



# cMT Database Server MS SQL Quick Start Guide

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This manual walks you through the steps to set up a Microsoft SQL Server and cMT Database Server object, and then uses Microsoft Excel to read historical data from the HMI.

- cMT-SVR Models
- cMT3000 Models
- cMT-HDMI

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## Overview

This user manual explains step by step how to install and set up a Microsoft SQL Server on your Windows PC, how to connect Excel to Microsoft SQL server, and how to design an EBPro project with a Database Server object to send data to the Microsoft SQL server.

The Database Server object is available for cMT Series Smart HMIs in EBPro V5.05.02 and later versions. The Database Server can synchronize sampled data and event logs to a remote Microsoft SQL server so that the user can use third-party software, such as Microsoft Office Excel, to manage the data on the server.

EBPro V6.00.01 adds the ability to query and display data from the Microsoft SQL server. The last section of this manual will cover the configuration of SQL Query and SQL Query Result Viewer objects.

## Hardware and Software Requirements for Installing MS SQL Server

### Note

Installation of SQL Server is supported on x64 (64 bit) processors only. It is no longer supported on x86 (32 bit) processors.

**An installation of Microsoft SQL Server Express has the following hardware requirements:**

- At least 512 MB of RAM
- 6.0 GB of free hard drive space
- x64 Intel or AMD Processor: 1.4 GHz or faster

**And the following software requirements:**

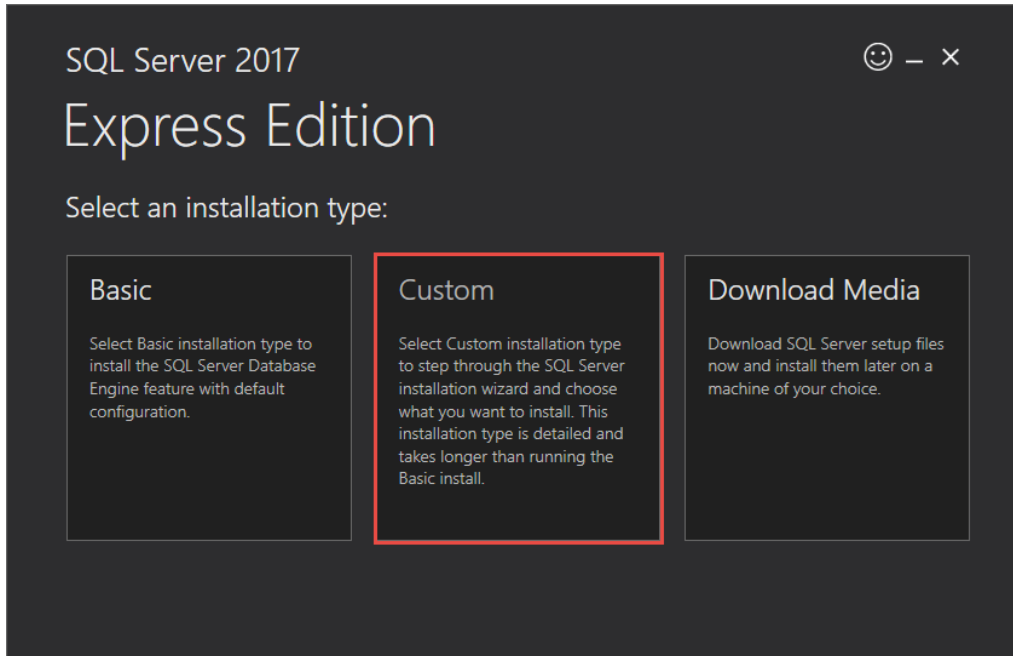
- Operating System (OS) of **Windows 8** or later
- .NET Framework 4.6 or later (SQL Server setup automatically installs .NET Framework)

## Installing Microsoft SQL Server Express

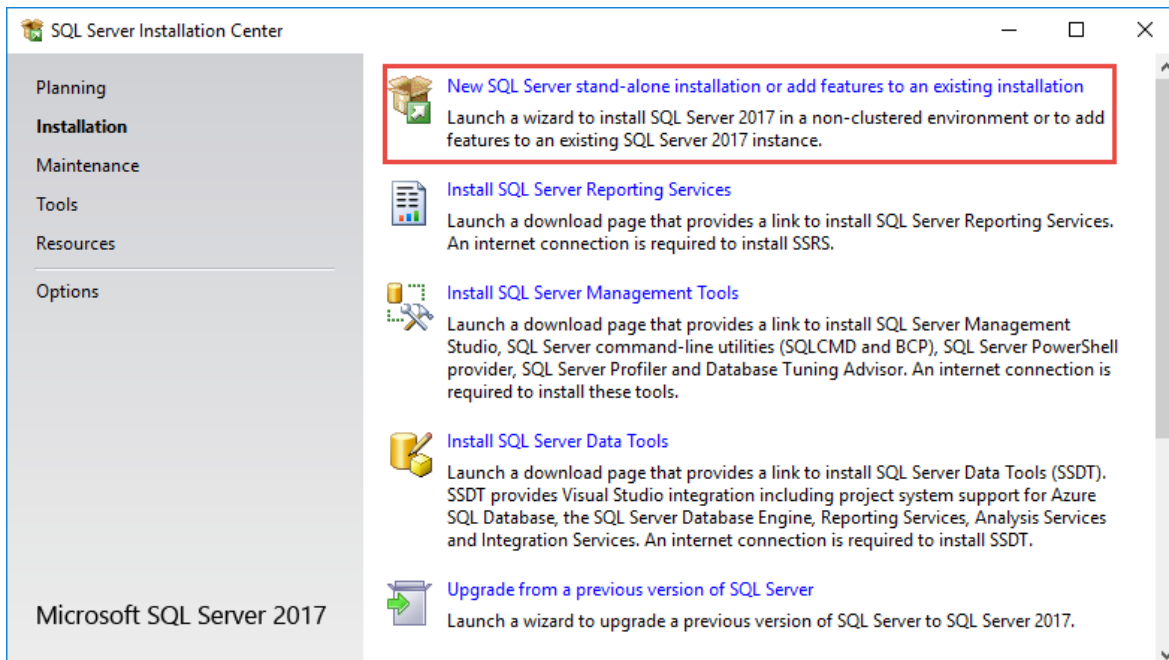
The SQL server used in the following demonstration is Microsoft SQL Server Express 2017 (14.x), which is a free and limited version of SQL software. Other versions can be purchased and installed based on the needs of the application. Most of the steps during the installation can be kept on default, however the authentication mode must be set to “Mix Mode” to allow the Maple Systems HMI to access the SQL Server.

1. Go to <https://www.microsoft.com/sql-server/sql-server-downloads> to download Microsoft SQL Server Express.

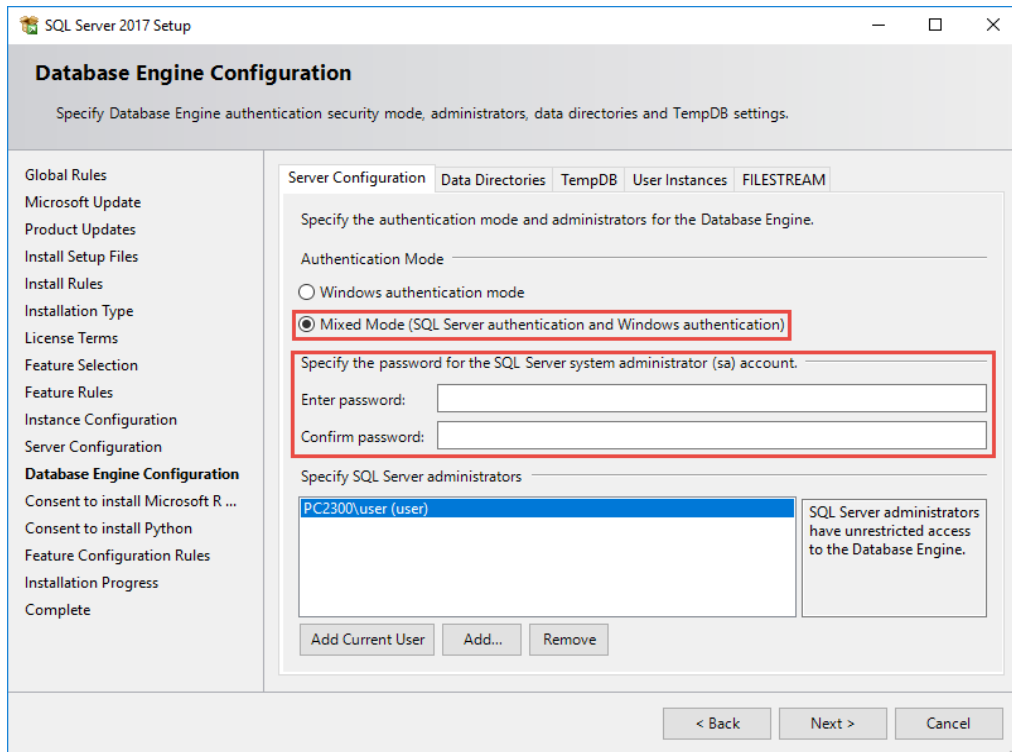
2. Click the [Download now] button under Express to download a Windows Microsoft SQL Server Express installation package .exe file.
3. Open the downloaded .exe file to start installing Microsoft SQL Server Express.
4. Select [Custom] as the Installation Type.



5. In the SQL Server Installation Center, select “New SQL Server stand-alone installation”



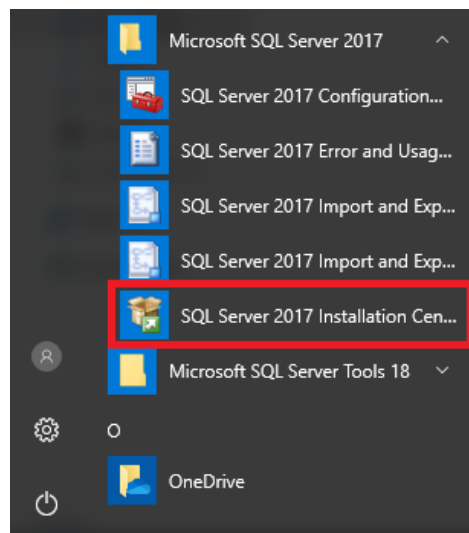
- In [Database Engine Configuration] » [Authentication Mode], choose **“Mix Mode.”** Specify a password for the SQL Server system administrator (sa) account.



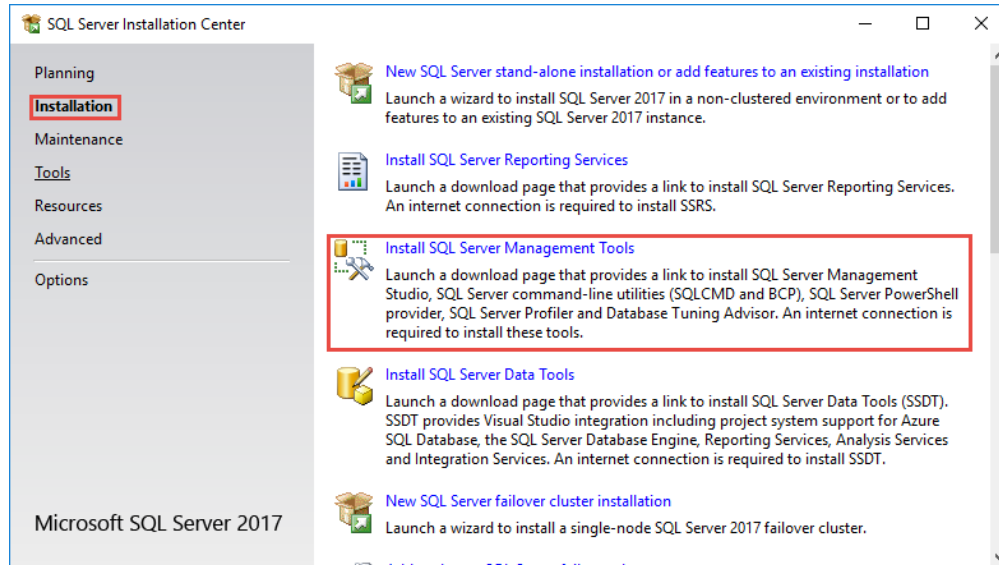
## Installing SQL Server Management Studio

After the installation has completed successfully, you can install SQL Server Management Studio (SSMS). SSMS is an integrated environment that allows you to manage your MS SQL Server Database. It provides a GUI alternative to the command line for interacting with the data stored in your SQL database.

- Open SQL Server 2017 Installation Center



## 8. Select [Installation] » [Install SQL Server Management Tools]



## 9. Download SSMS 18.2

### Download SSMS 18.2

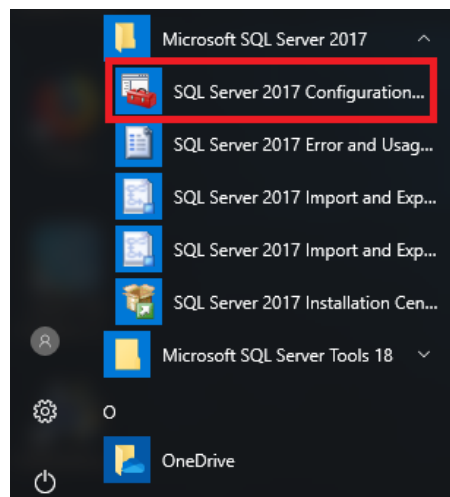
**SSMS 18.2 is now available, and is the latest general availability (GA) version of SQL Server Management Studio that provides support for SQL Server 2019!**

 [Download SQL Server Management Studio 18.2](#)

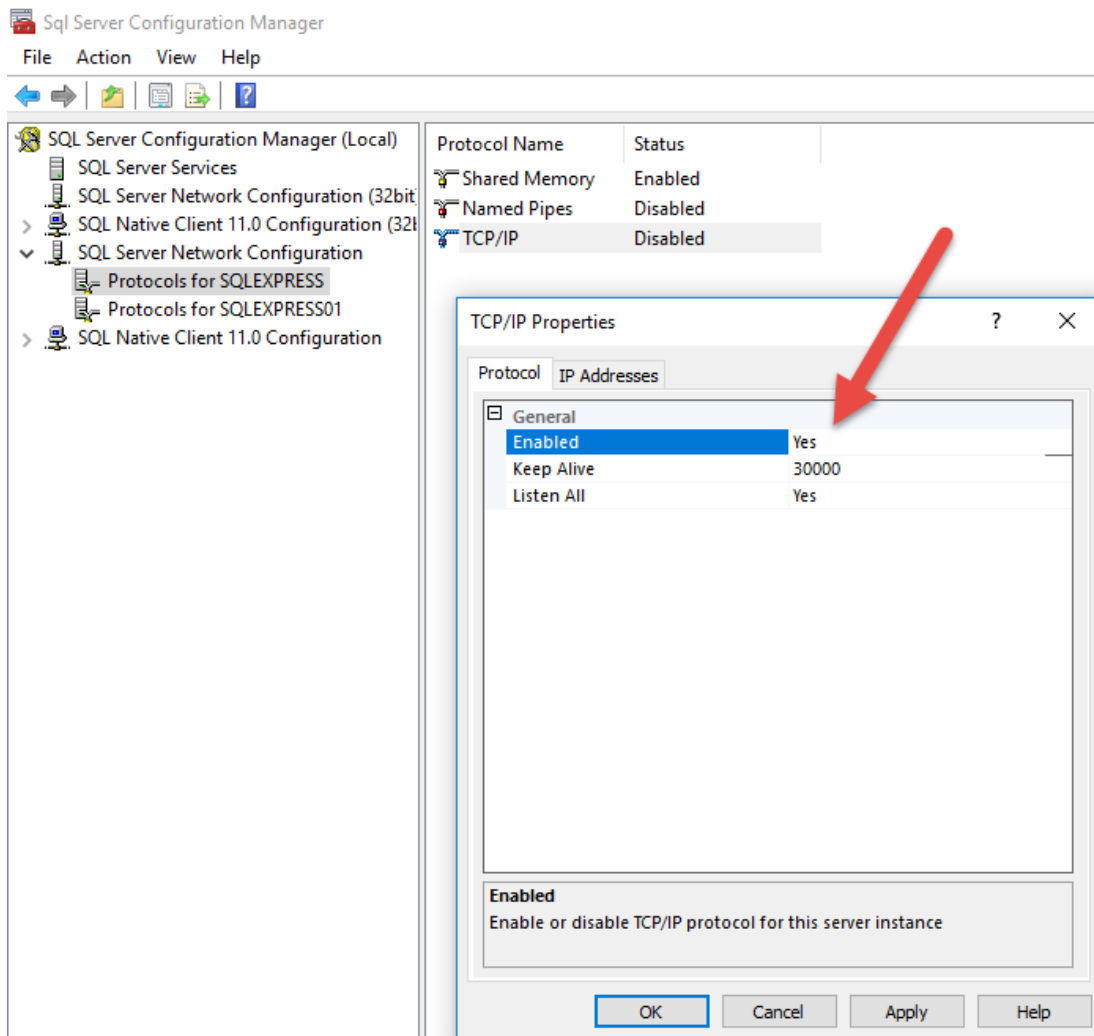
10. Run the installation file. When the installation has completed, close the Setup window.

