

# **K3IR** *Repeater Systems*

Understanding Repeater  
Terms and Usage



# Present Configuration

- Kenwood KTR-750 Repeater on 145.23T/144.63R PL 118.8
- Motorola T74RTA10008A 440 Mobile Radio (converted for repeater use) on 449.975/444.975 PL 114.8
- Motorola Phoenix Transceiver on 441.9125T/446.9125R (county link) PL 173.8
- Duplexers for 145.23 and 449.975 repeaters
- Link RLC 3 Station Controller
- IBM Thinkpad – for programming controller

# *Things you are afraid to ask.*

- What is the difference between a repeater and a transceiver?
- What is the duplexer and what does it do?
- What is PL?
- What is the function of the link radio?
- What does the controller do?

# *Some things you are going to ask later*

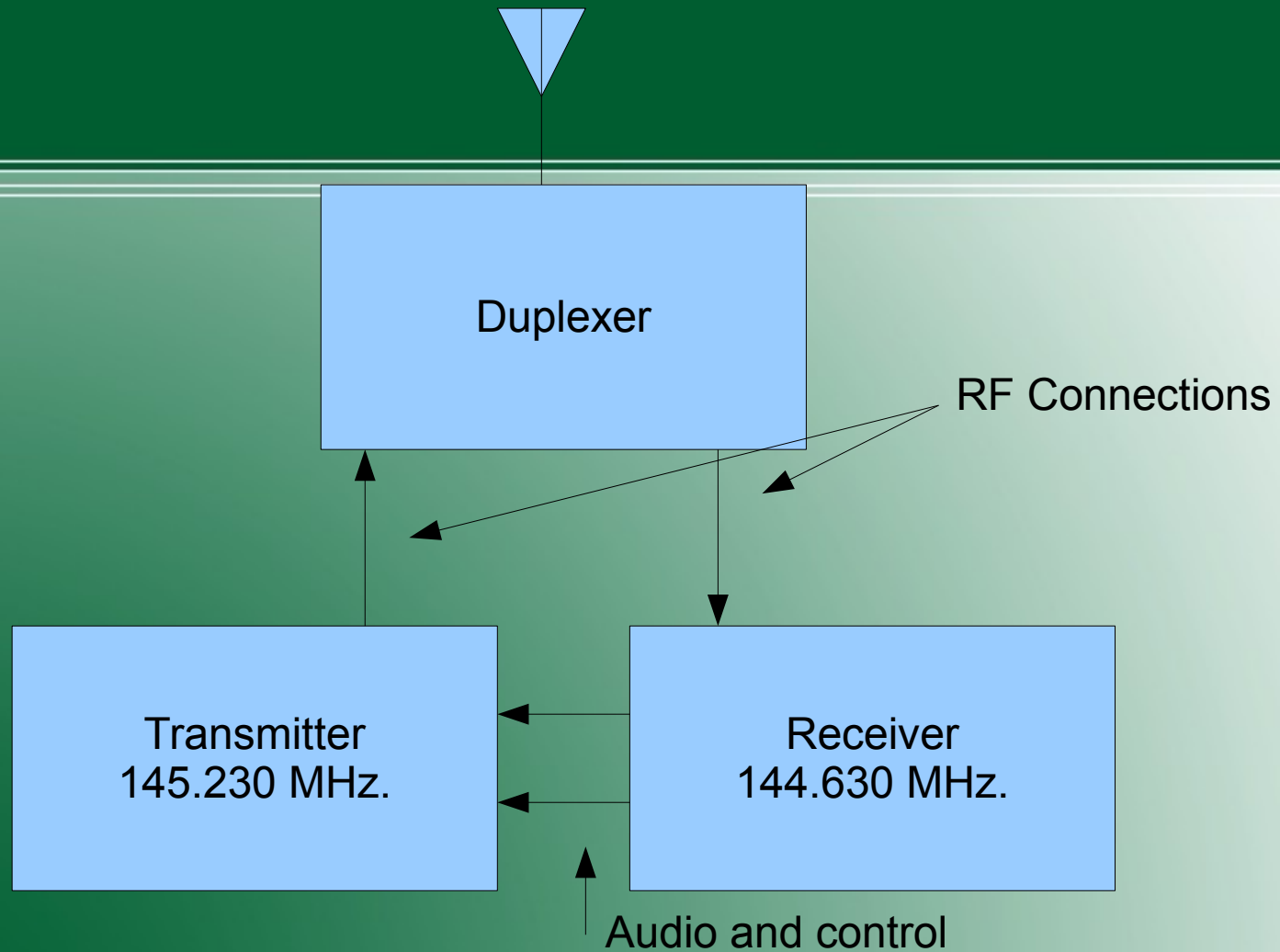
- What is Q? Hint – not a British Secret Agent
- Why is there an audio delay select on the controller receiver input?
- What is a pre access code?

