

SAMSUNG

GSM TELEPHONE

SGH-E340

SERVICE *Manual*

GSM TELEPHONE



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BASIC.

1. Specification

1-1. GSM General Specification

	GSM900 Phase 1	EGSM 900 Phase 2	DCS1800 Phase 1	PCS1900
Freq. Band[MHz] Uplink/Downlink	890~915 935~960	880~915 925~960	1710~1785 1805~1880	1850~1910 1930~1990
ARFCN range	1~124	0~124 & 975~1023	512~885	512~810
Tx/Rx spacing	45MHz	45MHz	95MHz	80MHz
Mod. Bit rate / Bit Period	270.833kbps 3.692us	270.833kbps 3.692us	270.833kbps 3.692us	270.833kbps 3.692us
Time Slot Period / Frame Period	576.9us 4.615ms	576.9us 4.615ms	576.9us 4.615ms	576.9us 4.615ms
Modulation	0.3GMSK	0.3GMSK	0.3GMSK	0.3GMSK
MS Power	33dBm~5dBm	33dBm~5dBm	30dBm~0dBm	30dBm~0dBm
Power Class	5pcl ~ 19pcl	5pcl ~ 19pcl	0pcl ~ 15pcl	0pcl ~ 15pcl
Sensitivity	-102dBm	-102dBm	-100dBm	-100dBm
TDMA Mux	8	8	8	8
Cell Radius	35Km	35Km	2Km	-

1-2. GSM TX power class

TX Power control level	GSM900	TX Power control level	DCS1800	TX Power control level	PCS1900
5	33±3 dBm	0	30±3 dBm	0	30±3 dBm
6	31±3 dBm	1	28±3 dBm	1	28±3 dBm
7	29±3 dBm	2	26±3 dBm	2	26±3 dBm
8	27±3 dBm	3	24±3 dBm	3	24±3 dBm
9	25±3 dBm	4	22±3 dBm	4	22±3 dBm
10	23±3 dBm	5	20±3 dBm	5	20±3 dBm
11	21±3 dBm	6	18±3 dBm	6	18±3 dBm
12	19±3 dBm	7	16±3 dBm	7	16±3 dBm
13	17±3 dBm	8	14±3 dBm	8	14±3 dBm
14	15±3 dBm	9	12±4 dBm	9	12±4 dBm
15	13±3 dBm	10	10±4 dBm	10	10±4 dBm
16	11±5 dBm	11	8±4dBm	11	8±4dBm
17	9±5 dBm	12	6±4 dBm	12	6±4 dBm
18	7±5 dBm	13	4±4 dBm	13	4±4 dBm
19	5±5 dBm	14	2±5 dBm	14	2±5 dBm
		15	0±5 dBm	15	0±5 dBm

2. Circuit Description

2-1. SGH-E340 RF Circuit Description

2-1-1. RX PART

— **FRONT END MODULE**(ANTENNA SWITCH MODULE + RX SAW FILTER) (MODULE1)

Switching Tx, Rx path for GSM900, DCS1800 and PCS1900 by logic controlling.

— **FRONT END MODULE Control Logic (MODULE1) Truth Table**

	VC1	VC2	VC3
Tx Mode (GSM900)	H	L	L
Tx Mode (DCS1800/1900)	L	H	H(L)
Rx Mode (GSM900)	L	L	L
Rx Mode (DCS1800)	L	L	L
Rx Mode (PCS1900)	L	L	H

— **VC-TCXO (U102)**

This module generates the 26MHz reference clock to drive the logic and RF.

It is turned on when the supply voltage +VCC_SYN is applied.

After buffering a reference clock of 26MHz is supplied to the other parts of the system through the transceiver pin OUT.

— **TRANSCEIVER (U100)**

This chip is fully integrated GSM GPRS tri-band transceiver with VCO, loop filters and most of the passive component in it.

And also fully integrated fractional N RF synthesizer with AFC control possibility, RF VCO with integrated supply regulator. Semi integrated reference oscillator with integrated supply regulator.

RF Receiver front-end amplifies the E-GSM900, DCS1800 and PCS1900 aerial signal, convert the chosen channel down to a low IF of 100kHz.

In IF section, further amplifies the wanted channel output level to the desired value and rejects DC.

2-1-2. TX PART

The transmitter is fully differential using a direct up conversion architecture. It consists of a signal side band power up mixer. Gain is controlled by 6 dB via 3-wire serial bus programing. The fully integrated VCO and power mixer achieve LO suppression, quadrature phase error, quadrature amplitude balance and low noise floor specification. Output matching/balun components drive a standard 50 ohms single ended load.

2-2. Baseband Circuit description of SGH-E340

2-2-1. PCF50603 (U403)

— Power Management

Eight low-dropout regulators designed specifically for GSM applications power the terminal and help ensure optimal system performance and long battery life. A programmable boost converter provides support for 1.8V, 3.0V SIMs, while a self-resetting, electronically fused switch supplies power to external accessories. Ancillary support functions, such as RTC module and High Voltage Charge pump, Clock generator, aid in reducing both board area and system complexity.

I2C BUS serial interface provides access to control and configuration registers. This interface gives a microprocessor full control of the PCF50603 and enables system designers to maximize both standby and talk times.

Supervisory functions, including a reset generator, an input voltage monitor, and a temperature sensor, support reliable system design. These functions work together to ensure proper system behavior during start-up or in the event of a fault condition (low microprocessor voltage, insufficient battery energy, or excessive die temperature).

— Backlight Brightness Modulator

The Backlight Brightness Modulator (BBM) contains a programmable Pulse-width modulator (PWM) and FET to modulate the intensity of a series of LEDs or to control a DC/DC converter that drives LCD backlight.

This phone (SGH-E340) uses PWM control to contrast the backlight brightness.

— Clock Generator

The Clock Generator (CG) generates all clocks for internal and external usage. The 32.768 kHz crystal oscillator provides an accurate low clock frequency for the PCF50603 and other circuitry.

2-2-2. LCD Connector

LCD is consisted of main LCD (color 6.5K TFT LCD).

Chip select signals in the U304, LCD_CS, can enable LCD. BACKLIGHT signal enables white LED of main LCD.

These signals are from U403.

16-bit data lines (LD(0)~LD(15)) transfer data and commands to LCD. Data and commands use "RS" signal. If this signal is high, inputs to LCD are commands. If it is low, inputs to LCD are data. The signal which informs the input or output state to LCD, is required. But this system is not necessary this signal. So "L_WR" signal is used to write data or commands to LCD. Power signals for LCD are "VDD_IO_HIGH".

2-2-3. Key

This is consisted of key interface pins KEY_ROW(0:4) and KEY_COL(0:4) in PCF5212EL1. These signals compose the matrix. Result of matrix informs the key status to key interface in the PCF5212EL1. Power on/off key is separated from the matrix. So power on/off signal is connected with PCF50603 to enable PCF50603. Key LED is consisted of sixteen blue LEDs.

key LED use the 3.3V LDO(U604) for a supply voltage. KEY_LED_ON signal enables sixteen blue LED. "FLIP" informs the status of slide (open or closed) to the PCF5212EL1. This uses the hall effect IC, SH248CSP(U602). A magnet under LCD enables SH248CSP.

2-2-4. EMI ESD Filter(U501)

This system uses the EMI ESD filter, U501 to protect noise from IF CONNECTOR part.

2-2-5. IF connetor(CN302)

It is 18-pin connector. They are designed to use VBAT, V_EXT_CHARGE, USB_D+, +VBUS, USB_D-, TXD1, RXD1, AUX_ON, EXT1, EXT2 and GND. They connected to power supply IC, microprocessor and signal processor IC.

2-2-6. Battery Charge Management IC(U505)

A complete constant-current/constant-voltage linear charger for single cell lithium-ion batteries is used.

If TA connected to phone, "V_EXT_CHARGE" enable charger IC and supply current to battery.

When fault condition caused, "CHG_ON" signal level change low to high and charger IC stop charging process.

2-2-7. Audio

HFR_P and HFR_N from PCF5212EL1 are connected to the main speaker via analog switches. MIC_P and MIC_N are connected to the main MIC as well. EAR1 is the source of External Speaker. YMU762 is a synthesizer LSI for mobile phones. This LSI has a built-in speaker amplifier for outputting sounds that are used by mobile phones in addition to game sounds and ringing melodies that are replayed by a synthesizer.

The synthesizer section adopts "stereophonic hybrid synthesizer system" that are given advantages of both FM synthesizers and Wave Table synthesizers to allow simultaneous generation of up to 32 FM voices and 32 Wave Table voices.

It provides simultaneous generation of up to 40 tones by stereophonic hybrid synthesizer.

YMU762 has built a speaker amplifier of which maximum out is 580 mW at SPVDD=3.6V in this device.

There is Stereophonic analog output for Headphone.

2-2-8. Memory(U301)

This system uses Samsung's memory, KAP17SG00A. The KAP17SG00A is a Multi Chip Package Memory which combines 256Mbit Synchronous Burst Multi Bank NOR Flash Memory and two 512Mbit OneNAND Flash and 128Mbit Synchronous Burst UtrAM.

It has 16 bit data line, HD[1~16] which is connected to PCF5212EL1 and MV3018SAQ, also has 24 bit address lines,

HA[1~24]. There are 3 chip select signals, CS0n_FLASH, CS4n_NAND, and CS1n_RAM.

In the Writing process, WEn is fallen to low and it enables writing process to operate. During reading process, OEn is fallen to low and it enables reading process to operate. Each chip select signals in the PCF5212EL1 choose different memories.

2-2-9. PCF5212EL1(U200)

The PCF5212EL1 is mainly composed of embeded DSP and ARM core. The DSP subsystem includes the Saturn DSP core with embedded RAM and ROM, and a set of peripherals. It has 24kx16 bits PRAM, 104k*16 bits, 32k*16 XYRAM and 63k*16 XYROM in the DSP.

The ARM946E-S consists of an ARM9E-S processor core, 8 kbyte instruction cache and 8 kbyte data cache, tightly-coupled ITCM(Instruction Tightly Coupled Memory) and DTCM(Data Tightly Coupled Memory) memories, a memory protection unit, and an AMBA(Advanced Microcontroller Bus Architecture) AHB(Advanced High-performance Bus) bus interface with a write buffer.

HD(0:15), data lines and HA(0:23), address lines are connected to KAP17SG00A (memory), MV3018B (image dsp) and YMU762 (melody IC). It has 64 kbyte SC RAM (0.5 Mbit) and 32 kbyte SC program ROM for bootstrap loader in the ARM core.

HD(0:15), data lines and HA(0:23), address lines are connected to memory and YMU762 to communicate.

MV3018B(Camera DSP Chip) controls the communication between ARM core and DSP core.

OEn, WEn control the access of memory. KROW, and KCOL recognize the key string input status.

It has J-TAG control pins (TDI/TDO/TCK) for ARM and DSP core. J-SEL signal controls different access to ARM and DSP core.

ADC(Analog to Digital Convertor) receives the condition of temperature, battery type and battery voltage.

2-2-10. TCO-5871U(26MHz)(U102)

This system uses the 26MHz TCXO, TCO-5871U, Toyocom. AFC control signal form PCF5212EL1 controls frequency from 26MHz x-tal. It generates the clock frequency. This clock is connected to PCF5212EL1, YMU762 and HD155166.

2-2-11. Camera DSP(MV3018SAQ)(U304)

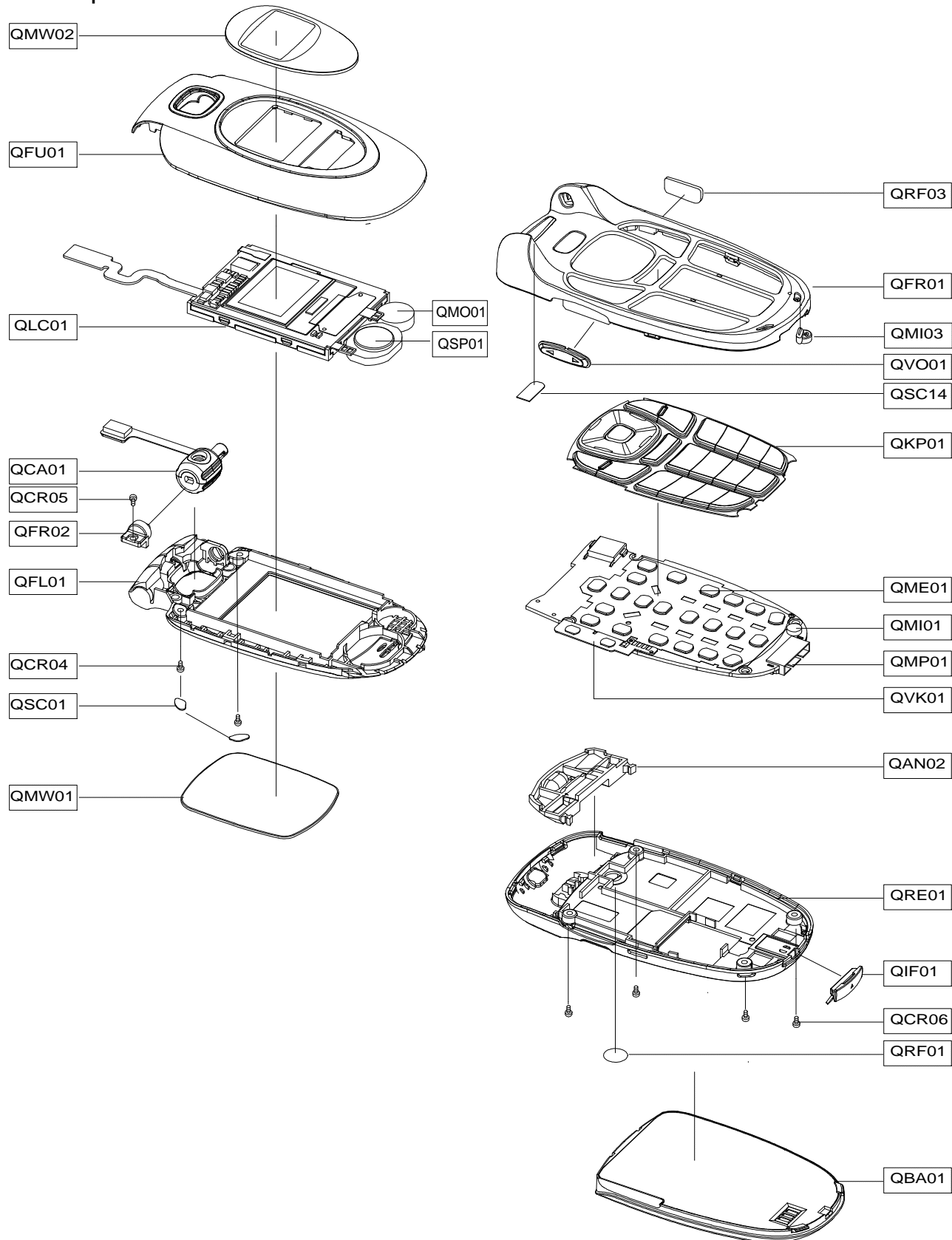
MV3018SAQ provides rich video functions up to 30-frame display with minimized tasks in the handset main processor

as well as hardware based real-time JPEG compression and decompression. MV3018SAQ directly transmits and previews the RGB data to the LCD graphic memory by processing the sensor output data according to the handset's command. It can save the raw RGB data up to VGA resoulution into its image buffer and allows the host processor to download with scalable sized compressed data.

It utilizes 16 bit data bus for communication with the main processor, including bus interface types.

