micpre one

designed by Langley

ASSEMBLY MANUAL

500 Series

Total Audio Control

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INTRODUCTION

Thank you for purchasing MICPRE ONE in kit form. You will have a lot of fun in building and using it.

MICPRE ONE is one of the first in our flagship “Designed by Langley” series of pro-audio products. Yes, as the name reveals it is designed by Mr Graham Langley, a name that requires no introduction. The premium quality components are used without any exception to provide the highest performance and most reliable operational life. The PCBs are fully gold plated. Nothing is compromised.

MICPRE ONE is similar in topology to the transformerless design Graham used on the Amek M2500 mixing console and the original Angela console of 1982.

A number of improvements have been made, but the design retains the use of parallel matched transistors and constant current sources. Exceptional noise performance has been achieved. Particularly at low gain settings. The signal path is balanced throughout.

0dB to 66dB of gain is selected in 6dB steps by a rotary switch and this is followed by the fader stage which provides an additional 4dB of gain and up to 24dB of control to adjust between switch settings and also to attenuate the final output to suit consumer interface.

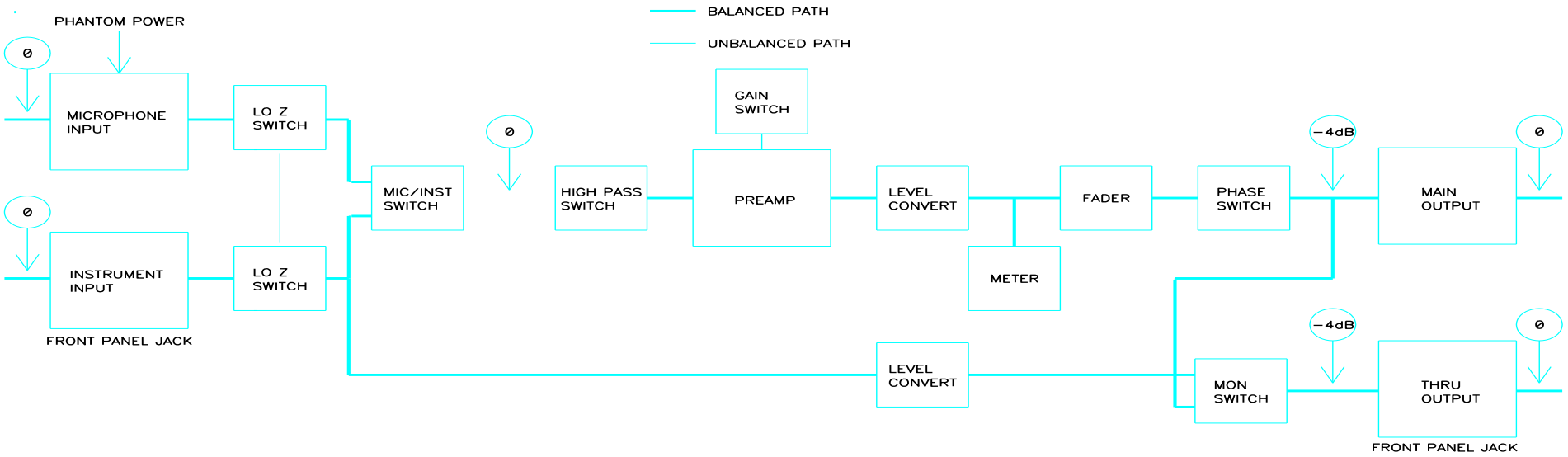
Switches are fitted for input impedance selection, a passive high pass filter before the preamplifier, phase and phantom power.

A high impedance balanced instrument input is also provided on a front panel jack.

An additional switch selects the source for a second front panel that can provide a balanced “THRU” output directly from the instrument source, or monitor off the main path.

An 8 segment pre fader LED meter is provided. The Signal Present LED illuminates at -18dBu. The response of the main bar approximates that of a PPM, while the +18 LED has faster attack and slower decay to catch peaks.

Figure 1: Block Diagram



Typical specification, both paths:

Mic. input impedance:	switchable 5k ohms/600 ohms
Instrument input impedance:	switchable 1.5M ohms/50k or 10k ohms
High pass filter:	120Hz @ 6dB/octave (nominal).
Frequency response:	+/- 0.5dB, 20Hz-80kHz (up to 60dB gain).
Phase response (EQ out):	+/-30 deg., 20Hz-80kHz (up to 60dBgain).
Maximum output (into 100k ohms)	+27dBu
THD&N (+10dBu input signal):	better than 0.05%, 20Hz-20kHz (up to 60dBgain).
Mic. EIN, 22Hz-22kHz, RMS, 150 ohm source:	-128dBu.
Output impedance (main and THRU)	75 ohms

ALL SPECIFICATIONS ARE SUJECT TO CHANGE.

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 MICPRE 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. A simple spring action desoldering pump will do fine for single sided boards. But for double sided/plated through boards such as this a proper (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.

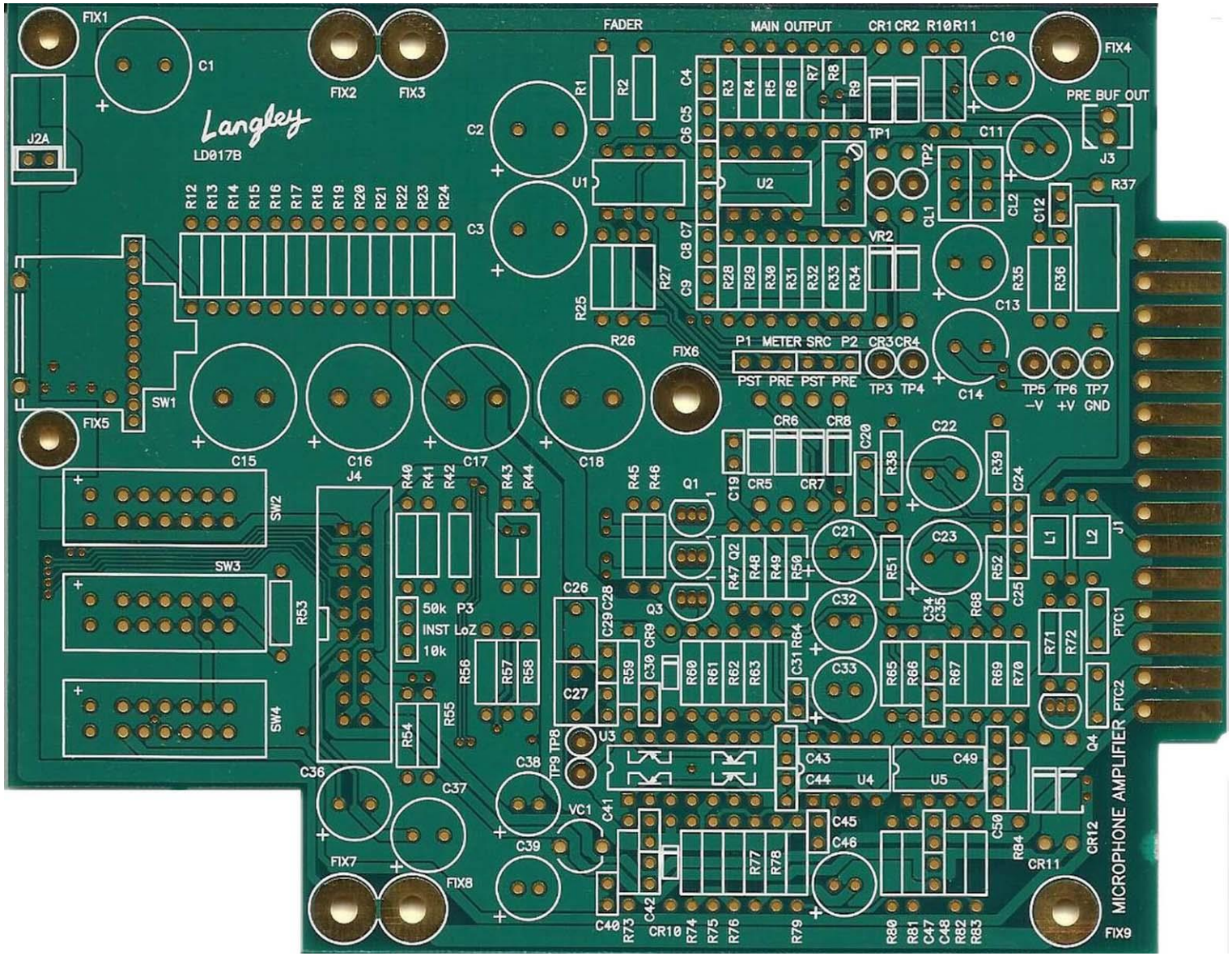
Do not stay on the components with the soldering iron for too long as there can be a possibility of causing damage. You should be able to get in and out of a solder node within few seconds.

There is no need to crop connectors, potentiometers or switches unless specified.

