Agilent 85309A H20, H21 Distributed Frequency Converter 0.1 to 18 GHz

Operating and Service Manual Modification

Use this manual modification with instrument serial number 3224A 00499 and above.

Use this manual modification with manual part numbers 85310-90001 (printed August 1993)

Manual part number: 85309-90056
Printed in USA
June 2000

Revision 6.0

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Agilent Technologies, Inc.
1400 Fountaingrove Parkway
Santa Rosa, CA 95403-1799, U.S.A.

What You'll Find in this Manual

This *Agilent 85309A H20, H21 Operating and Service Manual Modification* provides information specific to these options and in contrast to the information provided in the *Agilent 85309A Operating and Service Manual* (p/n 85309-90001).

All other information contained in the *Agilent 85309A Operating and Service Manual* is still applicable.

Contents

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Review this product and related documentation to familiarize yourself with safety markings and instructions before you operate the instrument. This product has been designed and tested in accordance with international standards.

WARNING

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

CAUTION

The **CAUTION** notice denotes a hazard. It calls attention to an operating procedure, practice, or the like, which, 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.

Instrument Markings

	When you see this symbol on your instrument, you should refer to the instrument's instruction manual for important information.
	This symbol indicates hazardous voltages.
	The laser radiation symbol is marked on products that have a laser output.
	This symbol indicates that the instrument requires alternating current (ac) input.
	The CE mark is a registered trademark of the European Community. If it is accompanied by a year, it indicates the year the design was proven.
	The CSA mark is a registered trademark of the Canadian Standards Association.
1SM1-A	This text indicates that the instrument is an Industrial Scientific and Medical Group 1 Class A product (CISPER 11, Clause 4).
	This symbol indicates that the power line switch is ON.
	This symbol indicates that the power line switch is OFF or in STANDBY position.

Safety Earth Ground

This is a Safety Class I product (provided with a protective earthing terminal). An uninterruptible safety earth ground must be provided from the main power source to the product input wiring terminals, power cord, or supplied power cord set. Whenever it is likely that the protection has been impaired, the product must be made inoperative and secured against any unintended operation.

Before Applying Power

Verify that the product is configured to match the available main power source as described in the input power configuration instructions in this manual. If this product is to be powered by autotransformer, make sure the common terminal is connected to the neutral (grounded) side of the ac power supply.

Typeface Conventions

Italics

- Used to emphasize important information:
  Use this software *only* with the Agilent 85309A H20, H21.
- Used for the title of a publication:
  Refer to the *Agilent 85309A H20, H21 Operating and Service Manual Modification*.
- Used to indicate a variable:
  Type `LOAD BIN` *filename*.

`Instrument Display`

- Used to show on-screen prompts and messages that you will see on the display of an instrument:
  The Agilent 85309A H20, H21 will display the message **`CAL1 SAVED`**.

[Keycap]

- Used for labeled keys on the front panel of an instrument or on a computer keyboard:
  Press **[Return]**.

{Softkey}

- Used for simulated keys that appear on an instrument display:
  Press ***{Prior Menu}***.

`User Entry`

- Used to indicate text that you will enter using the computer keyboard; text shown in this typeface must be typed *exactly* as printed:
  Type `LOAD PARMFILE`
- Used for examples of programming code:
  `#endif // ifndef NO_CLASS`

`Path Name`

- Used for a subdirectory name or file path:
  Edit the file *`usr/local/bin/sample.txt`*

Computer Display

- Used to show messages, prompts, and window labels that appear on a computer monitor:
  The **Edit Parameters** window will appear on the screen.
- Used for menus, lists, dialog boxes, and button boxes on a computer monitor from which you make selections using the mouse or keyboard:
  Double-click **EXIT** to quit the program.

Introduction

This operating and service manual modification describes the differences in the Agilent 85309A H20 and H21 options compared to the standard Agilent 85309A LO/IF distribution unit. It also describes the manual changes necessary to document the Agilent 85309A H20 and H21.

Description

The Agilent 85309A H20 and H21 are broadband, distributed frequency converters that utilize fundamental mixing to provide the performance required for antenna measurement systems. The Agilent 85309A H20 and H21 have one reference channel, up to three test channels, and operate from 100 MHz to 18 GHz in two overlapping bands, as follows:

Band	Operating Frequency
Low band	0.1 to 1 GHz
High band	0.3 to 18 GHz

The measurement bands can be selected manually from the instrument's front panel BAND SELECT switch or the TTL interface provided at the rear panel SELECT port for automated control.

Option Definition

The Agilent 85309A H20 and H21 are distinguished by the number of test channels available, as follows:

Option	Number of Test Channels
85309A H20	1
85309A H21	2

NOTE

Use Agilent 85320A/B option H20 external mixer modules to utilize the 0.1 to 3 GHz frequency range of operation.

Agilent 8836xx Series LO Source Operation Note

When using an Agilent 8360 series synthesized sweeper as the LO source, set the output power level to approximately +10 dBm in order to minimize potential Agilent 85310A system-generated spurious signals in the 0.1 to 3 GHz range.

The spurious signal levels seen on the Agilent 8510/30 depend on the LO power level setting.

- At the recommended +10 dBm setting, spur levels should be no greater than –100 dB.
- With a power level of as much as +23 dBm, spurs may be detected as high as –60 dB.

Revised Installation

The following modifies the “Installation” section of the *Agilent 85309A Operating and Service Manual*, pages 2-5 through 2-7.

AC Power Connections

No line voltage selector setting is required. The ac input power that the option H20 and H21 can accept is 90 to 132 Vac or 198 to 264 Vac at 50-60 Hz.

Fuse Type

4 A (p/n Agilent 2110-0680)

Revised Operations

The following modifies the "Operations" section of the *Agilent 85309A Operating and Service Manual*, page 3-2 through 3-4.

Front and Rear Panel Feature Changes

A green LED on the instrument's front panel (left side) indicates which measurement band has been selected. LED ON indicates HIGH BAND has been selected and LED OFF indicates LOW BAND has been selected. Figures 1 and 2 show typical front and rear panels.

