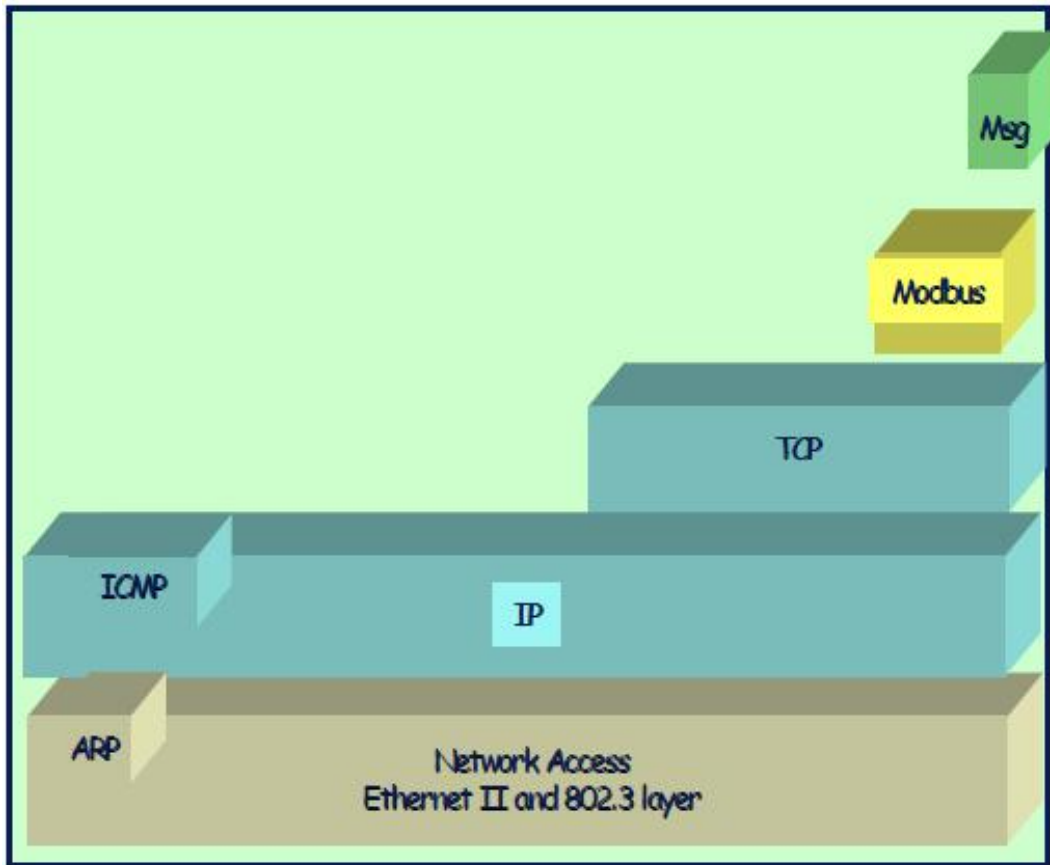


**OPERATING MANUAL
MFM_EM MODNET**

Modbus™ TCP (Ethernet)



The Device Options include an Ethernet communication module for connection to SCADA systems using the MODBUS TCP protocol. The Device with Ethernet option module acts as a MODBUS slave device and queried by a MODBUS master device. All messages sent to the Device Ethernet interface must conform to the MODBUS TCP protocol. For details see MODBUS MESSAGING ON TCP/IP IMPLEMENTATION GUIDE V1.0b Downloadable from the Modbus-IDA, www.Modbus-ida.org

The Device Ethernet option module supports 10/100Base-TX Ethernet communication. Connection is via an Ethernet switch that supports the IEEE 802.3 standard at 10/100Mbps. The Device is fitted with a socket suitable for an RJ45 connector. Use a CAT5 or CAT6 patch cord to connect the meter to an Ethernet switch or hub.

The MODBUS TCP protocol is used for data exchange between HMI/SCADA applications and the Device. The network architecture must include a MODBUS TCP client, (PC). TCP/IP port 502 is reserved for MODBUS messages.

Technical Specification:

1. Network:

- a) **Interface:** RJ45 connector Ethernet 100Base TX, Auto MDIX.
- b) 10/100MBit/s Auto-negotiation.
- c) Protocol: MODBUS/TCP.

2. Insulation:

- a) LAN-Basic unit = 3700 VAC_{RMS} (50Hz).

3. The maximum latency time of Device MODBUS/TCP is 200ms(provided that device is connected to only one PC) i.e. the amount of time that can pass before the response character is output.

Communication Parameters:

User can set the Communication Parameters via front end keys of the Device Display. The communication parameters of a Device fitted with an Ethernet option module refer to internal communications within the meter. User needs to set the following parameter values for Ethernet communication. For any details refer the Device manual.

Modbus Address: 001

Baud rate: 19.2 kBaud

Parity: no parity 1 stop bit

These are the default factory set values if the Device is with Ethernet module option. Other than these settings the Ethernet module will not communicate.

IP Address Assignment:

The IP address of the Device must be unique and appropriate for the network to which it is attached. The address to use will depend upon the local network and should be determined by the network administrator. The Device Ethernet option module supports static IP address assignment only.

The Device IP address is factory set to "192.168.11.11". If attaching two or more Device meters to the same network the IP addresses must be changed through the MFM_EM _MODNET Software so that each meter is assigned to a unique address.

Connections for configuring the IP address:

Preferably, set the IP address using a direct point to point connection between the PC and Device.

If this is not practical, for example, if replacing an Device in an existing network that has suffered accidental damage, it is possible to set the IP address using MFM_EM _MODNET Software via the Ethernet network, provided that no other device on the network is already using the Device factory set default address.

To directly connect the Device to a PC, an Ethernet Straight through or Crossover patch cable (CAT5 or CAT6) is required. The Device will auto configure transmit and receive lines.

Configuring a PC for Ethernet Device:

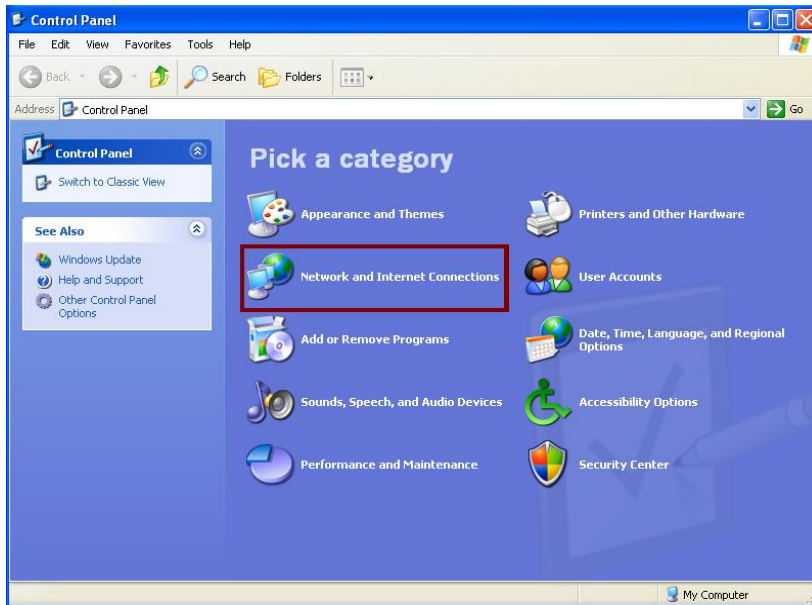
Before configuration of the PC for Ethernet Device, it is necessary to install MFM_EM _MODNET software from the CD provided with the Ethernet card.

To enable the PC to communicate with the Device the local area network settings for the PC must be set to appropriate values. If the PC is normally used on the site wide network then disconnect the PC from that network before making the changes described. This example shows Windows XP. Other versions of Windows will require a similar process but the details and screens may differ.

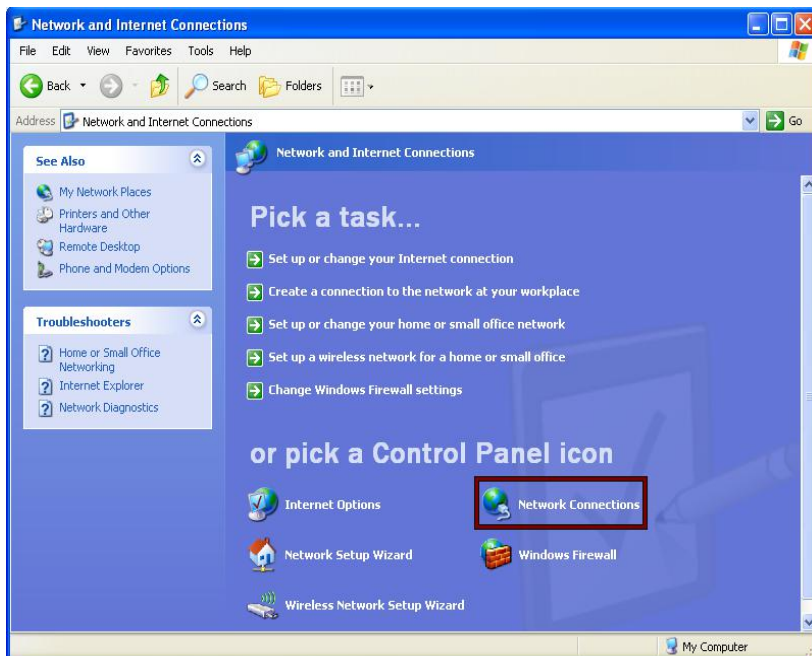
For setting local area network settings of the PC click on the "**Start menu**". Select the "**Control Panel**" utility from the available options.



