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Weintek HMI to MySQL Database Server

Introduction: This document discusses how to configure the SQL Sync and SQL Query features in Easybuilder Pro. The SQL Query feature in Weintek HMIs allow a user to query a SQL database and populate tags with the queried values. Data can vary from recipe information to other key production information. Historical data collected on an HMI such as "Data Sampling" can also be transferred to a MySQL server. This document was designed for those who have a basic understanding of MySQL servers and focuses on how to program SQL functionalities in Easybuilder Pro.

Equipment & Software:

A) cMT3090 (cMT Series HMI)
B) MySQL Server X64
C) MySQL Workbench X64

Note:

1.If you download MySQL Server 8.0 or use a later version for installation, please select "**Use Legacy Authentication Method (Retain MYSQL 5.x Compatibility)**" on the Authentication Method menu during the installation.

2. The Weintek HMI requires a user credential to log in to your MySQL server. To create a user account within MySQL server using MySQL Workbench, please follow the steps below:

I. Log in to your MySQL Workbench with your root account.
II. Go to the **Users and Privileges** tab.
III. Create a user account on the **Login** tab. After entering the user credentials, click on the [Apply] button.
IV. On the **Administrator Roles** tab, select all the **roles** as well as **privileges**. Then click on the [Apply] button.

3. The Weintek HMI requires a database in your MySQL server to store data or query the database. To create a database using MySQL Workbench, please follow the steps below:

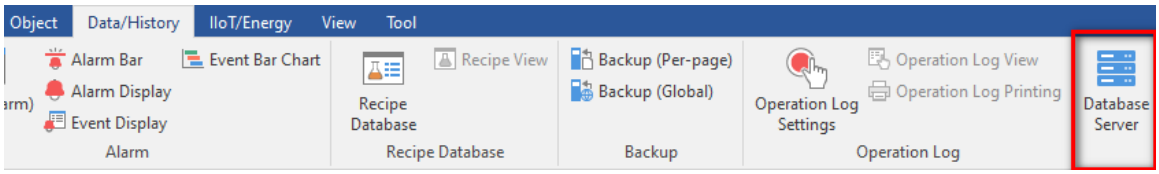
I. Log in to your MySQL Workbench with your root account.
II. Click the [Create a new schema in the connected server] button on the toolbar.
III. Give a name to the database and then click on the [Apply] button.
IV. The MySQL Workbench will prompt you to review the SQL Scripts. Click the [Apply] button.
V. Click on the [Finish] button on the next dialog.

Contents:

Chapter 1. Configuration of Database Server Object

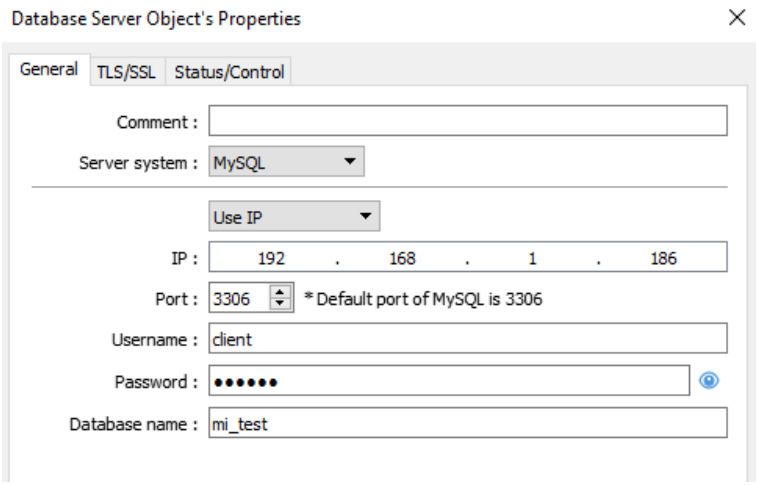
This object allows a Weintek HMI to connect to your MySQL database server and access the specified database. You must establish a MySQL connection before following the steps in **Chapter 2**, **Chapter 3**, or **Chapter 4**.

1. Launch Easybuilder pro and open your project. Go to the [Data/History] tab » [Database Server].



2.Click on the [New] button to add a database server.

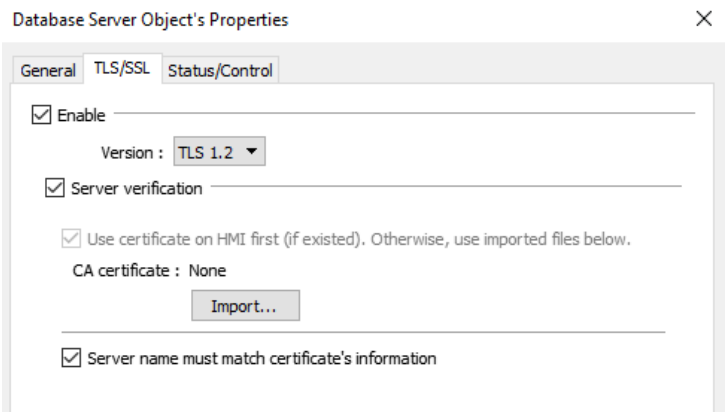
On the [General] tab, enter the IP address, port number, and a user account for your MySQL server. **Database name** depends on what database you want to use for SQL Sync or SQL Query.



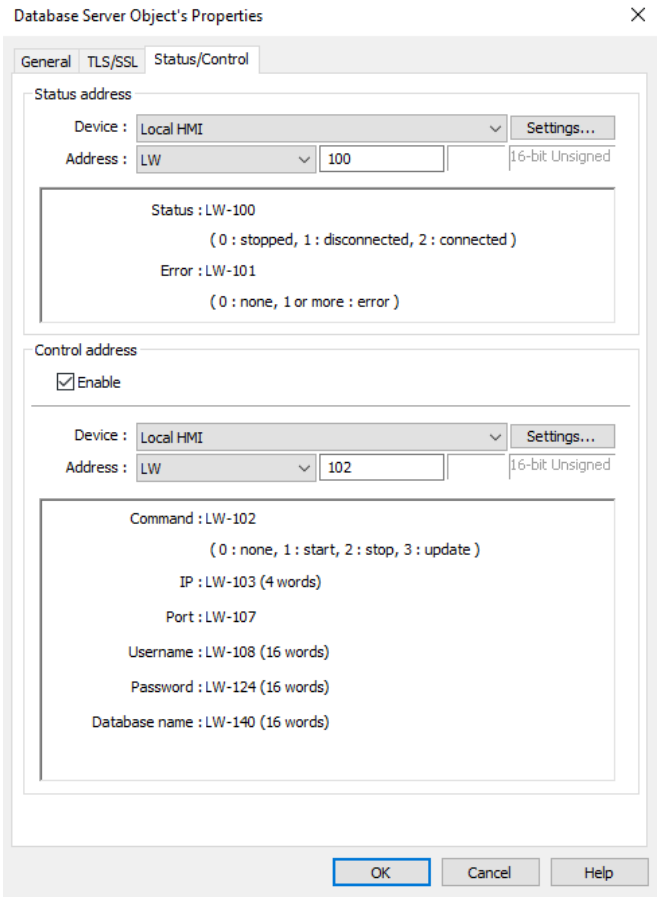
3.On the [TLS/SSL] tab, you can enable TLS/SSL encryption and server verification when using MySQL as your server. This feature is available in Easybuilder Pro v6.04.01.250 or greater.

