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NASA CR-

144553

ISS-00971

121.75 MHz BAND PASS FILTER

Job Order 17-060

(NASA-CR-144553) THE 121.75 MHz BAND PASS
FILTER (Lockheed Electronics Co.) 14 p
HC \$3.50 CSCL 09C

N76-11349

Unclas
02603

G3/33

Prepared By

Lockheed Electronics Company, Inc.

Aerospace Systems Division

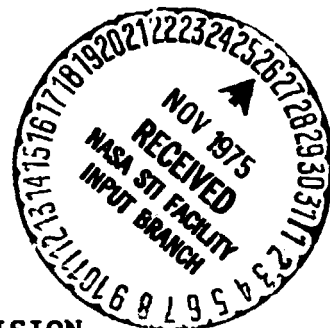
Houston, Texas

Contract NAS 9-12200

For

SPACECRAFT SYSTEMS TEST OFFICE

TRACKING AND COMMUNICATIONS DEVELOPMENT DIVISION



National Aeronautics and Space Administration
LYNDON B. JOHNSON SPACE CENTER

Houston, Texas
September 1975

LEC-6995
Shuttle

121.75 MHz BAND PASS FILTER

Job Order 17-060

PREPARED BY

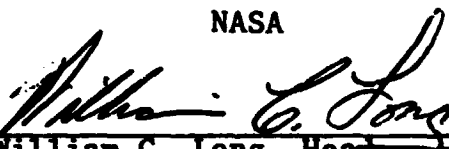

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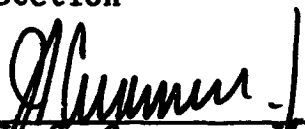
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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
LYNDON B. JOHNSON SPACE CENTER
HOUSTON, TEXAS

September 1975

PREFACE

This report describes the results of tests performed on a 121.75 MHz band pass filter. It is the filter recommended in LEC document 4457 as a solution for the rejection of an interfering signal at 142.417 MHz.

ACKNOWLEDGEMENTS

This document was prepared in response to Action Document 7060-21-60, submitted by the Spacecraft Systems Test Office (SSTO) of the Tracking and Communications Development Division. William C. Long, Office Head, was the Technical Monitor for this task. Robert J. Davis, of the Spacecraft Systems Test Section, Lockheed Electronics Company, Inc., prepared this document.

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1. SUMMARY

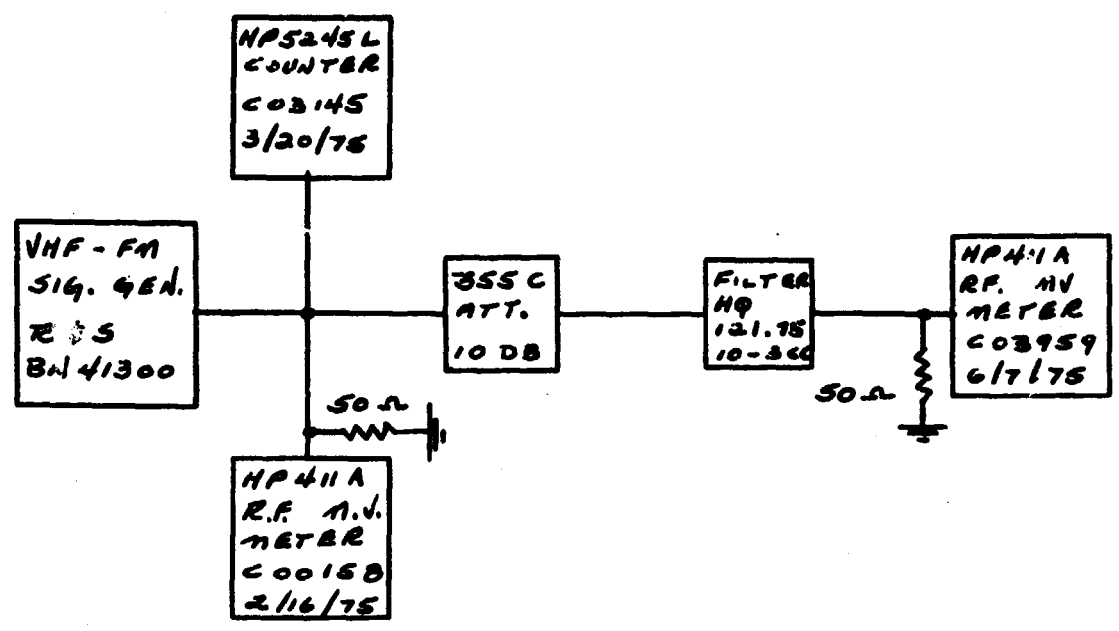
Prior to the ASTP joint flight it had been observed during various tests on the USA's VHF/FM system, that the 121.75 MHz receiver unsquelched when exposed to certain rf power levels at a frequency of 142.417 MHz. Consequently, tests were conducted per LEC Document 4457 in an effort to arrive at a solution. Several recommendations were made but the most feasible was to insert a selective band pass filter in the transmit/receive line of the VHF/FM transceiver. The tests shown in Section 2 were performed on the filter to determine the frequency response and rejection capabilities at 142.417 MHz.

