

# Product Family C21 Wireless Telephones



Motorola T193 GSM 1900 MHz & GPRS Technologies

Level III Service Manual Table of Contents

# **Table of Contents**

Introduction	1
Product Identification	
Product Names	
Product Changes	
Regulatory Agency Compliance	
Computer Program Copyrights	
About This Service Manual	
Warranty Service Policy	
Parts Replacement	
Specifications	
Product Overview	
Features	
General Operation	
Controls, Indicators, and Input / Output (I/O) Connectors	
User Interface Menu Structure	
Alert Settings	
Battery Function	
Operation	
Tools and Test Equipment	
Disassembly	
Removing and Replacing the Battery Cover and Battery	
Removing and Replacing the Subscriber Identity Module (SIM)	
Removing and Replacing the Front Cover (Convertible Cover)	
Removing and Replacing the Keypad	
Removing and Replacing the Transceiver Board Assembly	
Removing and Replacing the Cover Plate	
Removing and Replacing the Display Module	
Removing and Replacing the Alert Grommet	
Removing and Replacing the Microphone Grommet and Microphone	
Removing and Replacing the Vibrator	. 27
Subscriber Identity Module (SIM) and Identification	. 28
SIM	. 28
Identification	. 28
Troubleshooting	. 30
Manual Test Mode	. 30
Manual Test Mode Commands	. 30
Troubleshooting Chart	. 31
Programming: Software Upgrade and Flexing	. 33
Part Number Charts	
Related Publications	
Exploded View Diagram	
Exploded View Parts List	
Model-Specific Part Numbers	
Accessories	
IndexInd	

Table of Contents Product Family C21

Level III Service Manual Introduction

### Introduction

Motorola<sup>®</sup> Inc. maintains a worldwide organization that is dedicated to provide responsive, full-service customer support. Motorola products are serviced by an international network of company-operated product care centers as well as authorized independent service firms.

Available on a contract basis, Motorola Inc. offers comprehensive maintenance and installation programs which enable customers to meet requirements for reliable, continuous communications.

To learn more about the wide range of Motorola service programs, contact your local Motorola products representative or the nearest Customer Service Manager.

### **Product Identification**

Motorola products are identified by the model number on the housing. Use the entire model number when inquiring about the product. Numbers are also assigned to chassis and kits. Use these numbers when requesting information or ordering replacement parts.

### **Product Names**

Product names included in Product Families B95 and C21 (PF B95 and C21) telephones are listed on the front cover. Product names are subject to change without notice. Some product names, as well as some frequency bands, are available only in certain markets.

# **Product Changes**

When electrical, mechanical or production changes are incorporated into Motorola products, a revision letter is assigned to the chassis or kit affected, for example; - A, -B, or -C, and so on.

The chassis or kit number, complete with revision number is imprinted during production. The revision letter is an integral part of the chassis or kit number and is also listed on schematic diagrams and printed circuit board layouts.

# **Regulatory Agency Compliance**

This device complies with Part 15 of the FCC Rules. Operation is subject to the following conditions:

- 1. This device may not cause any harmful interference, and
- 2. this device must accept interference received, including interference that may cause undesired operation.

This class B device also complies with all requirements of the Canadian Interference-Causing Equipment Regulations (ICES-003).

Cet appareil numérique de la classe B respecte toutes les exigences du Règlement sur le matériel brouilleur du Canada.

Introduction Product Family C21

# **Computer Program Copyrights**

The Motorola products described in this manual may include Motorola computer programs stored in semiconductor memories or other media that are copyrighted with all rights reserved worldwide to Motorola. Laws in the United States and other countries preserve for Motorola, Inc. certain exclusive rights to the copyrighted computer programs, including the exclusive right to copy, reproduce, modify, decompile, disassemble, and reverse-engineer the Motorola computer programs in any manner or form without Motorola's prior written consent. Furthermore, the purchase of Motorola products shall not be deemed to grant either directly or by implication, estoppel, or otherwise, any license or rights under the copyrights, patents, or patent applications of Motorola, except for a nonexclusive license to use the Motorola product and the Motorola computer programs with the Motorola product.

### **About This Service Manual**

Using this service manual and the suggestions contained in it assures proper installation, operation, and maintenance of PF B95 and C21 telephones. Refer questions about this manual to the nearest Customer Service Manager.

A product family is the group of products having the same Account Product Code (APC). To locate the APC on a device, refer to "Mechanical Serial Number (MSN)" later in this manual.

### **Audience**

This document aids service personnel in testing and repairing PF B95 and C21 telephones. Service personnel should be familiar with electronic assembly, testing, and troubleshooting methods, and with the operation and use of associated test equipment.

Use of this document assures proper installation, operation, and maintenance of Motorola products and equipment. It contains all service information required for the equipment described and is current as of the printing date.

### Scope

The scope of this document is to provide the reader with basic information relating to PF B95 and C21 telephones, and also to provide procedures and processes for repairing the units at Level 1 and 2 service centers including:

- Unit swap out
- · Repairing of mechanical faults
- Basic modular troubleshooting
- · Testing and verification of unit functionality
- Initiate warranty claims and send faulty modules to Level 3 or 4 repair centers.

Level III Service Manual Introduction

### Conventions

Special characters and typefaces, listed and described below, are used in this publication to emphasize certain types of information.



Note: Emphasizes additional information pertinent to the subject matter.



Caution: Emphasizes information about actions which may result in equipment damage.



Warning: Emphasizes information about actions which may result in personal injury.



Keys to be pressed are represented graphically. For example, instead of "Press the Enter Key", you will see "Press Enter".

Information from a screen is shown in text as similar as possible to what appears in the display. For example, ALERTS or ALERTS or ALERTS.

Information that you need to type is printed in boldface type

### Revisions

Any changes that occur after manuals are printed are described in publication revision bulletins (PMRs). These bulletins provide change information that can include new parts listing data, schematic diagrams, and printed board layouts.

# **Warranty Service Policy**

The product will be sold with the standard 12 months warranty terms and conditions. Accidental damage, misuse, and extended warranties offered by retailers are not supported under warranty. Non warranty repairs are available at agreed fixed repair prices.

### **Out of Box Failure Policy**

The standard out of box failure criteria applies. Customer units that fail very early on after the date of sale, are to be returned to Manufacturing for root cause analysis, to guard against epidemic criteria. Manufacturing to bear the costs of early life failure.

### **Product Support**

Customer's original units will be repaired but not refurbished as standard. Appointed Motorola Service Hubs will perform warranty and non-warranty field service for level 2 (assemblies) and level 3 (limited PCB component). The Motorola HTC centers will perform level 4 (full component) repairs.

Introduction Product Family C21

### **Customer Support**

Customer support is available through dedicated Call Centers and in-country help desks. Product Service training should be arranged through the local Motorola Support Center.

# **Parts Replacement**

When ordering replacement parts or equipment, include the Motorola part number and description used in the service manual or supplement.

When ordering crystals or channel elements, specify the Motorola part number, description, crystal frequency, and operating frequency desired.

When the Motorola part number of a component is not known, use the product model number or other related major assembly along with a description of the related major assembly and of the component in question.

In the U.S.A., to contact Motorola, Inc. on your TTY, call: 800-793-7834

### **Accessories and Aftermarket Division (AAD)**

Replacement parts, test equipment, and manuals can be ordered from AAD.

U.S.A Outside U.S.A.

Phone: 800-422-4210 Phone: 847-538-8023

FAX: 800-622-6210 FAX: 847-576-3023

Level III Service Manual Specifications

# **Specifications**

General Function	Specification		
General Function	B95	C21	
Frequency Range GSM	880-915 MHz Tx (with EGSM) 925-960 MHZ Rx	_	
Frequency Range DCS	1710-1785 MHz Tx 1805-1880 MHz Rx	_	
Frequency Range PCS	_	1850-1910 MHz Tx 1930-1990 MHz Rx	
Channel Spacing	200 kHz	200 kHz	
Channels	174 EGSM, 374 DCS carriers with 8 ch. per carrier	299 PCS carriers with 8 ch. per carrier	
Modulation	GMSK at BT = 0.3	GMSK at BT = 0.3	
Transmitter Phase Accuracy	5 Degrees RMS, 20 Degrees peak	5 Degrees RMS, 20 Degrees peak	
Duplex Spacing	45 MHz GSM, 95 MHz DCS	80 MHz PCS	
Frequency Stability	± 0.10 ppm of the downlink frequency (Rx)	± 0.10 ppm of the downlink frequency (Rx)	
Operating Voltage	+3.0V dc to +5.1V dc (battery) +4.4V dc to +6.5V dc (external connector)	+3.0V dc to +5.1V dc (battery) +4.4V dc to +6.5V dc (external connector)	
Average Transmit Current	300 mA max	300 mA max	
Average Stand-by Current	7 mA max	7 mA max	
Dimensions	118 mm x 46.8 mm x 22 mm (3.3 inches X 1.7 inches X 0.8 inches)	118 mm x 46.8 mm x 22 mm (3.3 inches X 1.7 inches X 0.8 inches)	
Size (Volume)	93 cc (5.7 in <sup>3</sup> )	93 cc (5.7 in <sup>3</sup> )	
Weight	117 gm (4.06 oz)	117 gm (4.06 oz)	
Temperature Range	-10° C to +55° C (+15° F to +130° F)	-10° C to +55° C (+15° F to +130° F)	
Battery Life, 600 mAh NiMH Battery	Talk time up to 300 minutes	Talk time 200-300 minutes PS0-PS10	
	Standby time up to 180 hours Standby time 80-150 hrs		
	All talk and standby times are approximate and depend on network configuration, signal strength, and features selected. Standby times are quoted as a range from DRX=2 to DRX=9. Talk times are quoted as a range from DTX off to DTX on.		

Transmitter Function	B95	C21
RF Power Output	33 dBm nominal GSM 30 dBm nominal DCS	29 dBm nominal GSM
Output Impedance	50 ohms nominal	50 ohms nominal
Spurious Emissions	-36 dBm from 0.1 to 1 GHz, -30 dBm from 1 to 4 GHz	-36 dBm from 0.1 to 1 GHz, -30 dBm from 1 to 4 GHz

Receiver Function	B95	C21
Receive Sensitivity	-107 dBm GSM, -105 dBm DCS	-105 dBm GSM
RX bit error rate (100k bits) Type II	< 2%	< 2%
Channel Hop Time	500 microseconds	500 microseconds
Time to Camp	Approximately 5-10 seconds	Approximately 5-10 seconds

Specifications Product Family C21

Speech Coding Function	Specification	
Speech Coding Type	Regular pulse excitation / linear predictive coding with long term prediction (RPE LPC with LTP)	
Bit Rate	13.0 kbps	
Frame Duration	20 ms	
Block Length	260 bits	
Classes	Class 1 bits = 182 bits; Class 2 bits = 78 bits	
Bit Rate with FEC Encoding	22.8 kbps	

Level III Service Manual Product Overview

### **Product Overview**

Motorola PF B95 and C21 mobile telephones feature global system for mobile communications (GSM) air interface, general packet radio service (GPRS) transport technology, and wireless application protocol (WAP) Internet browser. PF B95 and C21 incorporate a simplified icon and list-based user interface (UI) for easier operation, allow short message service (SMS) text messaging, and include clock, alarm, datebook, calculator, and caller profiling personal management tools. The PF B95 is a dual band phone that allows roaming within the GSM 900 MHz and digital cellular system (DCS) 1800 MHz bands. The PF C21 is a single band phone operating in the personal communications services (PCS) 1900 MHz band.

PF B95 and C21 telephones support GPRS and SMS in addition to traditional circuit switched transport technologies. GPRS, where available, provides substantial increases in mobile data communications performance and the efficient use of radio spectrum. Data transmission rates for GSM networks can potentially increase from the current rate of 9.6 kbps up to a theoretical maximum of 171.2 kbps. An increased data rate is by no means the only benefit provided by GPRS. A key advantage is the provision of a permanent virtual connection to the network. This "always on" connection is possible because GPRS uses packet data transfer so that, for example, email can be downloaded in "background mode." There is no need for the user to reconnect before requesting a service, eliminating connection set-up delays and adding convenience and immediacy to data services access. The "virtual" nature of this connection means that network resources are not consumed during periods when a user is not actually sending or receiving data.

