



Service Manual Level III



# Motorola V60i

CDMA 800/1900/AMPS 800

## FREQUENCY SYNTHESIZER CIRCUITRY

The phone contains three PLL frequency synthesizers controlled by U700.

1. The main VCO: there are two main VCO modules- a) one synthesizer controls the tunable 979 – 1004Mhz main local oscillator – U626, which is ON during Cellular or 800Mhz mode. b) another synthesizer controls the tunable 2039-2100Mhz main local oscillator – U636, which is ON during PCS or 1900Mhz mode.
2. The Tx offset VCO: there are two modes and two frequency at which this oscillator which is internal to U700 works, but the tank circuit is external. There are two tank circuits one for Cellular mode (800 Mhz) which will set 309.6Mhz frequency for the oscillator to oscillate on. Another tank circuit for PCS mode (1900Mhz) which will set 379.6Mhz frequency for the oscillator to oscillate on. The Tx offset frequency is divided by 2 before being fed into the mixer for modulation.
3. The second LO: the second local oscillator also operates in two modes with two different frequencies: For AMPS mode the frequency is 219.3Mhz and for CDMA mode at cellular or 800Mhz band and PCS or 1900Mhz band the frequency is 219.8Mhz. The tank circuit is external to the U700. The frequency is divided by 2 before being fed into the mixer.

All the synthesizers obtain their reference frequency from the 16.8Mhz reference oscillator.

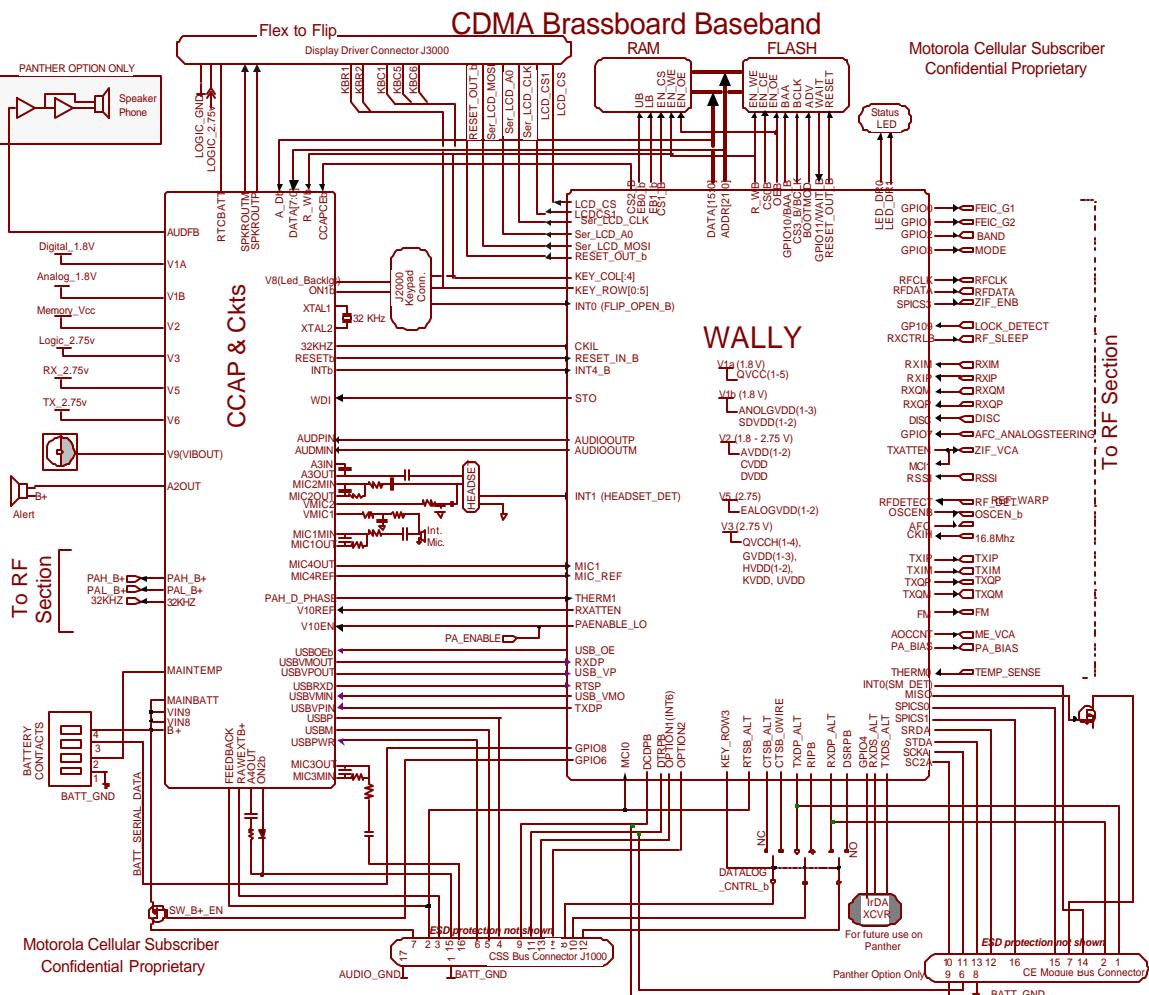
## TRANSMIT POWER CONTROL CIRCUITRY

The transmit signal power (the output RF power) is controlled by the three control signals ZIF\_VCA and ME\_VCA from WALLY IC and PA\_BIAS from CCAP IC. The output power is controlled at three places, ZIFSYN – U700 which has a gain control of max 40dB and ME3 IC- U400 which has a total gain of max 36dB and PA has a gain of max 27-32dB.

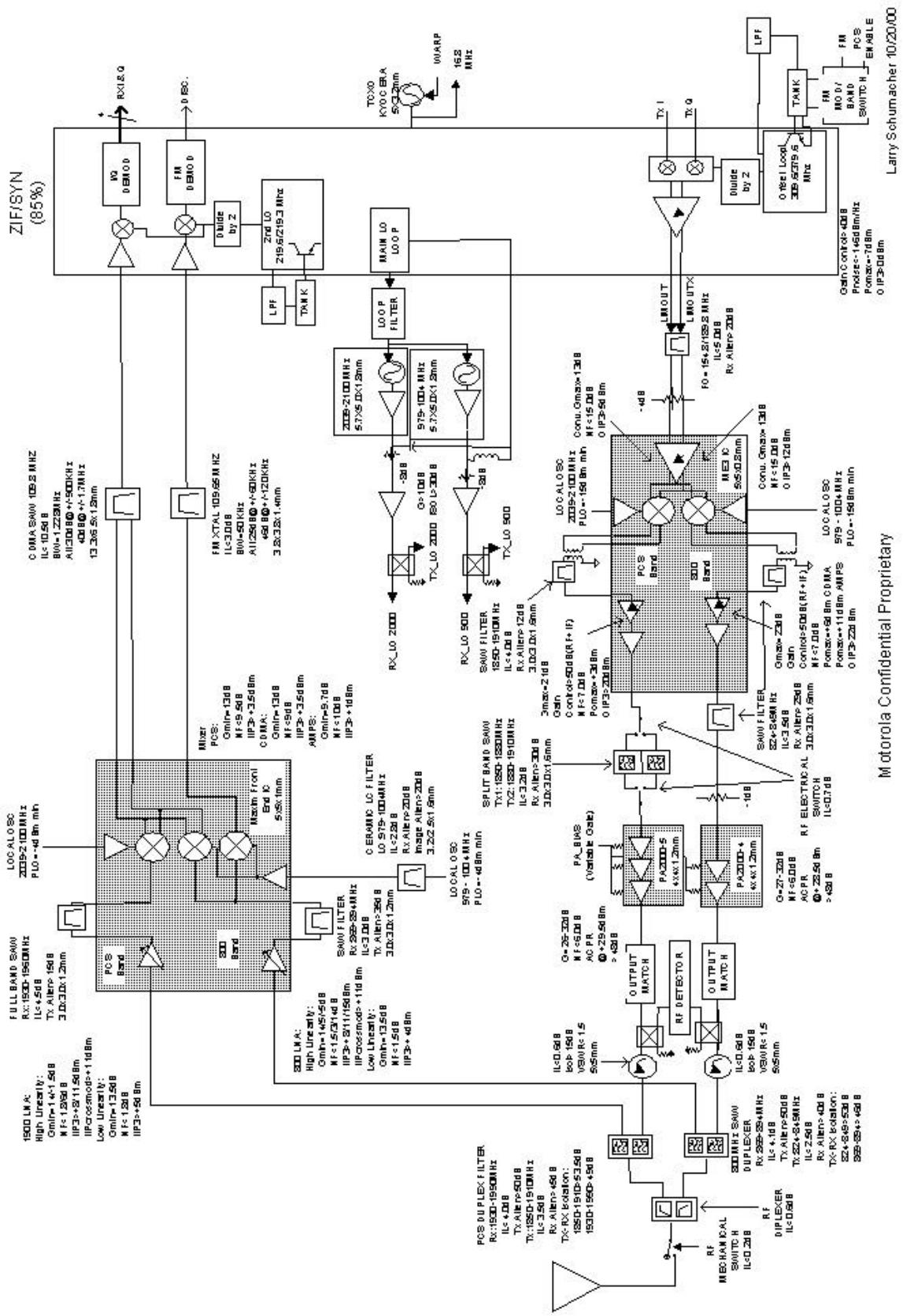
In Amps mode the power range is +8dBm to +28dBm. In CDMA mode the RF power range is from -50dBm to +23dBm.

