

411-6201-500

Wireless Solutions

TDMA 1900 Macrocell

Cell Site Maintenance Manual

MTX08 Preliminary 03.03 July 1999

NORTEL
NETWORKS™

Wireless Solutions

TDMA 1900 Macrocell

Cell Site Maintenance Manual

Product release: MTX08

Document release: Preliminary 03.03

Date: July 1999

Document Number: 411-6201-500

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Publication history

July, 1999 (Preliminary 03.03)

Added the TRU3 1900 to the document for internal review.

May, 1999 (Standard 03.02)

Updated to release for MTX08 Standard CD.

February, 1999 (Preliminary 03.01)

Updated to release for MTX08 Preliminary CD.

August, 1998 (Standard 02.01)

Updated document content and styles

March, 1998 (Preliminary 01.01)

Up-issue for MTX07 release

Feb, 1998 (Draft 00.03)

Updated release for G2

Dec, 1997 (Draft 00.02)

Updated release of this document for team review

Nov, 1997 (Draft 00.01)

The initial publication of this document

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About this document

This document is one of a suite of documents that provide Nortel customers with information and suggestions on the planning, operations and maintenance of their TDMA 1900 Macrocell system. This documentation suite includes the documents in the following table:

Document title	NTP#
<i>TDMA 1900 Macrocell Master Index of Publications</i>	411-6201-001
<i>TDMA 1900 Macrocell Cell Site Functional Description</i> (includes the following five documents)	411-6201-100
<i>TDMA 1900 Macrocell Cell Site Description</i>	411-6201-111
<i>TDMA 1900 Macrocell CE Frame Description</i>	411-6201-112
<i>TDMA 1900 Macrocell RF Frame Description</i>	411-6201-113
<i>TDMA 1900 Macrocell Enclosure Description</i>	411-6201-114
<i>TDMA 1900 Macrocell Pre-Installation Guidelines</i>	411-6201-115
<i>TDMA 1900 Macrocell Cell Site RF Deployment Guide</i>	411-6201-200
<i>TDMA 1900 Macrocell Cell Site Installation Methods</i>	411-6201-201
<i>TDMA 1900 Macrocell Cell Site Maintenance Manual</i>	411-6201-500
<i>TDMA 1900 Macrocell Cell Site Troubleshooting Guide</i>	411-6201-501

Audience for this publication

The audience for this set of manuals includes cell site technicians and planning engineers who require detailed information on the planning, operation and maintenance of a TDMA 1900 Macrocell cell site.

The *TDMA 1900 Macrocell Functional Description* is a technical reference foundation for the other documents in the documentation suite and is written for all individuals.

The *TDMA 1900 Macrocell RF Deployment Guide* and *TDMA 1900 Macrocell Installation Methods* are written for system planning personnel planning to implement new cells or expand existing cell sites.

The *TDMA 1900 Macrocell Maintenance Manual* and the *TDMA 1900 Macrocell Troubleshooting Guidelines* provide information on problem recognition and preventive maintenance are written for the cell site technician to assist in troubleshooting and performing routine work.

The document suite assumes that the reader has a basic knowledge of cellular systems and radio propagation and is familiar with measurement units and terms associated with these concepts. This document does not provide detailed information on the theory of switching and radio propagation.

How this publication is organized

This publication is organized to present the following information:

- TDMA 1900 Macrocell cell site general maintenance procedures
- Equipment needed for the TDMA 1900 Macrocell cell site maintenance processes
- TDMA 1900 Macrocell maintenance schedules
- Cell site equipment maintenance procedures

General maintenance procedures

General precautions

There are some general precautions to be aware of when performing maintenance on cell site components. When performing maintenance functions, take care not to do anything which would inadvertently take the site off the air (make the site drop phone calls in progress). The technician should always have a clear idea of the action being undertaken, and what is the potential impact and safety implications of the action on the operating condition of the network.

RF radiation hazard

Radio Frequency (RF) radiation can be hazardous to anyone working in the cell site. Before removing any RF cable, ensure that the transmitters are turned off. All RF cables should be connected properly and all unused RF ports should be terminated with an appropriate terminator.

**Caution*****Radiation Hazard***

Do NOT disconnect any RF cables when transmitters are on.

Cable/connector identification

Label all cables and connectors before disconnecting them from any cell site equipment. This will minimize the time required for tracing the connections and also reduce the possibility of incorrect connections.

Electrostatic Discharge (ESD)

When handling any circuit board, take care to prevent damage from static discharge. Observe the following rules:

1. To prevent electrostatic discharge, do not attach ribbon cables to circuit boards until the circuit boards are in place.
2. To dissipate any static charge, wear a wrist strap in contact with the skin.
3. Connect the wrist strap ground cord to the equipment cabinet ground.



Caution

Equipment Damage

Do not let the circuit board come into contact with clothing at any time, as the grounding strap cannot dissipate static charges on fabrics.

ElectroStatic Discharge (ESD) control

This section provides general guidelines and precautions for handling, transporting and storing components and printed circuit boards that are susceptible to permanent damage when subjected to electrostatic discharge (ESD).

ESD sensitive equipment

Various electrical and electronic components are vulnerable to ESD. These include:

- discrete components
- hybrid devices
- Integrated Circuits (ICs)
- circuit boards assembled with these devices

Identification

Manufacturers vary in their methods of identifying static-sensitive equipment. They may apply stickers or mark components with various colors, but many do not indicate that their products are sensitive. Examples of identification are:

- Circuit boards with ESD-sensitive devices may have a red edge.
- Hybrids containing Metal-Oxide Semiconductors (MOS) devices are red, with the letters MOS on the back. Non-sensitive hybrids are white.
- Pull-handles on circuit packs containing sensitive devices may have the letters MOS and the assembly part number printed in red.
- Assembly drawings may have manufacturing notes describing the circuits as ESD-sensitive.



Equipment damage

Electrostatic discharge

When in doubt, any circuit board containing microelectronic components must be assumed to be vulnerable to ESD.

Static control materials and devices

Use conductive bags and containers to store and transport circuit boards or components. There are three common types of conductive bags: Velostat, Tyvek and Pink Polyethylene.

Note: Pink Polyethylene is not recommended for ESD control.

**Electric shock hazard**

Metalized or carbon bags are conductive and therefore must not contact live electrical circuits, or they may cause shorting, sparking, and shock hazards to personnel.

Static-free work stations

Static-sensitive devices must be removed from packages only at a static-free work area. The minimum equipment for a static-free work station is

- conductive bench mat
- operator's conductive wrist strap

Ideally however, locations should be equipped as follows when necessary

- wrist strap
- shoe grounding straps
- ionized air blower (where required)
- ground cord
- floor mats
- table mats

Where protective measures have not been installed, a suitable alternative would be the use of a Portable Field Service Grounding Kit (3M part number 8012). This consists of a portable mat and wrist strap. The mat has pockets to hold circuit boards.

Handling procedures

Degradation may occur at any time during the handling of electrostatic-discharge-sensitive devices and components. Boards or components should never come in contact with clothing, because normal grounding cannot dissipate the static charges on fabrics.

Before handling static-sensitive equipment, personnel must discharge themselves of any static charge. The most effective method is the use of a grounded wrist strap combined with correctly installed ground static control

mats at all work locations. The wrist strap must be permanently attached to the frame on the basis of one between two frames. Alternatively the straps may be connected on an as-required basis to the battery return (ground) jack, where it is provided.

Handling

Electrostatic-discharge-sensitive devices must be handled only in static-free locations. These locations must be equipped with grounded table and floor mats and grounded wrist straps. Also a reasonable relative humidity (RH) level must be maintained, if economically feasible, of between 20% and 80% non-condensing. In places where humidification is not practical, the other static control measures must be carefully observed.

Electrostatic-discharge-sensitive equipment must be handled only after personnel have grounded themselves with wrist straps, or shoe straps and mats.

No electrostatic-discharge-sensitive device should be removed from its protective package, except in a static-free location. The recommended packaging is a form of Faraday cage that will protect the contents against any charge present under normal conditions. Damaged packaging must be replaced at once.

All common plastics and other prime generators (e.g. nylon carpet, plastic mats) must be prohibited in the electrostatic-discharge-free area.

Use only static-shielding packing material.

Transporting

A circuit pack must be placed into an anti-static shielding bag before being removed from the work location and must remain in the bag until it arrives at a static-free repair/test center.



Equipment damage

Electrostatic discharge

At no time must an unprotected circuit board come in contact with clothing, plastics, or ungrounded personnel

Where handles or finger holes are provided on circuit packs they must be used to remove and replace the boards, and care taken to avoid contact with the connectors and components.

Storage

Improper storage can cause failures in ESD-sensitive components. The guidelines for environmental factors (temperature, moisture, air pollutants) are as important during storage as they are for operating. Wider variations of temperature may be allowable, depending on the type of device. In general, low temperatures do not damage inactive equipment provided that the device is slowly raised to normal room temperature before use.

Electrostatic discharge damage to unprotected sensitive devices may occur at any time. Therefore it is important to keep ESD-sensitive circuit boards and components in proper protective packages during storage. Discard suspect bags and use new ones. Whenever possible, units requiring protection should be identified on the protective packing.

Note: A circuit board in a static shielding bag may be shipped or stored in a cardboard carton, but the carton must not enter a static-free area such as a bench top or repair zone.

For more information on ESD and its control, refer to the following documents:

- Test Methods for Static Control Products (Huntsman & Yenni, 3M Company)
- Protection and Handling of ESD-Sensitive Circuit Packs (Bell Canada, BCP069-8000-501)

Field Replaceable Units (FRU's)

The components of a TDMA 1900 Macrocell are not designed to be repaired in the field. The only maintenance that can be performed is to replace the components or the Field Replaceable Units (FRU). See Table 1-1, "Major components of a TDMA 1900 Macrocell cell site," on page 1-8 for FRU list and description.

Note: Refer to *TDMA 1900 Macrocell Troubleshooting Guide*, 411-6201-501 to determine if a component needs to be replaced.

Replacing faulty units in the Common Equipment (CE) frame



Caution
Service Affecting

A cell site may be completely out-of-service when a unit such as the RIP, VSMO, RPDU, splitters or the ICRM is removed. Replacing these units should only take place during non-busy hours.

For the replacement of a unit on the CE frame, use the following procedure:

1. From a MAP terminal put the cell site or the unit out-of-service as required.
2. If replacing the Rack Interface Panel (RIP), switch off the supply to the frame at the power plant.

If replacing other units, switch off both the 'A' and 'B' circuit breakers to that unit at the RIP.

3. Label and disconnect the cables/connectors connected to the unit.
4. Remove the screws mounting the unit to the frame and then remove the unit from the frame.
5. Replace a new or known working unit on to the frame and secure it with the mounting screws.
6. Reconnect the cables/connectors to their appropriate locations. Ensure that they are properly connected.
7. Switch on the circuit breakers to the unit at the RIP or switch on the power supply to the frame at the power plant.
8. From the MAP, ensure that the datafill information on the replacement unit is correct, if applicable.
9. From the MAP, return the cell site back into service.
10. Verify that the replacement unit is functioning correctly.

11. Tag and return the faulty unit to your Nortel Customer Service Operations office for repair.

Replacing faulty units in the Radio Frequency (RF) frame



Caution
Service Affecting

A cell site may be completely out-of-service when a unit such as the RIP, the Duplexer, or the ATC is removed. Replacing these units should only take place during non-busy hours.

For the replacement of a unit on the RF frame, use the following procedure:

1. Put the cell site or the unit out-of-service as required.
2. If replacing the Rack Interface Panel (RIP), switch off the supply to the RF frame at the power plant.
3. If replacing other units, switch off both the 'A' and 'B' circuit breakers to that unit at the RIP.
4. Label and disconnect the cables/connectors connected to the unit.
5. Remove the screws mounting the unit to the frame and then remove the unit from the frame.
6. Replace a new or known working unit into the frame and secure it with the mounting screws.
7. Reconnect the cables/connectors to their appropriate locations. Ensure that they are properly connected.
8. Switch on the circuit breakers to the unit at the RIP or switch on the power supply to the RF frame at the power plant.
9. Ensure that the datafill information on the replacement unit is correct.
10. Put the cell site back into service.
11. Verify that the replacement unit is functioning correctly.
12. Tag and return the faulty unit to your Nortel Customer Service Operations office for repair.

Latching mechanism

The module latching mechanism is mounted to the shelf with the pickup on the radio and SCLPA module. The cam-style lock latch is used to prevent "slamming" of the module into place, and allows consistent seating of the connector.

Replacement

The latch module can be replaced if required. If a latch on the PA breaks, the PA shelf needs to be pulled out of the frame, then the latch module can be removed and a new one installed. The latch module fastens to the top of the shelf with three screws. If a latch on the TRU shelf breaks, then the PA shelf directly above the TRU shelf should be removed, and the TRU shelf latch module can be replaced while the shelf is still in the frame. This is done because there is much less interconnect on the PA shelf, and it is easier to remove than the TRU shelf.

Product structure for a TDMA 1900 Macrocell cell site

The product structure is a list of components for the TDMA 1900 Macrocell cell site. This list depicts components that are available upon request. Contact the appropriate Customer Service Organization (CSO) for ordering.

Note: F = Field Replaceable Unit, M/O = Merchandise Orderable unit
P = Provisional unit, BD = Band Dependent

Table 1-1

Major components of a TDMA 1900 Macrocell cell site

Description	PEC	CPC	F/P or M/O	Quantity
--TDMA 1900 Macrocell Radio Frequency (RF) frame--				
•1900 MHz RF frame	NTTG10AA	B0248222	P	1
•Frame leveling kit	NTFB40AA	A0634172	P	1
• Kick plate	-	P0868447	P	2
•Floor anchoring kit (non-seismic)	NTFB42AA	B0244827	P	1
•Floor anchoring kit (seismic)	NTFB43AA	B0244829	P	1
••RF RIP assembly	NTTG11AA	B0248223	F	1
•••RF RIP PCP	NTFB13AA	B0242446	-	1
•••Power filter module	NTFB14AA	B0242447	-	2
•••Breakers 15 A	-	A0666061	-	6
•••Breakers 20 A	-	A0673869	-	14
•••A power filter cable	NTTG1150	B0248483	-	1
•••B power filter cable	NTTG1151	B0248484	-	1
••Cable TRU/SCLPA shelf 1 DC power	NTTG1050	A0673972	M/O	2
••Cable TRU/SCLPA shelf 2 DC power	NTTG1051	A0673973	M/O	2
••Cable TRU/SCLPA shelf 3 DC power	NTTG1052	A0673974	M/O	2
-sheet 1 of 7-				

Table 1-1
Major components of a TDMA 1900 Macrocell cell site (continued)

Description	PEC	CPC	F/P or M/O	Quantity
•TRU shelf assembly	NTTG12AA	B0248224	P & F	0 to 3
••Card cage TRU shelf	NTTG1210	A0670580	-	1/shelf
•••TRU shelf cardcage	-	P0870372	-	1/shelf
••TRU backplane module	NTTG1220	A0670583	F	1/shelf
•••TRU backplane assembly	NTTG1230	A0676244	-	1/shelf
•••TRU shelf TX o/p cable (RF)	NTTG1250	A0679086	-	8/shelf
•••Cable TRU shelf to SCLPA shelf (data)	NTTG1260	A0680237	-	2/shelf
•••Fan module (Metro)	NTFB24AA	B0242642	M/O	1/shelf
•••Fan module cable assembly (Metro)	NTFB36AA	B0242648	M/O	1/shelf
•••TRU shelf shroud	-	P0869144	-	1/shelf
•SCLPA shelf assembly	NTTG13AA	B0248225	F & P	0 to 3
••SCLPA shelf cardcage	NTTG1310	A0670584	-	1/shelf
••SCLPA backplane module assembly	NTTG1320	A0670585	F	1/shelf
•••SCLPA shelf fan module	NTTG1330	A0675437	F	1/shelf
•••SCLPA backplane PCP	NTTG1301	A0670586	-	1/shelf
•••SCLPA backplane PCB	-	P0866372	-	1/shelf
•••SCLPA backplane assembly	NTTG1321	A0675436	-	1/shelf
•••SCLPA shelf shroud	-	P0868754	-	1/shelf
•••Cable SCLPA shelf to fan module (data)	NT3P0214	A0603791	-	1/shelf
•••SCLPA shelf SCLPA I/P cable (RF)	NTTG1350	A0675945	-	8/shelf
•••SCLPA shelf to ATC/dup cable (data)	NTTG1361	A0680240	-	3/shelf
•Cable SCLPA O/P to ATC I/P (RF)	NTTG1360	A0680236	P & M/O	1 Per NTTG96AA
•ATC/duplexer shelf assembly	-	P0866774	F & P	0-3 per frame
•4:1 combiner	NTTG30AA	A0670588	F & P	0-2 per shelf
•8-ch phasing cables; band A,D	NTTG31AA	A0670589	M/O & P	B D/ configured
•12-ch phasing cables; band A, D	NTTG31AB	A0670592	M/O & P	B D/ configured
•8-ch phasing cables; band B, E	NTTG32AA	A0670593	M/O & P	B D/ configured
•12-ch phasing cables; band B, E	NTTG32AB	A0670595	M/O & P	B D/ configured
•8-ch phasing cables; band F, C	NTTG33AA	A0670596	M/O & P	B D/ configured
•12-ch phasing cables; band F, C	NTTG33AB	A0670597	M/O & P	B D/ configured
•ATC module blank panel	-	P0874805	P	0-2 per shelf
-sheet 2 of 7-				

1-10 General maintenance procedures

Table 1-1

Major components of a TDMA 1900 Macrocell cell site (continued)

Description	PEC	CPC	F/P or M/O	Quantity
•Indoor duplexer band A, D	NTTG40AA	A0670636	F & P	1/shelf
•Indoor duplexer band B, E	NTTG40AB	A0670637	F & P	1/shelf
•Indoor duplexer band F, C	NTTG40AC	A0670638	F & P	1/shelf
•Cable ATC O/P to duplexer I/P (RF)	NTTG3050	A0680253	F & P	1 / ATC O/P
•1:2 splitter assembly	NTTG4210	B0248851	M/O & P	1
•Splitter module 6 * 1:2	NTTG42AA	A0670644	F & P	1
•Cable 1:2 splitter to TRU shelf 1 (RF)	NTTG4250	A0680244	M/O & P	5
•Cable 1:2 splitter to TRU shelf 2 (RF)	NTTG4251	A0682159	M/O & P	5
•Cable 1:2 splitter to TRU shelf 3 (RF)	NTTG4252	A0682160	M/O & P	5
•Cable data RIP to TRU shelf 1	NTFA1004	A0239930	M/O & P	1
•Cable data RIP to TRU shelf 2	NTFA1008	A0239934	M/O & P	1
•Cable data RIP to TRU shelf 3	NTFA1009	A0239935	M/O & P	1
•TRU - 1900	NTTG98AA	B0248226	F & P	max 8/shelf
•TRU3 - 1900	NTTG90AA	A0736181	F & P	max 8/shelf
•SCLPA - 1900	NTTG96AA	A0670645	F & P	max 8/shelf
3U blank panel	-	P0871509	P	1
•11U blank panel	-	P0871510	P	1
--TDMA1900 Macrocell Common Equipment (CE) frame--				
•1900 MHz CE frame	NTTG50AA	B0248227	P	1
•CE RIP assembly	NTTG51AA	B0248228	F	1
•Frame leveling kit	NTFB40AA	A0634172	P	1
• Kick plate	-	P0868447	P	2
•Floor anchoring kit (non-seismic)	NTFB42AA	B0244827	P	1
•Floor anchoring kit (seismic)	NTFB43AA	B0244829	P	1
•CE frame DC power cable harness 1 - RPDU	NTTG5050	A0675943	M/O	1
•CE frame DC power cable harness 2 - VSMO	NTTG5051	A0675944	M/O	1
•CE frame DC power cable harness 3 - ACU	NTTG5052	A0677145	M/O	1
•CE frame DC power cable harness 4 - ICRM	NTTG5053	A0677146	M/O	1
•CE frame DC power cable harness 5- COMPAS	NTTG5056	A0724951	M/O	1
•Alarm and Control Unit	NTTG55AA	B0248450	F & P	1
ACU blank panel (Grey)	-	P0867879	P	
-sheet 3 of 7-				

Table 1-1
Major components of a TDMA 1900 Macrocell cell site (continued)

Description	PEC	CPC	F/P or M/O	Quantity
••Output contact card	NT3P20EA	A0359633	P	0-2
••Enhanced ACU input contact card	NT3P20FB	B0237996	P	0-15
•VSMO	NTTG53AA	B0248230	F & P	1
••50-ohm termination SMA male	-	A0689593	M/O & P	0-8
•Splitter module 6 * 1:6	NTTG54AA	A0670655	F	1
••50-ohm termination SMA male	-	A0689593	M/O & P	0-36
•Local receiver module (LRM) shelf	NTTG61BA	A0675435	P	1
•Local receiver module; band A, D"	NTTG61AA	A0670649	P & F	0-6; B D
•Local receiver module; band B, E"	NTTG61AB	A0670650	P & F	0-6; B D
•Local receiver module; band F, C"	NTTG61AC	A0670651	P & F	0-6; B D
•LRM to 1:6 splitter cable	NTTG6150	A0680255	M/O & P	6
•RPDU shelf	NTTG62AA	A0670652	F & P	1
•RRM to DC injector power cable (Cells site specific length)	NTTG6250	A0680233	M/O & P	1
•ICRM (duplex config. only)	NTAX86BA	B0245931	P	1
•ICRM to ACU	NTAX8637	B0233840	P	1
•ICRM cover assembly	NTTG5010	A0673711	M/O & P	1
•RMTC (Remote Module TimeSwitch Controller) slot 10,15	NTAX88CA	B0241020	F & P	2
•RMTP (Remote Module TCM/RS232 Pad) card - slot 3-6 of RMFS	NTAX91AA	B0231190	F & P	3
•RMAC (Remote Module Alarm Card) - slot 1,2 of RMFS	NTAX92AA	B0231499	F & P	2
•ICRM RMFS terminal plug	NTAX8650	B0234272	F & P	2
•Power converter card slots 1,22	NT2X70CA	B0230333	F & P	2
•T1 signalling card slots 11,12 then 13, 14	NT6X50AB	B0222998	F & P	2 min - 3 max
•E1 signalling card slots 11,12 then 13, 14	NT6X27BB	B0235838	F & P	2 min - 3 max
•16 channel TCM port card slots 20, 21, 17-19, 4-8	NT8X47BA	B0223714	F & P	2 min - 10 max
•filler card slots 17-21, 4-8	NT0X50AA	B0204315	F & P	max 9
•ICRM to T1/E1 customer cross connect	NTAX8640	B0233843	F & P	2
•ICRM cover plate	-	P0875480		1
•CE frame alarm cable	NTTF5050	A0680680	M/O	1
-sheet 4 of 7-				

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Table 1-1
Major components of a TDMA 1900 Macrocell cell site (continued)

Description	PEC	CPC	F/P or M/O	Quantity
•Tri-duplexer tray	-	PO871655	P	1
•Indoor duplexer band A, D	NTTG40AA	A0670636	F & P	3/tray, B D
•Indoor duplexer band B, E	NTTG40AB	A0670637	F & P	3/tray, B D
•Indoor duplexer band F, C	NTTG40AC	A0670638	F & P	3/tray, B D
•50-ohm N male termination (Dup Tx Port)	-	A0609689	F & P	3
•Cable duplexer Rx to LRM RF frame 1	NTTG5451	A0680677	M/O	configured/ max 3/frame
•2U blank panel	-	P0871508	P	3 or 4
•11U blank panel	-	P0871510	P	1
•Remote receiver module; band A, D	NTTG60AA	A0670646	F	0-6; B D
•Remote receiver module; band B, E	NTTG60AB	A0670647	F	0-6; B D
•Remote receiver module; band F, C	NTTG60AC	A0670648	F	0-6; B D
•Lightning protection assembly	NTTG63AC	A0720115	P	1 (Mounted in Cell site)
•Bias T lightning protection module	NTTG63AB	A0670654	F	6 /assembly
•Bias T mounting plate	-	P0875485	-	1
•Bias T DC power cable assembly	NTTG6301	A0689567	M/O	1
Interframe cables between CE frame and RF frame 1				
Cable CE RIP TO RF1 RIP J208	NTTG5155	A0680252	M/O	1
Cable RIP J205 to ICRM COT9 (3.2 meters)	NTAX8639	B0233842	M/O	1
Cable RIP J206 to ICRM COT10 (3.2 Meters)	NTAX8639	B0233842	M/O	1
Cable RIP J207 to ACU J1	NT3P31BH	A0369243	M/O	1
RX cables between 1:6 splitter and 1:2 splitter	NTTG6151	A0680251	M/O	6
VSMO cable between VSMO O/P and 1:2 splitter	NTTG6151	A0680251	M/O	1
Cable duplexer RX Port to LRM	NTTG5451	A0680677	M/O	configured/ max 3-frame
Bias T to duplexer (customer engineered)	N/A	N/A		configured/ max 3-frame
-sheet 5 of 7-				

Table 1-1
Major components of a TDMA 1900 Macrocell cell site (continued)

Description	PEC	CPC	F/P or M/O	Quantity
Interframe cables between CE frame and RF frame 2				
Cable RIP J205 to ICRM COT1 (3.9 Meters)	NTAX8639	B0233842	M/O	1
Cable RIP J206 to ICRM COT2 (3.9 Meters)	NTAX8639	B0233842	M/O	1
Cable RIP J207 to ACU J2	NTFB47AA	B0244713	M/O	1
RX cables between 1:6 splitter and 1:2 splitter	NTTG6152	A0680676	M/O	6
VSMO cable between VSMO O/P and 1:2 splitter	NTTG6152	A0680676	M/O	1
Cable duplexer RX Port to LRM	NTTG5452	A0680678	M/O	configured/ max 3-frame
Bias T to duplexer (customer engineered)	N/A	N/A		configured/ max 3-frame
Interframe cables between CE frame and RF frame 3				
Cable RIP J205 to ICRM COT3 (4.6 Meters)	NTAX8639	B0233842	M/O	1
Cable RIP J206 to ICRM COT4 (4.6 Meters)	NTAX8639	B0233842	M/O	1
Cable RIP J207 to ACU J3	NTFB48AA	B0244714	M/O	1
RX cables between 1:6 splitter and 1:2 splitter	NTTG6152	A0680676	M/O	6
VSMO cable between VSMO O/P and 1:2 splitter	NTTG6153	A0682158	M/O	1
Cable duplexer RX Port to LRM	NTTG5452	A0680678	M/O	configured/ max 3-frame
Bias T to duplexer (customer engineered)	N/A	N/A	-	configured/ max 3-frame
Interframe cables between CE frame and RF frame 4				
Cable RIP J205 to ICRM COT5 (3.2 Meters)	NTAX8639	B0233842	M/O	1
Cable RIP J206 to ICRM COT6 (3.2 Meters)	NTAX8639	B0233842	M/O	1
Cable RIP J207 to ACU J4	NT3P31BH	A0369243	M/O	1
RX cables between 1:6 splitter and 1:2 splitter	NTTG6151	A0680251	M/O	6
VSMO cable between VSMO O/P and 1:2 splitter	NTTG6151	A0680251	M/O	1
50-ohm N male termination (dup RX port)	-	A0609689	M/O	3
-sheet 6 of 7-				

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Table 1-1
Major components of a TDMA 1900 Macrocell cell site (continued)

Description	PEC	CPC	F/P or M/O	Quantity
Interframe cables between CE frame and RF frame 5				
Cable RIP J205 to ICRM COT7 (3.9 Meters)	NTAX8639	B0233842	M/O	1
Cable RIP J206 to ICRM COT8 (3.9 Meters)	NTAX8639	B0233842	M/O	1
Cable RIP J207 to ACU J5	NTFB47AA	B0244713	M/O	1
RX cables between 1:6 splitter and 1:2 splitter	NTTG6152	A0680676	M/O	6
VSMO cable between VSMO O/P and 1:2 splitter	NTTG6152	A0680676	M/O	1
50-ohm N male termination (dup RX port)	-	A0609689	M/O	3
Interframe cables between CE frame and RF frame 6				
Cable RIP J207 to RF frame 5 RIP J208	NT3P31CH	A0369245	M/O	1
RX cables between 1:6 splitter and 1:2 splitter	NTTG6152	A0680676	M/O	6
VSMO cable between VSMO O/P and 1:2 splitter	NTTG6152	A0680676	M/O	1
Jumper cable (TRU shelf3 to RF2 frame RIP)	-	A0609689	M/O	1
50-ohm N male termination (dup RX port)	-	A0609689	M/O	3
-sheet 7 of 7-				

Customer Service Operations (CSO)

Most of these TDMA 1900 Macrocell components can be ordered from Nortel. Contact the Nortel Customer Service Operations (CSO) when repair or replacement is required, as shown in Table 1-2.

