FOUR PORT UART

Presentation by KC0JFQ

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October 6, 2025

4-Port USB UART 102-73226-3
Current Design

http://n952.ooguy.com/HamRDF/index.html
http://n952.ooguy.com/eagle/index.html

Job: fox˙present˙15
File: fox˙present˙15.tex

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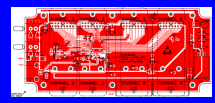

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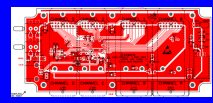
Motivation



Why did I do it?

Interesting project

Individual serial connections growing *out-of-contol*

Condense to one box (and USB connection) on the bench

Easy/cheap to implement new physical interface

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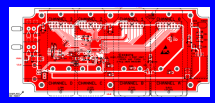
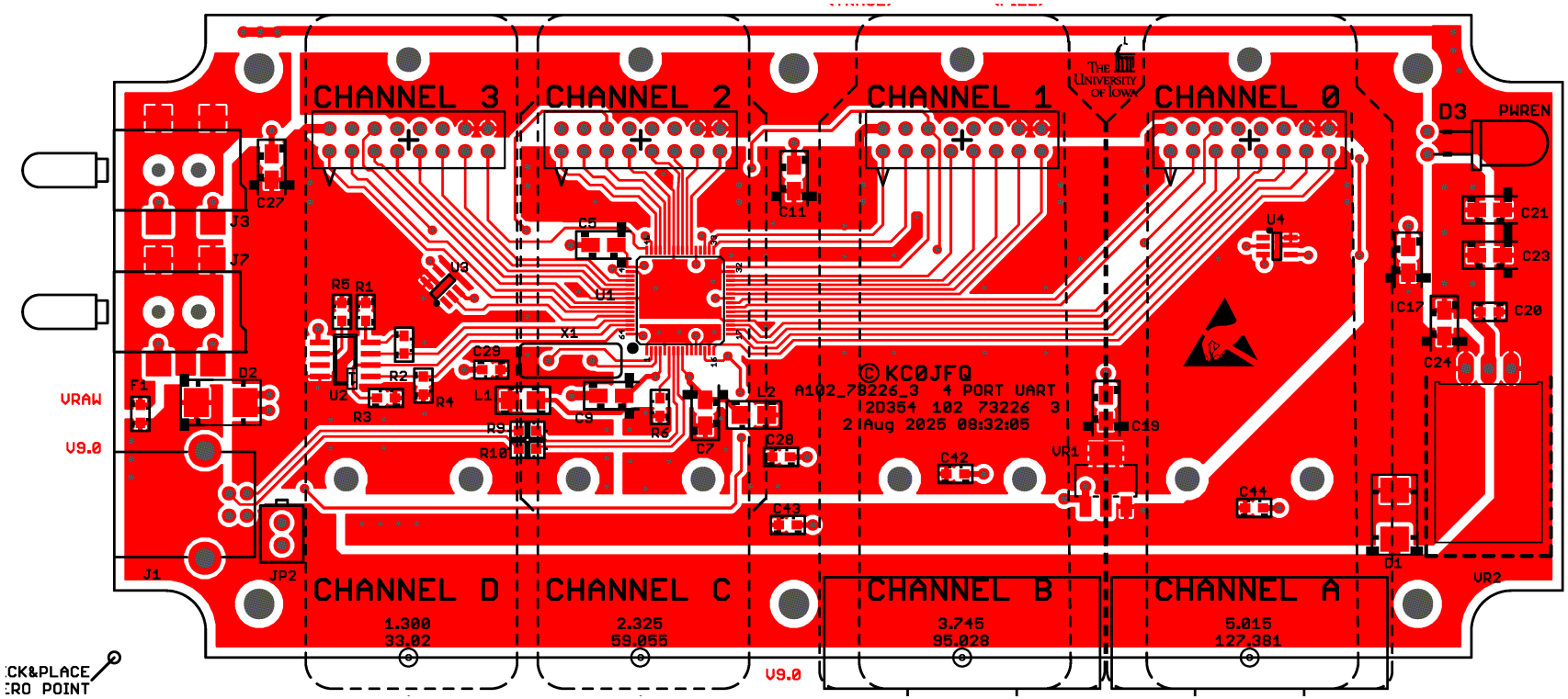
The MAIN Board



