Technical Info Doc: PIC16F876A LCD Satellite Tracker & Rotor Controller

ST2 –RS232 – 0220:

ST2 is an advanced Satellite Antenna Tracking Interface for Yaesu (Or similar) Rotor Controllers. Project uses PIC16F876A, 28PIN DIP.

Firmware has EEPROM to store user parameters and at the first run, should be configured with associated rotor in use.

To configure ST2's eeprom ("Bad EEPROM message will indicate that ST2 is not yet configured) **Please refer to setup document to configure ST2's eeprom**.

ST2 measures 14x8cm and is designed on a double sided PTH board.

Screw Terminals are used for Rotor Connections to simplify installation.

A Max232 level converter is used to obtain full RS232 compatibility.

ST2 supports Yaesu GS232, Extended GS232 and Easycomm commands, making it a suitable interface to use with NOVA, SatPC32 and many other amateur radio sat Programs.
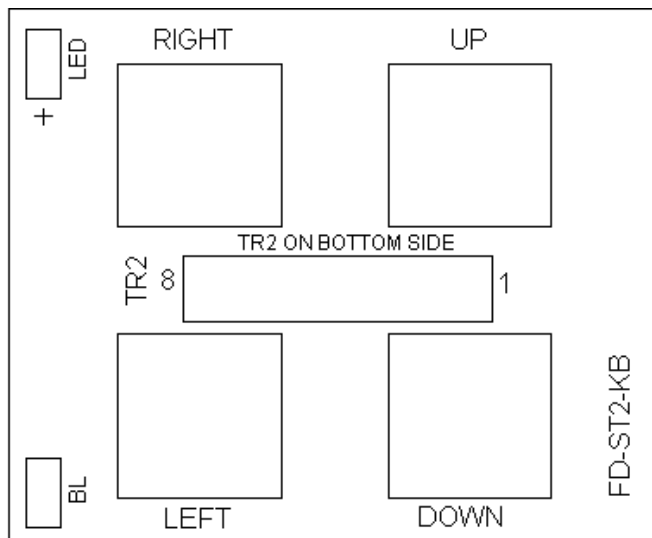
Completed ST2 in Free Metal Case:

ST2-RS232-0220 Complete kit:
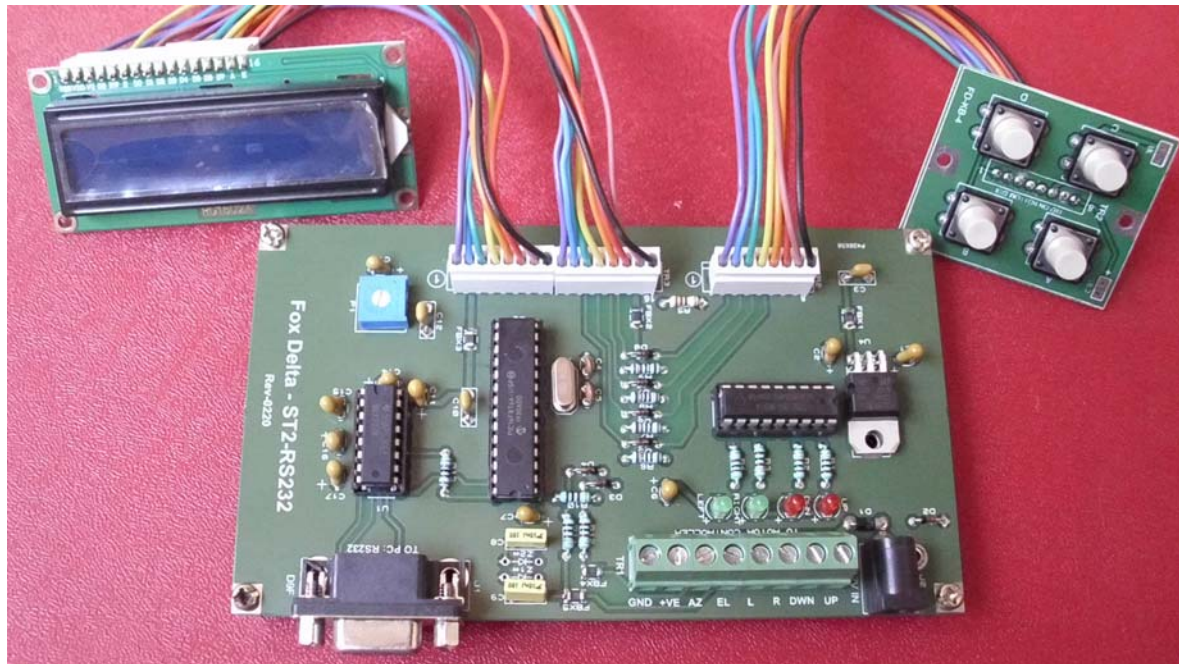
Silk View of Key Board:

TR2 is an 8 Pin SIL socket and installed on the bottom side of the Key Board.

