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cMT-G03 with OPC UA Server

Introduction: To implement IIoT connectivity without changing existing HMI and controller hardware, as well as HMI and controller programs, Weintek has released two Gateway protocol converters, which are cMT-G03 (Serial bridge) and cMT-G04 (Ethernet bridge), to retrofit customers' systems. This document discusses how to utilize cMT-G03 to build the OPC UA server for the serial- based communication machine and allows OPC UA client to access data.

cMT-G03 is equipped with two serial ports to act as a serial bridge. To bridge a cMT-G03 to the device, users need to connect the existing HMI to serial COM1 (IN) of cMT-G03 and connect the existing controller to serial COM2 (OUT) of cMT-G03. This architecture can ensure the communication between the HMI and the controller is not affected. The Ethernet port of cMT-G03 is communication port used for IIoT communication.

Equipment & software:

- 1. HMI
- 2. Hitachi P1 VFD
- 3. cMT-G03

Note: Easybuilder pro version 6.01.02 and greater supports cMT-G03.

Wiring diagram:

Before configuration-

The HMI communicates with the VFD via Modbus RTU protocol.



After configuration-



Hardware configuration:

Serial ports of cMT-G03 -

In this demonstration, RS-485 2W is used in the serial communication between the HMI and the VFD.

_			- HMI		COM1	[RS232-2\	V;RS-485-2	2W/4W],						
	Pin		Pin		COM2 [RS232-2W;RS-485-2W/4W]									
	1 3			D	PIN#	COM1 [RS232]	COM2 [RS232]	PIN#	COI [RS4	M1 85]	CO [RS4	M2 485]		
~	5		5 6 7			2W	2W		4W	2W	4W	2W		
	7		8		1	RXD1		2	Rx1-	Data1-				
	9		10		3	TXD1		4	Rx1+	Data1				
h	11				5	FG		6	Tx1-					
			d"X		7	GND		8	Tx1+					
	13	<u>pe</u>			9		RXD2	10			Rx2-	Data2-		
	15		16 2		11		TXD2	12			Rx2+	Data2+		
					13		FG	14			Tx2-			
-			Control	ler	15		GND	16			Tx2+			

Software configuration:

Launch Easybuilder pro and select the cMT-G03 Gateway(Serial Bridge).

 \times

Den	Model: MT8102iE (1024 x 600) MT8103iE (1024 x 600) ▲ ✓ ▲ XE Series MT8090XE/MT8091XE (1024 x 768) MT8092XE (1024 x 768) ▲ ✓ ▲ KT Series cMT3072 (1024 x 768) ▲ ✓ ▲ cMT Series - cMT3072 (1024 x 768) ▲ ✓ ▲ cMT Series - cMT3072 (1024 x 768) ▲ ✓ ← cMT Series - cMT3080 (1024 x 768) ▲ ✓ ← cMT-Solog ateway cMT-GOI Gateway ▲ ✓ ← cMT Series - Gateway cMT-GOI Gateway (Serial Bridge) ▲ ✓ ▲ mTV Series mTV-100 (1280 x 720) ✓	cMT-G03 Gateway (Serial Bridge)
Uncompress Pro	oject 🕹 Demo Project	OK Cancel

The popup window will be displayed as shown, the window will prompt you to configure the communication parameters of the IN(HMI) and Out(PLC).

System Parameter Settings									
Device	Model	General	System Setting	Remote	Security	Time Sync./DST	e-Mail		
Devic	e list:							What's my IP?	
Seria	alBrige								
	Name :	Local HMI							
								Settings	
In-									
In	Interface : COM 1 (9600,E,8,1)								
I/F p	rotocol :	RS485 2W	1						
							Duplicate From Out	Settings	
Out									
	Name :	Out							
Devi	ce type :	MODBUS	RTU, RTU over T	CP					
In	nterface :	COM 2 (96	500,E,8,1)						
I/F p	rotocol :	RS485 2W	1						
								Settings	
Projec	ct descript	lion:							
L									

Click on [Settings] within [Out].

