VLBA ACQUISITION MEMO #367

National Radio Astronomy Observatory

New Mexico
August 20, 1993

To: VLBA Data Acquisition Group

From: Bryan Martin

Subject: Procedure for testing frequency response of R131 Read modules and R132 Parallel Reproduce modules for the VLBA tape recorder

I was assigned the task of developing procedures for testing the frequency response of the equalizer circuits in the R131 Read modules and R132 Parallel Reproduce modules in the VLBA tape recorders. For these procedures I used the Wandel & Goltermann SNA-1 spectrum/network analyzer. You should become familiar with this instrument before performing these tests.

R131 Read Module tests:

SNA-1 setup:

Mode: Network Analysis.
If necessary, press MODE MENU key then select NETWORK ANALYSIS.

Display Parameters:
Freq Scale: START/STOP.
Press DISPLY PARAM key, select FREQ SCALE and use STEP keys (up and down arrow keys on bottom unit) to select START/STOP.

The test settings are displayed along the right side of the screen next to the soft keys. Figure 1 shows a plot of the screen, the settings shown on the screen should match the settings shown in Figure 1. To change the settings, press the soft key next to the setting until the setting is highlighted and use either the STEP keys or the DATA ENTRY keys to change the setting.

I used two 50 Ohm probes to conduct the tests; one connected to the output jack of the SNA-1 through a variable attenuator and the other connected to the input jack of the SNA-1. Through trial and error I determined that the best setting for the variable attenuator was 30dB for the 135 and 270 ips channels and 40dB for the 'special' or 160 ips channel. Before starting the test the display must be normalized. To normalize the display, connect the input probe to the output probe, press the CAL NORM key, and then press the NORMALIZE MAG & PHASE key. After this the NORM. OFF message to the left of the display should disappear as in Figure 1. For all tests on the R131 module, I normalized the display with a 30dB setting on the attenuator.

Procedure:

The test is performed by injecting the output signal from the

network analyzer into the input of the MC3467 amplifier stage before the equalizer and monitoring the output of the equalizer. Components for track A are located on column 3 of the circuit board and the components for track B are on column 4. The track A path is identical to the track B path. Figure 4 shows the block diagram of the sections of the read module being tested by this procedure. The inputs for the 135, 160, and 270 inch per second circuits are on pins 4, 2, and 7, respectively on chip A3602 or A4602; the outputs are monitored at pins 4, 2, and 7, respectively on chip A3402 or A4402.

Figure 1 shows a typical response curve for the 135 ips circuit. Figures 2 and 3 show typical responses for the 160 and 270 ips circuits, respectively. The curves agree favorably with those predicted in VLBA Data Acquisition Memo #169. According to A. E. E. Rogers, the low frequency integrator would normally show more of an increase in gain at lower frequencies than is shown.

R132 Parallel Reproduce Modules:

SNA-1 setup:

Figure 5 shows a plot of the display for the parallel reproduce test. The only differences in the settings between this test and the read module test are the scale and reference settings. The variable attenuator was not used for the tests on the R132 modules. Be sure to make these changes and normalize the system as described in the previous section of this document.

Procedure:

Figure 6 shows the parts layout of the parallel reproduce module. There are 6 groups of 3 circuits on this module. The frequency response test for this module is performed by injecting the test signal into the inputs of chips U1 through U6 and monitoring the outputs at pin 8 of the low pass filter boards H7 through H24. Figure 7 shows the schematic diagram of 2 of the 6 groups of circuits on the module. The inputs for chips U1 through U6 are on pins 2, 4, and 7, as shown in Figure 7.

Figure 5 shows a typical frequency response curve for one of the circuits on the parallel reproduce module. In the tests I performed on R132 serial number 52, the peak value of the response ranged from about -20dB to about -8dB.

