MAINTENANCE MANUAL

PLUG-IN FILTER BOARDS
For GETC LOGIC BOARD 188D6500G1 and G4

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SPECIFICATIONS

ITEM	SPECIFICATION
LOW SPEED DATA FILTER, ROA 117 2238	
Supply Voltage	+5 Vdc and -12 Vdc
Input Audio Level	0 dBm @ 75 Hz
Output Audio Level	+5 dBm ±4 dBm @ 75 Hz
Frequency Response	75 Hz 0 dB (test level reference) 25 Hz < -30 dB 105 Hz 0 ±3 dB 250 Hz < -25 dB 300 Hz < -30 dB
HIGH SPEED DATA FILTER, ROA 117 2237	
Supply Voltage	+5 Vdc , +12 Vdc and -12 Vdc
Input Audio Level (test level)	0 dBm @ 1000 Hz (500 Hz for ROA 117 2238/2 and /4)
Output Audio Level ROA 117 2237/1 and /3 ROA 117 2237/2 and /4	 -6.5 dBm ±2 dBm @ 1000 Hz -6.5 dBm ±2 dBm @ 500 Hz
Frequency Response	ROA 117 2237/1: 1000 Hz 0 dB (ref); 10 Hz 0 ±1 dB; 3000 Hz 0 ±1 dB; 6000 Hz -2 ±1 dB; 7000 Hz -3 ±1 dB; 20000 Hz < -20 dB ROA 117 2237/2: 500 Hz 0 dB (ref); 10 Hz 0 ±1 dB; 1500 Hz 0 ±1 dB; 3000 Hz -2 ±1 dB; 3500 Hz -3 ±1 dB; 10000 Hz < -20 dB ROA 117 2237/3: 1000 Hz 0 dB (ref); 10 Hz 0 ±1 dB; 2000 Hz 0 ±1 dB; 3600 Hz -2 ±1 dB; 4600 Hz -3 ±1 dB; 12000 Hz < -20 dB ROA 117 2237/4: 500 Hz 0 dB (ref); 10 Hz 0 ±1 dB; 1000 Hz 0 ±1 dB; 2300 Hz -2 ±1 dB; 3000 Hz -3 ±1 dB; 8000 Hz < -20 dB
8-POLE HIGH SPEED DATA FILTER, ROA 117 2314/1	
Supply Voltage	+12 Vdc and -12 Vdc
Input Audio Level	0 dBm @ 100 Hz
Output Audio Level	-4.5 dBm ±2 dBm @ 100 Hz
Frequency Response	100 Hz 0 dB (ref) 10 Hz 0 ±1 dB 1000 Hz 0 ±1 dB 4200 Hz -3 ±1 dB 7090 Hz -10 ±2 dB 11000 Hz < -20 dB

INTRODUCTION

This manual provides maintenance information for the Low Speed Data and High Speed Data plug-in filter boards used on the 188D6500G1 and G4 GETC Logic Boards.

DESCRIPTION

Low-Speed Data Filter

The Low Speed Data (LSD) Filter **ROA 117 2238** filters out voice-audio (300-3000 Hz) from the receiver unfiltered audio (vol/sq hi), leaving only the low-speed or subaudible data for input to the microprocessor.

High-Speed Data Filters

The High Speed Data (HSD) Filter selects only the high speed data (4800 or 9600 baud) from the receiver unfiltered audio (vol/sq hi). This data can control signaling or digital voice. The data is processed by the RF modem and passed on to the microprocessor.

The High Speed Filter is available for use in a number of different applications as described below:

- ROA 117 2237/1 - Wide Band 9600 Baud
- ROA 117 2237/2 - Narrowband 4800 Baud
- ROA 117 2237/3 - ETSI Wide Band 9600 Baud
- ROA 117 2237/4 - ETSI Narrow Band 4800 Baud
- ROA 117 2314/1 - 9600 Baud, Narrow Band

NOTE

GETCs with the "MODIFIED FOR EUROPEAN OPERATION" label must use High Speed Filter ROA 117 2237/3 or /4 to be ETSI (European Technical Standards Institute) compliant for adjacent channel power requirements.

LOW SPEED DATA FILTER

The GETC LSD Filter is a four-pole elliptic filter with a nominal bandwidth of 50 Hz centered at 75 Hz. This centering at a nominal 75 Hz is controlled by an on-board clock (9100 Hz).

Its design allows it to reject the voice audio above 300 Hz and low frequency modulation below 25 Hz. The low frequency cutoff below 75 Hz prevents frequency modulation from certain radios from interfering with the low speed data recovery.

INSTALLATION

Install the filter on the Logic board by properly orienting the board and inserting it onto Logic Board connectors J102 and J103.

NOTE

The pin at J103-5 is removed to allow for keying.

Refer to the drawings in the back of this manual for the LSD Filter Board's schematic and outline diagram.

Wide Band Applications

No modifications of the LSD filter board are required if the GETC is used in a Wide Band (9600 Baud) application.

Narrow Band Applications

If the LSD filter board is used in a Narrow Band (4800 or 9600 Baud) application, then it is necessary to install a zero (0) ohm resistor at R19 (part number REP 645 62) or solder a wire between H1 and H2.

HIGH-SPEED-DATA TRANSMIT FILTER

The High Speed Data (HSD) filter is basically an active GMSK (Gaussian Minimum Shift Keying) filter that filters the data transitions to minimize the high-speed-data transmission bandwidth.

INSTALLATION

Install the filter on the Logic board by properly orienting the board and inserting it onto the Logic Board connectors J100 and J101.

NOTE

The pin at J100-5 is removed to allow for keying.

Refer to the drawings in the back of this manual for the HSD Filter Board's schematic and outline diagram.

MAINTENANCE

There is normally no maintenance required for the filters. Normally if a filter is found to be defective it should be removed and replaced. The serviceability of the filters is determined by performing the Current, Output level and Distortion, and the Frequency Response tests.

EQUIPMENT REQUIRED

Audio Logic Test System HP3580A

Test Fixture Recommended, but not required

FILTER TESTING

The filter board tests may be performed on the filter boards using the test fixture described later in this manual. The board layout allows for easy custom design of a test fixture if the user so chooses.

To test the filter board, perform the following tests:

- Current Drain
- Output Level and Distortion
- Frequency Response

Test Setup

Plug the filter to be tested into the appropriate connector on the test fixture according to the table below.

Table 1 - Test Setup

FILTER	CONNECTOR
ROA 117 2237/1	Connector 1
ROA 117 2237/2	Connector 1
ROA 117 2237/3	Connector 1
ROA 117 2237/4	Connector 1
ROA 117 2314/1	Connector 1
ROA 117 2238	Connector 2

Current Drain Test

1. Apply the appropriate power to the filter.
2. Measure current (in ma.) from each supply.
3. Ensure the current drain is within the limits listed in Table 2.