Key Board also two pads "BL" and "LED" which are not used in ST2 Project.

These pads exist on keyboard PCB because we use same keyboard for other projects.
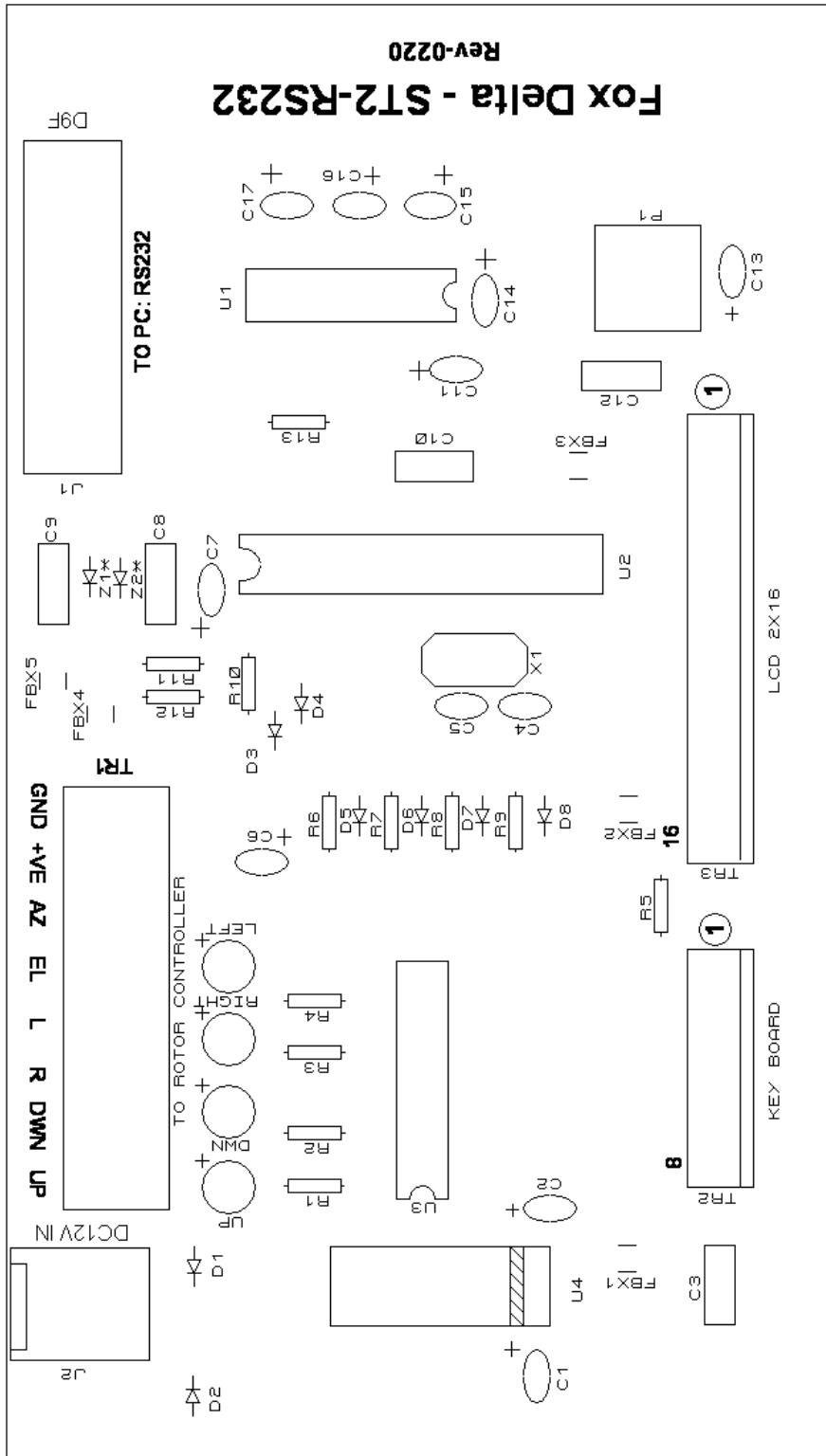
ST2 – RS232 – 0220 Parts List:

