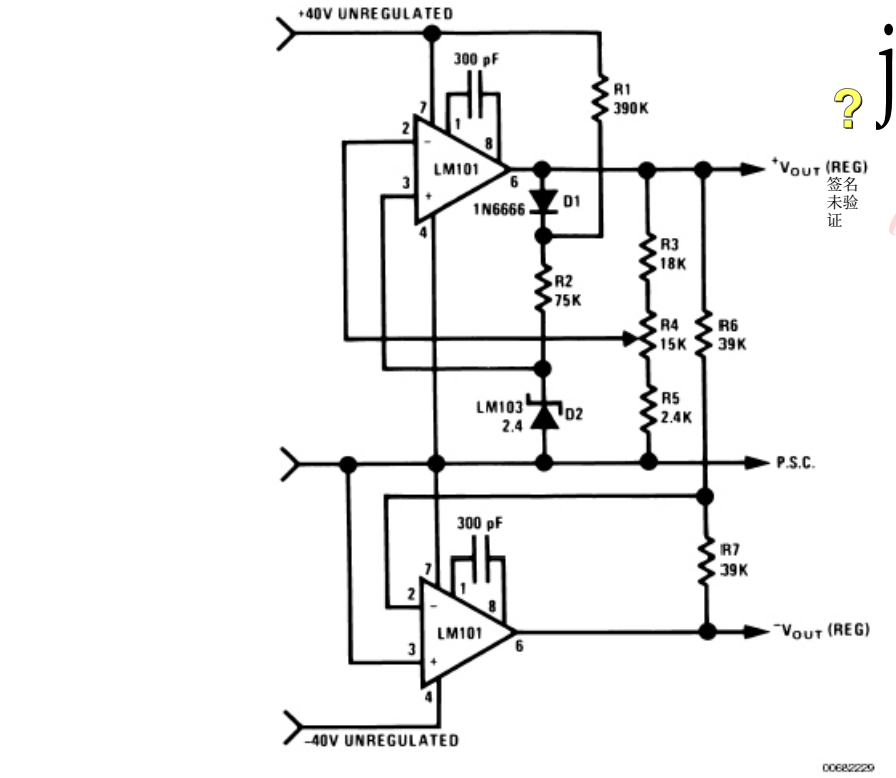
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Output voltage is variable from ±5V to ±35V.
Negative output tracks positive output to within the ratio of R6 to R7.

FIGURE 29. Tracking Power Supply

图 29 的电路是一个输出对称的稳压电源，它非常适合给 OP 供电，这是因为其正负电源电压是对称的，所以电源的共模干扰可以被抑制掉。此外，这个电路比较简洁，仅使用了一个基准电压源和很少的无源器件。

下面从正电源整流部分入手来介绍本电路的原理。正电源整流部分的 OP 对从电位器 R4 取出的电压和稳压管 D2 给出的参考电压进行比较，这两个电压的差值构成 OP 的输入电压；R3、R4、R5 构成了 OP 的负反馈路径，因此 OP 的输出变化趋势会使得输入的差值尽量减小；基准电压源的电流由放大器的输出端提供，这样可以提高对电源的线性范围，使本电路可以适应纹波较大的供电电源。这样一种调节基准电压源的电流的方法需要一个单独的电流源来提供初始启动电流，电阻 R1 和二极管 D1 就起到这个作用：D1 用于在启动时将启动电路和 OP 的输出端隔离开，而输入电源会经 R1 为 D1 提供启动电流。完成启动后，放大器很低的输出阻抗将会降低因流经 R1 的电流不足以影响稳压管上的电压稳定性。