[Name]: Enter a name of the controller and HMI.

[Device type]: Select this driver "Modbus RTU, RTU over TCP" for the communication of the VFD.

[I/F]: Select **RS-485 2W**.

[COM]: The settings are the same as the parameters that I set up on the VFD.

Click [OK] to exit.

Device Settings					2
Name :	Hitachi VFD with Profxxx H	HMI			
	Device				
Location :	Local V Se	ttings			
* Select Local for a HMI.	device connected to this HI	MI, or Remote	for a device connecte	d through another	
Device type :	MODBUS R	TU, RTU over	TCP •		
	Device ID: 4, V.3.40, MOI	DBUS_RTU.e30	1		
I/F:	RS-485 2W	~	Open Device Connect	ion Guide	
* Support off-line si	mulation on HMI (use LB-12	358)			
* Support communic	ations between HMI and de	evice in pass-th	rough mode		
* Set LW-9903 to 2	to enhance the speed of do	ownload/upload	d device program in pa	ss-through mode	
COM :	COM2 (9600,N,8,1)			Settings	
C	evice default station no. :	1			
	Default station no. use	station no. var	iable		
	Use broadcast comman	d			
	How to designate the statio	n no. in object's	s address?		
Inter	val of block pack (words) :	5 ~	Address Ran		
				ige Limit	
Max. rea	d-command size (words) :	120 ~	Data Conv	ige Limit ersion	
Max. rea Max. writ	d-command size (words) : te-command size (words) :	120 ~ 120 ~	Data Conv	ige Limit	

Click on [Settings] within [Serial Bridge] and enter a name on the popup window.

Click on [Duplicate From Out] to the communication parameters of the HMI.

System Parameter Settings											
Devic	e Model	General	System Setting	Remote	Security	Time Sync./DST	e-Mail				
Devi	ce list:							What's my IP?			
Ser	SerialBrige										
	Name : Weintek cMT-G03										
								Settings			
In-	In Interface : COM 1 (9600 N 8 1)										
I/F	protocol :	RS485 2W									
							Duplicate From Out	Settings			

Click [OK] to close [System Parameter Settings].

You can see the three main steps on the main screen to complete this project.

- *Step 1.* Add a driver into Device List in the project. (This step is completed)
- Step 2. Enable OPC UA Server and designate PLC addresses .
- *Step 3.* Download this project to cMT-G03.



Before starting Step 2., I suggest defining the tags in **Address Tag Library**. It not only avoids accidental reuse of addresses but also improves project readability. Let me show you how to build and use **Address Tag Library**.

Click [Project] » [Address] on the toolbar and the [Address Tag Library] dialog box appears.

File	8 🖶 🖡 🛠	1	* ≯ 4 ≠	Home	Project Obje	ect Data/History	lloT,	/Energy	View	Tool					
Syster Messag	Language ge & Font	K Compile	Online Simulation	Offline Simulation	Download n (PC->HMI)	Build Download F	Reboot HMI	Shape	Picture	e Label	⇒abc xxx String	Macro	@= Address	Group	Sound
9	Setting				Build								Libran	/	

Click [New] button to add a tag.