In CDMA mode the power control operates in two mode: Open loop and Close loop. In open loop mode (at the beginning of registering – access probe) the power level is proportional to the received signal level, in close loop mode the power level is controlled by the CDMA cell based on the received signal strength at the cell site.

# AUDIO LOGIC BLOCK DIAGRAM



## RF SIDE BLOCK DIAGRAM



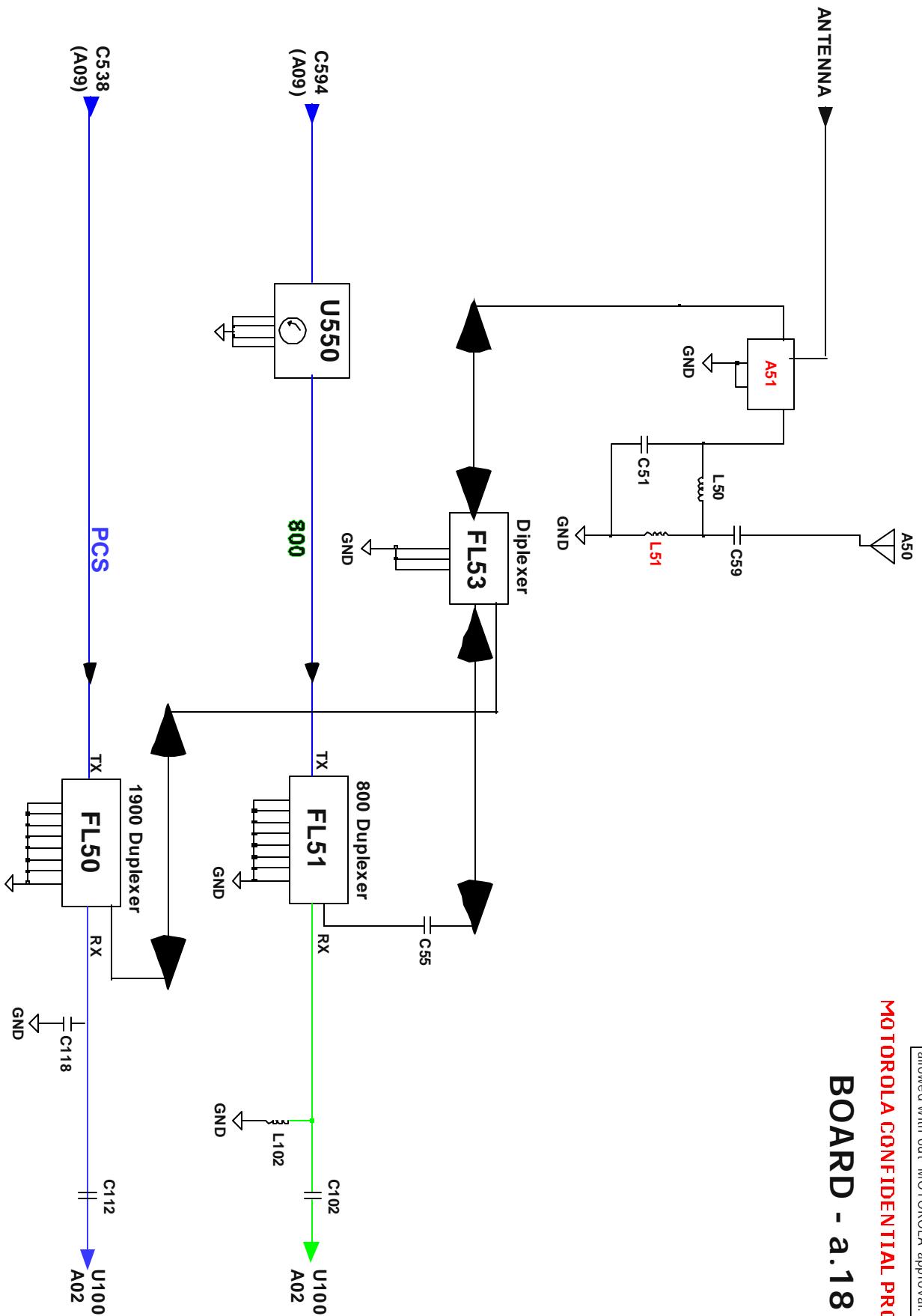
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## ANTENNA CIRCUIT

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## BOARD - a.18



**Antenna:A01**

FEIC CIRCUIT

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The diagram shows a vertical line labeled "FE\_2.75V" at the top. A red arrow points from this line down to a component labeled "(A02)". From the bottom of "(A02)", a red arrow points down to a junction point. From this junction point, two lines branch out: one to the left labeled "GND" and one to the right labeled "GND". These ground connections lead to a component labeled "L114". The "L114" component is shown with four pins: the top-left pin is labeled "3", the top-right pin is labeled "2", the bottom-left pin is labeled "1", and the bottom-right pin is labeled "4".

Circuit diagram showing the connection of various components to the **FE\_2.75V** output. The diagram includes resistors R103, R112, R115, and R125, capacitors C119, C120, C125, and C103, and an operational amplifier U103. The output **FE\_2.75V** is labeled with a red arrow.

Circuit diagram showing the connection of the FL150 module to the U700-PREII board. The FL150 module is connected to pins L113, C102, GND, L150, C151, C153, and GND. The U700-PREII board is connected to pins C155, (A03), and GND.

Circuit diagram for U100:

- Pin 1 (RF\_SLEEP) is connected to ground via R103.
- Pin 2 is connected to ground via R108.
- Pin 3 is connected to ground via C152.
- Pin 4 is connected to ground via two red-colored components labeled "C?".
- Pin 5 is connected to ground via a diode symbol pointing downwards.
- Pin 6 is connected to ground via a diode symbol pointing upwards.
- Pin 7 is connected to ground via a diode symbol pointing downwards.
- Pin 8 is connected to ground via a diode symbol pointing upwards.
- Pin 9 is connected to ground via a diode symbol pointing downwards.
- Pin 10 is connected to ground via a diode symbol pointing upwards.
- Pin 11 is connected to ground via a diode symbol pointing downwards.
- Pin 12 is connected to ground via a diode symbol pointing upwards.
- Pin 13 is connected to ground via a diode symbol pointing downwards.
- Pin 14 is connected to ground via a diode symbol pointing upwards.
- Pin 15 is connected to ground via a diode symbol pointing downwards.
- Pin 16 is connected to ground via a diode symbol pointing upwards.
- Pin 17 is connected to ground via a diode symbol pointing downwards.
- Pin 18 is connected to ground via a diode symbol pointing upwards.
- Pin 19 is connected to ground via a diode symbol pointing downwards.
- Pin 20 is connected to ground via a diode symbol pointing upwards.
- Pin 21 is connected to ground via a diode symbol pointing downwards.
- Pin 22 is connected to ground via a diode symbol pointing upwards.
- Pin 23 is connected to ground via a diode symbol pointing downwards.
- Pin 24 is connected to ground via a diode symbol pointing upwards.
- Pin 25 is connected to ground via a diode symbol pointing downwards.
- Pin 26 is connected to ground via a diode symbol pointing upwards.
- Pin 27 is connected to ground via a diode symbol pointing downwards.
- Pin 28 is connected to ground via a diode symbol pointing upwards.
- Pin 29 is connected to ground via a diode symbol pointing downwards.
- Pin 30 is connected to ground via a diode symbol pointing upwards.
- Pin 31 is connected to ground via a diode symbol pointing downwards.
- Pin 32 is connected to ground via a diode symbol pointing upwards.
- Pin 33 is connected to ground via a diode symbol pointing downwards.
- Pin 34 is connected to ground via a diode symbol pointing upwards.
- Pin 35 is connected to ground via a diode symbol pointing downwards.
- Pin 36 is connected to ground via a diode symbol pointing upwards.
- Pin 37 is connected to ground via a diode symbol pointing downwards.
- Pin 38 is connected to ground via a diode symbol pointing upwards.
- Pin 39 is connected to ground via a diode symbol pointing downwards.
- Pin 40 is connected to ground via a diode symbol pointing upwards.

Circuit diagram for the AMPS IF section:

- Node 146 is connected to GND through a capacitor C161.
- Node 146 is also connected to node 145 through a resistor R106.
- Node 145 is connected to GND through a capacitor C108.
- Nodes 145 and 146 are connected to node 144 through a capacitor C164.
- Node 144 is connected to GND through a capacitor C156.

