Service Manual Level III

MOTOROLA

Motorola V60i

CDMA 800/1900/AMPS 800

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MOTOROLA

Personal Communications Sector

CONTENTS

60i

60i CDMA DUAL BAND TRI MODE PHONE

General:

This product (60i) is based on CDMA Platform- 2000 reference Architecture. This is a Dual Band Tri Mode phone – 1900 Mhz CDMA / 800 Mhz CDMA/ 800 Mhz AMPS.

The clam form factor provides the smallest form factor (73 cc with 500 mAh battery), while maintaining the best usability, i.e maximizing the keypad and display sizes.

The 96 x 64 pixel array display will be larger than the current V-Series with improved readability, 3 lines using Synergy, Animation capability.

60i have a one line external display to allow viewing of caller ID and other phone status messages while the flip is closed. EL back lighting on both internal and external Caller ID displays with Hologram.

Painted metal housings will add a unique look and feel to 60i. Improved usability with the new Synergy User Interface.

LED back lighting for keypad. 19 keys on keypad for synergy support. Volume keys and Smart key on side. Micro browser capable. Integrated headset jack located on the top.

Accessory Connector: 17 pin CE Bus connector, Access to USB, RS232, power and ground, analog and digital audio. Internal charging: 60i supports dead battery operation with a CLA and Travel charger.

Batteries: Lithium Polymer and Lithium Ion (500mAh, 600mAh, 800mAh, 1100mAh) MT and MO SMS.

60i LOGIC CIRCUIT

The main chip sets of Platform 2000 reference architecture products consists of WALLY and CCAP IC. The memory chips are the FLASH and the RAM.

The WALLY includes the functionality of CPU + DSP + CSP + CIA. The WALLY is M-Core product (Motorola Proprietary) 32 bits.The CCAP IC works in Buck mode and provides the power management function of the phone. It also does the audio amplification and routing. It controls the 32Khz crystal, it interfaces with WALLY on 8 bit Parallel Bus. The communication to the accessories through the CSS bus connector is done through the CCAP IC. The audio through the external connector is digital. All audio interface is through CCAP IC- Alert, Phone Speaker, headset speaker & Microphone, External Speaker & Microphone, and Phone Microphone

The Wally IC integrates the functionality of Casper IC (which contains the MCU,

RIB, the CSP and the DSP) and CIA

Key features of the WALLY IC:

- M-Core integer processor, 32 bit RISC architecture
- 56600 NDE-UL DSP Core running at up to 70 Mhz @ 1.8V
- MCU-DSP interface
- CDMA signal processor (CSP3) ASIC
- 16 bit external memory interface for the MCU
- 8 bit parallel interface for CCAP
- 32-Input Interrupt Controller for the MCU
- Internal MCU ROM and RAM
- Special modules for CDMA mode (all are MCU peripherals):
- Dual 9.8304 M samples/sec 4-bit ADCs (RX I/Q with Receive AGC)
- Dual 4.9152 M samples/sec 9-bit DACs
- 13-bit linear CODEC
- 1-8bit, 2-10bit, 1-12bit measurement DAC
- 8-bit measurement ADC with 6 multiplexed inputs
- 10-bit AOC-loop control ADC and DAC (DSP peripheral)
- A UART with auto baud detection
- Universal serial bus (USB) interface module
- Serial Audio Port interface

Key features of the CCAP IC:

CCAP IC uses Buck converter mode with no 5V supply

- 8 bit parallel interface from Wally
- Buck and Boost converters
- 8-Linear voltage regulators
- 2-Hi end linear regulators w/ common reference (PA Drain regulators)
- External B+ clamp regulator
- 3 Microphone Amplifiers
- Differential audio interfaces to and from Wally
- Audio Amps, Multiplexers and Speaker & Alert Drivers
- Headset and Send/End key detection
- Battery charger
- 6 input 8 bit ADC
- Real time clock(RTC) with coin cell backup supply and coin cell charger
- Timer circuits
- CE bus interface
- Vibrator and Backlight regulator inside the CCAP IC

The external memory consists of 32 Mega bit 1.8V FLASH and 4 Mega bit 1.8V SRAM

The butt plug is a 17 pin CE bus connector , which supports the USB and RS232 Serial communications. CE bus runs at 1.8V.

V.60C will not support the 3WB or PST mode of communications.

Keypad connector is a 14 pin data no mating connector-keypad, compression type

32 Khz crystal controlled by CCAP IC for RTC and slotted mode operation.

The charging circuit consists of Fast charger which is similar to StarTac , 60i phones will also support Mid Rate charger

The flex connector interfaces the main board with the Display, Speaker and the RTC Battery in the flip.

The accessory antenna port is present on the back side of the phone near the antenna.

All the logic parts and IC's are placed on one side and all RF parts and IC's are placed on another side of the PCB

60i RF CIRCUIT

The RF circuit is somewhat similar to Dual band Caliber/Shark product, the 60i phone contains FE IC (the front end IC)

The receiver contains two complete receiver paths : 800 Mhz path that is used by 800 Mhz analog and 800 Mhz CDMA signals, and a PCS band(1900 Mhz) path for PCS signal. The two paths have different RF, LO and IF frequencies.

The switching of the antenna and accessory antenna port is mechanical, normally close circuit with antenna, but when accessory RF cable is inserted in the accessory port the switch opens the circuit with antenna and closes the circuit with the accessory port.

For Frequencies and channel numbers look at the table in this manual

The FE IC contains the LNA's , interstage filtering and Mixers, the switching and gain of the LNA's is controlled by the control signals

ZIF/SYN IC extracts the broadband signal from the IF , demodulate the analog signal and sends it to the audio logic side for further processing.

ZIF/SYN IC controls the Main VCO ,the second LO and the TX offset VCO (in analog mode).

60i uses the dual band VCO module for main LO (one for the 800 mhz band and another for PCS band) The output is split into RX_LO and TX_LO for both the bands.

60i uses the ME3 IC - the mixer exciter IC

The ME3 IC allows to control the RF output power. The ME3 IC requires two LO's, one for PCS, and the other for the 800 Mhz band.

The IF pins (input to the ME3 IC) are the same for any band. The control signal (TX Att) at the AGC pins control the gain of the ME3 IC.

There is an external interstage RF filter between the mixer and exciter.

From the mixer the outputs take two different paths one for TX PCS band and another for TX 800 Mhz band.

ME3 IC has 50 dBM attenuator control (input IF level= -23dBM , max output TX level= 25dBM)

At the output of ME3 IC band filter are used , in the PCS path two split band filters are used.

Two stage PA in 800 Mhz band and three stage PA in PCS band .

PA operates in depletion mode, therefore requires negative gate voltage.

In 60i PA adjustable bias both Gate and Drain therefore the output power can be controlled by PA_B+ DAC and PA_Bias DAC besides ME3 IC (through Tx_Attn)

CDMA –PCS 1900 Mhz BAND
Performance specification:
General
Frequency and channel information:

Table 1:

Channel No.	Tx Frequency (Mhz)	Rx Frequency(Mhz)
25	1851.25	1931.25
200	1860.00	1940.00
400	1870.00	1950.00
600	1880.00	1960.00
800	1890.00	1970.00
1000	1900.00	1980.00
1175	1908.50	1988.50

The 1900 MHz band is split into 6 blocks(ABC-DEF) of channels. usually only one block is used in a given geographic area.
There are no “standard” primary and secondry channels.

The actual primary and secondry channel depends on which block is used.
The lower valid channel number is 25.
The higher valid number is 1175.
Total Number of valid channel numbers is 46.

Table 2:

Function	*Specification*
Frequency Range	1850 to 1910 MHz(tx), 1930 to 1990(RX)
RF Channel Bandwidth	1.25 MHz
Channels	46 (Channel number spaced at an increment of-25, beginning channel, #25 lowest frequencyand ending channel number 1175 highest frequency)
Duplex Spacing	80 MHz
Frequency Stability	Center Frequency* +/- 8.5 $X10^{-8}$ +/- 150 Hz of incoming RX CDMA signal.
Operation Voltage	+3.6 V nominal (3.0 -4.4 V DC)
RF Power output	0.20 Watts - 23 dBm into 50 ohms (CDMA, nominal)
input/output impedance	50 ohms(nominal)
Spurious /Harmonic emissions	Complies with title 47, Part 22 of the code of federal regulations.
Vocoders	8kbps, 13kbps, EVRC
Transmit Time Error	+/- 1 US
Modulation Type	1M25D1W(1.25MHz bandwidth), OQPSK, G7W(CDMA)
Transmit Duty Cycle	Variable- full, 1/2, 1/4, 1/8 rate(CDMA Mode)
CDMA Transmit Waveform Quality(rho)	0.94
Receive Sensitivity	-104dBm(CDMA, 0.5% Static FER, 8kbps Vocoder)
Display	96 X 64 Pixel array (V.60C) have a one line external display to allow viewing of caller ID and other phone status messages while the flip is closed.

Specifications

CDMA 800 MHz Channel Numbering
General information:

The 800 MHZ CDMA channel numbering evolved from the Amps analog system which shares the same spectrum.
The Amps channel spacing is 30 KHZ.,because the CDMA signal BW=1.25 MHZ, the actual CDMA signal must be spaced every 41 channels (41*30 KHZ = 1.23MHZ)

In a dual-mode system, CDMA signals would never accupy analog control channels 313 to 354.
A -System preferred channels : primary =283, Secondary = 691
B- System preferred channels : Primary =384, Secondary = 771
The lowest valid CDMA channel is 1013.

The highest valid CDMA channel is 777.

Table 3: Overall System CDMA 800MH

Function	*Specification*
Frequency Range	824.04 - 848.97 MHz Tx, Channels 1 to 799, f_{Tx} = 0.03 * N+ 825 MHz Channels 990 to 1023, f_{Tx} = 0.03(N—1023) + 825 MHz 869.04 - 893.97 MHz Rx Channels 1 to 799 is f_{Rx} = 0.03 * N+ 870 MHz Channels 990 to 1023, f_{Rx} = 0.03(N—1023) + 870 MHz
Channel Spacing	30 KHz
Channels	832
Duplex spacing	45 MHz(amps)
Frequency Stability	+/- 2.5 ppm (Amps)
Operating Voltage	+3.6 v nominal (3.0v to 4.4 v DC)
Display	96 X 64 Pixel array (V.60C) have a one line external display to allow viewing of caller ID and other phone status messages while the flip is closed.
RF Power Output	0.6 watts - 28.0 dBM into 50 ohms (AMPS, nominal) 0.25 watts - 24.0 dBM into 50 ohms (CDMA, nominal)
Input/Output Impedance	50 ohms (nominal)
Spurious / Harmonic Emissions	Complies with Title 47, Part 22 of the code of Federal Regulations.
Audio Distortion	Less than 5% at
Hum and Noise(C-MSG)	32 dBm below +/- 8kHz deviation(transmit and receive)
Modulation	F3: + 12 kHz for 100% at 1 kHz, AMPS (wide) 1M25D1W (1.25 MHz bandwidth) CDMA
Transmit Audio Response	6 dBm/octave pre-emphasis
Transmit Audio sensitivity	(AMPS) + 2.9 kHz deviation (nom.) @ 97 dBm SPL input @ 1 kHz
Transmit Duty Cycle	full, 1/2, 1/4, 1/8 rate (CDMA Mode)
CDMA Transmit Waveform Quality(Rho)	0.94
Receiver Sensitivity	-116 dBm (AMPS, SINAD, C-MSG weighted) Sinad 12dB or greater -104 dBm (CDMA, 0.5% Static FER) 0.5 % or less
Alternate Channel Desense Protection	-60 db@+/- 60kHz (Amps)

Table 4: Environmental

Function	*Specification*
Temperature Range	Operational -30 o C to +60 o C (-22 o F to +140 o F) Storage -55 o C to +85 o C (-67 o F to +185 o F) Thermal Shock -40 o C to +85 o C (-40 o F to +185 o F) meets Mil. Std. 810C
Shock	Exceeds EIA Standards RS152B (Section 15) and IS-19
Drop	Exceeds EIA Standards RS316B and IS-19
Humidity	95% Relative Humidity; meets EIA Standard IS-19
Vibration	Exceeds EIA Standards RS316B and IS-19
Salt Fog	Salt Solution fog at 35 o C (95 o F), tested for 48 hours
Dust	140 mesh blown silica flour test, tested for 5 hours
Notes:	• EIA (Electronic Industries Association) Standard RS152B states the minimum stan-dards for Land Mobile Communications, FM or PM transmitters 25-470 MHz. • EIA IS-19 states the recommended standards for 800 MHz cellular subscriber units. • EIA Standard RS316B states the standards for portable land mobile communications. • U.S. Military Standard 810D establishes uniform environmental test methods for deter-mining the resistance of equipment to the effects of natural and induced environments peculiar to military operations. • TIA/EIA/IS-98 Recommended Minimum Performance Standards for Dual-Mode Wide band Spread spectrum Cellular Mobile Stations.

Specifications subject to change without notice.

Foreword

Scope of Manual

This manual is intended for use by experienced technicians familiar with similar types of equipment. It is intended primarily to support basic servicing, which consists primarily of mechanical repairs and circuit board replacement.

Authorized distributors may opt to receive additional training to become authorized to perform limited component repairs. Contact your regional Customer Support Manager for details.

Replacement Parts Ordering

Motorola maintains a parts office staffed to process parts orders, identify part numbers, and otherwise assist in the maintenance and repair of Motorola Cellular products. Orders for all parts should be sent to the Motorola International Logistics Department at the following address:

Accessories and After market Division
Motorola

Personal Communications Sector

Schaumburg, IL 60196

International Motorolans that need to purchase parts should contact AAD via one of the following numbers:

Phone: 1-847-538-8023, Fax: 1-847-576-3023

However, domestic Motorolans should contact AAD via one of the following numbers:

Phone: 1-800-422-4210, Fax: 1-800-622-6210

http://accesssecure.mot.com/Accesspoint/cgi-bin2/SoftCart.exe/Accesspoint/quick.html?L+test+rkod3498+930004870

When ordering replacement parts or equipment information, the complete identification number should be included. This applies to all components, kits, and chassis. If the component part number is not known, the order should include the number of the chassis or kit of which it is a part, and sufficient description of the desired component to identify it.

Model and Kit Identification

Motorola products are specifically identified by an overall model number on the product label. In most cases, assemblies and kits which make up the equipment also have kit numbers stamped on them.

Service

Motorola's regional Cellular Subscriber Service Centers offer some of the finest repair capabilities available to Motorola Subscriber equipment users. The Cellular Subscriber Service Centers are able to perform computerized adjustments and repair most defective transceivers and boards. Contact your regional Customer Service Manager for more information about Motorola's repair capabilities and policy for in-warranty and out-of-warranty repairs in your region.

General Safety Information

CAUTION

Do not jump start vehicle or use an automotive battery charger while the vehicle adapter option and the portable radiotelephone are connected to the vehicle electrical system, as this may cause serious damage to the radio. Disconnect the radio by removing the cable kit fuses.

Portable Operation

DO NOT hold the radio so that the antenna is very close to, or touching, exposed parts of the body, especially the face or eyes, while transmitting. The radio will perform best if it is held in the same manner as you would hold a telephone handset, with the antenna angled up and over your shoulder. Speak directly into the mouthpiece.

DO NOT operate the telephone in an airplane.

DO NOT allow children to play with any radio equipment containing a transmitter.

Mobile Operation (Vehicle Adaptor)

As with other mobile radio transmitting equipment, users are advised that for satisfactory operation of the equipment and for the safety of personnel, it is recommended that no part of the human body shall be allowed to come within 20 centimeters of the antenna during operation of the equipment.

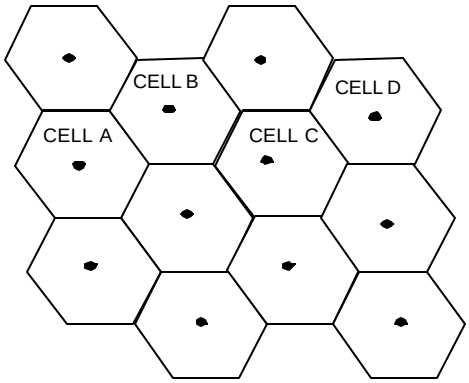
DO NOT operate this equipment near electrical blasting caps or in an explosive atmosphere. Mobile telephones are under certain conditions capable of interfering with blasting operations. When in the vicinity of construction work, look for and observe signs cautioning against mobile radio transmission. If transmission is prohibited, the cellular telephone **must be turned off** to prevent any transmission. *In standby mode, the mobile telephone will automatically transmit to acknowledge a call if it is not turned off.*

All equipment must be properly grounded according to installation instructions for safe operation.

Cellular Overview

Table 1:

Note
The following description is intended only as a preliminary general introduction to cellular systems. This description is greatly simplified and does not illustrate the full operating capabilities, techniques, or technology involved in cellular systems.



Overall Concept

Cellular systems are used to provide radiotelephone service in the frequency range of 824-894 MHz.

A cellular system provides higher call handling capacity and system availability than would be possible with conventional radiotelephone systems that require total system area coverage on every operating channel. The cellular system divides the system coverage area into several adjoining sub-areas, or cells.

Each cell contains a base station (cell site) which provides transmitting and receiving facilities. CDMA is a “spread spectrum” technology, which means that it spreads the information contained in a particular signal of interest over a greater bandwidth than the

original signal. With CDMA, unique digital codes, rather than separate RF frequencies or channels are used to differentiate subscribers. The codes are shared by both the mobile station and base station and are called “pseudo-random code sequences”. Since CDMA is a spread spectrum technology, all users share a range of the radio spectrum. CDMA cell coverage is dependent upon the way the network is designed. For each system 3 characteristics must be considered: coverage, quality, and capacity. These 3 must be balanced for desired lever of performance.

Some of the CDMA benefits are:

- Improved call quality with better and more consistent sound.
- Enhanced privacy.
- Variable rate vocoder.
- Soft hand off.

Hypothetical Cell System

Operation

In Figure 1: “Hypothetical Cell System”, the area bounded by bold lines represents the total coverage area of a cellular system. This area is divided into several cells, each containing a cell site base station which interfaces radiotelephone subscribers to the switching system. Since there are no reserved channels for each cell in CDMA, a user has a better chance of completing a call. Also, now there is no hard handoff between cell sites since all sites operate on the same frequency. This is called soft hand-offs. In this system, subscribers in cell A & D simul-taneously operate in the same frequency. As a user moves from cell site to cell site, the base station monitors the signal strength of the user. Based on this signal strength, the base station decides which cell shall carry the call.

When a radiotelephone is in use well within a cell, the signal strength received at the cell site base station will be high. As the phone is moved towards the edge of the cell, its received signal strength decreases. Signal strength information therefore provides an indication of the subscriber’s distance from a cell’s base station. This change is handled automatically, and is completely transparent to the user. For example, assume that a cellular tele-phone initiates a call in cell A and then moves across the system area through cells B and C to cell D. As the phone moves into cell B, it is instructed to change to a different frequency that operates through the B cell on that frequency. A similar change is performed when the phone moves from cell B to cell C and again when the phone moves from cell C to cell D.

In this example, the radiotelephone has operated in four cell sites, through four cell sites, and on the same spread spectrum without interruptions in voice communications. As the radiotelephone leaves a cell, the frequency on which the phone and base station were operating is made available to another subscriber in that cell. Since this radiotelephone is dual mode, the radiotelephone can operate in either a CDMA system or Analog system.

Service Area

The area within which calls can be placed and received is defined by the system operator. (Because this is a radio system, there is no exact boundary that can be drawn on a map.) If the portable is outside the radio service area, a No Svc (no service) message will appear on the phone’s display, and calls cannot be placed or received. If this happens during a conversation, the call is lost. Places where the ability to place or receive calls would be lost are in totally enclosed areas, such as underground parking garages, in buildings without windows, and in elevators. This situation would be indicated either by the No Svc message illuminating, or by the sound of either a fast busy signal or a high-low siren signal when call placement is attempted.

General usage in buildings having reasonable glass area is usually quite good. However, it may be necessary to move closer to a window to ensure reliable operation.

PCS System

(Personal communication System) is identical to this cellular system except that the radio telephone service in the frequency range of 1850 MHZ to 1990 MHZ and the duplex spacing is 80 MHZ.

V.60i Logic Circuit

The main chip sets of Platform 2000 reference architecture products consists of WALLY and CCAP IC. The memory chips are the FLASH and the RAM.

The WALLY includes the functionality of CPU + DSP + CSP + CIA.

The WALLY is M-Core product (Motorola Proprietary) 32 bits.

The CCAP IC works in Buck mode and provides the power management function of the phone. It also does the audio amplification and routing. It controls the 32Khz crystal, it interfaces with WALLY on 8 bit Parallel Bus. The communication to the accessories through the CSS bus connector is done through the CCAP IC. The audio through the external connector is digital.

All audio interface is through CCAP IC- Alert, Phone Speaker, headset speaker & Microphone, External Speaker & Microphone, and Phone Microphone.

The Wally IC integrates the functionality of Casper IC (which contains the MCU, RIB, the CSP and the DSP) and CIA.

Key features of the WALLY IC:

- M-Core integer processor, 32 bit RISC architecture
- 56600 NDE-UL DSP Core running at up to 70 Mhz @ 1.8V
- MCU-DSP interface
- CDMA signal processor (CSP3) ASIC
- 16 bit external memory interface for the MCU
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- 32-Input Interrupt Controller for the MCU
- Internal MCU ROM and RAM
- Special modules for CDMA mode (all are MCU peripherals):
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- 10-bit AOC-loop control ADC and DAC (DSP peripheral)
- A UART with auto baud detection
- Universal serial bus (USB) interface module
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Key features of the CCAP IC:

CCAP IC uses Buck converter mode with no 5V supply

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- 8 bit parallel interface from Wally
- Buck and Boost converters
- 8-Linear voltage regulators
- 2-Hi end linear regulators w/ common reference (PA Drain regulators)
- External B+ clamp regulator
- 3 Microphone Amplifiers
- Differential audio interfaces to and from Wally
- Audio Amps, Multiplexers and Speaker & Alert Drivers
- Headset and Send/End key detection
- Battery charger
- 6 input 8 bit ADC

- Real time clock(RTC) with coin cell backup supply and coin cell charger
- Timer circuits
- CE bus interface
- Vibrator and Backlight regulator inside the CCAP IC

The external memory consists of 32 Mega bit 1.8V FLASH and 4 Mega bit 1.8V SRAM.

The butt plug is a 17 pin CE bus connector, which supports the USB and RS23 Serial communications. CE bus runs at 1.8V.

V.60i will not support the 3WB or PST mode of communications.

Keypad connector is a 14 pin data no mating connector-keypad, compression type 32 Khz crystal controlled by CCAP IC for RTC and slotted mode operation.

The charging circuit consists of Fast charger which is similar to StarTac, V.60i phones will also support Mid Rate charger.

The flex connector interfaces the main board with the Display, Speaker and the RTC Battery in the flip.

The accessory antenna port is present on the back side of the phone near the antenna.

All the logic parts and IC's are placed on one side and all RF parts and IC's are placed on another side of the PCB

V.60i RF CIRCUIT

The RF circuit is somewhat similar to Dual band Caliber/Shark product, the V.60i phone contains FE IC (the front end IC).

The receiver contains two complete receiver paths: 800 Mhz path that is used by 800 Mhz analog and 800 Mhz CDMA signals, and a PCS band(1900 Mhz) path for PCS signal. The two paths have different RF, LO and IF frequencies.

The switching of the antenna and accessory antenna port is mechanical, normally close circuit with antenna, but when accessory RF cable is inserted in the accessory port the switch opens the circuit with antenna and closes the circuit with the accessory port.

For Frequencies and channel numbers look at the table in this manual. The FE IC contains the LNA's, interstage filtering and Mixers, the switching and gain of the LNA's is controlled by the control signals. ZIF/SYN IC extracts the broadband signal from the IF, demodulate the analog signal and sends it to the audio logic side for further processing.

ZIF/SYN IC controls the Main VCO,the second LO and the TX offset VCO (in analog mode).

V.60i uses the dual band VCO module for main LO (one for the 800 mhz band and another for PCS band) The output is split into RX_LO and TX_LO for both the bands. V.60i uses the ME3 IC - the mixer exciter IC. The ME3 IC allows to control the RF output power. The ME3 IC requires two LO's, one for PCS, and the other for the 800 Mhz band.

The IF pins (input to the ME3 IC) are the same for any band. The control signal (TX Att) at the AGC pins control the gain of the ME3 IC. There is an external interstage RF filter between the mixer and exciter. From the mixer the outputs take two different paths one for TX PCS band and another for TX 800 Mhz band. ME3 IC has 50 dBM attenuator control (input IF level= -23dBM, max output TX level= 25dBM). At the output of ME3 IC band filter are used, in the PCS path two split band filters are used.

Two stage PA in 800 Mhz band and three stage PA in PCS band. PA operates in depletion mode, therefore requires negative gate voltage. In V.60i PA adjustable bias both Gate and Drain therefore the output power can be controlled by PA_B+ DAC and PA_Bias DAC besides ME3 IC (through Tx_Attn)

Theory of Operation

AMPS

RECEIVER

RECEIVER CIRCUITRY

The phone receives the RF signal from the Antenna or the RF test port, the received RF signal is routed through the Diplexer - FL53 to mono block duplex SAW filter – FL51. The RF signal is then routed to the Front End IC(FE IC) – U100, which contains LNA which provides a 10-12 dB gain to the received RF signal, and U100 provides inter stage filtering and it contains Mixer which down converts the frequency of the signal to IF which is 109.65Mhz.
The local oscillator signal which is input to the filter FL101 is 978 – 1004 Mhz. The VCO module U626 is controlled by the ZIF/SYN IC – U700.
The mixer output IF signal 109.65Mhz is routed through IF filter- FL160 into the ZIF/SYN IC U700 for mixing with the second LO,filtering and demodulation.

RECEIVER AUDIO

DISC - signal an AMPS discriminator audio which is the output of FM demodulator in U700 is produced by mixing the IF signal with the second LO (which is controlled by U700) and then filtered. The audio on DISC line goes to WALLY IC-U1100 to be digitized. All receive audio filtering and gain control is performed in the digital domain within the WALLY which contains DSP, the processed RX audio is converted back to analog and routed to CCAP IC – U1200 on signals AUDIO_P and AUDIO_M. The CCAP - U1200 amplifies and route the audio signal(receive audio) to the speaker (phone speaker, boom speaker or external speaker). The alert tone originates in WALLY IC and follows the same path as receive audio except from CCAP it is routed to the alert.

TRANSMITTER

TRANSMITTER AUDIO

Audio from the Microphone (internal, boom or external) is routed through and amplified by CCAP – U1200 and then travel to the WALLY IC – U1100 on MIC1 and MICREF lines which is digitized by the CODEC inside the WALLY and the DSP present in WALLY performs the compression, pre-emphasis, limiting and band pass filtering function in the digital domain. All Amps signaling (SAT, ST, DTMF) is also generated in the digital domain by the DSP inside the WALLY. The digitized amps TX audio signal is converted back to analog inside the WALLY and sent on FM line to the 154.8Mhz Tx offset VCO to modulate the transmitter frequency.

TRANSMITTER CIRCUITRY

The FM signal from WALLY modulates the Tx offset VCO signal which is external but controlled by ZIF/SYN – U700. The Tx IF modulated signal 154.8Mhz is input to the ME3 IC – U400 where it get mixed with the 979 – 1004 Mhz local oscillator signal. The Tx signal then passes through the band pass filter FL404 into the Power Amplifier (PA) – U900 where it is amplified and the output passes through the isolator U550 and then through TX band pass mono block duplex SAW filter FL51 and through diplexer FL53 to the antenna or RF test port.

II. CDMA CELLULAR (800Mhz) MODE OF OPERATION

RECEIVER

RECEIVER CIRCUITRY

The phone receives the RF signal from the Antenna or the RF test port, the received RF signal is routed through the Diplexer - FL53 to mono block duplex SAW filter – FL51. The RF signal is then routed to the Front End IC(FE IC) – U100, which contains LNA which provides three stage gain to the received RF signal based on its strength, and U100 provides inter stage filtering and it contains Mixer which down converts the frequency of the signal to IF which is 109.8Mhz.

The FE IC is controlled by WALLY through the following signals: FEIC_G1, FEIC_G2, and MODE.

The local oscillator signal which is input to the filter FL101 is 978 – 1004 Mhz. The VCO module U626 is controlled by the ZIF/SYN IC – U700.

The mixer output IF signal 109.8Mhz is routed through IF filter- FL150 into the ZIF/SYN IC U700 for mixing with the second LO,filtering and demodulation.

RECEIVER AUDIO

Four outputs from U700 – RXIP, RXIM, RXQP, RXQM carries the base band signal of the receive digital call to the WALLY, the received QPSK data is gain controlled and converted to digital, the 1.2288 Mb/sec Rx data stream is then decoded by the CSP inside the WALLY to produce a signal containing only the desired data. The digital speech data is further decoded by the CELP vocoder a part of DSP within WALLY and then converted back into analog receive audio and routed to CCAP IC – U1200 on signals AUDIO_P and AUDIO_M.

The CCAP - U1200 amplifies and route the audio signal (receive audio) to the speaker (phone speaker, boom speaker or external speaker). The alert tone originates in WALLY IC and follows the same path as receive audio except from CCAP it is routed to the alert.

TRANSMITTER

TRANSMITTER AUDIO

Audio from the Microphone (internal, boom or external) is routed through and amplified by CCAP – U1200 and then travel to the WALLY IC – U1100 on MIC1 and MICREF lines which is digitized by the CODEC inside the WALLY and the DSP present in WALLY processes by CELP variable rate vocoder and then processed by the modem (CSP) within the WALLY which produces the 1.2288Mb/sec CDMA data stream. This stream is then converted to analog signals and send to ZIFSYN IC on four lines TXIP, TXIM, TXQP, TXQM. This modulates on the TX IF (QPSK modulation) 154.8Mhz TX offset VCO.

TRANSMITTER CIRCUITRY

The four signals TXIP, TXIM, TXQP, TXQM from WALLY modulates the Tx offset VCO signal which is external but controlled by ZIF/SYN – U700. The Tx IF modulated signal 154.8Mhz is input to the ME3 IC – U400 where it get mixed with the 979 – 1004 Mhz local oscillator signal. The Tx signal then passes through the band pass filter FL404 into the Power Amplifier (PA) – U900 where it is amplified and the output passes through the isolator U550 and then through TX band pass mono block duplex SAW filter FL51 and through diplexer FL53 to the antenna or RF test port.

III. CDMA PCS (1900Mhz) MODE OF OPERATION

RECEIVER

RECEIVER CIRCUITRY

The phone receives the RF signal from the Antenna or the RF test port, the received RF signal is routed through the Diplexer - FL53 to mono block duplex ceramic filter – FL50. The RF signal is then routed to the Front End IC(FE IC) – U100, which contains LNA which provides three stage gain to the received RF signal based on its strength, and U100 provides inter stage filtering and it contains Mixer which down converts the frequency of the signal to IF which is 109.8Mhz.
The FE IC is controlled by WALLY through the following signals: FEIC_G1, FEIC_G2, and MODE.
The local oscillator signal RX_LO_PCS is 2039-2100 Mhz. The VCO module U636 is controlled by the ZIF/SYN IC – U700.
The mixer output IF signal 109.8Mhz is routed through IF filter- FL150 into the ZIF/SYN IC U700 for mixing with the second LO,filtering and demodulation.

RECEIVER AUDIO

Four outputs from U700 – RXIP, RXIM, RXQP, RXQM carries the base band signal of the receive digital call to the WALLY, the received QPSK data is gain controlled and converted to digital, the 1.2288 Mb/sec Rx data stream is then decoded by the CSP inside the WALLY to produce a signal containing only the desired data. The digital speech data is further decoded by the CELP vocoder a part of DSP within WALLY and then converted back into analog receive audio and routed to CCAP IC – U1200 on signals AUDIO_P and AUDIO_M.
The CCAP - U1200 amplifies and route the audio signal (receive audio) to the speaker (phone speaker, boom speaker or external speaker). The alert tone originates in WALLY IC and follows the same path as receive audio except from CCAP it is routed to the alert.

TRANSMITTER

TRANSMITTER AUDIO

Audio from the Microphone (internal, boom or external) is routed through and amplified by CCAP – U1200 and then travel to the WALLY IC – U1100 on MIC1 and MICREF lines which is digitized by the CODEC inside the WALLY and the DSP present in WALLY processes by CELP variable rate vocoder and then processed by the modem (CSP) within the WALLY which produces the 1.2288Mb/sec CDMA data stream. This stream is then converted to analog signals and send to ZIFSYN IC on four lines TXIP, TXIM, TXQP, TXQM. This modulates on the TX IF (QPSK modulation) 189.8Mhz TX offset VCO.

