KT32 Temperature Acquisition Board

History/Description:

This circuit board was designed specifically for a company that provides time temperature software. This circuit board was designed to be mounted in a personal computer, powered by standard PC power supply connector and interface to DB25 serial connector. A 5 volt DC power supply + or - 5% is required for the digital components and 12 Volt DC voltage is required to energize the AD590 temperature sensor. The power supply connector is only for PC mounting and wires can be soldered when powering from other sources. Similarly the DB25 connector is optional, wires can be soldered to KT32 that terminate to DB9 or to some other connector for the serial interface.

The circuit board is designed to interface to the AD590 temperature controlled current source two wire temperature IC. The AD590 is originally manufactured by Analog Devices but is second sourced by a number of IC manufacturers. This IC has an operating range of -55 degree C to 150 degree C and outputs a current proportional to temperature at 1 micro-amp per degree Kelvin. The Kelvin temperature scale is based on Absolute Zero and as such 0 degrees Centigrade is equal to 273.15 degrees Kelvin. Therefore at 0 degrees Centigrade(32 degrees Fahrenheit) the AD590 will output 273.15 micro-amps. The current source nature of the IC ensures reliable delivery of temperature information as wire resistance is compensated. This current is converted to a voltage with a resistor and the voltage is then resolved to a digital value by a 12-bit Analog to digital converter (U9: LTC1290DCN). The Command set supports automatic calibration of the temperature sensor by simply sending a serial string with a temperature value (degrees Fahrenheit) obtained with an accurate measurement at the sensor location. The calibrated span value is stored in non-volatile EEprom as an IEEE single precision floating point number. This value can be read or force written by the Command Set. The command set is attached to this document.

In addition to providing temperature, the circuit board can provide a Personal Computer Reset. This PC Watch Dog function was required to prevent a software hang problem that they periodically experienced with their time temperature software. Essentially you would plug the PC reset switch onto the KT32 board at JP2 and then use a two pin extension wire from JP3 to PC Main board reset jumper. This output is optically isolated. Your software would then periodically send a serial string to keep the reset counter in check. If the reset counter times out a reset will be asserted. This is an optional feature of the board and does not required components(LED2, U8, JP2, JP3) unless desired.

Additional features of the KT32 circuit board are for future considerations and are not required for KT32 operations. Components HD1, HD2, U5, U11 are not required for KT32 operation and should be left empty. Although the A to D converter supports 8 analog inputs only one input is supported by the KT32 software.