Note: The address and phone numbers stated for CSO centers are subject to change. Contact a regional Nortel marketing/sales office for the most current information.

Table 1-2
Nortel CSO centers

Location	Address	Contact	Phone #
Canada & Int'l	Northern Telecom Canada Ltd. Customer Service Operations c/o Wesbell Distribution Resources Ltd. 2365 Matheson Blvd. East Door 1-4 Mississauga, Ontario, Canada L4W 5C2		1-800-668-5511 1-905-454-2808 Emergency: 1-905-457-9555
USA	Northern Telecom, Inc. Customer Service Operations - Richardson 400 N. Industrial Richardson, Texas 75081	Customer Service Rep.	972-684-7888 1-800-684-7888
Brazil	Northern Telecom Do Brasil Ind Com Ltda Customer Service Centre Av. Nacoes Unidas 17.891 - 4o. Floor CEP 04795-100 Vila Almeida/sao Paulo-SP	Discrepancy Prime: Luiz Crispin	55-11-882-4949 Fax: 55-11-882-4989
Mexico	Northern Telecom De Mexico General Mariano Arista No. 54 Bodega 7 Y 8 Col. Argentina Poniente 11230 Mexico, D.F.	Discrepancy Prime: (Liz) Elizabeth Rueda	(525) 386-39-21
Colombia	Northern Telecom De Colombia Customer Service Centre Carrera 41a # 128a - 49 Santa Fe De Bogota Colombia SA	Discrepancy Prime: Cesar Villamil	(571) 626-9811 ESN626-9866 ESN 626-9855 Fax: (571) 627-4145
-sheet 1 of 3-			

1-16 General maintenance procedures**Table 1-2**
Nortel CSO centers (continued)

Location	Address	Contact	Phone #
Puerto Rico (Services Pueryo Rico and Dominican Republic)	Northern Telecom (Cala) Corp. Road # 2 K.M. 16.6 Barrio Candelaria TOA Baja, Puerto Rico USA 00949	Discrepancy Prime: Gie Adorno	(809) 251-6317 Fax: (809) 251-6366
Morocco	Bell Canada International 6 Rue Najib Mahfoud Quartier Gaultier, Casablanca Morocco		212-2-268356 Fax: 212-2-200854 212-2-268592
Hong Kong	Northern Telecom (Asia) Ltd. 17/f Warwick House, East Wing, Taikoo Place 979 King's Road Quarry Bay, Hong Kong	Discrepancy Prime: CB Lui, Lawrence Chiu	852-2516 4688 Fax: 852-2516 4583
China - Beijing	Northern Telecom Beijing Service Centre 15#, Xiao Ying Rd Chaoyang District Beijing, P.R.C. 100101	Discrepancy Prime: Vivian Yu	86-10-64933879 Fax: 86-10-64933823
China Panyu	Northern Telecom Instrimpex Service Centre, 6/f, Electronic Bldg Fanhua Road, Shiqiao County Panyu, Guangdong, P. R. China		86-20-8489-7246
United Kingdom (Europe)	Nortel Logistics Centre c/o E.P.S. Ltd. Unit 3 Appletree Road Chipping Warden Banbury, Oxon. OX17 1LL	Discrepancy Prime: Dianne Watkins	01-628-795102
Austria (Customer Interface For Vienna, Austria)	There Is No Depot In Austria. Ericsson Schrack Ag Pottendorferstrasse 25-27 A-1121 Wien, Austria	Attn: Regina Braun	011-43-1- 7988498
-sheet 2 of 3-			

Table 1-2
Nortel CSO centers (continued)

Location	Address	Contact	Phone #
Australia & Asean	Nortel Customer Service Centre C/o Distribution Centre Unit 3/12 Fredrick Street. St. Leonards NSW 2065 Australia	Attn.: Anthony Stanbury	61-2-9919-5253 Fax: 61-2-9436-3245 Emergency: 61-2-9571-1180 Pager# 80092 Fax: 61-2-9436-3245
Singapore	Northern Telecom Singapore Ple Ltd. 151 Lorong Chuan #02-01 New Tech Park Singapore 556741	Discrepancy Prime: Joyce Chew	65-380-8819 ESN: 623-8819 Fax: 65-380-8797 Att: Allan Wong Pager: 65-9412-7118
Miami Service Center	Nortel Repair c/o Wesbell Warehouse 2315 N.W. 107th Ave. Bldg 1, Units B10 & B11 Miami, FL 33172		(954) 851-8841
(Miami will service all CALA countries where there are no regional depots)			
-sheet 3 of 3-			

Test equipment

The TDMA 1900 Macrocell is operated by the Digital Multiplex Switch - Mobile Telephone Exchange (DMS-MTX). It can also be operated by service personnel at the cell site through an interface terminal to perform some operational functions and tests. This section provides information on how to operate the cell site equipment and perform maintenance tasks and operational tests at the cell site. However, some of the tests may involve activities at the MTX. For details of the MTX activities, refer to the appropriate DMS-MTX manuals.

To operate and test cell site equipment, an interface terminal and other test equipment is required. This chapter provides a list of recommended test equipment and precautions to be aware of when performing any tasks at the cell site.

Precautions

Equipment warm-up

Do not perform tests immediately after the installation of any equipment. The cell site and the test equipment should be powered up for at least half an hour before testing. Inaccurate measurements may result if the warm-up period is less than 30 minutes.

Test equipment calibration

Proper setup of the test equipment is critical in obtaining proper test results. Consistency of setup and techniques from one person to another is essential for obtaining proper system operation. Calibrate all test equipment before use.



Equipment damage

Ensure that the test equipment maximum allowable input levels are not exceeded. Add an attenuator to reduce the power if necessary.

RF radiation hazard

Radio Frequency (RF) radiation is hazardous to anyone working in the cell site. All RF cables should be connected properly and all unused RF ports should be terminated with an appropriate terminator.



Caution

Radiation Hazard

Do NOT disconnect any RF cables when transmitters or SCLPA's are on. There is a possibility that the transmitters could be automatically activated.

Test equipment

It is assumed that the operator is familiar with the test equipment used in the test procedures. The following test equipment is recommended for performing the required tests. Any functionally equivalent unit may be used in its place. Double shielded coaxial cables are recommended for use between test equipment and the equipment being tested.

Note: Ensure test equipment is calibrated before performing any tests.

1. Communications Monitor: IFR 1900 (or equivalent) refer to appendix A for IFR 1900 set up.
2. Interface Terminal: VT100 Video Display Terminal or equivalent laptop PC with communications software) with Null Modem Cable. Refer to Table 2-1 on page 2- 11 for terminal interface connector pinouts.
3. HP 3551A Transmission Test Set
4. Spectrum Analyzer 0 to 2 GHz, 70 dB dynamic range
5. Two 1.5 meter N-male to N-male RF cables, double shielded
6. Two 1.5 meter N-male to BNC-male RF cables, double shielded
7. Two 1.5 meter BNC-male to BNC-male RF cables, double shielded
8. Two adapters BNC-female to Bantam (to be used with item 9)
9. Narda 370BNN 50-ohm terminations
10. Bird 8325 Coaxial Attenuator, 500 Watts, 30 dB
11. Bird Thruline Wattmeter with 5, 50 and 250 Watt elements
12. HP336 power meter or
HP436A power meter
13. Bird 4275 Adjustable Radio Frequency Sampler
14. Fluke 8050A Digital Multimeter

15. Directional Compass
16. Binoculars or Spotting Telescope
17. Frequency counter: 1 Hz resolution and 0.025 ppm reference
18. SMA torque wrench calibrated to 8 in/lbs
19. 7/16 DIN torque wrench calibrated to 220-265 in/lbs
20. VSWR bridge

Terminal interface operation

Introduction

The TRU supports an Interface Terminal (VT100 or equivalent) which allows local direct control for monitoring, maintenance, and control purposes. Connect the terminal to the RS-232 interface port on the front panel of the TRU while the TRU is in either “Active” or “Debug” mode. Commands are used to set operating parameters, and perform control, test, maintenance and status query functions. The TRU need not be connected to the rest of the Digital Multiplex System-Mobile Telephone Exchange (DMS-MTX) system.

The terminal interface can be operated in these modes:

- Command Line mode. This mode allows for maintenance, measurement, and test commands to be executed.

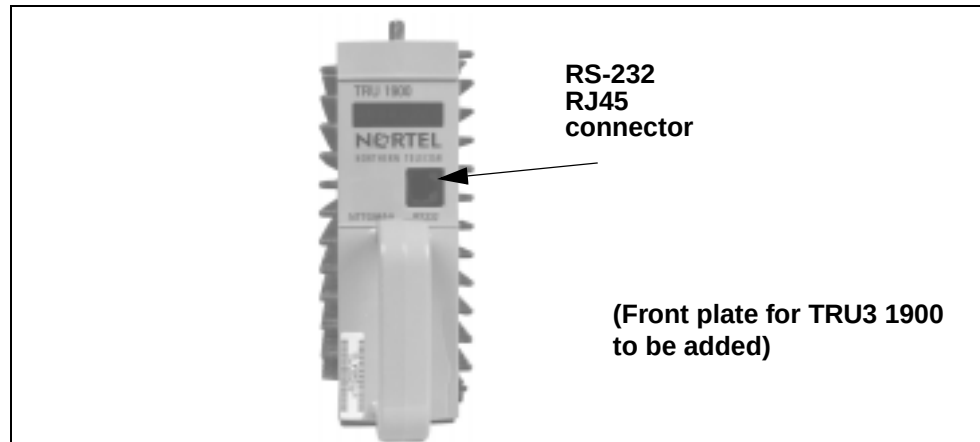
or

- Fullscreen Monitor mode. This mode groups the commands used for commissioning a cell site together into a single screen.

TRU to Terminal Interface connection

Use one of the cables with the pinouts as indicated in Table 2-1 to connect the TRU (RJ45 Teledapt connector on the front panel of the TRU) to the Terminal Interface.

Figure 2-1
TRU front panel



Looking into the RJ-45 connector on the TRU front panel, pins are numbered one to eight from top to bottom for the TRU 1900 and from bottom to top for the TRU3 1900.

Table 2-1
Terminal interface connector pinouts

Function	TRU	Terminal interface		
	TRU Front panel RS-232 port pin number RJ45 connector	25 pin D-connector pin number	9 pin D-connector pin number	8 pin Macintosh connector pin number
Tx from TRU	2	3	2	3
Rx to TRU	3	2	3	5
Ground	7	7	5	4

Setting up communications

Set up the Terminal Interface with the following communications parameters:

- 9600 baud
- eight bits, no parity
- one start bit, one stop bit
- 80 columns
- auto wraparound
- ANSI
- VT100 emulation

Interfacing the terminal with the TRU

Interfacing the TRU while it is “in service”

Interfacing to the TRU with a Terminal Interface while the TRU is in-service (active by MTX), can be established by pressing the RETURN key on the laptop once the physical connection is made. A “>” prompt will be printed on the screen indicating that the terminal is “communicating” with the TRU.

Information required can be obtained by using the QUERY commands which can be displayed by typing “HELP MSR”.

On-line help

Using the Fullscreen Monitor is simplified by an on-line help system. To access it, type “HELP” or “?” in response to any prompt. A brief description of the TRU terminal interface is displayed. Several on-line help categories are available. Each category contains a one-line description of each command in that category. The following categories of help commands are available:

- HELP HELP - Lists help categories
- HELP MTCE - Lists maintenance commands
- HELP TESTS - Lists test commands
- HELP MSR - List measurement and query commands
- HELP MONITOR - List commands within the monitor subsystem

Interfacing the TRU while it is Off-line or Manbusy

With the a terminal connected you can access the command line mode by pressing the “Break” key on the terminal keyboard. The terminal will display:

For the TRU 1900:

```
TRU Terminal Interface
(C) Copyright 1990,1996 Bell Northern Research, Inc.
>
```

For the TRUIII 1900:

```
TRU-III Terminal Interface
(C) Copyright 1996-97 Nortel
>
```

At this point, there is about ten seconds before the TRU times-out and returns to ROM IDLE. Before the ten seconds has elapsed, the Lap Timer must be disabled, by typing:

>SET LT OFF

The Terminal Interface is now in the Command Line mode and ready to receive commands. Please refer to Table 2-8, Table 2-9 and Table 2-10 for Command Line Mode commands.

Disconnecting the Terminal Interface

Once the terminal session is completed, terminate the communication with the following commands:

Fullscreen Mode: Use the Y command which initiates a restart and will disconnect the communications.

Command Line Mode: Use EXECUTE RESTARTFLASH command to disconnect the communications.

Note: Avoid removing the TRU from its transceiver shelf slot for the purpose of executing a restartflash. If the TRU is detached from its transceiver shelf backplane connection and then re-connected, it may require some commissioning to ensure that all RF connections are established correctly. Re-insertion of the TRUs to the backplane cause wear and tear on the gold-plated backplane pins and may reduce connectivity and increase path loss.

Remote Radio InterFace (RRIF)

The RRIF is a software feature introduced with MTX04. It allows remote OAM access to cell site DRU's from a MAP based terminal. Refer to NTP 411-2131-115 *Remote Radio InterFace Reference*.

Entering the Fullscreen mode

The primary purpose of the Fullscreen Monitor is to provide a means for quickly commissioning a TRU in a cell site. It provides a more user-friendly access to the TRU's OAM test and maintenance functions than the command line mode.

Note: The Fullscreen Monitor is intended for use on a TRU which is not in an active call processing state.

The TRU must be at ROM idle (indicated on the front panel display) to operate in the Fullscreen Monitor mode. The Fullscreen Monitor is capable of two modes of operation, analog (AMPS) and digital (TDMA) and has the ability to switch between either one.

Note: Although the AMPS (Advanced Mobile Phone System) personalities (ACC (Analog Control Channel), AVC (Analog Voice Channel), and ALR (Analog Locate Receiver)) are not valid operating modes, the terminal interface software does not block any attempts to set the TRU 1900 to these personalities. However, the AMPS personalities or any related terminal interface commands are not guaranteed for valid operation.

To enter the Fullscreen mode, at the command line prompt (>) type in the following command:

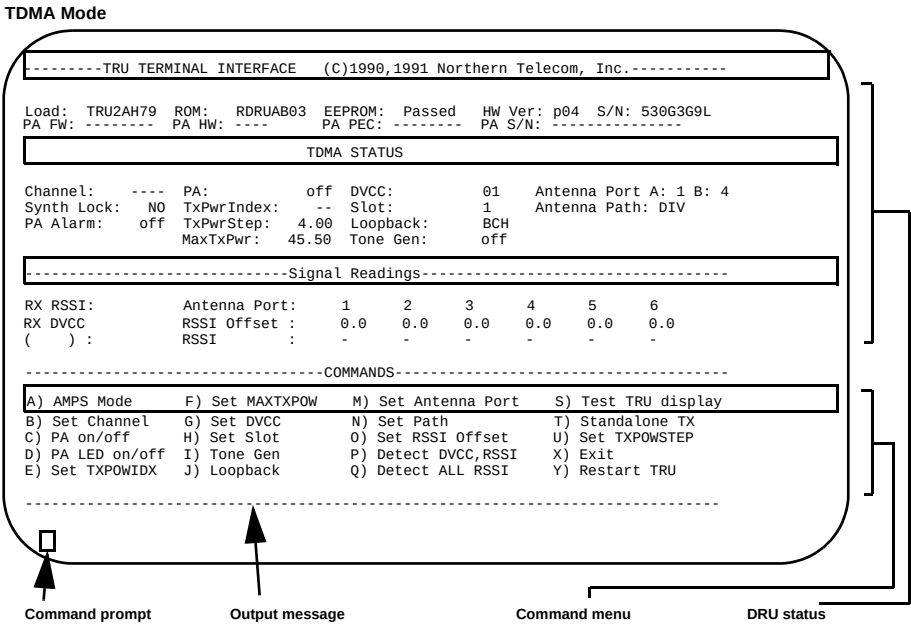
>SET FS ON

The **SET FS ON** command clears the existing display and changes the display to the **Fullscreen Display** in the AMPS mode. To get to **TDMA** mode select 'A', then return.

In the Fullscreen mode, the OAM commands are displayed and selected by their alphabetic code. The results of each OAM command are displayed at specific screen locations. Figure 2-2 shows the Fullscreen display for TRUs in the TDMA mode.

The Fullscreen display is divided horizontally into a status area and a command area. The bottom line of the display is used as the “command prompt” area; you may enter the appropriate command letter here. Directly above the command area is the output message line where status and output messages, such as selection parameters and error messages, are displayed. Table 2-2 (pg 2-8) is a summary of the fullscreen commands and these commands are explained in Table 2-3 to Table 2-7.

Figure 2-2
TRU Fullscreen display



Fullscreen commands

Some commands are only applicable to the TRU in either the analog or digital mode; others are applicable only when the TRU is in a particular state. Using such a command when the TRU is not configured correctly results in the error message below:

That function is not available in the TRU's current state.

A command is entered on the command line at the > prompt. You must press the “Return” key to execute the command. For some commands, additional parameters need to be entered and a prompt will appear on the message line. Enter the appropriate parameter and press the “Return” key to execute the command. Only one command may be executed at a time.

Note: The commands apply to both the TRU 1900 and the TRU3 1900 unless stated otherwise.

Table 2-2
Fullscreen command summary

Code	Amps Mode	TDMA Mode
A	Set TDMA Mode	Set AMPS Mode
B	Set Channel	Set Channel
C	Set PA on/off	Set PA on/off
D	Set PA LED on/off	Set PA LED on/off
E	Set TXPOWIDX	Set TXPOWIDX
F	Set MAXTXPOW	Set MAXTXPOW
G	SAT Transmit	Set DVCC
H	Change SAT	Set SLOT
I	Set Tone Gen	Set Tone Gen
L	Set Loopback	Set Loopback
M	Set Antenna Port	Set Antenna Port
N	Set Path	Set Path
O	Set RSSI Offset	Set RSSI Offset
P	Detect SAT/ST/RSSI	Detect DVCC/RSSI
Q	Detect ALL RSSI	Detect ALL RSSI
R	Set Rx/Tx Audio	—
S	Set TRU Display	Set TRU Display
T	Set Audio Sens	Stand-alone TX
U	Set TXPOWSTEP	Set TXPOWSTEP
X	Exit	Exit
Y	Restart TRU	Restart TRU

Note: Although the AMPS personalities (ACC, AVC and ALR) are not valid operating modes, the terminal interface software does not block any attempts to set the TRU 1900 to these personalities. However, the AMPS personalities or any related terminal interface commands are not guaranteed for valid operation.

A complete description of the fullscreen commands is given in Table 2-3 to Table 2-7.

These tables represent five groups according to the functions of the commands:

- Configuration functions for TRU operating parameters
- Transmit functions for TRU transmit status
- Receive functions for TRU receive status
- AMPS mode functions for functions available in AMPS mode only

Note: AMPs mode is not functionally supported.

- TDMA mode functions for functions available in TDMA mode only

Table 2-3
Fullscreen commands for configuration functions

Configuration functions (available to both the AMPS and the TDMA modes)			
Code	Command	Status	Action/initial value
A	Set Mode	AMPS, TDMA	Toggles between the AMPS mode display and the TDMA mode display
B	Set Channel	0000	Sets the current channel and updates the Channel field on the display. If the TRU Synthesizer was able to lock to the specified channel, the Synth Lock field displays "YES"; otherwise, the Channel field displays "----" and the Synth Lock field displays "NO"
D	Set PA LED	On or Off	Turns the alarm LED on the front panel of the PA on or off; the status is shown in the SCLPA/PA alarm field
I	Set Tone Gen	BCH, RF, or Off	Turns on either the tone generation (1004 Hz) on the B-channel to the MTX, the RF tone generation (1 kHz) on air, or turns off the tone generation. The status is shown in the Tone Gen field
J	Set Loopback	BCH, RF, or Off	Sets either the B-channel audio loopback (to MTX), the RF loopback (to mobile), or Off (no Loopback). The status is shown in the Loopback field
S	Test Display (for TRU 1900)	—	Verifies the TRUs 8-character LED display by alternately showing the following three patterns on the LED display until the Return key is pressed: 00000000 * * * * *
X	Exit	—	Leaves fullscreen monitor mode, clearing the screen and returning to command line mode

Table 2-4
Fullscreen commands for transmit functions

Transmit functions (available to both the AMPS and the TDMA modes):			
Code	Command	Status	Action/initial value
Y	Restart TRU	W or C	Executes either a ROM level reset (C = COLD) or a FLASH level restart (W = WARM); you are prompted for the type of restart to be performed
	Note: This restarts the TRU and forces an exit from the fullscreen mode.		
C	Set PA on/off	On or Off	Turns the PA on or off; the status is shown in the SCLPA/PA field
E	Set TXPOWIDX	0 to 7	Sets the current power level attenuation number. The TRU has maximum output power when power level is set at "0" (no attenuation); the status is shown in the Power Level or TxPwrIndex field
	Note: It is recommended that the power level be set to "0" unless otherwise specified as a site requirement.		
F	Set PA Max Power	30.5 dBm to 43.5 dBm	Sets the upper bound on output power of the PA (from 30.5 to 43.5 dBm) to the specified dBm with a resolution of 0.01dB
U	Set PA Power Step size	Set TXPOWSTEP dB_adjustment	Adjusts the output power PA step size of the PA by the amount specified; the power step value can be from 0.00 to 100.00 dB in steps of 0.01 dB

Table 2-5
Fullscreen commands for receive functions

Receive functions (available to both the AMPS and the TDMA modes):			
Code	Command	Status	Action / initial value
M	Set Antenna Port	(1 or 2 or 3) (4 or 5 or 6)	Selects antenna ports to use on path A and B. The Antenna Port field will show: Port A: 1, 2 or 3 Port B: 4, 5 or 6
	Note: Only 1 and 4 can be selected in Omni cell sites.		
N	Set Path	A B DIV	Selects the antenna path. The status is shown in the Antenna Path field. DIV indicates diversity switching between paths A and B.
O	Set RSSI Offset	00.0	Sets the RSSI Offsets (MCGAIN) for the ports on the specified antenna path. It should be performed during installation only. Do not change the values at this time.
Q	Detect All RSSI	— Signal reading area displays: -000.0	Constantly measures RSSI detected on all the six antenna ports until the Return key is pressed. Updates the six RSSI fields on the right hand side of the Signal Readings area on the display
	Note: The current path and port settings cannot be determined after this command is executed; the corresponding status fields will be cleared.		

Table 2-6
Fullscreen commands for AMPS mode functions

AMPS mode functions (available to the AMPS mode only):			
Code	Command	Status	Action/Initial Value
G	Set SAT Transmit	On or Off	Turns on/off generation of SAT; the status is shown in the SAT TX field
H	Change SAT	5970, 6000, or 6030	Sets the transmit SAT frequency; the selected SAT frequency is shown in the SAT TX field
K	Set Compander	On or Off	Sets TX compression and RX expansion on or off; the status is shown in the compandor field
L	Transmit Wideband Data (for TRU 1900)	—	Enables wideband data transmission; the TRU will begin to transmit wideband data at the currently selected MPA power level and the wideband data transmission is disabled by pressing the Return key.
P	Detect SAT,ST,RSSI	SAT, ST, RSSI or A (all) Signal reading area displays: -000.0	Constantly measures SAT, ST, and RSSI detected on the assigned port of the current path (set by the M and N commands) until the Return key is pressed; updates the RX SAT, RX ST, and RSSI fields on the left hand side of the signal readings area on the display
	Note: The M and N commands must be set prior to this command		
R	Set RX/TX Audio	TX, RX, BOTH, or OFF	TX—unmutes the TX audio; mutes the RX audio RX—mutes the TX audio; unmutes the RX audio BOTH (TX RX)—unmutes both TX and RX audio OFF—mutes both TX and RX audio The status is shown in the audio field
T	Set TX/RX Audio Sens	TX -xx.x, or RX -xx.x	Sets the audio sensitivity for the entered TX or RX path. The selected audio sensitivity levels are shown in the Audio Sens fields. The limits for the TX and RX audio sensitivity are: TX Sens: -28.0 dBm ð -xx.x ð -10.0 dBm RX Sens: -28.0 dBm ð -xx.x ð -16.0 dBm
	Note: Set both TX and RX sens to -18.0 in the tests described in this document.		

