Service Manual

Level 3

MOTOROLA™

DIGITAL WIRELESS TELEPHONE

Model T720

CDMA 1900MHz/ CDMA 800MHz

COMPUTER SOFTWARE COPYRIGHTS

The Motorola products described in this instruction manual may include copy-righted Motorola computer programs stored in semi-conductor memories or othermedia. Laws in the United States and other countries preserve for Motorola certain exclusive rights for copyrighted computer programs, including the exclusive right to copy or reproduce in any form the copyrighted computer program. Accordingly, any copyrighted Motorola computer programs contained in the Motorola products described in this instruction manual may not be copied or reproduced in any mannerwithout the express written permission of Motorola. Furthermore, the purchase of Motorola products shall not be deemed to grant either directly or by implication, estoppel, or otherwise, any license under the copyrights, patents or patent applica-tions of Motorola, except for the normal non-exclusive, royalty free license to use that arises by operation of law in the sale of a product.

This manual is the property of Motorola. No part of this manual may be duplicated in any form without the express written permission of Motorola. This manual must be returned upon Motorola request

The information in this manual is subject to change without notice. No guarantee is made for accuracy or thoroughness. This manual is intended as a training aid in conjuction with formal classes provided by Motorola. Motorola takes no responsibility for the use of this manual beyond its intended scope.

Motorola, the Motorola Logo and all other trademarks identified as such herein are trademarks of Motorola, Inc. All other product or service names are the property of their respective owners.

© Copyright 2002 by Motorola, Inc. All rights reserved

M

This page is intentionally left blank.

© 2002 Motorola, Inc.

T720 W/AGPS

T720 is similar as V 120X in functionality except that it also has the Assisted Global Positioning System. AGPS helps in 911 emergency calls to track the user to its exact location.

Concept:

The phone receives the signals from GPS satellites(from 3 of 24 in the orbit), signals as low as –149dB(typical is –130dB) and transmit the information to the cell site in CDMA mode.

GPS service is available only with CDMA service. No GPS operation in AMPS system. GPS works on 1575.42Mhz frequency. T720c is similar in electrical, mechanical is diffrent to V120X except as follows to support the AGPS:

- 30 new parts which contains discrete components – resistors , capacitors, and filters which are mostly at the front end of the receiver.
- T720c also use the same RF antenna. This is done by using a coupler between the internal antenna and the AGPS antenna.
- RF shield covers the front end receiver of the GPS circuit.
- FM and GPS share the lines at the back end of the receiver.
- The GPS IF frequency is 183.6Mhz
- The Bandwidth of the GPS IF filter is 40Mhz

T720 IC description:

1. 1.Qualcomm IC's:
   - MSM5100
   - PM1000
   - RFR3300
   - IFR3000
   - RFT3100
   - PA2001- 4C/5C
2. Non Qualcomm IC's:
   - Memory IC's :Flash part 32M bit intel sawtooth, Eeprom 8M bit intel Jaguar, SRAM: 8M bit
   - Semtech SC801 charger controller
   - Harness ASIC
   - Phase lock loop
   - Reference Oscillator 19.2Mhz

Testing and Troubleshooting GPS:

1. Do the DC analysis of the Front end of the GPS receiver.
2. The GPS Circuit is turned on momentarily when you dial 911.
3. Do the visual check of the Antenna coupler circuit and discrete parts at the Front end of the receiver.

For all other Testing and Troubleshooting refer to AGPS testing documentation.

© 2002 Motorola, Inc.

CDMA DUAL BAND TRI MODE PHONE

General:

T720 - CDMA Dual Band Tri Mode Phone

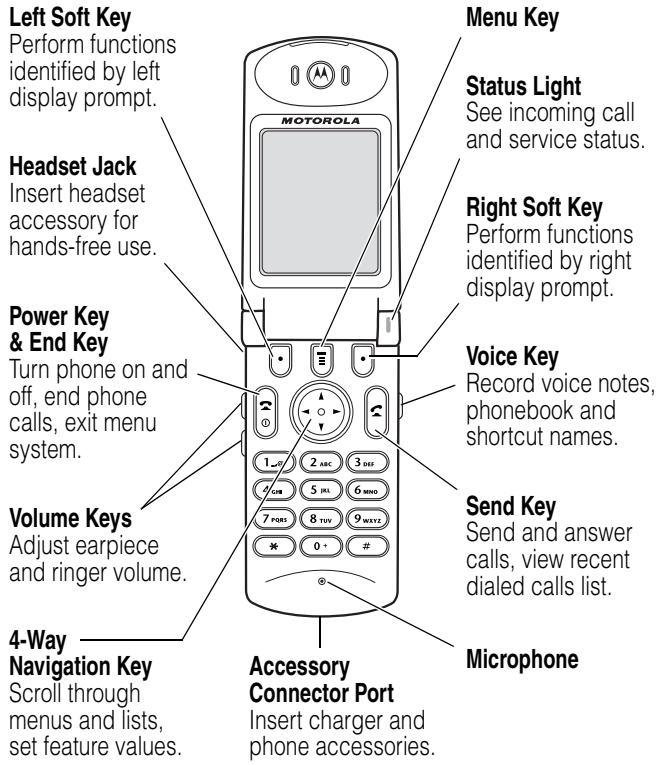
T720 also known as CDMA 1X is a CDMA2000 1XRTT version of V.120C. It uses Qualcomm chip set and software. This is a dual band tri mode phone- 1900Mhz CDMA / 800Mhz CDMA / 800Mhz AMPS.

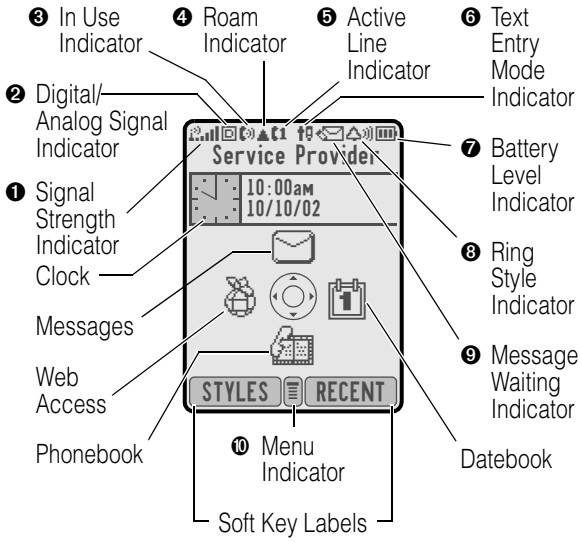
What is 1X?

CDMA 1X has many names such as CDMA 2000, IS-2000, 2.5G, CDMA One, IS95C, and 3G1X. As a fundamental way of thinking CDMA 1X is to CDMA as NAMPS is to AMPS. Using the 1.25 MHz bandwidth of a CDMA channel the CDMA 1X can adjust the amount of supplemental channels based on the data needs.

Advantages of CDMA 1X:

1. Approximately 2X voice capacity over IS-95B.
2. High Data Rates:
   - — 144 kbps full mobility
   - — 384 kbps low speed mobility
   - — 2 Mbps for fixed installations
3. Easy up grade for service providers who are currently operating systems using IS-95. All software enhancements.
4. Backward compatible with IS-95
   - — T720 due to lower cost chipset can support data rates of 153.6kbps down/9.6kbps up.





© 2002 Motorola, Inc.

KEY PRODUCT FEATURES

- — Higher data rates
- — Stylish and sleek design that fits perfectly in your hand for optimal comfort
- — Save time with voice activated dialing and menu control
- — Make notes using the 120 seconds voice note recorder
- — Fast and easy text messaging including E-Mail making it easy to stay in the loop
- — Create an entertainment experience with optimal FM stereo Radio and MP3 player accessories.
- — WAP micro browser for instant access to valuable information while on the go
- — Full PIM functionality with alarm and calendar settings
- — Up to 500 names and number entries in address book with unlimited entries per name
- — Add distinctive alert to selected address book entries and recognize incoming ID by alert
- — Three Games
- — Personalize your own look with colorful Phone Wrap cover
- — 19 keys on the keypad for synergy support
- — Volume and smart keys on the sides
- — Integrated headset jack on the top above which is the power button

Accessory connector:

- 17 pins CE bus connector, access to USB, RS232, power, ground, analog and digital audio, FM stereo headset.

720 AUDIO LOGIC ICs

Brief IC functional description:

1. Qualcomm Baseband IC is used in T720
   - — U1000: MSM5100 –uP, DSP, CoDec, Vocoder, ADC, PDM, RF interface, USB logic.
   - — U2000: PM1000-LDO’s, RTC/XO, GP ADC, State Machine w/POR, Battery Control, SBI Control.
   - — U150: IFR3300: RX IF- Baseband Converter extracts BB components from CDMA/Amp signals.
   - — U101: RFR3300: LNA, mixer
   - — U200: RFT3100: Baseband to RF transmit processor.
   - — PA's: U170 & U401
2. Non Qualcomm Baseband IC is used in T720
   - — U1201: 32 Mbit (4 Mbyte) Intel Sawtooth C3-Main software code
   - — U1202: 32 Mbit (4Mbyte) Intel Jaguar B3-NVM for phasing, voice notes, phone book, etc.
   - — U1203: 16 Mbit(2 Mbyte) SRAM
   - — U2101: Semtech SC801 Charger Controller
   - — U3000: Harness ASIC - Have the following features: 1. Parallel to Serial conversion 2. 16 additional dedicated GPIO and 8 optional GPIO 3. EPIT (Enhanced Programmable Interrupt Timer) 4. CE bus multiplexing, to allow Qualcomm based radio to look like a CE bus compliant radio. 5. One wire bus serial interface for battery EPROM.
   - — Y2000: 32.768Khz xtal- provide reference clock to the microprocessor during sleep mode operation.

© 2002 Motorola, Inc.

CDMA-PCS 1900 Mhz BAND

Performance specification:

General Frequency and channel information:

Channel No., Tx Frequency (Mhz), Rx Frequency (Mhz)

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(ABCDEF) of channels. usually only one block is used in a given geographic area.
There are no “standard” primary and secondary channels.
The actual primary and secondary channel depends on which block is used.
The lowest valid channel number is 25.
The highest valid number is 1175.
Total Number of valid channel numbers is 46.

CDMA 1900MHz Performance Specifications General.

© 2002 Motorola, Inc.

l

Table 1: Specifications

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 frequency and 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)
Displays	Large 120X160 transflective CSTN module with 4096 colors. CLI Display, 96X32 FSTN.

© 2002 Motorola, Inc.

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 occupy analog control channels 313 to 354.

A -System preferred channels: primary =283, Secondary = 691

B- System preferred channels: Primary =384, Secondary = 777

The lowest valid CDMA channel is 1013.

The highest valid CDMA channel is 777.

© 2002 Motorola, Inc.

Table 2: Overall System CDMA 800MHz

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	128 X 160 Pixel array. T720c has external display to allow viewing of caller ID and other phone status messages while the flip is closed.
RF Power Output	max power 25dBm for CDMA(800 & 1900) and 26.1 dBm for Analog.
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 -26dB
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)

© 2002 Motorola, Inc.

Table 3: 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 determining 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.

© 2002 Motorola, Inc.

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.

© 2002 Motorola, Inc.

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.

© 2002 Motorola, Inc.

Cellular Overview

Table 4:

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.

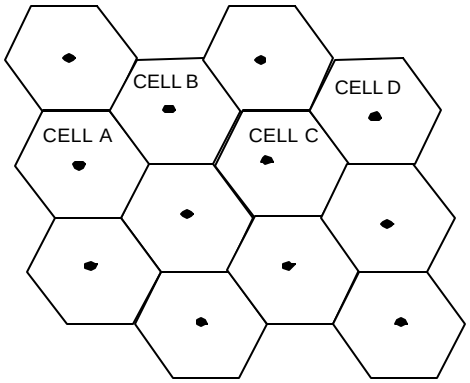
Overall Concept

Cellular systems are used to provide radio-telephone 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 spec-



trum 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.

©2002 Motorola, Inc.

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 handoffs. 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 oper-ator. (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 reason-able glass area is usually quite good. However, it may be necessary to move closer to a window to ensure reliable opera-tion.

PCS System

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

© 2002 Motorola, Inc.

T720- CIRCUIT DESCRIPTION AND THEORY OF OPERATION

BASEBAND OR AUDIO LOGIC SECTION

The logic part consists of (1)MSM5100 (vs Wally in V.120C) which has an ARM7 microprocessor, Qualcomm DSP, CODEC, VOCODER and audio amplifiers integrated. Low voltage operation: Digital Core as low as 2.3V, I/O 2.3V to 3.0V, Analog 2.5V to 2.7V.

Basic Features Includes the Following:

CDMA Module- 1XMC,IS-95A,B IS-2000, Digital FM module, ARM7TDMI microprocessor, Vocoder (13kQCELP and EVRC), integrated CODEC, QDSP2000, R-UIM controller.

RF Interface: Digital Rx I/Q, Tx D/A

Peripherals and Interfaces: General purpose I/O(GPIO), UART(2), USB(enhanced), Keypad, Ringer, M/N conter, Housekeeping A/D, Microphone amplification, Speaker drivers, Analog “hands free kit” interface, LCD support, JTAG for debugging.

Clock Support: PLL for 19.2 Mhz(tri-mode) and 19.8Mhz(J-CDMA) TCXO frequencies, separate PLL for Code clock.

Audio Features: Echo cancellation for handset, head set and “hands free kit” applications, Audio AGC, Voice Recognition (2) Qualcomm PM1000 (vs CCAP in V.120C) is a very simple power management IC with no integrated CODEC or audio amplifiers, it has 8 LDO voltage regulators, it doesn’t have internal charge controller, instead it requires external regulated voltage and current for hardware controlled charging of Lithium Ion batteries. NiMH charging not supported. It doesn’t have a USB transceiver integrated, but instead uses an USB IC and requires an external 48Mhz PLL. Power on reset control circuit, vibrator, LCD backlight, keypad backlight, buzzer/ringer, and EL display drivers. Contains RTC, and 32Khz sleep oscillator.

- PM1000 doesn’t have CE bus multiplexers integrated, but instead uses an ASIC called Harness.
- LDO (Low Drop Out) Regulator Operating Voltages

Table 5:

Linear Regulator	Nominal Volt
VREG_MSMC	2.86V
VREG_MSMP	2.83V
VREG_MSMA	2.65V
VREG_IF	2.90V
VREG_SYNTH	2.90V
VREG_TCXO	2.75
VREG_RF_RX	2.90V
VREG_RF_TX	2.90V

© 2002 Motorola, Inc.

Semtech SC801 Charger Controller: Charging algorithm is controlled by this IC, it is more of a hardware control than software control. It also provides an overvoltage input (>6.5V), reverse current, and output short circuit protection.

T720 does not support no battery/dead battery operation with fast charger since current is limited to 1A by hardware.

Harness Asic: To take care of the multiplexing of CE bus lines.

Have the following features: 1. Parallel to Serial conversion 2. 16 additional dedicated GPIO and 8 optional GPIO 3. EPIT (Enhanced Programmable Interrupt Timer) CE bus multiplexing, to allow Qualcomm based radio to look like a CE bus compliant radio. One wire bus serial interface for battery EPROM.

- USB transceiver chip does the interface function of USB to CE bus
- 32 Mbit (4Mbyte -4Mx8 bits) Intel Sawtooth-Main software code
- 32 Mbit (4 Mbyte) Intel Sawtooth C3-Main software code & NVM, voice tags, phone book
- 16 Mbit(2 Mbyte) SRAM

RF SECTION

The RF side consists of 3 Qualcomm RF chipset solution: RFR3300, IFR3300/ and RFT3100.

- Dual band VCO/PLL module and Cellular and PCS PA's
- RFR3300 is a tri-band/quad mode
- RF to IF analog receive IC, it contains the programmable cellular LNA gain control for all three bands and four modes and the Mixer (down converter)
- RF to IF for all three bands and four modes.
- The IF frequency for all bands and mode is 183.6Mhz.
- Programmable 1xLO and ½ xLO frequency settings, Independent CDMA, AMPS FM, and GPS IF outputs.

IFR3300 is a IF to digital baseband converter. It features the following:

- Quad mode operatin:PCS-CDMA, Cellular-CDMA, AMPS FM, and GPS position location
- Quadrature down conversion from IF to analog baseband Low pass baseband I and Q filtering with mode specific performance characteristics
- 4 bit I and Q analog to digital converters with parallel outputs for CDMA and GPS
- 8 bit I and Q analog to digital converters with serial outputs for FM
- Rx slotted operation for very low power consumption in FM mode
- Clock generators for all operating modes
- VCO for generating the receivers IF to base band LO
- Operational modes compatible with MSM devices
- Three line serial bus interface for initialization and control
-

© 2002 Motorola, Inc.

RFT3100: Baseband to RF transmit processor, it features the following:

- Full upconversion form Analog Baseband to RF TX
- Integrated I/Q Modulator, IF VCO/ PLL, SSB Upconverter, VGA, and Driver amplifiers
- Designed for dual mode cellular (CDMA/AMPS), single band PCS, or dualband PCS (PCSCDMA/ AMPS) applications
- Eliminates Image-reject filter between upconverter and Driver amplifier
- Includes two Cellular and two PCS Driver Amplifier outputs, eliminating external switches
- MSM5100-controlled operation via Serial Bus Interface (SBI)
- Tx Power Control through 85 dB dynamic range VGA

VCO/PLL MODULE

This is a dual band replacing dual synthesizer, loop filter, and dual band VCO.

It features the following:

- Dual band VCO + Dual PLL module
- RF VCO frequency is 2105.28 to 2173.9 Mhz, output power is about –3 to 0 dBM
- 367.2 Mhz is Rx IF VCO frequency
- 1391.82 Mhz is GPS VCO frequency
- MSM5100-controlled operation via Serial Bus Interface (SBI)

REFERENCE OSCILLATOR

Provide reference frequency for the phone, Oscillates at 19.2 Mhz

POWER AMPLIFIERS (PA)

Two PA's module one for Cellular & 800 CDMA Band and PCS Band PA

No PA biasing

THEORY OF OPERATION

RECEIVER SECTION

The receiver section occupies a frequency band of 869 Mhz to 894 Mhz in cellular band and a frequency band of 1930Mhz to 1990Mhz in PCS band. Rf signal received from the antenna is applied to diplexer and then through duplexer to RFR3300. Inside the RFR3300 the first step is it goes through LNA, where it is amplified and then applied to BPF. Finally only necessary signals are sent to the down converter – the first mixer. At this time the down converter (first mixer) mixes the RF signal with Local Oscillator signal generated by the Dual band VCO/PLL module. The IF 183.6 Mhz in frequency (same for both the Cellular and PCS band) is derived from the mixing operation is applied to the IF band pass filter and only necessary signals are selected. The IF signal now enters the IFR IC.

First it is induced to AGC Amp inside the IFR3000/IFR3300 which is adjusted to PDM (pulse density modulation) signal by received signal strength level (RSSI). This AGC amplifier is adjusted to the size matching to the input sensitivity of IFR(analog baseband). The AGC dynamic range is approximately 90 dB.

The output of AGC is down converted at 2^{nd} mixer in order to obtain a baseband signal necessary for demodulation. For this purpose the 2^{nd} Local oscillator, VCO of 367.2 Mhz signal is produced which is divided in frequency by half to get 183.6Mhz second LO.

The Second IF signal is divided into I and Q signals within the baseband(Zero-IF) and then filtered through low pass filter and then get A/D conversion. This is then output from

© 2002 Motorola, Inc.

IFR IC to MSM for decoding etc.

TRANSMITTER SECTION

Digital signal is applied in 8 bit to RFT3100 IC, the MSM output I and Q signals one by one and each of these signals passes the digital LPF and is sent to the quadrature modulator. From complex signal within the baseband the quadrature modulator makes the real spectrum of double-side band having 228.6Mhz (263.6Mhz for PCS) having obtained by dividing VCO frequency 457.2Mhz (527.2 Mhz for PCS) into half as carrier(Tx IF).

MSM5100 count from the received signal strength level (Open loop power) and generates PDM signals according to TX_AGC level appropriate for the number of power control bit not inconsistent with the total sum of Eb/No defined by the base station(Close Loop Power Control) and the calculated base station power. The dynamic range is approximately 90 dB.

The Tx IF signal of 228.6Mhz (263.6Mhz for PCS) is up-converted to UHF signal. The signal converted into transmit frequency is filtered and finally amplified by the power amplifier (PA), which then pass through the isolator, duplexer and diplexer and transmitted to the antenna.

The transmitter section occupies a frequency band of 824 Mhz to 849 Mhz in cellular band and a frequency band of 1850Mhz to 1910Mhz in PCS band.

FREQUENCY SYNTHESIZER SECTION

The frequency synthesizer uses VC-TCXO-19.2Mhz as reference frequency. 19.2 Mhz is input to the frequency synthesizer as reference input of VCO/PLL MODULE IC and then divided to frequency appropriate for the channel spacing by the reference divider in the IC.
This IC generates LO signal for the conversion of Transmit/Receive carrier frequency. One is used LO signal to down convert at the 1^{st} mixer in the receiver and the other is used as local signal for transmitter up converting mixer. Inside the IC the prescaler and the variable divider divides the input frequency(feed back) according to the channel number and frequency and then the phase detector compares it with the reference frequency and any correction is communicated through the LPF to the VCO.

The digital data for the determination of channels for the frequency synthesizer is sent from the MSM and consists of SYNTH_CLK, SYNTH_DATA, and SYNTH_LATCH in serial interface.

© 2002 Motorola, Inc.

Table 6: FREQUENCIES

AMPS VCO	2105.28 to 2155.14 Mhz
CELLULAR CDMA VCO	2105.28 to 2155.14 Mhz
PCS CDMA VCO	2113.60 to 2173.60 Mhz
AMPS RX IF	183.6 Mhz
CELLULAR CDMA RX IF	183.6 Mhz
PCS CDMA RX IF	183.6 Mhz

RECEIVER AUDIO

Output from IFR 3000/3300 IC signals C_RX_Q(DATA0,DATA1,DATA2,DATA3) and C_RX_I(DATA2,DATA3), FM_RX_IDATA, FM_RX_QDATA these signals carries the baseband signal of the receive digital call to MSM5100.

The received QPSK data is gain controlled and converted to digital, the Rx data stream is then decoded by the CSP inside the MSM to produce a signal containing only the desired data.

The digital speech is further decoded by the QCELP vocoder a part of the DSP within MSM and then converted back into analog receive audio and routed to the speaker.

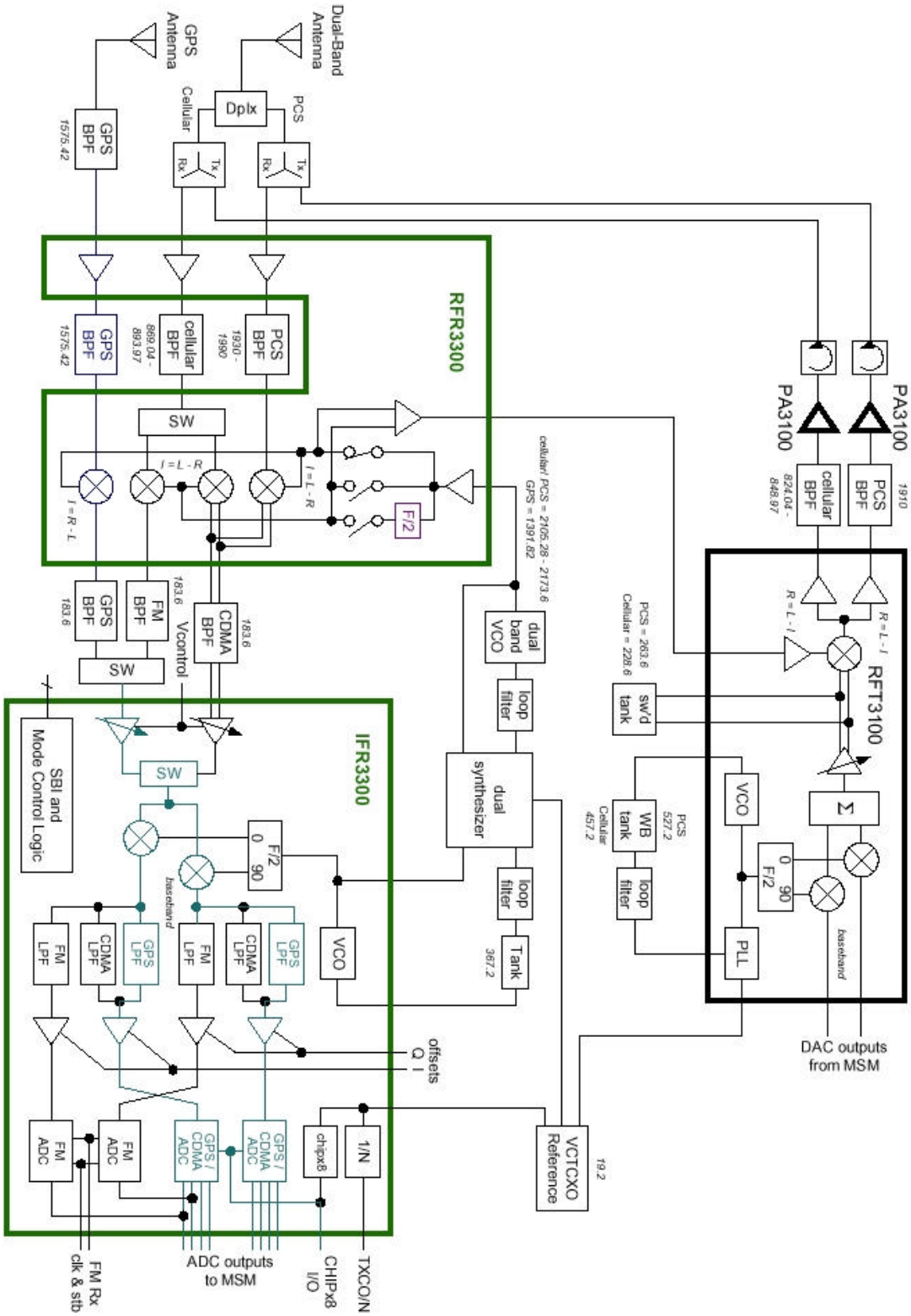
TRANSMITTER AUDIO

Audio from the Microphone is routed to the MSM5100 where it is digitized by the CODEC inside MSM and the DSP within processes by QCELP variable rate vocoder and then coded by the Modem (CSP) which produces CDMA data stream.

This stream is then converted to analog signals and send to RFT3100 IC on four lines TX_I, TX_Q, TX_IN and TX_QN. This modulates on the TX IF (QPSK Modulation) 228.6Mhz (263.6Mhz for PCS).

© 2002 Motorola, Inc.

RF SIDE BLOCK DIAGRAM



© 2002 Motorola, Inc.

This Page is intentionally left blank.

© 2002 Motorola, Inc.

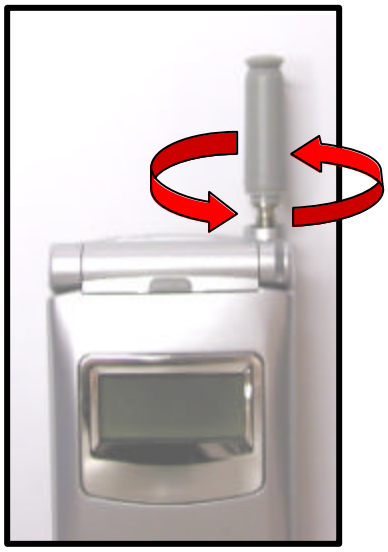
Disassembly

The procedures in this section provide instructions for the disassembly of a PF B85 telephone. Tools and equipment used for the phone are listed in Table 2, preceding.

Many of the integrated devices used in this equipment are vulnerable to damage from electrostatic discharge (ESD). Ensure adequate static protection is in place when handling, shipping, and servicing the internal components of this equipment.

Avoid stressing the plastic in any way to avoid damage to either the plastic or internal components.

Antenna Disassembly



1. Ensure the phone is turned off.
2. Grab the Bottom of the Antenna Assembly
3. Unscrew the Antenna from the Housings
4. Lift the Antenna and Antenna Bushing away from Housings

Disassembly

Battery Door Disassembly

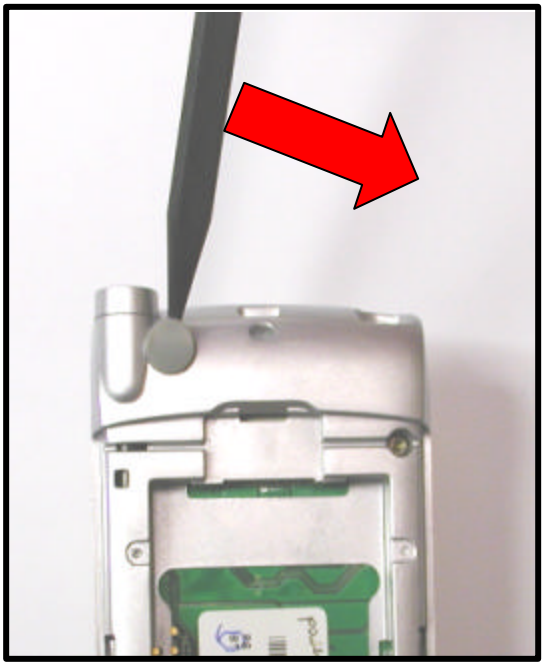
1. Push down the Battery Door Latch
2. Gently lift the Battery Door away from the Rear Housing

Battery Disassembly

1. Remove the Battery Door as described in the Procedures.
2. Slide the Battery in the direction of the Arrow
3. Lift the Top end of the Battery near the Antenna up and out of the Battery Compartment as shown.

Disassembly

RF Grommet Disassembly

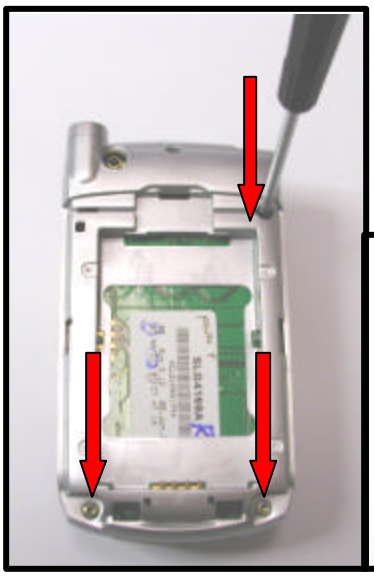


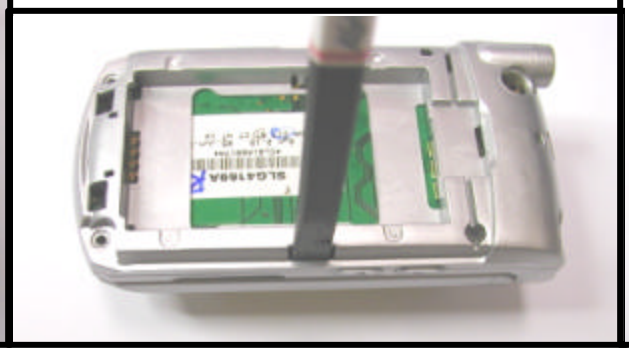
1. Use the Pointed end of the Plastic Disassembly Tool.
2. Put the Tool at the Top of the RF Grommet and pull up.

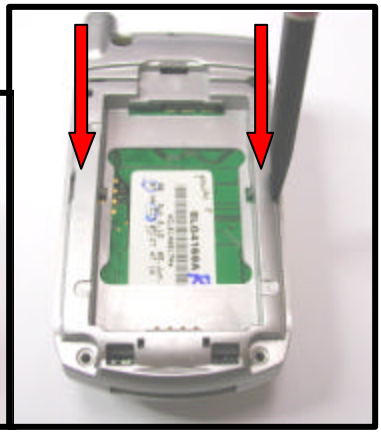
Disassembly

Rear Housing Disassembly (1)

1. Using a T-Driver with a T-7 bit, remove the 3 screws from the Rear Housing
2. There are the Snap Fits on both side of the Rear Housing. Pry them with the bezel stick and release both Snap Fits as shown in the picture below.



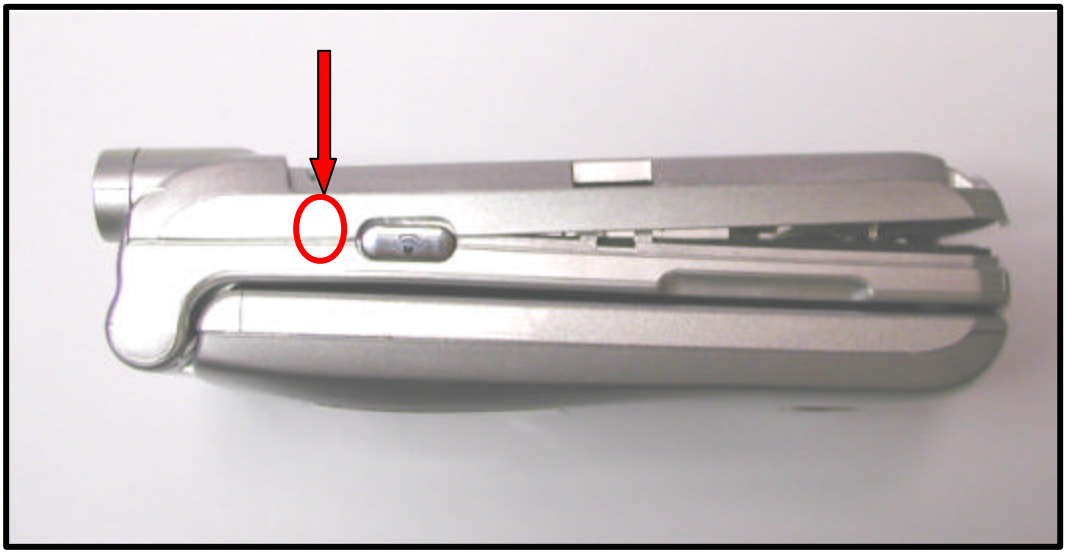




Disassembly

Rear Housing Disassembly (2)

1. After releasing the Snap fits, the bottom portion of the Rear housing can be disassembled.
2. Use the bezel stick, push the Top Portion of the side button , to release the Top Snap Fit.