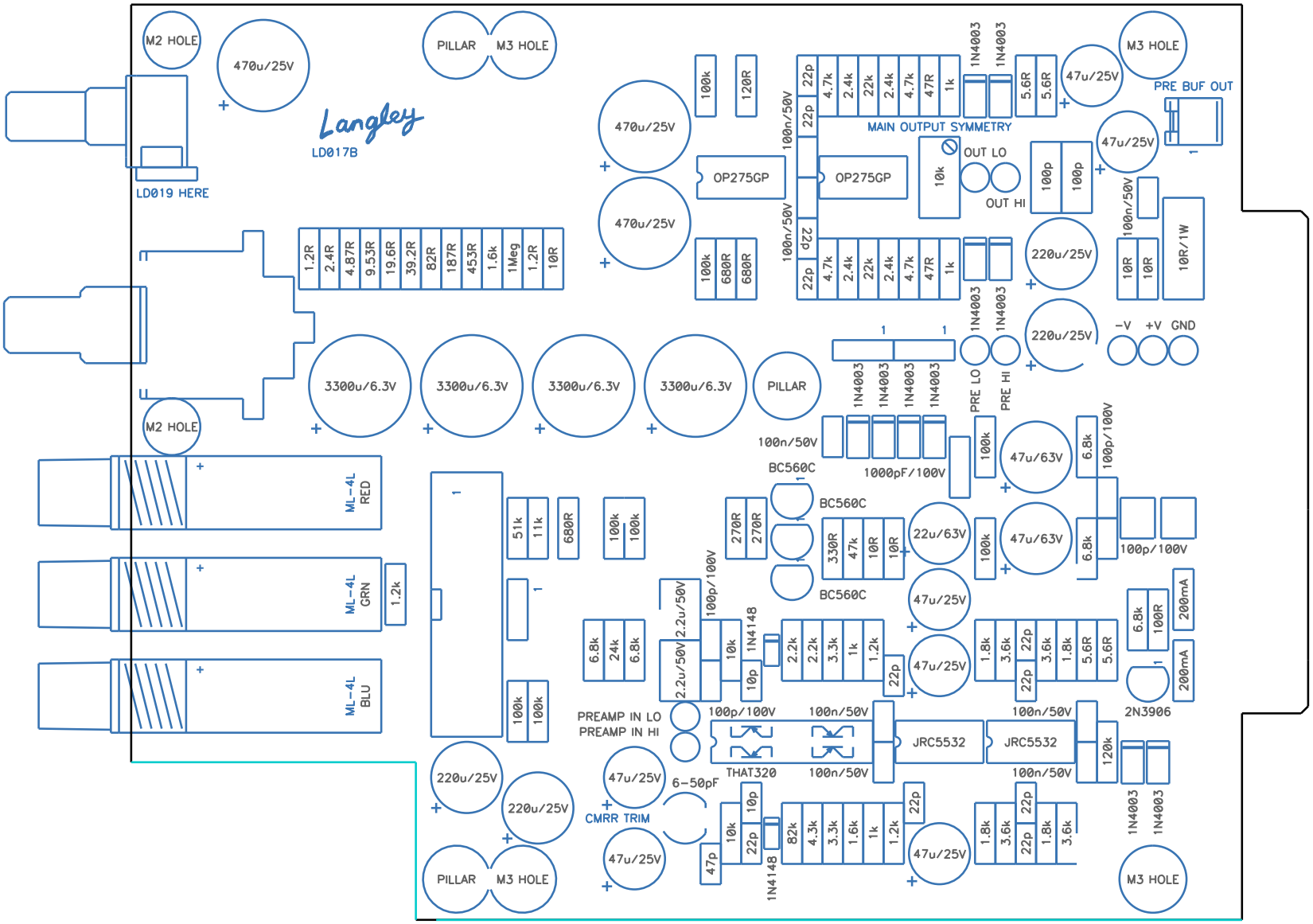
Safety first, Be extremely careful when trimming component leads as these can easily fly off into your face. Always hold the lead with one hand while trimming it with the other.

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

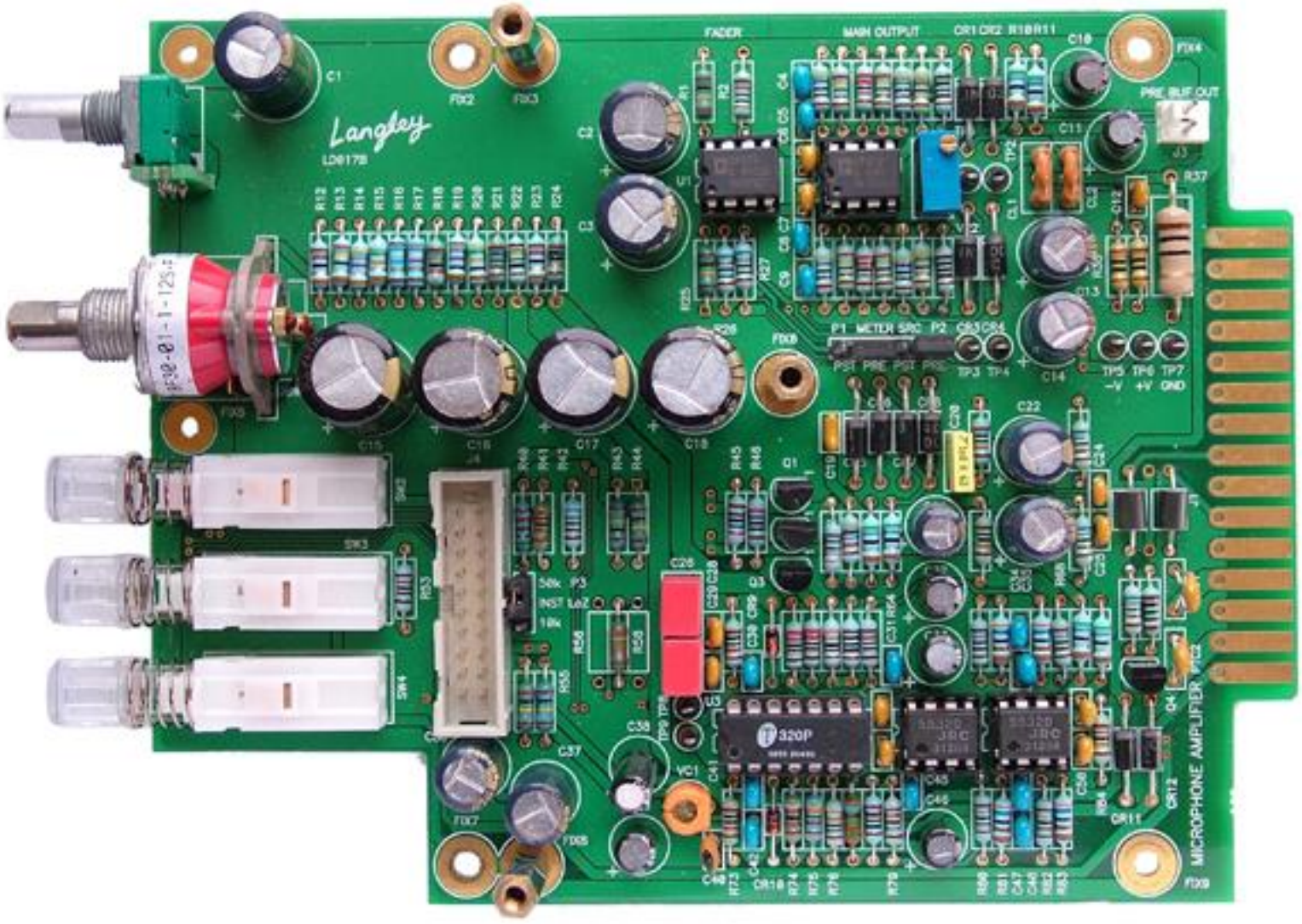
Total Audio Control
March 2013



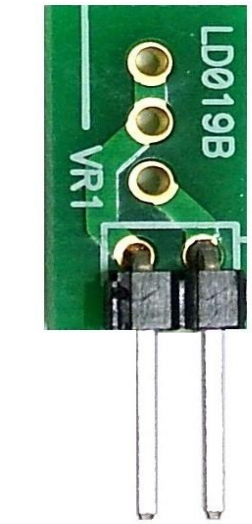
LDO17 B MAIN BOARD (ZOOM IN TO ENLARGE)

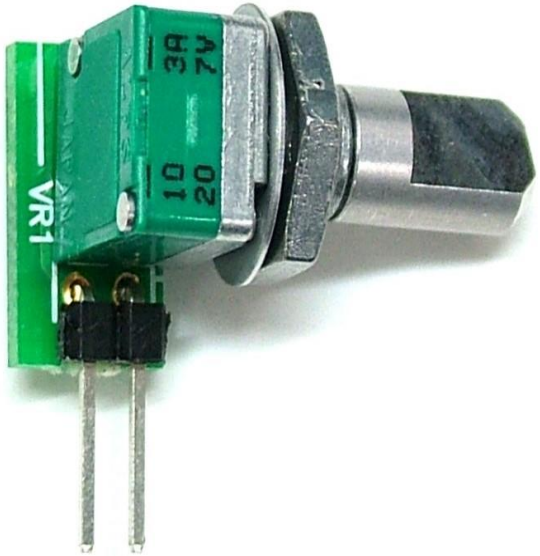


COMPONENT DESIGNATIONS WITH VALUES



LD017B MAIN BOARD ASSEMBLED.





LD019B FADER ADAPTER CARD ASSEMBLY.

