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High Quality Data Acquisition and Embedded Control Products

HRT-710 FAQ

Ver 1.3

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Q01 : How to add HART devices to HRT-710 ?

A01:

1. Add "Only One" HART device : (Ex : Add <u>ABB AS800</u> HART device)

[Step 1] Connect to HRT-710 with "HG_Tool" utility.

- (1) Set the com port parameters.
- (2) Click the "Connect" button to connect to HRT-710 module like Figure 1-1.



Figure 1-1 Connect to HRT-710





Figure 1-2 Delete the default setting of HRT-710.

[Step 3] Add the new HART device setting

(1) **Method 1** => Choose "Auto Configure" option to be **Enable** like Figure 1-3.

Device Configuration					
😑 HRT-710					
	Edit				
	Add Module				
	NC				

Module				_	
Channel :	0	V Auto Configure	: Enable 🛛 👻	Frame type :	Short
Master type	: Primary Master	✓ Network mode :	Point to Point 💌	Address :	0
Preambles :	5	Cmd 0 mode :	Initial 💌	Cmd 3 mode :	Polling 💌
Unique Ide	entifier mtifier automatically		100		700700

Figure 1-3 Add new HART device setting (Auto Config : Enable)

(2) **Method 2** => Choose "Auto Configure" option to be **Disable** like Figure 1-4.



ew Module						
Module Channel :	0	 Auto Configure : 	Disable 🗸	Frame type :	Long	~
Master type :	Primary Master	Network mode :	Point to Point 🗸	Address :		
Preambles :	5	Cmd 0 mode :	Initial 💌	Cmd 3 mode :	Polling	~
Unique Ide	ntifier ntifier automatically rer ID : 22	Device type :	133	Device ID :	723522	
					OK	Cancel

Figure 1-4 Add new HART device setting (Auto Config : Disable)

[Step 4] Save the HART device setting to HRT-710

(1) Click the "Save to Device" button to save the new HART device setting to HRT-710

```
like Figure 1-5.
```

Device Configuration		
HRT-710 System Module 0 Default CMD(0) Default CMD(3)	Item Module name Channel Auto Configuration Network Default Command (0) Default Command (3)	Value Module 0 O Enable Point to Point Mode Initial mode Polling mode
	Operation Load From File Lo Save to File	ad From Device Load Default Setting

Figure 1-5 "Save to Device" function

2. Add "More than One" HART devices : (Ex : Add <u>ABB AS800 (Addr=2)</u> and <u>Foxboro</u> <u>I/A Pressure (Addr=1)</u> HART devices)

[Step 1] Connect to HRT-710 with "HG_Tool" utility.

[Step 2] Delete the default HART device setting in HRT-710

=> These above two steps are the same with those of the "Only One" HART device.

[Step 3] Add two new HART device setting

(1) Click "Auto Configure" option to be **Disable** like Figure 1-6.



w Module							
Module							
Channel :	0	🖌 Auto Config	gure : Disable	~ F	Frame type :	Long	~
Master type :	Primary Master	💌 Network mo	de : Multidrop	~ A	Address :	2	
Preambles :	5	Cmd 0 mod	e : Initial	v C	Cmd 3 mode :	Polling	~
Unique Ide	ntifier		1				
🔽 Get iden	ntifier automatically	<i>,</i>					
Manufactur	er ID : 22	Device type	: 133	D)evice ID :	723522	
						OK	Cancel
						OK	Cancel
						OK	Cancel
w Module						OK	Cancel
w Module Module						OK	Cancel
w Module Module Channel :	0	💌 Auto Config	gure : Disable	F	Yrame type :	OK	Cancel
w Module Module Channel : Master type :	0 Primary Master	 Auto Config Network mo 	gure : Disable ide : Multidrop	F A	rame type : 1ddress :	OK Long	Cancel
w Module Module Channel : Master type : Preambles :	0 Primary Master 5	 Auto Config Network mo Cmd 0 mode 	gure : Disable de : Multidrop e : Initial	 F. A C 	Frame type : Address : Cmd 3 mode :	OK Long 1 Polling	Cancel
w Module Module Channel : Master type : Preambles : Unique Ide	0 Primary Master 5 ntifier	 Auto Config Network mo Cmd 0 mode 	gure : Disable nde : Multidrop e : Initial	F A C	rame type : iddress : Cmd 3 mode :	OK Long 1 Polling	Cancel
w Module Module Channel : Master type : Preambles : Unique Ide	0 Primary Master 5 ntifier atifier automatically	Auto Config Network mo Cmd 0 mode	gure : Disable nde : Multidrop e : Initial	F A	Frame type : Address : Cmd 3 mode :	OK Long 1 Polling	Cancel
w Module Module Channel : Master type : Preambles : Unique Ide Get iden Manufactur	0 Primary Master 5 ntifier ntifier automatically er ID : 22	Auto Config Network mo Cmd 0 mod	gure : Disable ode : Multidrop e : Initial : 133	F A C	rame type : iddress : Cmd 3 mode : Device ID :	OK Long 1 Polling	Cancel
w Module Module Channel : Master type : Preambles : Unique Ide Ø Get iden Manufactur	0 Primary Master 5 ntifier ntifier automatically er ID : 22	Auto Config Network mo Cmd 0 mod	gure : Disable ode : Multidrop e : Initial : 133	F A C	Yrame type : Address : Cmd 3 mode : Device ID :	OK Long 1 Polling 723522	Cancel

Figure 1-6 Add new HART device setting

[Step 4] Save the HART device setting to HRT-710

(1) Click the "Save to Device" button to save the new HART device setting to HRT-710 like Figure 1-7.

