

L C D - D I S P L A Y (3).

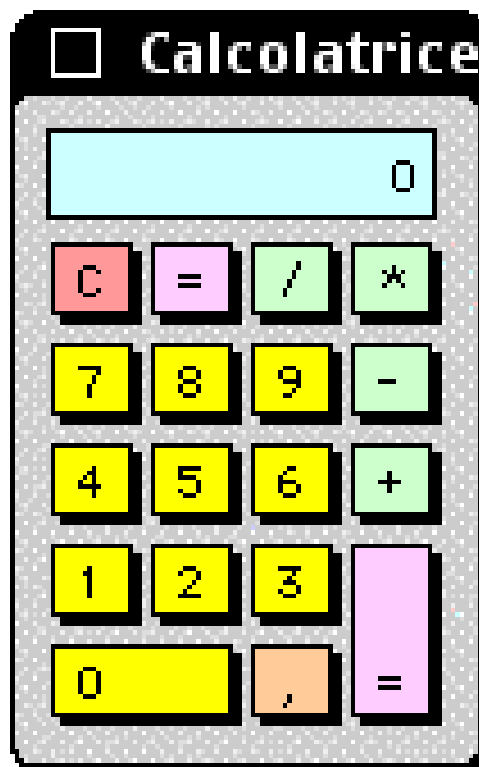
S I M P L E C A L C U L A T O R .

This program is similar to last one of **Chapter 6**. The unique differences are the replacement of serial console on **PC** with **LCD** display and **Keyboard** available on **GMM TST3**. All the other operations are basically the same.

The program describes how to realize a simple calculator able to perform the **4** basic operations. It is obvious that you can realize even more complex operations in a very simple way, in order to resolve expressions really more articulate.

With this chapter we have completed the examination of the features available on **GMM TST3** evaluation board. As you can recognize this and the previous chapters have shortly described all the **Macro** sections of the evaluation board.

In following chapters we'll start the examination of some additional hardware devices. These will increase your knowledge and enlarge the possibility to examine some new components.



Simple Calculator for the Four Basic Operations.

Example.023. 4 Operations Calculator With Keyboard and LCD Display.

Added Definitions:

None

Added Declarations:

None

Added Instructions:

None

Added Operators:

None

Example program **23** of **BASCOM AVR** course.

It manages a calculator able to perform the **4** basic operations, through an alphanumeric display with **2 x 20** characters and a matrix keyboard with **4 x 4** keys.

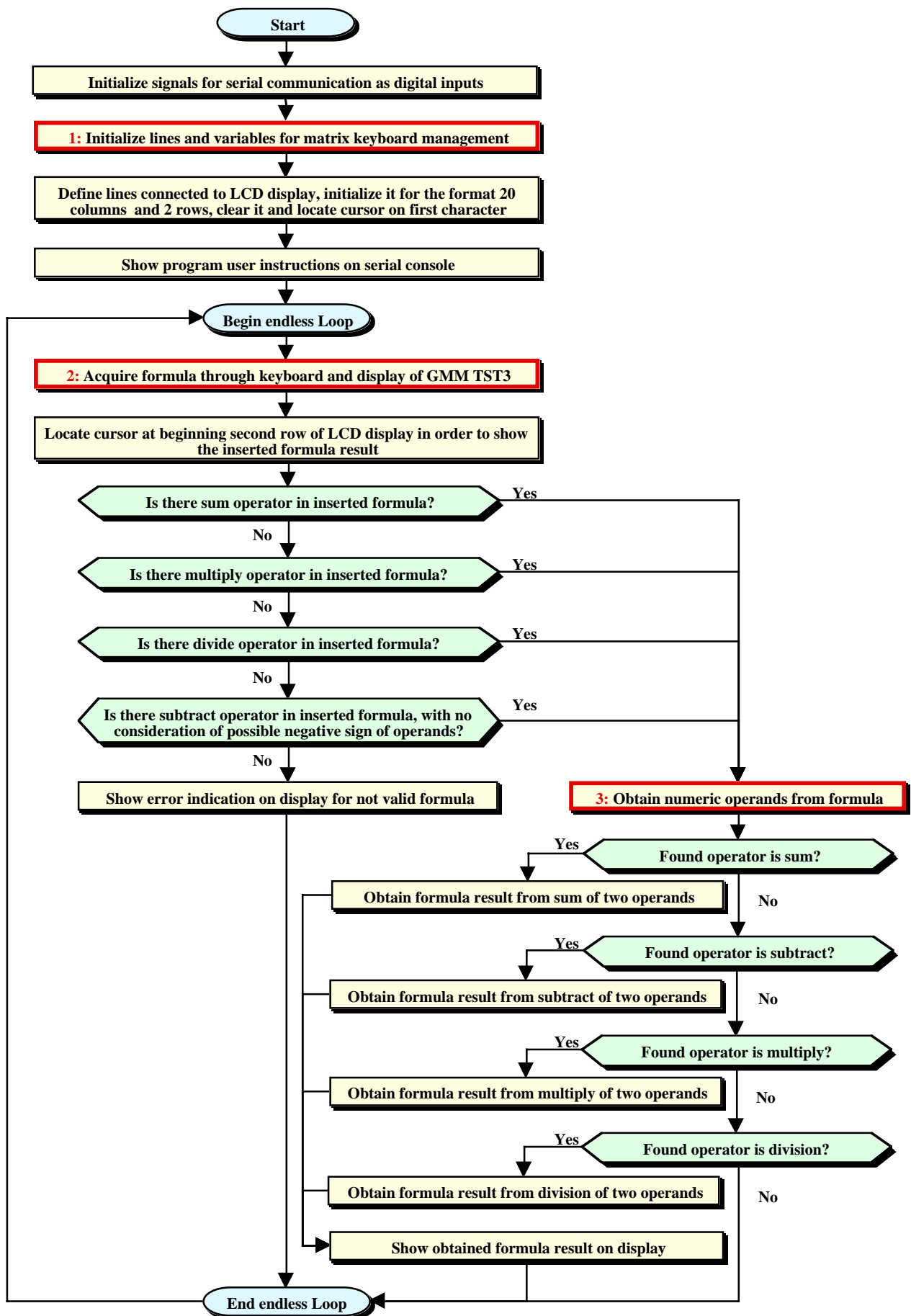
The program requires a formula composed by a first operand, one operator and a second operand on the same row and then it shows the result obtained from the formula on the second row. The operands can have sign and decimal point, up to **8** maximum significant digits.

