GRF-3300
RF Training Kits

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Date : Aug. 20, 2008

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Educational challenges coped in RF circuits training

- Short of proper training tools
  - The broad span of RF technology in relevant application
  - Not easy to prepare for the experiment apparatus
- RF technique specificity hinders educational flexibility
  - Complex technology for RF unit choose, PCB Layout
  - Difficult in tuning RF circuit
  - Needs antecedent and relevant experiences
- Expensive and complex conventional instrument
  - Building the RF experiment equipment is grind
  - The price is very expensive

What is GRF-3300 ?

- **The Most Integrated and Effective RF Training Solution for Wireless Communication Education**
  - Learning the operation principles of an RF system
  - Covering frequency range from 730MHz to 2.4GHz
  - Understanding spectrum analyzer
  - Recognizing its application for wireless communication systems.

GRF-3300 Series

- RF training course meets theoretical and practical requirements
- Through experiments to verify the theory learning
- Voice Communication System training
- Versatile modules include 22 modules and more than 50 experiments
- Flexible syllabus
  - Stepwise learning along each chapter
  - Selection Flexibility for the topic requirements

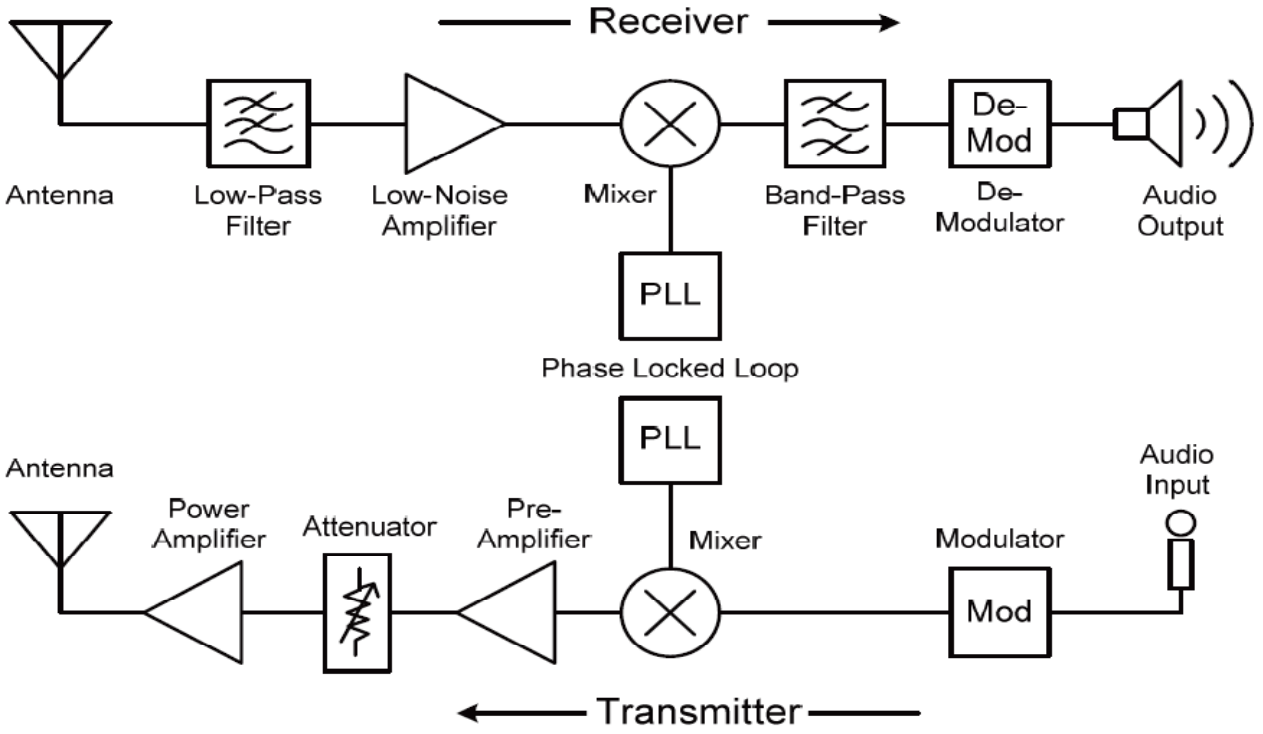
GRF-3300 Series

- Designed for
  - GRF-3300S for systemization : Well assembled and tested system packed in two main transmitter and receiver PCBs.
  - GRF-3300K for modularity: 22 well assembled and tested function blocks in 16 modules (12 for receiver and 10 for transmitter).
- Topics of the module includes

• Antenna	• Power Amplifier	• Audio Process
• Attenuator	• LC Filters	• Modulation
• Low Noise Amplifier	• Mixer	• Demodulation
• Preamplifier	• Phase-Locked Loop	• Microstrip Line Filter

GRF-3300 Generic Block Diagram

- **A generic block diagram of GRF-3300 training system**

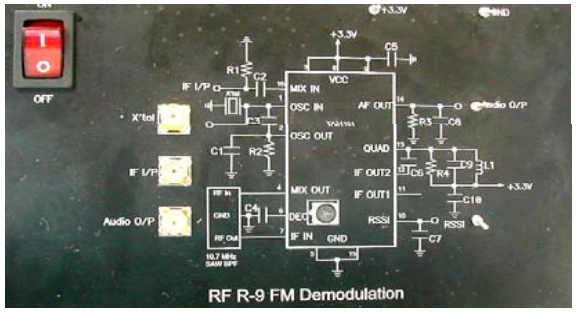


GRF-3300S

- Includes transmitter and receiver
- All modules are preassembled and integrated
- Convenient for
  - portable applications
  - easy to demonstrations

GRF-3300K

- Enabling flexible placement
- Sharing one training system with multiple students who run different experiments simultaneously



Main Features

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Main Features

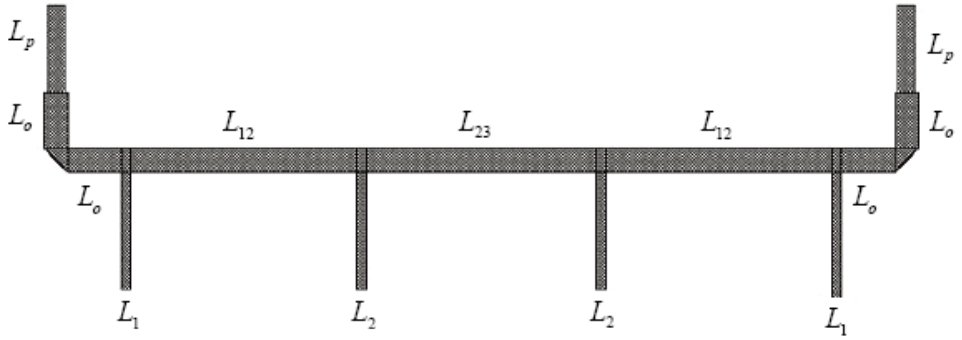
- Designed for wireless application
- 880MHz Digital PLL & 2.4GHz microstrip line filters
- Voice Communication System Training
- Understanding the applications and measurements for using spectrum analyzer
- Theory and hand-on experiments for each chapter
- Unique design RF circuit characteristic & PCB Layout on each module

Digital Phase-Locked Loop

- One of the key components in RF technology
- Prerequisite for the wireless technology industry; for example, cell phones, wireless adapters, and Bluetooth.
- Offers high frequency signals can be performed with high stability
- In GRF-3300
  - Frequency Range : 880±80MHz
  - Frequency resolution : 0.1Hz, more than 800 usable channels

Special circuit feature - Microstrip Line Filter

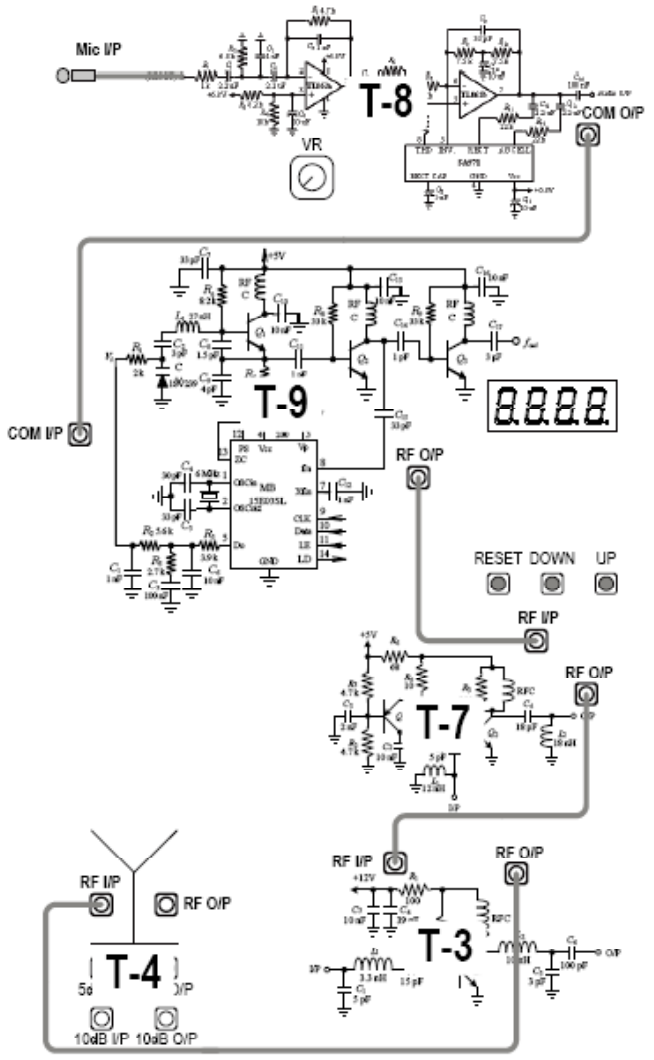
- Easy to implement the RF training in this specific and complex framework
- GRF-3300
  - Application for 2.4GHz Filter (LPF/HPF/BPF)
  - Implementation on FR4
  - Provides a practical, real-world and easy to comprehend platform for students



Voice Communication System Training

- Both transmitting and receiving systems can be integrated

- Connecting the microphone as a voice input transmitter and using a speaker as a voice output receiver.



