FILTER BOARD

INSTRUCTIONS FOR USE OF THE FILTER BOARD FOR TRIPATH AMPLIFIERS

Technical Information **Revised March 2000**

Reference: Excerpt from Application Note 4

Tripath recommends the use of an output filter to remove displaced harmonics generated by the switching amplifier, which are present outside of the audio band. This Filter Board allows users to test THD and THD+N with equipment that lacks a 20kHz or 30kHz internal filter. The filter board should be placed between the test equipment and the amplifier output as follows:

- Attach a load across the output jacks of one channel of the amplifier board.
- Connect the IN+ and IN- terminals of the filter board across the load.
- Connect the filter board's power terminals to a dual 15V power supply. Connect a 5V supply to drive the onboard gain changing relay circuit.
  Note: The 5V supply is not needed when testing a TA1101B or TA2020-020.
- Connect the THD+N test equipment to the 20kHz or 30kHz filter output.
- Apply power to the Tripath component and then the filter board.
- Apply test signals to the Tripath component.
- Make the measurements at the output of the Tripath filter board.

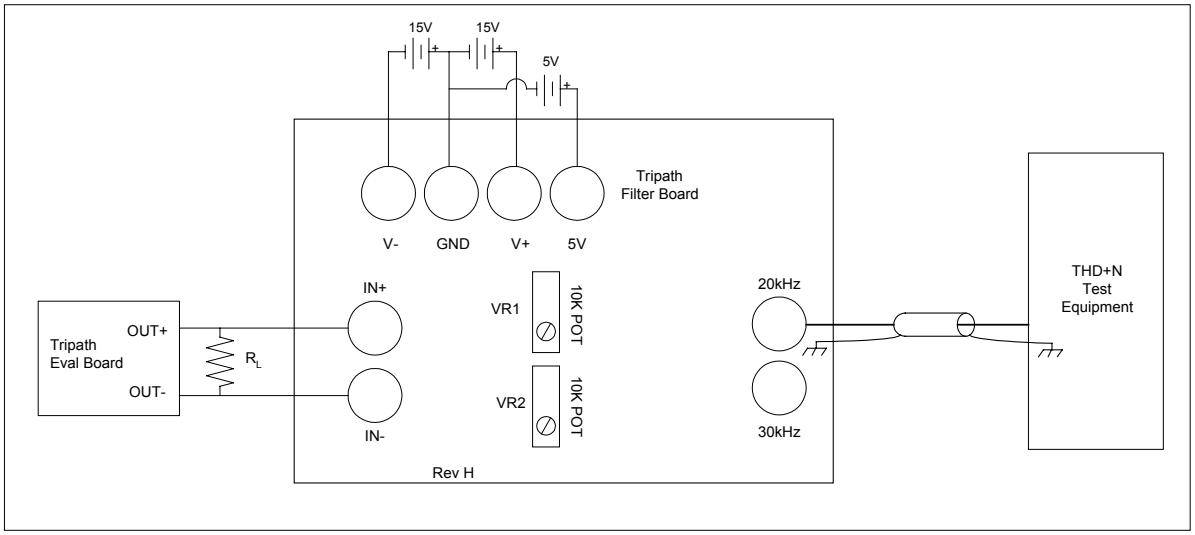

Figure 3: Recommended test setup for measuring a Class-T amplifier

There are two outputs on the filter card: 20kHz and 30kHz. The 20kHz output is the standard output. The 30kHz filter output has been included for compliance with the EIAJ testing standard. They will yield the similar results.

The filter board comes calibrated for use with the Tripath TA1101B or TA2020-020 amplifier. There are two variable resistors, VR1 and VR2, that the user may need to adjust when testing with TA101X based amplifiers:

- VR1 adjusts common mode rejection. This board comes calibrated from the factory, but if the input attenuation circuit is changed (when using power supplies greater than ±40V), VR1 may need to be trimmed. To calibrate it, apply the same 1V rms sine wave in phase to both inputs. Look at the output with a scope and trim VR1 until the output is minimized.
- VR2 is a potentiometer that forms a voltage divider that allows the user to set the gain change trip point to maximize the performance of the filter board. The onboard relay allows for two different filter board gains depending on the input signal level at IN+. The first range is a fixed 6 dB attenuation caused by the combination of R100 and R102 on IN+, and R103 and R105 on IN-. The attenuation factor of the second range is determined by the additional parallel resistance seen by the inputs when the relay is closed (R101 on IN+, R104 on IN-). The value of VR2 determines when the filter board will switch from Range 1 to Range 2. Assuming a gate threshold of 2V for Q1, VR2 should be adjusted to about 1500 Ohms. This attenuation will cause the relay to trip (therefore switching the filter board gain) before the input op amp starts to overload.

