

# RICH Flight Software

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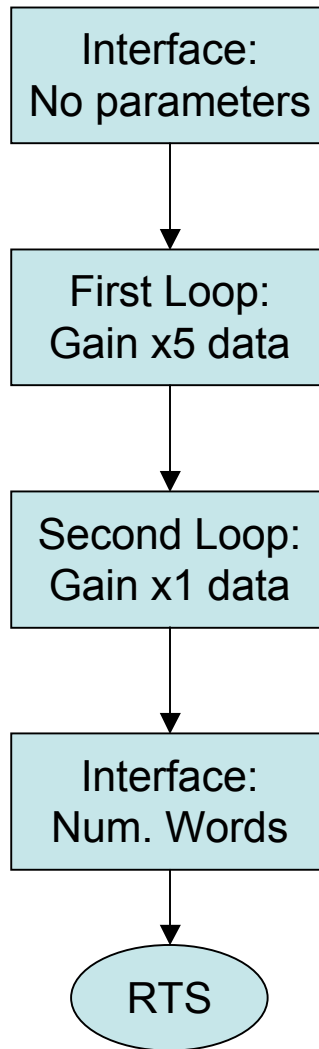
# RICH Flight Software

- Data reduction routine
- Calibration routine
- Other routines
- Status and future plans

# Data Reduction Routine

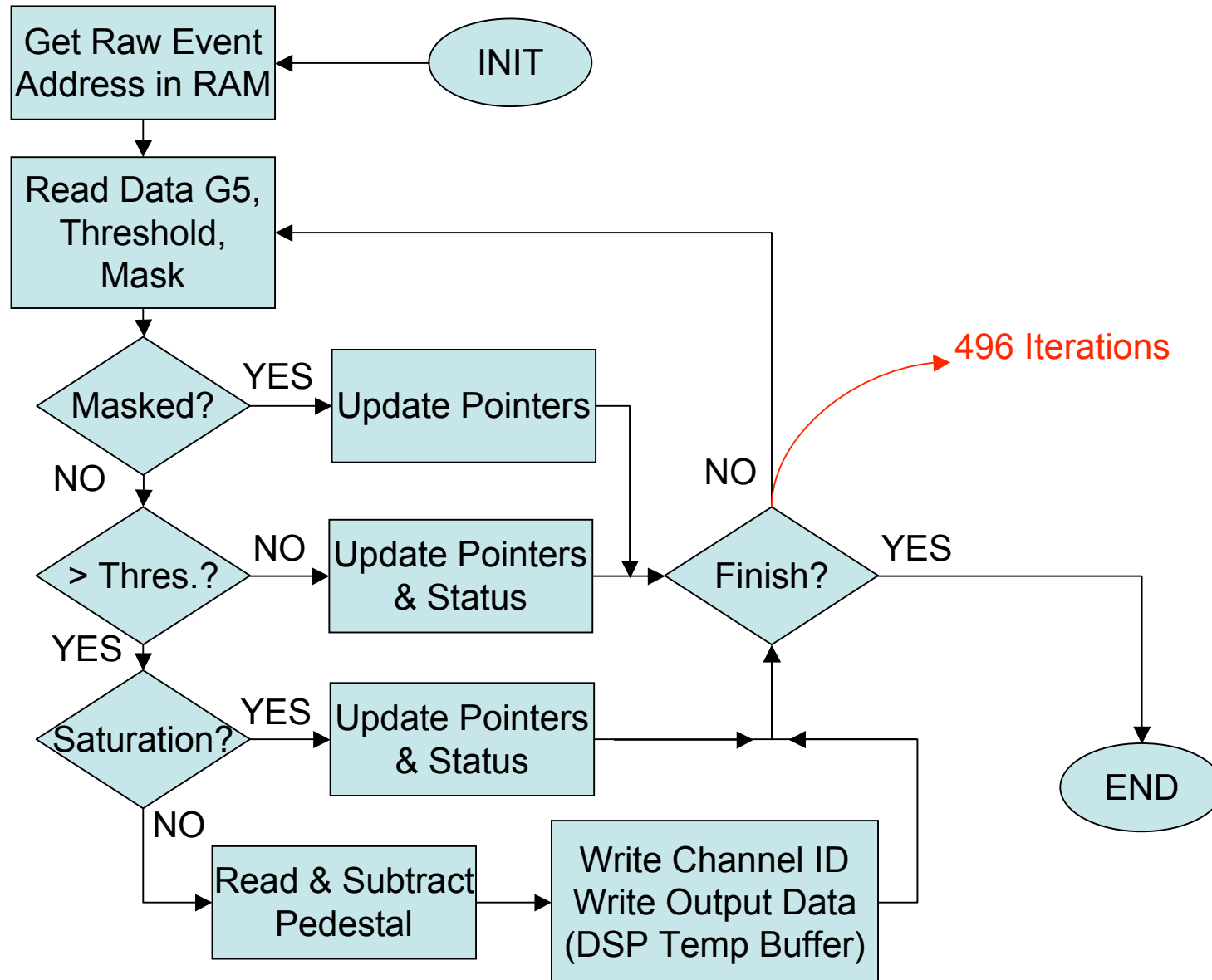
- Threshold based cut, Gain selection and Pedestal subtraction
- Threshold and Pedestal should be previously computed by calibration routine
- Gain selection is used against ADC range saturation. The same programmable value is used for all channels
- **Data volumes:**
  - 10 hits/event average in RICH => ~ 0.5 hits/event in RICH RDR
  - The typical RDR-node event is almost empty (only overhead)
  - But it is foreseen:
    - Events with ~ 100 hits every second
    - Events with ~ 1000 hits every minute
- **Processing time:**
  - No-hit event: 150 us
  - Worst case: 250 us

