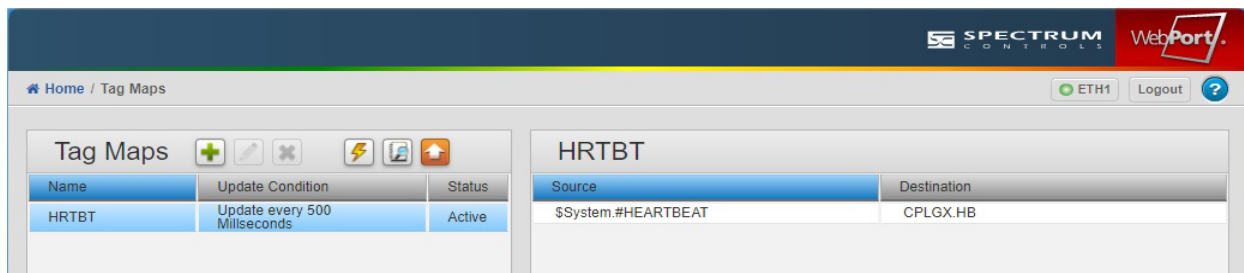


The Universal Industrial Gateway is a simple, easy to use, device for bridging multiple types of PLCs with multiple protocols using one device. One of the advantages it brings is that the PLC does not need to be configured to handle the communications, making setup and deployment simple and fast. In some applications it is necessary to determine the status of the communications without complicated PLC programming. Because of this, a “Heartbeat” tag was created that PLC’s can use to verify that the Gateway is indeed communicating with them. This paper will discuss what the Heartbeat is and how to utilize it.

The Universal Industrial Gateway uses a series of devices, tags and tag maps to bridge communications between multiple PLCs using multiple protocols. This includes pre-defined Device labeled “\$System” with a series of pre-defined Tags. The Heartbeat is one of these tags which has a static value of “1” and can be written to a PLC with a frequency ranging from once every 1ms to once every day. To use this tag the PLC is configured to monitor the status of its corresponding tag to verify that it is being updated I.E. the Gateway is actively communicating with the PLC.

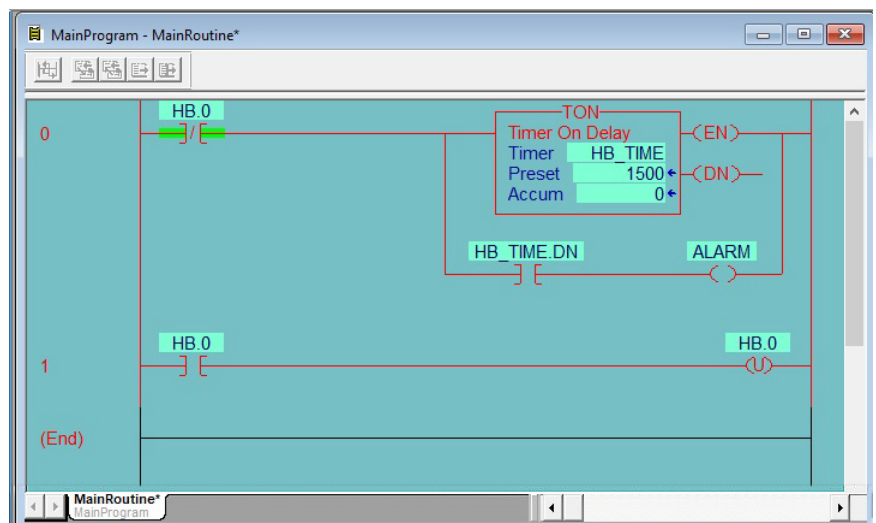
For the purpose of this paper there will be three examples of how to use the Heartbeat tag: one for Logix type PLCs, another for MicroLogix (SLC) type PLCs and a third for a Micro850 PLC. All three examples are similar in operation and very basic but effective in monitoring the Heartbeat tag.

To utilize the Heartbeat tag, the Gateway must have a tag map that has it as the source tag being written to a corresponding destination tag in the PLC.

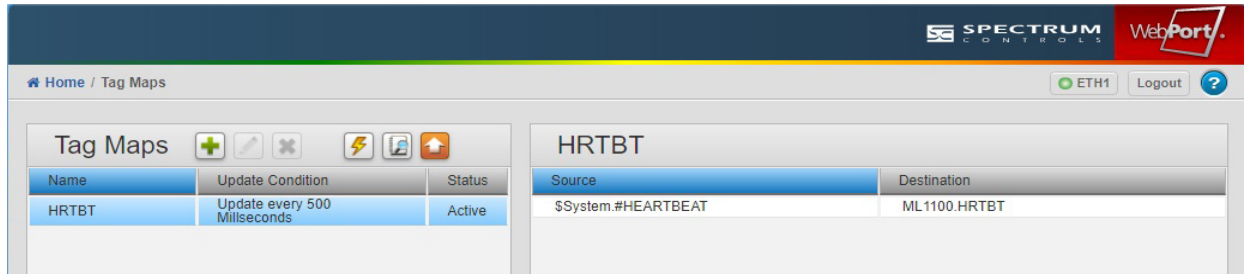


In the Logix example, a CompactLogix is configured with a tag labeled “HB” which is being updated every 500ms using the Heartbeat tag.

In Rung 0 of the sample ladder logic, the tag “HB” defaults to “0” which sets the bit “HB.0” to logic low enabling the timer “HB_TIME”. When the Gateway sends a “1” to the tag “HB”, the bit “HB.0” is set to logic high disabling the timer. If the timer expires before the tag “HB” is set to “1” the bit “ALARM” is set to logic high. If the timer has expired and the tag “HB” receives a “1”, the timer is no longer enabled, the done bit is unlatched which sets the bit “ALARM” back to logic low. Rung 1 of the logic uses bit “HB.0” to unlatch itself starting the process over again.

