

**LASER INTERFEROMETER GRAVITATIONAL WAVE OBSERVATORY
- LIGO -**

**CALIFORNIA INSTITUTE OF TECHNOLOGY
MASSACHUSETTS INSTITUTE OF TECHNOLOGY**

LIGO-T970052-00-D	2/6/97
NPRO-PSL Performance Data and System Documentation	
R. Abbott, J. Mason, and R. Savage	

This is an internal working note
of the LIGO Project.

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CALIFORNIA INSTITUTE OF TECHNOLOGY
Laser Interferometer Gravitational Wave Observatory (LIGO) Project

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updated 1/17/97

Laser Power:

At 126 output: 600 mW

Into reference cavity (including side bands): 10 mW

Into PSPD (YAG 444): 16 mW

Into PSPD (YAG 200A): 20 mW

Laser controller readings:

Pwr: 554 mW

DC: 2.12 A

DPM: -1.44V

DT: 20.5 C

DTEC: 1.2 V

LT: 43.2 C

LTEC: -0.1 V

T: +42.1038

12.33 MHz RF drive:

Oscillator attenuators: switch: 10, knob: 4

5 Watt Amp attenuators: switch: -10, knob: 0

Phase shifter: 300 deg.

Measured RF Out: 4.5 V P-P directly into 50 ohms

Reference Cavity:

RFPD DC out locked: -48.5 mV

RFPD DC out unlocked: -136 mV

Reference cavity visibility: 88% (1-15/128)

Discriminant P-P (at PCTI out): 4.5 V P-P

PSPD:

DC out (YAG444): -7.2 V

DC out (YAG200A): -8.3 V

Frequency Stabilization Amplifier Settings:

Slow Adjust: 0.40

Fast Adjust: 1.04

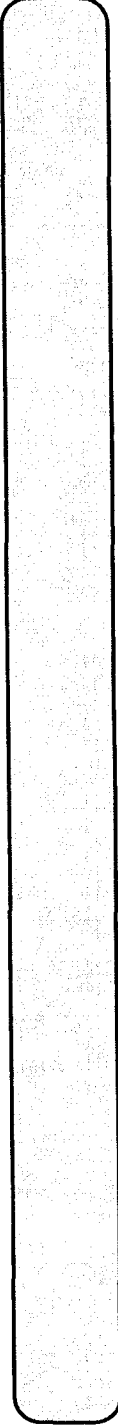
In Adjust: 0.91

Power Stabilization Amplifier Settings:

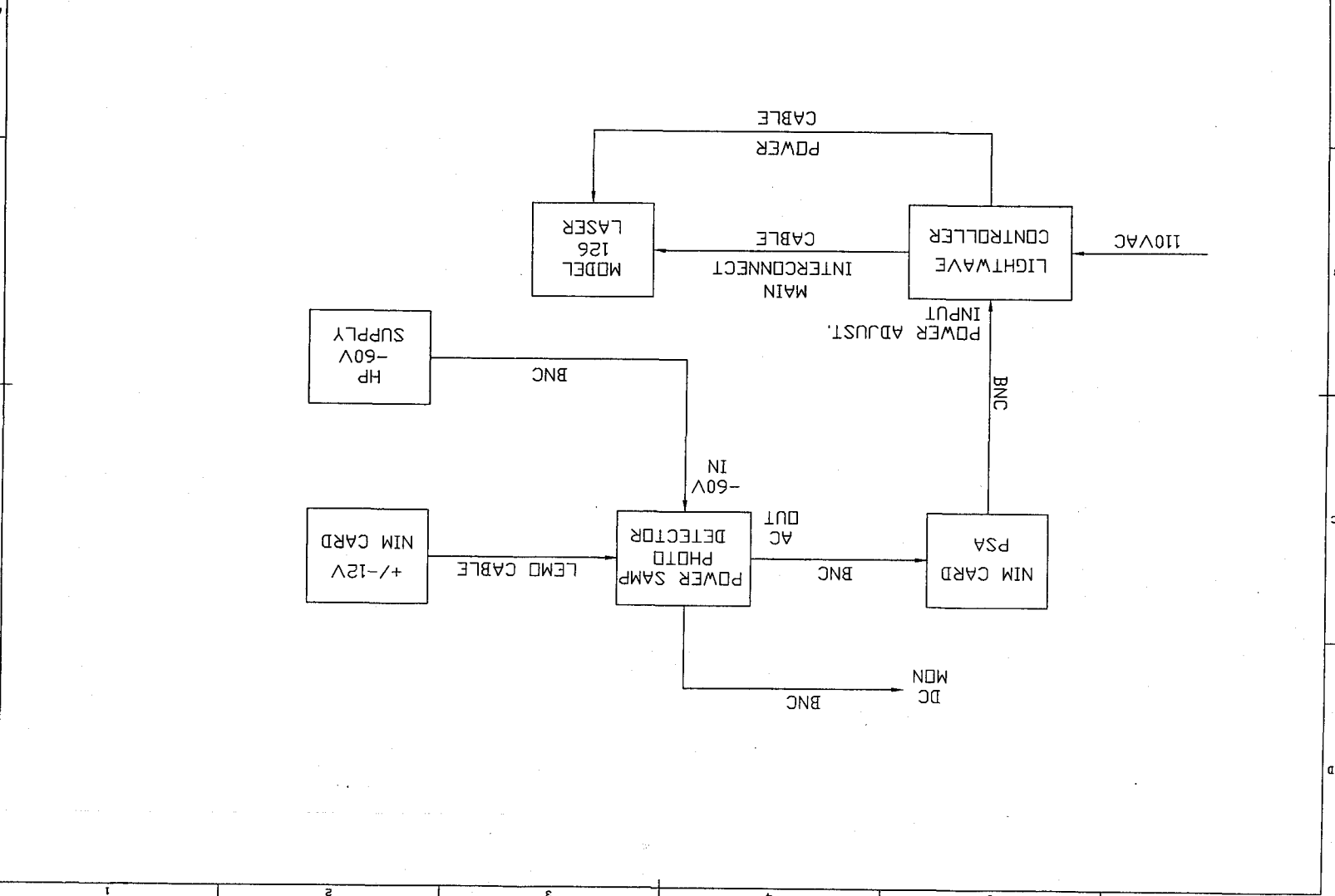
Gain Switch: 10

Gain Pot: 3.4

DC Offset Pot: 5.0



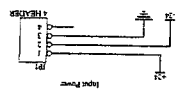
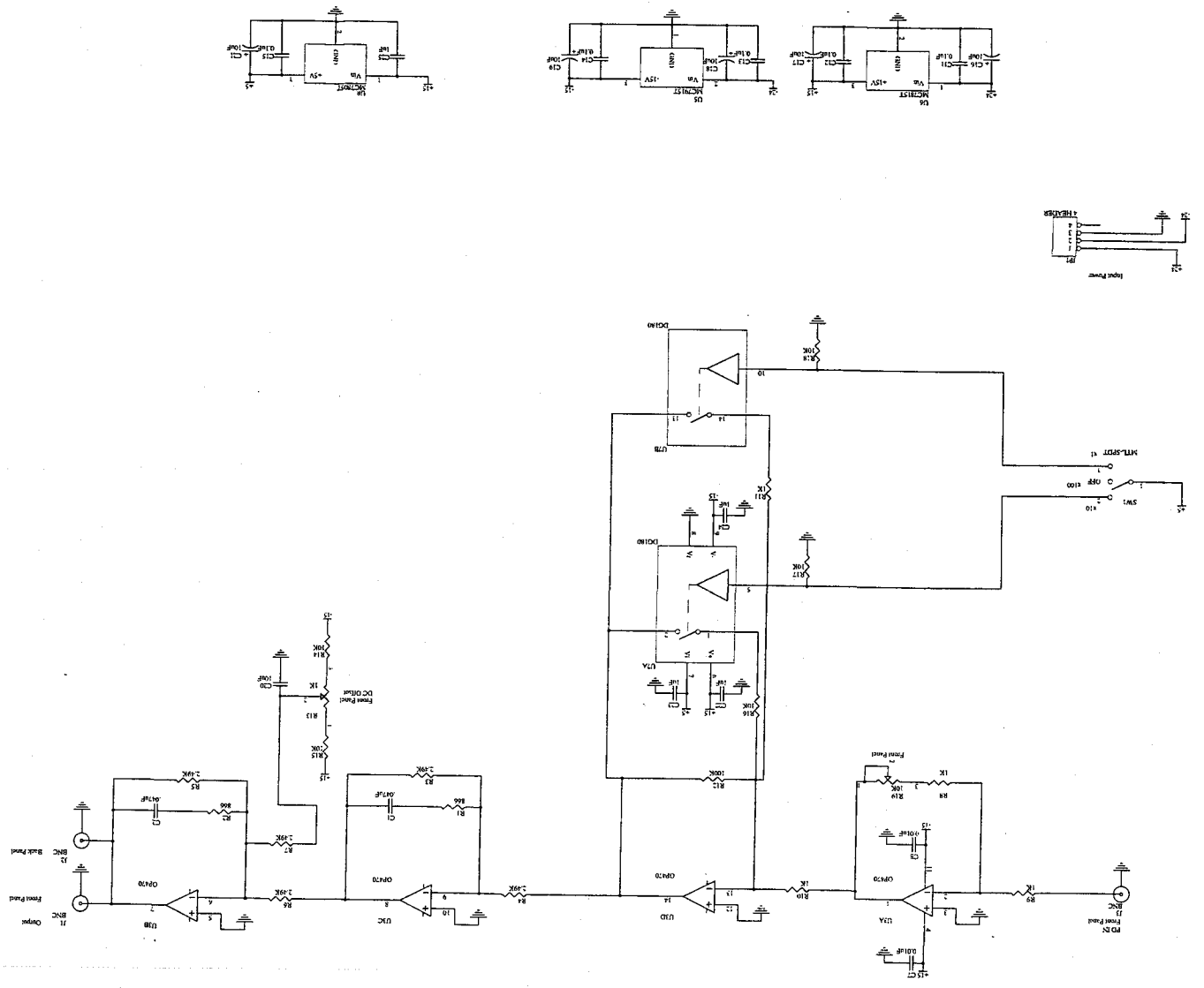
1		2		3		4		5		6	
REV	DATE	REV	DATE	REV	DATE	REV	DATE	REV	DATE	REV	DATE
1	1/2/77										
2	1/2/77										
3	1/2/77										
4	1/2/77										
5	1/2/77										
6	1/2/77										
7	1/2/77										
8	1/2/77										
9	1/2/77										
10	1/2/77										



