

4-UART-USB

Programming Manual

Board rev. 1.0-002

Overview

The ECB 4UART-USB board provides four 8250/16C550 similar serial interfaces using the TL16C754B or SC16C754B PLCC chip, which is clocked from 48mhz down to 1.8432mhz. Two of the serial outputs are dedicated to USB ports through a separate FT232RL adapter, and the remaining two outputs may be RS-232 terminal connections, or individually selected as USB connections. Bit rates up to 3mbps are possible, with the proviso that all interfaces use the same clock, but may individually prescale the clock by a divisor of 4.

USB Adapters

The first two UARTs, -A and -B, are dedicated to USB ports. These ports will accept adapters on either an 18-pin connection or a 6-pin connection. Two possible adapter types are recommended. The first recommendation is the 18-pin connected board containing the FT232RL chip which looks similar to Photo 1.

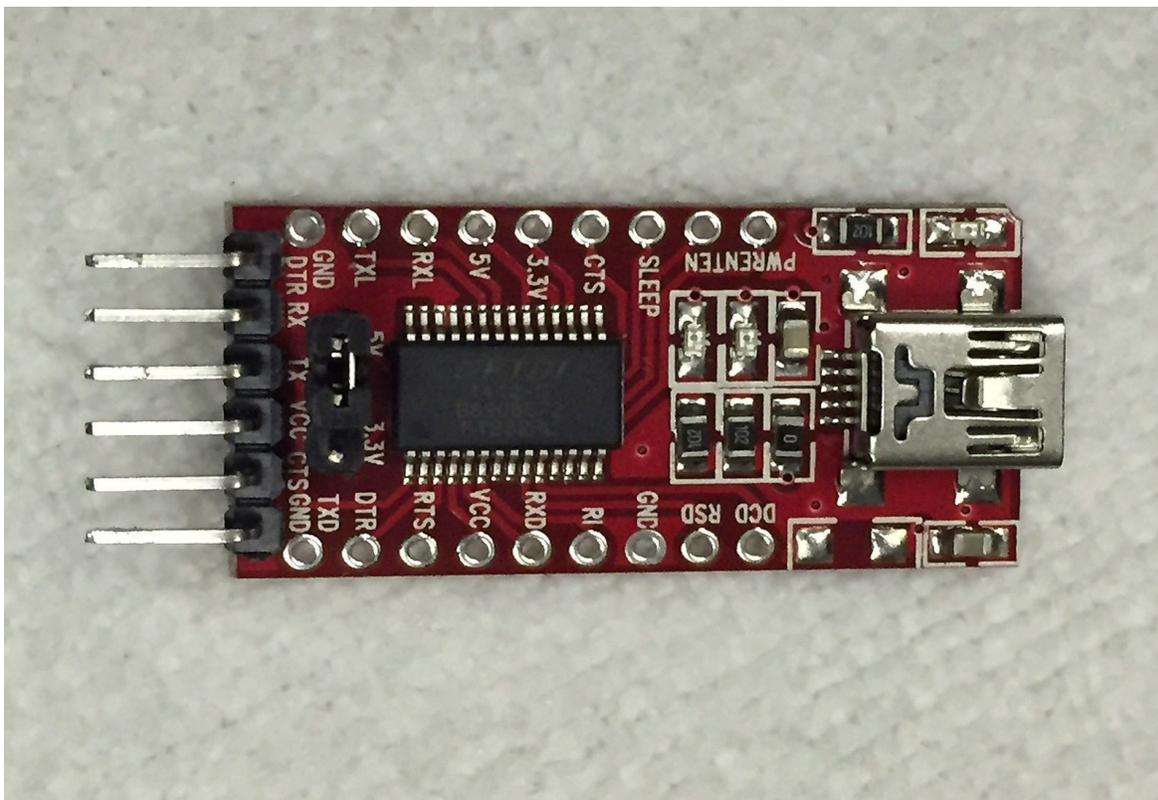


Photo 1. 18-pin USB adapter example.

If using this exact adapter, it would be suggested that the six pins on the left be clipped off.

All four UARTs may be connected for USB usage using the 6-pin header (K503,4,7,8). A right-angle header should be used here to position the



Photos 2A and 2B. Example 6-pin USB adapter.

USB connector toward the near 100mm edge of the board. This connector positions GND, pin 1, in the proper position for direct insertion of the board. Again note that pin 6 provides DTR, and the DTR/RTS jumper must be set appropriately. When used for USB on UARTs -C or -D, jumpers P703 or P704 must be removed.

