Diamond Technologies
Getting data where it needs to be.

DT9000 Master
Quick Start Guide
V1.3

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i Revision History

Version	Date	Description
1.0	11/2/2014	Original Version
1.1	12/29/2014	All Sections
1.2	3/26/2015	New Application Version (v1.2)
1.3	10/5/2015	New Application Version (v1.3)

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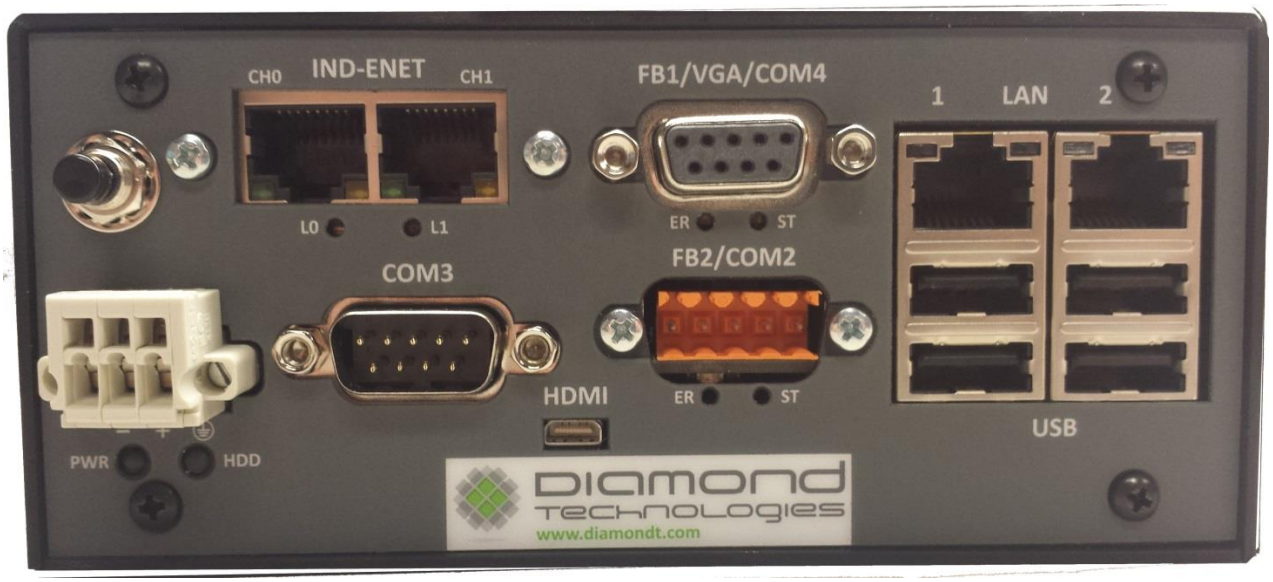
1.0 General

The DT9000 Master features an Ethernet card which is able to act as a master for a number of different Industrial Ethernet networks. The DT9000 Master can also optionally support other non-Ethernet based industrial networks. This guide provides a general overview of the DT9000 setup and configuration for use as an Ethernet master.

1.1 Front View



Front view of a DT9000 Master with Ethernet, Profibus and DeviceNet masters.

1.2 Power

Power (9-40V) is applied through the *PWR* connector on the bottom left of the front panel. When power is properly applied to the device, the *PWR* LED will turn Yellow. If the reverse polarity is applied, the *HDD* LED will turn red. If this occurs, disconnect the device from the power supply and switch the positive and negative wires in the connector. Once the power is properly connected, the push button switch directly above the *PWR* connector can be used to turn the DT9000 on.

1.2 Industrial Ethernet Port

The *IND-ENET* port is used to connect the Ethernet master to the industrial network. Depending on which network master you have configured in the Master Console Application, the two connectors can have different functions. In general (especially with a single, non-looping connection) you should use the Channel 0 (left socket). See Appendix A1 for information on network specific LED functions.

1.4 FB1/VGA/COM4 Port

Depending on the options your DT9000 Master has installed, this port will have a different function.

If you have at least one FieldBus master installed (DeviceNet, ProfiBus, CANopen) this port will house the connector for one of your FieldBuses. Consult the product description for your DT9000 device part number for information about which FieldBus adapter is on which port.

If you do not have a FieldBus master (Ethernet Only) this port will be either a VGA connection to the DT9000 or COM4 (see *1.7 COM Ports*). The VGA connection allows you to connect the DT9000 to a monitor instead of controlling it through remote desktop (also see *1.8 HDMI Connector*).

1.5 FB2/COM2 Port

Depending on the options your DT9000 Master has installed, this port will have a different function.

If you have two FieldBus masters installed (DeviceNet, ProfiBus, CANopen) this port will house the connector for one of your FieldBuses. Consult the product description for your DT9000 device part number for information about which FieldBus adapter is on which port.

If you have fewer than two FieldBus master options installed, this port will be COM2 (see *1.7 COM Ports*).

1.6 LAN Port

The *LAN* ports can be used to connect the DT9000 to a local network. Initially, the *LAN2* port is used to directly connect a PC to the DT9000 to configure and control the device. Both *LAN* ports can be configured as desired once the initial connection is made, but changing the default settings on *LAN2* is not recommended, as it could prevent you from connecting to the DT9000. Also the LAN1 port is

initially setup as a pass through network port. This allows the user to connect a corporate network to the LAN1 port and devices connected to LAN2 will have a connection to both the DT9000 and the corporate network.

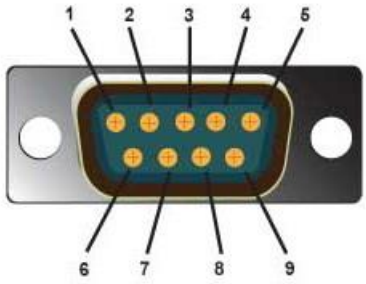
1.7 COM Ports

Depending on how many network masters are installed in the DT9000, there will be either 1 to 3 COM ports available. These ports are used by the Modbus RTU Master and can be configured as a generic serial port to attach other serial devices to the DT9000.

These COM ports support RS232, RS422 and RS485 serial protocols. The protocol is determined by the connection made. Because of this it is recommended that the cables used to connect serial devices to the DT9000 only connect the pins required for the desired protocol. When using a standard serial cable, active signals on pins used by the DT9000 for different protocols could cause it to switch communication methods and not work as desired. Cables for all supported protocols are available from the Diamond Technologies.

COM 2, COM3 – Supports RS232/RS422/RS485.

PIN	Connection
1	422 Rx+
2	232 Rx
3	232 Tx
4	NC or +5 VDC out *
5	GND
6	422 Rx-
7	NC
8	422 Tx+ / 485 D+
9	422 Tx- / 485 D-



** +5 VDC out on pin 4 is enabled by installing internal jumper*

J34 – COM2

J35 – COM3

1.8 HDMI Connector

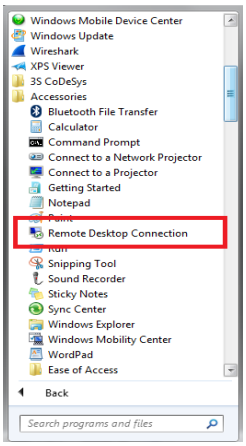
Though the preferred method for connecting to the DT9000 is using Windows Remote Desktop (see *2.0 Getting Connected*) you also have the option to connect the DT9000 to a screen using the mini HDMI connector and controlling it as you would a desktop computer (with USB mouse and Keyboard).

2.0 Getting Connected

The preferred method of connecting to the DT9000 Master is using Windows Remote Desktop. Before initiating the connection:

1. Ensure that your PC's network adapter is set to receive an IP address via DHCP.
2. Make sure that LAN 2 on the DT9000 is connected to an Ethernet port on your PC through a standard Ethernet cable. The DT9000 will automatically assign an IP address to your network adapter when you connect to it.

