

**Technical  
Information**



MOTOROLA G24 KJAVA

USER'S GUIDE



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## REVISION HISTORY

Revision	Date	Purpose
A	May 15, 2007	Initial release
B	June 21, 2007	Updated due to software updates



## **KJAVA ARCHITECTURE**

4.1 GENERAL.....	15
4.2 FUNCTIONAL DESCRIPTION.....	16
4.3 MIDLET MANAGER.....	17
4.4 JTOOL MANAGER.....	18
4.5 OEM MODES .....	19
4.6 MIDLET SECURITY.....	20

## **DEVELOPMENT AND MAINTENANCE**

5.1 GENERAL.....	21
5.2 JTOOL COMMANDS .....	21
5.3 KDWP .....	23
5.3.1 Activation Procedure.....	23

## **JAVA API**

6.1 KJAVA CONTENT .....	25
6.2 PACKAGES OVERVIEW.....	25
6.2.1 Access Package .....	26
6.2.2 Network Package .....	26
6.2.3 OSC Package.....	27
6.2.4 WebSession Package.....	33
6.2.5 HAPI Package .....	34
6.2.6 Call Package.....	37
6.3 STANDARD CLASSES DEVIATIONS .....	38
6.3.1 Comm Connections.....	38
6.3.2 Server Socket Connection.....	38
6.3.3 Message Connection .....	39

## **APPENDIX A - GPIO LINES**

### **APPENDIX B - DEFAULT MIDLET FEATURES**

B.1 SUPPLY OF ALL AVAILABLE UNIT INFORMATION .....	43
B.2 FAULT REPORT .....	43
B.3 CQA TESTING ROUTINES HANDLER.....	44
B.4 OTA PROVISIONING.....	44
B.5 GPRS INDICATOR.....	44
B.6 SMS UPDATES / REQUESTS LISTENER .....	45
B.6.1 Message Format .....	45
B.6.2 Messages Types.....	45

### **APPENDIX C - GPIO INTERRUPT LATENCY**

C.1 INTRODUCTION .....	51
C.2 MULTITHREADING BACKGROUND .....	51
C.3 HOW TO ACHIVE MINIMAL LATENCY .....	51
C.4 CODE EXAMPLE.....	52

**APPENDIX D - MIDLET SIGNING**

D.1 GENERAL..... 53  
D.2 GENERIC SIGNING..... 53  
D.3 BOUND SIGNING..... 53



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## 1.1 PURPOSE

This guide gives an overview of the G24 KJAVA product and its capabilities.

## 1.2 INTENDED AUDIENCE

This guide is intended for G24 KJAVA customers, developers and support groups.

## 1.3 DISCLAIMER

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## 1.4 ABBREVIATIONS, ACRONYMS AND DEFINITIONS

Abbreviation	Full Name
AMS	<u>A</u> pplication <u>M</u> anagement <u>S</u> oftware
APN	<u>A</u> ccess <u>P</u> oint <u>N</u> ame
Autoupdate	A user settable feature that synchronizes the local clock with the time received from the network
CPHS	<u>C</u> ommon <u>P</u> CN <u>H</u> andset <u>S</u> pecification
CSD	<u>C</u> ircuit <u>S</u> witch <u>D</u> ata
DM	<u>D</u> efault <u>M</u> IDlet
DNS	<u>D</u> omain <u>N</u> ame <u>S</u> erver
EVB	<u>E</u> valuation <u>B</u> oard
Flash	1. G24 software 2. The process of replacing the G24 software
Flex	G24 configuration file, allows product <b>flex</b> ibility
GIDx	Group Identifier level x
GPIO	<u>G</u> eneral <u>P</u> urpose <u>I</u> nput <u>O</u> utput
HAPI	<u>H</u> ardware <u>A</u> pplication <u>P</u> rogram <u>I</u> nterface
HMI	<u>H</u> uman <u>M</u> achine <u>I</u> nterface. G24 with display and keypad support
ICCID	<u>I</u> ntegrated <u>C</u> ircuit <u>C</u> ard <u>I</u> D
IDE	<u>I</u> ntegrated <u>D</u> evelopment <u>E</u> nvironment
IMEI	<u>I</u> nternational <u>M</u> obile <u>E</u> quipment <u>I</u> dentify
JAD	<u>J</u> ava <u>A</u> pplication <u>D</u> escriptor
JAR	<u>J</u> ava <u>A</u> rchive
JAL	<u>J</u> ava <u>A</u> pplication <u>L</u> oader
JPDA	<u>J</u> ava <u>P</u> latform <u>D</u> ebugger <u>A</u> rchitecture
KDWP	<u>K</u> VM <u>D</u> ebug <u>W</u> ire <u>P</u> rotocol
Kjava	<u>K</u> ilobyte Java
KMgr pin	<u>K</u> JAVA <u>M</u> anager GPIO pin
KVM	<u>K</u> ilobyte <u>VM</u> . Java VM for limited systems such as embedded ones
Local Clock	The unit's clock. This clock may be synchronized with the network or set by the user with the OSC class methods
M2M	<u>M</u> achine to <u>M</u> achine
MIDlet	An application that conforms to the MIDP standard.
MIDP	<u>M</u> obile <u>I</u> nformation <u>D</u> evice <u>P</u> rofile
MO	<u>M</u> obile <u>O</u> riginated
Motorola MD	Motorola <u>M</u> obile <u>D</u> evelopers Business
MT	<u>M</u> obile <u>T</u> erminated
NITZ	<u>N</u> etwork <u>I</u> dentify and <u>T</u> ime <u>Z</u> one
NVM	<u>N</u> on <u>V</u> olatile <u>M</u> emory

Abbreviation	Full Name
OEM	<b>O</b> riginal <b>E</b> quipment <b>M</b> anufacturer
OTA	<b>O</b> ver <b>T</b> he <b>A</b> ir
OTA Provisioning	The process by which the carrier configures the device
PC	<b>P</b> ersonal <b>C</b> omputer
PCN	<b>P</b> ersonal <b>C</b> ommunication <b>N</b> etwork
PKI	<b>P</b> ublic <b>K</b> ey <b>I</b> nfrasturcture
RTC	<b>R</b> ead <b>T</b> ime <b>C</b> lock
TBD	<b>T</b> o <b>B</b> e <b>D</b> efined
SA	<b>S</b> hip <b>A</b> ceptance
UM	<b>U</b> ser <b>M</b> IDlet
URL	<b>U</b> niform <b>R</b> esource <b>L</b> ocator
USSD	<b>U</b> nstructured <b>S</b> upplementary <b>S</b> ervice <b>D</b> ata
Web Session	Holds Internet connection settings, also known as Internet Settings.
WS	<b>W</b> eb <b>S</b> ession

## 1.5 TRADEMARKS

MOTOROLA and the Stylized M Logo are registered in the U.S. Patent and Trademark Office. All other product or service names are the property of their respective owners.

## 1.6 APPLICABLE DOCUMENTATION

- [1] Motorola G24 Developer's Guide, Module Hardware Description, G24 folder at <http://developer.motorola.com/>
- [2] Motorola G24 Developer's Guide, Developer's Kit, G24 folder at <http://developer.motorola.com/>
- [3] Sun J2ME, <http://java.sun.com/j2me>
- [4] MOTODEV web site, <http://developer.motorola.com>

## 1.7 PROBLEM REPORTING INSTRUCTIONS

Problems or corrections to this guide should be reported to G24 customer care by mail: [M2MCare@motorola.com](mailto:M2MCare@motorola.com)

## 1.8 HOW THIS GUIDE IS ORGANIZED

This guide contains the following chapters:

- **Chapter 1** - Preface
- **Chapter 2** - Product Overview
- **Chapter 3** - Development Environment Setup
- **Chapter 4** - Java Architecture
- **Chapter 5** - Development and Maintenance
- **Chapter 6** - Java API
- **Appendix A** - GPIO Lines
- **Appendix B** - Default MIDlet Features
- **Appendix C** - GPIO Interrupt Latency
- **Appendix D** - MIDlet Signing





Figure 1 and Figure 2 present the differences between basic module architecture and the KJAVA one:

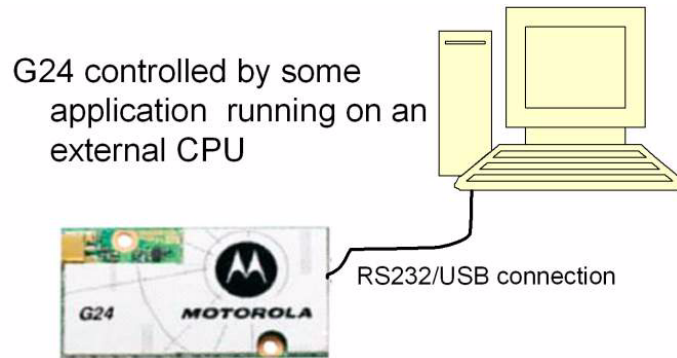


Figure 1. G24 - Basic Module Architecture

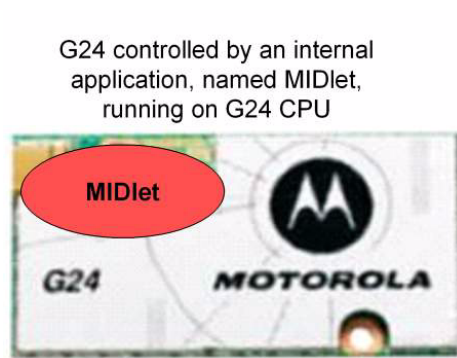


Figure 2. G24 - KJAVA Architecture

Two G24 hardware configurations are available:

- OEM - display and keypad are disabled
- HMI - display and keypad are enabled



**Note**

These two configurations look identical and can be identified by the model name printed on the units. The HMI model is available as a sample only.

In order to facilitate G24's integration with external systems, an evaluation board (EVB) should be used. The EVB consist of the following features:

- 70 pin connector for G24 placement
- SIM card interface
- Antenna
- DC power supply
- USB and RS232 interfaces
- Digital and analog audio interfaces
- Switches, jumpers and LEDs for miscellaneous controls and indications

For a detailed description of the EVB, see reference [2].

A handset, display and keypad can be attached to the EVB. Such an EVB configuration requires the use of an HMI G24 unit.