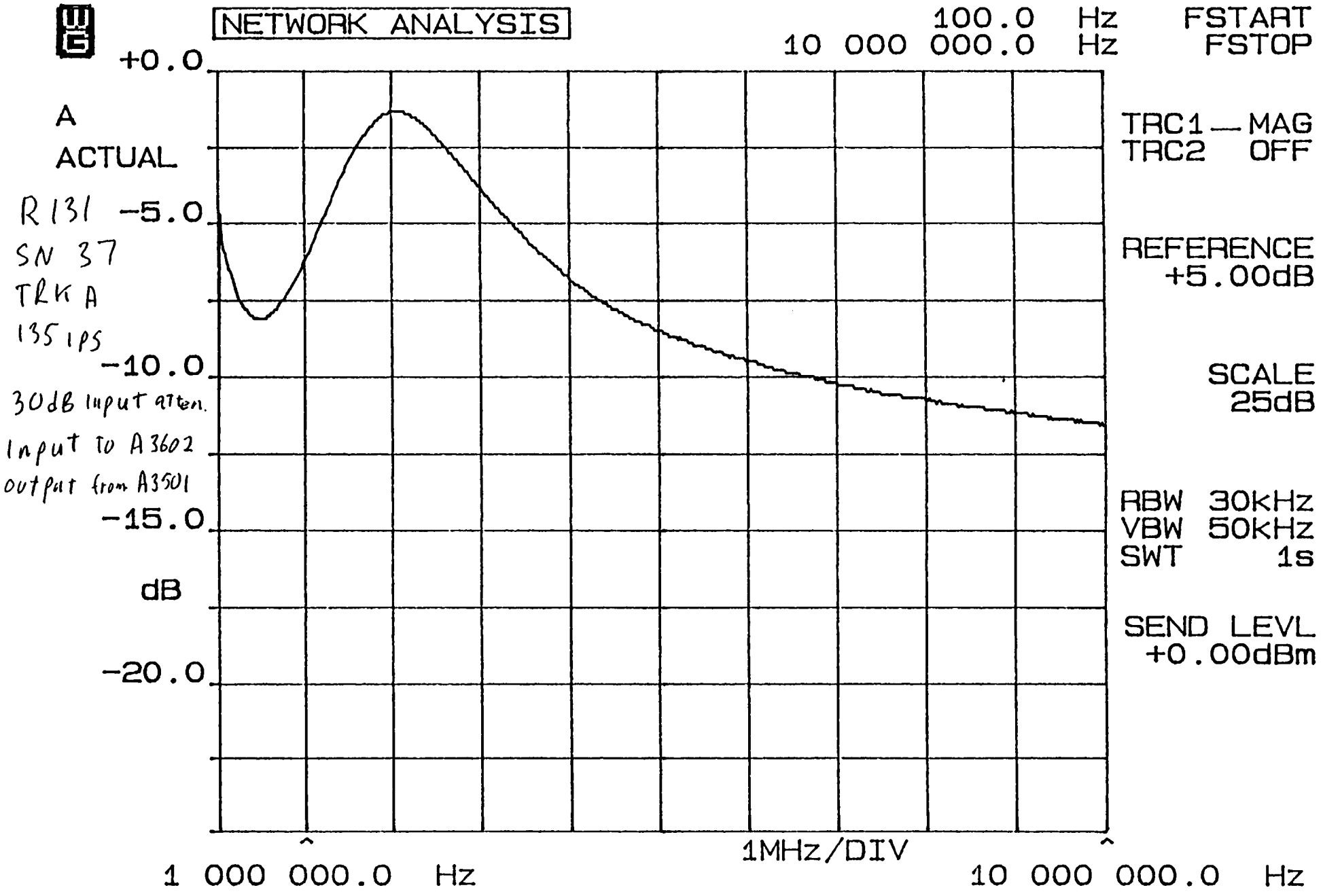

NETWORK ANALYSIS
100.0 Hz FSTART
10 000 000.0 Hz FSTOP
+0.0
A
ACTUAL
R131
SN 37
TRK A
135 ips
-5.0
-10.0
30dB input atten.
Input to A3602
output from A3501
-15.0
dB
-20.0
TRC1 — MAG
TRC2 OFF
REFERENCE
+5.00dB
SCALE
25dB
RBW 30kHz
VBW 50kHz
SWT 1s
SEND LEVL
+0.00dBm
1 000 000.0 Hz
1MHz/DIV
10 000 000.0 Hz