Version: supports TLS1.0, 1.1, and 1.2.

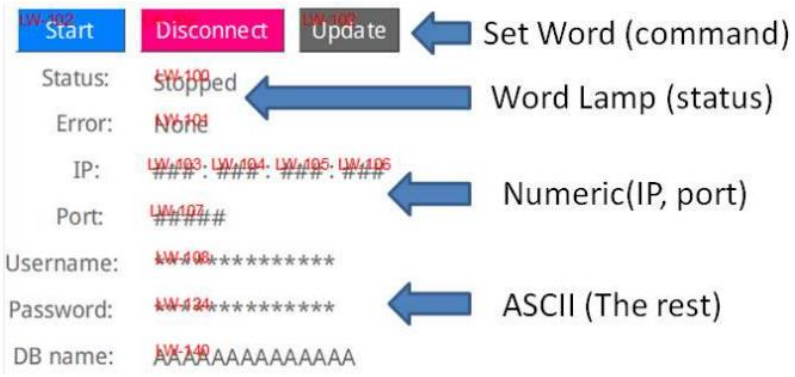
Server verification: If selected, please import your CA certificate.



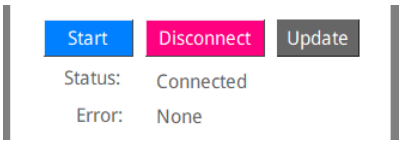
4.On the [Status/Control] tab, define the **Status address** to display the connection status on the HMI screen. You can define a **Control address** if enabled to change the following server parameters on the HMI screen during runtime.



5.Create the following objects on the editing area. These objects are used to monitor and control the MySQL server connection.



Once the Weintek HMI succeeds in connecting to the MySQL server, the “Connected” message will be displayed in the Status address.



Status: displays the connection status

Value	Description
0	Not attempting to connect to the server
1	Failed to connect to the server
2	Connected to the server

Error: displays the error code

Value	Description
0	No error
1	Unknown error
2	Failed to connect to database
3	Database blocks the unauthorized connection
4	Incorrect database name
5	Invalid domain name

Chapter 2. Configuration of SQL Sync

The **Sync to database** option will be available in the **Data Sampling** and the **Event Log** after you finish the steps in **Chapter 1**.

Data Sampling

Follow these steps after you have created your data logs in **Data Sampling.**

1.Go to the [Data/History] tab » [Data sampling].

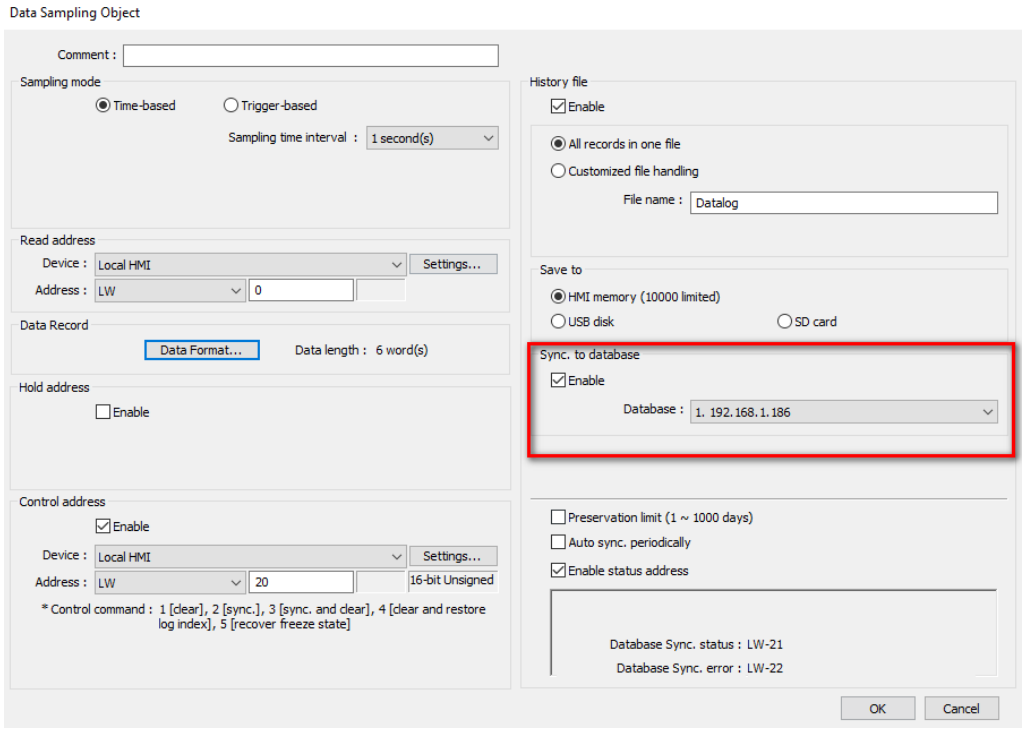
2. Under **History file** select [Enable] and then select the [Sync to database] option. Once configured, select a database server to store your historical data.

Note: SQL sync. does NOT support "**Customized file handling**." You must select "**All records in one file**."

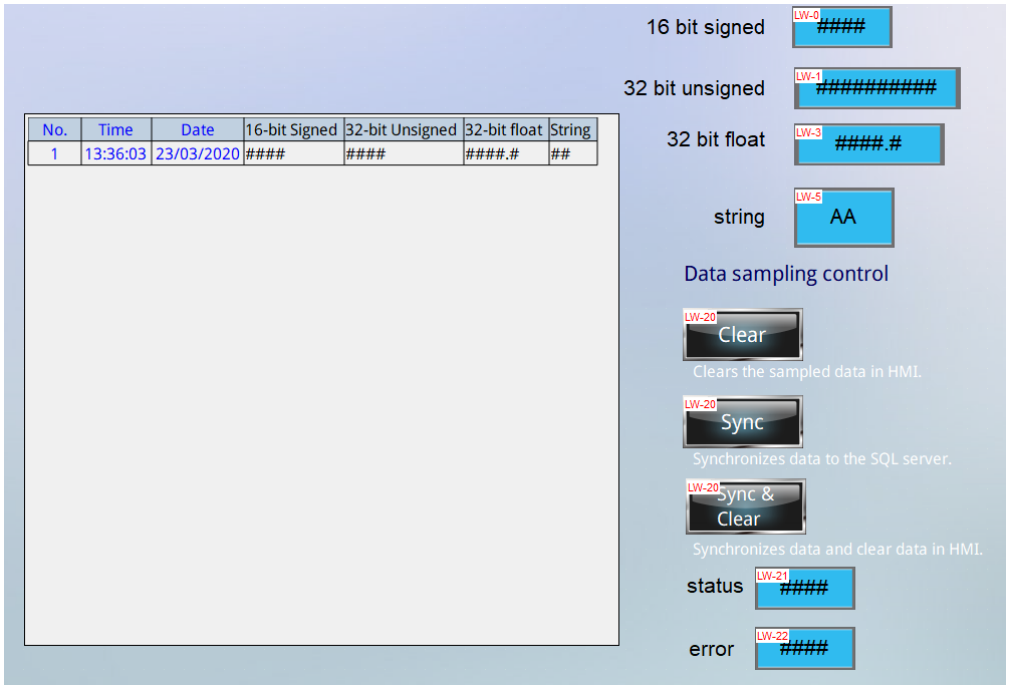
3.You can enable a **Control address** to trigger the following actions by issuing the corresponding commands. The HMI will perform auto synchronization at the specified time interval if **Auto sync. Periodically** is enabled.