Circuit diagram for mode A13:

- Mode Selection:** The MODE pin (A13) is connected to R107 and GND. The other end of R107 is connected to the base of Q114.
- Switch Configuration:** The collector of Q114 is connected to the base of Q113. The collector of Q113 is connected to the base of Q160. The collector of Q160 is connected to GND.
- Driver Connection:** The output of the switch configuration is connected to the L162 pin of the FL160 driver. The FL160 driver also receives inputs from C162, C163, L162, C157, and L154.
- Output:** The output of the FL160 driver is connected to the L162 pin of the driver stage.

Circuit diagram showing a feedback loop from FE\_2.75V through resistor R1 to the non-inverting input of op-amp U1.

RX\_LO\_800 (A06)

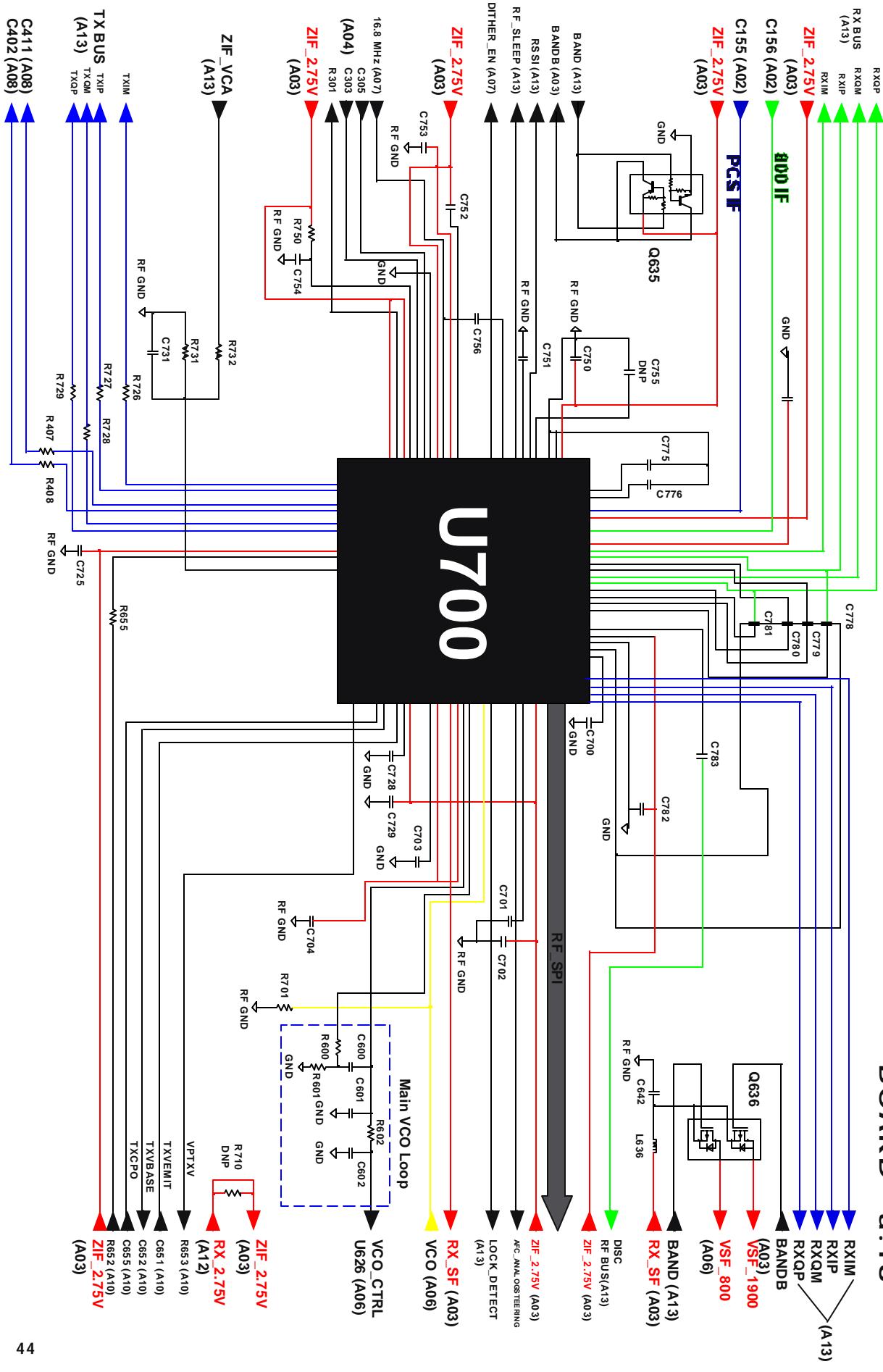
RX\_LO\_PCS  
(A06)

**FEIC:A02**

ZIF/SYN CIRCUIT

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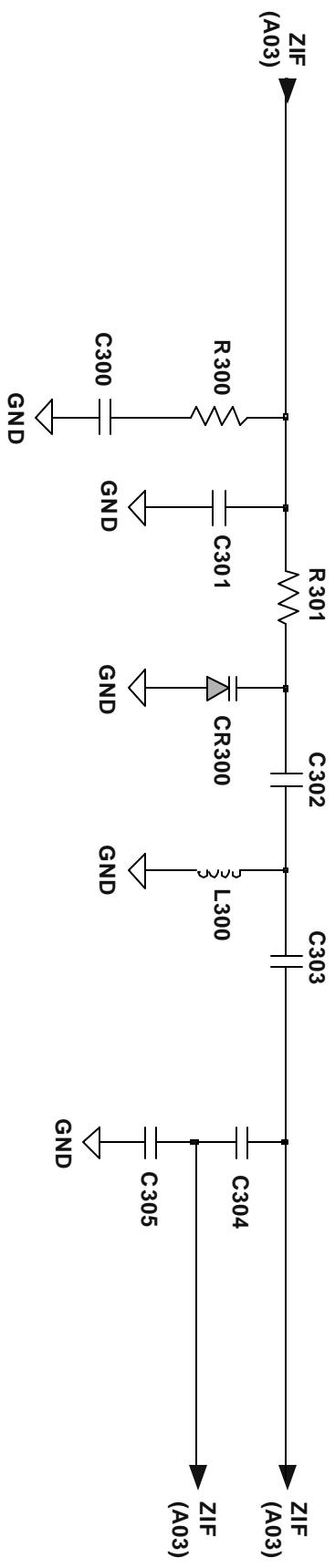
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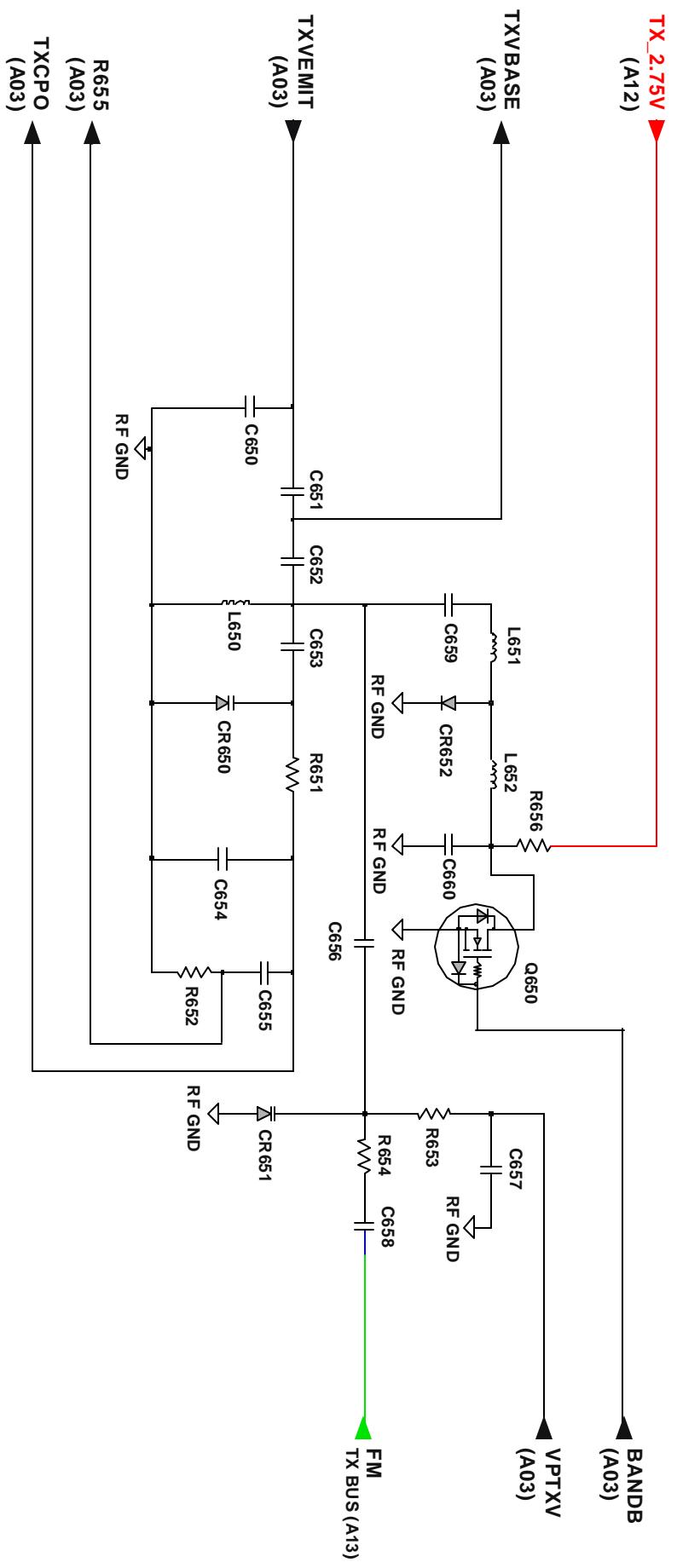
RX 2nd LO:A04