# *Repeater vs. Transceiver*

- While a transceiver may have a completely separate transmitter and receiver they do not operate at the same time. The receiver is usually muted during transmit.
- A repeater is configured to allow the transmitter and receiver to operate simultaneously. More on this later.

# *Duplexer*

- Prevents transmitter from interfering with the receiver during repeater operation.
- Not to be confused with a diplexer which is a slightly different animal.
- More to follow



Very basic repeater system  
The transmitter and receiver may be  
inside the same box but except for  
power supply circuits are separate

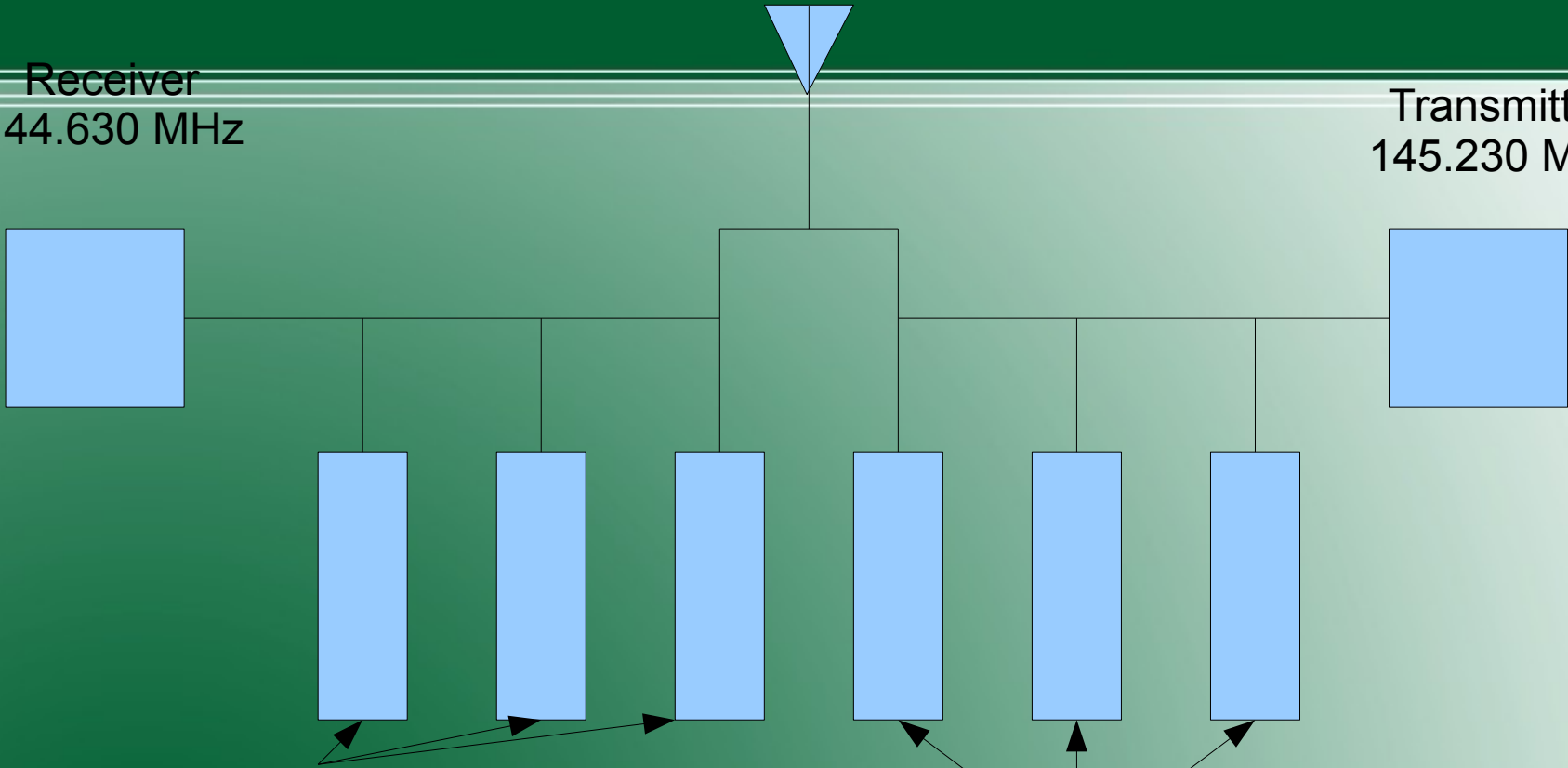


Typical VHF Duplexer. The 145.23 repeater has a “6 can” duplexer. The individual cans are very high Q tuned filters. The size of the inside “cavity” is adjusted to make the can resonate at the desired frequency. The cans are adjusted to different frequencies depending on its purpose in the duplexer.

