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SQL Synchronization and SQL Query to MS SQL Database

Introduction: This document discusses how to configure the SQL Sync and SQL Query feature in Easybuilder Pro and assist programmers in successfully connecting to **Microsoft SQL Server**. This document also explains how to install and configure Microsoft SQL Express step by step.

Equipment & Software:

- A) cMT3090 (cMT Series HMI)
- B) Microsoft SQL Express 2017, which includes SQL Server and SQL Server Management Studio(SSMS).

Note: Easybuilder pro version 6.01.01 and greater supports MS SQL functionalities. In this document, Easybuilder pro V6.01.01.292 is used.

MS SQL Installation:

MS SQL Express 2017 (14.x), which is a free and limited version of SQL software, is installed and used in the following demonstration. Users can purchase and install other versions based on needs. Most of the steps during the installation can be kept on *Default*. However, the authentication mode must be set to "*Mix Mode*" to allow Weintek HMIs to access the MS SQL server.

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

SOL Server 2017 Setup						_		×
and a server corr becop								
Database Engine Config	guration							
Specify Database Engine authen	tication security mode.	administrators, da	ta directori	es and TempDi	B settinas.			
	· · · ·				,			
License Terms	Server Configuration	Data Directories	TempDB	User Instance	s FILESTRE	AM		
Global Rules								
Product Updates	Specify the authenti	ication mode and	administra	tors for the Dat	tabase Engir	ne.		
Install Setup Files	Authentication Mod	ie						
Install Rules	○ <u>W</u> indows authen	tication mode						
Feature Selection	ture Selection							
Feature Rules	O mixed mode (se	e server souriende		Throoms bound	inconony			
Instance Configuration Specify the password for the SQL Server system administrator (sa) account.								
Server Configuration	Enter password:	•••••						
Database Engine Configuration	Confirm password:	•••••						Κ.
Feature Configuration Rules	c <u>o</u> mm passirona.							- 1
Installation Progress	Specify SQL Server a	dministrators —						-
Complete	MAO-LAPTOP\Mac	o (Mao)				SQL Server a	dministrato	rs
						have unrestr to the Datab	icted access ase Engine.	
	Add Current User	Add	amova					_
	Add <u>C</u> uffent Oser	<u>M</u> 00 <u>P</u>	emove					
								_
				< Ba	vck 🗌	Next >	Cancel	
				- <u>P</u>	~~	Truck	Concer	

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Chapter1. Configuration of MS SQL Server

After finishing the installation, the available utilities will be displayed as shown below. The following instructions show you how to configure SQL Server Configuration Manager and SQL Server Management Studio.



How to configure MS SQL Server

- 1. Launch SQL Server Configuration Manager.
- 2. Enable TCP/IP protocol in [TCP/IP Properties] because Weintek HMIs connect to the MS SQL server via TCP/IP protocol.
- 3. Expand [SQL Server Network Configuration].
- 4. Click on [Protocols for SQLEXPRESS].
- 5. Click on [TCP/IP].
- 6. Select [Yes].

SQL Server Configuration Manager (Local) SQL Server Services J SQL Server Network Configuration (32bit) SQL Server Network Configuration (32bit) J SQL Server Network Configuration (32bit) J SQL Server Network Configuration (32bit) J SQL Server Network Configuration J Protocols for SQLEXPRESS J SQL Native Client 11.0 Configuration	Protocol Name Shared Memory Named Pipes TCP/IP	Status Enabled Disabled Enabled			
J See Haure client the conliguration	TCP/IP Properties	i		?	×
	Protocol IP Add	esses			
	General Enabled Keep Alive Listen Ali		Yes 30000 Yes		•
	Enabled				

 Under the [IP Addresses] tab, the default port of MS SQL server is 1433. However, the port number can be changed depending on the project's requirements.