Command Number	Description
1	This command will clear all logged records in the HMI flash memory.
2	This command will synchronize the historical data to the MySQL server.
3	This command will synchronize the historical data to the MySQL server and then clear all logged records in the HMI flash memory.

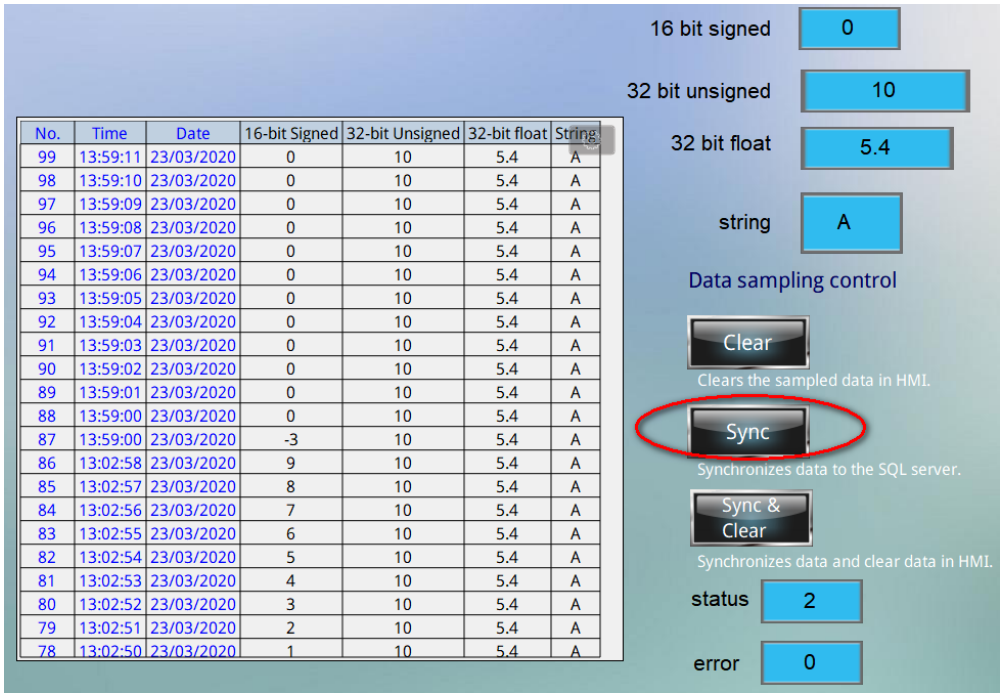
For more information about the **Control address**, please refer to the Easybuilder Pro user manual.



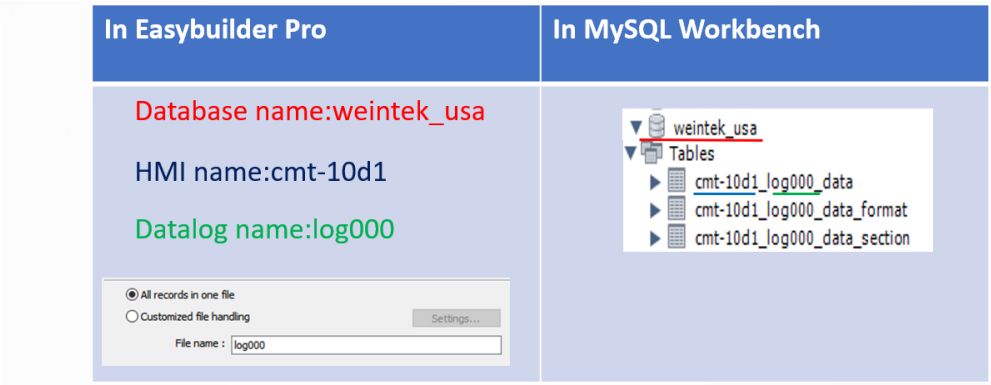
Screen Shot of the Final Project



Testing – Click the [Sync] button, which is used to issue command #2 via a **Set Word** object. If the sync succeeds, the following three tables will be generated in your database.



No.	Time	Date	16-bit Signed	32-bit Unsigned	32-bit float	String
99	13:59:11	23/03/2020	0	10	5.4	A
98	13:59:10	23/03/2020	0	10	5.4	A
97	13:59:09	23/03/2020	0	10	5.4	A
96	13:59:08	23/03/2020	0	10	5.4	A
95	13:59:07	23/03/2020	0	10	5.4	A
94	13:59:06	23/03/2020	0	10	5.4	A
93	13:59:05	23/03/2020	0	10	5.4	A
92	13:59:04	23/03/2020	0	10	5.4	A
91	13:59:03	23/03/2020	0	10	5.4	A
90	13:59:02	23/03/2020	0	10	5.4	A
89	13:59:01	23/03/2020	0	10	5.4	A
88	13:59:00	23/03/2020	0	10	5.4	A
87	13:59:00	23/03/2020	-3	10	5.4	A
86	13:02:58	23/03/2020	9	10	5.4	A
85	13:02:57	23/03/2020	8	10	5.4	A
84	13:02:56	23/03/2020	7	10	5.4	A
83	13:02:55	23/03/2020	6	10	5.4	A
82	13:02:54	23/03/2020	5	10	5.4	A
81	13:02:53	23/03/2020	4	10	5.4	A
80	13:02:52	23/03/2020	3	10	5.4	A
79	13:02:51	23/03/2020	2	10	5.4	A
78	13:02:50	23/03/2020	1	10	5.4	A



Datalog – Table naming

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

Note: The HMI will transfer the original data logs to the MySQL server. Please use SELECT statement to get a table that contains specific organized data.

