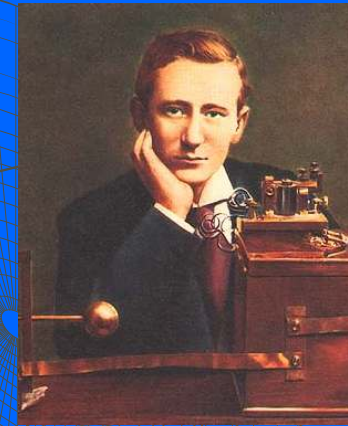


# Radio System Troubleshooting for Dispatchers

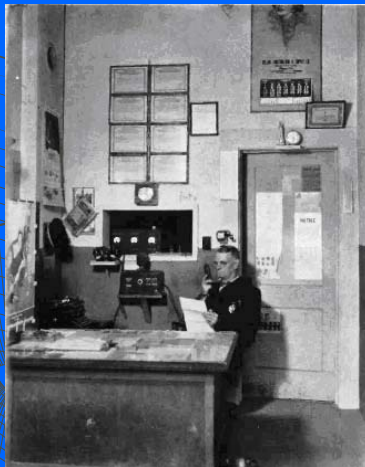
Bill Ruck  
Principal Engineer

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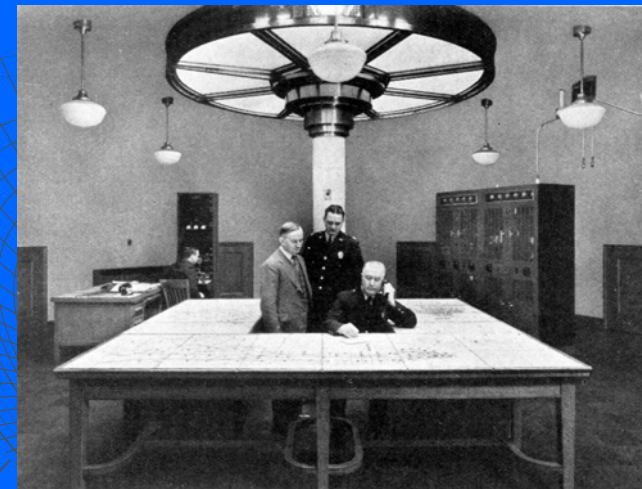
2



A metropolitan GHQ in the war on law breakers, 1936.

