

MX3 Reference Guide



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Revision Notice

MX3 Reference Guide Upgrade From Revision F to Revision G

Chapter 1 – Introduction	Added section "Configure the Software". Updated section "Terminal Emulation".
Chapter 4 – System Configuration	Marked PDTEST and SETHOST as unavailable as of Nov 2003. Replaced the appropriate sections of the "Sample NET.CFG Symbol 11MB Radio" section based on Datalight Stack Release changes as of Nov 2003.
Chapter 6 – RF Network Configuration	Added note to "Encrypt_Key_ID" : This parameter is valid for Symbol FHSS radios only. Added "Encrypt_Enable_Index": This section replaces the old "Encrypt_Key_Index" parameter for Datalight stacks after Nov 2003. Bootstrap Protocol (BOOTP): Removed this sentence "For file server based networks, Sockets workstations can be configured in a similar way using the SETHOST utility."
Appendix B – MX3 API	Removed. Replaced by standalone user guide : E-SW-DOSAPIPG available on the LXE Manuals CD and the LXE website. Relettered Appendices C and D to B and C.

Table of Contents

CHAPTER 1 INTRODUCTION	1
Components	2
When to Use This Guide	3
Document Conventions	4
Getting Started	5
Insert Main Battery	6
About Lithium-Ion Batteries	6
Attach Handstrap (Optional)	8
Connect DC Power (Optional)	9
Power On and Off	10
Turn On the MX3	10
Turn Off the MX3	10
Troubleshooting	10
Endcaps	11
COM Port Switching	11
Scanner / Serial Port	11
Dual Serial Port	12
PCMCIA Cards	13
PCMCIA Radio Card	15
Configure the Software	16
Data Entry	18
Keyboard Data Entry	18
Barcode Data Entry	18
RS-232 Data Entry	18
Terminal Emulation	19
Terminal Emulation Directories	19
DOS Terminal Emulation User Defined Stored Forms	20
MX3 Font/Screen Sizes	20
Getting Help	21
Manuals and Accessories	21
Manuals	21
Accessories	21
CHAPTER 2 PHYSICAL DESCRIPTION AND LAYOUT	23
Hardware Configuration	23
System Hardware	23

Central Processing Unit	23
AT Compatible Core Logic	24
System Memory	24
Upper Memory Block	24
Internal Flash Array	24
Video Subsystem	24
Power Supply	25
Memory Map	26
COM Ports	27
COM 1	27
COM 2 - IR Port	27
PCMCIA Slots	28
Physical Controls	29
On/Off Switch	29
Critical Suspend Mode and the Off Timer	29
Power Status and the Status LED	30
Power Management and the Keypad	31
Suspend State	31
Critical Suspend State	31
Display	32
Display and Display Backlight Timer	33
Panning	33
Optional Touchscreen	34
Cleaning the Display	34
Display Repair	34
Scan Buttons	35
Scan Buttons and the SCNR LED	35
Speaker	35
Keypads	36
QWERTY Keys	36
ABCD Keys	36
The Overlays	37
Programmable Buttons	38
Possible Button Configurations	38
Scan Key Function	38
Enter Key Function	39
Field Exit Key Function (IBM 5250/TN5250 Only)	39
2nd Key Function	39
Ctrl Key Function	39
Alt Key Function	39
Shft Key Function	39
Spc Key Function	40
Mode Key Functions	40
Caps Key and CapsLock Mode	40

Keypress Sequences.....	40
Reset Key Sequence	40
DOS Key Functions Not Available on the MX3	40
Function LEDs.....	41
Infrared (IR) Port	43
Endcaps	44
COM Port Switching	44
Scanner / Serial Port	44
Dual Serial Port	45
Storage Cradles	46
CHAPTER 3 POWER SUPPLY	47
Introduction	47
Main Battery Pack	47
Battery Charger.....	48
Low Battery Warning	48
Critical Suspend State.....	49
Backup Battery.....	50
Maintenance.....	50
Battery Hot-Swapping	51
Handling Batteries Safely.....	51
Battery Maintenance Publication.....	51
CHAPTER 4 SYSTEM CONFIGURATION	53
Introduction	53
Installed Software	53
Drive C Internal Flash Array	53
Software Loaded on Drive C	54
C Root Directory.....	55
\DOS Files	56
\AGENT.....	56
\IRDA Files.....	57
\PCMCIA Files	57
\UTILS.....	58
Terminal Emulation Directories	59
Dual Terminal Emulation.....	60
TE Selection Menu	60
Switching Terminal Emulators	60
Menu Customization.....	60
Radio-Specific Subdirectory.....	61

\PCTCP (2.4GHz Radio Specific Files).....	61
LXE 900Mhz Radio Files	62
Configuration and Sample Files	63
Sample AUTOEXEC.BAT File.....	64
For 900MHz Radio.....	64
For 2.4GHz Radio (with ANSI Plus)	65
Sample CONFIG.SYS File.....	66
Sample NET.CFG Files	67
Lucent Radio NET.CFG File	67
Proxim Radio NET.CFG File.....	68
Cisco Radio NET.CFG File	69
Symbol FHSS 2Mb Radio NET.CFG File.....	71
Symbol 4121 11Mb Radio NET.CFG File.....	73
Sample SOCKET.CFG File.....	75
BIOS Setup	77
Accessing the BIOS Setup.....	77
Using the Keypad	77
BIOS Setup Default Values by Option.....	78
Main Menu Options.....	79
Main Menu Parameters	79
Parameter Changes.....	79
Time	79
Date	80
Boot.....	80
Setup Msg.....	80
Post Msg.....	81
Summary	82
Advanced Menu Options	83
Parameter List	83
Power Management.....	84
Power Mgt.....	84
CPU and Suspend Timers and RF Communication	84
Left Scan	84
Right Scan	85
CPU.....	85
Custom Setting	85
Disp BL.....	86
Disp BL.....	86
Display	86
Suspend.....	87
Off Timer	88
Docked PM.....	89
Touch Wake.....	89
Power Key.....	89
Troubleshooting	90
Keyboard	90
Caps	90

NumLock	90
Rpt Delay	90
Rpt Rate	90
CtlAltDel.....	90
Other	91
Font	91
COM1 Pin9	91
COM2 Pin9	91
Exit Menu Options.....	92
Save and Exit.....	92
Exit w/o Save	92
Load Defaults	92
Load Previous.....	92
Save Changes	92
API Calls	93
Sample Code for API Calls.....	93
CHAPTER 5 UTILITIES	95
Introduction	95
IrDA Lite Plus	97
System Setup	97
IR Communication Reliability	97
IrDA Lite Plus and MX3	98
Quick Start.....	98
File Transfer Using IR Ports	99
File Transfer Using RS-232 Ports	100
Send MX3 File to a Printer	100
IrDA Lite Plus and MX3 and Powered Cradles	101
File Transfer Using IR Ports	101
Print Through Cradle.....	102
IRSEND and IRECV Files	103
IRSEND.C.....	103
IRECV.C	106
LXE BCWEDGE	109
Parameters.....	109
LXE Diagnostics.....	111
Backup Battery Test Utility (BBTST81.EXE)	113
Battery Discharge Utility (BBDIS81.EXE).....	113
Beeper Utility (BEEP81.EXE)	113
Volume Control Keys.....	113
Communication Port Utility (COMTST81.EXE).....	114
RS-232 Endcap Connector	114
RS-232 Endcap COM Port Loopback Configuration	114

Display Utility (DISP81.EXE)	115
File Transfer Utility (LXEF.EXE).....	115
Keyboard Utility (KEY2381.EXE)	115
Parameter Auto-Detect Utility (PARAM81.EXE)	116
Scanner Configuration Utility (SCU.EXE)	117
Set An API Function (SETAPI_4.EXE).....	118
Example – Enable COM2 for Tethered Scanner.....	119
Touchscreen Calibration (TSCAL.EXE).....	120
Touchscreen Test (TSTEST.EXE)	120
The NED ASCII Text Editor.....	122
NED Default Hot Keys.....	123
Serial File Transfer Utility.....	124
REMSERV	124
REMDISK	125
CHAPTER 6 RF NETWORK CONFIGURATION	127
Introduction	127
SNMP DOS Agent.....	127
NET.CFG Parameters.....	128
Lucent Parameters	128
Link Support.....	128
Protocol	128
WaveLAN_Network_Name.....	128
Station_Name.....	128
AP_Distance.....	128
Microwave_Robustness	129
Transmit_Rate.....	129
Medium_Reservation	129
Card_Power_Management.....	129
Maximum_Sleep_Duration.....	130
Receive_All_Multicasts	130
Enable_Encryption	130
Transmit_Key_ID.....	130
Proxim Parameters.....	131
Link Support.....	131
Protocol	131
Int	131
Port	131
Mem#1 (ODI).....	131
Domain.....	131
Station_type.....	131
Socket.....	131
Initialize_365.....	132

Inactivity_min	132
Inactivity_sec	132
Channel.....	132
Subchannel	132
Mac_optimize.....	132
Roam_config.....	132
Peer_to_peer.....	132
Cisco Parameters	133
Link Support.....	133
Protocol	133
LEAP.....	133
WorldMode	133
ShortPreamble	133
AWCLEAP.....	133
SSID	134
FragThreshold	134
RTSThreshold	134
DataRateX.....	134
RefreshInterval	134
PowerSaveMode.....	134
MaxPowerSave.....	134
NodeName.....	134
WEP enable.....	135
Diversity	135
PortBase – IRQ – Memory - Socket.....	135
BusType	135
Frame.....	135
LongRetryLimit.....	135
WEPDOS.....	136
Symbol Parameters	137
Link Support.....	137
Protocol	137
ESS_ID.....	137
cardservices	137
socketservices.....	137
mode	137
ioaddress.....	137
memory.....	137
interrupt	138
powermgmt.....	138
performance_index.....	138
Auth_type	138
Encrypt-Key#	138
encrypt_enable	138
Encrypt_Key_ID	139
Encrypt_Enable_Index.....	139

diversity	139
Tx_rate	139
SOCKETS TCP/IP Stack.....	140
Introduction	140
Bootp	140
DHCP	140
Setting SOCKETS.CFG Parameters.....	141
Set IP Address	141
Set ARP INIT	141
Set Interface.....	141
Set Router IP (Gateway only)	142
Set Domain Name Server	142
Display IP Address.....	142
Options	142
SOCKET.CFG Parameters	143
domain	143
iface	143
interface.....	143
ip.....	146
param.....	147
route.....	149
tcp.....	151
CHAPTER 7 TROUBLESHOOTING	155
Problem Determination Tips	155
Startup Problems	156
Bypassing the Configuration Files	156
Verifying Boot Order.....	157
Missing COMMAND.COM	157
Edit BIOS Setup	158
Copy File.....	159
Setting System Time and Date	160
Hardware Problems	161
Power Source.....	161
Keypad.....	161
Display.....	162
Hard Disk Drive.....	162
PCMCIA Cards.....	163
Upper Memory Conflicts	164
IRQ Assignments	164
Optional Devices	165
Radio Problems.....	166
Software Related Problems.....	167

FTP Kernel.....	167
Convert MX3 from MS-DOS to ROM-DOS.....	168
Memory	169
Conventional Memory.....	169
Extended Memory	169
Power On Self Test (POST)	170
POST Error Messages.....	170
Messages Probably Requiring Repair.....	171
POST Beep Codes	171
If You Need Further Assistance	172
Before You Call.....	172
APPENDIX A KEY MAPS	173
<hr/>	
Keypads	173
Key Map 101-Key Equivalencies for Batch Units	174
IBM 3270 and TN3270 Terminal Emulator Keypad.....	179
IBM 5250 and TN5250 Terminal Emulator Keypad.....	179
APPENDIX B TECHNICAL SPECIFICATIONS	181
<hr/>	
Physical Specifications	181
Environmental Specifications.....	183
LXE MX3 and Endcaps.....	183
Power Supplies	183
US AC Wall Adapter.....	183
International AC Adapter.....	184
Display Specifications	184
Radio Specifications.....	185
PCMCIA 900 MHz Type III.....	185
LXE 6400 PCMCIA 2.4 GHz Type II.....	185
LXE 6500 PCMCIA 2.4 GHz Type II.....	185
PCMCIA Cisco 2.4 GHz Type II	186
PCMCIA Symbol 2Mb 2.4 GHz Type II.....	186
PCMCIA Symbol 11Mb 2.4 GHz Type II.....	186
APPENDIX C COMMANDS	187
<hr/>	
Introduction	187
ROM-DOS Commands	187
ANSI.SYS.....	188
ATTRIB.EXE	189

CHKDSK.EXE	190
COMMAND.COM	191
DELTREE.EXE	192
FORMAT.COM	193
HIMEM.SYS	194
MEM.EXE	196
MODE.COM	197
MORE.COM	198
NED.EXE and NED.CFG	199
PRINT.COM	201
REMDISK.EXE	202
REMSERV.EXE	203
SYS.COM	204
VER	205
XCOPY.COM	206
ROM-DOS 6.22 Command Summary	207

INDEX**211**

Illustrations

Figure 1-1 Front of MX3	2
Figure 1-2 Back of MX3	2
Figure 1-3 Main Battery	6
Figure 1-4 Battery Compartment	7
Figure 1-5 Main Battery	7
Figure 1-6 MX3 With Handstrap Installed	8
Figure 1-7 DC Power Supply	9
Figure 1-8 Location of the Power Button	10
Figure 1-9 Standard Range Scanner / Serial Port Endcap	11
Figure 1-10 Dual Serial Port	12
Figure 1-11 PC Card Location	13
Figure 2-1 System Hardware	23
Figure 2-2 Location of the Power (PWR) Button	29
Figure 2-3 Power Status and the Status LED	30
Figure 2-4 MX3 Display	32
Figure 2-5 Scan/Enter/FLD EXIT Buttons	35
Figure 2-6 Speaker Location	35
Figure 2-7 The QWERTY Keypad	36
Figure 2-8 The ABCD Keypad	36
Figure 2-9 ABCD Keypad - ANSI/LDS/PC Overlay	37
Figure 2-10 QWERTY Keypad - ANSI/LDS/PC Overlay	37
Figure 2-11 TN3270/3270 Overlay for QWERTY Keypad	37
Figure 2-12 TN5250/5250 Overlay for QWERTY Keypad	37
Figure 2-13 Programmable Buttons (Field Exit / Scan / Enter)	38
Figure 2-14 Function LEDs	41
Figure 2-15 2 nd , ALT, CTRL, SHFT, CAPS	41
Figure 2-16 SCNR, BATT B	42
Figure 2-17 STAT, BATT M, CHGR	42
Figure 2-18 Infrared Port - COM2 Port	43
Figure 2-19 Standard Range Scanner / Serial Port Endcap	44
Figure 2-20 Dual Serial Port	45
Figure 2-21 RS-232 Pinouts	45
Figure 2-22 9-Pin RS-232 Description	45
Figure 2-23 Desktop Cradle	46
Figure 2-24 Vehicle Mounted Cradle	46
Figure 3-1 Main Battery Pack	47
Figure 3-2 LXE Multi-Charger	48
Figure 3-3 Insert Main Battery in Charger	48
Figure 5-1 RS-232 Serial Connector (COM1 or COM2)	114
Figure 5-2 RS-232 Endcap COM Port Loopback Configuration	114
Figure A-1 ABCD Keypad and QWERTY Keypad	173
Figure A-2 IBM 3270 Specific Keypad	179
Figure A-3 IBM 5250 Specific Keypad	179

Chapter 1 Introduction

The MX3 is a rugged, portable, mobile PC-compatible computer capable of wireless data communications. The MX3 can transmit information using either a 900 MHz or 2.4 GHz radio (with an internally mounted antenna). It can store information for later transmission through an RS-232 or InfraRed port. The MX3 is horizontally oriented and features electroluminescent backlighting for the display. The keys on the keypad are constructed of a phosphorescent material that can easily be seen in dimly lighted areas.

The MX3 is a DOS compatible computer designed to run as a batch unit or run software applications such as LXE's Terminal Emulator applications (ANSI Plus, LDS Plus, DOS 5250, DOS 3270, TN3270 and TN5250).

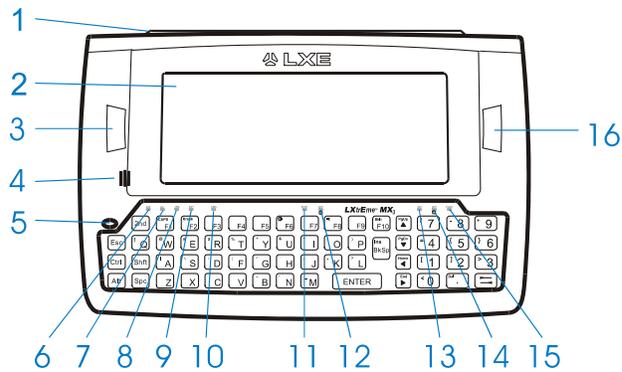


Please refer to the "MX3 Installation and Operator's Guide" for MX3 installation and user instruction.



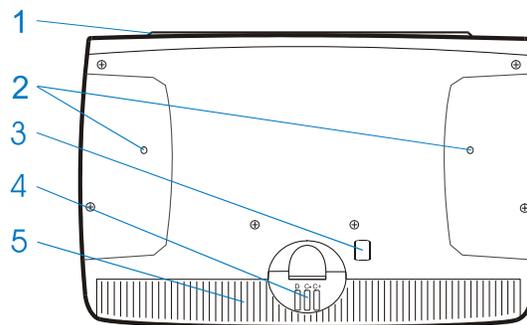
Please refer to the "MX3 Cradle Reference Guide" for technical information relating to the Desk Top and Vehicle Mount cradles.

Components



1. Endcap
2. Display
3. Field Exit or Scan or Enter
4. Beeper
5. On/Off Button
6. 2nd LED
7. Alt LED
8. Ctrl LED
9. Shift LED
10. Caps LED
11. Scanner LED
12. Backup Battery LED
13. Status LED
14. Main Battery LED
15. Charger LED
16. Scan or Enter

Figure 1-1 Front of MX3



1. Endcap
2. Leather Handstrap Connector
3. IR Port
4. Cradle Input Contracts
5. Main Battery

Figure 1-2 Back of MX3

When to Use This Guide

As the reference for LXE's MX3 computer, this guide provides detailed information on its features and functionality. Use this reference guide as you would any other source book -- reading portions to learn about the MX3, and then referring to it when you need more information about a particular subject. This guide takes you through all aspects of the installation and configuration of the LXE MX3.

Operating instructions for the general user are contained in the "MX3 Installation and Operator's Guide".

This chapter, "**Introduction**", briefly describes this reference guide structure, contains setup and installation instruction, briefly describes data entry processes, and explains how to get help.

Chapter 2 "Physical Description and Layout" describes the function and layout of the configuration, controls and connectors on the MX3.

Chapter 3 "Power Supply" describes the power sources and battery charging stations.

Chapter 4 "System Configuration" takes you through the BIOS Setup and memory maps, the MX3 file structure, describes LXE's Terminal Emulation programs compatible with the MX3 and contains instructions for panning the display.

Chapter 5 "Utilities" explains the function of MX3-specific utilities.

Chapter 6 "RF Network Configuration" describes the functions and delivers instruction on editing the NET.CFG and SOCKET.CFG files. It also contains information relating to the SNMP DOS agent.

Chapter 7 "Troubleshooting" solutions are split into several areas, including a list of Power On Self Test (POST) messages and run time messages. The solution may be found in one area or it may be a combination of the solutions in several areas.

Appendix A "Key Maps" describes the keypress sequences for the different keypads -- batch, IBM 3270, and IBM 5250.

Appendix B "Technical Specifications" lists technical specifications for physical, environmental, display and the radios.

Appendix C "Commands" describes ROM-DOS command files.

Document Conventions

This reference guide uses the following document conventions:

Convention	Meaning
ALL CAPS	All caps are used to represent disk directories, file names, and application names.
Menu Choice	Rather than use the phrase “choose the Save command from the File menu”, this manual uses the convention “choose File Save”.
“Quotes”	Indicates the title of a book, chapter or a section within a chapter (for example, “Document Conventions”).
< >	Indicates a key on the keyboard (for example, <Enter>).
	Indicates a reference to other documentation.
	Differences in operation or commands due to radio type.
ATTENTION	Keyword that indicates vital or pivotal information to follow.
	Attention symbol that indicates vital or pivotal information to follow. Also, when marked on product, means to refer to the manual or operator’s guide.
	International fuse replacement symbol. When marked on the product, the label includes fuse ratings in volts (v) and amperes (a) for the product.
<i>Note:</i>	Keyword that indicates immediately relevant information.
Caution 	Keyword that indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.
WARNING 	Keyword that indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.
DANGER 	Keyword that indicates a imminent hazardous situation which, if not avoided, will result in death or serious injury.

Getting Started

Note: When your MX3 is pre-configured, the radio, PCMCIA card and endcaps are assembled by LXE to your specifications. You may only need to install a storage/charging cradle or handstrap.

This section's instructions are based on the assumption that your new system is pre-configured and requires only accessory installation (e.g. handstrap or cradle) and a power source.

LXE recommends that installation or removal of accessories be performed on a clean, well-lit surface. When necessary, protect the work surface, MX3, and components from electrostatic discharge.

In general, the sequence of events is:

1. Insert fully charged battery.
2. Install accessories.
3. Power the MX3 on.
4. Configure the software.

Note: **New batteries must be fully charged prior to use.** This process takes up to four hours in an LXE Multi-Charger or LXE Multi-Charger Plus and up to eight hours using the MX3 internal charger.



Refer to the documentation received with the charger for complete information.

Note: At this time you should create a DOS boot SRAM card for the MX3. The bootup card can be used when the MX3 has corrupt or missing operating system files. Please refer to a commercially available DOS user manual for boot disk instruction.

Insert Main Battery

Note: New batteries must be charged prior to first use. This process takes approximately four hours in an LXE Multi-Charger or Multi-Charger Plus.

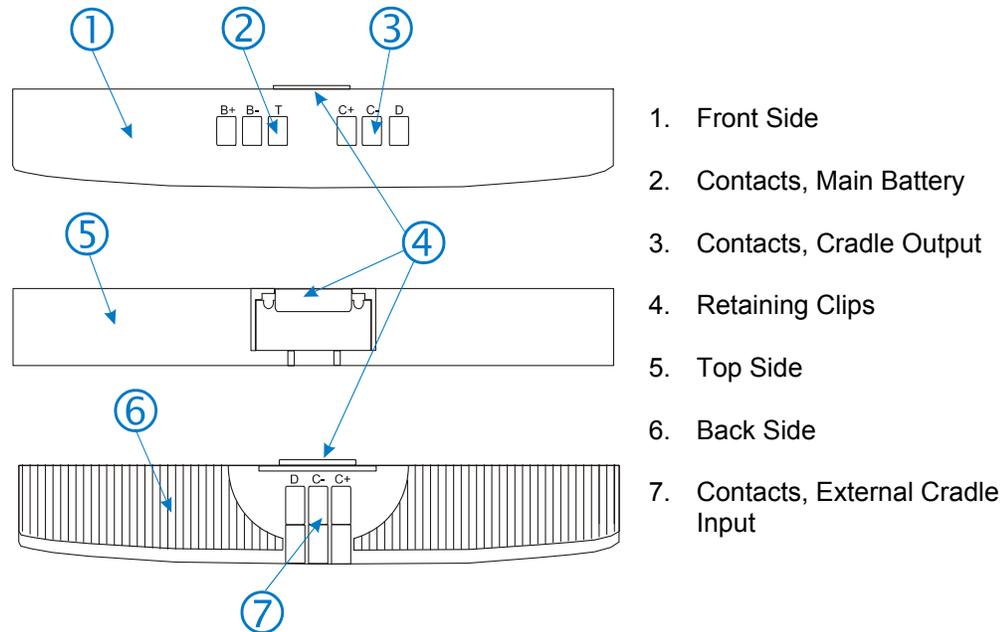


Figure 1-3 Main Battery

About Lithium-Ion Batteries

Li-Ion batteries (like all batteries) gradually lose their capacity over time (in a linear fashion) and never just stop working. Use the following chart to determine when to replace the battery:

LXE Part No. 2381A376BATT1600

100% capacity	1400 mAh minimum
80% capacity	1120 mAh minimum

LXE Part No. MX3A378BATT

100% capacity	1800 mAh minimum
80% capacity	1440 mAh minimum

Deciding when to replace a Main Battery pack in the MX3 is difficult to quantify because it is very application specific. 1000 mAh may be the cutoff for one customer who uses the computer frequently, while 300 mAh may be perfectly fine for a customer who occasionally uses the computer. You need to determine the point at which battery life becomes unacceptable for your business practices and replace the main battery pack before that point.

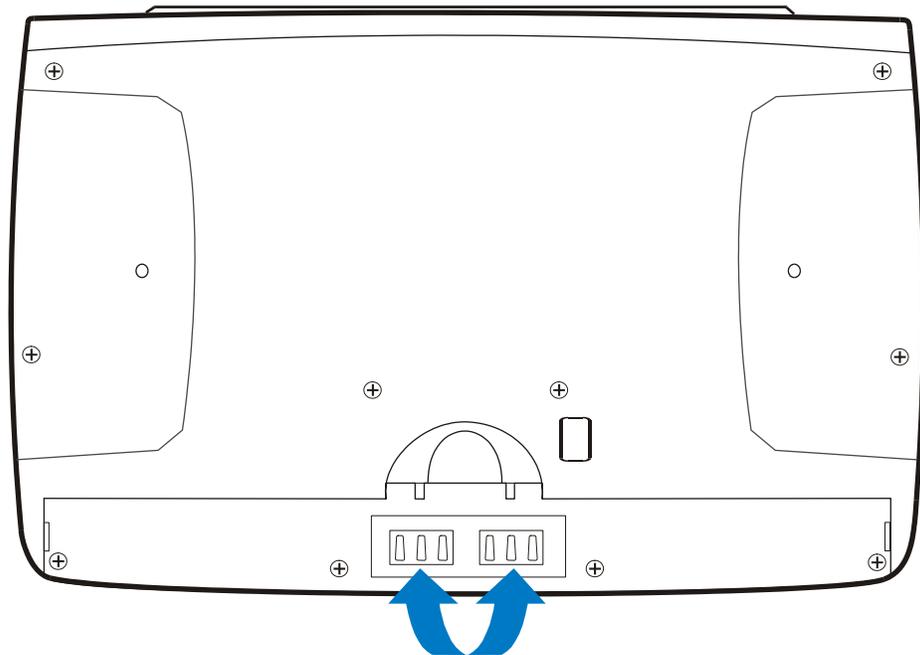


Figure 1-4 Battery Compartment

The MX3 Battery Compartment is located at the bottom of the back of the computer. The arrows in the figure above point to the battery contacts in the computer.

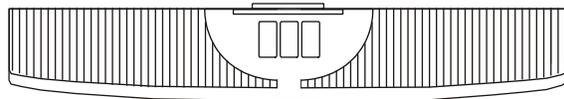


Figure 1-5 Main Battery

Place the battery in the compartment, making sure the side of the battery with six contacts matches up with the battery contacts in the computer battery compartment. Do not slide the battery sideways into the compartment.

Firmly press the battery into the compartment until it clicks. The battery is now securely fastened to the MX3.

Attach Handstrap (Optional)

An elastic handstrap is available for the MX3. Once installed, the handstrap provides a means for the user to secure the computer to their hand. It is adjustable to fit practically any size hand and does not interfere with battery charging when the MX3 is in a docking station.

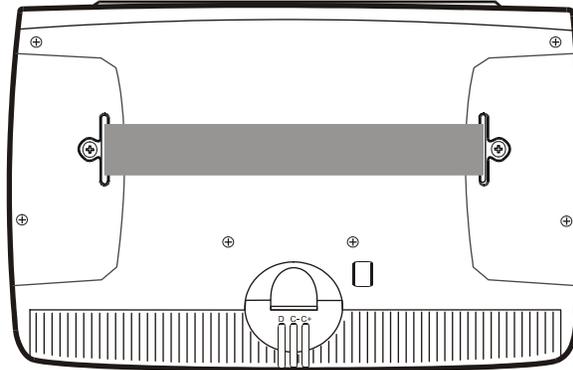


Figure 1-6 MX3 With Handstrap Installed

Tool Required: #1 Phillips Screwdriver

Installation

1. Remove the MX3 from the docking station.
2. Put the unit in Suspend mode or turn the unit off to prevent accidental key presses when you are attaching the handstrap.
3. Place the MX3, with the screen facing down, on a flat stable surface.
4. Attach the handstrap to the MX3 with the screws and washers provided.
5. Test the strap's connection making sure the MX3 is securely connected to each end of the strap connectors.

Connect DC Power (Optional)

Note: When an external power supply is used to power these products, the external power supply should be UL Listed, with LPS or Class 2 outputs rated 12V, minimum 1Amp.

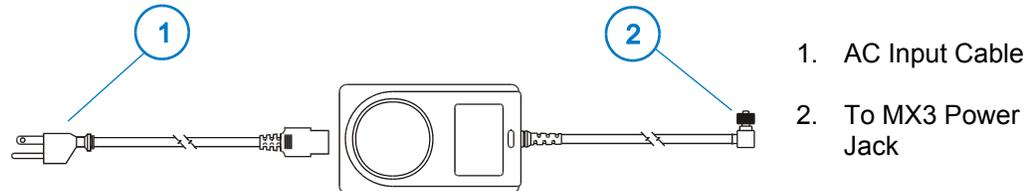


Figure 1-7 DC Power Supply

The MX3 connects to any of the following power supplies through the DC Power Jack on the endcap:

- US AC/DC 12V power supply
- International AC/DC 12V power supply

1. Insert the barrel connector into the MX3 power jack and push in firmly.
2. The CHGR LED above the keypad illuminates when the MX3 is receiving power through the power jack. The Main Battery automatically recharges when the MX3 is connected to an external power source.

Note: When the MX3 is receiving external power from a cradle, the cradle Status LED and the CHGR LED on the MX3 are illuminated.

Power On and Off

Turn On the MX3

Press and hold the Power button until the display turns on. The power button is located above the ESC key on the keypad.

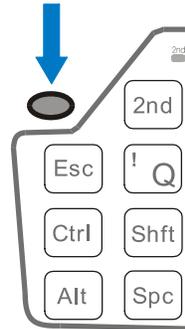


Figure 1-8 Location of the Power Button

When the MX3 is powered on, the display will begin scrolling power-on information as software and drivers are loaded. When the display has stopped scrolling and a DOS C: prompt is displayed or an application begins, the power on sequence is complete.

Turn Off the MX3

Hold the Power button down. The unit will emit three short beeps and one long beep. After the long beep the MX3 will power down. The Power button and the display will turn off. The Power key function is configured in the BIOS Setup.

Note: Tapping the Power button will place the MX3 in Suspend mode.

Troubleshooting

The MX3 will not turn off – force a Power Off by holding the Power key down for 15 seconds and the MX3 will power off. Locate and correct the problem before powering the MX3 back on – e.g. IRQ conflict, very low battery power, radio conflict, unexpected software application result, etc.

Endcaps



Refer to the “MX3 Operator’s Guide” for the section titled “Scanner Warnings and Labels” for important laser safety information **before** using the scanner.

The Scanner/Serial Port and the Dual Serial Port are designated COM 1. The COM2 port is the IR port.

Note: Your configuration may be different than those shown below.

COM Port Switching

The default COM 2 port is always the IR port on the back of the MX3, regardless of the endcap installed on the MX3.

On the Standard Range Scanner / Serial Port endcap COM 1 is the Integrated Scanner port.

On the Dual Serial Port endcap the COM1 port is the serial port on the left side of the endcap when the display is facing you.

An API can be run to switch power to the DB9 Serial port. If a tethered scanner is connected to the Serial Port without switching the power to the COM2 port (serial port), the scanner will not work.

Scanner / Serial Port

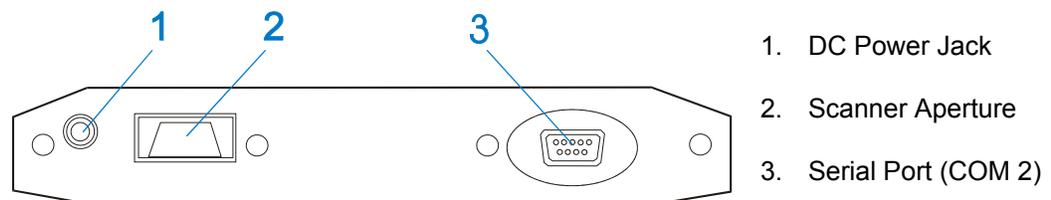


Figure 1-9 Standard Range Scanner / Serial Port Endcap

The internal barcode scanner scans only when the Scan button is pressed. Scan buttons have no effect on externally attached barcode scanners (see previous section titled “COM Port Switching”).

Dual Serial Port

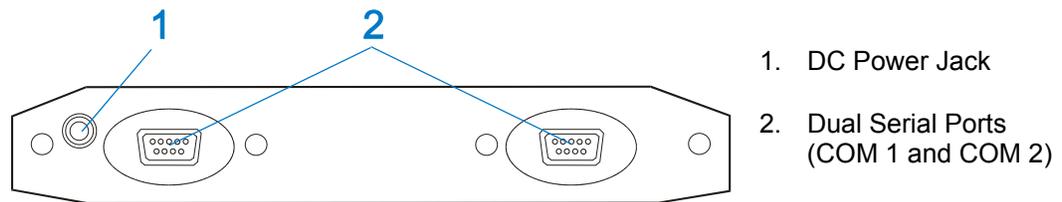


Figure 1-10 Dual Serial Port

The MX3 can be equipped with endcaps to perform different tasks. All MX3s are equipped with a beeper that is not connected to endcap functioning.

Each endcap type fulfills a different function. Changes may be required in application software when installing a different type of endcap.

Endcaps are installed and configured by LXE.

PCMCIA Cards

When removing or installing PCMCIA cards, protect the MX3 internal components from electrostatic discharge.

Use and operation of the Personal Computer Memory Card International Association (PCMCIA) device (e.g. PC card) is dependent upon both the type of device installed and the application(s) running on the computer.



When installed, the PC card will not function properly unless the proper PC card management software is installed in the PC card/MX3. (See Chapter 4, “System Configuration.”) Make sure the proper software is pre-loaded and PC cards are properly configured.

There are two PC card slots in the MX3. The slot in the middle is Slot 1 and the slot near the side of the MX3 is Slot 0. Both PC card slots will accept PC radio cards and PC data cards. Slot 1 is 5mm tall and Slot 0 is 2.2mm tall.

Note: Do not remove the radio card when installing a PC card.

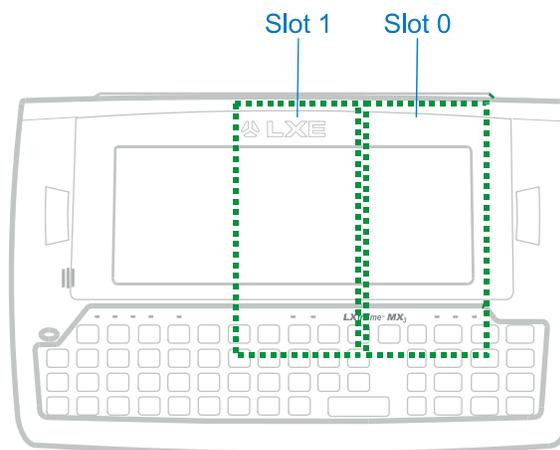


Figure 1-11 PC Card Location

Requirement: A screwdriver (not supplied by LXE)

Preparation

LXE recommends that installation of the PC card be performed on a clean, well-lit surface.

Using a screwdriver, loosen the endcap and set both the endcap and the screws aside.

Installation

Slide the PC Card, connector side first, into the slot until it seats. Use caution not to pull or snag the antenna connector.

If the PC Card is difficult to seat in the slot, remove the card, turn it around and re-install.

Removal

Grasp the top of the PC Card and pull it straight upward to remove.

Use caution not to pull or snag the antenna connector on the Radio card, if installed.

If you anticipate keeping the PC card out of the MX3 for a long period of time place it in an enclosed storage container. Store in an area that is protected from dirt, moisture, and electrostatic contact.

PCMCIA Radio Card

When removing or installing the radio, protect the MX3 internal components and the radio from electrostatic discharge.

Slot 1 accepts the following PCMCIA radio cards:

- LXE 6500 System 2.4GHz radio
- LXE 6200 System 900 MHz radio

Slot 0 accepts the following PCMCIA radio card:

- LXE 6400 System 2.4GHz radio



When installed, the radio will not work unless the proper radio driver software is installed in the computer. (See Chapter 4, “System Configuration”.)

Make sure the proper software is pre-loaded and a compatible radio network is available.

Preparation

LXE recommends that installation of the radio card be performed on a clean, well-lit surface.

Using a screwdriver, loosen the endcap and set both the endcap and the screws aside.

Installation

1. Slide the PCMCIA Radio, connector side first, into the slot until it seats.
5. The radio antenna connector must be positioned up and toward the front of the MX3 (near the display). If the PCMCIA Radio is difficult to seat, remove the Radio card, turn it around and re-install.
6. Gently snap the antenna cable into the connector on the PCMCIA Radio. Use caution not to damage either the antenna cable connector or the connector on the radio.

*Note: A 6400 System radio has one antenna cable. A 6500 System antenna has two antenna cables. Connect **all** antenna cables to the PCMCIA radio.*

7. Reinstall the endcap.

Removal

1. Disconnect the antenna cable from the radio, using caution not to damage the radio connector or the antenna cable connector.
8. Move the cable aside and grasp the top of the radio card and pull straight up until the radio is removed from the MX3 unit.

If you anticipate keeping the radio card out of the MX3 for a long period of time place it in an enclosed storage container. Store in an area that is protected from dirt, moisture, and electrostatic contact.

Configure the Software

Please have the following information available before setting up your computer for the first time:

- IP Address
- Network SSID number of the Access Point

In Brief . . .

1. Insert a fully charged battery into a hand-held computer. Connect a vehicle mounted computer to an external power source.
2. Power up the computer.
3. Using the NED editing utility, edit the NET.CFG file in the PCTCP subdirectory.
4. Using the NED editing utility, edit the SOCKET.CFG file in the PCTCP subdirectory.
5. Using the TE utility, edit the Terminal Emulation parameters (if needed).
6. Reboot.

How To Edit DOS Files on Your Computer Using NED.EXE

The following DOS file edit commands are required for setup. These commands are not case sensitive. The following keystrokes will control the cursor.

PgDn - Move cursor down
PgUp - Move cursor up
^{2nd} *PgUp* - Move up a page
^{2nd} *PgDn* - Move down a page
^{2nd} *CTRL PgUp* - Move to the top of the file
^{2nd} *CTRL PgDn* - Move to the bottom of the file

The cursor may not be visible on the screen. Use the key commands above to find the cursor when editing the NET.CFG and SOCKET.CFG files.

If the cursor is at the bottom of the file, the PgDn key and the 2nd PgDn keystrokes will not help you find the cursor.

How To Use F5 During Bootup

1. Power the computer on.
2. Press F5 when “Starting ROM-DOS” appears on the screen. It may flash quickly on the screen then disappear.
3. Press the Enter key at the Time prompt. Press the Enter key at the date prompt.
4. Type CLS and press the Enter key.
5. Type “Path=C:\DOS” and press the Enter key.
6. The DOS C:\ prompt appears on the screen.

How To Edit the NET.CFG File

Note: While editing the NET.CFG file, do not press Enter until all changes are completed.

1. At the C:\ prompt, type CD PCTCP. Then press Enter.

2. At the C:\PCTCP prompt, type NED NET.CFG. Then press Enter.
3. You should be at the top of the file. Use the PgDn (or down arrow) key to move down the screen. You may not see the cursor at first.
4. Move the cursor to the line of code that reads:


```
SSID      "" ; Must match Cisco Access Point setting
ESS_ID    "" ; Must match Symbol Access Point setting
WaveLan_Network_Name "" ; Must match Lucent/Orinoco/Agere Access Point setting
```
5. At this line, move the cursor to the right using the End (or the right arrow) key
6. Edit the line to contain the network name of the Access Point the computer is to connect through.
7. If you will be using WEP or another authentication protocol, please contact your wireless network administrator to acquire the WEP/LEAP keys. Please refer to Chapter 6, "RF Network Configuration" for the WEP key procedure.
8. After edits are complete, press *Alt F* to access the menu and save.
9. Move the cursor down to *Save* or press *Enter* or press *F9*.
10. To exit, press *Alt F*.
11. Move the cursor to *Exit* and press *Enter* or press *Alt F4*.

How To Edit the SOCKET.CFG File

Note: While editing the SOCKET.CFG file, do not press Enter until all changes are completed.

1. At the C:\ prompt, type CD PCTCP. Press Enter.
2. At the C:\PCTCP prompt, type NED SOCKET.CFG. Press Enter.
3. You should be at the top of the file. Use the PgDn key (or down arrow) to move down the screen. You may not see the cursor at first.
4. Move the cursor down to the line that reads:


```
IP address 0.0.0.1/16 // This is the default setting and allows the DHCP server to set the
                    computer's IP address to be set each time the computer is powered
                    up.
```
5. If a static IP address is to be set for the computer, edit this statement to read:


```
IP address 'assigned IP address'/xx
```

where 'xx' is the number of subnet bits for the assigned IP address.

Note: If a static address was set, then a route might also be required if there is a gateway between the Access Points the system uses and a Session Manager (if used).

6. After edits are complete, press *Alt F* to access the menu.
7. Move the cursor down to *Save* or press *Enter* or press *F9*.
8. To exit, press *Alt F*.
9. Move the cursor to *Exit* and press *Enter* or press *Alt F4*.

Data Entry

Note: The MX3 will not run Microsoft® Windows® products i.e. Windows 3.X, Windows For Workgroups, Windows 95/98, Windows NT, etcetera.

The MX3 computer accepts data entry from the keyboard, barcode scanner and the RS-232 input port when an LXE terminal emulation (TE) program is running and on batch (non-TE) units.

Keyboard Data Entry

Once the terminal emulation program is started, data can be entered with the MX3 keypads. Keyed data can be entered into a data field and transmitted to the host. You might respond to a prompt sent by the host application with a keypad entry, such as a menu listing choices for your next action.

Barcode Data Entry

The MX3 supports an accessory barcode label reading device. Keyboard data entries can be mixed with barcode data entries. Any scanner that decodes the barcode internally and outputs an RS-232 data stream may be used. The serial port parameters may need to be changed (using the terminal emulation's configuration utility) to match the parameters of the scanner.

RS-232 Data Entry

The MX3 accepts input from an RS-232 device connected to either RS-232 port, COM1 or COM2.

