

INTERFACING OMNI-FLOW COMPUTER TO REMOTE OPERATION CONTROLLER (ROC) REMOTE TERMINAL UNIT (RTU) FOR SCADA NETWORK IN SPDC

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Abstract

Remote operation is a prevalent technology in our time, this has taken deep root even in the oil and gas industry. With the emergence of wireless and wired technology, with different communication protocol ranging from parallel to serial it has made the transfer of data possible and faster. This paper is to provide way for data to be transmitted from Non-Associated Gas (NAG) location Omni-flow computer to a remote location to be used in making production management decision in Shell Petroleum Development Company (SPDC). OMNI 3000 Flow Computers is used in majority of liquid and gas flow measurement and control systems, it uses serial communication protocol RS232; 4 wire – TX, TERM, RX, GRND which has its own limitation for long distance communication, it has keypad function and local display read out, this instance does not have Ethernet port. With the help of remote operation controller (ROC) remote terminal unit (RTU) the data from omni-flow computer can get to supervisory control and data acquisition (SCADA) network via a local area network (LAN) interface. With this other devices and department can use this data points to make meaningful decision from OPC server. ROC RTU has serial communication interface to enable other RTU's communicate with it in master slave or slave master configuration.

Keywords: omni-flow computer, remote operation controller, ROC, RTU, SCADA, serial communication, LAN, RS232, Non-Associated Gas, OPC server, SPDC, shell Nigeria

1. INTRODUCTION

Gas measurement is essential but without data transfer, operational and billing function will be difficult to handle. In the oil and gas industry it is very important for decision making by other machines, devices or humans. Validation and accounting of production is another key thing. Sales of gas, to other gas station needs to be achieved. It is on this backdrop this paper will be looking at a way of transferring data.

OMNI-flow computers find its use in petrochemical and process measurement facilities. It is applicable to liquid and gas flow measurement, control and communication systems, and custody transfer operations. Various sensors installed on monitoring pipeline are connected to it. It calculates, displays, and prints data that will be used for operational or billing functions. The computer is configured according to the pipe specifications [1].

The data on the display is transferred through remote operation controller (ROC) remote terminal unit (RTU) via RS232 port using modbus RTU modem (Modicon Compatible) protocol Type, which is ideal for field installations where the monitoring, measurement and control of processes and equipment are required. ROCLINK 800 Software is used for the configuration of the ROC RTU.

The means of interface is RS232, a four wire configuration TX, TERM, RX, GRND.

Modbus is an industrial application-layer messaging protocol standard. It provides client/server communication between devices connected on different types of buses or network. Modbus-RTU (Remote Terminal Unit) means that the Modbus protocol is used on top of a serial line with an RS-232, RS-485 or similar physical interface. Numerous automation systems have Modbus-RTU interfaces for communication [2].

In Modbus communication there must be a master and a slave and their protocol must be identical otherwise there will no communication.

2. RELATED CONFIGURATION

2.1 Other Configuration of ROC RTU

Master-slave structure of HART communication protocol means that each message transaction is sent from a master and each slave device only responds when it receives a command that is particularly addressed to it.