Getting Familiar with Spectrum Analyzers

- The most common instrument for RF measurement
- In GRF-3300
  - To allow students familiar with the practical application of spectrum analyzers in the occupational industry
- To measure the return loss by incorporating it with a Tracking Generator (TG) and a Return Loss Bridge (RLB)

Complete Learning Experience

- Manual is comprised of two parts: the teachers' book and the students' book

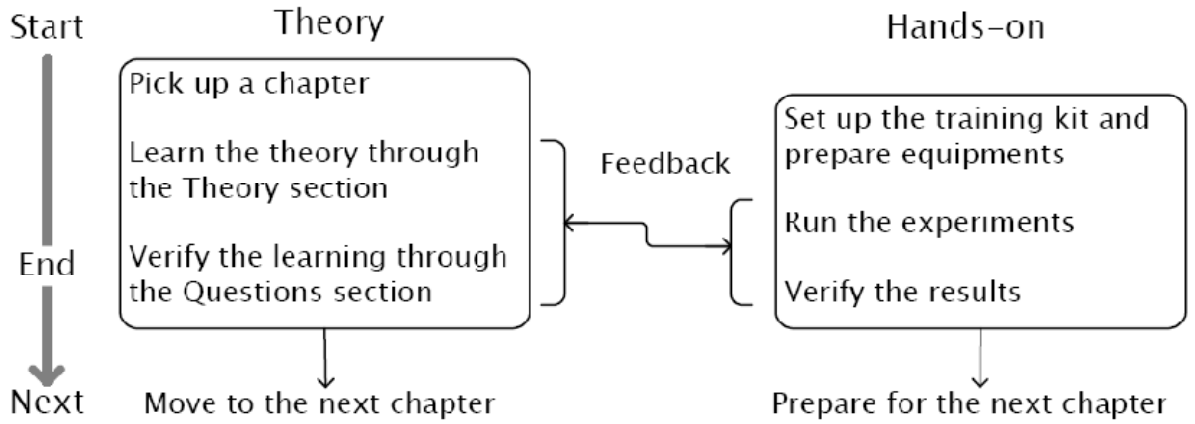
- Each chapter including
  - Theoretical explanations
  - Circuit structures
  - Experiment contents
  - Illustrations
  - Experiment result
  - Discussion

- Any chapter can be used separately for instruction without the completion of previous chapters

Complete Experimental Operation Manual

- All students are guided step by step through the experiments with clear and concise instructions

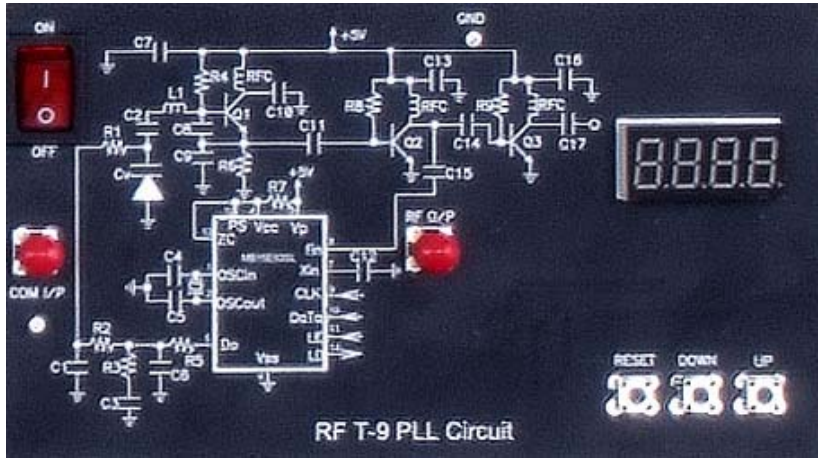
- All of the experimental results and solutions are illustrated in the teachers' book



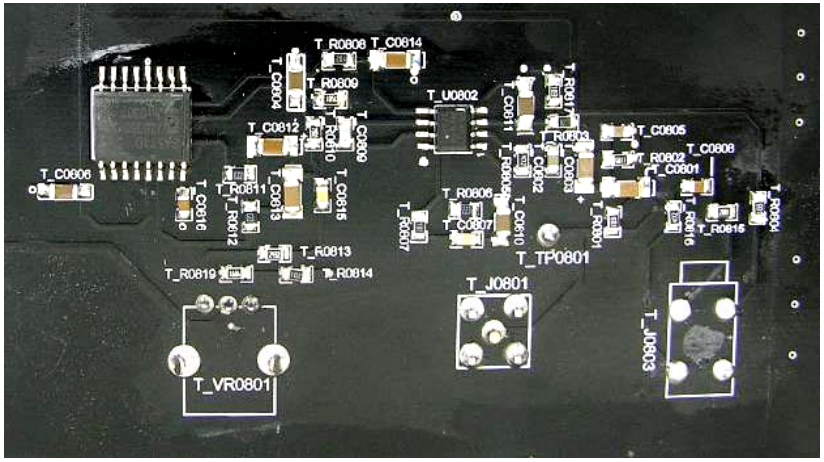
Studying Flow

PCB Layout Exhibition

- Each module's circuitry and layout are clearly printed upon the PCB, making it visible to students for a better learning experience



Front Side – Circuit Structure



Back Side – PCB Layout

Target Market

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Targeting Segment

- Communication, electrical engineering departments of universities and colleges.
  - Professors lecturing in RF communication field who wish to set up an RF related course.
  - Professors with a laboratory that don't have experiment apparatus or courses for higher frequency electronics.
  - In electronic related departments, professors who have an RF circuitry background but not the time or experience to implement an experiment course.

Marketing & Promotion

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Marketing & Promotion

- For professors with a demand for an educational solution that encompasses fundamental theory, practical experimentation and hands on training with questions and answers.
- One of the best strategies for entering the market is to sponsor a local leading university with subsidies. These subsidies will be in exchange for positive endorsement and recommendations. Once these universities adopt our education solution we then have a good opportunity for others to follow suit.

Marketing & Promotion

- Hosting regional or on-campus seminars to address issues of how to open an RF class, RF education solutions and the main features of GRF systems including the importance of Spectrum Analyzers.
- Promoting our products to telecommunications and or electronics professors with the intention of opening RF classes with budget concerns.

Service Policy

- GRF-3300 Series carry a 1-year warranty excluding test leads, adapters and power cords, which carry a 3 month warranty.

Service Policy

- Service Support
  - The structural system of GRF-3300 is formatted from every single module; if the circuit is out of order. The modular system of the GRF-3300 enables each module circuit or individual component to be individually tested and repaired. They can be repaired by the following:
    - Soldering the part again according to the service manual GWInstek provided.
    - Asking for the material and or circuit board support from GWInstek.
    - Most of the accessories are common electrical components and can be outsourced from local suppliers if time is a priority.

Order Information

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Ordering Information

GRF-3300S	RF Training System, Two systems (Transmitter and receiver)
GRF-3300K	RF Training Kit Sets, 22 modules (12 for receiver and 10 for transmitter systems)
GRF-3300 Series	Including Spectrum Analyzer GSP-830+Tracking Generator(TG),GRF-3300S, GRF-3300k

Standard Accessories

	GRF-3300S	GRF-3300K
Teacher book & Student book	1	1
N-SMA adaptor	3	3
RF cable,	6	6
RF cable,	6	6
RF cable,	3	3
Return loss bridge (RLB)	1	1
SMA(F)-SMA(F) Connector	1	1
50Ω terminator	1	1
Antenna	2	2
Microphone	1	1
DC power cable (red, black)	-	10
AC power cord	2	-

Demonstration

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Demonstration

- Filter Demo
- Microstrip Line Demo
- Voice Communication Demo

Filter Demonstration

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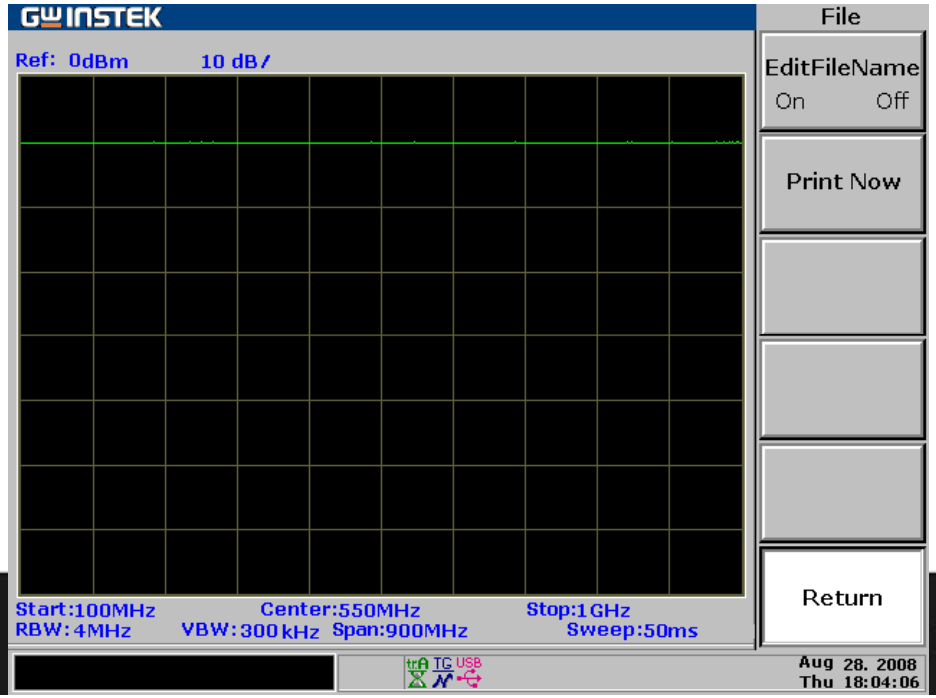
Filter Demonstration

- Testing R-5 High Pass Filter Circuit
  - R-5 HP Filter is designed for 450MHz

1. Connecting with adapter and accessory to GSP-830

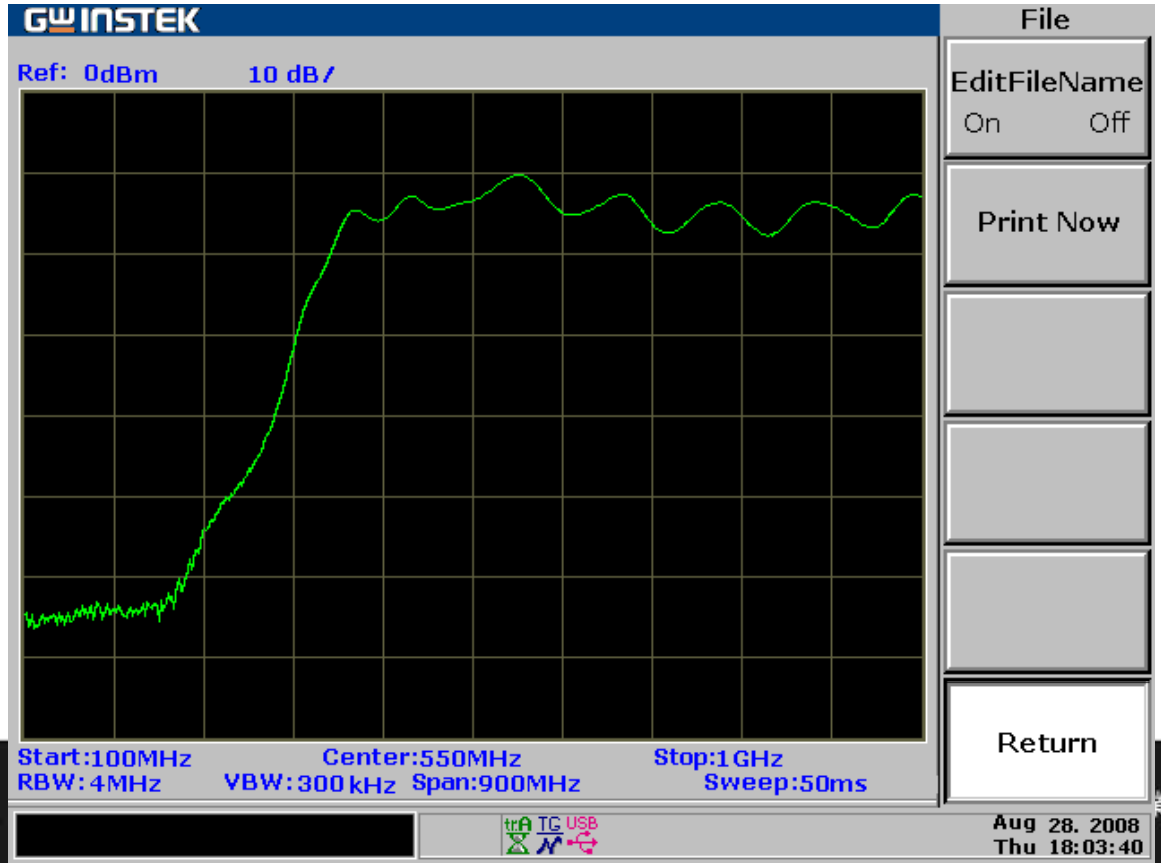
Filter Demonstration

- Testing R-5 High Pass Filter Circuit
  2. Set GSP-830's Span 100MHz ~ 1GHz
  3. TG and TG Value is 0dBm, TG Reference Level is -10dBm
  4. Use SMA-Stru to short circuit with TG & RF
  5. Normalize TG



