

Freeware Signal Fingerprinting: Xmit_ID

Xmit_ID 2.61 is a freeware program that is available for download on the Internet at <http://xmit.penguinman.com/down.html>. Although its method of identification is similar to MoTron's (see April issue), it takes a very different approach in its use of hardware. MoTron is very hardware intensive, supplying a separate microprocessor "box" for capture and manipulation of signals under analysis.

Xmit_ID, on the other hand, requires only a PC with a sound card. A simple two-resistor level circuit is required to interface between the receiver's discriminator output and the sound card input. Clearly, Xmit_ID utilizes a very different and less expensive software-intensive signal capture and analysis method. But does Xmit_ID do the job? Let's see.

◆ Xmit_ID Requirements

Xmit_ID is a DOS based program first written in the mid 1990s with very modest PC requirements. As its Readme file states, "A 386SX 16 MHz or better with 640K of ram and a large hard drive for unattended use. About 80 megs a day is needed on large systems. If you are going to keep a fingerprint on each user you will need about 30K of hard drive space per user to cover multiple rigs." With 20 to 40 Gig hard drives now commonplace, its reference to "large hard drives and 80 meg (0.08 Gig) reminds us of how far computer hardware has come since this program was first written.

A file called Hardware.txt (Figure 1) is included which gives very clear construction instructions for a very simple, two component attenuator. This is required to connect the receiver to the computer's sound card. The hardware file also contains a circuit for carrier-operated relay using the joystick port and built-in Xmit_ID software. I did not try the COR operation.

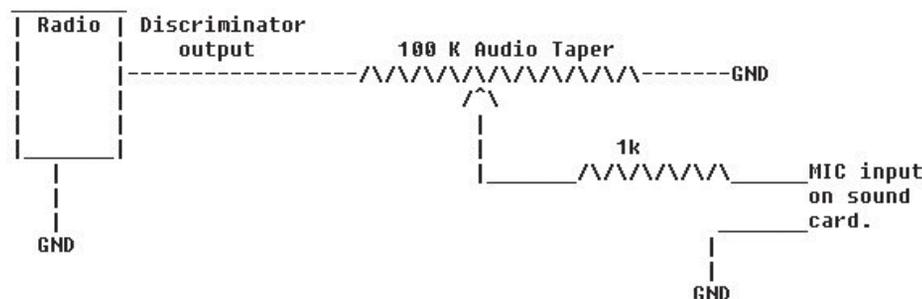


Figure 1 Attenuator Circuit – Interface between Radio and Computer's Sound Card

◆ Running DOS Programs Under Windows 95

I ran Xmit_ID under Windows 95 and 98. As per the Readme file, the Desktop shortcut that I made required that its Properties be changed in order to start this DOS program correctly under Windows. This is a simple matter of first creating the shortcut.

Right click with your mouse on the shortcut icon and select Properties at the bottom of the menu that appears. The result will be a new screen with six menu tabs across the top. With a left mouse click choose the second "Program". Then choose the "Advanced" box near the bottom of the screen. Finally, select (with a check next to them) the "Prevent MS-DOS programs from detecting Windows" and "Suggest MS-DOS mode as necessary". A few clicks of the "OK" boxes and the Xmit_ID software is ready to behave under Windows.

◆ Where Are the *&#! Instructions??

Xmit_ID comes with a file Xhelp.exe, which I anticipated would provide the new user with an overview of its operation, command keystrokes and advanced info. How about two out of three?! The Help file gives good information about individual commands and keystrokes. However, I could not find a clear concise step-by-step guide to actually capture and compare signals!

In my opinion this makes the use of Xmit_ID a labor of love, which may discourage all but the very determined, experienced users. I can tell you it took hours for me to dig through the jungle of keys, command, files types and terms ... and I'm still not sure if I am doing it right. For some reason I could not get the F1 key to bring up the Help file as per the Readme file instructions.

Another impediment was the fact that Windows would not print out DOS screens. So I could not print out the Help file. This did not help matters. But remember to keep Xmit_ID in perspective as a Freeware program trying to compete with MoTron's near \$1000 price tag! With that in mind I pressed on.

◆ Trying Xmit_ID

Just like MoTron, Xmit_ID captures the signal from the discriminator of a receiver. The similarities end right there. Instead of requiring extensive external hardware to interface between the radio and the computer, Xmit_ID just requires that the discriminator output be connected to the computer's microphone input.

◆ Grabbing Signals

The main screen of Xmit_ID is broken into four sections: two text sections and two signal graphs. See Figure 2.

