Service Manual

Level III

MOTOROLA

V series™

DIGITAL WIRELESS TELEPHONE

V8162

CONTENTS
V8162

Preface

Logic Changes

- The biggest change from ST7760 is a new IC called Casper (U1100). Casper is the 338 CPU, DSP, and CRIB ASIC in one package. However, it is identical in architecture to ST7760. Hence, any lines that interface those chips together on ST7760 are all internal to the IC now. Obviously, any lines that interface with the rest of the board (CIA, GCAP, 3WB, Memory, and RF) are still external.
- Aux_Battery is eliminated; this has reduced the complexity of the battery circuitry. There are only two power sources now: 'BATT+" and 'EXT_B+'.
- The memory devices are larger. Consequently, the SRAM has an additional line running to it. The Flash's Chip Select scheme is slightly different than ST7760 because of a new memor map.
    - Flash: 8Mb & 16 Mb on ST7760 to 16 Mb and 32 Mb on ST7860 - FDI Technology also contains EEProm -256 kb.
    - SRAM: 1Mb on ST7760 to 2Mb on ST7860
- An External B+ Disconnect Circuit has been added (it is identical to AMPS V3620). If the voltage on Ext_B+ rises above 8.5V, a voltage detector disconnects Ext_B+ from the rest of the board. This is for over voltage protection.
- A new headset jack is being used to commonize 800 CDMA with ST7762 and ST7867. However, the detection scheme is slightly different than ST7760.
- The display is holographic films (similar to Iridium) and EL backlit displays.
-

RF CHANGES

•Reciever:
•Similar to V8160 800 MHz except for the following:
•LNA Circuit has additional saw filter FL101.
•Output of mixer is only Digitak IF.
•U250 switch is removed.
•1900 Lo=2038 to 2100 MHz.
•IF frequency =109.8MHz.
•Filters: LND, LNA and mixer picked up from ST7867.
•

Transmitter:

The Tx line up is similar to ST7867 1900 line-up.

Tx-IF =189.8 MNz

ME2 is different than V8160, but same as ST7762.

Two stage Fujitsu PA with discrete driver stage.

VCO

New VCO module includes VCO, buffer and doubler.

Loop filter same as ST7867.

Frequency =2038 to 2100 MHz.

Mechanical Changes

Same as the 800 series except for the antenna which is different.
Since there will be no Aux_Batt support in V8162, there is no need for external Aux. Batt. contacts on the rear housing. Much of the housing remains the same as V3682 (GSM) or V3620(analog) phones.

Specifications

Overall System: CDMA

Table 1:

Frequency Range	1850 to 1910 MHz(TX),1930 to 1990(RX)
RF Channel Band-width	1.25MHz
Channels	1200
Duplex Spacing	80MHz
Frequency Stability	Center Frequency * +/- 8.5 x 10-8 +/- 150Hz of incoming RX CDMA signal
Operation Voltage	+3.6 V nominal (3.0 - 4.2V DC)
RF Power Output	0.20 Watts - 23dBm into 50 ohms(CDMA, nominal)
Input/Output Imped-ance	50 ohms(nominal)
Spurious/Harmonic Emissions	Complies with Title 47, Part 22 of the code of Federal Regulations
Vocoders	8kbps, 13kbps, EVRC
Transmit Time Error	+/- 1 us
Modulation Type	1M25D1W(1.25MHz bandwidth), OQPSK, G7W(CDMA)
Transmit Duty Cycle	Variable - full, 1/2, 1/4, 1/8 rate(CDMA Mode)
CDMA Transmit Waveform Quality(Rho)	0.94
Receive Sensitivity	-104dBm(CDMA, 0.5% Static FER,8kbps Vocoder)
Display	96x32 LCD
Temperature Range	Operational -30? to +60? Storage -40? to +85? Thermal Shock -40? to +85?
Shock	Exceeds EIA Standards RS152B(Section 15) and IS-19
Drop	Exceeds EIA Standards RS316B and IS-19
Humidity	80% Relative Humidity: meets EIA Standards IS-19
Vibration	Exceeds EIA Standards RS316B and IS-19
Salt Fog	Salt Solution fog at 35?(95?), tested for 48 hours
Dust	140 mesh blown silica flour test, tested for 5 hours

Table 2: Environmental

Function	*Specification*
Notes:	• EIA (Electronic Industries Association) Standard RS152B states the minimum stan-dards for Land Mobile Communications, FM or PM transmitters 25-470 MHz. • EIA IS-19 states the recommended standards for 800 MHz cellular subscriber units. • EIA Standard RS316B states the standards for portable land mobile communications. • U.S. Military Standard 810D establishes uniform environmental test methods for deter-mining the resistance of equipment to the effects of natural and induced environments peculiar to military operations. • TIA / EIA / IS-98 Recommended Minimum Performance Standards for Dual-Mode Wide band Spread spectrum Cellular Mobile Stations.

Specifications subject to change without notice.

Foreword

Scope of Manual

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

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

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.

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:

Attn.: Global Spare Parts Department
Motorola Cellular Subscriber Group
2001 N, Division St.
Harvard, IL 60033-3674
U. S. A.
FAX: 1-815-884-8354

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.

Service

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

General Safety Information

CAUTION

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

Portable Operation

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

DO NOT operate the telephone in an airplane.

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

Mobile Operation (Vehicle Adaptor)

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

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

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

DESCRIPTION

Table 3:

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 spectrum technology, all users share a range of the radio spectrum. CDMA cell coverage is dependent upon the way the network is designed. For each system 3 characteristics must be considered: coverage, quality, and capacity. These 3 must be balanced for desired lever of perfor-mance.

Some of the CDMA benefits are:

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

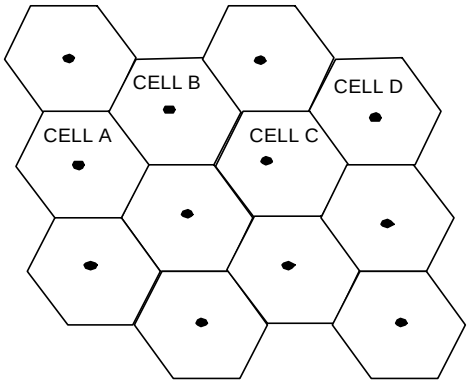


Figure 1: Hypothetical Cell System

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 channels 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

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.

Theory of Operation

Reciever Circuitry

RF enters the phone via the internal antenna, A1, or via the accessory connector. RF switch U75 selects which antenna is used. The received RF signal is routed through monoblock duplex filter FL75. Then

the RF signal is routed through RF switches U100, then thru FL100 and FL101 into U150-LNA. In CDMA Mode LNA-turns on or off based on the incomming signal strength. The received signal then enters the Mixer U200.

The local oscillator input to the mixer is a 978-1004 MHz VCO, U626 controlled by the IF/Synthesizer IC U700. The two mixer output is routed to separate paths for AMPS 109.8MHz and 109.8 MHz for CDMA is routed through U700. The IF during Amps mode (109.65MHZ)is routed through IF band pass filter FL250 into ZIF syn IC -U700. The IF during CDMA Mode (109.8MHz) is routed through IF band pass filter FL251 and through Q251 into ZIF syn IC - U700.

Transmitter Circuitry

The modulated TX Offset VCO signal is mixed with-the 2038 to 2100 MHz local oscil-lator signal in TX Mixer U400 to producetransmit signal. This signal passes through filter FL400 and voltage controlled attenuator U400 which controls the TX output power. Then the TX signal is amplified by U530 and passes through Tx detect circuit. The output passes through the mono-block duplex filter FL75 to RF switch U75 to either the internal antenna or the accessory connector.

Frequency Synthesizer Circuitry

The phone contains three PLL frequency synthesizers in the IF/Synthesizer IC U700. One synthesizer controls the tunable 978- 1004 MHz main local oscillator, U626. The second synthesizer controls the TX offset oscillator (internal to U700) which operates at a fixed frequency of 309.3 MHz for AMPS, and 309.6 MHz for CDMA. The TX offset signal is divided by 2 before going to the TX mixer. TX modulation occurs in the TX offset
synthesizer in both AMPS and CDMA modes. The third synthesizer (also internal to U700) operates at a fixed frequency of 219.3 MHz for AMPS, 219.8 MHz for CDMA. This oscillator is divided by 2 and used to mix the received first IF signal down to baseband. All synthesizers obtain their frequency reference from the 16.8 MHz reference oscillator, U325.

Transmit Power Control Circuitry

The power control signal controls voltage controlled attenuator U400 which is the TX mixer. A detected sample of the TX output signal with a variable reference voltage. A closed loop adjusts the Power Control signal such that the sampled RF signal level matches the reference level. In CDMA mode the RF power range is -50 dBm to +24 dBm. In CDMA mode, the power control can operate in either open-loop or closed-loop modes. In open-loop mode, the power level is proportional to the received signal level. In closed loop mode, the power level is controlled by the CDMA cell, based on received signal strength at the cell site.

Receive Audio - AMPS Mode

AMPS discriminator audio is routed to CIA-IC to be digitized. All receive audio filtering and gain control

is performed in the digital domain by DSP in casper. The processed RX audio is converted back to analog by CIA ICand amplified by the CCAP Lite. The

received audio is then routed to either the internal ear-piece speaker or head set speaker.

Receive Audio - CDMA Mode

Received CDMA QPSK data (RX I, RX Q) is gain controlled and converted to digital by CIA IC. The 1.2288 Mb/sec. RX data stream is then decoded by the Modem IC in casper (The CSP) to produce a signal containing only the desired data. The digital speech data is routed through the microprocessor , decoded by the DSP CELP Vocoder, and sent to CIA IC to be converted into analog audio. The audio signal is then amplified by C CAP Lite and sent to the ear-piece speaker or head set speaker.

Transmit Audio - AMPS Mode

Audio from the internal microphone is ampli-fied

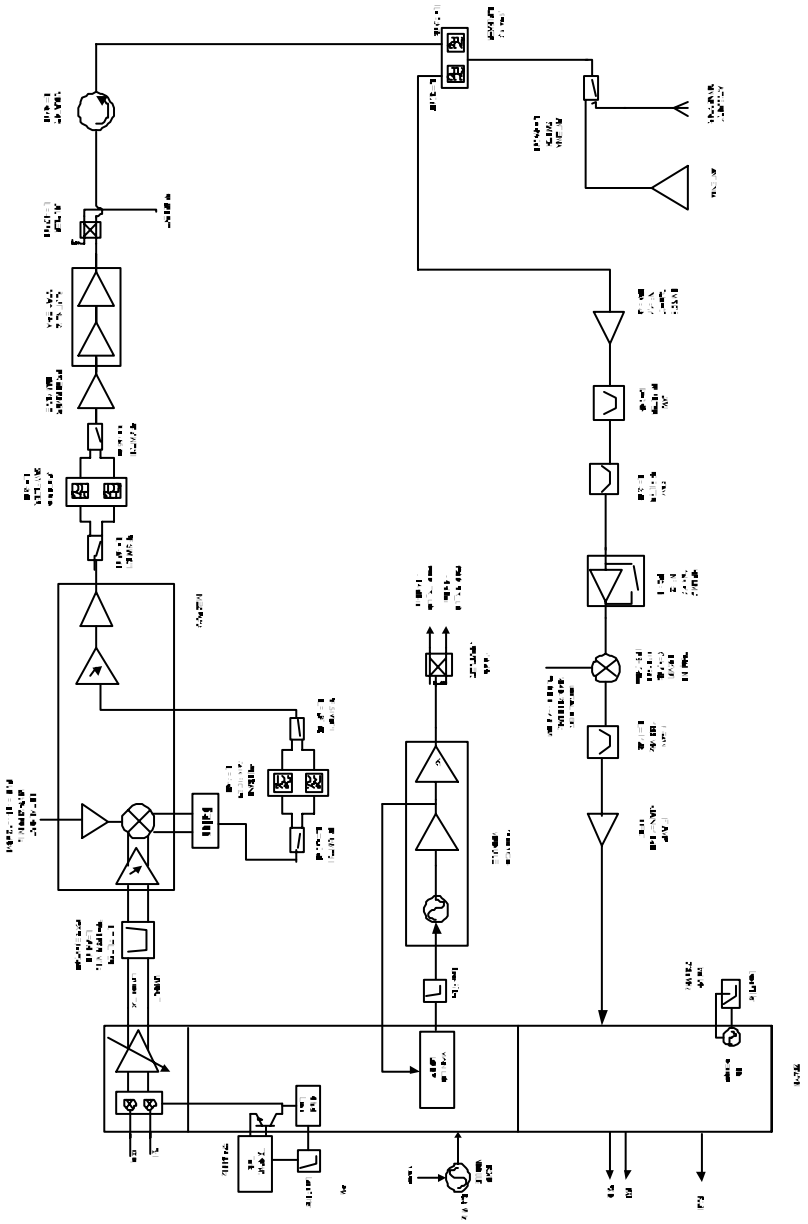
and converted to data by CIA IC. In AMPS mode, the digitized microphone audio is then sent to DSP in casperwhich performs all compression, pre-emphasis, limiting, and bandpass filtering functions in the digital domain. All AMPS signalling (SAT, ST, DTMF) is also generated in the digital domain by DSP in casper. The digitized AMPS TX audio signal is converted back to analog by the CIA ICand sent to the 154.65 MHz TX Offset VCO to modulate the transmitter.

Transmit Audio - CDMA Mode

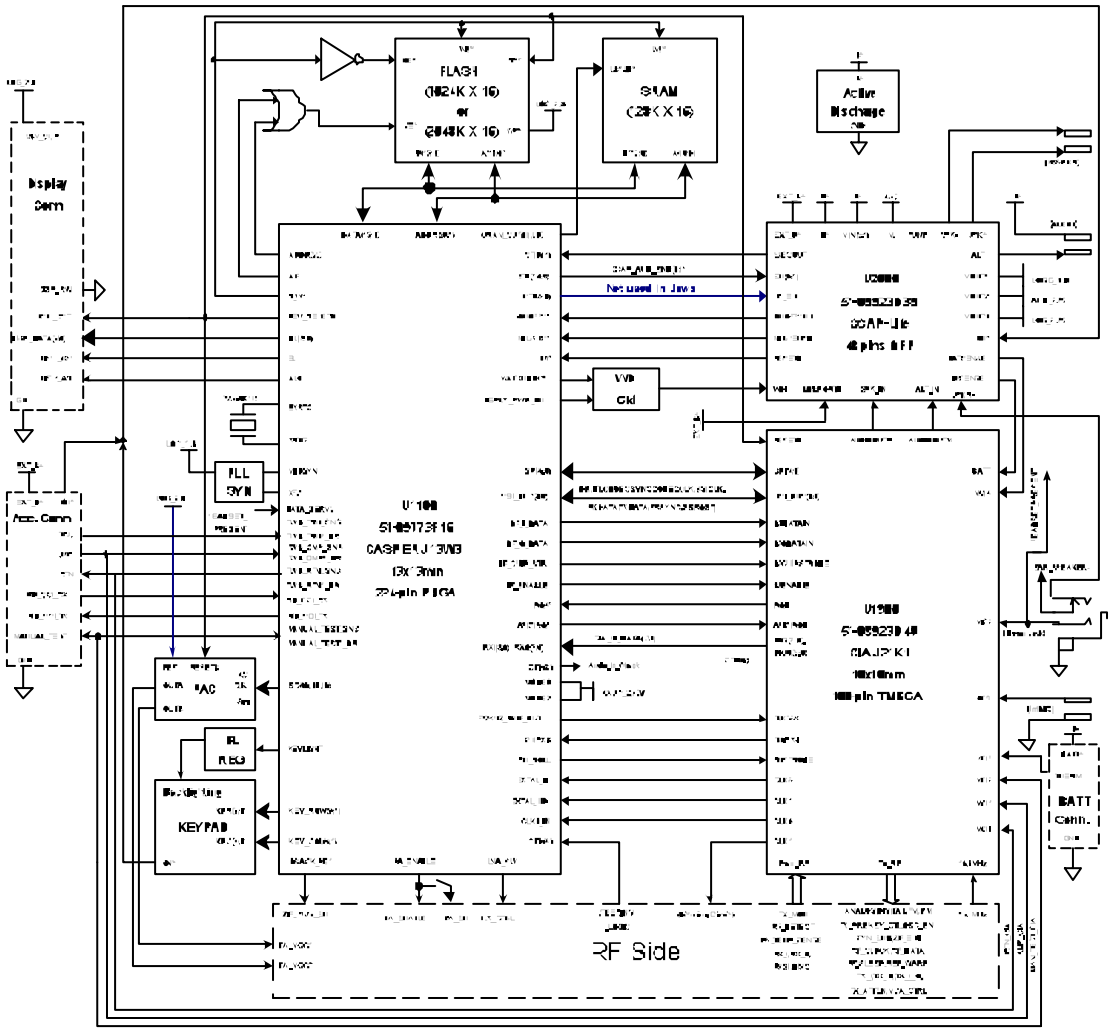
In CDMA mode, the digitized TX audio is processed by a CELP variable rate vocoder,in casper. The digital signal is then routed through microprocessor and processed by the CDMA Modem IC, in casper(the CSP), which produces the 1.2288 Mb/sec. CDMA data

stream. This stream is then converted to analog QPSK signals (TX I, TX Q) by D/A CIA IC. The TX I and TX Q signals are sent to the IF/Synthesizer IC U700 which modulates the 154.8 MHz TX offset VCO.