Device Configuration			
 HRT-710 System Module 0 Default CMD(0) Default CMD(3) Module 1 Default CMD(0) Default CMD(3) 	Item Module name Channel Auto Configuration Network Preamble length Master type Frame type Module address Auto Get Unique ID Default Command (0) Default Command (3)	Value Module 0 O Disable Multi-drop Mode 5 Primary Master Long Frame 2 Enable Initial mode Polling mode	
	Operation Load From File Lo Save to File S	ad From Device Load De	fault Setting

Figure 1-7 "Save to Device" function

Q02 : How to make sure that HRT-710 gets the HART device data correctly ?

A02:

After adding HART device setting to HRT-710 module (refer to the steps of Q01), please follow the steps.

(1) Make sure connecting to HRT-710 with HG_Tool successfully and then click "**Device Information**" button like Figure 2-1.



Figure 2-1 "Device Information" screen

[Check I/O Data of the Default CMD(0)]

(2) Right click the button of mouse on the "Default CMD(0)" item and choose the "Basic operation" option to open the "I/O Data" screen of the "Default CMD(0)" like Figure 2-2.

Device Information			
 HRT-710 System Module 0 		Item Module name Module index	Value Default CMD(0) 0
Default CMD(3)	Basic Adva	operation nced operation	Initial Normal 14
		Cmd Out size Cmd In address Cmd Out addres	0 1012 s 0

Figure 2-2 The "Basic operation" of the "Default CMD(0)" (3) The I/O Data of the "Default CMD(0)" is **OK** like Figure 2-3.

ommand 0 IO Data			
Information : Read Uniq	ue Identifier		
Manufacturer :	Hartmann_and_Braun(22)	Device Type Code :	133
Preambles Number :	7	Command Set Revision :	5
Transmitter Revision :	2	Software Revision :	11
Hardware Revision :	8	Flag :	2
Device ID :	723522		
	Sho	w Long Frame Address	Undate
	1010	* Fong Franc Haaress	opune

Figure 2-3 The I/O Data screen of the "Default CMD(0)" => OK (4) The I/O Data of the "Default CMD(0)" is **NG** like Figure 2-4.

C	ommand 0 IO Data			
	-Information : Read Uniqu	æ Identifier		
	Manufacturer :		Device Type Code :	0
	Preambles Number :	0	Command Set Revision :	0
	Transmitter Revision :	0	Software Revision :	0
	Hardware Revision :	0	Flag :	0
	Device ID :	0		- 1
Į				
			Show Long Frame Address	Update

Figure 2-4 The I/O Data screen of the "Default CMD(0)" => NG

[Check I/O Data of the Default CMD(3)]

(5) Right click the button of mouse on the "Default CMD(3)" item and choose the "Basic operation" option to open the "I/O Data" screen of the "Default CMD(3)" like Figure 2-5.



Figure 2-5 The "Basic operation" of the "Default CMD(3)"

(6) The I/O Data of the "Default CMD(3)" is **OK** like Figure 2-6.

С	ommand 3 IC) Data			
1	-Information :	Read Dynamic Variable	s and Pv Cur	rent	
	Pv Current :	20.1245155334473	Pv 1 unit :	kPA	
	$Pv\ 1$ Walue :	0.385074734687805	Pv 2 unit :	degC	
	$Pv \; 2 \; Value$:	22.5659942626953	Pv 3 unit :	Percent	
	$Pv\ 3$ Value :	100.778221130371	Pv 4 unit :	???	
	$Pv \mid 4$ Walue :	0			
1	-Auto Update -				
	Start	Stop Inte	rval (s) : 🚺		Update

Figure 2-6 The I/O Data screen of the "Default CMD(3)" => OK (7) The I/O Data of the "Default CMD(3)" is **NG** like Figure 2-7.

Command 3 IO Data		
Information : Read Dynan	nic Variables and Pv Current	
Pv Current: 0	Pv 1 unit : ???	
Pv 1 Value : O	Pv 2 unit : ???	
Pv 2 Value : 0	Pv 3 unit : ???	
Pv 3 Value : 0	Pv 4 unit : ???	
Pv 4 Value : 0		
Auto Update Start Stop	Interval (s) :	Update

Figure 2-7 The I/O Data screen of the "Default CMD(3)" => NG

=> If the I/O data of the "Default CMD(0)" and "Default CMD(3)" is ok, it means that the communication between HRT-710 and HART devices is ok.

Q03 : How to map HART device CMD(3) data directly to SCADA or HMI ?

A03:

(1) Make sure that the communication between **HRT-710** and **HART device** is ok. (Refer to the steps of Q02)

(2) Set "Swap Mode" of system setting in HRT-710 to be "W&B".

[1] In "Device Configuration" screen, right click the button of mouse on "System" item and click the "Edit" option to open "System Edit" screen like Figure 3-1.

Device Configuration			
HRT-710	Item Module name	Value System	
Def Add Module	System : Module count Command count Command interval(ms) Command timeout(ms) Auto Polling Retry count Modbus : Port num Baud rate(bps) Data bits Stop bits Parity Protocol	1 0 1000 Enable 3 1 115200 8 1 None Modbus R TIL Slave	
	Protocol Net ID Swap mode Operation Load From File Lo	Mod bus R IU Slave 1 None ad From Device Load Defa	wit Setting

Figure 3-1 Open "System Edit" screen

[2] Set the "Swap mode" item to be "W&B" and click "OK" button like Figure 3-2.

