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Multichannel Data Acquisition System

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Abstract: Multichannel data acquisition system they are capable in field of measurement signals. In this unit is capable to measure four channels of resistance, two channels of voltage and two channels of current measurement channels. In this Development of this system they are ensuring proper functions of various features of system. This paper used in this part of Digital Multimeter.
A computer or a standalone device sampled these signals, converts them to digital, and stores them. These devices can be freestanding or connected to a computer, and they can collect data from signal conditioner and counted through fixed gate period to get the frequency. Each channel has programmable input channels, integration amplifiers; voltage ranges on all channels are measured.
This configuration generates output frequency is proportional to the resistance, voltage and current of the sensor Microcontroller processed all of these digital values are measured and translated to sensor input current, voltages, and resistance values.
Each line is selected using voltage, current, and resistance measurements, and the multiplexer's controlling signal is connected to the microcontroller through an opto-isolator. The multiplexer's output is coupled to an opto-isolator before being routed to a microcontroller for pulse counting.
At last, the unit switches to measurement mode automatically counted and displaying the resistance, current, and voltage values on LCD display.
Keywords: ARM based Cortex M7 Microcontroller, DC converter, SDRAM, Programming Connector, and LCD Display.

I. INTRODUCTION

Multi-Channel Data Acquisition System will be many subsystems of data acquisition System. A systematic of data of collecting hardware, software allows one to measuring and are controlled the characteristic of applying new ideas. A Data acquisition systematic data consisting of signal that is analyses the system of hardware and data measuring the acquisition of applying hardware. In data acquisition system role of system is multiplexer.
A multiplexer is a system of inputs and receiving signals from multiple acquisition data networks. In this system they can be done automatically reading of data controlling by the computer. Each signal of data acquisition system it acquires the particular element of parallel analysis and are parameterized through whole basis of applying ideas, it can perform condition of signals on daily basis of applying digital systems.
Multi-Channel system of signals measured limiting of conditioning signals more complex than analog systems. The unit consists of measurement of resistance, voltage and current with suitable hardware and software, the unit is a microcontroller based electronic instrument with the following specifications. Design and development of arm7 based cortex microcontroller is based on specifications of multimeter capabilities.

1) Resistor Measurement (10 kΩ10000 kΩ)
2) Voltage Measurement (0-40 mV)
3) Current Measurement (4-20 mA)

In this existence of measurement data acquisition system are implemented at embedded system coding and are designed through external/internal clock pulses. They are electrical parameters taking the average values of three channels of sensors.
In this paper offers at resistance, voltage and current of sensors are converted into frequency through voltage to frequency converters of sensors.
Microcontroller based digital multimeter they are calculating each parameter and check the data values are processed through communication protocol.

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II. METHODOLOGY

A digital multimeter at low cost is still considered as an innovative implementation. In this typical of digital multi-meter it may include features such as the ability to measuring of voltages, channels of current and resistance. Multimeters are digitally used and are increasing levels of values of their functional element of controlling the features of data. Multi-meters of the signalling ability of testing and amplifies to controlling the levels of systems. Multi-meters are displaying the measurement of values of numbering and presenting the values of digital through errors of levels. In this increased solid state electronics they are controlling the circuit and have provided through metering of system.

This methodology of measured results of the meter can record and store in memory and synchronizes through a PC of systems. In a method of systems it can measure ranges and selected through manual or automatically developed through testing system.

It can be performed and are developed at list of data configurations and their functions of interconnection systems. It is capable and is measured different a service that ensures proper functioning through various features of the system. It can be pre-dispatch inspection of the developed unit and are performed through research of the system.

III. FUNCTIONAL DESCRIPTION

Basically the unit measured at the channels of system. On this channels it can measures resistance, voltage and current values are processed through microcontroller are converted to values of sensors using suitable algebraic equation. This detailed description is sequentially given below.

A. Signal Conditioning Circuit

The purpose of conditioning is 8outputs from op-amps are fed to a Schmitt trigger to produce a TTL pulse compatible for counting by microcontroller. In multiplexer output is given to opto-isolator to isolate the sensor with microcontroller to get any noise from sensor.

B. Data processing System

In processing system of data microcontroller shall receive the conditioned signal from signal conditioner and counted the data through gate period of frequency.

C. Counting System

The system of counter shall counts the capacity of counting pulses at minimum shall be zero counted values are counted.

D. LCD Display

The LCD Display is used to display the messages and intermediate results of different parameters and displayed in LCD.