2.2 Methodology

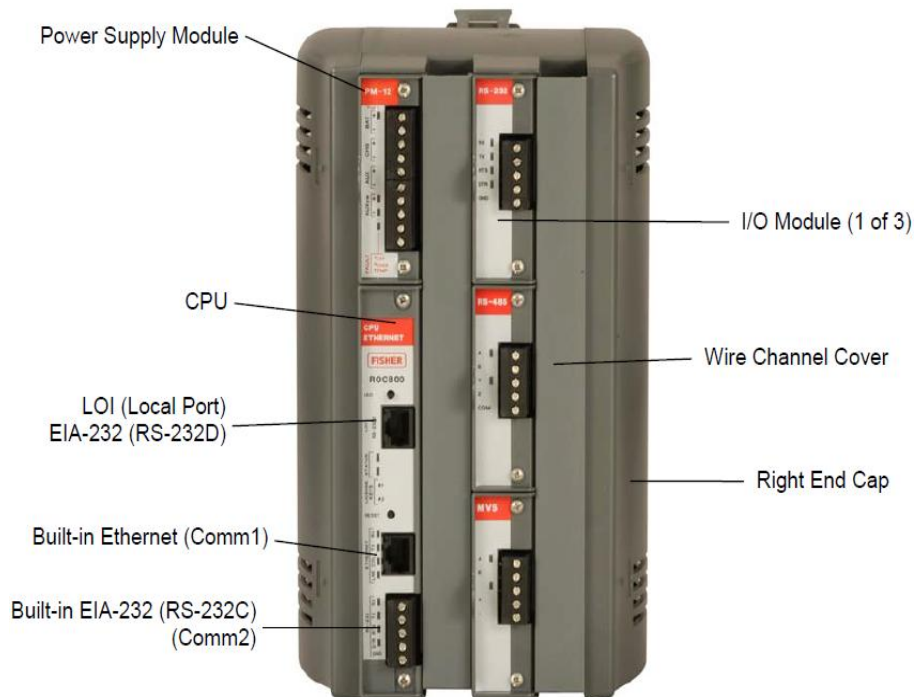


Fig 3.1: ROC827 base unit [3]



Fig 3.2: OMNI flow computer [4]

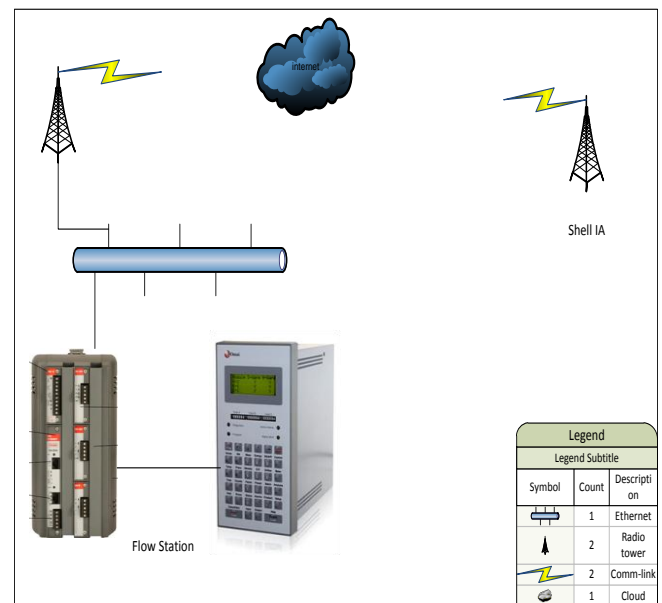


Fig 3.3: network connection

2.3 Configuration of ROC RTU device

Omni flow computer configuration setup information
 Serial Protocol RS232; 4 wire – TX, TERM, RX, GRND
 Protocol Type: Modbus RTU Modem (Modicon Compatible)
 CRC Detection Enabled: Y
 Baud Rate: 9600
 Parity: None
 Data Bits: 8
 Stop Bits: 1
 Modbus ID: 2

Transmit Key Delay: 0 ms
Modbus ID 2

Point No.: 7034 Point Count 1 Data Type: Float
(description: yesterday total export in MMSCF)

Point No.:7032 Point Count:1 Data Type: Float
(description: total export from 06:00 AM today until now in MMSCF)

Point No.: 7030 Point Count:1 Data Type: Float
(description: current flow rate in MMSCFD)

2.4 Installation and Configuration Process

The ROC 800 link software must be installed on an IBM compatible computer in other to have access to ROC RTU interface for configuration through Local Operator Interface (LOI) port which provides direct communications between the ROC800-Series and the serial port of an operator interface device.

2.4.1 Configuration of the Modbus Slave [5]

- Configure the Modbus operating parameter for the Omni-flow computer
- Create registers for the desired data transfer function at the Omni-flow computer

- Configure communication on RS232

2.4.2 Configuration of the Modbus Host [5]

- Configure the Modbus operating parameter for the ROC RTU
- Create registers that associate incoming slave data with specific ROC TLP data fields
- Construct query
- Configure communication on RS232

To establish RS232 connection between master and slave ROC 800 wiring is shown below

Table 3.1: RS 232 pin connection

Master ROC800 COM2	Slave ROC800 COM2
Rx	Tx
Tx	Rx
GND	GND

2.4.3 Configuration Interface [6]

The IP address for the ROC is configured, once connected the status off-line that was indicating red will turn green on-line below right as shown in the next screen shot.