Figure 1

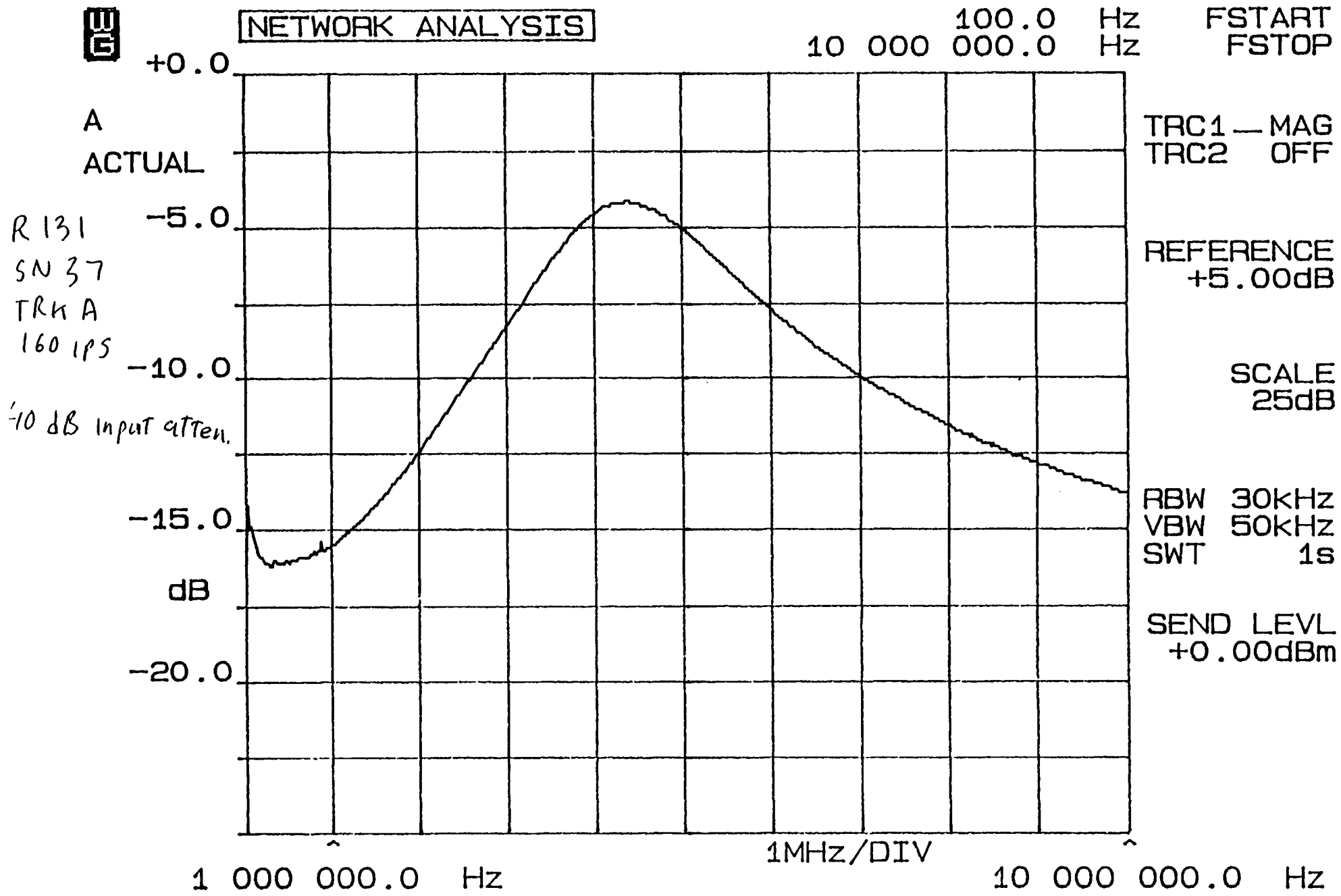

NETWORK ANALYSIS
100.0 Hz FSTART
10 000 000.0 Hz FSTOP
+0.0
A
ACTUAL
-5.0
-10.0
-15.0
dB
-20.0
R 131
SN 37
TRK A
160 IPS
10 dB input atten.
TRC1 — MAG
TRC2 OFF
REFERENCE
+5.00dB
SCALE
25dB
RBW 30kHz
VBW 50kHz
SWT 1s
SEND LEVL
+0.00dBm
1MHz/DIV
1 000 000.0 Hz
10 000 000.0 Hz

