C-1200 Multi-Channel LoRa Tester
New Product Announcement

This document allows GW Instek's partners to quickly grasp product's main features, FAB and ordering information.

GW INSTEK
Simply Reliable

The First Multi-Channel LoRa Tester for Transmitter(Tx) and Receiver(Rx) Tests

C-1200 is an OBT (One Box Tester) that incorporates LoRa Tx and Rx tests. In terms of LoRa Transmitter, C-1200 provides tests including spectrum analysis, time domain, FEI, and TOA. With respect to LoRa Receiver, tests include sensitivity, BER (Bit Error Rate), and PER (Packet Error Rate). In addition to Sub-GHz, C-1200 also supports the 2.4 GHz bandwidth and the FSK signal test. Users can also edit the transmitted Payload by themselves. When receiving data, the formats include binary, HEX, and ASCII code, which allow data transmission results to be easily confirmed. In addition to the signaling test of the finished product, C-1201 is a transfer box connecting C-1200 to LoRa module that directly controls the DUT to perform non-signaling tests on semi-finished products through UART/SPI/I^2C interfaces.

Complete measurement and analysis of LoRa signals	**Spectrum display, time domain display, FEI and TOA functions can identify the problems occurred in the design or production process while analyzing LoRa signals.** When measuring LoRa transmission signals, C-1200 can simultaneously display the spectrum of CSS (chirp spread spectrum) signals and the time domain waveform of the modulated signal to analyze whether the CSS modulation is correct. FEI (Frequency Error Indicator) measurement can be utilized to calibrate the frequency of the LoRa device to avoid greater frequency error, which leads to a reduced sensitivity or even the loss of packet due to the temperature change in the actual application environment. The actual TOA (Time-On-Air) measurement can be applied to ensure that the LoRa device meets the design goals after completing the settings of the various parameters including SF, CR and BW.
Ideal for pipeline production process	**4 sets of RF TRX half-duplex channels are ideal for pipeline production process.** First, select one of the 4 channels, then set the channel to Tx or Rx mode and start testing. That is, select a channel in one time to conduct Tx or Rx test, which allows users to switch to another channel for testing while the DUT is being picked and placed. For the pipeline production line using robotic arm and automation control (ATE), this method can greatly reduce the waiting time of the test equipment and test equipment investment costs so as to substantially improve production efficiency.
Full-featured, dedicated test application software	C-1200 provides a full-featured test software and the user interface style, which is similar to Semtech's SDK (software development kit) to allow users to quickly become familiar with the operation. In addition to the complete Rx and Tx test functions, the MP (Mass Production) test is also available. Users can perform a large number of repetitive tests by selecting the parameter settings to be tested such as production line test. In the Spectrum Mode, users can perform US FCC 15.209 and 15.247 communications test regulations to ensure that the product complies with the communications regulations of Europe and the United States. For power consumption test, the application software can conduct testing by connecting C-1200 with a high-precision power supply PPH-1503 or a high-precision multimeter GDM-9061.

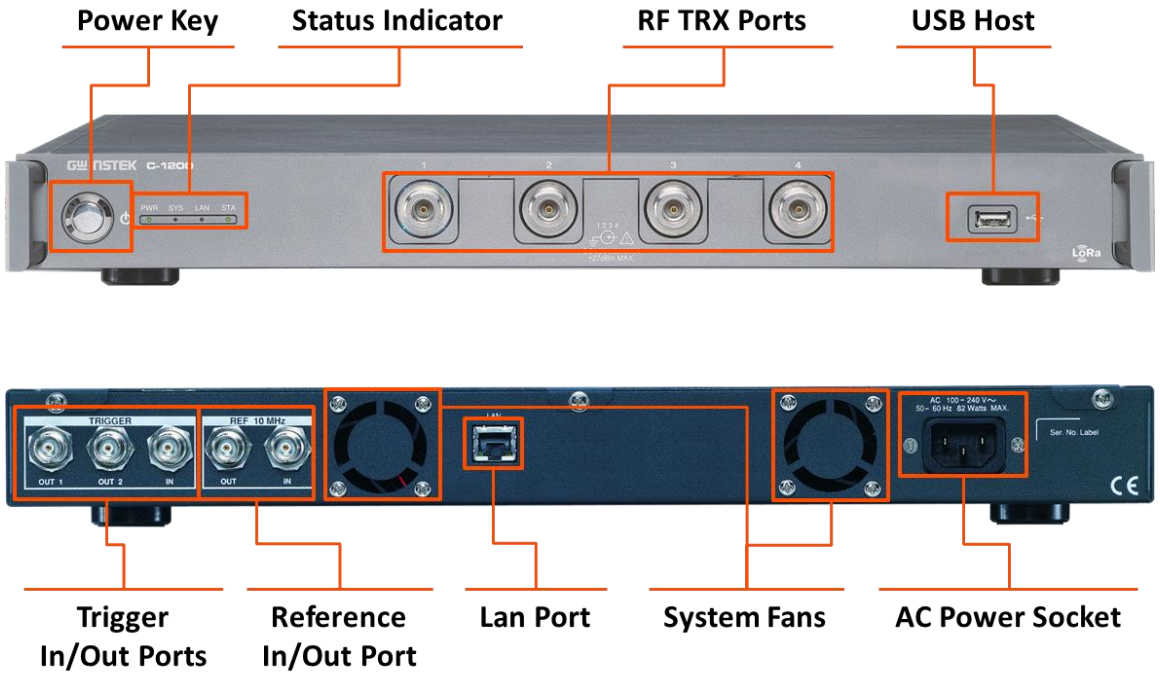
Features

- 4 half duplex TRX Ports (switching Type)
- Support LoRa/FSK modulation signals
- Support Sub-GHz and 2.4 GHz
- Complete PC Software and built-in MP (Mass Production) Test function
- Built-in FCC 15.209/15.247 test regulations
- Built-in temperature control calibration signal to allow Tx output signals more stable
- Support SPI, UART, I^2C interfaces to directly control DUT (must collocate with USB I/O expansion box, C-1201)
- Simultaneously test DUT's current consumption (must collocate with PPH-1503 high precision DC power supply)