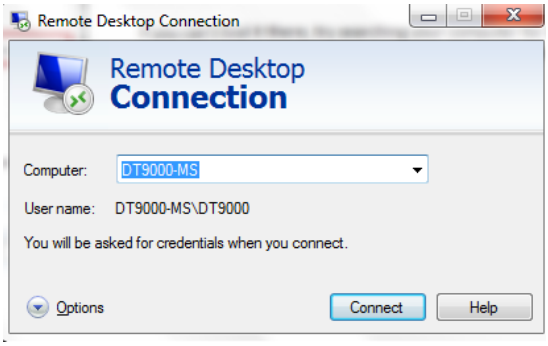
Note: The VGA and HDMI Ports can also be used to access the DT9000. If you hook up a monitor, mouse and keyboard the DT9000 can be used like any desktop PC.



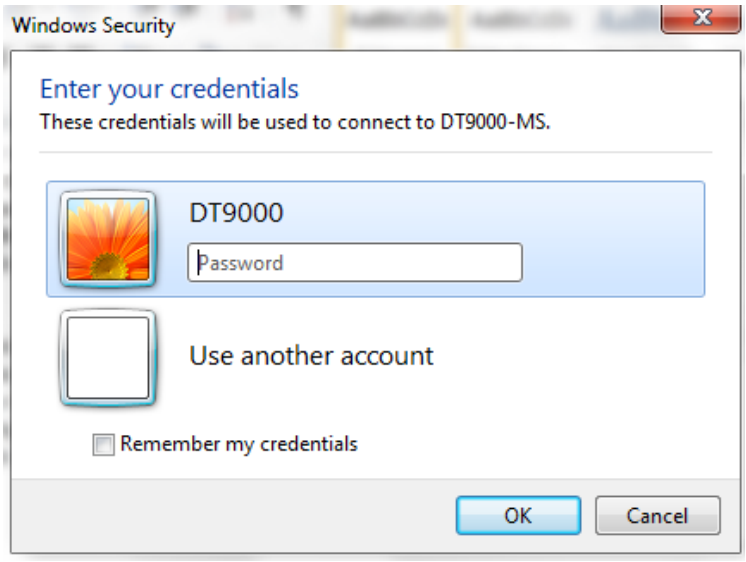
The Remote desktop tool can typically be found under "Start > Accessories > Remote Desktop Connection"

If you can't find it there, try searching your computer for it. Most Windows installations will come with the Remote Desktop tool.

When you start Remote Desktop, it will ask for the name of the computer you would like to connect to. You can either enter the name or IP address of the DT9000 to connect. The default name is **DT9000-MS.** The default IP address is **192.168.137.1**.



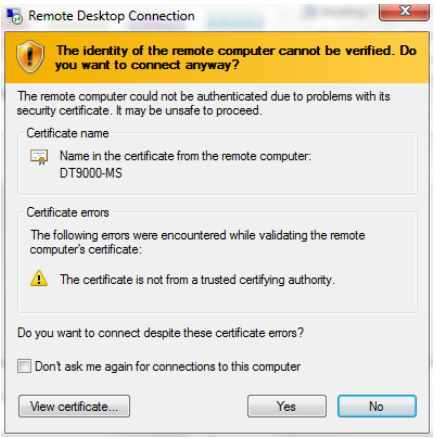
Note: Depending on how your Network Discovery is configured, your pc may not be able to connect using the computer name. In this case, use the IP address.



If you are able to successfully connect with the name or address you provided, you will be prompted to enter your account password. The username is **DT9000** and the password is **Diamond**

Depending on your computers security settings, you may see a warning similar to this one when the Remote Desktop connection is being established.

Click yes to continue with the connection.



You should now be remotely connected to your DT9000. If you get an error while attempting to connect, please read the **Troubleshooting Remote Desktop Connections** section of this guide.

2.1 Troubleshooting Remote Desktop Connections

2.1.1 Ensure that the DT9000 is on

First, check that the *PWR* LED is solid green. If the LED shows Yellow, the device is in "Standby Mode." If this is the case, push the button above the *PWR* connector to turn the DT9000 on. Wait a few minutes

for it to boot up and attempt to connect again. If the *HDD* LED (below the *PWR* connector) is solid red, this means the power is not properly connected (see section 1.2).

2.1.2 Ensure that you are connected to the proper LAN port

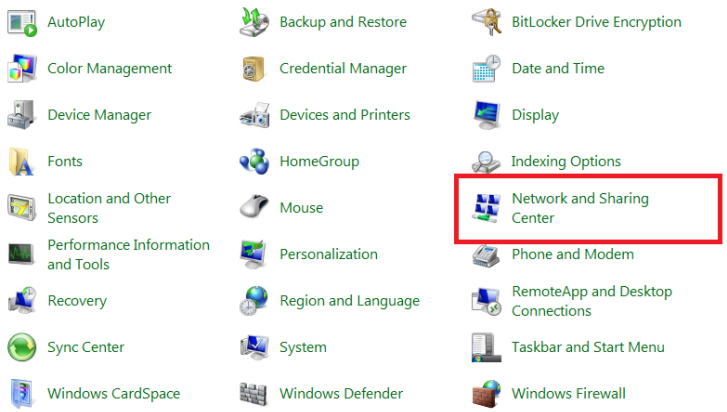
To make the initial remote desktop connection to your device, you must be using *LAN2* on the DT9000. *LAN 1* can later be configured to allow a remote desktop connection if you wish, but the initial device setup will only allow the connection to be made on the *LAN2* port. If the cable is connected properly, you should see the green and yellow LEDs above the *LAN2* port active.

2.1.3 Ensure that you have a direct connection to the device

DO NOT try to connect to the DT9000 through a router or switch when you make the initial Remote Desktop connection. The DT9000 should be plugged directly into an Ethernet port on the PC you wish to connect from. After making the initial connection you can configure the network settings to allow for different types of connections.

2.1.4 Ensure that your Ethernet port is being assigned a dynamic IP address

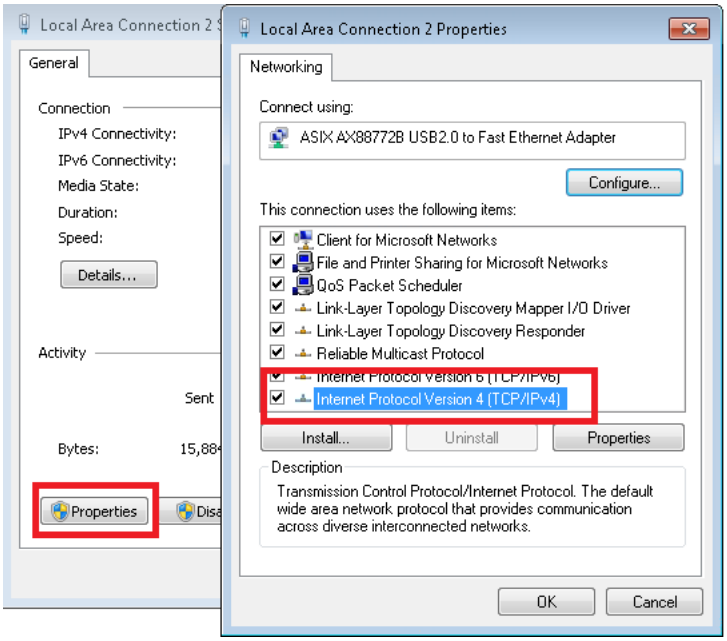
If your PC is set to a static IP address or static DNS server, you will be unable to connect to the DT9000 using Remote Desktop.



To access these settings, first Navigate to “Start > Control Panel > Network and Sharing Center”

Click the “Local Area Connection” link for the network adapter that is connected to the DT9000.

Note: If you have more than one Local Area Connection, ensure that you are selecting the correct one. You may have to have the network cable connected for this option to appear.

