



# ATOM SGA-1000

## 3-Stream Analyzer Operation Manual

## INTRODUCTION

The 3-stream Analyzer is operated entirely by the DCS via Modbus (it can, however, be calibrated either manually, or by the DCS via Modbus). This manual provides the sequence of operation that the DCS should follow to run stream analysis, switch between streams, and/or calibrate the unit.

The manual has taken into consideration specific state transitions that the DCS will encounter while running analyses. For example, transition from “Holding” state to “Run” state, or, from “Alarm” state to “Run” state. Each transition requires the DCS to follow a specific sequence of operation, which is addressed in the sub-sequent sections.

The screen-shots of the actual Analyzer GUI (Graphics User Interface) provided in the manual are solely to make it easier to understand and correlate the Modbus Registers to the actual menu items in the GUI. Otherwise, the manual is geared totally towards Analyzer operation by the DCS via Modbus Registers.

For the scope of this manual, the following color codes are used to better segregate the different types of Modbus Registers:

ATOM MODBUS REGISTERS		
Name	Register Designation	Default Data Type
Coils/Boolean	R00001 – R00032	Boolean; read/write
Input Status	R10001 – R10040	Boolean; read only
Input Register pairs	R30001 – R30080	32-bit Integer; read only
Input Registers	R30083 – R30120	16-bit Integer; read only
Input Register	R30121 – R30158	16-bit Integer; read only
Input Register pairs	R30165 – R30274	32-bit Integer; read only
Holding Register	R40001 – R40040	16-bit Integer; read/write
Holding Register pairs	R40041 – R40120	32-bit Integer; read/write
Holding Register pairs	R40121 – R40200	32-bit Integer; read/write
Holding Registers	R40201 – R40240	16-bit Integer; read/write

## PRINCIPLE OF OPERATION

The ATOM Analyzer is a 3-stream Analyzer, however it utilizes a single Sample Valve to inject samples for analysis. The Sample Conditioning System switches between streams depending on the Digital Output activated by the ATOM Analyzer, although internally the ATOM Analyzer continuously runs a single stream (Analyzer Stream 1).

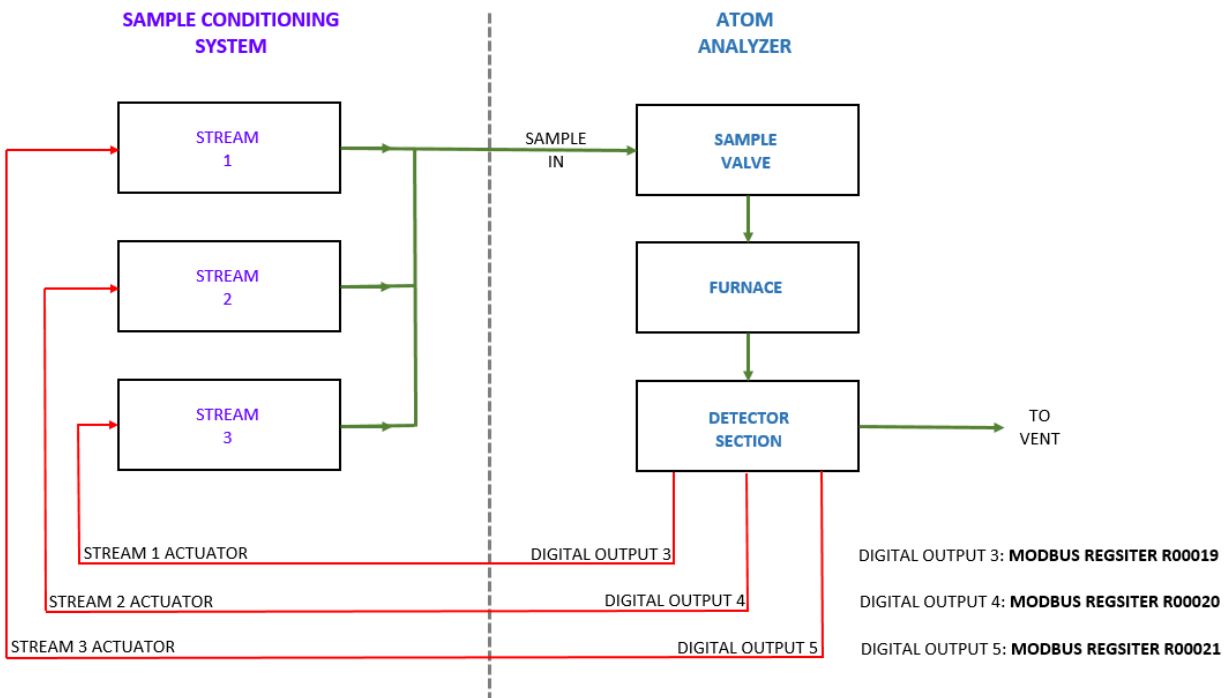


Figure 1.1 – Principle of Operation

## INITIAL SET UP

Analyzer Stream 1 must always be enabled/selected (**Modbus Register R00033 = 1; Enabled**) as long as analyses are to run. If Analyzer Stream 1 is disabled/deselected, the analyses will stop after the current run and the Analyzer will go into “Holding” state until re-started.

