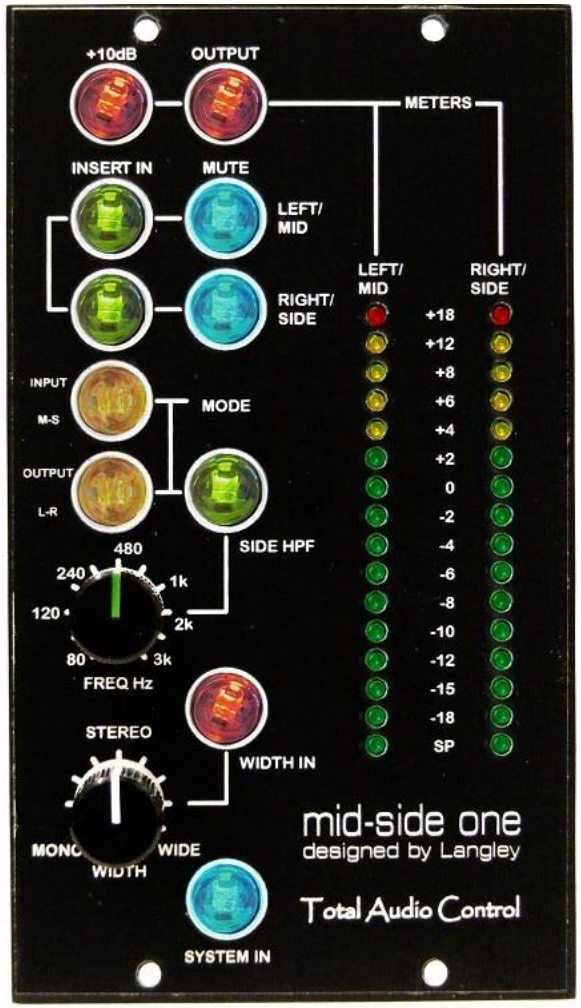


ASSEMBLY/USER MANUAL

500 Series

Total Audio Control

Suite 5, Fairfield, 1048 Govan Road, Glasgow G51 4XS, United Kingdom.

info@totalaudiocontrol.com www.totalaudiocontrol.com

MID-SIDE ONE

Thank you for purchasing MID-SIDE ONE in kit form. You will have fun with both building and using it.

MID-SIDE ONE can provide Mid-Side encoding and decoding as a standalone “500” rack module. The default set up is for encoding L-R signals to M-S.

The facilities available are:

- Selection of L-R or M-S input.
- Selection of M-S or L-R output.
- Switched insert points on both the Mid and Side paths.

  This allows the use of external EQ and different degrees and types of reverb on the M and S channels. This can produce spatial ambiance that is not easily possible to create by simple processing of the L-R stereo mix.

  Please note that the insert points are only available if your 500 series rack supports these functions. All of Total Audio Control 500 series racks naturally fully support these. Normally the insert points are unbalanced but can be converted to balanced using Total Audio Control BALANCING CARD.

- Mutes on both the Mid and Side paths

- Variable 80Hz to 3.3 kHz High pass filter on Side path.

  Low and mid frequencies up to 3 kHz are very important when it comes to signal positioning.

  Using a high-pass filter on the S channel enables selected low frequencies to be located in the center of the stereo image when re-combined to L and R. This improves mono compatibility.

  A stereo “width” control – mono/stereo/wide

  The MONO position combines all left and right signals. If there is a high amount of coincident signal, then the level will rise by up to 6dB. The STEREO position produces a normal stereo distribution. In WIDE mode the left and right signals are 180 degrees out of phase therefore any coincident signal will be cancelled.

- Metering switchable between input and output.

- +10dB meter gain switch.

- System “IN” switch

SPECIFICATIONS:

- Input impedance : 20k bridging
- Frequency response : +/- 0.5dB, 10Hz-80kHz
- Phase response (EQ out) : +/-5 deg., 20Hz-20 kHz.
- THD&N (+10dBu input signal) : Better than 0.05%, 20Hz-20 kHz.
- Output noise, 22Hz-22kHz, RMS, 40 ohm source:
  BYPASS: -99dBu.
  L-R to L-R: -95dBu
  L-R to L-R + WIDTH IN, set to stereo: -95dBu
  L-R to L-R + WIDTH IN, set to stereo + FILTER IN @ 80Hz: -94dBu
- Maximum input level : +26.5dBu.
- Maximum output : +26.5dBu into 200k ohms, +26dBu into 600 ohms.
- Output impedance : 75 ohms

SPECIFICATIONS ARE SUBJECT TO CHANGE WITHOUT NOTICE.

A FEW WORDS ON ASSEMBLY

This manual is not meant to be a step by step guide for the assembly. Therefore, before rushing into building your MID-SIDE ONE you should study it from front to back and familiarise yourself with the design before starting to solder the first component. As the expression says “one picture tells a thousand words”.

The components are packed and numbered in the correct order. The numbers correspond to the bill of materials. Open them one at a time. Do not open the next package before completing the assembly of the previous one. There is a reason behind each stage.

Populating a PCB always starts with the smallest components. Resistors and/or small signal diodes being the first. If you solder the larger components first you’ll have a hard time in soldering the resistors or the small signal diodes.

Before soldering a component visually check its value and designation. Although normally it is not required, testing them would also be a good practice (excluding integrated circuits) before they go on the board. We are extremely lucky to be living at a time when a reasonably well performing digital multimeter with semiconductor testing capability or a capacitance meter can be picked up from e-bay for the cost of literally a burger meal. Therefore, investing into a few handheld meters would pay dividends in the long run.

A good quality soldering iron with a fine tip and a set of hand tools are a must. Plumber’s torch does not have a place in electronics assembly and component leads are not trimmed using a Black Smith’s pliers. A miniature close cutting side cutter will have to be a part of your tool kit. Equally fixing an M2 screw will not be possible with a screw driver normally used for M10 bolt. In the event of a re-work simple spring action de-soldering pump will do fine for single sided boards. But for double sided/plated through boards such as this an electric motor pump action de-soldering tool will be essential. However, you do not have to get the ones that require re-mortgaging your house. There are affordable ones that will also do a good job.

Most faults will arise due to incorrect components being inserted or solder bridges. It is particularly important to closely examine the soldering of components with close pads such as transistors. Therefore, unless you have eagle eyes, checking each solder node with a hand held or table mount magnifier as you go along will be an extremely good practice.

Do not stay on the components with the soldering iron for too long as there can be a possibility of causing damage. You should be able to get in and out of a solder node within few seconds.

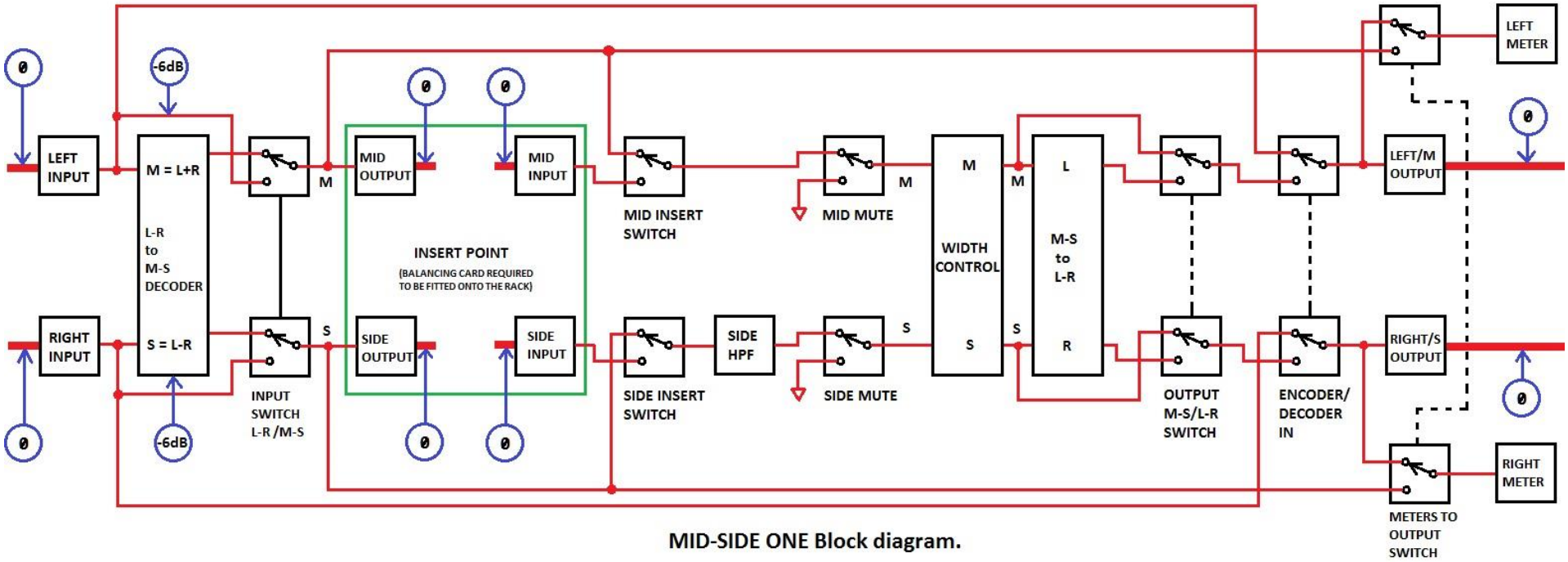
There is no need to crop connector, potentiometer or switch leads unless specified.

Safety first. Be extremely careful when trimming component leads as these can easily fly off into your face. Always hold the lead with one hand while trimming it with the other.