Table 2 - Current Drain

FILTER TYPE	CURRENT DRAIN (ma) for EACH SUPPLY		
	+5 Vdc	+12 Vdc	-12 Vdc
ROA 117 2237/1	n/a	3 to 6	3 to 6
ROA 117 2237/2	n/a	3 to 6	3 to 6
ROA 117 2237/3	n/a	3 to 6	3 to 6
ROA 117 2237/4	n/a	3 to 6	3 to 6
ROA 117 2314/1	n/a	19 ±3	17 ±3
ROA 117 2238	9 to 12	n/a	8 to 15

Output Level and Distortion

1. Setup a Signal Generator to apply 0 dBm at the input frequency shown in Table 3.
2. Connect the generator to the audio input of the filter board.
3. Connect a Distortion Analyzer to the audio output of the filter board.
4. Measure output level and distortion for the filter.
5. Ensure the filter meets the specifications listed in the table.

Frequency Response Test

This test verifies the frequency response of the filter boards using a normal signal generator. If an HP 3580A is available, you can use the alternate method.

1. Adjust the Signal Generator for a 0 dB signal at the reference frequency listed in the Frequency Response Table for the filter under test.
2. Connect the generator to the audio input of the filter board.
3. Vary the input frequency while monitoring the output level.
4. Verify the frequency response for the Filter is within the limits listed in the appropriate table.
5. Disconnect test equipment.

Table 3 - Filter Output Level and Maximum Allowable Distortion

FILTER	FREQUENCY	LEVEL	DISTORTION
ROA 117 2237/1	1000 Hz	-6.5 dBm +/-2 dB	<5%
ROA 117 2237/2	500 Hz	-6.5 dBm +/-2 dB	<5%
ROA 117 2237/3	1000 Hz	-6.5 dBm +/-2 dB	<5%
ROA 117 2237/4	500 Hz	-6.5 dBm +/-2 dB	<5%
ROA 117 2314/1	100 Hz	-4.5 dBm +/-2 dB	<5%
ROA 117 2238	75 Hz	+5 dBm +/-4 dB	<5%

ALTERNATE METHOD

A quick and easy way to verify the filter board's frequency response is to use an audio spectrum analyzer such as a Hewlett Packard HP3580A which contains its own audio tracking generator to apply to the audio input of the filter board. Besides power supplies, this is the only piece of test equipment needed. The HP3850A can display a reference filter board's frequency response plot besides the filter's response display for visual comparison.

Table 4 - Wide-Band 9600 Baud HSD Filter ROA 117 2237/1

Frequency (Hz)	Response (dB)
1,000	0 dB (reference)
10	0 ±1
3,000	0 ±1
6,000	-2 ±1
7,000	-3 ±1
20,000	<-20

Table 5 - Narrowband 4800 Baud HSD Filter ROA 117 2237/2

Frequency (Hz)	Response (dB)
500	0 dB (reference)
10	0 ±1
1,500	0 ±1
3,000	-2 ±1
3,500	-3 ±1
10,000	<-20

Table 6 - ETSI Wide-Band HSD Filter ROA 117 2237/3

Frequency (Hz)	Response (dB)
1,000	0 dB (reference)
10	0 ±1
2,000	0 ±1
3,600	-2 ±1
4,600	-3 ±1
12,000	<-20

Table 7 - ETSI Narrowband HSD Filter ROA 117 2237/4

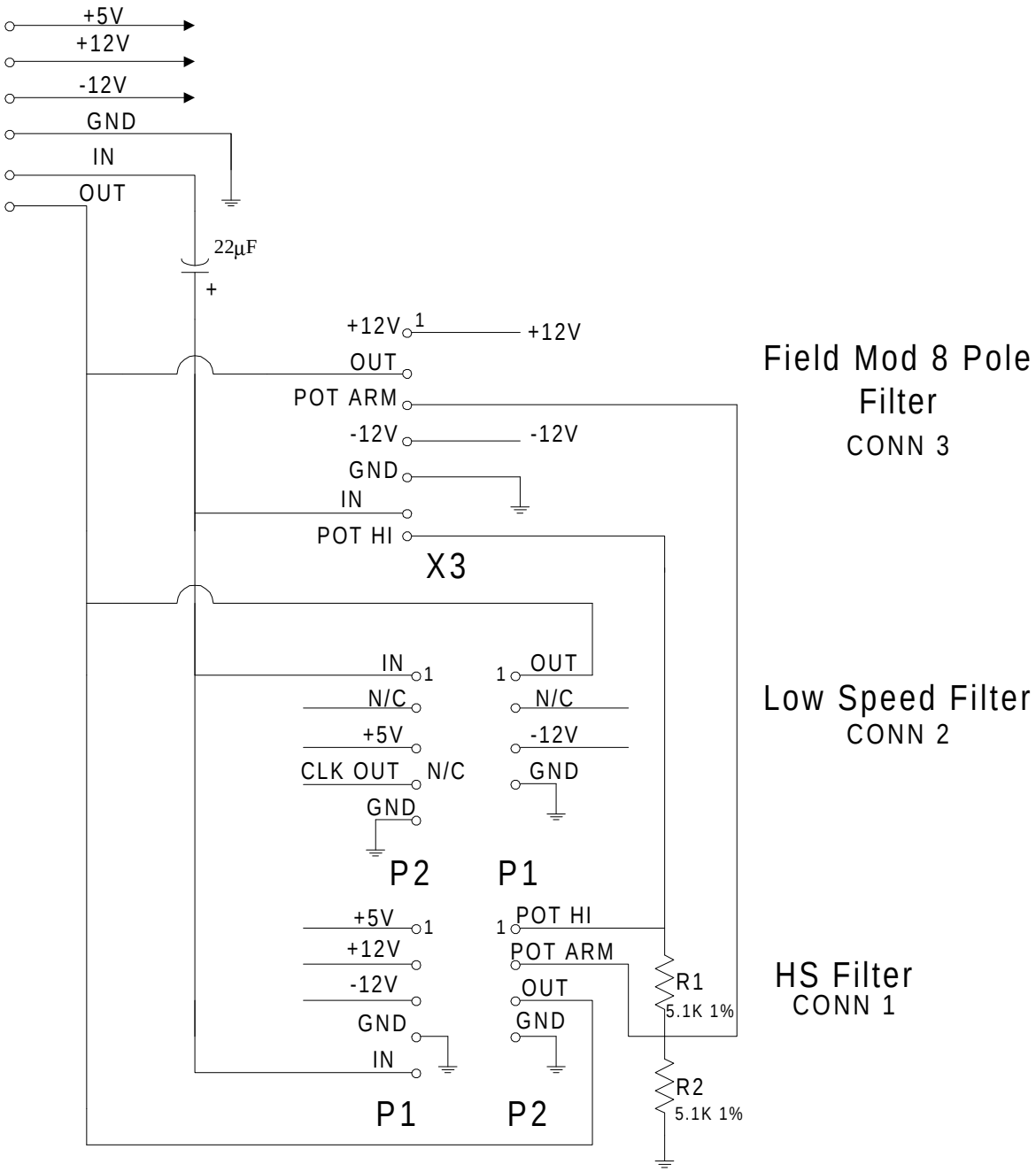
Frequency (Hz)	Response (dB)
500	0 dB (reference)
10	0 ±1
1,000	0 ±1
2,300	-2 ±1
3,000	-3 ±1
8,000	<-20

