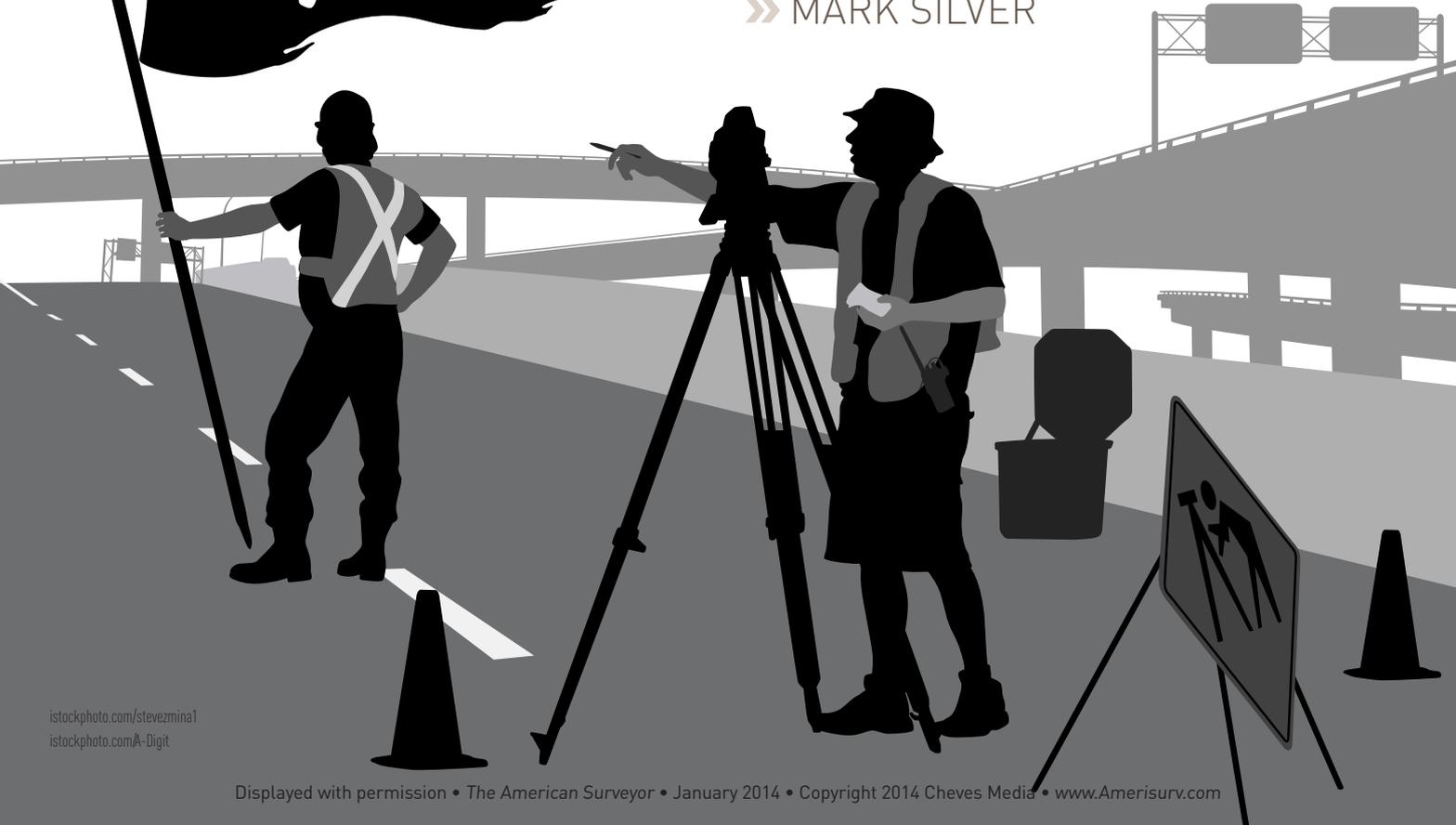


SAILING WITH THE Pirate Surveyors



Last week I went out to the office yard here in Salt Lake City to test some GPS receivers. When I turned on my base radio, I noticed there was someone else already using my favorite radio frequency (461.025 MHz.) I thumbed through each of the 14-frequencies programmed in my radio, there was someone else on every single channel.

» MARK SILVER



If you are operating without a license, *then you are a pirate*. The FCC has an 'Enforcement Division' that is specifically charged with finding pirates. When they do, they are authorized to seize your equipment, impose a fine and impose criminal penalties.

The FCC recently said "We are taking aggressive enforcement actions against violators" and they maintain a list of recent violators online to prove it (see *transition.fcc.gov/eb/sed/ulo.html*) While the FCC may not have sufficient enforcement to patrol all of the air waves—all of the time; if you do get caught, *you will really regret it*.

I looked through the past enforcement list and tallied up the recent 'Forfeiture Orders.' It appears that a fine for most first time offenses of operating without a license would be \$10,000. Operating with an expired license might be \$8,000.