3. Exploded View and Parts List

3-1. Exploded View



3-2. Parts List

Location NO.		Description	SEC CODE
QRF03		COVER EAR JACK	GH72-19702A
QFR01		FRONT	GH75-06795A
QMI03		MIC HOLDER	GH73-04563A
QVO01		VOLUME KEY	GH72-19705A
QSC14		TAPE FRONT HOLE	GH74-14197A
QKP01		MEC-KEYPAD	GH75-06860A
QME01		UNIT METAL DOME	GH59-02045A
QMI01		MICROPHONE ASSY	GH30-00199A
QMP01		PBA MAIN	GH92-02049A
QVK01		UNIT VOLUME KEY	GH59-02067A
QAN02		INTENNA	GH42-00557A
QRE01		MEC-REAR COVER	GH75-06861A
QIF01		COVER IF CONNECTOR	GH72-19704A
QCR06		SCREW-MACHINE	6001-001155
QRF01		RF COVER	GH74-14863A
QBA01		BATTERY	GH43-01677A
QMW02		WINDOW SUB	GH72-19678A
QFU01		UPPER FOLDER	GH75-06800A
QLC01		LCD	GH07-00680A
QMO01		MOTOR DC	GH31-00154D
QSP01		SPEAKER	3001-001759
QCA01		UNIT CAMERA	GH59-02098A
QCR05		SCREW-MACHINE	6001-001478
QFR02		OIL DAMPER	GH75-06799A
QFL01		FOLDER LOWER	GH75-06794A
QCR04		SCREW-MACHINE	6001-001479
QSC01		SCREW CAP	GH73-04750A
QMW01		MEC-WINDOW MAIN	GH75-06801A

Description	SEC CODE
BAG PE;LDPE,T0.05,W80,L180,TRP, -, -	6902-000634
ADAPTOR-TAD;TAD137ESE,SGH-P100,-,110	GH44-00482A
UNIT-EARPHONE;SGH-X910,AEP277SSE,-,E	GH59-01392A
LABEL(P)-WATER SOAK;SCH-X110,NORGE,1	GH68-02026A
LABEL(R)-MAIN(EU);SGH-E340,XET,POLYE	GH68-06970A
MANUAL-USE;SGH-E340,XET,ITALIAN,ITAY	GH68-07076A
CUSHION-CASE(1-2);SGH-X640,PULP,T0.8	GH69-02723A
BOX(P)-UNIT(EU);SGH-E340,SC300+S120+	GH69-02779A
MPR-BOHO VINYL IF;SGH-E720,#950,85X1	GH74-13606A
MPR-PORON MOTOR;SGH-E340,SRS,P4.9XT0	GH74-14191A
MPR-TAPE LCD MODULE;SGH-E340,PSR,5X3	GH74-14198A
MPR-BOHO VINYL REAR;SGH-E340,SP-600,	GH74-14717A
MEC-HAND STRAP;SGH-E620,SEC,-,-,ANTI	GH75-03207U

3-3. Test Jig (GH80-03306A)



3-3-1. USB JIG Cable



3-3-2. RF Test Cable (GH39-00283A)



3-3-3. Test Cable (GH39-00337A)



3-3-4. Serial Cable (CSA LL64151-A)



3-3-5. Power Supply Cable



3-3-6. DATA CABLE (GH39-00331A)



3-3-7. TA (GH44-00482A)



4. Electrical Parts List

SEC CODE	Description	Design LOC
0403-001387	DIODE - ZENER	ZD500
0403-001427	DIODE - ZENER	ZD501
0406-001104	DIODE - TVS	ZD601 ZD701
0406-001188	DIODE - TVS	U501
0406-001201	DIODE - TVS	V705 V706 V707
	DIODE - TVS	ZD602 ZD603 ZD604
	DIODE - TVS	ZD605
0504-001151	TR - DIGITAL	U201 U202 U203
	TR - DIGITAL	U504
0505-001423	FET - SILICON	U305
0601-001785	LED	LED601 LED602
	LED	LED603 LED604
	LED	LED605 LED606
	LED	LED607 LED608
	LED	LED609 LED610
	LED	LED611 LED612
	LED	LED613 LED614
	LED	LED615 LED616
	LED	LED617
0801-002237	IC	U302 U709
0801-002294	IC	U404
1001-001231	IC	U601 U603 U607
1001-001306	IC	U608
1001-001331	IC	U609 U610
1009-001018	IC	U602
1108-000018	IC	U710
1201-002223	IC	U702
1202-001068	IC	U605
1203-003208	IC	U701
1203-003545	IC	U402
1203-003568	IC	U403
1203-003737	IC	U401 U604
1203-003742	IC	U505
1204-002161	IC	U303
1205-002647	IC	U200
1205-002709	IC	U100
1404-001221	THERMISTOR	V500
1405-001082	VARISTOR	V701 V702 V708
	VARISTOR	V709 V710 V711
1405-001082	VARISTOR	V400 V712
2007-000137	R - CHIP	R512
2007-000138	R - CHIP	R113
2007-000140	R - CHIP	R404
2007-000141	R - CHIP	R601 R604
2007-000143	R - CHIP	R102 R103 R107
	R - CHIP	R108 R211 R305
	R - CHIP	R313 R314
2007-000148	R - CHIP	R141 R202 R311
	R - CHIP	R406 R409 R503
	R - CHIP	R603

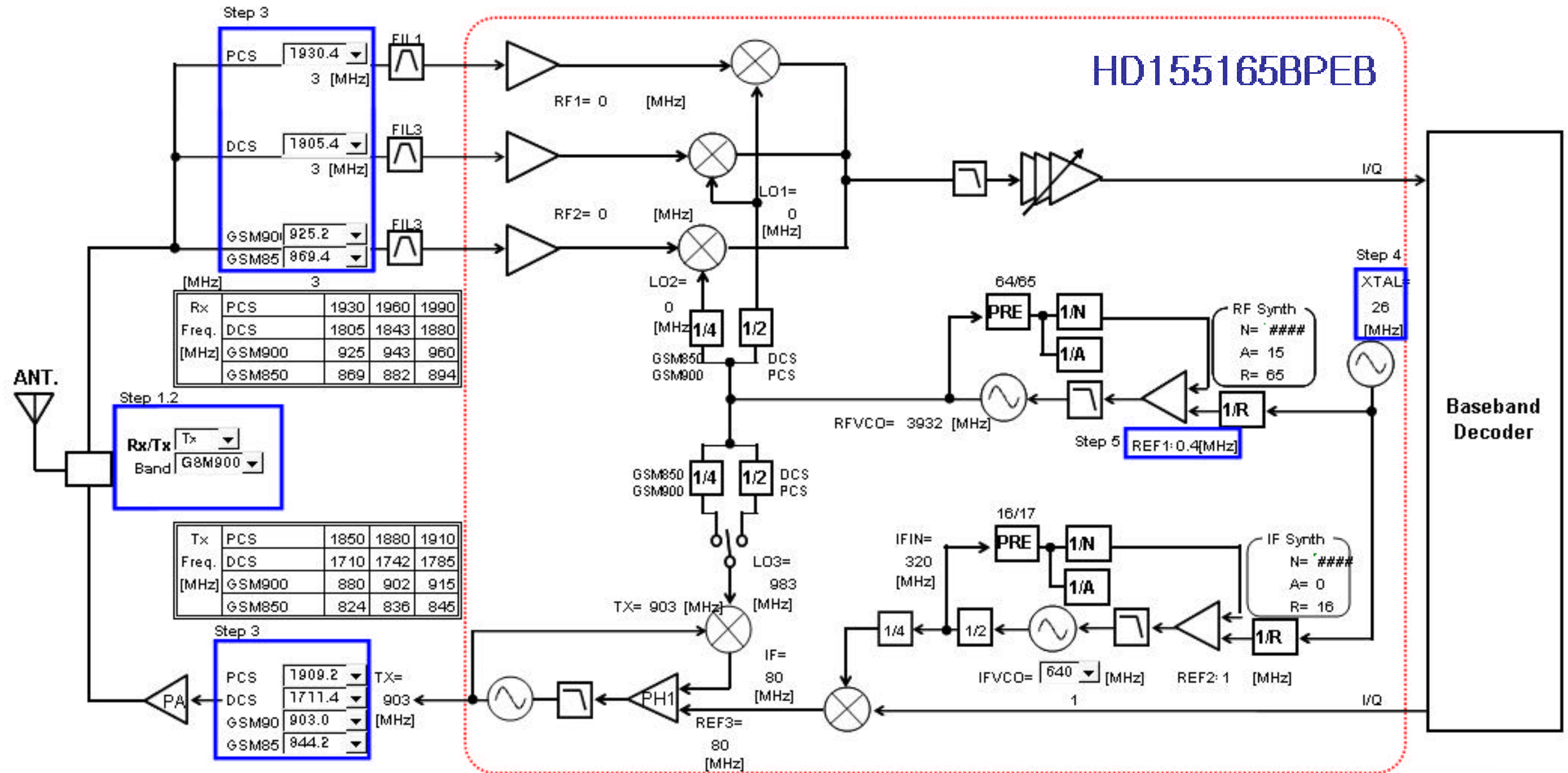
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2007-000152	R-CHIP	R519
2007-000153	R-CHIP	R306
2007-000155	R-CHIP	R632
2007-000162	R-CHIP	R207 R208 R209
	R-CHIP	R210 R216 R220
	R-CHIP	R221 R310 R317
	R-CHIP	R318 R403 R408
	R-CHIP	R501 R511 R602
	R-CHIP	R607 R626
2007-000162	R-CHIP	R518
2007-000170	R-CHIP	R116 R117 R119
	R-CHIP	R139 R506 R507
2007-000171	R-CHIP	R218
2007-000171	R-CHIP	R110 R111 R123
	R-CHIP	R135 R143 R144
	R-CHIP	R146 R200 R201
	R-CHIP	R203 R222 R309
	R-CHIP	R315 R322 R323
	R-CHIP	R324 R328 R333
	R-CHIP	R402 R407 R630
	R-CHIP	R631
2007-000172	R-CHIP	R101 R106
2007-000242	R-CHIP	R205 R206
2007-000758	R-CHIP	R500 R502
2007-000831	R-CHIP	R606
2007-001303	R-CHIP	R302
2007-001325	R-CHIP	R304
2007-001339	R-CHIP	R627
2007-002970	R-CHIP	R609 R610 R611
	R-CHIP	R612 R613 R614
	R-CHIP	R615 R616 R617
	R-CHIP	R618 R619 R620
	R-CHIP	R622 R623 R624
	R-CHIP	R633
2007-002970	R-CHIP	R621
2007-007013	R-CHIP	R307
2007-007014	R-CHIP	R301 R303
2007-007100	R-CHIP	R401
2007-007107	R-CHIP	R504
2007-007334	R-CHIP	R510
2007-007480	R-CHIP	R625
2007-007489	R-CHIP	R515
2007-007573	R-CHIP	R509 R608
2007-008275	R-CHIP	R516
2203-000233	C-CERAMIC	C146 C169 C425
2203-000254	C-CERAMIC	C125 C128 C133
	C-CERAMIC	C138 C158 C168
	C-CERAMIC	C201 C300 C616
	C-CERAMIC	C617
	C-CERAMIC	

SEC CODE	Description	Design LOC
2203 - 000278	C - CERAMIC	C163 C164 C602
	C - CERAMIC	C611 C615 C715
2203 - 000311	C - CERAMIC	C504
2203 - 000386	C - CERAMIC	C406 C407
2203 - 000438	C - CERAMIC	ESD2 ESD3
2203 - 000438	C - CERAMIC	C135 C137 C159
	C - CERAMIC	C167 C303 C307
	C - CERAMIC	C624 C625 ESD1
2203 - 000466	C - CERAMIC	C165
2203 - 000550	C - CERAMIC	C330
2203 - 000585	C - CERAMIC	C155
2203 - 000643	C - CERAMIC	C124 C127 C129
	C - CERAMIC	C132
2203 - 000654	C - CERAMIC	C153
2203 - 000679	C - CERAMIC	C304 C317
2203 - 000812	C - CERAMIC	C101 C121 C204
	C - CERAMIC	C213 C220 C221
	C - CERAMIC	C222 C223 C334
	C - CERAMIC	C335 C410 C632
	C - CERAMIC	C633 C634
2203 - 000995	C - CERAMIC	C166 C605 C614
	C - CERAMIC	C705 C706 C708
	C - CERAMIC	C709
2203 - 001153	C - CERAMIC	C426
2203 - 001178	C - CERAMIC	C716
2203 - 001221	C - CERAMIC	C313
2203 - 001259	C - CERAMIC	C115 C144
2203 - 002443	C - CERAMIC	C608
2203 - 002668	C - CERAMIC	C111 C141 C142
2203 - 005050	C - CERAMIC	C606
2203 - 005052	C - CERAMIC	C626 C627
2203 - 005054	C - CERAMIC	C601 C610
2203 - 005065	C - CERAMIC	C331
2203 - 005288	C - CERAMIC	C112 C143 C154
2203 - 005481	C - CERAMIC	C314
2203 - 005482	C - CERAMIC	C134 C202 C203
	C - CERAMIC	C205 C206 C207
	C - CERAMIC	C208 C209 C210
	C - CERAMIC	C211 C212 C214
	C - CERAMIC	C216 C301 C302
	C - CERAMIC	C305 C306 C308
	C - CERAMIC	C310 C311 C312
	C - CERAMIC	C316 C318 C404
	C - CERAMIC	C418 C500 C501
	C - CERAMIC	C502 C609 C630
	C - CERAMIC	C701 C703
2203 - 005496	C - CERAMIC	C151
2203 - 006090	C - CERAMIC	C403
2203 - 006093	C - CERAMIC	C319 C322 C323
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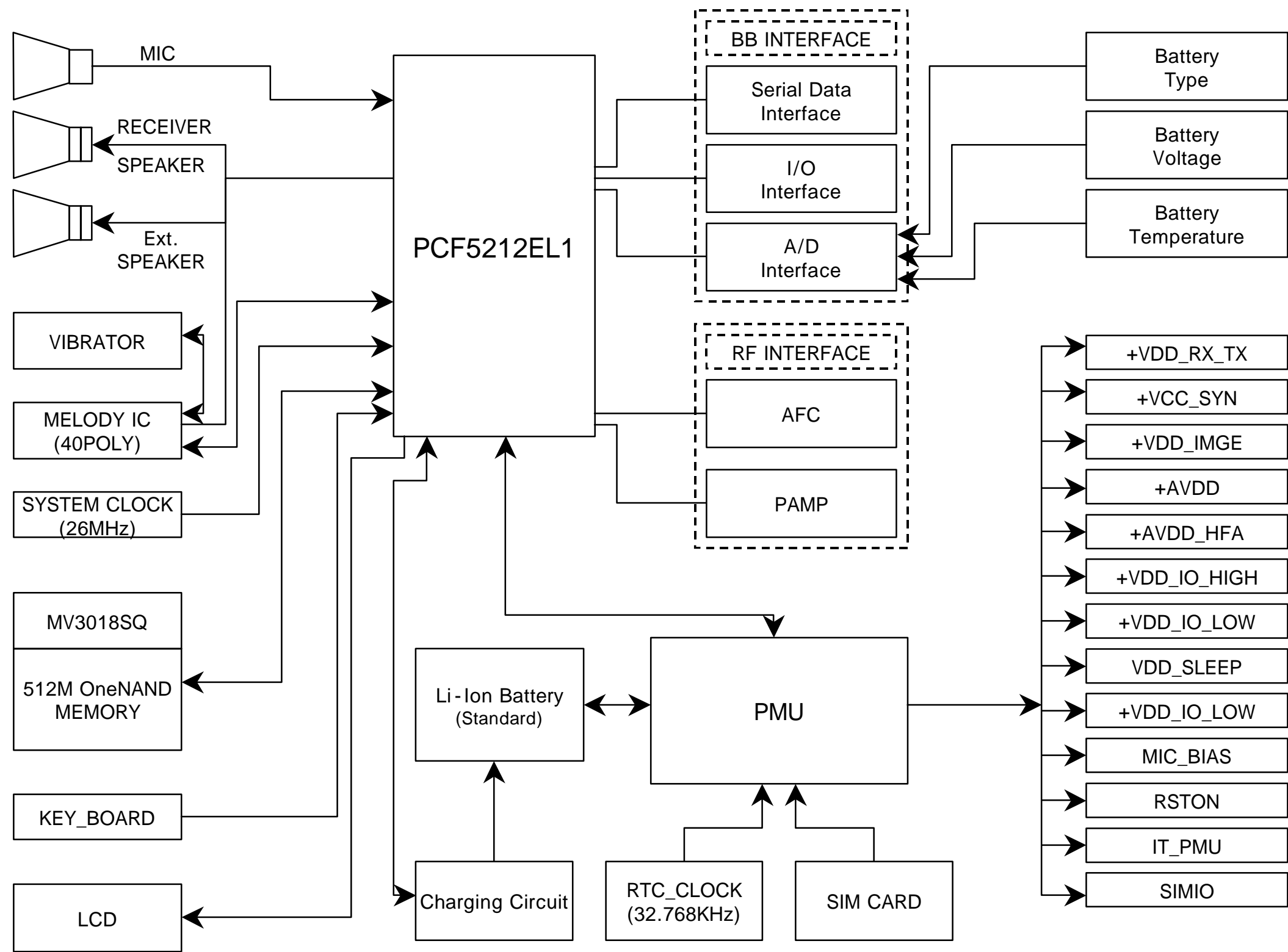
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	C-CERAMIC	C413 C417 C421
2203-006257	C-CERAMIC	C405 C412 C414
	C-CERAMIC	C415 C423 C424
2203-006562	C-CERAMIC	C400 C401 C603
	C-CERAMIC	C607 C613
2404-001225	C-TA	C700
2404-001268	C-TA	C503
2404-001281	C-TA	C422 C600 U704
2404-001348	C-TA	C122
2404-001374	C-TA	C123 C157 C409
2404-001394	C-TA	C150 C309
2703-001938	INDUCTOR-SMD	L121
2703-002201	INDUCTOR-SMD	L125
2703-002267	INDUCTOR-SMD	L124
2703-002346	INDUCTOR-SMD	L401
2703-002365	INDUCTOR-SMD	L101 L102 L103
	INDUCTOR-SMD	L104
2703-002596	INDUCTOR-SMD	L112
2801-004373	CRYSTAL-UNIT	OSC400
2809-001294	OSCILLATOR-VCTCXO	U102
2901-001286	FILTER-EMI SMD	F701 F702 F703
	FILTER-EMI SMD	F704 F705 F706
	FILTER-EMI SMD	F707 F708 F709
2901-001315	FILTER-EMI SMD	U502
2911-000007	DUPLEXER-SAW	MODULE1
3301-001120	BEAD-SMD	L400
3301-001534	BEAD-SMD	L600
3705-001358	CONNECTOR-COAXIAL	CN101
3709-001355	CONNECTOR-CARD EDGE	SIM400
3710-002115	CONNECTOR-SOCKET	CN302
3711-005212	CONNECTOR-HEADER	CN703
3722-002181	JACK-EAR PHONE	CN600
4302-001180	BATTERY	BAT401
4709-001371	IC	U306
GH13-00029A	IC	U304
4202-001049	ANTENNA	ANT3
GH30-00199A	MIC	MIC600