### TX OFFset Circuit

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## VCO Circuit

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VSF\_800  
(A03)RX\_LO\_800  
(A02)VC0\_CTRL  
(A03)

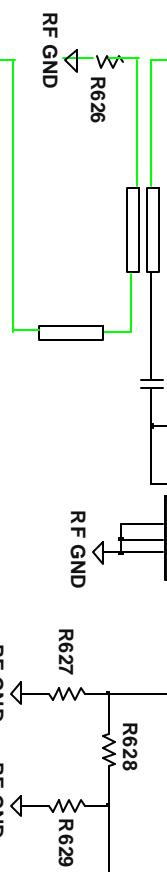
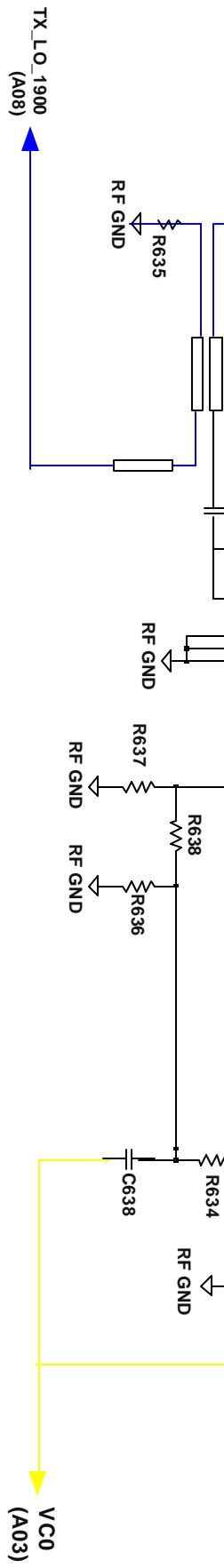
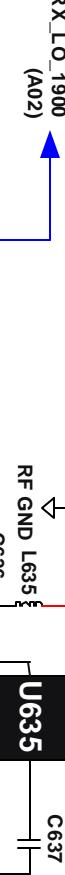
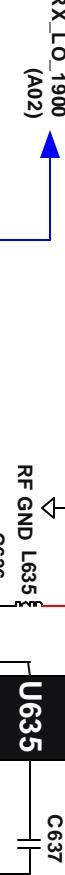
C625

U625

C629

U626

L626

TX\_LO\_800  
(A08)VC0  
(A03)VSF\_1900  
(A03)VC0\_CTRL  
(A03)VSF\_1900  
(A03)RX\_LO\_1900  
(A02)

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OSC<sub>RX\_2.75V</sub>  
(A12)OSCEN<sub>b</sub>  
(A13)OSC<sub>RX\_2.75V</sub>  
(A10)REF\_WARP  
(A13)  
R325  
C325  
GND  
C326  
GND  
C327  
GND  
16.8MHz  
(A03)U325  
R325  
C325  
GND  
C326  
GND  
C327  
GNDRX\_2.75V  
(A12)DITHER\_EN  
(A03)32KHZ\_RF  
(A12)16.8MHz  
(A13)U326  
R326  
R327  
C329  
R328  
C330  
CR330  
RF GND  
GND  
GND  
GND

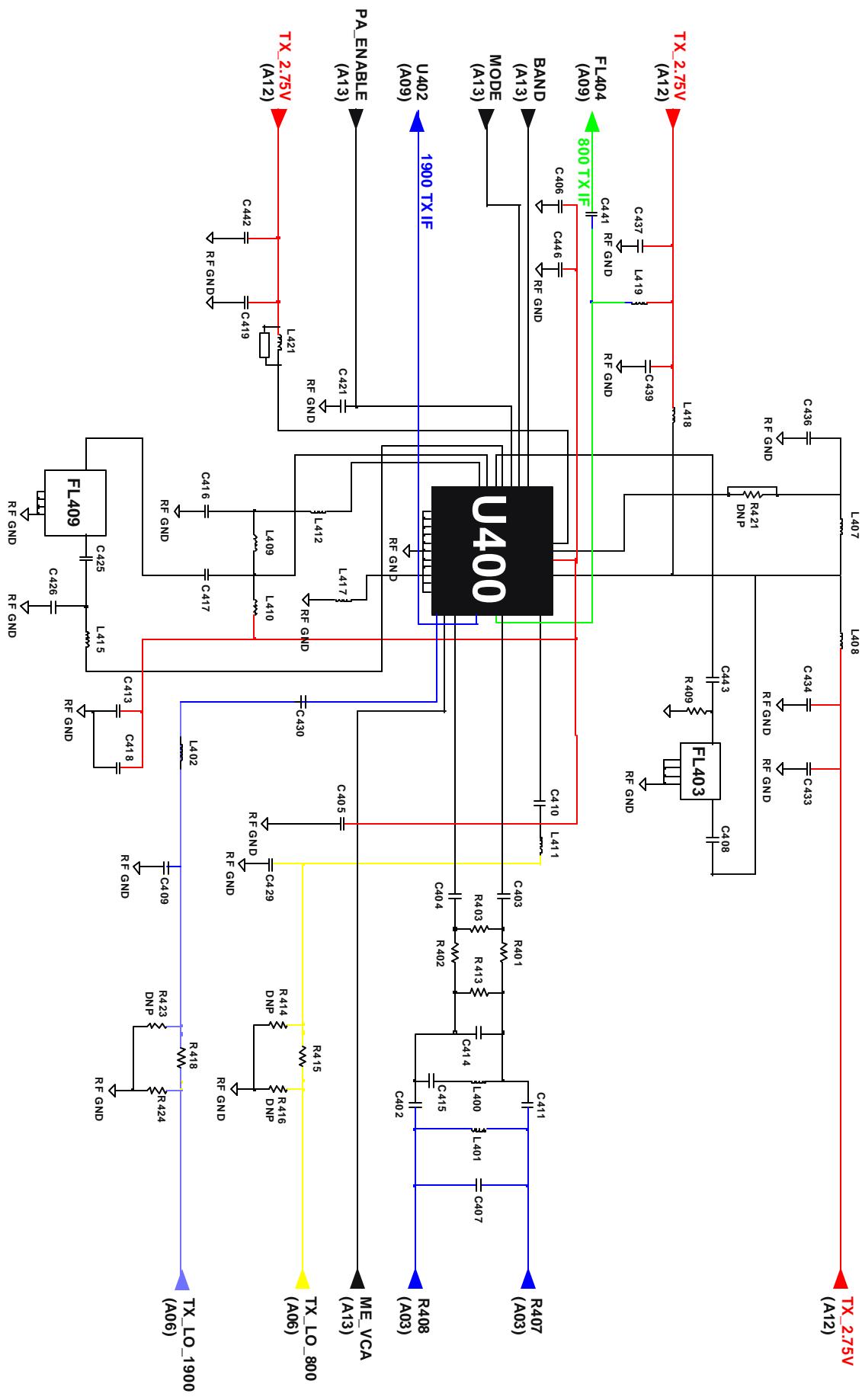
## ME3 Circuit

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TX\_2.75V  
(A12)