LoRa applications and C-1200 customers

C-1200 customers	LoRa applications
LoRa module designs/manufacturers	Smart factory
LoRa device designs/manufacturers	Smart agriculture
Other LoRa related designs/manufacturers	Public construction
	Smart power
	Smart mall
	Tracking security management

Appearance

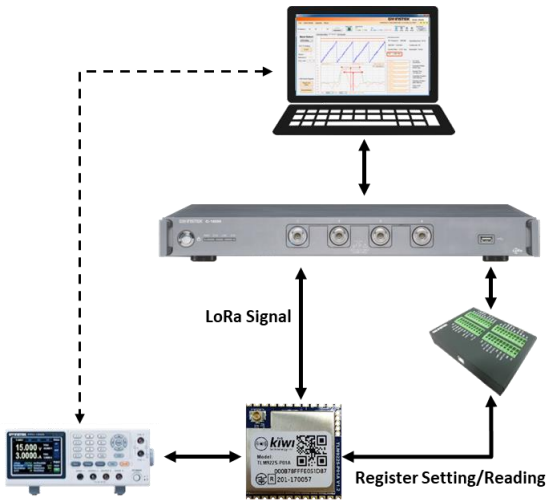


Features, advantages and benefits

Feature	Advantage	Benefit
4 sets of RF TRX half-duplex channels	No need to integrate Tx and Rx devices separately	Reduce equipment costs
	RF channel can be arbitrarily selected to test Tx or Rx	
	Production mode increases efficiency	Efficiency improvement
	Suitable for pipeline production mode	
Support global LoRa bandwidths	Applicable to the LoRa band specified by each country	Reduce equipment costs
	Support LoRa applications in the future 2.4GHz	Meet future measurement needs
Provide complete PC software support	Provide dedicated PC software for users to test immediately	Reduce equipment costs
	Save instrument integration time	
	Support time domain and frequency domain display	Improve test efficiency
	Provide key parameters such as FEI and TOA	
	Provide MP Test mode	
	Support spectrum analyzer mode and support FCC 15.209/15.247 regulation tests	
Provide C-1201 USB I/O expansion box	Users do not need to make additional program commands corresponding to the design of the switching circuit.	Reduce equipment costs Reduce the difficulty of use
	Support SPI, UART, I^2C interfaces to control DUT	
	Integrated in the C-1200 PC software for control	
Power consumption test for LoRa components	Test power consumption by integrating PPH-1503 or GDM-9061	Reduce equipment costs
	No need to design corresponding programs and commands	Reduce the difficulty of use
Built-in temperature control calibration signal	Provides a stable Tx output signal	Improve product yield
	No need to perform specification verification from time to time	Reduce operation costs
1U height design ideal for rack system	Standard cabinet size is easy to connect with other systems	Reduce the difficulty of use
	Handle design features safety and practicality	
	Two-color indicator design (green light is Tx mode, blue light is Rx mode)	

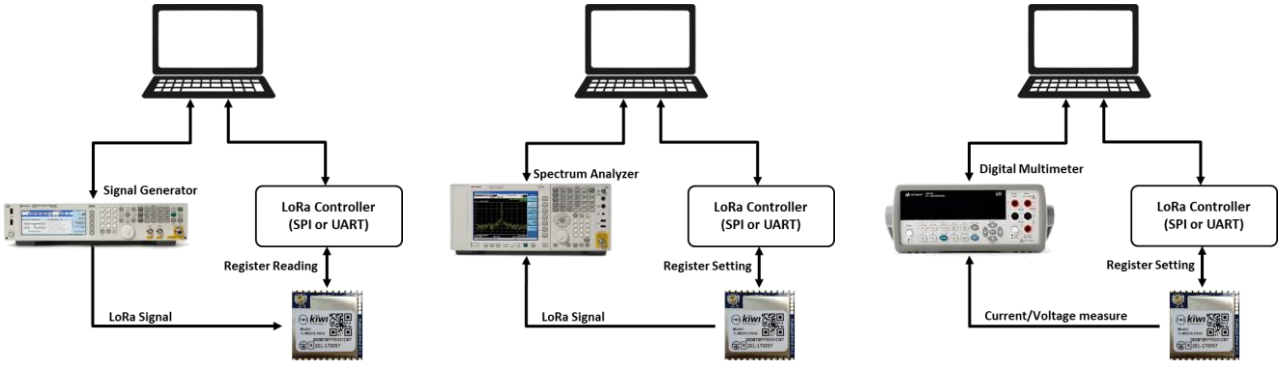
Competitive product comparison

GW Instek



Test all at once

Conventional LoRa Test



LoRa Rx Test | LoRa Tx Test | LoRa Test

Tx, Rx and power consumption tests require separate test environments that are not easy to integrate

	GW Instek	Others LoRa Solution
LoRa Transmit (Tx)	C-1200	Spectrum analyzer
LoRa Receive (Rx)	C-1200	Signal generator
Power consumption test	PPH-1503 or GDM-9061	Power analyzer
Software support	Standard, provide the related command set and LabVIEW driver	Need to additionally write control programs

Important Information of Product Ordering

Key Dates for Product Announcement

1. Global Market Announcement (Feb/20th/2019)
2. Order Queue Open(Feb/20th/2019)

Service Policy

- One year warranty. C-1200 LoRa carries a standard warranty for 1 year.
- Service Support
  - C-1200 LoRa tester: It is a high-frequency and high-precision measuring instrument. In order to maintain the measurement accuracy, the product needs to be re-calibrated after repair, therefore, the repair method is by sending back the entire instrument to the company (including the headquarters and subsidiaries) to carry out maintenance.
  - C-1201 USB I/O Expansion Box: It adopts the processing method of Board Swapping. Please contact the regional subsidiary of GW Instek.

Marketing documents and service manuals can be downloaded via the Internet. GW Instek will continue to provide after-sales service via the Internet. The latest marketing documents and service manuals of C-1200 spectrum analyzer will be announced in the distributor zone of the GW Instek website at http://www.gwinstek.com.