TRANSMITTER CIRCUITRY

The four signals TXIP, TXIM, TXQP, TXQM from WALLY modulates the Tx offset VCO signal which is external but controlled by ZIF/SYN – U700. The Tx IF modulated signal 189.8Mhz is input to the ME3 IC – U400 where it get mixed with the 2039-2100 Mhz local oscillator signal. The Tx signal then passes through the SPLIT BAND SAW filter FL401 into the Power Amplifier (PA) – U520 where it is amplified and the output passes through the isolator U551 and then through TX band pass mono block duplex ceramic filter FL50 and through diplexer FL53 to the antenna or RF test port.

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.

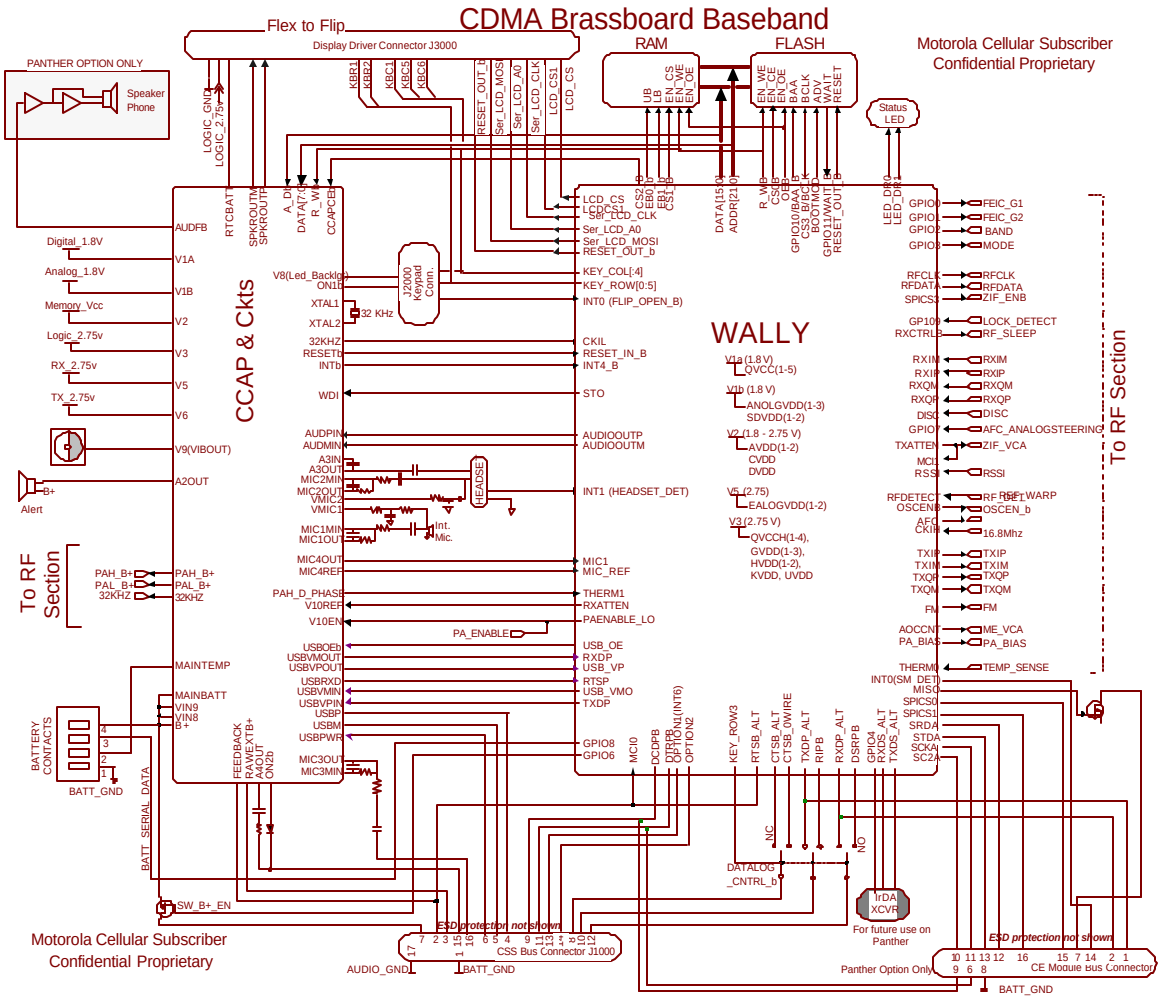
TRANSMIT POWER CONTROL CIRCUITRY

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.

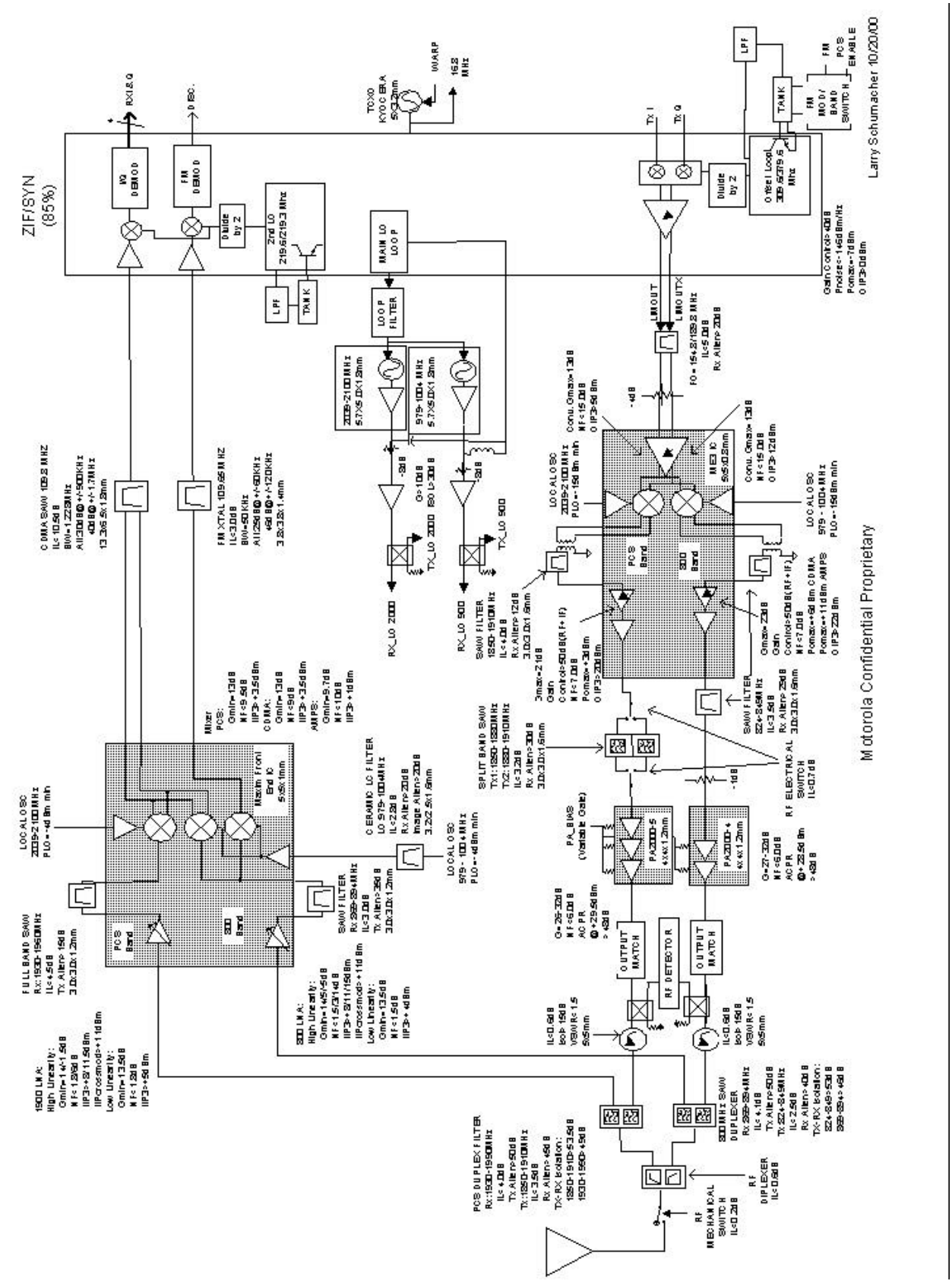
In Amps mode the power range is +8dBM to +28dBM. In CDMA mode the RF power range is from –50dBM to +23dBM.

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



Antenna Removal

Turn off the power.
Place the Antenna Removal tool over the antenna nut as shown in the picture below. Remove antenna by turning counterclockwise.

Battery Cover Removal

Press and hold the battery cover release button next to the antenna. Remove the battery cover.

Battery Removal

Remove the battery.

Label:

Remove the Label by applying heat with a heat gun gently. Care should be taken not destroy (burn) the label or the housing. Save and re-use the Label.

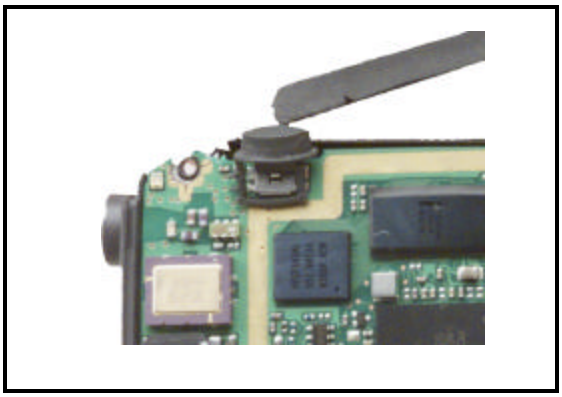
Rear Housing Removal

Unscrew the two top and two bottom screws on the rear housing.

A collar held by the screws is released as soon as the 4 screws come off. There is a tab on either side of the front housing which holds the rear and board down. Pry it with the bezel stick and release both the tabs as shown in the picture below.

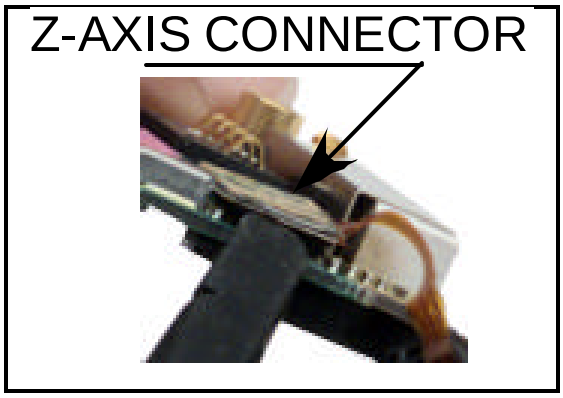
Volume/Smart and VA button removal

Remove the Volume/ Smart and VA buttons. as shown below.



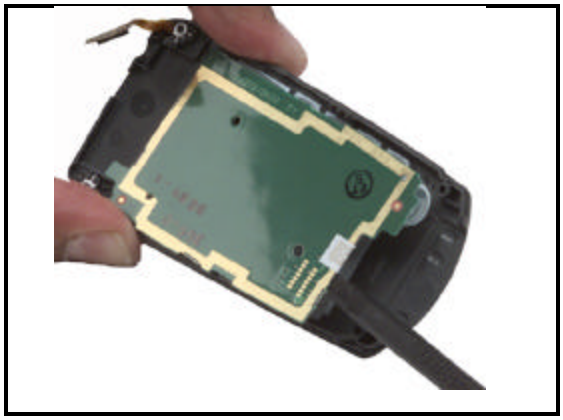
Z-Axis Connector Removal

The board is connected to the display assembly by a Z-Axis connector. Use the bezel stick to pry up the connector as shown in the picture.



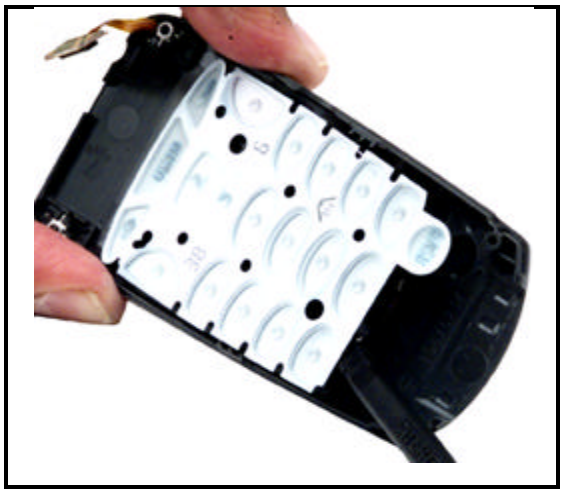
Spacer Gasket Removal:

Remove the spacer gasket as shown below.



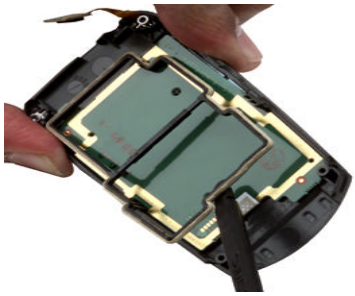
Keypadboard Removal:

Remove the keypad board as shown.



Domes or Popples Removal:

Remove the domes or popples. It is placed over the front housing

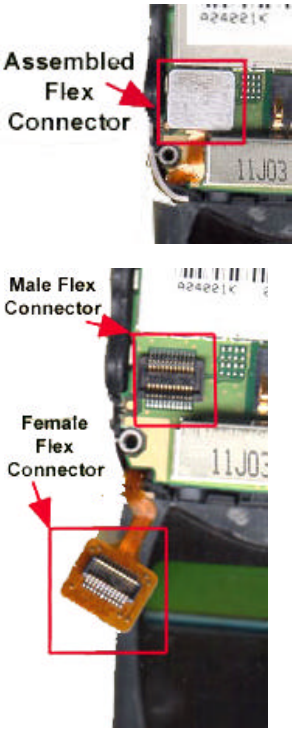


Flip Disassembly

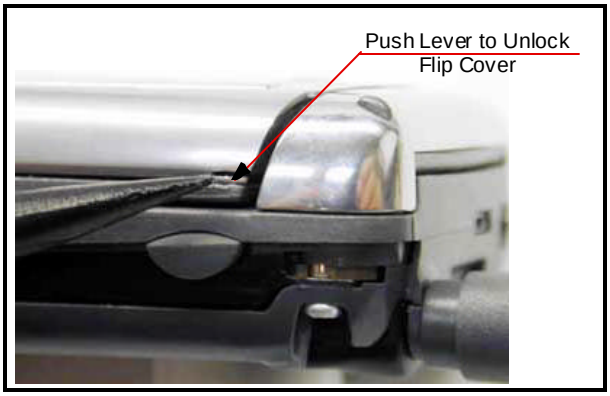
1. Disconnect the display flex from the transceiver board as shown below.

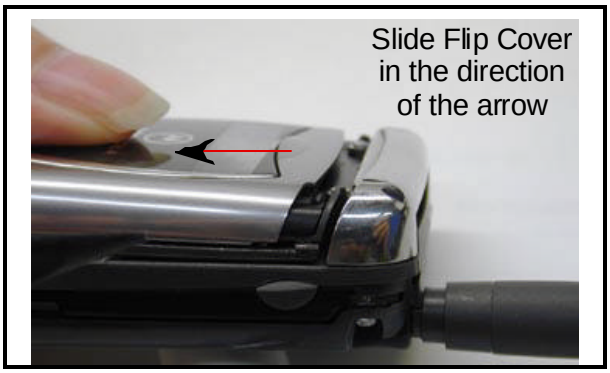
2. Remove the transceiver board. Make sure that the volume buttons and the VA button are not misplaced during repair.Remove the Chomerex gasket.

When removing the transceiver front housing from the knuckles be careful not to damage the flex or the flex connector.



3. Remove the flip cover as shown. On the top right hand side of the flip there is a lever which needs to depressed to unlock the cover. Press and hold the lever and slide out the flip cover as shown.

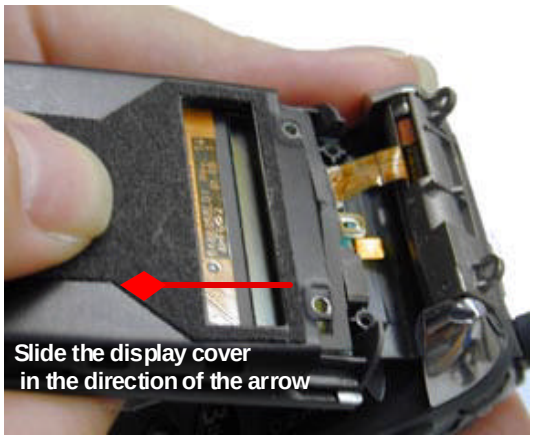


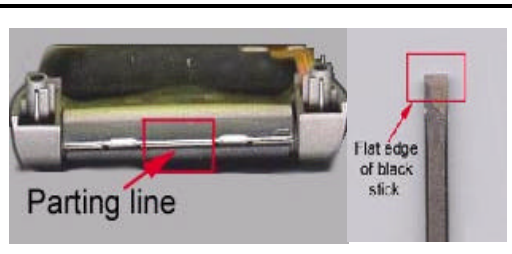


4. Remove the two screws from the flip display cover. Using the flat end of a Bezel(black stick) place it into the grooves between the flip inner housing and the display cover where they snap as shown.

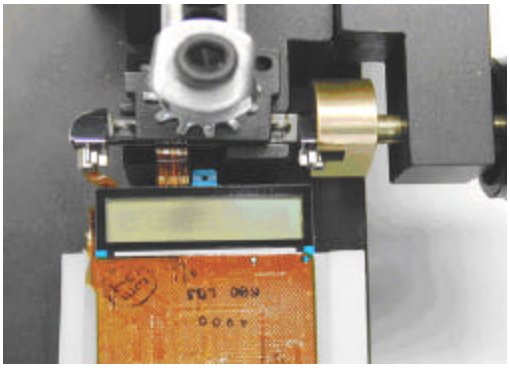
5. With the flat part of the black stick in the parting line yank the black stick. This will un-latch the flip inner housing from the Display cover. DO NOT PULL TO HARD ON THE FLIP INNER HOUSING.

6. Place the flat end of a plastic stick into the parting line between the flip inner housing and the flip outer housing where they snap into the hinge barrel.





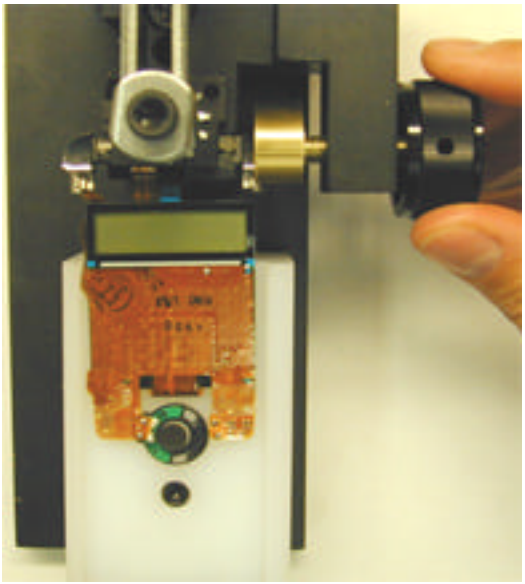
7. Remove the display from the flip inner housing. Be sure to remove the speaker from the gasket before removing the entire display assembly from the flip inner housing. The speaker gasket will get damaged when the display is removed.



8. Next place the display assembly into the winding fixture 6680384N03 with the main display face down and barrel in the slot of the fixture.

Make sure to clamp down the hinge barrel.

9. Next slide the right knuckle into the knuckle bit to unwind the fixture. The adapter bit will need to be somewhat manually aligned



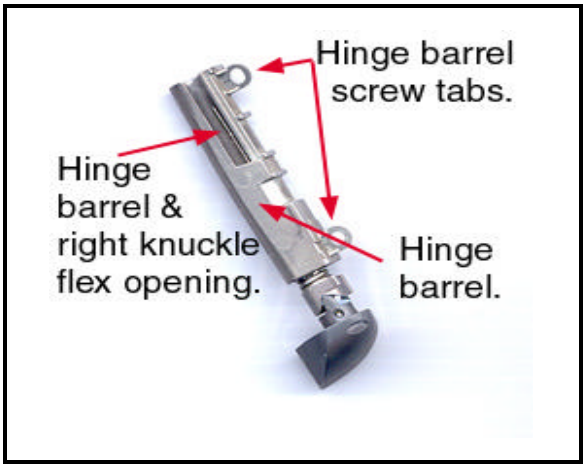
10. The display and the fixture should now be ready to unwind. With a slight amount of tension pull the display toward you. At the same time slowly turn the winding fixture knob clockwise.

11. The flex should start to unwind at this time. Turn the knob 4 times the flex will be completely unwound.

12. With the assembly still in the fixture hold the left knuckle with one hand and with the other hand insert a tweezers or other object that is able to disengage the shaft from the left knuckle.

13. Remove the display from the winding fixture. Next slide the display flex out of the right knuckle shaft.

14. Remove the hinge barrel and knuckle assembly from the fixture.



60i/60c/Timeport 270cV.120c PRODUCT SUPPORT TOOLS

FLASHING/FLEXING/NAM PROGRAMMING

All P2K products that include 60i,60c, Timeport 270c and V.120c are Wally based and are using the 17 pin CE Bus Connector which uses the USB and RS232 communication protocols. The following are the hardware and software requirements:

1. Personal computer with PST 2.3 software
2. Motorola test interface adapter box (junior board) - SYN8400A
3. Interface adapter power supply – SPN4029A or Wall charger SPN4278D
4. CE Bus cable SKN6304B

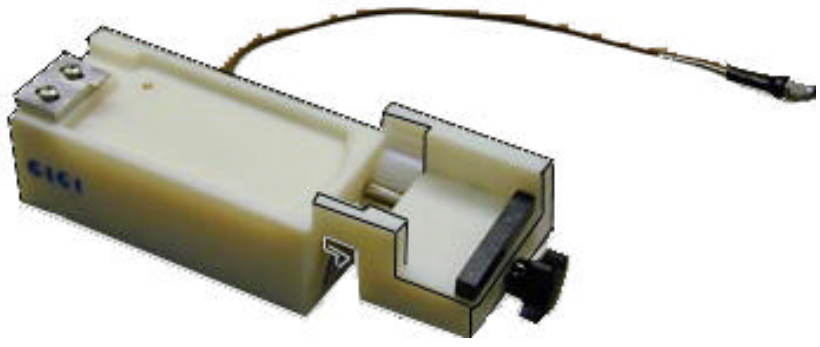
About Junior board operation:

To use USB mode plug the USB plug into the type B port provided on the back of the box. In this mode RS232 is turned off and only USB is allowed. Dip switches inside the box determines the mode of selection:

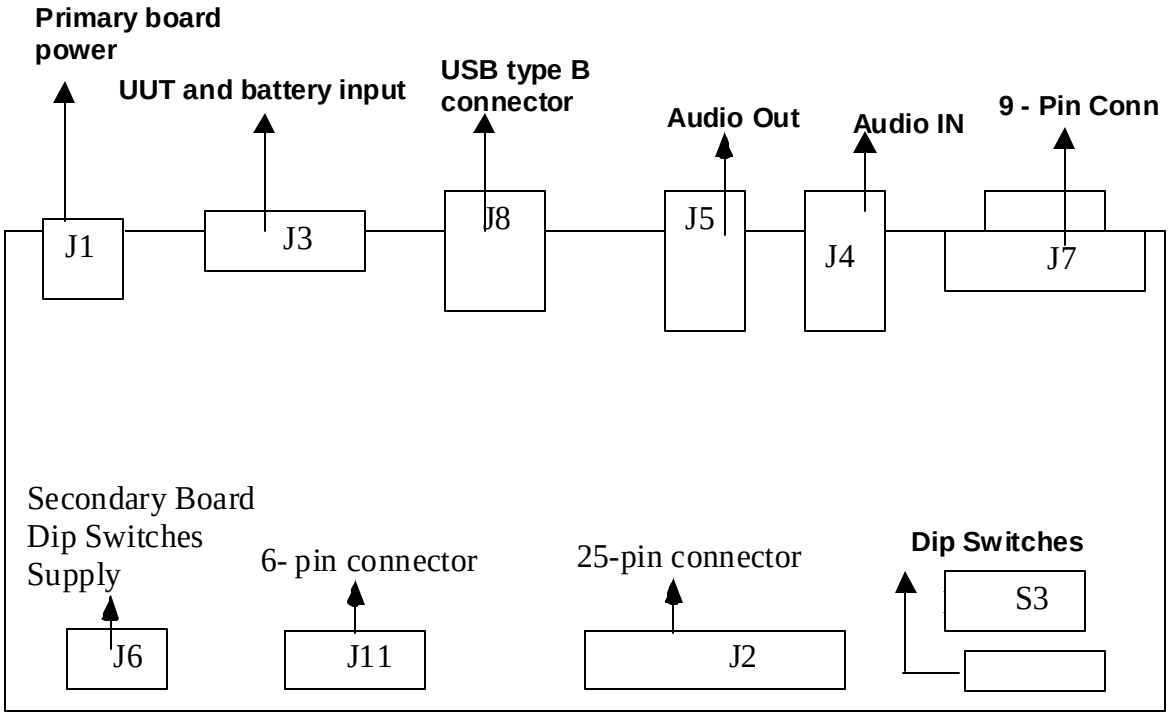
SWITCH NUMBER

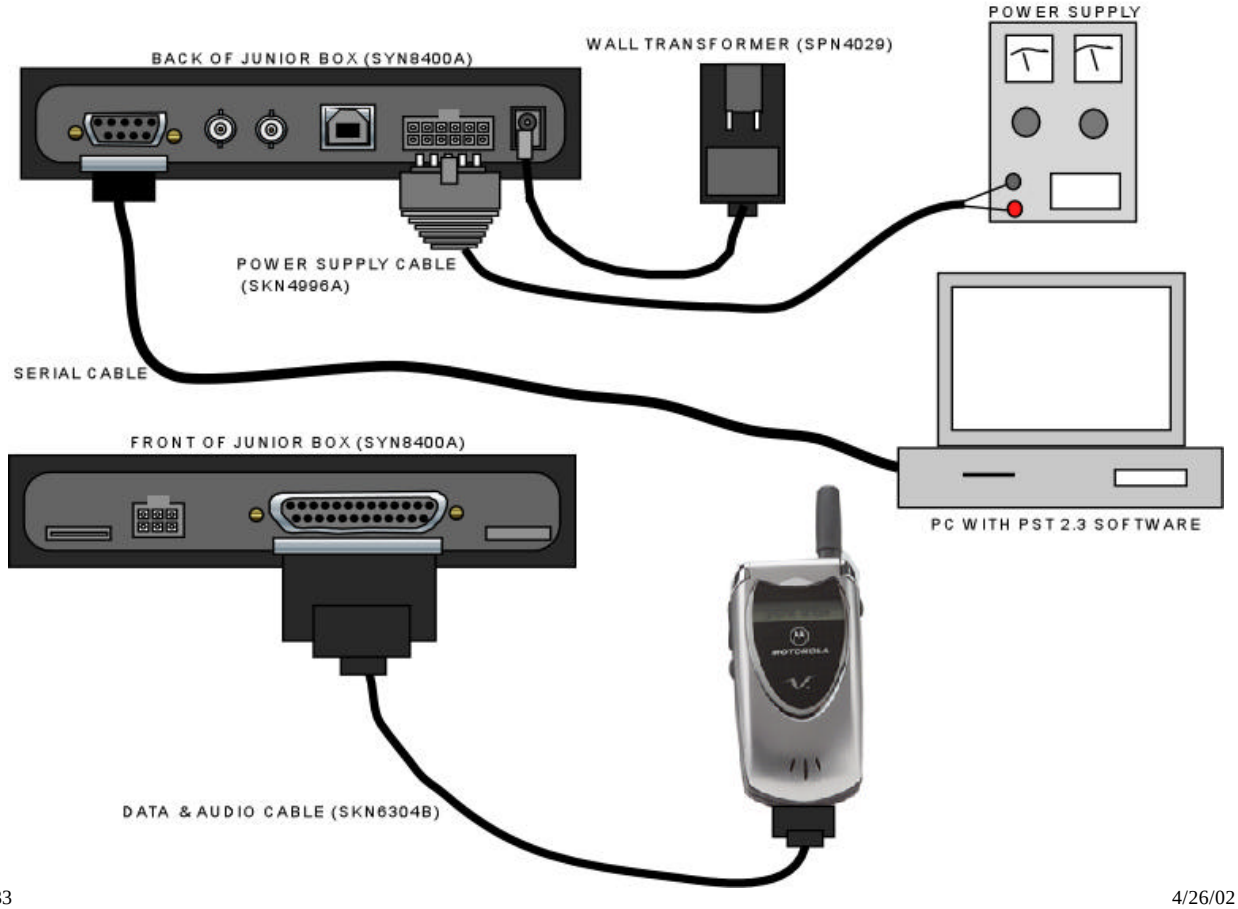
MODE Selection	1	2	3	4	5	6	7	8
Legacy TDMA flash	Down	Up	Up	Up	Up	Up	Up	Up
Legacy CDMA Serial Comm.	Up	Up	Down	Up	Up	Up	Up	Up
Legacy CDMA flash	Up	Up	Down	Up	Up	Up	Up	Up
Legacy CDMA datalog	Up	Down	Up	Up	Up	Up	Up	Up
P2K USB/ RS232	Up	Up	Up	Up	Up	Up	Up	Down
P2K Flash	Up	Down	Up	Up	Down	Up	Up	Up
P2K serial Comm.	Up	Down	Up	Up	Up	Down	Up	Up
USB	Up	Up	Up	Up	Up	Up	Up	Up