fined tags	O System tags			* Edit system,	tag.xml to customer	categories of system tag	ps .	
Tagname			PLC name		Address	T. Conversion	Data format	
UAC comma	nd execution result : sur	cceeds .	Local HMI		PLW_Bit-895100	8.		
UAC comma	nd execution result : inv	alid command	Local HMI		PLW_Bit-895101	B		
UAC comma	nd execution result : acc	count exists	Local HMI		PLW_Bit-895102	8.		
UAC comma	nd execution result : acc	count not exists	Local HMI		PLW_Bit-895103	8.		
UAC comma	nd execution result : par	ssword error	Local HMI		PLW_Bit-895104	B		
UAC comma	nd execution result : der	ny command	Local HMI		PLW_Bit-895105	8.		
UAC comma	nd execution result : invi	alid name	Local HMI		PLW_Bit-895106	8.		
UAC comma	nd execution result : invi	alid password	Local HMI		PLW_Bit-895107	8.		
UAC comma	nd execution result : invi	alid import data	Local HMI		PLW_Bit-895108	B.		
UAC comma	nd execution result : out	of validity range	Local HMI		PLW_Bit-895109	B.		
UAC privilege	(Class A)		Local HMI		PLW_Bit-895300	8.		
UAC privilege	(Class B)		Local HMI		PLW_Bit-895301	8.		
UAC privilege	(Class C)		Local HMI		PLW_Bit-895302	8.		
UAC privilege	(Class D)		Local HMI		PLW_Bit-895303	B		
UAC privilege	(Class E)		Local HMI		PLW_Bit-895304	B		
UAC privilege	(Class F)		Local HMI		PLW_Bit-895305	8.		
UAC privilege	(Class G)		Local HMI		PLW_Bit-895306	8.		
UAC privilege	(Class H)		Local HMI		PLW_Bit-895307	B		
UAC privilege	(Class I)		Local HMI		PLW_Bit-895308	8.		
UAC privilege	(Class J)		Local HMI		PLW_Bit-895309	8		
UAC privilege	(Class K)		Local HMI		PLW_Bit-895310	B		
UAC privilege	(Class L.)		Local HMI		PLW_Bit-895311	B		
UAC comma	nd		Local HMI		PLW-8950	W. Disable	Undesignated	
UAC comma	nd execution result		Local HMI		PLW-8951	W. Disable	Undesignated	
	Tag name UAC comma UAC privileg UAC privileg	Taj nami UAC command execution result: su UAC command execution result: nu UAC command execution result: no UAC command execution result: no UAC command execution result: no UAC command execution result: nu UAC command execution UAC privilege (Class F) UAC privilege (Class F)	Tap name UAC command execution result: succeds: UAC command execution result: succeds: UAC command execution result: account exists UAC command execution result: invalid password UAC command execution result: invalid password UAC command execution result: account exists UAC privilege (Class E) UAC privilege (Class E) UAC privilege (Class F)	Tag name PLC name UAC command execution result isoucceds Local Hall UAC command execution result insult on ante Local Hall UAC command execution result insult input data Local Hall UAC command execution result insult input data Local Hall UAC command execution result insult input data Local Hall UAC command execution result insult input data Local Hall UAC privilege (Class P) Local Hall </td <td>Tap name PLC name UAC command execution result invalid command UAC command execution result invalid command UAC command execution result invalid command UAC command execution result incontret exits UAC command execution result incontret exits UAC command execution result invalid mame UAC provides (Class F) Local Hell UAC provides (Class F) Local Hell<td>Tag name PLC name Address UAC command execution result invalid command UAC command execution result invalid command UAC command execution result invalid command UAC command execution result account desists UAC command execution result invalid name UAC command execution result invalid passwed UAC command execution result invalid result UAC provides (Class F) Local HMI PUV, Ba495101 UAC command execution result invalid result UAC provides (Class F) Local HMI PUV, Ba495302 PUV, Ba495302 UAC provides (Class F) Local HMI PUV, Ba495302 PUV, Ba495302 PUV, Ba495302 UAC provides (Class F) Local HMI PUV, Ba495302 PUV, Ba495302 PUV, Ba495302 UAC provides (Class F) Local HMI PUV, Ba495302 PUV, Ba495303 PUV, Ba495304 UAC provides (Class F) Local HMI</td><td>Tag name PLC name Address T. 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Conversion Data format UAC command execution result invalid command Local HMI PLV, Bit 99100 B. Hermitian invalid command Local HMI PLV, Bit 99100 B. UAC command execution result invalid command Local HMI PLV, Bit 99101 B. Hermitian invalid command Local HMI PLV, Bit 99101 B. UAC command execution result account not sits Local HMI PLV, Bit 99103 B. Hermitian invalid command Local HMI PLV, Bit 99103 B. UAC command execution result invalid name Local HMI PLV, Bit 99105 B. Hermitian invalid result invalid name Local HMI PLV, Bit 99103 B. Hermitian invalid result invalid name Local HMI PLV, Bit 99105 B. Hermitian invalid result invalid name Local HMI PLV, Bit 99106 B. Hermitian invalid result invalid name Local HMI PLV, Bit 99106 B. Hermitian invalid result invalid name Local HMI PLV, Bit 99106 B. Hermitian invalid invalid result invalid name Local HMI PLV, Bit 995109 B. Hermitian invalid result invalid result invalid name Local HMI PLV, Bit 995101 B. 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[Name]: Enter a name according to the VFD reference manual.

