

# Cinterion<sup>®</sup> Java Terminals

Hardware Interface Description

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## 0 Document History

Preceding document: "Cinterion® Java Terminals Hardware Interface Description" Version 05

New document: "Cinterion® Java Terminals Hardware Interface Description" Version 06

Chapter	What is new
Throughout document	Added EHS5T-US RS485 as new product.
<a href="#">3.7</a>	Added note on switch off and power saving behavior if using EHS5T's RS-485 interface.
<a href="#">4.2.5</a>	New section <a href="#">RS-485 Interface</a> .
<a href="#">4.2.6</a>	Added Ethernet characteristics.
<a href="#">4.3</a>	Revised power supply ratings.

Preceding document: "Cinterion® Java Terminals Hardware Interface Description" Version 04

New document: "Cinterion® Java Terminals Hardware Interface Description" Version 05

Chapter	What is new
Throughout document	Removed SPI option for EHS5T RS485. Added digital audio interface (DAI/PCM) lines as option for GPIO20 to GPIO23. Replaced GPIO14 / GPIO15 with GPIO22 / GPIO23 respectively. Assigned WD_RETRIG line to GPIO8 instead of the GPIO22.
<a href="#">3.7.1</a>	New section <a href="#">Serial Interface ASC1</a> .
<a href="#">3.7.2</a>	New section <a href="#">Digital Audio Interface</a> .
<a href="#">3.7.3</a>	New section <a href="#">I<sup>2</sup>C Interface</a> .
<a href="#">3.7.4</a>	New section <a href="#">SPI Interface</a> .
<a href="#">3.7.5</a>	New section <a href="#">PWM Interface</a> .
<a href="#">3.7.6</a>	New section <a href="#">Pulse Counter</a> .
<a href="#">3.7.7</a>	New section <a href="#">Analog-to-Digital Converter (ADC)</a> .
<a href="#">3.7.8</a>	New section <a href="#">DSR0 signal</a> .
<a href="#">8.3.1.10</a> <a href="#">8.4.1.4</a>	Revised GPIO default direction settings - all are set to INPUT now. Adapted configuration samples given in <a href="#">Section 8.5.1</a> and <a href="#">Section 8.5.1</a> accordingly.
<a href="#">9.4</a>	Added <a href="#">Figure 34</a> showing result of a firmware update command.

Preceding document: "Cinterion® Java Terminals Hardware Interface Description" Version 03

New document: "Cinterion® Java Terminals Hardware Interface Description" Version 04

Chapter	What is new
Throughout document	Added information for product variant EHS6T LAN.



Preceding document: "Cinterion® Java Terminals Hardware Interface Description" Version 02  
 New document: "Cinterion® Java Terminals Hardware Interface Description" Version 03

Chapter	What is new
Throughout document	Replaced the term "Weidmueller connector" with "GPIO connector". Added notes that GPIOs 14/15 will be replaced by GPIOs 22/23 in the next product release.
1.4	Updated label shown in <a href="#">Figure 1</a> .
3.9	Revised section and spun off new section <a href="#">3.10 Power Up/Power Down Scenarios</a> .
3.10.3	Removed note that watchdog can be configured to turn off Java Terminals.
4.1	Revised ESD ratings (in <a href="#">Table 18</a> ) and minimum voltage rating (in <a href="#">Table 19</a> ).
4.2.1	Revised input voltage ratings listed in <a href="#">Table 20</a> .
4.2.2	Revised ratings given in <a href="#">Table 21</a> .
4.2.4	Revised description for VCCref.
4.4	Added thermal resistance and thermal power values for Java Terminals.
4.3	Revised power supply ratings.
5.1	Added new figure showing mechanical dimensions ( <a href="#">Figure 19</a> ).
7	Revised <a href="#">Table 7</a> .
8, 8.1.1	Slightly revised (hardware) watchdog introduction and modified <a href="#">Reset stages</a> .
8.5	New section <a href="#">Configuring GPIO Directions</a> .

Preceding document: "Cinterion® Java Terminals Hardware Interface Description" Version 01  
 New document: "Cinterion® Java Terminals Hardware Interface Description" Version 02

Chapter	What is new
1.4	Revised product label shown in <a href="#">Figure 1</a> .
3.7	Revised section with regard to the GPIO connector pin availability.
4.1	Completed <a href="#">Table 18</a> giving absolute maximum ratings.
4.4	Added remarks on board temperature.
4.3	Revised and completed section listing power supply ratings.
6.3	Added CE conformity mark.
6.5	Revised section to include notes for IC (also in the French language).
8	Revised and updated <a href="#">Appendix A: (Hardware) Watchdog</a> .

New document: "Cinterion® Java Terminals Hardware Interface Description" Version 01

Chapter	What is new
---	Initial document setup.

# 1 Introduction

This document<sup>1</sup> describes the hardware of the Cinterion® Java Terminals. The Java Terminals come in five variants depending on the included Cinterion® module and the available interfaces:

- **EHS5T RS485** contains a Cinterion® EHS5-E module and implements a USB 2.0 interface with a USB-B connector as well as a 6-pole Western jack as plug-in power supply connector. Via a GPIO interface it also implements a RS-485 interface including power supply and ignition line.
- **EHS5T-US RS485** is identical to EHS5T RS485, but contains a Cinterion® EHS5-US module instead of a Cinterion® EHS5-E module. Note: Unless otherwise mentioned EHS5T RS485 refers to both product variants.
- **EHS6T USB** contains a Cinterion® EHS6 module and implements a USB 2.0 interface with a USB-B connector and also a V.24 / V.28 RS-232 interface with a D-sub 9-pole female socket as well as a 6-pole Western jack as plug-in power supply connector.
- **EHS6T LAN** contains a Cinterion® EHS6 module and implements an Ethernet interface with a RJ-45 8-pin connector and also a V.24 / V.28 RS-232 interface with a D-sub 9-pole female socket as well as a 6-pole Western jack as plug-in power supply connector.
- **BGS5T USB** contains a Cinterion® BGS5 module and implements a USB 2.0 interface with a USB-B connector and also a V.24 / V.28 RS-232 interface with a D-sub 9-pole female socket as well as a 6-pole Western jack as plug-in power supply connector.

Wherever necessary and appropriate this document distinguishes between these five variants.

[Table 1](#) gives a short overview of the available interfaces for the different Java Terminals.

**Table 1:** Cinterion® Java Terminals overview

Module/Interface	EHS5T RS485 and EHS5T-US RS485	EHS6T USB	EHS6T LAN	BGS5T USB
Cinterion® module	EHS5-E or EHS5-US	EHS6	EHS6	BGS5
RS-232 (Sub-D)	-	✓	✓	✓
USB (USB-B)	✓	✓	-	✓
GPIO interface (GPIOs, Power, ASC1, DAI, SPI, I <sup>2</sup> C, RS-485)	✓ (no SPI)	✓ (no RS-485)	✓ (no RS-485)	✓ (no RS-485, no SPI)
Ethernet (RJ-45)	-	-	✓	-
Power supply (RJ-11)	✓	✓	✓	✓
RF antenna	✓	✓	✓	✓

The scope of this document includes interface specifications, electrical as well as mechanical characteristics of the Java Terminals. It specifies standards pertaining to wireless applications and outlines requirements that must be adhered to for successful product design. The Java Terminals are compact GSM/UMTS modems for the transfer of data in GSM/UMTS networks. Industrial standard interfaces and an integrated SIM card reader allow using the Java Terminals easily as GSM/GPRS/UMTS terminals.

1. The document is effective only if listed in the appropriate Release Notes as part of the technical documentation delivered with your Gemalto M2M product.

## 1.1 Related Documents

- [1] AT Command Set for your Java Terminal product
- [2] Release Notes for your Java Terminal product

To visit the Gemalto M2M GmbH Website please use the following link:

<http://m2m.gemalto.com>

## 1.2 Terms and Abbreviations

**Table 2:** Terms and abbreviations

Abbreviation	Description
ARP	Antenna Reference Point
ATC	AT Command
BTS	Base Transceiver Station
CB	Cell Broadcast
CODEC	Coder-Decoder
DAI	Digital Audio Interface
DCE	Data Circuit terminating Equipment
DSR	Data Set Ready
DTR	Data Terminal Ready
EFR	Enhanced Full Rate
EGSM	Enhanced GSM
EMC	Electromagnetic Compatibility
ESD	Electrostatic Discharge
ETS	European Telecommunication Standard
FDMA	Frequency Division Multiple Access
G.C.F.	GSM Conformity Forum
GSM	Global Standard for Mobile Communication
HW	Hardware
IC	Integrated Circuit
IF	Intermediate Frequency
IMEI	International Mobile Equipment Identifier
I/O	Input/ Output
IGT	Ignition
ISO	International Standards Organization
ITU	International Telecommunications Union
kbits	kbits per second

## 1.2 Terms and Abbreviations

**Table 2:** Terms and abbreviations

Abbreviation	Description
LVD	Low voltage Directive
Mbps	Mbits per second
MCU	Microprocessor Control Unit
MMI	Machine Machine Interface
MO	Mobile Originated
MS	Mobile Station
MT	Mobile Terminated
NC	Not Connected
NTC	Negative Temperature Coefficient
PA	Power Amplifier
PCB	Printed Circuit Board
PCM	Pulse Code Modulation
PCS	Personal Communication System
PD	Power Down
PDU	Protocol Data Unit
R&TTE	Radio and Telecommunication Terminal Equipment
RF	Radio frequency
RI	Ring Indication
RX	Receive direction
SIM	Subscriber Identification Module
SMS	Short Message Service
SW	Software
TDD	Time Division Duplex
TDMA	Time Division Multiple Access
TX	Transmit direction
UART	Universal Asynchronous Receiver and Transmitter

## 1.3 Regulatory and Type Approval Information

## 1.3 Regulatory and Type Approval Information

## 1.3.1 Directives and Standards

Java Terminals have been designed to comply with the directives and standards listed below<sup>1</sup>.

