New Hadamard Matrices of Order $4p^2$ obtained from Jacobi Sums of Order 16.

Let $p \equiv 7 \mod 16$ be a prime. Then there are integers $a, b, c, d$ with $a \equiv 15 \mod 16$, $b \equiv 0 \mod 4$, $p^2 = a^2 + 2(b^2 + c^2 + d^2)$, and $2ab = c^2 - 2cd - d^2$. We show that there is a regular Hadamard matrix of order $4p^2$ provided that $p = a \pm 2b$ or $p = a + \delta_1b + 4\delta_2c + 4\delta_1\delta_2d$ with $\delta_i = \pm 1$. (Received February 02, 2005)