



Comprehensive LoRa measurement

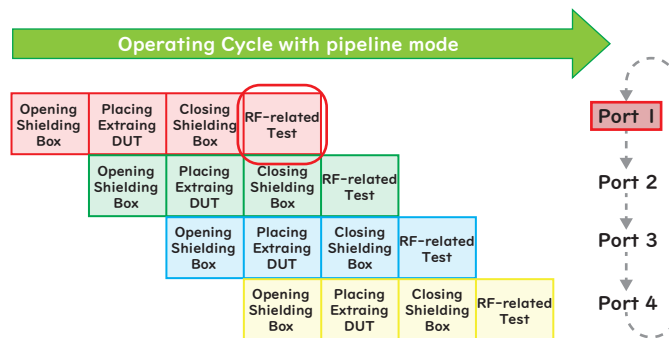


C-1200, a LoRa tester, equips with four sets of TRX Ports and supports Sub-GHz and 2.4 GHz. It not only provides complete parameter settings for LoRa and FSK modulation signals but also allows user to define required Payload. Four sets of TRx Ports conduct tests on for DUTs. Under the pipeline production mode, the production capacity can be substantially increased.

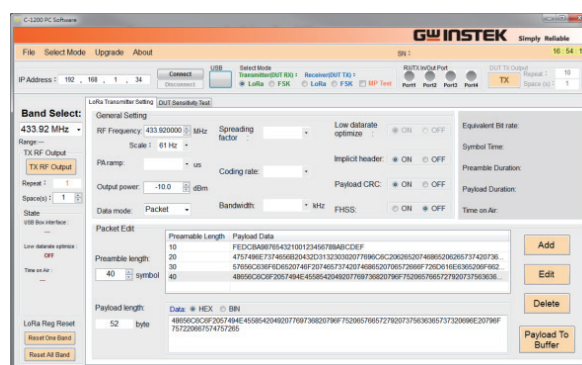
The standard rack size tremendously decreases the equipment space requirement. Collocating with test accessories such as computer control and isolation box can rapidly construct an efficient production test system.

Features Highlight:

- 4 sets of RF TRx Ports (switching Type)
- Support LoRa/FSK modulation signals
- Support Sub-GHz and 2.4 GHz
- Complete PC Software and built-in MP Test function
- Built-in FCC, ETSI test regulations
- Built-in temperature control calibration signal
- Support SPI, UART, I2C interfaces to directly control DUT (must collocate with IO Extension, C-1201)
- Simultaneously test DUT's current consumption (must collocate with PPH-1503 high precision DC power supply)



- Frequency Range
Transmitter: 433.92M, 490M, 868M, 915M, 923M, 2400 MHz
Receiver: 1 MHz to 3.25 GHz, Resolution: 1 Hz
- Output Power Level Range: -10 ~ -100 dBm, Resolution: 1 dB
- Input Power Level
Maximum measurement level: +25 dBm
- Modulation Type: LoRa, FSK, GFSK
- Dimension & Weight: 434(W) x 44(H) x 554(D) mm, 7.7 kg