THE UNIVERSITY OF CALIFORNIA, SAN DIEGO
 Department of Electrical and Computer Engineering
 San Diego, California 92162
 LIGO

NPRO-PSTL Power Stabilization Amplifier
 California Institute of Technology
 LIGO Project

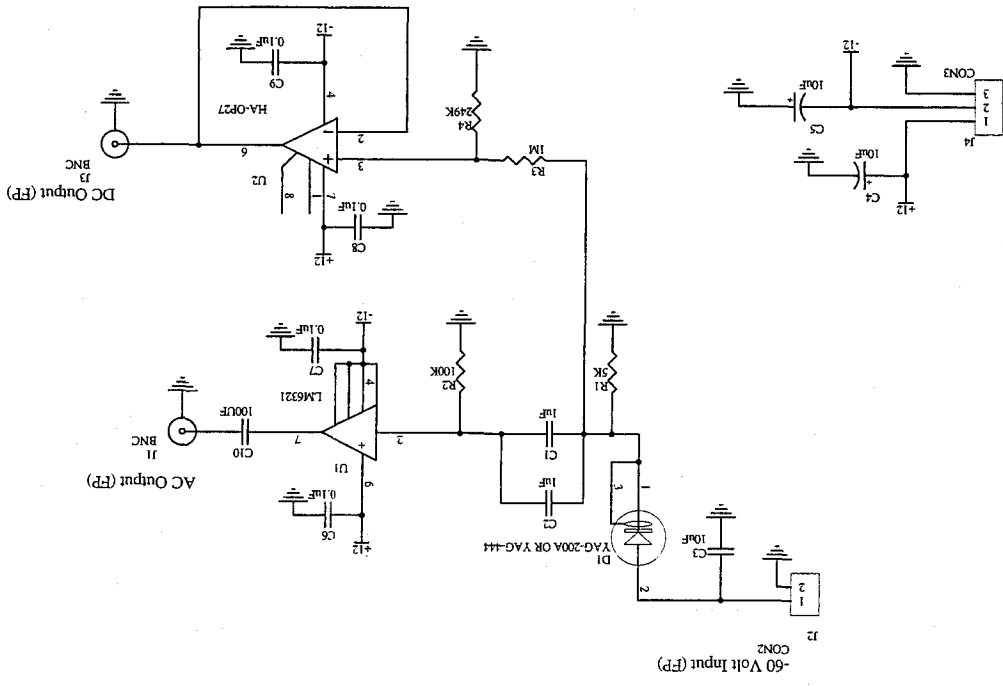
Title: NPRO-PSTL Power Stabilization Amplifier
 Date: C Number: D96-1346
 Revision:



A
 B
 C
 D

1
 2
 3
 4
 5

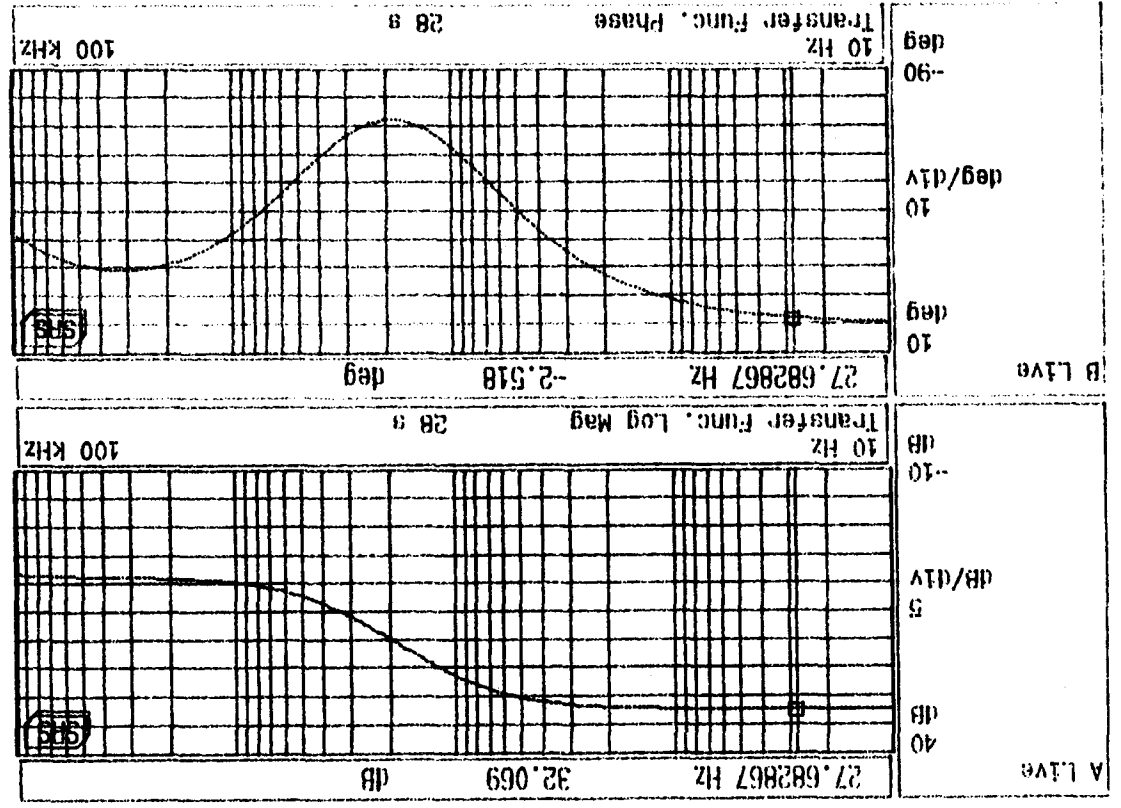
Revision:		Date:	Change:	Approved:
2	9/11/96	8/23/96	See above annotation on sheet	JH
1			Change R1 to 5K, add U2, C8, C9	
Title: NPRO-PSL Power Stab. Photodiode PSPD-2				
LIGO Project California Institute of Technology Massachusetts Institute of Technology				
Size: B	Number: D96-1247	Revision: 2	I. Heister	
File: MCAD\LIGO\NPRO_PSL\PW/R_PDB\H 6-Feb-1997 Time: 09:54:32 Sheet 1 of 1				



11 Sept. 1996:
 Added R3 and R4 to prevent overdrive of U2 causing oscillation. The 100pF capacitor, U10, is there to block the small DC offset present at the output of the buffer.

