

					
Product	AMD	Type/Series	C/CP2000	Appl. Note Nr. 001	Delta C2000
Issued by	DEN	Author	Marcel Dorti	Release Date	August , 2016
Title	MODBUS TCP communication between C2000 and AH500 in speed mode				

Devices and special tools/equipment

- ✓ Delta C/CP2000 + motor
- ✓ CMC-MOD01 – Communication card in Modbus TCP
- ✓ AH500 Modbus TCP Master
- ✓ ISPsoft – Software to program AH500
- ✓ Delta DCISoft - Software to change the settings of the CMC-MOD01 Modbus TCP card

Test setup
N/A

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1 Introduction

Modbus RTU is a famous layer 2 fieldbus protocol used in wide range of applications since the mid 80's and it has its encapsulation in a Ethernet frame, on TCP/IP protocol of layer 4 - 3 of OSI model. It can be used on Ethernet networks though a logic IP address, Modbus TCP uses the same function codes of RTU. The main advantage is that it is faster and can be used to send or receive data through any Ethernet device such as switches and routers in different topologies like star, tree or other line topologies using TCP/UDP/IP protocols in Layer 3-4. It can be installed in Standard 10, 100 or 1000 Mbit/s Ethernet technology based on copper cables, fibre optics or wireless standards can be used. Number of stations is almost infinite and it can go up to a speed of 1.5 Kbyte per telegram frame.

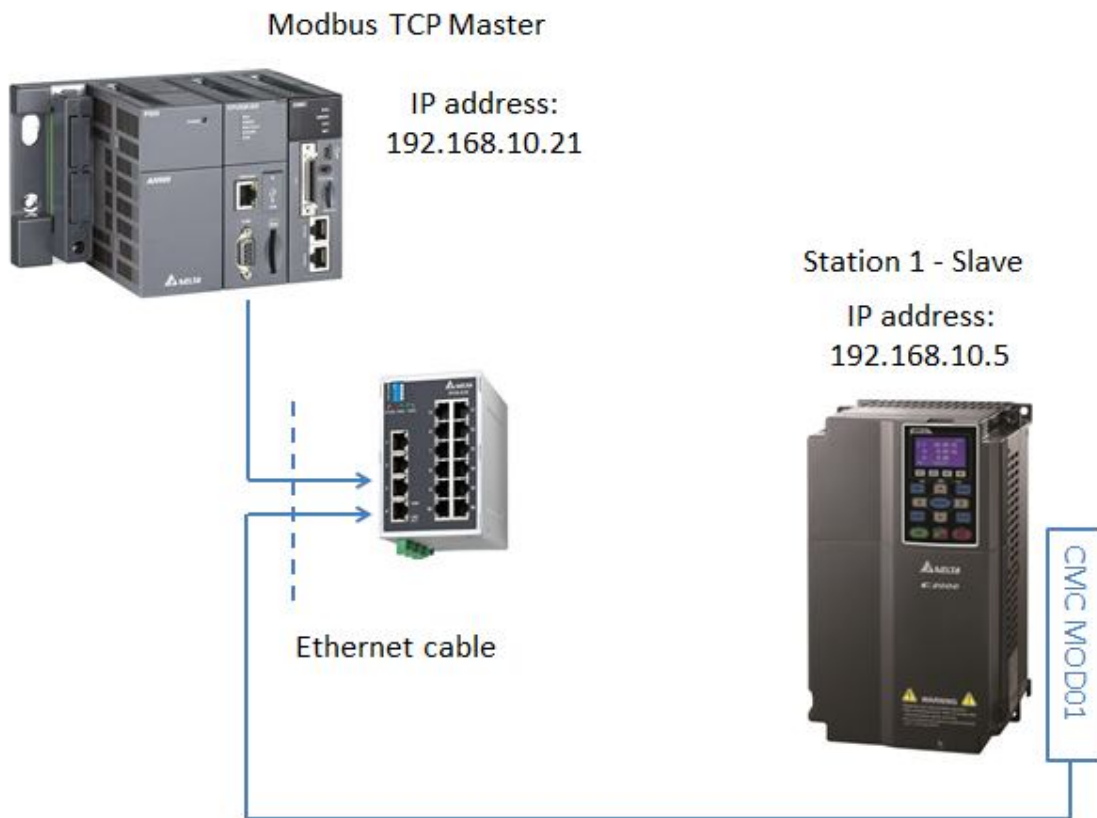


Figure 1 - Small star topology of AH500 as a master and C2000 as a slave through a Delta Ethernet switch

2 Connecting Hardware

To be able to work with Modbus TCP, you will need to install the CMC-MOD1 Modbus Card on the slot card on the right of the drive. Whenever you connect the Ethernet cable, the data transmission LED will start blinking. There are two side holes in order to fit the card and side clamps to hold it. It is not necessary force to insert or remove the card, just a screw-driver to loosen the clamps in order to take the card out. Use the screws to tighten the card to the drive.

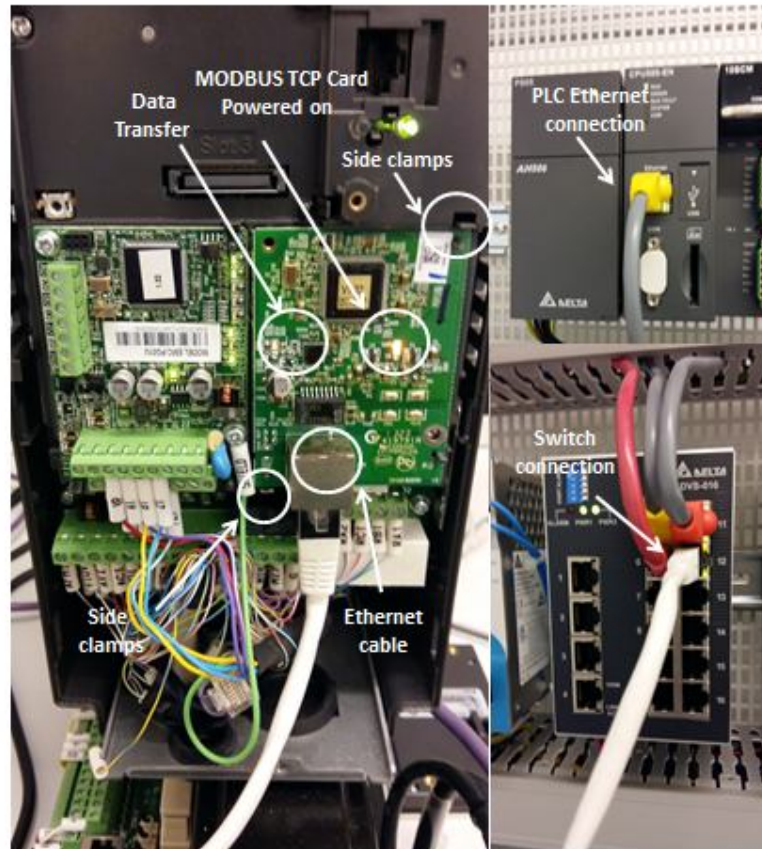


Figure 2 – C2000 with encoder card and CMC-MOD01 card, AH500 and Delta Switch connected

