HDS

HART Device Simulator

User's Manual (v1.08)

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1. Introduction

HART Device Simulator (called HDS) is the HART device simulation software developed by ICP DAS. It can be used to simulate multi HART slave devices simultaneously to exchange data with HART master device by using ICP DAS HART converter (like: I-7567 / I-7570 / I-7547) connected to any COM port (USB / 232 / 485 / Ethernet). By this way, users can develop or verify the HART master program without any HART slave device. The below figure is the application of HDS.



1.1 HDS Features

• Free HART slave device simulation software

(Must work with one of ICP DAS HART converter: I-7567/ I-7570/ I-7547)

- Support a lot of HART commands (like: CMD0 / 1 / 2 / 3 ...)
- Provide the setting for the long frame address of HART device.
- Provide the setting for the value and unit of HART command 3.
- Support 16 HART devices simulation simultaneously (address 0 ~ 15).
- Exchange data with HART master device by using ICP DAS HART converter (like: I-7567 / I-7570 / I-7547)
- Support HART communication data log.
- Provide the "adjustable" HART device status bit

1.2 HDS Information

- Compatible with command revision 5, 6, 7 of HART protocol.
- When the COM port is open, the HDS will listen for the incoming requests and response data.
- Only the HART simulation device with the "Enabled" option checked will response data.
- The field of the "Short Frame Address" is fixed.
- The field of the "Long Frame Address" with 5 bytes can be set to simulate the different HART manufacturer's slave device.
- All the HART communication data can be logged to file.
- The four main values and units of PV / SV / TV /QV of HART command 3 can be set for every HART simulation device.

ComPor	t 100 💌	Open					-I-7547	le 0 💌	Set Ch Get Ch	unction SetParam	Da	taLog DevSta	tus Dev	-Speci
IART_I Frable	Devices — Short Addr	Long (ddr (HFX)	PV Velue	PW II.	.;+	erfeV V2	9W II	nit	TV Velue	TV II	nit	OV Value	OW I	Init
		0x 16850B0A42	4.444000	psi	-	3.300000	bar	- III	2.200000	mbar	- III	1.100000	g/cm2	—
	01	0x 0A01000000	11.11111	kg/cm2	-	11.222222	Pa	-	11.333333	kPa	-	11.44444	torr	-
Г	02	0x 0D14000000	22.111111	MPa	-	22.22222	gal/sec	-	22.333333	gal/min	-	22.44444	gal/hr	_
	03	0 x 1190000000	33.111111	1/sec	-	33.222222	1/min	-	33.333333	l/hr	-	33.44444	m3/sec	Y
	04	0 x 1164000000	44.111111	m3/min	-	44.222222	m3/hr	-	44.333333	ft3/sec	-	44.44444	ft3/min	-
Γ	05	0 x 1127000000	55.111111	ft3/hr	-	55.222222	g/sec	-	55.333333	g/min	-	55.44444	g/hr	-
	06	0x 110E000000	66.111111	Kg/sec	-	66.222222	Kg/min	-	66.333333	Kg/hr	-	66.44444	lb/sec	v
	07	0 x 1207000000	77.111111	lb/min	-	77.222222	lb/hr	-	77.333333	Deg.C	~	77.44444	Deg.F	v
	08	0x 1304000000	88.111111	Deg.R	-	88.222222	Kelvin	T	88.333333	ft/sec	_	88.44444	m/sec	V
	09	0x 147D000000	99.111111	in/sec	-	99.222222	in/min	T	99.333333	ft/min	_	99.44444	m/hr	-
	10	0x 1501000000	100.111111	gal	-	100.222222	liter	-	100.333333	m3	-	100.444444	bbl	-
	11	0x 2007000000	101.111111	yd.3	-	101.222222	ft3	-	101.333333	in3	-	101.444444	ft	-
	12	0 x 1751000000	102.111111	m	-	102.222222	in	-	102.333333	cm	-	102.444444	mm	-
	13	0x 190900000	103.111111	min	-	103.222222	sec	-	103.333333	hour	-	103.444444	day	-
	14	0x 1A01000000	104.111111	gram	-	104.222222	kg	-	104.333333	lb	-	104.444444	SGU	-
	15	0x 1D03000000	5.500000	g/cm3	-	6.600000	kg/m3	-	77.000000	lb/gal	-	888.000000	pF	-

Figure 1-2 : HDS Tool

2. HDS Tool

The HDS software includes the below files.

- (1) **HDS.exe** => The main program.
- (2) **HDS.ini** => The record file for parameters.

=> Users can execute the "HDS.exe" to run HDS program.

=> HDS software can be downloaded from :

http://ftp.icpdas.com/pub/cd/fieldbus_cd/hart/converter/hds/software/. •

2.1 HDS Operation

Execute the HDS tool.