  Table 1 is used to choose an appropriate attenuation factor for the second gain range. The required attenuation factor is supply voltage dependant. The additional attenuation makes sure that the op amps on the filter board do not clip with large input signals. Vpp is the magnitude of positive supply in a traditional split supply, single ended amplifier configuration (i.e. TA010XA designs). See Table 1 for R101/R104 resistor value selection.

Amplifier Loaded Supply Voltage	Resistor Value (Ω)
Vpp ≤ 40V	49.9K*
40 < Vpp ≤ 50V	24.9K
50 < Vpp ≤ 60V	20.0K
60 < Vpp ≤ 70V	15.0K
70 < Vpp ≤ 80V	12.1K
80 < Vpp ≤ 90V	10.0K

Table 1: R101/R104 Resistor Value Selection

*The filter board comes stuffed with 49.9KΩ for R101/R104.

When your analyzer's standard THD+N test is performed, the results will meet or exceed Tripath's published specs and will be valid for comparison with non-Class-T amplifiers. Typical THD+N performance for a Tripath TA1101B amplifier is shown below in Figure 4.

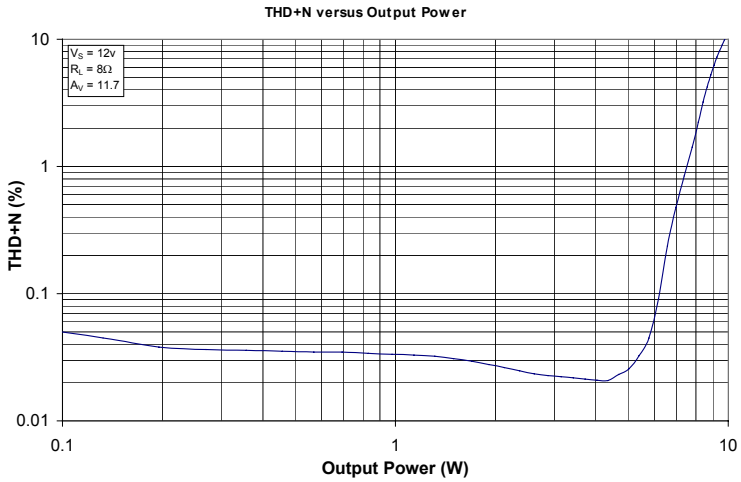

Figure 4: Typical THD+N versus Output Power Performance for TA1101B

Contact Information

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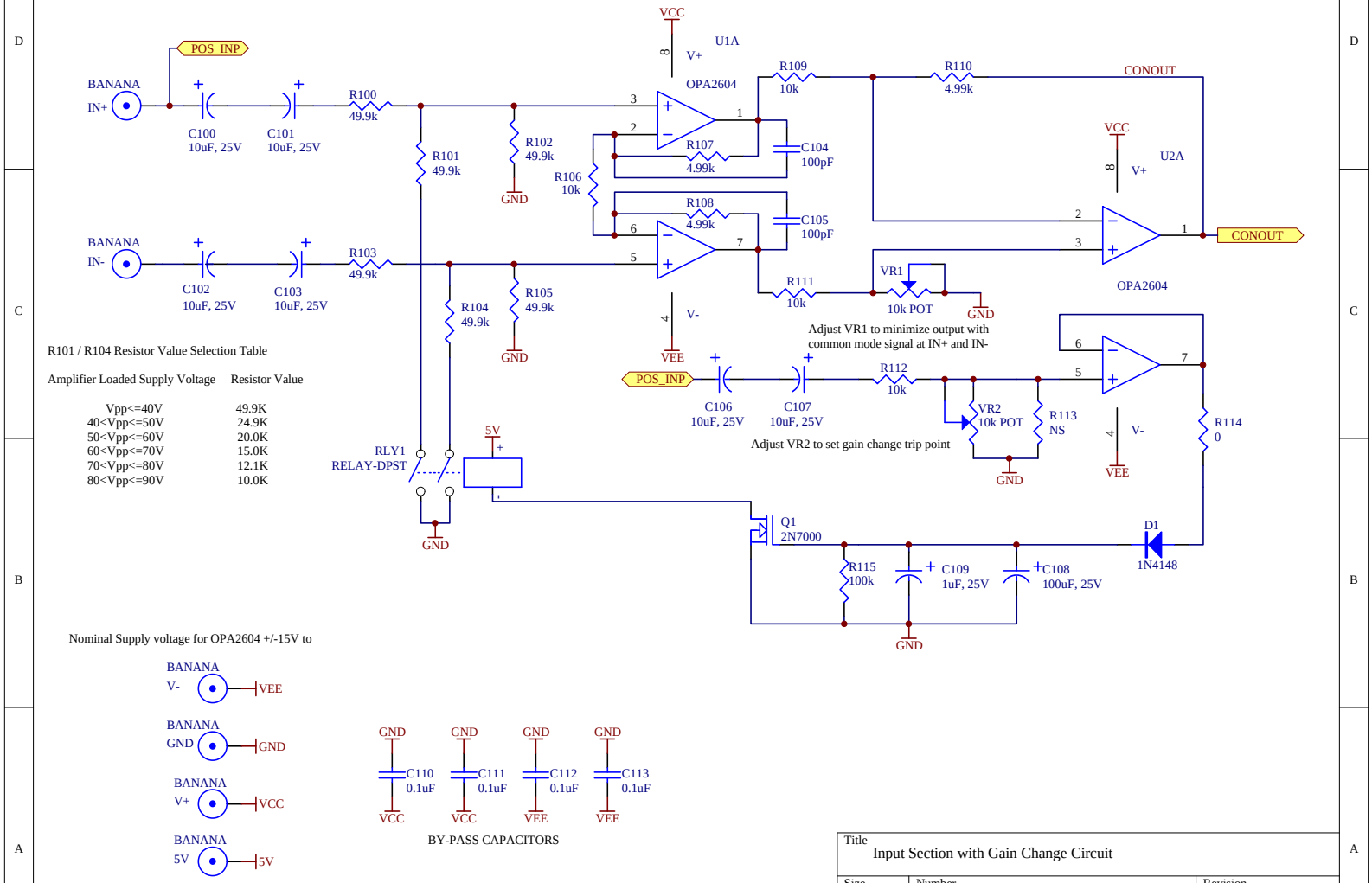
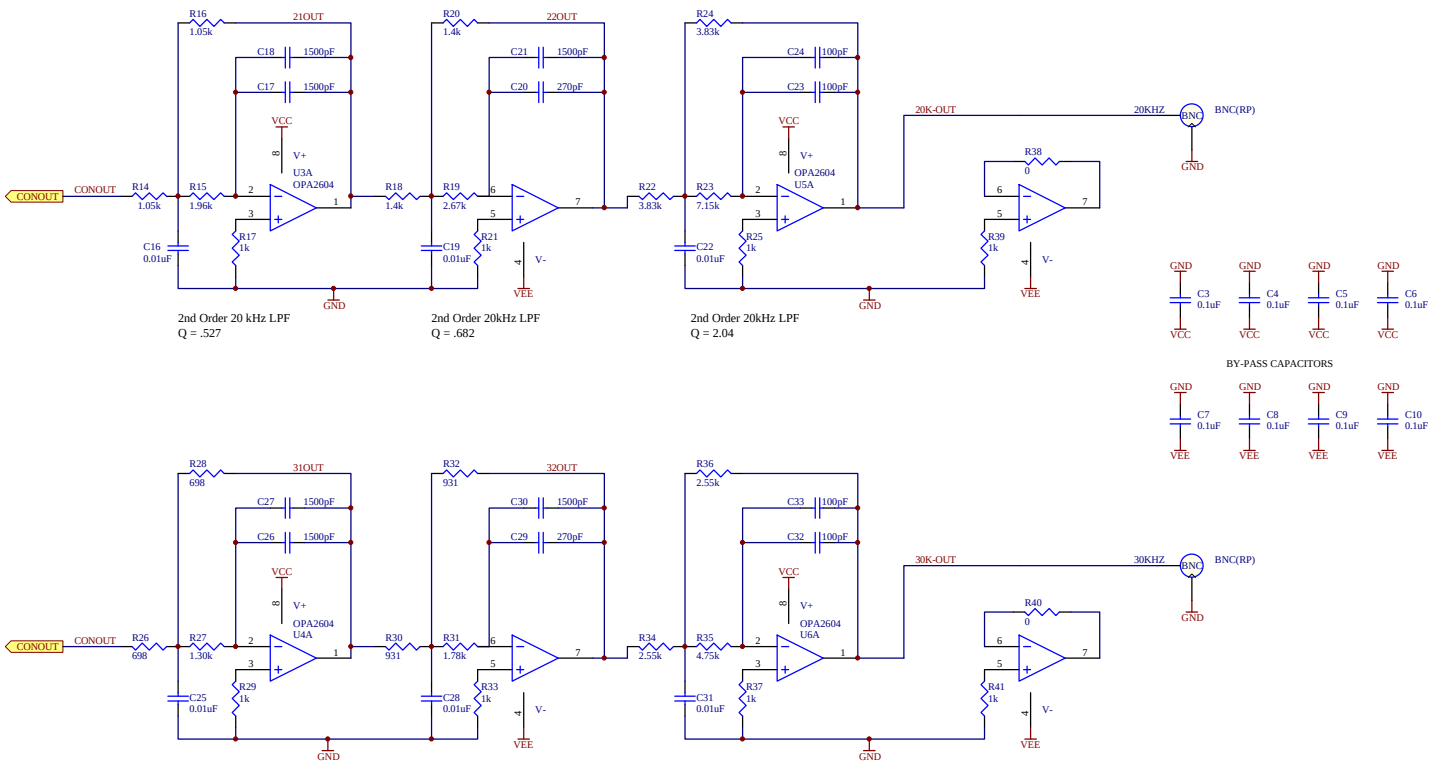
408.750.3001 - F