Ordering Information
C-1200 LoRa Tester

Standard Accessories

Power cord, factory certificate
CD-ROM (user manual, programming manual, C-1200 dedicated software)

Option

C-1201, USB I/O expansion box

Free Download

C-1200 PC control software (download from GW Instek website)

Detailed Product Information

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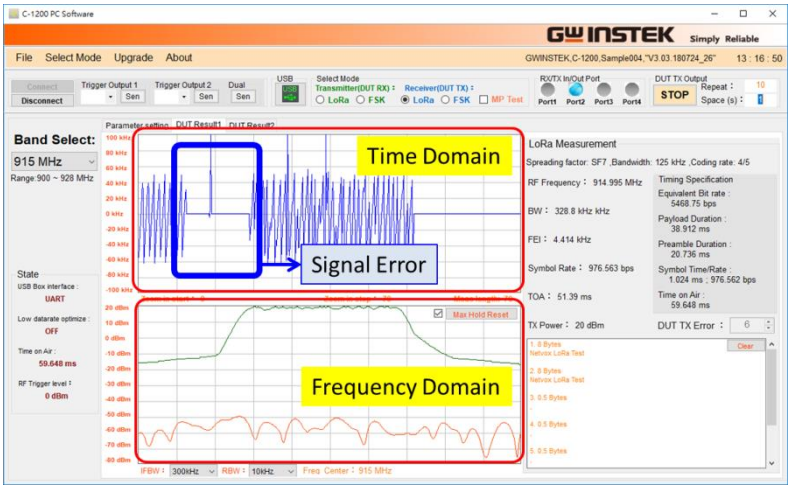
Complete Measurement and Analysis Function

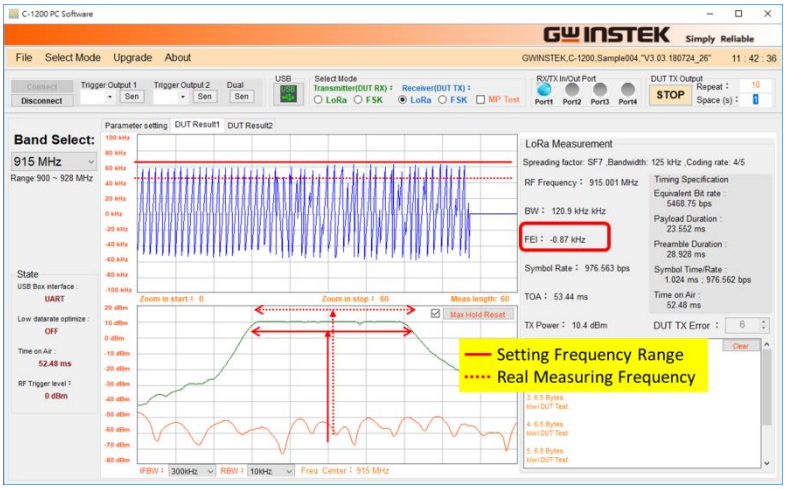
Frequency domain and time domain measurement

C-1200 can directly perform signal measurement in the frequency domain and the time domain for the transmitted signal of LoRa. In the frequency domain, LoRa's CSS (Chirp Spread Spectrum) signal spectrum can be directly displayed; in the time domain, the signal change of the signal within a set time range can be displayed. For example, in the figure below, the signal error that occurs during the transmission of the data can only be found in the time domain measurement (the blue box of the picture).



FEI (Frequency Error Indicator)

When the signal of LoRa is sent out, there may be a frequency error caused by environmental factors, which may result in a decrease in sensitivity or loss of a packet. FEI can be used to measure the DUT transmission frequency error and adjust or correct this error during production or quality control to ensure communications quality when deploying LoRa networks.



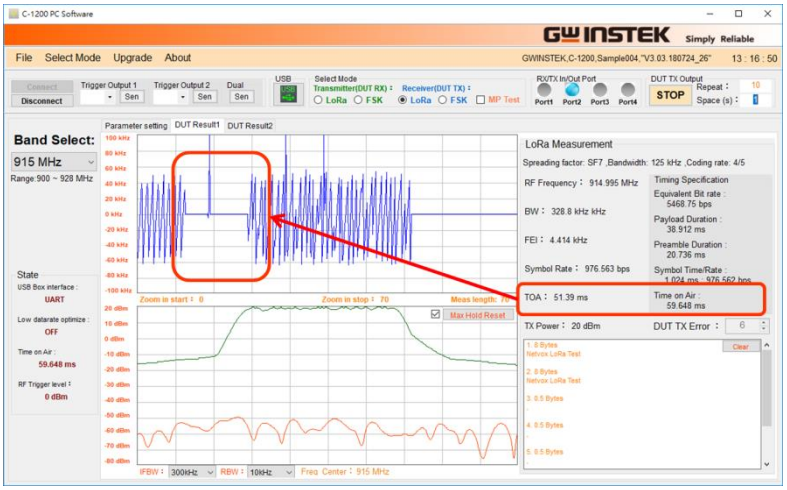
Complete Measurement and Analysis Function

TOA (Time On Air)

TOA is a mechanism to measure the actual transmission time of data in space and check whether it is normal to confirm the quality of LoRa communications quality.

As shown in the figure below, there are two data, Time On Air and TOA. The value of Time On Air is the theoretical value of the LoRa data transmission time, and the TOA is the transmission time obtained by the actual measurement. When the two values produce a large difference, there may be a coding error, a transmission error or a receiving error.

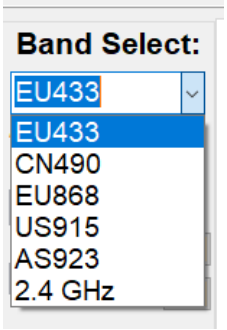
The example in the following figure shows that the theoretical Time On Air calculated by the system should be 59.648ms, but the actual TOA time is 51.39ms, which means that the signal is different during transmission. You can find out the signal error by comparing the waveform displayed in the time domain.