SQL Server Configuration Manager (Local)	Protocol Name Status		
■ SQL Server Services ■ SQL Server Network Configuration (32bit ■ SQL Server Network Configuration (32) ■ SQL Server Network Configuration ■ Protocols for SQLEXPRESS ■ SQL Native Client 11.0 Configuration	Protocol Name Status Stared Memory Enable Named Pipes Disable TCP/IP Enable	ed led ed	
	TCP/IP Properties	?	×
	Protocol IP Addresses		
	TCP Dynamic Ports TCP Port IP8 Active Enabled IP Address TCP Dynamic Ports TCP Port IP9 Active Enabled IP Address TCP Dynamic Ports TCP Port	0 Yes No fe80::a09a:12a4:1a3a:d499%9 0 Yes No 10.1.10.249 0	
	TCP Dynamic Ports	1433	

- 8. The changes will take effect after restarting the service, so you will need to restart the SQL server by the following steps.
 - I. Click on [SQL Server Services].
- II. Right click on [SQL Server (MSS..].
- III. Select [Restart].



Chapter2. Configuration of SSMS (SQL Server Management Studio)

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

Server type:	Database Engine	~		
Server name:	DESKTOP-HCLETDT\SQLEXPRESS			
Authentication:	Windows Authentication			
User name: Password:	DESKTOP-HCLETDT\WeintekUSA_Engineer	~		

Windows Authentication

	SQ	Serve	r	
Server type:	Databa	se Engine		~
Server name:	DESKTOP-HCLETDT\SQLEXPRESS			~
Authentication:	SQL Server Authentication			~
Login:	sa			~
Password:		*****		
	F	Remember passwor	d	
	Connect	Cancel	Help	Options >>

SQL Server Authentication

The user interface of SSMS will be displayed as shown.



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



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

Server Properties - DESKTOP	-HCLETDT\SQLEXPRESS			-		\times
Select a page	🖵 Script 🔻 😯 Help					
General General General Processors Security Connections Database Settings Advanced Pemissions	Server authentication Windows Authentication mo SQL Server and Windows / Login auditing None Failed logins only Successful logins only Both failed and successful l Server proxy account	ode Authentication mode				
Connection	Enable server proxy accourt	t				
Server: DESKTOP-HCLETDT\SQLEXPRE	Proxy account: Password:	******				
Connection: sa	Options					
₩ View connection properties	 Enable C2 audit tracing Cross database ownership of 	chaining				
Progress						
Ready						
			[ОК	Can	cel

How to add a Database

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



4. In the [General] tab, enter the desired name for this database. Click on [OK].

Select a page	🖵 Script 🔻 😮	Help			
 Options Filegroups 	Database name: Owner:	3	Warehouse <default></default>	9	
	Use full-text in Database files:	ndexing			
	Logical Name	File Type	Filegroup	Initial Size (MB)	Autogrowth / Maxsize
	Warehouse	ROWS	PRIMARY	8	By 64 MB, Unlimited
	Warehouse_	LOG	Not Applicable	8	By 64 MB, Unlimited
Server: DESKTOP-HCLETDT\SQLEXPRE Connection: sa y <u>Y</u> <u>View connection properties</u>					
Ponnecsion Server: DESKTOP-HCLETDT\SQLEXPRE Connection: sa yÿ <u>View connection properties</u> ?rogress					

5. The new database will be listed under Databases.



How to add user accounts

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

😡 Microsoft SQL Se	rver Management Studio
File Edit View	Debug Tools Window Help
0-0 13-1	: - 🛀 🔛 🔐 📙 New Query 🗯 😭 🔬 요. 요. 요.
Object Explorer	≁ ù ×
Connect - 🛱 🎽 ≡	▼ Ů **
E DESKTOP-HCLE	TDT\SQLEXPRESS (SQL Server 14.0.1000 - sa)
Databases	
Security	
	New Login
	Filter in##
2	Start PowerShell
 ≜	Reports
	SS SS
L	QLEXPRESS
NT S	ERVICE\SQLWriter
	EKVICE\Winmgmt
M Sd	

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

Select a page					
🔑 General	L Script • 🕜 Help				
 Server Roles User Mapping Securables Status 	Login name:	1			Search
	 SQL Server authentication Password: 				
	Specify old password				
	Old password				
	Enforce password policy				
	Enforce password expira	ition			
	User must change pass	word at next login			
	 Mapped to certificate 			~	
Connection	O Mapped to asymmetric key			~	
Server: DESKTOP-HCLETDT\SQLEXPRE	Map to Credential			~	
Connection: sa	Mapped Credentials	Credential	Provider		
View connection properties					
Progress					
Ready	Default database:	master		~	
		1 222			

8. In the [User Mapping] tab, select database roles for this user. Check the following Database roles checkbox, including **db_datareader**, **db_datawritter**, and **db_owner**.