V.60i Phone Testing / Troubleshooting Fixture



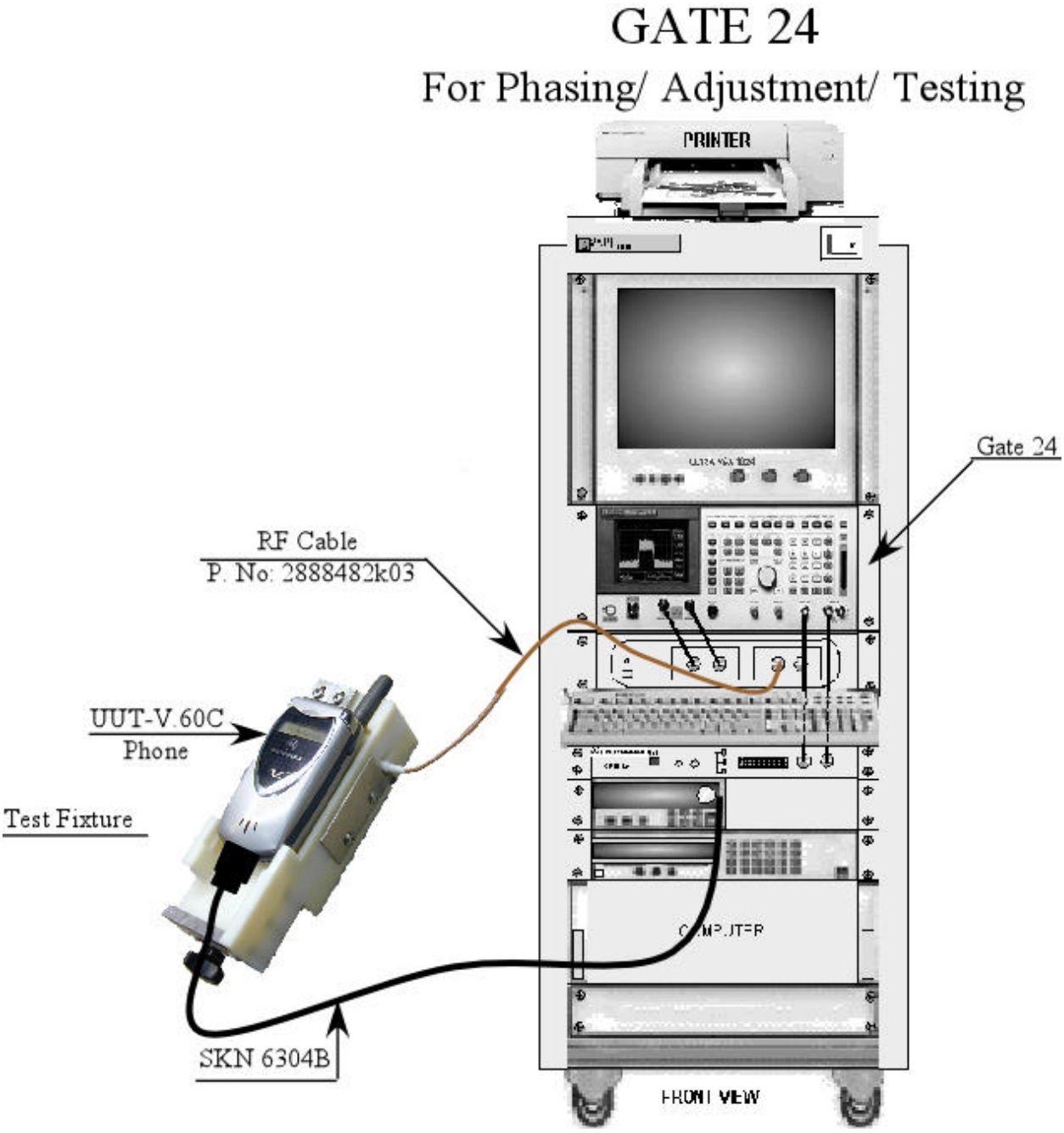
SYN8400A – JUNIOR BOARD



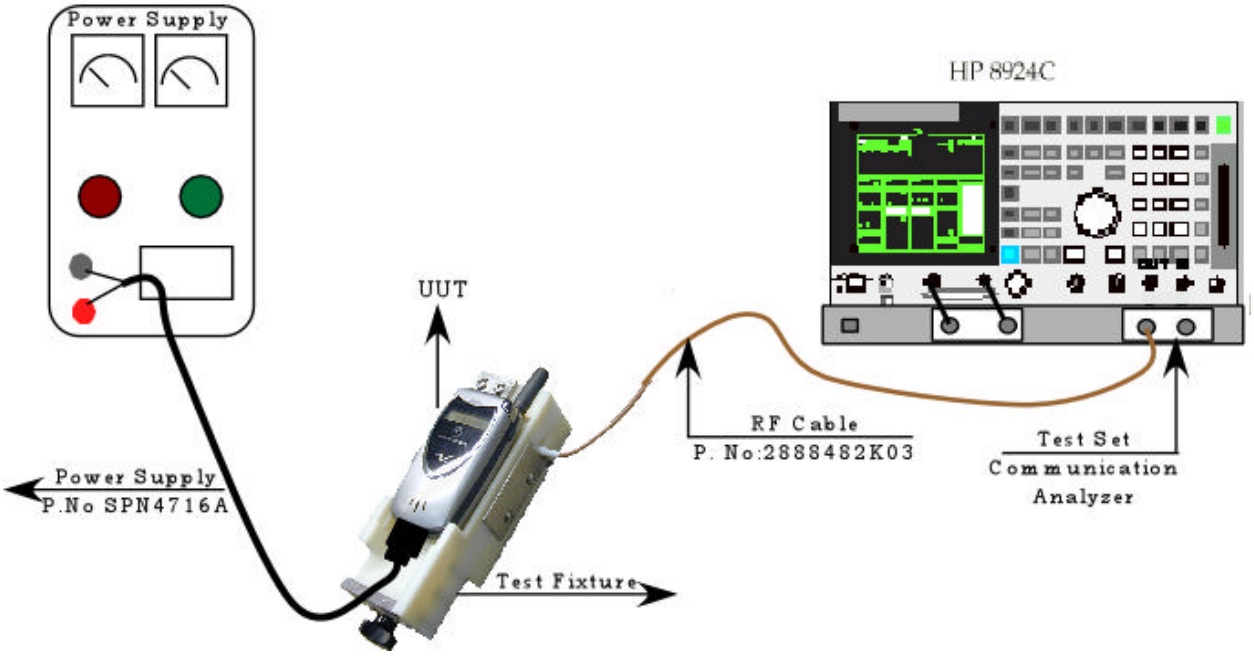


TEST AND PHASING

Gate 24 supports the testing and phasing of all P2K products, obtain the phasing and test software that includes V.60c, Timeport 270c and V.120c. For more details on Test and Phasing contact International Service Engineering ISE-CDMA



Manual Testing
Thru Handset Test Mode Commands



General Procedure for Analog Testing

- Connect RF and CE BUS connectors to radio and set power supply to level specified in the 12M issue X8.
- Before selecting suspend or other suspended commands for the radio, Data Mode must be selected first. Select Data Mode. If Data Mode step was successful, a message displaying " Returned From Radio: data stream xxx " will appear in the status window. Only then, can you proceed with entering the Suspend command.
- Select the Suspend command. If the Suspend command was successful, the status window will turn green and display data sent and returned from the radio. The window will also display a message "P2K HEAD COMMAND = SUSPEND = = > SUCCESSFUL".
- If the SUSPEND command was unsuccessful, the status window will turn red and display "Failed. Response = 0000,0". If any subsequent suspended commands sent to the radio fail, the status window will turn red and display a failed message.
- After the successful entry of Data Mode and Suspend, select and or set the fields highlighted in yellow as shown in the CDMAComm screen shots

Symptom	*Probable Cause*	*Verification and Remedy*
1. Phone will not turn on or stay on.	a) Battery either discharged or defective.	1. Measure battery voltage across a 50 ohm (>1 Watt) load. 2. If the battery voltage is <3.4 V DC, recharge the battery using the appropriate battery charger. 3. If the battery will not recharge, replace the battery.
	b) Battery connector open or misaligned.	1. Visually inspect the battery connectors on both the battery pack and the transceiver, including the solder connections from the battery connector to the main PC board. 2. Realign the contacts or, if necessary, replace either the battery or battery connector.
	c) RF/Audio-Logic Board defective.	1. Replace the keypad membrane with a known good part. 2. Temporarily connect 4.5 V DC to the battery contacts. 3. Depress the **PWR** button; if unit turns on and stays on, disconnect the power source and reassemble the phone with the new keypad membrane.
	d) Keypad board defective.	1. Replace keypad board assembly with a known good assembly. 2. Temporarily connect 4.5 V DC to the battery contacts. Depress the **PWR** button. 3. If the units turns on and stays on, discon-nect the power source and reassemble the phone with the new keypad board assembly.
	e) RF/AL Board Debugging Follow the no turn on Debug procedure.	1. Remove the RF/Audio-Logic Board. Substitute a known good board. 2. Temporarily connect 4.5 V DC to the battery contacts. 3. Depress the **PWR** button; if unit turns on and stays on, disconnect the power source and reassemble the phone with the new RF/Audio-Logic board and re-test phone.
2. Phone exhibits poor reception and/or erratic operation (such as calls frequently dropping, weak and/or distorted audio, etc.)	a) Defective antenna or damaged antenna connector. b) Defective RF/ Audio-Logic Board.	1. Make sure the antenna and antenna assembly is proper-shaft ferrule is screwed into the antenna socket. 2. Replace the antenna with a known good antenna. 3. Check for loose or damaged cans.

Symptom	*Probable Cause*	*Verification and Remedy*
3. Display is erratic, or provides partial or nodisplay.	a) Defectivedisplay module.	1. Gain access to RF/Audio-Logic board or keypad board as described in the “Disassembly” section of this manual. 2. Check connection. If connection not at fault, proceed to b.
	b) RF/Audio-Logic board defective.	Replace the RF/Audio-Logic Board
4. Alert ringer volume is distorted or too low.	a) Alert ringer defective.	Replace the defective speaker or alert ringer with a known good alert/ ringer.
	b) RF/Audio-Logic board defective.	Replace the RF/Audio-Logic Board
5. Transmit audio is weak, distorted, or dead.	a) Microphonedefective.	Replace defective microphone.
	b) RF/Audio-Logic board defective.	Replace the RF/Audio-Logic Board
6. Receive audio is weak and/or distorted.	a) Speaker defective.	Replace defective speaker.
	b) RF/Audio-Logic board defective.	Replace the RF/Audio-Logic Board

Nam Programming

UI Operation	Procedure
Enter the Programming Menu	1. MENU 0 S E T U P * 2. Enter the default code security code “000000”, then [ok] Note: If you have trouble opening the Programming Menu in step 1, try the following: after pressing MENU, immediately follow it with 0 when the display changes.
Program the phone number	1. Enter Programming Menu (see 1) 2. Select “User Activation” or “Extended NAM” 3. Select the appropriate NAM then press [CHANGE] 4. Highlight “MIN” and press [CHANGE] 5. Edit the number then press [OK] 6. If “MDN” is needed (Korea only?) then highlight “MDN” and repeat step 7.
Program the CDMA primary/secondary channels (for both system A & B)	1. Enter Programming Menu (see 1) 2. Select “Extended NAM” 3. Select the appropriate NAM then press [CHANGE] 4. Select “1st Channel A” then press [CHANGE] 5. Edit the number, then [OK] 6. Repeat steps 5 to 6 for other channels
Program the Analog primary/secondary channels (for both system A & B)	
Program the Home System ID	1. Enter Programming Menu (see 1) 2. Select “User Activation” or “Extended NAM” 3. Select the appropriate NAM then press [CHANGE] 4. Select “CDMA Sys ID” then press [CHANGE] 5. Edit the number, then [OK]

Read ESN	1. Press MENU 2. Select “Settings” 3. Select “Phone Status” 4. Select “Other Information” 5. Select “ESN”
Read software version	1. Press MENU 2. Select “Settings” 3. Select “Phone Status” 4. Select “Other Information” 5. Select S/W Version
Set DTMF long/short mode	1. Press MENU 2. Select “Settings” 3. Select “Other Settings” 4. Select “Initial Setup” 5. Select “DTMF” then press [CHANGE] 6. Select the appropriate DTMF setting
"Set call processing mode (Analog Only, ...)"	1. Press MENU 2. Select “Settings” 3. Select “Other Settings” 4. Select “Initial Setup” 5. Select “Network” 6. Select “Analog Only” then press [CHANGE] 7. Select the appropriate mode
Force preferred vocoder mode (8k, 13K, EVRC)	1. Enter Programming Menu (see 1) 2. Select “Vocode” then press [CHANGE] 3. Select the appropriate setting
Enable/disable voice privacy	Engine always request “voice privacy”. If the call has “voice privacy”, the display will show the icon.
Change station class mark (enable/disable slotted mode)	
Change slot cycle index	
"Change call termination enabled indicator: MOB_TERM (MOB_TERM_FOR_NID, MOB_TERM_FOR_SID,MOB_TERM_HOME,and HOME_REG, FOR_NID_REG, FOR_SID_REG)"	
"Change service option (analog, 8/13k voice, 8/13k Markov, 8/13k loopback, ...)"	
Disable/enable NAMPS	See procedure 8 for “analog only” option.

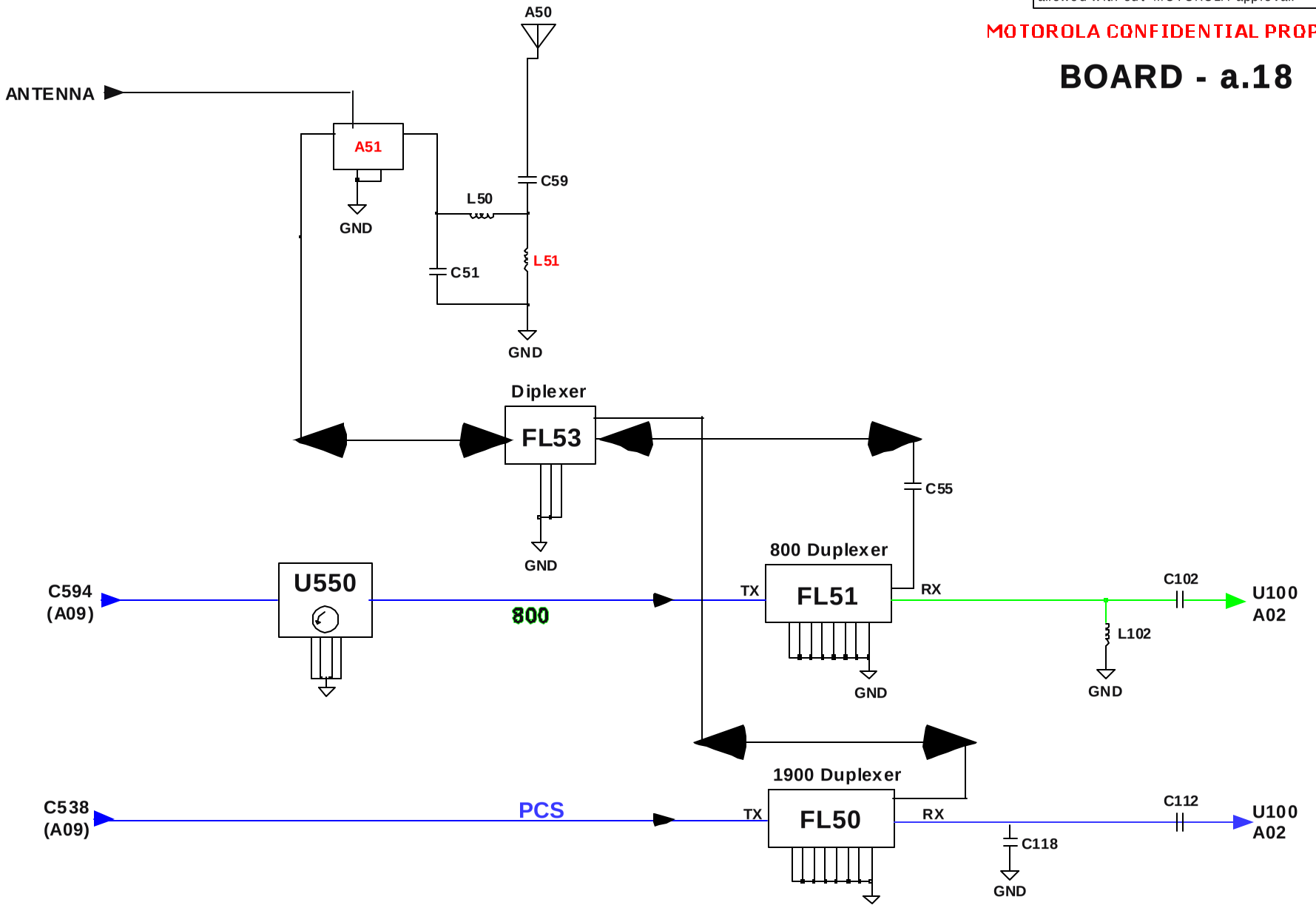
Program the A key	1. Enter Programming Menu (see 1) 2. Select “AKEY” then press [CHANGE]
"Originate, answer, and release a call"	**Originate a Call** 1. Enter the phone number from IDLE 2. Press “SEND” **Answer a Call** 1. Press RIGHT soft key [ANSWER] on the New Call dialog. Or 1. 1. Open the phone flip, if “Answer options”/”Open To Answer” is set to “yes” 2. Close the ohone flip
Read and delete Caller ID messages	**Accessing “Recent Calls”** 1. MENU 1. “Recent Calls” 1. “Received Calls” or “Dialed Calls” 1. RIGHT soft key [SELECT] **Read Caller ID** 1. Scroll to a message to delete 1. RIGHT soft key [VIEW] **Delete Caller ID** 1. Scroll to a message to delete 1. MENU 1. “Delete” 1. RIGHT soft key [SELECT] Or 1. Scroll to a message to delete 1. RIGHT soft key [VIEW] 1. MENU 1. “Delete” 1. RIGHT soft key [SELECT]
Originate call with call forwarding activation/ deactivation code	
Originate call with call forwarding no answer (CFNA) code	
Originate call with call forwarding busy (CFB) code	
Originate call with call forwarding busy (CFB) code	

	2. “Messages” **Read a Voicemail** 1. “Voicemail” 2. RIGHT soft key [CALL] Or 1. RIGHT soft key [CALL] from the “New Voice Mail” dialog. **Delete Voicemail** -
Read and delete Caller ID messages	**Accessing “Recent Calls”** 1. MENU 2. “Recent Calls” 3. “Received Calls” or “Dialed Calls” 4. RIGHT soft key [SELECT] **Read Caller ID** 1. Scroll to a message to delete 2. RIGHT soft key [VIEW] **Delete Caller ID** 1. Scroll to a message to delete 2. MENU 3. “Delete” 4. RIGHT soft key [SELECT] Or 1. Scroll to a message to delete 2. RIGHT soft key [VIEW] 3. MENU 4. “Delete” 5. RIGHT soft key [SELECT]
Originate call with call forwarding activation/ deactivation code	
Originate call with call forwarding no answer (CFNA) code	
Originate call with call forwarding busy (CFB) code	
Originate call with call forwarding busy (CFB) code	