data_index	time@timestamp	data_format_0	data_format_1	data_format_2	data_format_3
1021	1526401437.059	-4	30	21.600000381469727	BLOB
1022	1526401438.059	-5	40	27	BLOB
1023	1526401439.06	-6	50	32.400001525878906	BLOB
1024	1526401440.059	-7	60	37.80000305175781	BLOB
1025	1526401441.06	-8	70	43.20000457763672	BLOB
1026	1526401442.061	-9	80	48.600006103515625	BLOB
1027	1526401443.061	-10	90	54.00000762939453	BLOB
1028	1526401444.061	-9	100	59.40000915527344	BLOB
1029	1526401445.061	-8	110	64.80001068115234	BLOB
1030	1526401446.061	-7	120	70.20001220703125	BLOB
1031	1526401447.06	-6	130	75.60001373291016	BLOB
1032	1526401448.059	-5	140	81.00001525878906	BLOB

Event Log

Configuring the SQL Sync for the Event Log is similar to the Data Sampling section. Follow these steps after you have created your event logs in **Event Log(Alarm).**

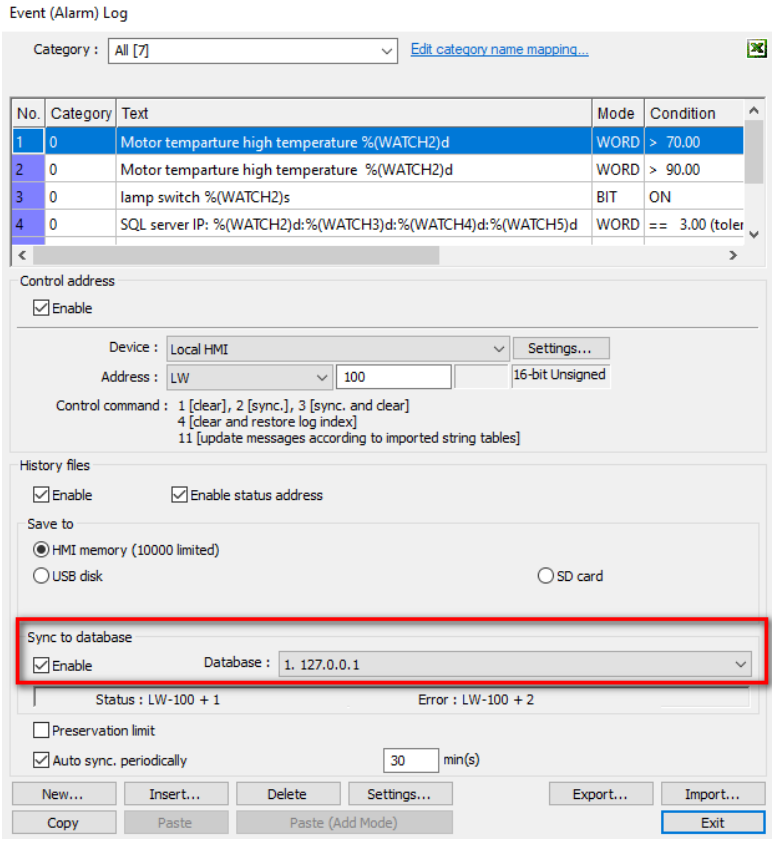
1.Go to the [Data/History] tab » [Event Log].

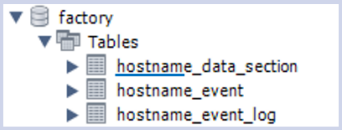
2. Under **History file** select [Enable] and then select the [Sync to database] option. Once configured, select a database server to store your historical data.

3.You can enable a **Control address** to trigger the following actions by issuing the corresponding commands. The HMI will perform auto synchronization at the specified time interval if **Auto sync. Periodically** is enabled.

Command Number	Description
1	This command will clear all logged records in the HMI flash memory.
2	This command will synchronize the historical data to the MySQL server.
3	This command will synchronize the historical data to the MySQL server and then clear all logged records in the HMI flash memory.

For more information about the **Control address**, please refer to the Easybuilder Pro user manual.



In Easybuilder Pro	In MySQL Workbench
HMI name: hostname (simulation)	

Eventlog – Table naming

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

Note: The HMI will transfer the original event logs to the MySQL server. Please use SELECT statement to get a table that contains specific organized data.

Event table displays all events detected by the HMI.

event_index	event_log_index	trigger_time@timestamp	confirm_time@timestamp	recover_time@timestamp
1	1	1584978242.261	NULL	1584978248.262
2	2	1584978246.228	NULL	1584978248.262
3	3	1584978246.26	NULL	1584978256.227
4	6	1584978248.262	NULL	1584978254.294
5	5	1584978258.261	NULL	NULL
6	1	1584978263.293	NULL	1584978269.261
7	3	1584978266.228	NULL	1584978276.261
8	2	1584978267.295	NULL	1584978269.261

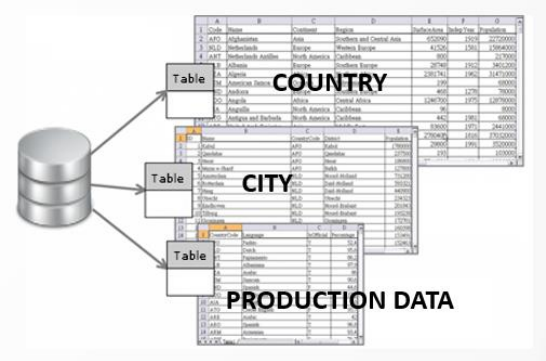
You can look up the event messages in the **event log** table.

event_log_index	GUID	category	priority	language1
1	38c...	0	0	Motor temparture high temperature %(WATCH2)d
2	85d...	0	2	Motor temparture high temperature %(WATCH2)d
3	77d...	0	0	lamp switch %(WATCH2)s
4	ba4...	0	0	SQL server IP: %(WATCH2)d:%(WATCH3)d:%(WATCH4)d:%(WATCH5)d
5	bd7...	0	2	Counter are over %(WATCH2)d times
6	88e...	0	0	Pressure = %(WATCH2)d
7	c2c5...	0	0	Barcode scanned = %(WATCH2)s

Chapter 3. Configuration of SQL Query Using Basic Mode

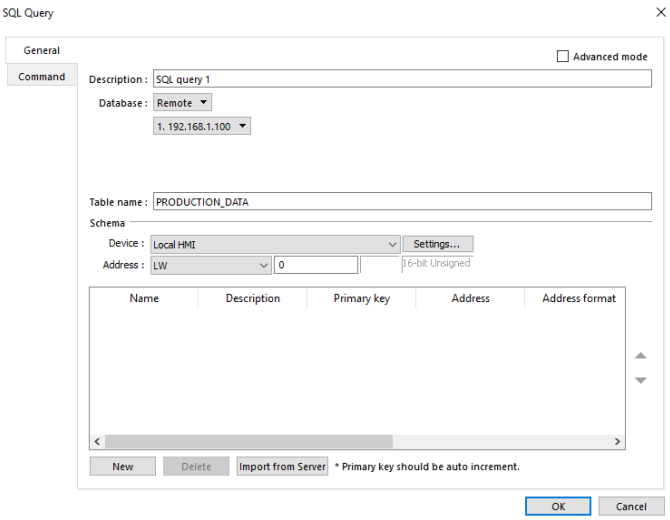
Before you configure a SQL Query object to query your MySQL server, you will need to finish the steps in **Chapter 1**.