🖋 General	🖵 Script 👻 😮 Help		
Server Roles	Users mapped to this login:		
 Securables Status 	Map Database master model model stab	User	Default Schema
Connection Server: DESKTOP-HCLETDT\SQLE	Guest account enabled for XPRE Database role membership for.	: Warehouse . Warehouse	
Connection: sa	db_accessadmin db_backupoperator		
Y¥ View connection propert	db_datawriter		
भ्रम् <u>View connection propert</u>	db_datawriter db_ddladmin db_ddladmin db_denydatareader db_denydatawriter ✓ db_owner		

Chapter 3. Configuration of SQL Sync

This chapter demonstrates how to program the SQL Sync. feature in Easybuilder Pro. You can synchronize data logs and event logs to your SQL server.



Adding a database server in EBpro

- 1. Launch Easybuilder pro. Go to [Data/History] tab » [Database Server]. Click on the [New] button to add a database server.
- On the [General] tab, choose [MS SQL server] for 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 use for data synchronization.

Note:

- I. Weintek HMIs cannot use **Windows Authentication**.
- II. Instead of entering the IP address, there are two more options to connect to your MS SQL server in EasyBuilder Pro v6.02.02 or greater.
 - Use IP: Enter the IP address of the database
 - Use domain name: Enter the Microsoft PC Name

• Use server name: The server name stands for the **instance** name of the MS SQL server and can be in one of the following formats.

<Computer name>\<Instance name>

<Computer name> (connection to a default instance: MSSQLSERVER)

<IP address>\<Instance name>

<IP address> (connection to a default: MSSQLSERVER)

Database Server			×
General Status/Contr	ol		
Comment :			
Server system : MS S	SQL Server 🔻		
lp:	10 . 1 .	10 . 249	Use domain name
Port : 1433	+ Default port of MS S	QL Server is 1433	
Username : Weir	ntek_usa		
Password : 1111	11		
Database name : Ware	ehouse		

3. 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.

Database Server		>
General Status	/Control	
Status address		
Device :	Local HMI V Settings	
Address :	LW ~ 100	
	Status : LW-100	
	(0:stopped, 1:disconnected, 2:connected)	
	Error : LW-101	
	(0: none, 1 or more : error)	
🗹 Enable		
Device :	Local HMI V Settings	-
Device : Address :	Local HMI v Settings LW v 102	_
Device : Address :	Local HMI v Settings LW v 102	_
Device : Address :	Local HMI	_
Device : Address :	Local HMI V Settings LW V 102 Command : LW-102 (0 : none, 1 : start, 2 : stop, 3 : update) IP : LW-103 (4 words)	_
Device : Address :	Local HMI V Settings LW 102 Command : LW-102 (0 : none, 1 : start, 2 : stop, 3 : update) IP : LW-103 (4 words) Port : LW-107	
Device : Address :	Local HMI V Settings 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)	
Device : Address :	Local HMI VIO2 LWV 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)	
Device : Address : Data	Local HMI V Settings UW 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) base name : LW-140 (16 words)	

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



Once the Weintek HMI succeeds in connecting to the MS SQL 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

Data Log Sync.

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

1. Go to the [Data/History] tab » [Data sampling]. 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. doesn't support "Customized file handling." You must select "All records in one file."

2. 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	Description
Number	
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.

Data Sampling	g Object				
Commen Sampling mode	Time-based) Trigger-based Sampling time interval :	1 second(s) V	History file Pinable O All records in one file Customized file handling File name : Datalon	
Read address Device : L Address : L	Local HIMI LW	~ 0	✓ Settings	Save to	O USB disk O SD card
Hold address	Data Format.	Data length : Mode :	6 word(s) DN v	Sync. to database ⊘Enable Database : 1, 10,1,10,249	~
Device : L Address : L	Local HMI LB	~ 20	✓ Settings		
Control address	s Z Enable			Preservation limit (1 ~ 1000 days) Auto sync. periodically	
Device : L Address : L * Control cr	Local HMI LW ommand : 1 [clear], 2 [st log index], 5 [v 20 ync.], 3 [sync. and dear], recover freeze state]	Settings I6-bit Unsigned 4 [dear and restore	∐Enable status address	
					OK Cancel

- 3. Create three **Set Word** objects on the editing area for the **Control address** of data sampling.
 - I. Write constant value 1 to clear data.
 - II. Write constant value 2 to sync data.
 - III. Write constant value 3 to sync data and then remove duplicate data on the HMI.

