

The KA7OEI FT-817 pages

Current consumption of the FT-817

Where does all of the current go?

One of the "complaints" that I've heard about the '817 is its battery consumption. Its average power consumption is certainly much more than that of a typical HT - and some believe that the fact that it *can* run off batteries *must* mean that it can do so efficiently. (For more information on operating the '817 from various types of batteries, look at the [Lithium-Ion page](#) as well as the [NiCd/NiMH/Alkaline page](#). Also, take a look at [K6XX's FT-817 pages](#) for power consumption information.

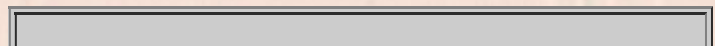


A Front-panel view of the FT-817.

Well, the fact is that the '817 *does* pull a fair amount of current in comparison with your typical battery-powered radio. There are a number of mitigating factors that can help one understand *why* the current consumption is what it is. (Disclaimer: I'm sure exceptions may be found to most of the points below, but that's why this is just an article and *not* a novel...)

- There is a *lot* of circuitry in this radio. Even though it pulls roughly 300 milliamps when sitting idle on receive, this is certainly *less* than *most* any other full-featured HF transceiver that you'll likely find. (Yeah, yeah, I'm sure you can come up with an exception or three, but I *did* say "most.")
- This receiver uses a fairly high-level mixer. On receivers, you can select high dynamic range (i.e. the ability to avoid receiver degradation in the presence of strong signals) *or* you can opt for low current consumption: In general, you can design for performance *or* low current consumption - but not both.
- There is no provision for a "battery saver" mode of operation. Most HT's nowadays actually *do* consume quite a bit of current - in some cases, well over 100 milliamps for (true) dual-banders such as the FT-530. The "battery saver" mode operates by turning off most of the receiver's circuits and then, every so often, they are turned back on to see if a signal is present: If there *is* a signal, then the receiver circuits are left on. Since a channel is likely to be quiet much of the time, the *average* current consumption is greatly reduced. This sort of "battery saver" operation is most effective during FM operation and somewhat less practical in SSB or CW. It is a shame that no battery saver modes are available on the '817 to use - or not.
- Mechanical relays are used extensively for routing RF through the radio and each relay consumes approximately 20 milliamps when it is energized. Why not use PIN diodes or latching relays? This would involve extra cost and PIN diodes (especially in an HF transmit path) would not necessarily reduce current consumption.
- A number of power-saving tricks are used in the '817. For example, when a mode is changed that affects the required circuitry (i.e. going from SSB to FM) the *unused* circuitry for the deselected mode is powered down rather than "muted" or bypassed, thus minimizing current consumption.
- For SSB, CW and HF data modes, DDS (Direct Digital Synthesizers) are used on both the main synthesizer as well as the BFO. These circuits, being rather complex and operating at fairly high speed, consume a fair amount of current (30-40 mA each) and thus contribute to the overall consumption.

There are also a number of mode/band/option selections that can significantly affect current consumption. Below is a list of various parameters that can affect current consumption. These measurements were taken at 9.0 volts:



- Display backlight: 27 milliamps, **regardless of color**.
- Rear antenna: 20 milliamps of **additional** current is consumed when the rear antenna connector is selected owing to the relay being energized.
- Noise Blanker: 13 milliamps of current is consumed by the noise blanker.
- Compared to 10 meters (with all other things like mode being equal) reception on 30 meters to 160 meters consumes approximately 3.5 milliamps less, and 6.6 milliamps less on the AM broadcast band, 10.2 milliamps less on 70cm, and 12 milliamps less on 2 meters and the aircraft band.
- Compared to SSB/CW/Digital modes, the AM mode consumes 16 milliamps **less**. The AM mode does not require BFO circuits, and these may be powered down.
- Compared to SSB/CW/Digital modes, the FM mode consumes 11 milliamps **less**. The BFO and product detector circuits are not needed and are powered down.
- Compared to SSB/AM/CW reception 10 meters, reception on the FM broadcast band consumes 38 milliamps less. Much of the RF/IF circuitry is unneeded when in this mode because a completely separate receiver chain (consisting of a single chip) is used for FM broadcast band reception.
- When squelched, current consumption reduces by between 9 and 11 milliamps, depending on band and mode. This is mostly a result of the front panel signal indicator LED being illuminated.
- Reception on 6 meters consumes an extra 7.7 milliamps - mainly due to the 6 meter (only) preamplifier built into the filter unit. (Note that this preamplifier is in **addition** to the one selected by the **IPO** setting.)
- Powering the '817 via the battery connector (as opposed to the rear panel power connector) reduces power consumption by 5 milliamps. (I'm not sure why - I'll have to look into this...)
- IPO on/off: When the preamplifier is on (i.e. IPO is **off**) an extra 2.5 milliamps is consumed.
- Depending upon the exact position of the main tuning dial, current consumption may vary by 2 milliamps due to the illumination (or lack of) the phototransistors in the rotary encoder.
- Depending on the exact position of the "Select" knob, current consumption may vary by 500 microamps.
- Attenuator: The difference between the attenuation on/off is approximately 100 microamps.
- Selecting the optional SSB/CW filter does not change current consumption by more than 100 microamps.
- AGC mode/selection doesn't affect current consumption measurably.
- The amount of audio from the internal speaker can increase the current consumption by more than 120 milliamps. This is, of course, dependent on volume and the content audio being amplified.
- When an **OFF** command as sent via the serial interface, the FT-817 will continue to draw approximately 10 milliamps (due to the microprocessor being powered) **if** powered via the rear power

How much current does the radio consume from its internal batteries when it is shut off?