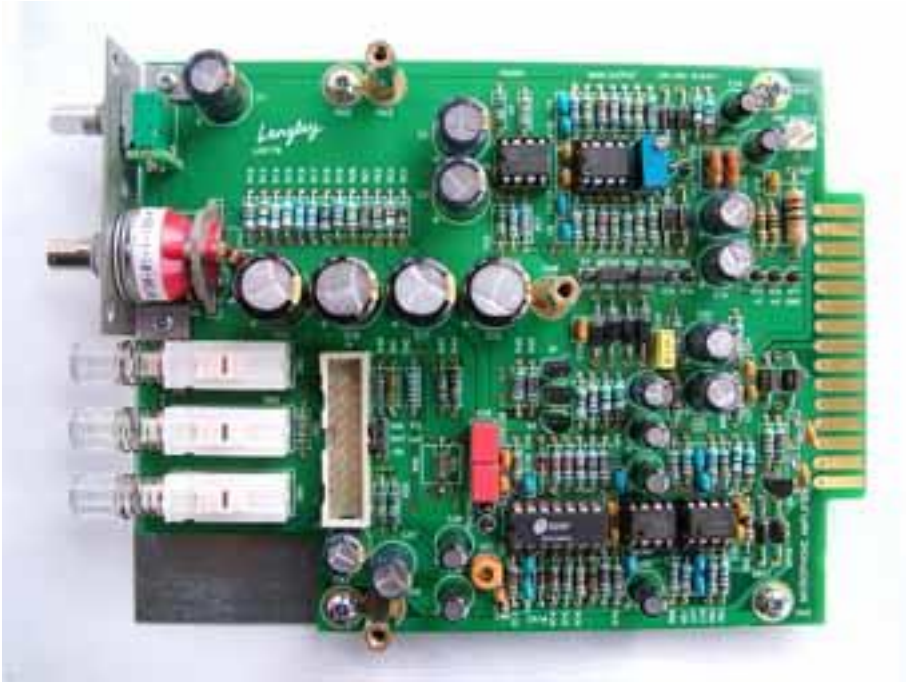
Solder the 2-pin right angle connector to the PCB paying particular attention to the position of the plastic spacer. This should butt up against the LD017.

Solder the fader potentiometer.

DO NOT SOLDER THE LD019B FADER ADAPTER CARD ASSEMBLY TO THE MAIN BOARD YET.

BACK PLATE ASSEMBLY.

1). Solder the Gain Switch onto the main board.
2). Place the anti-vibration (or locking) washer over the gain switch. This will act as a filler/spacer between the gain switch and back plate.
3). Insert LD019B Fader Adapter card into the main board. Do not solder it yet.
4).Gently fit the back plate over the gain switch and the fader potentiometer. The back plate sits on the component side of the PCB. Fix it using two M2 screws which are inserted from the solder side of the main PCB.
4). Fix the gain switch and the fader potentiometer onto the back plate by using their respective nuts/washer. Do not apply excessive force.
5). Solder the LD019B Fader Adapter Card.



LEFT HAND SIDE SCREEN PLATE ASSEMBLY.

The LD017B main board is fixed through Fix2, Fix4, Fix7 and Fix9 using M3 screws.

Fix3 (top), Fix6 (middle) and Fix8 (bottom) are the hex pillars which are locked from the solder side using washers/nuts.

FACE PLATE ASSEMBLY.

Fix the Face Plate to the Back Plate using three M3 screws. Use the two extra anti vibration/locking washers In addition to the one already on the screw. This is to slightly shorten the length of the screws.

SELECTING MODE OF OPERATION FOR THE METER:

On modules that include output faders, the meter source is normally pre-fader. This is the case because the fader is an attenuator. The signal level before the fader might be clipping, but with the fader set at say, -10dB, the output level indicated by a post fader meter would be well below the clipping level.

Therefore the metering source is normally set before the output stage because we want to know the actual level within the unit, so that hot signals do not clip. The level shown is relative to the ideal final output.

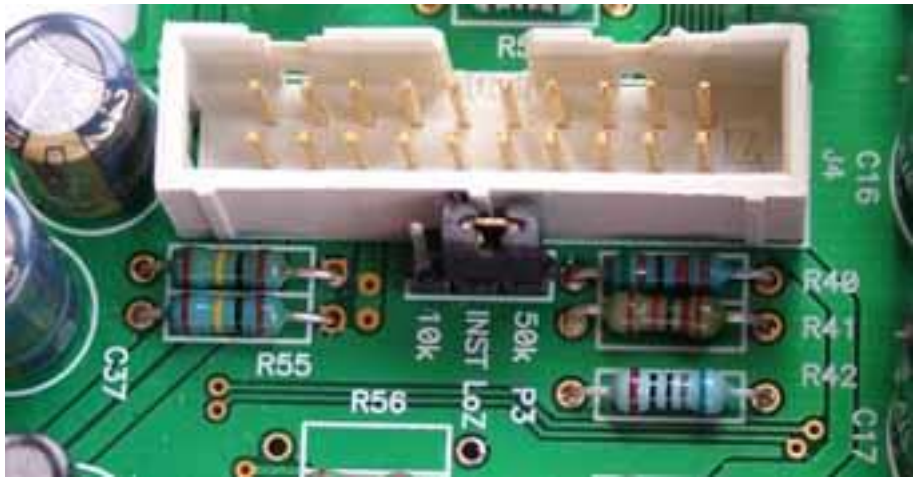
Provision is made for metering after the fader (post) for kit built units. However, the user will have to change a resistor on the input to rectifier to compensate for additional 5.1dB gain.

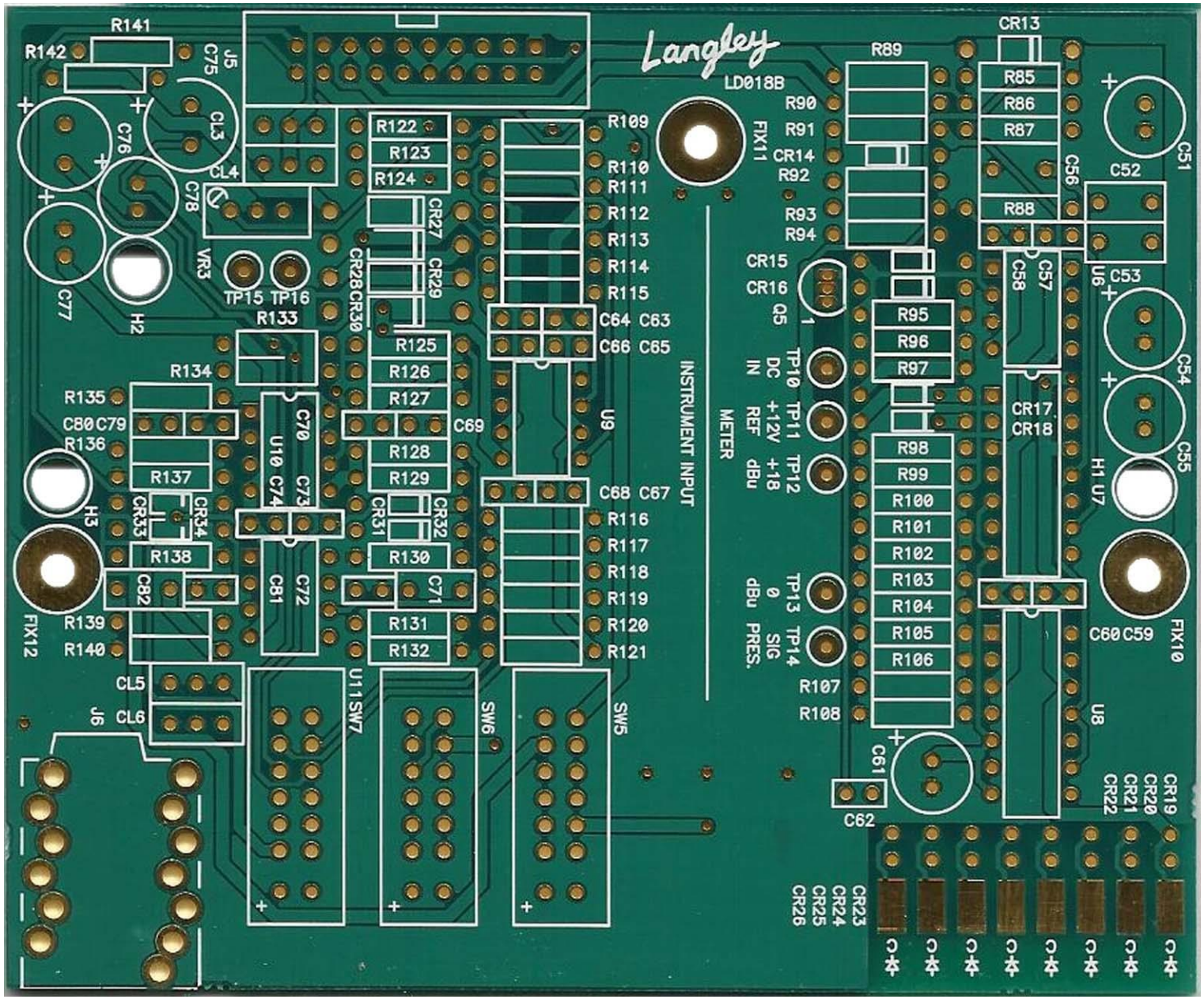
SELECTING INPUT IMPEDANCE OF INSTRUMENT INPUT:

The LOZ input impedance switch operates on both the microphone and instrument inputs.