Filter Demonstration

- Testing R-5 High Pass Filter Circuit
  5. Open circuit with TG & RF
  6. Connecting to R-5 high pass filter



Microstrip Line Filter Demonstration

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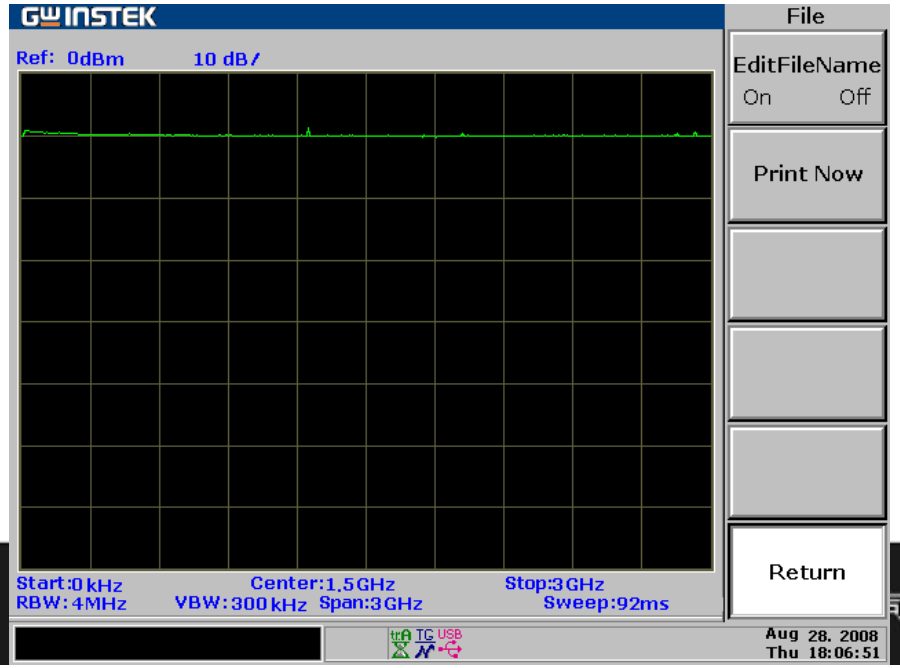
Microstrip Line Filter Demonstration

- Testing T-1 Distributed HPF
  1. Connecting with adapter and accessory to GSP-830

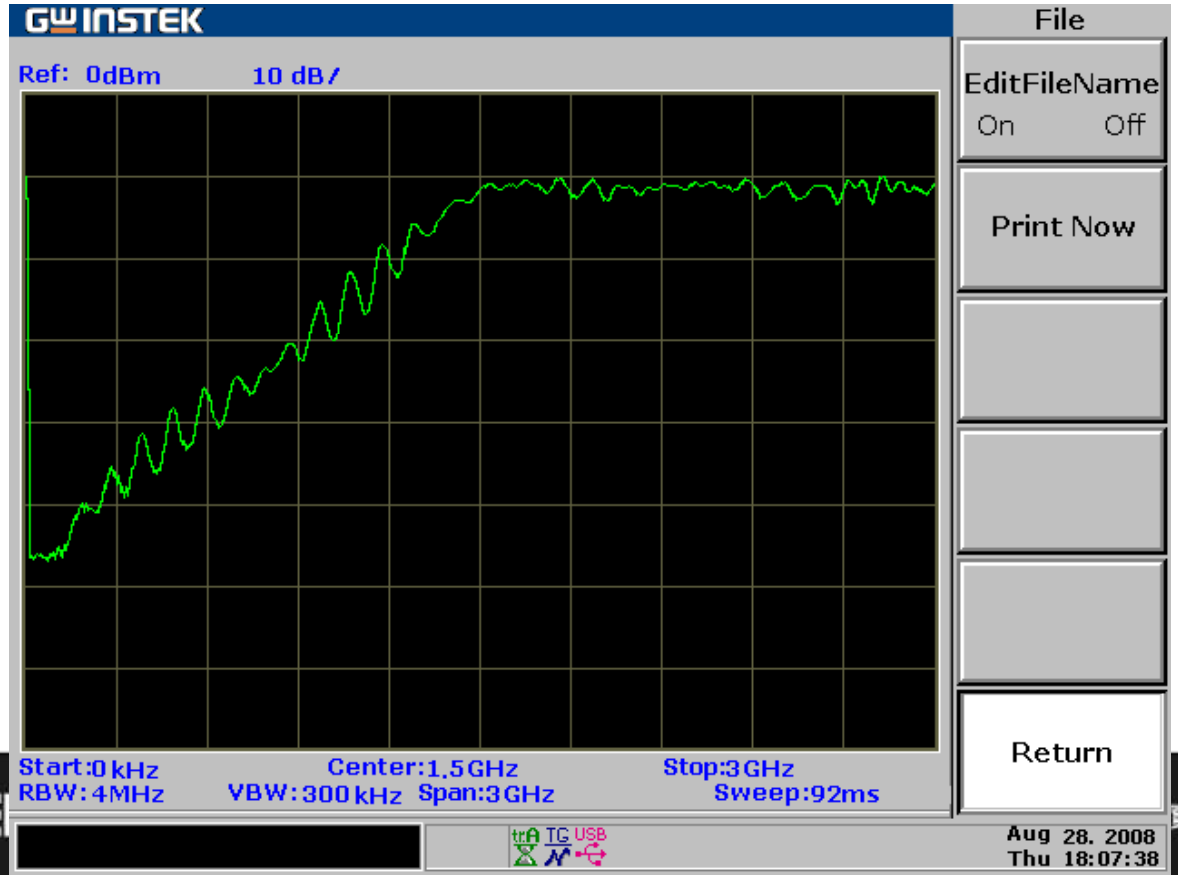
Microstrip Line Filter Demonstration

- Testing T-1 Distributed HPF
  2. Set GSP-830 Span to full span
  3. TG and TG Value is 0dBm, TG Reference Level is -10dBm
  4. Short circuit with TG & RF
  5. Normalize TG



Microstrip Line Filter Demonstration

- Testing T-1 Distributed HPF
  5. Open circuit with TG & RF
  6. Connecting to T-1 Distributed HPF