## **2.2 PRODUCT ADVANTAGES**

1. Cheaper & Simpler - No External CPU (the traditional controller).
  - Java MIDlet controls G24 functionality by running on its own CPU ("On target"), instead of using external controller CPU executing AT commands.
  - Smaller PCB.
2. Friendly & Flexible - Java Language has rich verity of standard cellular APIs.
3. Easy maintenance - Over The Air (OTA) customer MIDlet application upgrade.
4. Provides full Java solution -  
New Motorola proprietary API - dedicated for the M2M market segment.
5. Partial mode - AT command mode running simultaneously with Java mode.  
Example: Developers can use the G24 as a GPRS/EDGE module to connect to the internet via external TCP/IP stack (i.e. connect it to a standard computer dialer), on the other hand, in parallel, a Java MIDlet can be run.

## **2.3 TYPICAL USE CASE**

A typical M2M use case can be described as follows:

G24 integrated within a vending machine, when the machine is out of products it toggles a G24 I/O pin which notifies the MIDlet (via G24 proprietary API). The MIDlet uses a standard SMS protocol (JSR 120) to notify a control center about this event.



### 3.1 EVALUATION BOARD

Figure 3 shows a G24 unit, display and SIM card mounted on the evaluation board (EVB) and other major EVB components. Table 2 gives a description of the components.

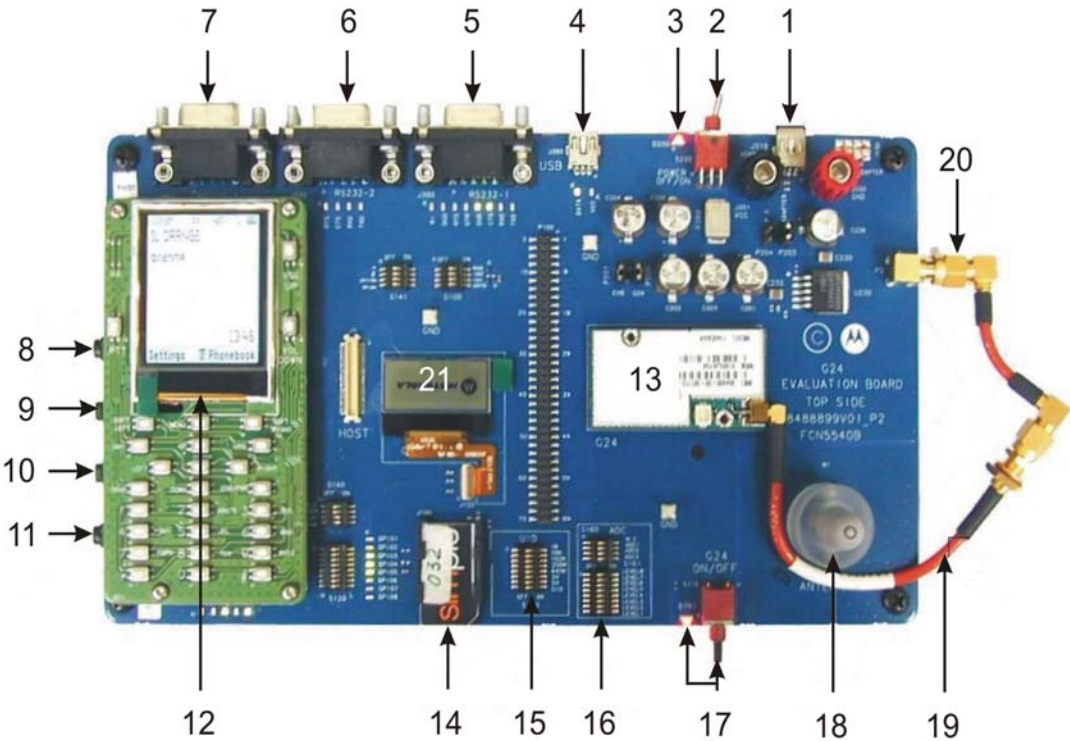


Figure 3. Evaluation Board - Major Components

Table 2: Evaluation Board Description

No.	Reference Designator	Description
1.	J210	Wall adapter supply connector
2.	S200	Main power supply switch
3.	D200	Main power supply indication LED

**Table 2: Evaluation Board Description (Continued)**

No.	Reference Designator	Description
4.	J380	USB Mini-B Connector
5.	J300	RS232-1 Connector
6.	J330	RS232-2 Connector
7.	J350	RS232-3 Data Logger Connector
8.	J430	Speaker Connector
9.	J460	Microphone Connector
10.	J440	Headset Connector
11.	J480	Alert speaker Connector
12.	-	Keypad and Display
13.	-	G24
14.	J100	SIM card Tray
15.	S170	General switches for testing
16.	S160	General switches for A2D
17.	S110, D701	G24 On/Off push-button and indication LED
18.	M1	Antenna
19.	-	Antenna Cable
20.	P2	On board antenna connector
21.	J122	CLI Display

### 3.1.1 Antenna Installation



**Note**

The numbers in parenthesis refer to the numbers shown in Figure 3.

1. Connect the supplied antenna stub to the EVB antenna base (18).
2. Connect the supplied antenna cable to the EVB SMA antenna connector (20).

### 3.1.2 Power Supply Installation

1. The supplied wall adapter includes a North-American type electrical plug, with optional adapter for European wall sockets. Connect the supplied wall adapter (1), or connect the power supply via the DC supply jacks.

**Note**

- When using a DC supply, set its voltage level to 3.6V-4.2V, and its current limiting to 2.5A.
- Use the power supply source selection jumper (P204 and P203) to activate either of the power supply sources.
- Verify that P200, P201 jumpers are placed.

### 3.1.3 G24 EVB Placement

1. Position the G24 unit over its connector and align with the supporting spacers.
2. Use the supplied screws to fasten the G24 to the board spacers.
3. Connect the antenna cable to the G24 MMCX connector.

### 3.1.4 Start Operation

1. Turn-on the main power switch S200 (2), and verify that indication led D200 (3) is on. Led D701 (10) will turn-on briefly.
2. Turn on G24 by pressing the On/Off push-button switch (17) for a period of 1-2 seconds. Led D701 (17) will turn on permanently.
3. G24 is now ready.

**Note**

Turning on the ignition switch (IGN1 - S100) causes the unit to turn on automatically whenever the main power switch S200 (2) is turned on, skipping the On/Off push-button switch (17) press.

## 3.2 SOFTWARE CONFIGURATION

G24 KJAVA has several GSM models available:

- Dual Band Europe
- Dual Band USA
- Quad Band
- Quad Edge

### 3.2.1 Software Version

User must use the following versions and up:

G24: G24\_G\_0C.11.90R.

DM: DM\_25\_4\_07.hs - version 2.2.1

### 3.2.2 Available Memory

**Flash:** 10 MB - Jar file and all data saved by MIDlet (RMS, File System).

**RAM:** 1.8 MB - Heap size.

### 3.2.3 USB PC Driver

USB PC driver (Usbmot2000.inf) can be found in:

[http://developer.motorola.com/docstools/othertools/Motorola\\_MIDway\\_v2.8.zip](http://developer.motorola.com/docstools/othertools/Motorola_MIDway_v2.8.zip)

### 3.2.4 Default RS232 Configuration

Baud rate 19200bps, 8 data bits, 1 stop bit, no parity bit, Flow Control = HW (Auto CTS/RTS)

### 3.2.5 Query System Information

There are two ways to query for system information. The first one is by using DM default outputs upon its startup. Some of its outputs are:

- Software version
- Flex version
- DM version

The second way is by using OSC API via user own MIDlet. This can be done by using: OSC.getProperty method.

### 3.2.6 MIDlet Downloading

#### 3.2.6.1 Serial (UART2)

Downloading a MIDlet via serial communications is done by a Motorola Java loader application tool called "MIDway". MIDway application is available in MOTODEV website [4], and is integrated in the SDK suite. It supports serial communication of 19200 Bps or 115200 Bps (UART2's baud rate must be set to one of these values prior to Midway launching).

#### Setup Stages:

1. Connect G24 UART2 to PC COM via RS232 cable.
2. Run MIDway and from "File" -> Settings menu -> "Communication Settings" configure to 19200 bps. In the "AT command" box enter "OEMdownload" and click OK.
3. Switch the KMgr pin to JTool mode.
4. Select "File" -> "Send AT command" menu item to send the download command to the device.
5. Select "File" -> "Open JAD" menu item to select JAD file.
6. Select "File" -> "Send JAD" menu item to send the JAD file (JAR file will be sent automatically).



**Note**

Using "AT command" box and "Debug Log" Tab in MIDway imitates the traditional terminal use. It is possible to work separately - sending JTool commands through external terminal and limiting the MIDway to handle the download process only.

#### 3.2.6.2 Over the Air

Provides the ability to download and install content over a wireless network.

MIDlets stored on a web server can be downloaded to the unit in two ways:

1. Using the OTADownload API from a UM.
2. By triggering an OTA download from the DM.

### **3.2.6.3 Common Errors**

1. Attributes common to JAR manifest and JAD are not identical.
2. The MIDlet-JAR-Size attribute field does not contain the correct JAR size in bytes.
3. Wrong JAD attributes:  
MIDlet-Name must be "UserMIDlet" (case sensitive).  
MicroEdition-Configuration should be CLDC-1.1.  
MicroEdition-Profile must be MIDP-2.0.
4. Untrusted MIDlet trying to replace trusted MIDlet (resolution: trusted MIDlet must be deleted first).  
Refer to "Motorola MIDway User's Guide" in the SDK documentation for additional information.

### **3.2.7 Reflashing G24 Software**

G24 enables its own software upgrade. Upgrades can be done via:

1. USB with RSD tool.
2. UART1 with PCLoader tool ("OEMreflash" command must be issued via UART2 before using PCLoader).

For the above tools installation and user guides, contact customer care:

[M2MCare@motorola.com](mailto:M2MCare@motorola.com)



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## 4.1 GENERAL

The G24 KJAVA product runs one of the following two types of MIDlets:

### **User MIDlet (UM)**

The UM is the customer's MIDlet which controls the G24 to its needs. The UM is the core concept within the G24 Java module. It lets the customers to run their own code on the G24's CPU. UM is expected to run "forever".