E. Microcontroller

Microcontroller cortex M7 32-bit is controlling and operating up to 216 MHz frequency. It has low power sleep, stop and stand by modes of operation. In this debugging mode of operation values are entered by development of measurement channels of sensors are displayed on LCD.

IV. BLOCK DIAGRAM OF MULTICHANNEL DATA ACQUISITION SYSTEM

Multichannel data acquisition system of this system is measured to the sensors for the measurement of four channels resistance and voltage drop across the sensors are measured. The constant current source should have a stability of at least 03 ppm.

The voltage drops across the sensors are proportional to the resistances of the sensors. In this unit consists of measurement of resistance, voltage and current with suitable hardware unit of microcontroller based electronic instrument with the following specifications are,

1) Resistor Measurement
2) Current Measurement
3) Voltage Measurement

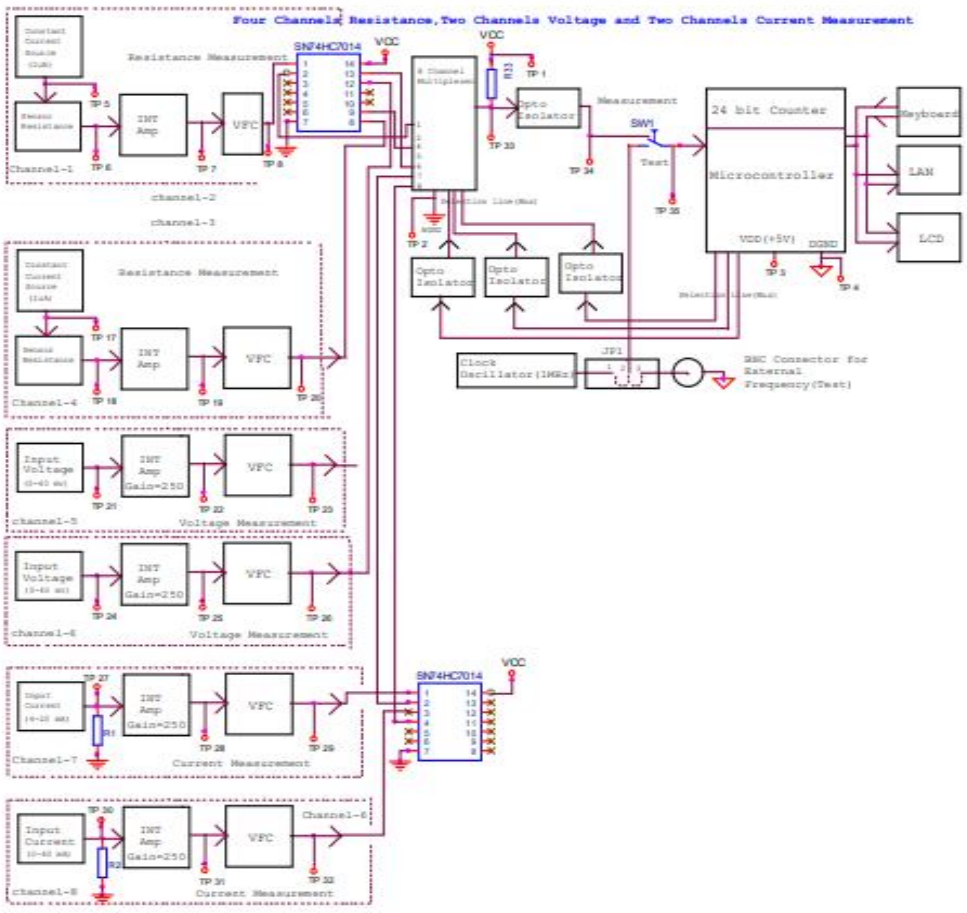


Fig.2 Block Diagram of Multichannel Data Acquisition System

A. Opto-Isolator

An Opto-Isolator is the dividing of electronics controlling the systems and is transferring the electrical energies of circuits through optical short transmission of shortest path between two circuits. It can monitor, controlling and communicating of these circuits. In this opto-isolator it can isolate the selection line of multiplexing channels.

B. Clock Oscillator

In this clock frequency oscillator multimeter should read a frequency that corresponds to the one written on the crystal clock oscillator casing of this system. It is used to establish the reference frequency used for timing circuits of this system.

C. Voltage to Frequency Converter

Voltage to Frequency Converting circuit, it converts level of voltages are proportionalised to converting of signals. In this converting of special systems they are performing the IC of signals and are able to providing the signals. In this signals of applying IC they also performs the conversion of frequency bit of signals.