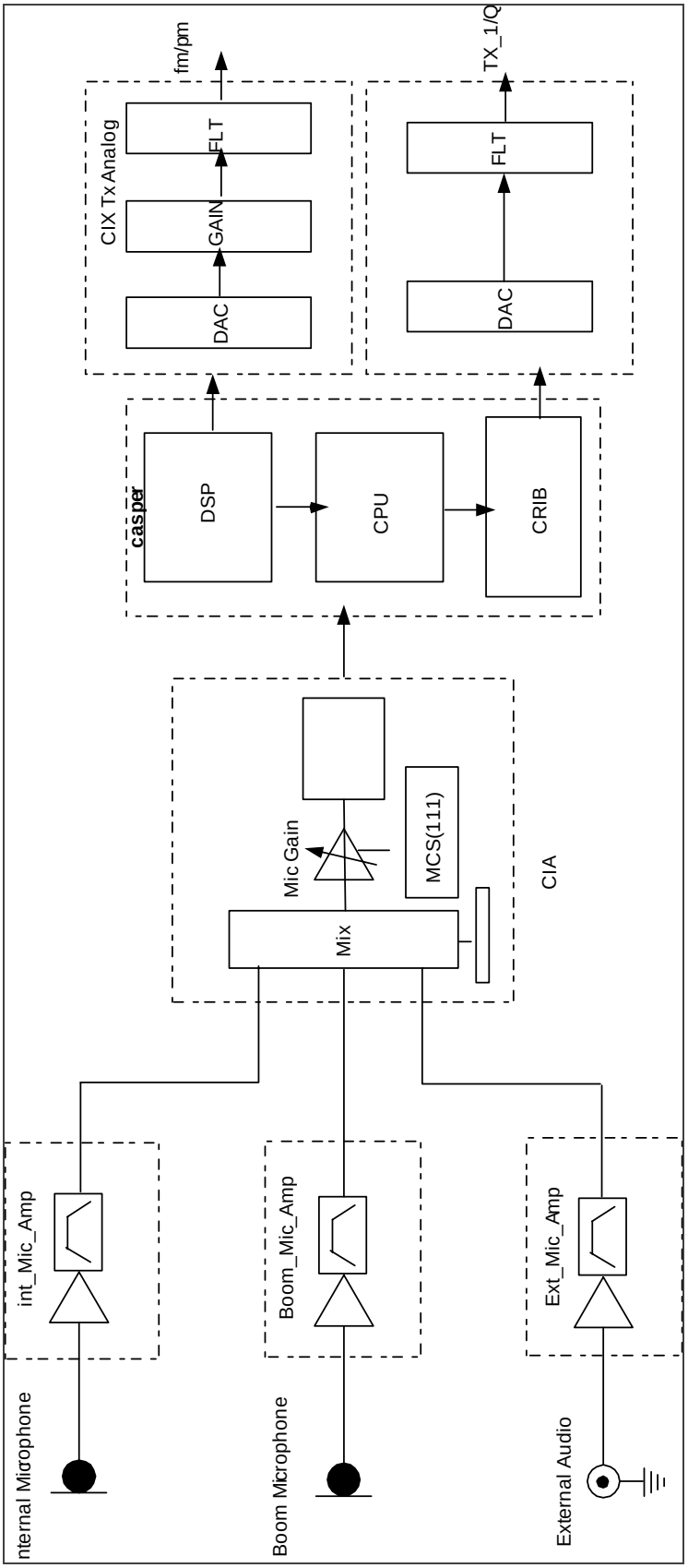
RFBlock Diagram



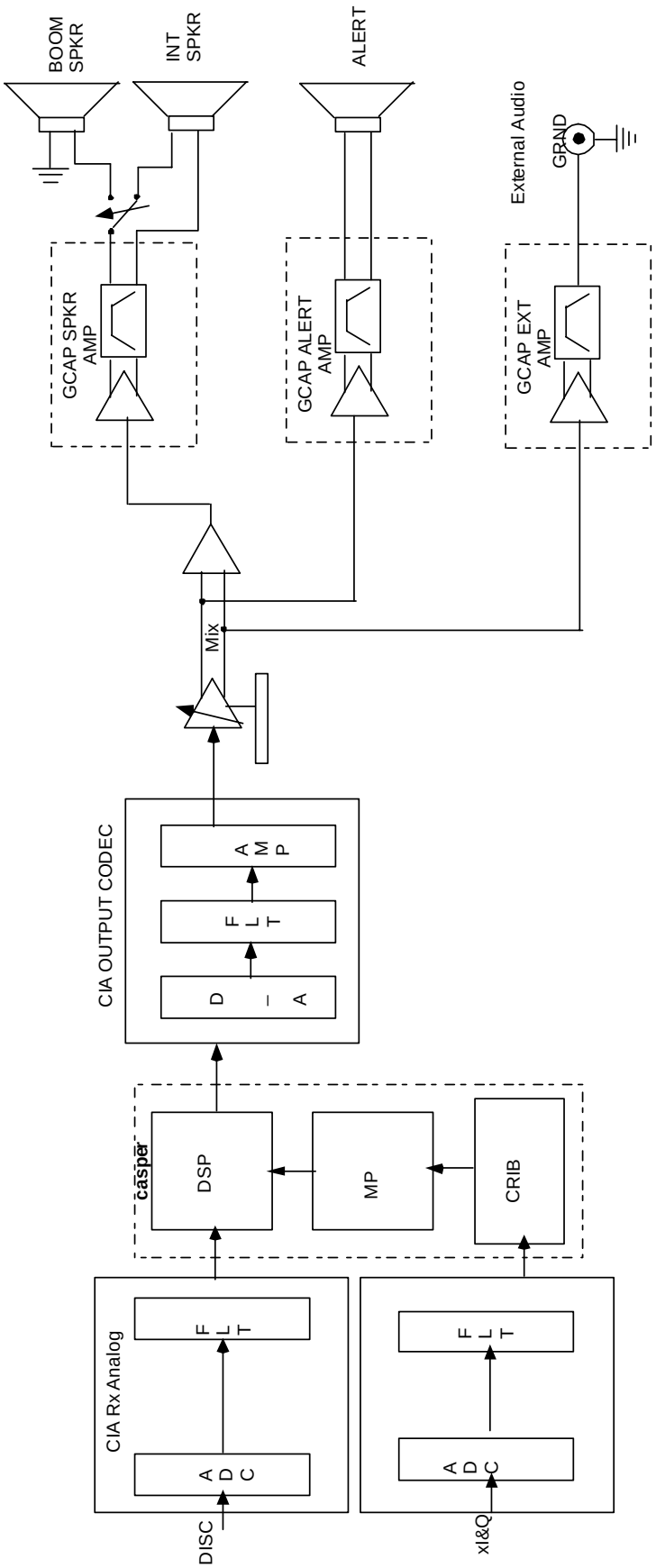
Audio Logic Side Block Diagram



Reverse Audio Functionality:



Forward Audio Functionality:



Test Mode / Test Menu

Introduction

Manual Test Mode software allows service personnel to monitor the telephone status on the display, and manually control tele-phone functions via the keypad.

Manual Test Mode operates at two levels: - Status Display Level, which allows the phone to operate normally while providing status indications in the display. Servicing Level, which disables normal call-processing and allows commands to be entered through the keypad to manually control operation of the phone.

Status Display Level

Status Display Level is the power-up state in Manual Test Mode. Manual Test Mode is entered by momentarily shorting the test pin of the accessory connector J3 to ground, while turning the phone on. Use the MCEL 2000 (SLN6625A) and Test Cable (SKN4800A). See Figure 7: “Connections for Testing and Adjustments” on page 48 In this level of Manual Test Mode the phone will place and receive calls as normal, but the display shows status information. The first line of data indicates channel number, RSSI value, and call-processing mode. The second line of data indicates SAT frequency, carrier state, signaling tone state, power level, voice/data channel mode, Rx audio state, and Tx audio state. The format and explanation of this status information is given in Table 1 under “02# Radio Status Request.” When dialing a phone number, the status display ceases when the first digit of the phone number is entered. The telephone number is displayed in the normal manner as entered. When the Snd button (or End or Clr) is pressed, the status information display resumes.

Servicing Level

The servicing level allows service personnel to manually control operation of a phone by entering test commands through the tele-phone keypad. Parameters such as oper-ating channel, output power level, mut-ing, and data transmission can all be selected by entering the corresponding commands. To enter the Servicing Level, press the # button while in Status Display level (power-up state of Manual Test Mode). In the Servicing Level, automatic call processing functions are disabled, and the phone is instead con-trolled manually by keypad commands. Table 2: “Test Commands For Manual Test Mode” on page 14 shows the test commands and the corresponding results.

NOTE

There is no Status Display when the phone is in CDMA mode.

CDMA Specific Features

Test Menu

A Test Menu allows a user to initiate Markov calls, place Service Option 2 calls and set

Software Configuration Options. The Test Menu is intended to provide a simple mechanism to perform various test and S/W debugging functions. Items will be added to and deleted from the menu period-ically. When Test Menu is enabled, it is entered by pressing the FCN key twice. Refer to Step “09” on page 27 for information on how to enable/ disable the Test Menu during NAM programming. Almost every Test Menu command accepts a parameter or data in the scratchpad. The procedure for transferring the scratchpad data and executing the Test Menu command is as follows:

Step 1. Decide which Test Menu command is going to be executed.

Step 2. Enter the necessary user input into the scratchpad.

Step 3. Press the FCN key twice to acti-vate the Test Menu.

Step 4. Press the volume keys until the desired Test Menu command is indicated on the display.

Step 5. Press the SND key to activate the command.

While the Test Menu is displayed, any keypress that is not volume or SND will also cause the menu to be exited without executing the current option. The Test Menu will also be exited whenever an incoming call is detected.

Markov Calls

During a Markov call, the “(G)ood” rate will be on the top line, and the “(T)otal” on the bottom line of the display. The display will cycle through all rates: (F)ull, (1/2) Half, (1/4) Quarter, and (1/8) Eight.

- Mobile originated Markov calls are performed by entering a telephone number and selecting a Test Menu option. Refer to the “Test Menu” section for further information.

- Mobile terminated Markov calls (Land to Mobile) are currently NOT supported. Pressing the SND key initiates a Markov call with the number in the scratchpad. If scratchpad is empty, “1234567” is used. This feature has no value in AMPS mode.

Service Option 2

For Service Option 2 calls, the In Use indi-cator will come on, but the display will remain blank.

- - Mobile originated Service Option 2 calls are performed by entering a telephone number and selecting a Test Menu option. Refer to the “Test Menu” section for further information.
- - Mobile terminated Service Option 2 calls will be automatically answered. Pressing the SND key initiates a Service Option 2 call with the number in the scratchpad. This feature has no value in AMPS mode.

SW (Software) DIP

Pressing the SND key initiates a one or more SW DIP functions based on the number in the scratchpad. Possible SW DIP functions are:

1: Disables closed loop power control.

4: Forces vocoder to provide full rate voice (may be enabled at any time during a call).

128: Sets the conversation audio path to “audio out” and “audio in” on the external connector.

For example, to disable closed loop power control, the user enters the following key sequence:

1 + FCN + FCN + ^ + SND

Undo all SW DIP settings (default at power on) by pressing:

0 + FCN + FCN + ^ + SND

These may be combined to do more than

one at a time. For example, 4 and 1 may be combined by entering 5 before entering menu and selecting SW DIP.

Test Mode

Also included in the software is a Manual Test Mode, which allows viewing the ESN, software version number, and programming the phone number (NAM).

To enter Manual Test Mode:

- 0 0 * * 83786633

(83786633 spells “TESTMODE” on the keypad).

Handset Commands

Table 4:

Key	***Function***
*	Toggles the display to the next location (enters data displayed to buffer). When hit at last program step, the command is terminated (if required, information may also be programmed into the EEPROM). If the command relates to a test function with multiple data displays, the * key is used to pause scanning data or to step through sequential test func-tions. Entering the * key during a pause time resumes scanning.
CLR/END	Resets the location to presently programmed information (if the command allows user input).
#	Terminates command without changing any of the programmed informa-tion. Each command consists of at least two digits entered from the telephone keypad with the entry terminated using the # key. For commands that initiate an action that requires a response or that accu-mulates error counts, the # key terminates the test.
DIGIT	Enter digit value. If the value to be modified is filled or exceeded, the **CLR** must be pressed before more digit selections are allowed. This is valid only if the command allows user input.
For The Gain and power Phasing handset test commands only	
SND	Send into HEX mode. Keys 0-5 enter immediately after the send key are translated into HEX A-F respectively.
Volume up/ down	Increments/decrements the current data value. If the maximum value for this data location is exceeded then it is set to zero.

Table 4:

Key	*Function*
STO	Shortcut to save values and quit test command.

This will cause the phone to enter the Test

Table 5:

Keypad Entry	*Command Description*	*Status Display*	*Result*
#	Suspend		Terminate normal mode and enter Test Command Mode. This command is valid only when in normal mode. The # key must be held for 2 seconds to suspend with handset. Performs initialization as in the INIT test command.
01#	Restart		Equivalent to turning power off, then on again.
02#	Radio Start Request	AAAZBBBC-DEFGHI	Display the current radio status: **Handset Display Format:** AAA = Current channel (1000-1023 represented as A00-A23) Z = Blank - AMPS **Analog Mode:** BBB = RSSI reading (averaged) for this channel. C = Digital Color Code (data channel) 0-3 DCC, 4 invalid = SAT Frequency (voice channel) 0=5970 Hz; 1=6000 Hz; 2=6030 Hz; 3=No SAT Lock D = Carrier (0=OFF, 1=ON) E = Word sync status (data channel) and Signalling tone (voice channel) (0=OFF, 1=sync acquired/ON) F = RF Power Level (Steps 0-7) G = Reception Mode (0=voice channel, 1=data channel) H = Receive Audio (0=enabled, 1=muted) I = Transmit Audio (0=enabled, 1=muted) **CDMA Mode: (Not currently supported)** **Bit fields undefined**
03#	(not used)		

Table 5:

Keypad Entry	*Command Description*	*Status Display*	*Result*
04#	Initialize Trans-ceiver		Initialize the current radio as follows: 1. Carrier = OFF 2. RF power attenuation set to level 2 3. Signaling Tone = OFF 4. SAT transponding = OFF 5. Audio Path = TO INTERNAL SPEAKER 6. DTMF & Audio Tones = OFF 7. Receive Audio & Transmit Audio = MUTED 8. AMPS Mode If the radio is a CDMA only model (not dual mode), it will default to CDMA mode instead.
05#	Carrier on		Turn on the carrier. **05#** turns the carrier on with a nominal value for the DAC for an output power level.
06#	Carrier Off		Turn off the carrier.
Note: Use the PATH command (**35A#**) to select the audio path to test before using commands **07#** through **10#**. (Default path is to internal speaker and microphone).			
07#	RXMUTE		Mute Recieve Audio
08#	RXUNMUTE		Unmute recieve audio
09#	TXMUTE		Mute Transmit audio.
10#	TXUNMUTE		Unmute transmit audio
11X#	Loadsynth		Load the specified channel into the radio synthesizer. X-Enter up to 4-digits for the channel number. Channel numbers must be in the range of 1 to 1024. Narrow mode channel numbers not currently supported.
12X#	Set-Attn		In AMPS mode: Set the AMPS RF power attenuation to the value specified (0-7). In CDMA mode: Set the TX gain adjust DAC to the value specified (0-255)
13#	(not used)		
14#	STON		Enables continuous signalling tone.
15#	STOFF		Disables signalling tone.
16#-18#	(Not Used)		

Table 5:

Keypad Entry	*Command Description*	*Status Display*	*Result*
19#	Version		Displays version corresponding to the two digit option x. The following table show the valid options for x: Decimal 00 Call processor 01 CDMA test command document number 02 Date 03 Time 22 DSP mask version 23 DSP patch version - The call processor (factory version) number in the format: 00 XXXX - The CDMA test command document number: 01 XXXX - The date the build was created in the format: 01JAN96 - The time the build was created in the format: xxyyzz where xx is the hour, yy is the minute, and zz is the second. - The version of the DSP mask xxxxyyyyyyzzzz where xxxx is the version, yyyyyy is the date, and zzzz is the device. - The version of the DSP patch xxxxyyyyyyzzzz where xxxx is the version, yyyyyyis the date, and zzzz is the device. All data fields can be viewed by hitting the * key repeatedly. To exit hit the # key.
19X	Multi-Version		Displays version corresponding to the two digit option x. The following table show the valid options for x: Decimal 00 Call processor 01 CDMA test command document number 02 Date 03 Time 22 DSP mask version 23 DSP patch version - The call processor (factory version) number in the format: 00 XXXX - The CDMA test command document number: 01 XXXX - The date the build was created in the format: 01JAN96 - The time the build was created in the format: xxyyzz where xx is the hour, yy is the minute, and zz is the second. - The version of the DSP mask xxxxyyyyyyzzzz where xxxx is the version, yyyyyy is the date, and zzzz is the device.
20#-24#	(not -used)		

Table 5:

Keypad Entry	*Command Description*	*Status Display*	*Result*
25X#	Sat/Dsat On		Enable SAT/DSAT transponding. For AMPS mode, the bye following the opcode is the color code of the SAT frequency that the radio may expect to receive. The command only uses the narrow phase lock loop mode and locks only to the frequency selected (+/- 15 Hz). Valid color codes for X: 0 = 5970 Hz 1 = 6000 Hz 2 = 6030 Hz
26#	Sat/Dsat Off		Disable the transponding of Sat/Dsat.
27X#	Cdata		AMPS: Continuous Transmit Data on the reverse Analog Control Channel. CDMA: Random Transmit Data (RTD) on the reverse CDMA channel. Input Action 0 Start (AMPS) / Variable Rate (CDMA) 1 Full Rate (CDMA) 2 Half Rate (CDMA) 4 Quarter Rate (CDMA) 8 Eighth Rate (CDMA) 9 Stop RTD (AMPS, CDMA)
28#	HITNON		Tuen on high tone (frequency 1150 Hz +/- 55Hz)
29#	HITNOFF		Turn off high tone.
30#	LOTNON		Turn on low tone (frequency 770 Hz +/- 40 Hz)
31#	LOTONFF		Turn off low tone.
32#	INVM		Initialize non-volatile memory to all zeros. This command should be reserved for special situations where reprogram-ming will be required (such as memory chip or circuit board replacement or when a radiotelephone is to be reissued to a new subscriber). This command may take a minute or more to complete; during which time the number 32 will be displayed. DO NOT turn off the radiotelephone until the normal servicing level display resumes.
33X#	DTMFON		Generates a continuous DTMF tone as specified by input X. Input X may be 0-9 for keypad DTMF, 10-18 for single low or high tone, and 20-25 for tripled low or high tone.
34#	DTMFOFF		Turn off DTMF tones.