**Note**

MIDlet-Name attribute (in JAD file) must be "UserMIDlet" (case sensitive) and is verified during MIDlet installation (Any other name will cause the MIDlet to be rejected).

### **Default MIDlet (DM)**

The DM is a MIDlet provided by the manufacturer. It is a backup MIDlet which enables basic control in case UM has failed or is absent (e.g. out of the factory). It also enables the customers to broadcast a command for a fresh UM download to all of their newly scattered units

“Appendix B - Default MIDlet Features” describes all the DM's supported features.

## 4.2 FUNCTIONAL DESCRIPTION

G24 KJAVA module has three entities:

- **MIDlet Manager** - Manages and executes the MIDlet.
- **JTool Manager** - Manages G24 maintenance
  - JAL
  - G24 SW reflash
  - KDWP activation
  - Module configuration
- **OTA download Manager** - Over The Air MIDlet download procedure

The handshake between these three entities, controlling the G24, is shown in Figure 4. These three entities are mutually exclusive, i.e. upon starting one of these entities the already running one will be stopped.

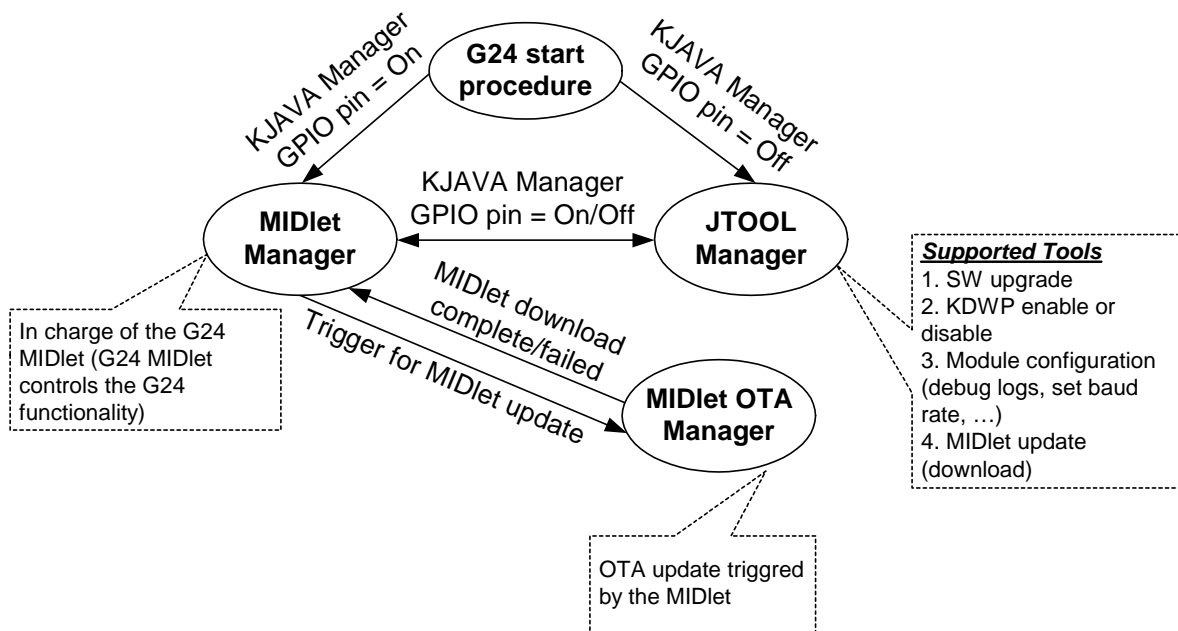


Figure 4. G24 KJAVA Architecture

A GPIO pin ("KMgr pin") selects between MIDlet Manager and JTool Manager entities.

Pin status and selection is defined as follows:

- OFF (low HW signal) - JTool Manager.
- ON (high HW signal) - MIDlet Manager.



**Note**

Line must be pulled to ON if not connected through a switch.

KMgr pin depends on the hardware configuration (OEM or HMI) as described in Table 3.

**Table 3: KMgr Pin**

G24 HW Type	Pin Number in 70 Pin Connector	GPIO Pin Name	EVB Switch
OEM	42	GPIO8	S120, GPIO8 reference
HMI	16	WKUPI_N/GPIO16	S100 WKUPI_N

Also refer to “Appendix A - GPIO lines” and reference [2].

### 4.3 MIDLET MANAGER

The MIDlet Manager manages and executes the MIDlet. It is activated when KMgr pin is ON.

MIDlet Manager executes UM if it exists and valid, otherwise it executes the DM. In case DM is invalid too, MIDlet Manager will move to "Fault" state (reports can be observed via AMS logs mechanism) - waiting for MIDlet upgrade via JTool commands.

When MIDlet exits by invalid operations, it is marked with "Invalidity flag".

- **DM** - Flag is effective to the current session and will be cleared upon reset.
- **UM** - Flag is effective until UM upgrade (replacement).

Figure 5 demonstrates the MIDlet Manager flow:

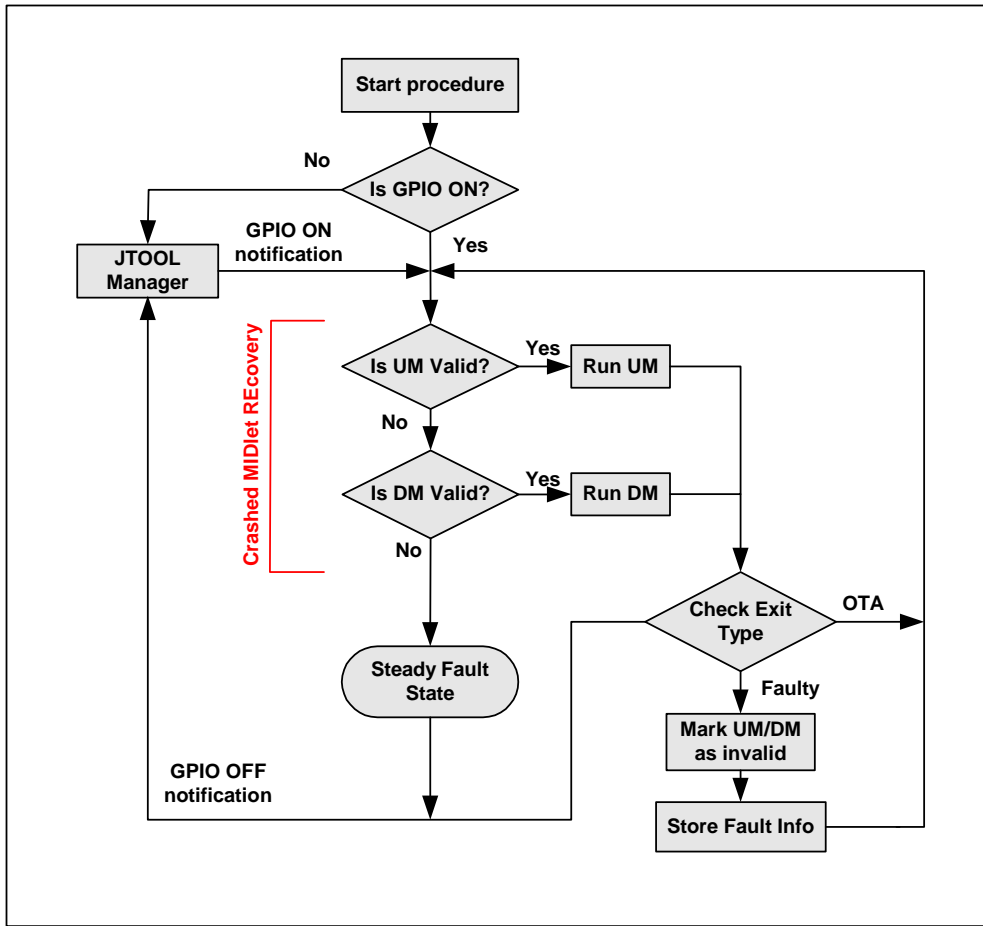


Figure 5. MIDlet Manager Flow



Note

- Switching to JTool mode, OTA download and Shutdown (reset, watchdog expired, panic, ...) are considered valid exit operations.
- Both UM and DM "invalidity flag" can be cleared using the JTool command.
- Run fault information can be accessed via `OSC.getProperty("oem.lastfault.running")` method.

## 4.4 JTool Manager

JTool Manager enables users to communicate with the G24 KJAVA module via RS232 over UART2 using a set of predefined commands (refer to “Default RS232 Configuration”).

JTool Manager functionality:

1. Downloading a MIDlet with Motorola MIDway.
2. Reflashing of G24 software.
3. KDWP activation.
4. Module configuration.

Default RS232 configuration:

Baud Rate = Default baud rate (value 19200 bps);

Data Bits = 8 bit;

Parity = NONE;

Stop Bits = ONE STOP BIT;

Flow Control = HW (Auto CTS/RTS)

See “JTool COMMANDS” section for more details

### 4.5 OEM MODES

The G24 unit has three functional modes (OEM modes):

1. Java - Only MIDlet controls the unit.
2. Partial Java - The unit is controlled by MIDlet and a limited set of AT commands.
3. AT - Only AT commands control the unit (KJAVA module is disabled).

OEM modes can be controlled by the OSC class.

For OEM mode settings see Table 4.

**Table 4: OEM mode settings**

OEM Mode	API	Connectivity availability
JAVA	OSC.setProperty("oem.mode", "java_mode")	<b>KJAVA</b> controls: UART1, UART2, USB
Partial JAVA 1	OSC.setProperty("oem.mode","partial_java_mode_1")	<b>KJAVA</b> controls: UART2 <b>AT Commands</b> via: UART1, USB
Partial JAVA 2	OSC.setProperty("oem.mode","partial_java_mode_2")	<b>KJAVA</b> controls: UART2, USB <b>AT Commands</b> via: UART1
Partial JAVA 3	OSC.setProperty("oem.mode","partial_java_mode_3")	<b>KJAVA</b> controls: UART1, UART2 <b>AT Commands</b> via: USB
AT Mode	OSC.setProperty("oem.mode", "AT_mode")	<b>AT Commands</b> via: UART1, UART2, USB

In order to read the OEM mode use - OSC.getProperty("oem.mode").

