Final report on

Non-contact Current Meter

MON – 14

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April-2023

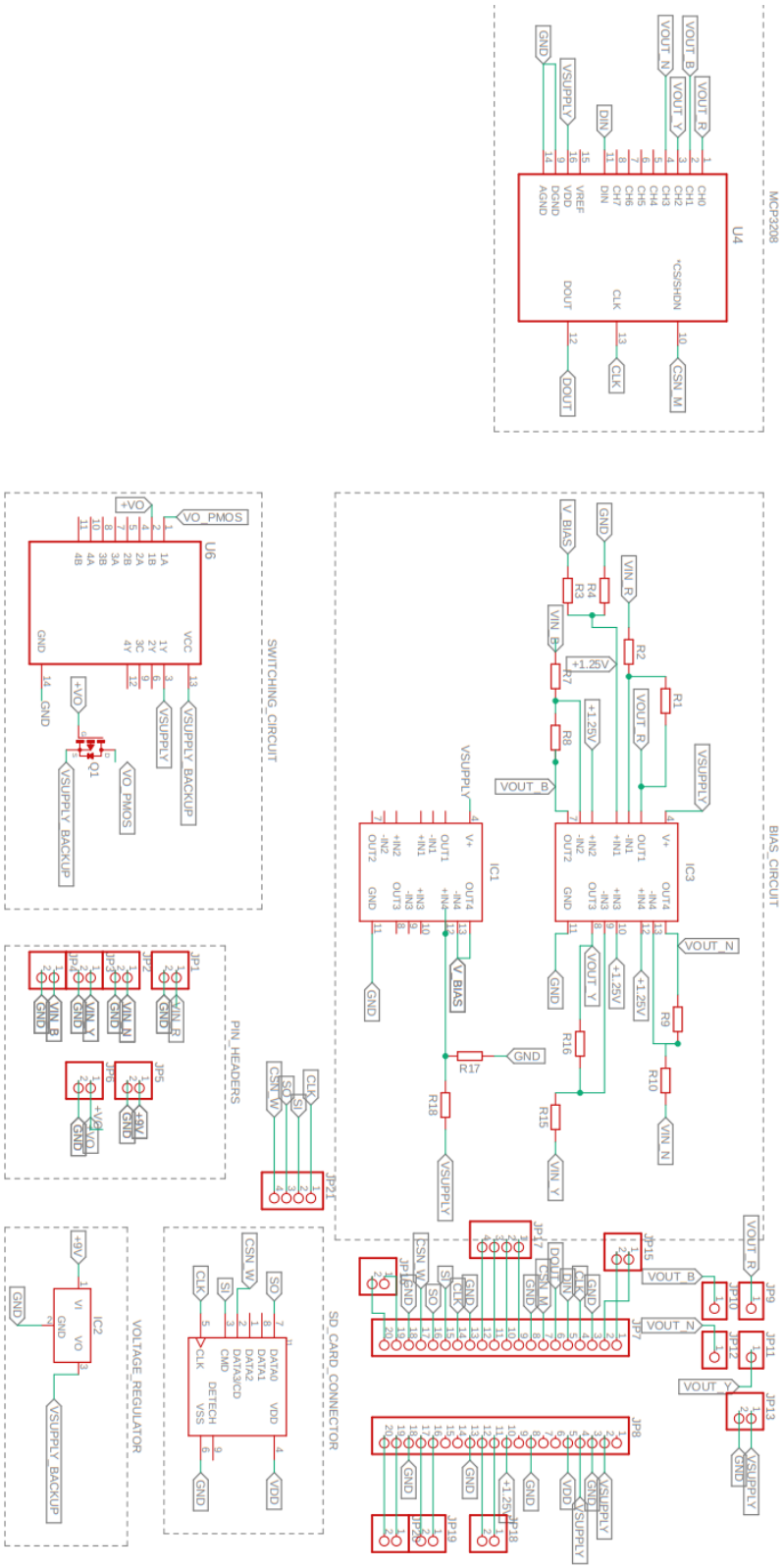
Introduction

A Non-Contact Current Meter is a device used to measure the electrical current in a wire or cable without making physical contact with the conductor. This is in contrast to traditional current meters, which require the use of probes that must be physically attached to the conductor in order to make a measurement. This device consists of a flexible coil that can be wrapped around with a conductor. We use the change in flux in the coil to calculate the current in the primary winding(main AC supply). Non-contact current meters have several advantages over traditional current meters. They can be used in situations where access to the conductor is difficult or impossible, such as in tight spaces or high-voltage environments. As there is no physical contact with the conductors, we eliminate the risk of electrical shock or damage to the conductor.