Support the Common LoRa Bandwidths in the World

Support the LoRa Bandwidths

The frequency bandwidths used by LoRa in different countries are different. The frequency bandwidths supported by C-1200 are as follows:



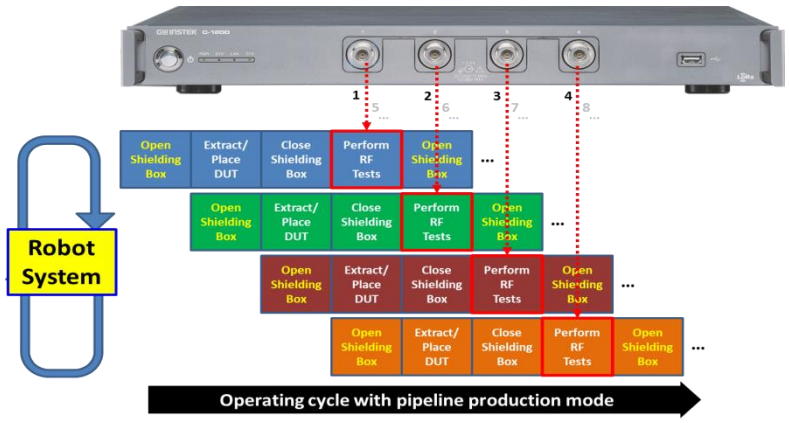
Area / Bandwidth	Frequency Range
EU 433MHz	433 ~ 435 MHz
CN 490MHz	470 ~ 510 MHz
EU 868MHz	862 ~ 875 MHz
US 915MHz	900 ~ 928 MHz
AS 923MHz	900 ~ 928 MHz
2.4GHz	2397 ~ 2403 MHz

Provide 4 Sets of RF TRX Channels

Suitable for pipeline production

With four sets of half-duplex RF TRX test channels, C-1200 is ideal for mass production testing of LoRa products. As shown in the flow chart below, the production process of each channel is a series of actions required to set up the DUT on the system. When the system starts to operate, the robot arm will open the isolation box, place the DUT, close the isolation box, and then conduct test. When the test is complete, the robot arm will open the isolation box and remove the DUT to position, then perform the same test steps for the next DUT.

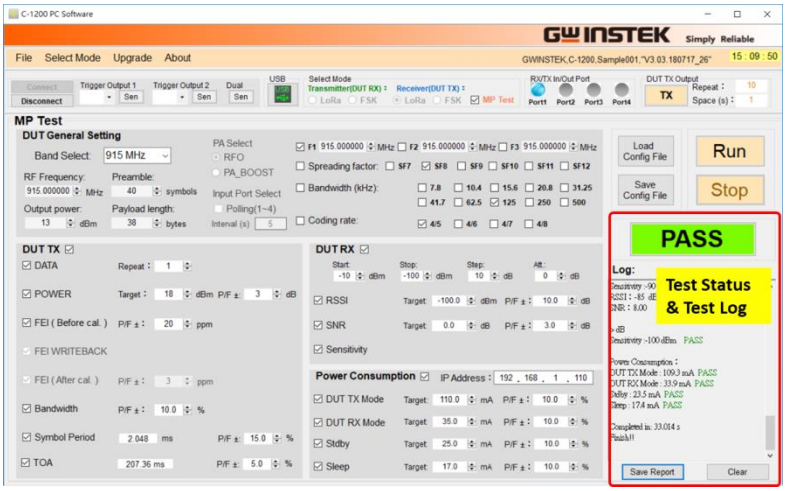
C-1200 provides four sets of RF TRX test channels. In the above-mentioned automatic control (ATE) test procedures, when the DUT test of channel 1 is completed, the robot arm takes out the DUT and puts it in the designated position. Next DUT is placed into the test fixture; at the same time, C-1200 has internally switched to channel 2 to test the placed DUT. After channel 2's DUT test is complete, C-1200 has switched to channel 3 and started testing when the tested DUT is removed and the next DUT is placed. This method can greatly reduce the waiting time of the test equipment and the investment cost of the test equipment. The test efficiency and capacity can be greatly improved.



Provide 4 Sets of RF TRX Channels

MP (Mass Production) Test

C-1200 software provides the MP Test mode. As long as the parameter settings and test items to be tested are selected in the program screen, C-1200 will start testing and the final pass/fail results will be clearly displayed. The test process is recorded and displayed in the Log field to track the testing process. This model is designed for a large number of repetitive tests on the production line. With C-1200 four sets of RF TRX channels and pipeline production method introduced in the previous paragraph, the production quality of LoRa products can be ensured and the production efficiency can be greatly improved.



Complete PC Software Support

Equipped with PC software

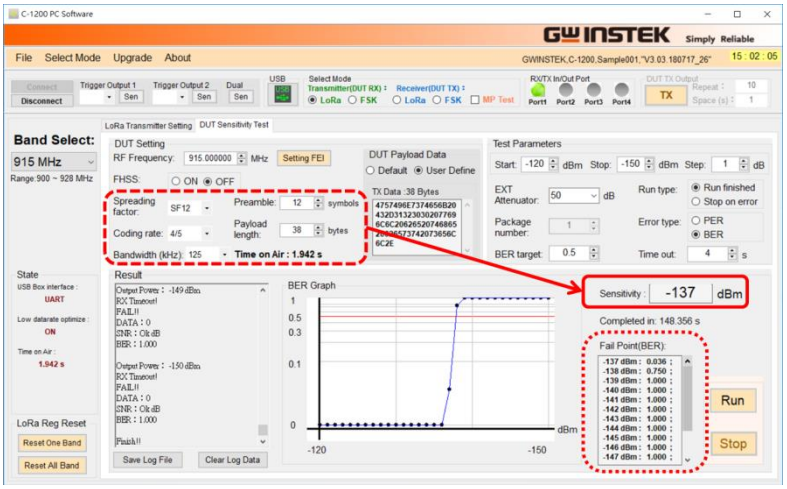
If several independent instruments are used to test LoRa, users need to write program or receive assistance from a third-party software in addition to complex wiring (including control and RF signals). C-1200 provides a dedicated PC software that eliminates the need for users to write ATE programs and instrument integration time. The required parameters and displays are completely provided for Tx or Rx analysis verification, or mass production testing.