The telephones are made of polycarbonate plastic. The display and speaker, as well as the 16-key keypad, transceiver printed circuit board (PCB), microphone, charger and headphone connectors, and power button are contained within the J form-factor housing. The user-replaceable 600 mAh nickel metal hydride (NiMH) battery provides up to 300 minutes of talk time with up to 180 hours of standby time  $^{1}$ . The phone accepts 3V mini subscriber identity module (SIM) cards which fit into the SIM holder underneath the battery. These telephones feature a 96 x 64 pixel 800 square millimeter high-resolution graphics display and an internal antenna.

### **Features**

PF B95 and C21 telephones use advanced, self-contained, sealed, custom integrated circuits to perform the complex functions required for GSM GPRS communication. Aside from the space and weight advantage, microcircuits enhance basic reliability, simplify maintenance, and provide a wide variety of operational functions.

Features available in this family of telephones include:

- · Lower voltage technology that provides increased standby and talk times
- Extended GSM (EGSM) channels (PF B95 only)
- Tri-coder/decoder (CODEC) that allows full rate, half rate, and enhanced full rate modes of transmission
- Supports SMS, concatenated SMS, and cell broadcast messages<sup>2</sup>
- Supports GPRS, circuit switched, and SMS networks<sup>2</sup>
- WAP 1.1 compliant<sup>2</sup>

<sup>1.</sup> All talk and standby times are approximate and depend on network configuration, signal strength, and features selected. Standby times are quoted as a range from DRX=2 to DRX=9. Talk times are quoted as a range from DTX off to DTX on.

<sup>2.</sup> Network, subscription and SIM card or service provider dependent feature. Not available in all areas.

Product Overview Product Family C21

- 96 X 64 pixel 800 square millimeter graphical display with 4 lines of English text and 1 line of icons
- Display zoom
- Display animation
- · VibraCall® vibrating alert
- Downloadable ring tones<sup>3</sup>
- · Voice activation for phone book entries
- Simplified text entry using iTAP<sup>TM</sup> predictive text entry
- Calling line identification<sup>3</sup>
- Supports call diverting for incoming voice calls<sup>3</sup>
- Supports 3V SIM cards
- SIM Toolkit<sup>™</sup> Class 2 (STK)<sup>3</sup>
- Personal management tools calculator with currency converter, real time clock with date, reminders, and caller profiling
- Phase II Unstructured Supplementary Service Data (USSD)<sup>3</sup>
- Hearing Aid Telephone Interconnection System (HATIS) support
- Chat messaging via WAP over GPRS<sup>3</sup>

### **Speaker Dependant Voice Activation**

The voice dialing feature allows the user to recall pre-programmed voice numbers simply by pressing the Voice/Ok key and speaking the desired voice tag. Up to 10 voice tags can be stored.



The user cannot place or receive calls while adding voice tags to the phone's memory.



Because the GSM standard does not provide the option to store voice tags onto the SIM card, voice tags are added to the phone's memory.

### Wireless Access Protocol (WAP) 1.1 Compliancy

In the WAP environment, access to the Internet is initiated in wireless markup language (WML), which is derived from hypertext markup language (HTML). The request is passed to a WAP gateway which retrieves the information from the server in standard HTML (subsequently filtered to WML) or directly in WML if available. The information is then passed to the mobile subscriber via the mobile network.

The PF B95 and C21's microbrowser can be configured for baud, idle timeout, line type, phone number, and connection type.



Bitmap image data will download as text. If the image is larger than the screen, only part of the image will display.



If the user receives a call while in browser mode, the browser will pause and allow the user to resume after completing the call.

<sup>3.</sup> Network, subscription and SIM card or service provider dependent feature. Not available in all areas.

Level III Service Manual Product Overview

### Simplified Text Entry

iTAP<sup>TM</sup> predictive text entry. Press a key to generate a character and a dynamic dictionary uses this to build and display a set of word or name options. The iTAP<sup>TM</sup> feature may not be available on the phone in all languages.

### **Caller Line Identification**

Upon receipt of a call, the calling party's phone number is compared to the phone book. If the number matches a phone book entry, that name will be displayed. If there is no phone book entry, the incoming phone number will be displayed. In the event that no caller identification information is available, an incoming call message is displayed.



User must subscribe to a caller line identification service through their service provider.

### SIM Toolkit™ - Class 2

SIM Application Toolkit is a value-added service delivery mechanism that allows GSM operators to customize the services they offer their customers, from the occasional user who requests sports news and traffic alerts, to a high call time business user who receives stock alerts and checks flight times. Operators can now create their own value-added services menu quickly and easily in the phone. The customized menu will appear as the first menu and may be updated over-the-air with new services when customers request them.

### **Network Based Chat Messaging**

The chat messaging feature provides a constant WAP connection through GPRS to carrier, service center, or factory flexed WAP site. The specific site can also be entered by the user. Chat messaging is a carrier option.

### Other Features

Detailed descriptions of these and the other features can be found in the appropriate PF B95 and C21 telephone user guides listed in the Related Publications section toward the end of this manual.

General Operation Product Family C21

# **General Operation**

# Controls, Indicators, and Input / Output (I/O) Connectors

The PF B95 and C21 telephones' controls are located on the front and side of the device, and on the keyboard as shown in Figure 1. Indicators, in the form of icons, are displayed on the LCD (see Figure 2).

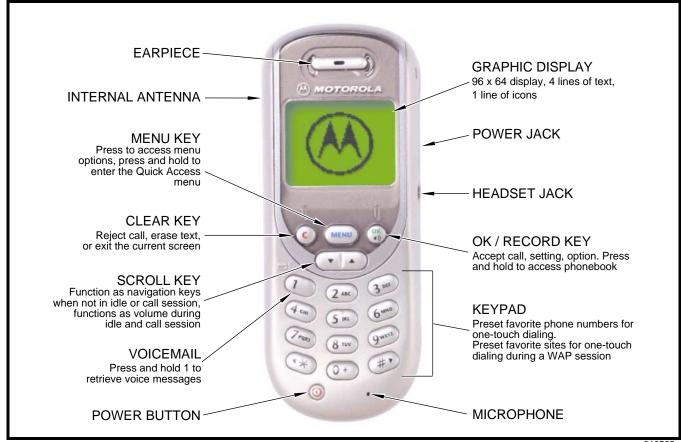


Figure 1. PF B95 and C21 Telephone Controls and Indicators Locations

0105020

### **Menu Navigation**

PF B95 and C21 telephones are equipped with a simplified icon and list-based user interface. The phone also features a user-definable Quick Access menu that is accessed by holding down the MENU key. See Figure 3 for details of the PF B95 and C21 menu structure.

### **Liquid Crystal Display (LCD)**

The LCD provides an 800 square millimeter green backlit display having user-adjustable contrast for optimum readability in all light conditions. The large bit-mapped  $96 \times 64$  pixel display includes up to 4 lines of text, user-adjustable to 2 lines with the zoom feature, and 1 line of icons.

Level III Service Manual General Operation

Display animation makes the phone's icon menu move smoothly as the user scrolls up and down.



Whether a phone displays all indicators depends on the programming and services to which the user subscribes.

Figure 2 shows some common icons displayed on the LCD.

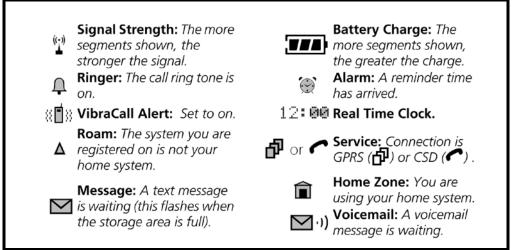


Figure 2. T193 Icon Indicators

010503c

- 1. **Signal Strength** shows the strength of the phone's connection with the network. Calls cannot be sent or received when the "no signal" indicator is displayed.
- 2. **Ringer** indicates whether the phone's ringer is enabled or disabled.
- 3. **Vibrate** shows whether the phone's vibrator alert is enabled or disabled.
- 4. **Roam** icon appears when the phone uses another network system outside the user's home network. When leaving the home network area, the phone roams, or seeks, another network.
- 5. **Message**<sup>4</sup> indicator appears when the phone receives a text message.
- 6. **Battery Charge Indicator** shows the amount of charge left in the battery.
- 7. **Alarm** indicates whether the phone's alarm is on or off.
- 8. **Real Time Clock** shows the current time.
- 9. **Service**<sup>4</sup> icon shows phone is currently functioning in either GPRS mode or in CSD mode.
- 10. **Home Zone** icon is on when the phone is registered in the user's home area.
- 11. **Voicemail**<sup>4</sup> icon indicates a voicemail message has been received.

<sup>4.</sup> Network, subscription and SIM card or service provider dependent feature. Not available in all areas.

General Operation Product Family C21

### **User Interface Menu Structure**

Figure 3 shows the T193 telephone menu structure.

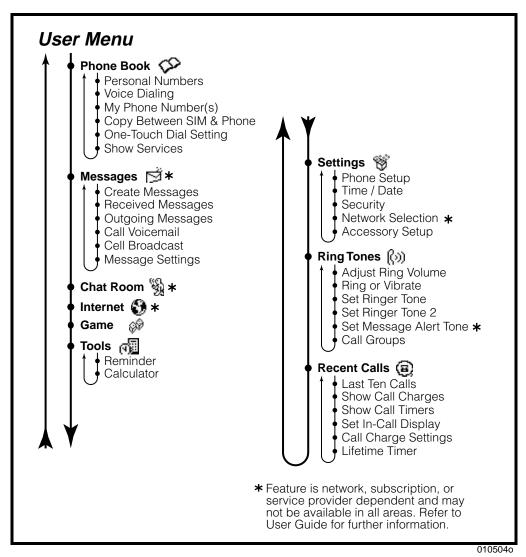


Figure 3. T193 Menu Structure

**Alert Settings** 

In addition to 11 preset ring tones, PF B95 and C21 telephones allow the user to download 2 additional ring tones via SMS to your PC. (Availability is carrier and Network dependant).

Motorola PF B95 and C21 phones incorporate the VibraCall® discreet vibrating alert that helps to avoid disturbing others when a ringing phone is unacceptable.

Alerts can be set to ring only, vibrate only, vibrate then ring, or no ring or vibrate

Additionally, the profiling feature allows users to identify incoming calls by a specific ringer tone.

Level III Service Manual General Operation

### **Battery Function**

### **Battery Charge Indicator**

The telephone displays a battery charge indicator icon in the idle screen to indicate the battery charge level. The gauge shows four levels: 100%, 66%, 33%, and Low Battery.

### **Battery Removal**

Removing the battery causes the device to immediately shut down and any pending work (partially entered phone book entries or outgoing messages, for example) is lost.



All batteries can cause property damage and/or bodily injury such as burns if a conductive material such as jewelry, keys, or beaded chains touch exposed terminals. The conductive material may complete an electrical circuit (short circuit) and become quite hot. Exercise care in handling any charged battery, particularly when placing it inside a pocket, purse, or other container with metal objects.



If the battery is removed while receiving a message, the message will be lost.



To ensure proper memory retention, turn the phone OFF before removing the battery. Immediately replace the old battery with a fresh battery.

# **Operation**

For detailed operating instructions, refer to the appropriate User Guide listed in the Related Publications section toward the end of this manual.

General Operation Product Family C21

# **Tools and Test Equipment**

The following tables list the tools and test equipment used on PF B95 and C21 telephones. Use either the listed items or equivalents.