Part	Quantity	Details
U2: PIC16F876A DIP28	1	Processor Pre-Programmed
U3: ULN2803 DIP18	1	Relay Driver
U1: MAX232 DIP16	1	RS232 Driver
U4: 7805 TO220	1	5V Regulator
16x2 LCD	1+2	LCD Display with SIL8 X 2 Male
X1: Crystal	1	4MHZ HC49U
ST2 RS232 PCB	1	ST2-RS232-0220 DSPTH PCB
TR3: SIL16 Male (8+8)	2	LCD connector
8PIN Ribbon	2	Ribbon for LCD Connect
TR2: SIL8 Male	2	PCB mounted for KB + Main Board
SIL 8 Ribbon	1	Key Board connection
IC SOCKET DIP16	1	MAX232
IC SOCKET DIP28	1	PIC16F876A
IC SOCKET DIP18	1	ULN2803
Ferrite Bead Inductors*	5	FBX1-5: Pre-Soldered on Board
J2: DC Socket	1	+12V External
TR1: Terminal 8	1	8 Terminal block (2x4)
P1: 10K Preset	1	LCD Contrast
J1: D9F	1	PCB R/A D9 Female Connector
Push Buttons	4	12MM FOR KEYBOARD
KB PCB	1	Keyboard PCB
LED 3mm	4	UP / DOWN / RIGHT / LEFT

- * = SMT PARTS PRE-SOLDERED ON BOARD

Part	Quantity	Details
1uf Tantalum	10	C1, 2, 6, 7, 13, 11, 14, 15, 16, 17
0.1uf Ploy	3	C3, 10, 12,
0.001/0.01uf Poly	2	C8, 9
27/33pf Ceramic	2	C4, 5
1N4007	1	Diode D1
1N4148	7	Diode D2, 3, 4, 5, 6, 7, 8,
1K	7	R1, 2, 3, 4, 10, 11, 12
100K	4	R6, 7, 8, 9
4.7K	1	R13
22 Ohms	1	R5

ST2 RS232 0220 Silk:

Fox Delta - ST2-RS232
Rev-0220

TO PC: RS232

D9F

J1

C17 C16 C15

U1

C14

P1

C13

C11

C12

FBX3

C10

R13

C9 C8 C7

Z1* Z2*

U2

FBX5

FBX4

R11

R10

R12

D4

D3

X1

C5 C4

TR1

D3

C6

R6 D5 R7 D6 R8 D7 R9 D8

FBX2

16

LCD 2X16

TR3

R5

GND +VE AZ EL L R DWN UP

TO ROTOR CONTROLLER

LEFT

RIGHT

R4

R3

DWN

R2

UP

R1

U3

1

KEY BOARD

8

TR2

DC12V IN

D1

C2

U4

FBX1

C3

J2
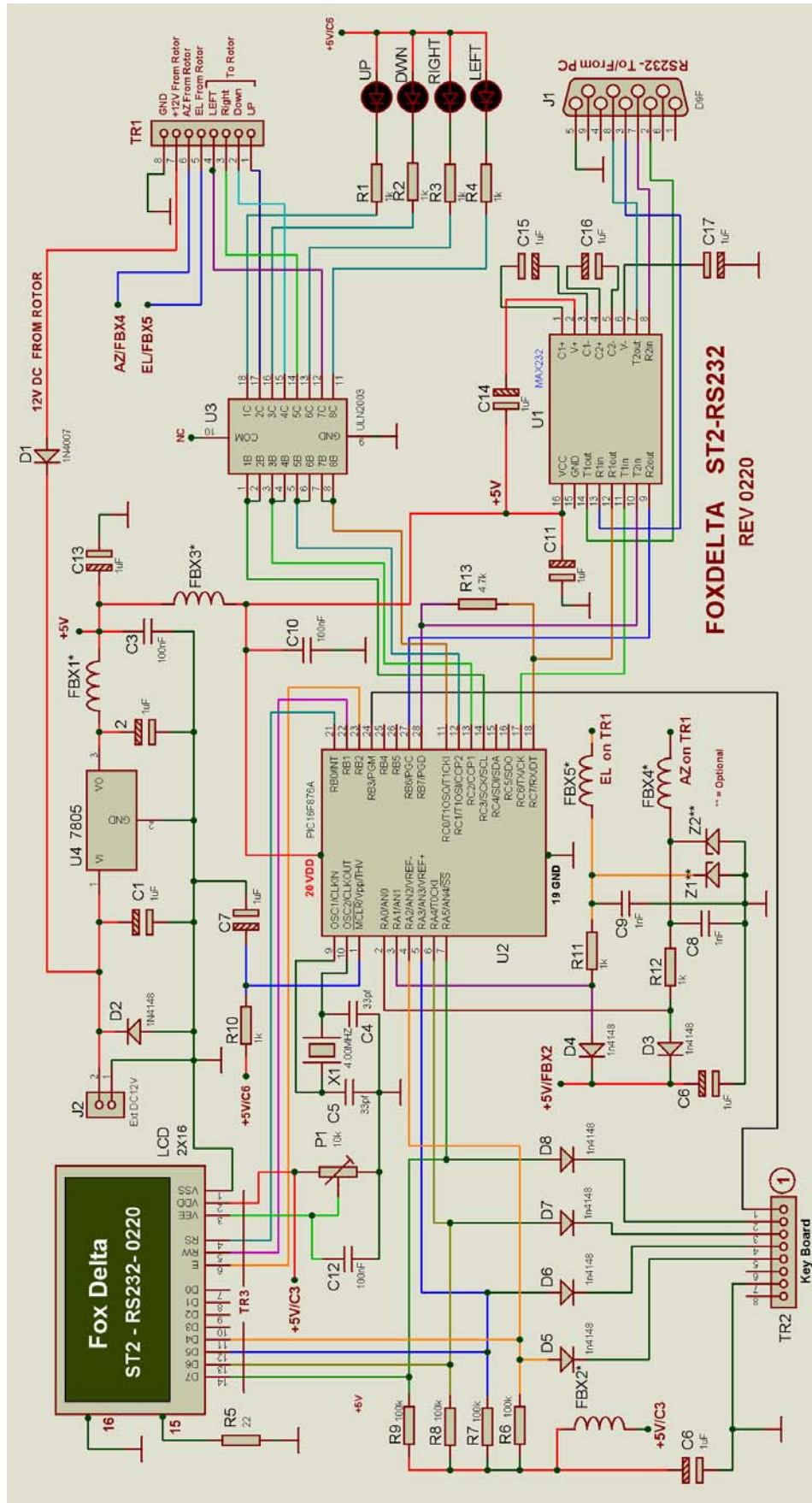
C1

D2

ST2 RS232 is powered by applying DC12V at J2. It may be powered from Rotor Controller's DC12V at TR1/Screw Terminals (from Yaesu Rotor Controller)

Ensure that you power ST2 from either of the source, not both!

Schematic of ST2 RS232 0220:

Note:

Z1 and Z2 in above schematic are protection Zeners. They are not part of ST2 kits.

Users intend to use ST2 with their own rotor or other interface, if they foresee a possibility of analog voltages in excess to +5V reaching at TR1, may use them to protect PIC from damage. (Zeners may be of 4.7V ratings)

Setup with Yaesu Rotor Controller:

Prior to connecting this interface with Rotor Controller, Please refer to the Controller Schematic.

User is required to make a cable from ST2 to Yaesu Rotor Controller.
This may be achieved by using an 8 Core cable and a DIN8 Plug at the other end.

TR1 Connections: (Goes to Yaesu Rotor Controller: DIN8)

Connections count from "TR1"

1. GROUND
2. +VE (_12V from ROTOR)
3. AZ (Analog Feedback From Rotor)
4. EL (Analog Feedback From Rotor)
5. LEFT
6. RIGHT
7. DOWN
8. UP

Using USB Adapter:

As most PCs do not have a COM port these days, ST2 may be used with an USB Adapter available in market.

Select one with good USB to RS232 chips, like, FTDI chips. Make sure that you install driver provided by Adapter supplier.

USB to RS232 Adepter create a Virtual COM port on your system, which we use in our satellite PC Program to access ST2.

73s / Dinesh Gajjar / VU2FD 15th Feb 20