Table 3: Directives


99/05/EC	Directive of the European Parliament and of the council of 9 March 1999 on radio equipment and telecommunications terminal equipment and the mutual recognition of their conformity (in short referred to as R&TTE Directive 1999/5/EC). The product is labeled with the CE conformity mark - see <a href="#">Section 6.3</a> .
2002/95/EC (RoHS 1) 2011/65/EC (RoHS 2)	Directive of the European Parliament and of the Council of 27 January 2003 (and revised on 8 June 2011) on the restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS) 
2002/96/EC	Directive of the European Parliament and of the Council on waste electrical and electronic equipment (WEEE)
2003/108/EC	Directive of the European Parliament and of the Council of 8 December 2003 amending directive 2002/96/ec on waste electrical and electronic equipment (WEEE)

Table 4: Standards of North American type approval

CFR Title 47	"Code of Federal Regulations, Part 15 B, Part 22 and Part 24 (Telecommunications, PCS)"; US Equipment Authorization FCC
OET Bulletin 65 (Edition 97-01)	Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields
UL 60 950-1	Product Safety Certification (Safety requirements)
NAPRD.03 V5.15	"Overview of PCS Type certification review board Mobile Equipment Type Certification and IMEI control" PCS Type Certification Review board (PTCRB)
RSS102 (Issue 4) RSS132 (Issue 3) RSS133 (Issue 6)	Canadian Standard
IEEE Std. C95.1-1999	IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz

Table 5: Standards of European type approval

3GPP TS 51.010-1	"Digital cellular telecommunications system (Phase 2); Mobile Station (MS) conformance specification"
ETSI EN 301 511 V9.0.2	Candidate Harmonized European Standard (Telecommunications series) Global System for Mobile communications (GSM); Harmonized standard for mobile stations in the GSM 900 and DCS 1800 bands covering essential requirements under article 3.2 of the R&TTE directive (1999/5/EC) (GSM 13.11 version 7.0.1 Release 1998)
GCF-CC V3.49	Global Certification Forum - Certification Criteria

1. Standards of North American type approval do not apply to EHS5T RS485, 3G/WCDMA related standards do not apply to BGS5T USB.

## 1.3 Regulatory and Type Approval Information

**Table 5:** Standards of European type approval

ETSI EN 301 489-1 V1.9.2	Candidate Harmonized European Standard (Telecommunications series) Electro Magnetic Compatibility and Radio spectrum Matters (ERM); Electro Magnetic Compatibility (EMC) standard for radio equipment and services; Part 1: Common Technical Requirements
ETSI EN 301 489-7 V1.3.1	Candidate Harmonized European Standard (Telecommunications series) Electro Magnetic Compatibility and Radio spectrum Matters (ERM); Electro Magnetic Compatibility (EMC) standard for radio equipment and services; Part 7: Specific conditions for mobile and portable radio and ancillary equipment of digital cellular radio telecommunications systems (GSM and DCS)
ETSI EN 301 489-24 V1.5.1	Electromagnetic Compatibility and Radio spectrum Matters (ERM); Electro Magnetic Compatibility (EMC) standard for radio equipment and services; Part 24: Specific conditions for IMT-2000 CDMA Direct Spread (UTRA) for Mobile and portable (UE) radio and ancillary equipment
ETSI EN 301 908-01 V5.2.1	Electromagnetic compatibility and Radio spectrum Matters (ERM); Base Stations (BS) and User Equipment (UE) for IMT-2000 Third Generation cellular networks; Part 1: Harmonized EN for IMT-2000, introduction and common requirements of article 3.2 of the R&TTE Directive
ETSI EN 301 908-02 V5.2.1	Electromagnetic compatibility and Radio spectrum Matters (ERM); Base Stations (BS) and User Equipment (UE) for IMT-2000 Third Generation cellular networks; Part 2: Harmonized EN for IMT-2000, CDMA Direct Spread (UTRA FDD) (UE) covering essential requirements of article 3.2 of the R&TTE Directive
EN 62311-2008	Assessment of electronic and electrical equipment related to human exposure restrictions for electromagnetic fields (0 Hz - 300 GHz)
EN 60950-1 (2006)+ A11:2009+A1:2010+ AC:2011+A12:2011	Safety of information technology equipment

**Table 6:** Requirements of quality

IEC 60068	Environmental testing
DIN EN 60529	IP codes

1.3 Regulatory and Type Approval Information

**Table 7:** Standards of the Ministry of Information Industry of the People’s Republic of China

SJ/T 11363-2006	“Requirements for Concentration Limits for Certain Hazardous Substances in Electronic Information Products” (2006-06).
SJ/T 11364-2006	<p>“Marking for Control of Pollution Caused by Electronic Information Products” (2006-06).</p> <p>According to the “Chinese Administration on the Control of Pollution caused by Electronic Information Products” (ACPEIP) the EPUP, i.e., Environmental Protection Use Period, of this product is 20 years as per the symbol shown here, unless otherwise marked. The EPUP is valid only as long as the product is operated within the operating limits described in the Hardware Interface Description.</p> <p>Please see <a href="#">Table 1.3.2</a> for an overview of toxic or hazardous substances or elements that might be contained in product parts in concentrations above the limits defined by SJ/T 11363-2006.</p>



**Table 8:** Toxic or hazardous substances or elements with defined concentration limits

部件名称 Name of the part	有毒有害物质或元素 Hazardous substances					
	铅 (Pb)	汞 (Hg)	镉 (Cd)	六价铬 (Cr(VI))	多溴联苯 (PBB)	多溴二苯醚 (PBDE)
金属部件 (Metal Parts)	○	○	○	○	○	○
电路模块 (Circuit Modules)	X	○	○	○	○	○
电缆及电缆组件 (Cables and Cable Assemblies)	○	○	○	○	○	○
塑料和聚合物部件 (Plastic and Polymeric parts)	○	○	○	○	○	○






O:  
表示该有毒有害物质在该部件所有均质材料中的含量均在SJ/T11363-2006 标准规定的限量要求以下。  
Indicates that this toxic or hazardous substance contained in all of the homogeneous materials for this part is below the limit requirement in SJ/T11363-2006.

X:  
表示该有毒有害物质至少在该部件的某一均质材料中的含量超出SJ/T11363-2006标准规定的限量要求。  
Indicates that this toxic or hazardous substance contained in at least one of the homogeneous materials used for this part *might exceed* the limit requirement in SJ/T11363-2006.

## 1.3 Regulatory and Type Approval Information




## 1.3.2 Safety Precautions

The following safety precautions must be observed during all phases of the operation, usage, service or repair of any cellular terminal or mobile incorporating Java Terminals. Manufacturers of the cellular terminal are advised to convey the following safety information to users and operating personnel and incorporate these guidelines into all manuals supplied with the product. Failure to comply with these precautions violates safety standards of design, manufacture and intended use of the product. Gemalto M2M GmbH assumes no liability for customer's failure to comply with these precautions.

	<p>When in hospitals or other health care facilities, observe the restrictions on the use of mobiles. Switch off the cellular terminal or mobile if to be instructed to do so by the guidelines posted in sensitive areas. Medical equipment may be sensitive to RF energy.</p> <p>The operation of cardiac pacemakers, other implanted medical equipment and hearing aids can be affected by interference from cellular terminals or mobiles placed close to the device. If in doubt about potential danger, contact the physician or the manufacturer of the device to verify that the equipment is properly shielded. Pacemaker patients are advised to keep their hand-held mobile away from the pacemaker, while it is on. This personal subgroup always should check the distance to the mobile.</p>
	<p>Switch off the cellular terminal or mobile before boarding an aircraft. Make sure it cannot be switched on inadvertently. The operation of wireless appliances in an aircraft is forbidden to prevent interference with communications systems. Failure to observe these instructions may lead to the suspension or denial of cellular services to the offender, legal action, or both.</p> <p>Check the local and actual laws about these themes.</p>
	<p>Do not operate the cellular terminal or mobile in the presence of flammable gases or fumes. Switch off the cellular terminal when you are near petrol stations, fuel depots, chemical plants or where blasting operations are in progress. Operation of any electrical equipment in potentially explosive atmospheres can constitute a safety hazard.</p>
	<p>Your cellular terminal or mobile receives and transmits radio frequency energy while switched on. Remember that interference can occur if it is used close to TV sets, radios, computers or inadequately shielded equipment. Follow any special regulations and always switch off the cellular terminal or mobile wherever forbidden, or when you suspect that it may cause interference or danger.</p>
	<p>Road safety comes first! Do not use a hand-held cellular terminal or mobile while driving a vehicle unless it is securely mounted in a holder for speakerphone operation. Before making a call with a hand-held terminal or mobile park the vehicle. Speakerphones must be installed by qualified personnel. Faulty installation or operation can constitute a safety hazard.</p> <p>Check the actual and local laws about these themes.</p>



## 1.3 Regulatory and Type Approval Information

	<p><b>IMPORTANT!</b> Cellular terminals or mobiles operate using radio signals and cellular networks. In that case connections cannot be guaranteed at all times under all conditions. Therefore, you should never rely solely upon any wireless device for essential communications, for example emergency calls.</p> <p>Remember, in order to make calls or receive calls the cellular terminal or mobile must be switched on in a service area with adequate cellular signal strength.</p> <p>Some networks do not allow for emergency calls if certain network services or phone features are in use (e.g. lock functions, fixed dialing etc.). You may need to deactivate those features before you can make an emergency call. Some networks require a valid SIM card to be properly inserted in the cellular terminal or mobile.</p>
	<p>If a power supply unit is used to supply the device it must meet the demands placed on SELV circuits in accordance with EN60950. The maximum permissible connection length between the device and the supply source should not exceed 3m.</p>
	<p>According to the guidelines for human exposure to radio frequency energy, an antenna connected to the FME jack of the device should be placed at least 20cm away from human bodies.</p>

## 1.4 Product Label

The label fixed to the bottom of a Java Terminal comprises the following information.