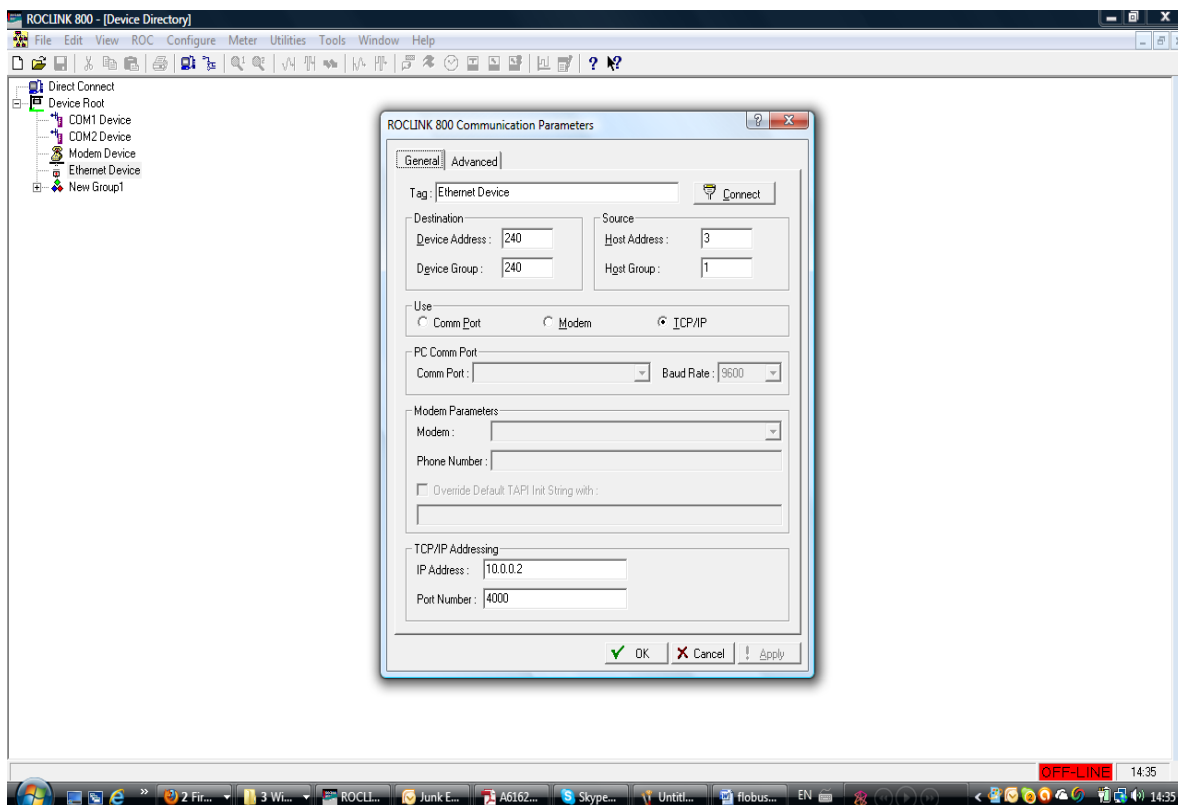


Fig 3.4: IP address configuration screenshot

A communication port is selected with RS232 type. The baud rate, parity data bit and stop bit are configured according to the slave (OMNI flow computer) information provided