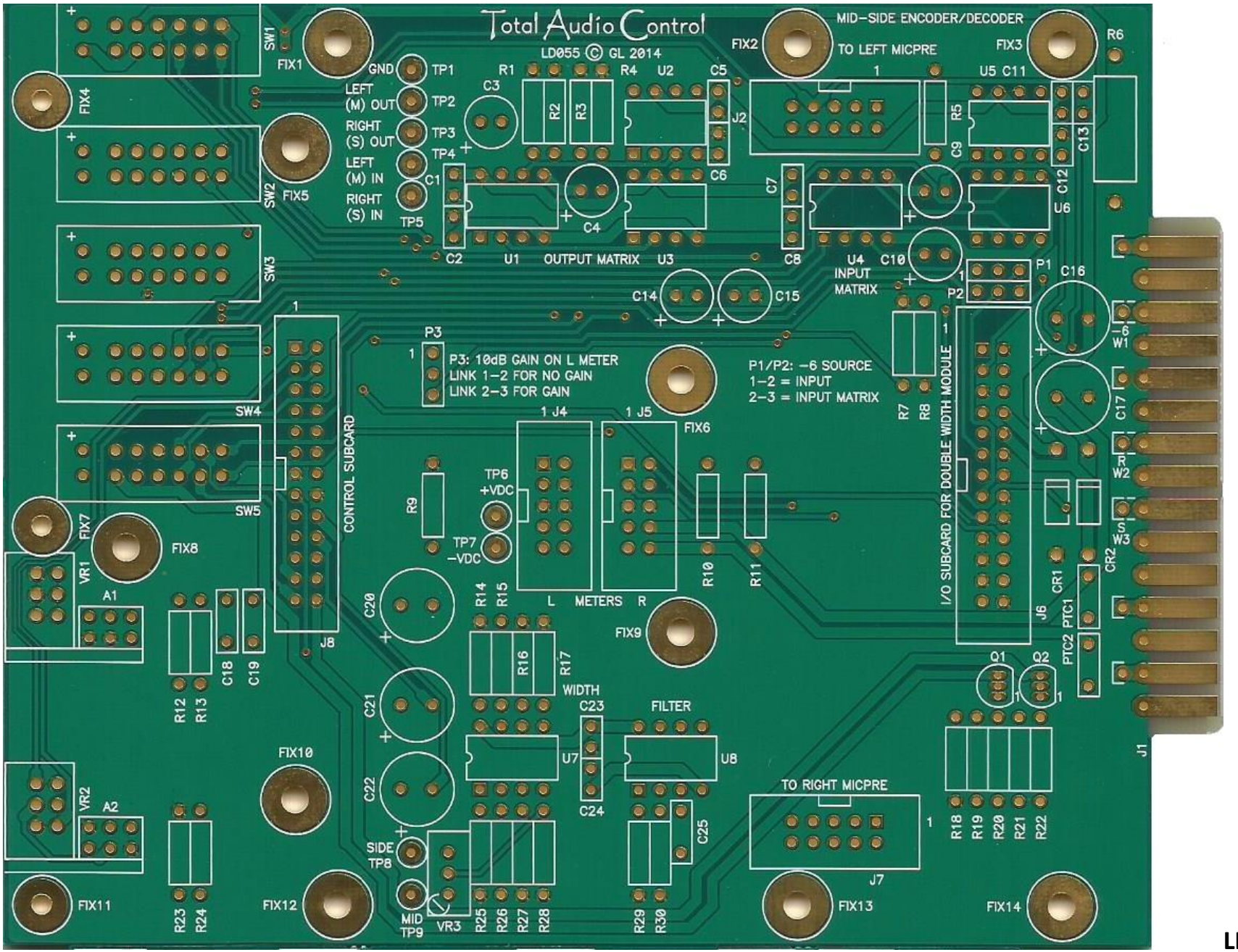
In general do not rush. Work methodically and have fun.

Total Audio Control

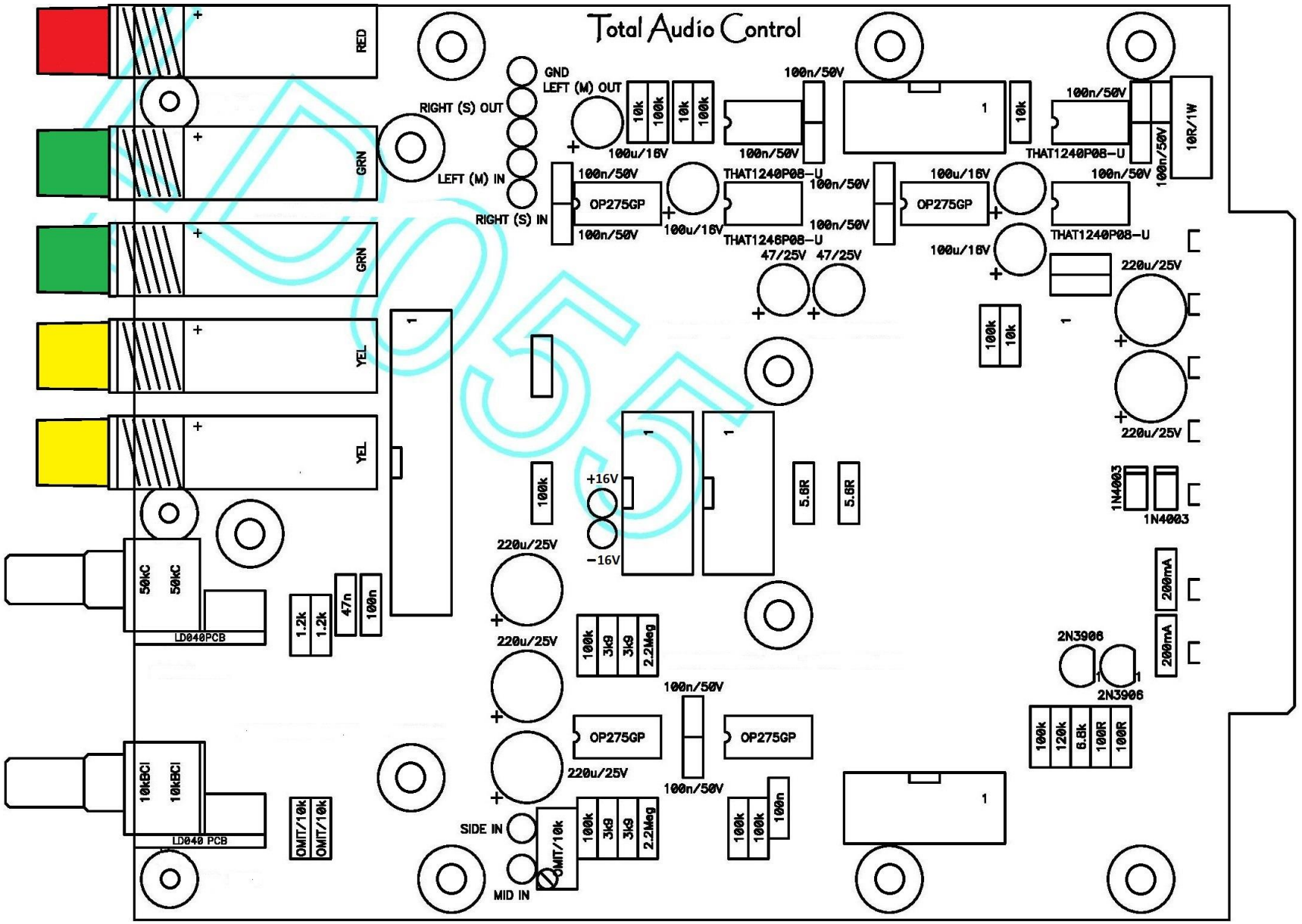
APRIL 2016



MID-SIDE ONE Block diagram.

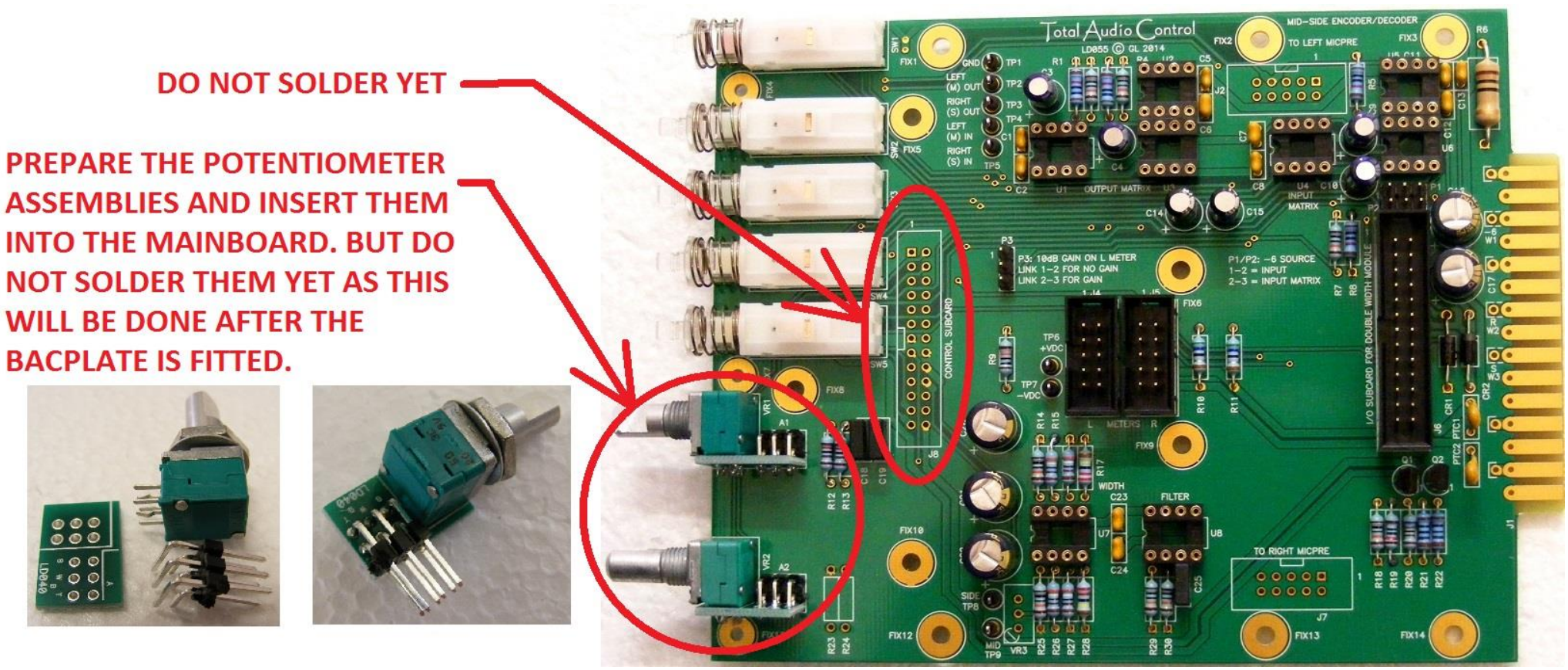


LD055 MAIN CARD



LD055 ASSEMBLY WITH COMPONENT VALUES (ZOOM IN FOR CLARITY)

.

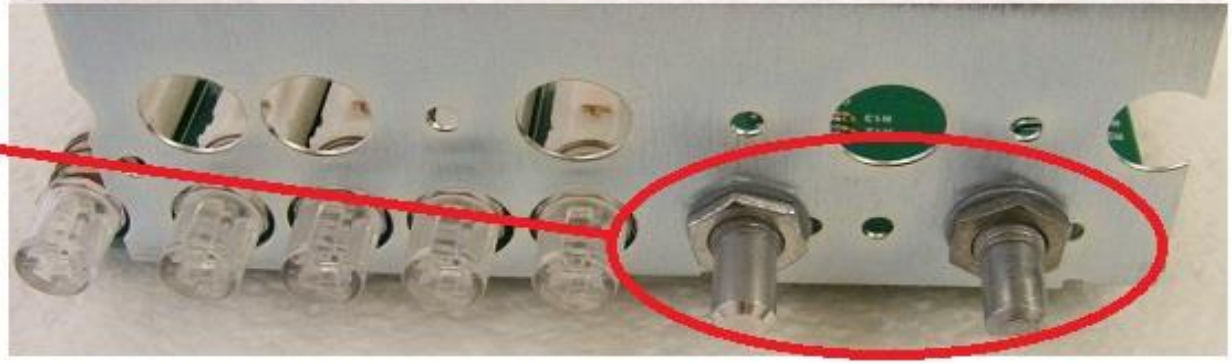


Soldering the potentiometer assemblies onto the main card after they are fixed onto the back plate eliminates the risk of any tension applied to them, hence the damage.