5. Block Diagrams

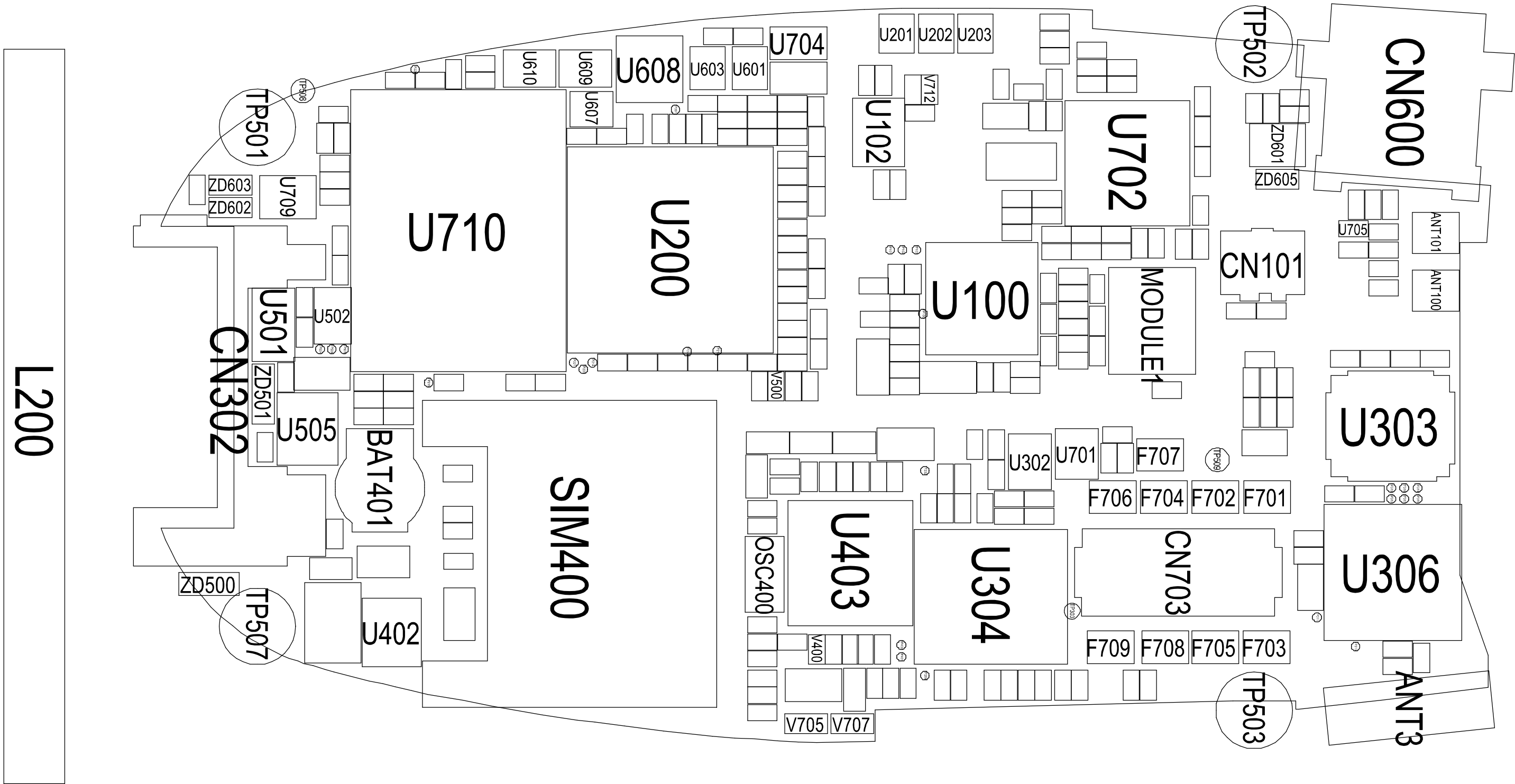
5-1. RF Solution Block Diagram



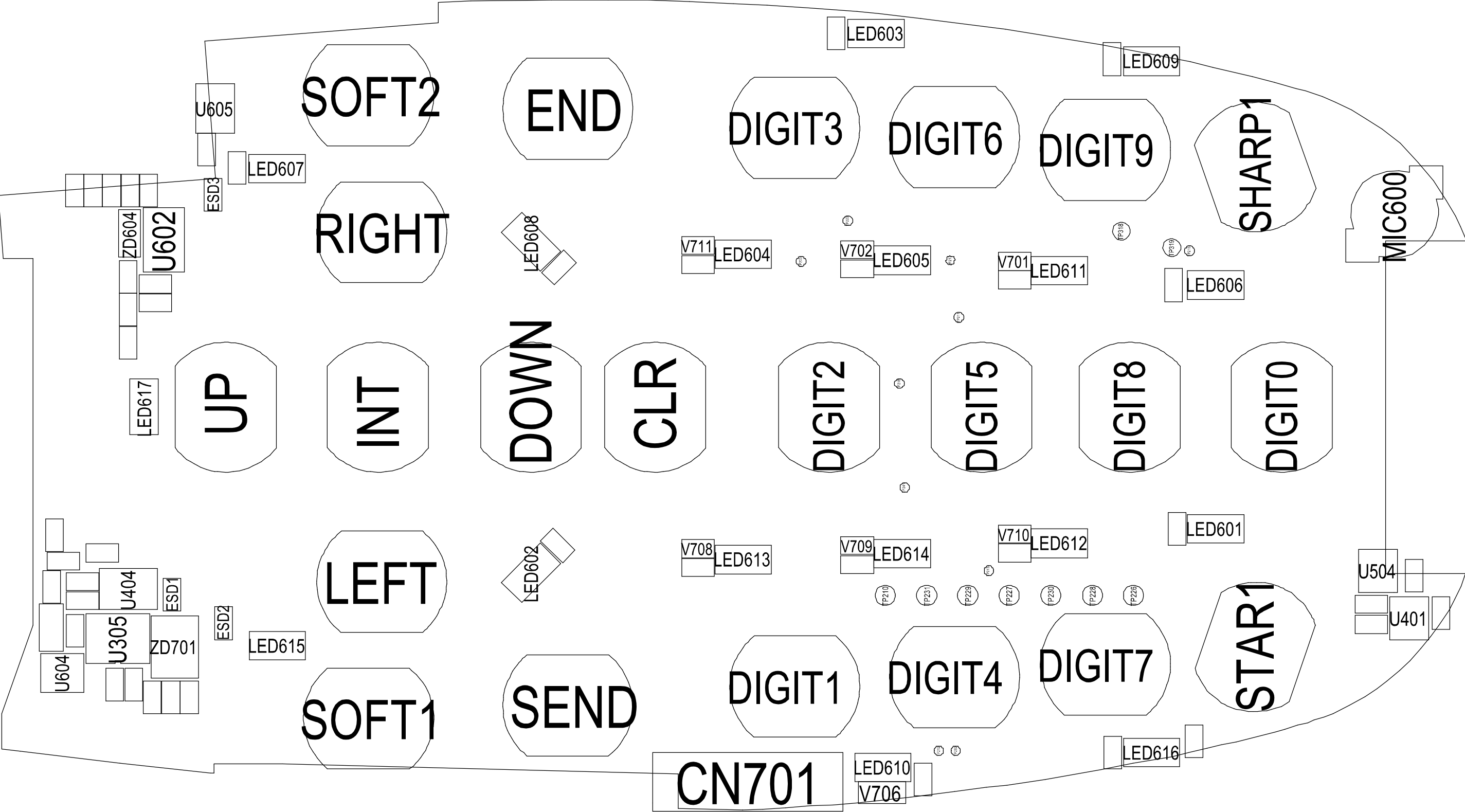
5-2. Base Band Solution Block Diagram



6-1. PCB Top Diagram

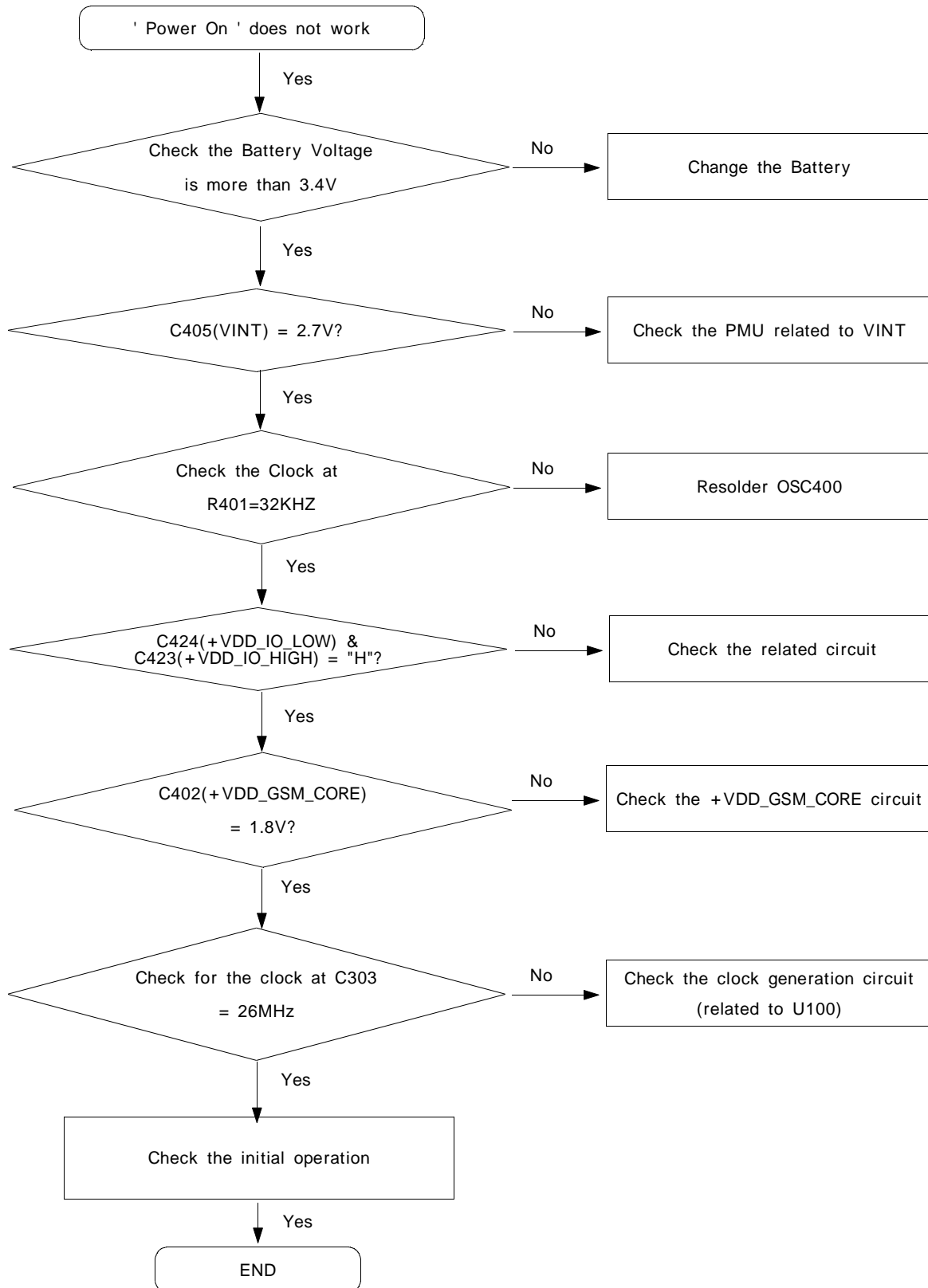


6-2. PCB Bottom Diagram



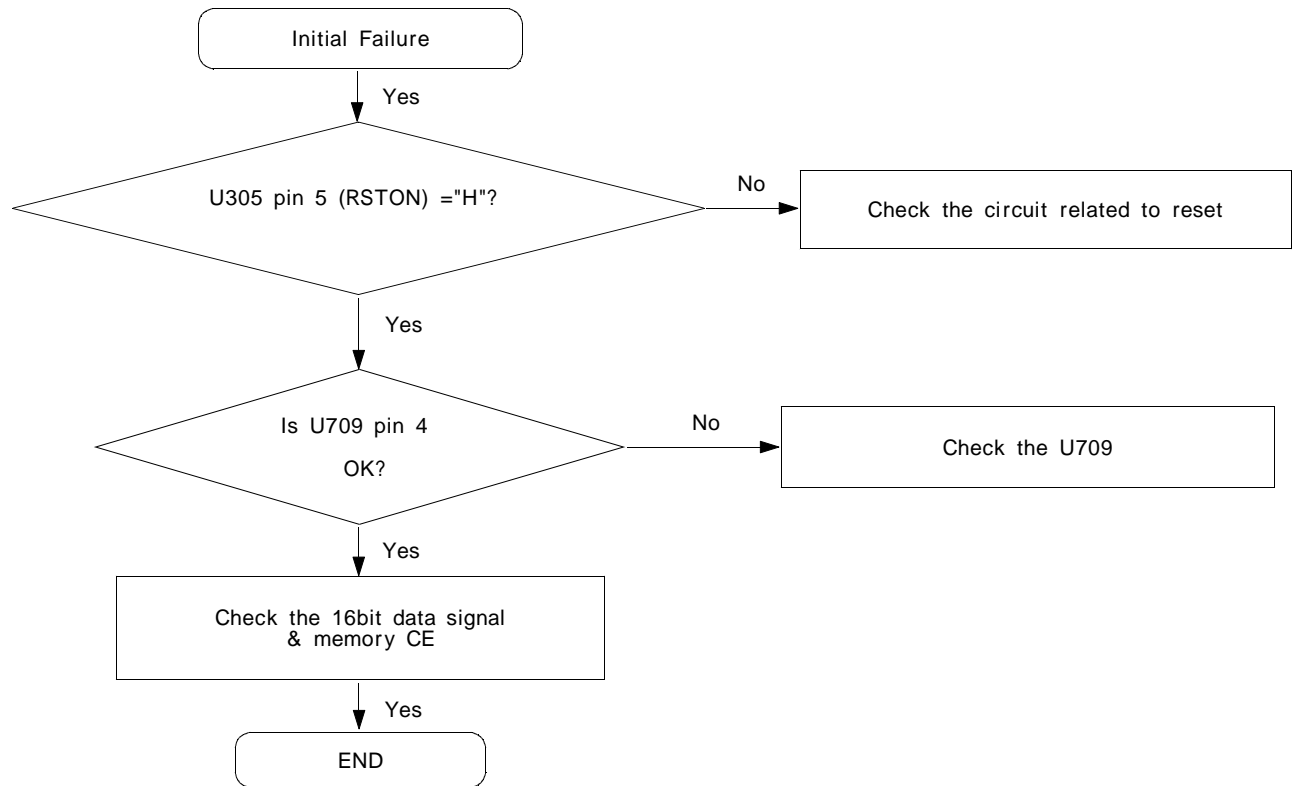
7. Flow Chart of Troubleshooting

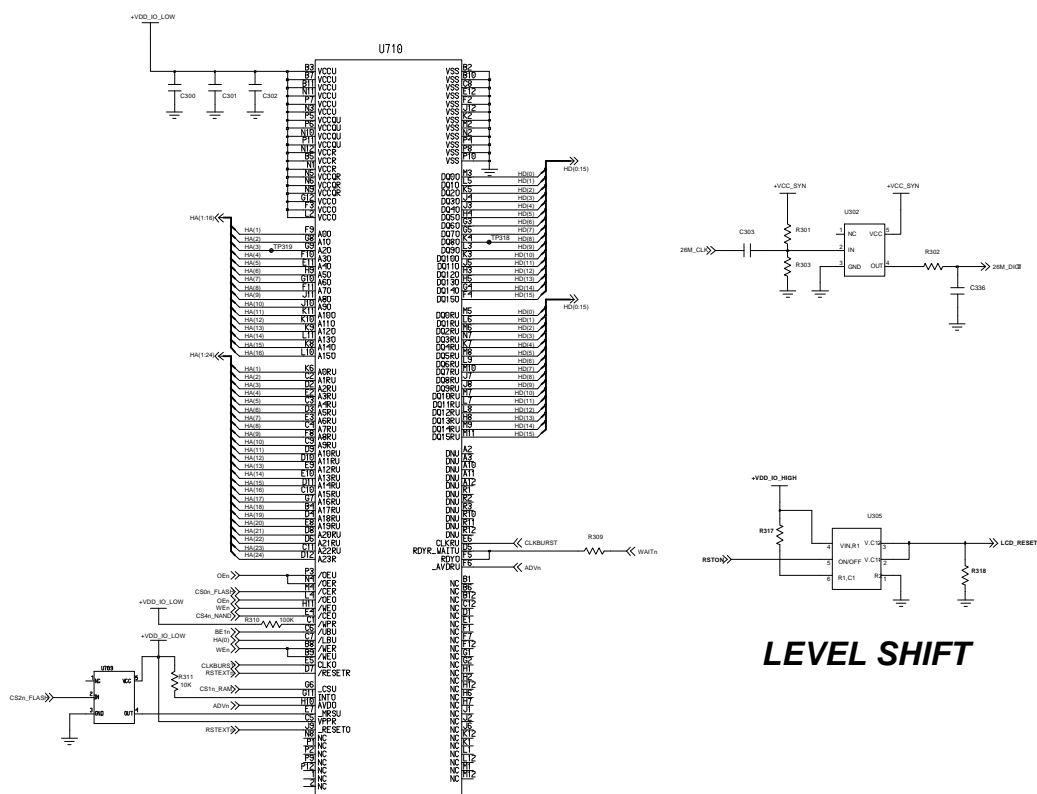
7-1. Power On





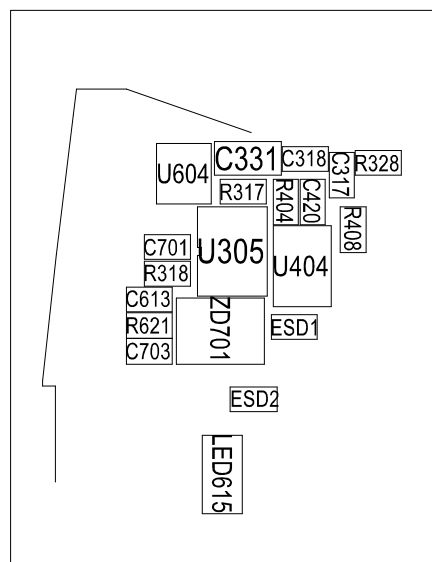
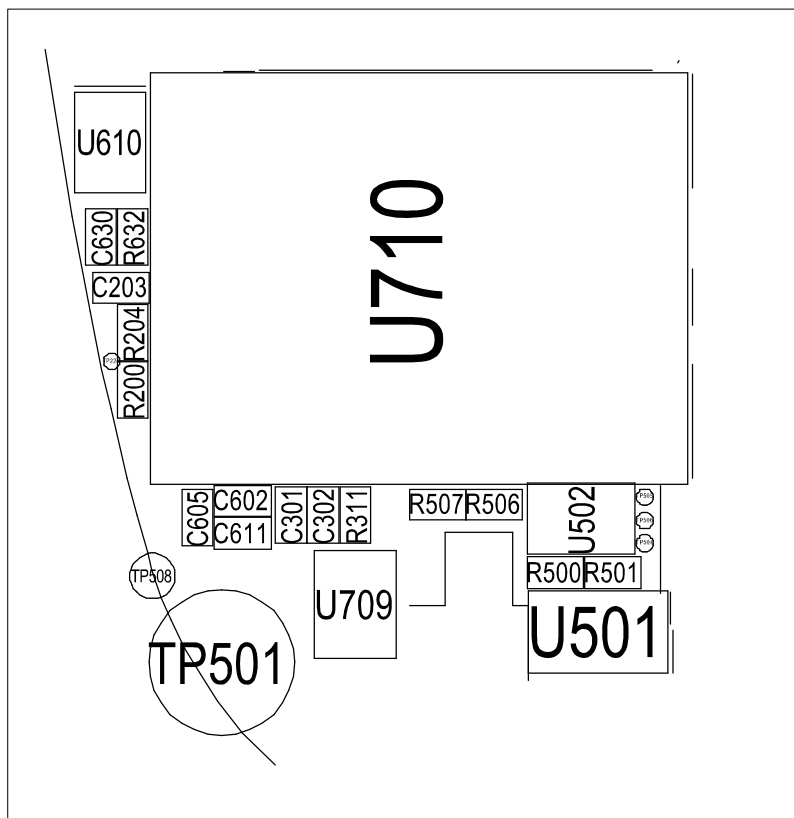
7-2. Initial



