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BP30 production test introduction

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Summary

- Production test support
- Production test flow
- SW support for production test
- RF and BB adjustment Algorithms – very short
- Handling of Calibration parameters
- PC DLL Function interface.

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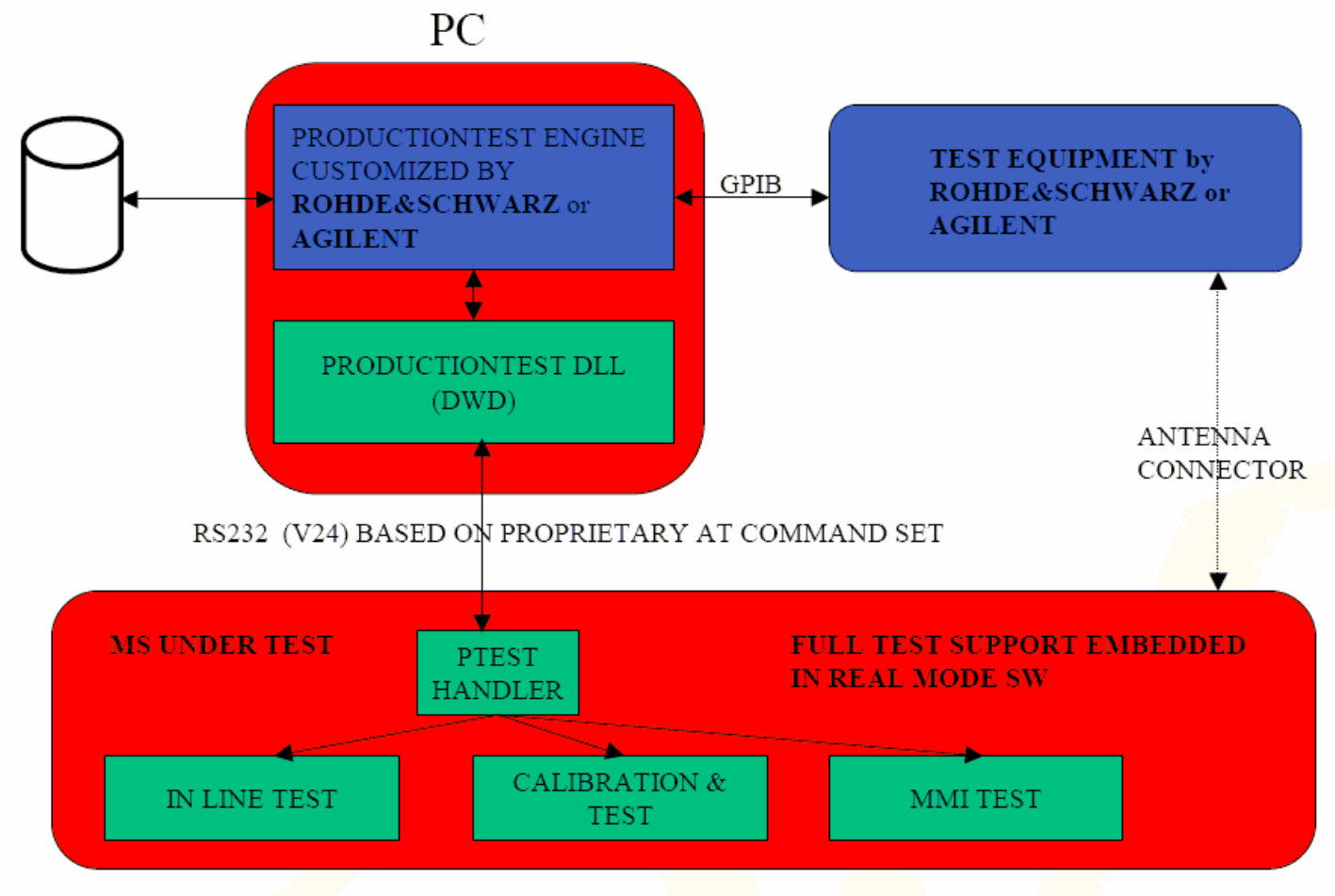
Production Test Support - Overview

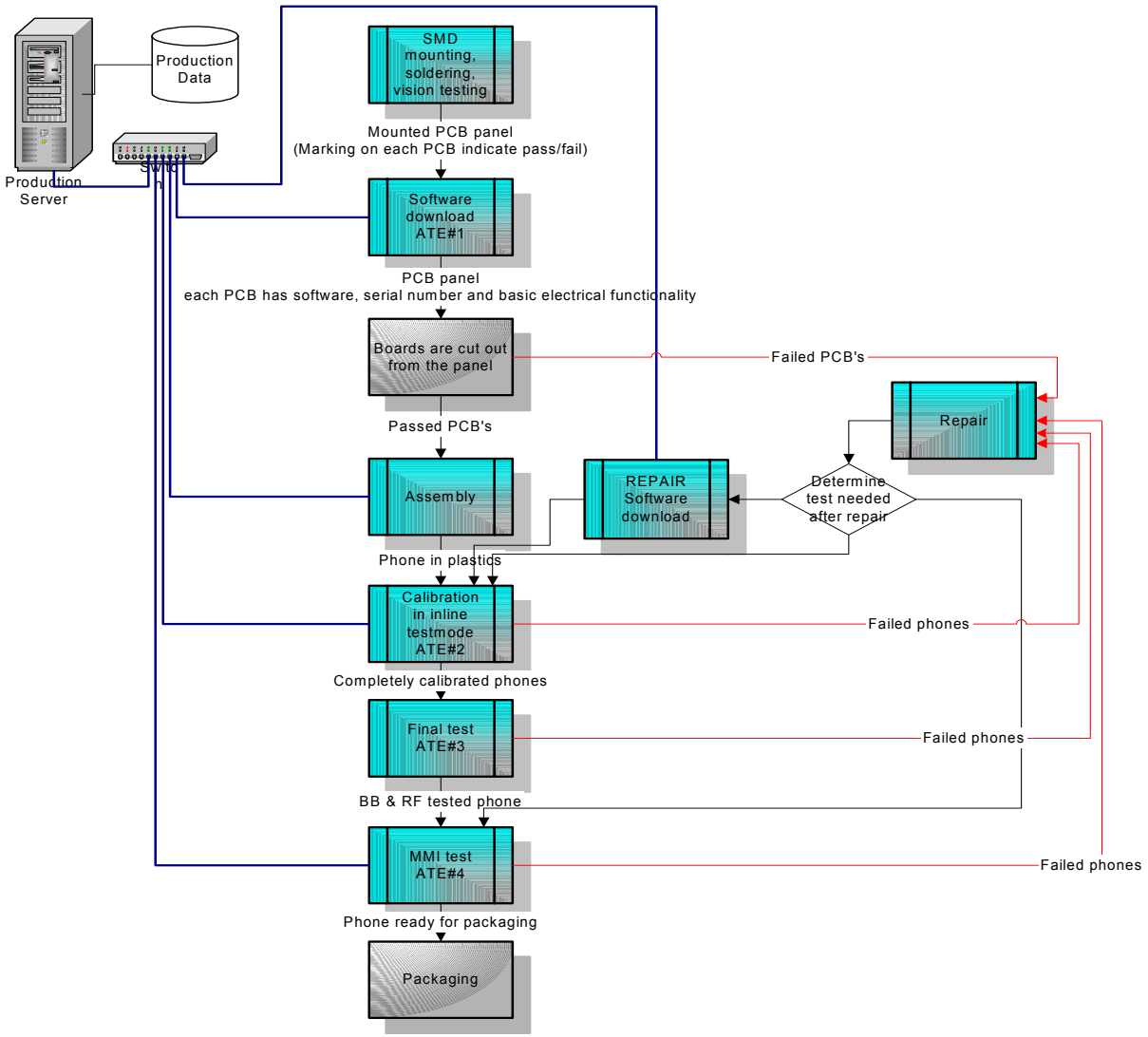
Not covered in this introduction are customer specific issues such as:

- Exact process- and test flow.
- Exact test coverage. (Trade offs)
- Test SW executables – environment, network etc. (’driving shells’).
- Data collection and SPC (Statistic Process Control).
- Test program error handling and fault prevention.
- Boards-management (serial numbers, pass fail flags etc).
- Customization (management of EEPROM content).
- Quality procedures – sample test etc.
- Hardware - instrumentation, fixtures, board handling etc.

SW support for production test.



Production test flow



SW Download : ATE#1

- Software download is the first test station after the SMD mounting (*)
- The software is downloaded into the phone together with default calibration parameters and file system
- The phone is programmed to automatically power up in modem enabled mode when applying VBat and VCharger
- The MS is now prepared for storage of calibration data and production flow control data

(*) Out of circuit programming is possible: in that case ATE#1 is reserved for rework

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IN LINE - tests and adjustments : ATE#2

- Before ATE#2 shielding and plastics are mounted: test and calibration of basic electrical functions
- Basic testing of RF RX path. By imposing a sine wave at the antenna performs a simple “hole through” test feed.
- Basic testing of RF TX path by means of a power meter
- BT Baseband test (simple connection + non-signalling)
- RF calibration
- Calibration of AD Converters
- Idle current measurement
- Calibration of the AFC
  - AFC setting at ambient temperature
  - Frequency/DAC step (Frequency/XoTune step for SmartiSD2)
- Outcome is a fully calibrated phone

RF and Audio Test : ATE#3

- All calibration is performed on the antenna connector
- Calibration of RF TX parameters
- Calibration of RF RX parameters
- Calibration of acoustic parameters (*)
- Verification of antenna performance
- Verification of SIM connection
- RF-performance check
- BT-performance test (antenna included)
- Outcome is a fully functional & tested phone

(*) Acoustic parameters calibration is not mandatory

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MMI TEST

- Visual inspection for scratches etc.
- Buzzer verification
- Backlight & Trembler verification
- Keypad verification
- Charger connector verification
- Display verification
- Programming of IMEI
- Programming of Service Provider Lock
- Setting the Phone to power up in Normal Mode at next power on
- The Phone is now ready for packaging

AT Interface between PC and DUT

- Reuse of V24 connection normally used for modem functionallity
- Electrical connections: RX, TX and Ground (No Flow Control)
- Data format: 8N1
- Typical data rate: 115.2 kBaud (default)
- Each AT command send from DTE must be confirmed by a result code send from DCE before next AT command can be initiated
- Proprietary AT command reserved for production test:
  - AT#[TEST CMD X]<CR>
- Potential <CR> contained in the test command is substituted by <LF> and restored to <CR> when received on the target side

Example of Test Command Flow

When the PC has issued an AT# command it must wait for the "CONFIRM" before issuing the next AT# command

