

# Estimation of Equivalent Number of Network Elements

## 1. Problem

The normalization factor for the Normalized One-Year Return Rate (NYR) is the number of normalization units that fall within the One-Year Return Rate (YRR) shipment period. For those TL 9000 Product Categories where this normalization factor is the number of network elements (NEs) or systems, this can lead to a problem for mature products. At some point in the life cycle of many products, the new hardware being shipped is being used to fill out or expand existing systems and not to create new systems. This can lead to a situation where the product has a substantial YRR Field Replaceable Unit (FRU) population, but few or even no new systems shipped in the YRR period. This then leads to a greatly distorted normalization factor. It could even become non-reportable if it was zero. The following provides a method to estimate an equivalent NE number based on the YRR FRU population. This in turn allows the calculation of a reasonable and comparable NYR figure.

## 2. Solution

This method yields an estimated “equivalent” number of Network Elements for reporting as the NYR normalization factor (FRs) for products subject to the problem described above. The estimate is based on other TL 9000 data elements. These elements are the number of FRU’s in the Early Return Index (ERI) , YRR and Long Term Return (LTR) populations and the total number of NEs that make up this overall population. The TL 9000 identifier terms for these values are FRsi (ERI FRUs), FRsy (YRR FRUs), FRst (LTR FRUs), and NPRs (Normalization Units used for NPR Measurement where the normalization units are network elements or systems).

The estimate itself is straight forward. First the average number of FRUs per network element is calculated. Then this average is applied to just the YRR FRU population to come up with the equivalent number of YRR network elements that quantity of FRUs represents. The equations for this are:

$$\# \text{ of FRU's per NE} = (\text{FRsi} + \text{FRsy} + \text{FRst}) / \text{NPRs}$$

$$\text{Equivalent NEs} = (\text{FRsy}) / (\# \text{ of FRU's per NE}) = \text{FRs}$$

If the population of network elements being tracked in the NPR measurement is different than the population being tracked by the FRU Return measures, then NPRs will need to be adjusted to account for the total number of network elements included in the overall FR population. One example of this would be where a customer does not return units to the organization for repair, but does send in problem reports.

This technique can also be applied when the NYR normalization unit is “system”. It can only be used for those product categories where the NYR normalization unit is “network element” or “system”. It can only be used on mature products where new units being shipped are primarily going into existing systems.

## 3. Example

ERI, YRR, and LTR FRU populations are 5,000 (FRsi), 10,000 (FRsy) and 185,000 (FRst) units respectively. The total count for the network elements included in the FR population is 500 (NPRs). The number of FRUs per NE would therefore be:

$$\# \text{ of FRUs per NE} = (5000+10000+185000)/500 = 400 \text{ FRUs/NE}$$

And the equivalent number of NEs that may be used for FRs is:

$$\text{Equivalent NEs} = 10000/400 = 25 \text{ NEs (FRs)}$$