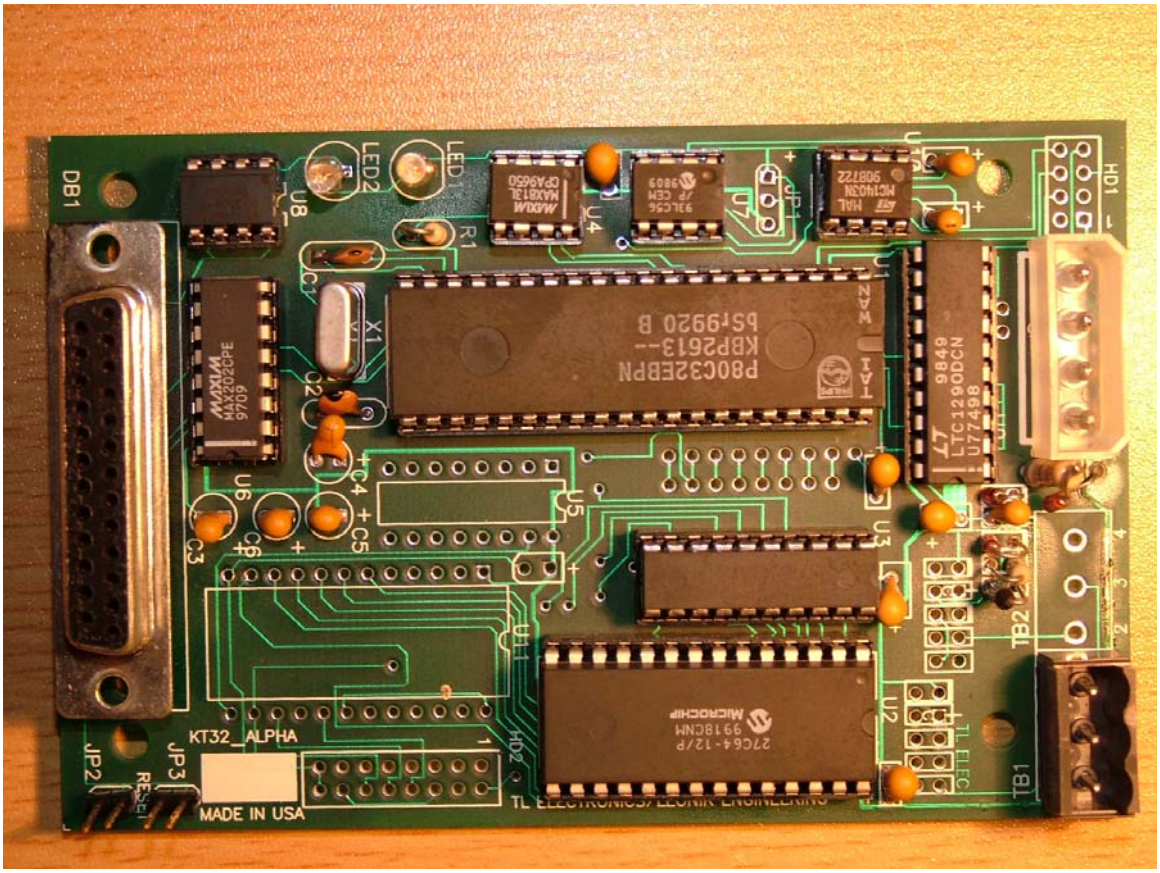
KT32 Parts List

Note: Use IC dual leaf sockets for all IC Locations

U1	P80C32	Intel or compatible(the required Crystal is 11.0592 Megahertz)
U2	Eprom	27C64
U3	74HC573	Any generic IC
U4	Max813L	Maxim Integrated Circuit
U5	Not Required	
U6	Max202 Or Max232	Maxim Integrated Circuit with Max202 C3-C4-C5-C6 are .1 uf with Max232 C3-C4-C5-C6 are 1 uf Tantalum watch polarity
U7	93C56	Any generic EEprom
U8	PS2506-2	NEC dual opto-isolator
U9	LTC1290	Linear Technology 8 Channel 12-bit A/D
U10	MC1403P1	Motorola 2.5 Volt reference
U11	Not Required	
R1	150 ohm	¼ watt 5%
X1	Crystal	11.0592 Meg FOX115-20
C1	30pf	Crystal Capacitor
C2	30pf	Crystal Capacitor
LED1	T1 Green	
LED2	T1 Red	

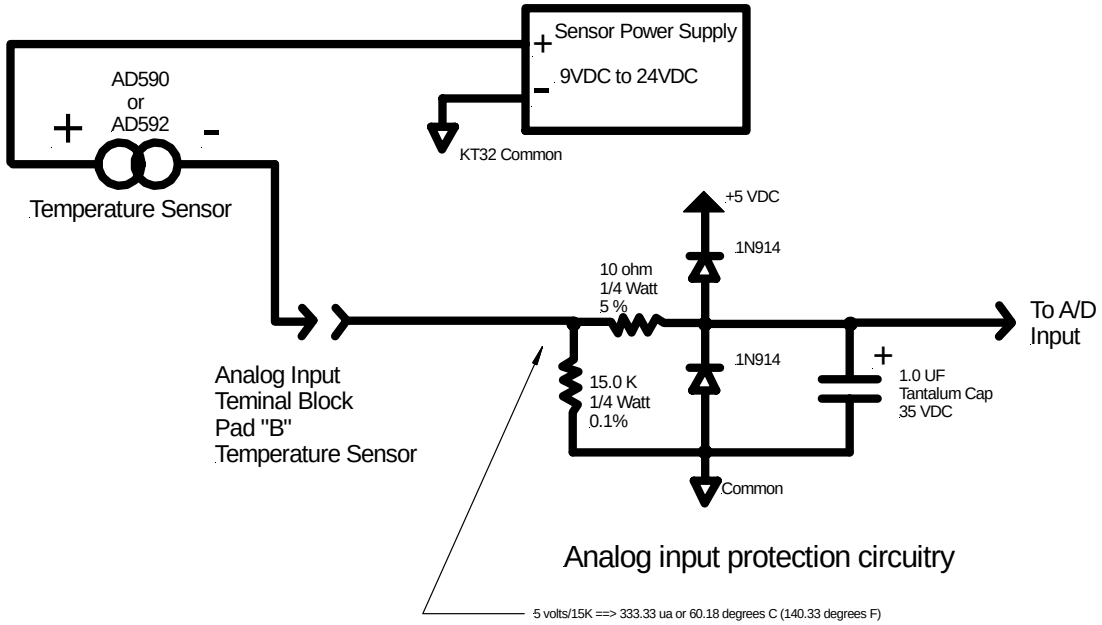
All other Capacitors are bypass caps 1uf rated 15VDC except for A/D bypass cap which is 22uf. May sure Capacitor Polarity is maintained.