Block Diagram

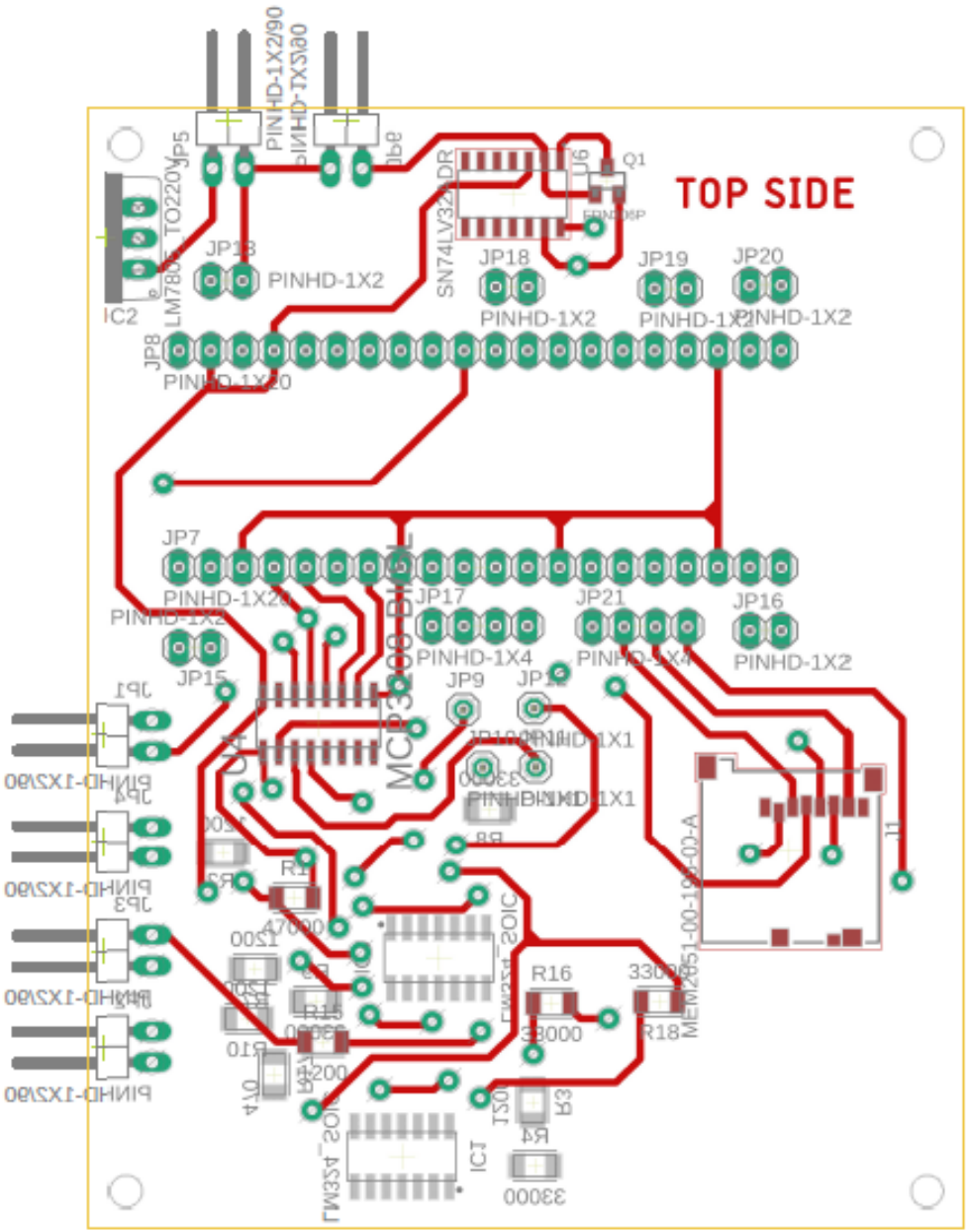
Circuit schematic and layout

Schematic:

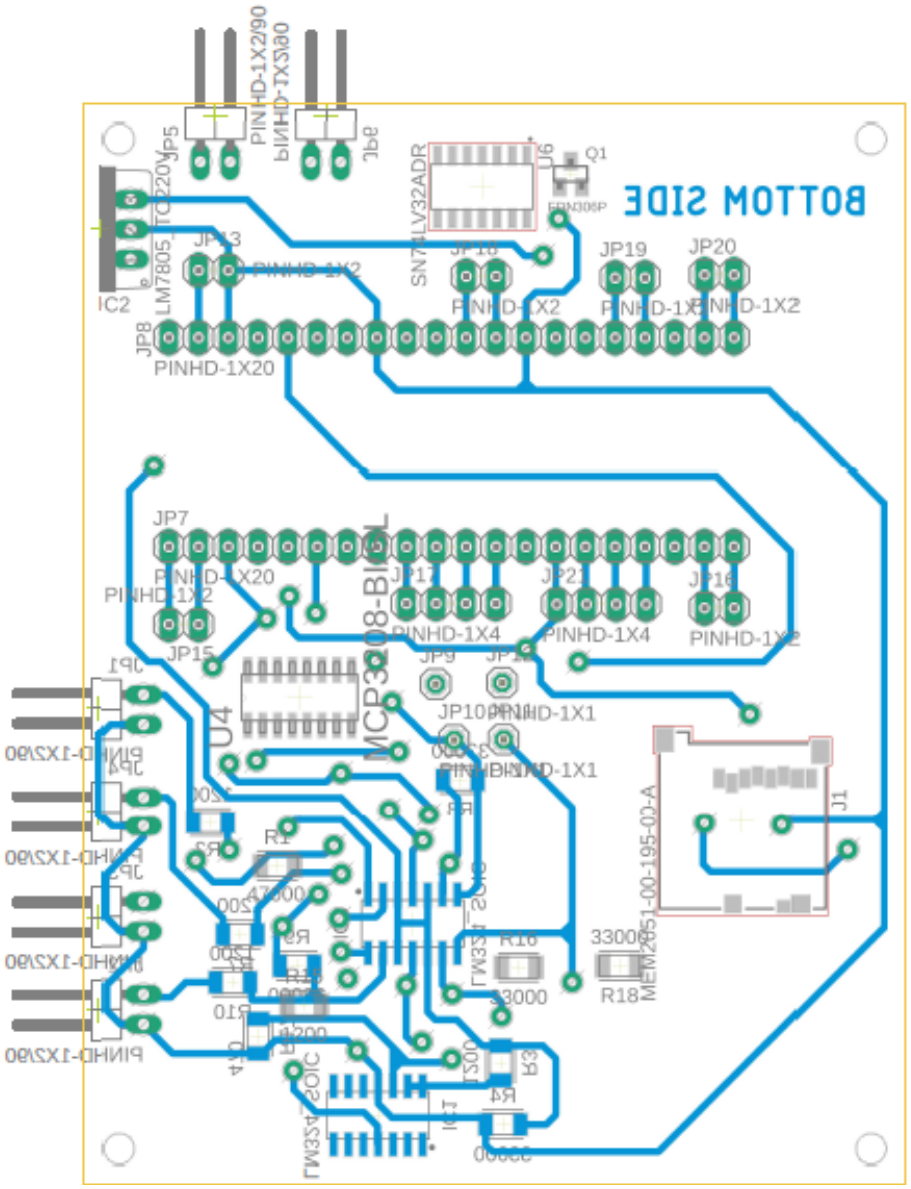

MCP3208
U4
VOUT_N
VOUT_B
VOUT_Y
VOUT_R
GND
VSUPPLY
DIN
CSN_M
CLK
DOUT
SWITCHING_CIRCUIT
U6
VO_PMOS
+VO
Q1
VSUPPLY_BACKUP
BIAS_CIRCUIT
V_BIAS
VIN_R
VIN_B
VIN_Y
VIN_N
+1.25V
IC1
IC3
R1
R2
R3
R4
R7
R8
R9
R10
R15
R16
R17
R18
PIN_HEADERS
JP1
JP2
JP3
JP4
JP5
JP6
JP21
CSN_W
SO
SI
CLK
VOLTAGE_REGULATOR
IC2
+9V
SD_CARD_CONNECTOR
JP7
JP8
JP9
JP10
JP11
JP12
JP13
JP15
JP16
JP17
JP18
JP19
JP20

Layout:

Top layer



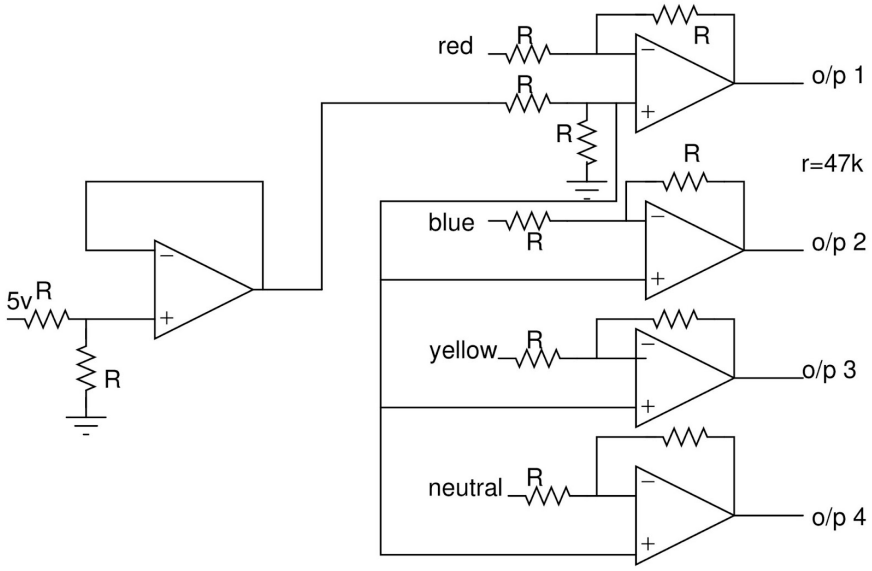
Bottom layer



Description of test setup and test method

Test Setup:

Test-1:
As we are using biasing circuitry to to make the input incoming AC voltage stay above 0V,a we are checking the circuitry to see if we are getting the required voltage after biasing circuit as output
Biasing Circuit: here all resistor values are 47k and the inverting terminal input of each opamp is the clamp o/p from each wire(red,blue,yellow and neutral).Here all opamps are lm324 we chose them because they can operate with 5V supply which is convenient for us