The picture above shows the use of sockets for all of the ICs including the THAT line drivers and receivers. However, generally THAT Corporation recommends soldering their line drivers/receivers for best performance. Therefore if you feel comfortable with it then you may omit the sockets. However, we have not found any audible difference between with or without the sockets. Therefore the issue may be limited to electrical performance and for this we included high quality turned pin sockets with the kit as standard.

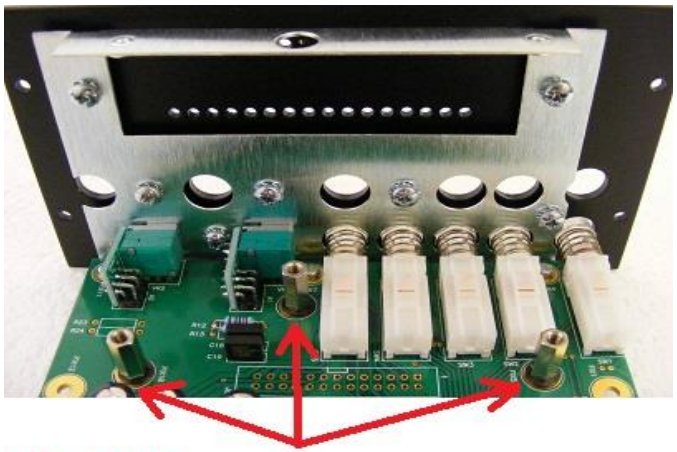
FIX BACKPLATE TO MAIN CARD USING M2 SCREWS AND WASHERS.

FIX POTENTIOMETERS USING NUTS + WASHERS



After the back plate is fitted turn the main card over and solder the potentiometer assemblies. Trim excess header leads.

1



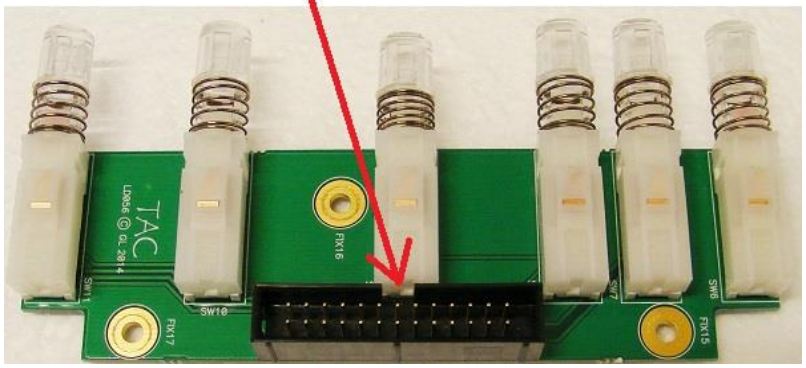
FIX 5, 8 and 10.
12mm FEMALE/FEMALE HEX PILLARS + 2 x WASHERS FOR A TOTAL HEIGHT OF 13mm. FIXED FROM BOTTOM USING M3 SCREWS WITH INTEGRAL SHAKE PROOF WASHER.