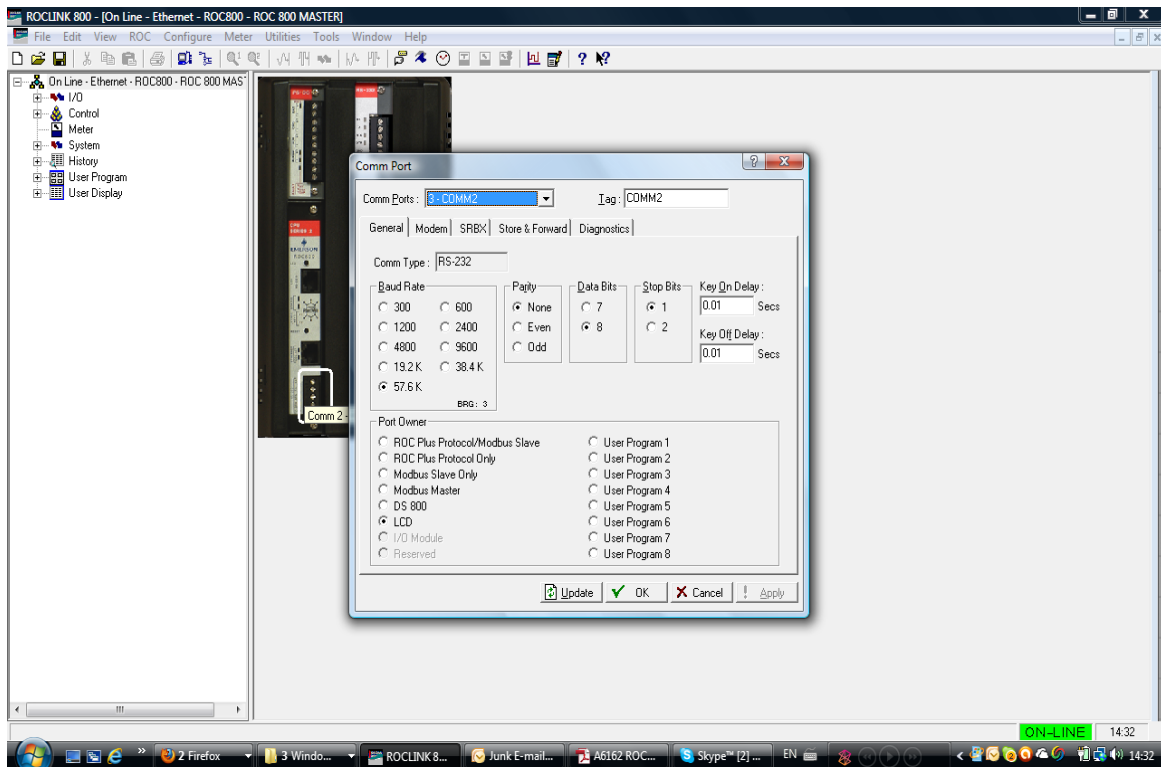


Fig 3.5: RS 232 configuration screenshot

Master is selected on communication port in modbus configuration with byte order as most significant byte first and communication mode as RTU in the screen shot below