Table 2-7
Fullscreen commands for TDMA mode functions

TDMA mode functions (available to the TDMA mode only):			
G	Set DVCC	01 to FF (hexadecimal)	Sets the DVCC transmitted by the TRU when the MPA is enabled; DVCC is an 8-bit verification code transmitted between the mobile and the base station; it is used in TDMA cellular to differentiate between mobiles on the same frequency
H	Set Slot	1 to 3	The TRU currently supports Full Rate (3 slots) coding, that is, three mobiles sharing one frequency; this command sets the current TDMA slot used by the TRU for DVCC transmission and signal measurements
P	Detect DVCC, RSSI	-000.0 Y/N	Displays if current DVCC setting is detected and/or the RSSI measurement on the current slot of the antenna setup. The status will be displayed in the RX RSSI and RX DVCC fields
T	Stand-alone TX	On or Off	Allows the TRU to transmit without using a PA. This is used for either low power testing or on low power cell sites

Terminal interface command line mode

The Command Line Mode of the Terminal Interface can be used to execute three types of commands:

- maintenance commands
- measurement commands
- test commands

Each type of command serves a specific function as outlined in the following sections.

Maintenance commands

Each maintenance function may be used by an operator to aid in the diagnosis and repair of faults in the TRU. There are periodic maintenance functions that must be performed at regular intervals these schedules can be found in Chapter 3, Maintenance Schedules in this manual.

Note: The Command Line mode and the Fullscreen mode are intended for testing purposes only. Do not place the TRU into either one of these modes during call processing. The call in progress may be dropped.

Table 2-8 gives the name, terminal command, state allowed, and description for the command line mode maintenance commands.

Note: Only capitalized characters need to be entered. These commands apply to the both the TRU 1900 and the TRU3 1900 unless stated otherwise.

Table 2-8
Command line maintenance commands

Name	Terminal command	State allowed	Description
DRU Reset	Execute RESET	Any	Causes the DRU to completely reset all of its systems and restart processing at the ROM level
DRU Restart	Execute RESTARTFLASH	Any	Causes the DRU to restart processing within the flash load
Display Message (for TRU 1900)	Set DISPLAY string	Any	Sets the front panel display on the TRU to the specified string
Blinking Display (for TRU 1900)	Set BLINKING on/off	Any	Causes the front panel display of the TRU to blink on and off if it is set to ON
Set Personality	Set PERS ACC/ALR/AVC/ TLR/TTC	Any	The DSPs are reset and set to the given personality; the personality may be IS-54 CCH, AMPS LCR, AMPS VCH, TDMA LCR, or TDMA TCH
Set Channel	Set CHANNEL chan	All but maint.	Sets the receive and transmit channel to the given value
Rx Audio On/Off	Rx Audio On/Off	VCH	Turns on (unmute) or off (mute) the transceiver audio output upstream (to the ICRM)
Tx Audio On/Off	Set TXAUDIO on/off	VCH	Turns on (unmute) or off (mute) the transceiver audio output downstream (to the mobile)
Set Audio Sensitivity	Set AUDSENS TX/RX dBm_value	VCH	Sets the audio sensitivity for the transmit or receive paths
SAT Generation On/Off	Set SATGEN on/off	VCH	Turns on/off generation of supervisory audio tone
SAT Frequency Select	Set TXSATCC cc	VCH	Selects frequency to be used for SAT generation
Receive SAT Color Code	Set RXSATCC detector cc	VCH	Configures the SAT detector to look for specified color code
Receive Path Selection	Set PATH A/B/CURRENT /D/V	VCH	Sets the diversity receiver to be either the A(0) or B(1) path, or enables diversity switching (2)

-sheet 1 of 4-

Table 2-8
Command line maintenance commands (continued)

Name	Terminal command	State allowed	Description
Path Antenna Select	Set DIVPORT path_A_port:1/2 path_B_port:3/4	VCH	Establishes a nailed connection for the given antenna
Antenna Switch Mode	Set ASWMODE A/B Fixed	VCH	Sets the antenna switch mode for the given path; the path can be A(0) or B(1); the mode is fixed
Compandor Control	Set COMPRESSION/ EXPANSION on/off	VCH	Controls the dynamic range compression and expansion of the TRU compandor
Set C-Side Tone Generation	Set BCHTONE on/off	VCH	Enables or disables tone generation to the ICRM
Set C-Side Loopback	Set BCHLOOP on/off	All but maint.	Enables or disables TCM loopback to the ICRM
Set Mobile Loopback	Set RFLOOP on/off	VCH, or CCH	Enables or disables the RF loopback capability of the TRU
Transmitter Tone Generation Control	Set RFGEN on/off	VCH	Turns on or off generation of transmitter test tone
PA On/Off	Set PA on/off	VCH, CCH, or TTC	Turns the PA on or off
Set Transmission	Set TRANSMIT on/off	VCH, CCH, or TTC	Enables or disables the transmitter in the TRU; this command functions the same as the Set PA/ PA on/off command
Set PA Max Power	Set MAXTXPOW dBm_level	VCH, CCH, or TTC	Sets the output power of the PA (from 30.5 dBm to 43.5 dBm) to the specified dBm value +/- .01 dB
Set PA Power Index	TXPOWIDX index	VCH, CCH, or TTC	Sets the PA power to the specified DPC index; the index is an integer (from 0 to 7) that corresponds to a dBm power level
Set PA Power Step	Set TXPOWSTEP dB_adjustment	VCH, CCH, or TTC	Adjusts the output power DPC step size of the PA by the amount specified
-sheet 2 of 4-			

Table 2-8
Command line maintenance commands (continued)

Name	Terminal command	State allowed	Description
PA Type	Set PATYPE type	VCH, CCH, or TTC	Allows for the setting of the type of PA being used; MPA indicates that a MPA is being used; SCLPA indicates that a SCLPA is being used; NONE indicates that no PA is used—the TRU is using its own internal PA to output a modulated signal (Note: 1900 Macrocell does not support the none mode.)
Nominal Application Gain	Set NOMGAIN dB_level	VCH, CCH, or TTC	Provides a method of compensating for nominal losses or gains as a result of cell site hardware used with the TRU (range: ± 100 dB; 0.01 dB resolution)
Installation Calibration	Set INSTCAL dB_level	VCH, CCH, or TTC	Provides the capability to correct the power reading of the TRU (range: ± 100 dB; 0.01 dB resolution)
PA LED On/Off	Set PALED on off	Any	Turns the fault indicator LED on PA modules on or off
LAPD Timeout Control	Set LT/ LAPD TIMEOUT on/off	Any	Enables/disables the LAPD timeout; if the TRU detects loss of the LAPD link, it resets itself after 10-12 seconds; with the LAPD timeout set off, the TRU does not reset, which is necessary for stand alone testing
Message Trace Control	Set TRACE from/to ICP/MPA/ DSP on/off	Any	Enables or disables message trace at the specified interface point in the specified direction
Message Injection	Run INJECT from/to ICP/MPA/ DSP bytes	Any	Injects the specified message trace (bytes) at the specified interface point in the specified direction
Set Multicoupler Gain	Set MCGAIN A/B dB_loss1 dB_loss2 dB_loss3	Any	Sets the compensation for the gain through the antenna and multicoupler system for the antennas connected to the specified path
Enable fullscreen Mode	Set FS on	VCH, CCH, ALR, or Maint.	Enables the fullscreen mode of the terminal interface
Digital Verification Color Code	Set DVCC dvcc_value slot_number	TTC	Sets the DVCC value for the slot specified or all slots if ALL is entered as the slot number
-sheet 3 of 4-			

Table 2-8
Command line maintenance commands (continued)

Name	Terminal command	State allowed	Description
Clear SWERR Table	Set RSETSWERR	Any	Clears the SWERR table and resets the current SWERR count to zero
Fault Simulation	Run FAULTSIM fault	Any	Simulates the specified fault by displaying the fault on the front panel and sending the fault up to the ICP
SWERR Simulation	Run SWERRSIM class code	Any	Logs an artificial software error that is displayed on the front panel
OM Simulation	Run OMSIM omtype	Any	Pegs the occurrence of the specified OM
-sheet 4 of 4-			

Measurement commands

Measurements of operational parameters are taken periodically and on demand from the ICP or the terminal interface. If a measurement exceeds a threshold value, the ICP receives an alarm message. Table 2-9 gives the name, terminal command, state allowed, and description of the measurement commands.

Table 2-9
Command line measurement commands

Name	Terminal command	State allowed	Description
Reset Reason	Query RESET REASON	Any	When the DRU is reset, a reason code is stored in non-volatile memory and can be read when the DRU is active again to give the reason for the last reset; if no reason is stored, then the reset was caused by some unsolicited event
SAT Status	Query SAT detector	VCH	Indicates that SAT status on the receive path for the current SAT color code In TRU3, the status indicates the actual SAT value.
ST Status	Query ST	VCH	Indicates the ST status on the receive path
Uptime Counter	Query UPTIME	Any	The time that the DRU has been operating since the last reset in days, hours, and minutes
Previous Uptime Counter	Query PREVUPTIME	Any	The time that the DRU had operated before the last reset in days, hours, and minutes
-sheet 1 of 2-			

Table 2-9
Command line measurement commands (continued)

Name	Terminal command	State allowed	Description
RSSI Measurement	Query RSSI	Any	In the TTC state, indicates RSSI readings for each slot; in other states, indicates current RSSI reading at the diversity switch
Multicoupler Gain Settings	Query MCGAIN	Any	The multicoupler gain compensation in dBm for each antenna on both receive paths
Audio Sensitivity Settings	Query AUDSENS	VCH	The audio sensitivity settings in dBm for the transmit and receive paths
Hardware Version Number	Query HWVERS	Any	The hardware release number of the TRU being queried
Continuous Status Display	Query STATUS on/off DIV/ALL/CUR R/ST/SAT/A	VCH	Enables/disables a continuous display of channel number, RSSI, SAT, and ST of the diversity port or the channel number and RSSI readings from each port
PA status	Query PASTATUS	Any	The PA information (PA type, current power, power reference, step size, DPC index, and alarm status) being queried
MPA Firmware Version Number (for TRU 1900)	Query MPAFW	Any	The MPA/PA firmware version number of the DRU being queried Note: When using an TRU 1900, this command applies to the MPA mode only
Digital Verification Color Code	Query DVCC	TTC	The DVCC status for each slot
Display SWERR Table	Query SWERR	Any	The SWERR class, SWERR code, and associated information words
PA Maximum Power Setting	Query MAXTXPOW	VCH, CCH, or TTC	The adjusted maximum SCLPA power setting in dBm, stored in the TRU and the delta adjust from the SCLPA.
PA Power Step Size	Query TXPOWSTEP	VCH, CCH, or TTC	The adjusted SCLPA power step size setting in dB, stored in the TRU and the delta adjust from the SCLPA.
Radio Load status	Query LOAD	Any	For obtaining load name of the TRU.
Radio status (for TRU3 1900)	Query RADIO	Any	For obtaining information on the status of the TRU3 1900. This information is provided through an alphanumeric display on the TRU 1900.
-sheet 2 of 2-			

Test commands

Testing ensures the proper working order of the TRUs components. Table 2-10 gives the name, terminal command, state allowed, and the action associated with each test command.

Table 2-10
Command line test commands

Name	Terminal Command	State Allowed	Action/Initial Value
RAM Read/Write Test (for TRU 1900)	TEST RAM	Any	The read/write memory is checked to ensure that all locations can be written to and read, and that each address accesses a unique memory location.
Flash Load CRC Test	TEST FLASH	Any	This test reads all data stored in flash EEPROM, calculates the CRC, and compares this value against the CRC stored in the flash EEPROM
DSP Sanity Test	TEST DSP ALL	Maint.	This test checks the basic sanity of the DSPs by checking for basic messaging ability in each one.
Individual DSP Sanity Test	TEST DSP dspid#	Maint.	This test is similar to the previous one except that the sanity test is only run on a particular DSP chip.
Calibration Table Sanity Tests (for TRU 1900)	TEST EEPROM	Any	Calibration information is stored in EEPROM along with an associated CRC. This test calculates each table's CRC and compares to the stored CRC. If a table has not been written, the result is n/a.

Maintenance schedules

This section provides the maintenance reference chart and the corresponding periodic check lists, and when necessary, refers to detailed process procedures in this manual.

Periodic maintenance records

Periodic maintenance allows for

- the detection and replacement of degraded equipment before it affects service
- preventative steps to protect equipment from damage or degradation

To support these functions, records must be kept. Records allow you to

- recognize deteriorating performance by comparing current and past test results
- ensure that all steps required to protect equipment have been taken
- create a maintenance history of a cell site; thereby allowing you to plan for the future and predict future maintenance needs
- provide information to decide sparing levels and "out of expectation" failure level for specific equipment

Manuals and records

For maximum benefit, manuals, site logs, and maintenance records should be organized, kept on site and readily accessible so that call-out staff have access to and can determine the maintenance history of a particular site. All records should be completed before leaving the site.

Schedule for periodic cell site maintenance

Regularly scheduled visits are important for the preventative maintenance of a cell site. However, if maintenance teams are responsible for a number of cell sites, maintenance schedules for the different sites should be staggered so that labour time is more effectively and efficiently managed. Table 3-1 is an example of a maintenance schedule for six cell sites where the periodic routines are distributed evenly throughout a one year period.

3-2 Maintenance schedules

Table 3-1
Maintenance schedule example

Cell	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
#1	1 yr	mo	mo	qtr	mo	mo	6 mo	mo	mo	qtr	mo	mo
#2	mo	mo	1 yr	mo	mo	qtr	mo	mo	6 mo	mo	mo	qtr
#3	mo	qtr	mo	mo	1 yr	mo	mo	qtr	mo	mo	6 mo	mo
#4	6 mo	mo	mo	qtr	mo	mo	1 yr	mo	mo	qtr	mo	mo
#5	mo	mo	6 mo	mo	mo	qtr	mo	mo	1 yr	mo	mo	qtr
#6	mo	qtr	mo	mo	6 mo	mo	mo	qtr	mo	mo	1 yr	mo

A cell site maintenance reference chart and preventive maintenance check lists are provided.

TDMA 1900 Macrocell cell site maintenance reference chart

Table 3-2

Cell site maintenance reference chart

	Every Visit	Monthly	Quarterly	Semi-Annual	Annual
CE and RF frames					
Breakers, fans, and fuses	X				
LED checklist	X				
Frame and equipment voltage check			X		
DC inspection			X		
VSMO tests					X
ACU tests					X
Tx Insertion loss test					X
Frame equipment fan cleaning			X		
Transmission facilities:					
Copper Audio Link (T1)			X		
Power:					
Breakers	X				
Battery		X			
Rectifiers:		X			
Voltage level		X			
Alarm cut off					X
Main generator	X				
Backup generator			X		
Building AC service					X
-sheet 1 of 2-					

3-4 Maintenance schedules

	Every Visit	Monthly	Quarterly	Semi- Annual	Annual
Antennas and towers:					
General structure					X
Antennas					X
Pressurized transmission lines	X				
Housekeeping					
Heating/air conditioning					X
Administration					X
Dust control		X			
Site performance					X
Outside grounding					X
Inside grounding					X
Outside area	X				
Cell site building	X				
-sheet 2 of 2-					

TDMA 1900 Macrocell cell site EVERY VISIT checklist

Date: _____ Performed by: _____

Table 3-3
Cell site EVERY VISIT checklist

		Reference pages	☒
CE and RF frames			
	Check all RIP breakers on all CE and RF frames.	4-2	
	Verify all cooling fans are working on each CE and RF frame	4-3	
	Check fuses	4-3	
	LED checklist	4-3	
Cell site building			
	HVAC: Check air filters on air exchange/conditioner equipment Check that the thermostat setting is between 19°-22° C (67°-74° F) Verify HVAC operation by varying the thermostat	9-7	
	Check all interior lights	-	
	Verify automated security system by tripping alarm if applicable (reset after test)	-	
	Verify the presence of a fire extinguisher & check expiry date	-	
	Check for leaks in the roof	-	
	Check the condition around windows/doors for weather proofing	-	
	Check for deterioration of paint on walls, repaint as necessary	-	
	Check cable access ways through the walls for deterioration	-	
	Perform general housekeeping duties	9-8	
	Complete manuals, site logs, and records	-	
Outside site area			
	Security site checks	9-7	
	Tower lighting check	9-6	
	Inspect antenna grounding	9-6	
	Site grounds keeping	9-8	
	Check that there are no overhead lines down	-	
Antennas and tower			
	Pressurized transmission lines	9-6	
Power			
	Main generator	9-3	
	Check breakers in the building panel box (check for tripped breakers)	-	

TDMA 1900 Macrocell cell site MONTHLY checklist

Date: _____ Performed by: _____

Table 3-4
Cell site MONTHLY checklist

		Reference Pages	☒
	Perform the <u>EVERY VISIT</u> routine checks	3-5	
Power:			
	Battery (liquid- electrolyte): Cell voltages Electrolyte levels Battery terminals Exhaust system and sensor	9-2	
	Rectifier: Check output voltage as per manufacturer's specifications	9-2	
Housekeeping:			
	Dust control	9-7	

TDMA 1900 Macrocell cell site QUARTERLY checklist

Date: _____ Performed by: _____

Table 3-5
Cell site QUARTERLY checklist

		Reference Pages	☒
	Perform the <u>EVERY VISIT</u> routine checks	3-5	
	Perform the <u>MONTHLY</u> routine checks	3-6	
CE and RF frames			
	Frame and equipment voltage checks	4-5	
	DC inspection	4-4	
	Equipment fan cleaning	9-7	
Power			
	Backup generators: Operation Fluid levels	9-3	
Transmission facilities:			
	Copper Audio Link (T-1)	9-2	

TDMA 1900 Macrocell cell site SEMI-ANNUAL checklist

Date: _____ Performed by: _____

Table 3-6
Cell site SEMI-ANNUAL checklist

		Reference pages	☒
	Perform the <u>EVERY VISIT</u> routine checks	3-5	
	Perform the <u>MONTHLY</u> routine checks	3-6	
	Perform <u>QUARTERLY</u> routine checks	3-7	

TDMA 1900 Macrocell cell site ANNUAL checklist

Date: _____ Performed by: _____

Table 3-7
Cell site ANNUAL checklist

		Reference Pages	☒
	Perform the <u>EVERY VISIT</u> routine checks	3-5	
	Perform the <u>MONTHLY</u> routine checks	3-6	
	Perform <u>QUARTERLY</u> routine checks	3-7	
	Perform <u>SEMI-ANNUAL</u> routine checks	3-8	
CE and RF frames:			
	Tx Insertion loss test	7-1	
ACU tests:			
	Alarm input points	8-2	
	Output contact points	8-2	
VSMO tests:			
	Oscillator frequency test	5-1	
	Oscillator level	5-1	
Power:			
	Rectifiers: Test the alarm/cut out sections on the rectifiers by adjusting the high and low voltage	9-2	
	Building AC service: Check the building AC main service	9-3	
Inside grounding:			
	Verify frame grounds	9-3	
	Verify that all inside ground connections lead back to the common ground point	9-3	
	Check all connections, ensure new/changed equipment is properly grounded	9-3	
	Check that the transmission line to the antennas is lightning protected where it comes into the building	9-4	
-sheet 1 of 3-			

Outside Grounding:			
	Using binoculars or a spotting scope, verify that the air lightning rod and antennas are still attached to the tower and grounding system	9-4	
	Verify that the antenna feed cables are grounded at both ends	9-4	
	Verify that the cables and clamps attaching the tower and waveguide bridge to the grounding system are secure	9-4	
	Verify that the cables and clamps connecting the guy wires to the grounding system are secure	9-4	
	Verify that transmission cables are grounded at both the top and bottom of the tower, and the building entrance	9-4	
	Buildings with metal walls, roof or base, all metal parts are grounded	9-5	
	Site fence, fuel tank or other metal structures are grounded	9-5	
	Check that grounding cables and clamps are secure	9-4	
Antennas and towers:			
	General structure: Check the tower base for cracks, concrete break up and upheaval	9-5	
	Check all guy anchors for cracks or upheaval	9-5	
	Check guy tension and attachment	9-5	
	Check fasteners for security	9-5	
	Check all components for rust	9-5	
	Check for flaking paint (often a sign of over-stress) re-paint if necessary	9-5	
	Check that the transmission line is adequately supported and protected between the cell site building and the antenna tower	9-6	
	When tower is climbed, check grounding on the higher parts	9-5	
	When tower is climbed, check the tower lights	9-5	
	Antennas: When tower is climbed, perform structural inspection of antenna: • Check for correct orientation and tilt • Check for cracks, dents, burns • Check for fasteners, attachment and security • Check for transmission line and ground attachment security • Check for audible gas leakage in pressurized system	9-6	
-sheet 2 of 3-			

3-10 Maintenance schedules

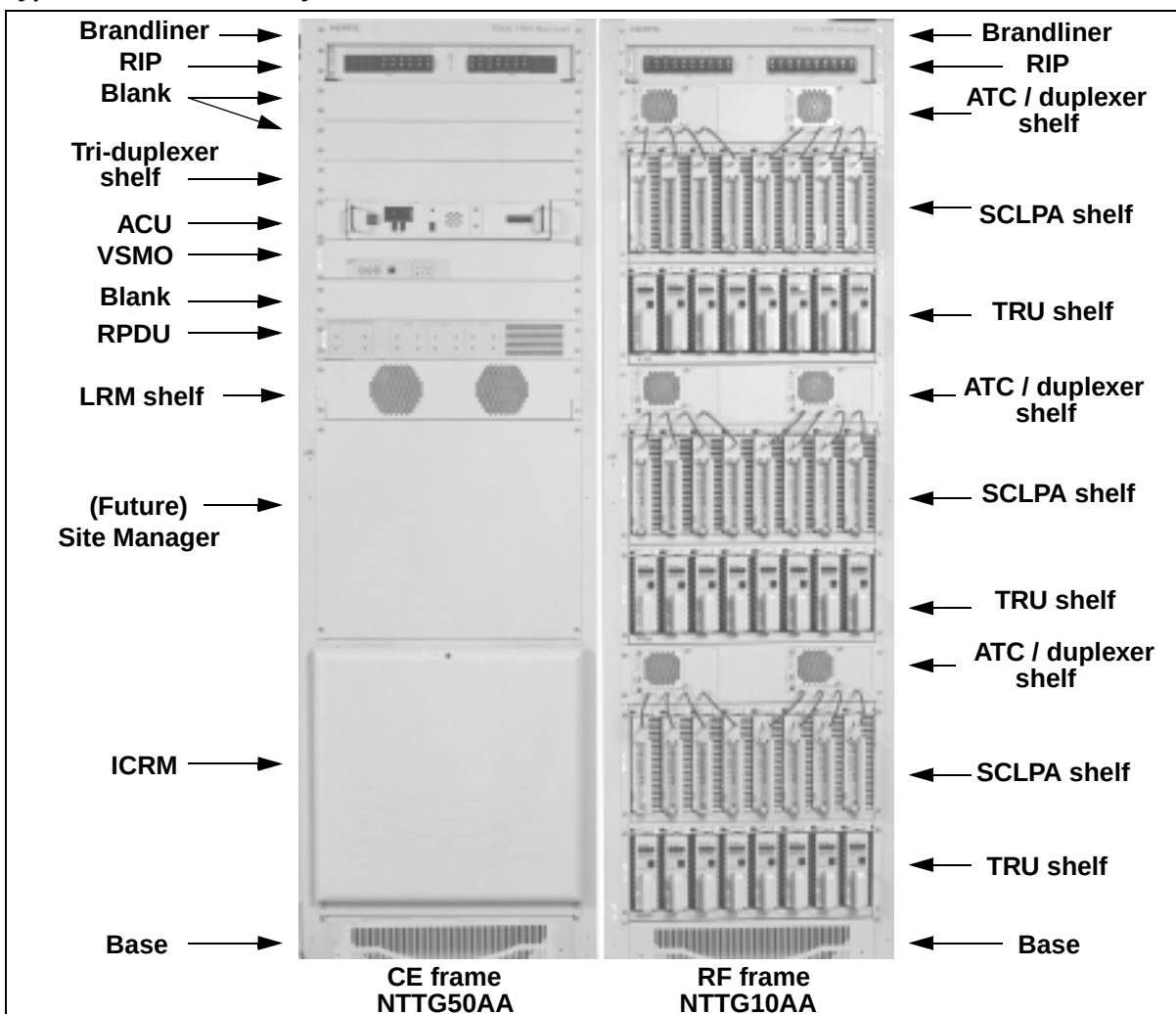
Site performance:			
	Confirm fringe coverage	9-6	
	Confirm call handoffs	9-6	
	Antenna sweep test	6-5	
Housekeeping:			
	Heating/ air conditioning: • Perform heating manufacturer's annual maintenance recommendation • Ensure unit is properly secured in location • Verify that the compressor and the fan motors are fully operational • Verify that the drainage system is fully operational • Check for insects, mouse and birds nest in intake and exhaust systems	9-7	
Administration:			
	Site licenses	9-8	
	Statutory requirements	9-8	
-sheet 3 of 3-			

CE and RF frames

CE and RF frames

Figure 4-1 shows the location of equipment in the Common Equipment (CE) and Radio Frequency (RF) frames of a typical cell site.

Figure 4-1
Typical cell site frame layout



Breakers

The ACU monitors the status of the breakers. It is good practice however to check that the correct breakers are on. Refer to Figure 4-2 for the CE and Figure 4-3 for the RF frame dc breaker panel layout. If a breaker is not functioning properly refer to *TDMA 1900 Macrocell Troubleshooting Guide*, 411-6201-501.

