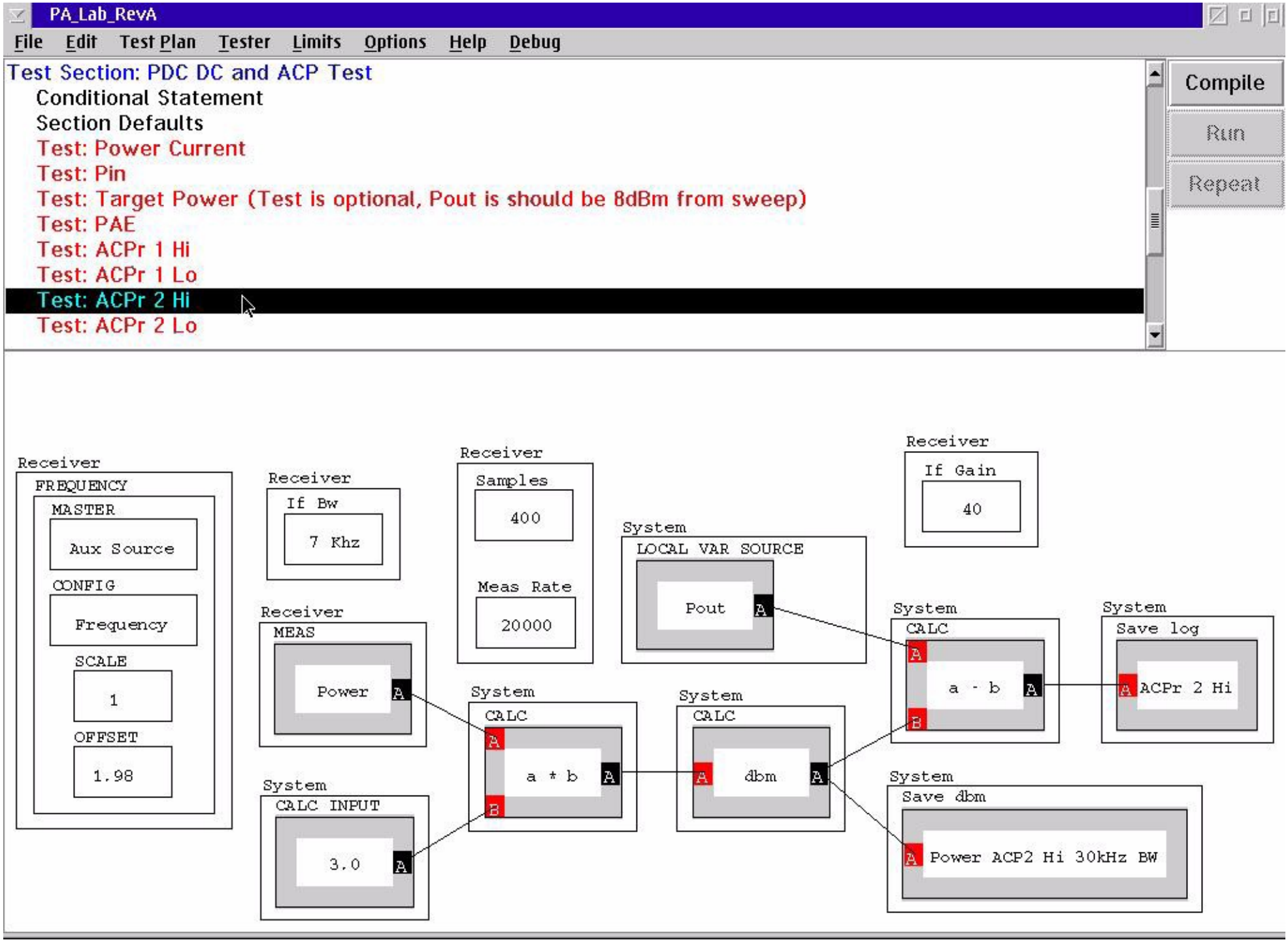
File Edit Test Plan Tester Limits Options Help Debug