Main-Board design for a multi-use USB UART



Hammond 1599E case

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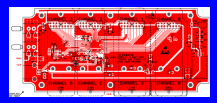
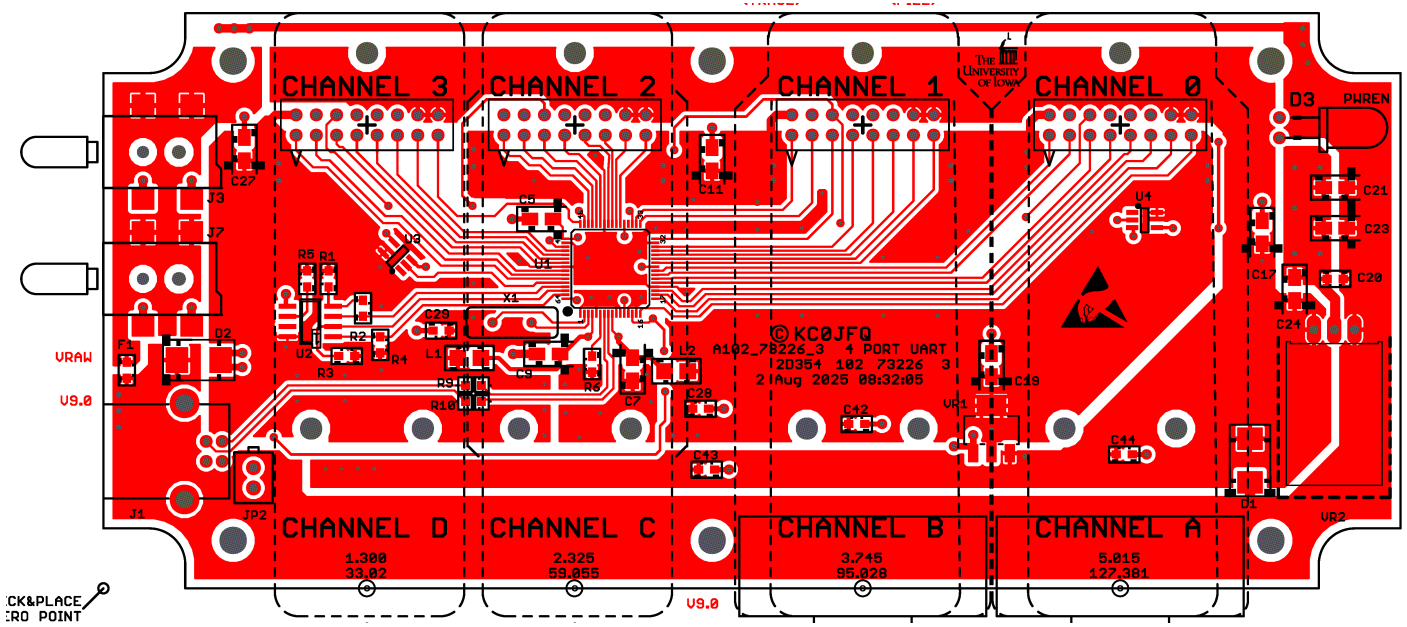
The Main Board





Plug-in *Channel Card* holds the actual interface

All cards are mechanically identical

Any cards may sit in any slot subject to width restrictions!

Channel 0 and 1 are a bit wider to accommodate DE9

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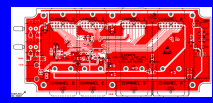
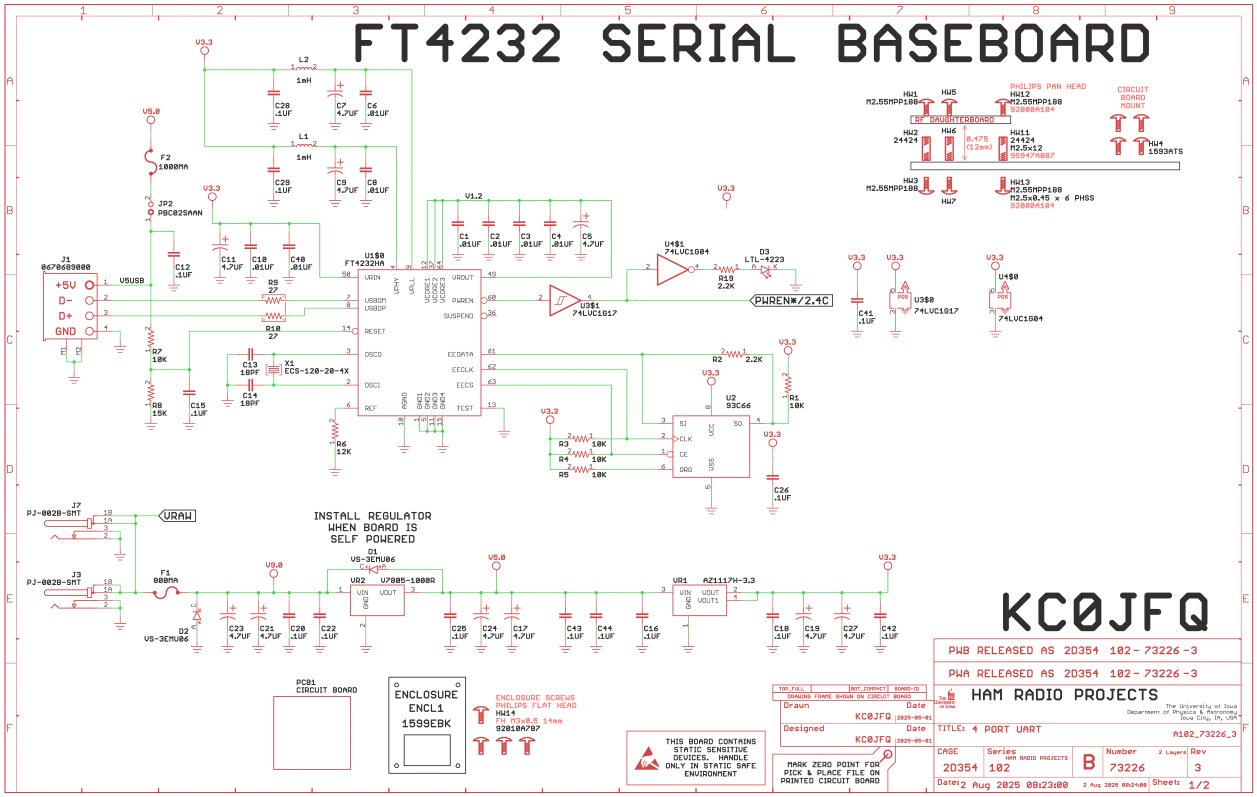
The Main Board Schematic