The Cycles number (**Modbus Register R40041**) must be a non-zero number for analyses to run.

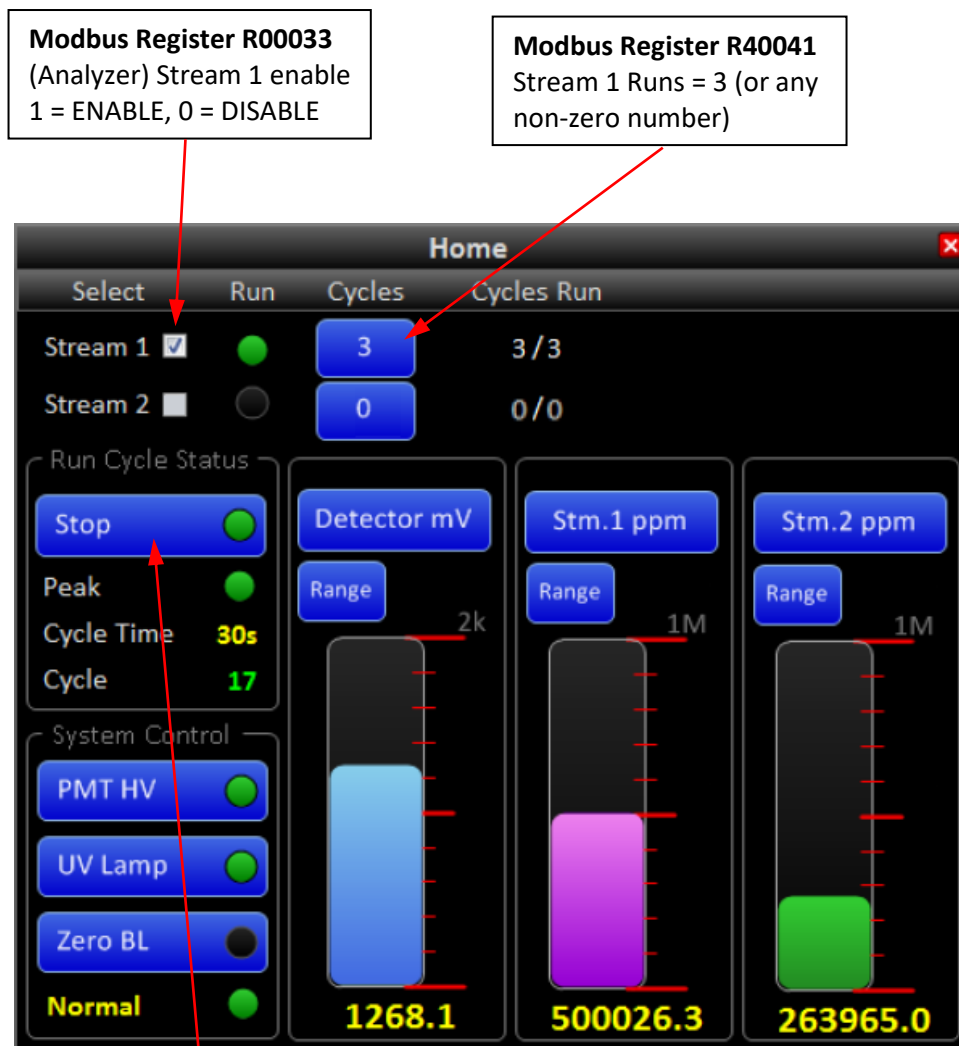


Figure 1.2 – Home Screen

**Modbus Register R00002**  
ARun – Start/Stop Analyzer  
1 = Start, 0 = Stop

Set the number of cycles to run during calibration (**Modbus Register R40027**), the Purge time in seconds (**Modbus Register R40016**), and the Cal Span concentration (**Modbus Registers R40095-R40096**).

Once this initial set up is completed, the Calibrations can either be actuated manually at the Analyzer, or by DCS via **Modbus Register R00004** (Run Cal Span (1 = Start), and automatically Stops after preset calibration cycles are run). The new RF can be calculated and saved by the DCS via **Modbus Register R00009** (1 = calculates and saves the new RF).