The formula is inserted and the result is displayed through the matrix **Keyboard** and **LCD** display, available on **GMM TST3**.

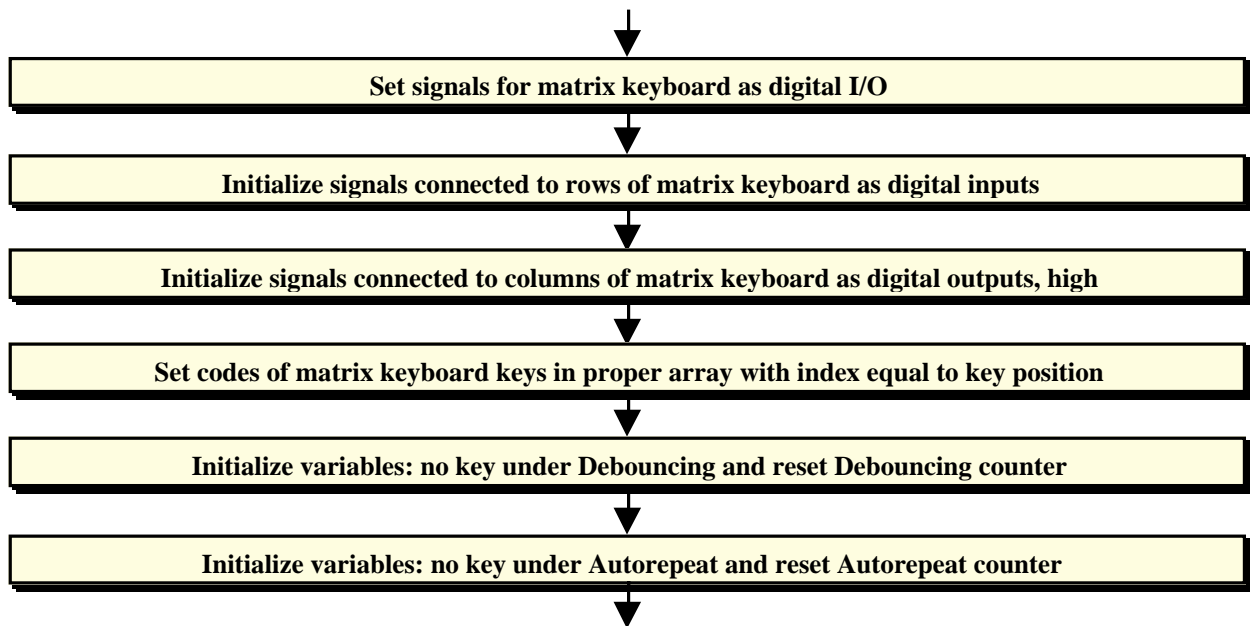
Moreover the program present itself and show the user instructions on a serial console provided of monitor and keyboard and it must communicate with a fixed physical protocol at **19.200 Baud, 8 Bit x chr, 1 Stop bit, No Parity**.