~65535 ms) : 10 Enable	000	timeo retry o	ut value (3) :ount (0~5)	05~65535 ms) :) :	1000
		Baud Rate :	115200	Data Bits :	8 🗸
1	~	Parity :	None	Net ID :	1
MB R TU Slave	~	Swap mode :	W&B		
	~65535 ms) : 1(Enable 1 1 MB R TU Slave	~65535 ms) : 1000 Enable 💌 1 👻 1 🐨 MB R TU Slave 👻	~65535 ms) : 1000 timeor Enable v retry o	~65535 ms) : 1000 timeout value (30 Enable v retry count (0~5) Baud Rate : 115200 1 v Parity : None MB R TU Slave v Swap mode : W22	~65535 ms) : 1000 timeout value (305~65535 ms) : Enable ♥ retry count (0~5) : Baud Rate : 115200 ♥ Data Bits : Baud Rate : 115200 ♥ Data Bits : None ♥ Net ID : MB R TU Slave ♥ Swap mode : W&B

Figure 3-2 Set "Swap mode" to be "W&B"

[3] Click the "Save to Device" button to save the new system setting to HRT-710 like Figure 3-3.

Device Configuration		
Device Configuration HRT-710 Module 0 Default CMD(0) Default CMD(3)	Item Module name System : Module count Command count Command interval(ms) Command timeout(ms) Auto Polling Retry count Modbus : Port num Baud rate(bps) Data bits Stop bits	Value System 1 0 1000 1000 Enable 3 1 115200 8
	Parity Protocol Net ID Swap mode Operation Load From File Lo Save to File	None Modbus R TU Slave Word & Byte ad From Device Load Default Setting

Figure 3-3 "Save to Device" function

(3) Check the firmware version of HRT-710 like Figure 3-4.



Figure 3-4 Firmware Version of HRT-710

- (4) Follow the below steps according to the different firmware version of HRT-710.
- [4.1 The firmware version of HRT-710 is v1.5 or newer]
 - [1] In firmware v1.5 or newer, HRT-710 provides the MB Address 1300 ~ 1459 (Default CMD(3)(S) Data for Module 0 ~ 15 in HRT-710 => The detailed information refers to the sector 4.3 of users' manual) and users can map the CMD(3) data of HART device to SCADA directly with these Modbus address 1300 ~ 1459.
 - [2] For the "Default CMD(3)(S) data of Module 0" in HRT-710, the mapped MB address is 1300 ~ 1309. The below MB/RTU client will use the "Modbus Poll" tool to show the CMD(3) data of HART device by polling Modbus address 1300 ~ 1309.
 <1> Confirm the connection between HG_Tool and HRT-710 is disconnected.
 <2> Set the "Modbus" parameters like Figure 3-5.

🖞 Modbus Poll	- Mbpoll1			
<u>File C</u> onnection	Setup Function	s <u>D</u> isplay	<u>V</u> iew <u>W</u> indow <u>H</u> elp	
🗅 🖻 🖥 🎒	Poll Definition	1 F2	05 06 15 16 22 23 101 💡	?₩?
POG 141 111	<u>O</u> ptions	<u> </u>		
😂 мвропт	Log			
Tx = O: Err	Logging Off		04: SR = 1000ms	
No Connecti 31301 =	Beest Country	- E1D		
31302 =	<u>R</u> eset Counter	S FIE		
31303 =	<u>U</u> se as Deraum			
31304 =	0	Poll Defi	nition	
31305 =	0			
		-		
31306 =	0	Slave ID:	1	OK
31306 = 31307 =	0 0	Slave ID: Function:	1 04 Read Input Registers	OK
31306 = 31307 = 31308 =	0 0 0	Slave ID: Function:	1 04 Read Input Registers	OK Cancel
31306 = 31307 = 31308 = 31309 =	0 0 0	Slave ID: Function: Address:	1 04 Read Input Registers •	OK Cancel
31306 = 31307 = 31308 = 31309 = 31310 =	0 0 0 0	Slave ID: Function: Address: Length:	1 04 Read Input Registers • 1301 10	OK Cancel <u>A</u> pply
31306 = 31307 = 31308 = 31309 = 31310 =	0 0 0 0	Slave ID: Function: Address: Length: Scan Rate	1 04 Read Input Registers 1301 10 1000 ms	OK Cancel <u>A</u> pply

Figure 3-5 Modbus Parameters of "Modbus Poll" tool <3> Set the "**Display**" mode to be "**Float**" format like Figure 3-6.

🐮 Modbus Poll - Mbpolli	
<u>File Connection Setup Functions</u>	Display <u>V</u> iew <u>W</u> indow <u>H</u> elp
D 🖻 🖬 🎒 🗙 🛅 📃	Signed
	<u>U</u> nsigned
📁 Mbpoll1	Hex
Tx = 0: Err = 0: ID = 1	<u>B</u> inary
No Connection	Long
31301 = 0.000000	Long Inverse
31302 =	🗸 <u>F</u> loat
31303 = 0.000000	Float Inverse K
31304 = 0.000000	<u>D</u> ouble
31306 =	D <u>o</u> uble Inverse
31307 = 0.000000	
31308 =	✓ <u>r</u> LC Autresses (Dase 1) Protocol & downood (Dase 0)
31309 = 0.000000	
31310 =	Error Counters F11
	<u>C</u> ommunication

Figure 3-6 "Float" format of "Modbus Poll" tool

<4> Set the "Com Port" parameters and click "OK" button to connect to HRT-710 like Figure 3-7.