1/14/96
R+RLS

Rev. stab. amp. trans. fctn.
 gain knob: 3.4
 gain switch: 10
 source level: 10 mV
 (verified no change w/ source at 20 mV)



1/14/97 14:45:01

1/15/97
PATRLS

Transfer function:

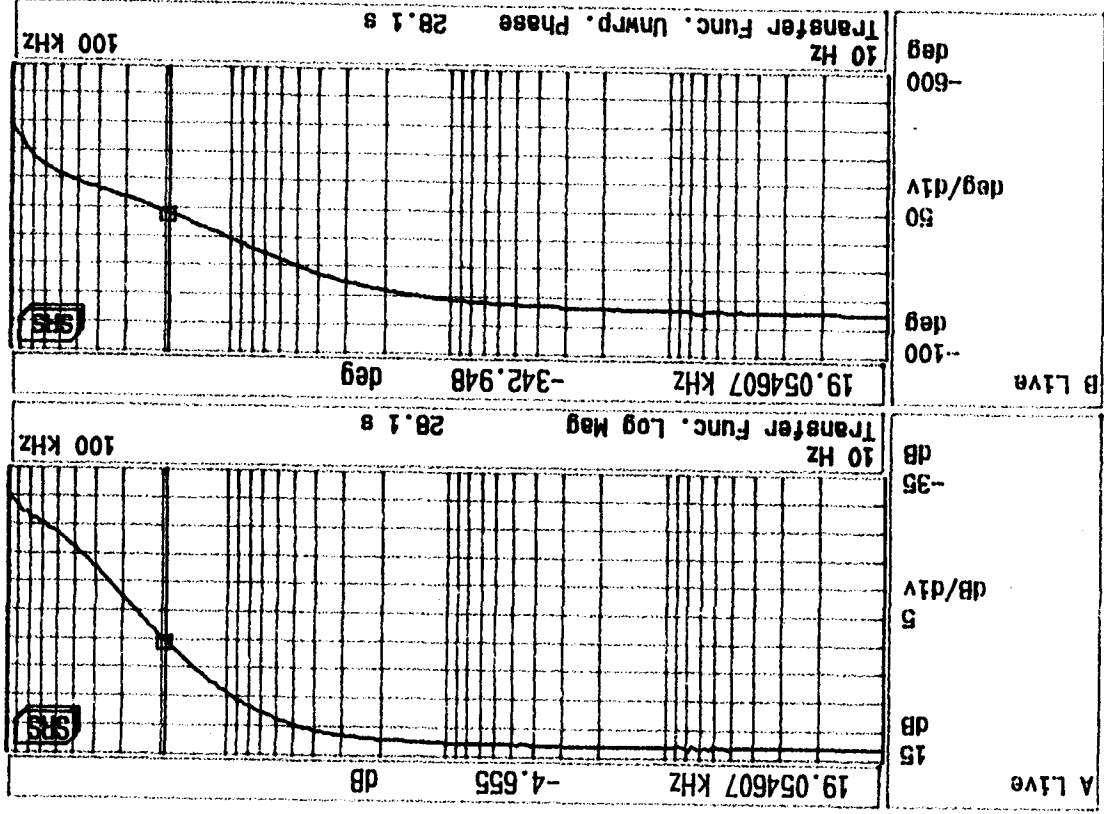
For adjust in to YAG444 out

NE OFF

Source level 50 mV.

File TF444BM

File: TF444BP



1/15/97 11:46:09

11/14/97
RAT:ELS

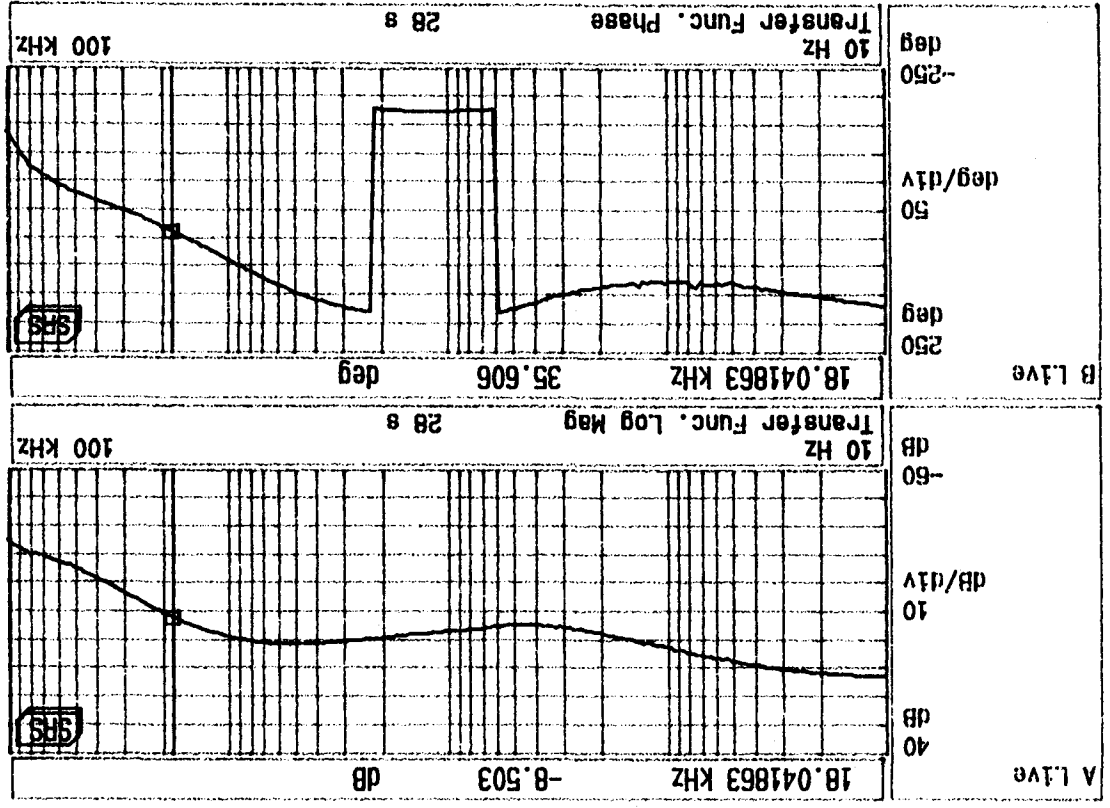
Transfer function: Four adjust in to
TSPD out for

YAG 444 PSTD
mounted at 45° w/rt hole
surface in U location

DC level: -7.2V

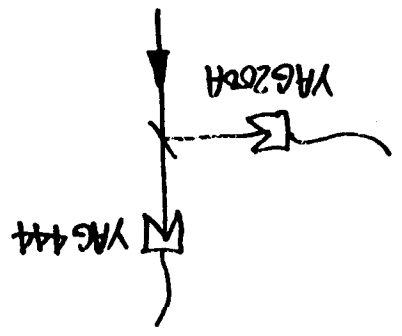
Source level: 50mV

TSPD response: ~ 5V/mA



1/14/97 15:36:33

NE ON



1/14/97
RA+RLS

Transfer fcn.: Pur. adjust in to

RSPD out for
YAG200A RSPD

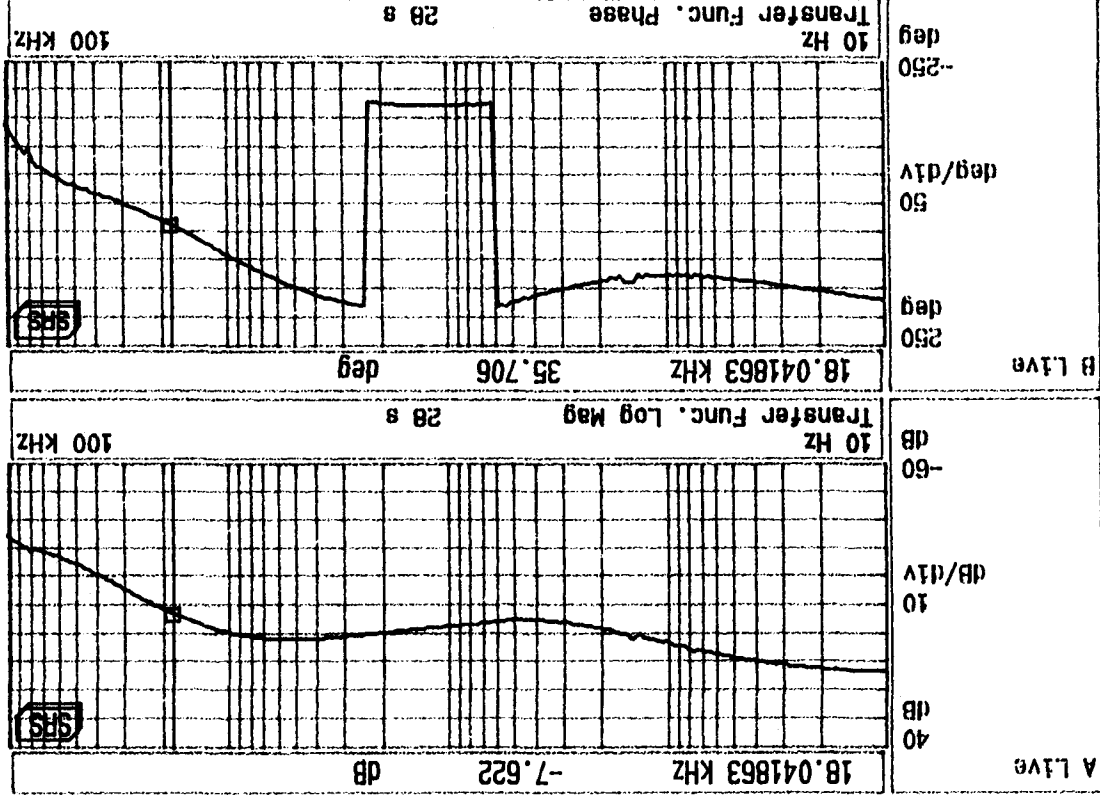
mounted at 45° to table
surface at 1 position