Figure 2

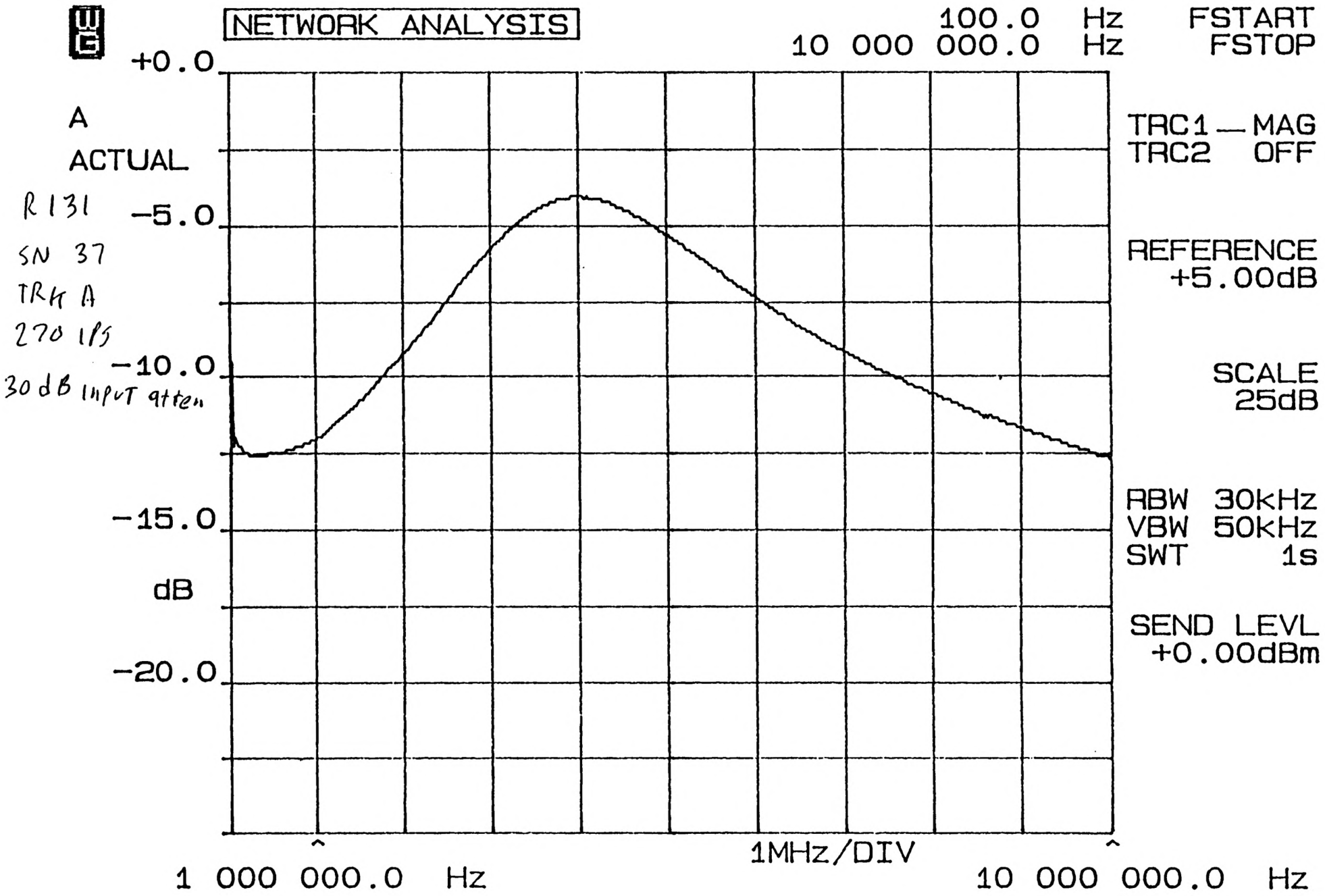
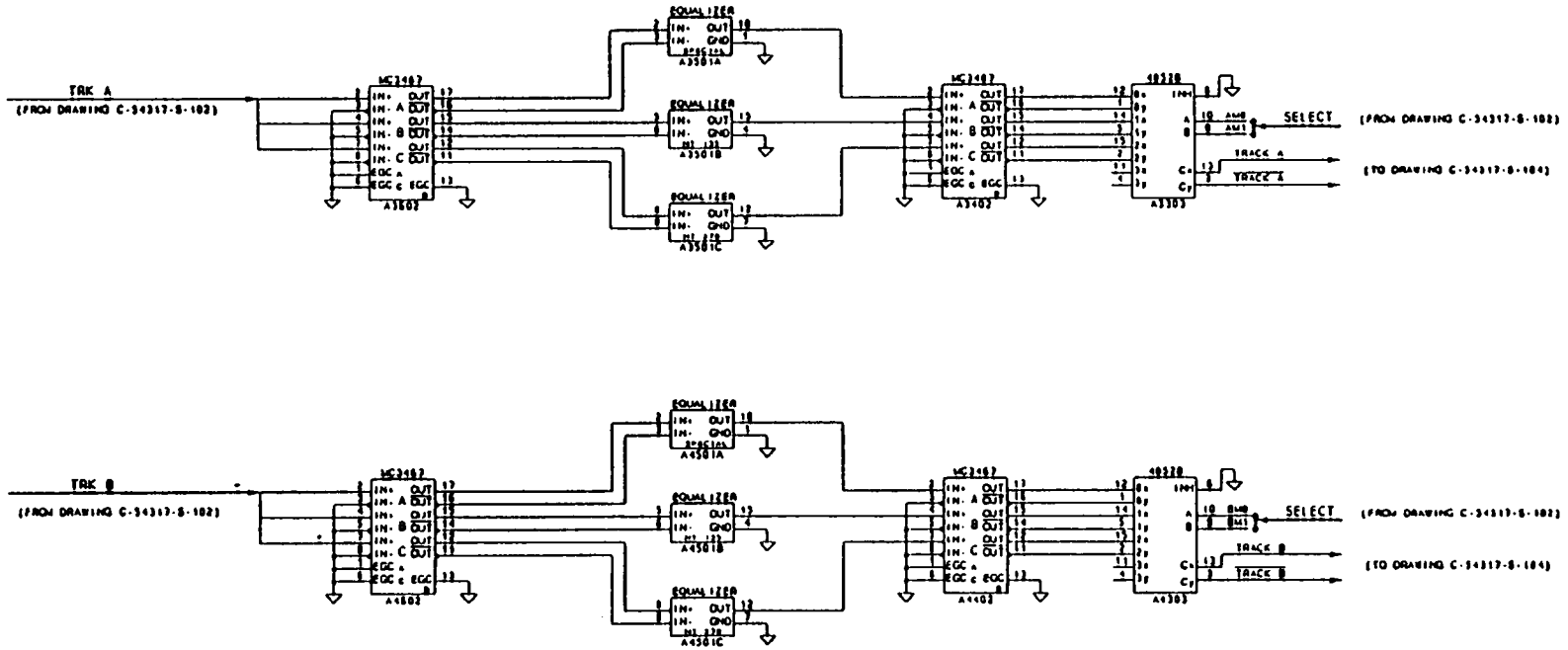

