

# G1013 HART to FF Gateway User Manual



Microcyber Corporation

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## Warning

1. Please don't take off/install gateway at random.
2. Please check if the power of temperature board set meets the power request in the User Manual.

# Chapter 1 Overview

G1013 HART to FF Gateway, designed by Microcyber Corporation is a gateway device for HART protocol and FF protocol. As HART master, G1013 HART to FF Gateway communicates with HART slave via HART interface, it can convert dynamic variables in the device to FF device variables output. G1013 HART to FF Gateway is shown as Figure 1.1.



Figure 1.1 G1013 HART to FF Gateway

## 1.1 Dimension

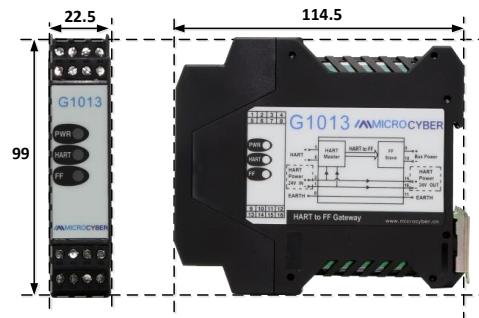


Figure 1.1 Dimension (Unit: mm)

## 1.2 Structure

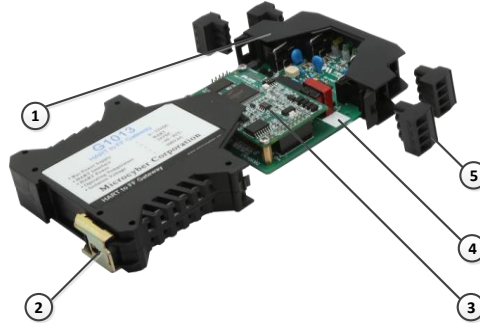


Figure 1.3 Structure

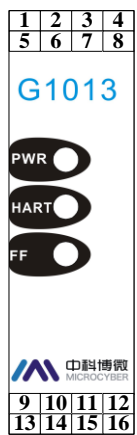
1	Upside Housing	2	Bottom Housing	3	FF Communication Board
4	HART Bottom Board	5	Terminal		

## Chapter 2 Installation

G1013 HART to FF Gateway is 99×22.5×114.5mm, supporting standard DIN rail installation.

### 2.1 Wiring

G1013 HART to FF Gateway's wiring is shown as Figure 2.1.



1	24V-	2	24V+
3	NC	4	NC
5	HART+	6	HART-
7	NC	8	EARTH
9	FF+	10	FF-
11	EARTH	12	NC
13	NC	14	NC
15	24V+	16	24V-

Figure 2.1 Wiring

G1013 HART to FF Gateway is powered by FF bus, and the HART part shall be with 24V external powered. The recommended is TP cable, and it shall improve device's anti-electromagnetic interference ability.

### 2.2 DIP Switch Setting

There is a 3-bit DIP switch for G1013 HART to FF Gateway, shown as Figure 2.2.

- SIM: Simulation switch, can be used for "simulation function".
- WP: Write protection, all the write operation for FF smart pressure transmitter shall be refused, which avoid data modification at random.
- RST: Reset, reset device date to factory original. Power off the device at first, and made the switch at ON, and then power on the device, the device shall be reset to factory original.

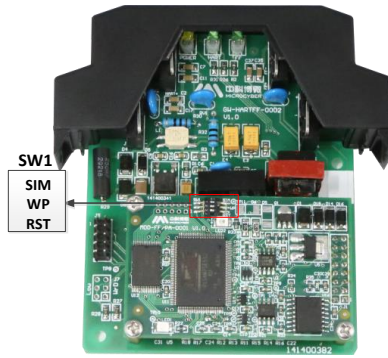


Figure 2.2 Hardware Switch

## Chapter 3 Working Principle

HART to FF gateway is a converter for HART protocol to FF protocol. As a HART master device, it can connect HART bus device in single-point mode or multiple-point mode. It can connect 4 HART devices. As a FF slave device, the gateway can convert HART device dynamic data to FF function block channel data, and transfer to control system via function block output. The system connection is shown in Figure 3.1.