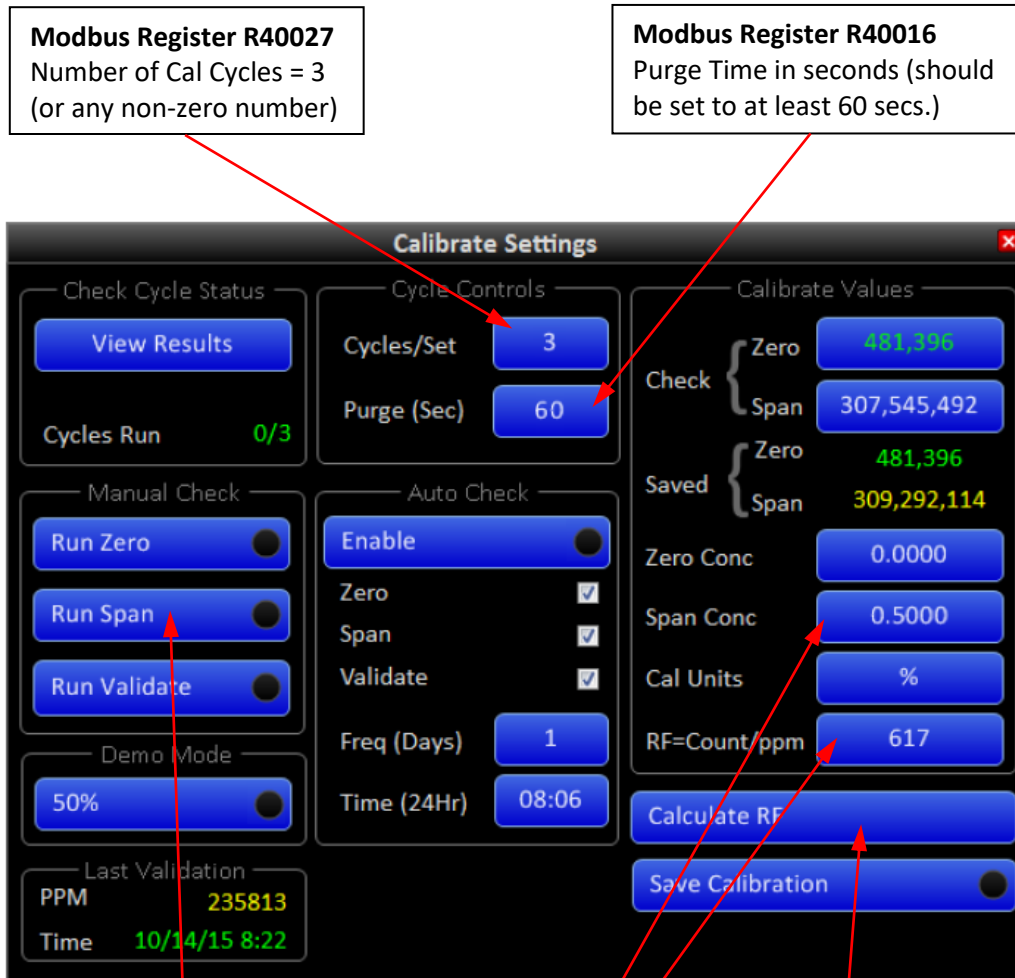


Figure 1.3 – Calibration Settings Screen

The System Settings screen contains all the Alarms and Warnings information.

Parameter	State	Alarm	Warn	Low Alarm	Value	High Alarm	Set Point
Loss of Purge	●	<input checked="" type="checkbox"/>	<input type="checkbox"/>				
O2 Pres. - Stop	●	<input checked="" type="checkbox"/>	<input type="checkbox"/>				
Furnace Temp. Low - Inhibit Run	●	<input checked="" type="checkbox"/>	<input type="checkbox"/>				
DI4	●	<input type="checkbox"/>	<input checked="" type="checkbox"/>				
DI5	●	<input type="checkbox"/>	<input type="checkbox"/>				
DI6	●	<input type="checkbox"/>	<input type="checkbox"/>				
DI7	●	<input type="checkbox"/>	<input type="checkbox"/>				
Zero Value	●	<input type="checkbox"/>	<input type="checkbox"/>	12	18.90	10000	
Span Value	●	<input type="checkbox"/>	<input type="checkbox"/>	0	12,447.48	550000	
Stream 1 Value	●	<input checked="" type="checkbox"/>	<input type="checkbox"/>	0	12,603.38	550000	
Stream 2 Value	●	<input type="checkbox"/>	<input type="checkbox"/>	0	6,800.16	550000	
MFC 1: cc/min	●	<input type="checkbox"/>	<input checked="" type="checkbox"/>	0	0.0	0	120
MFC 2: cc/min	●	<input type="checkbox"/>	<input type="checkbox"/>	0	0.0	0	0
TC 1: deg C	●	<input type="checkbox"/>	<input type="checkbox"/>	0	26.5	80	70
TC 2: deg C	●	<input type="checkbox"/>	<input type="checkbox"/>	1040	1050	1060	1050
TC 3: deg C	●	<input type="checkbox"/>	<input type="checkbox"/>	200	25.9	40	30

Figure 1.4 – System Settings Screen

If any of the Digital Inputs (DIs) checked for “ALARM” are triggered, the Analyzer will not run analyses, and will flash “ALARM!” on the main menu tab as shown below. The **Modbus Register R10008** for the Global Alarm will be “RESET” (=0), and the Alarm Status **Modbus Register R40026** will have a value greater than 0.



Figure 1.5 – System Settings Screen

If any of the Digital Inputs (DIs) checked for “WARN” are triggered, the Analyzer will flash “WARNING” on the main menu tab as shown below. However, the Analyzer will continue to run analyses. The Warn Status **Modbus Register R40040** will have a value greater than 0.