Table 8 - 9600 Baud Narrowband HSD Filter ROA 117 2314/1

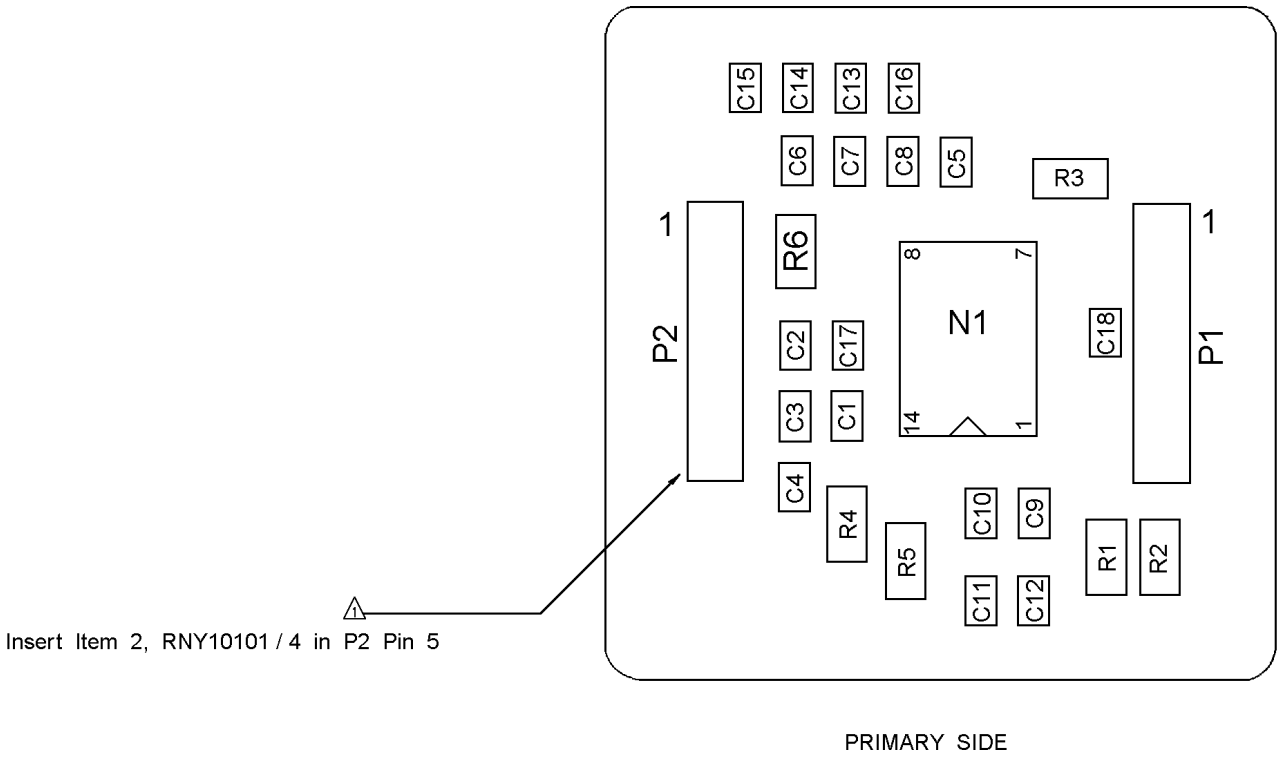
Frequency (Hz)	Response (dB)
100	0 dB (reference)
10	0 ±1
1,000	0 ±1
4,200	-3 ±1
7,090	-10 ±2
11,000	<-20

Table 9 - Low Speed Data Filter ROA 117 2238

Frequency (Hz)	Response (dB)
75	0 dB (reference)
25	< -30
105	0 ±3
250	< -25
300	< -30

