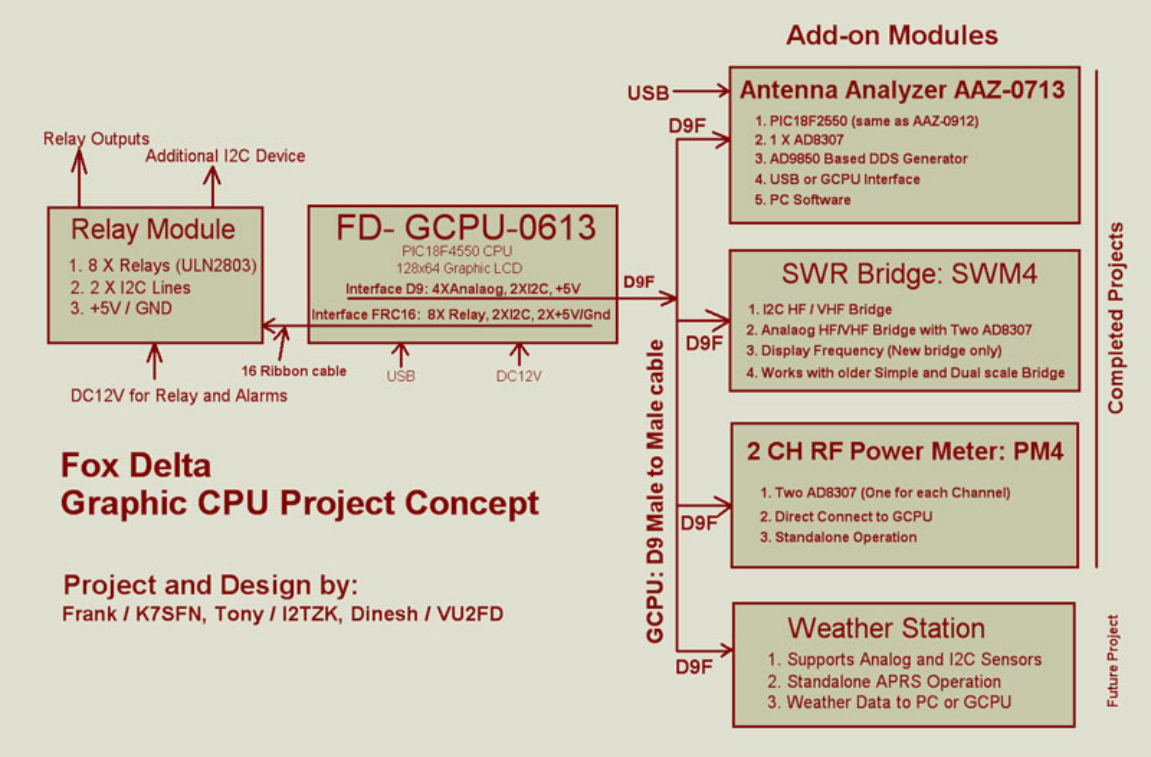
Fox Delta

Amateur Radio Projects & Kits

FD-GCPU4

GCPU Technical Info Document: Graphic LCD PIC18F4550 CPU

Graphic LCD CPU: Basic Concept



Task:

1. Common Graphic LCD CPU for all future project
2. For every new Project, we only develop a new GCPU Firmware and if possible a PC Software.
3. Make an add-on module for project specific purpose.
4. GCPU has 4 X Analog Inputs, One RF Input (Frequency Measurement) and I2C lines. Plus, +5V and Ground.
5. FRC16 Expansion Connector has 8 X Relay/Alarm output and I2C lines for expansion. +5V and Ground are available too.

Benefits:

1. Radio Amateur only Invest once in Graphic LCD Display.
2. Use same Graphic Display for various purposes
3. Programmers may write suitable code for GCPU and make their own add-on board.

