ANTENNA ANALYZER

ANTENNA ANALYZER BY K2ZIA & W8TEE, published in QST magazine, in late 2017.

This new schematic, adds some versatility and also better accuracy to the SWR readings by using a pair of AD8307ARZ Log detectors in place of the original Ge diode version. Some software changes are required for the AD8307 detector. This is available as a modified version of the original Version 110 and can be found in the "SoftwareControlledHamRadio .io" Group in the files area. You need to be a member of this group to access the file.

Alternatively, John Price, WA2FZW, has re-written the software to cater for the AD8307's and the diode detector of the original. Plus many enhancements have been made. As of writing, it's at Version 3.1 and is highly recommended.

The AD8307 detectors used in this version, provide about 25mV per dB in levels from the SWR bridge. When these devices are used, the software must calculate Return Loss, then SWR. As return loss gets lower and lower (ie SWR higher) then for high SWR's calculations over about 8:1, the precision of the caluclations is less.

Provision on the PCB is made to add a push button switch (at 'JK3') to allow fine frequency tune, digit selection in some of the Menu items. (Requires WA2FZW software)

A reverse polarity diode is added to provide some protection in case of reversed input voltage supply. This applies more so if the MINI_360 converter is not used. A suitable Zener could also be used.

Some PCB links have been added, (JK4, JK5) which can be used if the project is to run directly from a 5V supply. i.e. with the MINI_360 not fitted.Typically a Li_Po 'battery bank, as used to charge Cell Phones, for example. In this case, the MINI_360 inverter is not fitted.

NOTE:- the Schematic for the vk3pe AA board, does not have the same reference numbers as the original board. I made this PCB for myself only originally, so that was not a consideration. So, when you use Jacks build information, please take this into account.

ERROR:- The schematics and PCB for Version '1.2' show R14 and R15 are duplicated. This is not supposed to happen with a PCB package, but somehow it crept through. The values for R14 & R15 in the SWR bridge area only, should be 4.7 ohms.

This will be corrected in the Gerber files and updated to Vers '2.2', dated 260118. The correct resistors in the SWR area are now R11 and R20, 4.7 ohms.
ERROR:- Resistor values for R12, R14 & R16 are now 2k (2000ohms) 2k2 is ok also (2200ohm)
And for R19, R15 & R17 are now 1k ohm

