

# Substituting THAT 2180- and 2181-Series VCAs for THAT 2150-Series VCAs in Existing Designs

## Abstract

THAT Corporation's 2180- and 2181-series VCAs are pin-for-pin compatible, improved performance replacements for the 2150-series VCAs. Designers may convert existing 2150-series designs to use the 2180/2181 VCAs without making any changes to existing PCB layouts. This application note details the few component value changes and component deletions required to obtain optimum performance with the 2180- and 2181-series VCAs in existing 2150-series designs.

## Choosing the correct VCA

Table 1 shows the correct VCA to use when switching from a THAT 2150-series part to one of the THAT 218x-series. When retrofitting the 218x VCAs, designers may replace the 215x-series VCA with a trimmable VCA or a trimless VCA. For high performance applications, the choice is normally to choose a trimmable 2181Lx or 2181Sx. However, where distortion performance is less critical and trim-free production is a goal, the 2180Lx is the right choice.

Old VCA	Precision	Trimless
THAT 2155	THAT 2181LC or THAT2181SC	THAT 2180LC
THAT 2150A	THAT 2181LB or THAT2181SB	THAT 2180LB
THAT 2151	THAT 2181LA or THAT2181SA	THAT 2180LA

Table 1

## 2180 Series

The 2180-series VCAs are pre-trimmed at wafer stage for low THD and control-voltage feedthrough without further adjustment. The parts are available in three grades (2180LA, 2180LB, and 2180LC) selected for factory-trimmed distortion performance, allowing the user to optimize cost vs. performance.

Figure 1 shows a typical 2150-series application circuit in which the negative control port (pin 3) is used for gain control. Components R2, R3, and VR1 provide for external adjustment of VCA symmetry. Figure 2 shows the same circuit adapted for use with a 2180-series VCA.

Note that external symmetry trim components R2, R3, and VR1 have been deleted. In particular, R2 must not be used with the 2180 Series—it will upset the internal symmetry trim. Capacitor C3 may be reduced in value to as low as 22 pF in order to increase the circuit bandwidth if desired.

Figures 3 and 5 show similar 2150-series application circuits wherein the positive control port (pins 2 and 4) or both control ports are used, respectively. Figures 4 and 6 show the 2180-series counterparts to these circuits.

Table 2 summarizes the component deletions required to convert a typical 2150 application to the 2180-series.

External Component	2150 Series			2180 Series		
	2151	2150A	2155	2180A	2180B	2180C
R2	51	51	51	DELETE	DELETE	DELETE
R3	470k	390k	300k	DELETE	DELETE	DELETE
VR1	50k	50k	50k	DELETE	DELETE	DELETE

Table 2

### 2181 Series

The 2181-series VCAs are selected after packaging primarily on the basis of externally trimmed THD and control-voltage feedthrough performance. The parts are selected into three grades (2181A, 2181B, and 2181C) based on 100% tested performance after external trim. External trimming of VCA symmetry allows higher performance than can be consistently obtained with pretrimmed parts. Both SIP (L designation) and 50-8 (S designation) packages are available in the 2181-series. Of course, since the 2150-series was only available in SIP, only that package applies to the retrofit situation.

Figures 7, 8, and 9 illustrate typical 2181 application circuits utilizing the negative, positive, and both control ports respectively. Note that the external trim potentiometer VR1, and its wiper resistor R3 are present as in the 2150 circuits, but that R2 is deleted. R2 is not required because there is an internal 27 ohm resistor between pins 2 and 4 in all 2181-series VCAs. The values shown for R3 are scaled differently, based on +/- 15V supplies, for each of the three grades of these parts.

As with the 2180-series circuits, C3 may be reduced to as low as 22 pF if desired.

Table 3 summarizes the component value changes required to convert 2150-series circuits to utilize the 2181-series VCAs (assuming  $V_+ = +15V$ ,  $V_- = -15V$ , see the 2181 datasheet to calculate R3 values for other supply voltages).