The software interface is similar to the SDK package provided by Semtech. Users can quickly operate the software if they are familiar with the operation of the kit. According to the various functions introduced earlier, the software has four modes of operation:

- Transmitter (DUT Rx)
- Receiver (DUT Tx)
- MP Test
- Spectrum (Specification)

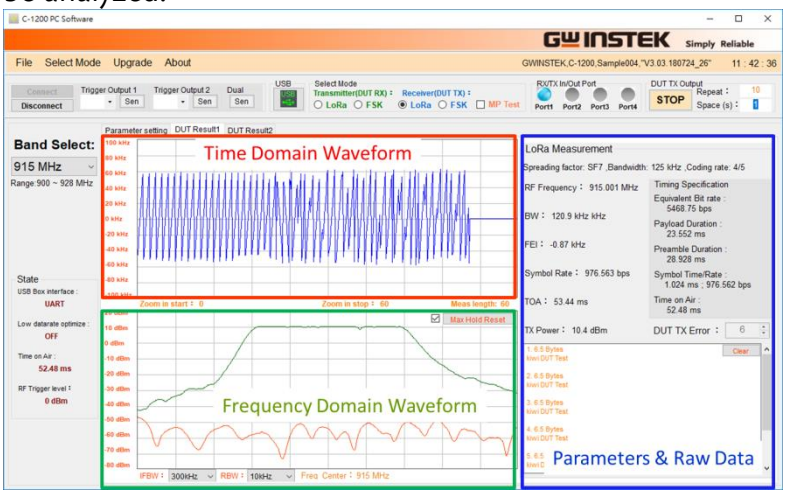
Transmitter (DUT Rx)

In this mode, C-1200 acts as a transmitter to test the DUT's receiving sensitivity and data error rate (Error Rate). The Packet Error Rate (PER) is the test item required by the LoRa system. In addition to the PER test, C-1200 also provides the BER (Bit Error Rate) test commonly used in communications systems for engineers to analyze.



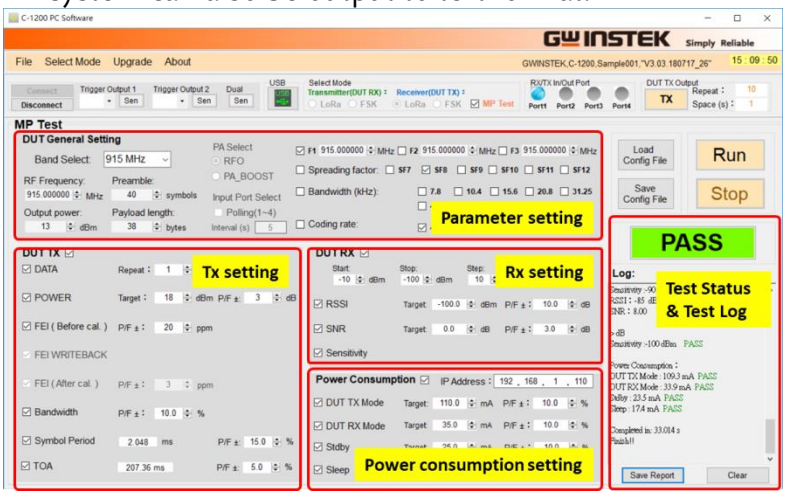
Complete PC Software Support

Receiver (DUT Tx) In this mode, C-1200 acts as a receiver to test the signal transmitted by the DUT. As mentioned above, the analysis of the transmitted signal in the time domain and the frequency domain, FEI, and TOA are operated in this mode. The parameters and decoded data (Raw Data) of LoRa can also be analyzed.



MP Test Perform the aforementioned MP Test. There are several main parts in the MP Test settings:

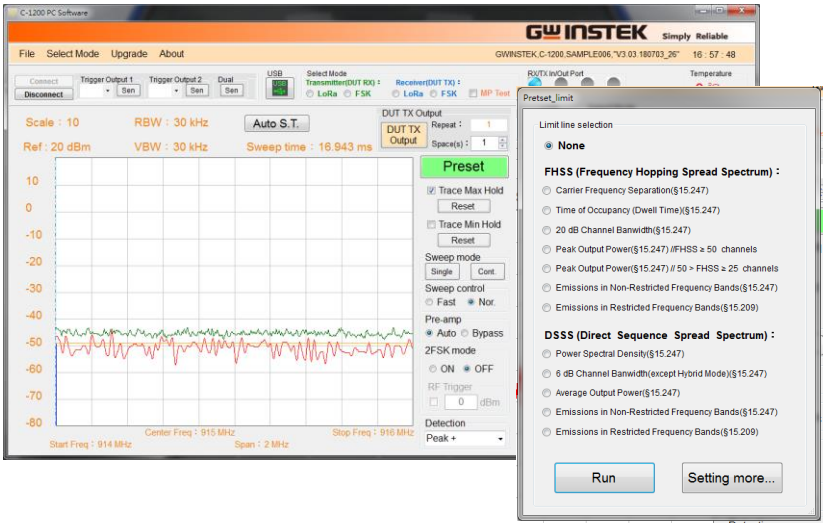
- **General Setting**: The basic parameters of LoRa are measured, such as frequency range, power, data length, SF (Spreading factor), BW (Bandwidth), CR (Coding Rate), etc.
- **Tx / Rx Setting**: Set the required items for Tx or Rx test. Users can check the parameters to be tested according to the test requirements.
- **Power consumption**: collocating with a PPH-1503 high-precision power supply or a GDM-9061 six-and-a-half digit digital meter, the power consumption of the DUT can be measured.
- **Test Status & Test Log**: Shows whether the DUT meets the test results. The Test Log data generated by the system can also be output to text format.



Complete PC Software Support

Spectrum (Specification) Mode

In addition to testing for LoRa, C-1200 is also a spectrum analyzer that operates through the software's spectrum mode and can be used with the built-in FCC 15.209/15.247 test regulations to verify that the tested DUT is compliant. The testable regulations are FHSS (Frequency Hopping Spread Spectrum) and DSSS (Direct Sequence Spread Spectrum).