12th Feb, 2018 Vers 1.2 & 2.2 PCB's.
<VK3PE>

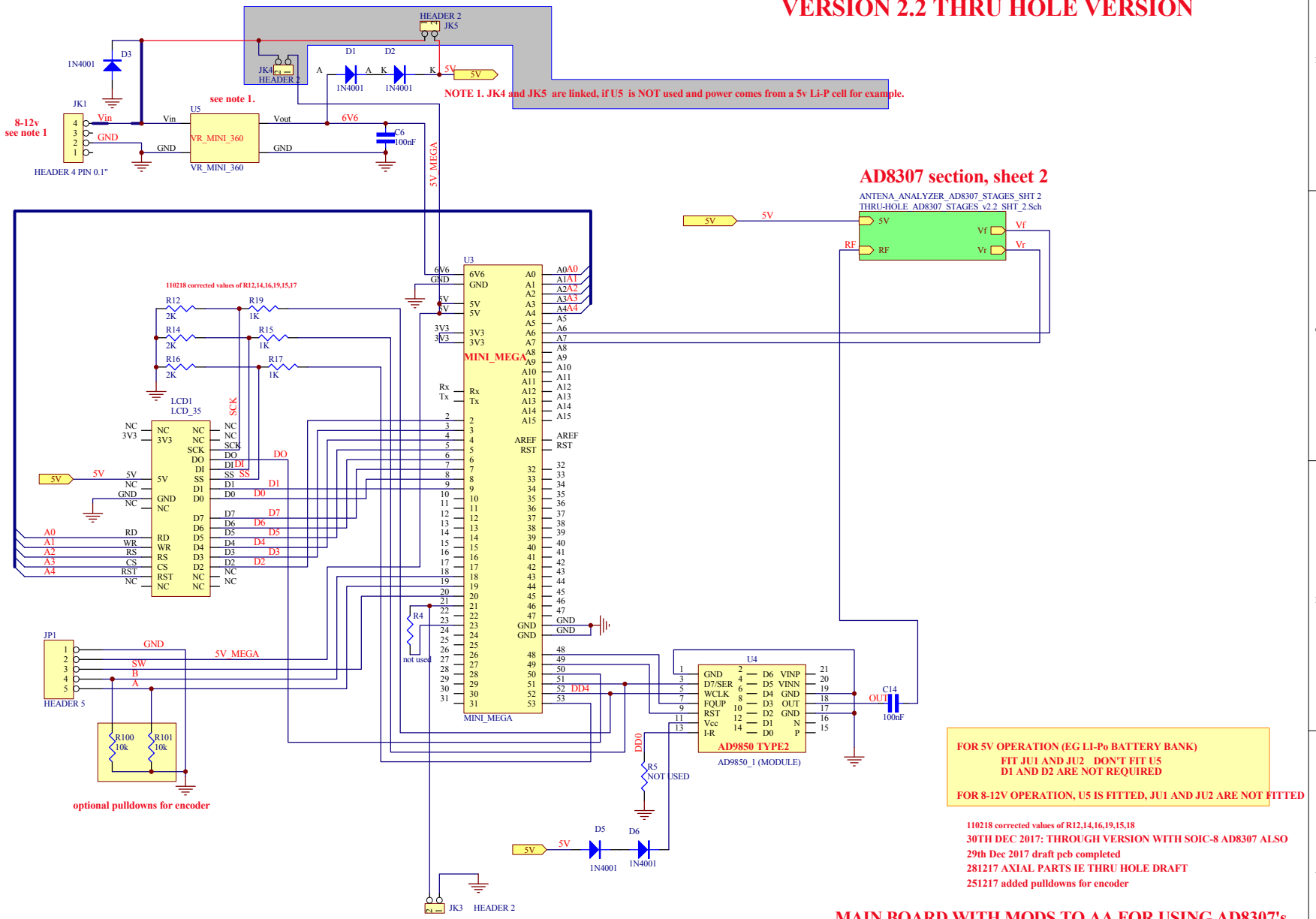
VERSION 2.2 PCB	**AA_THROUGH-HOLE VERSION BILL OF MATERIAL**			
	240118 DRAFTED by vk3pe			
	250118 CORRECTION, duplicate R14 and R15 on PCB and Schematic !!			
	For the Version 2.2 PCB, they are now R11 & R20.			
	180218 R12, R14 & R16 are now 2K. R19, R15 & R17 are now 1k.			
	Read this in conjunction with the build information by Jack, W8TEE.			
	NOTE: the reference numbers are NOT the same as Jacks original PCB.			
Part Type	**Designator**	**Footprint**	**Description**	**comments**
0R	R4	This part is NOT used.	Resistor	NOT used
100nF	C2	CAP_CER	Capacitor ~5mm pitch	
100nF	C3	CAP_CER	Capacitor ~5mm pitch	
100nF	C14	CAP_CER	Capacitor ~5mm pitch	
100nF	C1	CAP_CER	Capacitor ~5mm pitch	
100nF	C902	CAP_CER	Capacitor ~5mm pitch	
100nF	C6	CAP_CER	Capacitor ~5mm pitch	
100nF	C7	CAP_CER	Capacitor ~5mm pitch	
100nF	C4	CAP_CER	Capacitor ~5mm pitch	
100nF	C5	CAP_CER	Capacitor ~5mm pitch	
100R/1%	R10	AXIAL 0.4" PITCH	Resistor	
100R/1%	R9	AXIAL 0.4" PITCH	Resistor	
100R/1%	R7	AXIAL 0.4" PITCH	Resistor	
100R/1%	R8	AXIAL 0.4" PITCH	Resistor	
100R/1%	R6	AXIAL 0.4" PITCH	Resistor	