External Component	2150 Series			2181 Series		
	2151	2150A	2155	2181A	2181B	2181C
R2	51	51	51	DELETE	DELETE	DELETE
R3	470k	390k	300k	680k	220k	130k
VR1	50k	50k	50k	50k	50k	50k

Table 3

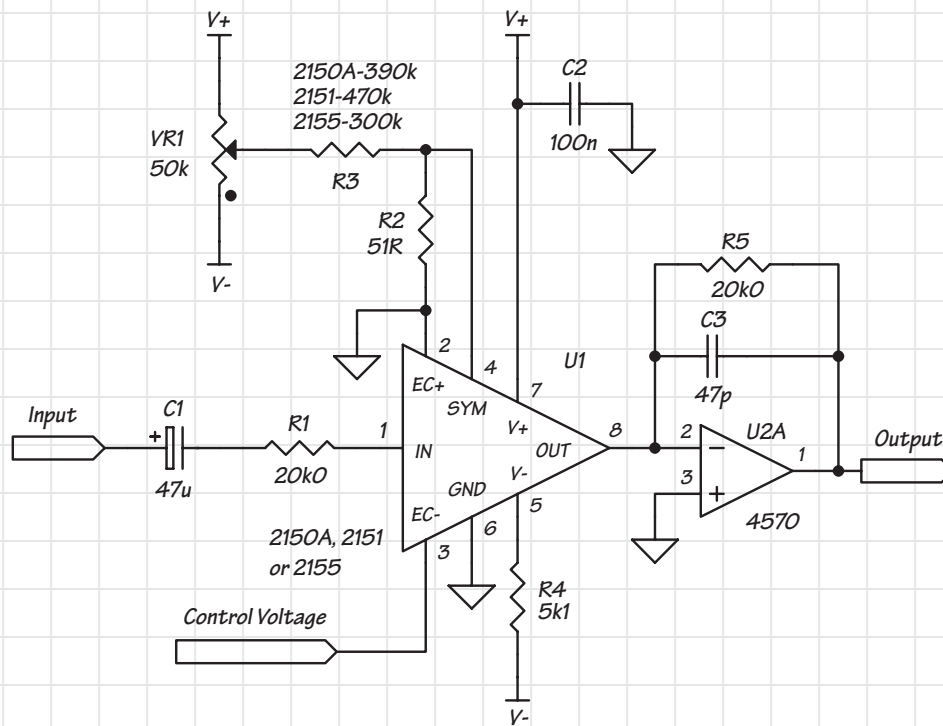


Figure 1. Typical 2150-series application circuit with Ec-driven