2

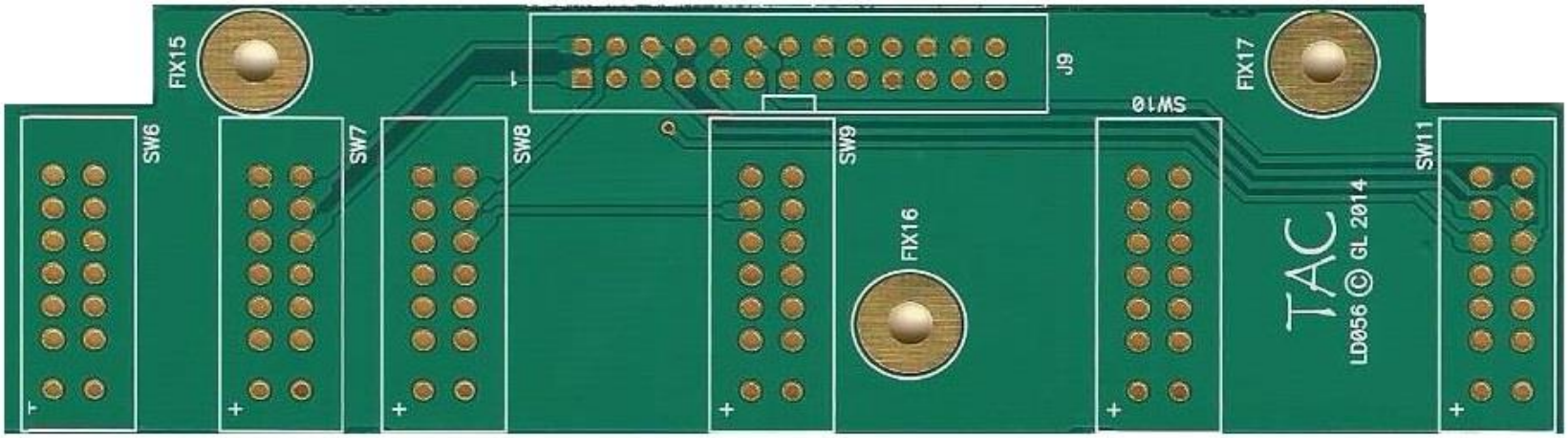
3

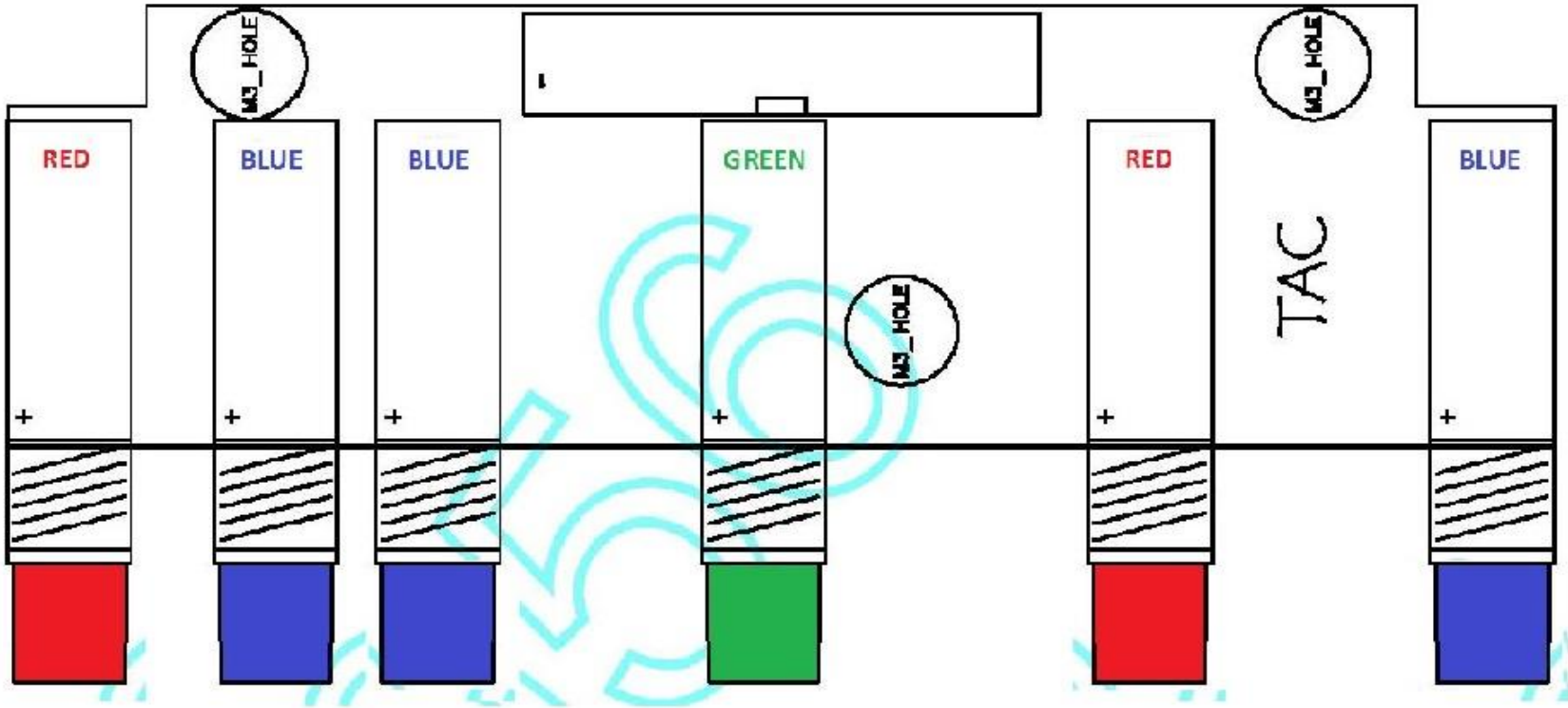
PREPARE LD056 SWITCH CARD

PAY ATTENTION TO THE
POLARITY NOTCH

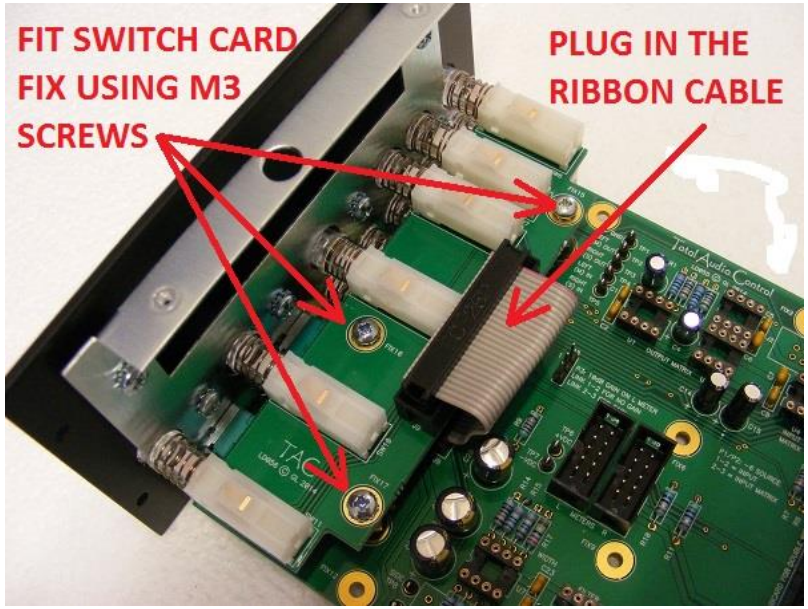


4

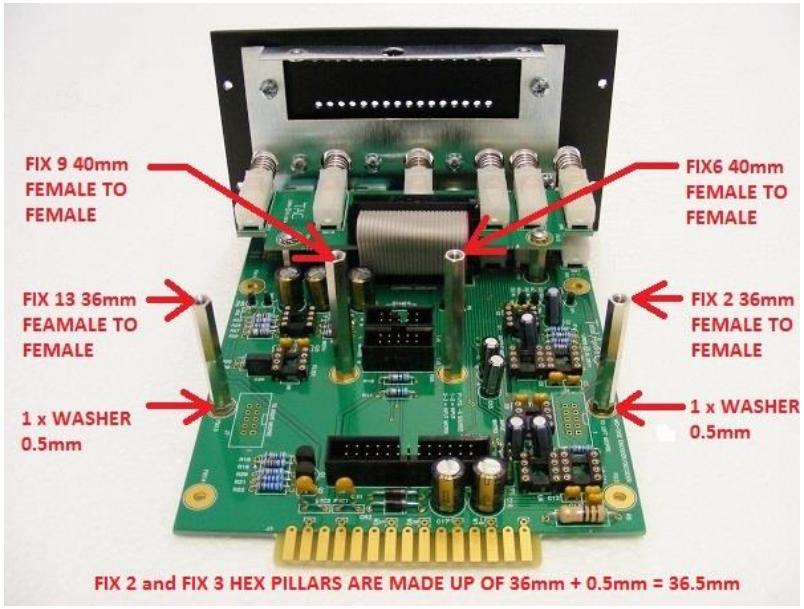




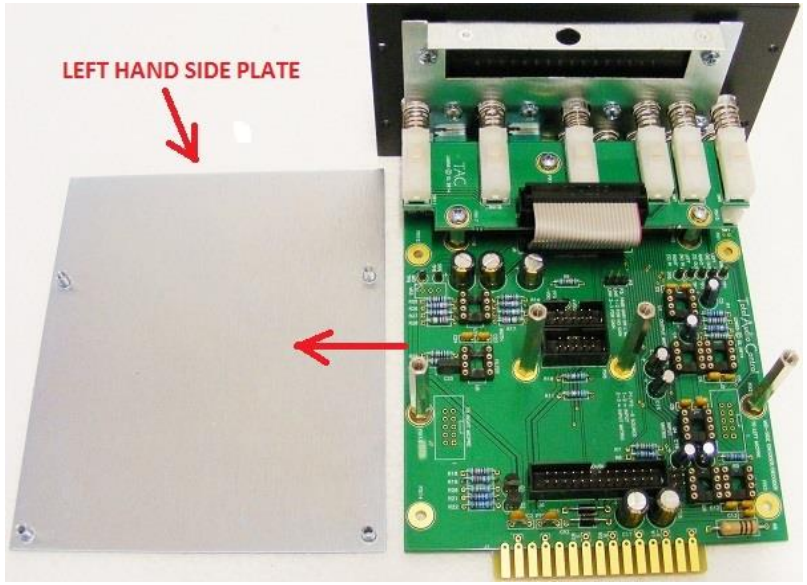
LD056 SWITCH CARD ASSEMBLY


FIT SWITCH CARD
FIX USING M3
SCREWS
PLUG IN THE
RIBBON CABLE

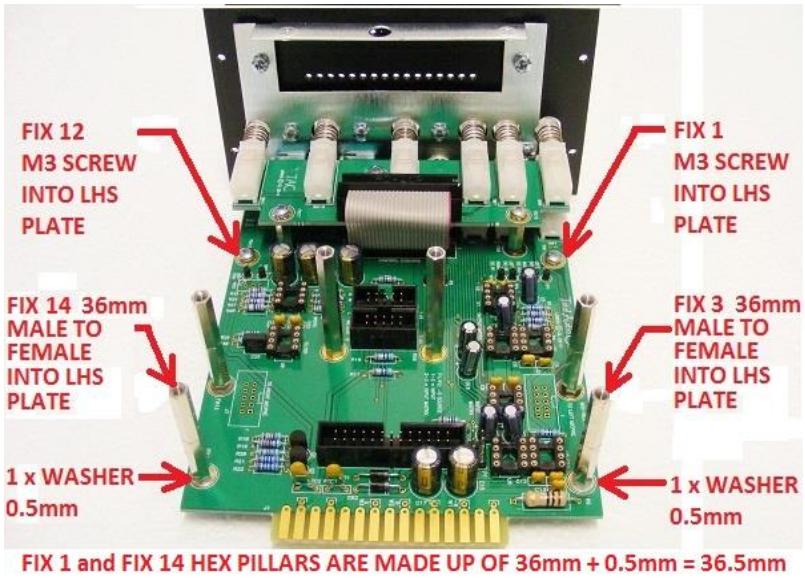
1


FIX 9 40mm
FEMALE TO
FEMALE
FIX6 40mm
FEMALE TO
FEMALE
FIX 13 36mm
FEAMALE TO
FEMALE
FIX 2 36mm
FEMALE TO
FEMALE
1 x WASHER
0.5mm
1 x WASHER
0.5mm
FIX 2 and FIX 3 HEX PILLARS ARE MADE UP OF 36mm + 0.5mm = 36.5mm