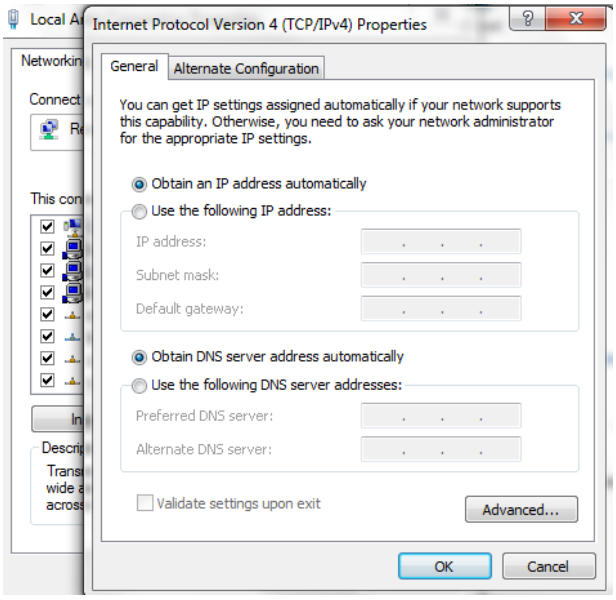


Clicking the “Properties” button will bring up the “Local Area Connection Properties” window. Scroll down until you see Internet Protocol Version 4 (TCP/IPv4). Select that option and click “Properties”

Set up your network connection so that it is the same as the window pictured to the right.

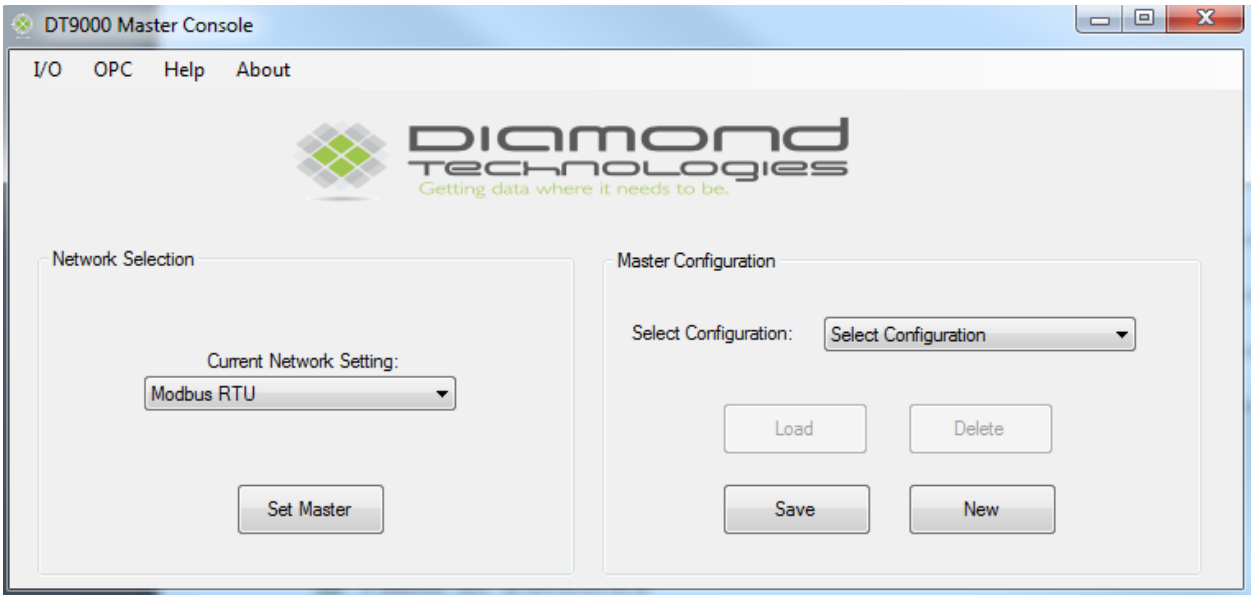
Ensure that “Obtain IP address automatically” is selected

Ensure that “Obtain DNS server address automatically” is selected



3.0 Master Setup and Configuration

The DT9000 can be configured as a master on many different industrial networks, depending on the options installed. To configure these networks, open the DT9000 Master Console application. This tool can be found under *C:\Program Files\Diamond Technologies Inc\DT9000 Master Console* and can also be found as an icon on your DT9000 desktop. The DT9000 Master Console must be run as an Administrator to function properly.



The master console can be used to select and configure Master communication channels

3.1 Master Devices and Firmware

The **Network Selection** section of the application can be used to change the firmware on the physical communication channels in the DT9000.

To change the firmware, select the firmware you would like to install and click **Set Master**. If the firmware is successfully loaded the communication channel will be initialized with the new protocol stack and a success message will appear.

The firmware you are loading must be compatible with the physical hardware connected to the communication channel. Below is a list of hardware options and available network firmware.

Network Firmware	**Hardware Option**
EthernetIP Master	Ethernet Adapter
EtherCAT Master	Ethernet Adapter
Profinet I/O Master	Ethernet Adapter
Profibus Master	PROFIBUS Adapter
Profibus DPV2 Master	PROFIBUS Adapter
CANopen Master	CANopen Adapter
DeviceNet Master	DeviceNet Adapter
Modbus RTU Master	Serial COM Port

3.2 Master Configuration

Once Firmware is downloaded to the device the next step is to build a Master Configuration. The Master Configuration defines what slave devices the Master will communicate with, the specifics about

each slave, as well the specifics about the network communications. *(See Section 4.0 for more information about creating a new configuration file.)*

The **Master Configuration** section can be used to switch between commonly used master configurations. It allows you to save and load device configurations with a single click. When you select a device, the **Select Configuration** selection box will display all saved configurations for the currently loaded firmware. Loading a new firmware to the device will refresh this list. Note that the configuration displayed in the box is not necessarily the currently loaded configuration.

To save the currently downloaded configuration simply click the **Save** button. This will open a dialog window asking you to name the configuration. If the configuration is successfully saved, a success popup window will appear.

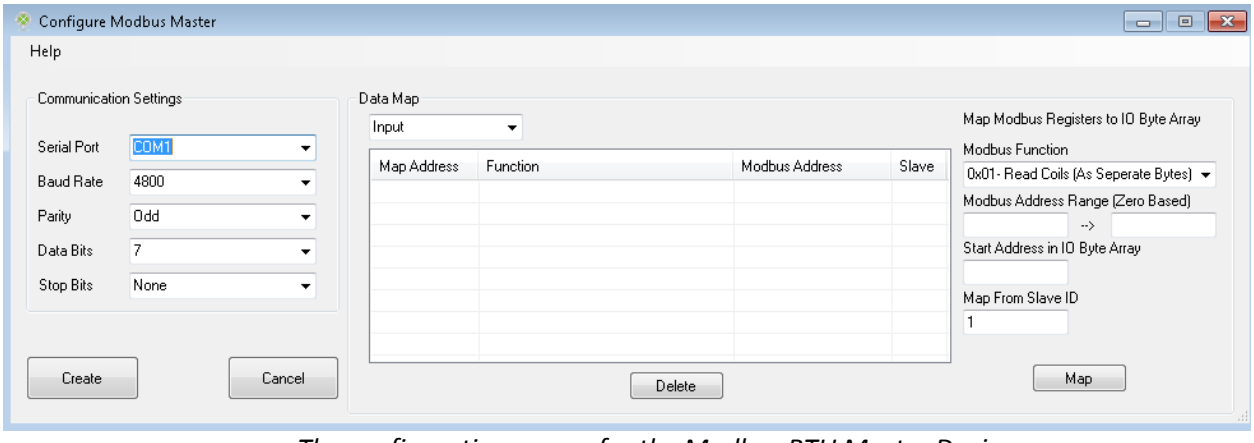
To load a configuration to the device, select the configuration you wish to load from the **Select Configuration** selection box and click the **Load** button. If the master configuration is successfully loaded the communication device will be restarted and a success popup window will appear. This operation will overwrite any existing configuration in the device.