By setting the front panel BAND SELECT switch to the EXTernal position for automated control, the rear panel SELECT port can be used to perform band selection. A TTL High (+5 V), LED ON, selects HIGH BAND and a TTL (0 V), LED OFF, selects LOW BAND.

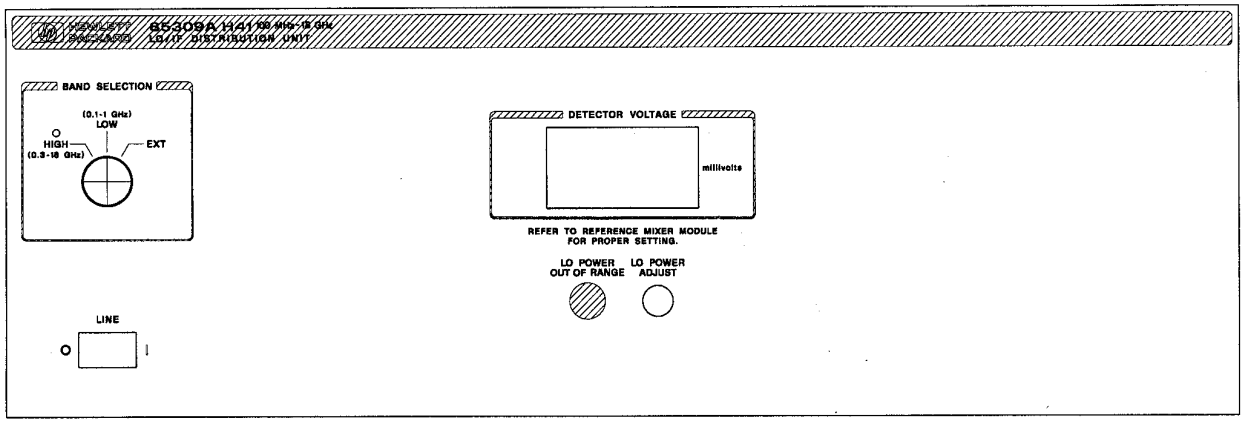


Figure 1 Typical front panel

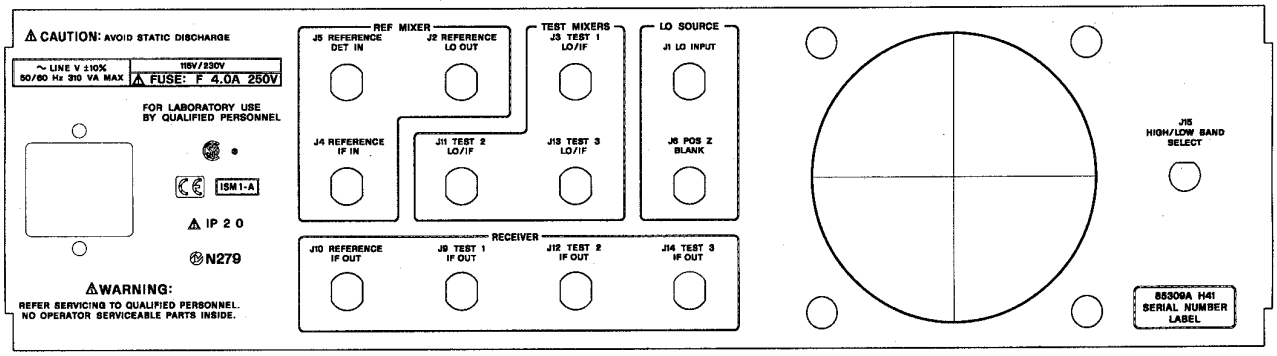


Figure 2 Typical rear panel

All rear panel functional descriptions are the same for the HIGH or LOW band operations.

J15 Rear Panel Port, HIGH/LOW BAND SELECT

When the front panel BAND SELECT switch is set to EXT, this port can be used to select the operating band desired by the following TTL levels:

HIGH BAND: > + 4 Vdc
LOW BAND: < 0.5 Vdc

J7 and J8 (using nondiplexed mixers)

These two rear panel ports are not available on the Agilent 85309A H20, and H21 options.

Revised General Information

The following general information supercedes “General Information, Table 5-3”, in the *Agilent 85310A Operating and Service Manual*.

Typical Agilent 85301B System Performance Data

Table 1 Typical Agilent 85301B System Performance Data with Agilent 85309A H20 and H21

Table 5-3a										
	Specification (Typical)	GHz	***0.1 - 0.3**	***0.3 - 0.8**	***0.8 - 1**	****0.3 - 3**	2 - 3	3 - 18	***6 - 20	***20 - 26.5
a	Sensitivity (S/N=1, 0 average)	-dBm	110	110	110	110	115	115	105	100
b	Compression Level (at 0.1 dB)	-dBm	20	20	20	20	20	20	15	15
c	Dynamic Range	dB	90	90	90	90	95	95	90	85
d	Channel Isolation	dB	100	95	90	105	110	105	110	105
e	Minimum phase lock power	-dB	55	55	55	55	55	55	55	55
	RF Port match (2.0:1 max)	dB	8	8	8	8	8	8	8	8

* w/85320A/B H20 mixer, Low Band; ** w/85320A/B H20, High Band; *** 3rd Harm. Mode

a Sensitivity is the calculated difference between IF noise and RF/IF conversion gain/loss. Averaging will improve sensitivity by 10 log (avg. factor).

b RF level for 0.1 dB compression: the RF input level where the RF and the IF levels are no longer tracking each other linearly within 0.1dB.

c Dynamic range is the calculated difference between 0.1 dB compression and sensitivity.

d Crosstalk is the coherent RF leakage from the reference ch3annel to the test channel with 1024 averages.

e Refers to systems that use an HP 8350 LO source. Minimum phase lock power is the minimum RF power into the reference mixer to achieve phase lock. *This does not apply to systems with a synthesized LO.*

Other

Environmental Characteristics

Operating conditions: 0 °C to + 50 °C

Power consumption: 300 Vac (maximum)

Absolute Maximum Rating

Parameter	Values
LO input port (CW)	+ 23 dBm
Reference channel IF input port (CW)	+ 13 dBm
Reference channel detector input	± 20 vdc
Pos. Z blanking input	± 10 vdc
Select HI/LOW input	± 5.5 vdc

Agilent 85309A H20 and H21 Operating Characteristics

The following parameters are unique to Agilent 85309A options H20 and H21. These parameters supercede Tables 5-5, 5-6, and 5-7 in the *Agilent 85310A Operating and Service Manual*.