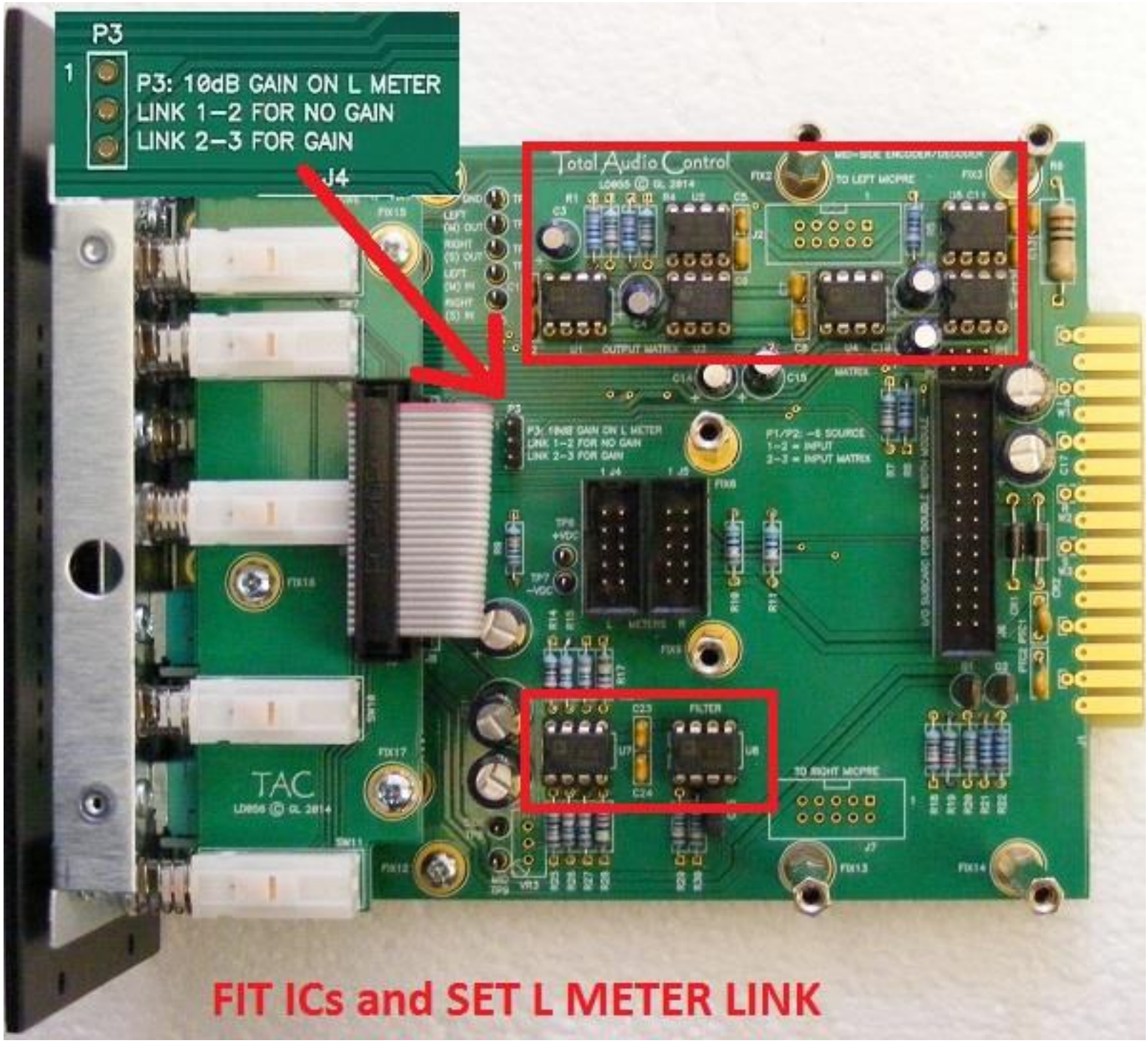
2

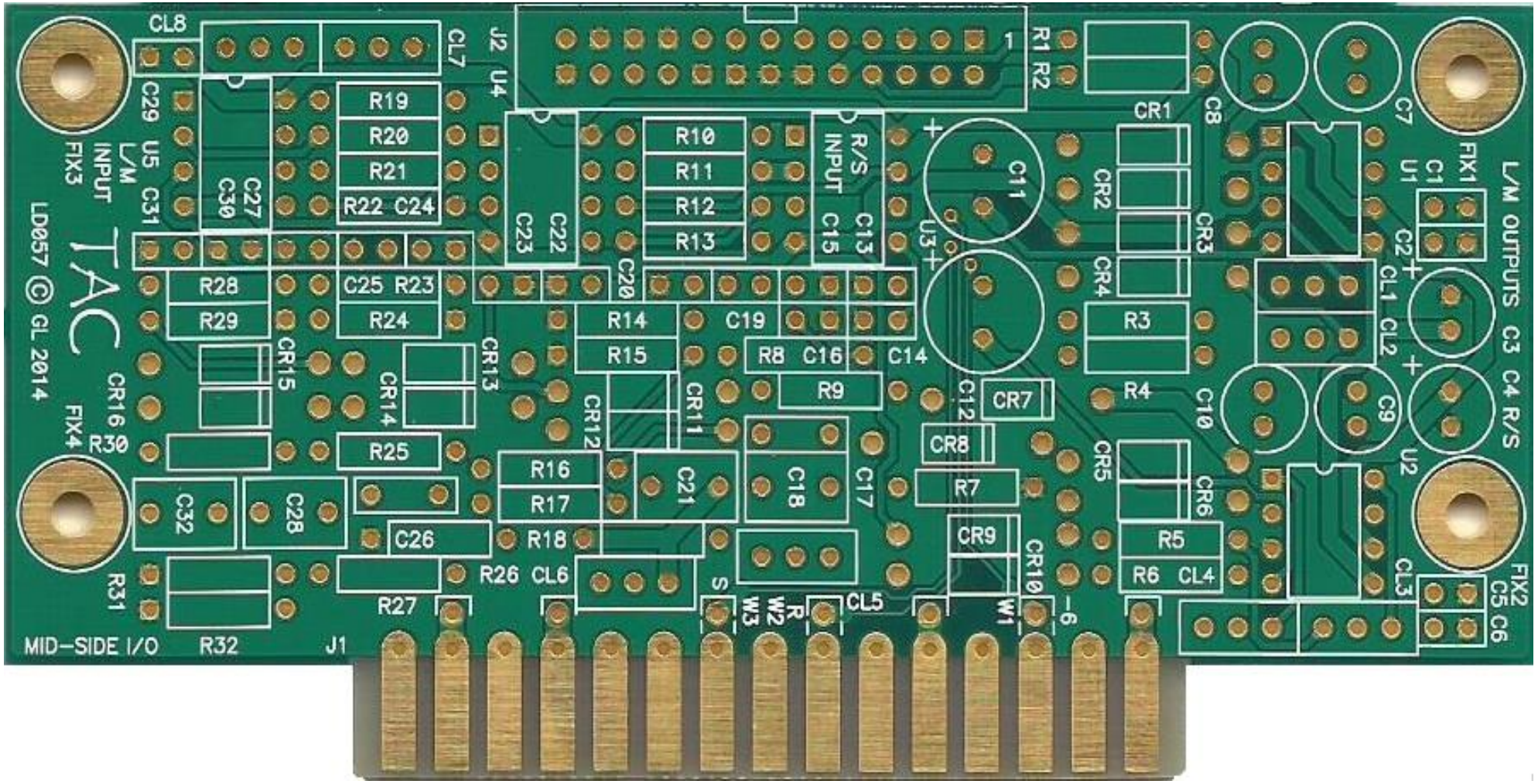

LEFT HAND SIDE PLATE

3

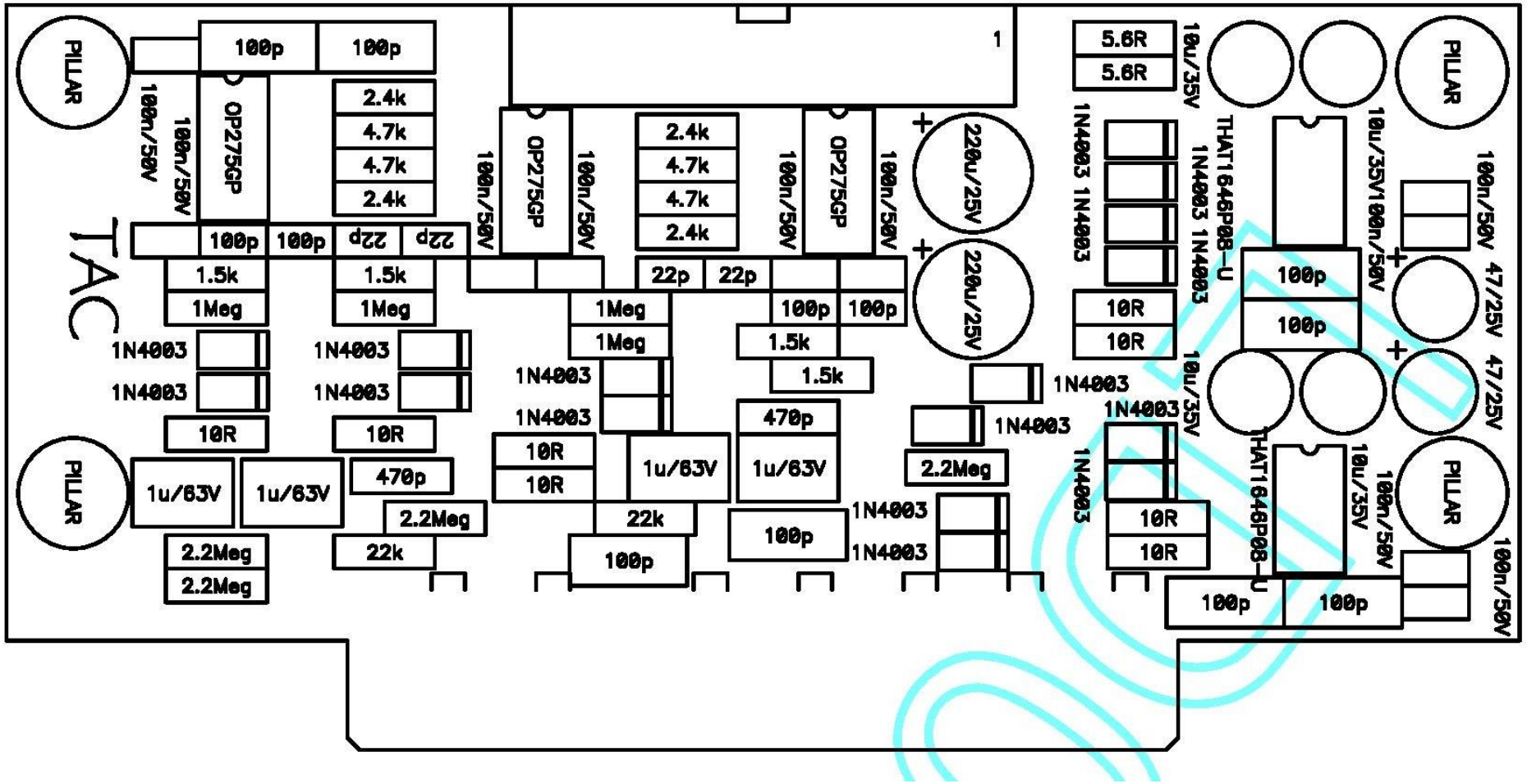

FIX 12
M3 SCREW
INTO LHS
PLATE
FIX 1
M3 SCREW
INTO LHS
PLATE
FIX 14 36mm
MALE TO
FEMALE
INTO LHS
PLATE
FIX 3 36mm
MALE TO
FEMALE
INTO LHS
PLATE
1 x WASHER
0.5mm
1 x WASHER
0.5mm
FIX 1 and FIX 14 HEX PILLARS ARE MADE UP OF 36mm + 0.5mm = 36.5mm

4

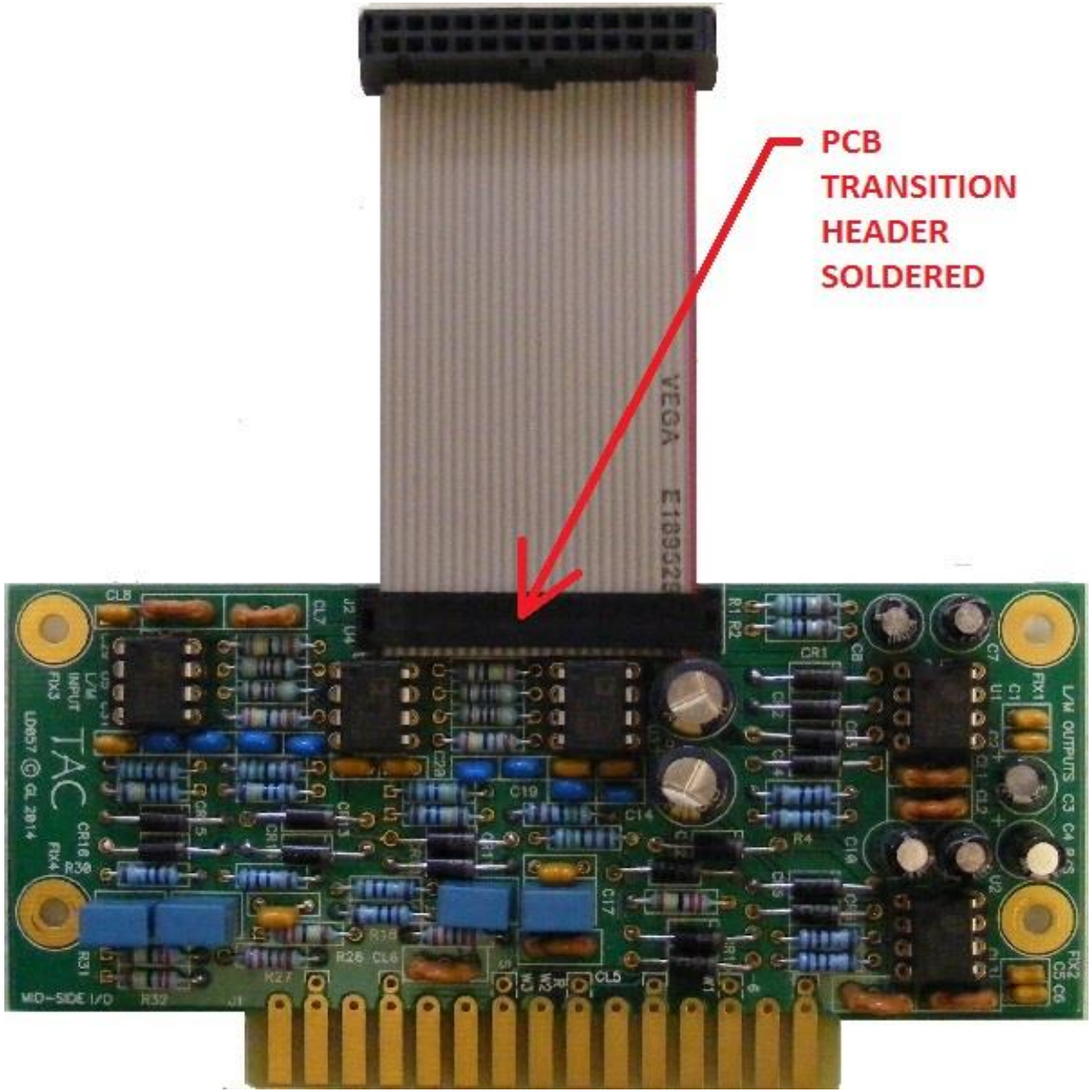

P3
1
P3: 10dB GAIN ON L METER
LINK 1–2 FOR NO GAIN
LINK 2–3 FOR GAIN
J4
Total Audio Control
TAC
FIT ICs and SET L METER LINK