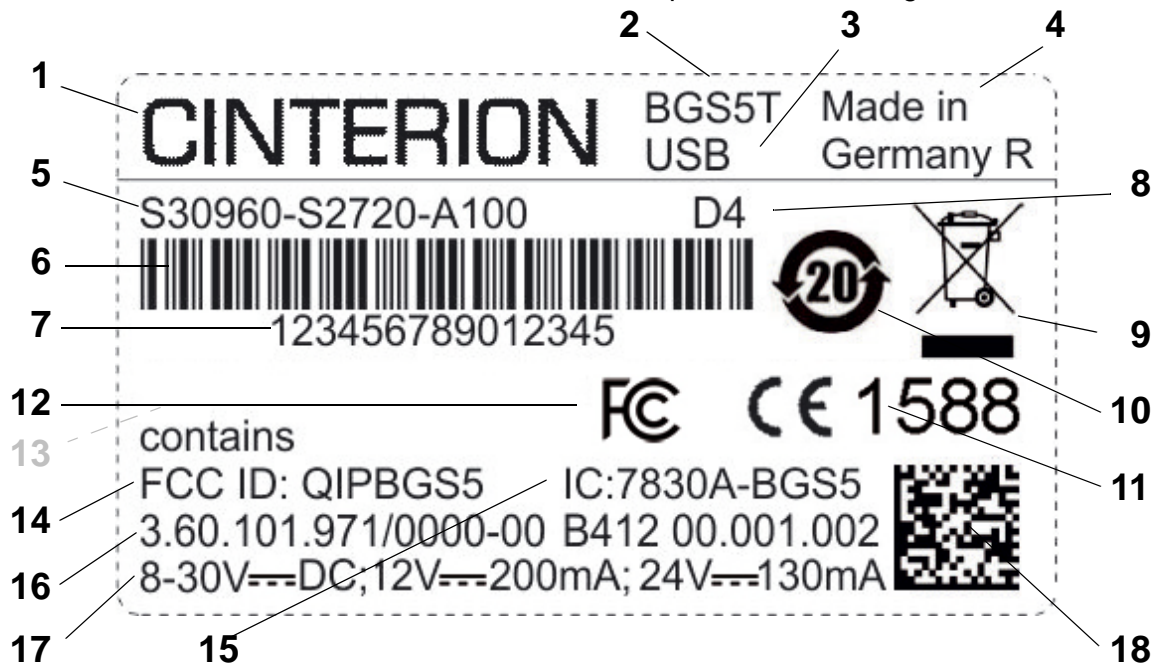


Figure 1: Sample Java Terminal label (BGS5T USB)

Table 9: Java Terminals label information

No.	Information
1	Cinterion logo
2	Product name
3	Product variant
4	Marking "Made in Germany"
5	Product ordering number
6	Barcode (Code128)
7	Product IMEI
8	Date code
9	WEEE symbol (see <a href="#">Table 3</a> )
10	Chinese RoHS symbol (see <a href="#">Table 7</a> )
11	CE logo with fixed notified body number. May be replaced for samples with "Not for sale" (see also <a href="#">Section 6.3</a> )
12	FCC Declaration of Conformity (DoC) logo (BGS5T USB only)
13	FCC ID for Java Terminal (EHS5T-US RS485, EHS6T USB/LAN only)
14	FCC ID for Java module contained in Java Terminal (BGS5T USB, EHS5T-US RS485 and EHS6T USB/LAN only)
15	IC ID for Java module contained in Java Terminal (BGS5T USB, EHS6T USB/LAN only)
16	Manufacturer code
17	Power supply unit ratings
18	Manufacturer code (2D)

## 2 Product Concept

### 2.1 Key Features at a Glance

Feature	Implementation
General	
Incorporates Cinterion® Java module	The Java module handles all signal and data processing within the Java Terminals. Internal software runs the application interface and the complete GSM/UMTS protocol stack.
Frequency bands	<p>EHS5T RS485 (with EHS5-E module):            GSM/GPRS/EDGE: Dual band GSM 900/1800MHz            UMTS/HSPA+: Dual band UMTS 900/2100MHz</p> <p>EHS5T-US RS485 (with EHS5-US module):            GSM/GPRS/EDGE: Dual band GSM 850/1900MHz            UMTS/HSPA+: Dual band UMTS 850/1900MHz</p> <p>EHS6T USB (with EHS6 module):            GSM/GPRS/EDGE: Quad band 850/900/1800/1900MHz            UMTS/HSPA+: Five band 800/850/900/1900/2100MHz</p> <p>EHS6T LAN (with EHS6 module):            GSM/GPRS/EDGE: Quad band 850/900/1800/1900MHz            UMTS/HSPA+: Five band 800/850/900/1900/2100MHz</p> <p>BGS5T USB (with BGS5 module):            GSM/GPRS: Quad band 850/900/1800/1900MHz</p>
GSM class	Small MS
Output power (according to Release 99, V5) depending on frequency band supported by module	<p>Class 4 (+33dBm ±2dB) for EGSM850            Class 4 (+33dBm ±2dB) for EGSM900            Class 1 (+30dBm ±2dB) for GSM1800            Class 1 (+30dBm ±2dB) for GSM1900            Class E2 (+27dBm ± 3dB) for GSM 850 8-PSK            Class E2 (+27dBm ± 3dB) for GSM 900 8-PSK            Class E2 (+26dBm +3 /-4dB) for GSM 1800 8-PSK            Class E2 (+26dBm +3 /-4dB) for GSM 1900 8-PSK            Class 3 (+24dBm +1/-3dB) for UMTS 2100, WCDMA FDD BdI            Class 3 (+24dBm +1/-3dB) for UMTS 1900, WCDMA FDD BdII            Class 3 (+24dBm +1/-3dB) for UMTS 900, WCDMA FDD BdVIII            Class 3 (+24dBm +1/-3dB) for UMTS 850, WCDMA FDD BdV            Class 3 (+24dBm +1/-3dB) for UMTS 800, WCDMA FDD BdVI</p> <p>The values stated above are maximum limits. According to Release 99, the maximum output power in a multislot configuration may be lower. The nominal reduction of maximum output power varies with the number of uplink timeslots used and amounts to 3.0dB for 2Tx.</p>
Power supply	Single supply voltage 8V to 30V
Operating temperature (Java module board temperature)	<p>Normal operation: -30°C to +85°C            Extended operation: -40°C to -30°C and +85°C to +90°C</p>
Physical	<p>Dimensions: 113.5mm x 75mm x 25.5mm            (excluding antenna and serial interface connectors)            Weight: 120g (approx.)</p>
RoHS, WEEE	All hardware components are fully compliant with the EU RoHS and WEEE Directives

## 2.1 Key Features at a Glance

Feature	Implementation
HSPA features	
3GPP Release 6,7 (EHSxT only)	DL 7.2Mbps, UL 5.7Mbps HSDPA Cat.8 / HSUPA Cat.6 data rates Compressed mode (CM) supported according to 3GPP TS25.212
UMTS features	
3GPP Release 4 (EHSxT only)	PS data rate – 384 kbps DL / 384 kbps UL CS data rate – 64 kbps DL / 64 kbps UL
GSM / GPRS / EDGE features	
Data transfer	<p>GPRS:</p> <ul style="list-style-type: none"> <li>• Multislot Class 12</li> <li>• Full PBCCH support</li> <li>• Mobile Station Class B</li> <li>• Coding Scheme 1 – 4</li> </ul> <p>EGPRS (EHSxT only):</p> <ul style="list-style-type: none"> <li>• Multislot Class 12</li> <li>• EDGE E2 power class for 8 PSK</li> <li>• Downlink coding schemes – CS 1-4, MCS 1-9</li> <li>• Uplink coding schemes – CS 1-4, MCS 1-9</li> <li>• SRB loopback and test mode B</li> <li>• 8-bit, 11-bit RACH</li> <li>• PBCCH support</li> <li>• 1 phase/2 phase access procedures</li> <li>• Link adaptation and IR</li> <li>• NACC, extended UL TBF</li> <li>• Mobile Station Class B</li> </ul> <p>CSD:</p> <ul style="list-style-type: none"> <li>• V.110, RLP, non-transparent</li> <li>• 2.4, 4.8, 9.6, 14.4kbps</li> <li>• USSD</li> </ul>
SMS	<ul style="list-style-type: none"> <li>• Point-to-point MT and MO</li> <li>• Cell broadcast</li> <li>• Text and PDU mode</li> </ul>
Software	
AT commands	Hayes 3GPP TS 27.007, TS 27.005, Gemalto M2M
Java™ Open Platform	<p>Java™ Open Platform with</p> <ul style="list-style-type: none"> <li>• Java™ profile IMP-NG &amp; CLDC 1.1 HI</li> <li>• Secure data transmission via HTTPS/SSL</li> <li>• Multi-threading programming and multi-application execution</li> </ul> <p>Major benefits: seamless integration into Java applications, ease of programming, no need for application microcontroller, extremely cost-efficient hardware and software design – ideal platform for industrial GSM applications.</p> <p>The memory space available for Java programs is around 10MB in the flash file system and around 10MB RAM. Application code and data share the space in the flash file system and in RAM.</p>
SIM Application Toolkit	SAT Release 99