Table 5:

Keypad Entry	*Command Description*	*Status Display*	*Result*

35X#	Path		Change the audio path to A, where A =:
			0 = Hands free (selects input signal AUDIO IN @ J3-pin 8 and outputs audio signal AUDIO OUT/ON-OFF @ J3-pin 7; internal speaker and microphone are muted.)
			1 = Speaker (normal audio path; selects internal mic and outputs audio @ AUDIO OUT/ON-OFF @ J3-pin 7; internal speaker is muted.)
			2 = Alert (activates the alert transducer for as long as the # key is pressed. To prevent overstressing the alert transducer., DO NOT hold the # key down for extended periods.)
			3 = Handset (selects the internal mic and speaker.)
			4 = Mute (all audio paths and supplies are off, DSP put to sleep.) This command must be followed by a different AUDIO-PATH command (not MUTE) in order to guar-antee proper DSP functionality. Failure to do so may result in a radio failure.
			5 = Internal MIC Test (routes the internal mic audio directly to AUDIO OUT/ON-OFF @ J3-pin 7, and routes audio input at AUDIO IN @ J3-pin 8 directly to the earpiece speaker.)
			6 = External Handset (selects input audio at AUDIO IN @ J3-pin 8, and outputs audio at AUDIO OUT/ON-OFF @ J3-pin 7; internal speaker and mic are muted, and sidetone is turned on.)
			7 = Reserved (not supported)
			8 = Reserved (not supported)
			9 = Boom MIC (selects input audio at AUDIO IN and outputs audio at AUDIO OUT/ON-OFF to headset connector; internal speaker and mic are muted, and sidetone is turned on.)
			This command enables all internal and external hardware controls necessary to route audio to/from the correct outputs/inputs.

36#	(not used)		
37#	(not used)		
38#	SND-SN	AABB	Returns serial number contents. If all bytes = 00, no serial number is programmed. Display four byte serial number in hexadecimal one byte at a time, along with a byte count. The * key causes the next byte/count to be displayed.
39#-44#	(not used)		
45#	READRSSI		Returns the RSSI reading taken on the current channel. The number is displayed as a three digit decimel number.
46#	(not used)		

Table 5:

Keypad Entry	*Command Description*	*Status Display*	*Result*
47X#	set-aud		Sets the audio level to the value specified by X. Audio level X is represented as 0 = lowest, 15 = loudest. Range of 8-15 has DTMF Feedback boost bit enabled.
48#	SIDETN		Enable sidetone. (Command **05#** must also be executed).
49#	SIDETF		Disable sidetone. (Command 06# must also be executed)
50# -54#	not used		
55#	Prog-nam	nam	Programs the NAM through the handset. This version uses supports only currently required NAM fields and it supports programming of data logger bytes. At the last step, the user enters a 1 to begin programming the data logger bytes. Handset key entry is defined in Table 1: “Handset Command Key Entry” on page 13. Refer to “NAM Programming” on page 25 of this manual for programming details.
56#	Auto-Cycle		Puts the radio in autocycle mode (CDMA only). Exit this command with the # key. This command causes the radio to infinitely loop between 2 cycles. One cycle is the display/transmit and the other is standby. The display/transmit cycle has a duration of 90 seconds and the radio has the following setup: - Display has all 8’s showing. - Turn on variable rate random transmit data. - Carrier is enabled. The standby cycle has a duration of 4.5 minutes and the radio has the following setup: - Display is blank. - Turn off variable rate random transmit data - Carrier is disabled. This test command forces the radio into CDMA mode.

Table 5:

Keypad Entry	*Command Description*	*Status Display*	*Result*
57X#	CP_Mode		Select radio call processing mode. This command will set up the radio to operate in the mode selected and will also perform initialization as specified by the INIT command. The synthesizer will be reprogrammed to setup parameters for the mode selected. 0 AMPS signalling (stop call processing test commands and PCM Loopback) 1 Not supported - NAMPS signalling 2 Not supported - Reserved for NAMPS expansion 3 Not supported - Reserved for NAMPS expansion 4 Not supported - Reserved for NAMPS expansion 5 CDMA signalling (stop call processing test commands and PCM Loopback) 6xy SIMVC test command From the handset, x is the maximum rate and y is the minimum rate. Valid rates for x and y are: 4 - Full rate 3 - Half rate 2 - Quarter rate 1 - Eighth rate From the Computer, no parameters are accepted and Full rate is forced. (This is not supported yet) 7 Start PCM Loopback 8 CDMA T-Tester mode (channel must be set by LOAD-SYTH. Handset only). 9 Not supported - CDMA force random data transmis-sion 12 Stop CPU - There is no way out of this except cycling power.
58#	COMPD-ON		Turns on the computer.
59#	COMPD-OFF		Turns off the computer.
60#-67#	not used		
68#	Read Model		MODEL Read radio model type. Displays three radio model bytes: hardware (model), flex (type), and factory.
69#-71#	not used		

Table 5:

Keypad Entry	*Command Description*	*Status Display*	*Result*
72X	gain phase		Program AMPS (only) gain phasing values through the handset. Gain phasing depends on the call processing mode. It is the responsibility of the user to select the proper call processing mode before using this test command. This command reprograms the EEPROM phasing values for MOD, MIC, AUX, etc. The value in X selects which step to start on. If no value for X is entered, it will start at step 0. The command keys are defined in Table 1: “Handset Command Key Entry” on page 13. NOTE: If you power down the radio after changes are made, the power up sequence re-programs the hardware with the correct phasing values. Refer to the “Tests and Adjustments” on page 47 for instructions on entering parameters from the keypad. AMPS GAIN PHASING RANGE STEP # PARAMETER (HEX) 00-04 MOD 0- MOD 4 0-7 05 Aux. audio path deviation 0-1 06 MIC audio deviation 0-F 07 DTMF deviation 0-3 08 Data deviation 0-3 09 SAT deviation 0-3 0A Discriminator audio gain 0-7 0B AFC WARP Analog 0-FF

Table 5:

Keypad Entry	*Command Description*	*Status Display*	*Result*
73#	PWR-Phase		Programs power phasing values through the handset. Power phasing depends on the call processing mode. It is the responsibility of the user to select the proper call processing mode before using this test command. This command reprograms the EEPROM phasing values for Max. Power Level, Attenuator Slope Adjust, etc. The value in X selects which step to start on. If no value for X is entered, it will start at step 0. The command keys are defined in Table 1: “Handset Command Key Entry” on page 13. NOTE: If you power down the radio after changes are made, the power up sequence re-programs the hardware with the correct phasing values. Refer to “Tests and Adjustments” on page 47 for instruc-tions on entering parameters from the keypad. Analog Power Level Parameters: RANGE STEP # POWER LEVEL (HEX) 00 Power Step 0 00-FF 01 Power Step 1 00-FF 02 Power Step 2 00-FF 03 Power Step 3 00-FF 04 Power Step 4 00-FF 05 Power Step 5 00-FF 06 Power Step 6 00-FF 07 Power Step 7 00-FF 08-0B Do Not Adjust CDMA Power Level Parameters: RANGE STEP # POWER LEVEL (HEX) 00 Attenuator Slope Adjust 00-FF 01 Attenuator Offset Adjust 00-FF 02 Clamp Adjust 00-FF 03 VCA Slope Adjust 00-FF 04 VCA Offset Adjust 00-FF 05 PMax 1 (Chan. 991-1023, 1-100) 00-FF 06 PMax 2 (Chan. 101-322) 00-FF 07 PMax 3 (Chan. 323-544) 00-FF 08 PMax 4 (Chan. 545-766) 00-FF 09 PMax 5 (Chan. 767-990) 00-FF

Table 5:

Keypad Entry	*Command Description*	*Status Display*	*Result*
73#	PWR-Phase		STEP # POWER LEVEL (HEX) 0A Ch. Gain Adj. 1 (Chan. 991-1023, 1-100) 00-FF 0B Ch. Gain Adj. 2 (Chan. 101-322) 00-FF 0C Ch. Gain Adj. 3 (Chan. 323-544) 00-FF 0D Ch. Gain Adj. 4 (Chan. 545-766) 00-FF 0E Ch. Gain Adj. 5 (Chan. 767-990) 00-FF 0F TX Gain Adjust 1 00-FF 10 TX Gain Adjust 2 00-FF 11 TX Gain Adjust 3 00-FF 12 TX Gain Adjust 4 00-FF 13 TX Gain Adjust 5 00-FF 14 TX Gain Adjust 6 00-FF 15 TX Gain Adjust 7 00-FF 16 TX Gain Adjust 8 00-FF 17 VC Sense Slope Adjust 00-FF 18 VC Sense Offset Adjust 00-FF 19 VC Sense Zero Adjust 00-FF 1A Available 00-FF 1B Not Available 00-FF

NAM Programming

Introduction

The Number Assignment Module (NAM) is a section of memory that retains information about the phone's characteristics, such as the assigned telephone number, system identifi-cation number, and options information.
Two methods are available to program the NAM using the keypad: Test Mode and User Mode.
Regardless of the method used, the NAM must be programmed before the phone can be placed into service. This chapter covers the NAM Programming steps for Test Mode NAM Programming.

Test Mode Programming

Table 3: "Minimum Required Test Mode NAM Programming Steps" on page 25 shows the minimum required Test Mode NAM programming steps. Table 4: "Test Mode NAM Programming Sequence" on page 26 lists all NAM programming steps, complete with parameters and definitions.

IMPORTANT

Consult with the System Operator regarding NAM information. Incorrect NAM entries can cause the phone to operate improperly or not at all.
.
For Test Mode NAM programming, the portable must be in the Servicing Level of Manual Test Mode (See "Test Mode/Test Menu" on page 11.) To enter test mode, the Manual Test pin (recessed center pin of the J6 battery connector) must be momentarily grounded while powering up the phone. This can be accomplished in a variety of ways, such as by using a 6.8 VDC power supply and an MCEL 2000 test cable or test plug. After powering up in test mode, press the # button to enter Servicing Level. Once in Test Mode Servicing Level, enter 55# to place the phone in NAM programming mode. The display will show factory default NAM data or show new data as it is entered, scrolling from left to right. Sequentially step through the procedures shown in Table 4: "Test Mode NAM Programming Sequence" on page 26 using the * key. Enter new data as required, or skip past factory default values for parameters that do not need to be changed.
If a second phone number is to be programmed, step 11 bit 6 must be set to 1. This bit enables dual-NAM operation and will cause NAM programming steps 1-6 and 12 to be repeated for the second phone number.

Minimum Required Test Mode NAM Programming Steps

Table 6:

Service Type	Minimum Required Programming Steps
Single NAM	1, 3, 4, 6, 8, 9
Dual NAM (part A)	1, 3, 4, 6, 8, 9, 11
Dual NAM (part B)	1, 3, 4, 6

Test Mode NAM Programming Sequence

* Advances to the next programming step; also programs the NAMafter the last programming step is entered. A valid value must be entered. Otherwise the phone will not advance to the next NAM step.

CLR= Clears the entered information and displays previously entered data for the current programming step.

Exits the programming mode without programming the NAM.

Test Mode NAM Programming Sequence

Table 7:

Step	*Factory Default*	*Description*
01	00000	**Home System ID (SID) Number.** Number assigned by system operator for system identification.
02	00000100	**A OPTION BYTE.** The display for step 02 represents the status of eight options, A7 through A0. Bit A7 (msb) is programmed first, followed by A6-A0. Bits enter display on the right and scroll left.
	0	**Local Use (Bit A7).** If set to 1 phone will respond to local control orders in the home area or when the group ID is matched. Assigned by system operator.
	0	**Preferred System (Bit A6).** Applies to units capable of operating on two service systems (A or B). 0 = system B; 1 = system A.
	0	**End-to-End Signaling (Bit A5).** When enabled, the phone is equipped for DTMF signaling during a call. 1 = enabled, 0 = disabled.
	0	**Markov test override MSB (Bit A4).** Enter 0.
	0	**Markov test override (Bit A3).** Enter 0.
	1	**Bit not used (Bit A2).** Enter 1.
	0	**Markov test override LSB.** Enter 0
	0	**MIN Mark (Bit A0).** Supplied by system operator. When enabled the user's area code will be sent with each call initiated or answered. 1 = enabled, 0 = disabled.
03	1111110111	**User 10 digit radiotelephone phone number (MIN).** 10_digits including area code; changing this value sets default for AOC. Number is assigned by system operator.
04	 010 042 074 106	**Station class mark (SCM).** A 2 digit number assigned by the system operator. Indicates maximum power step, VOX capability, and number of channels used. CDMA only & Non-Slotted mode configuration CDMA only & Slotted mode configuration Dual Mode & Non-Slotted mode configuration Dual Mode & Slotted mode configuration
05	Last digit of access over-load class	**Access overload class.** Specifies the level of priority assigned to the phone when accessing the system. Assigned by system operator.
06	000000	**Security code.** A 6-digit number supplied by the user. This number is used by the user to access or change "security" features such as the 3-digit unlock code or the service level.

Table 7:

Step	*Factory Default*	*Description*
07	123	**Unlock code.** A 3-digit number supplied by the user. If the lock feature is enabled by the user, the phone can be operated only by individuals who know the unlock code.
08	4	**Service level.** This 1-digit number supplied by the user allows various call placement restrictions if desired.
09	01100000 Test Menu enabled 00100000 Test Menu disabled 0	**B OPTION BYTE** The display for step 10 represents the status of eight options, B7 through B0. B7 (msb) is programmed first followed by B6-B0. Bits enter display on the right and scroll left. **Display Pilot Set Status/AMPS Status Mode (Bit B7).** CDMA: These statistics are useful for testing handoff parameters. When enabled, this feature displays the strongest pilot offset in the "Active Set" (only member during Idle) on the top line of the display, and the strongest pilot in the "Neighbor Set" on the bottom line. Each line has the same format. The left most 3-digit number is the pilot offset, and the right number is a relative signal strength. IDLE HANDOFF (handoffs on a paging channel) occurs when a Neighbor pilot is judged to be better. That neighbor pilot will be promoted to the active set, and thus move to the top line of the display. SOFT HANDOFF (handoff on a traffic channel) occurs when a Neighbor pilot fulfills requirements set by the network, and the network directs the mobile to add the new pilot to the Active Set. Pilot Set status is enabled by setting Step #9, bit #7 to 1. Channel Statistics is disabled by setting Step #9, bit #7 to 0. **WARNING: Turning on this option makes it difficult to see the Markov error rate statistics in a call.** AMPS: In AMPS mode, setting this bit to 1 causes status information similar to current Motorola AMPS products to be displayed. The contents of the display depends on the channel being monitored.
	0	**Test Menu (Bit B6).** This bit allows the user to enable or disable the FCN key Test Menu. Refer to "Test Menu" on page 12 for further information on Test Menu. 1 = enabled, 0 = disabled.
	1	**Paging Channel Message Filtering (Bit B5).** This bit limits the amount of paging channel messaging seen by the data logger debugging tool. A user not using this tool should see no noticeable difference in performance. 1 = enabled, 0 = disabled.

Table 7:

Step	*Factory Default*	*Description*
	0	**Portable Data Logging (Bit B4).** Enter 0.
	0	**Single Serving System Scan (Bit B3)**. This bit allows the user to enable or disable the serving system scanning on serving systems other than the phone's home serving system. If the phone has an odd Home System Identifier (Step 1), it's home serving system is A, otherwise it is B. If Single Serving System Scanning is enabled, only the home serving system will be scanned, otherwise both serving systems will be scanned. 1 = enabled, 0 = disabled.
	1	**Auto Recall (Bit B2).** When set to one, the user may access repertory by a one or two digit send sequence (speed dialing).
	0	**Disable Service Levels (Bit B1).** If set to 1, the service level (call restric-tions) cannot be changed by the user.
	0	0 **Lock Disable (Bit B0).** When set to 1, the user cannot lock and unlock the phone unit via the 3 digit lock code.
10	00000000	**C OPTION BYTE** The display for step 11 represents the status of eight options, C7 through C0. C7 (msb) is programmed first followed by C6-C0. Bits enter display on the right and scroll left.
	0	**User Mode NAM Programming Disable (Bit C7).** When set to 1, User Mode NAM programming cannot be accessed.
	0	**Dual NAM System Registration Enable (Bit C6).** Enter 1 if dual NAM operation is desired (for models capable of dual system operation). Enter 0 for single NAM operation
	0	**Test Mobile Enable/Auto Answer (Bit C5).** Enter 0.
	0	**Auto Redial Disable (Bit C4).** When set to 1, the user cannot access the 6-minute auto redial feature.
	0	**Three Wire Bus Speaker Disable (Bit C3).** This bit is used to disable internal handset speaker when adding V.S.P. option. 1 = handset speaker disabled, 0 = handset speaker enabled.
	0	**Bit not used (Bit C2).** Enter 0.
	0	**Selectable System Scan Disable (Bit C1).** When set to 1, the user cannot select the primary system.
	0	**Diversity Antenna (Bit C0).** (Extended systems only) 0 = Non-diversity, 1 = Diversity.
11	0334	**AMPS Initial paging channel.** There are 4 significant bits for the initial paging channel. For system A enter 0333 and system B enter 0334.