Terminal Emulation

All terminal emulation radio controlled data flows and exchanges are over the radio to the 62XX, 64XX or 65XX units, then to the computer network and then to a host computer. The LXE Network Management System (for 900MHz systems) or Client Configuration Manager (for 2.4GHz systems), as part of the wired network, can remotely configure the MX3's terminal emulation parameters.

- MX3's with 900MHz spread spectrum radios communicate only with 62XX Base Stations with installed 900MHz radios.
- MX3's with 64XX series 2.4GHz spread spectrum radios communicate only with 64XX Access Points with installed 64XX 2.4GHz radios.
- MX3's with 65XX series 2.4GHz spread spectrum radios communicate only with 65XX Access Points with installed 65XX 2.4GHz radios.

Please refer to the system specific terminal emulation reference guide for instruction when using an MX3 in a specific TE environment. A list of LXE reference guides is located at the end of this chapter in the section titled "Manuals".

Terminal Emulation Directories



Please refer to the specific Terminal Emulation's reference guide for complete instructions.

Batch MX3's do not have terminal emulation (TE) files and may or may not have a radio card. When a need exists to convert a batch MX3 to a TE unit or a different radio card, contact LXE Customer Services for assistance.

Note: 900 MHz radio files are loaded in the Terminal Emulation subdirectories, i.e. /APLUS, /LDSPLUS, /IBM (for both 3270 and 5250).

Following are the directory names containing the TE program files:

/APLUS	ANSI Plus with 2.4 GHz radio
/APLUS	ANSI Plus with 900 MHz radio
/LDSPLUS	DOS LDS Plus with 900 MHz radio
/LDS24	DOS LDS Plus with 2.4 GHz radio
/IBM	DOS IBM 3270 with 900 MHz radio
/IBM	DOS IBM 5250 with 900 MHz radio
/IBM24	TN3270 with 2.4 GHz radio
/IBM24	TN5250 with 2.4 GHz radio

Note: Dual TE's are supported on MX3 computers with an 8 Meg. Flash drive. MX3's with a 4 Meg. Flash drive DO NOT support dual TE's.

DOS Terminal Emulation User Defined Stored Forms

DOS terminal emulations have the following space requirements for user defined stored forms:

ANSI	2K required for each form
LDS	520 bytes required for each form
3270	1K required for each form
5250	1K required for each form

MX3 Font/Screen Sizes

The fonts/screen sizes available on the MX3 in Batch mode or at the DOS prompt are:

- 30 rows by 80 columns
- 15 rows by 80 columns

Please refer to the specific Terminal Emulation Reference Guide for font and screen sizes available when using the TE software.

Getting Help

All LXE user guides are now available on one CD and they can also be viewed/downloaded from the LXE website. Contact your LXE representative to obtain the LXE Manuals CD.

You can also get help from LXE by calling the telephone numbers listed on the LXE Manuals CD, in the file titled "Contacting LXE". This information is also available on the LXE website www.lxe.com.

Explanations of terms and acronyms used in this manual are located in the file titled "Glossary" on the LXE Manuals CD and on the LXE website.

Manuals and Accessories

Manuals

The following manuals are available on the LXE Manuals CD:

- MX3 Installation and Operator's Guide
- Integrated Scanner Programming Guide
- PCMCIA Card Management and LXE DOS Computers
- ANSI Plus Reference Guide
- LDS Plus Reference Guide
- 3270 DOS TE Reference Guide
- 3270 Programmer's Reference Guide
- 5250 DOS TE Reference Guide
- 5250 Programmer's Reference Guide
- 6200 Network Management Guide
- TN3270 Terminal Reference Guide
- TN5250 Terminal Reference Guide
- MX3 Multi-Charger Operator's Guide
- MX3 Multi-Charger Plus Operator's Guide
- Getting the Most From Your Batteries
- SNMP Agent Reference Guide
- Client Configuration Manager Reference Guide
- DOS Autoconfigurator Instructions

Accessories

Scanners

Scanner, LS3603, Std, 8' Cbl, EC	8010LS3603STC08DEC
Scanner, LS3603, Std, 8' Cbl, US	8010LS3603STC08DUS
Scanner, LS3603, Std, 20' Cbl, US	8010LS3603STC20DUS
Scanner, LS3203, Ext Rng, 8' Cbl, EC	8011LS3203ERC08DEC
Scanner, LS3203, Ext Rng, 8' Cbl, US	8011LS3203ERC08DUS
Scanner, LS3203, Ext Rng, 20' Cbl, US	8011LS3203ERC20DUS
Scanner, 5312IP, 7' Cbl, WW	8101IP5312XXC07DWW

Scanner, 530052IP, 7' Cbl, WW	8104IP530052C07DWW
Scanner, 530072IP, 7' Cbl, WW	8105IP530072C07DWW
Scanner, 530092IP, 7' Cbl, WW	8110IP530092C07DWW
Scanner, 5312IP, 15' Cbl, US	8101IP5312XXC15DUS
Scanner, 530052IP, 15' Cbl, US	8104IP530052C15DUS
Scanner, 530072IP, 15' Cbl, US	8105IP530072C15DUS
Scanner, 530092IP, 15' Cbl, US	8110IP530092C15DUS
PCMCIA Cards	
SRAM Card, 2 MB	9000A102PCC2SRAM
SRAM Card, 4 MB	9000A103PCC4SRAM
SRAM Card, 2 MB, Low Temp	9000A104PCC2SRAML0
SRAM Card, 4 MB, Low Temp	9000A105PCC4SRAML0
Holding Accessories	
Strap, Hand, Nylon	2381A407HANDSTRAP
Nylon Holster for use with Belt	2381A401HOLSTER
Nylon Hip Flip	2381A403HIPFLIP
Nylon Case with Shoulder Strap	2381A402CASE1
Miscellaneous	
Pen, Stylus, Black, 2335	2335A501PASSIVEPEN
Battery Chargers and Battery	
6 Unit Charger	2381A377CHGR6
5 Unit Charger/Analyzer, US	9000A377CHGR5US
5 Unit Charger/Analyzer, WW	9000A377CHGR5WW
Battery, Li-Ion, 1400 mAh	2381A376BATT1600
Battery, Li-Ion, 1800 mAh	MX3A378BATT
Cradles and Cradle Power Supplies	
Desktop Cradle ¹	2381A001DESKCRADLE
Vehicle Mount Cradle ¹	2381A003VMCRADLE
AC Power Supply, US	9000A301PSACUS
AC Power Supply, International, No power cord	9000A302PSACWW
Power Cord, AC, US	9000A066CBLPWRAC
Power Adapter, Bare Wire 12 VDC	1300A053CBL12ML3
Power Adapter, 24-72 VDC, 20 Watts	1300A301PS24WW
Power Adapter, 110-240 VAC	1300A303PSACWW
Cables for Cradle and MX3 Serial Ports	
Cable, Printer/PC, DA-9F to DB-25M, 6 ft.	9000A053CBL6D9D25
Cable, PC, DA-9F to DA-9F, 6 ft.	9000A054CBL6D9D9

¹ Power Adapter Required.

Chapter 2 Physical Description and Layout

Hardware Configuration

System Hardware

The MX3 hardware configuration is shown in the following figure.

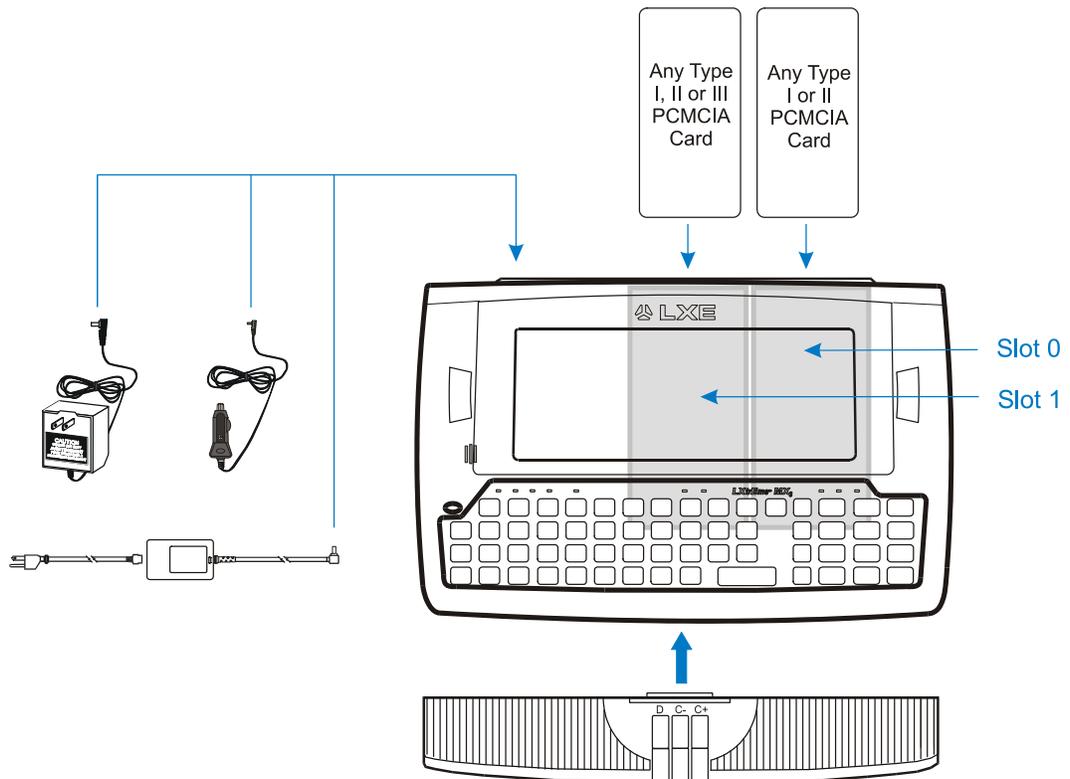


Figure 2-1 System Hardware

Central Processing Unit

The LXE MX3 CPU is an Intel® 486 running at 25 MHz.

AT Compatible Core Logic

The LXE MX3 utilizes AT-compatible core logic. The MX3 supports the following I/O components of the core logic:

- Two PCMCIA slots (Slot 1 supports Type I, II or III PCMCIA cards, Slot 0 supports Type I or II PCMCIA cards.).
- One InfraRed port.
- One Digitizer Input port (Touch screen).
- Two serial ports in two configurations (internal scanner port and a serial port option and the second configuration consists of two traditional serial ports).

System Memory

Main system memory is 4MB Internal Flash Array and 4MB on-board RAM. The CPU also contains a 1MB BIOS Flash.

Upper Memory Block

The upper memory area, or Upper Memory Block (UMB) consists of memory between 640KB and 1 MB. It occupies most of the address range A0000H-FFFFFFH and includes the areas used to shadow various system software components.

Internal Flash Array

The Internal Flash Array (IFA) is used to store all of the system files on the 4MB C drive that are used during system startup.

Video Subsystem

The display has a 640 pixel (horizontal) by 240 pixel (vertical) format which, depending on the font used, provides 15 rows of 80 characters in VGA 8 x 16 text mode. It provides 30 rows of 80 characters in 8 x 8 text mode and 17 rows of 80 characters in 8 x 14 text mode.

Character size is 2.28mm (width) by 4.92mm (height) in VGA 8 x 16 text mode and 2.28mm (width) by 2.28mm (height) in 8x8 text mode. The display contrast is adjustable with the contrast control keys or key sequences. Backlighting is available and can be configured through the BIOS Setup Utility.

The display controller supports VGA text and graphics modes.

An optional touch feature is available. The touch feature is for batch, Client Server or non-TE applications. The Touch option allows mouse functions (pointing and clicking on the display or Signature Capture) to be performed with either the touch of a finger or an LXE approved stylus.

Power Supply

The LXE MX3 uses two batteries for operation.

- A replaceable Lithium-Ion (Li-Ion) battery pack. The battery pack recharges while in the MX3 with the MX3 in a powered cradle or with the optional external power sources attached. The main battery pack can be removed from the MX3 and inserted in the LXE Multi-Charger or Multi-Charger Plus which simultaneously charges up to six battery packs in four hours.
- An internal 50 mAh Nickel Cadmium (NiCd) backup battery. The backup battery is recharged directly by the main battery when it is installed. Full charging of the backup battery may take several hours. The recharging of the backup battery is automatically controlled by the MX3. The backup battery must be replaced by qualified service personnel.

Memory Map

Map Physical Address Range	Size (kB)	Function
000 00000 - 000 9FFFF	640	DRAM
000 A0000 - 000 AFFFF	64	VGA Video RAM -- SMI Space, SMIACT# is Active
000 B0000 - 000 BFFFF	64	VGA Video RAM -- SMI Space, SMIACT# is Active
000 C0000 - 000 C7FFF	32	Shadowed VGA BIOS
000 C8000 - 000 C9FFF	8	PCMCIA PCM Boot When Enabled & Bootable Card Present
000 CA000 - 000 CBFFF	8	PCMCIA
000 CC000 - 000 CFFFF	16	PCMCIA
000 D0000 - 000 DFFFF	64	IFA Memory Window
000 E0000 - 000 E7FFF	32	IFA BIOS
000 E8000 - 000 EFFFF	32	Shadowed System BIOS
000 F0000 - 000 FFFFF	64	Shadowed System BIOS
001 00000 - 003 FFFFF	4k	DRAM - lower 4MB
004 00000 - 00F FFFFF	12k	DRAM
010 00000 - F8E FFFFF	3967k	Unused - 3.9MB
F8F 00000 - F8F FFFFF	1k	Flash BIOS Device - Alias
F90 00000 - F9E FFFFF	15k	Unused – 15kB
F9F 00000 - F9F FFFFF	1k	Flash BIOS Device - Alias
FA0 00000 - FAE FFFFF	15k	Unused – 15kB
FAF 00000 - FAF FFFFF	1k	Flash BIOS Device - Alias
FB0 00000 - FBE FFFFF	15k	Unused – 15kB
FBF 00000 - FBF FFFFF	1k	Flash BIOS Device - Alias
FC0 00000 - FCE FFFFF	15k	Unused – 15kB
FCF 00000 - FCF FFFFF	1k	Flash BIOS Device - Alias
FD0 00000 - FDE FFFFF	15k	Unused – 15kB
FDF 00000 - FDF FFFFF	1k	Flash BIOS Device - Alias
FE0 00000 - FEE FFFFF	15k	Unused – 15kB
FEF 00000 - FEF FFFFF	1k	Flash BIOS Device - Alias
FF0 00000 - FFE FFFFF	15k	Unused – 15kB
FFF 00000 - FFF DFFFF	896	Flash BIOS Device - BIOS Block - 14 x 64k Sectors
FFF E0000 - FFF FFFFF	128	Flash BIOS Device - Boot Block - 15 th 64k Sector & 8 x 8k Sectors

COM Ports

The MX3 has two serial ports available in three configurations.

In the first configuration, both COM1 and COM2 are connected to individual D-9 connectors on the endcap.

In addition, COM2 is software switchable between the D-9 serial port and the internal IR port located on the back of the unit.

In the third configuration, COM1 is connected to an internal SE923 scanner and COM2 is software switchable between the D-9 connector on the endcap and the internal IR port on the back of the unit.

Power to the COM ports may be turned off using a terminal emulation configuration utility.

COM 1

This port supports 4 signals, instead of the 8 signals supported by a standard PC COM port. There are two hardware selectable configurations of the COM1 port:

- COM1 connected to a D-9 serial connector
- COM1 connected to a scanner

The signals supported by this communication port are:

- RX Receive Data
- TX Transmit Data
- RTS Request to Send
- CTS Clear to Send

Though the signal Ring Indicator (RI) is not supported, the MX3 can use this signal as a wake-up event. Alternatively, this signal can be set up as +5V output on Pin 9 of the D-9 connector.

COM 2 - IR Port

The IR port provides bi-directional half-duplex IR communication at a maximum baud rate up to 115k (although restricted if using IrDA software to 19.2k). The IR port supports the Slow IrDA PHY Layer standard.

This port supports 4 signals, instead of the 8 signals supported by a standard PC COM port. There are two software selectable configurations of the COM2 port

- COM2 connected to a D-9 serial connector
- COM2 connected to the internal IR transceiver

The following signals supported by this communication port are:

- RX Receive Data
- TX Transmit Data
- RTS Request to Send
- CTS Clear to Send

Though the signal RI is not supported, this signal can be used as a wake-up event. Alternatively, this signal can be set up as +5V output on Pin 9 of the D-9 connector.

PCMCIA Slots

The MX3 features two internal PCMCIA slots that conform electrically to PCMCIA 2.1 specifications. The PC slots are accessible by the use of a Phillips screwdriver to first remove the endcap. Slot 1 is in the middle and Slot 2 is near the side of the MX3.

PC Cards

Slot 1 accepts cards of Types I and II. Slot II accepts cards of types I, II and III.

The slots, and the PC cards in them, are managed by Phoenix PicoCard software products which refers to the *Middle Slot as slot 1* and the *Outside Slot as slot 0*. The software can be used to format PC cards.

When formatting PC cards, Phoenix PicoCard identifies the PC cards by slot number and DOS drive letters. For example, an ATA PC card formatted in slot 0 is given disk drive letter D and an ATA PC card formatted in slot 1 is given disk drive letter E. If the MX3 is booted from the ATA PC Card in slot 0, the drive automatically becomes Drive C. The on-board flash drive changes to drive D until the MX3 is rebooted without an ATA card in Slot 0. An ATA PC Card formatted in Slot 1 is always Drive E and cannot boot the MX3 from Slot 1. If the MX3 is booted from an SRAM card in Slot 0, the drive automatically becomes Drive A. The on-board flash drive remains as Drive C.

See “PCMCIA Card Management and LXE DOS Computers”, for further information.

Radio Cards

Slot 1 accepts the PCMCIA radio cards identified in Appendix C, “Technical Specifications”.

Physical Controls

On/Off Switch

The power (on/off) switch is a push button located at the upper left portion of the keypad.

When the system is turned off, the current contents of RAM are lost. Save any needed data and exit in an orderly fashion from any running programs before turning the system off.

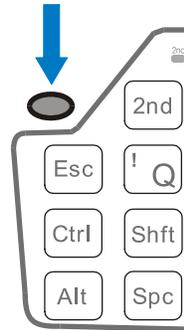


Figure 2-2 Location of the Power (PWR) Button

The Power button is used to turn the MX3 on and off and place it into the Suspend state. The button will beep when pressed and beep again every second while it is held down.

How To

- Turn the MX3 off Hold the Power key down for 4 beeps (signifies 3 or more seconds) then release.
- Turn the MX3 on Hold the Power key down until the display turns on.
- Force the Suspend state Tap the Power key (1 beep). The Suspend state is useful for breaks or when swapping batteries as the unit does not need to be turned off prior to replacing the Main Battery.
- Wake from Suspend Wake the MX3 from Suspend (before the 5 minute timer expires) using any of the following:
 - Tap Power key
 - Pen-touch on a touch screen display (if configured)

Note: The ability of the Touch screen activation to wake up the MX3 is configurable in BIOS Setup. The ability of the Power Key to turn off or suspend the MX3 is configurable in the BIOS Setup.

Critical Suspend Mode and the Off Timer

The MX3 is automatically turned Off when the Off Timer expires. The Off Timer runs when the MX3 is in Critical Suspend mode. The MX3 automatically goes into Critical Suspend mode when the main battery is dead or removed. The Off Timer default is 5 minutes. The value can be adjusted using the BIOS Setup.

Power Status and the Status LED

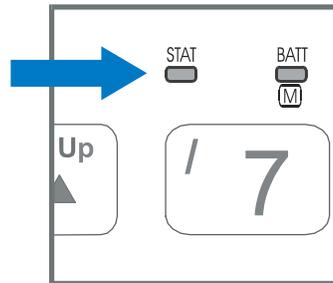


Figure 2-3 Power Status and the Status LED

The Status LED is located above the 7 key on the keypad. The LED changes color and state depending on power status.

Status LED	Condition
Off	MX3 is Off. <i>OR</i> The MX3 is powered On and the display is On.
Steady Green	The MX3 is powered On and the display is Off. Press any key to turn the display On.
Blinking Green	The MX3 is in the Suspend state. Tap the Power key to exit the Suspend state. To turn the MX3 off, hold the Power key down for 4 beeps to turn the MX3 off. There may be a brief wait while the MX3 synchronizes with the RF network.
Steady Red	Main Battery Low Warning or Low Main Battery. Replace the main battery or place the unit in a powered storage cradle or connect the MX3 to external power using the jack input.
Blinking Red	Main Battery Power Failure or the Main Battery is depleted, the MX3 is in Critical Suspend mode. The MX3 is drawing power from the backup battery. Replace the main battery or place the unit in a powered storage cradle or connect the MX3 to external power using the jack input. The MX3 will turn off in 5 minutes (default or the value selected in BIOS Setup for the Off Timer limit) if no action is taken.

Power Management and the Keypad

Status LED is Steady Green. When the MX3 is in the Display Off state, any keypress returns the computer to the On state and the display activates. The key pressed (key value) is not sent to the Operating System or application.

If the 2nd, Ctrl, Shift, or Alt keys were active (and the LEDs were illuminated) when the MX3 entered Display Off or Suspend, the modifier keys and their LEDs are cleared when the MX3 wakes up.

Suspend State

Status LED is Blinking Green. The display and all backlights are turned off.

The purpose of the Suspend state is to reduce the power consumption of the unit to a very low point and still retain the condition of the processor and memory. This state is primarily meant for breaks (lunch, afternoon) or for battery hot-swapping. The Suspend state is entered when the unit is inactive for the amount of time set by the Suspend Timer (typically 5 minutes) or the operator tapped the Power key (1 beep) to place the MX3 in the Suspend state.

The Suspend Timer is reset every time the MX3 wakes up and normal activity occurs (keypresses, touch screen, etc.). The Suspend Timer can be changed from its default time (5 minutes) in incremental steps of one minute up to 63 minutes. The Suspend state can be disabled (Suspend Timer set to 0) when the MX3 is docked/not docked or by setting PM Mode when Docked to None in BIOS Setup.

If the 2nd, Ctrl, Shift, or Alt keys were active (and the LEDs were illuminated) when the MX3 entered Suspend, the function keys and their LEDs are cleared when the MX3 wakes up.

Critical Suspend State

Status LED is Blinking Red. The display and all backlights are turned off.

The Critical Suspend state is only entered when the main battery has failed or has been removed and the unit is being powered by the backup battery. Once in this state, a fully charged backup battery will provide enough energy to keep the unit in this state for at least 5 minutes. As the energy in the backup battery is depleted, the unit will turn off and a reboot will be required.

Since the backup battery is supplying power in this state, the MX3 limits the amount of time it stays in the Critical Suspend state via the Off Timer. The Off Timer is configurable in incremental steps of one minute (the default is 5 minutes). The backup battery will supply power for at least five minutes. As the Off Timer expires the unit will turn off and a reboot will be required.

Note: Setting the Off Timer to zero will then turn the MX3 off immediately when the main battery is removed.

Once in the Critical Suspend state (and the main battery has not been replaced) the MX3 is automatically turned Off when the Off Timer expires or the backup battery is depleted. When a fully charged main battery is installed, the MX3 transitions to the Suspend state. Exit the Suspend state by tapping the Power key. If the MX3 has a touch screen display, and configured for touch, a pen-touch will exit the Suspend state.

Display

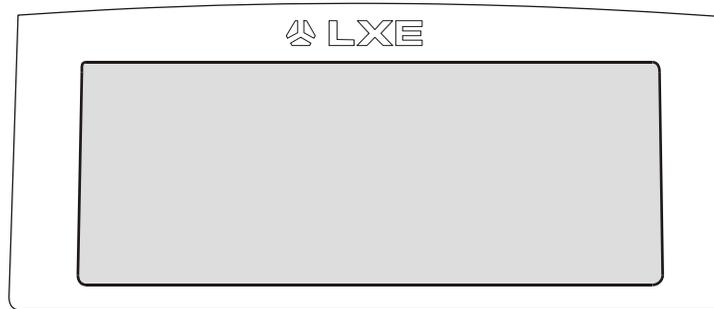


Figure 2-4 MX3 Display

The MX3 display is a transfective monochrome VGA LCD unit capable of supporting gray scales. The display window is 640 pixels (horizontal) x 240 pixels (vertical). VGA graphics are supported with this display.

Four font sizes are supported. The choice between font sizes is made in the BIOS Setup. Font size selection may be overridden by a user supplied application, such as the ANSI Plus TE.

Character size is 2.28mm (width) by 4.92mm (height) in VGA 8x16 text mode and 2.28mm (width) by 2.28mm (height) in 8x08 text mode.

Depending on the font size used, the display window's size in DOS mode is:

Font Size in Pixels	Rows	Columns
8x8	30	80
8x16	15	80

Note: Please refer to the specific Terminal Emulation Reference Guide for font and screen sizes available when using the TE software.

The display is automatically turned off when the MX3 enters the Suspend state, Critical Suspend state or the Display Timer expires (Display Timer default is 15 seconds).

Display and Display Backlight Timer

When the Display Timer expires the display is turned off. The default value for this parameter is 15 seconds.

When the Display Backlight Timer expires the display backlight is turned off. The default value for this parameter is 3 seconds.

Both values can be adjusted using the BIOS Setup. The Display Backlight parameter must be set to Timed to enable the Display Backlight Timer function.

Any of the following will wake the display and display backlight:

- Display update by host or currently running application on the MX3
- Any key on the keypad
- Pen-touch on a touch screen display

When the display wakes up, the Display Backlight Timer will begin the countdown again. When any of the above events occurs prior to the timer expiring, the timer starts the countdown again.

The ability of Touch screen activation to wake up the MX3 is configurable in BIOS Setup.

Panning

Pan Up - 2nd+Ctrl+Up Arrow

Pan Down - 2nd+Ctrl+Down Arrow

The MX3 display window can be panned up and down using keypress sequences so the user can view an entire virtual 640 x 480 pixel screen. Initially, using the default 8 x 16 pixel font, the top half (15 rows x 80 columns) of a virtual screen is displayed.

When the host sends a virtual screen to the MX3, the display window cannot show the whole virtual screen. The display window can only show parts of the virtual screen.

The *virtual screen* is the full 25 line x 80 column screen generated by the host computer. An example of a virtual screen is the screen you view when you use a personal computer. The *display window* is the part of the virtual screen viewed on the MX3.

Note: Panning functions may be overridden by terminal emulation programs running on the MX3.

Optional Touchscreen

An optional Touchscreen is available. Touchscreen provides a means of inputting information into the MX3 by touching the screen using either the operator's finger or by using the LXE approved stylus (the Passive Pen – see Chapter 1, "Introduction", section titled "Accessories".)

Touchscreen operation is not affected by Display Backlighting.

Touchscreen operation is affected by the Display mode. If the display is off, a touch to the display will turn on the display but no touch data will be sent to the running application until the next touch.

Touchscreen operation is determined by a user supplied application and is not supported by LXE TE programs.

Note: When the MX3 has a Lucent radio (LXE System 6500) and a touchscreen, the NET.CFG file must include the line

```
Stack_Size 256
```

before the Enable_Encryption line. See Chapter 6, "RF Network Configuration", for details.

Cleaning the Display

Keep fingers and rough or sharp objects away from the scan aperture and display. If the glass becomes soiled or smudged, clean only with a standard household cleaner such as Windex® without vinegar or use Isopropyl Alcohol. Do not use paper towels or harsh-chemical-based cleaning fluids since they may result in damage to the glass surface. Use a clean, damp, lint-free cloth. Do not scrub optical surfaces. If possible, clean only those areas which are soiled. Lint/particulates can be removed with clean, filtered canned air.

Display Repair

There are no user-repairable or replaceable components in the LXE MX3 Display system.

Scan Buttons

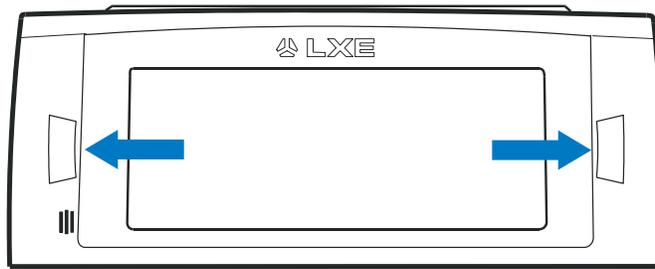


Figure 2-5 Scan/Enter/FLD EXIT Buttons

There are two buttons, one on each side of the display. The buttons are programmable. Depending on the type of unit purchased (e.g. IBM specific or batch), the buttons will function as an internal barcode scanner key or a numeric keypad Enter key. Scan keys have no effect on scanners tethered to the MX3.

The 5250/TN5250 specific MX3 uses the left scan key as the Field Exit key. It is labeled FLD EXIT.

See next section titled “Keypads”, subsection “Programmable Buttons”.

Scan Buttons and the SCNR LED

The SCNR LED, located above the keypad, illuminates during a barcode scanner function. It is affected by internal scanner functions. The 5250/TN5250 specific MX3 FLD EXIT button, when pressed, has no effect on the SCNR LED.

- **Red** - scanning.
- **Green** - good scan.
- **Unlit** - scanner is inactive.

Speaker

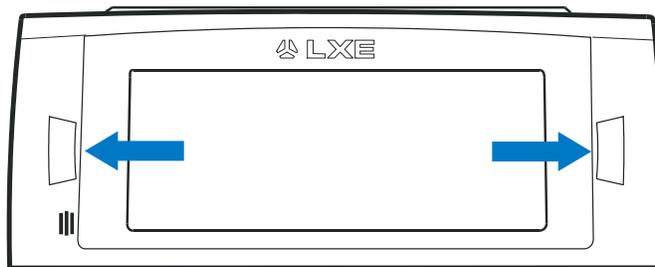


Figure 2-6 Speaker Location

The MX3 Speaker has a loudness of at least 90 dB at 10 cm measured from the front of the unit. The Speaker volume is adjustable via the keypad or by the application through the use of an API call. There are 8 distinct volume levels. The minimum volume level is 0 (no sound) with a default setting of midrange. The volume sticks at maximum and minimum levels. The Speaker beeps when the main battery is low otherwise it is under the control of the application and other software currently active.

Keypads

There are two keypads and three overlays available for the MX3. All keypads are phosphorescent. A phosphorescent keypad does not use a keypad backlight but glows in dim/dark areas *after exposure to a light source*.

All keypads are installed and configured by LXE.

The keymaps (keypress sequences) are located in Appendix A, “Key Maps”.

QWERTY Keys

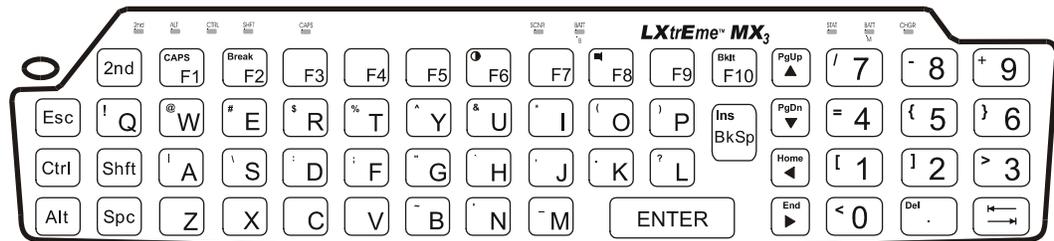


Figure 2-7 The QWERTY Keypad

ABCD Keys

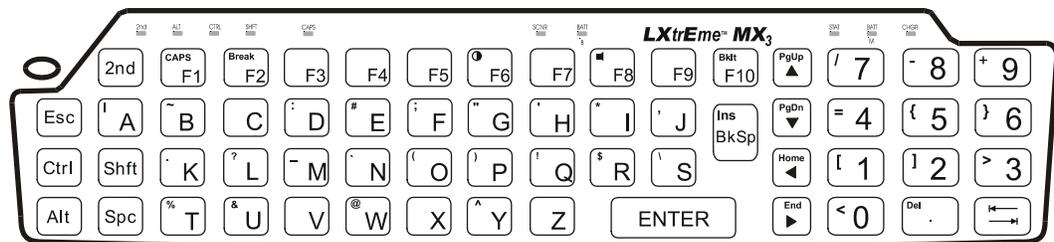


Figure 2-8 The ABCD Keypad

The Overlays

There are four keypad overlays. One for the ABCD keypad and three for the QWERTY keypad.

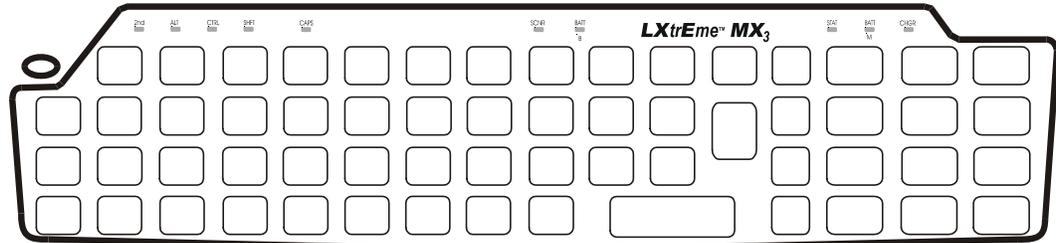


Figure 2-9 ABCD Keypad - ANSI/LDS/PC Overlay

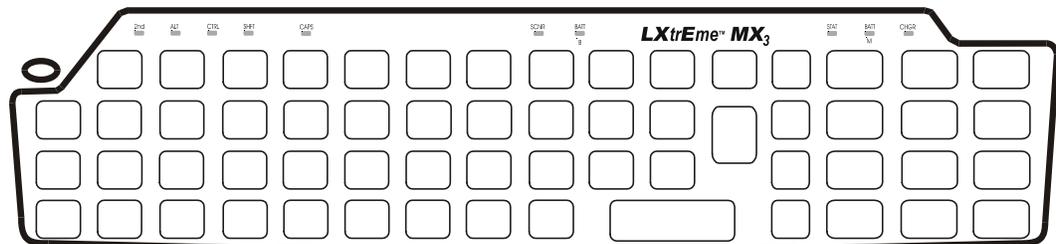


Figure 2-10 QWERTY Keypad - ANSI/LDS/PC Overlay

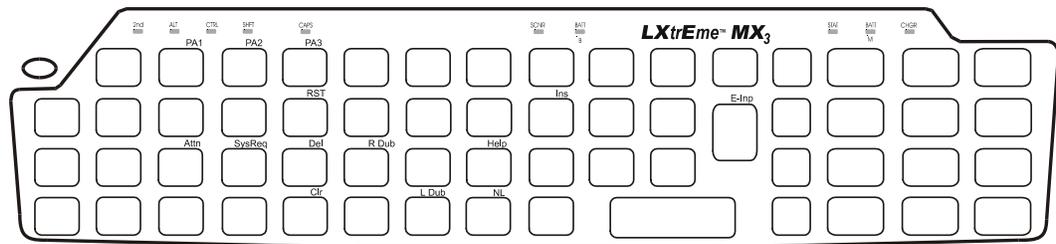


Figure 2-11 TN3270/3270 Overlay for QWERTY Keypad

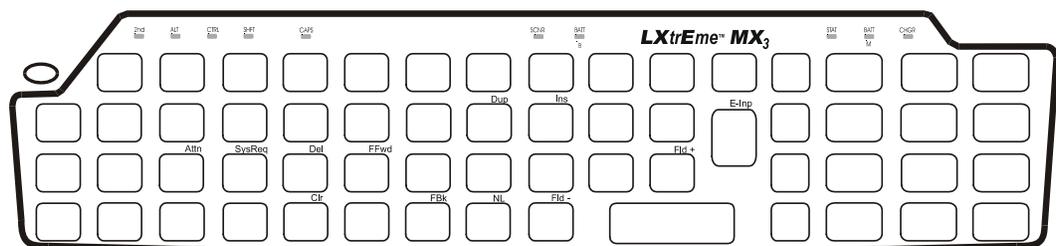


Figure 2-12 TN5250/5250 Overlay for QWERTY Keypad

Programmable Buttons

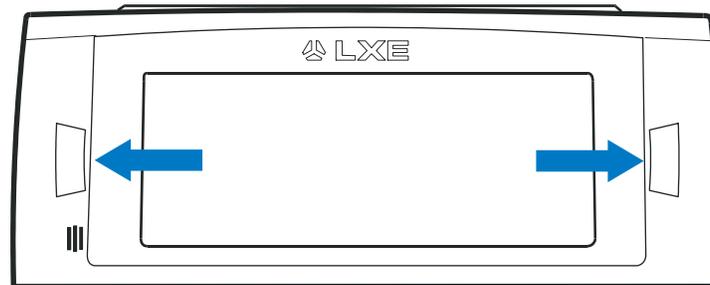


Figure 2-13 Programmable Buttons (Field Exit / Scan / Enter)

The buttons to the left and right of the display can be programmed by the System Administrator to perform the following functions:

- | | |
|------------|---|
| Scan | Pressing this key activates the laser scanner. See the following section titled “Scan Key Function”. |
| Enter | Pressing this key confirms a forms entry or transmits information. See the following section titled “Enter Key Function”. |
| Field Exit | IBM 5250/TN5250 units only. Pressing this key exits an input field. See the following section titled “Field Exit Key Function”. |

Possible Button Configurations

Endcap	Right Button ²	Left Button
Blank	Numeric keypad Enter	Numeric keypad Enter
Scanner/serial	Scan	Numeric keypad Enter
Serial/Serial	Numeric keypad Enter	Numeric keypad Enter
TN5250/5250 Terminal Emulation only:		
Blank	Numeric keypad Enter	Field Exit w/ FLD EXIT label
Scanner/Serial	Scan	Field Exit w/ FLD EXIT label
Serial/Serial	Numeric keypad Enter	Field Exit w/ FLD EXIT label

Scan Key Function



(MX3's with Scanner endcaps only.) The Scan key activates the scanner when a scanner endcap is installed and the Scan button is pressed. The internal scanner scans only when the Scan button is pressed. A Scan button press has no effect on externally attached scanners.

² Regardless of the type of endcap installed, the default value of the Right Button is always Scan.

Enter Key Function



The Enter key is used to confirm a forms entry or to transmit information. How it is used is determined by the application running on the computer.

Field Exit Key Function (IBM 5250/TN5250 Only)



The Field Exit key is used to exit an input field. If the field is an Auto Enter field, the auto transmit function is activated. This key function is present on the IBM 5250/TN5250 specific keypad only.

2nd Key Function



The 2nd key is used to activate the 2nd functions of the keypad. Printed on many keys at the upper left corner are small characters that represent the 2nd function of that key. Using the 2nd key activates the second key function. Note that the 2nd key only stays active for one keystroke. Each time you need to use the 2nd function you must press the 2nd key. To cancel a 2nd function before pressing another key, press the 2nd key again. When the 2nd function is active, the 2nd LED illuminates.

Ctrl Key Function



The Ctrl key function is only active when running the 3270 terminal emulation or the 5250 terminal emulation program. The Ctrl key (blue characters) enables the control functions of the keypad. This function is similar to a regular keyboard's Control key. Note that the Ctrl key only stays active for one keystroke. Each time you need to use a Ctrl function, you need to press the Ctrl key before pressing the desired character key. When the Ctrl function is active, the Ctrl LED illuminates.

Alt Key Function



The Alt key enables the alternate functions of the keypad. This function is similar to a regular keyboard's Alt key. Note that the Alt key only stays active for one keystroke. Each time you need to use an alternate function, you need to press the Alt key before pressing the function key. When the Alt function is active, the Alt LED illuminates.

Shft Key Function



The Shft key enables the shifted functions of the keypad. This function is similar to a regular keyboard's Shift key. Note that the Shift key only stays active for one keystroke. Each time you need to use a Shifted function, you need to press the Shft key before pressing the function key. When the Shft function is active, the Shft LED illuminates.

When the Shft key is pressed the next key is determined by the major key legends, i.e., the alpha keys display lower case letters when CAPS is On and alpha characters are capitalized.

Spc Key Function



The Spc key adds a space to the line of data on the display. This function is similar to a regular keyboard's Spacebar. Note that the Spc key only stays active for one keystroke.

Mode Key Functions

Caps Key and CapsLock Mode

This function is similar to a regular keyboard's CapsLock key. Note that the CapsLock mode stays active until the CapsLock key sequence is pressed again. Each time you need to use a Caps function, you need to press the Caps key sequence first. To cancel a CapsLock function press the Caps key sequence again. When the CapsLock mode is active, the Caps LED illuminates.

CapsLock key sequence is 2nd + F1.

Keypress Sequences

See Appendix A, "Key Maps" for key maps for all keypads.

Reset Key Sequence

Reset Key Sequence is **Ctrl + Alt + 2nd + Dot**.

The Reset Key sequence can be disabled in the BIOS Setup. See Chapter 4, "System Configuration".

DOS Key Functions Not Available on the MX3

- | | |
|------------------|--|
| Prnt Scrn | A function that is available at the DOS prompt on a desktop PC. The Prnt Scrn as a system function requires a parallel port and the MX3 has only serial ports. |
| Sys Req | A function that is available at the DOS prompt on a desktop PC. Sys Req is for use in a multi-tasking environment to switch between various running applications. The MX3 is not a multi-tasking computer, nor is DOS in general considered a multi-tasking environment. |

Function LEDs

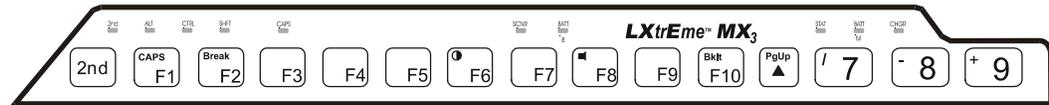


Figure 2-14 Function LEDs

Across the top of the keypad are LEDs that provide visual cues to current computer operation. When the LED is not illuminated, the function is inactive.

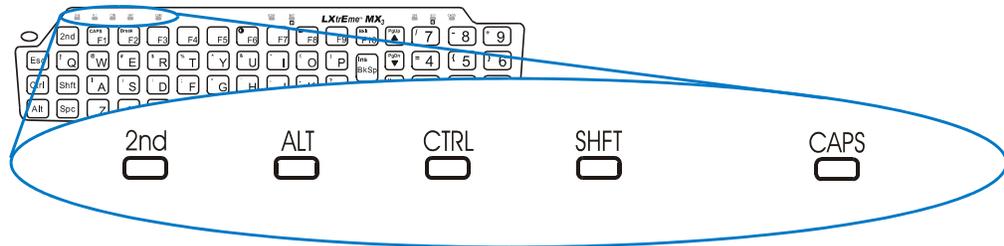


Figure 2-15 2nd, ALT, CTRL, SHFT, CAPS

LED	When illuminated ...
2nd	The 2 nd functions of the keypad. When illuminated, the next keypress is a 2 nd keypress. Orange or unlit.
ALT	The Alternate functions of the keypad. When illuminated, the next keypress is an ALT keypress. Orange or unlit.
CTRL	The Control functions of the keypad. When illuminated, the next keypress is a CTRL keypress. Orange or unlit.
SHFT	Uppercase or lowercase keyed input. When illuminated, the next letter is an uppercase letter. Orange or unlit.
CAPS	When illuminated, uppercase letters are active until the CAPS key sequence is pressed again. Orange or unlit.