3 Configuring the MODBUS TCP card

Those are the values for MODBUS TCP setting in C/CP2000:

Parameter	Function	Set value (Dec)	Explanation
P09-30	Decoding method for communication	0	Decoding method for Delta AC motor drive
P09-75	IP setting	0	Static IP(0) / Dynamic distribution IP(1)
P09-76	IP address -1	192	IP address 192.168.1.5
P09-77	IP address -2	168	IP address 192.168.1.5
P09-78	IP address -3	1	IP address 192.168.1.5
P09-79	IP address -4	5	IP address 192.168.1.5
P09-80	Netmask -1	255	Netmask 255.255.255.0
P09-81	Netmask -2	255	Netmask 255.255.255.0
P09-82	Netmask -3	255	Netmask 255.255.255.0
P09-83	Netmask -4	0	Netmask 255.255.255.0
P09-84	Default gateway -1	192	Default gateway 192.168.1.1
P09-85	Default gateway -2	168	Default gateway 192.168.1.1
P09-86	Default gateway -3	1	Default gateway 192.168.1.1
P09-87	Default gateway -4	1	Default gateway 192.168.1.1

Figure 3 - Parameters for MODBUS TCP according to manual

In these parameters you can check the setting of IP addresses and netmasks of the card, however **you cannot change the IP address through the keypad of the drive**. To accomplish that, you will need to download DCISoft, a software developed to set network topologies in Modbus with CMC-MOD01.

You can easily download it for free at www.delta-emea.com select **Industrial Automation**, go to **Download Center** at the end of the page and insert the **Software** check for Industrial Fieldbus Solution. Download the file, unzip and install DCISoft in your computer.

Software

EtherNet/IP Series

Software Name	Explanation	Operating System	Language	Issue Date	File
DCISoft V1.14	Software for Delta communication modules (DVPEN01-SL, RTU-EN01, IFD9506, IFD9507, DVPSCM12-SL, DVPSCM52-SL)	Windows® 2000/XP/7(32-bit/64-bit)	Multilanguage	2016/02/01	
DCISoft V1.16	Software for Delta communication modules (DVPEN01-SL, RTU-EN01, IFD9506, IFD9507, DVPSCM12-SL, DVPSCM52-SL)	Windows® 2000/XP/7(32-bit/64-bit)	Multilanguage	2016/06/08	
EDS Builder V3.00	Software for EtherNet/IP, CANopen, DeviceNet EDS file	Windows® XP/7(32-bit)/8.1(32-bit/64-bit)	Multilanguage	2016/04/19	

Figure 4 - DCISoft download screen at Delta EMEA website

Open DCI Soft from your desktop, it will show you a screen like this one:

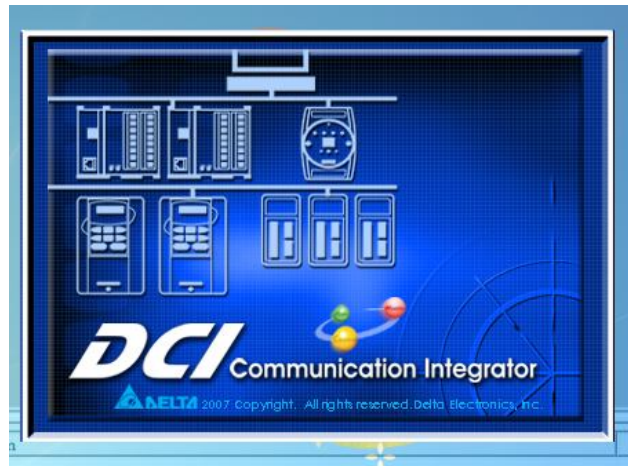


Figure 5 - DCI Start-up screen

Plug the Ethernet card from your computer to the Ethernet Switch, open the DCISoft and click on **Search**. Maybe you will need to adjust your computer's IP range address to the default address of the Modbus card. Click on **Search** for the software to identify the card, then click on the identified card.



Figure 6 - First screen of DCISoft - Click on search

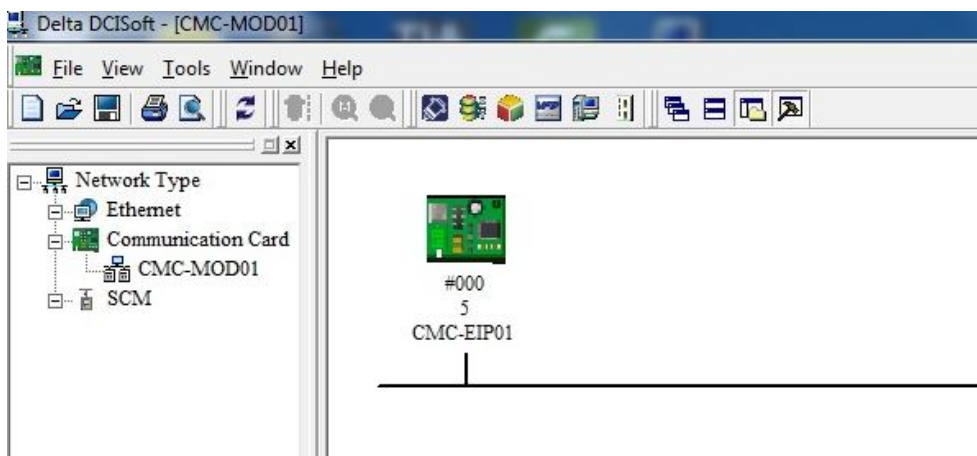


Figure 7 - The software should find the CMC-EI01 card – the same name for MODBUS and Ethernet IP are used