95	HDS_v1	.06 (HART	_Device_Simulator	- ICP DAS)												• ×
	ComPort COM1 Open CoM1 Open CoM1 Open CoM1 Open CoM0 CoM0 O															
	HARI_	_Devices										V	HART	v7.0 🔲 GetCM	D3Param (A	uto)
	Enable	Short Addr	Long Addr (hex)	MfrID (v7)	PV_Value	PV_Un	it	SV_Value	SV_	Unit	TV_Value	TV_U	Init	QV_Value	QV_U	nit
	◄	00	0x E28D990328	6084	4.444000	psi	•	3.300000	bar	-	2.200000	mbar	-	1.100000	g/cm2	•
		01	0x 0A01000000	0016	11.111111	kg/cm2	-	11.222222	Pa	-	11.333333	kPa	-	11.44444	torr	-
		02	0x 0D14000000	0016	22.111111	MPa	-	22.222222	gal/sec	-	22.333333	gal/min	-	22.44444	gal/hr	-
						-					_					

Figure 2-1: HDS Main Screen

2.1.1 **ComPort**

Choose the "ComPort" number and click the "Open" button.



Figure 2-2: Open the "ComPort"

2.1.2 Parameter of HART Simulation Device

HA	ART_I	Devices										Ŀ	HART	v7.0 🔲 GetCM	D3Param (.	Auto)
En	nable	Short Addr	Long Addr (hex)	MfrID (∨7)	PV_Value	PV_Unit		SV_Value	SV_U	Init	TV_Value	TV_U	Jnit	QV_Value	QV_t	Init
- F	•	00	0x E28D990328	6084	4.344000	psi	•	3.300000	bar	•	2.200000	mbar	•	1.100000	g/cm2	•
Г		01	0x 0A01000000	0016	12.111111	kg/cm2	-	11.222222	Pa	-	11.333333	kPa	~	11.444444	torr	~

(1) "HART v7.0" option : (Available after version v1.06)=> If checked, "MfrID" field will be enabled

(2) "GetCMD3Param" option : (Available after version v1.06)
 => If checked, HDS will load CMD3 parameters settings from INI file

(3) "Enable" option :

Enable

 $\overline{}$

=> If checked, the corresponding HART simulation device will be enabled.

(4) "Short Addr" field : (fixed, decimal)

=> The Short Frame Address of HART simulation device.

(5) "Long Addr (HEX)" field : (can be set, hex)=> The Long Frame Address of HART simulation device.

(6) "MfrID" field : (can be set, hex)

=> Enabled if "HART v7.0" checked, the manufacturer ID for HART v7.0

(7) "PV_Value / PV_Unit" field : (can be set)

=> The PV value and unit of HART simulation device.

(8) "SV_Value / SV_Unit" field : (can be set)

=> The SV value and unit of HART simulation device.

(9) "TV_Value / TV_Unit" field : (can be set)

=> The TV value and unit of HART simulation device.

(10) "**QV_Value** / **QV_Unit**" field : (can be set)

=> The QV value and unit of HART simulation device.

2.1.3 System Function



(1) "SetParam" button :

=> Set the current parameters of HART simulation device and save to the HDS.ini file. When executing the HDS tool next time, it will load the new settings.

(2) "DataLog" button :

=> It will open the HART communication screen.

<1> <== : HDS receive HART command.

<2> ==> : HDS send(response) HART command.

HART CommLog 5:51:21.437 <== FE FE FE FE FE 02 80 00 00 82 5:51:21.609 ==> FF FF FF FF FF 06 80 00 0E 00 20 FE 16 85 07 05 02 0B 08 02 0B 0A 42 87 15:51:22.125 <== FF FF FF FF FF 02 81 00 00 83 15:51:22.296 ==> FE FE FE FE FE 06 81 00 0E 00 08 FE 0A 01 07 05 02 0B 08 02 00 00 07 75 15:51:22.875 <== FF FF FF FF FF 02 82 00 00 80 15:51:24.406 <== FF FF FF FF FF 02 83 00 00 81 15:51:25.937 <== FF FF FF FF FF 02 84 00 00 86 15:51:31.265 <== FF FF FF FF FF FF FF 82 16 85 0B 0A 42 03 00 51 15:51:31.437 ==> FF FF FF FF FF 86 16 85 0B 0A 42 03 1A 00 00 C1 3D E7 4F 06 3D E3 8E 2A 07 3E 63 8E 2A 08 3E AA AA 9F 09 3E E3 8E 2A 4 M Auto Scroll Clear RecvCnt : Save

[1] "Auto Scroll" option :

=> If checked, it will show the latest HART communication data.

[2] "RecvCnt" field :

=> Show the total number of received HART command of HDS not including the response command.

[3] "Save" button :

- => Save all the HART communication data to file.
- [4] "Clear" button :
- => Clear all the HART communication data.

(3) "DevStatus" button : (Supported in v1.02)

The "DevSta Return Mode" option :

=> It is used to set the return mode of HART device status. (All the simulated HART devices use the same settings)

[1] Auto Mode :

The HART device status is decided by HDS software according to the current HART comm. status.



[2] Manual Mode :

The HART device status is decided by users according to the below "check" options.



(4) "Dev-Specific" button : (Supported in v1.05.1)

[1] It is used to set the parameters of the device-specific command. (All the simulated HART devices use the same settings)

[2] It supports 64 parameters for every device-specific command.