Table 7:

Step	*Factory Default*	*Description*
12	0333	**AMPS Initial A system channel.** To initialize system A enter 0333.
13	0334	**AMPS Initial B system channel.** To initialize system B enter 0334.
14	021	**AMPS Dedicated Paging Channels.** Number of dedicated paging chan-nels is 21. Enter 021.
15	00001000	**D OPTION BYTE**. The display for step 16 represents the status of eight options, D7 through D0. D7 (msb) is programmed first, followed by D6-D0. Bits enter display on the right and scroll to left.
	0	**Enhanced Scan (Bit D7)**. Enter 1.
	0	**Cellular Connection 1 (Bit E6)**. Normally set to 0.
	0	**Long Tone DTMF Enable (Bit E5)**. Normally set to 1.
	0	**Transportable Transducer Disable (Bit E4)**. Enter 0.
	1	**Bit not used (Bit E3)**. Normally set to 0.
	0	**Handset Test Mode Disable (Bit E2)**. Enter 0.
	0	**Failed Page Indication Disable (Bit E1)**.
	0	**Word Sync Scan Disable (Bit E0)**. Set to 1.
16	00100111	**E OPTION BYTE**. The display for step 16 represents the status of eight options, E7 through E0. E7 (msb) is programmed first, followed by E6-E0. Bits enter display on the right and scroll to left.
	0	**Bit not used (Bit E7)**. Enter 0.
	0	* **Preferred mode (Bit E6)**. Normally set to 0. Bit 6 - 1 and Bit 5 - 1 = Analog preferred Bit 6 - 1 and Bit 5 - 0 = Analog only
	1	**Preferred mode (Bit E5)**. Normally set to 1. Bit 5 - 1 and Bit 6 - 1 = CDMA preferred Bit 5 - 1 and Bit 6 - 0 = CDMA only
	0	**Extended Address Method (Bit E4)**. Enter 0.
	0	**Preferred Analog Serving System (Bit E3)**. Normally set to 0.
	1	**Config. for mob term using home SID, NID pair (Bit E2)**. Enter 1. 1 = Allow mobile terminated call while using a home (SID, NID) pair. 0 = Disallow mobile terminated call while using a home (SID, NID) pair.
	1	**Config. for mob term while SID roamer (Bit E1)** Enter 1. 1 = Allow mobile terminated call while a SID roamer. 0 = Disallow mobile terminated call while a SID roamer.

Table 7:

Step	*Factory Default*	*Description*
	1	† **Config. for mob term while NID roamer (Bit E0)**. Enter 1. 1 = Allow mobile terminated call while a NID roamer. 0 = Disallow mobile terminated call while a NID roamer.
17	0	**CDMA: Slot Cycle Index.** TBD
18	Entry Required	**CDMA: SID (SID_NIDp).** Up to 5-digits.
19	00000	**CDMA: Network ID Number (NID of SID_NIDp).** Up to 5-digits.
20	111111	**Mobile Country Code (first 3-digits), IMSI 11 (1-digit), IMSI 12 (1-digit).**
21	Entry Required	**CDMA: Primary Channel.** System A up to 4 decimal digits.
22	Entry Required	**CDMA: Primary Channel.** System B up to 4 decimal digits.
23	Entry Required	**CDMA: Secondary Channel.** System A up to 4 decimal digits.
24	Entry Required	**Secondary Channel.** System B up to 4 decimal digits.
25	0	**Data Logger Switch.** Enter 0. 1 = enabled, 0 = disabled.

* These bits will determine which modes of operation the radio will attempt
when seeking communication with a Base Station. Care should be taken when
either the CDMA only or the Analog only modes of operation are selected,
because this configuration will cause a dual mode phone to operate as a single
mode phone. Another issue to be aware of is that whenever Bit 5 is set to 0, no
handoffs between Analog and CDMA mode can take place. No examination of
the RF environment is performed when setting these fields.

† Setting these bits also effects the registrations that are transmitted by the
Mobile Station. If bits are set such that the Mobile cannot receive any incoming
calls (in CDMA mode), it is not necessary to send out any Registration mes-sages.

It should be noted that if all Mobile Terminated Call Preference bits are
set to zero, that there would (in a spec compliant system) be no way for the

Mobile Station to receive incoming calls.

Test & Adjustments

Introduction

These phones allow keypad controlled cali-bration
(often referred to as “phasing”) of
various operating parameters, as follows:

- Transmit output power
- TX deviation (SAT, DATA, DTMF, microphone)
- RX discriminator output

These parameters are stored in memory on the Logic Board and affect the operation of the transceiver. All transceiver units and all replacement RF/AL boards are shipped from the factory with these adjustments already made. However, if components are replaced, checking and adjustment of the parameters may be necessary. Checking and adjusting parameters is also useful a trou-blshooting/
diagnostic tool to isolate defec-tive compo-nents.

The adjusting parameters accessible through keypad commands are a subset of the com-plete complement of adjustments, but are the key parameters necessary for basic opertion. Access to all adjustments requires a com-puter connected to the accessory connector (J3). In addition, the computer must be loaded with the proper diagnostic software.

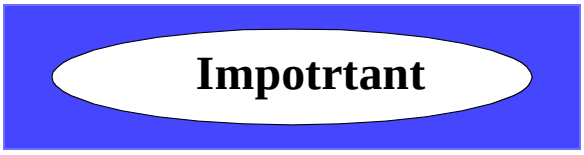
Consult with Motorola regarding specific hardware and software requirements for the diagnostic computer.

Test Interface

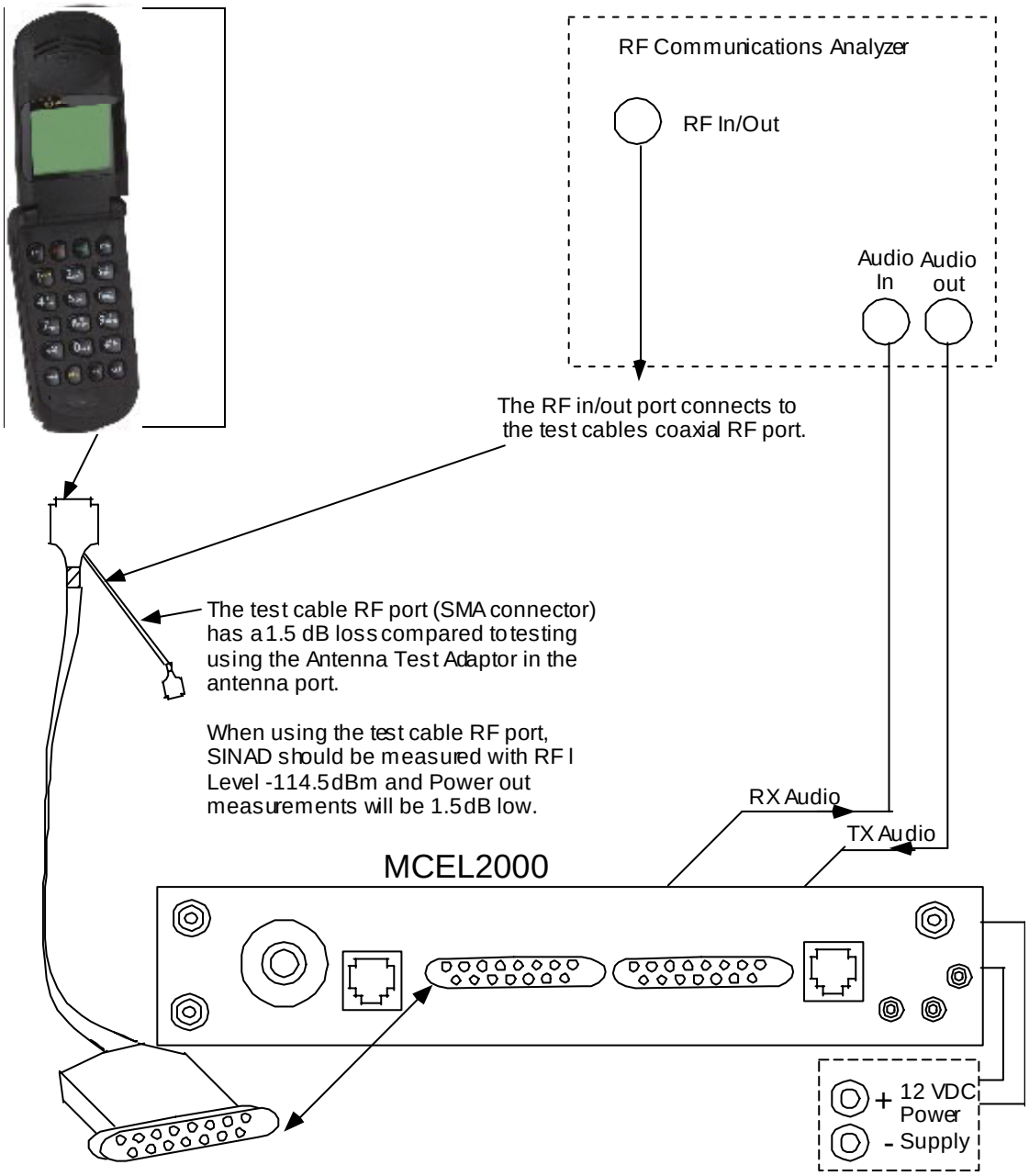
Figure 7: “Connections for Testing and Adjustments” on page 48 shows the audio and RF connections to a communications analyzer when using the MCEL 2000 test interface, and SKN4800A test cable.

Adjustments

To properly check and adjust the adjustment parameters using keypad commands, per-form the following procedures in sequence.



Only those memory locations referred to in the following proce-dure should be pro-grammed. Data in other memory locations which are “Stepped through” during the pro-cedure



Connections for Testing and Adjustments

15 Connector to test interface.

Table 8:

Table 8:

Pin	Function
1	RF Ground
2	RF Out
3	RF Ground
4	Battery Feedback
5	Manual Test
6	N/C
7	N/C
8	Audio In
9	Audio Out
10	Battery Ground
11	RTN
12	CMP
13	TRU
14	External B+
15	Analog Ground

Keypad Button Functions

Below is a description of the non-numeric keys used during the keypad calibration procedure:

Step 1. Connect the test cable RF to a servicing analyzer, using a coaxial cable. Enter Manual Test Mode.

Depress the # button. The display should show the ’ prompt.

Step 2. Enter 11434# via the keypad to program the synthesizer for channel 434.

Step 3. Enter 05# to key the transmitter.

TX Output Power Adjustment(Center of Band)

Step 4. Enter 73#. The portable display will show Step number “00” on the left and the corresponding hex value for the TX output power on the right.

Table 9:

Power Step	*Output Power (at antenna port, +/- 0.5 dBm)*
00	28dBm
01	28dBm
02	28dBm
03	24dBm
04	20dBm
05	16dBm
06	12dBm
07	8dBm
08	Do not adjust
09	Do not adjust
0A	Do not adjust
0B	Do not adjust

Step 5. Using the * button to advance through the power steps. Adjust each of the power steps listed in Table 6: “Output Power Levels” for the values shown as indicated on the servicing analyzer. Make adjustments as described in Step 6 and Step 7.

Step 6. Enter a 2-digit hexadecimal number via the keypad. This immediately updates the hex power level value, and the output power should change as indicated on the analyzer. If the new entry does not produce the desired analyzer reading (i.e. too high or too low),

a) depress the CLR button and enter another 2-digit number, or

b) use the VOL button to incrementally increase the hex value to obtain the desired reading on the analyzer. (The volume control may not be used to decrease the hex value.)

Table 10:

Note
In order to enter hex digits A thru F, depress the **SND** button followed by: 0 hex A 1 hex B 2 hex C 3 hex D 4 hex E 5 hex F

Step 7. With all necessary adjustments made and power Step "0B" showing in the display, depress * to enter all updated data and exit the 73# command.

Maximum Deviation Adjust

Table 11:

Note
Before SAT, DTMF, data, or microphone deviations can be adjusted, the maximum deviation must be checked (and adjusted, if necessary). Proceed as follows.

Step 8. Inject an unbalanced 1kHz 2.24V rms audio signal at J3 pin 8 (TX audio in). Connect the audio generator ground lead to J3 pin 6 (audio ground). The audio signal source must be low impedance (or the injection signal must be measured at pin 10 to ensure the proper level of 2.24 V rms).

Step 9. Enter the following commands:

58# to enable compandor
10# to unmute TX audio
356# to select external audio path
11434# to place the telephone on channel 434

Step 10. Enter 72#. Step 04 will be displayed on the left side of the display. Use the * button to toggle down to Step 0B (left side of display).

Step 11. Read the peak deviation on the analyzer. If it is not in the range of 11 to 12 kHz (preferably closer to 12kHz). Use the volume control or enter numbers via the keypad (as explained in Step 6) to adjust the maximum deviation to fall within the 11 to 12 kHz range. (Make adjustments so that the deviation remains as close to 12 kHz as possible, without exceeding 12 kHz.).

Step 12. Depress the * key to exit the 72# command. The display should show the ' prompt.

Microphone Deviation Adjust

Step 13. Adjust audio generator signal level at J3 pin 8 (TX audio in) to 90 mV rms (still at 1 kHz).

Step 14. Enter 11434# to place the portable on channel 434. Enter 356# to select the external handset audio path.

Step 15. Read the average deviation on the analyzer. If reading is 2.05 kHz + 7% (corresponds to 2.9 kHz peak), proceed to Step 28. If it is not, enter 72#, use the * button to toggle down to Step 05 (left side of display), and use the volume control or enter numbers via the keypad (as explained in Step 6) to adjust for a microphone deviation of 2.05 kHz + 7%. After adjustment, note the hex value for Step 05 and exit the 72# command by repeatedly depressing the * button until the display shows the ' prompt.

Step 16. Enter 72#, use the * button to toggle down to Step 06 (left side of display), and enter the Step 05 hex value noted in Step 26. Exit the 72# command by repeatedly depressing the * button until the display shows the ’ prompt. Remove the injection audio signal.

DTMF Adjust

Step 17. Enter the following commands:
09# to mute TX audio
59# to turn off compandor
473# to set receive audio volume to level 3 (disables DTMF boost)
335# to turn on DTMF tone “5”

Step 18. Read the peak deviation on the communications analyzer. If reading is 9.0 rad + 10%, proceed to Step 30. If it is not, enter 72#, use the * button to toggle down to Step 07 (left side of display), and use the volume control or enter numbers via the keypad (as explained in Step 6) to adjust for a deviation of9.0 rad + 10%. After adjustment, exit the 72# command by repeatedly depressing the * button until the display shows the ’ prompt.

Step 19. Enter 34# to turn off the DTMF tone.

SAT Deviation Adjust

Step 20. Enter 251# to enable a 6000 Hz SAT tone.

Step 21. Read the average deviation on the communications analyzer. If the reading is 1.4 kHz + 10% (corresponds to 2.0 kHz peak), proceed to Step 33. If it is not, enter 72#, use the * button to toggle down to Step 09 (left side of display), and use the volume control or enter numbers via the keypad (as explained in Step 6) to adjust for a deviation of 1.4 kHz + 10%. After adjustment, exit the 72# command by repeatedly depressing the * button until the display shows the ’ prompt.

Step 22. Enter 26# to turn off the 6000 Hz SAT tone.

Data Deviation Adjust

Step 23. Enter 14# to turn on the 10 kHz signaling tone.

Step 24. Read the average deviation on the communications analyzer. If the reading is 5.7 kHz + 10% (corresponds to 8.0 kHz peak), proceed to Step 36.
If it is not, enter 72#, use the * button to toggle down to Step 08 (left side of display), and use the volume control or enter numbers via the keypad (as explained in Step 6) to adjust for a deviation of 5.7kHz + 10%. After adjustment, exit the 72# command by repeatedly depressing the * button until the display shows the ’ prompt.

Step 25. Enter 15# to turn off the 10 kHz signaling tone.RX Discriminator Adjust
Step 26. Inject a -50 dBm, 883.020 MHz

RX Discriminator Adjust
Step 26. Inject a -50 dBm, 883.020 MHz (channel 434) signal FM modulated with a 1 kHz tone at + 2.9 kHz deviation into the antenna port, using an SLN8576A antenna test adaptor.

Step 27. Enter the following commands:
08# to unmute the RX audio 474# to set the receive audio volume to level 4356# to select the external handset audio path
Step 28. Enter 72#, use the * button to toggle down to step 0A (left side of display), and

use the volume control or enter numbers via the keypad (as explained in Step 6) to obtain 100 mV rms +15% at pin 7 of J3 (RX audio out). After adjustment, exit the 72# command by repeatedly depressing the * button until the display shows the ’ prompt.