See Analog Conditioning detail for Analog Input components

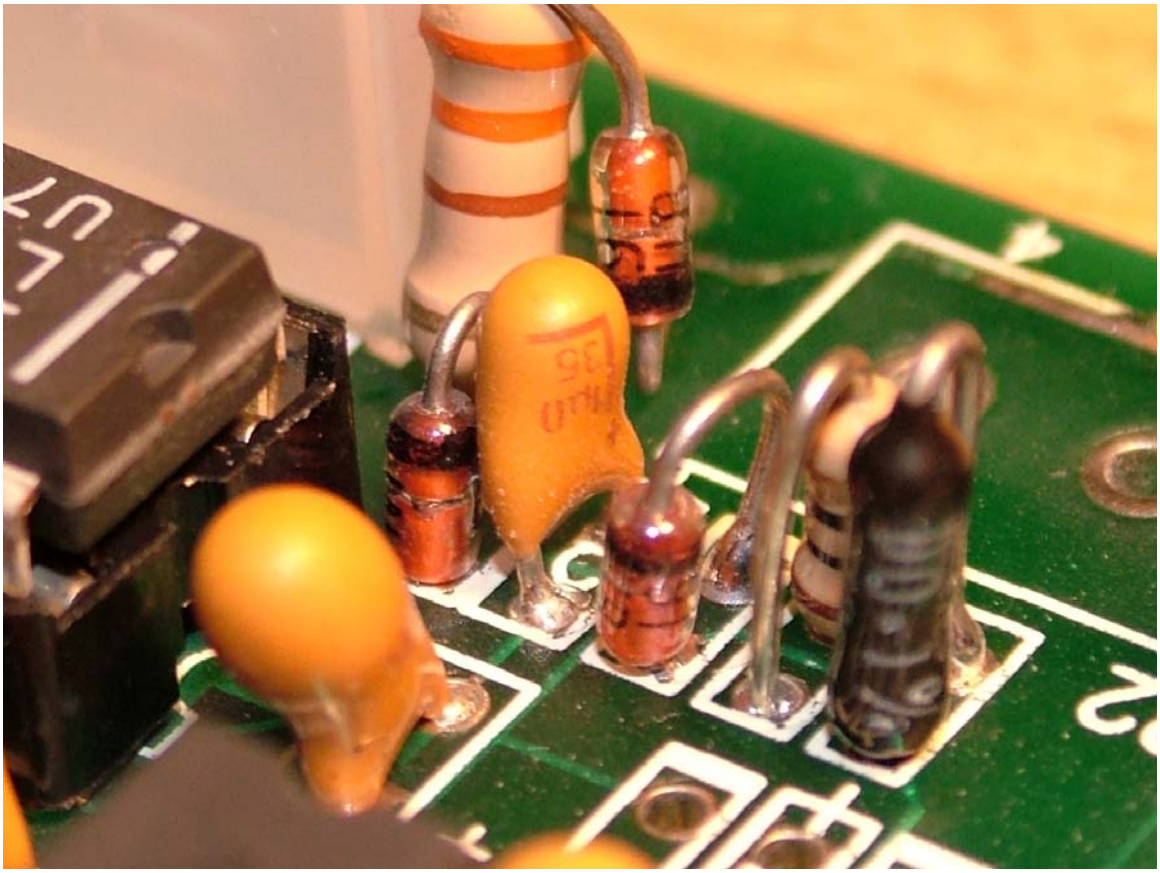


Picture of a fully populated KT32 Board