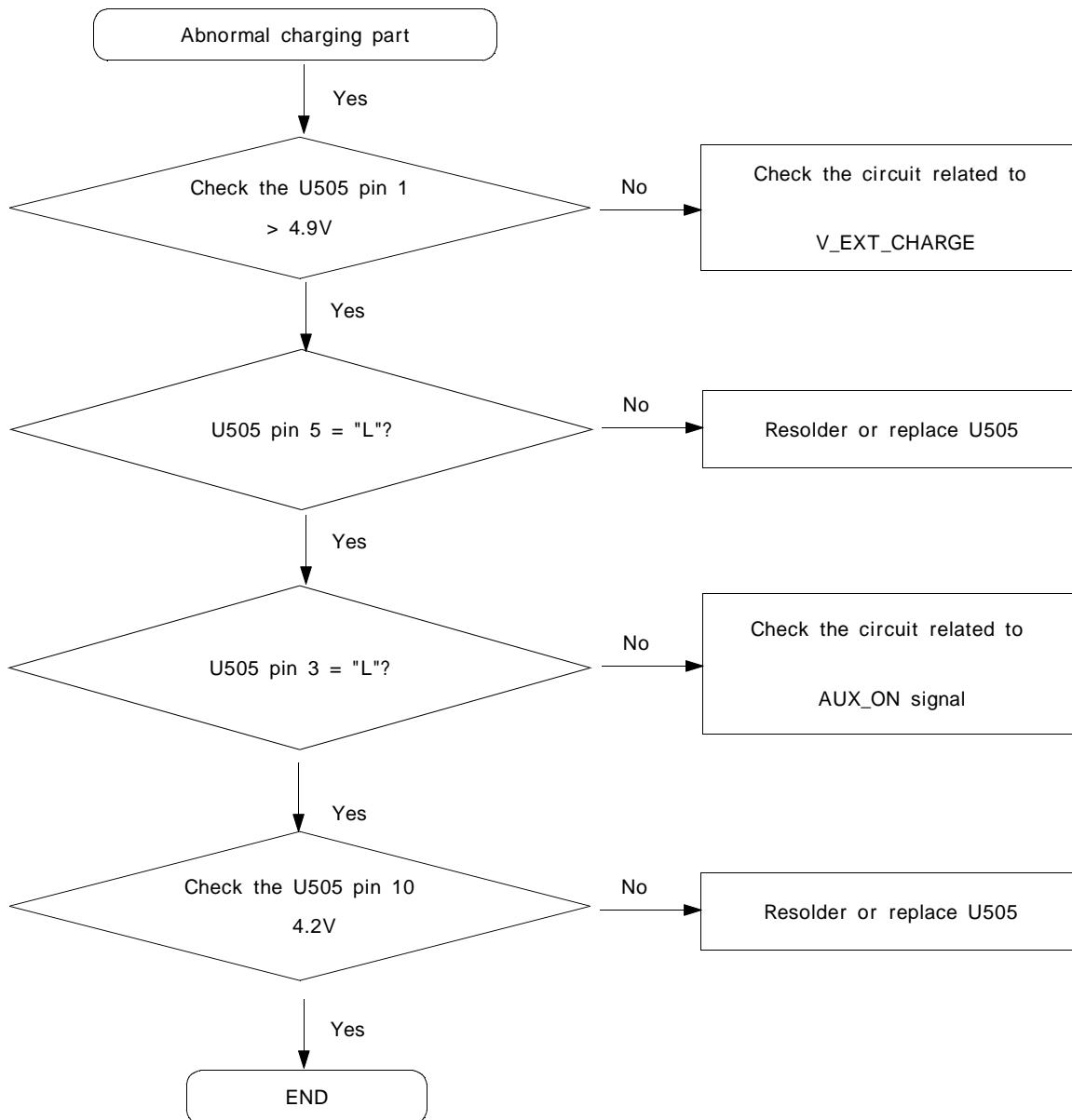


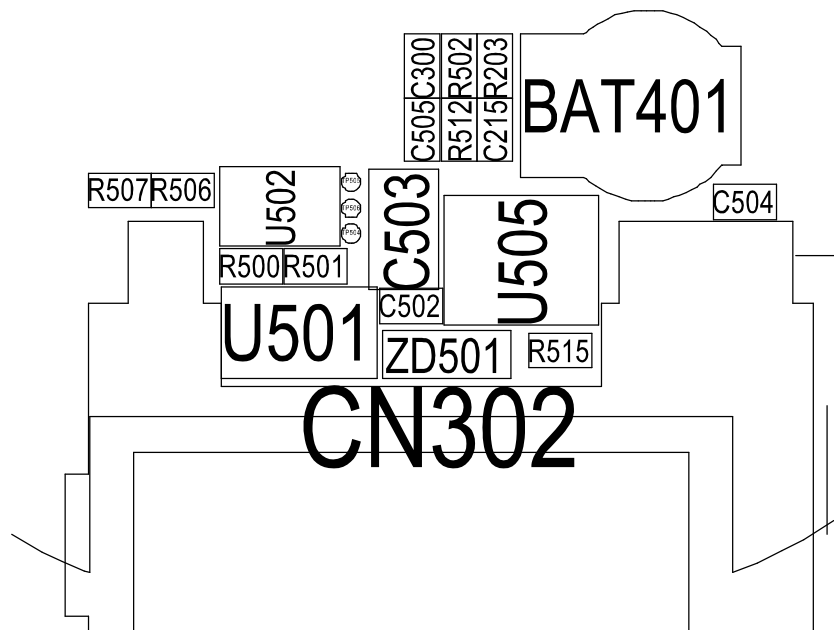
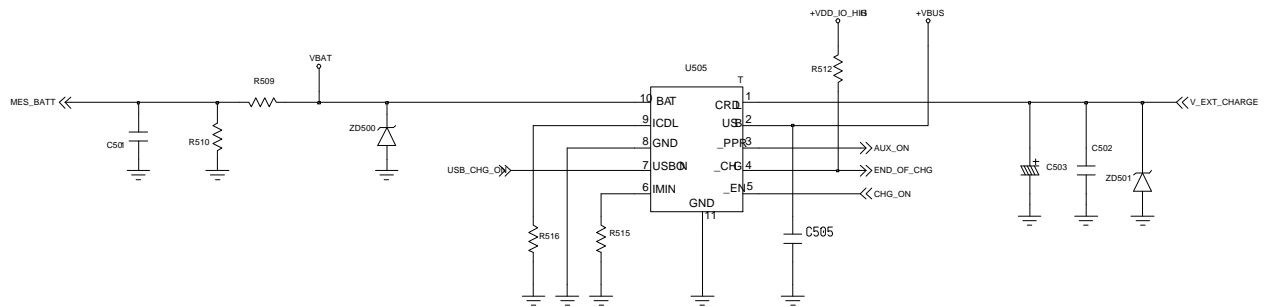
LEVEL SHIFT

MEMORY

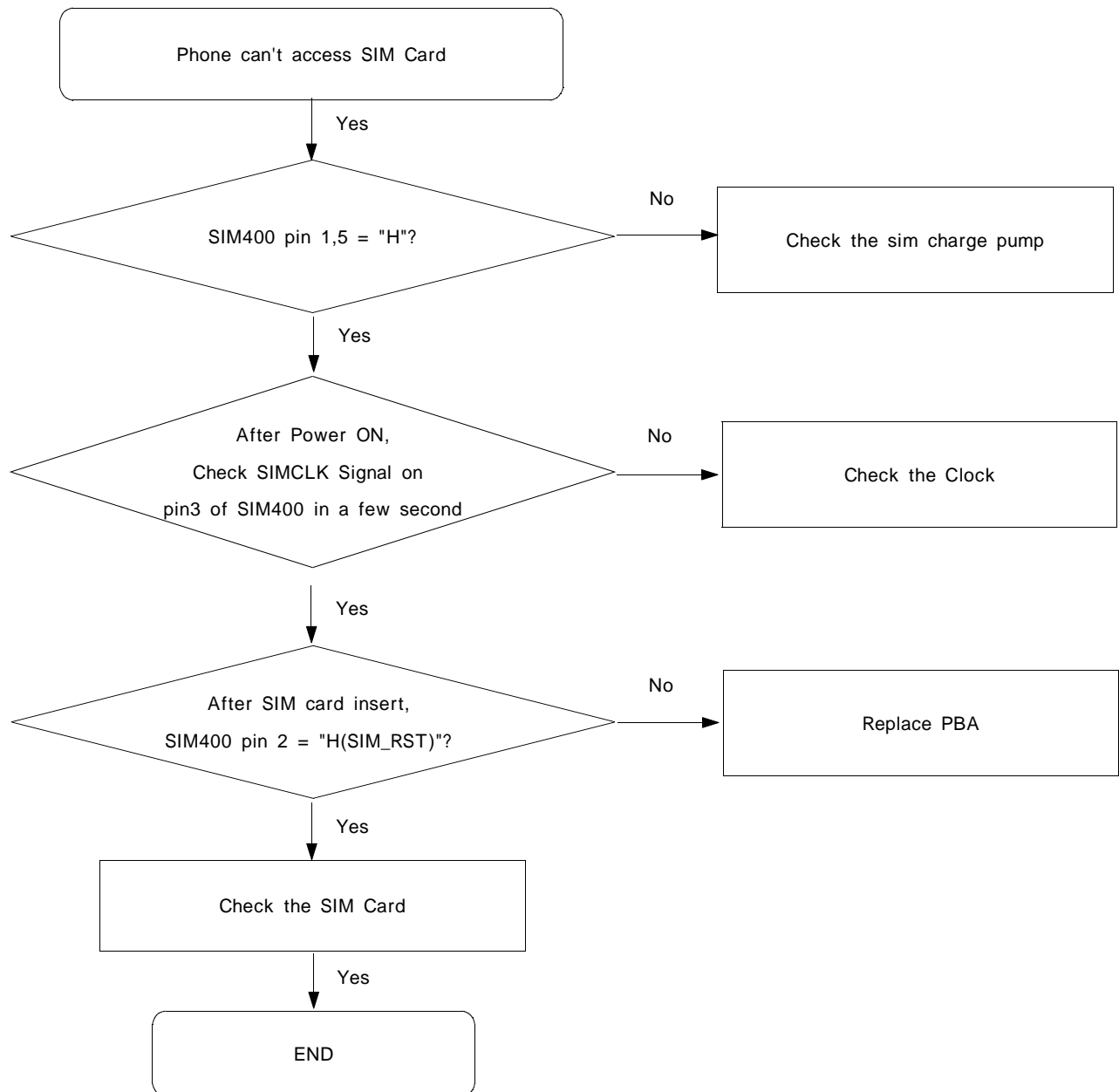


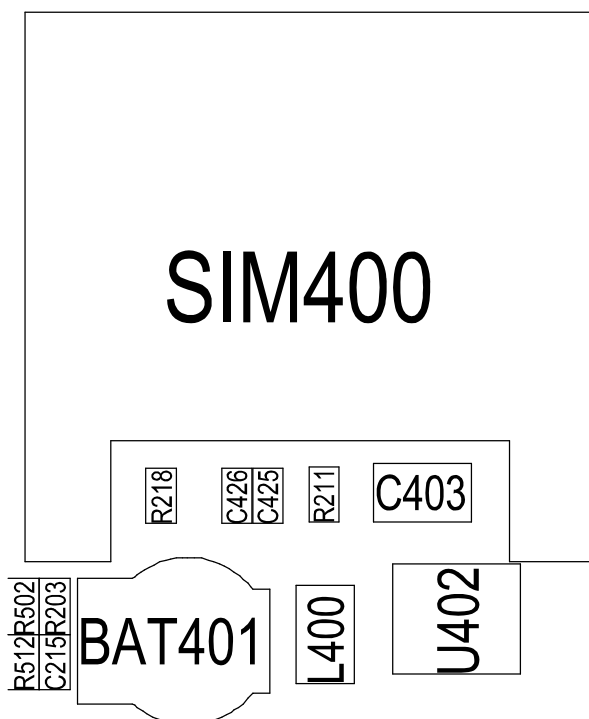
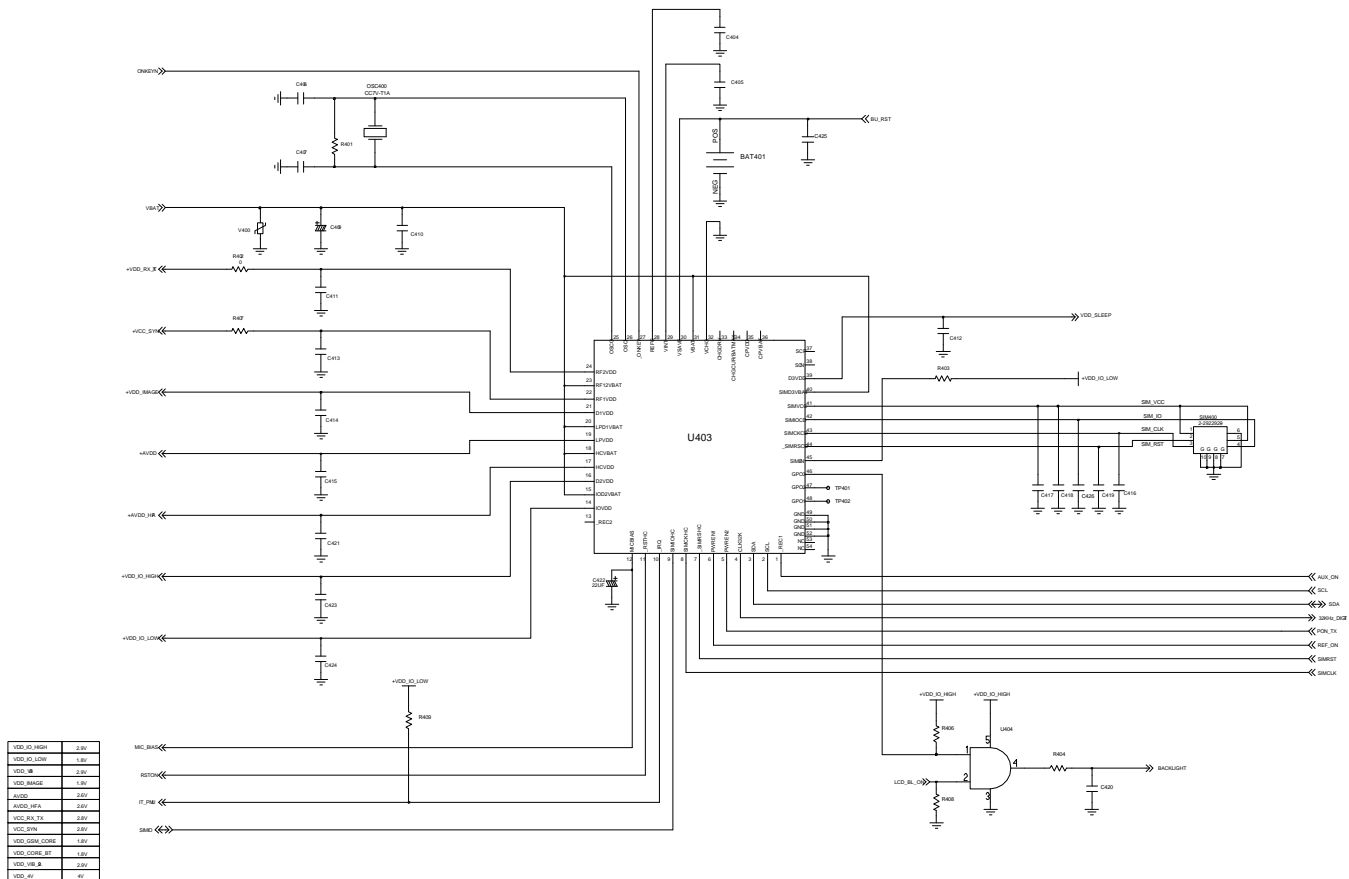
7-3. Charging Part