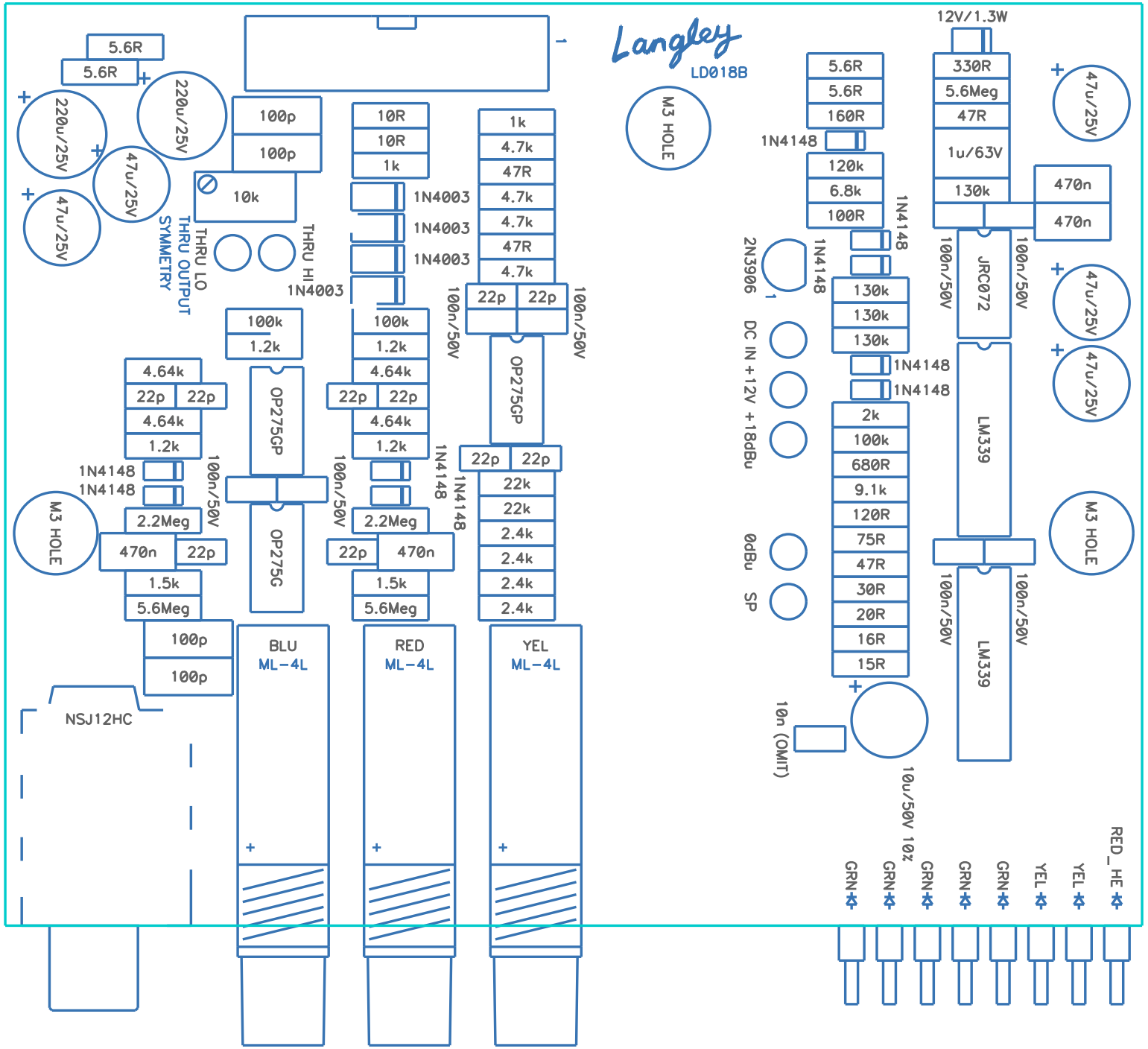
Nominally it sets the microphone input impedance to 600 ohms and the instrument input to 50kohms.

The internal jumper can select the instrument input impedance to be unchanged, 10kohms or 50kohms.

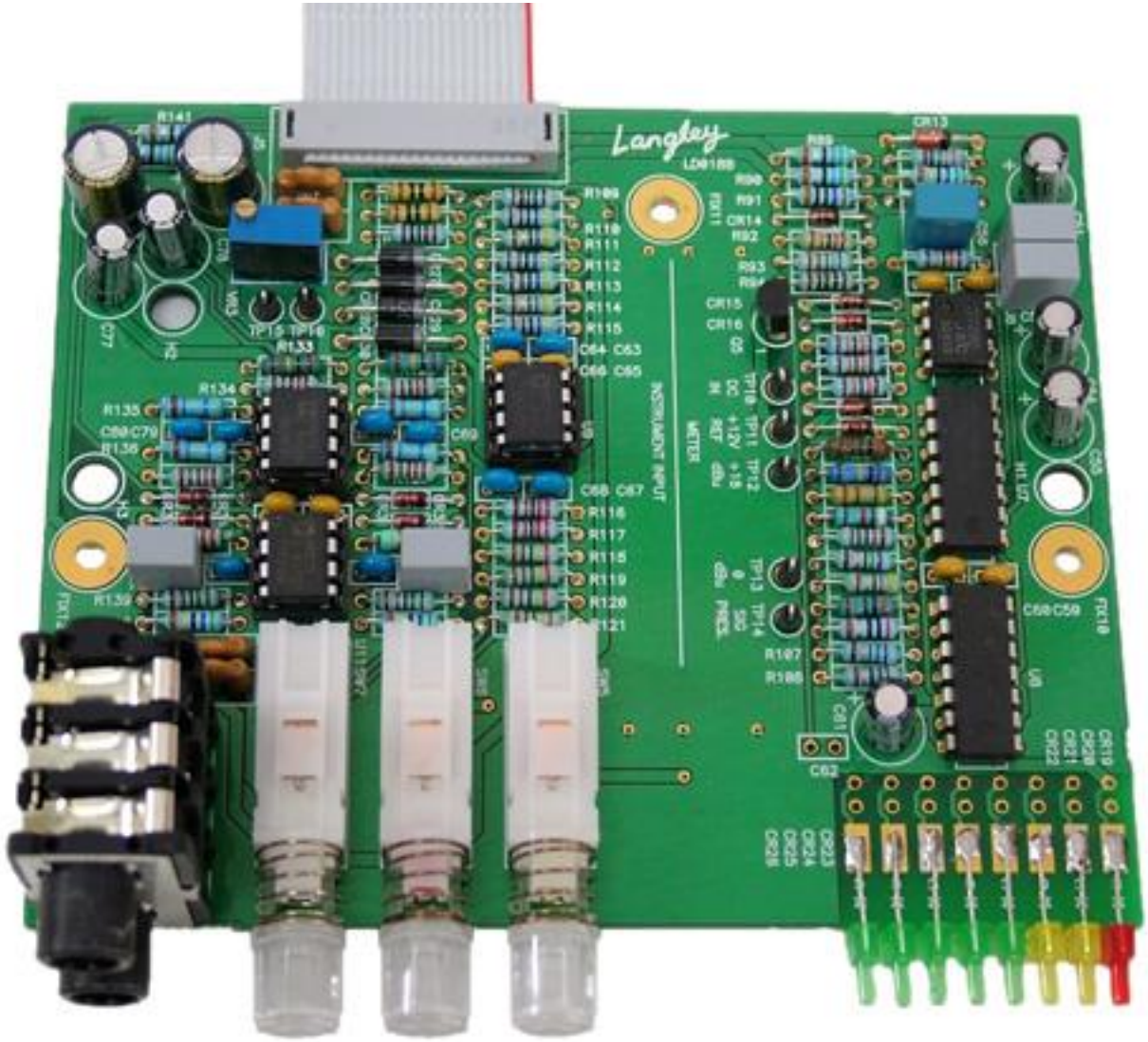




LD018B INSTRUMENT INPUT / METER BOARD (ZOOM IN TO ENLARGE).