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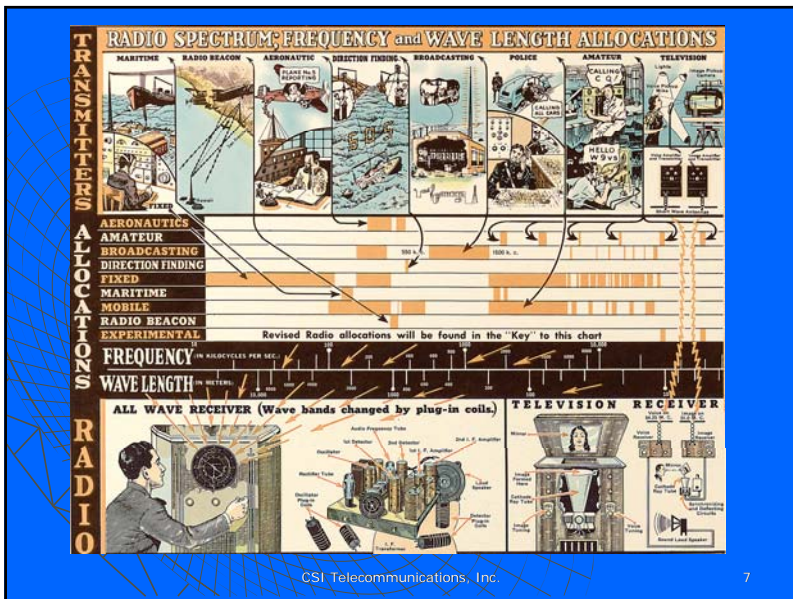
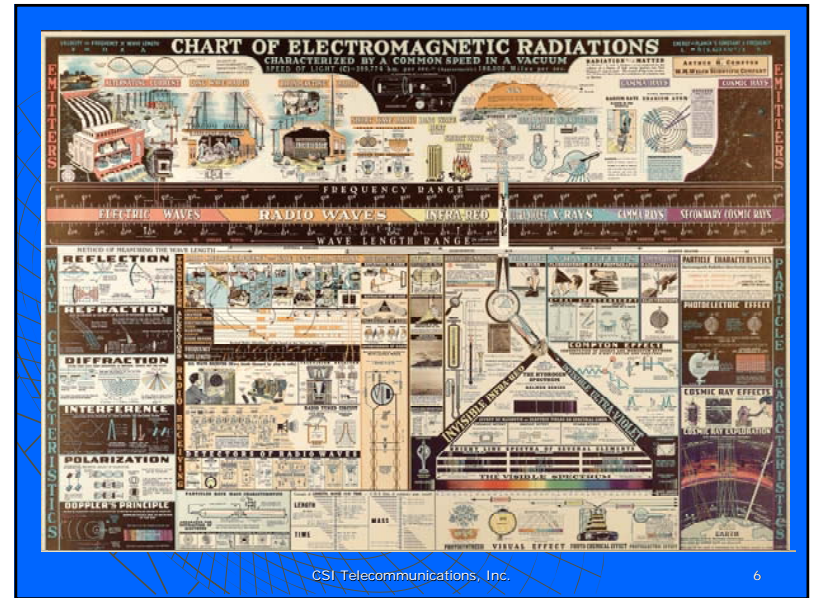
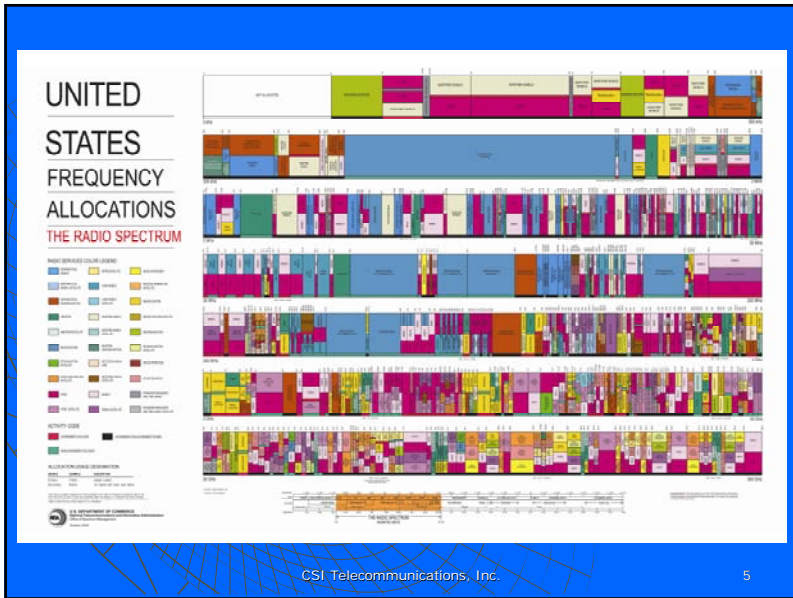
3



Radio Room at New York Police Headquarters, 1933

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# Definitions

Radio

Communications without wires using electromagnetic energy.

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## Definitions

### Transmitter

Device which generates radio frequency electrical energy.

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## Definitions

### Receiver

Device which detects radio frequency electrical energy.

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## Definitions

### Transceiver

Device which includes both a transmitter and a receiver into the same unit.

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## Definitions

### Antenna

Device which converts electrical energy into electromagnetic energy.

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## Definitions

### Base Station

A transceiver connected to an antenna mounted to a building or structure.

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## Definitions

### Mobile Station

A transceiver that is located in a vehicle or hand held.

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## Definitions

### Mobile Station

A transceiver that is located in a vehicle or hand held.