V60i

ANTENNA CIRCUIT

BOARD - a.18

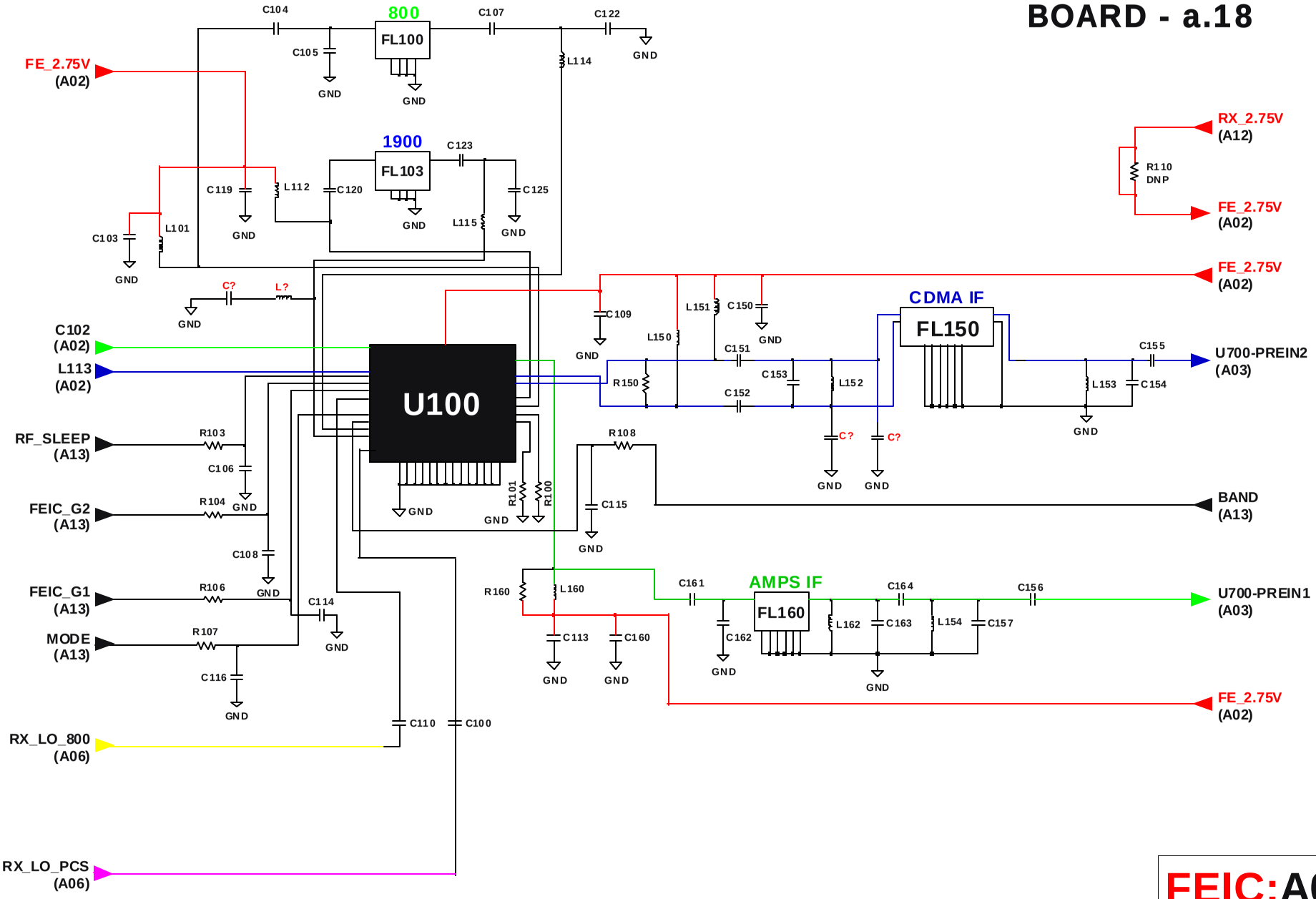


Antenna:A01

V60i

FEIC CIRCUIT

BOARD - a.18

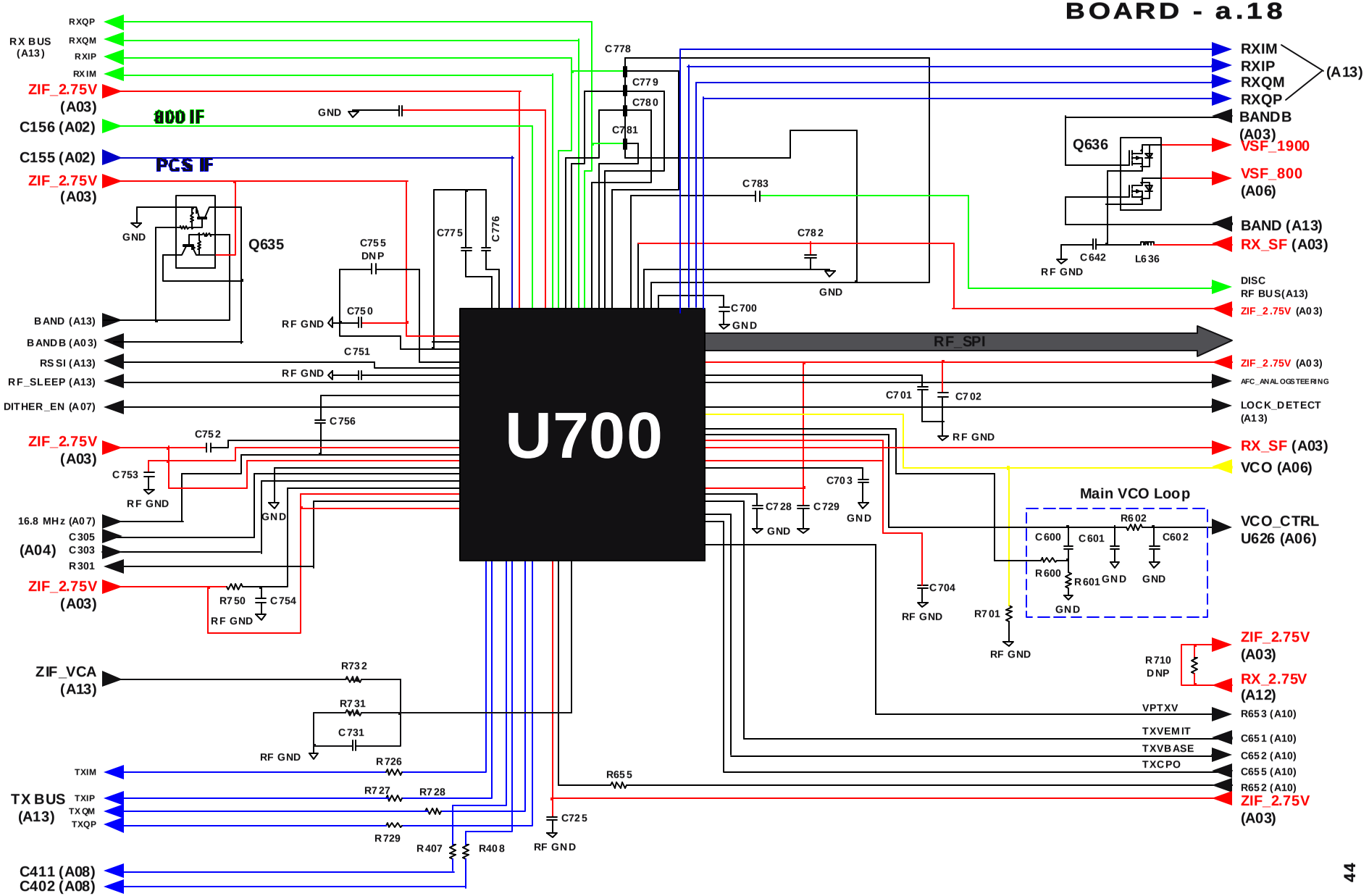


FEIC:A02

V60i

ZIF/SYN CIRCUIT

BOARD - a.18

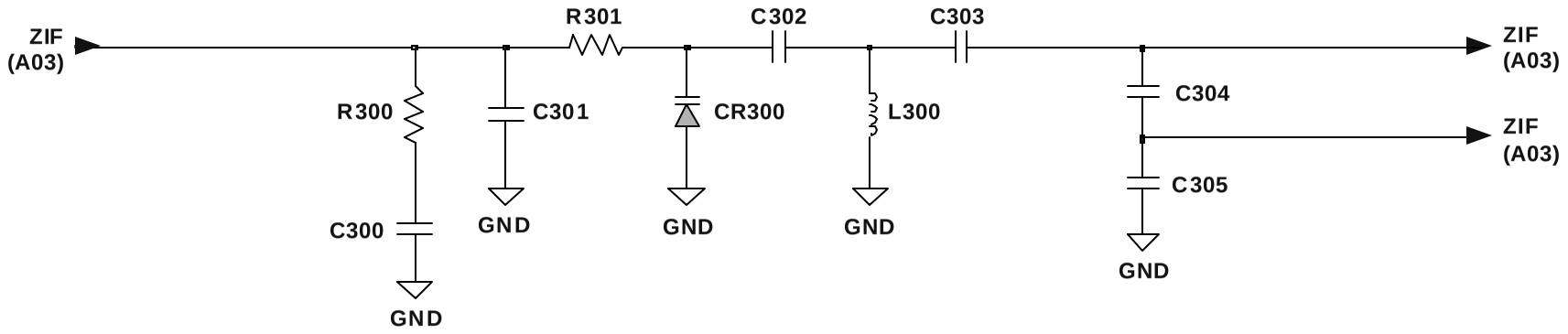


ZIF:A03

V60i

2nd LO Circuit

BOARD - a.18

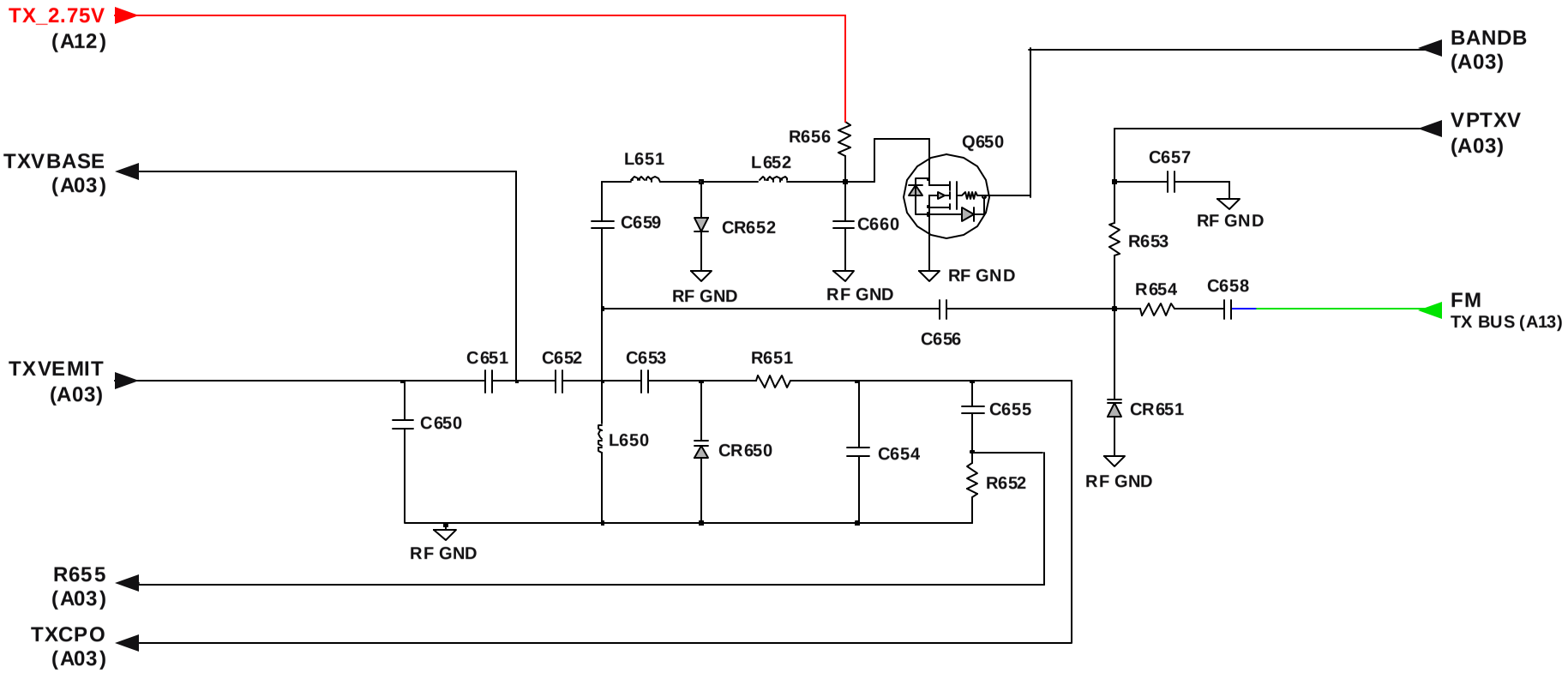


RX 2nd LO: A04

V60i

TX OFFset Circuit

BOARD - a.18

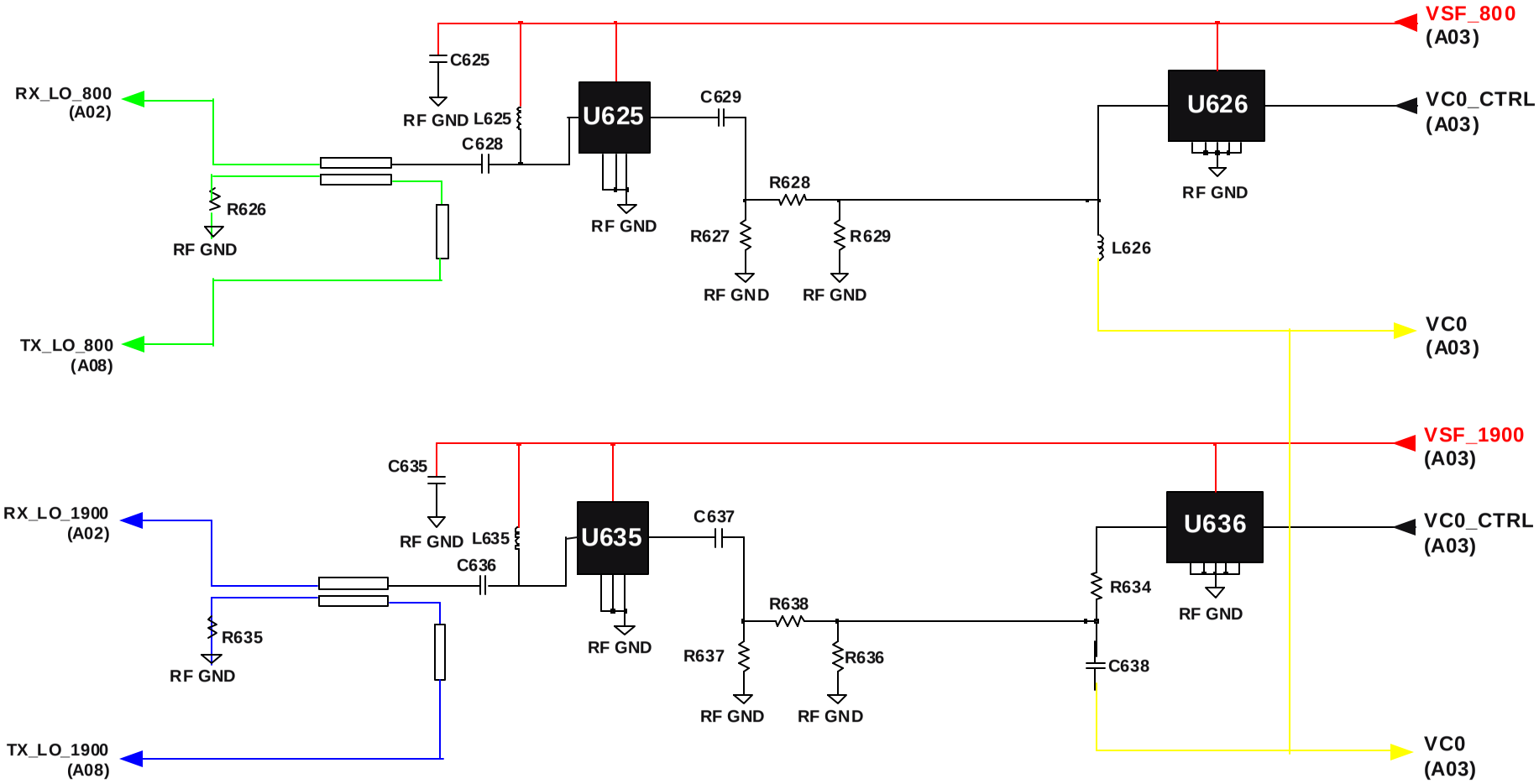


TX Offset Osc: A05

V60i

VCO Circuit

BOARD - a.18

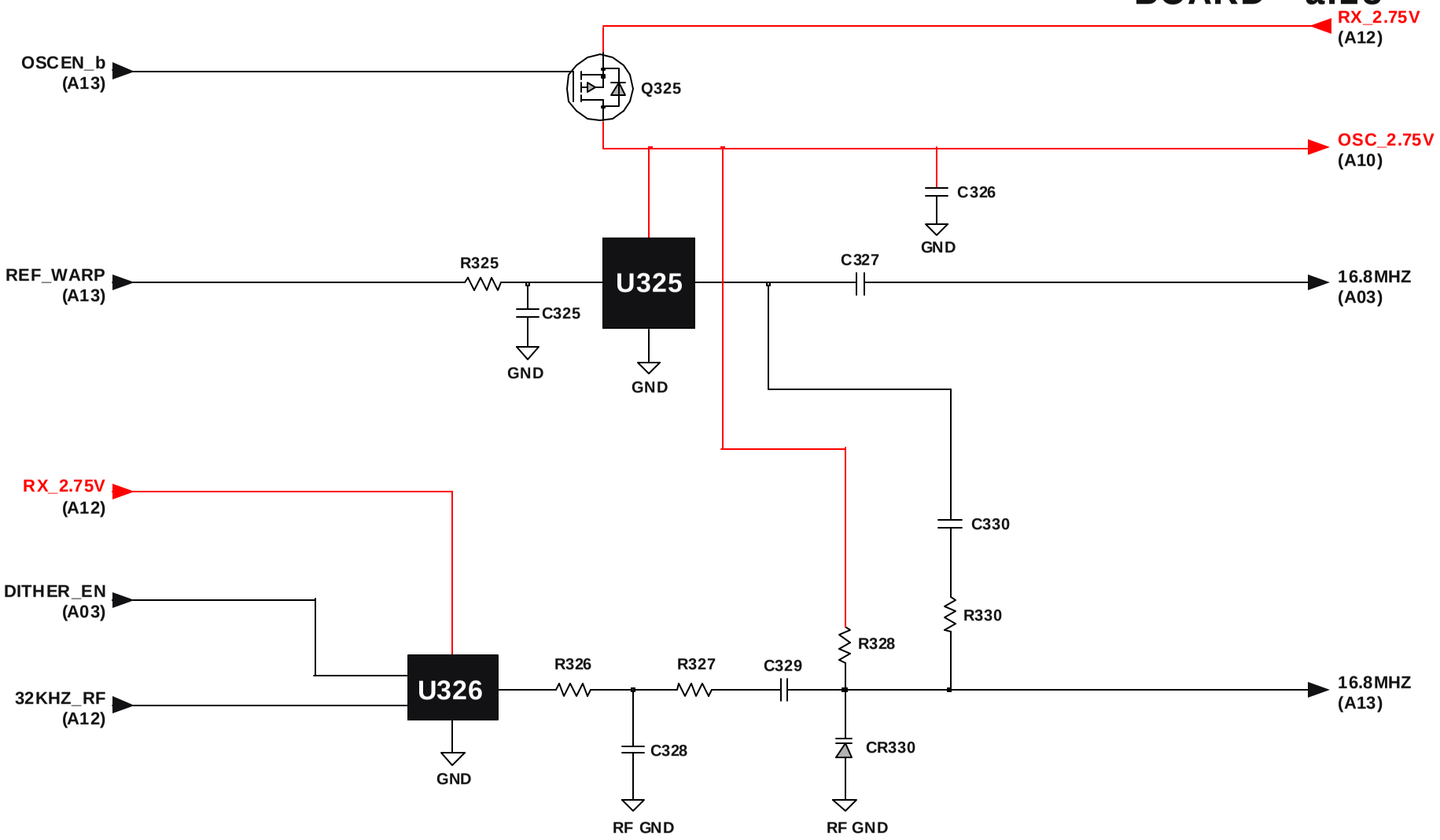


VCO:A06

V60i

REFERENCE OSCILATOR

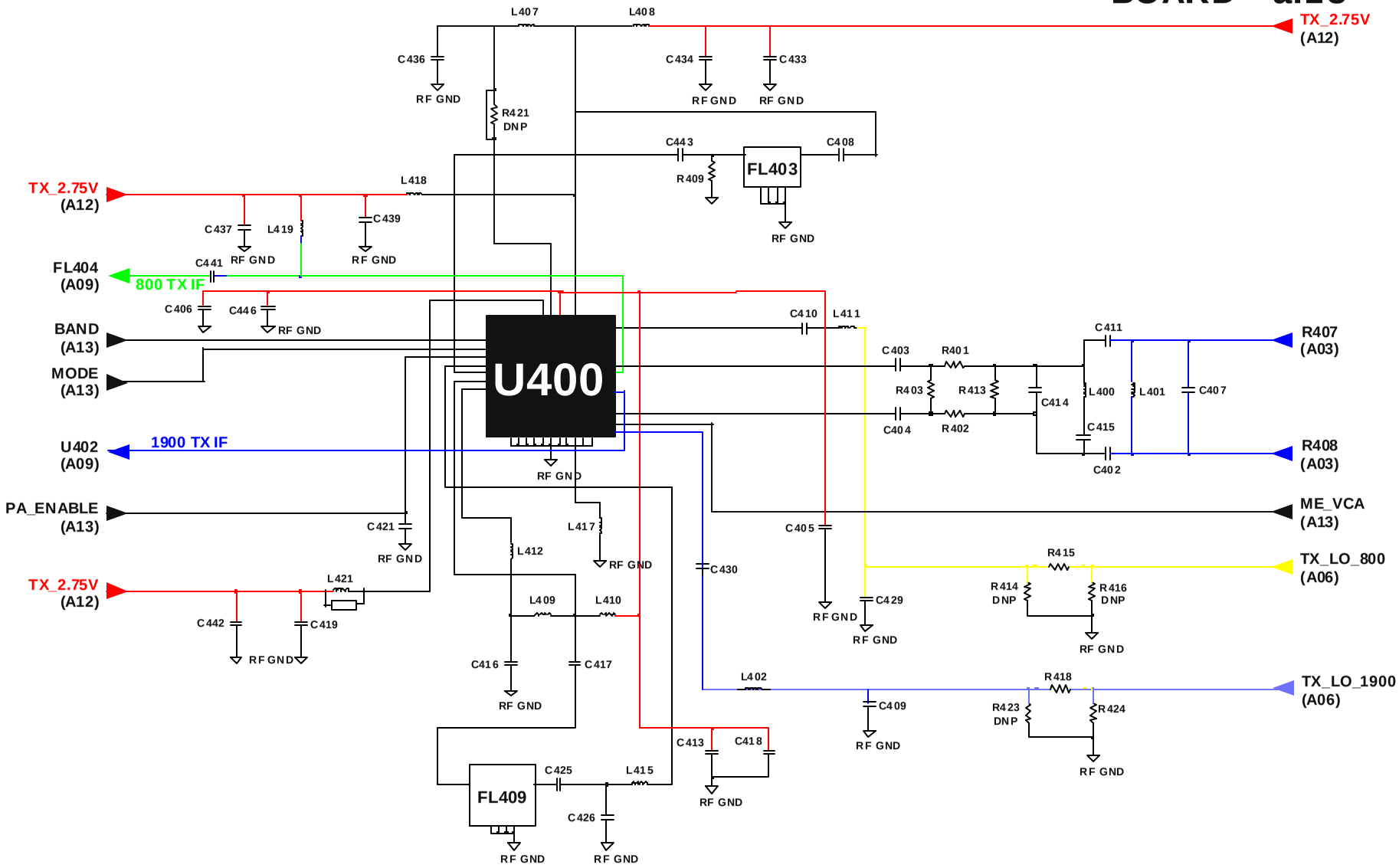
BOARD - a.18



Ref Osc: A07

ME3 Circuit

BOARD - a.18

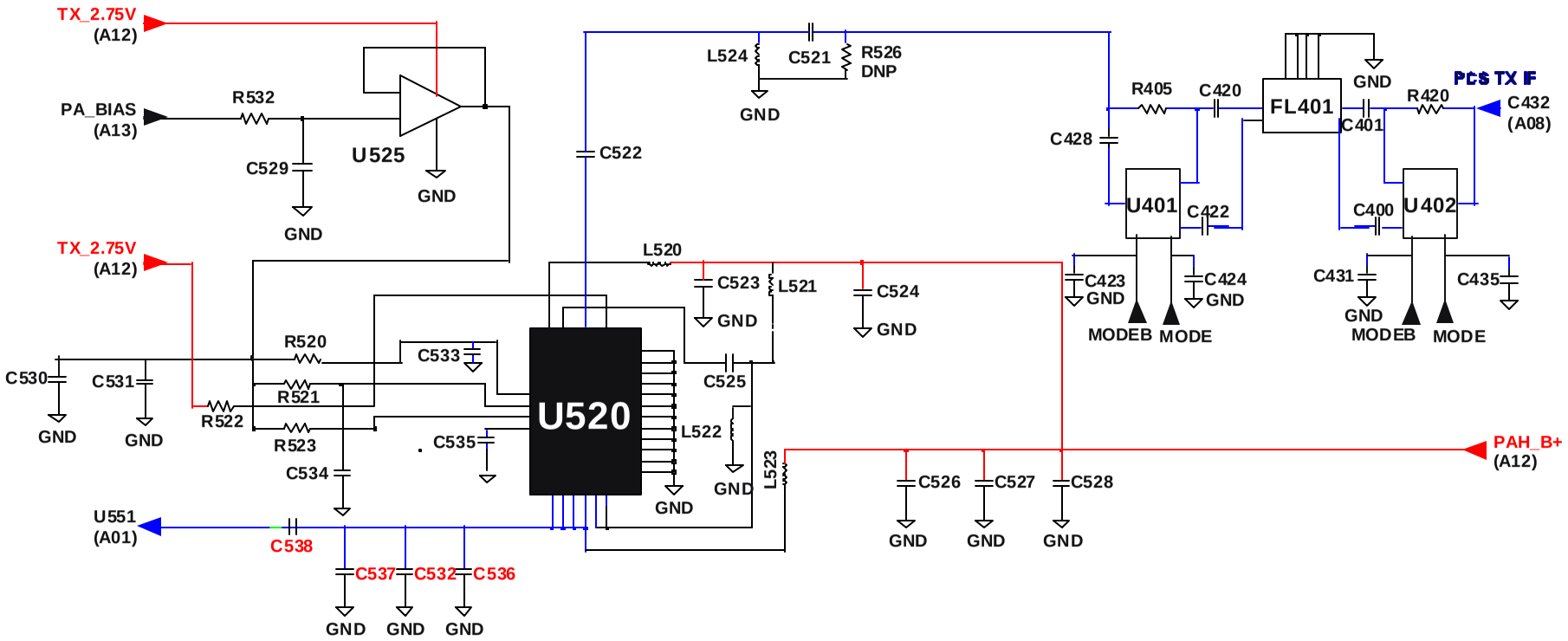


ME3:A08

V60i

1900 PA Circuit

BOARD - a.18

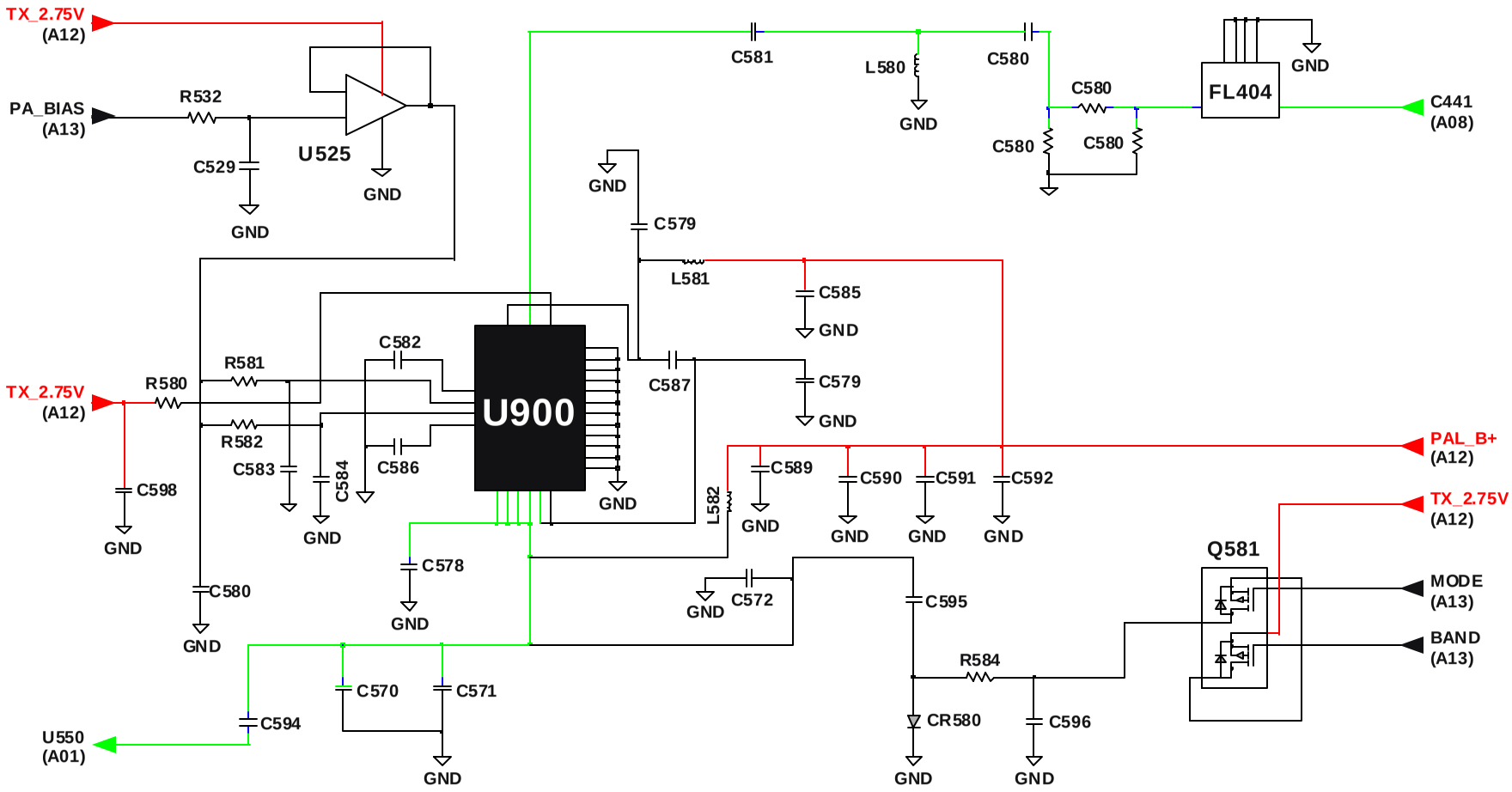


PA:A09

V60i

800 PA Circuit

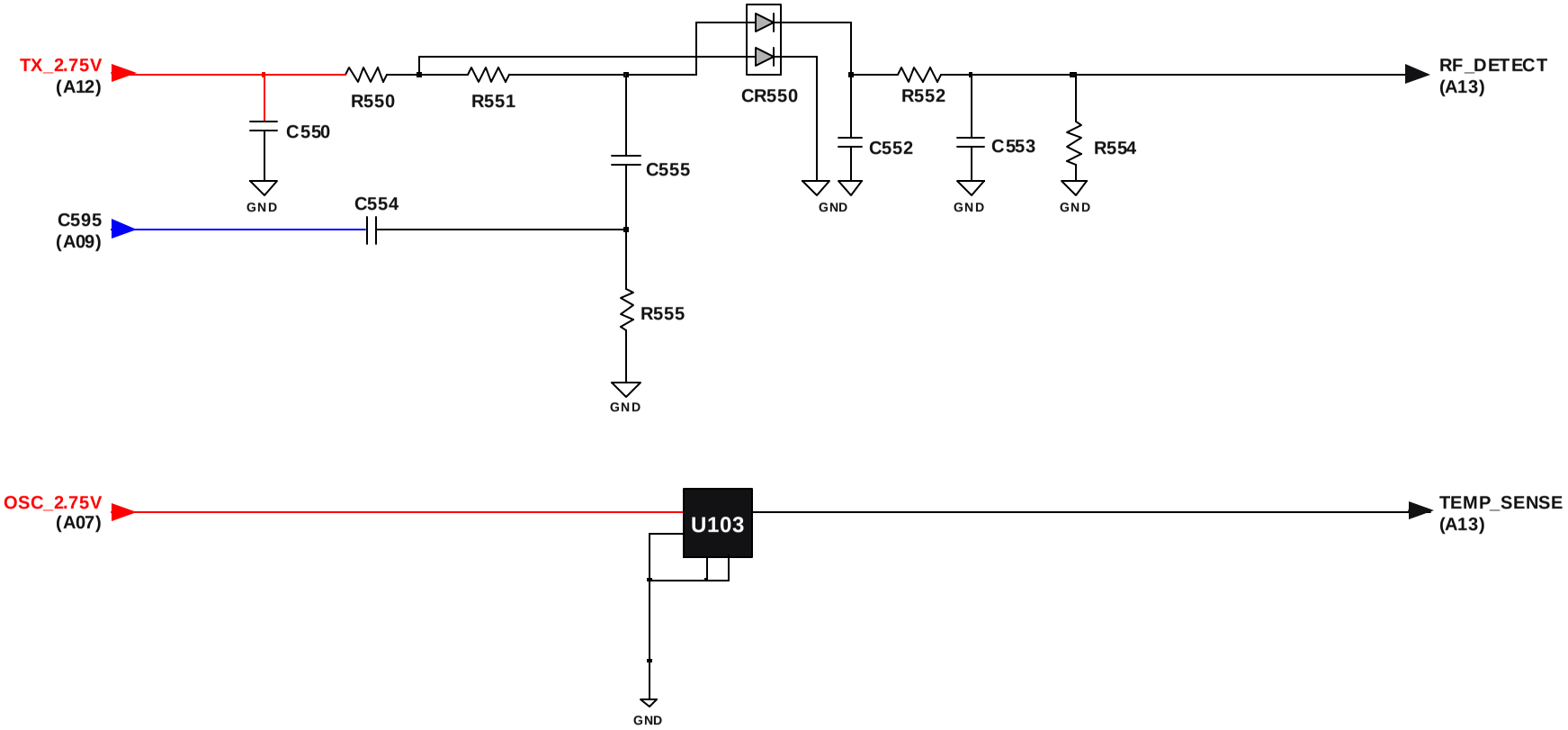
BOARD - P6.2



PA:A09

POWER DETECT & TEMP SENSE CIRCUIT

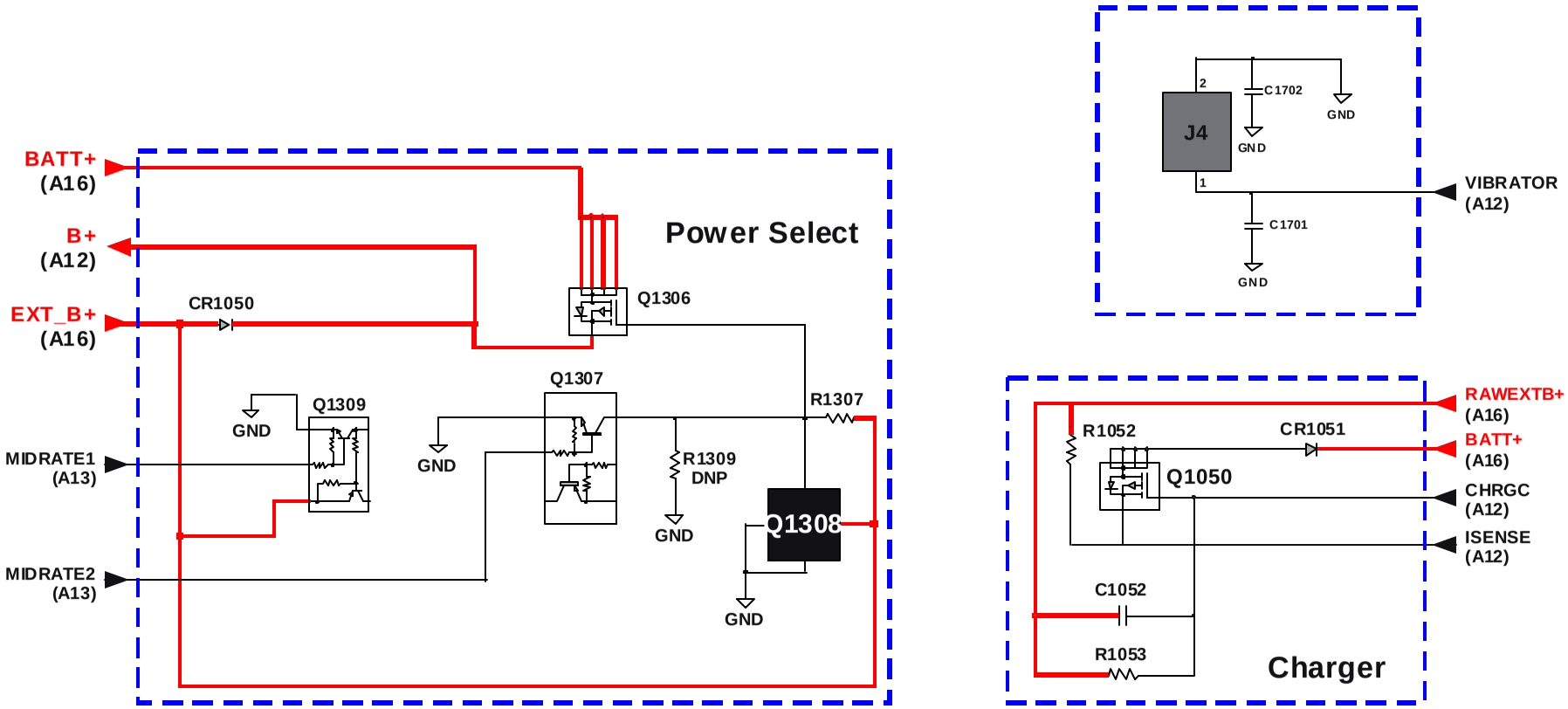
BOARD - a.18



Power Detect & Temp Sense: A10

V60i

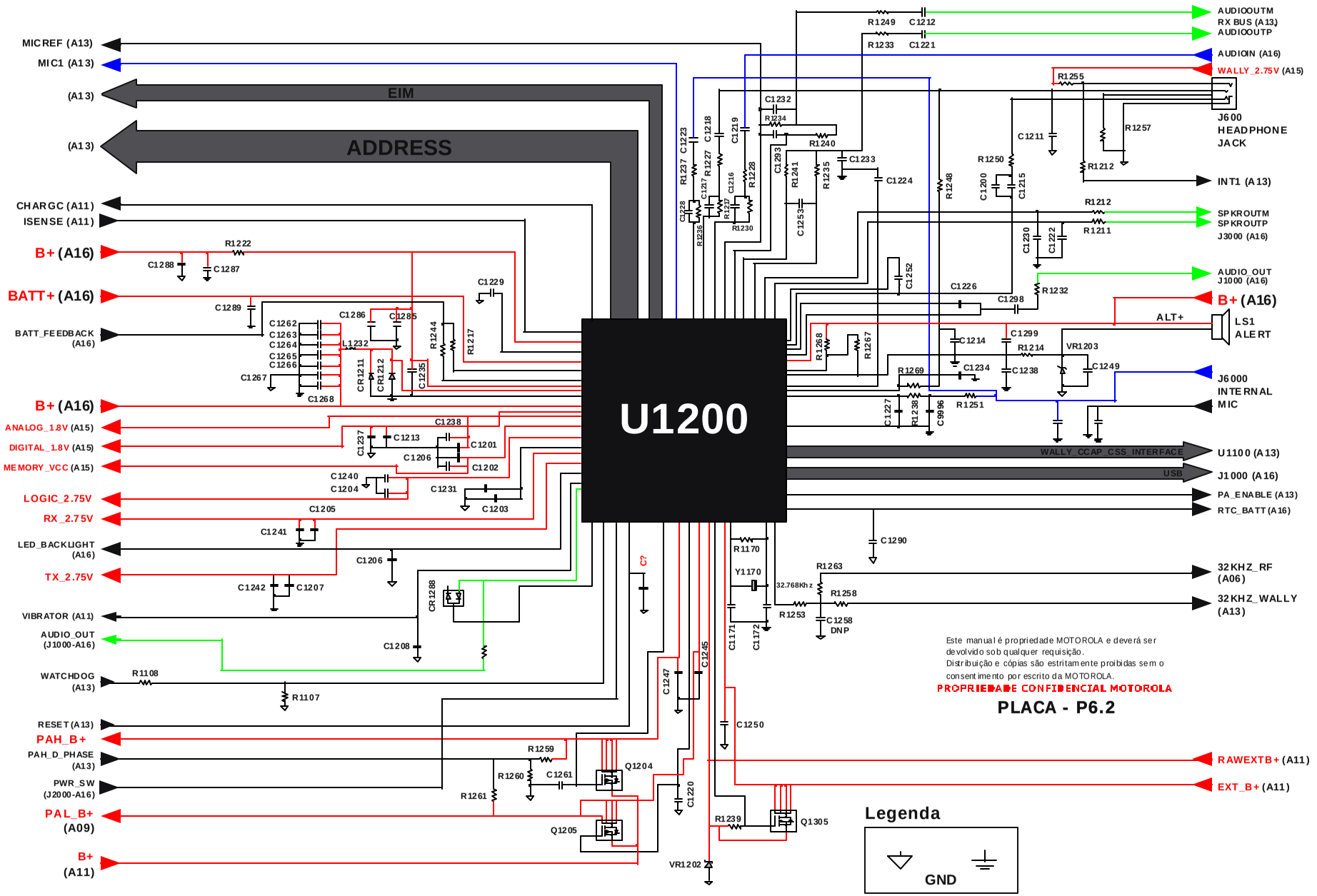
BOARD - a.18



Power Select, Charger & Vibrator: A11

V60i

BOARD - a.18



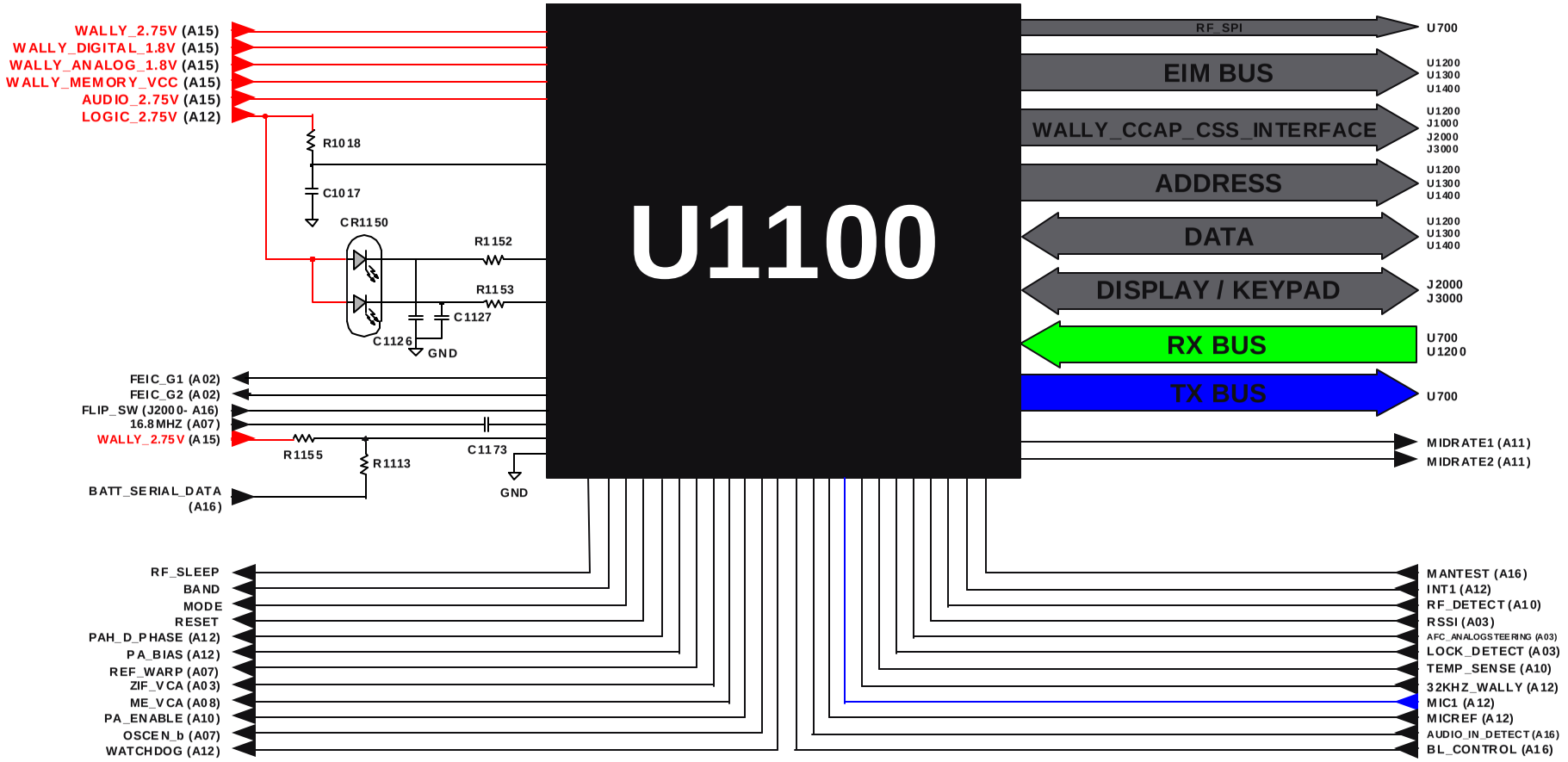
PLACA - P6.2

Legenda

GND

CCAP:A12

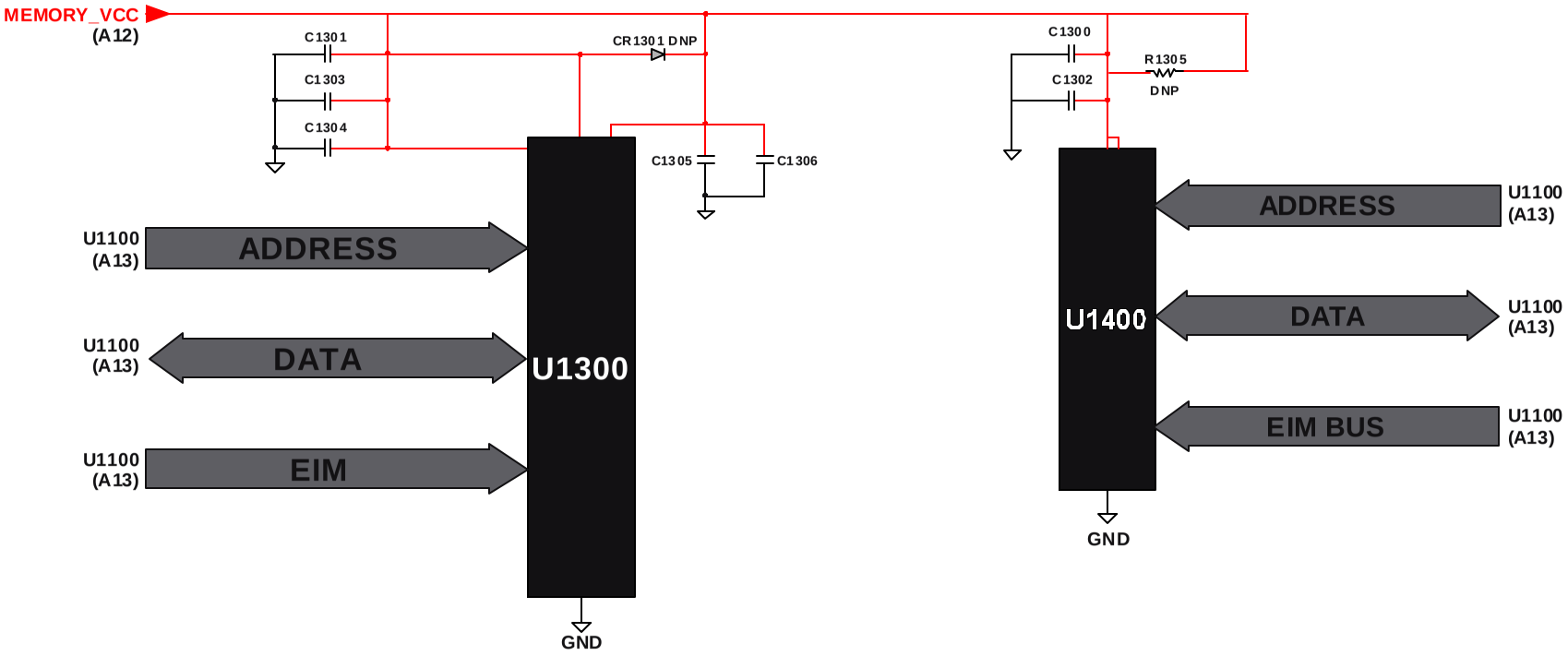
BOARD - a.18



WALLY:A13

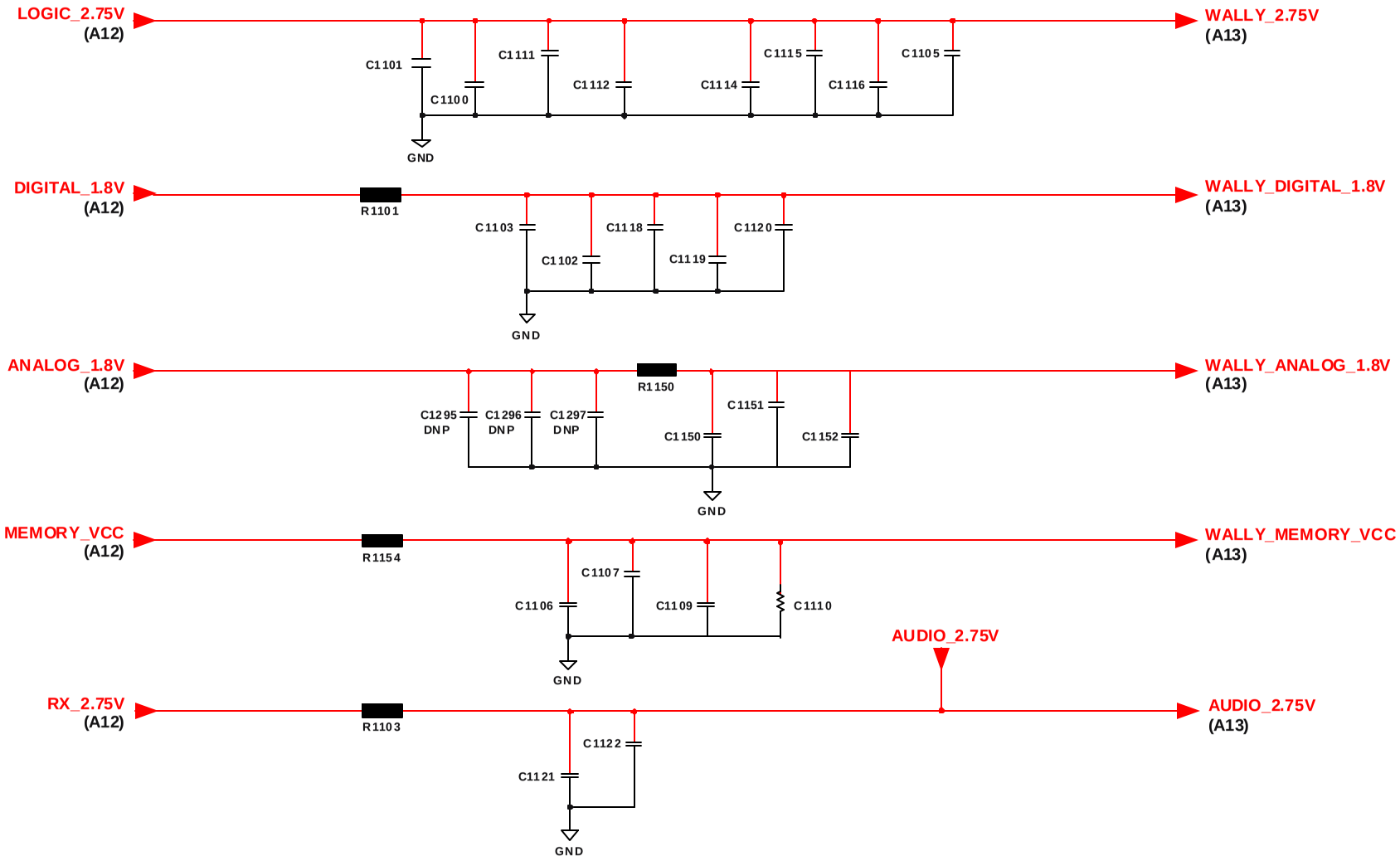
V60i

BOARD - a.18



Memory:A14

BOARD - a.18

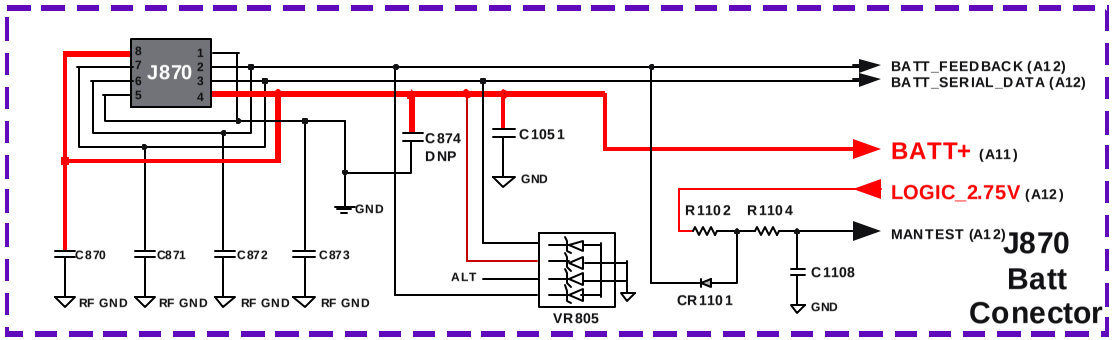


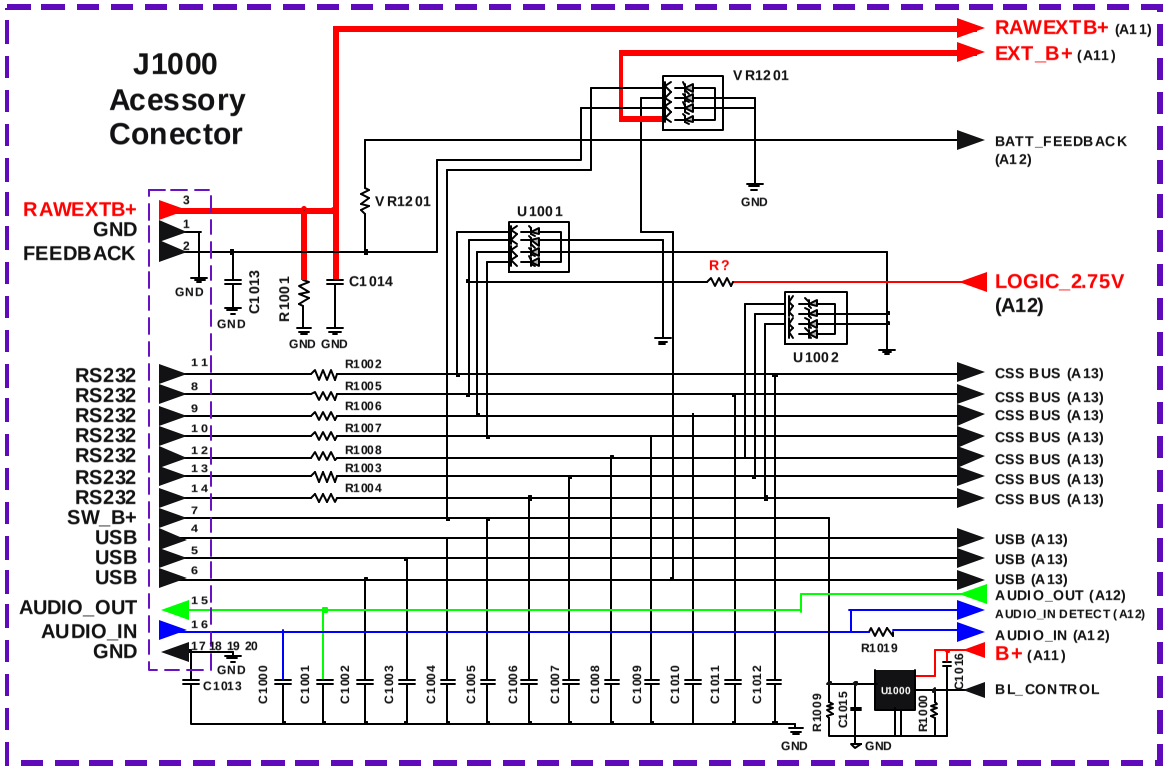
Power Distribuition:A15

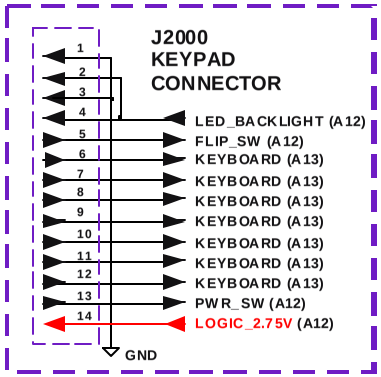
V60i

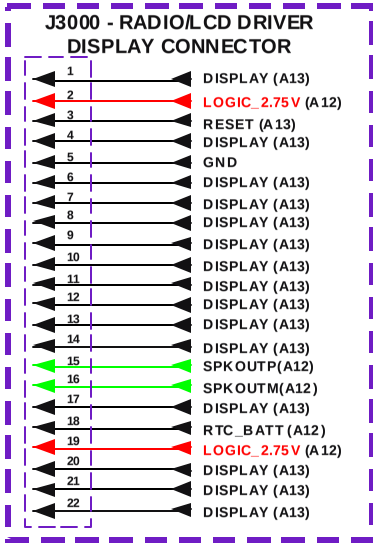
MOTOROLA CONFIDENTIAL PROPRIETARY

BOARD - a.18





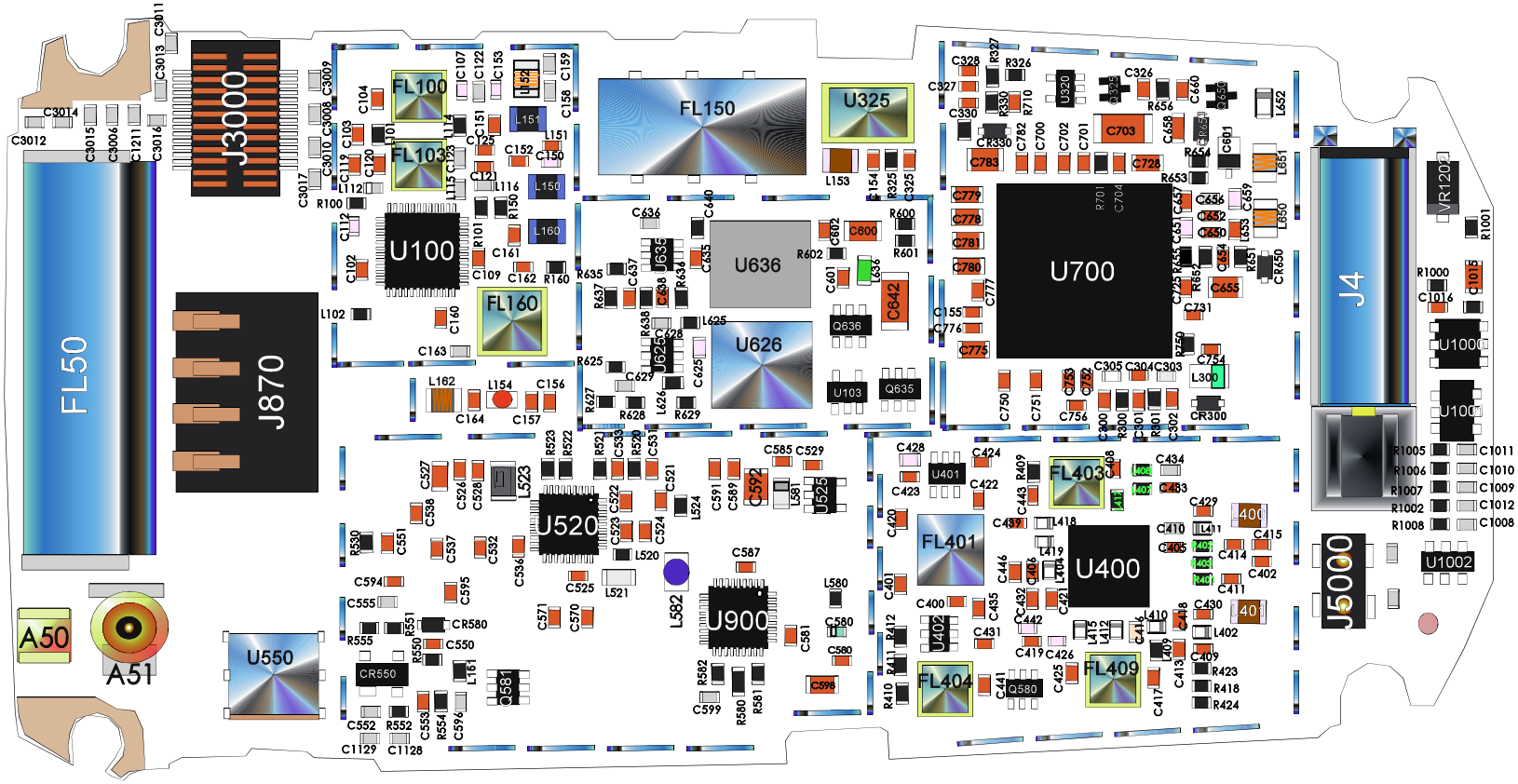




Connectors:A16

V60i RF BOARD LAYOUT

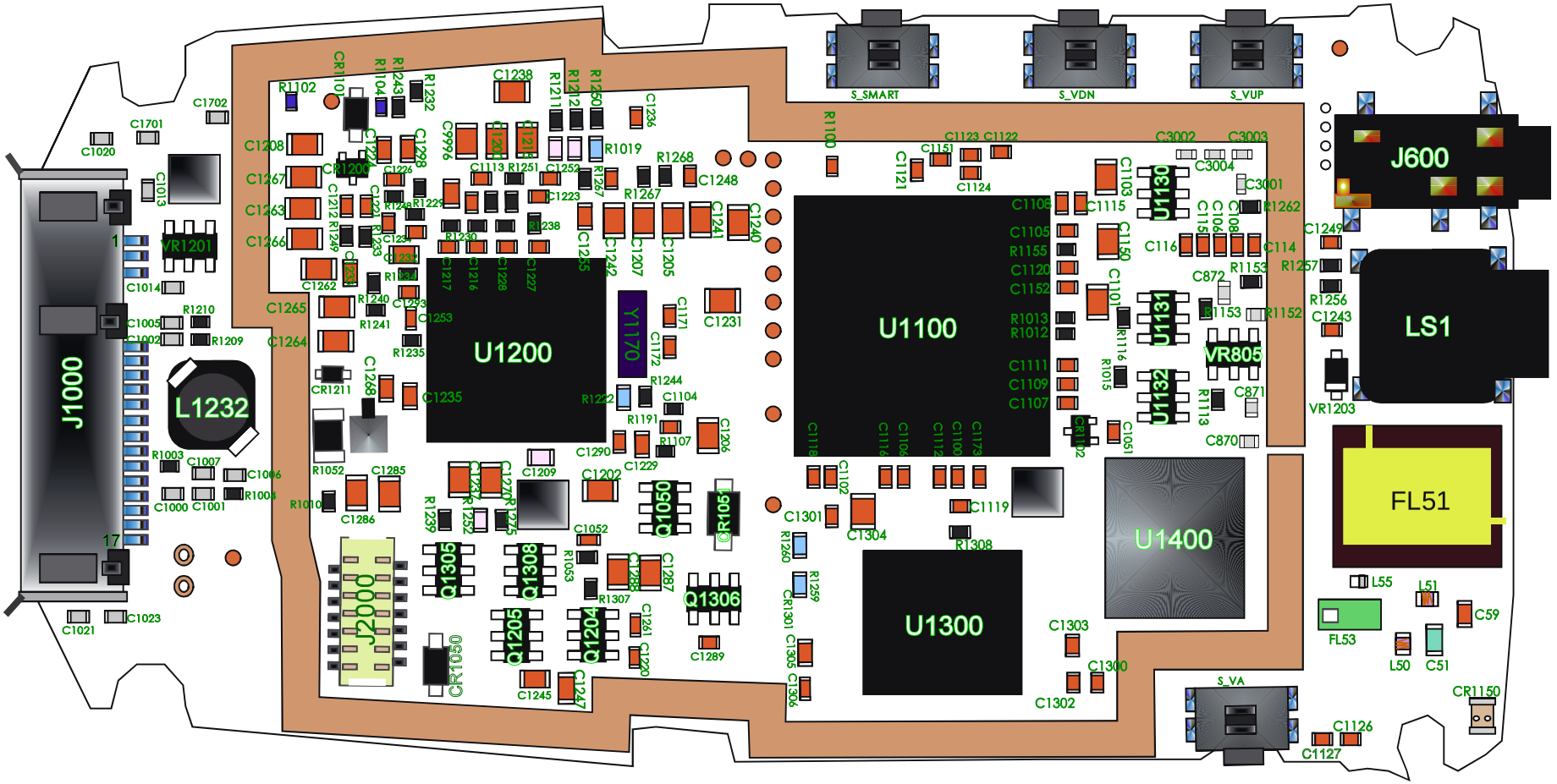
BOARD - a.18



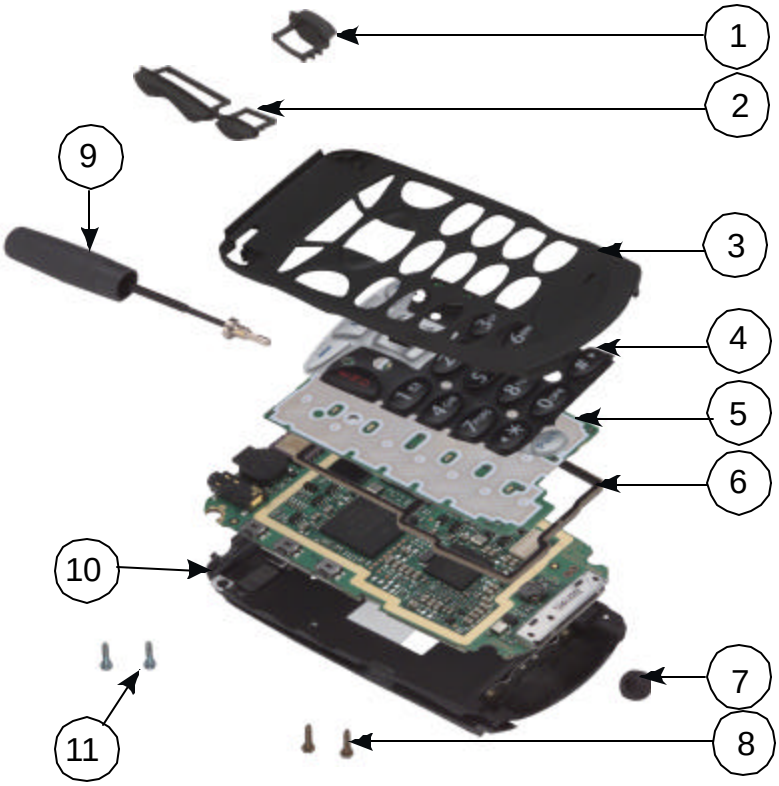
RF SIDE:A17

PHOENIX V60i A/L BOARD LAYOUT

BOARD - a.18



AUDIO LOGIC SIDE:A18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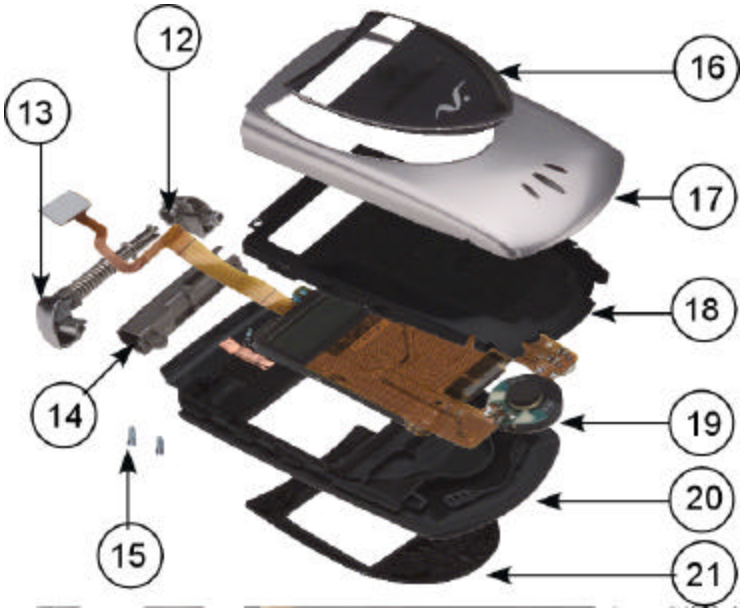
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Mechanical Parts List

1	3887987K03	Button, voice-it
2	3887988K03	Button, Voulme Smart
3	1587623K03	Front Housing
4	3887961K06	Keypad
5	0189969K04	Keyboard
6	268796K03	Keyboard Spacer
7	5087974K01	"Microphone"
8	0387790L01	"SCREW, BUTTON HEAD KNUCKLE"
9	8589650K22	Antenna
10	0187514l34	Rear Housing
11	0387790L04	Screw
12	0187870K24	Right Knuckle
13	1587581L12	Left Knuckle
14	1587571M01	Barrel Housing
15	0387927K02	Screw
16	6188106M02	CLI Lens
17	1588095M01	Flip Rear Cover
18	0788073M01	Flip Chassis Assembly
19	0188104K14	Display/Flex Assembly
20	1589741L01	Flip Front Housing
21	6188154M02	Main Lens

Electrical Parts List

Top Side

Reference Des	Part #	Description
C1000	2113743N40	CAP CHIP 39.0 PF 5% COG
C1001	2113743N40	CAP CHIP 39.0 PF 5% COG
C1002	2113743N40	CAP CHIP 39.0 PF 5% COG
C1005	2113743N40	CAP CHIP 39.0 PF 5% COG
C1006	2113743N40	CAP CHIP 39.0 PF 5% COG
C1007	2113743N40	CAP CHIP 39.0 PF 5% COG
C1013	2113743N40	CAP CHIP 39.0 PF 5% COG
C1014	2113743N40	CAP CHIP 39.0 PF 5% COG
C1017	2113928N01	CAP CER CHIP 0.1UF 10% 6.3
C1020	2113743N40	CAP CHIP 39.0 PF 5% COG
C1021	2113743N40	CAP CHIP 39.0 PF 5% COG
C1022	2113743N40	CAP CHIP 39.0 PF 5% COG
C1023	2113743N40	CAP CHIP 39.0 PF 5% COG
C1051	2113743N40	CAP CHIP 39.0 PF 5% COG
C1052	2113743L41	CAP CHIP 10000 PF 10% X7R
C106	2113743L41	CAP CHIP 10000 PF 10% X7R
C108	2113743L41	CAP CHIP 10000 PF 10% X7R
C1100	2113928N01	CAP CER CHIP 0.1UF 10% 6.3
C1101	2113928C04	CAP CER CHIP 4.7UF 6.3V10%0805
C1102	2113928N01	CAP CER CHIP 0.1UF 10% 6.3
C1103	2113928C04	CAP CER CHIP 4.7UF 6.3V10%0805
C1104	2113743L41	CAP CHIP 10000 PF 10% X7R
C1105	2113743L41	CAP CHIP 10000 PF 10% X7R
C1106	2113743L41	CAP CHIP 10000 PF 10% X7R
C1107	2113928N01	CAP CER CHIP 0.1UF 10% 6.3
C1108	2113743N40	CAP CHIP 39.0 PF 5% COG
C1109	2113743L41	CAP CHIP 10000 PF 10% X7R
C1111	2113743L41	CAP CHIP 10000 PF 10% X7R
C1112	2113743L41	CAP CHIP 10000 PF 10% X7R
C1113	2113743L41	CAP CHIP 10000 PF 10% X7R
C1114	2113743L41	CAP CHIP 10000 PF 10% X7R
C1115	2113743L41	CAP CHIP 10000 PF 10% X7R
C1116	2113743L41	CAP CHIP 10000 PF 10% X7R
C1118	2113743L41	CAP CHIP 10000 PF 10% X7R
C1119	2113743L41	CAP CHIP 10000 PF 10% X7R
C1120	2113743L41	CAP CHIP 10000 PF 10% X7R
C1121	2113928N01	CAP CER CHIP 0.1UF 10% 6.3
C1122	2113743L41	CAP CHIP 10000 PF 10% X7R
C1123	2113928N01	CAP CER CHIP 0.1UF 10% 6.3
C1124	2113928N01	CAP CER CHIP 0.1UF 10% 6.3