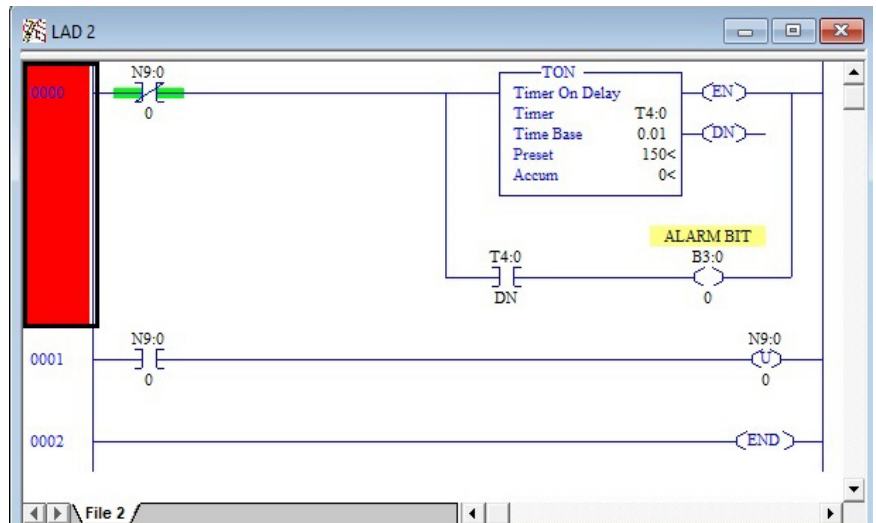


In the MicroLogix example, the only difference in the Gateway is the Heartbeat tag is being written to the Integer “N9:0” represented in the image as the destination “ML1100.HRTBT”.

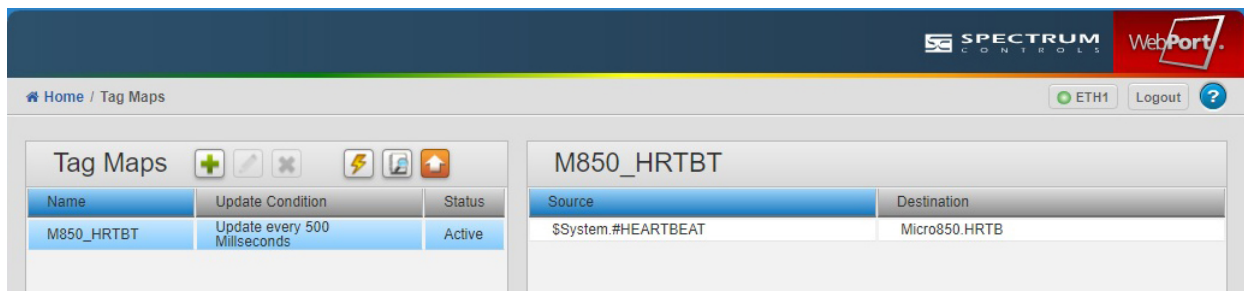


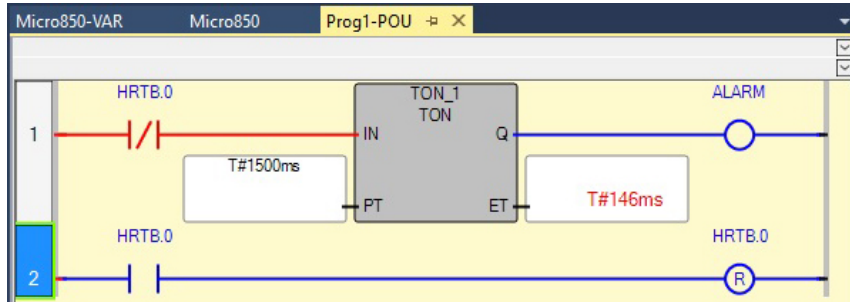
The ladder logic is the same except that it is using integer files rather than tags. As with the Logix example “N9:0” defaults to “0” which set the bit “N9:0/0” to logic low enabling the timer “T4:0”.

When the Gateway sends a “1” to “N9:0” the bit “N9:0/0” goes logic high disabling the timer. If the timer goes “Done” before “N9:0” is set to “1” the alarm bit “B3:0/0” is set. If the timer’s done bit is set and “N9:0” is then set to “1”, the timer is disabled, its done bit unlatches which sets the alarm bit back to logic low. Rung 1 of the logic uses the bit “N9:0/0” to unlatch itself restarting the process.



As expected, the Micro850 uses the same process with the Heartbeat Tag being written to the Micro850’s “HRTB” Tag.





As with the other two examples the ladder logic is fundamentally the same in that the tag “HRTB” being “0” enables the timer and when it changes to “1” the timer is disabled and the bit “HRTB.0” resets it to “0”. If the Gateway does not send a “1” to “HRTB” the time will eventually expire enabling the bit “ALARM”.

Note, in all three PLC types, the Heartbeat tags within the PLC must be a global tag and the rungs must be in the order they are in the examples for the program to function properly.

This is one example of how to utilize the Gateway’s Heartbeat function. There are many other possible ways to use this feature, but it is important to keep in mind that the tag remains at a constant value of “1”. If you prefer to use a changing value, the Gateway also has a tag labeled “RANDOM” which cycles randomly from 1 thru 99 approximately once every 5ms and can be updated to the PLC once every 25ms or less depending on how much other traffic the Gateway is handling.