DC level - 8.15V

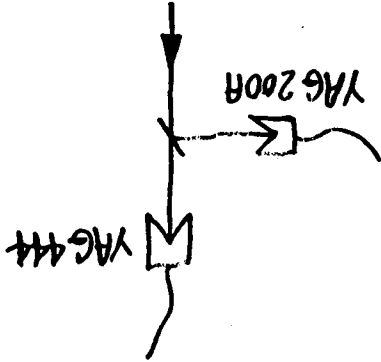
Source level = 50mV

RSPD response ~ 5V/mA

NE
ON



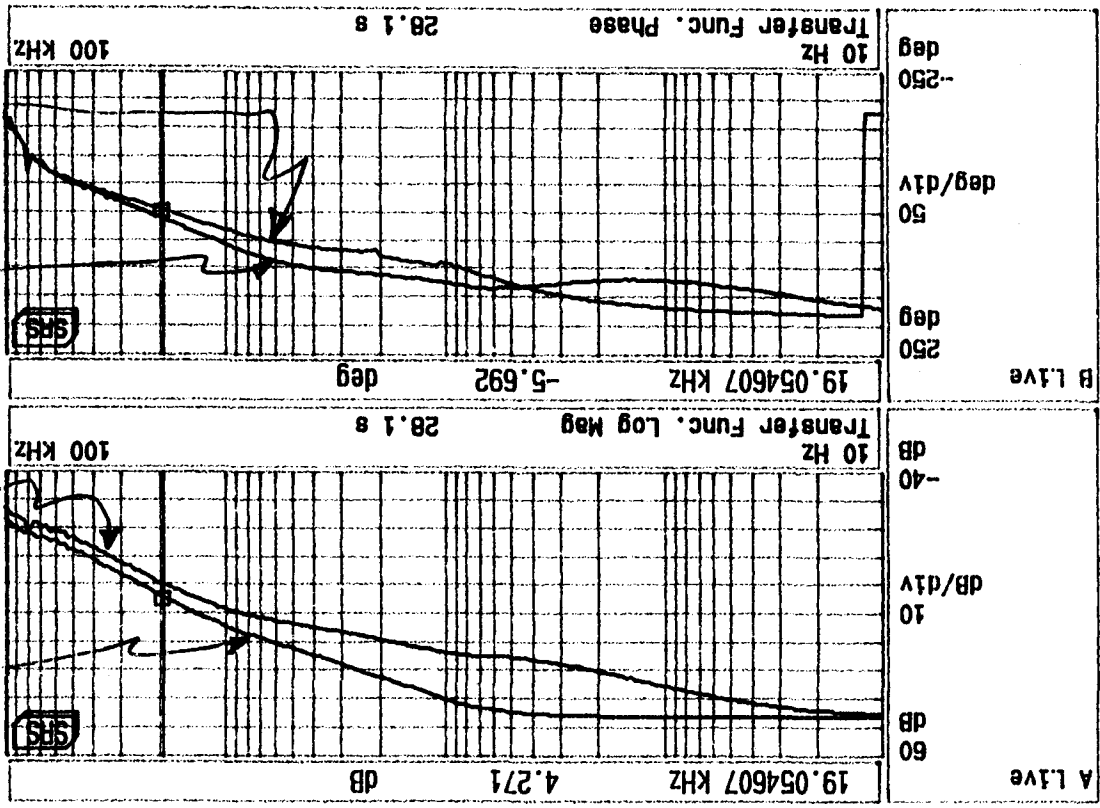
1/14/97 15:27:44



1/15/97
RLS

For Lab Loop Transfer Function
PSA in to VAG 444 out

Source level: 25 mV (inverted) with
PSA gain: 3.4 (knob)
: 10 (switch)



