MOTOROLA

Land Mobile Products Sector

Mobile Workstation 520™

Land Mobile Products Sector
16 Kremenetski Street, Tel Aviv 67899

Application Developer's Guide

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NOTE: This equipment has been tested and found to comply with limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial or residential environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications.

Trademarks

Contents

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Related Documents

The following manuals provide additional information:

- *Mobile Workstation 520™ Owner's Manual,* 68P02950C60
- *Mobile Workstation 520™ Quick Reference Card,* 68P02950C99
- *Mobile Workstation 520™ Vehicle Installation Manual,* 68P02951C30
- *RPM500, Radio Portable Modem, Radio Service Software, User's Guide,* 68P02945C40

About This Guide

Scope

Mobile Workstation 520™ is a standard Pentium®/120 or Pentium MMX/166 processor which runs MS-Windows® 3.11, Windows 95 or Windows NT® 4.0. The mobile workstation has an embedded wireless network device. Any Windows programmer workbench and application generators can be used by the application programmer. Typical programmer workbenches are:

- Visual C/C++®, Microsoft®
- Microsoft Foundation Class, Microsoft
- Visual Basic, Microsoft

In order to design and optimize applications for MW-520, the developer should follow some guidelines.

Although the application can be a standard Windows application, it can take advantage of services provided by MW-520 enhanced Application Program Interface (API) and follow its guidelines. These services are described in “Using Specific Hardware Features” on page 30.

The design goal of MW-520 system software is to free the application from managing the MW-520 hardware. This allows the application to be developed on a desktop PC with more memory resources and a larger display. It also saves the programmer the effort of studying the hardware and the Basic Input/Output System (BIOS), and of developing the software needed to manage them. See “System Software” on page 8 for more information.

Disclaimer

The information included in this document is intended for planning application development. Despite our best efforts, some information may change. Motorola will try to keep you informed of any significant changes. This document carries no guarantee that the information contained herein is completely accurate.

Intended Audience

This manual is intended for Original Equipment Manufacturer (OEM) and end user software application designers and integrators who require knowledge of the product programming interface.

Related Documents

The following manuals provide additional information:

- *Software Specification – MultiKey/3434L Technical Reference* V 1.0 Phoenix Technologies, 1996.
- *APM BIOS Interface Specification*, Rev 1.2. Intel and Microsoft, 1993.
- *Microsoft Windows 3.1 APM Release Notes*, Rev 2.0. 1992.
- *Writing Windows Device Drivers*, Microsoft.
- *405i Communication Protocol, Native Mode* V 1.1.
- *Phoenix PicoCard™ User's Guide*, Phoenix Technologies, 1996.
- *Power Management Developers Reference*, PM SDR, Phoenix Technologies, 1995.
- *PicoBIOS® BIOScope Technical Reference*, Phoenix Technologies, 1995.
- *PicoBIOS BIOS 4.0, Developer's Reference*, Phoenix Technologies, 1995.
- *PicoBIOS Porting Guide*, Phoenix Technologies, 1995.

MW-520 Description

General

This chapter provides an introductory overview of the MW-520 workstation. Characteristics of the mechanical and electrical design and the basics of operation are briefly described.

Specifications

Table 1
MW-520 Features & Specifications

Feature		Basic MW-520 Specifications	
Processor		Intel® Pentium®, 120 MHz or 166MHz MMX™	
Internal Memory		8 MB RAM expandable to 64 MB	
LCD		Monochrome VGA	Color VGA (optional)
	Resolution:	640 x 480	640 x 480
	Gray Levels:	64 Grays	256,000 Colors
	Type:	Transflective	Active Matrix
Communications/Expansion			
	Serial:	2 with 16550 UART support	
	Parallel:	1 with ECP/EPP support	
	Video:	Analog VGA	
	PC Card Slots:	Two Type II or One Type III	
Mass Storage			
	Hard Disk:	1.4 GB or larger (optional)	
	Flash Disk:	10 MB	
Keyboard			
	Main:	QWERTY, 84 keys total, 12 function keys, spill-resistant	
	Pointing Device:	Integrated Touch-Pad (optional)	
	Display:	6 illuminated function keys	
Radio Communications (800 MHz)			
	Frequency Range:	806 - 824 MHz Tx, 851 - 869 MHz Rx	
	Protocol:	MDC-4800™, RD-LAP 9.6, RD-LAP 19.2 (25 kHz spacing)	
	RF Power Output:	3 Watts into 50 Ohm load	
	Power Amplifier:	35 Watts, External (optional)	
Physical size (H×W×D)			
	Processor Unit:	2.65” x 7” x 8.5”	
	Mono Display Unit:	10.3” x 11” x 1.3”	
	Color Display Unit	10.5” x 12” x 2”	
	Keyboard Unit:	2” x 12” x 8”	
Environmental			
	Operating Temperature	-20° to +50°C without Hard Disk option 0 to +50°C	
	Storage Temperature	-40° to +70°C	
	Humidity	90% to 95% non condensing @ 50°C	
	Vibration	Per MIL STD 810E	

Data Exchange Network

MW-520 typically communicates over a radio data network consisting of a central (host) computer that runs messaging and form-generation software, a radio network control processor, and remote base stations with a general communications controller.

This network configuration allows messages to be transmitted and received quickly and accurately, to ensure the availability of information when and where it is needed. This also means that the MW-520 user can download and edit forms located on the host computer, regardless of the user's location.

Through the use of several base stations, a single frequency can be reused for wide area coverage. This allows different messages to be transmitted simultaneously to different workstations.

Hardware Description

MW-520 is intended to be a new class of terminal products for private and shared markets. The mobile device will support data entry via a keyboard and touchpad. It consists of three separate interconnected components: processor unit, display unit, and keyboard.

The Processor Unit

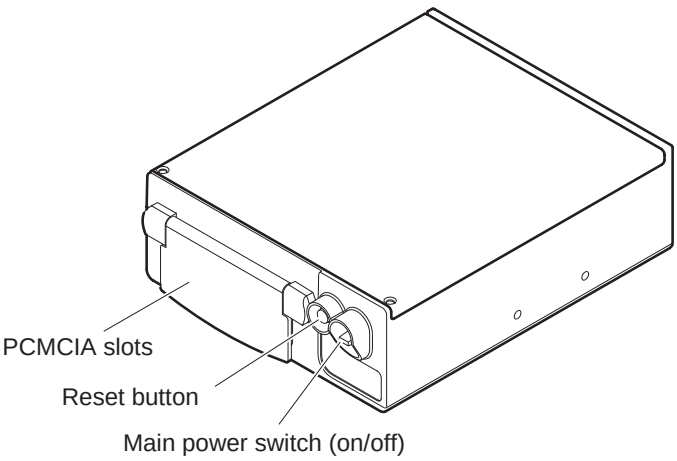

Figure 1
Processor

The main power switch, the reset button and the PCMCIA slot are located on the front panel of the processor.

Main Power Switch	Connects/disconnects the terminal power supply from the vehicle's battery.
Reset Button	Generates a hardware reset.

PCMCIA Slot — The MW-520 features a slot for installing two PCMCIA Type II cards or one PCMCIA Type III card. A cover protects the PCMCIA slot against severe environment conditions.

The Display Unit

The display unit is a VGA monochrome LCD, or upgrade option V557, that is a color, active-matrix LCD. The display includes seven pre-defined buttons and six user-defined buttons.

The pre-defined buttons are:

- Power
- Suspend/Resume
- Backlight on/off
- Contrast *(for momochrome display only)*
- Brightness
- Volume
- Emergency

The Emergency button is located in the lower left corner of the display unit. It may be used only if the application supports its functionality.

The other buttons are located near the LCD, together with the LEDs.

The Suspend button is a toggle switch.

In Suspend mode, the display is turned off, and the electrical circuits enter a power saving mode. When MW-520 wakes-up from Suspend mode, the previous terminal state is restored (previous display, LED indication, etc.).