The **Delete** button will delete the currently selected configuration file. This operation cannot be undone.

4.0 Creating a Master Configuration

Depending on which communication device you have selected, the “New” button will either open a configuration creation form, or start a second application to assist with configuring the master for network communication.

4.1 Configuring a Modbus RTU Master



The configuration screen for the Modbus RTU Master Device

Before you can see the Network IO data from your Modbus RTU Master device, you must configure some basic communication parameters and map the Modbus data to the Network IO Array.

The communication settings allow you to select the Serial Port that the Master will use to communicate, as well as some basic serial parameters. Ensure that the parameters here reflect the settings and capabilities of your slave device(s). The Serial Port numbers are labeled on the front of the DT9000. All listed serial ports may not be available, depending on your DT9000s installed hardware options.

The Data Map section allows you to associate any Modbus coil, input or register with a section of the Network IO Array for both inputs and outputs. The dropdown menu at the top allows you to select between the "Input" and "Output" data mappings. Depending on your selection, the list below will display all input or output maps already defined.

The fields on the right of the screen allow you to create a new data mapping. "Modbus Function" box will show either read or write functions depending if you have "Input" or "Output" data selected. This is the Modbus function that will be used to read or write your data from the slave.

Note: When mapping Coils or Discrete Inputs, there are two options for each read and write function. You can map them as 'bytes' or as 'bits.'

*Mapping them as **bytes** means that each Coil will be mapped to a byte in the Network IO Array. This is useful for viewing flags. Any output mapped with this option will set a 1 for any entered value above 0.*

*Mapping them as **bits** means that all of the coils in your map will be read and packed into a byte (8 bits). If the number of coils mapped are not a multiple of 8, the high bits of the last byte will be padded with zeros. This option is useful for viewing larger data fields stored in the Modbus Coils (integers, etc.).*

The fields labeled "Modbus Address Range" indicate the Modbus address to perform the operation at on the slave device. Entering an invalid address could cause errors when viewing the Network IO. Note that the addresses are absolute (zero based) and are inclusive. This means that if you read addresses 0 through 5 you are reading 6 registers.

Next, enter the starting byte address in the Network IO array you want to map the data to. The ending address and data length will be calculated based on the Modbus function and Modbus address range you have selected and displayed in the data map list to the left.

Note: No two data maps can intersect each other in the Input and Output Network IO Arrays. If you attempt to add a Data Map that conflicts with an existing mapping, you will get an error.

Once you have completed your configuration hit the "Create" button on the bottom left. This will automatically load your new configuration into the Modbus RTU Master. Be sure to save the configuration if you wish to keep it!

4.2 Configuring Network Masters with SYCON.NET

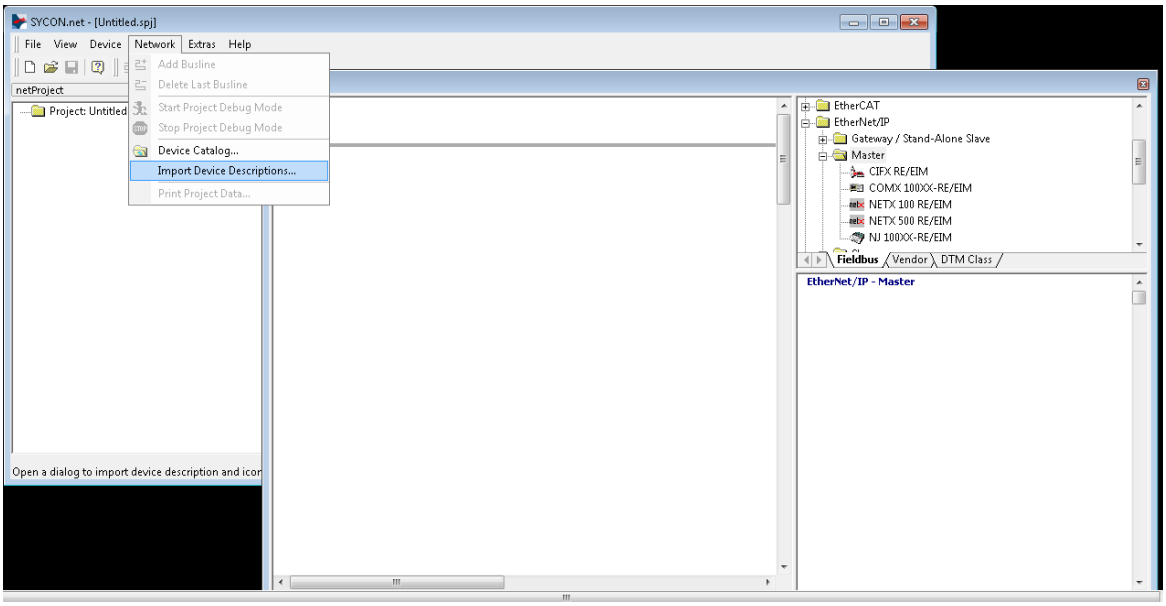
Some of the network devices must be configured using a second program called SYCON.NET. When you hit the “New” button with one of these masters selected, SYCON.NET will automatically open.

When SYCON.NET is opening, it will ask for a username and password. The default is:

Username	Administrator
Password	[blank]

For most of the network types, you will be required to upload a datasheet to Sycon.net for each type of slave device that will be included in the network configuration. The exact file format and content for this datasheet is network specific and vendor specific, and it should be available from the slave device manufacturer.

To add a datasheet simply select the Network drop down list in SYCON.NET and then click on Import Device Descriptions. This will allow you to select the specific slave configuration file. To do this first select the correct file type in the Files of Type box, next navigate to and select the specific configuration you would like to import. Note that you can easily drag and drop the Device Description files from your PC onto the DT9000 using Windows File Explorer or transfer them via a USB disk.



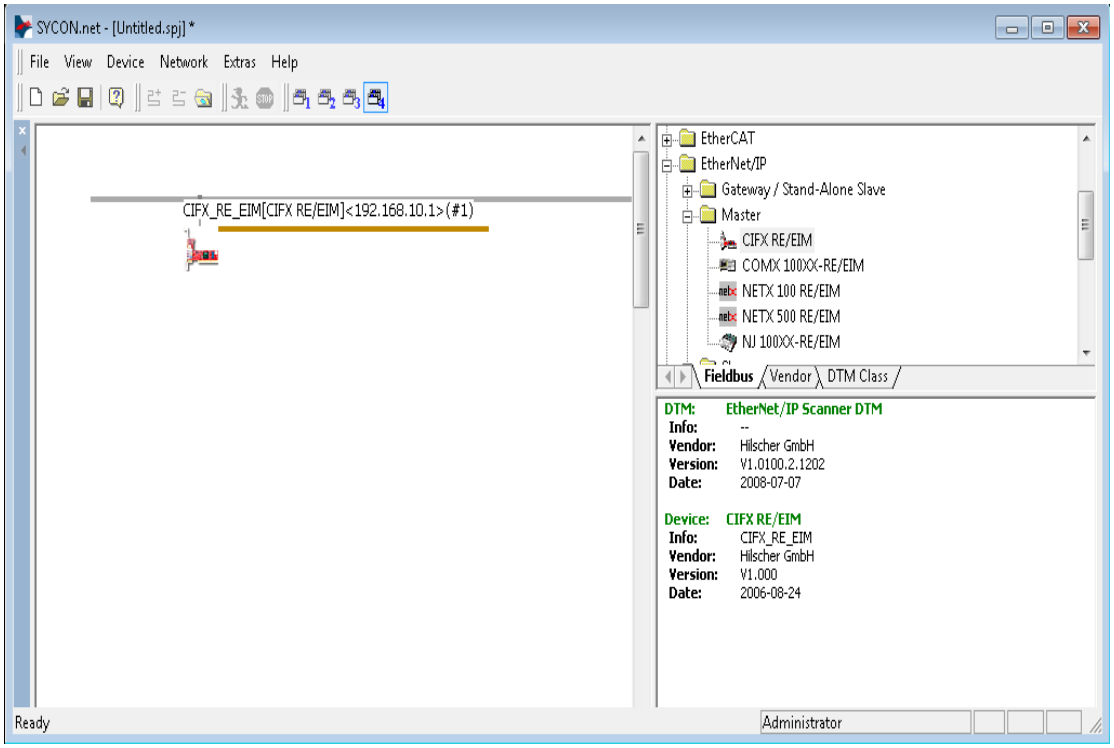
After you have imported your device description file(s) your devices will show up in the available devices list in the NetDevice window on the right side of the SYCON.NET screen. You will need to look under

the specific network and then the specific type of device you have, for example Profibus and then Slave to locate a Profibus Slave device description. If the device did not show up you may have to restart SYCON.NET.