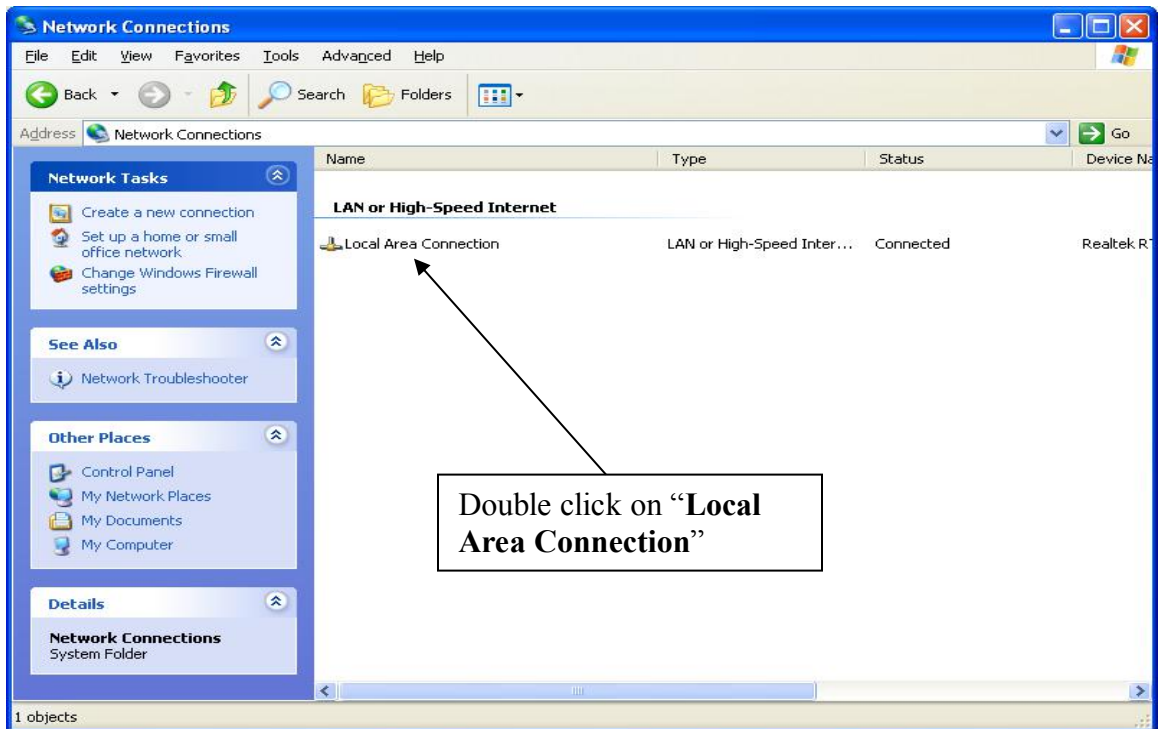
In the “**Control Panel**” window: click on the “**Network and Internet Connections**” item.



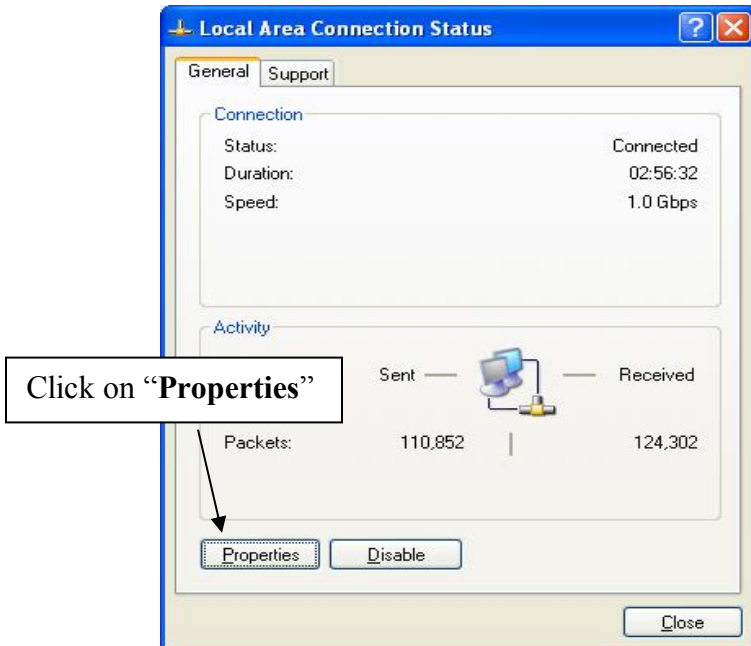
This will open Network and Internet Connections window.
In the “**Network and Internet Connections**” window: click on the “**Network Connections**” item, this will open the “**Network Connections**” window.



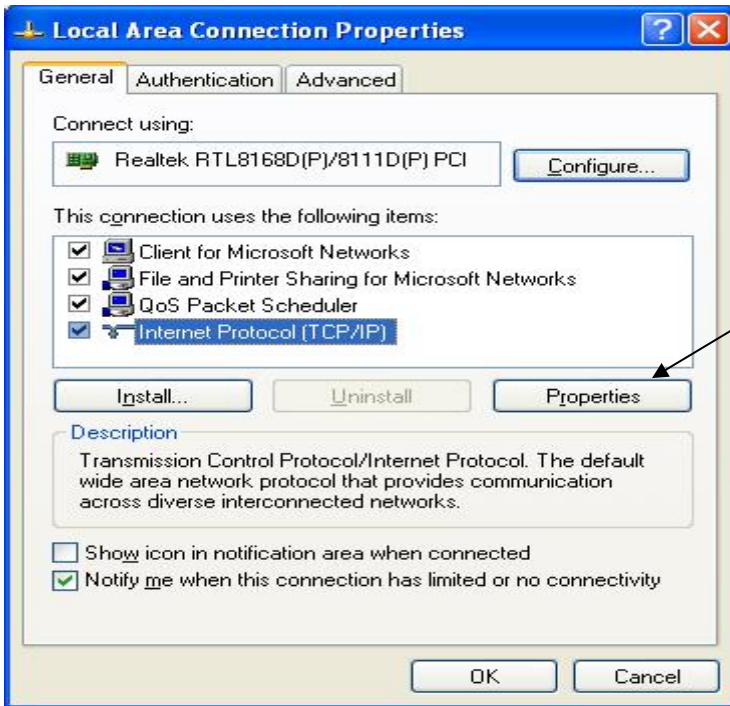
Double click on “**Local Area Connection**” item. This will open the “**Local Area Connection Properties**” window.



In the "Local Area Connection Status" click on the properties. This will open the Local Area Connection Properties.

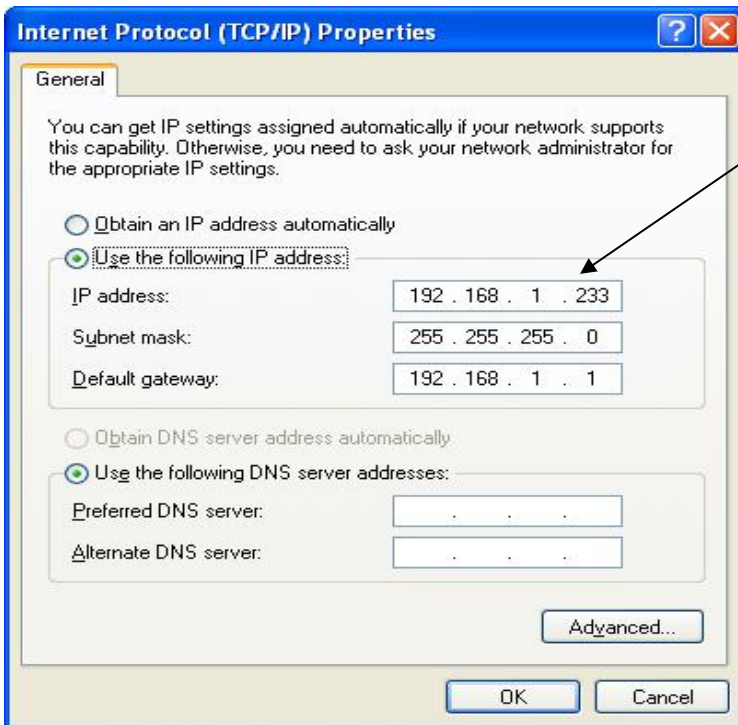


Select "Internet Protocol (TCP/IP)" item and click on the "Properties". This will open the "Internet Protocol (TCP/IP) Properties" window.



Click on “**Properties**”

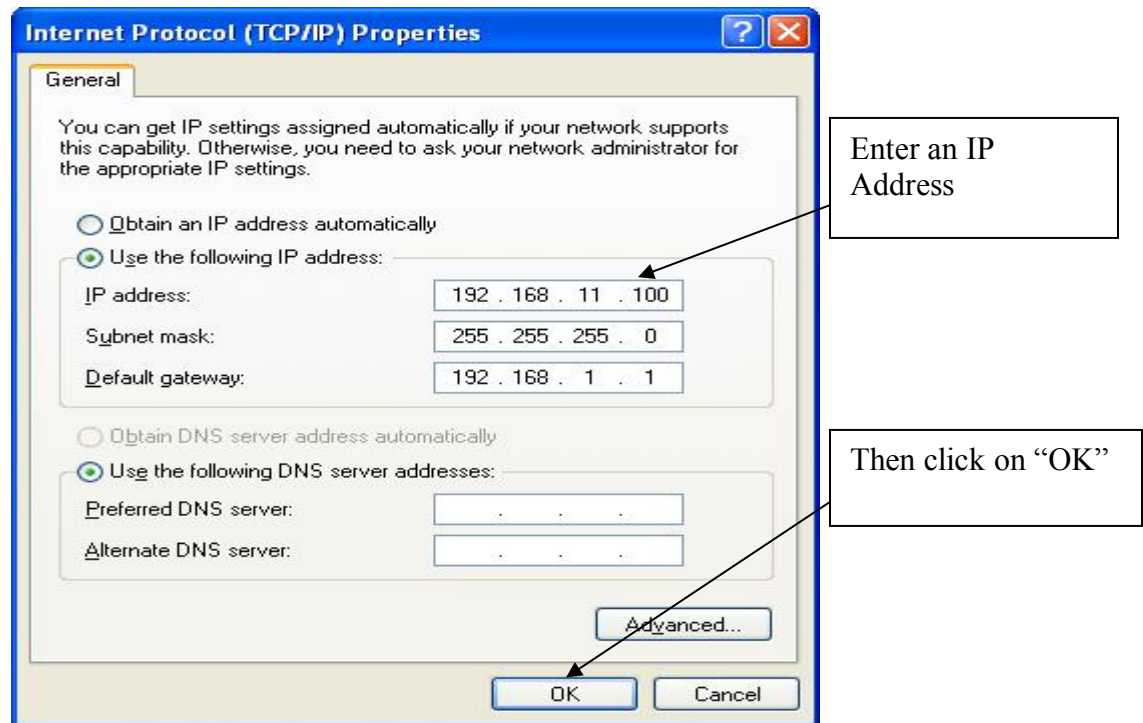
Select the “**Use the following IP address**” option and set the IP address and subnet mask as described below.



Enter an IP Address of your PC (Initially the address shown will be your network address)

Before making any changes, carefully note the previous settings – they may be essential to re-establishing the PC on the organization

network. Be sure to revise all settings to previous values before attempting to reconnect the target PC to the organization network.