[3] It supports device-specific command from 128 ~ 253.

				Щ						
H. - CMD	ART C Paran	MD N n Valu	o : 12 12 1e (H 22	28 18	• •	CMD I	^D aram	Num :	1	•
	1	2	25	50 51	5	6	7	8	9	10
0	00	00	029	52 53	• 00	00	00	00	00	00
1	00	00	00	00	00	00	00	00	00	00
2	00	00	00	00	00	00	00	00	00	00
3	00	00	00	00	00	00	00	00	00	00
4	00	00	00	00	00	00	00	00	00	00
5	00	00	00	00	00	00	00	00	00	00
6	00	00	00	00						
							Set	Ge	t	Clear

[1] "HART CMD No" option :

- => Choose HART device-specific command no.
- [2] "CMD Param Num" field :

=> Choose the amount of parameters for the chosen HART devicespecific command no.

- [3] "CMD Param Value (Hex)" field :
- => Set the parameter value with Hexadecimal format.
- [4] "Set" button :
- => Save the settings of the screen to the HDS.ini file.
- [5] "Get" button :
- => Get the settings from the HDS.ini file and show them to the screen.
- [6] "Clear" button :
- => Set all the parameter value to be zero.

2.1.4 I-7547 Function

-I-7547 ✓ Enable: Set Ch ChNo: 0 ▼ Get Ch	Function SetParam DataLog DevStatus	LCAS DAS

(1) "Enable" checkbox :

=> When checked, the HART channel setting of I-7547 will be enabled.

(2) "ChNo" combox :

=> It is used to choose the HART channel no. of I-7547.

(3) "SetCh" button :

=> It is used to set the HART communication channel of I-7547.

(4) "GetCh" button :

=> It is used to get the current HART communication channel of I-7547. [Note]

1. When using I-7547, the timeout value should be more than 1000ms in the HART master program for stable HART communication.

HC_Tool v1.05 (ICP D	AS)		
Settings Data Log	Msg HTCig	ModCfg Abo	ut
COM19 : Open	Close		
Search : Start	Stop		
S Settings			
Com Port Port Name : [1-7570 : [COM19 💌	N V 8	eout (ms) : 1000
HART (For Cmd 0)	Eachle 20	UT Changel	
Kub Comiguie .		HI Channel :	
Flame type .	SROTI Y	Master type .	Primary V
Preambles :	2	Address :	<u>U</u>
Manufacturer ID :	22	Device type :	133
Device ID :	723522		

2.2 HDS Other Function

2.2.1 HART Supported Command

HDS supports a lot of HART commands as below:

1. Universal command :

00, 01, 02, 03, 07, **08**, **09**, **11**, 12, 13, 14, 15, 16, 17, 18, 19, **20**, **21**, **22**

2. Common-Practice command :

- [1] 33 ~ 38
- [2] 40 ~ 44
- [3] 47 ~ 51

[4] 59, 71, 76, 89, 90, 95, 108, 109

3. Device-Specific command :

128 ~ 253

3. FAQ

Q01. Run the HDS tool step by step?

A01 : (2015/12/17)

Example

(1) Hardware required:

- [1] I-7567 or I-7570 or I-7547 * 1 (as Slave)
- [2] I-7567 or I-7570 or I-7547 * 1 (as Master)

[3] PC

(2) Software required:

- [1] HDS (for Slave)
- [2] HC_Tool (for Master)
- (3) Application structure:



(4) Procedure:

[1] Simulate HART Slave Device

- <1> Connect 1 ICP DAS HART converter to PC
- <2> Run HDS tool
- <3> Choose the ComPort number and click the "Open" button
- <4> If using I-7547, please do the following 2 steps
 - i. Use VxComm Utility to create virtual ComPort for I-7547, detailed instruction refer to Chapter 4.1 of I-7547 manual

ftp://ftp.icpdas.com.tw/pub/cd/fieldbus_cd/hart/converter/i-7547/manual/

ii. After Opened the virtual ComPort, tick Enable box as below and choose channel number and "Set Ch"





Q02. How to modify the parameters for HART simulated device? A02 : (2016/10/03)

(1) Modify the hardware parameters.

[1] Via the "HDS.ini" file.



(2) Modify the "Long Frame Address".

[1] Modify the value in the "Long Addr (HEX)" field of the HDS software and then click the "SetParam" button.