W Modbus P	oll - Mbpoll	1
File Connect	on <u>S</u> etup F	<u>unctions D</u> isplay <u>V</u> iew <u>W</u> indow <u>H</u> elp
Tx Quick 31301 =	ect F3 nnect F4 Connect Connect F9	 ↓ □ 05 06 15 16 22 23 101 ? № = 1: F = 04: SR = 1000ms
31302 =	Ŭ	Connection 🔀
31303 = 31304 = 31305 = 31306 = 31307 = 31308 = 31309 = 31310 =	0. 0. 0.	Fort 1 Mode OK 115200 Baud RTU ASCII 8 Data bits Response Timeout Cancel 1000 [ms] Delay Between Polls 10 [ms] Advanced Remote Server Port 502

Figure 3-7 Com Port Parameters of "Modbus Poll" tool

<5> The CMD(3) data of HART device is shown like Figure 3-8.

9	Mod	bus	Poll -	м	bpo	111										
	<u>File C</u> o	nne	ction	<u>S</u> et	սթ	F <u>u</u> nc	tion	s <u>D</u>	lispl	ay	<u>V</u> iev	v <u>1</u>	<u>N</u> ind	ow	<u>H</u> elp	1
	🗋 🖻		6	>	<		쁫	Ē	1.	Л	05	06	15	16	22	2
ľ	🕎 МЫ	poll	11													
	Tx =	3:	Err	=	0:	ID	=	1:	F	-	04:	SI	R =	10	00m	s
	31301 31302	=			20	. 12	558	39	_		_		Cur	ren	t	
	31303	=			0	.38	604	14	_		_	•	PV			
	31304 21205	=			22	52	411	5			_					
	31305 31306	=			20	. 55	111						5V			
	31307	=		:	100	.78	493	5	_		-	•	TV .			
	31308	=														
	31309	=			0	.00	000	00	_		-	•	QV			
	31310	=														

Figure 3-8 The CMD(3) data of HART device

[4.2 - The firmware version of HRT-710 is older than v1.5]

[1] Add "**User CMD(3)**" with "**Simple**" format and then click "Save to Device" to save the new HART device setting to HRT-710 like Figure 3-9. The mapped Modbus <u>start address</u> and <u>length</u> of User CMD(3) data can be found in "**Cmd In address**" and "**Cmd In size**" field. In the example, they are 0 and 20.

Device Configuration		
 HRT-710 System Module 0 Defau Defau Defau Defau 	Item Module name o Configuration vork ault Command (0) ault Command (3)	Value Module O O Enable Point to Point Mode Initial mode Polling mode
New Command Command Num. : 3 In Size : 20	Mode : Pollin Out Size : 0	g V Format : Simple V
Device Configuration		
HRT-710 System Module 0 Default CMD(0) Default CMD(3) User CMD(3)	Item Module name Module index User command index Command num. Command mode Command format Cmd In size Cmd Out size Cmd Out size Cmd Out address Cmd Out address Cmd Out address	Value User CMD(3) 0 3 Polling Simple 20 0 0 0 0 0 0 0 0 0 0 0 0 0 0

Figure 3-9 Add "User CMD(3)" to HRT-710

- [2] The below MB/RTU client will use the "Modbus Poll" tool to show the CMD(3) data of HART device by polling Modbus address 0 ~ 9.
 - <1> Confirm the connection between HG_Tool and HRT-710 is disconnected.
 - <2> Set the "Modbus" parameters like Figure 3-10.



Figure 3-10 Modbus Parameters of "Modbus Poll" tool <3> Set the "**Display**" mode to be "**Float**" format like Figure 3-11.

📲 Modbus Poll - Mbpolli	
File Connection Setup Functions	Display <u>V</u> iew <u>W</u> indow <u>H</u> elp
D 🖻 🖬 🎒 🗙 🛅 🖳	Signed
	<u>U</u> nsigned
💬 Mbpoll1	<u>H</u> ex
Tx = 153: Err = 0: ID =	<u>B</u> inary
	Long
30001 = 20.124897	Long Inverse
30002 =	✓ <u>F</u> loat
30003 = 0.385415	Float Inverse
30004 = 22 884032	Double
30006 =	D <u>o</u> uble Inverse
30007 = 100.780609	A RI C Addresses (Page 1)
30008 =	✓ <u>r</u> LC Addresses (Base 1) Destand & dimension (Date 0)
30009 = 0.000000	
30010 =	Error Counters F11
	<u>C</u> ommunication

Figure 3-11 "Float" format of "Modbus Poll" tool

<4> Set the "**Com Port**" parameters and click "**OK**" button to connect to HRT-710 like Figure 3-12.

₩Į M	lodbus Poll	- Mbp	o111						
<u>F</u> ile	<u>Connection</u>	<u>S</u> etup	Functions <u>D</u> ispla	y <u>V</u> iew	<u>W</u> indow	<u>H</u> elp			
	<u>C</u> onnect) F	3 📐 🗏 📋 🗉	L 05 00	6 15 16	22 2	3 101 💡	N?	
Doc .	<u>D</u> isconneo	t F	4 10						
	Auto Con	nect		~ ~ ~ ~					
TX No	Quick Co:	nnect F	⁷⁵ = 1: F	= 04: %	5R = 10	JUUms			
300	01 =	0							
300	02 =	0							
300	03 =	0	Connec	tion					
300	04 =	0			Mode				
300	105 - 106 =	0	[Port]	•	RICERT	ט וו	O ASCII		UK
300	07 =	Ō	11520	0 Baud 💌					Cancel
300	08 =	0	0.0.4	1.1.		nse Time	eout		
300	09 =	0	18 Dan	Dits	1 11000	D	ms]		
300	10 =	U	None	Parity 💌] _ Delay	Between	n Polls —		
			1 Stor	Bit 💌	10	D	ms]		Advanced
			1 201		/				
			-Rem)te Server – 1 ress		T	Port		
			0.0.0	.0		Î	502	_	
			,						

Figure 3-12 Com Port Parameters of "Modbus Poll" tool <5> The CMD(3) data of HART device is shown like Figure 3-13.