Voice Communication Demonstration

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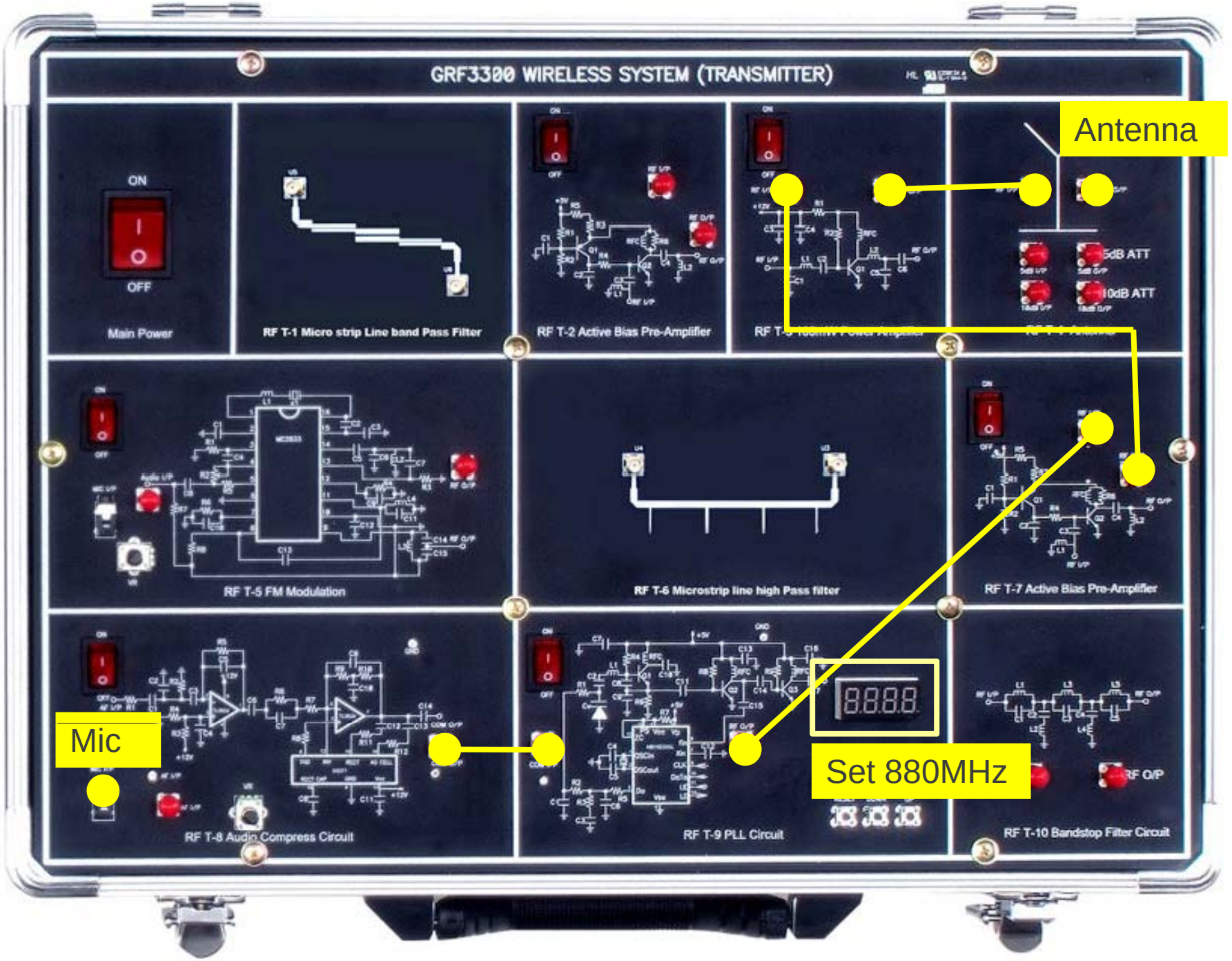
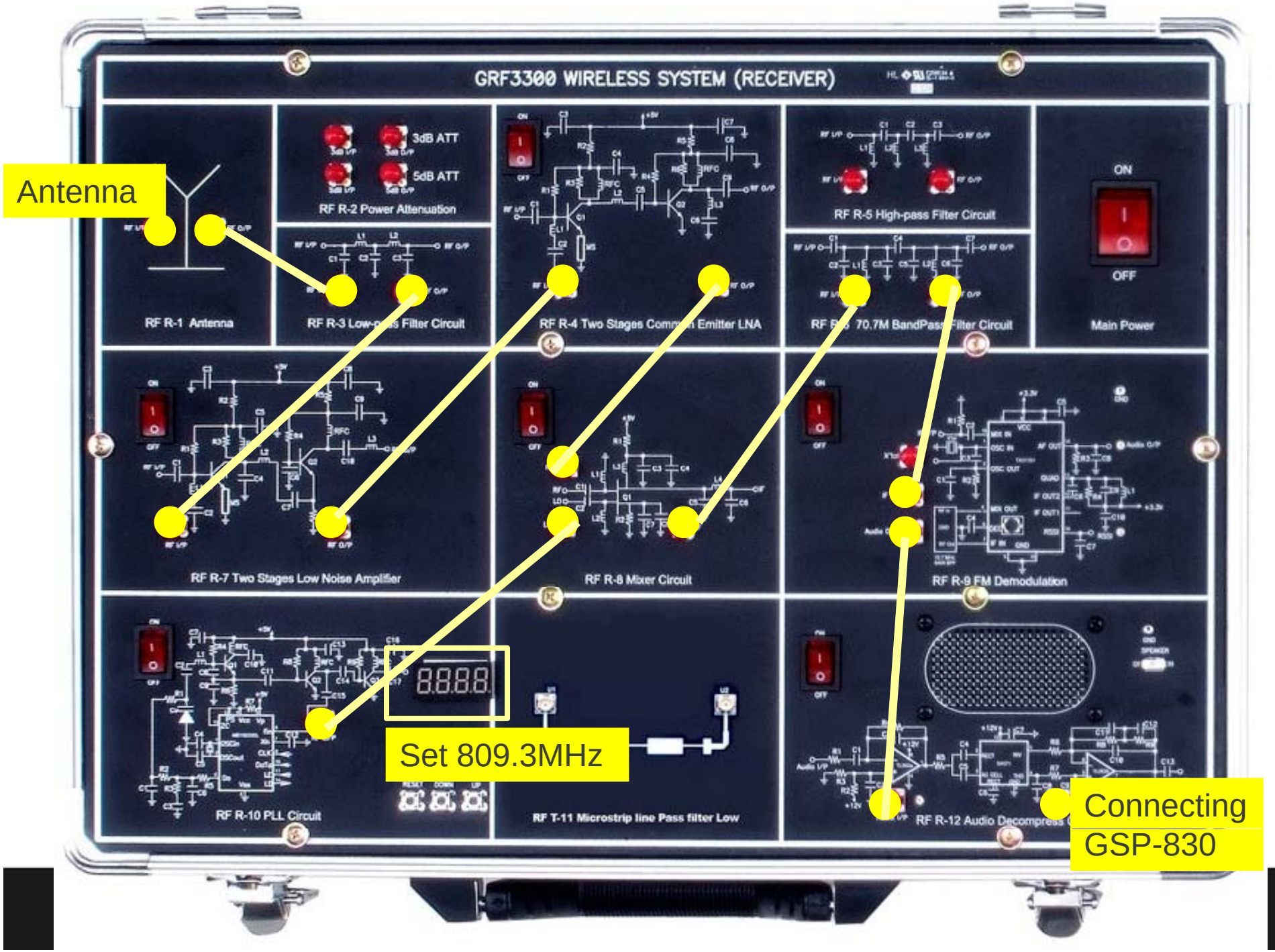
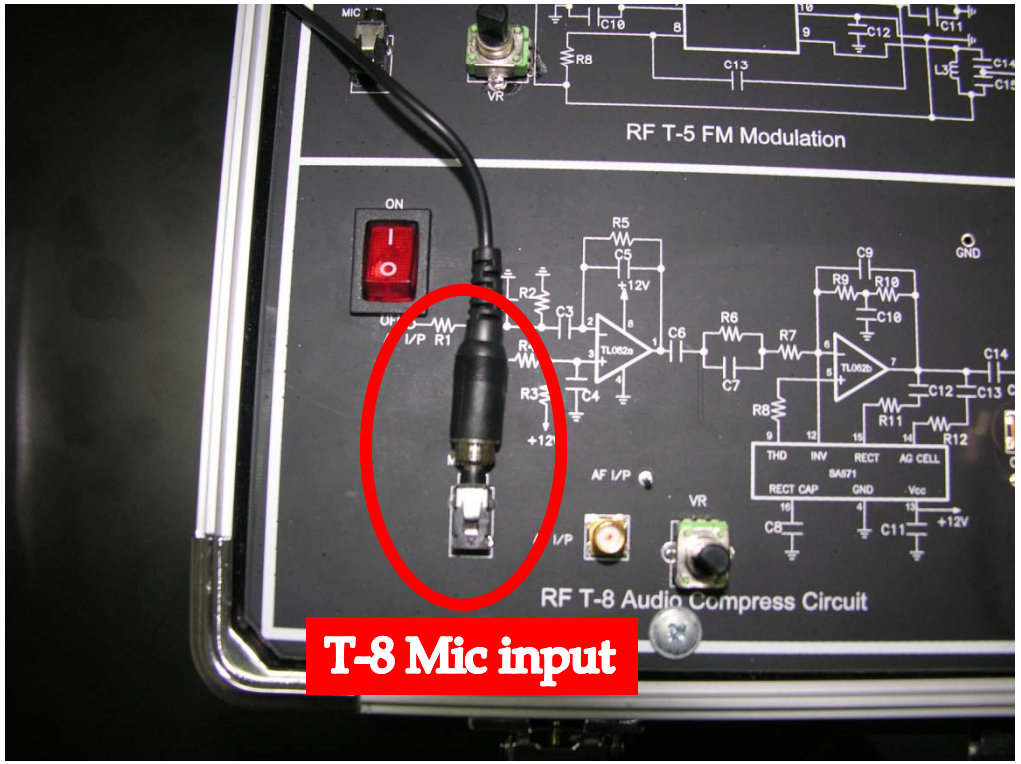

GRF3300 WIRELESS SYSTEM (TRANSMITTER)
ON
OFF
Main Power
RF T-1 Micro strip Line band Pass Filter
RF T-2 Active Bias Pre-Amplifier
5dB ATT
10dB ATT
RF T-5 FM Modulation
RF T-6 Microstrip line high Pass filter
RF T-7 Active Bias Pre-Amplifier
RF T-8 Audio Compress Circuit
RF T-9 PLL Circuit
RF T-10 Bandstop Filter Circuit
RF O/P
Antenna
Mic
Set 880MHz


GRF3300 WIRELESS SYSTEM (RECEIVER)
Antenna
RF R-1 Antenna
3dB ATT
5dB ATT
RF R-2 Power Attenuation
RF R-3 Low-pass Filter Circuit
RF R-4 Two Stages Common Emitter LNA
RF R-5 High-pass Filter Circuit
RF R-6 70.7M BandPass Filter Circuit
ON
OFF
Main Power
RF R-7 Two Stages Low Noise Amplifier
RF R-8 Mixer Circuit
RF R-9 FM Demodulation
RF R-10 PLL Circuit
Set 809.3MHz
RF T-11 Microstrip line Pass filter Low
RF R-12 Audio Decompress
Connecting
GSP-830