**Table 1. General Test Equipment and Tools** 

Motorola Part Number <sup>1</sup>	Description	Application
See Table 6	Charger	Used to charge battery and to power device
0180386A82	Antistatic Mat Kit (includes 66-80387A95 antistatic mat, 66-80334B36 ground cord, and 42-80385A59 wrist band)	Provides protection from damage to device caused by electrostatic discharge (ESD)
8102430Z04	GSM / DCS / PCS Test SIM	Used to enable manual test mode
6680388B67	Disassembly tool, plastic with flat and pointed ends (manual opening tool)	Used during assembly/disassembly of device
6680388B01	Tweezers, plastic	Used during assembly/disassembly
RSX4043-A	Torque Driver	Used to remove and replace screws
_	Torque Driver Bit T-6 Plus, Apex 440-6IP Torx Plus or equivalent	Used with torque driver
HP34401A <sup>2</sup>	Digital Multimeter	Used to measure battery voltage

<sup>1.</sup> To order in North America, contact Motorola Aftermarket and Accessories Division (AAD) by phone at (800) 422-4210 or FAX (800) 622-6210; Internationally, AAD can be reached by calling (847) 538-8023 or faxing (847) 576-3023. 2. Not available from Motorola. To order, contact Hewlett Packard at (800) 452-4844.

Disassembly Product Family C21

# **Disassembly**

The procedures in this section provide instructions for the disassembly of a PF B95 or C21 telephone. Tools and equipment used are listed in Table 1, preceding.



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



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

# Removing and Replacing the Battery Cover and Battery



All batteries can cause property damage and/or bodily injury such as burns if a conductive material such as jewelry, keys, or beaded chains touch exposed terminals. The conductive material may complete an electrical circuit (short circuit) and become quite hot. Exercise care in handling any charged battery, particularly when placing it inside a pocket, purse, or other container with metal objects.

- 1. Ensure the phone is turned off.
- 2. Depress the battery cover release, slide the battery cover in the direction of the arrow, and lift completely off the phone (see Figure 4).

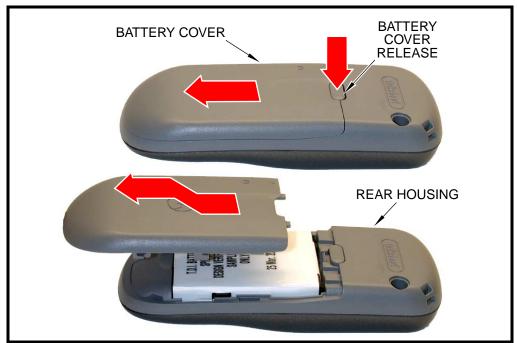


Figure 4. Removing the battery cover

0105050

Level III Service Manual Disassembly

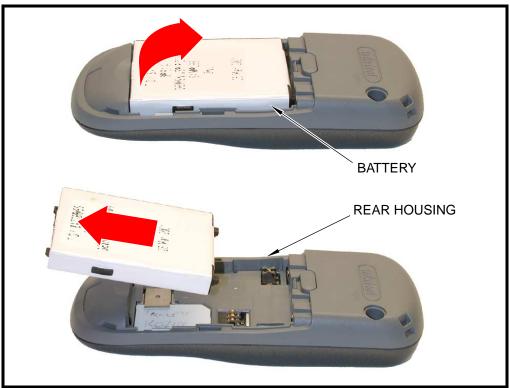


Figure 5. Removing the battery

010506o

3. Remove the battery by lifting its bottom end from the battery compartment and sliding it down and away from the compartment as shown in Figure 5.



There is a danger of explosion if the Nickel Metal Hydride battery is replaced incorrectly. Replace only with the same type of battery or equivalent as recommended by the battery manufacturer. Dispose of used batteries according to the manufacturer's instructions.

- 4. To replace, align the battery with the battery compartment so the terminals on the battery match the battery contacts in the phone.
- 5. Slide the top of the battery into the receptacle molded into the housing, then press the bottom end of the battery securely into the battery compartment.
- 6. Line up the battery cover with the rear housing then slide it forward until it snaps into place.

**Disassembly Product Family C21** 

# Removing and Replacing the Subscriber Identity Module (SIM)

- 1. Remove the battery cover and battery as described in the procedures.
- 2. As shown in Figure 6, slide the SIM retaining clip in the direction of the arrow to unlock.
- 3. Rotate the SIM upward and slide it out.

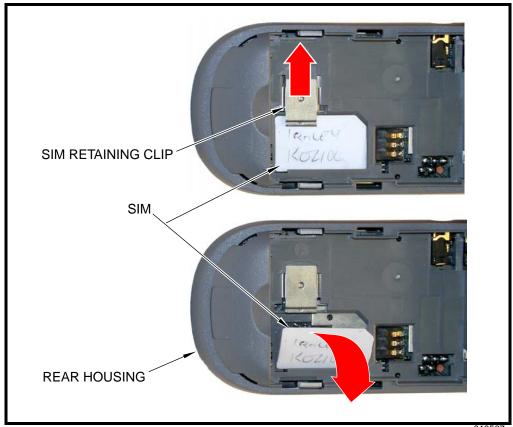


Figure 6. Removing the SIM

- To replace, carefully insert the SIM into its socket. Be sure the SIM is correctly 4. positioned to contact the terminals in the phone.
- 5. While holding the SIM in its socket, slide the SIM retaining clip to lock in place.
- Replace the battery and battery cover as described in the procedures.

18 July 27, 2001 6881038B70 **Level III Service Manual** Disassembly

# Removing and Replacing the Front Cover (Convertible Cover)

- 1. Remove the battery cover and battery as described in the procedures.
- Using the flat end of the disassembly tool in the indentation on the bottom of the phone, carefully separate the front cover from the rear housing. See Figure 7.

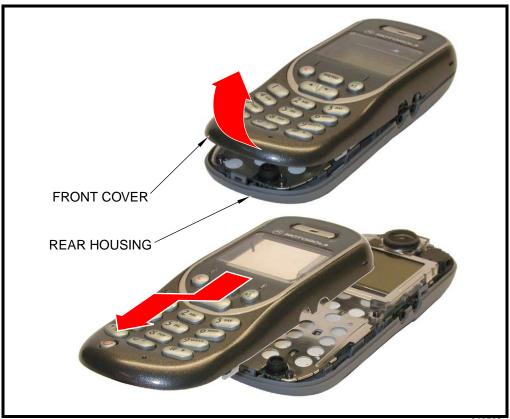


Figure 7. Removing the front cover

- Lift the front cover upward and slide as shown to release its top edge from the 3. rear housing. Lift the front cover completely off the phone.
- To replace, hook the top of the front cover onto the rear housing and press on 4. the front cover's bottom edge until it snaps into place.
- 5. Replace the battery and battery cover as described in the procedures.

6881038B70 July 27, 2001 19 Disassembly Product Family C21

# Removing and Replacing the Keypad

1. Remove the battery cover, battery, and front cover as described in the procedures.

2. Lift the keypad from the front cover as shown in Figure 8.

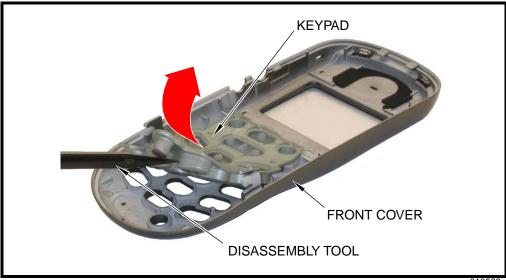


Figure 8. Removing the keypad

010509o

- 3. To replace, insert the keypad into the front cover. Ensure the keys align properly with the openings and the keypad is fully seated in the front cover.
- 4. Replace the front cover, battery, and battery cover as described in the procedures.

20 July 27, 2001 6881038B70

Level III Service Manual Disassembly

# Removing and Replacing the Transceiver Board Assembly

Remove the battery cover, battery, and front cover as described in the procedures.



This product contains static-sensitive devices. Use anti-static handling procedures to prevent electrostatic discharge (ESD) and component damage.

2. Using the Torx driver and T-6 bit, remove the 6 screws shown in Figure 9. Set the screws aside for reuse.

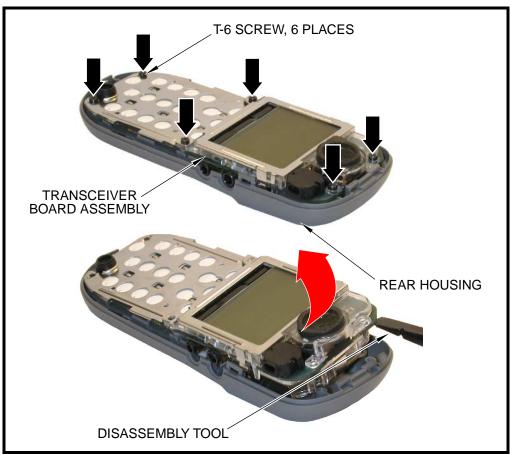


Figure 9. Removing the transceiver board assembly

010510o

- 3. Using the flat end of the disassembly tool, carefully pry the transceiver board assembly from the rear housing. The board assembly should separate easily from the rear housing.
- 4. Lift the transceiver board assembly completely away from the rear housing.
- 5. To replace, align the transceiver board assembly with the rear housing and press into place.

Disassembly Product Family C21

- 6. After ensuring the transceiver board assembly is properly seated in the rear housing, insert and tighten the 6 screws. Do not overtighten.
- 7. Replace the front cover, battery, and battery cover as described in the procedures.

### Removing and Replacing the Cover Plate

1. Remove the battery cover, battery, front cover, and transceiver board assembly as described in the procedures.



This product contains static-sensitive devices. Use anti-static handling procedures to prevent electrostatic discharge (ESD) and component damage.

2. Using the flat end of the disassembly tool, carefully disengage the 2 cover plate catches from the transceiver board.



The cover plate is reusable. Do not bend the catches permanently.

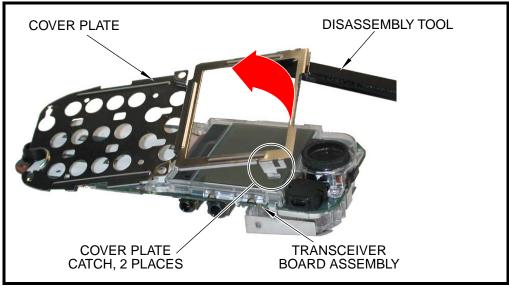


Figure 10. Removing the cover plate

0105120

- 3. Carefully lift the cover plate from the transceiver board assembly as shown in Figure 10.
- 4. To replace, align the cover plate with the transceiver board assembly and press together until the catches snap into place. Ensure the cover plate is properly aligned and flat against the transceiver board assembly.
- 5. Replace the transceiver board assembly, front cover, battery, and battery cover as described in the procedures.

Level III Service Manual Disassembly

# Removing and Replacing the Display Module



The flexible printed cable (FPC or flex) connecting the display module to the transceiver board is easily damaged. Exercise extreme care when handling.

- 1. Remove the battery cover, battery, front cover, transceiver board assembly, and cover plate as described in the procedures.
- 2. Locate the 2 display module mounting tabs shown in Figure 11.

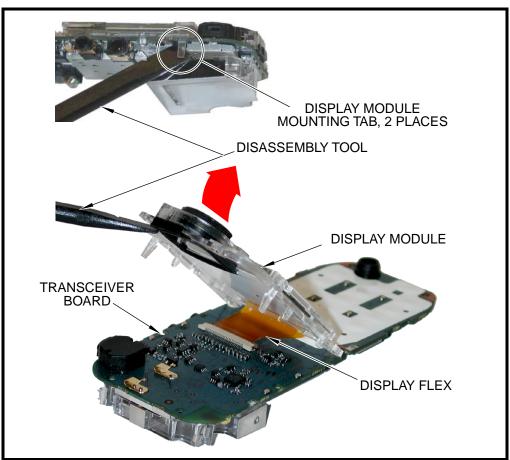


Figure 11. Removing the display module

010513o



The display module is attached to the transceiver board with the flex. Do not attempt to separate the module from the board until the flex has been disconnected as described in the following steps.

Disassembly Product Family C21

3. Using the flat end of the disassembly tool, gently pry the tabs away from the transceiver board to release the display module.