Disassembly

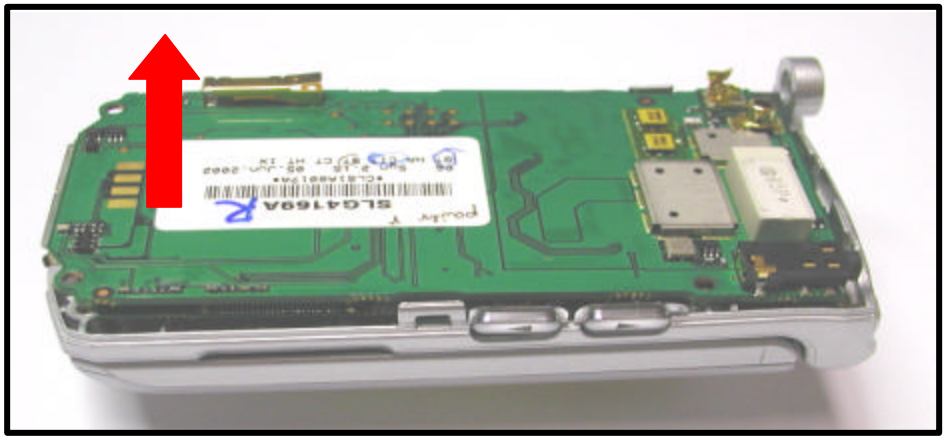
Rear Housing Disassembly (3)

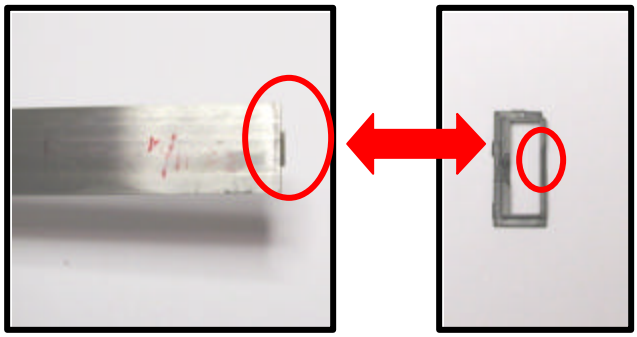
1. After releasing the Top Snap fit, the Rear Housing is unlocked at the Top Snap fit.
2. Pulling up the phone from the Bottom of the Phone to the Top .

Disassembly

Engine PCB Disassembly (1)

1. Pull up the Bottom side of the PCB Assembly
2. Use the Disassembly Tool . Put the Edge into the Hole of “Board to Board Spacer ”

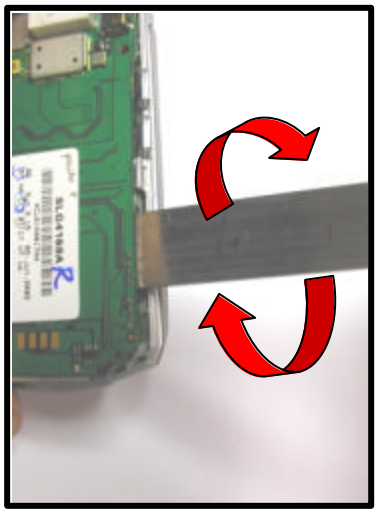


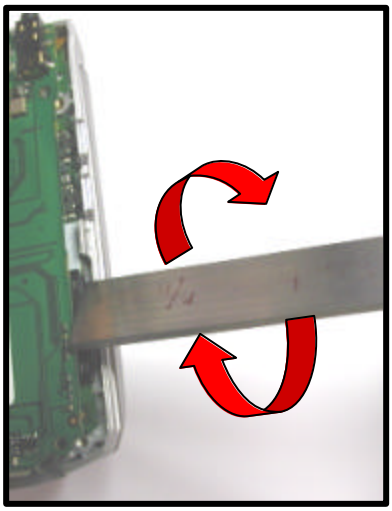


Disassembly

Engine PCB Disassembly (2)

1. Use the Disassembly Tool . Put the Edge into the Hole of "Board to Board Spacer "
2. Twist the Disassembly Tool, putting the Tool into Hole of the "Board to Board Spacer"

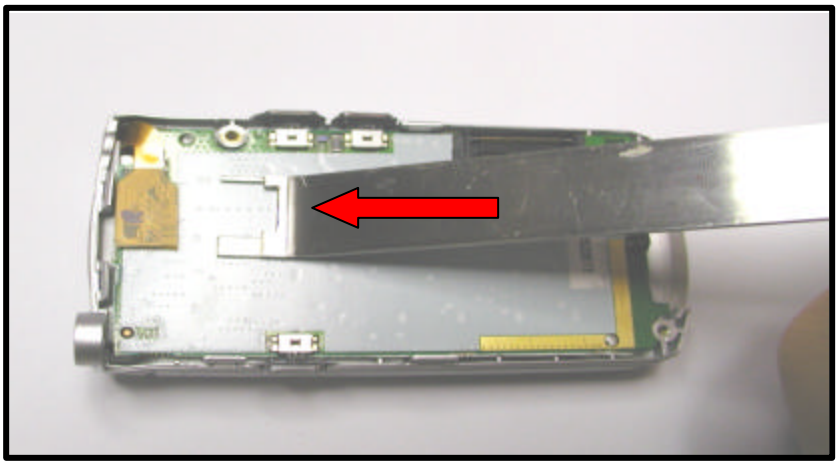


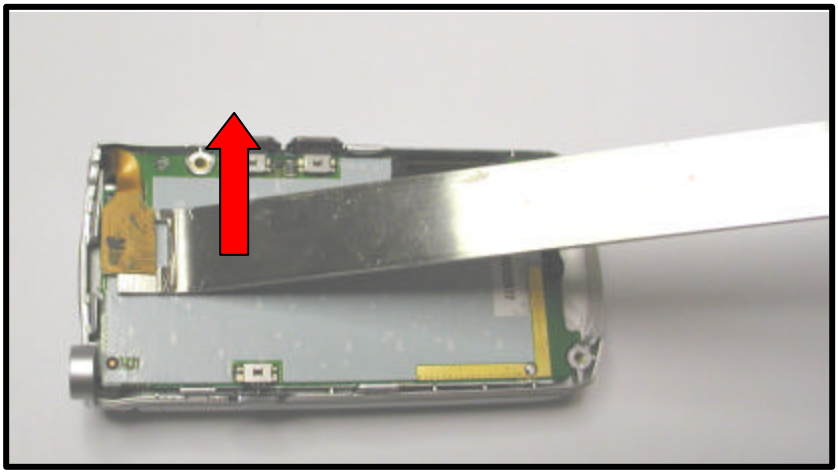


Disassembly

Personality PCB Disassembly

1. Use the Disassembly Tool
2. Slide the other Edge of the Disassembly Tool into the Flex Cable Connector
3. Pull up the Flex Cable Connector.

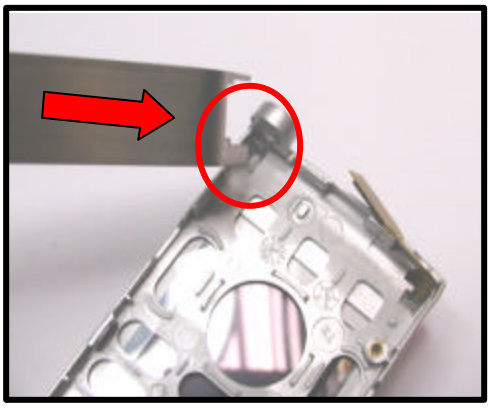




Disassembly

Alert Lens Disassembly

1. Use the Disassembly Tool
2. Put the Tool into the Hinge Area of the Base Front Housing
3. Push the Alert Lens to the Bottom



Flip Assembly Parts Disassembly (1)

1. Use the “Flip Disassembly Tool”
2. Put the “Assembly with Base Front Housing and Flip Assembly Part” onto the Flip Disassembly Tool.
3. Open the Flip Assembly .

Disassembly

Flip Assembly Parts Disassembly (2)

1. Push Down (Twist) the Grip
2. Pull up the Flip Assembly

Flip Cover Disassembly

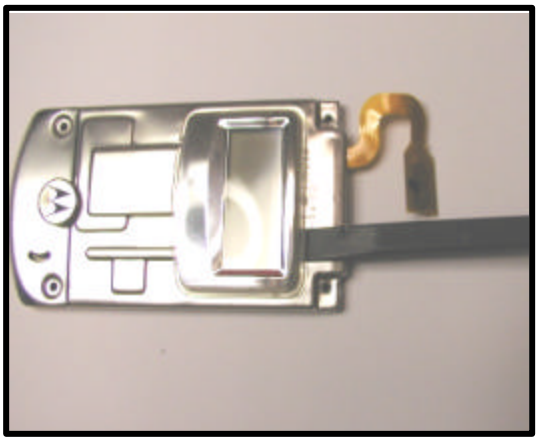
1. Put thumb into the Hole between Flip Cover and Flip Main Housing.
2. Pull up the Flip Cover .

Disassembly

LCD Module , Main Lens and CLI Lens Disassembly

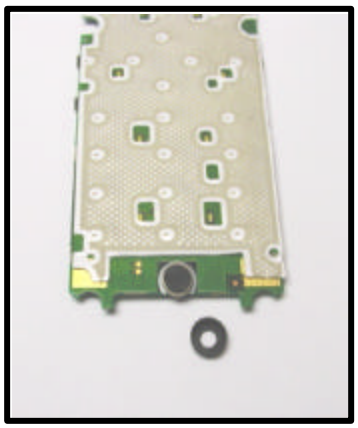
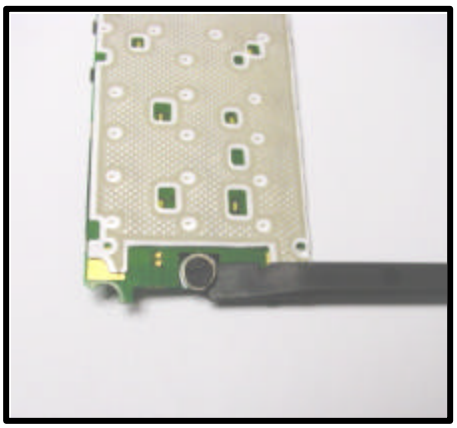
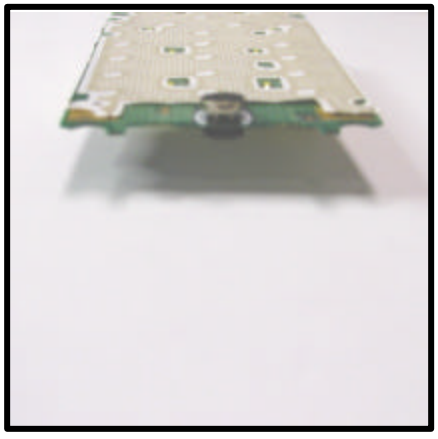
1. Using a T-Driver with a T-7 bit, remove the 4 screws from the LCD Module and then disassemble LCD Module from Flip Main Housing.
2. Using your thumb , apply firm even pressure to the top inside area of the display lens to separate it from the Flip Main Housing.
3. Using bezel stick pull up the CLI Lens from Top Area , following the Picture.





MIC and MIC Boot Disassembly

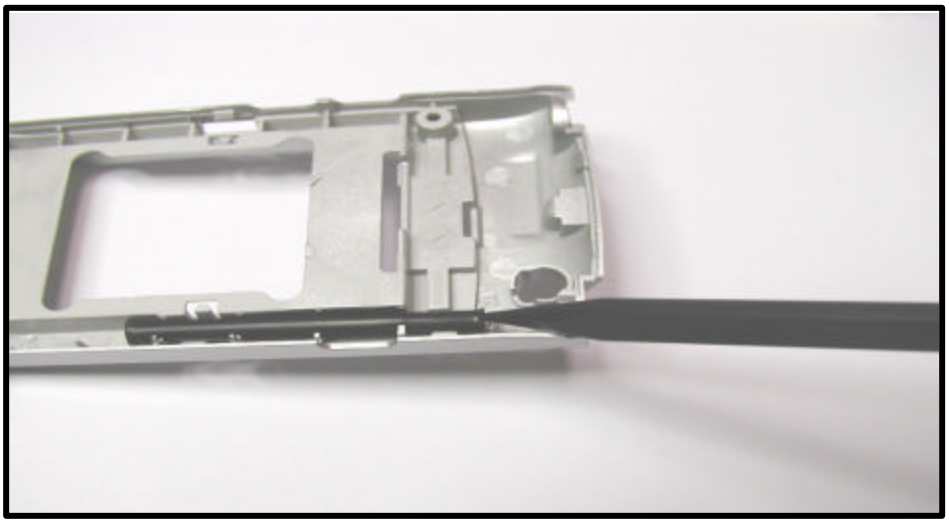
1. First, Pull off the MIC Boot .
2. Using bezel stick , put it under the MIC , following the Picture.
3. Using thumb, pull up the MIC from Personality PCB

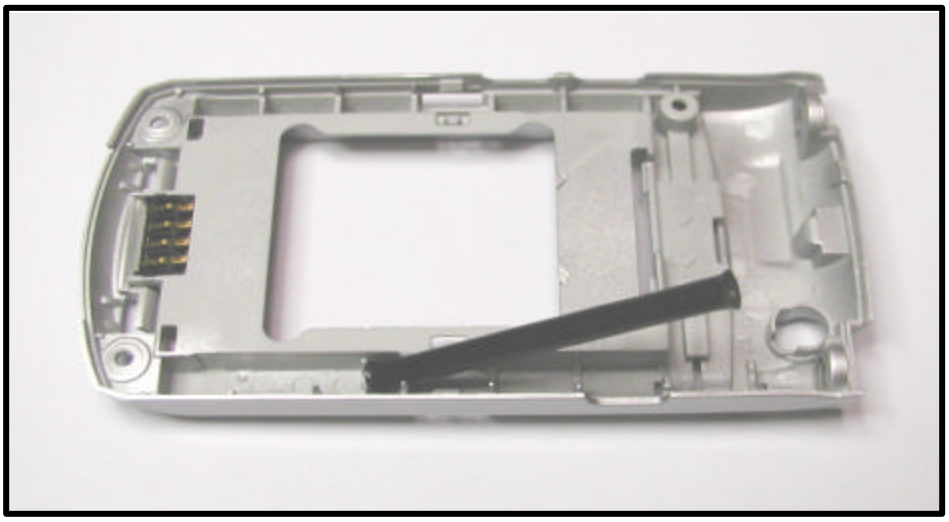




Disassembly

Antenna Tube Disassembly

1. Using bezel Stick , put the stick at the Top Hole of the Antenna Tube to pull up.
2. Disassembling the Antenna Tube from Rear Housing.

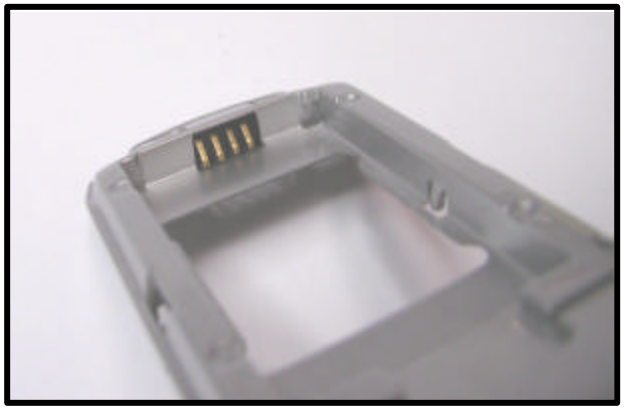


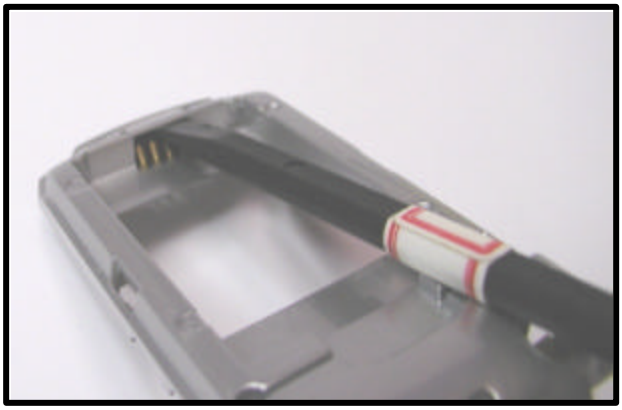


Disassembly

Battery Contact Disassembly

1. Using the bezel Stick, put it on the Top of the Battery Contact.
2. Push down the Battery Contact , follow the Picture.





Disassembly

Rubber Bumper Assembly

1. Insert the Rubber Bumper on the Front side of the Base Front Housing
2. Using a Tool, which has “Long Nose” ,draw the Legs of the Bumper .
3. Using the Cutting Tool, cut the Legs of the Bumper on the Inside of the Front Housing.

This Page is intentionally left blank.

© 2002 Motorola, Inc.

T720 PRODUCT SUPPORT TOOLS

FLASHING/FLEXING/NAM PROGRAMMING

T720 is a Qualcomm chipset based and it uses the 17 pin CE Bus Connector which uses the RS232 & USB communication protocols. The following are the hardware and software requirements:

1. Personal computer with
2. PST 4.5 or latest Motorola test interface adapter box (junior board) -
3. SYN8400A Interface adapter power supply –
4. SPN4029A or Wall charger
5. SPN4278D CE Bus cable
6. SKN6304B Serial & USB cable same as used for v.120 P2K

About Junior board operation:

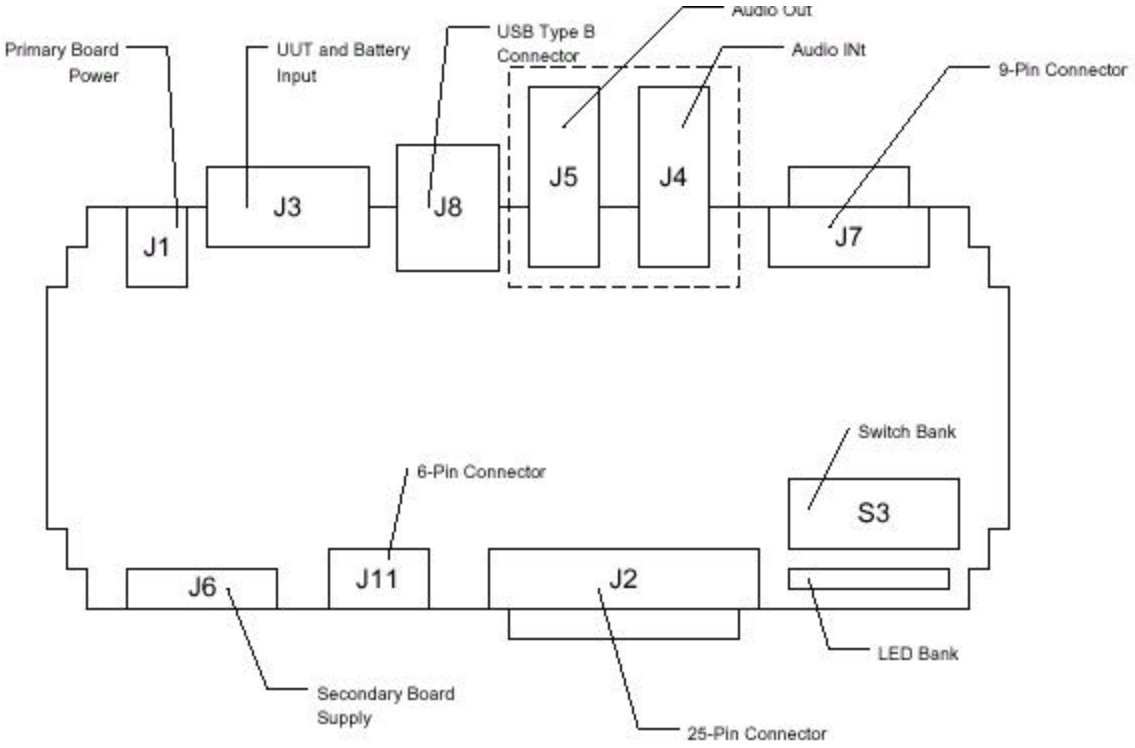
T720 will support both USB & Serial communication. However at this time of release only serial communication is functional. 120X uses the V2260 Rf Cable adaptor part # 288792Ok01 which is used for all Rf Phasing and testing.

Junior Board Switch Positions

MODE Selection	1	2	3	4	5	6	7	8
V120x	Up	Up	Up	Up	Down	Up	Up	Up

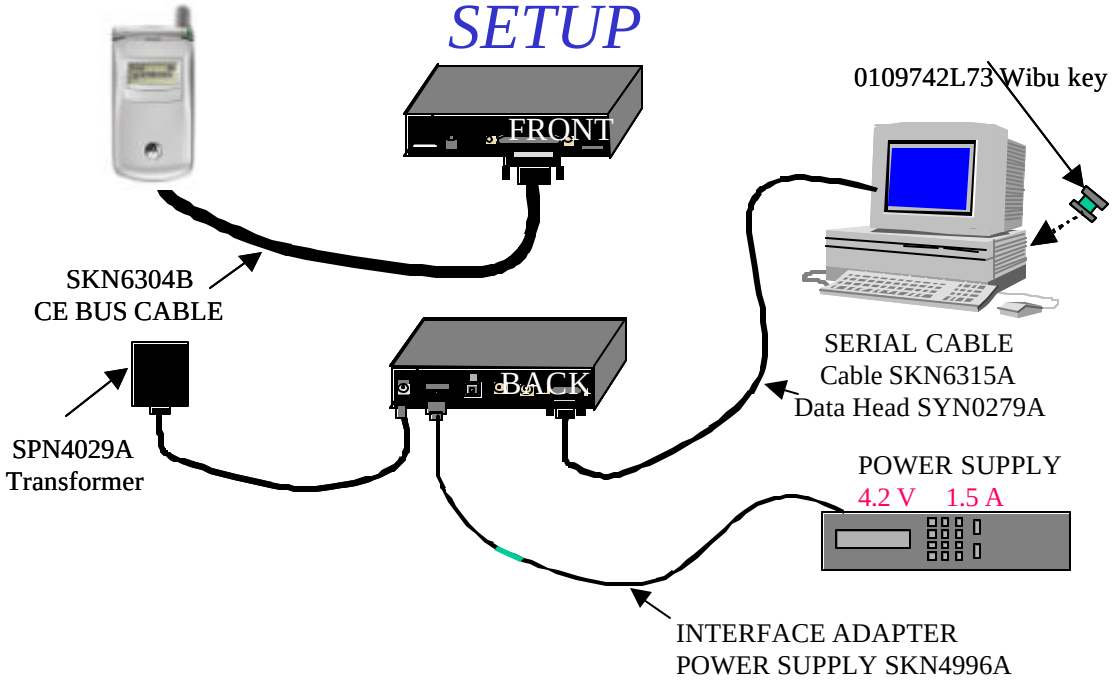
© 2002 Motorola, Inc.

SYN8400A – JUNIOR BOARD



JUNIOR BOX

SETUP

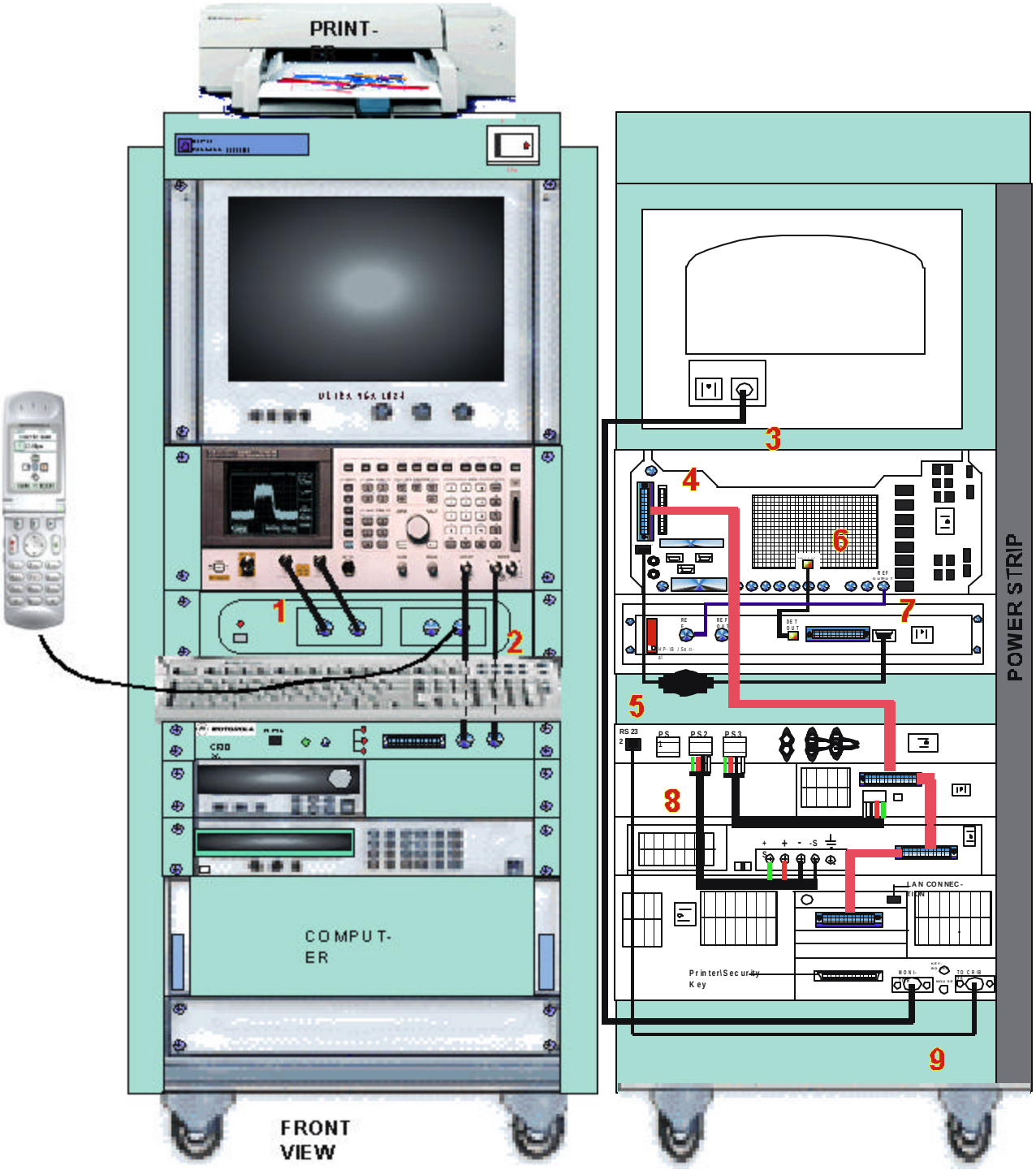


© 2002 Motorola, Inc.

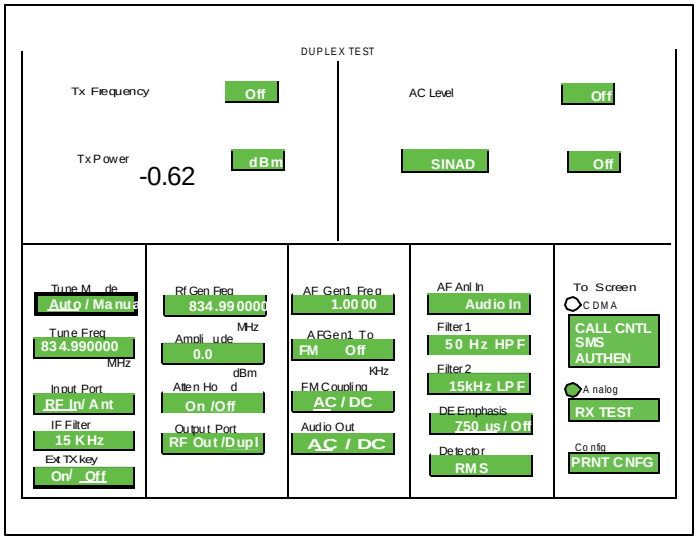
m

TEST AND PHASING

Gate 24 supports the testing and phasing of T720 product, For more details on Test and Phasing contact Service Test Engineering Group.



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

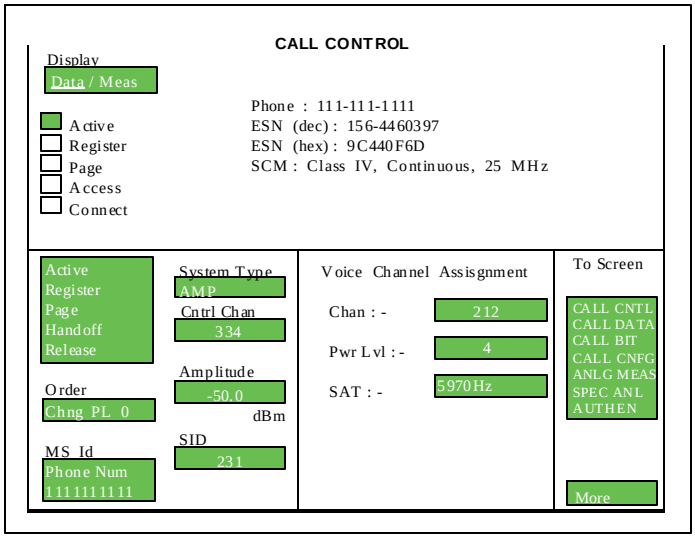
Bad cable: More than -.8 dBm

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.

Motorola Confidential Proprietary

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

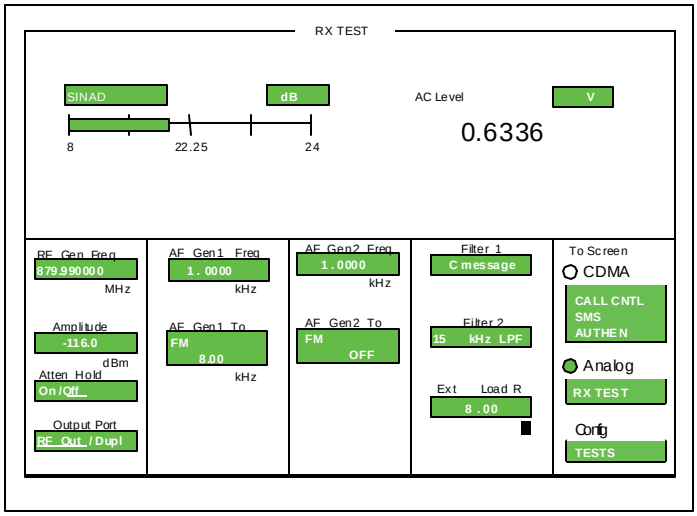
1 Dial the desired phone number on the mobile station and press SEND.

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.

Motorola Confidential Proprietary

RX Sensitivity Test (SINAD)



Communications Analyzer Setup:

- Select **RX** button from the Analog Screen Control panel
- Set **RX frequency** to **880.05 MHz**
- Set **Amplitude** to **-116 dBm**
- 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)
- Set **AF Filter 1** set to **C message filtering**
- Set **AF Filter 2** to **15 kHz**

Test Mode Commands:

Using RadioComm software

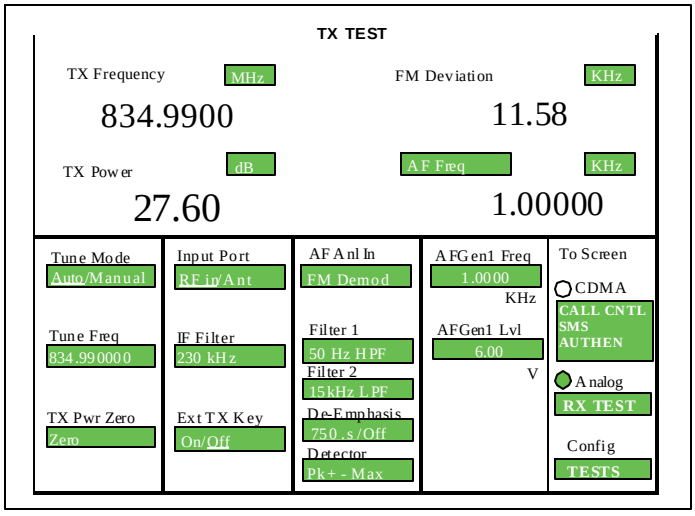
- Suspend Radio
- Load synthesizer to channel 350
- Unmute receiver audio path
- Turn on compander
- Set volume control to level 4
- Set RX audio path to Ext. path

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.

Motorola Confidential Proprietary

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

- 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

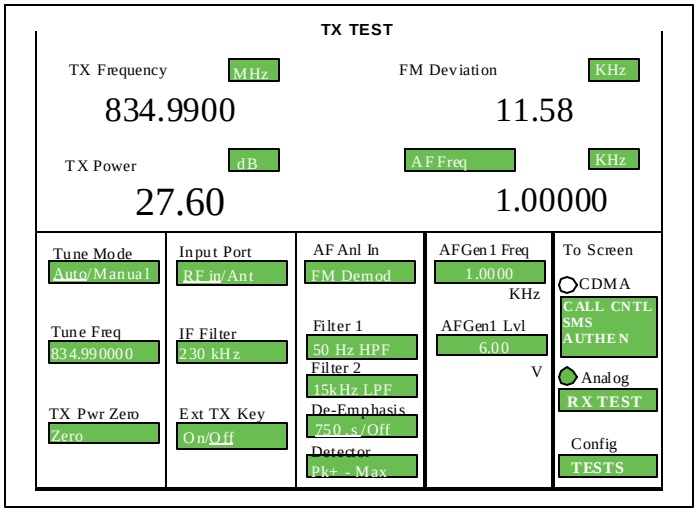
The TX Power Out specification for each portable power level is as follows:

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.

Motorola Confidential Proprietary

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:

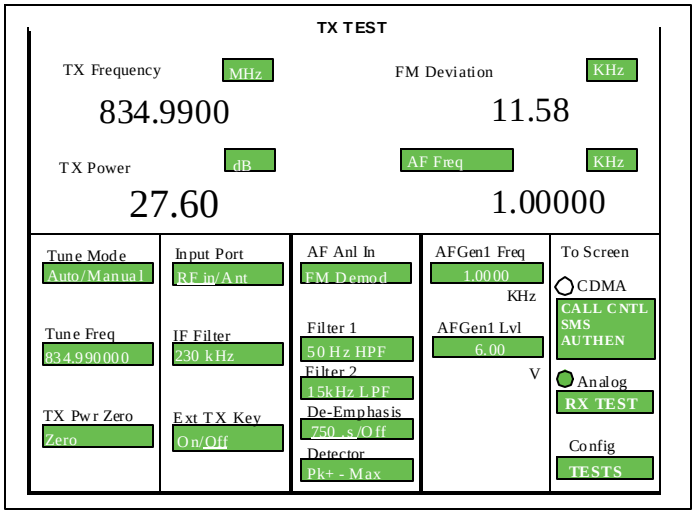
Using RadioComm software

- 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.

Motorola Confidential Proprietary

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 MHzz**
- 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

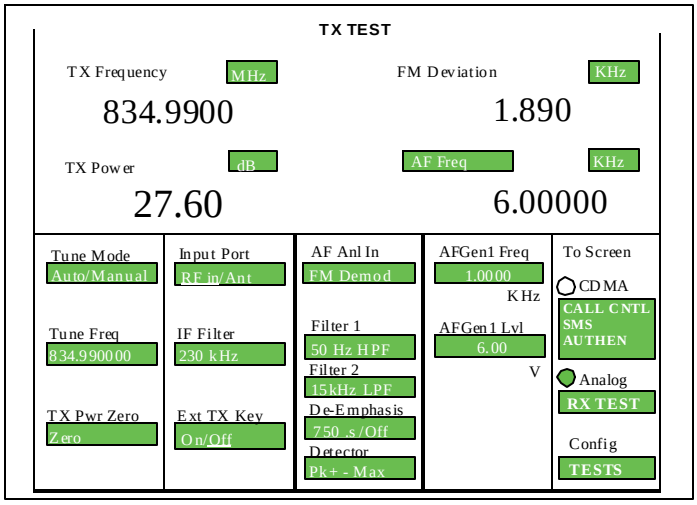
- Suspend Radio
- Load synthesizer to channel 350
- Set power level to power step 2,
- Turn on Carrier
- Select External TX audio path
- Unmute TX Audio path
- Turn on compandor

View FM Deviation for reading.