After proper adjustment of the level using the homemade attenuator and the receiver's squelch, Xmit_ID begins to "listen" for a new signal by pressing the "R" key. Once a transmission is detected a list appears on the screen. The list shows the number and duration of each transmission. Remember that Xmit_ID attempts to "fingerprint" the transmitter by looking very carefully at the first milliseconds of each transmission. It is trying to capture a characteristic turn-on graph that is not a simple on/off. Instead it is a complex function which is the product of many factors, including the frequency generating methodology, electrical components, component tolerances and mechanical component operation.

The list is actually a continuous graph of the discriminator signal from a known transmission source. Each entry indicates another identifiable turn-on cycle. The capture continues until the Esc key is pressed. Then the graph is stored as a unique file with a file extension of ".raw"; for example File012.raw.

These "raw" files can be played back over the computer's speakers and they can be displayed on Xmit_ID's main screen.

◆ The Wheat from the Chaff

Now that we have raw data, the next step is to scan through the graph and pick out the all important turn-on parts of the transmitter's signal. This is performed via a number of keystrokes clearly detailed in the Help file under the sec-

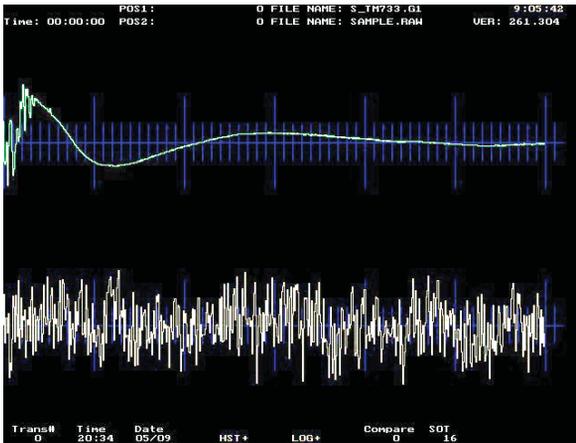


Figure 2 Main display with unknown signals “.raw” file on the bottom of the screen.