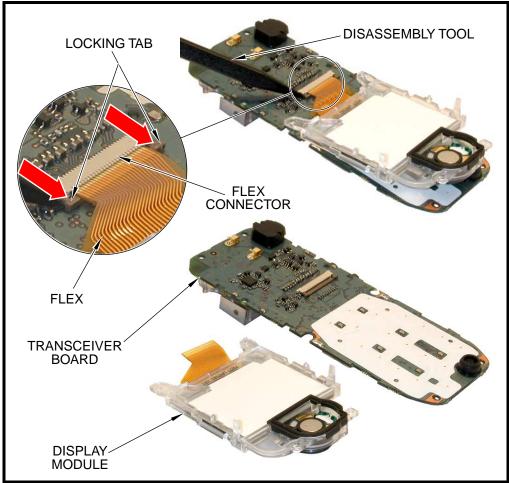


Figure 12. Removing the display module assembly

010514o

- 4. While holding the display module slightly away from the transceiver board, use the pointed end of the disassembly tool to disengage the 2 flex connector locking tabs as shown in Figure 12.
- 5. Pull the flex straight out of the connector, then lift the display module completely away from the transceiver board.
- 6. To replace, insert the end of the display module flex into the connector on the transceiver board. After ensuring the flex is straight and fully seated in the connector, use the disassembly tool to push the locking tabs until completely engaged.
- 7. Line up the display module mounting tabs with the corresponding notches in the transceiver board, then press together until the display module snaps into place.
- 8. Replace the cover plate, transceiver board assembly, front cover, battery, and battery cover as described in the procedures.

Level III Service Manual Disassembly

# **Removing and Replacing the Alert Grommet**

1. Remove the battery cover, battery, front cover, transceiver board assembly, cover plate, and display module as described in the procedures.

2. Using the flat end of the disassembly tool, carefully pry the alert grommet from the alert transducer. The grommet should come away easily. See Figure 13.

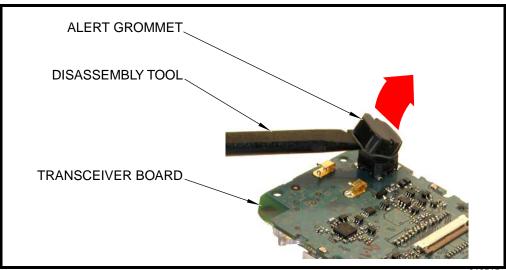


Figure 13. Removing the alert grommet

0105150

- 3. To replace, stretch the grommet over the alert transducer until it is in place.
- 4. Replace the display module, cover plate, transceiver board assembly, front cover, battery, and battery cover as described in the procedures.

Disassembly Product Family C21

# Removing and Replacing the Microphone Grommet and Microphone

1. Remove the battery cover, battery, front cover, transceiver board assembly, and cover plate as described in the procedures.

2. Using the flat end of the disassembly tool, carefully pry the microphone grommet from the microphone as shown in Figure 14. The grommet should come away easily.

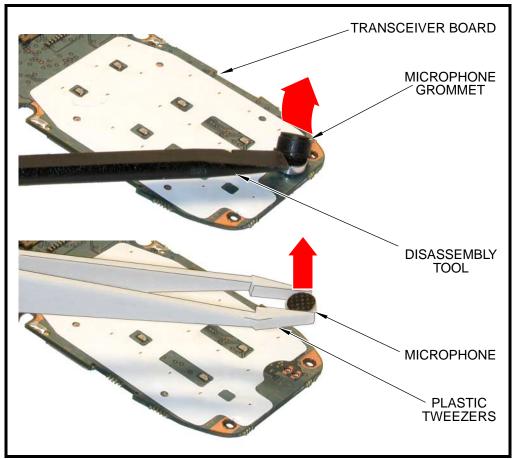


Figure 14. Removing the microphone grommet and microphone

010516o

3. Using the plastic tweezers to grasp the microphone, pull the microphone straight out of its socket.



The microphone leads are easily bent or broken. Use care to prevent damage when handling. The microphone is keyed to fit on the board only one way and will prevent proper board mounting if installed incorrectly.

- 4. To replace, insert the microphone leads into the socket on the transceiver board and carefully press straight down until fully seated.
- 5. Replace the cover plate, transceiver board assembly, front cover, battery, and battery cover as described in the procedures.

Level III Service Manual Disassembly

# **Removing and Replacing the Vibrator**

1. Remove the battery cover, battery, front cover, and transceiver board assembly as described in the procedures.

2. Using the flat end of the disassembly tool, carefully pry the vibrator from its cavity in the rear housing. The vibrator should come away easily from the rear housing. See Figure 15.

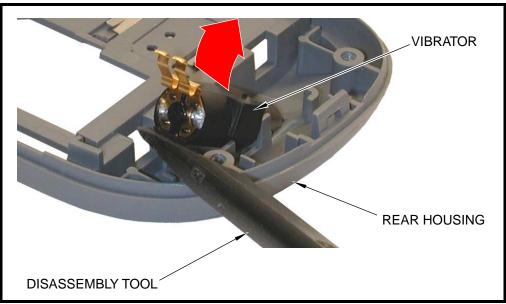


Figure 15. Removing the vibrator

010517o

- 3. To replace, insert the vibrator into the rear housing. Ensure the vibrator terminals are properly aligned to contact the corresponding pads on the transceiver board.
- 4. Replace the transceiver board assembly, front cover, battery, and battery cover as described in the procedures.

# Subscriber Identity Module (SIM) and Identification

### SIM

A SIM is required to access the existing local GSM network, or remote networks when traveling (if a roaming agreement has been made with the provider).

The SIM card contains:

- · All the data necessary to access GSM services
- The ability to store user information such as phone numbers.
- All information required by the network provider to provide access to the network.

### Identification

Each Motorola GSM device is labelled with a variety of identifying numbers. The following information describes the current identifying labels.

### **Mechanical Serial Number (MSN)**

The Mechanical Serial Number (MSN) is an individual unit identity number and remains with the unit throughout the life of the unit.

 $The \, MSN \, can \, be \, used \, to \, log \, and \, track \, a \, unit \, on \, Motorola's \, Service \, Center \, Database.$ 

The MSN is divided into 4 sections as shown in Figure 16.

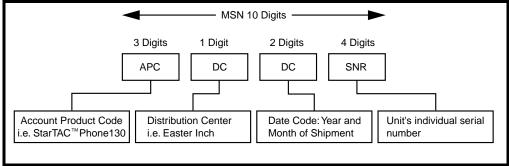


Figure 16. MSN label breakdown

000807a

### International Mobile Station Equipment Identity (IMEI)

The International Mobile station Equipment Identity (IMEI) number is an individual number unique to the PCB and is stored within the unit's memory. The following diagram illustrates the various parts of this number.

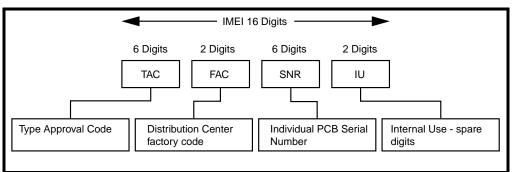


Figure 17. IMEI label breakdown

000808o

Other label number configurations present are:

- TRANSCEIVER NUMBER: Identifies the product type. Normally the SWF number. (i.e. V100).
- **PACKAGE NUMBER**: Identifies the equipment type, mode, and language in which the product is shipped.

Troubleshooting Product Family C21

# **Troubleshooting**

### **Manual Test Mode**

Motorola PF B95 and C21 telephones are equipped with a manual test mode capability. This allows service personnel to verify functionality and perform fault isolation by entering keypad commands.

To enter the manual test command mode, a GSM/DCS/PCS test SIM must be used.

- 1. Press © to turn the phone OFF.
- 2. Remove the battery as described in the procedures.
- 3. Remove the customer's SIM card from the phone as described in the procedures.
- 4. Insert the test SIM into the SIM slot.
- 5. Replace the battery as described in the procedures.
- 6. Press © to turn the phone ON.

Press and hold the # button for approximately 3 seconds until TEST displays on the screen. The phone may now be issued test commands listed in Table 2.

### **Manual Test Mode Commands**

**Table 2. Test Commands** 

Test Command	Test Function/Name
Press and hold # for 2 seconds	Enter manual test mode
01#	Exit manual test mode
07x#	Mute RX audio path
08#	Unmute RX audio path
09#	Mute TX audio path
10#	Unmute TX audio path
15x#	Generate tone
1590#	Vibrate Mode
1591#	Ringer Mode
16#	Mute tone generator
19#	Display software version number of Call Processor
20#	Display software version number of Modem
36#	Initiate acoustic loopback
360#	Full Rate
361#	Enhanced Full Rate
362#	Half Rate
37#	Stop test
38#	Activate Mini SIM
39#	Deactivate Mini SIM
43x#	Change audio path
47x#	Set audio volume
51#	Enable sidetone

Level III Service Manual Troubleshooting

**Table 2. Test Commands (Continued)** 

Test Command	Test Function/Name	
52#	Disable sidetone	
54#	Show service indicator LED (0 - Off, 1 - Red, 2 - Green, 3 - Amber) (flip must be closed)	
57#	Initialize non-volatile memory	
58#	Display security code	
58xxxxxx#	Modify security code	
59#	Display lock code	
59xxx#	Modify lock code	
60#	Display IMEI	
980#	DCS Mode (PF B95 only)	
981#	GSM Mode (PF B95 only)	
962#	PCS Mode (PF C21 only)	
99#	Display all pixels	

# **Troubleshooting Chart**

Table 3. PF B95 and C21 Telephone: Level II Troubleshooting Chart

SYMPTOM	PROBABLE CAUSE	VERIFICATION AND REMEDY
Telephone will not turn on or stay on.	a) Battery either discharged or defective.	Measure battery voltage across a 50 ohm (>1 Watt) load. If the battery voltage is <3.25 Vdc, recharge the battery using the appropriate battery charger. If the battery will not recharge, replace the battery. If battery is not at fault, proceed to b.
	b) Battery terminals open or misaligned.	Visually inspect the battery terminals on both the battery and the telephone. Realign and, if necessary, either replace the battery or refer to a Level 3 Service Center for the battery connector replacement. If battery terminals are not at fault, proceed to c.
	c) Transceiver board assembly defective.	Remove the transceiver board assembly. Substitute a known good assembly and temporarily reassemble the unit. Depress the PWR button; if unit turns on and stays on, disconnect the dc power source and reassemble the telephone with the new transceiver board assembly. Verify that the fault has been cleared.
Telephone exhibits poor reception or erratic operation such as calls frequently dropping or weak or distorted audio.	Transceiver board assembly defective.	Replace the transceiver board assembly (refer to 1c). Verify that the fault has been cleared and reassemble the unit with the new transceiver board assembly.
3. Display is erratic, or provides partial or no display.	a) Mating connections to or from transceiver board faulty.	Check general condition of flex and flex connector if the flex and connector are good, check that the connector locking tabs are fully engaged. If faulty connector, replace the transceiver board assembly. If connector is not at fault, proceed to b.
	b) Transceiver board assembly defective.	Replace the transceiver board assembly (refer to 1c). Verify that the fault has been cleared and reassemble the unit with the new transceiver board assembly.