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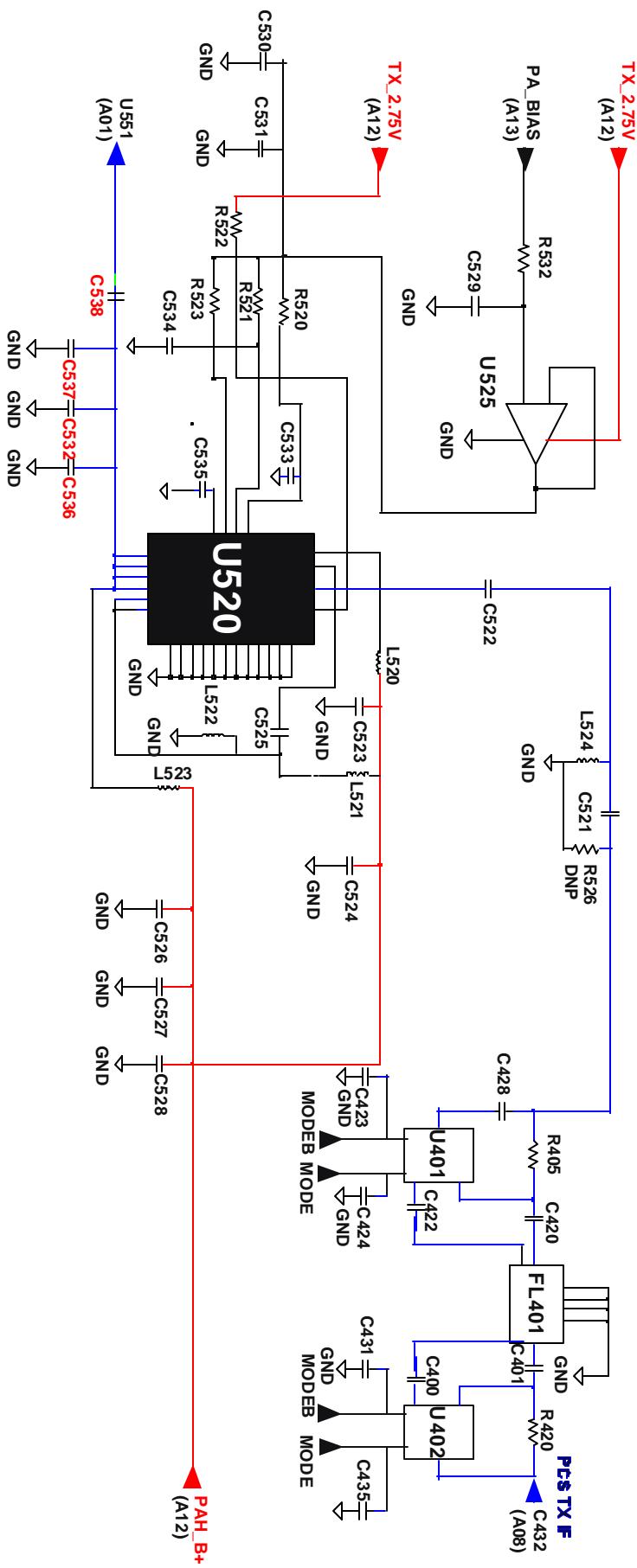


## 1900 PA Circuit

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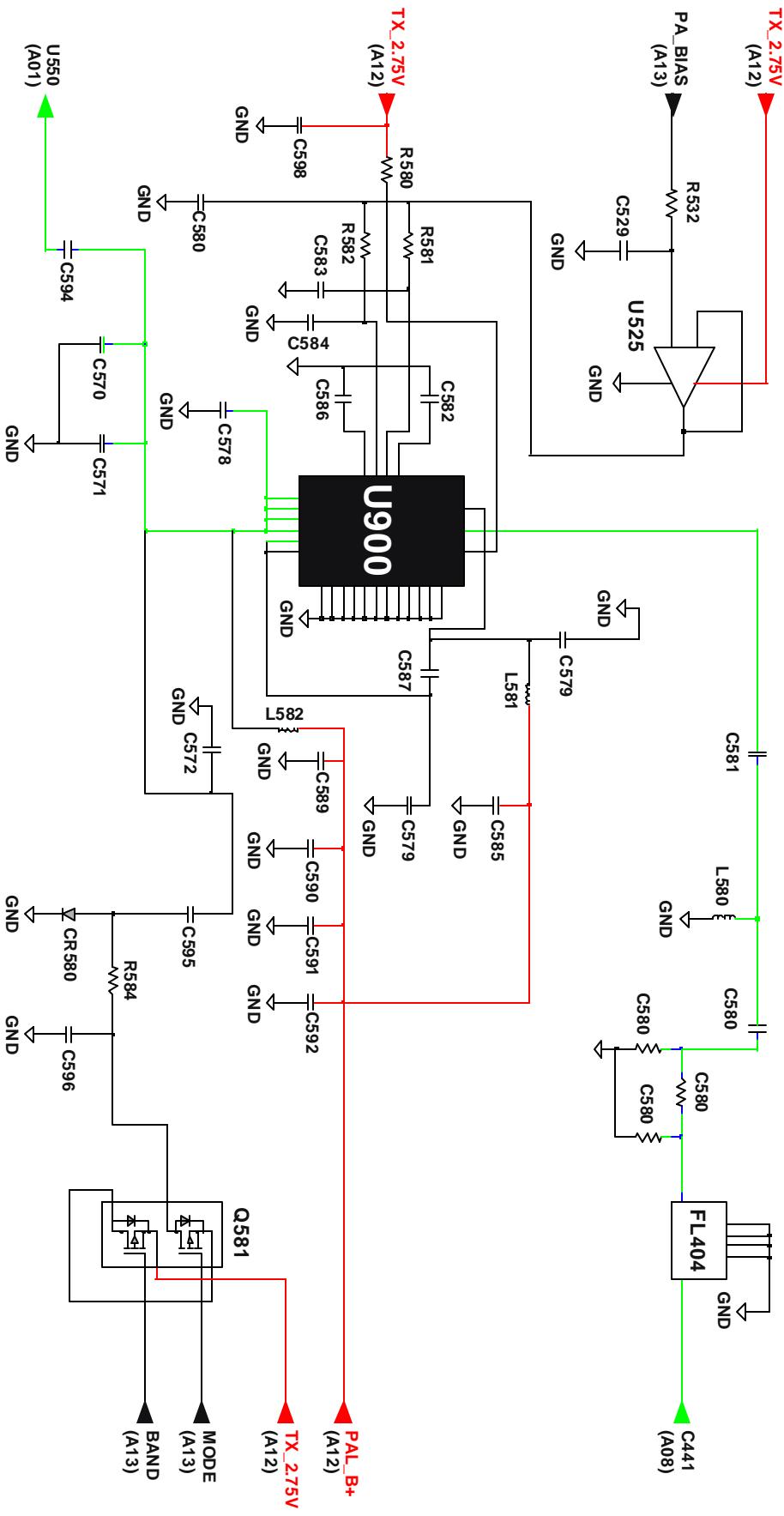


## 800 PA Circuit

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## BOARD - P6.2

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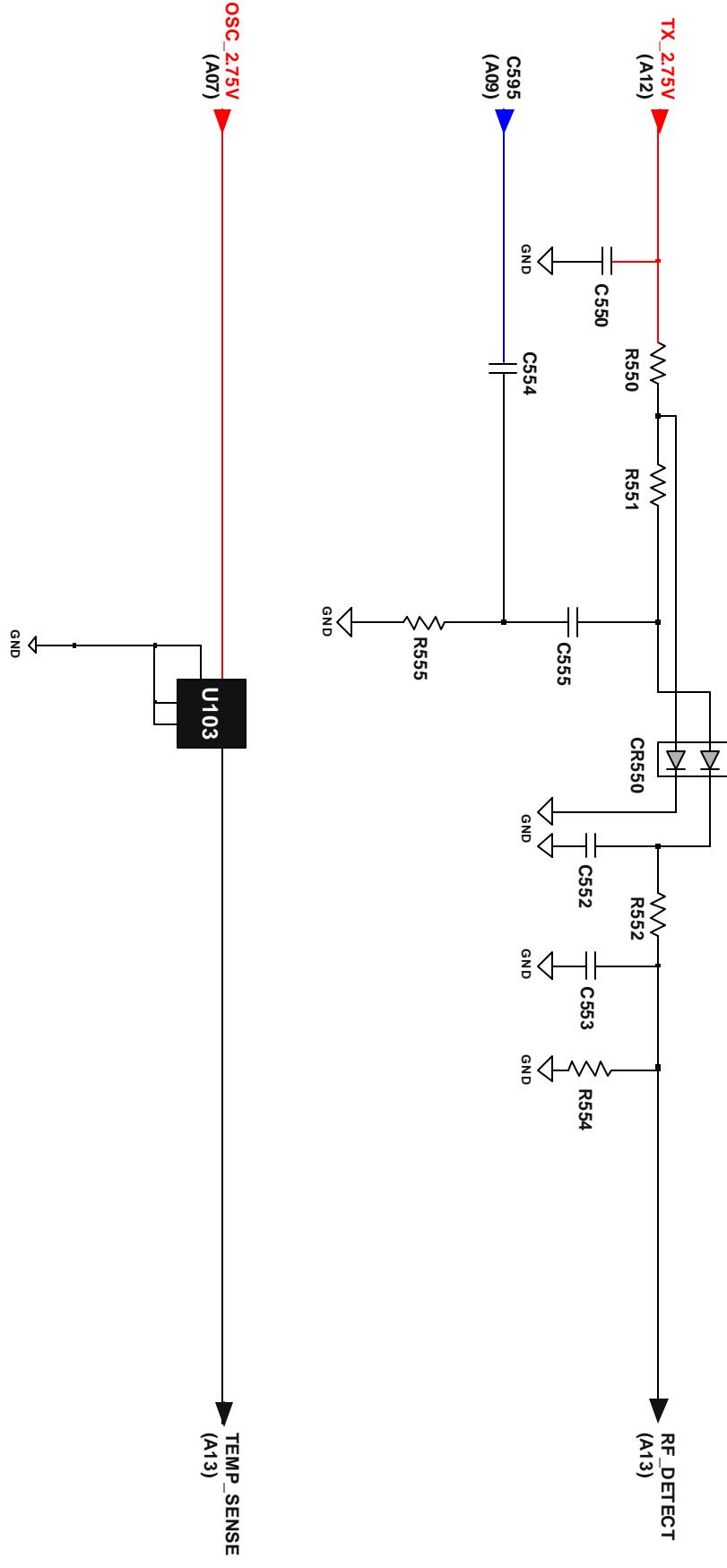