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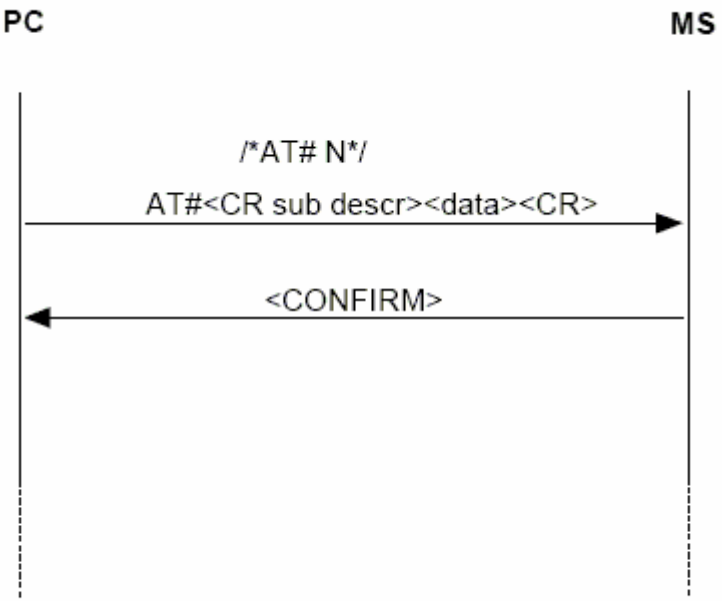
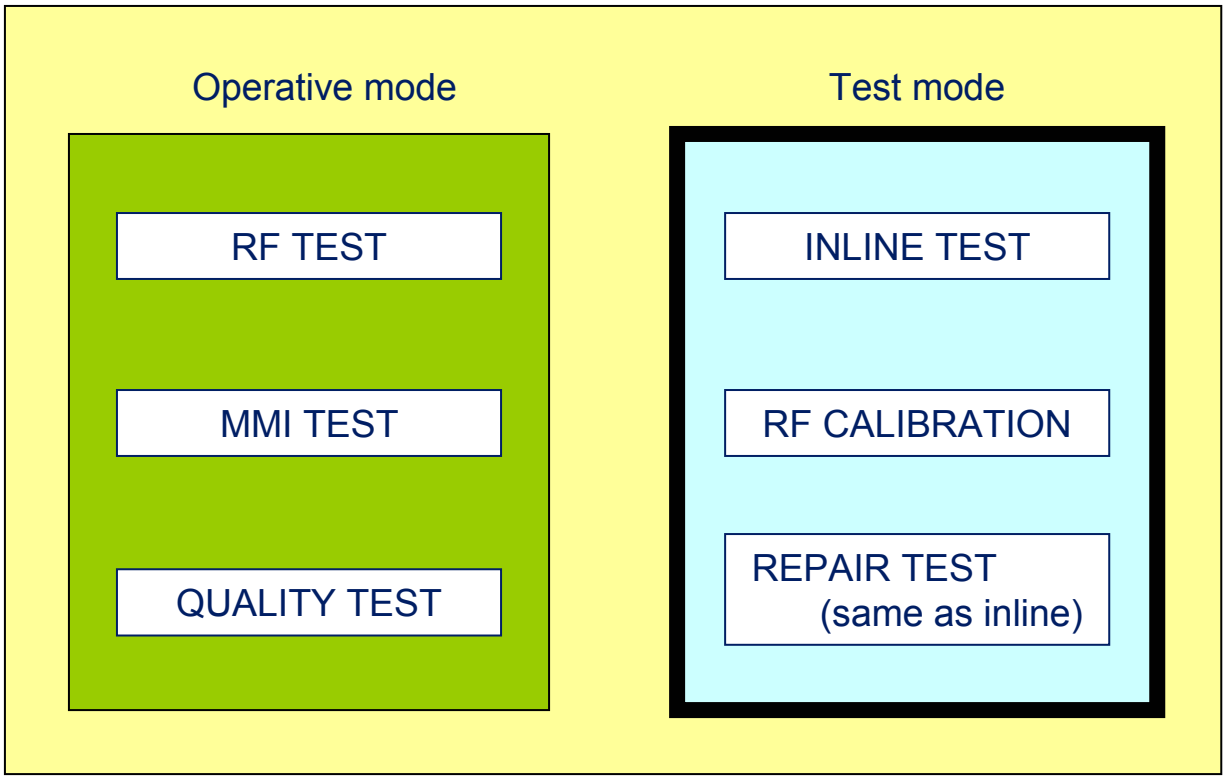
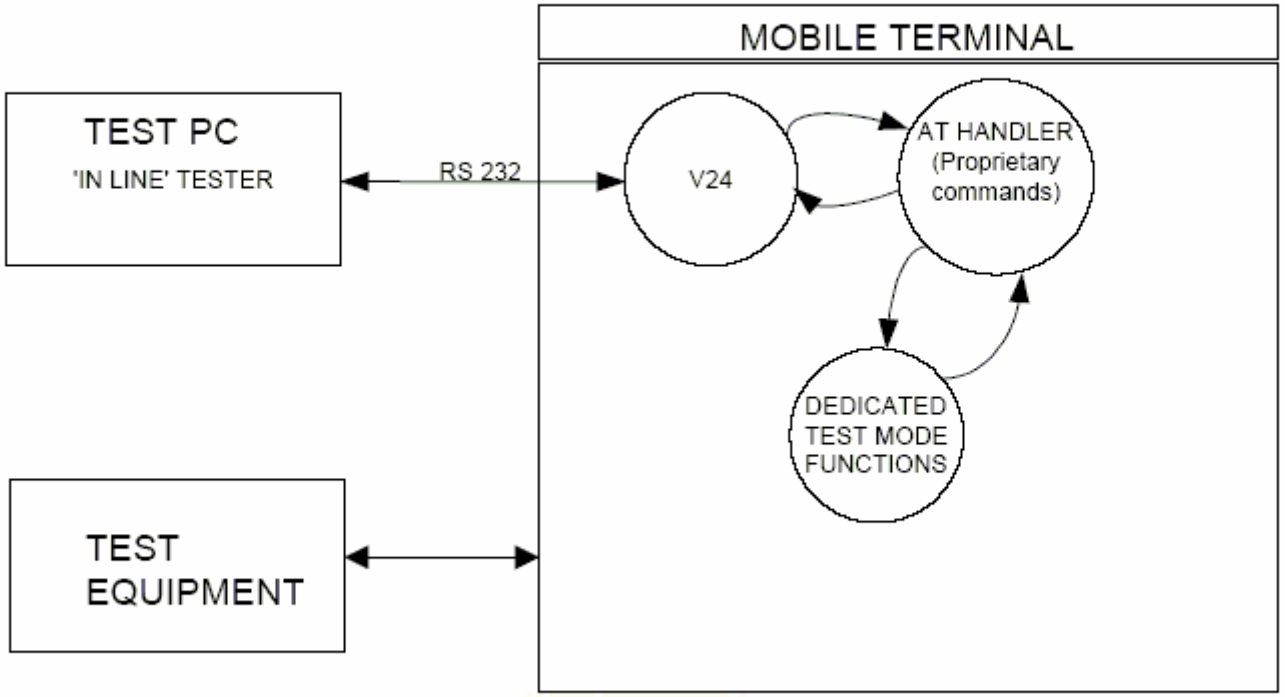