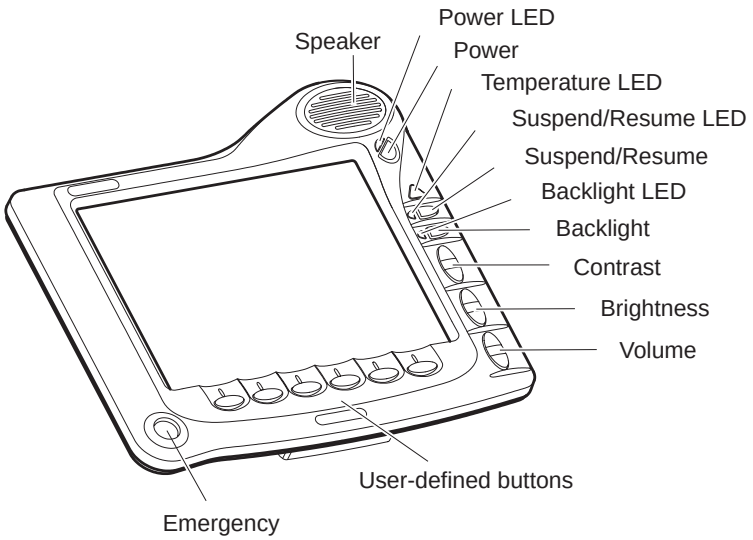

Figure 2
Monochrome Display Unit

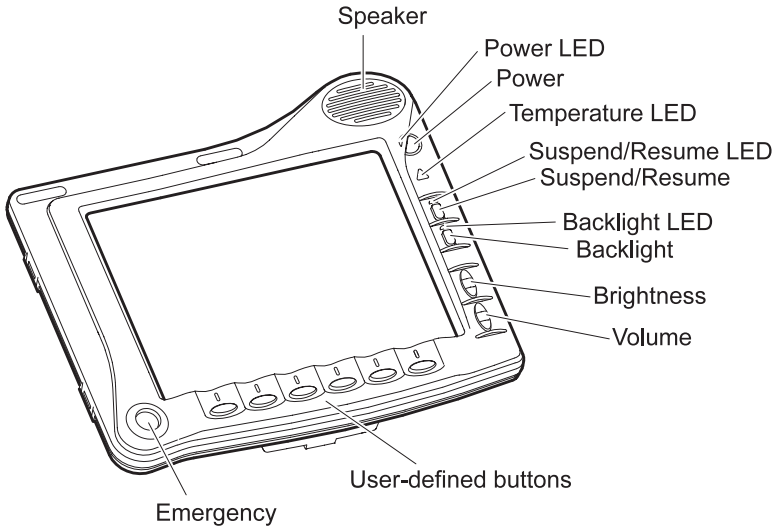

Figure 3
Color Display Unit

Table 2
Display Buttons Functionality

Control/Indicator	Function
Power	Turns the MW-520 on or off.
Power LED	Power on/off indication.
Temperature LED	Extreme temperature conditions indication.
Suspend/Resume	Toggles between suspend and resume.
Suspend/Resume LED	Suspend indication.
Backlight	Backlight on/off. Adjust backlight level, using the Brightness button.
Backlight LED	Backlight on/off or faulty processor indication.
Contrast *(for monochrome display only)*	Increases/decreases contrast level.
Brightness	Increases/decreases brightness level.
Volume	Increases/decreases speaker's volume level.
User-defined	Carries out a specific function, according to the specific user application.
Emergency	Sends an emergency message to the RF host computer. (This key's functionality depends on its definition in each user system and the active application.)

Battery

MW-520 is externally powered from the 12V vehicle battery. A backup battery maintains the system configuration and time.

Microphone, Sound Blaster, and Speaker

One of MW-520 main features is its integrated data and voice communication capability.

The workstation has an internal speaker located on the display unit. The speaker is used for various audio alert signals.

The processor unit includes a Windows 95 compatible sound card and external microphone and speaker jacks.

The microphone and the speaker may also be used for future two-way voice communication, text-to-speech, and voice recognition applications.

System Software

BIOS

The MW-520 system setup program is PicoBIOS, developed by Phoenix Technologies Ltd., for mobile Pentium based computers.

The BIOS enables running MS-DOS®, Windows® 3.11, Windows 95, and Windows NT® 4.0 on the MW-520 platform. It also provides hardware initialization, system boot, power management, Plug & Play registry data-base, and other features.

The BIOS setup is a program that configures the MW-520 hardware according to individual needs and saves the configuration into the CMOS memory (see *Mobile Workstation 520, Owner's Manual* for more information).

Operating System

MW-520 may run the following operating system configurations:

- A reduced set of MS-DOS 6.22 and Windows 3.11 to minimize storage requirements for the MW-520 basic model.
- A full set of MS-DOS 6.22 and Windows 3.11 for MW-520 upgrade option V525.
- A full set of Windows 95 for MW-520 upgrade option V525.
- A full set of Windows NT 4.0 for MW-520 upgrade version V525.

The basic model has 10 MB flash disk of mass storage memory that works as a standard IDE drive. No special drivers are required to work with it.


Note

At least 32 MB of RAM are required for the Windows NT 4.O operating system configuration.

Reduced Set of MS-DOS 6.22 and Windows 3.11

This operating system version contains only the components required to provide system boot, PCMCIA stack drivers and configuration files (AUTOEXEC.BAT and CONFIG.SYS).


Note

The PCMCIA drivers in the MW-520 CONFIG.SYS file must remain in the order in which they appear in the shipped configuration.

To reduce storage requirements, those extensions and optional accessories unnecessary for the mobile environment, such as games, fonts, disk caching, and many help functions, are omitted.

After functionality reduction this version contains:

- All core functions
- 386 enhanced mode
- Power Management
- Program Manager
- File Manager
- Dynamic Data Exchange (DDE) and Object Linking and Embedding (OLE)
- MW-520 Special Hardware Support

Note

Other DOS utilities can be installed by customers, subject to memory constraints.

The MW-520 includes additional files that were added by Motorola to support the workstation's special abilities.

Refer to the system software contents listed below if you want to use the same DLL files, fonts or utilities in your application.

Caution

Do not remove these files from the compact flash disk, as this can cause your system to malfunction.

