Modifying a power supply to add programmability

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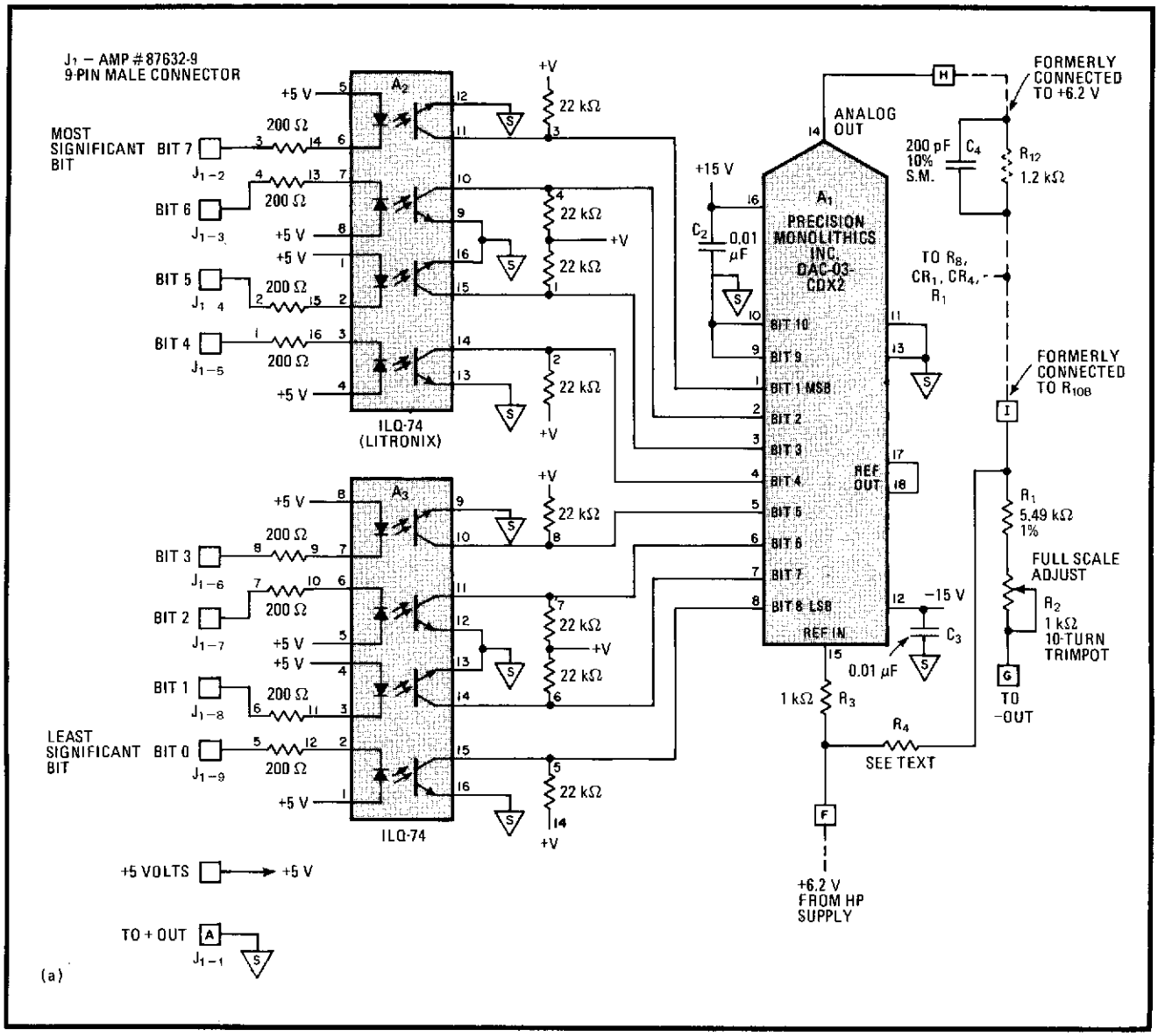
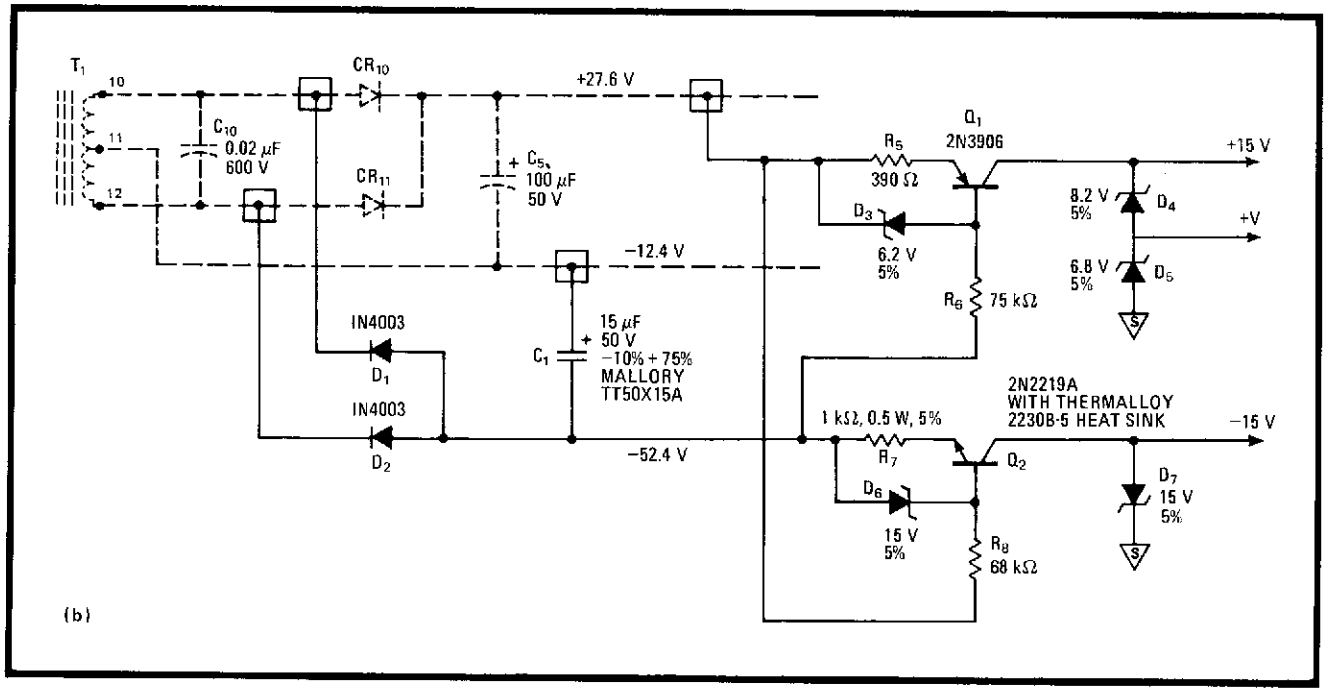
Modifying the commercial bench-type supply is a simple but effective and low-cost solution to the problem of obtaining a programmable power source if the supply's response time is not a primary consideration. Here, members of the popular Hewlett-Packard series (6212A–6218A) are converted by adding opto-isolators and a digital-to-analog converter to their basic circuits so that 8-bit programming capability is achieved. The modification may be completed for less than $50.