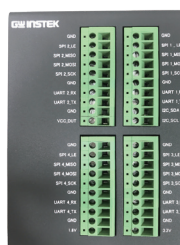


Optional Accessories

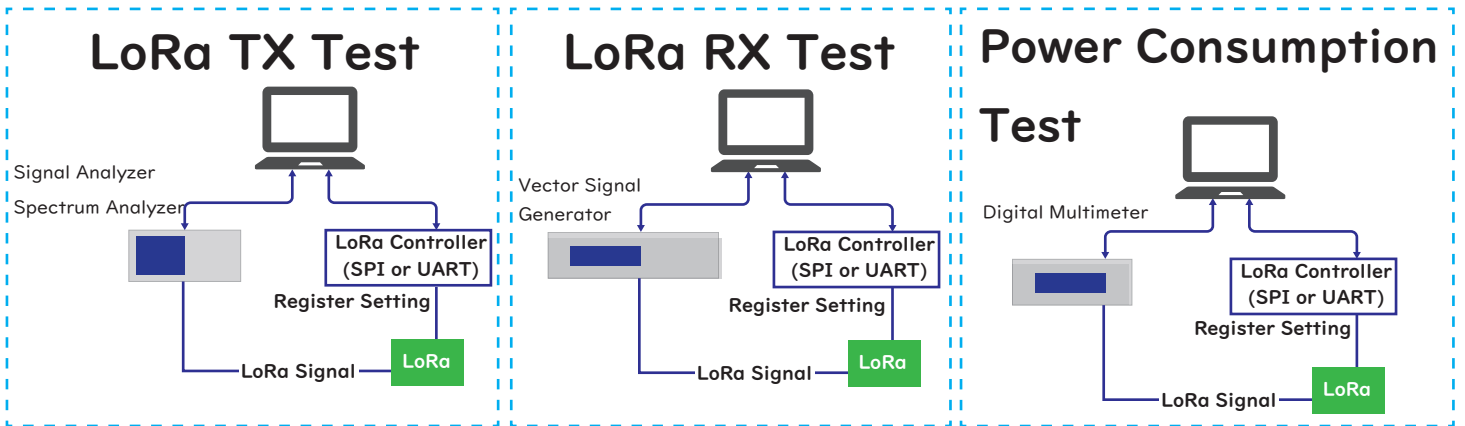
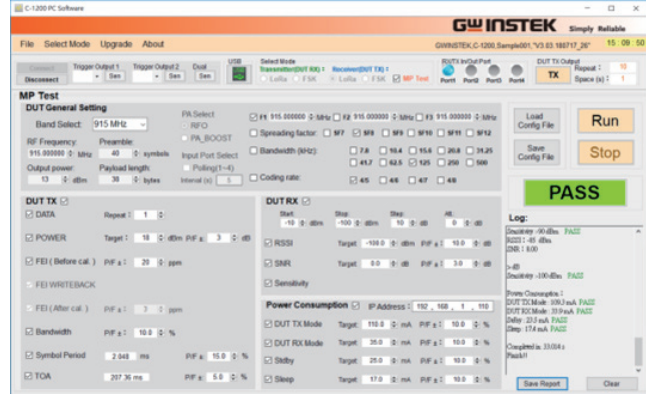
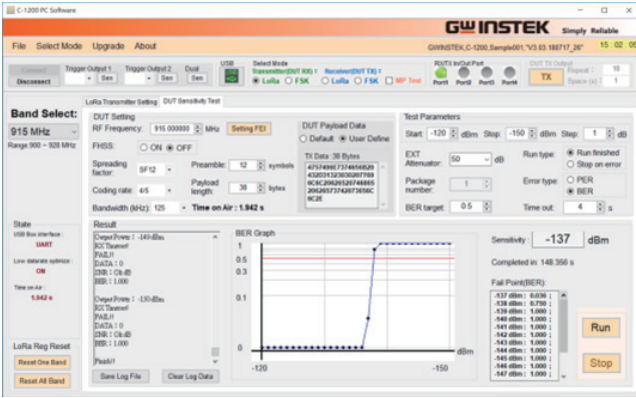
IO Extension, C-1201



- 4-wire SPI interface x 4
- UART interface x 4
- I2C interface x 1
- The output current is up to 300 mA

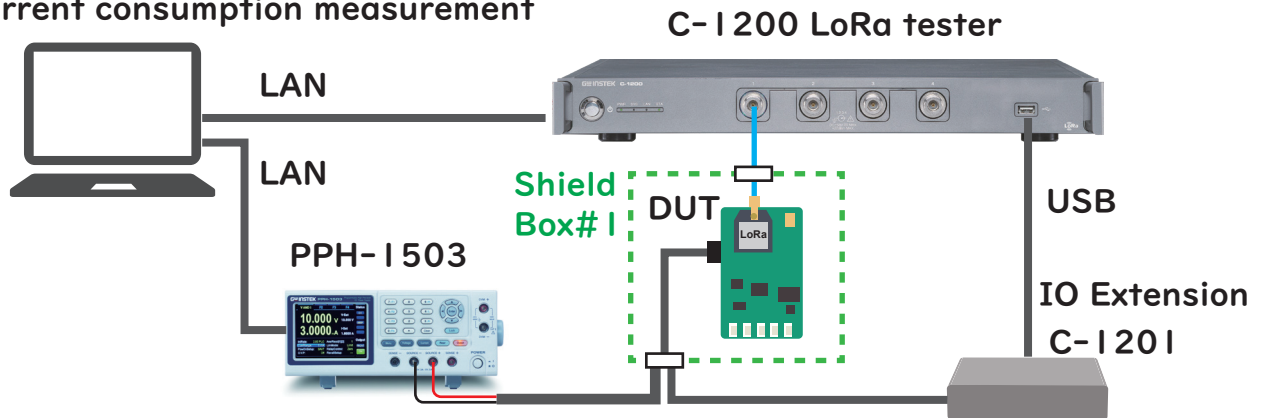


Provide PC Software with a Complete Functionality



All LoRa Test Solution C-1200

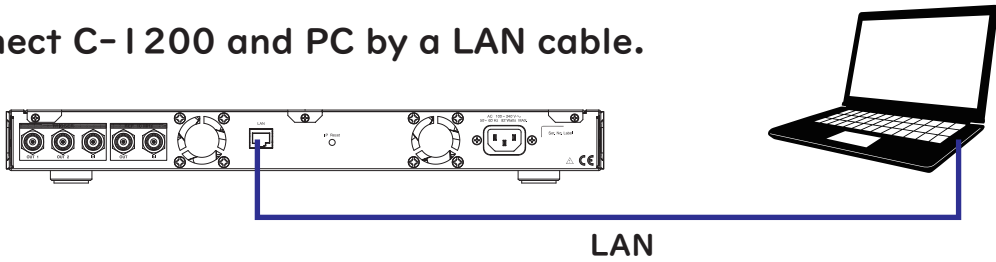
- RF parameters measurement, CSS demoduration and LoRa decoding
- Current consumption measurement



One-station test requirement can be realized while C-1200 collocating with IO Extension and PPH-1503.