Analog Connection ---- Analog input protection components

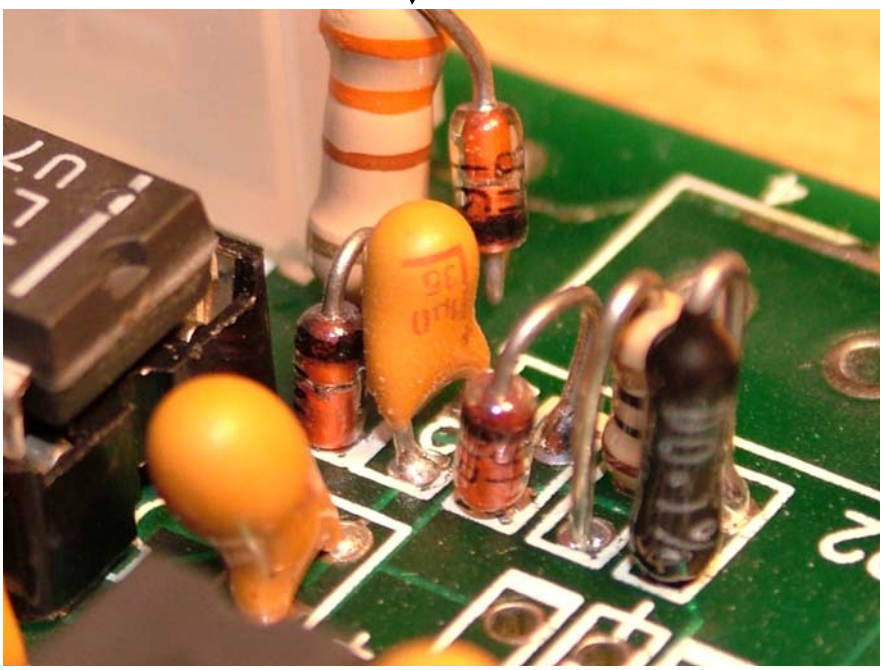


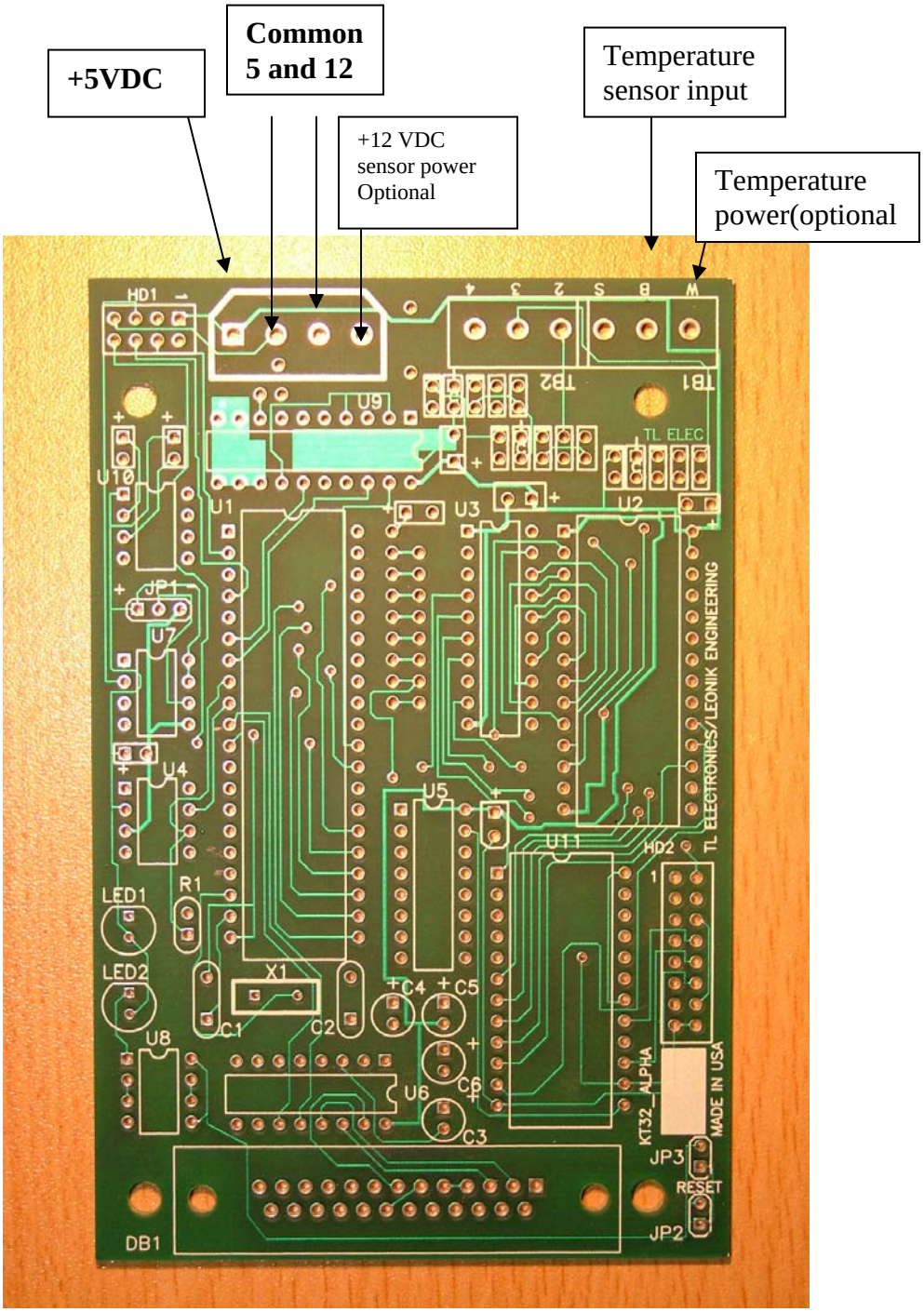
Picture of Analog component section of PC Board