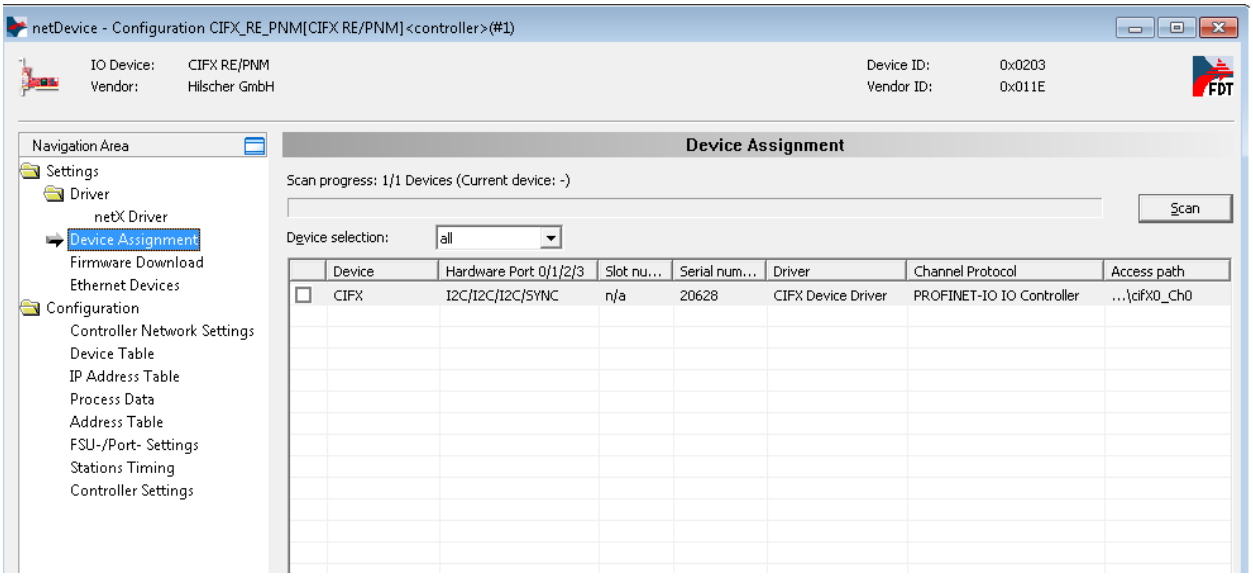
Once you have loaded all your slave devices into the SYCON.NET catalog, you can begin to build your configuration. Start by finding the folder on the right hand side of the NetDevice window that corresponds with the industrial network you have configured on your network card. Find the Network Master device in that folder and drag it into the blank area to the left (*see image below, The DT9000 utilizes the CIFX RE/EIM modules for Ethernet networks)*.

Note: The screenshots in this section show the configuration of an Ethernet IP master and slave. Depending on the network, the screens may look slightly different, but the basic procedure for configuration will be the same.

Drag and drop device descriptors from the catalog on the right into the Network window. Note that your cursor must be on the network (grey bar) to be able to drop the master into the configuration.

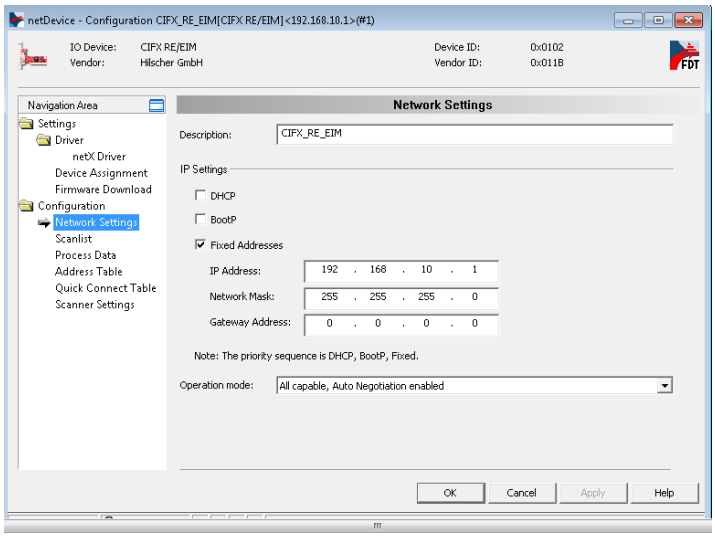


Next, we have to assign the device descriptor you have just selected to your actual network hardware. Right-click on the master in the network window and select **“Configuration…”**

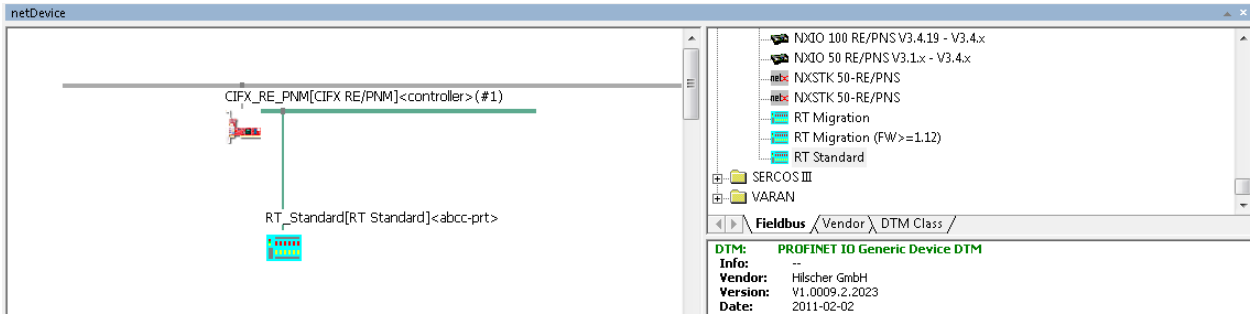


In the “Navigation Area” on the left of the configuration window, find “Device Assignment.” Set the **Device Selection** pull-down menu (to the right) to “all” and hit the **Scan** button. If your network firmware was properly installed, you should see the card come up in the list. Check the box next to the network card that represents the network master you are looking to utilize and click **Apply** at the bottom of the screen then select OK. The Channel Protocol column will show the firmware of each card installed in your DT9000. If the **Channel Protocol** section does not indicate the protocol you are attempting to use this means you have the wrong device firmware loaded (*see section 3.1).*

Next, you can use the options in the NetDevice Window to set other parameters specific to your network. In the case of Ethernet IP you will need to set your IP address as well as subnet mask as shown below.



Once the Master is setup you can setup your network slave devices. Drag any slave devices that you want to connect to the Master from the catalog into the network window so they attach to the network coming out of the master (see image below).



Right-click on the slave device in the network window and select "**Configuration…**" This will bring up the slave configuration window. This window is going to be slightly different depending on the type of network you are using. You need to set up the slave configuration so the master knows exactly what data is being communicated over the network by the slave (input and output size, for example).

Note:
If the Datasheet you imported came directly from the device manufacturer (usually means it will contain the exact name of the device in it) then you may not have to do any configuration in the slave configuration window.