Step 29. Exit Manual Test Mode by depressing the PWR button. This completes the keypad adjustment procedure.

AMPS Call Processing

The transceiver is connected to an RF Communications Test System capable of AMPS and CDMA base station simulation and the test simulation and the test described below are performed. The external antenna on a Portable is RF coupled to the Test System. The phone is powered by a battery. All of these tests are performed on a pass/fail basis except where otherwise specified.

The following AMPS Call Processing tests must be done in a single test sequence.

Step 1. Initialize: Set the RF Communication Test System to provide an AMPS control channel at -50 dBm on channel 334.

Step 2. AMPS Registration: Turn the mobile transceiver on and force an AMPS Registration.

Step 3. AMPS Page: Page the mobile transceiver.

When the transceiver alert rings, answer the call using the FLIP for a Portable, the SEND key for a Mortable. Verify that the mobile has transferred to the traffic channel and is transponding SAT.

Step 4. AMPS Handoff: Initiate a handoff to another AMPS traffic channel. Verify that the mobile has handed off to the new traffic channel and is transponding SAT. Terminate the call using the FLIP for a Portable, the END key for a Mortable. Verify that the mobile has terminated the all and de-keyed the transmitter.

CDMA Call Processing

The following CDMA Call Processing test must be done in a single test sequence.

Step 1. Initialize: Configure the test system to the following set parameters:
a. A CDMA pilot on channel 777 with sector A power at -70 dBm and sector B power at -80 dBm.
b. An AMP traffic channel with a 6 kHz tone modulated at 2 kHz of deviation.

c. A CDMA traffic channel handoff message set to the corresponding AMPS traffic channel frequency with SATcolor code 1 and power attenuation code 3.
d. A CDMA System Parameters Message with the following threshold data: Pilot detection threshold
(T_Add) = 28 Pilot drop threshold (T_Drop) = 32
Comparison threshold (T_Comp) = 5
Drop timer value (T_Tdrop) = 3

Step 2. CDMA Slotted Mode Page: Turn the mobile transceiver on and force a CDMA Registration. Page the mobile with a Service Option 1 call. Verify that the mobile establishes and maintains a CDMA call by measuring Rho.

Step 3. CDMA Softer Handoff: Set sector B power to -75 dBm.
The mobile must report sector B as

included in the Candidate set. Increase sector B power to -65 dBm. The mobile must report sector B to be added to the Active set. Initiate a softer handoff and decrease sector B power to -80 dbm. The mobile must report sector B to be dropped from the Active set.

Step 4. CDMA Hard Handoff: Perform a CDM Hard handoff theo channel 691 while still in a Service Option 1 call.
Verify that the mobile hands off and maintains the call by measuring Rho.

Step 5. CDMA to AMPS Handoff: To perform a CDMA to AMPS handoff, send the CDMA traffic channel handoff message to the mobile transceiver and activate the AMPS traffic channel. Verify that the mobile hands off to the AMPS traffic channel and is transponding SAT.

Step 6. Exit.

DISASSEMBLY

Introduction

Before disassembly is started, the antenna connector cap at the top of the phone has to be removed to allow full separation. Reasonable care should be taken during the disassembly and reassembly of the unit in order to avoid damaging or stressing the housing and internal components. Ensure that a properly grounded high impedance conductive wrist strap is used while
performing these procedures on electronic units.

Recommended Tools

The following tools are recommended for use during the disassembly and reassembly of the phone.
- Anti-Static Mat Kit (0180386A82); includes:

CAUTION

Many of the integrated circuit devices used in this equipment are vulnerable to damage from static charges. An anti-static wrist band, connected to an anti-static (conductive) work surface, must be worn during all phases of disassembly, repair, and reassembly.
Anti-Static Mat
Ground Cord
Wrist Band
Plastic (bezel stick)Prying Tool

Light guide removal Fixture

Flip Opening Tool

Flex Removal Pliers

Refer to the disassembly instructions and photo sequence on the following pages.

Assembly Procedure

antenna. Place the wide tip of the antenna in the large opening of the antenna tool. Put the bottom of the tool on the grooves in the base of the antenna. Turn counterclockwise until the antenna is free from the phone housing.

Housing disassembly:

Step 1:Battery Cover Removal.

With flat surface of bezel stick facing down, place the black bezel tool at the rear housing opening tab. Press gently downward and out as shown in the picture. Remove the battery cover.

Step 2. Light Guide Removal.

Using Light-guide extraction tool, align pin of tool with left-hand side gap of battery retention clip at the top right hand side of the battery compartment. (Ensure not to damage clip). Place the body of the tool flush with the right hand edge of the battery compartment and flat to the battery bed;

slowly push the tool in the direction of the light-guide. Any deviation from this movement and position can result in damage to the flex connector. Once pressure is felt against the tool, ensure that a guard is placed to stop the guide from getting lost, then push firmly against the guide keeping the body of the tool flush with the housing till the guide comes out. (If the guide does not come out then extract it with snips). Fully retract pin before the tool is lifted from the housing. Ensure no damage has occurred to battery retention clip.

Place the unit on its rear. Whilst pushing on the antenna mount, insert the flat end of the plastic bezel tool between the housing and each of the 4 catches to release the rear housing. When all 4 catches are released, remove the rear housing from the antenna end of the transceiver at an angle.

Step 4. Transceiver disassembly

Using the flat end of the plastic bezel tool, lift the black Zif connector gate.

(If this gate breaks the whole connector must be replaced). Make sure the ends of all the flex traces enter or leave the ZIF simultaneously. Otherwise it is possible to create new, intermittent shorts between traces;

Again using the plastic tool lever the PCB

from the front housing, antenna end first.

Step 5. Keyboard Removal

Using the flat end of the plastic tool carefully slide it between the main PCB and the keyboard to break the glue bond and separate the two.

Remove all left over glue deposits from both the keyboard and the main PCB.

Step 6. Using index finger, pull housing off going straight across phone.

Insert the flip opening tool with the curved edge against the knuckle of the phone. Prize the flip upwards. Repeat on other side.

Insert the long end of the tool between the gap created by the flip opener and rotate tool by 90 eg. To prize the rest of the flip open.

Troubleshooting

Introduction

Known good replacement parts and assemblies should be available to be used for troubleshooting 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.

CAUTION

Many of the integrated circuit devices used in this equipment are vulnerable to damage from static charges. An ESD-safe workstation should be used when-ever a transceiver is opened.

Troubleshooting and Repair

The troubleshooting chart in Table 7, “Assembly Replacement Level Troubleshooting and Repair Chart,” on page 56 shows some typical malfunction symptoms and the corresponding verification and repair procedures. 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 recieve audio quality is normally sufficient.

When the Logic/RF assembly is replaced, the unit must have a comprehensive test on a GSM/DCS 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.

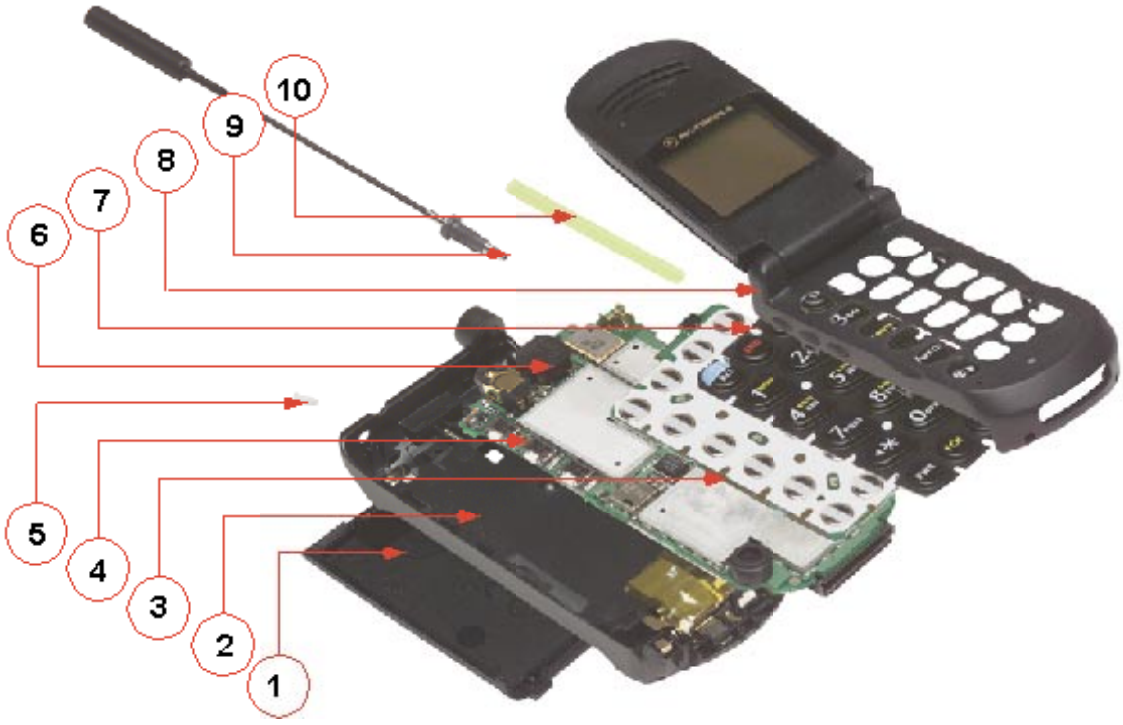
Table 12:

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) Switch inside option connector is open.	1. Measure resistance across the two option connector solder connections on the RF side of the RF/Audio-Logic board. 2. If the switch measures open, replace the option connector.
	d) Keypad membrane defective.	1. Replace the keypad membrane with a known good part. 2. Temporarily connect +4 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.
	e) Keypad board defective.	1. Replace keypad board assembly with a known good assembly. 2. Temporarily connect +4 V DC to the battery contacts. Depress the **PWR** button. 3. If the units turns on and stays on, discon-nect the power source and reassemble the phone with the new keypad board assembly.
	f) RF/Audio-Logic Board defective.	1. Remove the RF/Audio-Logic Board. Substitute a known good board. 2. Temporarily connect +4 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.

Table 12:

Symptom	*Probable Cause*	*Verification and Remedy*
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.	1. Make sure the antenna shaft ferrule is screwed into the antenna socket. 2. Make sure pin on antenna coil is seated in antenna connector socket. 3. Replace the antenna with a known good antenna.
	b) Defective RF/ Audio-Logic Board.	Replace the transceiver board (refer to symptom 1c Verification and Re edy.)
3. Display is erratic, or provides partial or nodisplay.	a) Defectivedisplay module.	1. Gain access to RF/Audio-Logic board or keypad board as described in the “Disassembly” section of this manual. 2. Check connection. If connection not at fault, proceed to b.
	b) RF/Audio-Logic board defective.	Replace the RF/Audio-Logic Board (refer to symptom 1f Verification and Remedy).
4. Alert ringer volume is distorted or too low.	a) Alert ringer defective.	Replace the defective speaker or alert ringer with a known good speaker or alert ringer.
	b) RF/Audio-Logic board defective.	Replace the RF/Audio-Logic Board (refer to symptom 1f Verification and Remedy).
5. Transmit audio is weak, distorted, or dead.	a) Microphonedefective.	Replace defective microphone.
	b) RF/Audio-Logic board defective.	Replace the RF/Audio-Logic Board (refer to symptom 1f Verification and Remedy).
6. Receive audio is weak and/or distorted.	a) Speaker defective.	Replace defective speaker.
	b) RF/Audio-Logic board defective.	Replace the RF/Audio-Logic Board (refer to symptom 1f Verification and Remedy).
7. StarTAC 800 (CDMA) model does not sense when flip is opened and closed.	a) Defective reed switch or magnet on keypad board	Replace keypad board assembly or magnet/flip assembly.

Replacement Parts



1.Battery Cover

2. Rear Housing

3.Keyboard

4.Transceiver Board

5. Status Indicator

6.Boom Mike

7.Keypad **3887496K18**

8.Front Housing Assembly with Flip

9.Antenna **8588765K01**

10.Antenna Tube

Mechanical Parts List

5909382K01	MOTOR VIB 6MM 1.3V 7.5KR
5509377U01	LATCH BATTERY
4285952G03	CLIP VIBRATOR BRACKET
4285953G05	CLIP VIBRATOR CONTACT
4109378U01	SPRING COMPRESSION
4104539Z01	SPRING MECHANICAL CONTAC
0309147T03	SCREW INTERNAL FRNT CRIC
1587335K01	HSNG V8162 XCVR REAR
1185855G01	PROTECTIVE LENS TAPE MYLAR
0509472U01	ALERT GROMMET DIGITAL RAE
0503856K01	GROMMET MIC DIGITAL RAE
0187367K02	LENS ASSEMBLY
0187798K01	ASSEMBLY FRONT FLIP
0185798G05	ASSY REAR HSNG
7585766G06	PAD
1110033G56	ADHES POLYMIDE 3/4" AMBER
6185833G04	LENS LCD
0187441K01	ASSY XCVR REAR V8162
0187442K01	ASSY XVCR FRNT V8162
0185895H02	ASSY FLIP REAR BLACK
0185896H08	ASM FLIP FRONT BLK HALL
5009135L07	MIC ELECT 6MM PINS
7585719J01	PAD FLIP FRONT V3682
6185635H02	LIGHT GUIDE
1509618K10	HSNG TUBE ANTENNA
0509380T01	V3620 MIC GROMMET
5504765Z06	HINGE MECHANISM
7585766G04	PAD SPEAKER
0188293K01	ASSY, ANTENNA 800 V-SERI
0103785K13	ASSY LCD MODE W/BATT/SPK
4309120E03	BUSHING ANT THREADED VAD
8588765K01	ANTENNA, WHIP V8160 800

Electrical Parts List

U150	5109940K31	IC MMIC GAAS LNA MGA-72543
U627	5109940K32	IC MMIC SI BUFF AMPL UPC8151TB
U400	5109923D29	IC CUST MXR/XCVR ME2 20TSSOP
U200	5109940K28	IC MMIC GAAS MXR W/IF TQ5M31
U2000	5109923D39	IC CUST BICMOS GCAP 1.8V 48QFP
U700	5109879E19	IC BICMOS ZIF/SYNTH SC79836GC
U1200	5199422A01	IC FLASH 16MB GT28F160C3BA90
J1	0909449B03	RECEPT MODULE 15 PIN SMD
J5000	0909195E01	SKT BOT ENTRY 2 POS
J2000	0909399T07	JACK MOD 2.5MM PLUG SMD
J1000	0903788K01	RECPT ZIF RT ANGL 27 CKT SMD
J600	3985737G01	CNTCT BLCK 4 CKT
J50	3903746K01	CNTCT ANT UPPER
ANTGND	3903770K01	CNTCT ANT LOWER
C650	2113743N16	CAP CHIP 3.9 PF +-.25PF COG

C503	2113743N17	CAP CHIP 4.3 PF +-.25PF COG
C259	2113743N18	CAP CHIP 4.7 PF +-.25PF COG
C509	2113743N19	CAP CHIP 5.1 PF + -.5PF COG
C652	2113743N21	CAP CHIP 6.2 PF + -.5PF COG
C256	2113743N22	CAP CHIP 6.8 PF + -.5PF COG
C76	2113743N23	CAP CHIP 7.5 PF + -.5PF COG
C304	2113743N24	CAP CHIP 8.2 PF + -.5PF COG
C508	2113743N25	CAP CHIP 9.1 PF + -.5PF COG
C504	2113743N26	CAP CHIP 10.0 PF 5% COG
C679	2113743N28	CAP CHIP 12.0 PF 5% COG
C207	2113743N30	CAP CHIP 15.0 PF 5% COG
C708	2113928G01	CAP CER CHIP .22 UF 6.3V 10%
C601	2113928N01	CAP CER CHIP 0.1UF 10% 6.3
C2302	2113928N01	CAP CER CHIP 0.1UF 10% 6.3
C784	2113928N01	CAP CER CHIP 0.1UF 10% 6.3
C60	2113928N01	CAP CER CHIP 0.1UF 10% 6.3
C700	2113928N01	CAP CER CHIP 0.1UF 10% 6.3
C783	2113928N01	CAP CER CHIP 0.1UF 10% 6.3
C781	2113928N01	CAP CER CHIP 0.1UF 10% 6.3
C782	2113928N01	CAP CER CHIP 0.1UF 10% 6.3
C780	2113928N01	CAP CER CHIP 0.1UF 10% 6.3
C300	2113928N01	CAP CER CHIP 0.1UF 10% 6.3
C706	2113928N01	CAP CER CHIP 0.1UF 10% 6.3
C704	2113928N01	CAP CER CHIP 0.1UF 10% 6.3
C103	2113928N01	CAP CER CHIP 0.1UF 10% 6.3
C102	2113928N01	CAP CER CHIP 0.1UF 10% 6.3
C2300	2113928N01	CAP CER CHIP 0.1UF 10% 6.3
C1730	2113928N01	CAP CER CHIP 0.1UF 10% 6.3
C2099	2113928N01	CAP CER CHIP 0.1UF 10% 6.3
C1120	2113928N01	CAP CER CHIP 0.1UF 10% 6.3
C2012	2113928N01	CAP CER CHIP 0.1UF 10% 6.3
C2030	2113928N01	CAP CER CHIP 0.1UF 10% 6.3
C1914	2113928N01	CAP CER CHIP 0.1UF 10% 6.3
C1110	2113928N01	CAP CER CHIP 0.1UF 10% 6.3
C2007	2113928N01	CAP CER CHIP 0.1UF 10% 6.3
C1930	2113928N01	CAP CER CHIP 0.1UF 10% 6.3
C1108	2113928N01	CAP CER CHIP 0.1UF 10% 6.3
C2027	2113928N01	CAP CER CHIP 0.1UF 10% 6.3
C2026	2113928N01	CAP CER CHIP 0.1UF 10% 6.3
C1903	2113928N01	CAP CER CHIP 0.1UF 10% 6.3
C2006	2113928N01	CAP CER CHIP 0.1UF 10% 6.3
C1916	2113928N01	CAP CER CHIP 0.1UF 10% 6.3
C1919	2113928N01	CAP CER CHIP 0.1UF 10% 6.3
C1106	2113928N01	CAP CER CHIP 0.1UF 10% 6.3
C600	2113928P04	CAP CER CHIP 1.0UF 20% 6.3V
C327	2113928P04	CAP CER CHIP 1.0UF 20% 6.3V
C110	2113928P04	CAP CER CHIP 1.0UF 20% 6.3V
C2033	2113928P04	CAP CER CHIP 1.0UF 20% 6.3V
C418	2113743N40	CAP CHIP 39.0 PF 5% COG
C501	2113743N40	CAP CHIP 39.0 PF 5% COG