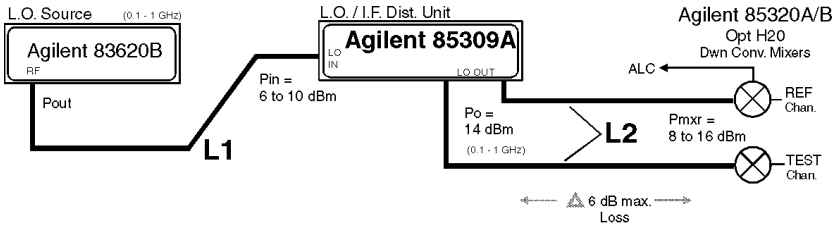
Nominal Channel Performance

Parameter	Values
Frequency range:	
Low band	0.1 to 1.0 GHz
High band	0.3 to 18 GHz
Input power range (LO input recommended):	
0.1 to 1.0 GHz (Low Band)	6 to 10 dBm
0.3 to 3.0 GHz	6 to 10 dBm
2.0 to 18 GHz	0 to 6 dBm
Power output (LO ports):	Minimum
0.1 to 1.0 GHz (Low Band)	14 dBm
0.3 to 1.0 GHz	16 to 20 dm
1.0 to 6.0 GHz	20 to 22 dBm
6.0 to 9.0 GHz	22 dBm
9.0 to 18 GHz	19 dBm
IF channel small signal gain:	Minimum
20 MHz	21 dB
Output power channel tracking (typical):	
0.1 to 1.0 GHz	± 1.3 dB
0.3 to 3.0 GHz	± 2 dB
2.0 to 18 GHz	± 2 dB
Port return loss, 0.1 to 18 GHz typical:	
LO input	9 dB
LO output	7 dB

Agilent 85381A Cable Length Limits

The following figure defines the allowable maximum cable lengths between the LO source and the Agilent 85309A LO/IF distribution unit, and between the Agilent 85309A and the external mixers. The cable lengths are provided when using standard Agilent 85381A RF cable assemblies and with MicroCoax type UFB311A RF low-loss cable assemblies.

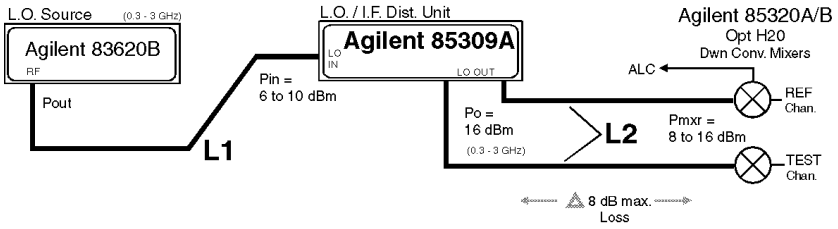
The standard mixers used in Agilent antenna measurement systems are the Agilent 85320A test mixer and the Agilent 85320B reference mixer. Both mixers operate from 2 to 18 GHz in fundamental mode, and from 6 to 26.5 GHz in third-harmonic mode. Figure 3 shows the RF power levels required for proper operation with the Agilent 85320A/B mixers and various other mixer products provided by Agilent Technologies.



0.1 - 1 GHz

L1 Max. = **2**1 meters
(40 meters)

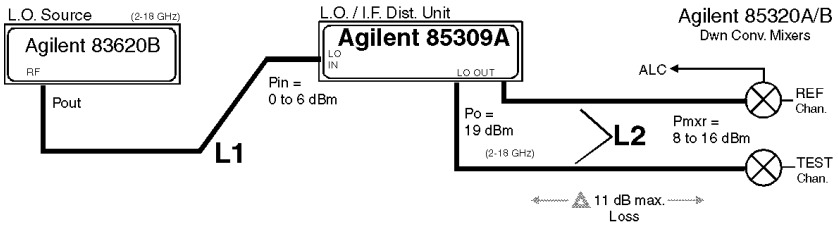
L2 Max. = 20 meters
(39 meters)



0.3 - 3 GHz

L1 Max. = 11 meters
(21 meters)

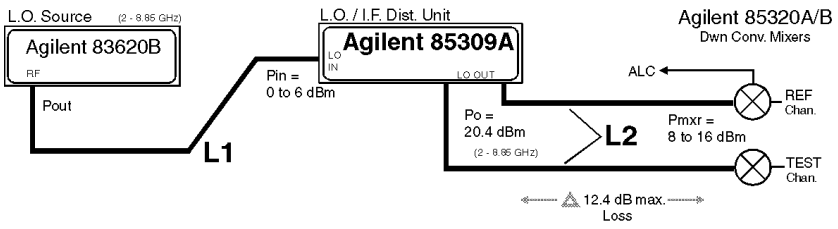
L2 Max. = 15.8 meters
(31.5 meters)



2 - 18 GHz

L1 Max. = 6 meters
(13 meters)

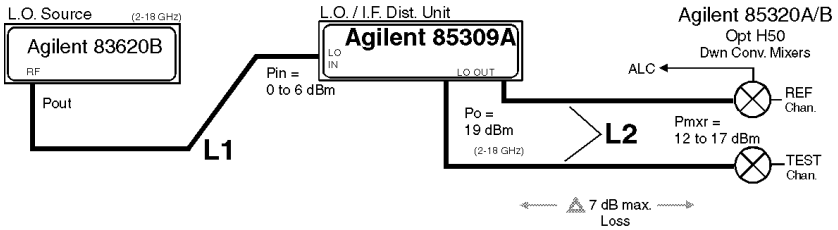
L2 Max. = 7.5 meters
(16 meters)



6 - 26.5 GHz*

L1 Max. = 11 meters
(23 meters)

L2 Max. = 13 meters
(26 meters)



2 - 18 GHz

L1 Max. = 6 meters
(13 meters)

L2 Max. = 4.8 meters
(10 meters)

(Low Loss RF Cable)

* Mixers are operated in the 3rd Harmonic Mode.