# Data Reduction Routine: Program Flow

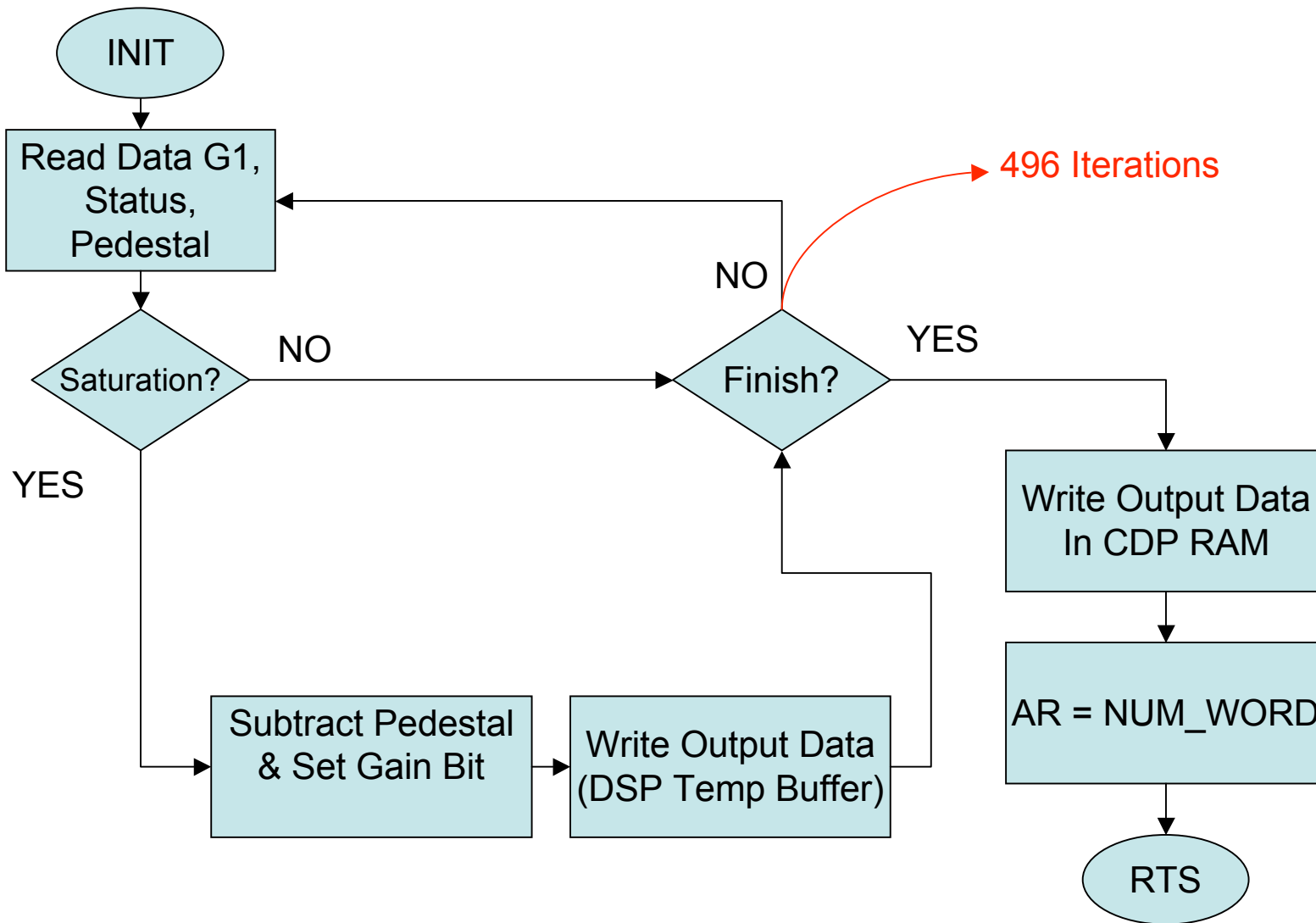


- Executed on “sEVBLD\_CMPRS” CALL
- No Input Parameters
- First Loop: Process Gain x5 Data
- Second Loop: Process Gain x1 Data
- Raw data is read from Buffer Memory