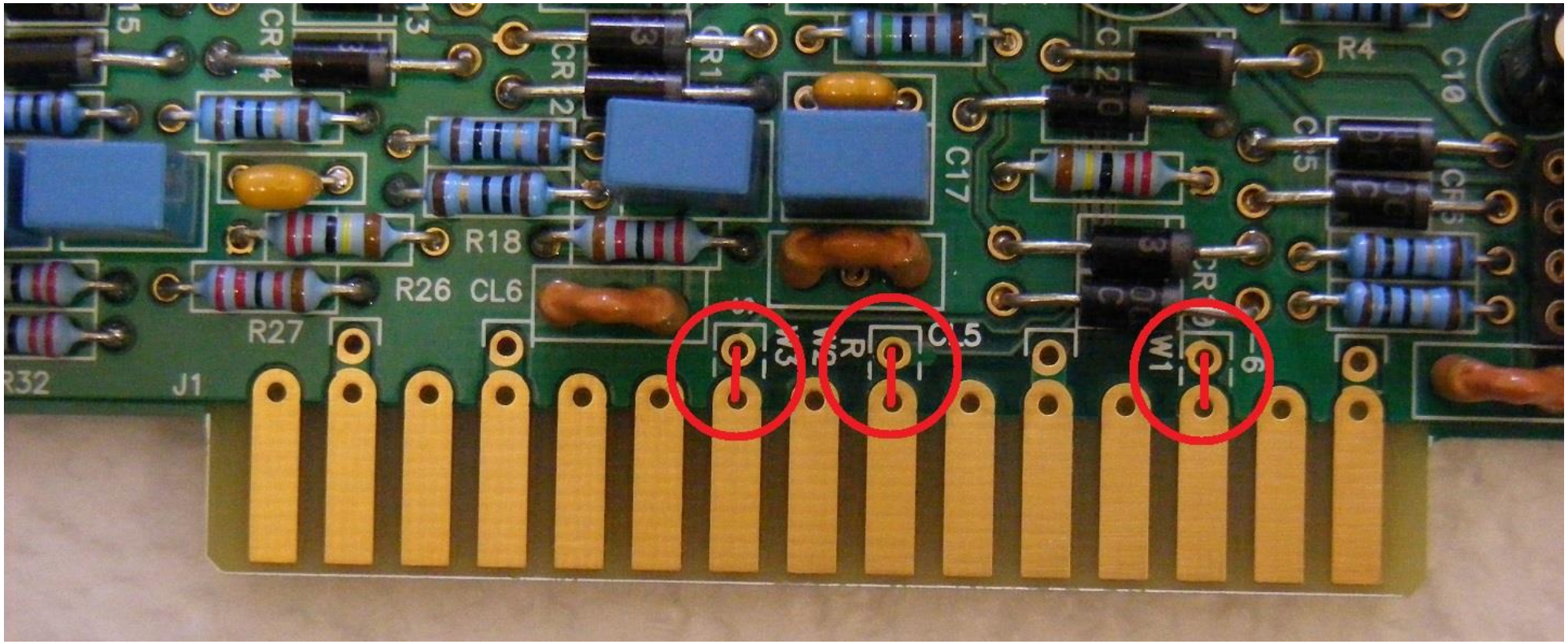
LD057 I/O CARD



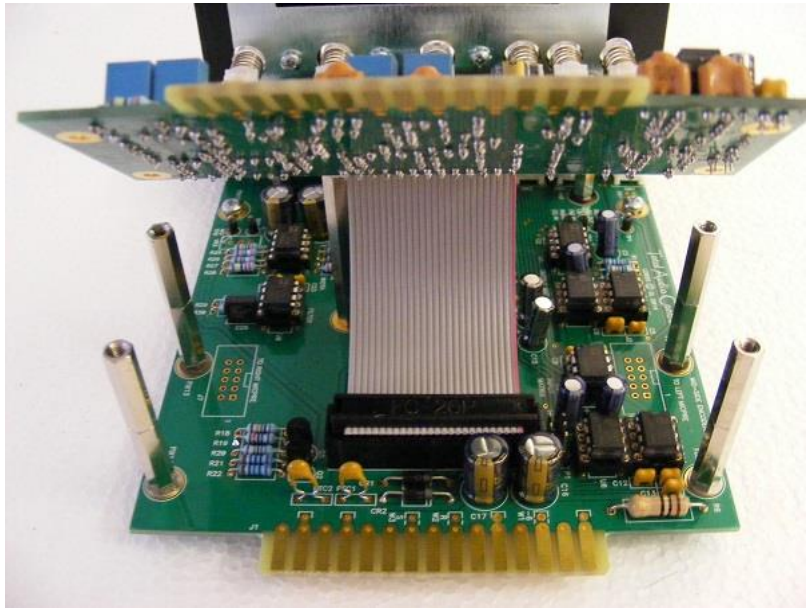
LD057 I/O CARD ASSEMBLY WITH COMPONENT VALUES (ZOOM IN FOR CLARITY).



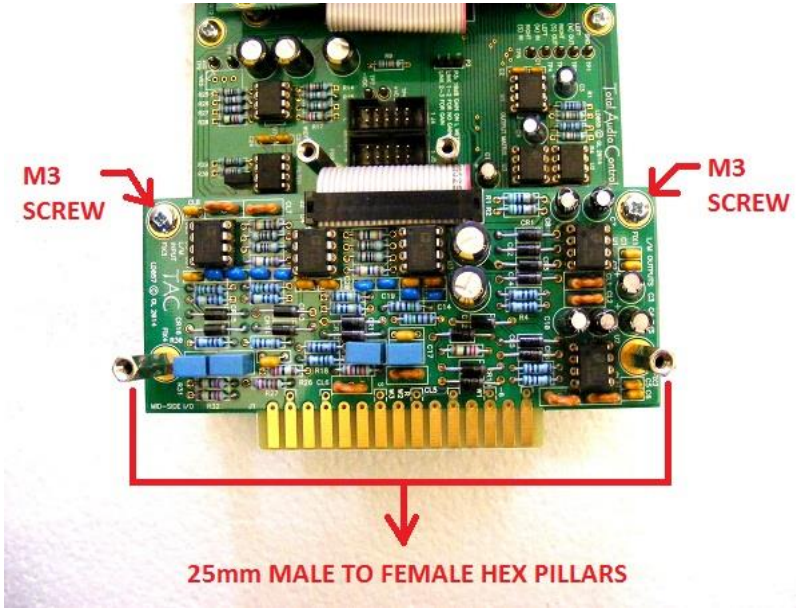
LD057 I/O CARD ASSEMBLY WITH RIBBON CABLE FITTED.



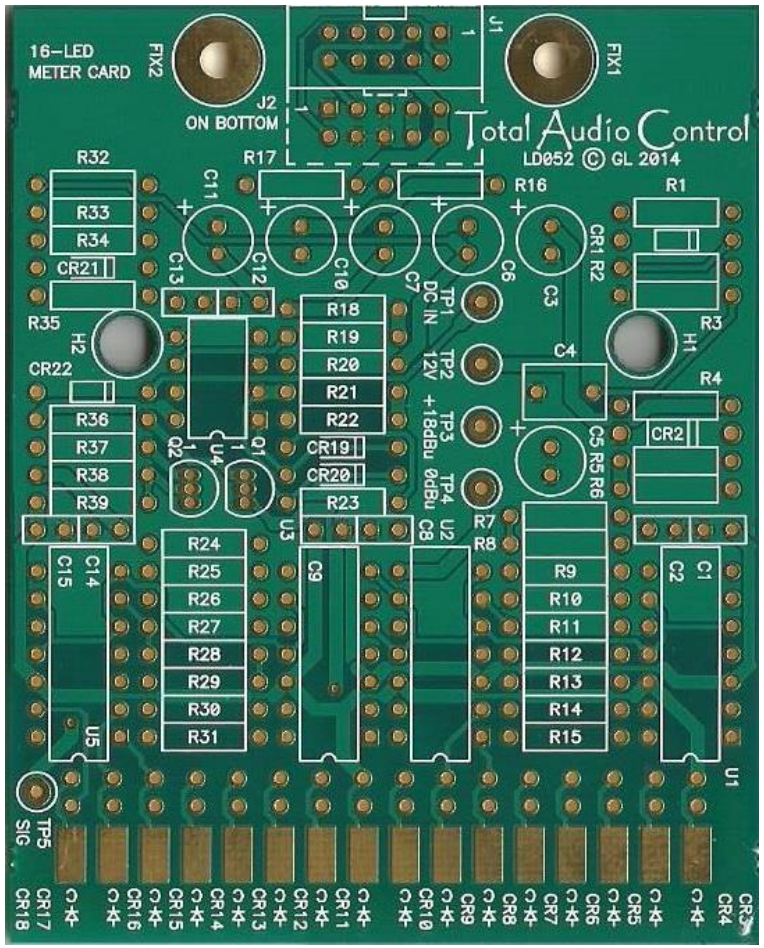
USING EXCESS RESISTOR LEADS SOLDER JUMPER LINKS AS SHOWN ABOVE. REPEAT THE SAME PROCEDURE ON THE MAIN BOARD.