[Address type] and [Address]: Enter Modbus function code and a Modbus register.

[Conversion/ Calculation]: Scale the value of the Modbus register. This tool can adjust the number of digits via **macro subroutine**.

Comment : Main speed (Hz) Address Device : Hitachi VFD with Profxxx HMI Address mode : OBI Address type : 4x Address type : 4x Address format : DDDD [range : 1 ~ 65535] Conversion/Calculation (use macro subroutine) Conversion/Calculation (use macro subroutine) Data format : 16-bit Unsigned Data format : 16-bit Unsigned Read conversion : main_speed Write conversion : None (Only data type conversion)					
Name : Main speed (Hz) Address Device : Hitachi VFD with Profxox HMI Address mode : Bit Image: Word Address type : 4x Original format : 16-bit Unsigned Address format : DDDD [range : 1 ~ 65535] Image: State Stat	Comment :				
Address Device : Hitachi VFD with Profxxx HMI Address mode : Bit Word Address type : 4x Original format : 16-bit Unsigned Address : 11001 Address format : DDDDD [range : 1 ~ 65535] Conversion/Calculation (use macro subroutine) DDDD [range : 1 ~ 65535] Conversion/Calculation (use macro subroutine) Data format : 16-bit Unsigned Read conversion : main_speed Write conversion : None (Only data type conversion) Array	Name :	Main speed (Hz)			
Address mode : Oilit Word Address type : 4x Original format : 16-bit Unsigned Address : 11001 Intervention Intervention Address format : DDDDD [range : 1 ~ 65535] Intervention Intervention Conversion/Calculation (use macro subroutine) Intervention Intervention Intervention Image: Data format : 16-bit Unsigned Intervention Intervention Intervention Image: Data format : 16-bit Unsigned Intervention Intervention Intervention Write conversion : Intervention Intervention Intervention Intervention Image: Data format :<	Address Device :	Hitachi VFD with Profxxx HMI	:		
Address type : 4x Original format : 16-bit Unsigned Address : 11001 Image: 1 ~ 65535] Image: 1 ~ 65535] Address format : DDDDD [range : 1 ~ 65535] Image: 1 ~ 65535] Conversion/Calculation (use macro subroutine) Image: 1 ~ 65535] Image: Ima	Address mode :	⊖Bit			
Address : 11001 Address format : DDDDD [range : 1 ~ 65535] Conversion/Calculation (use macro subroutine) Image:	Address type :	4x ~	Original format :	16-bit Unsigned	
Address format : DDDDD [range : 1 ~ 65535]	Address :	11001			
Conversion/Calculation (use macro subroutine) Conversion/Calculation (use macro subroutine) Conversion / Enable Data format : 16-bit Unsigned Read conversion : [main_speed] Write conversion : [None (Only data type conversion) Conversion] Array	Address format :	DDDDD [range : 1 ~ 65535]			_
Conversion/Calculation (use macro subroutine) Conversion/Calculation (use macro subroutine) C Enable Data format : 16-bit Unsigned Read conversion : main_speed Write conversion : None (Only data type conversion) Array					
Conversion/Calculation (use macro subroutine) Conversion/Calculation (use macro subroutine) Conversion : Constant : If the subsect of the s					
Data format : 16-bit Unsigned Read conversion : main_speed Write conversion : None (Only data type conversion) Array					
Read conversion : main_speed Write conversion : None (Only data type conversion)	Conversion/Calculation	on (use macro subroutine)			
Write conversion : None (Only data type conversion)	Conversion/Calculatio	on (use macro subroutine)			
	Conversion/Calculation Data for	n (use macro subroutine) Enable nat : 16-bit Unsigned			
	Conversion/Calculation Data for Read convers Write converse	on (use macro subroutine) Enable To -bit Unsigned To -bi			
	Conversion/Calculation Data for Read converse Write converse	In (use macro subroutine) Enable In t: 16-bit Unsigned In main_speed In None (Only data type of	conversion)		