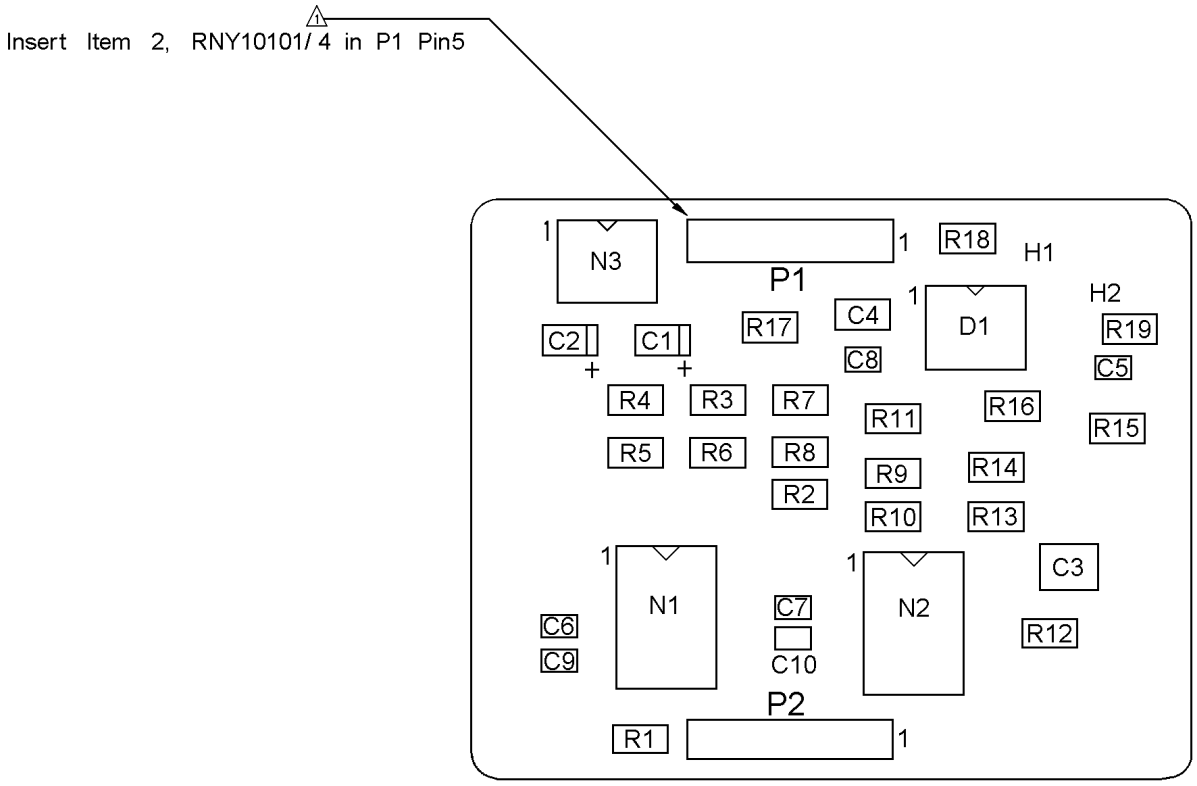


Filter Test Fixture



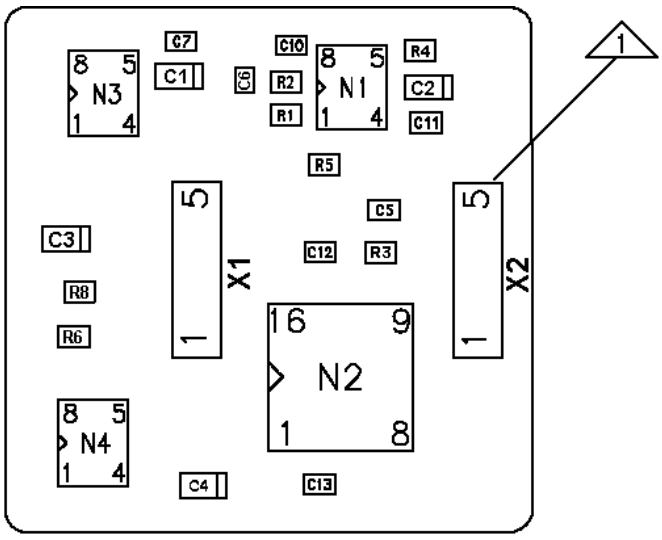
PRIMARY SIDE

HIGH SPEED FILTER BOARD
ROA 117 2237
(1078-ROA 117 2237, Sh. 1, Rev. A)



PRIMARY SIDE

LOW SPEED FILTER BOARD
ROA 117 2237
(1078-ROA 117 2238, Sh. 1, Rev. A)



PRIMARY SIDE

1 ASSEMBLE ITEM 2, RNY 10101/4 IN X2 - 5.

8 - POLE HIGH SPEED FILTER BOARD

ROA 117 2314

(1078-ROA 117 2314, Sh. 1, Rev. A)

LOW SPEED DATA BOARD
131 32-ROA 117 2238
Revision: A

SYMBOL	PART NUMBER	DESCRIPTION
1	TVA 117 2222 R1	Printed Wiring Board.
2	RNY 101 01/4	Key.
		---------- CAPACITORS ----------
C1 and C2	RJE 584 3167/1	Tantalum chip: 1 µF ±20%, 16 V.
C3	RJC 464 3076/1	Ceramic Chip: 100 nF 50V ±10%.
C4	RJC 464 3063/56	Ceramic Chip: 560 pF 50V ±10%.
C5 thru C10	RJC 464 3045/1	Ceramic Chip: 10 nF 50V -10%.
		------INTEGRATED CIRCUITS ----
D1	RYT 108 6003/C	Monolithic Timer; sim to TLC555.
N1 and N2	RYT 114 6005/C	Microcircuit: Switched Capacitor Filter; sim to LTC1059CS.
N3	RYT 113 6021/1C	Negative Regulator; sim to 79L05.
		---------- CONNECTORS - ---------
P1 and P2	RNV 403 843/005	Connector.
		---------- RESISTORS - ----------
R1	REP 615 625/1	10.0K ohm ±1%, ±100 ppm.
R2	REP 615 625/221	22.1K ohm ±1%, ±100 ppm.
R3	REP 615 625/825	82.5K ohm ±1%, ±100 ppm.
R4	REP 615 625/1	10.0K ohm ±1%, ±100 ppm.
R5	REP 615 625/619	61.9K ohm ±1%, ±100 ppm.
R6	REP 615 625/178	17.8K ohm ±1%, ±100 ppm.
R7	REP 645 625/124	12.4K ohm ±1%.
R8	REP 615 626/34	340K ohm ±1%, ±100 ppm.
R9	REP 615 625/1	13.7K ohm ±1%, ±100 ppm.
R10	REP 615 625/562	56.2K ohm ±1%, ±100 ppm.
R11	REP 615 625/1	10.0K ohm ±1%, ±100 ppm.
R12	REP 615 626/34	340K ohm ±1%, ±100 ppm.
R13	REP 615 625/1	10.0K ohm ±1%, ±100 ppm.
R14	REP 615 625/249	24.9K ohm ±1%, ±100 ppm.
R15	REP 615 625/1	10.0K ohm ±1%, ±100 ppm.
R16	REP 615 625/845	84.5K ohm ±1%, ±100 ppm.
R17	REP 645 62	0 ohm 0.15 watt.
R18	REP 645 625/453	45.3K ohm ±1%.

HIGH SPEED FILTER BOARD
131 32-ROA 117 2237/1
Revision: A

SYMBOL	PART NUMBER	DESCRIPTION
1	TVA 117 2221 R1	Printed Circuit Board.
2	RNY 101 01/4	Key; connector.
		----------CAPACITORS----------
C1	RJC 464 2044/47	4.7nF 0805 50V ±5%.
C5	RJC 464 2045/1	10nF 0805 50V ±5%.
C9	RJC 464 2044/1	1.0nF 0805 50V ±5%.
C13	RJC 464 2045/1	10nF 0805 50V ±5%.
C17	RJC 464 2045/1	10nF 0805 50V ±5%.
C18	RJC 464 2045/1	10nF 0805 50V ±5%.
		------- INTEGRATED CIRCUITS ----
N1	RYT 101 6055/2C	Linear: Quad Op-Amp; sim to MC3303.
		----------CONNECTORS----------
P1	RNV 403 843/005	Fork contact unit
P2	RNV 403 843/005	Fork contact unit
		----------RESISTORS----------
R1	REP 645 625/47	47K Ohm ±1% 1206 0.15 watt
R2	REP 645 625/47	47K Ohm ±1% 1206 0.15 watt
R3	REP 645 624/51	5.1K Ohm ±1% 1206 0.15 watt
R4	REP 645 625/16	16K Ohm ±1% 1206 0.15 watt
R5	REP 645 624/12	1.2K Ohm ±1% 1206 0.15 watt
R6	REP 645 624/1	1K Ohm ±1% 1206 0.15 watt