This console can be another system capable to support a serial **RS 232** communication. In order to simplify the use it can be used a **PC** provided of one **COMx** line, that execute a terminal emulation program as **HYPERTERMINAL** or the homonym modality provided by **BASCOM AVR** (see **IDE Configuration**).

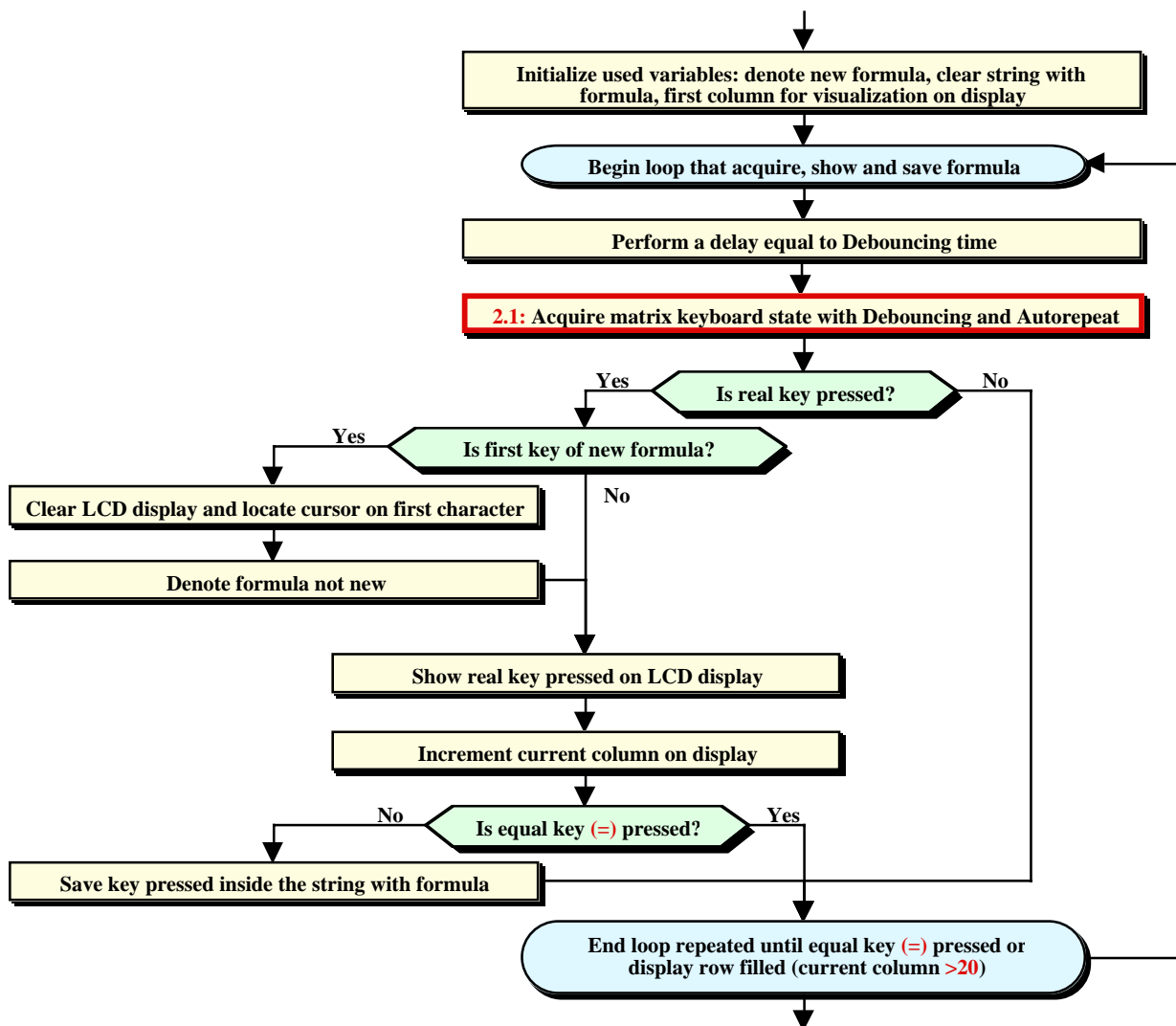
The program works only when the **GMM AM08** is mounted on **Z1** socket of **GMM TST3!!**