TX Maximum Deviation Pass Specifications: 9.8 kHz - 12 kHz

Motorola Confidential Proprietary

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

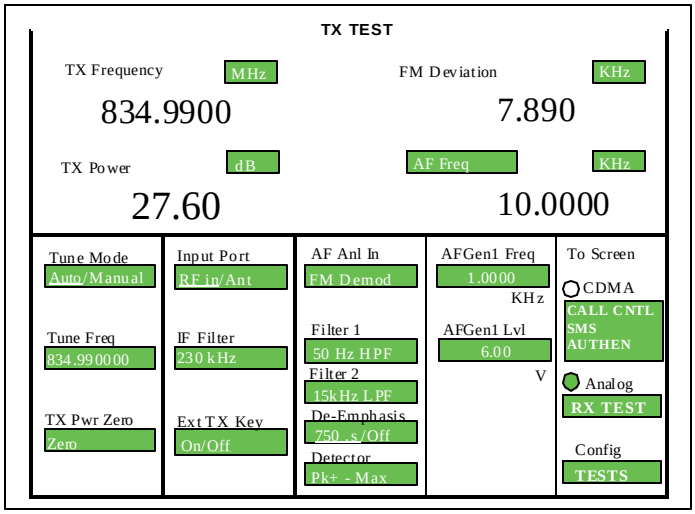
- Suspend Radio
- Load synthesizer to channel 350
- Set power level to power step 2,
- Turn on Carrier
- Enable 6000 Hz SAT tone

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

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

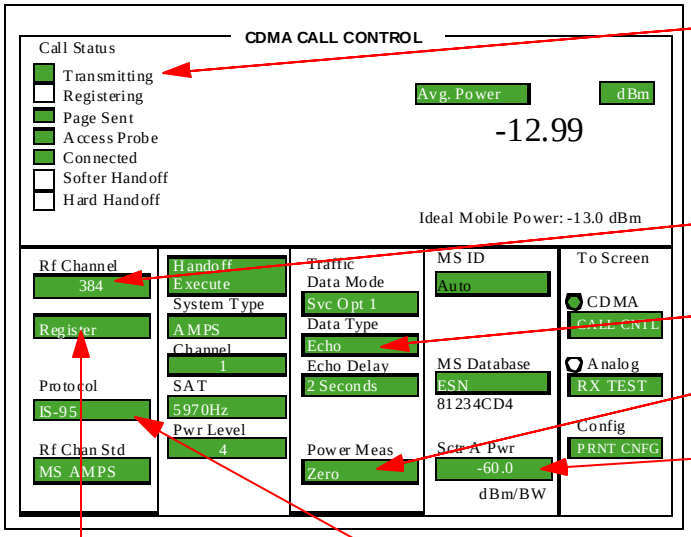
View FM Deviation for reading.

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.

Motorola Confidential Proprietary

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

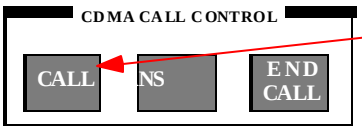
Select Protocol

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.

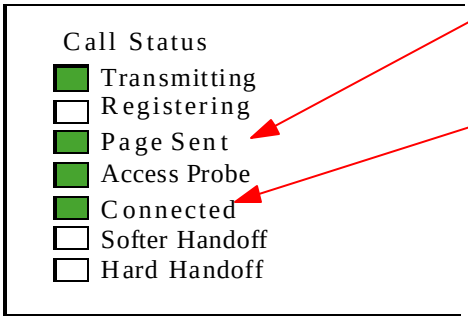
Motorola ConÞdential Proprietary

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.



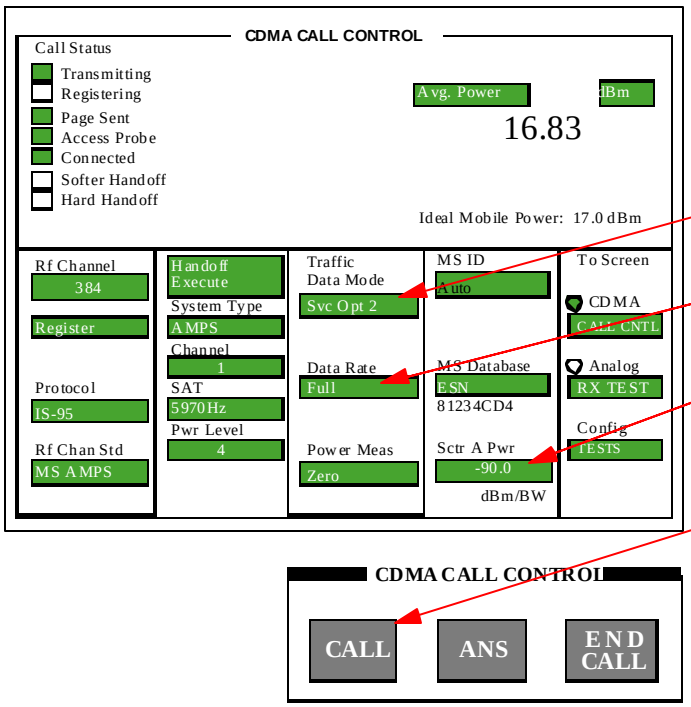
Each light activates as the call processing proceeds.

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.

Motorola Confidential Proprietary

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.

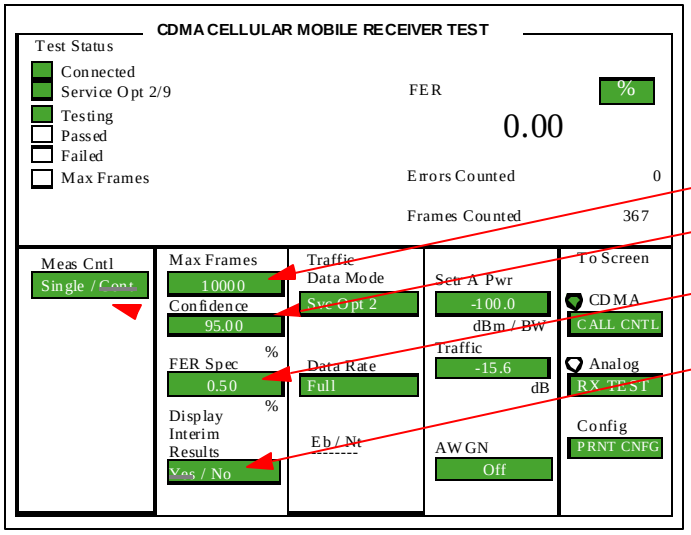
5.Set Sector A's power to -90 dBm/1.23 MHz (this value may need some adjustment for varying cable losses - some phones with their associate fixtures may require higher levels due to path losses to make a phone call).

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.

Motorola Confidential Proprietary

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

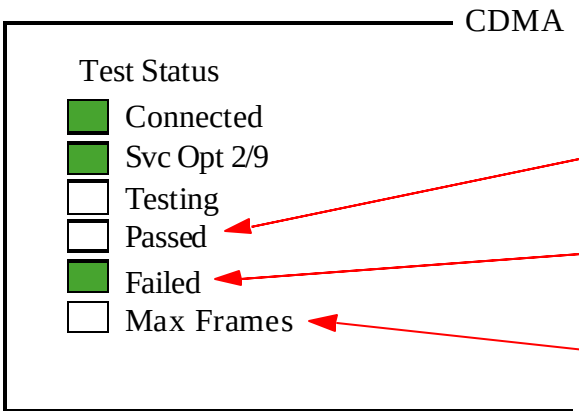
- Place the cursor at the “Cont” feld under Meas Cntl
- Push the Knob

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.

Motorola Confdential Proprietary

Receiver Test Termination



There are 3 possible outcomes to an FER Test:

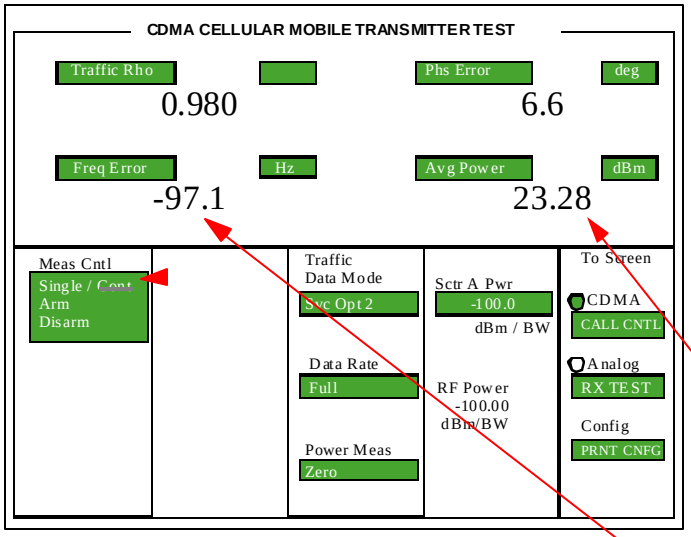
- **Passed:** this means that the measured FER meets the target FER speciÞcation with the speciÞed conÞdence.
- **Failed:** this means that the measured FER does not meet the target FER specification with the speciÞed conÞdence.
- **Max Frames:** this means that the test was indeterminate in that the 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.

Motorola Confdential Proprietary

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

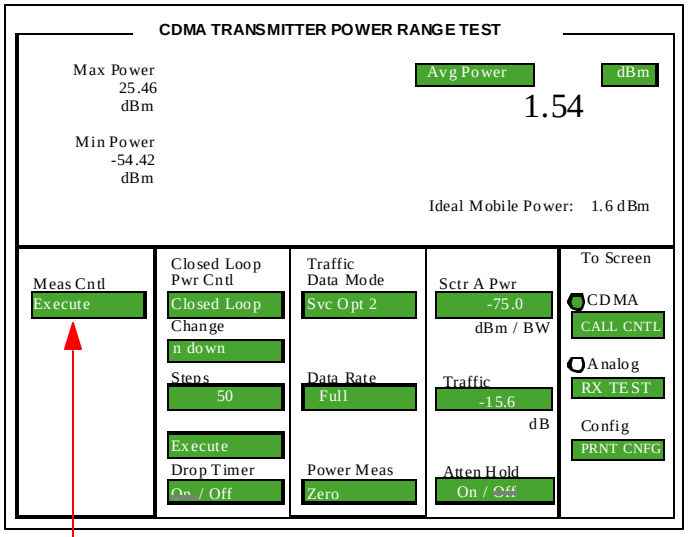
Simultaneous and transmitter tests is another feature of the HP 8924C. Simultaneous measurements results in much reduced test time. To make simultaneous receiver sensitivity and transmitter measurements:

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.

Motorola Confdential Proprietary

CDMA Transmitter Power Range Test



Select Execute

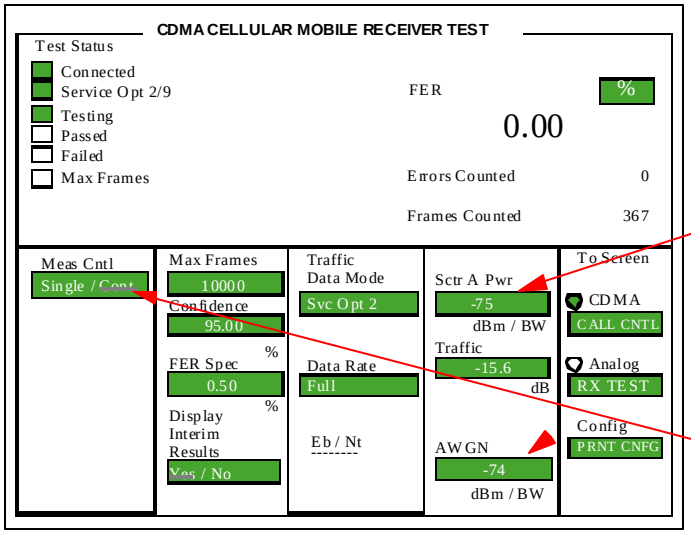
The ability to do min/max power measurements just by selecting Execute is another advanced feature of the HP 8924C. In this screen you can also control and test each power step while comparing Ideal Mobile Power to actual Avg Power measurements.

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 Contin-uous 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.

Motorola Confdential Proprietary

Tri-Mode (BAM) Program Label1 X+

T-Option/ Spec No:	SVN4519DE 8288397M02

1.0	Software Version	2100.03.28.05_flash.shx

PRI Version	2
Date	February 20, 2002

2.0	Flex File	CS4VRZ01T1NA2F.hs
	Flex Model #	

3.0	PRL - NAM1	VerizonAC_TM_50024.rla	Version	50024
	PRL - NAM2	VerizonAC_TM_50024.rla	Version	50024

4.0	# of NAMS	2
	NAM	V120C_nam_VZW_BAM_V141

LOC	DESCRIPTION	VALUE
	NAM 1 Field and Contents	
1	AMPS: Home System ID (SID)	02004
2	Option Byte 1 (Scan Home Side = 1 in 6th pos L to R)	10000100
	Mobile Identification Number	0000000XXXX
3	Mobile Directory Number (Phone Number)	0000000XXXX
4	Station Class Mark (SCM); 0-255 decimal	234
5	Access Overload Code (Equals the last digit of the MIN)	0X
6	Six Digit Security Code (6 decimal digits)	000000
7	Lock Code (4 decimal digits)	1234 See note In Sec 10
8	Service Level (1 decimal digit)	4
9	Option byte 2	00000000
10	Option byte 3	01000000
11	AMPS: Initial Paging Channel	0334
12	AMPS: First Dedicated Control Channel System A	0333
13	AMPS: First Dedicated Control Channel System B	0334
14	AMPS: Number of channels to scan	0021
15	Option Byte 4	00100000
16	Option Byte 5 (Voice Privacy = 1 in 5th pos L to R)	00101111
17	CDMA Slot Cycle Index (0-7)	1
18	CDMA Home system ID (SID 1) (must be 5 decimal digits)	02004
19	CDMA Network ID (NID 1) (must be 5 decimal digits)	65535
20	Mobile Country Code (MCC)	000
	IMSI 12 and IMSI 11	00
	System Mode (0-5) (1 decimal digit)	5
21	CDMA Primary Channel System A (up to 4 decimal digits)	0283
22	CDMA Primary Channel System B (up to 4 decimal digits)	0384
23	CDMA Secondary Channel System A (up to 4 decimal digits)	0691
24	CDMA Secondary Channel System B (up to 4 decimal digits)	0777
25	CDMA Home system ID (SID 2) (up to 5 decimal digits)	02004
26	CDMA Network ID (NID 2) (up to 5 decimal digits)	65535
	NAM 2 Field and Contents	
27	AMPS: Home System ID (SID)	02004
28	Option Byte 1 (Scan Home Side = 1 in 6th pos L to R)	10000100

5.0 User Selectable Settings

Personal Banner		
Personal Banner		
Car / HeadSet	**On**	**Off**
Auto Answer		X
Auto Handsfree	X	
Answer Options	**On**	**Off**
Multiple Key Answer		X
Open to Answer	NA	

Alerts			
Alerts (0 - 4)	0		
Initial Set Up	**On**	**Off**	
Auto Redial		X	
Display Language	English		
DTMF (0-2)	1		
Time Format (0,1)	0		
Date Format (0-2)	0		
Scroll	Wrap Around		

6.0 Browser Set Up

Dial Up Number (QNC)	#777
Cofirm at Start	OFF
Cache Start up (ON-OFF)	ON
Custom Splash Screen	No
Number of Profiles (1-4)	4

Item	Profile 1	Profile 2	Pro
Profile Name	VZW		
Profile Editable YES/NO	No	Yes	Ye
Home URL			
Primary IP Address	199.74.153.210	000.000.000.000	000.000
Primary Port Number	9203	9203	92
Secondary IP Address			
Secondary Port Number			
Linger Timeout	30 Sec.		

7.0	Wake Up Banner	Verizon

8.0	VoCoder	EVRC

9.0 Carrier def. Phone #s

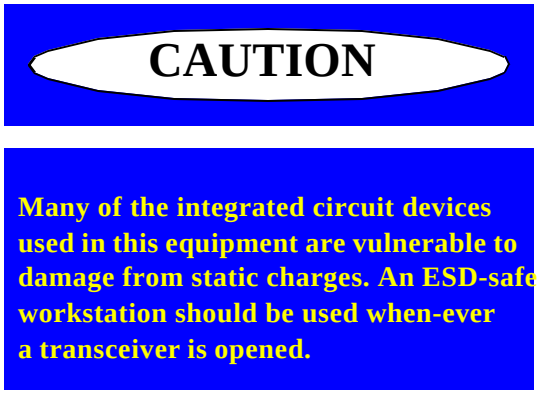
Emergency Number 1	*911

© 2002 Motorola, Inc.

Troubleshooting

Introduction

Known good replacement parts and assemblies should be available to be used for trou-bleshooting by substitution, and for replacement of defective parts/assemblies. Defective circuit boards should be forwarded to the appropriate Motorola service facility for repair. Refer to the “Replacement Parts” section of this manual for a list of replacement part descriptions and part numbers.



Troubleshooting and Repair

Refer to the disassembly instructions located in the “Disassembly” section of this manual for instructions on removing parts/assemblies.

Testing after Repair

After any repair work has been carried out, the unit should be thoroughly tested to ensure that it operates correctly. This is especially important if the Logic / RF assembly is replaced.

For general repairs which do not include replacing the Logic/RF assembly, simply placing a call and checking signal strength, and transmit and receive audio quality is normally sufficient.

When the Logic/RF assembly is replaced, the unit must have a comprehensive test on a CDMA cellular/PCS compatible communications analyzers. See “Testing” for further details. Placing a call on air is usually carried out at this stage to complete the testing procedure.

(Note: The field test guide will also provide you with additional information and help you in investigating a problem.

© 2002 Motorola, Inc.

TROUBLESHOOTING

The goal in trouble shooting is to quickly narrow down the possibilities to isolate a failure to a single faulty component. This is especially important before deciding to replace a large IC, filter or any component that is difficulty or risky to replace. Sometimes the problem will be visually obvious. For example: a cold solder joint, cracked chip, tombstone parts etc., other times it will be necessary to take some measurements.

NO TURN ON – DEBUG PROCEDURE

- Visual check – look for any damaged parts, unsolder, Cold solder or missing parts
- Checking for short circuits – apply 4.4V power supply with a 1A current limit through the external connector. If the phone draws more than 0.5A, check all the regulators signals for short to ground
- Check for the power B+ at C2102 or C2103, if no B+ present replace U3800
- Place a zero ohm resistor at R2006
- Check the regulated output voltages

•.if the voltages on the regulators are not correct

Table 7:

Linear Regulator	Nominal Voltage	Location to check
VREG_MSMP	2.83V	C2017
VREG_MSMC	2.86V	C2022
VREG_MSMA	2.65V	C2018
VREG_IF	2.90V	C2021
VREG_TCXO	2.75V	C2019

reflow or replace U2000

- Check the RTC clock Y2000: check the clock for 32.768 Khz signal if not present check C2009,C2010, C2011 and C2023, then replace Y2000
- Check the 19.2 Mhz clock signal at C2008 if not present replace U350

Remember to remove R2006 – zero ohm resistor after the trouble shooting process.

Internal Charger Test Debugging

Phone must be in Phone T mode to analyze charger.
In DMSS mode, the default state of the charger is off unless a valid charger (fast or mid rate) and battery (EPROM and Thermistor present) are detected by software.

Charging circuitry (except for PM1000) is next to battery contact block and not under any shields.

When charger is disabled, the EXT_B+ current should be ~150mA +/- 50mA. Otherwise battery charge test current limits will be exceeded. This failure may not be caused by the charger circuit.

When charger is enabled (using set DVT Option command) with 3.6V battery connected, EXT_B+ current should be at 1A for high current test, and ~370 for mid rate current test. If not, verify that EXT_B+ is >4.4V at CEBUS connector and battery voltage is 3.6V at the battery contact block.

When charger is enabled, battery charge current will be 1A – EXT_B+_Current for high rate, and 370mA – EXT_B+_Current for mid rate current settings.

When charger is enabled, voltage on R2101 (side connected to U2101) should be at 1.5V. This voltage is proportional to the EXT_B+ current and is calculated by (EXT_B+_CURRENT/ CURRENT_LIMIT) * 1.5 where current limit is either 1A or 0.370A.

© 2002 Motorola, Inc.

RECEIVER TROUBLESHOOTING

- No Service
  - Make sure phone has service programming and has phasing data stored. This can be verifie QPST.
  - Check for Rx IF VCO (367.2MHz) to be on frequency. Measure Rx IF VCO control voltage. I be between 1 and 2 volts.
  - Check for RF signals after each of the filters, and major functional blocks.
  - Check for RF at Antenna -> Diplexor -> Duplexor -> LNA -> RF Interstage Filter -> Mixer -:
  - Check LO frequency is locked and is present at the input of the mixer (RFR3300).
  - Check supplies to each functional block. Receiver runs off 2.75V.

TRANSMITTER TROUBLESHOOTING

Check for I and Q going into RFT3100.

Check for LO input into RFT3100. Level should be about –15dBm.

Check for Tx IF VCO Frequency and control voltage.

Tx IF VCO frequency is 457.2MHz for 800MHz CDMA and AMPS, and 527.2MHz for PCS CDMA.

Control voltage at 457.2MHz is about 1volt, and 2volts at 527.2MHz.

Check for Tx IF (near the Tx IF Filter)
Tx IF is 228.6MHz for 800 MHz CDMA & AMPS

Tx IF is 263.6MHz for 1900 MHz CDMA
Check for Tx RF at RF filter input and at PA input.

© 2002 Motorola, Inc.

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) Transceiver 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)Transceiver Board Debugging Follow the no turn on Debug procedure.	1. Remove the Transceiver 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. Replace the antenna with a known good antenna. 2. Check for loose or damaged cans.

© 2002 Motorola, Inc.

Symptom	Probable Cause	Verification and Remedy
3. Display is erratic, or provides partial or nodisplay.	a) Defective display module. b) RF/Audio-Logic board defective.	1. Disassemble the display and reassemble to check the connection. If it does not recover, check the transceiver board. 2. Check connection. If connection not at fault, proceed to b. Replace the RF/Audio-Logic Board
4. Alert ringer volume is distorted or too low.	a) Alert defective. b) RF/Audio-Logic board defective.	1. Replace the defective alert with a known good alert. 2. Replace the RF/Audio-Logic Board
5. Transmit audio is weak, distorted, or dead.	a) Microphone defective. b) RF/Audio-Logic board defective.	1. Replace defective microphone. 2. Replace the RF/Audio-Logic Board
6. Receive audio is weak and/or distorted.	a) Speaker defective. b) RF/Audio-Logic board defective.	1. Replace defective speaker. 2. Replace the RF/Audio-Logic Board

© 2002 Motorola, Inc.

This page is intentionally left blank.

© 2002 Motorola, Inc.

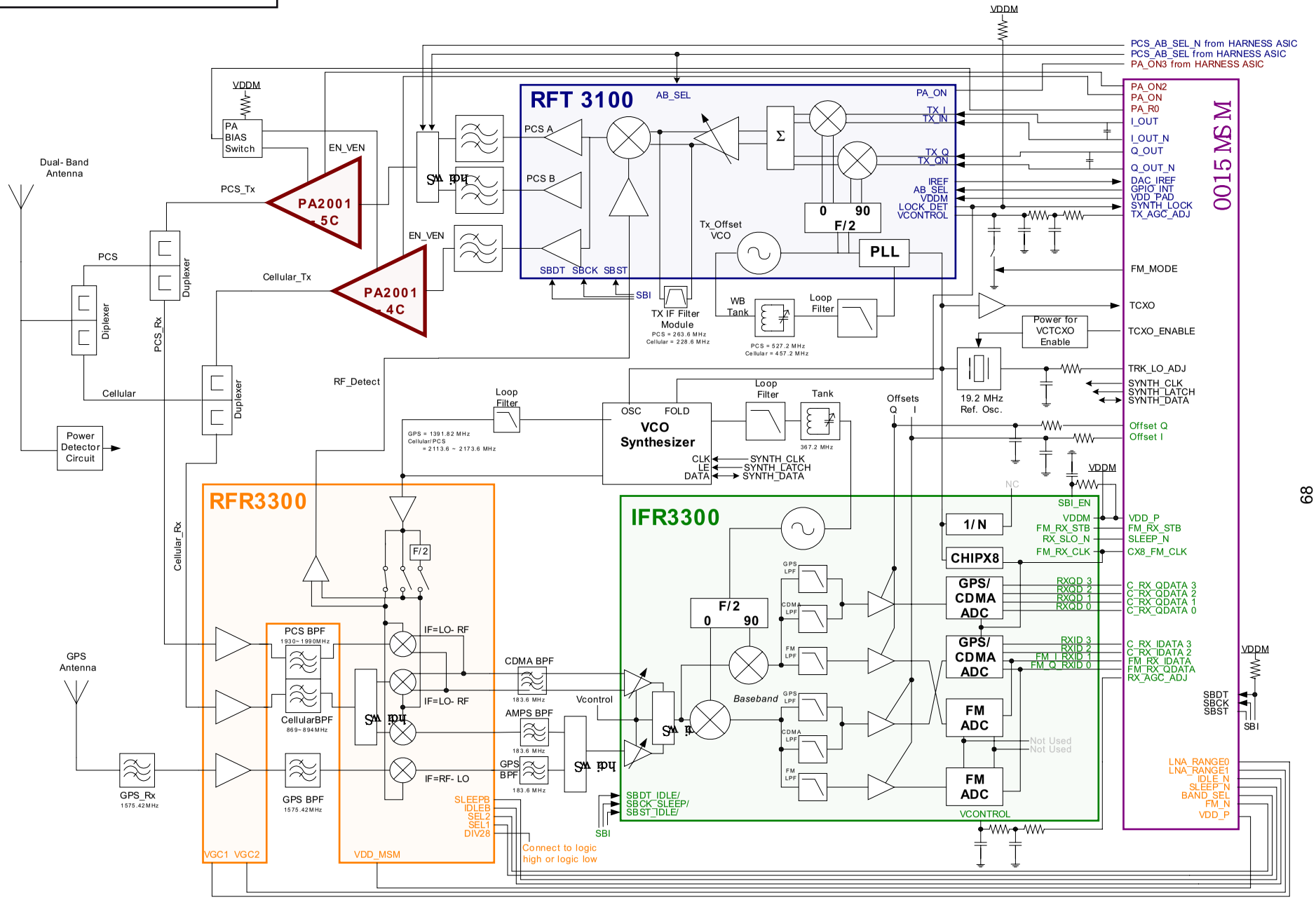
T720 TROUBLESHOOTING

This document is propriety of MOTOROLA and it should be return if not used .
Distribution and copies of this document are not allowed with out MOTOROLA approval.

MOTOROLA CONFIDENTIAL PROPRIETARY

BLOCK DIAG:A02

Radio System



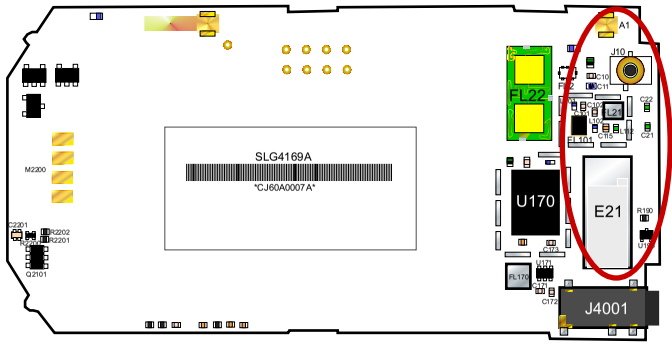
This document is propriety of MOTOROLA and it should be return if not used .
Distribution and copies of this document are not allowed with out MOTOROLA approval.

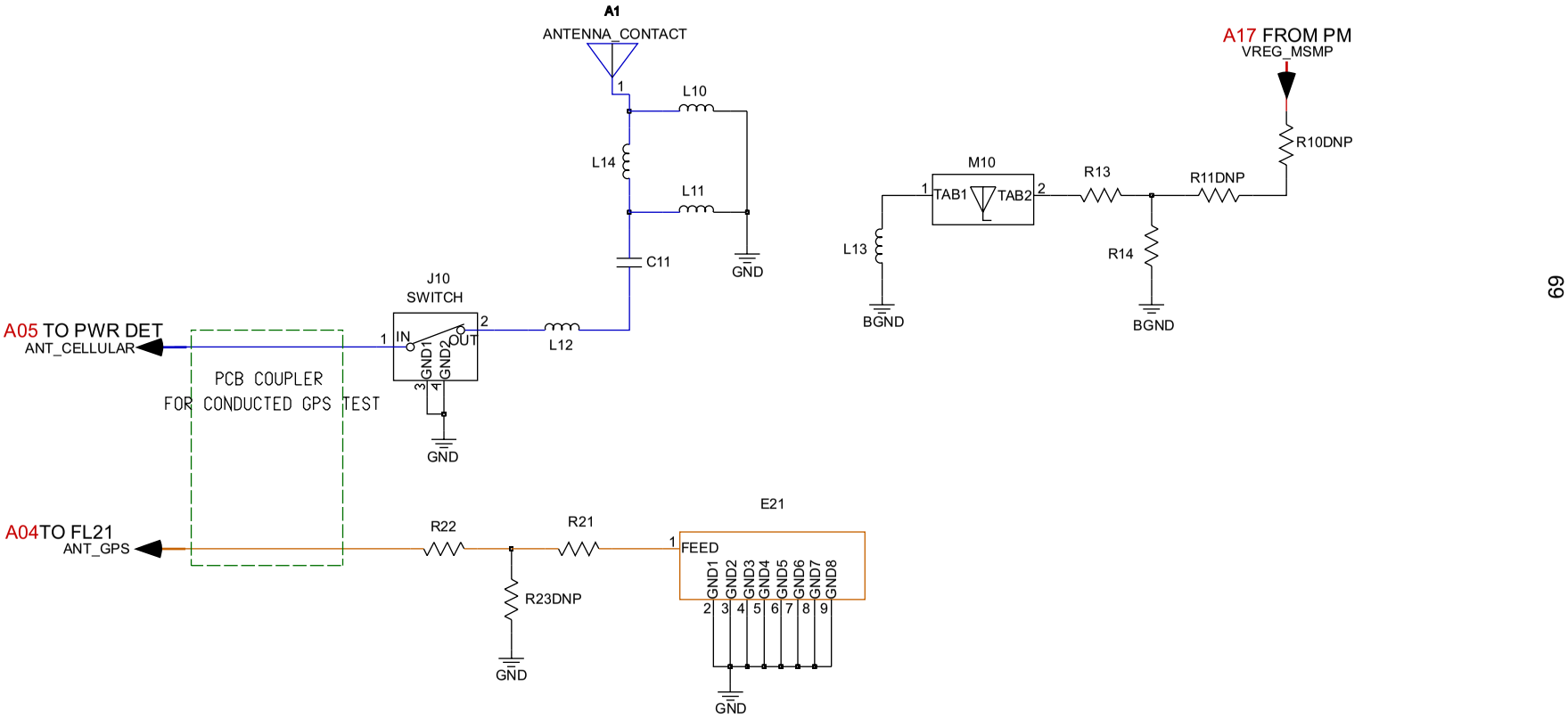
MOTOROLA CONFIDENTIAL PROPRIETARY

BOARD - P6.0

ANTENNA:A03

ANTENNA
REF 10-20



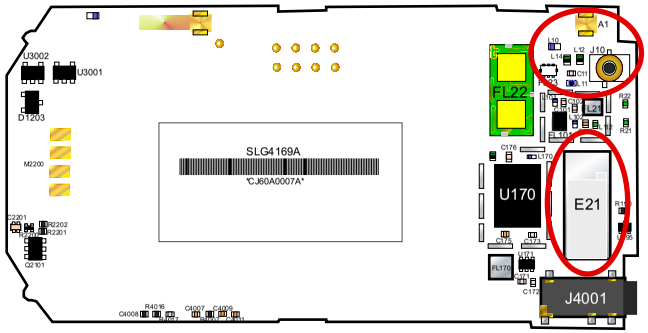


This document is propriety of MOTOROLA and it should be return if not used .
Distribution and copies of this document are not allowed with out MOTOROLA approval.