HIGH SPEED FILTER BOARD
131 32-ROA 117 2237/2
Revision: A

SYMBOL	PART NUMBER	DESCRIPTION
1	TVA 117 2221 R1	Printed Circuit Board.
2	RNY 101 01/4	Key; connector.
		---------- CAPACITORS----------
C2	RJC 464 2045/1	10nF 0805 50V ±5%.
C6	RJC 464 2045/22	22nF 0805 50V ±5%.
C10	RJC 464 2044/22	2.2nF 0805 50V ±5%.
C14	RJC 464 2045/22	22nF 0805 50V ±5%.
C17	RJC 464 2045/1	10nF 0805 50V ±5%.
C18	RJC 464 2045/1	10nF 0805 50V ±5%.
		-------INTEGRATED CIRCUITS ---
N1	RYT 101 6055/2C	Linear: Quad Op-Amp; sim to MC3303.
		---------- CONNECTORS----------
P1	RNV 403 843/005	Five (5) socket, single row PWB connector.
P2	RNV 403 843/005	Five (5) socket, single row PWB connector.
		---------- RESISTORS----------
R1	REP 645 625/47	47K Ohm 1% 1206 0.15 watt.
R2	REP 645 625/47	47K Ohm 1% 1206 0.15 watt.
R3	REP 645 624/51	5.1K Ohm 1% 1206 0.15 watt.
R4	REP 645 625/16	16K Ohm 1% 1206 0.15 watt.
R5	REP 645 624/12	1.2K Ohm 1% 1206 0.15 watt.
R6	REP 645 624/1	1K Ohm 1% 1206 0.15 watt.

HIGH SPEED FILTER BOARD
131 32-ROA 117 2237/3
Revision: B

SYMBOL	PART NUMBER	DESCRIPTION
1	TVA 117 2221 R1	Printed Circuit Board.
2	RNY 101 01/4	Key; connector.
		---------- CAPACITORS----------
C3	RJC 464 2045/1	10nF 0805 50V ±5%.
C7	RJC 464 2045/22	22nF 0805 50V ±5%.
C11	RJC 464 2044/15	1.5nF 0805 50V ±5%.
C15	RJC 464 2045/15	15nF 0805 50V ±5%.
C17	RJC 464 2045/1	10nF 0805 50V ±5%.
C18	RJC 464 2045/1	10nF 0805 50V ±5%.
		------- INTEGRATED CIRCUITS----
N1	RYT 101 6055/2C	Linear: Quad Op-Amp; sim to MC3303.
		----------CONNECTORS ----------
P1	RNV 403 843/005	Five (5) socket, single row PWB connector.
P2	RNV 403 843/005	Five (5) socket, single row PWB connector.
		----------RESISTORS ----------
R1	REP 645 625/47	47K Ohm 1% 1206 0.15 watt.
R2	REP 645 625/47	47K Ohm 1% 1206 0.15 watt.
R3	REP 645 624/51	5.1K Ohm 1% 1206 0.15 watt.
R4	REP 615 625/11	1.1K Ohm 1% ±100 ppm 0.15 watt.
R5	REP 615 624/196	1.96K Ohm 1% ±100 ppm 0.15 watt.
R6	REP 615 624/11	1.10K Ohm 1% ±100 ppm 0.15 watt.

PRODUCTION CHANGES

Changes in the equipment to improve performance or simplify circuits are identified by a "Revision Letter," which is stamped after the model number of the unit. The revision stamped on the unit includes all previous revisions. Refer to the parts list for the descriptions of the parts affected by these revisions.

Rev. R2A - ROA 117 2237/3

Resistors R4, R5, and R6 changed to reflect the correct values.

R4 was: REP 645 625/16, 16K Ohm 1% 1206 0.15 watt.
R5 was: REP 645 624/12, 1.2K Ohm 1% 1206 0.15 watt.
R6 was: REP 645 624/1, 1K Ohm 1% 1206 0.15 watt.

HIGH SPEED FILTER BOARD
131 32-ROA 117 2237/4
Revision: B

SYMBOL	PART NUMBER	DESCRIPTION
1	TVA 117 2221 R1	Printed Circuit Board.
2	RNY 101 01/4	Key; connector.
		----------CAPACITORS----------
C4	RJC 464 2045/15	15nF 0805 50V ±5%.
C8	RJC 464 2045/33	33nF 0805 50V ±5%.
C12	RJC 464 2044/22	2.2nF 0805 50V ±5%.
C16	RJC 464 2045/22	22nF 0805 50V ±5%.
C17	RJC 464 2045/1	10nF 0805 50V ±5%.
C18	RJC 464 2045/1	10nF 0805 50V ±5%.
		-------INTEGRATED CIRCUITS----
N1	RYT 101 6055/2C	Linear: Quad Op-Amp; sim to MC3303.
		---------- CONNECTORS ----------
P1	RNV 403 843/005	Five (5) socket, single row PWB connector.
P2	RNV 403 843/005	Five (5) socket, single row PWB connector.
		---------- RESISTORS ----------
R1	REP 645 625/47	47K Ohm 1% 1206 0.15 watt.
R2	REP 645 625/47	47K Ohm 1% 1206 0.15 watt.
R3	REP 645 624/51	5.1K Ohm 1% 1206 0.15 watt.
R4	REP 615 625/11	1.1K Ohm 1% ±100 ppm 0.15 watt.
R5	REP 615 624/196	1.96K Ohm 1% ±100 ppm 0.15 watt.
R6	REP 615 624/11	1.10K Ohm 1% ±100 ppm 0.15 watt.

PRODUCTION CHANGES

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Rev. R2A - ROA 117 2237/4

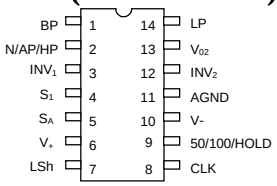
Resistors R4, R5, and R6 changed to reflect the correct values.

R4 was: REP 645 625/16, 16K Ohm 1% 1206 0.15 watt.
R5 was: REP 645 624/12, 1.2K Ohm 1% 1206 0.15 watt.
R6 was: REP 645 624/1, 1K Ohm 1% 1206 0.15 watt.