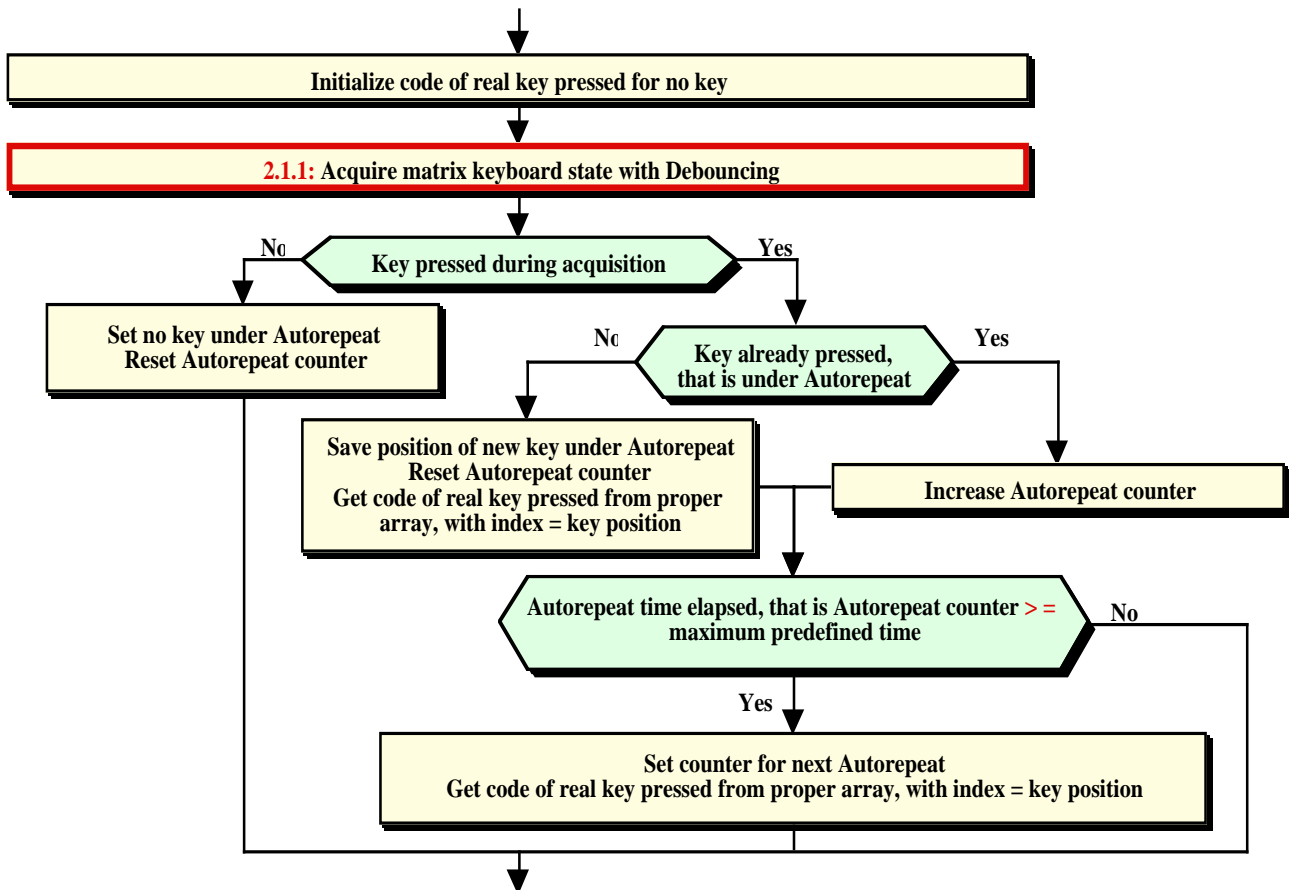
Flow Chart Diagram of the Program.