Agilent 85309A H20, H21
conf_h21.cdr
rev. 01 05/12/00

Figure 3 External Mixer Configurations (1 of 2)

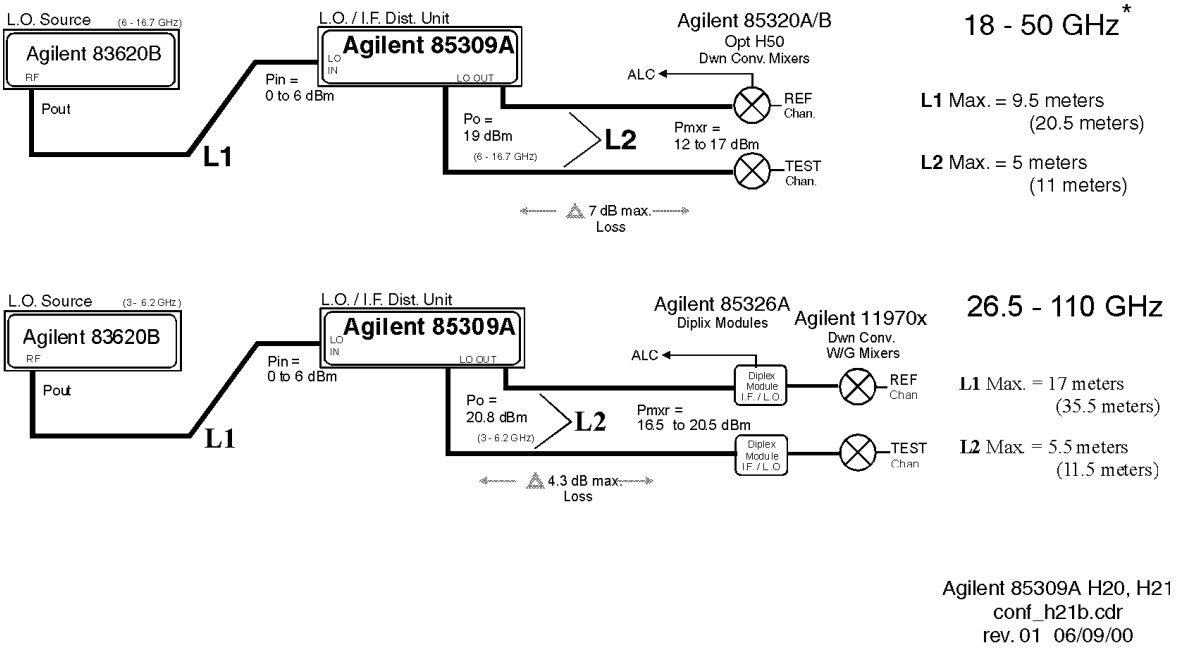


Figure 4 External Mixer Configurations (2 of 2)

Revised Replaceable Parts

Agilent 85309A H20 and H21 Major Assemblies

The following replaceable parts list supercedes Table 7-19 in the *Agilent 85309A Operating and Service Manual* (page 7-58). Refer to Figures 3, 4, and 5.

Reference Designator	Description	Agilent Part Number	Quantity H20 option	Quantity H21 option
A1	PC board, front panel display	85309-60022	1	1
A2	PC board, ALC/REG	85309-60093	1	1
A3	PC board, switch control	85309-60040	1	1
A4	PC, remote applications	85309-60047	1	1
A5	PC board, dc power distribution	85309-60098	1	1
A10	Low pass filter, 30 MHz	---	1	1
A11	Power divider, 18 GHz, 4-way	0955-0566	1	1
A12	RF amplifier, 0.3 to 18 GHz (Ref Chan)	5086-7530	1	1
A13	RF amplifier, 0.3 to 18 GHz (Test1 Chan)	5086-7530	1	1
A14	IF amplifier, 0.5 to 500 MHz (Ref Chan)	0955-0511	1	1
A15	IF amplifier, 0.5 to 500 MHz (Test1 Chan)	0955-0511	1	1
A16	Diplexer, (Test1 Chan)	5086-7542	1	1
A17	RF amplifier, 0.3 to 18 GHz (Input)	5086-7530	1	1
A18	Kit assembly, LO Power Adjustment	85309-60031	1	1
A20	Kit assembly, LO Power indicator	85309-60032	1	1
A22	dc power supply, -15, +5, +15, +24	85309-80019	1	1
A23	dc power supply, +15 @10A	85309-80020	1	1
A24	RF amplifier, 0.3 to 18 GHz (Test2 Chan)	5086-7530	0	1
A25	Diplexer, (Test2 Chan)	5086-7542	0	1
A26	IF amplifier, 0.5 to 500 MHz (Test2 Chan)	0955-0511	0	1
A30	RF amplifier, 10 to 1200 MHz	85309-80014	1	1
A31	RF amplifier, 10 to 1000 MHz	85309-80015	1	1
A32	Power divider, 1 GHz, 4way	85309-80022	1	1
A36	Filter, 100 MHz high-pass (Ref. Chan)	85309-80012	1	1
A37	Filter, 100 MHz high-pass (Test1 Chan)	85309-80012	1	1