Figure 1.6 – System Settings Screen

Figure 1.7 below shows the Digital Inputs and Outputs used by the ATOM Analyzer. The Digital Outputs (DO3, DO4 and DO5) are used to activate streams 1, 2, and 3 respectively. Figure 1.7 also shows the Modbus Registers that correspond with the respective Digital Outputs.



Figure 1.7 – Digital I/O Status Screen

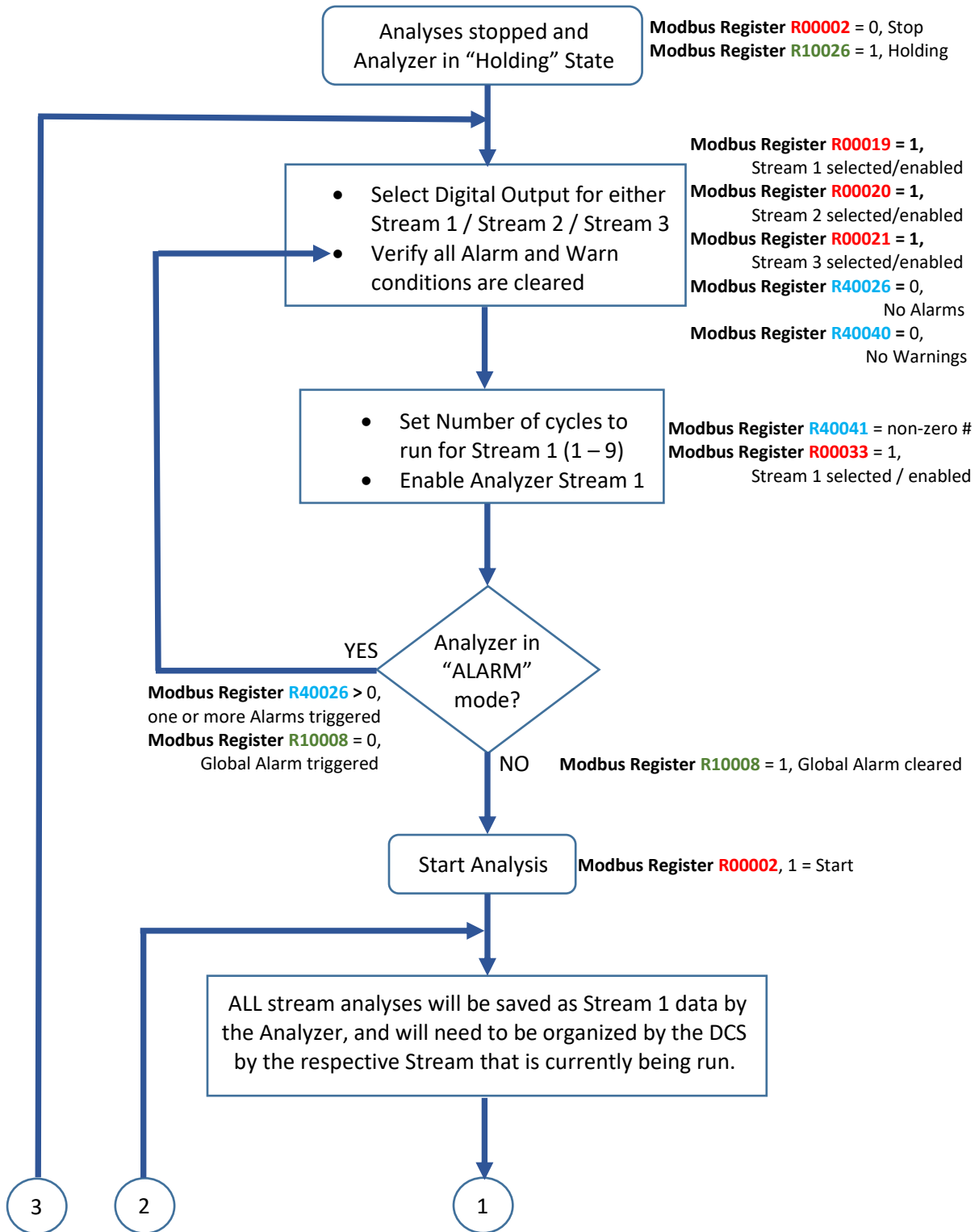
**Modbus Register R00019**  
Actuate Stream 1