C1126	2113928N01	CAP CER CHIP 0.1UF 10% 6.3
C1127	2113928N01	CAP CER CHIP 0.1UF 10% 6.3
C114	2113743L41	CAP CHIP 10000 PF 10% X7R
C115	2113743L41	CAP CHIP 10000 PF 10% X7R

C1150	2113928C04	CAP CER CHIP 4.7UF 6.3V10%0805
C1151	2113928N01	CAP CER CHIP 0.1UF 10% 6.3
C1152	2113743L41	CAP CHIP 10000 PF 10% X7R
C116	2113743L41	CAP CHIP 10000 PF 10% X7R
C1171	2113743N36	CAP CHIP 27.0 PF 5% COG
C1172	2113743N26	CAP CHIP 10.0 PF 5% COG
C1173	2113743N46	CAP CHIP 68.0 PF 5% COG
C1200	2113928C04	CAP CER CHIP 4.7UF 6.3V10%0805
C1202	2113928C04	CAP CER CHIP 4.7UF 6.3V10%0805
C1205	2113928C04	CAP CER CHIP 4.7UF 6.3V10%0805
C1206	2113928C03	CAP CER CHIP 1.0 UF 6.3V 10%
C1207	2113928C04	CAP CER CHIP 4.7UF 6.3V10%0805
C1208	2113928C04	CAP CER CHIP 4.7UF 6.3V10%0805
C1209	2113743N50	CAP CHIP 100 PF 5% COG
C1210	2113743N50	CAP CHIP 100 PF 5% COG
C1212	2113928N01	CAP CER CHIP 0.1UF 10% 6.3
C1214	2113928P04	CAP CER CHIP 1.0UF 20% 6.3V
C1215	2113928C04	CAP CER CHIP 4.7UF 6.3V10%0805
C1216	2113743L19	CAP CHIP 1200 PF 10% X7R
C1217	2113743L03	CAP CHIP 270 PF 10% X7R
C1218	2113928N01	CAP CER CHIP 0.1UF 10% 6.3
C1219	2113928N01	CAP CER CHIP 0.1UF 10% 6.3
C1220	2113743L25	CAP CHIP 2200 PF 10% X7R
C1221	2113928N01	CAP CER CHIP 0.1UF 10% 6.3
C1222	2113743N50	CAP CHIP 100 PF 5% COG
C1223	2113928N01	CAP CER CHIP 0.1UF 10% 6.3
C1224	2113743E20	'CAP CHIP .10 UF 10%
C1226	2113743L13	CAP CHIP 680 PF 10% X7R
C1227	2113928N01	CAP CER CHIP 0.1UF 10% 6.3
C1228	2113743L07	CAP CHIP 390 PF 10% X7R
C1229	2113743E11	'CAP CHIP .039 UF 10% X7R
C1230	2113743N50	CAP CHIP 100 PF 5% COG
C1231	2113928C04	CAP CER CHIP 4.7UF 6.3V10%0805
C1233	2113743E07	'CER CHIP CAP .022UF
C1234	2113928N01	CAP CER CHIP 0.1UF 10% 6.3
C1235	2113928N01	CAP CER CHIP 0.1UF 10% 6.3
C1236	2113743L41	CAP CHIP 10000 PF 10% X7R
C1237	2113928C04	CAP CER CHIP 4.7UF 6.3V10%0805
C1238	2113928C04	CAP CER CHIP 4.7UF 6.3V10%0805
C1240	2113928C04	CAP CER CHIP 4.7UF 6.3V10%0805
C1241	2113928C04	CAP CER CHIP 4.7UF 6.3V10%0805
C1242	2113928C04	CAP CER CHIP 4.7UF 6.3V10%0805
C1243	2113928N01	CAP CER CHIP 0.1UF 10% 6.3
C1245	2113928P04	CAP CER CHIP 1.0UF 20% 6.3V
C1247	2113928P04	CAP CER CHIP 1.0UF 20% 6.3V
C1248	2113928N01	CAP CER CHIP 0.1UF 10% 6.3
C1249	2113743L41	CAP CHIP 10000 PF 10% X7R
C1251	2113743L13	CAP CHIP 680 PF 10% X7R

C1252	2113743L17	CAP CHIP 1000 PF 10% X7R
C1253	2113743L25	CAP CHIP 2200 PF 10% X7R
C1255	2113928P04	CAP CER CHIP 1.0UF 20% 6.3V
C1261	2113743L25	CAP CHIP 2200 PF 10% X7R
C1262	2113928C04	CAP CER CHIP 4.7UF 6.3V10%0805
C1263	2113928C04	CAP CER CHIP 4.7UF 6.3V10%0805
C1264	2113928C04	CAP CER CHIP 4.7UF 6.3V10%0805
C1265	2113928C04	CAP CER CHIP 4.7UF 6.3V10%0805
C1266	2113928C04	CAP CER CHIP 4.7UF 6.3V10%0805
C1267	2113928C04	CAP CER CHIP 4.7UF 6.3V10%0805
C1268	2113928N01	CAP CER CHIP 0.1UF 10% 6.3
C1270	2113928C04	CAP CER CHIP 4.7UF 6.3V10%0805
C1285	2113928C03	CAP CER CHIP 1.0 UF 6.3V 10%
C1286	2113928C03	CAP CER CHIP 1.0 UF 6.3V 10%
C1287	2113928C04	CAP CER CHIP 4.7UF 6.3V10%0805
C1288	2113928C04	CAP CER CHIP 4.7UF 6.3V10%0805
C1289	2113928N01	CAP CER CHIP 0.1UF 10% 6.3
C1290	2113928N01	CAP CER CHIP 0.1UF 10% 6.3
C1293	2113743L25	CAP CHIP 2200 PF 10% X7R
C1298	2113928P04	CAP CER CHIP 1.0UF 20% 6.3V
C1300	2113743L41	CAP CHIP 10000 PF 10% X7R
C1301	2113743L41	CAP CHIP 10000 PF 10% X7R
C1302	2113928N01	CAP CER CHIP 0.1UF 10% 6.3
C1303	2113928N01	CAP CER CHIP 0.1UF 10% 6.3
C1304	2113928C04	CAP CER CHIP 4.7UF 6.3V10%0805
C1305	2113743E20	'CAP CHIP .10 UF 10%
C1306	2113743L41	CAP CHIP 10000 PF 10% X7R
C1701	2113743N40	CAP CHIP 39.0 PF 5% COG
C1702	2113743N40	CAP CHIP 39.0 PF 5% COG
C3001	2113743N40	CAP CHIP 39.0 PF 5% COG
C3002	2113743N40	CAP CHIP 39.0 PF 5% COG
C3003	2113743N40	CAP CHIP 39.0 PF 5% COG
C3004	2113743N40	CAP CHIP 39.0 PF 5% COG
C51	2113740F09	CAP CHIP REEL CL1 +/-30 1.8
C59	2113740F22	CAP CHIP REEL CL1 +/-30 6.2
C870	2113743N40	CAP CHIP 39.0 PF 5% COG
C871	2113743N40	CAP CHIP 39.0 PF 5% COG
C872	2113743N40	CAP CHIP 39.0 PF 5% COG
C873	2113743N40	CAP CHIP 39.0 PF 5% COG
C9996	2113928C04	CAP CER CHIP 4.7UF 6.3V10%0805
CR1050	4809653F07	RECT SCHTTKY 1A MBRM120ET3
CR1051	4809653F07	RECT SCHTTKY 1A MBRM120ET3
CR1101	4809948D42	DIODE SCHOTTKY RB751V-40
CR1102	4809606E07	'DIODE DUAL ARRAY DA221
CR1150	4809118D02	LED BICOLOR LNJ115W8POMT
CR1200	4809606E07	'DIODE DUAL ARRAY DA221
CR1211	4809924D18	DIODE HIGH VOLTAGE/SW RB520S
FL51	9109361K03	FLTR SAW DUPLEX 850MHZ SMD