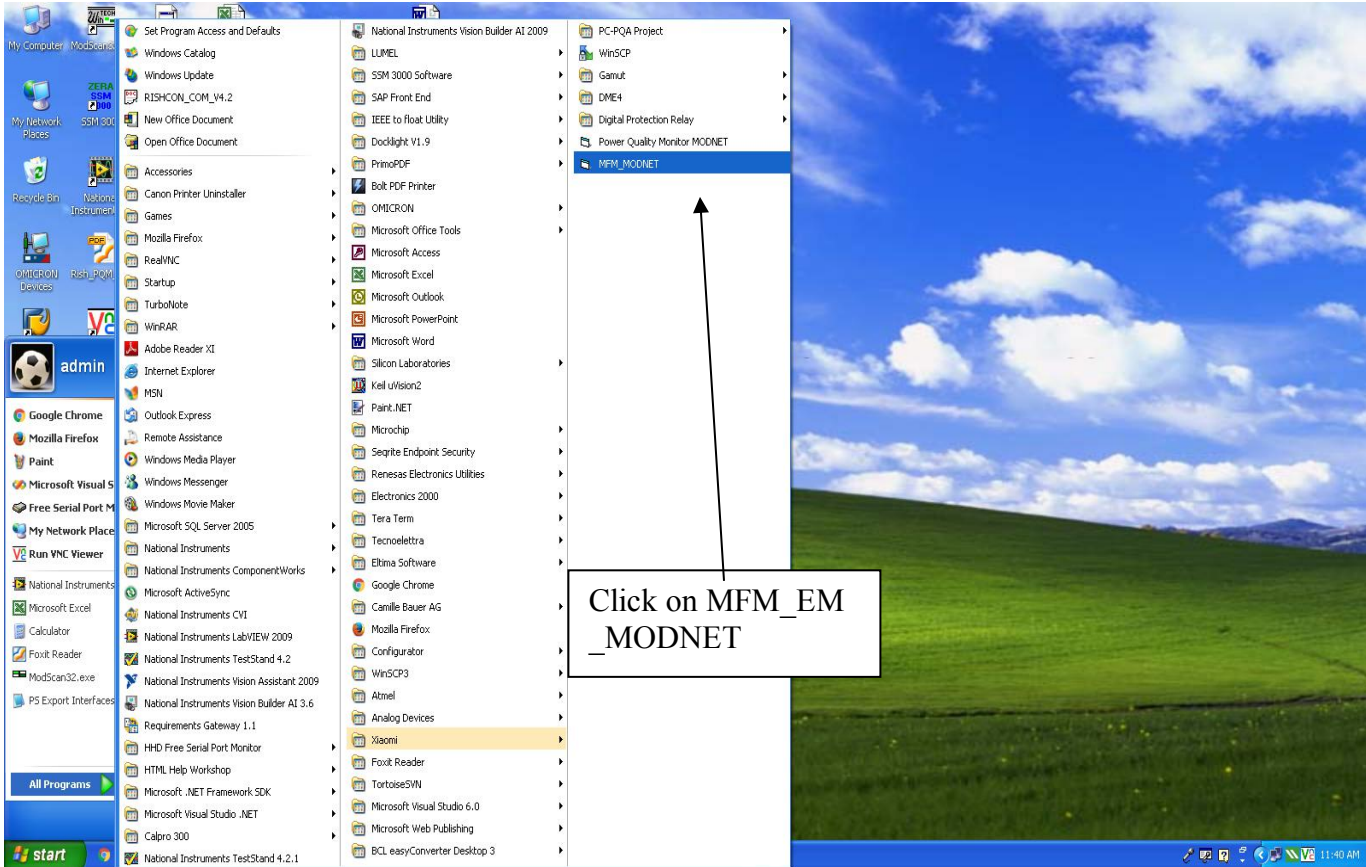
For any technical assistance, consult your organization's network administrator. The IP address shown in this example is suitable to connect PC to the Device which has default IP address of 192.168.11.11. For example, if the test meter(Device) is assigned to the IP address "192.168.11.11", then a suitable IP address for the PC can be set as "192.168.11.nnn", where "nnn" can be 1 to 254, (apart from 11 as this is already used by the Device, IP address for the Device & PC should not be same). So,we set IP Address of PC as 192.168.11.100. Enter the subnet mask as shown above.

Click on "OK" to close the window. Click on "closed" to close the "Local Area Connection Properties" window. Close the "Network Connections" window. The PC is now ready to communicate with the Device.

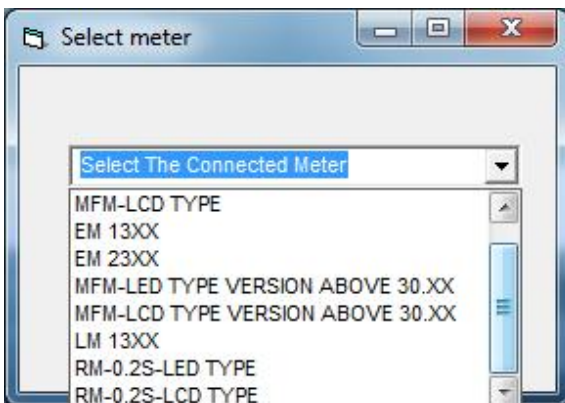
If the Device does not have the factory default IP address, then consult your organization's network administrator for the Device IP address, subnet mask and Default gateway settings.

Connect the patch cable to the RJ45 connector on the Device and plug the other end of the cable into the network port of the PC or the port available to the switch/hub.

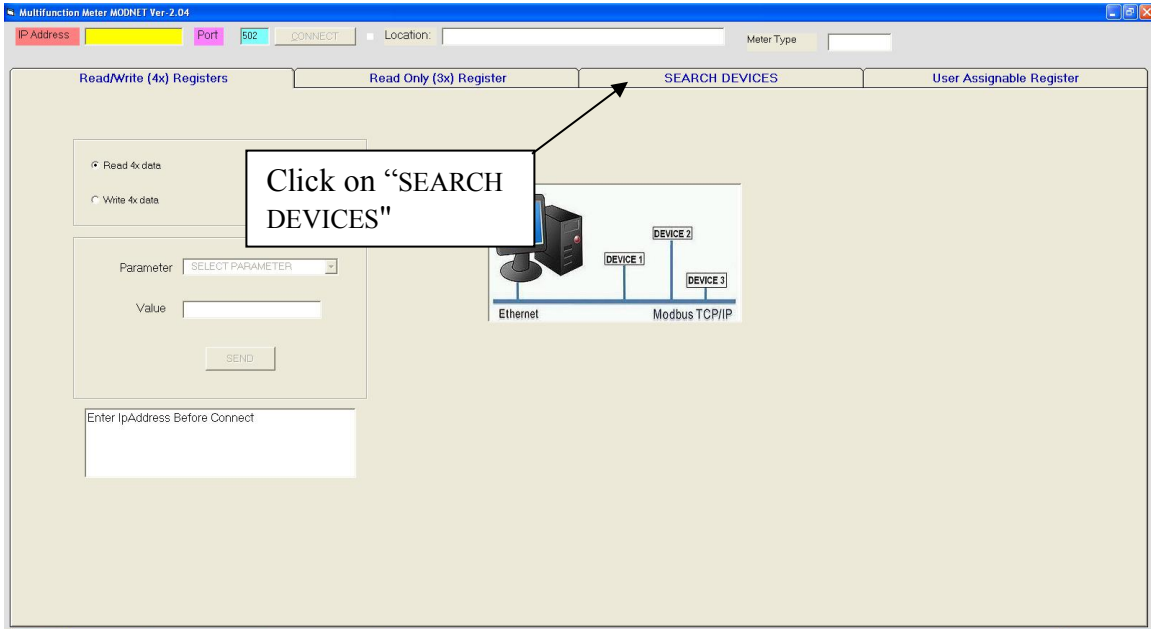
Click on windows start button of your PC, then click on All Programs. It will open ALL Program window, then select MFM_EM _MODNET (by moving cursor on the MFM_EM _MODNET) and then click on MFM_EM _MODNET. This will open MFM_EM _MODNET software.



When clicked on MFM_EM _MODNET the screen for selecting meter appears below: Select the meter in the list as per requirement.



After click on MFM_EM _MODNET,the Device WITH MODBUS TCP window opens, then click on **“SEARCH DEVICES”**. It will open **SEARCH DEVICES** tab.



Searching Device(using UDP protocol,Port number: 30303):

In “SEARCH DEVICES” tab it will search all Device with MODBUS TCP interface meters that are connected on the network. For searching Device over network data “D” is Broadcast to all devices connected over network by using Remote Host IP address as 255.255.255.255 ,using UDP protocol at port number 30303. In response 36 bytes is received ,first 15 bytes contains the hostname and 18 to 34 bytes contains the mac address. In the mac address 2 bytes are separated by “-”.

For example:

Query to DEVICE:

“D”

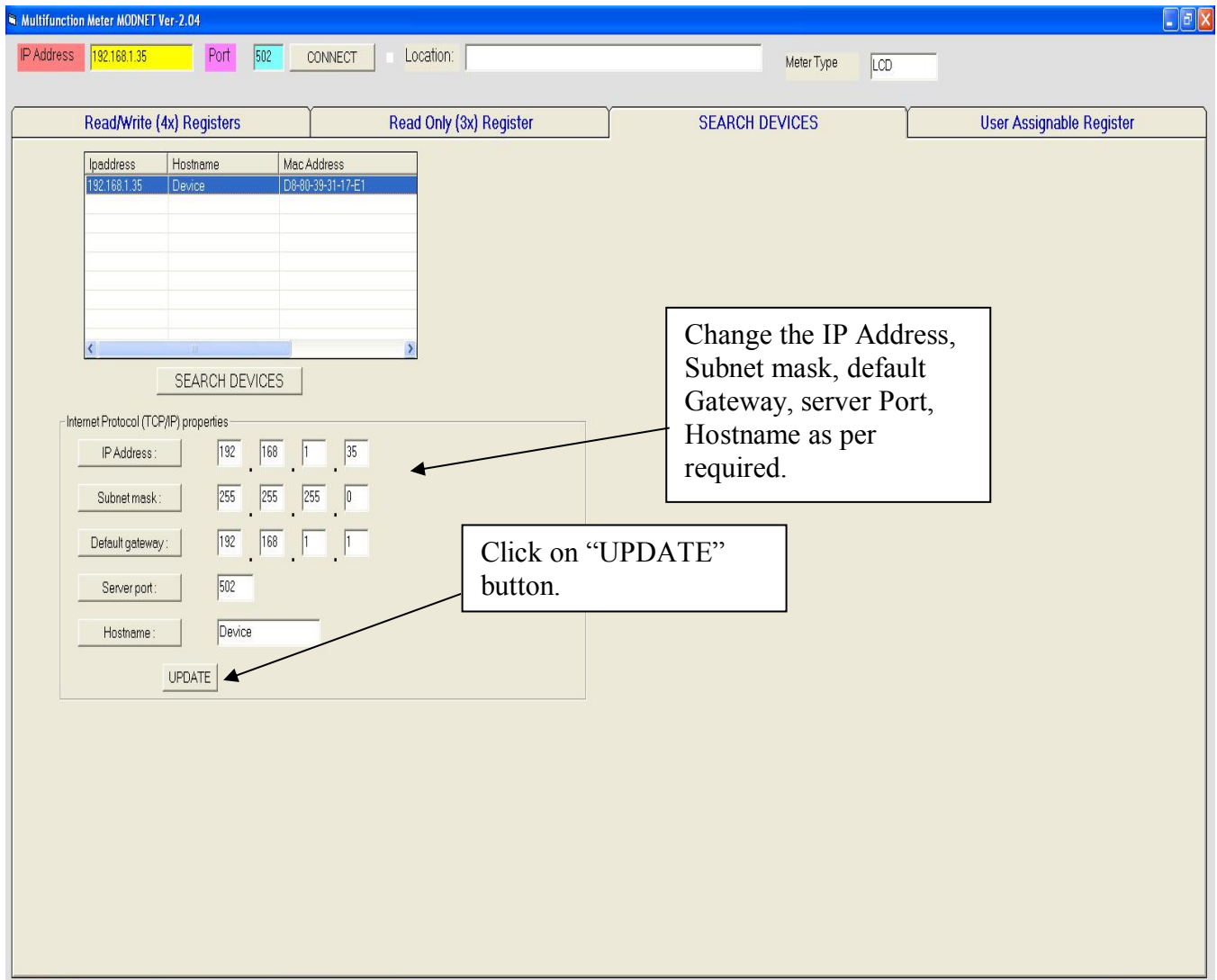
Response from DEVICE:

Hostname (1-15bytes)	16-17bytes	MAC address (18-34bytes)	35-36bytes
Device	\r \n	00-04-A3-50-0F-7A	\r \n

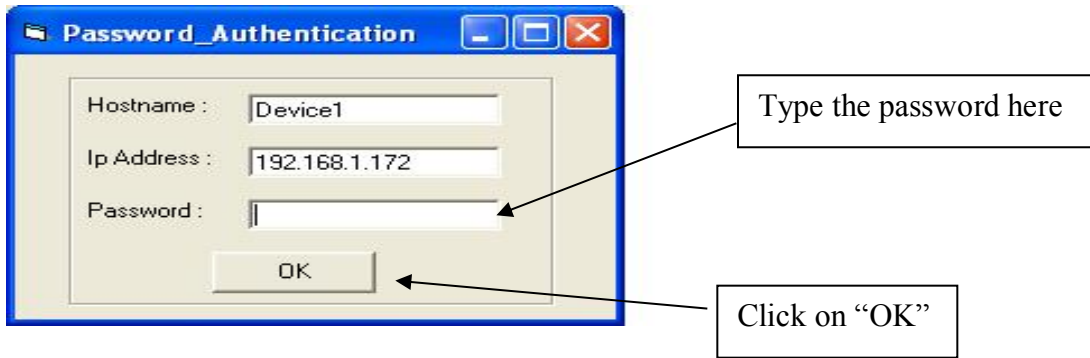
\r=carriage return (used to move the position of the cursor to the first position on the same line)

\n=newline (used to move the cursor to the next line)

Server port 502 is recommended. If port number other than 502 is needed then change the Server port through "SEARCH DEVICES TAB". At the same time 3 connections on 502 port and additional 1 connection on the changed port can be possible provided that the scan rate(polling time) for each session is minimum 5 seconds & 5 retries for each query if no response. If server port is 502 then the Device can be simultaneously connected to 4 PC provided that the scan rate(polling time) for each PC is minimum 5 seconds & 5 retries for each query if no response. Hostname can be changed as per required but it should not be more than 15 characters.



After changing all the network parameters click on "**UPDATE**" button. It will open password authentication window.



Type the password in the box appearing front of the password label .If password is CORRECT then Fig. A will be displayed otherwise Fig, B will be displayed.

If Fig. B is displayed then click on "OK" button. It will display password authentication window type password again .If password is CORRECT Fig. A will be displayed.

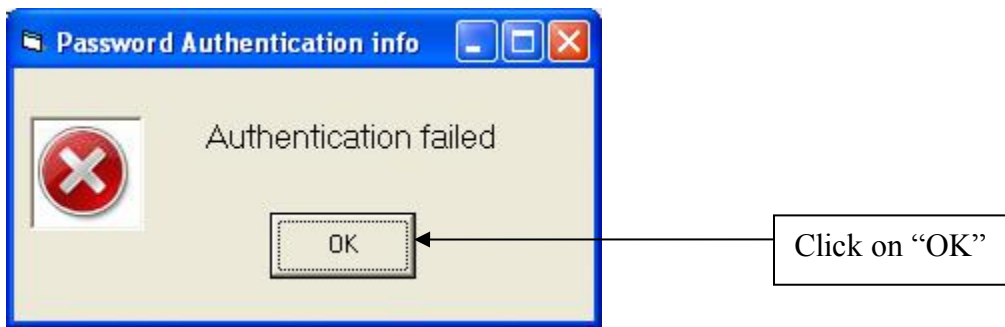


Fig.B

If Fig. A is displayed meter is now ready for communication on the selected network. After configuring all network (setup parameters – 4x registres), if required again you can enable password protection by entering the password from Read/Write (4x) Registers window.

IMPORTANT NOTE: Now to communicate with the Device change the network setting of your PC as per the device (Follow the same steps as on page no. 3 to 8 and Restart the software (to start software see page 9 & 10)).

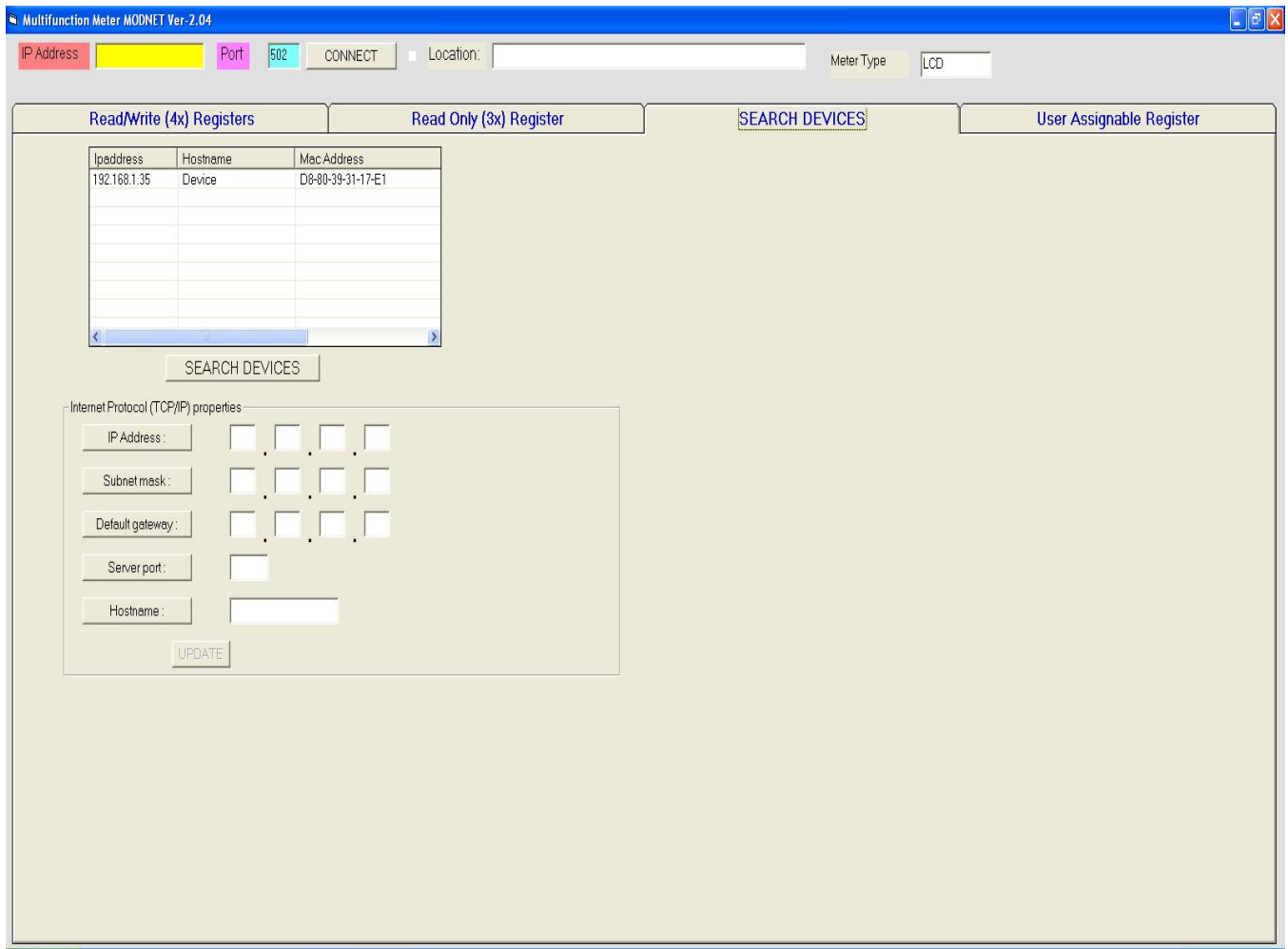


Fig. A

After restarting the software follow the steps as on page no. 9 to 10.It will show window as below:

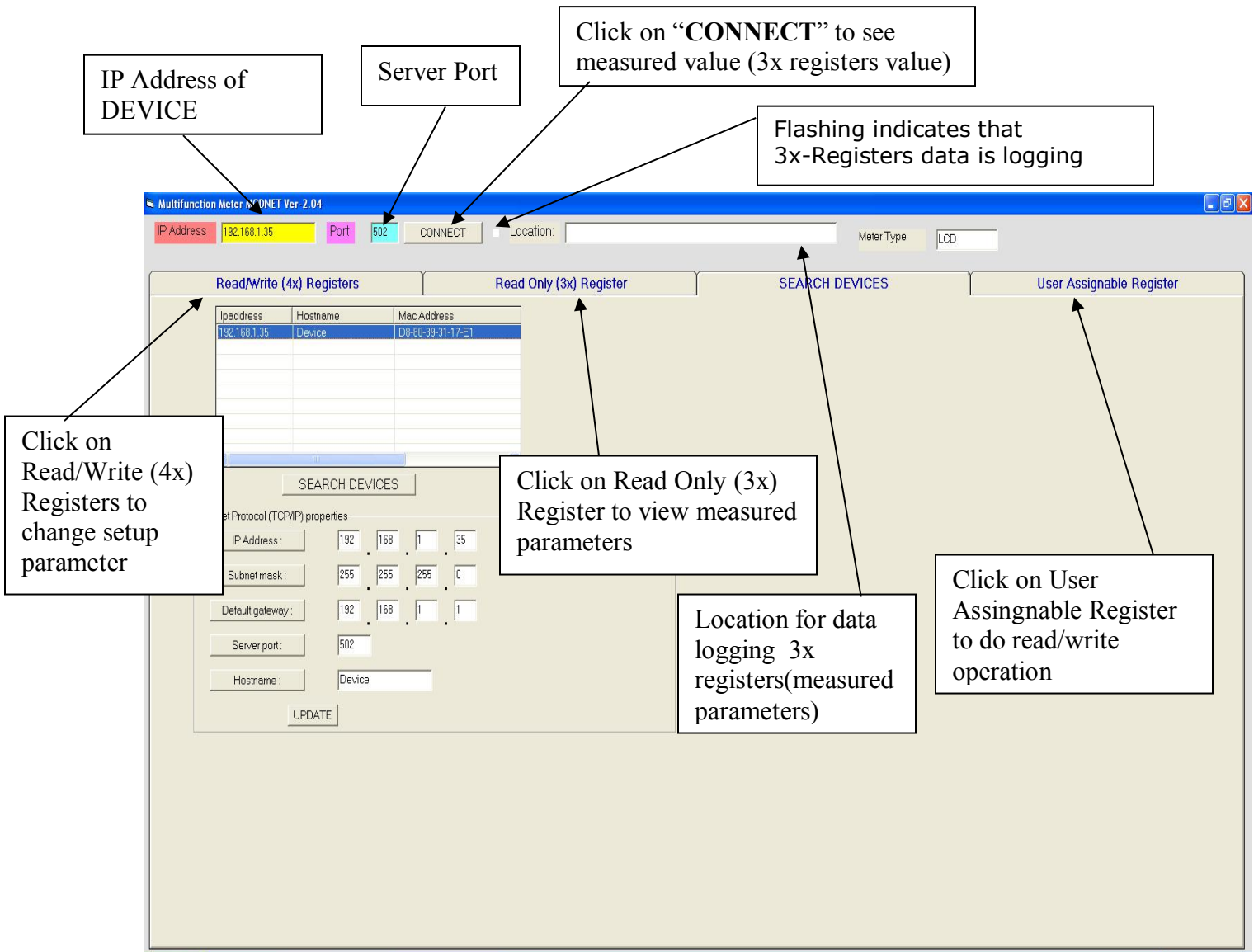


Fig. C

After click on "CONNECT" it will open **Read Only (3x) Register**.