Detailed Diagram

Receiver  
144.630 MHz

Transmitter  
145.230 MHz



These cans tuned to pass  
144.63 MHz and Short 145.23  
MHz to ground

These cans tuned to pass 145.23  
MHz and reject 144.63 MHz

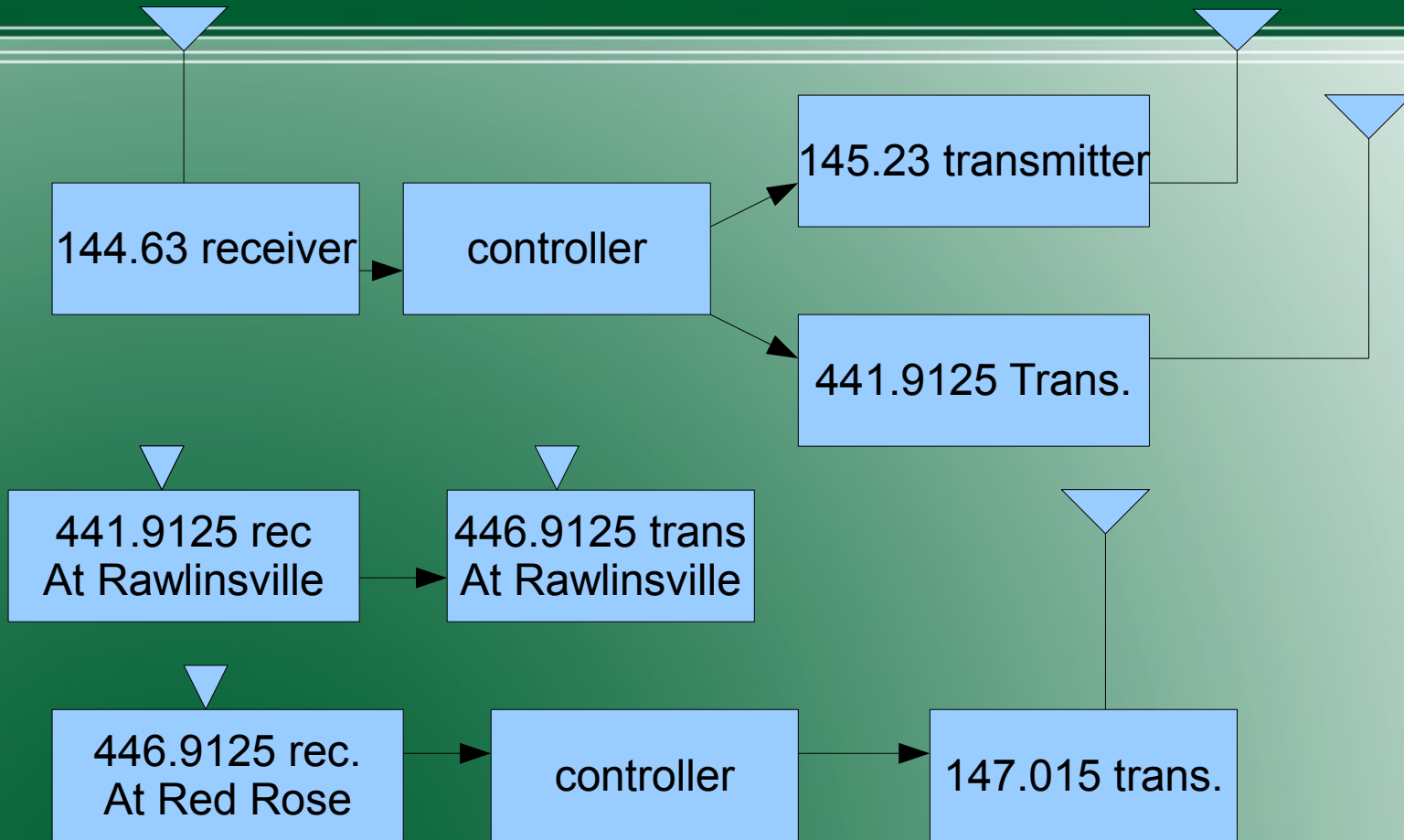
# *What is PL?*

- PL is actually a Motorola trademark.
- GE calls it Channel Guard
- AKA squelch tone.
- Accepted standard name is sub-audible tone.
- The RF carrier is modulated with a low level tone in the 80 to 200 Hz range.
- If “PL” is activated a detector in the receiver must find this tone before the squelch is opened.

# *Link Radio*

- Not to be confused with Link Controller. (Link is the brand name for the controller we use.)
- The link radio allows us to access a UHF repeater located at Rawlinsville.
- When someone transmits into our repeater the audio is routed to the link transmitter which the Rawlinsville repeater retransmits to other repeaters in the area, which in turn feed that audio to their transmitters.