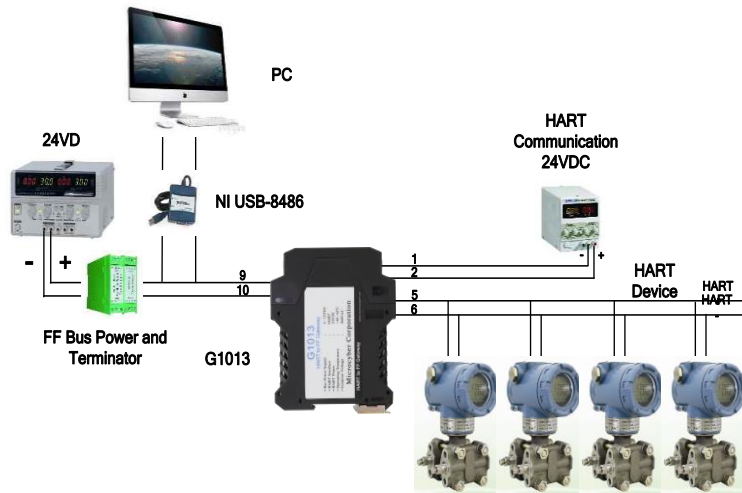


Figure 3.1 System Connection

HART to FF gateway consists of two boards, one is FF communication board and the other one is HART interface board. FF communication board is a universal board and it can be used in different devices, for FF bus communication. HART interface board is only used in G1013, for signal isolation, signal convert, FF/PA communication module power, and HART device power, etc. The working principle for G1013 is shown in Figure 3.2.



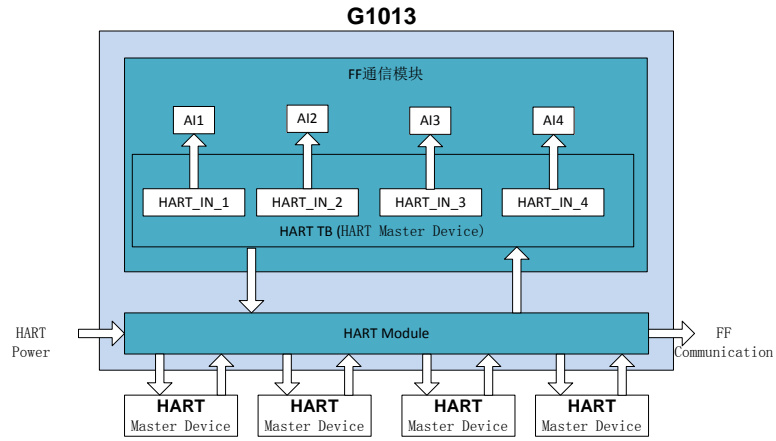


Figure 3.2 Working Principle

# Chapter 4 Gateway Configuration

## 4.1 Topology Connection

FF device supports multiple network topology connections, shown as Figure 4.1. The FF device bus connection is shown in Figure 4.2, the bus ends is connected with terminal matched resistance to ensure signal quality. The maximum length is 1900m, it shall be prolonged to 10km with repeaters.

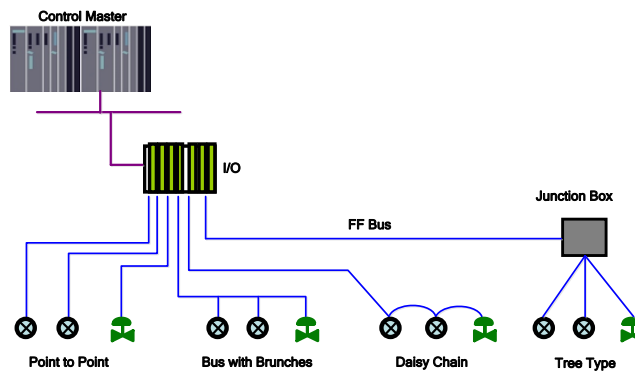


Figure 4.1 FF Network Topology

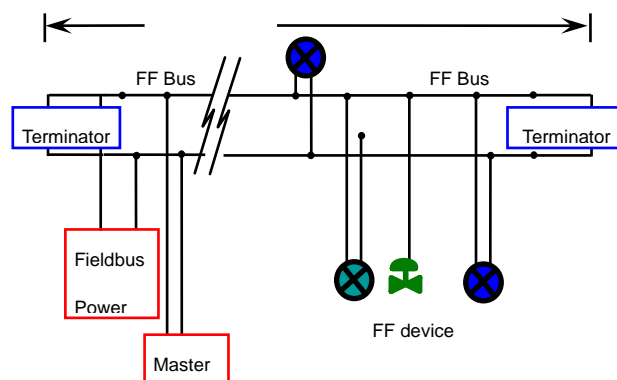


Figure 4.2 FF Bus Connection

## 4.2 Function Block Description

For default configuration for G1013, there is 1 RES function block complying with FF specification, 1 HART transducer block (HART\_TB), 4 AI function blocks and 1 PID function block. AI function blocks support 16 channels, and 16 channels and 4 devices' PV, SV, TV and QV are corresponding.