To change setup parameter (Read/Write (4x) Registers):

1. Click on Read/Write (4x) Registers tab as shown in Fig. C. It will open Read/Write (4x) Registers tab as shown below:

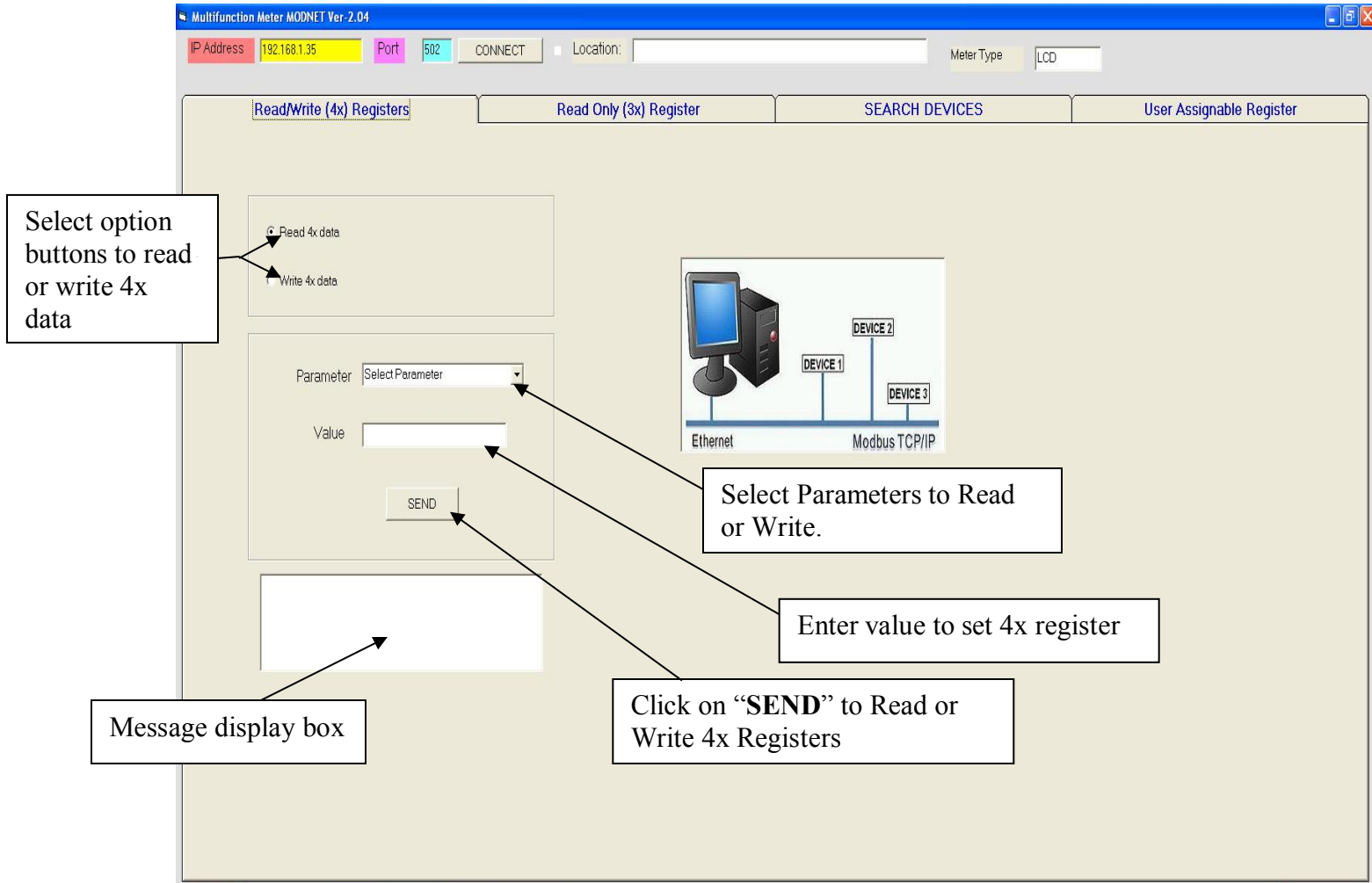


Fig. D

2. Select from option button to read or write 4x register.
3. After selecting read or write option select parameter to read or write from drop down box as shown in Fig. D
4. To write any parameter value, enter the required value to value box.
5. Click on "**SEND**".
6. If transaction is successfully completed, a message "SUCCESSFUL TRANSACTION" will be displayed on Message display box.

Additional 4x Registers for MFM-LED TYPE:

Address (Register)	Parameter No.	Parameter	Read/Write	Modbus Start Address (Hex)	
				High Byte	Low Byte
40081	41	IP Address	R/Wp	00(Hex)	50(Hex)
40083	42	Subnet Mask	R/Wp	00(Hex)	52(Hex)
40085	43	Default Gateway	R/Wp	00(Hex)	54(Hex)
40087	45	Server Port	R/Wp	00(Hex)	56(Hex)
40089	46	Hostname	R/Wp	00(Hex)	58(Hex)
40091	46	Hostname	NA	NA	NA
40093	46	Hostname	NA	NA	NA
40095	46	Hostname	NA	NA	NA
40097	47	Firmware Version	R	00	60(Hex)

Additional 4x Registers for MFM-LCD TYPE:

Address (Register)	Parameter No.	Parameter	Read/Write	Modbus Start Address (Hex)	
				High Byte	Low Byte
40107	54	IP Address	R/Wp	00	6A
40109	55	Subnet Mask	R/Wp	00	6C
40111	56	Default Gateway	R/Wp	00	6E
40113	57	Server Port	R/Wp	00	70
40115	58	Hostname	R/Wp	00	72
40117	58	Hostname	R/Wp	NA	NA
40119	58	Hostname	R/Wp	NA	NA
40121	58	Hostname	R/Wp	NA	NA
40123	59	Firmware Version	R	00	7A

Additional 4x Registers for EM13XX/EM23XX:

Address (Register)	Parameter No.	Parameter	Read/Write	Modbus Start Address (Hex)	
				High Byte	Low Byte
40135	68	IP Address	R/Wp	00	86
40137	69	Subnet Mask	R/Wp	00	88
40139	70	Default Gateway	R/Wp	00	8A
40141	71	Server Port	R/Wp	00	8C
40143	72	Hostname	R/Wp	00	8E
40145	72	Hostname	R/Wp	NA	NA
40147	72	Hostname	R/Wp	NA	NA
40149	72	Hostname	R/Wp	NA	NA
40151	73	Firmware Version	R	00	96

Additional 4x Registers for MFM LED/LCD Version above 30.XX:

Address (Register)	Parameter No.	Parameter	Read/Write	Modbus Start Address (Hex)	
				High Byte	Low Byte
40171	85	IP Address	R/Wp	00	AA
40173	86	Subnet Mask	R/Wp	00	AC
40175	87	Default Gateway	R/Wp	00	AE
40177	88	Server Port	R/Wp	00	B0
40179	89	Hostname	R/Wp	00	B2
40181	90	Hostname	R/Wp	NA	NA
40183	91	Hostname	R/Wp	NA	NA
40185	92	Hostname	R/Wp	NA	NA
40187	93	Firmware Version	R	00	BA

Additional 4x Registers for LM13XX/RM 0.2s LED/LCD:

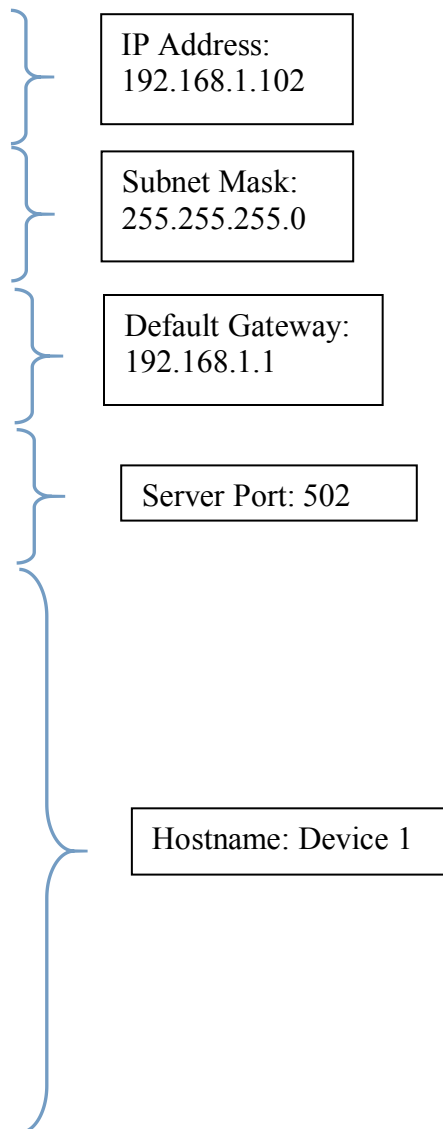
Address (Register)	Parameter No.	Parameter	Read/Write	Modbus Start Address (Hex)	
				High Byte	Low Byte
46357	178	IP Address	R/Wp	18	D4
46359	179	Subnet Mask	R/Wp	18	D6
46361	180	Default Gateway	R/Wp	18	D8
46363	181	Server Port	R/Wp	18	DA
46365	182	Hostname	R/Wp	18	DC
46367	183	Hostname	R/Wp	NA	NA
46369	184	Hostname	R/Wp	NA	NA
46371	185	Hostname	R/Wp	NA	NA
46373	186	Firmware Version	R	18	E4

Note: For writing Hostname address all 4 address to be use in a single query.

Example: For writing IP address, Subnet Mask, Default Gateway, Server Port & Hostname.