## 2.1 Key Features at a Glance

Feature	Implementation
TCP/IP stack	Protocols: TCP server/client, UDP, HTTP, FTP, SMTP, POP3 Access by AT commands
Firmware update	Upgradeable via serial ASC0 (RS-232 or RS-485) or USB interface
Interfaces	
USB interfaces	USB 2.0 Slave interface
RS232	RS-232 interface for AT commands and data: <ul style="list-style-type: none"> <li>• Supports RTS/CTS hardware handshake</li> <li>• Supports software XON/XOFF flow control</li> <li>• Multiplex ability according to GSM 07.10 Multiplexer protocol</li> <li>• Baud rates from 1200bps to 230400bps</li> <li>• Autobauding supported</li> </ul>
GPIO connector	20-pin (8-pin and 12-pin) header with GPIO interface, external power supply, serial interface ASC1, ADC, DAI/PCM, SPI, I <sup>2</sup> C and RS-485 option, depending on variant
Ethernet	8-pole RJ-45 Ethernet connector
Power connector	6-pole Western connector (female) for power supply, ignition, power down signal
SIM card reader	Supported SIM cards: 3V, 1.8V
Antenna	Antenna connected via female SMA connector
Power on/off, Reset	
Power on	DTR line at RS-232 interface, IGT_IN line at power connector or watchdog
Power off	Normal switch-off by AT^SMSO Automatic switch-off in case of critical temperature conditions
Reset	Orderly shutdown and reset by AT command Emergency restart via RST_IN line at power connector or via watchdog
Special features	
Real time clock	Timer functions via AT commands
Phonebook	SIM card and terminal
(Hardware) Watchdog	Configurable watchdog to control module

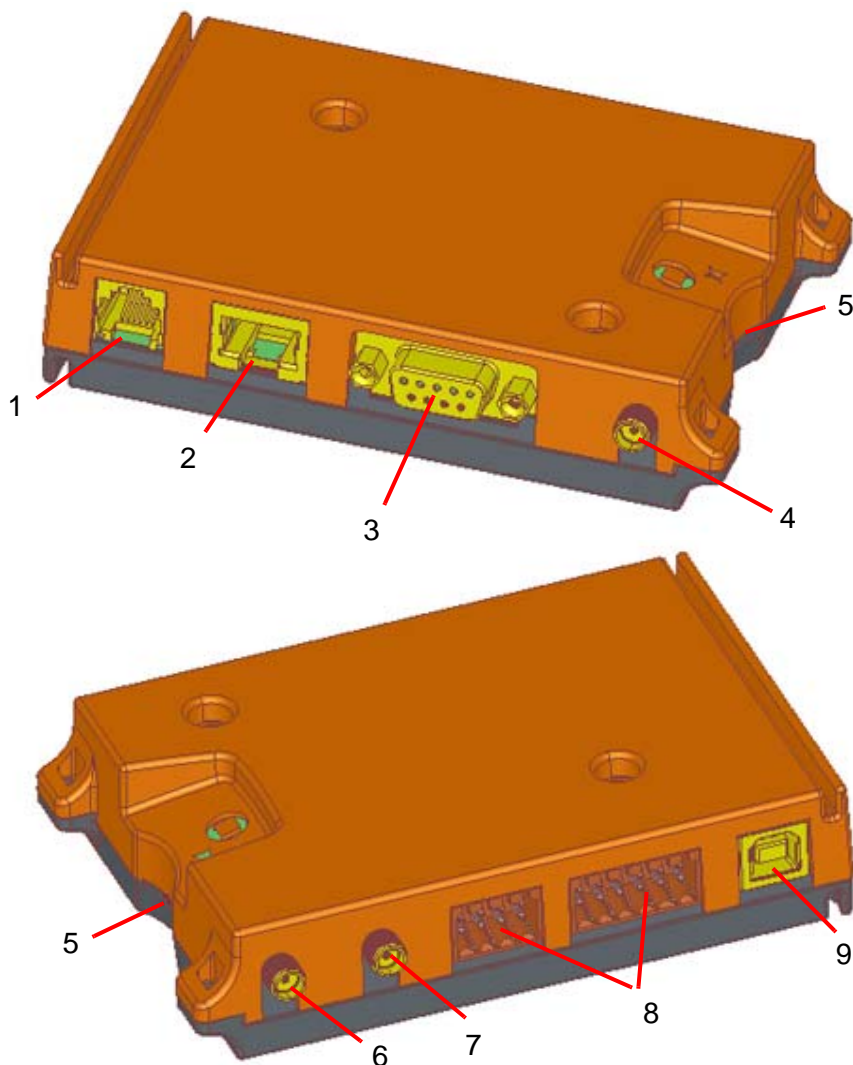
## 3 Interface Description

### 3.1 Overview

Java Terminals provide the following interfaces for power supply, antenna, SIM card and data transfer:

**Table 10:** Java Terminals' interfaces

No.	Description
1	6-pin Western connector (female) for power supply, ignition, power down signal
2	8-pin (female) RJ-45 Ethernet connector
3	9-pin (female) D-sub connector (RS-232 interface)
4	SMA connector (female) for GPS antennas (for future use, currently not available)
5	SIM card reader
6	SMA connector (female) for RF antenna
7	SMA connector (female) for Rx diversity antenna (for future use, currently not available)
8	12-pin and 8-pin GPIO connectors (male) (including RS-485)
9	4-pin (female) USB-B connector



**Figure 2:** Java Terminals 3D view

3.2 Block Diagram

### 3.2 Block Diagram

Figure 3 shows a block diagram of a sample configuration that incorporates a Java Terminal and typical accessories.

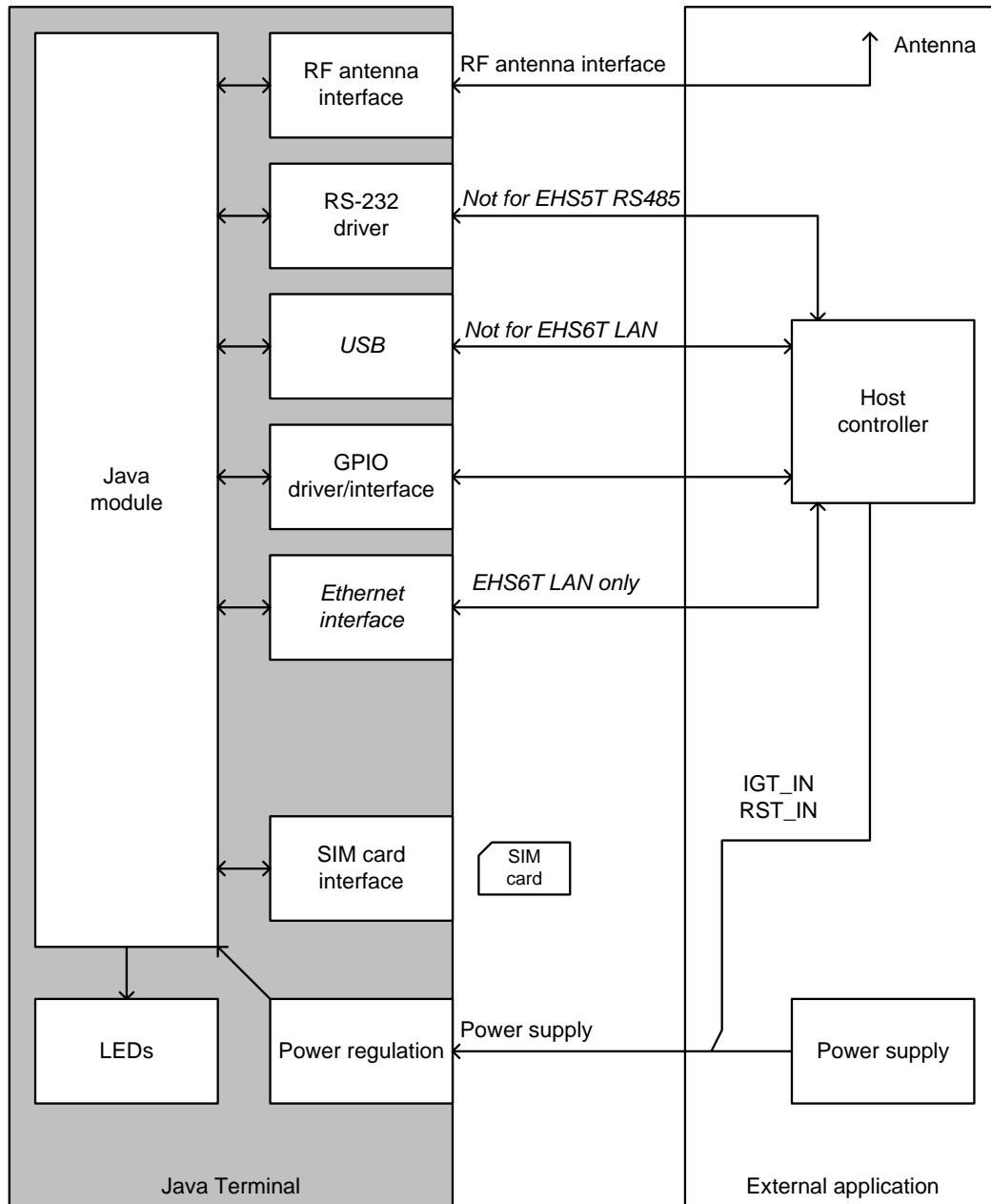


Figure 3: Block diagram





### 3.4 Operating Modes

The table below briefly summarizes the various operating modes referred to in the following chapters.