2. 121.75 MHz BANDPASS FILTER TEST REPORT

The test results are shown on the following pages of this section. Ran band pass characteristics of the filter per set up on page 2-2 with resulting data plot on page 2-4.

Also conducted a test with the filter connected in the planned flight position as shown on page 2-8. The resulting plot of unquelled levels vs frequency shows the rejection capability at 142.417 MHz.

| | | |
|---------------------------------|--|---|
| TEST NUMBER 020375 | SHEET 1 OF 3 | TEST PROCEDURE NO. PROCEDURE SECTION NO. |
| RECORDED BY <i>R. Dennis</i> | TYPE OF TEST AND DATA OUTPUT POINT BANDPASS FILTER #Q 121.75-10-3CC | |
| APPROVED BY | LARK ENGINEERING | |



TEST NUMBER

020375

SHEET

2 OF 3

TEST PROCEDURE NO.

PROCEDURE SECTION NO.

RECORDED BY

R. Davis

TYPE OF TEST

FREQUENCY RESPONSE

BANDPASS FILTER HQ121.75-10-3CC
LARK ENGINEERING

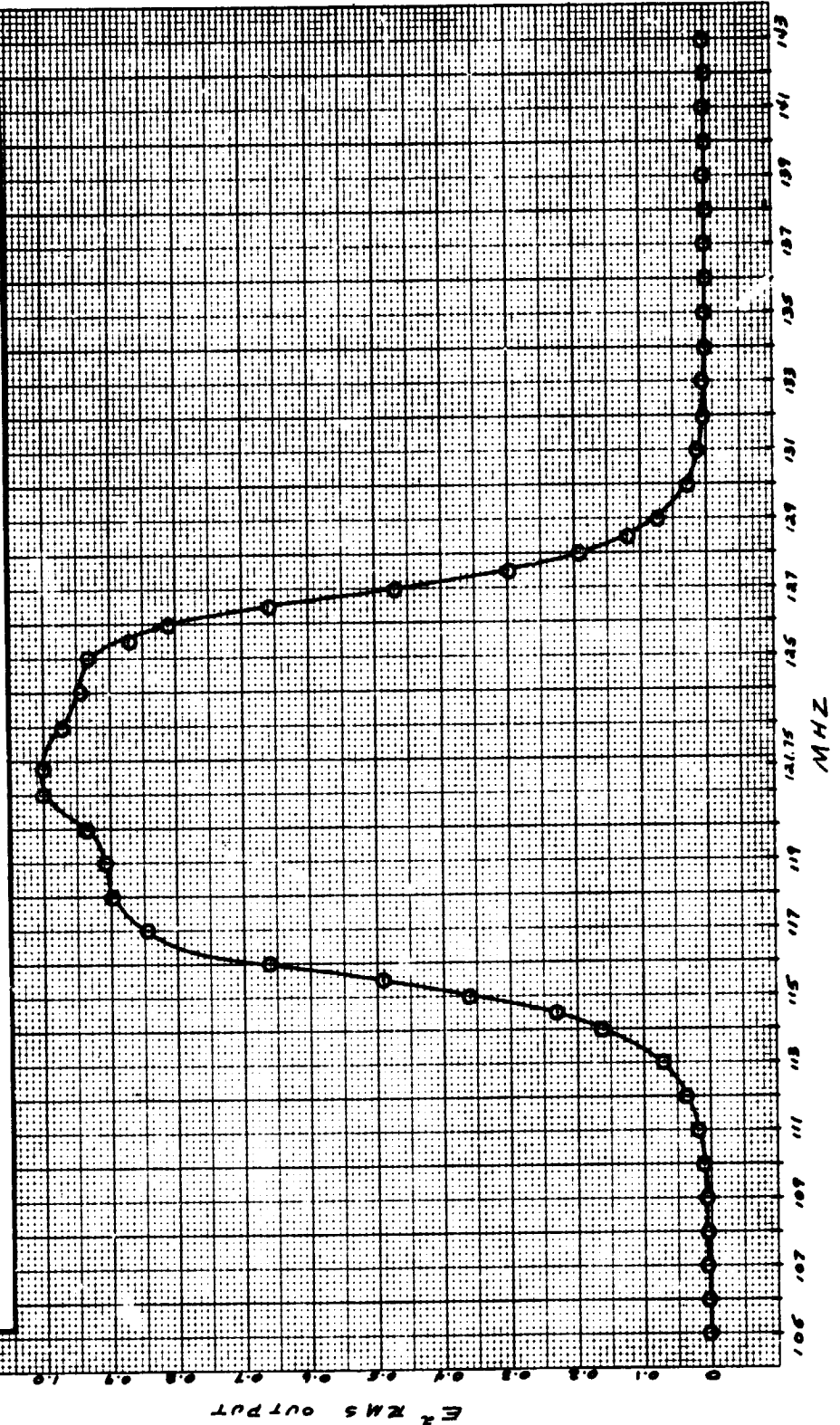
APPROVED BY

| FREQ. M Hz | E OUTPUT RMS MV | E ² NORM. | FREQ. M Hz | E OUTPUT RMS MV | E ² NORM. | FREQ. M Hz | E OUTPUT RMS MV | E ² NORM. |
|---------------|--------------------------|-------------------------|---------------|--------------------------|-------------------------|---------------|--------------------------|-------------------------|
| 105 | 5.4 | .001 | 125 | 145 | .934 | 143 | 1.3 | .0000 |
| 106 | 6.4 | .002 | 126 | 135 | .810 | 125.5 | 140 | .871 |