Reference Designator	Description	Agilent Part Number	Quantity H20 option	Quantity H21 option
A38	Filter, 100 MHz high-pass (Test2 Chan)	85309-80012	0	1
A39	Connection adapter, SMA m/f RT Ang (Ref. Chan)	1250-1249	1	1
A40	Connection .adapter, SMA m/f RT Ang (Test1 Chan)	1250-1249	1	1
A41	Connection adapter, SMA m/f RT Ang (Test2 Chan)	1250-1249	0	1
A43	Filter, 30 MHz low-pass (Test1 Chan)	85110-80015	1	1
A44	Filter, 30 MHz low-pass (Test2 Chan)	85110-80015	0	1
AT1	Coax attenuator, sloped (Test2 Chan)	33340CZ	0	1
AT3	Coax attenuator, sloped (Test2 Chan)	33340CZ	1	1
AT4	Coax attenuator, sloped (Ref. Chan)	33340CZ	1	1
AT5	Coax termination, 50 ohm, SMB(f)	1250-0676	1	1
AT6	Coax termination,50 ohm, SMA(m)	0955-0053	1	1
AT7	Coax attenuator, 1dB (Ref. Chan)	0955-0321	1	1
AT8	Coax attenuator, 1dB (Test1. Chan)	0955-0321	1	1
AT9	Coax attenuator, 1dB (Test2. Chan)	0965-0321	0	1
AT10	Coax attenuator, 10 dB	0955-0122	1	1
AT12	Coax termination, 50 ohm, SMA(m)	0960-0053	1	1
AT13	Coax termination, 50 ohm, SMA(m)	0960-0053	1	0
AT14	Coax termination, 50 ohm, SMA(m)	0960-0053	1	0
B1	Fan, 12 vdc	3160-0627	1	1
FL1	ac line filter	85309-80021	1	1
J1	Coax bulkhead connector, N(f)/SMA(f)	86290-60005	1	1
J2	Coax bulkhead connector, N(f)/SMA(f)	86290-60005	1	1
J3	Coax bulkhead connector, N(f)/SMA(f)	86290-60005	1	1
J4	Coax bulkhead connector, N(f)/SMA(f)	86290-60005	1	1
J5	Coax bulkhead connector, N(f)/SMA(f)	86290-60005	1	1
J6	Coax bulkhead connector, N(f)/SMA(f)	86290-60005	1	1
J9	Coax bulkhead connector, N(f)/SMA(f)	86290-60005	1	1
J10	Coax bulkhead connector, N(f)/SMA(f)	86290-60005	1	1
J11	Coax bulkhead connector, N(f)/SMA(f)	86290-60005	0	1
J12	Coax bulkhead connector, N(f)/SMA(f)	86290-60005	0	1
J15	Coax bulkhead connector, BNC(f)	1250-0118	1	1

Reference Designator	Description	Agilent Part Number	Quantity H20 option	Quantity H21 option
SW1	Switch, SPDT (part of W24 assy)	3101-0449	1	1
SW2	Switch, SP3T, rotary	3100-3244	1	1
SW3	Switch, RF SPDT, 15 Vdc 18 GHz	8762B #015	1	1
SW4	Switch, RF SPDT, 15 Vdc 18 GHz	8762B #015	1	1
SW5	Switch, RF SPDT, 15 Vdc 18 GHz	8762B #015	1	1
SW6	Switch, RF SPDT, 15 Vdc 18 GHz	8762B #015	0	1

RF Cables

The following standard cables list supercedes Table 7-22 in the *Agilent 85309A Operating and Service Manual* (page 7-66).

Reference Designator	Description	Agilent Part Number	Quantity H20 option	Quantity H21 option
W1	RP(J1) to SW3(C)	85309-20100	1	1
W2	SW3(2) to A17 In	85309-20101	1	1
W3	A17 Out to A11 Input	85309-20130	1	1
W4	A11 Out (AT3) to A12 In	85309-20131	1	1
W5	A11 Out (AT4) to A13 In	85309-20132	1	1
W6	A13 Out to SW5 (2)	85309-20105 [1]	1	1
W7	A16 Out to RP(J3)	85309-20106 [1]	1	1
W9	A12 Out to SW4(2)	85309-20107 [1]	1	1
W30	A11 Out (AT1) to A24 In	85309-20133	0	1
W31	A24 Out to SW6 (2)	85309-20109 [1]	0	1
W32	A25 LO/IF to RP (J11)	85309-20110 [1]	0	1
W41	SW3(1) to A30 In (AT10)	85309-20114	1	1
W42	A30 Out to A31 In	85309-20115	1	1
W43	A31 Out to A32 In(S)	85309-20116	1	1
W44	AT7 (A32-1 Out) to SW4 (1)	85309-20117	1	1
W45	AT8(A32-3 Out) to SW5 (1)	85309-20118	1	1
W46	SW4(C) to RP(J2)	85309-20119 [1]	1	1
W47	SW5(C) to A16 LO	85309-20120 [1]	1	1
W48	AT9(A32-2 Out) to SW6(1)	85309-20121	0	1
W49	SW6(C) to A25 LO In	85309-20122 [1]	0	1

1. Special low loss cable assembly done by SRC Cable Company.

Non-RF Cables

The following standard cables list supercedes Table 7-23 in the *Agilent 85309A Operating and Service Manual* (page 7-68).

Reference Designator	Description	Agilent Part Number	Quantity H20 option	Quantity H21 option
W8	Coax, flex/ A16 I.F. Out to A43(A15 In)	8120-5531	1	1
W11	Coax, flex, Test1 IF signal/ A15 Out to RP(J9)	08760-63404	1	1
W12	Coax, flex/ RP(J4) to A10 In	8120-5054	1	1
W13	Coax, flex/ A10 Out to A14 In	8120-5054	1	1
W14	Coax, flex/ A14 Out to RP(J10)	08760-62356	1	1
W15	Coax, flex, Ref IF signal/ A2(J1) to RP(J5)	8120-5106	1	1
W16	Coax, flex, PosZ signal/ A2(J2) to RP(J6)	8120-6118	1	1
W17	Ribbon, FP display intrface/ A2(J6) to A1(J1)	85309-60055	1	1
W18	Ribbon, RF Amp dc Pwr/ A2(J4) to A12 BiasBd.(J1)	85309-60064	1	1
W19	Ribbon, RF Amp dc Pwr/ A2(J3) to A24 BiasBd.(J1)	85309-60063	0	1
W20	Ribbon, Dual RF Amp dc Pwr/ A2(J5) to A13, 17 BiasBd.(J1)	85309-60062	1	1
W21	Wire Harness, dc Pwr Intrfc/ A22 to A2(J7),A5(J1)	85309-60057	1	1
W22	Wire Harness, IF Amp dc Pwr/ A2(J9) to A15(+15v)	85309-60053	1	1
W23	Wire Harness, IF Amp dcPwr/ A2(J8) to A14(+15v)	85309-60053	1	1
W24	Wire Harness, ac Pwr Intrfc/ AC switch assy	85309-60056	1	1
W25	Coax, flex/ A2(J12) to A4(J5)	8120-5021	1	1
W26	Coax, flex/ A4(J5) – A17 BiasBd.(J2)	8120-5024	1	1
W27	Coax, flex/ A4(J6) – A30 (ALC)	85309-60060	1	1
W28	Wire Harness, IF Amp dc Pwr/ A2(J13) to A26(+15v)	85309-60053	0	1