Voice Communication Demonstration

Transmitter

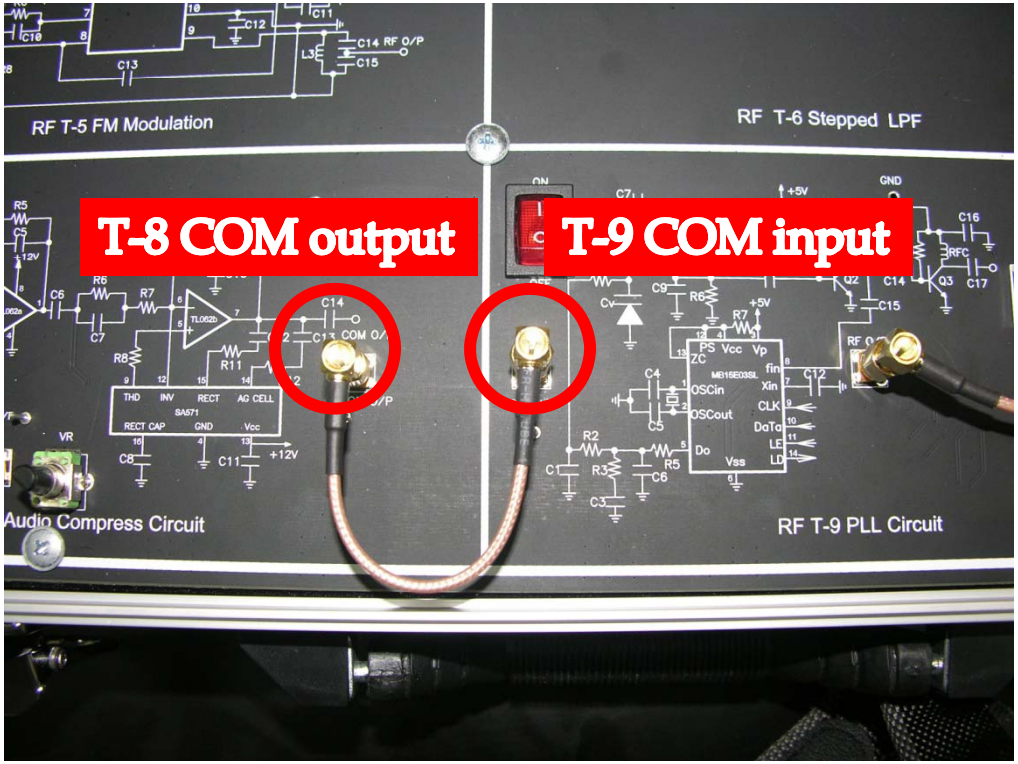
- Link Microphone to T-8 Mic input



Voice Communication Demonstration

Transmitter

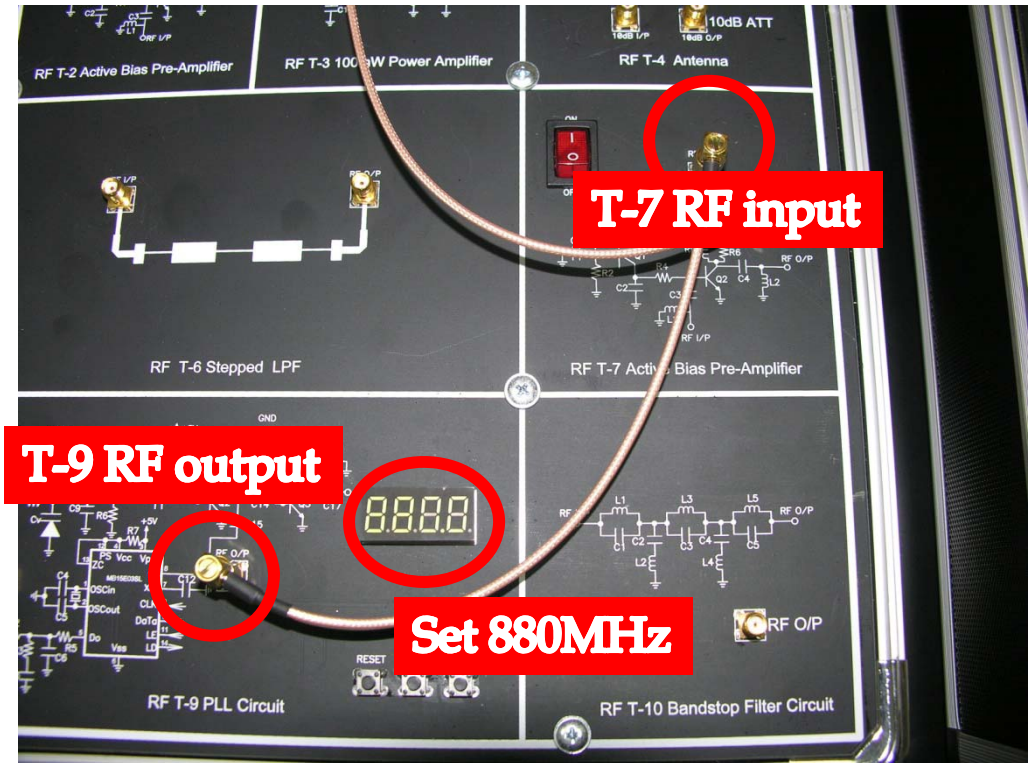
- Link T-8 COM output & T-9 COM input



Voice Communication Demonstration

Transmitter

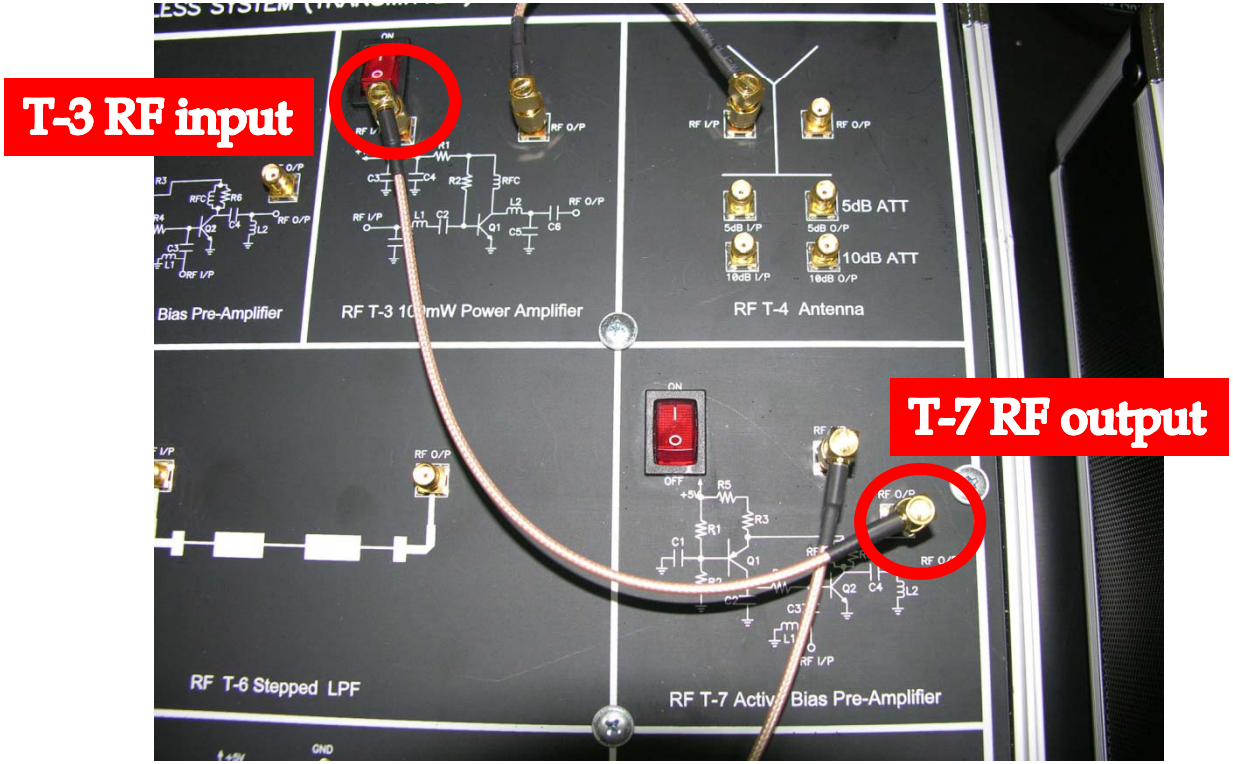
- Link T-9 RF output & T-7 RF input
- Set Frequency at 880MHz