Did I mention that these fines are 'Per Day?' You could easily rack up \$50,000 in fines in just a single week. I am not kidding, this is a big deal and has the potential to close a business.

What Can Survey Companies Do to Be Compliant?

Hopefully I have your attention now. Let's build a short checklist of things to do to keep your survey company on the happy side of the FCC.

1 Get a FCC License

This is actually the easiest part. Just find a FCC Licensing company and pay them to setup your license. The license is valid for 10 years and the cost will be about \$5 per month.

Depending upon your location, the fee for a new license will be around \$565. There are three components to the fee:

The FCC will get about \$210 of the total fee that you pay. About \$110 goes to 'Frequency Coordination' service. The balance is for the licensing company.

While it may be possible to obtain a license using the FCC's ULS online tool without professional help, I have never known anyone to successfully process their own application. Ever.

It currently takes about 5-months for the FCC to process an application however 10-days after your application is submitted you may use the FCC file number as a temporary FCC ID. Carry a copy of the completed application with your base radio as your temporary license.

If you are a dealer and rent systems with radios, your license should have the



Federal Communications Commission

Wireless Telecommunications Bureau

RADIO STATION AUTHORIZATION

LICENSEE: IGAGE MAPPING CORPORATION

ATTN: MARK E. SILVER
IGAGE MAPPING CORPORATION
1545 SOUTH 1100 EAST #1
SALT LAKE CITY, UT 84105

FCC Registration Number (FRN): 0013933296

Call Sign WQDN367	File Number 0002304390
Radio Service IG - Industrial/Business Pool, Conventional	
Regulatory Status PMRS	
Frequency Coordination Number PC20052490516	

Grant Date 10-06-2005	Effective Date 10-06-2005	Expiration Date 10-06-2015	Print Date
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STATION TECHNICAL SPECIFICATIONS

Fixed Location Address or Mobile Area of Operation

Loc. 1 Area of operation
Operating Nationwide including Hawaii, Alaska, and US Territories.
Location 1 Special Condition
Area of operation is restricted to south of Line A and/or west of Line C.

Loc. 2 Area of operation
Operating Nationwide including Hawaii, Alaska, and US Territories.
Location 2 Special Condition
Area of operation is restricted to south of Line A and/or west of Line C.

Antennas

Loc	Ant No.	Frequencies (MHz)	Sta. Cls.	No. Units	No. Pagers	Emission Designator	Output Power (watts)	ERP (watts)	Ant. Ht./Tp meters	Ant. AAT meters	Construct Deadline Date
1	1	000461.02500000	FBT	4		19K6F1D	35,000	35,000			
1	1	000461.07500000	FBT	4		19K6F1D	35,000	35,000			

Keep a copy of your license with your radio in the field.

FCC station class code 'FB6T'. If you rent a system, make sure you have a copy of the radio owner's FCC License and that their license has the FB6T code which makes the license transferable when rented.

2 Label Your Transmitter with your FCC Call Sign

This is as simple as writing your call sign on the side of your radio with a sharpie. I personally go all out with my label maker because, well... I love making labels.

3 Keep a Copy of Your FCC License with the Radio in the Field

You are required to have a copy of your FCC License with your base radio when it is operating.

When you receive your license from the FCC, make a copy and put it in with your base kit.

4 Make Sure your Radio is Configured to broadcast your FCC Call Sign

Your radio must broadcast your FCC Call Sign at least once every 15 minutes in Morse code (CW.) If you have a scanner, you can listen for the distinctive tones.

5 Enable CSMA or 'Rx Priority' on your Transmitter

Digital data is licensed at a lower priority than voice.

Surprisingly your licensed digital data cannot interfere with licensed or unlicensed voice traffic. Unfortunately this means an unlicensed trucker on the same frequency as your base has priority and you radio has to pause while the trucker illegally talks.

All radios have a 'Collision Sense Multiple Avoidance' or 'Rx Priority' setting that disables data transmission when voice or other data users are on the same frequency. You have to leave this feature enabled.

You can mitigate many of the CSMA side effects by setting the base radio's sensitivity to the lowest value. This prevents your radio from hearing and avoiding distant users on the same frequency.

6 Don't Keep Un-Licensed Frequencies Programmed in your Transmit Channel Table

It is illegal to have frequencies available for user selection that are unlicensed.

Receivers allow you to have channels with different transmit and receive frequencies. If you use a community base, your radio will need to listen to the CORS frequency, however you won't have a license to transmit on it so don't program the frequency into the transmit table.

7 Make Sure Your Radio is Narrowband Compliant

Since January 2013 all radios must be 12.5 KHz bandwidth or utilize an over-the-air

baud rate of 19,200 or higher in a 25 KHz channel. (However you must apply for and receive a special license for 19,200 operation in a 25 KHz channel prior to operation.)

What happens if you get caught transmitting with a 25 KHz Radio at 9600 or 4800 baud? The penalties are listed on page 6 of the FCC DA 13-376 Public Notice:

What are the potential enforcement consequences of unauthorized wideband operation or falsely claiming narrowband status while continuing wideband operation?