**Modbus Register R00020**  
Actuate Stream 2

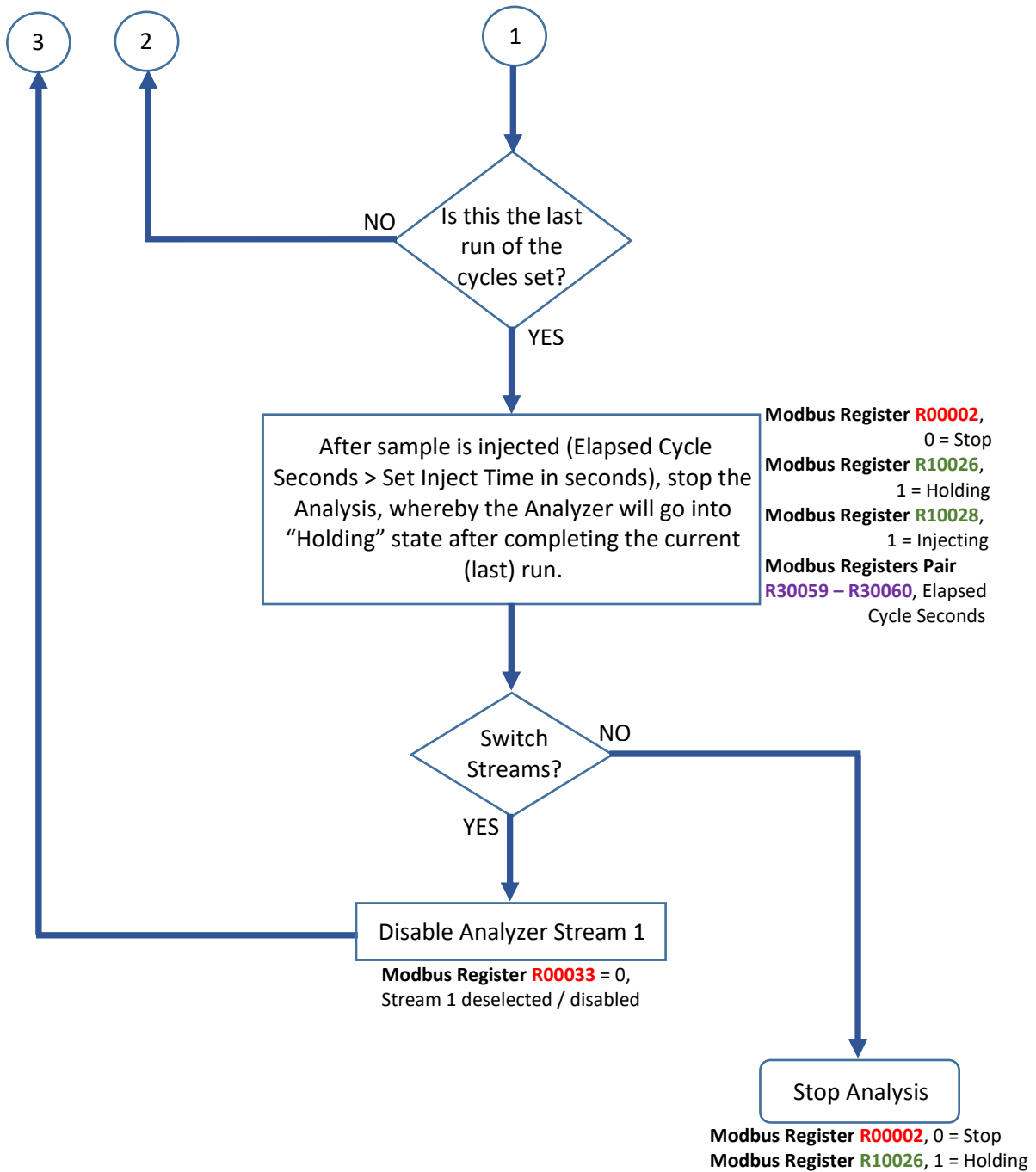
**Modbus Register R00021**  
Actuate Stream 3