New Set Word Objec	t	\times
General Security	Shape Label	
Comment :]
Write address		-
Device : Loca	I HMI V Settings	
Address : LW	 ✓ 20 16-bit Unsigned 	
	Write after button is released	
Notification	Enable	
Attribute Set Style : Set value :	Write constant value ~	

4. Go to the [Data/History] tab » [History Data Display]. Create this object on the editing area.

Screen Shot of the Final Project as shown below.

_							Start	Disconnect Update
No.	Time	Date	16-bit Signed	32-bit Unsigned	32-bit float St	ring	Status:	Stopped
	14:46:32	12/10/2018	####	####	#### #	#	Error:	None
							IP:	###:###:###:###
							Port:	#####
							Username:	АААААААААААААА
						- 10	Password:	АААААААААААААА
							DB name:	АААААААААААААА
							Clear Clears the sa Sync Synchronize	ampled data in HMI.
							Hold	ling data

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.

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

灵 SQLQuery4.sql - MAO-LAPTOP.cmt (sa (55)) - Microsoft !	SQL Server Manageme	nt Studio				Quick Launch (Ctrl+Q)	ρ.	
Eile Edit View Query Project Debug Tools	Window Help							
😋 - 💿 🏠 - 눕 - 🖕 🔛 🔐 🗿 New Query 🗿	8 8 8 8 X	D a ୨·୧	- 8			- 🗇 Generic Debugger -		- 🎜
Object Explorer 🛛 👻 🕂 🗙	SQLQuery4.sql - M	APTOP.cmt (sa (55)) 🕫 🗙					
Connect = 🕴 🍟 🔳 🝸 🗳 🚸	/***** S	cript for Sele	ctTopNRows o	ommand from	SSMS *****/			4
A MAO-LAPTOP (SOL Server 14.0.1000 - sa)	- SELECT TO	P (1000) [data	_index]					1
Databases	, [d	ata format 01						
🗊 🧰 System Databases	, [d	ata_format_1]						
🕀 🛑 Database Snapshots	, [di	ata_format_2]						
🗉 🛢 cmt	FROM [cr	nt].[dbo].[hos	tname_log000	_data]				
🕀 🛑 Database Diagrams								
🖂 📁 Tables								
🗉 🗰 System Tables								
ileTables								
External Tables								
🕀 📕 Graph Tables								
🗉 🎹 dbo.demo								
dbo.hostname_data_section	100 % 🔹 <							-)-
dbo.hostname_event	III Results of a	lassages						
co. III dhe herteame event lee	data index	time@timestamo	data format 0	data format 1	data format 2			
	1	1527587086.68	46	44	10			
	2	1527587087 715	47	44	10			
	2	1527597099 715	49	44	10			
() = VICVI2		1527597099 714	49	44	10			
External Resources	5	1527597090 714	50	44	10			
🗉 🧮 Synonyms	6	1527507030.714	50	44	10			
Programmability		1527567031.715	51	44	10			
Service Broker	/	152/56/032./14	52	44	10			
🔬 🚃 Storage		1527507004 712	55		10			
🗑 💼 Security	9 10	152/56/094./13	24	44	10			
🖶 🚃 Security	0 10	102/06/095./15	33	44	10			_
	Query executed	i successfully.				MAO-LAPTOP (14.0 RTM) sa (55) cmt 00:00	100 100	0 rows

Tables are automatically created by the HMI.

For example,

In Easybuilder Pro	In SQL Server Management Studio
Database name:Warehouse HMI name:hostname(simulation) Datalog name:log000	 Warehouse ∰ dbo.hostname_log000_data ∰ dbo.hostname_log000_data_format ∰ dbo.hostname_log000_data_section
Customized file handling Settings File name : log000	

Table	Description
dbo. <hmi name="">_<datalog name="">_data</datalog></hmi>	Saves data sampling
dbo. <hmi name="">_<datalog name="">_data_format</datalog></hmi>	System folder
dbo. <hmi name="">_<datalog name="">_data_section</datalog></hmi>	System folder

Datalog -Table naming

Event log Sync.