Macro subroutine configuration -

Creating a macro subroutine to convert read data, go to [Project] » [Macro] on the toolbar. This window will be displayed as shown. Click on [Library].



Click on [New] to create a macro function.



To adjust the number of the digits for Main speed command according to the VFD reference manual, write the following scripts on [Function Editor]. Click on [Compile] and [Save].

Register No.	Function Name	Monitor Content and	Data
(Decimal)		Setting Item	Resolution/Unit
11001	Main speed command	0 - 59000	0.01HZ
	(monitor +setting)		

Function Editor



For more information, please refer the sections of Easybuilder pro user manual.

18.9.2. How to Use Macro Function Library

16.2. Building Address Tag Library

Step2. -

Click [OPC UA] button on the main screen or go to [IIoT/Energy] » [OPC UA Server] on the toolbar, and check [Enable] checkbox to enable OPC UA server.

OPC UA Server	
Enable	
Server Settings	
Tag Weintek dMT-G03 Tags Hitachi VFD with Profxxx HMI Tags	New group New Tag Delete Settings Import Export

Click [Tags] within [Hitachi VFD..](Controller name) and then click [New Tag] to add OPC UA tags.

For example, add a tag for Main speed command.

[Name]: Enter Function name + unit
[Type]: Data type is Word.
[Address]: Enter Modbus function code + register number (Decimal) or choose a user-defined tag from [Settings] » [User-defined tag].
[Type]: data is readable and writable.

Click [OK] to exit.

1 VCI		
Se	ttings	
g		
₽- <u> </u> W	eintek dMT-G03	New group.
	tachi VFD with Profxxx HMI	New Tag
ē. [Tags	Delete
	Settings X	Settings
	Name : Main Speed (Hz)	Import
	Туре	Export
	⊖Bit () Word	
	Address	
	Device : Hitachi VFD with Profxxx HMI VED Settings	
	Address : Main speed (Hz) v 4x-11001 16-bit Unsigned (1)	
	* You can scale/convert data with conversion tag in Tag Library.	
	Туре	

The window as shown includes all tags created in the OPC UA server.

OPC UA Server	
⊡ Enable	
Settings	
Tag	
B→ Weintek dMT-G03	New group
Hitachi VFD with Profxxx HMI	New Tag
Tags	Delete
Cooling Fin Temperature(°C)	Settings
	Jetungs
	Import
	Export

Step3. -

Connect the **LAN** port of the cMT-G03 and the PC to a router with an Ethernet cable. Click [Download] button on the main screen or go to [Project] » [Download] on the toolbar. You can find the cMT-G03 by clicking [Search and Change IP].