## POWER DETECT & TEMP SENSE CIRCUIT

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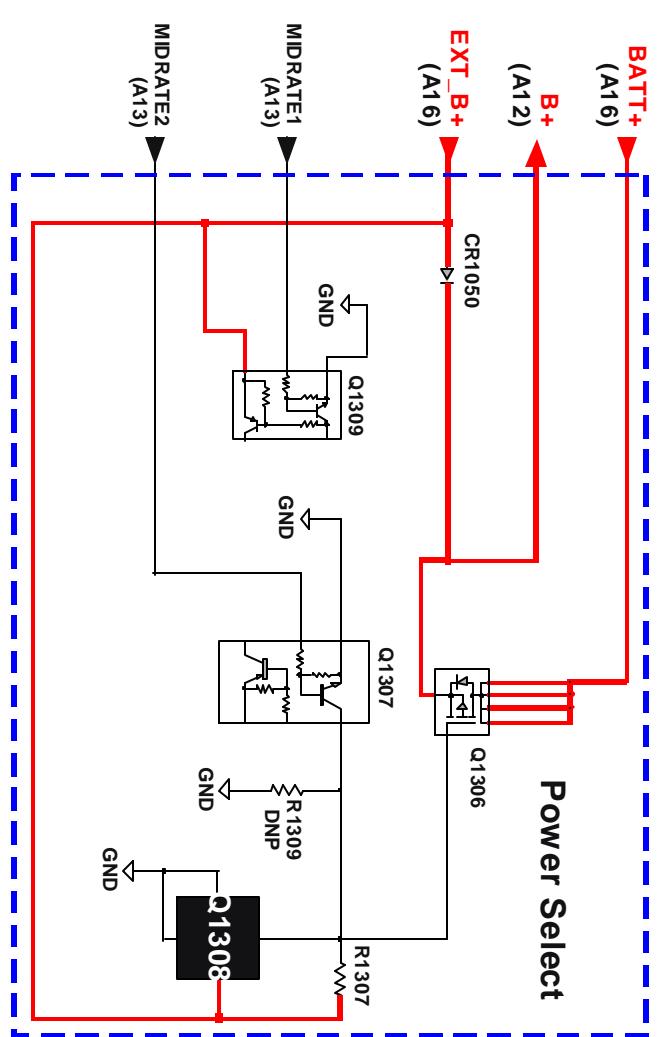
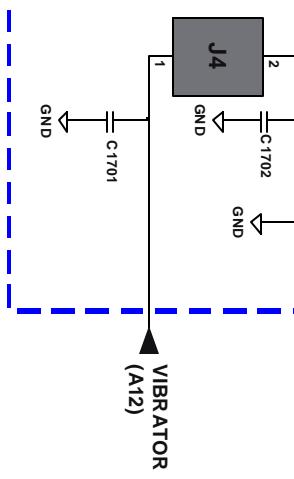
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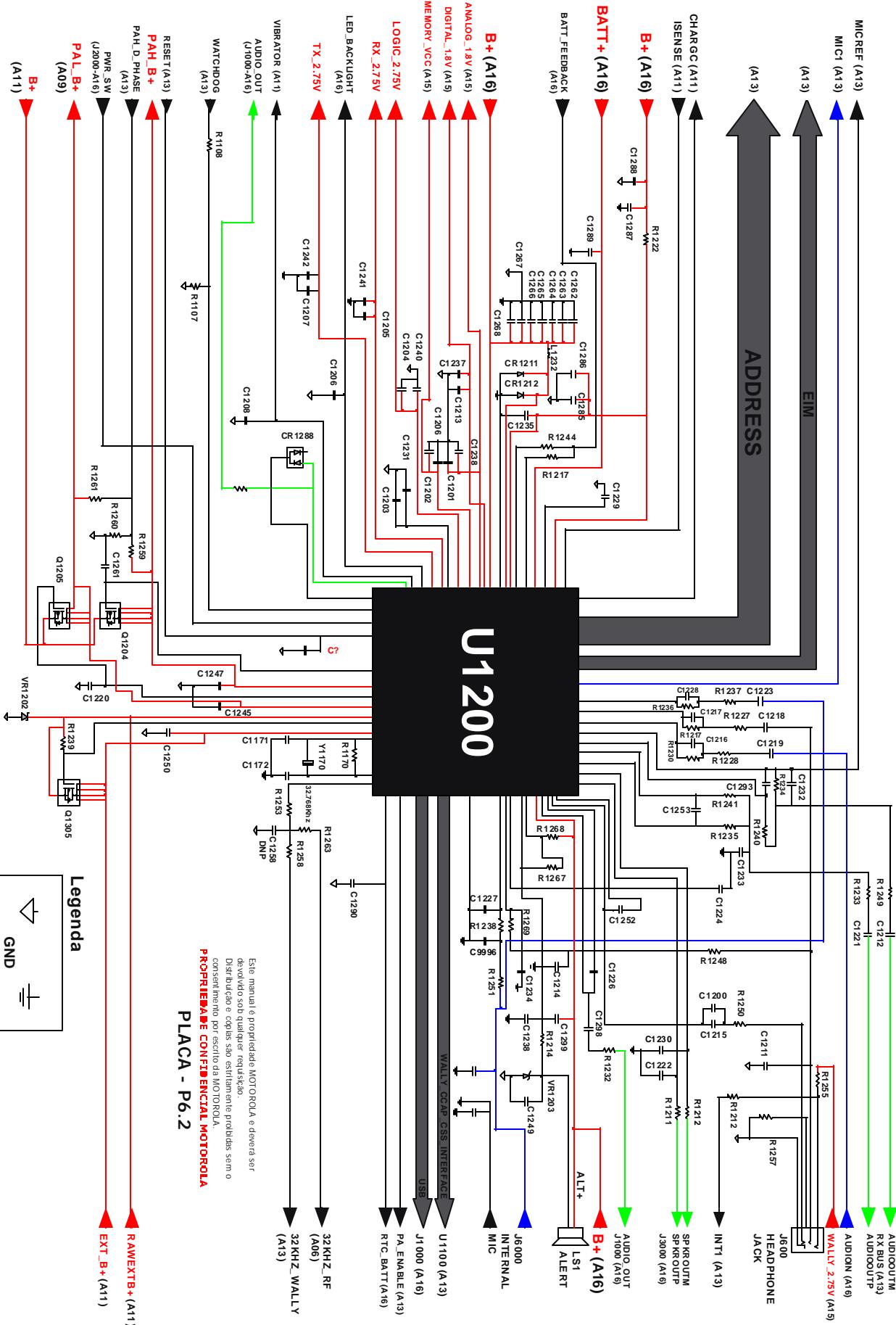
## BOARD - a.18