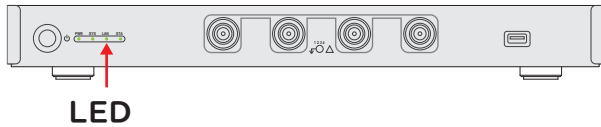
Connection

Connect C- I 200 and PC by a LAN cable.



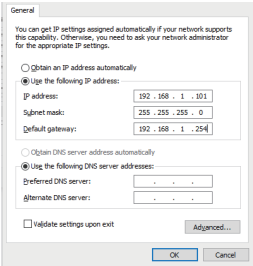
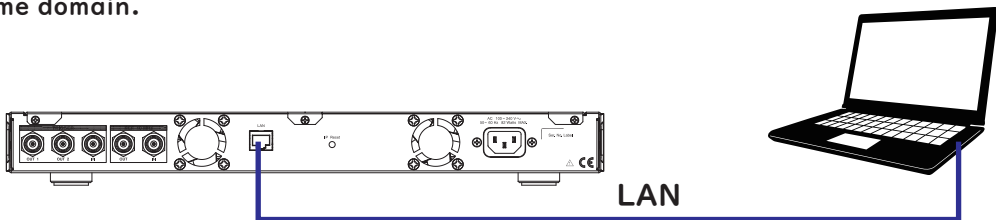
Turn on the C- I 200.

Check if the LAN LED indicators is lit.



Set the LAN configure

The factory default IP address for C- I 200 is 192.168.1.100, so the IP address on the PC should be in the same domain.



C- I 200 side:

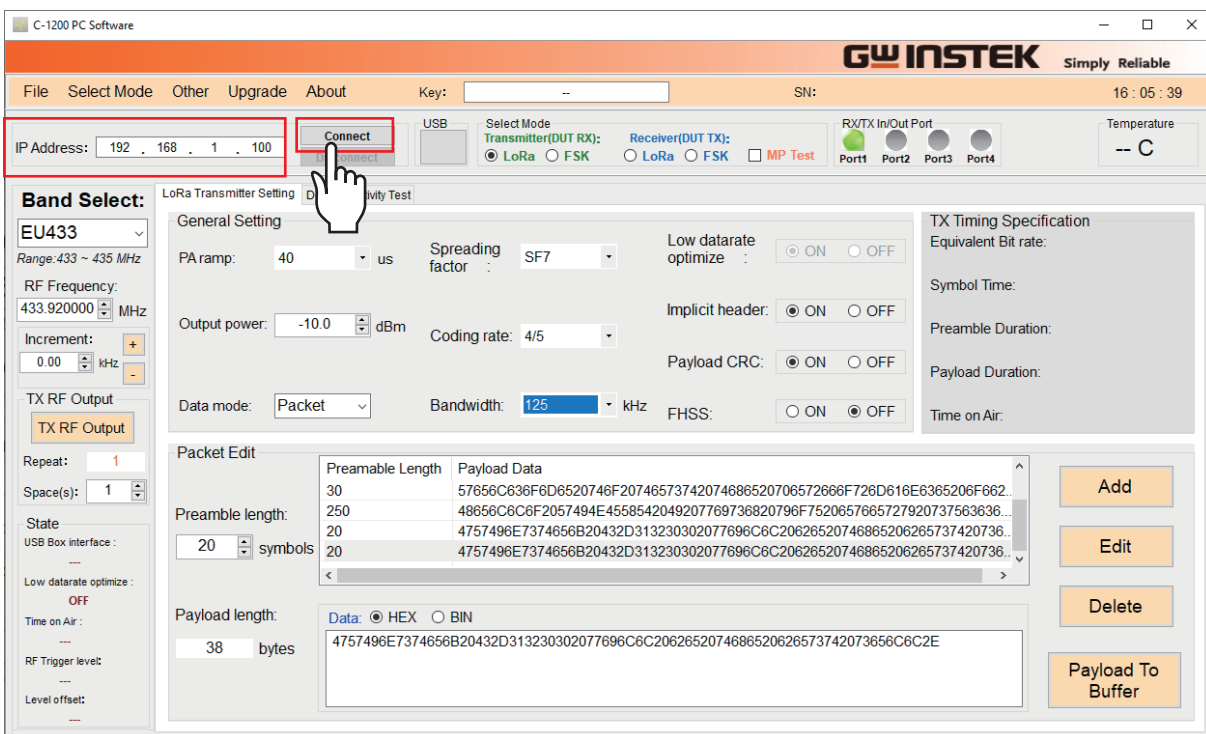
Factory default IP address: 192.168.1.100