FL53	9185906G08	FLTR CER DIPLEX 859\1920 3216
J1000	0987636K05	CONN I/O
J2000	0987816K04	CONN COMPRESS 1MM S
J600	0987837L02	CONN JACK 2.5 DIA 3.2 HT NO P
L1232	2589584K11	IND WW SHLD 47UH 20% 5X5MM
L50	2409377M23	IND CHIP WW 4.7 NH 5% 1608
L51	2409377M08	IND CHIP WW 22 NH 5% 1608
L55	2409154M27	IND CER MLTILYR 1.8NH 1005
LS1	5087951K01	ALERT 2.5V 8.5X10.4MM SMD REFL
Q1050	4809579E29	'TSTR FET P-CHAN SI3443DV 6TSOP
Q1204	4809579E29	'TSTR FET P-CHAN SI3443DV 6TSOP
Q1205	4809579E29	'TSTR FET P-CHAN SI3443DV 6TSOP
Q1305	4809579E29	'TSTR FET P-CHAN SI3443DV 6TSOP
Q1306	4809579E29	'TSTR FET P-CHAN SI3443DV 6TSOP
R1003	0662057M26	RES. CHIP 10 5% 20X40
R1004	0662057M26	RES. CHIP 10 5% 20X40
R1012	0662057N07	RES. CHIP 22K 5% 20X40
R1013	0662057N07	RES. CHIP 22K 5% 20X40
R1015	0662057M98	RES. CHIP 10K 5% 20X40
R1018	0662057N33	RES. CHIP 270K 5% 20X40
R1019	0662057V19	RES CHIP 47K 1% 1/16W
R1052	0609175L02	RES CHIP 0.25 1% .25W 1206
R1053	0662057N47	RES. CHIP 1.0 MEG 5% 20X40
R1102	0662057V17	RES CHIP 39K 1% 1/16W
R1104	0662057V02	RES CHIP 10K 1% 1/16W
R1108	0662057M98	RES. CHIP 10K 5% 20X40
R1113	0662057M50	RES. CHIP 100 5% 20X40
R1116	0662057M98	RES. CHIP 10K 5% 20X40
R1152	0662057M50	RES. CHIP 100 5% 20X40
R1153	0662057M64	RES. CHIP 390 5% 20X40
R1155	0662057M90	RES. CHIP 4700 5% 20X40
R1170	0662057N65	CHIP RES 10 M 5% 20X40
R1191	0662057M98	RES. CHIP 10K 5% 20X40
R1209	0662057M35	RES. CHIP 24 5% 20X40
R1210	0662057M35	RES. CHIP 24 5% 20X40
R1211	0662057M28	RES. CHIP 12 5% 20X40
R1212	0662057M28	RES. CHIP 12 5% 20X40
R1213	0662057M98	RES. CHIP 10K 5% 20X40
R1217	0662057M98	RES. CHIP 10K 5% 20X40
R1227	0662057M95	RES. CHIP 7500 5% 20X40
R1228	0662057N12	RES. CHIP 36K 5% 20X40
R1229	0662057N27	RES. CHIP 150K 5% 20X40
R1230	0662057N12	RES. CHIP 36K 5% 20X40
R1232	0662057M74	RES. CHIP 1000 5% 20X40
R1233	0662057N07	RES. CHIP 22K 5% 20X40
R1234	0662057N09	RES. CHIP 27K 5% 20X40
R1235	0662057N09	RES. CHIP 27K 5% 20X40
R1236	0662057N23	RES. CHIP 100K 5% 20X40

R1237	0662057M98	RES. CHIP 10K 5% 20X40
R1238	0662057M68	RES. CHIP 560 5% 20X40
R1239	0662057N47	RES. CHIP 1.0 MEG 5% 20X40
R1240	0662057M80	RES. CHIP 1800 5% 20X40
R1241	0662057M80	RES. CHIP 1800 5% 20X40
R1243	0662057M90	RES. CHIP 4700 5% 20X40
R1244	0662057V02	RES CHIP 10K 1% 1/16W
R1248	0662057M90	RES. CHIP 4700 5% 20X40
R1249	0662057N07	RES. CHIP 22K 5% 20X40
R1250	0662057M43	RES. CHIP 51 5% 20X40
R1251	0662057M90	RES. CHIP 4700 5% 20X40
R1256	0662057N33	RES. CHIP 270K 5% 20X40
R1257	0662057N03	RES. CHIP 15K 5% 20X40
R1259	0662057U81	RES CHIP 1.5K 1% 1/16W
R1260	0662057U89	RES CHIP 3.3K 1% 1/16W
R1262	0662057M98	RES. CHIP 10K 5% 20X40
R1267	0662057M90	RES. CHIP 4700 5% 20X40
R1268	0662057M92	RES. CHIP 5600 5% 20X40
R1269	0662057M82	RES. CHIP 2200 5% 20X40
R1275	0662057M78	RES. CHIP 1500 5% 20X40
R1307	0662057M90	RES. CHIP 4700 5% 20X40
R1308	0662057M01	RES. CHIP 0 5% 20X40
S_SMART	4087635K01	SWITCH 3 POLE LOW PROFILE
S_VA	4087635K01	SWITCH 3 POLE LOW PROFILE
S_VDN	4087635K01	SWITCH 3 POLE LOW PROFILE
S_VUP	4087635K01	SWITCH 3 POLE LOW PROFILE
SHIELD3	2609827G10	SHIELD INDUCTOR SURFACE MNT
SHIELD4	2609827G10	SHIELD INDUCTOR SURFACE MNT
SHIELD5	2609827G10	SHIELD INDUCTOR SURFACE MNT
U1100	5199490C03	IC WALLY PROG BASEBAND V3.2S
U1130	5109781E79	'IC SW ANAL SPDT MAX4544EUT
U1131	5109781E79	'IC SW ANAL SPDT MAX4544EUT
U1132	5109781E79	'IC SW ANAL SPDT MAX4544EUT
U1200	5109879E71	'IC BICMOS CCAP V2.6 121 BG
U1300	5199495A01	IC BRST 32M 85NS 1.8V TRAY
U1308	5109781E77'	IC VOLT DECT 3.6V PST995NNR
U1400	5109509A36	IC SRAM 256KX16 KM616FR4010ZI
VR1201	4813832P75	TRANS SUP QUAD 6.8 V
VR1203	4809788E06'	DIODE ZENER 6.8V UDZ6.8B
VR805	4813832P75	TRANS SUP QUAD 6.8 V
Y1170	4809995L05	XTAL QUARTZ 32.768KHZ CC4V-T1

Bottom Side

A50	3989013L02	CONT ANT
A51	0987796L01	RF SWITCH CONNECTOR
C1008	2113743N40	CAP CHIP 39.0 PF 5% COG
C1009	2113743N40	CAP CHIP 39.0 PF 5% COG
C1010	2113743N40	CAP CHIP 39.0 PF 5% COG
C1011	2113743N40	CAP CHIP 39.0 PF 5% COG
C1012	2113743N40	CAP CHIP 39.0 PF 5% COG
C1015	2113743E20	'CAP CHIP .10 UF 10%
C1016	2113928N01	CAP CER CHIP 0.1UF 10% 6.3
C102	2113743N40	CAP CHIP 39.0 PF 5% COG
C103	2113743N40	CAP CHIP 39.0 PF 5% COG
C104	2113743N15	CAP CHIP 3.6 PF +-.25PF COG
C107	2113743N24	CAP CHIP 8.2 PF + -.5PF COG
C109	2113743N40	CAP CHIP 39.0 PF 5% COG
C112	2113743N20	CAP CHIP 5.6 PF + -.5PF COG
C1128	2113743N40	CAP CHIP 39.0 PF 5% COG
C1129	2113743N40	CAP CHIP 39.0 PF 5% COG
C113	2113928N01	CAP CER CHIP 0.1UF 10% 6.3
C118	2113743N03	CAP CHIP 1.0 PF +-.25PF COG
C119	2113743N28	CAP CHIP 12.0 PF 5% COG
C120	2113743N07	CAP CHIP 1.5 PF +-.25PF COG
C121	2113743L41	CAP CHIP 10000 PF 10% X7R
C1211	2113743N40	CAP CHIP 39.0 PF 5% COG
C122	2113743N12	CAP CHIP 2.7 PF +-.25PF COG
C123	2113743N22	CAP CHIP 6.8 PF + -.5PF COG
C125	2113743N07	CAP CHIP 1.5 PF +-.25PF COG
C150	2113743N20	CAP CHIP 5.6 PF + -.5PF COG
C151	2113743N46	CAP CHIP 68.0 PF 5% COG
C152	2113743N46	CAP CHIP 68.0 PF 5% COG
C153	2113743N24	CAP CHIP 8.2 PF + -.5PF COG
C154	2113743N15	CAP CHIP 3.6 PF +-.25PF COG
C155	2113743L17	CAP CHIP 1000 PF 10% X7R
C156	2113743L41	CAP CHIP 10000 PF 10% X7R
C157	2113743N41	CAP CHIP 43.0 PF 5% COG
C158	2113743N12	CAP CHIP 2.7 PF +-.25PF COG
C159	2113743N12	CAP CHIP 2.7 PF +-.25PF COG
C160	2113743L17	CAP CHIP 1000 PF 10% X7R
C161	2113743L41	CAP CHIP 10000 PF 10% X7R
C162	2113743N21	CAP CHIP 6.2 PF + -.5PF COG
C163	2104801Z01	CAP CER NPO 0.5PF 16V 1005 SMD
C164	2113743N28	CAP CHIP 12.0 PF 5% COG
C300	2113928N01	CAP CER CHIP 0.1UF 10% 6.3
C3005	2113743N40	CAP CHIP 39.0 PF 5% COG
C3006	2113743N40	CAP CHIP 39.0 PF 5% COG
C3007	2113743N40	CAP CHIP 39.0 PF 5% COG

C3008	2113743N40	CAP CHIP 39.0 PF 5% COG
C3009	2113743N40	CAP CHIP 39.0 PF 5% COG
C301	2113743L41	CAP CHIP 10000 PF 10% X7R
C3010	2113743L33	CAP CHIP 4700 PF 10% X7R
C3011	2113743N40	CAP CHIP 39.0 PF 5% COG
C3012	2113743N40	CAP CHIP 39.0 PF 5% COG
C3013	2113743N40	CAP CHIP 39.0 PF 5% COG
C3014	2113743N40	CAP CHIP 39.0 PF 5% COG
C3015	2113928N01	CAP CER CHIP 0.1UF 10% 6.3
C3016	2113928N01	CAP CER CHIP 0.1UF 10% 6.3
C3017	2113743N40	CAP CHIP 39.0 PF 5% COG
C302	2113743N42	CAP CHIP 47.0 PF 5% COG
C303	2113743N40	CAP CHIP 39.0 PF 5% COG
C304	2113743N27	CAP CHIP 11.0 PF 5% COG
C305	2113743N14	CAP CHIP 3.3 PF +-.25PF COG
C325	2113743L41	CAP CHIP 10000 PF 10% X7R
C326	2113928N01	CAP CER CHIP 0.1UF 10% 6.3
C327	2113743N46	CAP CHIP 68.0 PF 5% COG
C328	2113743L25	CAP CHIP 2200 PF 10% X7R
C329	2113743L17	CAP CHIP 1000 PF 10% X7R
C330	2113743N46	CAP CHIP 68.0 PF 5% COG
C400	2113743N26	CAP CHIP 10.0 PF 5% COG
C401	2113743N26	CAP CHIP 10.0 PF 5% COG
C402	2113743N19	CAP CHIP 5.1 PF + -.5PF COG
C405	2113743N28	CAP CHIP 12.0 PF 5% COG
C406	2113743N26	CAP CHIP 10.0 PF 5% COG
C408	2113743N07	CAP CHIP 1.5 PF +-.25PF COG
C409	2113743N09	CAP CHIP 2.0 PF +-.25PF COG
C410	2113743N40	CAP CHIP 39.0 PF 5% COG
C411	2113743N19	CAP CHIP 5.1 PF + -.5PF COG
C413	2113743N26	CAP CHIP 10.0 PF 5% COG
C414	2113743N16	CAP CHIP 3.9 PF +-.25PF COG
C415	2113743N26	CAP CHIP 10.0 PF 5% COG
C416	2113743N10	CAP CHIP 2.2 PF +-.25PF COG
C417	2113743N07	CAP CHIP 1.5 PF +-.25PF COG
C418	2113743L41	CAP CHIP 10000 PF 10% X7R
C419	2113743L41	CAP CHIP 10000 PF 10% X7R
C420	2113743N26	CAP CHIP 10.0 PF 5% COG
C421	2113743N26	CAP CHIP 10.0 PF 5% COG
C422	2113743N26	CAP CHIP 10.0 PF 5% COG
C423	2113743N26	CAP CHIP 10.0 PF 5% COG
C424	2113743N26	CAP CHIP 10.0 PF 5% COG
C425	2113743N26	CAP CHIP 10.0 PF 5% COG
C426	2113743N03	CAP CHIP 1.0 PF +-.25PF COG
C428	2113743N50	CAP CHIP 100 PF 5% COG
C429	2113743N12	CAP CHIP 2.7 PF +-.25PF COG
C430	2113743N26	CAP CHIP 10.0 PF 5% COG
C431	2113743N26	CAP CHIP 10.0 PF 5% COG

C432	2113743N34	CAP CHIP 22.0 PF 5% COG
C433	2113743L41	CAP CHIP 10000 PF 10% X7R
C434	2113743N40	CAP CHIP 39.0 PF 5% COG
C435	2113743N26	CAP CHIP 10.0 PF 5% COG
C439	2113743L41	CAP CHIP 10000 PF 10% X7R
C441	2113743N40	CAP CHIP 39.0 PF 5% COG
C442	2113743N38	CAP CHIP 33.0 PF 5% COG
C443	2113743N40	CAP CHIP 39.0 PF 5% COG
C446	2113743L41	CAP CHIP 10000 PF 10% X7R
C5001	2113743N40	CAP CHIP 39.0 PF 5% COG
C5002	2113743N40	CAP CHIP 39.0 PF 5% COG
C521	2113743N16	CAP CHIP 3.9 PF +-.25PF COG
C522	2113743N26	CAP CHIP 10.0 PF 5% COG
C523	2113743M24	CAP CHIP 100000 PF +80-20% Y5V
C524	2113743N30	CAP CHIP 15.0 PF 5% COG
C525	2113743N23	CAP CHIP 7.5 PF + -.5PF COG
C526	2113743N26	CAP CHIP 10.0 PF 5% COG
C527	2113928A01	CAP CER CHIP 1.0 UF 10V
C528	2113743L41	CAP CHIP 10000 PF 10% X7R
C529	2113928N01	CAP CER CHIP 0.1UF 10% 6.3
C531	2113743N26	CAP CHIP 10.0 PF 5% COG
C532	2113743N03	CAP CHIP 1.0 PF +-.25PF COG
C533	2113743N30	CAP CHIP 15.0 PF 5% COG
C536	2113743N17	CAP CHIP 4.3 PF +-.25PF COG
C537	2113743N12	CAP CHIP 2.7 PF +-.25PF COG
C538	2113743N30	CAP CHIP 15.0 PF 5% COG
C550	2113743M24	CAP CHIP 100000 PF +80-20% Y5V
C551	2113743N07	CAP CHIP 1.5 PF +-.25PF COG
C552	2113743N40	CAP CHIP 39.0 PF 5% COG
C553	2113743L41	CAP CHIP 10000 PF 10% X7R
C555	2113743N40	CAP CHIP 39.0 PF 5% COG
C570	2109445U20	CAP CER COG 5.1 .1% 0402 SMD
C571	2109445U24	CAP CER COG 7.5 .1% 0402 SMD
C580	2113743N42	CAP CHIP 47.0 PF 5% COG
C581	2113743N18	CAP CHIP 4.7 PF +-.25PF COG
C585	2113743N42	CAP CHIP 47.0 PF 5% COG
C587	2109445U25	CAP CER COG 8.2 .1% 0402 SMD
C589	2113743N42	CAP CHIP 47.0 PF 5% COG
C591	2113743M24	CAP CHIP 100000 PF +80-20% Y5V
C592	2113928C03	CAP CER CHIP 1.0 UF 6.3V 10%
C594	2113743N42	CAP CHIP 47.0 PF 5% COG
C595	2113743N12	CAP CHIP 2.7 PF +-.25PF COG
C596	2113743N40	CAP CHIP 39.0 PF 5% COG
C598	2113928A01	CAP CER CHIP 1.0 UF 10V
C599	2113743N50	CAP CHIP 100 PF 5% COG
C600	2113928C03	CAP CER CHIP 1.0 UF 6.3V 10%
C601	2113928N01	CAP CER CHIP 0.1UF 10% 6.3
C602	2113743L41	CAP CHIP 10000 PF 10% X7R

C625	2113743N24	CAP CHIP 8.2 PF + -.5PF COG
C628	2104801Z04	CAP CER NPO 0.8PF 16V 1005 SMD
C629	2113743N40	CAP CHIP 39.0 PF 5% COG
C635	2113743N28	CAP CHIP 12.0 PF 5% COG
C636	2104801Z01	CAP CER NPO 0.5PF 16V 1005 SMD
C637	2113743N28	CAP CHIP 12.0 PF 5% COG
C638	2113743N19	CAP CHIP 5.1 PF + -.5PF COG
C640	2113928N01	CAP CER CHIP 0.1UF 10% 6.3
C642	2113743G26	CAP CHIP 4.7 UF 16V +80-20%
C650	2113743N16	CAP CHIP 3.9 PF +-.25PF COG
C651	2113743N24	CAP CHIP 8.2 PF + -.5PF COG
C652	2113743N32	CAP CHIP 18.0 PF 5% COG
C653	2113743N28	CAP CHIP 12.0 PF 5% COG
C654	2113743L41	CAP CHIP 10000 PF 10% X7R
C655	2113928C03	CAP CER CHIP 1.0 UF 6.3V 10%
C656	2104801Z06	CAP CER NPO 1.0PF 16V 1005 SMD
C657	2113928N01	CAP CER CHIP 0.1UF 10% 6.3
C658	2113928A01	CAP CER CHIP 1.0 UF 10V
C659	2113743N50	CAP CHIP 100 PF 5% COG
C660	2113743L41	CAP CHIP 10000 PF 10% X7R
C700	2113928N01	CAP CER CHIP 0.1UF 10% 6.3
C701	2113743L11	CAP CHIP 560 PF 10% X7R
C702	2113928N01	CAP CER CHIP 0.1UF 10% 6.3
C703	2113743G26	CAP CHIP 4.7 UF 16V +80-20%
C704	2113928N01	CAP CER CHIP 0.1UF 10% 6.3
C725	2113928N01	CAP CER CHIP 0.1UF 10% 6.3
C728	2113928P04	CAP CER CHIP 1.0UF 20% 6.3V
C731	2113743L03	CAP CHIP 270 PF 10% X7R
C750	2113928N01	CAP CER CHIP 0.1UF 10% 6.3
C751	2113743L41	CAP CHIP 10000 PF 10% X7R
C752	2113743L41	CAP CHIP 10000 PF 10% X7R
C753	2113928N01	CAP CER CHIP 0.1UF 10% 6.3
C754	2113928N01	CAP CER CHIP 0.1UF 10% 6.3
C756	2113743N46	CAP CHIP 68.0 PF 5% COG
C775	2113928G01	CAP CER CHIP .22 UF 6.3V 10%
C776	2113743L25	CAP CHIP 2200 PF 10% X7R
C777	2113928N01	CAP CER CHIP 0.1UF 10% 6.3
C778	2113928P04	CAP CER CHIP 1.0UF 20% 6.3V
C779	2113928P04	CAP CER CHIP 1.0UF 20% 6.3V
C780	2113928P04	CAP CER CHIP 1.0UF 20% 6.3V
C781	2113928P04	CAP CER CHIP 1.0UF 20% 6.3V
C782	2113928N01	CAP CER CHIP 0.1UF 10% 6.3
C783	2113928C03	CAP CER CHIP 1.0 UF 6.3V 10%
CR300	4809877C08	DIODE VARACTOR 1SV279 SMD
CR330	4809877C08	DIODE VARACTOR 1SV279 SMD
CR550	4809606E05	'DIODE DUAL SCHOTTKEY SOT-143
CR580	4809948D37	DIODE RF SW BA892 2 PIN ESC
CR650	4809877C13	DIODE VARACTOR ISV305 SMD

CR651	4809877C08	DIODE VARACTOR 1SV279 SMD
CR652	4809948D10	DIODE PIN BAR63-03
FL100	9103913K04	FLTR SAW TX 881MHZ SMD
FL103	9109239M08	FLTR SAW BP 1960MHZ 3X3MM SMD
FL150	9109405J08	FLTR SAW IF 109MHZ 5.3X11.4MM
FL160	9185838J01	FLTR XTAL 109.65MHZ 3.8MM SMD
FL401	9185726J03	FLTR SAW SPLT TXINT 3MM 1.9GHZ
FL403	9109247M03	FLTR SAW BP 836MHZ 3X3MM SMD
FL404	9103913K03	FLTR SAW TX 836MHZ SMD
FL409	9109239M04	FLTR SAW TX BP 1880MHZ SMD
FL50	9185911J03	FLTR CER DP 1880/1960 7X21MM
J3000	0987817K01	RECP BTB 0.5P 1.5 STACK SMD
J4	5987947K02	MOTOR VIB 5DIAM SMD
J5000	0985622G01	SKT TOP ENTRY 2 POS
J870	3987522K03	CONT BLOCK BATT
L101	2409154M61	IND CER MTLILYR 6.8 NH 1005
L102	2409154M62	IND CER MTLILYR 8.2 NH 1005
L112	2409154M29	IND CER MLTILYR 2.7NH 1005
L114	2409154M66	IND CER MTLILYR 18.0NH 1005
L115	2409154M33	IND CER MLTILYR 5.6NH 1005
L116	2409154M43	IND CER MTLILYR 39.0NH 1005
L150	2404574Z09	IND CHIP WW 100NH 2% 2012 SMD
L151	2404574Z09	IND CHIP WW 100NH 2% 2012 SMD
L152	2404574Z13	IND CHIP WW 220NH 2% 2012 SMD
L153	2485793G15	IND CHIP WW 82 NH 2% 1608 SMD
L154	2409377M13	IND CHIP WW 56 NH 5% 1608
L160	2404574Z12	IND CHIP WW 180NH 2% 2012 SMD
L162	2404574Z13	IND CHIP WW 220NH 2% 2012 SMD
L300	2413926K16	IND CER CHIP 27.0 NH 5%
L400	2404574Z13	IND CHIP WW 220NH 2% 2012 SMD
L401	2404574Z13	IND CHIP WW 220NH 2% 2012 SMD
L402	2409154M31	IND CER MLTILYR 3.9NH 1005
L404	2409154M35	IND CER MLTILYR 8.2NH 1005
L407	2409154M71	IND CER MLTILYR 47.0NH 1005
L408	2409154M65	IND CER MTLILYR 15.0NH 1005
L409	2409154M59	IND CER MTLILYR 4.7 NH 1005
L410	2409154M31	IND CER MLTILYR 3.9NH 1005
L411	2409154M38	IND CER MLTILYR 15.0NH 1005
L412	2409154M32	IND CER MLTILYR 4.7NH 1005
L415	2409154M33	IND CER MLTILYR 5.6NH 1005
L417	2409154M57	IND CER MTLILYR 3.3 NH 1005
L418	2409154M34	IND CER MLTILYR 6.8NH 1005
L419	2409154M40	IND CER MLTILYR 22.0NH 1005
L520	2409154M61	IND CER MTLILYR 6.8 NH 1005
L521	2409646M78	IN CER MULTILYR 5.6NH 1608
L523	2409594M12	IND CHIP 18.0NH 5% ACCU-L
L524	2409154M58	IND CER MTLILYR 3.9 NH 1005
L580	2409154M09	IND CER MLTILYR 4.7NH 1005

L581	2409646M27	IND CER MULTILYR 4.7NH 1608
L582	2409414M09	002 2 IND CHIP WW 18 NH 5 % 2012
L625	2409154M65	IND CER MTLILYR 15.0NH 1005
L626	2409154M62	IND CER MTLILYR 8.2 NH 1005
L636	2409646M98	IND CER MULTILYR 100NH 1608
L650	2409414M09	002 2 IND CHIP WW 18 NH 5 % 2012
L651	2409414M14	IND CHIP WW 47 NH 5 % 2012
L652	2413926D28	IND CER CHIP 270.0 NH 10%
Q325	4809579E24	'TSTR FET P-CHAN 2SJ347 SC90
Q580	4809939C03	TSTR DUAL NPN/PNP UMH3
Q581	4809579E50	'FET DUAL P CHAN SI1905DL SC70
Q635	4809939C03	TSTR DUAL NPN/PNP UMH3
Q636	4809579E50	'FET DUAL P CHAN SI1905DL SC70
Q650	4809579E02	'TSTR MOSFET N-CHAN 25K1830
R100	0662057N02	RES. CHIP 13K 5% 20X40
R1000	0662057N09	RES. CHIP 27K 5% 20X40
R1001	0662057M81	RES. CHIP 2000 5% 20X40
R1002	0662057M26	RES. CHIP 10 5% 20X40
R1005	0662057M26	RES. CHIP 10 5% 20X40
R1006	0662057M26	RES. CHIP 10 5% 20X40
R1007	0662057M26	RES. CHIP 10 5% 20X40
R1008	0662057M26	RES. CHIP 10 5% 20X40
R1009	0662057N23	RES. CHIP 100K 5% 20X40
R101	0662057N06	RES. CHIP 20K 5% 20X40
R150	0662057M81	RES. CHIP 2000 5% 20X40
R160	0662057M95	RES. CHIP 7500 5% 20X40
R300	0662057M86	RES. CHIP 3300 5% 20X40
R301	0662057M98	RES. CHIP 10K 5% 20X40
R325	0662057M74	RES. CHIP 1000 5% 20X40
R326	0662057M92	RES. CHIP 5600 5% 20X40
R327	0662057N10	RES. CHIP 30K 5% 20X40
R328	0662057N23	RES. CHIP 100K 5% 20X40
R330	0662057M76	RES. CHIP 1200 5% 20X40
R401	0662057M60	RES. CHIP 270 5% 20X40
R402	0662057M60	RES. CHIP 270 5% 20X40
R403	0662057M76	RES. CHIP 1200 5% 20X40
R409	0662057M50	RES. CHIP 100 5% 20X40
R410	0662057M67	RES. CHIP 510 5% 20X40
R411	0662057M26	RES. CHIP 10 5% 20X40
R412	0662057M67	RES. CHIP 510 5% 20X40
R418	0662057M26	RES. CHIP 10 5% 20X40
R423	0662057M67	RES. CHIP 510 5% 20X40
R424	0662057M67	RES. CHIP 510 5% 20X40
R520	0662057M76	RES. CHIP 1200 5% 20X40
R521	0662057M81	RES. CHIP 2000 5% 20X40
R522	0662057M62	RES. CHIP 330 5% 20X40
R523	0662057M83	RES. CHIP 2400 5% 20X40
R530	0662057M43	RES. CHIP 51 5% 20X40

R550	0662057M95	RES. CHIP 7500 5% 20X40
R551	0662057M91	RES. CHIP 5100 5% 20X40
R552	0662057M90	RES. CHIP 4700 5% 20X40
R554	0662057N11	RES. CHIP 33K 5% 20X40
R555	0662057M43	RES. CHIP 51 5% 20X40
R580	0660076N32	RES CHIP 200 OHM 1/16 W
R581	0662057M76	RES. CHIP 1200 5% 20X40
R582	0662057M83	RES. CHIP 2400 5% 20X40
R583	0662057M01	RES. CHIP 0 5% 20X40
R584	0662057M71	RES. CHIP 750 5% 20X40
R600	0662057M46	RES. CHIP 68 5% 20X40
R601	0662057M74	RES. CHIP 1000 5% 20X40
R602	0662057M68	RES. CHIP 560 5% 20X40
R625	0662057M43	RES. CHIP 51 5% 20X40
R627	0662057M52	RES. CHIP 120 5% 20X40
R628	0662057M43	RES. CHIP 51 5% 20X40
R629	0662057M52	RES. CHIP 120 5% 20X40
R635	0662057M43	RES. CHIP 51 5% 20X40
R636	0662057M52	RES. CHIP 120 5% 20X40
R637	0662057M52	RES. CHIP 120 5% 20X40
R638	0662057M43	RES. CHIP 51 5% 20X40
R651	0662057M95	RES. CHIP 7500 5% 20X40
R652	0662057M77	RES. CHIP 1300 5% 20X40
R653	0662057N02	RES. CHIP 13K 5% 20X40
R654	0662057N09	RES. CHIP 27K 5% 20X40
R655	0662057M50	RES. CHIP 100 5% 20X40
R656	0662057M83	RES. CHIP 2400 5% 20X40
R701	0662057M46	RES. CHIP 68 5% 20X40
R750	0662057M50	RES. CHIP 100 5% 20X40
SH1	2688029K08	SHIELD, FRONT END,CDMA,V.60i
SH2	2688030K08	SHIELD VCO 7.3
SH3	2688031K10	SHIELD, ZIFSYN
SH4	2688032K06	SHIELD, MEI, CDMA V.60i
SH5	2688033K06	SHIELD, PA, CDMA V.60i
SH7	2609827G10	SHIELD INDUCTOR SURFACE MNT
SH8	2688473L04	SHIELD, IF, CRS
U100	5109940K40	IC LNR MIXER 20 TSSOP1.3FEIC
U1000	5109817F58	IC CURRENT LIM SW SOT23-6
U1001	4813832P70	TRANS SUP 5.6V QUAD
U1002	4813832P70	TRANS SUP 5.6V QUAD
U103	5109768D08	IC TEMP SENSOR LM20BIM7X SC 70
U325	4809863M17	OSC MOD REF 16.8MHZ 5032 SMD
U326	5109522E22	'IC SNGL AND GATE TC7S08FU
U400	5109940K29	IC MIX/EXC CDMA/AMPS ME3 32BCC
U401	5109572E39	'IC GAAS SPDT RF SWITCH SC70-6
U402	5109572E39	'IC GAAS SPDT RF SWITCH SC70-6
U520	5109730C25	MMIC GAAS RF PA 2000 5 MLP
U525	5109731C27	IC OP AMP SNGL LMV821M7 5SC70

U550	5803912K03	ISLTR CER TX 836MHZ 6MM SMD
U625	5109940K32	IC MMIC SI BUFF AMPL UPC8151TB
U626	4809283D34	OSC MOD VCO 991MHZ SMD
U635	5109940K32	IC MMIC SI BUFF AMPL UPC8151TB
U636	4809283D47	OSC MOD VCO 2070MHZ 5548 SMD
U700	5109879E88	'IC BICMOSZIF/SYNTH SC79882VHR
U900	5109730C22	MMIC PA GAAS RF PA2000 4 MLP
VR1202	4813830C29	DIODE 16V `J1` MMSZ5246BT1
	5409884J18	BAR CODE LABEL WHITE/BLACK

MOTOROLA

Special Tools

Motorola V60i

CDMA 800/1900/AMPS 800

CONTENTS

60i

Hardware Introduction

Please refer to the RadioComm section for functions and recommended equipment setup.

Automatic Call-Processing Tests

Most communications analyzers can simulate site in order to perform automatic call processing tests. Automatic call processing tests can be performed while the phone is in its power-up state. However, it is useful to do the tests with the phone in Test Mode Status Display.

