

A Basic Primer on Recognizing Repeater Desense Source Unknown

Before repeater desense can be recognized it is best to understand the basic operation of a repeater. Recall that a repeater (also referred to as a *Mobile Relay*) receives a generally “weak” signal on one frequency and retransmits it on a different frequency, at a much higher power level. The transmit power level will always be the same, but the received signal can vary depending on the type of radio transmitting to the repeater. If that type of radio is a hand-held portable radio, the signal will be relatively weak as compared to that from a mobile or fixed station radio. Similarly, the further the transmitting station is from the repeater, the weaker its signal will be. Now, just tuck these concepts aside for a moment.

A repeater consists of a receiver and transmitter that are interconnected. How the receiver causes the transmitter to turn on is another subject by itself. (*This involves such great issues as “tones”, “squelch operated relays”, and “timer circuits” ... the latter of which is a critical circuit to mitigate those embarrassing stuck microphone incidents that sometimes reveal one’s endeavors that would be best kept private.*) Before the receiver/transmitter are interconnected, they must first be properly operating independently. Technicians perform tests to determine if this is indeed happening. Surprisingly, you might think the transmitter is more important. It is important, but a few watts output more or less is not all that critical. The receiver is that part of the repeater that deserves more attention.

Remember that a repeater is many times listening to a very weak signal from a portable radio user. (*Not to mention that our not-so-astute portable radio user has his/her portable radio antenna oriented horizontally and stuffed, for added warmth, within the newly acquired Lone Peak chest pack.*) So you think we should get to the point? We’ll try. A receiver’s performance is measured in terms of its **SENSITIVITY**. The better the sensitivity, the better a weak signal can be heard. All receivers have a sensitivity that is specified (a specification or spec) by their manufacturer. Thus, when technicians test repeaters, one of the things they are confirming is **SPEC SENSITIVITY**. (*And gee, we sure do hope its within spec so there isn’t something else to fix!*)

Well, you ask, can a receiver (and accordingly the repeater) work if it is out of spec? Certainly, but so can a six-cylinder car that has only three cylinders working. (*And all the time you thought it was the driver who wasn’t operating at spec when doing 40 mph in a 65 mph zone. Shame on you!*) Things are somewhat different with repeaters. If the receiver is operating out of spec, i.e., poor sensitivity (*no, we don’t send technicians to sensitivity training classes for this:*, weak signals from portable radios may not be heard but strong signals from mobile and fixed station radios sound just fine. So, you see, if everyone just had a mobile radio (no portables) repeater performance would not be such an issue. Get rid of all the portable radios? This is a possible concept!

The reality, Virginia, is that portable radios are here to stay and thus repeater receivers need to be kept operating at **SPEC SENSITIVITY**. And, with all the great circuitry that radios have today, sensitivity should remain unchanged. But (yes, but), certain external influences will cause sensitivities to degrade (*look that word up, Henry*). One of those so-called influences is lightning that can be in close proximity to a repeater's antenna. It just so happens that certain semiconductor devices (*transistors and the like, but you knew that*), are susceptible to high levels (and we do mean HIGH, Martha) of electrical energies that come with lightning strikes. (*Gee, I knew there was a reason why we shouldn't have gotten rid of those tube radios!*) When this happens, the above mentioned devices experience cardiac arrest for which no form of CPR is successful. The receiver is now generally operating without one or more amplifiers and, yes, the sensitivity has been significantly reduced to a level that affects the repeater's performance. This performance (or lack thereof) is not something that requires a technician's expertise (*yes, thank you*) to measure, but should be noticeable, by comparison, to the conscientious dispatcher (*yes, Roxanne, there is hope*) who uses that same repeater day after day.

Well, now that the repeater's receiver and transmitter are both working fine, isn't it about time to turn on the switch (interconnect the two)? Let's get this show on the road! (*Or on the air, Barry*). So, in doing so we find that a test with the local command center (*ECC, unless that's too much for one mouthful*) produces excellent results. (*Almost. "Grass Valley, this is DC24 on Tone 5". Drink thy Cappuccino while awaiting the response ... just kidding Many Jo!*). But remember, the fixed station (ECC) is powerful (*effective radiated power – ERP – of about 350 watts for those of you taking notes for Friday's quiz*). So maybe a check with Gifford Pinchott IV who is out cruising the woods on foot with his portable radio would be better (prudent, that is) test.