A database may contain several tables as shown below. In this example, the HMI will pull out of data from **PRODUCTION_DATA** table.

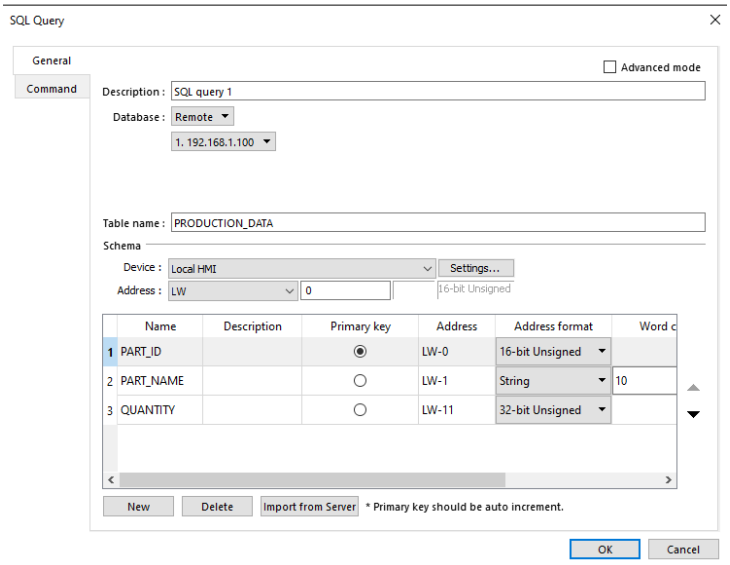


1. Go to the [Data/History] tab » [SQL Query].
2. Click on the [New] button to create a new query.
3. On the [General] tab,
   Database: Select the database server created in the MySQL server.
   Table name: Enter the **table** name created in the MySQL server.
   Schema: Define a register for the **Schema** (column) of the table.

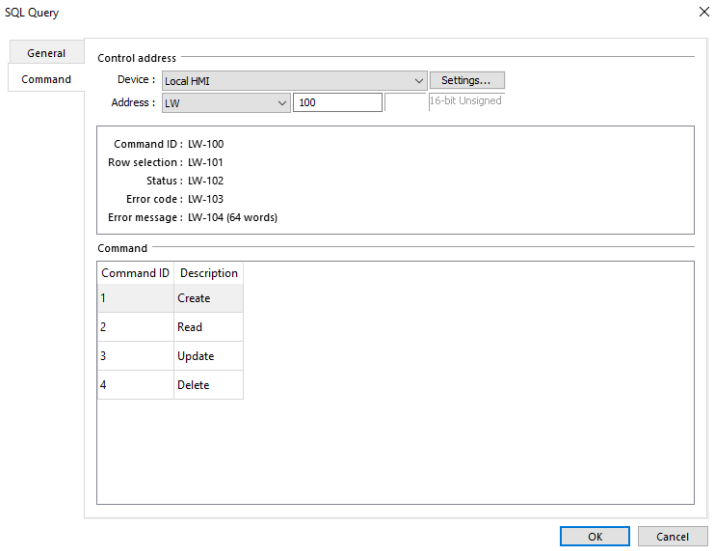
   Click on the [New] button to add the columns of the table or click on [Import from server] to import the column's information from the MySQL server.



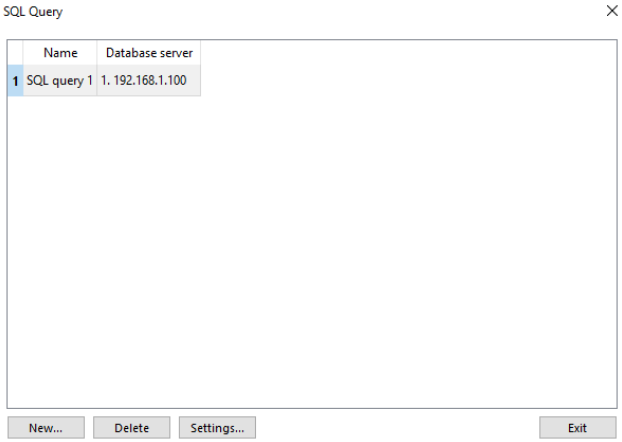
Based on the data format in your MySQL server, select the correct data type for each column under the [Address format] column. If the column is string data, enter the number of words under the [Word count] column.



4. On the [Command] tab, define a register for the Control Address. The following parameters will populate the sequential registers. During runtime, you can query the MySQL server by entering a Command ID into the **Command ID** register, which is LW-100 in this case.
   Create (Issuing Command number 1), **Read** (Issuing Command number 2)
   Update (Issuing Command number 3), and **Delete** (Issuing Command number 4)



5. You can create another SQL query object to query other tables if needed.

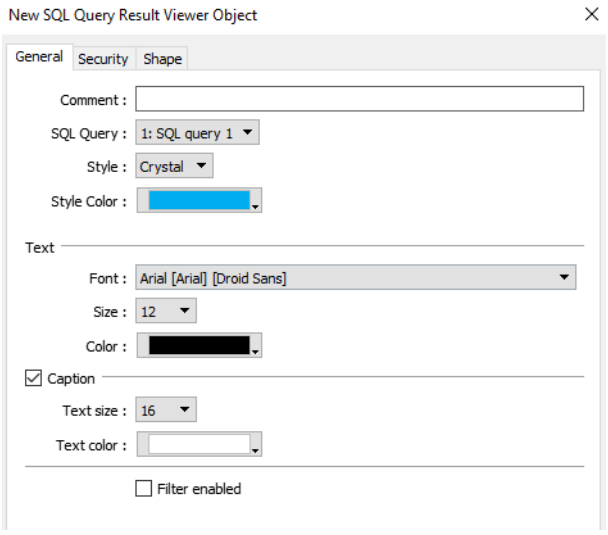


6. Create four **Set Word objects** on the editing area to issue the Commands during runtime.

7. Go to the [Data/History] tab and create a [SQL Query Result Viewer] object on the editing area. Once the HMI succeeds in performing a **Select** command, the result will be displayed in the **SQL Query Result Viewer** object.

   SQL Query: Select an existing SQL Query object.

   Filter enabled: Allows you to enter keywords into this object during runtime to search for a specific record.