## Power Select, Charger & Vibrator:A11

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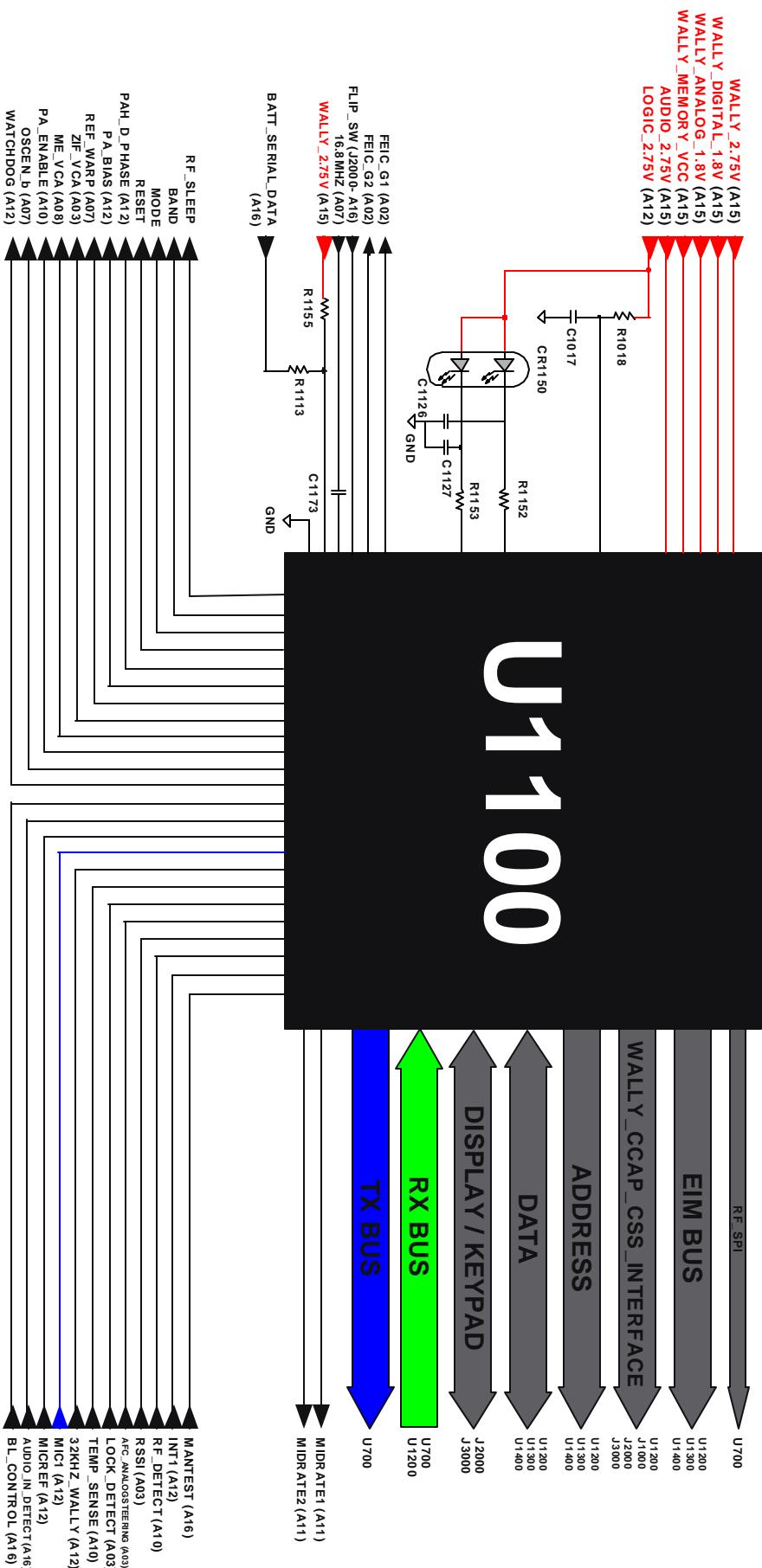
PLACA - P6.2  
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CCAP:A12

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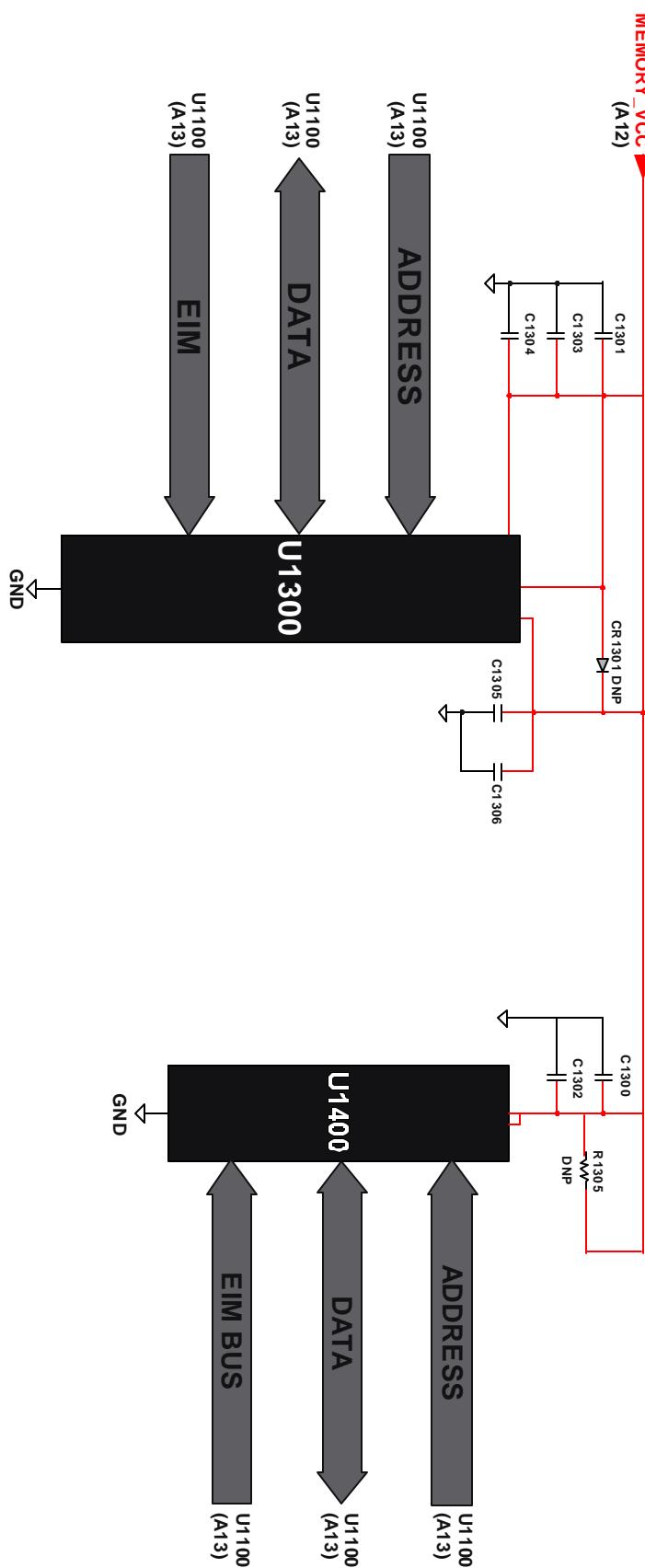
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WALLY:A13