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.

0	Category :	AII [7]		~ Ed	it category name map	ping				×
No.	Category	Text			Mode	Condition	^			
1	0	Motor t	emparture	high tempera	ture %(WATCH2)	d		WORD	> 70.00	
2	0	Motor t	emparture	high tempera	ture %(WATCH2)	d		WORD	> 90.00	
3	0	lamp switch %(WATCH2)s							ON	
4	0	SQL server IP: %(WATCH2)d:%(WATCH3)d:%(WATCH4)d:%(WATCH5)d							== 3.00	1
5	0	Couter are %(WATCH2)d times							> 30.00	~
<									>	
		Address :	LW		- 100		16-bit Unsigned			
6	Enable									
	Control	command	: 1 [dear],	2 [sync.], 3 [syn	ic. and dear]					
			4 [dear a 11 [updat	nd restore log ind te messages acco	dex] ording to imported str	ring table	s]			
His	tory files									
E	Enable		Enable	status address						
Sa	ave to									
0	HMI mem	ory (1000	0 limited)							
() USB disk			Os	iD card					
S	vnc to data	base								
			Data	base : 1, 10, 1,	10.249					
F	Enable			and the second						222
5	Enable									
6	∑Enable									
6	✓ Enable Preserva	tion limit								
6 [[✓ Enable Preserva Auto syn	tion limit c. periodic	aly							
6	<pre> Enable Preserva Auto syn New</pre>	tion limit c. periodic Int	aly ert	Delete	Settings		Expor	t	Import	

Command	Description
Number	
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.

- 4. Create three **Set Word** objects on the editing area for the **Control address** of data sampling.
 - I. Write constant value 1 to clear data.
 - II. Write constant value 2 to sync data.
 - III. Write constant value 3 to sync data and then remove duplicate data on the HMI.
- 5. Go to the [Data/History] tab » [Event Display]. Create this object on the editing area.

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.

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.



Tables are automatically created by the HMI.

For example,

In Easybuilder Pro	In SQL Server Management Studio
Database name:Warehouse HMI name: hostname (simulation)	 Warehouse ⊕ dbo.hostname_data_section ⊕ ⊕ dbo.hostname_event ⊕ ⊕ dbo.hostname event ↓ ⊕ ⊕ ⊕

Table	Description
dbo. <hmi name="">_event</hmi>	Saves event log
dbo. <hmi name="">_event_log</hmi>	Save event information
dbo. <hmi name="">_data_section</hmi>	System folder

Table naming of Event log

Chapter 4. Configuration of SQL Query

Weintek HMIs can perform CRUD operations (**C**reate, **R**ead, **U**pdate, **D**elete) to query the MS SQL server.



Creating a table in MS SQL server

1. Launch SSMS. Then create a table in SSMS because the HMI won't create a table within the database server. Right click on [Tables] and select [Table].

🔜 Solution1 - Micro	osoft SQL Server Management Studio
File Edit View	Project Debug Tools Window Help
S - C 🏠 - 🖞	ා - 🖕 💾 🍟 🚨 New Query 🔎 🔬 බූ බූ 🔝 🖓 🕹 ් බ 🔊
Object Explorer	→ ∄ ×
Connect 👻 🏺 🎽 🗏	T C ++
😑 🐻 DESKTOP-HCL	ETDT\SQLEXPRESS (SQL Server 14.0.1000 - sa)
🖃 🛑 Databases	
🗉 🛑 System	Databases
🕀 🛑 Databas	e Snapshots
🖃 🗑 Wareho	use
💼 Data	abase Diagrams
🖃 💻 Tab	Table
🕀 🗰 1	
E 📫	File Table
÷ 📫	Memory Optimized Table
۰ 💻 🗉	Node Table
• •	Edge Table
± == -	
• •	Filter
	Start PowerShell
	Keports •
	Refresh
	the bestrame event log
	aboaroscharne_evenc_log

2. 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 to Null. In this case, "id" will be the Primary Key.