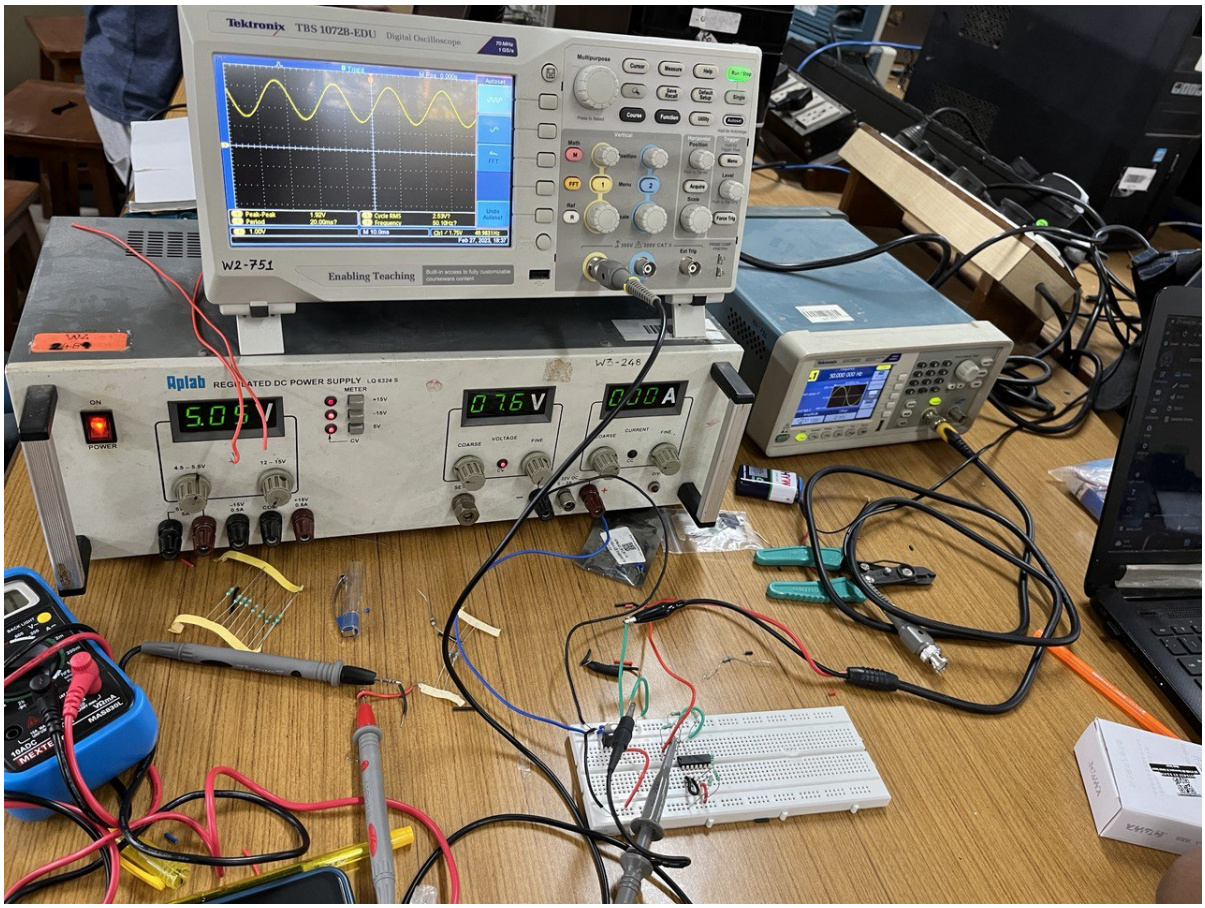
Test-2:
We gave these four outputs we got above which are in the range 1-4V after biasing, to MCP3208 ADC which has 8 channel analog input.This MCP3208 can send data to the rpi pico w using spi interface.In this test we are sending one of the biased analog o/p's to to the ADC then to rpi pico and calculating its rms value(which is

the final output we need).
For this test the circuit is as given in schematic

Test Method:

Test-1:

We connected the biasing circuit as shown in the above figure and supplied the 5V
from the power source in the lab and then we supplied one of the inputs , say input 1 (red) from the function generator (a sine wave between 0-1.41V since the clam o/p for current in the range 0 to 30A is 1V rms.) and measured the o/p using oscilloscope.



Test-2:
Here in this test we used the similar biasing circuit as in test 1 but we now connected the circuit to the MCP3208 and raspberry pi pico w as given in schematic and tested whether it can store the correct values in the registers.

We were successfully able to generate the dumpable file (u2f for r pi pic).