The following file list is subject to change without notice.

```
Directory of C:\DOS
MONOUMB   386  8,783    31/05/94  6:22
FORMAT    COM  22,974   31/05/94  6:22
SYS       COM  9,432    31/05/94  6:22
COMMAND   COM  54,645   31/05/94  6:22
EDIT      COM  413      31/05/94  6:22
QBASIC    EXE  194,309  31/05/94  6:22
INTERLNK  EXE  17,197   31/05/94  6:22
INTERSVR  EXE  37,426   31/05/94  6:22
SMARTDRV  EXE  45,145   31/05/94  6:22
POWER     EXE  8,052    31/05/94  6:22
FDISK     EXE  29,336   31/05/94  6:22
          13 file(s)    427,712 bytes

Directory of C:\WINDOWS
VHWEVNTD  386  5,285    11/02/97  11:52
SYSTEM    CLN  2,078    27/01/88  19:00
WIN       CLN  3,446    27/01/88  19:00
WIN       COM  50,904   28/01/88  23:18
REG       DAT  2,825    27/01/88  18:59
SETUP     EXE  244,255  01/11/93  2:11
WINSETUP  EXE  196,960  01/11/93  2:11
TERMINAL  EXE  148,160  01/11/93  2:11
```

```
WINFILE   EXE  170,464  01/11/93  2:11
EMM386    EXE  120,926  01/11/93  2:11
PROGMAN   EXE  115,312  01/11/93  2:11
CLIPSRV   EXE  19,456   01/11/93  2:11
CONTROL   EXE  15,872   01/11/93  2:11
NOTEPAD   EXE  32,736   01/11/93  2:11
SMARTDRV  EXE  45,145   01/11/93  2:11
WININIT   EXE  26,615   01/11/93  2:11
WINVER    EXE  3,888    01/11/93  2:11
EXITDOS   EXE  2,337    19/01/97  15:04
MAIN      GRP  2,944    16/02/88  18:07
ACCESSOR  GRP  1,493    16/02/88  18:07
STARTUP   GRP  44       16/02/88  18:07
DOSAPP    INI  143      05/02/88  4:03
SYSTEM    INI  2,551    19/03/97  13:58
MOUSE     INI  24       27/01/88  18:56
PROGMAN   INI  177      16/02/88  18:07
SERIALNO  INI  116      27/01/88  18:57
CONTROL   INI  3,661    29/01/88  2:14
GPOINT    INI  189      27/01/88  19:09
WINFILE   INI  200      16/02/88  19:03
CHIPSCPL  INI  2,471    28/01/88  23:20
HWAPP     INI  203      25/02/97  12:27
WIN       INI  3,761    16/02/88  17:44
PCM       NEW  1,583    27/01/88  19:34
_DEFAULT  PIF  545      27/01/88  18:59
DOSPRMPT  PIF  545      27/01/88  18:59
SHARES    PWL  620      27/01/88  18:59
SCRNSAVE  SCR  5,328    01/11/93  2:11
IFSHLP    SYS  4,548    01/11/93  2:11
HIMEM     SYS  29,136   01/11/93  2:11
RAMDRIVE  SYS  5,873    01/11/93  2:11
SYSTEM    <DIR>05/03/97 12:02
          43 file(s)    1,272,819 bytes

Directory of C:\WINDOWS\SYSTEM
CHIP      2GR  4,484    10/03/92  4:10
VFAT      386  32,925   01/11/93  2:11
VTDAPI    386  5,245    01/11/93  2:11
IOS       386  28,352   01/11/93  2:11
LPT       386  5,917    01/11/93  2:11
VPOWERD   386  9,426    01/11/93  2:11
IFSMGR    386  65,625   01/11/93  2:11
SERIAL    386  11,112   01/11/93  2:11
VCACHE    386  9,862    01/11/93  2:11
VCOMM     386  5,688    01/11/93  2:11
VPMTD     386  5,653    01/11/93  2:11
VSHARE    386  14,925   01/11/93  2:11
VXDLDR    386  5,678    01/11/93  2:11
CHIP31    386  40,620   23/06/95  11:07
VGA       3GR  16,384   01/11/93  2:11
CHIP      3GR  13,824   10/03/92  4:10
MIDIMAP   CFG  34,522   01/11/93  2:11
WIN       CNF  13,840   01/11/93  2:11
CPWIN386  CPL  111,760  01/11/93  2:11
MAIN      CPL  148,592  01/11/93  2:11
DRIVERS   CPL  41,440   01/11/93  2:11
SND       CPL  8,192    01/11/93  2:11
CHIPSCPL  CPL  55,264   12/01/96  15:11
```

```
NCDW      DLL  41,264   01/11/93  2:11
WFWSETUP  DLL  337,008  01/11/93  2:11
COMMCTRL  DLL  48,112   01/11/93  2:11
LZEXPAND  DLL  23,712   01/11/93  2:11
NDDEAPI   DLL  16,096   01/11/93  2:11
SCONFIG   DLL  45,120   01/11/93  2:11
SHELL     DLL  40,944   01/11/93  2:11
VER       DLL  9,696    01/11/93  2:11
CMC       DLL  70,048   01/11/93  2:11
MMSYSTEM  DLL  61,648   01/11/93  2:11
OLECLI    DLL  82,944   01/11/93  2:11
COMMDLG   DLL  97,936   01/11/93  2:11
UNIDRV    DLL  128,432  01/11/93  2:11
DDEML     DLL  38,912   01/11/93  2:11
DEMILAYR  DLL  48,304   01/11/93  2:11
OLESVR    DLL  24,064   01/11/93  2:11
TOOLHELP  DLL  14,128   01/11/93  2:11
WIN87EM   DLL  12,800   01/11/93  2:11
CTL3DV2   DLL  21,648   01/08/94  0:00
WINMEM32  DLL  4,320    23/03/92  5:10
COMM      DRV  5,968    01/11/93  2:11
KEYBOARD  DRV  7,568    01/11/93  2:11
MCISEQ    DRV  25,264   01/11/93  2:11
MCIWAVE   DRV  28,160   01/11/93  2:11
MMSOUND   DRV  3,440    01/11/93  2:11
MOUSE     DRV  10,672   01/11/93  2:11
POWER     DRV  15,504   01/11/93  2:11
SYSTEM    DRV  2,304    01/11/93  2:11
SOUND     DRV  3,440    01/11/93  2:11
MIDIMAP   DRV  52,784   01/11/93  2:11
TIMER     DRV  4,192    01/11/93  2:11
VMDGX4    DRV  113,488  15/01/96  15:33
GDI       EXE  220,800  01/11/93  2:11
KRNL386   EXE  76,400   01/11/93  2:11
USER      EXE  264,096  27/01/88  18:59
WIN386    EXE  577,557  01/11/93  2:11
DOSAPP    FON  36,656   01/11/93  2:11
8514FIX   FON  10,976   10/03/92  5:10
8514OEM   FON  12,288   10/03/92  5:10
8514SYS   FON  9,280    10/03/92  5:10
VGAFIX    FON  5,360    01/11/93  2:11
VGAOEM    FON  5,168    01/11/93  2:11
VGASYS    FON  7,280    01/11/93  2:11
SSERIFE   FON  64,544   01/11/93  2:11
SMALLF    FON  21,504   10/03/92  5:10
SSERIFF   FON  89,680   10/03/92  5:10
SMALLE    FON  26,112   01/11/93  2:11
TIMESBI   FOT  1,342    01/11/93  2:11
TIMESI    FOT  1,332    01/11/93  2:11
TIMES     FOT  1,326    01/11/93  2:11
TIMESBD   FOT  1,328    01/11/93  2:11
SETUP     INF  57,634   01/11/93  2:11
CONTROL   INF  17,667   01/11/93  2:11
APPS      INF  57,961   01/11/93  2:11
OEM65DGM  INF  7,275    04/05/95  15:29
VGALOGO   LGO  1,280    01/11/93  2:11
WINOA386  MOD  49,248   01/11/93  2:11
WIN386    PS2  852      01/11/93  2:11
SETUP     REG  4,043    01/11/93  2:11
```

```
VGALOGO   RLE  35,784   01/11/93  2:11
MMTASK    TSK  1,104    01/11/93  2:11
TIMESBD   TTF  79,804   01/11/93  2:11
TIMESBI   TTF  76,452   01/11/93  2:11
TIMESI    TTF  78,172   01/11/93  2:11
TIMES     TTF  83,260   01/11/93  2:11
          90 file(s)    4,112,815 bytes

Directory of C:\PCM401\PROGRAM
PCMVCD    386  13,642   05-08-96  8:12p
CTL3DV2   DL   21,648   08-01-94  12:00a
SUPPDLL   DLL  38,600   05-08-96  8:12p
PCMCS95   EXE  92,753   05-08-96  8:12p
PCMAPM    EXE  5,385    05-08-96  8:12p
PCMFDISK  EXE  44,527   05-08-96  8:12p
PCMFFCS   EXE  21,357   05-08-96  8:12p
PCMMTD    EXE  21,435   05-08-96  8:12p
PCMSCD    EXE  43,441   05-08-96  8:12p
CNFIGNAM  EXE  1,270    05-08-96  7:04p
DPMS      EXE  47,375   03-01-94  1:00a
PCMSS     EXE  24,945   09-30-96  3:54a
PCM       INI  1,583    01-27-88  7:13p
PCM       LOG  6,959    01-27-88  8:38p
PCM       NEW  1,084    01-27-88  7:34p
CONFIG    PCM  549      01-27-88  7:34p
CSRUN     PIF  995      05-08-96  8:12p
PCMATA    SYS  22,781   05-08-96  8:12p
PCMRMAN   SYS  99,280   05-08-96  8:12p
          19 file(s)    509,609 bytes
```

PROGMAN.INI file

This file is a standard Windows file. Following is a description of the restrictions that disable some features of Windows:

```
[Settings]
Window=68 48 580 384 1
display.drv=vmdgx4.drv
Order=5 2 1
SaveSettings=0

[Groups]
Group1=C:\WINDOWS\MAIN.GRP
Group2=C:\WINDOWS\ACCESSOR.GRP
Group5=C:\WINDOWS\STARTUP.GRP
```

Full Set of MS-DOS 6.22 and Windows 3.11

This operating system version may be installed on options V525 and V526 of the MW-520 in a *typical* installation configuration with power management features.

This Windows configuration has a Temporary Virtual Memory option installed. To improve the system's performance, you may change this option to Permanent.

Due to the large size of the hard disk, there are no restrictions regarding application installation.

The MW-520 includes additional files that were added by Motorola to support the workstation's special abilities.

When adding new applications to the hard drive, please be careful not to remove those files, as this can cause your system to malfunction.

In models F5201B and F5200B, COM1/COM3 and COM2/COM4 use IRQ sharing. To support this feature, perform the following modification in the SYSTEM.INI file:

```
[386enh]
ComIrqSharing=true
```

Windows 95

This operating system version may be installed on option V525 of the MW-520. Windows 95 operating system is Plug & Play and uses the registry data-base of PicoBIOS. To enable Windows 95, set the Plug & Play O/S option in the Advanced setup menu to "Yes".

As opposed to Windows 3.11, Windows 95 does not support drivers for peripheral device control, such as: PCMCIA cards, sound card, etc. However, it does include additional files that were added by Motorola to support the workstation's special abilities.

When adding new applications to the hard drive, please be careful not to remove those files, as this can cause your system to malfunction.

A brief explanation of the additional files tasks is attached if the file is non-standard Windows file.

To support I/O devices shared interrupts for models F5201B and F5200B, perform the following modification in the SYSTEM.INI file:

```
[386enh]
ComIrqSharing=true
```

HWAPP.INI file

This file is contained in all the system software configurations of Windows 3.11. It contains different parameters that are used by the driver that handles the special hardware and software of the MW-520. Changes in this file can be done directly or by changing the parameters by using the MW-520 maintenance application.