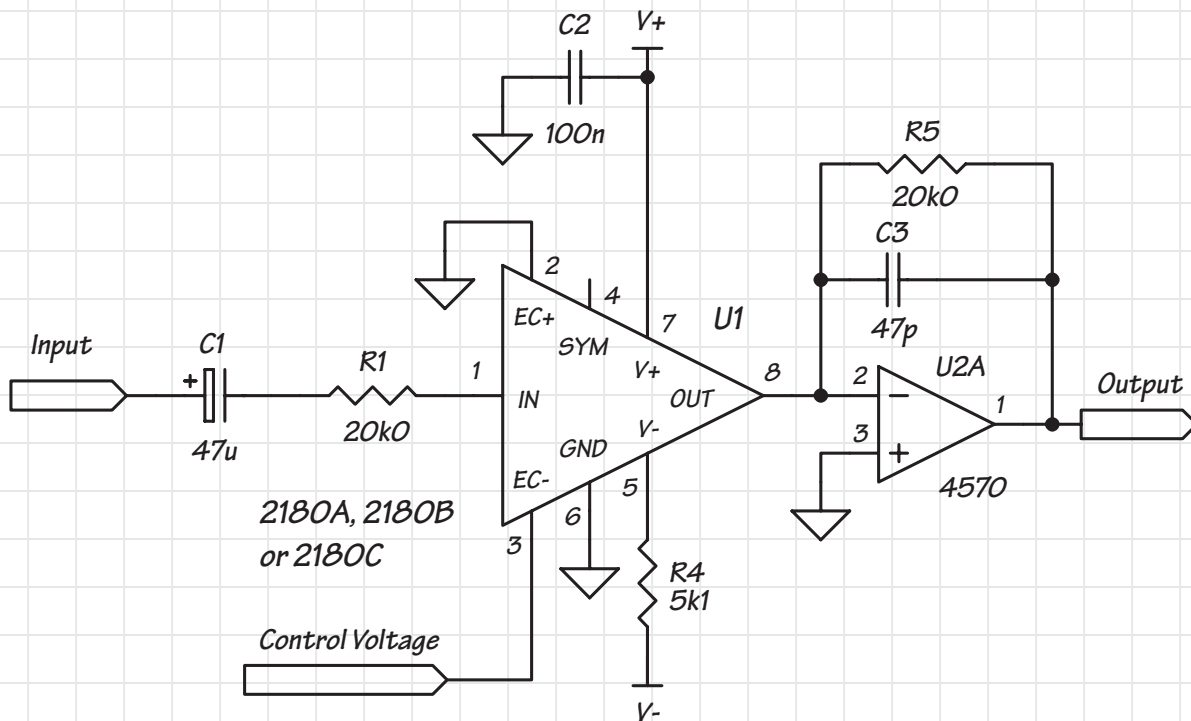
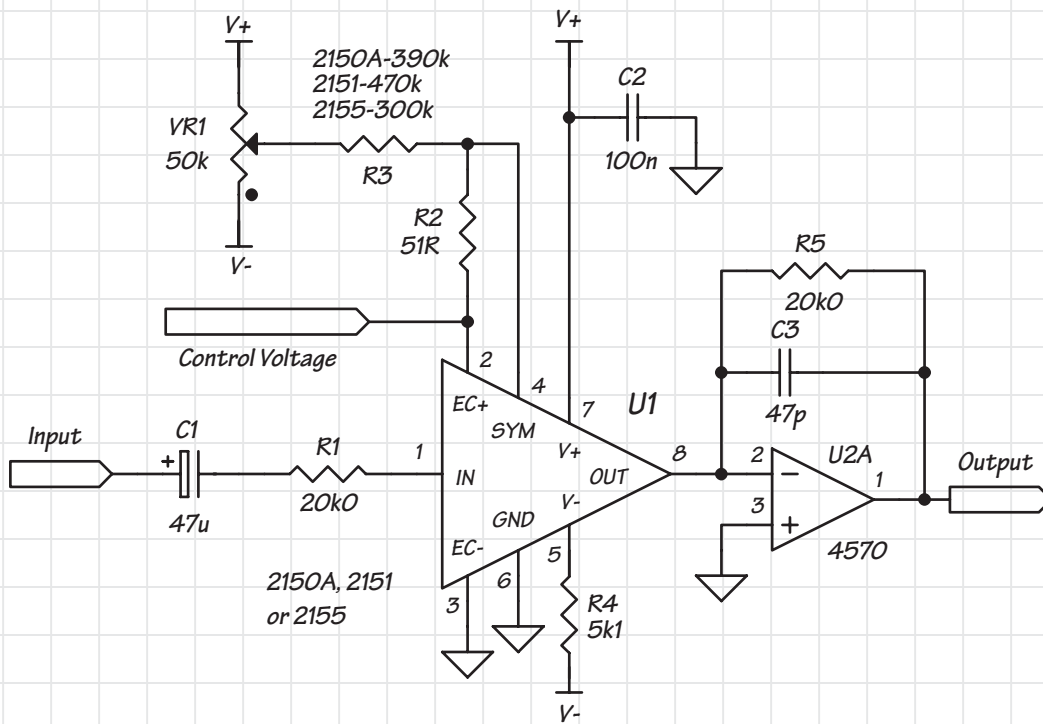
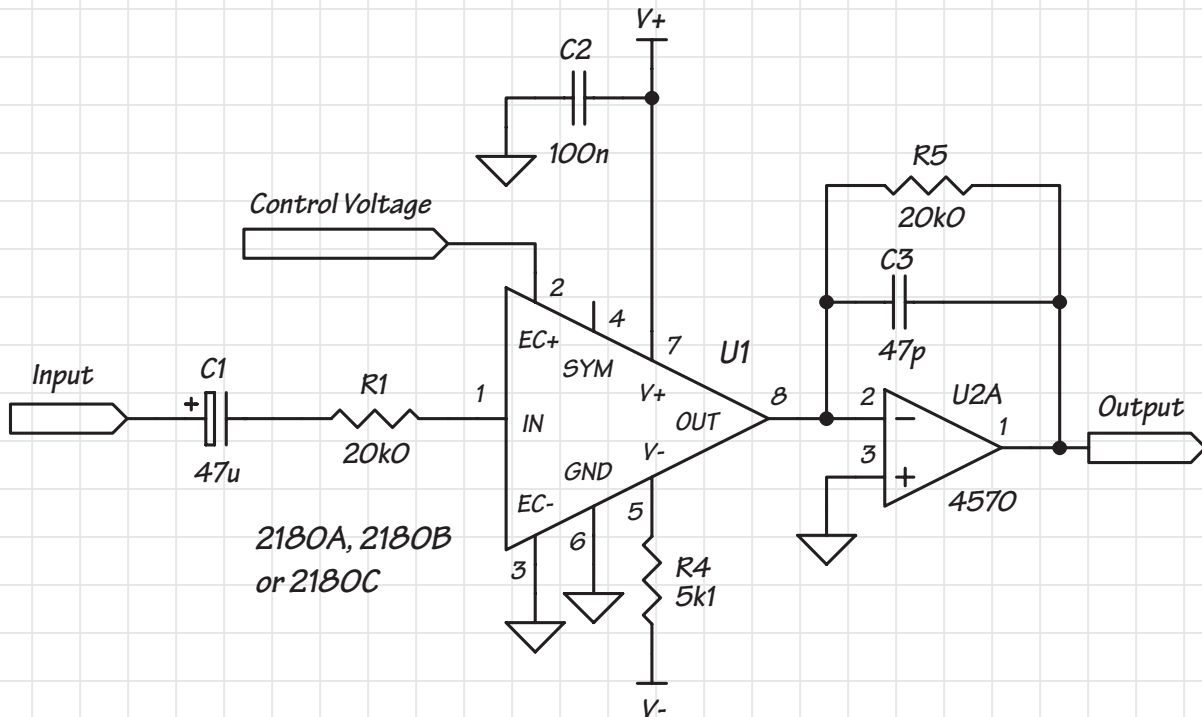