Figure 4-2
CE frame RIP panel layout

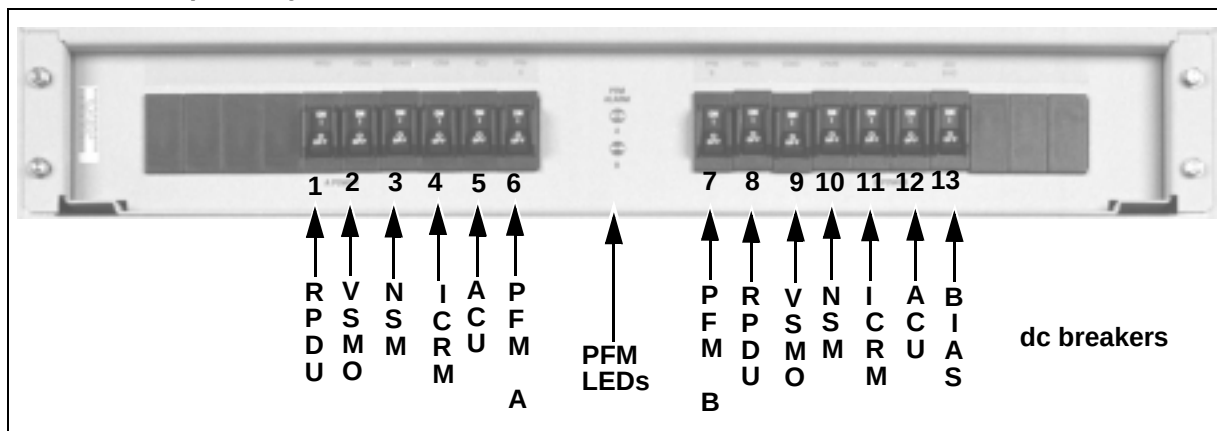
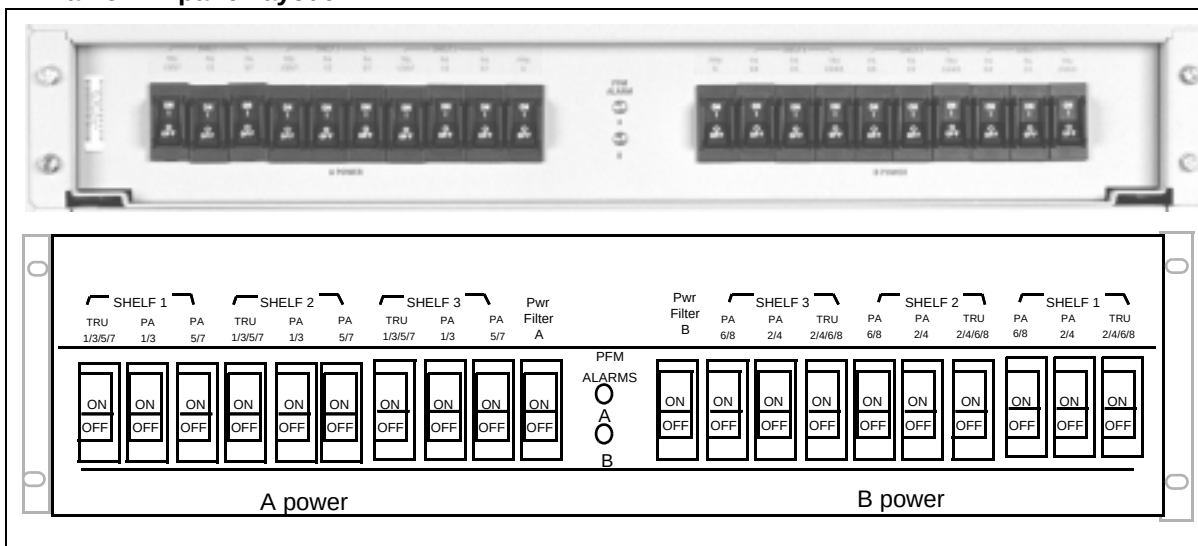


Figure 4-3
RF frame RIP panel layout



Fans and fuses

Part of the function of the ACU is to monitor the status of the fans, and fuses. It is good practice however to check that the shelf fans are working. If the ACU indicates a fan or module failure, and there is no apparent power to the unit, check the fuse. If necessary replace the fuse with one of the same type and rating. If the unit is still not functioning properly refer to *TDMA 1900 Macrocell Troubleshooting Guide*, 411-6201-501.

LED checklist

Verify the proper operation of various cell site equipment using the LED status checklist shown in Table 4-1. If any other LED condition is present other than the desired state refer to *TDMA 1900 Macrocell Troubleshooting Guide*, 411-6201-501.

Table 4-1
LED status checklist

Equipment	LED description	Desired state
CE RIP	PFM alarms A and B	on (green)
ACU	Four digit alarm display	no alarms flashing
VSMO	Unit pass Alarm	on (green) off
RPDU	LRM and RRM alarm indicator on the front panel. A fan module alarm LED for the RPDU and the LRM shelf on the front panel.	A green status LED on the RPDU indicates power with no alarms within the RPDU.
RF RIP	PFM alarms A and B	on (green)
ATC	Power Alarm Fan alarm	on (green) off off
TRU 1900	8 character display	no fault msg
TRU3 1900	Normal Alarm (LOS/FAIL LED)	on (green) off (red)
SCLPA	Normal Alarm	on (green) off

Dc power inspection

An orderly installation of dc power is required at the cell site to ensure ease of expansion as traffic increases. Refer to Table 4-2 and Table 4-3 for inspection procedures.

Table 4-2
Dc power inspection

Step	Action	Observation
1	Verify that the dc power cables from the breaker panel on the power bay to the equipment racks have been run in an orderly fashion and are secured to the runway.	
2	Verify that the lugs have been installed correctly and, if terminated on aluminum busbars, have been treated with anti-oxidant.	
3	Verify that the minimum bending radius has not been exceeded on the power cables see Table 4-3.	
4	Verify that the breaker positions on the power bay have been labeled and are cabled as indicated on the labels.	Note: See Figure 4-2 for dc breaker panel layout.
5	Verify that the RF bays are bonded to the principle ground bar line-up feeder with a #6 AWG jumper.	

Table 4-3
Minimum bending radii of power cables

Wire Size	Inches	Millimeters	Wire Size	Inches	Millimeters
14 AWG	11/16	17.5	3/0 AWG	3 3/16	80.5
12 AWG	3/4	19.6	4/0 AWG	3 7/16	87.6
10 AWG	15/16	23.1	300 MCM	4 1/8	104.6
8 AWG	1 3/16	31.0	350 MCM	4 3/8	111.5
6 AWG	1 1/2	39.6	400 MCM	4 5/8	117.3
4 AWG	1 3/4	45.7	500 MCM	5 1/16	128.3
2 AWG	2 1/8	53.3	600 MCM	5 9/16	142.2
1 AWG	2 1/2	63.0	700 MCM	5 15/16	151.1
1/0 AWG	2 5/8	68.0	750 MCM	6 1/8	155.4
2/0 AWG	2 7/8	73.9	800 MCM	6 5/16	160.0

Frame and equipment voltage checks

Verifying frame and equipment voltages is a good preventative check that can ensure proper cell site performance. Follow the procedure in Table 4-4 to verify the frame voltage and polarity.

Table 4-4
Frame voltage procedure

Action	Observation
Measure and record the <u>Voltage and Polarity</u> of the <u>A power</u> and <u>B power</u> terminals with respect to the dc Return bar at the top of <u>each frame</u> (CE and RF).	+26.5 to 29 V dc

Refer to Figure 4-4, Table 4-5, Table 4-6, Table 4-7, Table 4-8, Table 4-9, and Table 4-10 for voltage measurement pin locations for the CE and RF frame equipment.

Figure 4-4
Power connector on ACU backplane.

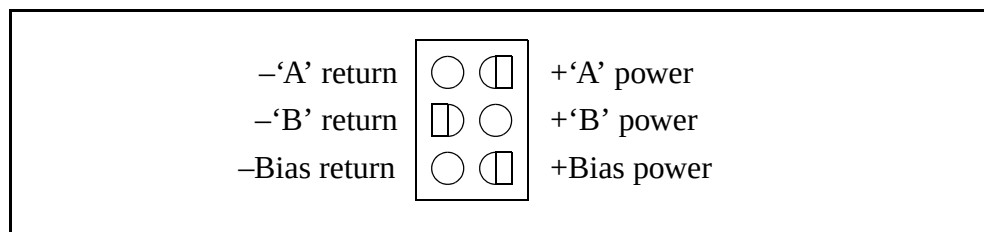


Table 4-5
VSMO input power connector (P3) signals

Pin#	Signal name	Description
1	+27 V–A	+27 V dc "A" power in
2	+27 V–RETA	+27 V dc "A" power return
3	+27 V–B	+27 V dc "B" power in
4	+27 V–RETB	+27 V dc "B" power return

Table 4-6
RPDU power connector (J2) (6-pin Mate'n lock)

Pin#	Signal
1	+27 V dc "A"
2	+27 V dc "B"
3	A ground
4	B ground
5-6	No connection

Table 4-7
RRM power connector on the RPDU (J9) (12-pin Mate'n lock)

Pin#	Signal
1	RRM X dc power
2	RRM X' dc power
3	RRM Y dc power
4	RRM Y' dc power
5	RRM Z dc power
6	RRM Z' dc power
7	RRM X dc return
8	RRM X' dc return
9	RRM Y dc return
10	RRM Y' dc return
11	RRM Z dc return
12	RRM Z' dc return

Table 4-8
LRM fan module (J10) (10-pin ribbon) on the RPDU

Pin#	Signal
1	+27 V dc "A"
2	+27 V dc "A"
3	+27 V dc "B"
4	+27 V dc "B"
5	dc return "A"
6	dc return "A"
7	dc return "B"
8	dc return "B"
9	Fan 1 alarm (Normal = +27 V dc, alarm =< 1 V dc)
10	Fan 2 alarm (Normal = +27 V dc, alarm =< 1 V dc)

Table 4-9
LRM (J3) power connector

Pin#	Signal
1	power
2	return

Table 4-10
ICRM power connector

Pin#	Signal
TB1	24 V dc

Very Stable Master Oscillator (VSMO) tests

Very Stable Master Oscillator (VSMO)

Cell site transceivers require a stable reference in order to accurately produce transmit carrier frequencies and to select receive frequencies. The VSMO produces this stable reference for the Transmit Receive Units (TRUs) to ensure that all channels operate on their assigned frequencies and do not interfere with other channels. Therefore the VSMO should be tested once each year.

Master Oscillator power and frequency test

Follow the steps in Table 5-1 for the oscillator test procedures. See Figure 5-1 and Table 5-2 for IFR test set up.



Attention

Measurement discrepancy

When using the Power Meter on the IFR 1900, the signal reading was 5.8–6.3 dB lower than the Spectrum Analyzer value.

Table 5-1
VSMO test procedures

Step	Action	Observation
1	Connect the communications monitor to the output port on the back of the VSMO.	SMA to N type cable required.
2	Measure the output of the master oscillator and record on the test form.	8.2dBm $\pm$ 2.6dB
3	Observe and record the RF frequency / frequency error	4.8 MHz $\pm$ 0.085 ppm

Note 1: All unused ports should be terminated with 50-ohms for a correct power reading.

Note 2: The VSMO is adjusted at the factory for frequency accuracy. If the frequency test fails it must be replaced with a new unit.

Note 3: The recommended frequency counter is a:
HP 53132 A 225 MHz Universal Frequency Counter
An external 10 MHz reference into the frequency counter must be used in order to ensure measurement accuracy (ensure external/internal reference switch is selected to "external"). Any one of GPS, rubidium, or cesium references may be used, or any reference that meets a minimum stability requirement of $\pm 1 \times 10^{-9}$ (± 1 ppb). Ensure that prior to usage, that the external frequency reference has stabilized/warmed up according to the manufacturer's specifications and requirements.

Figure 5-1
Oscillator power level and frequency test setup

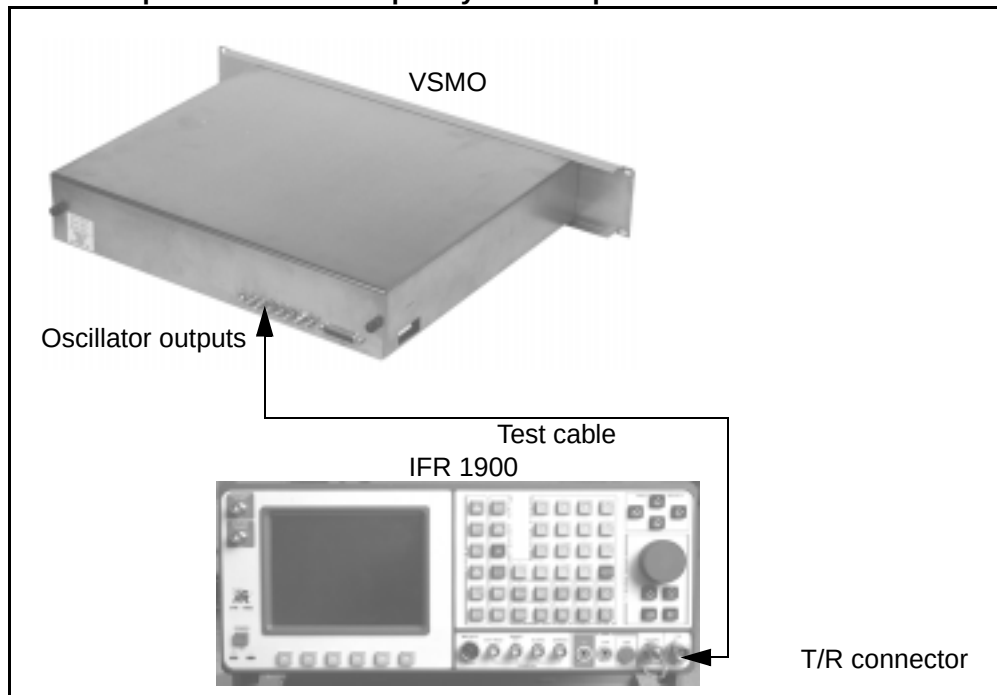


Table 5-2
IFR set up for VSMO test

IFR field	Data
Set Rcvr Freq	4.8000 Mhz
Select Mod	FM3
Select Rcvr In	T/R
Select Input Atten	0 dB
Select AGC Type	Auto
Rcvr Out Speaker	off
Rcvr Out Audio	off
Rcvr Out Demod Out	off
Auto Volume Level	off
Operation Mode	Direct
Signaling Formats	Digital

Note: For IFR operation refer to the “Appendix A” in this manual.

Antenna and Transmission line tests

**CAUTION****RF Radiation Hazard**

All transceiver transmitters must be turned off before disconnecting or connecting transmit cables to avoid RF induced injuries.

**CAUTION****Service Disruption**

The following tests are service affecting when the antenna is disconnected.

Antenna direct current continuity

These tests are required for new antennas or antennas suspected of faulty operation. **These tests are service affecting.**

The most important consideration of antenna direct current continuity is not so much the antenna but the transmission line shield. Of course, the antenna must be electrically connected to the coaxial transmission line, but most important, the transmission line shield must be grounded for lightning protection.

The other dc tests serve as more of a record of the resistance of the shield and center conductor. They may indicate future grounding problems or identify a change in the antenna dipole condition (open, now shorted or vice versa). Follow Table 6-1 for the antenna direct current continuity test.

Table 6-1
Direct current continuity test

Step	Action	Observation
1	Visually inspect the bonding of the transmission line to the mast ground riser at both the top and bottom of the tower.	The transmission line must be bonded at both the top and bottom. A set of binoculars or a spotting telescope may be required to verify the upper bonding.
2	Inside the building, measure the <u>dc resistance of the outer conductor to the principle ground</u> .	Less than or equal to 0.5 Ω
3	Measure and record the <u>dc resistance of the center conductor (pin) to the outer conductor (shield)</u> .	
4	Also check the alignment of the center pin of the heliax connector. If necessary re-align the centre pin so that the female pin in the antenna jumper cable connector is not damaged.	Repair or replace heliax, connectors, ground systems as required.

Antenna return loss

The antenna return loss is measured to verify that the antenna is properly matched to the system and to identify open connectors. This test uses the signal generator, the spectrum analyzer and the VSWR bridge to sweep the antenna for return loss at both the receive (1850 to 1910 MHz) and transmit (1930 to 1990 MHz) frequency bands.



CAUTION **Service Disruption**

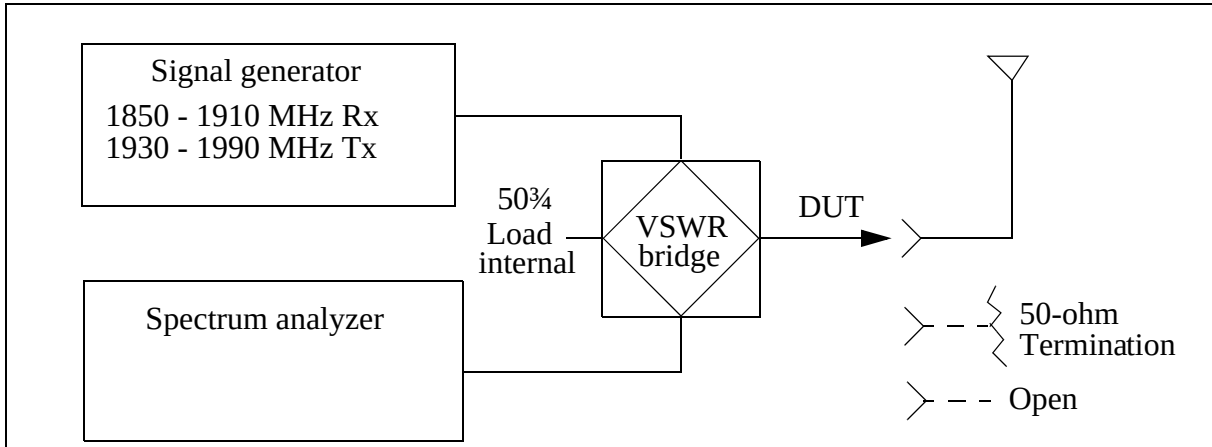
The following tests are service affecting when the antenna is disconnected.

Test equipment: RF Signal Generator
Spectrum Analyzer
VSWR Bridge

If any of the test equipment is not available, a Thruline Wattmeter may be used.

Refer to Figure 6-1 and Table 6-2 for antenna return loss test set up diagram and test procedure.

Figure 6-1
Antenna return loss block diagram



Antenna return loss test

Table 6-2
Antenna return loss test procedure

Step	Action	Observation
1	Connect the signal generator, the spectrum analyzer and a 50 ohm load to the VSWR bridge.	See Figure 6-1.
2	Set the signal generator output level to 0 dBm.	
3	With the Device under Test (DUT) VSWR bridge port connect to an open, adjust the display on the spectrum analyzer to the top of the screen.	
4	Connect a 50 ohm termination to the open port on the VSWR bridge and step the generator through the receive and transmit band to verify the test set-up for return loss.	Return loss should be greater than 35 dB over the bands.
5	Remove the termination from the VSWR bridge, connect the antenna jumper cable to the open port and again step the generator across the transmit and receive bands.	
-sheet 1 of 2-		

6-4 Antenna and Transmission line tests

Table 6-2
Antenna return loss test procedure (continued)

Step	Action	Observation
6	Record the minimum <u>return loss</u> of the antenna and transmission line in the system.	Return loss: 1850 to 1910 MHz Rx 1930 to 1990 MHz Tx The return loss typically should be 3 or 4 dB greater than the antenna return loss as stated by the antenna manufacturer.
7	Repeat the test for each antenna installed for the cell site.	
8	If the test fails, check the antenna matching, cables and connectors.	
-sheet 2 of 2-		

Thruline Wattmeter method (antenna return loss)

This is a service affecting test using a Thruline Wattmeter. It can be used with transmit antennas only.



CAUTION

RF Radiation Hazard

All transceiver transmitters must be turned off before disconnecting or connecting transmit cables to avoid RF induced injuries.

Follow steps in Table 6-3.

Table 6-3
Thruline wattmeter method

Step	Action	Observation
1	Connect the Thruline Wattmeter between the duplexer and the antenna.	
2	<u>Measure the forward and reverse power</u> using the appropriate element with one or more transmitters turned on.	Reflected power less than 4% of forward power

Antenna sweep

Measure the reflected power from the antenna across the entire cellular band (receive and transmit) to check for hidden damage or deterioration of the antennas.

Follow the procedure in Table 6-4 for the antenna sweep test.

Table 6-4
Antenna sweep procedure

Step	Action	Observation
1	Set up and calibrate a network analyzer (HP8753C or equivalent) to sweep 1850 to 1990 MHz.	
2	Notify the <u>Control Center</u> to OFFLINE the cell site.	
3	Connect the network analyzer to the antenna transmission line.	
4	Perform a return loss sweep on the Network Analyzer. Note the worst frequencies by placing 2 markers each on the transmit and receive frequencies. then print a hard copy of the upper left quadrant.	Measured return loss of the antenna can be calculated as: $RL(\text{ant}) = -14 \text{ dB} - 2 \text{ times the antenna cable loss}$ or: Compare you results with that of the RF Path calculated return loss of the cell site logbook (check the RF PAtH Analysis sheet). If the results are bad compared to the log book values connect the test cable directly to the main transmission line and resweep. It is possible to have a bad jumper. If the results are still bad then the problem could be either with the transmission line or the antenna.
5	Do a TDR sweep of the antenna. Print a hard copy of the lower left quadrant.	
6	Do a SWR sweep of the antenna. Print a hardcopy of the upper quadrant. The result should not be higher than 1.5:1	
-sheet 1 of 2-		

Table 6-4
Antenna sweep procedure (continued)

Step	Action	Observation
7	Do a Smith Chart of the antenna. Print a hard copy of the lower right quadrant. The results must be close to 50 ohms (± 50 ohms).	
8	Reconnect all the jumpers to their proper location then inform the Control Center to RTS the cell site.	If the transmit antenna is bad and the receive antenna is good on the transmit band, restore service by using the receive antenna until the transmit antenna is repaired.
-sheet 2 of 2-		

VSWR monitor deployment

Refer to the “VSWR monitor deployment” section in *TDMA 1900 RF Deployment Guide*, 411-6201-200.

Tx insertion loss test

Overview

Check the transmit insertion loss once a year. The AutoTune Combiners (ATC) require no periodic maintenance. For a complete functional description refer to *TDMA 1900 Macrocell RF Frame Description*, 411-6201-113.

If an alarm exists, perform the ATC troubleshooting procedure as described in Chapter 3, Troubleshooting at the cell site, in *TDMA 1900 Macrocell Troubleshooting Guide*, 411-6201-500.

Transmit insertion loss test

The purpose of the forward path insertion loss test is to verify the performance of the ATC, duplexer transmit (forward) filter, and all RF cables and connection between the TRU and the duplexer antenna connector. The test involves measuring the RF power output at the duplexer antenna connector for each TRU/PA pair, then comparing that power measurement to the power measurement taken at the PA RF output connector. The difference between the two measured power levels should be less than 4.9 dB. This test also will verify SCLPA output power.

**CAUTION****RF Radiation Hazard**

DO NOT disconnect an RF cable from the ATC if there is RF power applied to that cable.

**CAUTION****Damage to Test Equipment**

Be aware of and adhere to the signal input limits of all test equipment used in these procedures.

Combiner insertion loss–power method

This test verifies the loss from the power amplifier output to the antenna port of the duplexer. It also verifies that the return loss of the isolator is within specifications. The loss characteristic is verified by comparing the power output measured at the duplexer antenna (ANT) port with the power output measured directly from the power amplifier. Refer to procedure in Table 7-1 and Figure 7-1.

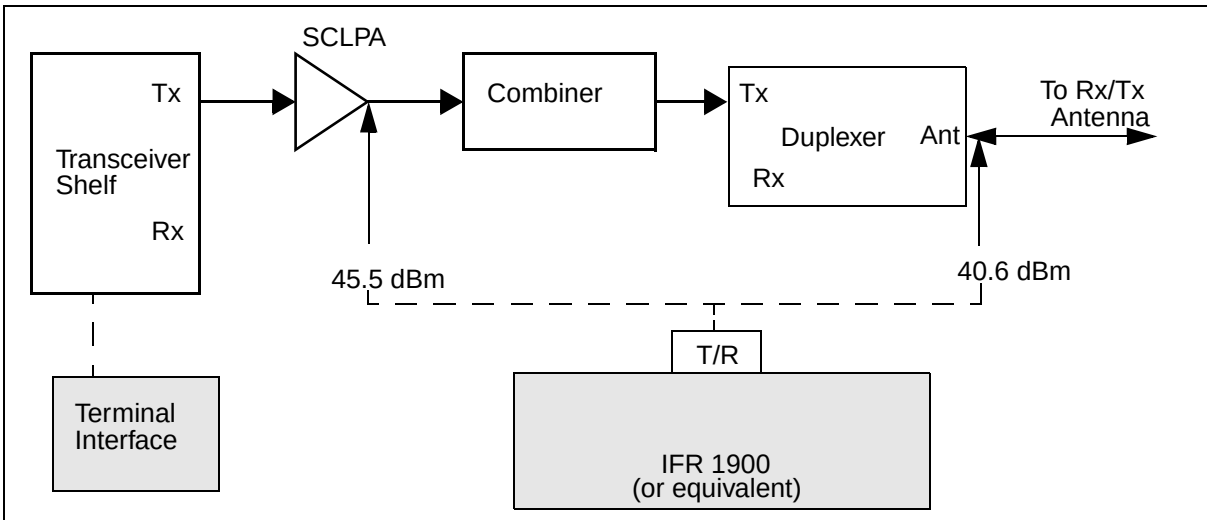
Table 7-1
Tx insertion loss procedure

Step	Action	Observation
1	Place the cell site out of service at the MTX using the "MANBUSY" command.	
2	Setup the communications monitor to measure the power of the on-frequency Tx carriers. For IFR setup refer to Appendix A in this manual.	
3	Connect a video terminal to the TRU used for this test. Set up the terminal as per the terminal setup procedure. (See Chapter 2 in this manual for terminal interface setup).	
4	Connect the RF input of the communications monitor (T/R) to the SMA connector on the PA output cable of the TRU to be tested.	
5	Set up the TRU for Tx power checks: • set max power level = 45.5dBm • set power step = 4 dB • power step level = 0 Set to the assigned channel (same as IFR). Turn the PA on.	Carrier: ON
6	Measure the max power output level at the SMA connector of the PA output.	Note the power output level.(45.5 dBm)
7	Turn the PA off and then restore the RF cabling.	Carrier: OFF
8	Connect the RF input (T/R) of the communications monitor (IFR) to the duplexer antenna port. See Figure 7-1 for the test set-up.	Note: Ensure only one TRU is transmitting due to the IFR power handling capabilities.
-sheet 1 of 2-		

Table 7-1
Tx insertion loss procedure (continued)

Step	Action	Observation
9	Turn the PA on and measure the power output at the antenna port of the duplexer.	Maximum loss between the PA output cable and the antenna port of the duplexer must not exceed 4.9 dB .
10	Record value	
11	Turn the PA off.	Carrier: OFF
12	If the power level output loss is out of spec., refer to <i>TDMA 1900 Troubleshooting Guide</i> , 411-6201-501.	
13	Repeat this test for the remaining Tx paths.	
14	Reconnect all cables.	
-sheet 2 of 2-		

Figure 7-1
Power measurement diagram



Note: Maximum loss is shown, if the loss is greater than 4.9 dB troubleshoot the ATC, cables and duplexer. Refer to the *TDMA 1900 Macrocell Troubleshooting Guide*, 411-6201-501.