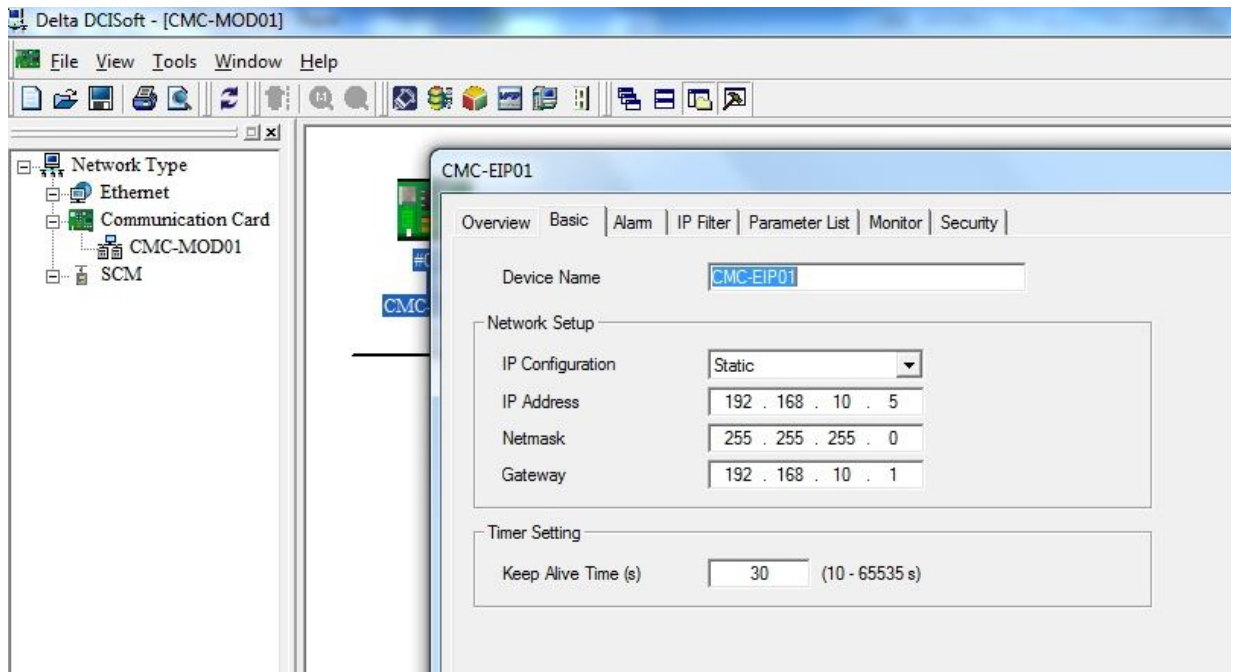


Figure 8 - Open the card setting and change the IP of the card, pressing APPLY.

Set appropriate IP and appropriate Netmask for the card, the gateway should be the number of the PLC, however, if the card does not accept it, insert the gateway address of the network type, which is, insert 1 on the last part of the **IP address**.

Turn the drive off, and turn it on again, check the IP address you set reading parameters from **09-76** to **09-79**, so you can check if the IP address was really changed.

Change the following in parameters in order to enable the C2000 to receive a frequency command from the Modbus card and enable it to be turned on/off via Fieldbus.

Parameter	Function	Set value (Dec)	Explanation
P00-20	Source of frequency command setting	8	The frequency command is controlled by communication card.
P00-21	Source of operation command setting	5	The operation command is controlled by communication card.

Figure 9 - Parameters to be changed to enable the drive for Modbus TCP

Once the IP is changed to suit the network, check also the AH500 address so that there is no conflict on the IP Ethernet networks. Now we have to set the AH500 for the data exchange.

4 Setting AH500 Hardware configuration

In order to communicate via Ethernet with AH500, it will be necessary to add a communication in COMMGR. If you do not have COMMGR installed in your computer, download it from www.delta-emea.com - > **Industrial Automation** -> **Download Center** and look for **AC Motor Drives, software**.

PLC Editing Software for VFD

Software Name	Explanation	Operating System	Comment	Issue Date	File
WPLSoft_V2.42	PLC programming software	Windows® XP/Vista/7/8 (32-bit/64-bit)	DCISoft is also installed after WPLSoft/ISPSOft is installed	2016/03/11	
WPLSoft_V2.41	PLC programming software	Windows® XP/Vista/7/8 (32-bit/64-bit)	DCISoft is also installed after WPLSoft/ISPSOft is installed	2015/05/29	
ISPSOft V3.02	PLC programming software	Windows® XP/Vista/7 (32-bit/64-bit)/8/10(64-bit)	please use with COMMGR for communication function	2016/07/25	
ISPSOft V3.01	PLC programming software	Windows® XP/Vista/7 (32-bit/64-bit)/8/10(64-bit)	please use with COMMGR for communication function	2016/05/25	
COMMGR V1.06	Communication management software	Windows® XP/7(32-bit/64-bit)/8/10 (64-bit)		2016/07/25	
COMMGR V1.04	Communication management software	Windows® XP/7(32-bit/64-bit)/8/10 (64-bit)		2013/07/23	

Figure 10 - Download COMMGR if you do not have in your computer

Once you install it, COMMGR will be minimized in your toolbar, just click and open it, and click on **ADD**.