D. 24-Bit Counter

In 24-bit counter it has automatic period of reloaded counting on pulses of programmable of operation which are able to send and verify its Interrupt option on comparing output or terminal count pulses. In this time system based sources they are externally sources of applying data.

E. Integration Amplifier

Integration amplifier is a combining of pre-amplifying or amplifying channels of two audio stabled amplifiers. Pre-amplifying provide the switching of input levels and are amplifies boosts of elements which are signalling to the audio effects.

V. RESISTOR CHANNEL MEASUREMENT SYSTEM

In this resistor channel measurement 10ua constant current is fed to the sensors for the measurement of channel resistance and voltage drop across the sensors are measured. The voltage drops across the sensors are proportional to the resistances of the sensors are measured through this system. At this resistance the current source flowing through the circuit depends upon the values of resistance to be measured in this system. For resistor channel measurement is designed as follows at fig 3

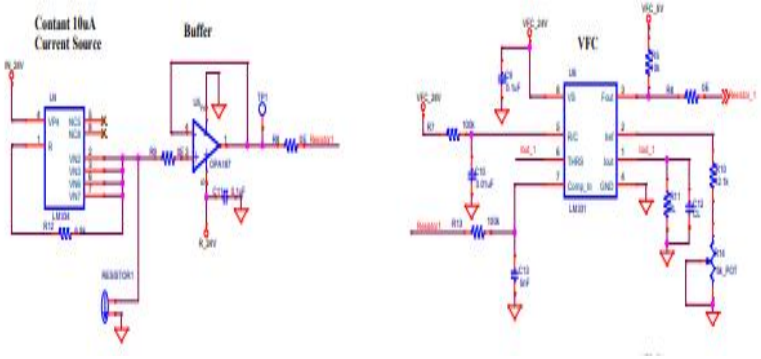
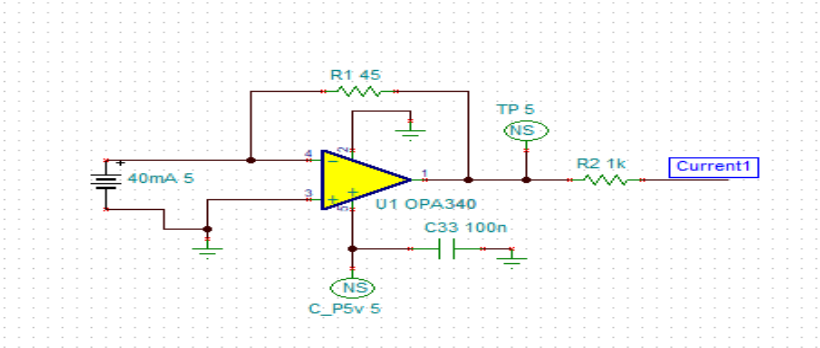


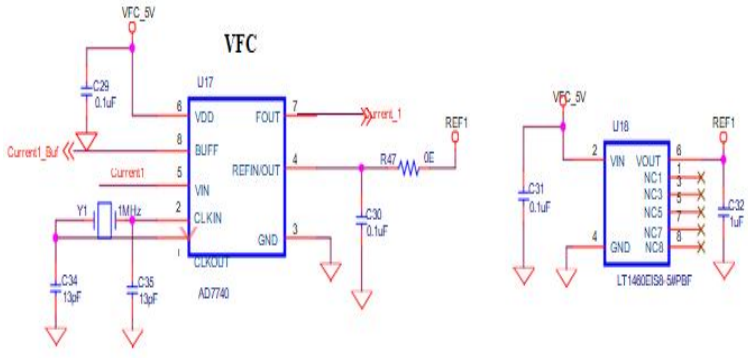
Fig.3 Circuit Diagram of Resistor Channel Measurement System

VI. CURRENT CHANNEL MEASUREMENT SYSTEM

In this current channel measurement sensors output current (4-20 ma) is passed across the resistance cause voltage drop across the resistance. At voltage drops across the resistance are amplified and after is connected to voltage to frequency converter to convert from voltage to frequency. By passing through precision voltage across the frequency pulses they are providing the different ranges of values across to measure the current values to sensor. The current to be measured at channels of modes at different part of current to range from frequency pulses of two channels and are proportional to different part of external oscillator of different ranges. For current channel measurement is designed as follows at fig 4a. The circuit for Voltage to frequency converter using low power differential line transceiver is shown in fig 4b.