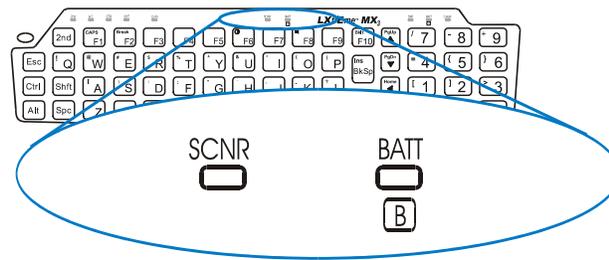


Figure 2-16 SCNR, BATT B

LED	When illuminated ...
SCNR	Barcode scanner function, affected by the internal scanner. <ul style="list-style-type: none"> • Red, scanning. • Green, good scan. • Unlit, scanner is inactive.
BATT B	Backup Battery. When illuminated, the backup battery is charging. When unlit, the Backup Battery is fully charged. Orange or unlit.

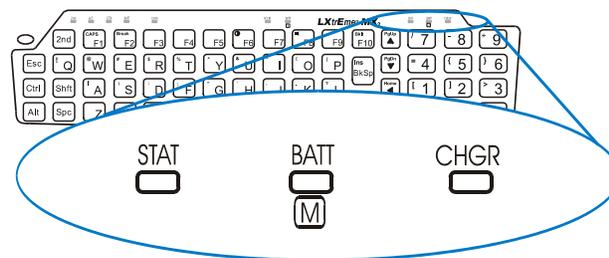


Figure 2-17 STAT, BATT M, CHGR

LED	When illuminated ...
STAT	Status Indicator. See section titled “Power Status and the Status LED”.
BATT M	Main Battery. When illuminated, main battery charge is low. The main battery is charged by powered docking cradles. <ul style="list-style-type: none"> • Red, Main Battery low warning. • Unlit, Main Battery is charged.
CHGR	Charger. The MX3 is seated in a powered storage cradle (or docking station). <ul style="list-style-type: none"> • Red, Main Battery is charging. • Green, battery charge is complete. • Orange, error (contact LXE Customer Services). • Unlit, MX3 is not seated properly or is not in a powered cradle or connected to a power jack.

Infrared (IR) Port

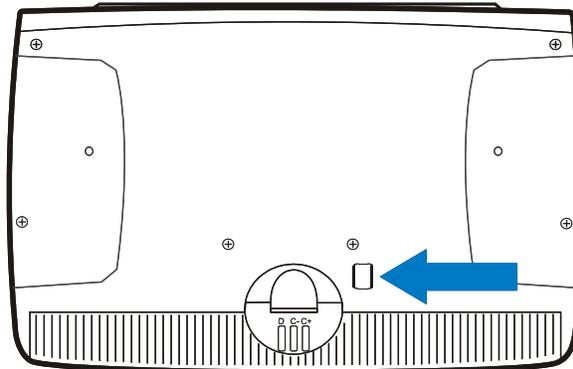


Figure 2-18 Infrared Port - COM2 Port

At the back of the MX3 Computer there is an Infrared (IR) Data Port. The IR Port is designed to provide a data link between the MX3 and a similarly equipped piece of equipment such as a printer. The IR port is the MX3's COM2 port and is a bi-directional half-duplex communication port. It supports baud rates up to 115k (although restricted if using IrDA software to 19.2k).

The IR operating envelope has a distance range of 2 cm (.79 inches) to 1 meter (3.2 feet) with a viewing angle of 30 degrees.

The MX3 uses LXE's IrDA Lite Plus protocol to send data in both directions, but not simultaneously. When sending data through the IR port, make sure the IR port on the first MX3 and the IR port on the second MX3 are in close proximity to each other. IrDA is not required and not used by terminal emulation programs.

See Chapter 5, "Utilities", for further information about using IrDA Lite Plus.

When the MX3 is docked in a cradle, the Status LED *on the cradle* is red when data is being transmitted through the IR port.

Endcaps

Note: Your configuration may be different than those shown below.

COM Port Switching

The default COM 2 port is always the IR port on the back of the MX3, regardless of the endcap installed on the MX3.

On the Standard Range Scanner / Serial Port endcap COM 1 is the Integrated Scanner port.

On the Dual Serial Port endcap the COM1 port is the serial port on the left side of the endcap when the display is facing you.

An API can be run to switch power to the DB9 Serial port. If a tethered scanner is connected to the Serial Port without switching the power to the COM2 port (serial port), the scanner will not work.

Scanner / Serial Port

Refer to the MX3 Installation and Operator's Guide and the section titled "Scanner Warnings and Labels" for important laser safety information **before** using the scanner.

The MX3 Barcode Scanner is used to collect barcode data from any nearby compatible barcode label. Depending on the size of the barcode, size of bars and spacing and quality of the barcode, the scanner is used to read barcodes between 3" and 30". The barcode scanner reads UPC/EAN, Code 39, Code 93, I 2 of 5, Discrete 2 of 5, Code 128, Codabar and MSI symbologies.

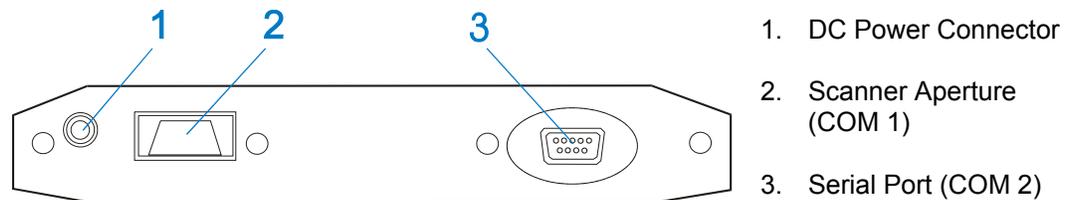
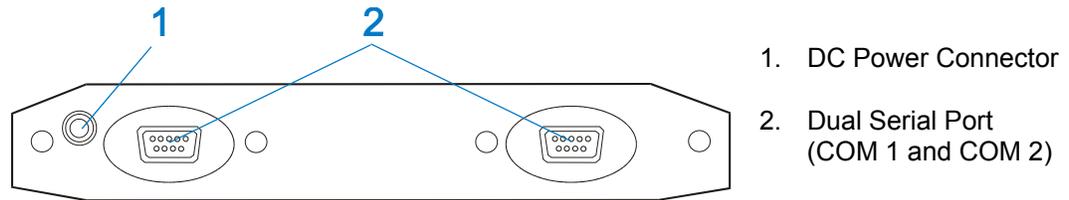


Figure 2-19 Standard Range Scanner / Serial Port Endcap

The internal barcode scanner scans only when the Scan button is pressed. Scan buttons have no effect on tethered barcode scanners connected to the RS-232 port on the MX3 or a cradle containing an MX3. The SCNR LED illuminates during any internal scanner activation.

Dual Serial Port



1. DC Power Connector
2. Dual Serial Port (COM 1 and COM 2)

Figure 2-20 Dual Serial Port

RS-232 connection is made through an RS-232 Serial Port if installed. The connector is an industry-standard RS-232. The connector includes a PC/AT standard 9-pin “D” male connector.

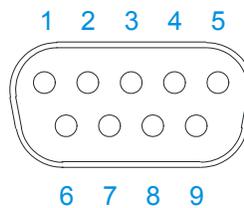


Figure 2-21 RS-232 Pinouts

PIN	SIGNAL	DESCRIPTION
1	DCD	Not Connected
2	RXD	Receive Data - Input
3	TXD	Transmit Data - Output
4	DTR	Not Connected
5	GND	Signal/Power Ground
6	DSR	Not Connected
7	RTS	Ready To Send - Not Connected
8	CTS	Clear To Send - Not Connected
9	RI or +5V DC	Ring Indicator - Input (Available for computer wakeup. See Power Management)

Figure 2-22 9-Pin RS-232 Description

Storage Cradles

There are two types of cradles for LXE's MX3 mobile computer: a desk top cradle for tabletop charging / communication applications and a vehicle mount cradle for vehicle mounted charging / communication applications. See the "MX3 Cradle Reference Guide".

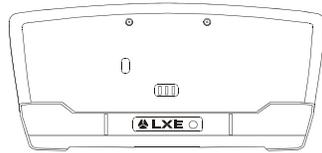


Figure 2-23 Desktop Cradle

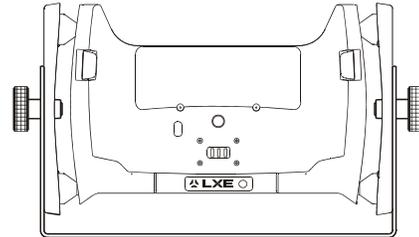


Figure 2-24 Vehicle Mounted Cradle

The cradles give the MX3 the ability to communicate with a host computer and other equipment. In addition, using wall AC adapters or DC/DC converters, the cradle transfers power to the internal charging circuitry of the MX3 and the MX3, in turn, recharges the Main Battery. The MX3 can be either on or off while in the cradle.

The MX3 can be either on or off while in the cradle. The MX3 can be inserted and removed from the cradle with one hand.

Cables are available from LXE for connecting the cradle to a printer, a personal computer or a barcode printer. Tethered scanners (for RS-232 cradle connection) are also available from LXE. See Chapter 1, "Introduction", section titled "Manuals and Accessories".

Chapter 3 Power Supply

Introduction

The MX3 computer is designed to work with a Lithium-Ion (Li-Ion) battery pack from LXE.

The LXE MX3 receives continuous power from two batteries. There is a Lithium-Ion Main Battery Pack that can be recharged separately by an LXE approved battery charging unit. The Main Battery is recharged, if required, while installed in a powered cradle or when the MX3 is connected to external power using the power jack. There is a 50 mAh Nickel-Cadmium (NiCd) Backup Battery inside the MX3 that is recharged only by the Main Battery Pack.

The MX3 maintains the date and time for a minimum of four days using a Main Battery that has reached the Low Warning point and a fully charged Backup Battery. The MX3 retains data, during a Main Battery hot swap, for at least 5 minutes.

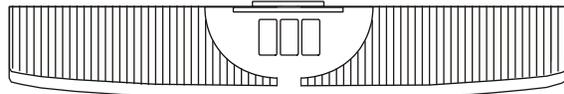


Figure 3-1 Main Battery Pack

Note: New batteries must be charged prior to use. This process takes up to four hours in an LXE Multi-Charger or Multi-Charger Plus and eight hours when the MX3 is connected to external power through its power jack.



Refer to the documentation received with the battery charger for complete information.

Main Battery Pack

The main battery pack has a rugged plastic enclosure that is designed to withstand the ordinary rigors of an industrial environment. Exercise care when transporting the battery pack making sure it does not come in contact with excessive heat or any power source other than the LXE Multi-Charger, Multi-Charger Plus or the MX3 unit.

When the Main Battery Pack is properly installed in the unit it provides up to eight hours of operation depending upon operation and accessories installed. The battery pack is resistant to impact damage and falls of up to four feet to a concrete surface.

Under normal conditions it should last approximately eight hours before requiring a recharge. The more you use the scanner or the transmitter, the shorter the time required between battery recharges.

Battery Charger

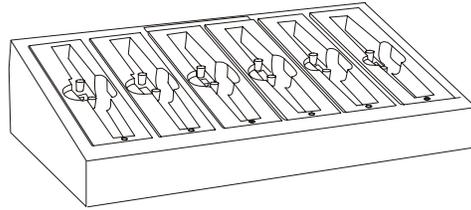


Figure 3-2 LXE Multi-Charger

The MX3 Main Battery Pack can be charged in the LXE Multi-Charger or Multi-Charger Plus.

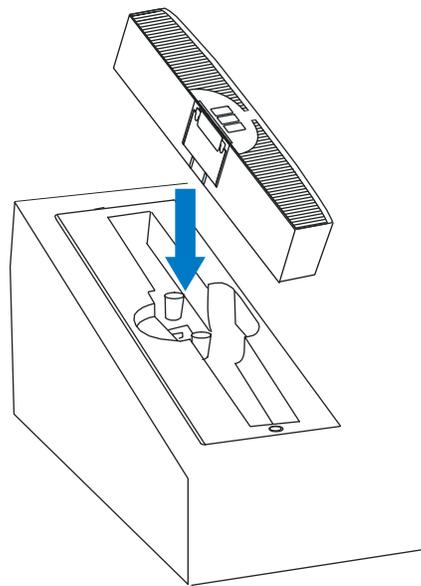


Figure 3-3 Insert Main Battery in Charger

Lower the battery pack straight into the battery charger pocket and push it down firmly until the retaining clip catches on the retaining pins.

Do not “slam” the battery into the charging cup or slide it in sideways.

Failure to follow these instructions can result in damage to the main battery or the charger.

Low Battery Warning

It is recommended that the Main Battery Pack be removed and replaced when its energy depletes. When the Low Battery Warning sounds (alternating one second beeps) do an orderly shut down of the MX3, minimizing the operation of any installed devices and insuring any information is saved that should be.

Note: Once you receive the Low Battery Warning, you have approximately 5 minutes to perform an orderly shutdown and replace the main battery pack before the unit powers off. The Low Battery Warning will transition to Critical Suspend before the computer powers off.

Critical Suspend State

The Critical Suspend state or mode can only be entered because of a Main Battery Power failure. A Main Battery Power failure can occur because the battery's energy has been depleted or the battery has been removed.

When the MX3 is in the Critical Suspend state the main battery LED illuminates, the System LED blinks red, all peripherals are shut down, the CPU clock is stopped, power is removed from the PCMCIA card(s) and the MX3 may beep. The MX3 is saving the state prior to the main battery failing and cannot be used.

If a new fully charged main battery is installed before the Off Timer expires the MX3 will transition to the Suspend state. To resume operation, tap the Power key for one beep.

If the Off Timer expires the MX3 will turn itself off and all unsaved information is lost. Insert a fully charged main battery and press the Power button to turn the MX3 back on.

Note: The Off Timer can be configured in the BIOS Setup (see Chapter 4, "System Configuration".)

Backup Battery

The MX3 has a backup battery that is designed to provide limited-duration electrical power in the event of Main Battery Pack failure. The Backup Battery is a 50 mAh Nickel Cadmium (NiCd) battery that is factory installed in the unit. The need for recharging of the backup battery is automatically detected and controlled by the MX3. The energy needed to charge the backup battery comes from the Main Battery.

It takes several hours of operation before the Backup Battery is capable of supporting the operation of the computer. The duration of Backup Battery life is dependent upon operation of the MX3, its features and any operating applications.

The backup battery is replaced by LXE.

Note: When there is no external power supplied to the computer, the unit is powered by the backup battery. When the backup battery is depleted, the BIOS parameters are reset to their factory default settings.

Maintenance

*Note: Make sure there is a fully charged main battery in the MX3 **before** running the Backup Battery Discharge Utility.*

The NiCd backup battery should be discharged completely once or twice a year. The Main Battery Pack will fully charge the backup battery. This process will allow longer life for the Backup Battery.

The backup battery is discharged by running the Battery Discharge Utility (BBDIS81.EXE) file (located in the Utilities subdirectory on the MX3 – see Chapter 5, “Utilities”, for further information). The discharge utility shows the progress of the discharging. At this time, the program can be exited while continuing the discharge process. Normal use of the MX3 can resume during the discharge, with the exception of Hot-Swapping the Main Battery. When the backup battery is fully discharged, the MX3 will automatically stop the discharge process and begin to recharge the backup battery.

DO NOT REMOVE THE MAIN BATTERY PACK from the MX3 until the backup battery is completely discharged (with BBDIS81.EXE) -- in approximately 1 hour and recharged in approximately 2.5 hours.

Battery Hot-Swapping

ATTENTION Powering off the MX3 before a write (to disk) function has completed, may result in the corruption of the flash drive.

When the main battery power level is low, the MX3 will signal the operator with a continuous, one-second beep and the MX3's BATT M LED will be red. Beeping will continue until the battery is replaced, the battery completely depletes, external power is applied to the MX3 using the power jack, or the MX3 is placed in a powered cradle.

You can replace the main battery without shutting the unit off. Simply place the MX3 in Suspend mode, remove the discharged battery and install a charged battery.

When the Main Battery is removed, the MX3 automatically transitions to the Critical Suspend state. During Critical Suspend, the MX3's backup battery will continue to power the unit for at least five minutes. Though data is retained, the MX3 cannot be used until a new main battery pack is installed. After installing the new battery, the MX3 automatically transitions to the Suspend state. To resume from the Suspend state, press the Power key for 1 beep. Recovery from Suspend can take several seconds while the radio (if installed) is reestablishing an RF link.

If the Critical Suspend timer expires before a fully charged main battery can be inserted, the MX3 will turn off and must be rebooted after the main battery pack is installed.

Handling Batteries Safely

Never dispose of a battery in a fire. This may cause an explosion.

Do not replace individual cells in a battery pack.

Do not attempt to pry open the battery pack shell.

Be careful when handling any battery. If a battery is broken or shows signs of leakage do not attempt to charge it. Dispose of it using proper procedures.

Caution 	<p>Nickel-based cells contain a chemical solution which burns skin, eyes, etc. Leakage from cells is the only possible way for such exposure to occur. In this event, rinse the affected area thoroughly with water. If the solution contacts the eyes, get immediate medical attention.</p>
Caution 	<p>NiCd and Li-Ion batteries are capable of delivering high currents when accidentally shorted. Accidental shorting can occur when contact is made with jewelry, metal surfaces, conductive tools, etc., making the objects very hot. Never place a battery in a pocket or case with keys, coins, or other metal objects.</p>

Battery Maintenance Publication

The LXE publication "Getting the Most from Your Batteries" is available on the LXE Manuals CD-ROM and is a single-source guide to battery management. The document contains information about battery recharging, conditioning, and other pertinent issues.

Chapter 4 System Configuration

Introduction

There are many different aspects to the setup and configuration of the MX3. Many of the setup and configuration settings are dependent upon the optional features, such as hardware and software, installed on the unit. The examples found in this chapter are to be used as samples only, the configuration of your specific MX3 computer may vary. The following sections provide a general reference for the configuration of the MX3 and some of its optional features.

Installed Software

When you order an MX3 you receive the software files required by the separate programs needed for operation and communication. The files are loaded by LXE and stored in subdirectories in the MX3.

This section lists the contents of the subdirectories and the general function of the files. Files installed in each MX3 are specific to the intended function of the MX3 -- an MX3 using ANSI Plus and TCP/IP software will have a different file structure than that of an MX3 being used for DOS batch functions.

Files installed in each MX3 configured for an RF environment contain PCMCIA card radio specific drivers – the drivers for each type of radio, for example 900 MHz versus 2.4 GHz, are specific to the radios installed in the RF environment and are not interchangeable.

Drive C Internal Flash Array

The on-board Internal Flash Array (IFA) is 4MB, and it is configured as the C: drive - i.e., the equivalent of a disk drive in a PC. One inherent difference between Flash technology and a rotating media disk drive is the fact that it is solid-state, therefore it is much more rugged than a rotating media would be. Another difference is that its write (but not read) time can be slower than a rotating media.

Depending on which software configuration is ordered, the following sections list the files that may be stored on the Flash or C drive.

ATTENTION Powering off the MX3 before a write (to disk) function has completed, may result in the corruption of the flash drive.

Software Loaded on Drive C

The software loaded on the MX3 computer consists of BIOS, Card and Socket Services, PCMCIA card drivers, utilities, DOS 6.22, a protocol stack for 2.4 GHz radio support, radio drivers, and/or a LXE terminal emulator.

The software supported by the MX3 is summarized below:

LXE Terminal Emulations

The terminal emulator resident on the MX3 determines the radio card type (900 MHz or 2.4 GHz) installed in the MX3.

- ANSI Plus 2.4 GHz Terminal Emulator
- ANSI Plus 900 MHz Terminal Emulator
- DOS LDS Plus 900 MHz Terminal Emulator
- DOS IBM 3270 900 MHz Terminal Emulator
- DOS IBM 5250 900 MHz Terminal Emulator
- TN3270 2.4 GHz Terminal Emulator
- TN5250 2.4 GHz Terminal Emulator

FTP Software's PC/TCP or Datalight's Sockets

Used for 2.4 GHz radio management.

DOS Version 6.22

DOS Version 6.22 files are loaded in the DOS subdirectory. Only those DOS files required for optimum performance are loaded on the MX3. Not all DOS 6.22 files are available on the MX3, but may be added to the flash disk at a later time by the system administrator.

PCMCIA

Used for PCMCIA card management. The following file types are resident in the MX3.

- Socket Services
- Card Services
- PCMCIA SRAM MTD
- PCMCIA ATA MTD

Radio Drivers

Only one radio is installed in the MX3 at any one time. The radio resident on the MX3 determines the radio card drivers (900 MHz or 2.4 GHz) installed in the MX3.

SNMP DOS Agent

The SNMP DOS agent executable resides in the \AGENT directory. For information on enabling the SNMP Agent, please refer to the "DOS Autoconfigurator Instructions". For details on Agent operation, please refer to the "SNMP Agent Reference Guide". Both manuals are available in electronic format on the LXE Manuals CD.

IR Port Driver

The IrDA Lite Plus file must be loaded on each MX3 and/or PC used in the file transfer. You will also need DOS 6.22 files PRINT.EXE and the COPY or XCOPY.EXE command files.

- LXE IrDA Lite Plus

Signature Capture

Signature capture software is only installed/used when the MX3 has the optional touch screen installed.

Utilities

See Chapter 5, “Utilities”.

C Root Directory

Filename	Function
AUTOEXEC.BAT	The AUTOEXEC.BAT file is not essential to the operation of the MX3. The MX3 will boot without it. The AUTOEXEC.BAT file is a batch file that contains a series of DOS commands. The MX3 reads the AUTOEXEC.BAT file and executes the commands in the order in which they appear. The information in this file may be altered and some software applications will automatically alter it during their installation process.
CONFIG.SYS	The CONFIG.SYS file is not essential to the operation of the MX3, but it is essential to the operation of certain software programs. The information in this file may be altered, some software applications will automatically alter it during their installation process.
TERMTYPE.EXE	Identifies the computer type for SNMP agent.

VDOS Files

Filename	Description
ANSI.SYS	Interprets ANSI escape sequences.
CHKDSK.EXE	Checks the status of a disk and displays a report. Can also fix disk errors.
COMMAND.COM	A DOS file that runs programs, manages files, controls information processing, directs input and output, among other functions.
FORMAT.COM	Formats a read-write disk drive (flash and RAM drives only) removing all data.
HIMEM.SYS	Extended memory manager.
MEM.EXE	Displays the amount of used and free memory on a computer.
MODE.COM	Configures system devices.
MORE.COM	Displays 25 lines of output at a time.
NED.CFG	Configuration file for NED.EXE ASCII text editor.
NED.EXE	This program is used when editing ASCII text files.
REMDISK.EXE	Companion file to REMSERV.EXE. Each computer must use the same baud rate and packet or non-packet-style transmission. This file runs on one computer and REMSERV.EXE runs on the other.
REMSERV.EXE	Companion file to REMDISK.EXE. This file runs on one computer and REMDISK.EXE runs on the other. Used for manipulating files on two computers' hard disks. Use a null modem cable connecting both serial ports.
REV.BAT	Displays software revision level.
SYS.COM	Adds system files to disks.
VER	Displays the current version identity of DOS. This command is run at the DOS prompt.
XCOPY.EXE	Copies multiple files and, optionally, subdirectories from one disk to another.

VAGENT

The SNMP agent files are loaded on MX3's with a 2.4GHz radio.



Please refer to the "SNMP Agent Reference Guide" and "Client Configuration Manager" for more details on the SNMP agent.

Filename	Description
AGENT.EXE	Diagnostic agent. Provides limited access to the LXE Private MIB.
CFGAGENT.EXE	Configuration agent. Provides full access to the LXE Private MIB.
REV.BAT	Displays current software revision level.

IRDA Files

Filename	Function
IRPLUS.EXE	IrDA Lite Plus application. Data can be sent in both directions but not at the same time.

PCMCIA Files



See “PCMCIA Card Management and LXE DOS Computers”, for complete instructions or troubleshooting when using these files.

Filename	Function
CISDUMP	Permits user to list and interpret contents of a PC Card’s Card Information Structure (CIS) for debug use.
CNFIGNAM.EXE	Driver that specifies which PC configuration should be accessed from the PCM.INI file. This file is added to the CONFIG.SYS file.
DPMS.EXE	Novell driver that provides memory management services.
PCM.EXE	DOS-based utility for reviewing, modifying, or creating PC Card configurations. <i>Note: May or may not be present.</i>
PCM.INI	Stores PCMCIA configuration parameters.
PCMATA.SYS	Device driver for ATA–IDE hard disk emulation. Used with SRAM cards, rotating disk cards, or solid-state mass storage cards. This file is added to the CONFIG.SYS file.
PCMCS95.EXE	Card Services (driver), the operating-system–level program that manages all PCMCIA cards. This file is added to the CONFIG.SYS file.
PCMFDISK.EXE	Edits partition table for ATA PC Cards.
PCMRMAN.SYS	Device driver that reads Card Services resources, passes data to Card Services which then makes device allocations. This file is added to the CONFIG.SYS file.
PCMSCD.EXE	Device driver for FAX/Modem and LAN cards. This file is added to the CONFIG.SYS file.
PCMSS.EXE	Socket Services (driver), the BIOS–level program that functions as the interface between the card socket and the Card Services program.

UTILS

Note: The utilities included in the following list are included with all non-terminal emulation configurations.

Filename	Function
BBDIS81.EXE	Battery Discharge Utility. Condition the 50 mAh NiCd Backup Battery mounted on the system board. The battery discharge starts and when discharged switches to backup battery charge mode.
BBTST81.EXE	Backup Battery Test Utility. Indicates the current status of the backup battery and the voltage.
BCWEDGE.EXE	Barcode Wedge utility. Interprets data from barcode scanner as keyboard data. Does not function in Win95.
BEEP81.EXE	Beeper Utility. Changes the volume of the beeper using the up and down arrow keys on the keypad/keyboard.
COMTST81.EXE	Communication Port Utility. To diagnose the serial communication port, a simple loop back test routine is included in this file. The figure showing how to build a loop back plug is included in this chapter. The test results will read PASS or FAIL. A failure is identified and described.
DISP81.EXE	Display Utility. Activates every pixel on the display to verify functionality.
KEY2381.EXE	Keyboard Utility. This utility performs a contact functional test of each key on the keyboard. When activated, the key labels appear on the screen and then each key, when initialized, clears the key label from the screen.
LXEF.EXE	File Transfer Utility. Transfer files using serial port or IR ports. Also acts as agent for the Win32 Developer Toolkit Application.
PARAM81.EXE	Parameter Dump Utility. This utility collects the setup configurable parameters and lists them in a text file.
SCU.EXE	Scanner Configuration Utility. Allows programming multiple scanners with the same data.
SETAPI_4.EXE	Set An API Function. Runs an API call to set a mode or change a parameter.
TSCAL.EXE	Touchscreen (Digitizer) Calibration Utility. Calibrates the touchscreen to the display screen area.
TSTEST.EXE	Touchscreen (Digitizer) Test Utility. Verifies touchscreen calibration when the data mode is set in compensated mode.

The following utilities are included with terminal emulation configurations.

BBDIS81.EXE	BBTST81.EXE	BCWEDGE.EXE
COMSTS81.EXE	PARAM81.EXE	SCU.EXE
SETAPI_4.EXE		

Terminal Emulation Directories



Please refer to the specific Terminal Emulation's reference guide for complete instructions.

Batch MX3's do not have terminal emulation (TE) files and may or may not have a radio card. When a need exists to convert a batch MX3 to a TE unit or a different radio card, contact LXE Customer Services for assistance.

Note: 900 MHz radio files are loaded in the Terminal Emulation subdirectories, i.e. \APLUS, \LDSPLUS, \IBM (for both 3270 and 5250).

The terminal emulator resident on the MX3 determines the radio card type (900 MHz or 2.4 GHz) installed in the MX3. Following are the directory names containing the TE program files:

\APLUS	ANSI Plus with 2.4 GHz radio
\APLUS	ANSI Plus with 900 MHz radio
\LDS24	DOS LDS Plus with 2.4 GHz radio
\LDSPLUS	DOS LDS Plus with 900 MHz radio
\IBM	DOS IBM 3270 with 900 MHz radio
\IBM	DOS IBM 5250 with 900 MHz radio
\IBM24	TN3270 with 2.4 GHz radio
\IBM24	TN5250 with 2.4 GHz radio

Note: Dual TE's are supported on MX3 computers with an 8 Meg. Flash drive. MX3's with a 4 Meg. DO NOT support dual TE's.

Dual Terminal Emulation

Dual TE's (if ordered) may be resident when the unit is used in conjunction with the LXE 6224 Session Manager, subject to the following conditions:

- Multiple Terminal Emulators on the same client device must use the same radio type (900MHz or 2.4GHz), and
- Only one IBM Terminal Emulator can be installed on the same client device (3270 or TN3270 or 5250 or TN5250).



For more information on items in this section, please refer to the LXE electronic manual titled "DOS Autoconfigurator Instructions" on the LXE Manuals CD.

TE Selection Menu

The user is presented with the TE Selection Menu listing the available terminal emulators. For example, a user could see:

```
[5] Launch 5250
[A] Launch ANSIPLUS
[E] Exit to DOS
Please select option: [5, A, E]?
```

Upon selecting one of the terminal emulator options, the desired TE is launched. When the user selects E, the screen is cleared and system is returned to the DOS prompt.

In addition to multiple TE's, the TE Selection Menu can also display multiple Autologin hosts for some TE's. Please refer to the applicable TE Reference Guide for more information on multiple hosts.

Switching Terminal Emulators

2.4GHz Radios

When the user quits the TE with an ALT-X, the screen is cleared and the menu is presented again.

900MHz Radio

After exiting the active terminal emulator, the computer reboots and displays the TE Selection Menu.

Single Terminal Emulator Present

After the initial auto-configuration, the system will boot up and immediately launch the terminal emulator. No menu is presented.

Menu Customization

The system administrator may change almost every facet of the menu display by modifying the variables found at the top of **TESELECT.BAT**. Details on modifying the **TESELECT.BAT** file are included in the "DOS Autoconfigurator Instructions".

Radio-Specific Subdirectory

VPCTCP (2.4GHz Radio Specific Files)

The PCTCP files are included with MX3's that have a 2.4 GHz radio installed.

Filename	Description
IPSTAT.EXE	Gives statistics on IP and memory.
LSL.COM	Link Support Layer driver.
NET.CFG	Contains radio parameters.
ODIPKT.COM	ODI Packet driver.
PDTEST.EXE	Test or diagnose the packet driver. Unavailable as of Nov 2003.
REV.BAT	Displays current software revision level.
SETHOST.EXE	Manage host names and IP addresses. Unavailable as of Nov 2003.
SOCKET.CFG	Contains options for SOCKETP.EXE
SOCKETP.EXE	Sockets TCP/IP kernel for use with packet drivers.
TCP.EXE	Manipulate or view TCP parameters and status.
XPING.EXE	Test installation with a continuous ping.
Lucent Specific	
WVLAN43 (all WVLAN44 files)	Lucent radio driver files.
DRIVER.1ST	Radio driver file.
Proxim Specific	
RL2PCM.COM	Proxim radio driver file.
Symbol Specific	
11ODIPC.COM	Symbol radio driver file (DS 11Mb only)
SLAINIT.EXE	Symbol radio driver files (2Mb only)
SLAODI.COM	Symbol radio driver files (2Mb only)
Cisco Specific	
CSCODI	Cisco radio driver file (350 series radio only).
AWCO48C	Cisco radio driver file (340 series radio only).
WEPDOS.EXE	Set WEP key into Cisco radio.
AWCLEAP.EXE	DOS utility to sep LEAP (350 series radio only).
SETLEAP.BAT	Batch file to run AWCLEAP (350 series only).
CLEAR.BAT	Batch file to clear LEAP username and password (350 series radio only).

LXE 900Mhz Radio Files

The LXE 900MHz radio files are installed in the Terminal Emulation subdirectories.

Filename	Description
LXE900SS.EXE	Spread spectrum radio driver.
LXE900SS.HEX	Modem control codes.
PCRFLIB.EXE	Interface between the radio driver and the terminal emulator.
RFPARSE.EXE	Used by PCRFLIB to obtain configuration settings.

Configuration and Sample Files

When the MX3 is turned on, the operating system looks for several files in order to start up your system. Two of these files are hidden system files that cannot be seen when you perform a DOS directory command (DIR). The other files that are read at start up are:

COMMAND.COM

The COMMAND.COM file is essential to the operation of your system. Without it your system cannot boot. It contains the programming for resident DOS commands (the commands which allow you to change directories, copy, rename and delete files, etc.).

The COMMAND.COM file should be located in the root (C:\) directory.

CONFIG.SYS

The CONFIG.SYS file is not essential to the operation of the MX3, but it is essential to the operation of certain software programs. The information in this file may be altered and some software applications will automatically alter it during their installation process.

The default CONFIG.SYS file that is shipped with the MX3 varies depending on both the software and hardware configuration of the unit.

AUTOEXEC.BAT

The AUTOEXEC.BAT file is not essential to the operation of the MX3. The MX3 will boot without it. The AUTOEXEC.BAT file is a batch file that contains a series of commands. The MX3 reads the AUTOEXEC.BAT file and executes the commands in the order in which they appear. The information in this file may be altered and some software applications will automatically alter it during their installation process.

The default AUTOEXEC.BAT file that is shipped with the MX3 varies depending on both the software and hardware configuration of the unit.



For information on customizing the keyboard and display for international use, refer to a commercially available “ROM-DOS User’s Manual”.

The examples provided throughout this section are for illustration purposes only.

Do not use these examples for your operation, as each computer configuration is different.

Sample AUTOEXEC.BAT File

For 900MHz Radio

Command	Explanation
@ECHO OFF	Do not display batch command text during AUTOEXEC.BAT file run
SET TEMP=C:\TEMP	Place temporary files/data here
PATH=c:\dos;c:\pcmcia;c:\utils\c\;	*/ When the computer starts up, the operating system will look in these directories for the files it needs
prompt \$p\$g	
C:	Move DOS pointer to the C drive
cd \aplus	Move DOS pointer to the LXE Terminal Emulation (e.g. ANSI Plus) subdirectory
lxe900ss	Load the radio driver
xxxxx.xxx	Load the keyboard driver (for ANSI Plus only)
pcrflib	Load the interface between the radio driver and the terminal emulator
w84nsync	
aplus	Run the TE interface program (e.g. ANSI Plus)

For 2.4GHz Radio (with ANSI Plus)

Command	Explanation
@ECHO OFF	Do not display batch command text during AUTOEXEC.BAT file run
PATH=c:\dos;c:\pcmcia;c:\utils\c:\pctcp;c:\;	*/ When the computer starts up, the operating system will look in these directories for the files it needs
SET TEMP=C:\TEMP	Place temporary files/data here
set sockets =c:\pctcp c:\pctcp\lsl.com	
C:\pctcp\XXXXXX	Load the 2.4GHz radio driver here: WVLAN43 for Lucent radio RL2PCM for Proxim radio AWCO48C for Cisco 340radio CSCODI for Cisco 350 radio SLAODI for Symbol radio
c:\pctcp\odipkt.com 0 0x69	
c:\pctcp\socketp.exe c:\pctcp\socket.cfg	Look in this file for TCP/IP parameters <i>Note: The Proxim radio requires that /m=12288 follows socketp.exe</i>
C:	Move DOS pointer to the C drive
cd \aplus	Move DOS pointer to the LXE Terminal Emulation (e.g. ANSI Plus) subdirectory
xxxxx.xxx	Load the keyboard driver (for ANSI Plus loads only)
aplus	Run the TE interface program (e.g. ANSI Plus)

Sample CONFIG.SYS File

Note: Do not use these examples for your operation, as each computer configuration is different.



Please refer to commercially available ROM-DOS User's Guides for complete instructions or troubleshooting when using these DOS files.

```
DEVICE=C:\DOS\HIMEM.SYS /TESTMEM:OFF
FILES=45
STACKS=9,256
DOS=HIGH,UMB
LASTDRIVE=Z
```

```
Rem Card and Card Socket Services
DEVICE=C:\PCMCIA\DPMS.EXE
DEVICEHIGH=C:\PCMCIA\CNFIGNAM.EXE /DEFAULT
DEVICEHIGH=C:\PCMCIA\PCMSS.EXE
DEVICEHIGH=C:\PCMCIA\PCMCS95.EXE
DEVICEHIGH=C:\PCMCIA\PCMRMAN.SYS
DEVICEHIGH=C:\PCMCIA\PCMSCD.EXE
DEVICEHIGH=C:\PCMCIA\PCMATA.SYS
NEWFILE=C:\RADIO.SYS
```

Sample NET.CFG Files

Note: Hex values are indicated with a leading 0x. NET.CFG values do not use the 0x.

Lucent Radio NET.CFG File



See Chapter 6, “RF Network Configuration”, for explanations of NET.CFG parameters.

```
Link Support
  buffers 4 1550

Protocol ODIPKT
  Bind WVLAN43

Link Driver WVLAN43
  FRAME ETHERNET_II
  WaveLAN_Network_Name ANY
  Station_Name "station_name"
  AP_Distance 1
  Microwave_Robustness = N
  Transmit_Rate 3
  Medium_Reservation 2347
  Card_Power_Management 1
  Maximum_Sleep_Duration 100
  Receive_All_Multicasts N

  Enable_Encryption N

; Key1 abcde
; Key2 0x123456789a
; Key3 abcdefghijkl2
; Key4 0x112233445566778899AABBCCDD

;>> Transmit_Key_ID: integer in the range 1..4
; If you enable WEP encryption, you can select one key for wireless
; data transmissions from the list of WEP Encryption Key Values.
; Valid range: 1-4
; Default value: 1
; Transmit_Key_ID
```

Proxim Radio NET.CFG File



See Chapter 6, “RF Network Configuration”, for explanations of NET.CFG parameters.

```
Link Support
  BUFFERS 2 1550
Protocol ODIPKT
  BIND RL2PCM
;IP address is maintained in the socket.cfg file
Link Driver RL2PCM
  Socket          A
  Initialize_365  N
  Int             3
  Mem #1          C100
  Port           300
  Inactivity_Min  0
  Inactivity_Sec  1
  Sniff_Time      0
  Domain          0 ; set per customer settings
  Station_Type    0
  Peer_To_Peer    N
  Roam_Config     1
  Mac_Optimize    1
  Channel         1
  SubChannel      1
  Frame           Ethernet_II
; Frame           Ethernet_802.2
; Frame           Ethernet_802.3
```

Cisco Radio NET.CFG File



See Chapter 6, “RF Network Configuration”, for explanations of NET.CFG parameters.

```

;Configuration settings for LSL.COM (Link Support Layer)
; Buffers 4 1550      : required to avoid "Network jammed" message in
;                      : Clarkson Terminal Emulator
Link Support
    BUFFERS 4 1550

;Configuration for Packet Driver shim. This shim is used by
;Clarkson Terminal Emulator (CUTE) and other 3rd party protocol
;stacks.
; BIND CSCODI        : binds to the Cisco 350 driver
Protocol ODIPKT
    Bind CSCODI

file handles=60

LINK DRIVER CSCODI

;Initialization file for Infrastructure operating mode
; NOTE: The following are some keyword parameters that may
;be modified. Any commented or omitted keyword parameter
;assumes the factory default. For most situations the
;factory defaults will be appropriate. In situations where
;the factory default needs to be modified, uncomment or add the
;keyword parameter line and set the appropriate keyword value.

SSID          "" ;Must match Access Point setting
;NodeName     "" ;Descriptive station name

LEAP           "OFF" ;LEAP authentication (OFF -or- ON)
PowerSaveMode "FASTPSP" ;Power save modes (CAM, FASTPSP, PSP)
MaxPowerSave  "ON" ;Maximum power save mode (OFF -or- ON)
;WorldMode    "OFF" ;World mode (OFF -or- ON)
;ShortPreamble 0 ;PLCP short preamble (0=auto,1=long, 2=short)

;FragThreshold 2312 ;Packet size to start fragmenting
;RTSThreshold  2312 ;Packet size to start sending RTS/CTS
;DataRate1     0x02 ;(1) Mbps supported data bit rate
;DataRate2     0x04 ;(2) Mbps supported data bit rate
;DataRate3     0x0B ;(5.5) Mbps supported data bit rate
;DataRate4     0x16 ;(11) Mbps supported data bit rate
;RefreshInterval 10000 ;Inactivity time to check association

;To enable WEP uncomment the following line and set the
;key with the wepdos.exe utility
authtype      "open" ; Set WEP key in radio before wepopen
;             (WEPOPEN, WEP SHARED, MIXEDOPEN, MIXEDSHARED)

;The diversity parameter must be set according to the
;number of antennas for each terminal.
;setting for MX1, MX3 = on
;setting for 1380,1390,VX1,VX2,VX4 = right
;setting for 2325,MX2 = right
diversity     "on" ; for use on terminals with 2 antennas
;diversity "left"; for use on terminals with 1 antenna left port
;diversity "right"; for use on terminals with 1 antenna right port

;The adapter needs 32 16-bit I/O ports, and 1 non-sharable IRQ.
;The following lines should be uncommented and the appropriate
;values set in the following scenarios:
; 1) PCMCIA mode: Override the I/O port base and/or IRQ

```

```
;          assigned by PCMCIA card services.
; 2) PCMCIA mode: PCMCIA card services is not being used.
; 3) ISA mode: Override the I/O port base and/or IRQ assigned
;          by Plug and Play.
; 4) ISA mode: Non-Plug and Play operation.

;PortBase      140
;IRQ           5

;If the PCMCIA interface is being used without PCMCIA card services,
;uncomment the following lines and set the appropriate values.

Memory        c9000
Socket        1

;If the PCMCIA interface is not being used, set the appropriate
;value of "ISA" or "PCI".

BusType       "PCMCIA"

Frame ETHERNET_II
; Frame ETHERNET_802.3
; Frame ETHERNET_802.2

protocol IPX 0 ETHERNET_II
show dots=on
```

Note: LEAP, WorldMode and ShortPreamble parameters are valid for Cisco 350 radios only.