Figure 2. Typical 2180-series application circuit with Ec-driven

Figure 3. Typical 2150-series application circuit with  $E_{c+}$  drivenFigure 4. Typical 2180-series application circuit with  $E_{c+}$  driven

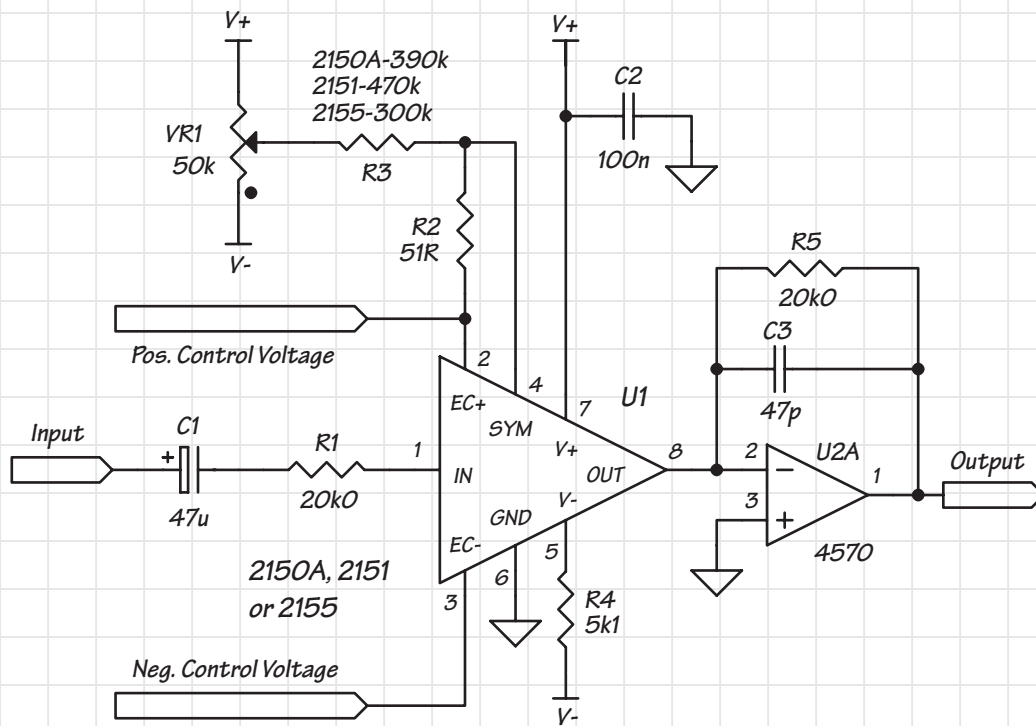