Table 3
HWAPP.INI Parameters

Parameter	Options	Description
ManualOffDelay	seconds	Determines the duration from pressing the Power button until the MW-520 is switched off.
TemperatureWarning	1=Enable 0=Disable	Enables/disables a software warning message when the ambient temperature deviates from the operating range.
TemperatureOffDelay	seconds	Determines the duration from the warning message display until the MW-520 is automatically switched off.
PowerWarning	1=Enable 0=Disable	Enables/disables a software warning message when the vehicle battery is discharged.
PowerOffDelay	seconds	Determines the duration from the warning message display until the MW-520 is automatically switched off.
SpeakerLevel	steps=0..8	Defines one out of nine volume levels for the speaker.
SpeakerBarDelay	seconds	Determines the duration from the time the Volume button is pressed until the Volume pop-up bar appears on the screen. If this parameter is set to 0, the Volume pop-up bar will not appear on MW-520 display.
Logger_On	1=Enable 0=Disable	Enables/disables the MW-520 logging utility.
Radio_On	1=ON 0=OFF	Defines the internal radio modem status.

To modify the HWAPP.INI file parameters, run the HWMNTAPP.EXE file located in the MAINT_AP directory.

If the application failed to read the HWAPP.INI file, the default parameters will be loaded. These parameters are:.

```
ManualOffDelay=30         30 seconds
TemperatureWarning        Enabled
TemperatureOffDelay=180   180 seconds

PowerWarning=1            Enabled
PowerOffDelay=180         180 seconds

SpeakerLevel=7            One of 8 steps
SpeakerBarDelay=3         3 seconds

Logger_On=0               Disable
Radio_On=1                ON
```

Windows NT

HWAPP Registry

Windows NT parameters are saved in the Registry data-base. The MW-520 Registry keys are located in the following registry folder:

- *My Computer/Hkey_Local_Machine/Software/MW-520/HWDRIVER*

The HWDRIVER contains the following parameters:

Table 4
HWDRIVER Parameters

Parameter	Data	Description
BatteryManagement	0×00000001	Enables an activity when the vehicle battery is discharged.
TemperatureManagement	0×00000001	Enables an activity when a temperature warning is displayed.
BatteryOffDelay	0×000000b4	Determines the duration from the warning message display, until the MW-520 is automatically switched off.
TemperatureOffDelay	0×000000b4	Determines the duration from the warning message display, until the MW-520 is automatically switched off.
SpeakerBarDelay	0×00000003	Determines the duration from the time the Volume button is pressed until the Volume pop-up bar appears on the screen.
RadioOn	0×00000001	Defines the internal radio modem status.

If the application failed to read the HWDRIVER, the default parameters will be loaded. These parameters are:.

```
BatteryManagement        Enabled
TemperatureManagement    Enabled

BatteryOffDelay=180      180 seconds
TemperatureOffDelay=180  180 seconds

SpeakerBarDelay=3        3 seconds

Radio_On=1               ON
```

User Interaction

The primary user interaction with the Windows interface is through the Program Manager from where the user can access Motorola's TX application or other remote data-base inquiry applications.

Configuration Options

Windows on MW-520 uses file-based configuration through such files as WIN.INI, SYSTEM.INI and CONTROL.INI. Separate .INI configuration files are used for individual drivers or applications.

Typically, the Windows Control Panel provides several options that allow users to configure the system.

PC Configuration

The MW-520 mobile workstation consists of three separate interconnected components: processor, display unit, and keyboard.

Figure 4 describes the MW-520 components and their interfaces.

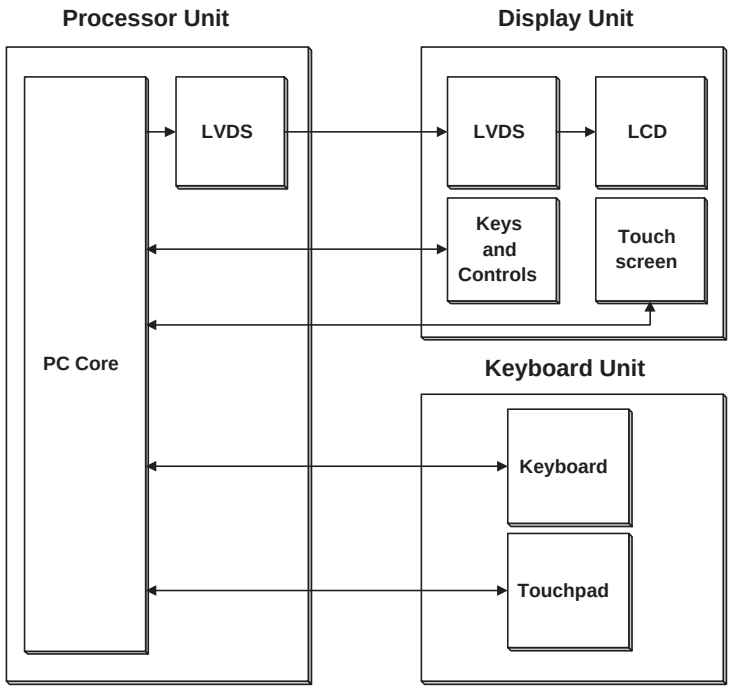

Figure 4
MW-520 Three Unit Model

The MW-520 PC architecture is illustrated in Figure 5 . It contains the devices listed below:

Processor	Pentium® 120 MHz or 166 MHz MMX™
ChipSet	PicoPower VESUVIUS (chips V1, V2, V3)
DRAM	8 MB (1 × 1M × 64 bit)
	16 MB (1 × 2M × 64 bit)
	32 MB (1 × 4M × 64 bit)
	64 MB (1 × 8M × 64 bit)
Keyboard controller	Hitachi H647343416 (Flash) or H647343416 (OTP)
VGA controller	C&T 65548 + 1MB Video RAM
LCD panel	SHARP LM64K837 or LQ10D42 (color)
PCMCIA controller	CL-PD6729
IDE controller	National PC87415
COM1, COM2	Super I/O National PC87338
COM3, COM4	National PC16550
BIOS Flash	28F020
Sound blaster	ESS 1868
Touchscreen	Elo™ Resistive Digitizer

The MW-520 computer is based on the GEMINI MicroChip Module (MCM) that includes a Pentium or Pentium MMX CPU, V1 and V2 VESUVIUS chips, and 256KB second level cache.

PCI and ISA buses are used for peripheral device connection.

PCMCIA, VGA, and IDE controllers are connected to the PCI bus.

The following devices are connected to the ISA bus: the BIOS flash chip, the keyboard controller, the super I/O chip (two UARTs, parallel port and floppy disk controller), three auxiliary UARTs, the sound blaster, the touchscreen (via UART) and the processor ASIC.

The MW-520 PC architecture complies with Microsoft requirements regarding Windows 95 hardware.

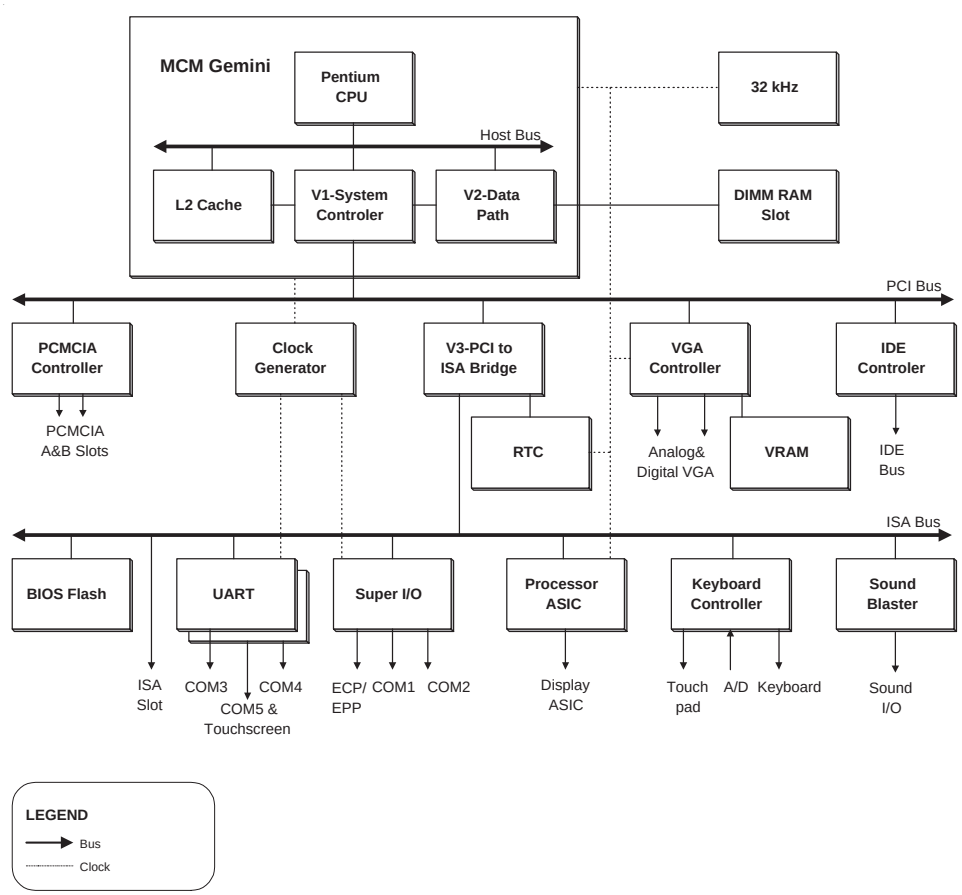

Figure 5
MW-520 PC Architecture

Logic Control and Addressing

This section includes maps of upper memory blocks, I/O addresses, and interrupts.