## SQL Synchronization and SQL Query to MS SQL Database

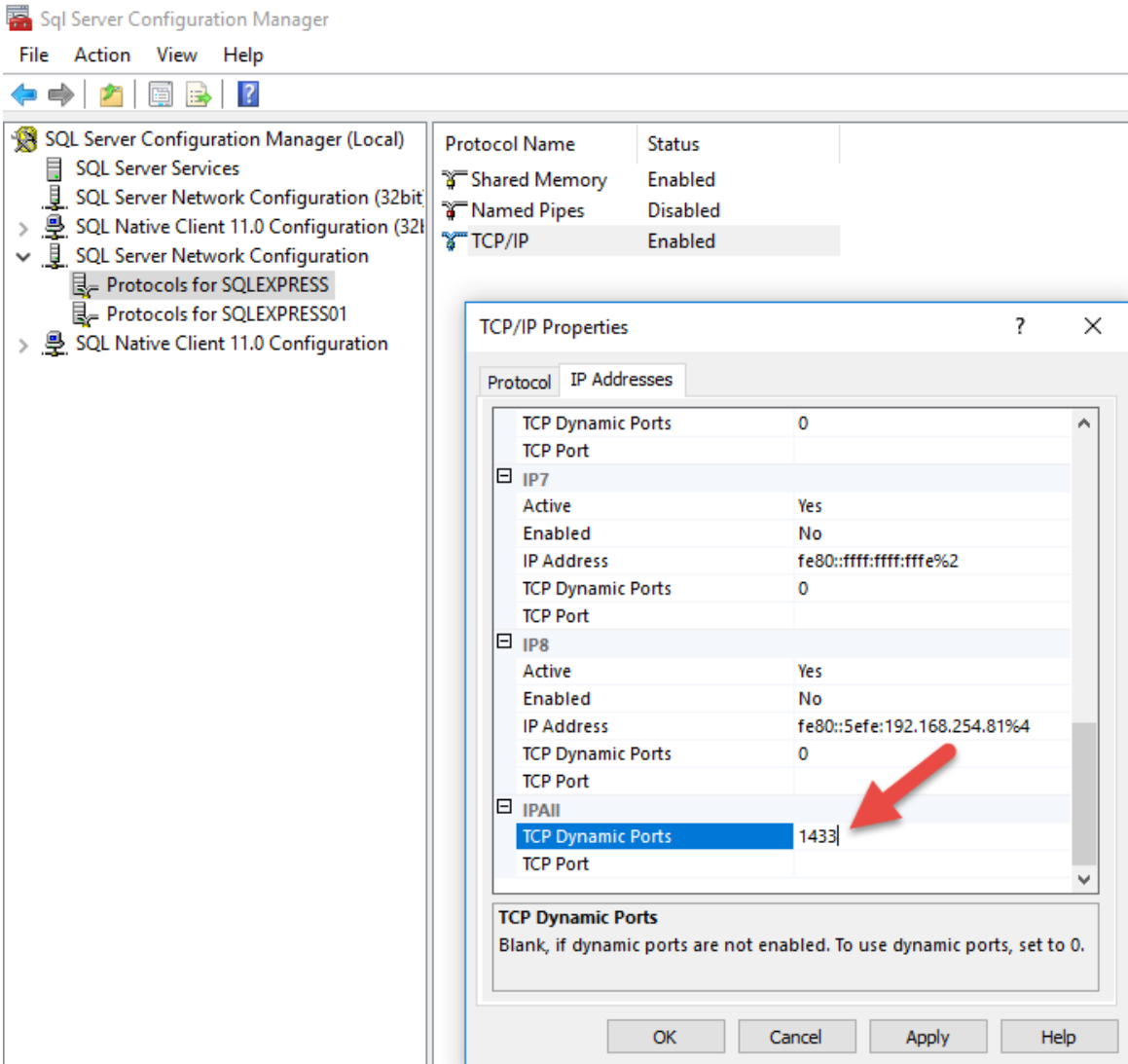
### 1. Launch SQL Server Configuration Manager.



2. Enable TCP/IP protocol in [TCP/IP Properties] because the Maple Systems HMI will connect to the MS SQL server instance using TCP/IP Protocol.
  - a. Expand [SQL Server Network Configuration].
  - b. Click on [Protocols for SQLEXPRESS].
  - c. Click on [TCP/IP].
  - d. Select [Yes].

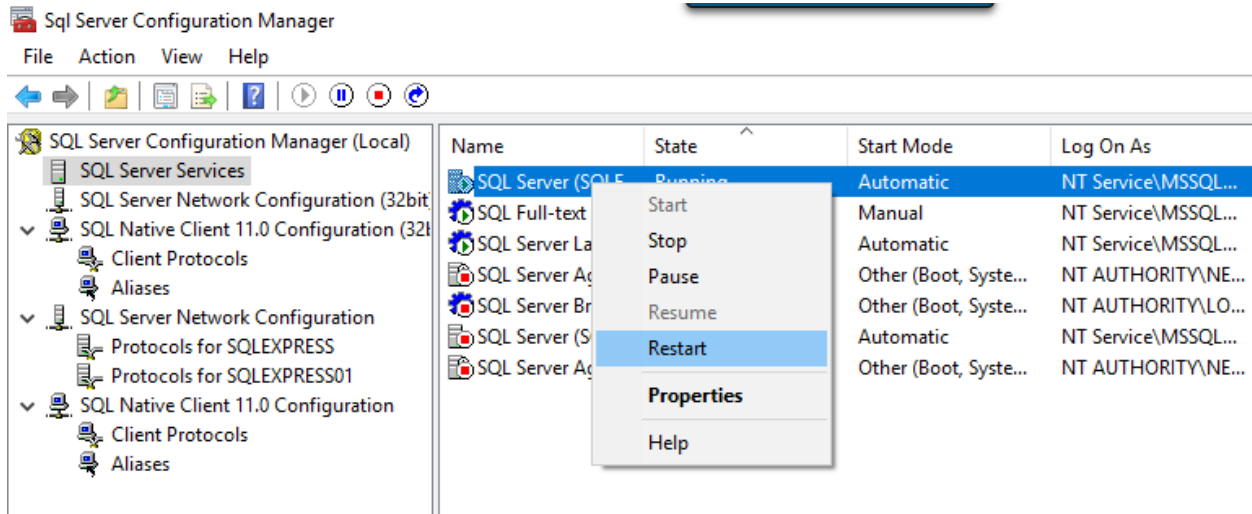


- 3. 7. Under [IP Addresses] tab, the default port of MS SQL server is 1433. Changing the port number is allowed.



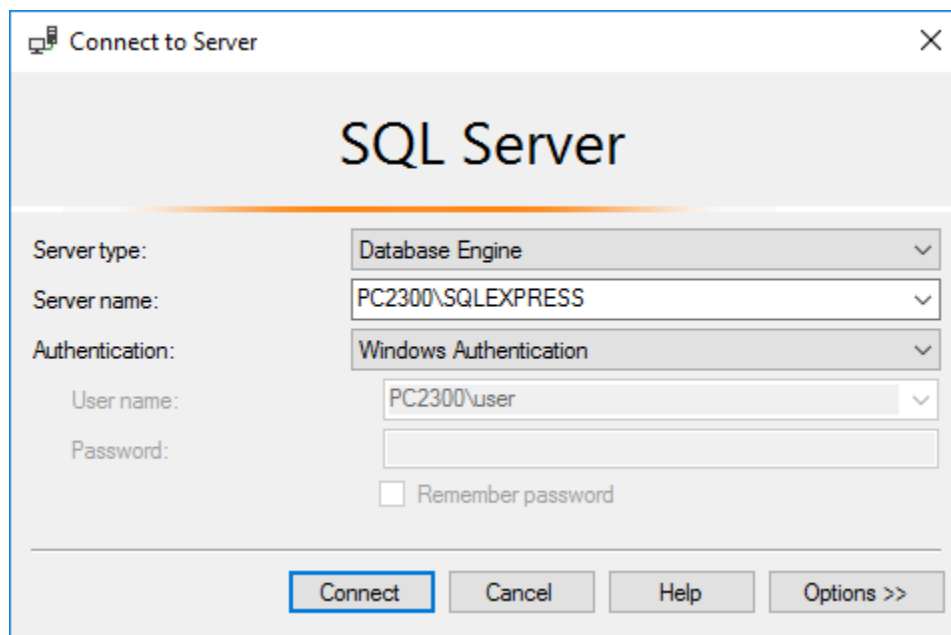


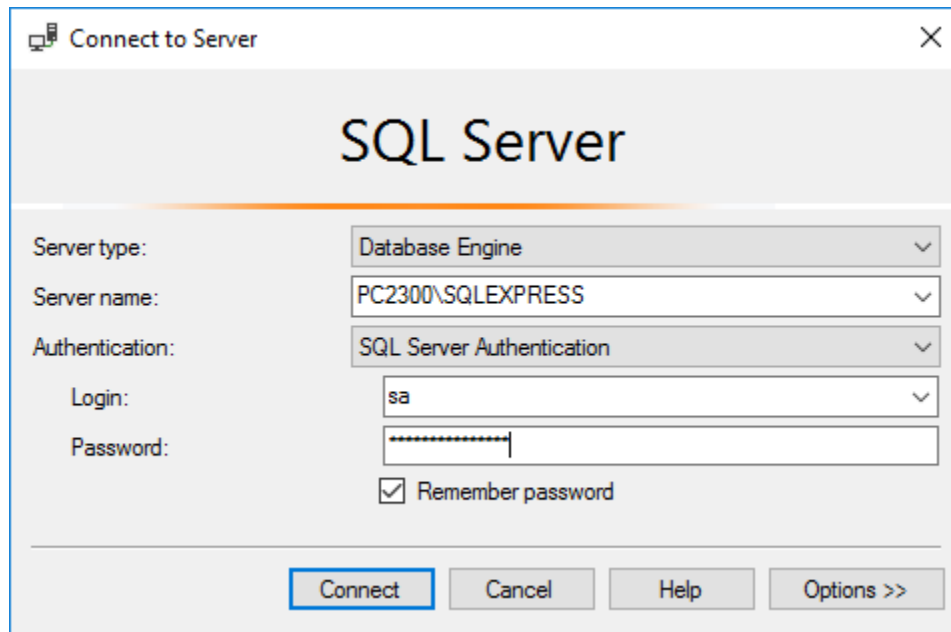
4. The changes will take effect after restarting the service, so you need to restart the SQL server by the following steps:
  - a. Select [SQL ServerServices].
  - b. Right click on [SQL Server (<INSTANCENAME>)].
  - c. Select [Restart].



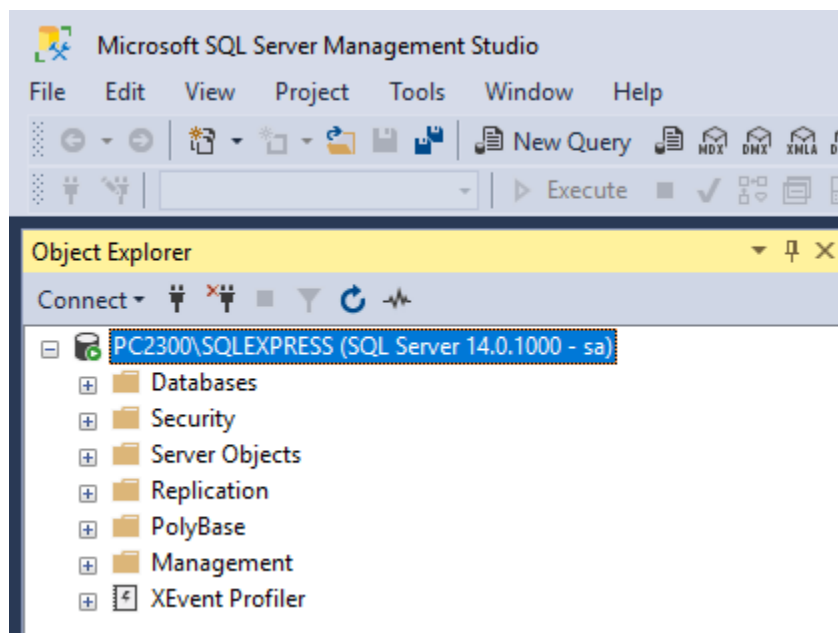
## SSMS (SQL Server Management Studio) Configuration

1. Launch SQL Server Management Studio.
2. To log in the SQL server via SSMS, you can use Windows Authentication or SQL Server Authentication.