Mode switching between AT mode and JAVA mode without Java APIs:

- JTool command - "OEMconfig\_java2at" for AT mode.
- AT command - "AT+MJAVA=0" for JAVA mode.



**Note**

- Upon changing the OEM mode, G24 performs power cycle.
- Use AT+MJAVA? Command to query current OEM mode.

#### Partial Java Mode

In this mode, KJAVA is available in parallel with the AT commands as in Table 4.

The main purpose of this mode is to allow External GPRS call while KJAVA is active; however more commands are available.

## KJAVA ARCHITECTURE

When developing in such mutual environment it is important to avoid addressing the same platform resource. In such cases inconsistencies and failures may occur.

The main problematic components are blocked to AT commands in this mode and are listed in the following lists.

There are two types of commands. "Type 1" consists of permanently blocked commands and "Type 2" consists of configurable blocked commands (can be reconfigured to be unblocked). Configuration is done on the entire list and by Motorola only.

### Type 1

CHLD, CHUP, CR, A, D, DL, H, CACM, CAMM, CAOC, CPAS, CPUC, CSNS, CTRF1, MCST, MIPCALL, MIOD, MIOC, MMAD

### Type 2

CFUN, CCLK, ATS24, CPBS, CPBR, MCSN, MDSI, CPBF, CPBW, CSVM, MPDPM, CPIN, CPWD, CLCK, EMPC, COPS, CLIP, CLIR, CUSD, CCWA, COLP, CALM, CLVL, CMUT, CRSL, CRTT, MADIGITAL, MAFEAT, MAMUT, MAPATH, MAVOL, MMICG, MPCMC, VTD, VTS, S94, S96, CBM, CMT, CMTI, CNMA, CNMI, CSCB, MCSAT

## 4.6 MIDLET SECURITY

This paragraph describes the MIDP 2.0 Security Model for the Motorola G24 KJAVA product.

Two types of MIDlets can be downloaded into the G24: "Untrusted" (Unsigned) or "Trusted" (Signed).

### Security modes:

MIDlet may run in one of two security modes:

- Normal mode (Trusted domain) - Full access is granted to all APIs
- Safe mode (Untrusted domain) - Limited access to API.  
Any access to a protected API will be blocked and an exception will be thrown (java.lang.SecurityException).

Mode is determined according to MIDlet JAD during the download process. Signed MIDlet will run at Normal mode, Unsigned will run in Safe mode.

G24 uses x.509 PKI for signing and verifying trusted MIDlets.

The JAD file of a signed MIDlet contains additional attributes:

- MIDlet-JAR-RSA-SHA1
- MIDlet-Permissions
- MIDlet-Certificate-1-1

The protected APIs are:

- javax.microedition.io.HttpConnection
- javax.microedition.io.HttpsConnection
- javax.microedition.io.DatagramConnection
- javax.microedition.io.SocketConnection
- javax.microedition.io.SecureConnection
- javax.microedition.io.ServerSocketConnection
- javax.wireless.messaging.\*
- com.motorola.oem.OTADownload
- com.motorola.oem.call.\*



**Note**

Download process will fail in case of signature error.

See "Appendix D - Midlet Signing" for additional information.

# DEVELOPMENT AND MAINTENANCE

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## 5.1 GENERAL

The following log types are available:

- **AMS logs** - Issued by unit components (AMS, KVM, and Native Code)
- **MIDlet logs** - Issued by running MIDlet (stdout)

## 5.2 JTool COMMANDS

JTool commands enable external communication to G24 KJAVA module over serial connection (See “JTool Manager” section for more information).

When switching to JTool, running MIDlet is stopped.

A command line consists of JTool command string and a carriage return (commands are not case sensitive):

**<Command><CR>**

G24 KJAVA module echoes the input to the terminal.

The G24 KJAVA JTool commands are listed in Table 5:

**Table 5: JTool Commands**

Subject	JTOOL commands	Action	Notes
JTOOL	JT	Returns "JTool OK" when alive and listening.	
Download	OEMdownload	Prepares the unit for downloading a MIDlet.	
Reflash	OEMreflash	Switch to boot mode - ready for reflash.	Only for UART1 with PCLoader tool
KDWP	OEMkdpwON	Sets KDWP flag 'ON'.	KDWP flag is checked when running a MIDlet. If it is 'on' then the MIDlet will run in debug mode.
	OEMkdpwOFF	Sets KDWP flag 'OFF' (future use).	

Table 5: JTool Commands (Continued)

Subject	JTOOL commands	Action	Notes
UART's Baud Rate	OEMconfig_BaudRead: <u>X</u>	Read baud rate for serial <u>X</u>	<u>X values:</u> '1' - UART1 '2' - UART2  <u>Y ranges:</u> 9600, 19200, 38400, 57600, 115200  <b>Note:</b> When JTOOL is activated UART2 is set to "Default baud rate".
	OEMconfig_BaudDefaultSet: <u>X,Y</u>	Set default baud rate <u>Y</u> for UART <u>X</u>	
	OEMconfig_BaudDefaultRestore: <u>X</u>	Restore default baud rate for UART <u>X</u>	
	OEMconfig_BaudSet: <u>X,Y</u>	Set baud rate <u>Y</u> for UART <u>X</u> for the current session.	
Log Routing	OEMconfig_LogRead	Read log routing	<u>X values:</u> '0' - USB '1' - UART1 '2' - UART2 Logs are routed to UART2 by default. Only one log type to one port  <u>Y values:</u> '0' - AMS '1' - STDOUT
	OEMconfig_LogSet: <u>X,Y</u>	Route to serial <u>X</u> log type <u>Y</u>	
Log	OEMconfig_LogEnable: <u>X</u>	Enable Logs	<u>X values:</u> '0' - AMS '1' - STDOUT  <b>Note:</b> Disabling "AMS logs" will cause them to be routed to platform data logger.
	OEMconfig_LogDisable: <u>X</u>	Disable Logs	
Trace	OEMconfig_TraceEnable: <u>X</u>	Enable Trace	<u>X values:</u> 1-n, when n is the number of available traces types.  <b>Note:</b> Traces are subcategories of AMS logs.
	OEMconfig_TraceDisable: <u>X</u>	Disable Trace	
	OEMconfig_TraceEnableAll	Enable All Traces	
	OEMconfig_TraceDisableAll	Disable All Traces	
	OEMconfig_TraceRead	Outputs all available traces with their number and current status	
Java to AT Mode	OEMconfig_java2at	Change OEM mode from Java mode to full AT mode	<b>Note:</b> Unit will reset before the change takes place. For switching back to Java: AT+MJAVA=0
Clear invalidity flag	OEMconfig_clearFlag:UM	Clear UM invalidity flag (for debug purposes)	See "KJAVA ARCHITECTURE" for additional information.
	OEMconfig_clearFlag:DM	Clear DM invalidity flag (for debug purposes)	
Delete MIDlet	OEMconfig_delete:UM	Delete UM	

## 5.3 KDWP

KDWP is used for MIDlet "on target" debugging. Its "Debug agent" (PC application) communicates with the target's KVM over RS232 (A serial connection must be set between G24 UART2 and PC COM). Only UART2 can be used, therefore Serial Logs should be routed to UART1, USB or disabled.

IDE application must be JPDA (Java Platform Debugger Architecture) compliant to be able to attach to "Debug agent". Known JPDA compliant IDEs are: NetBeans, Eclipse and JBuilder.

All KDWP relevant files (including detailed activation procedure) can be found in the related bundle located in MOTODEV website, see reference [4].



**Note**

- MIDlet must be compiled with debug information.
- After restart KDWP is off.

### 5.3.1 Activation Procedure

1. Switch to JTool.
2. Enable KDWP on unit ("OEMkdwpon" command).
3. Set UART2's baud rate to 115200.
4. Switch to MIDlet Manager.
5. Execute the following command on a PC (in KDWP folder):

```
java -jar kdp.jar -v 9 -r serial: <com_port_number> -l <debugger_port_number> -cp <classes>
```

- **com\_port\_number** - port number on PC
- **debugger\_port\_number** - port to be used by IDE debugger
- **classes** - semicolon separated files with classes to debug including MIDlet's JAR file.



**Note**

MIDlet JAR file must be in KDWP folder.

Example:

```
java -jar kdp.jar -v 9 -r serial: 1 -l 1234 -cp WSupdata.jar
```

6. Start IDE and set breakpoints as needed.
7. Attach debugger to IDE.  
Note that IDE should attach to the same port number as in <debugger\_port\_number>.
8. In order to quit KDWP G24 should be restarted (restarting will take ~30 seconds).

*development and maintenance*

## 6.1 KJAVA CONTENT

The APIs available in G24 KJAVA product are listed in Table 6.

**Table 6: Motorola API Matrix**

G24 APIs	Description	JSR's	API Type
CLDC 1.1	Infrastructure	139	Standard
MIDP 2.0	UI, RMS, Connections, Basic Audio	118	
WMA 1.1/2.0	SMS, MMS	120,205	
MMAPI 1.1	Audio record play, video playback	135	
PIM	Contacts Access	75	
File Connection	File system access	75	
COMM Connection		118	
Access		N/A	Motorola Proprietary
HAPI		N/A	
Network		N/A	
OSC		N/A	
Websession		N/A	
Call		N/A	

## 6.2 PACKAGES OVERVIEW

For detailed package usage information refer to Javadoc.

## 6.2.1 Access Package

Package name: com.motorola.oem.access

The Access package provides these SIM card services:

1. SIM card status: indication and query.
2. SIM PIN1:
  - Lock utility - enable/disable and query status
  - Unlock
  - Change Code



**Note**

- Enabling/ Disabling Lock utility will take effect after next power cycle.
- Unlocking is valid until next power cycle.
- Code change can be done only when Lock utility is enabled and SIM PIN1 is unlocked.
- 3 times wrong PIN1 entry will cause SIM to be blocked.