MOTOROLA CONFIDENTIAL PROPRIETARY

BOARD - P6.0

Antenna:



RX

PCS
Channel 650 (1962.5)
Amplitudel -30dbm

CDMA
Channel 350 (880.5)
Amplitudel -50dbm

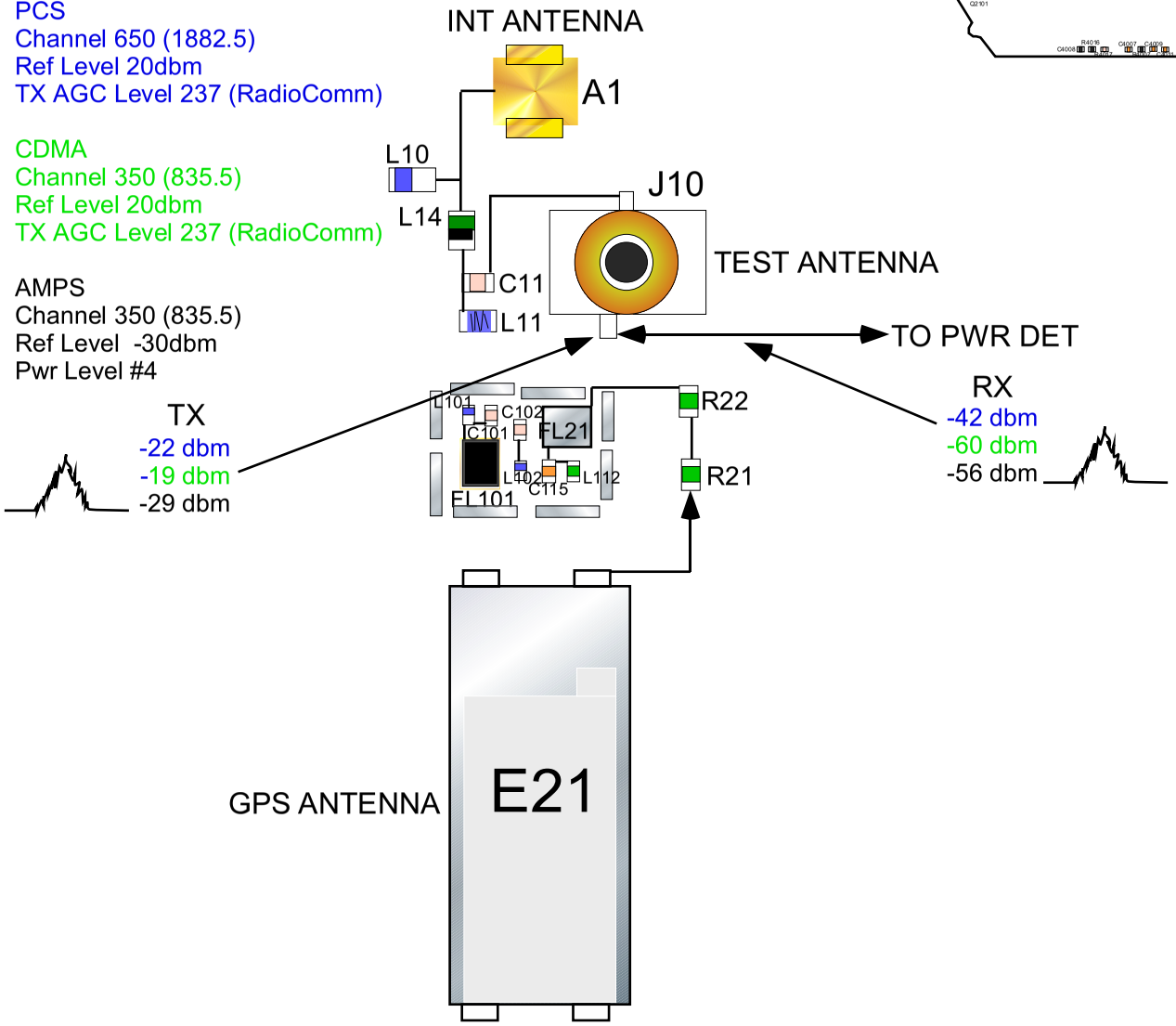
AMPS
Channel 350 (880.5)
Amplitude -50dbm

TX

PCS
Channel 650 (1882.5)
Ref Level 20dbm
TX AGC Level 237 (RadioComm)

CDMA
Channel 350 (835.5)
Ref Level 20dbm
TX AGC Level 237 (RadioComm)

AMPS
Channel 350 (835.5)
Ref Level -30dbm
Pwr Level #4



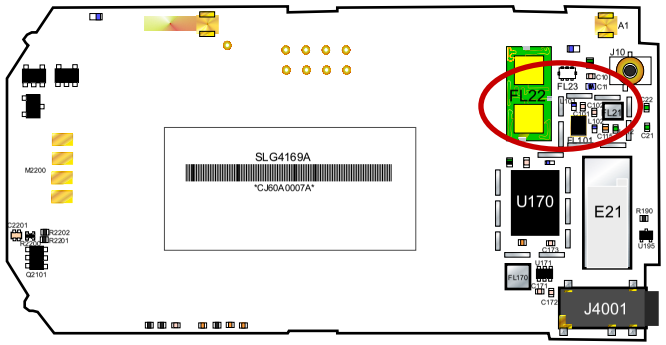
This document is propriety of MOTOROLA and it should be return if not used .
Distribution and copies of this document are not allowed with out MOTOROLA approval.

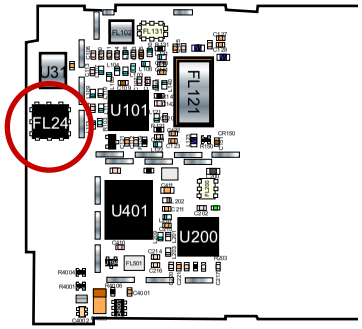
MOTOROLA CONFIDENTIAL PROPRIETARY

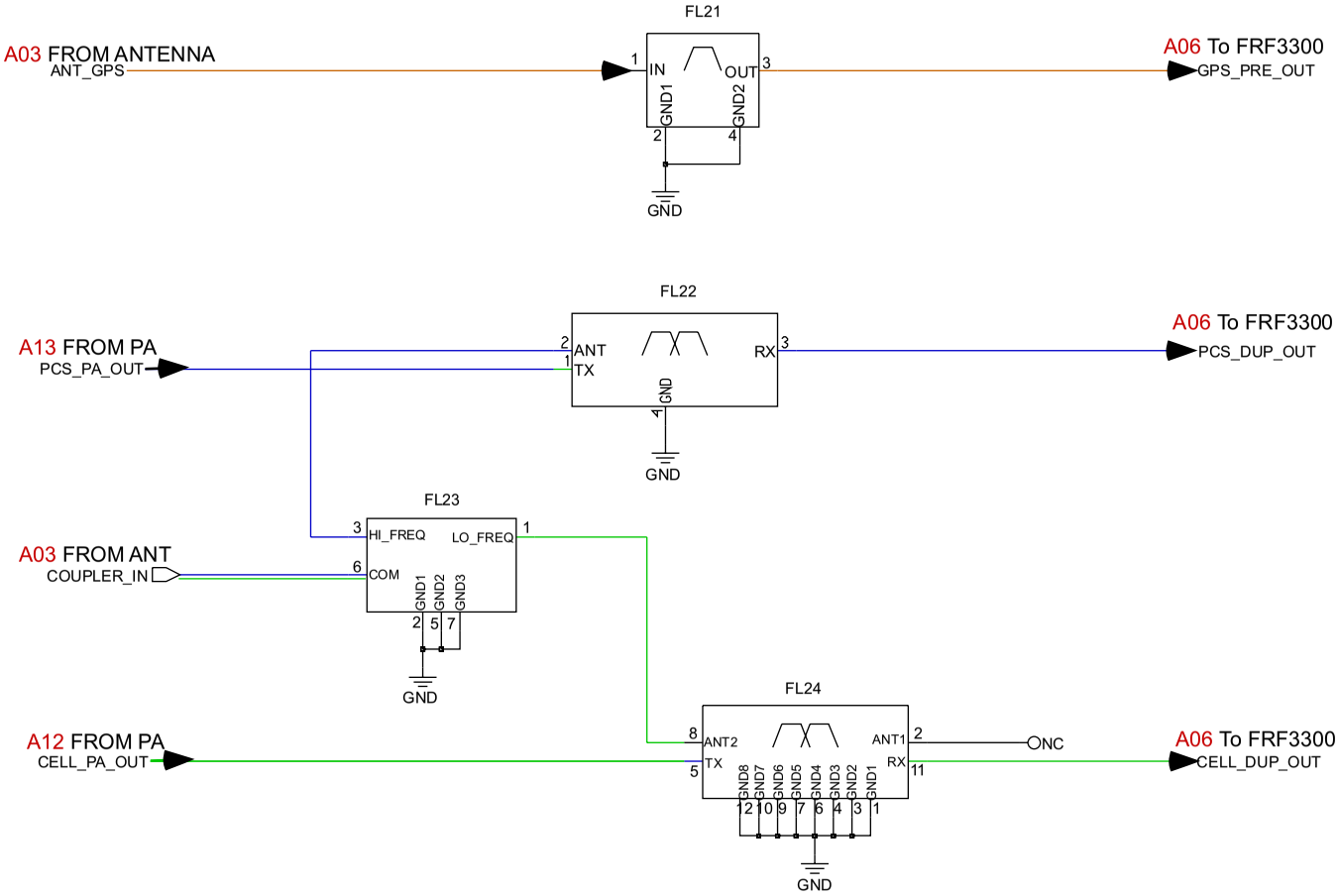
BOARD - P6.0

DUPLEXER:A04

DUPLEXERS
REF 21-30







71

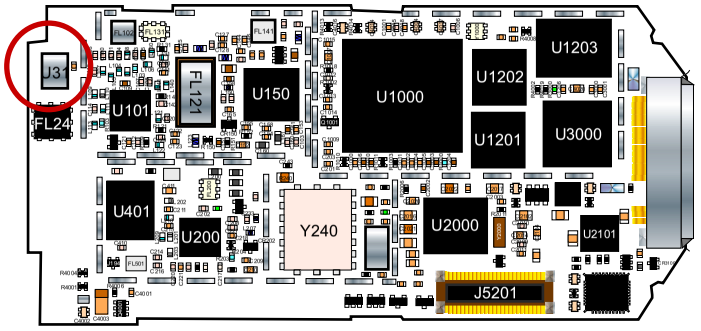
This document is propriety of MOTOROLA and it should be return if not used .
Distribution and copies of this document are not allowed with out MOTOROLA approval.

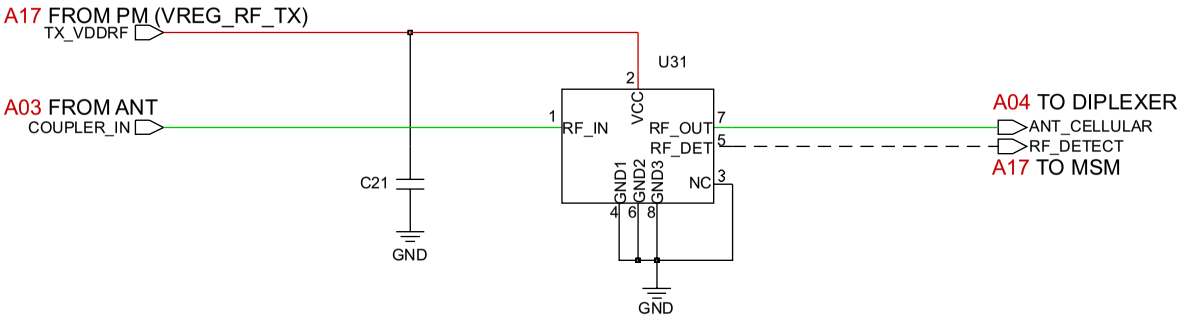
MOTOROLA CONFIDENTIAL PROPRIETARY

BOARD - P6.0

POWER DETECT:A05

PWR_DETECT
REF 31-32



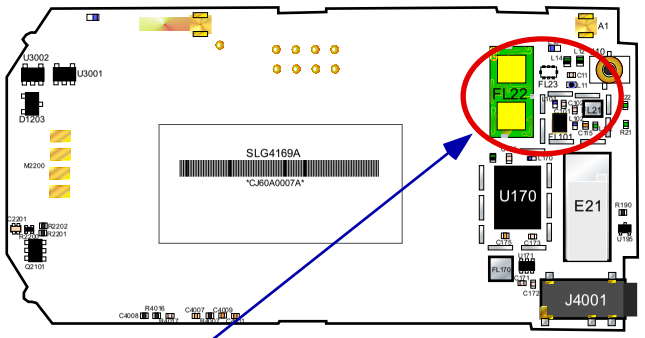


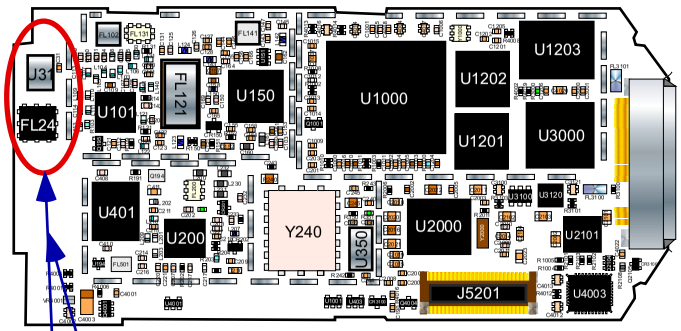
This document is propriety of MOTOROLA and it should be return if not used .
Distribution and copies of this document are not allowed with out MOTOROLA approval.

MOTOROLA CONFIDENTIAL PROPRIETARY

BOARD - P6.0

Duplexer & Power Det





TO DIPLEXER

FROM PWR DET

TO FRF3300

PCS RX

RX
--43 dbm
--63 dbm
--50 dbm

RX
--67 dbm
--65 dbm

POWER DET

FROM ANT

U31

C31

TX_VDDRF
2.8V

TO MSM

RF_DET

CELL & CDMA RX

TO FRF3300

CELL & CDMA DUPLEXER

DIPLEXER

FL23

TX
-24 dbm

PCS DUPLEXER

FL22

FL24

FROM DIPLEXER

73

L101
C102
C101
FL21
L102
C115
L112
FL101

FROM CDMA & CELL PA

TX
-17 dbm
-29 dbm

FROM PCS PA

FROM GPS ANT

RX

PCS
Channel 650 (1962.5)
Amplitude -30dbm

CDMA
Channel 350 (880.5)
Amplitude -50dbm

AMPS
Channel 350 (880.5)
Amplitude -50dbm

TX

PCS
Channel 650 (1882.5)
Ref Level 20dbm
TX AGC Level 237 (RadioComm)

CDMA
Channel 350 (835.5)
Ref Level 20dbm
TX AGC Level 237 (RadioComm)

AMPS
Channel 350 (835.5)
Ref Level -30dbm
Pwr Level #4

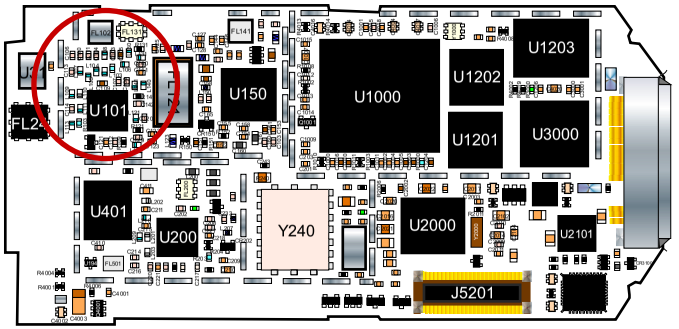
This document is propriety of MOTOROLA and it should be return if not used .
Distribution and copies of this document are not allowed with out MOTOROLA approval.

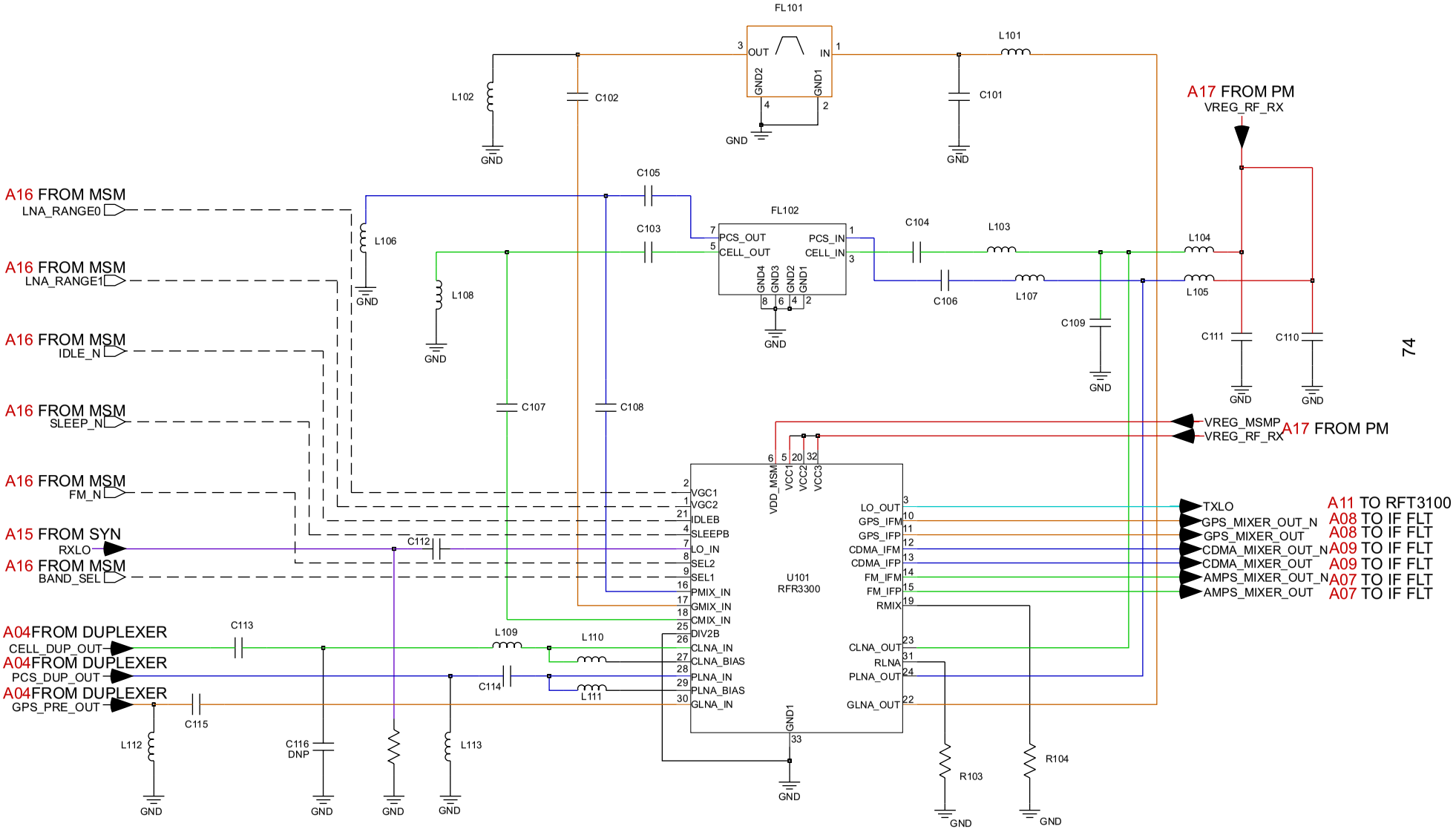
MOTOROLA CONFIDENTIAL PROPRIETARY

BOARD - P6.0

RFR3300:A06

RFR3300
REF 101-119





74

This document is propriety of MOTOROLA and it should be return if not used .
Distribution and copies of this document are not allowed with out MOTOROLA approval.

MOTOROLA CONFIDENTIAL PROPRIETARY

BOARD - P6.0

1 RFR3300 Overview

This section describes the Tri-Band/Quad-Mode RF-to-IF Analog Receive Integrated Circuit (RFR3300 IC). The RFR3300 is a custom device fabricated in a SiGe BiCMOS process. It contains all of the circuitry (with the exception of external filters and LO synthesizer) needed to support conversion of received CDMA, GPS, and AMPS RF signals to IF signals capable of driving the IFR3300 IF-to-Baseband Analog Receive IC in any of the following four phone platforms: Quad-mode (PCS, GPS, Cellular CDMA, and AMPS) with a dual-band VCO, PCS only, Dual-Band (PCS CDMA, Cellular AMPS) with a single-band VCO, and Dual-Mode (Cellular CDMA, AMPS). Each platform can support GPS. The circuitry in the RFR3300 consists of three Low Noise Amplifiers (GPS, Cellular, and PCS), four RF-to-IF Down converting Mixers, a divide-by-2 LO frequency divider, and an LO Buffer Amplifier to buffer the UHF VCO to the UHF Transmit Up converter. The RFR3300 device offers the most advanced and integrated CDMA Rx solution designed to meet cascaded Noise Figure (NF) and Third-order Intercept Point (IIP3) requirements of IS-98, J-STD-018, and ARIB-T53 specifications for Sensitivity, Two-tone Intermodulation, and Single-tone Desense.

Gain control for the RFR3300 device's Cellular LNA is provided for improved dynamic range and Rx performance in the presence of high-level interfering signals. Operating modes and band selection are specially controlled from the MSM3300σ.σιMobile Station Modem. Designed to meet the requirements for global CDMA markets, the RFR3300 device will operate over the following frequency ranges:

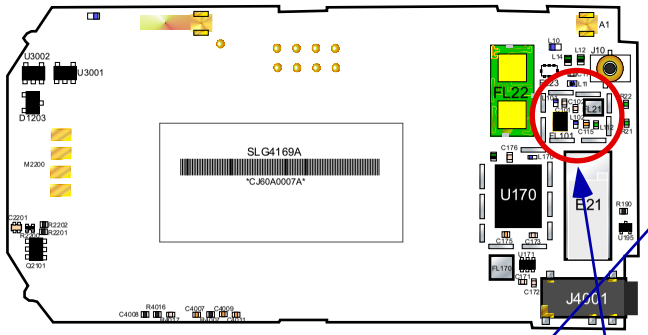
Cellular: 832 – 894 MHz
PCS: 1841 – 1990 MHz
IMT: 2110 – 2170 MHz
GPS: 1575.42 MHz

This document is propriety of MOTOROLA and it should be return if not used .
Distribution and copies of this document are not allowed with out MOTOROLA approval.

MOTOROLA CONFIDENTIAL PROPRIETARY

BOARD - P6.0

RFR3300 (FE)



RX
--46 dbm

RX
--31 dbm

RX
--51 dbm
--52 dbm

RX
--49 dbm
--49 dbm

RX
--49 dbm
--49 dbm

RX
--65 dbm
--58 dbm

RX
--30 dbm

RX
--41 dbm

FL102
PCS_IN
PCS_OUT
CELL & CDMA IN
CELL & CDMA OUT

U101

FL101
L101
C102
C101
FL21
L102
C115
L112

VREG_RF_RX
2.8V

FROM DUPLEXER
CELL_RX

FROM DUPLEXER
PCS_RX

FROM SYN
RXLO

FROM SYN

GPS_PRE_OUT

C106 C110 C111 C104 L108 C103 C105 L106
C113 L107 L105 L104 L103 C109 C107 C108
L109 L110 C114 L111 L113 R103 C112 R109

RX

PCS
Channel 650 (1962.5)
Amplitude -30dbm

CDMA
Channel 350 (880.5)
Amplitude -50dbm

AMPS
Channel 350 (880.5)
Amplitude -50dbm

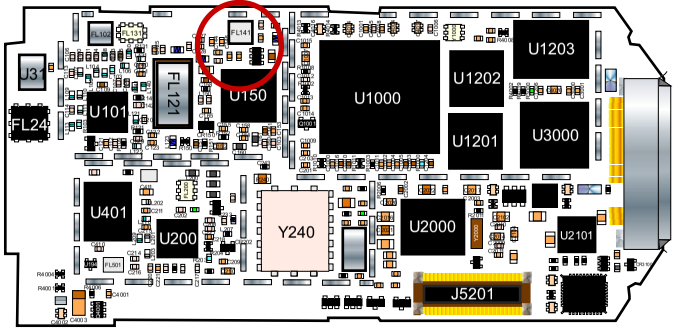
This document is propriety of MOTOROLA and it should be return if not used .
Distribution and copies of this document are not allowed with out MOTOROLA approval.

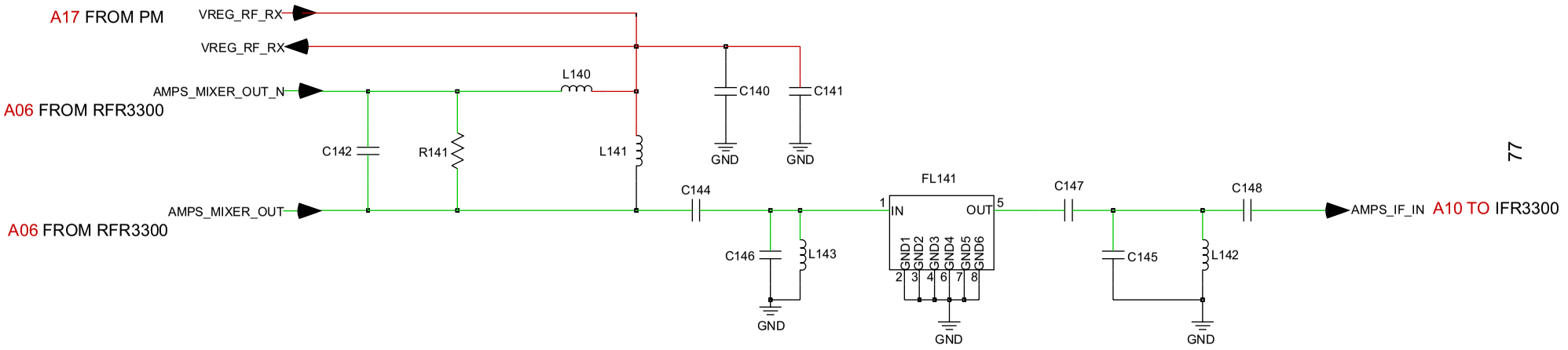
MOTOROLA CONFIDENTIAL PROPRIETARY

BOARD - P6.0

AMPS IF FILTER:A07

AMPS_IF_FILTER
REF 140-147





77

This document is propriety of MOTOROLA and it should be return if not used .
Distribution and copies of this document are not allowed with out MOTOROLA approval.

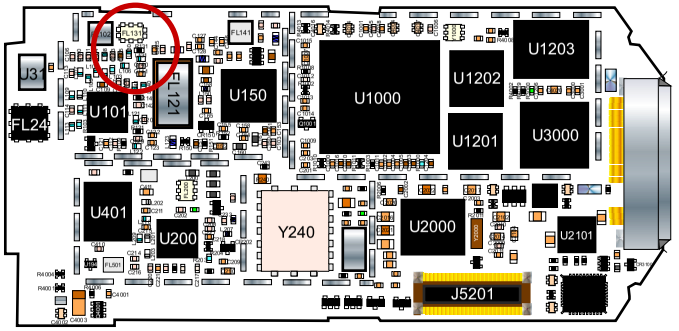
MOTOROLA CONFIDENTIAL PROPRIETARY

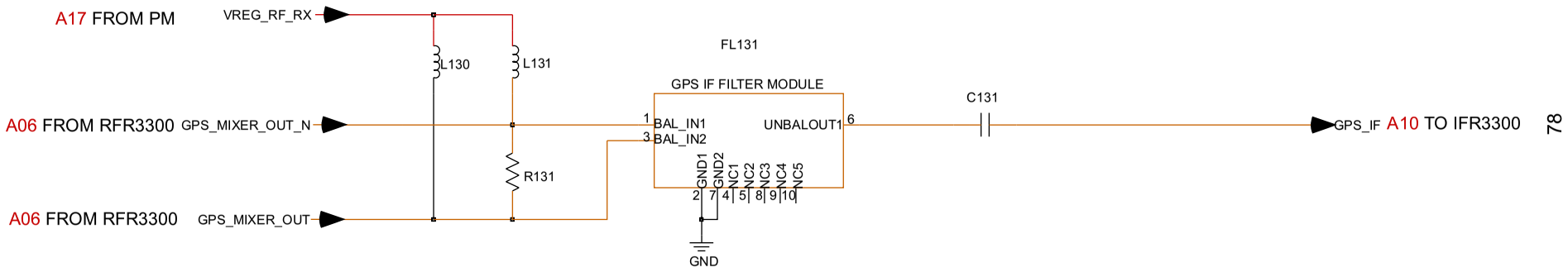
BOARD - P6.0

GPS IF:A08

GPS_IF

REF 130-131





This document is propriety of MOTOROLA and it should be return if not used .
Distribution and copies of this document are not allowed with out MOTOROLA approval.

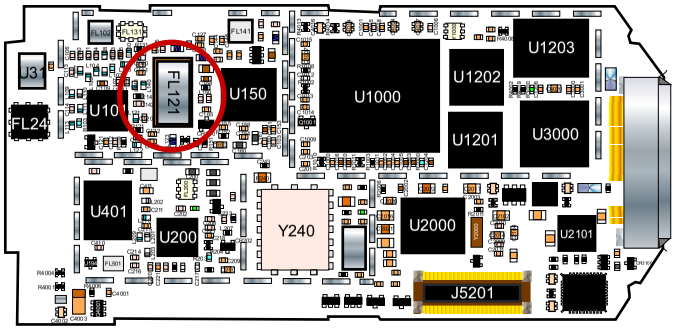
MOTOROLA CONFIDENTIAL PROPRIETARY

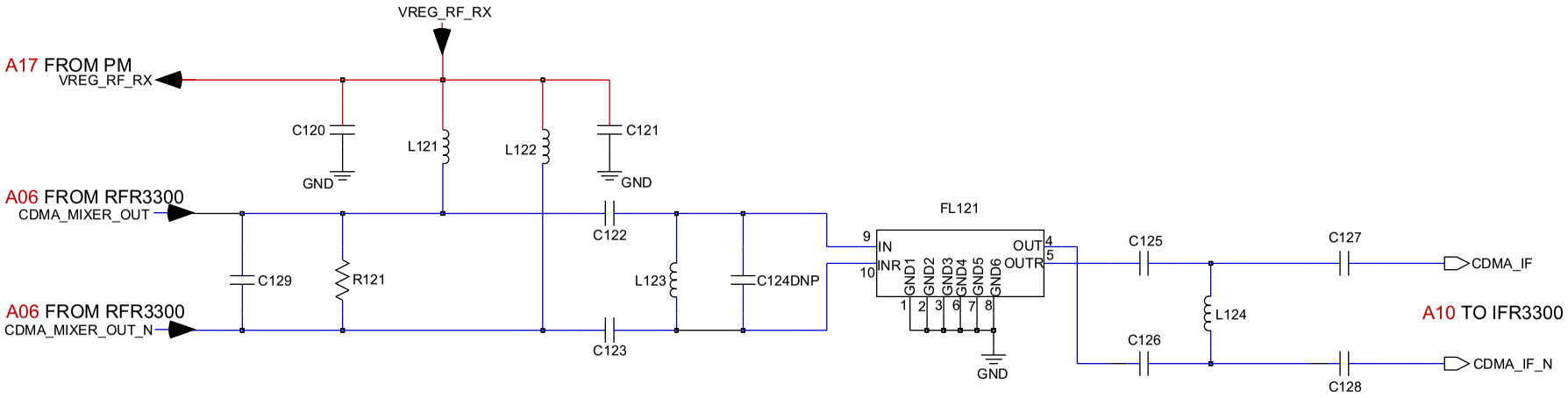
BOARD - P6.0

CDMA IF FILTER:A09

CDMA_IF_FILTER

REF 120-129



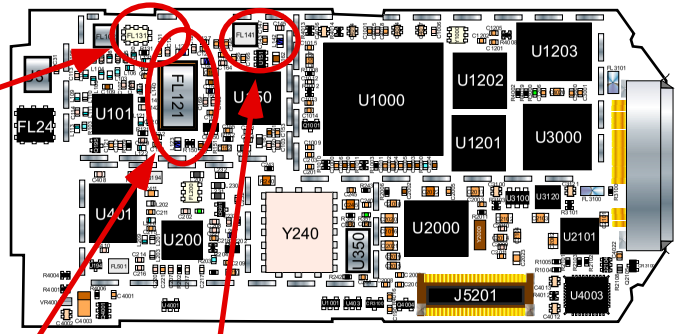


This document is propriety of MOTOROLA and it should be return if not used .
Distribution and copies of this document are not allowed with out MOTOROLA approval.

MOTOROLA CONFIDENTIAL PROPRIETARY

BOARD - P6.0

IF Filters, Amps, GPS & CDMA (FE)



GPS IF FILTER

FL131

OUT

IN1

IN2

R131

C105

L130

L131

C131

GPS_IF

TO IFR3300

GPS_MIXER_OUT_N

FROM FRF3300

GPS_MIXER_OUT

RX

--49 dbm

183.6 Mhz

FROM FRF3300

AMPS_MIXER_OUT

C144

C146

FL141

OUT

IN

C147

C145

C143

L142

AMPS_IF_IN

TO IFR3300

AMPS IF FILTER

RX

--49 dbm

RX

CDMA

Channel 350 (880.5)

Amplitude -50dbm

AMPS

Channel 350 (880.5)

Amplitude -50dbm

C131

C125

C126

C127

C128

L124

RX

--66 dbm

OUTR

OUT

FL121

IN2

INR

CDMA IF FILTER

RX

--55 dbm

FROM FRF3300

FROM FRF3300

CDMA_MIXER_OUT

CDMA_MIXER_OUT_N

C122

C123

L123

183.6 Mhz

80

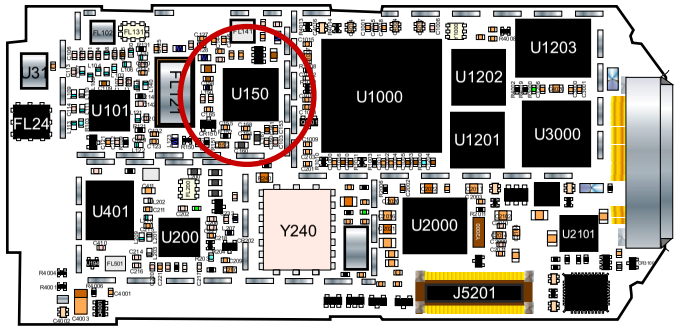
This document is propriety of MOTOROLA and it should be return if not used .
Distribution and copies of this document are not allowed with out MOTOROLA approval.

MOTOROLA CONFIDENTIAL PROPRIETARY

BOARD - P6.0

IFR3300:A10

IFR3300
REF 150-169



A17 FROM PM
VREG_IF
L160
L161
IF_VDDA
IF_VDDD
C168
GND

IF_VDDD
IF_VDDA

A16 FROM MSM CX8_FM_CLK
A19 FROM HARNESS RESOUT_N
A14 FROM REF OSC TCXO
A16 FROM MSM FM_RX_STB
A16 FROM MSM Q_OFFSET
A16 FROM MSM I_OFFSET
A16 FROM MSM SLEEP_N
A16 FROM MSMT RX_AGC_ADJ

C157 C158 C164 C161 C160 — GND

VREG_MSMP A15 FROM PM
C162 — GND

A10 FROM IFR3300
RX_OFFSET_VCO_CONTROL
R150 C150 R151 CR150 C151 C152 C165 L150 C169 C170

U150 IFR3300

4	VDDA1	RXVCO_OUT	25
6	VDDA2	RXQD3_MSB	39
14	VDDA3	RXQD2	40
15	VDDA4	RXQD1	41
17	VDDA5	RXQD0	42
20	VDDA6	RXID3_MSB	45
24	VDDA7	RXID2	46
35	VDDD	FM_RX_IDATA_RXID1	47
44	VDDM	FM_RX_QDATA_RXID0	48
1	FM_RX_CLK	TCXO_N	37
26	EN_SBI	CHIPX8	38
36	TCXO		
2	FM_RX_STB		
21	RXVCO_T1		
22	RXVCO_T2		
27	Q_OFFSET		
28	I_OFFSET		
29	RX_SLOT		
7	VCONTROL		
9	FM_IF		
10	FM_IF		
11	CDMA_IF		
12	CDMA_IF		
30	SBST_IDLE		
31	SBDT_FM		
32	SBCK_SLEEP		
3	GND1		
5	GND2		
8	GND3		
13	GND4		
16	GND5		
18	GND6		
19	GND7		
23	GND8		
43	GND9		
49	GND10		
34	GNDD		
33	DNC		

RXVCO_OUT → RX_OFFSET_VCO — A15 TO SYN
RXQD3_MSB → C_RX_QDATA3 — A16 TO MSM
RXQD2 → C_RX_QDATA2 — A16 TO MSM
RXQD1 → C_RX_QDATA1 — A16 TO MSM
RXQD0 → C_RX_QDATA0 — A16 TO MSM
RXID3_MSB → C_RX_IDATA3 — A16 TO MSM
RXID2 → C_RX_IDATA2 — A16 TO MSM
FM_RX_IDATA_RXID1 → FM_RX_IDATA — A16 TO MSM
FM_RX_QDATA_RXID0 → FM_RX_QDATA — A16 TO MSM

A16 FROM MSM GPS_MODE
A16 FROM MSM GPS_MODE_N
A07 FROM IF FLT AMPS_IF_IN
A08 FROM IF FLT GPS_IF
C155 C166 U151 J1 J2 J3 V1 V2 GND

C168 C154 C156 — GND

A09 FROM IF FLT CDMA_IF
A09 FROM IF FLT CDMA_IF_N
A16 FROM MSM SBST
A16 FROM MSM SBDT
A16 FROM MSM SBCK

This document is propriety of MOTOROLA and it should be return if not used .
Distribution and copies of this document are not allowed with out MOTOROLA approval.