I.e., "Has tires or shoes".

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## Definitions

### Simplex

A radio system that transmits and receives on the same frequency.

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## Definitions

### Duplex

A radio system that transmits on one frequency and receives on a different frequency.

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## Definitions

### Half Duplex

A radio system that uses two frequencies that either transmits or receives but not both at the same time.

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## Definitions

### Full Duplex

A radio system that uses two frequencies that can transmit and receive simultaneously.

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## Definitions

### Repeater

A Full Duplex transceiver that is configured to simultaneously transmit signals received.

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## Definitions

### Direct

Generally refers to a mobile directly communicating with another mobile, generally using the same frequency or "Simplex".

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## Definitions

### Control Station

In a repeater system, a base station that is configured with the same transmit and receive frequencies as a mobile station.

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## Definitions

### Remote Control

A system that allows the control of a base station from a different location.

Functions include (1) received audio; (2) transmitted audio; (3) transmitter control (a/k/a "Push To Talk").

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## Definitions

### Wire Line Control

A Remote Control system that uses copper wires (generally rented from the local telephone company) to connect the control point to the base station.

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## Definitions

### Talk-In

Generally used to describe the process of mobiles in the field communicating with the control point.

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## Definitions

### Talk-Out

Generally used to describe the process of the control point communicating with mobiles in the field.

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## Definitions

### Carrier Squelch

A receive system that unmutes the receiver whenever any signal is received on the receive frequency.

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## Definitions

### Coded Squelch

A system to encode a transmission with a specific signal that allows the receiver to ignore (remain muted) co-channel transmissions unless the proper signal is transmitted.

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## Definitions

### Coded Squelch

In ANALOG systems this is called CTCSS and in Motrola systems "PL". There is a digital version of this called DCS. In DIGITAL systems this is called NAC.

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## Definitions

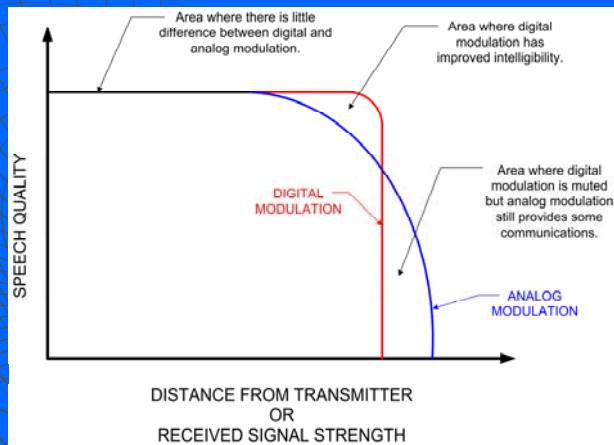
### Trunking

A system where multiple radio channels are shared among users controlled by a computer. Instead of radio channels users are separated into "Talk Group".

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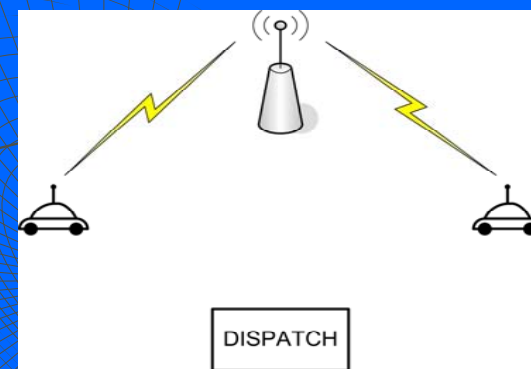
## Analog vs. Digital