FTDIchip FT4232H is the *guts* of the design!

- BUS Powered or Self Powered (on board power system)
- TWO power jacks for **self powered** operation (daisy chain with other *things*)
- 93LC66B EEPROM holds programmable *identity*
- Board spacing is nominally 12mm

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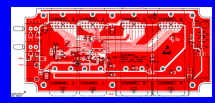
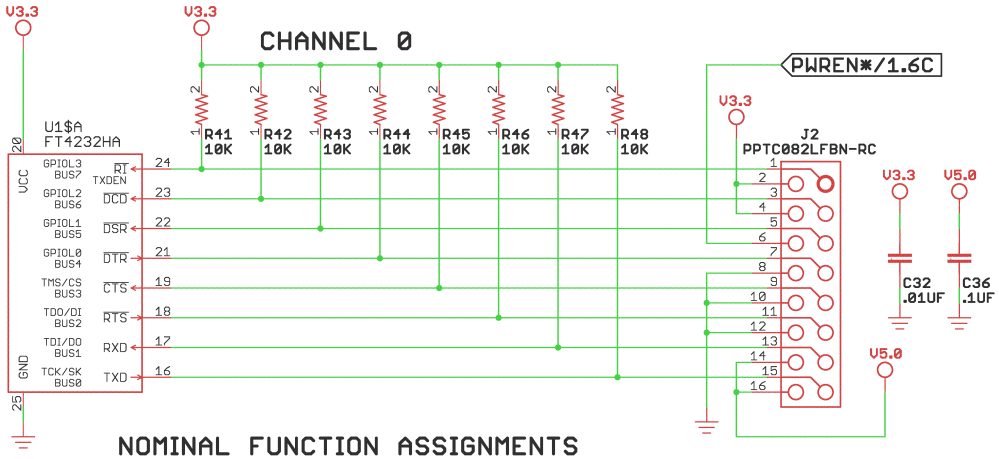
The Main Board Channel Schematic





NOMINAL SIGNAL	FUNCTION ACTIVE		ASSIGNMENTS FUNCTION
RI*/TXDEN*	H->T	0	TRANSMIT BUFFER ENABLE
DCD*	H<-T	?	
DSR*	H<-T	?	
DTR*	H->T	0	HOST CHANNEL ACTIVE
CTS*	H<-T	0	TARGET not PRESENT
RTS*	H->T	1	TARGET not RESET
RXD	H<-T	1	RECEIVE DATA
TXD	H->T	1	TRANSMIT DATA

RED INDICATES ALTENATE FUNCTION

FOUR identical channels are in the FT4232H

- Straight connection between FT4232H and daughtercard
- **PWREN*** goes low when USB host connects
- Full modem signals on all channels
- +5V and +3.3V to daughter card

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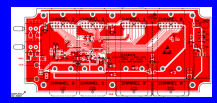
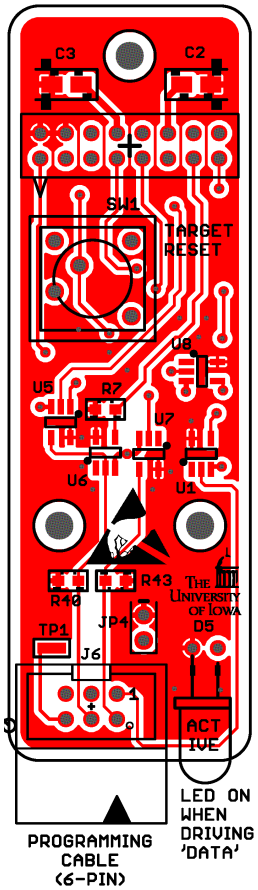
zNEO/eZ8 Programmer





16-pin connector to main board.