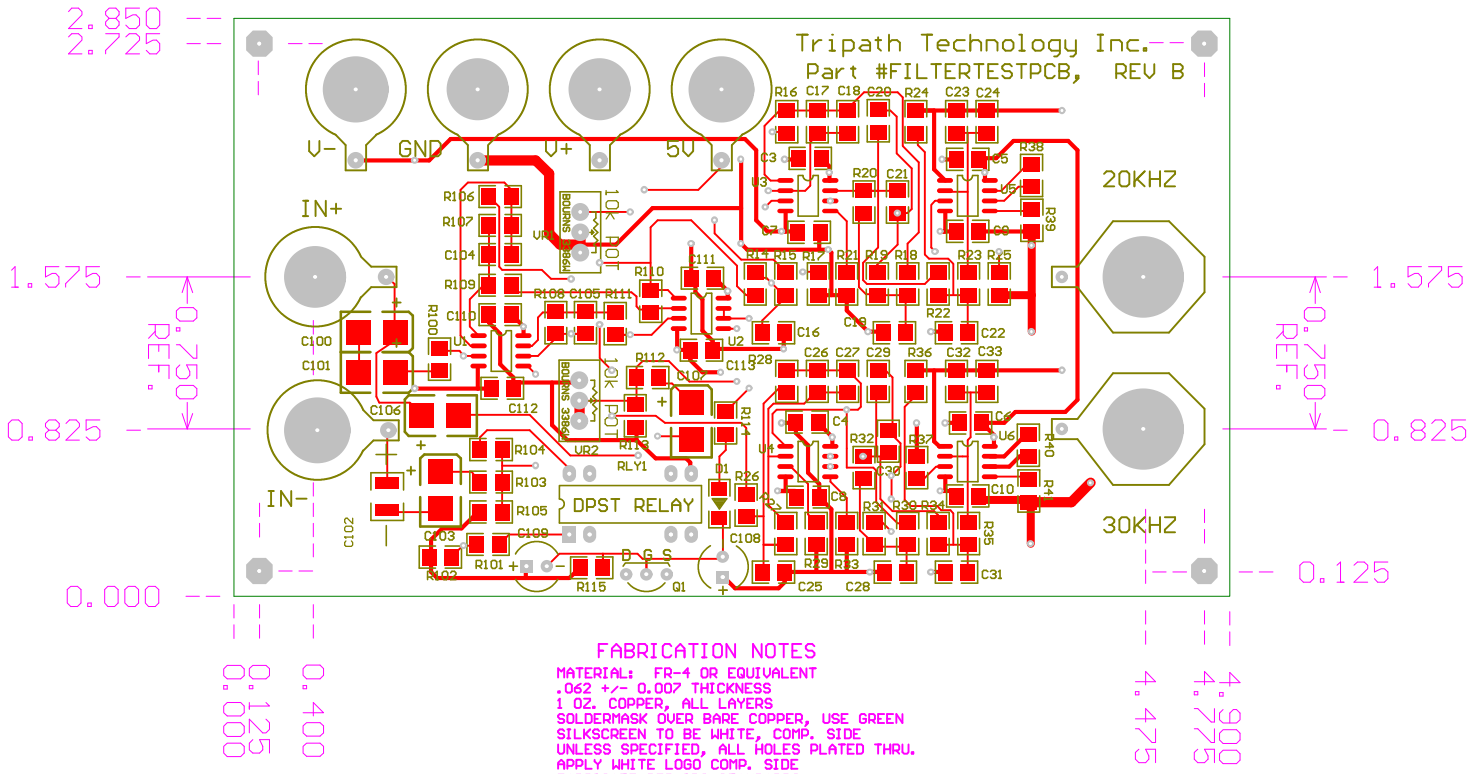
For more Sales Information, please visit us @ www.tripath.com/cont_s.htm
For more Technical Information, please visit us @ www.tripath.com/data.htm