WARNING: DO NOT FIT IC SOCKETS FOR U6, U7 & U8

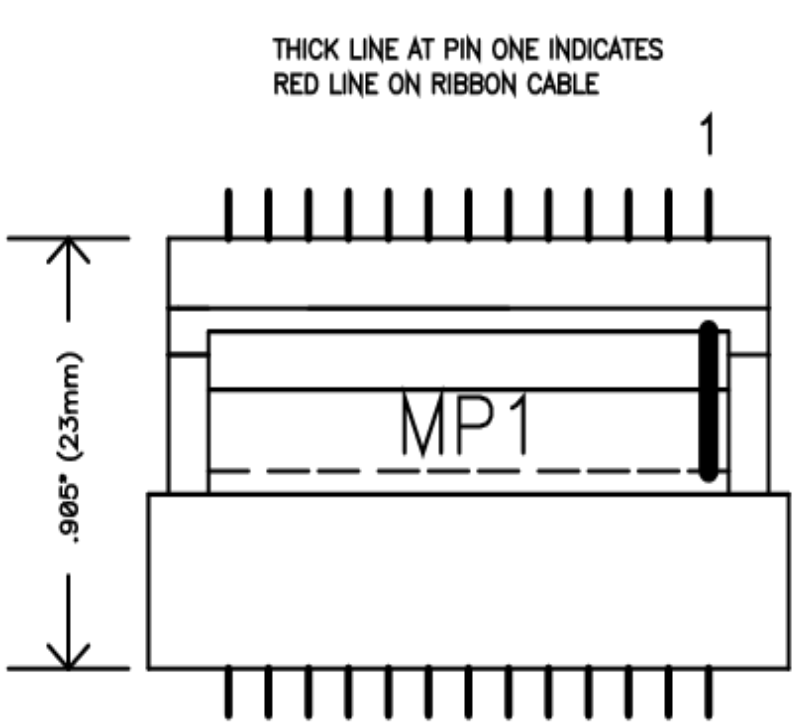


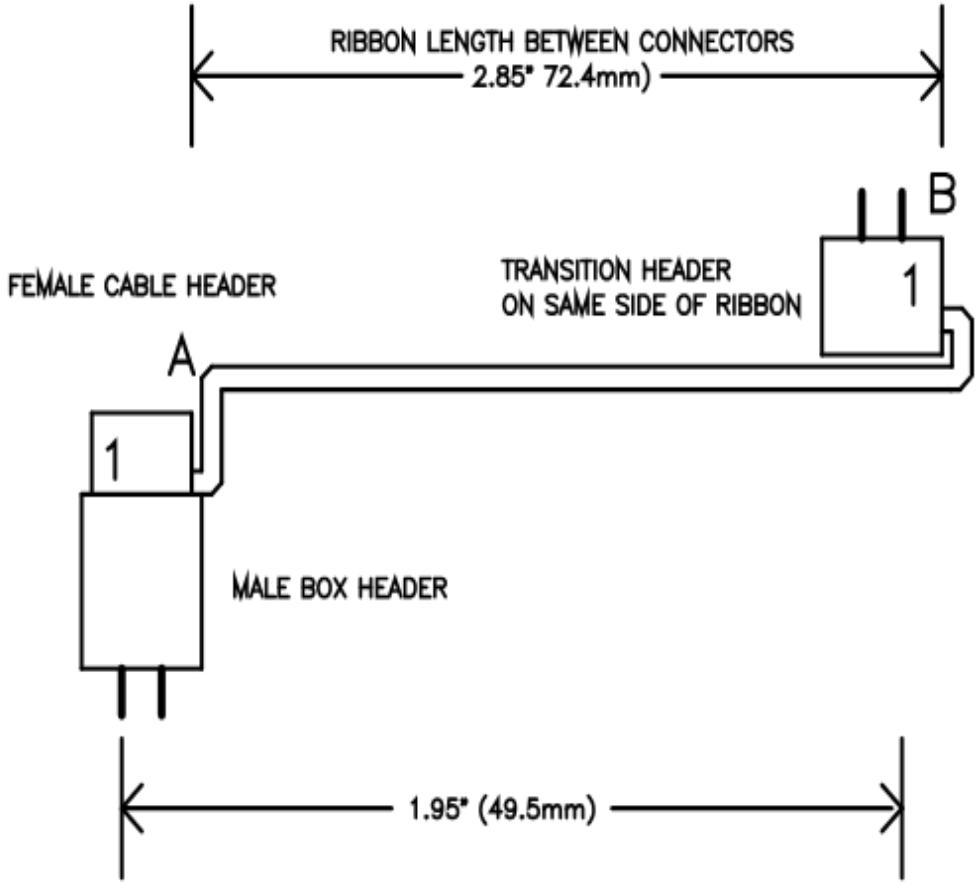
LD018B INSTRUMENT INPUT / METER BOARD ASSEMBLED.

WARNING: DO NOT FIT IC SOCKETS FOR U6, U7 and U8 DUE TO HEIGHT RESTRICTION.

MICPRE ONE RIBBON CABLE

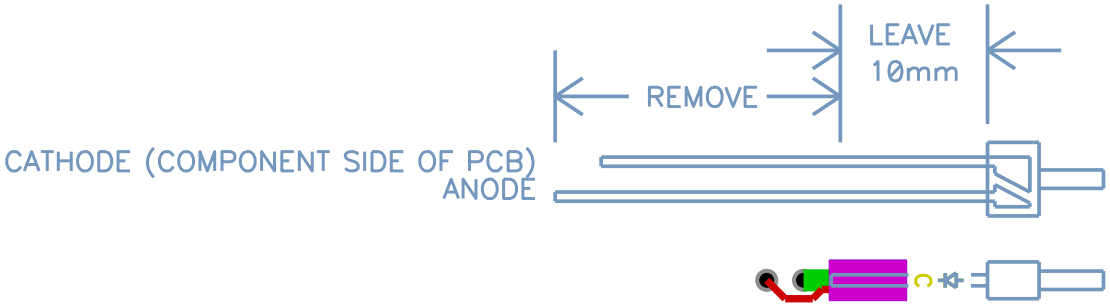
NOTE: NO STRAIN RELIEF IS FITTED ON FEMALE CABLE HEADER





26 WAY RIBBON LENGTH
BETWEEN A AND B = 2.85" (72.4mm)
THIS ALLOWS A LITTLE SLACK.

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.

A "C" on the silkscreen indicates the cathode position.

Tack-solder the LED in line with the two holes, as far as from the plastic as possible.

Repeat this for all other LEDs in the bar.

Using the faceplate as a jig, align the LEDs correctly (see below image).

Trim the anode leads to 10mm and solder to the pads (on the solder side of the PCB).

Resolder the cathodes making any necessary realignment adjustments.

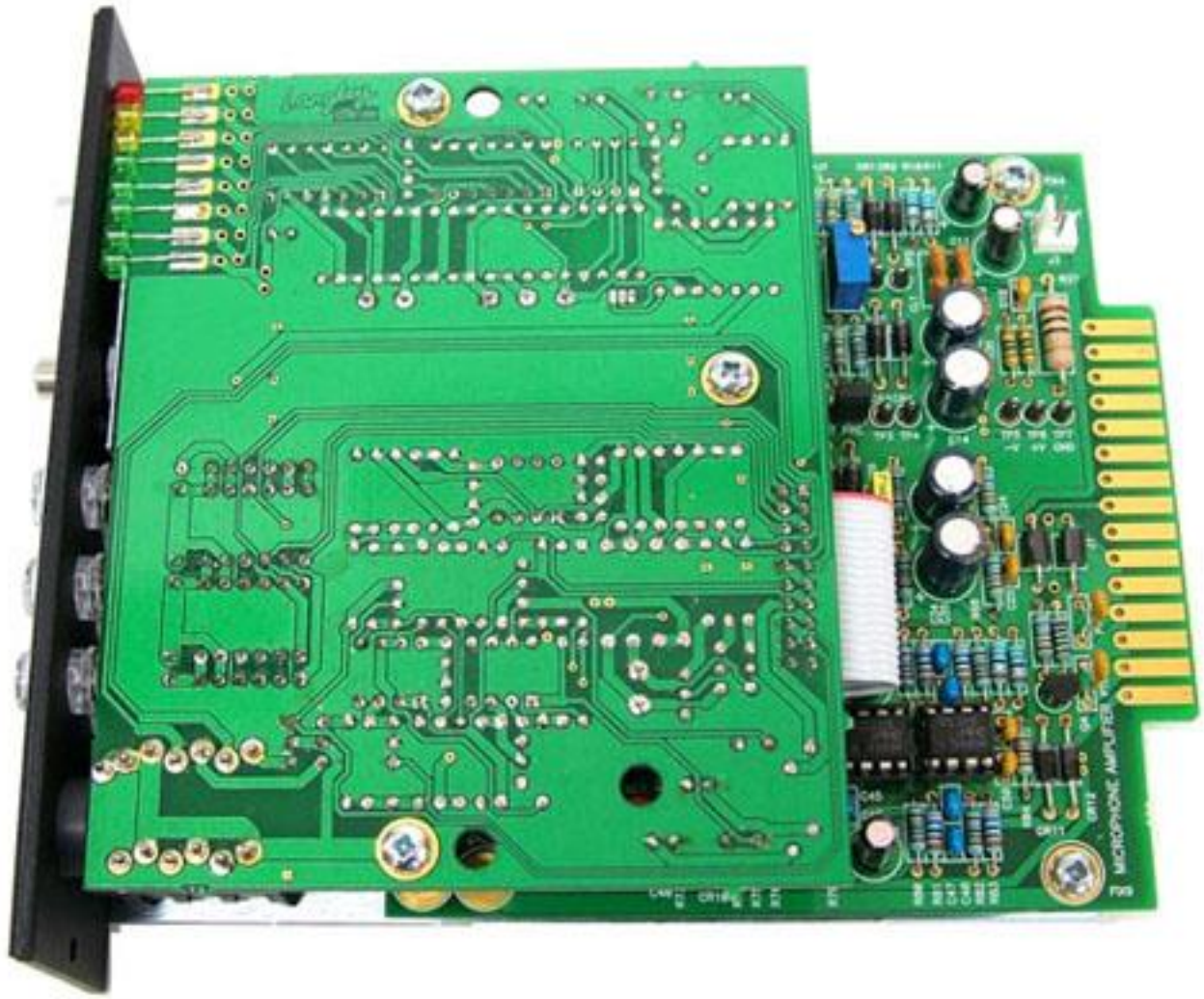
DO NOT APPLY HEAT FOR MORE THAN A FEW SECONDS OTHERWISE THE

LEDs MAY BE DAMAGED.

