

Monitoring Ladder Logic On/Off Status

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This Application Note details a method of monitoring the on/off status of the Ladder Logic block for TMR systems that use Ladder Logic. This addresses the issue described in Service Bulletin 01419 pertaining to the monitoring the LL_VALUES.RUNNING output use in Ladder Logic.

Refer to Figure 1 below.

1. Create a Ladder Logic rung that toggles after every pass through Ladder Logic. This is the LADDER.LL_VALUES.MW_B_1000 line shown below. This BOOLEAN then creates a square wave in the Ladder Logic program (TRUE-FALSE-TRUE-FALSE-TRUE, etc). When the Ladder Logic program is stopped, the toggling stops. The watchdog is designed to detect this.
2. Create and connect the Ladder Logic blocks as shown below. Verify that the DLY_TIME input is longer than period of the toggle frequency.
3. Instead of monitoring the LL_VALUES.RUNNING output, the output of the LL_NOTRUN.NOT block is monitored to determine the on/off status of the Ladder logic.

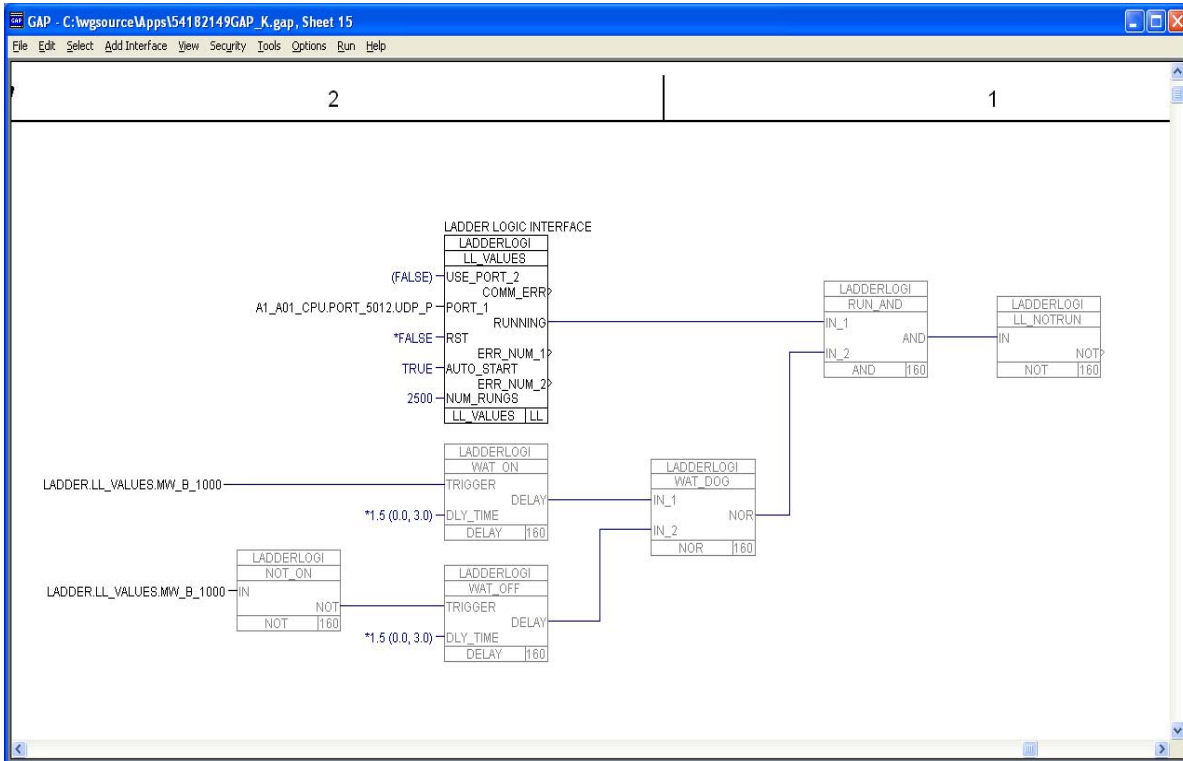


Figure 1. GAP / Ladder Logic Interface

When Ladder Logic is running, the output of the LL_NOTRUN.NOT block will be FALSE. This is because the outputs of the WAT_ON.DELAY and WAT_OFF.DELAY blocks will be FALSE since when toggling the TRIGGER, the DLY_TIME value will not allow the output to go TRUE before a new TRIGGER input. These outputs result in WAT_DOG.NOR becoming TRUE, and when ANDed with LL_VALUES.RUNNING TRUE, result in a TRUE value out of RUN_AND.AND. This value is then inverted to get the resulting FALSE output of the LL_NOTRUN.NOT.

When Ladder Logic is not running, the LADDER.LL_VALUES.MW_B_1000 will stop toggling. This means that either the output of WAT_ON.DELAY or WAT_OFF.DELAY will be high, but not both because of the NOT_ON.NOT block inversion. The WAT_DOG.NOR output will now be FALSE, which makes the RUN_AND.AND result FALSE. This results in a TRUE value on the output of LL_NOTRUN.NOT. Note that this case is independent of the RUNNING output of the Ladder Logic Interface.

The output of LL_NOTRUN.NOT may now be used to determine if Ladder Logic is running. A TRUE value output indicates Ladder Logic is NOT running, while a FALSE value indicates that Ladder Logic is running.

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Please reference publication **51308.**



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