3. Get MSISDN phone numbers.
4. Get SIM card files data (IMSI, GID1, GID2, CPHS, ICCID, and Preferred Languages).

## 6.2.2 Network Package

Package name: com.motorola.oem.network

The Network package provides these network (GSM/GPRS) features:

1. Network related indications and query:
  - Signal strength (RSSI and BER)
  - Cell information
  - Registration status
2. Operator selection.
3. Query of available networks.
4. Edit the preferred operators list.
5. Network Clock (NITZ) - format "yyyy/mm/dd,hh:mm:ss+timezone" (time zone is presented in units of quarter hour). Availability depends on network operator. See "OSC Package" "Time and Date".
6. Supplementary services (SS):
  - Calling line ID (CLI) presentation
  - Calling line ID (CLI) restriction
  - USSD -  
Two kinds of USSD network **responses** are supported:
    1. Structured - a confirmation response to request as:
      - Call Forward
      - Call Barring
      - Calling Line Identification
      - Calling Line Identification Restriction
    2. Unstructured - String representing the network indication or confirmation.  
Some network indication response require user's action (example: password for barring).

For each transaction response a required-action code will be attached.

Possible action codes:

- Further user action required - session continues, the MIDlet should follow with a new MO transaction.
- No action needed - session is closed.

USSD service restrictions:

- Network query operations (including a second USSD transaction) will be restricted when USSD transaction is taking place
- USSD transaction will be restricted when Network query operations are taking place.
- USSD String length will be at most 200 characters
- Sending an Empty string will result in session termination.
- The option to cancel a session after starting a transaction is not supported.

For more details refer to [3] - Java Doc.

### 6.2.3 OSC Package

The OSC class provides:

- “get” and “set” methods to access system properties
- Enable sleep mode
- SW Reset
- Power down
- Get Power-up reason
- Real time clock mechanism
- Measurements indication and query:
  - Battery level
  - G24 internal temperature
  - Antenna
- Air plane mode - RF disable
- MIDlet Watchdog

#### 6.2.3.1 OSC System Properties

The OSC system properties are listed in Table 7.

**Table 7: OSC System Properties**

Property name	Description	Possible values	Default value	Available for get/set method
oem.lastfault.running	UM/DM Last run fault information.	NA	NA	Get
oem.lastfault.panic	Last panic information.	NA	NA	Get
oem.lastfault.ota	Last OTA fault information.	NA	NA	Get
oem.lastfault.reportaddressX	Report destination address (X: 1 to 3)	Refer to “Appendix B - Default MIDlet Features”	NA	Set, get

**Table 7: OSC System Properties (Continued)**

Property name	Description	Possible values	Default value	Available for get/set method
oem.logs.ams.available oem.logs.stdout.available	AMS logs Standard output logs	ON, OFF	ON	Set, get
oem.logs.ams.route oem.logs.stdout.route	Serial port for log	USB, UART1, UART2	UART2	Set, get
oem.mode	Java or AT operation mode	See Table 4	NA	Set, Get
oem.dm.smslistener	DM SMS Listener	ON, OFF	ON	Set, Get
oem.dm.updateurl	Update URL for download the dm	NA	NA	Set, Get
oem.audio.digital	Audio to be used: digital or analog	ON, OFF	ON	Set, Get
oem.hw.module	Hardware configuration	OEM, HMI	NA	Get
oem.hw.imei	Product IMEI	NA	NA	Get
oem.version.software	Software version	NA	NA	Get
oem.version.flex	Flex Version	NA	NA	Get
oem.version.dm	DM version number	NA	NA	Get
oem.version.um	UM version number	NA	NA	Get
oem.kmgrpin.timesample	Kmgr pin time sample.  Valid for the next power cycle.  See “Sleep Mode” for more details.	"disable"->0ms "level1" ->0.5ms "level2" ->5 ms "level3" -> 10 ms "level4" ->20 ms	"level1"	Set, Get

### 6.2.3.2 Sleep Mode

G24 will enter sleep mode once it is **enabled** and **idle** state is reached (no I/O interrupts and RF activities).

Unit current consumption while in sleep mode is 3.5mA @ DRX9.



**Note**

- USB device connected to G24 will prevent unit from entering sleep mode.
- If data (Serial Logs or Comm Connection) is not being read by external device (remains in UART1 or UART2 buffers) G24 will not enter Sleep Mode.
- To reduce power consumption to minimum, Kmgr pin time sample (polling) should be reduced respectively. Use setProperty("oem.kmgrpin.timesample",XXX).

### 6.2.3.3 Airplane Mode

When "Airplane" mode is turned on, all transmit and receive RF circuits are disabled and Network related classes will throw an exception, if accessed:

- SocketConnection
- UDPDatagramConnection
- SocketServerConnection
- HTTPConnection

After power cycle, G24 restarts in normal mode, i.e. RF operations are enabled, even if in the previous session they were closed.

### 6.2.3.4 Real Time Clock (RTC) Mechanism

The RTC mechanism consists of two parts:

1. "Time and Date" - contains current date and time synchronized with Network time.
2. "Alarm" - contains some pre-installed date and time.

The RTC mechanism operates in all of the G24 KJAVA operating modes (**Off**, Idle, Sleep) as long as the power supplied is above the minimum operating level, see reference [1]. If the power supply is physically disconnected from the G24, the RTC timer resets and all the time, date and alarm settings are lost. On the next G24 power-up the time and date will revert to a default value.

The currently default is "00:00:00 01-Feb-07" (This value may be changed in further versions).

#### **Time and Date**

The OSC class provides the ability for the UM to accept or to decline Network NITZ update.

There are two ways to set "Time and Date" to be available:

- By auto update - if network supports NITZ and UM enables this feature.
- Direct set - if UM disables auto update and manually set Time and Date.

After power cut "time and date" will be reset and not be available until next set.

If network does not support Network NITZ update it is recommended not to enable auto update.

#### **Alarm**

Enable the user to set a time for an Alarm event to occur. This event will take place when "Time and Date" becomes equal to Alarm's setting time.

This feature can be used to automatically switch the module ON at a pre-defined time (can be used to save battery power).

### 6.2.3.5 Measurements

The G24 KJAVA module supports measurements of antenna presence, battery level and temperature.

#### **Battery**

All available range of battery voltage - from 3200 mV to 4200 mV is broken on pre-defined levels according to the table below:

<b>Level</b>	<b>Battery Voltage</b>
<b>5</b>	3700 - 4200
<b>4</b>	3500-3700
<b>3</b>	3400-3500
<b>2</b>	3350-3400
<b>1</b>	3300-3350
<b>0</b>	3200 - 3300 (Low battery)

Notification will be sent if average value of battery voltage crosses to new range.

**Temperature**

Temperature measurement is mapped from 0-255 A2D units to Celsius.

The actual temperature level (in degrees Celsius) can be derived from table or graphical representation (see Table 8 or Figure 6).

**Table 8: A/D Value to Temperature Conversion**

Temperature (°C)	A2D units	Temperature (°C)	A2D units	Temperature (°C)	A2D units
-30	229	4	114	38	43
-29	226	5	111	39	41
-28	223	6	108	40	40
-27	219	7	105	41	39
-26	216	8	102	42	38
-25	213	9	100	43	37
-24	210	10	97	44	36
-23	206	11	94	45	34
-22	203	12	92	46	33
-21	199	13	89	47	32
-20	196	14	87	48	31
-19	192	15	84	49	31
-18	189	16	82	50	30
-17	185	17	79	51	29
-16	182	18	77	52	28
-15	178	19	75	53	27
-14	175	20	73	54	26
-13	171	21	71	55	26
-12	168	22	69	56	25
-11	164	23	67	57	24
-10	160	24	65	58	23
-9	157	25	63	59	23
-8	153	26	61	60	22
-7	150	27	59	61	21
-6	146	28	57	62	21
-5	143	29	56	63	20
-4	140	30	54	64	20
-3	136	31	52	65	19
-2	133	32	51	66	19
-1	130	33	49	67	18
0	127	34	48	68	18
1	123	35	47	69	17
2	120	36	45	70	17
3	117	37	44		

A temperature level approximation can be obtained using the following 5th order polynomial formula:

$$\text{Temp [C]} = A5 * \text{ADCp5} + A4 * \text{ADCp4} + A3 * \text{ADCp3} + A2 * \text{ADCp2} + A1 * \text{ADCp1} + A0$$

$$A5 = -1.3e-09, A4=8.91591e-07, A3=-0.00024, A2=0.032894, A1=-2.56084, A0=103.2997$$

- ADCpN means ADC value powered by N
- XeY means X\*(10 powered by Y)

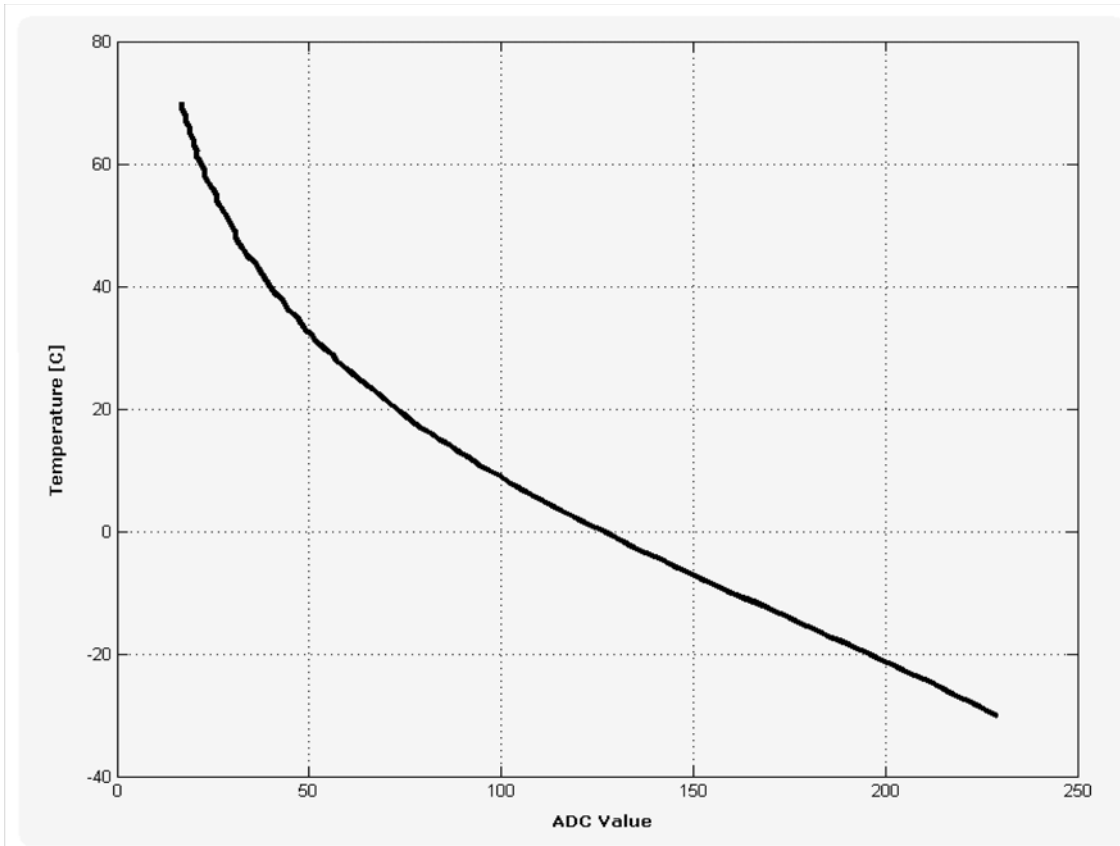


Figure 6. Actual Temperature Level (in degrees Celsius)

### 6.2.3.6 MIDlet Watchdog

The watchdog is a guard that keeps the system alive, and will restart the G24 when a MIDlet lockup is detected.