| 107 | 7.6 | .003 | 126.5 | 122 | .661 | | | |
| 108 | 9.5 | .004 | 127 | 103 | .471 | | | |
| 109 | 12 | .006 | 127.5 | 83 | .306 | | | |
| 110 | 15.5 | .011 | 128 | 66 | .194 | | | |
| 111 | 20.5 | .019 | 128.5 | 52 | .120 | | | |
| 112 | 28 | .035 | 129 | 41 | .075 | | | |
| 113 | 40 | .071 | 129.5 | | | | | |
| 113.5 | 48 | .102 | 130 | 26 | .030 | | | |
| 114 | 60 | .160 | 130.5 | | | | | |
| 114.5 | 72 | .230 | 131 | 18 | .014 | | | |
| 115 | 90 | .360 | 132 | 13 | .007 | | | |
| 115.5 | 105 | .490 | 133 | 9.5 | .004 | | | |
| 116 | 122 | .661 | 134 | 7.5 | .0025 | | | |
| 117 | 138 | .846 | 135 | 5.5 | .0013 | | | |
| 118 | 142 | .896 | 136 | 4.5 | .0009 | | | |
| 119 | 143 | .908 | 137 | 3.7 | .0006 | | | |
| 120 | 145 | .934 | 138 | 3.0 | .0004 | | | |
| 121 | 150 | 1 | 139 | 2.5 | .0003 | | | |
| 121.75 | 150 | 1 | 140 | 2.1 | .0002 | | | |
| 123 | 148 | .973 | 141 | 1.7 | .0001 | | | |
| 124 | 146 | .947 | 142 | 1.5 | .0001 | | | |

REMARKS:

INSERTION LOSS OF FILTER = 0.7 DB

| | | |
|------------------------------------|-----------|-------------------------------|
| TEST NUMBER | SHEET | NORMALIZED FREQUENCY RESPONSE |
| TPET- 020375 | 3 OF 3 | |
| TYPE OF TEST AND DATA OUTPUT POINT | | |
| BANDPASS FILTER, #P121.75-10-3CC | | |
| LARK ENGINEERING | | |
| 340mm | 11.35 MHZ | |
| MSW | | |
| SPR | | |



TEST NUMBER

020675-1

SHEET

1 OF 4

TEST PROCEDURE NO.