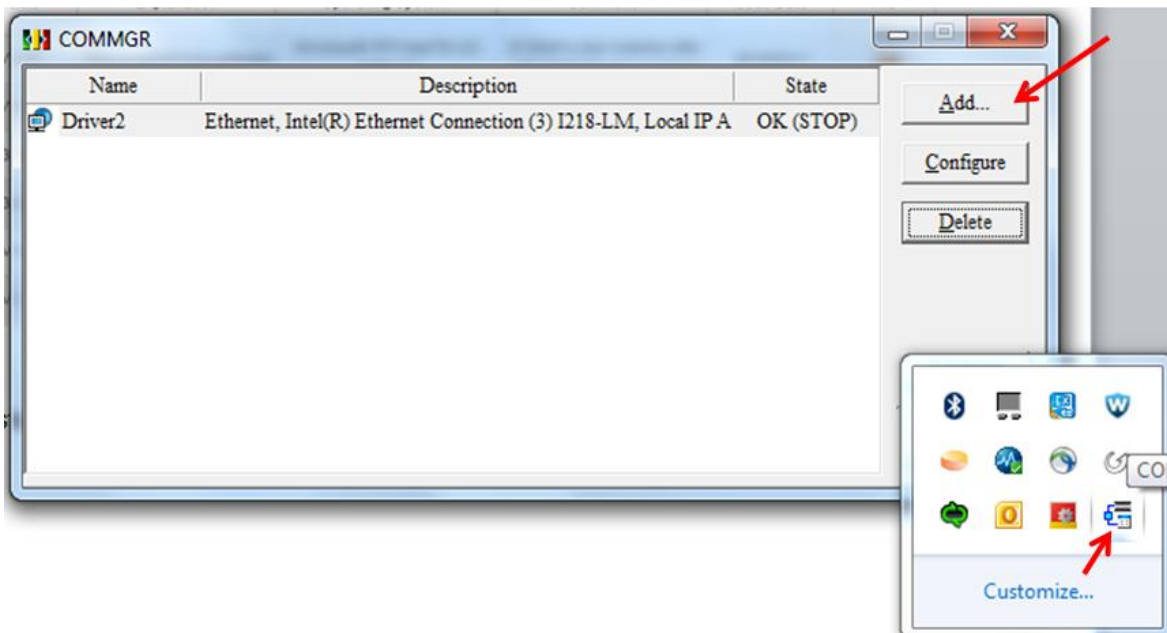


Figure 11 - Opening COMMGR to add a new connection

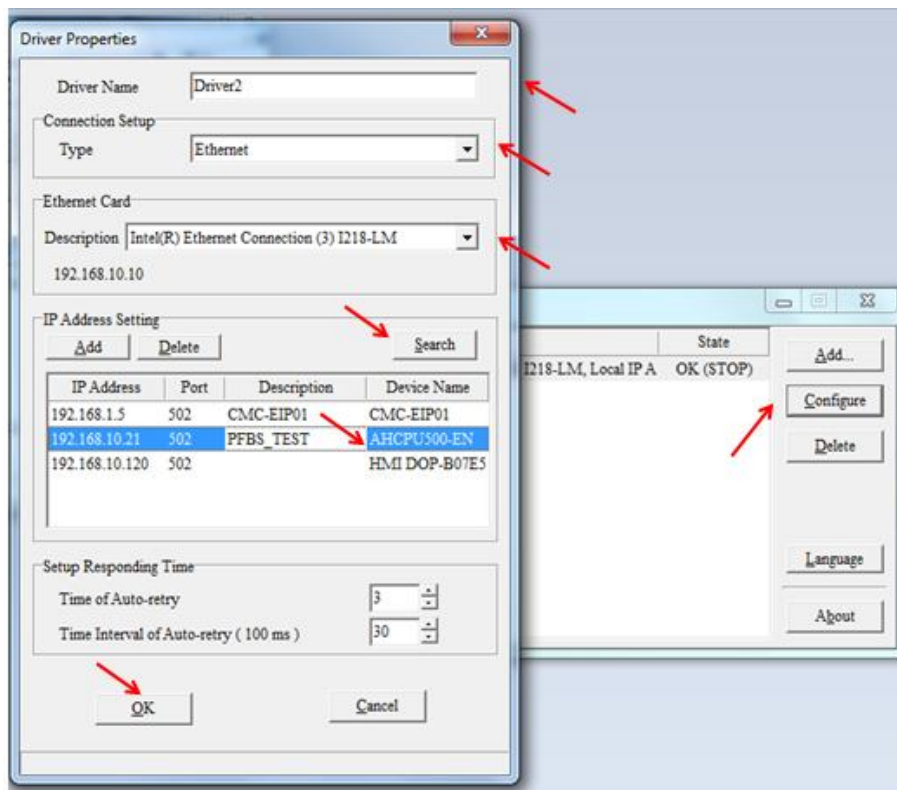


Figure 12 - Click on Configure, set a name for the connection, select your computer's Ethernet card, click on Search, check the AH500 on the list and then click on OK.

Now, open ISPsoft and select this communication with the appropriate IP address in Communication Settings and the appropriate communication setting, in this example, Driver2.

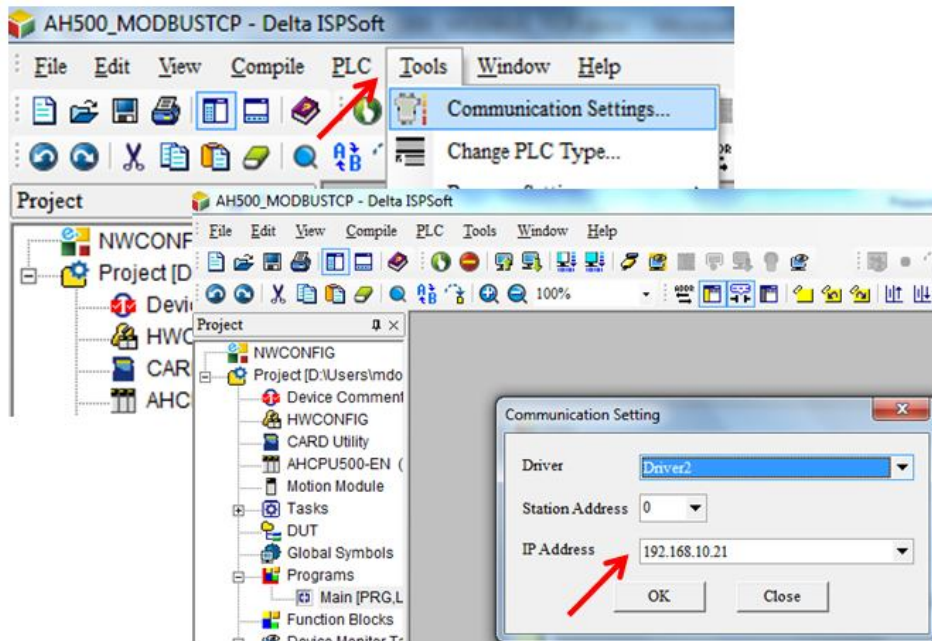


Figure 13 - Setting communication via Ethernet with AH500

Once you open a new project, and select AH500 you will be able to access the hardware configuration of the AH500 rack.

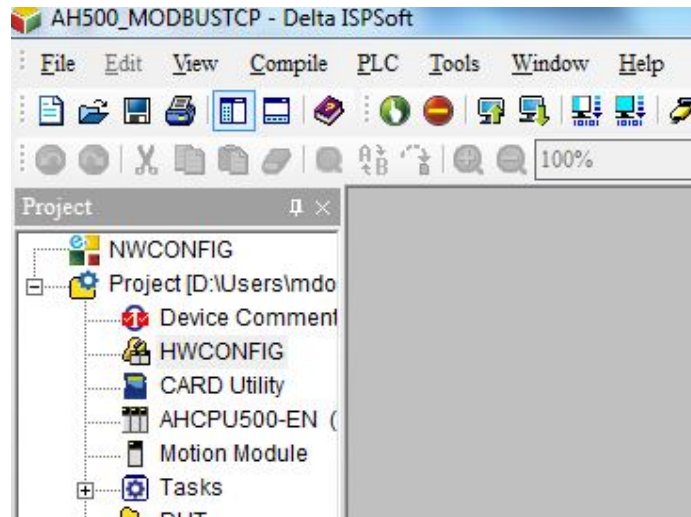


Figure 14 - Hardware configuration of the AH500

Once you open the hardware configuration, upload the current topology of the AH500, in which you already connected through COMNGR. It is easier to upload, then entering the data of all AH500 modules.

