

Planning for Cesium Beam Tube Replacement

Most cesium clocks operate in applications where unexpected clock downtime is not acceptable. A proactive tube replacement plan is the best plan for uninterrupted service.

Unlike most time and frequency references (e.g., rubidium, OCXO), cesium clocks consume the material on which their measurements are based. Run a cesium clock long enough without replacing its cesium tube and it will eventually run out of cesium. And, unlike a car, there is no gauge on a cesium clock to tell you when it's time for a refill.

That means that users have a decision to make. They can simply wait until the clock stops working and then replace the cesium tube. Or they can commit to a proactive tube replacement schedule.

Here are some factors to consider:

How long will the clock likely run before needing a tube replacement?

More precise cesium clocks consume cesium faster than less precise cesium clocks. That greater precision is achieved by heating cesium to a higher temperature, producing a higher signal-to-noise ratio and thus a more stable and accurate frequency output. But the higher temperature also uses up the cesium faster, which is why Symmetricom® and its most precise clocks, like the 5071A, have a typical life time of seven years versus the 15-year typical life time of our standard cesium clocks.

How long can you afford to have the clock offline?

Depending on your location, replacing the tube typically takes about four to six weeks if you ship the clock back to Symmetricom®. If you have a 5071A model cesium clock and you wish to replace the tube yourself, you may order a replacement kit from Symmetricom; this option will also take about four to six weeks.

How old are the clock's electronics?

By the time the cesium tube expires, the clock may have run continuously for eight or more years. As with any electronic device, components can weaken, need adjustment or even fail over time. Sending the clock back to Symmetricom for a cesium tube replacement offers an opportunity to have other clock components checked out as well — so the chances of a clock failure are further reduced.

Do you have redundant clocks or spare tubes?

A failure is obviously less of an issue if you are running multiple clocks or have spare tubes on hand. Of course, if all your clocks went into service around the same date, their tubes could expire around the same date, so there is greater risk if one fails. Some Symmetricom 5071A



FIG 1 Replacement Cesium Beam Tubes

customers keep spare tubes on hand; however, like most systems, these tubes must be run periodically to stay healthy — say, for 30 days every six months. These “maintenance runs,” however, create operational and cost overhead.

Consider staging tube replacements.

Since cesium clocks are required to operate in fairly significant and autonomous applications, such as national timescales and satellite ground stations, complete loss of service is usually not acceptable. Most users will therefore wish to commit to a proactive tube replacement schedule, where replacements are done deliberately and spread out (or staged) over time. The replacement date should depend on the factors listed above — expected life, how long you can have a clock offline, age of

the clock’s electronics, and availability of redundant clocks and spare tubes.

Let’s say you put three clocks into service at the same date, each with a guaranteed tube lifespan of five years, but with an expected lifespan of five to eight. You might wish to schedule replacements one to two years apart, starting with the first tube at year 5.

Ultimately, the schedule you choose, or whether you choose a schedule at all, depends on your application’s tolerance for risk. The key is knowing the risks involved, and making that decision, before the gas runs out.

For further information about Symmetricom tube replacement options, please contact your local Symmetricom representative.

Shipping your instrument to Symmetricom

Installation of a replacement tube restores your cesium instrument’s tube performance and will extend your cesium instrument’s life span for less than the cost of a new instrument. The replacement cesium beam tube meets or exceeds the original performance levels when all other components of the instruments perform to original specifications.

If you ship the clock to Symmetricom, not only will Symmetricom replace the tube, but will also thoroughly examine the clock’s other components, perform any required adjustments and replace any marginal components with new ones. If you own a 5071A clock and you opt to replace the tube yourself, Symmetricom will send you a replacement kit. In addition to the replacement tubes, the kits also include key electrical parts, bracket adapters, as well as detailed retrofit and alignment procedures, all of which enable the replacement tube to successfully operate within the instrument.

Symmetricom offers cesium beam tube replacement for most Symmetricom cesium instruments and some cesium instruments sold by Agilent® and FEI®.