Troubleshooting Product Family C21

Table 3. PF B95 and C21 Telephone: Level III Troubleshooting Chart (Continued)

SYMPTOM	PROBABLE CAUSE	VERIFICATION AND REMEDY
• • • • • • • • • • • • • • • • • • • •		
Incoming call alert transducer audio distorted or volume is too low.	Faulty transceiver board assembly.	Replace the transceiver board assembly (refer to 1c). Verify that the fault has been cleared and reassemble the unit with the new transceiver board assembly.
Telephone transmit audio is weak.     (usually indicated by called parties complaining of difficulty in hearing voice).	a) Microphone defective.	Replace the microphone as described in the procedures. If fault is not cleared, proceed to b.
	b) Transceiver board assembly defective.	Replace the transceiver board assembly (refer to 1c). Verify that the fault has been cleared and reassemble the unit with the new transceiver board assembly.
Receive audio from earpiece speaker is weak or distorted.	a) Connections to or from transceiver board assembly defective.	Check connection from the earpiece to the transceiver board assembly. If connection is not at fault, proceed to b.
	b) Earpiece speaker defective.	Temporarily replace the LCD speaker assembly with a known good assembly. Ensure good connection. Place a call and verify improvement in earpiece audio. If fault is cleared, reassemble the phone with the good assembly. If fault is not cleared, proceed to c.
	c) Transceiver board assembly defective.	Replace the transceiver board assembly (refer to 1c). Verify that the fault has been cleared and reassemble with the new transceiver board assembly.
7. Telephone will not recognize or accept SIM card.	a) SIM card defective.	Check the SIM card contacts for dirt. Clean if necessary, and check if fault has been cleared. If the contacts are clean, insert a known good SIM card into the telephone. Power up the unit and confirm that the card has been accepted. If the fault no longer exists, replace the defective SIM card. If the SIM card is not at fault, proceed to b.
	b) Transceiver board assembly defective.	Replace the transceiver board assembly (refer to 1c). Verify that the fault has been cleared and reassemble the unit with the new transceiver board assembly.
8. Vibrator feature not functioning.	a) Vibrator defective.	Replace vibrator as described in the procedures. If the fault has not been cleared, proceed to b.
	b) Transceiver board assembly defective.	Replace the transceiver board assembly (refer to 1c). Verify that the fault has been cleared and reassemble the unit with the new transceiver board assembly.
9. Internal Charger not working.	Faulty charger circuit on transceiver board assembly.	Test a selection of batteries in the rear pocket of the desktop charger. Check LED display for the charging indications. If these are charging properly, then the internal charger is at fault. Replace the transceiver board assembly (refer to 1c). Verify that the fault has been cleared and reassemble the unit with the new transceiver board assembly.
10. No or weak audio when using headset.	a) Headset plug not pushed fully home.	Ensure the headset plug is fully seated in the jack.
	b) Faulty jack on transceiver board assembly.	Replace the transceiver board assembly (refer to 1c). Verify that the fault has been cleared and reassemble the unit with the new transceiver board assembly.

Level III Service Manual Troubleshooting

#### **Programming: Software Upgrade and Flexing**

Contact your local technical support engineer for information about equipment and procedures for flashing and flexing.

6881038B70 July 27, 2001 33

Part Number Charts Product Family C21

#### **Part Number Charts**

The following charts are provided as a reference for the parts associated with PF B95 and C21 telephones.

#### **Related Publications**

Motorola T192 Wireless Phone User Guide, English9870290FxxMotorola T193 Wireless Phone User Guide, English9888164K95Motorola T193 Wireless Phone User Guide, Spanish9889883L01

Level III Service Manual Part Number Charts

#### **Exploded View Diagram**

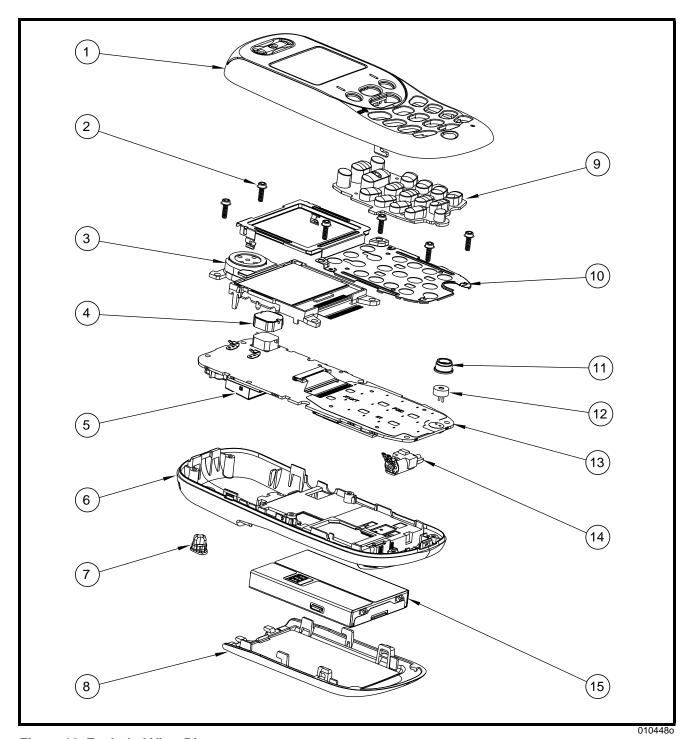


Figure 18. Exploded View Diagram

6881038B70 July 27, 2001 35

Part Number Charts Product Family C21

#### **Exploded View Parts List**

**Table 4. Exploded View Parts List** 

Item Number	Motorola Part Number	Description		
1	See Table 5	Front housing kit		
2	02093158B07	Screw, mounting, 6 places		
3	0104119F79	LCD speaker assembly		
4	0586500P01	Grommet, transducer		
5	Note 1	Antenna assembly, internal		
6	0186475P01	Rear housing assembly		
7	0586470P01	RF plug		
8	AAHN5385	Battery cover, Gray		

Item Number	Motorola Part Number	Description		
9	See Table 5	Keypad		
10	0104119F76	Cover plate assembly		
11	0586501P01	Grommet, microphone		
12	5009135L07	Microphone		
13	See Table 5	Transceiver board		
14	0186497P01	Vibrator assembly		
15	See Table 6	Battery		

Notes:

1. Order next higher assembly, item 13.



There is a danger of explosion if the Nickel Metal Hydride battery pack is replaced incorrectly. Replace only with the same type of battery or equivalent as recommended by the battery manufacturer. Dispose of used batteries according to the manufacturer's instructions.

#### **Model-Specific Part Numbers**

**Table 5. Model-Specific Part Numbers** 

Item Number	Part Description	Part Number
1	Front cover kit, Magic Green	AAHN5383
1	Front cover kit, Silver Mist	AAHN5398
1	Front cover kit, Graphite Gray	AAHN5399
9	Keypad, Generic	7586482P01
9	Keypad, Stroke	7586482P02
9	Keypad, BoPoMoFo	7586482P03
13	Transceiver board, GSM / DCS (PF B95)	8486506P01
13	Transceiver board, PCS (PF C21)	8486506P02

Level III Service Manual Part Number Charts

#### **Accessories**

Table 6. Accessories

Item Number	Part Description	Part Number
1	Front cover kit, Limewash	SYN9309
1	Front cover kit, Nordic Teal	SYN9310
1	Front cover kit, Orange Glow	SYN9311
15	Battery, 600 mAh NiMH, English label	AANN4106
15	Battery, 600 mAh NiMH, Chinese label	SNN5628
_	Travel charger, 300 mAh economy with fixed plugs, UK	SPN4680
_	Travel charger, 300 mAh economy with fixed plugs, US	SPN4681
_	Travel charger, 300 mAh economy with fixed plugs, Euro 220	SPN4682
_	Travel charger, 300 mAh economy with fixed plugs, Australia	SPN4683
_	Travel charger, 300 mAh economy with fixed plugs, India 5 Amp	SPN4684
_	Travel charger, mid-rate switching with fixed plugs, Brazil	SPN4835
_	Vehicle power adapter (VPA)	SYN8087
_	Hands free car kit, easy install	SYN8543
_	Headset, Translucent Blue	AAYN4207
_	Headset, Translucent Gray	AAYN4208
_	Headset, Neon Green	AAYN4262
_	Headset, Neon Blue	AAYN4263
_	Headset, mono with boom microphone	SYN8146
_	Headset, mono, retractable	SYN8284
_	Headset, ear bud, silver	AAYN4264

6881038B70 July 27, 2001 37

Part Number Charts Product Family C21

Level III Service Manual Index

Index	mechanical serial number 28
	product 1
A	identification, labels 28 IMEI 29
alert grommet, removing and replacing 25	Introduction 1
alert settings 12	The odd of the
	K
В	
B	keypad, removing and replacing 20
charge indicator 13	_
function 13	L
battery cover, removing and replacing 16	LCD 10
battery, removing and replacing 16	liquid crystal display (LCD) 10
C	M
caller ID 9	manual test mode 30
Canadian Interference-Causing Equipment regulations 1	menu structure 12
changes	microphone grommet, removing and replacing 26
product 1	microphone, removing and replacing 26
commands, manual test mode 30	model-specific part numbers 36
copyrights	MSN 28
computer software 2	
cover plate, removing and replacing 22	N
	names
D	product 1
disassembly 16	
display flex, disconnecting 23	0
display module, removing and replacing 23	operation 10
	alert settings 12
E	battery 13
exploded view diagram 35	controls, indicators, and I/O connectors 10
exploded view parts list 36	icons 11
•	alarm 11
E	battery charge indicator 11
FCC rules 1	home zone 11 message 11
features	real time clock 11
caller ID 9	ringer 11
chat messaging 9	roam 11
SIM Toolkit 9	service 11
text entry 9	signal strength 11
voice recognition 8	vibrate 11
Wireless Access Protocol (WAP) 8	voicemail 11
front cover, removing and replacing 19	LCD 10
	menu navigation 10
I	menu structure 12
identification	overview, product 7
international mobile station equipment identity 29	

Index Product Family C21

P	S
parts	serial number
exploded view diagram 35	mechanical 28
exploded view parts list 36	service manual
model-specific part numbers 36	about 2
replacement 34	audience 2
product	conventions 3
changes 1	revisions 3
identification 1	scope 2
names 1	service policy 3
product overview 7	customer support 4
features 7	out of box failure 3
publications, related 34	product support 3
	shut down
R	upon battery removal 13
	SIM Toolkit 9
regulatory agency compliance 1	SIM, description 28
related publications 34	SIM, removing and replacing 18
removing	specifications 5
alert grommet 25	subscriber identity module (SIM) 28
battery 13, 16	support
battery cover 16	customer 4
cover plate 22	product 3
display module 23 front cover 19	
	Т
keypad 20 microphone 26	<del>-</del>
microphone grommet 26	test equipment 15 text entry 9
SIM 18	tools, disassembly 15
transceiver board 21	transceiver board, removing and replacing 21
vibrator 27	troubleshooting 30
replacement parts	manual test mode 30
ordering 4	manual test mode commands 30
replacing	troubleshooting chart 31
alert grommet 25	troublestrioding shart of
battery 16	
battery cover 16	V
cover plate 22	vibrator, removing and replacing 27
display module 23	voice recognition 8
front cover 19	
keypad 20	W
microphone 26	
microphone grommet 26	WAP (Wireless Access Protocol) 8
SIM 18	warranty service 3
transceiver board 21	
vibrator 27	
revisions	

service manual 3

MOTOROLA, the Stylized M Logo, and all other trademarks indicated as such herein are trademarks of Motorola, Inc.

® Reg. U.S. Pat. & Tm. Off.

© 2001 Motorola, Inc.

All rights reserved.