Licenses operating in wideband mode after January 1, 2013 (...) are in violation of these rules. Licensees who operate in violation of the Commission's rules or the terms of the licensee's license, or who cause harmful interference to another licensee, may be subject to appropriate enforcement action. Such enforcement action may include admonishments, license revocation, and/or monetary forfeitures of up to \$16,000 for each such violation or each day of a continuing violation, and up to \$112,500 for any single act or failure to act.

8 Watch Special Regulations When Near Canada

Your license restricts operation when you are "South of Line A, West of Line C"; about 75 miles from Canada. If you are near the Canadian border use the absolute lowest power setting that will provide coverage for your job.

9 Beware of 'Business Band' Frequencies

The frequency coordination of licenses for surveyors results in nearly all new licenses having the same 14-frequencies allocated. These standard frequencies typically have two frequencies that are shared with 'Business Band' users:

Business Band Itinerant Frequencies	
Name	Frequency (MHz)
Brown Dot	464.500
Yellow Dot	464.550
Brown Dot Duplex	469.500
Yellow Dot Duplex	469.550

The 'Dot' Business Band (Industrial/Business Pool) frequencies are in common use by just about everyone, for just about

Loc No.	Ant No.	Frequencies (MHz)	Sta. Cls.	No. Units	No. Pagers	Emission Designator	Output Power (watts)	ERP (watts)
1	1	000461.02500000	FBT	4		19K6F1D	35,000	35,000

Maximum permissible Effective Radiated Power (ERP)

everything. Unless you are really in the middle of nowhere, it may be best to avoid these Dot frequencies.

10 Stay within your Licensed Power

All FCC licenses specify a Maximum Effective Radiated Power (ERP). Typically your license will allow a 35 watt ERP transmission:

A 35 watt transmitter connected to a 'Unity Gain' antenna will broadcast 27 watts. Using readily available 'high' gain antennas you can greatly exceed your licensed ERP:

Effective Radiated Power (ERP) vs. Antenna Gain		
Transmitter Power	Antenna Gain (dBi)	ERP
35 watts	1.0 (Unity Gain)	27 watts
35 watts	2.4 dB	37 watts
35 watts	3 db	43 watts
35 watts	5 db	68 watts
35 watts	7 db	107 watts

Someone will definitely notice if you are broadcasting 100 watts from your base and the FCC won't like it much either.

You may ask "why anyone would use a high gain antenna?"

If you have a 5 db gain antenna, you can set your radio to 18 watts output and generate a 35 watt ERP while doubling the life of your radio's battery.

So What Should I Do?

When I deliver GPS equipment to a new RTK users they usually ask if I think they need to obtain an FCC license. Let's carefully do the math:

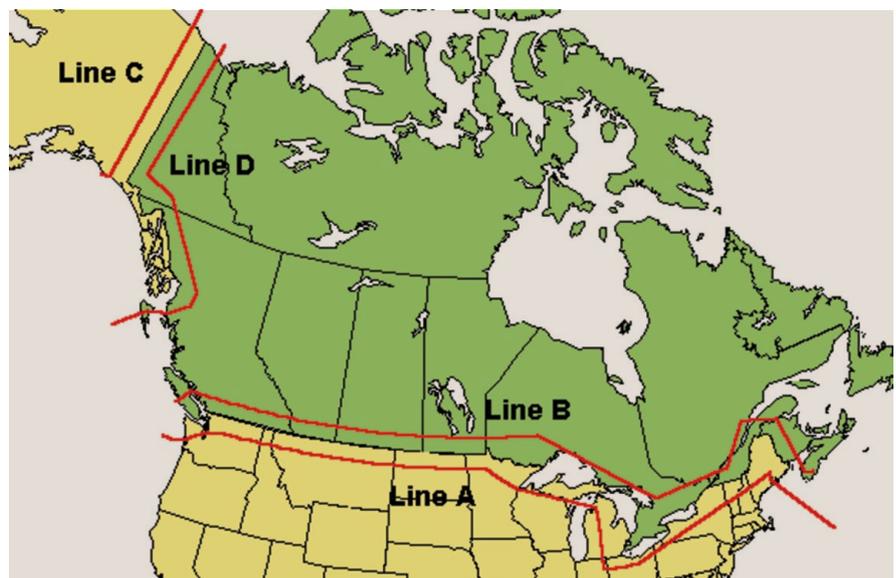
The FCC License Dilemma

Pros: avoid \$8,000 to \$20,000 per day in FCC fines, the loss of radios plus any attached survey equipment, future inability to obtain a license.

Cons: \$5 per month in licensing fees. Yes, I suppose this could be a difficult decision. If you only plan on being in business for the next week.

I very strongly recommend that you follow the 'Not-A-Pirate Checklist'! It won't cost much, it won't take long and it reflects positively on both your company and our profession. Good surveying to you! ■

Mark Silver is an Electrical Engineer, a topographic map collector, and a long time vendor of GPS products.



Special radio operation zones near Canada