Figure 5. Typical 2150-series application circuit with both control pins driven

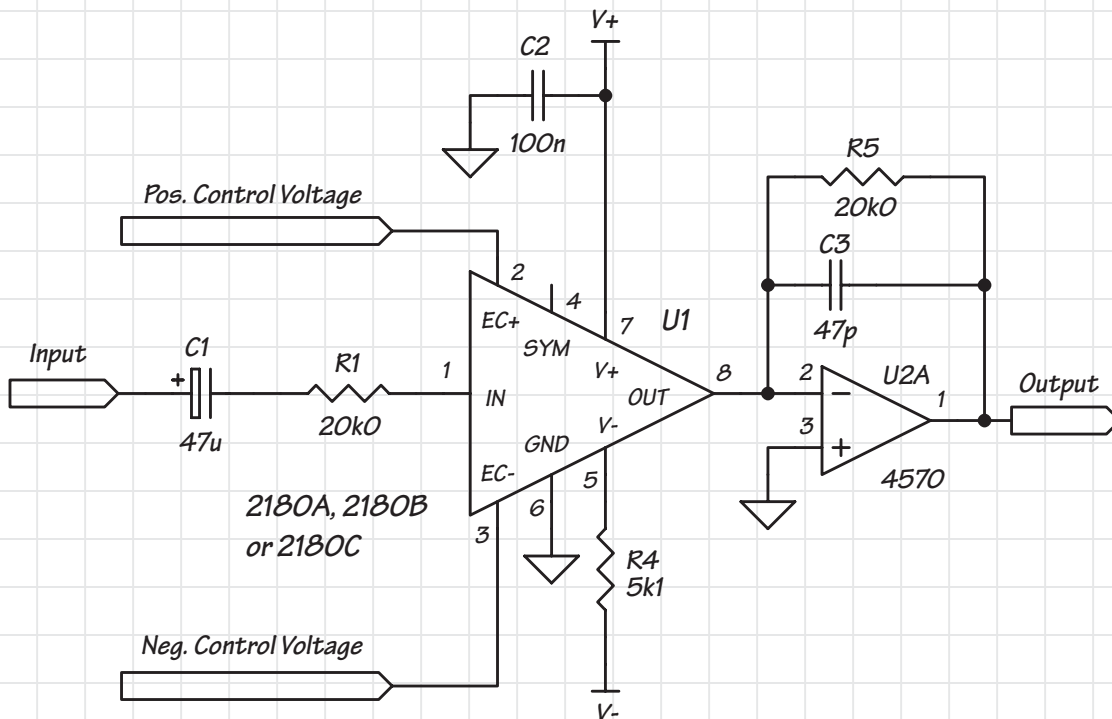


Figure 6. Typical 2180-series application circuit with both control pins driven

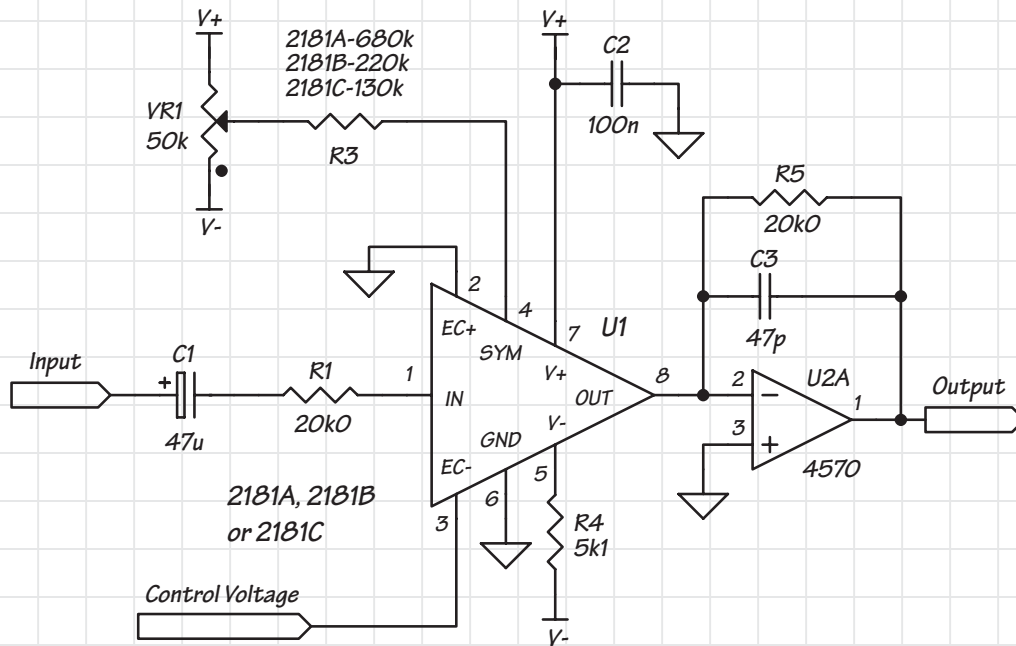


Figure 7. Typical 2181-series application circuit with Ec- driven