Reference Designator	Description	Agilent Part Number	Quantity H20 option	Quantity H21 option
W33	Coax, flex/ A25 I.F. Out to A26 In	8120-5531	0	1
W34	Coax, flex, Test2 IF signal/ A26 Out to RP(J12)	08760-63404	0	1
W40	Wire harness, dc Pwr Intrfc/ A23 to A2(P1)	85309-60052	1	1

Chassis Parts

The following chassis parts list supercedes Table 7-25 contained in the *Agilent 85309A Operating and Service Manual* (page 7-72).

Reference Designator	Description	Agilent Part Number	Quantity H20 option	Quantity H21 option
	Bracket, switch-mount	33311-02005	2	3
1	Cover, top-perforated	08513-00040	1	1
6	Cover, side-perforated	08513-00041	1	1
7	Cover, side-perforated	08513-00041	1	1
A3 & A4 boards	Housing assembly	08513-60156	1	1
	Hole plug	6960-0028	4	2
13	Subpanel, front	85309-00028	1	1
14	Panel, rear	85309-00058	1	1
15	Main deck	85309-00053	1	1
16	H20 front panel, dress	85309-00034	1	0
16	H21 front panel, dress	85309-00027	0	1
18	Rear panel standoff	5040-8821	4	4
23	Fan, 12 vdc	3160-0627	1	1
24	Finger guard, fan	08760-82032	1	1
	Bracket, fan duct	85309-00050	1	1
	Bracket, input amp/switch mount	85309-00054	1	1
	Bracket, power divider mount	85309-00055	1	1
	Bracket, diplexers mount	85309-00056	1	1
	Bracket, LPF A10 mount	85309-00057	1	1
	Bracket, amp mount	E7340-20002	2	3

