Introduction – Profibus DP Slave State Machine

To contextualize the functionality of the option NA_To_Abort (Not Answer to Abort), a brief explanation about how the PRM – Profibus Remote Master establish the communication with the Profibus devices. The example below shows the state machine for each Profibus device against the sequence adopted by the PFB Stack from the PRM to validate the whole profibus cycle and finally starts the communication.

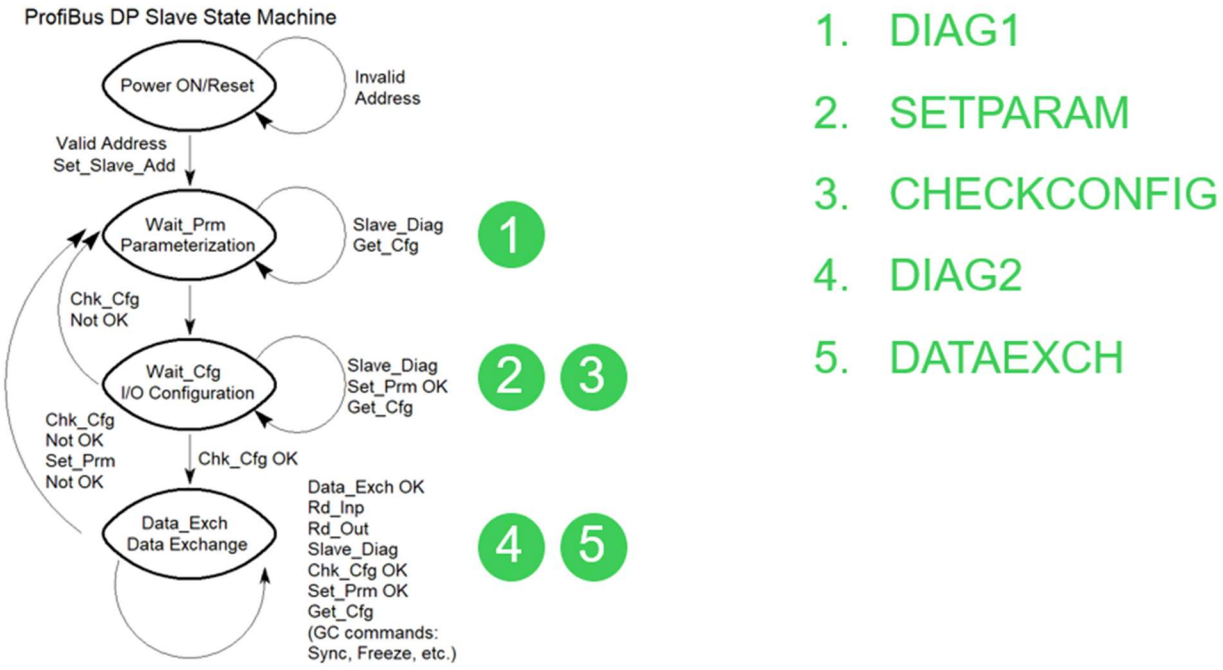

Figure 1 – Profibus DP Slave state machine and PFB Stack from PRM

After the Profibus device be pre-configured with the node defined at Control Expert application, installed and energized, the Stored Data to Device from PRM needs to be performed. This command will send the configuration to the Profibus devices and to successfully achieve the DATA EXCHANGE, these 5 steps are necessary:

DIAG1 – The device generates the first diagnostic

SETPARAM – Parametrization set

CHECKCONFIG – Configuration check.

DIAG2 – The device generates the second diagnostic.

DATAEXCH – Data exchange starts between the device and the PRM.

Context – Communication flow initialization failure

The communication flow initialization failure can be described when the PRM still see the device at DIAG2 or DATAEXCH after the failure occurrence. There are multiple factors that could cause this behavior and different variables such quality of the signal/network, therefore the method forces the PRM get into the flow initialization failure is perform two actions in a live system.

- Replace the node of an existing device configured in the network with another node that is showing (Sync) but with a different GSD to generate GSD conflict (Wrong GSD).
- Swap the node from device configured previously with the wrong GSD to another node in the PRM network, at which point the initialization flow is interrupted. And any device that leaves the network at that time isn't automatically reconfigured.