Target Reset (button)

Logic-level buffers

6-pin programming header

LED illuminates when host accesses this channel

Load *Operating Software* into the ICARC Fox Transmitters

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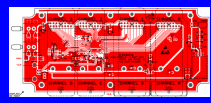
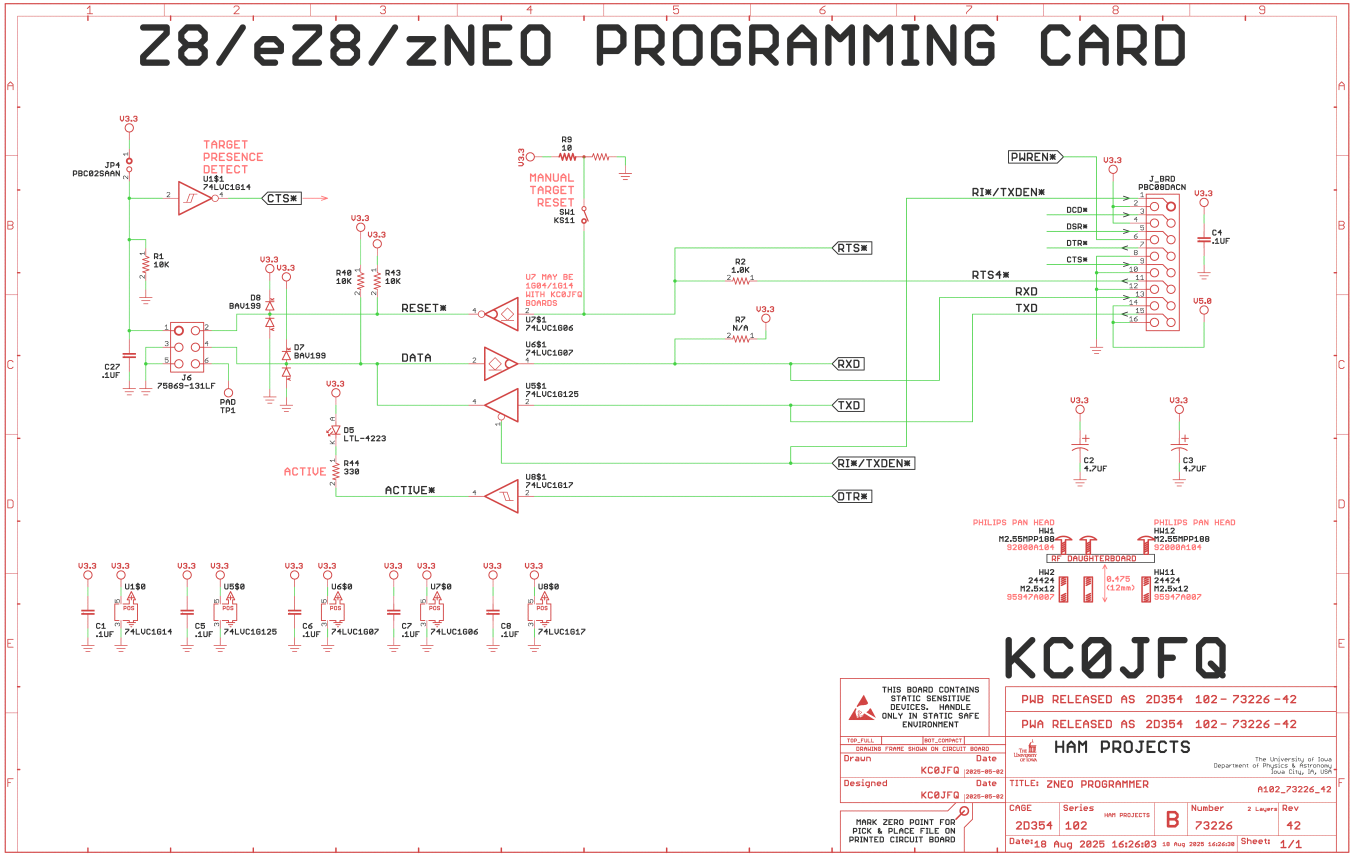
zNEO/eZ8 Programmer Schematic





Simple half-duplex open-drain interface to target

- TxD is tri-state to improve drive when host has programming bus
- DTR active when host is connected (LED on)
- Reset button to alleviate frustration!

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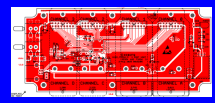
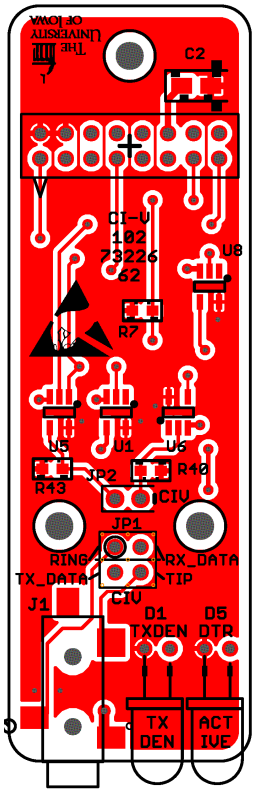
CI-V 3.5mm





16-pin connector to main board.