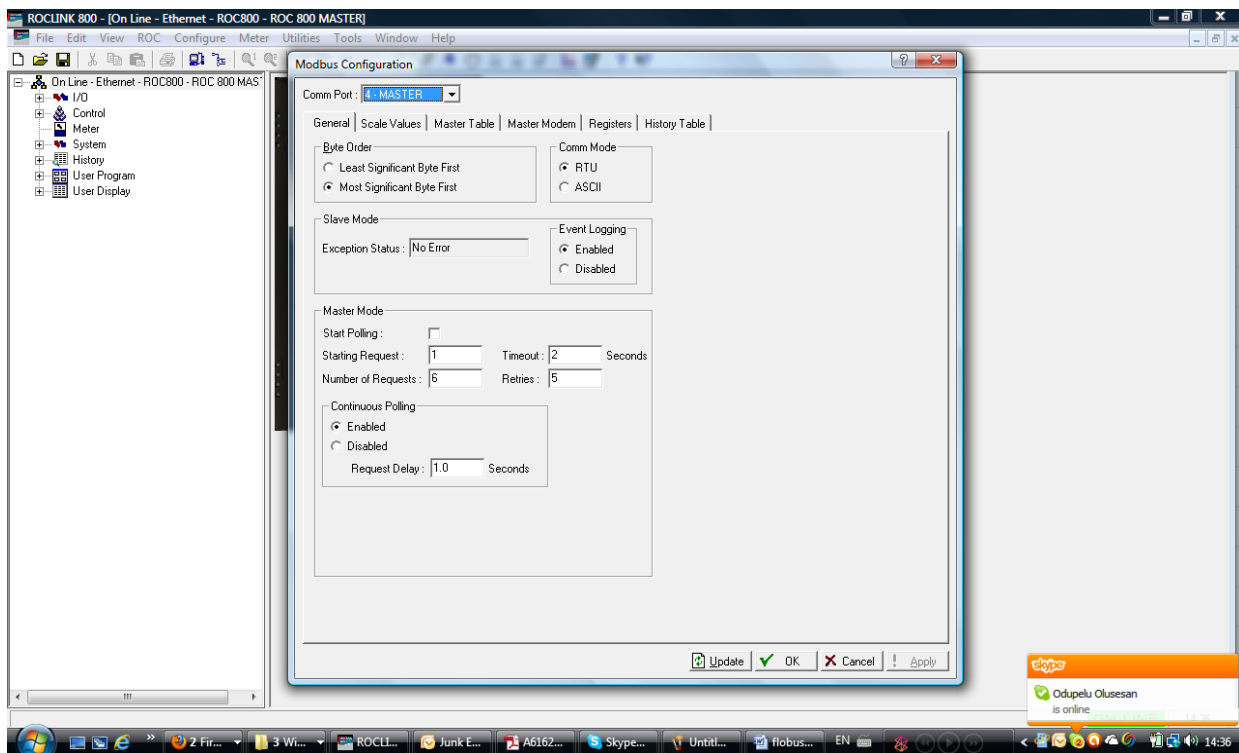


Fig 3.6: Modbus configuration screenshot

The data soft point is configured in the function code of master table tab as provided from the omni flow computer. In RTU address 2 is entered having number of register as 1