8-POLE FILTER BOARD
131 32-ROA 117 2314/1
Revision: A

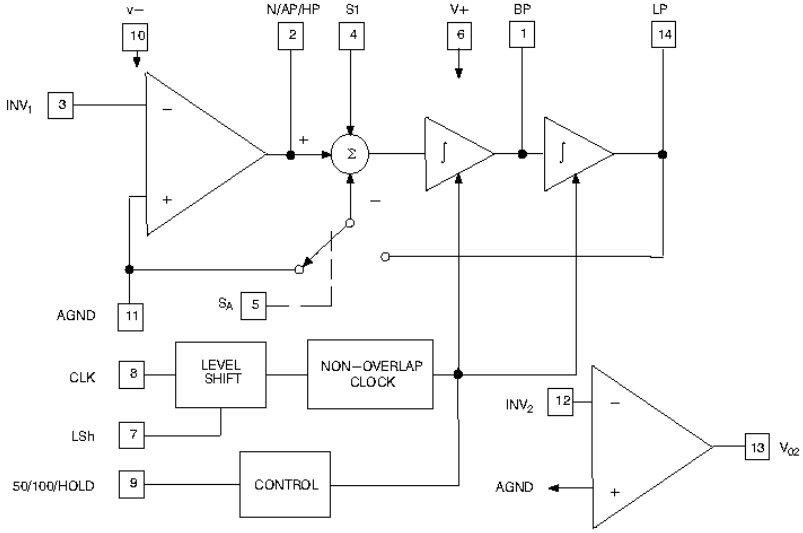
SYMBOL	PART NUMBER	DESCRIPTION
1	TVA 117 2260	8 pole filter high speed/printed board
		---------- CAPACITOR ----------
C1	RJE 584 3167/1	Tantalum: 1 uF 16 V SMD Case A.
C2	RJE 584 3167/1	Tantalum: 1 uF 16 V SMD Case A.
C3	RJE 584 3167/1	Tantalum: 1 uF 16 V SMD Case A.
C4	RJE 584 3167/1	Tantalum: 1 uF 16 V SMD Case A.
C5	RJC 464 2045/1	10 nF 0805 50V - 5%.
C6	RJC 463 3032/68	68 pF 0603 50V ±5%.
C7	RJC 463 0041/56	5.6 pF ±0.25 pF 0805 NPO.
C10	RJC 464 2045/1	10 nF 0805 50V - 5%.
C11	RJC 464 2045/1	10 nF 0805 50V - 5%.
C12	RJC 464 2045/1	10 nF 0805 50V - 5%.
C13	RJC 464 2045/1	10 nF 0805 50V - 5%.
		------- INTEGRATED CIRCUITS ---
N1	RYT 101 039/C	Dual Opamp.
N2	RYT 114 6019/1	Switched Capacitive Filter; sim to MAX292CWE.
N3	RYT 113 6018/1C	Regulator: sim to 78L05.
N4	RYT 113 6021/1C	Regulator: sim to 79L05.
		---------- RESISTORS ----------
R1	REP 624 656/1	100K Ohm 1% 0805 0.125w.
R2	REP 624 655/82	82K Ohm 1% 0805 0.125w.
R3	REP 624 653/47	470 Ohm 1% 0805 0.125w.
R4	REP 624 656/1	100K Ohm 1% 0805 0.125w.
R5	REP 624 656/15	150K Ohm 1% 0805 0.125w.
R6	REP 624 655/316	31.6K Ohm 1% 0805 0.125w.
R8	REP 624 655/464	46.4K Ohm 0805 0.125w.
		---------- CONNECTORS ---------
X1	RNV 403 843/005	Five (5) socket, single row PWB connector.
X2	RNV 403 843/005	Five (5) socket, single row PWB connector.

SWITCHED CAPACITOR FILTER
RYT 114 6005 (LTC 1059 CS)

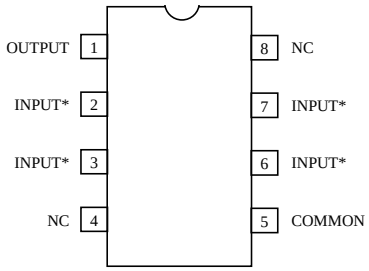


CONNECTIONS

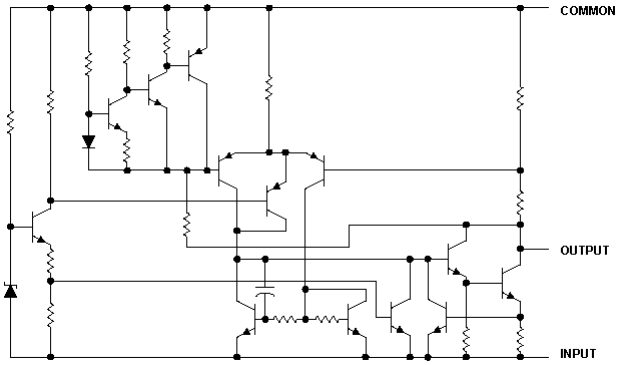
Terminal	Symbol	Function
1	BP	Band Pass
2	N/AP/HP	Notch/All Pass/High Pass
3	INV_1	Inverting Input
4	S_1	Input
5	S_A	Input
6	V+	Supply Voltage
7	LSh	Level Shift
8	CLK	Clock Input
9	50/100/HOLD	Ratio Select
10	V-	Negative Supply Voltage
11	AGND	Ground
12	INV_2	Inverting Input
13	V_{02}	Output
14	LP	Low Pass



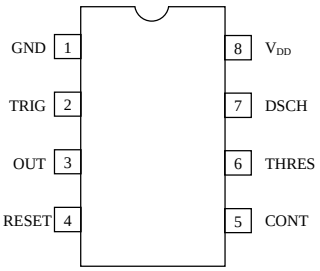
-5 VOLT NEGATIVE REGULATOR
RYT 113 6021 (MC79L05)