DESKTOP-HCLETDT\use - dbo.Table_1* + ×								
	Column Name	Allow Nulls						
	id	int						
	item	nchar(10)	\checkmark					
Þ	count	int	\checkmark					

3. To set Primary Key, right click on [id] and select [Set Primary Key].

D	ESKTO	OP-HCLETDT\use - dbo.	Table_1* ↔ ×	
		Column Name	Data Type	Allow Nulls
D	i a		int .	
·	70	Set Primary Key		
	Ū.	Insert Column		
	×	Delete Column		
	캶	Relationships		
	蝐	Indexes/Keys		
		Fulltext Index		
	٦	XML Indexes		
	===	Check Constraints		
	2Y	Spatial Indexes		
	∎Ţ	Generate Change Script.		
	۶	Properties	Alt+Enter	

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

Column Name	Data Type	Allow Nulls					
id	int						
item	nchar(10)						
count	int						
lumn Properties							
21							
(General)							
(Name)			id				
Allow Nulls			No				
Data Type			int				
Default Value or Bindir	ng						
 Table Designer 							
Collation			<database defa<="" td=""></database>				
Computed Column Sp	Computed Column Specification						
Condensed Data Type			int				
Description							
Deterministic			Yes				
DTS-published			No				
Full-text Specification			No				
Has Non-SOL Server S	ubscriber		No				
 Identity Specification 			Yes				
(Is Identity)			Yes				
Identity Increment	t		1				
Identity Seed			1				
Indexable			res				
Is Columnset			No				
Is Sparse			No				
Merge-published			No				
			No				
Not For Replication							
Not For Replication Replicated			No				

5. To save this table, Right click this tab and select [Save Table_1].



6. Enter a desired name for the table.



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

Object Explorer	DESKTOP-HCLETDT\ dbo.weintek_usa → ×				
Connect ▼ ¥ ¥ = ▼ C →			Column Name	Data Type	Allow Nulls
DESKTOP-HCLETDT\SQLEXPRESS (SQL Server 14.0.1000 - sa)		₽ ₿	id	int	
🖃 🛑 Databases			item	nchar(10)	\checkmark
🕀 💼 System Databases			count	int	
🕀 💼 Database Snapshots					
🖃 🗑 Warehouse					
📕 Database Diagrams					
🖃 💼 Tables					
🕀 💼 System Tables					
🕀 💼 FileTables					
🕀 💼 External Tables					
🕀 💼 Graph Tables					
🗉 🎛 dbo.cMT-10D1_Datalog_data					
🖽 🎹 dbo.cMT-10D1_Datalog_data_format					
🖽 🎹 dbo.cMT-10D1_Datalog_data_section					
🕀 🎛 dbo.hostname_data_section					
🕀 🎹 dbo.hostname_Datalog_data					
표 🧰 dbo.hostname_Datalog_data_format					
🕀 🎛 dbo.hostname_Datalog_data_section					
🕀 🎹 dbo.hostname_event					
🗉 🎹 dbo.hostname_event_log					
🕀 🌐 dbo.weintek_usa					

Note: 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.

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

Supported data type

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



9. Enter the data into each cell.

Object Explorer 🔹 🖣 🗙	DESKT	OP-HCLETDT\ dl	oo.weintek_usa 👳	×
Connect 🕶 🌹 🎽 🔲 🍸 🖒 🚸		id	item	count
BESKTOP-HCLETDT\SQLEXPRESS (SQL Server 14.0.1000 - sa)		1	wine	20
🖃 📕 Databases		2	coke	13
🗉 💼 System Databases)-m	NULL	NULL	NULL
표 🛑 Database Snapshots				
🖃 🗑 Warehouse				
📁 Database Diagrams				
🖃 💼 Tables				
🕀 🛑 System Tables				
🕀 💼 FileTables				
🕀 🛑 External Tables				
🕀 🛑 Graph Tables				
🕀 🎹 dbo.cMT-10D1_Datalog_data				
🕀 🎹 dbo.cMT-10D1_Datalog_data_format				
🕀 🎹 dbo.cMT-10D1_Datalog_data_section				
🕀 🎹 dbo.hostname_data_section				
🗉 🏢 dbo.hostname_Datalog_data				
표 🎹 dbo.hostname_Datalog_data_format				
표 🎹 dbo.hostname_Datalog_data_section				
🗉 🌐 dbo.hostname_event				
표 🧰 dbo.hostname_event_log				
🖃 🎹 dbo.weintek_usa				

Programming SQL Query in Easybuilder Pro

Launch Easybuilder pro. Go to the [Data/History] tab » [Database Server]. Click on the [New] button to add a database server. It is the same as the steps for adding a database for **SQL Sync.** section.