Completed Multi-Purpose Graphic CPU: GCPU-0613

Graphic LCD/CPU loaded with PM4 Firmware

Minimum Hardware configuration:

1. Graphic CPU and
2. Some kind of measuring device attached to D9F connector:

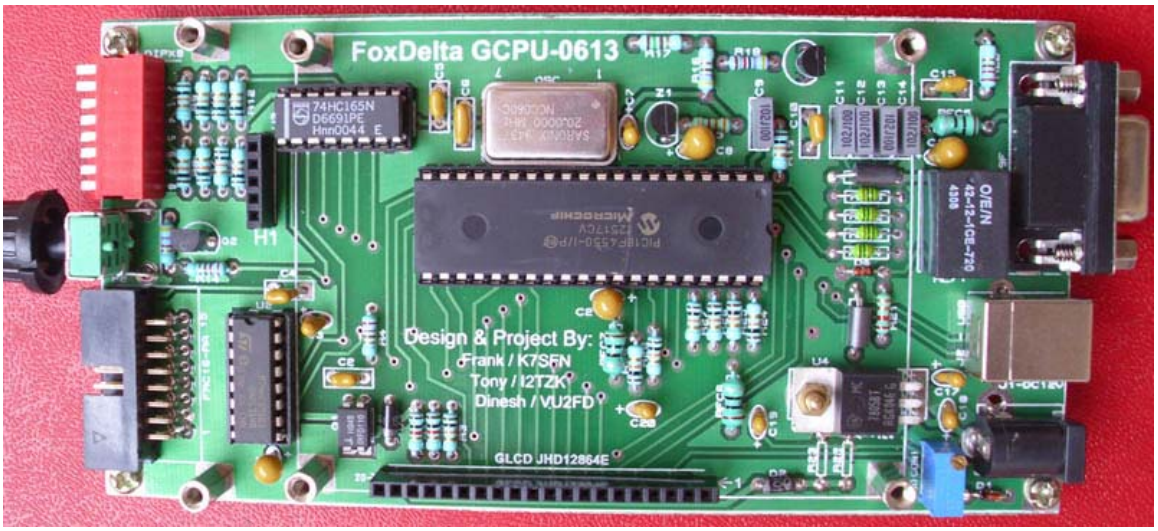
- "Fox Delta INFINITY" Graphic CPU with PIC18F4550
- Graphic CPU hardware details:
  - 128 x 64 Graphic LCD with Back light control
  - DC12V or USB Powered
  - Expansion slot for relays and alarms (FRC16)
  - 8 DIP Switches for CPU Configuration
- RF Measurement add-on boards: SWM4, AAZ-0713, PM4
- A Free Powder Coated Case is available with Kits

Graphic CPU/LCD:

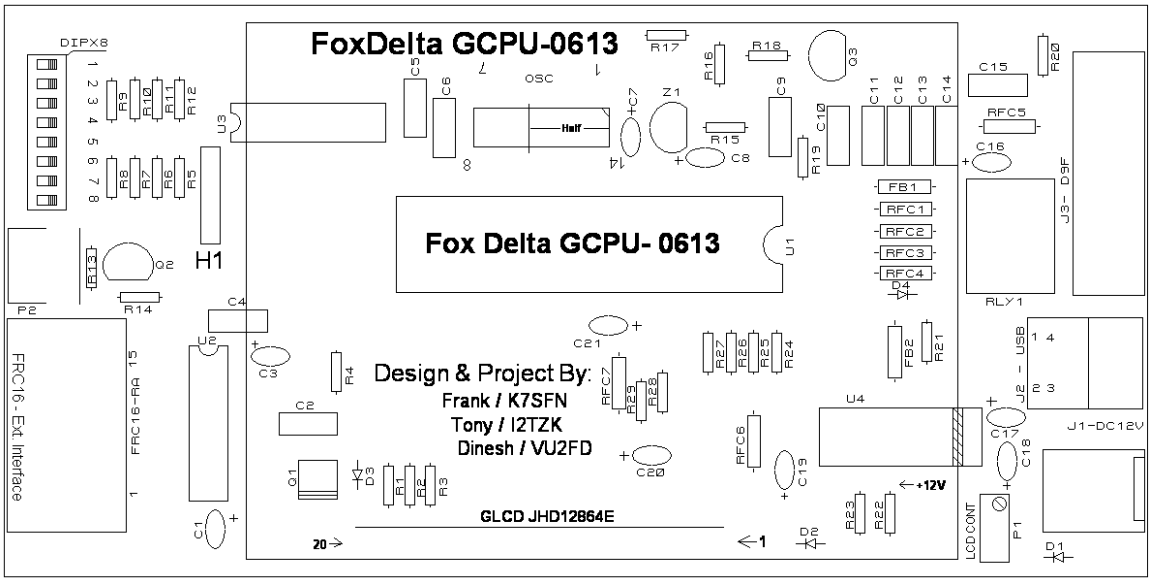
Graphic CPU is a single board Single CPU type hardware. Uses a JHD12864E type Graphic LCD and PIC 18F4550 processor.