C51	2113743N40	CAP CHIP 39.0 PF 5% COG
C303	2113743N40	CAP CHIP 39.0 PF 5% COG
C65	2113743N40	CAP CHIP 39.0 PF 5% COG
C452	2113743N40	CAP CHIP 39.0 PF 5% COG
C417	2113743N40	CAP CHIP 39.0 PF 5% COG
C250	2113743N40	CAP CHIP 39.0 PF 5% COG
C82	2113743N40	CAP CHIP 39.0 PF 5% COG
C512	2113743N40	CAP CHIP 39.0 PF 5% COG
C705	2113743N40	CAP CHIP 39.0 PF 5% COG
C409	2113743N40	CAP CHIP 39.0 PF 5% COG
C201	2113743N40	CAP CHIP 39.0 PF 5% COG
C514	2113743N40	CAP CHIP 39.0 PF 5% COG
C155	2113743N40	CAP CHIP 39.0 PF 5% COG
C479	2113743N40	CAP CHIP 39.0 PF 5% COG
C410	2113743N40	CAP CHIP 39.0 PF 5% COG
C351	2113743N40	CAP CHIP 39.0 PF 5% COG
C631	2113743N40	CAP CHIP 39.0 PF 5% COG
C152	2113743N40	CAP CHIP 39.0 PF 5% COG
C630	2113743N40	CAP CHIP 39.0 PF 5% COG
C475	2113743N40	CAP CHIP 39.0 PF 5% COG
C411	2113743N40	CAP CHIP 39.0 PF 5% COG
C153	2113743N40	CAP CHIP 39.0 PF 5% COG
C681	2113743N40	CAP CHIP 39.0 PF 5% COG
C50	2113743N40	CAP CHIP 39.0 PF 5% COG
C78	2113743N40	CAP CHIP 39.0 PF 5% COG
C628	2113743N40	CAP CHIP 39.0 PF 5% COG
C477	2113743N40	CAP CHIP 39.0 PF 5% COG
C52	2113743N40	CAP CHIP 39.0 PF 5% COG
C1727	2113743N40	CAP CHIP 39.0 PF 5% COG
C1728	2113743N40	CAP CHIP 39.0 PF 5% COG
C1731	2113743N40	CAP CHIP 39.0 PF 5% COG
C1020	2113743N40	CAP CHIP 39.0 PF 5% COG
C1023	2113743N40	CAP CHIP 39.0 PF 5% COG
C1008	2113743N40	CAP CHIP 39.0 PF 5% COG
C1024	2113743N40	CAP CHIP 39.0 PF 5% COG
C1751	2113743N40	CAP CHIP 39.0 PF 5% COG
C1021	2113743N40	CAP CHIP 39.0 PF 5% COG
C1005	2113743N40	CAP CHIP 39.0 PF 5% COG
C1004	2113743N40	CAP CHIP 39.0 PF 5% COG
C1701	2113743N40	CAP CHIP 39.0 PF 5% COG
C1917	2113743N40	CAP CHIP 39.0 PF 5% COG
C1722	2113743N40	CAP CHIP 39.0 PF 5% COG
C9915	2113743N40	CAP CHIP 39.0 PF 5% COG
C1726	2113743N40	CAP CHIP 39.0 PF 5% COG
C1006	2113743N40	CAP CHIP 39.0 PF 5% COG
C1007	2113743N40	CAP CHIP 39.0 PF 5% COG
C1725	2113743N40	CAP CHIP 39.0 PF 5% COG
C1721	2113743N40	CAP CHIP 39.0 PF 5% COG
C1723	2113743N40	CAP CHIP 39.0 PF 5% COG
C1724	2113743N40	CAP CHIP 39.0 PF 5% COG

C1022	2113743N40	CAP CHIP 39.0 PF 5% COG
C1055	2113743N40	CAP CHIP 39.0 PF 5% COG
C1057	2113743N40	CAP CHIP 39.0 PF 5% COG
C1054	2113743N40	CAP CHIP 39.0 PF 5% COG
C1720	2113743N40	CAP CHIP 39.0 PF 5% COG
C511	2113743N42	CAP CHIP 47.0 PF 5% COG
C302	2113743N42	CAP CHIP 47.0 PF 5% COG
C779	2113743L41	CAP CHIP 10000 PF 10% X7R
C778	2113743L41	CAP CHIP 10000 PF 10% X7R
C786	2113743L41	CAP CHIP 10000 PF 10% X7R
C755	2113743L41	CAP CHIP 10000 PF 10% X7R
C777	2113743L41	CAP CHIP 10000 PF 10% X7R
C752	2113743L41	CAP CHIP 10000 PF 10% X7R
C301	2113743L41	CAP CHIP 10000 PF 10% X7R
C407	2113743L41	CAP CHIP 10000 PF 10% X7R
C756	2113743L41	CAP CHIP 10000 PF 10% X7R
C732	2113743L41	CAP CHIP 10000 PF 10% X7R
C785	2113743L41	CAP CHIP 10000 PF 10% X7R
C733	2113743L41	CAP CHIP 10000 PF 10% X7R
C325	2113743L41	CAP CHIP 10000 PF 10% X7R
C753	2113743L41	CAP CHIP 10000 PF 10% X7R
C750	2113743L41	CAP CHIP 10000 PF 10% X7R
C625	2113743L41	CAP CHIP 10000 PF 10% X7R
C1122	2113743L41	CAP CHIP 10000 PF 10% X7R
C1123	2113743L41	CAP CHIP 10000 PF 10% X7R
C1121	2113743L41	CAP CHIP 10000 PF 10% X7R
C1925	2113743L41	CAP CHIP 10000 PF 10% X7R
C1113	2113743L41	CAP CHIP 10000 PF 10% X7R
C1112	2113743L41	CAP CHIP 10000 PF 10% X7R
C1933	2113743L41	CAP CHIP 10000 PF 10% X7R
C1934	2113743L41	CAP CHIP 10000 PF 10% X7R
C1107	2113743L41	CAP CHIP 10000 PF 10% X7R
C1105	2113743L41	CAP CHIP 10000 PF 10% X7R
C1614	2113743L41	CAP CHIP 10000 PF 10% X7R
C1061	2113743L41	CAP CHIP 10000 PF 10% X7R
C1111	2113743L41	CAP CHIP 10000 PF 10% X7R
C2023	2113743M08	CAP CHIP 22000 PF +80-20% Y5V
C1901	2113743M08	CAP CHIP 22000 PF +80-20% Y5V
C728	2113743M24	CAP CHIP 100000 PF +80-20% Y5V
C729	2113743M24	CAP CHIP 100000 PF +80-20% Y5V
C513	2113743M24	CAP CHIP 100000 PF +80-20% Y5V
C709	2113743M24	CAP CHIP 100000 PF +80-20% Y5V
C53	2113743M24	CAP CHIP 100000 PF +80-20% Y5V
C1201	2113743M24	CAP CHIP 100000 PF +80-20% Y5V
C1200	2113743M24	CAP CHIP 100000 PF +80-20% Y5V
C1750	2113743M24	CAP CHIP 100000 PF +80-20% Y5V
C1923	2113743M24	CAP CHIP 100000 PF +80-20% Y5V
C1924	2113743M24	CAP CHIP 100000 PF +80-20% Y5V
C1302	2113743M24	CAP CHIP 100000 PF +80-20% Y5V
C1912	2113743M24	CAP CHIP 100000 PF +80-20% Y5V

C1922	2113743M24	CAP CHIP 100000 PF +80-20% Y5V
C1921	2113743M24	CAP CHIP 100000 PF +80-20% Y5V
C1775	2113743M24	CAP CHIP 100000 PF +80-20% Y5V
C1910	2113743M24	CAP CHIP 100000 PF +80-20% Y5V
C258	2113743N01	CAP CHIP 0.5 PF +-.25PF COG
C257	2113743N03	CAP CHIP 1.0 PF +-.25PF COG
C632	2113743N03	CAP CHIP 1.0 PF +-.25PF COG
C416	2113743N05	CAP CHIP 1.2 PF +-.25PF COG
C507	2113743N07	CAP CHIP 1.5 PF +-.25PF COG
C633	2113743N07	CAP CHIP 1.5 PF +-.25PF COG
C629	2113743N07	CAP CHIP 1.5 PF +-.25PF COG
C515	2113743N13	CAP CHIP 3.0 PF +-.25PF COG
C305	2113743N14	CAP CHIP 3.3 PF +-.25PF COG
C101	2113743N14	CAP CHIP 3.3 PF +-.25PF COG
C328	2113743N46	CAP CHIP 68.0 PF 5% COG
C1161	2113743N50	CAP CHIP 100 PF 5% COG
C1056	2113743N50	CAP CHIP 100 PF 5% COG
C1160	2113743N50	CAP CHIP 100 PF 5% COG
C203	2113743N54	CAP CHIP 150 PF 5% COG
C656	2113928C03	CAP CER CHIP 1.0 UF 6.3V 10%
C627	2113928C04	CAP CER CHIP 4.7UF 6.3V10%0805
C2402	2113928C04	CAP CER CHIP 4.7UF 6.3V10%0805
C1102	2113928C04	CAP CER CHIP 4.7UF 6.3V10%0805
C2032	2113928C04	CAP CER CHIP 4.7UF 6.3V10%0805
C2022	2113928C04	CAP CER CHIP 4.7UF 6.3V10%0805
C1060	2113928C04	CAP CER CHIP 4.7UF 6.3V10%0805
C1707	2113743L01	CAP CHIP 220 PF 10% X7R
C1909	2113743L05	CAP CHIP 330 PF 10% X7R
C1908	2113743L05	CAP CHIP 330 PF 10% X7R
C757	2113743N36	CAP CHIP 27.0 PF 5% COG
C206	2113743L17	CAP CHIP 1000 PF 10% X7R
C404	2113743L17	CAP CHIP 1000 PF 10% X7R
C775	2113743L17	CAP CHIP 1000 PF 10% X7R
C266	2113743L17	CAP CHIP 1000 PF 10% X7R
C265	2113743L17	CAP CHIP 1000 PF 10% X7R
C1913	2113743L17	CAP CHIP 1000 PF 10% X7R
C754	2113743L21	CAP CHIP 1500 PF 10% X7R
C2014	2113743L21	CAP CHIP 1500 PF 10% X7R
C1907	2113743L33	CAP CHIP 4700 PF 10% X7R
C1616	2113743A27	CAP CHIP .470 UF 10% 16V
C2008	2113743E03	CER CHIP CAP .015UF
C1920	2113743E10	CAP CHIP .033 UF 10% X7R
C655	2113743E12	CAP CHIP .047 UF 10% X7R
C408	2113743E20	CAP CHIP .10 UF 10%
C406	2113743E20	CAP CHIP .10 UF 10%
C403	2113743F18	CAP CHIP 2.2 UF 16V +80-20%
C2011	2113743F18	CAP CHIP 2.2 UF 16V +80-20%
C1915	2113741F33	CAP CHIP CL2 X7R REEL 2200
C654	2113740F03	CAP CHIP REEL CL1 +/-30 1.0
C81	2113740F10	CAP CHIP REEL CL1 +/-30 2.0

C80	2113740F12	CAP CHIP REEL CL1 +/-30 2.4
U1102	5109817F17	IC VOLT DECT 2.7V ILC5061 SOT
U530	5109730C15	IC INT PA GAAS 1.0W FMM5605ZE
J101	2809329U01	PLUG INTRBD 20PIN .5MM SMD
U401	5109768D06	IC TEMP SNSR LM60CIM3X SOT23
U2300	5109632D99	IC CUST PAC MAX511EEE 16QSOP
U1201	5109522E14	IC 2-INPUT OR GATE TC7S32FU
U1202	5109522E15	IC SNGL INV TC7S04FU
U75	5109572E06	IC GAAS RF SW SPDT AS139-73
U1300	5109509A25	IC SRAM 128KX16 KM616FU20AZI-1
U402	5109512F17	IC VOLT REG MC33263NW-28R2 SOT
U1750	5109512F17	IC VOLT REG MC33263NW-28R2 SOT
LS1	5009365S05	ALERT 3V 10OHM 8.5 SMD
L777	2462587Q44	IND CHIP 560 NH 10%
CR1013	4813830A70	DIODE DL 5.6V COM ANODE
CR1011	4813830A70	DIODE DL 5.6V COM ANODE
VR450	4813830A73	DIODE 2.7V 5% 225MW
Q2504	4809940E02	TSTR DIG NPN DTC114YE
Q1022	4809940E02	TSTR DIG NPN DTC114YE
Q1021	4809940E02	TSTR DIG NPN DTC114YE
Q1751	4809940E03	TSTR DIG NPN DTC114TE
Y1770	4809995L09	XTAL QUARTZ 32.768KHZ MC-146
R1004	0609175L02	RES CHIP 0.25 1% .25W 1206
CR651	4809877C08	DIODE VARACTOR 1SV279 SMD
CR300	4809877C08	DIODE VARACTOR 1SV279 SMD
CR650	4809877C13	DIODE VARACTOR ISV305 SMD
Q50	4809939C03	TSTR DUAL NPN/PNP UMH3
Q325	4809939C04	TSTR DUAL PNP/NPN UMC3
Q60	4809939C23	TSTR DUAL NPN/NPN UM6
L510	2409646M80	IN CER MULTILYR 8.2NH 1608
L503	2409646M80	IN CER MULTILYR 8.2NH 1608
U325	4809863M15	OSC MOD REF TCXO 16.8MHZ 5032
RV1700	0603780K01	VARISTOR CHIP 18V 0603 SMD
RV1701	0603780K01	VARISTOR CHIP 18V 0603 SMD
RV1702	0603780K01	VARISTOR CHIP 18V 0603 SMD
RV1703	0603780K01	VARISTOR CHIP 18V 0603 SMD
CR2003	4809924D09	DIODE SCHTTKY DUAL MA742 SS
VR1000	4809788E06	DIODE ZENER 6.8V UDZ6.8B
L77	2409646M30	IND CER MULTILYR 8.2NH 1608
L300	2409377M09	IND CHIP WW 27 NH 5% 1608
Q2500	4809579E12	TSTR MOSFET P-CHAN ML6302
Q2501	4809579E12	TSTR MOSFET P-CHAN ML6302
FL402	9103913K03	FLTR SAW TX 836MHZ SMD
FL401	9103913K03	FLTR SAW TX 836MHZ SMD
FL100	9103913K04	FLTR SAW TX 818MHZ SMD
Q1715	4809607E11	TSTR PNP MGST1131T3 6TSOP
Q251	4809608E03	TSTR DIG PNP DTA114YE
Q2000	4809608E03	TSTR DIG PNP DTA114YE
Q2519	4809608E03	TSTR DIG PNP DTA114YE
L80	2409377M01	IND CHIP WW 1.8 NH 10% 1608