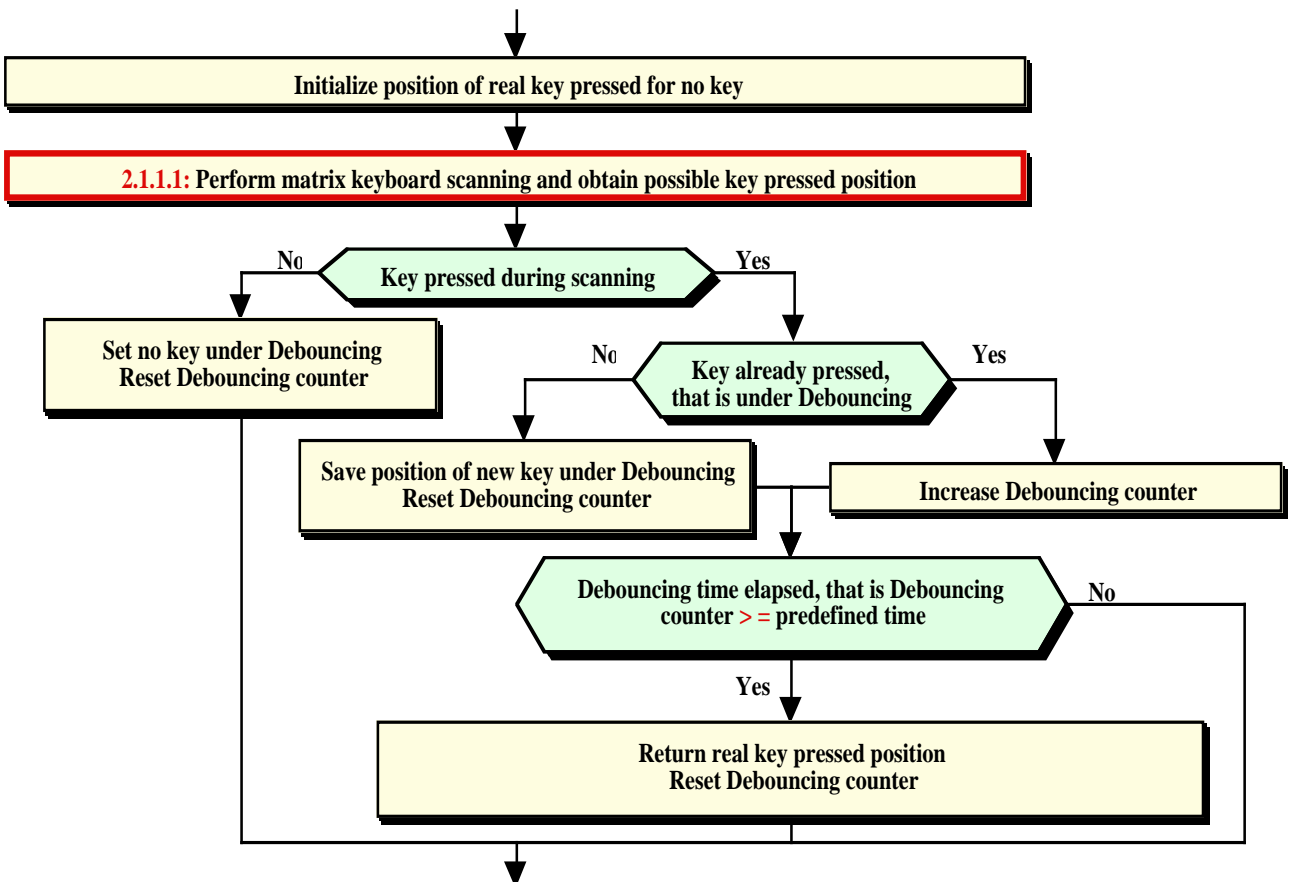
1: Initialize Lines and Variables for Matrix Keyboard Management.



