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Bob;

In regard to the comment I made regarding 82E149 preamp being dumb requires, in fairness to your evaluation, a few explanations which may not have been obvious in the documentation sent you.

The problem occurs due to the nature of the transducer interface. Most high quality "condenser" microphones require phantom power of 12-48V DC. This potential is supplied by the signal leads, tip and ring if you will, with respect to sleeve. On most consoles it is 48V sourced by 6.8K resistors. On the 82E149 they are R9 and R10. Most microphones load lightly, so 40-48V is present from both tip and ring with respect to sleeve. Hopefully, no dial tone is supplied.

This high voltage places demands on several components with respect to noise and stress. Input coupling capacitor leakage current can be significant. Aluminum electrolytics are used since we've already ruled out tantalums for audio. Low leakage Panasonic caps are usually OK; pedestrian brands are sometimes problematic.

Unswitched 48V is applied continuously via R11 and R12 to keep C13-16 biased. Switched 48V, phantom on condition, is applied at pin 2. This capacitor biasing scheme makes good sense, but with phantom either on or off large voltages are blocked by the input caps.

To preserve LF CMMR, the caps must be well matched.

Noisy resistors are common at 48V. R8 and R107 on the 82E149 are particularly useless with 480 uA of current flowing through them presumably to discharge C13 and C15. Some brands of resistors sound bubbly. I found it to be smarter to put a bleeder across C12 and discharge C13 and C15 through R9 and R10. Removal of R8 and R107 and the corresponding noise contribution makes a big difference considering its' followed by as much as 60 db of gain!

Many consoles do not have individual phantom off switches on the channels, and even if they do, are usually left on. Input transistors and protection diodes take large hits as microphones are patched with miniature tip, ring, sleeve cords. Powering cycling the console, bad mic cables, large potential differences (ie sparks from the guitar strings to mic stand), and patching take their toll on the superb noise performance of the LM349's. Usually the degradation is slow, but sometimes you'll find D1-D4, or TR1-2 shorted. Hmm...

I've commissioned about 30 of these consoles when they were originally delivered to the client. On a 48 input desk I'd allow about a half day or more to get the active mic preamps checked out and happening. (This was after final test!)

The transformer based preamps SSL supplies usually worked and I'd be moving on in about 15 minutes to another part of the console. Occasionally you'd have to loosen the transformer mounting screws slightly to reduce microphonics (they were mounted with rubber grommets) or change a single 5534. If I heard noise I knew where to look. With the 82E149 I had lots of places to look!

When it comes to mic preamps most silicon solutions are worth about what you pay for them. With a transformer you have virtually noiseless voltage gain (150R-25K impedance transformation), galvanic isolation, relative immunity to input faults and other 48V abuse. Transformers block DC just fine. Care must be taken not to magnetize the core, second harmonic distortion comes up if you do, but hot signals usually demagnetize them.

People spend thousands for transformer input, vacuum tube or discrete transistor class A discrete preamps when an LM349/5534 or SSM/ADI integrated solution is available at a tenth the cost.

When the 5534 became available active mic preamps were a selling point. After our industry listened for awhile we decided we liked the sound and robustness of nickle steel better than aluminum and silicon.

What makes the 82E149 dumb, and other silicon solutions to this problem is that it wasn't designed for the real world. The input source is not a termination resistor or padded oscillator. The real world is a hostile place full of stored charges, noisy resistors, and imperfect capacitors. Low noise audio pots don't like having DC in them, but I often find op amp DC feedback loops closed by them in high gain preamps.

Circuits have to be designed to work not only now, but in the future after the components age. What will the power supplies' line dropout voltage be after the filter caps have lost 20% of their value due to age? With DC in it will that pot be as quiet a year from now? Will that switch or relay contact work well at 10ua of signal level five years from now?

Thanks for your reply to my letter. I apologize for not getting back to you sooner. Business is good!