ACU tests

Overview

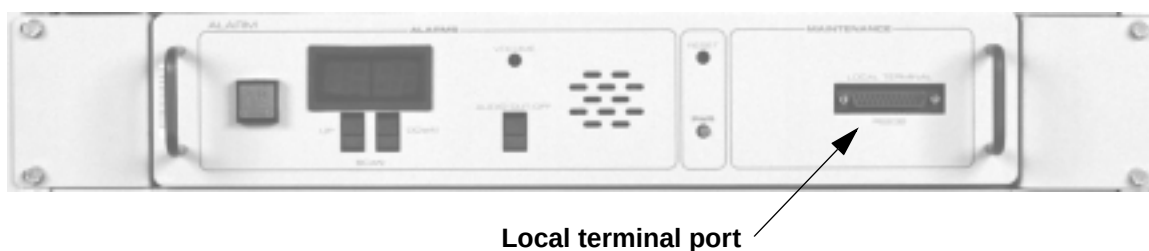
Alarm Control Unit (ACU)

The Alarm and Control Unit (ACU) provides discrete alarm monitoring, reporting and control functions at a cell site. The site ACU concentrates all alarm input points at the cell site and updates the MTX of any status change over redundant data links. The MTX can also poll for the condition of the ACU and request current status information or change the status of any output control contact. For a complete description of the ACU, refer to *TDMA 1900 Macrocell CE Frame Description*, 411-6201-112.

The ACU alarm input points for equipment such as fans, over-temperature alarms and door switches should be verified once a year. Alarm output contacts and alarm reactions should be verified at the same time.

The MAINTENANCE (Local Terminal) port located on the front of the ACU gives direct access to the ACU MPU (microprocessor) board. You can use this interface to configure and monitor the alarm input points and the control output contacts. A photo of the ACU is shown in Figure 8-1.

Figure 8-1
ACU front panel



ACU test setup

Connect a VT100 terminal (or equivalent) using a null modem cable to the ACU local terminal connector. Setup the terminal as described in Table 8-1.

Should you be unable to set the terminal to the settings listed, the ACU configuration can be changed by setting the local terminal switch (SW3) on the MPU board to match your terminal settings. Refer to Table 4-6 for the settings of SW3 in *TDMA 1900 Macrocell CE Frame Description*, 411-6201-112.

Once the terminal and ACU are set properly, connect the terminal to the MAINTENANCE port with a null modem cable.

Table 8-1
ACU test setup procedure

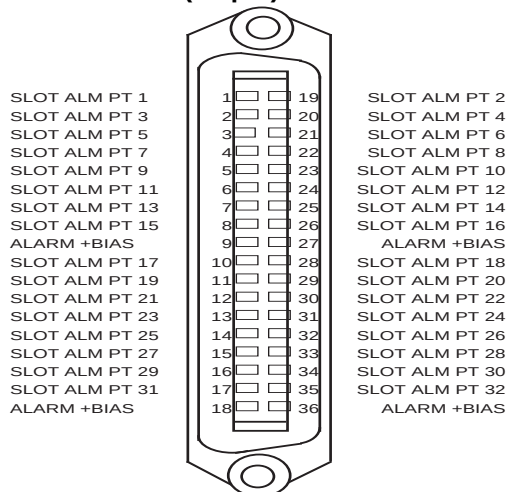
Step	Action	Observation
1	Set up the terminal as per the requirements to the right.	BAUD Rate: TX 9600 RX 9600 Scroll: smooth Auto repeat: on ANSI Auto Wrap: off Receiver Parity: ignore Parity: disabled Character Bits: 8 bits Interface: on Scroll Key: VT100 Form Feed: line feed Control Characters: executed Local Echo: off RTS-CTS Handshake: off 8 Bits Tx: space
2	Power up the terminal, hold down the CONTROL key and press the Z key. Press the RESET key on the ACU to activate the Maintenance Screen on the terminal.	The CS ACU Maintenance Screen (Figure 8-3) will appear.
3	Using the keyboard arrows, select the Input and Monitor menu items on the screen.	Verify the remote alarms per the site alarm records.
-sheet 1 of 2-		

Table 8-1
ACU test setup procedure (continued)

Step	Action	Observation
4	Test all equipped alarm points on the ACU. This can be done by turning the appropriate DC breaker OFF, removing fuses, connectors, opening doors, etc. Note: Some of these steps may be service affecting.	Bold display - alarm ON Normal display - alarm OFF
5	Apply +27 Vdc to each equipped alarm input at the rear of the ACU. Verify that each alarm indicates the correct status on the VT100 screen.	Bold display - alarm ON Normal display - alarm OFF
6	Open and close each selected output and verify its action by observing an open or short on the rear output connector, J8.	
7		The MAP technician should verify that the correct alarms and logs are generated at the MTX as the site technician activates alarm conditions. Similarly, the cell site technician should ensure that the audible and LED alarm indicators on the ACU properly report the activation of the alarm conditions.
-sheet 2 of 2-		

A typical alarm connector pinout is shown in Figure 8-2.

Figure 8-2
Typical alarm connector (36-pin)



Using the ACU maintenance terminal

A menu of options will appear on the screen as shown in Figure 8-3.

There are four primary options at the first level to choose:

- input
- output
- general
- analog ins (not used)

Each option consists of up to three lines on the screen. Figure 8-4 shows the structure of these options.

Figure 8-3
Initial screen display

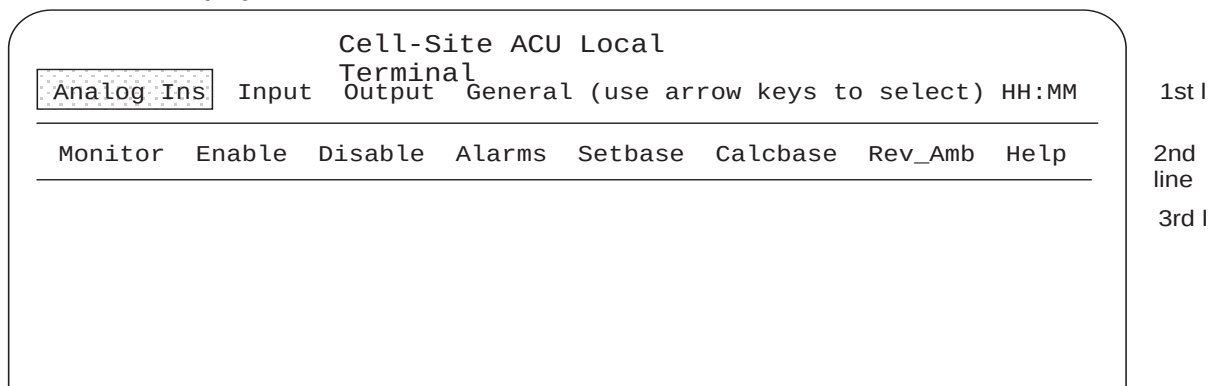
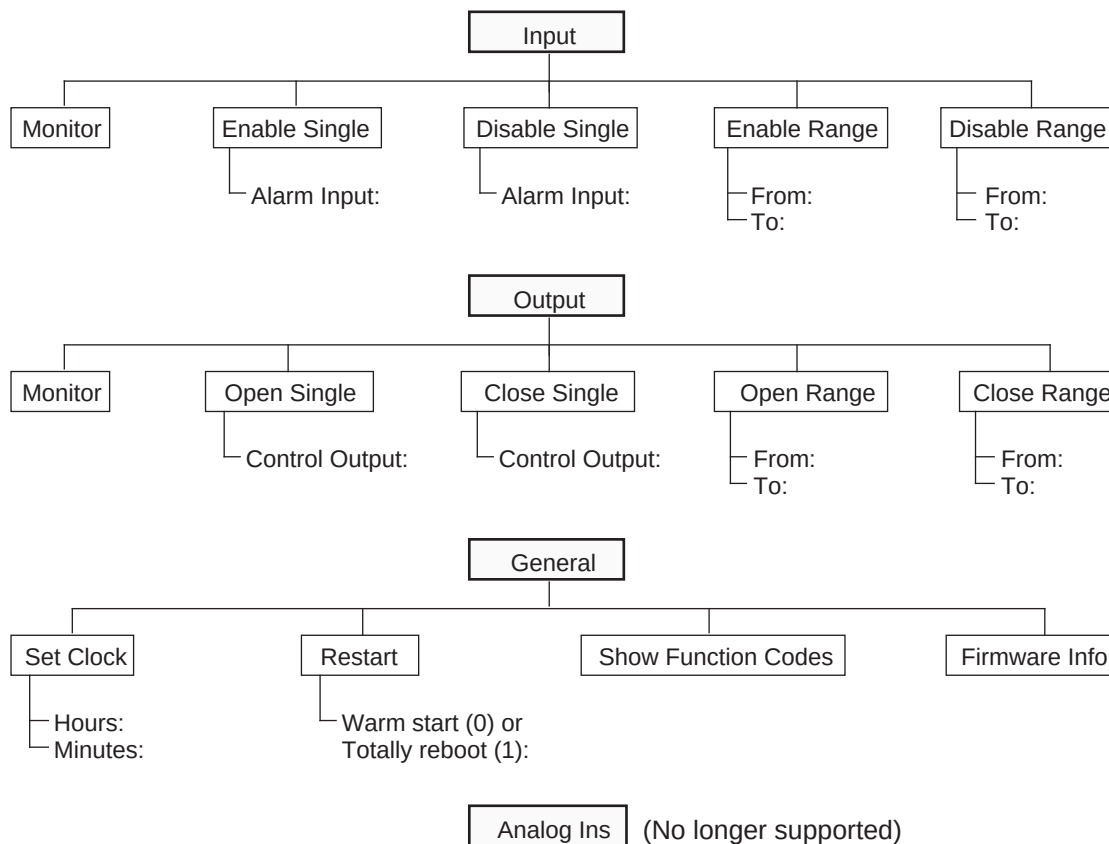


Figure 8-4
ACU menu structure



Selecting an option

The procedure for selecting an option and setting the parameters for that option are as follows (the 'Enable Single' in the Input option is described as an example):

Note: The left and right arrow keys move the cursor to options on the same line. The up arrow key moves the cursor back to the previous line and down arrow key moves the cursor to the next line.

1. On the first line, move the cursor to the Input option by pressing the right arrow key. The options on the second line will change accordingly as the cursor is moved.
2. Use the down arrow key to move the cursor to the second line. The cursor will always highlight the first option on the second line.
3. On the second line, move the cursor to the Enable Single option by pressing the right arrow key. The options on the third line will change accordingly as the cursor is moved.
4. Use the down arrow key to move the cursor to the third line. The cursor will always highlight the first option on the third line.

5. On the third line, type in the number of the alarm input point that needs to be enabled and press the Return key.

Note: For options that have more than one parameter on the third line, use the left and right arrow keys to move the cursor from one parameter to another parameter.

6. Press the Return key a second time to execute the selected parameters of the option. The display will show:

Command Sent...Acknowledge Received

7. Move the cursor back to the previous line by pressing the Up arrow key.

Note: The 'Monitor', 'Show Function Codes' and 'Firmware Info' options do not have a third line on the menu. When selecting these options, press the Return key after they are selected. The information for these options will appear on the display.

Input option

Five functions can be selected under the Input option:

- Monitor
- Enable Single
- Disable Single
- Enable Range
- Disable Range

Monitor

This function monitors the status of each alarm input point. Figure 8-5 shows a typical Input Monitor screen display.

Figure 8-5
Typical input monitor screen display

Cell-Site ACU Local Terminal

Analog Ins Input Output General (use arrow key to select) HH:MM

Monitor Enable Single Disable Single Enable Range Disable Range

Monitoring Inputs...

Disable/Inactive					Enable/Inactive					Disable/Active					Enable/Active				
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	<-- Slot 1			
17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	<-- Slot 2			
33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	<-- Slot 3			
49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	<-- Slot 4			
65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	<-- Slot 5			
81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	<-- Slot 6			
																<-- Slot 7			
																<-- Slot 8			
																<-- Slot 9			
																<-- Slot 10			
																<-- Slot 11			
																<-- Slot 12			
																<-- Slot 13			
																<-- Slot 14			
																<-- Slot 15			

241
242
243
244
245
246
247
248

<-- ACU Internal Alarm Points

- Alarm point 241—ROM check
- Alarm point 242—RAM check
- Alarm point 243—Non-volatile RAM check
- Alarm points 244 to 248—Reserved

For the assignment of the external input alarm points, refer to Table 4-4 in *TDMA 1900 Macrocell CE Frame Description*, 411-6201-112.

The status of each point is displayed as follows (see Figure 8-5 for the screen display):

- Disable/Inactive The alarm input point has been disabled either from the MTX or the terminal and is currently not detecting an alarm.
- Enable/Inactive The alarm input point has been enabled and is currently not detecting an alarm.
- Disable/Active The alarm input point has been disabled. It is currently detecting an alarm which, because it is disabled, will not be reported to the MTX.
- Enable/Active The alarm input point has been enabled. It is currently detecting an alarm that has been reported to the MTX.

You can monitor the status of the alarms continuously since the display is automatically updated every second while in the Monitor mode.

After you leave the Monitor function, the data will still be displayed until the RETURN key is pressed.

Enable Single

The Enable Single function enables input alarm points one at a time. An input alarm point must be enabled before it will report alarm conditions to the MTX.

Disable Single

The Disable Single function disables input alarm points one at a time. An input alarm point which is disabled will not report alarm conditions to the MTX.

Enable Range

The Enable Range function enables a group of input alarm point at a time.

Disable Range

The Disable Range function disables a group of input alarm point at a time.

Output option

Five functions can be selected under the Output option:

- Monitor
- Open Single
- Close Single
- Open Range

Monitor

This function monitors the status of each output contact point. Figure 8-6 shows a typical Output Monitor screen display.

Figure 8-6
Typical output monitor screen display

```

Cell-Site ACU Local Terminal

Analog Ins  Input  Output  General  (use arrow key to select)  HH:MM

Monitor  Open Single  Close Single  Open Range  Close Range

Monitoring Outputs...

Open  Closed

17 18 19 20 21 22 23 24  <-- Slot 16
                        <-- Slot 15
                        <-- Slot 14
                        <-- Slot 13

```

For the assignment of the output contact points, refer to Tables 4-3 in *TDMA 1900 Macrocell CE Frame Description*, 411-6201-112.

HH:MM is the ACU clock display. It is updated once a minute.

The status of each point is displayed as follows (see Figure 8-6 for the screen display):

- Open The output contact is open.
- Closed The output contact is closed.

You can monitor the status of the output contacts continuously since the display is updated whenever an output contact is opened or closed.

After you leave the Monitor function, the data will still be displayed until the RETURN key is pressed.

Open Single

The Open Single function opens output contact points one at a time. An output contact point is disabled when it is set to Open.

Close Single

The Close Single function closes output contact points one at a time. An output contact point is enabled when it is set to Closed.

Open Range

The Open Range function opens a group of output contact points at a time.

Close Range

The Close Range function closes a group of output contact points at a time.

General option

Three functions can be selected under the General option.

- Set Clock
- Restart
- Show Function Codes

Set Clock

The ACU clock determines the time alarms are generated. You can set the time on a 24-hour basis by using this option. **From the map terminal at the MTX.**

Restart

This function restores the alarm input points and output contacts of the ACU to the default states.

Show Function Codes

This function displays the function codes the system uses on messages between the MTX and the ACU.

ACU front panel display

A red four digit LED display indicates the status of the input points. Only alarms from enabled inputs will be reported; a disabled Input will not alarm. The display shows the Input point by the number of the last active alarm. For example, a flashing [167] indicates that Input point #167 -RRMX ALARM- is *active* (in alarm state). The display will flash until acknowledged by pressing either the UP or DOWN button. All the active alarm points can then be scrolled with the UP and DOWN buttons. When an Input point returns to the inactive (normal) state, the Input point number will no longer be displayed. Inactive or disabled input points do not display on the front panel. An Input point is enabled or disabled from the local terminal or DMS–MTX interface. Similarly, status of the output contacts can only be obtained from either the local terminal or DMS–MTX interface.

Audible alarm

A Sonalert type of audible indication is provided at the ACU. This alert sounds on every new alarm, and continues until silenced by the operator.

Front panel controls

SCAN: The UP/DOWN buttons allow the maintenance personnel to scan through all the enabled alarm points which are currently active (in alarm state). The alarm point numbers are displayed on the LED display.

UP/DOWN

Note: Input points must be enabled to alarm or be displayed.

AUDIO CUT-OFF This momentary-close switch acknowledges the alarm and silences the audible indication. The ACU is silenced but will sound again if any more alarms occur.

VOLUME This recessed potentiometer control adjusts the sound volume of the audible alarm.

RESET The RESET switch is a momentary-close push button that is recessed in the front panel to ensure it is not pressed by accident. This is a forced hardware reset of the ACU.

PWR This green LED indicates the ACU is powered.



DMS–MTX I/O Point Numbering

The Input and Output points in the DMS–MTX datafill tables ACUALM and ACUCTRL are shown numerically one point lower than in the ACU.

For example: Alarm input point 10 in the ACU corresponds to point 09 in the ACUALM table.

Firmware Info

You can display information about the existing firmware load in the ACU.

Miscellaneous equipment tests

RRM (Remote Receive Module)

There are no operational tests for the Remote Receive Module (RRM) at the cell site. If you want to check the operation of the RRM, refer to *TDMA 1900 Macrocell Troubleshooting Guide*, 411-6201-501.

LRM (Local Receiver Module)

The LRM primary function is to amplify receive band signals received from the antenna/RRM prior to distribution to the splitters and coaxial cables which connect to the transceiver shelves.

Rotating the LRM attenuator switches on both LRM's (LRM X and LRM X') should cause the RSSI to change by approximately 1/2 dB per setting. The total range of the switch settings is approximately 6 dB. The function of the switch is to introduce a specific level of attenuation to a receive path to maintain a constant level across all receive paths. Refer to *TDMA 1900 Macrocell Cell Site RF Deployment Guide*, 411-6201-200.

There is no scheduled maintenance for the Local Receive Module. If you suspect a fault in the LRM refer to *TDMA 1900 Macrocell Troubleshooting Guide*, 411-6201-501.

RPDU (Receive Power Distribution Unit)

There are no operational tests for the RPDU at the cell site. If you want to check the operation of the RPDU, refer to the *TDMA 1900 Macrocell Troubleshooting Guide*, 411-6201-501.

ICRM (Integrated Cellular Remote Module)

There are no operational tests for the Integrated Cellular Remote Module (ICRM) at the cell site. If you want to check the operation of the ICRM, contact the operator at the MTX for assistance. For a functional description refer to *TDMA 1900 Macrocell CE Frame Description*, 411-6201-112.

Other equipment

CE and RF frame equipment not already specifically mentioned do not require periodic maintenance.

Transmission facilities

Transmission facilities include pressurized transmission lines, microwave radio equipment and any copper facilities. It is important that your facilities are in good condition, otherwise cell site performance might be compromised. See recommended maintenance intervals from the manufacturer for the specific equipment.

Microwave

Refer to the manufacturer's instructions for periodic maintenance. Transmission level and noise tests should be conducted once a year.

Copper Audio Link

The susceptibility of copper to noise and level problems requires more frequent checks than digital or microwave facilities. Perform noise and level checks quarterly on the T-1 transmission facilities.

Power

Clean, reliable power is essential to your cell site. The following are generic periodic maintenance recommendations. Consult the manufacturer's documentation for specific maintenance and specifications.

Acid safety equipment

Before you do anything in a liquid-electrolyte battery plant, make sure you have proper acid-handling safety equipment available and in good condition. The following equipment is recommended:

- face shield
- rubber gloves
- rubber apron
- eye wash station
- neutralizing powder and solution to clean up spills

Battery

Gell cell batteries are virtually maintenance free. Liquid-electrolyte batteries, however, require monthly maintenance refer to manufacturer's recommendation. Each month:

- check the cell voltages and note any discrepancies; Increase the rectifier output voltage from float voltage to equalizing voltage for 24 hours; If the low cells are still low, replace them
- check electrolyte levels and top up with distilled water
- check exhaust system and hydrogen sensor (if equipped)

Rectifiers

Check the rectifier output voltage once a month refer to manufacturer's recommendation. Check the high and low voltage alarm/cut-out sections once a year.

Main generators

Some cell sites may not have access to public mains service; instead, they are powered by on-site generators. At the very least you should:

- keep records of coolant and oil temperatures and operating times
- monitor fuel, oil and coolant levels
- follow manufacturer's recommendations for oil and coolant changes and periodic inspection and overhaul

Backup generators

Some sites will have backup generators. Every three months, verify that the generators start and operate correctly by removing AC power from the cell site. You should also:

- monitor fuel, oil and coolant levels and record operating times
- record generator readings
- follow manufacturer's recommendations for oil and coolant changes and periodic inspection and overhaul

Building service

If the building uses AC mains service from overhead poles, take a look at the drop and service entrance once a year. Look for obviously damaged insulation and threats from overhanging trees.

Cabling and connections

Whenever equipment is installed or changed, check the cabling and connections. Take note of any suspect cables that give you problems from time to time.

Inside grounding

Inside grounding performs two functions: it prevents noise from one unit getting into other equipment, and it ties all equipment together for protection. Check for and repair any deterioration and corrosion of the grounding system, you should also check to see that all new equipment installed in the building is grounded properly. Refer to Power, Ground, and System Cabling for TDMA 1900 Macrocell, IM 16-1753.

Frame bonding

Individual frames in a line-up should be bonded together with 3/8 inch or larger bolts with star washers bearing on clean metal.

Ground cabling

Ground cables (battery return and chassis ground) run between each frame and a customer-supplied common ground point. The specific number of frames, and the type and location of customer-supplied power and ground equipment, determines the detailed power and ground cabling requirements. Site-specific power, ground, and system cabling information is provided in the job specification documents and in the Interconnect Schematic (IS) documents.

Check the ground for each frame, ensure that the frame ground cable (green) from one of the frame ground points, runs to the site common ground point . The cable must be #6AWG or larger. Ensure the cable is neat and observe the minimum bend radius specifications.

Battery return cables connect to the CE frame and to the RF frames on a bus bar in the RIP of each frame. In the RIP, the center (of three) bus bars is the battery return bus bar. The cables run to the site common ground point. The two battery return cables are connected to the battery return bus bar of the RF frame RIP. Minimum size of the cable is #2/0AWG. Each cable is required to carry approximately 110 Amps of current for a fully-provisioned frame. Ensure the cables run to the site common ground point, and are connected to the common ground point using the same technique and equipment as is used for other cables at the common ground point.

Check all connections and ensure that new or changed equipment is properly grounded. If there is a water pipe in the building, the principle ground bar should be connected to it.

Transmission line entrance

The transmission line to the antennas should be lightning protected where it comes into the building. Check the condition of the grounding connections once a year and also following any severe lightning storm activity.

Outside grounding

A typical cell site, with its tall metal structures and antennas, is an open invitation to a lightning strike. To avoid cell site degradation or total loss due to electrical storm activity, inspect the grounding system just before the local thunderstorm season. Checking the outside ground can be part of a site walk-around check, also checking antennas, cables, structures, lighting and foundations.

Tower and associated structures

Use a pair of binoculars or a spotting scope to verify that the air terminal (lightning rod) and antennas are still attached to the tower and grounding system. Verify that:

- the antenna feed cables are grounded at both ends
- the cables and clamps attaching the tower and waveguide bridge to the grounding system are secure
- the cables and clamps connecting the guy wires to the grounding system are secure
- transmission cables are grounded at both the top and the bottom of the tower, and at the building entrance.

Building sheath, fences and other equipment

If the building has metal walls, roof or base, the metal components must be grounded. The cell site fence and any fuel tanks or other metal structures must be grounded as well. Check that the grounding cables and clamps are secure.

Antennas and tower

General structure

Detailed inspection of towers should be performed every one to three years by an experienced inspector who can climb the tower and check all components. Cell site maintenance personnel can perform an effective partial inspection without leaving the ground, and this is recommended:

- once a year
- following a severe storm
- following a prolonged period of heavy icing

Use binoculars or a spotting scope if necessary. To perform a partial inspection:

- check the tower base for cracks, concrete break up and upheaval
- check all guy anchors for cracks or upheaval
- check guy tension and attachment
- check fasteners for security
- check all components for rust
- check for flaking paint (often a sign of over-stress)

Tower lighting

At every visit visually confirm operation of the tower lights at the site after dark. When the tower is climbed for structural inspection, the lights should be thoroughly checked at the same time.

Grounding

Check all grounding that is accessible from the surface during your outside grounding check for corrosion and damage. When the tower is climbed for structural inspection, grounding on the higher parts of the tower should be checked at the same time.

Paint

Painted towers need to be re-painted every few years. Check the over all condition of the paint on an annual basis and re-paint as necessary.

Feed

Check that the transmission line is adequately supported and protected between the cell site building and the antenna tower.

Antennas

When the tower is climbed for structural inspection, antennas should be inspected as well. Check for:

- correct orientation and tilt
- crack, dents and burns
- fasteners, attachment and security
- transmission line and ground attachment security
- audible gas leakage in pressurized systems

Pressurized transmission lines

If a pressurized transmission line to the antenna is used, check the nitrogen tank pressure and manifold pressure every visit. Check the dehydrator at the same time.

Site performance

The ultimate measure of the condition of the cell site is the actual measured performance. Site performance should be tested once a year and can be gauged by the following tests. It should be taken into consideration that coverage and handoffs can be impacted by seasons and weather.

Fringe coverage

Using the most recent coverage maps, take a test mobile and drive to the fringe of the site coverage area with a call established to confirm coverage. Most mobiles are able to access signal strength function mode.

Handoff checks

Using the “standard drive” defined for the site or system acceptance procedures, drive across the cell boundaries with a call established. Confirm that the handoffs occur in the appropriate places and that there is sufficient hysteresis to prevent ping-ponging of calls. Use a test mobile with channel-indicating firmware to check the exact location of the handoffs.

Housekeeping**Security**

Check fences, gates, barbed wire and razor ribbon, both around the building and around the tower guy anchors. Check door locks and gate locks before leaving the site.

Heating/air conditioning**Every visit**

Proper air conditioning is essential to the functioning of your cell site; so essential, in fact, that many companies choose to contract out the maintenance to a specialty company. When responsible for the heating, ventilation and air conditioning (HVAC) of the cell site, the most important thing is to make sure that the filters are clean; refer to the manufacture’s equipment manual for specific maintenance recommendations. Check thermostat setting at the site, recommended setting is 19° to 22°C. Verify HVAC operation by varying the thermostat .

Annual visit

All HVAC equipment should be inspected at least once a year. Check for insects, mice and bird nests in the intake and exhaust systems in the fall and the spring. Refer to the manufacture’s equipment manual for specific annual maintenance recommendations.

Dust control

Keep dust levels to a minimum by mopping the floors once a month, taking care not to get the equipment wet. Whenever you remove a transceiver or power amplifier, wipe off the dust on the unit and shelf slides. Dust accumulation on circuit boards and heat sinks interferes with heat dissipation and shortens the life of the equipment.

Equipment fans

Accumulation of dust can clog fans, raising the equipment operating temperature. All frame equipment fans should be cleaned quarterly or sooner depending on the site location.

Trash and loose articles

Keep the inside of your cell site as clean and tidy as possible. Trash and loose articles pose fire and tripping hazards and should be removed after every visit.

