x432 Calibration Sequence

Sep-2023

Calibrations in x432

	Calibration terminology	Details	Components
Factory (one-time)	Customer Factory Calibration	• Performed in customer factory at room temp. • mmWave TX and RX calibrations • Calculates and stores results (bias settings) for 3 temperature bins	Synth delta trim, PD offset cal & LO DIST LUT update
			Rx Gain
			Tx Power
Field operation	Cold Boot	• APLL Hardware calibration during cold boot	APLL hardware calibration
	Runtime Calibration (at boot and when temperature changes significantly – Refer next slide)	• Temperature compensation for RF performance optimization	Synth delta trim
			Tx power LUT update (if OLPC) Tx power cal (in case of CLPC)
			Rx gain & LoDIST LUT updates
			PD offset cal (optional in non-safety applications if CLPC is not used).

NOTE:
LUT updates are greyed out as they are just software tasks and have negligible execution times

Refer Previous gen cal app note for functionalities of each cal

Calibration Sequence

Step 1: Customer Factory cal sequence

- To be done at room temp
- While enabling APLL in cold boot → ensure the “calibration ON” option is selected
- Perform RF calibration using below API RL_FECSS_RF_FACTORY_CAL
  - Enable all cals except for IFA.
  - Confirm that the enabled cals are passing
- Save the Tx/ Rx calibration data using below API RL_FECSS_RF_RX_TX_CALIB_DATA_GET

Step2: In-field sequence (CLPC disabled)

- Can boot at any temp
- While enabling APLL in cold boot → ensure the “calibration ON” option is selected.
- Restore the the Tx/ Rx calibration data using below API RL_FECSS_RF_RX_TX_CALIB_DATA_SET API

For loop across frames

APLL cal NOT required for successive warm boots.

At the start of every frame, check present temperature

Determine present temp bin based on present temp (“low” if <0C, “mid” if 0C to 85C, “high” if > 85C)

if abs(current temp-last temp)> 10 deg && present temp bin != prev temp bin

Call API RL_FECSS_RF_RUNTIME_CAL (Synth, Tx, Rx & LODIST cals enabled; PD enabled for safety apps)

[Reset static clutter history if applicable - algorithm side]

elseif abs(current temp-prev temp)>20 deg

Call API RL_FECSS_RF_RUNTIME_CAL (Synth, Tx, Rx & LODIST cals enabled; PD enabled for safety apps)

% No need to reset static clutter as the temp bin is the same

else

Call API RL_FECSS_RF_RUNTIME_CAL (Tx , Rx & LODIST cals enabled; Synth & PD cals disabled)

% No need to reset static clutter as the temp bin is the same

end

prev temp bin = present temp bin; prev temp = present temp

end

Step2: In-field sequence (CLPC enabled)

- Can boot at any temp
- While enabling APLL in cold boot → ensure the “calibration ON” option is selected. Not required for successive warm boots.
- Restore the the Tx/ Rx calibration data using below API RL_FECSS_RF_RX_TX_CALIB_DATA_SET API

For loop across frames

APLL cal NOT required for successive warm boots.

At the start of every frame, check present temperature

Determine present temp bin based on present temp (“low” if <0C, “mid” if 0C to 85C, “high” if > 85C)

if abs(current temp-last temp)> 10 deg && present temp bin != prev temp bin

Call API RL_FECSS_RF_RUNTIME_CAL (Synth, PD, Rx & LODIST cals enabled; Tx is don’t care since CLPC will overwrite)

Call RL_FECSS_RF_TX_CLPC_CAL API. Application to save the Tx bias codes returned by the API in memory.

[Reset static clutter history if applicable - algorithm side]

elseif abs(current temp-prev temp)>20 deg

Call API RL_FECSS_RF_RUNTIME_CAL (Synth, PD, Rx & LODIST cals enabled; Tx is don’t care since CLPC will overwrite)

Call RL_FECSS_RF_TX_CLPC_CAL API. Application to save the Tx bias codes returned by the API in memory.

[Reset static clutter history if applicable - algorithm side]

else

Call API RL_FECSS_RF_RUNTIME_CAL (Rx & LODIST cals enabled; Tx, Synth & PD cals disabled)

Call RL_FECSS_RF_TX_CLPC_CAL API in override mode. Application to restore the Tx bias codes previously saved in memory.

% No need to reset static clutter

end

prev temp bin = present temp bin; prev temp = present temp

end