Test support in MS

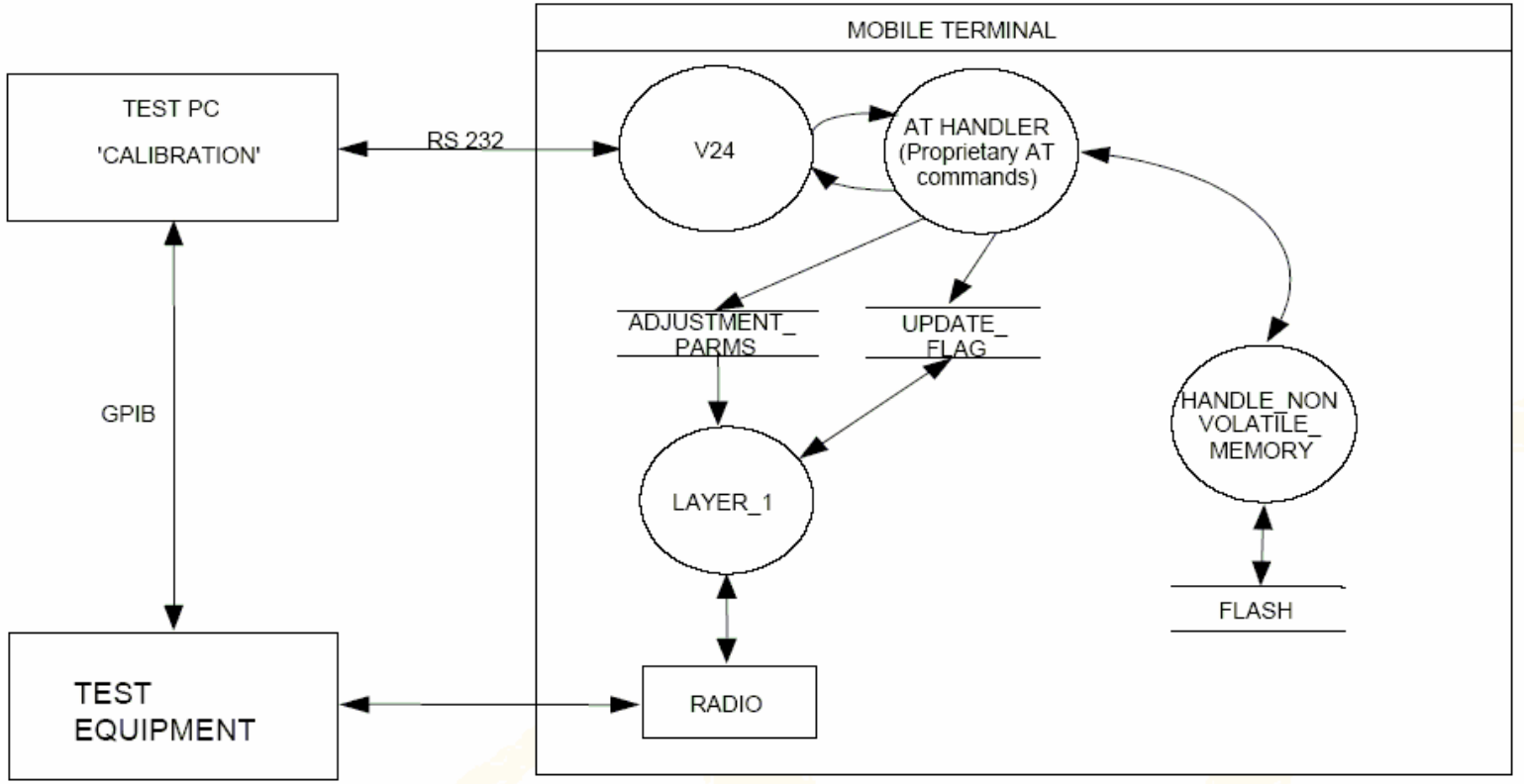
MS standard software packet



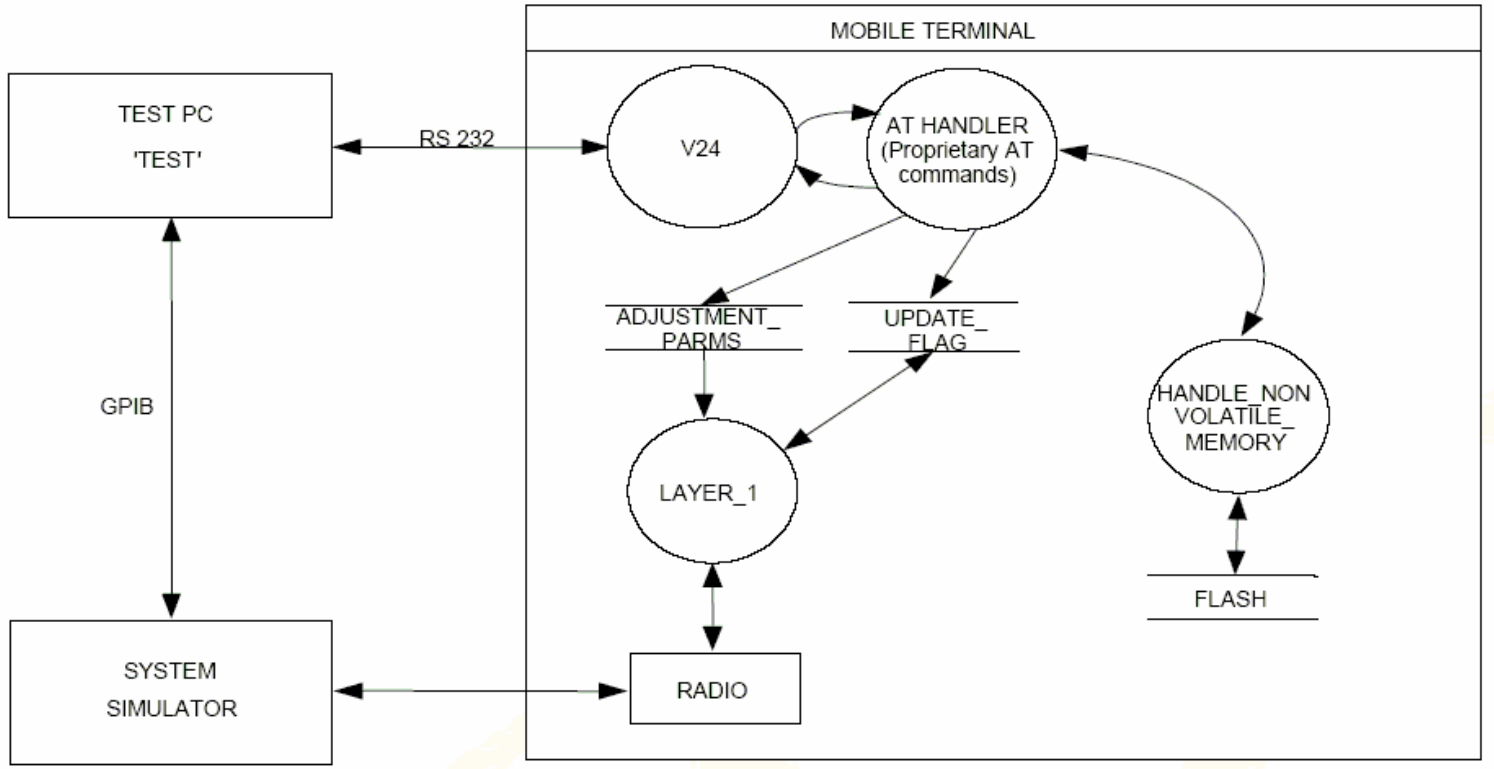
In line support architecture : ATE#2



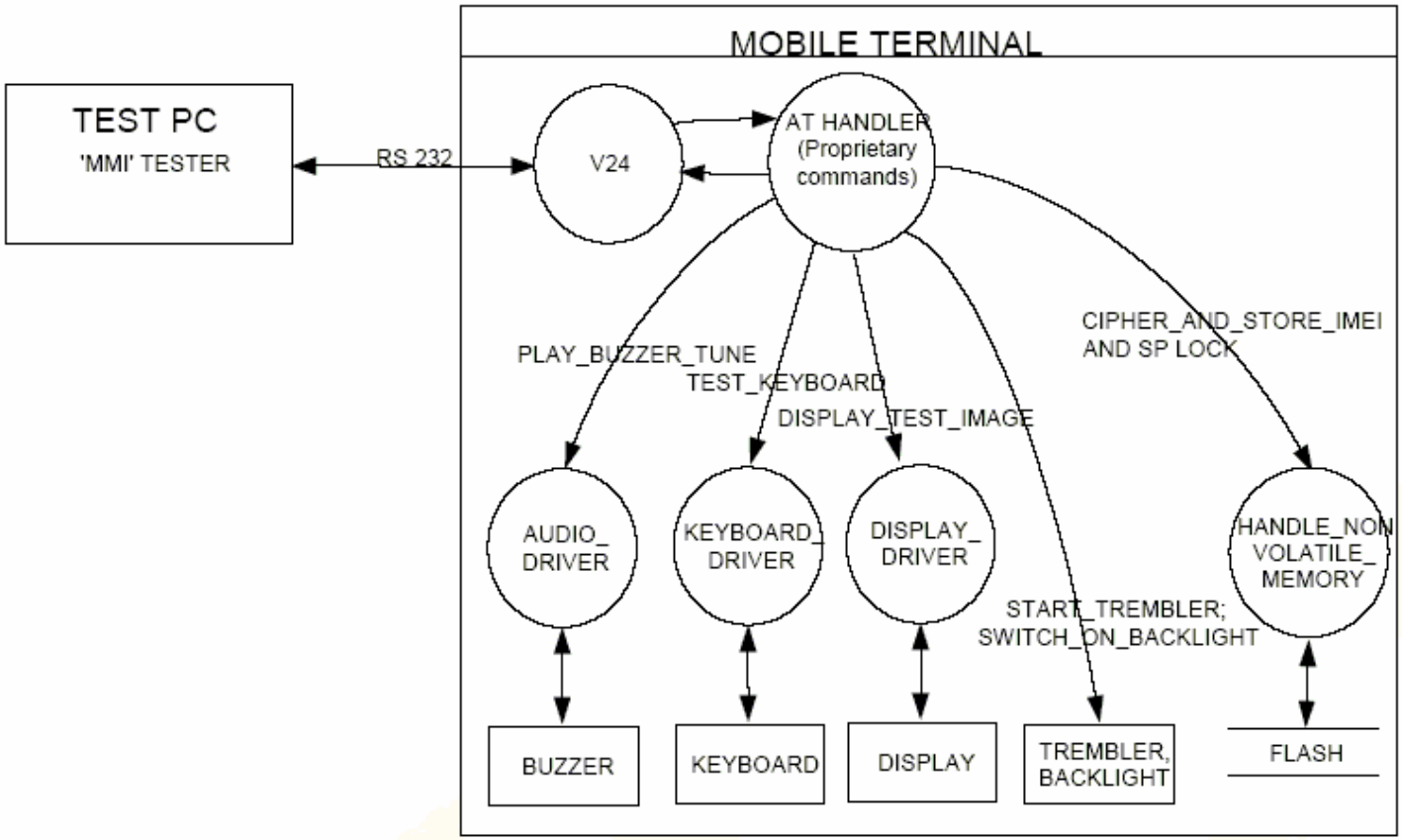
”Calibration” Support Architecture : ATE#2