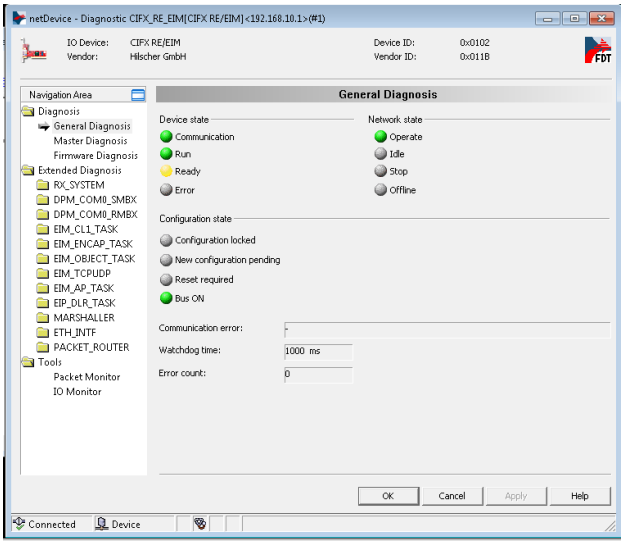
There are some situations when a manufacturer will provide you with the datasheet for the 3rd party hardware they use for network integration, so it does not contain the specific I/O configuration of the device. If this is the case, the device manufacturer will need to provide additional instruction on how the slave device is configured so you can set it up with your master.

Once you have completed the configuration for all of your slave devices, you need to send the configuration to the network master. Right-click on the master icon in the network window and select **"Download."** Once the download is complete communication should automatically start between the master and the slaves.

Be sure to download the configuration every time you make a change. The changes in SYCON.NET will not be reflected in the actual master hardware until you download the configuration. This new configuration will now be accessible through the DT9000 Master Console application.

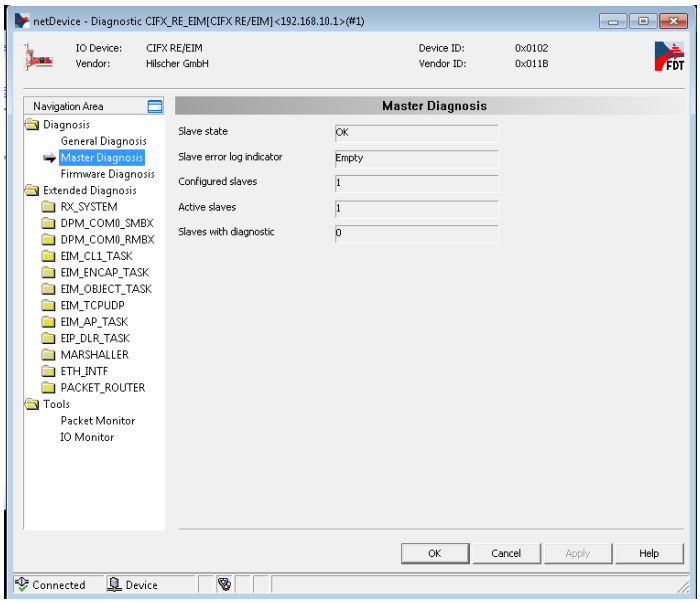
Note: Make sure to save the generated configuration file in the DT9000 Master application. If you wish to edit the configuration in the future, make sure that you also save the SYCON.net project.

After downloading the configuration you can view the status of the network and troubleshoot any communication issues, right click on the master icon in the network window and click "**Diagnostic…**" This will bring up the master configuration menu. To access the "General Diagnosis" and "Master Diagnosis" select them from the navigation area on the left.

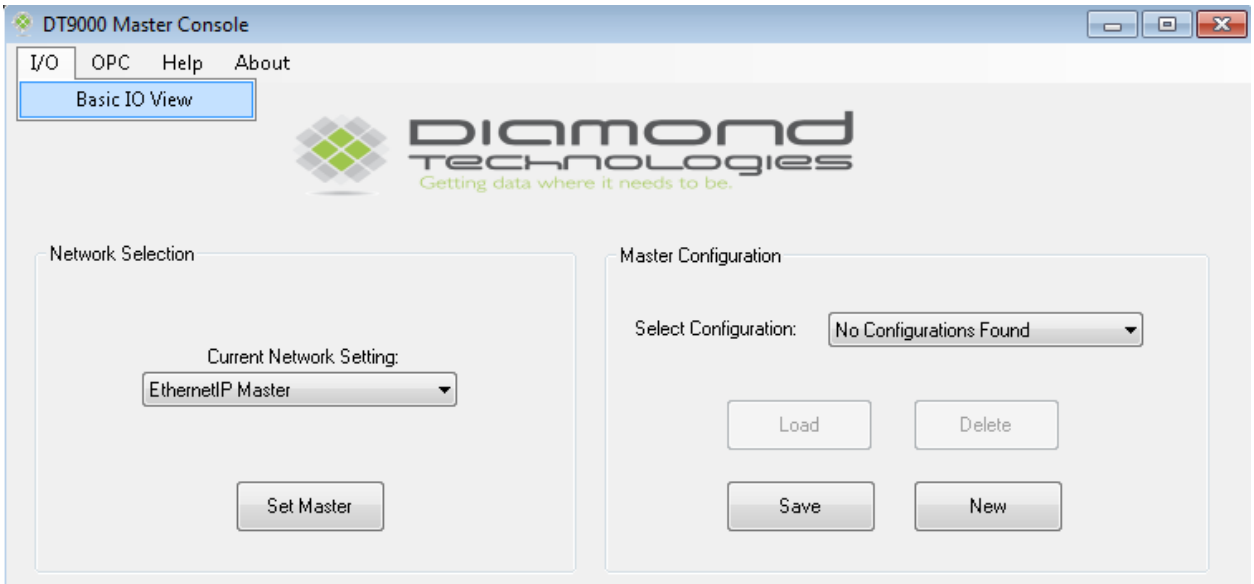


This "General Diagnosis" screen is indicating that there are no errors on the network and the network is in a run state.

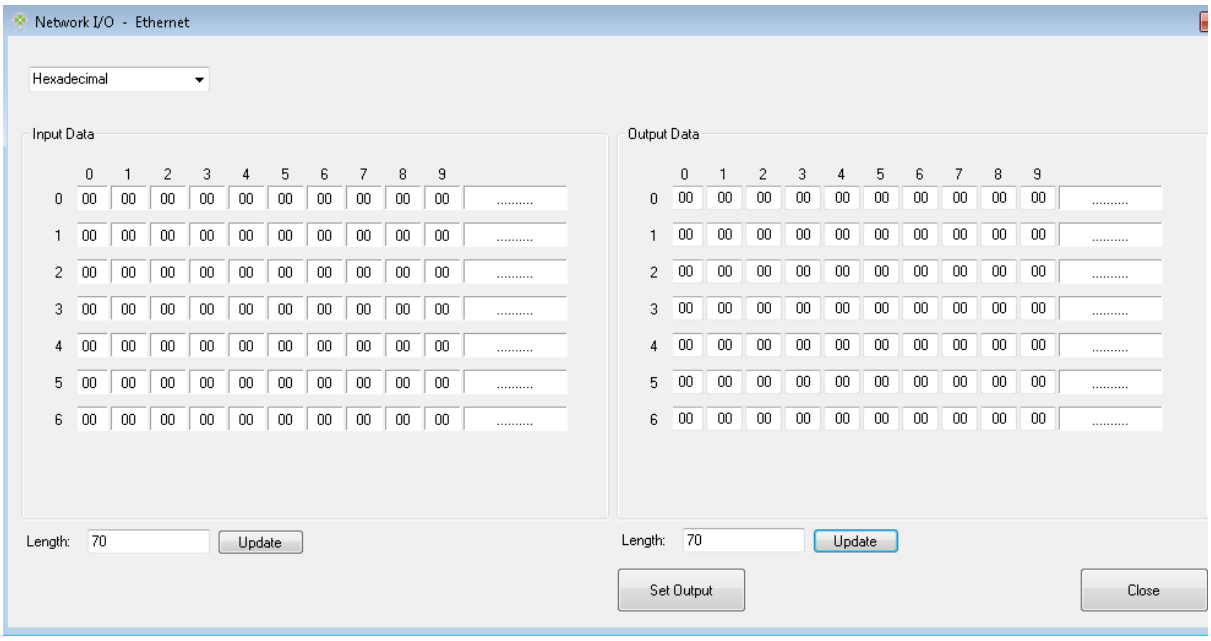
The “Master Diagnosis” tab can also give some useful information about the current state of the network. This screen is showing the number of configured slaves and their status.