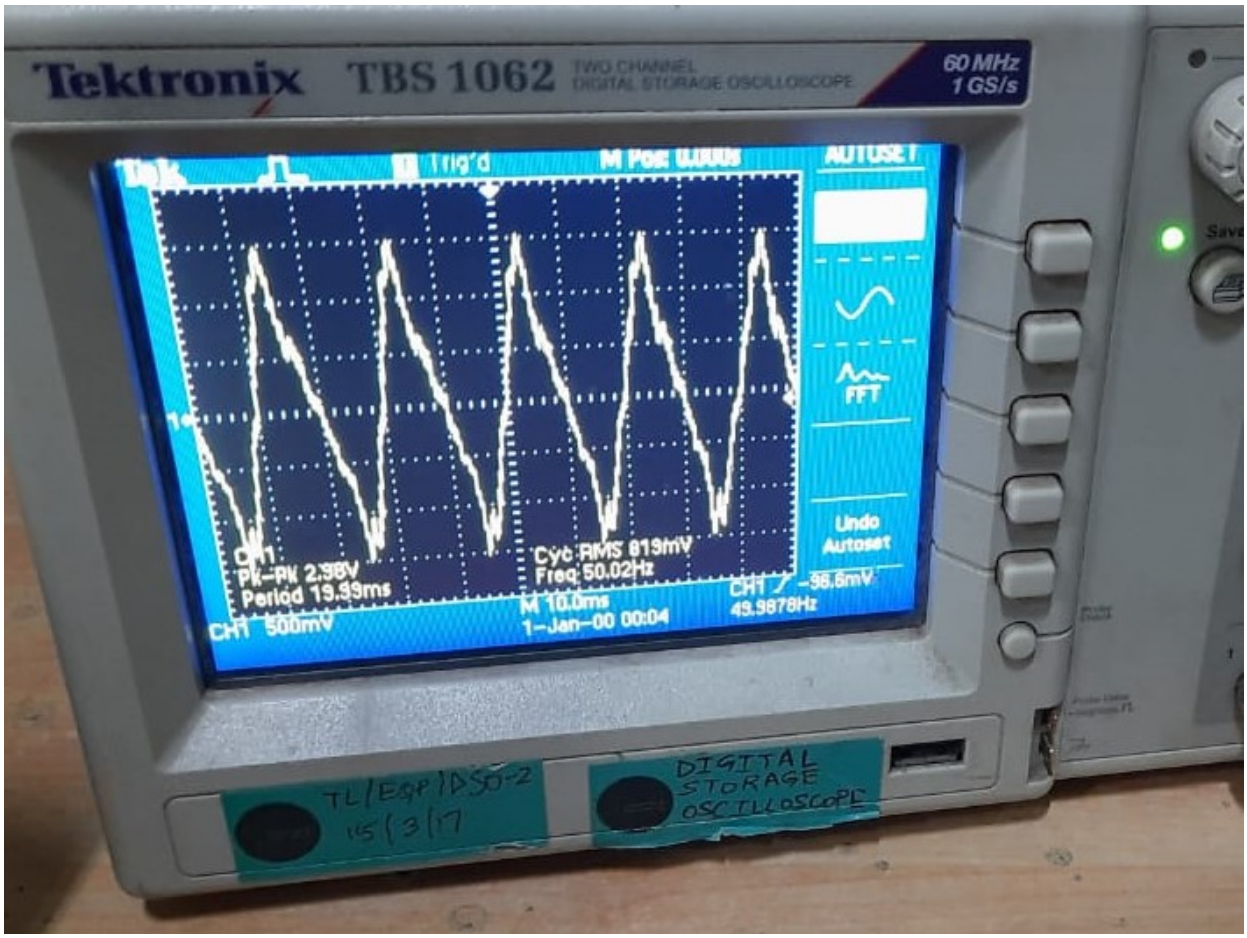
Test results

Test-1:

Here we have given input of voltage between 0-1.141V to the biasing circuit and the o/p is as expected is in the range of 1-4V