1/15/97 13:45:31

1/15/97
RA+RLS

For Sdk loop Transfer function

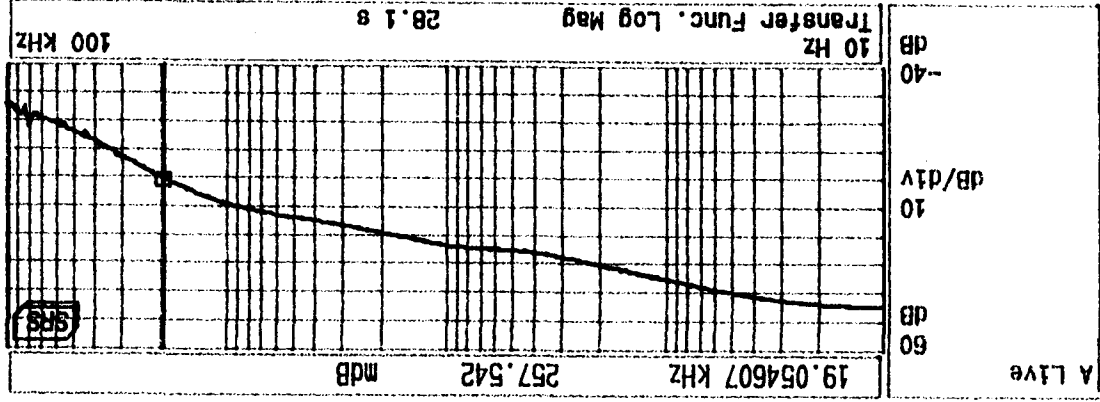
PSA IN to RA6200A out

Source level 2.5 mV

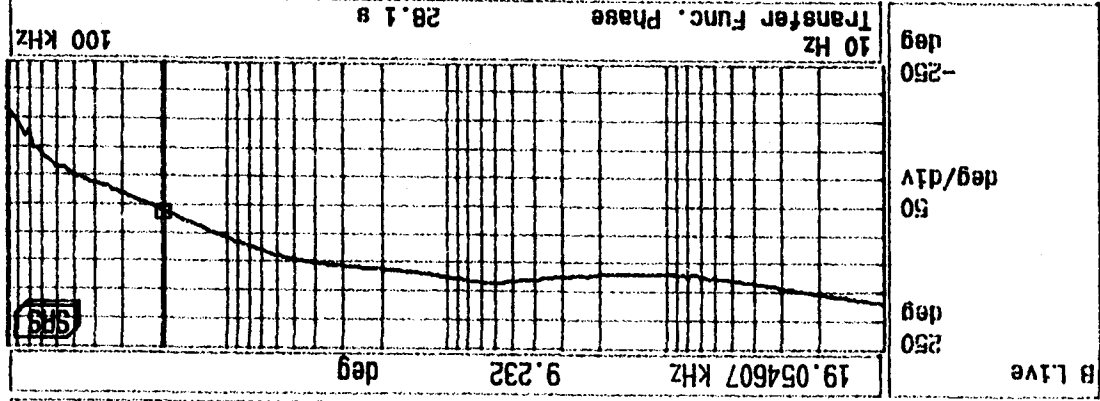
PSA gain knob: 34

Switch: 10

file TF200AH



file TF200AP



1/15/97 10:56:09

NE ON

Free-running Relative Intensity Noise of Model 126 NFRM

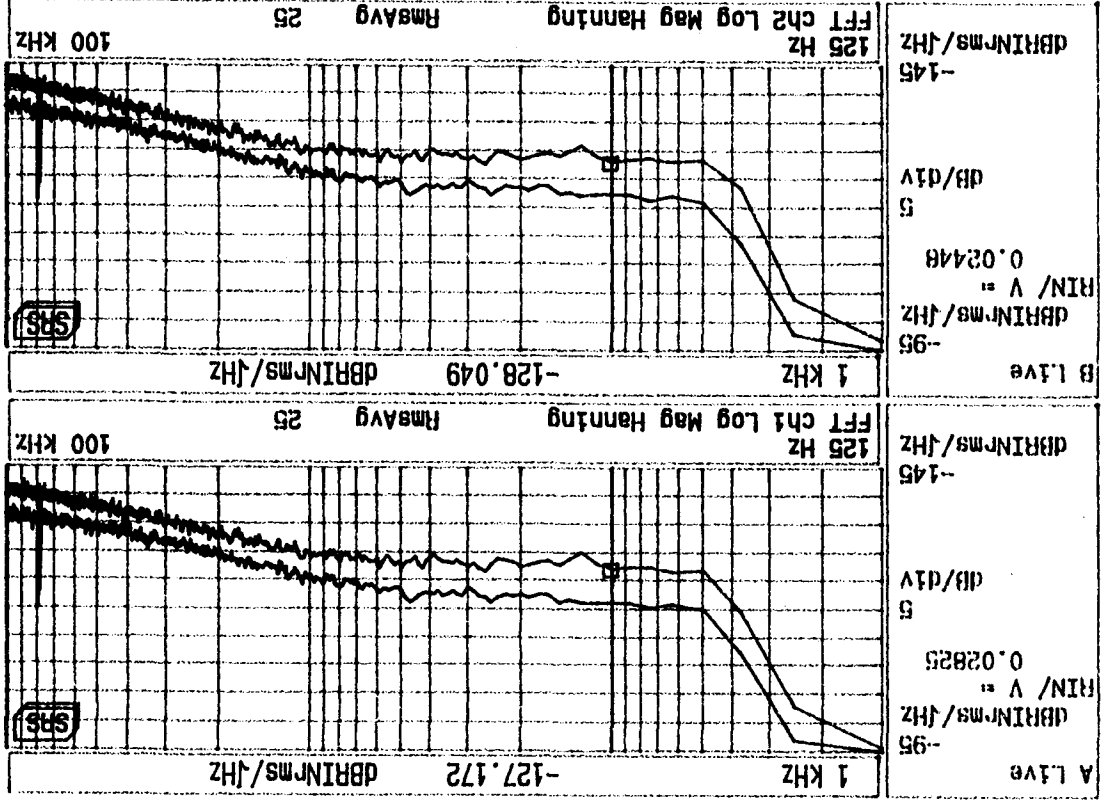
Upper traces: NE OFF
 Lower traces: NE ON

For adjust input term 50.0

11/19/97
 RLS

PSPD w/ YAG 444A
 DC out: 7.08x5 V

PSPD w/ YAG 20DA
 DC out: 8.17x5 V



1/14/97 18:47:15

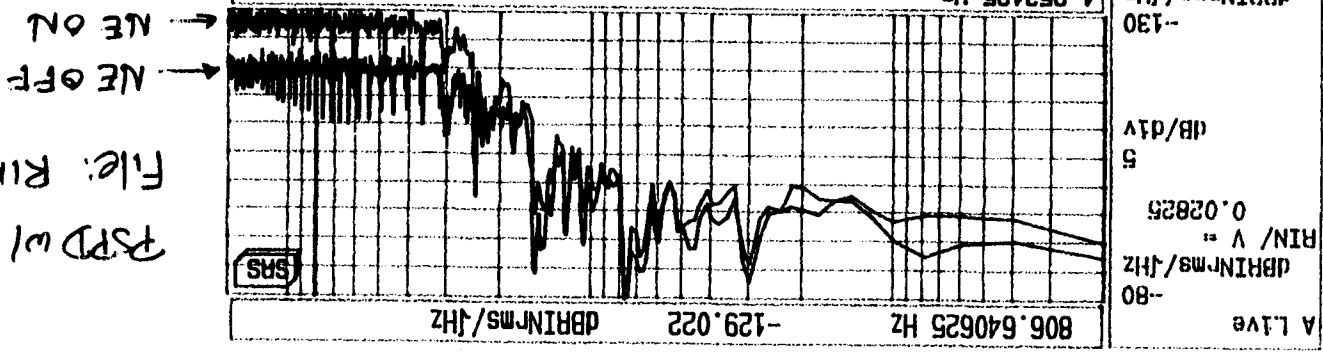
Lights on, AC off

1/14/97
 RLS
 Same as 18:47 plot except for freq. axis

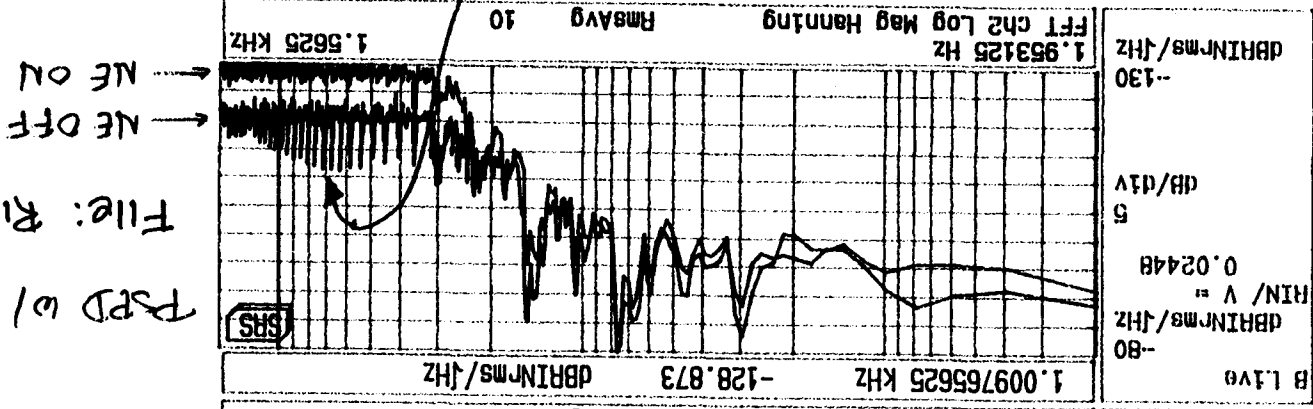
Settings: FILE RINSET.78S

Proc. adjust input down 50.2

PSD w/ YAG 444
 File: RIN 444.78D



PSD w/ YAG 700A
 File: RIN200.78D



1/14/97 19:21:31

room lights?
 Lights ON, AC OFF

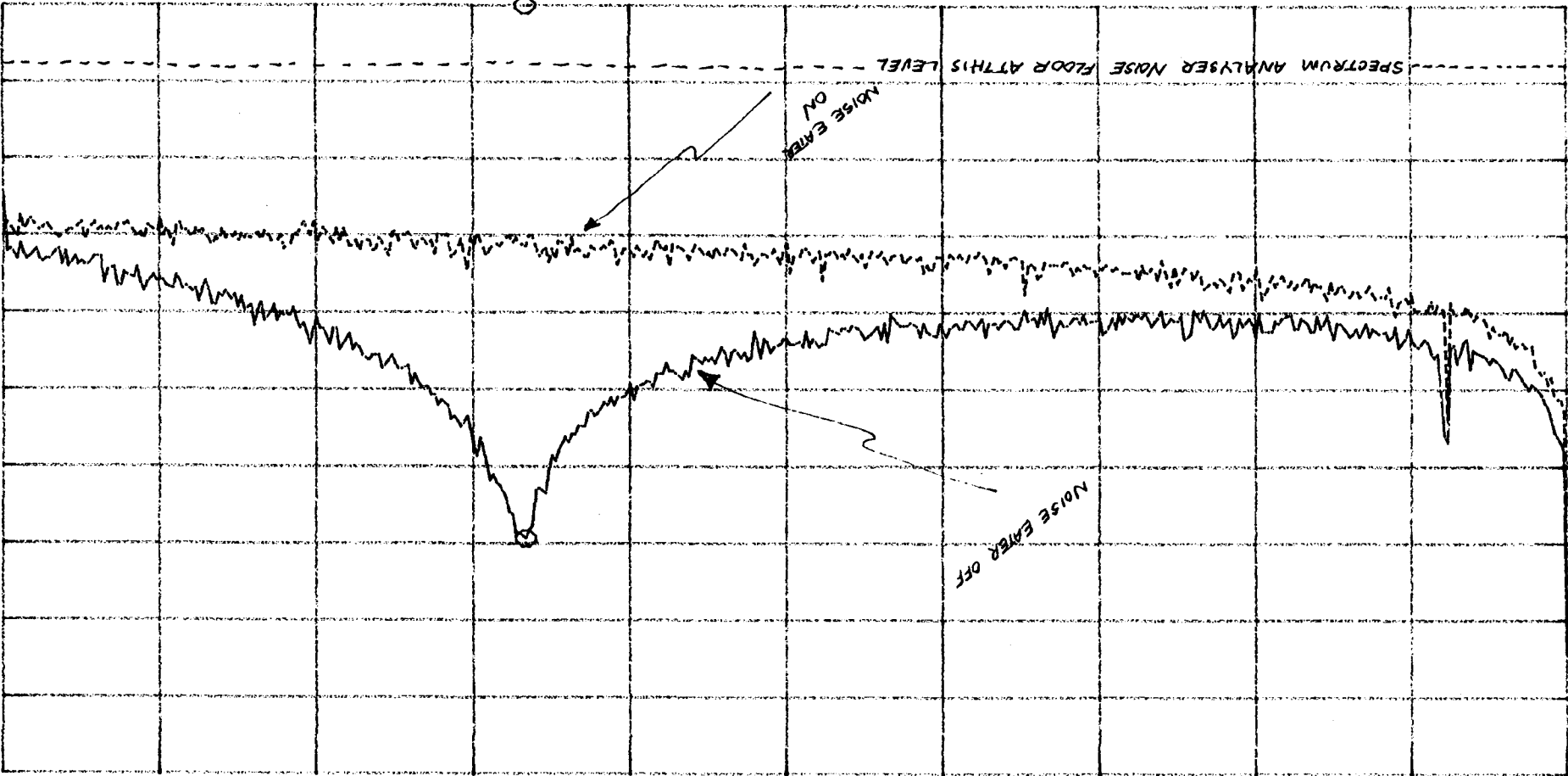
12G INTENSITY NOISE AS MEASURED USING YAG444 PHOTODIODE.