MDS_v	1.U2 (HAR	I_Device_Simulator)											
ComP	ort								F	unction —	_			-
CON	17 💌	Close								SetParam] [D	ataLog DevS	tatus	DAS
HADT	Devices													
Enabl	_Devices e Short Add	r Long Addr (HEX)	PV Value	PV Un	uit	SV Value	SV U	nit	TV Value	TV U	nit	OV Value	OV U	Init
	00	0x 16850B0A42	15.111111	psi	-	0.222222	bar	-	0.333333	mbar	-	0.44444	g/cm2	-
•	01	0x 0.000000	16.111111	kg/cm2	•	11.222222	Pa	•	11.333333	kPa	-	11.444444	torr	•
Г	02	0x 0D14000000	22.111111	MPa	-	22.22222	gal/sec	-	22.333333	gal/min	-	22.44444	gal/hr	-
	03	0x 1190000000	33.111111	Vsec	-	33.222222	1/min	-	33.333333	l/hr	-	33.444444	m3/sec	-
Г	04	0 x 1164000000	44.111111	m3/min	-	44.222222	m3/hr	-	44.333333	ft3/sec	-	44.44444	ft3/min	-
	05	0 x 1127000000	55.111111	ft3/hr	~	55.222222	g/sec	~	55.333333	g/min	-	55.44444	g/hr	-
	06	0x 110E000000	66.111111	Kg/sec	-	66.222222	Kg/min	-	66.333333	Kg/hr	-	66.44444	lb/sec	-
	07	0x 1207000000	77.111111	lb/min	-	77.222222	lb/hr	-	77.333333	Deg.C	-	77.444444	Deg.F	-
	08	0x 1304000000	88.111111	Deg.R	-	88.222222	Kelvin	~	88.333333	ft/sec	-	88.44444	m/sec	~
	09	0x 147D000000	99.111111	in/sec	-	99.222222	in/min	-	99.333333	ft/min	-	99.444444	m/hr	T
	10	0 x 1501000000	100.111111	gal	-	100.222222	liter	-	100.333333	m3	-	100.444444	bbl	-
Г	11	0 x 2007000000	101.111111	yd.3	-	101.222222	ft3	-	101.333333	in3	-	101.444444	ft	-
	12	0x 1751000000	102.111111	m	-	102.222222	in	-	102.333333	cm	-	102.444444	mm	-
Г	13	0 x 1909000000	103.111111	min	-	103.222222	sec	-	103.333333	hour	-	103.44444	day	-
	14	0x 1A01000000	104.111111	gram	-	104.222222	kg	-	104.333333	lb	-	104.44444	SGU	-
	15	0x 1D03000000	105.111111	g/cm.3	-	105.222222	kg/m3	-	105.333333	lb/gal	-	105.444444	pF	-

(3) Modify the value of "HART CMD12" (Read Message) ?

[1] In HC_Tool (HART Master), send the "HART CMD17" (Write Message).

Universal Common Specific
Universal Cmd : 12 : Read Message
HART Setting & Info
Cmd7 Cmd8 Cmd9 Cmd11 Cmd12 Cmd13 Cmd14 Cmd15 Cmd16 Cmd17 Cmd18 Cn
Read Message
Message : Go To Write
[1] Binary (24) : (HEX) C7 1C 71 7D 32 4D 54 C0 54 3D 2C 60 82 08 20 82 08 20 82 08 20 82 08 20
[2] ASCII (32) : 11111_SIMULATOR1
(Read Message, HART CMD12)
Universal Common Specific
Universal Cmd: 17 : Write Message
HAR T Setting & Info
Cmd7 Cmd8 Cmd9 Cmd11 Cmd12 Cmd13 Cmd14 Cmd15 Cmd16 Cmd17 Cmd18 Cn
Write Message
GoTo Read GoTo Read GoTo Read
[1] Binary (24) : (HEX)
C7 1C 71 7D 32 4D 54 C0 54 3D 2C 60 82
[2] ASCII (32) : 1111_SIMULATOR1

(Write Message, HART CMD17)

(4) Modify the current value ?

[1] "<u>Point to Point</u>"模式:

HART device address must be 0. The current will vary depending on the PV value.

[Ex1: PV=0.11111 => Current=-11.868970]

	Cmd3 Cmd6 Cmd7 Cmd8 Cmd9 Cmd11
	ic Variables and Loop Current
	Current: -11.868970 mA
	PV : 0.111111 psi
-HART_Devices	SV : 0.222222 ber
Enable Short Addr Long Addr (HEX) PV_Value	TV : 0.333333 mbar
▼ 00 0x 16850B0A42 0.111111	QV : 0.44444 g/cm2
[Ex2 : PV=15.11111 => Current=5.8	819850] Cmd.3 Cmd.6 Cmd.7 Cmd.8 Cmd.9 Cr
	Variables and Loop Current
	Current : 5.819850 mA
	PV : 15.111110 psi
HOPT Devices	SV : 0.222222 bar
Enchle Short iddr Long iddr (HEV) BV Volus	TV : 0.333333 mba

PV_Value

15.111111

[2] "<u>Multi-Drop</u>"模式:

Enable Short Addr

₹

00

HART device address should be between 01 and 15. The current will be fixed to be 4 mA.

g/cm2

QV: 0.444444

[Ex1: PV=0.11111 => Current=4.00000]

Long Addr (HEX)

0x 16850B0A42

	Cmd3 Cmd6 Cmd7 Cmd8 Cmd9 Cmd11
	Variables and Loop Current—
	Current: 4.000000 mA
HART Devices	PV: 11.111110 kg/cm2
Enable Short Addr Long Addr (HEX) PV_Value	SV: 11.222220 Pa
00 0x 16850B0A42 15.111111	TV: 11.333330 kPa
▼ 01 0x 0A01000000 11.11111	QV : 11.44440 torr

[Ex2: PV=16.11111 => Current=4.00000]

	Cmd3 Cmd6 Cmd7 Cmd8 Cmd9 Cmd11
	: Variables and Loop Current
	Current: 4.000000 mA
HART Devices	PV: 16.111110 kg/cm2
_ Enable Short Addr Long Addr (HEX) PV_Value	SV: 11.222220 Pa
00 0x 16850B0A42 15.111111	TV: 11.333330 kPa
✓ 01 0x/0A01000000 16.111111	QV : 11.444440 torr

Q03. How to use HDS to virtually transfer Modbus device to HART device?