To fit the LD018B board to the assembly, plug the ribbon cable header into the socket.

Fit the spacers onto the jack socket.

Lower the LD017B board down onto the pillars while holding it a few mm back from the faceplate. It might help to depress the three switches. Gently slide the LD018B forward and fix to the pillars using M3 screws.



Fit the self-tapping screw for the Instrument/Thru jack.

Fit the gain knob. Turn the fader potentiometer to bring the flat part of the shaft to the left to allow the hex key to keep straight.

Push fit the fader knob.

LED AND KNOB COLOUR CODING:

LOZ	Red
+48V	Yellow
HPF	Green
PH	Red
INPUT	Blue
MON	Blue
Fader	Black pointer
Gain	Red pointer

APPLICATIONS:

1) INPUT SWITCH - **INPUT**

Pressing this selects the instrument input front panel jack as the source for the preamplifier.

2) "**MON**" SWITCH

This switch sources the front panel "THRU" jack socket from the main path.
The output can therefore be used as a zero latency monitor output.

If the main path source is the instrument input this output also function as an amplifier feed taking advantage of the gain and filtering facilities.

3) HIGH PASS FILTER SWITCH - **HPF**

This prevents low frequency breath noise and pops being amplified. It is also useful to reduce spillage from other low frequency signals. It operates on both the mic and instrument inputs.

It is a first order filter on the input of the main amplifying stage. The filter lowers the input impedance seen by the microphone in a frequency dependent manner. It also alters the source impedance seen by the micamp which will increase the LF noise marginally when in use. The attenuation is limited to approx. 20dB

4) IMPEDANCE SWITCH - **LOZ**

Microphones are voltage generators and will perform in a similar manner into input impedances of 1000 to 10000ohms.

The normal input impedance is nominally 5000 ohms. With the LoZ switch pressed, this becomes 600 ohms. Pressing the high pass filter switch reduces the input impedance in both cases.

The microphone input impedance varies depending on the switch combinations used. These can therefore be used to add colour or add character to the sound.

The switch can also be used to change the instrument input impedance. An internal jumper can select this to be unchanged, 10k ohms or 50k ohms.

5) PHASE SWITCH - **PH**

This provides phase reversal on the main path or “MON” path.

6) PHANTOM POWER SWITCH - **48V**

This applies phantom power for the microphone.

7) METER

This is an 8 segment display. The Signal Present (SP) LED illuminates at approx. -18dBu. The response of the main bar approximates that of a PPM, while the +18 LED has faster attack and slower decay to catch peaks.

8) GAIN

0dB to 66dB of gain is selected in 6dB steps

9) FADER

Provides an additional 4dB of gain and up to 24dB of control to adjust between switch settings and also to attenuate the final output to suit consumer interface.

APPLYING POWER:

For applying power you may either fit the module to the rack or use an extender cable/connector adapter. However, for SYMMETRY and CMRR trimming using an extender cable/connector adapter would be convenient. Below pictures assume the use of an extender/adapter.

Before applying power visually check and inspect the module one last time.

Check that no ICs are inserted the wrong way round.

Have the LD018 card removed from the faceplate but plugged into the main LD017 card:

Fold it back so that the component side of both cards is visible:

Use a piece of cardboard, plastic or similar material to insulate the back of the LD018 card from the LD017.

After switching the module on do the following checks.

Do all the illuminated switches light up on pressing them?

The bargraph meter may initially light up but should stabilise with no LEDs illuminated.

Does anything smell of burning or feel excessively warm. If so switch off. Wait a short time then switch on power again and try to locate the component that is warm.

INITIAL MEASUREMENTS:

If all seems well, using a DC voltmeter measure each of the test points referenced to GND (TP7).

All these figures are nominal and can vary due to component tolerances, particularly with output offset voltages. However, large deviations may indicate a fault.

1). Measure the supply voltages. Note that approx. 250mV is dropped across the PTCs at the quiescent current of about 120-130mA.

TP5	-15.78V	-VDc
TP6	+15.80V	+VDc
TP7	0V	GND

2). Measure the current consumption if possible.
With no input signal they should be 78mA on the positive rail and 63mA on the negative rail.
The higher current on the positive rail is mainly due to the voltage reference for the meter.

TP3	-1.65mV	Pre fader Lo
TP4	+3.46mV	Pre fader Hi
TP8	+152mV	Preamp input Lo
TP9	+154mV	Preamp input Hi
TP10	+7.09mV	DC input to meter
TP11	+11.97V	12V meter reference
TP12	+3.917V	+18dB meter reference
TP13	+526.6mV	0dB meter reference
TP14	+61.93mV	Sig present meter reference

Below voltages will have to be confirmed after OUTPUT SYMMETRY Trimming.

TP1	-2.57mV	Main output Lo
TP2	-2.66mV	Main output Hi
TP15	-3.85mV	Thru output Lo
TP16	-3.68mV	Thru output Hi

However, SYMMETRY trimming is an optional feature and if you choose not to do it your MICPRE ONE will still give a superior performance. Strictly speaking in great majority of the cases most will not even know the difference. But it is included for those who demand to perfect the perfection.

If you do not have the means to carry out this operation skip the OUTPUT SYMMETRY section and follow the below procedure.

- Manually adjust the wiper of VR2 & VR3 to their mid positions by measuring both sides with your multimeter before fitting them into their places on the main and instrument/meter boards respectively.

- Or omit VR2 and VR3 altogether.

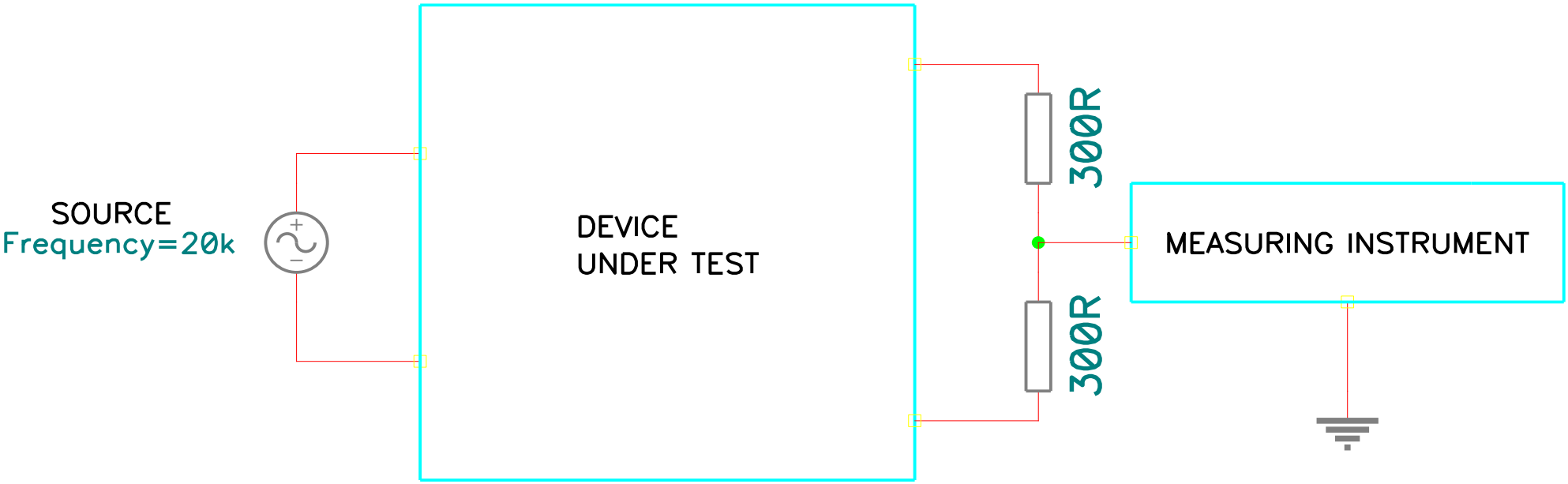
OUTPUT SYMMETRY:

Symmetry is a measure of how much the device can suppress common-mode signals at its output.

Symmetry is ideally measured with a balanced output level of +20dBu.

The gain of the signal path should remain as close to unity gain as possible to minimise noise contribution at the output.

Symmetry is measured at the junction of two closely matched 300R resistors (600R load) and trimmed to achieve a null at 20kHz.



OUTPUT SYMMETRY TEST SETUP

PROCEDURE:

Make a normal balanced connection to the device under test as shown above.

Connect the measuring instrument using two 300R closely matched resistors as shown above.

Set the gain control no higher than 40dB (A typical, practical setting), otherwise noise generated by the circuit may affect the results.