(81 Mod	hus	Poll -	. м	hnol	11										
ľ	File C	onne	ction	Seti	JD	Func	tion:	s D	ispl	av	Viev	, 1	Wind	ow	Help	1
		6	18	>	<		틧	Ē	L .	Л	05	06	15	16	22	23
	🕎 мь	pol	11													
	Tx =	7:	Err	=	0:	ID	=	1:	F	=	04:	S	R =	10	00m	s
	3000:	L =			20	.12	463	6	_		_	•	Cur	ren	t	
	30002	2 =			0	.38	521	.0	_		_		ΡV			
	30004	1 = -			22	40.	461	а					617			
	30003	5 =			23	. 49	401	. 7	_				34			
	3000° 30008	7 = 3 =		1	.00	.77	897	6	-		-		TV			
	30009	9 =			0	.00	000	0	_		-	•	QV			
	30007 30008 30008 30009	7 = 3 = 9 =		1	.00 0	. 77: . 00:	897 000	'6)0	_		-	•	TV QV			

Figure 3-13 The CMD(3) data of HART device

[Note]

1. The simple CMD(3) data format and value are shown as below.

[Index] [Format] [Description]

Byte 00~03:	float	Primary Variable Current
Byte 04~07:	float	Primary Variable
Byte 08~11:	float	Secondary Variable

Byte 12~15:floatTertiary VariableByte 16~19:float4th Variable

The 30001 and 30002 registers mean "Primary Variable Current (20.124636)" The 30003 and 30004 registers mean "Primary Variable (0.385210)" The 30005 and 30006 registers mean "Secondary Variable (23.494614)" The 30007 and 30008 registers mean "Tertiary Variable (100.778976)" The 30009 and 30010 registers mean "4th Variable (0)"

Q04 : How to update the firmware of HRT-710 ?

A04:

[For HRT-710 hardware v1.1 or firmware v1.1 or below]

The firmware update function is not supported for users and please contact your local dealer.

[For HRT-710 hardware v1.2 and firmware v1.2 or newer]

The firmware update function is supported for users. Please follow the below steps.

(1) Download the newest firmware of HRT-710. (Download from <u>ftp://ftp.icpdas.com/pub/cd/fieldbus_cd/hart/gateway/hrt-710/firmware/</u>)

(2) Turn off the power and open the shell of HRT-710. Then connect the pin 2 & 3 of JP5 together like Figure 4-1.



Figure 4-1 Connect pin 2 & 3 of JP5 together

(3) Connect RS-232 cable between PC and HRT-710 and turn on the power of HRT-710 (LED 1,2,3 will flash every second => Firmware Update Mode) like Figure 4-2.



Figure 4-2 RS-232 Connection between PC and HRT-710

- (4) Run "**FW_Update_Tool**" like Figure 4-3 (Download from : <u>ftp://ftp.icpdas.com/pub/cd/fieldbus_cd/hart/gateway/utilities/fw_tool/</u>).
 - [1] Choose "COM" option and select "Com Port number".
 - [2] Click "Browser" button to choose the firmware of HRT-710.
 - [3] Click "Firmware Update" button to start firmware update process.
 - [4] Wait for "Firmware Update Success" message.

😌 FW_Update_Tool v1.06
1. Download Interface COM COM Port : C USB COM1 www.icpdas.com
2. Firmware Path
E:\code\Hart\ARM7\Converter\HART-710\For User\H710v12.fw
Browser
- 3. Firmware Update
Firmware Update Success! Please Reboot Module !
Firmware Update
Exit



(5) Turn off the power and connect the pin 1 & 2 of JP5 together like Figure 4-4.



Figure 4-4 Connect pin 1 & 2 of JP5 together

(6) Close the shell and turn on the power of HRT-710. Then users can check the firmware version of HRT-710 by using "HG_Tool" like Figure 4-5.



Figure 4-5 Firmware Version of HRT-710

Q05 : How to read HART device command 1 data with standard format by Modbus ?

A05:

(1) By using "HG_Tool" to add "User CMD(1)" of HART device and save settings to HRT-710. The Modbus <u>start address</u> and <u>length</u> of the "User CMD(1)" will show in the "**Cmd In address**" and "**Cmd In size**" field like Figure 5-1. In the example they are 0 and 7 (byte count=7 => word count=4).



New Command	
Command Command Num. : 1	Mode : Polling V Format : Normal V
In Size : /	Out Size : O OK Cancel
Device Configuration	
HRT-710 System Module 0 Default CMD(0) Default CMD(3) User CMD(1)	Item Value Module name User CMD(1) Module index 0 User command index 0 Command num. 1 Command mode Polling Command format Normal Cmd In size 7 Cmd Out size 0 Cmd Out address 0
	Operation Load From File Load From Device Load Default Setting Save to File Save to Device

Figure 5-1 Add "User CMD(1)" of HART device to HRT-710

(2) The below demo will use the free **MB/RTU tool** provided by ICP DAS to show HART command 1 data. (Download from

http://ftp.icpdas.com.tw/pub/cd/8000cd/napdos/modbus/modbus_utility/)

(3) Run "MB/RTU" tool. Set the com port settings the same with HART-710 (Baud Rate / Data Bits / Stop Bits / Parity) and then click "Open" button to connect to HRT-710 like Figure 5-2.