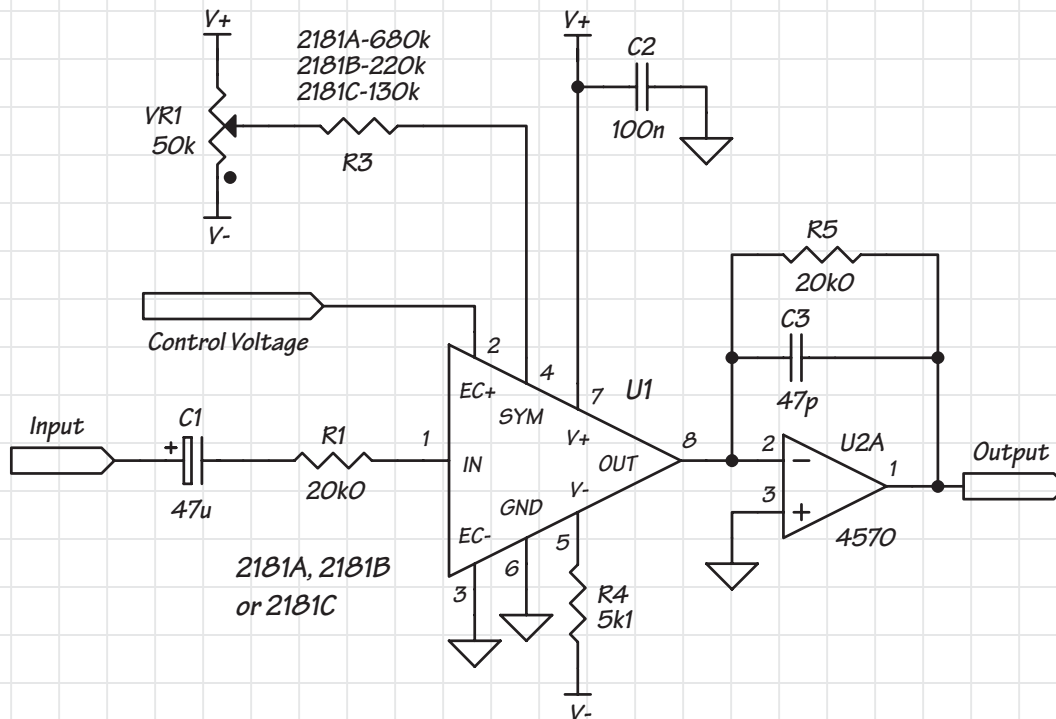


Figure 8. Typical 2181-series application circuit with Ec+ driven

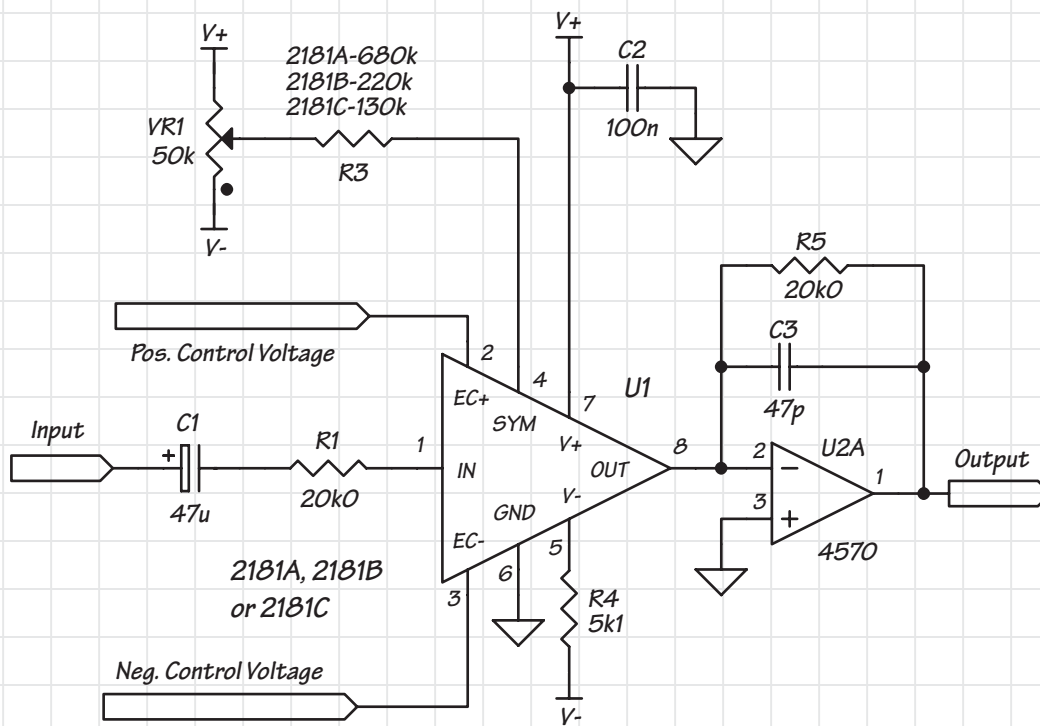


Figure 9. Typical 2181-series application circuit with both control pins driven

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