100R/1%	R13	AXIAL 0.4" PITCH	Resistor	
10k	R101	AXIAL 0.4" PITCH	Resistor	
10k	R100	AXIAL 0.4" PITCH	Resistor	
150R	R18	AXIAL 0.4" PITCH	Resistor	
150R	R2	AXIAL 0.4" PITCH	Resistor	
1N4001	D2	AXIAL 0.4" PITCH	Diode	
1N4001	D6	AXIAL 0.4" PITCH	Diode	
1N4001	D1	AXIAL 0.4" PITCH	Diode	
1N4001	D5	AXIAL 0.4" PITCH	Diode	
1N4001	D3	AXIAL 0.4" PITCH	Diode	
1nF	C8	CAP_CER	Capacitor ~5mm pitch	
1nF	C9	CAP_CER	Capacitor ~5mm pitch	
2K2	R12	AXIAL 0.4" PITCH	Resistor	
2K2	R14	AXIAL 0.4" PITCH	Resistor	
2K2	R16	AXIAL 0.4" PITCH	Resistor	
39R	R1	AXIAL 0.4" PITCH	Resistor	
1K	R19	AXIAL 0.4" PITCH	Resistor	
1K	R15	AXIAL 0.4" PITCH	Resistor	
1K	R17	AXIAL 0.4" PITCH	Resistor	
47k	R3	AXIAL 0.4" PITCH	Resistor	
50k	RV2	POT_TRIM_3	Trim-Pot	
4.7 ohms	**R11**	AXIAL 0.4" PITCH	Resistor	
4.7 ohms	**R20**	AXIAL 0.4" PITCH	Resistor	
AD8307ARZ (SMD)	U2	SOIC-8	Analog Devices chip	
AD8307ARZ (SMD)	U1	SOIC-8	Analog Devices chip	
AD9850_1 (MODULE)	U4	AD9850_2	AD9850 module (ebay)	

HEADER 2	JK2	0.1" pitch header male	0.1" pitch male header single row	the 'unknown Port' connect to BNC socket
HEADER 2	JK3	0.1" pitch header male	0.1" pitch male header single row	locking type prefered
HEADER 2	JK4	0.1" pitch header male	0.1" pitch male header single row	---optional - only required if MINI_360 is not used
HEADER 2	JK5	0.1" pitch header male	0.1" pitch male header single row	---optional - only required if MINI_360 is not used
HEADER 4 right angle	JK1	0.1" pitch header male	0.1" pitch male header single row	NB right angle type !
HEADER 5	JP1	0.1" pitch header male	0.1" pitch male header single row	locking type prefered
LCD_35	LCD1	TFT_3.5	mcufriend TFT display	
MINI_MEGA	U3	MINI_MEGA	Mini Arduino MEGA board	
NOT USED	R5	AXIAL 0.4" PITCH	part not used	NOT used
VR_MINI_360	U5	VR_MINI_360	DC-DC converter module (eBay)	
Dual row headers to suit MEGA board fitting			can use 2 a single row	refer to Jacks build info
Single row header socket to suit AD9850 module			can use 2 a single row	refer to Jacks build info
Single row header socket to mate with JK3, JP1, JK1				see picture of vk3pe board.
Dual row socket to suit AD9850 module			can use 2 a single row	refer to Jacks build info
Rotary encoder with push button switch				refer to Jacks build info
Push Button switch				Optional if using WA2FZW's software
Hardware, nuts. Bolts etc for your mounting method				refer to Jacks build info
Case				refer to Jacks build info
Wire, solder etc				refer to Jacks build info
PCB V2.1 or 2.2 by vk3pe				

K2ZIA / W8TEE: ANTENNA ANALYZER, WITH MODS FOR AD8307

VERSION 2.2 THRU HOLE VERSION



W8TEE/K2ZIA ANTENNA ANALYZER BRIDGE, NEW PCB WITH AD8307

ADJUST THE ATTENUATOR VALUES SO THERE IS ABOUT 70mV AT THE POINT SHOWN.

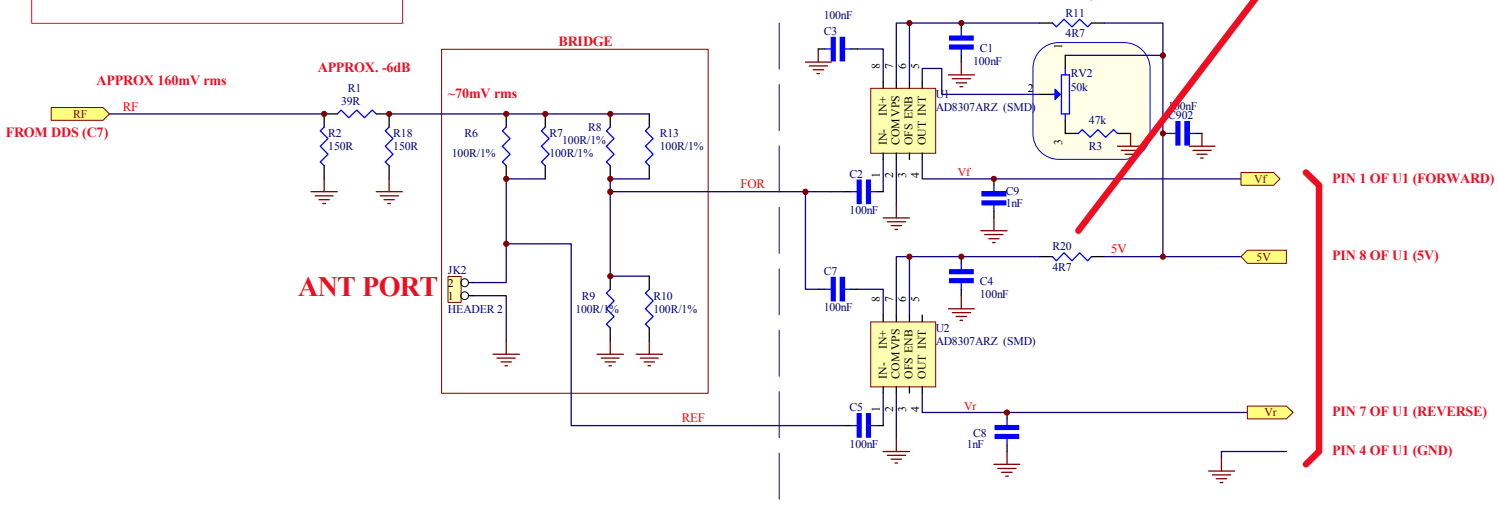
THE OUTPUT OF THE DDS IS TOO HIGH.