MOTOROLA CONFIDENTIAL PROPRIETARY

BOARD - P6.0

IFR3300 Overview

The IFR3300 provides key IF to digital baseband processing for subscriber unit receivers, including IF AGC amplification, quadrature down conversion to analog baseband, baseband filtering and amplification, and I and Q digitization Figure 1). The IFR3300 provides these critical receiver functions for three different operating modes: CDMA, AMPS FM, and GPS position location. It is functionally compatible with the IFR3000, while adding GPS processing capability. Designer familiarity with the IFR3000 simplifies and expedites position location implementations using the IFR3300, with negligible impact to existing IF and baseband designs.

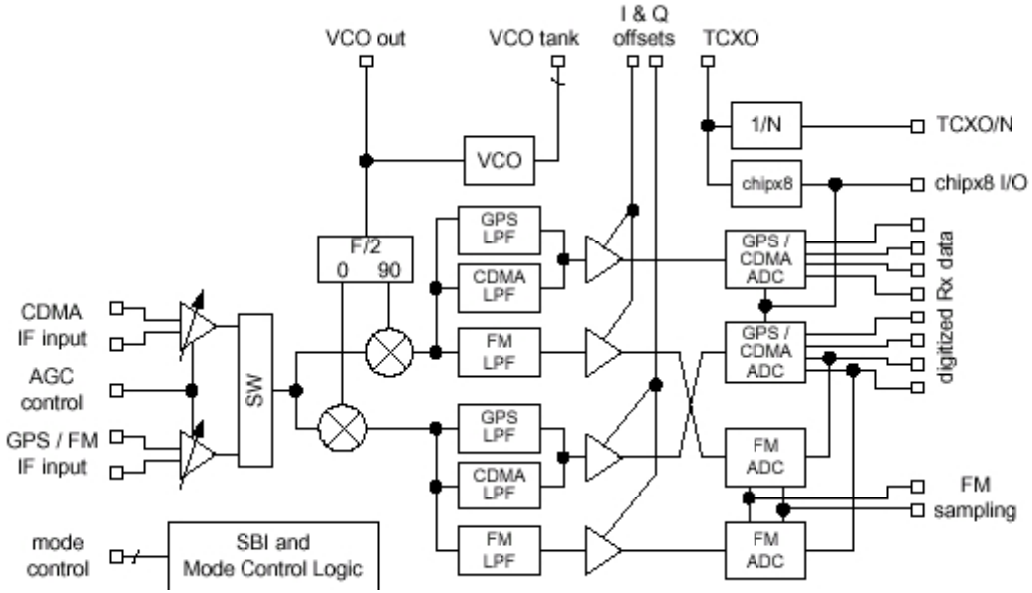


Figure 1: IFR3300 Block Diagram

The IFR3300 interfaces with RFR3100 or RFR3300 based RF subsystems, and with the MSM5100 Mobile Station Modem (MSM) for digital control and data processing. It is fabricated on an advanced BiCMOS silicon process and designed to operate with 2.7 to 3.15 volt power supplies. Although the MSMs operate at lower voltages, compatibility is assured and latch-up is prevented by IFR3300 input and output buffers when its VDDM (pin 41) is connected to the MSM pad voltage. The IFR3300 is available in the 48-pin bump chip carrier (48 BCC+) package only. It is not available in the 48-lead low-profile plastic quad flat pack (LQFP), an option for IFR3000 devices.

This document is propriety of MOTOROLA and it should be return if not used .
Distribution and copies of this document are not allowed with out MOTOROLA approval.

MOTOROLA CONFIDENTIAL PROPRIETARY

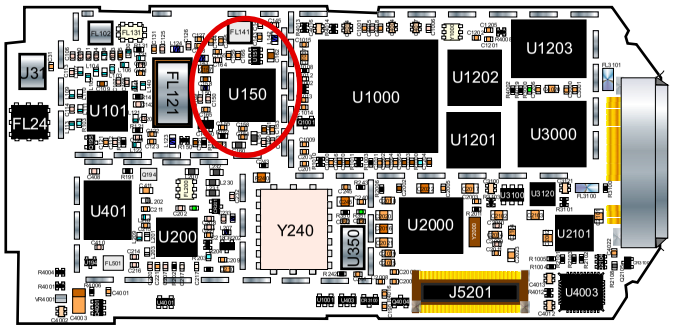
BOARD - P6.0

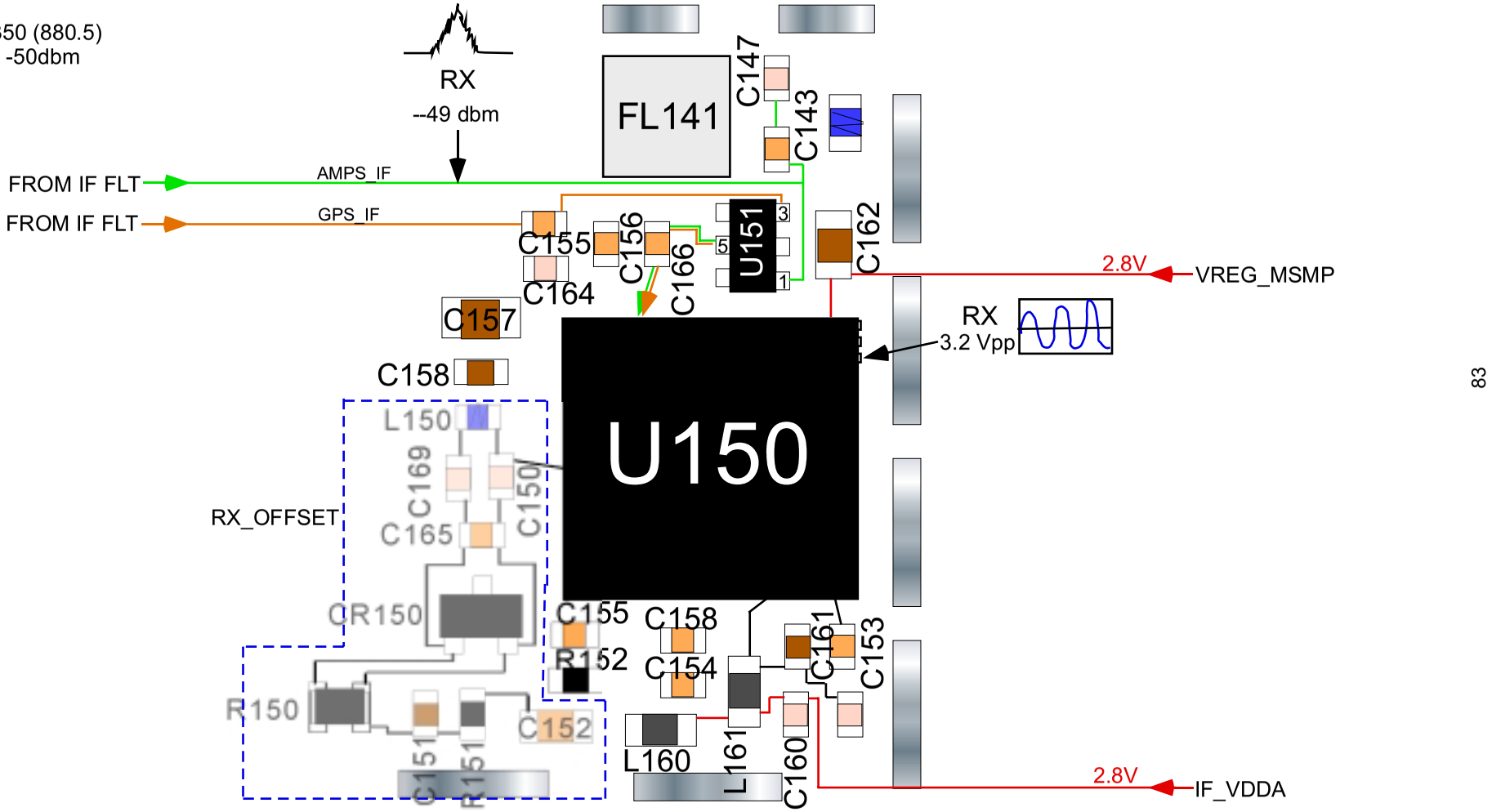
IFR3300

RX

CDMA
Channel 350 (880.5)
Amplitude -50dbm

AMPS
Channel 350 (880.5)
Amplitude -50dbm



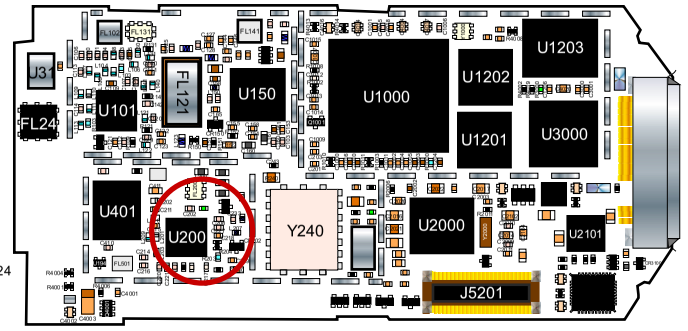


This document is propriety of MOTOROLA and it should be return if not used .
Distribution and copies of this document are not allowed with out MOTOROLA approval.

MOTOROLA CONFIDENTIAL PROPRIETARY

UP MIXER:A11

UP_MIXERS
REF 200-228



TX_VDDA
TX_VDDD
TX_VDDRF
L230
L231
L282
VREG_RF_TX A17 FROM PM
C282
GND
C220
C221
L200
C223
C224
C225
C217
C218
TX_VDDD
VREG_MSMP A17 FROM PM
A14 FROM REF OSC TCXO
A16 FROM MSM SBCK
A16 FROM MSM SBST
A16 FROM MSM SBDT
FL200
NC
NC
NC1
NC2
BAL_IN1
BAL_IN2
BIAS
C201
C202
C203
C204
TX_VDDRF
L201
C219DNP
L202
C228
L203
C214
A16 FROM MSM TX_Q
A16 FROM MSM TX_QN
A16 FROM MSM TX_I
A16 FROM MSM TX_IN
A16 FROM MSM TX_AGC_ADJ
A16 FROM MSM PA_ON3
A16 FROM MSM PCS_AB_SEL_N
A15 FROM SYN TXLO
U200
RFT3100
TCXO
SBCK
SBST
SBDT
TX_Q
TX_QN
TX_I
TX_IN
IF_BPF1
IF_BPF2
VCONTROL
PA_ON
RF_LO
AB_SEL
PD_ISET
TXVCO_T1
TXVCO_T2
GND_SLUG
VDDA1
VDDA2
VDDA3
VDDA4
VDDRF1
VDDRF2
VDDD
VDDM
PCSB_OUT
PCSA_OUT
CELLB_OUT
CELLA_OUT
LOCK_DET
PD_OUT
DAC_IREF
C215
C211
C216
L209
L210
PCS_RFT_B A12 TO TX FLT
PCS_RFT_A A12 TO TX FLT
TX_VDDRF A13 TO PA
CELL_RFT A13 TO TX FLT
SYNTH_LOCK A15 FROM SYN
DAC_IREF A16 FROM MSM
R202
C207
C208
CR201
CR202
R204
L206
L207
C233
C227
R205
C209
C210

84

This document is propriety of MOTOROLA and it should be return if not used .
Distribution and copies of this document are not allowed with out MOTOROLA approval.

MOTOROLA CONFIDENTIAL PROPRIETARY

BOARD - P6.0

RFT3100 Overview

The RFT3100 Baseband-to-RF Transmit Processor performs all transmit (Tx) signal processing functions required between digital baseband and the Power Amplifier (PA) for IS-95 CDMA Cellular, JSTD-018 PCS, and ARIB-53 (Japan) single band and dual band applications. The RFT3100 incorporates the previous-generation functionality of the IFT3000 Baseband-to-IF Processor together with the RF up conversion and driver amplifiers. The RFT3100 offers the most advanced and integrated CDMA Tx solution providing a board area savings of more than 65% over previous generation chipsets, along with minimized power consumption for extended talk-time performance. The RFT3100 is available in three configurations: Dual-band Cellular and PCS (RFT3100-1), Cellular-only (RFT3100-2), and PCS-only (RFT3100-3).

The RFT3100 connects directly with QUALCOMM's MSM5100 utilizing an analog baseband interface. The baseband quadrature signals are up converted to the Cellular or PCS frequency bands and amplified to provide signal drive capability to the PA. The RFT3100 includes an IF mixer for up converting analog baseband to IF, a programmable PLL for generating Tx IF frequency, single sideband up conversion from IF to RF, two Cellular and two PCS driver amplifiers, and Tx power control through an 85 dB VGA. As added benefit, the single sideband up conversion eliminates the need for a band pass filter normally required between the up converter and driver amplifier providing overall board area and cost savings. RFT3100 functionality is specifically controlled from the MSM5105 via the three-line serial bus interface (SBI).

Designed to meet the requirements for global CDMA markets, the RFT3100 will operate over the following Tx frequency ranges:

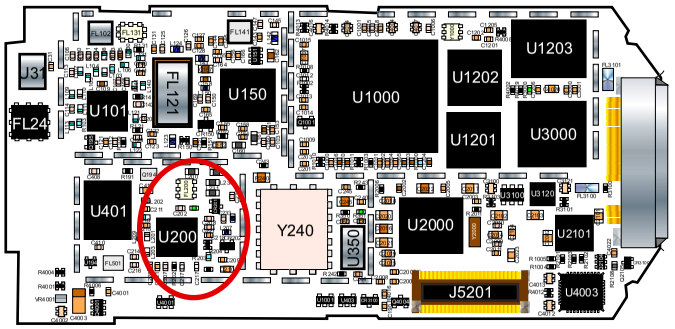
Cellular band 824 MHz – 925 MHz
PCS band 1750 MHz – 1910 MHz

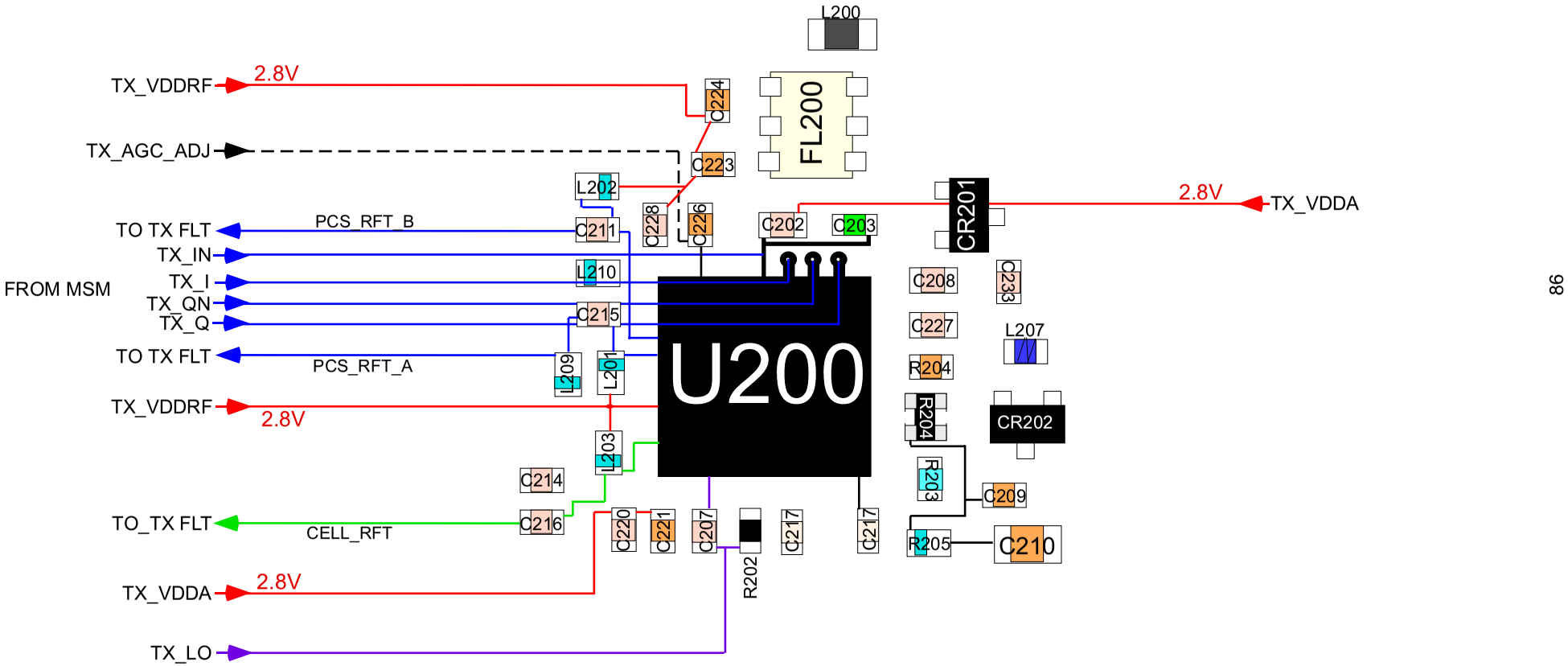
Range of supply voltage is from 2.7 V to 3.3 V, which provides operating compatibility for platforms utilizing a single-cell Li-Ion battery design. RFT3100 operating modes are controlled by the MSM5100 and include selective power-down, gain control, and punctured CDMA transmission (gated Tx power), for optimal power savings and talk-time improvement. The RFT3100 is fabricated on an advanced BiCMOS process, which accommodates both precision high-frequency analog circuits and low-power CMOS functions, and is provided in a 32-pad BCC++ plastic package.

This document is propriety of MOTOROLA and it should be return if not used .
Distribution and copies of this document are not allowed with out MOTOROLA approval.

MOTOROLA CONFIDENTIAL PROPRIETARY

RFT3100





This document is propriety of MOTOROLA and it should be return if not used .
Distribution and copies of this document are not allowed with out MOTOROLA approval.

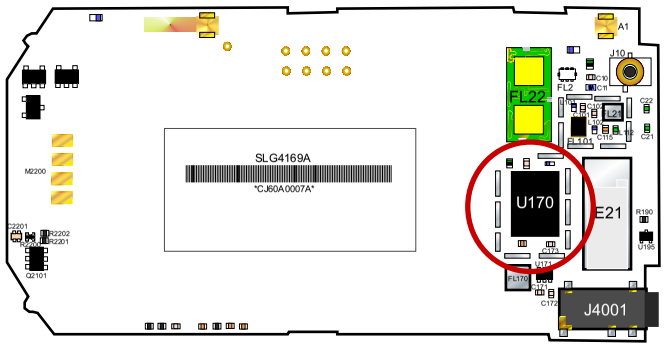
MOTOROLA CONFIDENTIAL PROPRIETARY

BOARD - P6.0

1900TX FILTER & PA:A12

1900TX FILTER $ PA

REF 170-176



A20 FROM Q194
PA_B+
C175
GND
16 15 18
VCC3 VCC2 VCC1
C176
A04 TO DUPLEXER PCS_PA_OUT
10 RFOUT
EN_VEN 2
RFIN 21
IBIAS 19
VBA1 4
VBA2 5
VREF 1
VLD 12
PA_ON2
A16 FROM MSM
VBA2
A13 TO 800 PA
TX_VDDRF
A17 FROM VREG_RF_TX PM
VLD
A13 TO 800 PA
L172DNP
L170
NC 7 NC1
NC 8 NC2
NC 13 NC3
U170
GND9 GND8 GND7 GND6 GND5 GND4 GND3 GND2 GND1
23 22 20 17 14 11 9 6 3
GND
GND
GND
87

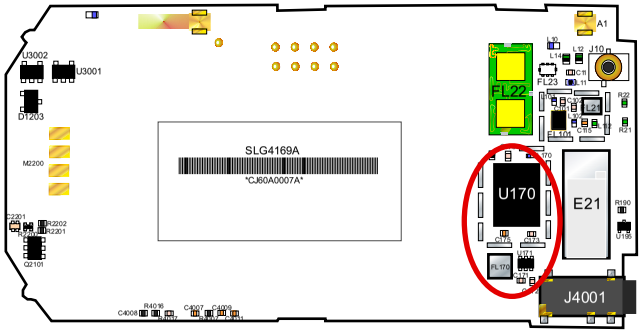
A11 FROM RFT3100 PCS_AB_SEL_N
A11 FROM RFT3100 PCS_AB_SEL
FL170
A11 FROM RFT3100 PCS_RFT_B
A11 FROM RFT3100 PCS_RFT_A
1 IN1
3 IN2
OUT1 7
OUT2 5
GND4 GND3 GND2 GND1
2 4 6 8
GND
C171
C172
U171
4 V1
6 V2
1 J3
3 J2
J1 5
GND
2
GND
C173
L171 DNP
GND

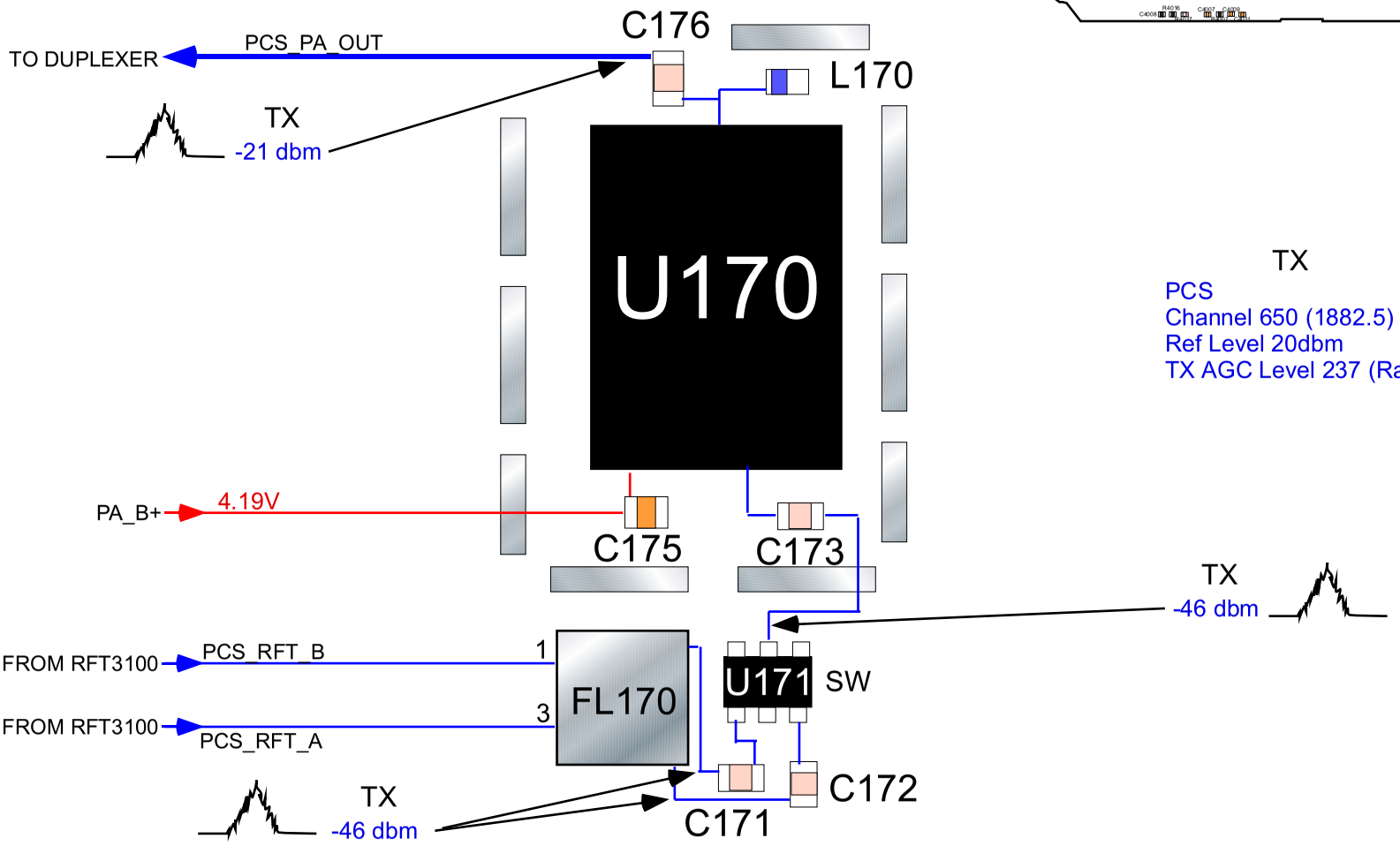
This document is propriety of MOTOROLA and it should be return if not used .
Distribution and copies of this document are not allowed with out MOTOROLA approval.

MOTOROLA CONFIDENTIAL PROPRIETARY

BOARD - P6.0

1900 TX Filter & PA





TX
PCS
Channel 650 (1882.5)
Ref Level 20dbm
TX AGC Level 237 (RadioComm)

88

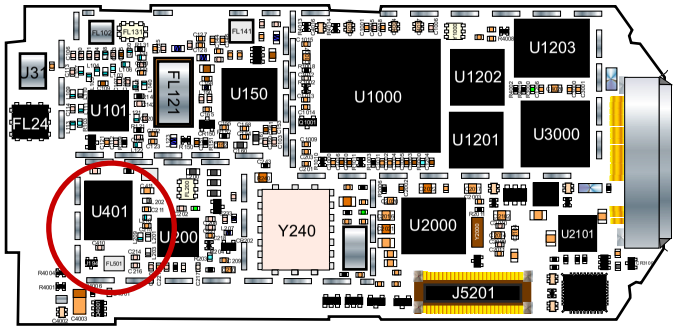
This document is propriety of MOTOROLA and it should be return if not used .
Distribution and copies of this document are not allowed with out MOTOROLA approval.

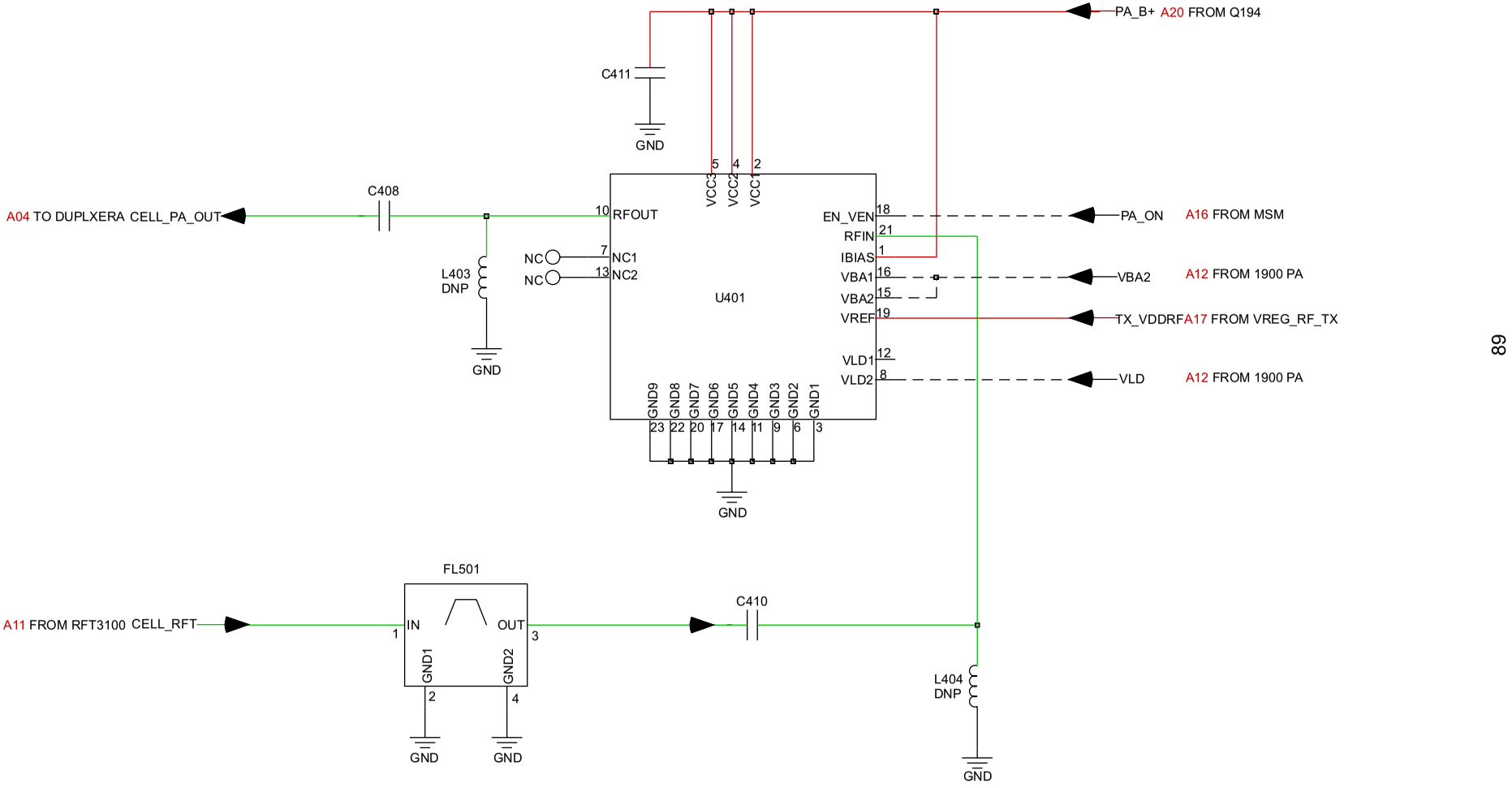
MOTOROLA CONFIDENTIAL PROPRIETARY

BOARD - P6.0

800TX FILTER & PA:A13

TX800_EC.B109.ver





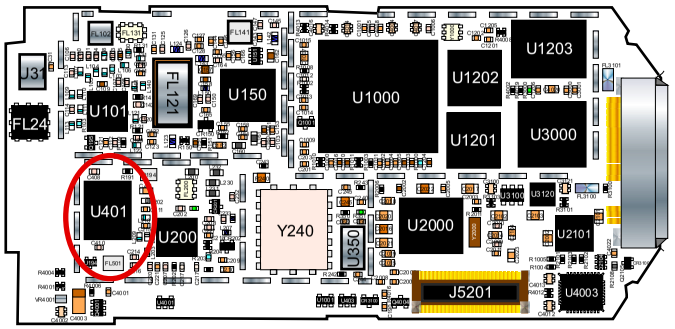
89

This document is propriety of MOTOROLA and it should be return if not used .
Distribution and copies of this document are not allowed with out MOTOROLA approval.

MOTOROLA CONFIDENTIAL PROPRIETARY

BOARD - P6.0

800 TX Filter & PA



TO_DUPLEXER

CELL_PA_OUT

C408

TX
-60 dbm
-29 dbm

U401

4.19V

PA_B+

C411

L210

C215

L209

L201

C410

C214

L203

C220

C216

FL501
IN
OUT

CELL_RFT

FROM RFT3100

TX
-60 dbm
-29 dbm

TX

CDMA
Channel 350 (835.5)
Ref Level -30dbm

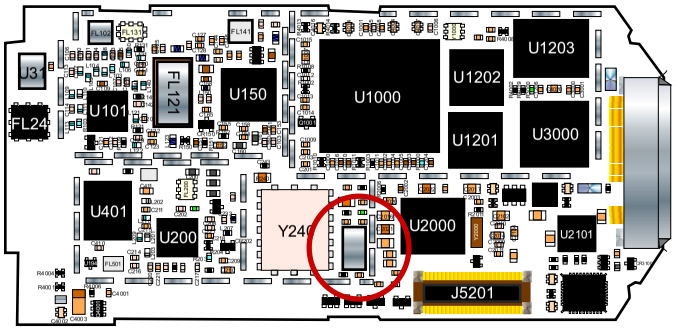
AMPS
Channel 350 (835.5)
Ref Level -30dbm
Pwr Level #4

This document is propriety of MOTOROLA and it should be return if not used .
Distribution and copies of this document are not allowed with out MOTOROLA approval.

MOTOROLA CONFIDENTIAL PROPRIETARY

TCXO:A14

TCXO



R351

VREG_TCXO A17 FROM PM

C351

GND

U350
19.2Mhz

4

VCC

R350

TRK_LO_ADJ
A16 FROM MSM

NC_VCON

1

OUTPUT

3

TCXO

A16 TO MSM
A15 TO SYN
A10 TO IFR3300
A11 TO RFT3100
A17 TO PM

C352

GND

2

GND

GND

91

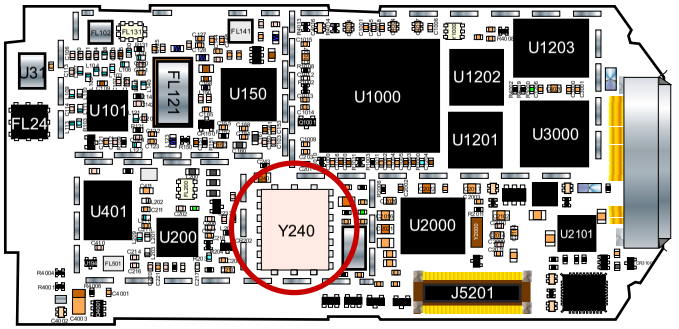
This document is propriety of MOTOROLA and it should be return if not used .
Distribution and copies of this document are not allowed with out MOTOROLA approval.