PC side:

IP address: 192.168.1.101
Subnet Mask: 255.255.255.0
Default gateway: 192.168.1.254

Run PC software

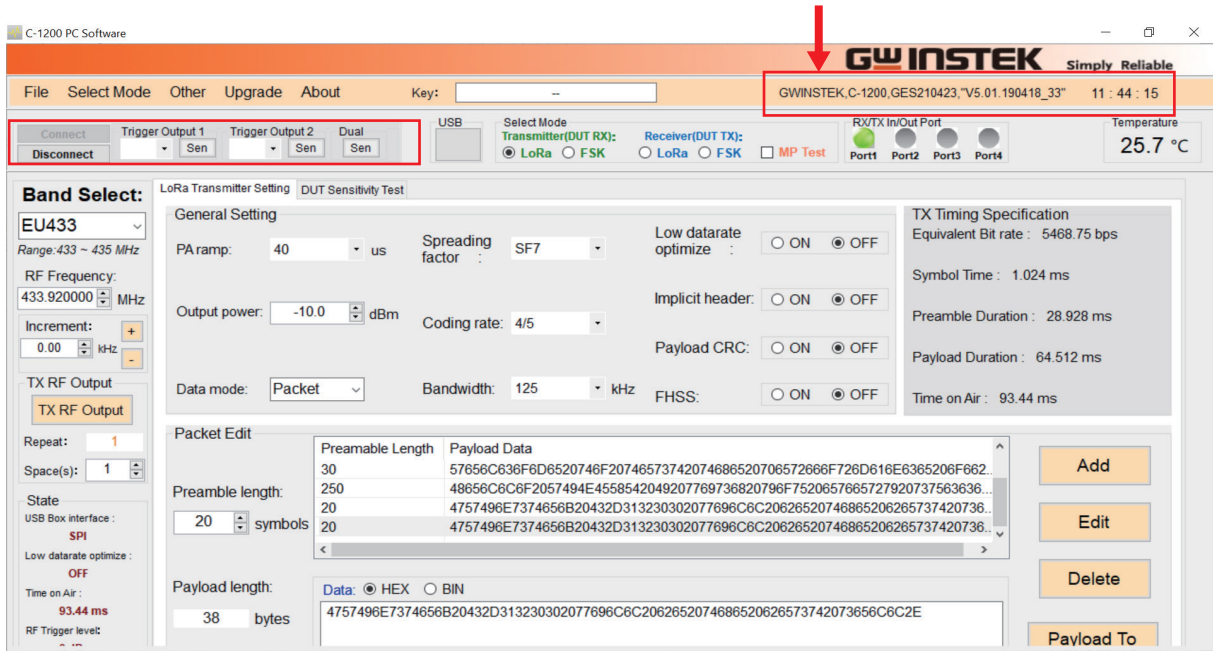
Confirm the IP address and press Connect.



After the connection is successful

After the connection is successful, the basic information about C-I 200 will display at the top right of the main window.

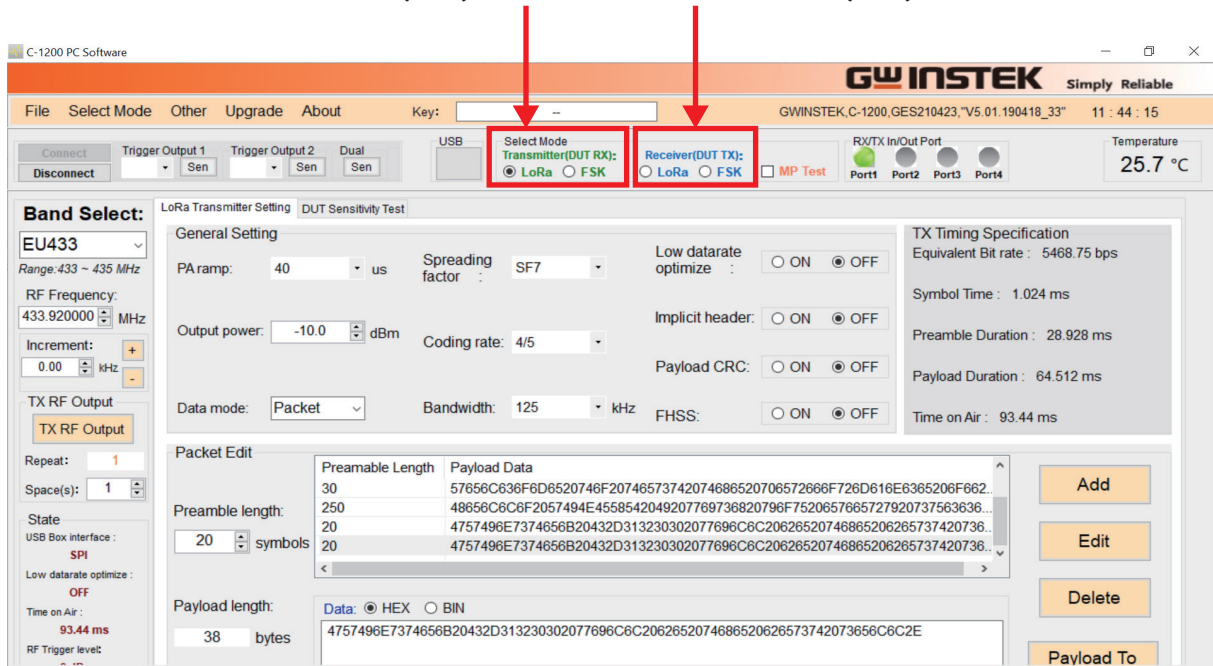
GWINSTEK, C-I 200, Serial Number, Version, Time