Board Address

Each UART on the board contains 8 registers, addressed by bits [A2..A0]. There are 4 UARTs, selected [UARTA..UARTD] by bits [A4,A3]. Hence, the board occupies 32 I/O slots in the 8-bit ECB I/O space. The device code for the board is selected by a jumper on P401, which selects the state of bits [A7..A5], the bits which will enable the board for I/O Read or I/O Write. A jumper on pins 1-2 will enable the board at binary address 000x_xxxx; pins 3-4 at address 001x_xxxx; etc., down to pins 15-16 at address 111x_xxxx.

Configuration

K401 - RESET input selector; 1-2 legacy DIN C31; 2-3 Kontron DIN C26.

- K501, K502, K505, K506 – DTR/RTS must be installed for any USB interface that uses a 6-pin adapter. Check which signal is output on pin 6.
- P301 – CLKSEL – should always be installed
- P401 – selects the board device code (Board Address, above)
- P402, P403, P404, P405 – Interrupt connection for UARTs A..D respectively. Install jumper to direct interrupt input to a particular CPU or PIC input as specified for the OS you are running.
- P703, P704 – installed if RS-232 interface C or D will be enabled. USB board must not be installed on the corresponding port. Omit jumper if USB is used.

Configuration register at (device code + 0x0F) which resets to '0000_0000'b. The register overlays UARTB+7, the Scratch Register, SCR.

- bit 7 – lock bit; once set, the register becomes unwritable.
 - bit 2 – if set, MCR[3] on all UARTs controls the tri-state driver for that particular UART. If reset (default), MCR[3] is overridden, and all interrupt drivers are enabled. Individual interrupt requests may be inhibited by not installing selected jumpers, K402..K405.
 - bit 1 – oscillator selection. If reset (default), 7.3728mhz oscillator is selected; if set, 48.00mhz oscillator is selected. Oscillator selection applies to all UARTs.
- All other bits should be programmed as '0'; i.e., bits[0,3..6].

P301 should be installed to achieve “default” board setup when Reset is asserted. This results in the selection of the 7.3728mhz oscillator with a divide ratio of 4X selected for all UARTs, or a common clock of 1.8432mhz.

K401 reset selection setting *Kontron* is preferred, since it is compatible with newer boards, specifically the Backplane8-167, Backplane12-6508, MF/PIC v.3, both Motorola 68k CPU boards, &c. The Legacy connection is out-of-date, and only needs to be used if you have a board in your backplane that does not have the Legacy/Kontron reset selector jumper.

RS-232 Interface

The traditional RS-232 serial connections are connected to UART-C and UART-D. The RS-232 voltage levels are connected through the MAX249 PLCC-44 chip to the IBM-PC 10-pin headers. All DTE data and modem connections are implemented. If RS-232 is not to be used, it is okay to omit the MAX249 chip.

Each of the 10-pin headers is individually enabled using jumpers P703 or P704 for UART-C or UART-D, respectively. Installing a jumper enables the interface. If USB signaling is being used with either of these UARTs, the corresponding jumper must be omitted. No USB adapter board may be installed if the RS-232 level signaling is enabled on a particular UART.

It is possible to use one of UART-C or UART-D for USB and the other for RS-232. The USB port has the USB adapter board installed and the corresponding jumper P70x omitted, and the other port has no USB board installed, and the corresponding jumper P70x installed. In this mixed case, the MAX249 chip is, of course, required.

Dedicated USB

UART-A and UART-B are dedicated USB ports. Six pin adapter boards or 18-pin adapter boards may be installed. The latter are preferred since they provide all modem signals to the UART, and they may be soldered in place using 2 rows of 9x1 pin headers. Soldering provides extra physical stability.

On all 6-pin USB ports, note that pin 1 is GND. Pin 6 is usually DTR, but one adapter cable is known to place RTS on this pin. Hence, all ports used for USB will have to have the DTR/RTS jumper installed as appropriate (K501, K502, K505, K506).

Interrupt Connection

Interrupts from each of the four UARTs, A to D, may be individually directed as selected by a jumper on pin header P402, P403, P404, P405, respectively. A jumper may be omitted to prevent interrupts from a particular UART. Interrupts may be directed to a CPU using the NMI or INT connection, or if an interrupt controller is present (MF/PIC board), connection IR0..IR7. IR7 is the lowest priority, and IR0 is the highest.

When an interrupt jumper is installed, interrupts are further controlled by the setting of MCR[3] or bit 2 of the Configuration Register. If a jumper is installed, then the UART interrupt output should never be tri-stated, since this output drives the open-collector 74LS06 chip, and will result in a continuous interrupt request.

It is suggested that bit 2 of the Configuration Register be kept at '0' (default).