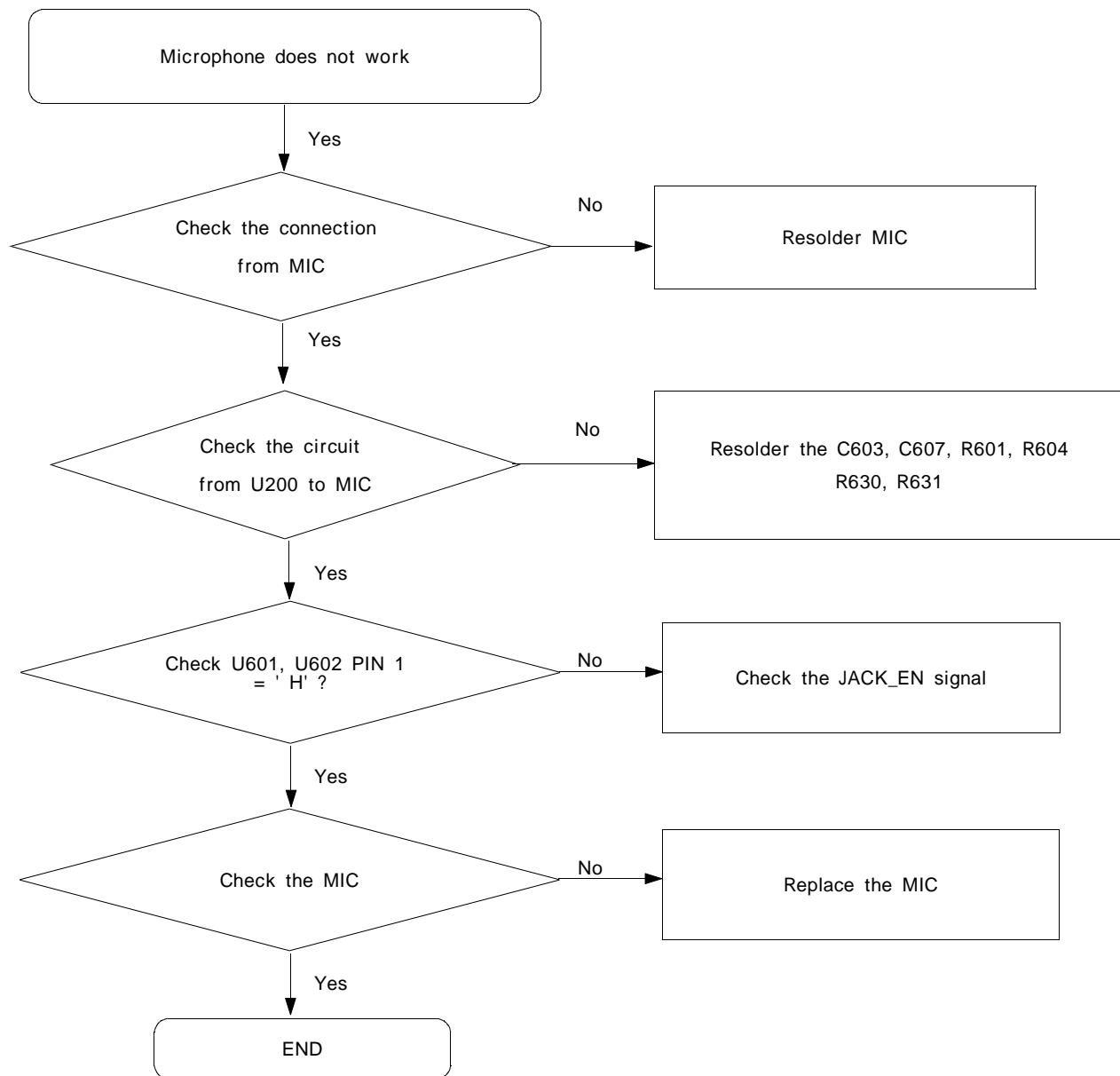


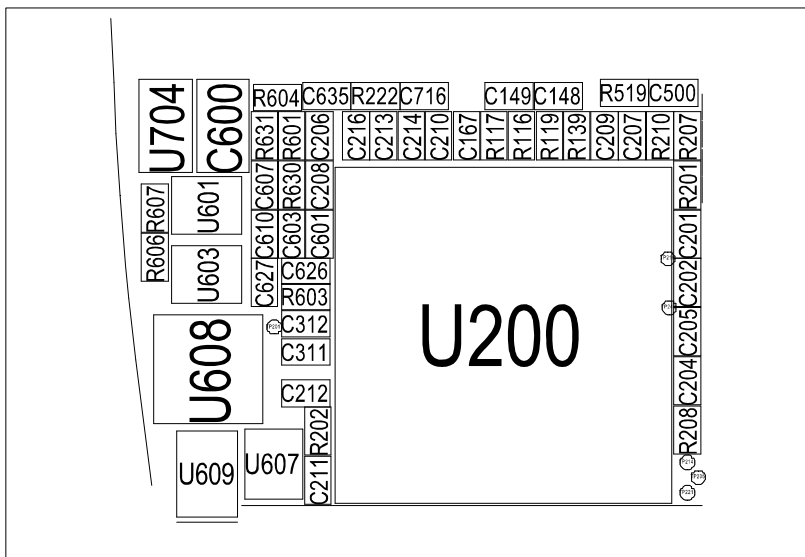
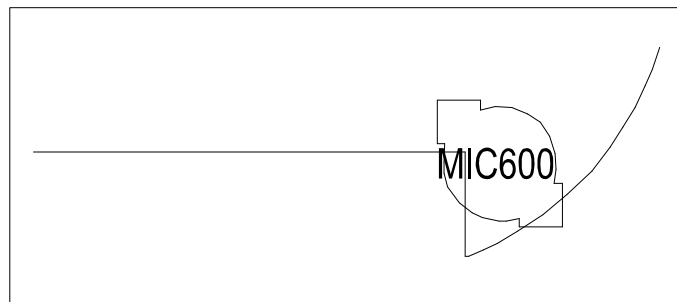
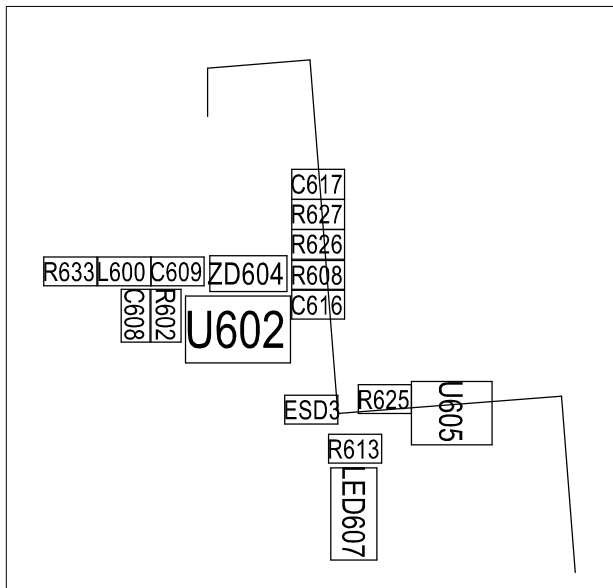
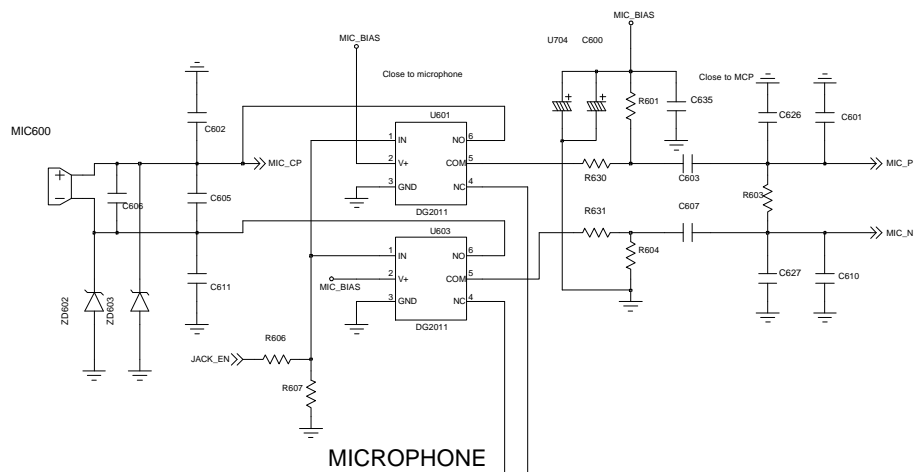
7-4. Sim Part



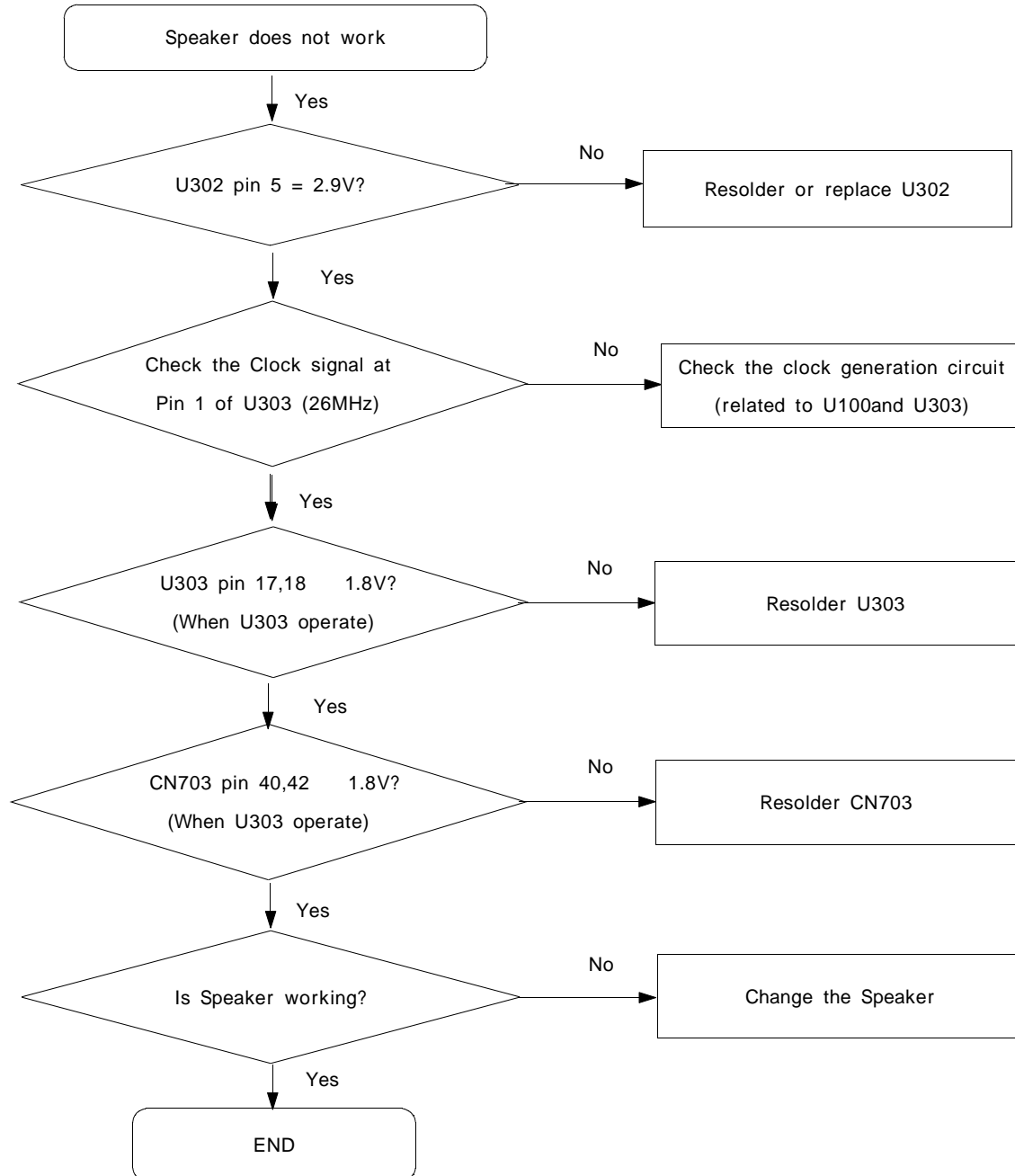


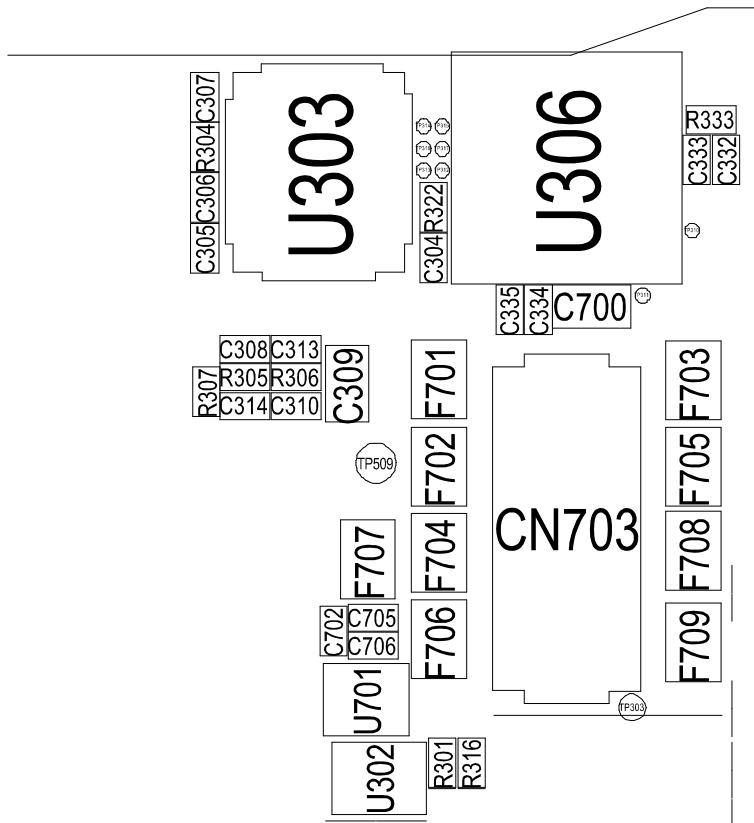
7-5. Microphone Part



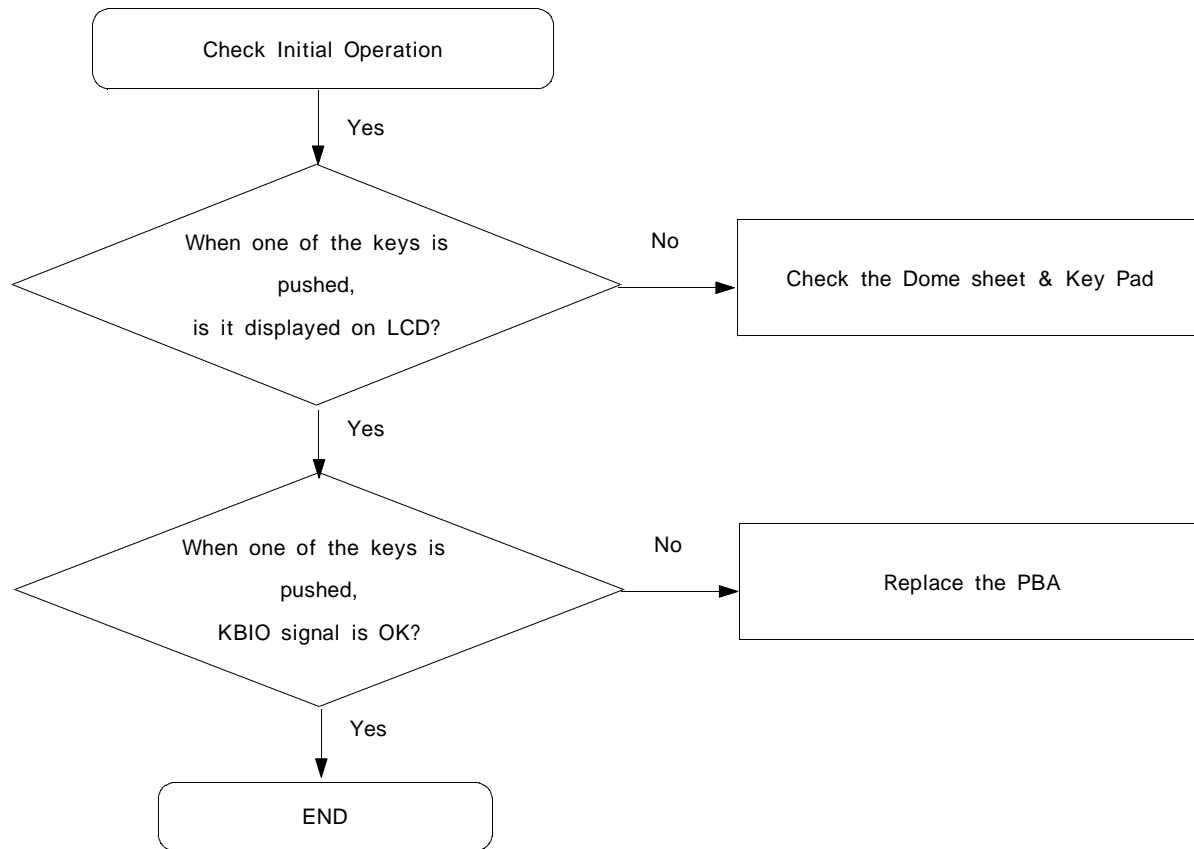


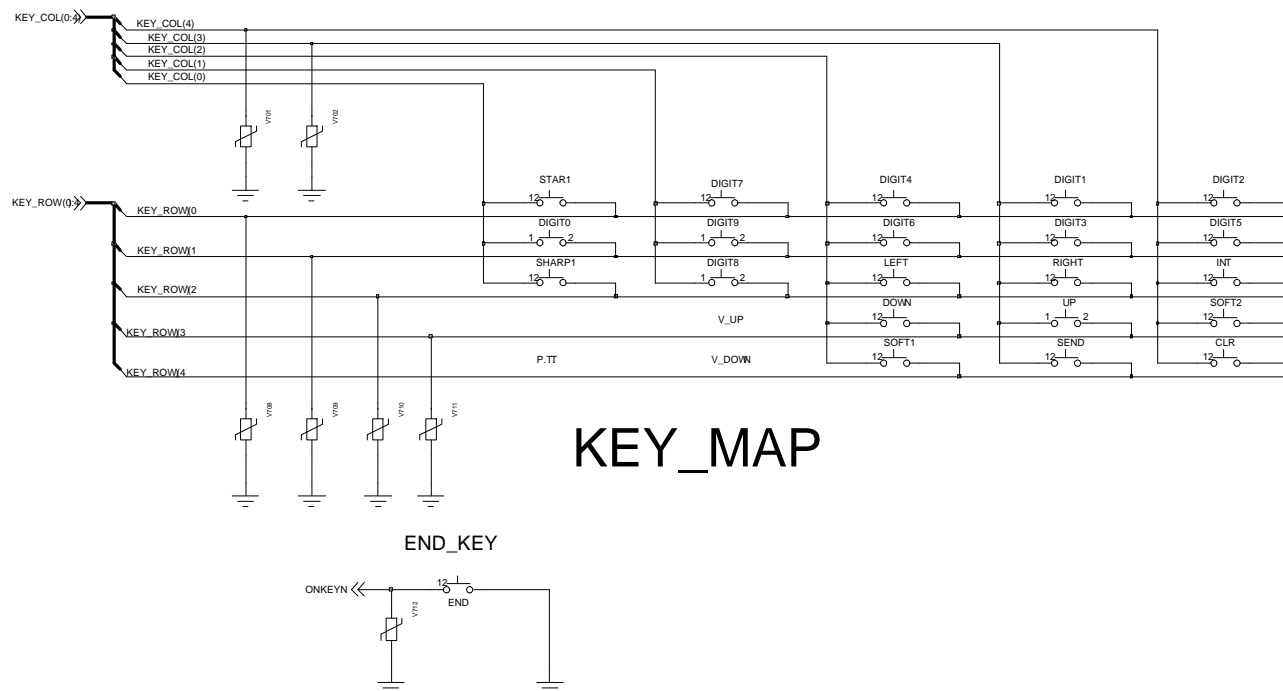
7-6. Speaker Part(Melody)



