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#include "pico/stdlib.h"
#include "hardware/spi.h"
#include <stdio.h>

// --- MAX6675 Definitions ---
#define MAX6675_CS   17
#define MAX6675_SCK  18
#define MAX6675_MISO 16

// --- MAX6675 Init ---
void max6675_init(uint cs_pin, uint sck_pin, uint miso_pin) {
    spi_init(spi0, 500000); // Initialize SPI0 at 500 kHz
    gpio_set_function(sck_pin, GPIO_FUNC_SPI);
    gpio_set_function(miso_pin, GPIO_FUNC_SPI);

    // CS pin setup
    gpio_init(cs_pin);
    gpio_set_dir(cs_pin, GPIO_OUT);
    gpio_put(cs_pin, 1);
}

// --- MAX6675 Read Temperature ---
float max6675_read_temperature(uint cs_pin) {
    uint8_t buf[2] = {0};

    gpio_put(cs_pin, 0);
    sleep_us(10);
    spi_read_blocking(spi0, 0x00, buf, 2);
```

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    gpio_put(cs_pin, 1);

    uint16_t value = (buf[0] << 8) | buf[1];
    if (value & 0x4) return -1.0f; // No thermocouple connected

    value >>= 3;
    return value * 0.25f; // Celsius
}

// --- Main Program ---
int main() {
    stdio_init_all(); // USB serial

    // Initialize MAX6675
    max6675_init(MAX6675_CS, MAX6675_SCK, MAX6675_MISO);

    printf("MAX6675 Thermocouple Sensor Initialized\n");

    while (true) {
        float temp = max6675_read_temperature(MAX6675_CS);

        if (temp >= 0) {
            printf("Temperature: %.2f °C\n", temp);
            if (temp > 30.0) {
                printf("Hot Surface Detected\n");
            } else {
                printf("Temperature Normal\n");
            }
```

```
        } else {
            printf("Thermocouple not connected!\n");
        }

        sleep_ms(1000); // Read every second
    }

    return 0;
}
```