Graphic CPU has 4 analog A/D inputs at its D9 socket. Also has 2XI2C plus +5 and a Ground line.

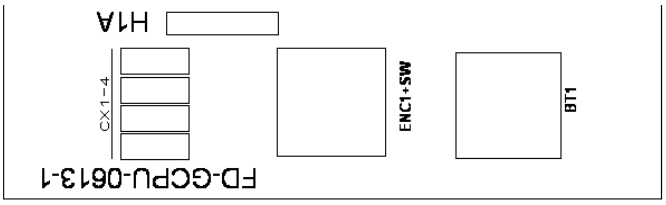
GCPU-0613: LCD Removed:



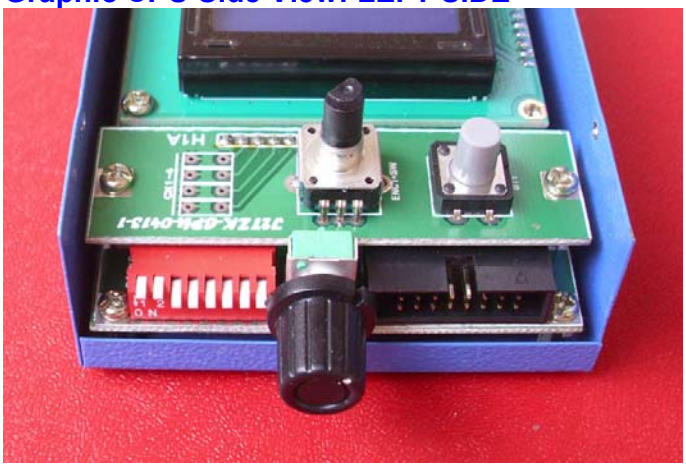
GCPU-0613 PCB TOP SIDE Silk:



GCPU-0613 Keyboard PCB:



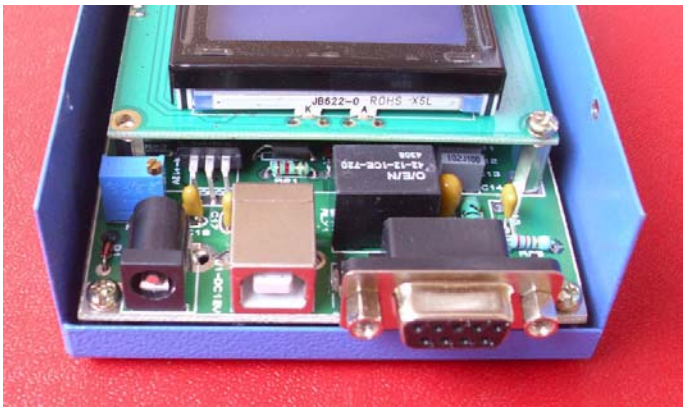
Graphic CPU Side View: LEFT SIDE



On this side we have:

1. **8XDIP switch used for CPU configuration**
2. **Backlight Dimmer Control (Between FRC16 ad DIP Switches)**
3. **FRC16 Connector for Relay and alarm operation. (Add-on board is under development)**
4. **Keyboard has 1 push button and 1 Rotary encoder with a button. (4XCX1-4 are key-bounce capacitors: Option)**