Symbol FHSS 2Mb Radio NET.CFG File



See Chapter 6, “RF Network Configuration”, for explanations of NET.CFG parameters.

```

IMPORTANT NOTE: commented lines must have a ; in column 1.
; Lines that are not commented out must have a space in column
; 1 and the parameter starts on column 2.
;

link support
  buffers 4 1550

protocol odipkt
  bind slaodi

link driver slaodi
  frame ethernet_ii

  ess_id      "LXE"

  cardservices  yes           ; must load slainit before
  socketservices yes         ; slaodi to use CS&SS
  mode io

; ioaddress 300                ; assigned by CS&SS
; memory CC00
; interrupt 5
; tx_rate 1
; tx_rate 2
; socket 2
; powermgmt      yes
  beacon_alg      11
  beacon_minimum  1
  beacon_maximum  10

;-----
; The following keywords are used to enable and manage the 802.11 WEP
; Encryption
;
; Auth_Type can be either Open_System or Shared_Key for the MU, the
; MAP will support both Auth_Type settings at the same time.
; The MU will only associate with APs or MAPs that support the it's
; Auth_Type. The MAP will only allow MUs to associate if the MAP
; supports the Auth_Type of the MU The default Auth_Type is
; Open_System
;
; Encrypt_Key# (where # is 1, 2, 3, or 4) will update the 1st, 2nd,
; 3rd, or 4th key encryption key in the adapter, according to the
; value of #. The parameter to these Keywords is 5 pairs of hex
; digits([0-9,a-f,A-F]) in a string.
; DO NOT prefix each pair with 0x.
; The default keys for the MU match the default keys of the UAP and
;
; MAP Encrypt_Key_ID indicates which key the adapter is to use for
; encrypting packets for transmission. The parameter is a decimal
; digit from 1 to 4.
; The default Encrypt_Key_ID is 1
; Note: The key to by used to decrypt packets being received is
; contained in the received packet.
;-----
; Auth_Type      Open_System
; Auth_Type      Shared_Key
; Encrypt_Key1   "xx xx xx xx xx"

```

```
; Encrypt_Key2  "xx xx xx xx xx"  
; Encrypt_Key3  "xx xx xx xx xx"  
; Encrypt_Key4  "xx xx xx xx xx"  
; Encrypt_Key_ID n
```

```
link driver slainit
```

```
verbose yes  
DynWindowRsrcs yes
```

Symbol 4121 11Mb Radio NET.CFG File



See Chapter 6, “RF Network Configuration”, for explanations of NET.CFG parameters.

- ; 1. A semicolon as the first non blank character denotes a comment line.
- ; 2. Commented out parameter lines create the default setting.
- ; 3. Rate control only works with 2 Mbps (or greater) radios
- ; 4. Encryption controls only work with 2Mbps (or greater) radios
- ; 5. ESSID must be changed to reflect the local network.

```
link support
  Buffers 4 1550
```

```
Protocol ODIPKT
  Bind sllodi
```

```
link driver sllodi
  frame ethernet_II
; frame ethernet_802.2
```

```
; The ESS_ID can be a string of 1 to 32 case sensitive characters.
```

```
ess_id 101
station_name
```

```
; Use the following keyword to specify rates at which the Adapter
; is allowed to operate. If no rates are specified, the Adapter
; will use all rates available on the radio. Regardless of what is
; specified, the radio will allow either 1 and 2 Mbps or all four
; rates, i.e., 1, 2, 5.5, and 11 Mbps.
```

```
; Tx_Rate 1 (1 Mbps)
; Tx_Rate 2 (2 Mbps)
; Tx_Rate 5 (5.5 Mbps)
; Tx_Rate 11 (11 Mbps)
;
; Tx_Rate 1
; Tx_Rate 2
; Tx_Rate 5
; Tx_Rate 11
```

```
; Note: IO Mode is required if using Card/Socket Services
```

```
Mode IO

IOAddress 340

Memory CC000

Interrupt 5
```

```
; Set performance index to "0" for VX1 and "1" for MX3. 0=CAM ,
1=Power Management On
performance_index 1
```

```
; Set diversity to "Both" for two antennas and "A" for one antenna.
diversity BOTH
```

WEP – Prior to November 2003

```
; To enable WEP you must set encrypt_enable to "y" and then set the
; encryption key to the same value as the AP is set for. For 128 bit
; encryption keys you must have 13 pairs of hex digits and 5 pairs of
; hex digits for 40 bit encryption. Once the key is set use the
; "encrypt_key_index" parameter to select which key is transmitted.

; encrypt_enable y
; Encrypt_Key1 12 34 56 78 90 12 34 56 78 90 12 34 56
; Encrypt_Key2 12 34 12 34 12 34 12 34 12 34 12 34 12
; Encrypt_Key3 AB CD EF 12 34 56 78 90 AB CD EF 12 34
; Encrypt_Key4 12 34 56 78 12 34 56 78 12 34 56 78 12
; encrypt_key_index 1
; encrypt_level 2
```

WEP – After November 2003

```
; To enable WEP you must set Encrypt_Enable_Index to the number of the
; Encrypt_Key# to use and then set the encryption key to the same
; value as the AP is set for. Zero means No Encryption and is the
; default.
; For 128 bit encryption keys you must have 13 pairs of hex digits and
; 5 pairs of hex digits for 40 bit encryption.

; Encrypt_Enable_Index 0
; Encrypt_Key1 12 34 56 78 90 12 34 56 78 90 12 34 56
; Encrypt_Key2 12 34 12 34 12 34 12 34 12 34 12 34 12
; Encrypt_Key3 AB CD EF 12 34 56 78 90 AB CD EF 12 34
; Encrypt_Key4 12 34 56 78 12 34 56 78 12 34 56 78 12
```

Sample SOCKET.CFG File



See Chapter 6, “RF Network Configuration”, for explanations of SOCKET.CFG parameters.

Note: the values for some parameters are dependent on the type of radio card installed. Please refer to Chapter 6, “RF Network Configuration” for appropriate values for a specific radio card.

```
# Socket.cfg sets the options for Data Light socketp.exe
# The section xxx.xxx.xxx.xxx is for this machines IP
# The net mask is specified as part of the ip address.
# In the ip address command an optional /net_bits can be
# used to indicate the number of bits in the network ID.

# Net Bits Net Mask      Class IP address range
# 8         255.0.0.0     A      0.x.x.x to 127.x.x.x
# 16        255.255.0.0   B      128.x.x.x to 191.x.x.x
# 24        255.255.255.0 C      192.x.x.x or higher

# The network can be subdivided by two for every net bit added.

# Net Bits Net Mask Net Bits      Net Mask
# 1         128      5          248
# 2         192      6          252
# 3         224      7          254
# 4         240      8          255

# To enable DHCP set the IP address to 0.0.0.1

IP address 0.0.0.1/16

# The ARP INIT parameter makes this stack the same as
# before. The stack will not send a DHCP ARP (DEFAULT) when
# booting up. For added IP address checking you may comment
# this line out if you are NOT using proxy ARP.

ARP INIT GRAT

# Interface sets the physical interfaces
# pdr=packet driver
# if0=interface_card
# dix=frame type
# 1500=MTU
# 10=Buffers
# 0x69=ioaddr

Interface pdr if0 dix 1500 10 0x69

# When using a gateway (IP router) to the rest of the world,
# replace "XXX.XXX.XXX.XXX" with your gateway ip and
# remove the # at the beginning of the line.

# route add default if0 XXX.XXX.XXX.XXX

# When using a domain name server (DNS),
# replace XXX.XXX.XXX.XXX with the IP address of the DNS,
# and remove the # at the beginning
# of the line

# domain server XXX.XXX.XXX.XXX

# domain suffix          # example lxe.com

# Redisplay IP information
```

```
IP address  
  
# options, refer to documentation to change  
  
ip ttl 15  
tcp mss 1360  
tcp window 2920  
tcp retry 8  
tcp irtt 500ms
```

BIOS Setup

Be very careful when using this utility to modify BIOS Setup parameters. The MX3 may generate unexpected results when incorrect or conflicting parameter values are entered. The parameters should only be modified by Information Services personnel or the system administrator.

Note: Make sure there is a fully charged battery in the MX3 **before** accessing BIOS Setup.

Accessing the BIOS Setup

When you turn the MX3 on the unit will start to boot programs from the Internal Flash Array (IFA). If the Main Menu Setup Msg parameter is toggled On, watch the bootup sequence and when the following is displayed:

Press F2 to Enter Setup

Press the [F2] key. When the Main Menu Setup Msg parameter is toggled Off (default), the [F2] key is still available during the bootup sequence. The next screen displayed is the BIOS Setup Main Menu.

BIOS Setup has three menus: Main, Advanced and Exit.

Using the Keypad

The set of keypad commands used to select menu items and parameters, as well as modify parameter values is as follows:

Action	Keypress
Exit a menu	Esc
Activate Help Screen	F1
Modify parameter value	Space key or alpha-numeric key
Move to next parameter	Enter or Arrow Key
Move from menu to menu	Arrow key

Note: Refer to Appendix A, "Key Maps", for other key press sequences.

BIOS Setup Default Values by Option

Menu Option	Menu / Section	Default Value
Boot	Main	A: then C:
Caps	Advanced / Keyboard	Off
COM1 Pin 9	Advanced / Other	RI
COM2 Pin9	Advanced / Other	RI
CPU	Advanced / Power Mgt	Aggressive
CtlAltDel	Advanced / Keyboard	Reboot
Date	Main	09/02/1988
Disp. BL	Advanced / Power Mgt	Timed
Disp. BL	Advanced / Power Mgt	3 s
Display	Advanced / Power Mgt	15 s
Docked PM	Advanced / Power Mgt	Off
Font	Advanced / Other	8x16
Left Scan	Advanced / Power Mgt	Numeric Enter
NumLock	Advanced / Keyboard	On
Off Timer	Advanced / Power Mgt	5 m
POST Msg	Main	Off
Power Key	Advanced / Power Mgt	Susp-Off
Power Mgt	Advanced / Power Mgt	On
Right Scan	Advanced / Power Mgt	Scan
Rpt Delay	Advanced / Keyboard	0.5 s
Rpt Rate	Advanced / Keyboard	10 /s
Setup Msg	Main	Off
Summary	Main	Off
Suspend	Advanced / Power Mgt	5 m
Time	Main	00:00:00
Touch Wake	Advanced / Power Mgt	On

Settings are saved temporarily as each parameter activity screen is closed. Changes are saved to CMOS RAM when Exit With Save is selected and the BIOS setup program closes.

Changed parameter values will take effect when the MX3 reboots upon exiting BIOS Setup. If the MX3 does not automatically reboot upon exit, please reboot the MX3.

Main Menu Options

To edit parameters, use the up and down arrow key to move from parameter to parameter.

Use the space key or an alpha-numeric key to modify a parameter value.

Press F1 to activate the help screen then use the panning function to move around the help screen. Press ESC to close the help screen.

Use the left and right arrow keys to move from menu to menu.

Press the ESC key or key sequence to go directly to the Exit Menu.

Main Menu Parameters

When changes have been made, press an arrow key to go to another parameter or menu or press ESC to go to the Exit Menu.

Menu Option	Default Value
Time	00:00:00
Date	01/04/2000
Boot	C: then A:
Setup Msg	Off
POST Msg	Off
Summary	Off

Parameter Changes

Settings are saved temporarily as each parameter activity screen is closed. Changes are saved to CMOS RAM when “Save and Exit” is selected and the BIOS Setup program closes.

Changed and saved parameter values take effect after the MX3 is rebooted.

Time

Specifies the current system time.

This parameter is shown in the following format:

hh:mm:ss

where:

hh is hours
mm is minutes
ss is seconds.

Each of these fields is selected and modified separately. When the parameter is highlighted, type the desired numeric entry and then press the <Tab> key to move from hours to minutes to seconds. The system time is set according to the standard 24-hour clock.

Default: **00:00:00**

Post Msg

Set this parameter to On to stop the boot process if the Power On Self Test (POST) procedure encounters errors. Otherwise, the system continues to attempt to boot despite many startup error messages that display.

See Chapter 7, “Troubleshooting”, for more information on POST messages.

Values: On, Off

Default: Off

A parameter setting of On only affects the following error conditions (messages are displayed) and the bootup is halted:

Messages that Halt Bootup

- **IDE Unit Error**
 - No media connected
 - Configured for 0 cylinders
 - Controller reset failed
 - Media not ready
 - Track 0 seek timed out
 - Media initialization failed
 - Media recalibration failed
 - Last track seek failed
- **Timer Error**
 - System timer (0) failed
- **Disk Error for Debug**
 - Floppy type does not match setup only for debug capabilities
- **I/O Chip Error**
 - I/O conflicts exist for serial ports, parallel ports, and IDE units (any or all)
- **Other Error**
 - IRQ conflict, unsupported COM port configuration, keyboard locked

Bootup Continues after These Messages

This option does not affect the following error conditions (messages are displayed and the bootup continues):

- **Keyboard Error**
 - Keyboard reset failed
 - Keyboard interrupts failed
- **CMOS Error**
 - CMOS checksum failed
 - CMOS time and date not set
 - Real time clock failure
- **Configuration Error**
 - Previous POST execution was incomplete
- **Scanner Error**
 - Scanner detected, but attempts to read scanner configuration failed.

Summary

This option is used to enable or disable a summary of the system configuration which displays before the operating system starts to load. To speed up booting, this parameter can be set to Off.

Values: **On, Off**

Default: **Off**

Advanced Menu Options

The Advanced Menu contains several sections – Power Management, Keyboard and Other. **To view all sections, press the down arrow key instead of using the Pan Down command.**

See the section titled “Panning Function” earlier in this chapter. Panning commands are used to view a 25 row by 80 column virtual screen display using specific keypresses.

To edit parameters, use the up and down arrow key to move from parameter to parameter.

Use the space key or an alpha-numeric key to modify a parameter value.

Press F1 to activate the help screen then use the panning function to move around the help screen. Press ESC to close the help screen.

Use the left and right arrow keys to move from menu to menu.

Press the ESC key or key sequence to go directly to the Exit Menu.

Parameter List

Menu Section	Option	Default Value
Power Mgt	Power Mgt	On
	Left Scan	Numeric Keypad Enter
	Right Scan	Scan
	CPU	Aggressive (1 s)
	Disp BL	Timed
	Disp BL	3 s
	Display	15 s
	Suspend	5 m
	Off Timer	5 m
	Docked PM	Off
	Touch Wake	On
	Power Key	Susp-Off
	Keyboard	Caps
NumLock		On
Rpt Delay		0.5s
Rpt Rate		10 s
CtlAltDel		Reboot
Other	Font	8x16
	COM1 Pin9	RI
	COM2 Pin 9	RI

Settings are saved temporarily as each parameter activity screen is closed. Changes are saved to CMOS RAM when “Save and Exit” is selected and the BIOS Setup program closes.

Changed and saved parameter values take effect after the MX3 is rebooted.

Power Management

When changes have been made, press an arrow key to go to another parameter or menu or press ESC to go to the Exit Menu.

Power Mgt

This parameter must be set to On before timer options can be activated. When Power Management is Off, the CPU setting is Full Speed.

*Note: **Critical Suspend.** The Off Timer is ignored when Power Management is disabled -- the MX3 will skip critical suspend mode (running on backup battery) and turn off immediately. It will not use any backup battery power and currently unsaved information will be lost.*

Values: On, Off

Default: On

CPU and Suspend Timers and RF Communication

When using an MX3 with a 2.4GHz radio driver (see previous section titled “\PCTCP Files”), the CPU and Suspend timers can be affected by the radio.

The 2.4 radio has a time-out setting. This time-out setting is in the radio config file under inactivity time. This time, by default, is 5 seconds and is the lowest possible value. During this 5 seconds, the radio is polled which is detected by the MX3 BIOS as “activity”. As a result, the MX3’s Power Management keeps resetting the CPU and Suspend timers.

Left Scan

Use this parameter to reprogram the button to the left of the display.

The factory setting for the left button is Numeric Keypad Enter.

Once reprogrammed and the BIOS change saved, the button will keep the setting over cold boots.

Values: Scan, Num Enter

Default: Num Enter

Endcap	Possible Left Button Configurations
Blank	Numeric keypad Enter
Scanner/serial	Numeric keypad Enter
Serial/Serial	Numeric keypad Enter
TN5250/5250 Terminal Emulation only:	
Blank	Field Exit w/ FLD EXIT label
Scanner/Serial	Field Exit w/ FLD EXIT label
Serial/Serial	Field Exit w/ FLD EXIT label

Right Scan

Use this parameter to reprogram the button to the right of the display.

The factory setting for the right button is Scan.

Once reprogrammed and the BIOS change saved, the button will keep the setting over cold boots.

Values: Scan, Num Enter

Default: Scan

Endcap	Possible Right Button ³ Configurations
Blank	Numeric keypad Enter
Scanner/serial	Scan
Serial/Serial	Numeric keypad Enter
TN5250/5250 Terminal Emulation only:	
Blank	Numeric keypad Enter
Scanner/Serial	Scan
Serial/Serial	Numeric keypad Enter

CPU

Note: Pwr Mgt Modes - Power Mgt must be set to On before the value in CPU has any effect on the MX3.

The CPU setting determines how Power Management values control the CPU.

Aggressive setting maximizes battery life.

Moderate will balance battery life and performance.

Light will maximize performance.

Full Speed disables power management of the CPU only.

Custom setting is used to set the CPU timer in 1 second increments.

Values: Aggressive (1 second)
 Moderate (5 seconds)
 Light (15 seconds)
 Full Speed
 Custom (user configurable in 1 second increments;
 range = 1 - 63 seconds)

Default: Aggressive (1 second)

Custom Setting

CPU Custom Setting is user configurable in 1 second increments up to 63 seconds. After selecting Custom, press the down arrow to move the highlight to the seconds setting. Use the numeric keys to enter number of seconds. Higher second values will adversely affect battery life.

³ Regardless of the type of endcap installed, the default value of the Right Button is always Scan.

Disp BL

The DispBL parameter is used to set which of three modes the Display Backlight will be in.

Off - the most battery-efficient way to operate the display.

On - provides full time backlighting whenever the unit is on.

Timed - provides backlighting for a predetermined amount of time from the last key input or display update. Set the time with the Disp BL timer parameter.

Values: **On, Off, Timed**

Default: **Timed**

Note: *When the Timed option is selected, use the Disp BL time parameter to set the amount of time the display backlight remains on. If the Disp BL timer is set to a period of time longer than the Display Timer, the backlight will be forced off when the display turns off.*

Disp BL

The Disp BL timer works in conjunction with the parameter setting of *Pwr Mgt Modes - Disp BL*.

The display backlight timer is reset every time the following occurs: video write, touch (on a touch screen), or any keypress.

Values: **1 - 63 seconds (in 1 second increments)**

Default: **3 seconds**

Note: *If Pwr Mgt Modes - Disp BL setting is not "Timed" this setting is ignored.*

Display

The Display parameter designates, in seconds, how long the MX3 senses inactivity on the MX3 before shutting down. The display timer is reset every time the following occurs: video write, touch (on a touch screen), or any keypress.

When the display timer expires and the display turns off, the Status LED turns steady green.

When the display is off, the MX3 is still powered on. Trigger presses will initiate activity. Communications through the radio or serial ports will still continue. However, the keypad clears all sticky key modes and LEDs and a key press functions only as a wakeup event (does not send to the operating system or application).

Press any key once to wake the display.

Values: **0 - 63 seconds (in 1 second increments)**

Default: **15 seconds**

A value of 0 means Full On.

Note: *If the Disp BL timer is set to a period of time longer than Display, the display backlight will be forced off when the display turns off.*

Suspend

This parameter establishes how long the MX3 senses inactivity on the system before entering Suspend Mode. This option is used to conserve battery life.

Pressing the Power key once also places the MX3 in Suspend Mode. Once in the Suspend state, the Status LED blinks green.

Use the Power key to wake the MX3 from suspend mode or a touch on an installed touch screen.

The Suspend Timer is reset every time one of the following occurs:

Video write	Keypress
Disk / IFA Access	Touch screen touch-up
COM 1 or COM 2 access	
PCMCIA Slot 0 IRQ, Slot 1 IRQ and Controller IRQ	

Note: Disabling the Suspend timer does not disable the Off Timer.

Values: 0 - 63 minutes (in 1 minute increments)

Default: 5 Min

A value of 0 means "Disabled".

Note: Suspend can be disabled when the MX3 is to be in a cradle. See the Docked PM parameter.

Off Timer

Note: When the Off Timer parameter is set to 0, the MX3 will skip Critical Suspend mode and turn off immediately. It will not use backup battery power. The currently unsaved information is lost.

Off Timer designates, in minutes, how long the MX3 waits in critical suspend mode before shutting down.

The Off Timer begins its countdown when the MX3 is in the critical suspend state. Critical suspend state is initiated when there is a Main Battery Power Fail caused by the inserted battery pack failing or the main battery being removed from the MX3. The Off Timer begins the countdown as soon as power draw is transferred from the Main Battery pack to the Backup battery.

Note: A fully charged Backup battery can keep the MX3 in the critical suspend state for at least 5 minutes.

Values: 0 - 63 minutes (in 1 minute increments)

Default: 5 minutes

The backup battery will continue to operate the MX3, in very low power mode, for the number of minutes set in the Off Timer parameter.

When the MX3 is in critical suspend mode the main battery LED illuminates, all peripherals shut down, the CPU clock is stopped, power is removed from the PCMCIA cards, and the Status LED is blinking red.

The MX3 is saving the state prior to the main battery failing and cannot be used.

- If a fully charged main battery pack is installed before the Off Timer time expires the MX3 will transition to Suspend. Exiting from Suspend allows the MX3 to resume operation where it left off – install the new battery pack.
- If the Off Timer expires the MX3 will turn itself off and all unsaved information is lost. Insert a fully charged battery pack and press the Power button to turn the MX3 back on.
- When the Off Timer parameter is set to 0, the MX3 skips the critical suspend state and turns off immediately – it will not use backup battery power. The currently unsaved information is lost.
- When the main battery pack is removed and the MX3 completely drains the backup battery, the MX3's date and time settings are lost but all other parameters are recovered. When a fully charged battery pack is again inserted in the MX3, the backup battery will recharge itself using the power in the battery pack. The main battery life during the recharge session is lessened.

Docked PM

Use the Docked PM parameter to set the power management preferences for the MX3 when it is in a powered cradle.

Selecting *Lights Off* will turn off the display and keypad backlights.

Selecting *Unchanged* maintains the current power management settings.

Selecting *Off* disables power management settings when the MX3 is in a powered cradle.

Values: **Off**
 Unchanged
 Lights Off

Default: **Off**

Touch Wake

This parameter is used to determine whether the MX3 recovers from Suspend mode when the screen is touched. The MX3 must have a touch screen installed and active.

See also Suspend.

Values: **On, Off**

Default: **On**

Power Key

Use this option to determine how the Power key will function when pressed.

When *Disabled* is selected and the user presses the Power key, nothing happens. The user will not be able to place the unit in Suspend with the Power key or turn the unit off.

Note: *When the Power key is disabled, the MX3 will power off only when both the Main and Backup batteries are depleted.*

When *Suspend* is selected, the MX3 will enter Suspend state upon a Power key press.

When *No Susp* is selected and the user presses the Power key, nothing will happen unless the user holds the key down for 4 beeps. In other words, the user cannot suspend the MX3. The user can only turn the MX3 off.

When *Suspend-Off* is selected, the user can both suspend and power off the MX3. If the user holds the Power key down for less than 4 beeps, the MX3 will transition to the Suspend state. If the user holds the Power key down for 4 beeps, the MX3 will power off.

Values: **Disabled**
 Suspend
 No Susp
 Suspend-Off

Default: **Susp-Off**

Note: *Before leaving this screen, make sure the Power Key status is correct.*

Troubleshooting

The MX3 will not turn off -- force the MX3 to power off by holding the Power key down for 15 seconds -- the MX3 will power off. Locate and correct the problem before powering the MX3 back on – e.g. IRQ conflict, very low battery power, radio conflict, unexpected software application result, etc.

Keyboard

When changes have been made, press an arrow key to go to another parameter or menu or press ESC to go to the Exit Menu.

Caps

This parameter is used to determine whether the CAPS function is turned on or off at bootup.

Values: On, Off

Default: Off

NumLock

Use this option to set NumLock at boot time. When NumLock is On, the keypad is locked in numeric mode. When NumLock is Off the numeric keys are inoperable.

Whether NumLock at Boot is Off or On, no LED is illuminated on the MX3.

Values: On, Off

Default: On

Rpt Delay

The Rpt Delay parameter will designate the period of time from the depression of a key until the key repeats.

Values: 0.25 to 2.00 second
(0.25, 0.5, 0.75, 1.00, 1.25, 1.50, 1.75, 2.00)

Default: 0.5 seconds

Rpt Rate

The Rpt Rate parameter sets the number of times a keystroke will be repeated, per second, as the key is depressed.

Values: 2 to 30 chars per second
(2, 6, 10, 15, 20, 30)

Default: 10 chars per second

CtlAltDel

This parameter determines whether the user can restart the MX3 by pressing the reboot key sequence: CTRL+ALT+2nd+DOT.

When this parameter is *No Reboot*, the reboot key sequence will have no effect.

Values: Reboot, No Reboot

Default: Reboot

Other

When changes have been made, press an arrow key to go to another parameter or menu or press ESC to go to the Exit Menu.

Font

The Font parameter selects the screen display font size.

Note: This font size choice may be overridden by an application.

Values: **8x8**
 8x16

Default: **8x16**

COM1 Pin9

This option is used to configure the endcap COM 1 serial port.

Values: **RI (Ring Indicator)**
 5V

Default: **RI**

The MX3 has two serial ports available in three configurations.

In the first configuration, both COM1 and COM2 are connected to individual D-9 connectors on the endcap.

In addition, COM2 is software switchable between the D-9 serial port and the internal IR port located on the back of the unit.

In the third configuration, COM1 is connected to an internal SE923 scanner and COM2 is software switchable between the D-9 connector on the endcap and the internal IR port on the back of the unit.

Power to the COM ports may be turned off using a terminal emulation configuration utility.

COM2 Pin9

This option is used to configure the endcap COM 2 serial port.

Values: **RI (Ring Indicator)**
 5V

Default: **RI**

The MX3 has two serial ports available in three configurations.

In the first configuration, both COM1 and COM2 are connected to individual D-9 connectors on the endcap.

In addition, COM2 is software switchable between the D-9 serial port and the internal IR port located on the back of the unit.

In the third configuration, COM1 is connected to an internal SE923 scanner and COM2 is software switchable between the D-9 connector on the endcap and the internal IR port on the back of the unit.

Power to the COM ports may be turned off using a terminal emulation configuration utility.

Exit Menu Options

To edit parameters, use the up and down arrow key to move from parameter to parameter.

Press F1 to activate the help screen then use the panning function to move around the help screen. Press ESC to close the help screen.

Use the left and right arrow keys to move from menu to menu.

Press the ESC key or key sequence to go directly to the Exit Menu.

As changes are made to Setup values and the values saved, the next time the MX3 is turned on or rebooted, those saved values will be in effect.

Save and Exit

Use this option to immediately save current Setup settings to CMOS RAM and into the Flash Boot Device (FBD).

When “Save and Exit” is highlighted, press <Enter> to save. When the saving process is complete, press <Enter> again to exit and reboot with the current values.

Exit w/o Save

Use this option when any current changes made to Setup parameters are to be ignored. The parameters revert to their state when Setup was entered.

When this option is highlighted, press <Enter> and the boot process continues. The system reboots with unchanged values.

Load Defaults

This option is used to reset the Setup values to the original, default values that were set at the factory, before suppliers or end users made changes.

As changes are made to Setup values and the values saved, the next time the MX3 is turned on or rebooted, those saved values will be in effect.

Save this change by selecting “Save and Exit”.

Load Previous

Use this option to immediately restore CMOS RAM and update the current Setup settings from the Flash Boot Device.

Save this change by selecting “Save and Exit”.

Save Changes

Used to save BIOS Setup changes without rebooting. The changed parameters will be in effect the next time the MX3 is powered on or rebooted.

Reboot by selecting either “Exit w/o Save” or “Save and Exit”.

API Calls

See Also: LXE DOS API Programming Guide

The LXE DOS Computer Application Programmer's Interface (API) is designed to enable application programmers to access the functionality of the computer hardware without requiring them to understand the details of the hardware design.

The LXE MX3 Mobile Computer is architecturally an AT Clone with power management features required for mobile use. Like all AT computers, it uses a BIOS software layer to provide a hardware programming interface to both DOS and the Application Programs. It is functionally a 486 mobile AT customized for data collection applications. Both BIOS and DOS are available for programming ease, but applications must be customized to make use of the enhanced features as well as to operate with the reduced function LCD and keypad. The MX3 is not designed to be a general-purpose computer.

API services are accessed through software interrupts 10h and 15h. The 486 API is the application-level and driver-level software interface for all of the unique MX1 hardware.

A simple register-based procedure parameter passing architecture has been implemented with a similar structure used by IBM BIOS. All procedural calls to the 486 API microcode is to be done via a software interrupt.

Sample Code for API Calls

The following is a brief code segment that enables the scanner on the combination Scanner/RS-232 endcap, demonstrating the proper use of API calls:

```
#include <stdio.h>
#include <dos.h>

#define PROT_INT          0x15
#define PROT_EXT          0xba
#define SCAN_CONTROL     0x56
#define COM1_MODE         0x41
#define SCANNER           0x00
#define RS_232            0x01

union REGS          inRegs, retRegs

main() {

    inRegs.h.ah=PROT_EXT;
    inRegs.h.al=SCAN_CONTROL;
    inRegs.h.bh=COM1_MODE;
    inRegs.h.bl=SCANNER;
    int86(PROT_INT, &inRegs, &retRegs);

}
```


Chapter 5 Utilities

Introduction

*Note: Make sure there is a fully charged battery in the MX3 **before** beginning a process described in this chapter. When using an MX3 in a powered cradle or with an external power source connected through the MX3 power jack, make sure there is an uninterrupted power source during file transfer or process.*

ATTENTION Powering off the MX3 before a write (to disk) function has completed may result in corruption of the flash drive.

This chapter contains descriptions and instructions for the following MX3 resident utilities:

IrDALite Plus

A standard DOS device driver (IRPLUS.EXE) which converts data sent to the MX3 COM ports to infrared data that is then sent to an external device through the infrared port on the MX3. This protocol sends data in both directions, but not simultaneously. Please refer to the “MX3 Cradle Reference Guide” when using IrDALite Plus on an MX3 in a powered cradle.

LXE BCWEDGE

This Terminate and Stay Resident (TSR) program is used to redirect input from COM1 or COM2 to the BIOS key ring buffer. With this TSR running, input from a communication port appears as if it was typed in from the keyboard.

This utility is most useful with applications that do not know about the MX3’s scanner port. This utility, therefore, allows an off-the-shelf application to accept barcode data.

LXE Diagnostics

Use the utility programs to verify, test and program the MX3:

- COM Port Utility
- Keyboard Utility
- Display Utility
- File Transfer Utility
- Scanner Config Utility
- Beeper Utility
- Battery Discharge Utility
- Backup Battery Test Utility
- Parameter Auto-Detection Utility
- Touchscreen Calibration
- Touchscreen Test
- Set an API Function

DOS Extensions

The following utilities are included with terminal emulation configurations.

BBDIS81.EXE	BBTST81.EXE	BCWEDGE.EXE
COMSTS81.EXE	PARAM81.EXE	SCU.EXE
SETAPI_4.EXE		

All utilities are included in non-TE configurations.

IrDA Lite Plus

Note: IrDA Lite Plus is not compatible with LXE's terminal emulation programs.

IrDA Lite Plus (IRPLUS.EXE) is a DOS device driver that complies with the standard produced by InfraRed Data Associates for infrared communications.

The IrDA Lite Plus device driver was developed for the LXE MX3 computer. It is a standard DOS device driver which converts data sent to the LPT/PRN, and COM1 and COM2 ports via the BIOS, DOS, and a proprietary application interface to infrared data that is transmitted using the infrared port on the mobile computer. Even though this device driver was developed for the MX3, it works on a regular PC *with an installed infrared port or an attached serial to infrared converter cable (commercially available)*.

Note: The MX3's IR Port is COM2 regardless of the endcap installed on the MX3.

On the back of the MX3 Computer is the InfraRed (IR) Data Port. The IR Port is designed to provide a data link between the MX3 and a similarly equipped piece of equipment such as a printer.

The IR operating envelope has a distance range of 2 cm (.79 inches) to 1 meter (3.2 feet) with a viewing angle of 30 degrees.

Operation of the IR Port is application dependent so a description of implementation varies from application to application.

System Setup

When preparing to use IrDA Lite Plus, a command line must be added to the CONFIG.SYS file in the MX3. See the "Quick Start" section that follows.

The IrDA Lite Plus file must be loaded on each MX3 and/or PC used in the file transfer.

When using a PC that does not have an installed IR port, a commercially available serial to infrared adapter is required for IR file transfer to/from the MX3.

IR Communication Reliability

Transmitted data is reflected into the receiver and the software programmer needs to make sure the data is cleared before the IR port starts its receive routines.

When the MX3 is transmitting data to the PC, it starts to fill up its Tx FIFO buffer (First In First Out). During transmission, any reflections or light disturbances from the IR medium are going to get interpreted as data and is clocked into the Rx FIFO buffer. Unless software developers take preventative steps, when it goes to access the Rx FIFO buffer to determine if an ACK was received, it may find data and "thinks" it did not receive an ACK because it contains corrupted data due to the reflections or disturbances coming in from the IR medium. Software must be able to handle these types of reflections or disturbances at any time during transmit or receive when using IR communications on the MX3. If the receive algorithm requires that a specific character be present in a specific sequence, extra precautions/steps must be taken to properly manipulate the receive sections of the system. For example, if the software expects the first character received after a transmission to be an "ACK", the software design must be such that the receive buffers and shift registers are cleared first of any other characters before getting the "ACK".

IrDA Lite Plus and MX3

This configuration supports all features of the IrDA Lite Plus device driver. The driver provides conversion from serial and printer I/O to infrared transmission packets. Applications using extended BIOS interfaces to the serial and print devices can be utilized in these operations. The MX3 with the IrDA Lite Plus driver installed can transmit and receive data to and from other infrared capable devices.

For example, the MX3's flash⁴ memory can be updated by transferring files from an IrDA-compliant PC to the MX3. Until IrDA Lite Plus, SRAM cards (edited using a PC and inserted in the target MX3) were the most common means of updating the MX3's files and/or Flash.

Note: The IrDA Lite Plus file must be loaded on each MX3 and/or PC used in the file transfer. You will also need DOS utility files PRINT.EXE and the COPY (or XCOPY.EXE) command file.

Note: IrDA Lite Plus is compatible with a standard PC. When using a PC without an installed IR port, a commercially available serial to infrared adapter is required for file transfer to/from the MX3.

Quick Start

Note: See section titled "IRSEND and IRECV Files" for add-in Borland C/C++ programs. IRSEND.C, after compiling, can be loaded on the MX3 or PC that will send data using IRPLUS.EXE. IRECV.C, after compiling, can be loaded on the MX3 or PC that will receive data using IRPLUS.EXE.

In brief, the process (without IRSEND and IRECV) is as follows:

1. Load the IrDA Lite Plus file, IRPLUS.EXE, into the appropriate (e.g. \IRDA) subdirectory on the sending and receiving units (e.g. MX3 or PC).
2. Add the IRPLUS.EXE device command line to the CONFIG.SYS file in the MX3 and/or PC.

The CONFIG.SYS command line format is shown below. The '=', ' ' (space), '/', and ':' are required punctuation in the command line. The parameters are optional.

device=path\irplus.exe [/p:baud]

Default values used when command line parameters are not provided are: Port (p) = COM1 and Baud = 9600

COM 1 Example: device=c:\irda\irplus.exe /1:96

COM 2 Example: device=c:\irda\irplus.exe /2:96

3. If necessary, add the appropriate subdirectory name (e.g. \IRDA) to the PATH command in the AUTOEXEC.BAT file.
4. Reboot the MX3 and/or PC.

⁴ Upgrade or transfer files to MX3 Flash by sending files to Drive C.

5. During the MX3 bootup process, access the BIOS Setup. (For instruction please see Chapter 4, “System Configuration”.)

Verify that PM Enable is Enabled. Verify the CPU parameter is set to Aggressive (Aggressive waits one second before slowing the clock).

Note: IrDA Lite Plus sends frames at approximately 160 mSec.

If performance becomes an issue, set the CPU to Moderate. (System Menu | PM | CPU).

Change the parameter value if necessary. Select the SCU “Save/Reboot” exit option and continue the MX3 reboot operation.

A message similar to the following is displayed as the IrDA Lite Plus driver loads on the MX3 and/or PC:

```
IrDA Lite Plus Driver Version
X.XX using COM1 with maximum
speed at 9600 bps.
```

File Transfer Using IR Ports

Note: The MX3 and the external computer must be running the same communication software.

When using a PC that does not have an installed IR port, a commercially available serial to infrared adapter is required. Connect the adapter to the PC’s serial port before continuing.

1. If necessary, enable the IrDA protocol driver (IRPLUS.EXE) in the MX3 CONFIG.SYS file.
2. Begin running the communications software on the receiving unit. Set up the software to *receive* data.
3. Begin running the communications software on the sending unit. Set up the software to *send* data.
4. Face the infrared ports on the two devices toward each other, and place the units approximately 3 feet apart. Offset the optical centerline of the two devices 15 degrees. The IR operating envelope has a distance range of 2 cm (.79 inches) to 1 meter (3.2 feet) with a viewing angle of 30 degrees.
5. Press the appropriate keys on the units to transmit the file.

File Transfer Using RS-232 Ports

Note: The MX3 and the external computer must be running the same communication software.

The MX3's RS-232 endcap is COM1 or COM2. The RS-232 port on a PC may be COM1 or COM2.

1. If necessary, disable (REM out) the IrDA protocol driver (IRPLUS.EXE) in the MX3 CONFIG.SYS file.
2. Connect the appropriate serial cable to the MX3's RS-232 endcap port and the serial port on the external computer.
3. Begin running the communications software on the receiving unit. Set up the software to *receive* data.
4. Begin running the communications software on the sending unit. Set up the software to *send* data.
5. Press the appropriate keys on the MX3 to transmit the file to the external computer or press the appropriate keys on the computer to transmit the file to the MX3.

Send MX3 File to a Printer

Perform the steps in "Quick Start" on the MX3. This will power up the MX3, edit the CONFIG.SYS files, the AUTOEXEC.BAT files, load the IrDA Lite Plus file and establish the COM port / baud rate to use for printing.

Note: Load the DOS file PRINT.EXE into the DOS subdirectory of the MX3.

When the DOS prompt (e.g. C:\>) appears, you are ready to begin.

1. Load the file to be printed into a subdirectory on the MX3.
2. Face the infrared ports on the MX3 and the printer (e.g. O'Neill MicroFlash) toward each other, and place them approximately 3 feet apart. Offset the optical centerline of the two devices 15 degrees. The MX3's IR operating envelope has a distance range of 2 cm (.79 inches) to 1 meter (3.2 feet) with a viewing angle of 30 degrees.
3. Using the file name of the file to be printed (*prntfile*), type the following, at the DOS prompt, on the MX3:

```
copy prntfilePress [Enter]
```
4. Press [Enter] again to accept the default device (PRN).

The file is sent through the IR port of the MX3 and is printed at the printer.

IrDA Lite Plus and MX3 and Powered Cradles

The powered cradle (both Desk Top and Vehicle Mount) is an MX3 mobile computer accessory which provides physical storage, power, and infrared to wired communication for the MX3. The MX3 is fully operational when it is in the cradle. The cradle must be connected to an approved power source for the processes that are described in this section. The MX3 may also be connected to an external power source through its power jack while the cradle is connected to a power source as well.

Note: No software is required or present in the powered cradle.

With IrDALite Plus the MX3 passes infrared data in both directions. The MX3 has an infrared port that passes the data through to the RS-232 serial port on the cradle. The data is passed between the infrared port and the RS-232 port without any protocol interpretation.

Before files can be transferred using the powered cradle, the MX3 can be either 1) fully seated in the cradle or 2) held in the hand with its IR port facing the IR port on the cradle. The cradle must be connected to a power source. The cradle can be mounted on a table, wall or vehicle.

When the MX3 is seated in the cradle the IR port on the MX3 and the cradle line up.

You could use the powered cradle to send data between:

- an MX3 and a PC with a serial to infrared adapter.
- an MX3 and a PC with an RS-232 null modem cable connecting the PC with the cradle.
- an MX3 and an IrDA-compatible printer.

File Transfer Using IR Ports

Note: Both units must be running the same communication software.

Make sure peripherals and accessories are powered on: cradle, printer, PC, etc. Connect required cables: RS-232 null modem for PC or non-IrDA printer, commercially available serial to infrared adapter for PC.

Perform the steps in “Quick Start”. This will power up the sending and receiving units, edit the CONFIG.SYS file, the AUTOEXEC.BAT file, load the IrDA Lite Plus file and establish the COM port / baud rate to use for file transfer.

1. Place the MX3 in the cradle, seating the IrDA window firmly against the IrDA window in the cradle. The IrDA port is now the COM2 port.
2. Make sure the cradle has power.
3. Begin running the communications software on the receiving unit. Set up the software to *receive* data.
4. Begin running the communications software on the sending unit. Set up the software to *send* data.
5. Press the appropriate keys on the units to transmit the file.

During transmission, the Status LED will turn red. When transmission is complete the Status LED will turn green

Print Through Cradle

Make sure peripherals and accessories are powered on: cradle, printer, PC, etc. Connect required cables: RS-232 null modem for PC or non-IrDA printer, commercially available serial to infrared adapter for PC.

Perform the steps in “Quick Start”. This will power up the MX3, edit the CONFIG.SYS file, the AUTOEXEC.BAT file, load the IrDA Lite Plus file and establish the COM port / baud rate to use for file transfer.

Note: Load the DOS file *PRINT.EXE* into the DOS subdirectory of the MX3 in the cradle.

When the DOS prompt (e.g. C:\>) appears on the MX3, you are ready to begin.