L80	2409377M01	IND CHIP WW 1.8 NH 10% 1608
L90	2409377M02	IND CHIP WW 3.9 NH 5% 1608
L90	2409377M02	IND CHIP WW 3.9 NH 5% 1608
L81	2409377M05	IND CHIP WW 12 NH 5% 1608
L81	2409377M05	IND CHIP WW 12 NH 5% 1608
Q150	4809579E02	TSTR MOSFET N-CHAN 25K1830
Q475	4809579E02	TSTR MOSFET N-CHAN 25K1830
Q1151	4809579E02	TSTR MOSFET N-CHAN 25K1830
Q1150	4809579E02	TSTR MOSFET N-CHAN 25K1830
Q1160	4809579E02	TSTR MOSFET N-CHAN 25K1830
Q1161	4809579E02	TSTR MOSFET N-CHAN 25K1830
Q1705	4809579E02	TSTR MOSFET N-CHAN 25K1830
Q1703	4809579E02	TSTR MOSFET N-CHAN 25K1830
Q1704	4809579E02	TSTR MOSFET N-CHAN 25K1830
L650	2409377M08	IND CHIP WW 22 NH 5% 1608
CR1010	4809653F02	RECT SCHOTTKY 1.0A UPS5817
CR2002	4809653F02	RECT SCHOTTKY 1.0A UPS5817
CR1008	4809653F02	RECT SCHOTTKY 1.0A UPS5817
CR1060	4809606E02	DIODE DUAL ARRAY DAN222
CR700	4809606E03	DIODE DUAL ARRAY DAP222
CR1750	4809606E03	DIODE DUAL ARRAY DAP222
CR475	4809606E05	DIODE DUAL SCHOTTKEY SOT-143
Q250	4809527E38	TSTR NPN RF NE687M03 M03
U626	4809283D41	OSC MOD VCO 991MHZ 6X6MM SMD
Q1010	4809579E27	TSTR FET P-CHAN SI3441 6TSOP
Q1008	4809579E27	TSTR FET P-CHAN SI3441 6TSOP
Q452	4809579E29	TSTR FET P-CHAN SI3443DV 6TSOP
Q1020	4809579E29	TSTR FET P-CHAN SI3443DV 6TSOP
Q1000	4809579E39	TSTR FET DUAL FDG6323L SC70-6
Q1060	4809579E40	TSTR FET DUAL N/P FDG6320C SC7
Q1731	4809579E40	TSTR FET DUAL N/P FDG6320C SC7
L507	2409348J08	IND AIR CORE 9.85NH 5% 4014
L400	2409154M60	IND CER MTLILYR 5.6 NH 1005
L150	2409154M62	IND CER MTLILYR 8.2 NH 1005
L406	2409154M64	IND CER MTLILYR 12.0NH 1005
L405	2409154M75	IND CER MLTILYR 100 NH 1005
L728	2409154M75	IND CER MLTILYR 100 NH 1005
L403	2409154M81	IND CER MLTILYR 2.7 NH 1005
L100	2409154M87	IND CER MLTILYR 8.2 NH 1005
L627	2409154M88	IND CER MLTILYR 10.0NH 1005
L404	2409154M91	IND CER MLTILYR 18.0NH 1005
L502	2409154M57	IND CER MTLILYR 3.3 NH 1005
L101	2409154M59	IND CER MTLILYR 4.7 NH 1005
CR1150	4809118D02	LED BICOLOR LNJ115W8POMT
L2000	2409092R09	IND CHIP PWR 1008 15 UH SMD
L401	2409154M13	IND CER MLTILYR 10.0NH 1005
L411	2409154M13	IND CER MLTILYR 10.0NH 1005
L200	2409154M38	IND CER MLTILYR 15.0NH 1005
L413	2409154M38	IND CER MLTILYR 15.0NH 1005
L402	2409154M38	IND CER MLTILYR 15.0NH 1005

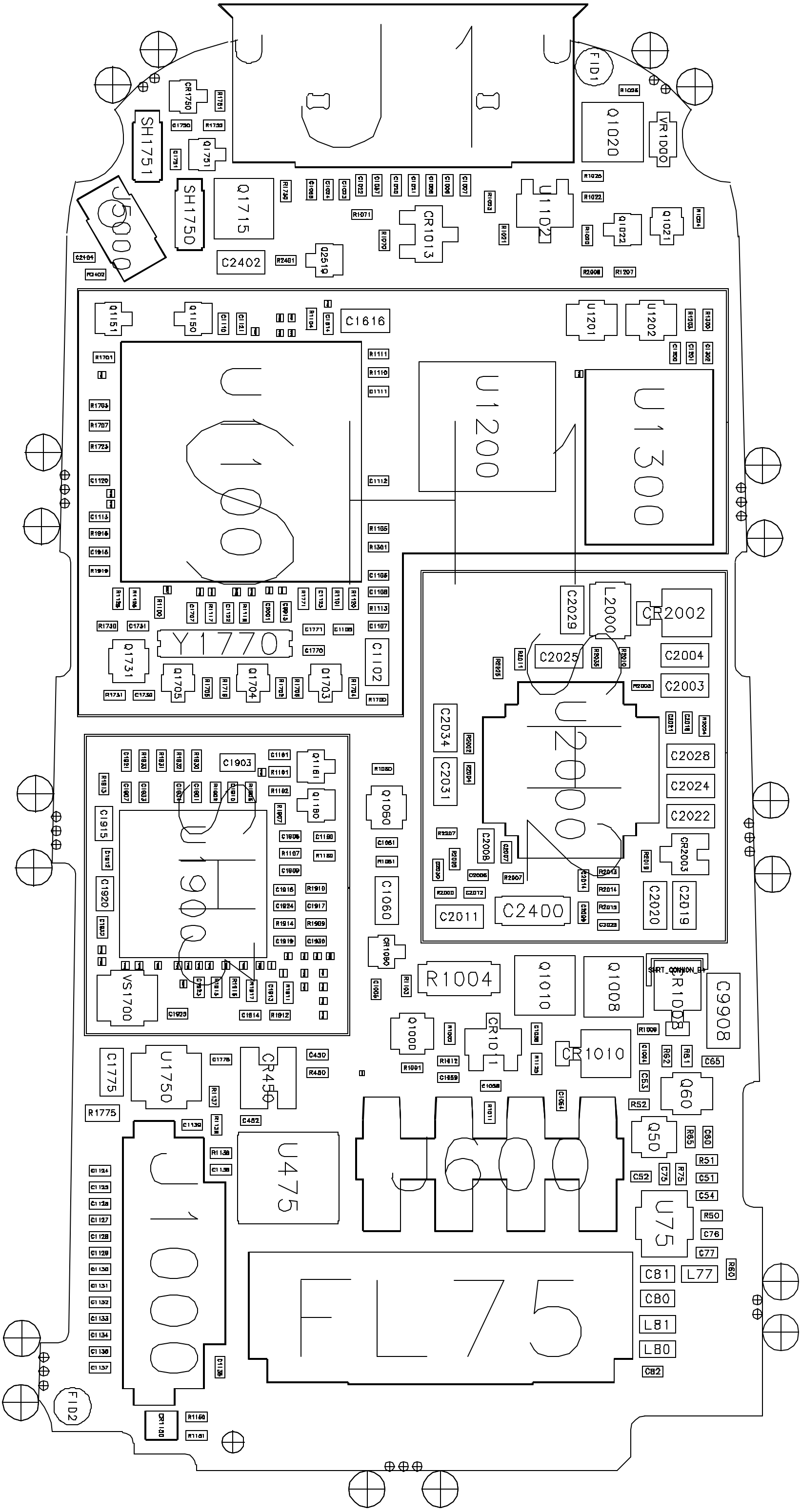
L151	2409154M38	IND CER MLTILYR 15.0NH 1005
L676	2409154M40	IND CER MLTILYR 22.0NH 1005
L252	2404574Z08	IND CHIP WW 82NH 2% 2012 SMD
L253	2404574Z08	IND CHIP WW 82NH 2% 2012 SMD
L203	2404574Z11	IND CHIP WW 150NH 2% 2012 SMD
FL251	9185672J01	FLTR SAW IF 109MHZ 7X14MM SMD
S_VDN	4009368L01	SW TACTILE RT ANGL SMD
S_SMART	4009368L01	SW TACTILE RT ANGL SMD
S_VUP	4009368L01	SW TACTILE RT ANGL SMD
C2400	2311049A89	CAP TANT CHIP 22 UF 4V 10%
R1021	0662057V02	RES CHIP 10K 1% 1/16W
R1020	0662057V07	RES CHIP 15K 1% 1/16W
R1930	0662057V07	RES CHIP 15K 1% 1/16W
R1931	0662057V07	RES CHIP 15K 1% 1/16W
R476	0662057M43	RES. CHIP 51 5% 20X40
R151	0662057M44	RES. CHIP 56 5% 20X40
R100	0662057M44	RES. CHIP 56 5% 20X40
R601	0662057M46	RES. CHIP 68 5% 20X40
R625	0662057M48	RES. CHIP 82 5% 20X40
R627	0662057M48	RES. CHIP 82 5% 20X40
R626	0662057M48	RES. CHIP 82 5% 20X40
R406	0662057M50	RES. CHIP 100 5% 20X40
R728	0662057M50	RES. CHIP 100 5% 20X40
R752	0662057M50	RES. CHIP 100 5% 20X40
R1151	0662057M50	RES. CHIP 100 5% 20X40
R1070	0662057M50	RES. CHIP 100 5% 20X40
R1060	0662057M50	RES. CHIP 100 5% 20X40
R1071	0662057M50	RES. CHIP 100 5% 20X40
R155	0662057M54	RES. CHIP 150 5% 20X40
R152	0662057M54	RES. CHIP 150 5% 20X40
R154	0662057M54	RES. CHIP 150 5% 20X40
R1707	0662057M54	RES. CHIP 150 5% 20X40
R2000	0662057M58	RES. CHIP 220 5% 20X40
R516	0662057M61	RES. CHIP 300 5% 20X40
R261	0662057M64	RES. CHIP 390 5% 20X40
R1150	0662057M64	RES. CHIP 390 5% 20X40
R2007	0662057M64	RES. CHIP 390 5% 20X40
R1913	0662057N03	RES. CHIP 15K 5% 20X40
R407	0662057N06	RES. CHIP 20K 5% 20X40
R102	0662057N06	RES. CHIP 20K 5% 20X40
R413	0662057N06	RES. CHIP 20K 5% 20X40
R653	0662057N07	RES. CHIP 22K 5% 20X40
R2032	0662057N07	RES. CHIP 22K 5% 20X40
R60	0662057N09	RES. CHIP 27K 5% 20X40
R479	0662057N09	RES. CHIP 27K 5% 20X40
R2014	0662057N09	RES. CHIP 27K 5% 20X40
R2015	0662057N09	RES. CHIP 27K 5% 20X40
R1706	0662057N10	RES. CHIP 30K 5% 20X40
R1752	0662057N11	RES. CHIP 33K 5% 20X40
R408	0662057N13	RES. CHIP 39K 5% 20X40

R414	0662057N13	RES. CHIP 39K 5% 20X40
R2207	0662057N13	RES. CHIP 39K 5% 20X40
R2500	0662057N15	RES. CHIP 47K 5% 20X40
R1105	0662057N15	RES. CHIP 47K 5% 20X40
R1102	0662057N15	RES. CHIP 47K 5% 20X40
R1103	0662057N15	RES. CHIP 47K 5% 20X40
R1106	0662057N15	RES. CHIP 47K 5% 20X40
R1704	0662057N15	RES. CHIP 47K 5% 20X40
R2005	0662057N15	RES. CHIP 47K 5% 20X40
R1107	0662057N15	RES. CHIP 47K 5% 20X40
R1911	0662057N15	RES. CHIP 47K 5% 20X40
R1916	0662057N15	RES. CHIP 47K 5% 20X40
R1917	0662057N15	RES. CHIP 47K 5% 20X40
R1118	0662057N15	RES. CHIP 47K 5% 20X40
R1912	0662057N20	RES. CHIP 75K 5% 20X40
R454	0662057N23	RES. CHIP 100K 5% 20X40
R474	0662057N23	RES. CHIP 100K 5% 20X40
R1002	0662057N23	RES. CHIP 100K 5% 20X40
R1001	0662057N23	RES. CHIP 100K 5% 20X40
R1750	0662057N23	RES. CHIP 100K 5% 20X40
R2010	0662057N23	RES. CHIP 100K 5% 20X40
R1907	0662057N27	RES. CHIP 150K 5% 20X40
R1910	0662057N27	RES. CHIP 150K 5% 20X40
R2033	0662057N27	RES. CHIP 150K 5% 20X40
R1771	0662057N31	RES. CHIP 220K 5% 20X40
R65	0662057N33	RES. CHIP 270K 5% 20X40
R62	0662057N33	RES. CHIP 270K 5% 20X40
R400	0662057N33	RES. CHIP 270K 5% 20X40
R2004	0662057N33	RES. CHIP 270K 5% 20X40
R1731	0662057N33	RES. CHIP 270K 5% 20X40
R1061	0662057N47	RES. CHIP 1.0 MEG 5% 20X40
R1162	0662057M85	RES. CHIP 3000 5% 20X40
R300	0662057M86	RES. CHIP 3300 5% 20X40
R455	0662057M90	RES. CHIP 4700 5% 20X40
R1902	0662057M90	RES. CHIP 4700 5% 20X40
R1125	0662057M90	RES. CHIP 4700 5% 20X40
R1701	0662057M90	RES. CHIP 4700 5% 20X40
R1113	0662057M90	RES. CHIP 4700 5% 20X40
R456	0662057M92	RES. CHIP 5600 5% 20X40
R2013	0662057M92	RES. CHIP 5600 5% 20X40
R264	0662057M32	RES. CHIP 18 5% 20X40
R2400	0662057M32	RES. CHIP 18 5% 20X40
R101	0662057M34	RES. CHIP 22 5% 20X40
R503	0662057M36	RES. CHIP 27 5% 20X40
R510	0662057M36	RES. CHIP 27 5% 20X40
R200	0662057M40	RES. CHIP 39 5% 20X40
R153	0662057M40	RES. CHIP 39 5% 20X40
R1909	0662057M94	RES. CHIP 6800 5% 20X40
R2031	0662057M94	RES. CHIP 6800 5% 20X40
R651	0662057M95	RES. CHIP 7500 5% 20X40

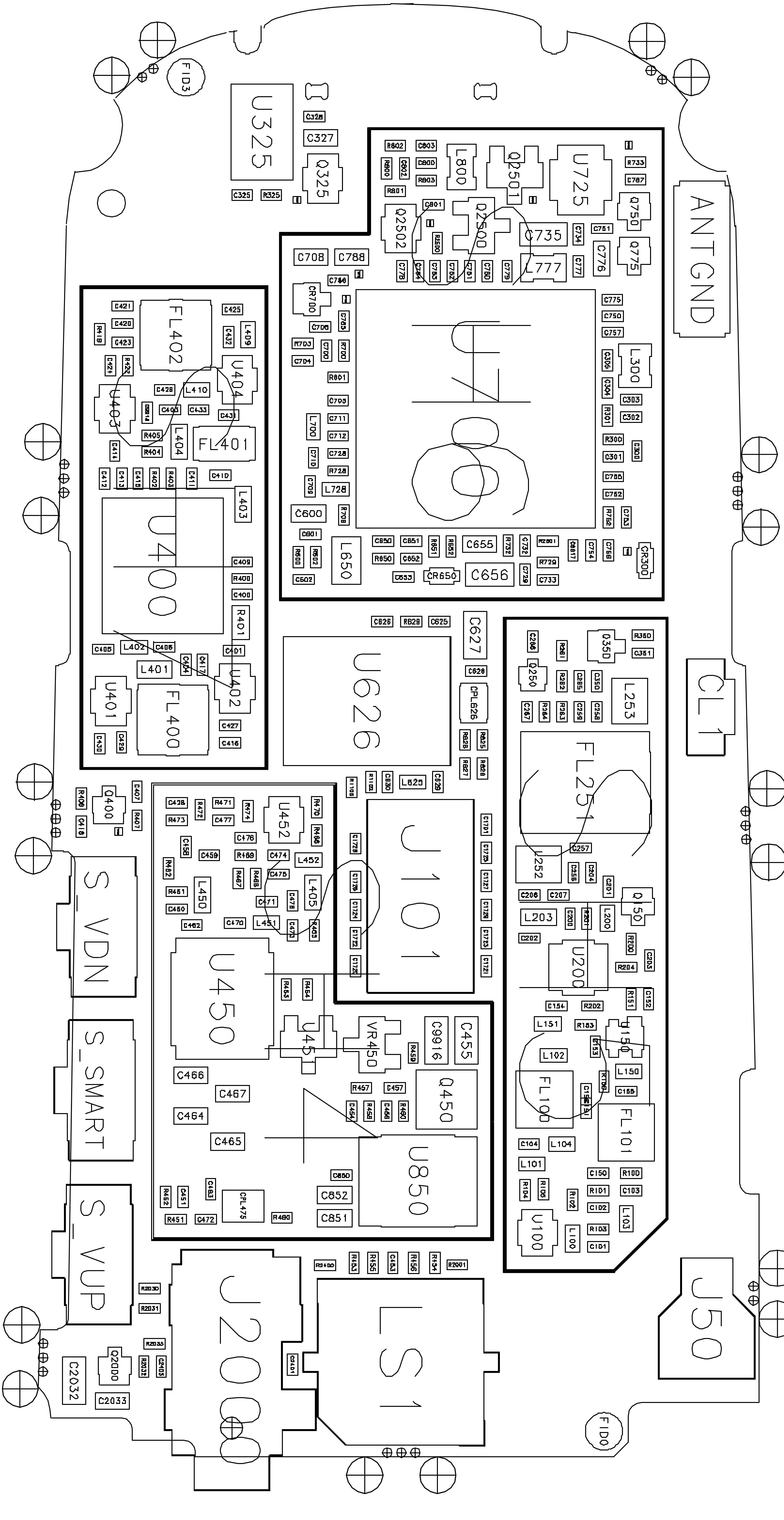
R1933	0662057M95	RES. CHIP 7500 5% 20X40
R1932	0662057M95	RES. CHIP 7500 5% 20X40
R250	0662057M98	RES. CHIP 10K 5% 20X40
R51	0662057M98	RES. CHIP 10K 5% 20X40
R301	0662057M98	RES. CHIP 10K 5% 20X40
R52	0662057M98	RES. CHIP 10K 5% 20X40
R50	0662057M98	RES. CHIP 10K 5% 20X40
R150	0662057M98	RES. CHIP 10K 5% 20X40
R1022	0662057M98	RES. CHIP 10K 5% 20X40
R1111	0662057M98	RES. CHIP 10K 5% 20X40
R1011	0662057M98	RES. CHIP 10K 5% 20X40
R1906	0662057M98	RES. CHIP 10K 5% 20X40
R1730	0662057M98	RES. CHIP 10K 5% 20X40
R1012	0662057M98	RES. CHIP 10K 5% 20X40
R1110	0662057M98	RES. CHIP 10K 5% 20X40
R1161	0662057M98	RES. CHIP 10K 5% 20X40
R1009	0662057M98	RES. CHIP 10K 5% 20X40
R1160	0662057M98	RES. CHIP 10K 5% 20X40
R1723	0662057M98	RES. CHIP 10K 5% 20X40
R1025	0662057M98	RES. CHIP 10K 5% 20X40
R1702	0662057M98	RES. CHIP 10K 5% 20X40
R1716	0662057M98	RES. CHIP 10K 5% 20X40
R1023	0662057M98	RES. CHIP 10K 5% 20X40
R1024	0662057M98	RES. CHIP 10K 5% 20X40
R1703	0662057M98	RES. CHIP 10K 5% 20X40
R1705	0662057M98	RES. CHIP 10K 5% 20X40
R1700	0662057M98	RES. CHIP 10K 5% 20X40
R1918	0662057N01	RES CHIP 12K 5% 20X40
R1751	0662057N01	RES CHIP 12K 5% 20X40
R473	0662057M01	RES. CHIP 0 5% 20X40
R258	0662057M01	RES. CHIP 0 5% 20X40
R2003	0662057M01	RES. CHIP 0 5% 20X40
R1915	0662057M01	RES. CHIP 0 5% 20X40
R1914	0662057M01	RES. CHIP 0 5% 20X40
R1101	0662057M01	RES. CHIP 0 5% 20X40
R1126	0662057M01	RES. CHIP 0 5% 20X40
R1128	0662057M01	RES. CHIP 0 5% 20X40
R2024	0662057M01	RES. CHIP 0 5% 20X40
R1100	0662057M01	RES. CHIP 0 5% 20X40
R1919	0662057M01	RES. CHIP 0 5% 20X40
R1117	0662057M01	RES. CHIP 0 5% 20X40
R1203	0662057M01	RES. CHIP 0 5% 20X40
R1104	0662057M01	RES. CHIP 0 5% 20X40
R2025	0662057M01	RES. CHIP 0 5% 20X40
R2019	0662057M01	RES. CHIP 0 5% 20X40
R2011	0662057M01	RES. CHIP 0 5% 20X40
R1300	0662057M01	RES. CHIP 0 5% 20X40
R1207	0662057M01	RES. CHIP 0 5% 20X40
R478	0662057M70	RES. CHIP 680 5% 20X40
R650	0662057M74	RES. CHIP 1000 5% 20X40