Chapter 4. Configuration of SQL Query Using Advanced Mode

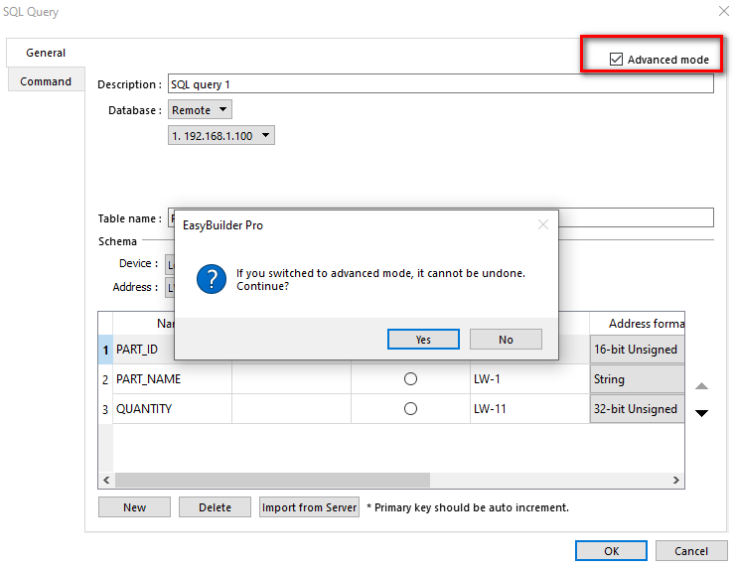
Before you configure a SQL Query object to query your MySQL server, you will need to finish the steps in **Chapter 1**. In advanced mode, you can write your own SQL statement to perform a specific query.

For example, SELECT [column_no_1], [column_no_2], [column_no_3] FROM [table_name] where [default_name_2] =20;

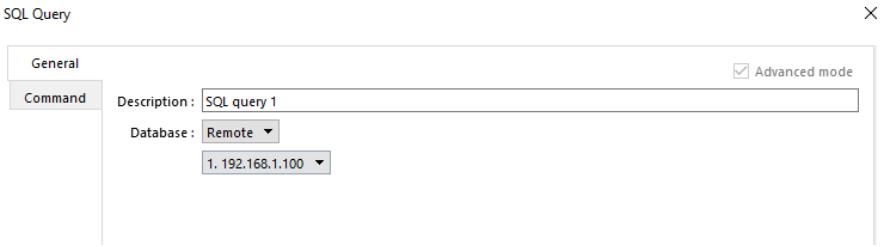
PK (Primary Key): column_no_1

1. Go to the [Data/History] tab » [SQL Query]. Then click on the [New] button to create a new query.

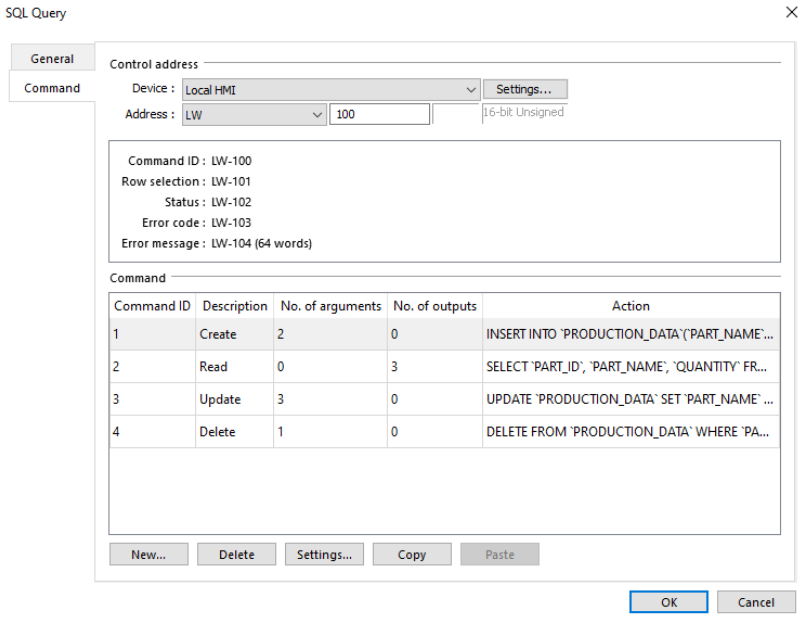
2. The SQL Query which is set to Basic mode, like the one you created in **Chapter 3**, can switch to advanced mode. Once you check the [Advanced mode] checkbox, it cannot be undone for that SQL Query.



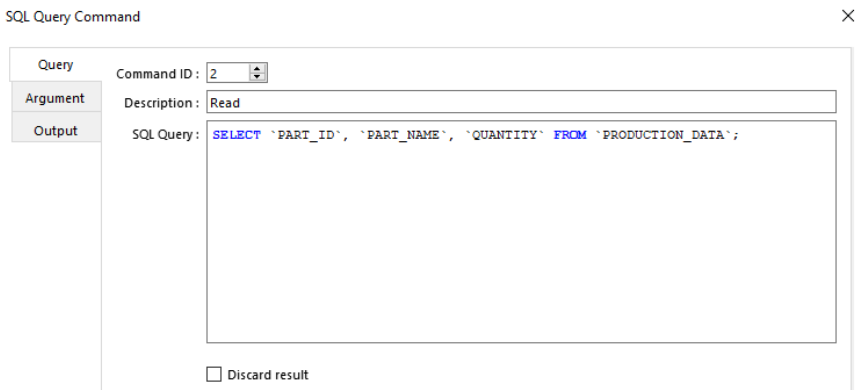
3. The setting dialog will be displayed as shown after being switched to advanced mode. On the [General] tab, select a MySQL server.

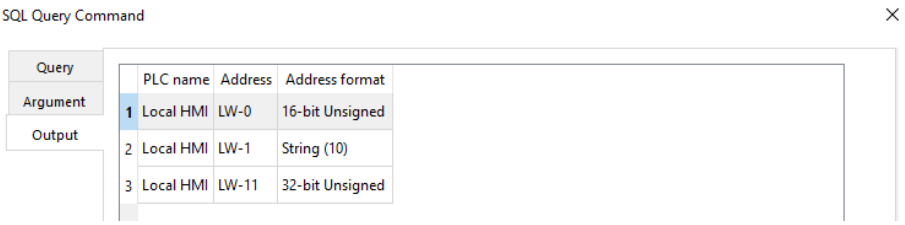


4. On the [Command] tab, there are four SQL commands converted to the following format.
   No. of arguments: the number of data columns you want to be dynamic.
   No. of outputs: the number of data columns used for the result.
   Click the [New] button to create a command or click the [Settings] button to modify the selected command.



