Small monochrome LCD systems often require split (dual)-bias supplies with precise voltage tracking to prevent plating of the LCD. The circuit in Figure 1 provides ±18 to ±20V adjustable LCD bias voltages with 1% tracking accuracy. The circuit operates from a single 4.2 to 2.5V Li-ion cell for portable monochrome LCD applications. The circuit comprises two blocks: a negative-bias supply using the LT1611 inverting switching regulator and a positive-bias supply using the LT1636 rail-to-rail op amp. The LT1611 converts the Li-ion battery input voltage to a negative output voltage. The combination of 1.4-MHz switching frequency and a 36V internal switch results in small, low-profile circuit. LCD bias requires high voltage at low current. A charge pump consisting of $C_2$, $C_4$, $D_2$, and $D_3$ generates the negative output voltage. Some benefits of this circuit topology include zero output power during shutdown and low output ripple.

The LT1636 rail-to-rail op amp generates the positive LCD-bias output. The large capacitive-load capability, low quiescent current, and high-impedance input stage make the LT1636 suitable in this application. The LT1636 inverts the LT611's output to provide the positive LCD-bias voltage. To meet the 1% tracking requirement, you should use a precision-resistor network, such as the 664 series from BI Technologies (http://www.bitechnologies.com), for $R_1$ and $R_3$. The unique input stage of the LT1636 allows you to generate the $V_{CC}$ of the inverting op amp from the rectified switching waveform (using $D_1$ and $C_1$) of the LT1611 switching regulator. You adjust both LCD-bias supplies by varying the 2-kW potentiometer at the feedback node of the LT1611 regulator.