Query For LED type MFM :

Transaction identifier High byte	00(Hex)
Transaction identifier Low byte	00(Hex)
Protocol Identifier High Byte	00(Hex)
Protocol Identifier Low Byte	00(Hex)
Number of Data bytes High Byte	00(Hex)
Number of Data bytes Low Byte	27(Hex)
Unit identifier	01(Hex)
Function code	10(Hex)
Start Address High Byte	00(Hex)
Start Address Low Byte	50(Hex)
Number of Registers Hi	00(Hex)
Number of Registers Lo	10(Hex)
Byte count	20(Hex)
Data Register-1 High Byte	C0(Hex)
Data Register-1 Low Byte	A8(Hex)
Data Register-2 High Byte	01(Hex)
Data Register-2 Low Byte	66(Hex)
Data Register-3 High Byte	FF(Hex)
Data Register-3 Low Byte	FF(Hex)
Data Register-4 High Byte	FF(Hex)
Data Register-4 Low Byte	00(Hex)
Data Register-5 High Byte	C0(Hex)
Data Register-5 Low Byte	A8(Hex)
Data Register-6 High Byte	01(Hex)
Data Register-6 Low Byte	01(Hex)
Data Register-7 High Byte	00(Hex)
Data Register-7 Low Byte	00(Hex)
Data Register-8 High Byte	01(Hex)
Data Register-8 Low Byte	F6(Hex)
Data Register-9 High Byte	44(Hex)
Data Register-9 Low Byte	65(Hex)
Data Register-10 High Byte	76(Hex)
Data Register-10 Low Byte	69(Hex)
Data Register-11 High Byte	63(Hex)
Data Register-11 Low Byte	65(Hex)
Data Register-12 High Byte	20(Hex)
Data Register-12 Low Byte	31(Hex)
Data Register-13 High Byte	00(Hex)
Data Register-13 Low Byte	00(Hex)
Data Register-14 High Byte	00(Hex)
Data Register-14 Low Byte	00(Hex)
Data Register-15 High Byte	00(Hex)
Data Register-15 Low Byte	00(Hex)
Data Register-16 High Byte	00(Hex)
Data Register-16 Low Byte	00(Hex)



Response:

Transaction identifier High byte	00(Hex)
Transaction identifier Low byte	00(Hex)
Protocol Identifier High Byte	00(Hex)
Protocol Identifier Low Byte	00(Hex)
Number of Data bytes High Byte	00(Hex)
Number of Data bytes Low Byte	06(Hex)
Unit identifier	01(Hex)
Function code	10(Hex)
Start Address High Byte	00(Hex)
Start Address Low Byte	50(Hex)
Number of Registers Hi	00(Hex)
Number of Registers Lo	10(Hex)

Similarly for other meters in the list, IP change query can be formed as per addresses mentioned in tables "Additional 4x Registers" as per product selected.

Example: Reading System Type

System type: Start Address=0A (Hex) Number of Registers =02
Each setting is held in the 4x registers, modbus code 03 is used to read the current setting and code 16 is used to write/change the setting (**For more information refer modbus section of the Device manual**).

Query:

Transaction identifier High byte	00(Hex)
Transaction identifier Low byte	00(Hex)
Protocol Identifier High Byte	00(Hex)
Protocol Identifier Low Byte	00(Hex)
Number of Data bytes High Byte	00(Hex)
Number of Data bytes Low Byte	06(Hex)
Unit identifier	01(Hex)
Function code	03(Hex)
Start Address High Byte	00(Hex)
Start Address Low Byte	0A(Hex)
Number of Registers Hi	00(Hex)
Number of Registers Lo	02(Hex)

Response: System type (3phase 4wire=3)

Transaction identifier High byte	00(Hex)
Transaction identifier Low byte	00(Hex)
Protocol Identifier High Byte	00(Hex)
Protocol Identifier Low Byte	00(Hex)
Number of Data bytes High Byte	00(Hex)
Number of Data bytes Low Byte	07(Hex)
Unit identifier	01(Hex)
Function code	03(Hex)
Byte count	04(Hex)
Data Register-1 High Byte	40(Hex)
Data Register-1 Low Byte	40(Hex)
Data Register-2 High Byte	00(Hex)
Data Register-2 Low Byte	00(Hex)

Transaction identifier High /Low byte: Identification of a MODBUS Request / Response transaction.

Protocol Identifier High/Low Byte: For MODBUS protocol it is 0.

Number of Data bytes High/Low Byte: The length field is a byte count of the following fields, including the Unit Identifier and data fields.

Unit identifier: Identification of a remote slave connected on a serial line or on other buses.

Example: Writing System Type

System type: Start Address=0A (Hex) Number of Registers =02

Query: (Change System type to 3phase 3wire =2)

Transaction identifier High byte	00(Hex)
Transaction identifier Low byte	00(Hex)
Protocol Identifier High Byte	00(Hex)
Protocol Identifier Low Byte	00(Hex)
Number of Data bytes High Byte	00(Hex)
Number of Data bytes Low Byte	0B(Hex)
Unit identifier	01(Hex)
Function code	10(Hex)
Start Address High Byte	00(Hex)
Start Address Low Byte	0A(Hex)
Number of Registers Hi	00(Hex)
Number of Registers Lo	02(Hex)
Byte count	04(Hex)
Data Register-1 High Byte	40(Hex)
Data Register-1 Low Byte	00(Hex)
Data Register-2 High Byte	00(Hex)
Data Register-2 Low Byte	00(Hex)

Response:

Transaction identifier High byte	00(Hex)
Transaction identifier Low byte	00(Hex)
Protocol Identifier High Byte	00(Hex)
Protocol Identifier Low Byte	00(Hex)
Number of Data bytes High Byte	00(Hex)
Number of Data bytes Low Byte	06(Hex)
Unit identifier	01(Hex)
Function code	10(Hex)
Start Address High Byte	00(Hex)
Start Address Low Byte	0A(Hex)
Number of Registers Hi	00(Hex)
Number of Registers Lo	02(Hex)

Transaction identifier High /Low byte: Identification of a MODBUS Request / Response transaction.

Protocol Identifier High/Low Byte: For MODBUS protocol it is 0.

Number of Data bytes High/Low Byte: The length field is a byte count of the following fields, including the Unit Identifier and data fields.

Unit identifier: Identification of a remote slave connected on a serial line or on other buses.

For more information on Modbus refer modbus section of Device manual & for information on Modbus TCP/IP refer MODBUS MESSAGING ON TCP/IP IMPLEMENTATION GUIDE V1.0b Downloadable from the Modbus-IDA, www.Modbus-ida.org

To view 3x registers (measured parameters) :

1. Click on Read Only (3x) Register tab or Click on **"CONNECT"** button as shown in Fig. C. It will open Read Only (3x) Register tab as shown below:

Parameter name

Click on this to CONNECT OR DISCONNECT

Location for data logging 3x registers (measured parameters) 1*

Register Address

Parameter Value

Select to view normal data or mapped data

Register	Parameter	Value	Register	Parameter	Value	Register	Parameter	Value
30001	Volts1	212.3935	30055	VA Ave	0	30201	VL 1-2 (Cal.)	0
30003	Volts2	212.3918	30057	VA Sum	0	30203	VL 2-3 (Cal.)	0
30005	Volts3	212.5764	30059	VAR Ave	0	30205	VL 3-1 (Cal.)	0
30007	Current1	0	30061	VAR Sum	0	30207	V1 THD(%)	4.379049
30009	Current2	0	30063	PF Ave	1	30209	V2 THD(%)	4.346316
30011	Current3	0	30065	PF Sum	3	30211	V3 THD(%)	4.335212
30013	Watt1	0	30067	Phase Angle Ave	0	30213	I1 THD(%)	0
30015	Watt2	0	30069	Phase Angle Sum	0	30215	I2 THD(%)	0
30017	Watt3	0	30071	Freq	50.01962	30217	I3 THD(%)	0
30019	VA1	0	30073	Active Energy Import	1.06	30219	Sys. Volt THD(%)	4.353526
30021	VA2	0	30075	Active Energy Export	0.841	30221	Sys. Curr. THD(%)	0
30023	VA3	0	30077	ReActive Energy Import	0.031	30225	I neutral	0
30025	VAR1	0	30079	ReActive Energy Export	1.502	30227	Run Hour	0
30027	VAR2	0	30081	Apparent Energy	4.789999	30229	On Hour	0
30029	VAR3	0	30083	Ah	0	30231	No. Of Interrupts	0
30031	PF1	1	30085	W Dem.(Imp.)	0			
30033	PF2	1	30087	W Max Dem.(Imp.)	0			
30035	PF3	1	30089	W Dem.(Exp.)	0			
30037	Phase Angle1	0	30091	W Max Dem.(Exp.)	0			
30039	Phase Angle2	0	30101	VA Demand	0			
30041	Phase Angle3	0	30103	VA Max Demand	0			
30043	Volts Ave	212.4539	30105	A Demand	0			
30045	Volts Sum	637.3617	30107	A Max Demand	0			
30047	Current Ave	0	30133	Volts Ave Max	215.0125			
30049	Current Sum	0	30135	Volts Ave Min	207.1624			
30051	Watts Ave	0	30141	Current Ave Max	1.094287			
30053	Watts Sum	0	30143	Current Ave Min	0			

Fig. E

Caution : Before logging data in excel please close all other excel sheet.

Note:

1. a)Data will default log at the location

C:\MODNET_LOG_FILES\ (date)_(time) as shown in Fig. C.

For example-: C:\MODNET_LOG_FILES\07.18.2012_14.32.08

b) Location can also be change by writing valid address in the box as shown in **Fig. E**. But change the location before clicking on "**CONNECT**" button.
For example: **D:\Device\filename**

c) After changing tab from "Read Only(3x) Register" to other tab it will save excel file and while clicking on again "**CONNECT**" it will create new file.

2. Select to view normal data or mapped data as shown in Fig. , by default normal data is selected.

Example:

To read parameter

Volts 3: Start address =04(hex) Number of registers =02

Each query for reading the data must be restricted to 20 parameters or less. Exceeding the 20 parameters limit cause a modbus exception code to be returned.

Query:

Transaction identifier High byte	00(Hex)
Transaction identifier Low byte	00(Hex)
Protocol Identifier High Byte	00(Hex)
Protocol Identifier Low Byte	00(Hex)
Number of Data bytes High Byte	00(Hex)
Number of Data bytes Low Byte	06(Hex)
Unit identifier	01(Hex)
Function code	04(Hex)
Start Address High Byte	00(Hex)
Start Address Low Byte	04(Hex)
Number of Registers Hi	00(Hex)
Number of Registers Lo	02(Hex)

Response: Volt3 (219.25V)

Transaction identifier High byte	00(Hex)
Transaction identifier Low byte	00(Hex)
Protocol Identifier High Byte	00(Hex)
Protocol Identifier Low Byte	00(Hex)
Number of Data bytes High Byte	00(Hex)
Number of Data bytes Low Byte	07(Hex)
Unit identifier	01(Hex)
Function code	03(Hex)
Byte count	04(Hex)
Data Register-1 High Byte	40(Hex)
Data Register-1 Low Byte	40(Hex)
Data Register-2 High Byte	00(Hex)
Data Register-2 Low Byte	00(Hex)

To assign User Assignable Register:

1. Click on “User Assignable Register” as shown in **Fig. C** to do Read/Write operation on User assignable Register a window open as shown in **Fig. F**.