- Results are stored in DSP internal buffer
- Finally results are written into Buffer Memory
- Output number of words is stored in AR register before RTS

# Data Reduction Routine: **First Loop**



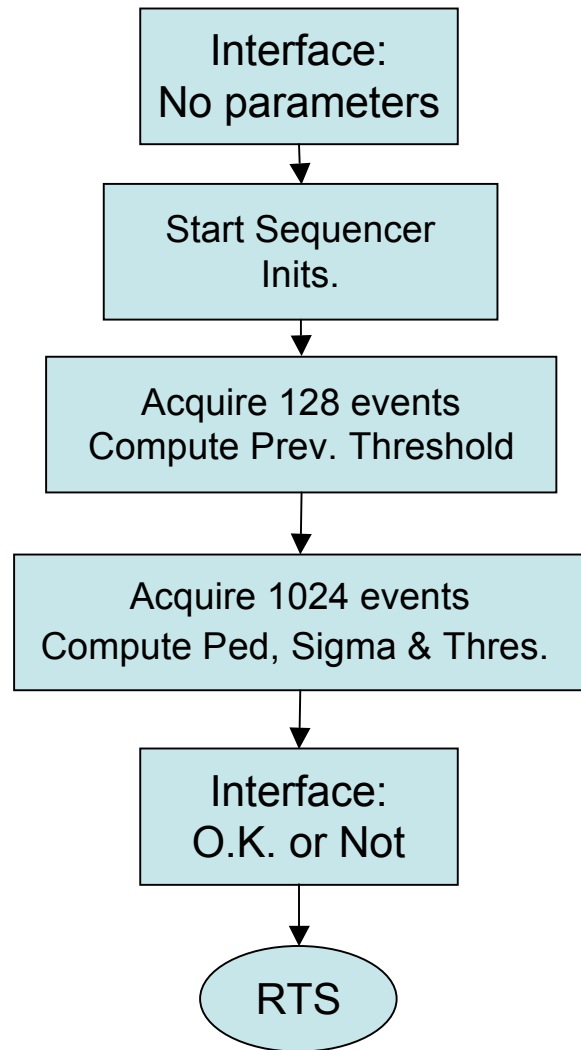
# Data Reduction Routine: **Second Loop**