Refer to the communication s analyzer's manual for details about performing call processing tests. The following call processing test sequence is recommended:

1. Inbound call, analog mode
2. Outbound call, analog mode
3. Analog-to-Analog channel handoff
4. Analog-to-Digital channel handoff
5. Inbound call, digital mode
6. Outbound call, digital mode
7. Digital-to-Digital channel handoff
8. Digital-to-Analog channel handoff

Handoffs should be performed between low, middle, and high frequency channels.

Analog Test Measurements

- RX Sensitivity (SINAD)
- RX Audio Distortion
- TX Power Out
- TX Frequency Error
- TX Audio Distortion
- TX Maximum Deviation
- TX SAT Deviation
- TX ST Deviation

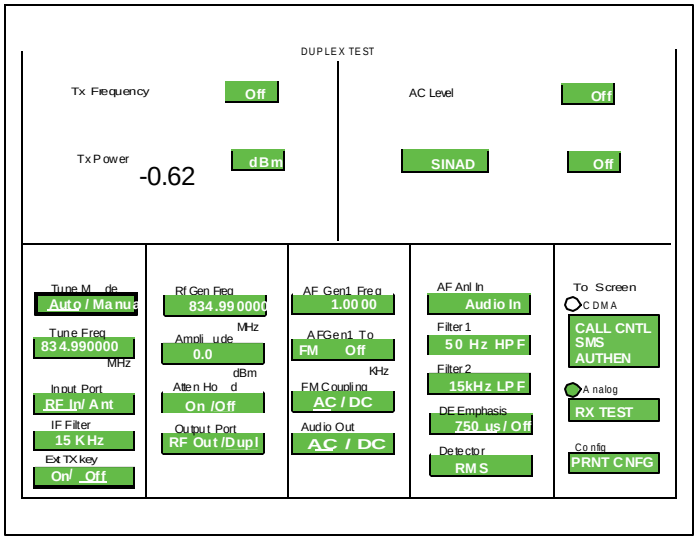
Digital Test Measurements

- Digital RX Sensitivity (FER)
- Digital P ower Out
- TX Frequency Error
- Waveform Quality (Rho)

The analog and digital parameters are stored in EEPROM on the Transceiver Board. Each transceiver is shipped from the factory with these parameters already calibrated. However, if a board is repa ired, these parameters should be measured and, if necessary, adjusted. Checking and adjusting calibration parameters is also useful as a troubleshooting/diagnostic tool to isolate defective assemblies.

Connections for performing Tests

RF Cable Test



To test the RF cable for proper loss:

- **Tune Freq** should be set to TX frequency: 834.990000 MHz.
- **RF Gen Freq** should be set to same frequency (834.990000 MHz).
- **Tx Power** should be set to read in dBm, not Watts.

In order to properly measure and adjust the parameters of a telephone, it is important that you use RF cabling that has minimal loss. Therefore, it is important that you test the RF cable for proper loss. This can easily be done by using the DUPLEX TEST screen of your HP8924. To test the cable, set up the DUPLEX screen as shown above.

Action:

Take the cable under test and connect it from the RF in/out port to the Duplex Out port. At this point you will be getting some type of power reading for cable loss.

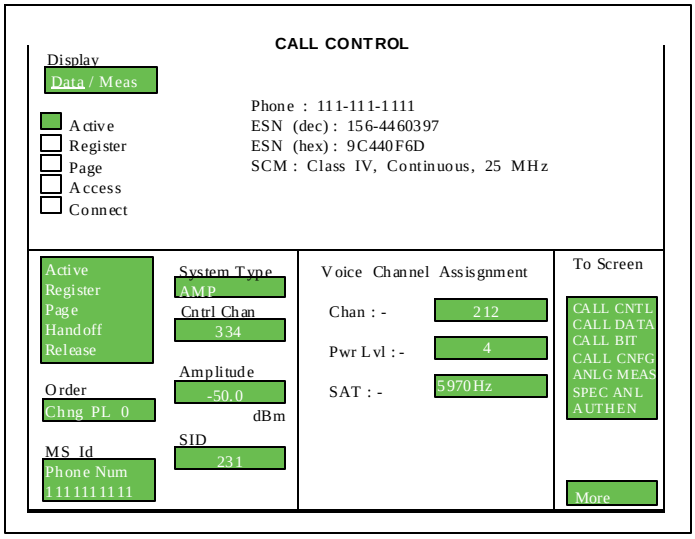
Good range: -.2 dBm through -.8 dBm

Bad cable: More than -.8 dBm

If the reading you are getting shows gain (positive number,) you may need to zero the power meter. This may happen on an HP8924 whose memory has just been cleared.

To zero the meter, press the **TX** button on the 8924 panel. Bring the cursor down to the field under **TX Pwr Zero** where it reads **Zero** Tap the cursor on the Zero field and it will highlight for a moment as it zeroes the meter. Set up the screen as shown above, and test your cable.

Set up for Analog call



Select CALL CTRL from the ANALOG SCRNS Control panel

- ï Select System type: **AMPS**
- ïZero the RF Power meter in the: **Call Config Screen**
- ïSet Amplitude to:**-50 dBm**
- ïSet SID: **Your phoneís System ID**
- ïSelect: **Active**
- ï **Voice Channel Assignment Type:**
- ïChan: **212**
- ïPwr Lvl: **4**
- ï S A T **5970Hz**

Registration

1. Put the Test Set in Active state by selecting **Active** from the list on the left side of the screen.
2. Select **Data** from the **Data/Meas** field. This is the default mode.
3. Select **Register** from the list to register phone.
4. If the registration message has been received, the Test Set will display registration data in the upper half of the screen as shown in the sample screen above.

Page

1 Select page from the list on the left side of the screen.

2 If the mobile responds, you will see theAccess annunciator light briefly.

3 Answer the call by raising the flip or press SEND on the mobile to start the conversation.

4 The Connect annunciator lights. This is the Connect state.

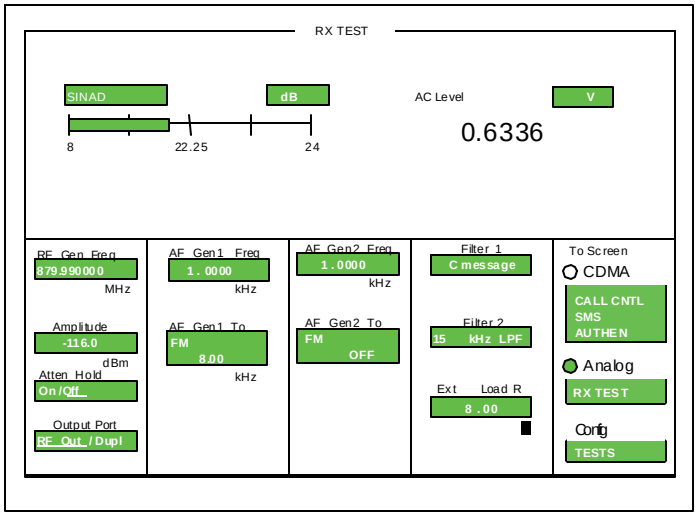
Origination

1 Dial the desired phone number on the mobile station and press SEND.

2 The Access annunciator will light while the Test Set signals the mobile on the assigned voice channel.

3 The connect annunciator will light if the mobile properly signals the Test Set.

RX Sensitivity Test (SINAD)



Communications Analyzer Setup:

ï Select **RX** button from the Analog Screen Control panel
ï Set **RX frequency** to **880.05 MHz**
ï Set **Amplitude** to **-116 dBm**
ï Set **AF gen1** to **1 kHz frequency** at **8 kHz deviation**, using **FM modulation** (PLEASE NOTE: this is for AMPS only; NAMPS uses much lower deviation)
ï Set **AF Filter 1** set to **C message filtering**
ï Set **AF Filter 2** to **15 kHz**

Test Mode Commands:

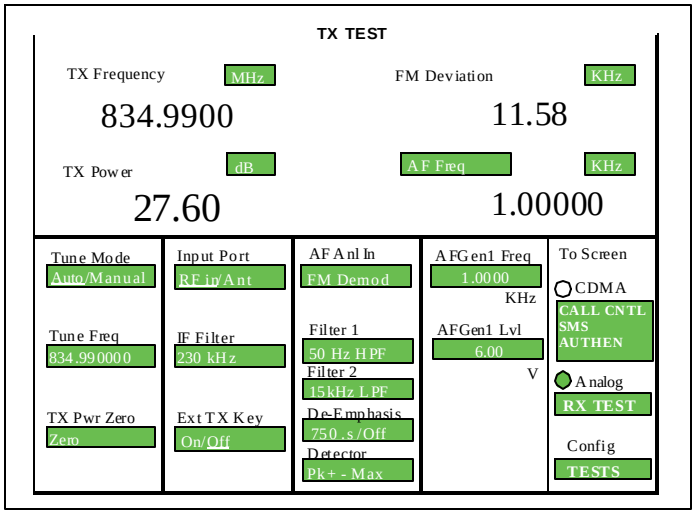
Using RadioComm software (Please refer to the RadioComm Test Procedure)

- Suspend Radio
- Load synthesizer to channel 350
- Unmute receiver audio path
- Turn on compander
- Set volume control to level 4
- Set RX audio path to Ext. path

Sinad measured on the communications analyzer must be more than 12dB.

Duplex SINAD can be measured with the same setting “SET_RF_PWR to lv 2 and turn “CARRIER” on using RadioComm, which turns on the transmitter at power step 2.

TX Power Out Test



Communications Analyzer Setup:

- Select **TX** button from the Screen Control panel
- **PWR** is measured in **dBm**
- Set **Frequency Measurement** to **auto or manual** (display will show TX Freq. Error)
- Set **TX frequency** to **835.05 MHz**
- Set **IF filter** to **230 kHz**
- Set **AF Filter 1** to **50 Hz**
- Set **AF Filter 2** to **15 kHz**
- Set **AF gen1** for **1 kHz frequency** at **6V level** (output will go to the **audio** port)

Test Mode Commands:

Using RadioComm software (Please refer to the RadioComm Test Procedure)

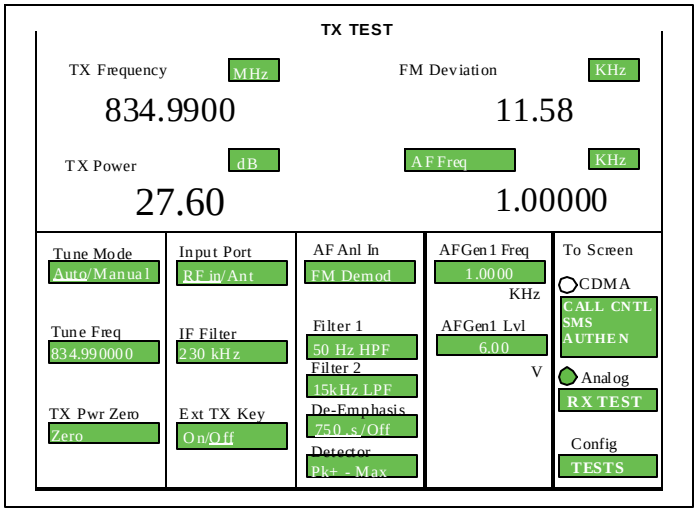
- Suspend Radio
- Load synthesizer to channel 350
- Set power level to step X,
  where X is a power level from 1 to 7
- Turn on Carrier

The TX Power Out specification for each portable power level is as follows:

Power Step 225dBm - 29dBm
Power Step 321.5dBm - 25.5dBm
Power Step 417.5dBm - 21.5dBm
Power Step 513.5dBm - 17.5dBm
Power Step 69.5dBm - 13.5dBm
Power Step 75.3dBm - 9.5dBm

Note: When taking measurements, remember to compensate for cable loss.

TX Frequency Error Test



Communications Analyzer Setup:

- Select **TX** button from the Analog Screen Control panel
- **PWR** is measured in **dBm**
- Set **Frequency Measurement** to **auto or manual** (display will show TX Freq. Error)
- Set **TX frequency** to **835.05 MHz**
- Set **IF filter** to **230 kHz**
- Set **AF Filter 1** to **50 Hz**
- Set **AF Filter 2** to **15 kHz**
- Set **AF gen1** for **1 kHz frequency** at **6V level** (output will go to the **audio** port)

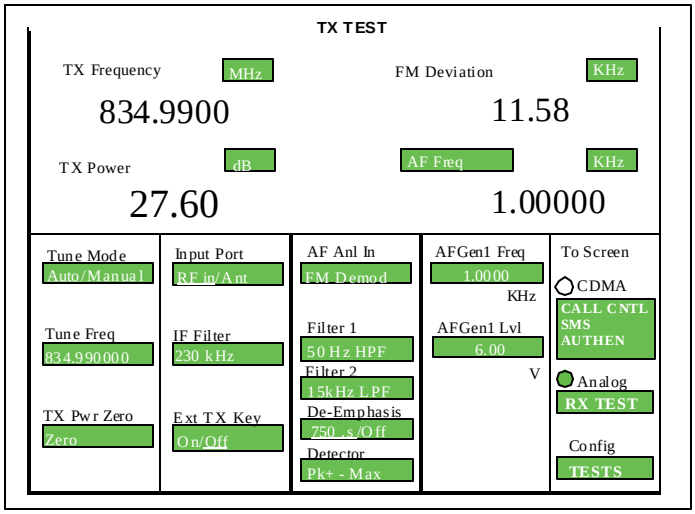
Test Mode Commands:

Using RadioComm software (Please refer to the RadioComm Test Procedure)

- Suspend Radio
- Load synthesizer to channel 350
- Set power level to step 2,
- Turn on Carrier

The frequency error measured on the communications analyzer must be less than ±1 kHz.

TX Maximum Deviation Test



Communications Analyzer Setup:

- Select **TX** button from the Analog Screen Control panel
- **PWR** is measured in **dBm**
- Set **Frequency Measurement** to **auto or manual** (display will show TX Freq. Error)
- Set **TX frequency** to **835.05 MHz**
- Set **IF filter** to **230 kHz**
- Set **AF Filter 1** to **50 Hz**
- Set **AF Filter 2** to **15 kHz**
- Set **AF gen1** for **1 kHz frequency** at **6V level** (output will go to the **audio** port)

Test Mode Commands:

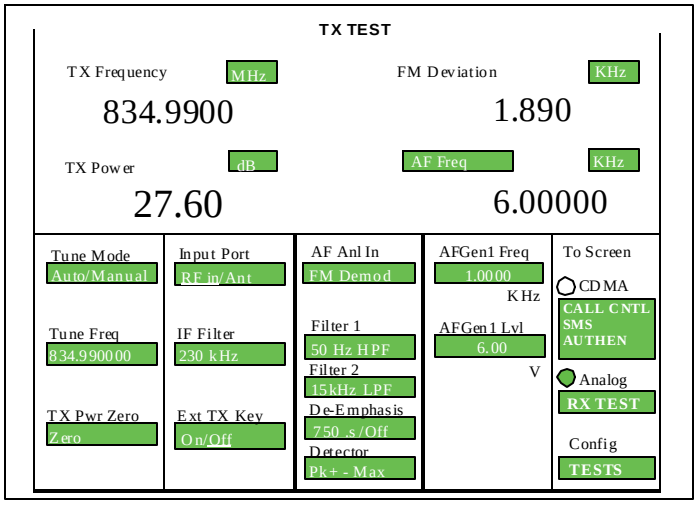
Using RadioComm software (Please refer to the RadioComm Test Procedure)

- Suspend Radio
- Load synthesizer to channel 350
- Set power level to power step 2,
- Turn on Carrier
- Select External TX audio path
- Unmute TX Audio path
- Turn on compandor

View FM Deviation for reading.

TX Maximum Deviation Pass Specifications: 9.8 kHz - 12 kHz

TX SAT Deviation Test



Communications Analyzer Setup:

- Select **TX** button from the Analog Screen Control panel
- **PWR** is measured in **dBm**
- Set **Frequency Measurement** to **auto or manual** (display will show TX Freq. Error)
- Set **TX frequency** to **835.05 MHz**
- Set **IF filter** to **230 kHz**
- Set **AF Filter 1** to **50 Hz**
- Set **AF Filter 2** to **15 kHz**
- Set **AF gen1** for **1 kHz frequency** at **6V level** (output will go to the **audio** port)

Test Mode Commands:

Using RadioComm software (Please refer to the RadioComm Test Procedure)

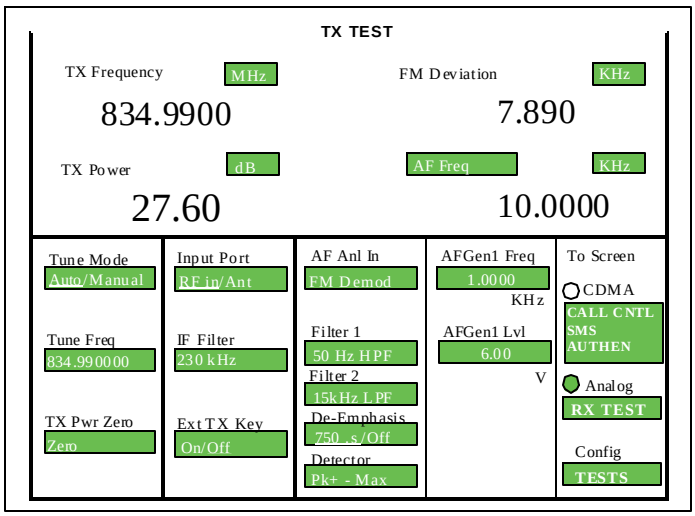
- Suspend Radio
- Load synthesizer to channel 350
- Set power level to power step 2,
- Turn on Carrier
- Enable 6000 Hz SAT tone

View FM Deviation for the reading.

The transponded peak SAT FM deviation should be 2 kHz ±200 Hz.

The demodulated signal on the communications analyzer should have an audio frequency of 6000 Hz.

TX ST Deviation Test



Communications Analyzer Setup:

- Select **TX** button from the Analog Screen Control panel
- **PWR** is measured in **dBm**
- Set **Frequency Measurement** to **auto or manual** (display will show TX Freq. Error)
- Set **TX frequency** to **835.05 MHz**
- Set **IF filter** to **230 kHz**
- Set **AF Filter 1** to **50 Hz**
- Set **AF Filter 2** to **15 kHz**
- Set **AF gen1** for **1 kHz frequency** at **6V level** (output will go to the **audio** port)

Test Mode Commands:

Using RadioComm software (Please refer to the RadioComm Test Procedure)

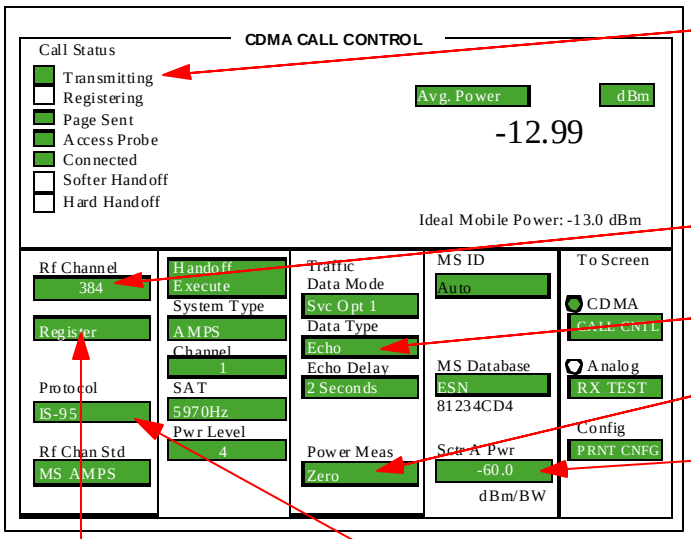
- Suspend Radio
- Load synthesizer to channel 350
- Set power level to power step 2,
- Turn on Carrier
- Enable signaling tone

View FM Deviation for reading.

The peak ST deviation measured on the communications analyzer should be 8 kHz ±800 Hz deviation.

The demodulated signal on the communications analyzer should have an audio frequency of 10 kHz.

Set up for CDMA call



Pseudo LED's show call Status
The "Transmitting" light means that the HP 8924C is configured and transmitting the required CDMA signals to make a call.

Enter the expected RF channel number

Select Echo Mode

Zero the Power Meter

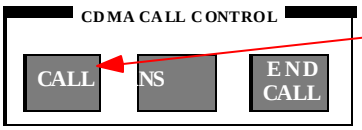
Set CDMA Generator Power to -60 dBm/1.23MHz

Select Protocol

Once the Phone Acquires Service, Register it by Using the Knob

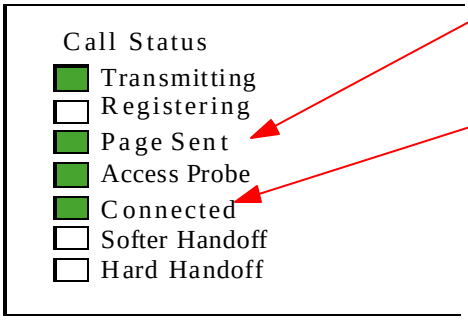
1. Enter the channel number that the CDMA phone expects to find a CDMA system on. The IS-95A standard defines a primary and secondary channel number for both the A and B service providers. These channels are: 283 and 691 for the A side, and 384 and777 for the B side. A CDMA phone will only look for a CDMA system on power-up at its programmed primary or secondary channels. The HP 8924C defaults to channel 384. The phone you are using is set to B side service with a primary channel of 384.
2. Select the necessary protocol (IS-95, ID-95A, J-STD-008). For this demo we select IS-95.
3. Select the Traffic Data Mode to Service Option 001 (duplexed voice mode).
4. Set the Data Type to echo. This will allow you to speak into the phone under test and hear the voice quality echoed in the phone via the CDMA link from the HP 8924C.
5. Zero the average power detector. This is a good time to perform this step since no power is being transmitted by the phone.
6. Finally, set the Sector A power to -60 Dbm/ 1.23 MHz. You are now ready to make a CDMA phone call.
7. Make sure that the phone has acquired service (some type of display indicator on the phone).
8. Register the phone. This step is not required for mobile initiated calls. When registration is successful, the Registration Indicator will go out. The MS database should now show an ESN value.

Making a CDMA Phone Call



Press the front panel "CALL" key to initiate a CDMA call.

Answer the call on the CDMA Phone. Then speak into the phone and wait to hear your voice echoed back to you by the HP8924C.

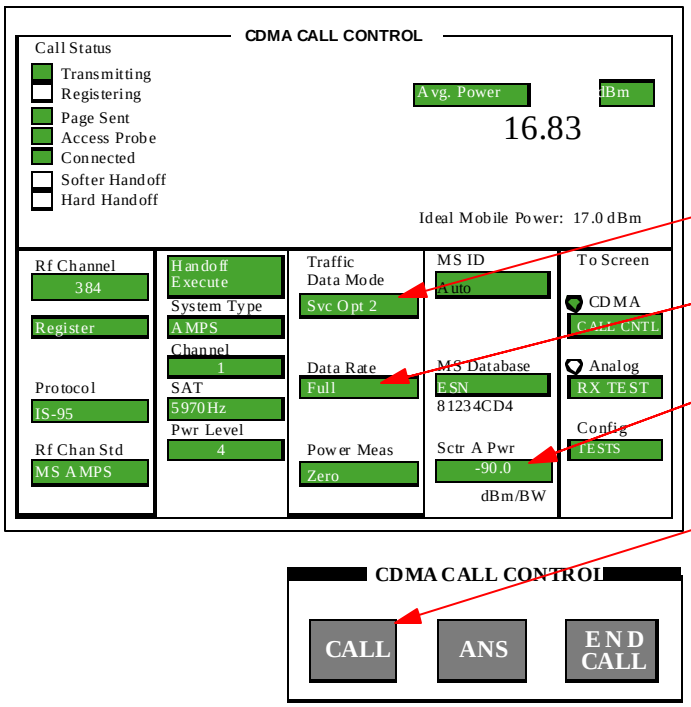


Each light activates as the call processing proceeds.

The "Connected" light indicates that the call was successfully completed.

1. Press the HP 8924C's CALL button.
2. Notice the call status indicators are activated at each step in the call process. First the PAGE indicator activates when the HP 8924C sends out a page message on its paging channel. When the mobile answers with an access probe, the access probe indicator is activated.
3. The phone will now ring, or indicate on its display there is an incoming call.
4. To complete the call, press the send key on the phone. The connected indicator should now be on. When the HP 8924C receives an acknowledgment from the phone that the traffic channel connection process is completed, the connected indicator is activated.

Set up for CDMA RF Parametric Measurements



Setup a CDMA Call with the following parameters:

Traffic Data Mode:

Service Option 2

•Data Rate:

Full

•Set Sector A's power:

-90 dBm/1.23 MHz

•Press the front panel "CALL" key

While service option 001 calls are useful for the verification of CDMA mobile functionality, parametric tests cannot be accurately made in this mode. The TIA IS-98A minimum performance standard recommends that testing be made using service option 002. In service option 002, the mobile under test demodulates the received signal and then re-transmits this data to the HP 8924C. This mode allow accurate receiver performance measurements.

To make a service option 002 call:

1.Press the **END CALL** front panel key to terminate the service option 001 call.

2.Return to the CDMA Call Control screen.

3.Change the Traffic Data Mode to Service Option 002.

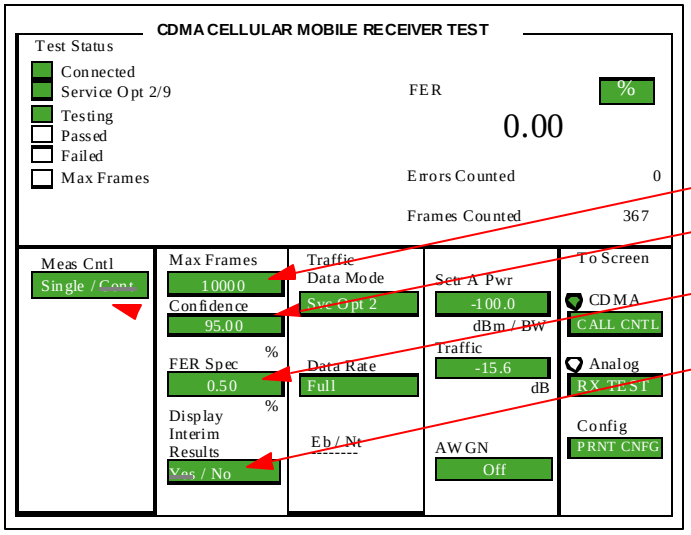
4.Make sure that the Data Rate is set to Full.

5.Set Sector A's power to -90 dBm/1.23 MHz (this value may need some adjustment for varying cable losses - some phones with their associate fixtures may require higher levels due to path losses to make a phone call).

6.Press the HP 8924C's front panel CALL button.

The HP 8924C's call status indicators should now indicate that a call is connected. Depending on the phone being used, either SO2 or Loopback will be shown on the phone's display. Also available is service option 03 (voice EVRC), along with service option 09 and service option 32768 for 14.4 vocoder type phones.

Making a Receiver Sensitivity Measurement



To make an FER Measurement:

- Enter the Maximum number of frames to Test: 10,000
- Enter the Confdence: 95%
- Enter the Target FER Specifcation: 0.5%
- Enable the display of interim results: Yes

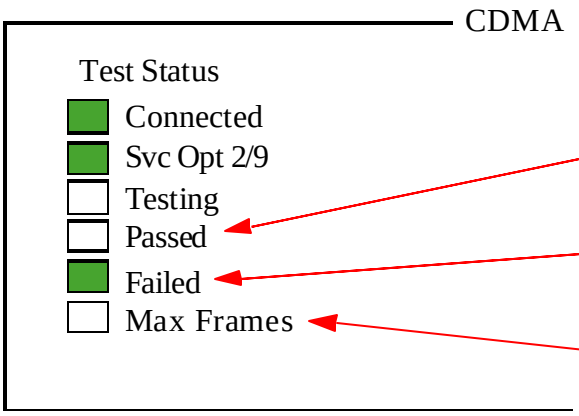
Arm the Measurement

- Place the cursor at the “Cont” feld under Meas Cntl
- Push the Knob

Now that you have a service option 002 call connected, you are ready to make parametric receiver and transmitter measurements. To perform receiver measurements:

1. Go to the **RX Test screen**
2. Notice that the RX Test screen also has call status indicators that show if the call is still connected and if the call is a service option 002 call.
3. The parameter used to evaluate CDMA receiver quality is frame-error-rate. To setup a FER measurement with the HP 8924C, you need to enter three parameters: Max Frames, Confidence, and FER Spec.
4. Enter 10,000 into the Max frames field. This sets an upper bound to the time limit of the test.
5. Enter 95% into the Confidence field. This field sets the desired confidence limit for the test. If confidence limit testing is not desired, you can turn this field off. In that case, the FET test will run until the number of frames tested reaches the value entered into the Max Frames field.
6. Enter 0.5% into the FER spec field. This field sets the desired FER specification to test to.
7. Make sure that the Display Interim Results field is set to yes.
8. Use the knob to place the cursor in front of the Arm field. Press the knob to start the measurement.

Receiver Test Termination



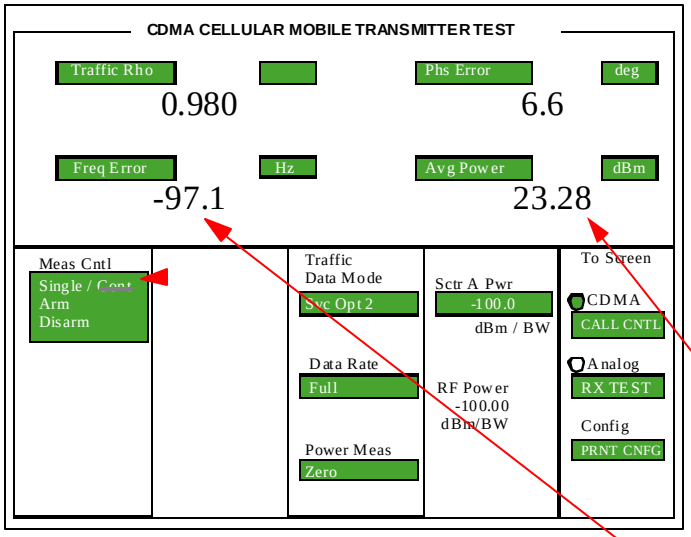
There are 3 possible outcomes to an FER Test:

- **Passed:** this means that the measured FER meets the target FER speciÞcation with the speciÞed conÞdence.
- **Failed:** this means that the measured FER does not meet the target FER specification with the speciÞed conÞdence.
- **Max Frames:** this means that the test was indeterminate in that the measured FER could neither pass nor fail the target FER specification with the specific confidence in the number of frames specified.

There are three possible outcomes for a confidence interval receiver frame-error-rate test with the HP 8924C:

1. When the HP 8924C determines that the measured FER will meet the user specified FER specification with the specified confidence level, the test is halted and the Passed indicator is activated.
2. The HP 8924C extends the TIA recommendation to also check for failures with the user specified confidence level. In other words, if the HP 8924C detects that the measured FER will fail the user entered FER specification with the specified confidence level, the test is halted and the Failed indicator is activated. This feature eliminates wasted time testing phones that are clearly failing the test.
3. If neither the pass or fail conditions are met, the FER test will run until the number of frames counted equals the valued entered into the Max Frames field. When this occurs, the Max Frames indicator is activated. If the confidence interval is turned off, the HP 8924C does not perform any confidence level checking and the FER test will run until the number of frames tested equals Max Frames.

CDMA Transmitter Tests



To make Concurrent RX and TX Measurements:

- Restart FER with Confidence Limits Off
- Go to the TX Test Screen
- Switch to Continuous Measurements

Read Average Power

- Check Max Power
- Check Open Loop Power Control

Read Rho Measurements

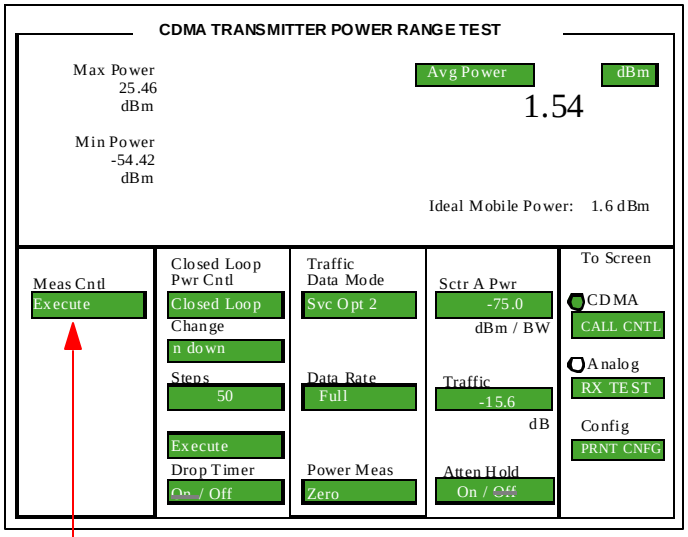
- Waveform Quality
- Frequency Error
- Amplitude & Phase Error

Simultaneous and transmitter tests is another feature of the HP 8924C. Simultaneous measurements results in much reduced test time. To make simultaneous receiver sensitivity and transmitter measurements:

1. Go to the TX test screen. (Press TX Test under the CDMA screens area.)
2. Make sure that the Meas Cntl is in Continuous mode. The HP 8924C will now make TX measurements.
3. Now select several measurement field and change the measurement types. Note: TM Rho (Test Mode Rho) only works with phones that have Test Mode functionality.