Let the test begin. Contact (*I thought that term was just used when starting airplanes.*) with good old Giff is made. But, when he transmits with his weak portable radio, the repeater just goes off and on and off and on and off and ... get the picture? Or, as some not-so-refined technicians would say: "The repeater is kur-chunking". (*I knew we would have difficulty explaining this in a narrative way.*) Well, Giff's radio is OK, but something is astray with the repeater. How right you are, Jennifer! But you just said the transmitter and receiver were checked and found to be "operating at spec". (*Don't you just like this cool radio lingo now that you've got the hang of it?*) Remember, the check was done on both the receiver and transmitter, independently. When the two are interconnected (*or interfaced, for those of you who have a finer appreciation of literary composition*), something is amuck. Actually, the preferred term here is "when the repeater is enabled". Well you see, Christine, the truth of the matter is that the receiver works fine until the transmitter is turned on. When that occurs, the receiver becomes ill. Since enabling (*no this doesn't have anything to do with dysfunctional family relationships*) the transmitter is done by the receiver (through the interface), the transmitter now shuts down. But now that the

transmitter is off, the receiver has regained its health. It can thus again receiver ol' Giff (*he really must be old by now*). But that only occurs for a moment since once the receiver hears something it turns on the repeater's transmitter. And, do you remember what happened last time? You've got it, Arthur ... its "kur-chuck" time again. Well, after two or three times of that routine you should be able to draw a conclusion. What is suppose to happen is that the transmitter and receiver are to work in harmony (*no Dagwood, this isn't the same harmony as when Senator Lott and his quartet rock on*), but in reality the transmitter seems to be degrading (you did look up that word?) the receiver's performance. Bottom line: the receiver's sensitivity (spec sensitivity, that is) goes South every time the transmitter comes on. Or, if you will (Josephine), the receiver has become "desensitized" (*oh no, Jack, not another term!*) This desensitization is a quantifiable parameter and for brevity, if there is such a thing, is just known as "desense" or in the case of repeaters (*and yes, Sherman, mobile relays too*) is referred to as **REPEATER DESENSE**. Don't you just feel good about how smart you are now! (*And we didn't even think to elaborate on quantifiable parameter since we were so certain of your academic excellence.*)

Well, the truth is, that Repeater Desense is neither desirable or acceptable. Weak signals need to be able to activate repeater transmitters just as with strong signals. There is a certain minimal threshold that a repeater's receiver must have (the spec sensitivity) to operate the interface which turns on the associated transmitter. However, that sensitivity cannot be degraded (desense) by the repeater's own transmitter. The amount of desense is really capable of being measured, electronically, that is). Performance tests on repeaters are not really done with field personnel using portable radios, but are completed using processes and instrumentation that not only measure the degree of desense but also help the technician determine the inherent causes.

So, Gertrude, you want to know what causes repeater desense? You've got to be kidding! Actually its magic and if I told you, well you know what I would need to do. In conclusion (*oh, yes, there really is going to be an end and I promise to go to church Sunday, Mom, if he would only just shut up*), several components in the overall repeater system can contribute to the desense problem. These include the antenna, feedline (*that's the part that goes from the repeater to the antenna, not the line-up you did at the cafeteria when you attended P.S. 142 in Brooklyn, Eddie*), another adjacent station's transmitter (*easy to fix, just look for the power cord*), bad feedline connectors, and something called a duplexer (*oh here we go again, Debra, with another word when I just had everything I really ever wanted to know!*), which permits the transmitter and receiver to share (*a most cost-effective term in government circles and one that is, hopefully, PC ... and I don't mean personal computer, Lucille*) the same antenna. And the probability of it being more than one of these is fairly minimal, which is nice.

As we draw to a close (oh, yes!), it is hoped you have gained something from this tutorial of sorts. And if you didn't, that's OK too, because now its your problem

(again, just kidding, Delores, because we really are a sensitive bunch here despite the external influences that contribute to our desense You like that?)
So, as they (whoever they are) say in the world of dynamic digital video processing "Rock-On" and may your desense problems be kept to an absolute minimum. -30-