Select TX or RX mode:

Transmitter (TX) Mode

Receiver (RX) Mode



Transmitter (TX) Mode

LoRa/FSK Setting parameters

- ① Select Mode
- ③ Select the Transmitter(DUT RX): LoRa or FSK Mode
- ④ The specified port will light up with green indicator.

The screenshot shows the GWINSTEK C-1200 PC Software interface. Key elements include:

- Select Mode:** A dropdown menu with 'LoRa/FSK Mode' selected.
- Band Select:** A dropdown menu with 'EU433' selected.
- Transmitter(DUT RX):** Radio buttons for 'LoRa' (selected) and 'FSK'.
- RX/TX In/Out Port:** Four indicator lights for Port1, Port2, Port3, and Port4, with Port1 lit green.
- General Setting:** Fields for PA ramp (40 us), Spreading factor (SF7), Output power (-10.0 dBm), Coding rate (4/5), Data mode (Packet), Bandwidth (125 kHz), and various optimization options.
- Packet Edit:** Fields for Preamble length (20 symbols) and Payload length (38 bytes), with a table for editing payload data.
- Buttons:** 'Add', 'Edit', 'Delete', and 'Payload To Buffer'.

- ⑤ Output data setting/editing: Select or edit payload data format and preamble length to send out.

General Setting

- PA ramp: 40 us
- Spreading factor: SF7
- Low datarate optimize: OFF
- Output power: -10.0 dBm
- Coding rate: 4/5
- Implicit header: OFF
- Data mode: Packet
- Bandwidth: 125 kHz
- Payload CRC: OFF
- FHSS: OFF

After selecting or setting, the relevant time of TX Timing Specification (TOA) will be calculated.

- ⑥ **Payload To Buffer** After setting /editing, you must press the Payload To Buffer so that the C-I 200 PC Software will transfer the setting parameters to the C-I 200.

Note: If you reset/ edit, you must press the Data Output To Buffer button again.

- ⑦ **TX RF Output** Afterward, just press the TX Data Output button at the top of the main window to send the TX signal.

Editing output data

There are two methods to edit output data

Method 1

You can directly edit the codes in the TX mode: Preamble/ Payload Data code.

Packet Edit

Preamble Length	Payload Data
30	57656C636F6D6520746F20746573742074686520706572666F726D616E6365206F662...
250	48656C6C6F2057494E4558542049207769736820796F7520657665727920737563636...
20	4757496E7374656B20432D313230302077696C6C20626520746865206265737420736...
20	4757496E7374656B20432D313230302077696C6C20626520746865206265737420736...

Preamble length: symbols

Payload length: bytes

Data: HEX BIN

4757496E7374656B20432D313230302077696C6C2062652074686520626573742073656C6C2E

Add

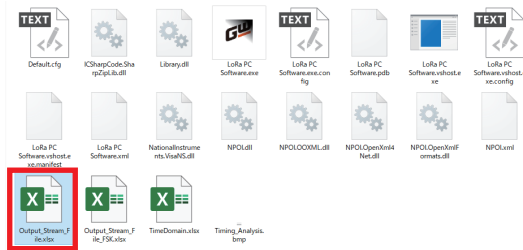
Edit

Delete

Payload To Buffer

Method 2

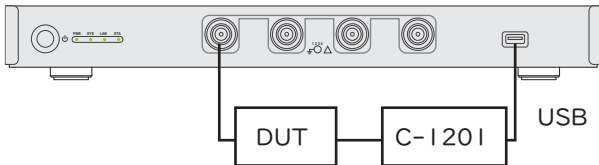
Boot the Output_Stream_File_FSK.xlsx and Output_Stream_File.xlsx file under the C-I 200 PC Software folder to edit the codes.



DUT Sensitivity Test

Validate sensitivity of RX receiving power (10^{-100} dBm) of DUT in the C-I 200 PC software directly.