Upper Memory Blocks

Table 5
UMB Map

Address (hex)	Task	Comments
A0000-AFFFF	video buffers	
B0000-BFFFF	video buffers	
C0000-C7FFF	VGA BIOS	
C8000-CFFFF	PCM - boot	
D0000-D7FFF	socket services	
D8000-DFFFF	socket services	
E0000-EFFFF	BIOS	
F0000-FFFFF	BIOS	

I/O Map

Table 6
I/O Map

Address (hex)	Width	Function
000-01F	8 bits	DMAC-1
024, 026	8 bits	
024, 026	16 bits	V1-LS Registers
020-03F	8 bits	PIC-1
040-05F	8 bits	Timer
061	8 bits	Port B
060,064,062, 066	8 bits	Keyboard
070	8 bits	CMOS index and NMI enable
070-07F		Real time clock
080		BIOS port 80 (debug port)
080-08F	8 bits	DMA page register
092	8 bits	Port 92

Table 6 (Continued)
I/O Map

Address (hex)	Width	Function
0A0-0BF	8 bits	PIC-2
0C0-0DF	8 bits	DMAC-2
0F0	8 bits	Coprocessor
100-10F		Processor unit ASIC ports
110-11F		Sound chip ports
170-177, 376		Channel 2 IDE
1F0-1F7, 3F6		Channel 1 IDE
220		Sound blaster*
2E8-2EF		COM4*
2F8-2FF		COM2*
308-30F		COM5* (touchscreen)
330		MIDI sound*
370-377		Secondary diskette controller (not used)
398,399		Super I/O
3BC,3BD,3BE		Parallel port*
3B0-3BB/3BF		Video 65548
3C0-3CF		Video 65548
3D0-3DC		Video 65548
3E0-3E1		PCMCIA controller
3E4-3E5		PCMCIA controller
3E8-3EF		COM3 (radio)*
3F0-3F5		Primary diskette controller (not used)
3F8-3FF		COM1*
CF8-CFC		PCI configuration space
* May be disabled in the BIOS Setup utility.		

Interrupt Map

Table 7
Interrupt Map

IRQ	Source
IRQ15	Processor unit ASIC (processed by the MW-520 software)
IRQ14	IDE hard disk
IRQ13	Floating point exception
IRQ12	Mouse
IRQ11	COM5 touchscreen
IRQ10	PCMCIA controller
IRQ9	Redirected IRQ2 and PCMCIA controller
IRQ8	RTC
IRQ7	LPT1, parallel port
IRQ6	Floppy drive (not used)
IRQ5	Sound blaster
IRQ4	COM1, COM3
IRQ3	COM2, COM4
IRQ2	Second internal interrupt controller
IRQ1	Keyboard controller
IRQ0	Timer

Caution

COM1/COM3 use IRQ4 and COM/2COM4 use IRQ3 in sharing mode. Please take this feature into consideration when making a high speed device connection.

Power Management

System State Machine

The System State Machine defines the states of all components in the system.

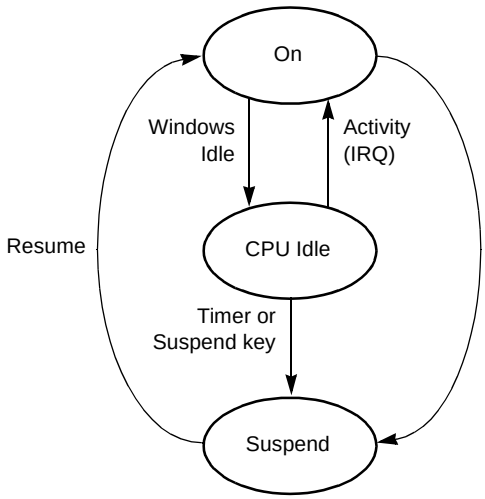

Figure 6
System State Machine

The machine contains three states: On, CPU Idle, and Suspend. All local *Standby* modes are canceled.

Table 8
State Definitions

Phoenix	PicoPower	Functionality
On	On	All devices on, full clock
CPU idle	Doze	All devices On, Reduced Clock
Suspend	Suspend to RAM	Display and Disk power down Stop Clock, DRAM slow refresh

A detailed device power management is presented in Table 9 on page 26.

Power Management Events

The following events will resume the MW-520 from Suspend mode:

- Resume key pressed
- Key pressed
- COM1, COM2, COM3 ring indicator

- COM4 ring indicator (for upgrade option V184)
- Specific hardware event
- Touchscreen (for upgrade option V311)

A specific hardware event may be:

- Emergency key pressed.
- The ambient temperature deviates from the normal operating range.
- The vehicle battery is discharged.

The Windows software informs the application about a power management event over a WM_POWER message. Use this message for Windows 3.11 and Windows 95 16-bit applications. Use a WM_POWER BROADCAST message for Windows 95/NT 32-bit applications.

WM_POWER

The WM_POWER message is sent when the system is about to enter Suspend mode.

```
WM_POWER
fwPowerEvt = wParam; // power-event notification message
```

Parameters

fwPowerEvt

Value of *wParam*. Specifies a power-event notification message. This parameter can be one of the following values:

Value	Meaning
PWR_CRITICALRESUME	Indicates that the system is resuming operation after entering Suspend mode without first sending a PWR_SUSPENDREQUEST notification message to the application. An application should perform any necessary recovery actions.
PWR_SUSPENDREQUEST	Indicates that the system is about to enter Suspend mode.
PWR_SUSPENDRESUME	Indicates that the system is resuming operation after having entered Suspend mode normally, that is, the system sent a PWR_SUSPENDREQUEST notification message to the application before the system was suspended. An application should perform any necessary recovery actions.

Return Values

The value an application returns depends on the value of the *wParam* parameter. If *wParam* is PWR_SUSPENDREQUEST, the return value is PWR_FAIL to prevent the system from entering the suspended state; otherwise, it is PWR_OK. If *wParam* is PWR_SUSPENDRESUME or PWR_CRITICALRESUME, the return value is zero.

WM_POWERBROADCAST

The WM_POWERBROADCAST message is sent by Windows NT to a 32-bit application to notify it of power-management events.

```
WM_PowerEvent = (DWORD) wParam;
dwData = (DWORD) lParam;
```

Parameters

dwPowerEvent

Event notification message. This parameter can be one of the following values:

Value	Meaning
PBT_APMBATTERYLOW	Battery power is low.*
PBT_APMOEMEVENT	OEM-defined event occurred.*
PBT_APMPOWERSTATUSCHANGE	Power status has changed.*
PBT_APMQUERYSUSPEND	Request for permission to suspend.
PBT_APMQUERYSUSPENDFAIL	Suspension request denied.
PBT_APMRESUMECRITICAL	Operation resuming after critical suspension.
PBT_APMRESUMESUSPEND	Operation resuming after suspension.*
PBT_APMSUSPEND	System is suspending operation.

*Not supported by MW-520 BIOS and irrelevant to the application.

dwData

Function-specific data. For most messages, this parameter is reserved and not used. However, if *wParam* is one of the resume notifications (PBT_RESUME), the *lParam* parameter can specify the PBTF_APMRESUMEFROMFAILURE flag. This flag indicates that a suspend operation failed after the PBT_APMSUSPEND message was sent.

Return Values

Return TRUE to grant a request.

Request BROADCAST_QUERY_DENY to deny a request.

PBT_APMRESUMESUSPEND

The PBT_APMRESUMESUSPEND message is sent as a notification that the system has resumed operation after being suspended. A window receives this message through the WM_POWERBROADCAST message.

```
dwData = (DWORD) lParam;
```

Parameters

dwData

Reserved; must be 0.