Now switch back to the RX Test screen. Notice that the FER test continued to run while you were making TX measurements.

CDMA Transmitter Power Range Test



Select Execute

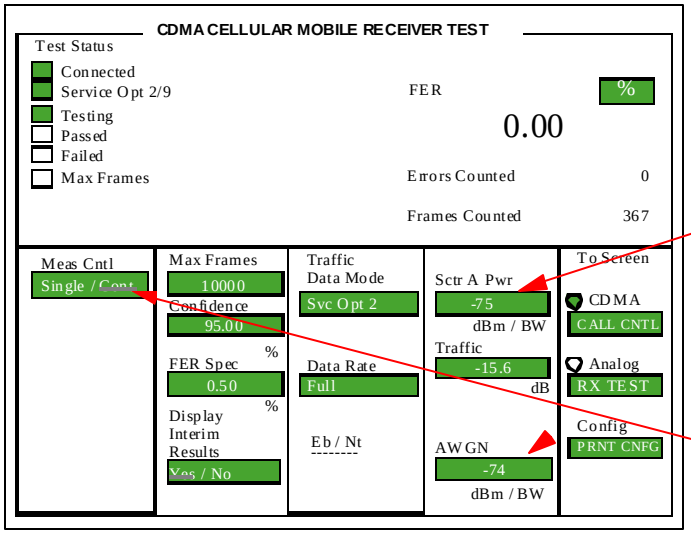
The ability to do min/max power measurements just by selecting Execute is another advanced feature of the HP 8924C. In this screen you can also control and test each power step while comparing Ideal Mobile Power to actual Avg Power measurements.

1.Go to the CDMA Transmitter Power Range Test screen (press the blue Shift key and then the Range key).

2.Now execute the min/max power measurement (use the knob and select execute under the min/max power field).

3.You will also notice in this screen you can select closed-loop power control to manually control power settings of the phone. Note: If “always down” is selected, the phone will step its power down until the call is lost. If power control is changed, be sure to return it to “closed-loop” before proceeding onto the next test.

FER with AWGN Tests



To make a CDMA FER with AWGN measurement:

- Use the same setup as for the receiver sensitivity test
- Set Sector A Power to -75 dBm/1.23 MHz
- Set AWGN Power to -74 dBm/1.23 MHz

Arm the Measurement

- Place the cursor at the “Cont” feld under Meas Cntl
- Push the knob

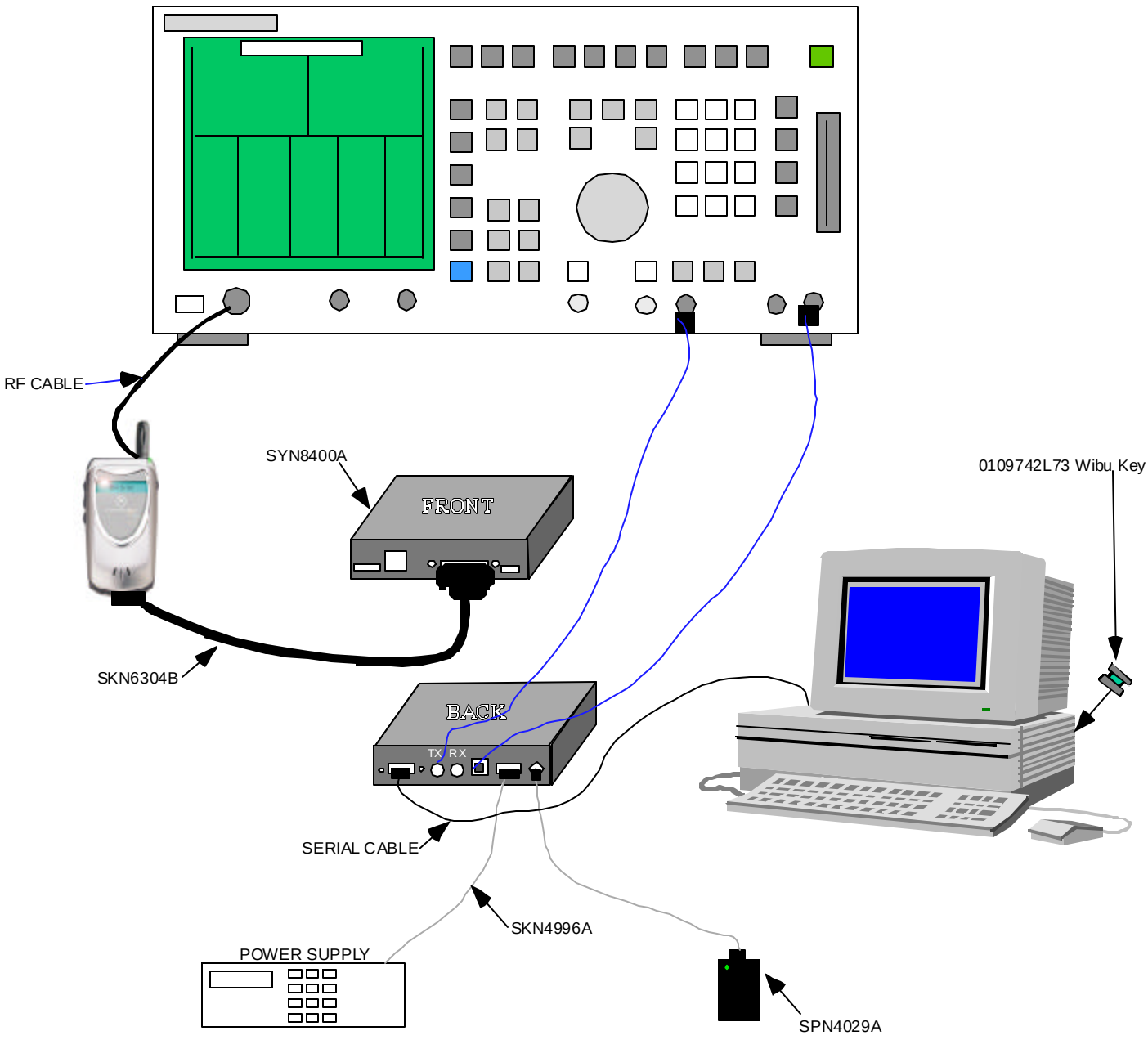
The other key receiver measurement for CDMA phones is the FER with AWGN test. In this test, large amounts of uncorrelated noise is added to simulate the actual conditions encountered by a CDMA phone in actual use. To make this measurement:

1. Set the Sector A Power to -55 dBm/1.23 MHz.
2. Set the AWGN source to -54 dBm/1,23 MHz (this means that the traffic channel is 16.6 dB below the noise level!).
3. Arm the measurement by selecting Continuous in the Meas Cntl field.
4. Under these conditions, a CDMA phone should meet 0.5% FER with 95% confidence.

Standards specify other tests for other rates. These can be performed by changing the Data Rate and Traffc level to the specifed settings.

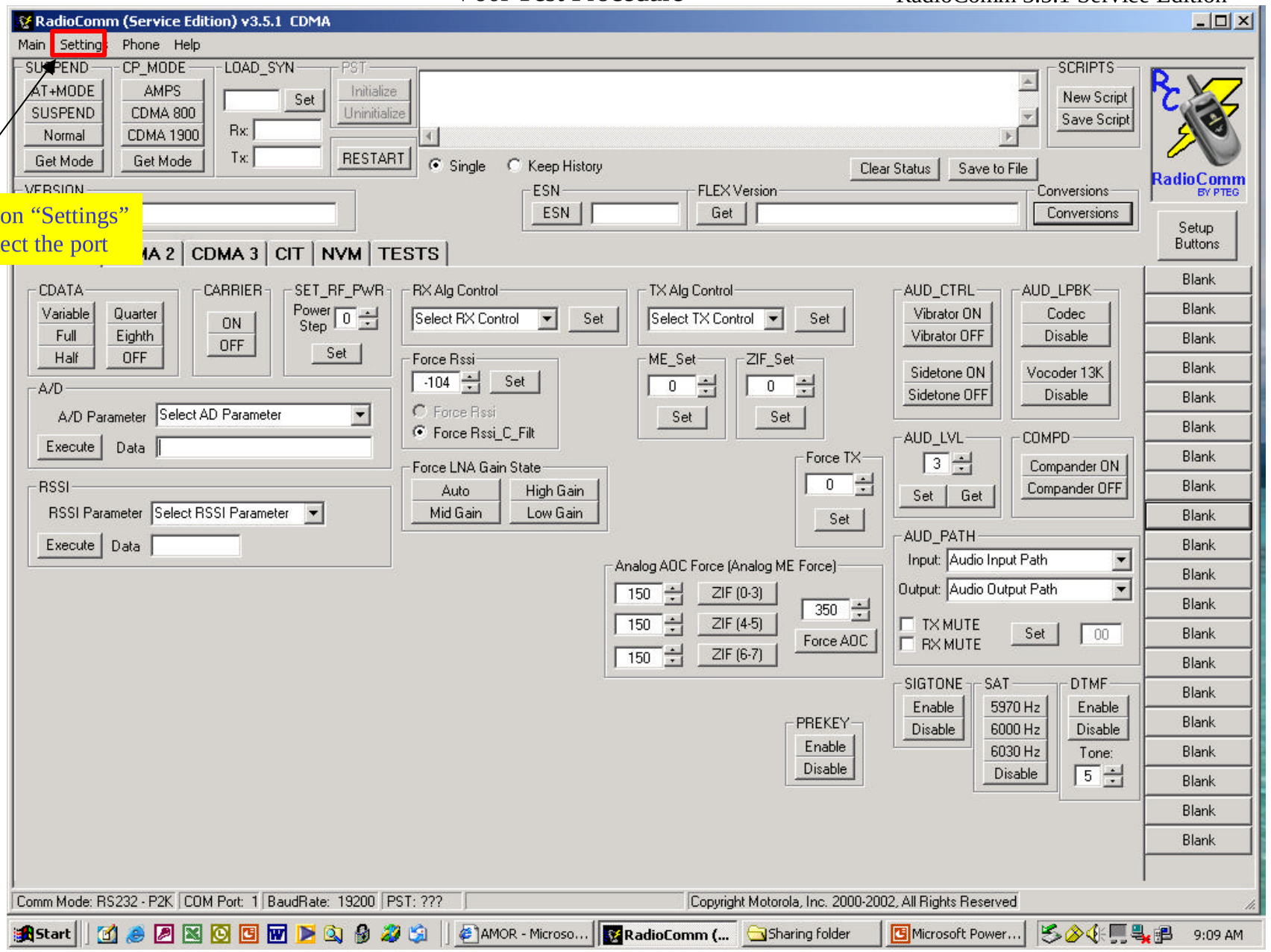
RadioComm

Equipment Setup

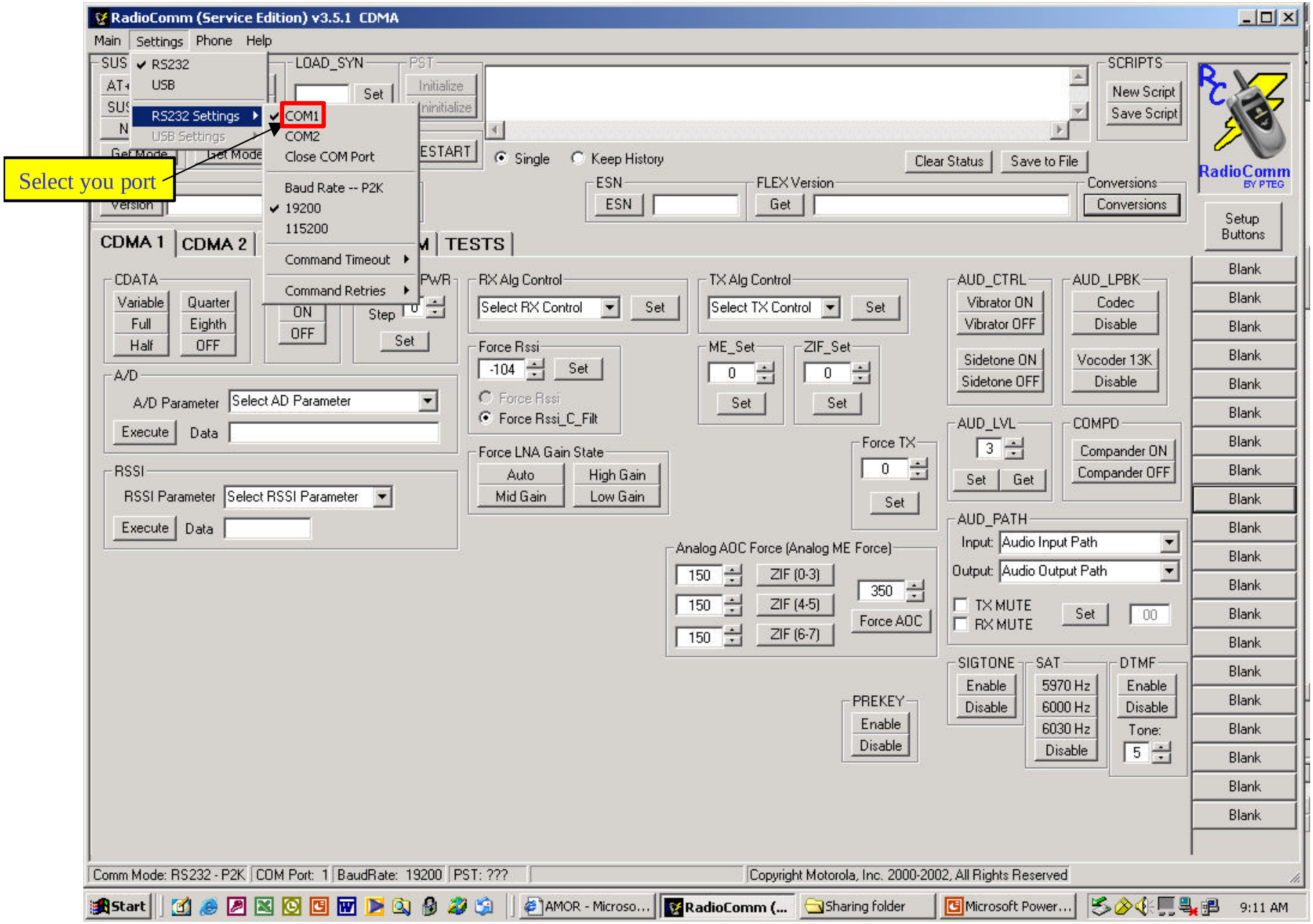


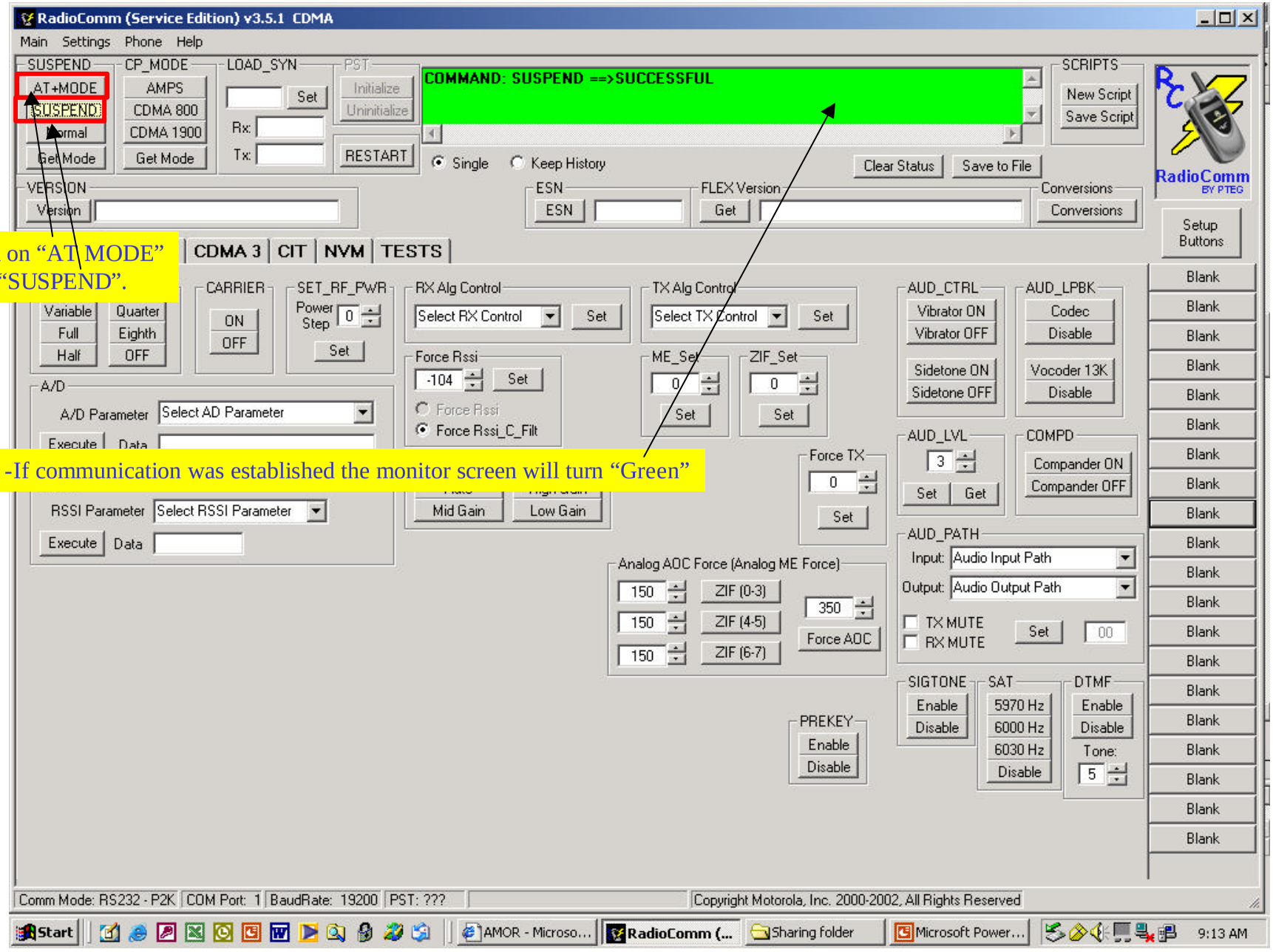
V60i Test Procedure

RadioComm 3.5.1 Service Edition



Click on “Settings” To select the port

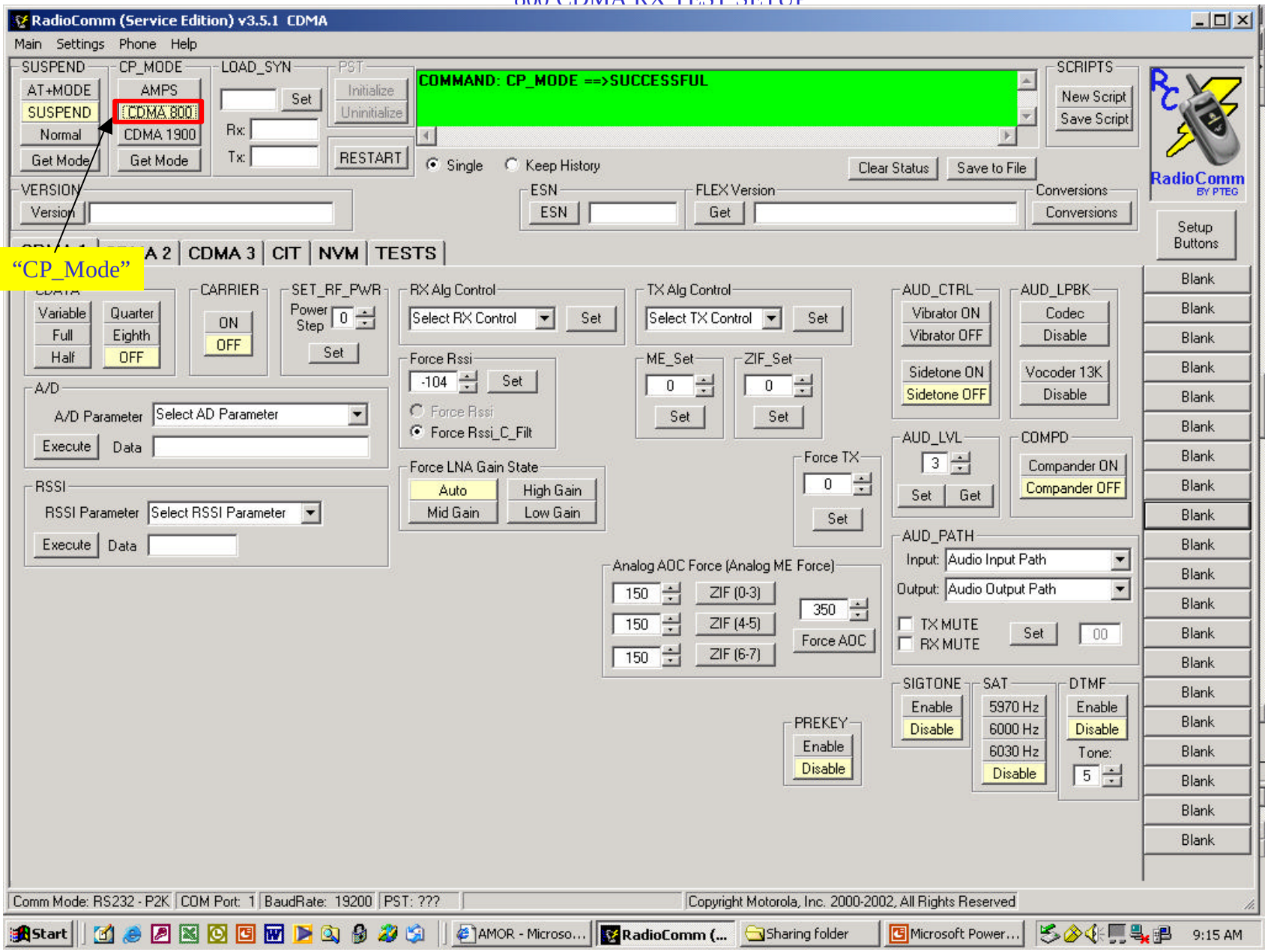

Select you port
RadioComm (Service Edition) v3.5.1 CDMA
Main
Settings
Phone
Help
RS232
USB
RS232 Settings
USB Settings
COM1
COM2
Close COM Port
Baud Rate -- P2K
19200
115200
Command Timeout
Command Retries
LOAD_SYN
Set
PST
Initialize
Uninitialize
RESTART
SCRIPTS
New Script
Save Script
Single
Keep History
Clear Status
Save to File
ESN
Get
FLEX Version
Conversions
RadioComm
BY PTEG
Setup Buttons
CDMA 1
CDMA 2
TESTS
CDATA
Variable
Quarter
Full
Eighth
Half
OFF
ON
OFF
PWR
Step
RX Alg Control
Select RX Control
TX Alg Control
Select TX Control
Force Rssi
-104
Force Rssi
Force Rssi_C_Filt
ME_Set
ZIF_Set
A/D
A/D Parameter
Select AD Parameter
Execute
Data
RSSI
RSSI Parameter
Select RSSI Parameter
Force LNA Gain State
Auto
High Gain
Mid Gain
Low Gain
Force TX
Analog AOC Force (Analog ME Force)
150
ZIF (0-3)
ZIF (4-5)
ZIF (6-7)
350
Force AOC
PREKEY
Enable
Disable
AUD_CTRL
Vibrator ON
Vibrator OFF
Sidetone ON
Sidetone OFF
AUD_LPBK
Codec
Vocoder 13K
AUD_LVL
COMPD
Compander ON
Compander OFF
AUD_PATH
Input:
Audio Input Path
Output:
Audio Output Path
TX MUTE
RX MUTE
SIGTONE
SAT
5970 Hz
6000 Hz
6030 Hz
DTMF
Tone:
Blank
Comm Mode: RS232 - P2K
COM Port: 1
BaudRate: 19200
PST: ???
Copyright Motorola, Inc. 2000-2002, All Rights Reserved
Start
AMOR - Microso...
RadioComm (...
Sharing folder
Microsoft Power...
9:11 AM



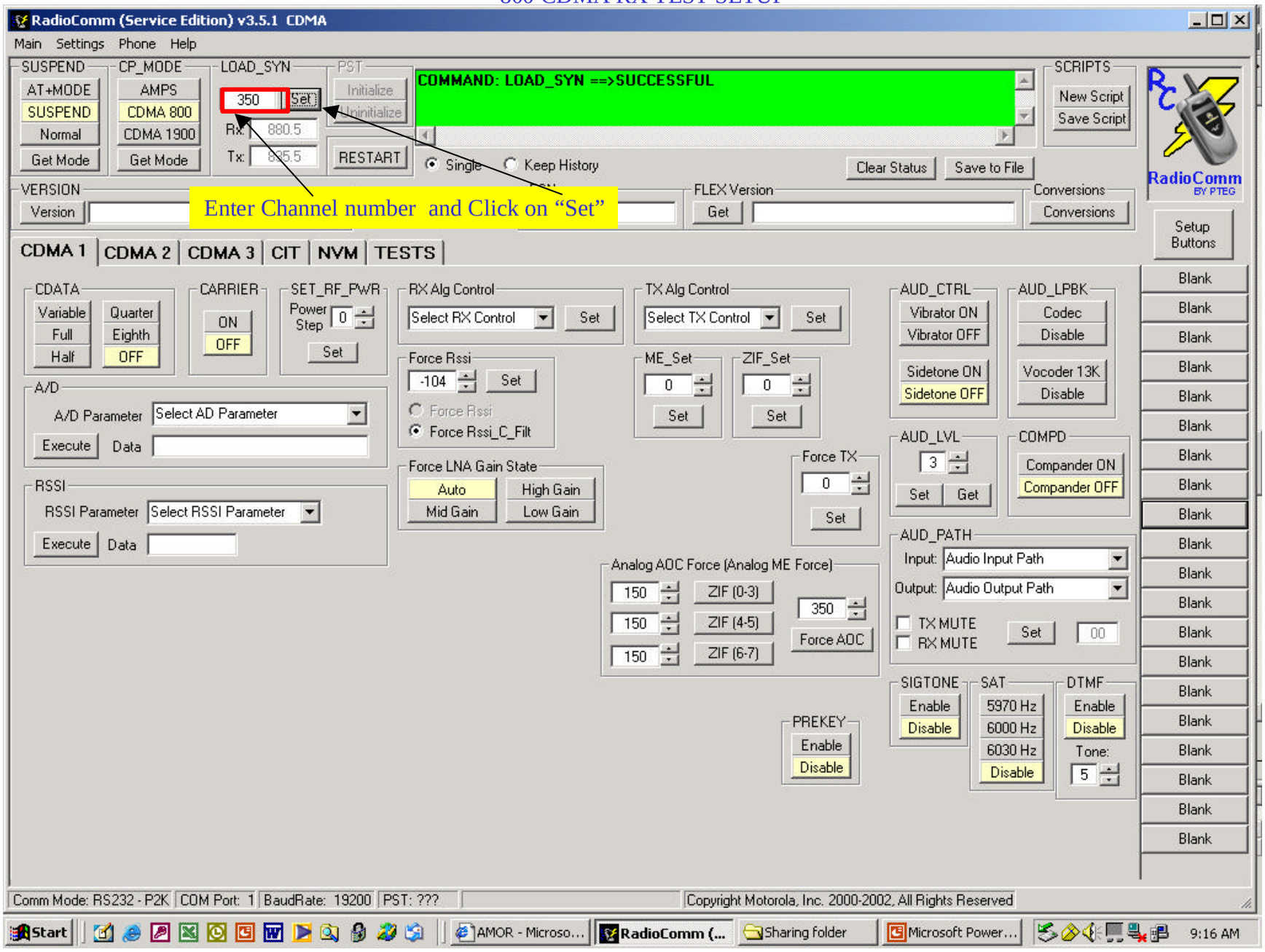
Click on "AT MODE" And "SUSPEND".

-If communication was established the monitor screen will turn "Green"

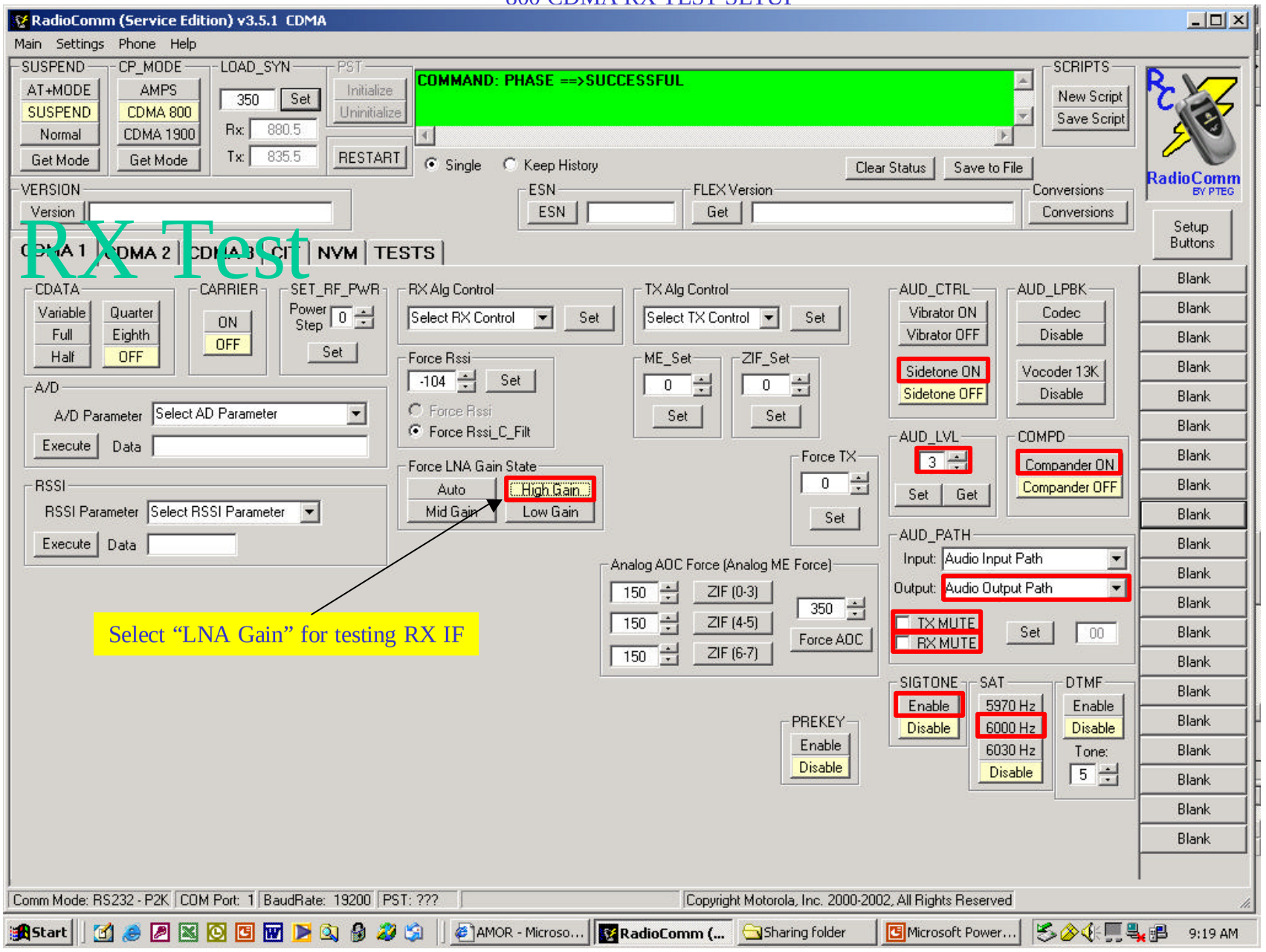
800 CDMA RX TEST SETUP



800 CDMA RX TEST SETUP



800 CDMA RX TEST SETUP



800 CDMA TX TEST SETUP