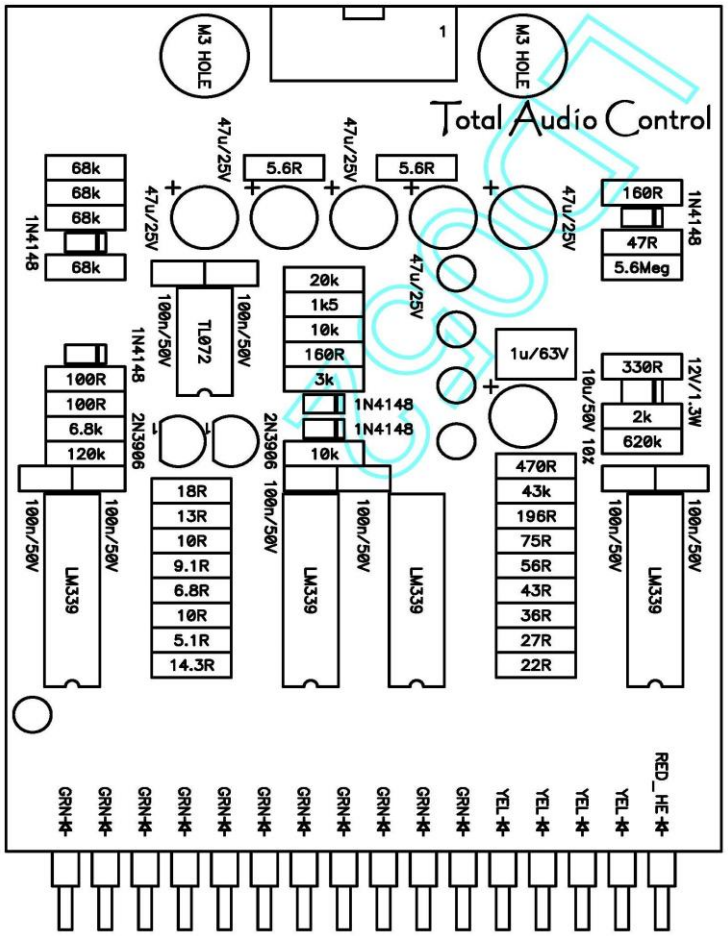


PLUG IN THE I/O CARD RIBBON CABLE TO J6

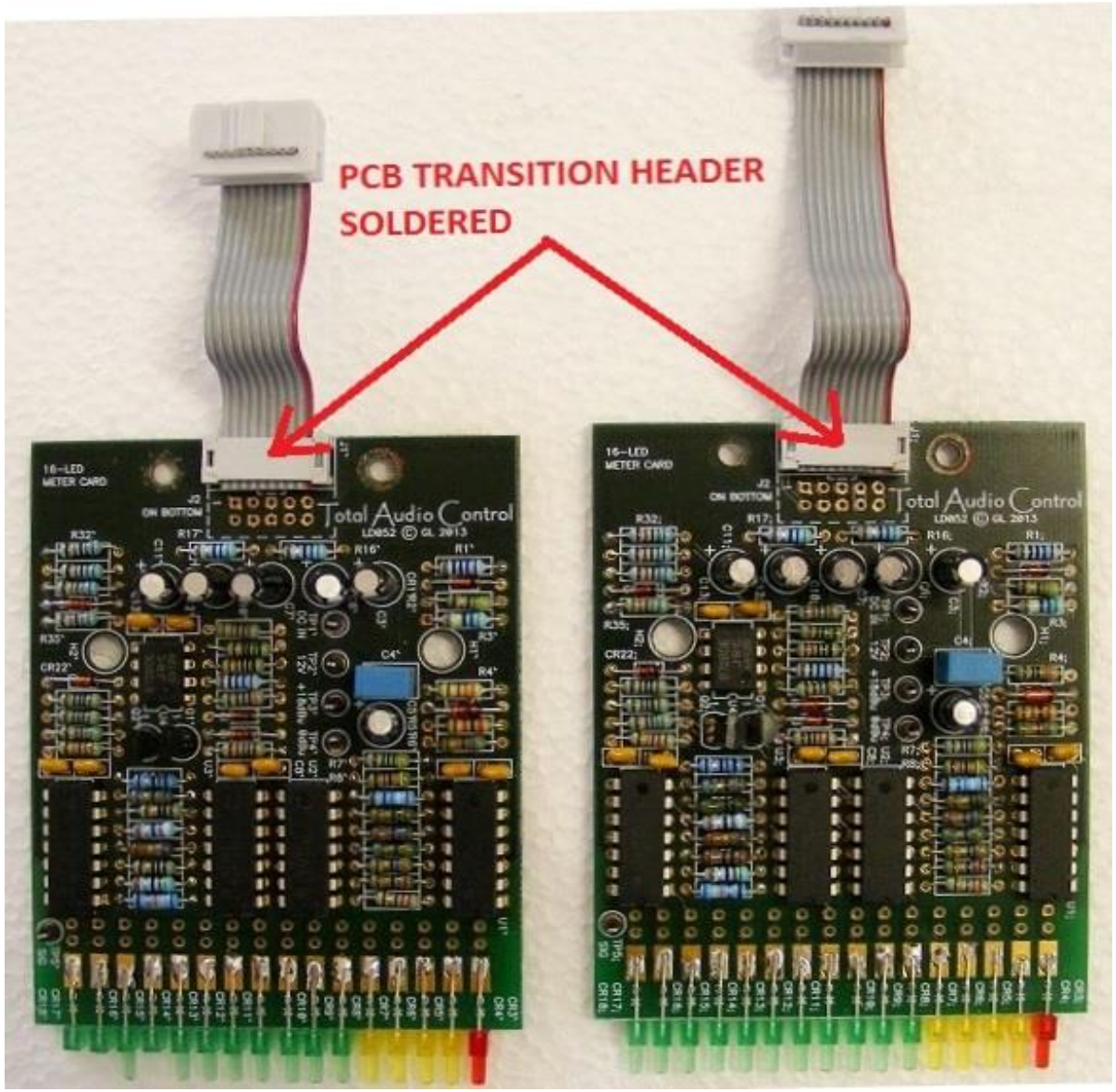


LOCK THE I/O CARD USING TWO M3 SCREWS AND 25mm HEX PILLARS





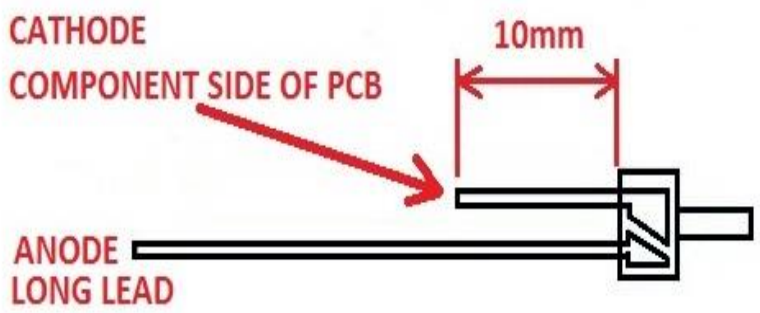
16 LED METER CARD **WITH COMPONENT VALUES**



LEFT METER CARD/SHORTER RIBBON

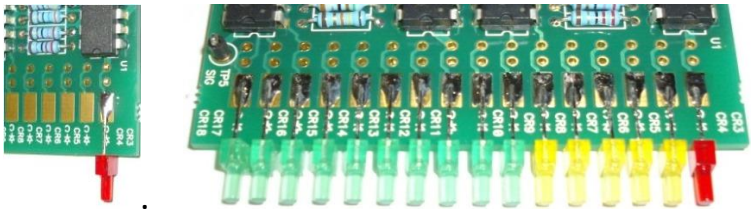
DO NOT USE SOCKETS FOR THE ICs. SOLDER DIRECTLY ONTO THE PCB.

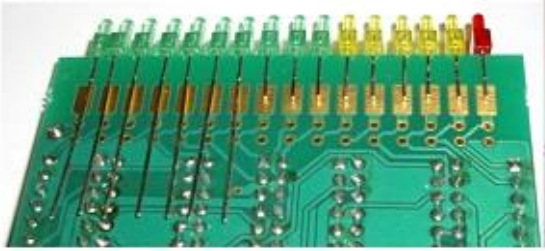
FITTING OF METER LEDs.



The cathode is the short lead. Trim the cathode to 10mm (0.4").
Align the LED with the trimmed cathode on the component side of the PCB.
"C" on the silkscreen indicates the cathode position.
Tack-solder the LED in line with the two holes. Repeat for other LEDs.

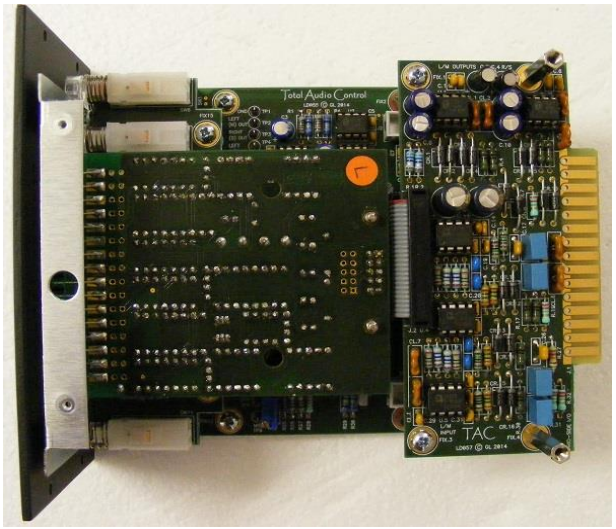
DO NOT APPLY HEAT FOR MORE THAN A FEW SECONDS OTHERWISE THE LEDS MAY BE DAMAGED.



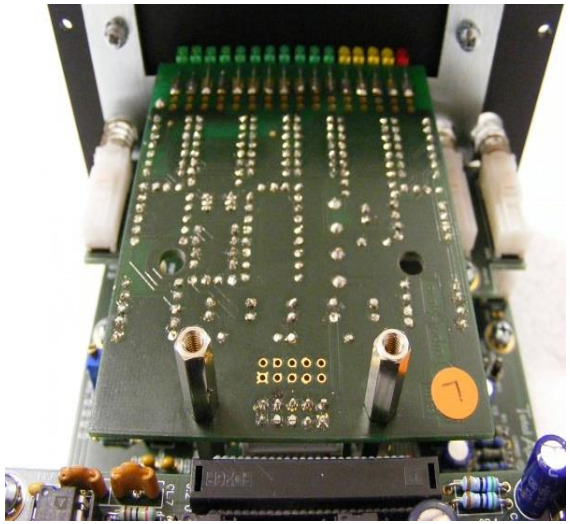


TURN OVER THE PCB AND TRIM THE ANODE LEADS TO 10mm

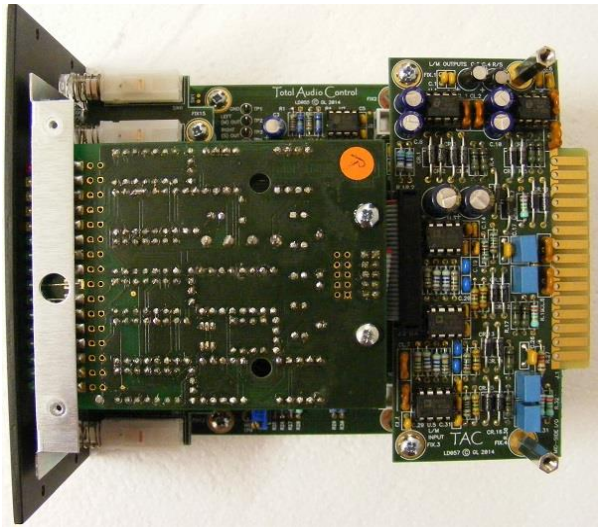
USE THE FRONT PANEL AS A JIG TO ALIGHT THE LEDS. LOCK THE PCB IN ITS POSITION USING THE TWO 15mm MALE TO FEMALE HEX PILLARS. SOLDER THE ANODE LEADS.