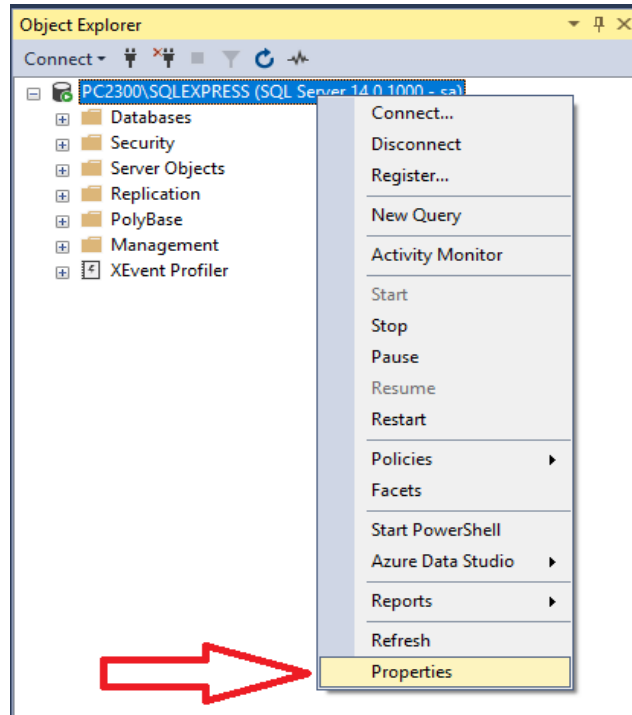




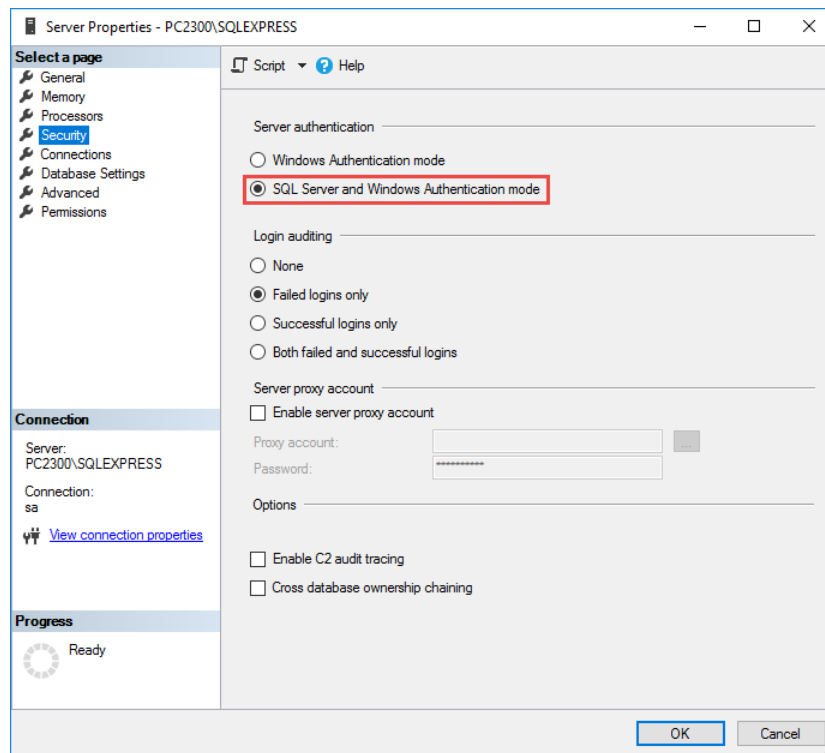
3. The user interface of SSMS will be displayed as shown.



- 4. If you didn't choose "Mix mode" during installation, right click on server and select [Properties].

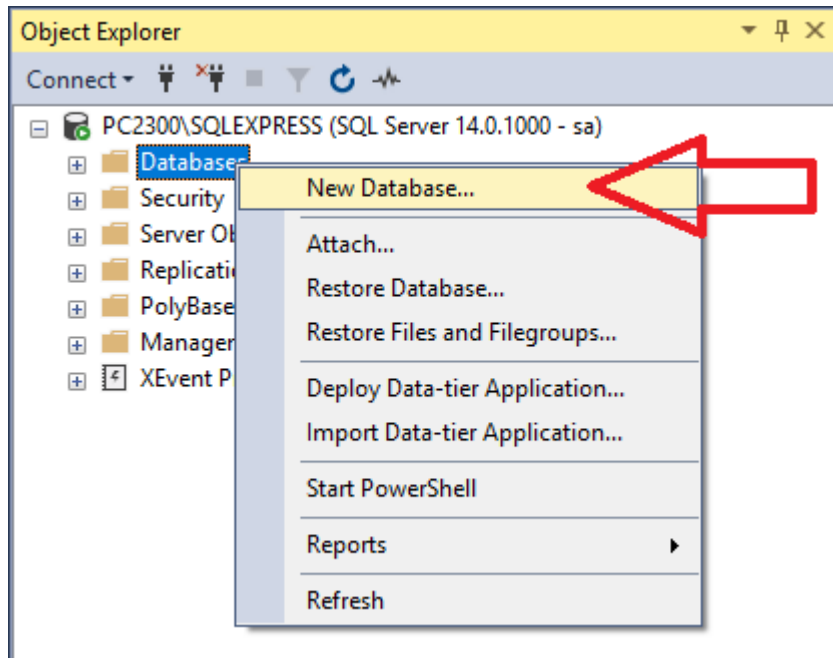


- 5. In [Security] tab, select SQL server and Windows Authentication mode for server authentication.

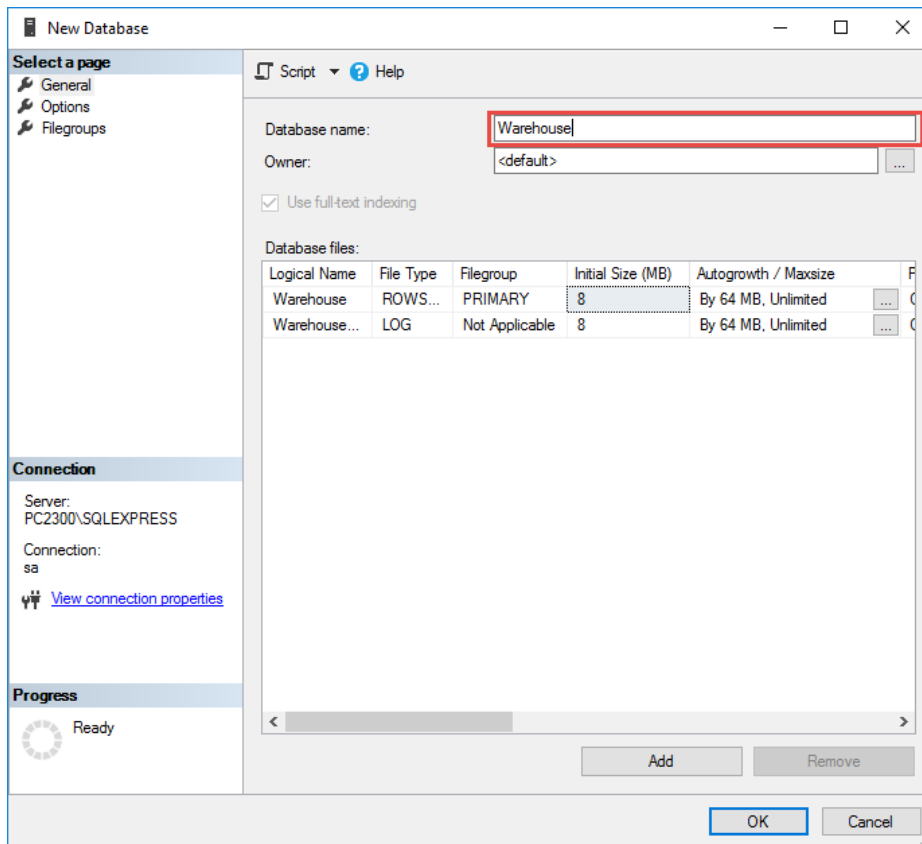


## Creating Databases

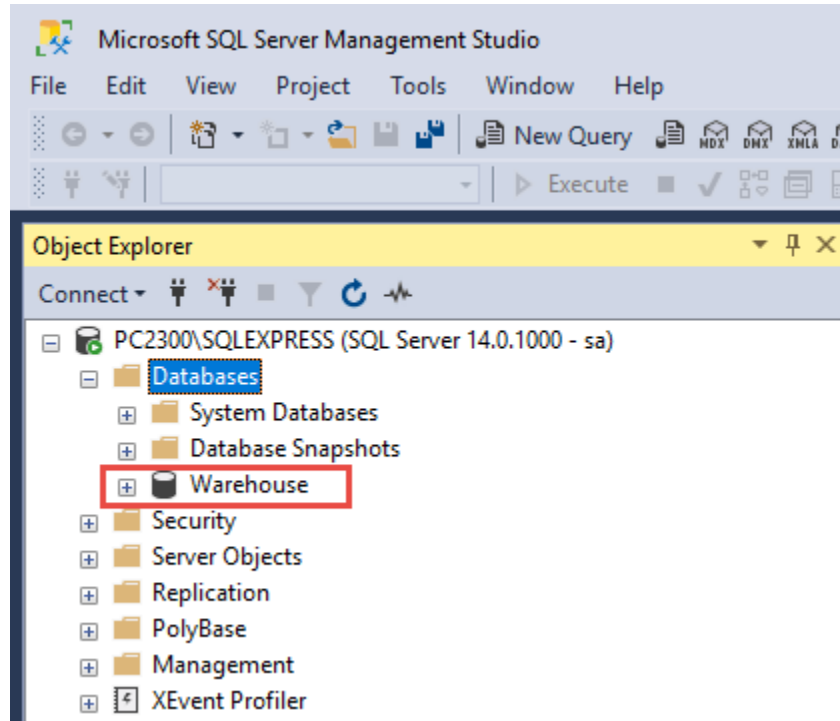
6. Right click on [Databases] and select [New Database].



7. In [General] tab, enter a desired name to this database. Click on [OK].

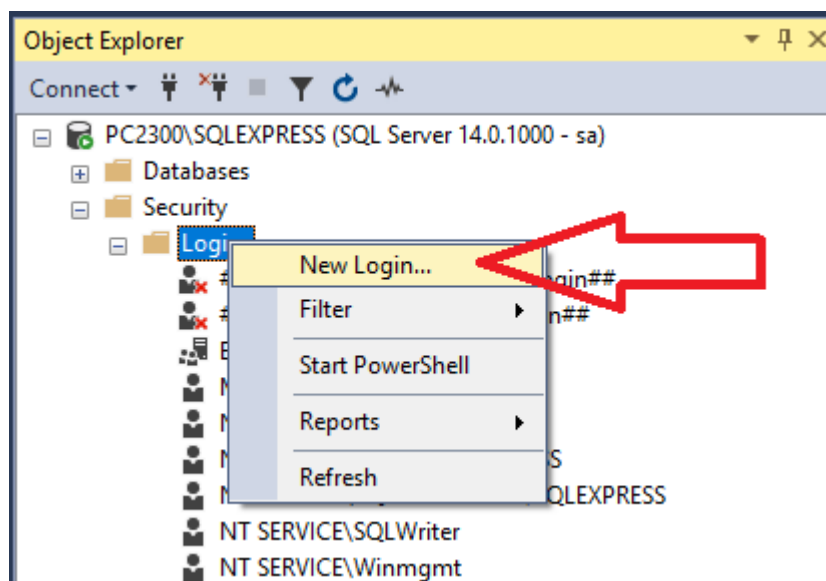


- The new database will be listed under Databases.

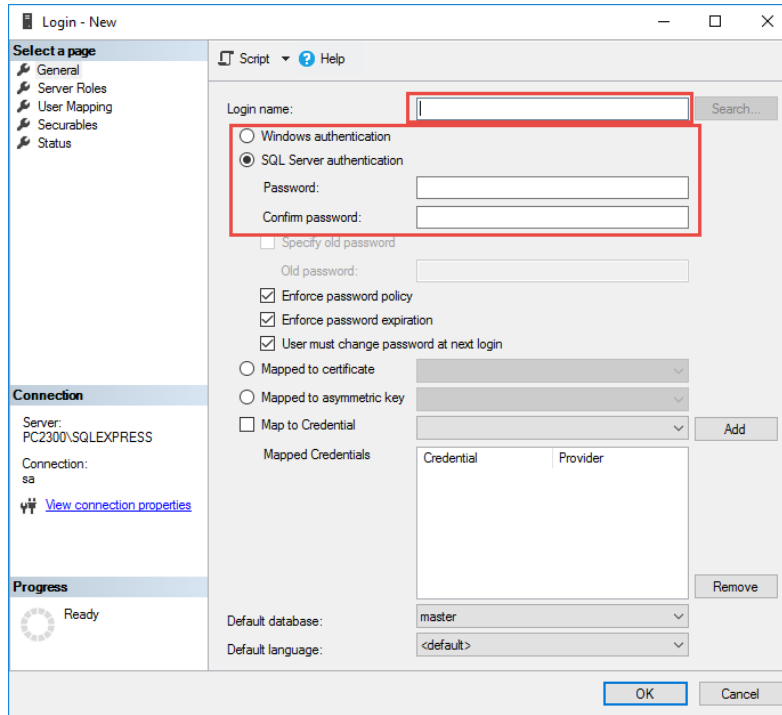


## Adding accounts

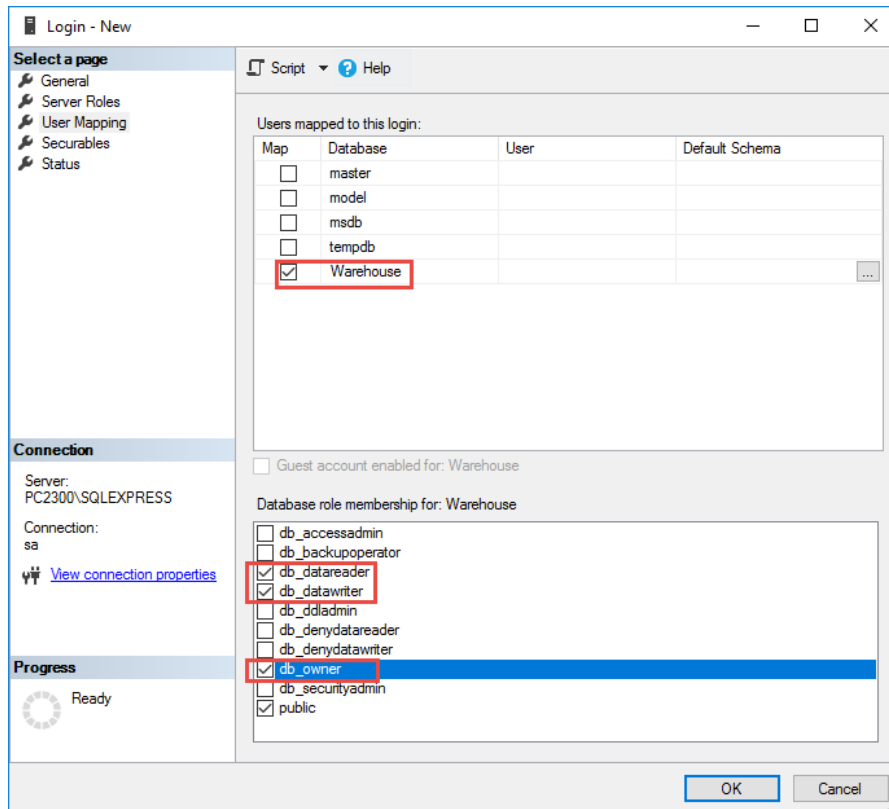
- Go to [Security] » [Logins]. Right click [Logins] and select [New Login].



10. In [General] tab, create a new user. Specify a desired name and a password.



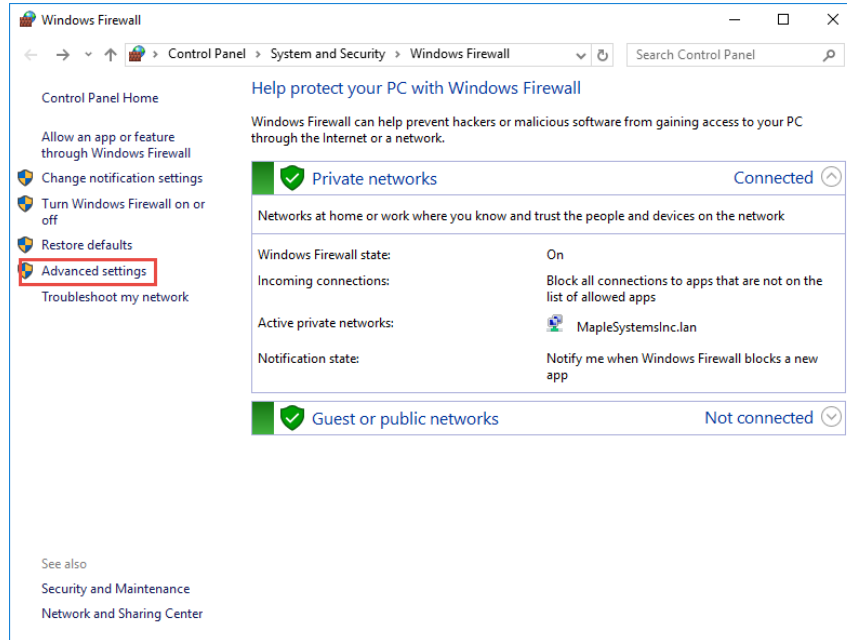
11. In [User Mapping] tab, select database roles to allow this user can access. Check the following Database roles checkbox, **db\_datareader**, **db\_datawriter**, and **db\_owner**.