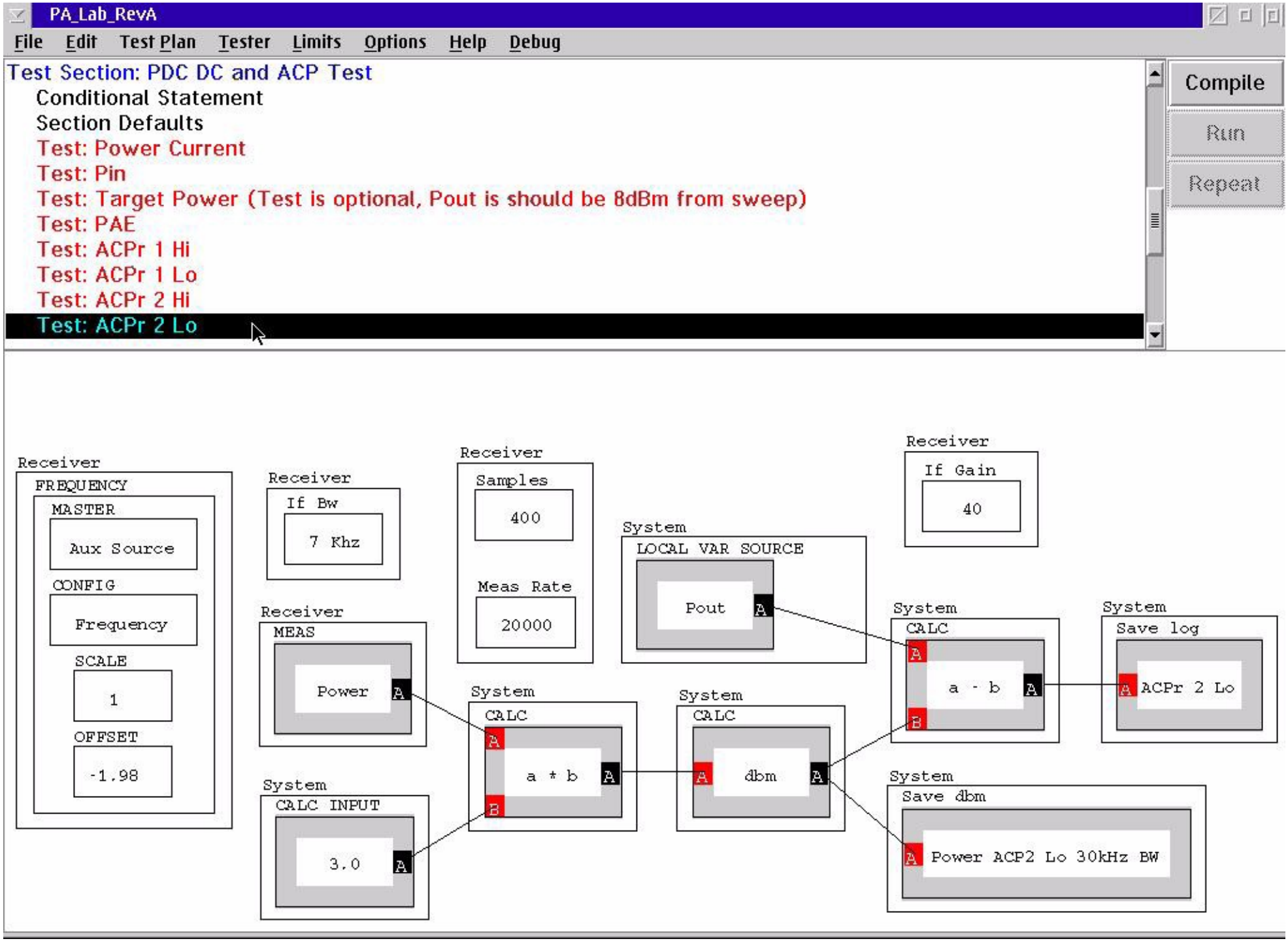
Test Section: PDC DC and ACP Test
- Conditional Statement
- Section Defaults
- Test: Power Current
- Test: Pin
- Test: Target Power (Test is optional, Pout is should be 8dBm from sweep)
- Test: PAE
- Test: ACPr 1 Hi
- Test: ACPr 1 Lo
- Test: ACPr 2 Hi
- Test: ACPr 2 Lo