A03 : (2018/11/08)

(1) Hardware required:

[1]. HART converter * 1 (I-7567 or I-7570 or I-7547)

<1> work with HDS software => simulate HART Slave device

- [2]. Modbus instrument
- [3]. PC * 1

<1> Need to write an nModbus program with following functions:

[1] Collect Modbus device data

[2] Keep updating the Modbus device data to HDS.ini file

<2> Execute HDS.exe software

(2) Software required:

[1]. HDS (HART Device Simulator), Download from:

ftp://ftp.icpdas.com/pub/cd/fieldbus_cd/hart/converter/hds/software/

[2]. **HC_Tool** (converter utility), Download from:

ftp://ftp.icpdas.com.tw/pub/cd/fieldbus_cd/hart/converter/i-7547/software/

- [3]. nModbus related information:
 - <1> introduction / example

http://www.icpdas.com/products/PAC/i-8000/modbus.htm

<2> nModbus_Demo program:

Reads AI data from Modbus device and modify HDS.ini file, download from:

<u>ftp://ftp.icpdas.com/pub/cd/fieldbus_cd/hart/converter/hds/software/demo/</u>(3) Application structure and procedures description:



- [1]. Write an nModbus program to read Modbus device data (Please save the program to the same folder with HDS program)
- [2]. nModbus program updating the HDS.ini file with the Modbus device data simultaneously.
- [3]. Use a HART converter with HDS to simulate HART device (The simulated HART device shares the same data with Modbus slave as the program keeps updating the HDS.ini file)
- [4]. Use another HART converter with HC_Tool to test

(4) Application function test:

- [1]. HART Master setup:
 - <1> HART converter * 1 (I-7567 or I-7570 or I-7547)

<2> work with HC_Tool software => HART Master functions

[2]. nModbus program gets data from Modbus device

COM:	COM3	-	Baud:	9600	-	Data Bit:	8 🗸	Parity:	None 👻	Stop Bit:	1	•
DO	DI	AO	AI									
	77	0		0		0	0					
	<i>''</i>	U	0		0	0	0	0				

[3]. nModbus program updates the Modbus device data to HDS.ini file

HDS -	·記事本	
檔案(F)	編輯(E)	格式(O)
DevIDN	o=72352	22
[HTDev PV1Uni PV1Val	00_Cmd0 t=32 ue=27.7)01] 7
[HTDev PV1Uni: PV1Val: PV2Uni: PV2Val: PV2Val: PV3Uni:	00_Cmd0 t=32 ue=27.7 t=7 ue=0.22 t=8)03] 7] 22222

[4]. HDS program shows value which same as Modbus device data

B HDS_v1.03 (HART_Device_Simulator)		
ComPort COM31 Close	I-7547 Enable ChNo: 0	Set Ch Function Get Ch SetParam DataLog DevStatus
HART_Devices	7	
Enable Short Addr Long Addr (HEX) PV_Value	PV_Unit SV_Value SV_Unit	TV_Value TV_Unit QV_Value QV_Unit
✓ 00 0x 16850B0A42 27.7	Deg.C 💌 0.222222 bar 💌	0.333333 mbar 🔻 0.444444 g/cm2 💌
[5]. HC_Tool utility rea	ds data from HDS	Cmd3 values

-HART Setting & Info

Cmd1	Cmd2	Cmd3	Cmd6	Cmd7	Cmd8	Cmd9	Cmd11	C
Rea	ad Dynami	ic Variable:	s and Loop	Current				
			C	ument :	20.665360)	mA	
				PV :	27.700000)	deg (C)	
				SV :	0.222222		bar	
				TV:	0.333333		mbar	
				QV :	0.444444		g/cm2	

Q04. How to use HART Device-Specific commands A04 : (2018/05/15)

HDS_v1.05.1 supports HART Device-Specific command from 128 to 253 and 64 parameters for every HART Device-Specific command.