Logic-level buffers
Jumpers for FDX or HDX operation

3.5mm serial connection (ICOM CI-V compatible)

ACTIVE LED when host accesses channel
TX_DEN LED when output buffer active

Host access port on the ICARC Fox Transmitters *(time, sequence, audio file)*

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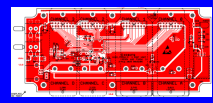
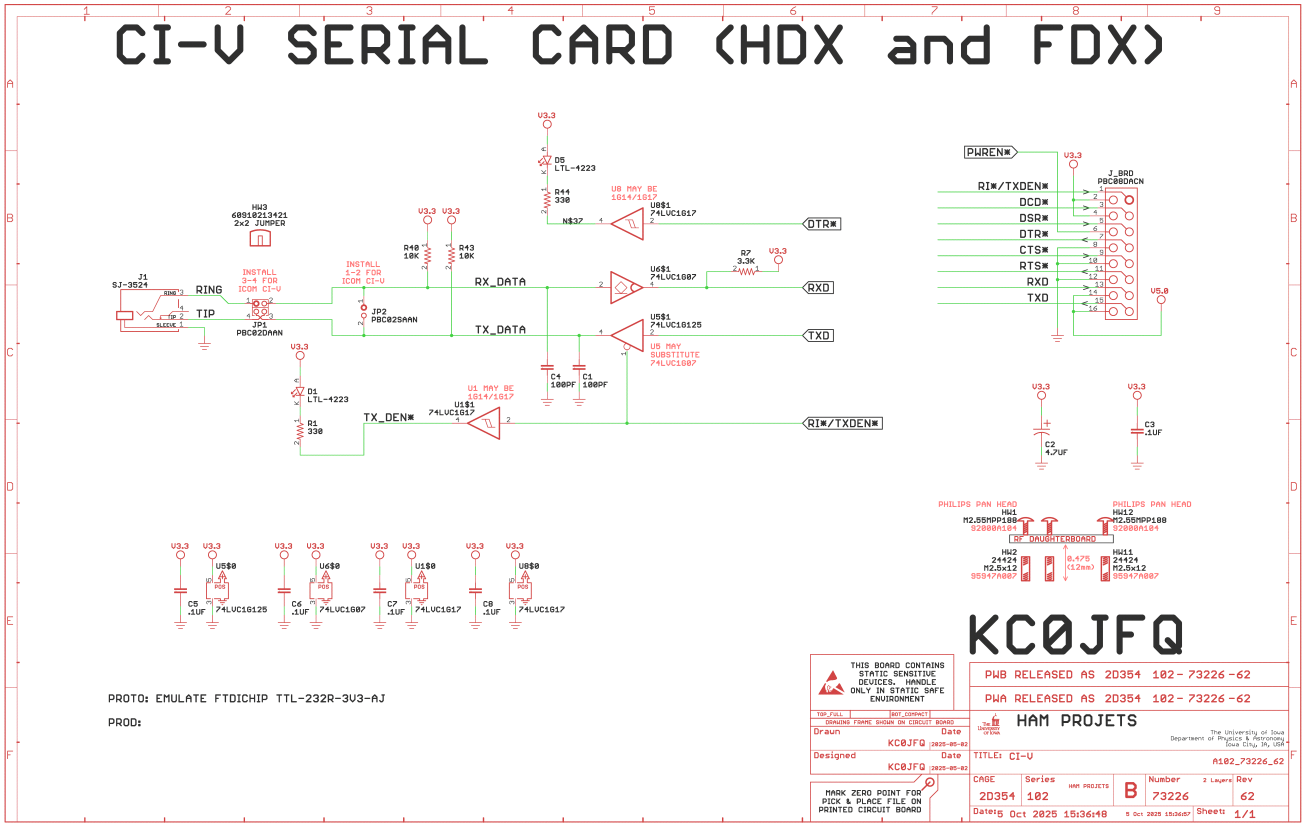
CI-V 3.5mm Schematic





Same style half-duplex open-drain interface

- TxD is tri-state to improve drive when host drives the bus
- DTR active when host is connected (LED on)
- JP1 allows quick Txd/RxD swap
- JP2 allows CI-V operation

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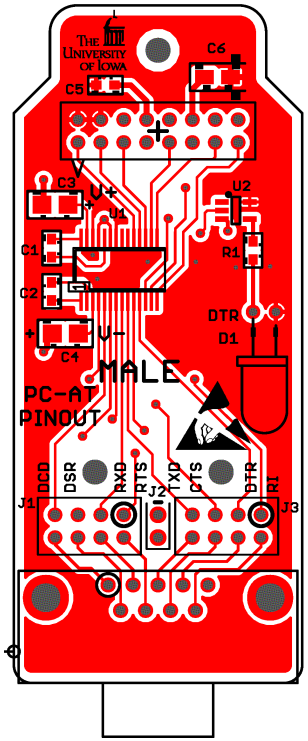
DE9M



16-pin connector to main board.