The initial changes required are shown in (a), and they are fairly straightforward. The 6.2-volt reference from the supply is disconnected for one end of R_{12} and reconnected to the analog input of A_1, the Precision Monolithics DAC-03-CDX2 d-a converter. C_4 is then mounted directly across R_{12}. The analog output of the converter is reconnected in place of the 6.2-V reference and the supply's front-panel potentiometer, R_{10}, previously used for coarse-voltage adjustment, is replaced by the R_1-R_2-R_4 combination. The digital



Bits of voltage. Adding digital-to-analog converter and optocouplers (a) to bench supply gives the source 8-bit programming capability. Separate power tap (b) for energizing converter is required to eliminate interaction with supply's regulator (not shown).



programming inputs to the converter are isolated from the power supply by A_2 and A_3, the Litronix ILQ-74 optocouplers.

Additions to the section in the reference regulator (not shown) that derives the supply's internal voltages must be made next, as shown in (b), so that the converter can be powered. Note that the components within the dotted line show the standard configuration of the HP supply (this part of the circuit is not modified).

Here, the converter is powered through the circuitry surrounding Q_1 and Q_2. Note that none of the regulator's current can flow into the s terminals, so that regulator operation, which depends on a complex balance of currents to maintain a given output voltage, is not disturbed. C_1 must be in the range of 10 to 30 microfarads to prevent turn-on and turn-off transients from reaching the output of the supply.

The added circuitry can be placed on a printed-circuit board and mounted inside the supply with a small metal bracket bolted to the transformer's mounting screws. As for circuit details, all resistors are ¼-watt carbon-film devices and all capacitors are ceramic-disk types, rated at 25 V, unless otherwise specified. All 200-ohm resistors are contained within a resistor network (Sprague 916C201X5SR). Similarly, the 22-kilohm resistors are contained within the Sprague 914C223X5PE network.

The calibration of the supply is simple. First R_4 is adjusted for a minimum offset voltage at 0 V, and then R_2 is set for a full-scale output voltage of 29.88 V. □

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