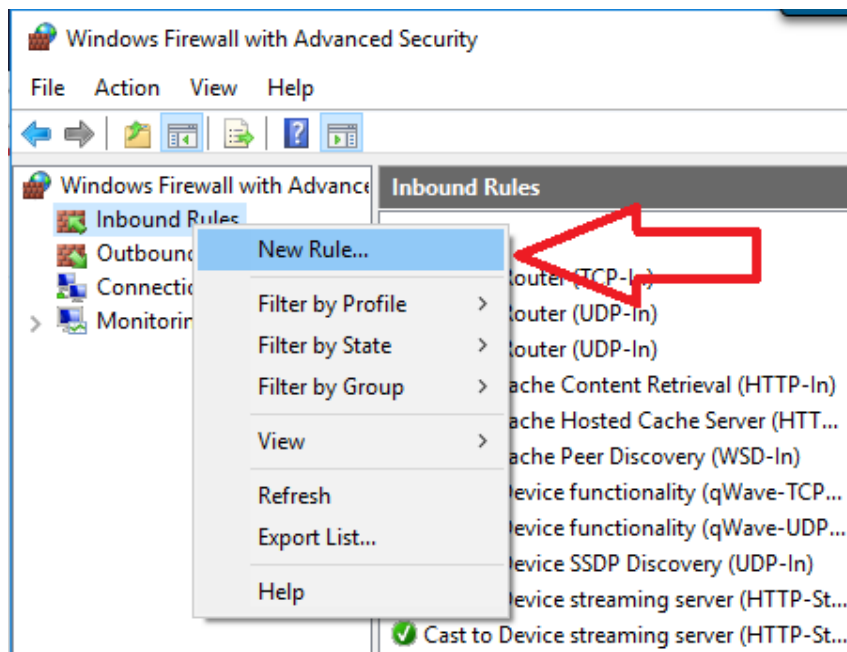
## Open Firewall Ports in Windows 10

You can manually permit a program to access the internet by opening a firewall port. You will need to know what port it uses and the protocol to make this work.

1. Navigate to Control Panel >> System and Security >> Windows Firewall.
2. Select Advanced settings and highlight Inbound Rules in the left pane.



3. Right click Inbound Rules and select New Rule.



4. Add the port you need to open and click Next.

The screenshot shows the 'New Inbound Rule Wizard' dialog box, specifically the 'Rule Type' step. The title bar reads 'New Inbound Rule Wizard' with a close button. The main heading is 'Rule Type' with the instruction 'Select the type of firewall rule to create.' On the left, a 'Steps' pane lists: Rule Type (selected), Protocol and Ports, Action, Profile, and Name. The main area asks 'What type of rule would you like to create?' and offers three radio button options: 'Program' (Rule that controls connections for a program.), 'Port' (Rule that controls connections for a TCP or UDP port.), and 'Predefined:' (Rule that controls connections for a Windows experience.). The 'Predefined:' option has a dropdown menu currently showing 'AllJoyn Router'. Below it is the 'Custom' option (Custom rule.). At the bottom right, there are three buttons: '< Back', 'Next >', and 'Cancel'. The 'Port' radio button is highlighted with a red box.

5. Add the protocol (TCP or UDP) and the port number into the next window and click Next.

The screenshot shows the 'New Inbound Rule Wizard' dialog box, specifically the 'Protocol and Ports' step. The main heading is 'Protocol and Ports' with the instruction 'Does this rule apply to TCP or UDP?'. There are two radio button options: 'TCP' (selected) and 'UDP'. Below this, the question is 'Does this rule apply to all local ports or specific local ports?'. There are two radio button options: 'All local ports' and 'Specific local ports:'. The 'Specific local ports:' option is selected and has a text input field containing '1433'. Below the input field, an example is provided: 'Example: 80, 443, 5000-5010'. The 'TCP' radio button and the 'Specific local ports:' radio button with its input field are highlighted with red boxes.



6. Select Allow the connection in the next window and hit Next.

What action should be taken when a connection matches the specified conditions?

**Allow the connection**  
This includes connections that are protected with IPsec as well as those are not.

**Allow the connection if it is secure**  
This includes only connections that have been authenticated by using IPsec. Connections will be secured using the settings in IPsec properties and rules in the Connection Security Rule node.  
[Customize...](#)

**Block the connection**

7. Select the network type as you see fit and click Next.

When does this rule apply?

**Domain**  
Applies when a computer is connected to its corporate domain.

**Private**  
Applies when a computer is connected to a private network location, such as a home or work place.

**Public**  
Applies when a computer is connected to a public network location.

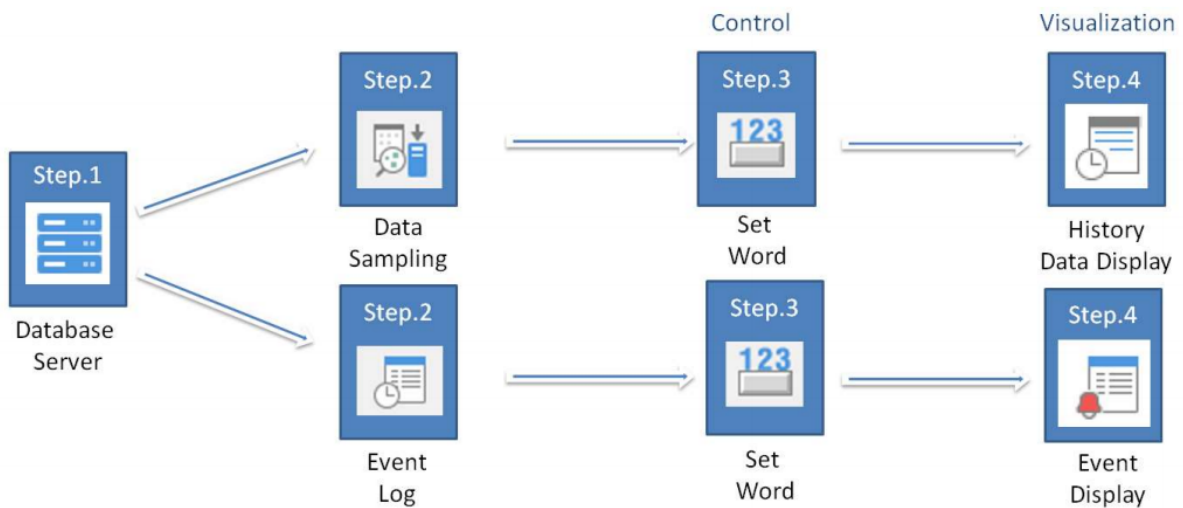
- 8. Name the rule something meaningful and click Finish.

Name:  
MSSQLDB\_ACCESS

Description (optional):  
Allows access to the MSSQL database through the Windows firewall.

### Syncing a SQL Database with an HMI in EasyBuilder Pro

Workflow - You can synchronize data log and event log to SQL servers.



## Adding a Database Server in EBPro

1. Launch EasyBuilder Pro. Go to [Data/History] tab » [Database Server]. Click on [New] to add a database server.
  - a. Choose [MS SQL server] for the server system. Enter the IP address, port number, and an authentication account of the SQL server. **Database name** depends on what database you want to be used for data synchronization.

**Note:** Maple Systems HMI cannot use Windows Authentication, the database must be enabled for SQL Server Authentication.

Database Server

General | Status/Control

Comment :

Server system : MS SQL Server

Use IP

IP : 10 . 1 . 10 . 81

Port : 1433 \* Default port of MS SQL Server is 1433

Username : Mapleuser

Password : 111111

Database name : Warehouse

- b. Define the Status address and the Control address if the Control address is enabled.

Database Server

General | Status/Control

Status address

Device : Local HMI Settings...

Address : LW 100

Status : LW-100  
( 0 : stopped, 1 : disconnected, 2 : connected )

Error : LW-101  
( 0 : none, 1 or more : error )

Control address

Enable

Device : Local HMI Settings...

Address : LW 102

Command : LW-102  
( 0 : none, 1 : start, 2 : stop, 3 : update )

IP : LW-103 (4 words)

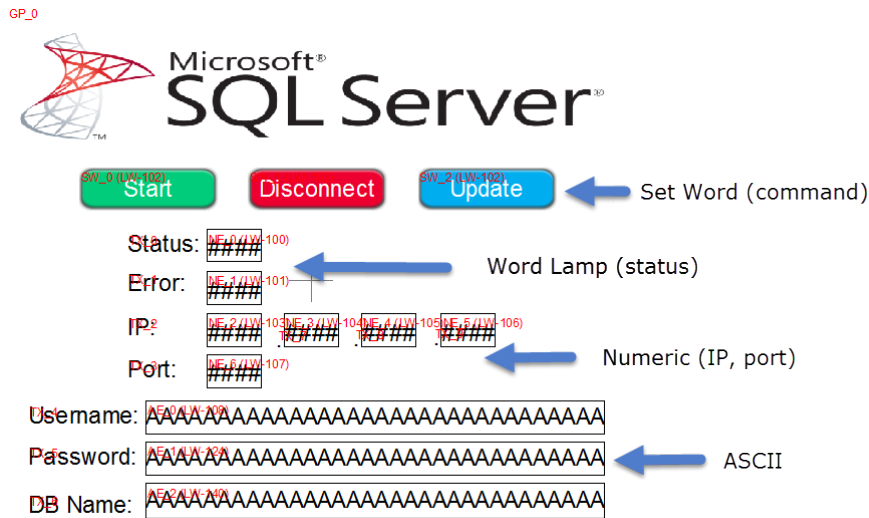
Port : LW-107

Username : LW-108 (16 words)

Password : LW-124 (16 words)

Database name : LW-140 (16 words)

- c. Create the following objects on the editing area. These objects are used to monitor and control the SQL server connection.

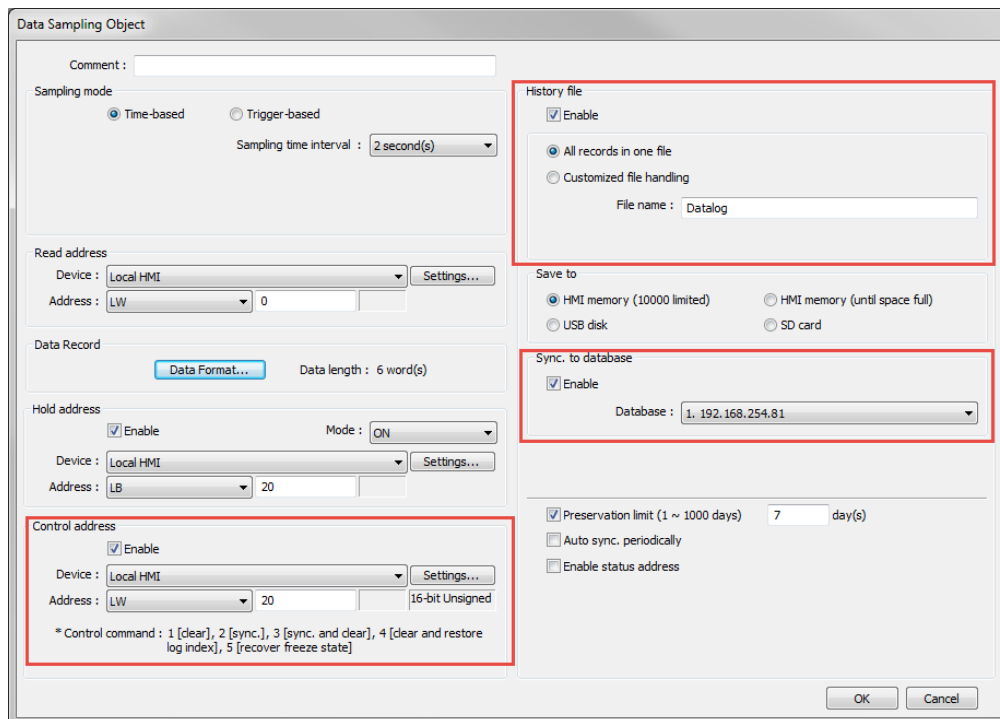


## Data Log Sync. With Server

### Configuring a Data Sampling Object

1. Go to [Data/History] tab » [Data sampling]. Click **new** and enable and define the **Control address**, **History file**, select a database server for **Sync. to database**.

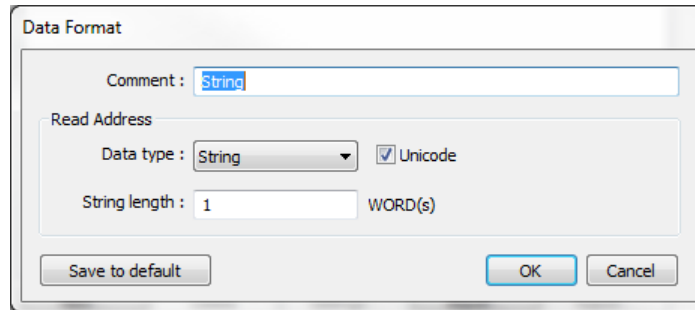
Note: SQL sync. Doesn't support "Customized file handling."



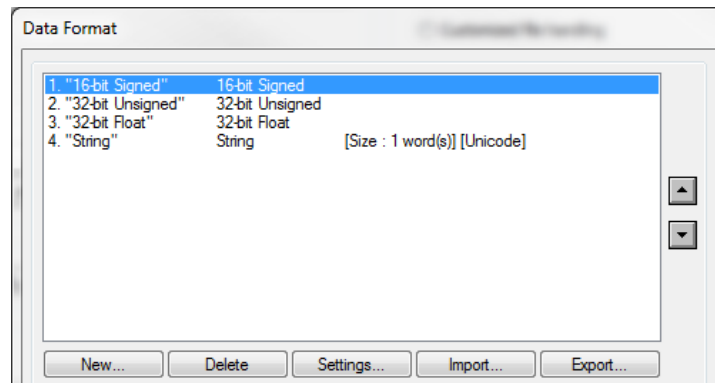
## Define Data Format

The data format is the organization of the data in the table that will be created for the data sampling object. Data is formatted by type and size.