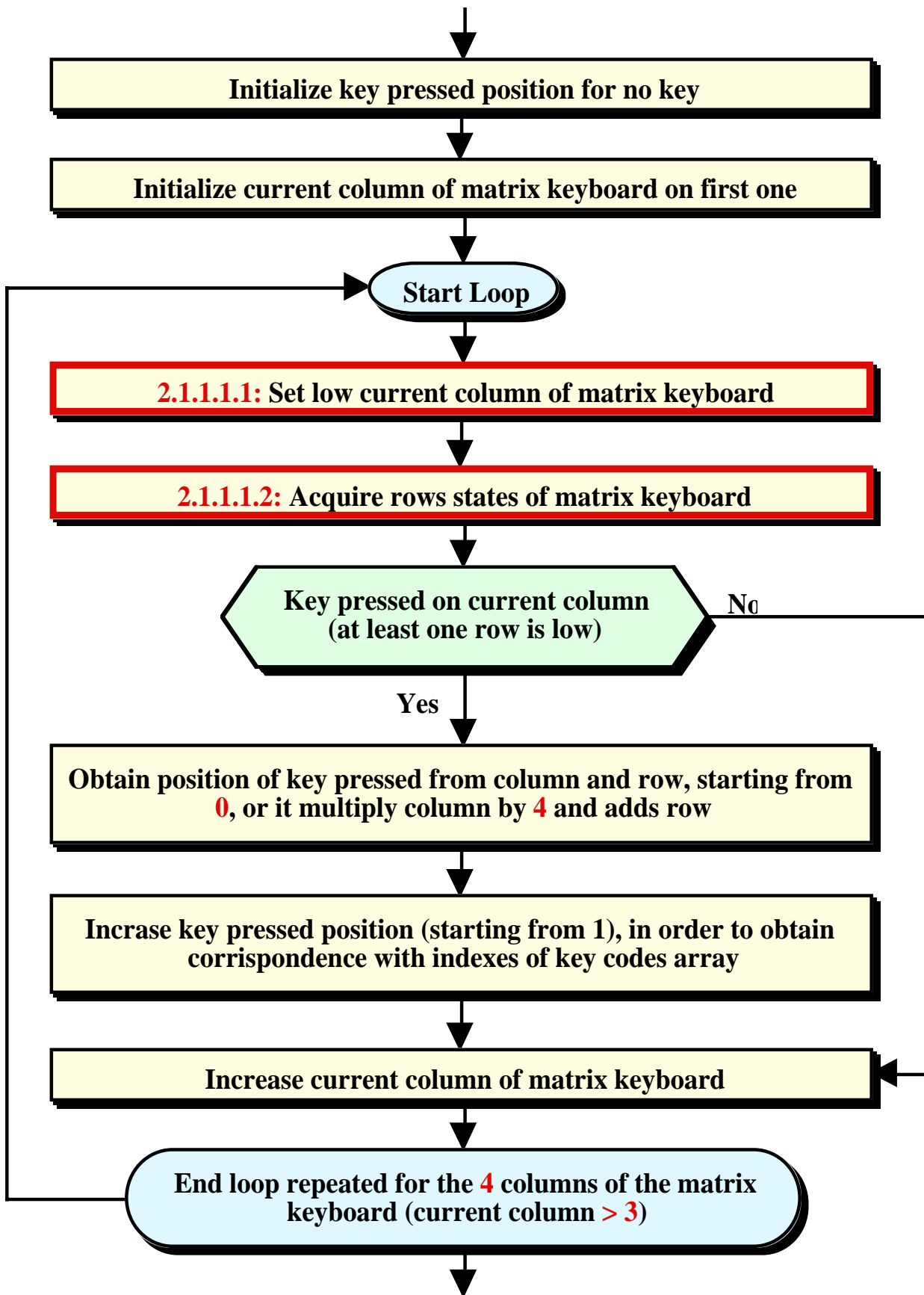
2: Acquire Formula Through Keyboard and Display of GMM TST3.



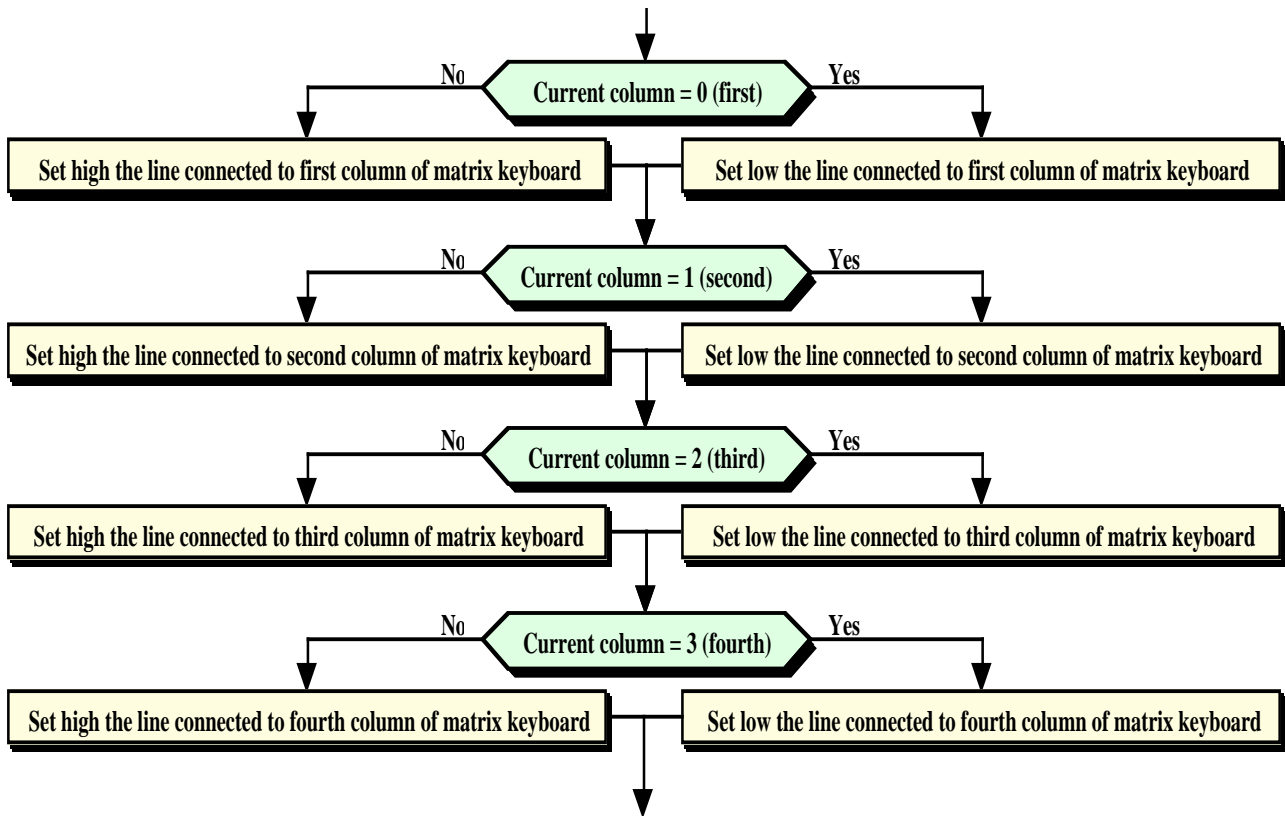
2.1: Acquire Matrix Keyboard State with Debouncing and Autorepeat.