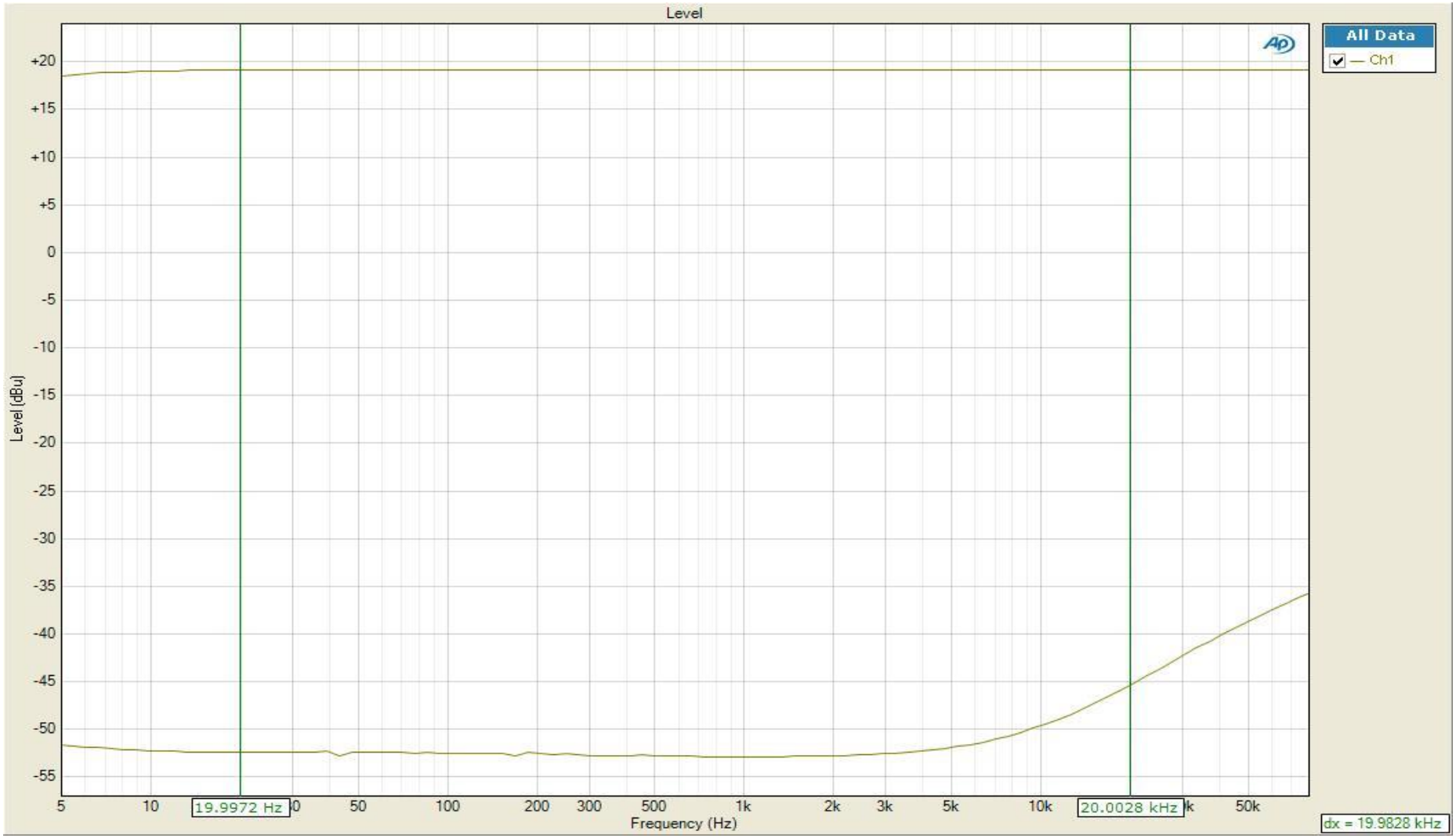
On the signal generator, select low output impedance and a frequency of 20kHz.

Adjust the signal generator level to obtain an output from the device under test of +20dBu.

Adjust the input SYMMETRY trimmer for minimum output and note the level if required.

A typical frequency sweep of SYMMETRY is shown below.

TYPICAL AP PLOT OF OUTPUT SYMMETRY FOR DISCRETE CROSS-COUPLED OUTPUT



The top curve is the normal output feeding 600R.
The bottom curve is the trimmed symmetry signal.

CMRR (COMMON MODE REJECTION RATIO)

The CMRR is a measure of how much the device can suppress common-mode signals at its input.

Therefore, for best rejection performance the capacitors on each input leg should be the same (100pF).

This is achieved by adjusting VC1 (6-50pF variable capacitor) and monitoring the output.

If you do not have the facility to carry out this operation please skip the CMRR MEASUREMENT section and follow below procedure.

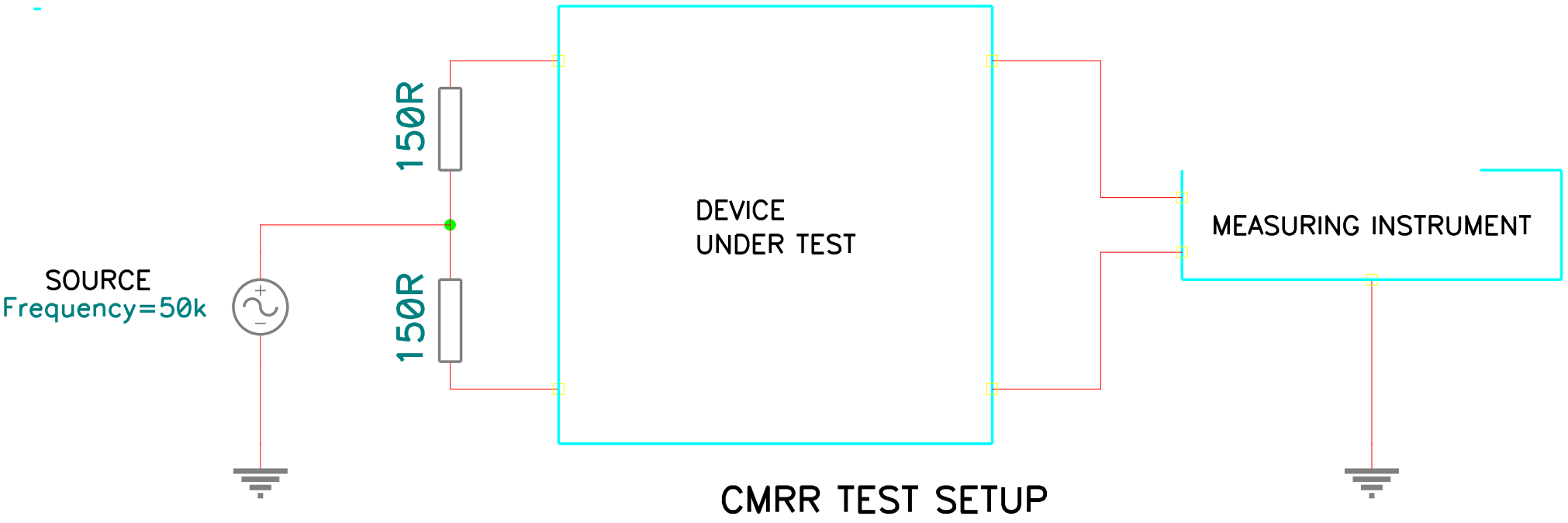
- Omit C40, C42 and VC1 and replace C40 by 100pF to match C28 (100pF).

Normally the CMRR will only end up being “reasonable” unless these two capacitors (C28 and C40) are closely matched. To meet this requirement as close as possible the capacitors included in the kit are high tolerance type and from the same batch. However, we should not read too much into this as these capacitances will most likely be swamped by the varying cable capacitance.

CMRR MEASUREMENT:

The CMRR test uses a precision 150R resistor in each input leg.

CMRR trimming should take place at 50 kHz, or not less than 20 kHz.



CMRR TEST SETUP

PROCEDURE:

Make the balanced connection using two 150R precision resistors and connect the signal generator to the device under test as shown above.

On the signal generator, select low output impedance and a frequency of 50kHz.

Adjust the signal generator level to obtain an output from the device under test of +20dBu.

Set the gain control no higher than 40dB (A typical, practical setting), otherwise noise generated by the circuit may affect the results.

Adjust the input CMRR trimmer VC1 (6-50pF variable capacitor) for minimum output and note the level if required.