Do not exceed about 1.8 - 2V DC out of the AD8307.'s

NOTE:- There was an error in the V1.2 PCB and schematics. R14 and R15 were duplicated and also appear on the other sheet.

The PCB itself shows two R14's & R15's also. The VALUE for R14 and R15 are 4.7 ohms (4R7)

In Version 2.2. this error was corrected and they are now R11 and R20.



TO K2ZIA/W8TEE PCB.

REMOVE THE OP-AMP AND R6 & R10

TO ADJUST 'BALANCE'.

WITH NORMAL INPUT SIGNAL AND A SHORT CIRCUIT CONNECTED TO THE PORT, ADJUST THE TRIM-POT SO THAT Vf AND Vr ARE EQUAL.

IT'S BEST TO USE A MULTI TURN TRIM POT. FOR RV2

IT's BEST TO PUT THE METER ACROSS THE Vr AND Vf TERMINALS AND ADJUST FOR A ZERO READING.

RV1 IS NOT REQUIRED.

281218 AXIAL PARTS IE THRU HOLE DRAFT

for pcb version 1a AA_MAIN_AD8307_2.PCB

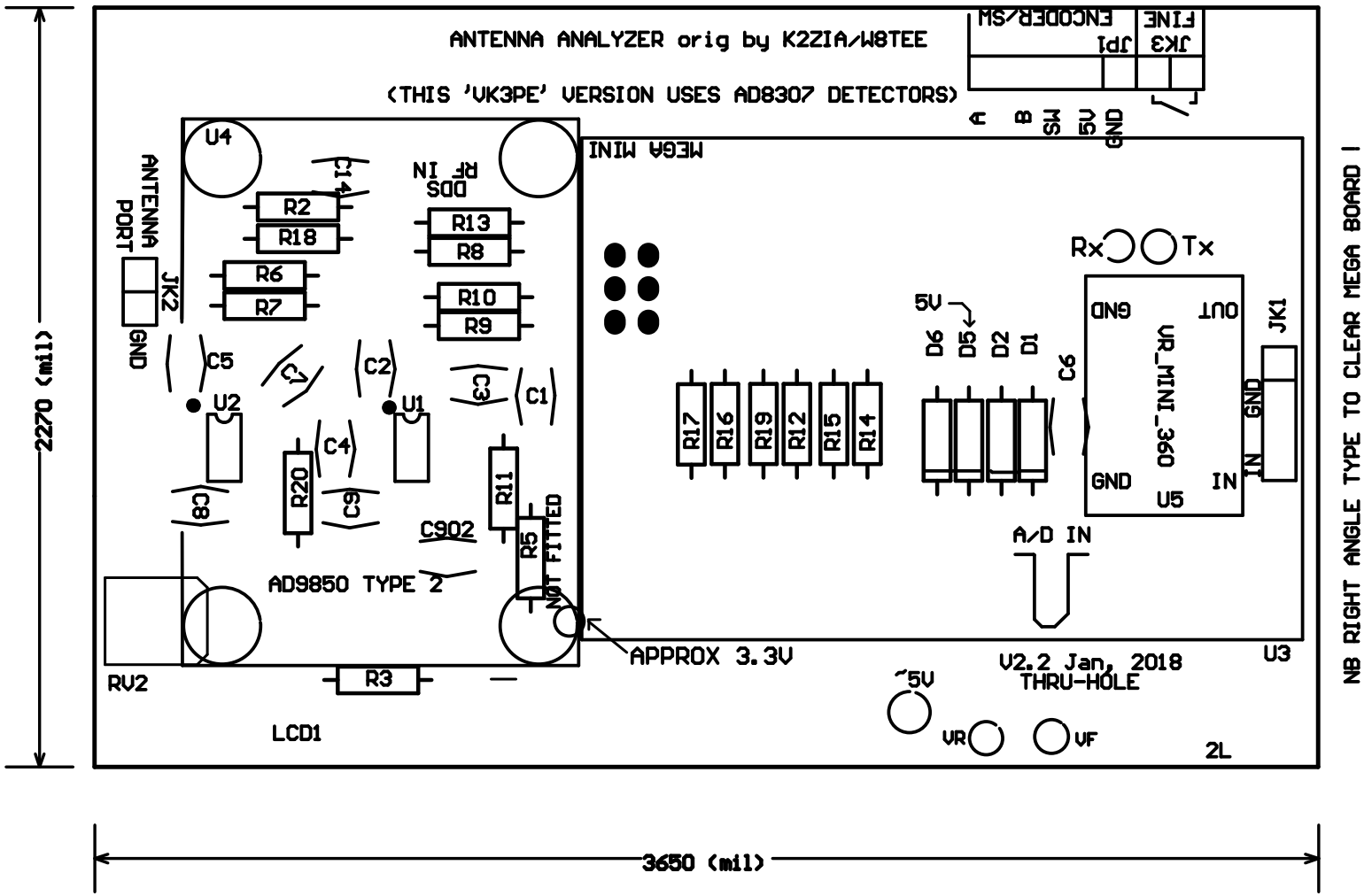
03-12-17 6dB pad now.
01-12-2017 VK3PE

Title: AD8307 BASED BRIDGE FOR THE K2ZIA/W8TEE ANALYZER		DRAWN BY: VK3PE