Personal Communications Sector,

1500 Gateway Blvd.

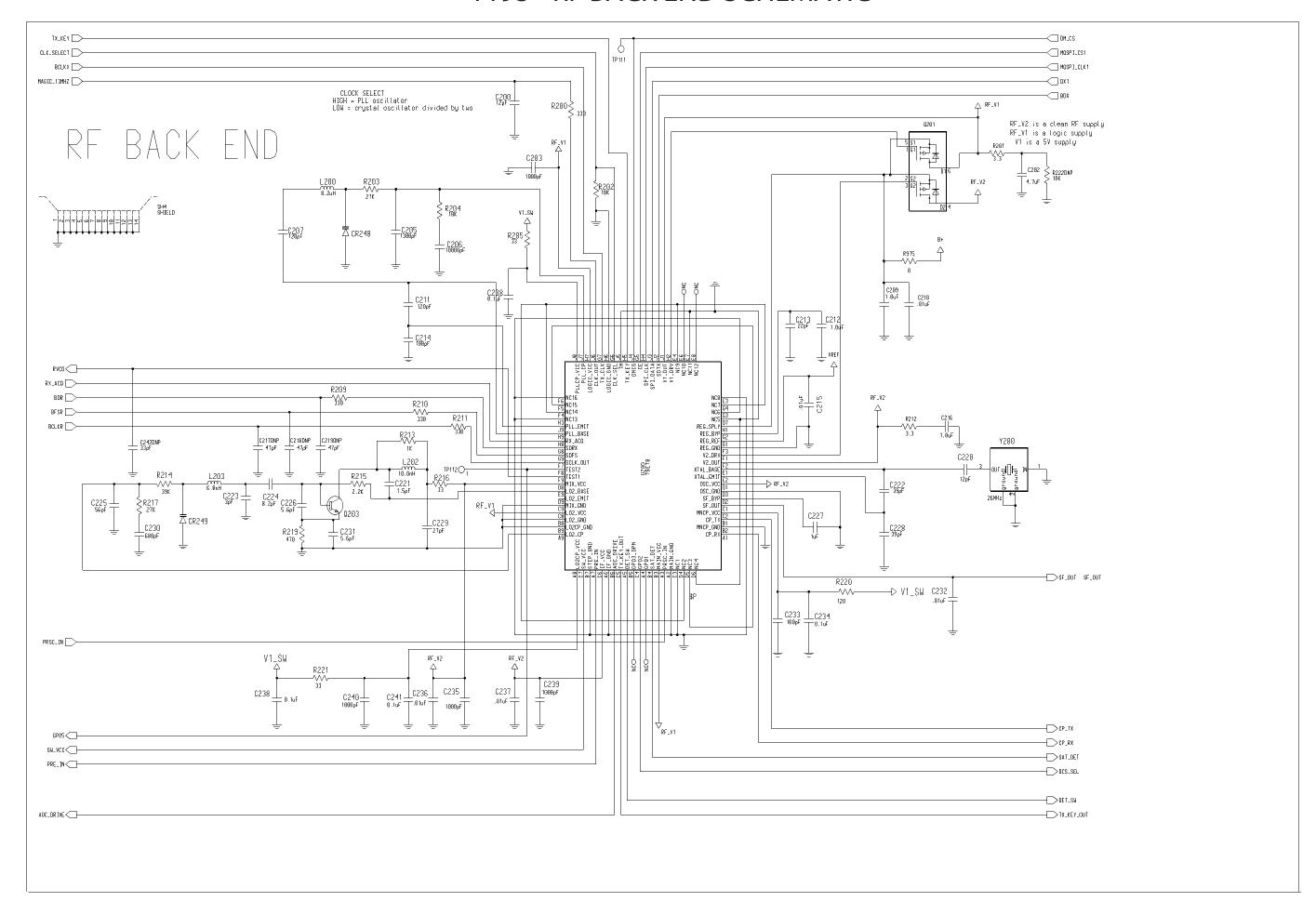
Boynton Beach, FL 33426-8292

Printed in U.S.A. 07/01

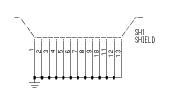


6881038B70-A

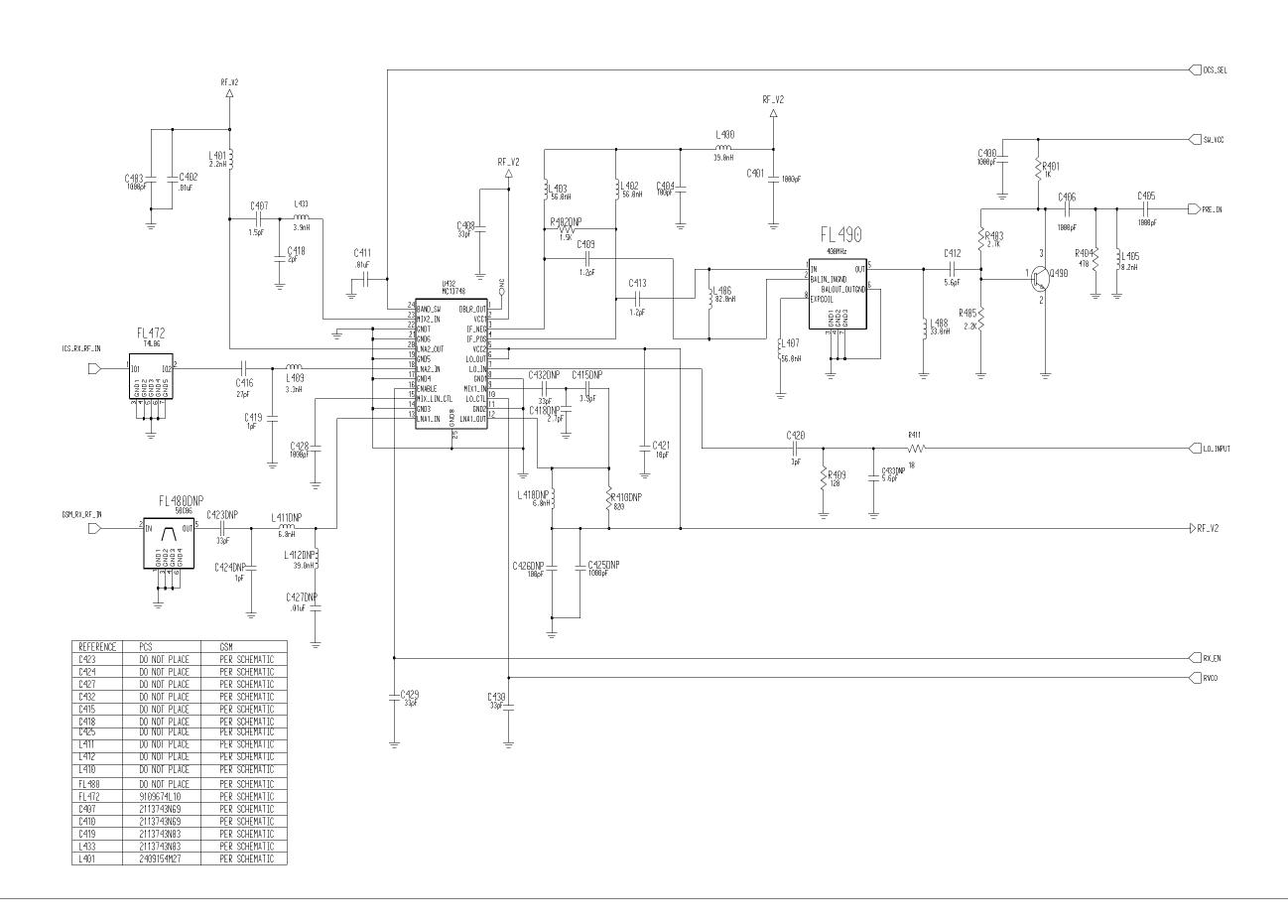
#### T193 - RF BACK END SCHEMATIC



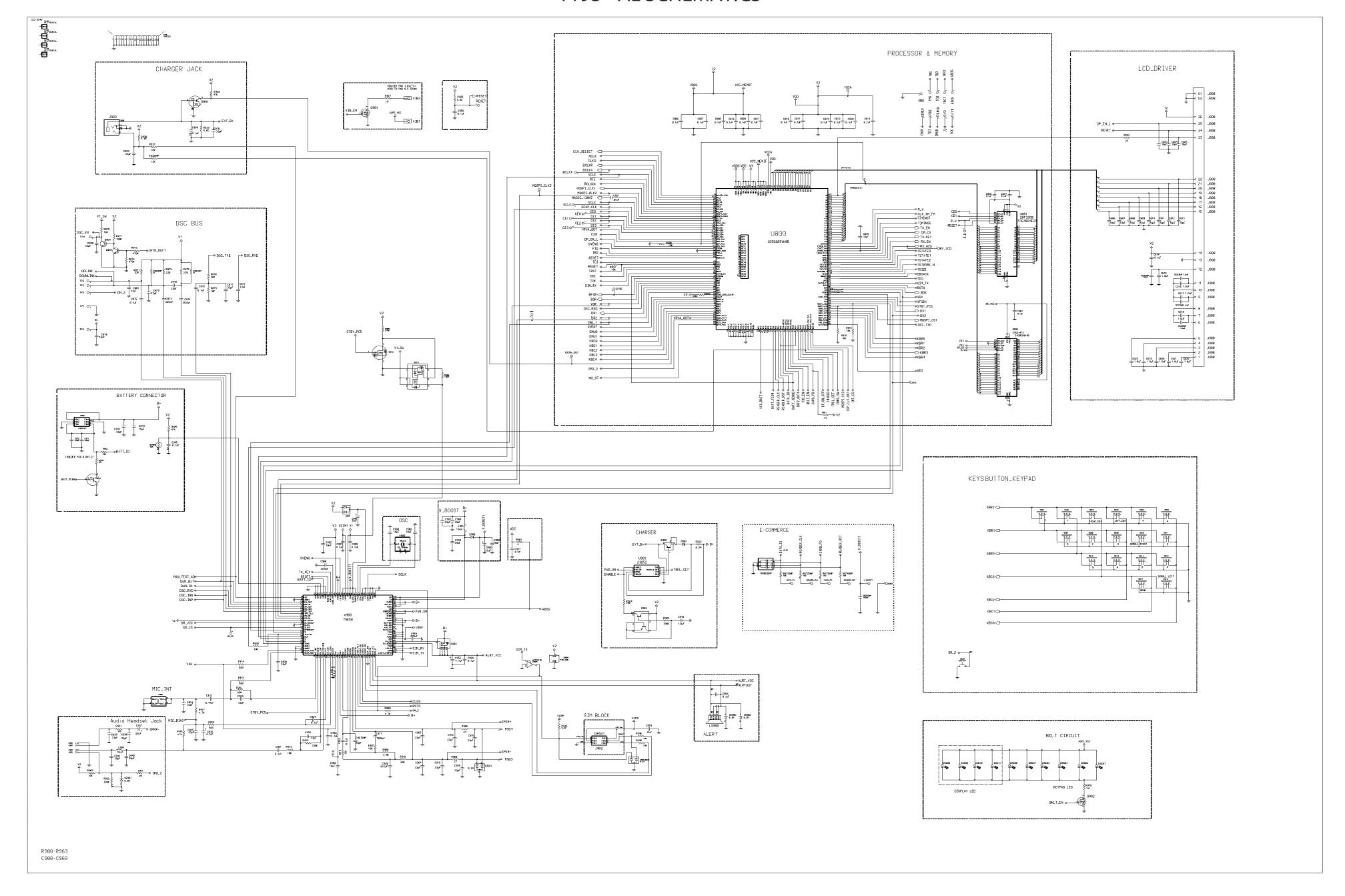
### T193 - RX FRONT END SCHEMATIC

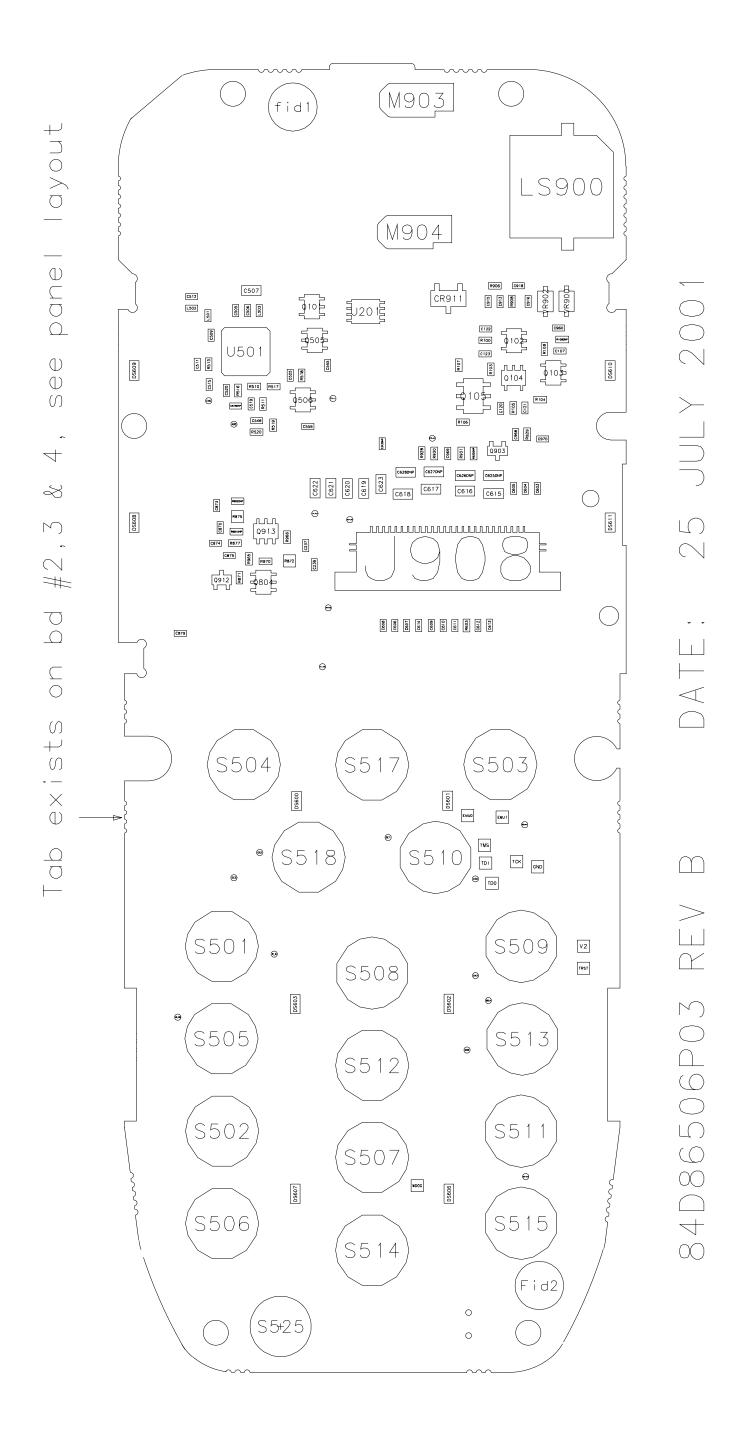


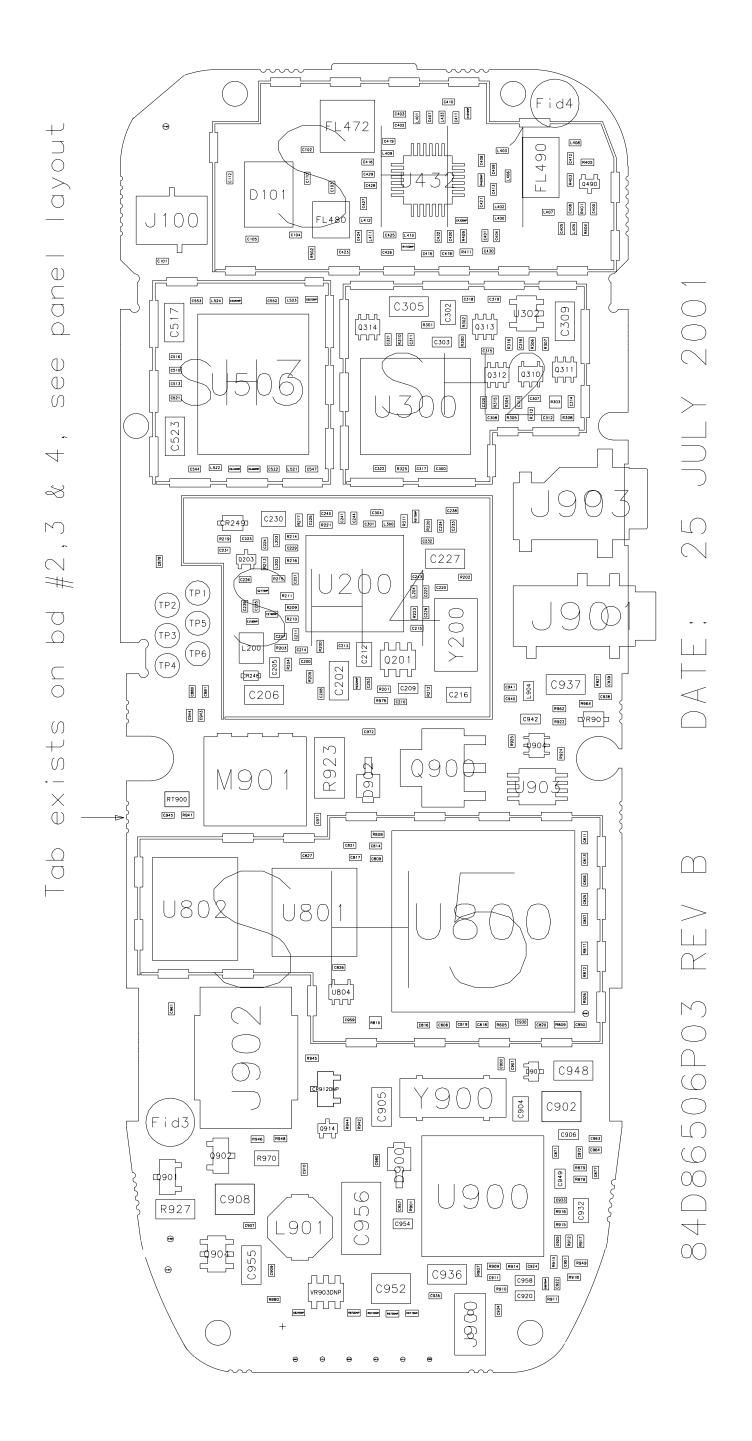
## RX FRONT END



## T193 - AL SCHEMATICS







## T193 - ANTENNA SWITCH SCHEMATIC

VC4

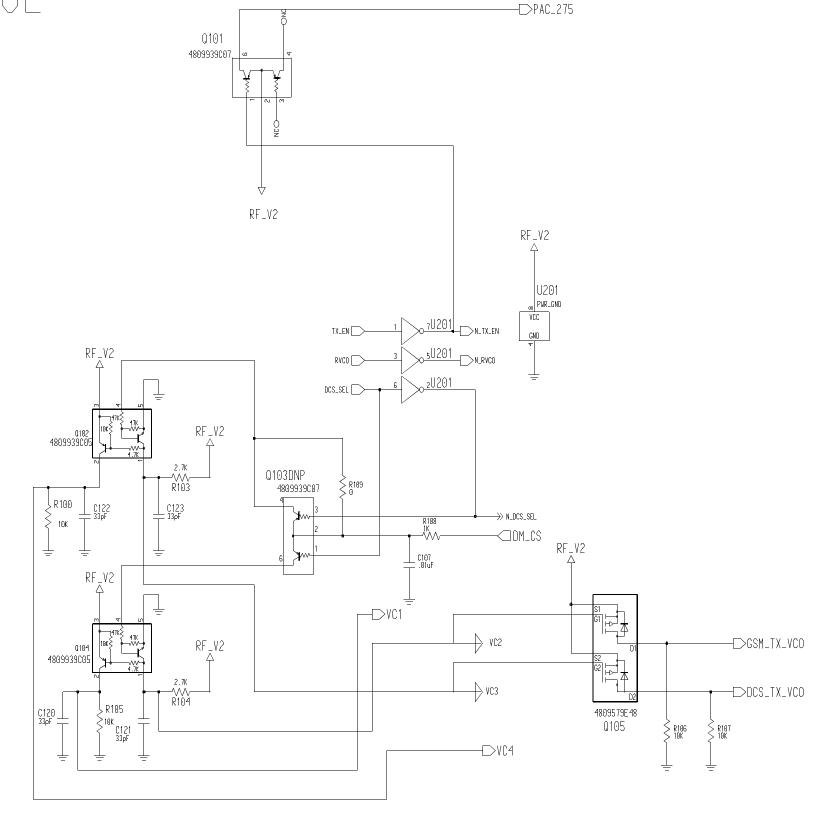
Ant\_Front End Switch

# ANTENNA AND SWITCHING

## 

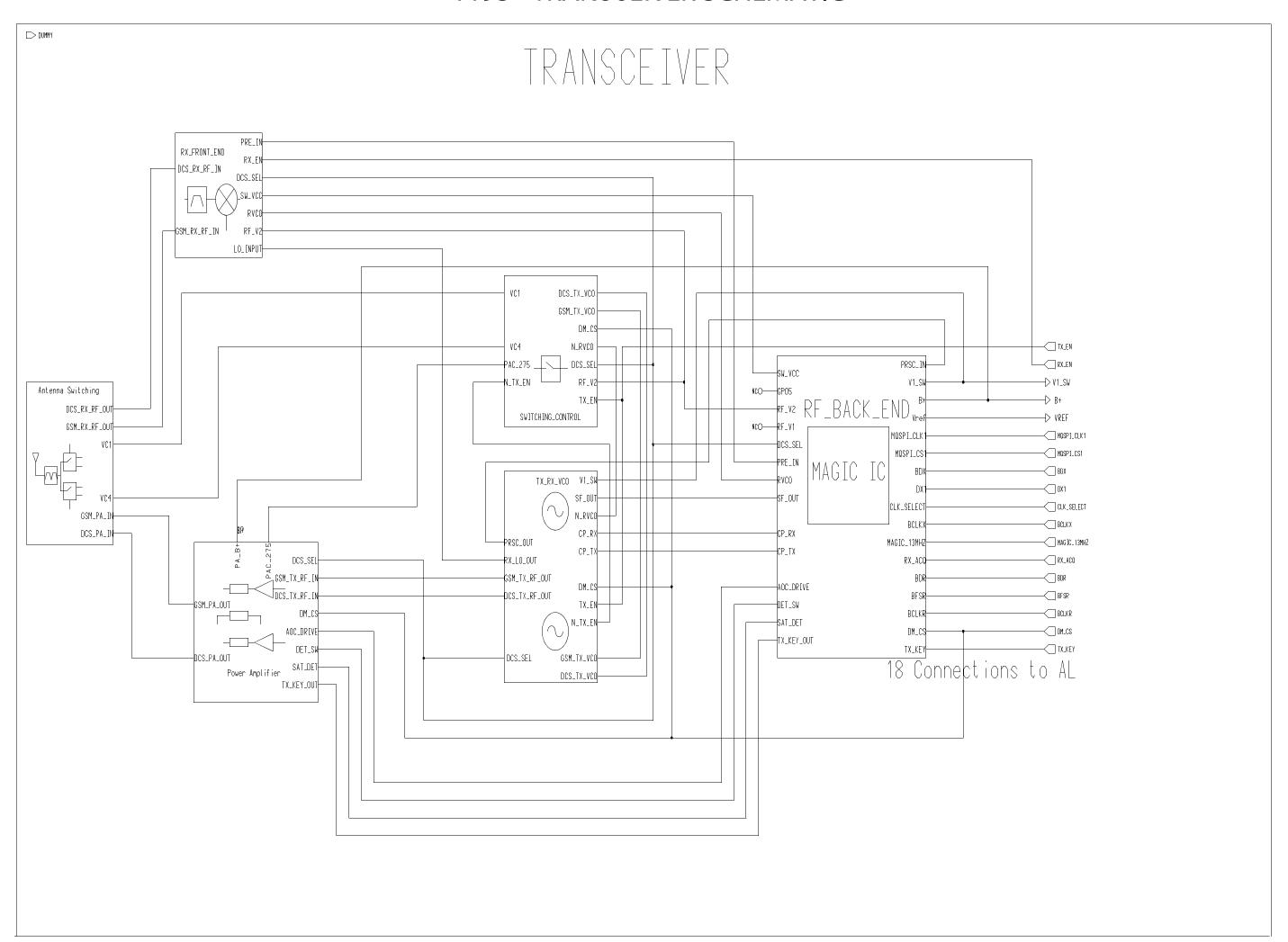
## T193 - SWITCHING CONTROL SCHEMATIC

# SWITCHING CONTROL

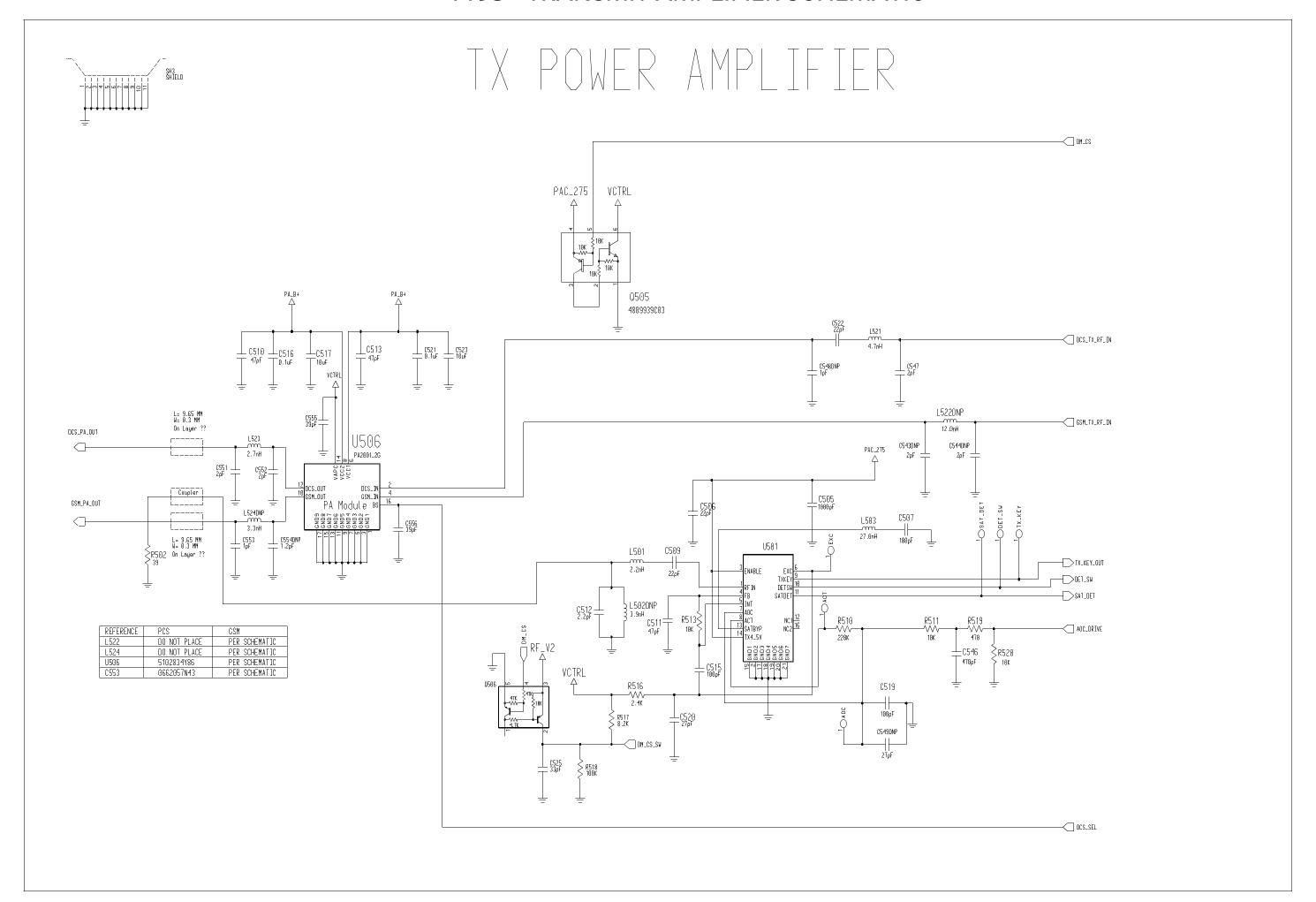


	GSM Rx	GSM Tx	DCS Rx	DCS Tx	PCS Rx	PCS Tx
DCS_SEL	0	0	1	1	1	1
DMCS	0	1	0	1	0	1
N_DCS_SEL	1	1	0	0	0	0
Vc1	0	1	0	0	0	0
Vc2	1	0	1	1	1	1
Vc3	1	1	1	0	1	0
Vc4	0	0	0	1	0	1
DCS_TX_VCO	0	0	0	1	0	1
GSM_TX_VCO	0	1	0	0	0	0

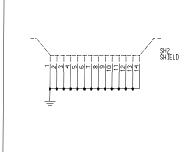
## T193 - TRANSCEIVER SCHEMATIC



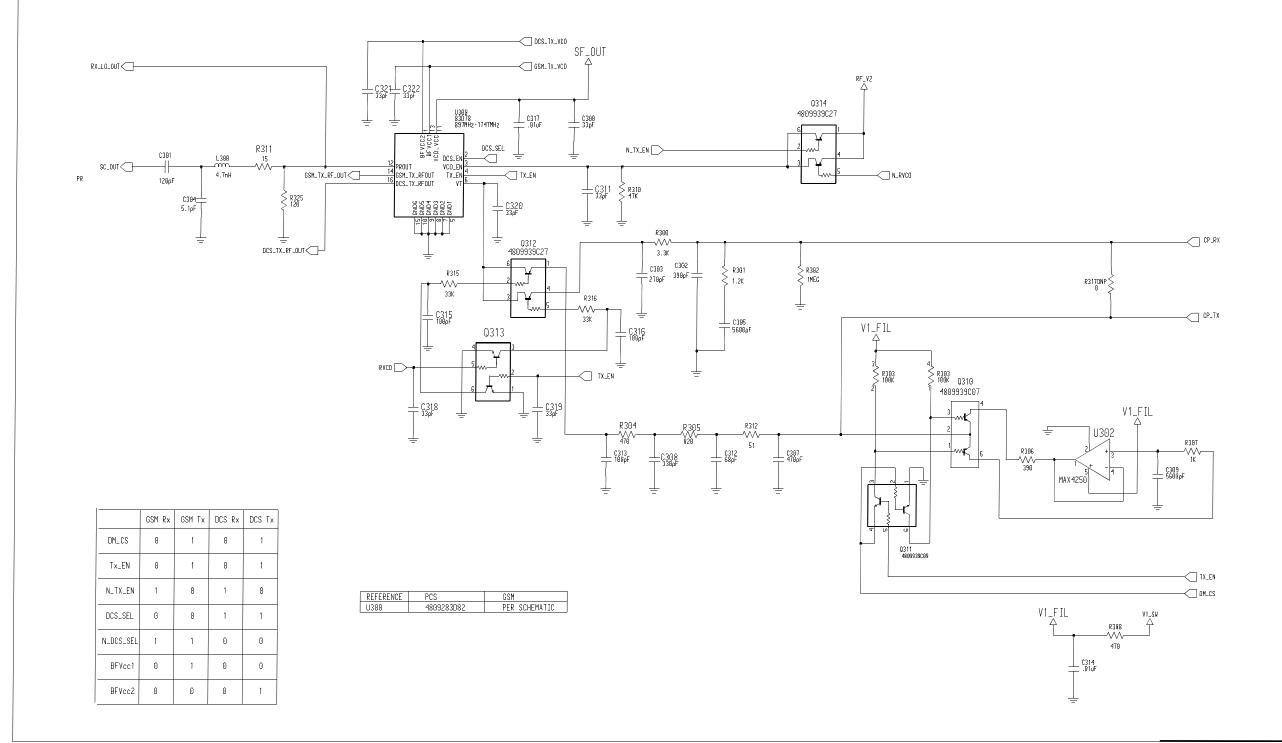
### T193 - TRANSMIT AMPLIFIER SCHEMATIC



## T193 - TRANSMIT / RECEIVE VCO SCHEMATIC



## TX AND RX VCO



T193 Level 3 Parts List							
Part Designator	Part Number	Part Description		Part Designator		Part Description	Part Type
CR248	4809877C10	dio1_60x0_80		Q314	4809939C27	sot2_00x1_25	UMB4NTN,
CR249	4809641F02	sod1_70x1_25		Q490	4809527E41'	sotem3-rb	27E41,