It is required to connect DUT, via USB cable, to C-I 200 before sensitivity test.



LoRa Transmitter Setting DUT Sensitivity Test!

DUT Setting

PA Select: RFO PA_BOOST

Spreading factor: SF7

Coding rate: 4/5

Bandwidth (kHz): 125

Time on Air: 81.152 ms

DUT Reset:

Check FEI:

FHSS: ON OFF

Preamble: 12 symbols

Payload length: 38 bytes

DUT Payload Data

Default User Define

ASCII Hex

TX Data : 38 Bytes

4757496E7374656B20432D313230302077696C6C2062652074686520626573742073656C6C2E

Test Parameters

Start: -10 dBm Stop: -100 dBm Step: 10 dB

EXT Attenuator: 0 (None) dB Run type: Run finished Stop on error

Package number: 1 Error type: PER BER

BER target: 0.5 Time out: 1 s

Save Log File

Clear Log Data

BER Graph

Sensitivity: -10 dBm

Completed In: --

Fail Point:

Receiver (RX) Mode

LoRa/FSK Setting parameters

① Select Mode

② Select LoRa or FSK Mode

③ The specified port will light up with green indicator.

④ Band Select:

⑤ Receive function setting: RF output frequency fine-tune (3MHz for up and down range), Demod Axis time domain analysis range setting and parameters including IFBW, RBW, Gaussian Filter and Trigger mode, etc.

Parameter Setting DUT Result RX Data Comparison

Tester Setting Mode

IFBW: 300kHz

RBW: 10kHz

Gaussian Filter: OFF

BT: 0.35

NT: 1

Demod Axis

Ref. Value: 0.000 kHz

Ref. Pos: 5

Scale/Div: 20.000 kHz

Meas length: 100

Symbol format: ASCII

Waveform Resolution: Normal

X axis Type: Bit length

Symbol Setup

Fdev: +/- 35.0 kHz

Bit rate: 19.20 kbps

Rx filter bandwidth: kHz

Coding(DC-free): None(OFF)

Tester Trigger Mode

Condition: RF

Edge: OFF (RF trigger)

RF Trigger level: 0 dBm

Trigger delay: 0 ms

Trigger mode: Normal

Free run / Action now

⚠ Note: If the RX Mode Baud rate is different from the Baud rate at the source, there will be a decoding error.

LoRa/FSK DUT Setting

Sets DUT related parameters, which need to be consistent with C-1200 PC SW; otherwise analysis will be unsuccessful.

The main set values to confirm: DUT RF Frequency, SF, BW, Coding rate and Preamble length.

Note 1;

When BW is small, e.g., 7.8kHz, and FEI deflection is greater than 20% of BW that is causing impact on decoding, it is necessary to execute FEI calibration.

Note2;

When symbol time is greater than 16ms, it is required to enable low data rate optimize.

FEI (Frequency Error Indication):

This frequency error indicator measures the frequency error between the programmed RF center frequency and the carrier frequency of the modulated input signal to the receiver. When the FEI is performed, the frequency error is measured.

How to use trigger

The Trigger function sets the signal conditions upon which the spectrum analyzer triggers captured waveforms, including frequency, amplitude, and delay. An external trigger signal, instead of the default internal signal, may be used as required for special conditions. Trigger setting fields are as follows.

- Condition: RF, External
- Edge: Positive, Negative, OFF
- RF trigger level: 10 ~ -80dBm
- Trigger Delay: 0 ~ 1000s
- Trigger Mode: Normal, Single, Continue

After setting is finished, switch Free Run to Action Now option

Note;

If you expect that the received signal tend to be small, you need to adjust the level of RF Trigger level again (default is -30dBm). Confirm if settings of (Modulation (FSK or ASK), Center frequency (315MHz or 433.92MHz) and Baud Rate are correct. If not, there will be an error occurred and fail to trigger.

MP Test

It provides the basic MP Test functions including DUT General Setting, DUT TX, DUT RX, Power Consumption (PPH required).



PPH-1503

DC Power Supply with dual range of 15V/3A or 9V/5A.

① Select LoRa or FSK Mode

② Set DUT General Setting.

- Band Select, RF Frequency, Output Power and Input Port.
- Check the SF, BW and CR settings for test.

③ Check the items for test and adjust the judgment limit line of PASS/FAIL.

④ **Run** Click the RUN button to execute MP Test process.

It is available to save/load config file directly.

Spectrum(Specification) Mode: Pretest

Specification Pretest mode provides a simple Spectrum analyzer function which can perform testing complying to FHSS (Frequency Hopping Spread Spectrum) & DSSS (Direct Sequence Spread Spectrum). Compliance with the specification § 15.247 and § 15.209.

① Select LoRa or FSK Mode

The shortcut menu is available on the main window: Auto Sweep time, Pre-amp, Sweep mode, Max/Min Hold, Preset, Sweep control, 2FSK mode, Detection.