RI ATTN. = 10dB ON ANALYSER.

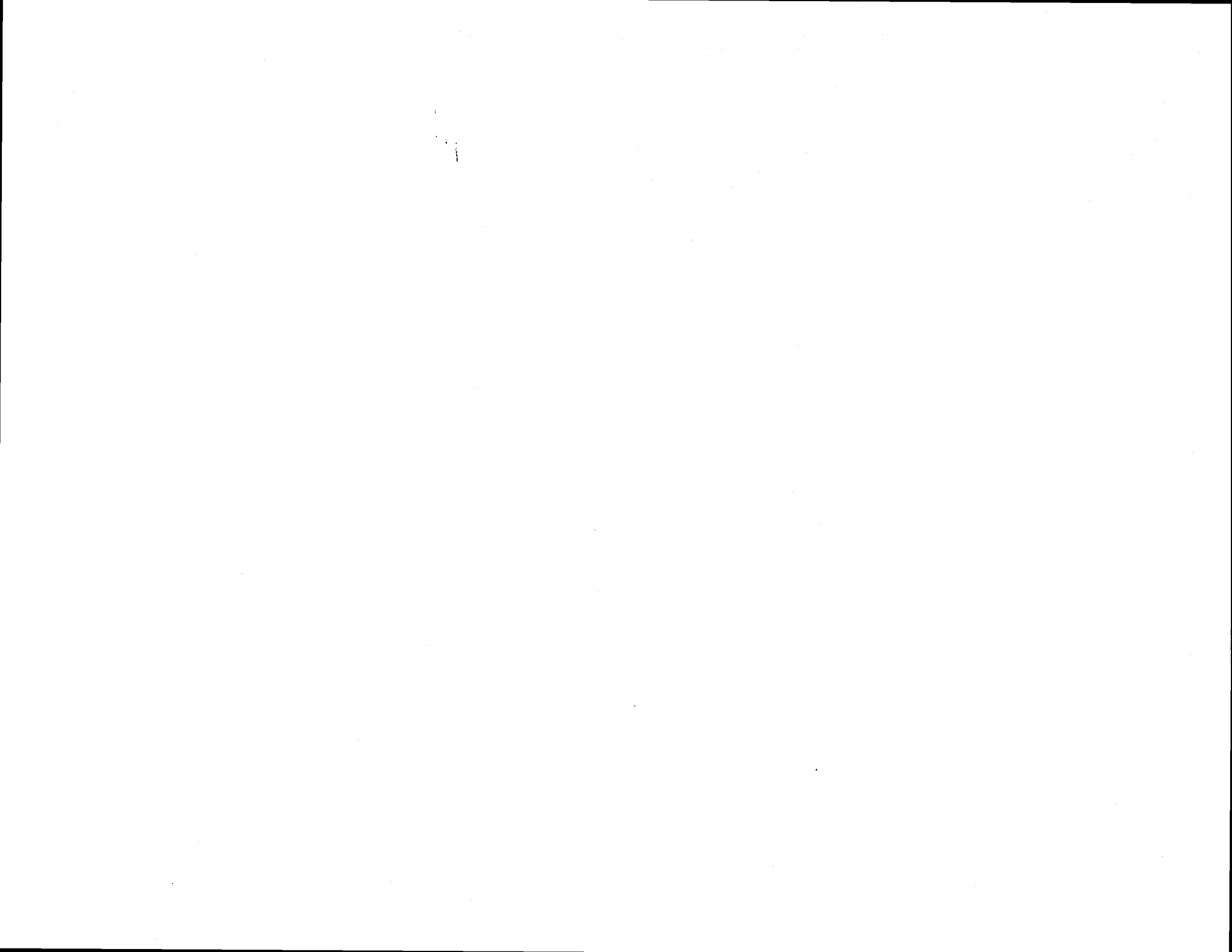
R.A. 15 JANUARY 1997 1606

SPECTRUM

A: REF [dBm]
 B: REF []
 O MKR []
 MAG []
 MAG []
 667.533.250 HZ []
 -40.8149 dBm []



DIV 10.00 DIV 10.00
 START 100.000 HZ STOP 100.000 HZ
 RANGE: R=-10, T=-20dBm
 RBW: 300 HZ ST: 2.53 HZ

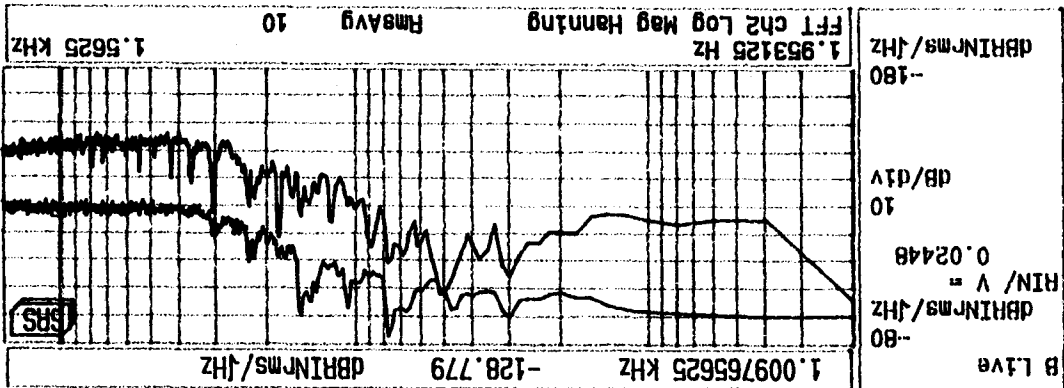


Lights OFF, AC OFF, NE ON

1/14/97 19:57:26

File: RIN200A (free running)
File: KIN200A

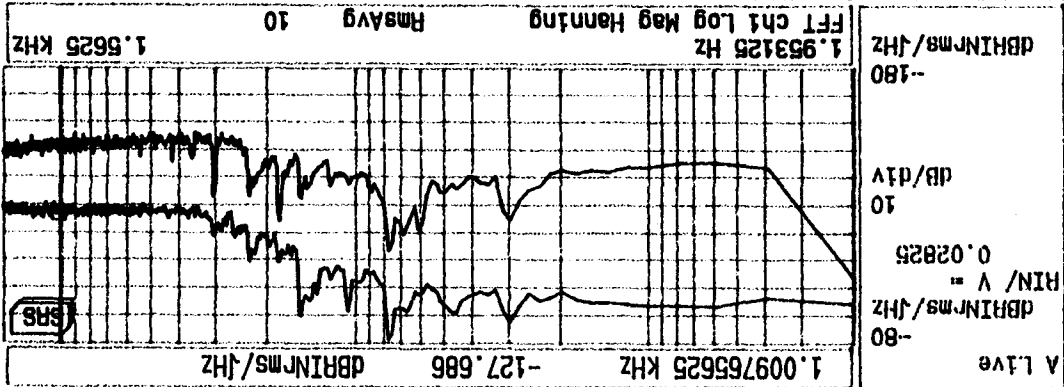
RSPD w/ YAG200A



"Outside the loop"

File: RIN444A (free running)
File: KIN444A

RSPD w/ YAG444



"Inside the loop"

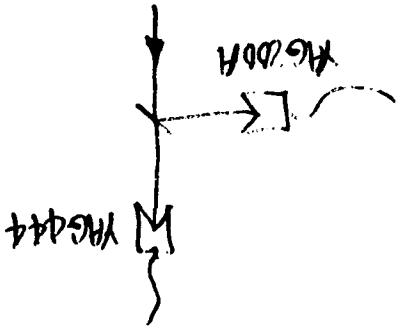
PSA input YAG444 (in-line)