Size: A3	Date: 12-Feb-2018 Time: 11:46:56	Sheet 2 of 2

E:\PROJECTS 2017\ANTENNA ANALYZER\THRU HOLE VERS 2.2\THRU-HOLE_AD8307_STAGES_v2.2_SHT_2.SCH

LCD_35
ANTENNA ANALYZER orig by K2ZIA/W8TEE
(THIS 'VK3PE' VERSION USES AD8307 DETECTORS)
AD9850_1 (MODULE)
ENCODER/SW
FINE
HEADER 2
A
B
SW
5V
GND
MEGA MINI
ANTENNA PORT
HEADER 2
GND
RF IN
DDS
150R
150R
100R/1%
100R/1%
100R/1%
100R/1%
100R/1%
100R/1%
100nF
100nF
100nF
100nF
100nF
100nF
100nF
AD8307/AD2
AD8307/AD2
1nF
1nF
4.7 ohm
4.7 ohm
NOT USED
NOT FITTED
50k
AD9850 TYPE 2
47k
APPROX 3.3V
1K
2K
1K
2K
1K
2K
1N4001
1N4001
1N4001
1N4001
5V
Rx
Tx
VR_MINI_360
GND
OUT
GND
IN
IN
GND
A/D IN
MINI_MEGA
V1.2 Jan. 2018
THRU-HOLE
5V
VR
VF
2L
2270 (mil)
3650 (mil)
HEADER 4 PIN 0.1
NB RIGHT ANGLE TYPE TO CLEAR MEGA BOARD !

10k
REFER TO VK3PE SCH FOR FITMENT
OF R100 & 101
10k
OR NOT FIT
R4 is NOT FITTED !
39R
HEADER 2
HEADER 2
SEE Sch
1N4001
FUSABLE
LINK
TEST POINTS
Vf
Vr
BACK
3250 (mil)
3250 (mil)