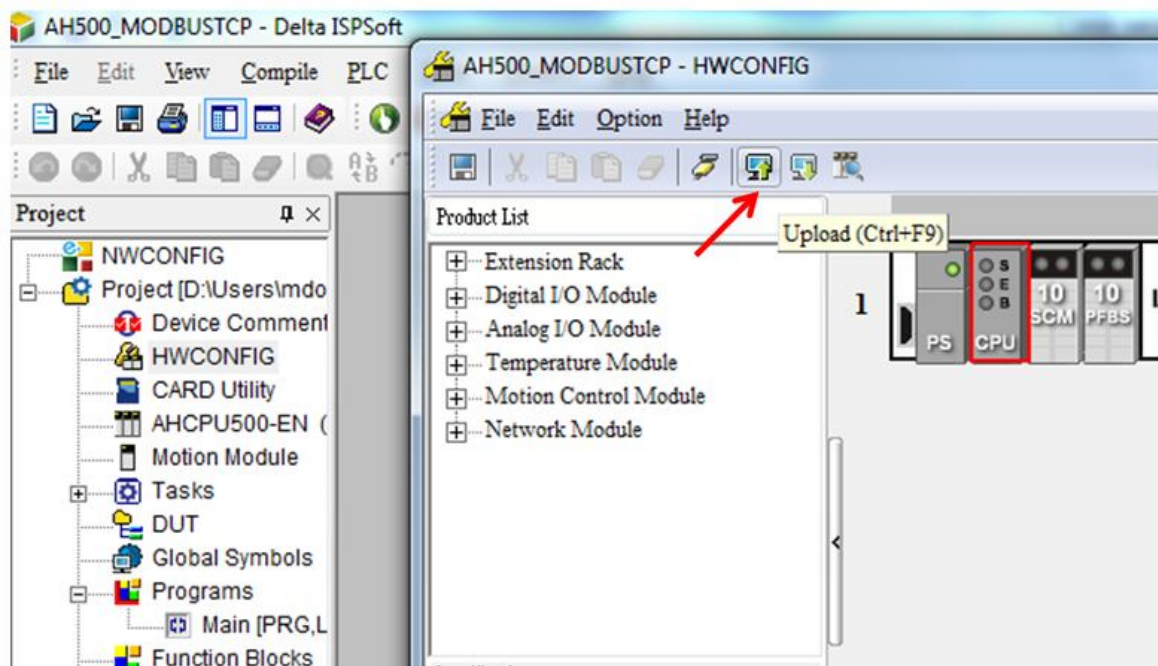


Figure 15 - Upload the current topology of AH500

5 Setting MODBUS TCP and testing monitoring tables

Now, after you uploaded the topology, you should have something like the picture below, depending on your hardware topology. **Double click on the CPU**, and open the configuration Menu. Then click on **Ethernet-Advance, Data Exchange**.