PROCEDURE SECTION NO. AD # 7060-21-60

RECORDED BY

R. Davis

TYPE OF TEST AND DATA OUTPUT POINT

VHF/FM TRANSCEIVER SIGNAL
TEST WITH FILTER

APPROVED BY

FREQ.
MHZSQUELCH
LEVEL
DBMUNSQUELCH
LEVEL
DBMFILTER
IN

113

- 11

- 10

No

113

- 9.7

- 8.7

YES

115

- 21

- 20

No

115

- 19.7

- 18.7

YES

118

- 39

- 38

No

118

- 38.7

- 37.7

YES

120

- 62

- 61

No

120

- 61.7

- 60.7

YES

121.750

- 108

- 107

No

121.750

- 107.7

- 106.7

YES

123

- 63

- 62

No

123

- 63.7

- 62.7

YES

125

- 39

- 38

No

125

- 38.7

- 37.7

YES

127

- 21

- 20

No

127

- 15.7

- 14.7

YES

130

0

+ 1

No

130

NO
UNSQUELCH

YES

131

+ 12

+ 11

No

131

NO
UNSQUELCH

YES

132

+ 2

+ 3

No

132

NO
UNSQUELCH

YES

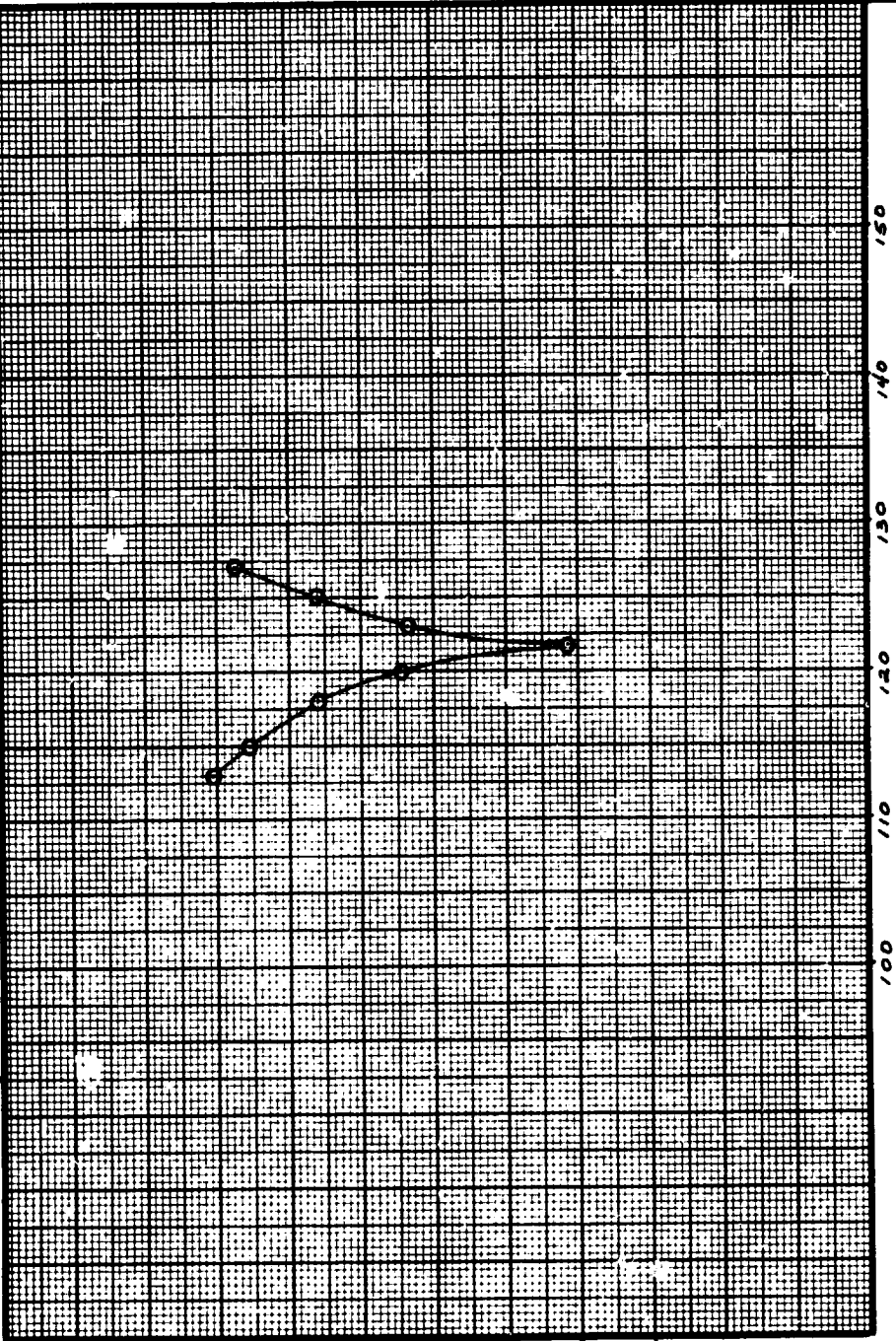
REMARKS: ① VHF/FM XMT R DEVIATED 10 KHZ WITH 1 KHZ SINE WAVE
② RF POWER INSERTED AT J4 OF VHF/FM RCLR.