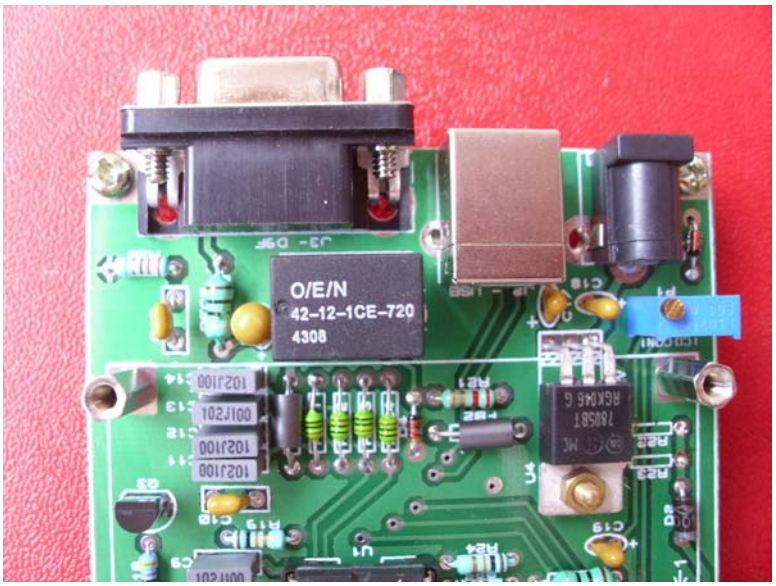
Graphic CPU SIDE VIEW: RIGHT SIDE



This side has:

1. **D9 connector with 4XA/D, 2XI2C, +5V and a Ground**
2. **USB Connector for USB Power and Communications**
3. **DC12V Connector**
4. **Relay on this board is simply to change over power from USB to DC12V**

Graphic CPU D9 Connector Side:

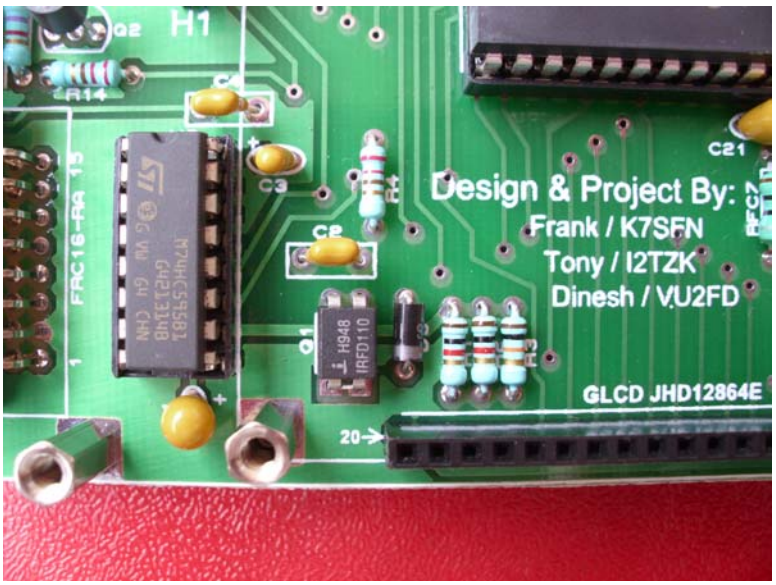


In above picture:

1. **P1 is an LCD Contrast Preset (10 Turn)**
2. **FB1 and FB2 are Ferrite beads**
3. **R22 and R23 are present but are installed on the bottom side.**