5.0 Network IO Monitor



To view the network IO data you must first select a device and a configuration. Once the configuration has been loaded you can select the “Basic IO View” from the I/O Menu Item.



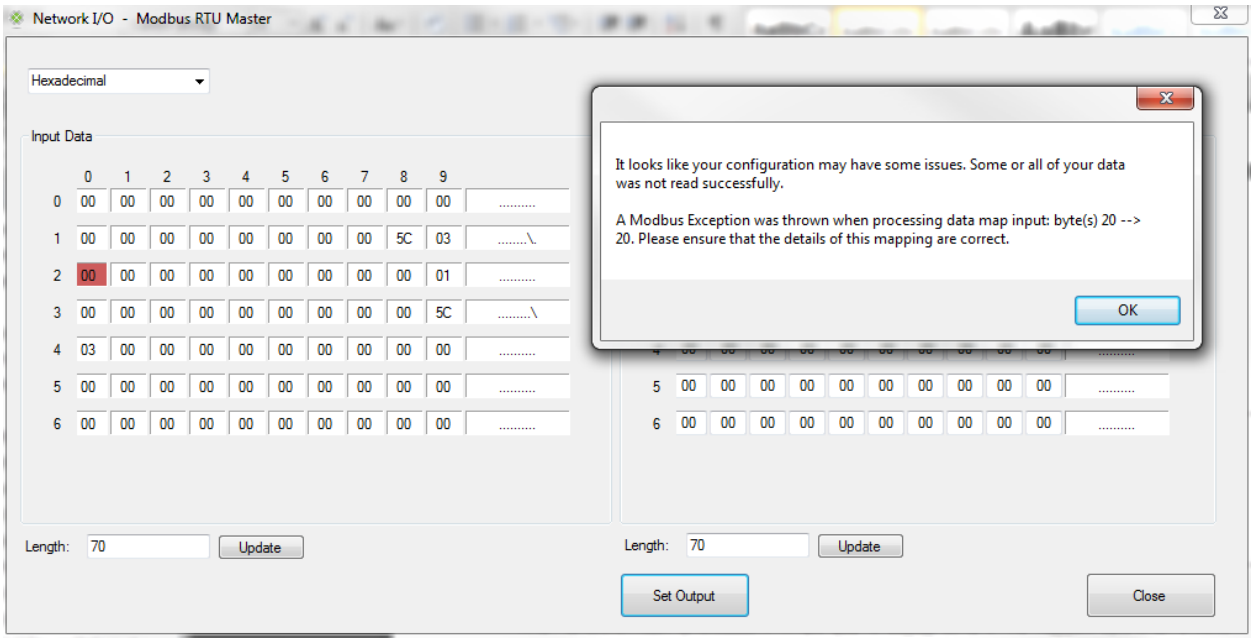
The network IO Monitor displays the real-time input and output data over the selected network. Each row of data contains 10 bytes, and the ASCII value of that row is displayed next to it, with a '.' symbolizing an unprintable character. The dropdown menu at the top allows you to switch between hexadecimal and decimal data.

To write to the output data, simply enter the values you wish to write into the corresponding bytes in the output array and hit "set output." You will get a popup confirmation if the write was successful.

5.1 Troubleshooting Network Data

Many Industrial Networks will not show any of the data if there is an error in the configuration. If you are seeing all zeros on your IO window, review the configuration file and ensure that it is correct.

Other networks (Such as Modbus RTU) are able to display some of the mapped data when a minor configuration error is present. The network IO Monitor will pop up an error to indicate the mappings that are not correct, and those bytes will change red on the IO Screen. Any other data mappings will continue to function, though for large data maps, these errors could cause a significant slowdown in communication between master and slaves.

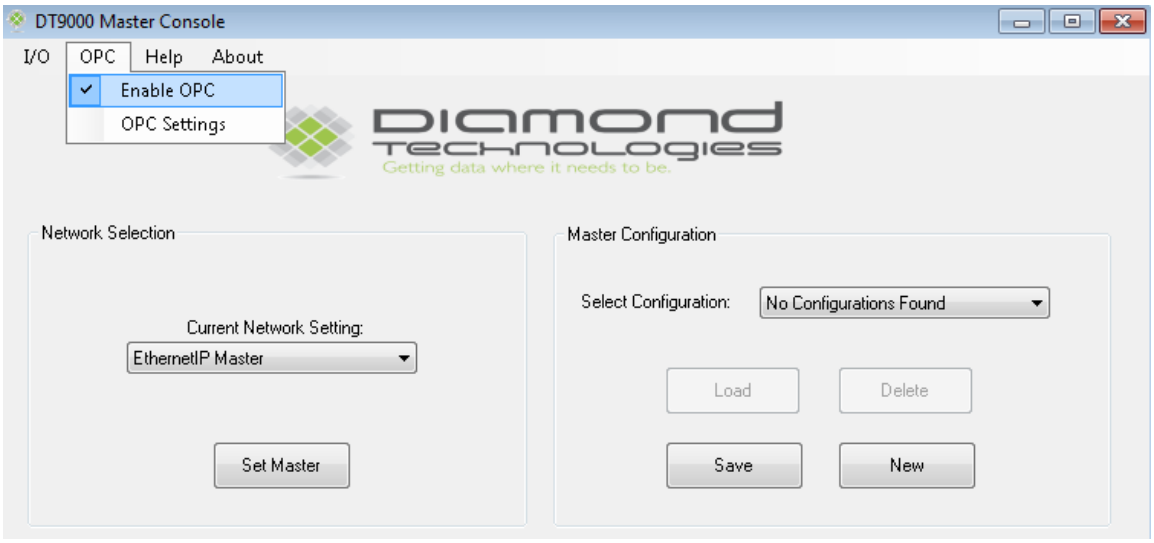


Here is an example with one byte of incorrectly mapped data. Only the affected byte(s) will turn red and the rest of the data will be read as usual.

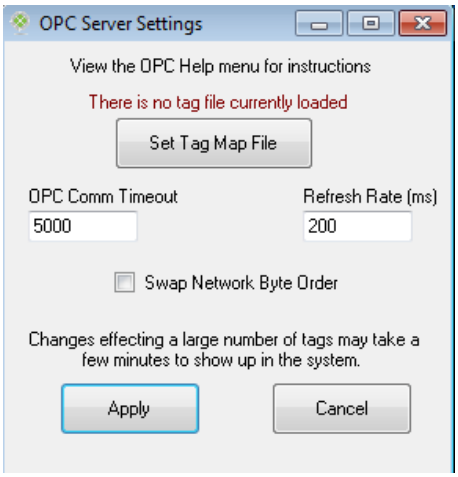
6.0 OPC Server

The DT9000 can be set up as an OPC server, allowing you to set and read data through the OPC protocol. You can enable the OPC server functionality using the OPC dropdown menu at the top of the application.

<u>Note:</u> OPC functionality is an optional feature. If you have not yet purchased OPC functionality, the OPC menu will be disabled in your application.



To set up OPC server functionality, you must map your network byte data to OPC tags. This is done through a CSV file which allows you to define tag names, tag types and byte boundaries (*see 6.1 Tag Setup*).