ANTENNA ANALYZER orig by K2ZIA/W8TEE
(THIS 'VK3PE' VERSION USES AD8307 DETECTORS)
ENCODER/SW
FINE
JK3
JP1
A
B
SW
5V
GND
MEGA MINI
DDS
RF IN
U4
ANTENNA PORT
JK2
GND
R2
R18
R6
R7
R13
R8
R10
R9
C14
C5
C7
C2
C3
C1
U2
U1
C4
R20
C8
C9
C902
R11
R5
NOT FITTED
AD9850 TYPE 2
RV2
R3
LCD1
APPROX 3.3V
Rx
Tx
5V
D6
D5
D2
D1
C6
R17
R16
R19
R12
R15
R14
GND
OUT
UR_MINI_360
GND
IN
U5
JK1
GND
IN
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V2.2 Jan, 2018
THRU-HOLE
U3
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2270 (mil)
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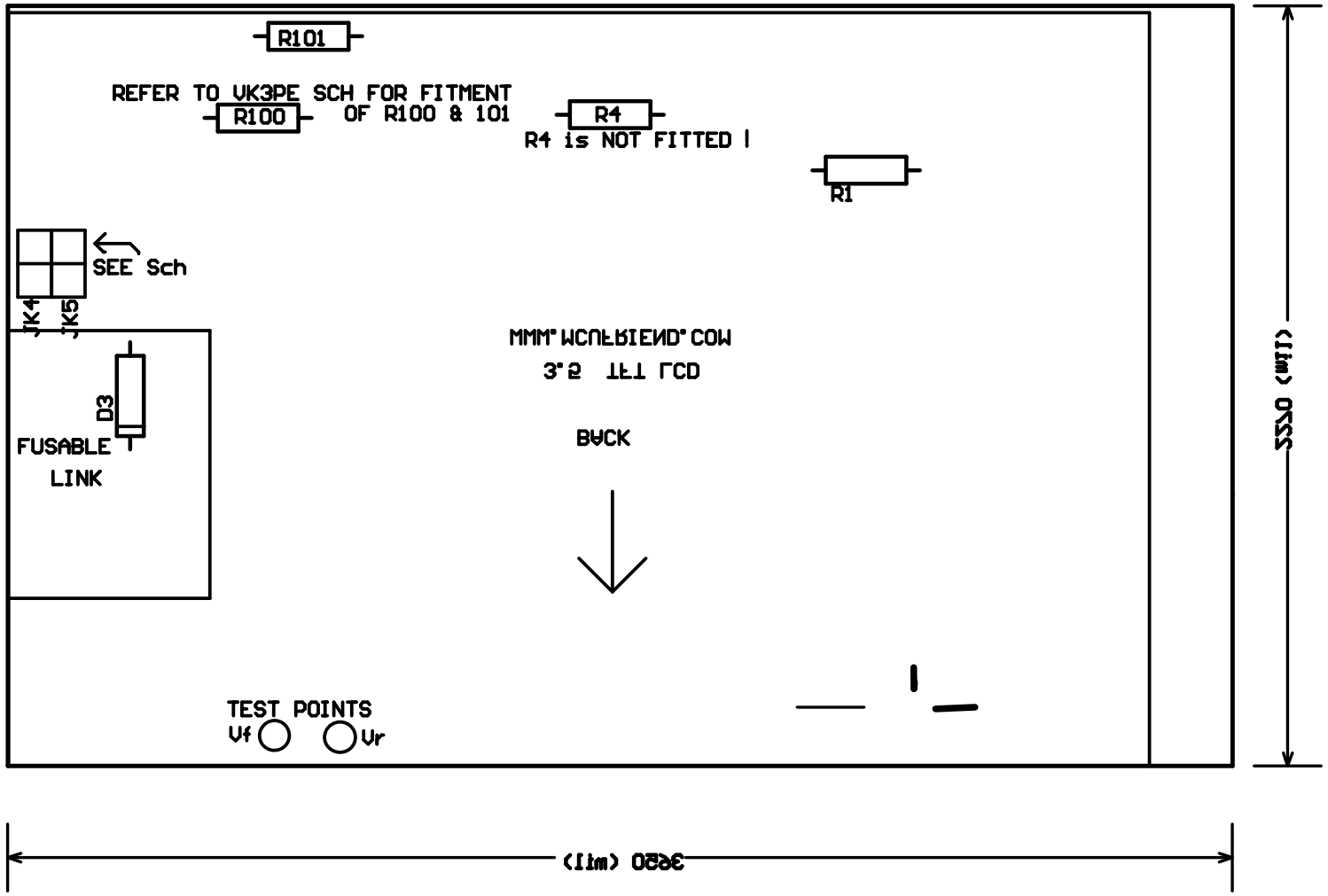