(a) Circuit Diagram of current channel measurement system



(b) Voltage to frequency converter using low power differential line transceiver

Fig.4

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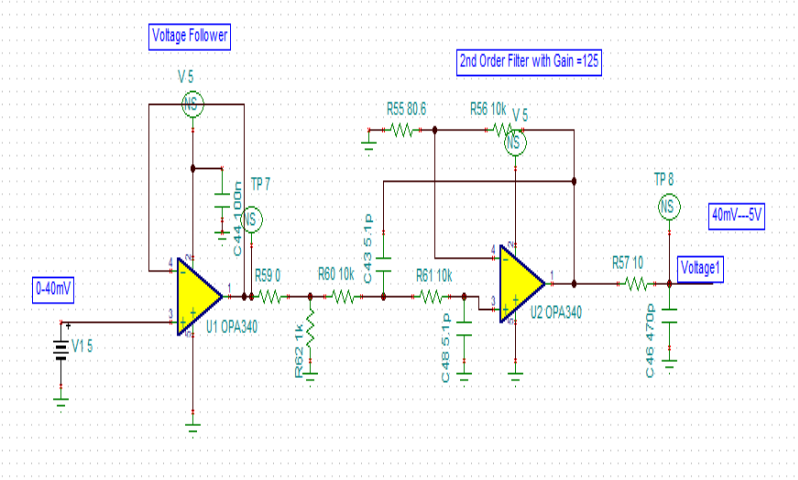
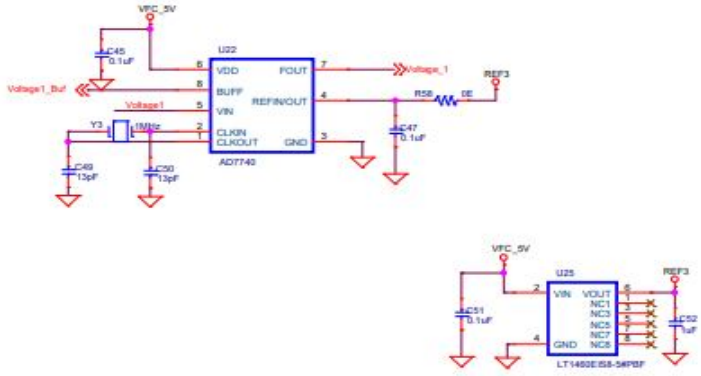
VII. VOLTAGE CHANNEL MEASUREMENT SYSTEM

In this Voltage channel measurement, sensors output voltage (0-40 mv) is connected to amplifier for amplification. These amplified voltages are connected to VFC to convert from voltage to frequency. In this channel measurement of system the frequencies of pulses from Schmitt trigger and are connected to a multiplexer. They are counting the values and are converted to input voltage of suitable period of pulses. Measurement of system are occurring the source of range generated at increment values of voltage at operating the unknown node voltage measuring the variance of given countable sources. In this part the electronic instrument of channel are able to produce source to given mode of operation. At input terminal the measure value of voltage value is calculated at ultra-small voltage to transceiver of external system clock pulses. In this pulse they are internally generated pulse of internal and external voltage conversion of clock pulses. Electrical parameters are generally measuring voltage channel measurement system and are more digital part is estimated along this measurement of voltage channels between in two conditioning signals. For voltage channel measurement is designed as follows at fig 5a. The circuit for Voltage to frequency converter using low power differential line transceiver of Voltages is shown in fig 5b.



(a) Circuit Diagram of voltage channel measurement system



(b) Voltage to frequency converter using low power differential line transceiver of Voltages

Fig.5

VIII. HARDWARE IMPLEMENTATION

Multi-channel data acquisition system is an unknown node voltage, current, resistor like multimeter to calculate and check the resistor of any pair some voltage is at constant current source of the load varies. In this current source an electric current is independent to the voltage across it. The power source of the voltage is at load, even despite changes and variance in load resistance. Frequency pulses of counting pulses are connected to a multiplexer.fig6 is shown Data acquisition system sends the data to LCD display and is networking at local area network.

