

RECOMMENDED PROCEDURE FOR CARE OF TWTs IN STORAGE

Periodic operation and testing of TWTs in storage is not recommended. Experience has shown that the risk of improper operation and handling outweighs the benefits that can be obtained from periodic testing.

The following procedure is recommended for TWTs which will be in storage for more than six months.

1. Adequately test the TWTs when they are received. It is recommended that the output power and small signal gain be measured and compared to the manufacturer's data.
2. Store the TWTs in a dry, relatively cool place. Keep the TWTs in the original shipping container. If the TWTs must be stored in a warm, humid environment for an extended period (more than a few months), it is recommended that each TWT be enclosed in a well-sealed, vapor-barrier bag.
3. Retest the TWTs only one additional time. This retesting should take place between six and twelve months after receipt, preferable several months before the end of the warranty period. The power and small signal gain data should be retaken and compared to that taken in Step 1. If there are significant differences between this data, consult the manufacturer.

The rationale for the above described procedure is based on the fact that microleaks are by far the most probable cause of TWT failure during the shelf life period. If a TWT tests satisfactorily after being stored for six months, then the probability of the existence of any microleaks is extremely low and the TWT can then be safely stored (as described above) indefinitely.

ANSWERS ON TYPICAL QUESTIONS ON AGING PART 2

1. The term "aging" is usually used to describe the processing with which a TWT is subjected to before its vac-ion pump is "pinched-off". The most important "and longest" portion of this aging consists of operating the TWT with the nominal RF input power at the TWT's rated duty. The baseplate temperature is usually maintained at the maximum specified operating temperature. The duration of this operation can depend on the required performance, but usually lasts about 50 hours. Less frequently the term "aging" is used to refer to describe operating the TWT at periodic intervals, say every six months, for a brief period, say one hour, in order to "re-fresh" it. For reasons stated above, CPI thinks that such retesting is ill-advised.
2. For extended storage, the TWTs should be wrapped and properly packaged. The TWTs can be placed as close to one another as possible, even touching. If there is magnetic material in the vicinity of the TWTs, the TWTs should be sufficiently far from it so that the magnetic field is less than 25 gauss (any direction) at the TWT, especially the electron gun area.

Recommended Procedure for Care of TWTs in Storage

Page 2

3. After receipt from CPI, it would be prudent to verify the TWT's RF performance immediately. After this, its performance should be checked prior to the expiration of the warranty. Additional testing is not recommended.
4. The stored TWT should be retested just prior to the expiration of its warranty, as explained before. The TWT should be tested as if it were a new TWT. For example, only a three minute heater warm-up is required, after which the high voltage and RF drive can be immediately applied. If there is any problem, the manufacturer should be notified immediately.
5. If the TWT has any microleaks, this will be obvious when it is retested prior to the expiration of the warranty. When the high voltage is applied for the first time, the TWT will arc internally or display higher than normal helix current. In either case, the power supply's protection circuitry should safely turn off the TWT. The high voltage can be reapplied a maximum of two more times. If the TWT does not stay on indefinitely, the manufacturer should be notified.
6. Based on our experience in which TWTs have been stored for approximately three years maximum, the performance characteristics of the TWTs do not change. This assumes that there are not microleaks in the TWT.
7. Turn-on procedure:
 - a) Hi Potential test (if equipment is available)
 - b) 3 minutes** FIL warm-up (or as required per product specification).
** After prolonged storage, i.e. greater than one year, it is advisable to warm-up the filament for 30 minutes prior to applying high voltage.
 - c) High voltage turn on -- no RF drive
 - d) Apply RF drive gradually if possible
8. Extending TWT life can best be achieved by adequate cooling, minimizing thermal transients, and avoiding excessive cathode temperatures. Incorporating these general principals, the following offers a guide for longest/shortest TWT life:

LONGEST LIFE - (Steady State)

- Beam/RF on continuously
- Beam on, RF Off during downtime
- Beam and heater off during long downtime
- Heater voltage backed off, beam off during downtime

SHORTER LIFE - (Transients)

- Heater voltage full, beam off during downtime