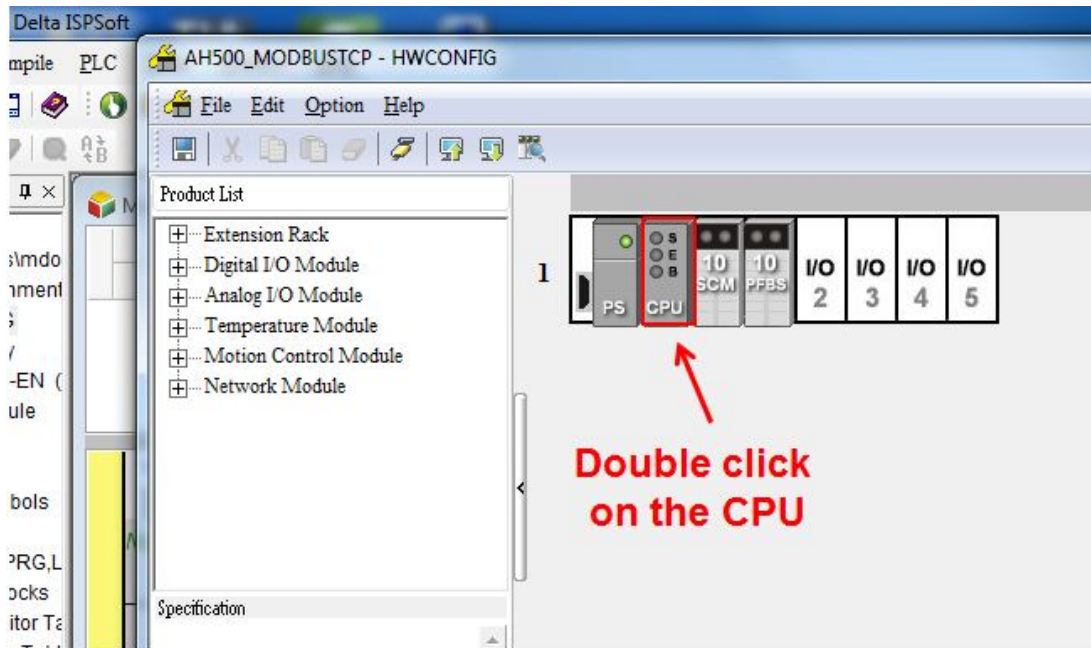


Figure 16 - Hardware Topology after upload

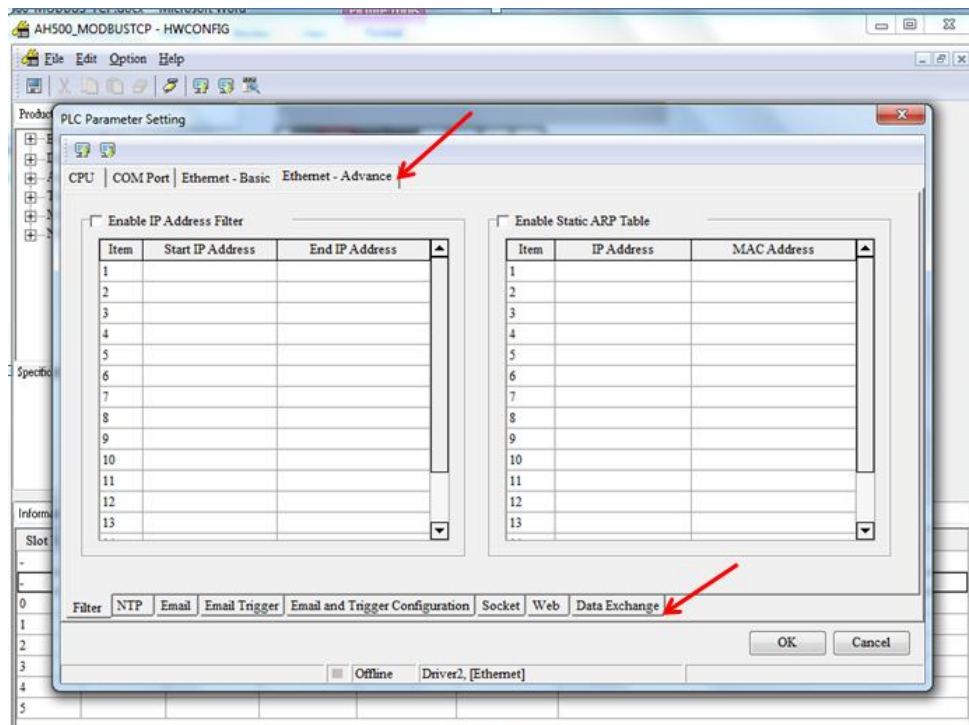


Figure 17 - Click on Ethernet Advance - Data Exchange

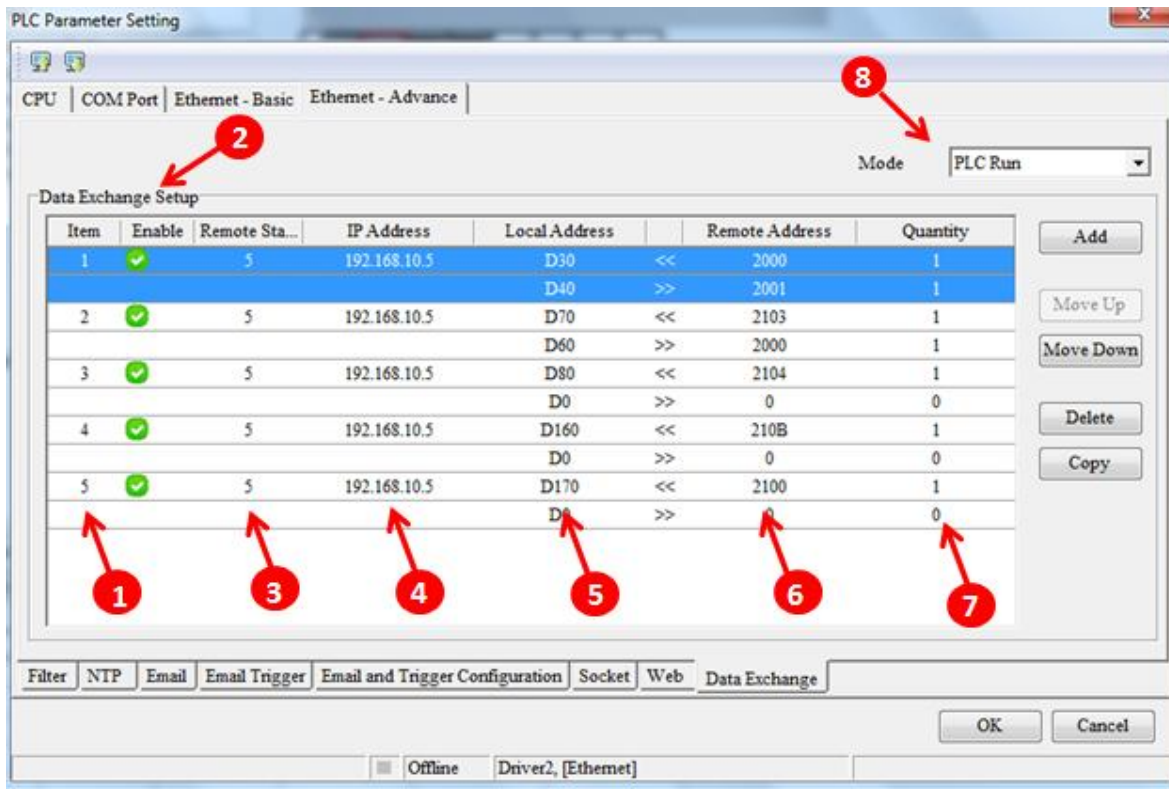


Figure 18 - Parameter Setting of AH500 for Modbus TCP

This is the PLC parameter setting of Ethernet communication in Modbus in AH500, here the functions of each column are briefly described:

- 1 – Number of the Item of the communication, it can handle until 32.
- 2 – If this data exchange package is enabled or not enabled.
- 3 – The Station of the communication device, in our example, C2000, **Parameter 09-00 = 5** (VFD Comm Address).
- 4 – The IP of the communication device.
- 5 – Local address, the internal register in AH500 which allocates the value received or sent.
- 6 – The internal register of C2000, from which data can be written or read. Check the C2000 manual for a list of C2000 internal register addresses.
- 7 – Quantity of words exchanged between drive and PLC from the target address.
- 8 – **Mode in which data will be exchanged, if you connect more than 3 data exchange packages, you have to change it to PLC RUN, the ALWAYS ENABLE function for more than 3 data exchange packages is still under development. If you insist on it, communication will become unstable for card firmware version until 1.06 and C2000 will soon warn a communication Timeout fault.**

Click on **ADD**, to **ADD** a new communication exchange. You can also, move or delete other communication exchanges with the Menu on the side.