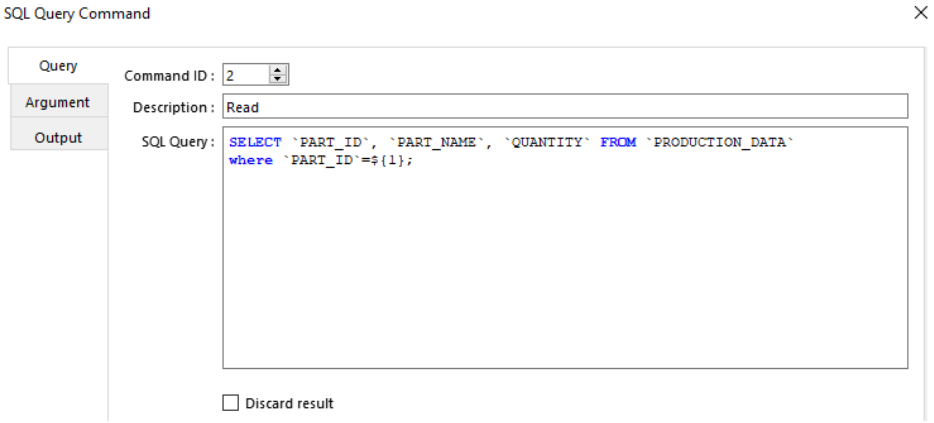
5. How to configure a static query:
   The Select command as shown is configured to be static, so there is no register defined on the [Argument] tab. The result will populate the registers defined on the [Output] tab.
   Command ID: Specify the ID number used to issue this command.
   SQL Query: Enter the SQL statements for this query.
   Discard result: If checked, the result of issuing this command won't be shown on a **SQL Query Result Viewer** object.





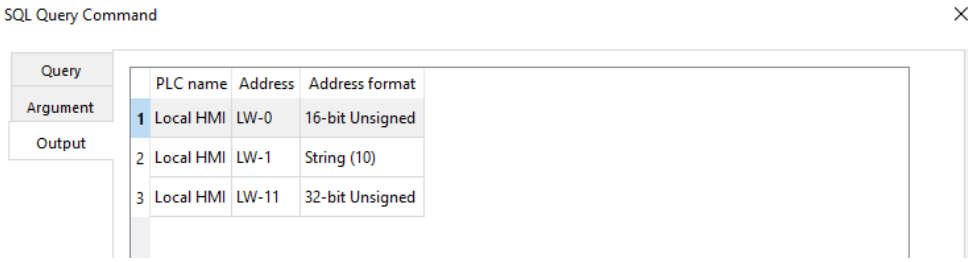
How to configure a dynamic query:

The Select command as shown is configured to be dynamic. The value of **Part_ID** will be determined during runtime, so **${argument number}** is used in the query to represent the value.

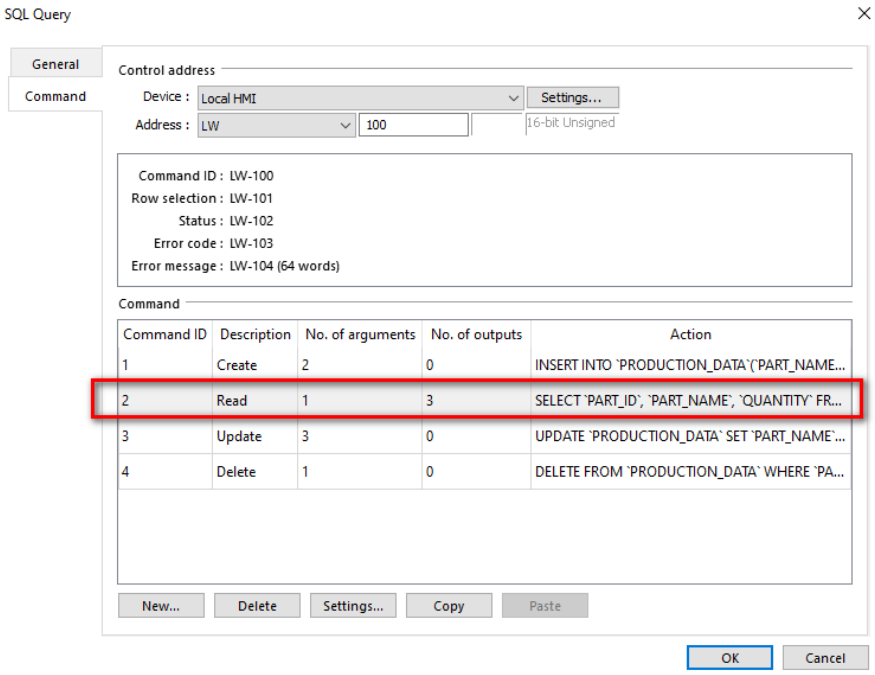


On [Argument] tab, specify a register for the argument. The HMI will refer to the registers specified on this tab corresponding to the **argument number** enclosed in **${ }**

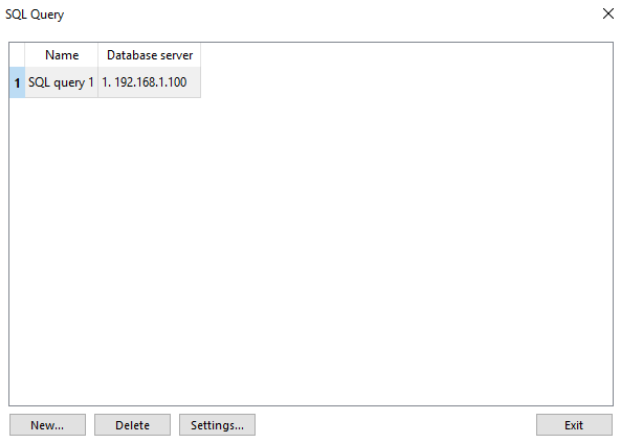
On [Result] tab, specify registers for the result. The result will populate the specified registers.



Once completing the dynamic configuration, the value of **No. of arguments** will be 1.



6. You can create another SQL query to query other tables if needed.

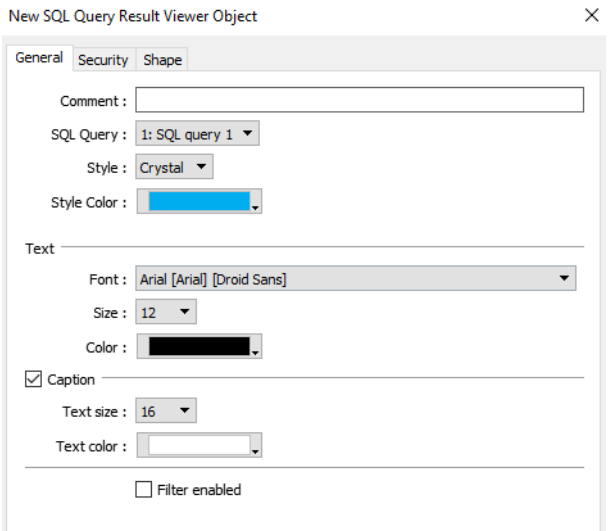


7. Create four **Set Word objects** on the editing area to issue the commands during runtime.

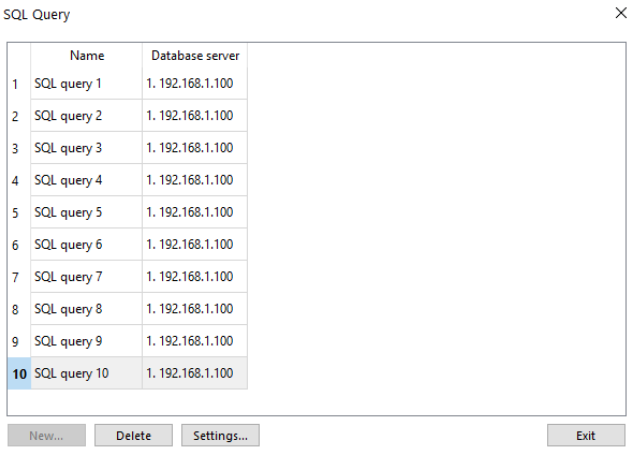
8. Go to the [Data/History] tab and create a [SQL Query Result Viewer] object on the editing area. Once the HMI succeeds in performing a Select command, the result will be displayed on the **SQL Query Result Viewer** object.