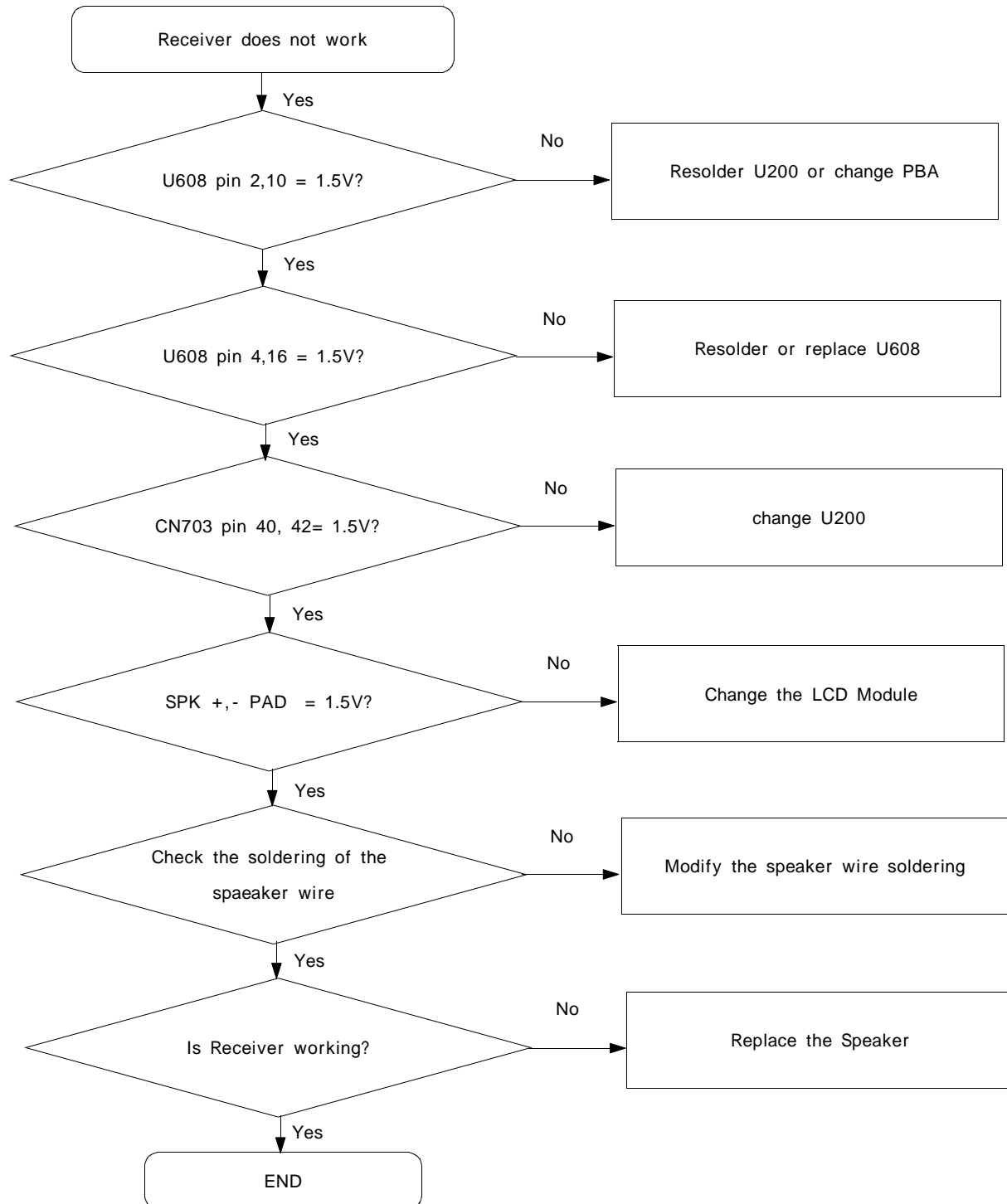


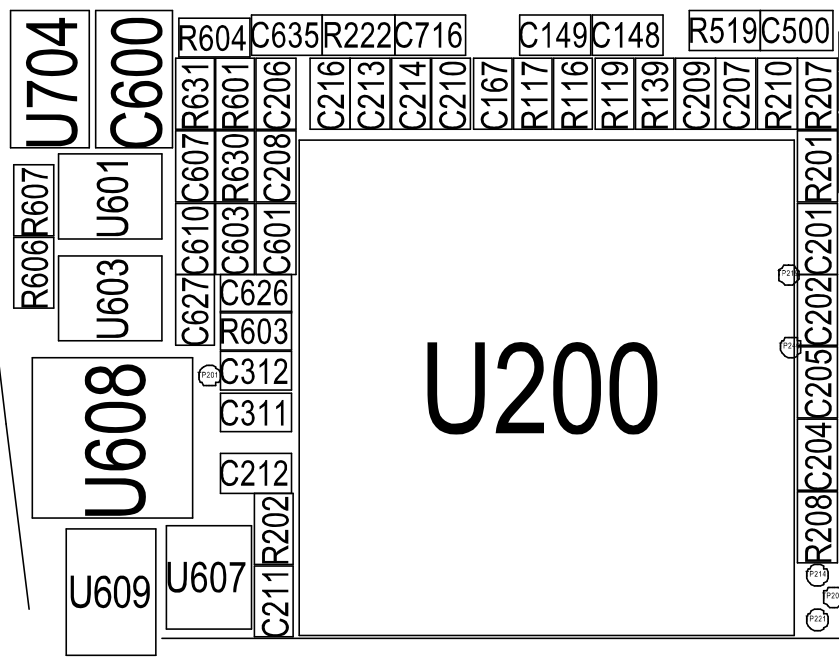
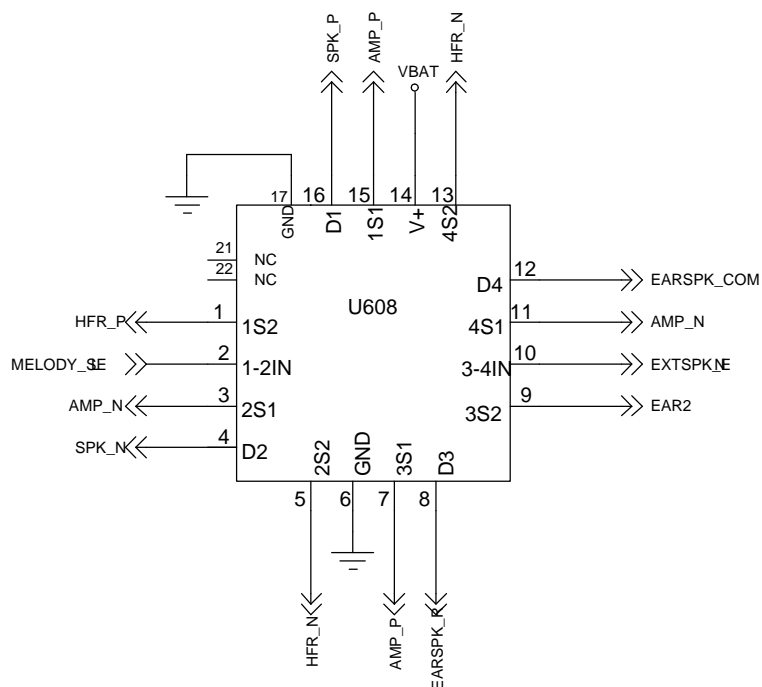
7-7. Key Data Input



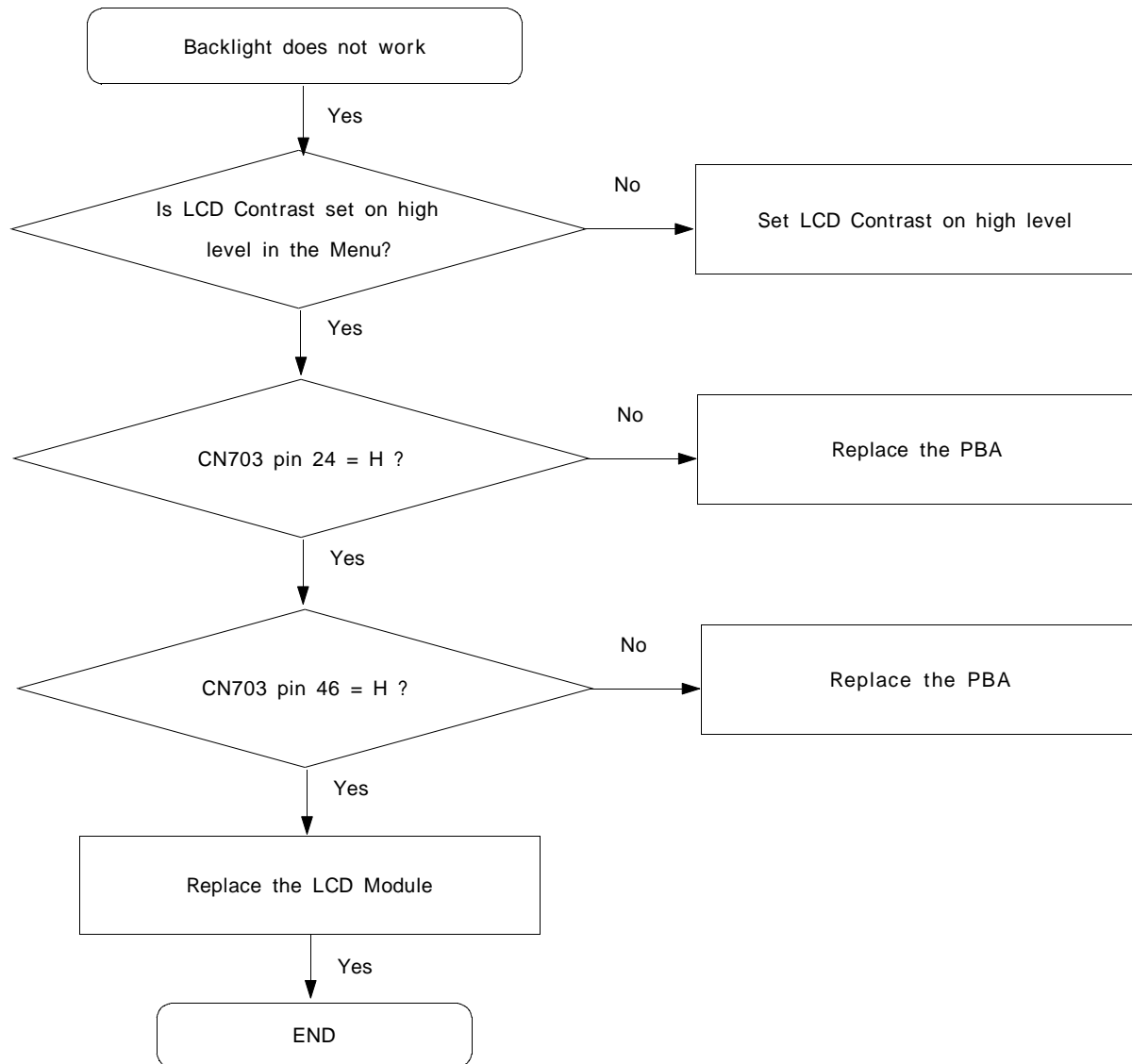


7-8. Receiver Part

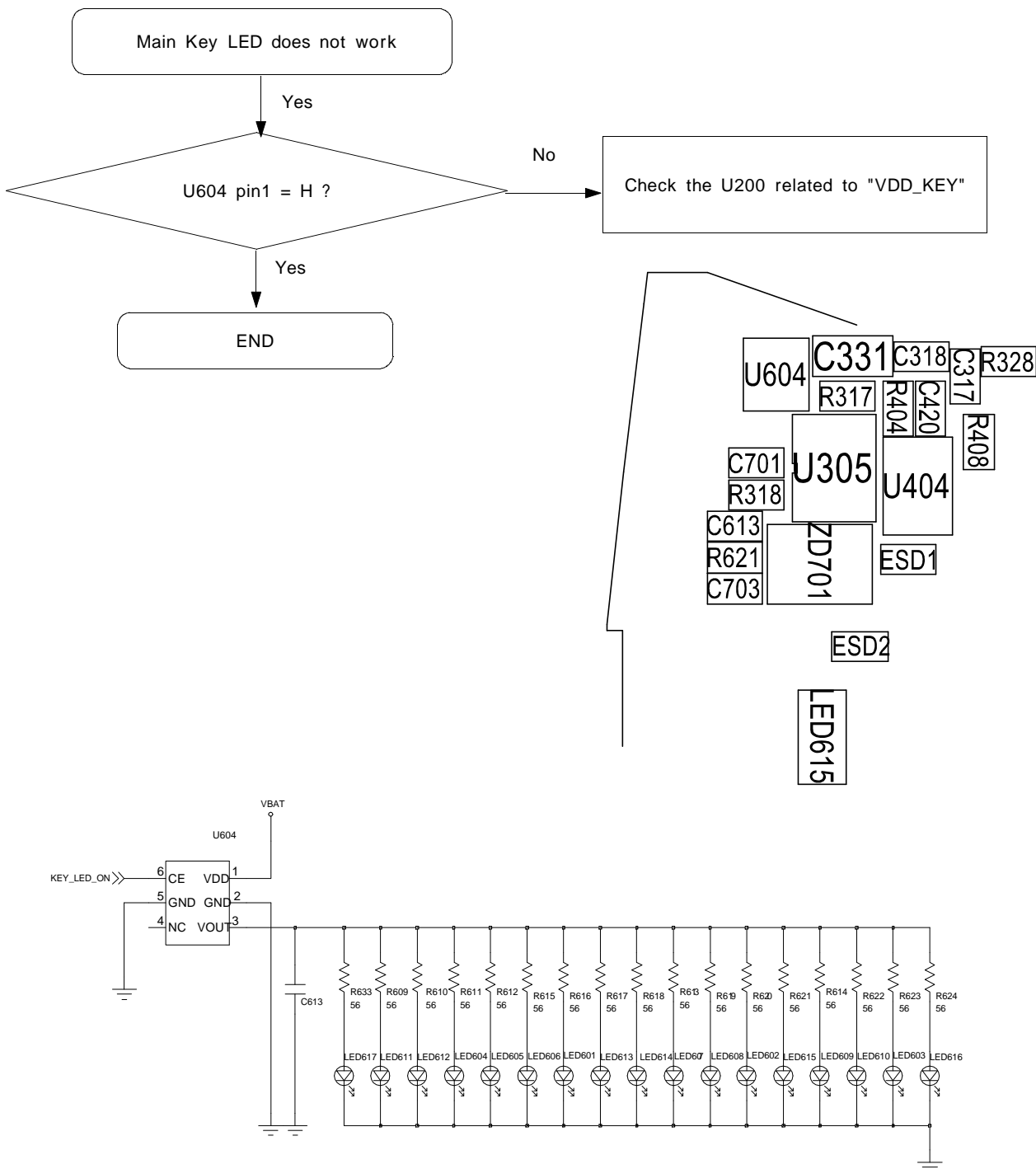




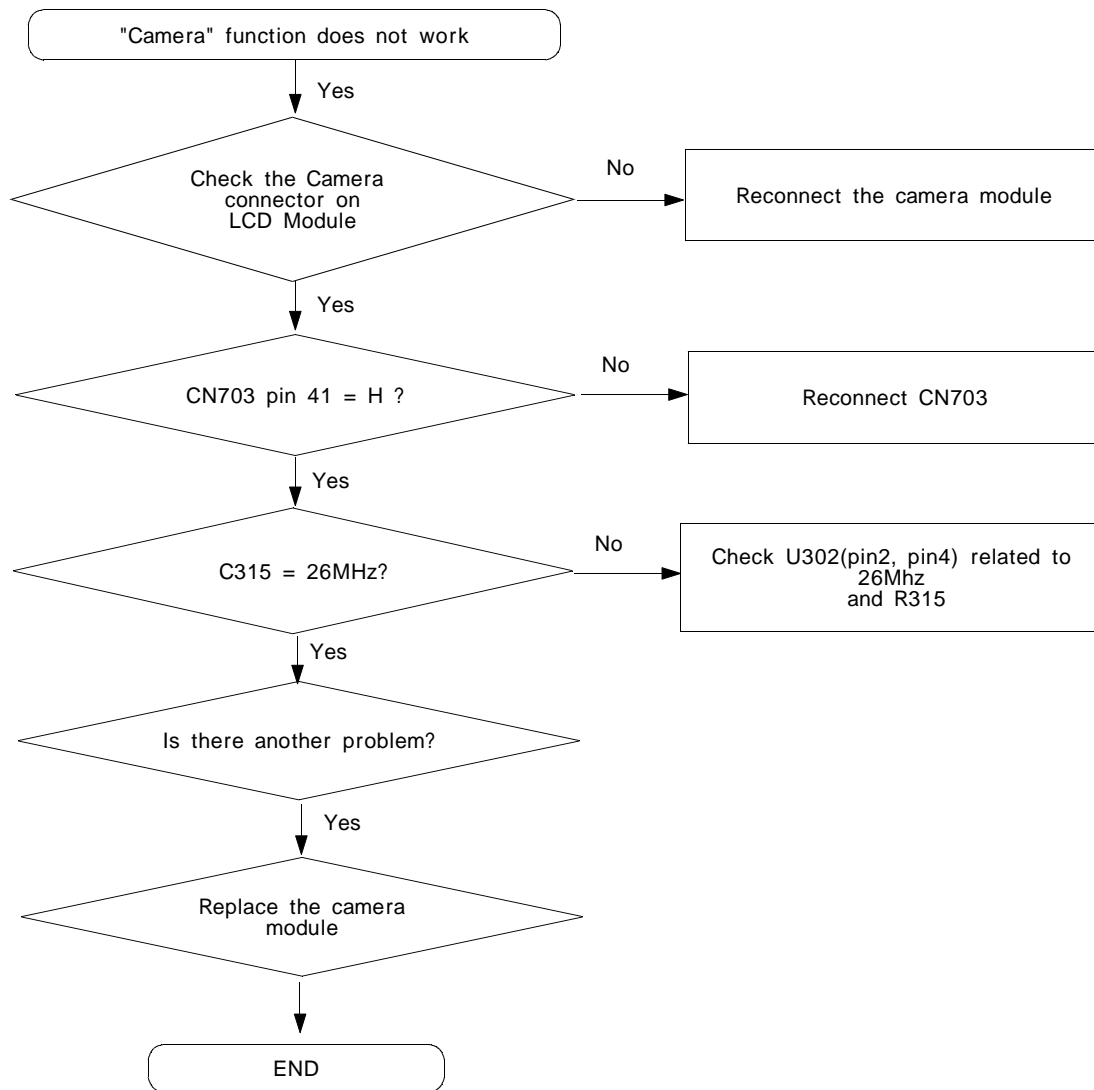
7-9. Back Light (for Color Main LCD)