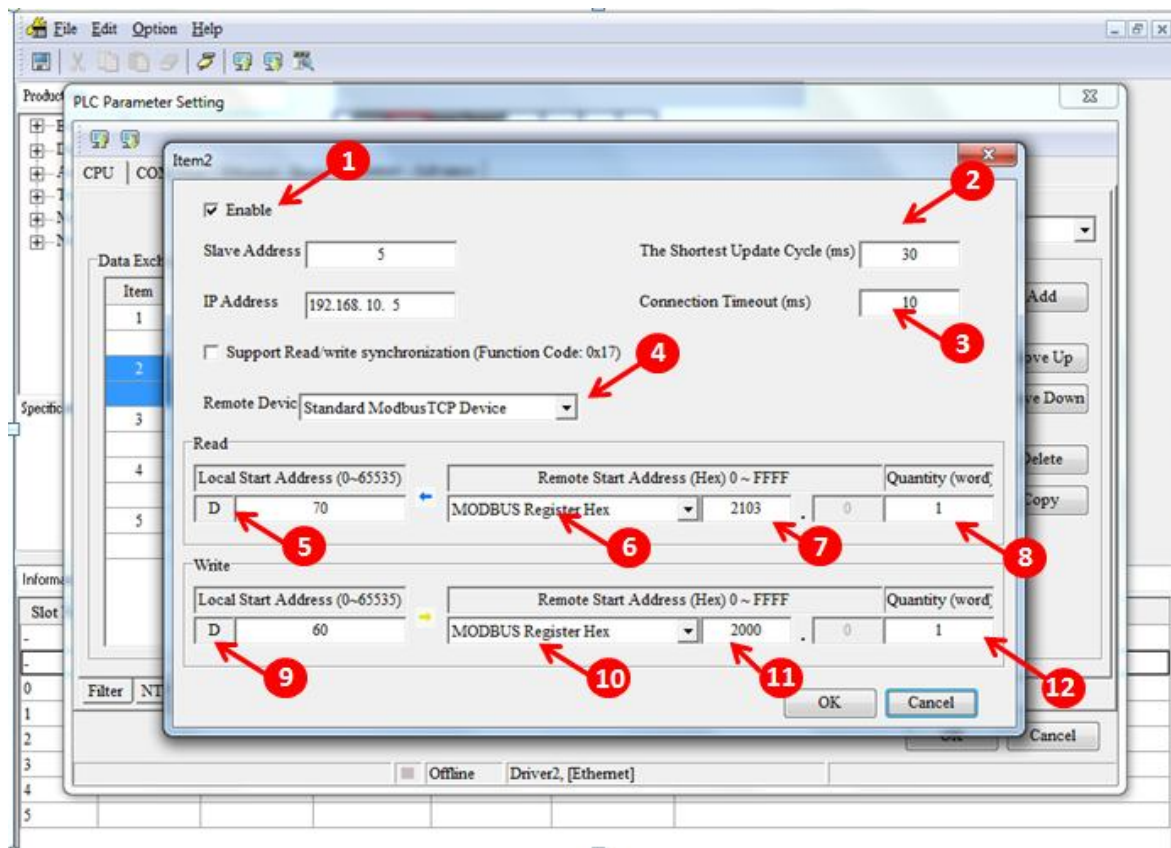


Figure 19 - Data exchange package setting - Item 2

This is the Data exchange setting of AH500:

- 1 – If communication is enabled or not. Just check to enable communication.
- 2 – Shortest Update Cycle in ms: The update time of data exchanged.
- 3 – Connection Timeout: Time for the PLC to enable communication timeout.
- 4 – Type of device to be used with Modbus TCP, for C2000, select **Standard Modbus TCP Device**.
- 5 – Local Start Address in the AH500 which will store the value read from C2000
- 6 – Function code, **Select MODBUS Register Hex to read C2000 data.**
- 7 – Address in C2000 which data will be read from.
- 8 – Quantity of words which will be read from C2000.
- 9 – Local Address from which data will be written in C2000.
- 10 – Function code, **Select MODBUS Register Hex for C2000.**
- 11 – Address in which data will be written in C2000.
- 12 – Quantity of words which will be written in C2000.

Here we are reading **2101H**, which is output frequency, and writing **2000H**, which is the control word, listed on the manual. Values for those registers should be inserted in Decimal, and binary word is listed on the manual, however, 1dec disables the drive and 2dec enables the drive. And you have to set a **frequency command** on the drive. Which can be found on the previous data exchange package.

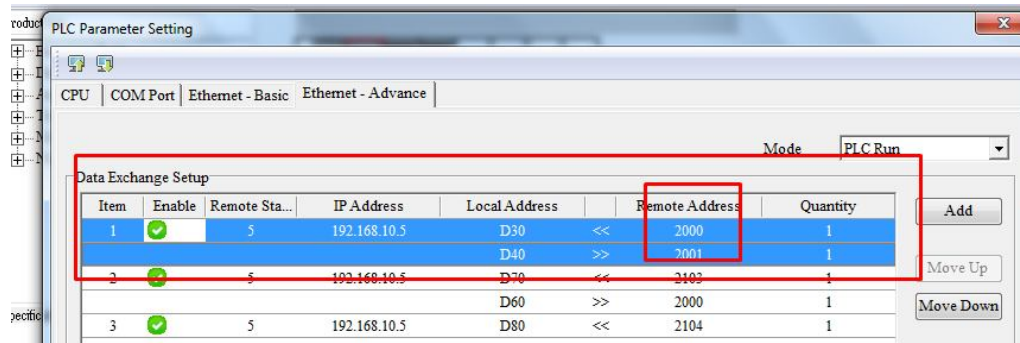


Figure 20 - Reading C2000 and inserting the value in D30 (control word) , Writing the value from D40 to register 2001 in C2000 (frequency command)

You can create all the connections to read and write in which you need by assigning the addresses listed on the manual of C2000 and insert as many as you want up till 32 . Be aware that, the number of connections inflicts directly in Bandwidth and speed of data acquisition.

After you finished assigning your connections, save your topology and upload it to the AH500 PLC.

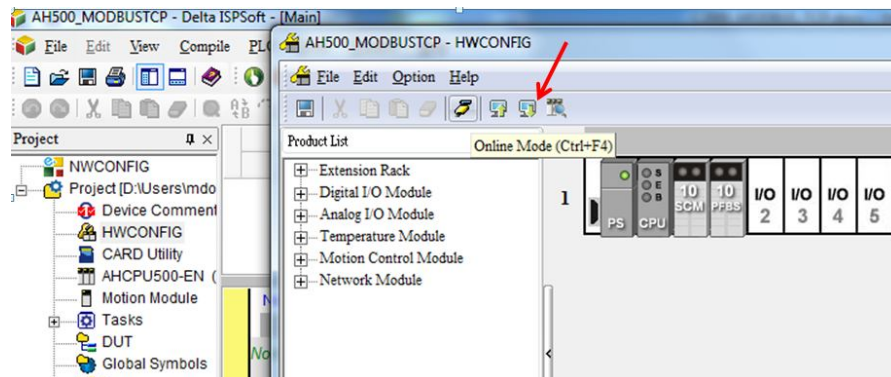


Figure 21 - Download your Hardware topology into the PLC

Now we have to insert a small program in the main routine of the PLC, just a digital input and output will be enough. Since it is just to have a program in the AH500 main routine, download it, RUN and go online with it.