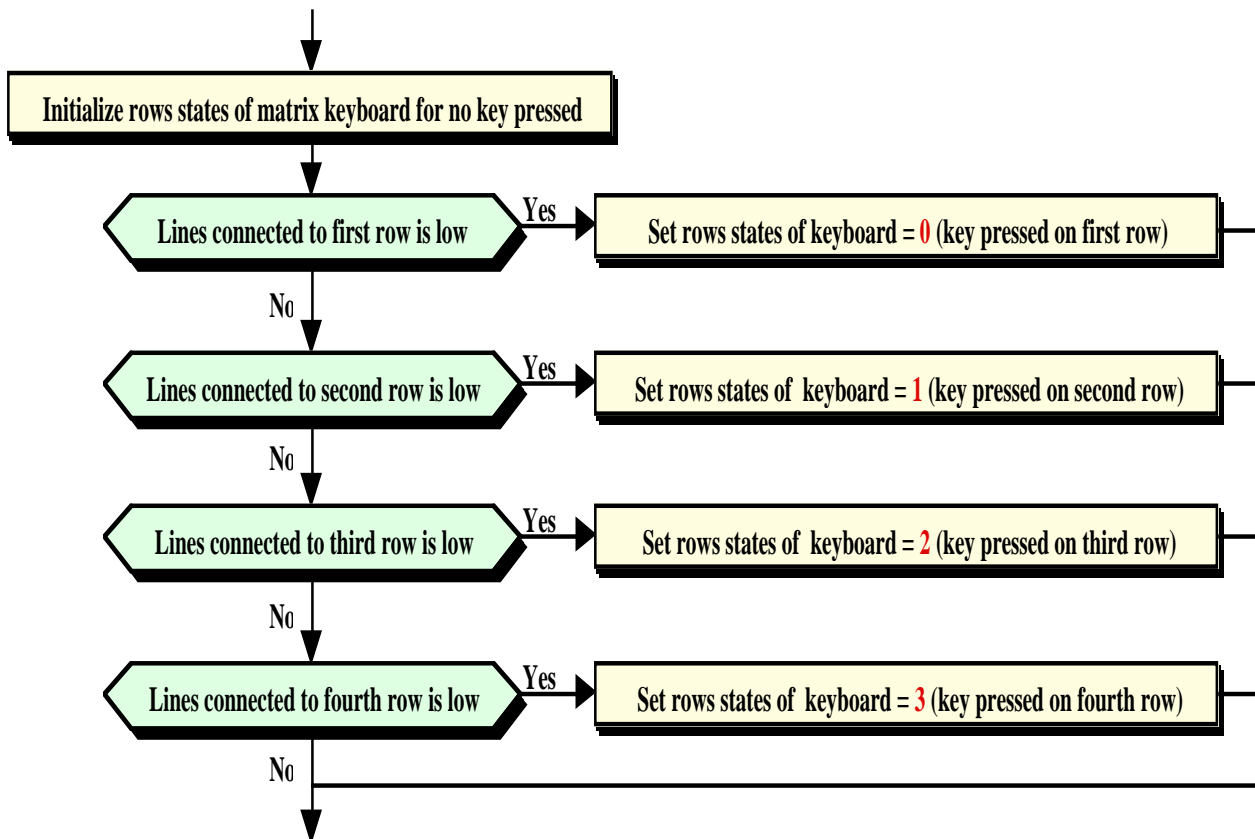
2.1.1: Acquire Matrix Keyboard State with Debouncing.



