Accumulation of error

- Hole location through chain dimensioning techniques produces error accumulation when tolerances on those dimensions are considered.
- Baseline dimensioning from a common reference (datum) will reduce the effects of error accumulation.

Datum referencing

- Datum: common fixed position used as a basepoint for dimension reference.
- The location dimensions for patterns of holes are referenced from a datum (or data) hole or surface.
- For patterns on mating parts, the same datum (data) should be used on each part.

Positional tolerances

- Bi-lateral tolerances applied to the basic dimension specifying hole center location.
- Tolerances (and obviously, the basic dimensions) are the same for both the mating patterns of holes.

The tolerances on dimensions of position (or location) are dependent upon the size tolerances, and hence the fits, between the mating parts in the assembly.

The objective is to provide for the maximum possible variation in the locational dimensions (to reduce machining costs), while still ensuring that the parts will assemble under the size conditions specified by the designated fit.

Critical conditions

- the size dimensions of the mating parts are at MMC
- the distance between mating features is at a maximum for one component and at a minimum for the other (2 components).
- the distances between features alternate between a maximum and minimum for one features and a minimum and a maximum for the other (3+ component pairs).
Assemblies of pin/hole components are specified as

- **Fixed pin**: Fixed (in location) cylindrical components on one part in combination with holes on the other part.
- **Floating pin**: Cylindrical components passing through fitted holes on two (or more) parts.

### Fixed pin / 2 mating features

- If the allowance is the same for both pairs, the total positional tolerance is equal to the allowance between mating parts.
- If the allowance between pairs is different, the total positional tolerance is equal to the average of the allowances.

### Fixed pin / 3 or more mating features

- If the allowance between pairs of mating features is the same, the total positional tolerance is equal to one half that allowance.
- If the allowance of one pair is different, the datum is chosen to be that feature pair and the total positional tolerance is equal to one half of the allowance of the other pairs.
- Note that the datum pair allowance does not contribute to positional tolerance.

### Floating pin / 2 mating feature pairs

- Total positional tolerance is equal to twice the allowance between mating pairs.

### Floating pin / 3 or more mating features

- If the allowance be all pairs is the same, the total positional tolerance is equal to that allowance.
- If the a differing allowance is present, the datum is taken at the differing pair and total positional tolerance is equal to the allowance.
Combination fixed / floating pin 2 mating feature pairs

• Total positional tolerance is equal to one half of:
  – the sum of twice the allowance of the floating pin
  – plus the allowance of the fixed pin