Name	Description
Resource (RES)	Resource block is used to describe device characters in the field, such as device name, manufacture, serial number. There is no input or output parameter in resource block. Generally there is

	only one resource block for each device.
HART_TB(MTB)	HART_TB can be used to configure HART communication parameters, such baud rate, stop bit, communication overtime, etc.
Analog Input (AI)	Analog input function block is used to achieve transducer block input data and transfer it to other function blocks, and has the function of range conversion, filtering, and square root, etc.
Proportional Integral Derivative (PID)	PID function block has the function of PID control and setting point adjustment, process value(PV) filtering and alarm, output tracking, etc.

### 4.3 HART Transducer Block Configuration Parameters

HART transducer block provides 4 groups of variables, and they are corresponding to 4 HART slave devices. The user may read related device information and dynamic variables information by configuration of HART slave polling address.

#### DS-272 HART Device Parameter HART\_LOC\_PARM

The new added data type DS-272 is HART device parameters, including HART slave polling address and device basic information, including: HART protocol revision, transmitter revision, software revision, hardware revision, device ID, number of requested prefix characters, number of variables, tag number, etc.

Data Member	Data Type	Function Description
POLLING_ADDRESS	USIGN8	HART slave polling address, range 0~63
UNIVERSAL_REVISION	USIGN8	HART protocol revision
TRANSMITTER_REVISION	USIGN8	Transmitter revision
SOFTWARE_REVISION	USIGN8	Software revision
HARDWARE_REVISION	USIGN8	Hardware revision
DEVICE_ID	USIGN32	Device ID
RESPONSE_PREAMBLES	USIGN8	Number of requested prefix characters
MAX_NUM_DEVICE_VARIABLES	USIGN8	Number of variables
TAG	OctString	Tag number

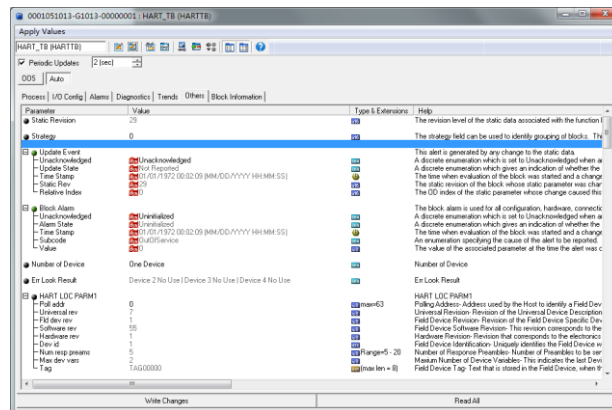
#### DS-273 HART PV Related Parameter MOD\_LOC\_PARM

The new added data type DS-273 is device PV related parameters, they are: read-only parameters, including: upper range, lower range, sensor upper range, sensor lower range, minimum span, damp, unit and linearization, etc.

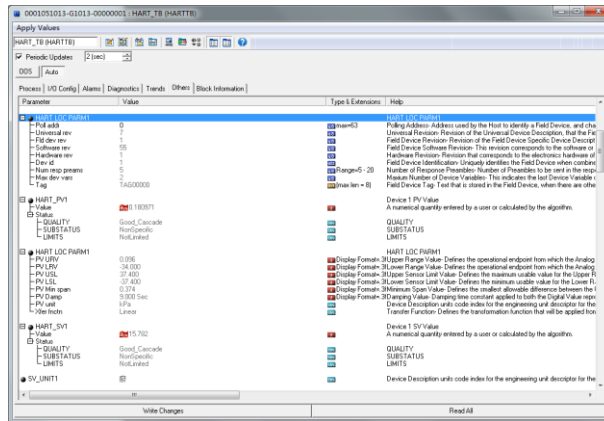
Data Member	Data Type	Function Description
UPPER	FLOAT	Upper range
LOWER	FLOAT	Lower range
UPPERLIMIT	FLOAT	Sensor upper range
LOWERLIMIT	FLOAT	Sensor lower range
MINSPAN	FLOAT	Minimum span
DAMP	FLOAT	Damp
FORCEDUNIT	USIGN16	Unit
FUNCT	USIGN8	Linearization