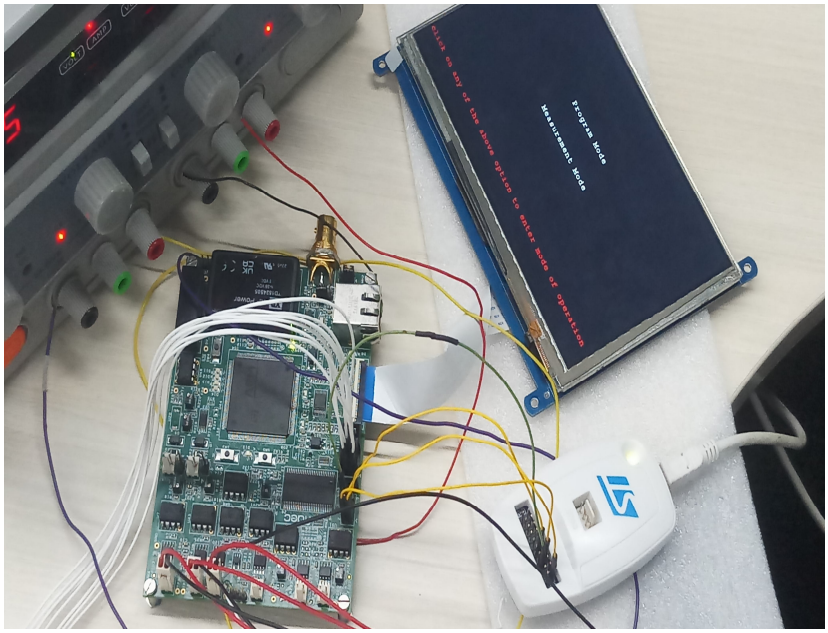


Fig.6 Data acquisition system sends the data to LCD and local area network

Local area network is provided the data to preceding the port on which the LAN communication are checked by the data and for handshaking by using TCP/Communication protocol. In this TCP protocol the data is exchanged by providing this end -to- end communication protocol and are transmitted, routed and received at the destination. Each communication data are received and exchange across the network. In this tested mode jumper selection decides the input is from internal pulses or external pulses. The toggle switch of connected external pulses and fig 7 Ethernet communicate the system and checks the value of count, frequency and resistance on LCD Display.

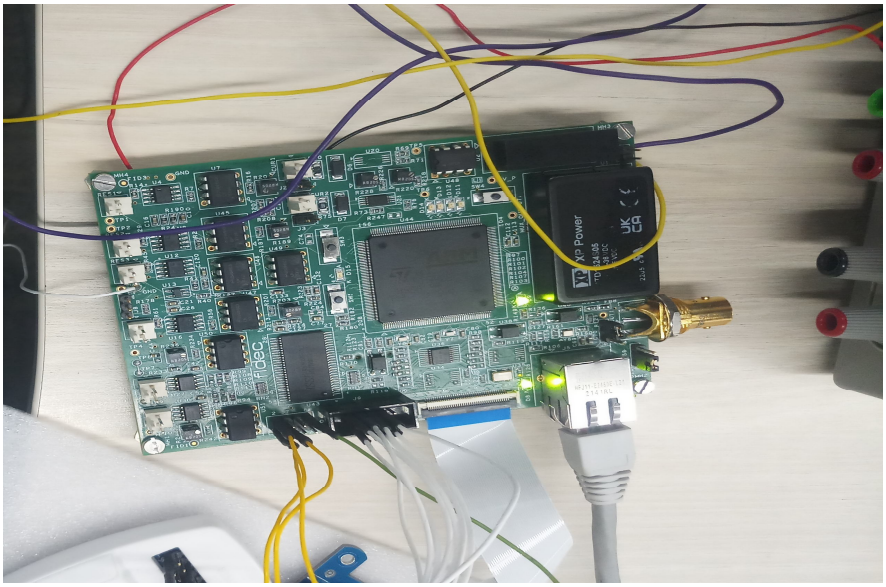


Fig.7 Ethernet communication of Data Acquisition System

In Ethernet network it can standardize the data exchange of routing the protocols across the network. By interfacing the protocol of data system it can operate control message for data and are counted the message protocol for communication message and are provided through network boundaries of interfacing current operating local network and are calculated through fig 8 resistor values are counted to variable data Communication network.