NETWORK ANALYSIS
100.0 Hz FSTART
10 000 000.0 Hz FSTOP
+0.0
A
ACTUAL
R131
SN 37
TRK A
270 I/S
30 dB INPUT atten
-5.0
-10.0
-15.0
dB
-20.0
TRC1 — MAG
TRC2 OFF
REFERENCE
+5.00dB
SCALE
25dB
RBW 30kHz
VBW 50kHz
SWT 1s
SEND LEVL
+0.00dBm
1 000 000.0 Hz
1MHz/DIV
10 000 000.0 Hz

Figure 3

REV.	DATE	DRAWN BY	APPRV'D BY	DESCRIPTION
A	9-91	ANDREATTA		UPDATED TO NRAO STANDARDS ;



NOTES:

1) SEE DRAWING C-54317-S-105 FOR EQUALIZER SCHEMATIC AND COMPONENT VALUES

2) SEE DRAWING C-54317-A-106 FOR GROUND CLIPS AND BYPASS CAPACITORS PLACEMENTS FOR THE MC3487 PREAMPLIFIERS.

FNET : C3175003

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES

VLBA

PROJECT
RECORDER
READ INTERFACE

TITLE
RECORDER
READ INTERFACE
EQUALIZERS WITH PRE-AMPS
SCHEMATIC DIAGRAM

NATIONAL RADIO ASTRONOMY OBSERVATORY

DRAWN BY HAYSTACK DATE 9-91

DESIGN BY DATE

APPROVED BY DATE

SHEET NUMBER 1 of 1 DRAWING NUMBER C54317S003 REV. A SCALE —

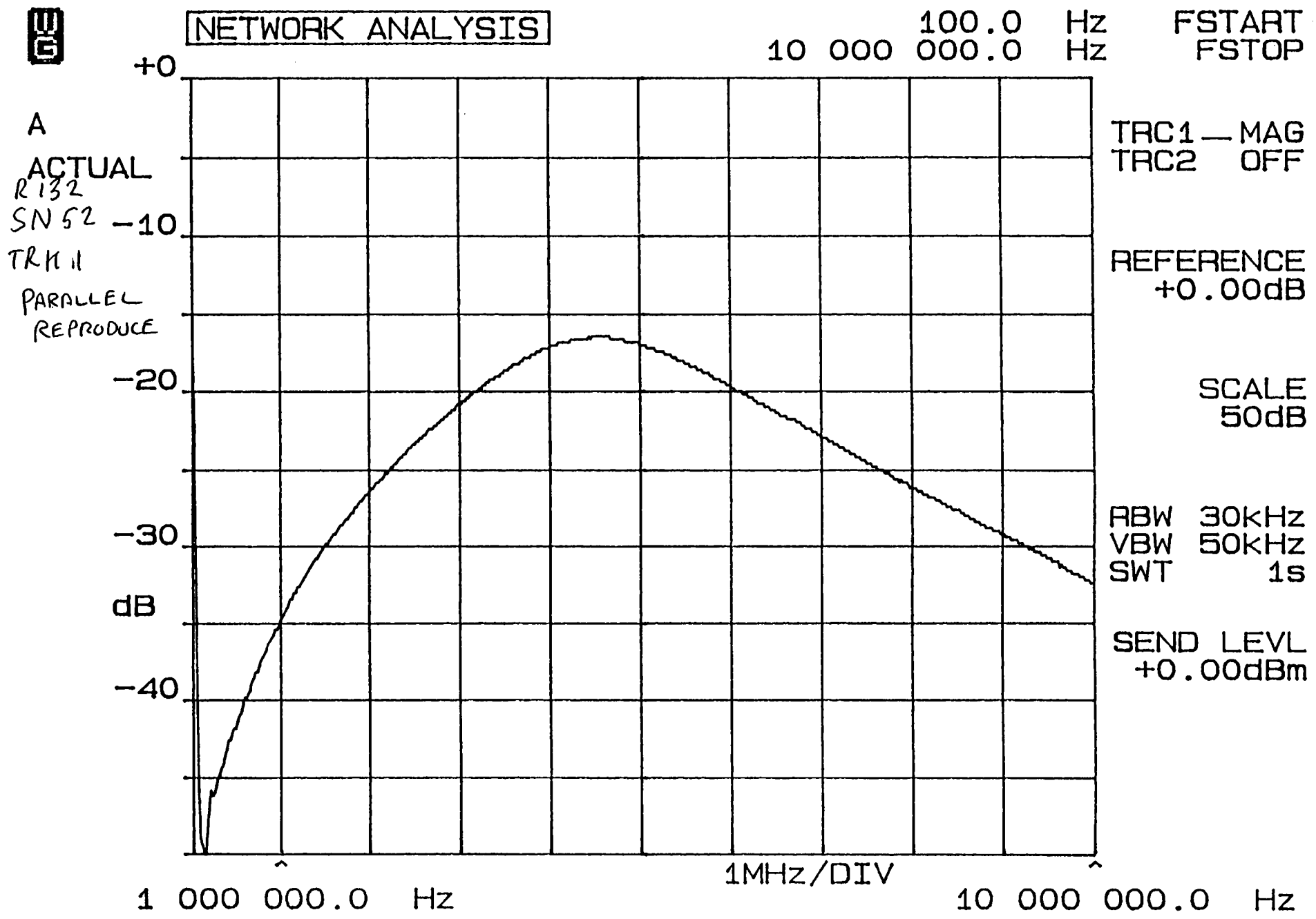
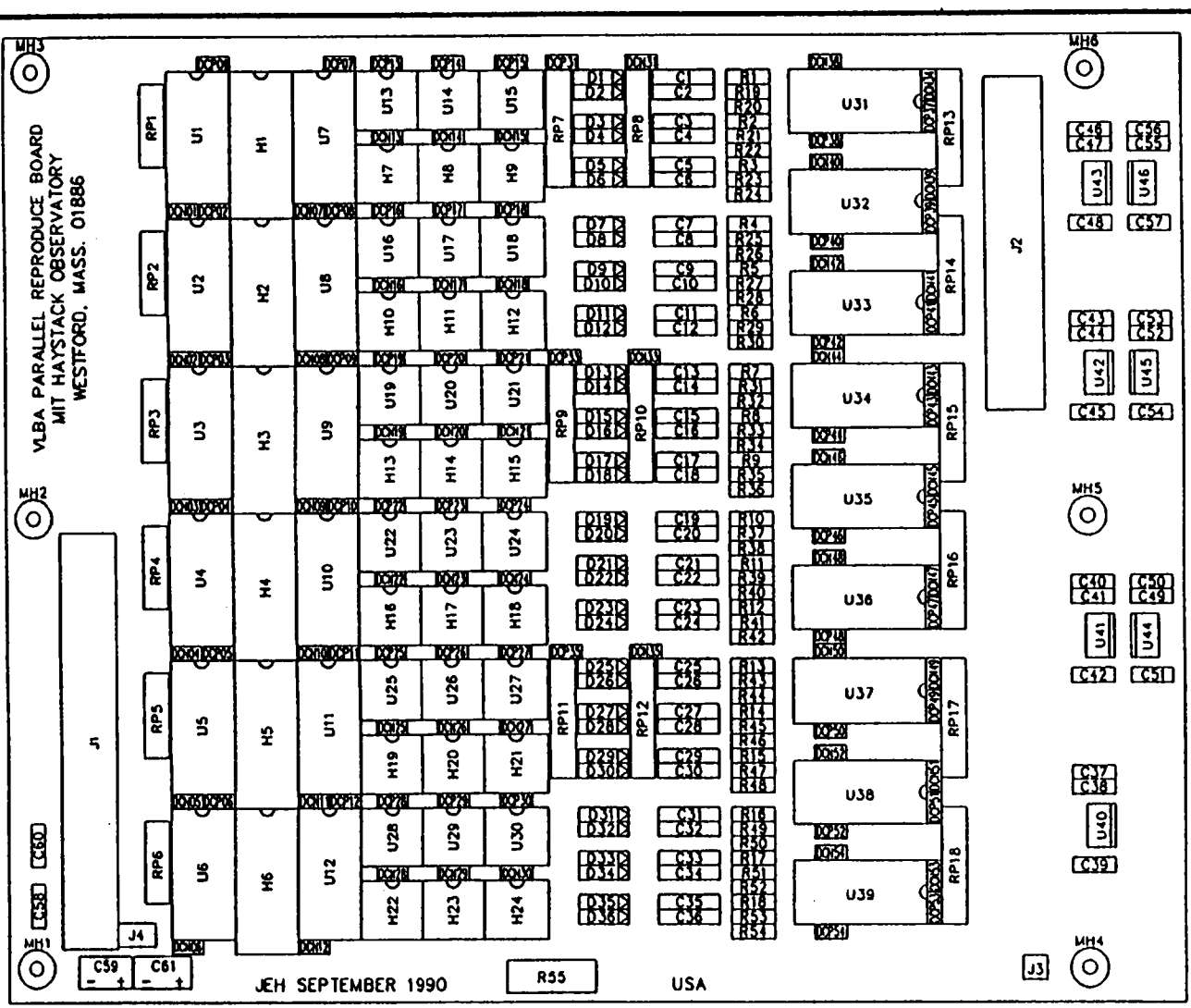