(4) Input "**1 4 0 0 0 4**" in "Command" field and click "Send Command" button to send the modbus command. The HART command 1 data will be received in "Responses" field =>

"01 04 08 00 00 3E 0C 20 C5 00 A4 2A 94" like Figure 5-2.

Send Modbus Command : 01 04 00 00 00 04 F1 C9

Get Response : 01 04 08 00 00 3E 0C 20 C5 00 A4 2A 94

MBRTU V. 1.0.7 COM1				
COM status	Protocol Description			
COM1 -	FC4 Read multiple input registers (3xxxx) for Al			
115200 Line control : N,8,1 Open Close	[Response] Byte 0: Net ID (Station number) Byte 1: FC=04 Byte 2: Byte count of response (B=2 x word count) Byte 3-(B+2): Register values ✓			
Polling mode (no wait) Timeout Start Stop 200	Statistics Clear Statistics Commands Packet Current Packet Size (bytes) 8 Total Packet bytes 16 Packet Quantity Difference Cotal Packet Duaptity seet 0			
I imer mode (fixed period)				
Start Stop	Polling of Limer mode (Date/Lime) Polling Mode Liming (ms) Start time Time Start Stop time Time Stop			
Command				
140004	Send Command			
Commands 🔽 With CRC Responses				
<u>01 04 00 00 00 04 F1 C9</u>	 <u>01 04 08 00 00 3E 0C 20 C5 00 A4 2A 94</u> ✓ 			
	Clear Lists Exit Program			

Figure 5-2 Receive HART Command 1 data

(5) Parse the modbus response data.

Response Data => 01 04 08 00 00 3E 0C 20 C5 00 A4 2A 94

Register data => <u>00 00 <u>3E 0C</u> <u>20 C5</u> <u>00 A4</u></u>

Because the unit of HART-710's database is byte and the unit of Modbus register is word and the Modbus register is composed of database's byte and the order is low byte first.

(For example: Modbus register0 = 0x3412, database byte0 = 0x12, byte1 = 0x34).

So we need to change the byte order.

So the data will be $\underline{00\ 00}$ $\underline{0C\ 3E}$ $\underline{C5\ 20}$ $\underline{A4\ 00}$.

According to the data count is 7, so the actual data will be $\underline{00\ 00}$ $\underline{0C}$ $\underline{3E\ C5\ 20\ A4}$ About the format of HART Command 1, it is shown as below.

Command 1: Read Primary Variable

Request data bytes: None

Response data bytes: 2+5 = 7

Index format description

Byte 0: uint8 Response code 1

Byte 1: uint8 Response code 2

Byte 2: uint8 Unit code Byte 3~6: float Primary Variable So the data of HART command 1 is parsed as below. Response code1 = 0x00 Response code2 = 0x00 Primary Variable Unit code = 0x0C (kPA) Primary Variable = 0x3E 0xC5 0x20 0xA4 (0.385 => IEEE754)

Q06 : How to read HART device command 3 data with standard format by Modbus ?

A06:

(1) When adding a new HART device to HRT-710, the "Default CMD(3)" will be added automatically. The Modbus <u>start address</u> and <u>length</u> of the "Default CMD(3)" will show in the "**Cmd In address**" and "**Cmd In size**" field like Figure 6-1. In the example they are 1236 (For MB Addr = 618 = 0x026A) and 26 (byte count=26 => word count=13).

Device Configuration			
 HRT-710 System Module 0 Default CMD(0) Default CMD(3) 	Item Module name Module index Command num. Command mode Command format Cmd In size Cmd Out size Cmd Out size Cmd Out address Cmd Out address Cmd Out address Cmd From File Load From File Save to File Save to File	Value Default CMD(3) 0 3 Polling Normal 26 0 1236 0 1236 0 4 From Device Load Defa	ault Setting

Figure 6-1 "Default CMD(3)" of HART device in HRT-710

(2) The below demo will use the free **MB/RTU tool** provided by ICP DAS to show HART command 1 data. (Download from

http://ftp.icpdas.com.tw/pub/cd/8000cd/napdos/modbus/modbus_utility/)

(3) Run "MB/RTU" tool. Set the com port settings the same with HART-710 (Baud Rate /

Data Bits / Stop Bits / Parity) and then click "Open" button to connect to HRT-710 like Figure 6-2.

(4) Input "01 04 02 6A 00 0D" in "Command" field and click "Send Command" button to send the modbus command. The HART command 3 data will be received in "Responses" field => "01 04 1A 00 00 A1 41 22 01 3E 0C C5 C5 20 B0 B6 41 C0 78 42 39 91 C9 00 C5 00 00 00 00 E5 B0" like Figure 6-2.