R600	0662057M74	RES. CHIP 1000 5% 20X40
R325	0662057M74	RES. CHIP 1000 5% 20X40
R2401	0662057M74	RES. CHIP 1000 5% 20X40
R2030	0662057M74	RES. CHIP 1000 5% 20X40
R490	0662057M76	RES. CHIP 1200 5% 20X40
R480	0662057M76	RES. CHIP 1200 5% 20X40
R652	0662057M76	RES. CHIP 1200 5% 20X40
R263	0662057M78	RES. CHIP 1500 5% 20X40
R511	0662057M81	RES. CHIP 2000 5% 20X40
R512	0662057M81	RES. CHIP 2000 5% 20X40
R475	0662057M82	RES. CHIP 2200 5% 20X40
R262	0662057M82	RES. CHIP 2200 5% 20X40
R1026	0662057M84	RES. CHIP 2700 5% 20X40
R2402	0662057M84	RES. CHIP 2700 5% 20X40
R2002	0662057M02	RES. CHIP 1.0 5% 20X40
R603	0662057M19	RES. CHIP 5.1 5% 20X40
R703	0662057M26	RES. CHIP 10 5% 20X40
R700	0662057M26	RES. CHIP 10 5% 20X40
R515	0662057M26	RES. CHIP 10 5% 20X40
R729	0662057M26	RES. CHIP 10 5% 20X40
R513	0662057M26	RES. CHIP 10 5% 20X40
R732	0662057M26	RES. CHIP 10 5% 20X40
R709	0662057M26	RES. CHIP 10 5% 20X40
R2035	0662057M26	RES. CHIP 10 5% 20X40
R1120	0662057M26	RES. CHIP 10 5% 20X40
R1775	0660076N01	RES CHIP 10 OHM 5 1/16W
SH1750	4209388S01	CLIP TOP FLEX
SH1751	4209388S01	CLIP TOP FLEX
CL1	4204771Z01	CLIP ANTENNA TUBE VADAR
U1100	5109773F16	IC CUST CASPER SC29007VHR2
U1900	5109923D48	IC CUST CIA PC29009VHR2 144BGA
C455	2113928K09	CAP CER CHIP 10.0 UF 6.3V 10%
C9908	2113928K09	CAP CER CHIP 10.0 UF 6.3V 10%
C2024	2113928K09	CAP CER CHIP 10.0 UF 6.3V 10%
C2031	2113928K09	CAP CER CHIP 10.0 UF 6.3V 10%
C2019	2113928K09	CAP CER CHIP 10.0 UF 6.3V 10%
C2025	2113928K09	CAP CER CHIP 10.0 UF 6.3V 10%
C2003	2113928K09	CAP CER CHIP 10.0 UF 6.3V 10%
SH5	2687389K01	SHIELD V8162 PA
SH1	2687388K01	SHIELD V8162 CASPER
SH3	2687390K01	SHIELD V8162 CIA
SH6	2687392K01	SHIELD V8162 ZIF
SH2	2687391K01	SHIELD V8162 CCAP
SH7	2687396K01	SHIELD V8162 RCV
SH4	2687398K01	SHIELD V8162 EXCITER
SH8	2687397K01	SHIELD V8162 IF
U100	4887716K01	TRANSISTOR RF SIGE IBM43RF0100
FL75	9109170T02	FLTR SAW DP 836/881MM SMD

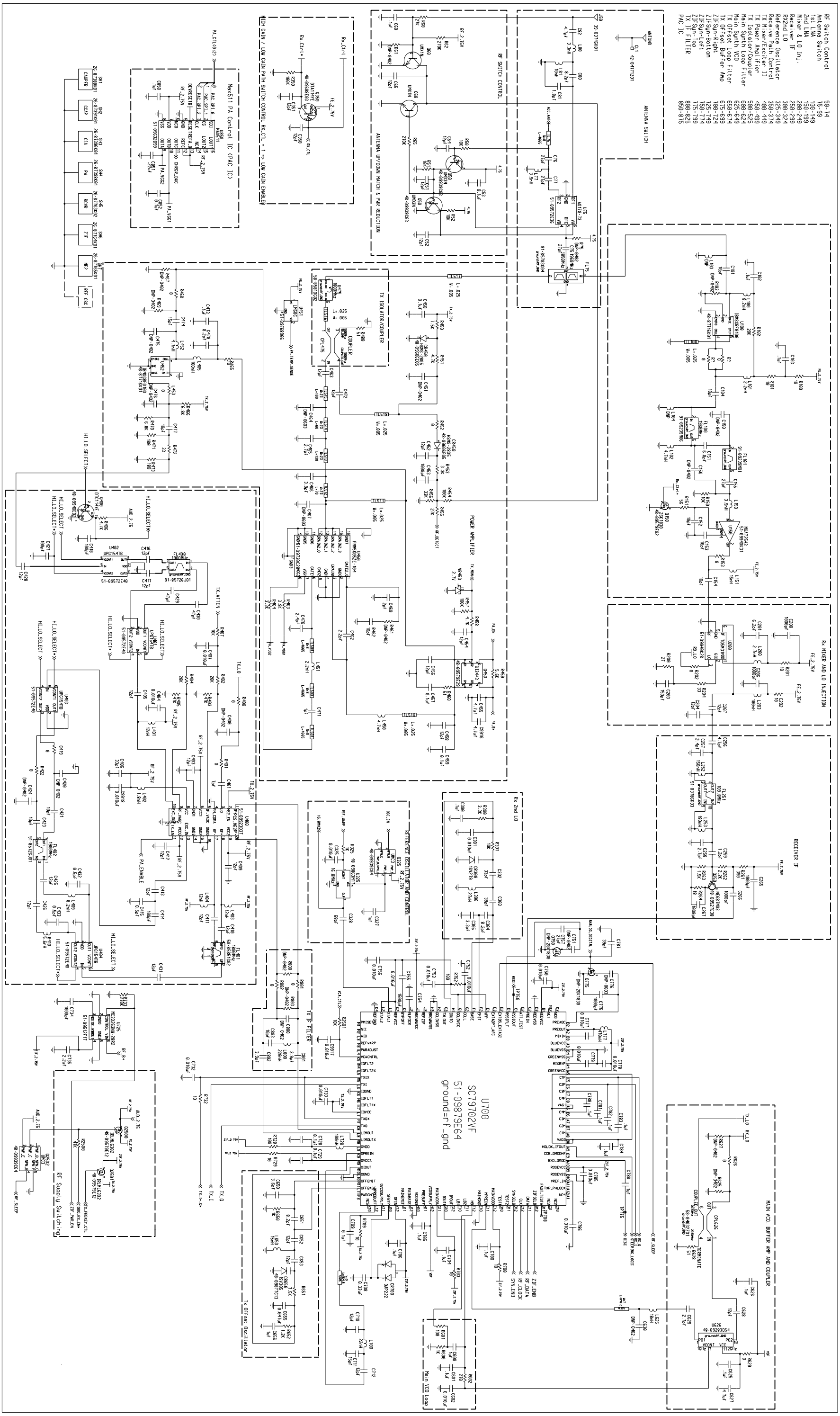
CDMA V8162 : BOTTOM SIDE BOARD OVERLA



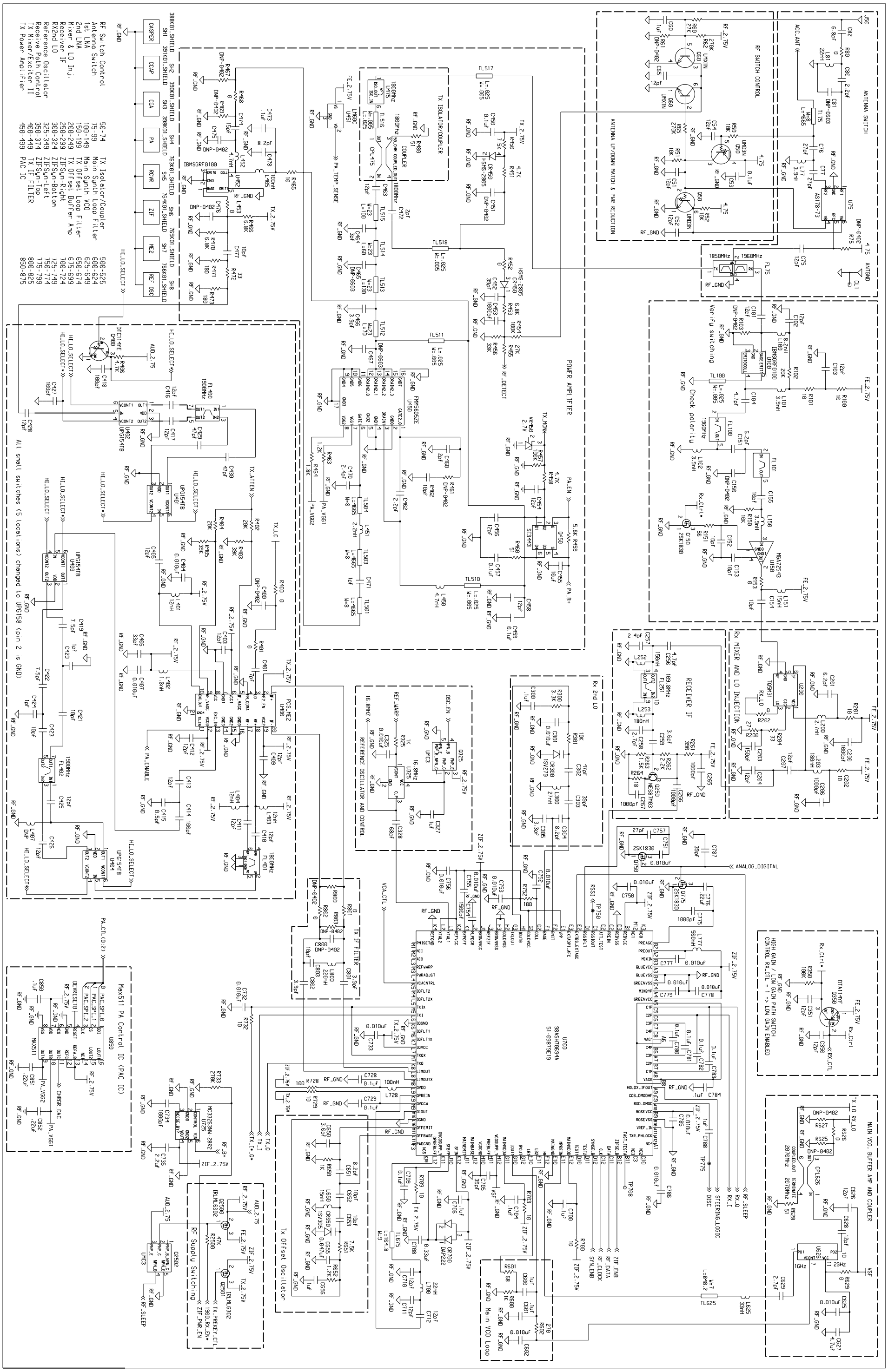
CDMA V8162 : BOTTOM SIDE BOARD OVERLAY



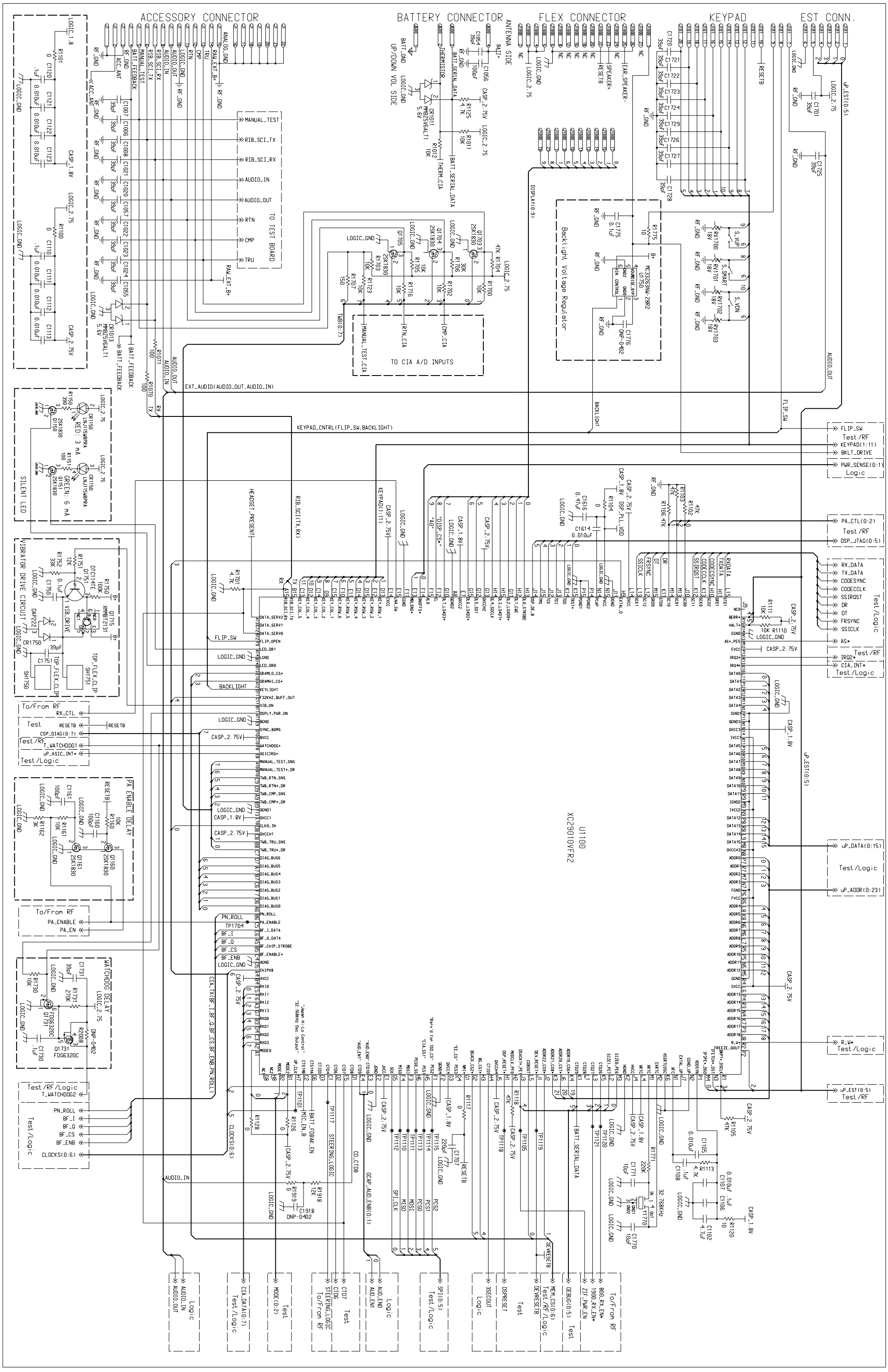
CDMA V8162 : RF SCHEMATICS



CDMA V8162 : AL SCHEMATICS SIDE 1 OF 3



CDMA V8162 : AL SCHEMATICS SIDE 2 OF 3



CDMA V8162 : AL SCHEMATICS SIDE 3 OF 3