Once it is activated platform initiates a timer. Timer expiry is considered a MIDlet lockup.

UM should kick the watchdog timer in order to reset it.

Once it is activated platform send events every 10 seconds that can be caught by OSCWdogListener interface implementer. This will allow the MIDlet to kick the watchdog timer (by calling KickMIDletWatchdog) without maintain its own Timer mechanism.



Note

The watchdog default state is not active.

## 6.2.4 WebSession Package

Web Session is a collection of parameters which configure and manage the Internet connection (GPRS, MMS).

There are 2 types of web sessions used by Java platform for network (GPRS) connection. It is the user responsibility to set these parameters which are operator's specific:

**Java Session** - used for all javax.microedition.io (MIDP2.0), with addition of OTADownload APIs.

**Mms Session** - used for MMS send/receive (including emails).

### 6.2.4.1 OTADownload

The OTADownload class enables the UM to update itself over the air (JAD and JAR).

OTADownload is using "Java Session" parameters by default.

In order to enable the OTA download, UM should provide a URL to the requested MIDlet suite along with all OTA websession parameters. Once the download process started, "there is no return" and the running MIDlet will be closed.

MIDlet downloading and installing is fully automatic. In case of a successful download and install, the new MIDlet will start automatically. In case of a failure, previous MIDlet will be launched again (if it's the DM a report will be send to all saved report addresses).

OTADownload uses HTTP 1.1 and WAP 2.0 protocols.

### 6.2.4.2 WebSessionManager

The WebSessionManager class manages Web Sessions entries addition, deletion, update and setting the "current" G24 Web Session.

#### Session provisioning-

Web session's OTA Provisioning is the process, by which the carrier configures a web session.

The user may "listen" to a "browser settings received" event, indicating the arrival of a new "browser settings" (sent by the carrier). In case web session update is accepted by the MIDlet, the "**Prov Session**" web session entry is overridden with the newly received settings.

The "browser settings" message may contain an optional parameter which indicates the security mechanism used. If the parameter is not present, no security is used. If the parameter is present it must take one of the values: AUTH\_METHOD\_NETWPIN, AUTH\_METHOD\_USERNETWPIN, AUTH\_METHOD\_USERPIN, and AUTH\_METHOD\_USERPINMAC.

The following table describes the 3 predefined (reserved) web session entries:

Web Session Name	Web Session Name	Web Session Index
Java Session	"Java Session"	SESSION_INDEX_JAVA
Mms Session	"Mms Session"	SESSION_INDEX_MMS
Prov Session	"Prov Session"	SESSION_INDEX_PROV



Note

Prov Session is read only.

See Table 9 for Web Session Parameters.

**Table 9: Web Session Parameters**

Web Session Parameter	Sub Parameters	Parameter Description	Possible Values	Default Value
Access				
Name		Web session name	Any name, except for the reserved session names.	
Home Page		URL		
Gateway IP 1/2		Gateway IP		null
Port 1/2		Port number	8080 (HTTP) 9201 (WAP)	Port 1: 8080 Port 2: 9201
Domain 1/2				
Service Type 1/2		Service Type for the connection	wap, wap_connectionless wap_secure, wap_secure_connectionless http http_secure  Note: For MIDP2 connections use http and http_secure only.	HTTP
DNS 1/2		DNS URL		
DNS 2		DNS URL		
Time Out		Connection timeout	In minutes: 1, 2, 5, 10, 15	15
CSD 1/2	<b>Phone Number</b> <b>User Name</b> <b>Password</b> <b>Speed</b> <b>Line type</b>	CSD session 1 and 2 configuration	<b>Speed</b> Baud rates available: 2400, 4800, 9600,14400 <b>Line type</b> available: Modem, Isdn	Speed: 14400 Line type: Modem
GPRS	<b>APN</b> <b>User Name</b> <b>Password</b>	GPRS session access parameters		null

## 6.2.5 HAPI Package

The G24 KJAVA product supports two hardware-controlling APIs:

- GPIO API
- A2D API

### 6.2.5.1 GPIO API

The GPIO API is responsible for configuring and handling the I/O pins.

The API allows direct access to GPIO lines for:

- Read pin status
- Write to pin
- Interrupt or counter (enable/disable)

Several GPIO lines support two configuration modes:

1. **Interrupt** - Receive notifications on edge-triggered, according to pre-defined notification and debounce type.  
**Available GPIOs: 1, 14, 15, 16**
2. **Counter** - Receive notifications on counter expiry according to pre-defined notification type, counter type and counter expiry value.  
**Available GPIOs: 14, 15**

Working in counter mode enable system to receive interrupts in high frequency. Notifications to user about counter expiry occurrence will arrive only when reaching pre-defined number of interrupts - counter expiry value. See Figure 7 for GPIO counter mechanism.

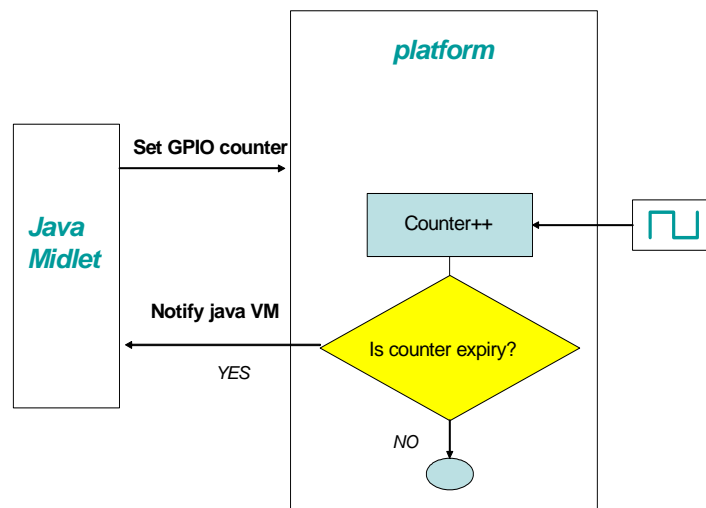


Figure 7. GPIO Counter Mechanism

**Interrupt and Counter performance:**

1. Interrupt latency - notification to UM.
  - Idle - 10 ms.
  - While HTTP download session - 15 ms.
  - While UDP download session - 20ms.



**Note**

For both HTTP and UDP, thread yielding must occur. See “Appendix C - GPIO Interrupt latency” for more information.

2. Counter frequency:
  - Idle - 2 KHz.
  - While HTTP download session - 500 Hz.

For additional GPIO information refer to “Appendix A - GPIO lines”.

**GPIO Classes**

1. **GpioInput** - GPIO configuration as input, interrupt or counter.  
Actions: read status, enable/disable interrupt/counter

2. **GpioOutput** - GPIO configuration as output.  
Actions: write
3. **GpioInterruptConfig** - is container of interrupt GPIO.  
Configuration: notification type, debounce type, and notifications listener.  
Default configuration values:
  - a. Debounce: 40ms (Normal).
  - b. Notifications: both edges.



**Note**

Gpio interrupt performance are detailed in "Appendix C - GPIO Interrupt latency".

4. **GpioCounterConfig** - is container of counter GPIO.  
Configuration: notification type, counter type, counter expiry, and notifications listener.  
Default configuration values:
  - a. Debounce: disabled (Can not be changed).
  - b. Notifications: both edges.
  - c. Counter: cyclical.
  - d. Counter expiry: 50 pulses.
5. **GpioCounter** - Service methods for GPIO counter.  
Actions: Read and reset counter.

### 6.2.5.2 A2D API

A2D API is responsible for configuring and handling the 3 external A2D converters, pins: 37, 43 and 47.

Converter values are between 0 to 255 unit ranges, representing 0-2.3 Volt.

Automatic notifications:

1. Periodical - cyclically with pre-defined period.
2. Threshold - notification upon Voltage (see Figure 8):
  - a. Below the "low limit range".
  - b. Above the "high limit range".

A2D automatic notification default state is OFF.

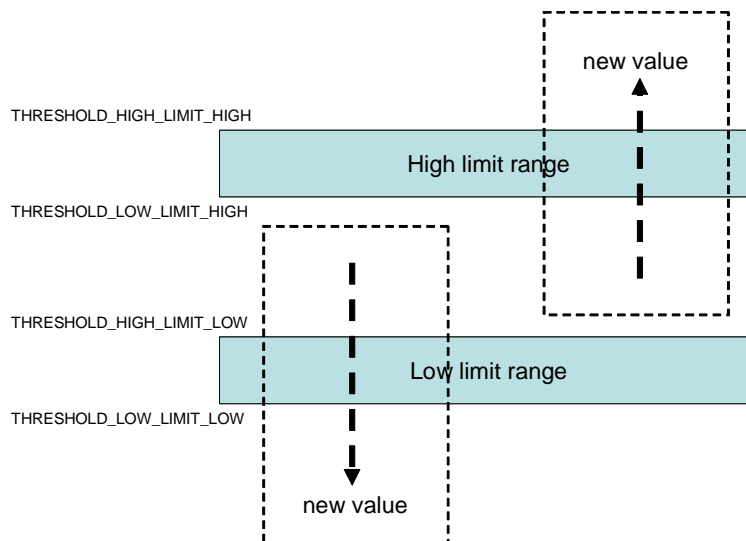


Figure 8. Threshold's Conditions for Auto Notification by Threshold Mode

#### **G24 performance:**

1. Periodical notification - Every 4 sec. at the minimum (defined by multiples of 4 sec).
2. Due to system architecture, threshold notification may be delayed up to 4 sec.