R101
REFER TO VK3PE SCH FOR FITMENT
R100
OF R100 & 101
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R4 is NOT FITTED !
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100nF	C902	CAP_CER	Capacitor ~5mm pitch	
100nF	C6	CAP_CER	Capacitor ~5mm pitch	
100nF	C7	CAP_CER	Capacitor ~5mm pitch	
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MINI_MEGA	U3	MINI_MEGA	Mini Arduino MEGA board	
NOT USED	R5	AXIAL 0.4" PITCH	part not used	NOT used
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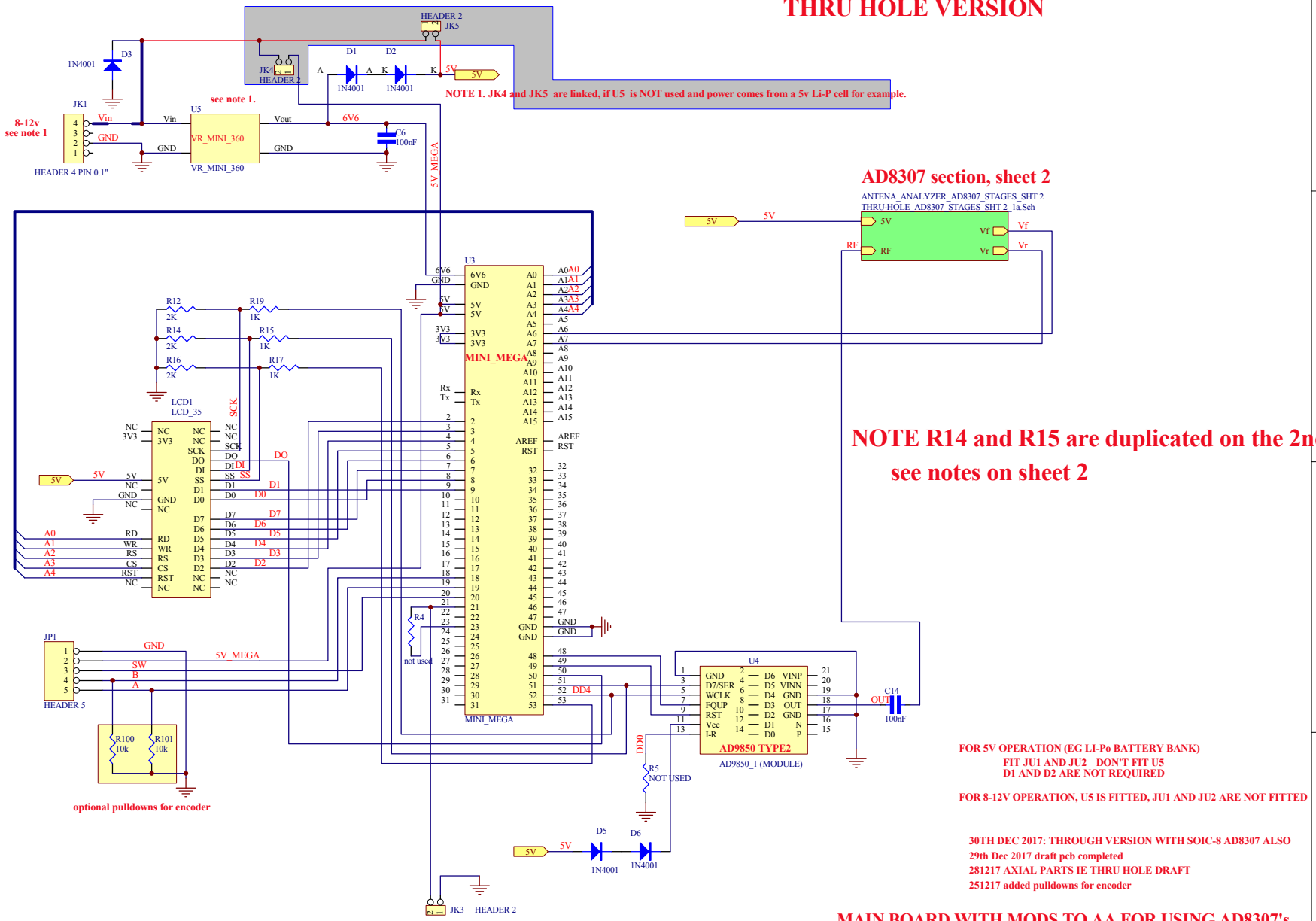
PCB V2.1 or 2.2 by vk3pe				