 Crow P		-								1.754	,		-							
COMPO	142 -	Close								-1-754	nable	Set Ch		SetPara		DataLos		evStatus	Dev	Specific
,									C	ChNo		Get Ch								
HART_Devices HART Device Specific Command Enable Short Addr Long Addr (HEX) PV_Value PV_Unit S																				
	00	0x 16850B	0A42	4.4	44000	psi	_0.m.	3.30		HAR	T CMD N	No : <u>1</u> 2	28	•	CMD	Param	Num :	1	•	
	01	0x 0A0100	0000	11.	.111111	kg/cr	n2 🔽	11.2		CMD Pa	ram Val	ue (HE)	۹ <u> </u>							_
Γ	02	0x 0D1400	0000	22.	.111111	MPa	-	22.2			2	3	4	5	6	7	8	9	10	
	03	0x 1190000	0000	33.	.111111	1/sec	~	33.2		0 0	0 00	00	00	00	00	00	00	00	00	
Γ	04	0x 1164000	0000	44.	.111111		nin 💌	44.2		1 0	0 00	00	00	00	00	00	00	00	00	
	05	0x 1127000	0000	55.	.111111	ft3/h		55.2		2 0	0 00	00	00	00	00	00	00	00	00	
	06	0x 110E000	0000	66.	.111111	Kg/s	ec 💌	66.2		3 0	0 00	00	00	00	00	00	00	00	00	
Γ	07	0x 1207000	0000	77.	.111111	lb/mi	n 🔻	77.2		4 0	0 00	00	00	00	00	00	00	00	00	
	08	0x 1304000	0000	88.	.111111	Deg.	R 💌	88.2		5 0	0 00	00	00	00	00	00	00	00	00	
	09	0x 147D00	0000	99.	.111111	in/sec	-	99.2		6 0	0 00	00	00							
Γ	10	0x 1501000	0000	100	D.111111	gal	~	100								Set	Ge	at 🗍	Clear	
	11	0x 2007000	0000	101	1.111111	yd.3	~	101												
	12	0x 1751000	0000	102	2.111111	m	~	102]
		ĺ	HART	Devi	ice Spec	ific Co	mmand			-		-				x				
				Г					_	_					1					
				Н	IART C	MD No	o: 25	3	-	CMD	Param	Num	64	•						
				CMD) Paran	n Valu	e (HEX]——								1				
					1	2	3	4	5	6	7	8	9	10	1					
				0	00	00	00	00	00	00	00	00	00	00)					
				1	00	00	00	00	00	00	00	00	00	00)					
				2				00		00	00	00		1 00	1					
				-		00		00	00	00	00	00	00							
				3	00	00	00	00	00	00	00	00	00		-					
				4	00	00	00	00	00	00	00	00	00	00)					
				5	00	00	00	00	00	00	00	00	00	00)					
				6	00	00	00	00												
					,			,					.	01						
										_	Set	Ge	н -	clea						
								-	_	_			_	_	_		1			

[For Example]

The user wants HDS to response HART device-specific command 128 with 3 parameters and these value are 0x11, 0x22 and 0x33. Please follow the below steps:

(1)Set the parameter of HART device-specific CMD 128 for HDS.

[1] Open "HART Device Specific Command" screen.

[2] Choose "**128**" in the "<u>HART CMD No</u>" option.

[3] Choose "**3**" in the "<u>CMD Param Num</u>" option.

[4] Type "11", "22" and "33" in the "CMD Param Value (HEX)" field.

[5] Click "Set" button to save the settings to HDS.ini.

T Devi	ce Spe	cific Co	mman	d	P.34		-	1 mar		(Page 1
н	IART C	MD N	o: 12	28	-	CMD	Param	Num :	3	•
CMD	Parar 1	n Valu 2	e (HE) 3	<) 4	5	6	7	8	9	10
0	11	22	33	00	00	00	00	00	00	00
1	00	00	00	00	00	00	00	00	00	00
2	00	00	00	00	00	00	00	00	00	00
3	00	00	00	00	00	00	00	00	00	00
4	00	00	00	00	00	00	00	00	00	00
5	00	00	00	00	00	00	00	00	00	00
6	00	00	00	00						
						ſ	Set	Ge	t (Clear

(2)Send HART master command 128.

[Method 1: Using ICP DAS HART converters with HC_Tool]

- [1] By using ICP DAS HART converters (I-7567, I-7547 or I-7570) with HC_Tool.
- [2] Click "SRMsg" option to open "Send & Receive Msg" screen.
- [3] Search the HART device.
- [4] Open "HTCfg" screen to send HART command 3.

[5] Then see the sending	HART CIVID3 format in	SRIVISG screen
Send & Receive Msg	1 10	
Send Data	HART CMD3	
FF FF FF FF FF 02 80 00 00		Send
Vith Parity Check		
2018/05/14 18:39:04.641 → FF FF FF FF FF FF FF F8 2 <u>16</u> Long Fram	85 0B 0A 4203 ne Address	
		-
📄 Auto Scroll		Clear
Receive Data 2018/05/14 18:39:05.331 <= FF FF FF FF FF 86 16 85 0B CD C3	0A 42 03 1A 00 00 C0 D8 4C F0 06 40 8E 35 3F 07 40 5:	3 33 33 08 40 0C CC CD 09 3F 8C CC
[6] Send the HART comm	hand 128 with the same	long frame address

[6] Send the HART command 128 with the same long frame address.[7] In the "Receive Data" field, it will show the HART CMD128 response from HDS with 0x11, 0x22, 0x33 data.