CR911	4813830M74	sot23-rb		Q505	4809939C03	sot2_00x1_25	UMD3NTR,
CR912DNP	4813830M74	sot23-rb		Q506	4809939C05	sot1_25x2_00-5pin-lb	UMC5NTL,
D101	5102834Y83	dio5_4x4_0_12pin	LMSP54,	Q804	4809939C23	sot2_00x1_25	UMX1N,
D900	4809653F02	dio1_90x1_90	MBRM120T3	Q900	4813824B11	sot223-rb	MMJT9435,
D901	"4809606E02"	sc90-rt	DAN222T,	Q901	"4809579E16	to236-rb	TN0200T,
D902	4809653F07	dio1_90x1_90	MBRM120ET	Q902	"4809579E16	to236-rb	TN0200T,
DS600	4809496B11	led1_60x0_80	QSMG-H799		4880048M03	sotem3-rt	DTC144EE,
DS601	4809496B11	led1_60x0_80	QSMG-H799	Q904	"4809579E29	tsop3_00x1_50p6	SI3443,
DS602	4809496B11	led1_60x0_80	QSMG-H799	Q912	"4809579E02	sc90-rb	2SK1830,
DS603	4809496B11	led1_60x0_80	QSMG-H799	Q913	"4809579E39	sc70-6pin-rb	FDG6323L,
DS606	4809496B11	led1_60x0_80	QSMG-H799	Q914	4870370A14	sotem3-rt	70A14,
DS607	4809496B11	led1_60x0_80	QSMG-H799	RT900	0687802K01		THERM,
DS608	4809496B11	led1_60x0_80	QSMG-H799	SH1	2686483P01	shield2686483p01	SHIELD,
DS609	4809496B11	led1_60x0_80	QSMG-H799	SH2	2686484P01	shield2686484p01	SHIELD,
DS610	4809496B11	led1_60x0_80	QSMG-H799	SH3	2686485P01	shield2686485p01	SHIELD,
DS611	4809496B11	led1_60x0_80	QSMG-H799	SH4	2686486P01	shield2686486p01	SHIELD,
FL472	9109674L10	fltr4_45x4_30-7pin	74L10	SH5	2686487P01	shield2686487p01	SHIELD,
FL480DNP	9109450C06	fltr3_0x3_0-6pin	50C06,	U200	"510989E78"	bga8_00x8_00p80	79E78,
FL490	9109487U02	fltr5_00x3_00-8pin	400MHz,	U201	5162852A64	ssop8-sz2_0x2_3	TC7W04FK,
J100	0987378K01	mech0987378k01	SWITCH,	U300	4809283D82	osc9_00x8_00_16pin	83D82