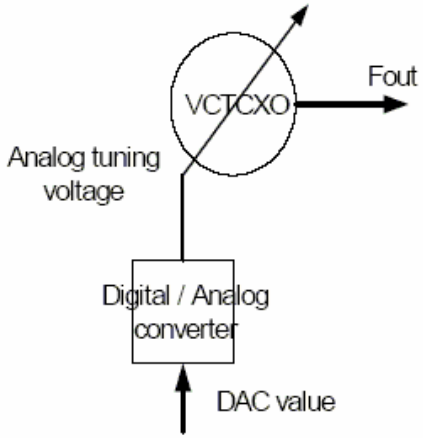
”Test” Support Architecture : ATE#3

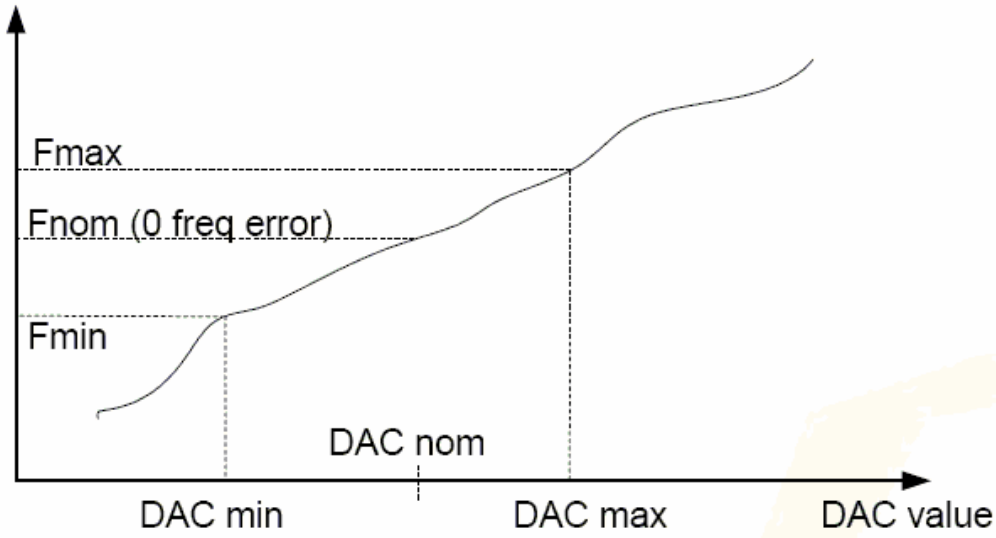


MMI Support Architecture : ATE#4



VCTCXO adjustment algorithm (ATE#2)