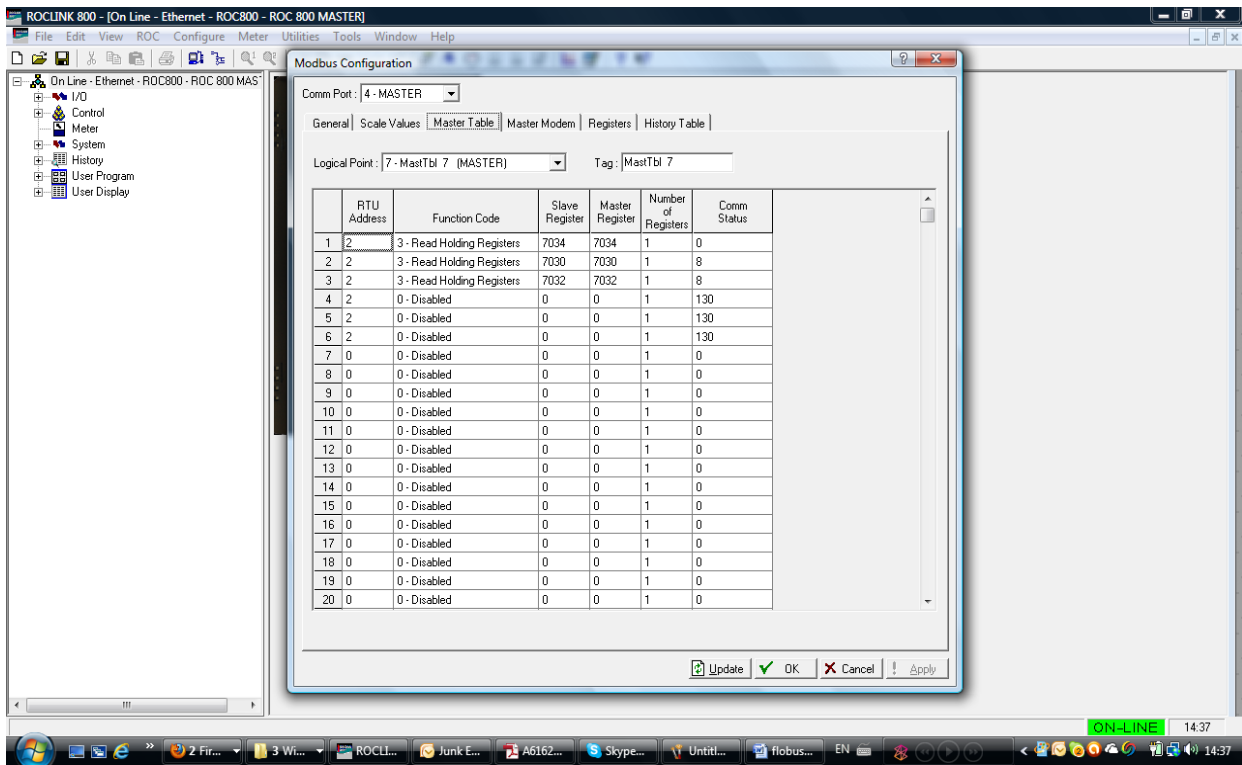


Fig 3.7: Modbus data point configuration screenshot

In figure 3.8 after entering the start and end registers the right conversion value must be entered in this case 25 in

other get a soft point read out in exact with the local read out of omni flow computer

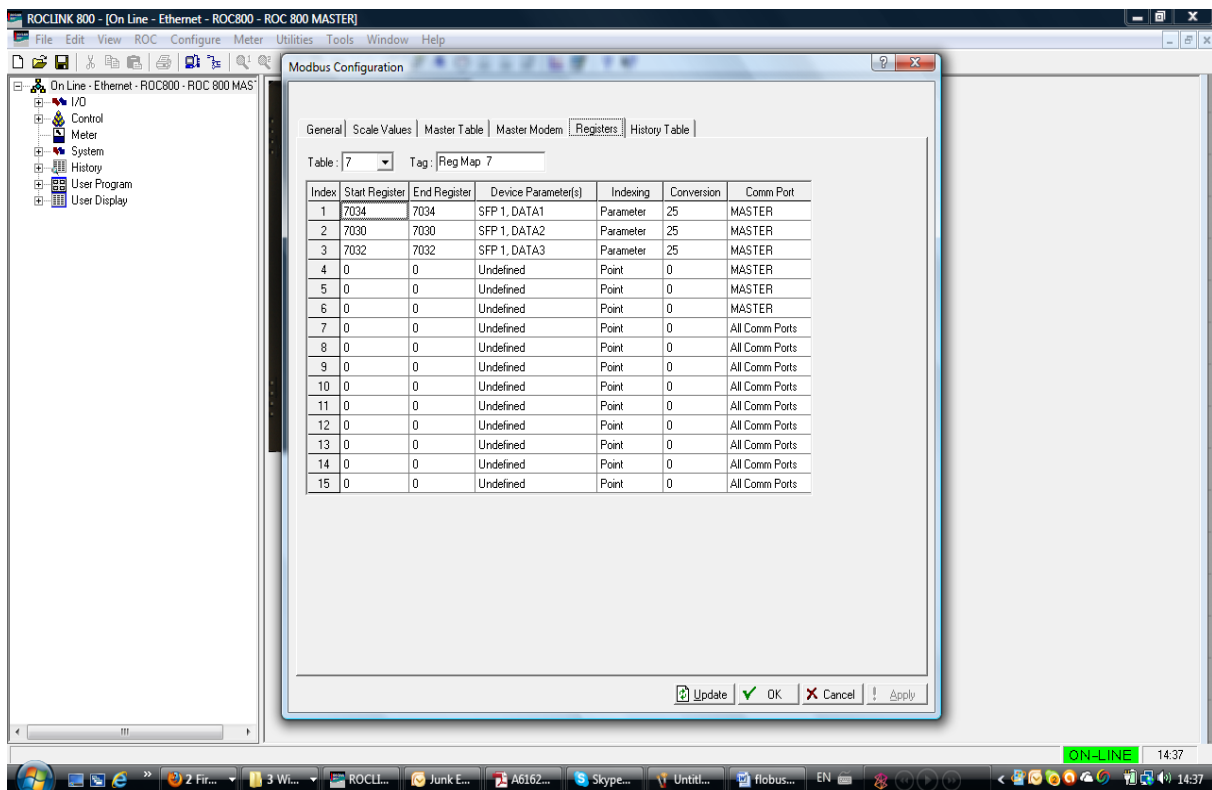


Fig 3.8: Modbus conversion configuration screenshot

Figure 3.9 screen shot shows the data that is transmitted remotely from the slave (omni-flow computer) to the master (ROC RTU) which is the same.