*Maybe this will make it clearer*

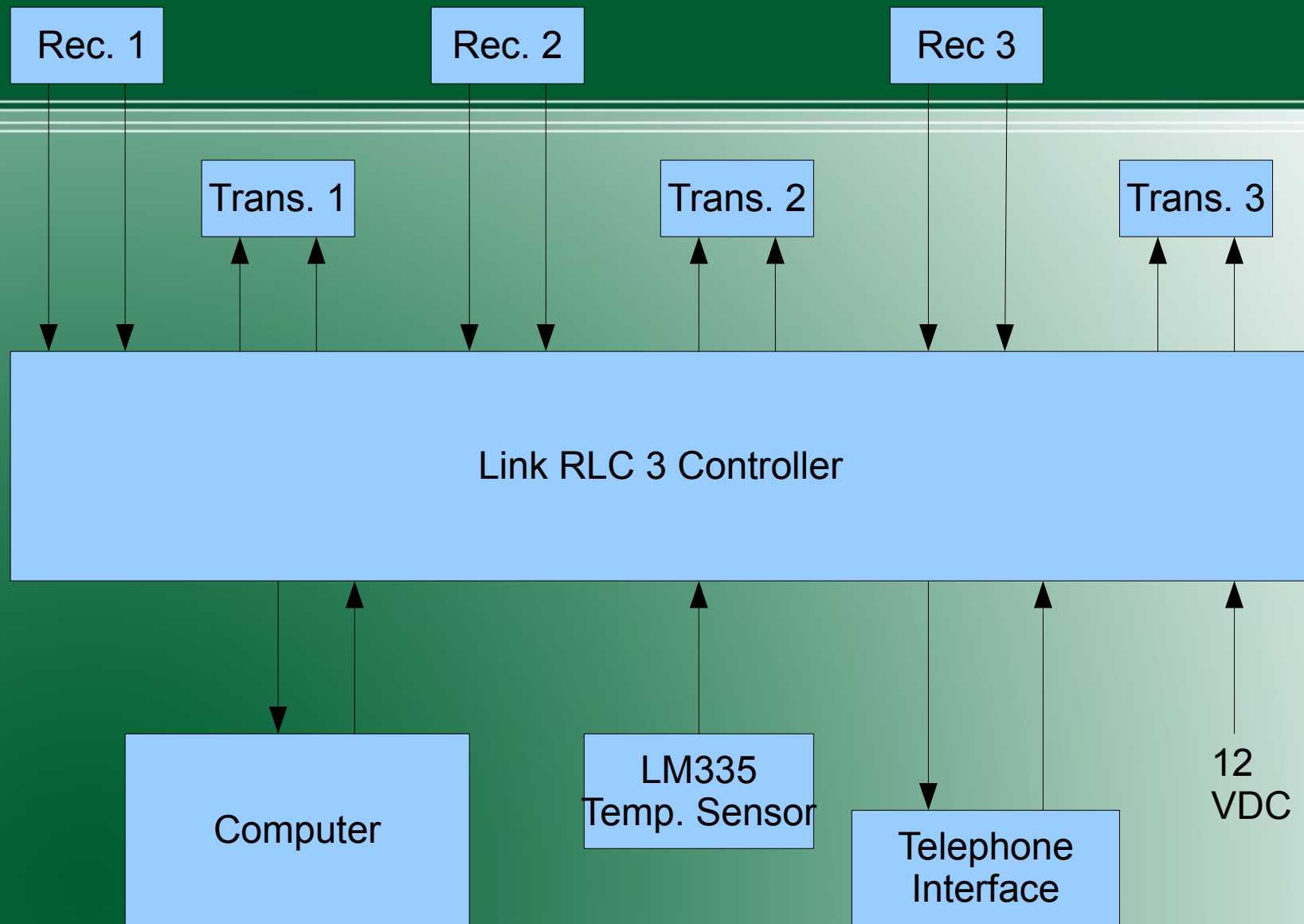


# *Link System*

- The link system is not on all the time.
- Since link is operated as a two way radio no duplexer is required.
- Access can be selected by using a combination of touch tone digits.
- In order for two repeaters to be linked control operators at both sites must select link operation.

# *The Controller*

- The controller keys the appropriate transmitter and routes the appropriate audio from the receiver to the transmitter.
- Generates CW ID.
- It also generates the annoying voice Ids and announcements at inappropriate times.
- Allows automatic phone patch option.
- Allows Voip.



More complex system showing audio circuits only.

# *Radio Connections*

The controller consists of a main board containing a basic microprocessor, a serial port, and 8 radio card slots and two user slots. These slots are occupied by I/O cards selected for the task to be performed.

The radio circuit cards contain dip switches for programming input levels and other parameters including audio delay. Audio delay may be needed to allow time for the transmitter to key up.

Inputs from the Receiver include:

- Receiver Audio
- Carrier Operated Relay (COR)
- Squelch Tone Detected

Outputs to Transmitter:

- PTT
- Microphone Audio

# *Programming the Controller*

- Programming the RLC 3 is a complicated and time consuming task.
- The RLC 3 manual is 412 pages!
- Programming can be accomplished by using a computer connected to the serial port or by using the touch tone pad on a radio tuned to any of the input frequencies. Note: County Link requires a pre access code.
- Link supplies a disc with a basic operating program which can be modified to meet the individual user's needs.

# *For Example*

To program the voice identifier K3IR requires the following input:

- Log in to controller using command 187 plus password
- Input command XXX 066 041 003 039 048 411
  - XXX is program line number
  - 066 is voice command (067 for “polite” voice)
  - 041 is “K”, 003 is “3”, 039 is “I”, 048 is “R” and 411 is “repeater”
  - These numbers are for “Romeo's voice” Selected words may be programmed in “Juliet's voice”