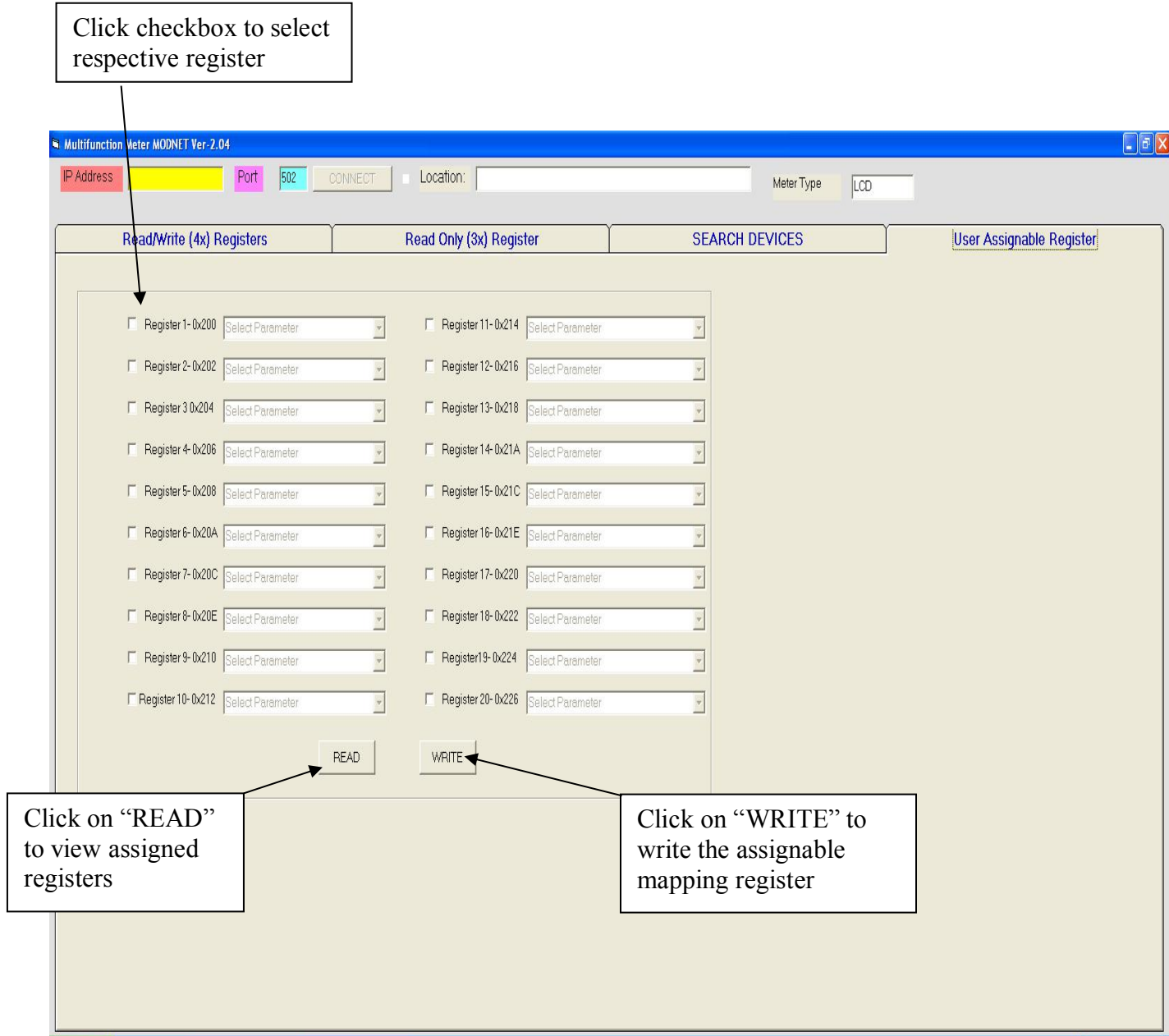


Fig. F

- Click on checkbox, it will enable the respective register field and after enabling register field, select the parameter through drop down box to write as shown in Fig. G.

Note: Please select the parameters in multiple of two i.e. 2, 4, 6, 8..... 20.

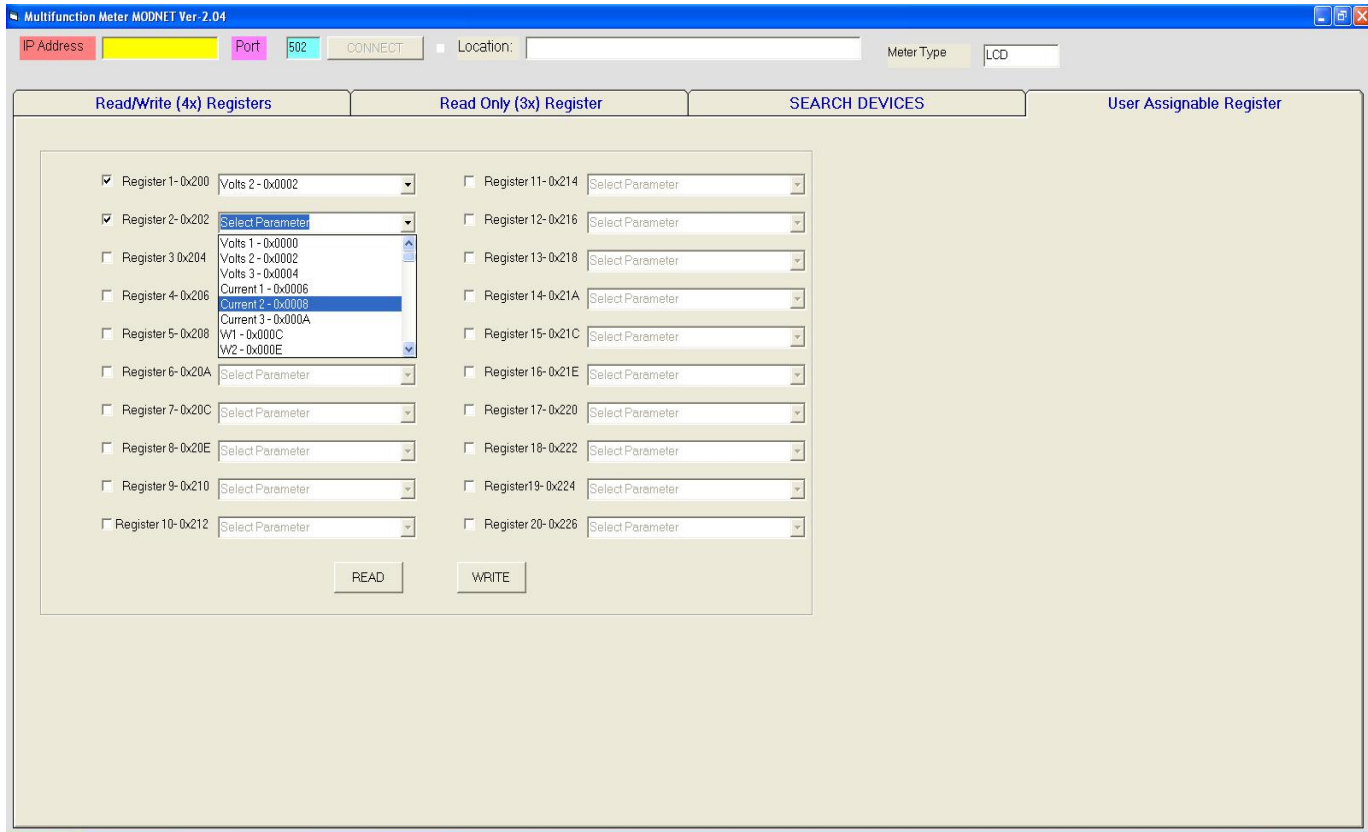


Fig. G

- After selecting user assignable registers click on the "WRITE" button.
- To read user assignable mapping register click on "READ".

Example:

Assigning parameter to user assignable registers

To access the voltage2 (3x address 0x0002) and Power Factor1 (3x address 0x001E) through user assignable register assign these addresses to 4x register (**For more information refer modbus section of Device manual**) 0x0200 and 0x0201 respectively.

Assigning Query:

Transaction identifier High byte	00(Hex)	
Transaction identifier Low byte	00(Hex)	
Protocol Identifier High Byte	00(Hex)	
Protocol Identifier Low Byte	00(Hex)	
Number of Data bytes High Byte	00(Hex)	
Number of Data bytes Low Byte	0B(Hex)	
Unit identifier	01(Hex)	
Function code	10(Hex)	
Start Address High Byte	02(Hex)	
Start Address Low Byte	00(Hex)	
Number of Registers Hi	00(Hex)	
Number of Registers Lo	02(Hex)	
Byte count	04(Hex)	
Data Register-1 High Byte	00(Hex)	
Data Register-1 Low Byte	02(Hex)	
Data Register-2 High Byte	00(Hex)	
Data Register-2 Low Byte	1E (Hex)	

***Note: Parameters should be assigned in Multiple of two i.e. 2, 4, 6, 8.....20.**

Response:

Transaction identifier High byte	00(Hex)
Transaction identifier Low byte	00(Hex)
Protocol Identifier High Byte	00(Hex)
Protocol Identifier Low Byte	00(Hex)
Number of Data bytes High Byte	00(Hex)
Number of Data bytes Low Byte	06(Hex)
Unit identifier	01(Hex)
Function code	10(Hex)
Start Address High Byte	02(Hex)
Start Address Low Byte	00 (Hex)
Number of Registers Hi	00(Hex)
Number of Registers Lo	02(Hex)

Transaction identifier High /Low byte: Identification of a MODBUS Request / Response transaction.

Protocol Identifier High/Low Byte: For MODBUS protocol it is 0.

Number of Data bytes High/Low Byte: The length field is a byte count of the following fields, including the Unit Identifier and data fields.

Unit identifier: Identification of a remote slave connected on a serial line or on other buses.

Reading Parameter data through User Assignable Registers:

In assigning query Voltage 2 and Power Factor 1 parameters were assigned to 0x 200 and 0x201(Table 10) which will point to user assignable 3x registers 0x200 and 0x202 (Table 9). So to read Voltage 2 and Power Factor 1 data reading should be as below.