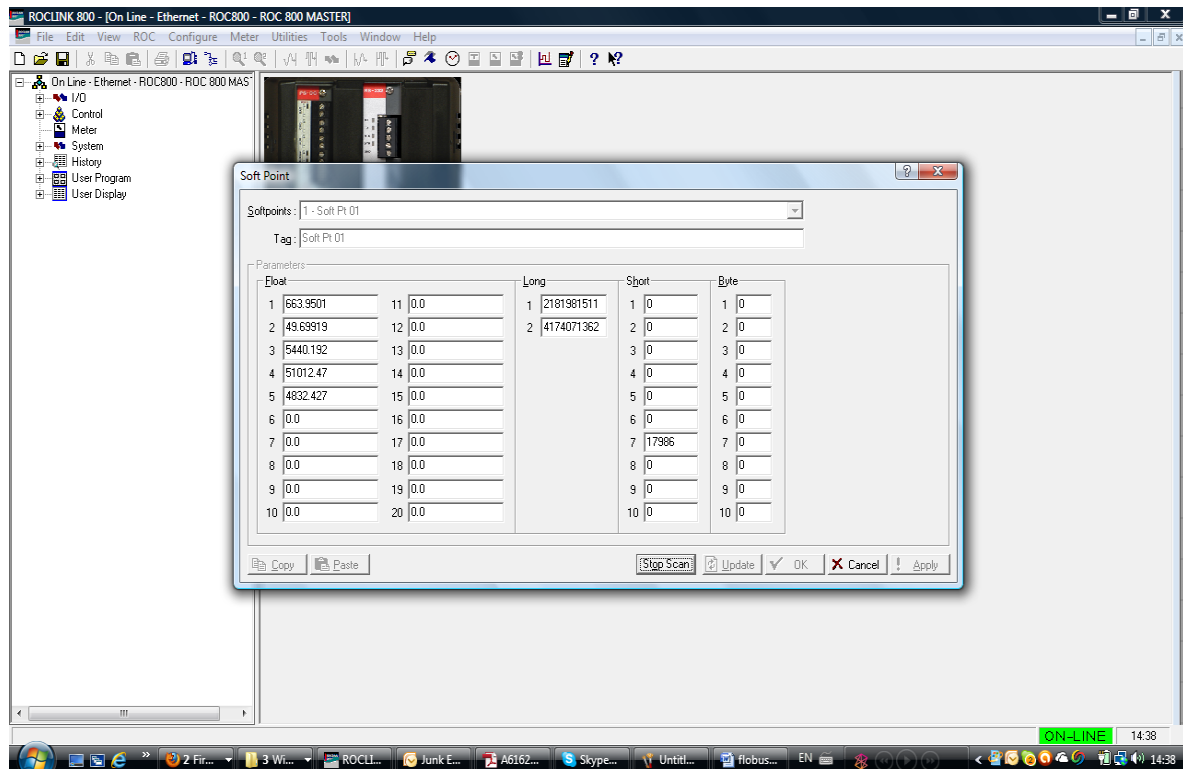


Fig 3.9: soft point readout screenshot

3. CONCLUSION

The omni-flow computer installed was without ethernet interface it became necessary to get data from it to remote OPC server for decision making therefore a means of achieving this was made possible by the available ROC800 series RTU as at then. The configuration of the omni-flow computer was provided including the soft point registers. The challenge in this configuration exercise was the conversion value that was not made available, several arbitrary values was sequentially selected until the exact value of twenty five (25) was gotten which took almost a week on the work bench to accomplish.

REFERENCES

- [1]. <http://www.omniflow.com/products/Products>
- [2]. <http://www.anybus.com/technologies/modbustcp2.shtml>
- [3]. ROC 809 instruction manual February 2005
- [4]. Configuration and advance operation volume 3, omni 3000/6000 flow computer user manual
- [5]. ROC 800 series shell oil support; july 2011
- [6]. ROCLINK 800 configuration software user manual

BIOGRAPHIES



He graduated and obtained a B.Tech degree in Electronics Engineering in Rivers State University of Science & Technology where he is working presently, after his first degree he worked for some years before proceeding for further studies. In 2008, he obtained MSc. in mobile personal and satellite

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