   SQL Query: Select an existing SQL Query object.

   Filter enabled: Allows you to enter keywords into this object during runtime to search for a specific record.



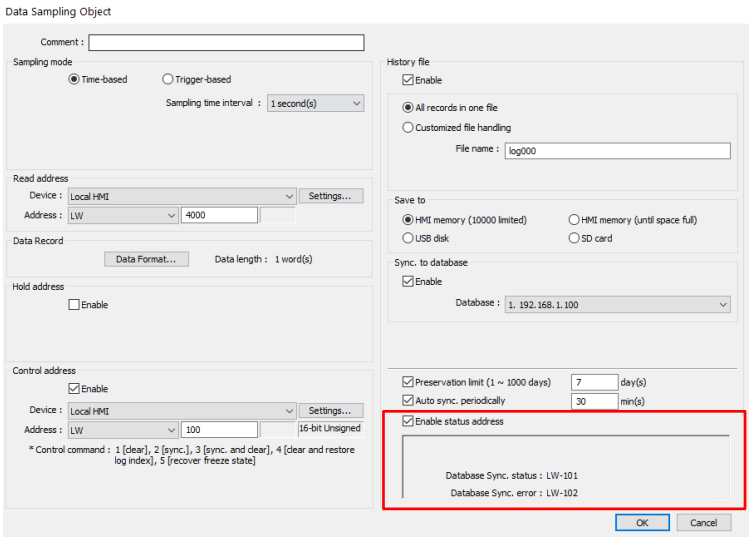
Note: Up to 10 SQL queries can be created in the **SQL Query** object.



Appendix A

The **SQL Sync** and **SQL Query** features provide status registers to simplify troubleshooting during runtime.

SQL SYNC



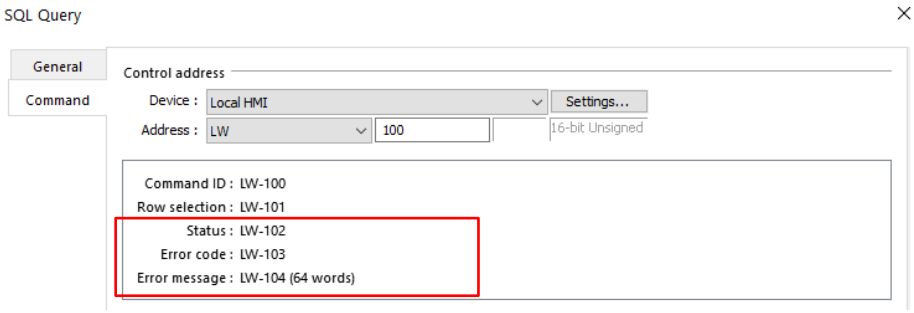
Database Sync. Status

Value	Description
0	Disconnected from the database server
1	Connecting with the database server
2	Connected with the database server
3	Storing records into the archive. When this is done, the value returns to 2.

Database Sync. Error

Error Code	Description
0	No error
1	Unknown error
2	Failed to connect with the database server
3	Access denied
4	Wrong database name
5	Inconsistent data format
6	Failed to open table
7	Failed to create table
8	Failed to write table

SQL Query



Status

Value	Description
0	Normal
1	Query result exceeds 1000 records (rows). Use LIMIT clause to reduce number of rows.

Error

Error Code	Description
0	No error
1	Unknown error
2	Invalid command
3	Database Server is not connected yet
4	Argument cannot be read
5	Cannot write and output
6	Incorrect number of arguments
7	Error in MySQL, please read error message
8	Unsupported datatype
9	The number of columns exceeds the limit
10	The number of rows exceeds the limit
11	Unable to read local database directory
12	Name of local database does not exist
13	Internal error

Appendix B

Converting Datatype in SQL Query

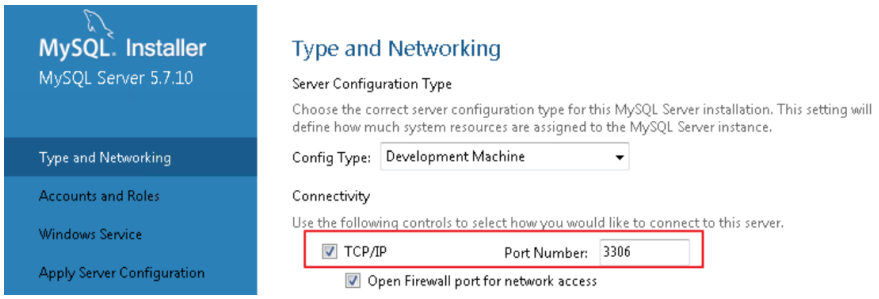
If data type conversion cannot run properly, error code 5 will show in the specified error register. For example, when converting MySQL's INT into EB Pro's 16-bit unsigned, error code 5 will show if the value exceeds the limit of 16-bit unsigned data.

MySQL data format	EasyBuilder Pro datatype
TINYINT SMALLINT MEDIUMINT INT BIGINT BIT	16/32-bit BCD 16/32-bit HEX 16/32-bit Binary 16/32-bit Signed 16/32-bit Unsigned
FLOAT DOUBLE DECIMAL	32-bit Float
DATETIME CHAR, BINARY VARCHAR, VARBINARY TINYBLOB, TINYTEXT BLOB, TEXT MEDIUMBLOB, MEDIUMTEXT LONGBLOB, LONGTEXT	String

Appendix C

Opening firewall port for network access

Your PC which runs the MySQL server needs to allow traffic going to the defined TCP port to pass through. The **Open Firewall port** option is available during the MySQL installation.



You can manually configure the firewall port by the following these steps.

Steps to configure Windows Firewall in Windows 10

1. In your Windows 10 PC, launch **Windows Defender Firewall with Advanced Security**.
2. Right click [Inbound Rules] and then select [New Rule…].
3. On the **Rule Type** menu, select [Port] and click the [Next] button.
4. On the **Protocol and Ports** menu, select [TCP] and add the port number of your MySQL server (Example:3306) into [Specific local ports] as below. Click the [Next] button.
5. On the **Action** menu, select [Allow the connection] and click the [Next] button.
6. On the **Profile** menu, select the network types as you see fit your network.
    - Domain
    - Private
    - Public
7. On the **Name** menu, name the rule, add a description, and click the [Finish] button.

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