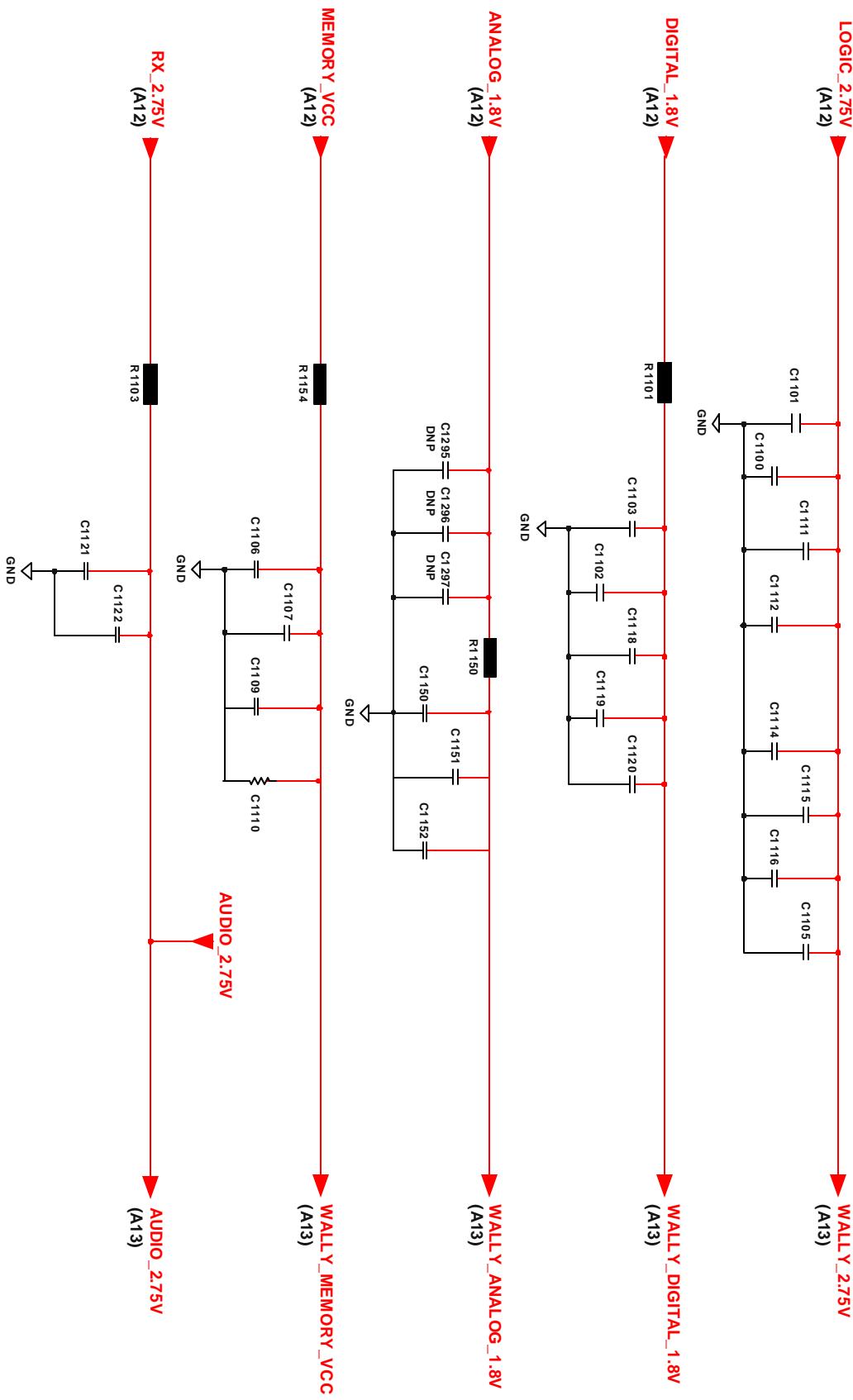
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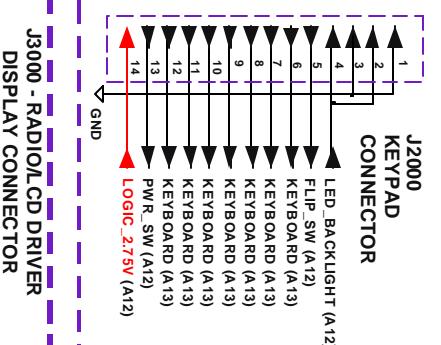
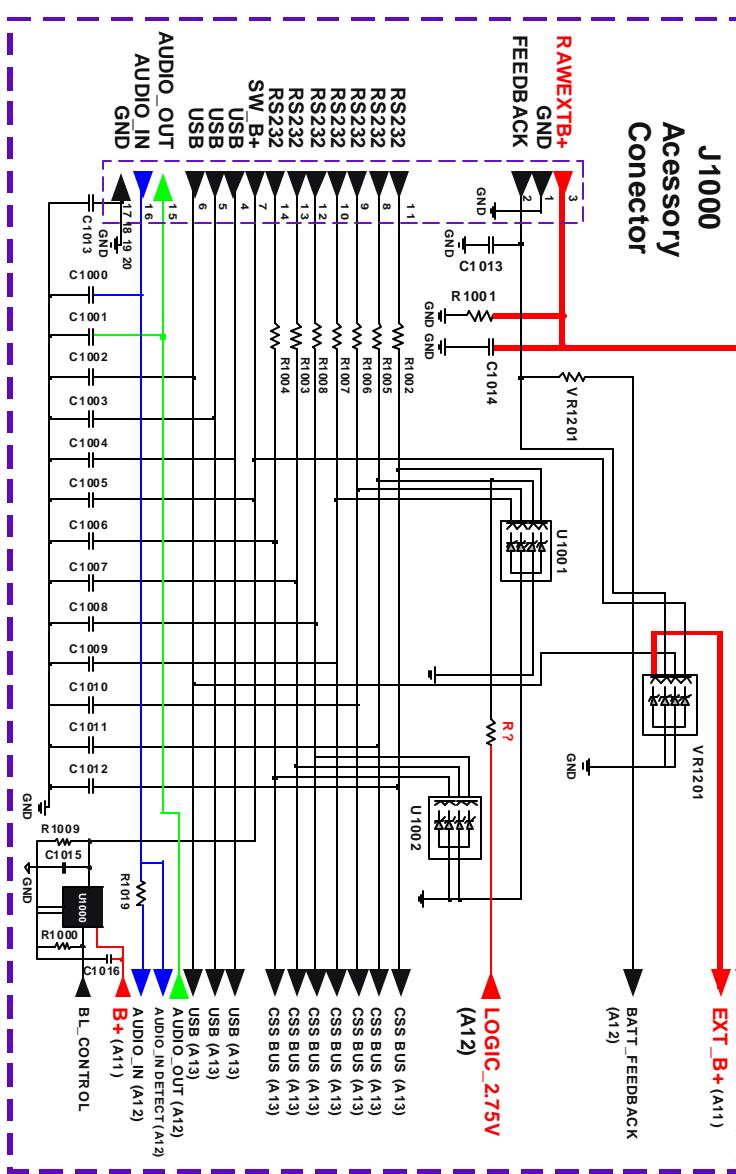
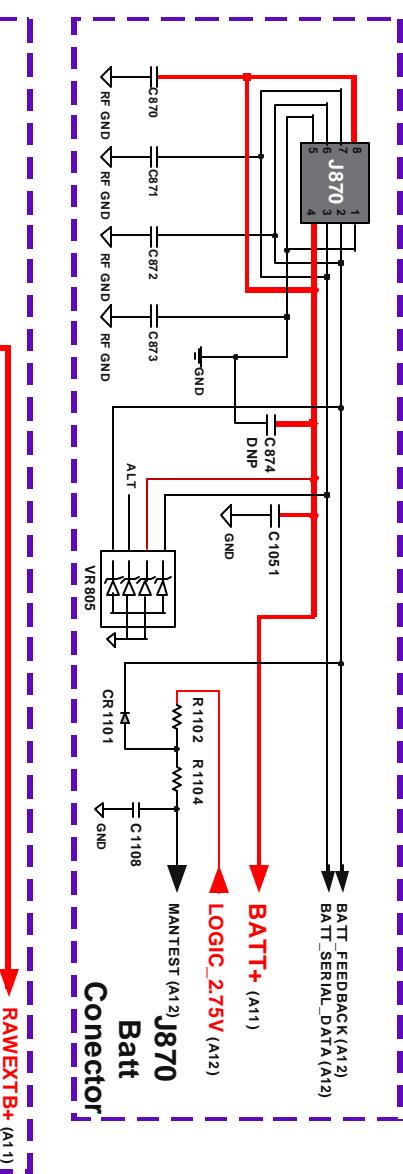
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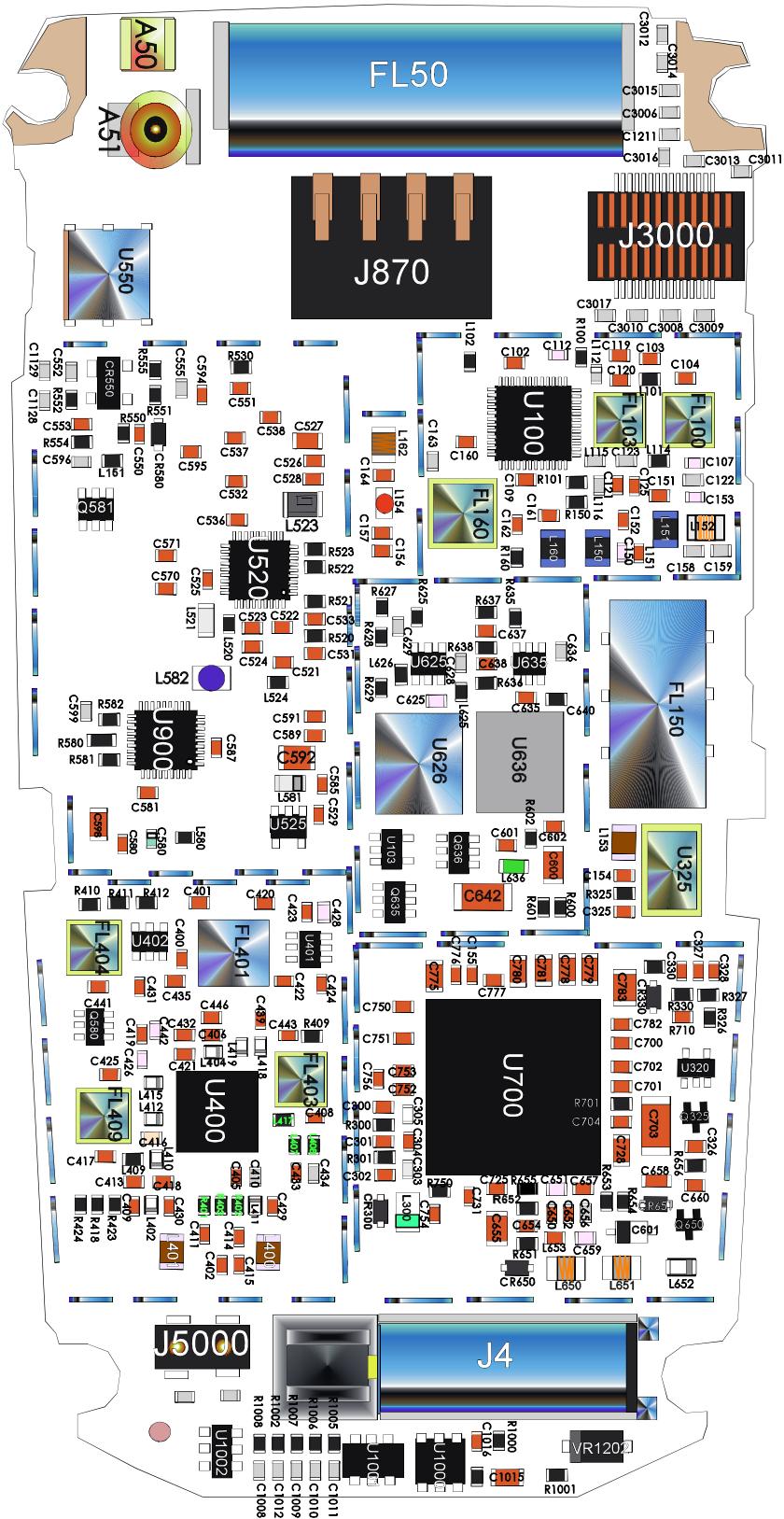


## V60i RF BOARD LAYOUT

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## PHOENIX V60i A/L BOARD LAYOUT

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