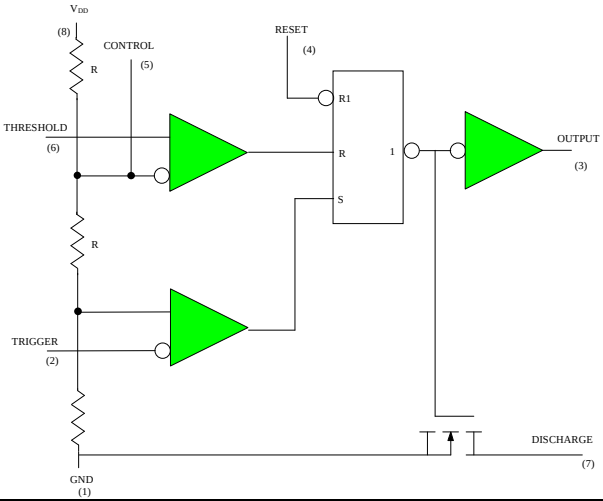


* Internally connected

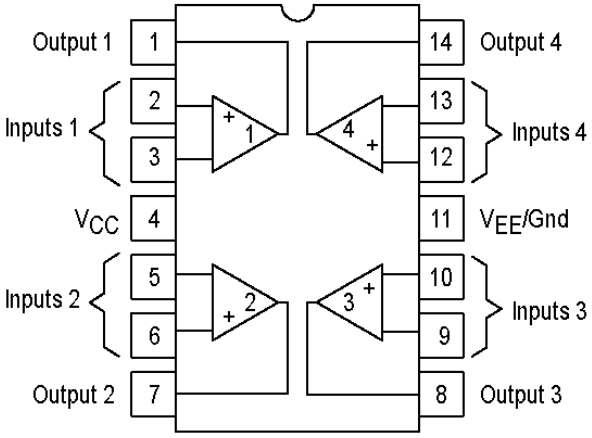


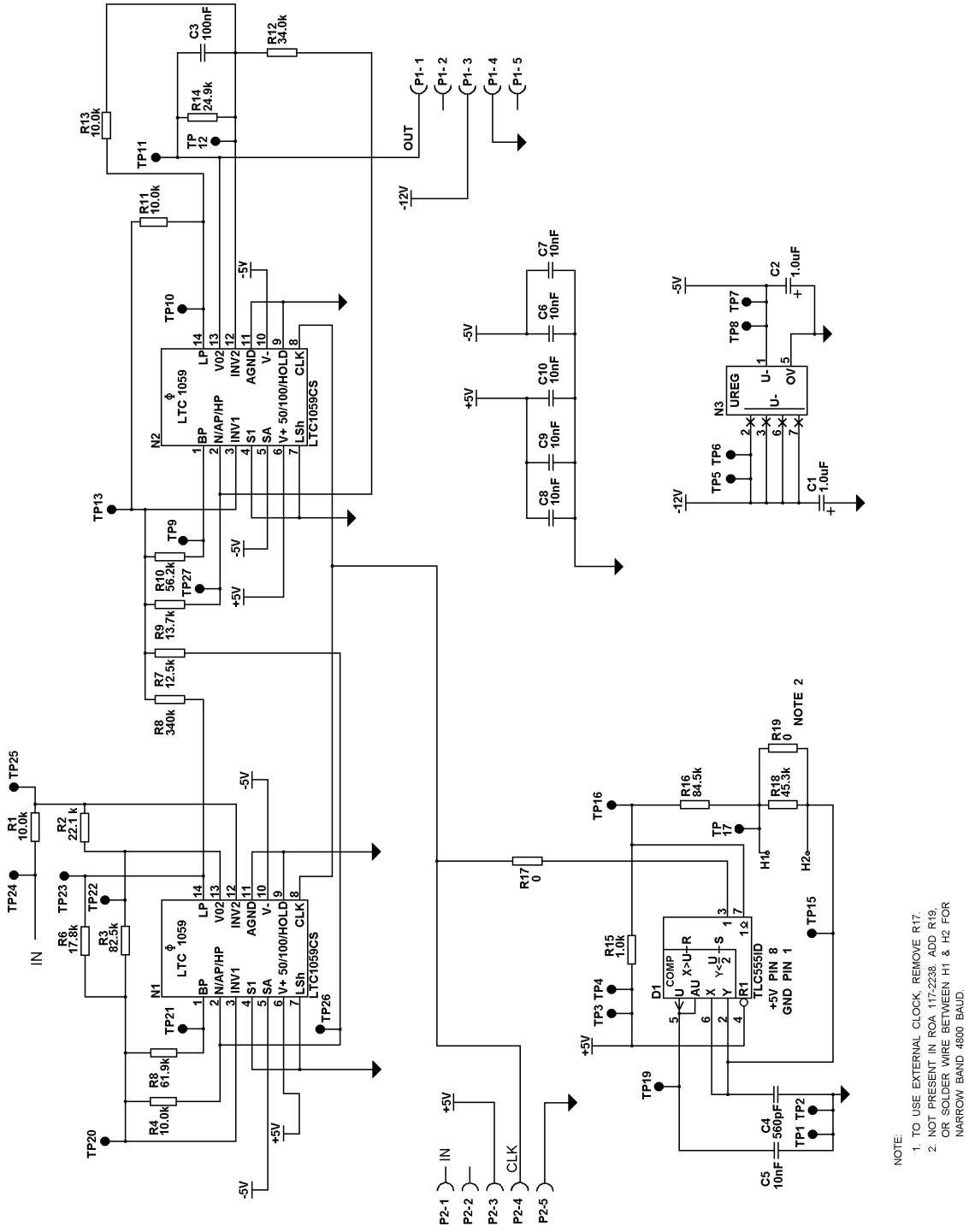
MONOLITHIC TIMER
RYT 108 6003/C (TLC555ID)





QUAD OP AMP
RYT 101 6055/2C (MC3303D)