| TEST NUMBER | | SHEET | TEST PROCEDURE NO. | |
|---------------------------|-------------------------|------------------------------------|---------------------------------------|--|
| 020675-1 | | FL OF 4 | PROCEDURE SECTION NO. AD # 7060-21-60 | |
| RECORDED BY R. D. LIMA | | TYPE OF TEST AND DATA OUTPUT POINT | | |
| APPROVED BY | | VHF/FM TRANSCEIVER SIGNAL | | |
| | | TEST WITH FILTER | | |
| FREQ. MHZ | SQUELCH LEVEL DBM | UNSQUELCH LEVEL DBM | FILTER IN | |
| 141 | +3 | +4 | No | |
| 141 | | No UNSQUELCH | YES | |
| 141.500 | -3 | -2 | No | |
| 141.500 | | No UNSQUELCH | YES | |
| 142 | -5 | -4 | No | |
| 142 | | No UNSQUELCH | YES | |
| 142.417 | -5 | -4 | No | |
| 142.417 | | No UNSQUELCH | YES | |
| 142.800 | | No UNSQUELCH | No | |
| 142.800 | | No UNSQUELCH | YES | |
| 143 | | No UNSQUELCH | No | |
| 143 | | No UNSQUELCH | YES | |
| 143.140 | -41 | -40 | No | |
| 143.140 | | No UNSQUELCH | YES | |
| 143.150 | -44 | -43 | No | |
| 143.150 | +0.7 | +1.7 | YES | |
| 143.183 | -39 | -38 | No | |
| 143.183 | | No UNSQUELCH | YES | |
| 143.190 | -27 | -26 | No | |
| 143.190 | -7.7 | -6.7 | YES | |
| | | | | |
| | | | | |
| REMARKS: | | | | |

TEST NUMBER
TPET-020675-1

SHEET
3 OF 4

VHF/FM TRANSCEIVER SIGNAL TEST WITH FILTER
AD # 7060-21-60



FREQ. MHZ

LEC FORM 96 (JULY 70)