Auto Sweep time:

Automatic adjust the sweep time and dwell time

Preset: The Preset function loads either factory default states.

Max/Min Hold:

The maximum or minimum points are maintained for the selected trace. The trace points are updated each sweep if new maximum or minimum points are found. The Hold Max setting also has a threshold setting. This setting will ensure only those values above the threshold are kept.

Sweep mode:

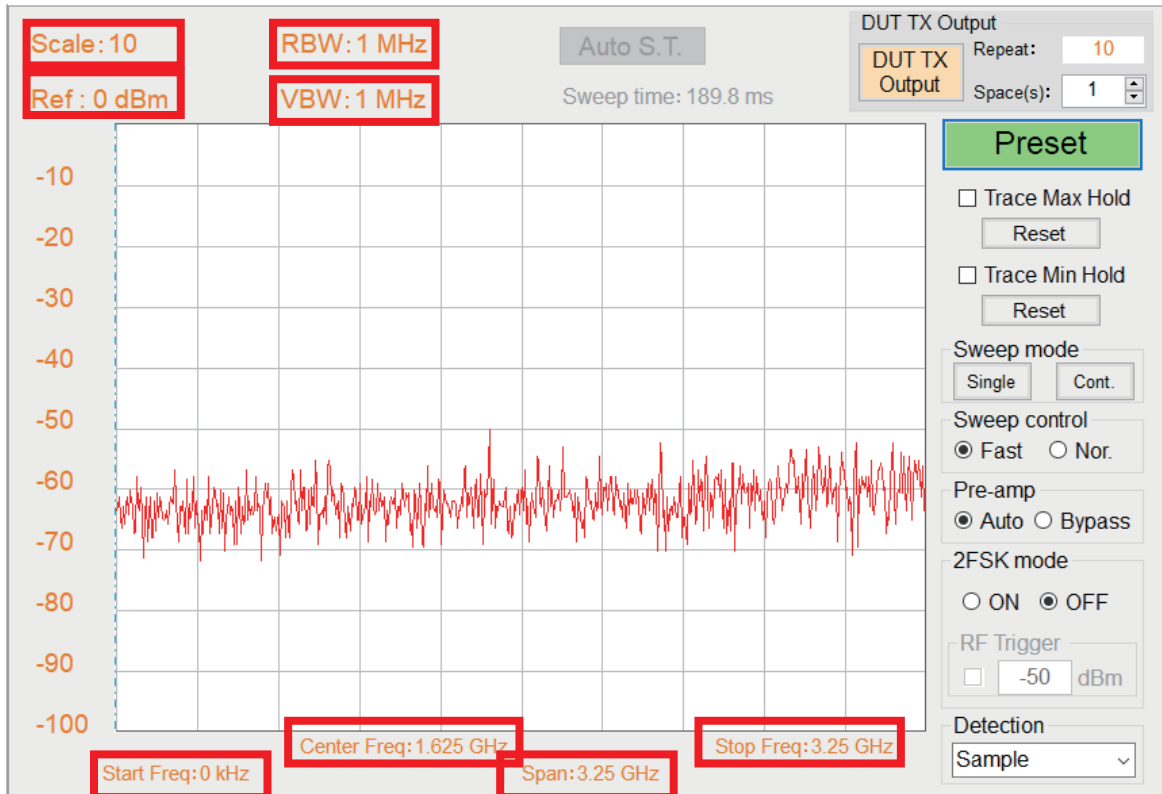
The Fast setting speeds up the signal processing and the display update rate to increase the overall sweep time. This mode is especially useful when the span is greater than 1 MHz. When set to Normal, signal processing and update rate is set to normal levels.

Pre-amp:

In the Auto setting mode, the pre-amplifier will be turned on automatically when the reference level is less than -30dBm. The pre-amplifier will be turned off when the reference level is greater than -30dBm. The bypass setting turns the preamplifier off.

Operation

You can change the setting by directly clicking on the display information such as Scale, Ref, RBW, VBW, frequency, etc. on the main window.



Example: Move mouse to RBW and double click on the left mouse button to edit

The diagram shows a hand icon double-clicking on the 'RBW: 1 MHz' label. This action opens a dropdown menu with the following options:

- Auto
- Auto
- 1MHz
- 300kHz
- 100kHz
- 30kHz
- 10kHz
- 3kHz
- 1kHz
- 300Hz
- 100Hz
- 30Hz
- 10Hz

- Scale: 10, 5, 2, 1
- Ref: 30dBm ~ -120dBm
- RBW: Auto, 1MHz, 300kHz, 100kHz, 30kHz, 10kHz, 3kHz, 1kHz, 300Hz, 100Hz, 30Hz, 10Hz
- VBW: Auto, 1MHz, 300kHz, 100kHz, 30kHz, 10kHz, 3kHz, 1kHz, 300Hz, 100Hz, 30Hz, 10Hz