1. Go to [Data Record] >> [Data Format] in the Data Sampling Object window. To define a new data type click **new**.

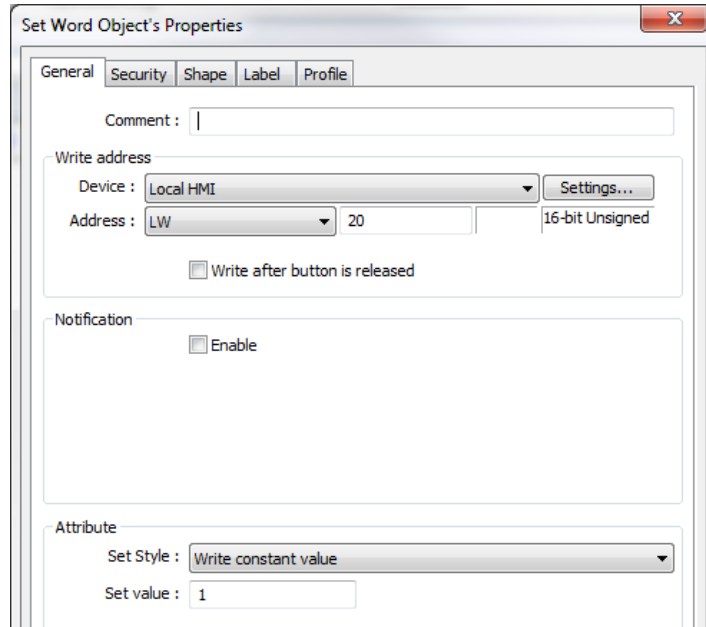


2. In this example, we use four different data types for a total of 6 words

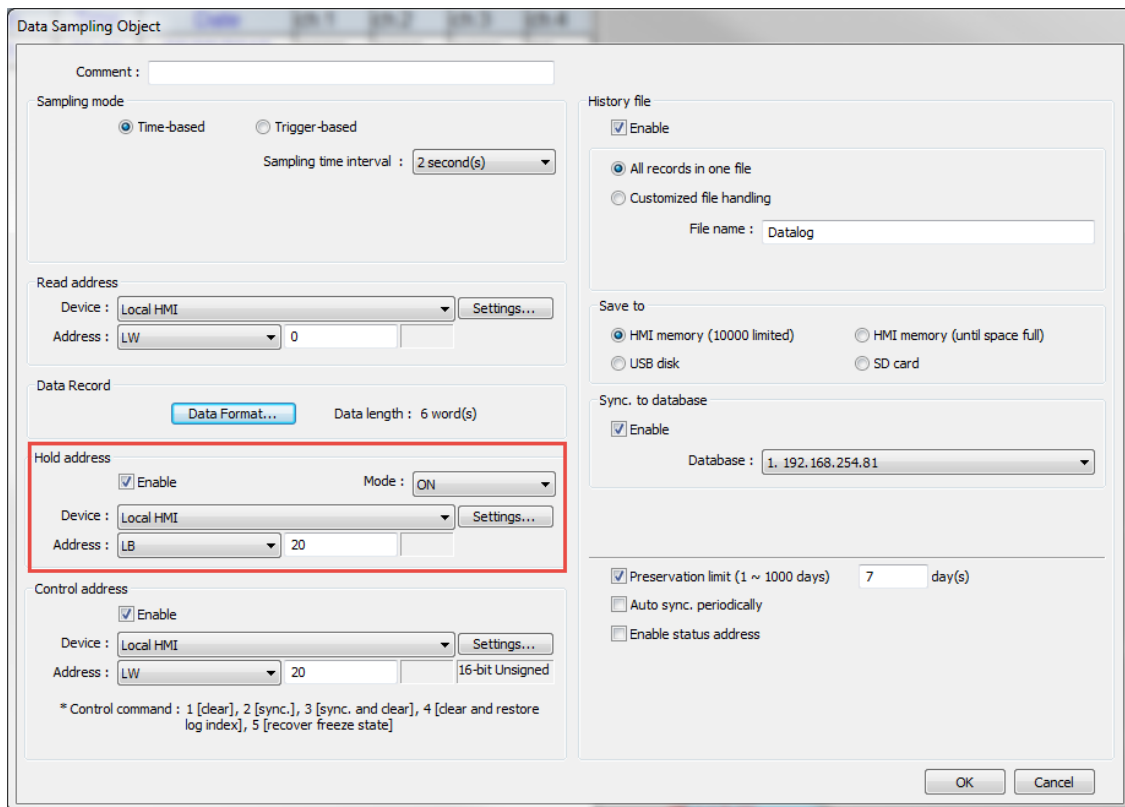


## Database Control Commands

1. You can create three **Set Word** objects in your project for the control address of the data sampling object.
2. Write constant value 1 to **clear** data, like below setting.
3. Write constant value 2 to **sync** data.
4. Write constant value 3 to **sync data and then remove** duplicate data on HMI.



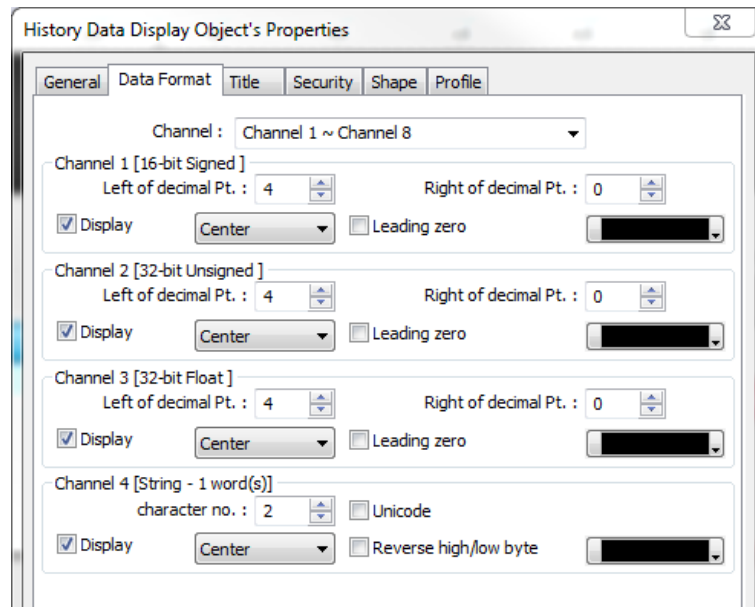
5. Go to [Data/History] tab » [Data sampling]. Enable and define the **Hold address**.



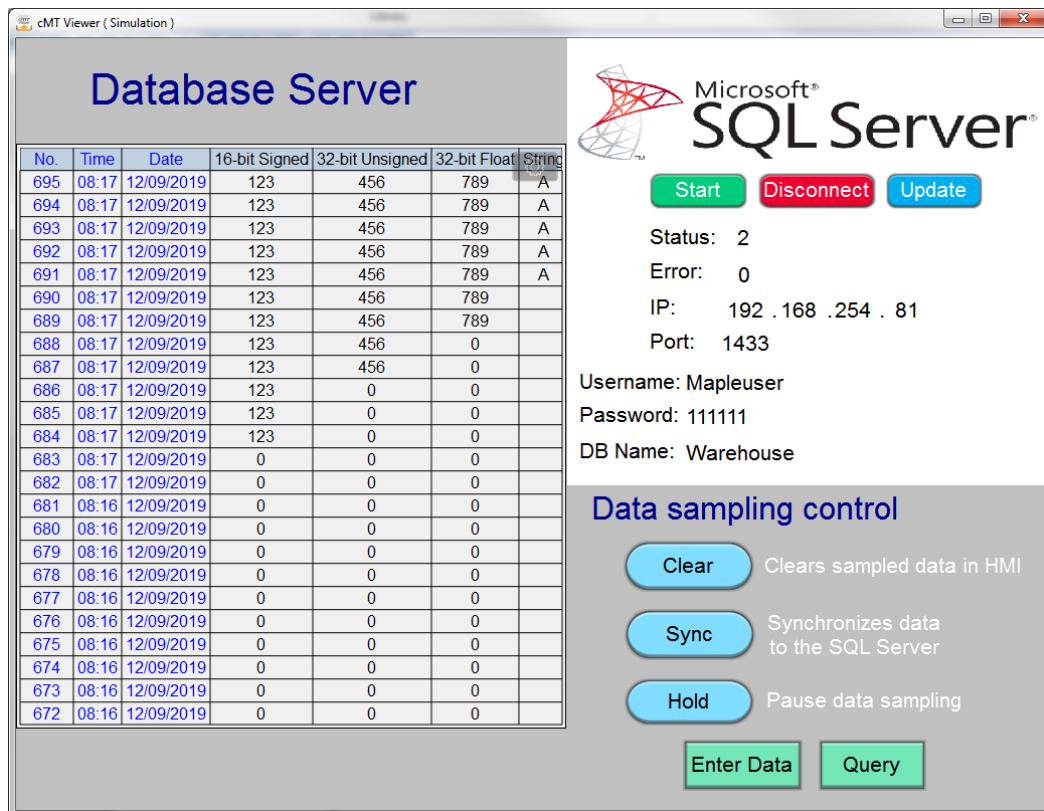
6. Create a **Set bit** object to toggle this bit on and off. This will cause sampling on the HMI to be paused until the bit status is returned to OFF.

### Configuring History Data Display Object

1. Go to [Data/History] tab >> [History Data Display].
2. In the History Data Display Object's Properties window, go to [Data Format] tab >> and check the box **Display** next to each channel. Create this object on the editing area.



3. Screen Shot of the Final Project:



**Testing:** Create some numeric and ASCII objects to enter values into memory for the data sampling object to sample and run an online simulation.

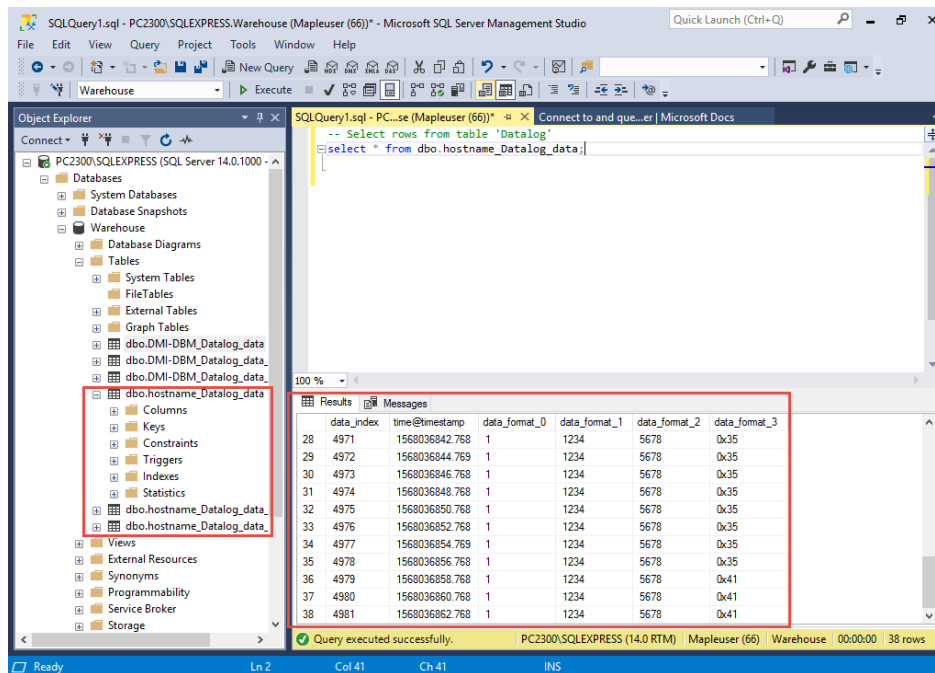
Then press ‘Sync’ to sync the data from the HMI to the database server.

In Microsoft SQL Server Management Studio, send a T-SQL query to view the data stored in the table.

Paste the following T-SQL code snippet into the query window, and then select **Execute**:

```
-- Select rows from table 'hostname_Datalog_data'
SELECT * FROM dbo.hostname_Datalog_data;
```

The results of the query are displayed under the area where the text was entered:



Tables will be automatically created by the HMI in SSMS. Tables will be named with the following format:

**In Easybuilder Pro**

Database name: Warehouse

HMI name: hostname(simulation)

Datalog name: log000

All records in one file  
 Customized file handling

File name: log000

**In SQL Server Management Studio**

| Table                                      | Description         |
|--------------------------------------------|---------------------|
| dbo.<HMI NAME>_<DATALOG NAME>_data         | Saves data sampling |
| dbo.<HMI NAME>_<DATALOG NAME>_data_format  | System folder       |
| dbo.<HMI NAME>_<DATALOG NAME>_data_section | System folder       |



## Event Log Sync. With Database Server

Configuring the Event Log Sync is similar to Data Log Sync. Follow these steps after you have added some events/alarms and a database server to your project.

### Configuring Event Log

Go to [Data/History] tab » [Event Log]. Enable and define the Control address and select a database server for **Sync to database**. This configures all events in the project to sync with the database.

Event (Alarm) Log

Category :  [Edit category name mapping...](#)

Enable back light when alarm occurs

| No. | Category | Text    | Mode | Condition | Read address     | Notification address | Buzzer  | e-Mail  |
|-----|----------|---------|------|-----------|------------------|----------------------|---------|---------|
| 1   | 0        | Event 0 | WORD | < 0.00    | Local HMI: LW-50 | Disable              | Disable | Disable |
| 2   | 0        | Event 1 | BIT  | ON        | Local HMI: LB-50 | Disable              | Disable | Disable |

Control address

Enable

Device :  [Settings...](#)

Address :

Control command : 1 [clear], 2 [sync.], 3 [sync. and clear]  
4 [clear and restore log index]  
11 [update messages according to imported string tables]

History files

Enable  Enable status address

Save to

HMI memory (10000 limited)  HMI memory (until space full)  
 USB disk  SD card

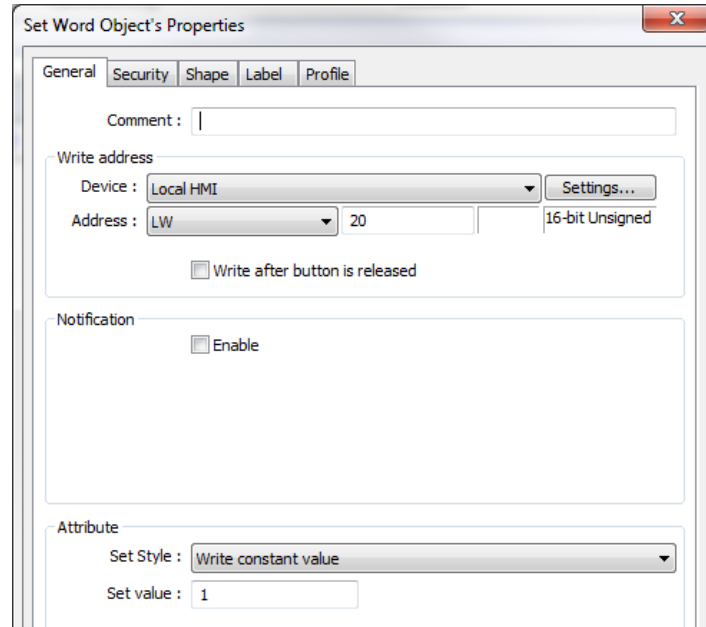
Sync to database

Enable Database :

Preservation limit  
 Auto sync, periodically

### Database Control Commands

1. You can create three **Set Word** objects in your project for the control address of the event log.
  - a. Write constant value 1 to **clear data**, like below setting.
  - b. Write constant value 2 to **sync data**.
  - c. Write constant value 3 to **sync data and then remove** duplicate data on HMI.

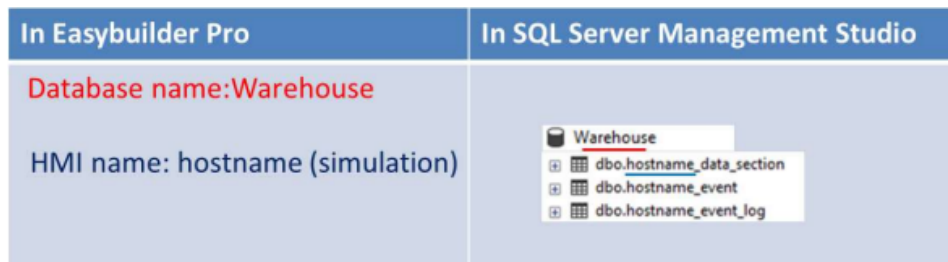


### Event Display Object

Go to [Data/History] tab >> [Event Display]. Add the event display object to the project.

Testing: When writing constant value 2 via a **Set Word** object to the control address of the event log, the event log stores in the HMI memory will be synchronized to the SQL server.

