The paper presents a parallel wire technique designed and developed in our laboratory for systematic measurements of thermal diffusivity of nano-fluids. Alumina nanoparticles were used for preparation of nano-fluids in an ethylene glycol base fluid. These prepared nano-fluids were examined for their potential of modulation in thermal diffusivity. Measurements of thermal diffusivity have been done at temperatures ranging from 10 to 70 °C and the concentration of nano-particles varies from 0 to 1.0 volume percent. It is shown that the thermal diffusivity of the considered nano-fluids depends on concentration, nano-particle size, as well as the base fluid properties. It is revealed that thermal diffusivity of nano-fluids increases with increasing concentration and size of nano-particles while the temperature increases from 10 to 20 °C, thermal diffusivity decreases and further increase in temperature from 20 to 70 °C, thermal diffusivity increases.