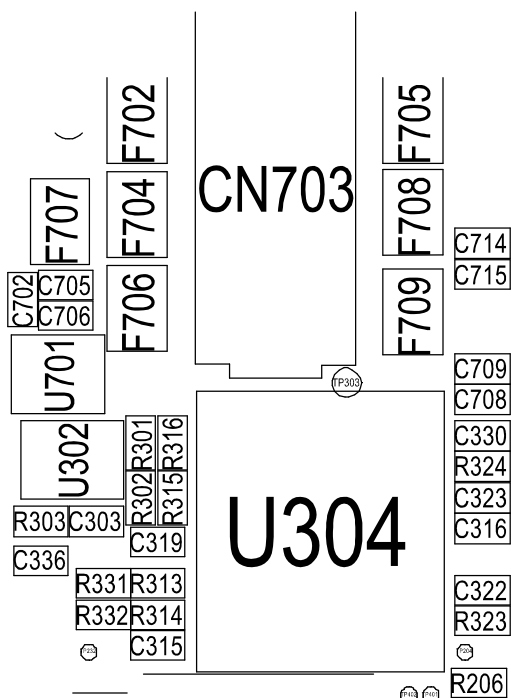
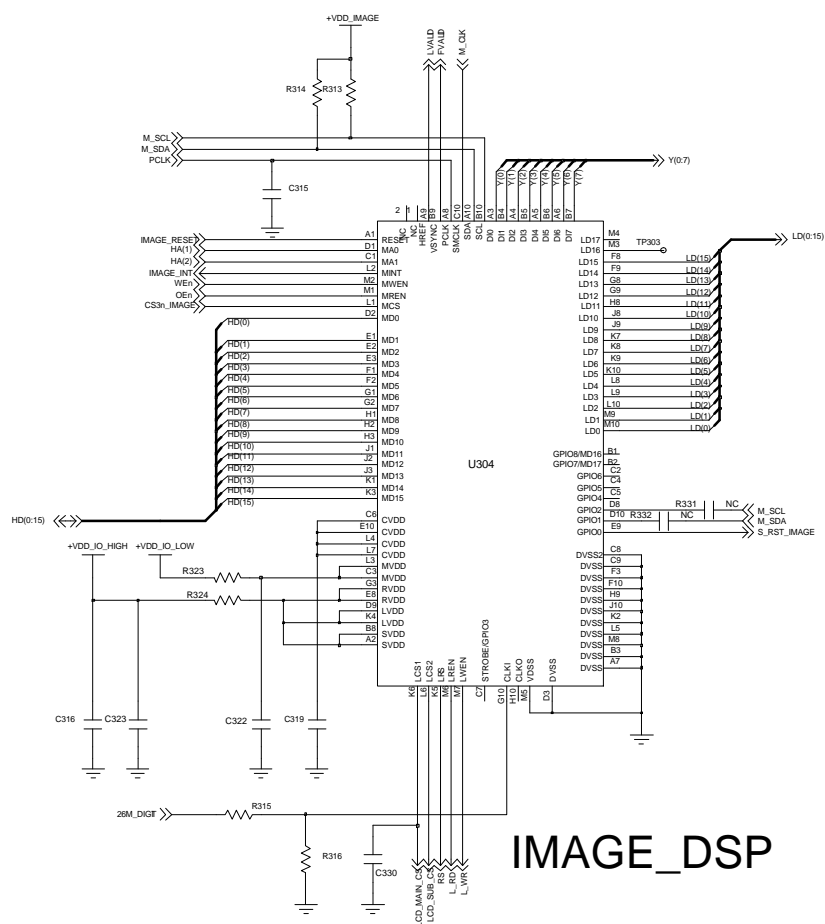