**Table 11:** Overview of operating modes

Normal operation	GSM IDLE	Software is active. Once registered to the GSM network paging with BTS is carried out. The Terminal is ready to send and receive. Watchdog active.
	GSM TALK GSM DATA	Connection between two subscribers is in progress. Power consumption depends on network coverage individual settings, such as DTX off/on, FR/EFR/HR, hopping sequences, antenna. Watchdog active.
	GPRS/UMTS/HSPA IDLE	Terminal is ready for GPRS data transfer, but no data is currently sent or received. Power consumption depends on network settings and GPRS configuration (e.g. multislot settings). Watchdog active.
	GPRS DATA	GPRS data transfer in progress. Power consumption depends on network settings (e.g. power control level), uplink / downlink data rates, GPRS configuration (e.g. used multislot settings) and reduction of maximum output power. Watchdog active.
	EGPRS DATA (EHSxT only)	EGPRS data transfer in progress. Power consumption depends on network settings (e.g. power control level), uplink / downlink data rates, EGPRS configuration (e.g. used multislot settings) and reduction of maximum output power. Watchdog active.
	UMTS TALK UMTS DATA (EHSxT only)	UMTS data transfer in progress. Power consumption depends on network settings (e.g. TPC Pattern) and data transfer rate. Watchdog active.
	HSPA DATA (EHSxT only)	HSPA data transfer in progress. Power consumption depends on network settings (e.g. TPC Pattern) and data transfer rate. Watchdog active.
Power Down	Normal shutdown after sending the AT^SMSO command. The RTC works continuously, but the software is not active. Interfaces are not accessible. Watchdog continues to operate, depending on its configuration.	

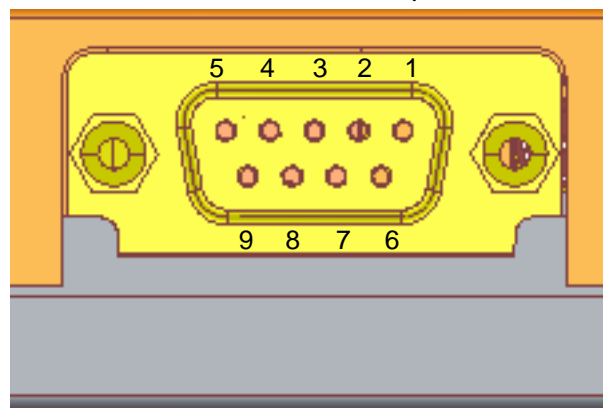
## 3.5 RS-232 Interface

The RS-232 interface is not available for EHS5T RS485. The interface is implemented as a serial asynchronous transmitter and receiver conforming to ITU-T V.24 Interchange Circuits DCE. It is configured for 8 data bits, no parity and 1 stop bit, and can be operated at bit rates from 1200bps to 921kbps. Autobauding supports bit rates from 1.2kbps to 230kbps.

For more information see also [Section 3.5.1](#).

### 3.5.1 9-Pole D-sub Connector

Via RS-232 interface, the host controller controls the Java Terminals and transports data.



**Figure 5:** Pin assignment RS-232 (D-sub 9-pole female)

**Table 12:** 9-pole D-sub (female) RS-232

Pin no.	Signal name	I/O	Function
1	DCD0	O	Data Carrier Detected
2	RXD0	O	Receive Data
3	TXD0	I	Transmit Data
4	DTR0	I	Data Terminal Ready Attention: The ignition of Java Terminals is activated via a rising edge of high potential (+3 ... +15 V)
5	GND	-	Ground
6	DSR0 <sup>1</sup>	O	Data Set Ready
7	RTS0	I	Request To Send
8	CTS0	O	Clear To Send
9	RING0	O	Ring Indication

1. Note that DSR0 may also be available via GPIO connector pin - see [Section 3.7](#).

Java Terminals are designed for use as a DCE. Based on the conventions for DCE-DTE connections it communicates with the customer application (DTE) using the following signals:

- Port TxD @ application sends data to TXD0 of the Java Terminals
- Port RxD @ application receives data from RXD0 of the Java Terminals

Hardware handshake using the RTS0 and CTS0 signals and XON/XOFF software flow control are supported.

3.6 USB Interface

In addition, the modem control signals DTR0, DSR0, DCD0 and RING0 are available. The modem control signal RING0 (Ring Indication) can be used to indicate, to the cellular device application, that a call or Unsolicited Result Code (URC) is received. There are different modes of operation, which can be set with AT commands.

**Note:** The DTR0 signal will only be polled once per second from the internal firmware of Java Terminals.

### 3.6 USB Interface

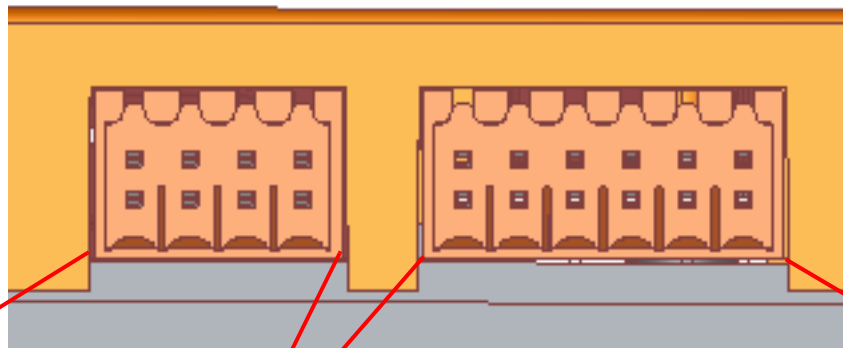
The USB interface is not available for EHS6T LAN. The other Java Terminals support a USB 2.0 High Speed (480Mbit/s) device interface that is Full Speed (12Mbit/s) compliant.

The USB interface can be used as command and data interface and for downloading Java module firmware. It is only available as a slave device and not able to act as a USB host.

### 3.7 GPIO Interface

The GPIO connectors (8-pin and 12-pin) provide access to various module signals including a number of configurable GPIOs. Note that not all of the pins are available for every Java Terminal variant. The following figures show the available pins for the Java Terminal variants and the below [Table 13](#) lists the overall availability of the pins.

**EHS5T  
RS485:**



1	2	3	4
GPIO6	GPIO7	GPIO8	n/a
5	6	7	8
n/a	n/a	GPIO22	GPIO23

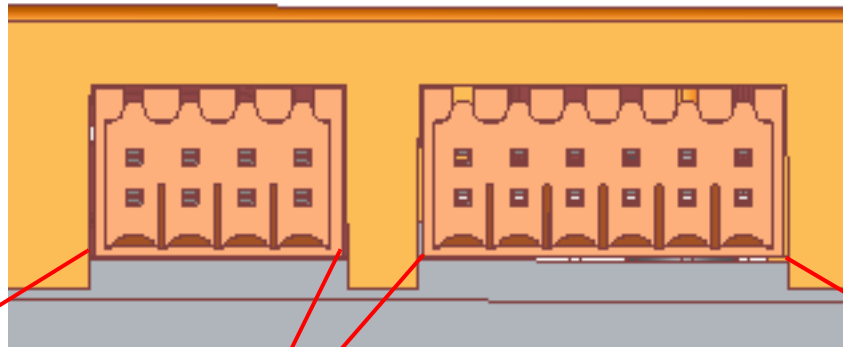
1	2	3	4	5	6
VCCref	GND	TXD1	RXD1	A+ (RS-485)	B- (RS-485)
7	8	9	10	11	12
+5Vout	DSR0/ ADC1_IN	I2CDAT	I2CCLK	GPIO20	GPIO21

n/a: not applicable

**Figure 6:** EHS5T RS485: GPIO connectors (8-pin and 12-pin)

3.7 GPIO Interface

**EHS6T  
USB/LAN:**



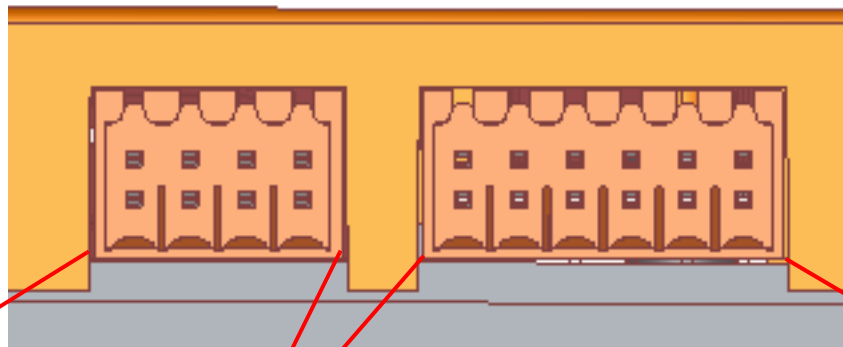
1	2	3	4
GPIO6	GPIO7	GPIO8	GPIO11
5	6	7	8
GPIO12	GPIO13	GPIO22	GPIO23

1	2	3	4	5	6
VCCref	GND	TXD1/ SPI_MISO	RXD1/ SPI_MOSI	CTS1 (RS232)/ SPI_CS	RTS1 (RS232/
7	8	9	10	11	12
+5Vout	DSR0/ ADC1_IN/ SPI_CLK	I2CDAT	I2CCLK	GPIO20	GPIO21

n/a: not applicable

**Figure 7:** EHS6T USB/EHS6T LAN: GPIO connectors (8-pin and 12-pin)

**BGS5T  
USB:**



1	2	3	4
GPIO6	GPIO7	GPIO8	n/a
5	6	7	8
n/a	n/a	GPIO22	GPIO23

1	2	3	4	5	6
VCCref	GND	TXD1	RXD1	CTS1 (RS232)/	RTS1 (RS232/
7	8	9	10	11	12
+5Vout	DSR0/ ADC1_IN	I2CDAT	I2CCLK	GPIO20	GPIO21

n/a: not applicable

**Figure 8:** BGS5T USB: GPIO connectors (8-pin and 12-pin)

## 3.7 GPIO Interface

The following [Table 13](#) shows the availability of the GPIO connector pins for various Java Terminal variants.