NETWORK ANALYSIS
100.0 Hz FSTART
10 000 000.0 Hz FSTOP
+0
A
ACTUAL
R132
SN52
TRK 11
PARALLEL
REPRODUCE
-10
-20
-30
dB
-40
TRC1 — MAG
TRC2 OFF
REFERENCE
+0.00dB
SCALE
50dB
RBW 30kHz
VBW 50kHz
SWT 1s
SEND LEVL
+0.00dBm
1MHz/DIV
1 000 000.0 Hz
10 000 000.0 Hz

FIGURE 5



PART LIST

1	MC7905.2C	MOTOROLA MC7905.2C -5.2V REG	U46
2	MC7906C	MOTOROLA MC7906C -6V REG.	U44, U45
3	MC7805C	MOTOROLA MC7805C 5V REG.	U41-U43
•1	MC7806C	MOTOROLA MC7806C 6V REG.	U40
9	AM6871	AMD AM6871	U31-U39
18	HA-5002	HARRIS HA-5002 VIDEO BUFFER	U13-U30
12	MC3467	MOTOROLA MC3467	U1-U12
6	SRES7.1K	BOURNS 4608X-101-102	RP13-RP18
6	SRES7.22K	BOURNS 4608X-101-223	RP7-RP12
•6	SRES3.100R	BOURNS 4606X-102-101	RP1-RP6
•1	3.9R	ALLEN BRADLEY 1WATT RES.	R55
36	2000R	ALLEN BRADLEY RCR05G202JS	R19-R54
18	1000R	ALLEN BRADLEY RCR05G102JS	R1-R18
•1	JUMPER		J4
1	CON4	4PIN CONN. 0.1" SPACING	J3
1	CONN40	40PIN BY 0.1" DIP CONN.	J2
1	CONN50	50PIN BY 0.1" DIP CONN.	J1
18	LPF4.2M	4.2MHz LOW BESSEL FILTER SEE DWG #B5143195004	H7-H24
6	NT-160	NT-135 TRIPLE EQUAL. SEE DWG #C5143195003	H1-H6
18	.001uF	CENTRALAB CW15C102K	DCP38,40,42,44,46 DCP48,50,52,54 DCN38,40,42,44,46 DCN48,50,52,54
84	0.1uF	CENTRALAB CY20C104P	DCP01-31 DCP33,35,37 DCP39,41,43,45 DCP47,49,51,53 DCN01-31 DCN33-35 DCN39,41,43,45 DCN47,49,51,53
36	2835	HP 5082-2835 DIODES	D1-D36
2	3.3uF	SPRAGUE 1190335X0758A1 TANT.	C59, C61
2	0.33uF	CENT. CY30A334M	C58, C60
21	1uF	CENT. CY10C105M CERAMIC	C37-C57
36	3.3uF	AUV MD011C337JAA	C1-C36
QTY	PRT/VAL	DESCRIPTION	REF. DES.