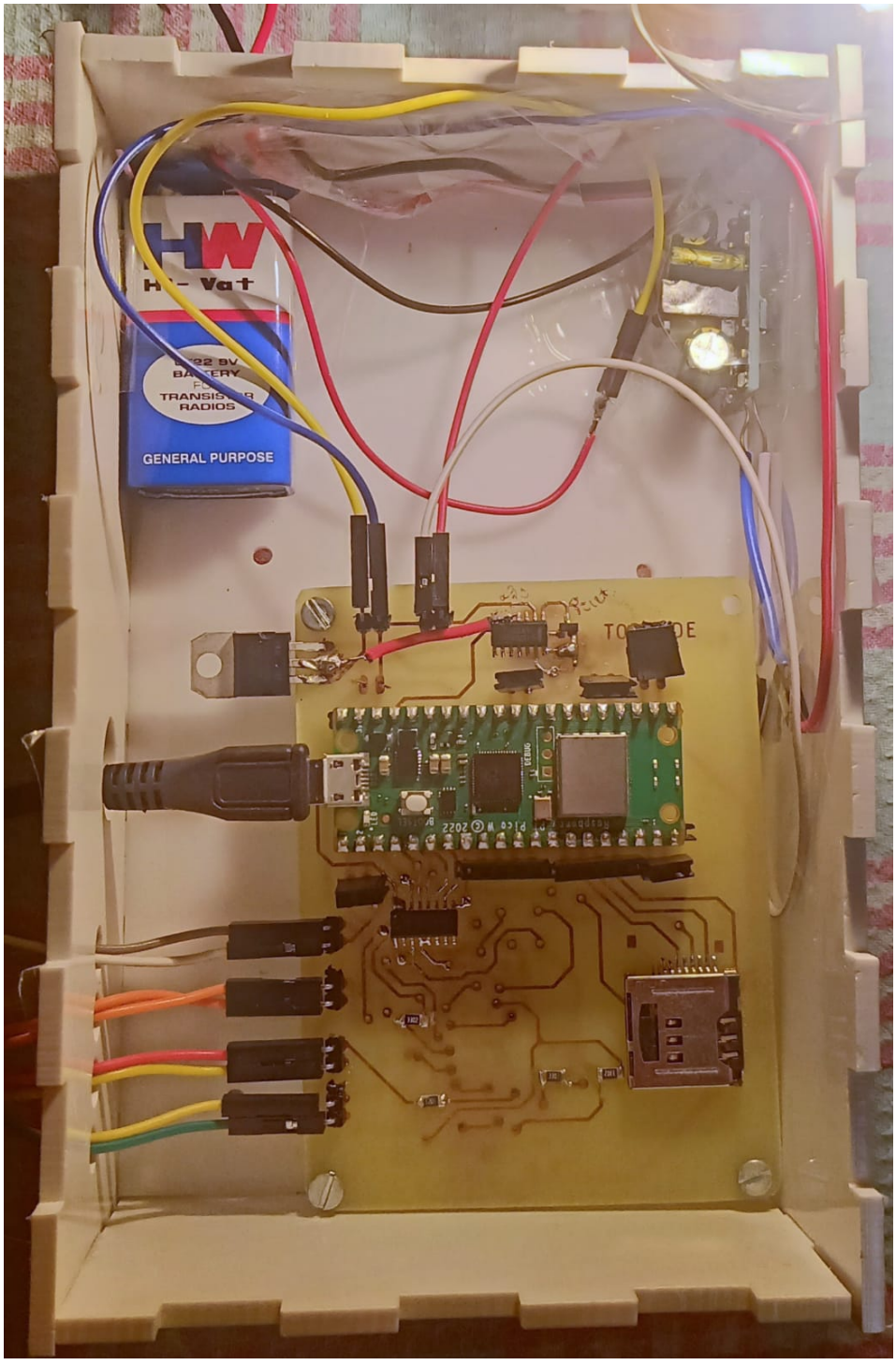
Test-2:

The entire working circuit till r pi pico gathering the data from MCP3208 to r pi pico



We were able to successfully sense the current value through clamps and bias it using the biasing circuit and transfer the analog data to MCP3208 and sample it digitally in raspberry pi pico and store those values in local variables (or registers) to transfer it to the server.:

Final Board



Future Work

We have achieved sending the data to a web server, Further the data it acquired can be processed into a graph,plot and with a time stamp attached to it can be made available to anyone using the link generated. And for over loads alarm system can be added

Bill of Materials

Electronic Part	Cost
Current Clamps x 4	1500 Rs
9V battery x 1	30 Rs
Voltage regulator 220v-5V x 1	108 Rs
Voltage regulator 9V-5V x 1	20 Rs
LM324 pin hole x 2	40 Rs
LM324 SMD x 2	20 Rs
MCP3208 x 1	300 Rs
Micro SD card x 1	360 Rs
SD card connector x 1	70 Rs
SMD PMOS x 1	14 Rs
Total	2462 Rs

Links to Final Demo Video.

https://drive.google.com/file/d/1uT5wDoE5foYpzJS_CDBUaAYBgT4pXP6K/view?usp=share_link