1. Seat the MX3 firmly into the cradle. Make sure the cradle has power.
2. Make sure the file to be printed is on the MX3.
3. Using the file name of the file to be printed (*prntfile*), type the following, at the DOS prompt, on the MX3:

```
copy prntfile    Press [Enter]
```

4. Press [Enter] again to accept the default device (PRN).

During transmission, the cradle’s Status LED will turn red. When transmission is complete the Status LED will turn green.

IRSEND and IRECV Files

Compile IRSEND.C and IRECV.C files using Borland C/C++ Version 4.5 compiler. The “include” files listed are standard Borland C/C++ Version 4.5 library files.

Note: When using these files, the receiving MX3 or PC must have IRPLUS.EXE and IRECV files loaded. The sending MX3 or PC must have IRPLUS.EXE and IRSEND loaded.

IRSEND.C

```
#include <stdio.h>
#include <ctype.h>
#include <io.h>
#include <fcntl.h>
#include <sys\stat.h>
#include <conio.h>
#include <dos.h>
#include <bios.h>
#include <time.h>

#define BUF_SIZE 4096 // 60
char buf[BUF_SIZE];

void delay_ms(unsigned int tm)
{
    clock_t tmp, endTm;

    tmp = clock() + tm;
    while (1) {
        endTm = clock();
        if (endTm > tmp);
        break;
    }
}

unsigned stopExec() // return TRUE if "ESC" key or
"CONTROL D" key
{
    int key;

    /* Read and display keys until ESC or "CNTL D" is pressed.
    */
    while( kbhit() ) {
        /* If first key is 0, then get second extended. */
        key = getch();
        if( (key == 0) || (key == 0xe0) )
            key = getch();

        /* Echo character response to prompt. */
        if(( key == 0x1b) || ( key == 4)) // "ESC" key or
"Control D"
            return (1);
    }

    return (0);
}

void main (int argc, char *argv[])
{
    int status, count, fh, i, comPort = 0xffff;
```

```

unsigned long    bytesSend = 0;
unsigned char    *c;
clock_t         start, tmp;

    /* IS.EXE filename */

    fprintf(stderr, "\nIrPlus Version 1.00, write size %d
bytes.\n", BUF_SIZE);

    // check which COM port
    __asm {
        mov     ax, 0ffffH
        mov dx, 0ffffH
        int 14H
        cmp     ax, dx
        jz      COMM
        jmp     DONE
    COMM:
        mov     comPort, ax
    DONE:
    }
    if (comPort < 0) {
        fprintf(stderr, "IrPlus is not installed.\n");
        return;
    }
    if (argc <= 1) {
        fprintf(stderr, "enter a filename to send.\n");
        return;
    }
    #if 0
    /* comPort 0 for COM1 */
    if (((status = _bios_serialcom(_COM_STATUS, comPort, 0)) < 0) {
        fprintf(stderr, "IrPlus does not exit, status %x\n",
status);
        return;
    }
    #endif
    /* open file */
    if ((fh = open(argv[1], O_RDONLY|O_BINARY)) == -1) {
        fprintf(stderr, "cannot open the %s file.\n", argv[1]);
        return;
    }

    /* open connection */
    fprintf(stderr, "connecting...\n");
    __asm {
        mov     ax, 0fffeH
        mov dx, comPort
        int 14H
        mov status, ax
    }

    if (status < 0) { /* cannot open connection */
        close(fh);
        fprintf(stderr, "connection timeout\n");
        goto CLOSE_CONN; //return;
    }
    else
        fprintf(stderr, "sending file %s \n", argv[1]);

    //delay_ms(2000);
    start = clock();
    status = 0;
    while (status >= 0) {
        if (stopExec())
            break;
        putchar('|');
    }

```

```

        count = read(fh, buf, sizeof(buf));
        if (! count) {
            fprintf(stderr, "\nsend complete\n");
            break;
        }
        if (count == -1) {
            fprintf(stderr, "\nreading %s error\n", argv[1]);
            break;
        }
        /* send data */
        for (c = buf, i = 0; i < count; i++, bytesSend++) {
            //while (_bios_serialcom(_COM_STATUS, comPort,
0) < 0){;}
            /* send a char */
            if ((status = _bios_serialcom(_COM_SEND,
comPort, *c++)) < 0) {
                fprintf(stderr, "\nsend error %x\n",
status);
                break;
            }
            if (! (bytesSend & 0x00ff))
                putchar('.');
        }
    }

    start = clock() - start;
    fprintf(stderr, "\n%lu ms\n", start);

    fprintf(stderr, "send %lu bytes\n", bytesSend);
#ifdef 0
    // close 5 second later
    start = clock() + 5000;
    while (1) {
        tmp = clock();
        if (tmp > start)
            break;
    }
#endif
    close(fh);

CLOSE_CONN:
    /* close connection */
    __asm {
        mov ax, 0ffffH
        mov dx, comPort
        int 14H
        mov status, ax
    }

    if (status < 0) { /* cannot disconnection */
        fprintf(stderr, "disconnection failed, status %x\n",
status);
    }
}

```

IRECV.C

```

#include      <stdio.h>
#include      <ctype.h>
#include      <io.h>
#include      <fcntl.h>
#include      <sys\stat.h>
#include      <conio.h>
#include      <dos.h>
#include      <bios.h>

#define      BUF_SIZE      4096 // 60
char      buf[BUF_SIZE];

unsigned stopExec()          // return TRUE if "ESC" key or
"CONTROL D" key
{
int key;

/* Read and display keys until ESC or "CNTL D" is pressed.
*/
while( kbhit() ) {
/* If first key is 0, then get second extended. */
key = getch();
if( (key == 0) || (key == 0xe0) )
key = getch();

/* Echo character response to prompt. */
if(( key == 0x1b) || ( key == 4)) // "ESC" key or
"Control D"
return (1);
}

return (0);
}

void main (int argc, char *argv[])
{
unsigned char      *c;
unsigned long      bytesRecvd = 0;
int                status, comPort = 0xffff;
int                fh;
unsigned int       i, writen;

/* IR.EXE filename */

fprintf(stderr, "\nIrPlus Version 1.00, read buffer size %d bytes.\n", BUF_SIZE);

// check which COM port
__asm {
mov ax, 0ffffH
mov dx, 0ffffH
int 14H
cmp ax, dx
jz COMM
jmp DONE
COMM:
mov comPort, ax
DONE:
}

```

```

    if (comPort < 0) {
        fprintf(stderr, "IrPlus is not installed.\n");
        return;
    }
    if (argc <= 1) {
        fprintf(stderr, "enter a filename.\n");
        return;
    }
#ifdef 0
    /* comPort 0 for COM1 */
    if (((status = _bios_serialcom(_COM_STATUS, comPort, 0)) <
0)) {
        fprintf(stderr, "IrPlus does not exist, status %x\n",
status);
        return;
    }
#endif
    fh = -1;
    if (_dos_creat((const char *)argv[1], _A_NORMAL, &fh) != 0)
{
    fprintf(stderr, "cannot create a file %s\n",
argv[1]);
    return;
}
    if (fh < 0){
        fprintf(stderr, "cannot open a file %s\n", argv[1]);
        return;
    }

    /* open connection */
    fprintf(stderr, "connecting...\n");
    __asm {
        mov ax, 0fffeH
        mov dx, comPort
        int 14H
        mov status, ax
    }

    if (status < 0) { /* cannot open connection */
        close(fh);
        fprintf(stderr, "connection timeout\n");
        goto CLOSE_CONN; //return;
    }
    else
        fprintf(stderr, "write to file %s\n", argv[1]);

    /* read data */
    for (i = 0, c = buf; (1); bytesRecvd++) {
#ifdef 1
        if (stopExec())
            break;
#endif
        if (! (bytesRecvd & 0x00ff))
            putchar('.');
        status = _bios_serialcom(_COM_RECEIVE, comPort, 0);
        if (status < 0)
        {
            /* timeout */
            if (i) {
                putchar('|');
            }
        }
    }
}

```

```

        if (_dos_write(fh, buf, i,
&writen) != 0)
            fprintf(stderr, "\nwrite file error3\n");
        else {
            if (i != writen)
                fprintf(stderr, "\nwrite file
error4\n");
        }
    }
    break;
}

*c++ = (unsigned char)status;
if (++i >= sizeof(buf)) {
    putchar('|');
    if (_dos_write(fh, buf, i, &writen) != 0)
{
    fprintf(stderr, "\nwrite file error1\n");
    break;
}
    if (i != writen) {
        fprintf(stderr, "\nwrite file error2\n");
        break;
    }
    i = 0; c= buf;
}
}

_dos_close(fh);
fprintf(stderr, "\n%lu bytes received\n", bytesRecvd);

CLOSE_CONN:
/* close connection */
__asm {
    mov ax, 0ffffH
    mov dx, comPort
    int 14H
    mov status, ax
}

if (status < 0) { /* cannot disconnection */
    fprintf(stderr, "disconection failed, status %x\n",
status);
}
}

```

LXE BCWEDGE

This DOS based utility, BCWEDGE.EXE, is installed on a **batch** MX3 by LXE.

This Terminate and Stay Resident (TSR) program is used to redirect input from COM1 or COM2 to the BIOS key ring buffer. This DOS based utility enables the use of a barcode scanner on a COM port, provided power is available on that port. The software interprets data from the scanner as keyboard data, thus it will work with DOS applications such as EDIT. It will not function on Microsoft Windows 95 platforms.

When a terminal emulator program is started after the wedge utility has initialized, the keyboard interrupt used by the wedge utility is trapped and used by the terminal emulator. The keyboard interrupt needed by the wedge utility is no longer available.

Note: It is the responsibility of the application programmer to make the MX3 beep on errors, etc., when running the wedge utility.

Parameters

Command line:

```
BCWEDGE c=# b=baud s=dps [opt unitname]
```

Example:

```
BCWEDGE c=1 b=9600 s=8N1 2381
```

Sets BCWEDGE to use COM1, 9600 baud, 8 data bits, no parity, and 1 stop bit on an MX3 platform.

The command to unload the wedge TSR is **BCWEDGE -u**.

Default options for BCWEDGE are: COM1, 9600 baud, 8, N, 1. Options are not case sensitive.

Parameter	Explanation
-h	Displays BCWEDGE command line options.
-u	Uninstall the TSR
c=#	Communications port. Default: COM1 Options: 1, 2 <i>Note: The optional endcaps on an MX3 are COM1 and COM2. The MX3's IR Port is COM2.</i>
B=baud	Sets the baud rate. Default: 9600 Options: 9600, 19200

Parameter	Explanation
s=dps	data / parity /stop Data Default: 8 Options: 5, 6, 7, 8 Parity Default: N Options: N, O, E, M, S (None, Odd, Even, Mark, Space) Stop Default: 1 Options: 1, 2
unitname	Optional. Enables the scanner for the specifically designated computer. Default: 2381 Options: 1330, 2330, 2381

LXE Diagnostics

*Note: Make sure there is a fully charged battery in the MX3 **before** beginning a diagnostic process. When using an external power supply, make sure there is an uninterrupted power source for the MX3. When using the MX3 in a powered cradle make sure there is an uninterrupted power source for the cradle.*

The MX3 comes equipped with several utility programs. These programs can be run to make adjustments as indicated.

LXE does not recommend running these commands in a DOS window from any Microsoft Windows application.

Filename	Description
BBDIS81.EXE	Battery Discharge Utility Condition the 50 mAh NiCd Backup Battery mounted on the system board. The battery discharge starts and when discharged switches to backup battery charge mode.
BBTST81.EXE	Backup Battery Test Utility Indicates the current status of the backup battery and the voltage.
BEEP81.EXE	Beeper Utility Changes the volume of the beeper using the up and down arrow keys on the keypad/keyboard.
COMTST81.EXE	Communication Port Utility To diagnose the serial communication port, a simple loop back test routine is included in this file. The figure showing how to build a loop back plug is included in this chapter. The test results will read PASS or FAIL. A failure is identified and described.
DISP81.EXE	Display Utility Activates every pixel on the display to verify functionality.
KEY2381.EXE	Keyboard Utility This utility performs a contact functional test of each key on the keyboard. When activated, the key labels appear on the screen and then each key, when initialized, clears the key label from the screen.
LXEF.EXE	File Transfer Utility Transfer files to and from a PC through any of the MX3's COM ports, as well as act as the agent for the Win32 Developer Toolkit Application.
PARAM81.EXE	Parameter Dump Utility This utility collects the setup configurable parameters and lists them in a text file.

Filename	Description
SCU.EXE	Scanner Configuration Utility Allows programming multiple scanners with the same data.
SETAPI_4.EXE	Set An API Function Runs an API call to set a mode or change a parameter.
TSCAL.EXE	Touchscreen (Digitizer) Calibration Utility Calibrates the touchscreen to the display screen area.
TSTEST.EXE	Touchscreen (Digitizer) Test Utility Verifies touchscreen calibration when the data mode is set in compensated mode.

Backup Battery Test Utility (BBTST81.EXE)

This command is run at the DOS prompt. There are no parameters.

Run this command file to view the current status of the backup battery and the voltage.

If the backup battery needs to be replaced, the unit must be returned to LXE for service (see Chapter 1, “Introduction”, section titled “Getting Help”.)

Battery Discharge Utility (BBDIS81.EXE)

This command is run at the DOS prompt. There are no parameters.

Use this command file to condition the backup battery mounted on the system board. When the program is initiated, the battery discharge process begins, “Discharging” is displayed on the screen and the voltage changes are displayed. When discharge is complete (at approximately 4V), the battery charge process begins. The word “Charging” appears on the screen and the voltage changes are displayed.

If the backup battery needs to be replaced, the unit must be returned to LXE for service (see Chapter 1, “Introduction”, section titled “Getting Help”.)

Beeper Utility (BEEP81.EXE)

This command is run at the DOS prompt. There are no parameters.

Running this executable file will set the beeper to a single beep and turn the beeper on. The beeper or speaker volume can be changed at this time using the volume control keys – see next section “Volume Control Keys”. The volume is increased or decreased one step each time the volume key is pressed and the changed beep tone is emitted. The program is ended by pressing the <Esc> key.

Volume Control Keys

◀ To adjust the beeper volume, locate the <F8> key at the top of the keypad. Adjust the beeper volume by pressing the:

- 2nd key, then the <F8> key
- Use the Up Arrow and Down Arrow keys to adjust volume until the beeper volume is satisfactory.
- Press <Enter> to accept the change and exit the Volume change mode.

Communication Port Utility (COMTST81.EXE)

This command is run at the DOS prompt. There are no parameters. **The program requires LXE cable part number 155746-0001.**

This command file is used to test the TX, RX and handshaking lines of the unit's COM port. A loopback connector is needed to perform this test. The configuration of the connector for the RS-232 endcap follows.

Note: The optional endcap with an RS-232 serial port, when installed in the MX3, is COM1 or COM2. The MX3's IR Port is COM2.

RS-232 Endcap Connector

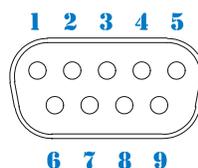


Figure 5-1 RS-232 Serial Connector (COM1 or COM2)

Pin	Signal	Description
1	DCD	Data Carrier Detect – Not Connected
2	RXD	Receive Data – Input
3	TXD	Transmit Data – Output
4	DTR	Data Terminal Ready – Not Connected
5	GND	Signal/Power Ground
6	DSR	Data Set Ready – Not Connected
7	RTS	Request to Send – Output
8	CTS	Clear to Send – Input
9	RI	Ring Indicator – Input (Default)
	or	or
	+5V DC	Bar Code Scanner Power -400mA max (Use BIOS Setup software to configure)

RS-232 Endcap COM Port Loopback Configuration



Figure 5-2 RS-232 Endcap COM Port Loopback Configuration

Display Utility (DISP81.EXE)

This command is run at the DOS prompt. There are no parameters.

Run this command file to test the screen display. It will draw a border around the display, wait for an <Enter> keypress, and then fill the inside of the box by turning on all the pixels. There are a total of 640 pixels across and 240 pixels down the display area – 0,0 is located at the upper left and 640,240 is located at the lower right.

File Transfer Utility (LXEF.EXE)

The LXEF.EXE utility gives you the ability to both transfer files to and from a PC through either the MX3's serial port or IR port, as well as act as the agent for the Mobile Enterprise SDK Application. If neither the transmit file (/t) or the receive file (/r) option is specified, LXEF runs in client mode, and will respond to both file transfer requests and remote information requests from the Mobile Enterprise SDK Application.

Syntax:

```
LXEF [ /option1 /option2 ... ] [ filename ]
```

Options:

- | | |
|---------------|--|
| /Com? [: #] | where either Com1 or Com2 is used to indicate which com port is to be used and optionally # can be set to represent the baud rate. E.g.: /Com2:9600 (default) tells the utility to use the serial transfer protocol through COM2 at 9600 baud. The serial protocol is also compatible with multiple MX3's running concurrently in powered cradles. |
| /Irda [: #] | where Irda indicates that the utility should use the IrDA protocol through the IrDA port. # represents the baud rate and by default (and with some of the cradles) is set to 9600 baud. |
| /h | displays the help message for the LXEF command. |
| /o | Existing files may be overwritten during file transfers. If this option is not used, file transfers will return an error if the specified file exists. |
| /r | receives the specified file and then LXEF exits. |
| /t | transmits the specified file and then LXEF exits. |
| /q | Indicates that the LXEF utility should restrict its display messages to a minimum. |

Filename is either the name of the file to send or receive if LXEF is being used to transfer files.

Keyboard Utility (KEY2381.EXE)

This command is run at the DOS prompt. There are no parameters.

Use this command file to display the keyboard key labels on the screen. As each key is pressed, its label is cleared from the screen.

Parameter Auto-Detect Utility (PARAM81.EXE)

The Parameter Auto-Detect Utility (PARAM81.EXE) is used to search for user-configurable parameter files and then write the data to a text file. The utility is a DOS stand-alone program -- it does not require that other files (except standard DOS operating system files) be present in the MX3 before it will run.

The utility captures data from the following files:

BIOS Setup	The MX3 setup parameters. See Chapter 4, "System Configuration".
AUTOEXEC.BAT	DOS command file. See Chapter 4, "System Configuration", for an example.
CONFIG.SYS	DOS command file. See Chapter 4, "System Configuration", for an example.
LXE.INI file	LXE terminal emulation parameter file.
NET.CFG file	Radio command file. See Chapter 4, "System Configuration", for an example.
SOCKET.CFG file	Radio command file. See Chapter 4, "System Configuration", for an example.

and places the data in an ASCII text file called PARAM.DAT.

The ASCII text file should then be printed out or copied to a PC or floppy disk and stored for safekeeping. The information in the text file may be used, as a reference, to reconstruct parameter values if the files become unreadable or to program several MX3's with the same values.

The Parameter Auto-Detect Utility filename is PARAM81.EXE and it creates a text file called PARAM.DAT. The PARAM.DAT file may be renamed and the next time PARAM81.EXE is run, a new PARAM.DAT file will be created. The combined file size is approximately 50K and both files may be deleted from the MX3 if more disk space is needed in the unit.

Run Parameter Auto-Detect Utility

The file must be run from the DOS command line.

Using DOS commands, change the DOS prompt to the drive letter and subdirectory of the DOS files (for example, C:>\DOS).

At the DOS prompt type the following command to run the utility:

`PARAM81` and press **Enter**.

The PARAM.DAT file is created and stored in the DOS subdirectory on the MX3.

Use DOS commands to copy the PARAM.DAT file to another media or print the file.

Scanner Configuration Utility (SCU.EXE)

This utility allows programming multiple scanners with the same data. It copies barcode setup parameters from one barcode scanner and places them in a file. The file can then be sent to another barcode scanner, and when the receiving unit reboots, the receiving unit's initial scanner configuration is replaced with the new configuration. This utility is used for MX3's with a scanner/serial port and scanner/scanner endcap.

This command is run at the DOS prompt.

The file can be sent to another MX3 using the MX3's IR ports. The file can be transferred from one MX3 to another on an SRAM card. Or, the file can be transferred to a PC with a data transfer communication program installed and a commercially available null modem cable attached to a serial port. The cable must have a connector compatible with the MX3's RS-232 endcap DB9 male connector and the calling PC.

The MX3 is set up with data transfer communication parameters of 9600 baud, 8 data bits, 1 stop bit, and No parity when the SCU.EXE utility runs on the MX3.

Menu Options

1. Parameter Request

Select this option to collect barcode configuration data from a barcode scanner.

The data is stored in a file on the calling PC. Give the file an 8-character name, using standard DOS naming conventions, e.g. *yourfile*. No extension is necessary. Press <Enter>.

The scanner configuration file is given an extension of .SCN. The file can be copied to another directory or PC or renamed after its creation.

2. Parameter Send

Select this option to send barcode configuration data to a barcode scanner.

When "Open File" appears on the screen, type the name of e.g. *yourfile* and press <Enter>. The receiving MX3 reboots when the scanner configuration file has finished transferring.

3. Exit

Select this option to exit the scanner configuration utility.

Set An API Function (SETAPI_4.EXE)

This command is run at the DOS prompt. Run this command at the DOS prompt to set a mode or change a parameter.

All arguments are in HEX format. Put an X in the place of arguments that are not used.

Format for INT 10:

```
SETAPI_4 arg1 arg2 arg3 arg4 arg5 arg6
```

where

- *arg1* is always 10
- *arg2* - (AH) = 12
- *arg3* - (BL) = BA (Panning) or BC (DOS Font)
- *arg4* - (AL) = Function Requested
- *arg5* - (BH) = Value Requested
- *arg6* - (CX) = Value Requested

Format for INT 15:

```
SETAPI_4 arg1 arg2 arg3 arg4 arg5 arg6 arg7
```

where

- *arg1* is always 15
- *arg2* - (AH) = BA
- *arg3* - (AL) = Service Group
- *arg4* - (BH) = Function Number
- *arg5* - (BL) = Action
- *arg6* - (CX) = 16 Bit Register Value (where appropriate)
- *arg7* - (DX) = 16 Bit Register Value (where appropriate)

INT 15 Example:

```
Sound Beeper  SETAPI_4 15 BA 53 4 30 07D0 000A
```



Please refer to the “LXE DOS API Programming Guide” for complete information about the MX3 Application Programming Interfaces.

Example – Enable COM2 for Tethered Scanner

The process used to enable the MX3 COM2 port for use with a tethered scanner has three steps:

1. BIOS Setup

- Select Advanced Menu / Select Other / Select COM2 Pin9:
- Change the parameter value to 5V.
- Select Exit Menu / Save and Exit

2. Terminal Emulation Configuration Utility (if used) e.g. ANSI Plus TE:

- Select System Menu / RFFileModeCfg
- Change the parameter value to Comm1 Out, Comm2 In
- Select Exit with Save Option.

3. DOS

- Add the following line to the AUTOEXEC.BAT file on the line above any existing SETAPI_4 commands:

```
SETAPI_4 15 ba 56 31 01 x x
```

Note: If COM1 port is an integrated scanner, the integrated scanner is disabled by this procedure.

Touchscreen Calibration (TSCAL.EXE)

Note: If you run TSCAL.EXE on an MX3 that does not have the optional touch screen installed, the MX3 must be powered off then on again.

Note: It is very important that the stylus touch be as accurate as possible to ensure proper calibration.

The transparent touch panel overlays the LCD display. Calibration ensures that the stylus touch is translated as accurately as possible. For proper positioning of touch points, the touch screen must be calibrated to the viewing area. The 0,0 coordinates reside in the lower left-hand corner of the touch panel. As each stylus touch is processed, its X,Y coordinates are sent to the PS/2 controller on the system board as raw data coordinates. Any application of calibration offsets or averaging must be performed by the software driver or application software.

This command is run at the DOS prompt. There are no parameters.

The first calibration point is at the lower left hand corner and it appears on the display as a crosshair icon (+). Press the stylus down on the center of the crosshair and hold for three seconds. The second calibration point is located at the top right hand corner – press the stylus down on the center of the second crosshair and hold for three seconds.

When the calibration process is finished, “Process Complete” is displayed on the screen.

See also section titled “Touchscreen Test”.

Touchscreen Test (TSTEST.EXE)

The TSTEST.EXE program is run at the DOS prompt. There are no parameters.

Menu:

1. 8Bit, Raw
2. 8Bit, Comp
3. 12Bit, Raw
4. 12Bit, Comp
5. POLL MODE
6. INT MODE
7. Exit

Enter:

Process - Get Raw Data:

1. Select 5 for Polled Mode. “Polled” is displayed for a few seconds and is then erased.
2. Select 1 or 3 (as desired) and the test criteria are displayed on the screen. For example, upon selecting (1), “8-Bit”, “Raw” and “Polled” are displayed on the screen for a few seconds.
3. The next screen displays three crosshairs equidistant between two arrows diagonally from bottom left to upper right – x,y coordinates are also displayed.
4. With a stylus, press on the tip of the arrows and in the center of the crosshairs one at a time, starting from the bottom left arrow.
5. The x,y coordinates increase in value when moving from the bottom left corner arrow tip to the top right corner arrow tip.

6. Press <E> key to return to the menu.

Process - Get Compensated Data:

1. Select 5 for Polled Mode. "Polled" is displayed for a few seconds and is then erased.
2. Select 2 or 4 (as desired) and the test criteria are displayed on the screen. For example, upon selecting (2), "8-Bit", "Compensated" and "Polled" are displayed on the screen for a few seconds.
3. The next screen displays two arrows and three crosshairs diagonally from left to right – x,y coordinates of either 0,0 or 640,240 are also displayed.
4. With a stylus, press on the tip of the arrows and in the center of the crosshairs one at a time, starting from the bottom left arrow.
5. The x,y coordinates should be within these ranges:

Arrow Location	x	y
Left bottom arrow tip	-5 to 5	-5 to 5
Left lower crosshair center	154 to 164	54 to 64
Middle crosshair center	314 to 324	114 to 124
Upper right crosshair center	474 to 484	174 to 184
Upper right arrow tip	634 to 644	234 to 244

6. Press <E> key to return to the menu.

The NED ASCII Text Editor

NED uses the standard Microsoft Windows interface for cut, copy, and paste operations. Del and Shift+Del both move the selected block to the clipboard. There is no true undo command, but Ctrl+V or Shift+Ins may be used to paste the clipboard contents to the current cursor position. Table 1 lists all the default shortcut keys.

The NED editor is a menu-based text editor available for use with ROM-DOS. This editor is similar to other desktop editors but has special functions designed for use in editing C-source and assembly code.

To start the editor, enter

```
NED [filename] [filename]
```

NED may be initiated with or without filename arguments. Wildcard file specifications are allowed.

Up to ten files can be entered on the command line. If NED is run without arguments, it loads all files accessed during the last editing session, returning you to the exact position in the file. You can switch between the open files.

You can also enter

```
NED @errfile
```

where *errfile* is the name of your compiler error output file. NED loads all files that had errors and allows you to move between errors.

Once NED is running, you may load files into memory by using the File/Open menu command. File/Reload replaces the current file with a new file or reloads a new copy of the same file. File/Reload confirms before replacing an unsaved file.

- If a search string is all lowercase, NED treats it as a case-insensitive search. If a search string contains any uppercase letters, it is case sensitive. The replacement string is inserted exactly as entered. Repeating a Search command repeats the last Forward or Backward Search operation, not the last Replace operation.
- There is one bookmark for all files. Once the bookmark is set, going to the bookmark returns you to the file and position where you set it.
- The Indent and Remove-indent (referred to as Undent in the Options/Do Command) commands work on tabs. Indent inserts a tab at the beginning of the current line, or if a block is active, at the beginning of each line in the block. Remove-indent removes the first tab from the current line or from each line in the block. If there are no tabs, Remove-indent has no effect.
- Toggle case inverts the case of the current character if no block is active. If a block is active, Toggle case sets the entire block to uppercase if the first character was lower and to lowercase if the first character was uppercase.
- Tabs are currently set to 3 for .C, .H, .CPP, .HPP, and .T files. They are set to 8 for all other files.
- File/Print prints the current block if there is one, otherwise it prints the current file. NED prompts for a device to print to, which may be a filename. Tabs are expanded to spaces.
- The Options/Do Command is intended primarily for debugging. This command allows you to execute any editor command by choosing it from a menu list.

- The macro commands (Record Macro/Play Macro) allow you to define a sequence of keystrokes that can be repeated repetitively. Select Record Macro (ALT=), enter the keystrokes, then press ALT= again. The macro sequence can be played by selecting Play Macro or by pressing ALT-. Keyboard bindings are saved in NED.CFG in the same directory as NED.EXE. NED.CFG also contains the list of active files and positions.
- If you record and play a recursive macro, it plays continuously.
- If you press an invalid key on a menu, NED operates as if you pressed enter.
- If you run out of memory, such as when you have more than 300KB of files open, NED returns to DOS.

NED Default Hot Keys

Many of the editor commands can be accessed directly by pressing key combinations. For example, press Alt-X to exit the editor and save any open files. The following table lists the default hot keys.

Key	Function	Key	Function
Alt-Q	Quit without saving	F1	Help
Alt-X	Exit, saving as needed	F7	Load file into current buffer
Ctrl-A	Search again	F9	Save file
Ctrl-B	Search backward	F10	Exit asking for save as needed
Ctrl-C	Copy the block to clipboard	Left-Arrow	Left one character
Ctrl-D	Find the mark	Right-Arrow	Right one character
Ctrl-E	Erase to end-of-line	Up arrow	Up one line
Ctrl-F	Search forward	Down arrow	Down one line
Ctrl-G	Go to a line number	Home	Beginning of line
Ctrl-I	Indent the block	End	End of line
Ctrl-K	Toggle block mode	Page Up	Up one screen
Ctrl-L	Delete line to the clipboard	Page Down	Down one screen
Ctrl-M	Set the mark	Center (5)	Center the cursor onscreen
Ctrl-N	Read a file into a new buffer	Ctrl-Left-Arrow	Left one word
Ctrl-P	Move to the previous position	Ctrl-Right-Arrow	Right one word
Ctrl-Q	Quote the next character	Ctrl-Up-Arrow	Up one C function
Ctrl-R	Replace text	Ctrl-Down-Arrow	Down one C function
Ctrl-S	Switch to the next buffer	Ctrl-Home	Scroll toward beginning of file
Ctrl-T	Toggle the case of character(s)	Ctrl-End	Scroll toward end of file
Ctrl-U	Remove indent from the block	Ctrl-Page	Up Beginning of file
Ctrl-V	Insert the clipboard	Ctrl-Page	Down End of file
Ctrl-W	Delete word to the clipboard Ins	Toggle	Insert/Overwrite mode
Ctrl-X	Delete block to the clipboard	Del	Delete character
Ctrl-Z	Cancel the selected block	Backspace	Delete character backward
Alt =	Start/end recording macro	Ctrl-Ins	Copy block to clipboard.
Alt -	Playback macro	Ctrl-BackSpace	Delete word backward
Alt-F7	Previous error	Shift-Ins	Insert the clipboard
Alt-F8	Next error	Shift-Del	Delete block to clipboard

Serial File Transfer Utility

A null modem cable must be used to connect the two computers. Both computers must have both REMSERV and REMDISK set to the same settings. REMSERV is run on the host (which is usually the mobile computer). REMDISK is run on the client (which is usually a desktop or laptop PC).

Using this utility you can move files from one computer to the other over the serial line using the DOS Copy or Xcopy commands.

REMSERV

REMSERV.EXE d: [/T] [/H] [/Bxxxx] [+|-] [/COMn] [/IRQn]

/Bxxxx	Set the baud rate. Choose from 300, 1200, 2400, 19200, 38400, 57600, 115. A '+' after the BAUD specifies 'packet' style transfers. By default, packet transfers will be used for all baud rates higher than 9600. Use '-' after the BAUD to force polling operation under Microsoft Windows 95. Both sides must agree on using either '+' or '-'.
/COMn	Set the communications port. Choose 1, 2, 3 or 4.
/IRQn	Set the IRQ for the communications port. choose 3-15.
/S	Silent (no output)
/Tnnn	Set the timeout in seconds. Choose 2-3640, 15 seconds is not unusual for FLASH drives.
/H	Use Hardware Handshaking for flow control.

Example:

```
REMSERV D: /B38400- /COM2 /T10
```

Default:

```
/B115+ /COM1 /T2
```

REMDISK

REMDISK [/?] [/U] [/T] [/H] [/Bxxxx] [+|-] [/COMn] [/IRQn]

/Bxxxx	Set the baud rate. Choose from 300, 1200, 2400, 19200, 38400, 57600, 115. A '+' after the BAUD specifies 'packet' style transfers. By default, packet transfers will be used for all baud rates higher than 9600. Use '-' after the BAUD if REMSERV is running under Microsoft Windows 95. Both sides must agree on using either '+' or '-'.
/COMn	Set the communications port. Choose 1, 2, 3 or 4.
/IRQn	Set the IRQ for the communications port. Choose 3-15.
/Tnm	Set the timeout in seconds. Choose 3-3640, 15 seconds is not unusual for FLASH drives.
/H	Use Hardware Handshaking for flow control.
/U	Unload REMDISK from memory

Examples:

```
(in CONFIG.SYS)    DEVICE=REMDISK.EXE /T15
(in AUTOEXEC.BAT)  REMDISK /B9600 /COM2 /T10
```

Default:

```
/B115K+ /COM1 /T3
```


Chapter 6 RF Network Configuration

Introduction

Note: The information and programs in this section only pertain to LXE's 2.4GHz system radios. They do not work with LXE's 900MHz system radios.

Change the radio parameters by editing the NET.CFG file in the PCTCP directory. This can be done with any ASCII text editor or NED. The NET.CFG file is the configuration file used by the radio card's ODI driver. The NET.CFG file determines the wireless network name, the workstation name and other information regarding the wireless system.

2.4GHz radio parameters cannot be changed using LXE's terminal emulation (TE) configuration utilities.

The Sockets software package provides an interface to all of the TCP/IP parameters. Parameter configuration is performed by editing the file SOCKET.CFG.

SNMP DOS Agent

The SNMP DOS agent executable resides in the \AGENT directory. For information on enabling the SNMP Agent, please refer to the "DOS Autoconfigurator Instructions". For details on Agent operation, please refer to the "SNMP Agent Reference Guide". Both manuals are available in electronic format on the LXE Manuals CD.

The agent is placed into memory as a TSR and uses approximately <70k of memory. When the agent is not being polled, it is invisible to the user. When it is being polled, there is a slight delay, depending on how much data is being retrieved by the agent.

NET.CFG Parameters

Lucent Parameters

The following is a list of parameters that can be modified in the NET.CFG file for computers with Lucent 2.4GHz radios. For additional information about the parameters in this file, see the WVLAN43.CFG file located in the PCTCP directory. To set the TCP/IP parameters, see the *SOCKET.CFG* file documentation.

Link Support

Parameter used to define resources for the LSL.COM file. Any modifications may cause resource conflicts.

Protocol

Instructs TCP/IP stack to bind to radio driver.

WaveLAN_Network_Name

Identifies the WaveLAN network the station will connect to.

Valid: 0 to 32 string of printable uppercase
 characters.
Default: ANY

Note: Setting this value to ANY will enable the station to connect to any IEEE 802.11 network.

Note: The string for WaveLAN_Network_Name is case-sensitive. The WaveLAN DOS ODI driver requires the use of only UPPERCASE characters. If you have configured the Access Points with lower-case names you will need to change your Access Point WaveLAN_Network_Name parameter to UPPERCASE characters for proper operation.

Or, place double quotes around the WaveLAN_Network_Name to allow proper operation with upper and lower case letters e.g. "NameofUnit".

Station_Name

Identifies the stations on the network. This parameter is used when performing diagnostic tests.

Valid: 0 to 32 string of printable characters.
Default: station_name

AP_Distance

Controls the roaming sensitivity of your computer. This parameter must be set according to the settings of the WavePOINT-II access points.

Valid: 1=Low
 2=Medium
 3=High
Default: 1

Microwave_Robustness

This option should only be used when troubleshooting slow performance of the network that could be related to in-band interference from microwave ovens.

Use this option when experiencing recurrent “bursts” of in-band interference exhibited by specific units where the unit (or the access point) is close to a microwave oven or a microwave oven is located in the signal path between the unit and the access point. The radio will try to retransmit the “lost messages”. When retransmission fails again, the radio in Auto Transmit Rate Select Mechanism mode will attempt to retransmit the message again at a lower data speed. (See Transmit_Rate)

Selecting “Y” will enable fragmentation of data frames when the automatic transmit rate selection switches to a lower transmit rate. Fragmentation will avoid increased vulnerability due to longer frame lengths of transmissions at lower data speeds.

```
Valid:      Y=Yes, N=No
Default:    N
```

Transmit_Rate

Controls the data rate the WaveLAN card will use. Supported rates depend on the card. If the card does not support the selected rate, the default value of 3 is selected automatically.

```
Valid:      1=Fixed Low
            2=Fixed Standard
            3=Auto Rate Select (High)
            4=Fixed Medium
            5=Fixed High
            6=Auto Rate Select (Standard)
            7=Auto Rate Select (Medium)
Default:    3
```

Medium_Reservation

Enables RTS/CTS communications. Sets the frame length threshold that determines when the station should start using RTS/CTS.

```
Valid:      0-2347
Default:    2347
```

Note: The use of Medium Reservation is recommended in network environments where the density of the WaveLAN stations and WavePOINT-II access points is very low, and where there is poor network performance due to excessive frame collisions at the WavePOINT-II access points.

Card_Power_Management

Configures the power management used by the station in an ESS. The recommended mode is Enhanced Power Management (EPM) for hand held computers. In this mode, the station switches between Power Save Mode (PSM) and Continuous Active Mode (CAM), based on activity. Any frame transfer switches the station to CAM. Inactivity for 100ms switches the station to PSM. For vehicle mount computers, the default is CAM.

```
Valid:      0=CAM (No power management)
            1=EPM
            2=PSM (Maximum power savings)
Default:    1
```

Maximum_Sleep_Duration

Configures the maximum amount of time the radio will stay in Sleep mode.

Valid: 1-65535
 Default: 100 (10 seconds)

Receive_All_Multicasts

Configures whether this station will receive Multicast packets.

Valid: Y=Yes or N=No
 Default: N

Enable_Encryption

Configures whether this station will receive/send encrypted data traffic. When “Y” is chosen, the unit will be able to receive both non-encrypted data and messages encrypted with one of the listed WEP encryption key values (see Transmit_Key_ID).

If encryption is enabled (Y) while the card does not support WEP, an error is reported.

Valid: Y=Yes or N=No
 Default: N

Transmit_Key_ID

If you enable WEP encryption, you can select one key for wireless data transmissions from the list of WEP Encryption Key Values.

Key1 abcde
 Key2 0x123456789a
 Key3 abcdefghijkl2
 Key4 0x112233445566778899AABBCCDD

Valid: 1-4
 Default: 1
 Format: Transmit_Key_ID 1

Proxim Parameters

The following is a list of parameters that can be modified in the NET.CFG file. To set the TCP/IP parameters see the *SOCKET.CFG* file documentation.

Link Support

Parameter used to define resources for the LSL.COM file. Any modifications may cause resource conflicts.

Protocol

Instructs TCP/IP stack to bind to radio driver.

Int

Sets the interrupt (IRQ) line to be used. MX3 specific setting is int 5.

Default: 5

Port

Sets the I/O port address. Use 270 for the MX3.

Default: 0x270

Mem#1 (ODI)

Memory_address sets the resource memory location (0xC000 to 0xE800). Upper memory blocks from 0xA000 to 0xCFFF are used by MX3 system software.

Default: ce00

Domain

Sets the network domain. It can be any number from 0 through 15 and must match the domain of the server or access point to which you want to connect.

Valid: 0 through 15
Default: 0

Station_type

Sets the status of the PC card as a master (2), alternate master (1), or nonmaster (0) station.

Valid: 0, 1, 2
Default: 0

Socket

Sets the PCMCIA socket (A, B, C, or D) that has the PC card installed.

Valid: A, B, C D
Default: A

Initialize_365

Determines whether to initialize the Intel 82365SL PCMCIA controller chip.

Valid: Y, N
Default: Y

Inactivity_min

Sets the number of minutes of inactivity before the PC card goes to sleep. To minimize draw on the vehicle battery, set this to 0.

Valid: 0 through 20 minutes
Default: 0

Inactivity_sec

Sets the number of seconds of inactivity before the PC card goes to sleep. Valid settings are 0 through 55 (values above 5 are rounded to the nearest multiple of 5). To minimize draw on the vehicle battery, set this as low as possible, preferably to 1.

Valid: 0 through 55 seconds
Default: 1

Channel

Sets the channel to be used when the PC card is acting as the master.

Valid: 1 through 15
Default: 1

Subchannel

Sets the subchannel to be used when the PC card is acting as the master.

Valid: 1 through 15
Default: 1

Mac_optimize

Optimizes the PC card for the number of concurrent modes.

Valid: 0 (light) or 1 (normal)
Default: 1

Roam_config

Sets the roaming speed.

Valid: 0 (slow), 1 (normal) or 2 (fast)
Default: 1

Peer_to_peer

Sets the ability of the PC card to talk to other peers.

Valid: N (off) or Y (on)
Default: N

Cisco Parameters

The following is a list of parameters that can be modified in the NET.CFG file. To set the TCP/IP parameters see the *SOCKET.CFG* file documentation. Unless otherwise noted, the following parameters apply to both Cisco 340 series and 350 series radios.

Link Support

Parameter used to define resources for the LSL.COM file. Any modifications may cause resource conflicts.

Protocol

Instructs TCP/IP stack to bind to radio driver.

LEAP

Used to set LEAP (Light Extensible Authentication Protocol) authentication on LXE computers equipped with Cisco 350 series radios.

```
Valid:      OFF or ON
Default:    OFF
```

Note: This parameter is valid for Cisco 350 series radios only.

WorldMode

Allows the radio to adopt the maximum transmit power level and frequency range of the access point to which it is associated (available only in infrastructure mode).

```
Valid:      OFF or ON
Default:    OFF
```

Note: This parameter is valid for Cisco 350 series radios only.

ShortPreamble

This parameter allows the radio to use short radio headers (or preambles). Short radio headers improve throughput performance. Long radio headers ensure compatibility if a client or access point does not support short radio headers.

```
Valid:      0=auto
             1=long
             2=short
Default:    0
```

Note: This parameter is valid for Cisco 350 series radios only.

AWCLEAP

AWCLEAP is a DOS utility used to set LEAP (Light Extensible Authentication Protocol) authentication for Cisco 350 radios. The SETLEAP.BAT file runs the AWCLEAP utility. To set LEAP, type *setleap <username> <password>* at the c:\pctcp prompt.

The CLEAR.BAT file is used to clear the LEAP username and password. To clear LEAP, type *clear* at the c:\pctcp prompt.

SSID

Identifies the 802.11B wireless network the station will connect to.