Integrated RS232 buffers

DE9 male connector

DTR LED when host accesses channel

DTR also on the DE9 connector

PC-AT serial connector, standard pinout, standard voltage levels

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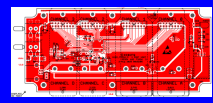
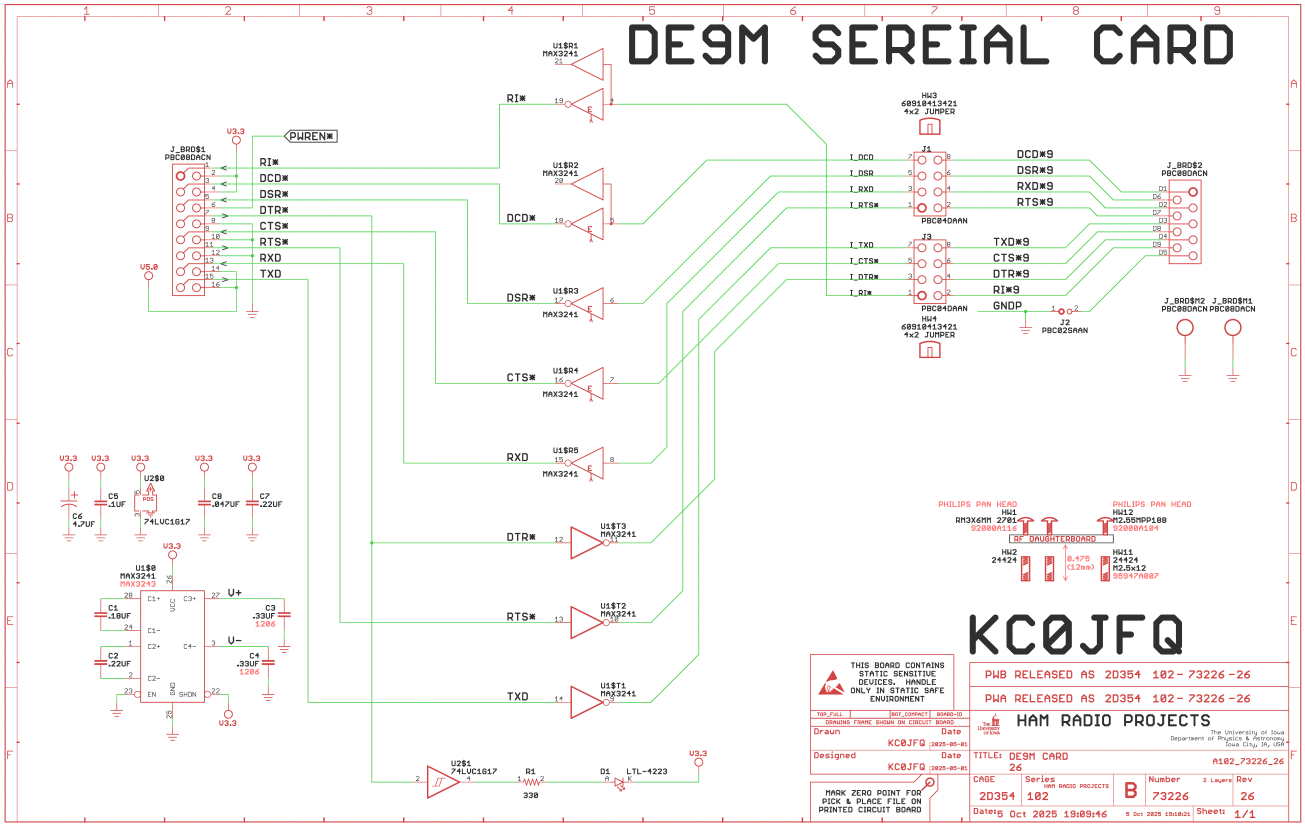
DE9M Schematic





MAX3241 tranceiver provides charge pump for -V (all in one chip!)

- J1/J2/J3 jumpered straight across for PC-AT pinout (DCE)
- J1/J3 can be rewired to provide DCE pinout
- Output levels are +V and -V
- J2 is ground

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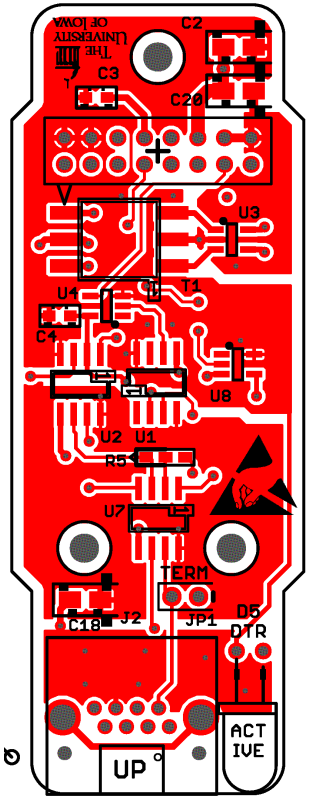
RS485