Clicking the *OPC Settings* option in the OPC menu will open the OPC configuration window. Use the *Set Tag Map File* button to add a new tag mapping CSV file. This will overwrite the currently configured OPC tags.

OPC Comm Timeout: The time the DT9000 will wait before timing out its connection with the OPC server.

Refresh Rate: The frequency that the Network Data is refreshed to the OPC server.

Swap Network Byte Order: Swaps the byte order (Big Endian / Little Endian) used to create the OPC data types for the tags.

When OPC is enabled, it will effectively disable the Output functionality on your I/O Monitor. This is because the network output will be based on the value of any mapped OPC tags, and not the value entered in the I/O Monitor. The I/O Monitor will still show the network inputs. Disabling OPC will simply break the link between the industrial network and the OPC tags, so the tags will still exist but they will no longer be updated based on the network inputs.

6.1 Tag Setup

The OPC tags are created using a CSV File. To create the file you can simply open an Excel spreadsheet (or any CSV compatible editor) program and enter the tag information in the following format:

~TagGroup	Tag Name	Tag Type	Data Offset	Transfer Type
GroupName	Alarm_Flag	UByte	0	Output
GroupName	System_Status	UShort	1	Output
GroupName	Run_Speed	Integer	3	Input

When you are finished, export the file as a CSV and save it to your DT9000. You may also just create the CSV file manually, separating each column with a comma:

GroupName,TagName,UByte,0,Output

Note: Any line beginning with a ~ character will be treated as a comment and will be ignored.

There are currently 6 supported OPC data types:

Byte	8 bits, signed
UByte	8 bits, unsigned
Short	16 bits, signed
UShort	16 bits, unsigned
Integer	32 bits, signed
UInteger	32 bits, unsigned

The master input and output byte arrays are separate, so the input mapping and output mapping will both start at data offset zero. Be careful you do not unintentionally overlap bytes when defining your tags. This IS allowed and will not produce an error but you will likely get unintended results in your OPC values.

INPUT Array								
Offset	0	1	2	3	4	5	6	7
Data	0x00	0x01	0xFF	0xAC	0x02	0xFF	0x01	0xCC
TagName	MyByte			MyShort			MyInt	
Type	Ubyte			Ushort			Integer	
Value	1			65452			50266572	

The above image illustrates a simple example as to how the data is mapped between OPC tags and the Input/Output byte arrays on the network master. Bytes can be mapped in any order and mappings can overlap if required. The datatype defined determines the number of bytes in the mapping, you simply need to give the offset of the starting byte. The above mapping would be defined with three lines in the CSV File:

TagGroup,MyByte,UByte,1,Input

TagGroup,MyShort,UShort,2,Input

TagGroup,MyInt,Integer,4,Input

A1 IND-ENET and FieldBus LED Descriptions

This appendix provides descriptions of the LED indicators on the DT9000 Fieldbus connectors. The LEDs have different meanings depending on the network firmware installed.

A1.0 Etherernet Connector

There are 6 LEDs on the Ethernet Connector. Two standard Ethernet LEDs for each Ethernet port (green on the left and yellow on the right) and two status LEDs below the Ethernet connector. The left LED is referred to as *L0* and the right *L1*.

Ethercat Firmware Installed

CH0

Green	Ethernet Link
Yellow	Ethernet Activity

CH1

Green	N/A
Yellow	N/A

L0		
Color	**State**	**Description**
Off	Off	Device is in the INIT state.
Green	Flashing (2.5 Hz)	Device is in the PREOPERATIONAL state
Green	Flashing (10Hz)	Device is in BOOT state
Green	Single Flash	Device is in SAFE-OPERATIONAL state
Green	On	Device is in OPERATIONAL state

L1		
Color	**State**	**Description**
Off	Off	Master has no errors
Red	On	Communicator error. Read error code from Dual-Port Memory.

Ethernet IP Firmware Installed

CH0

Green	Ethernet LINK
Yellow	Ethernet ACT

CH1

Green	Ethernet LINK
Yellow	Ethernet ACT

L0		
Color	**State**	**Description**
Green	On	Device is operational
Green	Flashing 1Hz	Standby Mode, No configuration loaded
Red/Green	Flashing 1Hz	Self-Test on power up
Red	Flashing 1Hz	Minor Fault, (incorrect configuration can be considered minor fault)
Red	On	Major Fault, device cannot recover
Off	Off	No power to device

L1		
Color	**State**	**Description**
Green	On	Device has established at least one connection
Green	Flashing 1Hz	Device has IP address, but no established connection
Red/Green	Flashing 1Hz	Self-Test on power up
Red	Flashing 1Hz	Connection timeout, status will persist until connections are re-established.
Red	On	Device detected that another device on the network is using the same IP address
Off	Off	No power to device OR device does not have an IP address

Modbus TCP Firmware Installed

CH0

Green	Ethernet LINK
Yellow	Ethernet ACT

CH1

Green	Ethernet LINK
Yellow	Ethernet ACT

L0		
Color	**Status**	**Description**
Green	On	Connected to at least one device
Green	Flashing 1Hz	Ready, no configuration loaded
Green	Flashing 5Hz	Configured, waiting for communication
Off	Off	Not ready

L1		
Color	**Status**	**Description**
Off	Off	No Communication Errors
Red	Flashing 2Hz	System Error
Red	On	Communication Error

Profinet IO Firmware Installed

CH0

Green	Ethernet LINK
Yellow	Ethernet ACT

CH1

Green	Ethernet LINK
Yellow	Ethernet ACT

L0		
Color	**Status**	**Description**
Off	Off	No Errors
Red	Flashing 1Hz, 3 sec	DCP signal service initiated by the bus
Red	Flashing 2Hz	Invalid configuration, Watchdog error or Internal error

L1		
Color	**Status**	**Description**
Off	Off	No Errors
Red	Flashing 2Hz	Configuration fault: not all configured devices are connected
Red	On (With L0 On)	No Valid Master License
Red	On (With L1 not On)	No Ethernet link

A1.1 ProfiBus Connector

The ProfiBus connector has two LEDS directly below it. The one on the left is the *Error (Er)* indicator and the one on the right is the *Status (ST)* indicator.

ST		
Color	**State**	**Description**
Green	Solid	Communication to all slaves established
Green	Flashing at 5 Hz	Configured, but no bus communication
Green	Flashing irregular	No configuration / Incorrect configuration
Green	Off	ERROR (see Error LED) or no power to device

ER		
Color	**State**	**Description**
Red	Off	No ERROR / no power to device
Red	Flashing at 5 Hz	No communication with at least one slave device
Red	Solid	No communication to all slaves or serious bus error occurred

A1.2 CANopen Connector

The CANopen connector has two LEDs directly below it. The one on the left is the *Error (Er)* indicator and the one on the right is the *Status (ST)* indicator.

ST		
Color	**State**	**Description**
Green	Solid	Device is in OPERATIONAL state
Green	Flashing at 2.5 Hz	Device is in PREOPERATIONAL state
Green	Single Flash	Device is in STOPPED state
Green	Off	ERROR (see Error indicator) OR device is executing a reset

		OR device has no configuration loaded

Error Indicator

ER		
Color	**State**	**Description**
Red	Off	No ERRORs
Red	Single Flash	WARNING limit reached (too many error frames)
Red	Double Flash	Error Control Event Occurred (NMT slave or NMT Master)
Red	Solid	The device is in BUS OFF state

A1.3 DeviceNet Connector

The DeviceNet connector has a single LED directly below it.

Color	**State**	**Description**
Green	On	Online, Connection established with all slaves
Green	Flashing 1Hz	Online, no connection established (missing or incorrect configuration)
G-> R -> OFF	Flashing 2Hz	Self-test after power on.
Red	Flashing 1Hz	Minor Fault / Connection Timeout / No Network Power
Red	On	Critical fault / Link Failure (Duplicate MAC or CAN-bus OFF)
Off	Off	Device not powered on / No Network Power