Database Server	
1: Server : 10.1.10.249:1433 User name : Weintek_usa Database : Warehouse	
New Delete Settings	Exit

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

SQL Query Using Basic Mode

2. On the [General] tab, select a database server for querying. Enter a table name and define a register for **Schema**. Click on [New] to add the columns of the table. Another way is to click on the [Import from server] button to import column's information. You will need to select the correct data type for each column under [Address format] based on the data format in your MS SQL server.

SQL Query							×	
General						Advanced m	node	
Command	Description : SQL query 1						Enter the name of	
	Database : 1. 10.1.10.249 🔻							this guery table.
	Table name : weintek_usa							
	Schema				Colliner			
	Address :	LOCALHMI	~ 100		Setungs		-	The data read from database will
			Description	Dimension	A	A 11		be filled into the corresponding
	1 id	lame	Description	Primary key	Address	Address forma		address specified in the schema.
	2 item		varshar	0	1.00-101	String	L	
	2 10011			0	EW-IOI	sung		
	3 count		Int	0	LW-111	16-bit Unsigned		
							-	
								Import the definition
								into EssyRuildor Pro
								into Easybuilder Pro.
	<					>		
	New	Delete	Import from Serv	er * Primary key sh	ould be auto increment			
						OK Ca	ancel	

3. On the [Command] tab, define a register for **Control address**. Create the following objects related to the Control address on the editing area. Each SQL command is given a unique ID number.

S	QL Query									
	General	Control addre	\$5							
	Command	Device :	.ocal HMI			~	 Settings 			
		Address : LW V 200								
		Command	ID : LW-200							
		Row selection	on : LW-201							
		Stat	us : LW-202							
		Error co	de : LW-203							
		Error messa	ge: LW-204 (64 words)						
		Command —								
		Command ID	Description							
		1 Create 2 Read								
		3 Update								
		4 Delete								

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

Set Word Objec	t's Properties	>
General Secu	rity Shape Label Profile	
Comr	nent:	
Write addres	s	
Device :	Local HMI	
Address :	LW v 200 16-bit Unsigned	
	Write after button is released	
- Notification -	Enable	
Attribute Set 1	Style : Write constant value	~
Set v	value : 1	

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

SQL Query Result Viewer Object's Properties	×	
General Security Shape Profile Comment :		Select an existing SQL Query to show its result.
Text Font : Arial [Arial] [Droid Sans]	1	
Size : 12 Color : Color : Caption Text size : 16 Text color :	_	With this checkbox selected, enter keywords in SQL Query Result Viewer to search for specific text.
Filter enabled		

Testing: When writing constant value 2 (Command no.2: Select all) via **Set Word** object to the control address of the SQL query. The data will be retrieved from the MS SQL server and displayed on **SQL Query Result Viewer** (Table) and **Schema** registers (Blue boxes).

		Read	
id	item		count
1	wine		20
2	coke		13
	create	read update	delete

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

SQL Query Using Advanced Mode

In the advanced mode of **SQL Query** object, you can write your own SQL statements to perform a specific query.

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 the [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.

General						Advanced mo
ommand	Description :	SQL quer	y 3			
	Database :	1. 127.0.0	.1 👻			
	Table name :	table_nan	ne			
	Schema	-				
	Device :	Local HMI		× 5	Settings	
	Address :	LW	~ 0			
	Nam	•	Description	Primany key	Address	Address format

2. On the [General] tab, the user interface will be displayed as below after switching to advanced mode. Select a database server for querying.

QL Query		
General		✓ Advanced mode
Command	Description : SQL query 3	
	Database : 1. 127.0.0.1 💌	

3. On the [Command] tab, click on the [New] button to create a command or click the [Settings] button to modify a command.