16-pin connector to main board.
Isolated supply

Optical Isolators and buffers

RJ45 network connector
ACTIVE LED when host accesses channel
NO power to network!
(PAD to power pin on bottom side)

KC0JFQ sensor network

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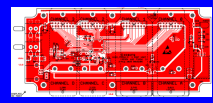
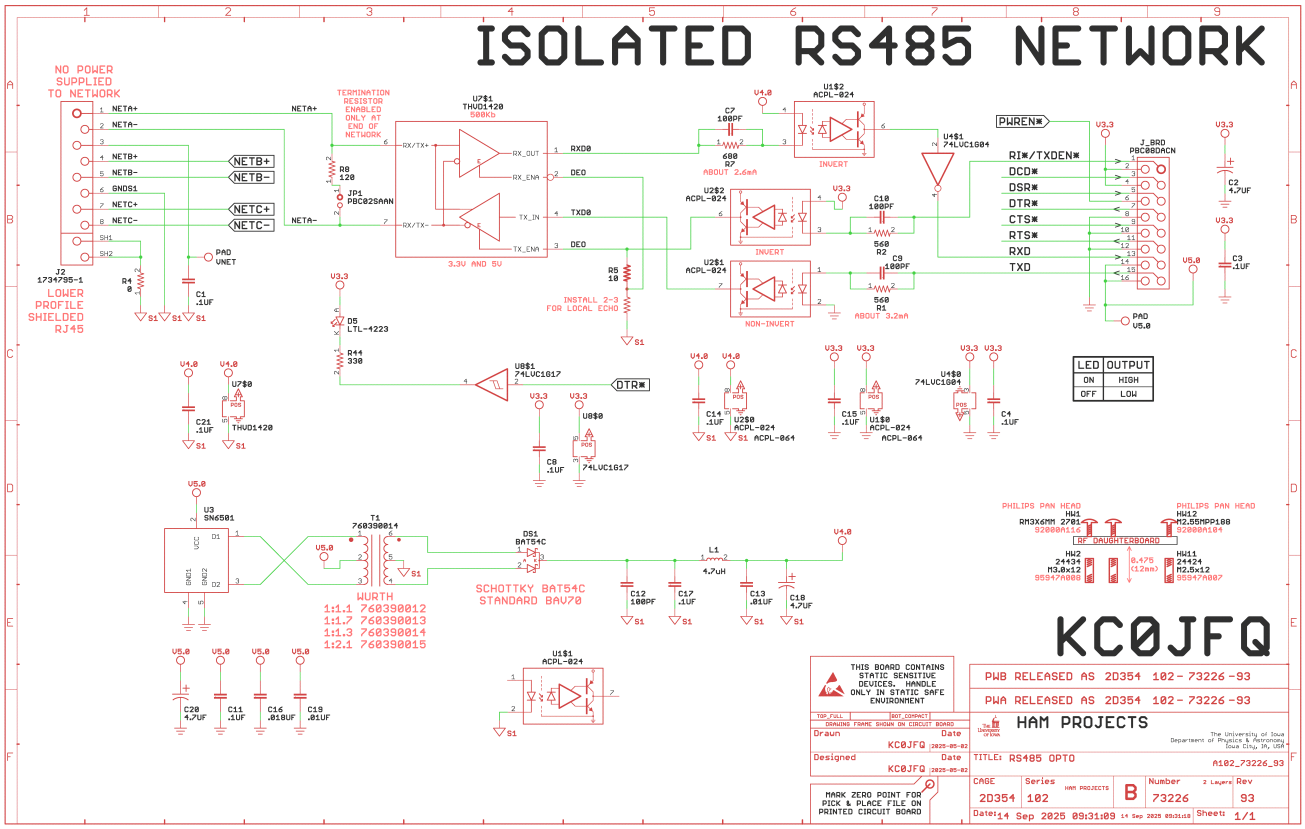
RS485 Schematic





Optically Isolated RS485 network interface

- Low power isolation supply (driver, transformer, diodes)
- Opto-isolator device is logic-level output
- Keeps the **DTR** LED from other boards

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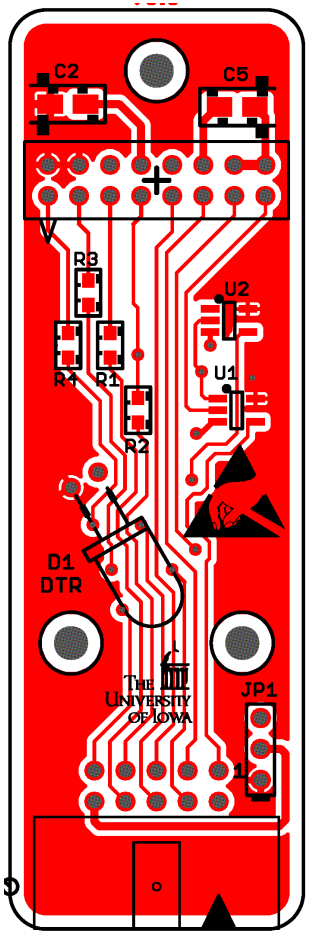
SPI



16-pin connector to main board.