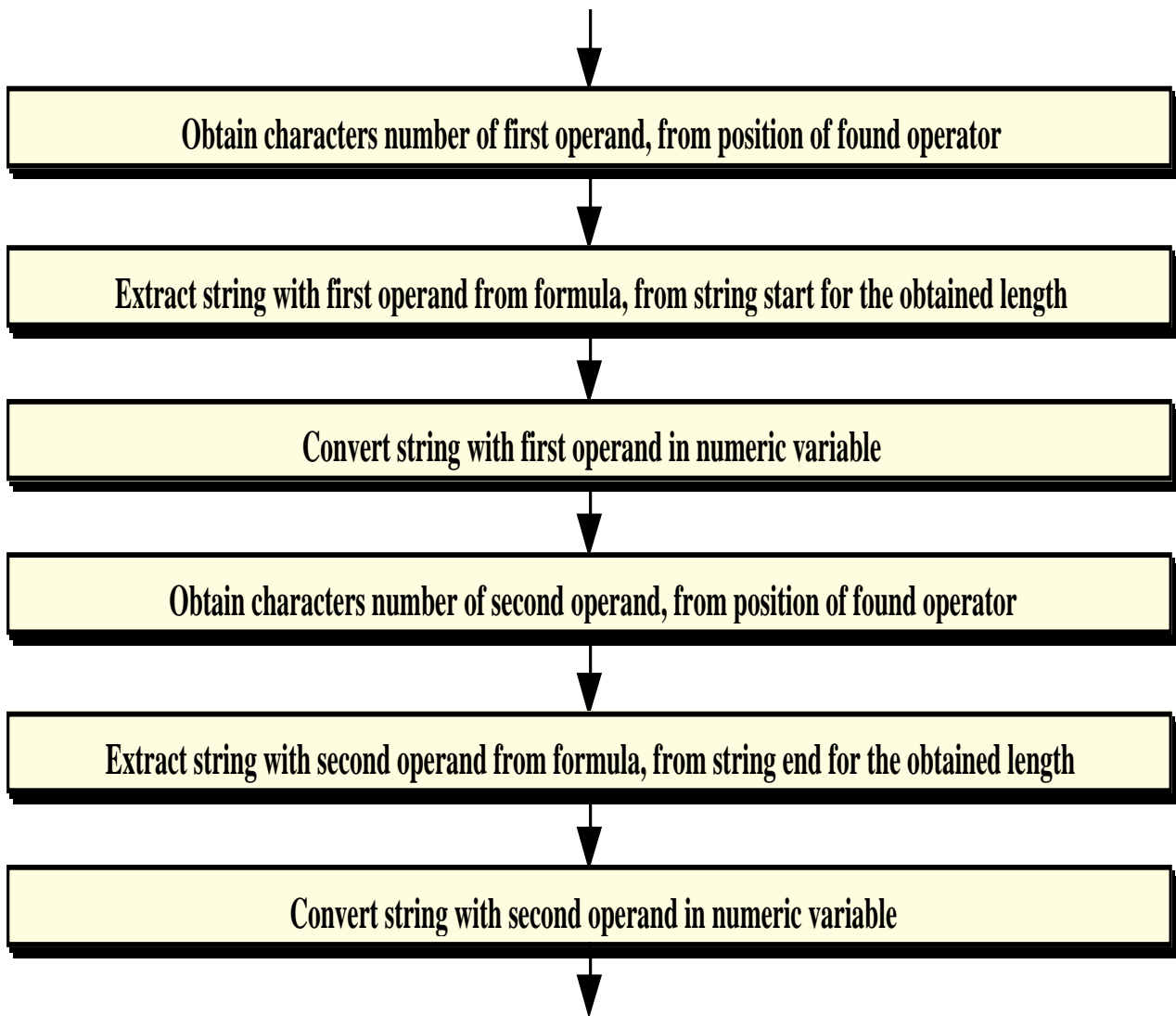
2.1.1.1: Perform Matrix Keyboard Scanning and Obtain Possible Key Pressed Position.



2.1.1.1.1: Set Low Current Column of Matrix Keyboard.



2.1.1.1.2: Acquire Rows State of Matrix Keyboard.



3: Obtain Numeric Operands from Formula.