• = OMIT THESE COMPONENTS

NOTE: USE SAMTEC TS-120-G-G-1-2 FOR J1-J3

D-05431B4004

NOV 26 1991

NOTES:

MATERIAL:

FINISH AND/OR HEAT TREATMENT:

NONE

K. WILSON

C. KOSTKA 8/91

NORTHEAST RADIO OBSERVATORY CORPORATION
HAYSTACK OBSERVATORY
WESTFORD, MASSACHUSETTS

VLBA PLAYBACK SYSTEM
PARALLEL REPRODUCE MODULE
P.C. BOARD COMPONENT LAYOU

FINISH

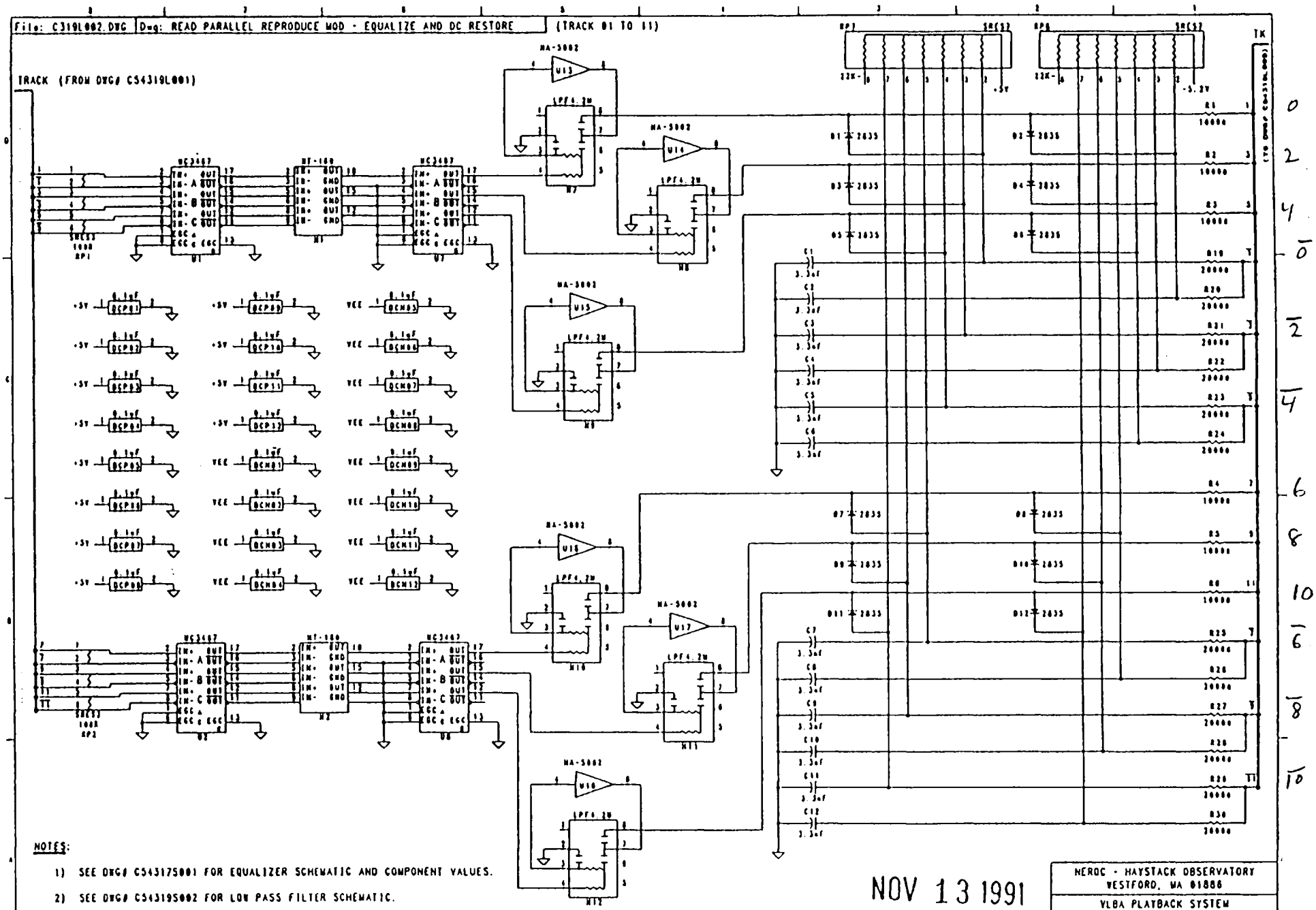

File: C319L002.DWG
Dwg: READ PARALLEL REPRODUCE MOD - EQUALIZE AND DC RESTORE
(TRACK 01 TO 11)
TRACK (FROM DWG# C54319L001)
NOTES:
1) SEE DWG# C543175001 FOR EQUALIZER SCHEMATIC AND COMPONENT VALUES.
2) SEE DWG# C54319S002 FOR LOW PASS FILTER SCHEMATIC.
3) RP1 AND RP2 ARE NOT USED.
NOV 13 1991
NEROC - HAYSTACK OBSERVATORY
WESTFORD, MA 01886
VLBA PLAYBACK SYSTEM
READ PARALLEL REPRODUCE MODULE
(EQUALIZE AND DC RESTORE TR 01-11)
R.P. REPROD
C
C54319L002
B

FIGURE 7