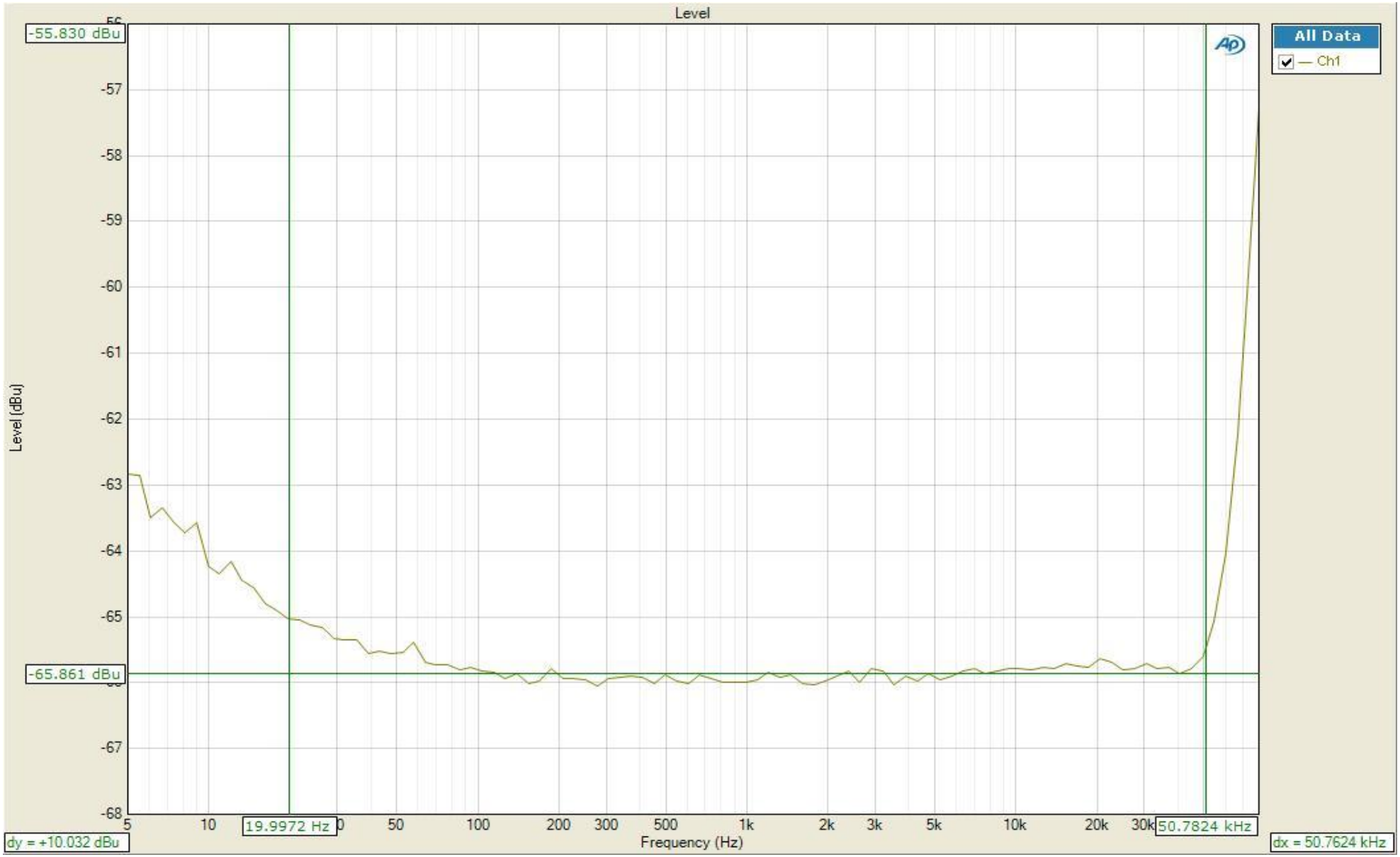
A typical frequency sweep of CMRR is shown below.

The curve is relative to a +20dB output and the circuit therefore achieves about –85dB at 50kHz. If noise filtering were applied mid band results would be improved.

There is slight reduction of CMRR at low frequencies due to the tolerance of the input capacitors.

The CMRR obtainable is dependent on the source impedance and any imbalance between components in the HI and LO signal paths. CMRR worsens with increasing source impedance for a given trimmer setting.

TYPICAL AP PLOT OF MIC INPUT CMRR WITH 150R SOURCE



SIGNAL PATH TESTS:

These tests should be carried out using balanced input and output signals.
Input signals should be from a low impedance source and the output load should be greater than10k ohms.

Turn the gain switch to 0dB and the fader to fully clockwise.
Ensure that none of the illuminated switches are pressed.
Connect a 1kHz signal of 0dB (0.775V RMS) to the mic input.

The meter should read with all green LEDs illuminated.
A signal of approximately +4dBu should appear at the MAIN output.

Press the MON switch. A signal of approximately +4dBu should appear at the THRU output.

Remove the signal from the mic input, de-select the MON switch and apply a 1kHz signal of 0dB (0.775V RMS) to the Instrument/ Line input.

The meter should not read and a signal of 0dBu should appear at the THRU output.

Press the INPUT switch. A signal of approximately +4dBu should appear at the MAIN output and he meter should read with all green LEDs illuminated.

Once these tests have been carried out it is known that the module basically works.

FURTHER SIGNAL PATH TESTS:

These are best carried out with an audio source, microphone, instrument or recorded music, as appropriate.

1). Check the gain switch operates with 6dB between each step. Appropriate signal levels will have to be applied otherwise distortion will occur at high gains.

2). Check that the fader operates correctly. The “0” point is only a nominal indication for a unity gain path. The fader provides approximately 20dB attenuation when fully anticlockwise.

3). Check the HP switch. There should be a loss of low frequencies when engaged.

4). Check the LoZ switch. This may be difficult to evaluate, but will cause a tonal changed when operated. The effect is source dependent.

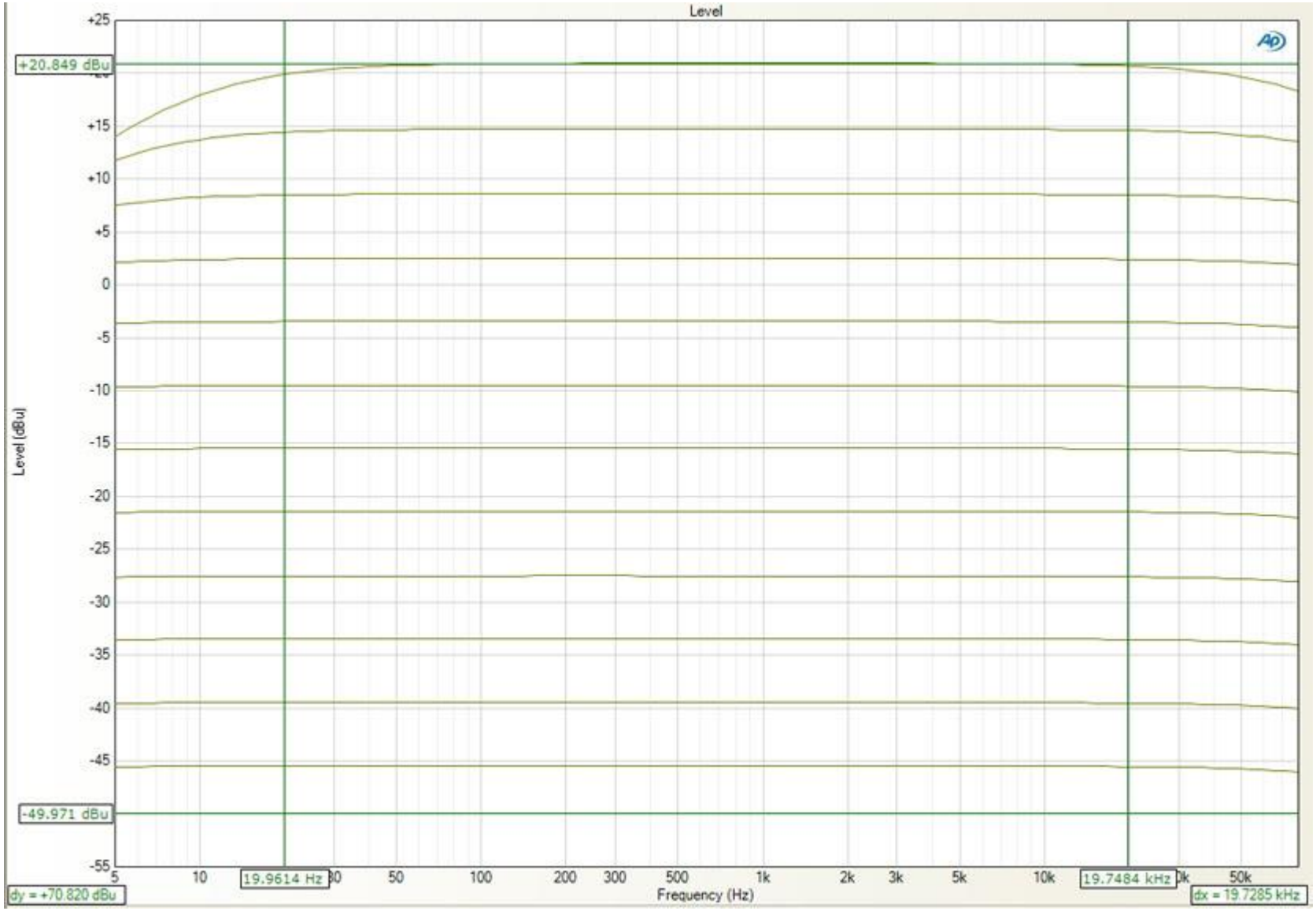
5). Check the PHASE switch. There should be no level change when operated.

6). Check that the +48V phantom power switch operates.

Switches related to the changes on the input will cause clicks when activated, particularly at high gains. This is to be expected.

CURVES:

FREQUENCY VERSUS GAIN



FREQUENCY RESPONSE -3dB