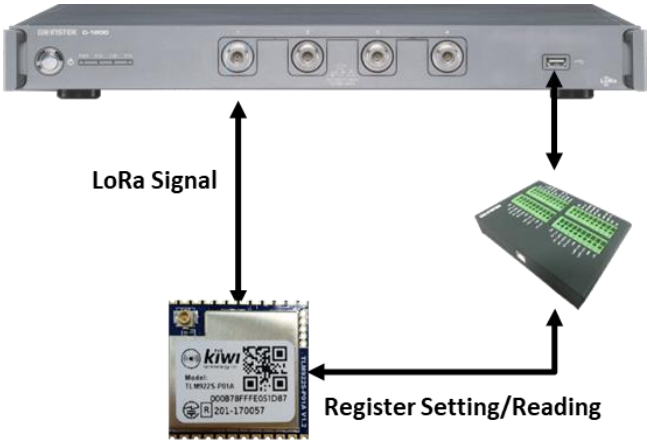
Extended Applications

C-1201 USB I/O Expansion Box

C-1201 is a transfer box that connects the C-1200 to the LoRa module. It is converted to UART/SPI/I^2C interfaces to directly control the DUT through the USB interface of the front panel of C-1200. The interfaces supported by C-1201 are:

- Four 4-wire SPI interfaces
- Four UART interfaces
- One I^2C interface
- With respect to power, it supports DC 1.8V and 3.3V and the highest current output is 300mA.

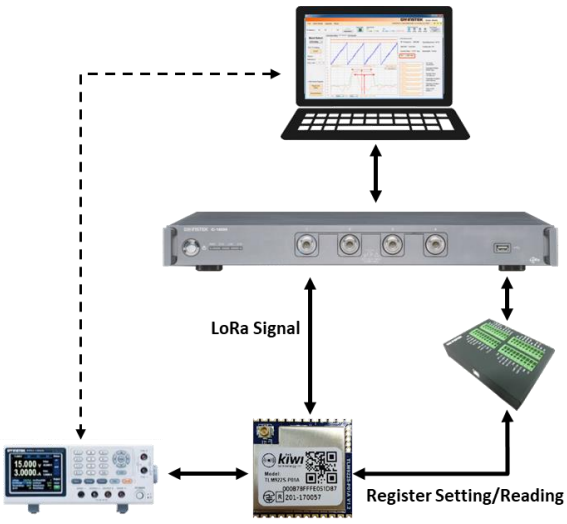
Through C-1201 expansion box, users can create the program commands corresponding to the switching circuit and the design without using the C-1200 PC software or command sets to directly control the parameters and actions of the DUT for non-signaling test (NST). In the mass production process or semi-finished product testing process, using C-1201 for NST can save the time of establishing communications channels to speed up the test.



Extended Applications

Power consumption test

Since LoRa devices are usually located outdoors, even in remote areas, power consumption characteristics become an important part of the LoRa system. C-1200 collocating with a PPH-1503 high-precision power meter or a GDM-9061 six-and-a-half digit digital meter can directly perform the power consumption test through the PC software, making the LoRa test more comprehensive.



Communications Interface

Controlled by Lan (LXI)

C-1200 uses the LAN (LXI) interface for control, and the supported programming regulations conform to IEEE488.2, which is the same as the common regulations and is easy for users to write.

Command conversion via USB

The USB on the front panel of C-1200 provides users with the ability to control the DUT through the C-1201 expansion box or a self-defined software, and it can perform a Non-Signaling Test.

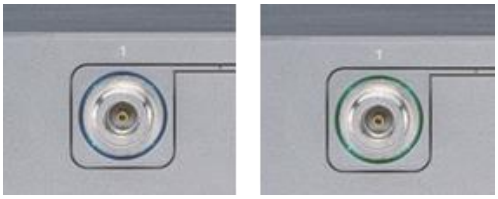
Other Functions

Built-in temperature control calibration signal

Since the built-in Tx output signal of C-1200 requires high signal sensitivity and accuracy, the built-in temperature control calibration signal allows the Tx signal to be very stable at the output, making the sensitivity test more accurate.

Tx/Rx signal indicator

The two-color indicator design is adopted at the signal input and output terminal. The green light design is for the Tx mode, and the blue light design is for the Rx mode. The transmission of the indicator light through the angle shows a uniform aura, in addition to the sense of technology and fashion; users can quickly understand the current action situation.



Appearance and handle design

In the choice of design, the 1U industry standard rack design can effectively reduce the space used. Both the panel and handles adopt aluminum block cutting and molding technics and anodized and the laser engraving is used to improve durability and texture. The handle is standard, which makes it convenient for C-1200 to enter and exit the cabinet. In addition, when users accidentally face C-1200 down, the damage of the terminals can be effectively avoided.

Product Specifications

The specifications apply when the C-1200 is powered on for 45 minutes* to warm-up to a temperature of 20˚C to 30˚C, unless specified otherwise.
* 45 minutes typical, 90 minutes maximum.