POS_INP
BANANA
IN+
C100
10uF, 25V
C101
10uF, 25V
R100
49.9k
R101
49.9k
R102
49.9k
GND
VCC
U1A
V+
OPA2604
R109
10k
R110
4.99k
CONOUT
R106
10k
R107
4.99k
C104
100pF
R108
4.99k
C105
100pF
BANANA
IN-
C102
10uF, 25V
C103
10uF, 25V
R103
49.9k
R104
49.9k
R105
49.9k
V-
VEE
R111
10k
VR1
10k POT
Adjust VR1 to minimize output with
common mode signal at IN+ and IN-
U2A
OPA2604
CONOUT
POS_INP
C106
10uF, 25V
C107
10uF, 25V
R112
10k
VR2
10k POT
R113
NS
Adjust VR2 to set gain change trip point
R114
0
5V
RLY1
RELAY-DPST
Q1
2N7000
D1
1N4148
R115
100k
C109
1uF, 25V
C108
100uF, 25V
R101 / R104 Resistor Value Selection Table
Amplifier Loaded Supply Voltage Resistor Value
Vpp<=40V 49.9K
40<Vpp<=50V 24.9K
50<Vpp<=60V 20.0K
60<Vpp<=70V 15.0K
70<Vpp<=80V 12.1K
80<Vpp<=90V 10.0K
Nominal Supply voltage for OPA2604 +/-15V to
BANANA
V-
VEE
BANANA
GND
GND
BANANA
V+
VCC
BANANA
5V
5V
C110
0.1uF
C111
0.1uF
C112
0.1uF
C113
0.1uF
BY-PASS CAPACITORS
Title
Input Section with Gain Change Circuit
Size
A
Number
Revision
Date:
19-Feb-2001
Sheet of
File:
C:\TEMP1\NEWFOL~2\FLTRINPT.SCH
Drawn By:


R16
1.05k
21OUT
C18
1500pF
C17
1500pF
VCC
V+
U3A
OPA2604
CONOUT
CONOUT
R14
1.05k
R15
1.96k
C16
0.01uF
R17
1k
GND
R18
1.4k
R20
1.4k
22OUT
C21
1500pF
C20
270pF
R19
2.67k
C19
0.01uF
R21
1k
V-
VEE
R22
3.83k
R24
3.83k
C24
100pF
C23
100pF
R23
7.15k
C22
0.01uF
R25
1k
20K-OUT
20KHZ
BNC
BNC(RP)
GND
R38
0
R39
1k
2nd Order 20 kHz LPF
Q = .527
2nd Order 20kHz LPF
Q = .682
2nd Order 20kHz LPF
Q = 2.04
C3
0.1uF
C4
0.1uF
C5
0.1uF
C6
0.1uF
BY-PASS CAPACITORS
C7
0.1uF
C8
0.1uF
C9
0.1uF
C10
0.1uF
R28
698
31OUT
C27
1500pF
C26
1500pF
R26
698
R27
1.30k
C25
0.01uF
R29
1k
R30
931
R32
931
32OUT
C30
1500pF
C29
270pF
R31
1.78k
C28
0.01uF
R33
1k
R34
2.55k
R36
2.55k
C33
100pF
C32
100pF
R35
4.75k
C31
0.01uF
R37
1k
30K-OUT
30KHZ
R40
0
R41
1k
2nd Order 30 kHz LPF
Q = .527
2nd Order 30kHz LPF
Q = .681
2nd Order 30kHz LPF
Q = 2.04
Title
20kHz / 30kHz Filter Stage
Size
B
Number
Revision
Date:
19-Feb-2001
Sheet of
File:
C:\TEMP1\NEWFOL~2\FLTRSTGE.SCH
Drawn By:

Bill of Material for Amplifier Filter Board RevB

Used	Part Type	Designator	Footprint	Part Field 1
3	0	R114 R38 R40	1206	1%, METAL FILM
6	0.01uF	C16 C19 C22 C25 C28 C31	1206	5%, NPO
12	0.1uF	C10 C110 C111 C112 C113 C3 C4 C5 C6 C7 C8 C9	1206	5%, NPO
2	1.05k	R14 R16	1206	1%, METAL FILM
1	1.30k	R27	1206	1%, METAL FILM
2	1.4k	R18 R20	1206	1%, METAL FILM
1	1.78k	R31	1206	1%, METAL FILM
1	1.96k	R15	1206	1%, METAL FILM
1	100k	R115	1206	5%, NPO
6	100pF	C104 C105 C23 C24 C32 C33	1206	5%, NPO
1	100uF, 25V	C108	RADPO.10AX34	20%, ELECTROLYTIC
4	10k	R106 R109 R111 R112	1206	5%, NPO
2	10k POT	VR1 VR2	VR7	BOURNS
6	10uF, 25V	C100 C101 C102 C103 C106 C107	SM D Size	20%, TANTALUM
6	1500pF	C17 C18 C21 C26 C27 C30	1206	5%, NPO
8	1k	R17 R21 R25 R29 R33 R37 R39 R41	1206	1%, METAL FILM
1	1N4148	D1	1206	5%, NPO
1	1uF, 25V	C109	RADPO.10AX34	20%, ELECTROLYTIC
2	2.55k	R34 R36	1206	1%, METAL FILM
1	2.67k	R19	1206	1%, METAL FILM
2	270pF	C20 C29	1206	5%, NPO
1	2N7000	Q1	TO92	FAIRCHILD
2	3.83k	R22 R24	1206	1%, METAL FILM
1	4.75k	R35	1206	1%, METAL FILM
3	4.99k	R107 R108 R110	1206	5%, NPO
6	49.9k	R100 R101 R102 R103 R104 R105	1206	5%, NPO
2	698	R26 R28	1206	1%, METAL FILM
1	7.15k	R23	1206	1%, METAL FILM
2	931	R30 R32	1206	1%, METAL FILM
6	BANANA	5V GND IN+ IN- V+ V-	GBNA002	*
2	BNC(RP)	20KHZ 30KHZ	GBNC001	*
1	NS	R113	1206	5%, NPO
6	OPA2604	U1 U2 U3 U4 U5 U6	SO-8	BURR BROWN
1	RELAY-DPST	RLY1	RLYDPST	HAMLIN



FABRICATION NOTES

MATERIAL: FR-4 OR EQUIVALENT
.062 +/- 0.007 THICKNESS
1 OZ. COPPER, ALL LAYERS
SOLDERMASK OVER BARE COPPER, USE GREEN
SILKSCREEN TO BE WHITE, COMP. SIDE
UNLESS SPECIFIED, ALL HOLES PLATED THRU.
APPLY WHITE LOGO COMP. SIDE
FABRICATE PER IPC STANDARDS