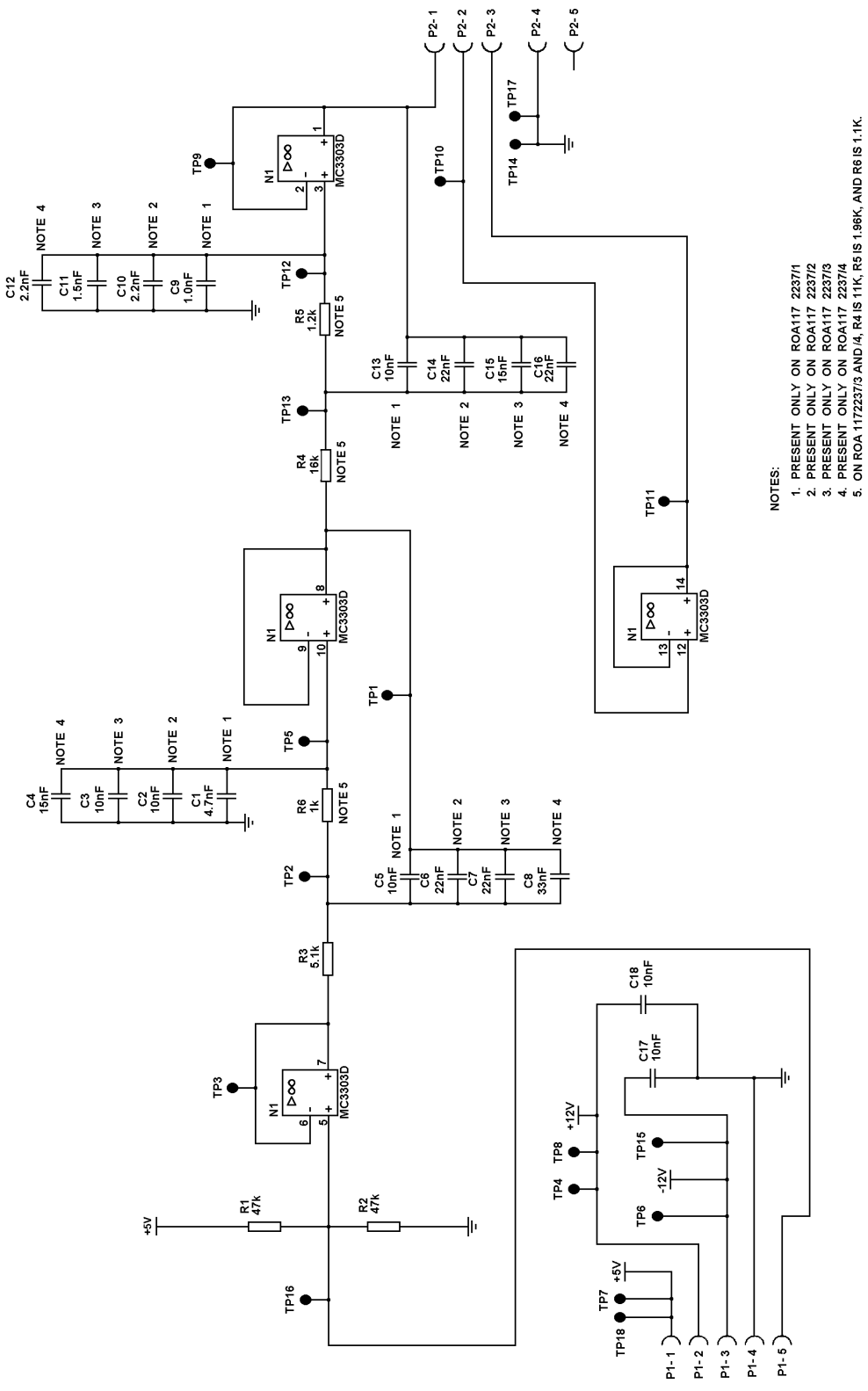




LOW SPEED FILTER BOARD

ROA 117 2238

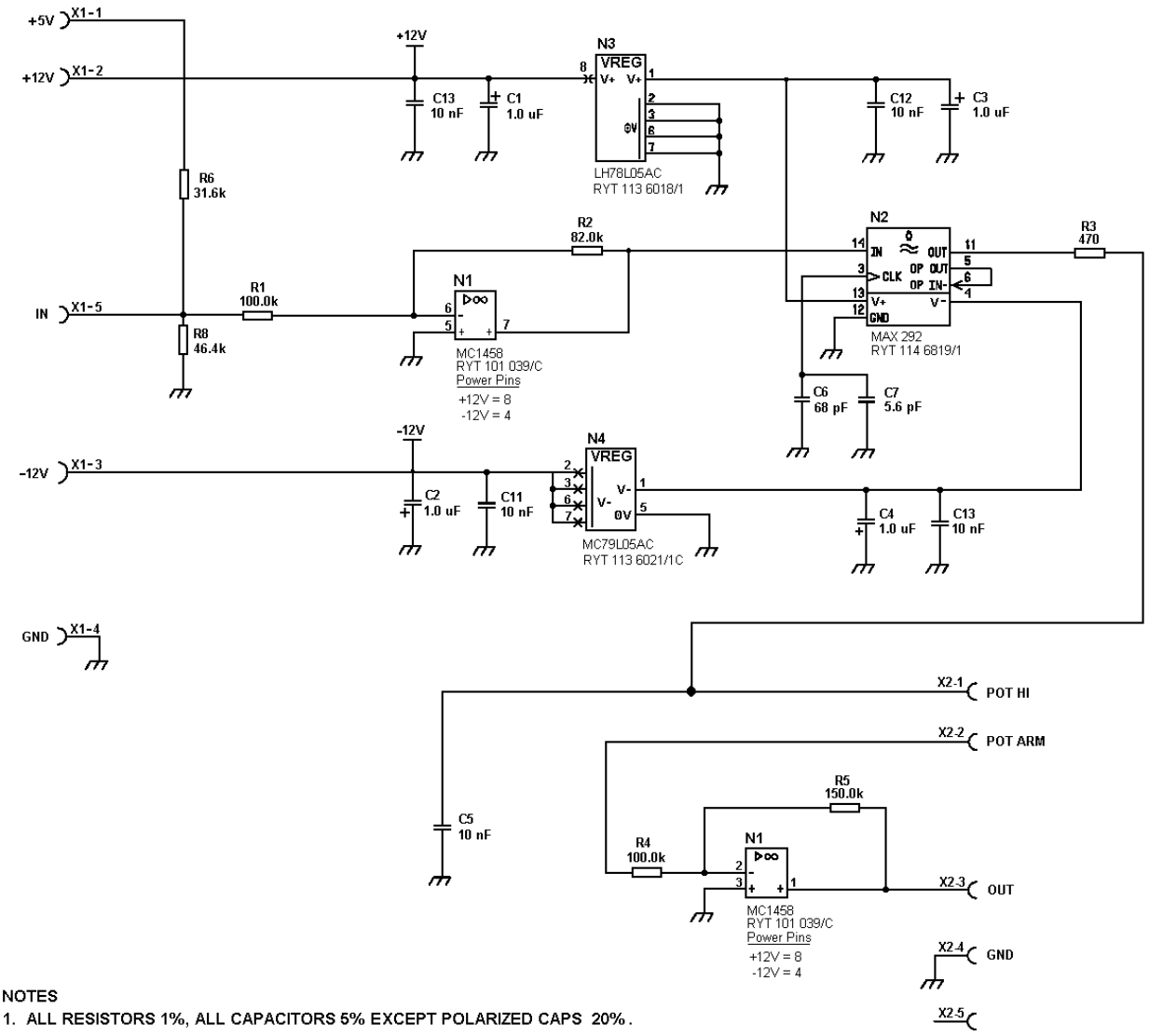
(1911-ROA 117 2238, Sh. 1, Rev. A)



HIGH SPEED FILTER BOARD

ROA 117 2237

(1911-ROA 117 2237, Sh. 1, Rev. B)



NOTES
1. ALL RESISTORS 1%, ALL CAPACITORS 5% EXCEPT POLARIZED CAPS 20%.

8 - POLE HIGH SPEED FILTER BOARD

ROA 117 2314

(1911-ROA 117 2314, Sh. 1, Rev. A)

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Printed in U.S.A.