Default: ""

Note: Setting this value to "" will enable the station to connect to any IEEE 802.11b network.

FragThreshold

Packet size to start fragmenting.

Default: FragThreshold 2312

RTSThreshold

Packet size to start sending RTS/CTS.

Default: RTSThreshold 2312

DataRateX

To set a data rate other than 11 MB default uncomment rate desired and all data rates less than that rate. Example to set for 5.5MB data rate uncomment the DataRate1, DataRate2 and DataRate3.

1 Mbps supported data bit rate
DataRate1 0x02
2 Mbps supported data bit rate
DataRate2 0x04
5.5 Mbps supported data bit rate
DataRate3 0x0B
11 Mbps supported data bit rate
DataRate4 0x16

RefreshInterval

Inactivity time to check association with AP

RefreshInterval 10000

PowerSaveMode

PowerSaveMode "FASTPSP"

Fast Power Save Mode

MaxPowerSave

Maximum power save mode

MaxPowerSave "ON"

NodeName

Descriptive station name

NodeName " "

WEP enable

To enable WEP uncomment the following line and set the key with the wepdos.exe utility

```
authtype "wepopen"
```

Set WEP key in radio before wepopen using the WEPDOS program in the PCTCP directory.

Diversity

The diversity parameter must be set according to the number of antennas for each computer. To determine left and right, hold the Cisco radio with the label side up and look directly at the antenna ports.

MX3 computers = 2 antenna

```
Diversity "on" - for 2 antennas
Diversity "left" - for 1 antenna left port
Diversity "right" - for 1 antenna right port
```

PortBase – IRQ – Memory - Socket

The adapter needs 32 16-bit I/O ports, and 1 non-sharable IRQ. Any commented lines are set by PCMCIA card & socket services and should not be changed or uncommented.

```
;PortBase 140
;IRQ 5
Memory C9000
;Socket 1
```

BusType

PCMCIA interface is used on all LXE DOS computers.

```
BusType "PCMCIA"
```

Frame

Frame type of wired and wireless network.

```
(Default) Frame ETHERNET_II
Frame ETHERNET_802.3
Frame ETHERNET_802.2
```

LongRetryLimit

Specifies the number of times an unfragmented packet is retried before it is dropped and a transmit error is reported to the driver.

```
Valid: 0 - 255
Default: 6
```

WEPDOS

WEPDOS utility is used to program the WEP key into the Cisco 340 radios. Once the key value and key number to be used is set the `authtype` parameter in `NET.CFG` file must be modified. To set the key type `wepdos` at the `c:\pctcp` prompt.

Syntax

```
WEPDOS [-ascii|-hex] [-key#|-home] key ;set a key
WEPDOS [-key#|-home] -clear ;clear a key
WEPDOS [-tx#] ;select transmit key index
WEPDOS [-d] ;display settings
```

Where

- `key` is a 5 character ascii string
- `key` is a 10 character hex-digit number
- WEP128 allows 5 or 13 character ascii, and 10 or 26 hex-digit keys
- `-key#` is default key index 1, 2, 3 or 4
- `-home` selects the home key for use with home access points
- `-tx#` selects the transmit key index 1, 2, 3 or 4 (enterprise networking)

Standard Options

```
-p[iobase] io base address (hex) [380]
-b[membase] memory base address (hex) [D000]
-i[irq] interrupt request (decimal) [10]
-s[slot] slot number (decimal) [0]
-365 82365 startup of card
Default: no startup, IO:380, MEM:D000:0, IRQ:10, SLOT:0
```

Examples

To check wep key on a LXE computer the correct syntax type at `c:\` prompt

```
Wepdos -365 -p340 - bcc00 -d
```

To set key for use type

```
Wepdos -365 -hex -key# <10 or 26 byte key> -tx# -d
```

WEPDOS supports up to 4 keys. As an example of setting key number 3 to `0f0f0f0f0f` for use in transmitting type:

```
Wepdos -365 -p340 -bcc00 -s1 -hex -key3 1234567890 -tx3 -d
```

Symbol Parameters

The following is a list of parameters that can be modified in the NET.CFG file. To set the TCP/IP parameters see the *SOCKET.CFG* file documentation. Unless otherwise noted, the following parameters apply to both Symbol FHSS (2Mb) and Symbol 4121 (11Mb) series radios,

Link Support

Parameter used to define resources for the LSL.COM file. Any modifications may cause resource conflicts.

Protocol

Instructs TCP/IP stack to bind to radio driver.

ESS_ID

Identifies the 802.11B wireless network the station will connect to. The ESS_ID is a string of 1 to 31 case sensitive characters. Spaces may be included by using quotes.

Default: "LXE"

cardservices

To use card and socket services, you must load slainit before slaodi. iodaddress, memory, interrupt and socket lines must be commented with ;.

Default: yes

Note: This parameter is valid for Symbol FHSS radios only.

socketservices

To use card and socket services, you must load slainit before slaodi. iodaddress, memory, interrupt and socket lines must be commented with ;.

Default: yes

Note: This parameter is valid for Symbol FHSS radios only.

mode

IO mode required if using card and socket services.

Default: IO

iodaddress

Sets the I/O address location.

Default: 300

memory

Sets the resource memory location.

Default: CC00

interrupt

Sets the interrupt (IRQ) line to be used.

Default: 5

powermgmt

Configures whether the Symbol FHSS radio card will perform power management.

Valid: Y=Yes or N=No

Default: N

Note: This parameter is valid for Symbol FHSS radios only.

performance_index

Configures whether the Symbol 4121 series radio will perform power management.

Valid: 0=CAM Constant Awake Mode
1=Power Management On

Default: 1

Note: This parameter is valid for Symbol 4121 series radios only.

Auth_type

This parameter is used to enable and manage the 802.11 WEP encryption. The radio card will only associate with APs that support the same Auth_type.

Valid: "Open_System" or "Shared_Key"

Default: "Open_System"

Note: This parameter is valid for Symbol 4121 series radios only.

Encrypt-Key#

Updates the first, second, third or fourth encryption key, according to the value of #.

For Symbol 4121 series radio cards, use 5 pairs of hex digits for 40 bit encryption. Use 13 pairs of hex digits for 128 bit encryption.

encrypt_enable

Enables encryption on Symbol 4121 series radios.

Valid: yes or no

Default: yes

Note: This parameter is valid for Symbol 4121 series radios only.

Note: This parameter was removed from the Symbol NET.CFG file by LXE effective 11/ 2003.

Encrypt_Key_ID

The key ID indicates which key the adapter is to use for encrypting packets.

Valid: 1 to 4
Default: 1

Note: This parameter is valid for Symbol FHSS radios only.

Encrypt_Enable_Index

Previously named *encrypt_key_index*. This parameter indicates which key the adapter is to use for encrypting packets for transmission. Zero means No Encryption (i.e. turn encryption off), and numbers 1 through 4 mean turn encryption on and use the specified key (i.e. key #1, key #2, key #3 or key #4). The key to be used to decrypt packets being received is contained in the received packet.

Valid: 0, 1, 2, 3, 4
Default: 0 (No Encryption)

Note: This parameter is valid for Symbol 4121 series radios only.

diversity

Set diversity to “both” for two antennas and “A” for one antenna.

Default: both

Note: This parameter is valid for Symbol 4121 series radios only.

Tx_rate

Use this parameter to specify that rates at which the radio is allowed to operate. If no rates are specified, the radio will use all available rates.

Valid: 1 1 Mbps
2 2 Mbps
5 5.5 Mbps (Symbol 4121 series only)
11 11 Mbps (Symbol 4121 series only)

SOCKETS TCP/IP Stack

Introduction

SOCKET.CFG sets the options for SOCKETP.EXE. The section XXX.XXX.XXX.XXX is for this machines IP. The net mask is specified as part of the ip address. In the ip address command an optional /net_bits can be used to indicate the number of bits in the network ID.

Net Bits	Net Mask	Class	IP address range
8	255.0.0.0	A	0.x.x.x to 127.x.x.x
16	255.255.0.0	B	128.x.x.x to 191.x.x.x
24	255.255.255.0	C	192.x.x.x or higher

The network can be subdivided by two for every net bit added.

Net Bits	Net Mask	Net Bits	Net Mask
1	128	5	248
2	192	6	252
3	224	7	254
4	240	8	255

Bootp

BOOTP is a UDP/IP based protocol that provides a means to assign an IP address to a booting host dynamically and without user supervision. BOOTP can also supply the net mask, host name, and address of a domain name server. One obvious advantage of this procedure is the centralized management of network addresses, which eliminates the need for per-host unique configuration files. Sockets implements the BOOTP client whenever it is started with no (or the 0.0.0.0) IP address supplied.

DHCP

DHCP is a UDP/IP based protocol that provides a means to assign the IP address dynamically to a booting host and without user supervision. It can also supply the net mask, host name, address of a domain name server, and other parameters. An advantage of this procedure is the centralized management of network addresses, which eliminates the need for per-host unique configuration files. Sockets implements the DHCP client whenever it is started with the 0.0.0.1 IP address supplied. All LAN interfaces specified when this IP address is in use will attempt to use DHCP to resolve the IP address, the subnet mask, hostname, default router and DNS server(s).

Setting SOCKETS.CFG Parameters

Set IP Address

To enable DHCP set the IP address to 0.0.0.1

```
IP address XXX.XXX.XXX.XXX/16
```

where

XXX.XXX.XXX.XXX is the IP address

16 indicates the number of bits in the network ID

Set ARP INIT

Controls whether a DHCP ARP is sent when booting up.

```
ARP INIT GRAT
```

Using this option makes the stack behave the same as before. The stack does not send a DHCP ARP when booting up (In this mode, the ARP contains the MAC and IP addresses in the sender's field). This option is the default.

```
ARP INIT DHCP
```

Using this option sends a DHCP ARP on boot up (the sender's IP address field is zero filled).

Set Interface

For all radios except Symbol DS 11MB

Interface sets the physical interfaces

```
Interface pdr if0 dix 1500 10 0x69
```

where

pdr = packet driver
 if0 = interface_card
 dix = frame type
 1500 = MTU
 10 = Buffers
 0x69 = ioaddr

For Symbol DS 11MB radios

Interface sets the physical interfaces

```
Interface pdr if0 dix 1400 10 0x69
```

where

pdr = packet driver
 if0 = interface_card
 dix = frame type
 1400 = MTU
 10 = Buffers
 0x69 = ioaddr

Set Router IP (Gateway only)

When using a gateway (IP router) to the rest of the world, replace “XXX.XXX.XXX.XXX” with your gateway ip and remove the # at the beginning of the line.

```
# route add default if0 XXX.XXX.XXX.XXX
```

Set Domain Name Server

When using a domain name server (DNS), replace XXX.XXX.XXX.XXX with the IP address of the DNS, and remove the # at the beginning of the line.

```
# domain server XXX.XXX.XXX.XXX
```

Display IP Address

Redisplay IP information when SOCKET.CFG runs.

```
IP address
```

Options

For all radios except Symbol DS 11MB

Refer to documentation to change.

```
ip ttl 15
tcp mss 1460
tcp window 2920
tcp retry 8
tcp irtt 500ms
```

For Symbol DS 11MB radios

Refer to documentation to change.

```
ip ttl 64
tcp mss 1360
tcp window 2920
tcp retry 8
tcp irtt 500ms
```

SOCKET.CFG Parameters

domain

If a host name is not a decimal (dotted) address and it is not found in the HOSTS file and at least one Domain Name Server has been defined, an attempt is made to obtain the address from the defined DNS server(s). The number of times any server is polled (retries), in addition to the time to wait for a response, can also be specified. A suffix may be specified and is attached to all names not containing any dots.

All of the following sub-commands can be issued without the optional parameters to obtain information on the current status.

Syntax

```
domain server [host_name]
domain retry [retry_count]
domain time [wait_time]
domain suffix [domain]
```

domain server adds a DNS address or lists the current servers if *host_name* not specified.

domain retry specifies the retry count for polling each server. *domain retry* lists the retry count if *retry_count* not specified.

domain time specifies or lists the time (milliseconds) to wait for a response before attempting retry.

domain time lists the time (milliseconds) to wait if *wait_time* not specified.

domain suffix specifies the domain suffix to add to all simple names; names that contains no dots.

domain suffix lists the domain suffix if *domain* is not specified.

Example

```
domain retry 3
domain server 196.2.1.1
domain suffix myorg.co.za
domain time 2000
```

iface

iface is a synonym for the *interface* command.

interface

interface informs Sockets of the hardware or software communications interface(s) to be used at the network interface level. At least one network interface is required, and two or more are used in gateway (router) applications.

The class or mode of each interface defines the encapsulation used for packaging the data frame into the transport frame. Some types of interface support only one class.

When using more than one interface, Sockets assigns the previous given IP address in the .CFG file to this interface and uses its net mask to add a route to that net through this interface. Using the same IP address would result in multiple routes to the same network. The default route is set on the first interface with an IP address with a zero net mask (for example, IP address 19.63.10.11/0).

Each interface statement uses the IP address from the last supplied IP address statement.

Syntax (general)

```
interface type name class other parameters
```

Syntax (specific)

```
interface pdr name dix mtu numbuf intvec [irq]
interface asy name [slip | cslip | ppp] mtu buflim ioaddr
iovec speed [modemfile]
```

Parameters

Type

Type defines the type of hardware or software interface.

interface supports the following software interfaces.

Interface	Description
Asy	Standard PC asynchronous interface (RS232 port)
Pdr	packet driver interface

name

name defines the name by which the interface is known on the local host. *name* is a symbolic name known only to the local host on which it is used.

name may be arbitrarily assigned. Each interface command on the same host must have a unique name assigned. This name is used by commands such as route, trace, param, and so on.

class

class specifies how IP datagrams are to be encapsulated in the link level protocol of the interface.

Some interfaces offer a choice between classes while others use a fixed class. The following classes are available and are listed with their associated types.

Type	Class (defined in the following list)
Pdr	dix, ieee, token, driver, slip
Asy	raw, slip, cslip, ppp

Class	Description
Dix	The DEC/Intel/Xerox Ethernet interface also known as Blue Book Ethernet or Ethernet II.
Token	IBM Token Ring. Source routing is supported for multiple rings.
Ieee	IEEE: 802.3 Ethernet with SNAP headers.
Driver	Use the default class for the packet driver.

Class	Description
Slip	Serial Link Internet Protocol (SLIP) for point-to-point asynchronous links. This mode is compatible with UNIX SLIP.
Cslip	Compressed Serial Link Internet Protocol (SLIP) for faster reaction over point-to-point synchronous links.
Ppp	Point-to-point protocol over asynchronous links.

mtu

mtu specifies the Maximum Transmission Unit size, in bytes. Datagrams larger than this limit are fragmented into smaller pieces at the IP layer. The maximum value of *mtu* for the various interfaces is:

Ethernet - 1500

For serial links a standard value for *mtu* is 576. (576 is the maximum according to specifications, but may be increased on reliable connections as long as both sides use the same value.)

numbuf

numbuf specifies how many incoming datagrams may be queued on the receive queue at one time. If this limit is exceeded, further received datagrams are discarded. This mechanism is used to prevent fast interfaces from filling up memory when data cannot be handled fast enough.

buflim

buflim specifies the maximum number of outgoing datagrams or packets to queue before starting to discard datagrams. This mechanism is used to prevent the memory from filling up when a serial link goes down.

bufsize

bufsize specifies the size of the ring buffer in bytes to be allocated to the receiver in raw mode.

intvec

intvec specifies the software interrupt number (vector) in hexadecimal to use for resident packet drivers.

ioaddr

ioaddr is the I/O base address in hexadecimal of a serial port or the hardware controller and must correspond with the jumper or switch settings used during the setup of the controller board. The standard values for serial ports are:

COM1	03F8h
COM2	02F8h
COM3	03E8h
COM4	02E8h

iovec

iovec is the hardware interrupt vector used by the serial port or controller and must correspond with the jumper or switch settings used during setup of the controller. The standard values for serial ports are:

COM1	4
COM2	3
COM3	4
COM4	3

irq

irq is the hardware interrupt vector used by the network interface controller. This is only used for faster response in Sockets.

modemfile

A file containing the modem commands and scripts.

speed

speed specifies the transmission speed for serial interface devices (baud rate). Before using a serial connection you have to set flow control with the param command.

Examples

```
interface pdr if0 dix 1500 5 0x60
interface asy ser0 cslip 576 15 0x3f8 4 9600
interface asy p0 ppp 1500 30 0x3f8 4 9600 pppmod.mod
```

ip

ip displays or sets the values of the options selected when defining the IP (internet protocol) host address of the next interface to be defined.

Syntax

```
ip address [hostid [/net_bits] ]
ip status
ip ttl [number]
```

ip address sets the IP host address of the next interface to be defined. A route is automatically added to each interface for the default or specified net mask for its address. To make an automatic route the default, specify the net bits as zero. When specified without the optional parameters, *ip address* displays the current value(s) of the local host IP address(es). To assign different IP addresses to different interfaces on the same host, an *ip address* statement must precede each interface definition. The last IP address given is used in case of missing *ip address* statements.

ip status displays Internet Protocol (IP) statistics, such as total packet counts and error counters of various types. It also displays statistics on the Internet Control Message Protocol (ICMP). This includes the number of ICMP messages of each type sent or received.

ip ttl sets the default time-to-live value which is placed in each outgoing IP datagram. The *ttl* value limits the number of gateway hops the datagram is allowed to take in order to kill datagrams that got stuck in loops.

Parameters

hostid

hostid specifies the IP host address to assign to the next interface to be defined. This may be a symbolic name from the HOSTS file, or a dotted decimal address.

/net_bits

A net mask can be specified for the host. In the ip address command an optional */net_bits* can be used to indicate the number of bits in the network ID. The net mask is used to determine whether an incoming datagram is a broadcast and also for sending UDP broadcasts.

Net masks are more easily represented in binary or hexadecimal format. For example, the IP address 128.1.1.5/24

corresponds to a net mask of 255.255.255.0 (FFFFFF00h),

25 bits to 255.255.255.128 (FFFFFF80h)

and 26 bits to 255.255.255.192 (FFF FFC0h).

The default net mask used corresponds to the class of address used if not explicitly specified.

Net Bits	Net Mask	Class	IP address range
8	255.0.0.0	A	0.x.x.x to 127.x.x.x
16	255.255.0.0	B	128.x.x.x to 191.x.x.x
24	255.255.255.0	C and higher	192.x.x.x or higher

If you want to subdivide your network, you can divide it by two for every net bit added. The following table provides information on converting between net bits and net mask. The number of net bits to add when changing a 0 in the net mask to:

Net Bits	Net Mask	Net Bits	Net Mask
1	128	5	248
2	192	6	252
3	224	7	254
4	240	8	255

number

When *number* is omitted, **ip ttl** displays the current value of the time to live parameter.

param

param invokes a device-specific control routine. When executed without parameters, **param** displays defined interface names and device-specific flags. **param** operates differently for each interface type and even interface mode. In many cases it is used to interrogate the status of an interface. The **ifstat** and **param** commands perform similar and, in some cases, exactly the same function.

Syntax

```
param ifname [arg1...argn]
```

Parameters

ifname

ifname defines the name used in the interface command for the device to be controlled.

arg1...argn

These parameters depend on the type of interface in use.

Example

To display current serial link settings and restart the statistics on it, use:

```
param sl0 clear
```

param, Alternative Routing Control Sub-commands

The Alternative Routing Control Sub-commands set up and check the Sockets alternative route mechanism. More than one route can be specified to a target host or network. The first route which has an associated interface in the up state is used.

An interface is in the up state when it is defined by the interface command. It enters the query state when it does not receive valid input within a specified up-time period after sending data expecting a response. At this stage three (catering for links with a high data loss) ICMP echo requests (ping) are sent to a query IP address. It enters the down state by a Sockets command or when it does not receive valid input within the specified up-time period after entering the query state. If an up-time has never been specified or a value of 0 is specified, the interface will stay in the up state whether valid input is received or not.

An interface enters the up state by a Sockets command or when valid input is received on that interface when in the down or query states. An ICMP echo request is sent on an interface in the down state every down-time period. If a down-time has never been specified or a value of 0 is specified, the ICMP echo request will not be sent. Up-time and down-time is specified in seconds.

Syntax

```
param ifname [ uptime | downtime ] time
param ifname query hostname
```

Example Alternative Routing

Two X.25 interfaces are used to get to the target network 192.6.1.0. The first interface, named if0 should preferably be used, but if it stops receiving for a period of 20 seconds, it should try to ping 192.6.1.2 and if no response is received within another 20 seconds, if1 should take over, but if0 should be tried every five seconds. Interface if1 should disconnect after 80 seconds of no traffic.

The SOCKET.CFG file should contain the following:

```
interface x25 if0 ... ..
param if0 uptime 20
param if0 downtime 5
param if0 query 192.6.1.2
interface x25 if1 ... ..
param if1 uptime 80
param if1 downtime 5
param if1 query 192.6.1.2
route add 192.6.1.0 if0
route add 192.6.1.0 if1
```

In the case of both if0 and if1 failing, both are tried every five seconds until one comes up. The return paths should also be maintained in a similar way with Sockets or by using RIP.

param, RIP Advertising Sub-command for Interfaces

When the rip advertise command has been used, this param sub-command makes allowance to disable and re-enable RIP advertising on a specific interface.

Syntax

```
param ifname [ ripadv | noripadv ]
```

Examples

```
param if0 noripadv
param if1 ripadv
```

route

route creates an entry in the IP routing table for Sockets to determine where to send data. The Alternative Routing mechanism allows more than one route to be specified to a particular host or network. Failure of one route causes an automatic switch to the next route.

Refer also to the ip address command for specifying the net mask, because a route is automatically added to each interface for the default or specified net mask for that address. When multiple routes are defined to the same address, Sockets uses the route with the network size (largest number of bits in the net mask).

Syntax (general)

```
route [ add | drop destination ifname [gateid |none [
metric [proxy] [private] [static] ] ] ]
```

Syntax (specific)

```
route add [ hostid | netid ] ifname [gateid]
route add [ hostid | netid[/mask] ] ifname [gateid]
route add default ifname
route drop [ hostid | netid ]
route drop [ hostid | netid[/mask] ]
route drop default
```

Parameters

add or drop

Sub-command to add or drop (remove) a route from the routing table.

default

All transmissions to IP addresses not otherwise defined in routing commands are sent via the network interface specified by *ifname*.

hostid

hostid is the IP address of a destination remote host to which data must be sent, or a remote host which must be removed from the routing table (dropped).

netid

netid is the IP address of a destination network to which data must be sent. Any host with this IP network address is able to receive the data. Whether a particular host will use the data depends on the host portion of the specific IP address in the IP header.

mask

mask specifies the number of bits in the network portion of the address if sub-netting is used. If not used, the network portion of the address is determined according to the class (A, B or C) of the address.

ifname

ifname defines the name used in the interface command for the immediate network on which the data for the designated host must be sent. This is the network level interface to be used by the local host to reach the remote host.

gateid

gateid parameter specifies the IP address of a host, on the same physical network as the local host, which is used as a gateway or router to a different network. The gateway or router host specified in *gateid* must be directly reachable on the same physical network as the local host defining this gateway. In other words, this must be the nearest gateway to this local host.

metric

When using RIP or Proxy ARP a value from 0 to 16 for *metric* must be specified indicating the distance or cost of that route. A *metric* of 16 indicates that the route is down.

proxy, private and static

To support the Routing Information Protocol (RIP) the route command utilizes the proxy, private and static key words. These words can be used in any order following *metric*.

Proxy ARP should be used with care and not in conjunction with RIP. When more than one host responds to an ARP request, it can cause confusion and even lead to system crashes. This is possible in situations where more than one gateway implements Proxy ARP to a common destination.

When “RIP advertising” is selected, all interfaces advertise all routes except those routes making use of that specific interface (split horizon) and routes marked private. A route which is dropped as a result of a RIP update or which becomes unavailable as a result of its associated interface going into the down state, is immediately advertised as being infinite (metric = 16) and is not advertised until it becomes available again. In order for an interface to be used for advertising, a route without a gateway using that interface must be available. The advertisement is sent as a subnet broadcast using the net mask of the host and the IP address of the interface.

When “RIP using” is selected, routes are updated according to received RIP advertisements. Routes added or amended as a result of RIP, have a timeout associated with them. If another RIP advertisement is not received during that time, the route is dropped. A route is also dropped if an advertisement of infinity (metric = 16) is received. To prevent dropping a route, it must be marked as static. The metric of a route marked static is never updated by a RIP advertisement. Instead a duplicate route is added before the static route. If the duplicate route is dropped as a result of a timeout or RIP, the static route is used again.

Examples

```
route add default ipx0
route add unix_net eth0
route add unix_host ipx1 unx_gate
route add unix_net2 eth0 /eth 1
route add unix_net ipx0 unx_gate
route add subnet/26 eth0 sub_gw
route drop unix_net
```

route can specify a Proxy ARP on a route, as follows:

```
route add net interface gateway metric [proxy]
```

When using Proxy ARP, gateway and metric must be specified. If no gateway is used, none can be specified. For example:

```
route add 192.6.1.0 ifx25 none 5 proxy
```

tcp

tcp commands display or set various TCP operating parameters. The TCP configuration commands are put into SOCKETS.CFG.

Syntax

```
tcp irtt [time]
tcp lport [port_number]
tcp mss [size]
tcp retry [number]
tcp rtt [time]
tcp smss [size]
tcp timemax [time]
tcp window [size]
```

Parameters

time

time is the new time value in seconds, or milliseconds if “ms” is appended to the number, as in 2000ms.

port_number

port_number is the local port starting number.

size

For tcp mss, *size* is the maximum segment size in bytes sent on all outgoing TCP connect requests (SYN segments). *size* tells the remote host the size of the largest segment that may be received by this host. When changing the MSS value, any existing connections remain unchanged.

For tcp smss, *size* is the send maximum segment size in bytes sent on all outgoing TCP connect requests. This limits the size of the largest segment that may be sent by this host. When changing the SMSS value, any existing connections remain unchanged.

For tcp window, *size* is the size of the receive window in bytes for any new TCP connections. Existing connections are unaffected.

number

number is the number of retries attempted without receiving an acknowledge from the remote host before the connection is broken. If the value exceeds 255, it implies an infinite number of retries; such a connection does not time-out. The default value for *number* is 6.

tcp irtt Sub-command

tcp irtt displays or sets the initial round-trip-time estimate. When specified without an argument, the command displays the current values of TCP parameters including the initial round-trip-time in milliseconds.

time is the initial round-trip-time (IRTT) estimate and is used for new TCP connections until the actual value can be measured and adapted to. By increasing this value when operating over slow communication links, unnecessary retransmissions that otherwise occur before the smoothed estimate value approaches the correct value are minimized. The system default is 5000 milliseconds.

To affect incoming connections, tcp irtt should be executed before the servers are started.

Example

```
tcp irtt 120
```

Sample Output

```
TCP: IRTT 5 ms Retry 6 MSS 1460 SMSS 1460 Window 2920
```

tcp lport Sub-command

tcp lport specifies the local port starting number. When specified without a number the current value of the next free local port number is displayed.

Example

```
tcp lport 2004
```

Sample output

```
Lport = 2004
```

tcp mss Sub-command

tcp mss displays or sets the TCP maximum segment size in bytes. When size is not specified, the current values of the TCP parameters, including the maximum segment size, are displayed. It is recommended to reduce the MSS and SMSS on bad network connections.

Example

```
tcp mss 1460
```

tcp retry Sub-command

tcp retry displays or sets the retry count before a connection is broken. When specified without the number parameter, tcp retry displays the current values of TCP parameters, including the retry count.

tcp rtt sub-command

tcp rtt replaces the automatically computed round-trip time (RTT) for the specified connection with the time in milliseconds. Sockets calculates the RTT as a smooth average of past measured RTTs, starting with the IRTT on a new connection.

To get the current RTT in use for a connection n, use the tcp status n command that will give the smoothed average RTT indicated by SRTT.

Because tcp rtt provides a manual override of the normal back-off retransmission timing mechanisms, it may be used to speed up recovery from a series of lost packets.

Example

```
tcp rtt 4 100
```

tcp smss sub-command

tcp mss displays or sets the TCP send maximum segment size in bytes. When size is not specified, the current values of the TCP parameters, including the SMSS, are displayed.

A small SMSS causes the remote to reduce its segment size. tcp mss can reduce the MSS and SMSS on bad network connections with high loss rates or where large packets get lost.

Example

```
tcp smss 512
```

tcp window sub-command

tcp window displays or sets the default and maximum receive window size.

When specified without the size parameter the current TCP parameters, including the current window size, are displayed.

Example

```
tcp window 2920
```

tcp timemax sub-command

tcp timemax sets the maximum duration of a tcp retry. If a value greater than 255 seconds is specified, connections will never timeout.

This is very useful in wireless applications where nodes roam in and out of service.

Example

```
tcp timemax 2000ms
```


Chapter 7 Troubleshooting

Problem Determination Tips

Use the tips in this chapter as a guide. They include solutions to the simplest problems as well as things to observe when trying to diagnose more serious problems.

Consider the following:

- If a problem occurs while you're working, stop immediately. If you continue, you may lose data and destroy problem-related information.
- Observe what is happening. Write down what the MX3 and any optional devices are doing as well as what actions you took immediately before the problem occurred.
- Consider the simplest solution first. Ask yourself logical questions and consider alternatives.
- Which part of the system is operating erratically? Keypad? Disk/Flash Drive? Barcode Scanner? Radio? Display? Each produces different symptoms.
- What program and/or optional devices are you using?
- What appears on the screen? Do you see any messages or random characters? Look up any messages in the documentation for your software, (e.g. DOS, etc.)
- Are any LEDs illuminated? Which ones?
- Do you hear any beeps? How many? Are they long or short?
- Is the MX3 making any unusual noises?
- See if you can cause the problem to occur again. This may help you understand the source of the problem and will help you describe the problem if you must call for technical assistance.
- Make sure you are operating under the specified environmental conditions discussed in Chapter 3, "Power Supply" and Appendix C, "Technical Specifications", subsection "Environmental Specifications".

Use the troubleshooting procedures that follow these tips and, if necessary, perform any diagnostic procedures that may apply.

Based on the answers to the previous questions and suggestions, try to narrow the problem down to one of the following areas:

- Startup Problems
- Hardware Problems - (i.e. power source, keypad, display, hard drive, PCMCIA cards, optional devices, etc.)
- Radio Problems
- Software Related Problems
- Memory

The following sections provide more detailed troubleshooting information about each of these areas.

Startup Problems

This section lists some of the configuration error messages that may appear at system startup and their possible solutions.

Note: If you press the Power key and the MX3 remains off, refer to the “Power Source” section of this chapter.

Problem	Solution
MX3 computer stops working and locks up each time you start it.	Your CONFIG.SYS or AUTOEXEC.BAT file might be corrupt. To recover from this error, follow the steps in the “Bypassing the Configuration Files” section of this chapter.
The MX3 displays the “Non-System disk or disk error” message.	Make sure the MX3 is booting from the proper drive. To recover from this error, follow the steps in the “Verifying Boot Order” section of this chapter.
The MX3 displays the “Bad or missing Command Interpreter” message.	You’re missing the COMMAND.COM file, which should be located in the root directory of the C drive. To recover from this error, follow the steps in the “Missing COMMAND.COM” section of this chapter.
The MX3 displays either “CMOS time and date not set” or “Real time clock failure” messages.	There may be a problem with the Backup Battery. Follow the steps in the “Setting System Time and Date” section of this chapter.

Bypassing the Configuration Files

If you are using DOS 6.0 or higher, you may want to bypass the configuration files and restore configuration files from backup. To bypass the configuration files:

1. Turn on the MX3.
2. When “Starting DOS” appears press the <F5> key.

Verifying Boot Order

1. During bootup, the <F2> key must be pressed to enter BIOS Setup. Turn on the MX3. Press <F2>. (If Main Menu BIOS parameter Setup Msg is turned Off, the “Press F2” message is not seen but the <F2> key function is still available.)
2. At the BIOS Setup Main Menu, view the Boot parameter.
3. If the Boot parameter is not already highlighted, press the <DownArrow> until it is highlighted.
4. Make sure the field entry is set to “C:”, if not press SP, and change the field entry to “C:”.
5. Press <Right Arrow> until you reach the Exit menu.
6. Select “Save and Exit” to save the changes. Press <Enter>. If the MX3 does not reboot automatically, reboot the MX3.

If the error continues please contact LXE Technical Support.

Missing COMMAND.COM

If the computer displays “Bad or missing Command Interpreter”, the computer is configured to start from the hard disk and...

- the COMMAND.COM file was accidentally deleted, or
- the operating system can't find the COMMAND.COM file (it may be in a directory other than the root directory), or
- an incompatible version of COMMAND.COM was copied over the COMMAND.COM version supplied with the MX3.

To replace the command interpreter, follow these steps:

1. Make sure the MX3 is powered off.
2. Remove the endcap.
3. Insert the DOS boot SRAM card into Slot 0, the right slot.

Note: You should have created a DOS boot SRAM when you received the MX3.

4. Power on the MX3.
5. If you receive the “Bad or missing command interpreter” message continue with step 6, otherwise go to step 12.

Edit BIOS Setup

6. During bootup the <F2> key must be pressed to enter BIOS Setup. You may need to reboot.
7. At the BIOS Setup Main Menu, view Boot parameter.
8. If the Boot Sequence parameter is not already highlighted, press the <DownArrow> until it is highlighted.
9. Press SPC until the field entry is changed to “A: then C.”.
10. Press <Right Arrow> until you reach the Exit menu.
11. Select “Save and Exit” to save the changes. Press <Enter>.

Copy File

12. When the DOS prompt appears, type

```
SYS C:
```

and press <Enter>.

13. Type

```
Type C:\AUTOEXEC.BAT
```

and press <Enter>.

If your AUTOEXEC.BAT file contains a COMSPEC command, confirm that it identifies the correct location for COMMAND.COM (i.e. the C:\ directory).



Please refer to commercially available DOS User's Guides for complete instructions or troubleshooting when using these DOS files or commands.

14. Type

```
Type C:\CONFIG.SYS
```

and press <Enter>.

If your CONFIG.SYS file contains a SHELL command, confirm that it identifies the correct location for COMMAND.COM (the C:\ directory).

15. Power off the MX3.
16. Remove the DOS boot SRAM card.
17. Replace the PC card cover.
18. Power on the MX3.

Setting System Time and Date

1. If the MX3 is not already powered up, turn it on.
2. During bootup the <F2> key must be pressed to enter BIOS Setup.
3. At the BIOS Setup Main Menu, move the highlight to the Time parameter.
4. Type the desired entry and then press the <Tab> key to move from hours to minutes to seconds. The colons are automatically added by the system.
5. Press the <DownArrow> to move to the Date parameter.
6. Type the desired entry and then press the <Tab> key to move from month to day to year. The backslashes are automatically added by the system.
7. Press <Right Arrow> until you reach the Exit menu.
8. Select "Save and Exit" to save the changes. Press <Enter>.

If the MX3 does not automatically reboot, turn the MX3 off and then on again.

Hardware Problems

This section lists possible solutions to some common problems with hardware.

Power Source

The MX3 receives power from an internal battery pack. The MX3's battery can be recharged while it is in a charging station (battery only) or docking stations (MX3 with battery).

Problem	Solution
The computer won't start.	Make sure the main battery is installed and fully charged.
Power key will not turn the unit off	Force a Power Off by holding the Power key down for 15 seconds. Locate and correct the problem before powering the unit back on – e.g. IRQ conflict, very low battery power, radio conflict, unexpected software application result, etc.

If you cannot find the source of the problem, consult LXE Technical Support.

Keypad

The following table provides solutions to common keypad problems:

Problem	Solution
Get an unexpected character or function when pressing some keys.	Make sure the correct keyboard and radio drivers are loaded.
The keyboard locked and you cannot use <Ctrl> + <Alt> + to reboot.	The Ctl+Alt+Del function may be disabled in BIOS Setup. Use the Power key to reboot the MX3.

Display

For general display problems follow these guidelines.

Problem	Solution
Unable to read the display in outdoor lighting.	Adjust the display contrast.

Hard Disk Drive

Note: Primary storage is accomplished by an integrated flash circuit. BIOS software in the MX3 provides an interface layer between the operating system and the hardware. To the operating system (DOS) and the application software, the flash looks like a small hard disk drive. The flash drive is still susceptible to many of the same problems as a hard drive. If the computer is interrupted while writing data to a disk, the disk may become corrupted. Interruptions include such things as power failure, operator generated power removal, operator generated reboot or catastrophic software failure (crash).

If you have problems with the hard disk drive, run the DOS CHKDSK utility. CHKDSK analyzes the directories, files and File Allocation Table (FAT) on the flash disk.



For information on running CHKDSK, refer to the DOS documentation.

If CHKDSK does not report any errors and the hard disk still has problems, contact LXE Technical Support.

PCMCIA Cards

Problem	Solution
You are having trouble accessing data on a PCMCIA card or some of the data appears to be missing.	Run the DOS CHKDSK command, which analyzes the directories, files and the File Allocation Table (FAT) on the card.
CHKDSK reports no errors and you're still experiencing problems.	Can you access the PCMCIA card? Try to view the contents of the directory. For example, try using the DOS DIR command. If the DIR command doesn't display all the files stored in the directory, recovering data is unlikely.
SRAM card will not work.	PicoCard supports SRAM cards with the Phoenix ATA driver PCMATA. Format the SRAM in another computer and try again.
Data files are damaged or corrupted.	Refer to your software documentation for file recovery procedures. Many software packages automatically create backup files.
Receive message "Warning: conflict with system COM".	The COM port selected is already being used by another device. If you know what COM ports are available, you can edit the PCM.INI file and change the COMORDER= number to an available COM port. <i>Note: COM4 seems to be the best choice for PC Cards.</i>
Receive message "Invalid command line switch".	Command line switches are in the PCM.INI file, not the CONFIG.SYS file.
Receive message "A previous version of Card and Socket Services has been detected. You must first remove this version and rerun install."	Run Deinstall to remove the older/other software. DEINSTALL.EXE is a stand-alone DOS program.

Upper Memory Conflicts

Some drivers require an unused upper memory block. In this case, “unused” means that the upper memory block⁵ does not contain any ROM or RAM.

Driver	Memory Required	Default Address Range
PCMCS95.EXE	4K	C800-C8FF
PCMATA.SYS	16K per SRAM card	C900
PCMFCS.EXE	4K to 64K	D000 - (dependent on variable size)
PCMFDD.EXE	16K	D000-D3FF

Available upper memory (C800 - DFFF) is crucial to using PCMCIA cards successfully. The addresses shown above have the following characteristics:

- The system has no RAM at these addresses.
- The system has no ROM at these addresses.
- Run a utility, such as MSD.EXE (not included with the MX3) which shows the memory requested with ADDR= and /BASE= parameters listed as “available”.

IRQ Assignments

AT compatible systems have 16 IRQs, numbered 0 through 15, many of which are already assigned as follows:

IRQs	Device(s)
IRQ0	Timer Output
IRQ1	Keyboard
IRQ2	Route to Interrupt Controller 2, IRQ8-IRQ15
IRQ3	Serial Port COM2
IRQ4	Serial Port COM1
IRQ5	Reserved for PC Cards
IRQ6	Floppy Disk Controller
IRQ7	Power Management
IRQ8	Real Time Clock
IRQ9	Keyboard
IRQ10	PC Card Controller
IRQ11	Reserved for PC Cards
IRQ12	Touch Screen Data
IRQ13	80x87 Math Coprocessor
IRQ14	Hard Disk Controller
IRQ15	Some Hard Disk/SCSI Controllers (Default)

⁵ UMB is fully allocated in the MX3. Do not load drivers that require UMB or EMM386.EXE.

Optional Devices

This section provides information on solving problems related to optional devices.

Note: Make sure the MX3 is powered on before you turn on any powered optional devices.

To help determine which device is causing the problem:

- Check that all connecting cables are correctly and firmly attached. Loose cables can cause erroneous or intermittent signals. You may need to inspect connecting cables for loose wires, and check connectors for loose pins.
- Isolate the problem. Turn the computer off and remove all devices. Turn the computer on and write down any error messages.
- Turn the computer off. Add one optional device and turn the computer on again. Continue this procedure of adding one device at a time until you resolve the problem.
- Device Configuration. The smooth operation of the system depends on the interaction of all devices, programs and features.

Note: Before you make any changes to your configuration files, make a copy of each file (typically with a different extension, for example, copy AUTOEXEC.BAT to AUTOEXEC.OLD). After you modify the configuration files, restart the computer for the changes to take effect.

The following table provides some solutions to common configuration problems:

Problem	Solution
You connected a device and the device isn't operating properly.	<ul style="list-style-type: none"> • If you start programs or drivers from the configuration files (CONFIG.SYS and AUTOEXEC.BAT), remove the commands that start those programs from the configuration files and restart the computer. • Add the program commands back into the configuration files one at a time until the problem reappears. Experiment with the order of the programs. (Keep in mind that some files must be loaded prior to others in order for your system to operate properly. Check the software documentation for any configuration requirements.)
You connected an external device and the computer isn't operating properly.	<ul style="list-style-type: none"> • Make sure you chose the correct setting for the device in the BIOS Setup utility. • You may have plugged in a device when the MX3 was on. Turn the MX3 off, reconnect the device and turn the MX3 on again. • The cable wiring may be faulty. Try a different cable or check the device's wiring requirements. Check all the connections. Try operating the system again.

Radio Problems

Problem: The radio is on, configured properly and still won't transmit or receive data.

Solution: Make sure the sending system is not busy or off-line.

The 2.4GHz Radios

Problem: The Proxim 2.4GHz radio won't receive or transmit properly.

Solution: Check the settings in the NET.CFG or SOCKETS.CFG files (i.e. communications parameters: station type, Domain, etc.) Refer to Chapter 6, "RF Network Configuration" for information on how to modify these settings.

Problem: The Lucent 2.4GHz radio won't connect to the network even though everything else seems to be working properly.

Solution: Check WaveLAN/IEEE Advanced Setup configuration for the Access Point and to see if you have configured the wireless network as a "Closed System". If this is the case then the WaveLAN Network Name on the station must match what is configured in the Access Point.

- or -

The string for WaveLAN_Network_Name is case-sensitive. The WaveLAN DOS ODI driver requires the use of only UPPER-CASE characters. If you have configured the Access Points with lower-case names you will need to change your Access Point WaveLAN_Network_Name parameter to UPPER-CASE characters for proper operation.

The 900MHz Radios

Problem: The 900MHz radio won't receive or transmit properly.

