LIST OF ACTIVE CIRCUIT DEVICES, THEIR SYMBOLS AND FUNCTIONS

SECTION	ITEM	APPLICATION	FREQ.
Receiver	N500	Custom ASIC	925 – 1990 MHz
	V802	LNA	1930 - 1990 MHz
Synthesizer	G500	VCO	3420 - 3980 MHz
	G501	VCTCXO	26 MHz
	N500	PLL/Custom ASIC	1700 - 4100 MHz
Transmitter	N500	Custom ASIC	880 – 1910 MHz
	N700	Power Amplifier	880 – 1910 MHz
FM radio	N356	Stereo FM receiver	87.5 – 108 MHz

TUNE-UP PROCEDURES FOR LJPNPM-6X

1. Introduction

1.1 Testing phases

Production testing is divided to two phases, **module** and **product** testing.

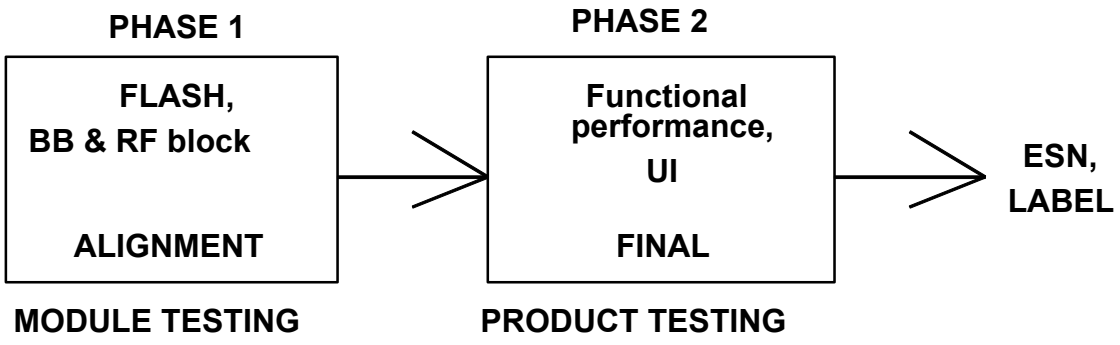

Figure 1. Testing Phase

2. Module Testing Phase 1

2.1 Tests and alignments for RF

During the design phase of the engine, all the tests and alignments will be optimized by analyzing previous build data and flashing new values into the phone.

2.2 Recommended Equipment

The following equipment is required for the RF tests and alignments:

- RF signal generator
  - frequency range: up to 2 GHz
  - frequency resolution: 10 Hz
  - frequency accuracy: ±0.1 ppm
  - amplitude resolution: 0.1 dB
- Spectrum analyzer
  - frequency range: up to 2 GHz
  - dynamic range: 70 dB
  - sweep time: min. 50 ms
- PC and PC-locals

2.3 Alignments

2.3.1 AFC (VCXO, VCTCXO)

Purpose: To calibrate the VCXO at room temperature by feeding in one accurate receive frequency into the receiver. This is required so that the AFC algorithm has starting values for the center frequency and the slope of the control curve. If a VCTCXO is used this calibration may not be required (decision will be made after testing various samples)

Equipment: RF signal generator set to the middle channel, CW, train of ”0” and ”1” bits

Procedure:

- Input RF signal with frequency set to middle channel (+67.71kHz)
- PC Locals sets DAC -value to 0, DSP measures the frequency error and rough correction for D/A -converter is calculated
- PC Locals checks whether +/-341 (DAC -value) measurement can be carried out (if not =>”freq, error out of range”)
- Phase error with corrected DAC -values of 0, -341 and +341 is measured
- Phase errors are converted to frequency errors and, based on the results from previous measurement, a 3-point curve is calculated
- The curve is mathematically temperature-compensated so that the height of the curve settles down to the level on which it would be if the measurement was done at T=25°C (the actual measuring temperature is read from the phone)
- Based on this temperature-compensated curve, a more precise, calibrated 0-frequency-error-point is now calculated and stored to phone‘s EEPROM
- Points -341 and +341, and the slope between those two, are also calculated and stored to EEPROM

2.3.2 RSSI (AGC)

Purpose: The AGC algorithm must learn two correct RF levels for the RSSI measurement to work within specifications. This calibration is completed using the middle channel and at room temperature.

Equipment: RF signal generator

Procedure:

- Input an RF signal (-55 dBm) set to middle channel
- PC locals calculates value (lowest AGC gain calibrated)
- Input an RF signal (-85 dBm) set to middle channel
- PC locals calculates value (highest AGC gain calibrated)

2.3.3 TX power

Purpose: To calibrate the power control circuitry including detector drift compensation and TXC values for RF power levels. The RF output power should be measured into a 50 ohm load at specified power levels.

Equipment: Spectrum analyzer.

Procedure:

- 16 power samples are measured with fixed DAC values stored in test SW. Sample values are from -5 ... +32 dBm
- TXC power control words are calculated to correspond to following target power in GSM1900:

Power level	Target power		Power level	Target power
0	29.5 dBm		8	14 dBm
1	28 dBm		9	12 dBm
2	26 dBm		10	10 dBm
3	24 dBm		11	8 dBm
4	22 dBm		12	6 dBm
5	20 dBm		13	4 dBm
6	18 dBm		14	2 dBm
7	16 dBm		15	0 dBm

  ion is performed by using interpolation with three closest measured power samples.
- Two extra samples calculated down from the lowest power level 15 for base level calculation.
- Base level is interpolated from these two measured samples with target power of -30 dBm.

2.3.4 TX IQ modulator tuning

Purpose: To compensate for the modulator offset voltage and adjust the I and Q amplitude and phase.

Equipment: Spectrum analyzer

Procedure:

- Offset voltage
- PC-locals sets phone to transmit train of ”0” or ”1” bits on middle power level
- DSP sets I and Q DAC offset to 0.0mV, measure the difference between the wanted sideband and the carrier frequency

- DSP sets I DAC offset to 10.0mV and Q DAC offset to 0.0mV, measure the difference between the wanted sideband and the carrier frequency
- DSP sets I DAC offset to 0.0mV and Q DAC offset to 10.0mV, measure the difference between the wanted sideband and the carrier frequency
- PC-locals calculates the compensation value knowing 3 reading

Procedure:

- Amplitude tuning
- Offset voltage must be tuned first
- Measure the rejection between the unwanted sideband and the wanted sideband
- PC-locals tunes the phone by varying the amplitude of the I and Q DACs

Procedure:

- Phase tuning
- Offset and amplitude must be tuned first
- Measure the rejection between the unwanted sideband and the wanted sideband
- PC-locals tunes the phone by varying the phase of the I and Q DACs