TOP LAYER

TOP OVERLAY

PC DESIGN
135 W. MAIN ST., #C
LOS GATOS, CA 95030
TEL 408-395-8188 PAGE 800-590-7196
FAX 408-395-8559 CELL 415-279-1071

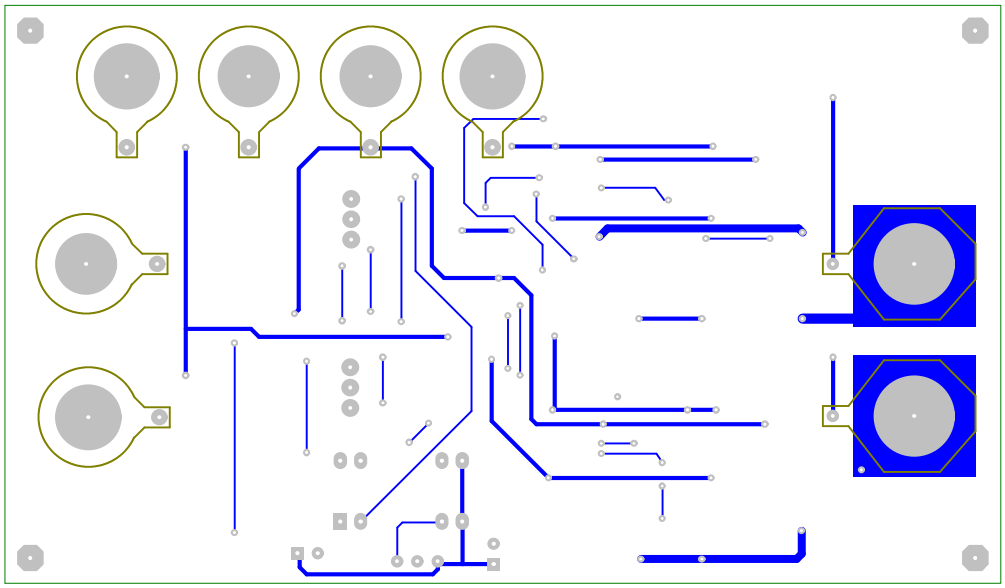
19-Feb-2001 | FILTERTESTPCB, REV B

TRIPATH TECH

FILTER TEST BOARD.
Mechanical Layer 3

FLTRREVB.PCB

59	70	111	2
NET COUNT	VIA COUNT	HOLE COUNT	FILL COUNT



BTM LAYER BTM OVERLAY

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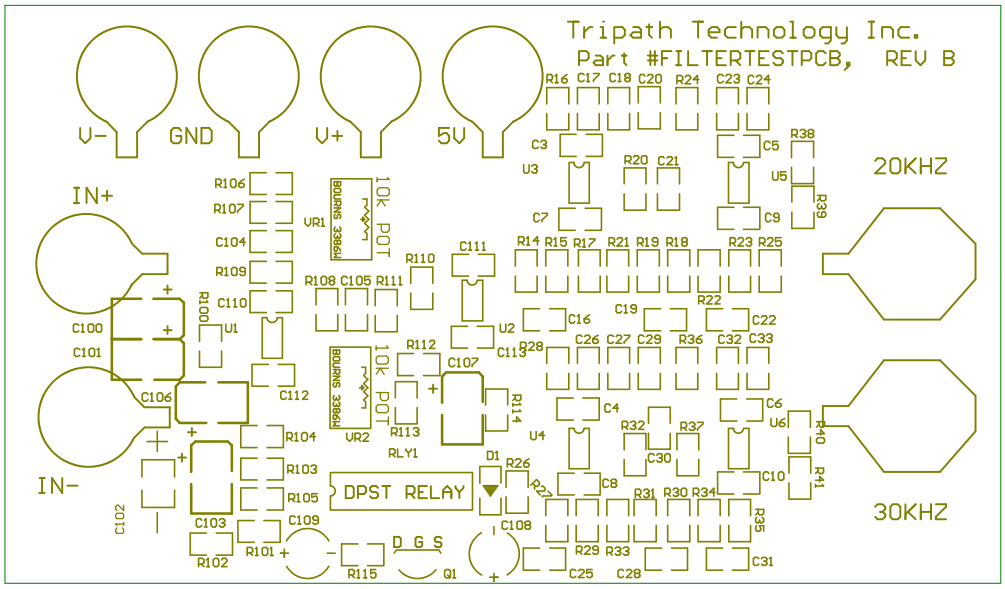
	19-Feb-2001	FILTERTESTPCB, REV B
TRIPATH TECH	FILTER TEST BOARD. Mechanical Layer 3	FLTRREVB.PCB

59 NET COUNT	70 VIA COUNT	111 HOLE COUNT	2 FILL COUNT



TOP OVERLAY

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135 W. MAIN ST., #C	FAX 408-395-8559	CELL 415-279-1071
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TRIPATH TECH	FILTER TEST BOARD. Mechanical Layer 3	FLTRREVB.PCB

59	70	111	2
NET COUNT	VIA COUNT	HOLE COUNT	FILL COUNT