Site groundskeeping

Tall grass can present a fire hazard; poorly kept trees can lean on or fall on buildings and equipment. Snow and ice removal on and around the site may be a statutory or legal liability requirement in some jurisdictions. Grounds keeping is often contracted out to a specialty firm.

Keep the cell site grounds clean and clear, removing any trash or unnecessary material.

Administration

Statutory requirements

Fire equipment, hazard signs and exit signs may be required by law. Make sure required signs are present and safety equipment is maintained.

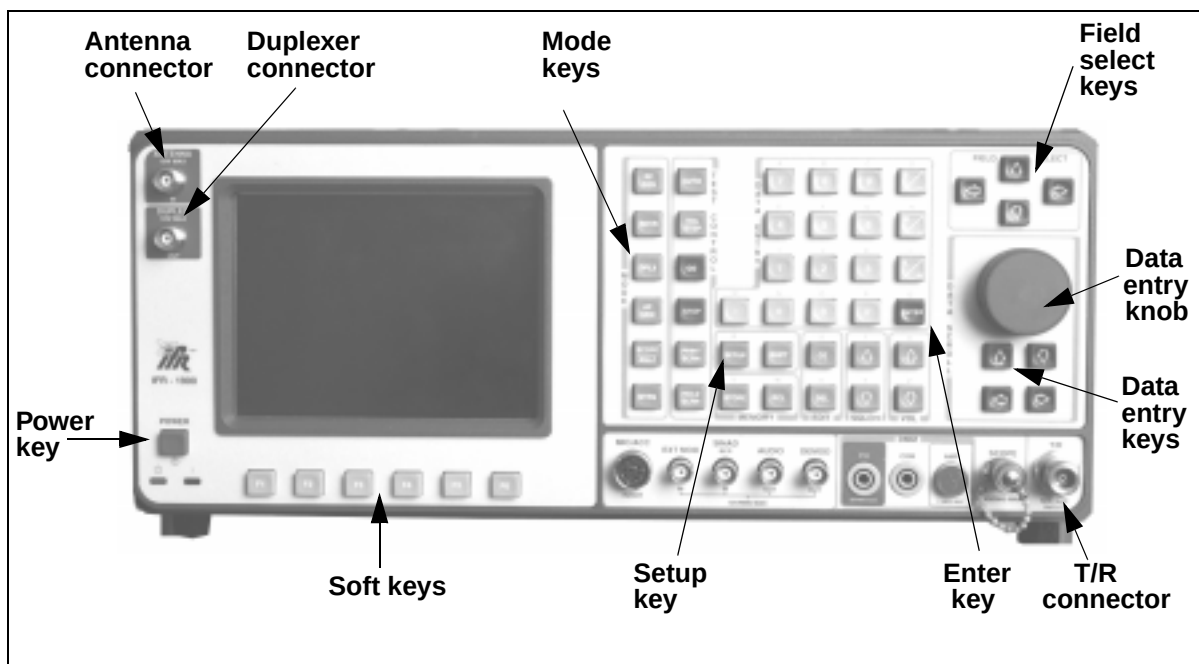
Site licenses

Radio and tower and business licenses are often required to operate a cell site. Check once a year to ensure that they are being maintained, whether they are located on the site or with the company's legal department.

Appendix A: IFR1900 setup

The IFR1900 is a versatile and powerful radio test instrument. Due to its versatility and power, it has hundreds of optional settings and configurations. Before beginning to use the IFR1900, the test technician should go through a setup checklist to assure that those settings and configurations are correct for testing cell site radios and RF equipment. This appendix provides a checklist that, if followed, will assure that the IFR1900 can be used for testing the radios and RF equipment at a TDMA 1900 Macrocell. Refer to Figure 10-1 as you go through the checklist.

Figure 10-1
IFR 1900



IFR setup checklist:

1. Connect ac power to the back of the IFR1900.
2. Press the POWER key at the lower left of the front of the IFR1900.
3. After the IFR logo screen appears, press the MTRS mode key.
4. Use the FIELD SELECT keys to move the cursor to item 2 -- Freq Error Meter/Freq meter.
5. Press the ENTER key.
6. Press the SETUP key.
7. Use the FIELD SELECT keys, the ENTER key, and data entry keys to set the setup options as follows:

Table 10-1
Setup options--Frequency Meter

Meter Range	Autorange
Gate Time	1 second
Select Peak Hold	Off
Upper Lmt	Off
Set Upper Lmt	0.000 kHz
Lower Lmt	Off
Set Lower Lmt	0.000 kHz
Set Alarm	Off

8. Press the RET soft key.
9. Press the MTRS mode key.
10. Use the FIELD SELECT keys to move the cursor to item 3 -- Pwr Meter (Pulse/CW).
11. Press the ENTER key.
12. Press the SETUP key.
13. Use the FIELD SELECT keys, the ENTER key, and data entry keys to set the setup options as shown in Table 10-2.

Table 10-2
Setup options–Power Meter

Meter Range	Autorange
Measurement Type	CW
dBm Enable	On
Select Peak Hold	Off
Upper Lmt	Off
Set Upper Lmt	0.0 mW
Lower Lmt	Off
Set Lower Lmt	0.0 mW
Set Alarm	Off
Ext Loss/Gain	0.0 dB
Assumed RF Freq	4.8000 MHz

14. Press the RET soft key.
15. Press the MTRS mode key.
16. Use the FIELD SELECT keys to select item 4 -- Dev Meter (Peak)
17. Press the ENTER key.
18. Press the SETUP key.
19. Use the FIELD SELECT keys, the ENTER key, and data entry keys to set the setup options as shown in Table 10-3.

Table 10-3
Setup options–Deviation Meter

Meter Range	Autorange
Select Peak Hold	Off
Upper Lmt	Off
Set Upper Lmt	0.00 kHz
Lower Lmt	Off
Set Lower Lmt	0.00 kHz
Set Alarm	Off
Average	Off
Mode	+/-Peak/2

20. Press the RET soft key.
21. Press the MTRS mode key.
22. Use the FIELD SELECT keys to select item 7 -- SINAD Meter
23. Press the ENTER key.
24. Press the SETUP key.
25. Use the FIELD SELECT keys, the ENTER key, and data entry keys to set the setup options as shown in Table 10-4.

Table 10-4
Setup options--SINAD Meter

Select SINAD In	Demod Audio
Notch Filter Freq	1000 Hz
Select Peak Hold	Off
Upper Limit	Off
Set Upper Lmt	3.0dB
Lower Lmt	Off
Set Lower Lmt	30.0 dB
Average	On
Filter Select	C Wt
Readout Res.	.1 dB

26. Press the RET soft key.
27. Press the RET soft key.
28. Press the SCOPE/ANLZ mode key.
29. Press the SETUP key.
30. Use the FIELD SELECT keys to select item 4 -- Setup Analyzer.
31. Press the ENTER key.
32. If item 12, RF Mode is set to Channel, use the FIELD SELECT keys to select item 12, then press the ENTER key until the mode is Direct.
33. Use the FIELD SELECT keys, the ENTER key, and data entry keys to set the setup options as shown in Table 10-5.

Table 10-5
Setup options–Analyzer

Scale	dBm
Frequency	4.8000 MHz
Rcvr Input	T/R
Input Atten	0 dB
Range	10 dB
Scan Width	20 kHz
Track Gen	Off
Track Gen Lvl	-90.0 dBm
Gen Lvl Units	dBm
Velocity Factor	69.4 %
Mode	Live
RF Mode	Direct

34. Press the RET soft key.
35. Press the RCVR mode key.
36. Press the SETUP key.
37. Use the FIELD SELECT keys, the ENTER key, and data entry keys to set the setup options as shown in Table 10-6.
38. Observe item 10-- Operation Mode. If it is set to anything other than Direct, use the FIELD SELECT keys to select item 10, then use the SELECT keys and the ENTER key to set the field to Direct.

Table 10-6
Setup options–Receiver Operational Mode

Set Rcvr Freq	4.8000 MHz
Select Mod	FM3
Select Rcvr In	T/R
Select Input Atten	0 dB
Select AGC Type	Auto
Rcvr Out Speaker	Off
-sheet 1 of 2-	

Rcvr Out Audio Out	Off
Rcvr Out Demod Out	Off
Auto Volume Level	Off
Operation Mode	Direct
Signaling Formats	Digital
-sheet 2 of 2-	

39. Observe the status of RF lock (the field just above the F2 soft key). If it is white, press the F2 key until it is pink.
40. Press the RET soft key.
41. Press the RF GEN mode key.
42. Observe the Forward/Reverse Field and the Frequency Band field in the upper left area of the screen. The Forward/Reverse field should contain an “R” and the frequency band field should contain an “HY”. If necessary, use the FIELD SELECT keys, the data entry keys or knob, and the ENTER key to set the two fields.
43. Press the SETUP key.
44. Use the FIELD SELECT keys to select item 5 -- RF Gen Output Setup.
45. Press the ENTER key
46. Observe item 3 -- RF Gen Format. If it is set to anything other than CHANNEL, use the FIELD SELECT keys to select item 3, then use the FIELD SELECT keys and the ENTER key to set the field to CHANNEL.
47. Use the FIELD SELECT keys, the ENTER key, and data entry keys to set the setup options as shown in Table 10-7.

Table 10-7
Setup options–RF Generator Output

RF Gen Freq	NNN NADC R
RF Gen Level	-90.0 dBm
RF Gen Format	Channel
RF Gen Level Units	dBm
Source to Audio Out	Off
Source to Demod Out	Off
To Speaker	None

Note: The NNN in the RF Gen Freq field represents the channel number of the radio to be tested. Select any channel at this time. The actual channel numbers will be set as the radio tests are performed.

48. Press the RET soft key.
49. Press the DPLX mode key.
50. Observe the channel fields (lines near the top of the screen that begin with CH). They should read as follows:
CH NNN F HY CH NNN R HY

If this is not the way the lines read, use the FIELD SELECT keys and the ENTER key to set them up as indicated. (NNN is a channel number. Use any number for now. Actual channel numbers will be selected during the radio tests.)

51. Use the FIELD SELECT keys to move the cursor to the word TRANSMITTER at the top left of the screen.
52. Press the SETUP key.
53. Observe item 10 -- Operation Mode. If it is set to anything other than "Channel", use the FIELD SELECT keys to select item 10, then use the ENTER key and the FIELD SELECT keys to set the field to "Channel".
54. Use the FIELD SELECT keys, the ENTER key, and data entry keys to set the setup options as shown in Table 10-8.

Table 10-8
Setup options--Transmitter Operational Mode

Set Rcvr Freq	NNN NADC F
Select Mod	FM3
Select Rcvr In	T/R
Select Input Atten	0 dB
Select AGC Type	Auto
Rcvr Out Speaker	Off
Rcvr Out Audio Out	Off
Rcvr Out Demod Out	Off
Auto Volume Level	Off
Operation Mode	Channel
Signaling Formats	Digital

55. Press the RET soft key.
56. Use the FIELD SELECT keys to move the cursor to the word RECEIVER at the top right of the screen.
57. Press the SETUP key.
58. Use the FIELD SELECT keys to select item 5 -- RF Gen Output Setup
59. Press the ENTER key.
60. Observe item 3 -- RF Gen Format. If it is set to anything other than "Channel", use the FIELD SELECT keys to select item 3, then use the ENTER key and the FIELD SELECT keys to set the field to "Channel".
61. Use the FIELD SELECT keys, the ENTER key, and data entry keys to set the setup options as follows

Table 10-9
Setup options--RF Generator Output

RF Gen Freq	NNN NADC R
RF Gen Level	-90.0 dBm
RF Gen Format	Channel
RF Gen Level Units	dBm
Source to Audio Out	Off
Source to Demod Out	Off
To Speaker	None

62. Press the RET soft key.
- The IFR1900 is now set up.

Appendix B: Channel and frequency tables

Channel numbering for 1900Mhz spectrum

Transmitter	Channel Number	Center Frequency (MHz)
Mobile	$1 < N > 1999$	$0.030 N + 1849.980$
Base	$1 < N > 1999$	$0.030 N + 1930.020$

PCS frequency sub-bands

Sub-band	Bandwidth (MHz)	Available channels ^a
A	15	2 to 498
D	5	502 to 665
B	15	668 to 1165
E	5	1168 to 1332
F	5	1335 to 1498
C	15	1502 to 1998

a. Channels 1 and 1999 are not used.

11-2 Appendix B: Channel and frequency tables

Table 11-1
Frequency chart for TDMA 1900 Macrocell (channels 1–160)

Chan #	Tx (MHz)	Rx (MHz)	Chan #	Tx (MHz)	Rx (MHz)	Chan #	Tx (MHz)	Rx (MHz)	Chan #	Tx (MHz)	Rx (MHz)
1	1930.05	1850.01	41	1931.25	1851.21	81	1932.45	1852.41	121	1933.65	1853.61
2	1930.08	1850.04	42	1931.28	1851.24	82	1932.48	1852.44	122	1933.68	1853.64
3	1930.11	1850.07	43	1931.31	1851.27	83	1932.51	1852.47	123	1933.71	1853.67
4	1930.14	1850.10	44	1931.34	1851.30	84	1932.54	1852.50	124	1933.74	1853.70
5	1930.17	1850.13	45	1931.37	1851.33	85	1932.57	1852.53	125	1933.77	1853.73
6	1930.20	1850.16	46	1931.40	1851.36	86	1932.60	1852.56	126	1933.80	1853.76
7	1930.23	1850.19	47	1931.43	1851.39	87	1932.63	1852.59	127	1933.83	1853.79
8	1930.26	1850.22	48	1931.46	1851.42	88	1932.66	1852.62	128	1933.86	1853.82
9	1930.29	1850.25	49	1931.49	1851.45	89	1932.69	1852.65	129	1933.89	1853.85
10	1930.32	1850.28	50	1931.52	1851.48	90	1932.72	1852.68	130	1933.92	1853.88
11	1930.35	1850.31	51	1931.55	1851.51	91	1932.75	1852.71	131	1933.95	1853.91
12	1930.38	1850.34	52	1931.58	1851.54	92	1932.78	1852.74	132	1933.98	1853.94
13	1930.41	1850.37	53	1931.61	1851.57	93	1932.81	1852.77	133	1934.01	1853.97
14	1930.44	1850.40	54	1931.64	1851.60	94	1932.84	1852.80	134	1934.04	1854.00
15	1930.47	1850.43	55	1931.67	1851.63	95	1932.87	1852.83	135	1934.07	1854.03
16	1930.50	1850.46	56	1931.70	1851.66	96	1932.90	1852.86	136	1934.10	1854.06
17	1930.53	1850.49	57	1931.73	1851.69	97	1932.93	1852.89	137	1934.13	1854.09
18	1930.56	1850.52	58	1931.76	1851.72	98	1932.96	1852.92	138	1934.16	1854.12
19	1930.59	1850.55	59	1931.79	1851.75	99	1932.99	1852.95	139	1934.19	1854.15
20	1930.62	1850.58	60	1931.82	1851.78	100	1933.02	1852.98	140	1934.22	1854.18
21	1930.65	1850.61	61	1931.85	1851.81	101	1933.05	1853.01	141	1934.25	1854.21
22	1930.68	1850.64	62	1931.88	1851.84	102	1933.08	1853.04	142	1934.28	1854.24
23	1930.71	1850.67	63	1931.91	1851.87	103	1933.11	1853.07	143	1934.31	1854.27
24	1930.74	1850.70	64	1931.94	1851.90	104	1933.14	1853.10	144	1934.34	1854.30
25	1930.77	1850.73	65	1931.97	1851.93	105	1933.17	1853.13	145	1934.37	1854.33
26	1930.80	1850.76	66	1932.00	1851.96	106	1933.20	1853.16	146	1934.40	1854.36
27	1930.83	1850.79	67	1932.03	1851.99	107	1933.23	1853.19	147	1934.43	1854.39
28	1930.86	1850.82	68	1932.06	1852.02	108	1933.26	1853.22	148	1934.46	1854.42
29	1930.89	1850.85	69	1932.09	1852.05	109	1933.29	1853.25	149	1934.49	1854.45
30	1930.92	1850.88	70	1932.12	1852.08	110	1933.32	1853.28	150	1934.52	1854.48
31	1930.95	1850.91	71	1932.15	1852.11	111	1933.35	1853.31	151	1934.55	1854.51
32	1930.98	1850.94	72	1932.18	1852.14	112	1933.38	1853.34	152	1934.58	1854.54
33	1931.01	1850.97	73	1932.21	1852.17	113	1933.41	1853.37	153	1934.61	1854.57
34	1931.04	1851.00	74	1932.24	1852.20	114	1933.44	1853.40	154	1934.64	1854.60
35	1931.07	1851.03	75	1932.27	1852.23	115	1933.47	1853.43	155	1934.67	1854.63
36	1931.10	1851.06	76	1932.30	1852.26	116	1933.50	1853.46	156	1934.70	1854.66
37	1931.13	1851.09	77	1932.33	1852.29	117	1933.53	1853.49	157	1934.73	1854.69
38	1931.16	1851.12	78	1932.36	1852.32	118	1933.56	1853.52	158	1934.76	1854.72
39	1931.19	1851.15	79	1932.39	1852.35	119	1933.59	1853.55	159	1934.79	1854.75
40	1931.22	1851.18	80	1932.42	1852.38	120	1933.62	1853.58	160	1934.82	1854.78

Table 11-2

Frequency chart for TDMA 1900 Macrocell (channels 161–320)

161	1934.85	1854.81	201	1936.05	1856.01	241	1937.25	1857.21	281	1938.45	1858.41
162	1934.88	1854.84	202	1936.08	1856.04	242	1937.28	1857.24	282	1938.48	1858.44
163	1934.91	1854.87	203	1936.11	1856.07	243	1937.31	1857.27	283	1938.51	1858.47
164	1934.94	1854.90	204	1936.14	1856.10	244	1937.34	1857.30	284	1938.54	1858.50
165	1934.97	1854.93	205	1936.17	1856.13	245	1937.37	1857.33	285	1938.57	1858.53
166	1935.00	1854.96	206	1936.20	1856.16	246	1937.40	1857.36	286	1938.60	1858.56
167	1935.03	1854.99	207	1936.23	1856.19	247	1937.43	1857.39	287	1938.63	1858.59
168	1935.06	1855.02	208	1936.26	1856.22	248	1937.46	1857.42	288	1938.66	1858.62
169	1935.09	1855.05	209	1936.29	1856.25	249	1937.49	1857.45	289	1938.69	1858.65
170	1935.12	1855.08	210	1936.32	1856.28	250	1937.52	1857.48	290	1938.72	1858.68
171	1935.15	1855.11	211	1936.35	1856.31	251	1937.55	1857.51	291	1938.75	1858.71
172	1935.18	1855.14	212	1936.38	1856.34	252	1937.58	1857.54	292	1938.78	1858.74
173	1935.21	1855.17	213	1936.41	1856.37	253	1937.61	1857.57	293	1938.81	1858.77
174	1935.24	1855.20	214	1936.44	1856.40	254	1937.64	1857.60	294	1938.84	1858.80
175	1935.27	1855.23	215	1936.47	1856.43	255	1937.67	1857.63	295	1938.87	1858.83
176	1935.30	1855.26	216	1936.50	1856.46	256	1937.70	1857.66	296	1938.90	1858.86
177	1935.33	1855.29	217	1936.53	1856.49	257	1937.73	1857.69	297	1938.93	1858.89
178	1935.36	1855.32	218	1936.56	1856.52	258	1937.76	1857.72	298	1938.96	1858.92
179	1935.39	1855.35	219	1936.59	1856.55	259	1937.79	1857.75	299	1938.99	1858.95
180	1935.42	1855.38	220	1936.62	1856.58	260	1937.82	1857.78	300	1939.02	1858.98
181	1935.45	1855.41	221	1936.65	1856.61	261	1937.85	1857.81	301	1939.05	1859.01
182	1935.48	1855.44	222	1936.68	1856.64	262	1937.88	1857.84	302	1939.08	1859.04
183	1935.51	1855.47	223	1936.71	1856.67	263	1937.91	1857.87	303	1939.11	1859.07
184	1935.54	1855.50	224	1936.74	1856.70	264	1937.94	1857.90	304	1939.14	1859.10
185	1935.57	1855.53	225	1936.77	1856.73	265	1937.97	1857.93	305	1939.17	1859.13
186	1935.60	1855.56	226	1936.80	1856.76	266	1938.00	1857.96	306	1939.20	1859.16
187	1935.63	1855.59	227	1936.83	1856.79	267	1938.03	1857.99	307	1939.23	1859.19
188	1935.66	1855.62	228	1936.86	1856.82	268	1938.06	1858.02	308	1939.26	1859.22
189	1935.69	1855.65	229	1936.89	1856.85	269	1938.09	1858.05	309	1939.29	1859.25
190	1935.72	1855.68	230	1936.92	1856.88	270	1938.12	1858.08	310	1939.32	1859.28
191	1935.75	1855.71	231	1936.95	1856.91	271	1938.15	1858.11	311	1939.35	1859.31
192	1935.78	1855.74	232	1936.98	1856.94	272	1938.18	1858.14	312	1939.38	1859.34
193	1935.81	1855.77	233	1937.01	1856.97	273	1938.21	1858.17	313	1939.41	1859.37
194	1935.84	1855.80	234	1937.04	1857.00	274	1938.24	1858.20	314	1939.44	1859.40
195	1935.87	1855.83	235	1937.07	1857.03	275	1938.27	1858.23	315	1939.47	1859.43
196	1935.90	1855.86	236	1937.10	1857.06	276	1938.30	1858.26	316	1939.50	1859.46
197	1935.93	1855.89	237	1937.13	1857.09	277	1938.33	1858.29	317	1939.53	1859.49
198	1935.96	1855.92	238	1937.16	1857.12	278	1938.36	1858.32	318	1939.56	1859.52
199	1935.99	1855.95	239	1937.19	1857.15	279	1938.39	1858.35	319	1939.59	1859.55
200	1936.02	1855.98	240	1937.22	1857.18	280	1938.42	1858.38	320	1939.62	1859.58

11-4 Appendix B: Channel and frequency tables

Table 11-3

Frequency chart for TDMA 1900 Macrocell (channels 321–480)

321	1939.65	1859.61	361	1940.85	1860.81	401	1942.05	1862.01	441	1943.25	1863.21
322	1939.68	1859.64	362	1940.88	1860.84	402	1942.08	1862.04	442	1943.28	1863.24
323	1939.71	1859.67	363	1940.91	1860.87	403	1942.11	1862.07	443	1943.31	1863.27
324	1939.74	1859.70	364	1940.94	1860.90	404	1942.14	1862.10	444	1943.34	1863.30
325	1939.77	1859.73	365	1940.97	1860.93	405	1942.17	1862.13	445	1943.37	1863.33
326	1939.80	1859.76	366	1941.00	1860.96	406	1942.20	1862.16	446	1943.40	1863.36
327	1939.83	1859.79	367	1941.03	1860.99	407	1942.23	1862.19	447	1943.43	1863.39
328	1939.86	1859.82	368	1941.06	1861.02	408	1942.26	1862.22	448	1943.46	1863.42
329	1939.89	1859.85	369	1941.09	1861.05	409	1942.29	1862.25	449	1943.49	1863.45
330	1939.92	1859.88	370	1941.12	1861.08	410	1942.32	1862.28	450	1943.52	1863.48
331	1939.95	1859.91	371	1941.15	1861.11	411	1942.35	1862.31	451	1943.55	1863.51
332	1939.98	1859.94	372	1941.18	1861.14	412	1942.38	1862.34	452	1943.58	1863.54
333	1940.01	1859.97	373	1941.21	1861.17	413	1942.41	1862.37	453	1943.61	1863.57
334	1940.04	1860.00	374	1941.24	1861.20	414	1942.44	1862.40	454	1943.64	1863.60
335	1940.07	1860.03	375	1941.27	1861.23	415	1942.47	1862.43	455	1943.67	1863.63
336	1940.10	1860.06	376	1941.30	1861.26	416	1942.50	1862.46	456	1943.70	1863.66
337	1940.13	1860.09	377	1941.33	1861.29	417	1942.53	1862.49	457	1943.73	1863.69
338	1940.16	1860.12	378	1941.36	1861.32	418	1942.56	1862.52	458	1943.76	1863.72
339	1940.19	1860.15	379	1941.39	1861.35	419	1942.59	1862.55	459	1943.79	1863.75
340	1940.22	1860.18	380	1941.42	1861.38	420	1942.62	1862.58	460	1943.82	1863.78
341	1940.25	1860.21	381	1941.45	1861.41	421	1942.65	1862.61	461	1943.85	1863.81
342	1940.28	1860.24	382	1941.48	1861.44	422	1942.68	1862.64	462	1943.88	1863.84
343	1940.31	1860.27	383	1941.51	1861.47	423	1942.71	1862.67	463	1943.91	1863.87
344	1940.34	1860.30	384	1941.54	1861.50	424	1942.74	1862.70	464	1943.94	1863.90
345	1940.37	1860.33	385	1941.57	1861.53	425	1942.77	1862.73	465	1943.97	1863.93
346	1940.40	1860.36	386	1941.60	1861.56	426	1942.80	1862.76	466	1944.00	1863.96
347	1940.43	1860.39	387	1941.63	1861.59	427	1942.83	1862.79	467	1944.03	1863.99
348	1940.46	1860.42	388	1941.66	1861.62	428	1942.86	1862.82	468	1944.06	1864.02
349	1940.49	1860.45	389	1941.69	1861.65	429	1942.89	1862.85	469	1944.09	1864.05
350	1940.52	1860.48	390	1941.72	1861.68	430	1942.92	1862.88	470	1944.12	1864.08
351	1940.55	1860.51	391	1941.75	1861.71	431	1942.95	1862.91	471	1944.15	1864.11
352	1940.58	1860.54	392	1941.78	1861.74	432	1942.98	1862.94	472	1944.18	1864.14
353	1940.61	1860.57	393	1941.81	1861.77	433	1943.01	1862.97	473	1944.21	1864.17
354	1940.64	1860.60	394	1941.84	1861.80	434	1943.04	1863.00	474	1944.24	1864.20
355	1940.67	1860.63	395	1941.87	1861.83	435	1943.07	1863.03	475	1944.27	1864.23
356	1940.70	1860.66	396	1941.90	1861.86	436	1943.10	1863.06	476	1944.30	1864.26
357	1940.73	1860.69	397	1941.93	1861.89	437	1943.13	1863.09	477	1944.33	1864.29
358	1940.76	1860.72	398	1941.96	1861.92	438	1943.16	1863.12	478	1944.36	1864.32
359	1940.79	1860.75	399	1941.99	1861.95	439	1943.19	1863.15	479	1944.39	1864.35
360	1940.82	1860.78	400	1942.02	1861.98	440	1943.22	1863.18	480	1944.42	1864.38