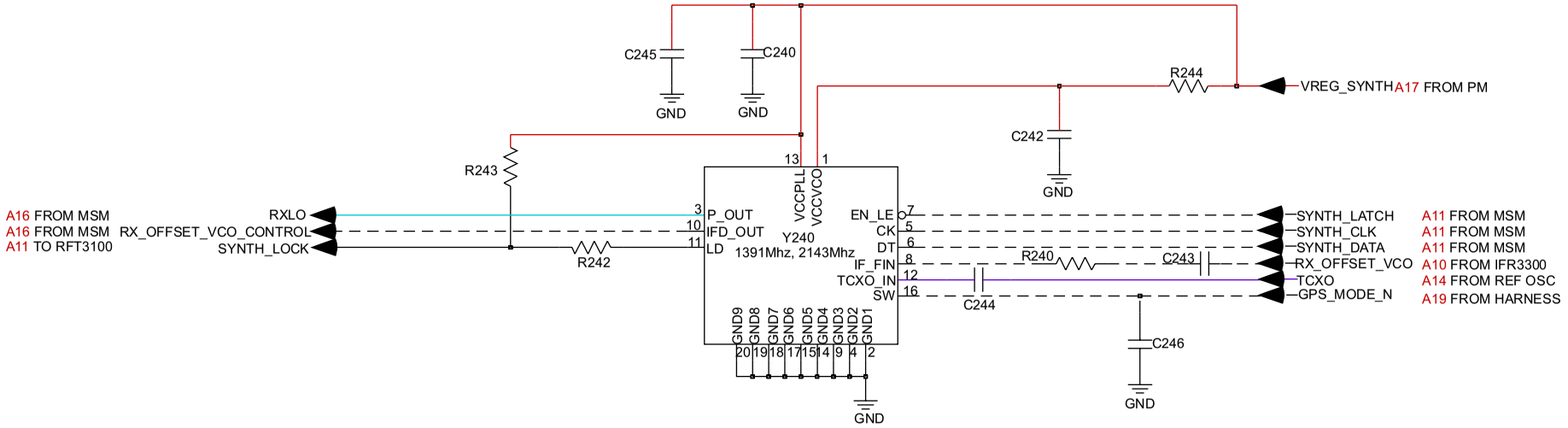
MOTOROLA CONFIDENTIAL PROPRIETARY

BOARD - P6.0

VCO SYN:A15

VCO Synthesizer
REF 240-246





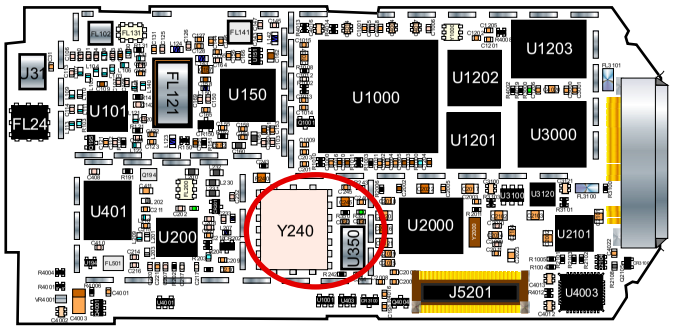
This document is propriety of MOTOROLA and it should be return if not used .
Distribution and copies of this document are not allowed with out MOTOROLA approval.

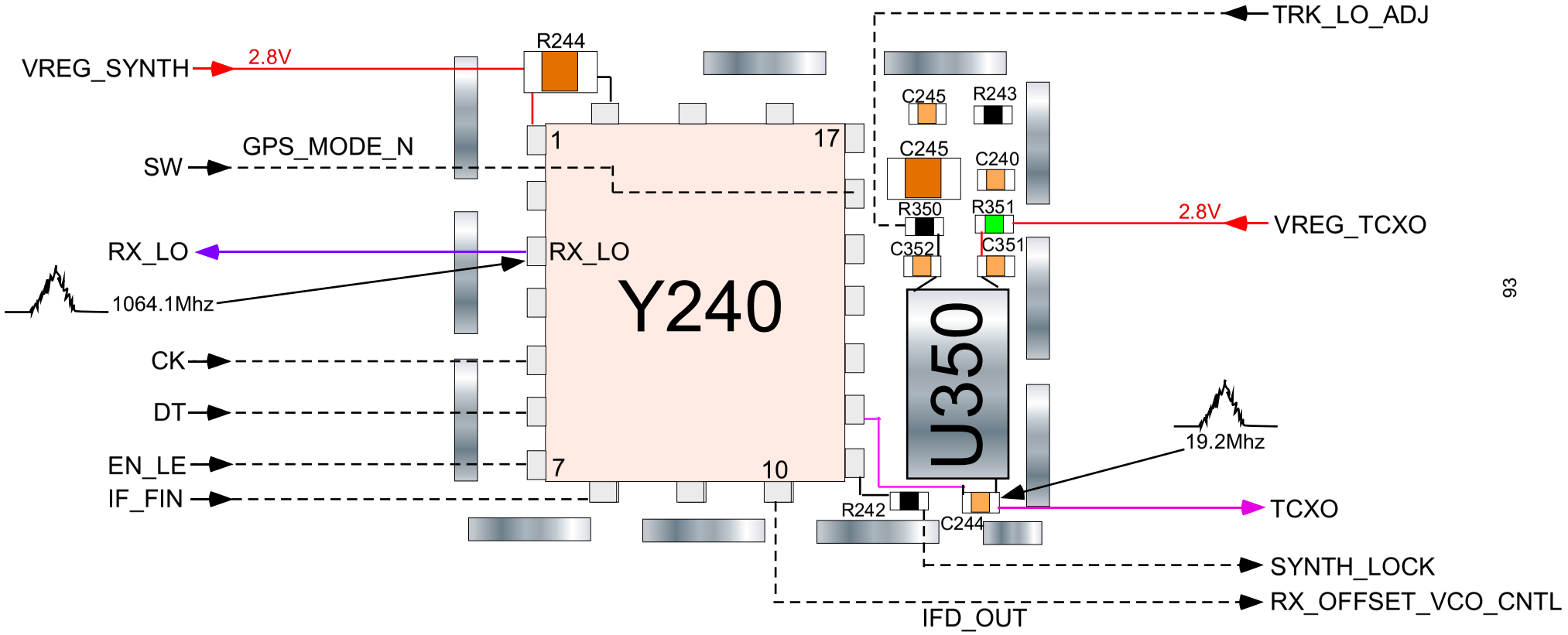
MOTOROLA CONFIDENTIAL PROPRIETARY

BOARD - P6.0

TCXO & VCO SYN

RX Frequency =880.5 (Channel 350)
VCO =1064.1
IF Freq. =183.6





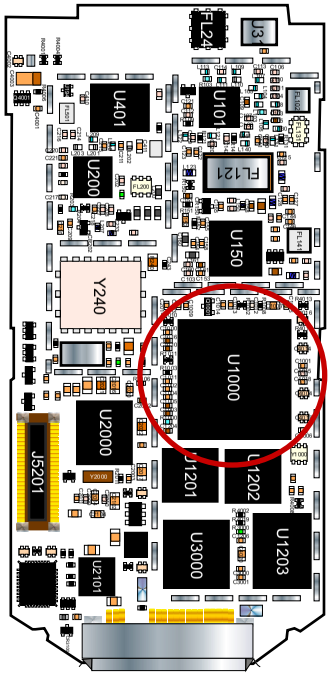
This document is propriety of MOTOROLA and it should be return if not used .
Distribution and copies of this document are not allowed with out MOTOROLA approval.

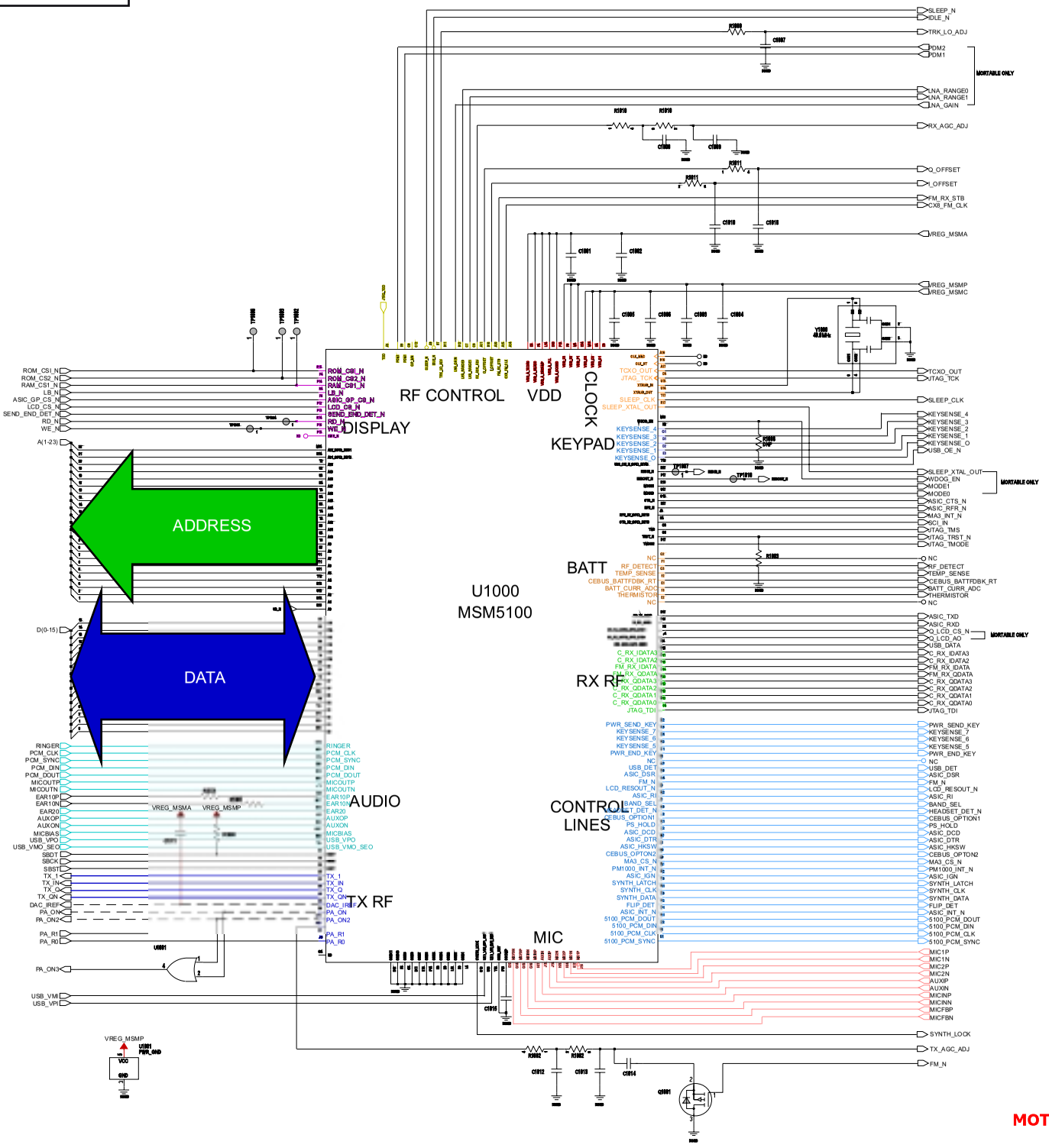
MOTOROLA CONFIDENTIAL PROPRIETARY

BOARD - P6.0

MSM(5100):A16

MSM5100
REF 1000-1018





This document is propriety of MOTOROLA and it should be return if not used .
Distribution and copies of this document are not allowed with out MOTOROLA approval.

MOTOROLA CONFIDENTIAL PROPRIETARY

BOARD - P6.0

The MSM5100 device is the centerpiece of the chipset made up of the MSM5100 mobile station modem, the RFT3100 analog baseband to RF up converter, the IFR3300 IF to baseband down converter, the RFR3300 RF to IF down converter, and the PM1000 power management ASIC.

For the receive data path (Rx), the RFR3300 device down converts the received RF signal to the intermediate frequency (IF). The IFR3300 device converts the modulated IF signal from the RFR3100 device into digital baseband data. Finally, the MSM5100 device demodulates Rx digital baseband data from the IFR3300 device. This path also down converts the GPS received signals to interface with the gpsOne processor on the MSM5100 device. For the transmit data path (Tx), the MSM5100 device modulates, interpolates, and converts the digital signal into an analog baseband before sending it to the RFT3100 device. The RFT3100 device up converts the Tx analog baseband into RF. The MSM5100 device communicates with the external RF and analog baseband to control signal gain in the RF Rx and Tx signal paths, reduce baseband offset errors, and tune the system frequency reference.

For the receive data path (Rx), the RFR3100 down converts the received RF signal of the intermediate frequency (IF). The IFR3000 converts the modulated IF signal from the RFR3100 into digital baseband data. Finally, the MSM5100 demodulates Rx digital baseband data from the IFR3000.

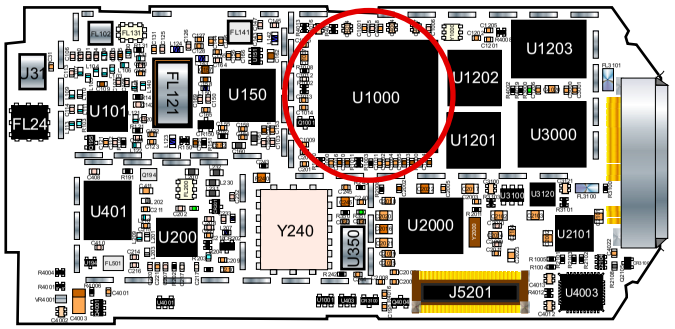
For the transmit data path (Tx), the MSM5100 modulates, interpolates, and converts the digital signal into an analog baseband before sending it to the RFT3100. The RFT3100 up converts the Tx analog baseband into RF. The MSM5100 communicates with the external RF and analog baseband to control signal gain in the RF Rx and Tx signal paths, reduce baseband offset errors, and tune the system frequency reference.

QUALCOMM also supplies system software and development tools to minimize the development time of a subscriber unit. With the release of the MSM5100, a new, optimized version of Dual Mode Subscriber Software (DMSS) is available with device driver support for the new functionality of the MSM5100. Additionally, the Subscriber Unit ReFerence design (SURF) offers a baseline hardware platform for additional software development.

This document is propriety of MOTOROLA and it should be return if not used .
Distribution and copies of this document are not allowed with out MOTOROLA approval.

MOTOROLA CONFIDENTIAL PROPRIETARY

MSM



VREG_MSMA 2.69V

C1001 C4015 C4018 C1006 48.0Mhz Y1000

C1015 C1007 R1008

TRK_LO_ADJ

C1012 R1002 C1013 C1014

FM_N

Q1001

C1009

RX_AGC_ADJ

U1000

2.78V VREG_MSMP

ADDRESS

DATA

Q_OFFSET

I_OFFSET

R1010 C1000 C1016 C1010 R1011 R1003 C1011 C1002 C1004 C1005 C1003 R1000 C1204

96

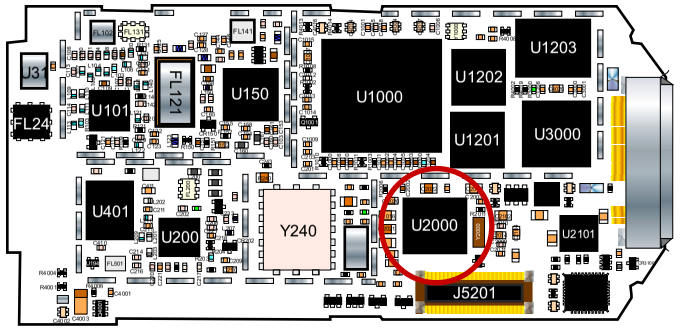
This document is propriety of MOTOROLA and it should be return if not used .
Distribution and copies of this document are not allowed with out MOTOROLA approval.

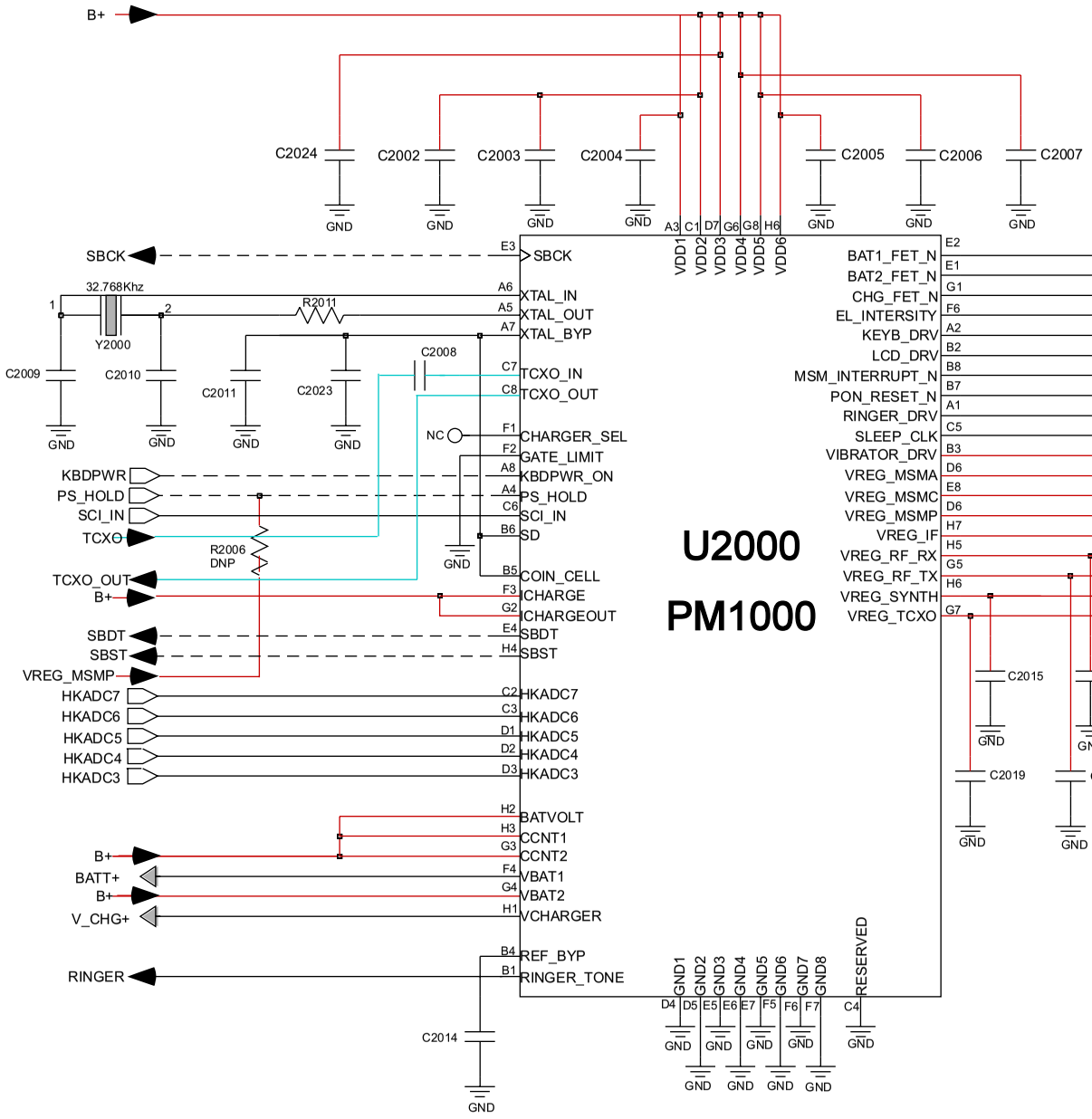
MOTOROLA CONFIDENTIAL PROPRIETARY

BOARD - P6.0

PM:A17

PWR MGMT
REF 2000-2023





97

This document is propriety of MOTOROLA and it should be return if not used .
Distribution and copies of this document are not allowed with out MOTOROLA approval.

MOTOROLA CONFIDENTIAL PROPRIETARY

BOARD - P6.0

1 PM1000 Device Description

The PM1000 chip is a complete power-management system device for CDMA handset applications whose primary functions provide battery management and charger control and linear voltage regulation with programmable voltages for digital and RF/analog circuits. This device only supports the use of a regulated external charger pack (Subsystem 1). The regulated charger pack provides both a constant-current and constant-voltage source. Over voltage and over current protection are not utilized, since the regulated charger pack provides these protections. The battery management includes low battery alarm, and accurate battery gas gauge. The charger control includes charge modes for Lithium-Ion (Li-Ion) and Nickel Metal Hydride (NiMH) batteries. The voltage regulation includes power-on reset control.

There are two charging modes within the charging subsystem, a trickle charging system and a fast charging system. The PM1000 device supports the use of only a single battery system, which includes a low battery voltage alarm. A coulomb counter, which indicates battery energy and drives a gas gauge function, is included on the PM1000 device. It senses both the charging and the discharging of the battery and is also used to detect the End of Charging Detection (EOCD). The PM1000 also contains eight Low Dropout (LDO) Voltage Regulators to provide regulation to both the RF and digital sections of a CDMA phone. Using QUALCOMM's three wire Serial Bus Interface (SBI), the microprocessor is able to control and program each regulator independently. This gives the microprocessor the ability to turn off and on various systems and adjust the output voltages of the LDOs as system loads vary and battery voltages change. In addition, a Startup State Machine is used to control the power-up sequencing of the PM1000 device. A sub-system related to Power On sequencing is the Slotted Cycle Index (SCI), which is used to manage the TCXO clock through the control of the TCXO LDO and the PM1000 TCXO buffer.

In addition to the power management function, the PM1000 device also contains a variety of collateral support functionality including a general purpose Analog-to-Digital Converter (ADC), a Real Time Clock, keyboard backlight driver, Liquid Crystal Display (LCD) backlight driver support, ringer/buzzer driver, and a vibrator driver.

The PM1000 device contains an eight input analog multiplexer (5 external, 3 internal) that is connected to a full-scale general purpose 10-bit ADC. The three internal inputs to the multiplexer include dual battery voltage monitoring and charger voltage monitoring. The five external inputs can be used to monitor various system parameters such as temperature, battery ID and RF output power.

The PM1000 device's Real Time Clock (RTC) generator is based upon an external sleep crystal oscillator operating at 32 kHz (32.768 kHz). An internal RC oscillator circuit is used to provide the 32 kHz sleep clock until the 32-kHz crystal is stabilized. Once the crystal stabilizes, an SBI command will switch over from the RC oscillator to the external crystal. The RTC remains active when the entire phone is put into a sleep mode. A key function of the RTC is for FM mode in dual mode handsets where no clock is available through the network. An optional button cell battery can be used to keep the RTC running when the phone has been turned off or the battery pack has been removed. This allows the phone to maintain the time and calendar function when network timing is unavailable. The clock generator contains a clock counter, calendar counter, automatic leap-year recognition (to 2020).

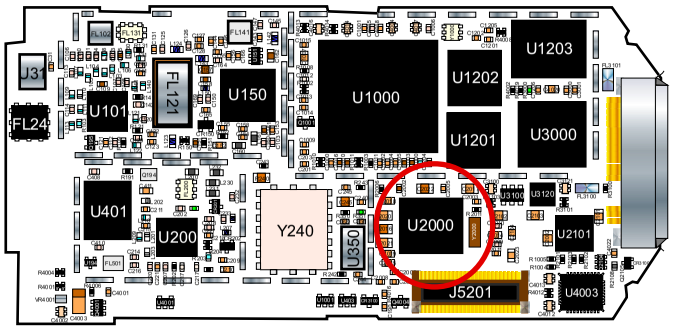
The backlight drivers are used to control the brightness of the keyboard and LCD. Both the keyboard driver and the LCD backlight driver produce a programmable constant current sink to control the brightness of the LCD. An optional Electro-Luminescent (EL) Display driver support is also included on the PM1000 device. The Electro-Luminescent driver support provides the required interfacing and four programmable levels of intensity to Sipex's SP4416 EL driver. The PM1000 device also has a vibrator driver and a buzzer/ringer driver. The vibrator driver constant voltage source is used to drive a small DC motor to silently alert the user of an incoming call. The ringer driver is used for a phone's buzzer or ringer device. Because the vibrator and ringer drivers are independent of one another, they can both be simultaneously driven for applications requiring dual functions.

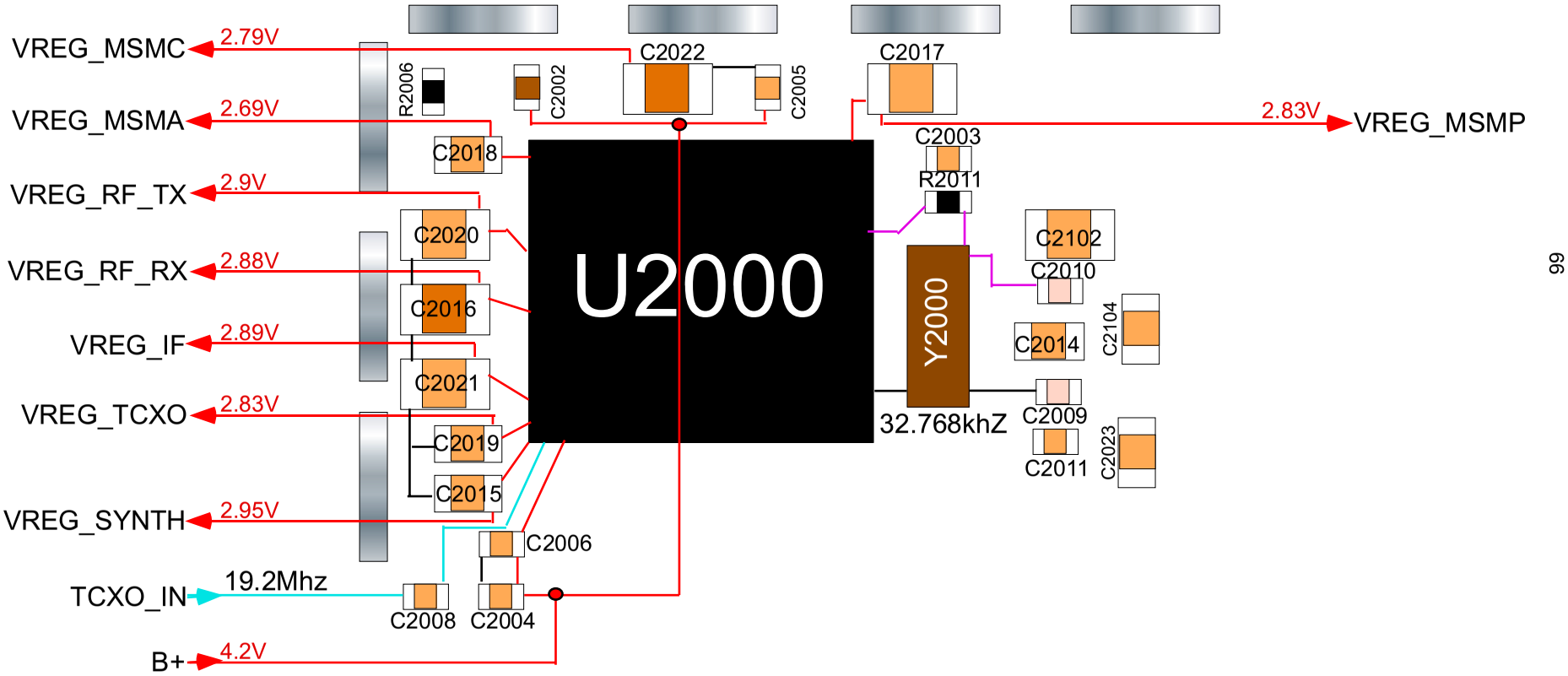
All PM1000 device operating modes and functionality can be controlled by the MSM3000 or MSM5105 microprocessor through their three-wire Serial Bus Interface (SBI). This chip will be available in a 64 fine pitch plastic ball grid array (FBGA) package.

This document is propriety of MOTOROLA and it should be return if not used .
Distribution and copies of this document are not allowed with out MOTOROLA approval.

MOTOROLA CONFIDENTIAL PROPRIETARY

PM





99

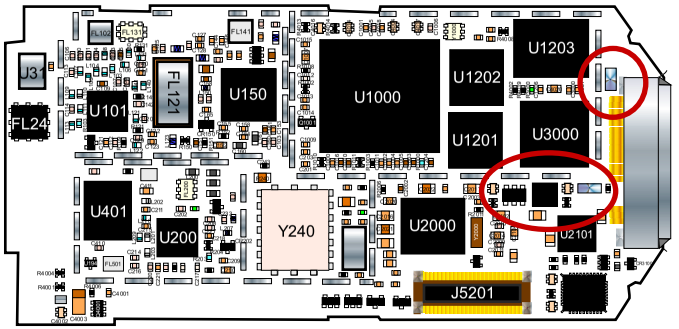
This document is propriety of MOTOROLA and it should be return if not used .
Distribution and copies of this document are not allowed with out MOTOROLA approval.

MOTOROLA CONFIDENTIAL PROPRIETARY

BOARD - P6.0

CE BUS:A18

CE BUS
REF 3100-3136



R3100
R310133
R3101
USB_VPU
CEBUS_USBP_TXD — A19 FROM HARNESS
CEBUS_USBM_RXD — A19 FROM HARNESS
R3135
VREG_MSMA — A17 FROM PM
CEBUS_RTS_USBPWR — A19 FROM HARNESS
CEBUS_BATTFDBK_RT — A19 TO HARNESS
AUDIO_IN_FLT — A21 TO AUDIO INT
CEBUS_CTS — A19 FROM HARNESS
CEBUS_DCD — A19 FROM HARNESS

A23 FROM/TO J3201 — USBP_UTXD — 4
A23 FROM J3201 — BATT_FDBK — 2
A23 TO J3201 — AUDIO_IN — 16
A23 FROM/TO J3201 — UCTS — 8
A23 FROM/TO J3201/TO — UDCD — 9
A23 FROM J3201 — USBM_URXD — 5

FL3100
A1 E8D1 — E8D3 C1
A2 FLTR1 — FLTR1 C2
A3 FLTR2 — FLTR2 C3
A4 FLTR3 — FLTR3 C4
A5 FLTR4 — FLTR4 C5
A6 E8D2 — E8D4 C6
GND1 GND2 GND3
B1 B2 B3
BGND

PWR_END_KEY — A16 FROM MSM
PWR_SEND_KEY — A16 FROM MSM
KBDPWR_ON — A17 TO PM

CR3100
R3105DNP
D3101

FL3101
A23 FROM/TO J3201 — URI — 10
A23 FROM/TO J3201 — UDTR — 11
A23 FROM/TO J3201 — UDSR — 12
A23 TO J3201 — OPTION1 — 13
A23 TO J3201 — OPTION2 — 14
A23 FROM J3201 — AUDIO_OUT_ONOFF — 15

A1 FLTR1 — FLTR1 C1
A2 FLTR2 — FLTR2 C2
A3 FLTR3 — FLTR3 C3
A4 FLTR4 — FLTR4 C4
A5 FLTR5 — FLTR5 C5
A6 FLTR6 — FLTR6 C6
GND1 GND2 GND3
B1 B2 B3
BGND

CEBUS_RI — A19 FROM HARNESS
CEBUS_DTR — A19 FROM HARNESS
CEBUS_DSR — A19 FROM HARNESS
CEBUS_OPTION1 — A16 TO MSM
CEBUS_OPTION2 — A16 TO MSM
AUDIO_OUT — A19 FROM HARNESS

VREG_MSMP — A17 FROM PM
SW_B+ — A19 FROM HARNESS
B+ — A20 FROM BATT CHARG
SW_B+EN — A19 FROM HARNESS

A23 FROM J3201 CEBUS_RTS_USBPWR — 6
BGND — 17 — C3121 — 2 — 1 — BGND

U3100
VIN 1
VOUT 6
ENABLE 3
NC 4
GND2 5
GND1 2
R3103 4 — 1 — BGND
C3100 1 — 2 — BGND
NC
BGND
C3100 3 — 4 — BGND
R3103 3 — 2 — BGND

U3120
VREG 13
RCV 2
VP 3
VM 4
VPU 15
DPOS 16
DNEG 9
USB_DET 8
VBUS 14
VCC 7
OE_N 1
VO_VPO 11
F8E0_VMO 12
SUSPND 5
ENUMERATE
MODE 6
GND 17

A16 TO MSM — USB_DATA
A16 TO MSM — USB_VPI
A16 TO MSM — USB_VMI
A16 TO MSM — USB_VPU
A16 TO MSM — CEBUS_USBP_TXD
A16 TO MSM — CEBUS_USBM_RXD
A16 FROM MSM — USB_DET

4 — C3121 — 3 — BGND
BGND

USB_OE_N — A16 TO MSM
USB_VPO — A16 TO MSM
USB_VMO_SE0 — A16 TO MSM
USB_SUSPEND — A16 TO MSM
USB_RENUMRATE — A16 TO MSM
VREG_MSMP — A17 FROM PM

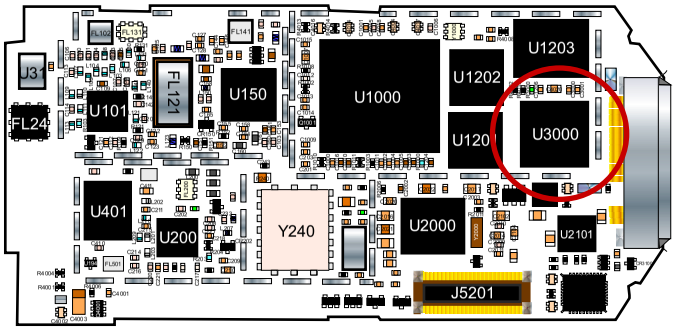
This document is propriety of MOTOROLA and it should be return if not used .
Distribution and copies of this document are not allowed with out MOTOROLA approval.

MOTOROLA CONFIDENTIAL PROPRIETARY

BOARD - P6.0

HARNESS:A19

HARNESS ASIC
REF 3000-3009

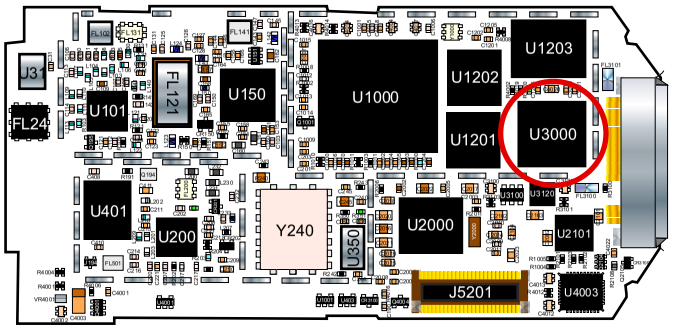


This document is propriety of MOTOROLA and it should be return if not used .
Distribution and copies of this document are not allowed with out MOTOROLA approval.