**Table 13:** GPIO connector pin availability and alternate pin functionalities

PIN	Signal	Comment	EHS5T RS485	EHS6T USB	EHS6T LAN	BGS5T USB
8-pin connector						
1	GPIO6	Configurable via AT command, also as PWM2 signal	✓	✓	✓	✓
2	GPIO7	Configurable via AT command, also as PWM1 signal	✓	✓	✓	✓
3	GPIO8	Configurable via AT command, also as COUNTER signal	✓	✓	✓	✓
4	GPIO11	Configurable via AT command	-	✓	✓	-
5	GPIO12	Configurable via AT command	-	✓	✓	-
6	GPIO13	Configurable via AT command	-	✓	✓	-
7	GPIO22	Configurable via AT command also as TFSDAI	✓	✓	✓	✓
8	GPIO23	Configurable via AT command also as SCLK	✓	✓	✓	✓
12-pin connector						
1	VCCref	Input supply for level adjustment. E.g., connect +5Vout for 5V IO operation	✓	✓	✓	✓
2	GND		✓	✓	✓	✓
3	TXD1 or SPI_MISO	Configurable via AT command, also as SPI_MISO signal	TXD1	TXD1 / SPI_MISO	TXD1 / SPI_MISO	TXD1
4	RXD1 or SPI_MOSI	Configurable via AT command, also as SPI_MOSI signal	RXD1	RXD1 / SPI_MOSI	RXD1 / SPI_MOSI	RXD1
5	CTS1 or SPI_CS or A+	CTS1 (RS-232) or SPI_CS or A+ (for RS-485) depending on product variant	A+ (RS-485)	CTS1 / SPI_CS	CTS1 / SPI_CS	CTS1
6	RTS1 or B-	RTS1 (RS-232) or B- (for RS-485) depending on product variant	B- (RS-485)	RTS1	RTS1	RTS1
7	+5Vout	External power supply up to 100mA, usable as VCCref input	✓	✓	✓	✓
8	DSR0 or ADC1_IN or SPI_CLK	Configurable via AT command	DSR0 / ADC1_IN	✓	✓	DSR0 / ADC1_IN
9	I2CDAT	I <sup>2</sup> C interface	✓	✓	✓	✓
10	I2CCLK	I <sup>2</sup> C interface	✓	✓	✓	✓
11	GPIO20	Configurable via AT command also as TXDDAI	✓	✓	✓	✓
12	GPIO21	Configurable via AT command also as RXDDAI	✓	✓	✓	✓

Please refer to the respective “AT Command Set” for details on how to configure the GPIO pins using AT commands.

EHS5T's RS-485 interface is based on the TIA/EIA-485 standard defining electrical characteristics of drivers and receivers for use in balanced multidrop communication systems. RS-485 is used in a lot of different fieldbus systems like Profibus, Interbus, Modbus and P-net.

RS-485 uses a shielded twisted pair cable where the inner pairs are used for balanced communication. The two conductors in each pair are called A and B. RS-485 is usually half-duplex.

Data transmission speed depends on the length of the RS-485 bus cable and may be up to 115kbps.

**Note:** If employing EHS5T's RS-485 interface be sure not to switch off the EHS5 module, e.g., by calling AT^SMSO, to put the module into Power Down mode. This completely occupies and therefore blocks the RS-485 bus, and may thus lead to a higher current consumption.

Also, be sure not to activate SLEEP mode, e.g., by setting AT^SPOW with <mode>=2, for the EHS5 module, as the module may no longer be able to wake up from SLEEP mode, and will then have to be reset.

### 3.7.1 Serial Interface ASC1

With EHS5T and EHS6T Java Terminals two respectively four pins at the GPIO connector can be configured as ASC1 interface signals to provide a 2- or 4-wire serial modem interface ASC1. For electrical characteristics please refer to [Table 22](#).

The following pins at the GPIO connector can be configured as ASC1 interface signals: RXD1, TXD1, RTS1 and CTS1 (see also [Table 13](#)). The configuration is done by AT command AT^SCFG - see [\[1\]](#). It is non-volatile and becomes active after a Java Terminal restart.

Java Terminals are designed for use as a DCE. Based on the conventions for DCE-DTE connections they communicate with the customer application (DTE) using the following signals:

- Port TXD @ application sends data to Java Terminal's TXD1 signal line
- Port RXD @ application receives data from the Java Terminal's RXD1 signal line

Hardware handshake using the RTS1 and CTS1 signals is only supported for EHS6T.

### 3.7.2 Digital Audio Interface

Four pins at the Java Terminals' GPIO connector can be configured as digital audio interface (DAI). The DAI can be used to connect audio devices capable of pulse code modulation (PCM). The PCM functionality allows for the use of an external codec like the W681360.

The DAI interface supports a 256kHz, long frame synchronization master mode with the following features:

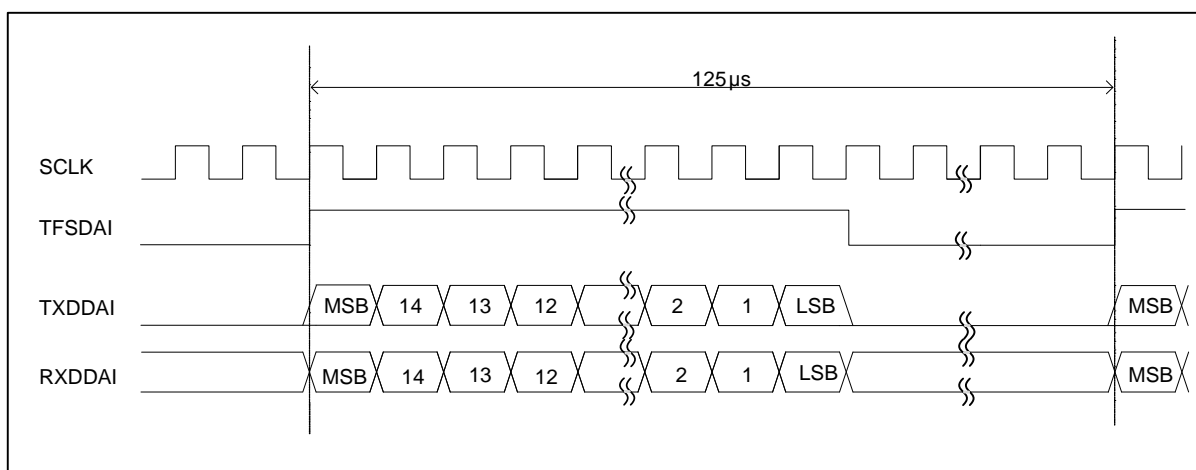
- 16 Bit linear
- 8kHz sample rate / 125µs frame duration
- The most significant bit MSB is transferred first
- Data write at rising edge / data read at falling edge
- Common frame sync signal for transmit and receive

The following pins at the GPIO connector can be configured as DAI/PCM interface signals: TXDDAI, RXDDAI, TFSDAI and SCLK (see also [Table 13](#)). The configuration is done by AT^SCFG command - see [\[1\]](#). It is non-volatile and becomes active after a module restart. DAI/PCM and GPIO functionalities for these lines are mutually exclusive. [Table 14](#) describes the available DAI/PCM lines at the digital audio interface<sup>1</sup>. For electrical details see [Table 22](#).

**Table 14:** Overview of DAI/PCM signals

Signal name	Input/Output	Description
TXDDAI (GPIO20)	O	PCM data from Java Terminals to external codec.
RXDDAI (GPIO21)	I	PCM data from external codec to Java Terminals.
TFSDAI (GPIO22)	O	Frame synchronization signal to external codec: Long frame (8kHz)
SCLK (GPIO23)	O	Bit clock to external codec: 256kHz

[Figure 9](#) shows the PCM timing for the master mode available with Java Terminals.



**Figure 9:** Long frame PCM timing, 256kHz

[Section 3.7.2.1](#) gives an example of how the DAI can be employed.

1. **Note:** For the DAI interface to operate, the directions of the Java Terminals' GPIO level shifters must be set according to the defined directions of the DAI signals. See [Section 8.3.1.10](#) and [Section 8.5](#) for more information on how to change level shifter directions.

### 3.7.2.1 Solutions for the Digital Audio Interface (DAI/PCM)

Figure 10 and Figure 11 show an example of using the digital audio interface of the Java Terminal. The below mentioned sample Nuvoton codec W681360 can be replaced with a DSP. In the example, framesync and clock master is the module (TFSDAI line) and thus the GSM network.

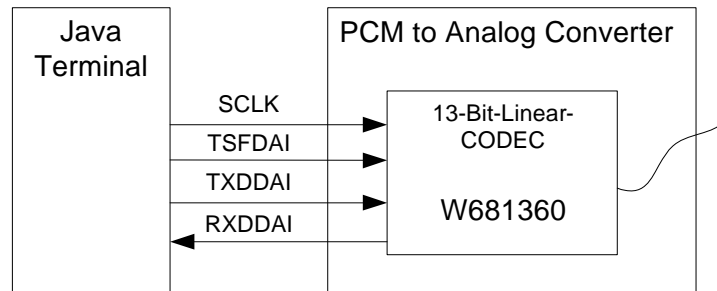


Figure 10: Block circuit for DAI/PCM to analog converter

This DAI/PCM analog converter is well suited for evaluating and testing a telephone handset.