Table naming of event log in SSMS - Tables are automatically created by HMI. For example,



| Table                       | Description            |
|-----------------------------|------------------------|
| dbo.<HMI NAME>_event        | Saves event log        |
| dbo.<HMI NAME>_event_log    | Save event information |
| dbo.<HMI NAME>_data_section | System folder          |

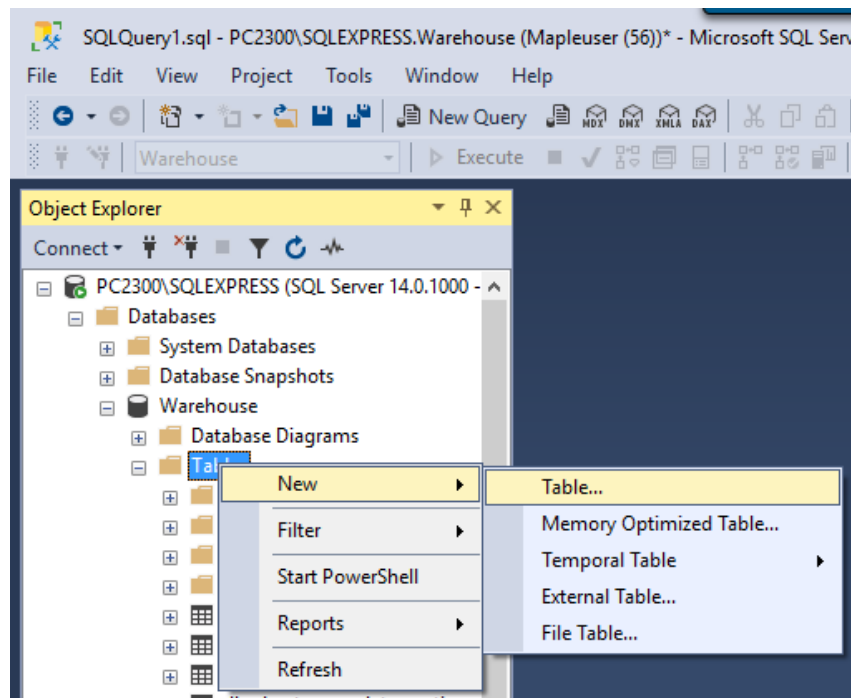
## Configuring an SQL Query Object and Query Result Viewer

Easy Builder Pro can be configured to perform CRUD database operations (Create, Read, Update, Delete) to query the SQL server.



## Make a Table in MS SQL

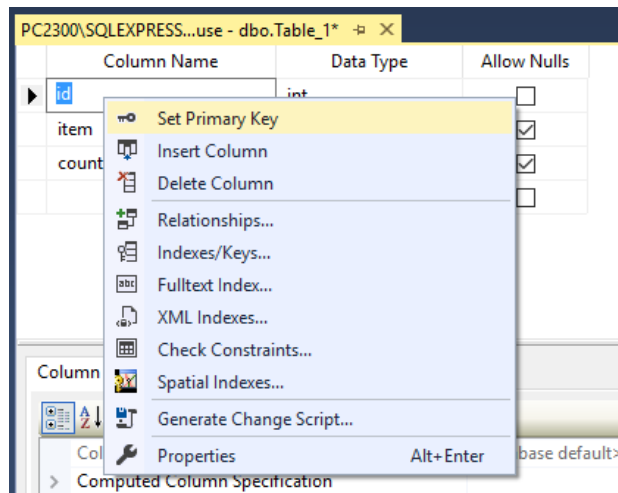
1. Launch SSMS. Create a table in SSMS because the HMI doesn't create a table in the database server automatically. Right click on [Tables] >> [New] and select [Table...].



- a. Fill out the column names and select data type for each column. Specify one column as **Primary Key**. A Primary Key is placed in the first column, and cannot be set NULL. In this case, "id" will be the Primary Key.

| Column Name | Data Type | Allow Nulls                         |
|-------------|-----------|-------------------------------------|
| id          | int       | <input type="checkbox"/>            |
| item        | nchar(10) | <input checked="" type="checkbox"/> |
| count       | int       | <input checked="" type="checkbox"/> |
|             |           | <input type="checkbox"/>            |

b. To set the Primary Key of the table, right click on [id] and select [Set Primary Key].



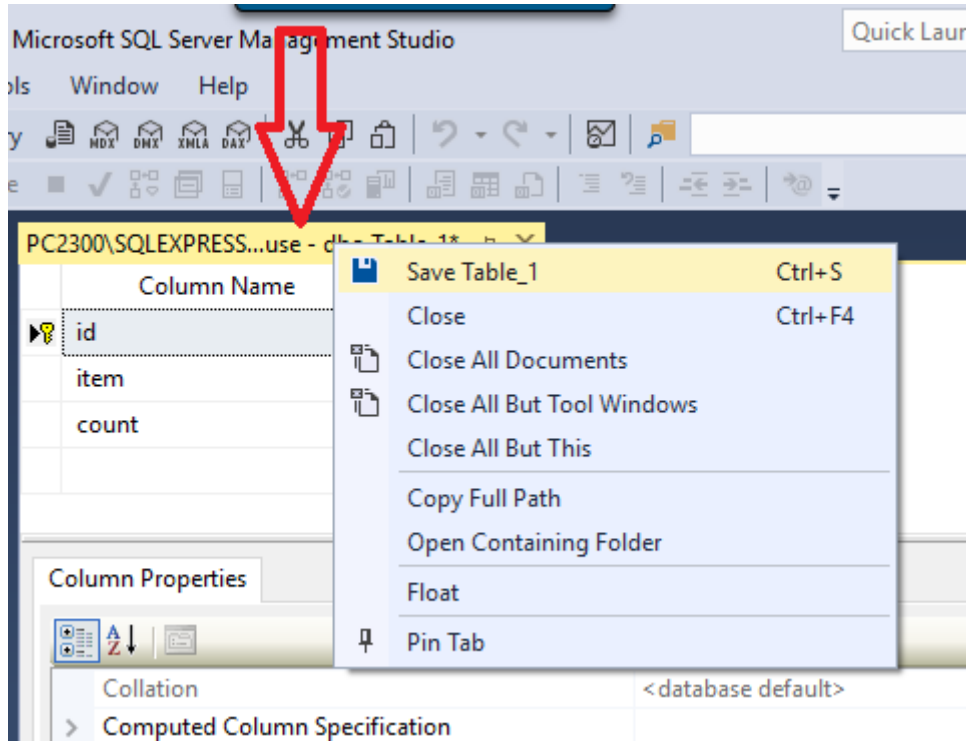
c. To enable AI (Auto Increment), click on [id]. Under [Column Properties] tab, expand [Identity Specification] and change “No” to “Yes” for [Is Identity].

| Column Name | Data Type | Allow Nulls                         |
|-------------|-----------|-------------------------------------|
| id          | int       | <input type="checkbox"/>            |
| item        | nchar(10) | <input checked="" type="checkbox"/> |
| count       | int       | <input checked="" type="checkbox"/> |
|             |           | <input type="checkbox"/>            |

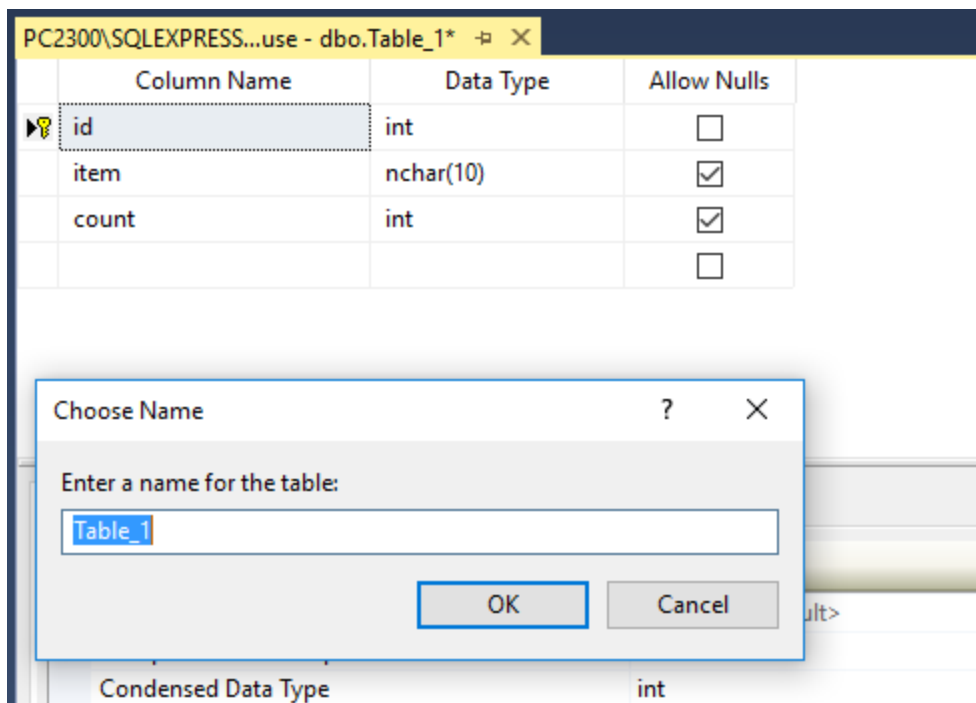
  

| Column Properties             |                      |
|-------------------------------|----------------------|
| Collation                     | < database default > |
| Computed Column Specification |                      |
| Condensed Data Type           | int                  |
| Description                   |                      |
| Deterministic                 | Yes                  |
| DTS-published                 | No                   |
| Full-text Specification       | No                   |
| Has Non-SQL Server Subscriber | No                   |
| Identity Specification        | Yes                  |
| (Is Identity)                 | Yes                  |
| Identity Increment            | 1                    |
| Identity Seed                 | 1                    |
| Indexable                     | Yes                  |
| Is Columnset                  | No                   |
| Is Sparse                     | No                   |
| <b>(Is Identity)</b>          |                      |

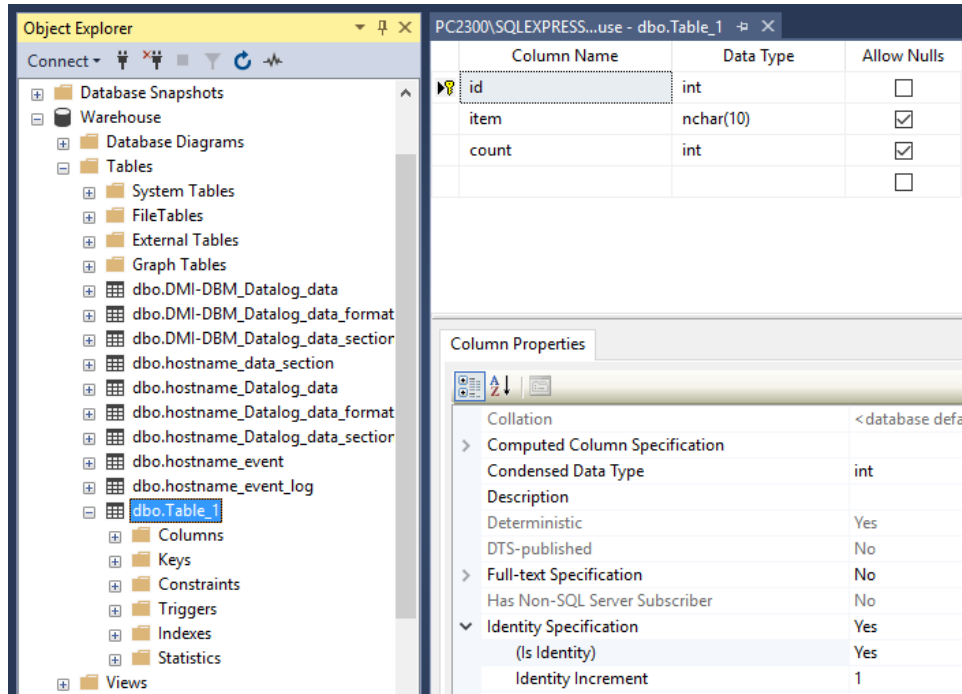
- d. To save this table, Right click this tab and select [Save Table\_1].



- e. Enter a desired name for the table.



- f. Right click on [Tables] and select [Refresh] to finish the procedure of adding the table.



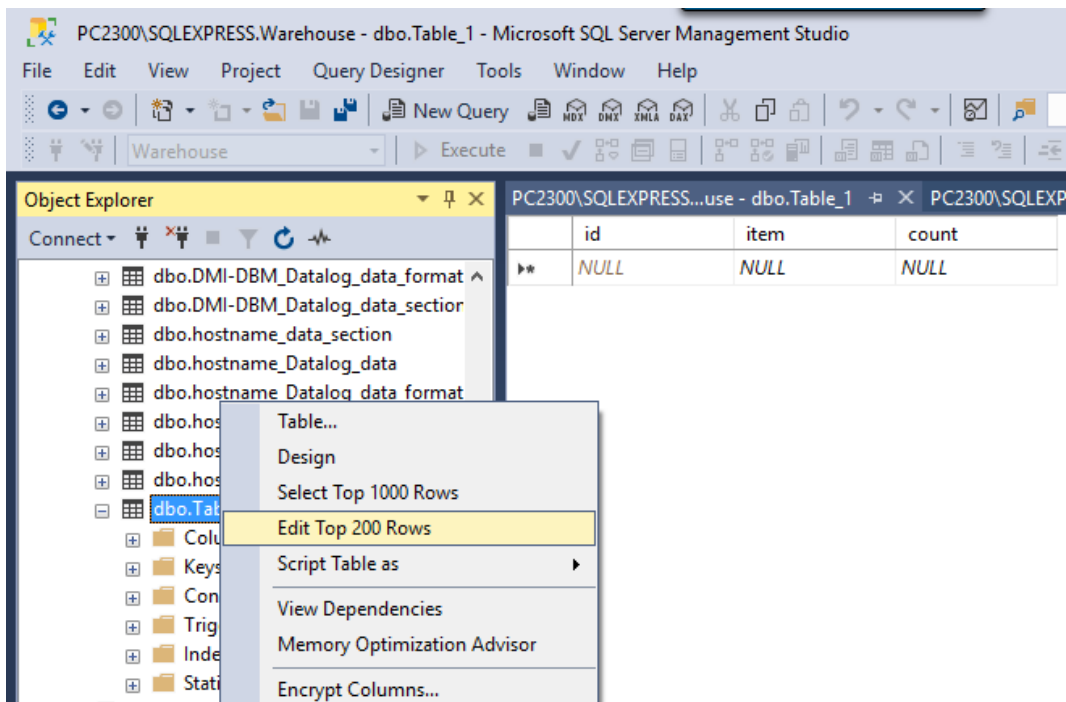
### Datatype Conversions

The following table illustrates the allowable datatype conversions when reading from a Microsoft SQL database. If conversion cannot run properly, error code 5 will be set. For example, when converting Microsoft SQL’s INT into EBPro’s 16-bit Unsigned, if the value exceeds the limit of 16-bit Unsigned, error code 5 will show.

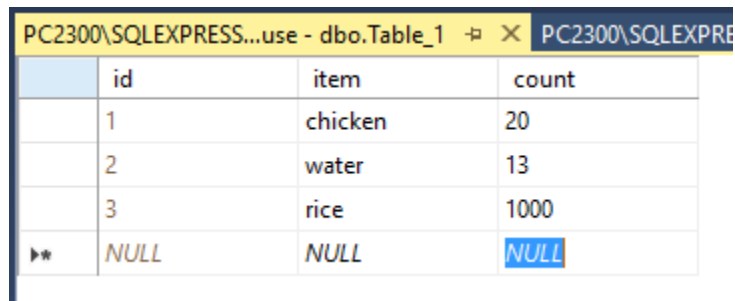
#### Supported Data Types

| MS SQL data format | EasyBuilder Pro datatype |
|--------------------|--------------------------|
| TINYINT            | 16/32-bit BCD            |
| SMALLINT           | 16/32-bit HEX            |
| INT                | 16/32-bit Binary         |
| BIGINT             | 16/32-bit Signed         |
| BIT                | 16/32-bit Unsigned       |
| FLOAT              | 32-bit Float             |
| REAL               |                          |
| DECIMAL            |                          |
| DATETIME           | String                   |
| NCHAR, NVARCHAR    |                          |
| BINARY, VARBINARY  |                          |
| TEXT               |                          |

- g. To insert data to the table, right click the table created earlier, and select [Edit Top 200 Rows].