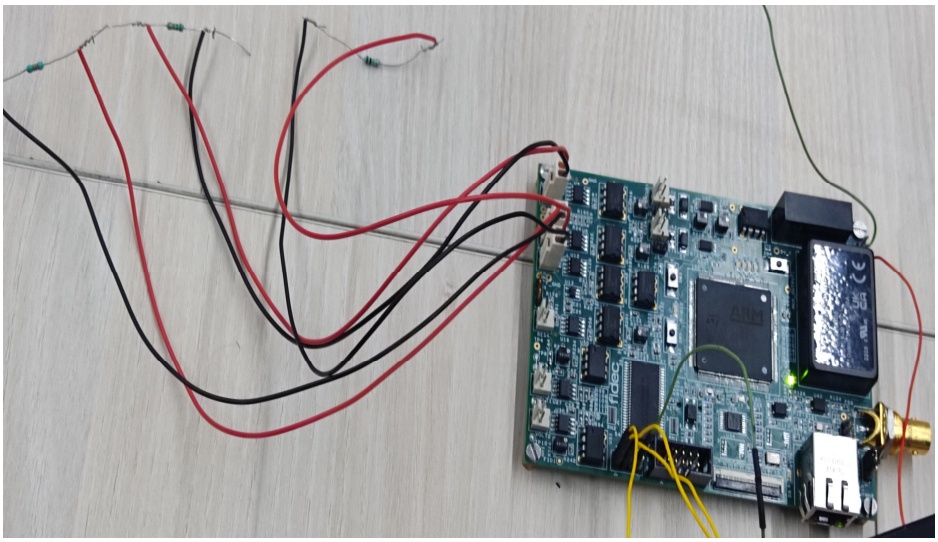


Fig.8 Resistor values are counted to Communication Network

Resistor values of selection between the networks are communicated and are received the conditioned signal from signal conditioner of counted through fixed gate period to get the frequency and there should be provision to give the frequency from internal or external pulses to the microcontroller for testing purpose of checking resistors to calculate the values of given mode of programming through local area network.

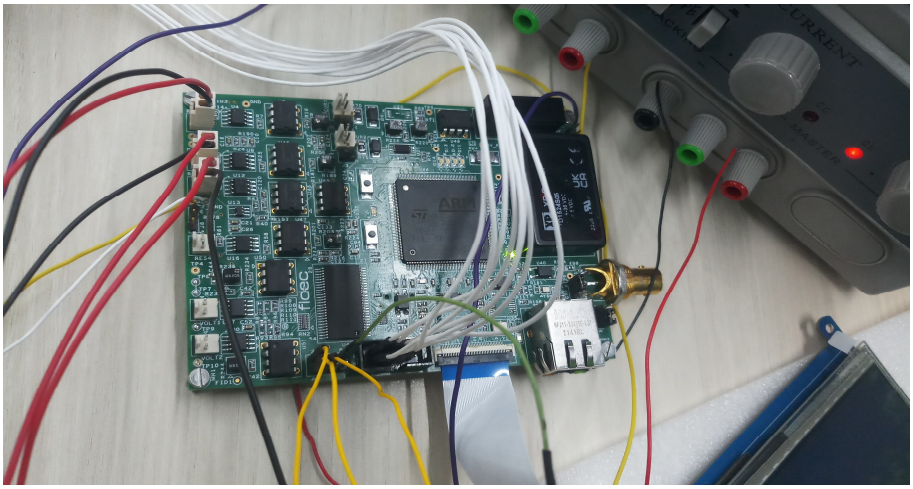


Fig.9 Counting and debugging of Data Acquisition System

Fig 9 Data acquisition system they are counted and debugging the pulse of pair of resolution is 1us and counting system shall counted at the maximum rate of 1 MHz At this given input the testing mode of data system are counted to the timer and generate a pulse for enabling counting and debugging port of networks are applied though local area network of checking the data values and are variable to calculating the port of given communication protocol.

IX. RESULTS & DISCUSSION

Multichannel Data acquisition system describes the resistance, current, & voltages of channels measured in the system and are noted. To determine the characteristic of our Digital multimeter movement used in this application is Multimeter and are buffered through TCP/IP communication protocol. Multimeter where we can measure the voltage, current and resistance in this application of this measured system. After determining all the ratings of channels measurement we are accurately to measure movement of source and are notifies through whole system. As per the functions, in each modes of selection channels are described at LCD display. In program mode the user can used the enable/disable the channels of calculating the data of sensors on display. Measurement mode the unit switches to 10seconds mode automatically and start displaying the resistance of sensors on display.