Voice Communication Demonstration

Transmitter

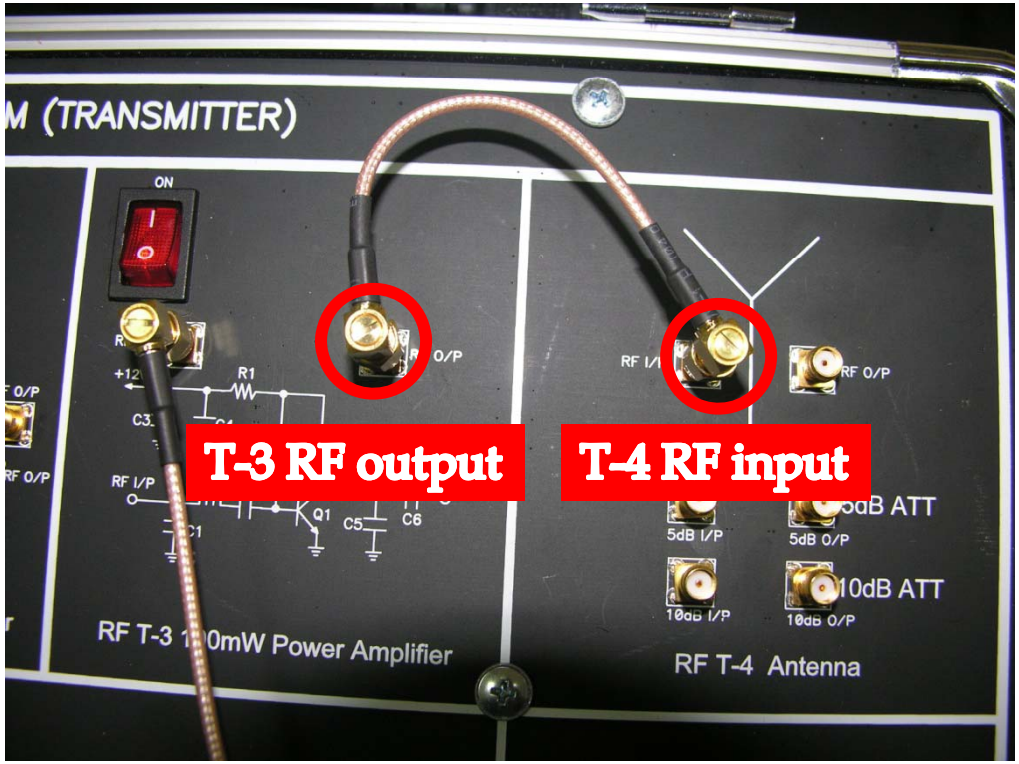
- Link T-7 RF output & T-3 RF input



Voice Communication Demonstration

Transmitter

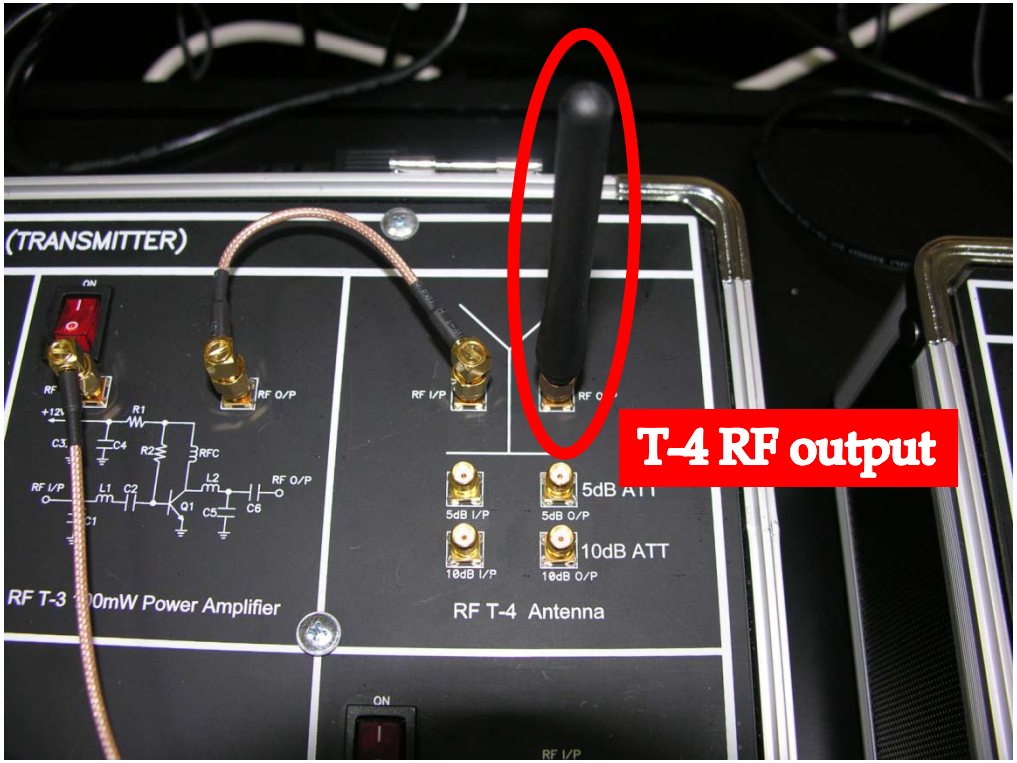
- Link T-3 RF output & T-4 RF input



Voice Communication Demonstration

Transmitter

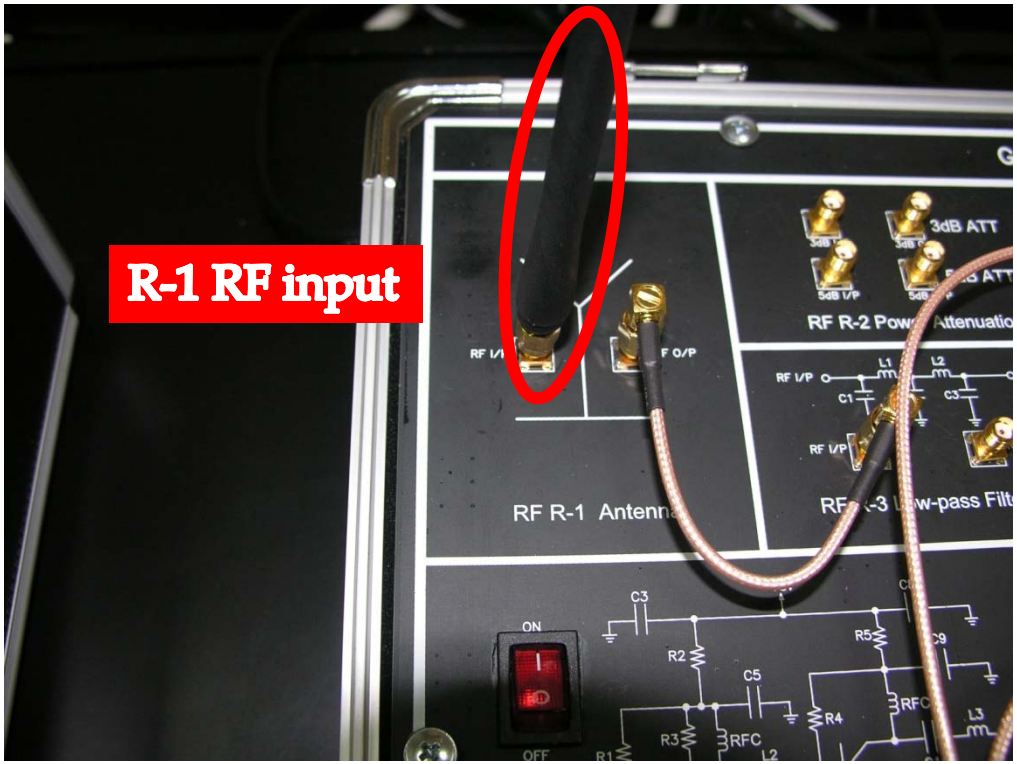
- Link T-4 RF output & Antenna



Voice Communication Demonstration

Receiver

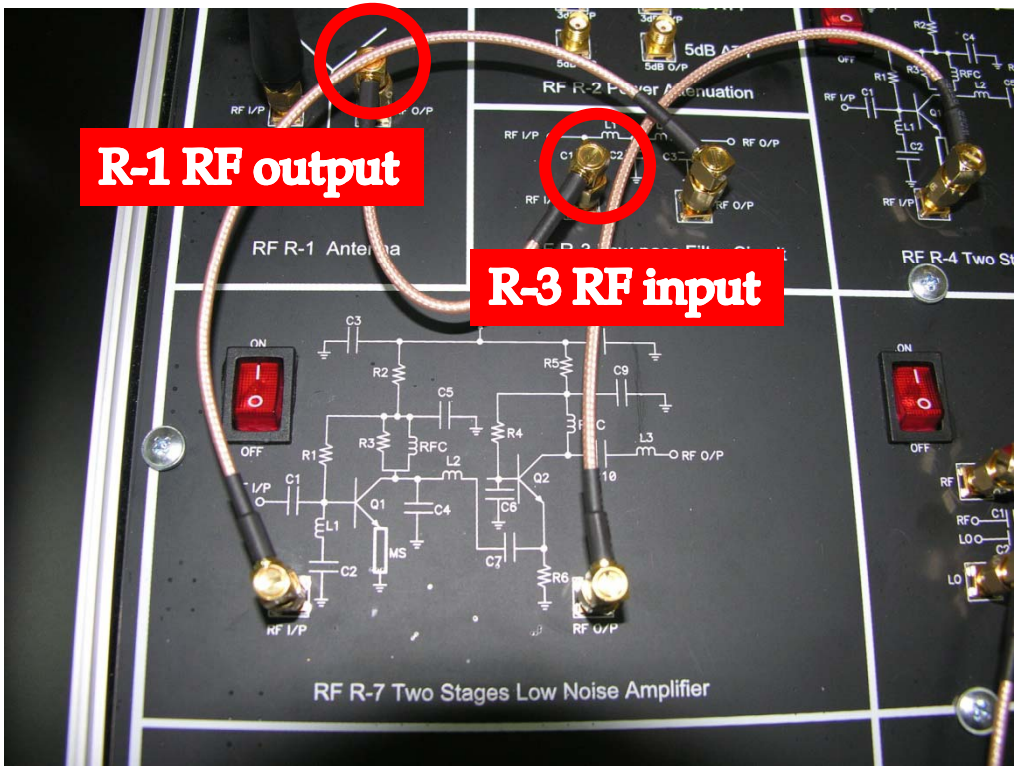
- Link Antenna & R-1 RF input



Voice Communication Demonstration

Receiver

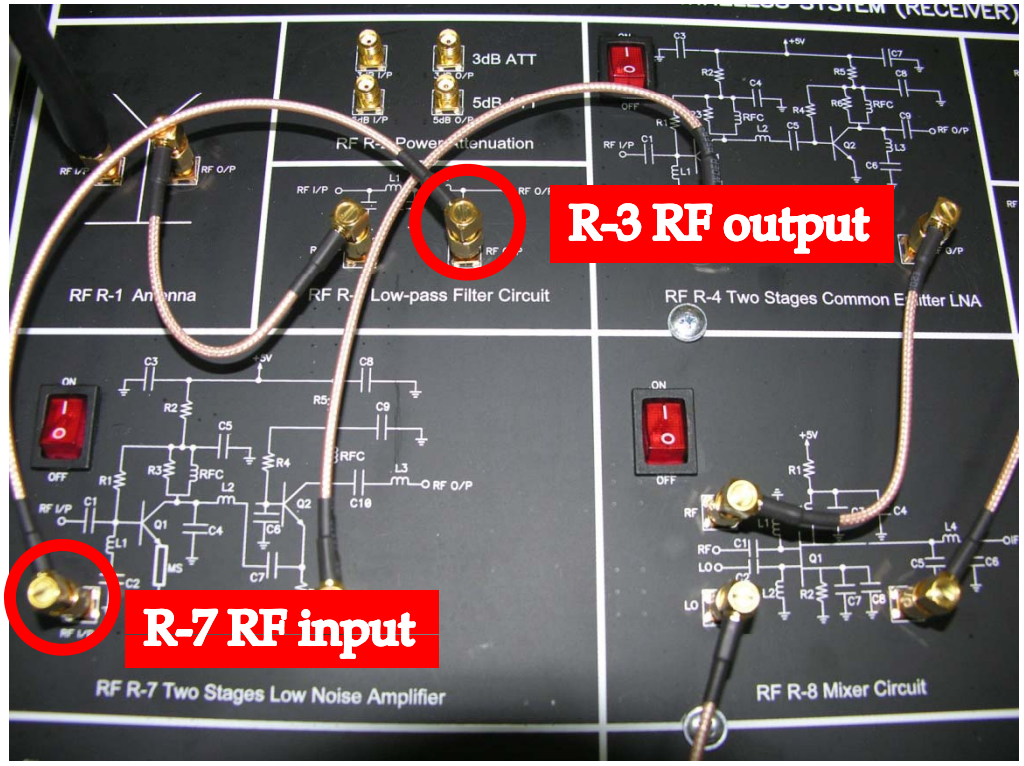