# Calibration Routine

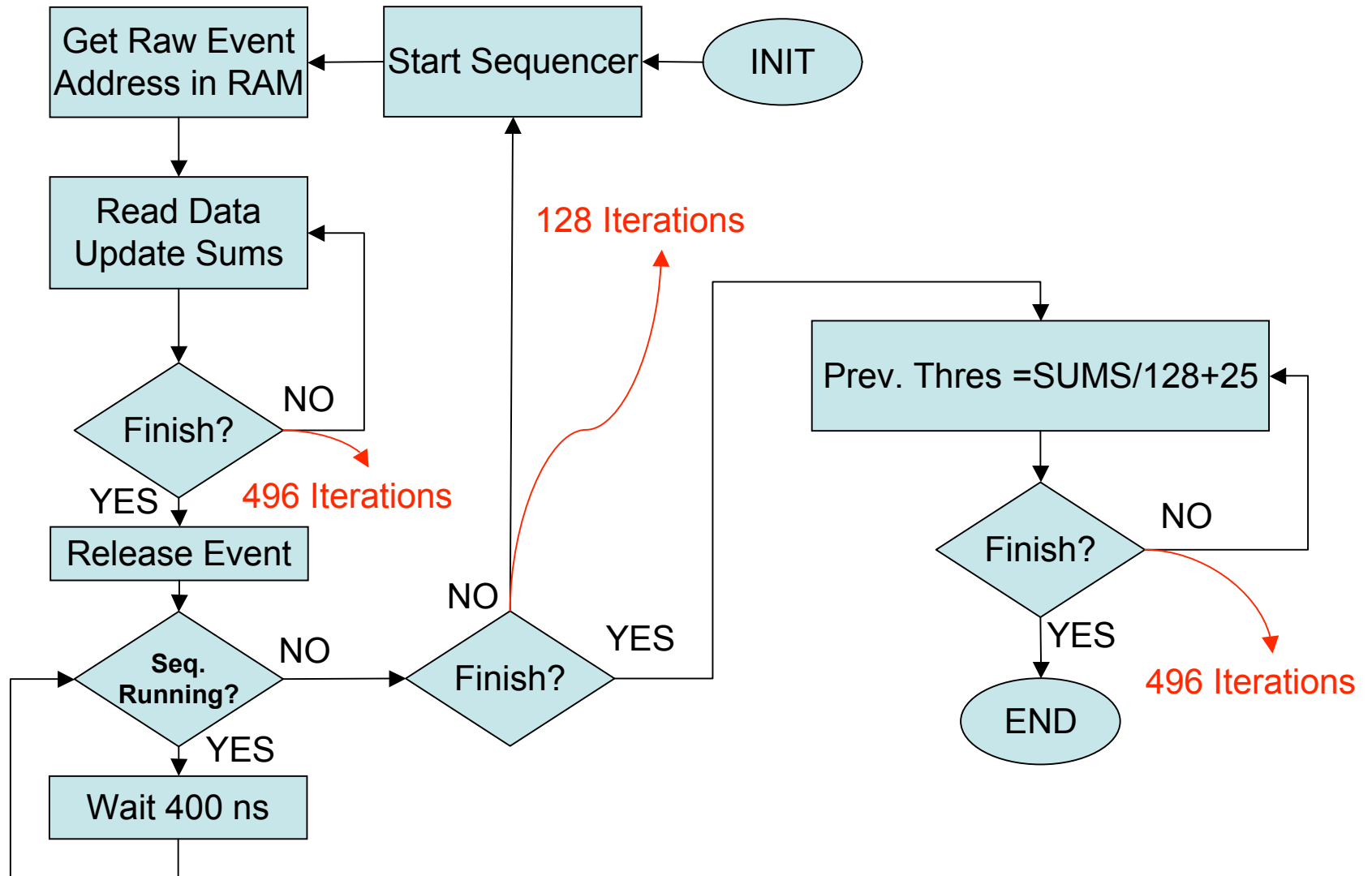
- Pedestal mean and standard deviation computation for gain x5 data
- Pedestal mean computation for gain x1 data
- Events are generated by the routine (Sequencer Software Start).
- Calibration procedure is divided in two stages:
  - First, a previous threshold is calculated to apply rough cut in calibration data
  - Then the calibration itself is done
  - Intended to avoid:
    - “light noise” (photons)
    - PMT Dark Current
- Processing time:
  - Typical: 300ms
  - Worst case: 375ms
- Frequency of repetition: in the once-per-orbit range

