

# Optimizing Rig Placement and Ergonomics for Contesting

## Introduction

When I got back into ham radio in 2000 after a 25 year or so absence I encountered a whole new world of computerized logging and radio control. After setting up my station in an upstairs bedroom I did what a lot of other people seemed to do. I put the keyboard on the desk, the radio behind the keyboard and the computer display on top of the radio. To tune the radio (as I often have to do, being a little pistol), I had to lean forward and reach over the keyboard. I found this to be, quite literally, a real pain — especially when tuning the band from one end to the other. To look at the PC display I had to take my eyes off the keyboard (I'm not a touch typist) and tilt my head back, thus putting a strain on my neck. I guess you'd have to call this a real pain in the neck. By the end of the contest — pain!

When I built a new shack in the basement I realized that I was starting with a blank slate and might be able to come up with a design that maximizes operator comfort and safety. The obvious payoff would be the ability to spend more time in the chair and not be so tired at the end of the contest. One thing that dawned on me during this process was that, unlike the *old* days, the focal point had shifted from the radio to the computer keyboard and display. This meant designing the operator's position around those accessories as opposed to the radio.

This article describes what I came up with. It's organized as a sequence of requirements for physical comfort and safety, each followed by a description of how I implemented it. It is based on the requirements for a low-power CW, RTTY and SSB station in the single operator, multi-single and multi-two categories, (no SO2R yet) as well as on the needs of an op first licensed in 1953. I have no formal expertise in ergonomics; I just did what made sense to me.

## Posture

In terms of posture, my requirements were to maintain a position that imposes little or no stress, particularly on my neck, arm and shoulder muscles (not to mention the rest of my body). Additionally, I wished to minimize the stress caused by those unavoidable times when you have to move your eyes and fingers from the keyboard.

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Figure 1 — Secretarial desk with keyboard at proper height and PC display positioned to minimize neck strain

First, the keyboard needs to be at the correct height for typing. This height was determined decades ago. The typical secretarial desk of that era was L-shaped. One leg of the L is the main desk surface at a height of 28-1/2 inches from the floor. The other leg, called the "return," is 1-1/2 inches below the main desk surface, or 27 inches from the floor. This is where the typewriter used to sit. Since I already had one of these desks, it was a no-brainer:

Just take the desk I have, shove it into a corner of the shack, put the keyboard on the return and the radio on the main desk surface (see Figure 1).

Although I'm a hunt-and-peck typist, I can type 40 WPM pretty much error-free, but I have to keep my eyes on the keyboard while typing. The only way to view the monitor without having to raise my head (see pain in the neck, above) was to place the monitor directly behind with the base

lower than the keyboard. How do you do that when there's no room for both the keyboard and the monitor? My solution was to build an alcove into the wall behind the desk, install a shelf at the desired height and place the monitor on that (see Figure 1). The net result is a very comfortable body position.

The radio sits on the main desk surface to my right, positioned so it mostly faces me. When I rest my right forearm on the main desk surface the tuning knob is just inches away from my hand. To reach it, all I have to do is pivot my arm slightly to the right, using my elbow as the pivot point. I don't even have to look at the radio to do this.

A second PC monitor is very useful for displaying things like *DXAtlas* and *HamCAP*. It's also pretty much essential if you do RTTY while running more than one decoder. To view a second monitor, however, you're going to have to move your head. You won't have to move it very much, though, if you put the monitor above the main one, as I did. This is not really a big deal, because you aren't going to be looking at it every 30 seconds.

For RTTY decoding *N1MM* does the heavy lifting. I also use a PK-232 hardware TNC, which takes its audio input from the Collins 75A-4 receiver on my left or VFO A or VFO B of the Yaesu MARK-V FT-1000MP on my right. Source selection is done by setting the appropriate jumpers on a patch bay, visible top-center in Figure 1. Of course, to tune in a signal on the PK-232 you have to be able to see the tuning indicator, so the PK-232 is stuffed into the alcove immediately to the left of the main PC monitor, where I don't have to move my head to see it.

The little box immediately to the left of the secondary monitor is the control box for the AlfaSpid rotator. It's nice to have it in the field of view, so I'm not pointing at PY when I'm trying to work JA.

