# Replicant Error, and other modern radio software heartaches...

***In the short 21 years I have been in the two-way radio business, I like many of you have seen the technology change from crystals and hollow state (tubes), to icoms and solid state, to PLL's and computer control. Today, the line between computers and modern land-mobile two-way radios has gotten so blurry, you sometimes can't tell too much difference.***

Having said all of that, one if the more common issues I see and hear about almost everyday are data errors encountered involving the programming of modern two-way radios. Radios doing very odd/freaky things after they are programmed.

Over the past two years, I have kept track of the common issues I have either encountered personality or have read about in reports. From this, I hope to pass onto the reader some tips and advice to avoid these headaches... Always keep in mind, in simplest terms; a modern radio is a computer with an antenna attached! Treat it as such.

***"A modern personal wireless telephone has more computing power than ALL the computers in a Lunar Module that landed men on the moon in 1969!"***
*[History Channel, 2004]*

***"A modern DSP driven two-way radio is roughly equivalent in computing power to a 286/386 computer, with one heck of a soundcard."***
*[...Comment by a radio software engineer, 2004]*

---

## FLASHCODE

The flashcode in a radio is equivalent to the BIOS (or operating system) in a computer. You would never attempt to read-out the Window Operating system out of one PC and load it into another computer. The same with a radio! ALWAYS USE A CLEAN MASTER ARCHIVE COPY OF THE FIRMWARE when loading it into a radio. DO NOT READ-OUT THE FLASHCODE FROM ONE RADIO AND INSTALL INTO A SECOND RADIO.

With any size data file, the chance of a data read error is always present. It only takes on bit flipped backwards to really screw-up your day. One simple bit, like the display not turning-on, the squelch not working, ECT...

**Remember, Murphy's Law of Software states:**
***"If the problem can occur in worst possible place...It will!"***

Always get a clean master copy of flashcode to distribute to your service technicians. If given the choice between a .BIZ and .BIN flashcode file, always go with the BIZ file. It is a master and can only come from the manufacturer. A BIN file on the other hand could have been read out of a radio.

## ADI & DSP FILES

The same applies for as for a Flashcode file. Please don't read one out of a radio and recycle. Always get a clean master copy of flashcode to distribute.

## PERSONALITIES

Never, reuse a Factory Test Personality that is contained in a new radio from the factory. There is no exception to this rule!

When radios are assembled for customer orders on the plant floor, they are loaded with a test personality for high-speed AUTOMATED testing.

To support this activity, there is a whole suite of "background" functions turned-on in the radio's test floor personality that a technician/end-user in the field using 'normal' programming software CANNOT TURN OFF!

**** ALWAYS CREATE A NEW USER PERSONALITY FROM SCRATCH***

If you are unfamiliar with the structure of how the personalities are 'assembled', yes, go ahead and read-out a radio to see how it works. But please do not edit the factory data and load it into a customer's radio. Create a new personality from scratch. If you need help, call the factory's Technical Assistance Center 800 number.

If you are getting in a radio to update the personality, always try to use a MASTER ARCHIVED PERSONALITY.

Only read-out a radio, edit the personality, and program the 'edited' personality as a last resort. You are creating a major risk of something known as, REPLICANT ERROR!

If you know the MASTER ARCHIVED PERSONALITY is ok. Use it. Edit it as required to incorporate any customer/user changes. Save the master personality file, and program this file into the radios.

***RECYCLING CUSTOMER PERSONALITIES*** is never a good idea. Reading-out a radio to get the personality and programming into other radios can introduce a multitude of problems, if the original read had errors.

I personally dealt with a situation for a large law enforcement agency were one of the radio technicians (to save time) read-out a known good working portable radio, and programmed that read-out information into 150 new portable radios that were issued to officers.

The source radio was functioning ok, but the read had errors. The end result was all 150 radios were programming with an error that caused the radios to be 75 kHz off frequency! They were totally unusable.
In an effort to resolve their problem, they read-out a second 'known good' radio and repeated the sequence. It only got worse.

What had happened over the years was the first generation of 'new radios' was programmed with a MASTER PERSONALITY. As new radios were acquired and new techs hired, this master file got lost or misplaced. Radio 1 was read-out to program radio 100 to 200. Down the line, radio 200 was read-out to program radio 300-600. Further down the line the in successive generations of radios, the "copies" just kept getting copied!

**PERSONALITIES** [Continued]

I received several of the 'bad' radios from this customer. I programmed one with a known good "lab rat" personality I had created, and the radio with within 3 Hz of being perfect! This only illustrates how important the source of data can be.

***Photocopy a photocopy too many times and see what happens to your quality!***

...Essentially no difference here. Data simply gets corrupted.

***Recycling is a good idea for the environment, but not for radios!***

## SUGGESTIONS

One suggestion I have to solve most, if not all, data error problems is to issue your service technicians a single CD-Rom containing the following items:

1. Copies of all their required programming software applications to allow the complete reload of programming software in the field if required by a computer problem.
2. Master Copies of all customer personalities
3. Master Copies of all required flashcode/adi code/dsp code files Tracking Data (.trk) and Feature Encryption (.enc) data acquired (thru programming) by field by technicians is returned to the shop and archived.
4. This data is also distributed to the technicians via the same CD-Rom to allow the Forced Recovery of a radio in the field were the original data it not available from the 'problem' radio.

These CD's are updated regularly as required. If a short-term change is needed, the data is stored on a 3.5-inch disk for transport. These changes would be incorporated into the next issue of CD.

*Very inexpensive insurance compared to a wasted time of a technician spent reprogramming radios and observed incompetence of your facility to your customer base/end-users.*