# Calibration Routine

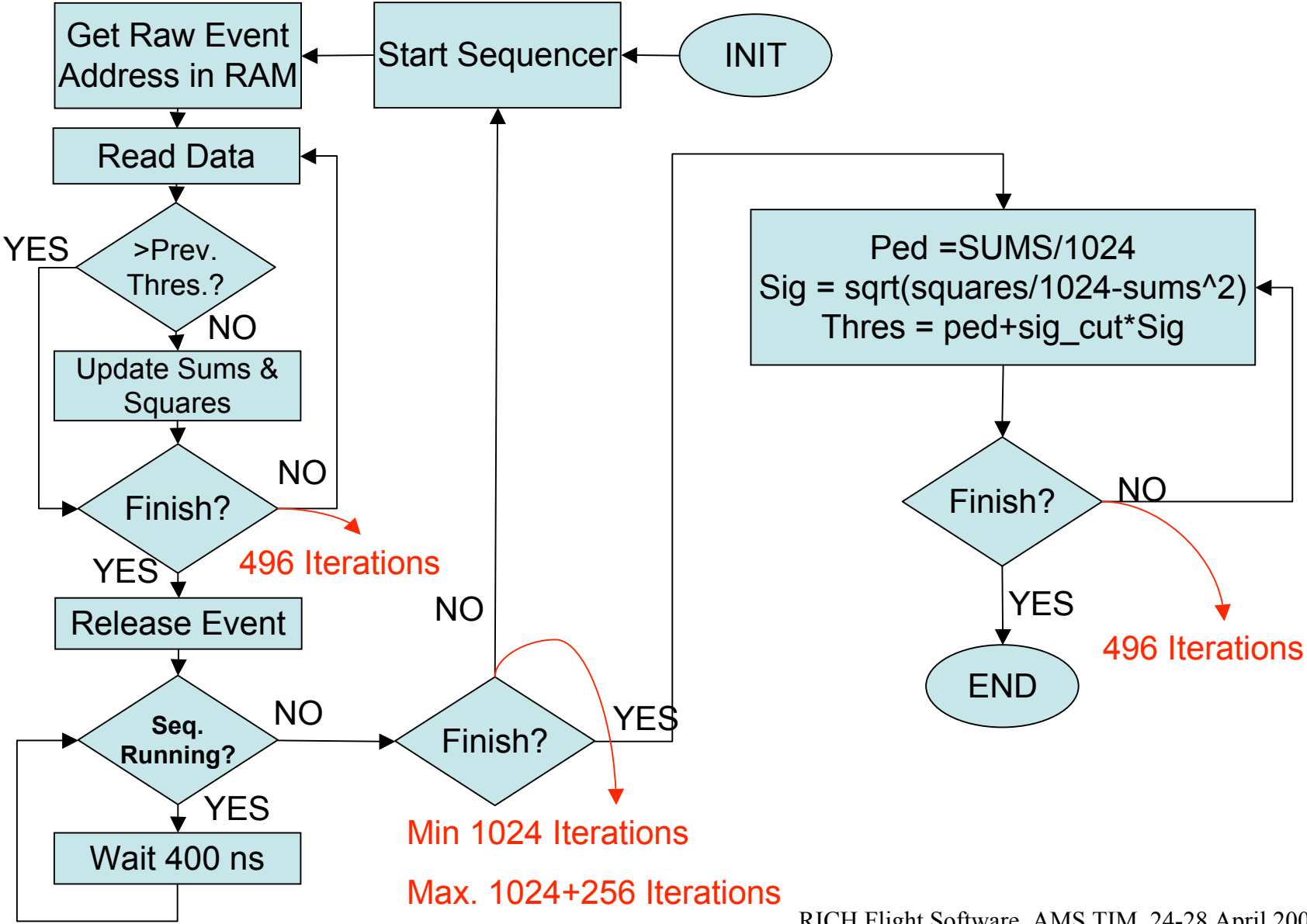


- Executed on “sCALIB\_MAIN” CALL
- No Input Parameters
- First loop, to compute a threshold in order to avoid non-pedestal data:
  - ~ 13 kHz trigger rate
- Second loop, for pedestal calibration:
  - ~ 4 kHz trigger rate
- Output:
  - AF = 0, Calibration O.K.
  - AF = 1, Calibration Error
    - Sequencer does not run after software start
    - Other cases could be added

# Calibration Routine: Previous Threshold



# Calibration Routine: Pedestal, Sigma & Threshold



# Other Routines

- “sCALIB\_DAC”
  - Used to set some parameters in sequencer (DSP IO memory space)
  - Front-end electronics Linear Regulators control
  - Front-end electronics Shaping Time (Track and Hold Front-end ASIC)
  - 1us execution time (but the parameters should be previously update in DSP internal memory)
- “sEVBLD\_INIT”
  - Used to initialize some RICH specific variables
  - 25us execution time
- “sEVBLD\_INFO”
  - RICH specific information (To be defined)

# Status and Future Plans

- These routines have been tested in Lab. with both EM and QM hardware and Front-End electronics
- Test with PMT grid in progress:
  - QM RDR hardware
  - Flight PMT grid
  - High Voltage
  - The most realistic conditions up to now
- Flight Software version can be ready after PMT grid test
  - Summer 2006