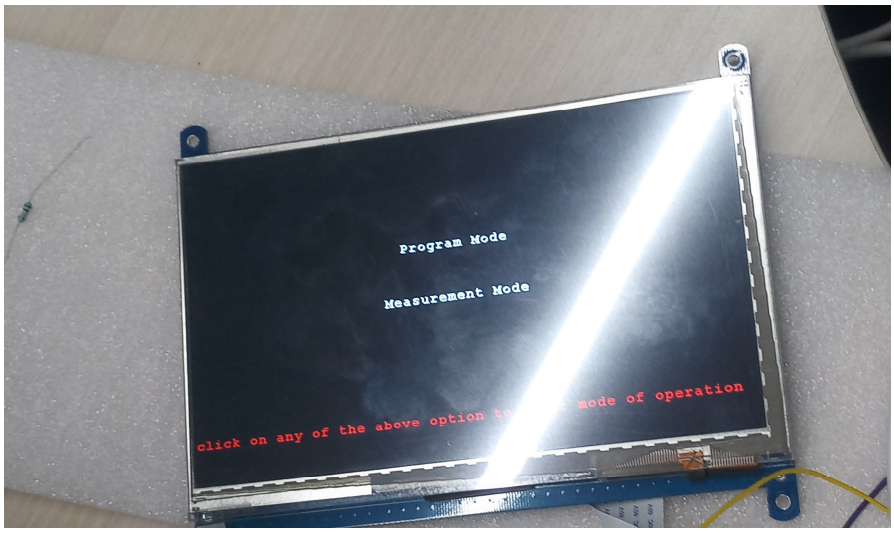


Fig.10 LCD Display on Program mode and measurement mode

Fig.11 LCD Display on Measurement mode

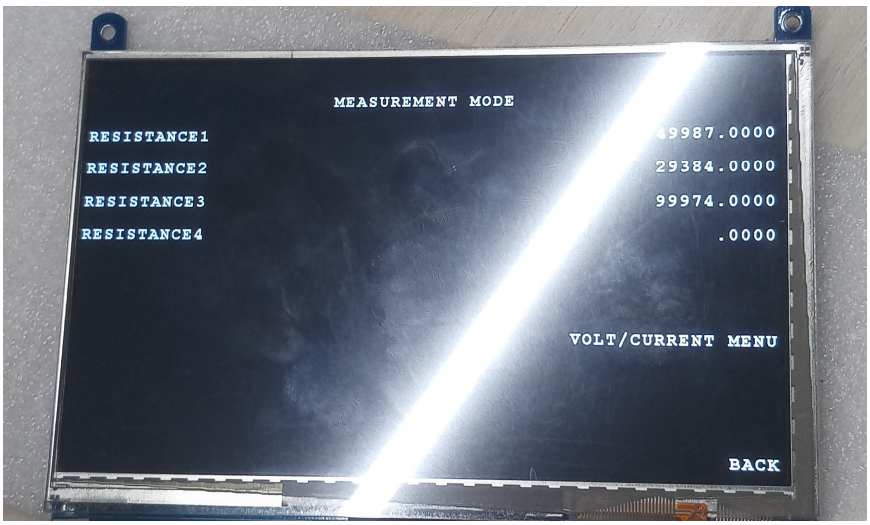


Fig.12 Values of Resistance on LCD Display

Fig.11 a resistance, voltage and current value of the unit switches at measurement mode automatically and start displaying the resistance of sensors on display. Fig.12 The value of resistance of debugging operation mode is applying to the microcontroller and is counting the values at 10us and the averaging values are applying to the mode of operating channels. In this communicating system the measured values of counted resistance are readed and noted to pulses, range and frequency in testing mode. Data of system and the readings are counted to incremented the measured values of resistance, voltage and current modes of channels on display. Fig.10 at modes of display program mode is enabling the channels of system and measurement mode is automatically displaying the sensors on display.

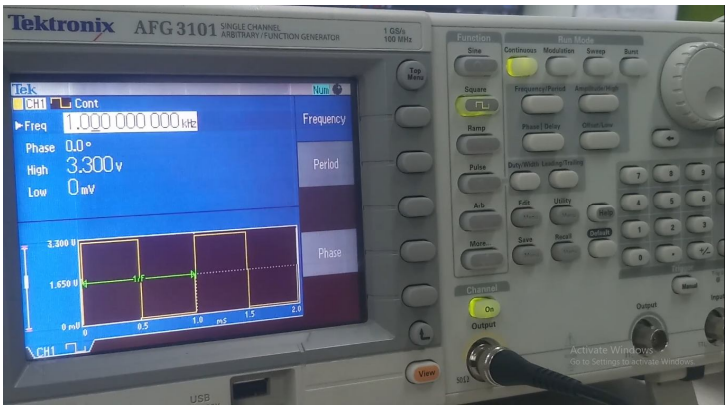


Fig.13 Square wave generated in CRO

In this fig.13 square wave generated CRO the jumper position for external oscillator input are reading through external pulses and are counted to the values of 1 kHz range at position for the measured value of input selected pulses for oscillating an external frequency pulses of data to calculate the average values of channels through communication protocol.