J900	"0909195E01"	conn0909195e01	CONN_J,	U302	"5109731C29	sot23-5-rb	MAX4250,
J901	0987850K03	conn0987850k03_4	CONN_J,	U432	5109944C43	tqfp4x4p25	MC13748,
J902	0170297V01	mech0170297v01_0	CONTACT,	U501	5109923D50	lcc21-sz4_00x4_00	23D50,
J903	0985882K01	conn0985882k01_4	CONN_J,	U506	5102834Y86	lcc17-sz9_1x11_6	PA2001_2G,
J908	"0909195E01"	connpt09pnga19_2	CONN_J,	U800	5102834Y81	bga15_00x15_00p196	SC56685VH
LS900	5002811Y27	acous5085873j01	SPKR,	U801	5164824E01	bga6_964x7_286p48	28F320B,
M901	3986492P01	mech3986492p01	CONTACT,	U802	5109509A40	bga8_50x7_00p48	CY62147V,
M903	3986491P01	mech3986491p01	CONTACT,	U804	"5109522E53	sot1_25x2_00-5pin-rb	NC7SZ125,
M904	3986491P01	mech3986491p01	CONTACT,	U900	"5109879E58	bga10_00x10_00p100	79E58,
Q101	4809939C07	sotum5-rb-po12346	UMA4N,	U903	5109923D52	msoic8	23D52,
Q102	4809939C05	sot1_25x2_00-5pin-	UMC5NTL,	U904	4809939C06	sot2_00x1_25	UMZ2NTR,
Q104	4809939C05	sot1 25x2 00-5pin-	UMC5NTL,	VR900	4809788E06'	sod1 70x1 25	UDZTE-176.
Q105	"4809579E48"	sot2 90x1 60-6pin	FDC6306P,	VR901	4809788E06'	sod1 70x1 25	UDZTE-176.
Q201	"4809579E48"	sot2 90x1 60-6pin	FDC6306P,	VR902	"4809788E06	sod1 70x1 25	<b>UDZTE-176.8</b>
Q203	"4809527E41"	sotem3-rb	27E41,	VR903DNP	4813832P75	sc59-6pin-rb	MMQA6V8T
Q310	4809939C07	sotum5-rb-po12346	UMA4N,	Y200	4809612J22	xtal6 00x3 50-po1234	12J22,
Q311	4809939C09	sot2_00x1_25	UMH4N,	Y900	4809995L03		
Q312	4809939C27	sot2_00x1_25	UMB4NTN,				
Q313	4809939C09	sot2 00x1 25	UMH4N,				
			,				