Swilload (PC-211Wil)	
Ethernet	Password/Port no. of download/upload : Settings
4 IP HMI Name	4
HMI : cMT-9956 ~	
Search	
Search All	
Search and Change IP	
	What's my IP?
Runtime * Necessary if update runtime or execute down	wnload first time.
□Reset recipe (RW, RW_A) □Reset ev	vent log Reset data sampling
□Reset recipe (RW, RW_A) □Reset ev	vent log Reset data sampling
Reset recipe (RW, RW_A) Reset ev Automatically using current settings to download after of	vent log Reset data sampling

In this window, you can choose DHCP or Static IP for the cMT-G03 according to your Intranet. Click on [Apply] to complete.

Search and Change IP	×
HMI Name ^ IP HMI Model Ma CMT-0AAB 192.168.0.144 cMT-G03 Ga 00:1	DHCP : On Off IP : 192 . 168 . 0 . 144 Subnet mask : 255 . 255 . 0 Password : Blink LED Apply
< >>	
Refresh	Exit

Choose the cMT-G03 and click [Download].

Download (PC->HMI)	×				
Ethernet	Password/Port no. of download/upload : Settings				
4 IP HMI Name	4				
HMI : CMT-0AAB	✓ 192.168.0.144 (cMT-0AAB)				
Search and Change I	P				
Runtime * Necessary if update runtime or exe	What's my IP?				
Reset recipe (RW, RW_A)	Reset event log Reset data sampling				
Automatically using current settings to download after compiling					
Download Stop	Exit				

Testing:

After downloading the project file, launch the OPC UA client software UAExpert on a PC to monitor OPC UA tags data.

Unified Automation UaExpert - The OPC Unified Architecture Client - G03_OPC UA TES	T*						
File View Server Document Settings Help							
D 💋 🖸 🙆 💠 🗕 🜣 🗙 💊 🗋 🖬 🕷 🥯							
Project 🗗	×	Data Access View					
 ♥ Project ♥ Servers ♥ UaServer@cMT-8F78 - None - None (uatcp-uasc-uabinary) ♥ Documents Data Access View 		Server 1 UaServer@cM 2 UaServer@cM	Node Id NS2[Strina]Hit NS2[Strina]Hit	Display Name Cooling Fin Temperature(*C) Main Speed (Hz)	Value 0 50	Datatype Int16 UInt16	Source Timestamp PM 04:39:56:468 PM 04:39:58:111
Address Space 🗗	×						
😏 No Highlight	•						
 Root Cobjects Hitachi VFD with Profox HMI Statistics Cooling Fin Temperature(°C) Main Speed (Hz) Server Veintek cMT-G03 Statistics Statistics Tags Tags Tags Yes Views 							

You can drag and drop tags configured in the OPC UA server to [Data Access View].

🛅 F	Root
× (Objects
`	🗸 🚞 Hitachi VFD with Profxxx HMI
	> 🛅 Statistics
	🗸 🚞 Tags
	> 🥌 Cooling Fin Temperature(°C)
	🔉 💷 Main Speed (Hz)
3	> 👶 Server
`	🗸 🚞 Weintek cMT-G03
	> 🛅 Statistics
	> 🛅 Tags

The data will be displayed as shown.

	Dat	ta Access View					
1	#	Server	Node Id	Display Name	Value	Datatype	Source Timestamp
I	1	UaServer@cM	NS2 String Hit	Cooling Fin Temperature(°C)	0	Int16	PM 04:28:00.282
Ш	2	UaServer@cM	NS2 String Hit	Main Speed (Hz)	50	UInt16	PM 04:28:01.899

Reference Link:

Weintek Labs website: http://www.weintek.com



Founded in 1996, WEINTEK LABS is a global-leading HMI manufacturer and is dedicated to the development, design, and manufacturing of practical HMI solutions. WEINTEK LAB's mission is to provide quality, customizable HMI-solutions that meet the needs of all industrial automation requirements while maintaining customer satisfaction by providing "on-demand" customer service. WEINTEK LABS brought their innovative technology to the United States in 2016, WEINTEK USA, INC., to provide quality and expedient solutions to the North American industrial market.

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