Solution: Refer to the appropriate Terminal Emulation Reference Guide for information on how to modify RF parameters for the 900MHz PCMCIA radio.

Software Related Problems

Consider the following:

- If an error message appears while you are using a software package, check the software documentation first. It usually includes a troubleshooting section or summary of error messages. If you cannot find the error message in the software documentation, look for the message in the ROM-DOS documentation.
- If you cannot load a software package, the SRAM card (or diskette if using REMSERVE.EXE) may be corrupt, try another card/disk. If you have received a bad disk/SRAM card call the manufacturer for a new one.
- Some software may be incompatible with other software already installed. If the problem continues, contact the manufacturer of the software program.
- Some software may require more time than the Video Timer parameter maximum value (15 minutes) to install. In this case, press an arrow key or the spacebar to keep the MX3 “awake” until the software installation is complete.
- Be sure you have enough memory and hard disk space to handle the software being installed.

FTP Kernel

If you cannot connect to the network or if you do not have any success using XPING try the following:

1. Ensure that you have restarted your system, after making changes to any configuration files. Changes to your configuration files will not take effect until you restart your system.
2. Verify that you have a valid entry in the SOCKET.CFG file for IP addresses.
3. Ensure that network driver parameters and configuration files, such as NET.CFG, have the correct entries.
4. Verify that your system files (AUTOEXEC.BAT and CONFIG.SYS) have the correct entries. Refer to Chapter 4, “System Configuration”, for the correct parameters for AUTOEXEC.BAT and CONFIG.SYS.

Convert MX3 from MS-DOS to ROM-DOS

This section is contained in this manual to assist the System Administrator when upgrading existing MS-DOS units to ROM-DOS units. MX3s received from LXE after March 2001 do not require ROM-DOS upgrades.

From the ROM-DOS directory create a bootable 1M SRAM or bootable ATA card.

1. Type the following at the DOS prompt, assuming the SRAM card is located in Drive D:
D:
12. Sys d:
13. Copy the following ROM-DOS files to the SRAM card by typing at the DOS prompt:
14. Copy sys.com d:
15. Copy format.com d:
16. Insert the SRAM card in the MX3's PC slot and edit BIOS Setup to allow bootup from the SRAM card.
17. Reboot the MX3 and format the unit by typing the following at the DOS prompt:
18. format c: /s /u

Memory

This section lists possible solutions to some common memory problems.

Conventional Memory

If your program reports that there isn't enough memory for it to run, you may not have enough conventional memory available for that program. To determine the memory needs of the program and the availability of memory in the MX3, follow these steps:

1. Check the software documentation to see what kind of memory the program can use (conventional, extended or expanded)⁶.
2. At the system prompt, type MEM to run the DOS MEM command and check how much conventional memory is left for your programs. (MEM reports the number of bytes available.)
3. Refer to the program's documentation to verify that this is enough memory to run the program. If not, you may need to remove device drivers or memory-resident programs from the CONFIG.SYS or AUTOEXEC.BAT files. (If unsure of how to accomplish this, contact LXE Technical Support.)

When you start the computer and it displays an error during the memory test, write down the error and call LXE Technical Support.

Extended Memory

To use software with extended memory, the software must be compatible with the Extended Memory Specification (XMS).

⁶ UMB is fully allocated in the MX3. Do not load drivers that require UMB or EMM386.EXE.

Power On Self Test (POST)

Each time the MX3 is turned on (or is rebooted using <Ctrl> + <Alt> +), a series of comprehensive hardware tests are performed. These tests are called the Power On Self Test, or POST.

In the event that the system does not complete the POST, a beep code will sound. If this happens, contact LXE Customer Support.

If the LXE MX3 display is operational and the unit appears to boot when you turn it on, yet behaves in a manner that leads you to believe it is not working properly, refer to Chapter 7, “Troubleshooting”. If the unit still operates erratically, contact LXE Customer Support (refer to “Getting Help” section in Chapter 1, “Introduction”). You may need to return the MX3 for service.

POST Error Messages

The following table lists the POST error messages for the MX3. If problems persist, contact LXE Customer Support (refer to “Getting Help” section in Chapter 1, “Introduction”).

Message

System CMOS checksum bad - run SETUP

Possible Cause

The backup battery may be completely drained.

Action

Insert a new battery pack. The battery pack will begin charging the backup battery. Wait until the BB LED goes off. Turn the power off, then back on again. If the problem persists, contact LXE Customer Support.

Message

Stuck Key

Possible Cause

A keypad key may be stuck in the down position.

Action

Check the keypad for a physically stuck key and loosen the key. Turn the power off, then back on again. If the problem persists, contact LXE Customer Support.

Message

Previous boot incomplete - Default configuration used

Action

Run BIOS Setup to recall the previously saved settings. Turn the power off, then back on again. If the problem persists, contact LXE Customer Support.

Messages Probably Requiring Repair

Message

```

Operating system not found
Keyboard error
K System RAM Failed at offset:
K Shadow Ram Failed at offset:
K Extended RAM Failed at offset:
System cache error - Cache disabled
System timer error
Real time clock error
Keyboard controller error

```

Action

Turn the power off, then back on again. If the problem persists, contact LXE Customer Support for repair instruction.

POST Beep Codes

The system speaker emits a coded beep to alert the user that the system failed the Power On Self Test. If this happens, contact qualified service personnel. Do not attempt to fix the problem yourself.

Beep codes are listed below with a short description of the error.

Beep Seq.	Description
1-2-2-3	BIOS ROM Checksum Failure
1-3-1-1	DRAM Refresh Failure
1-3-1-3	Keyboard Controller Failure
1-3-4-1	512KB Base Address Line Failure
1-3-4-3	512KB Base Memory Failure
2-1-2-3	ROM Copyright Notice Error
2-2-3-1	Unexpected Interrupt

If You Need Further Assistance

If you have followed these recommendations and are still having problems, you may need additional technical assistance. This section contains the steps to take as you prepare to ask for help.

Before You Call

Since some problems you experience may be related to the operating system or software, it is important to investigate other sources of assistance first. Try the following before contacting LXE.

- Review the troubleshooting information in commercially available DOS documentation.
- If the problem occurs while running software applications loaded after your purchase of the MX3, consult the software documentation for troubleshooting suggestions. Contact the software company's technical support department for assistance.

Key Map 101-Key Equivalencies for Batch Units

Note: The batch unit key mapping is used on mobile computers that are NOT running an LXE Terminal Emulator.

When using a sequence of keys that includes the 2nd key, press the 2nd key first then the rest of the key sequence. Set the On/Off condition of NumLock before pressing a key sequence. There is no visual indication of the condition of NumLock.

Note: When the computer boots, the default condition of NumLock is On. NumLock can be set using BIOS Setup.

Note: When the computer boots, the default condition of Caps (or CapsLock) is Off. The Caps (or CapsLock) condition can be set using BIOS Setup or toggled with a 2nd-F1 key sequence. The CAPS LED is illuminated when CapsLock is On.

To get this key	Press These Keys and Then					Press this key
	2 nd	Shift	Ctrl	Alt	CapsLock	
Contrast	x					F6
Volume	x					F8
Backlight	x					F10
2 nd						2 nd
Shift						Shft
Alt						Alt
Ctrl						Ctrl
Scan ⁷						Scan
Esc						Esc
Space						Spc
Enter						Enter
Enter (numeric)	x		x			Enter
CapsLock (Toggle)	x					F1
Back Space						BkSp
Tab						Tab
BackTab	x					Tab
Break	x					F2
Pause	x	x				F3
Up Arrow						Up Arrow
Down Arrow						Down Arrow
Right Arrow						Right Arrow
Left Arrow						Left Arrow
Insert	x					BkSp
Delete	x					DOT
Home	x					Left Arrow

⁷ Left Scan key default value is Numeric Enter.
Right Scan key default value is Scan.

To get this key	Press These Keys and Then					Press this key
	2 nd	Shift	Ctrl	Alt	CapsLock	
End	x					Right Arrow
Page Up	x					Up Arrow
Page Down	x					Down Arrow
Right Shift	x	x				F7
Right Alt	x	x				F8
Right Ctrl	x	x				F9
ScrollLock	x	x				F4
PrintScrn	x	x				F6
SysReq	x	x				F5
F1						F1
F2						F2
F3						F3
F4						F4
F5						F5
F6						F6
F7						F7
F8						F8
F9						F9
F10						F10
F11	x	x				F1
F12	x	x				F2
a					x	A
b					x	B
c					x	C
d					x	D
e					x	E
f					x	F
g					x	G
h					x	H
i					x	I
j					x	J
k					x	K
l					x	L
m					x	M
n					x	N
o					x	O
p					x	P
q					x	Q
r					x	R
s					x	S

To get this key	Press These Keys and Then					Press this key
	2 nd	Shift	Ctrl	Alt	CapsLock	
t					x	T
u					x	U
v					x	V
w					x	W
x					x	X
y					x	Y
z					x	Z
A						A
B						B
C						C
D						D
E						E
F						F
G						G
H						H
I						I
J						J
K						K
L						L
M						M
N						N
O						O
P						P
Q						Q
R						R
S						S
T						T
U						U
V						V
W						W
X						X
Y						Y
Z						Z
1 (alpha)	x	x				1
2 (alpha)	x	x				2
3 (alpha)	x	x				3
4 (alpha)	x	x				4
5 (alpha)	x	x				5
6 (alpha)	x	x				6
7 (alpha)	x	x				7

To get this key	Press These Keys and Then					Press this key
	2 nd	Shift	Ctrl	Alt	CapsLock	
8 (alpha)	x	x				8
9 (alpha)	x	x				9
0 (alpha)	x	x				0
DOT (alpha)	x					K
1 (numeric)						1
2 (numeric)						2
3 (numeric)						3
4 (numeric)						4
5 (numeric)						5
6 (numeric)						6
7 (numeric)						7
8 (numeric)						8
9 (numeric)						9
0 (numeric)						0
DOT (numeric)						DOT
<	x					0
[x					1
]	x					2
>	x					3
=	x					4
{	x					5
}	x					6
/ (numeric)	x		x			7
/ (alpha)	x					7
- (numeric)	x		x			8
- (minus sign)	x					8
- (alpha)	x					8
+ (numeric)	x		x			9
+ (alpha)	x					9
* (numeric)	x					I
* (alpha)	x		x			I
: (colon)	x					D
; (semicolon)	x					F
?	x					L
`	x					N
_ (underscore)	x					M
, (comma)	x					J
' (apostrophe)	x					H
~ (tilde)	x					B
\	x					S

To get this key	Press These Keys and Then					Press this key
	2 nd	Shift	Ctrl	Alt	CapsLock	
	x					A
"	x					G
!	x					Q
@	x					W
#	x					E
\$	x					R
%	x					T
^	x					Y
&	x					U
(x					O
)	x					P

IBM 3270 and TN3270 Terminal Emulator Keypad

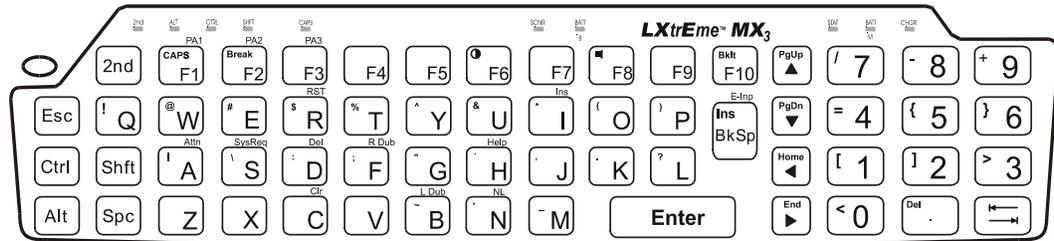


Figure A-2 IBM 3270 Specific Keypad

This QWERTY keypad is designed to allow the user to enter terminal emulator commands when running LXE's IBM 3270 and TN3270 Terminal Emulation (TE) programs. The MX3's ABCD keypad is not available for these terminal emulations.

When running these programs on the MX3, please refer to the following terminal emulation reference guides for equivalent keys and keypress sequences:

- [3270 Terminal Reference Guide \(3270 DOS TE\)](#)
- [3270 Programmer's Reference Guide](#)
- [TN3270 Terminal Reference Guide](#)

IBM 5250 and TN5250 Terminal Emulator Keypad

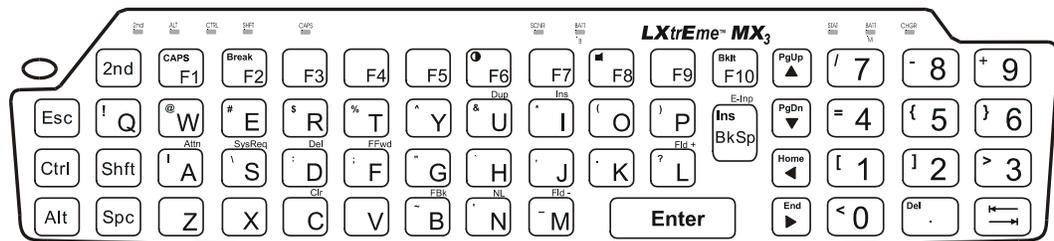


Figure A-3 IBM 5250 Specific Keypad

This QWERTY keypad is designed to allow the user to enter terminal emulator commands when running LXE's IBM 5250 and TN5250 Terminal Emulation (TE) programs. The MX3's ABCD keypad is not available for these terminal emulations.

When running these programs on the MX3, please refer to the following terminal emulation reference guides for equivalent keys and keypress sequences:

- [5250 Terminal Reference Guide \(5250 DOS TE\)](#)
- [5250 Programmer's Reference Guide](#)
- [TN5250 Terminal Reference Guide](#)



Appendix B Technical Specifications

Physical Specifications

Features		Specifications	Comments	
CPU		Intel 486SX 25 MHz	32 bit CPU (with on-chip cache)	
Memory	ROM	1MB BIOS Flash	System Memory	
	RAM	4 MB Dynamic RAM		
Display	Controller	VGA Compatible Controller	512 KB of Video RAM	
	LCD	Monochrome Transflective w/optional Touchscreen	Transflective LCD Customer Configurable Backlighting Touchscreen - LXE Installed Option	
Mass Storage	Flash	4 MB	Drive C:	
	Removable PC Card (Customer Installable)	SRAM or Flash PCMCIA Type II PC Cards (Various Sizes)	Configurable as Drive D: and E: SRAM PC card Boots as Drive A: Others boot as Drive C:	
		Solid State Disk and ATA Rotating Hard Drive PCMCIA Type III Drive (Various Sizes)	Configurable as Drive D: and E:	
PCMCIA Interface		Two (2) PCMCIA Slots: Slot 1 accepts Type I, II, and III Slot 0 accepts Type I and II	Compatible with the PCMCIA version 2.1 standard.	
Weights		Unit with radio, battery and scanner endcap	Less than 30 oz	>850g
		Battery	5.6 oz	157g
		Radio Card 2.4GHz Type II 900MHz	1.0 oz	28g
			1.6 oz	45g
		SRAM Card	1 oz	28g

Features		Specifications	Comments	
External Connectors/Interface		IrDA Connector (COM 2) bi-directional half-duplex	Supports 115k baud (IrDA software restricts to 19.2k baud)	
		Endcap - Dual Serial, DB-9 Connector (COM 1 and COM 2)	9 Pin "D" (male) Connector. Provides connection to external devices such as a printer.	
		Endcap - includes Scanner, DB-9 Connector (COM 1)	9 Pin "D" (male) Connector. Provides connection to external devices such as a printer.	
Power Connector		8.5V - 15 VDC Input Power	External Battery Charger Contacts	
		10.8 - 16VDC Input Power	Power Jack	
Dimensions w/Endcap		Length	6.5"	165 cm
		Width	9"	228 cm
		Depth	1.5"	38 cm
Batteries	Main	10.8V, 3 cell, Li-Ion battery pack	In-Unit Chargeable or Externally Chargeable	
	Backup (CMOS)	Internal Nickel-Cadmium (NiCd) 5.7V max.	Automatically charges from Main Battery during normal operation Keeps MX3 operational for 5 minutes (depending upon usage) when Main Battery is depleted	

Environmental Specifications

LXE MX3 and Endcaps

Feature	Specification
Operating Temperature	-4°F to 122°F (-20°C to 50°C)
Storage Temperature	-22°F to 140°F (-30°C to 60°C)
Water	IEC IP55 (with standard endcaps)
MX3 - Sand and Dust	IEC IP55 (with standard endcaps)
Endcaps - Water and Dust	IEC IP56 (with standard endcaps)
Operating Humidity	Up to 90% non-condensing at 104°F (40°C)
Vibration	Based on MIL Std 810D
ESD	8 KV air, 4kV direct contact
Shock	Multiple 4 foot drops to concrete 6 foot with protective cover

Power Supplies

US AC Wall Adapter

Feature	Specification
Input Power Switch	None
Power "ON" Indicator	None
Input Fusing	Thermal Fuse
Input Voltage	108VAC min - 132VAC max
Input Frequency	47 - 63 Hz
Input Connector	North American wall plug, no ground
Output Connector	Barrel connector, female, 5.5 x 2.5 x 11.5mm, Center Positive
Output Voltage	+12VDC, unregulated
Output Current	0 Amps min, 1.5 A max
Operating Temperature	32° F to 104° F / 0° C to 40° C
Storage Temperature	-13° F to 158° F / -25° C to 70° C
Humidity	Operates in a relative humidity of: 5 – 95% (non-condensing)

International AC Adapter

Feature	Specification
Operating Temperature	32°F to 104°F (-0°C to 40°C)
Storage Temperature	-13°F to 158°F (-25°C to 70°C)
Operating Humidity	Up to 90% non-condensing at 104°F (40°C)
Input Power Switch	None
Power "ON" Indicator	None
Input Voltage	108VAC min - 264VAC max
Input Frequency	47 - 63 Hz
Input Connector	Customer supplied
Output Connector	Barrel connector, female, 5.5 x 2.5 x 11mm, Center Positive
Output Voltage	+12VDC, regulated
Output Voltage Regulation	+/- 5%
Output Current	0 Amps min, 1.00 Amps max

Display Specifications

Feature	Specification	Comments
Type	Transflective Monochrome LCD	Electroluminescent Backlighting
Resolution	640x240 pixels	30 lines x 80 characters 15 lines x 80 characters
Cell Size	DOS Mode	8 x 8 8 x 16
Size	½ VGA	
Diagonal Viewing Area	5.92 in (150.4mm)	
Dot Pitch	0.22mm	
Dot Size	0.20mm x 0.20mm	
Gray Scale	16 Shades of Gray	

Radio Specifications

PCMCIA 900 MHz Type III

Bus Interface:	PCMCIA 2.0, Type III slot
Radio Frequencies:	902.2 MHz to 927.8 MHz FH SS
RF Data Rates:	64K bits/sec CPFSK
RF Power Output:	250 mW \pm 2.0 dB into 50 Ohms (varies by country)
Channel Spacing:	400 KHz or 200 KHz
Operating Temperature MX3	-20°C to +50°C, -4°F to 122°F
Storage Temperature MX3	-40°C to 70°C, -40°F to 158°F
Connectivity:	Novell, TCP/IP, Ethernet, NDIS, ODI
Antenna	Internal

LXE 6400 PCMCIA 2.4 GHz Type II

Bus Interface:	PCMCIA 2.0, Type II slot
Radio Frequencies:	2.4 - 2.4835 GHz FH SS
RF Data Rates:	0.8 / 1.6 Mbps
RF Power Level:	100 mW (varies by country)
Channels	15
Operating Temperature	see MX3 Environmental Specs
Storage Temperature	see MX3 Environmental Specs
Connectivity:	Novell, TCP/IP, Ethernet, NDIS, ODI
Antenna	Internal

LXE 6500 PCMCIA 2.4 GHz Type II

Bus Interface:	PCMCIA 2.0, Type II slot
Radio Frequencies:	2.4 - 2.4835 GHz IEEE 802.11b DS SS
RF Data Rates:	1 / 2 Mbps
RF Power Level:	15 dBm nominal (varies by country)
Channels	11 US, 13 Europe, 4 France, 14 Japan
Operating Temperature	see MX3 Environmental Specs
Storage Temperature	see MX3 Environmental Specs
Connectivity:	Novell, TCP/IP, Ethernet, ODI
Antenna	Internal

PCMCIA Cisco 2.4 GHz Type II

Bus Interface:	PCMCIA 2.0, Type II slot
Radio Frequencies:	2.4 - 2.4835 GHz IEEE 802.11b DS SS
RF Data Rates:	11 Mbps maximum
RF Power Level:	35 mW nominal
Channels	11 US, 13 Europe, 4 France, 1 Japan
Operating Temperature	see MX3 Environmental Specs
Storage Temperature	see MX3 Environmental Specs
Connectivity:	Novell, TCP/IP, Ethernet, ODI
Antenna	Internal

PCMCIA Symbol 2Mb 2.4 GHz Type II

Bus Interface:	PCMCIA 2.0, Type II slot
Radio Frequencies:	2.4 - 2.5 GHz FH SS
RF Data Rates:	2 Mbps maximum
RF Power Level:	100 mW
Channels	15
Operating Temperature	see MX3 Environmental Specs
Storage Temperature	see MX3 Environmental Specs
Connectivity:	Novell, TCP/IP, Ethernet, NDIS, ODI
Antenna	Internal

PCMCIA Symbol 11Mb 2.4 GHz Type II

Bus Interface:	PCMCIA 2.0, Type II slot
Radio Frequencies:	2.4 - 2.5 GHz IEEE 802.11b DS SS
RF Data Rates:	11 Mbps maximum
RF Power Level:	100 mW
Channels	11 US, 13 Europe, 4 France, 1 Japan
Operating Temperature	see MX3 Environmental Specs
Storage Temperature	see MX3 Environmental Specs
Connectivity:	Novell, TCP/IP, Ethernet, ODI
Antenna	Internal

Appendix C Commands

Introduction

This appendix describes the Datalight ROM-DOS commands *that are loaded in the MX3 by LXE*. The information in this appendix is taken from Datalight's "ROM-DOS 6.22 User's Guide" and is used by permission.

ROM-DOS Commands

Each entry includes an explanation of the command's purpose, the command entry syntax, remarks, and examples. Where applicable, command syntax and parameters are given. Parameters may be supplied using either uppercase or lowercase letters, and the hyphen (-) may be substituted for the forward slash (/).

Each command also has a label to designate whether it is an internal or external command. Internal commands are part of the command processor program, COMMAND.COM. These functions are available only while COMMAND.COM is running. External commands are actually stand-alone utility programs. They are independent from COMMAND.COM.

ANSI.SYS

Type

Installable Device Driver

Purpose

ANSI.SYS is a console device driver that allows you to support ANSI codes on the local display.

Syntax

```
Device=ANSI.SYS [options]
```

Remarks

ANSI.SYS supports standard ANSI escape sequences.

ANSI.SYS writes directly the screen when using text video mode.

Options

The */K* option forces use of the extended keyboard BIOS calls which sense F11 and F12.

The */X* option lets you redefine the extended keys independently.

The */S* option disables the keyboard redefinition feature.

The */Tnn* option indicates that the video mode *nn* is a text mode. By default, modes 0, 1, 2, 3 and 7 are text modes.

Examples

```
DEVICE=ANSI.SYS
```

This example loads ANSI.SYS with default settings.

```
DEVICE=ANSI.SYS /T54 /S
```

Load ANSI.SYS with mode 54h as a video text mode and disable keyboard redefinition.

ATTRIB.EXE

Type

External

Purpose

The ATTRIB command either displays or modifies the attribute of a file.

Syntax

```
ATTRIB [+ | -][option][filespec]
```

Remarks

The file attributes define the characteristics of a file. They determine if a file may be deleted or modified, or if it is archived. The ATTRIB command is used to manage these file attributes.

Wildcard characters may be used in the ATTRIB **filespec**.

The ATTRIB command will modify file attributes if modify commands are given to ATTRIB. The modify commands are:

Command	Description
+/-	Add(+) or remove(-) attribute
A	Archive attribute
C	Clear all attributes
H	Hidden file attribute
R	Read only attribute
S	System file attribute

If no modify commands are found by ATTRIB, then the files are displayed along with the file names and their current attributes.

Examples

ATTRIB will add the read-only attribute to the file myfile.dat.

```
ATTRIB +r myfile.dat
```

ATTRIB will remove the read-only attribute and the archive attribute for all files with the DAT extension.

```
ATTRIB -a -r *.dat
```

ATTRIB will display the attributes of all files with the DAT extension.

```
ATTRIB *.dat
```

CHKDSK.EXE

Type

External

Purpose

The CHKDSK command checks the disk directories and File Allocation Table (FAT) and displays a disk and memory report.

Syntax

```
CHKDSK [d:][path][filespec][ /C ] [ /F ] [ /V ]
```

Remarks

CHKDSK examines a disk and determines if the disk has any errors in the File Allocation Table (FAT) and will optionally fix errors.

Options

The /F option causes CHKDSK to fix errors on the disk if any were found. The errors that can be found are directory or FAT errors. If the /F is not specified then CHKDSK acts as if it will fix the disk, but the corrections will not be written out to the disk.

If errors are detected, you will be prompted with a message similar to the following:

```
15 lost allocation units found in 5 chains.  
Convert lost chains to files?
```

If you answer Y for Yes, each lost chain will be written to a file in the root directory of the current default drive. Each file will have the name file $nnnn$.chk. $nnnn$ will be a sequential number. The first chain will be in FILE000.CHK. These files can be verified to see if they contain valuable information, and then deleted if desired. Answering N for No to the above prompt, CHKDSK will still make the corrections however the lost chains will not be saved to the disk.

The /C option allows CHKDSK to correct errors without user confirmation. This option must be used along with the /F option for corrections to be made.

The /V option causes CHKDSK to display each path and file as it is processed.

If a file specification is specified, then CHKDSK displays all files matching the specification that have noncontiguous data areas on the disk. Files that are stored in noncontiguous areas, especially .exe files, have slower disk access times. If CHKDSK reports a large number of files with this problem, a utility program that optimizes the files and free space on your disk should be used.

After checking the disk, CHKDSK displays any error messages followed by a report on the state of the disk that was checked. An example of the report is shown below.

```
Volume ROM-DOS created June 1,1990 1:00a  
Volume Serial Number is 190E-4AA2  
362496 bytes total disk space  
0 bytes in 1 hidden files  
6144 bytes in 2 user files  
356352 bytes available on disk  
655360 bytes total memory  
595360 bytes free
```

CHKDSK does not wait for a disk to be inserted before the checking is initiated nor does it repair any errors.

Examples

CHKDSK will check the integrity of drive A. The report will be printed to the console.

```
CHKDSK a:
```

CHKDSK will check the integrity of RAM disk D. The report will be saved in a file called DRIVE_D.RPT.

```
CHKDSK d: >drive_d.rpt
```

COMMAND.COM

Type

External

Purpose

Start a new command processor.

Syntax

```
COMMAND[device] [/E:number] [/K:filename]  
[/P] [/C string] [/MSG]
```

Remarks

This command starts a new copy of the ROM-DOS command processor. The command processor is the program that has all the internal DOS commands in it.

Starting a new command processor will also produce a new environment. The size of the environment is 128 bytes by default, but it can be changed using the /E switch.

Command and its arguments can also be used in a SHELL= statement in your config.sys file. See the full description of SHELL for more details.

Options

The *device* option specifies that COMMAND.COM should use a different device, such as AUX, for input and output.

The /E:*number* switch sets the environment size. Number represents the size of the environment in bytes. Number must be in the range from 160 to 32768. All other values will be ignored and the default value of 256 will be used. ROM-DOS will round the value entered up to the nearest multiple of 16.

The /K:*filename* option tells the command processor to run the specified filename and then display the ROM-DOS command prompt. It is not recommended that this option be used in a CONFIG.SYS SHELL= statement.

The /P *switch* causes COMMAND not to exit, or in other words, to remain permanent. The /P switch should be used only when command is used in a CONFIG.SYS SHELL statement.

The /c *string* switch causes COMMAND to execute the command in string and then terminate. The string command can be any internal or external command.

The `/MSG` option indicates that all error messages should be stored in memory. This option is recommended only for diskette based systems. ROM-DOS keeps many of its error messages in the resident part of `COMMAND.COM` rather than using valuable memory to store them. If an error message is needed and you have loaded ROM-DOS from a diskette, the message will only be available if the boot disk is still in the drive. By using the `/MSG` option, the messages will be available in memory at all times. The `/P` option must be used along with the `/MSG` option.

Examples

The following command will cause a new copy of `COMMAND` to be executed. It will perform a `DIR` command on the C drive and then exit back to the previous Command Processor.

```
COMMAND /C DIR C:
```

The following example shows loading of a permanent copy of command with an environment size of 256 bytes.

```
SHELL=C:\COMMAND.COM /P /E:256
```

DELTREE.EXE

External Command

The `DELTREE` command deletes one or more directory trees or individual files.

Syntax

```
DELTREE [/Y] [drive:]path [[drive:]path[...]]
```

Remarks

`/Y` prevents `DELTREE` from prompting before deleting.

`[drive:]path` indicates the name(s) of the file(s) or directory tree(s) to delete. Wildcards are allowed.

Examples

Datalight `DELTREE` deletes one or more directory trees. For example, to delete all files and directories in the tree `C:\TEMP`, enter

```
DELTREE C:\TEMP.
```

You can also use `DELTREE` to delete individual files, one at a time, using wildcards. For example, to delete selected files in the current directory, enter

```
DELTREE *.*
```

`DELTREE` then prompts you for each file it finds, allowing you to choose whether to delete them.

Caution: *Take care when using wildcards with `DELTREE`. `DELTREE` deletes all specified files and subdirectories regardless of their attributes. Multiple files and/or subdirectories may be specified.*

FORMAT.COM

External Command

The FORMAT command initializes a disk so ROM-DOS can access files on that disk. A disk must be formatted before ROM-DOS can use it.

Syntax

```
FORMAT [drive:] [/options]
```

Remarks

FORMAT initializes the disk and directory of the specified drive. The size of the formatted disk is the largest possible size that the specified drive supports, unless a different size is specified via a command line option.

Options

The */4* switch causes the floppy disk to be formatted as a 360KB disk even if the drive is a 1.44MB, 2.88MB, or 1.2MB drive.

The */7* switch causes the floppy disk to be formatted as a 720KB disk even if the drive is a 1.44MB or 2.88MB drive.

The */B* option causes FORMAT to use BIOS Int 13h calls. By default, FORMAT checks the DOS version, and if it is DOS 5.0 or higher, it uses the floppy device driver to do the format. Using the */B* option forces FORMAT to bypass the floppy or hard disk controller and use BIOS calls. */B* makes FORMAT device independent.

The */C* switch causes FORMAT to format one disk without operator input. The disk is assumed to be in the specified drive, and FORMAT exits immediately when the format is complete. This switch is useful in batch files or programs that require a formatted disk without user input.

The */F:size* option specifies the size of the floppy disk to be formatted. Available size values are 360, 720, 1.2, 1.44, and 2.88, and are entered as */F:size*. For example, */F:1.2*.

The */H* switch causes the system files not to be hidden or write-protected. This can be used along with the */S* option.

The */I* option forces FORMAT to use IOCTL calls and never use BIOS calls. Normally, FORMAT first tries to access the device driver IOCTL calls to format the disk. If this fails, BIOS calls are used (unless the */B* option is specified). BIOS calls are always used for DOS 3.3 and earlier.

The */Q* option causes FORMAT to do a quick format. A quick format reinitializes the disk, deleting each file and subdirectory from the disk. A quick format can only be performed on a previously fully formatted disk.

The */S* switch causes FORMAT to copy the ROM-DOS system files, ROM-DOS.SYS and COMMAND.COM, onto the disk. The file ROM-DOS.SYS is renamed and stored on the disk as files IBMBIO.COM and IBMDOS.COM, which are stored as hidden files, unless the */H* option is used.

The */V:LABEL* switch causes FORMAT to place a volume label on the disk. If the volume label is not provided on the command line, you are prompted for the volume label once the format is complete.

The */Y* switch causes FORMAT to run without display of the sign-on message.

If FORMAT encounters an error, the exit code returned to DOS indicates the type of error. The error codes are listed in the following table.

Error Level	Type of Error
0	No error encountered
1	Invalid drive
2	Unsupported drive format
3	Attempted hard drive format (unsupported)
4	Write-protect error

HIMEM.SYS

Installable Device Driver

The HIMEM.SYS device driver manages extended memory and the High Memory Area (HMA) in a 286, 386 or greater, or PS/2 systems. HIMEM prevents programs from simultaneously using the same area of memory for two different purposes. HIMEM supports the Extended Memory Specification (XMS) 2.0. HIMEM is installed as a device driver in CONFIG.SYS.

Syntax

```
DEVICE = [d:] [path] HIMEM.SYS [/machine:n] [/A20[+]] [/PS2]
[/CONTROLA20:OFF]
```

Remarks

The HIMEM driver can be used to allow ROM-DOS to run in High Memory.

HIMEM supports a default of 32 handles.

HIMEM should not be used with older versions of Datalight's VDISK. Current versions of VDISK use XMS memory if it is available.

HIMEM recognizes PS/2-style A20 line control and determines whether to use the PS/2 A20 control or the AT A20 control method automatically by calling Int 15h, function C0h (get system configuration). This automatic detection can be overridden with the /Machine:n, /A20, A20+, or /PS2 command line switches in the event that the auto detection on a given system fails.

/Machine:1 and /A20 both designate the PC AT A20 control method. These switches instruct HIMEM *not* to wait for the A20 line to settle.

/Machine:2 and /PS2 both designate the PS/2 control method.

/A20+ is similar to /A20 but instructs HIMEM to wait for the A20 line to settle.

/Machine:3 designates support for the Phoenix Cascade BIOS A20 control methods.

Alternately, /CONTROLA20:OFF instructs HIMEM to *not* detect the control method for the A20 line and assumes the A20 line is always on.

The /BIOS switch forces the use of BIOS Int15h, Function 87h, for data transfers to and from XMS memory.

The /QUIET switch forces HIMEM to remove the sign-on message when loading.

Error Conditions

No Extended Memory—An extended memory error condition can occur if the BIOS (via Int 15H, function 88H) notifies HIMEM that there is no extended memory. In this situation, HIMEM displays an appropriate error message and does not install.

Failure to Control the A20 Line—When HIMEM installs, it attempts to control the A20 line, which controls access to the HMA. HIMEM first attempts control via the AT method (using the 8259 keyboard control). If that fails, HIMEM then attempts control via the PS/2 method (using I/O port 60H). If both methods fail, HIMEM assumes it can't control the A20 line and displays the message

```
A20 Control (OFF)
```

If either of these errors occur, try using the /A20, /A20+, or /PS2 in the HIMEM command line.

Note also that some older programs assume that the machine is a 1MB 8086 and so require that the A20 line to be disabled (OFF) while they run. Current programs typically do not require that the A20 line be disabled.

Examples

```
Device = HIMEM.SYS
```

Installs the XMS device driver. Once this driver is installed, accessing the HMA and Extended Memory (XMS) memory areas are legal. The Extended Memory area can contain up to 2GB of memory. Typical systems have 4, 8, or 16MB of XMS memory installed.

```
Device = HIMEM.SYS /machine:1
```

Forces the use of the AT-style A20 line control.

The HIMEM driver fails to load when either the machine does not have memory above the 1MB boundary or the BIOS does not provide support for it. It also fails to load when another XMS manager has been previously installed.

MEM.EXE

External Command

The MEM command displays the used and free memory in your system.

Syntax

```
MEM [/BiosExtensions] [/Classify] [/Raw]
```

Remarks

Options	Description
/B	Displays each BIOS extension and its size.
/C	Classifies the memory usage.
/R	Does raw dump of the MCB chain.

MEM displays a list of the DOS memory contents, what free space is available, and how much memory is in conventional memory, upper memory, the HMA and extended memory. This program is useful to fine tune the system to have as much free memory as possible for applications.

Options

The */B* option displays BIOS extensions in the range from C000:0 to F800:0.

The */C* option shows program, TSR, and device driver sizes.

The */R* option shows a low-level DOS listing of MCBs (Memory Control Blocks).

MODE.COM

External Command

The MODE command modifies the operation of the printer, serial port, and active video display.

Syntax

```
MODE LPT#[:]=COM#[:]
MODE COM#:baud[,parity[,databits[,stopbits[,P]]]]
MODE <video mode>
MODE <display lines>
```

Remarks

The first syntax above redirects line printer output to the serial port.

The second syntax above changes the operation of the specified communications port. The options that can be modified are listed below. Invalid for any of the options are flagged with an error message.

```
baud 110, 150, 300, 600, 1200, 2400, 4800, 9600
parity N - None, O - Odd, E - Even
databits Either 7 or 8
stopbits Either 1 or 2 stop bits
P Printer Port
```

Using the P option as the last argument causes output to be sent repeatedly to the printer port until successfully received. Without the P, output is sent only once, causing a critical error if unsuccessful.

The third syntax changes the active video mode for the display terminal. The valid choices for this version of the MODE command are as follows:

40—Indicates 40 characters per line.

80—Indicates 80 characters per line.

bw40—For a color graphics adapter with color disabled and 40 characters per line.

bw80—For a color graphics adapter with color disabled and 80 characters per line.

co40—Indicates a color monitor with color enabled and 40 characters per line.

co80—Indicates a color monitor with color enabled and 80 characters per line.

mono—For a monochrome display. Assumes 80 characters per line.

The final syntax sets the number of display lines. Valid included L25, L43, and L50.

Note: A serial port should be initialized before an LPT device is redirected to it.

Examples

```
MODE COM1:9600,n,8,1
```

Modifies the settings for the COM1 device to a baud rate of 9600, no parity, eight data bits, and one stop bit.

```
MODE LPT2:=COM2
```

Redirects the output from LPT2 to the COM2 serial port. All following output to LPT2 actually goes to the COM2 device.

```
MODE mono
```

Indicates a monochrome display adapter.

MORE.COM

External Command

The MORE command displays a text file one screen at a time.

Syntax

```
MORE [filename]  
or  
<command> | MORE
```

Remarks

The input to MORE may come from a file, or it may be piped in from another filter or a DOS command. If the *filename* is present, then the file is viewed; otherwise MORE reads from the Standard Input.

Once a screen has been viewed, a line is displayed on the bottom of the screen indicating the percent of the file that has been viewed. At this point, there are several options for the next lines of text to be viewed.

B	Display the previous full page.
<enter>	Display just one more line.
T	Display starting at the top of the file.
Spacebar	Display the next full page of text.
Q	Exit MORE

Examples

```
DIR | MORE
```

Displays a directory one screen at a time.

```
MORE READ.ME
```

Displays the file READ.ME one page at a time.

NED.EXE and NED.CFG

External Command

ASCII text Editor Program

The NED editor is a menu-based text editor available for use with ROM-DOS. This editor is similar to other desktop editors but has special functions designed for use in editing C-source and assembly code.

Starting the Editor

To start the editor, enter

```
NED [filename] [filename]
```

NED may be initiated with or without filename arguments. Wildcard file specifications are allowed.

Up to ten files can be entered on the command line. If NED is run without arguments, it loads all files accessed during the last editing session, returning you to the exact position in the file. You can switch between the open files.

You can also enter

```
NED @errfile
```

where *errfile* is the name of your compiler error output file. NED loads all files that had errors and allows you to move between errors.

Once NED is running, you may load files into memory by using the File/Open menu command. File/Reload replaces the current file with a new file or reloads a new copy of the same file. File/Reload confirms before replacing an unsaved file.

Basic Editor Operation

NED uses the standard Microsoft Windows interface for cut, copy, and paste operations. Del and Shift+Del both move the selected block to the clipboard. There is no true undo command, but Ctrl+V or Shift+Ins may be used to paste the clipboard contents to the current cursor position. Table 1 lists all the default shortcut keys.

If a search string is all lowercase, NED treats it as a case-insensitive search. If a search string contains any uppercase letters, it is case sensitive. The replacement string is inserted exactly as entered. Repeating a Search command repeats the last Forward or Backward Search operation, not the last Replace operation.

There is one bookmark for all files. Once the bookmark is set, going to the bookmark returns you to the file and position where you set it.

The Indent and Remove-indent (referred to as Undent in the Options/Do Command) commands work on tabs. Indent inserts a tab at the beginning of the current line, or if a block is active, at the beginning of each line in the block. Remove-indent removes the first tab from the current line or from each line in the block. If there are no tabs, Remove-indent has no effect.

Toggle case inverts the case of the current character if no block is active. If a block is active, Toggle case sets the entire block to uppercase if the first character was lower and to lowercase if the first character was uppercase.

Tabs are currently set to 3 for .C, .H, .CPP, .HPP, and .T files. They are set to 8 for all other files.

File/Print prints the current block if there is one, otherwise it prints the current file. NED prompts for a device to print to, which may be a filename. Tabs are expanded to spaces.

The Options/Do Command is intended primarily for debugging. This command allows you to execute any editor command by choosing it from a menu list.

The macro commands (Record Macro/Play Macro) allow you to define a sequence of keystrokes that can be repeated repetitively. Select Record Macro (ALT=), enter the keystrokes, then press ALT= again. The macro sequence can be played by selecting Play Macro or by pressing ALT-. Keyboard bindings are saved in NED.CFG in the same directory as NED.EXE. NED.CFG also contains the list of active files and positions.

If you record and play a recursive macro, it plays continuously.

If you press an invalid key on a menu, NED operates as if you pressed enter.

If you run out of memory, such as when you have more than 300KB of files open, NED returns to DOS.

NED Default Hot Keys

Many of the editor commands can be accessed directly by pressing key combinations. For example, press Alt-X to exit the editor and save any open files. The following table lists the default hot keys.