Frequency			
Frequency	Range	1 MHz to 3.25 GHz	
	Resolution	1 Hz	
Frequency Reference	Accuracy	±(period since last adjustment X aging rate) + stability over temperature + supply voltage stability	
	Aging Rate	±1 ppm max.	1 year after last adjustment
	Frequency Stability over Temperature	±0.025 ppm	0 to 50 °C
	Supply Voltage Stability	±0.02 ppm	
Frequency Readout Accuracy	Start, Stop, Center, Marker	±(marker frequency indication X frequency reference accuracy + 10% x RBW + frequency resolution[1])	
	Trace points	Max 601 points, min 6 points	
Marker Frequency Counter	Resolution	1 Hz, 10 Hz, 100 Hz, 1 kHz	
	Accuracy	±(marker frequency indication X frequency reference accuracy + counter resolution)	RBW/Span >=0.02 ; Mkr level to DNL>30 dB
Frequency Span	Range	0 Hz (zero span), 100 Hz to 3.25 GHz	
	Resolution	1 Hz	
	Accuracy	± frequency resolution[1]	RBW: Auto;
Phase Noise	Offset from Carrier		Fc =1 GHz; RBW = 1 kHz, VBW = 10 Hz; Average ≥ 40
	10 kHz	<-88 dBc/Hz	*Typical*[2]
	100 kHz	<-95 dBc/Hz	*Typical*
	1 MHz	<-113 dBc/Hz	*Typical*
Resolution Bandwidth (RBW) Filter	Filter Bandwidth	1 Hz to 1 MHz in 1-3-10 sequence	-3dB bandwidth
		200 Hz, 9 kHz, 120 kHz, 1MHz	-6dB bandwidth
	Accuracy	± 8%, RBW = 1MHz	Nominal[3]
		± 5%, RBW < 1MHz	Nominal
	Shape Factor	< 4.5:1	Nominal ; Normal Bandwidth ratio: -60dB:-3dB
Video Bandwidth (VBW) Filter	Filter Bandwidth	1 Hz to 1 MHz in 1-3-10 sequence	-3dB bandwidth
[1] Frequency Resolution = Span/(Trace points - 1) [2] Typical specifications in this datasheet mean that the performance can be exhibited in 80% of the units with a 95% confidence level over the temperature range 20 to 30 °C. They are not covered by the product warranty. [3] Nominal values indicate expected performance. They are not covered by the product warranty.			
Amplitude			
Amplitude Range	Measurement Range	1 MHz to 10 MHz	Displayed Average Noise Level (DANL) to 21 dBm
		10 MHz to 3.25 GHz	DANL to 25 dBm
	Modulated Mode Measurement Range	Maximum measurement level +25 dBm	
		Att. Auto, in Sub-1GHz Band and 2.4GHz Band, support time domain, frequency domain and waveform demodulation	
		Trigger level > -40dBm	Preamp off
		Trigger level > -70dBm	Preamp on
Attenuator	Input Attenuator Range	0 to 50 dB, in 1 dB step	Auto or manual setup
Maximum Safe Input Level	Average Total Power	≤ +27 dBm	Input attenuator ≥ 10 dB
	DC Voltage	± 50 V	
1 dB Gain Compression	Total Power at 1st Mixer	> 0 dBm	*Typical*; Fc ≥ 50 MHz; preamp. off
	Total Power at the Preamp	> -22 dBm	*Typical*; Fc ≥ 50 MHz; preamp. on
		mixer power level (dBm)= input power (dBm)-attenuation (dB)	
Displayed Average Noise Level (DANL)[4]	Preamp off	0 dB attenuation; RF Input is terminated with a 50Ω load. RBW 10 Hz; VBW 10 Hz; span 500 Hz; reference level = -60dBm; trace average ≥ 40	
	1 MHz to 2 GHz	< -120 dBm	Nominal
	2 GHz to 3.2 GHz	< -115 dBm	
	3.2 GHz to 3.25 GHz	< -113 dBm	

	Preamp on	0 dB attenuation; RF Input is terminated with a 50Ω load ; RBW 10 Hz; VBW 10Hz; span 500 Hz; reference level = -60dBm; trace average ≥ 40	
	1 MHz to 10 MHz	< -139 dBm	Nominal
	10 MHz to 3.25 GHz	< -139 dBm + 3 x (f/1 GHz) dB	
[4] DANL spec excludes spurious response in the proximity frequency range of 5 kHz.			
Absolute Amplitude Accuracy	Absolute Point	Center=160 MHz; RBW 10 kHz; VBW 1 kHz; span 100 kHz; log scale; 1 dB/div; peak detector; 23°C±1°C; Signal at Reference Level	
	Preamp off	± 0.3 dB	Ref level 0 dBm; 10 dB RF attenuation
		± 0.2 dB	After Self Calibration[5]
	Preamp on	± 0.4 dB	Ref level -30 dBm; 0 dB RF attenuation
[5] Self Calibration can be used after the C-1200 power on over 3 minutes. When Self Calibration always turn on, for three items change the Self Calibration will auto recalibrate • Time of every hour • Ambient temperature changes more than ±3 °C • Reference 10 MHz changes			
Frequency Response	Preamp off	Attenuation: 10 dB; Reference: 160 MHz; 20 to 30°C	
	1 MHz to 2.0 GHz	± 0.5 dB	
	2GHz to 3.25 GHz[6]	± 1.5 dB	
	Preamp on	Attenuation: 0 dB; Reference: 160 MHz; 20 to 30°C	
	1 MHz to 2 GHz	± 0.6 dB	
	2 GHz to 3.25 GHz	± 0.8 dB	
[6] If others ports are unused should be connected to 50 ohm terminal, otherwise the frequency response will be falling beyond 2.6 GHz			
Attenuation Switching Uncertainty	Attenuator setting	0 to 50 dB in 1 dB step	
	Uncertainty	± 0.25 dB	reference: 160 MHz, 10dB attenuation
RBW Filter Switching Uncertainty	1 Hz to 1 MHz	± 0.25 dB	reference : 10 kHz RBW
Level Measurement Uncertainty	Overall Amplitude Accuracy	± 1.5 dB	20 to 30°C; frequency > 1 MHz; Signal input 0 to -50 dBm; Reference level 0 to -50 dBm; Input attenuation 10 dB; RBW 1 kHz; VBW 1 kHz; after cal; Preamp Off
		± 0.5 dB	*Typical*
Spurious Response	Second Harmonic Intercept	Preamp off; signal input -30dBm; 0 dB attenuation	
		+35 dBm	*Typical*; 10 MHz < fc < 775 MHz
		+60 dBm	*Typical*; 775 MHz ≤ fc < 1.625 GHz
	Third-order Intercept	Preamp off; signal input -30dBm; 0 dB attenuation	
		> 1 dBm	300 MHz to 3.25 GHz
	Input Related Spurious	< -60 dBc	Input signal level -30 dBm, Att. Mode, Att=0dB; 20-30°C
	Residual Response (inherent)	<-90 dBm	Input terminated; 0 dB attenuation; Preamp off
Sweep			
Sweep Time	Range	204 µs to 1000 s	Span> 0 Hz
		50 µs to 1000 s	Span= 0 Hz; Min. Resolution= 10 µs
	Sweep Mode	Continuous; Single	
	Trigger Source	Free run; Video; External	
	Trigger Slope	Positive or negative edge	
RF Preamplifier			
RF Preamplifier	Frequency Range	1 MHz to 3.25 GHz	
	Gain	18 dB	Nominal
			(installed as standard)
RF Characteristic			
Channel Performance	Channel Frequency Response	± 1 dB	For all ports except port 1 ; Reference to port 1; Zero span
	Switching Time	0.5 ms	without sweep time
	Isolation	Output Power - 10 dBm	
		30 dB	Between port 1 and port 2 or Between port 3 and port 4
		60 dB	otherwise
RF Generator			
Frequency	Sub-1GHz Band	433.92 MHz Band	433 MHz ~ 435 MHz
		490 MHz Band	470 MHz ~ 510 MHz