## 4.4 HART Transducer Block Configuration Example

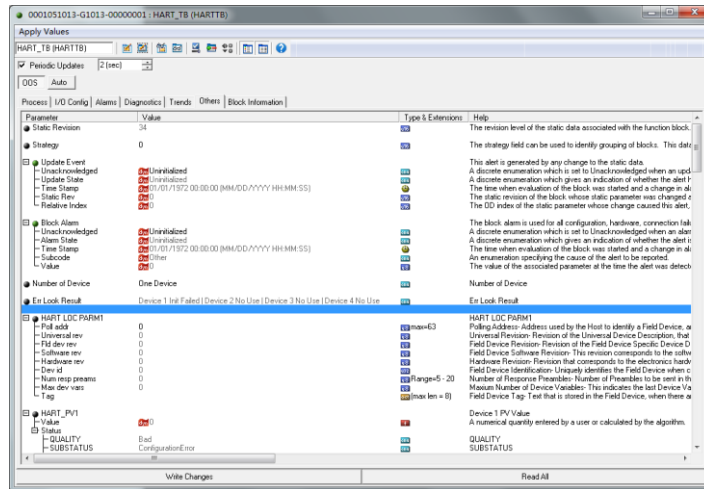
Following is an example with NI- Configurator of how to configure HART transducer block.  
**Configuration for Number of HART devices**



**HART Device Connected Normally**



## HART Device Connected Abnormally



Following is an example of configure 1 HART device to describe HART transducer block (HART\_TB):

- ◆ Switch HART transducer block mode to OOS;
- ◆ Modify connected Number of Device to One Device;
- ◆ Known connected HART device polling address is 0, then modify Poll Addr of HART LOC PARM1 to 0;
- ◆ Switch HART transducer block mode to Auto;
- ◆ If the communication is not successful, the function block mode shall be at OOS, meanwhile Device 1 Init Failed shall appear in Err Look Result;
- ◆ If the communication is successful, Device 1 Init Failed shall disappear in Err Look Result. Meanwhile all the parameters in HART LOC PARM1 shall refresh, and PV, SV, TV and QV shall be read from HART device automatically.

## 4.5 HART Transducer Block List

No	Parameter Name	Data Type	Valid Range	Default Value	Save	Mode	Function Description
1	ST_REV	Unsigned16		0	S/RO		Statistic

							Revision
2	TAG_DESC	OctString(32)		Spaces	S		Bit Number
3	STRATEGY	Unsigned16		0	S		Strategy
4	ALERT_KEY	Unsigned8	1-255	0	S		Alarm
5	MODE_BLK	DS-69		O/S	S		Mode
6	BLOCK_ERR	Bitstring(2)			D/RO		Error
7	UPDATA_EVT	DS-73			D		Statistic Data Update Case
8	BLOCK_ALM	DS-72			D		Function Block Alarm
9	TRANSDUCER_TYPE	Unsigned16		65535	N/RO		Transducer Block Type
10	XD_ERROR	Unsigned8		0	D/RO		Transducer Block Error Description
11	SENSOR_TYPE	Unsigned16		65535	D/RO		Sensor Type
12	NUMBER_DEVICE	Unsigned8	0-4	0	S	O/S	Number of HART Devices
13	ERR_LOOK_RESULT	Bitstring(32)			N		Status Indication
14	HART_LOC_PARM1	DS-272			S	O/S	HART Device Parameter
15	HART_PV1	DS-65			N		PV
16	PV_LOC_PARM1	DS-273			D/RO		PV Parameter
17	HART_SV1	DS-65			N		SV
18	SV_UNIT1	Unsigned16			D/RO		SV Unit
19	HART_TV1	DS-65			N		TV
20	TV_UNIT1	Unsigned16			D/RO		TV Unit
21	HART_QV1	DS-65			N		QV
22	QV_UNIT1	Unsigned16			D/RO		QV Unit