- Link R-1 RF output & R-3 RF input



Voice Communication Demonstration

Receiver

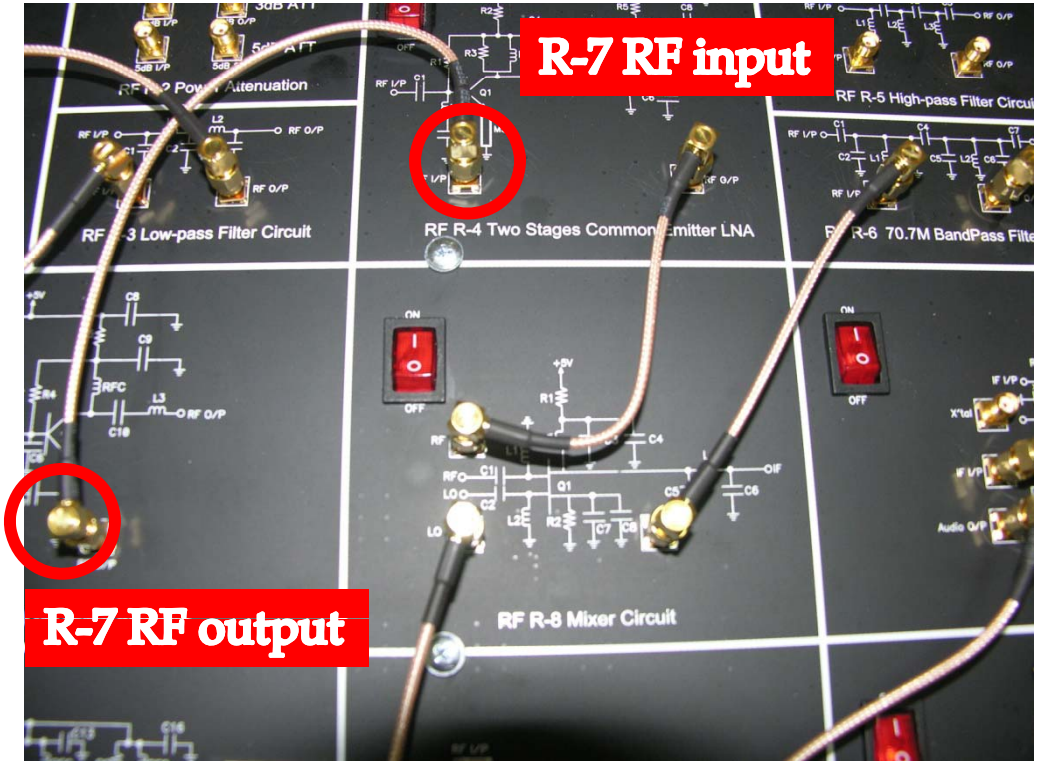
- Link R-3 RF output & R-7 RF input



Voice Communication Demonstration

Receiver

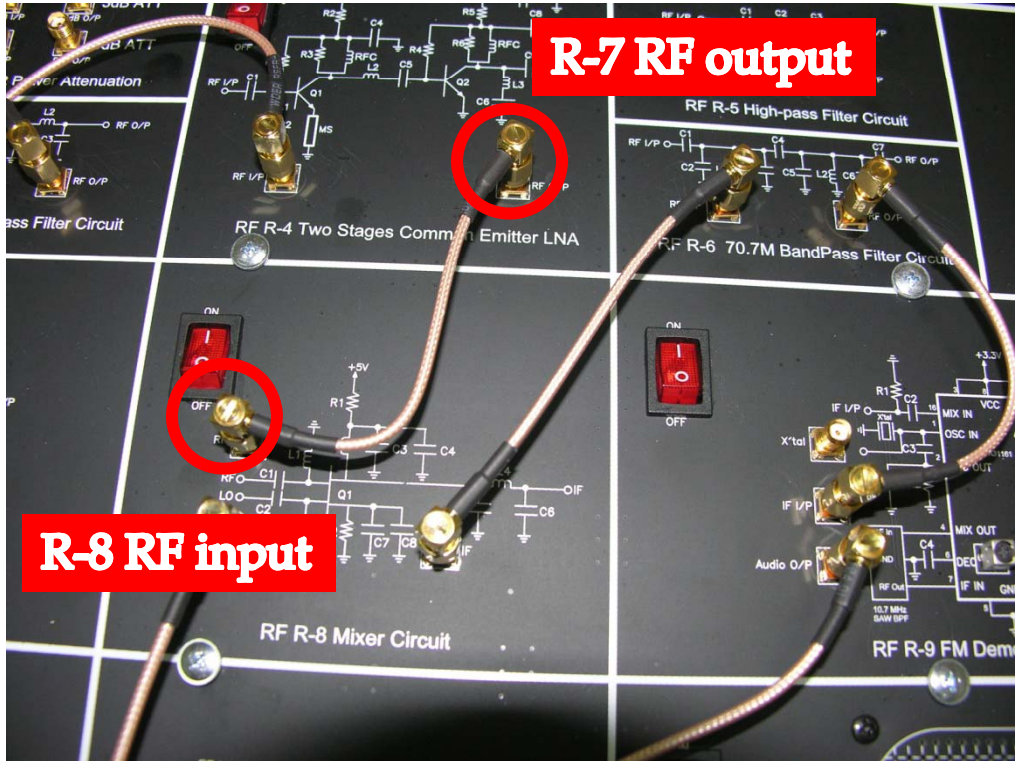
- Link R-3 RF output & R-7 RF input



Voice Communication Demonstration

Receiver

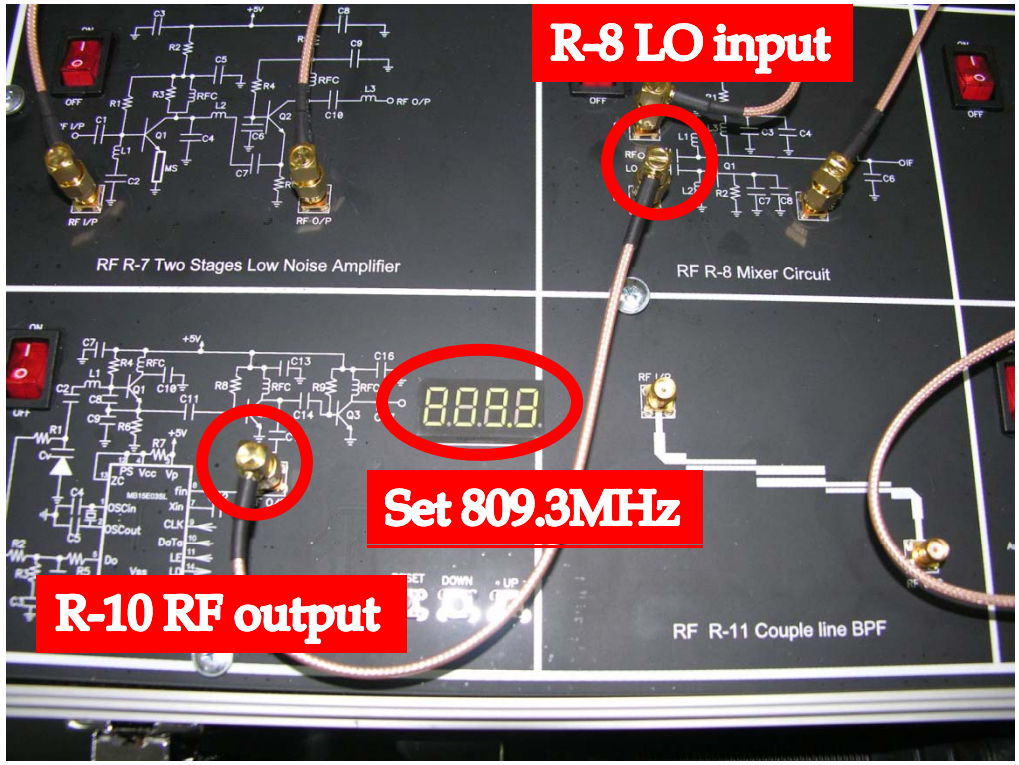
- Link R-7 RF output & R-8 RF input



Voice Communication Demonstration

Receiver

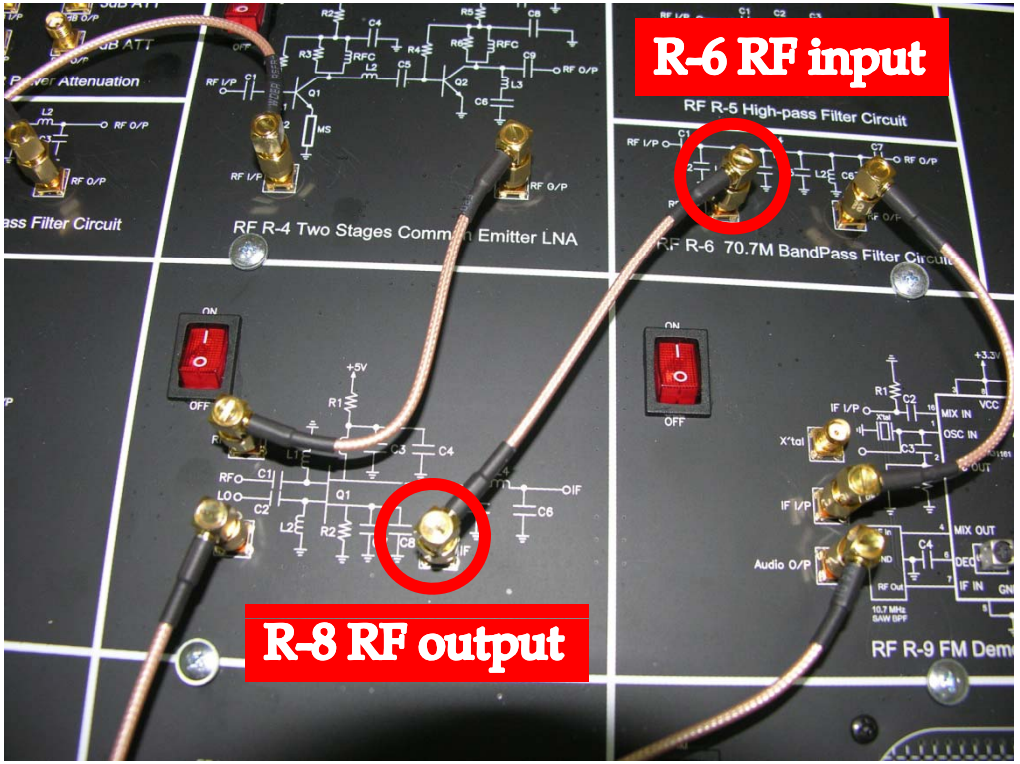
- Link R-10 RF output & R-8 RF input
- Set frequency at 809.3MHz