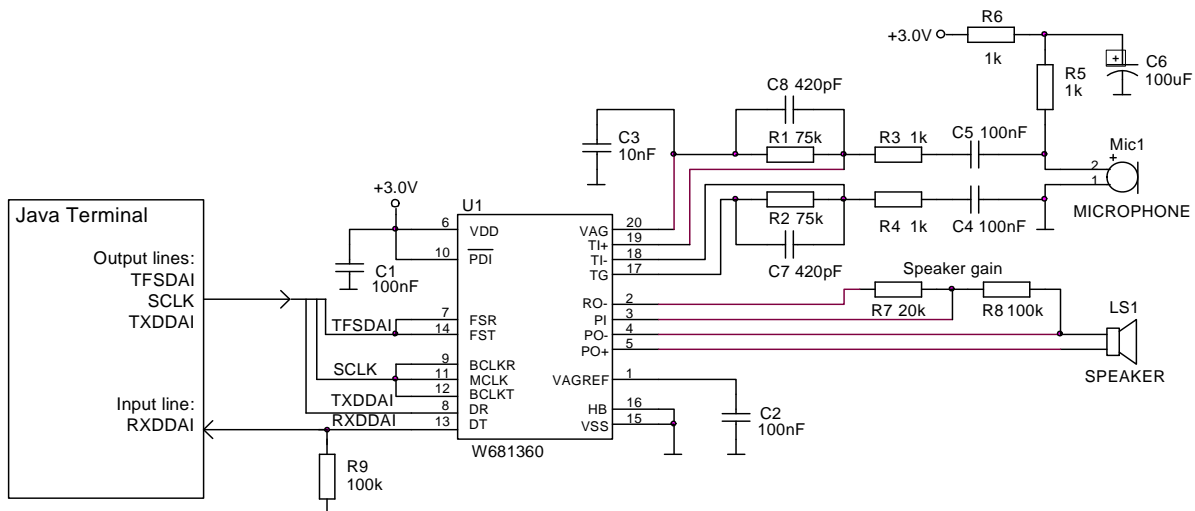


Figure 11: Sample circuit for analog to DAI/PCM circuit

On the module side, the PCM interface has to be enabled. This can be done by using the following AT command: `AT^SCFG="GPIO/mode/DAI", "std"`.

Please note that level converters may be required between the the 3.0V audio codec interface lines and the module's digital audio lines and - depending on VCCref settings for the GPIO interface lines.



### 3.7.3 I<sup>2</sup>C Interface

Two lines of the Java Terminals' GPIO connector are I<sup>2</sup>C lines. I<sup>2</sup>C is a serial, 8-bit oriented data transfer bus for bit rates up to 400kbps in Fast mode. It consists of two lines, the serial data line I2CDAT and the serial clock line I2CCLK. The Java Terminals' internal Java module act as a single master device, e.g. the clock I2CCLK is driven by the Java module. I2CDAT is a bi-directional line. Each device connected to the bus is software addressable by a unique 7-bit address, and simple master/slave relationships exist at all times. The Java module operates as master-transmitter or as master-receiver. An external application transmits or receives data only on request of the module.

To configure and activate the I2C bus use the AT^SSPI command. Detailed information on the AT^SSPI command as well explanations on the protocol and syntax required for data transmission can be found in [\[1\]](#).

With the external application, I2CDAT and I2CCLK lines need to be connected to a positive supply voltage via a pull-up resistor. For electrical characteristics please refer to [Table 22](#).

Note: Good care should be taken when connecting the I2C lines to the external application: The wires of I2CCLK and I2CDAT should be equal in length and as short as possible.

### 3.7.4 SPI Interface

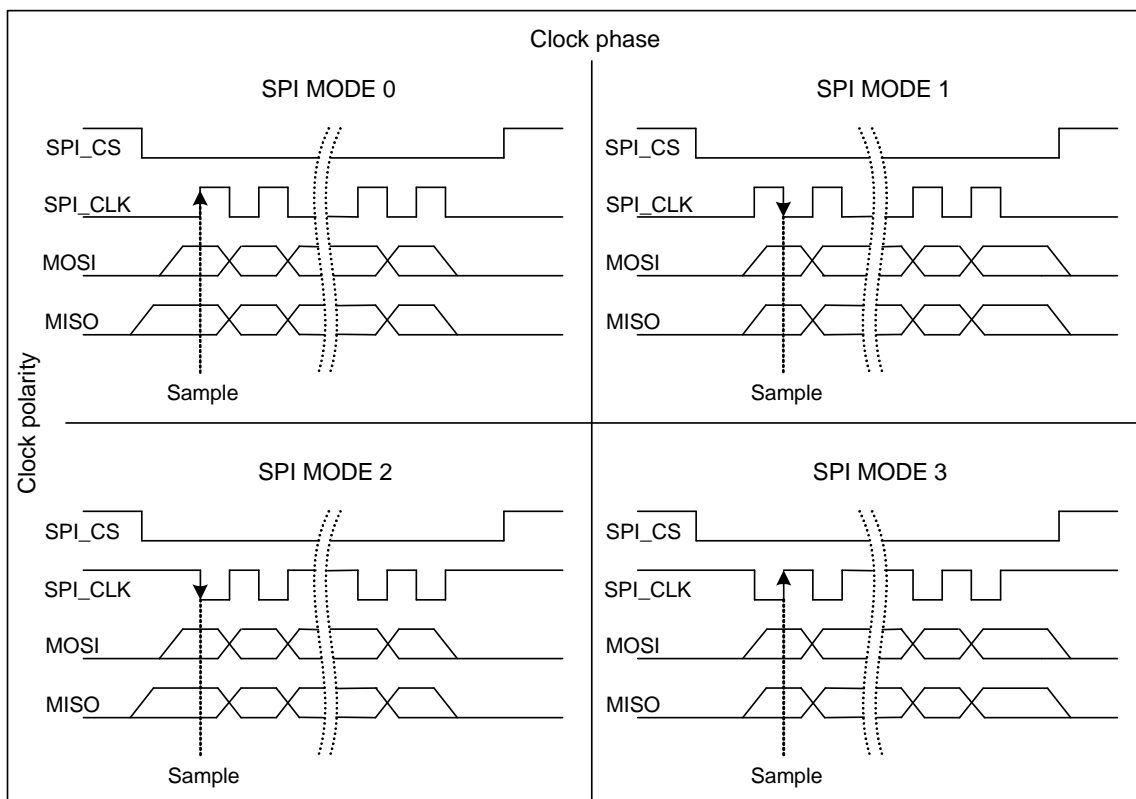
For EHS6T Java Terminals four GPIO interface pins can be configured as Serial Peripheral Interface (SPI). The SPI is a synchronous serial interface for control and data transfer between Java Terminals and the external application. Only one application can be connected to the SPI and the interface supports only master mode. The transmission rates are up to 6.5Mbit/s. The SPI interface comprises the two data lines MOSI and MISO, the clock line SPI\_CLK a well as the chip select line SPI\_CS.

The following pins at the GPIO connector can be configured as SPI interface signals: SPI\_CLK, SPI\_MOSI, SPI\_MISO and SPI\_CS (see also [Table 13](#)). The configuration is done by AT command (see [\[1\]](#)). It is non-volatile and becomes active after a module restart. For electrical characteristics please refer to [Table 22](#).

To configure and activate the SPI interface use the AT<sup>^</sup>SSPI command. Detailed information on the AT<sup>^</sup>SSPI command as well explanations on the SPI modes required for data transmission can be found in [\[1\]](#). SPI, ADC1\_IN and DSR0 functionalities are mutually exclusive.

In general, SPI supports four operation modes. The modes are different in clock phase and clock polarity. The module's SPI mode can be configured by using the AT command AT<sup>^</sup>SSPI. Make sure the module and the connected slave device works with the same SPI mode.

[Figure 12](#) shows the characteristics of the four SPI modes. The SPI modes 0 and 3 are the most common used modes.



**Figure 12:** Characteristics of SPI modes

### 3.7.5 PWM Interface

The GPIO6 and GPIO7 pins at the GPIO connector can be configured as Pulse Width Modulation signals PWM1 and PWM2 by AT^SCFG command - see [1]. The PWM interface lines are output lines and can be used, for example, to connect buzzers. The PWM1 line is shared with GPIO7 and the PWM2 line is shared with GPIO6 (see also Table 13). GPIO and PWM functionalities are mutually exclusive<sup>1</sup>.

### 3.7.6 Pulse Counter

The GPIO8 pin at the GPIO connector can be configured as pulse counter line COUNTER by AT^SCFG command - see [1]. The pulse counter interface is an input line and can be used, for example, as a clock (see also Table 13). GPIO and COUNTER functionalities are mutually exclusive<sup>1</sup>.

### 3.7.7 Analog-to-Digital Converter (ADC)

ADC1\_IN can be used for general purpose voltage measurements. For electrical characteristics see Section 4.2.4. ADC1\_IN is configured and read by the AT^SRADC command - see [1]. ADC1\_IN, DSR0 and SPI functionalities are mutually exclusive.

### 3.7.8 DSR0 signal

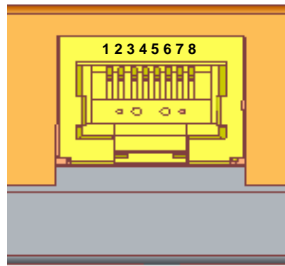
The DSR0 line available at the RS-232 interface is also routed to the GPIO connector and available as a separate pin. For electrical characteristics see Section 4.2.4. DSR0 can be configured by AT^SCFG command - see [1]. DSR0, ADC1\_IN and SPI functionalities are mutually exclusive.

---

1. **Note:** For the PWM interface and pulse counter to operate, the directions of the Java Terminals' GPIO level shifters must be set according to the defined directions of the PWM and COUNTER signals. See Section 8.3.1.10 and Section 8.5 for more information on how to change level shifter directions.

