Date: Mon, 18 Nov 2002 22:45:20 -0500
From: "elmacaco"
Subject: VCO 4D

      Just finished building one of these. They are a little different than the
      SBM osc's which I have been using. So I made a few changes.

      I added a 4.7k resistor from the 383 pin 1 to V+ to square up the pulse
      wave and make it go bi polar. (Harry's old tip.)

      The output levels are a bit strange. Sine and tri are about 5V p-p, but
      saw and square were only 1v p-p. Had a quick look at the schematic and I
      changed the output resistors of the saw and pulse.

      Saw output resistor is R30 100K, Swapped it for a 1k like the sine & tri.
      that got it to 5V.

      Pulse wave R41 from 470K to 33k for 12V p-p from +6V to -6V (bipolarity
      product of the 383 pin one mod) I need +6 to trigger eg's and for deep
      modulations stuff.

      I don't know if this is a bad idea for any reason, so if I blow something
      up I'll let you all know. I suspect it is ok. I hope that may be of use to
      some people.

      Eduardo

 Date: Sun, 17 Nov 2002 23:09:37 -0500
From: harrybissell
Subject: Re: VCO 4D

      The resistors for square and saw are the right values to make the outputs
      "sound" about equally loud... but they have to assume some (high) input
      impedance. If you drive a low impedance... they are toast (like 470K / 1K
      ain't much signal, na?)

      My latest is to use an LM329D (yeah sure the 329A is better... but at
      50ppm max temperature drift the -D which I have in stock... is good
      enough). I sub this part for the lower resistor in the divider that sets
      the reset amplitude point. This makes the sawtooth immune to any power
      supply variations and will help keep your LFOs etc (esp if you use
      LEDs...) from modulating your VCO.

      This will fuck up the sine wave resistors and the triangle wave resistors
      as well... but hey thats what mods are all about.

      I'm thrilled with the idea of the LM3900 ARP filter btw....

      H^) harry

      ps. Eduardo is not just bragging... he HAS become dangerous. Soon he will
      have to register his soldering iron with the BATF... ;^)

Date: Sun, 17 Nov 2002 22:30:58 -0800
From: "tomg"
Subject: Re: VCO 4D

    Don't get too excited....It looks like you'll have to match 6 pair of
    2N3096s for the best performance....I originally designed it for 798s but
    they are impossible to come by in quantify...so... You only need 4 pair
    that are close the other two just need to be close to each other. I guess
    if you had 798s you could hack 'em on but the pad layout would make it a
    little tough. It works pretty well with anything out of the bin but
    matching is better.

    Tom

Date: Sun, 17 Nov 2002 23:33:24 -0500
From: harrybissell
Subject: Re: VCO 4D

    Well unless you really SLAY me with the layout I could hack it. I just put
    some 2SC3381 pairs into the VCF2e... they work way better than random
    pairs, that is certain.Sad about the 2SA798... it was a great PNP pair.
    The 2SA1349 is getting hard to find as well...I could use MAT 03 ($$$) and
    pretend its an MOTM module ;^PI don't know... should I build it with the
    12K resistors for the classic (wrong) sound ???

Date: Wed, 29 Jan 2003 11:33:42 +0100
From: std-
Subject: VCO4D tuning questions

    Hi List I built Tom's VCO4D and it sounds ugly (because it is not tuned
    yet :-) So, anybody has any suggestion of a "protocol" how to tune this
    VCO (step by step ...) It is my first VCO, so no reference (except a
    crimpy "virtual-analoge" AN1x)

    thanks for help cheers, Stefan

Date: Wed, 29 Jan 2003 08:34:31 -0500
From: "elmacaco"
Subject: Re: VCO4D tuning questions

    check the sbm assembly manual in the files section of EFM support

Date: Fri, 14 Feb 2003 05:37:34 -0000
From: "pmclean_80207 "
Subject: VCO4D (not VCO3D) pulse wave problem

    Can anybody help? I've completed a VC04D (not a 3D as I said in my
    previous post).
    Everything is find except the pulse output. it goes from -10V to 0V, with
    a very curved leading edge. With very narrow pulse-width it can't even get
    up to 0V and "blinks out" at - 10V. Shouldn't the range be either all
    positive (as with the sawtooth output) or centered around 0V?
    Thoughts anyone?
    Thanks, Paul McLean

Date: Thu, 13 Feb 2003 22:16:59 -0800
From: Scott Bernardi
Subject: Re: VCO4D (not VCO3D) pulse wave problem

    Just looking at the schematic, the pulse output comes from a LM393
    comparator. Shouldn't that have a pullup resistor to the positive supply?
    Try tying a 10K resistor from between pin 1 there and the 470K (R41) to
    the positive supply.

Date: Sat, 15 Feb 2003 02:04:09 -0000
From: "pmclean_80207 "
Subject: Re: VCO4D (not VCO3D) pulse wave problem

    Thanks again Scott, that did the trick (although it is still somewhat
    rounded on the leading edge, hmmm...)

    I wonder why this was necessary(?) (Thoughts Tom?). Musn't I have botched
    something else up along the pulse signal path?

    On the whole, it is a terrific VCO. The linear FM is a dream and the sync
    is totally unlike other VCOs. I'm sure that
    I'll be getting another one as soon as my wife will clear me for another
    Mouser order!