Return Values

No return value.

Remarks

Applications may receive this message at any time without a preceding PBT_APMSUSPEND message.

PBT_APMSUSPEND

The PBT_APMSUSPEND is sent immediately before the computer is suspended. This message is typically sent when all applications and installable drivers have returned TRUE to a previous PBT_APMQUERYSUSPEND message. A window receives this message through the WM_POWERBROADCAST message.

```
dwData = (DWORD) lParam;
```

Parameters

dwData

Reserved; must be 0.

Return Values

No return value.

Remarks

An application should process this message by completing all tasks necessary to save data. This message may also be sent, without a prior PBT_APMQUERYSUSPEND message, if an application or device driver uses the **SetSystemPowerState** function to force suspension.

Device Power Management Table

The MW-520 power management is very similar to a standard PC power management, with the following exceptions:

- The workstation preserves most devices power during Suspend mode.
- Suspend to RAM mode is used.

All device status changes are managed by the APM BIOS. However, the following table information is useful for driver developers if their program behavior is dependent on the power management events. The COM ports behavior during Suspend mode is described in the "Main Peripherals" section on page 38.

The status of each MW-520 device is described in Table 9.

Table 9
Device Power Management

Device	P/N	Control signal	Input signal	Controlled by	On	Doze	Suspend
CPU	Intel P5 120 MHz	-	-	Software/ BIOS	Full speed	5% clock	Stop clock
VGA controller	CH&Tech 65548	PC0	STNDBY#	MCM (V1)	On	On	Standby
LVDS transmitter	National DS90CF581	PCO	PWRDWN#	MCM (V1)	On	On	Shut down
LVDS receiver	National DS90CF582	LVDS_EN	PWRDWN#	Display ASIC	On	On	Shut down
LCD backlight 5V contrast	Sharp LM64K837	ENABLK ENVDD ENVEE	-	Display ASIC	On	On	Off
Temperature sensor	Thermistor 10 kOhm	-	-	-	On	On	On
Keypad lighting		LIGHT_EN	-	Display ASIC	On	On	Off
PCMCIA controller	Cirrus Logic CL-PD6729	-	-	Software/ BIOS	On internal PM	On internal PM	Shut down
IDE controller	National PC87415	-	-	BIOS	On	On	On
Hard disk	IBM 810MB	IDE_PWR	-	IDE control	On	On	Off
Compact Flash disk	SanDisk	IDE_PWR	-	IDE control	On	On	Off
V1	PicoPower PT86C521	-	-	BIOS	On	On	Stop clock
V3	PicoPower PT86C523	-	-	BIOS	On	On	Stop clock
Real time clock	Benchmarq BQ3285E	-	-	-	On	On	On
Clock generator	AV9155 ICS	PC1	PD#	MCM (V1)	On	On	Shut down
Super I/O	National PC87338	-	-	Software/ BIOS	On	On	Shut down
UART	National PC16550	-	-	-	On	On	On
RS232 buffer	Maxim MAX213EAI	PC2	SHDN#	ASIC	On	On	Shut down
Keyboard controller	Hitachi HD64F3434	-	-	-	On	On	On 14 MHz
ASIC (EPLD)	Motorola	PC3	PC	MCM	On	On	On
Sound controller	ESS 1868	-	-	Software	On	On	Shut down
Audio Regulator	LT1121IS8	-	SHDN#	Software	On	On	Shut down

Table 9 (Continued)
Device Power Management

Device	P/N	Control signal	Input signal	Controlled by	On	Doze	Suspend
Digitizer	ELO ACC Touch	-	-	-	On	On	On
13.8V Keyboard	-	PC3	-	MCM (V1)	On	On	Off
13.8V Display	-	PC3	-	MCM (V1)	On	On	Off
5V GPS	-	PC3	-	MCM (V1)	On	On	Off
RS-232 Buffer (COM3)	MAX213EAI Maxim	shdwn_buff_3_4, en_buff_3	SHDN#	Software	On	On	Shut down
RS-232 Buffer (COM4)	MAX213EAI Maxim	shdwn_buff_3_4, en_buff_3	SHDN#	Software	On	On	Shut down

The device state definitions in suspend mode are:

- On - The device is powered-on as usual.
- Shut down - The device is shut down by a special control line.
- Off - The device is powered off.

Stop clock - The device clock frequency is set to 0.

PCMCIA Configuration

Assigning Resources for PCMCIA Cards

PCMCIA cards are configured differently in Windows 95 and Windows 3.11 for Workgroups. Windows 95 has its own PCMCIA support, while DOS and Windows 3.11 use PCMCIA DOS drivers.

DOS PCMCIA Drivers' Stack

Both the reduced and the full set of Windows 3.11 have the same PCMCIA drivers' stack in CONFIG.SYS.

```
DEVICE=C:\WINDOWS\HIMEM.SYS

DEVICE=C:\WINDOWS\EMM386.EXE NOEMS X=CC00-CCFF X=CD00-D0FF
REM by PCM+ V4.0 X=CC00-CCFF X=CD00-D0FF

DOS=HIGH, umb
FILES=30
buffers=20


DEVICE=C:\PCM402,13\PROGRAM\DPMS.EXE
DEVICEHIGH=C:\PCM402,13\PROGRAM\CNFIGNAM.EXE /DEFAULT
DEVICEHIGH=C:\PCM402,13\PROGRAM\PCMSS.EXE
DEVICEHIGH=C:\PCM402,13\PROGRAM\PCMCS95.EXE
DEVICEHIGH=C:\PCM402,13\PROGRAM\PCMRMAN.SYS
DEVICEHIGH=C:\PCM402,13\PROGRAM\PCMSCD.EXE
DEVICEHIGH=C:\PCM402,13\PROGRAM\PCMATA.SYS
SET PCMPLUS=C:\PCM402,13\PROGRAM
```

Where:

DPMS.EXE	Enables loading all other drivers to the upper memory (DOS protected mode service driver).
CNFIGNAM.EXE	Dynamically allocates resources according to the PCM.INI file and the current type of PCMCIA card inserted in the slot.
PCMSS.EXE	Functions as a socket service driver for the PCMCIA controller.
PCMCS95.EXE	Functions as a card service driver.
PCMSCD.EXE	Functions as a resource manager (DOS memory resident program).
PCMSCD.EXE	Functions as a client driver for communication services such as: modem, LAN, etc.
PCMATA.SYS	Functions as an IDE hard disk emulation driver.

Configuring PCMCIA Cards in DOS and Windows 3.11

To use a PCMCIA communication device under Windows 3.11, verify that the communication driver in the [386Enh] section of the SYSTEM.INI file is properly configured. Replace:

```
device=*vcd
```

with:

```
;device=vcd*
device=C:\PCM402,13\PROGRAM\PCMVCD.386
```

For more information on PCMCIA customizing, refer to the *PicoCARD™ User's Guide*.

Configuring PCMCIA Cards in Windows 95

Windows 95 automatically assigns computer resources (such as communication ports and memory addresses) to a PCMCIA card installed in or removed from the MW-520.

For further information on configuring a PCMCIA card in Windows 95:

1. Click on the Start button on the Window 95 taskbar. A pop-up menu appears.
2. Click on *Help*. A submenu appears.
3. Click on the Index tab. The Index help window appears.
4. Type in field 1:

   ```
   PCMCIA Card
   ```

   A list of PCMCIA card topics appears in field 2.

1. Follow the instructions on the screen.

Note

PCMCIA cards may be configured in MW-520 options V525 and V526 only.

Configuring PCMCIA Cards in Windows NT

When you have Windows NT as your operating system, the Phoenix Card Executive for NT is automatically loaded onto your hard drive. Card Executive configures the PCMCIA card properly each time it is inserted in MW-520.

It is recommended to insert Ethernet cards before running Windows NT and removing the cards after Windows shutdown. Card Executive enables Modems, ATA and SRAM cards "hot insertion" mode, i.e., inserting and removing the cards while Windows NT are running.

Whenever you insert a PCMCIA card in your workstation for the first time, the *PCMCIA IDE Driver Parameters* appears on the screen. To configure a PCMCIA card:

1. Set the IRQ Level parameter to IRQ 9, or IRQ 10.
2. Set the I/O Port Address to 0×120h (see Table 6, " I/O Map," on page 19).
3. Press *Continue.*
   A prompt for configuration completed appears on the screen.

Using Specific Hardware Features

Software Development Tools

Microsoft Visual C++ development kit was used by the MW-520 engineering team during product development. No special restrictions apply to the software development tools for its applications.