Key	Function	Key	Function
Alt-Q	Quit without saving	F1	Help
Alt-X	Exit, saving as needed	F7	Load file into current buffer
Ctrl-A	Search again	F9	Save file
Ctrl-B	Search backward	F10	Exit asking for save as needed
Ctrl-C	Copy the block to clipboard	Left-Arrow	Left one character
Ctrl-D	Find the mark	Right-Arrow	Right one character
Ctrl-E	Erase to end-of-line	Up arrow	Up one line
Ctrl-F	Search forward	Down arrow	Down one line
Ctrl-G	Go to a line number	Home	Beginning of line
Ctrl-I	Indent the block	End	End of line
Ctrl-K	Toggle block mode	Page Up	Up one screen
Ctrl-L	Delete line to the clipboard	Page Down	Down one screen
Ctrl-M	Set the mark	Center (5)	Center the cursor onscreen
Ctrl-N	Read a file into a new buffer	Ctrl-Left-Arrow	Left one word
Ctrl-P	Move to the previous position	Ctrl-Right-Arrow	Right one word
Ctrl-Q	Quote the next character	Ctrl-Up-Arrow	Up one C function
Ctrl-R	Replace text	Ctrl-Down-Arrow	Down one C function
Ctrl-S	Switch to the next buffer	Ctrl-Home	Scroll toward beginning of file
Ctrl-T	Toggle the case of character(s)	Ctrl-End	Scroll toward end of file
Ctrl-U	Remove indent from the block	Ctrl-Page	Up Beginning of file
Ctrl-V	Insert the clipboard	Ctrl-Page	Down End of file
Ctrl-W	Delete word to the clipboard Ins	Toggle	Insert/Overwrite mode
Ctrl-X	Delete block to the clipboard	Del	Delete character
Ctrl-Z	Cancel the selected block	Backspace	Delete character backward
Alt =	Start/end recording macro	Ctrl-Ins	Copy block to clipboard.
Alt -	Playback macro	Ctrl-BackSpace	Delete word backward
Alt-F7	Previous error	Shift-Ins	Insert the clipboard
Alt-F8	Next error	Shift-Del	Delete block to clipboard

PRINT.COM

External Command

The PRINT command prints a single file or a list of files.

Syntax

```
PRINT [/drive:] [filename] [/options]
```

Remarks

PRINT allows you to enter between one and 32 files for spooling to the printer. The files are output to the device in a spooled manner (while you perform other operations).

If PRINT is entered without any parameters, it displays all the files that are in the queue.

The first time PRINT is used, the operator is prompted with this message for the device to perform the operation.

```
Name of list device [PRN]:
```

The legal devices for printing are LPT1, LPT2, LPT3, LPT4, COM1, COM2, COM3, COM4, AUX, or PRN.

Options

The */B* option sets the buffer size. The default buffer size is 512 bytes. A larger buffer size causes print to operate faster. The maximum buffer size is 32KB and the minimum size is 256 bytes. This option is only allowed the first time PRINT is run.

The */C* option cancels only the filenames listed after the */C* command.

The */F* option sets the maximum number of files to be queued up at one time. The default number of files is ten. The minimum is two and the maximum is 32. Support for more files is often useful when using wildcards in filenames. This option is only allowed the first time PRINT is run (or until the next system reboot).

The */P* option causes all files listed after this option to be submitted for printing. This is the default for filenames encountered on the PRINT command line.

The */T* option cancels all the files from the print queue (list).

The */H* option displays the help screen.

Examples

```
PRINT FILE1.TXT FILE2.TXT FILE3.TXT
```

Puts three files into the print queue. The first file prints after the command ends.

```
PRINT /C FILE2.TXT
```

Removes file FILE2.TXT from the print queue. All other files in the queue print normally.

```
PRINT /T
```

Cancels all files in the print queue. Printing may continue for a short time because of the buffer in your printer.

REMDISK.EXE

Remote Disk Program

See Also: REMSERV.EXE

REMSERV is usually run on the MX3 (host). REMDISK is usually run on the client (e.g. a desktop PC).

The remote disk program allows you to access a disk drive on a remote system via a serial cable and standard PC-style (8250UART) serial port. In a remote disk setup, one system, the one that shares its drives, is termed the server. The other system, the one that accesses and uses the remote drives, is called the client. The serial ports on both systems must be connected via a null modem cable. Remdisk / Remserv works across a standard 3-pin serial cable. The cable does not require the CTS/RTS DTS/DTR pins.

To use the remote disk, both REMDISK and REMSERV must be running on their respective systems and must use the same baud rate and packet or nonpacket-style transmission. After starting both programs, you can access the new drive on the client system. You can change the default directory to this new drive, copy files to and from the remote drive, and also run utilities such as CHKDSK on the drive. The remote drive on the server system can be used as any other drive on the client system.

Syntax

The program REMDISK runs on the client system and creates a new drive letter for the client. REMDISK uses the next available system drive letter.

For example, if the last assigned drive was D:, REMDISK creates drive E:. This drive acts like any other drive, except that it requires the serial port. REMDISK.EXE can be loaded by a DEVICE= command in the CONFIG.SYS or AUTOEXEC.BAT files or it can be entered at the DOS prompt.

```
CONFIG.SYS --- DEVICE=REMDISK.EXE /T15
AUTOEXEC.BAT - REMDISK /B9600 / COM2 /T10
```

The syntax for REMDISK is:

```
REMDISK [/U] [/H] [/Bnnnn] [+|-][/Tnnn] [/COMn]
```

The default is : /B115K+ /COM1 /T3

Option	Description
/U	Unloads REMDISK from memory, thereby disabling the drive letter and freeing the memory occupied by REMDISK. This option can only be used when REMDISK is installed from the DOS command line. A remote disk installed via CONFIG.SYS cannot be unloaded.
/H	Selects hardware handshaking for flow control.
/Bnnnn	Selects the baud rate for transmission. Available baud rates are 300, 1200, 2400, 4800, 9600, 19200, 38400, 57600, and 115000. The default baud rate is 115000.
+/-	The plus sign (+) specifies packet-style transmission and is recommended for any baud rate over 19200. The default setting is to include + for packet transmission. Use the minus sign (-) to specify polling operation under Microsoft Windows 95. Both sides must agree on using either (+) or (-).
/Tnnn	Sets the time-out in the range of 3 to 3,640 seconds. 15 seconds is not unusual for Flash drives.
/IRQn	Set the IRQ for the communications port. Valid settings are 3 – 15. Default is IRQ3 for COM 2 and COM4, and IRQ4 for COM1 and COM3.
COMn	Selects the communication port. Choose 1, 2, 3 or 4. COM1 is the default port.

To install the REMDISK program from CONFIG.SYS at 19200 baud, on COM1, using packet-style transmission, insert the following line in CONFIG.SYS and then reboot the system (remember to include the full path to find REMDISK.EXE if not located in the root directory).

```
DEVICE=REMDISK.EXE /B19200 +
```

To display a help screen for REMDISK from the DOS prompt, enter

```
REMDISK /?
```

To install REMDISK from the DOS prompt or from a batch file (such as AUTOEXEC.BAT) at 9600 baud, without packet-style transmission, on COM2, enter

```
REMDISK /B9600 /COM2
```

To unload the REMDISK installed from the batch file or the DOS prompt, enter `REMDISK /U`

REMSERV.EXE

Remote Disk Program

See Also: REMDISK.EXE

REMSERV is usually run on the MX3 (host). REMDISK is usually run on the client (e.g. a desktop PC).

The remote disk program allows you to access a disk drive on a remote system via a serial cable and standard PC-style (8250UART) serial port. In a remote disk setup, one system, the one that shares its drives, is termed the server. The other system, the one that accesses and uses the remote drives, is called the client. The serial ports on both systems must be connected via a null modem cable. Remdisk / Remserv works across a standard 3-pin serial cable. The cable does not require the CTS/RTS DTS/DTR pins.

To use the remote disk, both REMDISK and REMSERV must be running on their respective systems and must use the same baud rate and packet or nonpacket-style transmission. After starting both programs, you can access the new drive on the client system. You can change the default directory to this new drive, copy files to and from the remote drive, and also run utilities such as CHKDSK on the drive. The remote drive on the server system can be used as any other drive on the client system.

The server system runs the program REMSERV.EXE that can make a single drive on the server system available to the client. The available drive can be changed at any time by quitting the REMSERV program and then running the program again with a new drive letter.

The server program can be terminated at any time by pressing the Esc key. The client can then no longer access the server's drive until the REMSERV program is run again.

Syntax

```
REMSERV.EXE d: [/Tnnnn] [/H] [/Bnnnn] [+|-] [/COMn] [/IRQn]
[/Tnnn] [/S]
```

where d: represents the letter of the drive the server makes available to the client.

The default is `/B115+ /COM1 /T2`

Option	Description
<code>/Bnnnn</code>	Selects the baud rate for transmission. Available baud rates are 300, 1200, 2400, 4800, 9600, 19200, 38400, 57600, and 115000. The default baud rate is 115000.
<code>+/-</code>	The plus sign (+) after the BAUD specifies packet-style transmission and is recommended for any baud rate over 19200. The default setting is to include + for packet transmission. Use the minus sign (-) to specify polling operation under

Option	Description
	Microsoft Windows 95. By default, packet transfers will be used for all baud rates higher than 9600. Both sides must agree on using either (+) or (-).
<i>COMn</i>	Selects the communication port. Available ports are 1, 2, 3 or 4. COM1 is the default port.
<i>/IRQn</i>	Set the IRQ for the communications port. Valid settings are 3 – 15. Default is IRQ3 for COM 2 and COM4, and IRQ4 for COM1 and COM3.
<i>/Tnnn</i>	Sets the time-out in the range of 2 to 3,640 seconds. 15 seconds is not unusual for Flash drives.
<i>/S</i>	Instructs REMSERV to run without any display output (Silent).
<i>/H</i>	Selects hardware handshaking for flow control.

Example

To select drive B: as the available server drive at 115000 baud, packet transmission, using COM1, enter

```
REMSERV B:
```

To set drive C: as the server disk at 38400 baud, without packet-style transmission, on COM2, with a timeout of 10 seconds, enter:

```
REMSERV C: /B38400 /COM2 /T10
```

SYS.COM

External Command

The SYS command copies the ROM-DOS system files ROM-DOS.SYS and COMMAND.COM from the disk in the default drive to the disk in the specified drive. The file ROM-DOS.SYS is renamed and stored on the disk as files IBMBIO.COM and IBMDOS.COM, which are stored as hidden files.

Syntax

```
SYS drive: [/options]
```

Remarks

Use the SYS command to transfer the ROM-DOS system files to a floppy disk or hard disk. The disk can be a formatted blank disk or can contain files; it is not necessary for the system files to be the first files on the disk. The only requirement is that there is enough contiguous free space on the disk for the new system files to be placed. If the disk already contains system files, installing the new system files deletes the existing files.

The command processor, COMMAND.COM, is also transferred to the disk and does not need to be copied into the same contiguous space as the system files.

You can run SYS three different ways. The first is to boot and run your system with ROM-DOS. When you run the SYS command this way, SYS copies the ROM-DOS system files and COMMAND.COM from the root directory of the default/current disk drive.

The second method is to run SYS from the root directory of a disk drive that has been previously prepared with the SYS command, but isn't booted and running. For example, you can run SYS from a bootable floppy disk to copy the files to the hard disk without actually booting from the floppy disk itself.

The third method uses the file ROM-DOS.SYS, the equivalent of the hidden system files IBMBIO.COM and IBMDOS.COM. ROM-DOS.SYS should be present in the same directory with COMMAND.COM and SYS.COM. These three files can be placed in the root directory or subdirectory on a floppy disk (that need not be booted or bootable), or in a subdirectory on the

hard drive. Run the SYS command from the directory where the files reside to transfer the system files to the destination drive.

Options

The `/C` option prevents confirmation before transferring system files.

The `/H` option shows the newly transferred system files on the destination disk.

The `/J` option prevents display of the sign-on message.

Example

```
SYS B:
```

Copies the ROM-DOS system files to drive B:.

VER

Type

Internal

Purpose

Displays the version number of ROM-DOS in use. Allows revision of this version number.

Syntax

```
VER [n.nn] [/R]
```

Remarks

If a new version number is specified, two digits after the decimal are required. Note that this command revises only the record of the DOS version number; it does not change the actual operating system loaded in the computer.

The version command shows both the version of the VER command itself and the version of DOS in operation.

Options

The `/R` option shows the full version and release number of ROM-DOS.

Example

The following example changes the record of current DOS version in use to DOS 5.0. Any programs that are executed, following this command, will recognize that DOS 5.0 is running.

```
VER 5.0
```

XCOPY.COM

External Command

The XCOPY command copies multiple files and, optionally, subdirectories from one disk to another.

Syntax

```
XCOPY [source] [target] [/options]
```

Remarks

Use the XCOPY command to copy multiple files and subdirectories, if they exist.

The *source* and the *target* parameter are complete drive-path and file-specification descriptions.

If you do not specify a path, XCOPY assumes the default path. If a filename is not specified, then *.* is assumed.

The ATTRIB command may be used to modify the archive bit for the various XCOPY options that check the archive status of files. Refer to the ATTRIB command for instructions.

Options

The */A* option copies only source files that have the archive bit set in them. The archive is not reset.

The */D<mm-dd-yy>* option copies only those files with a date later than that specified.

The */E* option creates subdirectories on the target even if they are empty.

The */M* option copies only those source files that have the archive bit set. Once the source file is copied, the archive bit is reset.

The */P* option prompts before each file is copied. The prompt appears as follows; enter Y to copy the file:

```
C:\COMMAND.COM (Y/N) ?
```

The */S* option copies files in subdirectories of the source directory.

The */V* option verifies each write to the disk.

The */W* option waits before starting to copy files and prompts with the following message.

```
Press any key to begin copying file(s)
```

Example

```
XCOPY \bin\*.exe a: /a
```

Copies all files in the BIN subdirectory to the A: drive that have an .EXE extension and that have the archive bit set.

ROM-DOS 6.22 Command Summary



For information on ROM-DOS commands, please refer to a commercially available ROM-DOS user guide.

Following are brief descriptions of ROM-DOS commands, including batch file commands.

Note: The external ROM-DOS files loaded on the MX3 by LXE (and supported by LXE) are marked with an asterisk in the table that follows. ROM-DOS internal commands are a part of the ROM-DOS operating system.

ROM-DOS Command	Command Type	Description
?	Internal	CONFIG.SYS command. It directs ROM-DOS to pause for confirmation before processing a command.
@	Internal	Used to suppress the display of a single batch-file command line.
;	Internal	Identifies nonexecuting lines. The same as the REM command.
ANSI.SYS*	Installable	A console device driver that allows you to support Ansi codes on the local screen.
ATTRIB.COM*	External	Displays or modifies the attributes associated with a file.
BREAK	Internal	Turns on or off the ability to stop program execution at a non-I/O point.
BUFFERS	Internal	Sets the number of internal data buffers.
CALL	Internal	Batch file command. Invokes execution of a secondary batch file.
CHDIR (also CD)	Internal	Changes the current directory (also CD).
CHKDSK.COM*	External	Checks the integrity of data on a disk. Displays information.
CLS	Internal	Clears all information from the monitor's screen.
COMMAND.COM*	External	Starts a second DOS command processor.
COPY	Internal	Copies files from one storage location to another.
COUNTRY.SYS ⁸	External	Designates the country code for displays.
CTTY	Internal	Changes the default terminal interacting with ROM-DOS.
DATE	Internal	Displays the date from the system's internal calendar. Allows revision.

⁸ International keyboards and code pages require COUNTRY.SYS, DISPLAY.SYS and KEYB.COM. These files are placed on the computer when needed. They are not part of the LXE installed and LXE supported file load.

ROM-DOS Command	Command Type	Description
DEL	Internal	Deletes specified files.
DELTREE.EXE*	External	Deletes one or more directory trees or individual files.
DEVICE	Internal	Installs a device driver into ROM-DOS.
DEVICEHIGH	Internal	Loads a device into the upper memory area, if available.
DIR	Internal	DIRectory. Lists contents of a specified directory.
DISPLAY.SYS ⁹	Installable	Displays international letters and symbols.
DOS (ROM-DOS)	Internal	Installs ROM-DOS into High Memory Area (HMA).
ECHO	Internal	Batch file command. Turns on or off display of batch execution on the monitor.
EGA/EGA3.CPI	Internal	Font data files for use with the International video display driver, DISPLAY.SYS.
ERASE	Internal	Erases specified files (same as DEL).
EXIT	Internal	Used to exit nested running of ROM-DOS within another program.
FCBS	Internal	Specifies the number of File Control Blocks (FCBS) open at one time.
FILES	Internal	Sets the maximum number of files that can be open at one time on the system.
FOR	Internal	Batch file command. Performs one DOS command on a set of files.
FORMAT.COM*	External	Initializes a disk so that ROM-DOS can access files on that disk.
GOTO	Internal	Batch file command. Moves control to a specified line in the batch file.
HELP	Internal	Lists all available ROM-DOS commands along with brief descriptions.
HIMEM.SYS*	Installable	Manages extended memory and the high memory area in a 286, 386, PS/2 system.
IF	Internal	Batch file command. Performs a command based on a specified condition.
INCLUDE	Internal	Allows instructions in one configuration block to be included with instructions in another configuration block.
INSTALL	Internal	Loads Terminate and Stay Resident (TSR) programs during CONFIG.SYS processing.

⁹ International keyboards and code pages require COUNTRY.SYS, DISPLAY.SYS and KEYB.COM. These files are placed on the computer when needed. They are not part of the LXE installed and LXE supported file load.

ROM-DOS Command	Command Type	Description
KEYB.COM ¹⁰	External	Allows altering of the keyboard layout for a different language or nationality.
KEYBOARD/ KEYBRD2.SYS	Internal	Keyboard code page data files for use with the International keyboard driver, KEYB.COM.
LASTDRIVE	Internal	Sets the maximum number of drives.
LOADHIGH	Internal	Loads a program into the upper memory area, if available.
MEM.EXE*	External	Displays the used and free memory in your system.
MENUCOLOR	Internal	Allows setting of text and background colors for the startup menu.
MENUDEFAULT	Internal	Sets the default menu-item choice and time-out value for making a selection.
MENUIITEM	Internal	Specifies an item to be placed on the startup menu display during system boot
MKDIR	Internal	Creates a new subdirectory.
MODE.COM*	External	Modifies the operation of the printer, serial port, and active video display.
MORE.COM*	External	Displays a text file one screen at a time.
MOVE.EXE	Internal	Moves files and renames files and directories.
NED.CFG*	Installable	Configuration file for NED.EXE ASCII text editor.
NED.EXE*	Installable	This program is used when editing ASCII text files.
NEWFILE	Internal	Allows continuation of CONFIG.SYS processing from a new file.
NUMLOCK	Internal	Sets the NUMLOCK keyboard key to on or off when your computer starts. This setting is ignored by the VXX OS.
PATH	Internal	Displays current command search path(s). A new path line can be specified.
PAUSE	Internal	Batch file command. Causes execution to halt until a key is pressed.
PRINT.COM*	External	Prints a list of files, up to ten files.
PROMPT	Internal	Resets the appearance of the system prompt line.
REM	Internal	A batch file command for identifying non-executing lines.

¹⁰International keyboards and code pages require COUNTRY.SYS, DISPLAY.SYS and KEYB.COM. These files are placed on the computer when needed. They are not part of the LXE installed and LXE supported file load..

ROM-DOS Command	Command Type	Description
REMDISK.EXE*	Installable	A remote disk management program. Usually run on the client.
REMSERV.EXE*	Installable	A remote disk management program. Usually run on the host.
REN	Internal	Renames files.
RMDIR (also RM)	Internal	Deletes a specified subdirectory.
SET	Internal	Sets environment variables and command processor strings.
SHELL	Internal	Allows selections of a command interpreter other than COMMAND.COM.
SHIFT	Internal	Batch file command. Shifts replaceable parameters one position to the left.
STACKDEV.SYS	Internal	Increases the number of stacks available for IRQ handlers and Int13h.
STACKS	Internal	Allows for the use of dynamic data stacks to handle interrupts.
SUBMENU	Internal	Defines a menu item that represents a secondary menu.
SWITCHES	Internal	Allows special CONFIG.SYS file options.
SYS.COM*	External	Transfers the hidden system files to a specified drive.
TIME	Internal	Displays current time from the system's internal clock. Also allows revision.
TYPE	Internal	Displays the contents of a text file on the monitor.
UMBLINK.SYS UMBLINK.EXE	Internal	A non-protected mode program that can allow the creation of Upper Memory Blocks using existing RAM areas.
VER*	Internal	Displays current version of ROM-DOS on the monitor.
VERIFY	Internal	Displays the current VERIFY state or sets the VERIFY state to on or off.
VERSION.SYS	Internal	Modifies the version number ROM-DOS reports.
VOL	Internal	Displays the volume label on a disk.
XCOPY.COM*	External	Copies multiple files and optionally subdirectories.

Index

; @ ?207
2nd key function39
3270 and 5250 TE
 Ctrl key function39
6224 Session Manager.....60

A

Access BIOS Setup.....77
Accessories21
 Electrostatic Discharge5
 Installing5
Aggressive CPU Setting85
Allocation units, lost
 and CHKDSK190
Allow Caps Function90
Alt key function39
ANSI.SYS56, 188
AP_Distance
 NET.CFG parameter128
API
 Application Programmer's Interface93
 Sample Code93
 Software Interrupt93
API Function Utility118
AT-compatible core logic24
ATTRIB.EXE189
Auto-Detect116
Auto-Detect Utility
 How To116
AUTOEXEC.BAT55, 63
 2.4 Sample65
 900 Sample64
AWCO48C61

B

Backup Battery
 Discharge Utility113
 Maintenance50
 Replacement50
 Test Utility113
 Time Limit51
Bad or missing Command Interpreter156, 157
Barcode
 Data Entry18
Barcode scanner in endcap11, 44
Batch units and TEs19, 59

Batteries182
Battery
 Backup50
 Charge New5
 Charger48
 Charging25
 Handling Safely51
 Lithium-Ion (Li-Ion)25
 Low Warning timing47
 Nickel Cadmium (NiCad)25
Battery Compartment7
Battery Discharge Utility50, 113
Battery Life
 Approximate47
Battery, charge before using6
Battery, How To7
BBDIS81.EXE58, 111, 113
BBTST81.EXE58, 111, 113
BCWEDGE109
BCWEDGE.EXE58, 109
BEEP81.EXE58, 111, 113
Beeper Test Utility113
BIOS
 Advanced Menu
 Keyboard90
 Other91
 Other menu91
 Power Mgt84
 Boot80
 Caps90
 COM1 Pin991
 COM2 Pin991
 CPU85
 CtlAltDel90
 Date80
 Disp BL86
 Display86
 Docked PM89
 Exit Menu92
 Exit w/o Save92
 Font91
 Left Scan84
 Load Defaults92
 Load Previous92
 NumLock90
 Post Msg81
 Power Key89
 Power Mgt84

Right Scan.....	85
Rpt Delay.....	90
Rpt Rate.....	90
Save and Exit.....	92
Save Changes.....	92
Setup Msg.....	80
Summary.....	82
Suspend.....	87
Time.....	79
Touch Wake.....	89
BIOS Setup	
Advanced Menu.....	83
Main Menu.....	79
Parameter Changes.....	77
Boot.....	80
Boot Order	
Verifying.....	157
BOOTP.....	140
Borland C/C++ Version 4.5.....	103
BREAK, Internal File.....	207
BUFFERS, Internal File.....	207
BusType	
NET.CFG parameter.....	135
Bypass Configuration Files.....	156

C

CALL, Internal File.....	207
Caps.....	90
Caps mode function.....	40
Card_Power_Management	
NET.CFG parameter.....	138
Channel	
NET.CFG parameter.....	132
Charger	
Battery.....	48
Charging Battery	
Time Required.....	25
CHDIR, Internal File.....	207
CHKDSK.EXE.....	56, 190
Cisco Specific Radio Driver.....	61
CISDUMP.....	57
Cleaning	
Display.....	34
CLS, Internal File.....	207
CMOS time and date not set.....	156
CNFIGNAM.EXE.....	57
COM Port Switching.....	11, 44
COM Port Test Utility.....	114
COM1 Pin9.....	91
COM2 Pin9.....	91
Command Summary.....	207
COMMAND.COM.....	56, 63, 157, 191
Components, Location.....	2
COMTST81.EXE.....	58, 111, 114

Condition, Restore.....	92
CONFIG.SYS.....	55, 63
Sample.....	66
Configuration.....	63
Configuration Files	
Bypass.....	156
Conventional Memory.....	169
Convert MS-DOS to ROM-DOS.....	168
COPY, Internal File.....	207
COUNTRY.SYS, External File.....	207
CPU.....	23, 85, 181
CPU Custom Setting.....	85
Cradles, storage and function.....	46
Critical Suspend.....	51, 84, 88
State.....	31
what happens when.....	49
Critical Suspend mode.....	29
Critical Suspend state.....	49
CtlAltDel.....	90
Ctrl key function.....	39
CTTY, Internal File.....	207
Custom CPU Setting.....	85

D

Data Entry	
Barcode, RS-232 and Keyboard.....	18
Datalight ROM-DOS commands.....	187
DataRateX	
NET.CFG parameter.....	134
Date.....	80
DATE	
Internal File.....	207
Default	
CPU Setting.....	85
NED Hot Keys.....	123, 200
Default Font.....	91
Default Value	
Delay Off Timer.....	29
Default Values, Load.....	92
Defaults	
BIOS parameters.....	78
DEINSTALL.EXE.....	163
DEL, Internal File.....	208
DELTREE.EXE.....	192
DEVICE, Internal File.....	208
DEVICEHIGH, Internal File.....	208
Devices, Optional	
Troubleshooting.....	165
DHCP.....	140
Digitizer Calibration Utility.....	58
Digitizer Test Utility.....	58
Dimensions.....	182
DIR, Internal File.....	208
Directory.....	19, 59

Directory File Listing	55
Discard BIOS Parameter Changes	92
Disp BL	86
DISP81.EXE	58, 111, 115
Display	86, 181
Cleaning	34
Description	32
Panning	33
Repair	34
Size	32
Specifications	184
Troubleshooting	162
Display Backlight Timer	33
Display POST Errors	81
Display Timer	33
Display Window	33
Display window size	33
DISPLAY.SYS, External File	208
Diversity	
NET.CFG parameter	135
Docked PM	89
Docking Cradle	101
Docking Stations	
and Power Mgt BIOS parameter	89
Document Conventions	4
domain	
Socket parameter	143
Domain	
NET.CFG parameter	131
DOS (ROM-DOS), Internal File	208
DOS boot SRAM card	5
DOS Configuration	63
DOS Files	53
DOS key functions unavailable	40
DOS Menu	
Internal	
MENUCOLOR	209
MENUDEFAULT	209
MENUITEM	209
SUBMENU	210
DPMS.EXE	57
DRIVER.1ST	61
Dual TE Menu	60

E

ECHO, Internal File	208
EGA/EGA3.CPI, Internal Files	208
Electrostatic Discharge	13, 15
Enable Encryption	
NET.CFG parameter	130
Endcap	12
Endcaps	
COM1 and COM2	11
Enter key function	39

Environmental Specifications	183
ERASE, Internal File	208
Error Messages	156
Errors	
POST	81
Exit and Save	92
Exit Menu	
Exit w/o Save	92
Load Defaults	92
Load Previous	92
Save and Exit	92
Save Changes	92
Exit w/o Save	92
EXIT, Internal File	208
Extended Memory	169
External Connectors/Interface	182

F

Failure	
Battery Pack	50
FCBS, Internal File	208
Features	1
Field Exit key function	39
File Allocation Table (FAT)	190
FILES, Internal File	208
Flash or Hard Disk	
Troubleshooting	162
Font	91
Font size in pixels, chart	33
Font Sizes	32
FOR, Internal File	208
Force Suspend State	29
FORMAT.COM	56, 193
FragThreshold	
NET.CFG parameter	134
Frame	
NET.CFG parameter	135
FTP Kernel	
Troubleshooting	167
Full Speed CPU Setting	85
Function	
2nd Key	39
Alt Key	39
Caps Mode	40
Ctrl Key	39
Enter Key	39
Field Exit Key	39
Power Key	29, 89
Scan Key	38
Shft Key	39
Spc Key	40

G

Getting Started.....	5
Getting the Most from Your Batteries.....	51
GOTO, Internal File.....	208
Graphics, VGA.....	32

H

Handling Batteries.....	51
Handstrap, How To.....	8
Hard Disk or Flash Troubleshooting.....	162
Hardware Configuration.....	23
Troubleshooting.....	161
Help.....	172
HELP, Internal File.....	208
HIMEM.SYS.....	56, 194
Hot Keys, NED editor.....	123, 200
Hot Swapping Main Battery.....	51
How To File Transfer.....	99, 101
Get Help.....	172
Print.....	100, 102
Radio Card.....	15
Set System Time and Date.....	160

I

IEC IP55.....	183
IF, Internal File.....	208
iface Socket parameter.....	143
Inactivity_min NET.CFG parameter.....	132
Inactivity_sec NET.CFG parameter.....	132
INCLUDE, Internal File.....	208
InfraRed Port.....	43
Initialize_365 NET.CFG parameter.....	132
INSTALL, Internal File.....	208
Int NET.CFG parameter.....	131
interface Socket parameter.....	143
Internal Flash Array (IFA).....	24, 53
Internal Flash Array (IFA) and Bootup.....	77
ip Socket parameter.....	146
IPSTAT.EXE.....	61
IR operating envelope.....	43, 97
IR Operating Envelope.....	99

IR Port.....	43
IrDA Lite Plus.....	43, 97
and Docking Cradle.....	101
File Transfer.....	99, 100
Print.....	100
Quick Start.....	98
Setup.....	97
IRECV.C.....	98, 103
IRPLUS.EXE.....	57
IRQ NET.CFG parameter.....	135
Troubleshooting.....	164
IRSEND.C.....	98, 103

K

Key Map, ANSI Plus.....	173
Key Map, LDS Plus.....	173
KEY2381.EXE.....	58, 111, 115
Keyboard Caps.....	90
CtlAltDel.....	90
Data Entry.....	18
NumLock.....	90
Rpt Delay.....	90
Rpt Rate.....	90
Keyboard Key Label Test.....	115
KEYBOARD, Internal File.....	209
KEYBRD2.SYS, Internal File.....	209
Keypad Troubleshooting.....	161
Keypads.....	36
Backlight.....	36
Keypads, overlays.....	37
Keypress Delay Rate.....	90
Keypress Repeat Delay.....	90
Keypresses BIOS.....	77

L

LASTDRIVE, Internal File.....	209
LEDs 2nd function.....	41
ALT function.....	41
BATT B function.....	42
BATT M function.....	42
CAPS function.....	41
CHGR function.....	42
CTRL function.....	41
Notification/Status.....	30
on keypads, location.....	41
SCNR function.....	42
SHFT function.....	41

STAT function	42
Left Scan.....	84
Light CPU Setting	85
Li-Ion	
1400 mAh	25
1800 mAh	25
Link Support	
NET.CFG parameter	128, 131, 133, 137
Lithium-Ion (Li-Ion).....	47
Load Defaults	92
Load Previous.....	92
LOADHIGH, Internal File	209
Location, Components	2
Loopback Connector	
for RS-232 Endcap COM Port Test Utility.....	114
Lost chains.....	190
Low Battery Warning	48
Low Main Battery.....	30
LSL.COM.....	61
Lucent Specific Radio Driver.....	61
LXE and ROM-DOS commands.....	187
LXE BCWEDGE.....	109
LXE Customer Support.....	172
LXE manuals.....	21
LXE900SS.EXE.....	62
LXE900SS.HEX.....	62
LXEF.EXE	58, 111, 115

M

Mac_optimize	
NET.CFG parameter	132
Main Battery	
and Critical Suspend state.....	51
components	6
Hot Swapping	51
Main Battery is depleted.....	30
Main Battery Low Warning.....	30
Main Battery Pack	47
Main Battery Power Failure	30, 49
Main system memory	24
Maintenance, required	
Backup Battery.....	50
Manuals	21
Mass Storage	181
Maximum_Sleep_Duration	
NET.CFG parameter	130
MaxPowerSave	
NET.CFG parameter	134
Medium_Reservation	
NET.CFG parameter	129
Mem#1 (ODI)	
NET.CFG parameter	131
MEM.EXE.....	56, 196

Memory	181
NET.CFG parameter	135
Troubleshooting.....	169
Memory Map.....	26
Microsoft Windows.....	18
Microwave_Oven_Robustness	
NET.CFG parameter	129
Missing Files	207
MKDIR, Internal File	209
Mode Key Functions	40
MODE.COM.....	56, 197
Moderate CPU Setting.....	85
MORE.COM	56, 198
MOVE.EXE, Internal File.....	209
MX3 Reference Guide.....	1

N

NED editor	122, 199
NED.CFG.....	56, 209
NED.EXE.....	56, 209
NET.CFG	61, 127
and Touchscreen	34
Sample	
Cisco	69, 71, 73
Lucent	67
Proxim.....	68
New Battery.....	5
NEWFILE, Internal File.....	209
NiCad	47
NiCAD	
50 mAh	25
Nickel-Cadmium (NiCad)	47
NodeName	
NET.CFG parameter	134
Non-System disk or disk error.....	156
NumLock	
NUMLOCK, DOS Command.....	209
NUMLOCK, Internal File	209

O

O'Neill MicroFlash	100
ODIPKT.COM	61
Off Timer.....	31
Default Value.....	29
On/Off Switch	29
Operating Temperature.....	183
US AC to DC	183
WW AC to DC.....	184
Other	
COM1 Pin9.....	91
COM2 Pin9.....	91
Font.....	91

P

Panning the display.....	33
param	
Socket parameter.....	147
PARAM.DAT.....	116
PARAM81.EXE.....	58, 111, 116
Parameter Auto-Detect Utility.....	116
Parameter Changes	
BIOS.....	79
Parameters	
NET.CFG	
Cisco.....	133, 137
Lucent.....	128
Proxim.....	131
Parameters, BCWEDGE.....	109
PATH, Internal File.....	209
PAUSE, Internal File.....	209
PC Card.....	13
Storage.....	14
PC card management software	
Required.....	13
PC Card Slot 1.....	13
PC card slots.....	13
PC Radio.....	15
PCM.EXE.....	57
PCM.INI.....	57
PCMATA.SYS.....	57
PCMCIA.....	13
PCMCIA Cards	
Troubleshooting.....	163
PCMCIA Directory.....	57
PCMCIA Interface.....	181
PCMCIA Radio.....	15
PCMCIA Slots.....	28
PCMCS.EXE.....	57
PCMFDISK.EXE.....	57
PCMRMAN.SYS.....	57
PCMSCD.EXE.....	57
PCMSS.EXE.....	57
PCRFLIB.EXE.....	62
PDTEST.EXE.....	61
Peer_to_peer	
NET.CFG parameter.....	132
Physical Controls.....	29
Physical Specifications.....	181
Ping, use XPING.EXE.....	61
Port	
NET.CFG parameter.....	131
PortBase	
NET.CFG parameter.....	135
POST Messages	
Beep Codes.....	171
Error Messages.....	170
Post Msg.....	81

Power	
On and Off, How To.....	10
Power button.....	29
and suspend mode.....	10
Power Connector.....	182
Power Key.....	89
Power Light.....	29
Power Management	
and the Keypad.....	31
Power Mgt.....	84
CPU.....	85
Disp BL (time).....	86
Disp BL (timer).....	86
Display.....	86
Docked PM.....	89
Left Scan.....	84
Power Key.....	89
Power Mgt.....	84
Right Scan.....	85
Suspend.....	87
Touch Wake.....	89
Power Mgt and CPU Setting.....	85
Power Mgt and Delay Off.....	84
Power Off	
Forced.....	10, 90, 161
Power On Self Test (POST).....	170
Power Source	
Troubleshooting.....	161
Power Status LED.....	30
Power Supply.....	47
Battery Packs.....	25
Power Switch.....	29
PowerSaveMode	
NET.CFG parameter.....	134
Pre-loaded DOS Files.....	53
Print.....	100, 102
PRINT.COM.....	201
Problem Solving.....	155
Programmable Buttons.....	38
PROMPT, Internal File.....	209
Protocol	
NET.CFG parameter.....	128, 131, 133, 137
PROTOCOL.INI.....	84
Proxim Specific Radio Driver.....	61

Q

Quick Start Instructions.....	5
-------------------------------	---

R

Radio	
Troubleshooting.....	166
radio driver software	

- Required.....15
 - Radio Specifications.....185
 - RAM.....29
 - Real time clock failure.....156
 - Reboot.....40
 - Reboot permission.....90
 - Receive_All_Multicasts
 - NET.CFG parameter.....130
 - RefreshInterval
 - NET.CFG parameter.....134
 - REM, Internal File.....209
 - REMDISK.....202
 - REMDISK.EXE.....56, 125, 202, 210
 - REMSERV.EXE.....56, 124, 203, 210
 - REN, Internal File.....210
 - Repair Display.....34
 - Reset Key Sequence.....40
 - Restore.....92
 - Restore BIOS from Flash.....92
 - RF and Suspend Timers.....84
 - RFPARSE.EXE.....62
 - Right Scan.....85
 - RL2PCM.COM.....61
 - RMDIR, Internal File.....210
 - Roam_config
 - NET.CFG parameter.....132
 - ROM-DOS command processor.....191
 - ROM-DOS commands.....187
 - Root Directory.....55
 - route
 - Socket parameter.....149
 - Rpt Delay.....90
 - Rpt Rate.....90
 - RS-232
 - Data Entry.....18
 - RS-232 Pinouts.....45
 - RTSThreshold
 - NET.CFG parameter.....134
-
- S**
- Sample Files.....64
 - Save and Exit.....92
 - Save BIOS Parameter Changes.....92
 - Save Changes.....92
 - Save to CMOS RAM.....78
 - Scan button
 - and Tethered Scanners.....11, 44
 - Scan key function.....38
 - Scanner Configuration Utility.....117
 - Scanner in endcap.....11, 44
 - Scanner indicator.....44
 - Screen or Display Test Utility.....115
 - Screwdriver
 - Phillips, for handstrap.....8
 - SCU.EXE.....58, 112, 117
 - Select Boot Sequence.....80
 - Serial Port endcap.....12, 45
 - Serial to infrared converter cable
 - and a PC.....97
 - Set COM 1 Port Pin9 Setting.....91
 - Set COM 2 Port Pin9 Setting.....91
 - Set Display Backlight Mode.....86
 - Set Display Backlight Timer.....86
 - Set Display Timer.....86
 - Set Left Button.....84
 - Set Right Button.....85
 - Set System Date.....80
 - Set System Time.....79
 - SET, Internal File.....210
 - SETAPI_4.EXE.....58, 112, 118
 - SETHOST.EXE.....61
 - Setting SOCKETS.CFG Parameters.....141
 - Setup Msg.....80
 - SHELL, Internal File.....210
 - Shift key function.....39
 - SHIFT, Internal File.....210
 - Show Summary Screen.....82
 - Show System Prompt.....80
 - Shutdown time limits.....48
 - SLAINIT.....61
 - Slot 0
 - Lower Slot.....28
 - Slot 1
 - Upper Slot.....28
 - Socket
 - domain.....143
 - iface.....143
 - interface.....143
 - ip parameter.....146
 - NET.CFG parameter.....131, 135
 - param.....147
 - route.....149
 - tcp.....151
 - SOCKET.CFG.....61, 140
 - Sample.....75
 - SOCKETP.EXE.....61, 140
 - Sockets TCP/IP Stack.....140
 - Software
 - Troubleshooting.....167
 - Software and Files.....53
 - Space key function.....40
 - SRAM or Flash PCMCIA.....181
 - SSID
 - NET.CFG parameter.....134
 - STACKDEV.SYS, Internal File.....210
 - STACKS, Internal File.....210
 - Startup
 - Troubleshooting.....156
 - Station_Name

NET.CFG parameter	128
Station_type	
NET.CFG parameter	131
Status LED	30
Status/Notification LED	30
Storage Temperature	183
US AC to DC	183
WW AC to DC	184
Stored Forms	
Space required	20
Storing PC Cards	14
Subchannel	
NET.CFG parameter	132
Subdirectory	
DOS	56
PCTCP	61
Summary	82
Summary, ROM-DOS Commands	207
Suspend	
Power Key	89
Timer	87
Touch	89
Suspend State	29, 31
Suspend Timer	29
Suspend Timers	
and CPU and RF Communication	84
SWITCHES, Internal File	210
Symbol Specific Radio Driver	61
SYS.COM	56, 204
System Configuration	53, 63
DOS Configuration	
AUTOEXEC.BAT	63
COMMAND.COM	63
CONFIG.SYS	63
System Hardware Configuration	23
System Setup	
IrDA Lite Plus	97
System Suspend Timer	87

T

tcp	
Socket parameter	151
TCP.EXE	61
TCP/IP Stack	140
TE Directories	19, 59
TE screen and font sizes	20
Technical Specifications	181
Terminal Emulation Programs	1
Terminal Emulations	
ANSI Plus	19
DOS 3270	19
DOS 5250	19
LDS Plus	19
TN3270	19

TN5250	19
TERMTYPE.EXE, Function	55
TESELECT.BAT	60
Tethered scanner	
and the Scan button	11, 44
Time	79
TIME, Internal File	210
Timer	
Off	29
Touch Wake	89
Touchscreen	34
and NET.CFG file	34
Display backlighting effect	34
Touchscreen Calibration	120
Transmit_Key_ID	
NET.CFG parameter	130
Transmit_Rate	
NET.CFG parameter	129
Troubleshooting	155
Hard Disk or Flash	162
Power Off	10, 90, 161
TSCAL.EXE	58, 112, 120
TSTEST.EXE	58, 112, 120
Type II radio	15
TYPE, Internal File	210

U

UMBLINK.EXE, Internal File	210
UMBLINK.SYS, Internal File	210
Unavailable	
DOS key functions	40
Upper Memory Block (UMB)	24
Upper Memory Conflicts	
Troubleshooting	164
Using the Keypad	
BIOS	77
Utilities	95
BBDIS81.EXE	113
BBTST81.EXE	113
BEEP81.EXE	113
COMTST81.EXE	114
DISP81.EXE	115
KEY2381.EXE	115
Parameter Auto-Detect	116
SCU.EXE	117
SETAPI_4.EXE	118
Enable COM2	119
TSCAL.EXE	120
TSTEST.EXE	120
UTILS Directory	58

V

VER.....	56
VER and ROM-DOS.....	205
VER, Internal File.....	210
Verify Boot Order.....	157
VERIFY, Internal File.....	210
VERSION.SYS, Internal File.....	210
VGA Text and Graphics.....	24, 32
Video Subsystem	
Character Size.....	24, 32
Display Characteristics.....	24
Virtual Screen.....	33
Virtual screen segment	
Top left corner.....	33
Virtual screen size.....	33
VOL, Internal File.....	210

W

Wake the MX3 from Suspend.....	29
--------------------------------	----

Wake Up.....	31
Warning	
Low Battery beeps.....	48
WaveLAN_Network_Name	
NET.CFG parameter.....	128, 137
Weights.....	181
WEP enable	
NET.CFG parameter.....	135
WEPDOS utility.....	136
WEPDOS.EXE.....	61
When to use this guide.....	3
WVLAN43 (all WVLAN44 files).....	61

X

XCOPY.COM.....	206
XCOPY.EXE.....	56
XPING.EXE.....	61