Send Data FF FF FF FF FF FF	com 7 FF 82 16 85	mand num	ber (in hex)					
With Parity CF	eck		-					Send
2018/05/15 09:2: 2018/05/15 09:2:	3:00.962 => 3:15.152 =>	F FF FF FF FF F FF FF FF FF	FF FF 82 16 85 FF FF 82 <u>16 85</u>	0B 0A 42 03 0B 0A 42 <mark>80</mark>	00 51 00 D2	+ HART	CMD128	
Auto Scroll								Clear
🗖 Auto Scroll Receive Data								Clear

[Method 2: Using ICP DAS HART gateway with HG_Tool]

- [1] By using ICP DAS HART gateway (HRT-710, HRT-310 or HRT-711) with HG_Tool.
- [2] Run the HG_Tool and connect to the HART gateway.
- [3] Add a new command in the "Device Configuration" screen.

-					
Device Configur	Received and a second		٢		
HRT-310 System HART I Defs Defs Defs Defs Defs Defs Defs Defs Defs 	Edit Delete Add Command	Item H & P T Defaul Operat Load	Device Name Channel Configuration rk t Command (0) t Command (3) t Command (3) t Command (3) t Command (3)	Value HART Device 0 O Enable Point to Point Initial Polling ad From Device	Load Default Setting

[4] Type "**128**" in the "<u>Command Num</u>" field and "**5**" in the "<u>In Size</u>" field (<u>Response Code(2 bytes) + CMD128 Param Number (3 bytes)</u>) and

"0" in the "Out Size	" field.	
ew Command		
Command Command Num. : 128 In Size : 5	Mode : Polling ▼ OutSize : 0	- Format : Normal 👻
		OK Cancel

[5] Click "Save to Device" button.

- [6] Using Modbus master tool (ModScan) to get the HART CMD 128 response data from HART gateway.
 - <1> The response data of HART CMD 128 will be as below.
 - => 0x00 0x00 (Response Code) 0x11 0x22 0x33 (Data).

<2> Because the gateway has set the "WORD & BYTE" swap, so users will see the below data.

🖶 ModSca1		
Address:	0001	Device Id: 1 MODBUS Point Type
Length:	5	04: INPUT REGISTER 🔹
30001: <1 30002: <00 30003: <00 30004: <3 30005: <00	122H> 100H> 100H> 100H> 100H>	•

Q05. How to change CMD48 parameters setting

A05 : (2018/07/10)

HDS_v1.05.1 supports HART command 48, all parameters setting stored in the .ini file of HDS.

HDS.ini - 記事本 檔案(F) 編輯(E) 格式(O) [HTDev00_Cmd048] DevSpecSta0=1 DevSpecSta1=1 DevSpecSta2=1 DevSpecSta3=1 DevSpecSta3=1 DevSpecSta5=1 ExtDevSta6=2 DevOpMode7=3 AnalogChSat8=1 AnalogChSat9=1 AnalogChSat10=1

[Example: modify the CMD48 parameter of HART Device00]

(1) Open the HDS.ini file

(2) Find [HTDev00_Cmd048], modify parameter value and save (as below)



Send CMD48 to corresponding device, you can see the saved changes

						HART Cmd :	48 : Read Addition	al Device Status
Cmd38	Cmd41	Cmd42	Cmd48	Cmd71	Cmd7	6		
-Read	l Additions	al Device S	tatus					
			Device-	Specific S	tatus :	0x02010101010	11 01	
			Extended	l Device S	tatus :	0x02 => Device	Variable Alert	
			Device O	perating N	4ode :	0x03 =>		
		I	Inalog Cha	nnel Satu	rated :	0x01 01 01		
			Analog	Channel H	7ixed :	0x01 01 01		
			Device-	Specific S	tatus :	0x01 01 01 01 0	01 01 01 01 01 01 01 01	

Q06. How to simulate HART 7.0 device by HDS

A06 : (2019/02/13)

HDS supports simulating HART 7.0 devices after HDS_v1.06, users just need to do three steps as described below:

HDS_v1.06 (HART_Device_Simulator - IC	CP DAS)								x
ComPort			I-7547 ChNo : 0	Set Ch Get Ch	Function SetParam	DataLog	vStatus Dev-Sp	pecific	
HART_Devices						✓ HART	v7.0 □ GetCMI	D3Param (Auto)	
Enable Short Addr Long Addr (hex) M	ffrID (v7) PY Value	PV_IInit	CV_V.1	SV_Unit	I V_Value	TV_Unit	QV_Value	Q∀_Unit	
▼ 00 0x E28D000000 6	6084 4.344000	psi 💌	3.300000	bar 💌	2.200000	mbar 💌	1.100000	g/cm2 ▼	
□ 01 0x 0A01000000 0	0016 12.111111	kg/cm2 💌	11.222222	Pa 💌	11.333333	kPa 💌	11.444444	torr 💌	

- 1. Tick the "HART v7.0" option to enable "MfrID (v7)" field editing
- 2. Fill in the correct parameters of HART 7.0 device to the "MfrID (v7)" and "Long Address" fields in HDS.
- 3. Click "SetParam" button.