Switch: 10

PSA Gain knob: 3.4

Stabilized RIN NPRO 5/17K

1/14/97 RLS



11/19/97 PLS

Stabilized RIN NPRO 5/1170

PSA gain knob: 3.4

Switch: 10

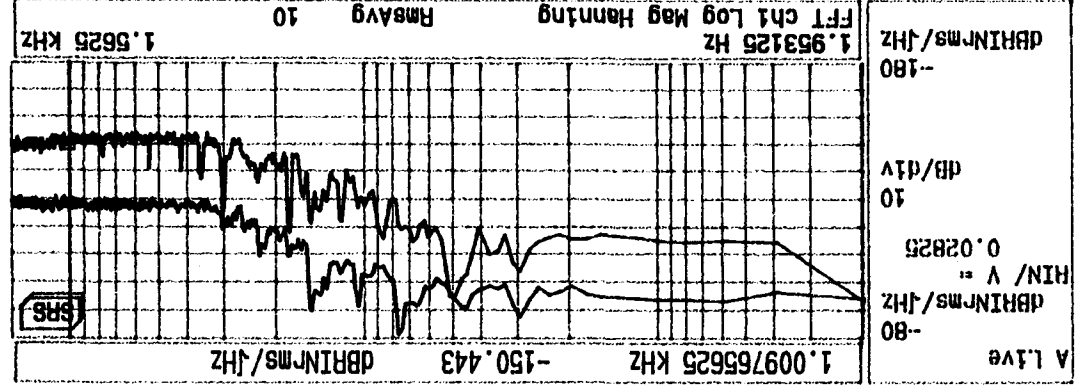
PSA input YAG 250 (perpendicular)
off-line

Upper traces: free-running parallel input term 50.12
Lower traces: loop locked

PSPD w/ YAG444

File: RIN444R

File: RIN200B

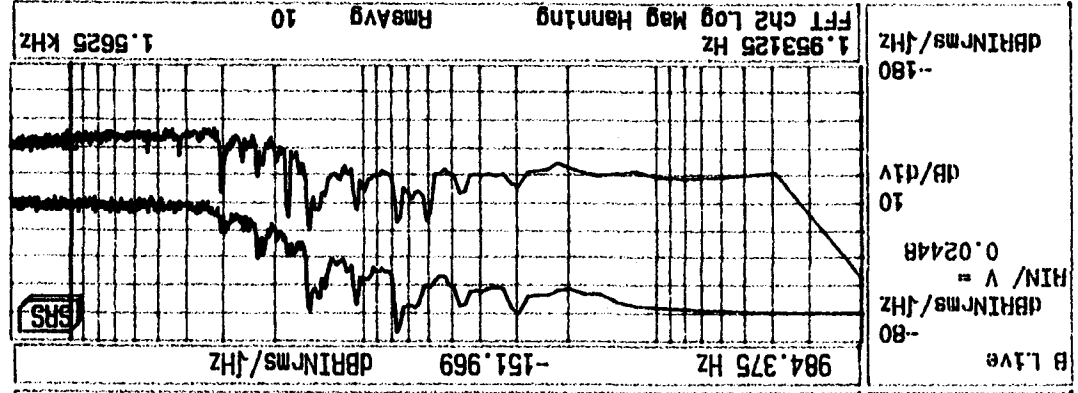


"outside the loop"

PSPD w/ YAG200A

File: RIN200FR

File: RIN200B



"inside the loop"

1/14/97 20:13:58

Lights off, AC off, NE on

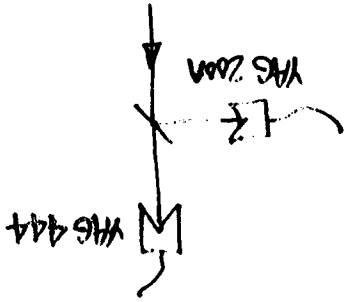
11/14/97 ELS

Stabilized PIN NPROS/NITC

PSA Gain knob: 3.4

switch ~~set~~: 10

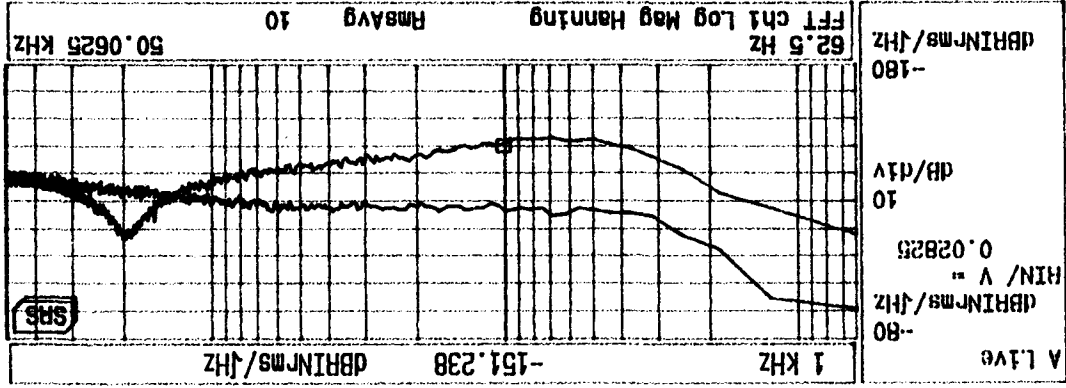
PSA input YAG 444 (in-line)



PSPD w/ YAG 444

Upper trace - file RIN444RA

Lower trace - file RIN444C

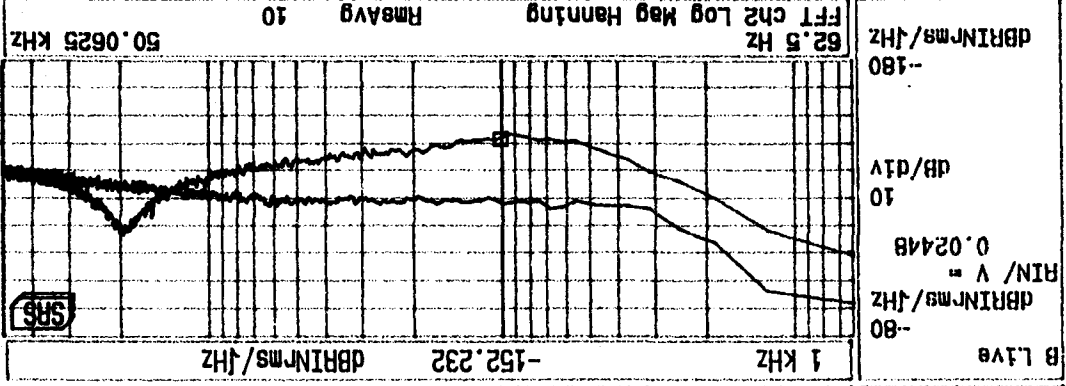


"inside the loop"

PSPD w/ YAG 200A

Upper trace - file RIN200RA

Lower trace - file RIN200C



"outside the loop"

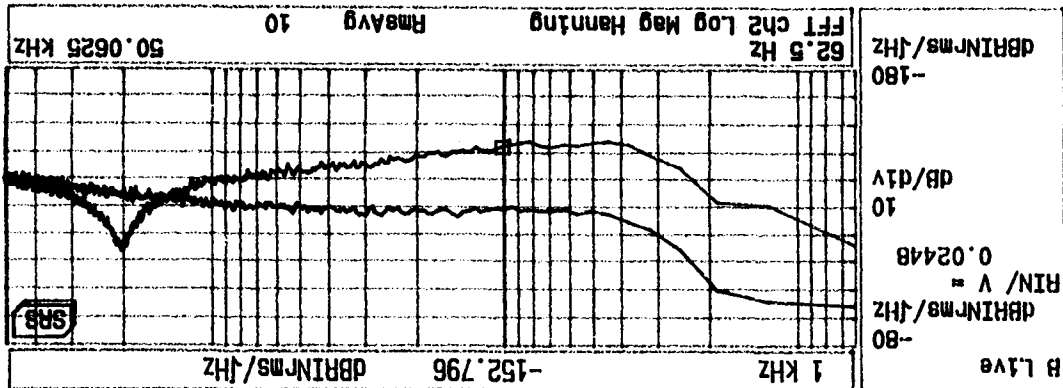
1/14/97 20:41:23

Lights off, AC off, NE on

Lights off, AC off, NE ON

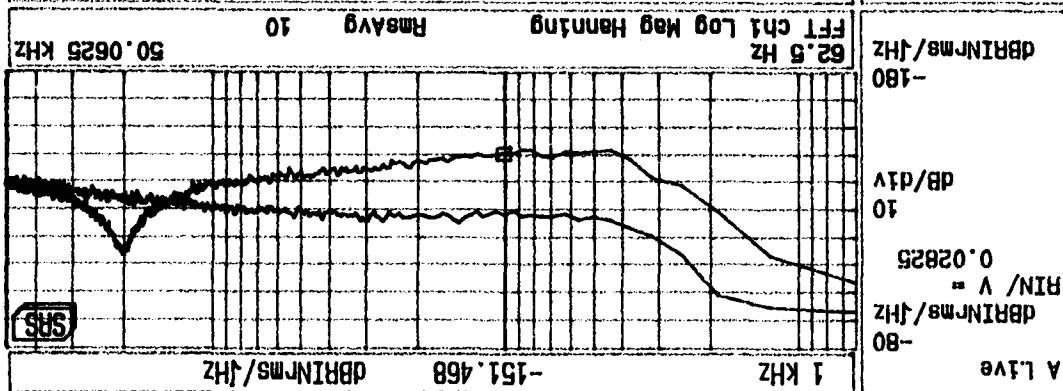
1/15/97 10:15:04

file: RIN20D
PSPD w/ YAG 200A



"inside loop"

file: RIN44D
PSPD w/ YAG 444



"outside loop"