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## System Diagram

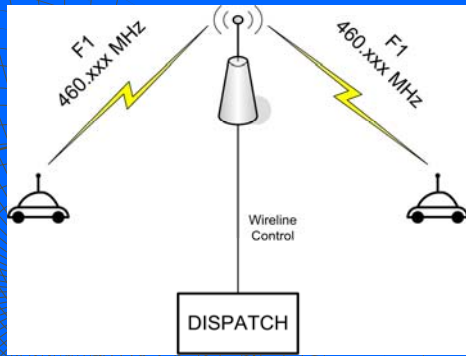


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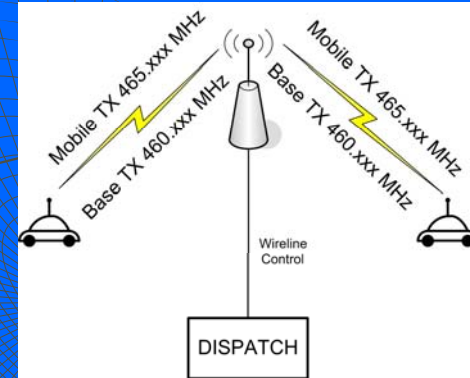
# System Diagram



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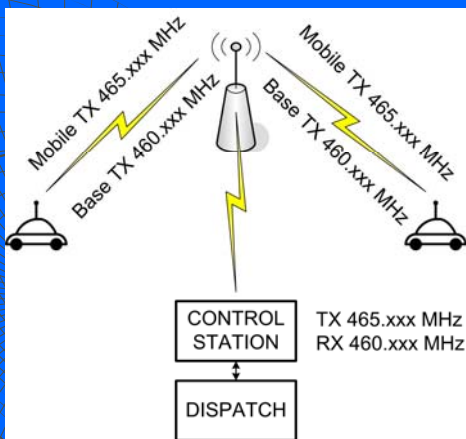
# System Diagram



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34

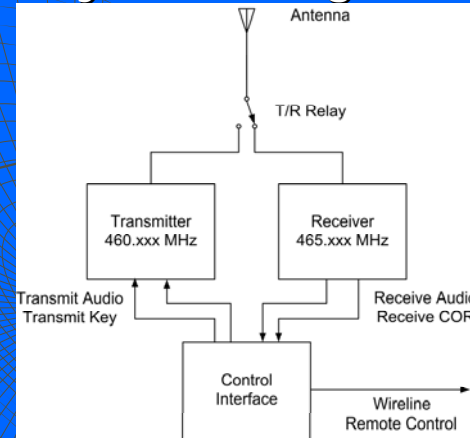
# System Diagram



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35

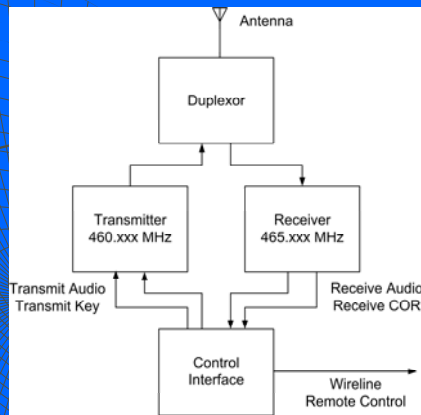
# System Diagram



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36

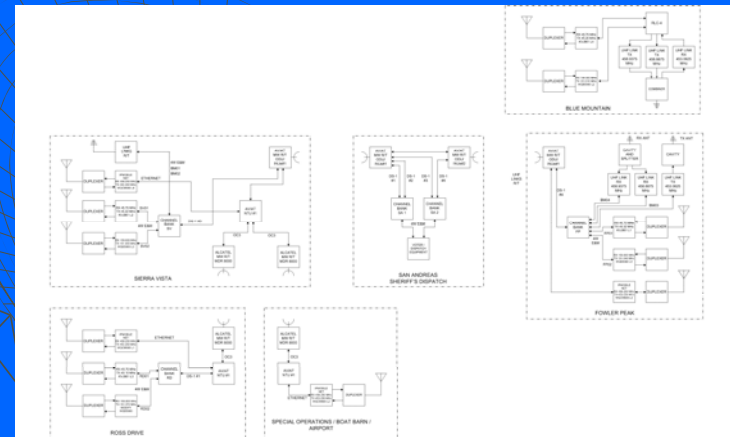
## System Diagram



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## System Diagram



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38

## "It's Not Working"

- ◆ Panic is not a good option.