Here is an example of simulating HART 7.0 device:

(1) Below is the information of MP100 HART 7.0 device from 3S Co., Ltd.

REGISTERED PRODUCT INFORMATION	^				
Manufacturer: 3S Co., Ltd					
Product Name: MP100					
Product Description: Positioner					
Protocol: HART					
Category: Actuators, Regulators, Positioners					
Profile: HART Field Device					
REGISTERED PRODUCT DETAILS	^				
REGISTERED PRODUCT DETAILS Manufacturer ID (hex): 006084	^				
REGISTERED PRODUCT DETAILS Manufacturer ID (hex): 006084 Device Type ID (hex): E28D	^				
REGISTERED PRODUCT DETAILS Manufacturer ID (hex): 006084 Device Type ID (hex): E28D DEV_REV (hex): 1	^				
REGISTERED PRODUCT DETAILS Manufacturer ID (hex): 006084 Device Type ID (hex): E28D DEV_REV (hex): 1 DD Revision: 1	^				
REGISTERED PRODUCT DETAILS Manufacturer ID (hex): 006084 Device Type ID (hex): E28D DEV_REV (hex): 1 DD Revision: 1 Technology Version: 7	^				

(2) Simulate HART 7.0 device with HDS.

[1] Fill in the value of Manufacture ID (hex) – "6084" to the "MfrID (v7)" field of HDS.

[2] Fill in the value of Device Type ID (hex) – "E28D" and additional "000000" to the "Long Addr" field of HDS.

[3] Click " SetParam ":								
HDS_v1.06 (HART_Device_Simulator - ICP DAS)								
ComPort ComPort I-7547 Function COMB Close Choo: 0 Get Choo Dev.Specific								
HART_Devices Image: Hart vr.0 GetCMD3Param (Auto) Enable Short Addr Long Addr (hex) MfrID (vr.7) PV_Value PV_Unit SV_Value SV_Unit TV_Value TV_Unit QV_Value QV_Unit Image: Comparison of the state								
(3) Test the simulated HART device by using a HART converter (I-7567/ I- 7570/ I-7547) with HC_Tool (after version v1.08).								
HC Tool download :								
HC_Tool v1.08 (ICP DAS)								
Settings Data Log SRMsg HTCfg ModCfg About								
COM15 : Open Close								
Search : Stop								
Status : Idle								
Information :								
[Polling Address : 0] Manufacturer ID Code : 24708 (0x6084) => 3\$ Co., Ltd. Manufacturer Device Type Code : 57997 (0xE28D) => MP100 (Positioner) Number of Preambles Required : 7 (Master to Slave) Universal Command Revision : 7 Device-Specific Command Revision : 2 Software Revision : 8 (HW_Rev:1 / Bell_202_Current) Device Function Flags : 2 Device ID Number : 0 (0x000000) Unique Address : 0xE28D000000								
Number of Preambles Required : 5 (Slave to Master) Max Number of Device Variables : 11 Configuration Change Counter : 10 Extended Device Status : 0 Private Distributor Code : 24708 (0x6084) => 3S Co., Ltd Device Profile Code : 5 (0x05) =>								

Q07. How to use Modbus to communicate with HDS ? A06 : (2019/08/26)

(1) Using ICP DAS HART Converter with HDS to simulate HART device:

[1] Refer to the steps of FAQ01.

 (2) Additional to add ICP DAS Modbus/HART Gateway. So users can use Modbus to communicate with HDS in the PC or PLC side.:
 (Using the method, users don't need to know HART protocol. Just using Modbus communication and can access HDS data.)

[1] Adopt HRT-310 or HRT-710 structure : (For MB/RTU)



[2] Adopt HRT-310 structure : (For MB/TCP)



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4. Version History

Ver.	Author	Date	Description
1.00	Edward	2015/12/17	1. First version.
1.01	Edward	2016/07/28	1. Add the "DevStatus" button to set the status of the simulated HART device.
1.02	Edward	2016/11/10	1. Add the Q02 in FAQ. 2. Add the section 2.1.4 (I-7547 Function)
1.03	Peter	2017/06/30	1. Add the Q03 in FAQ
1.04	Peter	2018/05/15	 Add the Q04 in FAQ HDS_1.05.1 version new function: [1] New supported command (48, 128~253)
1.05	Peter	2018/11/01	1. Add the Q05 in FAQ
1.06	Peter	2018/11/30	1. Modify Q01 and Q03 in FAQ
1.07	Peter	2019/02/13	 1. HDS_1.06 new function: (1) Support HART v7.0 protocol. (partial) (2) New supported command (8) 2. Section 2.1.2 add description of new functions 3. Add the Q06 in FAQ
1.08	Edward	2020/03/20	 Add the Q07 in FAQ HDS_1.07 new function: New supported CMD (9, 11, 20~22, 33, 43, 44, 47, 50, 51, 71, 76, 89, 90, 95)