Please note that the diode anode side is positioned down and the cathode is up as shown. Note the polarity of the tantalum capacitor. The resistor to the far right is 15K .1% and the resistor to the left of it is 10 ohms. The two diodes are 1N914 and the Capacitor is 1uf 35VDC tantalum.

This 330 ohm resistor and diode is used to route 12VDC from the power supply connector to the temperature sensor power terminal block TB1-W. This is only required if you are using a PC power supply connector. Otherwise supply +5 VDC as follows and wire sensor as shown in the previous diagram.





DB25 Pinout

Square pad is pin 1
Pin 2 is RXD
Pin 3 is TXD
Pin 7 is common

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KT32_ALPHA

COMMANDS

The protocol is 8N1-9600 {8bit/no parity/one stop/9600 baud}.
<CR>=carriage return NOTE: ALL **COMMANDS** MUST BE UPPER CASE

1) **READ TEMPERATURE**
$T<CR>
RESPONSE: **@+0074.63<CR>**
NOTE: + IS SIGN OF TEMPERATURE IN DEGREES F
@-0159.69<**CR**> INDICATES AN OPEN PROBE
@+0140.18<**CR**> INDICATES A SHORTED PROBE

2) **IDENTIFY (SOFTWARE REV)**
ID<CR>
RESPONSE: **TL ELECTRONICS KT32 REV00<CR>**

3) **WATCH DOG (0001 TO 9999 SEC)**
$W0005<CR>
NO RESPONSE: PC RESET INITIATED IN APPROXIMATELY 5 SECONDS
$W0000<CR> WILL HALT WATCHDOG

4) **CALIBRATE TEMPERATURE PROBE**
T=1:SXXXX.XX<CR> S IS SIGN AND XXXX.XX IS ACTUAL TEMPERATURE OF A KNOWN TEMPERATURE REFERENCE.
RESPONSE: **1S=$3F836D40<CR>** NEW FLOATING POINT SPAN VALUE IN HEX
NOTE: $3F800000 IS A IEEE SINGLE PRECISION FLOATING POINT VALUE FOR 1

5) **READ SPAN VALUE**
$S<CR>
RESPONSE: **1S=$3F836D40<CR>**

6) **WRITE A SPAN VALUE**
S=1:3F800000<CR>
RESPONSE: **1S=$3F800000<CR>**
CALIBRATE DATA IS STORED IN EEPROM