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## "It's Not Working"

- ◆ Panic is not a good option.
- ◆ Divide and Conquer.

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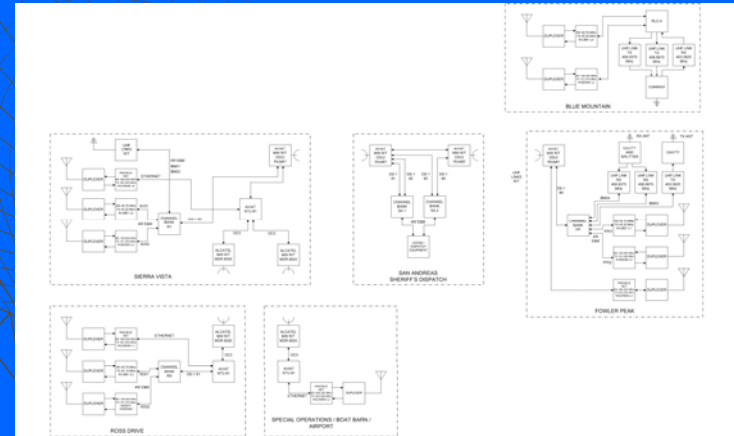
## "It's Not Working"

- ◆ Panic is not a good option.
- ◆ Divide and Conquer.
- ◆ Know how your system is configured.

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## "It's Not Working"



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## "It's Not Working"

- ◆ Panic is not a good option.
- ◆ Divide and Conquer.
- ◆ Know how your system is configured.
- ◆ Separate "Talk-In" from "Talk-Out".

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## "It's Not Working"

- ◆ Panic is not a good option.
- ◆ Divide and Conquer.
- ◆ Know how your system is configured.
- ◆ Separate "Talk-In" from "Talk-Out".
- ◆ Isolate individuals.

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## "It's Not Working"

- ◆ Panic is not a good option.
- ◆ Divide and Conquer.
- ◆ Know how your system is configured.
- ◆ Separate "Talk-In" from "Talk-Out".
- ◆ Isolate individuals.
- ◆ Implement back-up plan.

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## "It's Not Working"

- ◆ Panic is not a good option.
- ◆ Divide and Conquer.
- ◆ Know how your system is configured.
- ◆ Separate "Talk-In" from "Talk-Out".
- ◆ Isolate individuals.
- ◆ Implement back-up plan.
- ◆ Have a handheld radio in the dispatch center.

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46

## "It's Not Working"

- ◆ Panic is not a good option.
- ◆ Divide and Conquer.
- ◆ Know how your system is configured.
- ◆ Separate "Talk-In" from "Talk-Out".
- ◆ Isolate individuals.
- ◆ Implement back-up plan.
- ◆ Have a handheld radio in the dispatch center.
- ◆ Pay attention to alarms.

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## Common Annoyances

"We have a stuck mic. All units, check your microphone."

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## Common Annoyances

"Unit 3, if you can't hear me turn up your volume."

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## Common Annoyances



It is NOT a key ring holder !

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## Common Annoyances



Just NO !

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## Common Annoyances

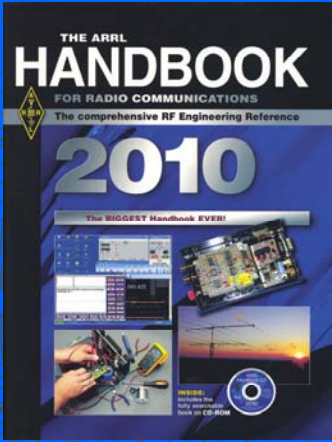
### Batteries

They are not forever;  
they have a definite life.

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Learn More



THE ARRL  
**HANDBOOK**  
FOR RADIO COMMUNICATIONS  
The comprehensive RF Engineering Reference

**2010**

The BIGGEST Handbook EVER!

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# Questions ?

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