Voice Communication Demonstration

Receiver

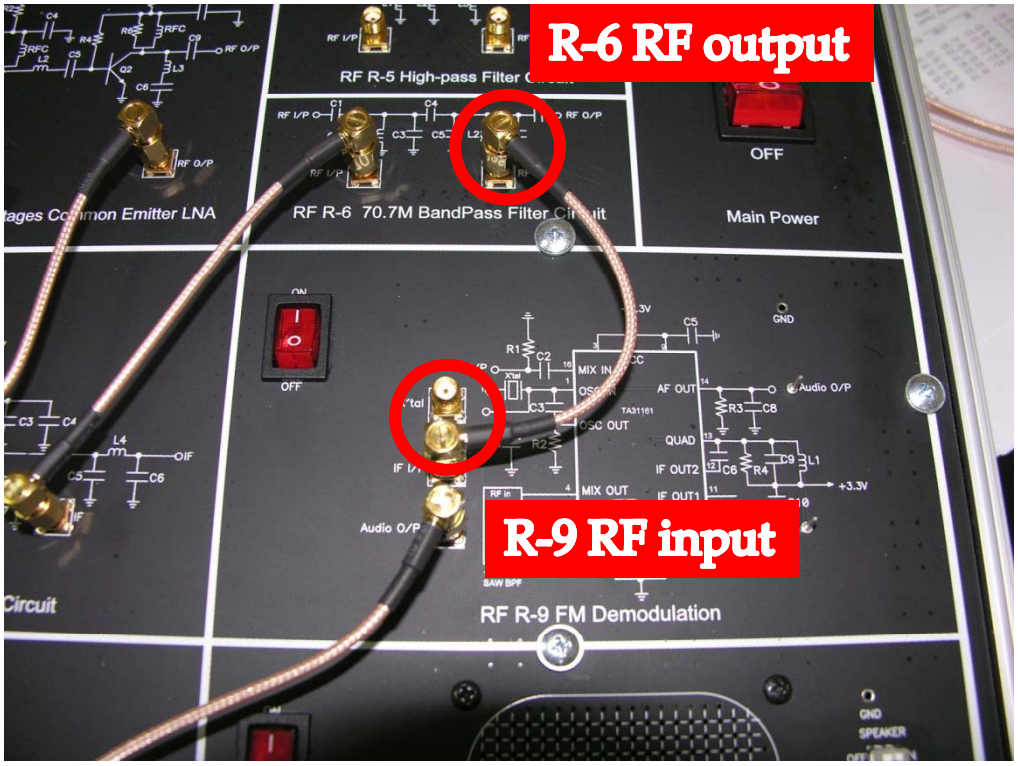
- Link R-8 RF output & R-6 RF input



Voice Communication Demonstration

Receiver

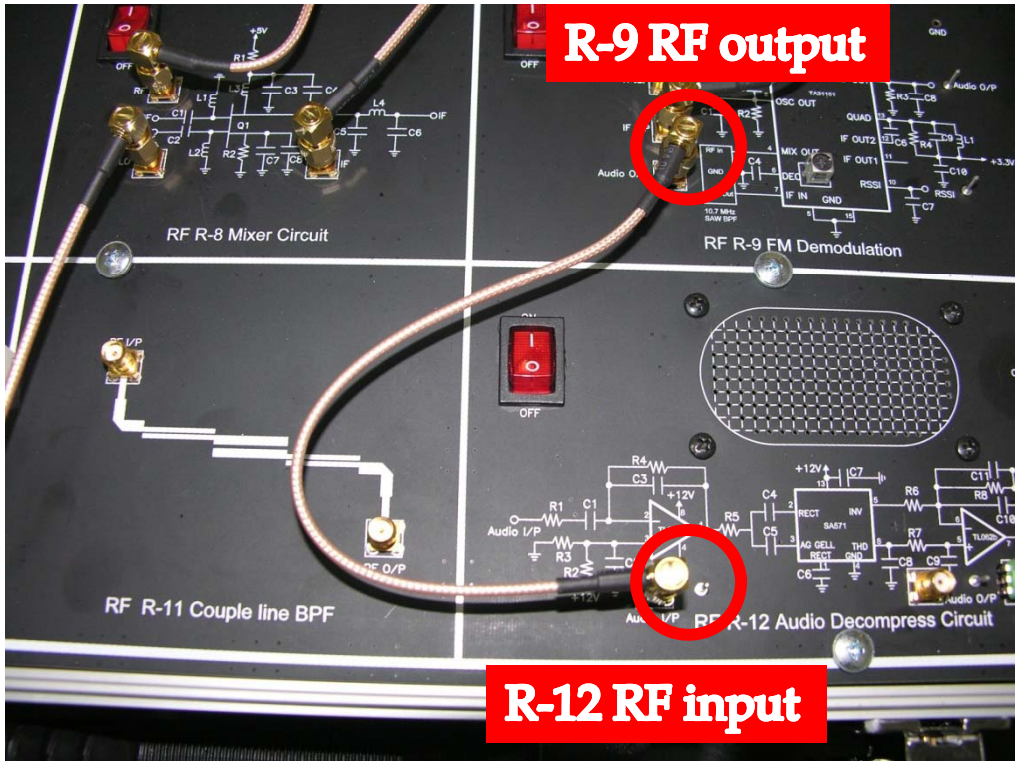
- Link R-6 RF output & R-9 RF input



Voice Communication Demonstration

Receiver

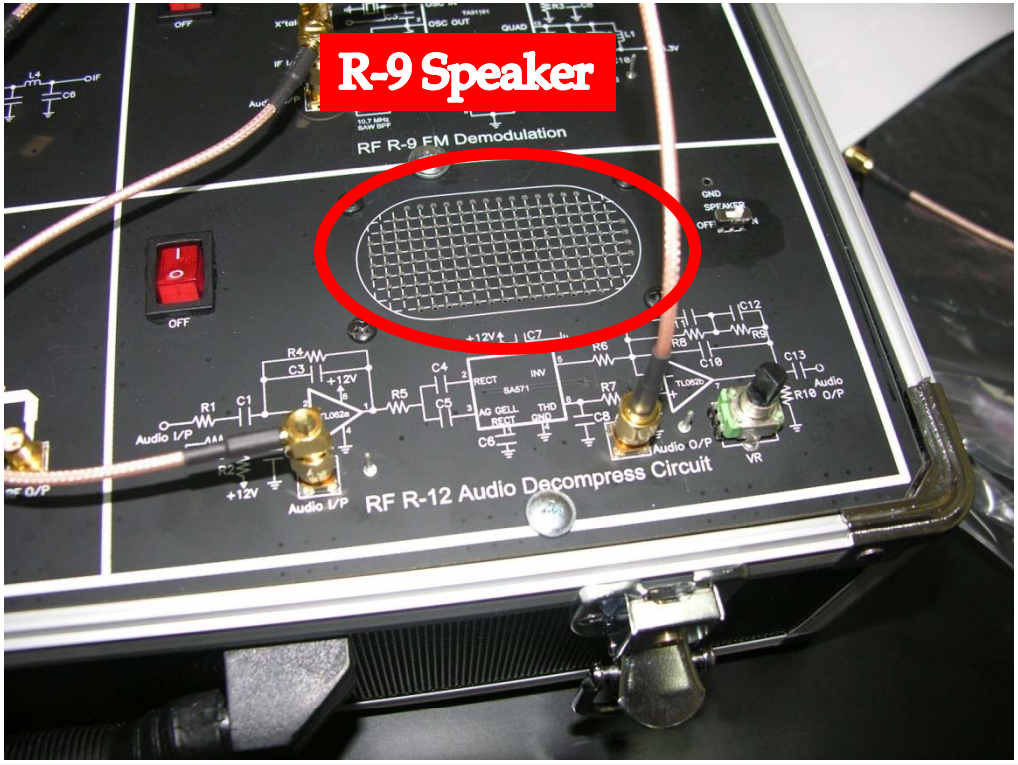
- Link R-9 RF output & R-12 RF input



Voice Communication Demonstration

Receiver

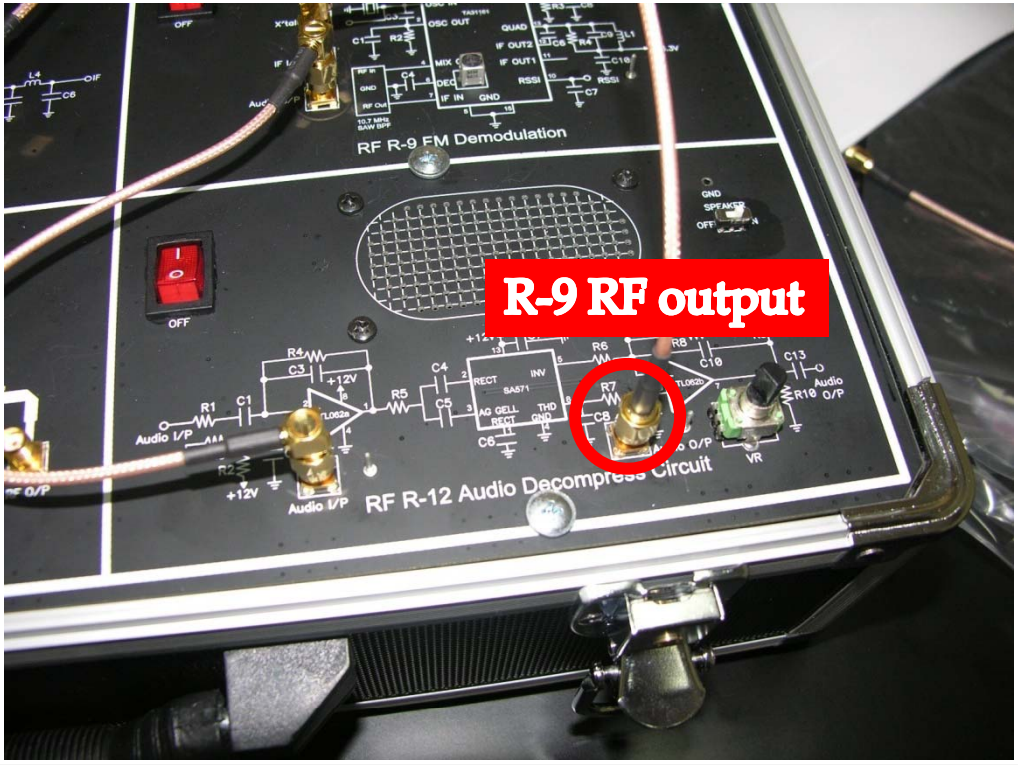
- We can get voice from R-9 Speaker



Voice Communication Demonstration

Receiver

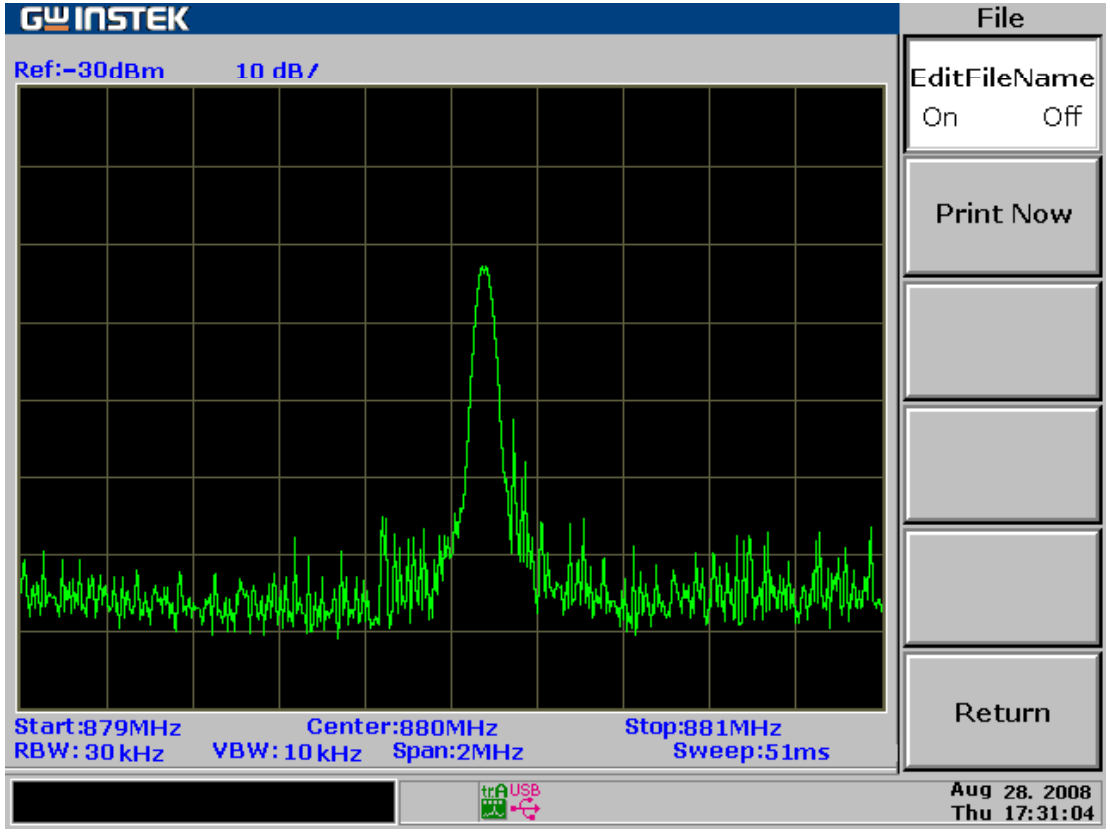
- Connecting R-9 RF output to GSP-830's RF port



Voice Communication Demonstration

Receiver

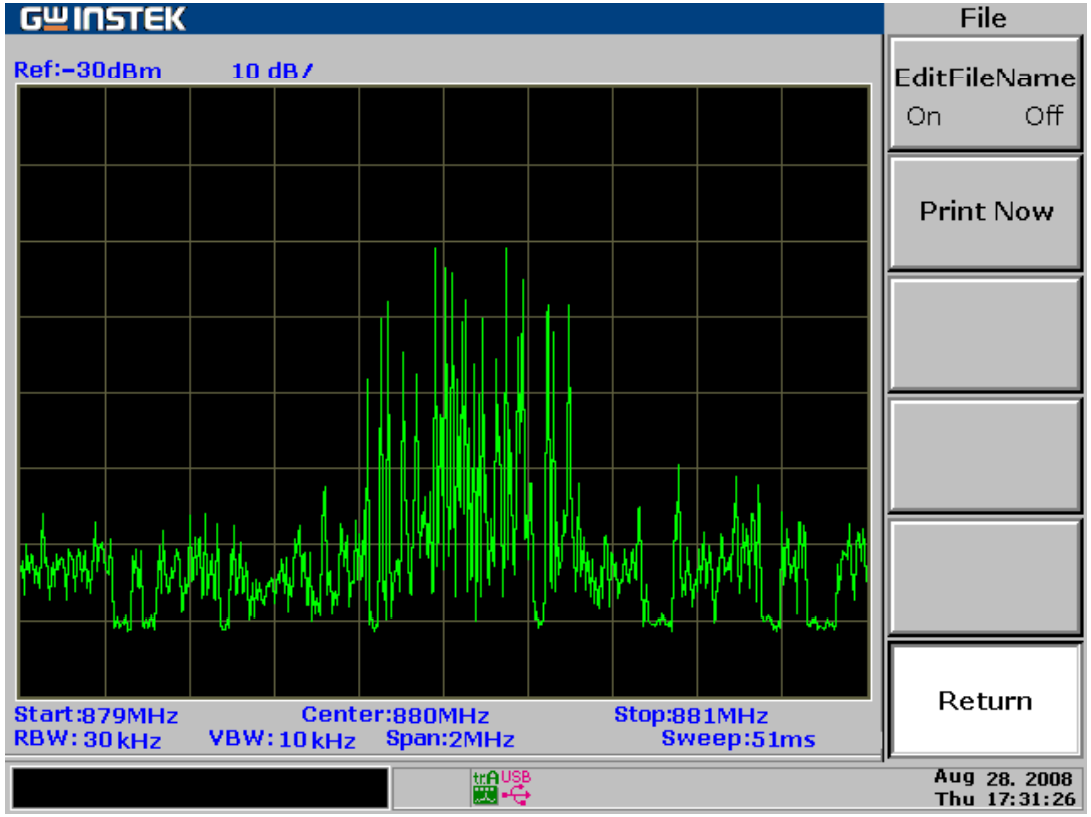
- We can find a signal about 880MHz



Voice Communication Demonstration

Receiver

- If we are in speaking, the waveform



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Thank You and Look Forward to Your Continuous Support