Revised Instrument Diagrams

Components Layout

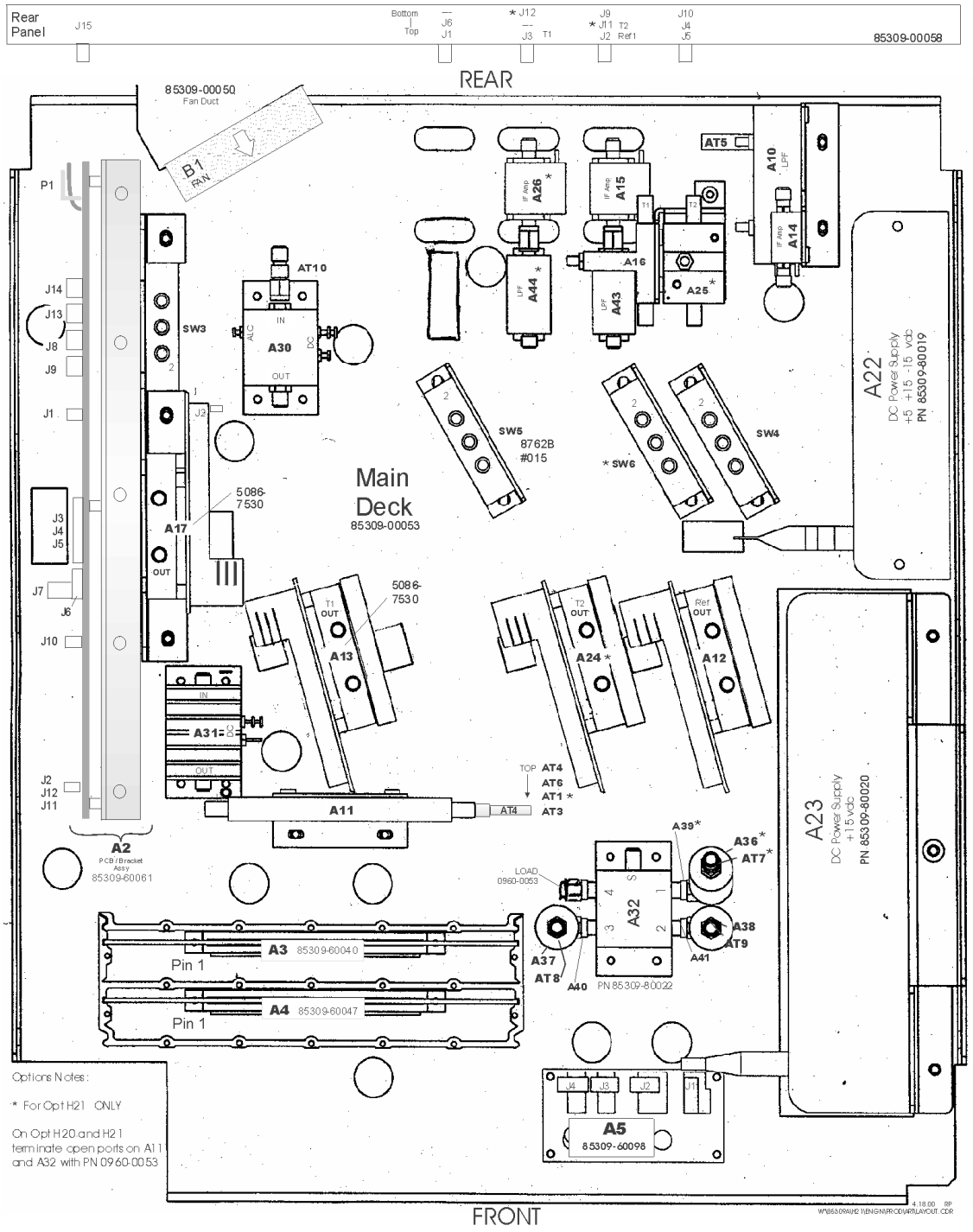


Figure 5 Major Components Layout Locations

Semirigid RF Cable Locations

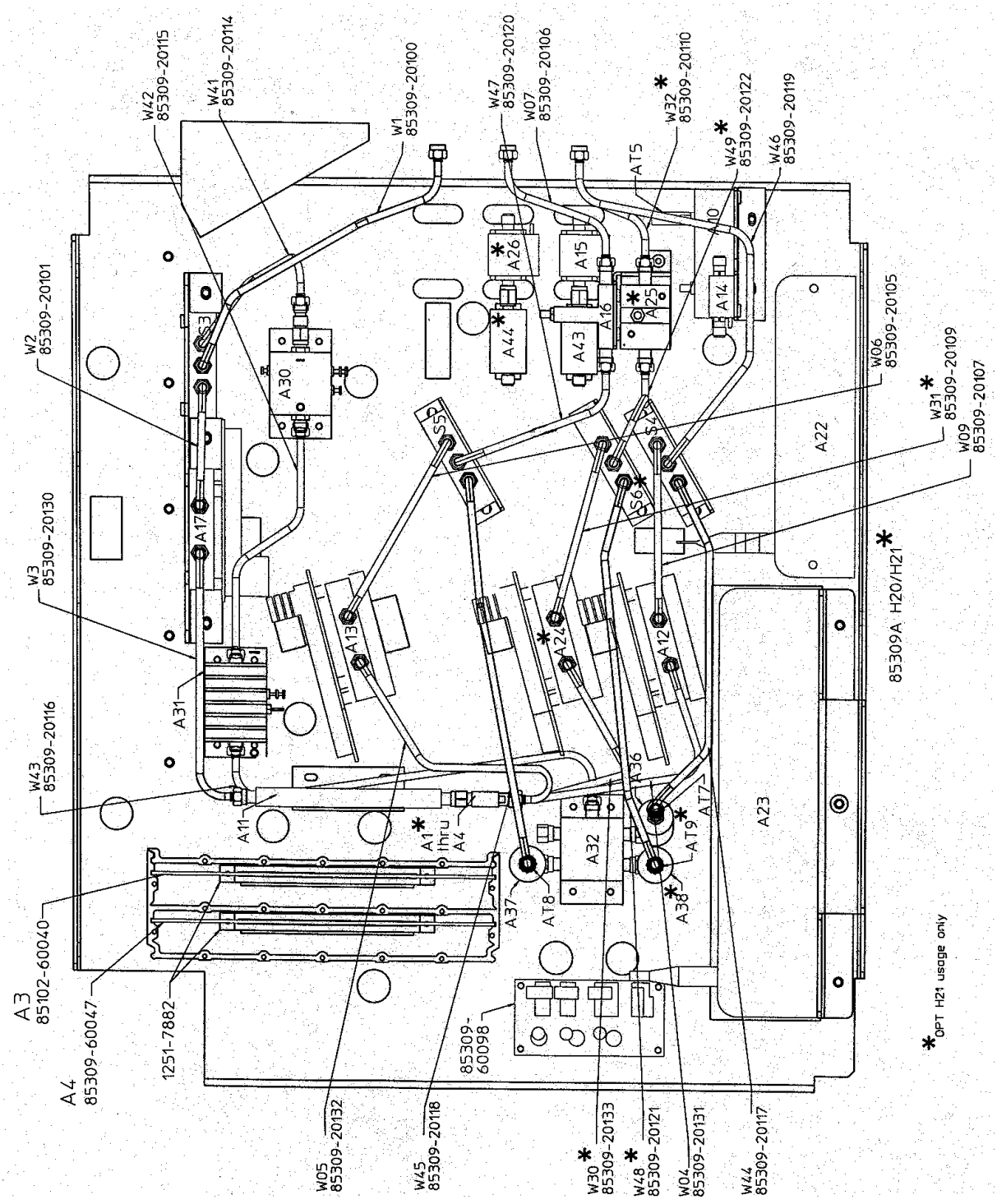


Figure 6 Semirigid RF Cable Locations

Agilent 85309A H20 Major Assembly Block Diagram

For the Agilent 85309A H20, Figure 3, replaces Figure 7-24 in the *Agilent 85309A Operating and Service Manual* (page 7-65).