Table 11-4

Frequency chart for TDMA 1900 Macrocell (channels 481–640)

481	1944.45	1864.41	521	1945.65	1865.61	561	1946.85	1866.81	601	1948.05	1868.01
482	1944.48	1864.44	522	1945.68	1865.64	562	1946.88	1866.84	602	1948.08	1868.04
483	1944.51	1864.47	523	1945.71	1865.67	563	1946.91	1866.87	603	1948.11	1868.07
484	1944.54	1864.50	524	1945.74	1865.70	564	1946.94	1866.90	604	1948.14	1868.10
485	1944.57	1864.53	525	1945.77	1865.73	565	1946.97	1866.93	605	1948.17	1868.13
486	1944.60	1864.56	526	1945.80	1865.76	566	1947.00	1866.96	606	1948.20	1868.16
487	1944.63	1864.59	527	1945.83	1865.79	567	1947.03	1866.99	607	1948.23	1868.19
488	1944.66	1864.62	528	1945.86	1865.82	568	1947.06	1867.02	608	1948.26	1868.22
489	1944.69	1864.65	529	1945.89	1865.85	569	1947.09	1867.05	609	1948.29	1868.25
490	1944.72	1864.68	530	1945.92	1865.88	570	1947.12	1867.08	610	1948.32	1868.28
491	1944.75	1864.71	531	1945.95	1865.91	571	1947.15	1867.11	611	1948.35	1868.31
492	1944.78	1864.74	532	1945.98	1865.94	572	1947.18	1867.14	612	1948.38	1868.34
493	1944.81	1864.77	533	1946.01	1865.97	573	1947.21	1867.17	613	1948.41	1868.37
494	1944.84	1864.80	534	1946.04	1866.00	574	1947.24	1867.20	614	1948.44	1868.40
495	1944.87	1864.83	535	1946.07	1866.03	575	1947.27	1867.23	615	1948.47	1868.43
496	1944.90	1864.86	536	1946.10	1866.06	576	1947.30	1867.26	616	1948.50	1868.46
497	1944.93	1864.89	537	1946.13	1866.09	577	1947.33	1867.29	617	1948.53	1868.49
498	1944.96	1864.92	538	1946.16	1866.12	578	1947.36	1867.32	618	1948.56	1868.52
499	1944.99	1864.95	539	1946.19	1866.15	579	1947.39	1867.35	619	1948.59	1868.55
500	1945.02	1864.98	540	1946.22	1866.18	580	1947.42	1867.38	620	1948.62	1868.58
501	1945.05	1865.01	541	1946.25	1866.21	581	1947.45	1867.41	621	1948.65	1868.61
502	1945.08	1865.04	542	1946.28	1866.24	582	1947.48	1867.44	622	1948.68	1868.64
503	1945.11	1865.07	543	1946.31	1866.27	583	1947.51	1867.47	623	1948.71	1868.67
504	1945.14	1865.10	544	1946.34	1866.30	584	1947.54	1867.50	624	1948.74	1868.70
505	1945.17	1865.13	545	1946.37	1866.33	585	1947.57	1867.53	625	1948.77	1868.73
506	1945.20	1865.16	546	1946.40	1866.36	586	1947.60	1867.56	626	1948.80	1868.76
507	1945.23	1865.19	547	1946.43	1866.39	587	1947.63	1867.59	627	1948.83	1868.79
508	1945.26	1865.22	548	1946.46	1866.42	588	1947.66	1867.62	628	1948.86	1868.82
509	1945.29	1865.25	549	1946.49	1866.45	589	1947.69	1867.65	629	1948.89	1868.85
510	1945.32	1865.28	550	1946.52	1866.48	590	1947.72	1867.68	630	1948.92	1868.88
511	1945.35	1865.31	551	1946.55	1866.51	591	1947.75	1867.71	631	1948.95	1868.91
512	1945.38	1865.34	552	1946.58	1866.54	592	1947.78	1867.74	632	1948.98	1868.94
513	1945.41	1865.37	553	1946.61	1866.57	593	1947.81	1867.77	633	1949.01	1868.97
514	1945.44	1865.40	554	1946.64	1866.60	594	1947.84	1867.80	634	1949.04	1869.00
515	1945.47	1865.43	555	1946.67	1866.63	595	1947.87	1867.83	635	1949.07	1869.03
516	1945.50	1865.46	556	1946.70	1866.66	596	1947.90	1867.86	636	1949.10	1869.06
517	1945.53	1865.49	557	1946.73	1866.69	597	1947.93	1867.89	637	1949.13	1869.09
518	1945.56	1865.52	558	1946.76	1866.72	598	1947.96	1867.92	638	1949.16	1869.12
519	1945.59	1865.55	559	1946.79	1866.75	599	1947.99	1867.95	639	1949.19	1869.15
520	1945.62	1865.58	560	1946.82	1866.78	600	1948.02	1867.98	640	1949.22	1869.18

11-6 Appendix B: Channel and frequency tables

Table 11-5

Frequency chart for TDMA 1900 Macrocell (channels 641–800)

641	1949.25	1869.21	681	1950.45	1870.41	721	1951.65	1871.61	761	1952.85	1872.81
642	1949.28	1869.24	682	1950.48	1870.44	722	1951.68	1871.64	762	1952.88	1872.84
643	1949.31	1869.27	683	1950.51	1870.47	723	1951.71	1871.67	763	1952.91	1872.87
644	1949.34	1869.30	684	1950.54	1870.50	724	1951.74	1871.70	764	1952.94	1872.90
645	1949.37	1869.33	685	1950.57	1870.53	725	1951.77	1871.73	765	1952.97	1872.93
646	1949.40	1869.36	686	1950.60	1870.56	726	1951.80	1871.76	766	1953.00	1872.96
647	1949.43	1869.39	687	1950.63	1870.59	727	1951.83	1871.79	767	1953.03	1872.99
648	1949.46	1869.42	688	1950.66	1870.62	728	1951.86	1871.82	768	1953.06	1873.02
649	1949.49	1869.45	689	1950.69	1870.65	729	1951.89	1871.85	769	1953.09	1873.05
650	1949.52	1869.48	690	1950.72	1870.68	730	1951.92	1871.88	770	1953.12	1873.08
651	1949.55	1869.51	691	1950.75	1870.71	731	1951.95	1871.91	771	1953.15	1873.11
652	1949.58	1869.54	692	1950.78	1870.74	732	1951.98	1871.94	772	1953.18	1873.14
653	1949.61	1869.57	693	1950.81	1870.77	733	1952.01	1871.97	773	1953.21	1873.17
654	1949.64	1869.60	694	1950.84	1870.80	734	1952.04	1872.00	774	1953.24	1873.20
655	1949.67	1869.63	695	1950.87	1870.83	735	1952.07	1872.03	775	1953.27	1873.23
656	1949.70	1869.66	696	1950.90	1870.86	736	1952.10	1872.06	776	1953.30	1873.26
657	1949.73	1869.69	697	1950.93	1870.89	737	1952.13	1872.09	777	1953.33	1873.29
658	1949.76	1869.72	698	1950.96	1870.92	738	1952.16	1872.12	778	1953.36	1873.32
659	1949.79	1869.75	699	1950.99	1870.95	739	1952.19	1872.15	779	1953.39	1873.35
660	1949.82	1869.78	700	1951.02	1870.98	740	1952.22	1872.18	780	1953.42	1873.38
661	1949.85	1869.81	701	1951.05	1871.01	741	1952.25	1872.21	781	1953.45	1873.41
662	1949.88	1869.84	702	1951.08	1871.04	742	1952.28	1872.24	782	1953.48	1873.44
663	1949.91	1869.87	703	1951.11	1871.07	743	1952.31	1872.27	783	1953.51	1873.47
664	1949.94	1869.90	704	1951.14	1871.10	744	1952.34	1872.30	784	1953.54	1873.50
665	1949.97	1869.93	705	1951.17	1871.13	745	1952.37	1872.33	785	1953.57	1873.53
666	1950.00	1869.96	706	1951.20	1871.16	746	1952.40	1872.36	786	1953.60	1873.56
667	1950.03	1869.99	707	1951.23	1871.19	747	1952.43	1872.39	787	1953.63	1873.59
668	1950.06	1870.02	708	1951.26	1871.22	748	1952.46	1872.42	788	1953.66	1873.62
669	1950.09	1870.05	709	1951.29	1871.25	749	1952.49	1872.45	789	1953.69	1873.65
670	1950.12	1870.08	710	1951.32	1871.28	750	1952.52	1872.48	790	1953.72	1873.68
671	1950.15	1870.11	711	1951.35	1871.31	751	1952.55	1872.51	791	1953.75	1873.71
672	1950.18	1870.14	712	1951.38	1871.34	752	1952.58	1872.54	792	1953.78	1873.74
673	1950.21	1870.17	713	1951.41	1871.37	753	1952.61	1872.57	793	1953.81	1873.77
674	1950.24	1870.20	714	1951.44	1871.40	754	1952.64	1872.60	794	1953.84	1873.80
675	1950.27	1870.23	715	1951.47	1871.43	755	1952.67	1872.63	795	1953.87	1873.83
676	1950.30	1870.26	716	1951.50	1871.46	756	1952.70	1872.66	796	1953.90	1873.86
677	1950.33	1870.29	717	1951.53	1871.49	757	1952.73	1872.69	797	1953.93	1873.89
678	1950.36	1870.32	718	1951.56	1871.52	758	1952.76	1872.72	798	1953.96	1873.92
679	1950.39	1870.35	719	1951.59	1871.55	759	1952.79	1872.75	799	1953.99	1873.95
680	1950.42	1870.38	720	1951.62	1871.58	760	1952.82	1872.78	800	1954.02	1873.98

Table 11-6
Frequency chart for TDMA 1900 Macrocell (channels 801–960)

801	1954.05	1874.01	841	1955.25	1875.21	881	1956.45	1876.41	921	1957.65	1877.61
802	1954.08	1874.04	842	1955.28	1875.24	882	1956.48	1876.44	922	1957.68	1877.64
803	1954.11	1874.07	843	1955.31	1875.27	883	1956.51	1876.47	923	1957.71	1877.67
804	1954.14	1874.10	844	1955.34	1875.30	884	1956.54	1876.50	924	1957.74	1877.70
805	1954.17	1874.13	845	1955.37	1875.33	885	1956.57	1876.53	925	1957.77	1877.73
806	1954.20	1874.16	846	1955.40	1875.36	886	1956.60	1876.56	926	1957.80	1877.76
807	1954.23	1874.19	847	1955.43	1875.39	887	1956.63	1876.59	927	1957.83	1877.79
808	1954.26	1874.22	848	1955.46	1875.42	888	1956.66	1876.62	928	1957.86	1877.82
809	1954.29	1874.25	849	1955.49	1875.45	889	1956.69	1876.65	929	1957.89	1877.85
810	1954.32	1874.28	850	1955.52	1875.48	890	1956.72	1876.68	930	1957.92	1877.88
811	1954.35	1874.31	851	1955.55	1875.51	891	1956.75	1876.71	931	1957.95	1877.91
812	1954.38	1874.34	852	1955.58	1875.54	892	1956.78	1876.74	932	1957.98	1877.94
813	1954.41	1874.37	853	1955.61	1875.57	893	1956.81	1876.77	933	1958.01	1877.97
814	1954.44	1874.40	854	1955.64	1875.60	894	1956.84	1876.80	934	1958.04	1878.00
815	1954.47	1874.43	855	1955.67	1875.63	895	1956.87	1876.83	935	1958.07	1878.03
816	1954.50	1874.46	856	1955.70	1875.66	896	1956.90	1876.86	936	1958.10	1878.06
817	1954.53	1874.49	857	1955.73	1875.69	897	1956.93	1876.89	937	1958.13	1878.09
818	1954.56	1874.52	858	1955.76	1875.72	898	1956.96	1876.92	938	1958.16	1878.12
819	1954.59	1874.55	859	1955.79	1875.75	899	1956.99	1876.95	939	1958.19	1878.15
820	1954.62	1874.58	860	1955.82	1875.78	900	1957.02	1876.98	940	1958.22	1878.18
821	1954.65	1874.61	861	1955.85	1875.81	901	1957.05	1877.01	941	1958.25	1878.21
822	1954.68	1874.64	862	1955.88	1875.84	902	1957.08	1877.04	942	1958.28	1878.24
823	1954.71	1874.67	863	1955.91	1875.87	903	1957.11	1877.07	943	1958.31	1878.27
824	1954.74	1874.70	864	1955.94	1875.90	904	1957.14	1877.10	944	1958.34	1878.30
825	1954.77	1874.73	865	1955.97	1875.93	905	1957.17	1877.13	945	1958.37	1878.33
826	1954.80	1874.76	866	1956.00	1875.96	906	1957.20	1877.16	946	1958.40	1878.36
827	1954.83	1874.79	867	1956.03	1875.99	907	1957.23	1877.19	947	1958.43	1878.39
828	1954.86	1874.82	868	1956.06	1876.02	908	1957.26	1877.22	948	1958.46	1878.42
829	1954.89	1874.85	869	1956.09	1876.05	909	1957.29	1877.25	949	1958.49	1878.45
830	1954.92	1874.88	870	1956.12	1876.08	910	1957.32	1877.28	950	1958.52	1878.48
831	1954.95	1874.91	871	1956.15	1876.11	911	1957.35	1877.31	951	1958.55	1878.51
832	1954.98	1874.94	872	1956.18	1876.14	912	1957.38	1877.34	952	1958.58	1878.54
833	1955.01	1874.97	873	1956.21	1876.17	913	1957.41	1877.37	953	1958.61	1878.57
834	1955.04	1875.00	874	1956.24	1876.20	914	1957.44	1877.40	954	1958.64	1878.60
835	1955.07	1875.03	875	1956.27	1876.23	915	1957.47	1877.43	955	1958.67	1878.63
836	1955.10	1875.06	876	1956.30	1876.26	916	1957.50	1877.46	956	1958.70	1878.66
837	1955.13	1875.09	877	1956.33	1876.29	917	1957.53	1877.49	957	1958.73	1878.69
838	1955.16	1875.12	878	1956.36	1876.32	918	1957.56	1877.52	958	1958.76	1878.72
839	1955.19	1875.15	879	1956.39	1876.35	919	1957.59	1877.55	959	1958.79	1878.75
840	1955.22	1875.18	880	1956.42	1876.38	920	1957.62	1877.58	960	1958.82	1878.78

11-8 Appendix B: Channel and frequency tables

Table 11-7

Frequency chart for TDMA 1900 Macrocell (channels 961–1120)

961	1958.85	1878.81	1001	1960.05	1880.01	1041	1961.25	1881.21	1081	1962.45	1882.41
962	1958.88	1878.84	1002	1960.08	1880.04	1042	1961.28	1881.24	1082	1962.48	1882.44
963	1958.91	1878.87	1003	1960.11	1880.07	1043	1961.31	1881.27	1083	1962.51	1882.47
964	1958.94	1878.90	1004	1960.14	1880.10	1044	1961.34	1881.30	1084	1962.54	1882.50
965	1958.97	1878.93	1005	1960.17	1880.13	1045	1961.37	1881.33	1085	1962.57	1882.53
966	1959.00	1878.96	1006	1960.20	1880.16	1046	1961.40	1881.36	1086	1962.60	1882.56
967	1959.03	1878.99	1007	1960.23	1880.19	1047	1961.43	1881.39	1087	1962.63	1882.59
968	1959.06	1879.02	1008	1960.26	1880.22	1048	1961.46	1881.42	1088	1962.66	1882.62
969	1959.09	1879.05	1009	1960.29	1880.25	1049	1961.49	1881.45	1089	1962.69	1882.65
970	1959.12	1879.08	1010	1960.32	1880.28	1050	1961.52	1881.48	1090	1962.72	1882.68
971	1959.15	1879.11	1011	1960.35	1880.31	1051	1961.55	1881.51	1091	1962.75	1882.71
972	1959.18	1879.14	1012	1960.38	1880.34	1052	1961.58	1881.54	1092	1962.78	1882.74
973	1959.21	1879.17	1013	1960.41	1880.37	1053	1961.61	1881.57	1093	1962.81	1882.77
974	1959.24	1879.20	1014	1960.44	1880.40	1054	1961.64	1881.60	1094	1962.84	1882.80
975	1959.27	1879.23	1015	1960.47	1880.43	1055	1961.67	1881.63	1095	1962.87	1882.83
976	1959.30	1879.26	1016	1960.50	1880.46	1056	1961.70	1881.66	1096	1962.90	1882.86
977	1959.33	1879.29	1017	1960.53	1880.49	1057	1961.73	1881.69	1097	1962.93	1882.89
978	1959.36	1879.32	1018	1960.56	1880.52	1058	1961.76	1881.72	1098	1962.96	1882.92
979	1959.39	1879.35	1019	1960.59	1880.55	1059	1961.79	1881.75	1099	1962.99	1882.95
980	1959.42	1879.38	1020	1960.62	1880.58	1060	1961.82	1881.78	1100	1963.02	1882.98
981	1959.45	1879.41	1021	1960.65	1880.61	1061	1961.85	1881.81	1101	1963.05	1883.01
982	1959.48	1879.44	1022	1960.68	1880.64	1062	1961.88	1881.84	1102	1963.08	1883.04
983	1959.51	1879.47	1023	1960.71	1880.67	1063	1961.91	1881.87	1103	1963.11	1883.07
984	1959.54	1879.50	1024	1960.74	1880.70	1064	1961.94	1881.90	1104	1963.14	1883.10
985	1959.57	1879.53	1025	1960.77	1880.73	1065	1961.97	1881.93	1105	1963.17	1883.13
986	1959.60	1879.56	1026	1960.80	1880.76	1066	1962.00	1881.96	1106	1963.20	1883.16
987	1959.63	1879.59	1027	1960.83	1880.79	1067	1962.03	1881.99	1107	1963.23	1883.19
988	1959.66	1879.62	1028	1960.86	1880.82	1068	1962.06	1882.02	1108	1963.26	1883.22
989	1959.69	1879.65	1029	1960.89	1880.85	1069	1962.09	1882.05	1109	1963.29	1883.25
990	1959.72	1879.68	1030	1960.92	1880.88	1070	1962.12	1882.08	1110	1963.32	1883.28
991	1959.75	1879.71	1031	1960.95	1880.91	1071	1962.15	1882.11	1111	1963.35	1883.31
992	1959.78	1879.74	1032	1960.98	1880.94	1072	1962.18	1882.14	1112	1963.38	1883.34
993	1959.81	1879.77	1033	1961.01	1880.97	1073	1962.21	1882.17	1113	1963.41	1883.37
994	1959.84	1879.80	1034	1961.04	1881.00	1074	1962.24	1882.20	1114	1963.44	1883.40
995	1959.87	1879.83	1035	1961.07	1881.03	1075	1962.27	1882.23	1115	1963.47	1883.43
996	1959.90	1879.86	1036	1961.10	1881.06	1076	1962.30	1882.26	1116	1963.50	1883.46
997	1959.93	1879.89	1037	1961.13	1881.09	1077	1962.33	1882.29	1117	1963.53	1883.49
998	1959.96	1879.92	1038	1961.16	1881.12	1078	1962.36	1882.32	1118	1963.56	1883.52
999	1959.99	1879.95	1039	1961.19	1881.15	1079	1962.39	1882.35	1119	1963.59	1883.55
1000	1960.02	1879.98	1040	1961.22	1881.18	1080	1962.42	1882.38	1120	1963.62	1883.58

Table 11-8
Frequency chart for TDMA 1900 Macrocell (channels 1121–1280)

1121	1963.65	1883.61	1161	1964.85	1884.81	1201	1966.05	1886.01	1241	1967.25	1887.21
1122	1963.68	1883.64	1162	1964.88	1884.84	1202	1966.08	1886.04	1242	1967.28	1887.24
1123	1963.71	1883.67	1163	1964.91	1884.87	1203	1966.11	1886.07	1243	1967.31	1887.27
1124	1963.74	1883.70	1164	1964.94	1884.90	1204	1966.14	1886.10	1244	1967.34	1887.30
1125	1963.77	1883.73	1165	1964.97	1884.93	1205	1966.17	1886.13	1245	1967.37	1887.33
1126	1963.80	1883.76	1166	1965.00	1884.96	1206	1966.20	1886.16	1246	1967.40	1887.36
1127	1963.83	1883.79	1167	1965.03	1884.99	1207	1966.23	1886.19	1247	1967.43	1887.39
1128	1963.86	1883.82	1168	1965.06	1885.02	1208	1966.26	1886.22	1248	1967.46	1887.42
1129	1963.89	1883.85	1169	1965.09	1885.05	1209	1966.29	1886.25	1249	1967.49	1887.45
1130	1963.92	1883.88	1170	1965.12	1885.08	1210	1966.32	1886.28	1250	1967.52	1887.48
1131	1963.95	1883.91	1171	1965.15	1885.11	1211	1966.35	1886.31	1251	1967.55	1887.51
1132	1963.98	1883.94	1172	1965.18	1885.14	1212	1966.38	1886.34	1252	1967.58	1887.54
1133	1964.01	1883.97	1173	1965.21	1885.17	1213	1966.41	1886.37	1253	1967.61	1887.57
1134	1964.04	1884.00	1174	1965.24	1885.20	1214	1966.44	1886.40	1254	1967.64	1887.60
1135	1964.07	1884.03	1175	1965.27	1885.23	1215	1966.47	1886.43	1255	1967.67	1887.63
1136	1964.10	1884.06	1176	1965.30	1885.26	1216	1966.50	1886.46	1256	1967.70	1887.66
1137	1964.13	1884.09	1177	1965.33	1885.29	1217	1966.53	1886.49	1257	1967.73	1887.69
1138	1964.16	1884.12	1178	1965.36	1885.32	1218	1966.56	1886.52	1258	1967.76	1887.72
1139	1964.19	1884.15	1179	1965.39	1885.35	1219	1966.59	1886.55	1259	1967.79	1887.75
1140	1964.22	1884.18	1180	1965.42	1885.38	1220	1966.62	1886.58	1260	1967.82	1887.78
1141	1964.25	1884.21	1181	1965.45	1885.41	1221	1966.65	1886.61	1261	1967.85	1887.81
1142	1964.28	1884.24	1182	1965.48	1885.44	1222	1966.68	1886.64	1262	1967.88	1887.84
1143	1964.31	1884.27	1183	1965.51	1885.47	1223	1966.71	1886.67	1263	1967.91	1887.87
1144	1964.34	1884.30	1184	1965.54	1885.50	1224	1966.74	1886.70	1264	1967.94	1887.90
1145	1964.37	1884.33	1185	1965.57	1885.53	1225	1966.77	1886.73	1265	1967.97	1887.93
1146	1964.40	1884.36	1186	1965.60	1885.56	1226	1966.80	1886.76	1266	1968.00	1887.96
1147	1964.43	1884.39	1187	1965.63	1885.59	1227	1966.83	1886.79	1267	1968.03	1887.99
1148	1964.46	1884.42	1188	1965.66	1885.62	1228	1966.86	1886.82	1268	1968.06	1888.02
1149	1964.49	1884.45	1189	1965.69	1885.65	1229	1966.89	1886.85	1269	1968.09	1888.05
1150	1964.52	1884.48	1190	1965.72	1885.68	1230	1966.92	1886.88	1270	1968.12	1888.08
1151	1964.55	1884.51	1191	1965.75	1885.71	1231	1966.95	1886.91	1271	1968.15	1888.11
1152	1964.58	1884.54	1192	1965.78	1885.74	1232	1966.98	1886.94	1272	1968.18	1888.14
1153	1964.61	1884.57	1193	1965.81	1885.77	1233	1967.01	1886.97	1273	1968.21	1888.17
1154	1964.64	1884.60	1194	1965.84	1885.80	1234	1967.04	1887.00	1274	1968.24	1888.20
1155	1964.67	1884.63	1195	1965.87	1885.83	1235	1967.07	1887.03	1275	1968.27	1888.23
1156	1964.70	1884.66	1196	1965.90	1885.86	1236	1967.10	1887.06	1276	1968.30	1888.26
1157	1964.73	1884.69	1197	1965.93	1885.89	1237	1967.13	1887.09	1277	1968.33	1888.29
1158	1964.76	1884.72	1198	1965.96	1885.92	1238	1967.16	1887.12	1278	1968.36	1888.32
1159	1964.79	1884.75	1199	1965.99	1885.95	1239	1967.19	1887.15	1279	1968.39	1888.35
1160	1964.82	1884.78	1200	1966.02	1885.98	1240	1967.22	1887.18	1280	1968.42	1888.38

Table 11-9

Frequency chart for TDMA 1900 Macrocell (channels 1281–1440)