		868 MHz Band	862 MHz ~ 875 MHz
		915 MHz Band	900 MHz ~ 928 MHz
		923 MHz Band	900 MHz ~ 928 MHz
	2.4GHz Band	2.4 GHz Band	2.4 GHz
Frequency Reference	Accuracy	± 2 ppm	before frequency calibration
	Aging Rate	± 1 ppm / 1 year	1 year after last adjustment
	Frequency Stability over Temperature	± 0.5 ppm	-40 ~ +85°C
	Resolution	61 Hz	In Sub-1GHz Band
		198 Hz	In 2.4GHz Band
Amplitude	Output Power Range	-10 dBm ~ -100 dBm , in 1 dB step	
	Uncertainty	± 1 dB	433.92 MHz, 490 MHz, 868 MHz, 915 MHz, 923 MHz, 2.4 GHz@ -10 x n dBm
		± 1 dB	Output power other than above, and reference to -10 x m dBm
		n= 1 to 10, integer m=int(|X|/10), X=nominal output level int(Y) means taking integer part of Y	
	Output Flatness	± 2 dB	Frequency band relative to 433.92 MHz, 490 MHz, 868 MHz, 915 MHz, 923 MHz@ - 10 dBm
		± 1.5 dB	*Typical*
Modulation / Demodulation			
LoRa Mode	Spreading Factor (SF)	SF7, SF8, SF9, SF10, SF11, SF12	In Sub-1GHz Band, Nominal
		SF5, SF6, SF7, SF8, SF9, SF10, SF11, SF12	In 2.4GHz Band, Nominal
	Signal Bandwidth (BW)	7.8 kHz, 10.4 kHz, 15.6 kHz, 20.8 kHz, 31.25 kHz, 41.7 kHz, 62.5 kHz, 125 kHz, 250 kHz (without 169 MHz), 500 kHz (without 169 MHz)	In Sub-1GHz Band, Nominal
		203.125 kHz, 406.25 kHz, 812.5 kHz,1.625 MHz	In 2.4GHz Band, Nominal
	Coding rate (CR)	4/5, 4/6, 4/7, 4/8	Nominal
	Preamble length	4 ~ 400 symbols	The 4 preamble length that including 2 Up-Chirp and 2 Down-Chirp, Nominal
	Payload length	0~255 bytes	Nominal
FSK Mode	Sub-1GHz Band		
	Deviation	0.6 kHz ~200 kHz	Nominal
	Bit Rate	1200, 2400, 4800, 9600, 19200, 38400, 57600, 76800, 115200 bps	Nominal
	Encoder / Decoder	Manchester, Whitening	Nominal
	Preamble length	10 ~ 400 bytes	Nominal
	Payload length	0~64 bytes	Nominal
GFSK Mode	2.4GHz Band		
	Bit Rate	125, 250 kbps	300 kHz Occupied Bandwidth, Nominal
		250, 400, 500 kbps	600 kHz Occupied Bandwidth, Nominal
		400, 500, 800, 1000 kbps	1.2 MHz Occupied Bandwidth, Nominal
		800, 1000, 1600, 2000 kbps	2.4 MHz Occupied Bandwidth, Nominal
	Encoder / Decoder	Whitening	Nominal
	Preamble length	10 ~ 400 bytes	Nominal
	Payload length	0~64 bytes	Nominal
Front Panel Input/Output			
LED indicator	POWER	orange	Standby mode
		green	System normal mode
	SYSTEM	green	LED off, system is booting up LED on, system ready or system into power off
	LAN	green	LED off, LAN disconnected LED on, get IP address
	STATUS	green	LED on, system ready LED flashing for 1 second, system is booting up or system into power off LED flashing for 250 ms, system upgrade
USB Host	Connector Type	A plug	
	Power	5VDC/0.5A	Nominal

	Protocol	Version 2.0	Supports Full/High/Low speed
RF Input/Output	Connector Type	4-port N-type female	
	RF input LED	blue	When port to be used
	VSWR	<2:1	300 kHz to 3.25 GHz; Input attenuator ≥ 10 dB
	RF output LED	green	When port to be used
	VSWR	<1.5:1	Frequency at Sub-1GHz Band, and 2.4 GHz, Output power< -80 dBm
Rear Panel Input/Output			
Reference Input	Connector Type	BNC female	
	Input Reference Frequency	10 MHz	
	Input Amplitude	-5 dBm to +10 dBm	
	Frequency Lock Range	Within ± 5 ppm of the input reference frequency	
Reference Output	Connector Type	BNC female	
	Output Frequency	10 MHz	Nominal
	Output Amplitude	3.3V CMOS	
	Output Impedance	50 ohm	
Trigger Input	Connector Type	BNC female	
	Input Amplitude	3.3V CMOS	
Trigger 1 & Trigger 2 Output	Connector Type	2-port BNC female	
	Output Amplitude	3.3V / 2.5V	
	Mode	Toggle mode	Always low, 5ms high when trigger output
LAN TCP/IP Interface	Connector Type	RJ-45	
	Base	10Base-T; 100Base-Tx; Auto-MDIX	
IP Reset	TACT Switch		
AC Power Input	Power Source	AC 100 V to 240 V, 50 / 60 Hz Auto range selection	
General			
	Internal Data storage	16 MB nominal	
	Power Consumption	< 82 W	
	Warm-up Time	< 45 minutes	
	Temperature Range	+5 °C to +45 °C	Operating
		-20 °C to + 70 °C	Storage
	Weight	7.7 kg (16.9 lb)	Basic, without optional
	Dimensions	554 x 434 x 44 (mm)	Approximately
		21.8 x 17.1 x 1.73 (in)	
IO Extension (Optional)			
	Connector Type	USB B	For remote control only
	Support Voltage	1.8V & 3.3V	
	Output Logic Voltage	1.8V & 3.3V	VCC_DUT should be connected to 1.8V or 3.3V
	Output Interface	I^2C*1 & UART*4 & SPI*4	
	Output Current	300 mA	Maximum, Nominal

Please do not hesitate to contact us if you have any queries on C-1200 LoRa tester.

Sincerely yours,

Overseas Sales Department

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