Example: Move mouse to Center Frq: 1.625 GHz and double click on the left mouse button to edit

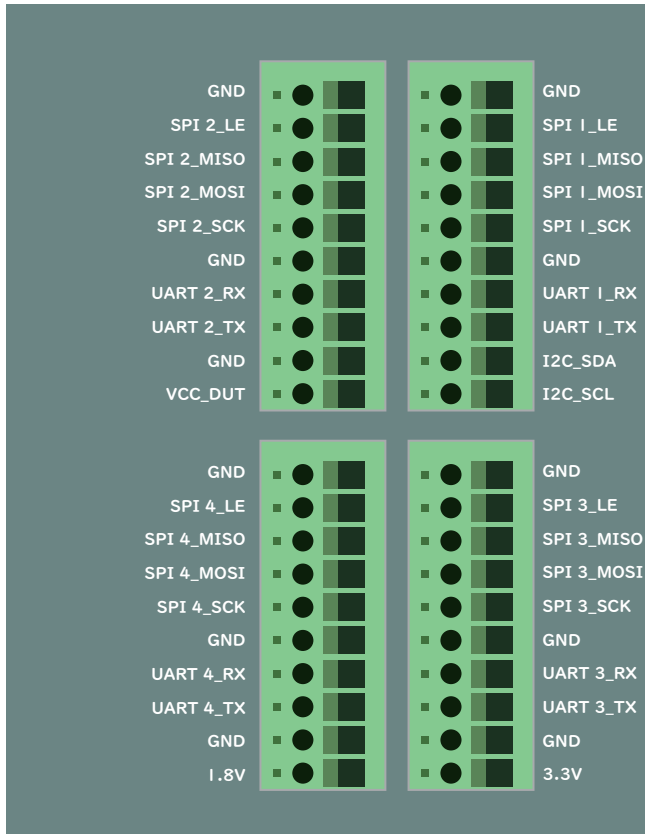
The diagram shows a hand icon double-clicking on the 'Center Freq: 1.625 GHz' label. This action opens an input field where the user can enter a new value. The sequence of steps is:

- Center Freq: 1.625 GHz
- Center Freq: 1.625 GHz MHz (input field is active)
- Center Freq: 1.625 GHz 433 MHz (value 433 is entered)
- Center Freq: 433 MHz (value 433 is confirmed)

IO Extension

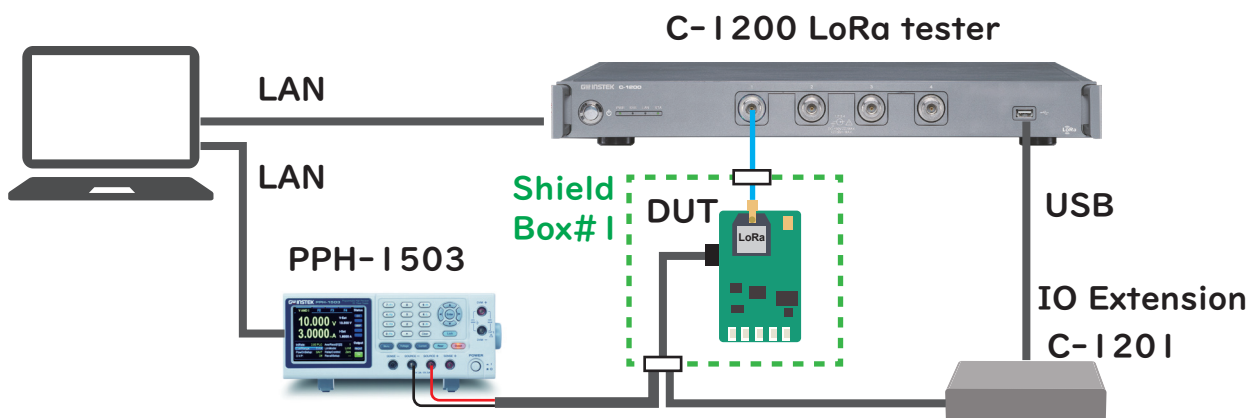
IO Extension (C-I201), the external interface accessory for C-I200, provides up to 4 groups of SPI, 4 groups of UART, 1 group of I2C (I2C_SDA, I2C_SCL) or 2 pins of GPIO (GPIO1, GPIO2) for signal sending and receiving. Note that I2C_SDA:GPIO1 and I2C_SCL:GPIO2.

IO Extension (C-I201), which is mainly used to control external DUT, can be remotely controlled by C-I200 to send or receive signal.



- Note:
1. Due to the fact that I2C and GPIO share the same pin, either one state will be present at a time.
 2. Voltage will be output when GPIO Mode State is output.

Example



One-station test requirement can be realized while C-I200 collocating with IO Extension and PPH-1503.