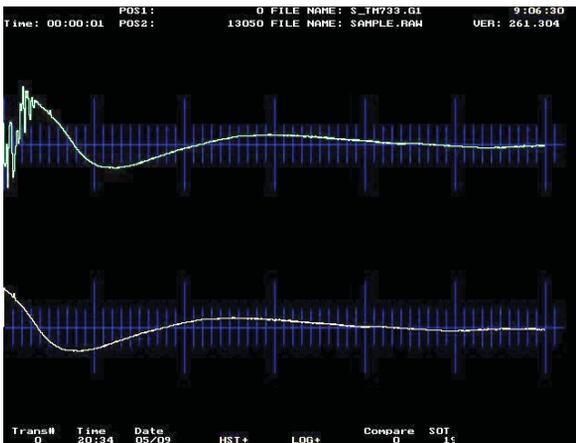


Figure 3 Pressing F3 key results in positioning to first SOT on bottom display.

```
Name: S_TM733.G1 Score: 19470 8115
Done...#1 COMPARE: 6000
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Figure 4 Screen displaying Compare results and listing “.G” file(s) which have similar signal “fingerprints” to “.raw” file SOT position.

tions Moving Screen View and Finding Start and End of Transmissions (SOT and EOT).

Once the start and end points are defined we then store the resulting piece of graph as a “fingerprint” and identify it by a name for later comparison. This is done using the “S” key to save the start portion of the transmission, and the “T” key to save the end part. Then the F11 key will begin the file naming process. F11 produces automatic compare files that have filename extensions beginning with “G”.

◆ Comparing “Fingerprints”

After all the very manual “finding” and “saving” we just went through, I think you’ll agree that the Auto Compare function of Xmit_ID is a bit of a misnomer. However, now we can capture new transmitters and compare their SOT (start of transmission) with our saved “.G” files. Lining up the SOT of the new transmission and then pressing the “G” key performs this compare. A list of files, which have high comparison scores with the unknown signal, is then displayed.

◆ Instructions According To John

The full actual step-by-step procedure, which I could not find documented in a simple manner anywhere in the instructions, is as follows:

- Capture signal(s) — see above.
- Save as a file with an extension of “.raw”
- Pick out start/end of transmissions from “.raw” file
- Make “.G” files from each SOT/EOT piece in step 3.
- Capture unknown signal(s) and save as new “.raw” file
- Display the unknown “.raw” file on the bottom of the screen — Figure 2
- Press F3 to find first SOT in unknown “.raw” file — Figure 3
- Press G key to compare unknown SOT to your previously saved “.G” files
- New screen will appear with a list of “.G” file(s) which have similar “fingerprints” — Figure 4
- Press Tab key to re-position “.raw” file to next signal
- Go to Step 7 and repeat for each signal captured in “.raw” file

This procedure was used using the discriminator output of an FRG-9600 and a Pentium II 300 MHz laptop computer running Windows 98. The same three FRS transceiver units used in the MoTron review were again used. However, the included Figures have been produced using the Xmit_ID’s sample files so new Xmit_ID users can follow on their computers.

◆ Finally, We Have A Winner(s)!?

I found that a number of factors were critical in obtaining a clear “winner” in matching transmitter fingerprints. Using the attenuator, the signal level has to be very carefully set. Then the SOT and EOT files must be carefully positioned and saved. Finally, the F2 key must be used to set a useful compare level.

If the user is very careful in performing all these steps (The XHELP file provides some additional information on many commands) then Xmit_ID can really be useful.

After a few days of use I was able to get about a 73% valid identification rate. Although very impressive, this was lower than achieved using the expensive MoTron system. Xmit_ID required far more operator training, judgment and keystrokes.

However, even with fine tuning the Compare threshold value, in most cases two or more files resulted as possible matches. Taking the file with the highest compare value usually resulted in the correct ID.

◆ That’s It, Watson!

For anyone who wants to try his or her hand at signal fingerprinting I heartily recommend giving Xmit_ID a try. The price is right and your time and patience will be rewarded.

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tine parodies of all time, returned to active duty at Easter as is usually the case. This year they announced a new alliance with Genera-
lissimo Groundhog. (Former maildrop closed and defunct)

WHYP- The James Brownyard station, memorializing an old medium wave outlet in North East, PA, remains very active on the pirate bands. Look for his temperature reports in Lake Erie area cities, which may or may not be current. At times they have been using **WBZO** call letters during their shows. (Providence; also uses various e-mail addresses such as)

WMFQ- The QSL promotion station is still with us. (Providence)

WPN- The World Parody Network has returned, but recent shows have announced an obsolete maildrop. (Apparently now using wpn_sw@yahoo.com e-mail)

Wreckin Radio- Programming on this relatively new pirate has primarily been classic rock music so far. (None known)

◆ QSLing Pirates

Reception reports to pirate stations require three first class stamps for USA maildrops or \$2 US to foreign locations. The cash defrays postage for mail forwarding and a souvenir QSL to your mailbox. Letters go to these addresses: PO Box 1, Belfast, NY 14711; PO Box 28413, Providence, RI 02908; PO Box 69, Elkhorn, NE 68022; PO Box 24, Lula, GA 30554; and Ostra Porten 29, 44254 Ytterby, Sweden.

Some pirates prefer e-mail, bulletin logs or internet web site reports instead of snail mail correspondence. The best bulletins for sending pirate loggings, in hopes that pirates might QSL them, remain *The ACE*, with sample copies \$2.00 US via the Belfast maildrop and the e-mailed *Free Radio Weekly*, still free to contributors via yukon@tm.net. Martin Schoech of Germany recommends the following internet resources for discovering current Europirate addresses: SRS News at <http://www.srs.pp.se> and Dr. Tim’s News at <http://www.doctortim-news.de.vu/> as well as Martin’s own lists at <http://www.schoechi.de/pwdb-pir.html> and <http://www.schoechi.de/pwdb-ema.html> that are quite useful.

◆ Thanks

Your loggings and news are always welcome via 7540 Hwy 64 West, Brasstown, NC 28902, or via the e-mail address atop the column. We thank this month’s valuable contributors: John T. Arthur, Belfast, NY; Jerry Berg, Lexington, MA; Ralph Brandi, Tinton Falls, NJ; Ross Comeau, Andover, MA; David Crawford, Titusville, FL; Alan Davies, Surabaya, Indonesia; Gerry Dexter, Lake Geneva, WI; Bill Finn, Philadelphia, PA; Ulis Fleming, Glen Burnie, MD; Garth Doetzel; Harold Frodge, Midland, MI; Paul Gustafson, Holden, MA; William Hassig, Mount Prospect, IL; Harry Helms, Ridgecrest, CA; Chris Lobdell, Stoneham, MA; Larry Magne, Penn’s Park, PA; Greg Majewski, Oakdale, CT; Bill McClintock, Minneapolis, MN; John Morris, Whidbey Island, WA; Lee Reynolds, Leppster, NH; Mike Rutkaus, Winchester VA; Martin Schoech, Merseburg, Germany; Tom Sevart, Frontenac, KS; Lee Silvi, Mentor, OH; Bud Stacey, Setsuma, AL; Tom Sundstrom, Vincentown, NJ; Niel Wolfish, Toronto, Ontario; and Mike Wolfson, Ashland, OH.