Device :	Local HMI			✓ Settings				
Address :	LW	~ 200						
Command	ID : LW-200							
Row selection	on : LW-201							
Stat	us : LW-202							
Error co	Error code : LW-203							
Error messa	ge : LW-204 (64 words)						
Command -								
Command ID	Description	No. of arguments	No. of outputs	Action				
1	Create	2	0	INSERT INTO [weintek_usa]([item], [count]) values('\${1}', \${2});				
2	Read	0	3	SELECT [id], [item], [count] FROM [weintek_usa];				
3	Update	3	0	UPDATE [weintek_usa] SET [item] = '\${2}', [count] = \${3} WHERE [id] = \${1};				
4	Delete	1	0	DELETE FROM [weintek_usa] WHERE [id] = \${1};				

4. On the [Query] tab, the command window comes up as shown. There are three tabs to set up for a SQL command.

Specify a unique command ID and write a SQL command with MS SQL syntax (T-SQL).

QL Query Co	mmand	Specify the ID number used to give this command.
Query	Command ID :	2
Argument	Description :	Read
Output	SQL Query :	<pre>SELECT [id], [item], [count] FROM [weintek_usa] where [count]= \${1}; Enter the syntax for this command. An argument should be enclosed in braces: \${argument no }</pre>
		Discard result With this checkbox selected, the result of executing this command will not be shown in SQL Query Result Viewer object.

5. On the [Argument] tab, if arguments are used in the syntax of a command in the [Query] tab, the HMI will refer to the addresses specified in this tab corresponding to the argument number enclosed in \${argument no.}

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

SQL Query Cor	mmai	nd		
Query		PLC name	Address	Address format
Argument	1	Local HMI	LW-1000	16-bit Unsigned
Output				

6. On the [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 **Discard result** option in [Query] tab is enabled.

L Query Cor	nma	nd					
Query		PLC name	Address	Address format			
Argument	1	Local HMI	LW-100	16-bit Unsigned			
Output	2	Local HMI	LW-101	String (10)			
	3	Local HMI	LW-111	16-bit Unsigned			
					Ouput (Reg	gisters)	
					LW-100	АААААААААААААААААА	W-111 #####
					id	item	count

Testing: Enter a value to the box below the [Read] button and then click on the [Read] button. [Read] means the HMI will issue the command ID no.2 (Select command) via the **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.

item coke			count 13
coke			13
create	read	update	delete
	12		
	15		
Duput (Regi	sters)		
Ouput (Regi	sters)		
2	coke		13
	create Ouput (Regi	create read 13 Ouput (Registers) 2 coke	create read update 13 Ouput (Registers) 2 coke

Appendix A

Troubleshooting: To make sure the HMI is able to establish the connection to the MS SQL server, the PC which runs the MS SQL server needs to allow traffic going to the defined TCP port to pass through. Anti-virus software might block traffic so that the HMI cannot connect to the MS SQL server.

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 MS SQL server into [Specific local ports] as below. Click the [Next] button.

Does this rule apply to TCP or UDI	P?
TCP	
O ODP	
Does this rule apply to all local port O All local ports Specific local ports: 	ts or specific local ports? 1433 Example: 80, 443, 5000-5010

- 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.

Appendix B

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

<u>SQL SYNC</u>

Data Sampling Object	
Comment :	
Sampling mode	History file
Time-based O Trigger-based	Enable
Sampling time interval : 1 second(s) \checkmark	All records in one file
	O Customized file handling
	File name : log000
Read address	
Device : Local HMI V Settings	Save to
Address : LW V 4000	Bildt memory (10000 km/had)
	Ourse state
Data Record	Obse disk Osb card
Data Format Data length : 1 word(s)	Sync. to database
Hold address	Enable
Enable	Database : 1. 192.168.1.100 V
Control address	Propagation limit (1 + 1000 days) 7 day(e)
Enable	Preservation mint (1 ~ 1000 days) 7 day(s)
Device : Local HMI V Settings	Auto sync. periodically 30 min(s)
Address : LW v 100 16-bit Unsigned	Enable status address
* Control command : 1 [dear], 2 [sync.], 3 [sync. and dear], 4 [dear and restore log index], 5 [recover freeze state]	
	Database Sync. status : LW-101
	Database Sync. error : LW-102
	OK Cancel

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

	ntroi address				
ommand	Device : Lo	cal HMI		~	Settings
	Address : LV	/ ~	100		16-bit Unsigned
	Command ID Row selection Status Error code Error message	: LW-100 : LW-101 : LW-102 : LW-103 : LW-104 (64 words)			

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		

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