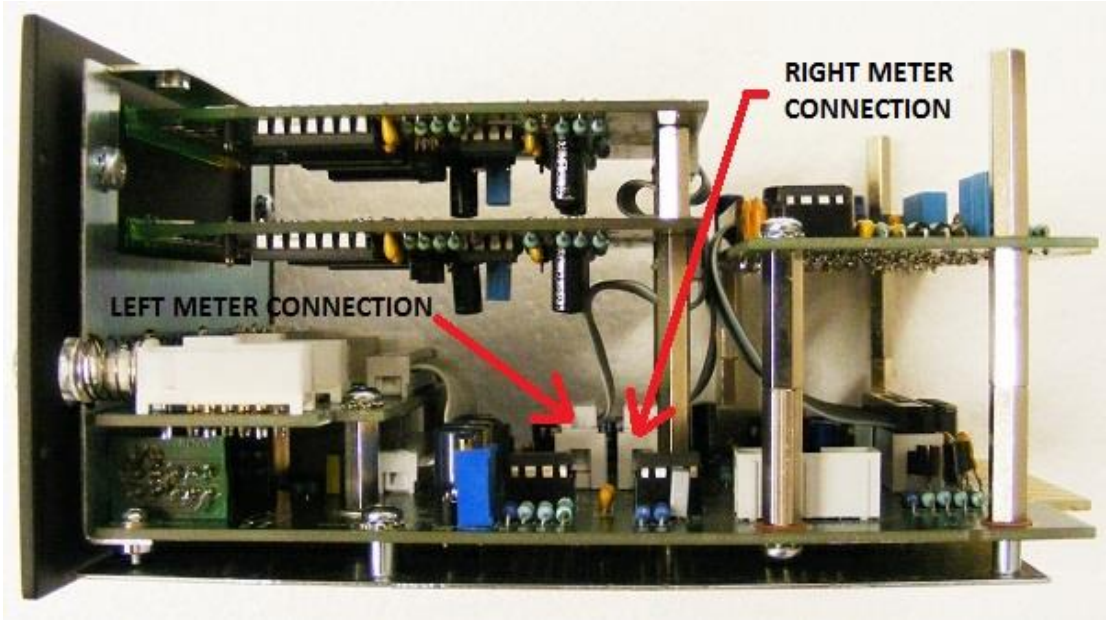
INSERT THE LEFT METER CARD

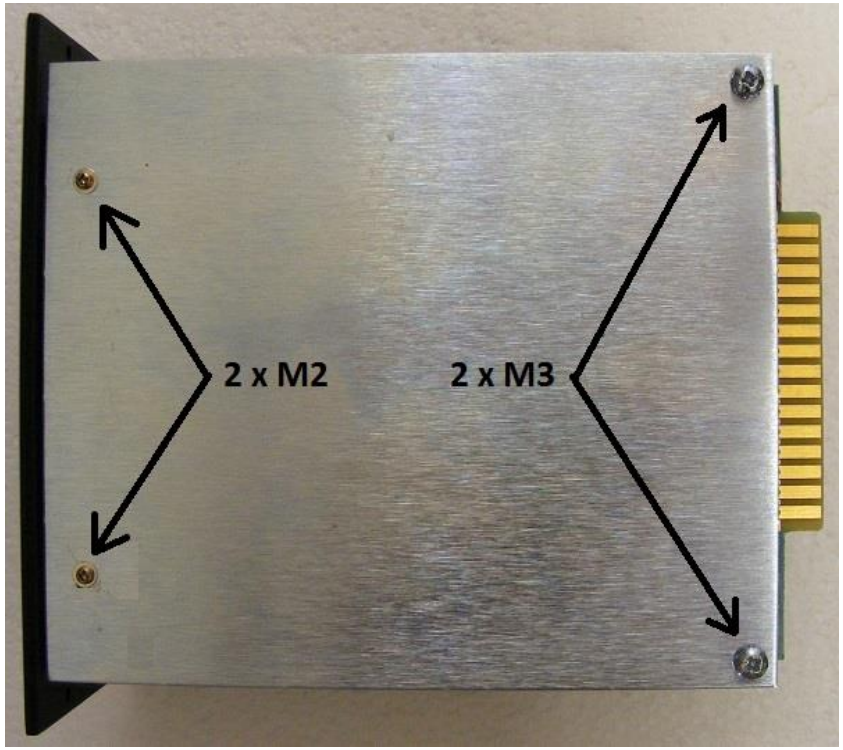


SCREW IN 15mm MALE TO FEMALE HEX PILLAR. DO NOT OVER TIGHTEN.



INSERT THE RIGHT METER CARD AND SECURE IT USING TWO M3 SCREWS.





FIT THE RIGHT HAND SIDE SCREEN

FIT THE POTENTIOMETER KNOBS

OPERATION:

1). When not pressed, the SYSTEM “IN” switch bypasses all Encode/Decode processing.

The insert sends can still be used to send an encoded/decoded signal as selected by the INPUT switch.

2). Pressing the IN switch selects the default input to be L-R and the default output to be M-S

This enables encoding of an L-R input to M-S.

The outputs will become:
M = mono = L + R
and
S= difference = L – R

Then by adding and subtracting the M and S signals
M + S = (L+R) + (L-R) = 2L
M - S = (L+R) - (L-R) = L + R - L + R = 2R

If the input is an M-S signal, the INPUT M-S switch should be pressed. The output will still be in M-S mode but can be processed if required by the filter and width functions.
If it is required to decode the M-S input to L-R, the OUTPUT L-R switch should be pressed.

The outputs will become:
L = (M+S)/2
and
R = (M-S)/2

3). When the input is L-R and the “IN” switch is pressed, pressing the OUTPUT L-R switch allows the width control to be used on a conventional stereo signal.

TABLE 1, below, shows the expected results are for different combinations of signal based on a +10dBu 1kHz coincident source to both inputs:

L-R to M-S	(L) INPUT	(R) INPUT	(M) OUTPUT	(S) OUTPUT
M=L+R	+10	+10	+16	Zero (see note)
S=L-R	+10	zero	+10	+10
	zero	+10	+10	+10 (-180deg)
	zero	zero	zero	zero

L-R to L-R	(L) INPUT	(R) INPUT	(M) OUTPUT	(S) OUTPUT
	+10	+10	+10	+10
	+10	zero	+10	zero
	zero	+10	zero	+10
	zero	zero	zero	zero

M-S to M-S	(M) INPUT	(S) INPUT	(L) OUTPUT	(R) OUTPUT
	+10	+10	+10	+10
	+10	zero	+10	zero
	zero	+10	zero	+10
	zero	zero	zero	zero

M-S to L-R	(M) INPUT	(S) INPUT	(L) OUTPUT	(R) OUTPUT
M +L=2L	+10	+10	+10	zero
M – L=2R	+10	zero	+4	+4
	zero	+10	+4	+4 (-180deg)
	zero	zero	zero	zero

Note: The S output level is the cancellation of L & R inputs. The actual level is therefore dependent on the matching of these signals.

TESTING

1) Apply a +10dB 1kHz signal to both inputs via a unity gain path. With the Encoder/Decoder NOT switched in, the outputs should be identical to the inputs.

Now switch the system IN and verify the results given in TABLE 1 for the various input and output combinations. If the inputs are not EXACTLY the same the “zero” signal points will simply be a low level of, say, -30dBu. This is acceptable for the test.

TESTING THE FILTER

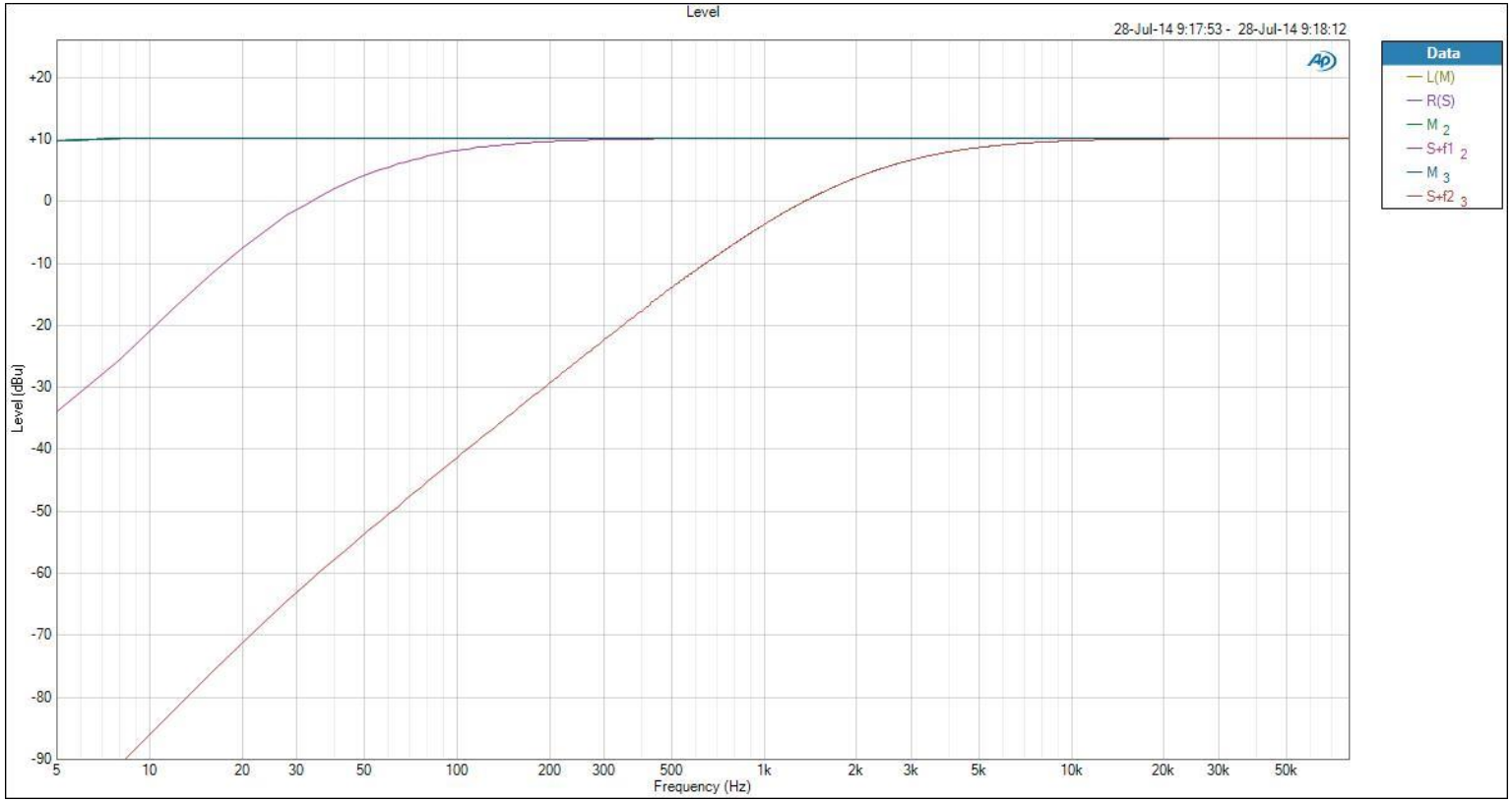
Set up the following highlighted signal and switch combination from TABLE 1.

M-S to M-S	(M) INPUT	(S) INPUT	(L) OUTPUT	(R) OUTPUT
	+10	+10	+10	+10
	+10	zero	+10	zero
	zero	+10	zero	+10
	zero	zero	zero	zero

Press FILTER IN and observe the increasing attenuation as the frequency control is rotated clockwise. Use an input signal of 250Hz if possible to obtain a greater degree of change.

The response should be as shown below, at the extremes of the potentiometer setting.

AP PLOT 1:



TESTING THE WIDTH CONTROL

Set up the following highlighted signal and switch combination from TABLE 1.

L-R to L-R	(L) INPUT	(R) INPUT	(M) OUTPUT	(S) OUTPUT
	+10	+10	+10	+10
	+10	zero	+10	zero
	zero	+10	zero	+10
	zero	zero	zero	zero

Select SYSTEM IN and WIDTH IN.

Set the WIDTH control to STEREO.

The outputs should be as shown in the above table.

Set the Width to MONO. The outputs should both increase 6dB. This is because the L & R signals are being added together.

Set the Width to WIDE The outputs should both increase drop to nearly zero. This is because the L & R signals are being subtracted from each other.