Free abelian groups as an adjunction

Let S be a set, A an abelian group. Then, we have a natural bijection

$$\mathrm{Mor}_{\boldsymbol{Ab}}(\mathbb{Z}[S], A) \xrightarrow{\sim} \mathrm{Mor}_{\boldsymbol{Set}}(S, u(A))$$

where $\mathbb{Z}[S]$ denotes the free abelian group on S and $u(A)$ denotes the set underlying A. This is an example of an adjunction. One can write:-

$$\mathbb{Z}[-] \dashv u$$

Question

Consider $(-)^{\mathrm{ab}}\colon \boldsymbol{Gp} \to \boldsymbol{Ab}$ be the functor which sends a group G to its abelianization G^{ab}. On the other hand, one has $u\colon \boldsymbol{Ab} \to \boldsymbol{Gp}$ which 'forgets' the group being abelian. Show that one has an adjunction of the form:-

$$\mathrm{Mor}_{\boldsymbol{Ab}}(G^{\mathrm{ab}}, A) \xrightarrow{\sim} \mathrm{Mor}_{\boldsymbol{Gp}}(G, u(A))$$