1281	1968.45	1888.41	1321	1969.65	1889.61	1361	1970.85	1890.81	1401	1972.05	1892.01
1282	1968.48	1888.44	1322	1969.68	1889.64	1362	1970.88	1890.84	1402	1972.08	1892.04
1283	1968.51	1888.47	1323	1969.71	1889.67	1363	1970.91	1890.87	1403	1972.11	1892.07
1284	1968.54	1888.50	1324	1969.74	1889.70	1364	1970.94	1890.90	1404	1972.14	1892.10
1285	1968.57	1888.53	1325	1969.77	1889.73	1365	1970.97	1890.93	1405	1972.17	1892.13
1286	1968.60	1888.56	1326	1969.80	1889.76	1366	1971.00	1890.96	1406	1972.20	1892.16
1287	1968.63	1888.59	1327	1969.83	1889.79	1367	1971.03	1890.99	1407	1972.23	1892.19
1288	1968.66	1888.62	1328	1969.86	1889.82	1368	1971.06	1891.02	1408	1972.26	1892.22
1289	1968.69	1888.65	1329	1969.89	1889.85	1369	1971.09	1891.05	1409	1972.29	1892.25
1290	1968.72	1888.68	1330	1969.92	1889.88	1370	1971.12	1891.08	1410	1972.32	1892.28
1291	1968.75	1888.71	1331	1969.95	1889.91	1371	1971.15	1891.11	1411	1972.35	1892.31
1292	1968.78	1888.74	1332	1969.98	1889.94	1372	1971.18	1891.14	1412	1972.38	1892.34
1293	1968.81	1888.77	1333	1970.01	1889.97	1373	1971.21	1891.17	1413	1972.41	1892.37
1294	1968.84	1888.80	1334	1970.04	1890.00	1374	1971.24	1891.20	1414	1972.44	1892.40
1295	1968.87	1888.83	1335	1970.07	1890.03	1375	1971.27	1891.23	1415	1972.47	1892.43
1296	1968.90	1888.86	1336	1970.10	1890.06	1376	1971.30	1891.26	1416	1972.50	1892.46
1297	1968.93	1888.89	1337	1970.13	1890.09	1377	1971.33	1891.29	1417	1972.53	1892.49
1298	1968.96	1888.92	1338	1970.16	1890.12	1378	1971.36	1891.32	1418	1972.56	1892.52
1299	1968.99	1888.95	1339	1970.19	1890.15	1379	1971.39	1891.35	1419	1972.59	1892.55
1300	1969.02	1888.98	1340	1970.22	1890.18	1380	1971.42	1891.38	1420	1972.62	1892.58
1301	1969.05	1889.01	1341	1970.25	1890.21	1381	1971.45	1891.41	1421	1972.65	1892.61
1302	1969.08	1889.04	1342	1970.28	1890.24	1382	1971.48	1891.44	1422	1972.68	1892.64
1303	1969.11	1889.07	1343	1970.31	1890.27	1383	1971.51	1891.47	1423	1972.71	1892.67
1304	1969.14	1889.10	1344	1970.34	1890.30	1384	1971.54	1891.50	1424	1972.74	1892.70
1305	1969.17	1889.13	1345	1970.37	1890.33	1385	1971.57	1891.53	1425	1972.77	1892.73
1306	1969.20	1889.16	1346	1970.40	1890.36	1386	1971.60	1891.56	1426	1972.80	1892.76
1307	1969.23	1889.19	1347	1970.43	1890.39	1387	1971.63	1891.59	1427	1972.83	1892.79
1308	1969.26	1889.22	1348	1970.46	1890.42	1388	1971.66	1891.62	1428	1972.86	1892.82
1309	1969.29	1889.25	1349	1970.49	1890.45	1389	1971.69	1891.65	1429	1972.89	1892.85
1310	1969.32	1889.28	1350	1970.52	1890.48	1390	1971.72	1891.68	1430	1972.92	1892.88
1311	1969.35	1889.31	1351	1970.55	1890.51	1391	1971.75	1891.71	1431	1972.95	1892.91
1312	1969.38	1889.34	1352	1970.58	1890.54	1392	1971.78	1891.74	1432	1972.98	1892.94
1313	1969.41	1889.37	1353	1970.61	1890.57	1393	1971.81	1891.77	1433	1973.01	1892.97
1314	1969.44	1889.40	1354	1970.64	1890.60	1394	1971.84	1891.80	1434	1973.04	1893.00
1315	1969.47	1889.43	1355	1970.67	1890.63	1395	1971.87	1891.83	1435	1973.07	1893.03
1316	1969.50	1889.46	1356	1970.70	1890.66	1396	1971.90	1891.86	1436	1973.10	1893.06
1317	1969.53	1889.49	1357	1970.73	1890.69	1397	1971.93	1891.89	1437	1973.13	1893.09
1318	1969.56	1889.52	1358	1970.76	1890.72	1398	1971.96	1891.92	1438	1973.16	1893.12
1319	1969.59	1889.55	1359	1970.79	1890.75	1399	1971.99	1891.95	1439	1973.19	1893.15
1320	1969.62	1889.58	1360	1970.82	1890.78	1400	1972.02	1891.98	1440	1973.22	1893.18

Table 11-10
Frequency chart for TDMA 1900 Macrocell (channels 1441–1600)

1441	1973.25	1893.21	1481	1974.45	1894.41	1521	1975.65	1895.61	1561	1976.85	1896.81
1442	1973.28	1893.24	1482	1974.48	1894.44	1522	1975.68	1895.64	1562	1976.88	1896.84
1443	1973.31	1893.27	1483	1974.51	1894.47	1523	1975.71	1895.67	1563	1976.91	1896.87
1444	1973.34	1893.30	1484	1974.54	1894.50	1524	1975.74	1895.70	1564	1976.94	1896.90
1445	1973.37	1893.33	1485	1974.57	1894.53	1525	1975.77	1895.73	1565	1976.97	1896.93
1446	1973.40	1893.36	1486	1974.60	1894.56	1526	1975.80	1895.76	1566	1977.00	1896.96
1447	1973.43	1893.39	1487	1974.63	1894.59	1527	1975.83	1895.79	1567	1977.03	1896.99
1448	1973.46	1893.42	1488	1974.66	1894.62	1528	1975.86	1895.82	1568	1977.06	1897.02
1449	1973.49	1893.45	1489	1974.69	1894.65	1529	1975.89	1895.85	1569	1977.09	1897.05
1450	1973.52	1893.48	1490	1974.72	1894.68	1530	1975.92	1895.88	1570	1977.12	1897.08
1451	1973.55	1893.51	1491	1974.75	1894.71	1531	1975.95	1895.91	1571	1977.15	1897.11
1452	1973.58	1893.54	1492	1974.78	1894.74	1532	1975.98	1895.94	1572	1977.18	1897.14
1453	1973.61	1893.57	1493	1974.81	1894.77	1533	1976.01	1895.97	1573	1977.21	1897.17
1454	1973.64	1893.60	1494	1974.84	1894.80	1534	1976.04	1896.00	1574	1977.24	1897.20
1455	1973.67	1893.63	1495	1974.87	1894.83	1535	1976.07	1896.03	1575	1977.27	1897.23
1456	1973.70	1893.66	1496	1974.90	1894.86	1536	1976.10	1896.06	1576	1977.30	1897.26
1457	1973.73	1893.69	1497	1974.93	1894.89	1537	1976.13	1896.09	1577	1977.33	1897.29
1458	1973.76	1893.72	1498	1974.96	1894.92	1538	1976.16	1896.12	1578	1977.36	1897.32
1459	1973.79	1893.75	1499	1974.99	1894.95	1539	1976.19	1896.15	1579	1977.39	1897.35
1460	1973.82	1893.78	1500	1975.02	1894.98	1540	1976.22	1896.18	1580	1977.42	1897.38
1461	1973.85	1893.81	1501	1975.05	1895.01	1541	1976.25	1896.21	1581	1977.45	1897.41
1462	1973.88	1893.84	1502	1975.08	1895.04	1542	1976.28	1896.24	1582	1977.48	1897.44
1463	1973.91	1893.87	1503	1975.11	1895.07	1543	1976.31	1896.27	1583	1977.51	1897.47
1464	1973.94	1893.90	1504	1975.14	1895.10	1544	1976.34	1896.30	1584	1977.54	1897.50
1465	1973.97	1893.93	1505	1975.17	1895.13	1545	1976.37	1896.33	1585	1977.57	1897.53
1466	1974.00	1893.96	1506	1975.20	1895.16	1546	1976.40	1896.36	1586	1977.60	1897.56
1467	1974.03	1893.99	1507	1975.23	1895.19	1547	1976.43	1896.39	1587	1977.63	1897.59
1468	1974.06	1894.02	1508	1975.26	1895.22	1548	1976.46	1896.42	1588	1977.66	1897.62
1469	1974.09	1894.05	1509	1975.29	1895.25	1549	1976.49	1896.45	1589	1977.69	1897.65
1470	1974.12	1894.08	1510	1975.32	1895.28	1550	1976.52	1896.48	1590	1977.72	1897.68
1471	1974.15	1894.11	1511	1975.35	1895.31	1551	1976.55	1896.51	1591	1977.75	1897.71
1472	1974.18	1894.14	1512	1975.38	1895.34	1552	1976.58	1896.54	1592	1977.78	1897.74
1473	1974.21	1894.17	1513	1975.41	1895.37	1553	1976.61	1896.57	1593	1977.81	1897.77
1474	1974.24	1894.20	1514	1975.44	1895.40	1554	1976.64	1896.60	1594	1977.84	1897.80
1475	1974.27	1894.23	1515	1975.47	1895.43	1555	1976.67	1896.63	1595	1977.87	1897.83
1476	1974.30	1894.26	1516	1975.50	1895.46	1556	1976.70	1896.66	1596	1977.90	1897.86
1477	1974.33	1894.29	1517	1975.53	1895.49	1557	1976.73	1896.69	1597	1977.93	1897.89
1478	1974.36	1894.32	1518	1975.56	1895.52	1558	1976.76	1896.72	1598	1977.96	1897.92
1479	1974.39	1894.35	1519	1975.59	1895.55	1559	1976.79	1896.75	1599	1977.99	1897.95
1480	1974.42	1894.38	1520	1975.62	1895.58	1560	1976.82	1896.78	1600	1978.02	1897.98

Table 11-11**Frequency chart for TDMA 1900 Macrocell (channels 1601–1760)**

1601	1978.05	1898.01	1641	1979.25	1899.21	1681	1980.45	1900.41	1721	1981.65	1901.61
1602	1978.08	1898.04	1642	1979.28	1899.24	1682	1980.48	1900.44	1722	1981.68	1901.64
1603	1978.11	1898.07	1643	1979.31	1899.27	1683	1980.51	1900.47	1723	1981.71	1901.67
1604	1978.14	1898.10	1644	1979.34	1899.30	1684	1980.54	1900.50	1724	1981.74	1901.70
1605	1978.17	1898.13	1645	1979.37	1899.33	1685	1980.57	1900.53	1725	1981.77	1901.73
1606	1978.20	1898.16	1646	1979.40	1899.36	1686	1980.60	1900.56	1726	1981.80	1901.76
1607	1978.23	1898.19	1647	1979.43	1899.39	1687	1980.63	1900.59	1727	1981.83	1901.79
1608	1978.26	1898.22	1648	1979.46	1899.42	1688	1980.66	1900.62	1728	1981.86	1901.82
1609	1978.29	1898.25	1649	1979.49	1899.45	1689	1980.69	1900.65	1729	1981.89	1901.85
1610	1978.32	1898.28	1650	1979.52	1899.48	1690	1980.72	1900.68	1730	1981.92	1901.88
1611	1978.35	1898.31	1651	1979.55	1899.51	1691	1980.75	1900.71	1731	1981.95	1901.91
1612	1978.38	1898.34	1652	1979.58	1899.54	1692	1980.78	1900.74	1732	1981.98	1901.94
1613	1978.41	1898.37	1653	1979.61	1899.57	1693	1980.81	1900.77	1733	1982.01	1901.97
1614	1978.44	1898.40	1654	1979.64	1899.60	1694	1980.84	1900.80	1734	1982.04	1902.00
1615	1978.47	1898.43	1655	1979.67	1899.63	1695	1980.87	1900.83	1735	1982.07	1902.03
1616	1978.50	1898.46	1656	1979.70	1899.66	1696	1980.90	1900.86	1736	1982.10	1902.06
1617	1978.53	1898.49	1657	1979.73	1899.69	1697	1980.93	1900.89	1737	1982.13	1902.09
1618	1978.56	1898.52	1658	1979.76	1899.72	1698	1980.96	1900.92	1738	1982.16	1902.12
1619	1978.59	1898.55	1659	1979.79	1899.75	1699	1980.99	1900.95	1739	1982.19	1902.15
1620	1978.62	1898.58	1660	1979.82	1899.78	1700	1981.02	1900.98	1740	1982.22	1902.18
1621	1978.65	1898.61	1661	1979.85	1899.81	1701	1981.05	1901.01	1741	1982.25	1902.21
1622	1978.68	1898.64	1662	1979.88	1899.84	1702	1981.08	1901.04	1742	1982.28	1902.24
1623	1978.71	1898.67	1663	1979.91	1899.87	1703	1981.11	1901.07	1743	1982.31	1902.27
1624	1978.74	1898.70	1664	1979.94	1899.90	1704	1981.14	1901.10	1744	1982.34	1902.30
1625	1978.77	1898.73	1665	1979.97	1899.93	1705	1981.17	1901.13	1745	1982.37	1902.33
1626	1978.80	1898.76	1666	1980.00	1899.96	1706	1981.20	1901.16	1746	1982.40	1902.36
1627	1978.83	1898.79	1667	1980.03	1899.99	1707	1981.23	1901.19	1747	1982.43	1902.39
1628	1978.86	1898.82	1668	1980.06	1900.02	1708	1981.26	1901.22	1748	1982.46	1902.42
1629	1978.89	1898.85	1669	1980.09	1900.05	1709	1981.29	1901.25	1749	1982.49	1902.45
1630	1978.92	1898.88	1670	1980.12	1900.08	1710	1981.32	1901.28	1750	1982.52	1902.48
1631	1978.95	1898.91	1671	1980.15	1900.11	1711	1981.35	1901.31	1751	1982.55	1902.51
1632	1978.98	1898.94	1672	1980.18	1900.14	1712	1981.38	1901.34	1752	1982.58	1902.54
1633	1979.01	1898.97	1673	1980.21	1900.17	1713	1981.41	1901.37	1753	1982.61	1902.57
1634	1979.04	1899.00	1674	1980.24	1900.20	1714	1981.44	1901.40	1754	1982.64	1902.60
1635	1979.07	1899.03	1675	1980.27	1900.23	1715	1981.47	1901.43	1755	1982.67	1902.63
1636	1979.10	1899.06	1676	1980.30	1900.26	1716	1981.50	1901.46	1756	1982.70	1902.66
1637	1979.13	1899.09	1677	1980.33	1900.29	1717	1981.53	1901.49	1757	1982.73	1902.69
1638	1979.16	1899.12	1678	1980.36	1900.32	1718	1981.56	1901.52	1758	1982.76	1902.72
1639	1979.19	1899.15	1679	1980.39	1900.35	1719	1981.59	1901.55	1759	1982.79	1902.75
1640	1979.22	1899.18	1680	1980.42	1900.38	1720	1981.62	1901.58	1760	1982.82	1902.78

Table 11-12
Frequency chart for TDMA 1900 Macrocell (channels 1761–1920)

1761	1982.85	1902.81	1801	1984.05	1904.01	1841	1985.25	1905.21	1881	1986.45	1906.41
1762	1982.88	1902.84	1802	1984.08	1904.04	1842	1985.28	1905.24	1882	1986.48	1906.44
1763	1982.91	1902.87	1803	1984.11	1904.07	1843	1985.31	1905.27	1883	1986.51	1906.47
1764	1982.94	1902.90	1804	1984.14	1904.10	1844	1985.34	1905.30	1884	1986.54	1906.50
1765	1982.97	1902.93	1805	1984.17	1904.13	1845	1985.37	1905.33	1885	1986.57	1906.53
1766	1983.00	1902.96	1806	1984.20	1904.16	1846	1985.40	1905.36	1886	1986.60	1906.56
1767	1983.03	1902.99	1807	1984.23	1904.19	1847	1985.43	1905.39	1887	1986.63	1906.59
1768	1983.06	1903.02	1808	1984.26	1904.22	1848	1985.46	1905.42	1888	1986.66	1906.62
1769	1983.09	1903.05	1809	1984.29	1904.25	1849	1985.49	1905.45	1889	1986.69	1906.65
1770	1983.12	1903.08	1810	1984.32	1904.28	1850	1985.52	1905.48	1890	1986.72	1906.68
1771	1983.15	1903.11	1811	1984.35	1904.31	1851	1985.55	1905.51	1891	1986.75	1906.71
1772	1983.18	1903.14	1812	1984.38	1904.34	1852	1985.58	1905.54	1892	1986.78	1906.74
1773	1983.21	1903.17	1813	1984.41	1904.37	1853	1985.61	1905.57	1893	1986.81	1906.77
1774	1983.24	1903.20	1814	1984.44	1904.40	1854	1985.64	1905.60	1894	1986.84	1906.80
1775	1983.27	1903.23	1815	1984.47	1904.43	1855	1985.67	1905.63	1895	1986.87	1906.83
1776	1983.30	1903.26	1816	1984.50	1904.46	1856	1985.70	1905.66	1896	1986.90	1906.86
1777	1983.33	1903.29	1817	1984.53	1904.49	1857	1985.73	1905.69	1897	1986.93	1906.89
1778	1983.36	1903.32	1818	1984.56	1904.52	1858	1985.76	1905.72	1898	1986.96	1906.92
1779	1983.39	1903.35	1819	1984.59	1904.55	1859	1985.79	1905.75	1899	1986.99	1906.95
1780	1983.42	1903.38	1820	1984.62	1904.58	1860	1985.82	1905.78	1900	1987.02	1906.98
1781	1983.45	1903.41	1821	1984.65	1904.61	1861	1985.85	1905.81	1901	1987.05	1907.01
1782	1983.48	1903.44	1822	1984.68	1904.64	1862	1985.88	1905.84	1902	1987.08	1907.04
1783	1983.51	1903.47	1823	1984.71	1904.67	1863	1985.91	1905.87	1903	1987.11	1907.07
1784	1983.54	1903.50	1824	1984.74	1904.70	1864	1985.94	1905.90	1904	1987.14	1907.10
1785	1983.57	1903.53	1825	1984.77	1904.73	1865	1985.97	1905.93	1905	1987.17	1907.13
1786	1983.60	1903.56	1826	1984.80	1904.76	1866	1986.00	1905.96	1906	1987.20	1907.16
1787	1983.63	1903.59	1827	1984.83	1904.79	1867	1986.03	1905.99	1907	1987.23	1907.19
1788	1983.66	1903.62	1828	1984.86	1904.82	1868	1986.06	1906.02	1908	1987.26	1907.22
1789	1983.69	1903.65	1829	1984.89	1904.85	1869	1986.09	1906.05	1909	1987.29	1907.25
1790	1983.72	1903.68	1830	1984.92	1904.88	1870	1986.12	1906.08	1910	1987.32	1907.28
1791	1983.75	1903.71	1831	1984.95	1904.91	1871	1986.15	1906.11	1911	1987.35	1907.31
1792	1983.78	1903.74	1832	1984.98	1904.94	1872	1986.18	1906.14	1912	1987.38	1907.34
1793	1983.81	1903.77	1833	1985.01	1904.97	1873	1986.21	1906.17	1913	1987.41	1907.37
1794	1983.84	1903.80	1834	1985.04	1905.00	1874	1986.24	1906.20	1914	1987.44	1907.40
1795	1983.87	1903.83	1835	1985.07	1905.03	1875	1986.27	1906.23	1915	1987.47	1907.43
1796	1983.90	1903.86	1836	1985.10	1905.06	1876	1986.30	1906.26	1916	1987.50	1907.46
1797	1983.93	1903.89	1837	1985.13	1905.09	1877	1986.33	1906.29	1917	1987.53	1907.49
1798	1983.96	1903.92	1838	1985.16	1905.12	1878	1986.36	1906.32	1918	1987.56	1907.52
1799	1983.99	1903.95	1839	1985.19	1905.15	1879	1986.39	1906.35	1919	1987.59	1907.55
1800	1984.02	1903.98	1840	1985.22	1905.18	1880	1986.42	1906.38	1920	1987.62	1907.58

Table 11-13**Frequency chart for TDMA 1900 Macrocell (channels 1921–1999)**

1921	1987.65	1907.61	1961	1988.85	1908.81
1922	1987.68	1907.64	1962	1988.88	1908.84
1923	1987.71	1907.67	1963	1988.91	1908.87
1924	1987.74	1907.70	1964	1988.94	1908.90
1925	1987.77	1907.73	1965	1988.97	1908.93
1926	1987.80	1907.76	1966	1989.00	1908.96
1927	1987.83	1907.79	1967	1989.03	1908.99
1928	1987.86	1907.82	1968	1989.06	1909.02
1929	1987.89	1907.85	1969	1989.09	1909.05
1930	1987.92	1907.88	1970	1989.12	1909.08
1931	1987.95	1907.91	1971	1989.15	1909.11
1932	1987.98	1907.94	1972	1989.18	1909.14
1933	1988.01	1907.97	1973	1989.21	1909.17
1934	1988.04	1908.00	1974	1989.24	1909.20
1935	1988.07	1908.03	1975	1989.27	1909.23
1936	1988.10	1908.06	1976	1989.30	1909.26
1937	1988.13	1908.09	1977	1989.33	1909.29
1938	1988.16	1908.12	1978	1989.36	1909.32
1939	1988.19	1908.15	1979	1989.39	1909.35
1940	1988.22	1908.18	1980	1989.42	1909.38
1941	1988.25	1908.21	1981	1989.45	1909.41
1942	1988.28	1908.24	1982	1989.48	1909.44
1943	1988.31	1908.27	1983	1989.51	1909.47
1944	1988.34	1908.30	1984	1989.54	1909.50
1945	1988.37	1908.33	1985	1989.57	1909.53
1946	1988.40	1908.36	1986	1989.60	1909.56
1947	1988.43	1908.39	1987	1989.63	1909.59
1948	1988.46	1908.42	1988	1989.66	1909.62
1949	1988.49	1908.45	1989	1989.69	1909.65
1950	1988.52	1908.48	1990	1989.72	1909.68
1951	1988.55	1908.51	1991	1989.75	1909.71
1952	1988.58	1908.54	1992	1989.78	1909.74
1953	1988.61	1908.57	1993	1989.81	1909.77
1954	1988.64	1908.60	1994	1989.84	1909.80
1955	1988.67	1908.63	1995	1989.87	1909.83
1956	1988.70	1908.66	1996	1989.90	1909.86
1957	1988.73	1908.69	1997	1989.93	1909.89
1958	1988.76	1908.72	1998	1989.96	1909.92
1959	1988.79	1908.75	1999	1989.99	1909.95
1960	1988.82	1908.78			

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Term	Meaning	Term	Meaning
E		H	
EBCCH	Extended BroadCast CHannel	H/W	Hardware
EDSPM	Enhanced Digital Signal Processing Module	HLD	High Level Design
EEPROM	Electrically Erasable Programmable Read Only Memory	HLR	Home Location Registry
EFRC	Enhanced Full Rate Codec	HMI	Human Machine Interface
EIA	Electronics Industry Association	HSMO	High Stability Master Oscillator
EIRP	Effective Isotropic Radiated Power	HVAC	Heating Ventilation Air Conditioning
ESD	Electro Static Discharge	I	
ESN	Enhanced Services Network	IBN	Isolated Bonding Network
EISP	Enhanced ISDN Signaling Preprocessor	IC	Integrated Circuit
EMR	Electromagnetic Radiation	ICP	Intelligent Cellular Peripheral
EMI	Electro Magnetic Interference	ICRM	Integrated Cellular Remote Module
EPROM	Erasable Programmable Read Only Memory	ICRM+	Integrated Cellular Remote Module Plus
F		ICRMO+	Integrated Cellular Remote Module Offshore Plus
FACCH	Fast Associated Control Channel	IDPROM	IDentification Programmable Read Only Memory
Fc	Center Frequency	IEC	International Electrotechnical Commission
FCC	Federal Communications Commission	IF	Intermediate Frequency
FDTC	Forward Digital Traffic Channel	IM	InterModulation
FDMA	Frequency Division Multiple Access	I/O	Input Output
FEC	Forward Error Correction	I/P	Input
FG	Frame Ground	IRM	Indoor Receive Module
FM	Frequency Modulation	IROM	Identification Read Only Memory
Forward path	Path from cell site to cellular subscriber.	Isolation	Attenuation between any two signal or radiation points (expressed in dB)
FRU	Field Replacement Unit	I&Q	Inphase and Quadrature
FSK	Frequency Shift Keying		
FTM	Frequency Translation Module		
G			
GHz	Gigahertz		
GPS	Global Positioning System		
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Term	Meaning	Term	Meaning
P		RMTC	Remote Module Timeswitch Controller
PA	Power Amplifier	RPM	Revolutions Per Minute
PAD	Packet Assembler/Disassembler	RMTP	Remote Module Time compression multiplex Packet assembler/disassembler
PAS	Product Administration System	RPDU	Receive Power Distribution Unit
PC	Personal Computer	RRIF	Remote Radio InterFace
PCL	Product Content Load	RRM	Remote Receiver Module
PCM	Pulse Code Modulation	RSID	Residential Service Identification
		RSM	Receiver Splitter Module
PCB	Printed Circuit Board	RSS	Receive Signal Strength
PCP	Printed Circuit Pack	RSSI	Receive Signal Strength Indicator
		RTB	Real Time Billing
PCS	Personal Communications Services	RTS	Return To Service
PDQP	Product Development Quality Plan	RAM	Random Access Memory
PEC	Product Engineering Code	ROM	Read Only Memory
PFM	Power Filter Module	Rx	Receive
ppb	Parts Per Billion	S	
ppm	Parts Per Million	SACCH	Slow Associated Control CHannel
PSID	Private Service Identification	SAT	Supervisory Audio Tone
PSTN	Public Switching Telephone Network	SAW	Surface Acoustic Wave
PSU	Power Supply Unit	SBI	Shorten Burst Indicator
R		SCC	SAT Color Code
RBS	Radio Backplane Splitter	SCLPA	Single Channel Linear Power Amplifier
RCMI	Remote Cellular Multiplexer Interface	SINAD	Signal-to-noise and distortion
RDTC	Reverse Direction Traffic Channel	S/N	Signal-to-Noise ratio
Return loss	Logarithmic relationship of the incident signal to the reflected signal.	SMS	Short Message Service
Reverse path	Path from cellular subscriber terminal to cell site.	SMA	Subminiature A coaxial connector dc–18 GHz
RF	Radio Frequency	SND	Serial Number Checking Disable
RH	Relative Humidity	SPS	System Packaging Specification
RIP	Rack Interface Panel	ST	Signaling Tone
RMAC	Remote Module Alarm Card	STB	Split Ticket Billing
RMC	Receiver Multi Coupler	STSR	Sectored Transmit Sectored Receive configuration
RMCP	Remote Module Control Processor	S/W	Software
RMDP	Remote Module DRU Port card	SRF	Special Function Register
RMFS	Remote Module Frame Supervisor	SRAM	Static Random Access Memory
RMPT	Remote Module Time Compression Multiplex Packet		
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12-6 List of terms and abbreviations

Term	Meaning	Term	Meaning
T		V	
TCM	Time Compression Multiplex	VCH	Voice CHannel
TCU	Thermal Control Unit	VLR	Visitor Location Register
TDMA	Time Division Multiple Access		
TIA	Telecommunications Industry Association	VMLA	Virtual Mobile Location Area
TIA	Test Interface Adapter	VRLA	Valve Regulated Lead Acid
TiGER	Two Gigahertz Enhanced Radio	VSELP	Vector Sum Excited Linear Predictive Speech Coding
TLR	TDMA Locate Receiver	VSMO	Very Stable Master Oscillator
TRU	Transmit Receive Unit	VSWR	Voltage Standing Wave Ratio
TTC	TDMA Traffic Channel	X	
Tx	Transmit	XCVR	Transceiver
TxF	Transmit Filter	XPM+	Extended Peripheral Module
U			
UL	Underwriters Laboratories		
-sheet 6 of 6-			

Wireless Solutions

TDMA 1900 Macrocell

Cell Site Maintenance Manual

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Publication number: 411-6201-500

Product release : MTX08

Document version: Preliminary 03.03

Date: July 1999

Printed in Canada

CPC: A0688110

PEC: NTTG7858