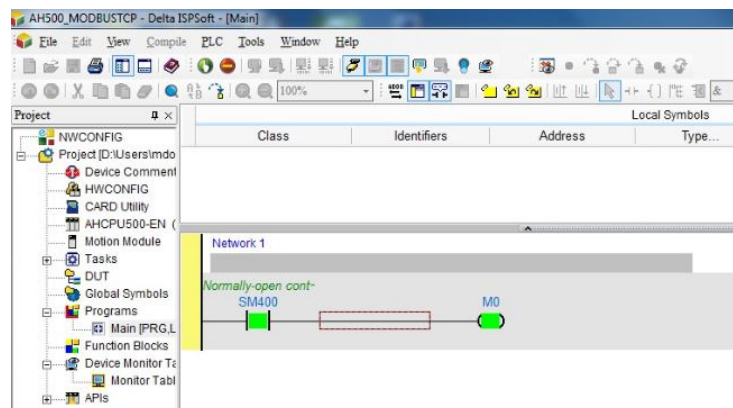


Figure 22 - Program in the main routine

Once you have a connection and is running the PLC, you can create a monitor table in order to read the values from the registers and write values in the registers assigned in the **Modbus TCP data** exchange packages.

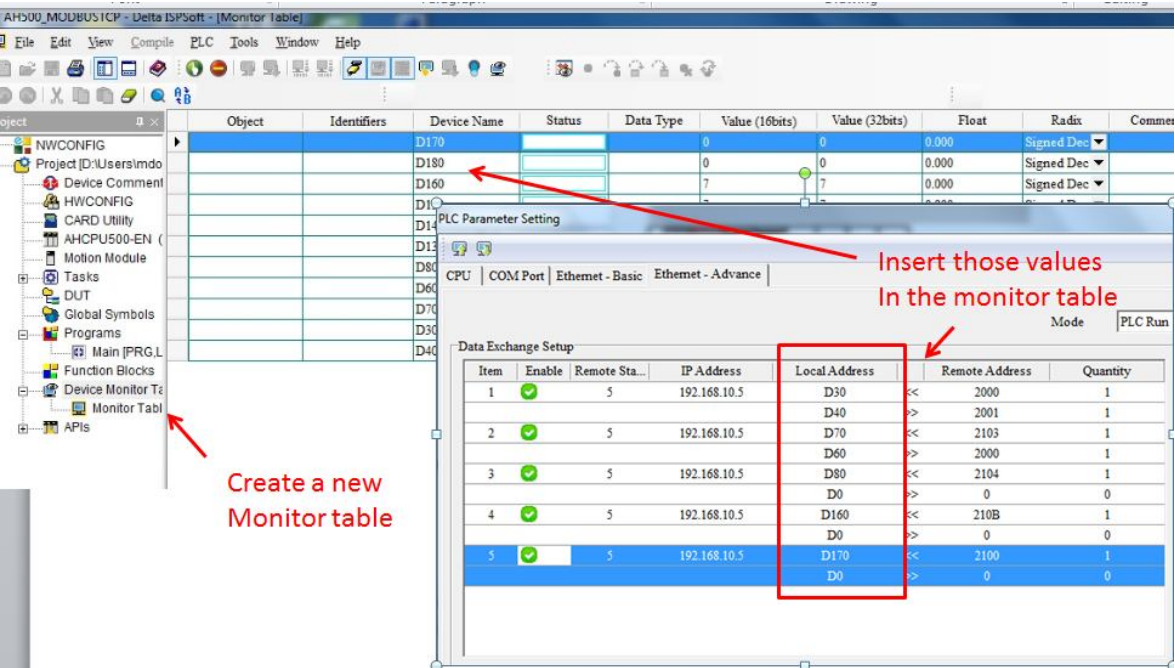


Figure 23 - Creating a new monitor table and inserting the D registers to be monitored

All the values will be read and written, following Delta style of data, always the data are x 100, so divide the datum by 100 to have the actual value of the measurement from the drive.

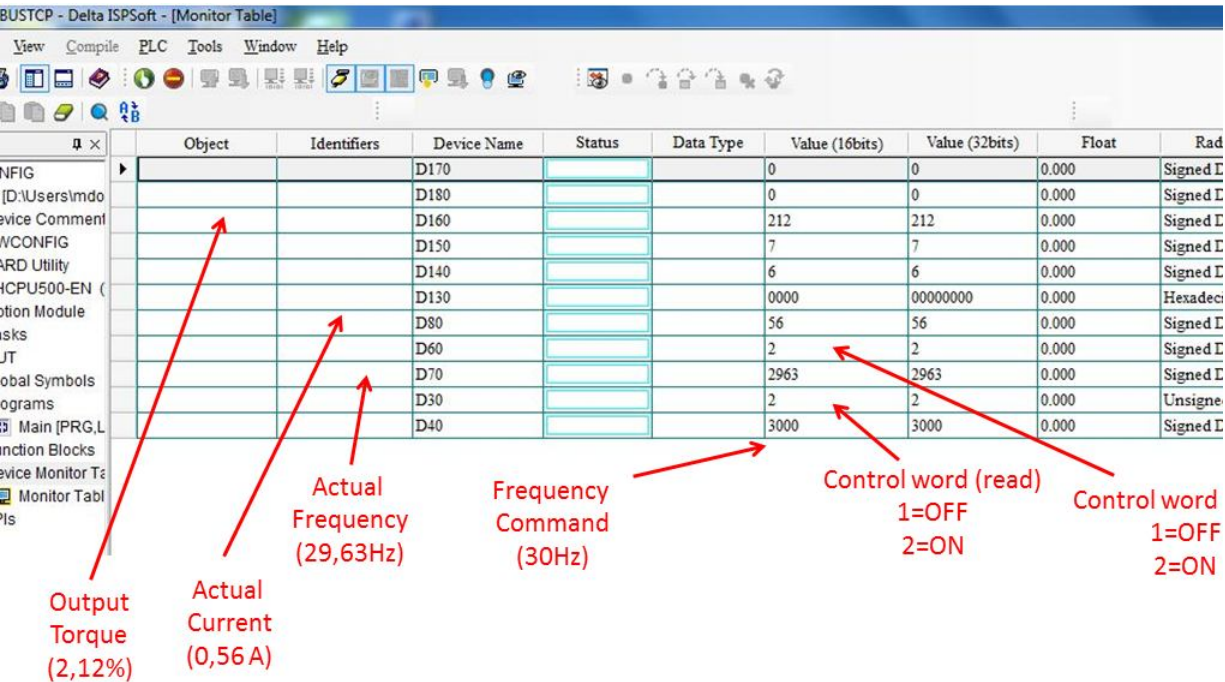


Figure 24 - AH500 running and data being read and written with MODBUS TCP

Now you can insert those values wherever you need in the main program, AH500 also permits you to flag a bit to enable those communications. Check for that in AH500 manual for more instructions on MODBUS TCP.