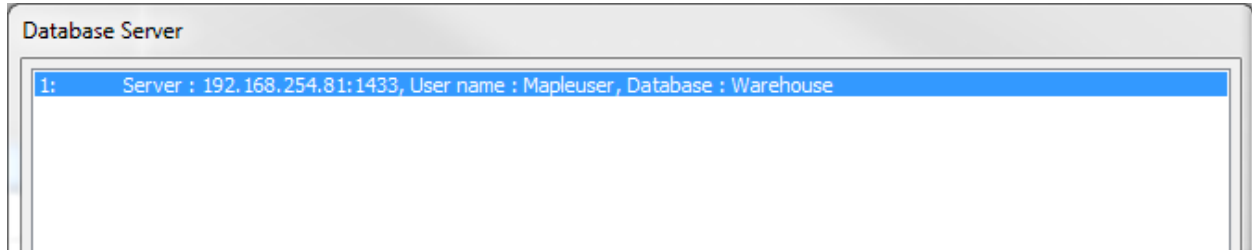


- h. Enter the data into each cell



## Sending a SQL Query in EasyBuilder Pro

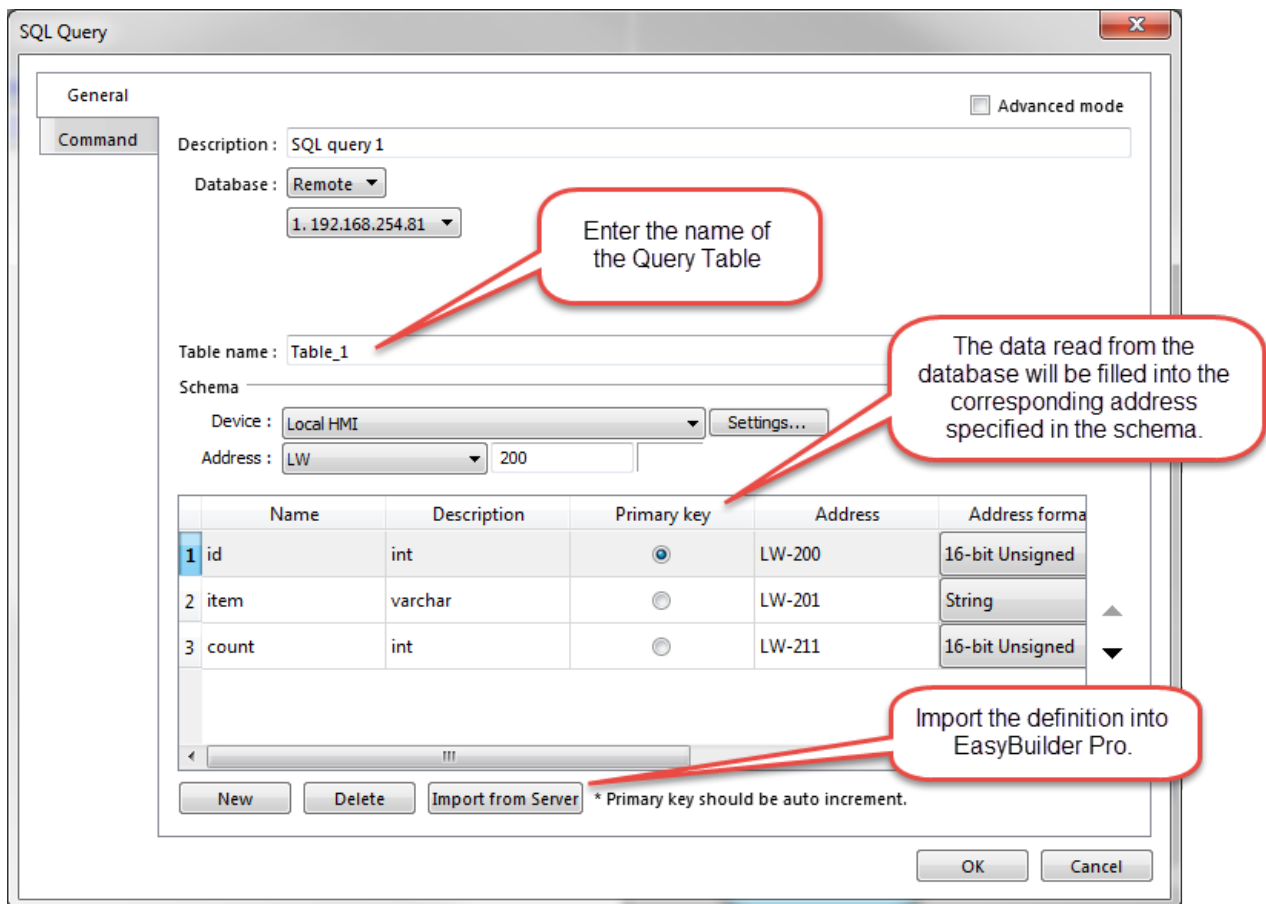
Launch Easybuilder Pro. Go to [Data/History] tab >> [Database Server]. Click on [New] to add a database server. It's the same as the steps for adding a database for SQL Sync.



Go to [Data/History] tab >> [SQL Query]. Create a [SQL Query] object. There are two options for this object, **Simple Mode** and **Advanced Mode**.

### General Tab

- On the [General] tab: Select a database server for querying. Enter a table name and define a register for the **Schema**. Click on [New] to add the columns of the table. Another way is to click on [Import from server] to import columns. You could select the correct data type for each column under [Address format] based on its' MSSQL data format.

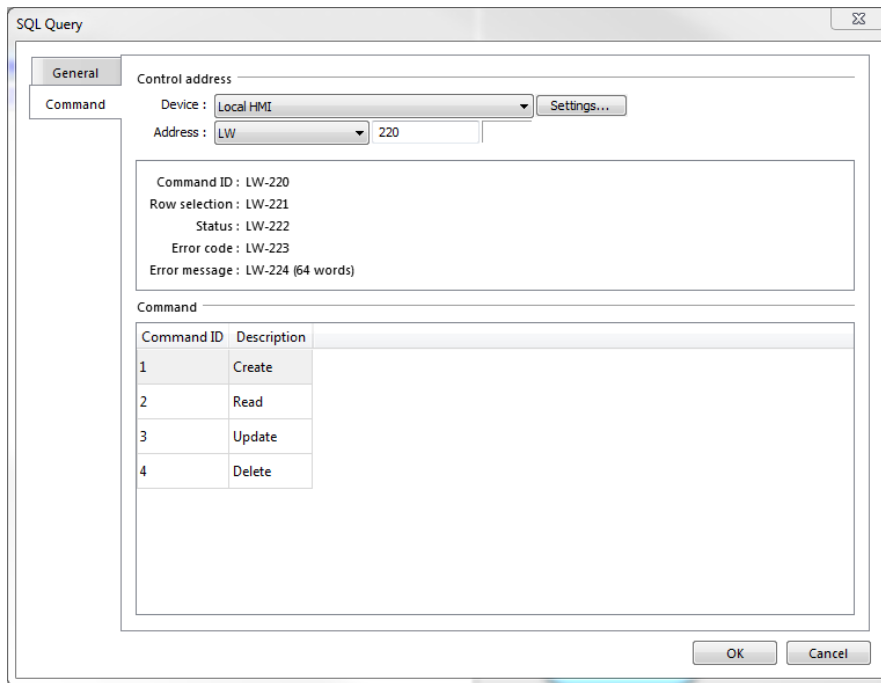




| Setting       | Description                                                                                                                                                                                                                                           |
|---------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Advanced Mode | When selected, advanced mode allows you to manually enter syntax in the Command tab to control the Microsoft SQL database.<br><b>Note:</b> Once Advanced Mode is selected, it is not possible to go back to General Mode.                             |
| Description   | User’s description about this query.                                                                                                                                                                                                                  |
| Database      | Select the source database to read from.                                                                                                                                                                                                              |
| Table Name    | Enter the name of the query table.                                                                                                                                                                                                                    |
| Schema        | Click [New] to add an entry. The data read from database will be written to the corresponding address specified in the schema. You must manually set Address Format for each entry.<br><b>Note:</b> A Primary Key should contain only numeric values. |

### Command Tab

- [Command] tab: Define a register for the Control Address. Create the following objects related to the Control Address on the editing area. Each SQL command is given a unique ID number.



| Setting         | Description                                                                                                                                                                                                   |
|-----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Control address | Designate five consecutive registers to execute commands and show results. When importing the table from database, four commands will exist by default in the Command table: Create, Read, Update, and Delete |

| Status Value | Meaning                                                                                             |
|--------------|-----------------------------------------------------------------------------------------------------|
| 0            | Normal                                                                                              |
| 1            | Query result exceeds 1000 records. Using LIMIT clause can constrain the number of rows in one page. |

| Error Code | Meaning                                           |
|------------|---------------------------------------------------|
| 0          | No errors                                         |
| 1          | Unknown error                                     |
| 2          | Invalid command                                   |
| 3          | Database Server is not connected                  |
| 4          | Argument cannot be read                           |
| 5          | Cannot write and output                           |
| 6          | Incorrect number of arguments                     |
| 7          | Error in Microsoft SQL, please read error message |
| 8          | Unsupported datatype                              |
| 9          | Number of columns exceeds the limit               |
| 10         | Number of rows exceeds the limit                  |
| 11         | Inside error                                      |

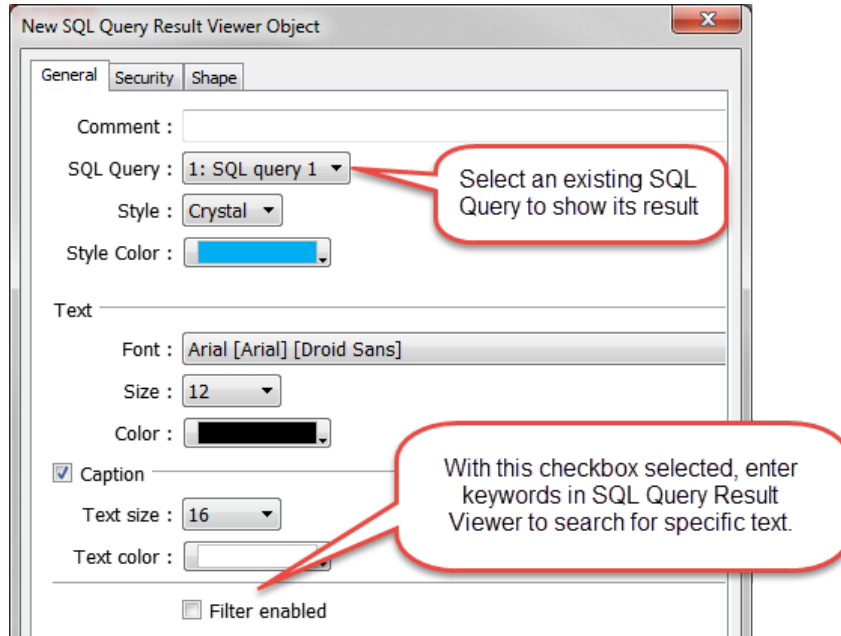
4. Create four **Set Word** objects on the editing area for the four commands, Create (Command no.1), Read (Command no.2), Update (Command no.3), and Delete (Command no.4), like the below setting.

The screenshot shows the 'New Set Word Object' dialog box with the following settings:

- General** tab selected.
- Comment:** (empty text box)
- Write address:**
  - Device:** Local HMI
  - Address:** LW 200
  - 16-bit Unsigned:** (checkbox)
  - Write after button is released:** (checkbox)
- Notification:**
  - Enable:** (checkbox)
- Attribute:**
  - Set Style:** Write constant value
  - Set value:** 1

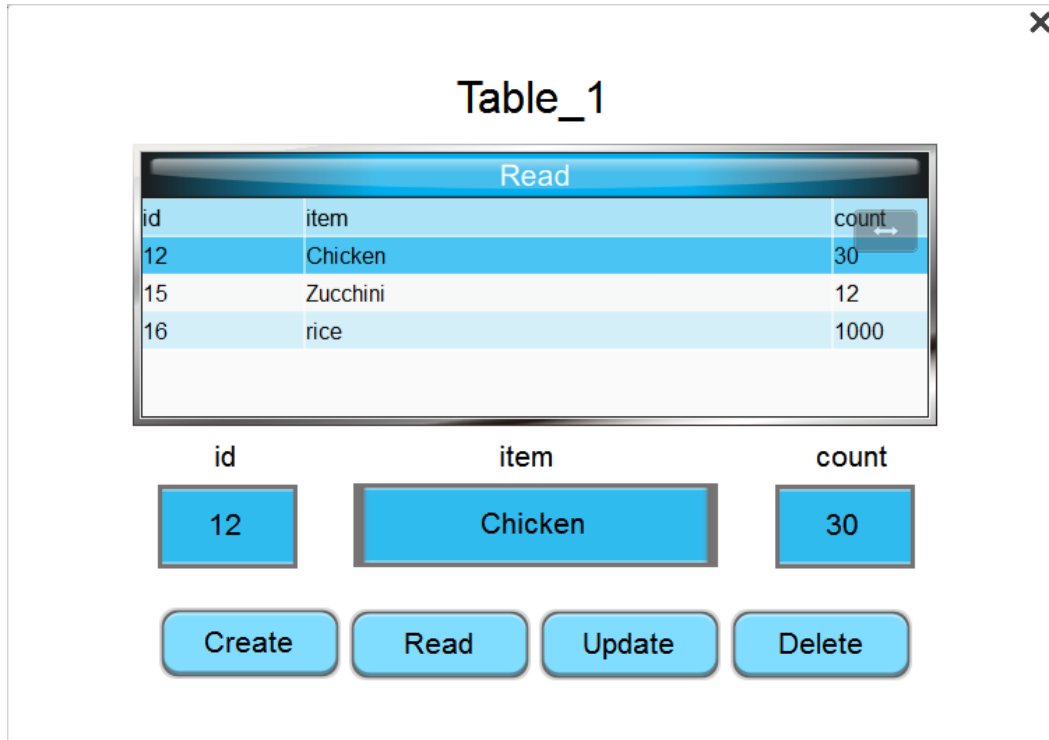
## SQL Query Results Viewer

5. Go to [Data/History] tab and create a [SQL Query Result Viewer] object on the editing area to show the result obtained from SQL server.



| Setting            | Description                                                                                                |
|--------------------|------------------------------------------------------------------------------------------------------------|
| Comment            | User’s comment about this result viewer                                                                    |
| SQL Query          | Select an existing SQL Query to show its result.                                                           |
| Style/ Style Color | Select a style and a color for this result viewer.                                                         |
| Text               | Set the font, font size, and font color for the text shown in this result viewer.                          |
| Caption            | Set the font size and font color for the caption of this result viewer                                     |
| Table              | This group box opens when selecting Default as style. The attributes of the query table can be configured. |
| Filter enabled     | When selected, the user can enter keywords in the SQL Query Result Viewer to search for specific text.     |

- Testing:** When writing a constant value 2 (Command no.2: Select all) via **Set Word** object (**Read**) to the control address of the SQL query. The data will be retrieved from the SQL server and be displayed on **SQL Query Result Viewer** (Table) and **Schema registers** (Blue Boxes). You can edit the contents of the Schema Registers and click **Update** (writes constant value of 3 to control address) to edit the data in the table on the database. New entries can be created and deleted using command no.1 and 4 respectively. After executing a command, read from the table again to update the SQL Query result viewer object.