负电源整流部分就是一个简单的单位增益反相器，输入电阻是 R6，反馈电阻是 R7。

图中所用 OP 必须进行单位增益稳定的补偿。如果在电位器 R4 的抽头处注入外接信号，就可以实现供电电源调制。这时，输出正负电压始终对称，变化量相等。

将 D1、D2、R1 和 R2 换成一个可变参考电压源，本电路就变成了一个可控电源。

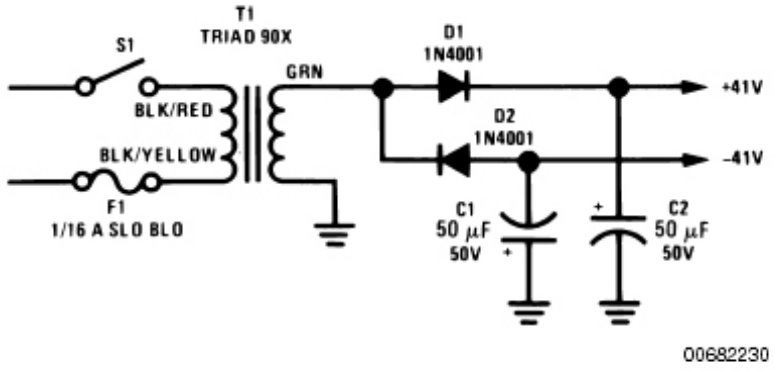
20. Programmable Bench Power Supply

可调的实验电源：

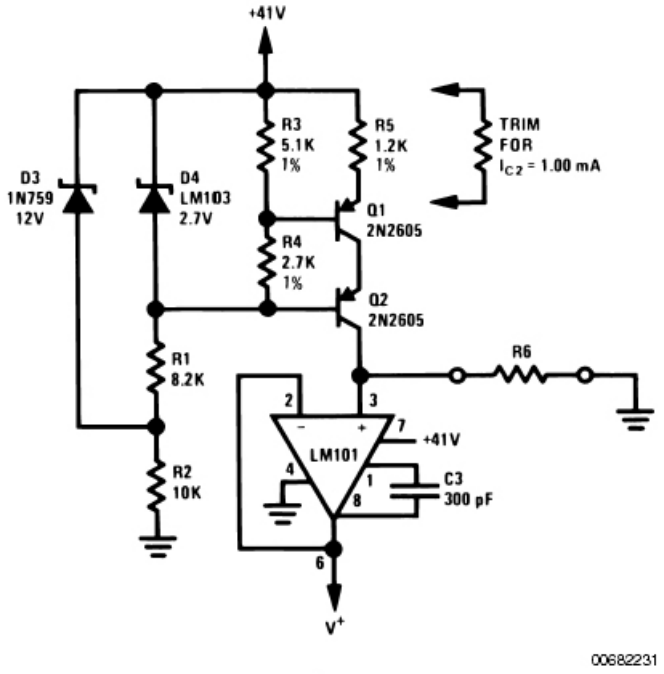
The complete power supply shown in Figure 30 is a programmable positive and negative power supply. The regulator section of the supply comprises two voltage followers whose input is provided by the voltage drop across a reference resistor of a precision current source. Output voltage is variable from ±5V to ±35V. Negative output tracks positive output to within the ratio of R6 to R7.

Programming sensitivity of the positive and negative supply is 1V/100Ω of resistors R6 and R12 respectively. The output voltage of the positive regulator may be varied from approximately +2V to +38V with respect to ground and the negative regulator output voltage may be varied from - 38V to 0V with respect to ground. Since LM107 amplifiers are used, the supplies are inherently short circuit proof. This current limiting feature also serves to protect a test circuit if this supply is used in integrated circuit testing.

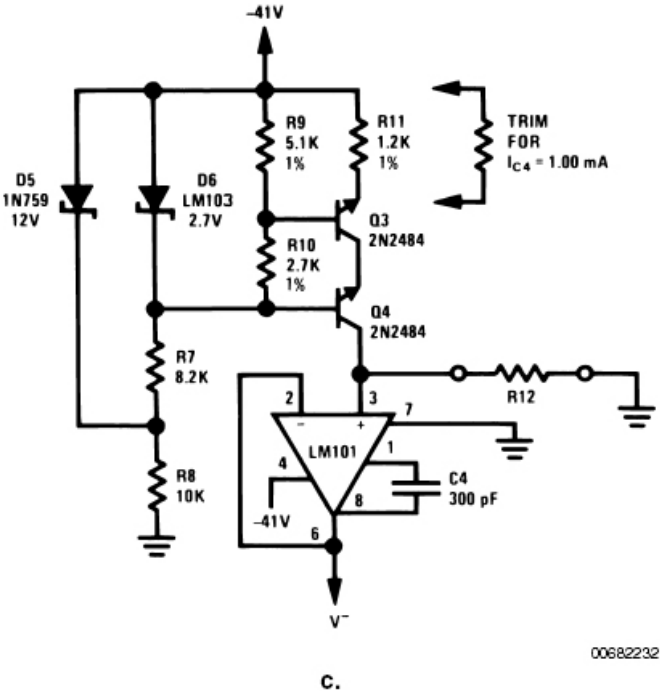
Internally compensated amplifiers may be used in this application if the expected capacitive loading is small. If large capacitive loads are expected, an externally compensated amplifier should be used and the amplifier should be overcompensated for additional stability. Power supply noise may be reduced by bypassing the amplifier inputs to ground with capacitors in the 0.1 to 1.0 μF range.



a.



b.



c.