#### **A2D classes**

1. **A2dManager** - Manages the access to A2D converters.
2. **A2dChannel** - A2D converter configuration and notification (access to A2D value, Enable/Disable notification).
3. **A2dAutoPeriodConfig** - A2D period notification container, default period is 4 sec.
4. **A2dAutoThresholdConfig** - A2D threshold notification container.  
Default value for "low limit range" - 50 to 60 and "high limit range" - 190 to 200.

### **6.2.6 Call Package**

This package enables the UM to perform a single MO/MT voice or data call.

Contains: interface "DataCallConnection" and classes "Call" and "DataCallConfig".

The interface "DataCallConnection" is based on the Generic Connection Framework and extends the StreamConnection interface.

The major features of the package are:

- Dial, Answer or release a call.
- Indicates call direction, number and type.
- Report call state and call exit cause.
- Configure air link parameters for the next MO data call.
- Get Radio Link Protocol parameters range to be used in air link configuration.
- Several events type Voice/Data call alerts and state change events.

## 6.3 STANDARD CLASSES DEVIATIONS

### 6.3.1 Comm Connections

Package: javax.microedition.io.CommConnection.

Description: Handling serial connection.

Three parallel serial ports are available: UART1, UART2 and USB.

See Table 10 for Port to Serial mapping.

**Table 10: Port to Serial Mapping**

Port Identifier	Serial
COM0	UART2
COM1	UART1
COM2	UART2
COM3	USB

### 6.3.2 Server Socket Connection

Package: javax.microedition.io.ServerSocketConnection.

Description: Handling listen TCP/UDP socket.

Deviation: One client per connection socket (up to 4 sockets).

Example for handling server socket connection:

```
public class TcpConnection extends Thread {  
    public SocketConnection sc = null;  
    public ServerSocketConnection scn = null;  
    public InputStream is = null;  
  
    public void run() {  
        //gets port number from jad file  
        openConnection(getAppProperty("PORT"));  
        byte[] ReceiveData = new byte[256];  
        try {  
            InputStream is = sc.openInputStream();  
            while (true) {  
                int len = is.read(ReceiveData);  
                if (len > -1) {
```

```

        //receive data
        System.out.println("Receive data - " + new String(ReceiveData) + "\n");
        System.out.println("Number of bytes - " + len + "\n");
    } else if (len == -1) {
        //connection with client has been broken.
        openConnection(getAppProperty("PORT"));
    }
}
} catch (IOException e) {
    ...
}
}
private void openConnection(String port) {
    try {
        //create ServerSocketConnection instance
        scn = (ServerSocketConnection) Connector.open("socket://:" + port);
        //wait for client connection.
        sc = (SocketConnection) scn.acceptAndOpen();
        sc.setSocketOption(SocketConnection.LINGER, 5);
    } catch (IOException e) {
        //cannot open connection
        ...
    }
}
}
}

```

**Note**

In order to open more sockets in parallel, use another TcpConnection thread.

### 6.3.3 Message Connection

Package: javax.wireless.messaging.

Default SMS Port API.

## *java API*

All regular incoming SMS (without destination and source port) will be redirected to a special, default MT port;

- Destination port - 6024
- Source port - 49153

In order to be able to get this kind of SMS, MIDlet should listen on port 6024 using JSR120.

MIDlet Messages are stored in a separate JSR120 Inbox folder (up to 26 messages).

When this folder reaches its limit then the oldest unread message in a group of existing port (xxxx) will be deleted. If no group port messages exist the oldest unread message in the folder will be deleted.

### **Notification about Incoming Message**

There are two main use-cases for message arrival:

1. MIDlet is running  
MIDlet handles message (registered to 6024 port).
2. MIDlet is not running  
SMS will be stored in the JSR120 Inbox folder. When MIDlet is launched and registers to 6024 port, then incoming SMS will be handled it and deleted from storage.

# APPENDIX A - GPIO LINES

Pin assignment details for G24 KJAVA module GPIO lines are listed in the following tables.



**Note**

1. GPIO 1-8 can be accessed via EVB switch S120.
2. Pin dedicated for **Java Tool** is marked yellow.
3. GPIO13 must **not** be grounded at power up.
4. If GPIO direction is input and line is not connected, its state will be defined according Initial value.
5. If GPIO direction is output, "Floating" state is not available. Initial state depends on initial configuration. This configuration can be controlled by Java GPIO API.

Y=Yes; N=No.

I = Input; O = Output; I/O = Input/Output.

**Table 11: Java Module GPIO Lines, OEM Units**

70 Pin Conn. Pin No.	G24 Signal	Java Signal	Internal resistor (Pull Up)	Initial Value	Direction	Default Direction	Input	
							Interrupt	Counter
28	GPIO1	<b>GPIO1</b>	100k	1	I/O	I	Y	N
30	GPIO2	<b>GPIO2</b>	100k	1	I/O	I	N	N
32	GPIO3	<b>GPIO3</b>	22k	1	I/O	I	N	N
34	GPIO4	<b>GPIO4</b>	22k	1	I/O	I	N	N
36	GPIO5	<b>GPIO5</b>	22k	1	I/O	I	N	N
38	GPIO6	<b>GPIO6</b>	22k	1	I/O	I	N	N
40	GPIO7	<b>GPIO7</b>	22k	1	I/O	I	N	N
42	<b>GPIO8</b>	<b>GPIO8</b>	22k	1	I/O	I	N	N
41	ANT_DET	<b>GPIO9</b>		0	O	O	N	N
49	GPRS	<b>GPIO10</b>		0	O	O	N	N
26	WKUPO_N	<b>GPIO11</b>	22k	1	O	O	N	N
23	RI_N	<b>GPIO12</b>	100k	1	I/O	I	N	N
13	DSR_N	<b>GPIO13</b>	100k	1	I/O	I	N	N
19	DTR_N	<b>GPIO14</b>	100k	1	I/O	I	Y	Y
17	DCD_N	<b>GPIO15</b>	100k	1	I/O	O	Y	Y

Table 11: Java Module GPIO Lines, OEM Units (Continued)

70 Pin Conn. Pin No.	G24 Signal	Java Signal	Internal resistor (Pull Up)	Initial Value	Direction	Default Direction	Input	
							Interrupt	Counter
16	WKUPI_N (EVB S100)	<b>GPIO16</b>	22k	1	I/O	I	Y	N

Table 12: Java Module GPIO Lines, HMI Units

70 Pin Conn. Pin No.	G24 Signal	Java Signal	Internal resistor (Pull Up)	Initial Value	Direction	Default Direction	Input	
							Interrupt	Counter
26	WKUPO_N	<b>GPIO11</b>	22k	1	O	O	N	N
23	RI_N	<b>GPIO12</b>	100k	1	I/O	I	N	N
13	DSR_N	<b>GPIO13</b>	100k	1	I/O	I	N	N
19	DTR_N	<b>GPIO14</b>	100k	1	I/O	I	N	N
17	DCD_N	<b>GPIO15</b>	100k	1	I/O	O	N	N
16	WKUPI_N (EVB S100)	<b>GPIO16</b>	22k	1	I/O	I	N	N

# APPENDIX B - DEFAULT MIDLET FEATURES

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## B.1 SUPPLY OF ALL AVAILABLE UNIT INFORMATION

DM outputs all available unit information to the standard output. If it's an HMI unit, information is printed to the screen as well. Output information includes:

- DM Version
- Earliest required software version for present DM
- Software version
- Flex version
- Product description
- OEM mode
- IMEI
- MSISDN
- Unit Time and Date
- UM version
- Fault report address
- Last OTA status
- OTA fault data
- MIDlet run fault data
- DM SMS listener status

## B.2 FAULT REPORT

DM manages the fault report mechanism. There are two types of faults:

- Run fault - In case there was a critical error in UM or DM run-time (uncaught exception, VM error, etc.).
- OTA fault - In case an OTA download process has failed.

When DM loads, a fault report is sent automatically (in case fault information is available). In addition, the DM can be triggered to send a fault report using an SMS request.

The following table shows report types:

Report Type	Report Address	Report Address Example	Description
File	file	file	A text file containing a detailed report in XML format is saved in the file system under "file:///c:/mobile/kjava/" folder. Three fault reports may be saved, named "fault_report<n>.xml", where "fault_report1.xml" is the most recent and "fault_report3.xml" is the least recent. Only one fault report may be saved every session to prevent the same report from being written twice.
SMS	sms://<phone number>	sms://972541234567	An SMS message is sent to the phone number, containing the IMEI of the unit, and what fault information is available.
E-Mail	email://<email address>	email:// name@company.com	An E-Mail message is sent to the address, containing a detailed report in XML format.
HTTP/HTTPS	http://<web server address> https://<web server address>	http://www.example.com	An HTTP post request is sent to the address, in which the post variable "fault_report" contains a detailed report in XML format.



**Note**

All report addresses can be configured through SMS to DM and through OSC API.

### B.3 CQA TESTING ROUTINES HANDLER

DM handles the CQA tests as part of the manufacturing process. DM implements several capabilities such as MT voice call and serial port communication, which are tested in the factory.



**Note**

This feature is enabled only in case there is no UM installed on the unit.

### B.4 OTA PROVISIONING

DM handles OTA provisioning through WAP push messages (browser messages).

### B.5 GPRS INDICATOR

DM "outputs" GPRS registration status to GPIO 11 - LOW represents registered, HIGH represents unregistered.



**Note**

This feature is enabled only in case there is no UM installed on the unit.

## B.6 SMS UPDATES / REQUESTS LISTENER

The DM starts an SMS listener which allows updates and requests to be sent to the unit. The SMS sent to this listener must meet a specific format.

Upon initialization, the DM reads the OSC property "oem.dm.smslistener", if set to "on", which is the default value, it starts listening to SMS messages. To turn off the listener set the property to "off". Using these messages, updates and requests can be sent to the unit.