Query:

Transaction identifier High byte	00(Hex)
Transaction identifier Low byte	00(Hex)
Protocol Identifier High Byte	00(Hex)
Protocol Identifier Low Byte	00(Hex)
Number of Data bytes High Byte	00(Hex)
Number of Data bytes Low Byte	06(Hex)
Unit identifier	01(Hex)
Function code	04(Hex)
Start Address High Byte	02(Hex)
Start Address Low Byte	00(Hex)
Number of Registers Hi	00(Hex)
Number of Registers Lo	04(Hex)

Response :(Volt2=219.30 / Power Factor =1.0)

Transaction identifier High byte	00(Hex)
Transaction identifier Low byte	00(Hex)
Protocol Identifier High Byte	00(Hex)
Protocol Identifier Low Byte	00(Hex)
Number of Data bytes High Byte	00(Hex)
Number of Data bytes Low Byte	07(Hex)
Unit identifier	01(Hex)
Function code	04(Hex)
Byte count	08(Hex)
Data Register-1 High Byte	43 (Hex)
Data Register-1 Low Byte	5B(Hex)
Data Register-2 High Byte	4E(Hex)
Data Register-2 Low Byte	04(Hex)
Data Register-3 High Byte	3F(Hex)
Data Register-3 Low Byte	80(Hex)
Data Register-4 High Byte	00(Hex)
Data Register-4 Low Byte	00(Hex)

Transaction identifier High /Low byte: Identification of a MODBUS Request / Response transaction.

Protocol Identifier High/Low Byte: For MODBUS protocol it is 0.

Number of Data bytes High/Low Byte: The length field is a byte count of the following fields, including the Unit Identifier and data fields.

Unit identifier: Identification of a remote slave connected on a serial line or on other buses.

To view Individual Harmonics or Long energy parameters:

1. Click on Individual Harmonics or Long energy parameters tab and Click on **“CONNECT”** button as shown in Fig. H & I. It will open the respective tabs as shown below:

The screenshot shows the 'Individual Harmonics' tab in the MFM_EM MODNET Ver-2.09 software. The interface includes a header with IP Address (192.168.1.36), Port (502), a 'DISCONNECT' button, and a Location field (C:\MODNET_LOG_FILES\04.04.2018_12...19.xls). Below the header are tabs for 'Read/Write (4x) Register', 'Read Only (3x) Register', 'SEARCH DEVICES', 'User Assignable Register', 'Individual Harmonics', and 'Energy in Long Format'. The main area contains a table with three columns: Register, Parameter, and Value. The table lists 18 rows of harmonics, each with a unique Register address and a Parameter name (e.g., VR Harmonic-1, IR Harmonic-1, etc.). A 'CONNECT' button is visible above the table. Callouts from external boxes point to various elements: 'Parameter name' points to the 'Parameter' column; 'Register Address' points to the 'Register' column; 'Parameter Value' points to the 'Value' column; 'Click on this to CONNECT OR DISCONNECT' points to the 'DISCONNECT' button; and 'Location for data logging of individual harmonics' points to the 'Location' field.

Register	Parameter	Value	Register	Parameter	Value	Register	Parameter	Value
30401	VR Harmonic-1	0	30529	VY Harmonic-1	0	30657	VB Harmonic-1	0
30403	IR Harmonic-1	0	30531	IY Harmonic-1	0	30659	IB Harmonic-1	0
30405	VR Harmonic-2	0	30533	VY Harmonic-2	0	30661	VB Harmonic-2	0
30407	IR Harmonic-2	0	30535	IY Harmonic-2	0	30663	IB Harmonic-2	0
30409	VR Harmonic-3	0	30537	VY Harmonic-3	0	30665	VB Harmonic-3	0
30411	IR Harmonic-3	0	30539	IY Harmonic-3	0	30667	IB Harmonic-3	0
30413	VR Harmonic-4	0	30541	VY Harmonic-4	0	30669	VB Harmonic-4	0
30415	IR Harmonic-4	0	30543	IY Harmonic-4	0	30671	IB Harmonic-4	0
30417	VR Harmonic-5	0	30545	VY Harmonic-5	0	30673	VB Harmonic-5	0
30419	IR Harmonic-5	0	30547	IY Harmonic-5	0	30675	IB Harmonic-5	0
30421	VR Harmonic-6	0	30549	VY Harmonic-6	0	30677	VB Harmonic-6	0
30423	IR Harmonic-6	0	30551	IY Harmonic-6	0	30679	IB Harmonic-6	0
30425	VR Harmonic-7	0	30553	VY Harmonic-7	0	30681	VB Harmonic-7	0
30427	IR Harmonic-7	0	30555	IY Harmonic-7	0	30683	IB Harmonic-7	0
30429	VR Harmonic-8	0	30557	VY Harmonic-8	0	30685	VB Harmonic-8	0
30431	IR Harmonic-8	0	30559	IY Harmonic-8	0	30687	IB Harmonic-8	0
30433	VR Harmonic-9	0	30561	VY Harmonic-9	0	30689	VB Harmonic-9	0
30435	IR Harmonic-9	0	30563	IY Harmonic-9	0	30691	IB Harmonic-9	0
30437	VR Harmonic-10	0	30565	VY Harmonic-10	0	30693	VB Harmonic-10	0
30439	IR Harmonic-10	0	30567	IY Harmonic-10	0	30695	IB Harmonic-10	0
30441	VR Harmonic-11	0	30569	VY Harmonic-11	0	30697	VB Harmonic-11	0
30443	IR Harmonic-11	0	30571	IY Harmonic-11	0	30699	IB Harmonic-11	0
30445	VR Harmonic-12	0	30573	VY Harmonic-12	0	30701	VB Harmonic-12	0
30447	IR Harmonic-12	0	30575	IY Harmonic-12	0	30703	IB Harmonic-12	0
30449	VR Harmonic-13	0	30577	VY Harmonic-13	0	30705	VB Harmonic-13	0
30451	IR Harmonic-13	0	30579	IY Harmonic-13	0	30707	IB Harmonic-13	0
30453	VR Harmonic-14	0	30581	VY Harmonic-14	0	30709	VB Harmonic-14	0
30455	IR Harmonic-14	0	30583	IY Harmonic-14	0	30711	IB Harmonic-14	0
30457	VR Harmonic-15	0	30585	VY Harmonic-15	0	30713	VB Harmonic-15	0
30459	IR Harmonic-15	0	30587	IY Harmonic-15	0	30715	IB Harmonic-15	0
30461	VR Harmonic-16	0	30589	VY Harmonic-16	0	30717	VB Harmonic-16	0
30463	IR Harmonic-16	0	30591	IY Harmonic-16	0	30719	IB Harmonic-16	0
30465	VR Harmonic-17	0	30593	VY Harmonic-17	0	30721	VB Harmonic-17	0
30467	IR Harmonic-17	0	30595	IY Harmonic-17	0	30723	IB Harmonic-17	0
30469	VR Harmonic-18	0	30597	VY Harmonic-18	0	30725	VB Harmonic-18	0
30471	IR Harmonic-18	0	30599	IY Harmonic-18	0	30727	IB Harmonic-18	0

Fig. H

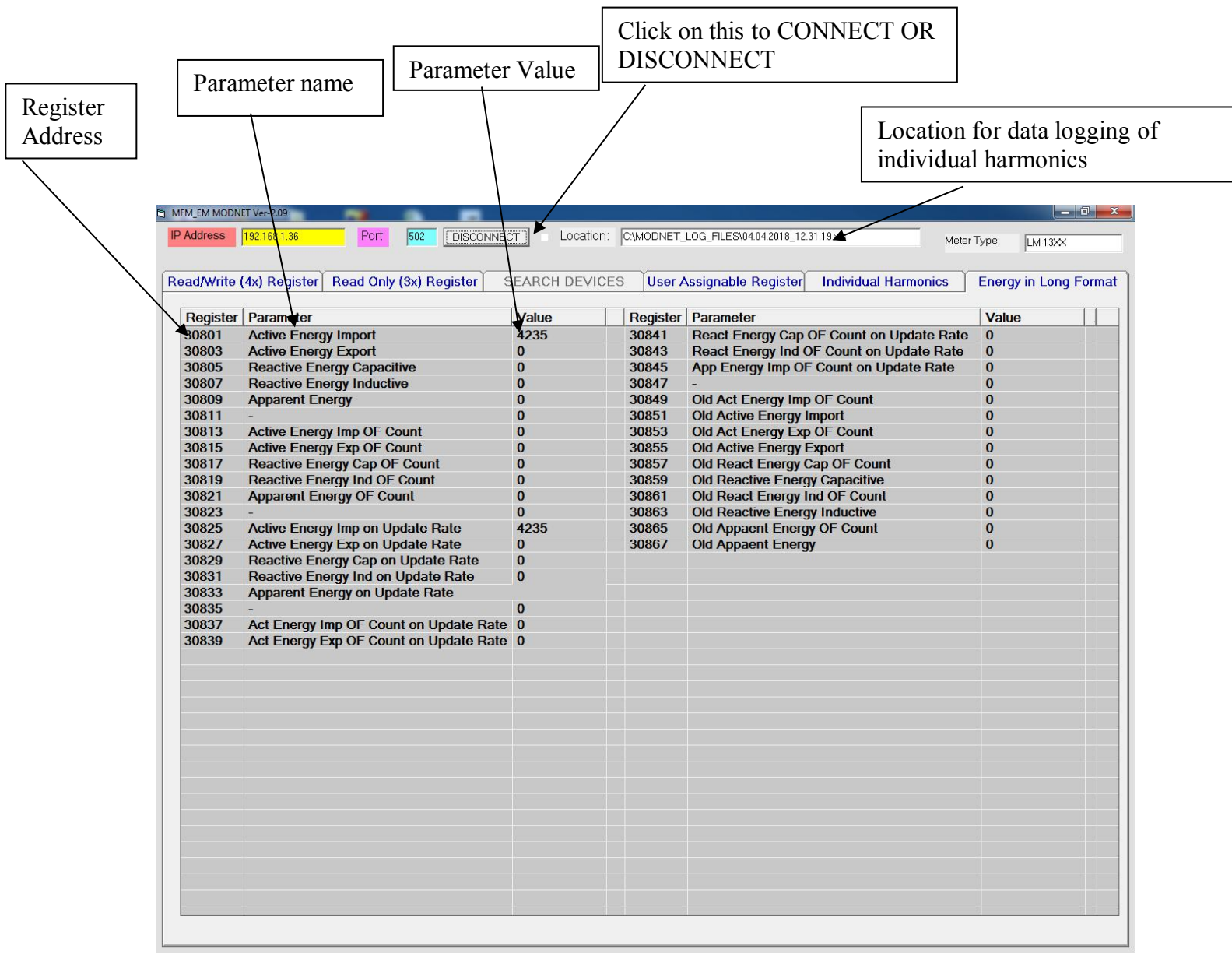


Fig. I

2. Logging of excel files,query & response format for above two tabs is similar to that for Read Only (3x) Register tab So for examples of query & response for reading of the above two tabs refer examples of Read Only (3x) Register.

Note : The "Individual Harmonics" & "Energy in long format" tabs are only present for LM13XX, RM 0.2s LED & RM 0.2s LCD meters.

For more information on Modbus refer modbus section of Device manual & for information on Modbus TCP/IP refer MODBUS MESSAGING ON TCP/IP IMPLEMENTATION GUIDE V1.0b Downloadable from the Modbus-IDA, www.Modbus-ida.org.