**Note:** When you write the command ID to LW-200 (Command ID register) via **Set Word** object to send a SQL command, you must wait for the value to return to 0 and before sending the next command to the SQL server.

## Advanced Mode

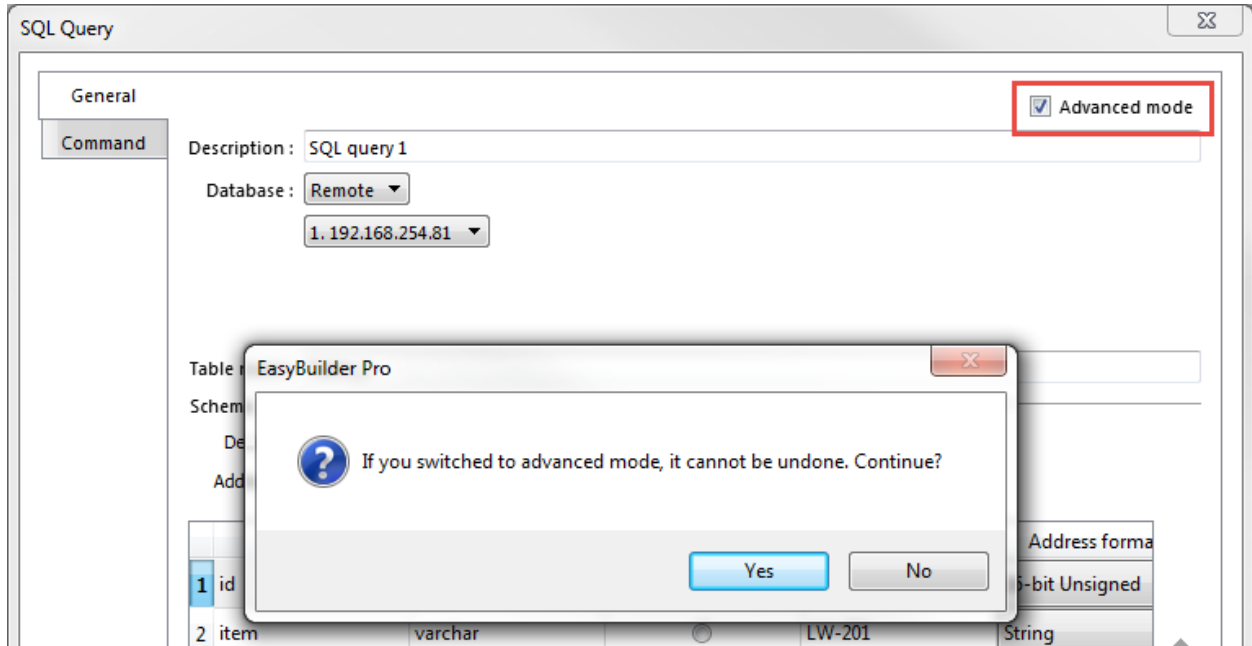
In the advanced mode of the SQL Query object, you can write your own SQL statements instead of just using the four basic commands.

For Example:

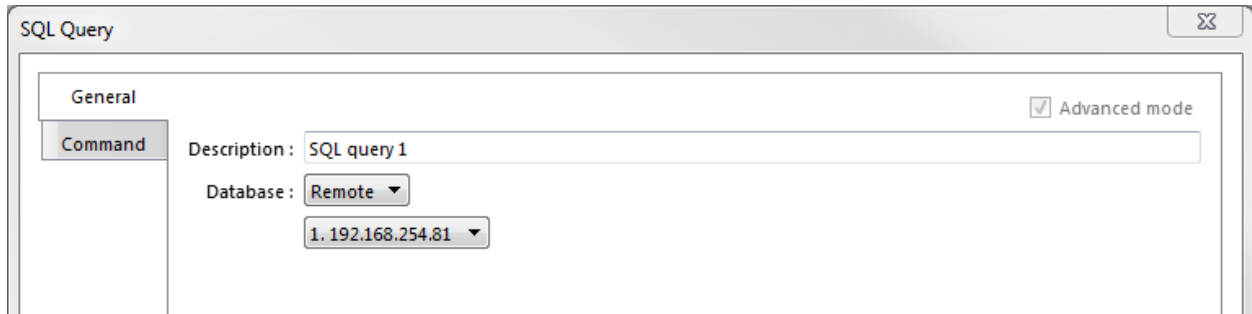
```
SELECT [default_name_1], [default_name_2], [default_name_3] FROM [table_name] where
[default_name_2] =20;
```

PK : default\_name\_1

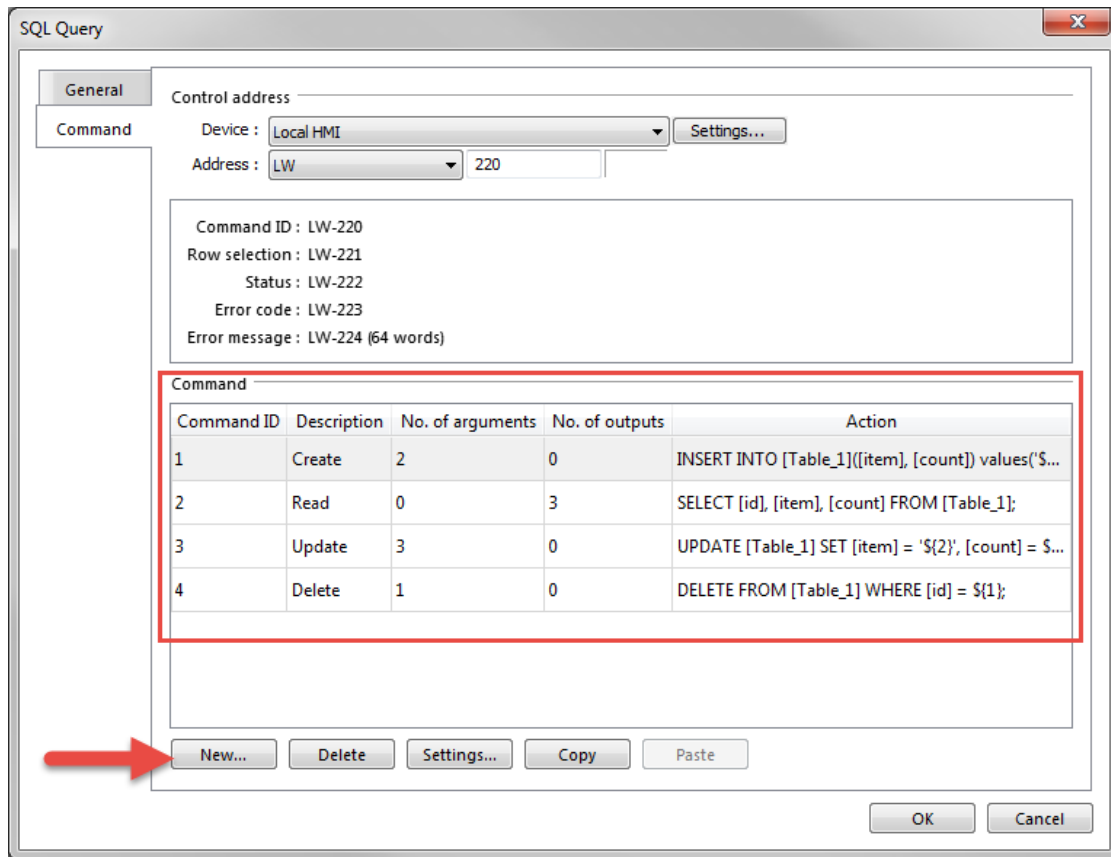
1. Go to [Data/History] tab >> [SQL Query]. Create a [SQL Query] object. To write your own SQL Query commands, check the [Advanced mode] checkbox. Once you switch to advanced mode, it cannot be undone for that SQL Query object.



- 2. On the [General] tab: After advanced mode is enabled, the user interface will be displayed as shown. Select a database server for querying.

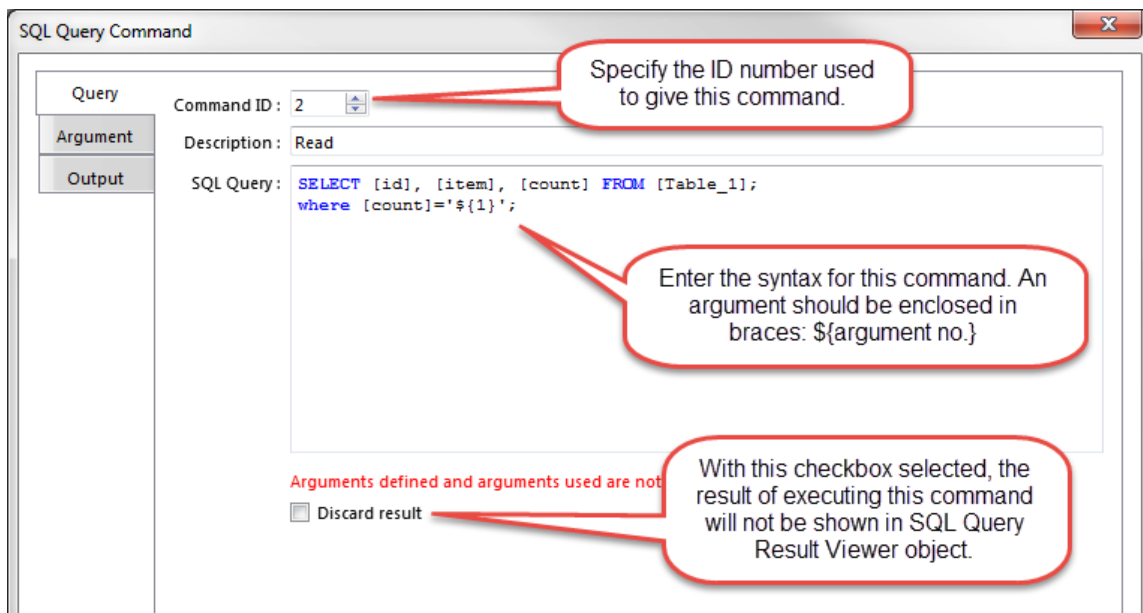


- 3. On the [Command] tab: Click [New] to create a command or click [Settings] to modify a command.



### Query Tab

- The command window comes up as shown. There are three tabs to set up for a SQL command. On the [Query] tab: Specify a unique command ID and write a SQL command with MS SQL syntax (T-SQL).



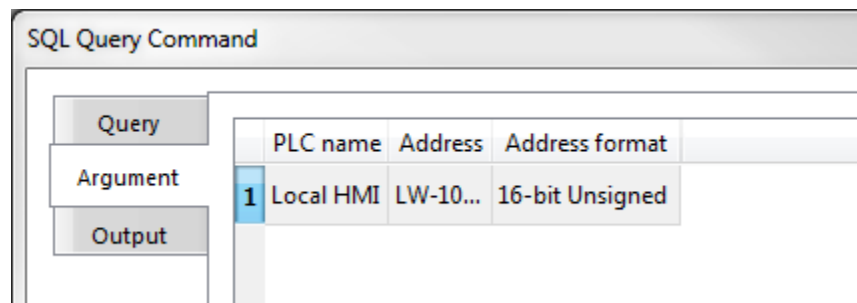
**Note:** You will need to define the arguments used in the query before you can save the command.

| Setting        | Description                                                                                                                                                                                                                                                         |
|----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Command ID     | Specify the ID number used to give this command.                                                                                                                                                                                                                    |
| Description    | Enter the description of this command.                                                                                                                                                                                                                              |
| SQL Query      | Enter the syntax for this command. An argument should be enclosed in braces: $\${argument\ no.}$                                                                                                                                                                    |
| Discard result | When selected, the result of executing this command will not be shown in SQL Query Result Viewer object. This checkbox can be selected for commands that are done directly to the database that do not require a result, such as INSERT INTO, UPDATE, DELETE...etc. |

### Argument Tab

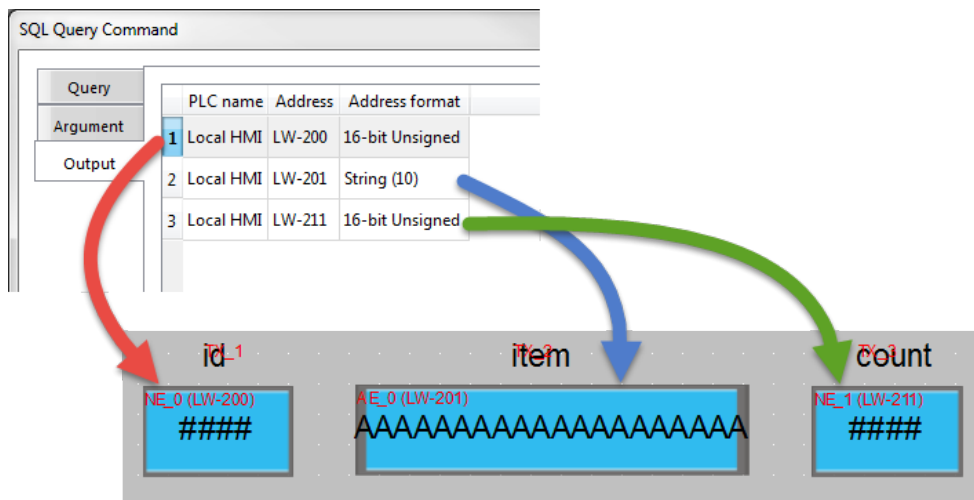
- [Argument] tab: If arguments are used in the syntax of a command in the [Query] tab, like the example code below, the HMI will refer to the addresses specified in this tab corresponding to the argument number enclosed in  $\${argument\ no.}$

```
SELECT [id], [item], [count] FROM [Table_1] where [count] = $\${1}$ ;
```



### Output Tab

- [Output] tab: When the HMI successfully reads data from the SQL server, the result will be transferred to the addresses specified in this tab. This tab will be hidden if the **Discard result** option in [Query] tab is enabled.



### Example

**Testing:** Enter a value to the box below the [Read] button and click on [Read]. [Read] means running the command ID no.2 (Select command) via **Set Word** object to the control address of the SQL query. If the value exists in the SQL database, data will be displayed on the table and the specified **Output** registers.

The screenshot shows a window titled 'cMT Viewer (Simulation)' containing a 'Table\_1' interface. At the top center is a 'Read' dialog box with a table containing one row: id: 15, item: Zucchini, count: 12. Below the dialog are four buttons: 'Create', 'Read', 'Update', and 'Delete'. Under 'Commands:' is a text input field containing '12'. Below that are three output registers labeled 'id', 'item', and 'count', with values '15', 'Zucchini', and '12' respectively.

The screenshot shows a SQL Server query window titled 'PC2300\SQLEXPRESS...use - dbo.Table\_1'. It displays a table with the following data:

|    | id   | item     | count |
|----|------|----------|-------|
|    | 12   | Chicken  | 30    |
|    | 15   | Zucchini | 12    |
|    | 16   | Rice     | 1000  |
| »* | NULL | NULL     | NULL  |



## References

1. Download Microsoft SQL Server 2017 Express edition: <https://www.microsoft.com/en-us/sql-server/sql-server-editions-express>
2. Download SQL Server Management Studio (SSMS): <https://docs.microsoft.com/en-us/sql/ssms/download-sql-server-management-studio-ssms?view=sql-server-2017>
3. Microsoft SQL Server Express 2017 requires .NET Framework 4.7.2, available here: <https://dotnet.microsoft.com/download/dotnet-framework/net472>
4. Tutorial: Connect to and query a SQL Server instance by using SQL Server Management Studio (SSMS): <https://docs.microsoft.com/en-us/sql/ssms/tutorials/connect-query-sql-server?view=sql-server-2017>

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