Like most modern TVs, VCR, and radios, the FT-817 consumes a bit of current **even when the radio is turned off!**

Why? Well, you may have noticed that the **power** switch is a pushbutton. Pushing the switch does **not** connect/disconnect the radio's power supply, but rather it applies power to the computer in the radio, which then turns the rest of the radio on. It may come as no surprise that this circuit consumes a small amount of current to perform this function.

How much current?

At 8 volts, this is between 100 and 200 microamps, going up to as high as 300 microamps at 16 volts, with the exact amount depending on temperature (lower temperature = lower current.)

What does this mean? At a continuous current consumption of 200 microamps it will deplete the useful life out of a set of AA alkaline batteries within a year - more or less.

In other words: Don't leave batteries in your '817 for a year and expect them to work!

When powering the radio from the rear panel, things are different:

If rechargeable batteries are installed, the '817 trickle charges the pack at 10-15 milliamps - even when the radio is off. This small amount of current is unlikely to damage any cells (due to overcharging) that are left in the radio - even for long periods of time - but you should keep this in mind if the voltage to the rear panel is supplied by a battery.

One "gotcha" to be aware of: If you are using the CAT interface, power to the adapter is applied **at all times** - and 10 milliamps of current is consumed whether the radio is on, off, internally, or rear-panel powered.

connector. If powered via the internal batteries, this current consumption will not occur as the microprocessor is powered down - and it will **not** respond to an **ON** command. If the '817 is then again powered by the rear connector, the 10 milliamp current consumption will resume. **Note:** This current consumption will occur only if the **OFF** command was used.

- When the Yeasu CAT interface is plugged into the rear panel, an extra 10 milliamps (approximately) will be drawn by the FT-817 powering this interface. This will occur whether the '817 is on or off or using internal batteries or an external source.

While the current consumption is only slightly affected by the supply voltage, **power consumption** is much higher at the increased voltages. Since **power** is determined by current **multiplied** by voltage, even if current consumption were to not increase, power consumption would **still** increase. The table shows current and power consumption under the following conditions: 10 meters, receiver unsquelched, minimum volume, USB mode, noise blanker turned off, front antenna selected, and backlight turned off.

As can be seen from the table, while the current consumption increases only by 8% or so from 7.5 volts (the lowest voltage at which the '817 will operate without much degradation) to 16.0 volts (the highest rated voltage) the **power** consumption **more than doubles!**

What does all of this really mean?

From this information, there are several things to do to minimize power consumption when trying to conserve battery power. The most important of these are as follows:

- **Turn off the backlight:** This is, perhaps the easiest way to knock about 10% off the current consumption. (*Yes, it is rather annoying that the "auto" backlight function is disabled when using the rear panel power connector.*)
- **Use the front antenna connector:** This reduces current consumption by about 6% by de-energizing the selector relay.
- **Turn off the noise blanker:** If you are running on battery, you are probably well away from noise sources and turning off the blanker will shave the current consumption by about 4%.
- **Enable the IPO:** You probably don't need to have the preamp enabled on HF anyway. Turning the preamplifier off (i.e. the IPO "on") tends to reduce the magnitude of background noise, which also tends to reduce the amount of power consumed by the audio amplifier trying to amplify this noise.
- **Use the squelch:** This is most easily done when using FM - although if signals are strong, this can also work on HF. This will save not only current used by the audio amplifier (see below) but it will cut current consumption by about 3% when squelched even when the volume is turned completely down. (It will save even more power if the speaker isn't blasting noise all of the time...)
- **Use minimum speaker volume:** Next to the radio just being on, the audio amplifier can be one of the largest factors affecting current consumption, and minimum volume is the best way to reduce this current. Current may be further reduced by using headphones instead of the internal speaker. This current saving can easily average between 10 and 20% when listening on a noisy HF band.
- **Use minimum operating voltage:** The radio consumes about 8% less current when running at 8 volts as opposed to 16 volts. More importantly, though, is that the **power** consumption is **less than half** at 8 volts compared to what it is at 16. Managing power consumption in this way may not be particularly convenient when using batteries, but using modern switching supplies, it **is** possible as demonstrated on the ["Optimizing the Power Consumption of the FT-817"](#) page.
- **Use minimum transmit power:** Transmitting (even using the lowest power) consumes several times as much power as receiving does so it makes sense that the lowest transmit power is conducive to lowest power consumption.

Supply Voltage	Current (mA)	Power (watts)
7.5	290	2.18
8.0	291	2.33
8.5	293	2.49
9.0	293	2.64
10.0	296	2.96
11.0	298	3.28
12.0	301	3.61
13.0	304	3.98
14.0	308	4.31
15.0	311	4.66
16.0	314	5.02

Table relating current and power consumption versus power supply voltage.

In short, just turning off the backlight, using the front antenna connector, and turning off the noise blanker will reduce the current consumption by 20%. Using headphones and minimum transmit power will also go a long way toward battery longevity as well.

Other FT-817 pages at this site:

Go to [The KA7OEI FT-817 "Front Page"](#) - This is, well, the "front" page of the '817 pages here...

Any comments or questions? Send an [email!](#)

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