X. CONCLUSION

The Main advantage of Multichannel data acquisition system is to observe the part of data to calculate the modes of operation. Most of this system, it can accurately collect the data and are measured at movement of source through whole system. Taking the square wave as the test of counting the values of phase, length and the signal waveform analysis to measure the frequency of internal and external pulses including measurement mode of resistance values of sensors are shown in LCD display. By this measurement mode values of this system, it can automatically switches the channel values of systematic data and are connected through hardware requirements of precision, ,resolution ,ranges, accuracy so on.

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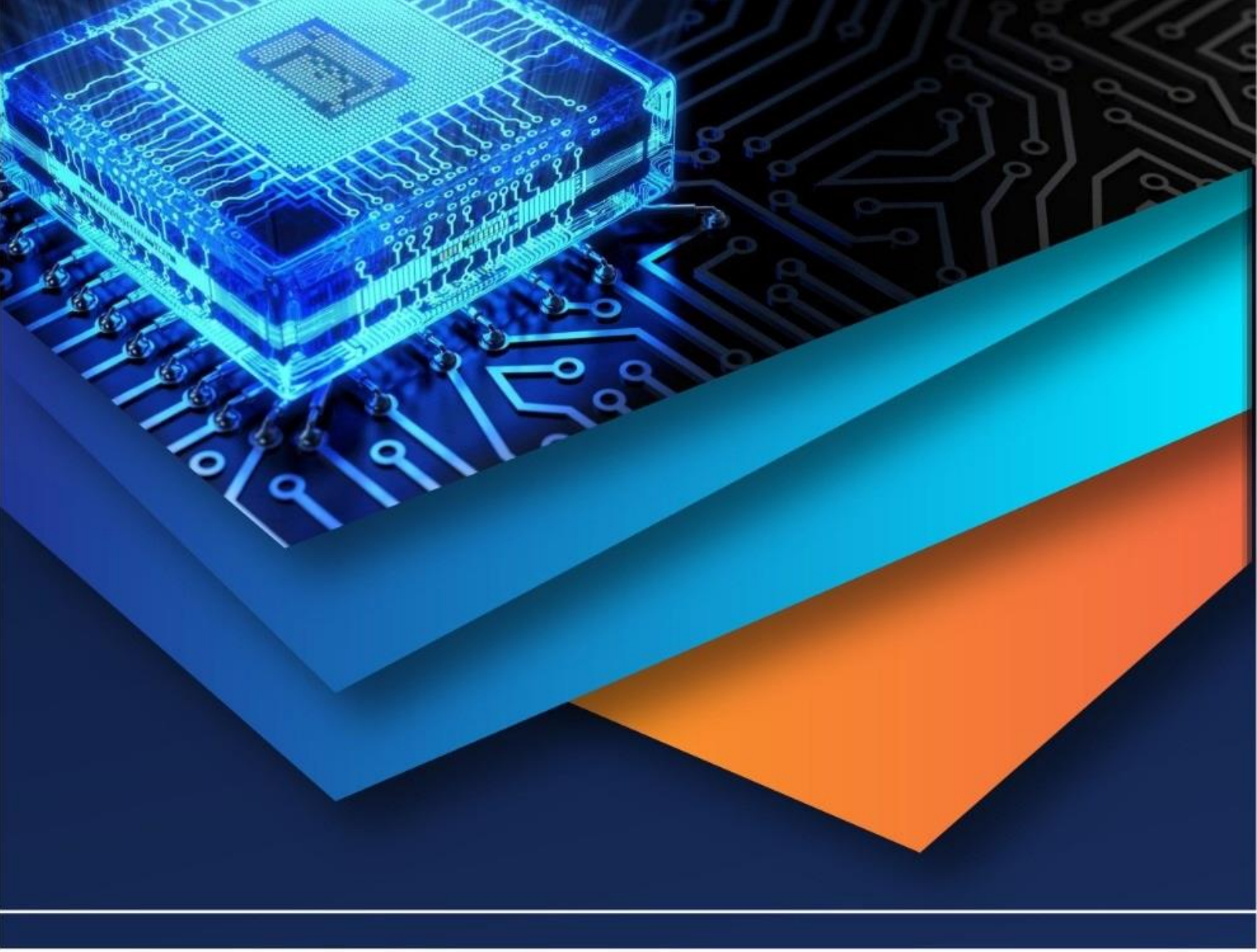

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