Buffers

MPSSE available **only** on Channel 0 and Channel 1
Bit-Bang available on all channels

DTR LED when host accesses channel

10-pin programming connector

Example for using MPSSE feature of FT4232H

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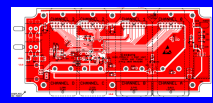
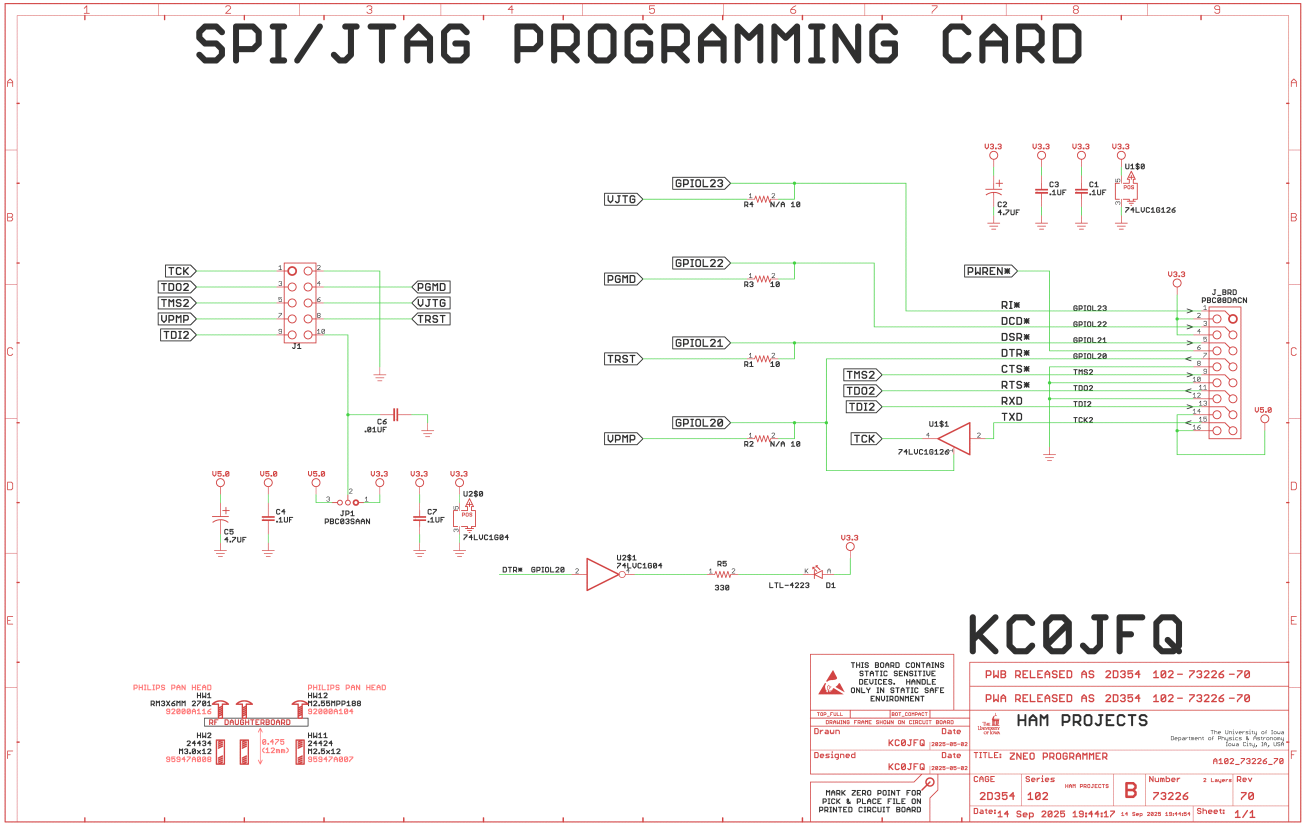
SPI Schematic





SPI/JTAG device programming interface

- Requires D2XX driver (PITA on Linux)
- Pinput from 2010 vibntage ACTEL FPGA development kit
- Would benefit from SOC between host and target!

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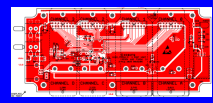
Secret Content



End of the line We are **done here**

Go away Get Back

Dragons be here

You are not permitted to lokk beyond here

Scary Notes for the Presenter

Notes taken from the Libreoffice presentation

Here we go again!
-Dolly Parton

Outline

Discussion of *4-Port USB UART* by KC0JFQ

This is a simple USB UART design.

The slides should be pretty much self-explanatory