    Thanks again, Paul

Date: Sat, 15 Feb 2003 20:40:35 -0000
From: "pmclean_80207 "
Subject: VCO4D (last!)

    O.K. One more update. The pull-up resistor works great. The rounded-off
    leading edge is apparently an oscilloscope artifact. I put the signal
    through a buffer and low-and-behold it was wonderfully square. I ear-
    tested it by Fming another VCO with the VCO4D pulse wave and nice solid
    trill.

Date: Sat, 15 Feb 2003 17:25:53 -0500
From: "elmacaco"
Subject: Re: VCO4D (not VCO3D) pulse wave problem

    this is a documented fix on the list. search for vco4 and harry.

    iirc he recommends a 4.7k resistor

Date: Wed, 14 May 2003 09:33:39 -0300 (ART)
From: "Ramiro E.J. Tunin"
Subject: Questions about VCO 4D triangle wave glitch.

    Hi: After a long time without building any synth I returned back to what I
    considered an interesting idea: taking a moog prodigy elements to build a
    "simplified moog modular".

    I found the EFM site (the old one) with it's "vault" so I built a group of
    VCO 4A because its simplicity and availability of components (and its
    excellent sawtooth wave).

    My system is "nearly" a moog 55 (without the sequencer module) now, but
    some problems remains very clearly since I found a minimoog at a pawnshop
    two weeks ago (with only a burned CA 3080 in VCO 2...but for only 450
    pesos = 150 U$S -I live in Argentina- you can't say no!)

    The VCO 4A triangle wave glitch was annoying so I remembered an old e-mail
    (by Harry Bissell) about this fault and maked the following:

    #1: I updated the design from VCO 4A to VCO 4D.
    #2: I changed R 13 with a 100 K preset (this changed the quality
        drastically)
    #3: I changed C3 from 470 pf. to 2n7.

    All this worked fine but if you compare the results with a real minimoog
    triangle (considering that the mini's VCOs are based on discrete
    components and only the exponential converter uses ICs) ...it's not
    perfect yet: it sounds like a decent triangle mixed with a VERY subtle
    sawtooth, and specially in the low range. This is more evident when you
    mix two VCOs.

    So, here are my questions:
    a) Does anybody know if the original moog prodigy triangle wave has the
       same "fault" -or "sound"- ?
    b) What else can I do to improve that? (I think it's a problem of wave
       simmetry).

    Thanks to all for reading and have a nice time building authentic (no
    software) analog beasts!

    Ramiro Tunin.

Date: Thu, 15 May 2003 05:30:05 -0700
From: "tomg"
Subject: Re: Questions about VCO 4D triangle wave glitch.

> triangle mixed with a VERY subtle sawtooth, ...Does anybody know if
> the original moog prodigy triangle wave has the same "fault" -or
> "sound"- ?

Actually, yes I do...I picked up one from the guys on AH a couple of years
ago....and guess what...It sure does. The 4A actually looks a little
better because the 4A saw looks a little better too but the sound is right
on despite the nicer waveforms.

> b) What else can I do to improve that? (I think it's a
> problem of wave symmetry).

For a better tri 60K is just about right for R13..... 47K+33K for the
original Moog sound go back to the original value of 75K. A value of 100K
would give you ....for all practical purposes a saw output.

Tom

Try changing R13 and R30 from 100K to 47K
Tom

I used an LM329   (6.9V)
The LM336 (almost the same as LM329) IS a very easy hack into the VCO4d.
Put it in place of the lower resistor on the sawtooth ramp reset level
divider...and make the top resistor something like 1K ohm. Now the ramp
level is 7V ... not bad for a +/-15V supply.
My VCO4d(s) track over a very wide range. More annoying to me is the
unusual signal levels. I did some hacking to get them more normalled. I'd
like to see all the waveforms symmetrical with respect to ground, but it
just ain't that way. At these prices, who cares ???   :^P   After so many
years of having just ONE VCO its a welcome addition in my modular.

H^) harry

Tom Arnold wrote:
I'm playing with my VCO4D's again trying to actually get them properly
tuned and I've got a question... How accurate are these beasts supposed to
be? I tune lo-scale on C1/C2 and hi-scale on C3/C4 when I'm done,
C1/C2/C3/C4/C5 are all on C, C0 is way flat and C6+ are way sharp. I'm
about to go start changing some resistor values in the divider to try and
clean up the sine and triangle (I'm using +-15v not +-12v). I'm just
curious if this is the best I can expect from this VCO. Just outa
curiosity, what do you do for a simple 10v reference? I just happened to
have picked up a large quantity of lm336z-5.0's but thats not exactly a
simple 10v reference to wedge into an existing board. Well, its not
incredably complex but its more then I'd want to retrofit. As you might
have noticed, I gave up on the 4D's, but I'm still curious about your
voltage reference.

On Sun, Sep 11, 2005 at 02:47:11PM -0400, harrybissell wrote:

        I think you are pretty much there. I did mine with premium parts and it
        does not go much further. I used MAT-01 expo pairs.

        I think I changed the value of the reference resistor in the expo to 1M or
        1.5M.... that helped a lot. I also tied that to a precision 10V
        reference, and tied that reference to the ramp reset comparator divider
        string.

        Also, add some decoupling caps RIGHT AT the power header. The onboard caps
        are all the way on the opposite side of the board.

        These tips are for the 4d only. The 4e is a different layout.

        H^) harry