### Chair

My chair requirements are pretty basic. It must be comfortable and allow freedom of motion, so I wouldn't be locked into one position all the time. My philosophy is that a chair needs to be just as comfortable at the end of the contest as it is at the beginning. The chair need not be expensive (mine wasn't), but swivel, tilt and casters are absolutely essential to enable the operator to move around and not get stiff. It should have more than four legs, so you don't tip over while leaning back. It should have adjustable height and not trap sweat where it touches the body. Finally, it should not capture the odor of a little pistol op miraculously doing 1000 Qs in four hours near the end of the contest, then emanate it for weeks thereafter.



Figure 2 — Position of radio, intake/exhaust fan and cable duct carrying station AF wiring



Figure 3 — Headphones hang at the left end of the desk return are plugged into jacks wired to radio via the patch bay. A cable roller stores excess cable.

### Lighting

Lighting should create negligible shadows and not reflect off the PC display face. My design includes six fluorescent fixtures around the 11 x 10 foot perimeter of the shack, each with two 40 W tubes. Power

to each of the six ballasts is run through its own wall switch. I rewired the fixtures so that one ballast serves one tube in its fixture and one in the adjacent fixture. This gives enormous flexibility in adjusting light levels in different parts of the shack.

I usually light one tube in each of the six fixtures, which gives pretty normal room lighting with few shadows. Because of the placement of the fixtures, there are *no* reflections in the monitors. For contesting I can light one tube in the fixtures above the keyboard and the radio and shut the rest off. For tasks requiring high light levels I turn on two tubes in the fixtures over that area (see Figure 4).

### Heating, Ventilation and Noise

Temperature should be adjustable to suit the operator. Hot air should be exhausted and cool air brought in as required. Sounds from outside the shack should not disturb the operator. In addition, sounds from the shack such as "Get off my frequency, ya bum!" should not disturb others in the house. The shack should be acoustically dead, with no echoes.

I mounted a baseboard heater below the main part of the desk. This turned out to be a mistake, however, since hot air billowing from beneath the desk dries out the face, causing rate-destroying consumption of liquids. I installed a variable-speed dual fan in the window. One can be set to suck and the other to blow. This gives pretty good air circulation if needed (see Figure 2).

I used standard soundproofing techniques, with drywall mounted on anti-vibra-

tion hangers fastened to studs, wall cavities and ceiling joists filled with fiberglass, suspended ceiling with acoustic ceiling tile and weather-stripped custom doors built just like the walls but with hinges.

I also I applied TenTest board (aka BeaverBoard) over the drywall and held it in place with 1-1/2 inch battens. This involved a lot of work, but it was quite effective. Given the typical noise levels around here, I almost never find it necessary to close the door, but it sure gets quiet when I do.

### Safety

The main safety requirement is that there should be nothing to trip over. Headphone cable lying on the floor can be a problem. My headphones hang on a hook in the lower part of the bookcase (see Figure 3) and plug into a couple of jacks at the far left end of the desk return (below the 75A-4). Excess cable is wound up on a cable roller. It's very easy to pull out additional cable as needed. (See how this works at [www.youtube.com/watch?v=ei5fUGKmAqs](http://www.youtube.com/watch?v=ei5fUGKmAqs)).

Any cable lying on the floor can be a problem. I've routed all cables through plastic cable duct fastened to the wall behind the desk, with openings every inch for cables to break out near their destination (see Figure 2). It may be hard to see, but it runs along the wall below the curtain and the plaques, before diving down out of sight. The bonus section of the NCJ Web site, [www.ncjweb.com](http://www.ncjweb.com), contains high-resolution JPEG files of Figures 1-3, so you can zoom and pan to your heart's content and even read the control legends on the fan if you want.

### Results

Does it all work? For the most part, yes. I can operate continuously for 12 hours or longer and *never* suffer a stiff neck or other discomfort beyond the normal stiffness for my age from sitting for long periods.

Would I do anything different? I'm going to move the heater from beneath the desk to avoid the problem described earlier. I'd also like to make the alcove wider, so it could accommodate more stuff, but it's too late now. I'm going to double the cross-sectional area of the cable duct, though. It's full now, and I don't have everything wired to the patch bay yet.

I hope that you find some of the ideas presented here to be useful for your own station.



Figure 4 — Two fluorescent fixtures — one with a single tube lit and one with two

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