Send Modbus Command : 01 04 02 6A 00 0D 10 6B

Get Response : 01 04 1A 00 00 A1 41 22 01 3E 0C C5 C5 20 B0 B6 41 C0 78 42 39 91 C9 00 C5 00 00 00 00 E5 B0

🛹 MBRTU V. 1.0.8 COM5			
COM status	Protocol Description FC1 Read multiple coils status (0xxxx) for D0		
Line control : N,8,1	Byte 0: Net ID (Station number) Byte 1: FC=01 Byte 2-3: Reference number Byte 4-5: Bit count		
Polling mode (no wait) Timeout Start Stop 200	Statistics Clear Statistics Commands Packet Responses Current Packet Size (bytes) 8 Current Packet Size (bytes) 31 Total Packet Quantity Difference Total Packet bytes 31 Packet Quantity sent 1 0 Packet Quantity received 1		
Interval 50 ms	Polling or Timer mode (Date/Time) Polling Mode Timing (ms) Start time Time Start Stop time Time Stop		
Command			
Commands V	With CRC Responses		
01 04 02 6A 00 0D 10 6B	01 04 1A 00 00 A1 41 22 01 3E 0C C5 C5 20 B0 B6 41 C0 78 42 39 91 C9 00 C5 00 00 00 00 E5 B0		
	Clear Lists Exit Program		

Figure 6-2 Receive HART Command 3 data

(5) Parse the modbus response data.

Response Data => 01 04 1A 00 00 A1 41 22 01 3E 0C C5 C5 20 B0 B6 41 C0 78 42 39 91 C9 00 C5 00 00 00 00 E5 B0

Register data =>

<u>00 00 A1 41 22 01 3E 0C C5 C5 20 B0 B6 41 C0 78 42 39 91 C9 00 C5 00 00 00 00 00 00</u>

Because the unit of HART-710's database is byte and the unit of Modbus register is word and the Modbus register is composed of database's byte and the order is low byte first. (For example: Modbus register0 = 0x3412, database byte0 = 0x12, byte1 = 0x34). So we need to change the byte order. So the data will be as below. <u>00 00 41 A1 01 22 0C 3E C5 C5 B0 20 41 B6 78 C0 39 42 C9 91 C5 00 00 00 00 00 00</u>

About the format of HART Command 3, it is shown as below. **Command 3: Read Dynamic Variables and P.V. Current** Request data bytes: None Response data bytes: 2+24 = 26 Index format description Byte 2~5: float Primary Variable Current Byte 6: uint8 Primary Variable Unit code Byte 7~10: float Primary Variable Byte 11: uint8 Secondary Variable Byte 12~15: float Secondary Variable Byte 16: uint8 Tertiary Variable Unit code Byte 17~20: float Tertiary Variable

So the data of HART command 3 is parsed as below. Response code1 = 0x00Response code2 = 0x00Primary Variable Current = 0x41 0xA1 0x01 0x22 (20.125553)Primary Variable Unit code = 0x0C (kPA)Primary Variable = 0x3E 0xC5 0xC5 0xB0 (0.386274)Secondary Variable Unit code = 0x20 (degC)Secondary Variable Unit code = 0x39 (Percent)Tertiary Variable Unit code = 0x39 (Percent)Tertiary Variable = 0x42 0xC9 0x91 0xC5 (100.784706)4th Variable Unit code = 0x00 (???)

Q07 : How to know the connection status between HRT-710 and HART devices ?

A07: (2013/01/30)

The communication status description of HART command in HRT-710 is as below.

- 0 No error
- 1 Means the command has never be executed
- 2 Receive timeout, can't receive any HART data from HART device.
- 3 Receive HART data is too short
- 4 The delimiter of HART data has some error

- 5 The address (the bit of master type) of HART data has some error
- 6 The address (the bit of burst mode) of HART data has some error
- 7 The command of HART data has some error
- 8 The parity of HART data has error.

[Ex1 => The Default CMD(3) of "Module 0" is Polling Mode]

By using the Hi-Byte value of MB address 1000 (unit:WORD) (refer to sector 4.3 - Modbus / HART Mapping Table), users can get the communication status of the Default CMD(3) in "Module 0".



Figure 7-1 The status of the Default CMD(0&3) in Module 0

In the Figure 7-1, the status of the Default CMD(3) in Module 0 is 0x02. It means that the HART device for the Default CMD(3) is disconnected from HRT-710. (In the Figure 7-1, the status of the Default CMD(0) is 0x02, too.)

[Ex2 => The User CMD Index = 0 is Polling Mode]

By using the Lo-Byte value of MB address 1050 (unit:WORD) (refer to sector 4.3 - Modbus / HART Mapping Table), users can get the communication status of the User CMD Index = 0.



Figure 7-2 The status of the User CMD Index = 0&1

In the Figure 7-2, the status of the <u>User CMD Index = 0</u> is 0x02. It means that the HART device for the User CMD Index = 0 is disconnected from HRT-710.

[Ex3 => The User CMD Index = 1 is Polling Mode]

By using the Hi-Byte value of MB address 1050 (unit:WORD) (refer to sector 4.3 - Modbus / HART Mapping Table), users can get the communication status of the User CMD Index = 1.



Figure 7-3 The status of the User CMD Index = 0&1

In the Figure 7-3, the status of the <u>User CMD Index = 1</u> is 0x02. It means that the HART device for the User CMD Index = 1 is disconnected from HRT-710. (In the Figure 7-3, the status of the <u>User CMD Index = 0</u> is 0x00. It means that the HART device for the User CMD Index = 0 is connected to HRT-710.)

Q08 : How to integrate Active and Passive HART devices in multi-drop network ?

A07: (2013/12/06)

1. If there are more than 7 HART devices in the HART network, users need to disable the internal resistor (250 Ohm, 1/4W) of HRT-710 (adjust JP4 to be pin2 and pin3, refer to the section 2.6 for detailed). Then add the external resistor (250 Ohm, 1W) in HART network.

2. The HART wiring of the Active and Passive HART devices, please refer to the figure 8-1.



Figure 8-1 The HART wiring of the Active and Passive HART devices

Q09 : How to integrate multiple HRT-710 modules in the same project ?