MOTOROLA CONFIDENTIAL PROPRIETARY

BOARD - P6.0

HARNESS



ADDRESS

R3000

C3000

C3001

2.83V

VREG_MSMP

TCXO_OUT
SLEEP_CLK
RESOUT_N
RD_N
WE_N
ASIC_GP_CS_N
ASIC_INT_N
SER_CS1_N
SER_CS0_N
LCD_SER_DATA
LCD_SER_CLK
CHG_CTL
PCS_AB_SEL_N
SPK_DRV_EN
CHG_V_SEL
UIM_RESET
UIM_PWR_EN
BATT_FDBK_EN
SW_B+_EN
USB_SUSPEND
SER_RS
PCS_AB_SEL
CHG_TX
AUDIO_IN_DET_N
ASIC_HKSW
ASIC_IGN
ASIC_DSR
BATT_SERIAL_DATA

U3000

LCD_CS_N
SER_CS2_N
GPS_MODE_N
GPS_MODE
BL_LED_G
BL_LED_B
STATUS_LED_R
STATUS_LED_G
5100_PCM_NSYNC
5100_PCM_CLK
5100_PCM_DOUT
PCM_SYNC
PCM_CLK
PCM_DOUT
ASIC_TXD
ASIC_RFR_N
5100_PCM_DIN
STEREO_DOUT
STEREO_CLK
STEREO_L_R_N
IRDA_TXD
BT_PCM_SYNC
BT_PCM_DOUT
UIM_CLK
PCM_DIN
CEBUS_BATTFDBK_RT
CEBUS_USBP_TXD
CEBUS_USBM_RXD
CEBUS_RTS_USBPWR
CEBUS_CTS
CEBUS_DCD
CEBUS_RI
CEBUS_DTR
CEBUS_DSR
ASIC_RXD
ASIC_CTS_N
ASIC_DCD
ASIC_RI
ASIC_DTR

DATA

102

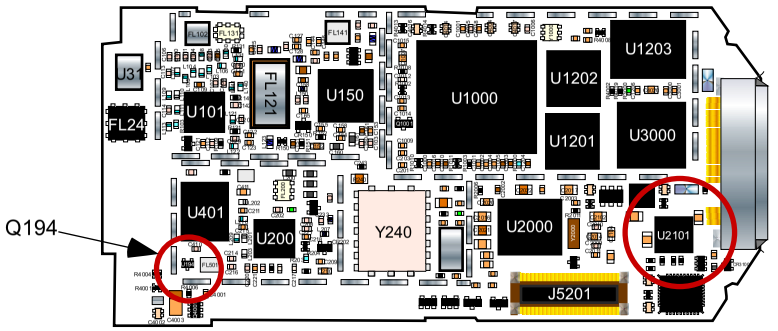
This document is propriety of MOTOROLA and it should be return if not used .
Distribution and copies of this document are not allowed with out MOTOROLA approval.

MOTOROLA CONFIDENTIAL PROPRIETARY

BOARD - P6.0

BATT CHARGING:A20

BATT CHARGING
REF 2100-2108



Q194

A23 FROM CONN
B+

EXT_B+
A23 FROM CONN

C2102
C2103
BGND
BGND

U2101
VOUT1
VOUT2
NC1
NC2
VCC2
VCC1
GND2
GND1
OEN
BSEN
VPROGM
IPROGM
ITERM
BIP
SHUNT
STAT
CP

C2101
BGND
BGND

Q2101
BATT+

R2108
BATT FEEDBACK CIRCUIT
A17 FROM PM
BATT_CHG

Q2105
A16 FROM MSM
CHG_CTL
BGND

A16 FROM MSM
CHG_V_SEL

NC
V_CHG
TO PM1000
For sensing charging voltage (valid / not valid)

BATT_CURR_ADC
A16 TO MSM

A17 FROM PM
VREG_MSMA
R2200
A17 FROM PM
VREG_MSMP

R2201
R2202
BATT_SERIAL_DATA
BATT_ONEWIRE
Sensing Batt ID
for valid battery
C2201
BGND

A19 FROM HARNESS
CHG_I_SEL
Q194
A20 FROM BATT CHAR
B+
PA_B+

R2101
R2103
R2102
BGND

Q2104
D2
G1
B1
S2
G2
D1
BGND

A16 FROM MSM
IDLE_N
Q195

BATT_THERMISTOR
THERMISTOR
R2200
Sensing Batt temp
(Temp range for charging)
-25 - +40c
C2201
BGND

CHG_TX
A16 FROM MSM

Software Current Control
1000ma
350ma

103

This document is propriety of MOTOROLA and it should be return if not used .
Distribution and copies of this document are not allowed with out MOTOROLA approval.

MOTOROLA CONFIDENTIAL PROPRIETARY

BOARD - P6.0

BATT CHARGING THEORY:A20

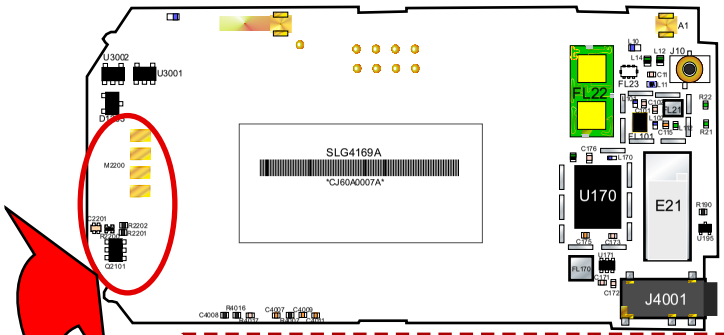
The power management chip (Qualcomm PM1000) controls an external Lithium-ion charge control IC U2101(Semtech SC801) which provides constant current and voltage regulation for charging lithium ion batteries. Software is required to set up pre-charge conditions and program the PM1000 internal trickle charger, select the peak voltage (4.1V or 4.2V) for the battery based on the battery EPROM data, select charge current based on midrate or fast charge accessory detected, enable/disable fast charging, and monitor battery charge state for the battery meter.

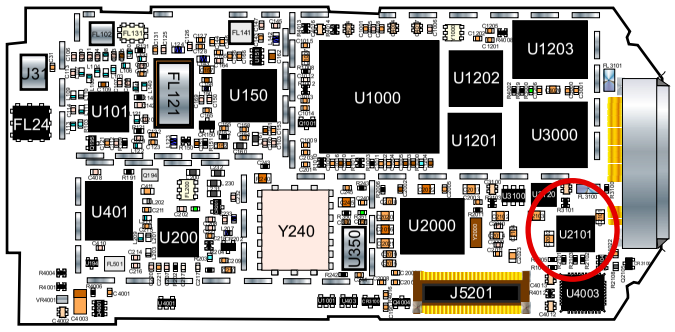
Charge current requirements: Provide maximum rapid charge current of ~850mA and maximum mid-rate charge current of ~250mA. Unlike P2K products, these rates are controlled by hardware via a logic control signal from software.

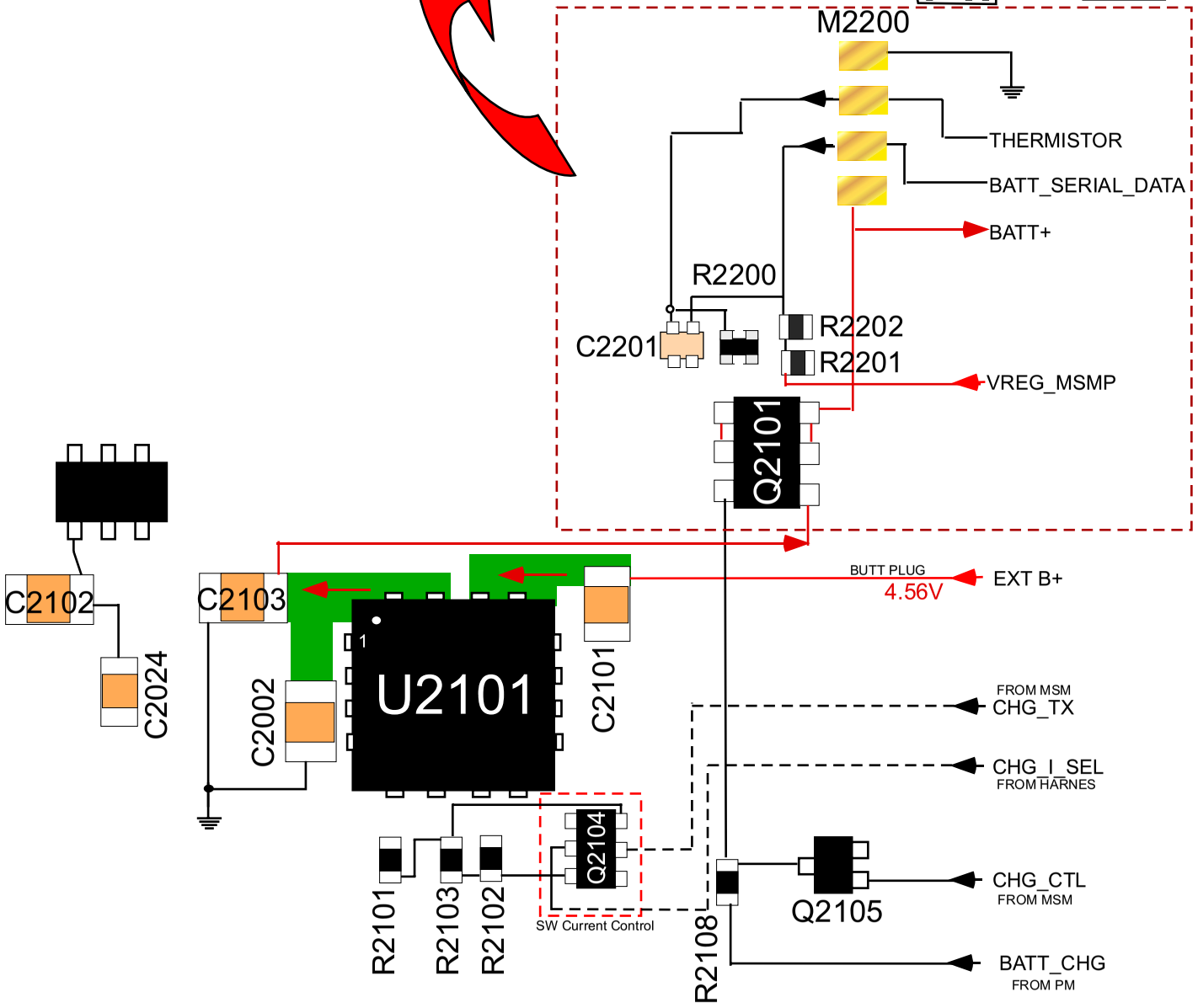
This document is propriety of MOTOROLA and it should be return if not used .
Distribution and copies of this document are not allowed with out MOTOROLA approval.

MOTOROLA CONFIDENTIAL PROPRIETARY

Batt Charging







105

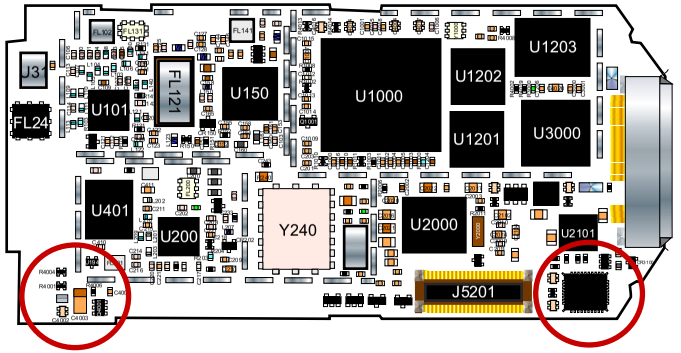
This document is propriety of MOTOROLA and it should be return if not used .
Distribution and copies of this document are not allowed with out MOTOROLA approval.

MOTOROLA CONFIDENTIAL PROPRIETARY

BOARD - P6.0

AUDIO INTERFACE:A21

AUDIO INTERFACE
REF 4000-4023



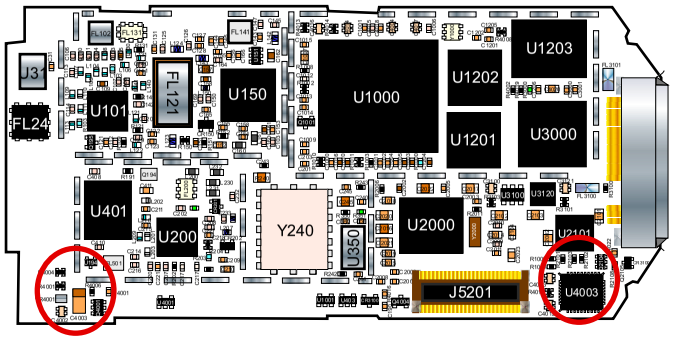
R4008
FROM MSM
HEADSET_DET_N
R4003
DNP
VREG_MSMP
R4004
TO MSM
SEN_END_DET_N
U4001
BGND
A17 FROM PM
VREG_MSMA
Q4001
R4001
R4005
VREG_MSMP
A17 FROM PM
R4002
J4001
SW1
MIC
BRK
SP
GND
C4001
TO MSM
MIC2P
MIC2N
C4002
C4004
TO MSM
MICFBP
MICINN
R4013
R4014
C4014
A16 TO MSM
MICOUTP
FROM MSM
MICINP
TO MSM
MICFBN
R4013
R4014
C4014
A16 TO MSM
MICOUTN
TO MSM
C4016
MICBIAS
C4015
C4003
Head Phone
TO MSM
EAR20
C4021DNP
C4002
VR4001
VREG_MSMP
B+
C4007
C4032DNP
106
AUDIO_OUT
C4017
A16 TO MSM
AUXOP
AUXON
A16 TO MSM
C4022
C4004
TO MOTOR
VIBRATOR_DRV
Q4004
B+
D4010
R4018
MTR
TCXO_OUT
WE_N
RD_N
RESOUT_N
MA3_CS_N
A(1)
CLKI
EN_WR
EN_RD
RST
CS
A0
VDD
SPVDD
IOVDD
HPOUTL_MONO
HPOUT_R
MTR
LED
SPOUT1
SPOUT2
Speaker
POLY_P
POLY_N
PLCC
IRQ
VREF
EQ1
EQ2
EQ3
MA3_INT_N
U4003
YAMAHA
D0
D1
D2
D3
D4
D5
D6
D7
NC
DATA
D(0:15)
VSS
SPVSS
GND1
GND2
GND3
GND4
AUDIO_IN_FLT
R4007
C4009
C4008
C4011
R4016
R4017
C4010
C4017
A16 TO MSM
AUXIP
AUXIN
A16 TO MSM
VREG_MSMP
C4018
R4019
A19 FROM HARNESS
AUDIO_IN_DET_N
C4020
A16 TO MSM
MICBIAS
R4012
C4013
A17 FROM J5201
MIC_P
A16 TO MSM
MIC1P
C4012
A17 FROM J5201
MIC_N
A16 TO MSM
MIC1N
C4012
R4012

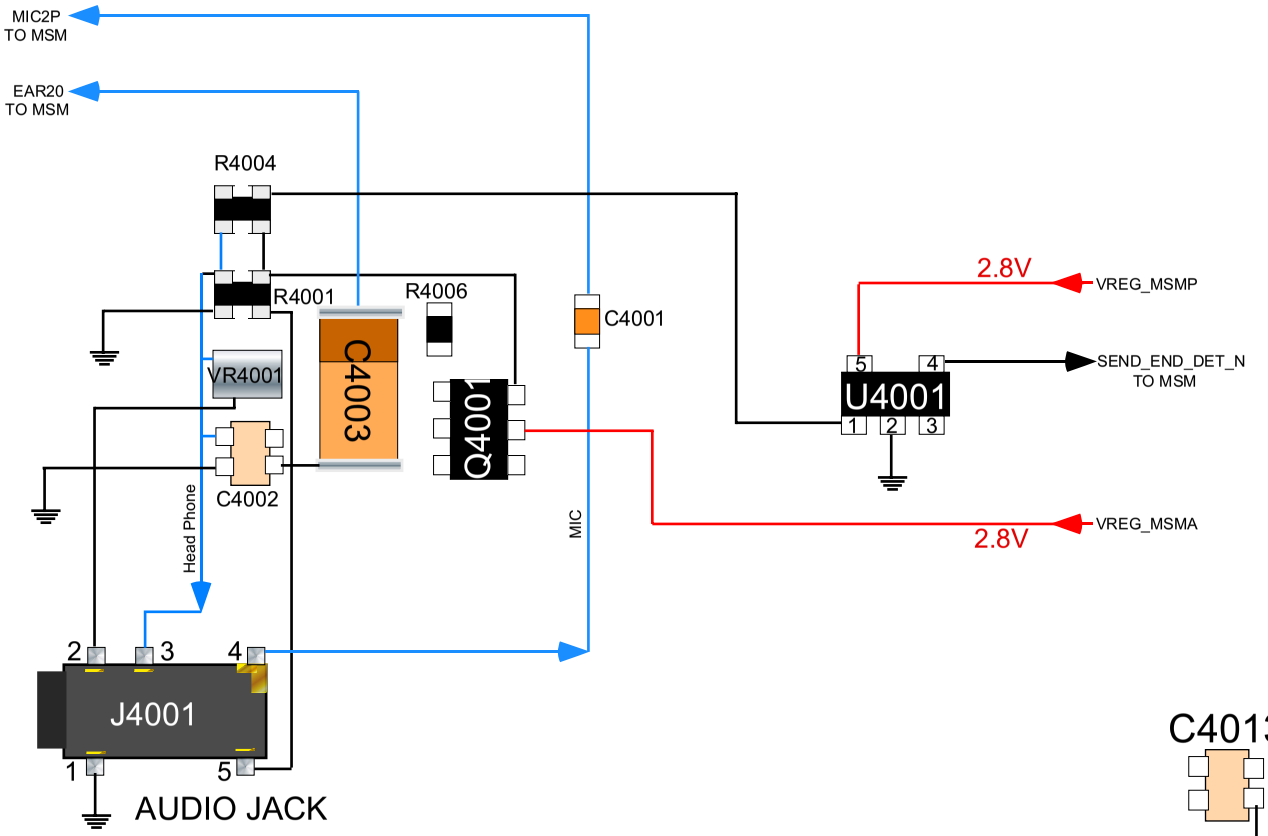
This document is propriety of MOTOROLA and it should be return if not used .
Distribution and copies of this document are not allowed with out MOTOROLA approval.

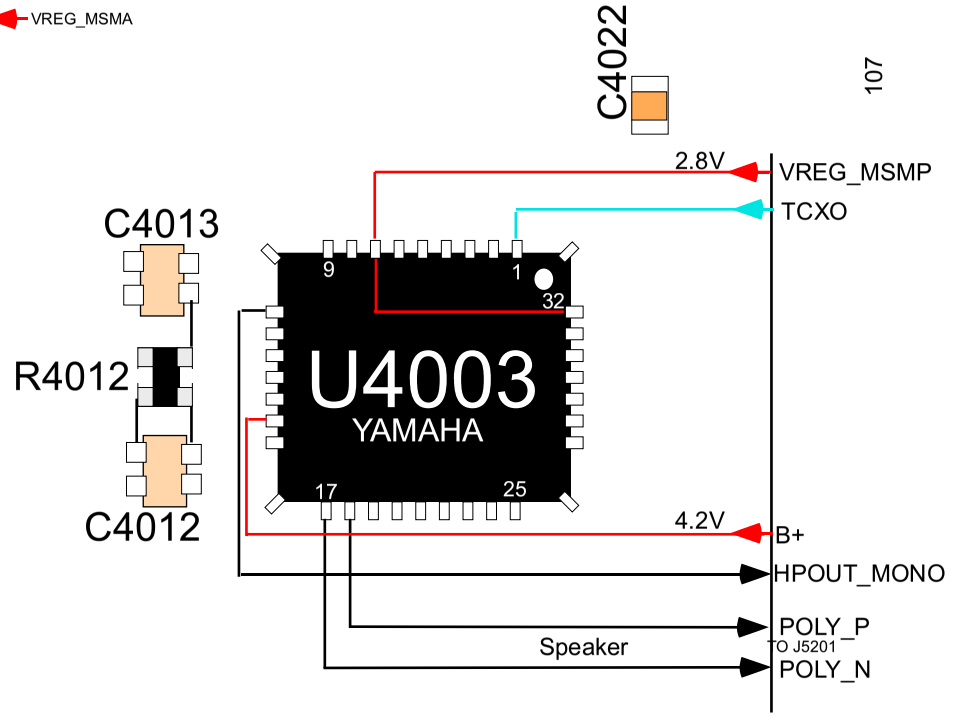
MOTOROLA CONFIDENTIAL PROPRIETARY

BOARD - P6.0

Audio Interface







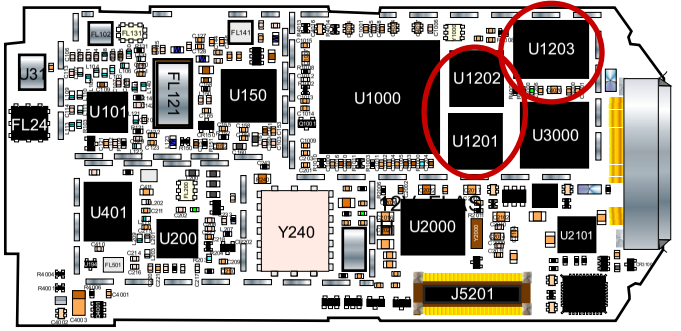
This document is propriety of MOTOROLA and it should be return if not used .
Distribution and copies of this document are not allowed with out MOTOROLA approval.

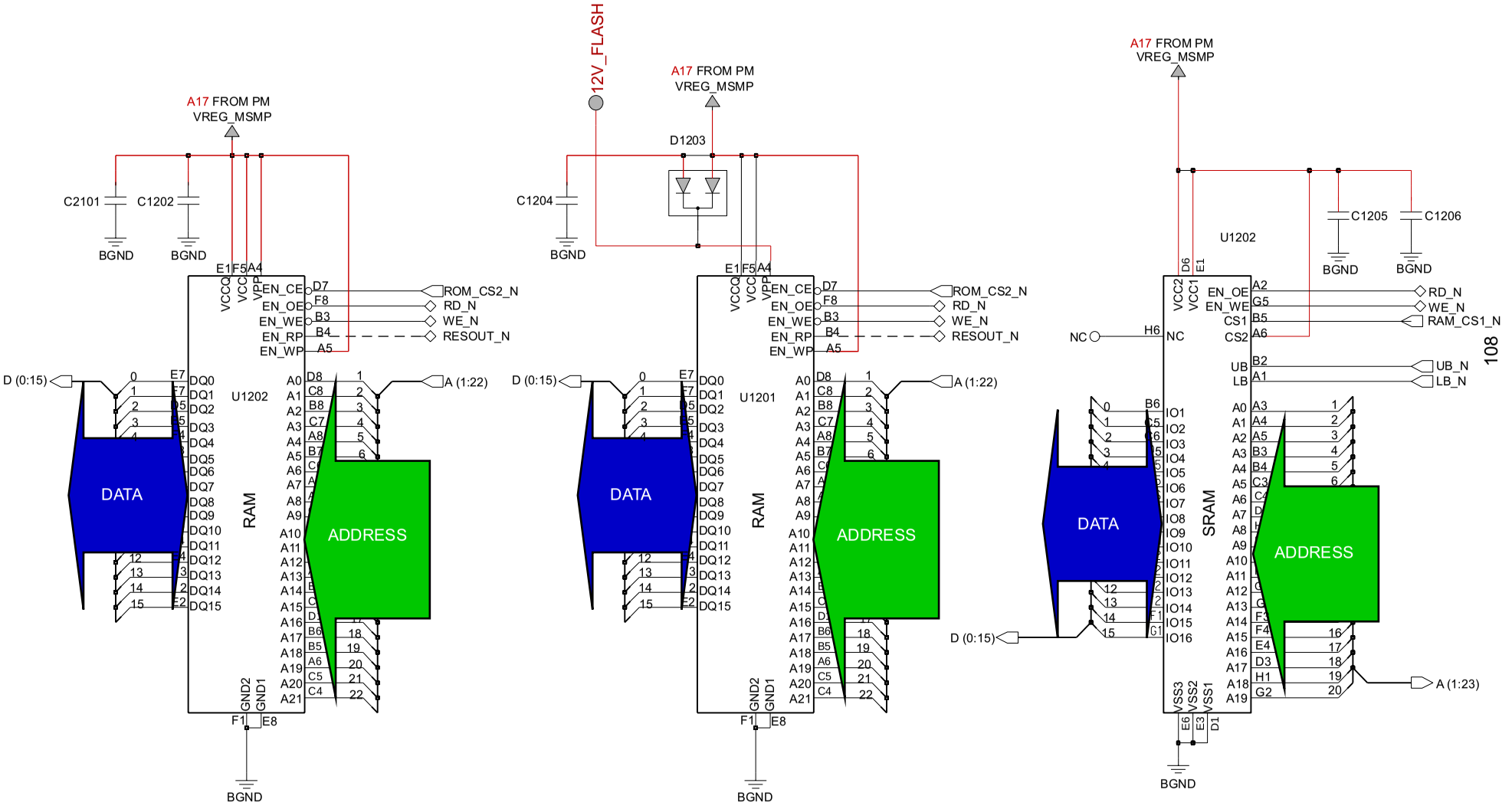
MOTOROLA CONFIDENTIAL PROPRIETARY

BOARD - P6.0

MEMORY:A22

MEMORY
REF 1200-1206



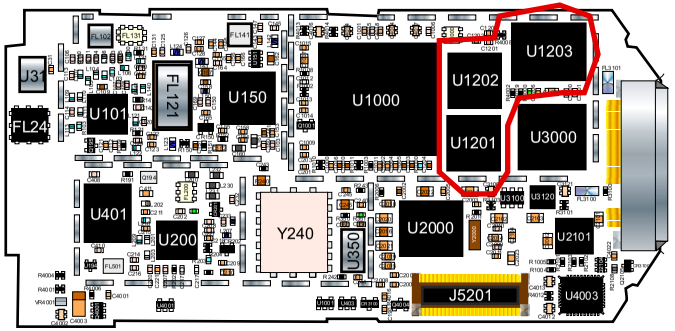


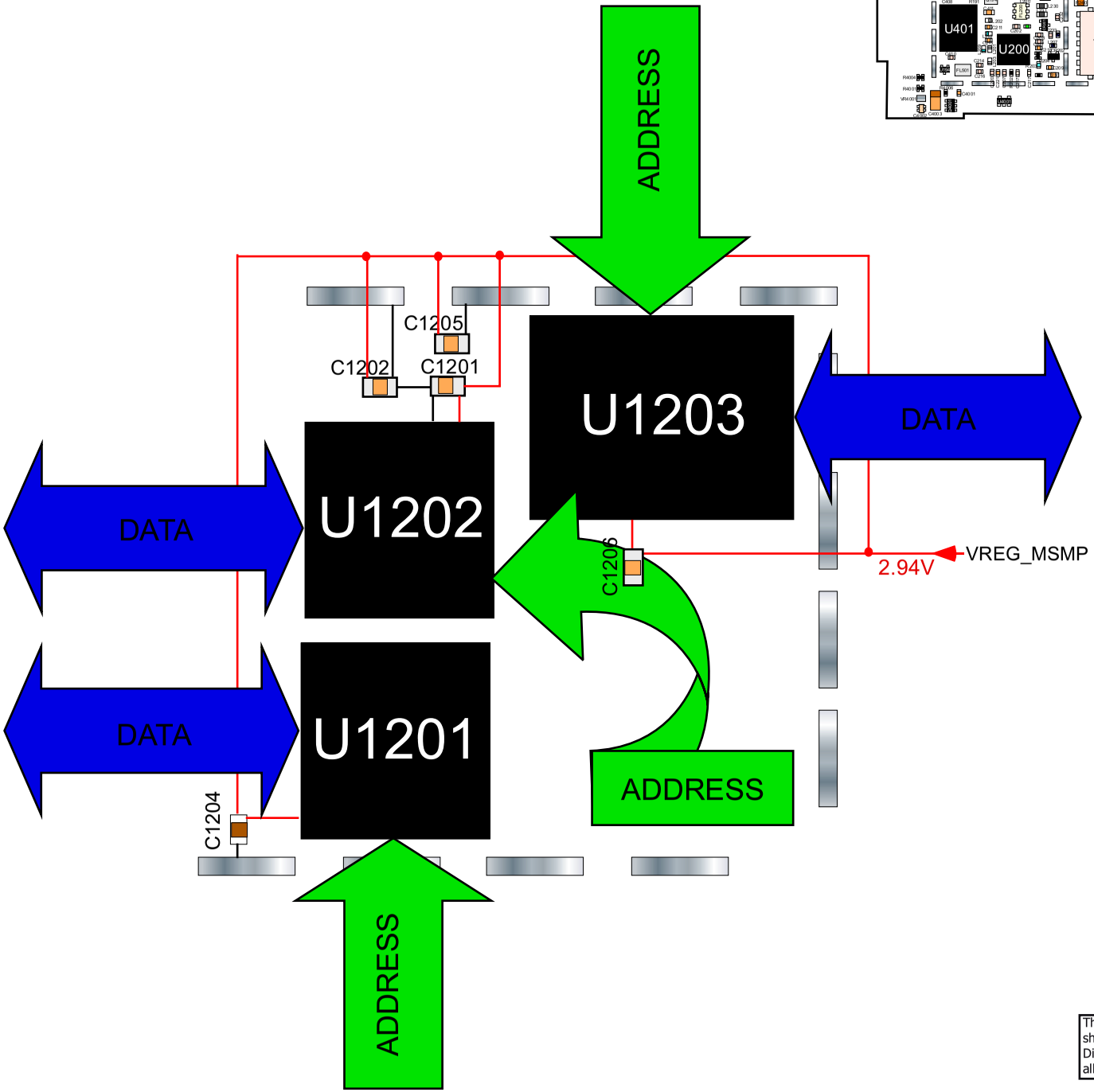
This document is propriety of MOTOROLA and it should be return if not used .
Distribution and copies of this document are not allowed with out MOTOROLA approval.

MOTOROLA CONFIDENTIAL PROPRIETARY

BOARD - P6.0

Memory





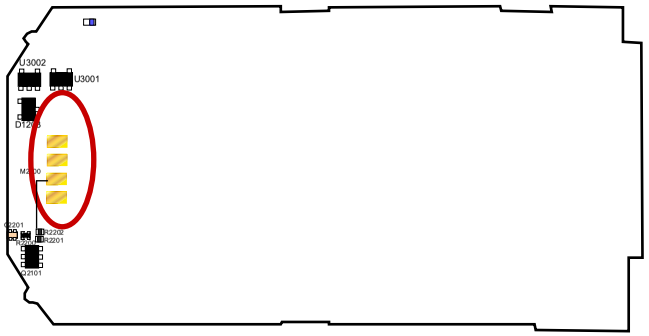
109

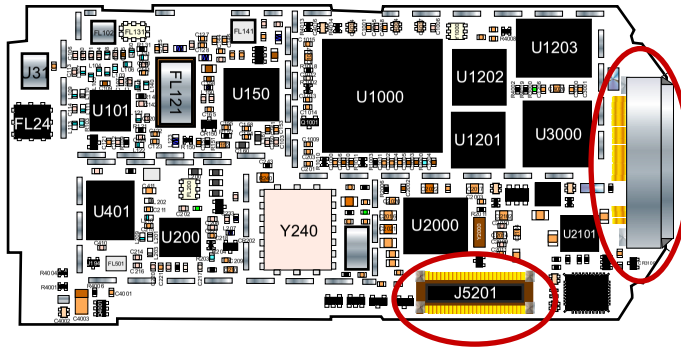
This document is propriety of MOTOROLA and it should be return if not used .
Distribution and copies of this document are not allowed with out MOTOROLA approval.