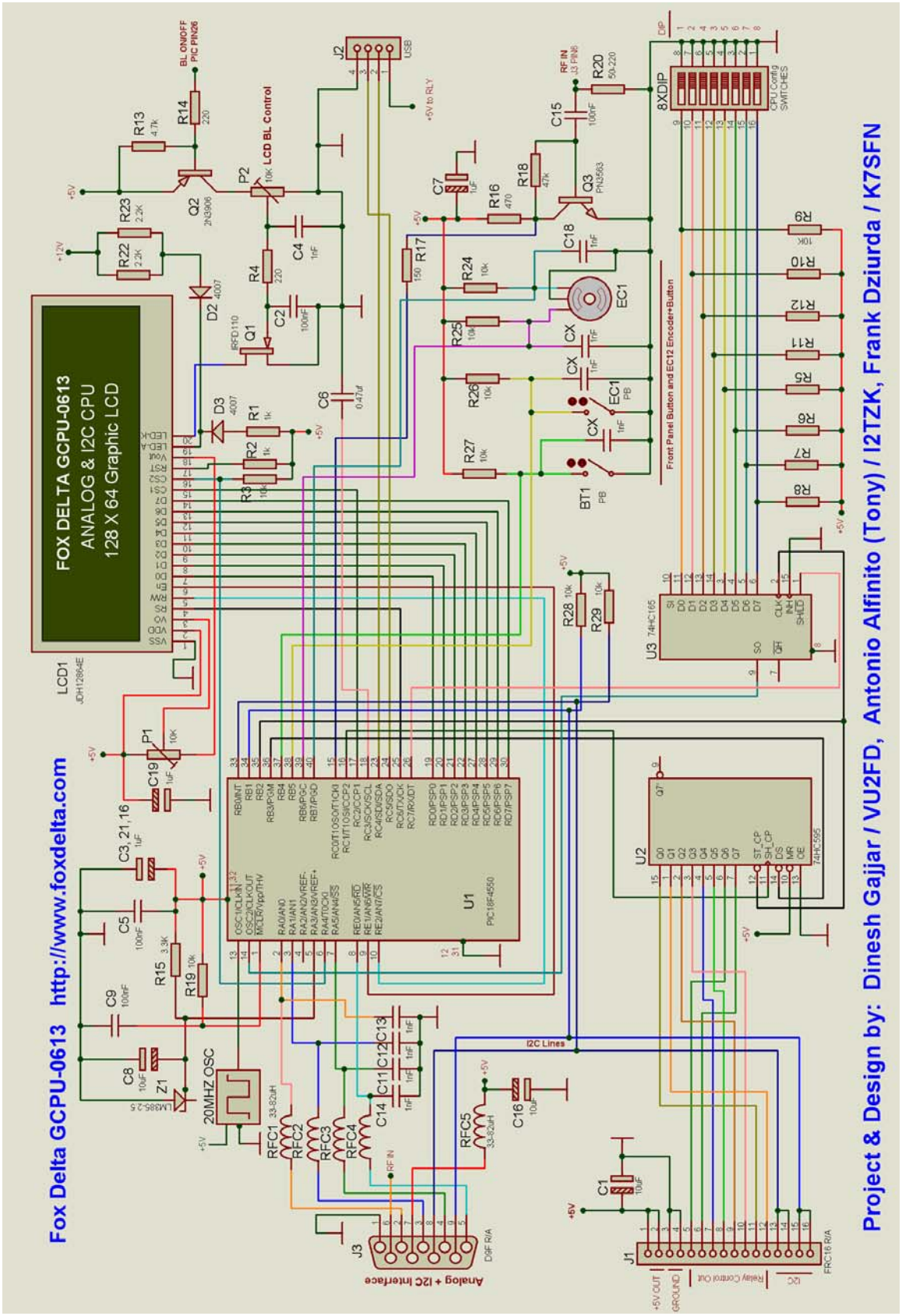
What is that O/E/N Relay doing there? Well its nothing but simple power change over from DC12V to USB! Activates when 12V is applied at J1.

Another View of Graphic CPU:



1. **Q1 is a backlight dimmer FET**
2. **Graphic LCD header is a 20PIN SIL**
3. **All spacers for LCD and keyboard are 9mm long**

GCPU-0613 Schematic:



GCPU-0613 KIT PARTS LIST:

Qtty	Part ID	Part Details
1	U1	PIC18F4550 Pre-Programmed DIP40
1	LCD	128X64 Graphic LCD: JHD128X64E
1	Q1	IRFD110
1	Z1	LM385-2.5V
1	J1	DC 12V connector
1	J2	USB PCB Connector
1	J3	D9F R/A PCB Connector: 4XA/D + I2C + 5V
1	Q2	BC557B or 2N3906 or 2N2907 (GP PNP)
1	Q3	2N3553 RF Transistor TO92
2	D2, 3	1N4007
2	D1, 4	1N4148
1	BT1	12MM Push Button
1	FD-GCPU-0613	Double Sided PTH PCB Main Board
1	FD-GCPU-0613-1	Double Sided PTH PCB Keyboard
1	P1	10K Preset (LCD Contrast)
1	P2	10K POT + Knob (LCD Backlight Control)
1	ENC1	Alps EC12 Encoder with Switch
1	OSC	20MHZ Crystal Oscillator DIP14
1	DIP8	8XDIP SWITCH
1	U2	74HC595 DIP16
	U3	74HC165 DIP16
1	U4	7805 5V regulator
2	DIP16	IC Sockets
1	RLY1	OEN42 12V 1CO Relay (USB/DC Select)
1	40DIP	IC Socket
7	RFC1, 2, 3, 4, 5, 6, 7,	10uH RFC
2	FB1, 2	Ferrite Beads
1	Set	Nuts / Bolts for LCD and KB Mounting
1	FRC16	PCB R/A FRC16 Socket for Extension
1	LCD Header	0.1IN 20PIN Header Male + Female for LCD
1	KB Header: H1/1A	0.1IN 5PIN Header Male + Female
1	Case	Free Powder Coated Metal Case
1	Set	LCD and KB Spacers (4 + 2)
1	Cable	D9 Male to Male 1Mtrs Long

QTTY	Capacitors	
3	C1, 8, 16	10uF Tantalum
7	C3, 7, 17, 18, 19, 20, 21	1uF Tantalum
5	C4, 11, 12, 13, 14	0.001uf Poly/Mylar
1	C6	0.47uf Poly/Mylar
5	C2, 15, 9, 10, 5	0.1uf Poly/Mylar

QTTY	All Resistors ¼ W 5%	
16	R3, 5, 6, 7, 8, 9, 10, 11, 12, 19, 24, 25, 26, 27, 28, 29	10K
1	R21	2.2 Ohms
2	R1, 2,	1K
2	R22, 23	2.2K
X	R20	R-Termination (50 to 220 Ohms)
2	R4, 14	220 Ohms
1	R13	4.7K
1	R15	3.3K
1	R18	47K
1	R16	470 Ohms
1	R17	150 Ohms

Assembly:

At moment no assembly document is available. You may use this document and schematic, silk pictures as a guide for kit assembly.

Firmware and FW Guide:

GCPU-0613 firmware is written by Tony/I2TZK for various projects and is free for use by Amateur Radio Community.

A Firmware is a hex program inside PIC18F4550. At moment, we have following firmware ready for use with this GCPU:

1. **Antenna Analyzer AAZ-0713**
2. **500MHZ RF POWER Meter: PM4**
3. **SWR Meter: SWM4**
4. **Expected soon: FC4 (500MHZ Freq. Counter + RF Meter) and more**

Understanding Backlight Control For Graphic LCD:

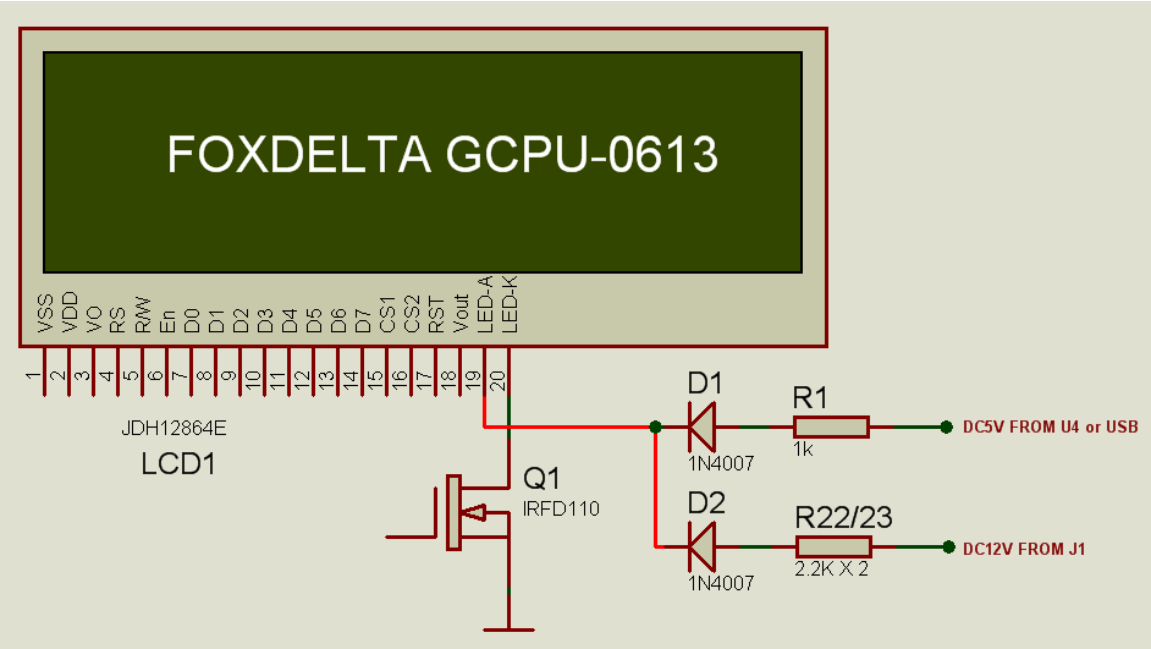
GCPU-0613 has two arrangements for powering Graphic LCD.