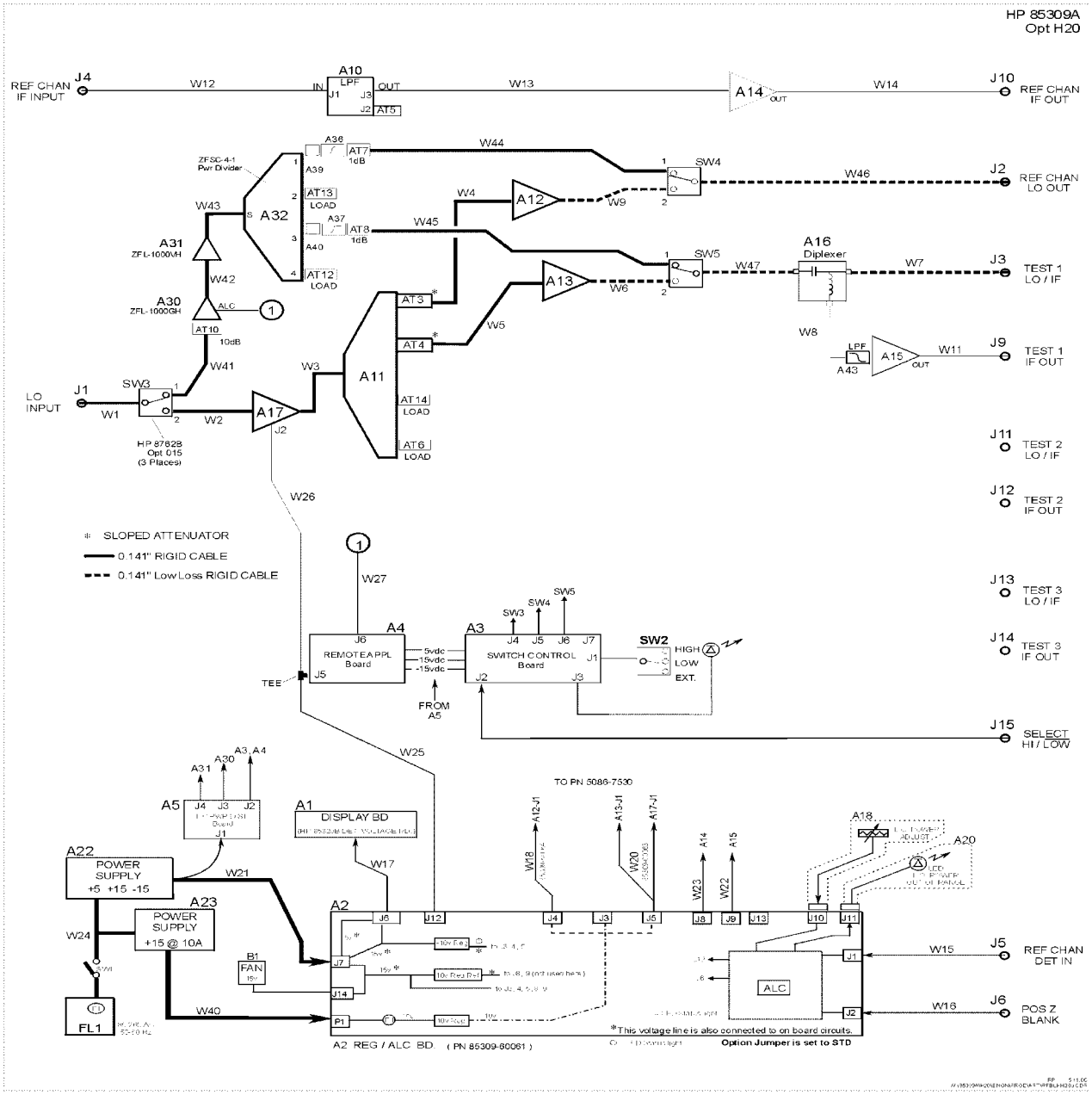


Figure 7 Agilent 85309A H20 Block Diagram

Agilent 85309A H21 Major Assembly Block Diagram

For the Agilent 85309A H21, Figure 4, replaces Figure 7-24 in the *Agilent 85309A Operating and Service Manual* (page 7-65).

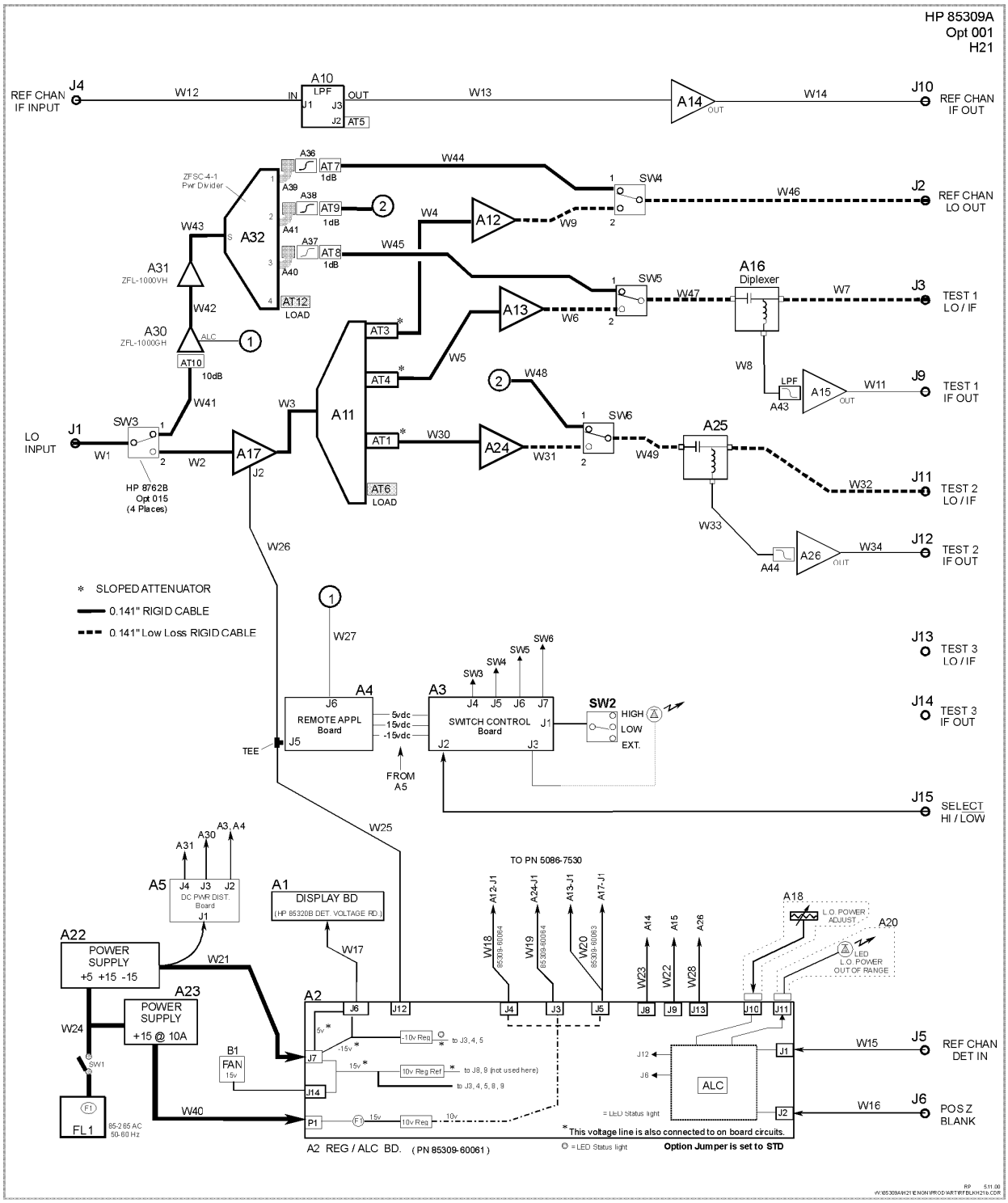


Figure 8 Agilent 85309A H21 Block Diagram