## STARTING ANALYSES FROM “HOLDING” STATE (ANALYSES STOPPED)

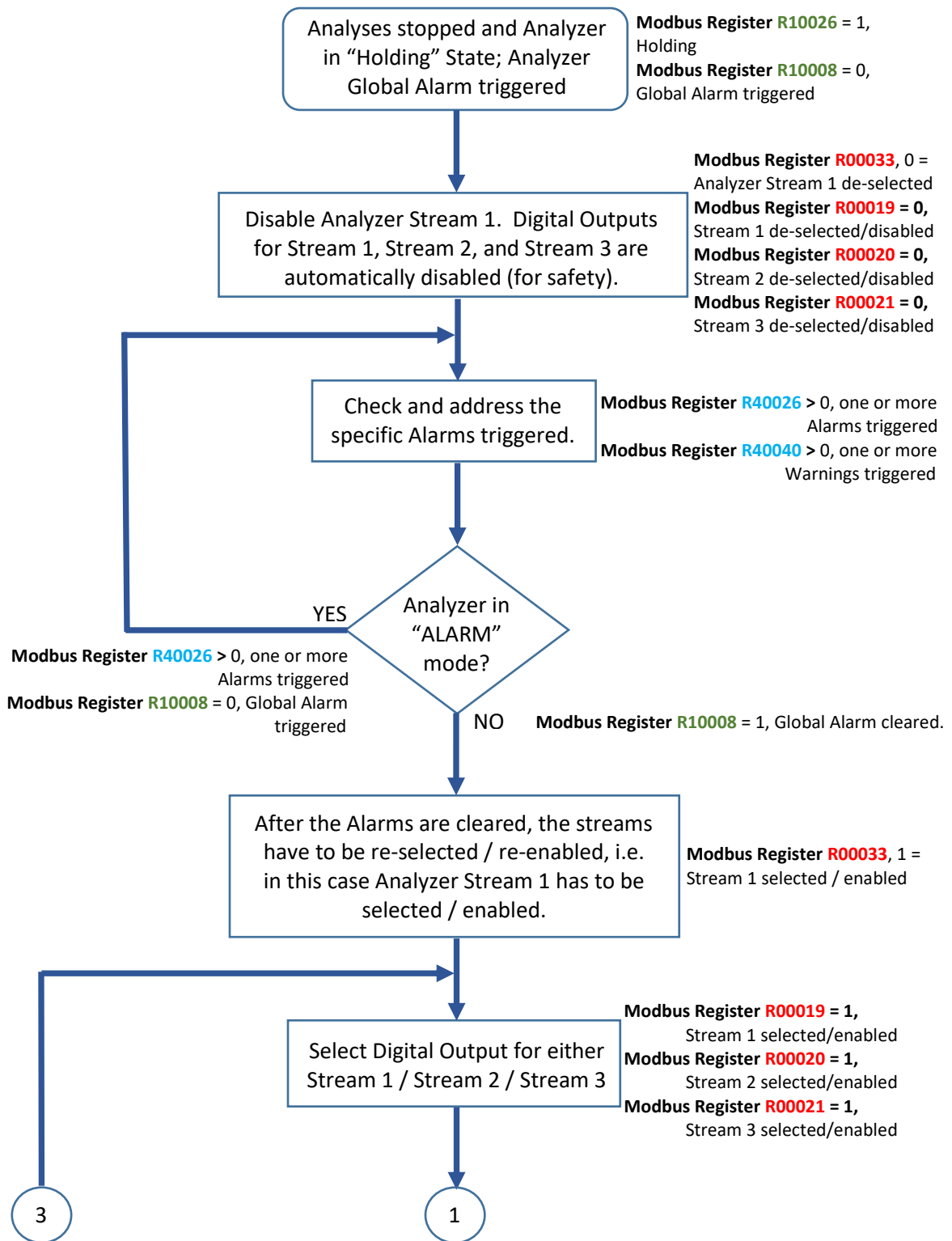


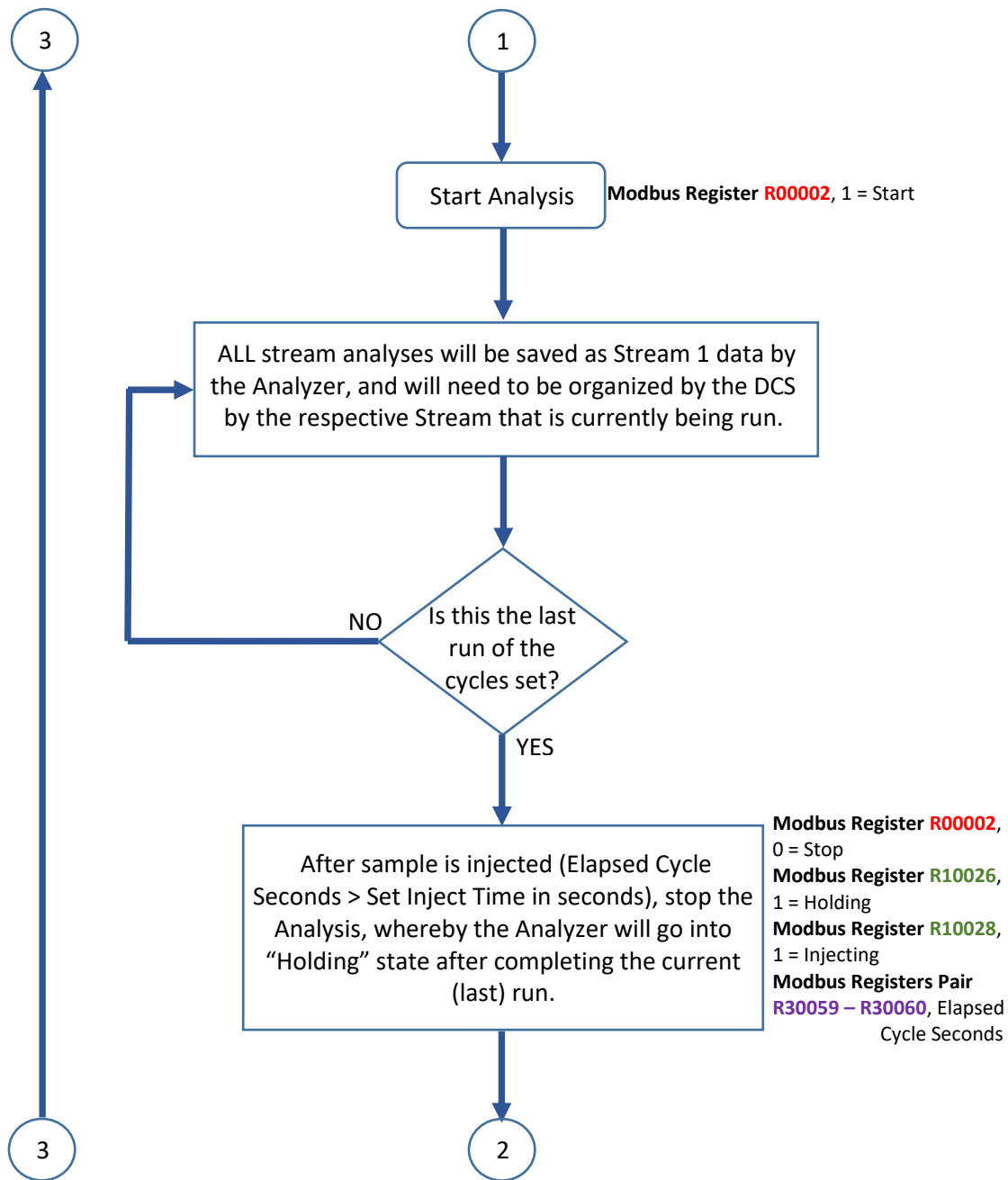


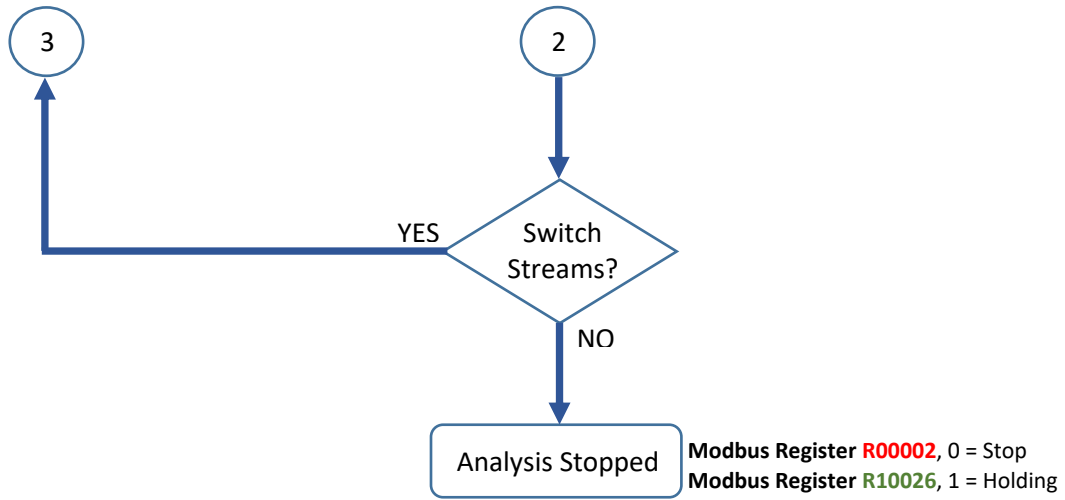




## RECOVERING FROM “ALARM” STATE WHILE RUNNING ANALYSES



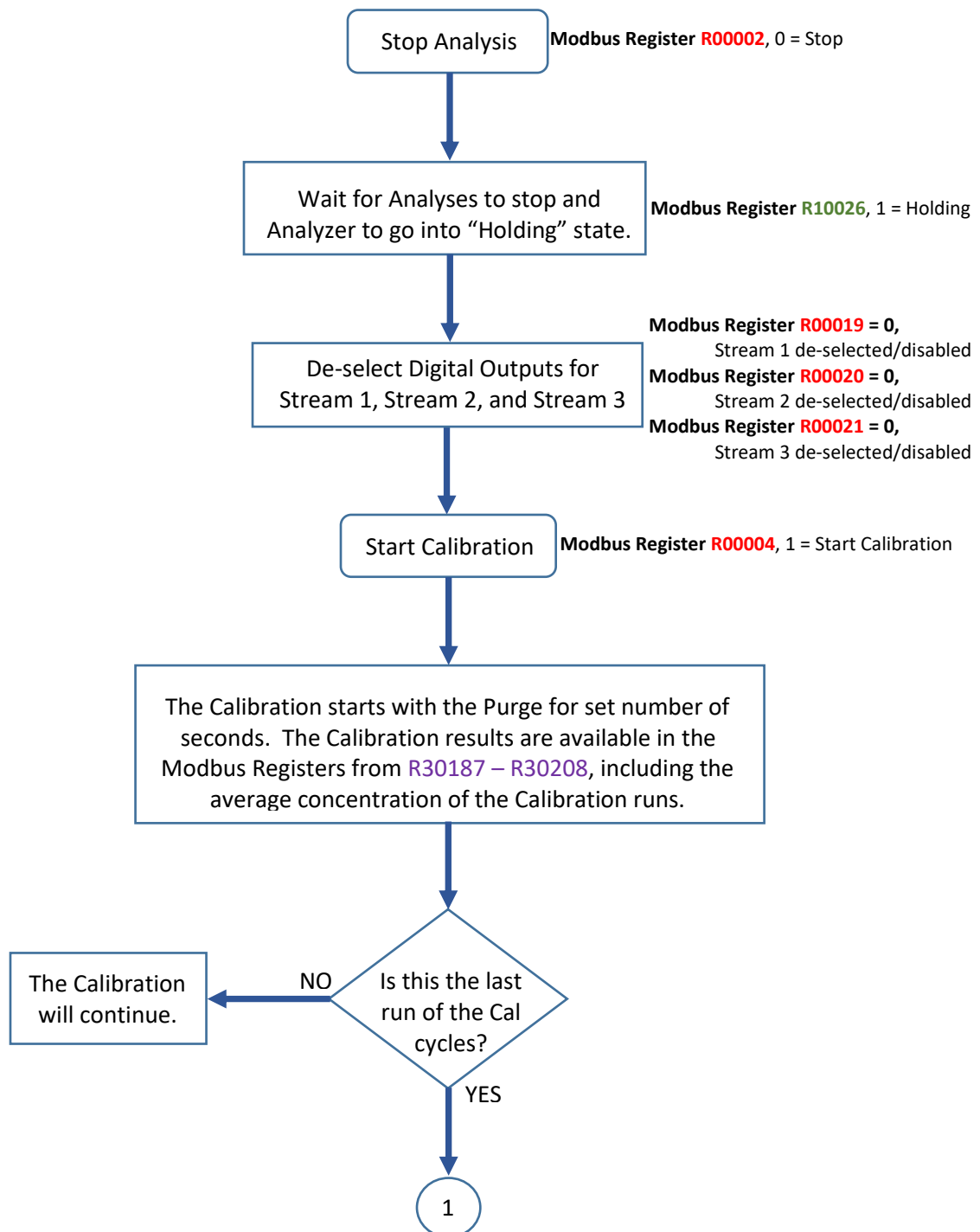


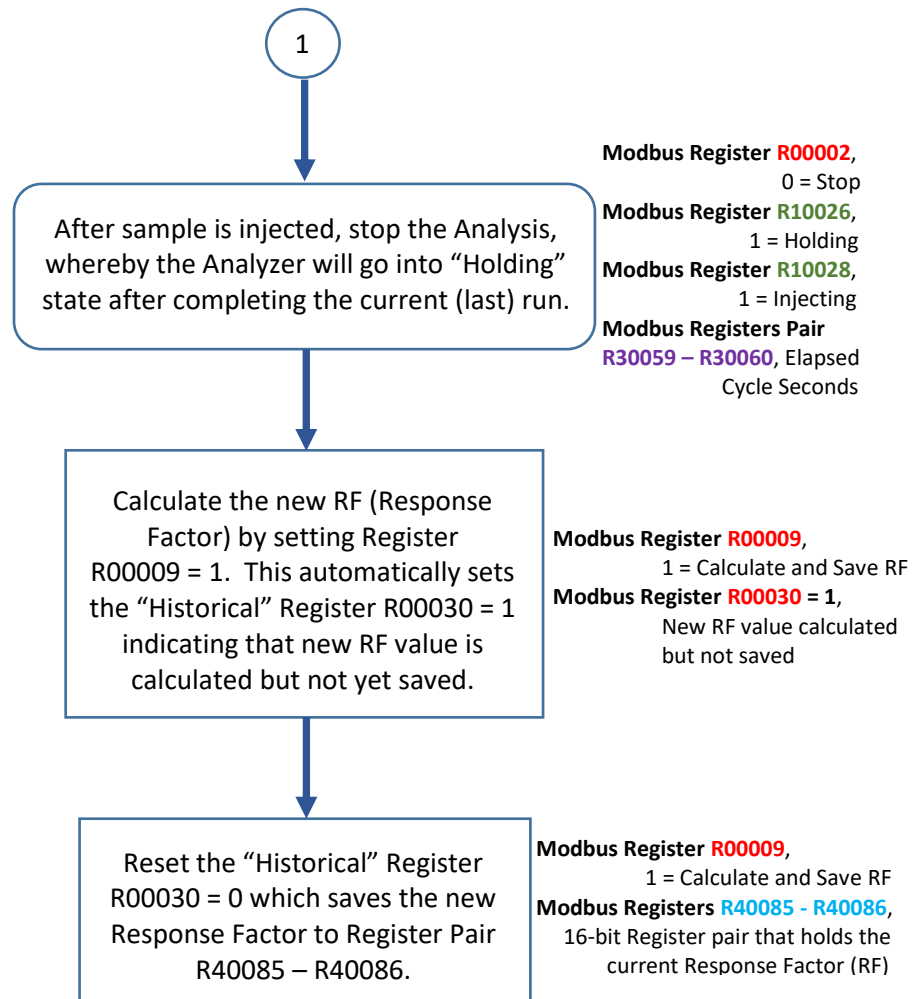


## CALIBRATING THE ANALYZER

### SWITCHING FROM “RUNNING” ANALYSES TO “CALIBRATE”

This procedure assumes that the initial setup such as, setting the purge time, number of calibration cycles, and Cal Span concentration, etc. has already been completed.





**\*\* Note:**

To check if the Analyzer is calibrated correctly, re-run the Calibration (i.e. Validate the Calibration without calculating and saving a new RF), and check if the measured Stream concentration is correct, and within acceptable standard deviation.

If not, re-calibrate the Analyzer by the above-mentioned procedure till it is correctly calibrated.

The Analyzer can also be calibrated manually at the instrument itself.



## RECOVERING FROM “ALARM” STATE WHILE CALIBRATING ANALYZER