A09: (2013/12/06)

[Case Example]

1. A user wants to integrate 20 HART devices (Ultrasonic Water Level) in the same project via Modbus RTU communication and HART wiring will be point to point.

[Solution]

< Hardware >

1. We suggest the user to use 20 HRT-710 modules to connect to 20 HART devices with point to point wiring.

< Software >

- 1. Set the RS-485 station No. of these twenty HRT-710 modules from 1 to 20. Please follow the below steps.
 - (1) Run the "HG_Tool" and connect to HRT-710.

(2) Click the "Device Configuration" item and then right click on the "System" item to choose the "Edit" option.



Figure 9-1 "Device Configuration" Screen

(3) In the "System Edit" screen, please input the RS-485 station No. of HRT-710 in the "Net ID" field.

System Edit		
System cmd interval (auto polling :	75~65535 ms) : 1000 Enable	timeout value (305~65535 ms) : 1000 retry count (0~5) : 3
For Modbus =	=>	
Port Num :	1	Baud Rate : 115200 🗸 Data Bits : 8 🗸
Stop Bits :	1	Parity : None 🐱 Net ID : 1
Protocol :	MB R TU Slave 🛛 🗸	Swap mode : None 💌
		OK Cancel

Figure 9-2 Setting for the RS-485 Station No. of HRT-710

(4) After the settings are finished, in the "Device Configuration", please click the "**Save to Device**" button to save the parameters to HRT-710.

Device Configuration			
 ■ HRT-710 ■ Module 0 ■ Default CMD(0) ■ Default CMD(3) ■ User CMD(1) ■ User CMD(2) ■ User CMD(12) ■ User CMD(13) ■ User CMD(14) ■ User CMD(15) ■ User CMD(16) ■ User CMD(17) ■ User CMD(18) ■ User CMD(19) 	Item Module name System : Module count Command count Command interval(ms) Command timeout(ms) Auto Polling Retry count Modbus : Port num Baud rate(bps) Data bits Stop bits Parity Protocol Net ID Swap mode Operation Load From File Save to File	Value System 1 11 1000 1000 Enable 3 1 115200 8 1 None Modbus R TU Slave 1 None ad From Device Load De	fault Setting
	Load From File Los Save to File S	ad From Device Load De ave to Device	fault Setting

Figure 9-3 Save the parameters to HRT-710

=> As a result, these twenty HRT-710 modules can be integrated in the same RS-485 network to gather these HART devices information.

Q10 : How to integrate HART communication device with RS-232 hardware interface ?

A10: (2013/12/06)

[Case Example]

1. A user wants to integrate HART communication device (Flowmeter, Mobrey MCU900) with RS-232 hardware interface.

[Solution]

< Hardware >

1. We suggest the user to use **HRT-710** and **I-7570** to do that and the wiring for this case is like figure 10-1.



Figure 10-1 The Hardware Wiring for MCU900

< Software >

1. Please refer to the steps in the Q01, Q02 and Q03 of HRT-710 FAQ to integrate HART device information to SCADA.

[Note]

2. In MCU900, please choose HART protocol not "Mobreyspecific LogDownload" protocol.

Q11 : How to add the HART Device-Specific command to HRT-710 ?

A11: (2013/12/06)

[Case Example]

1. A user wants to get the HART command No.149 data from Emerson 8800D HART device.

[Solution]

< Software >

1. Users must get the HART Device-Specific command first. The HART command No.149 format of Emerson 8800D is like Figure 11-1.



Figure 11-1 The HART command No.149 format of Emerson 8800D

2. Add the HART command No.149 to HRT-710 like Figure 11-2.

Device Configuration		
HRT-710 System Defau Defau Delete Add Command	Item Module name Channel Configuration (ork ult Command (0) ult Command (3)	Value Module 0 O Enable Point to Point Mode Initial mode Polling mode
New Command		
Command Command Num. : 149	Mode : Polling	g 🔽 Format : Normal 🗸
In Size : 5	Out Size : 0 ┥	Request Data Byte
R	esponse Data Byte	OK Cancel

Figure 11-2 Add the HART command No.149 to HRT-710

3. After the setting is finished, in the "Device Configuration" screen, please click the "**Save to Device**" button to save the parameters to HRT-710.

Device Configuration			
■ HRT-710 System ■ Module 0 Default CMD(0) Default CMD(3) User CMD(149)	Item Module name Module index User command index Command num. Command format Comd In size Cmd Out size Cmd Out size Cmd Out address Cmd Out address Cmd Out address Cmd Out address Cmd Example Log Save to File	Value User CMD(149) 0 149 Polling Normal 5 0 0 0 0 0 ad From Device Load D Save to Device	Pefault Setting

Figure 11-3 Save the parameters to HRT-710

4. Get the Modbus address for the HART command No.149 data.

(1) Open the "Address Map" screen and click the "UserCMD(149) " item.

[1] In the "**Modbus AO**" area, the light blue grid means the Modbus address for data sending.

[2] In the "**Modbus AI**" area, the light blue grid means the Modbus address for data receiving.

=> In the case, the HART command No.149 is used for reading data. Therefore, the light blue grid just show in "Modbus AI" area and the Modbus address for receiving data is from 0 to 2.

Figure 11-4 The Modbus address for UserCMD

(2) Users can use the Modbus Function Code 4 and address from 0 to 2 to get the HART command No.149 data.

(Ex: Request Cmd => 0x01 0x04 <u>0x00 0x00</u> <u>0x00 0x03</u>)