MOTOROLA CONFIDENTIAL PROPRIETARY

BOARD - P6.0

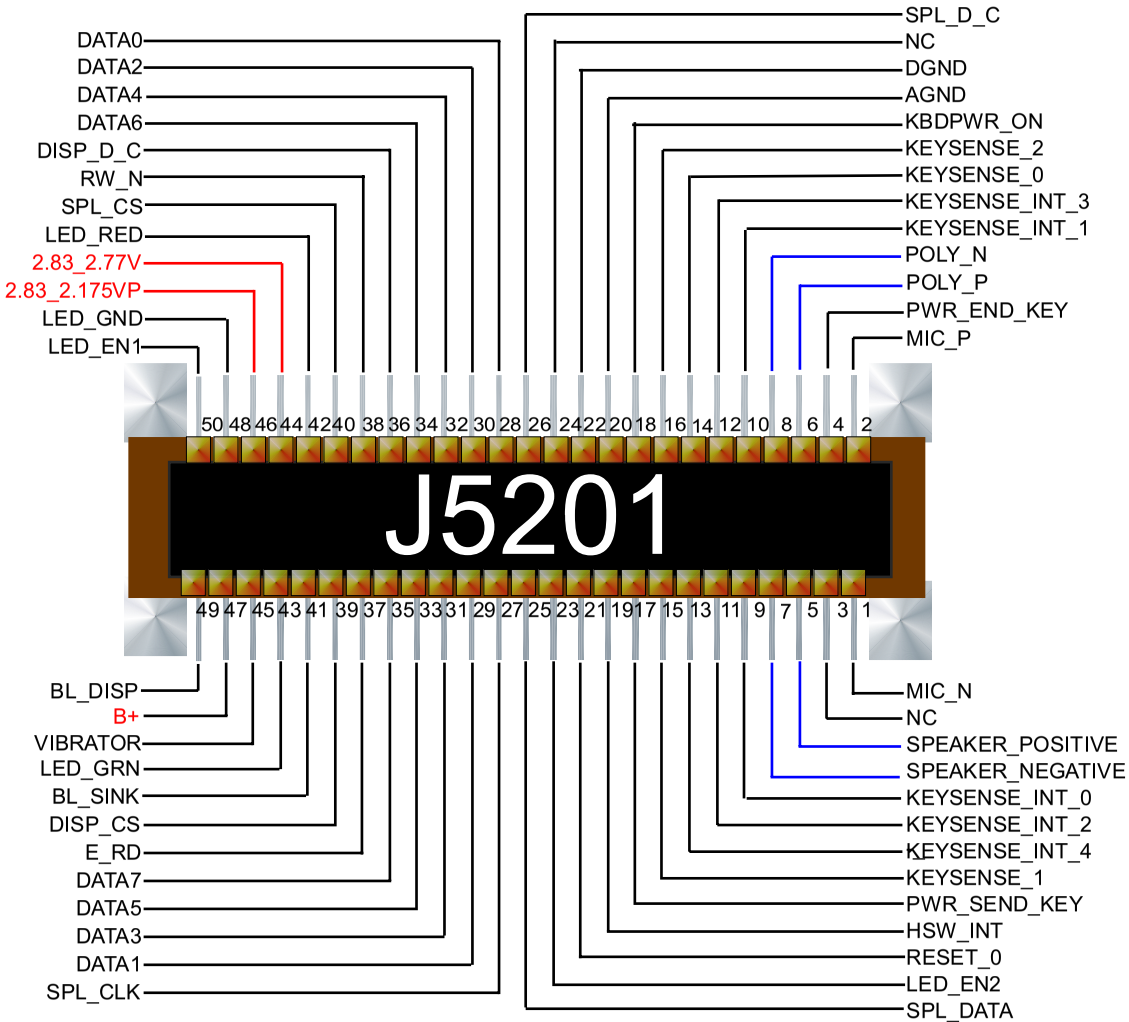
CONNECTORS:A23

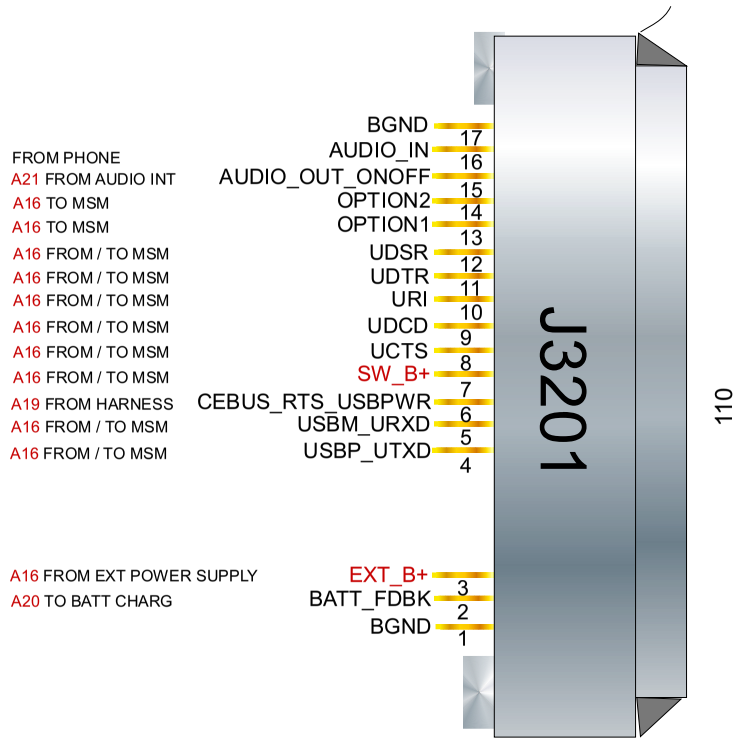




M2200

GND		
THERMISTOR	A20 TO BATT CHARG	
BATT_SERIAL_DATA	A20 TO BATT CHARG	
BATT+	FROM PHONE BATTERY	



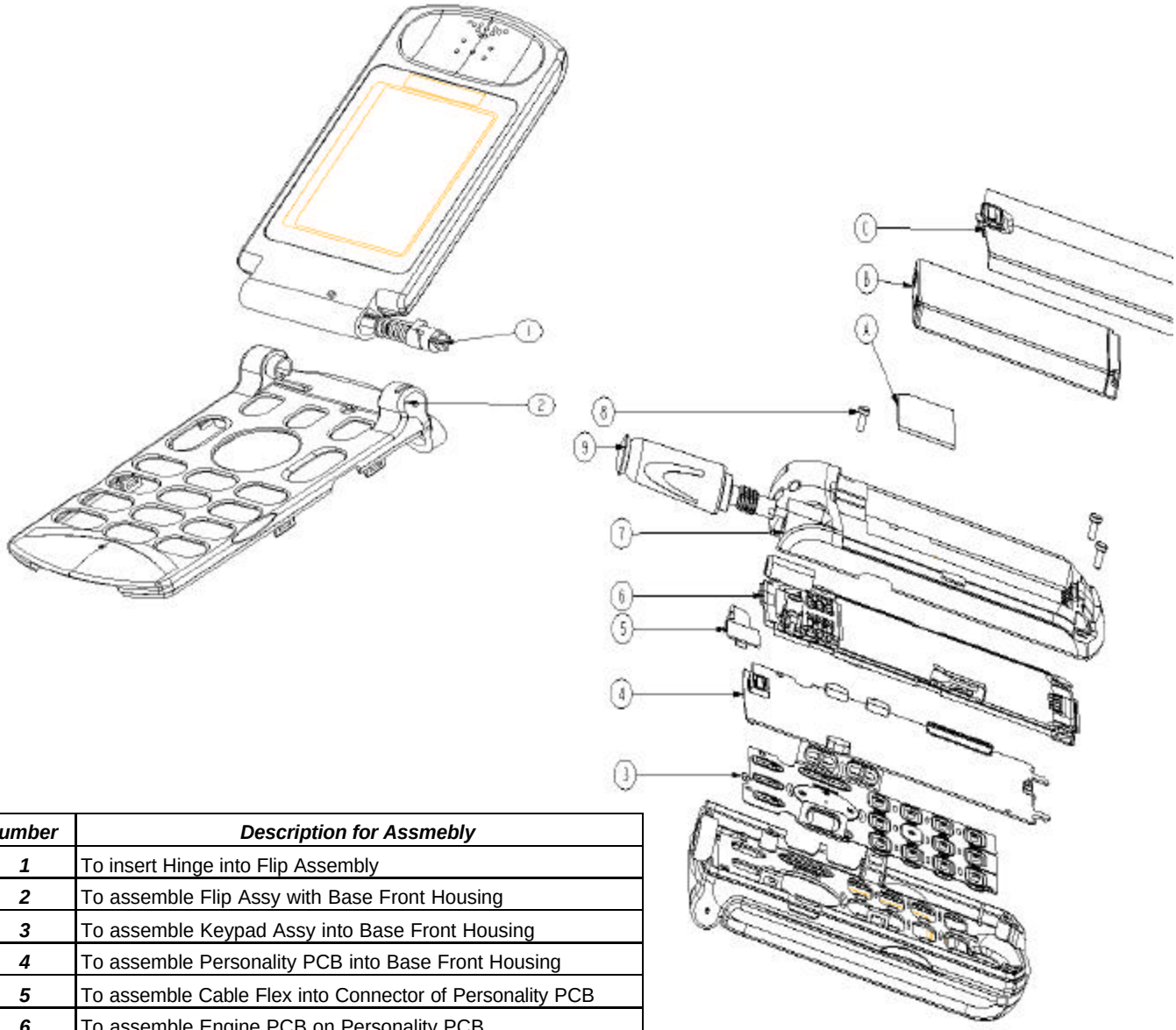


This document is propriety of MOTOROLA and it should be return if not used .
Distribution and copies of this document are not allowed with out MOTOROLA approval.

MOTOROLA CONFIDENTIAL PROPRIETARY

BOARD - P6.0

Exploded View Diagram



Number	*Description for Assmebly*
1	To insert Hinge into Flip Assembly
2	To assemble Flip Assy with Base Front Housing
3	To assemble Keypad Assy into Base Front Housing
4	To assemble Personality PCB into Base Front Housing
5	To assemble Cable Flex into Connector of Personality PCB
6	To assemble Engine PCB on Personality PCB
7	To assemble Base Rear Housing with Front Housing
8	To screw into Basr Rear Housing
A	To Put the RUIM Card into Base Rear Housing ***(Only KCDMA)***
B	To Put the Battery into Base Rear Housing
C	To Close the Battery Door

Part Number : SUG2663A
Description : XCVR T720 CDMA

Part #	Description
SHN9019A	**ASSY,HSG,,,ASSY**
0188663M01	ASSY,REAR HOUSING,,,,US
1587495M01	HSNG REAR TP01 CD
3787581M01	TUBE HSNG ANT
3987576M01	BATTERY CONNECTOR
0304387F02	SCR,METRIC,,,,,,MACHINE
0587359N01	GROM,,SANTOPRENE,CDMA R
1486604K01	GROM,,SANTOPRENE
1586639K01	HSG,,,FLIP CVR FROSTED
1587581N01	HSG,,,BOARD TO BOARD SP
4086609K02	SW,,,,,METAL DOME CDMA
5087974K02	MIC ELECT 1.5X6MM DIA P
5402393T02	LABEL VADER
8587583M01	ANT RETRACTIVE
SHN9020A	**ASSY,HOUSING AN**
0187442N01	ASSY,,,,,CDMA FLIP
0186646K01	ASSY FLIP MOD TO MAIN H
0187414N01	HSG,,,US CDMA BASE F/H
0304387F02	SCR,METRIC,,,,,,MACHINE
5586687K01	HINGE T720
SLG4169A	**CDMA 1X ENG BRD**
0109051A52	T720 CDMA AMER DB5100
0109051A53	T720 CDMA AMER DB5100
8488724M01	PCB BEAR FOR T720 ENG
SLG4171A	**TX20 UI BOARD 4**
0109051A54	TX20 UI BOD 4 NAV
0109051A55	TX20 UI BOD 4 NAV
8488723M01	PCB BOARD PERSONA
SYN9594A	**KEYPAD STD T720**
7586600K01	KYPD,,,,ENGLISH

Part Number : 0109051A52
Description : T720 CDMA AMER DB5100 TOP S

Ref. Desc.	Part #	Description
C1001	2113928N01	CAP CER CHIP 0.1UF 10% 6
C1002	2113743L41	CAP CHIP 10000 PF 10% X7
C1003	2113928N01	CAP CER CHIP 0.1UF 10% 6
C1004	2113743L41	CAP CHIP 10000 PF 10% X7
C1005	2113928N01	CAP CER CHIP 0.1UF 10% 6
C1006	2113743L41	CAP CHIP 10000 PF 10% X7
C1007	2113928P04	CHIP CAPACITOR (CERAMIC)
C1008	2113743L41	CAP CHIP 10000 PF 10% X7
C1009	2113743L33	CAP CHIP 4700 PF 10% X7R
C1010	2113928N01	CAP CER CHIP 0.1UF 10% 6
C1011	2113743L41	CAP CHIP 10000 PF 10% X7
C1012	2113743L41	CAP CHIP 10000 PF 10% X7
C1013	2113743L33	CAP CHIP 4700 PF 10% X7R
C1014	2113928N01	CAP CER CHIP 0.1UF 10% 6
C1015	2113928N01	CAP CER CHIP 0.1UF 10% 6
C1016	2113928N01	CAP CER CHIP 0.1UF 10% 6
C103	2113743N09	CAP CHIP 2.0 PF +-.25PF
C104	2113743N09	CAP CHIP 2.0 PF +-.25PF
C105	2113743N64	CAP CHIP 7.0PF 16V .5PF
C106	2113743N40	CAP CHIP 39.0 PF 5% COG
C107	2113743N40	CAP CHIP 39.0 PF 5% COG
C108	2113743N14	CAP CHIP 3.3 PF +-.25PF
C109	2113743N03	CAP CHIP 1.0 PF +-.25PF
C110	2113743N28	CAP CHIP 12.0 PF 5% COG
C111	2113743N40	CAP CHIP 39.0 PF 5% COG
C112	2113743N44	CAP CHIP 56.0 PF 5% COG
C113	2113743N40	CAP CHIP 39.0 PF 5% COG
C114	2113743N40	CAP CHIP 39.0 PF 5% COG
C120	2113743N50	CAP CHIP 100 PF 5% COG
C1201	2113928N01	CAP CER CHIP 0.1UF 10% 6
C1202	2113928N01	CAP CER CHIP 0.1UF 10% 6
C1204	2113928N01	CAP CER CHIP 0.1UF 10% 6
C1205	2113928N01	CAP CER CHIP 0.1UF 10% 6
C1206	2113928N01	CAP CER CHIP 0.1UF 10% 6
C121	2113743L17	CAP CHIP 1000 PF 10% X7R
C122	2113743L17	CAP CHIP 1000 PF 10% X7R
C123	2113743L17	CAP CHIP 1000 PF 10% X7R
C125	2113743N50	CAP CHIP 100 PF 5% COG
C126	2113743N50	CAP CHIP 100 PF 5% COG
C127	2113743L17	CAP CHIP 1000 PF 10% X7R
C128	2113743L17	CAP CHIP 1000 PF 10% X7R
C129	2113743N18	CAP CHIP 4.7 PF +-.25PF
C131	2113743L17	CAP CHIP 1000 PF 10% X7R
C140	2113743N50	CAP CHIP 100 PF 5% COG

Part Number : 0109051A52
Description : T720 CDMA AMER DB5100 TOP S

Ref. Desc.	Part #	Description
C141	2113743L17	CAP CHIP 1000 PF 10% X7R
C142	2113743N18	CAP CHIP 4.7 PF +-.25PF
C143	2113743L17	CAP CHIP 1000 PF 10% X7R
C144	2113743L17	CAP CHIP 1000 PF 10% X7R
C145	2113743N12	CAP CHIP 2.7 PF +-.25PF
C146	2113743N03	CAP CHIP 1.0 PF +-.25PF
C147	2113743N28	CAP CHIP 12.0 PF 5% COG
C150	2113743N40	CAP CHIP 39.0 PF 5% COG
C151	2113928N01	CAP CER CHIP 0.1UF 10% 6
C152	2113928P04	CHIP CAPACITOR (CERAMIC)
C154	2113743L17	CAP CHIP 1000 PF 10% X7R
C155	2113743L17	CAP CHIP 1000 PF 10% X7R
C156	2113743L17	CAP CHIP 1000 PF 10% X7R
C157	2113928P04	CHIP CAPACITOR (CERAMIC)
C158	2113928N01	CAP CER CHIP 0.1UF 10% 6
C160	2113743N50	CAP CHIP 100 PF 5% COG
C161	2113928N01	CAP CER CHIP 0.1UF 10% 6
C162	2113743K16	CAP CHIP .220 UF +80-20%
C163	2113743N50	CAP CHIP 100 PF 5% COG
C164	2113743N50	CAP CHIP 100 PF 5% COG
C165	2113743N29	CAP CHIP 13.0 PF 5% COG
C166	2113743L17	CAP CHIP 1000 PF 10% X7R
C168	2113743L17	CAP CHIP 1000 PF 10% X7R
C169	2113743N40	CAP CHIP 39.0 PF 5% COG
C170	2113743L17	CAP CHIP 1000 PF 10% X7R
C190	2113743L17	CAP CHIP 1000 PF 10% X7R
C2002	2113928C04	CAP CER CHIP 4.7UF 6.3V1
C2003	2113743L41	CAP CHIP 10000 PF 10% X7
C2004	2113743L41	CAP CHIP 10000 PF 10% X7
C2005	2113743L41	CAP CHIP 10000 PF 10% X7
C2006	2113743L41	CAP CHIP 10000 PF 10% X7
C2007	2113928N01	CAP CER CHIP 0.1UF 10% 6
C2008	2113743L17	CAP CHIP 1000 PF 10% X7R
C2009	2113743N30	CAP CHIP 15.0 PF 5% COG
C201	2113743L01	CAP CHIP 220 PF 10% X7R
C2010	2113743N30	CAP CHIP 15.0 PF 5% COG
C2011	2113743L41	CAP CHIP 10000 PF 10% X7
C2014	2113928P04	CHIP CAPACITOR (CERAMIC)
C2015	2113928P04	CHIP CAPACITOR (CERAMIC)
C2016	'2113928E03'	CAP CERAMIC CHIP 2.2 UF
C2017	2113928C04	CAP CER CHIP 4.7UF 6.3V1
C2018	2113928P04	CHIP CAPACITOR (CERAMIC)
C2019	2113928P04	CHIP CAPACITOR (CERAMIC)
C202	2113743N50	CAP CHIP 100 PF 5% COG
C2020	2113928C04	CAP CER CHIP 4.7UF 6.3V1

Part Number : 0109051A52
Description : T720 CDMA AMER DB5100 TOP S

Ref. Desc.	Part #	Description
C2021	2113928C04	CAP CER CHIP 4.7UF 6.3V1
C2022	'2113928E03'	CAP CERAMIC CHIP 2.2 UF
C2023	2113928P04	CHIP CAPACITOR (CERAMIC)
C2024	2113928P04	CHIP CAPACITOR (CERAMIC)
C203	2113743L01	CAP CHIP 220 PF 10% X7R
C204	2113743L17	CAP CHIP 1000 PF 10% X7R
C207	2113743N44	CAP CHIP 56.0 PF 5% COG
C208	2113743N32	CAP CHIP 18.0 PF 5% COG
C209	2113743N50	CAP CHIP 100 PF 5% COG
C210	2113743L17	CAP CHIP 1000 PF 10% X7R
C2101	2113743A24	CAP CHIP .330 UF 10% 16V
C2102	2113928C12	CHIP CAPACITOR (CERAMIC)
C2103	2113928C12	CHIP CAPACITOR (CERAMIC)
C211	2113743N60	CAP CHIP 5.0PF 16V .25PF
C214	2113743N32	CAP CHIP 18.0 PF 5% COG
C215	2113743N60	CAP CHIP 5.0PF 16V .25PF
C216	2113743N12	CAP CHIP 2.7 PF +-.25PF
C217	2113743L17	CAP CHIP 1000 PF 10% X7R
C218	2113743L17	CAP CHIP 1000 PF 10% X7R
C220	2113743N50	CAP CHIP 100 PF 5% COG
C221	2113928N01	CAP CER CHIP 0.1UF 10% 6
C223	2113743L29	CAP CHIP 3300 PF 10% X7R
C224	2113743L09	CAP CHIP 470 PF 10% X7R
C225	2113743N50	CAP CHIP 100 PF 5% COG
C226	2113743L17	CAP CHIP 1000 PF 10% X7R
C227	2113743N32	CAP CHIP 18.0 PF 5% COG
C228	2113743N42	CAP CHIP 47.0 PF 5% COG
C232	2113743N50	CAP CHIP 100 PF 5% COG
C233	2113743N09	CAP CHIP 2.0 PF +-.25PF
C240	2113928N01	CAP CER CHIP 0.1UF 10% 6
C242	2113928C04	CAP CER CHIP 4.7UF 6.3V1
C243	2113743L17	CAP CHIP 1000 PF 10% X7R
C244	2113743L17	CAP CHIP 1000 PF 10% X7R
C245	2113928P04	CHIP CAPACITOR (CERAMIC)
C246	2113743L17	CAP CHIP 1000 PF 10% X7R
C3000	2113928N01	CAP CER CHIP 0.1UF 10% 6
C3001	2113928N01	CAP CER CHIP 0.1UF 10% 6
C31	2113928N01	CAP CER CHIP 0.1UF 10% 6
C3100	2113947H01	CAP DL ARRAY 100,000PF 6
C3121	2113947H01	CAP DL ARRAY 100,000PF 6
C351	2113928N01	CAP CER CHIP 0.1UF 10% 6
C352	2113743L41	CAP CHIP 10000 PF 10% X7
C4001	2113928N01	CAP CER CHIP 0.1UF 10% 6
C4002	2113947B05	CAP DL ARRAY 33.0PF 50V
C4003	2311049A89	CAP TANT CHIP 22 UF 4V 1

Part Number : 0109051A52
Description : T720 CDMA AMER DB5100 TOP S

Ref. Desc.	Part #	Description
C4004	2113947H01	CAP DL ARRAY 100,000PF 6
C4012	2113947B05	CAP DL ARRAY 33.0PF 50V
C4013	2113947H01	CAP DL ARRAY 100,000PF 6
C4014	2113947H01	CAP DL ARRAY 100,000PF 6
C4015	2113743N38	CAP CHIP 33.0 PF 5% COG
C4016	2113947B05	CAP DL ARRAY 33.0PF 50V
C4017	2113947H01	CAP DL ARRAY 100,000PF 6
C4018	2113928N01	CAP CER CHIP 0.1UF 10% 6
C4020	2113928P04	CHIP CAPACITOR (CERAMIC)
C4022	2113928N01	CAP CER CHIP 0.1UF 10% 6
C408	2113740F41	CAP CHIP REEL CL1 +/-30
C410	2113743N40	CAP CHIP 39.0 PF 5% COG
C411	2113928P04	CHIP CAPACITOR (CERAMIC)
CR150	4809877C28	DIODE VARAC DUAL 400MHZ
CR201	4809877C29	DIODE VARAC DUAL 550MHZ
CR202	4809877C29	DIODE VARAC DUAL 550MHZ
CR3100	'4809606E08'	DIODE DUAL SCHOTTKEY RB7
D3101	'4809606E08'	DIODE DUAL SCHOTTKEY RB7
D4010	'4809606E08'	DIODE DUAL SCHOTTKEY RB7
FL102	9109474K04	FLTR SAW DUAL 881/1960 3
FL121	9185646H09	FLTR SAW IF 183.6MHZ 5X9
FL131	9109144M03	FLTR CER IF 183MHZ 3225
FL141	9109142L09	FLTR XTAL 3POLE 183.6MHZ
FL200	9109144M05	FLTR CER IF 183MHZ 3225
FL24	9109170T04	FLTR DUPLX 836.5/881.5MH
FL3100	4889526L02	IPD ESD FLTR 4CH 3X1.3MM
FL3101	4889526L01	IPD ESD FLTR 6CH 3X1.3MM
FL501	9103913K16	FLTR SAW BP 836MHZ 3X3MM
J3201	0987636K05	CONN,I/O,F,17,,I/O 17 PI
J5201	2888679M01	PLG,,0.5MM PITCH 2.0MM S
L103	2409154M15	IND CER MLTILYR 15.0NH 1
L104	2409154M21	IND CER MLTILYR 47.0NH 1
L105	2409154M12	IND CER MLTILYR 8.2NH 10
L106	2409154M04	IND CER MLTILYR 1.8NH 10
L107	2409154M11	IND CER MLTILYR 6.8NH 10
L108	2409154M13	IND CER MLTILYR 10.0NH 1
L109	2409154M12	IND CER MLTILYR 8.2NH 10
L110	2409154M48	IND CER MLTILYR 100 NH 1
L111	2409154M19	IND CER MLTILYR 33.0NH 1
L113	2409154M12	IND CER MLTILYR 8.2NH 10
L121	2409154M21	IND CER MLTILYR 47.0NH 1
L122	2409154M21	IND CER MLTILYR 47.0NH 1
L123	2485793G21	IND CHIP WW 72 NH 2% 160
L124	2485793G21	IND CHIP WW 72 NH 2% 160
L130	2409154M22	IND CER MLTILYR 56.0NH 1

Part Number : 0109051A52
Description : T720 CDMA AMER DB5100 TOP S

Ref. Desc.	Part #	Description
L131	2409154M22	IND CER MLTILYR 56.0NH 1
L140	2409154M23	IND CER MLTILYR 68.0NH 1
L141	2409154M23	IND CER MLTILYR 68.0NH 1
L142	2485793G19	IND CHIP WW 180NH 2% 160
L143	2485793G14	IND CHIP WW 68 NH 2% 160
L150	2489711L33	IND WW 15NH 5% 1005 SMD
L160	2462586G07	INDUCTOR CHIP FERRITE BE
L161	2462586G07	INDUCTOR CHIP FERRITE BE
L200	2462586G07	INDUCTOR CHIP FERRITE BE
L201	2409154M37	IND CER MLTILYR 12.0NH 1
L202	2409154M37	IND CER MLTILYR 12.0NH 1
L203	2409154M37	IND CER MLTILYR 12.0NH 1
L206	2489711L27	IND WW 6.8NH 5% 1005 SMD
L207	2489711L27	IND WW 6.8NH 5% 1005 SMD
L209	2409154M08	IND CER MLTILYR 3.9NH 10
L210	2409154M08	IND CER MLTILYR 3.9NH 10
L230	2462586G07	INDUCTOR CHIP FERRITE BE
L231	2462586G07	INDUCTOR CHIP FERRITE BE
L232	2462586G07	INDUCTOR CHIP FERRITE BE
Q1001	'4809579E24'	TSTR FET P-CHAN 2SJ347 S
Q194	'4809579E52'	FET, P-CHANNEL, 2.5V, BG
Q195	4880048M03	TRST NPN DIG 47K/47K
Q2104	'4809579E30'	TSTR FET DUAL N-CHAN HN1
Q2105	'4809579E02'	TSTR MOSFET N-CHAN 25K18
Q4001	4809939C39	TRANS DUAL NPN/PNP EMT6
R1000	0662057V60	RES CHIP 8.25 K 1% 0402
R1002	0609591M25	RES CHIP DUAL 1K 5% 0.63
R1003	0662057M98	RES. CHIP 10K 5% 20X40
R1004	0662057M30	RES. CHIP 15 5% 20X40
R1005	0662057M30	RES. CHIP 15 5% 20X40
R1008	0662057M74	RES. CHIP 1000 5% 20X40
R1010	0609591M25	RES CHIP DUAL 1K 5% 0.63
R1011	0609591M37	RES CHIP DUAL 10K 5% 0.6
R103	0662057U98	RES CHIP 7.5K 1% 1/16W
R104	0662057V60	RES CHIP 8.25 K 1% 0402
R109	0662057M50	RES. CHIP 100 5% 20X40
R121	0662057M86	RES. CHIP 3300 5% 20X40
R131	0662057M85	RES. CHIP 3000 5% 20X40
R141	0662057M70	RES. CHIP 680 5% 20X40
R150	0609591M37	RES CHIP DUAL 10K 5% 0.6
R151	0662057M74	RES. CHIP 1000 5% 20X40
R191	0662057M98	RES. CHIP 10K 5% 20X40
R201	0662057M01	RES. CHIP 0 5% 20X40
R2011	0662057N31	RES. CHIP 220K 5% 20X40
R202	0662057M43	RES. CHIP 51 5% 20X40

Part Number : 0109051A52
Description : T720 CDMA AMER DB5100 TOP S

Ref. Desc.	Part #	Description
R203	0662057V61	RES CHIP 12.1 K 1% 0402
R204	0609591M37	RES CHIP DUAL 10K 5% 0.6
R205	0662057M95	RES. CHIP 7500 5% 20X40
R2101	0662057M81	RES. CHIP 2000 5% 20X40
R2102	0662057M84	RES. CHIP 2700 5% 20X40
R2103	0662057M67	RES. CHIP 510 5% 20X40
R2108	0662057N15	RES. CHIP 47K 5% 20X40
R240	0662057M50	RES. CHIP 100 5% 20X40
R242	0662057M98	RES. CHIP 10K 5% 20X40
R243	0662057N27	RES. CHIP 150K 5% 20X40
R244	0662057M23	RES. CHIP 7.5 5% 20X40
R3000	0662057M01	RES. CHIP 0 5% 20X40
R3100	0662057M78	RES. CHIP 1500 5% 20X40
R3101	0609591M07	RES CHIP DUAL 33 5% 0.63
R3103	0609591M49	RES CHIP DUAL 100K 5% .6
R3136	0662057N09	RES. CHIP 27K 5% 20X40
R350	0662057M50	RES. CHIP 100 5% 20X40
R351	0662057M01	RES. CHIP 0 5% 20X40
R4001	0609591M29	RES CHIP DUAL 2.2K 5% 0.
R4002	0662057N09	RES. CHIP 27K 5% 20X40
R4004	0609591M25	RES CHIP DUAL 1K 5% 0.63
R4005	0662057N23	RES. CHIP 100K 5% 20X40
R4008	0609591M37	RES CHIP DUAL 10K 5% 0.6
R4012	0609591M29	RES CHIP DUAL 2.2K 5% 0.
R4013	0609591M53	RES CHIP DUAL 220K 5% .6
R4014	0609591M37	RES CHIP DUAL 10K 5% 0.6
R4019	0662057N09	RES. CHIP 27K 5% 20X40
SH1	2687577M01	SHIELD TX
SH2	2687578M01	SHIELD RX
SH3	2687579M01	SHIELD TCXO
SH4	2687580M01	SHIELD A/L
U1000	5109962C29	IC,,,,,,,,,MSM5100 ESD &
U1001	'5109522E14'	IC 2-INPUT OR GATE TC7S3
U101	5109944C50	IC RF-TO-IF REC DEV 3300
U1201	5185130C97	IC SAWTOOTH
U1202	5185130C97	IC SAWTOOTH
U1203	5109509A46	IC SRAM 1M X 16 48PIN 0.
U150	5109817F67	IC RX IF-BASEBAND IFR330
U151	'5109572E39'	IC GAAS SPDT RF SWITCH S
U194	'4809608E03'	TSTR DIG PNP DTA114YE
U200	5109944C48	IC TRANSMIT PROCESSOR 5X
U2000	5187970L03	IC PWR MAN SCI CTR 570KH
U2101	5187970L17	IC,POWER MANAGEMENT
U3000	5109962C21	IC,ASIC,,,,,,SM,BGA100
U31	4889695L04	MOD RF PWR DET 836/1880

Part Number : 0109051A52
Description : T720 CDMA AMER DB5100 TOP S

Ref. Desc.	Part #	Description
U3100	5109817F58	IC CURRENT LIM SW SOT23-
U3120	5187970L15	IC USB TRANS FULL-SPEED
U350	4809718L15	OSC MOD TCXO 19.2MHZ 5X3
U4001	5109731C24	IC OP AMP SNGL LMV321 5S
U4003	5187537N01	IC,,,,,,,,,YMU762 SYNTH
U401	5109908K62	IC PA2001-4C 800MHZ
U403	5109768D08	IC TEMP SENSOR LM20BIM7X
VR4001	4809948D44	4 CHANNEL ESD ARRAY 5-PI
Y1000	4887820K04	RESON 48MHZ 800PPM 2.5X2
Y2000	4809995L13	XTAL 32.768KHZ 30PPM 1.5
Y240	4889695L07	IC,PLL,,,,,SM20,,,MODULE

Part Number	:	0109051A54
Description	:	TX20 UI BOD 4 N.Y TOP SIDE
Ref. Desc.	Part #	Description
C7002	2113947B05	CAP DL ARRAY 33.0
C7003	2113947B05	CAP DL ARRAY 33.0
C7004	2113947B05	CAP DL ARRAY 33.0
C7006	2113947B05	CAP DL ARRAY 33.0
C7007	2113947B05	CAP DL ARRAY 33.0
C7008	2113947B05	CAP DL ARRAY 33.0
C7009	2113947B05	CAP DL ARRAY 33.0
C7010	2113947B05	CAP DL ARRAY 33.0
C7011	2113947B05	CAP DL ARRAY 33.0
D7001	4809118D02	LED BICOLOR LNJ11
D7002	4809496B18	DIODE,,,,,,,,,,,
D7003	4809496B18	DIODE,,,,,,,,,,,
D7004	4809496B18	DIODE,,,,,,,,,,,
D7005	4809496B18	DIODE,,,,,,,,,,,
D7006	4809496B18	DIODE,,,,,,,,,,,
D7007	4809496B18	DIODE,,,,,,,,,,,
D7008	4809496B18	DIODE,,,,,,,,,,,
D7009	4809496B18	DIODE,,,,,,,,,,,
R7001	0662057M52	RES. CHIP 120 5%
R7002	0662057M64	RES. CHIP 390 5%
R7010	0609591M45	RES CHIP DUAL 47K

Part Number : 0109051A53
Description : T720 CDMA AMER DB5100 BOT

Ref Desc.	Part #	Description
A1	3987575M01	CONT ANT MAIN
C101	2113743N09	CAP CHIP 2.0 PF +-.25P
C102	2113743N14	CAP CHIP 3.3 PF +-.25P
C11	2113743N12	CAP CHIP 2.7 PF +-.25P
C115	2113743N24	CAP CHIP 8.2 PF + -.5P
C171	2113743N34	CAP CHIP 22.0 PF 5% CO
C172	2113743N34	CAP CHIP 22.0 PF 5% CO
C173	2113743N34	CAP CHIP 22.0 PF 5% CO
C175	2113928P04	CHIP CAPACITOR (CERAMI
C176	2113740F29	CAP CHIP REEL CL1 +/-3
C2201	2113947B05	CAP DL ARRAY 33.0PF 50
C4007	2113928N01	CAP CER CHIP 0.1UF 10%
C4008	2113743L41	CAP CHIP 10000 PF 10%
C4009	2113743L17	CAP CHIP 1000 PF 10% X
C4010	2113743N50	CAP CHIP 100 PF 5% COG
C4011	2113928N01	CAP CER CHIP 0.1UF 10%
D1203	'4809606E08'	DIODE DUAL SCHOTTKEY R
E21	8588547M01	ANT GPS 1575.42 MHZ
FL101	9109239M18	FLTR SAW BP 1575MHZ 25
FL170	9185726J06	FLTR SAW SPLT 1865/189
FL21	9109239M19	FLTR SAW BP 1575MHZ 25
FL22	9109170T03	FLTR SAW 1880/1960MHZ
FL23	9185906G09	FLTR CER DIPLX 859/123
J10	0987378K01	CONN RF MOD3
J4001	0987837L04	CONN JACK
L10	2409154M16	IND CER MLTILYR 18.0NH
L101	2409154M11	IND CER MLTILYR 6.8NH
L102	2409154M08	IND CER MLTILYR 3.9NH
L11	2409154M14	IND CER MLTILYR 12.0NH
L112	2409154M07	IND CER MLTILYR 3.3NH
L12	2409154M03	IND CER MLTILYR 1.5NH
L13	2409154M01	IND CER MLTILYR 1.0NH
L14	2409154M07	IND CER MLTILYR 3.3NH
L170	2409154M08	IND CER MLTILYR 3.9NH
M10	3989579K02	CONT LOWER ANT
Q2101	'4809579E29'	TSTR FET P-CHAN SI3443
R13	0662057M01	RES. CHIP 0 5% 20X4
R14	0662057M01	RES. CHIP 0 5% 20X4
R190	0662057N13	RES. CHIP 39K 5% 20X
R21	0662057M01	RES. CHIP 0 5% 20X4
R22	0662057M01	RES. CHIP 0 5% 20X4
R2200	0609591M37	RES CHIP DUAL 10K 5% 0
R2201	0662057M90	RES. CHIP 4700 5% 20X
R2202	0662057M50	RES. CHIP 100 5% 20X4

Part Number : 0109051A53
Description : T720 CDMA AMER DB5100 BOT

Ref Desc.	Part #	Description
R4007	0662057M86	RES. CHIP 3300 5% 20X
R4016	0662057N09	RES. CHIP 27K 5% 20X
R4017	0662057N27	RES. CHIP 150K 5% 20X
SH5	2687586M01	SHIELD PA PCS
SH6	2687587M01	SHIELD GPS RF BLOCK SH
U170	5109908K63	IC PA2001-5C 1900MHZ
U171	'5109572E39'	IC GAAS SPDT RF SWITCH
U195	'4809608E03'	TSTR DIG PNP DTA114YE
U3001	'5109522E14'	IC 2-INPUT OR GATE TC7
U3002	'5109522E14'	IC 2-INPUT OR GATE TC7
U4004	2409154M09	IND CER MLTILYR 4.7NH

Part Number : 0109051A55
Description : TX20 UI BOD 4 NAV KEY BOT SIDE

Ref. Desc.	Part #		Description
VR7001	4813832C70		TRAN SUP QUAD 5.6V SC59
VR7002	4813832C70		TRAN SUP QUAD 5.6V SC59
VR7003	4813832C70		TRAN SUP QUAD 5.6V SC59
J7002	0987817K04		30PIN RECPT MATING CNTCR 1.5MM
R7008	0609591M13		RES CHIP DUAL 100 5% .63W
R7009	0609591M13		RES CHIP DUAL 100 5% .63W
R7006	0609591M13		RES CHIP DUAL 100 5% .63W
R7007	0609591M13		RES CHIP DUAL 100 5% .63W
J7003		9.09E+10	JCK,,PIN TYPED MIC. CONNECTOR
J7001	0988678M01		CONN,RCPT,,,,0.5MM PITCH 2.0MM
R7004	0662057N23		RES. CHIP 100K 5% 20X40
S7002	4087635K01		SWITCH 3 POLE LOW PROFILE
S7003	4087635K01		SWITCH 3 POLE LOW PROFILE
S7004	4087635K01		SWITCH 3 POLE LOW PROFILE
Q7001		4.81E+08	TSTR MOSFET N-CHAN 25K1830