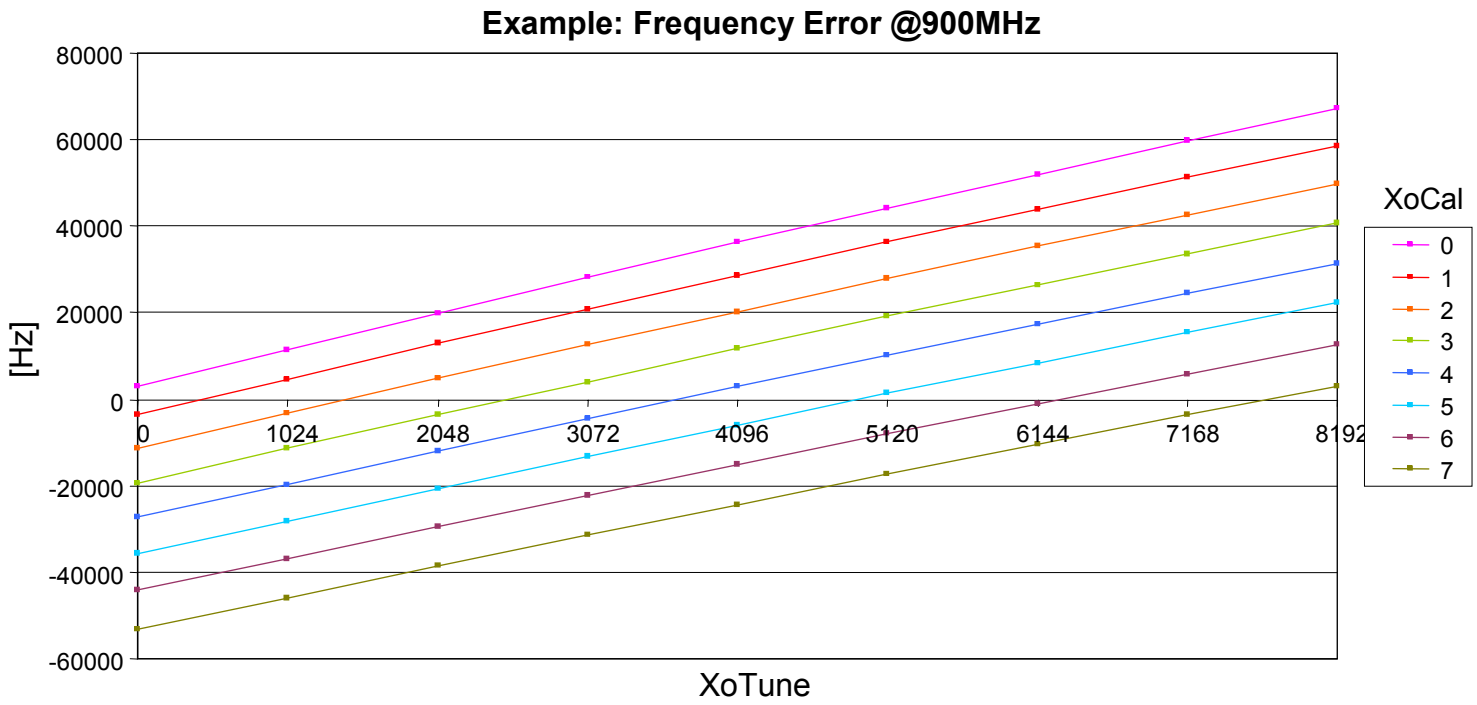




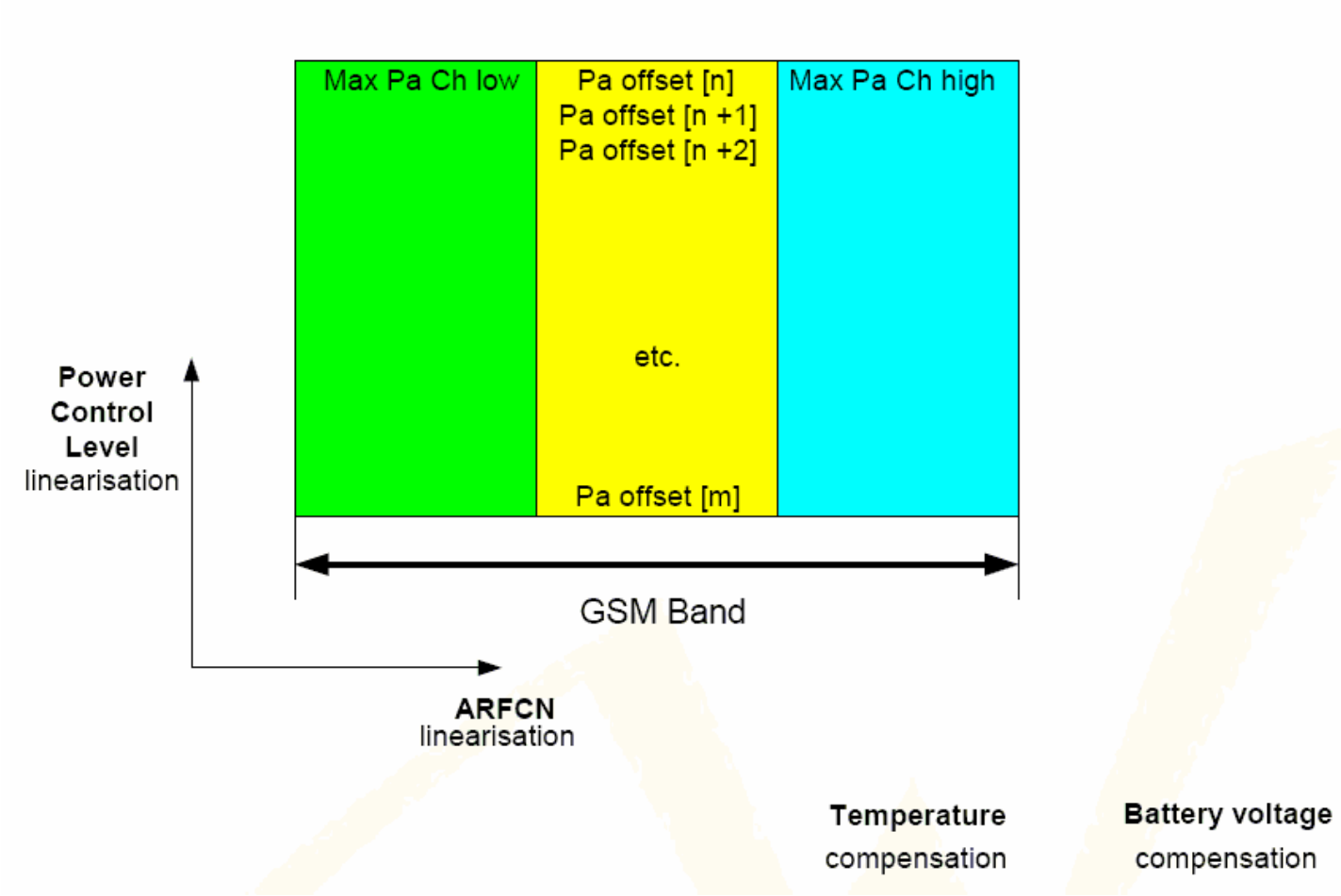
DAC nom = f(Fmax, Fmin, DACmax, DAC min)

slope = g(Fmax, Fmin, DACmax, DAC min)

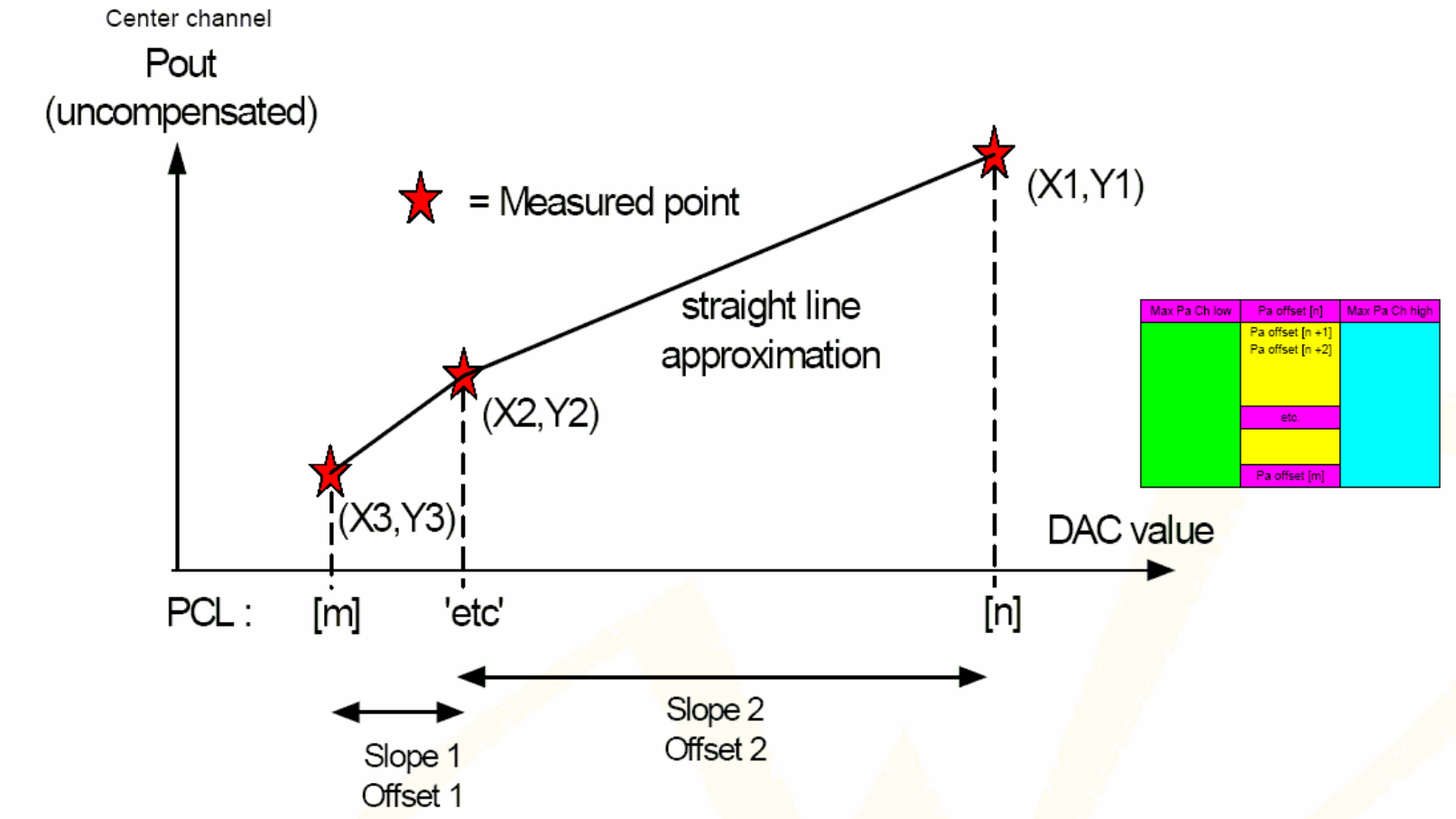
DCXO adjustment algorithm (ATE#2 : Smarti-SD2)