PSA input YAG 200A (perpendicular)

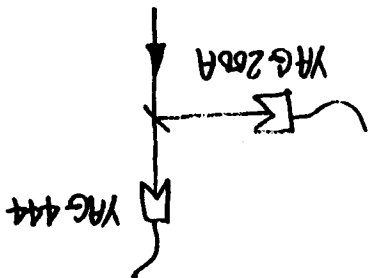
Switch: 10

PSA Gain Knob: 3.4

Stabilized RIN NPRO 9/170

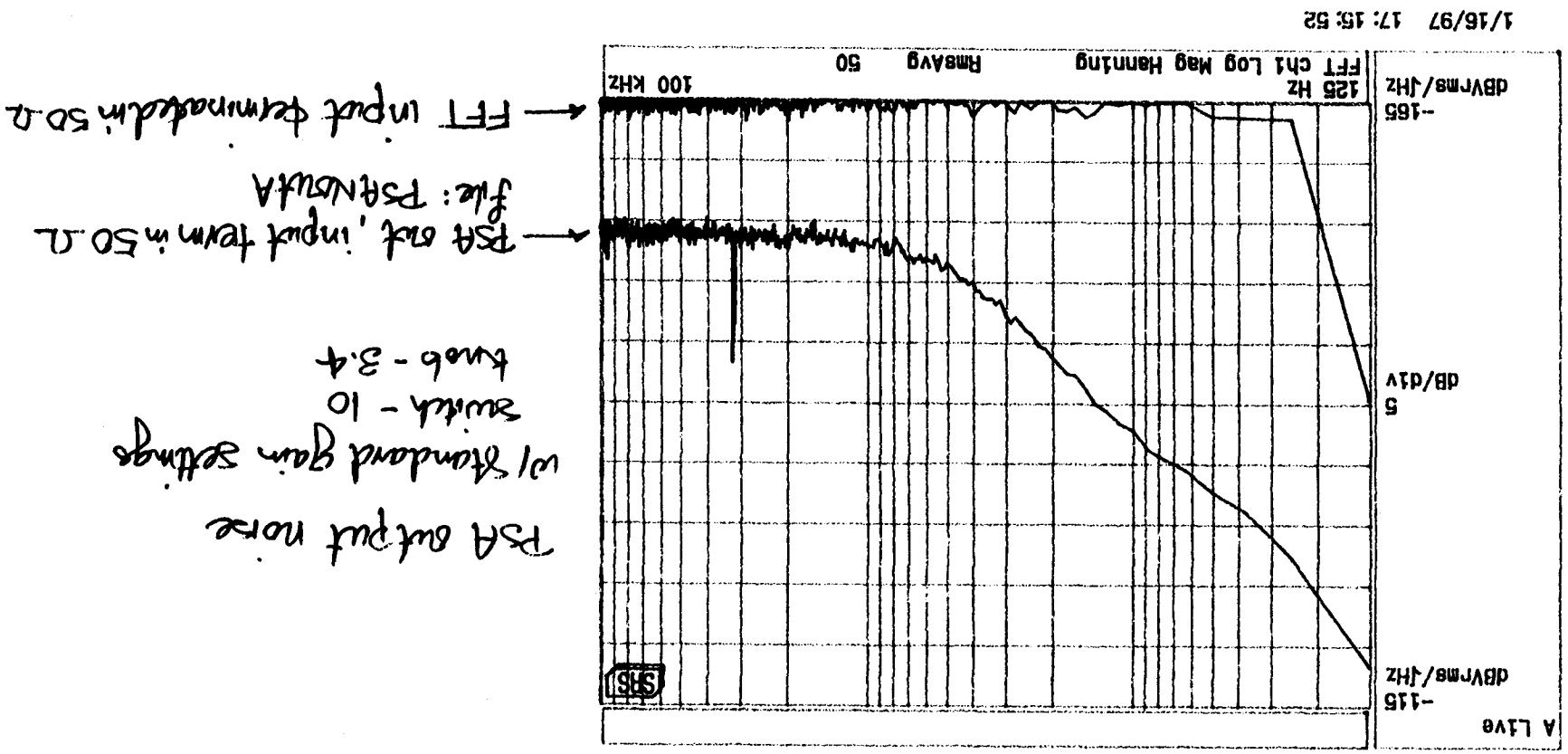
RA + RLS

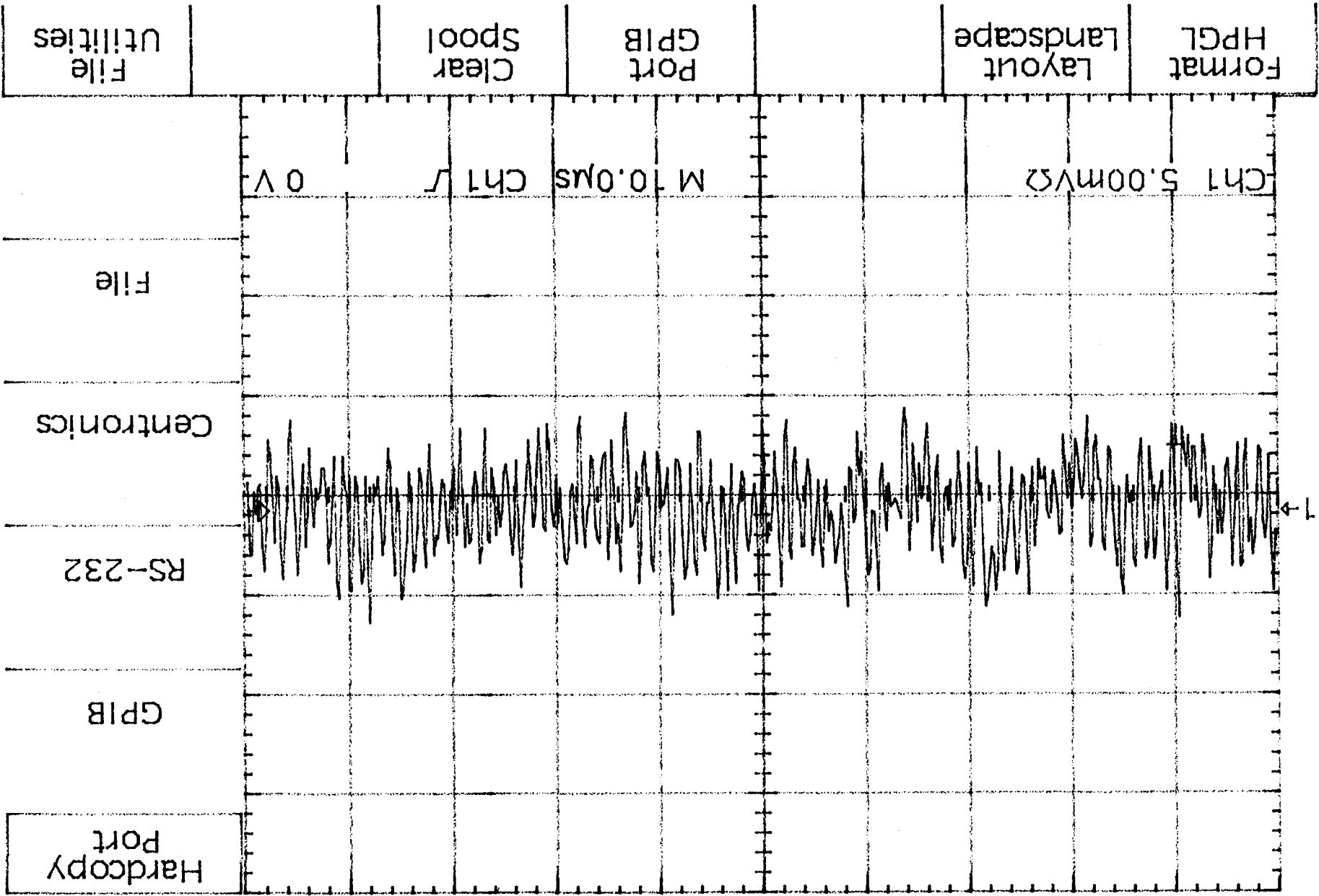
1/15/97



11/01/96
RAT/ELS

PSA output noise does not increase (PSPD output noise when loop is open. i.e. PSD output noise w/ PSA input term in 50 Ω same as w/ PSD input term in 50 Ω (PSA disconnected)).





Format HPGL
Layout Landscape
Port GPB
Clear Spool
File Utilities

Tek Stop: 5.00MS/S
126 Acqs
PSA input w/ loop locked using VAG444 PPD
Standard gain settings (34x in)
116196
RARELS
17:30
(lights on)

Hardcopy Port