Compile | Run | Repeat




PA_Lab_RevA
File Edit Test Plan Tester Limits Options Help Debug
Test Section: PDC DC and ACP Test
Conditional Statement
Section Defaults
Test: Power Current
Test: Pin
Test: Target Power (Test is optional, Pout is should be 8dBm from sweep)
Test: PAE
Test: ACPr 1 Hi
Test: ACPr 1 Lo
Test: ACPr 2 Hi
Test: ACPr 2 Lo
Compile
Run
Repeat
Receiver
FREQUENCY
MASTER
Aux Source
CONFIG
Frequency
SCALE
1
OFFSET
-0.885
Receiver
If Bw
7 Khz
Receiver
Samples
400
Meas Rate
20000
Receiver
If Gain
40
System
LOCAL VAR SOURCE
Pout
A
Receiver
MEAS
Power
A
System
CALC
A
B
a * b
A
System
CALC
A
dbm
A
System
CALC
A
B
a - b
A
System
Save log
A
ACPr 1 Lo
System
CALC INPUT
3.0
A
System
Save dbm
A
Power ACP1 Lo 30kHz BW


PA_Lab_RevA
File Edit Test Plan Tester Limits Options Help Debug
Test Section: PDC DC and ACP Test
Conditional Statement
Section Defaults
Test: Power Current
Test: Pin
Test: Target Power (Test is optional, Pout is should be 8dBm from sweep)
Test: PAE
Test: ACPr 1 Hi
Test: ACPr 1 Lo
Test: ACPr 2 Hi
Test: ACPr 2 Lo
Compile
Run
Repeat
Receiver
FREQUENCY
MASTER
Aux Source
CONFIG
Frequency
SCALE
1
OFFSET
1.98
Receiver
If Bw
7 Khz
Receiver
Samples
400
Meas Rate
20000
Receiver
If Gain
40
System
LOCAL VAR SOURCE
Pout
A
Receiver
MEAS
Power
A
System
CALC
a * b
A
B
System
CALC INPUT
3.0
A
System
CALC
dbm
A
System
CALC
a - b
A
B
System
Save log
ACPr 2 Hi
System
Save dbm
Power ACP2 Hi 30kHz BW


PA_Lab_RevA
File
Edit
Test Plan
Tester
Limits
Options
Help
Debug
Test Section: PDC DC and ACP Test
Conditional Statement
Section Defaults
Test: Power Current
Test: Pin
Test: Target Power (Test is optional, Pout is should be 8dBm from sweep)
Test: PAE
Test: ACPr 1 Hi
Test: ACPr 1 Lo
Test: ACPr 2 Hi
Test: ACPr 2 Lo
Compile
Run
Repeat
Receiver
FREQUENCY
MASTER
Aux Source
CONFIG
Frequency
SCALE
1
OFFSET
-1.98
Receiver
If Bw
7 Khz
Receiver
Samples
400
Meas Rate
20000
Receiver
If Gain
40
System
LOCAL VAR SOURCE
Pout
A
Receiver
MEAS
Power
A
System
CALC INPUT
3.0
A
System
CALC
A
a * b
A
B
System
CALC
A
dbm
A
System
CALC
A
a - b
A
B
System
Save log
A
ACPr 2 Lo
System
Save dbm
A
Power ACP2 Lo 30kHz BW

Example Applications - Lab E

- Get into Groups of Three
- Each will take turns performing the lab
- One drives, one reads, one uses pointer

PA Test Plan Lab: ACPR Test

- Use Aux Source
- Measure Leakage
- Search and Fix Pout
- Measure CDMA ACPR
  - 1.23 MHz Channel
  - 885 kHz, 1980 kHz Offset; 30 kHz BW

PA Test Plan Lab: NADC ACPR

- Create NADC Measurement
  - 25 kHz Ch.; 30 kHz Offset 25 kHz BW
- Channel is Flat
- Significant Power exists outside the channel
- Pout Does Not Equal Channel Power