TX 'soft' compensations (ATE#2)



TX adjustment algorithm (ATE#2)(1)



RX adjustment algorithm

- Specified in ATE#2 - NON iterative algorithm.
- Measures RX-level at 3 different generator levels on one channel and with same generator level at 6/8 different channels

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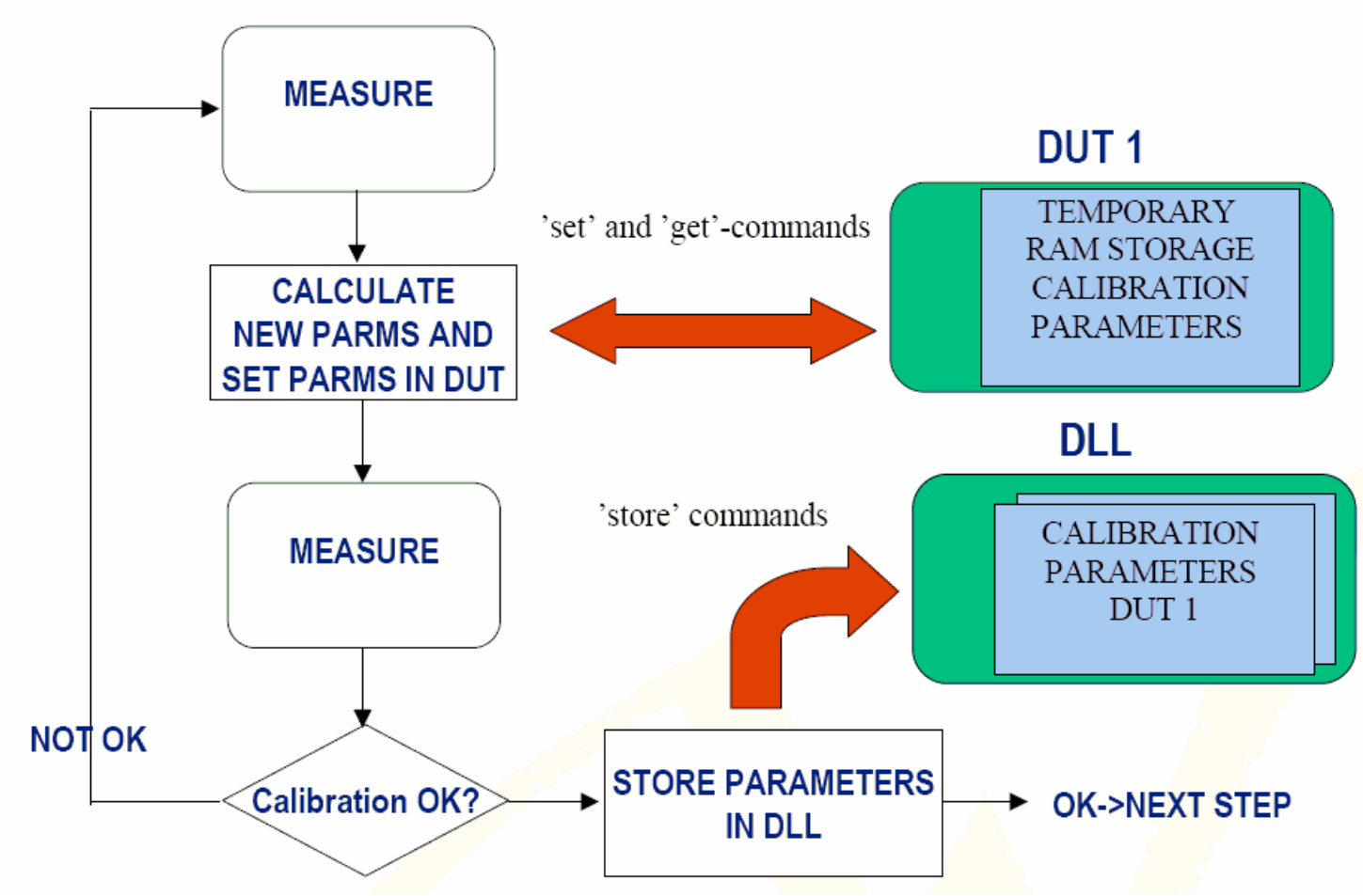
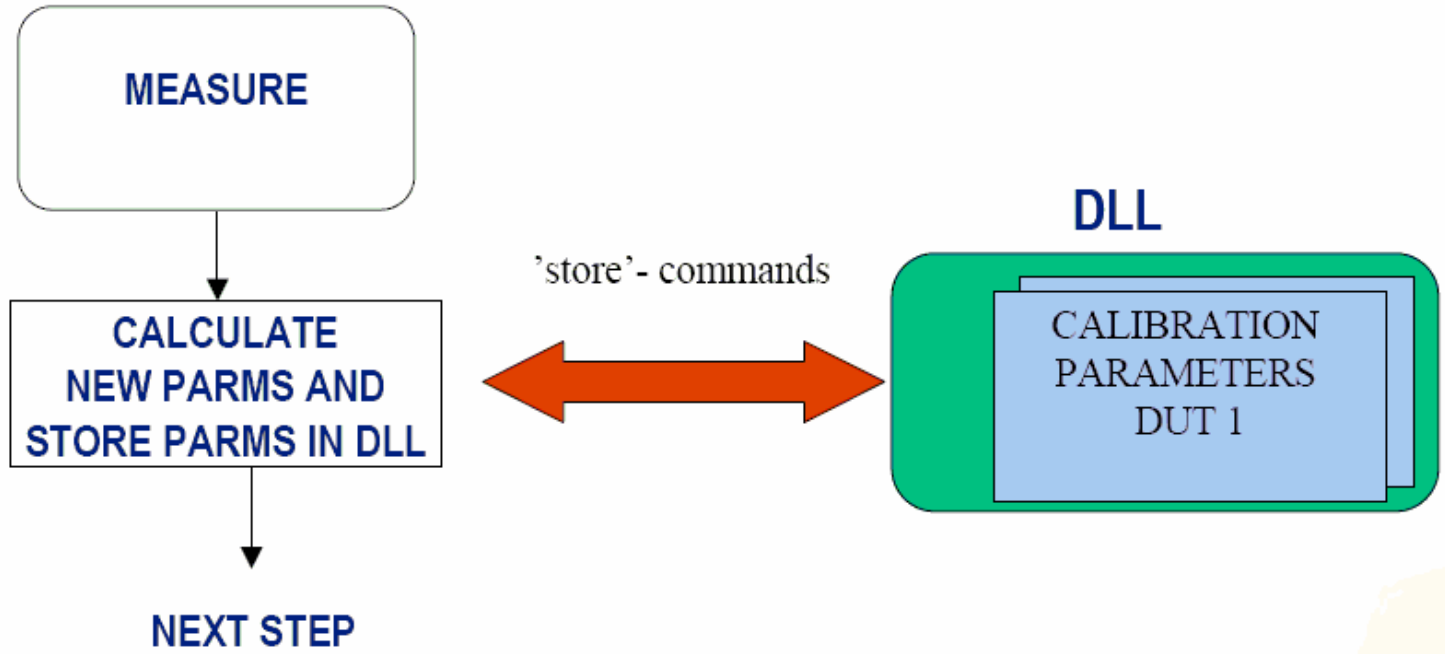
ADC adjustment algorithm

- Specified in ATE#2 - NON iterative algorithm.
- Measures ADC value at two different applied voltages.
- Calculates an offset and a gain.
- Battery-calibration must be accurate due to charger algorithm.