K2ZIA / W8TEE: ANTENNA ANALYZER, WITH MODS FOR AD8307

THRU HOLE VERSION



NOTE R14 and R15 are duplicated on the 2nd she

see notes on sheet 2

FOR 5V OPERATION (EG LI-Po BATTERY BANK)
FIT JU1 AND JU2 DON'T FIT U5
D1 AND D2 ARE NOT REQUIRED

FOR 8-12V OPERATION, U5 IS FITTED, JU1 AND JU2 ARE NOT FITTED

30TH DEC 2017: THROUGH VERSION WITH SOIC-8 AD8307 ALSO
29th Dec 2017 draft pcb completed
281217 AXIAL PARTS IE THRU HOLE DRAFT
251217 added pulldowns for encoder

MAIN BOARD WITH MODS TO AA FOR USING AD8307's

main_pcb_thru_hole_V1.2_271217.pcb

Title: THROUGH_HOLE_AA_MAIN			DRAWN BY: VK3PE
Size: A3	Date: 12-Feb-2018	Sheet 1	(C) 2007-2017 and on
	Time: 11:30:22	of 2	

E:\PROJECTS 2017\ANTENNA ANALYZER\THRU HOLE V2.1\THRU-HOLE_AA_V1.2.PRJ

W8TEE/K2ZIA ANTENNA ANALYZER BRIDGE, NEW PCB WITH AD8307

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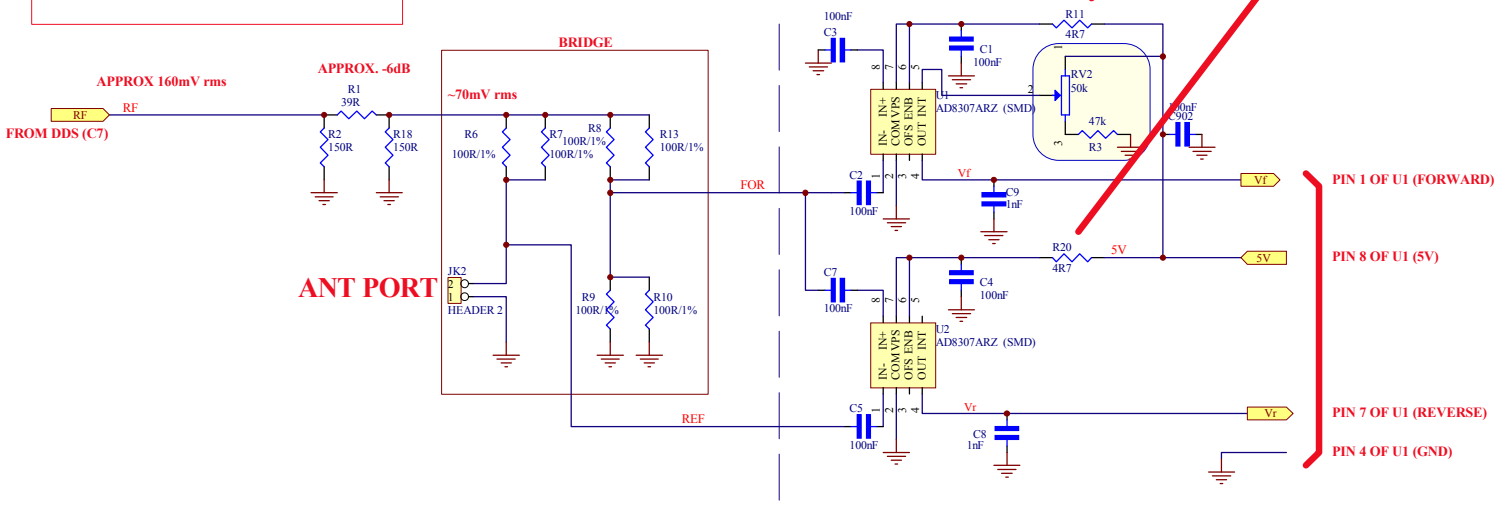

TO K2ZIA/W8TEE PCB.

REMOVE THE OP-AMP AND R6 & R10

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281218 AXIAL PARTS IE THRU HOLE DRAFT

for pcb version 1a AA_MAIN_AD8307_2.PCB

03-12-17 6dB pad now.
01-12-2017 VK3PE

Title: AD8307 BASED BRIDGE FOR THE K2ZIA/W8TEE ANALYZER		DRAWN BY: VK3PE
Size: A3	Date: 12-Feb-2018 Time: 11:33:20	Sheet 2 of 2

E:\PROJECTS 2017\ANTENNA ANALYZER\THRU HOLE VERS 2.2\THRU-HOLE_AD8307_STAGES_v2.2_SHT_2.SCH