Sincerely;

Wayne Kirkwood

PS: 2/23/93. I wrote this letter and got side tracked and didn't mail it. Also enclosed is a copy of two articles I've received since writing this letter to you. While AN-242 from Analog Devices addresses this problem (and actually attempts to destroy their preamp with MOSFET generated switches) I know from experience the real world is not this friendly. Also included is an RF Design article on hFE degradation due to avalanche.

Business really slowed down after the election so I have lots of creative time! Good to see the spreadsheet bit in print!

Dennis
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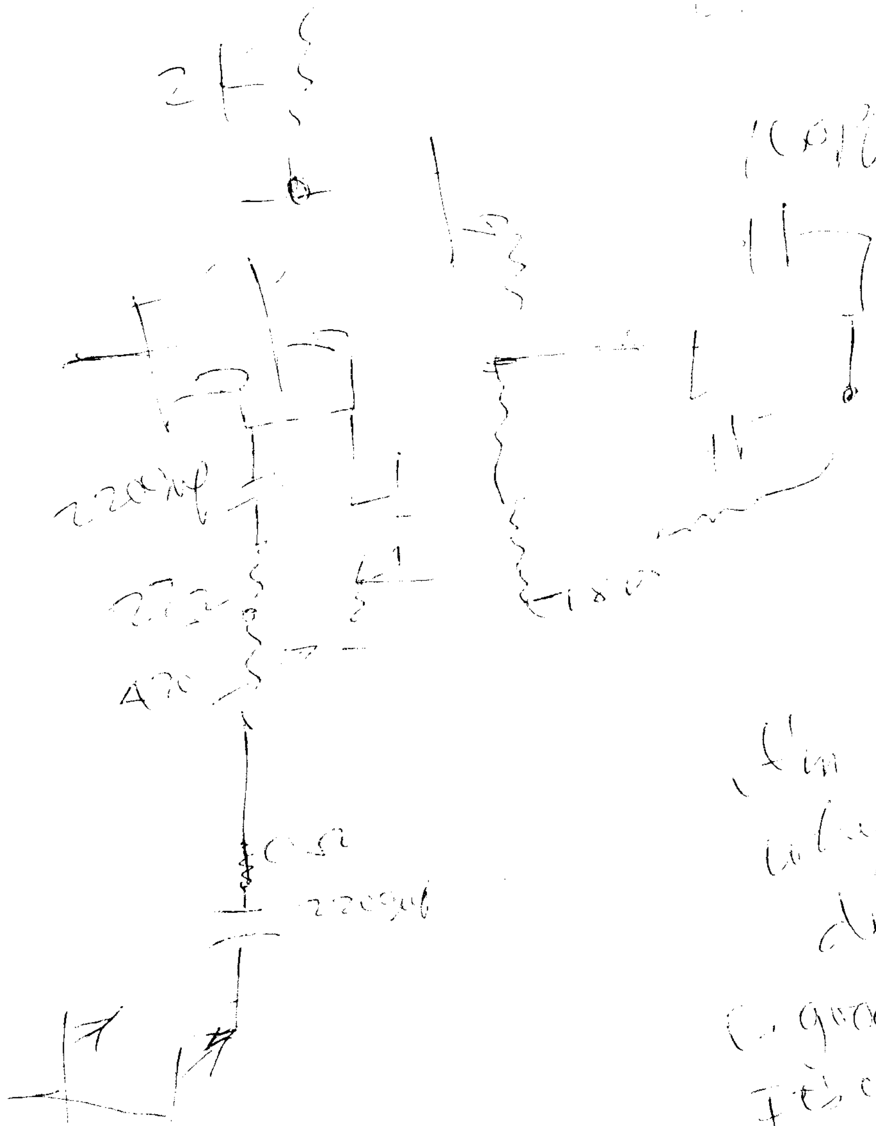
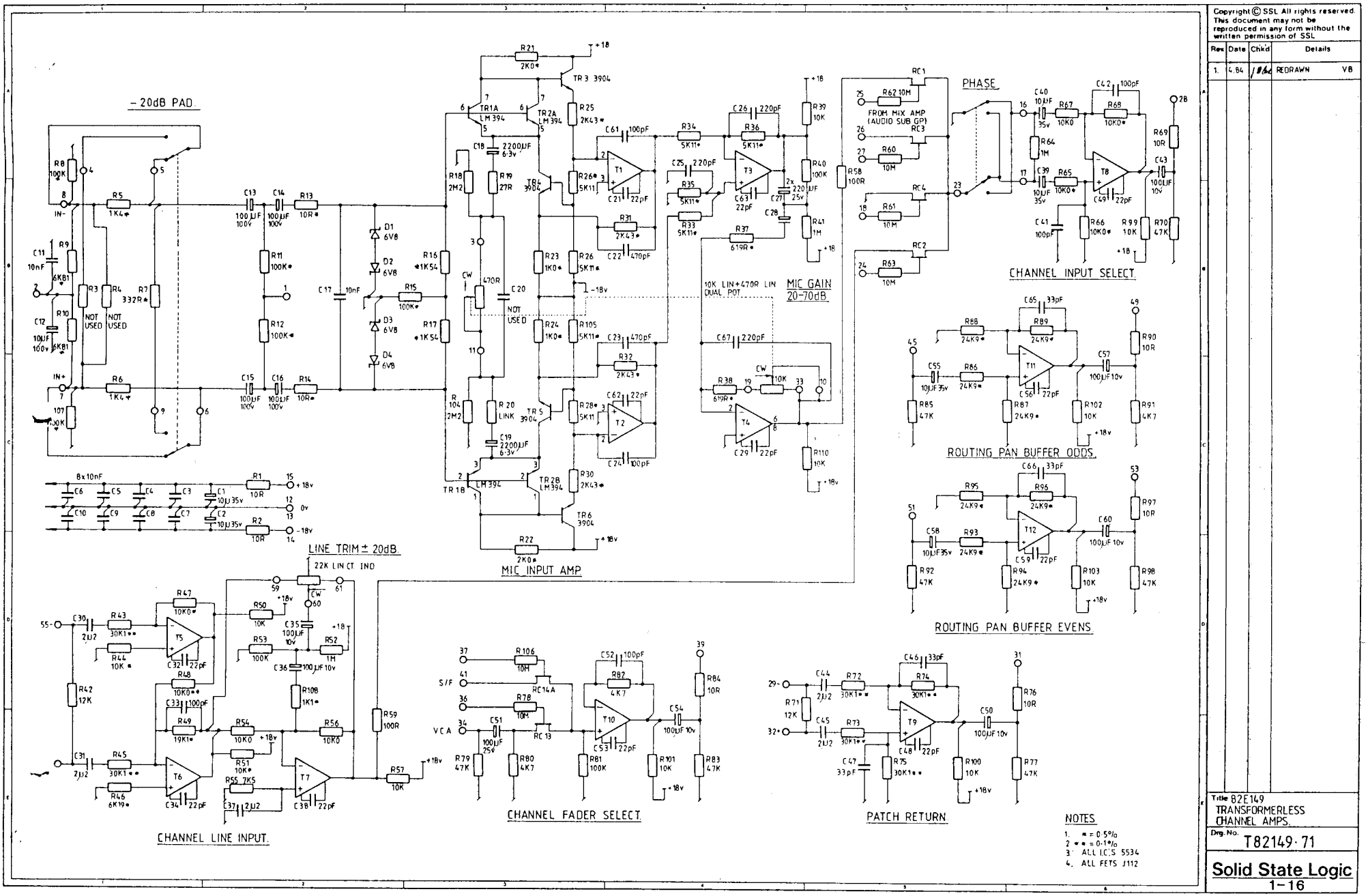
Thermal noise
Channel type?



OK.

center Lw

I'm not sure
why you say it's
dumb. The LM394
is good & low noise.
It's connected Y2 & Y2,
It doesn't look very dumb.
Some of signals are small,
— Comments?/KW



Rev.	Date	Chkd	Details
1.	4.84		REDRAWN VB

Title B2E149
TRANSFORMERLESS CHANNEL AMPS.

Drg. No. T82149·71

Solid State Logic
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