### B.6.1 Message Format

The SMS has to be sent to port 16001. The message is constructed from fields and values. The field and value are separated by a colon, and the fields are separated by an LF (line feed, "\n") sign or a CR (carriage return, "\r") sign. LF and CR are treated as the same character.

Example:

```
action:value
field1:value
field2:value
field3:value
```

Additional notes:

- Every message must contain an "action" field which defines the update or request type.
- The order of the fields has no importance.
- If there is more than one occurrence of a field, the last occurrence will be used.
- The field strings and value strings are not case-sensitive.
- All field strings and value strings are trimmed.

### B.6.2 Messages Types

Supported messages:

- Java/Mms Session Update
- OTA Download Triggering
- Fault Report Addresses Update
- Fault Report Triggering
- Ping

#### B.6.2.1 Java/MMS Session Update

This message updates the "Java Session" or "Mms Session" web sessions.

Additional notes:

- The only difference between the two is the action field.
- If the message contains a field with an invalid value, the message is dismissed.
- To set a field to its default value, don't include the field in the message.
- The update replaces the full Web Session, not specific fields. Old values are not saved.

**Appendix B - Default MIDlet Features**

Message fields are given in the table below:

Description	Field String	Valid Values	Notes
Action to be performed (Update "Java Session" or "Mms Session" web sessions)	action	<ul style="list-style-type: none"> <li>• java session</li> <li>• mms session</li> </ul>	This field defines the message type. This is a mandatory field.
Homepage	homepage		This field is used as a default OTA download URL.
Service Type 1	service1	<ul style="list-style-type: none"> <li>• wap</li> <li>• wap connectionless</li> <li>• wap secure</li> <li>• wap secure connectionless</li> <li>• http</li> <li>• http secure</li> </ul>	Default value is http
Proxy 1	proxy1		
Port 1	port1		Default value is 8080
Domain 1	domain1		
Service Type 2	Service2	<ul style="list-style-type: none"> <li>• wap</li> <li>• wap connectionless</li> <li>• wap secure</li> <li>• wap secure connectionless</li> <li>• http</li> <li>• http secure</li> </ul>	
Proxy 2	proxy2		
Port 2	port2		Default value is 9201
Domain 2	domain2		
DNS 1	dns1		
DNS 2	dns2		
Timeout (minutes)	timeout	<ul style="list-style-type: none"> <li>• 1</li> <li>• 2</li> <li>• 5</li> <li>• 10</li> <li>• 15</li> </ul>	Default value is 15
CSD No. 1	csd1		
CSD No. 1 User Name	csduser1		
CSD No. 1 Password	csdpass1		
Speed (Bps) 1	speed1	<ul style="list-style-type: none"> <li>• 2400</li> <li>• 4800</li> <li>• 9600</li> <li>• 14400</li> </ul>	Default value is 14400
Line Type 1	line1	<ul style="list-style-type: none"> <li>• modem</li> <li>• isdn</li> </ul>	Default value is modem
CSD No. 2	csd2		

Description	Field String	Valid Values	Notes
CSD No. 2 User Name	csduser2		
CSD No. 2 Password	csdpass2		
Speed (Bps) 2	speed2	<ul style="list-style-type: none"> <li>• 2400</li> <li>• 4800</li> <li>• 9600</li> <li>• 14400</li> </ul>	
Line Type 2	line2	<ul style="list-style-type: none"> <li>• modem</li> <li>• isdn</li> </ul>	Default value is modem
GPRS APN	apn		
GPRS User Name	gpruser		
GPRS Password	gprpass		

Example: Update the Java Session

```
action:java session
homepage:http://www.domain.com/directory/midlet.jad
service1:wap
service2:wap
csd1:+972540000000
port1:9201
port2:9201
apn:internet
```

### B.6.2.2 OTA (Over the Air) Download Trigger

This message triggers an OTA download of a new MIDlet to the unit. If the message does not specify a JAD file URL, the homepage parameter of the "Java Session" web session will be used as a URL.

Message fields are given in the table below:

Description	Field String	Valid Values	Notes
Action to be performed: OTA download trigger	action	ota	This field defines the message type. This is a mandatory field.
JAD File URL	url		

Example 1: Download, install and run the MIDlet found at the homepage of the "Java Session" web session

```
action:ota
```

Example 2: Download, install and run the MIDlet found at http://www.domain.com/directory/midlet.jad

```
action:ota
```

```
url:http://www.domain.com/directory/midlet.jad
```

### B.6.2.3 Fault Report Addresses Update

This message updates the fault report addresses of the unit.

Message fields are given in the table below:

Description	Field String	Valid Values	Notes
Action to be performed: Update fault report address	action	report address	This field defines the message type. This is a mandatory field.
Report Address 1	address1		Must be a valid address
Report Address 2	address2		Must be a valid address
Report Address 3	address3		Must be a valid address

Example 1: Update fault report address 1 to email://name@company.com.

```
action:report address
address1:email://name@company.com
```

Example 2: Update fault report address 1 to email://name@company.com, fault report address 2 to email://anothername@anothercompany.com and don't use fault report address 3

```
action:report address
address1:email://name@company.com
address2:email://anothername@anothercompany.com
address3:
```

### B.6.2.4 Request for Fault Report

This message commands the unit to report the fault information to its defined addresses. The report happens automatically when the DM loads if there is fault information available.

Message fields are given in the table below:

Description	Field String	Valid Values	Notes
Action to be performed: Report fault information	action	fault report	This field defines the message type. This is a mandatory field.

Example: Report the fault information to the defined addresses.

```
action:fault report
```

### B.6.2.5 Ping

This message is used to verify if the unit is working. When the DM receives this message, it returns a message to the sender containing the text "Ping (Motorola Wireless Modules)".

Message fields are given in the table below:

Description	Field String	Valid Values	Notes
Action to be performed: Ping the unit	action	fping	This field defines the message type. This is a mandatory field.

Example: Ping the unit.

action:ping



# APPENDIX C - GPIO INTERRUPT LATENCY

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## C.1 INTRODUCTION

In order to achieve minimal average interrupt latency (HW I/O to Java) one should understand JVM limitation, and how to manipulate code accordingly.

Java VM provides limited RT abilities. Programming in a multithreading environment while trying to ensure strict RT scheduling, is an impossible mission. As a result, working in such an environment will cause interrupt latency to be inconsistent, specially when parallel threads consume large amount of VM resource (i.e. +UDP or HTTP connection).

## C.2 MULTITHREADING BACKGROUND

A basic understanding of how to use threads is the key to writing effective J2ME applications. Some important issues about multithreaded environments are listed below:

1. Scheduling  
Thread scheduling is a complicated affair over which the application has little control. The KVM scheduler allocates byte code slot for current running thread (classical OS uses run time slot). It impossible to ensure fix run time for a fixed number of bytes code slot.
2. Priority  
The only real influence the application has over thread scheduling is via the thread's priority level: higher-priority threads execute more often than those with lower priority (default thread priority is NORAML PRIORITY).  
  
A thread keeps running until:
  - It yields by calling the yield method
  - The scheduler selects new thread to run
3. Garbage collection  
Has higher priority then any other user thread, therefore will always have precedence over user thread.  
This behavior may cause inconsistent interrupt performance.

## C.3 HOW TO ACHIVE MINIMAL LATENCY

Limited control over JVM scheduling mechanism can be achieved using Thread class:

- Thread.setPriority(priority level) -  
This method enables user to adjust, in runtime, the current thread priority (range is from MIN\_PRIORITY to MAX\_PRIORITY).
- Thread.yield() -  
This method enforces current thread to give up the CPU resource.

In order to create minimal average interrupt latency, one should set interrupt thread (NativeExtEventThread) priority to the maximum level, other threads to the lower one and limit those threads execution time by using yield function (if not used, interrupt thread can be delayed for a significant amount of time: 40-50 milliseconds).

## C.4 CODE EXAMPLE

The following code example demonstrates the use of the above sections:

```
public class myMidlet extends MIDlet implements GpioInterruptListener{

    void startApp(){
        // Define gpio 15 as input and enable interrupts on it.
        GpioInput gpioInput = new GpioInput(15);
        GpioInterruptConfig gpioInterruptConfig = new GpioInterruptConfig(this);
        gpioInterruptConfig.enableDebounce(false);
        gpioInterruptConfig.setNotificationType(GpioInterruptConfig.NOTIFICATION_TYPE_LOW_TO_HIGH);
        gpioInput.enableInterrupt(gpioInterruptConfig);

        // Start the HTTPConnection thread.
        HTTPConnection myHttp = new HTTPConnection("http://www.domain.com");
        myHttp.start();
    }

    ...

    public void onInterrupt(int gpioNum, boolean val) {
        // Set onInterrupt thread priority to MAX priority.
        Thread.currentThread().setPriority(Thread.MAX_PRIORITY);
    }

    // HTTPConnection is used to demonstrate VM resource consuming thread.
    protected class HTTPConnection extends Thread{
        private String url ;
        private HttpConnection conn;
        private InputStream iStream;

        public HTTPConnection(String Url){
            // Set HTTP connection thread priority to MIN priority.
            this.setPriority(this.MIN_PRIORITY);
            this.url = Url;
        }
        public void run(){
            conn = (HttpConnection)Connector.open(url,Connector.READ, true);
            iStream = conn.openInputStream();
            while(true){
                iStream.read();
                // HTTPConnection thread yield the CPU after each reading.
                this.yield();
            }
        }
    }
}
```



## Appendix D - Midlet Signing

6. Upon receiving the "Bound Certificate" (.crt) file from Motorola, you should create a directory for G24 in the following location: C:\BOUND\_Certificate\cert\G24.



7. Place the "Bound Certificate" (.crt) file at the following location:  
C:\BOUND\_Certificate\cert\G24  
It is important to preserve the above path since an automatic tool relays on it.
8. Open a command window and run the "BoundSign.bat" batch file as follows:  
**BoundSign.bat UserMIDlet 182-1.X**  
Where:
  - "UserMIDlet" is the name of your midlet (without the jad or jar suffix).
  - "182-1.X" is the certificate file name you received from Motorola without the crt suffix.The "BoundSign.bat" batch file performs all the steps listed in chapter 2.2.6 of "Signing a MIDlet with a BOUND Certificate (External Release)" document.





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