FIGURE 30. Low-Power Supply for Integrated Circuit Testing

图 30 给出了一个正负输出均可调的电源电路。基准电压源由两个电压跟随器组成，跟随器的输入是精密恒流源的电流在参考电阻上的压降。本电源的输出电压从±5V 至±35V 可调，负电压跟随正电压一起变化，R6/R12（原文中为 R6/R7，疑为作者笔误——译者）决定了二者绝对值之比。

正负电源分别由电阻 R6 和 R12 调整，调整率都是 1V/1000Ω。正电压参考源对地的输出电压为+2V 至+38V，负电压整流器对地的输出电压为-38V 至 0V。由于使用了放大器 LM107（原图中为 LM101，不知是否为作者笔误——译者），此电路具有了短路保护能力。当用这个电源测试集成电路时，这种限流能力可以为被测电路提供保护。

此电路配接较低的容性负载时，可选用内部补偿型运放。如果需要接较大的容性负载，就要选用外部补偿型运放，并且为了提高稳定性还需要进行过补偿。在运放的输入端与地之间加接 0.1μF 至 1.0μF 大小的去耦电容可以降低电源的噪声。

21. Conclusions

结论：

The foregoing circuits are illustrative of the versatility of the integrated operational amplifier and provide a guide to a number of useful applications. The cautions noted in each section will show the more common pitfalls encountered in amplifier usage.

本文述及的电路展示了集成运放放大器的多种运用，给出了 OP 的多种实际应用电路。每个章节中的注意事项列举了很多在应用运放时常见的错误。

22. 附录 I Definition of Terms

术语表：

Input Offset Voltage: That voltage which must be applied between the input terminals through two equal resistances to obtain zero output voltage.	输入失调电压：为了使OP静态输出电压为零，运放的两个输入端对地之间必须有相等的直流电阻。
Input Offset Current: The difference in the currents into the two input terminals when the output is at zero.	输入失调电流：输出电压为零时，流入运放两个输入端的电流的差值。
Input Bias Current: The average of the two input currents.	输入偏置电流：运放静态下两个输入端电流的平均值。
Input Voltage Range: The range of voltages on the input terminals for which the amplifier operates within specifications.	输入电压范围：在保证放大器性能的前提下，输入端允许的电压范围。
Common Mode Rejection Ratio: The ratio of the input voltage range to the peak-to-peak change in input offset voltage over this range.	共模抑制比：输入电压变化对由其引发的输入失调电压峰-峰值变化之比。
Input Resistance: The ratio of the change in input voltage to the change in input current on either input with the other grounded.	输入电阻：当运放的一个输入端接地时，另一个输入端上的输入电压变化量与输入电流变化量之比。
Supply Current: The current required from the power supply to operate the amplifier with no load and the output at zero.	供电电流，在空载及零输出的条件下，OP的工作电流。
Output Voltage Swing: The peak output voltage swing, referred to zero, that can be obtained without clipping.	输出电压摆幅：在不出现削峰的情况下，输出端对地的最大输出电压。
Large-Signal Voltage Gain: The ratio of the output voltage swing to the change in input voltage required to drive the output from zero to this voltage.	大信号电压增益：输出电压摆幅与为了获得该输出摆幅而施加的输入电压变化量之比。
Power Supply Rejection: The ratio of the change in input offset voltage to change in power supply voltage producing it.	电源抑制比：输入失调电压变化量与引起该变化的电源电压变化量之比。
Slew Rate: The internally-limited rate of change in output voltage with a large-amplitude step function applied to the input.	摆速：由OP内部结构所限制的，在OP的输入端加大幅值的阶跃信号，输出端电压的变化速率。

23. References

参考文献：

[1] D.C. Amplifier Stabilized for Zero and Gain . Williams, Tapley, and Clark AIEE Transactions, Vol. 67, 1948.

[2] Active Network Synthesis . K. L. Su, McGraw-Hill Book Co., Inc., New York, New York.

[3] Analog Computation . A. S. Jackson, McGraw-Hill Book Co., Inc., New York, New York.

[4] A Palimpsest on the Electronic Analog Art . H. M. Paynter, Editor. Published by George A. Philbrick Researches, Inc., Boston, Mass.

[5] Drift Compensation Techniques for Integrated D.C. Amplifiers . R. J. Widlar, EDN, June 10, 1968.

[6] A Fast Integrated Voltage Follower With Low Input Current . R. J. Widlar, Microelectronics, Vol. 1 No. 7, June 1968.