As the Profibus cycle is theoretically completed from the PRM state machine perspective, the PRM will just understand that device is still there exchanging data, but there is no data flow between the PRM and the device. Therefore, as the state machine stays at DIAG2/DATAEXCH phase the PRM will not restart the communication by itself without intervention.

Additionally, if any other device gets out of the PRM network, the PRM will not understand and will still see the status as DATAEXCH which does not reflect the real status of the communication. The reason is because when the initialization failure is present, the PRM stop to send SYNCs through the Profibus network. Without the SYNCs the PRM cannot detect the presence of new and/or existent devices that eventually are removed from the network.

Solution - NA_To_Abort

The option NA_To_Abort is originally developed for Redundant DP systems, to avoid any disruption during the swap over between 2 Profibus DP masters. In a scenario with a 2nd master, in case of switch over, the master defined as primary will keep seeing the device in DATAEXCH status if the the option NA to Abort is not checked.

Enabling the NA to Abort option, brings the capability for the PRM to reset the machine state after the attempts to re-establish the communication (retry) to DIAG1 which is the first step to initialize the communication between PRM and the device. With the NA_To_Abort enabled, the PRM will wait for the device to came back to the network (example: power cycle the device after some possible issue in the field) and then follow the sequence of Profibus DP Slave State Machine to establish the communication.

To enable this option, go to DTM Browser and open the PRM configuration. The option must be enabled individually, therefore is necessary open all the devices and navigate to Profibus Settings as shown in the follow screen capture

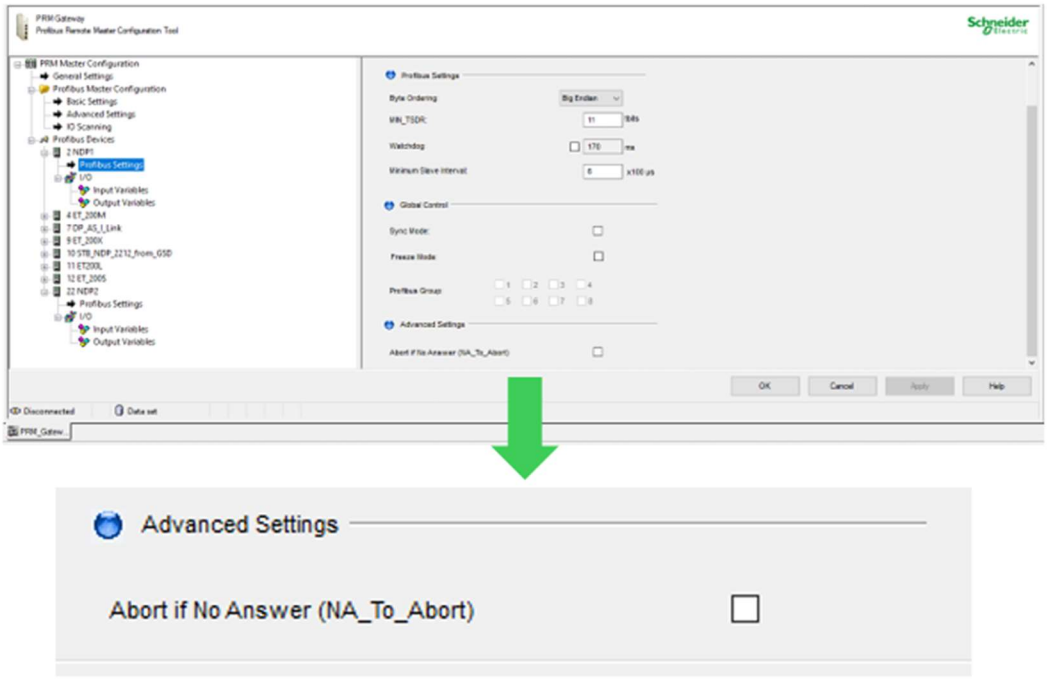

Figure 2 – NA_To_Abort option at PRM Gateway DTM

The NA_To_Abort is only 100% effective if all devices under the PRM network have the NA_To_Abort enabled, otherwise the functionality **will not work**.

PS.: The modification requires Rebuild the application, PLC full download and store data to the PRM.

Final considerations

Schneider Electric recommends the application of NA_To_Abort for Profibus Remote Master applications along with best practices of Profibus network such as cabling, termination etc in order to guarantee a good functionality of the Profibus system and avoid the communication flow failure.