The Application Program Interface (API) library and *include* files are located on your hard disk as follows:

```
C:\HWDRIVER\HWEVNT.LIB (16-bit),   HWEVNT.H
C:\HWDRIVER\HWEVNT32.LIB (32-bit), HWEVNT32.H
```

Windows 3.11 (16-bit) Hardware Access API

User Application's Connection Mechanism

The MW-520 hardware access software contains an application, a DLL and a VxD driver.

Figure 7 describes the hardware access software modules and their interfaces. HWAPP.INI is a system parameter text file.

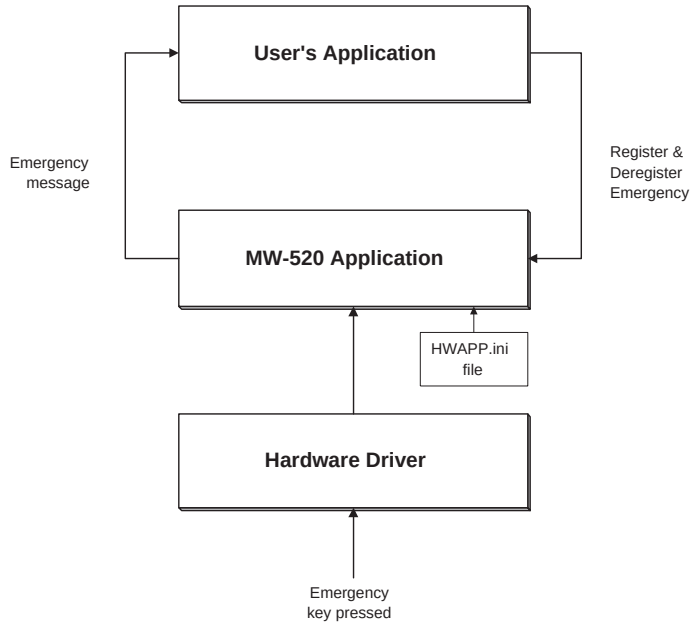

Figure 7
Hardware Access Software

When the Emergency key is pressed, an interrupt that modifies the MW-520 application is generated. The MW-520 application notifies the user's applications registered for an emergency event. The registration mechanism is described in the following section.

Emergency Event Registration

The Windows user application can be registered to receive the MW-520 emergency events. The registration process is as follows:

1. Activate the Register_Emg function call from the user's application (see API for details). Its output is the registration status.
2. If an emergency occurred, the message defined by the user's application is sent to it.

If the registered application is not activated, the DeRegister_Emg application should be activated.

Following is a C-code example of emergency registration/deregistration:

```
long FAR PASCAL_EXPORT Wnd Proc
     (HWND hwnd,
      UINT message
      UINT wParam
      UINT lParam
{
.
.
.
switch (message)
     {
     case WM_CREATE
          .
          .
          .
          Register_Emg (hwnd, MY_MSG_NUMBER);
          .
          .
          .
          break;
          case WM_DESTROY:
          .
          .
          .
          Deregister_Emg (hwnd);
          Break;
     }
}
```

Power Off Event Registration

The duration until the MW-520 is shut down may be used for several purposes, for example, sending deregistration messages by the TX application. The registration process of the application is similar to the emergency registration.

1. Activate the RegisterSysEvent function call with the event parameter POWER_OFF (see API for details). Its output is the registration status.
2. If a POWER_OFF occurred, the message defined by the user's application is sent to it.

If the registered application is not activated, the DeRegisterSysEvent application should be activated before closing the user's application.

Miscellaneous Event Registration

Other events such as: extreme temperature conditions or discharged vehicle battery can also be used for the application own purposes.

For example the power off process can be initiated after a high-temperature warning. The registration application process should use the TEMP_HIGH_WARN event. As a result, each time a high-temperature warning is issued, the application will receive a message and decide if the power off process will be sustained or rejected.

16-bit API

Register_Emg

WORD FAR PASCAL _export Register_Emg(WORD hwnd, UINT uiMsg)

Purpose	Opens the emergency session.
Input	hwnd: Window handle of the emergency session. uiMsg: The message number used for notification.
Output	None.
Returned Value	EMG_SUCCESS or EMG_FAILURE depending on the number of registered applications.

DeRegister_Emg

WORD FAR PASCAL _export DeRegister_Emg(WORD hwnd)

Purpose	Closes the emergency session.
Input	hwnd: Window handle of the emergency session.
Output	None.
Returned Value	EMG_SUCCESS.

RegisterSysEvent

WORD FAR PASCAL _export RegisterSysEvent (WORD hwnd, UINT uiMsg, WORD event)

Purpose Registers the application to get notification for the system events.

Input hwnd: Specifies the handle of any user application.
uiMsg: The message number used for notification.

```
EMERGENCY      0×0100
POWER_OFF      0×0080
TEMP_LOW_WARN  0×0010
TEMP_HIGH_WARN 0×0008
TEMP_OK        0×0004
MAIN_BAT_WARN  0×0002
MAIN_BAT_OK    0×0001
OverTemp       0×0200
OverTempOK     0×0400
```

Output event, pointer to actual system event status

Returned Value 1 - ok, 0 - fail

DeRegisterSysEvent

WORD FAR PASCAL _export DeRegisterSysEvent (WORD hwnd)

Purpose De-registers the system event session.

Input hwnd: specifies the handle of the user application.

Output None.

Returned Value 1 - ok, 0 - fail

Note

The MW-520 software (HWDriver and application) allows running 16-bit applications on 32-bit software under Windows 95. The THUNK mechanism is used to implement this feature. When using THUNK during applications' development some restrictions should be taken into consideration. For more information on THUNK, see Microsoft Visual C++ 5.0 on-line help and Microsoft Development Network Knowledge data base

Win 32 Hardware Access API

This application is identical with Windows 3.11 application, except for the following functions:

32-bit API

Register_Emg

WORD WINAPI Register_Emg32 (HWND hwnd, UINT uiMsg)

Purpose	Opens the emergency session.
Input	hwnd: Window handle of the emergency session. uiMsg: The message number used for notification.
Output	None.
Returned Value	EMG_SUCCESS or EMG_FAILURE, depending on the number of registered applications.

DeRegister_Emg

WORD WINAPI DeRegister_Emg32 (HWND hwnd) **Register_Emg**

Purpose	Closes the emergency session.
Input	hwnd: Window handle of the emergency session.
Output	None.
Returned Value	EMG_SUCCESS

RegisterSysEvent

WORD APIENTRY RegisterSysEvent32 (HWND hwnd, UINT uiMsg, WORD event)

Purpose Registers the application to get notification for the system events.

Input hwnd: Specifies the handle of any user application.
uiMsg: The message number used for notification.

```
EMERGENCY      0×0100
POWER_OFF      0×0080
TEMP_LOW_WARN  0×0010
TEMP_HIGH_WARN 0×0008
TEMP_OK        0×0004
MAIN_BAT_WARN  0×0002
MAIN_BAT_OK    0×0001
OverTemp       0×0200
OverTempOK     0×0400
```

Output event, pointer to actual system event status.

Returned Value 1 - ok, 0 - fail

DeRegisterSysEvent

WORD FAR PASCAL _export DeRegisterSysEvent32 (HWND hwnd)

Purpose De-registers the system event session.

Input hwnd: specifies the handle of the user application.

Output None.

Returned Value 1 - ok, 0 - fail

Note

Run all developed applications from the Windows NT/Windows 95 Start menu.

Sound System Configuration

If the internal sound chip is enabled, the drivers will be installed on the MW-520 hard disk. The BIOS initializes the ESS 1868 chip, so DOS utilities ESSCFG.EXE and ESSVOL.EXE are not required. If you installed the sound drivers independently, please remove these files from the AUTOEXEC.BAT.

The following information is included the SYSTEM.INI configuration:

```
[drivers]
timer=timer.drv
midimapper=midimap.drv
MUX=es1868wn.drv
WAVE=es1868wn.drv
MIDI=es1868wn.drv
AUX=es1868wn.drv
MIXER=es1868wn.drv
MIDI1=audmpu.drv
[auddrive.drv]
mpu401=yes
essdaemon=no
ControlRegisterAddressing=FALSE
AudioDrive=ES1868
Synth=OPL3
portchoices=220
irqchoices=5
dmachoices=0,1
port=220
int=5
dmachannel=1
portchoicesMPU401=330
irqchoicesMPU401=5
portMPU401=330
intMPU401=5
DMAChoicesWave2=0,1
DMAChannelWave2=0
AutoConfig=yes
VerifyInt=yes
VerifyDMA=no
Mute=No
MutePCspk=No
VolumeMutes=4
WaveInMonitor=No
VoiceMonitor=No
VolumeMaster=32768
VolumeMasterR=32768
VolumeWave=32768
VolumeWaveR=32768
VolumeSynth=32768
VolumeSynthR=32768
VolumeLine=32768
VolumeLineR=32768
VolumeMic=32768
VolumeMicR=32768
VolumeCD=32768
VolumeCDR=32768
VolumeAuxB=32768
```

```
VolumeAuxBR=32768
VolumePCspk=32768
WaveInMic=32768
WaveInMicR=32768
WaveInLine=32768
WaveInLineR=32768
WaveInCD=32768
WaveInCDR=32768
WaveInMaster=32768
WaveInMasterR=32768
WaveSource=Mic
VoiceMic=32768
VoiceMicR=32768
VoiceLine=32768
VoiceLineR=32768
VoiceCD=32768
VoiceCDR=32768
VoiceMaster=32768
VoiceMasterR=32768
VoiceSource=Mic
[386Enh]
device=es1868wn.386
```

To modify the sound system configuration, use the ESS utilities installed on the hard disk.