1. **Power from USB**
2. **Power directly from DC12V**

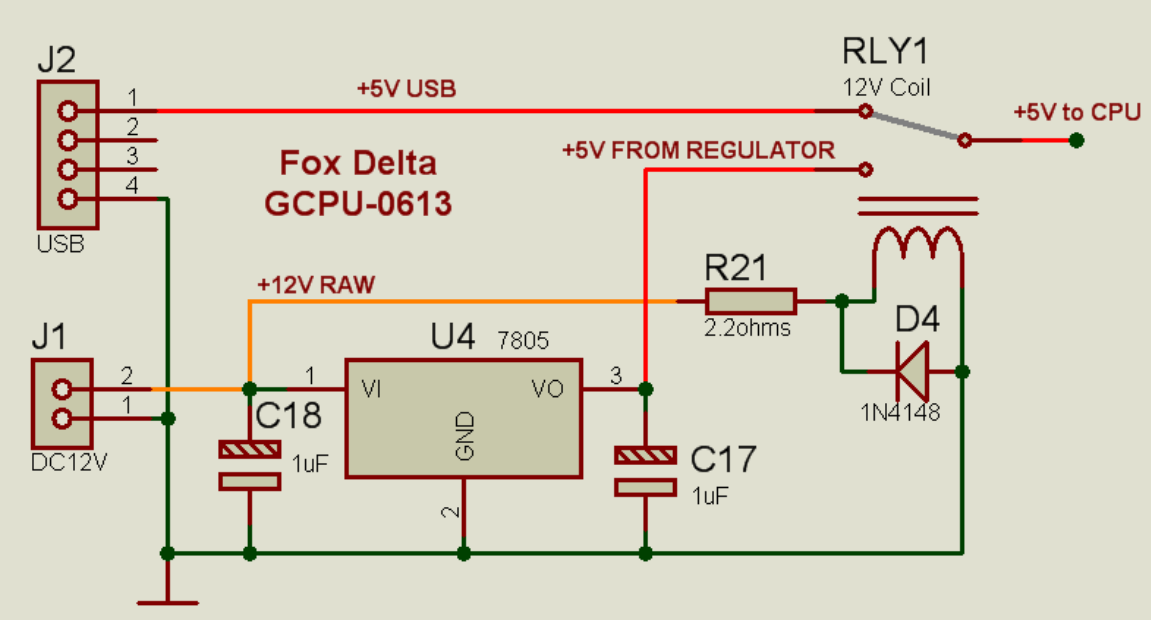
This arrangement was necessary in view to reduce current consumption while powering GCPU from USB and reduce load on 7805 Regulator when running from DC 12V

Two series resistors are used for this purpose.

Simplified Schematic of LCD Backlight powering:



DC12V / USB Power Select Schematic:



73s

Dinesh/VU2FD, Tony/I2TZK, Frank/K7SFN
29th July 2013

For more details please visit http://www.foxdelta.com