NASA - MSC

TEST NUMBER
020675-1

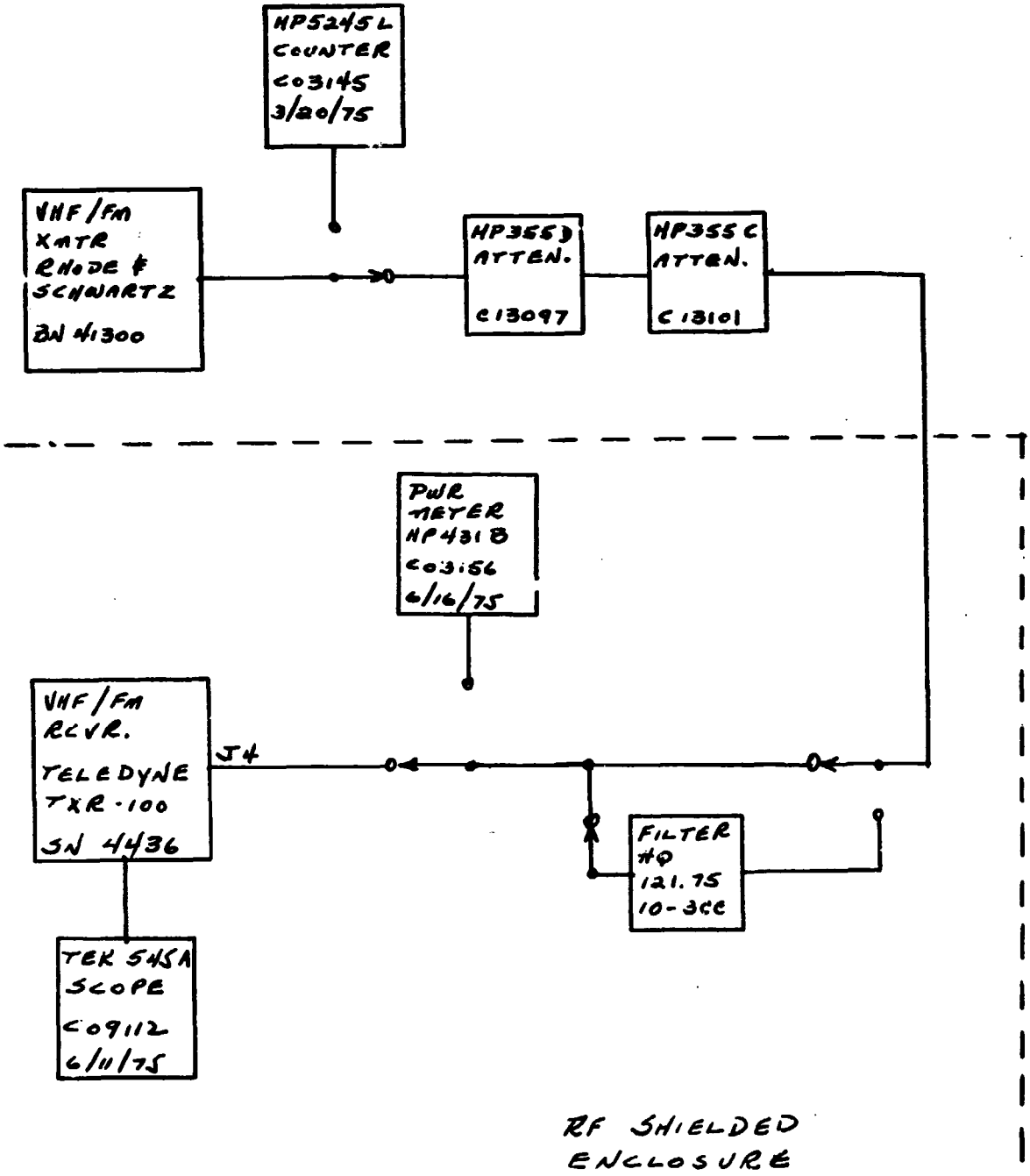
SHEET
4 OF 4

TEST PROCEDURE NO. AD#7060-21-60
PROCEDURE SECTION NO.

RECORDED BY
R. Davis

TYPE OF TEST AND DATA OUTPUT POINT
VHF/FM TRANSCEIVER SIGNAL
TEST WITH FILTER

APPROVED BY



RF SHIELDED
ENCLOSURE

3. CONCLUSIONS

The frequency response of the filter shows it to have a 3 dB bandwidth of 11.35 MHz or ± 5.675 MHz about a center frequency of 121.75 MHz. It also shows the interfering frequency, 142.417 MHz, to be well out of the band pass region.

Unsquench tests were also conducted and the rejection capabilities were more than adequate, especially at the interfering frequency of 142.417 MHz.