User-Defined Buttons

The six user-defined buttons located on the display unit have scan codes 77h through 7Ch, from left to right. These scan codes are not used by any other keys on the keyboard.

To modify these codes and load them at system boot use the C:\MATRIX\MATRIX.EXE utility.

Note

The MATRIX utility enables you to modify the user-defined buttons scan codes to keyboard scan codes alone.

To modify the scan codes, perform the following steps:

1. Run MATRIX.EXE.
2. Press F2 to modify.
3. Follow the instructions on the screen.
4. Press the user-defined button and see what key it simulates. If this is not the required key, press the button again. Another key will be simulated.
5. Press F6 to save the matrix configuration in an .MTX file.
6. Add the following line to the AUTOEXEC.BAT:

```
C:\MATRIX\MATRIX.EXE C:\MATRIX\XXX.MTX
```

7. Reboot the MW-520.

Main Peripherals

General

The following peripheral devices may be attached to the MW-520 connectors:

- mobile printers
- external speaker
- serial RS-232 communication devices
- DATATAC® radio
- ASTRO® radio

Mobile Printer

A mobile printer may be attached to the parallel port, or to one of the serial ports COM1 and COM2 through the standard Windows interface.

The printer driver may be selected from the SETUP directory on the hard disk. The printer is accessed through the standard Windows Print Manager, and no special API is required by the application.

No printer drivers are installed in the basic model of MW-520 due to memory limitations. See "Reduced Set of MS-DOS 6.22 and Windows 3.11" on page 8.

The MW-520 External Ports

The MW-520 external ports support a full set of RS-232 lines. The basic MW-520 model includes two external ports COM1 and COM2. Upgrade option V184 consists of two additional standard COM ports.

DATATAC Radio

Creating a Radio Application

Using the standard interface for RF communication, you can choose to communicate directly with the MW-520 internal modem which is a standard serial device, running on COM3, with a default of 8 bits, no parity, 9600 baud interface. Options such as handshaking are selectable through the Native Mode interface. The only difference in the software interface is the COM3 base address, which is 03E8H, and the COM3 IRQ, which is IRQ4. By using Native Mode, you take on the responsibility of respecting all conventions of the Native Mode protocol and must personally address any contention between multiple applications (if there are any). For more information, refer to the *Native Mode Interface Reference Manual*, 68P04014C90.

When the MW-520 is in Suspend, the RF modem will usually be powered up in Receive mode. In order to prevent data loss when an outbound message arrives while the system is in Suspend (wake-up from Suspend can take 5 seconds), it is recommended to deassert the DTR line before Suspend.

The radio application/driver can detect the Suspend event by waiting for the Windows PWR_SUSPENDREQUEST message. When the Suspend request occurs, the radio application should notify the modem to stop transferring data (deassert DTR, or switching the modem to transparent mode). If the application receives a PWR_SUSPENDREQUEST message during data transferring, it is recommended to reject the request in order to prevent data loss. When Resume occurs, it should notify the modem to continue (assert DTR, or switch the modem to Native mode).

The MW-520 resumes from Suspend mode when an RI signal is received from an external radio-modem connected to COM1 or COM2, or from the internal radio-modem connected to COM3 (resume occurs on the RI falling edge). The modem sends an RI signal only when the DTR line is deasserted.

Note

Ensure that your application is power management aware and compatible with Microsoft Power Management API.

The RF-modem power-on can be controlled automatically via Windows start-up by an MW-520 HWAPP application (the power-on option is the default option).

Any Modem that Supports DTR Functionality

When the MW-520 is transitioned into Suspend state, the DTR is inactivated. When the MW-520 is resumed from the Suspend state, an application should activate the DTR when it is ready to get incoming data from the RF-modem.

The required sequence when resuming from Suspend:

1. Get the Windows message PWR_SUSPENDRESSUME.
2. Assert DTR.
3. Return with PWR_OK from the window procedure.

MWCS for DATATAC

MWCS is a 16-bit software package for Windows 3.x. This package can also run under Windows 95. MWCS for DATATAC is a Windows 3.x SDK (Software Development Kit) over DATATAC network. It includes the Winsock 1.1 API for transmitting/receiving data over the air and RAPI (Radio API) for controlling the RF-modem. The MWCS for DATATAC is a Windows WOSA-based API, i.e., it is an extension to the Windows 3.x operating system for radio services.

For more information, refer to *MagicPipe™ Wireless CommStack (MWCS), Programmer's Reference manual*, Motorola publication no. 68P02947C90.

Acronyms and Abbreviations

API	Application Program Interface
ASIC	Application Specific Integrated Circuit
BIOS	Basic Input/Output System
CMOS	Complementary Metal-Oxide Semiconductor
CPU	Central Processing Unit
DDE	Dynamic Data Exchange
DMA	Direct Memory Access
DOS	Disk Operating System
DRAM	Dynamic Random Access Memory
DTE	Data Terminal Equipment
DTR	Data Terminal Ready
IDE	Integrated Drive Electronics
I/O	Input/Output
IRQ	Interrupt ReQuest
ISA	Industry Standard Architecture
LCD	Liquid Crystal Display
LED	Light Emitting Diode
MWCS	MagicPipe™ Wireless CommStack
OEM	Original Equipment Manufacturer
PCI	Peripheral Component Interconnect
PCMCIA	Personal Computer Memory Card International Association
RAM	Random Access Memory
RF	Radio Frequency
RI	Ring Indicator
UART	Universal Asynchronous Receiver Transmitter
VGA	Video Graphics Array
VRM	Vehicular Radio Modem

Glossary

Application	A computer program used to perform a specific work.
API	The interface between application programs and the network software.
ASIC	A chip which can be readily customized for a given application.
BIOS	Software for transferring information between elements such as memory, screen and disk.
Bus	A communication channel carrying signals from any device used by the system to another device. For example, data being transferred to and from a hard disk travels on a bus.
CMOS	The memory that stores the configuration you establish by running the computer's setup program. CMOS memory uses very little power and stores the information even when the computer is turned off.
COM Port	COM stands for communication. COM ports are the serial ports of the MW-520.
DDE	A Microsoft protocol that allows Windows applications to communicate using a client/server model.
Device driver	A program that controls how software communicates with a physical device (for example, a mouse, memory, or a printer).
DMA	A method that allows a peripheral device to directly read or write to memory, without the time delay of going through the CPU.
DOS	A software that supervises computer's operation, including handling I/O.
Drive	A hierarchical organization of directories, stored on a disk.
DTR	An RS-232 control signal used by a terminal to tell a modem that it is ready to receive data.
Emergency key	An orange key - although it can be any key - that is configured to send emergency information to Dispatch.
Hard disk	A large-capacity data-storage device that is installed inside the MW-520.

IDE	A hard drive with a built-in controller.
ISA bus	A computer's bus is the hardware system it uses to transfer information between the different hardware elements of the computer. The ISA bus is the most common form of bus.
OEM	Supplier who makes equipment for sale by a third party. The equipment is usually disguised by the third party with his own labels.
Operating System	A program that supervises the computer's operation, including handling I/O.
PCI bus	A 32-bit local bus that provides connections for 32-bit add-in boards. The bus operates at an external clock speed of the microprocessor (up to 33 MHz). PCI devices are configured automatically by the system.
PCMCIA slot	Either of the two sockets on the processor into which the PCMCIA cards are placed.
RAM	A portion of the system's memory that is designed as a temporary storage area for data and programs. RAM includes conventional and extended memory.
RI	A modem signal which indicates that a remote modem has called (literally, "the phone is ringing").
UART	An integrated circuit which takes a character of data (eight bits in parallel), and transmits each bit serially over an asynchronous communication channel. It also accepts asynchronous data and provides a character to the device in which the UART is installed.

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