7-10. Key Back Light

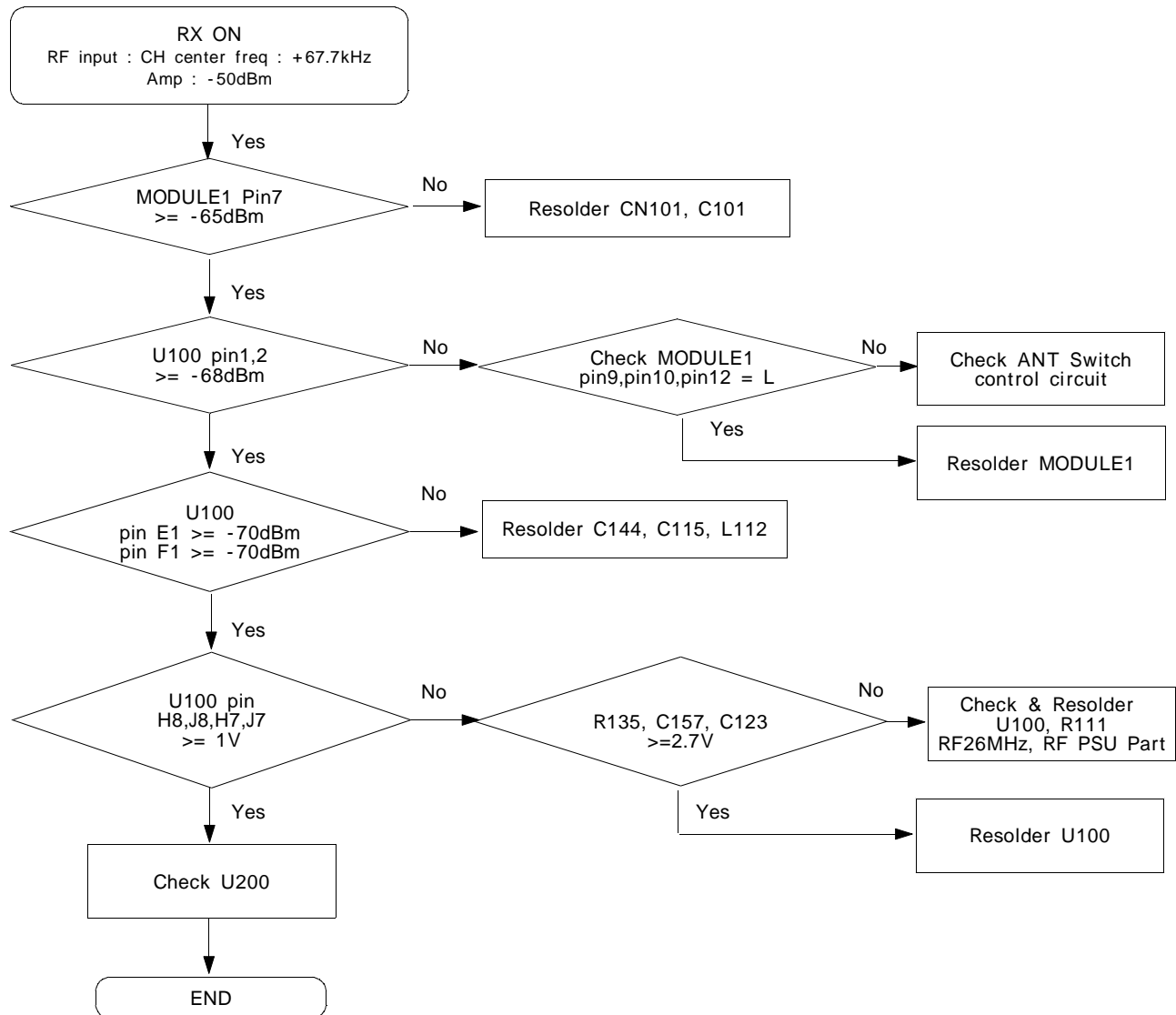


7-11. Camera part

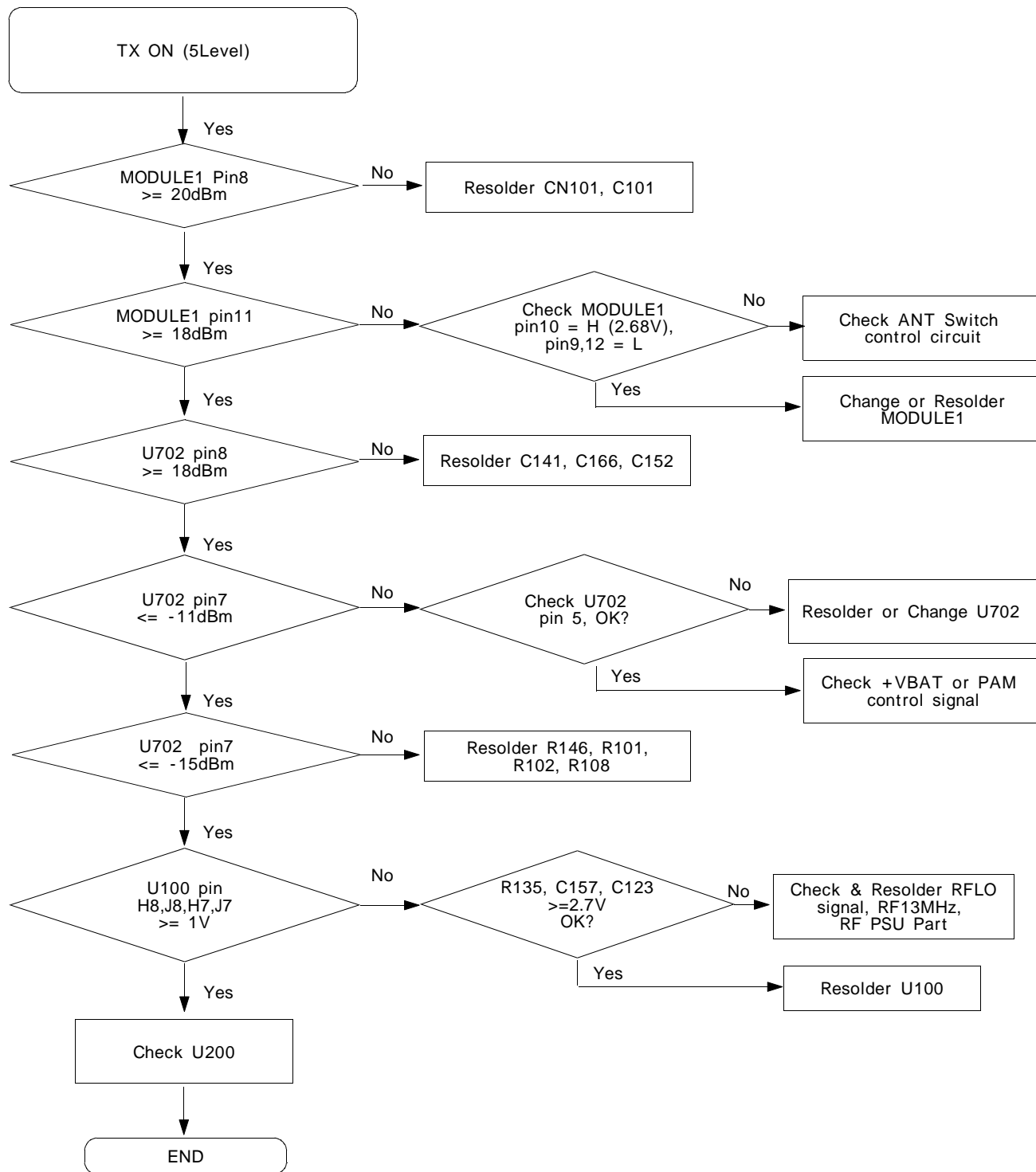




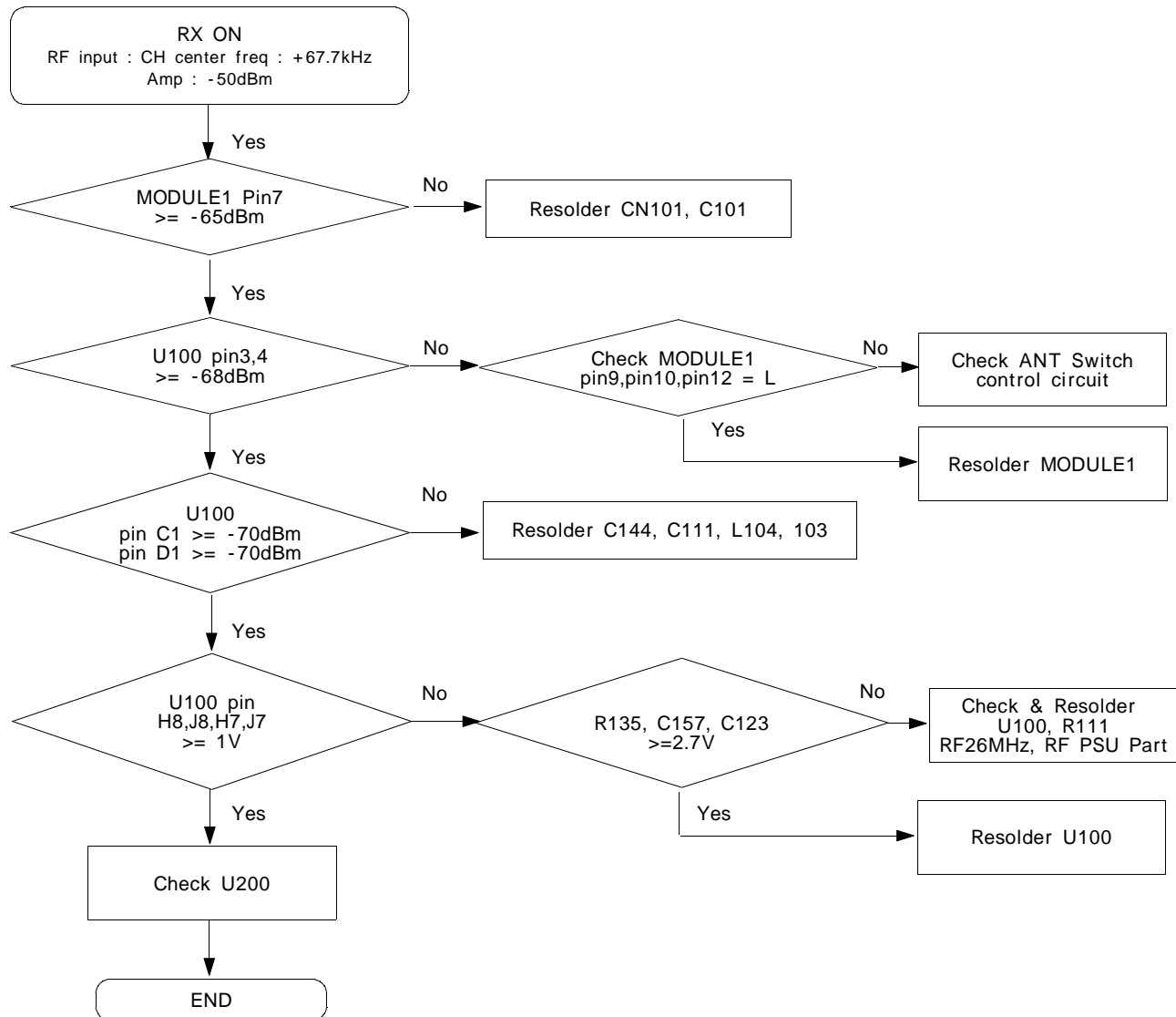
7-12. GSM Receiver



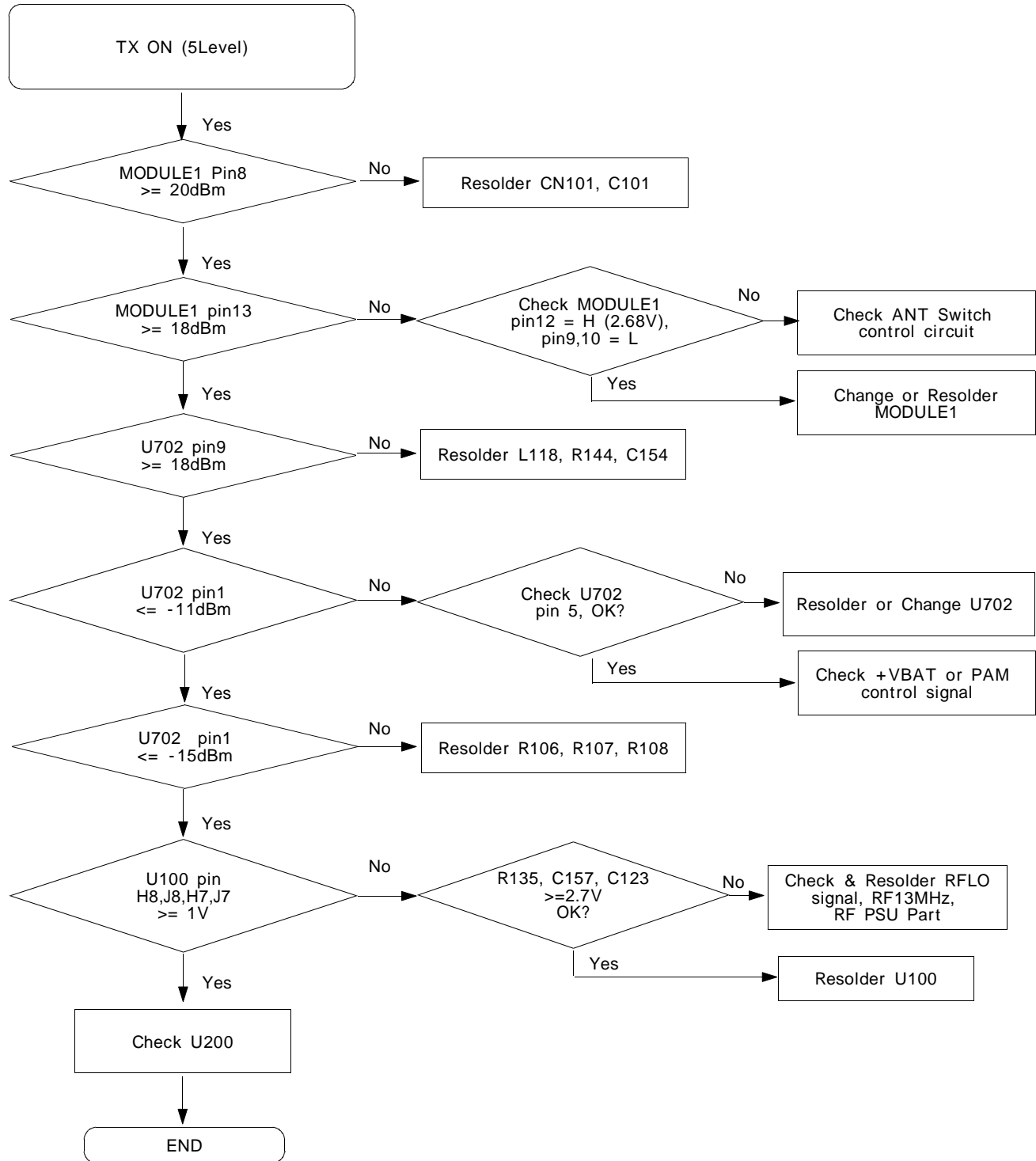
7-13. GSM Transmitter



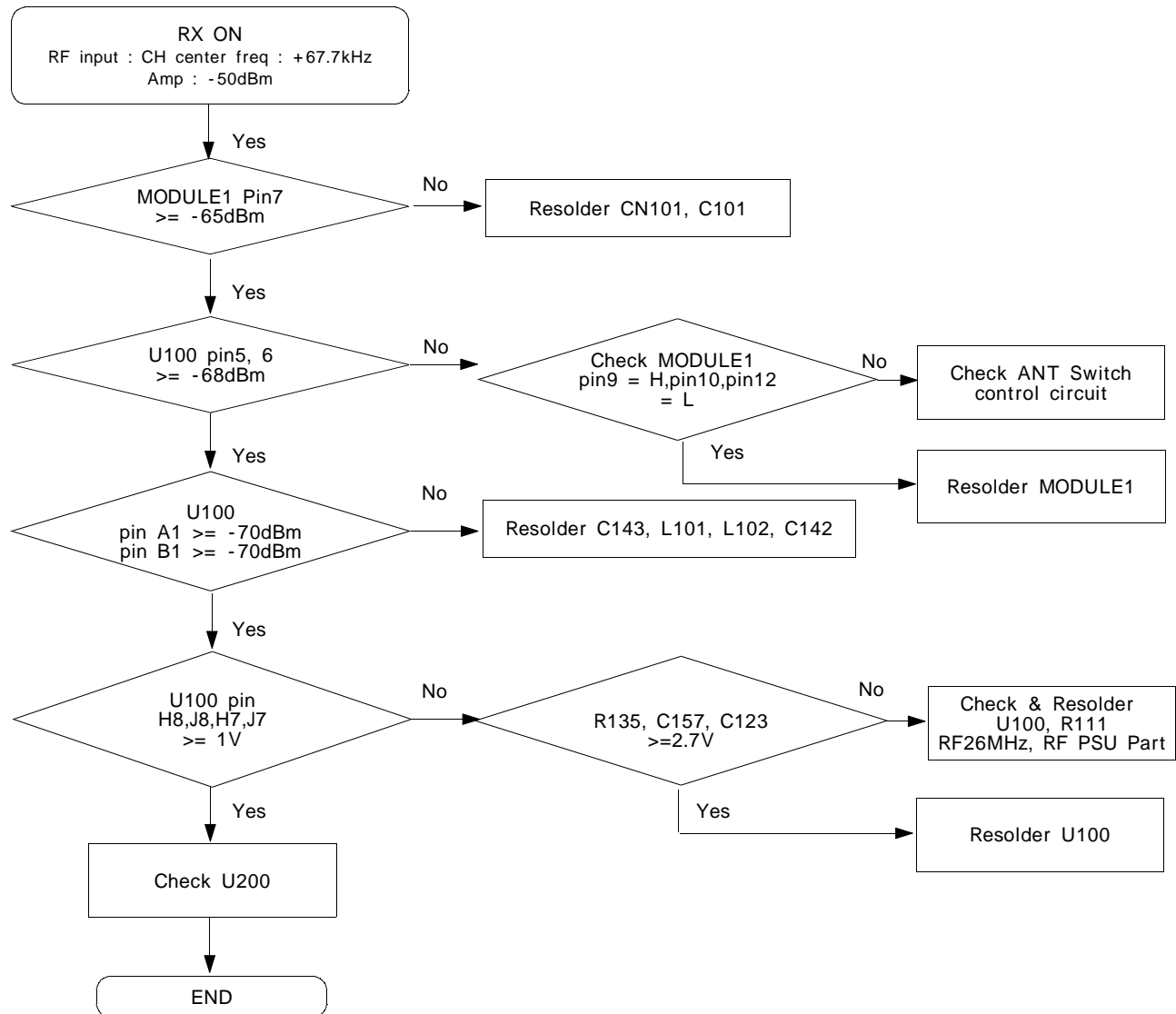
7-14. DCS Receiver



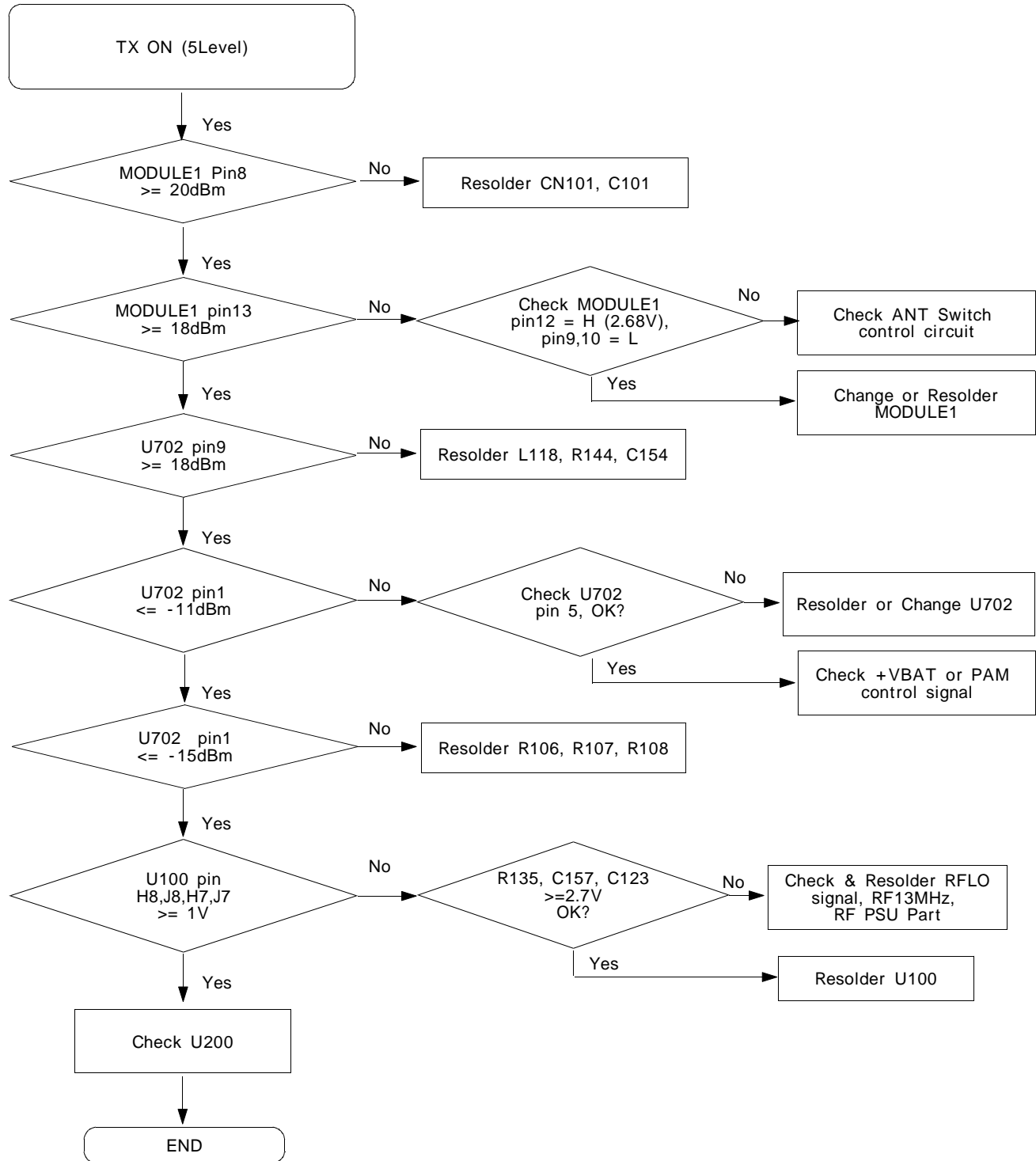
7-15. DCS Transmitter

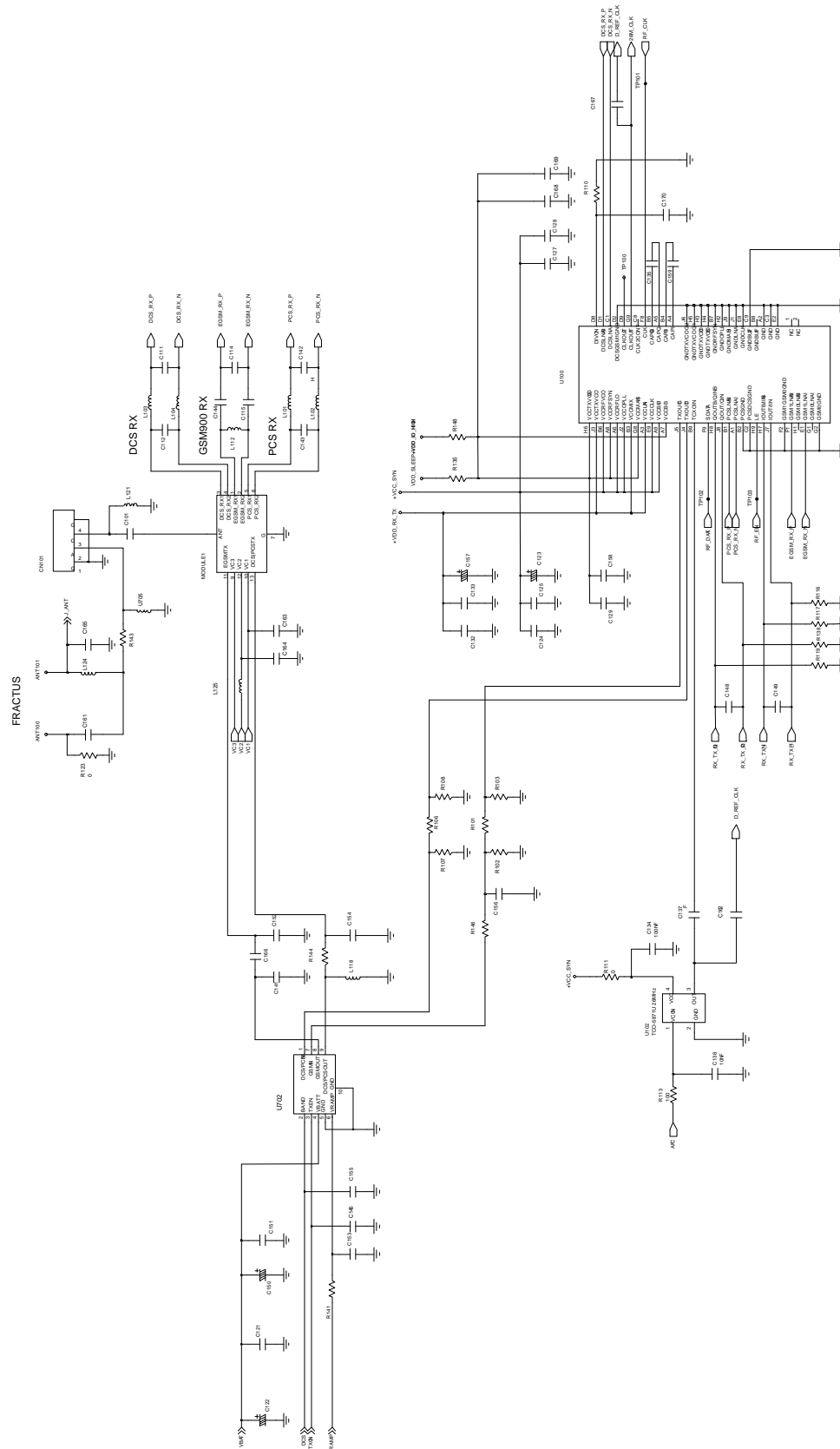


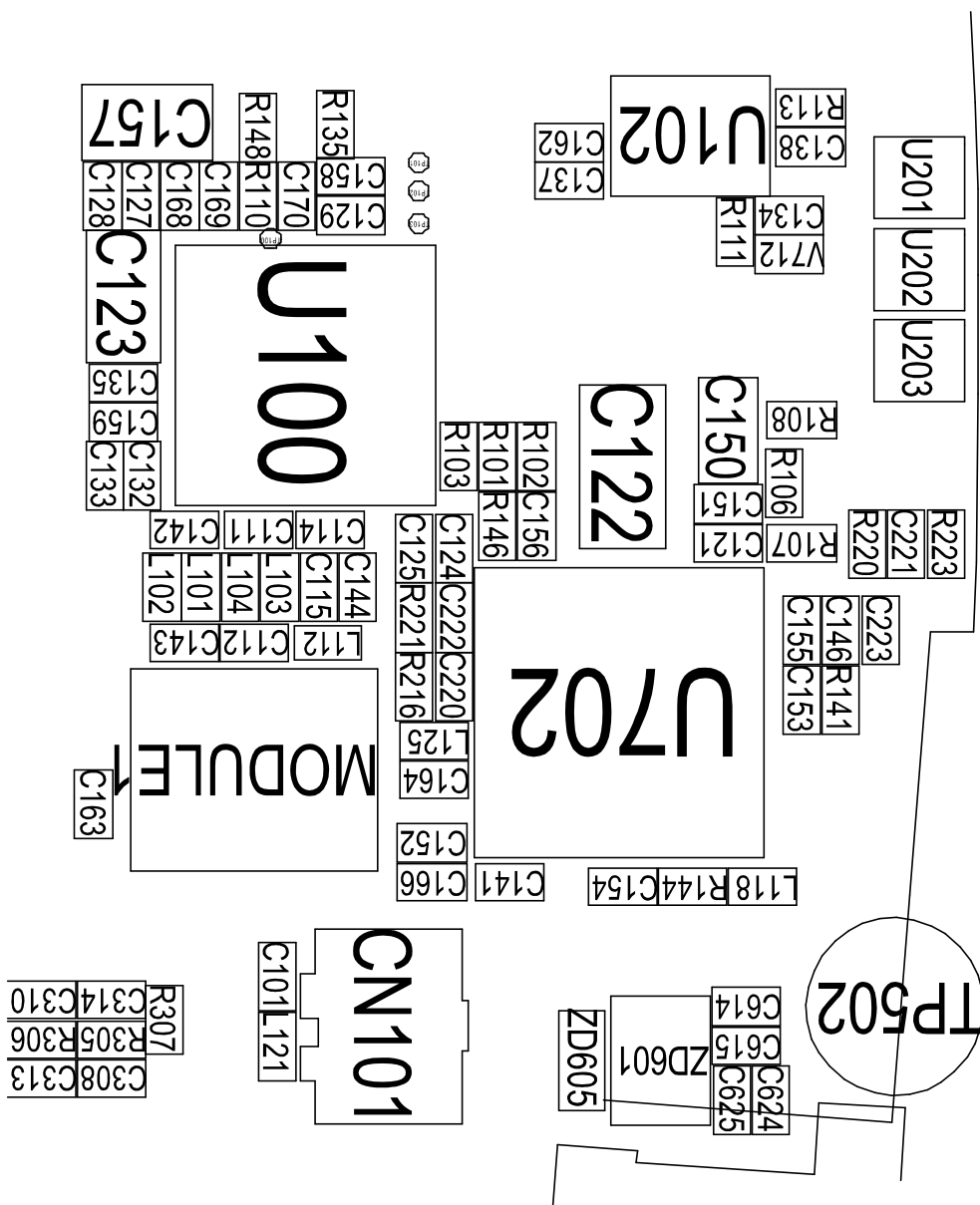
7-16. PCS Receiver



7-17. PCS Transmitter







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