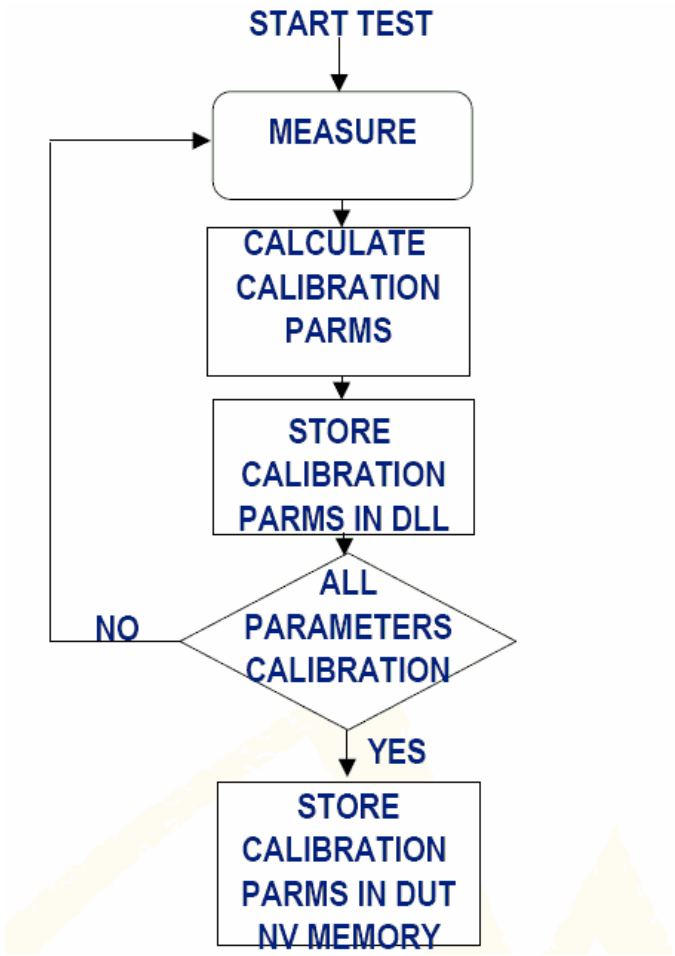
Calibration of Iterative parameters



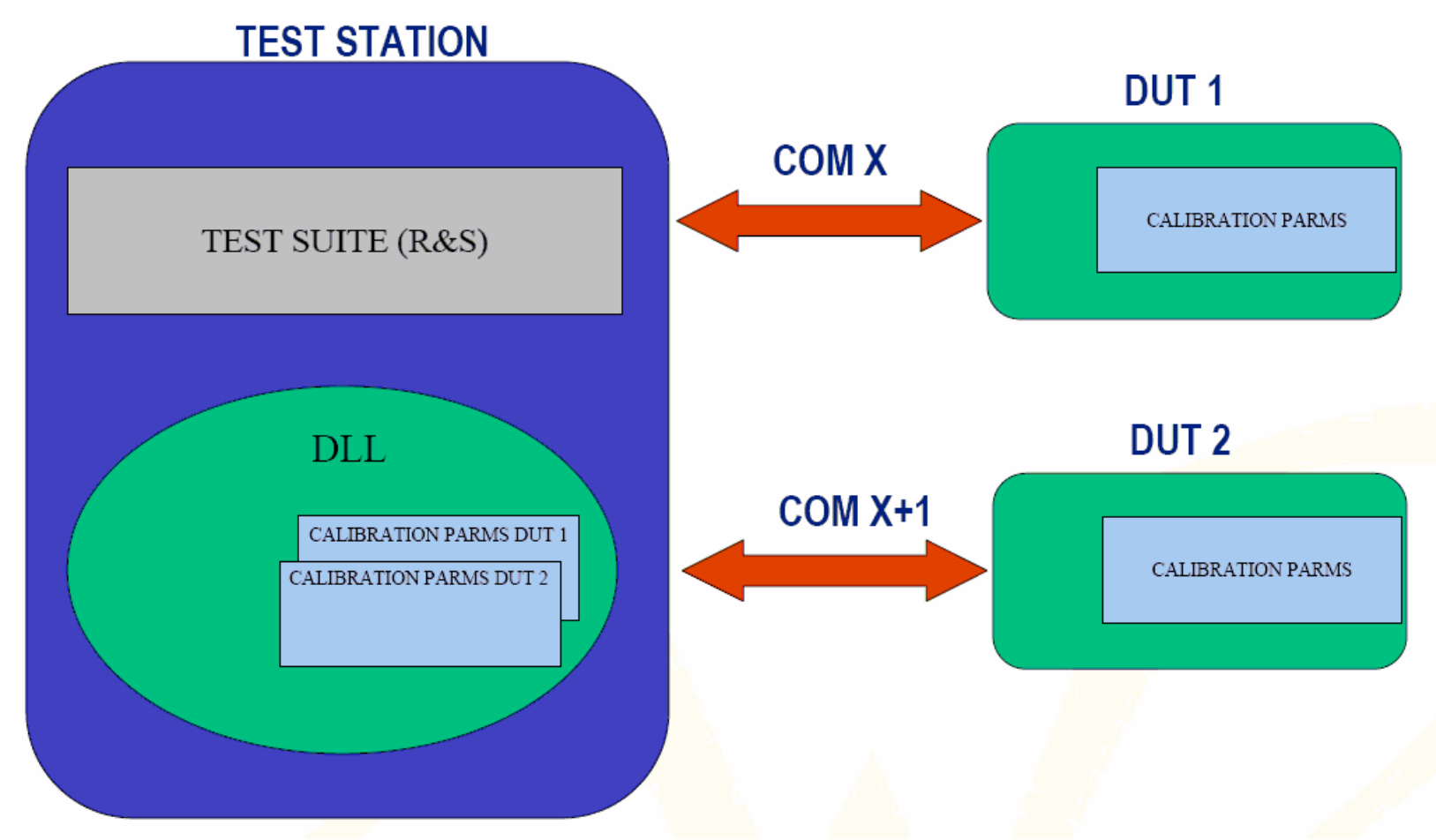
Calibration of NON Iterative parameters



Storing of calibration parameters to Non Volatile Memory



Parallel calibration



PC DLL function interface Grouping

- Communication link
- Configuration of test modes
- IN LINE testing
- Calibration (not signalling)
- Test & Calibration (signalling)
- MMI Testing
- Handling Production configuration data
- Miscellaneous functions

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End