23	HART_LOC_PARM2	DS-272			S	O/S	HART Device Parameter
24	HART_PV2	DS-65			N		PV
25	PV_LOC_PARM2	DS-273			D/RO		PV Parameter
26	HART_SV2	DS-65			N		SV
27	SV_UNIT2	Unsigned16			D/RO		SV Unit
28	HART_TV2	DS-65			N		TV
29	TV_UNIT2	Unsigned16			D/RO		TV Unit
30	HART_QV2	DS-65			N		QV
31	QV_UNIT2	Unsigned16			D/RO		QV Unit
32	HART_LOC_PARM3	DS-272			S	O/S	HART Device Parameter
33	HART_PV3	DS-65			N		PV
34	PV_LOC_PARM3	DS-273			D/RO		PV Parameter
35	HART_SV3	DS-65			N		SV
36	SV_UNIT3	Unsigned16			D/RO		SV Unit
37	HART_TV3	DS-65			N		TV
38	TV_UNIT3	Unsigned16			D/RO		TV Unit
39	HART_QV3	DS-65			N		QV
40	QV_UNIT3	Unsigned16			D/RO		QV Unit
41	HART_LOC_PARM4	DS-272			S	O/S	HART Device Parameter
42	HART_PV4	DS-65			N		PV
43	PV_LOC_PARM4	DS-273			D/RO		PV Parameter
44	HART_SV4	DS-65			N		SV
45	SV_UNIT4	Unsigned16			D/RO		SV Unit
46	HART_TV4	DS-65			N		TV
47	TV_UNIT4	Unsigned16			D/RO		TV Unit
48	HART_QV4	DS-65			N		QV
49	QV_UNIT4	Unsigned16			D/RO		QV Unit

### ERR\_LOOK\_RESULT Parameter Description

ERR\_LOOK\_RESULT parameter is HART device status display mark, and it is divided into four groups for displayed devices.

Initialization and communication status.

The detailed description is shown as following:

#### ERR\_LOOK\_RESULT

Value	Description	Value	Description
0	Device 1 No Use	16	Device 3 No Use
1	Device 1 Init Failed	17	Device 3 Init Failed
2	Device 1 Comm Failed	18	Device 3 Comm Failed
3	Reserved	19	Reserved
4	Reserved	20	Reserved
5	Reserved	21	Reserved
6	Reserved	22	Reserved
7	Reserved	23	Reserved
8	Device 2 No Use	24	Device 4 No Use
9	Device 2 Init Failed	25	Device 4 Init Failed
10	Device 2 Comm Failed	26	Device 4 Comm Failed
11	Reserved	27	Reserved
12	Reserved	28	Reserved
13	Reserved	29	Reserved
14	Reserved	30	Reserved
15	Reserved	31	Reserved



## Chapter 5 Maintenance

- Simple maintenance

LED Indicator Light	Color	Normal	Abnormal	Reason	Solution
FF Communication	Green	Flicker	Off	No FF communication	Check FF master device and FF interface device
				Power failure	Check power and connection
				Internal failure	Contact technical support
HART Communication	Green	Flicker	Off	Not connected with slave device	Connect master device correctly
				Slave device failure	Check master device and connection
				Internal failure	Contact technical support
HART Power	Yellow	On	Off	Power failure	Check power and connection
				Internal failure	Contact technical support

- Daily maintenance is only for device cleansing.
- Failure maintenance: Please return to factory if there is failure.

## Chapter 6 Technical Specification

### 6.1 Basic Parameter

Measurement Object	HART slave device
HART Power	24VDC
FF Bus Power	9~32VDC
Bus Protocol	2-wire, FF Protocol
Isolation Voltage	HART and FF bus interface, 500VAC
Temperature Range	-40℃~85℃
Humidity Range	5~95%RH
Start Time	≤5s
Refresh Time	0.2s

### 6.2 Performance Index

Protection Level	IP20
EMC	GB/T 18268.1-2010 GB/T 18268.23-2010

### 6.3 Physical Performance

Weight	0.2kg
Structure Material	Housing: Polyamide PA6.6 Coating: Polyester epoxy resin

### 6.4 Default Communication Parameter

Number of Slave	0
Slave Polling Address	0,1, 2, 3

### 6.5 Supported HART Command

0	Read device only mark
3	Read dynamic variable and PV current
12	Read device information
13	Read device mark, description and date
14	Read PV sensor information
15	Read device primary variables' information
16	Read last assembly line number

## Appendix G1013 Selection Example

GW-HART-FF		G1013 HART to FF Gateway	
		Code	Hardware Interface
		F	FSK(1200bps)
		Code	Software Interface
		M	HART Master
GW-HART-FF	F	M	Selection Example