### 3.8 Ethernet Interface

The Ethernet interface is available for EHS6T LAN only. The other Java Terminals do not support an Ethernet interface.



**Figure 13:** 8-pole RJ-45 Ethernet connector (female)

**Table 15:** Female 8-pole RJ-45 Ethernet connector

Pin	Signal name	Use
1	TX+	Transmit +
2	TX-	Transmit -
3	RX+	Receive +
4	n/c	Reserved
5	n/c	Reserved
6	RX-	Receive +
7	n/c	Reserved
8	n/c	Reserved

The Ethernet interface can be used as transparent data interface and for downloading new Java Terminal MCU firmware releases. Via Ethernet it is also possible to maintain a database containing possible APNs for the Java Terminals, to configure the Java Terminal's MAC address, and to enable usage of DHCP or a static IP address. Please refer to [Appendix B: Ethernet Setup and Configuration](#) for details on how to configure the Java Terminals via Ethernet connection. For further characteristics of Ethernet interface refer to [Section 4.2.6](#).

## 3.9 Power Supply

### 3.9 Power Supply

The power supply of the Java Terminals has to be a single voltage source of  $V_{PLUS}=8V\dots30V$  capable of providing a peak current (pulsed  $2\times 577ms$  at  $T=4.615ms$ ) of about  $1.2A$  at  $8V$  during an active transmission. The uplink burst causes strong ripple (drop) on the power lines. The drop voltage should not exceed  $1V$ . The absolute minimum voltage during drops is given in [Section 4.1](#).

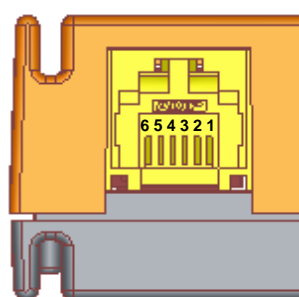
The Java Terminals are protected from supply voltage reversal. An external fast acting fuse  $\geq 0.4A$  with melting integral  $I^2t$  ( $0.15 \dots 0.25$ )  $A^2s$  is necessary to use the Java Terminals at a  $12V$  or  $24V$  unlimited power supply system.

The power supply must be compliant with the EN60950 guidelines. A switching regulator regulates the input voltage for the internal supply.

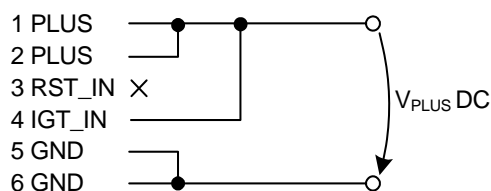
When power fails for  $>1ms$ , Java Terminals reset or switch off. The watchdog can be configured to restart the Java Terminals. When power fails for  $>15s$  the RTC will be reset.

**Table 16:** Female 6-pole Western plug for power supply, ignition, power down

Pin	Signal name	Use	Parameters
1	PLUS	Power supply	$8V - 30V$ DC
2	PLUS	Power supply	$8V - 30V$ DC
3	RST_IN	Signal for module reset	$U_{IH} \geq 8V$ for $t > 10ms$ resets the terminal. $U_{IL} < 2V$ and low level for normal operation.
4	IGT_IN	Ignition	$U_{IH} \geq 8V$ Ignition $\geq 8V$ for more than $200ms$ switches the Java Terminals on. Ignition is activated only by a rising edge. The rise time is $< 20ms$
5	GND	Ground	$0V$
6	GND	Ground	$0V$



Pin assignment and typical connection:



**Figure 14:** 6-pole Western jack for power supply, ignition, reset, typical connection

**Mains adapter:** If it fits into the design of your application we recommend the plug-in supply unit used with the type approved Gemalto M2M reference setup. Ordering information can be found in [Chapter 7](#). This  $12V$  mains adapter comes with a 6-pole Western plug and provides an internal connection between IGT\_IN pin and PLUS pin. If there is such an “auto ignition” connection between PLUS and IGT\_IN, the module will restart automatically after a normal shutdown.

## 3.10 Power Up/Power Down Scenarios

In general, be sure not to turn on the Java Terminals while it is beyond the safety limits of voltage and temperature stated in [Section 4.1](#). Java Terminals immediately switch off after having started and detected these inappropriate conditions. In extreme cases this can cause permanent damage to the Java Terminals.

### 3.10.1 Turn Java Terminals on

There are various possibilities to turn on Java Terminals and start into normal mode, depending on connecting and/or operating states.

If powered off (i.e., if Java Terminals' power supply is disconnected):

- Java Terminals can simply be started up by plugging an appropriate power supply unit between PLUS and GND of the 6-pole Western jack.

If switched off (i.e., while in Power Down mode):

- Java Terminals can be started up by activating the IGT\_IN signal (pin 4).
- Java Terminals can be started up by activating the RS-232 DTR line (as long as RST\_IN signal (pin 3) is not active (voltage <2V)
- Java Terminals can be started up by configuring the watchdog appropriately. For details see [Chapter 8](#).

Note: With an “auto-ignition“ connection between IGT\_IN and PLUS (see [Section 3.9](#)) Java Terminals will automatically restart into normal mode after switch off (see [Section 3.10.3](#)). The start up variant from Power Down mode is therefore only applicable if there is no such “auto-ignition“ connection at the power supply unit.

### 3.10.2 Reset/Restart Java Terminals

There are various possibilities to reset/restart Java Terminals:

- Java Terminals can be reset/restarted by entering the command AT+CFUN=x,1. For details on AT+CFUN please see [\[1\]](#).
- Java Terminals can be reset/restarted by configuring the watchdog appropriately. For details see [Chapter 8](#).
- Java Terminals can be reset/restarted by configuring a wake-up alarm (see [Section 3.13](#)) before using AT^SMSO to turn them off and send them into Power Down mode.
- Java Terminals can be reset/restarted by simply shutting them down as described in [Section 3.10.3](#) and then restarting them as described in [Section 3.10.1](#). Note: With an “auto-ignition“ connection between IGT\_IN and PLUS (see [Section 3.9](#)) it is ensured that the module will automatically restart after a normal shutdown using AT^SMSO.

Emergency restart:

- Finally, Java Terminals can be reset/restarted in the event of software hang-ups etc. by applying a voltage >8V to the RST\_IN pin (pin 3) for more than 10ms. The RST\_IN signal then restarts the Java Terminals.

Caution: Use the RST\_IN pin only when, due to serious problems, the software is not responding for more than 5 seconds. Pulling the RST\_IN pin causes the loss of all information stored in the volatile memory since power is cut off immediately. Therefore, this procedure is intended only for use in case of emergency, e.g. if Java Terminals fails to shut down properly.

### 3.10.3 Turn Java Terminals off

Normal shutdown:

- To turn off the Java Terminals use the AT^SMSO command, rather than disconnecting the mains adapter. This switch off procedure lets the Java Terminals log off from the network and allows the software to enter a secure state and save data before disconnecting the power supply. After AT^SMSO has been entered the Java Terminals returns the following result codes:

```
^SMSO: MS OFF
OK
^SHUTDOWN
```

The "^SHUTDOWN" result code indicates that the Java Terminals turns off in less than 1 second. After the shutdown procedure is complete the Java Terminals enters the Power Down mode. The yellow LED stops flashing (see [Section 3.15](#) for a detailed LED description). The RTC is still fed from the voltage regulator in the power supply ASIC. Please note that if there is an "auto ignition" connection between PLUS and IGT\_IN (see [Section 3.9](#)) the module will restart automatically after a normal shutdown.

### 3.10.4 Disconnecting power supply

Before disconnecting the power supply from the PLUS pin, make sure that the Java Terminals are in a safe condition. The best way is to wait 1s after the "^SHUTDOWN" result code has been indicated.

### 3.11 Automatic thermal shutdown

An on-board NTC measures the temperature of the built-in Java module. If over- or undertemperature is detected on the module the Java Terminals automatically shut down to avoid thermal damage to the system. [Table 25](#) specifies the ambient temperature threshold for the Java Terminals.

The automatic shutdown procedure is equivalent to the power-down initiated with the AT^SMSO command, i.e. Java Terminals log off from the network and the software enters a secure state avoiding loss of data.

Alert messages transmitted before the Java Terminals switch off are implemented as Unsolicited Result codes (URCs). For details see the description of AT^SCTM command provided in [\[1\]](#).

The watchdog can be configured to restart the Java Terminals after a defined period of time.

### 3.12 Hardware Watchdog

The Java Terminals feature a programmable hardware watchdog that permanently monitors the terminals' hardware and can be configured to react to various hardware states. The watchdog may for example be configured to periodically restart the terminal, independent of its current operating state. [Figure 4](#) shows how the watchdog is integrated into the Java Terminals.

Please refer to [Chapter 8](#) for details on how to control and configure the hardware watchdog.

### 3.13 RTC

The internal Real Time Clock (RTC) of the Java Terminals retains the time and date and handles the alarm function. The AT+CCLK command serves to set the time and date, and AT+CALA specifies a reminder message or sets an alarm for the Java Terminals to wake up. See [\[1\]](#) for details.

A dedicated voltage regulator backs up the RTC even in Power Down mode and enables Java Terminals to keep track of time and date.

However, please note that the Alarm function described in [\[1\]](#), Section AT+CALA, will only work if there is no "auto ignition" connection active between IGT\_IN pin and PLUS pin at the power supply unit that will automatically trigger a restart (see [Section 3.9](#)). Otherwise, the AT+CALA command can only be used to set a reminder message, but not to configure the Java Terminals to wake up from Power Down mode.



### 3.14 SIM Interface

The SIM interface is intended for 1.8V and 3V SIM cards in accordance with GSM 11.12 Phase 2. The card holder is a five wire interface according to GSM 11.11. A sixth pin has been added to detect whether or not a SIM card is inserted.

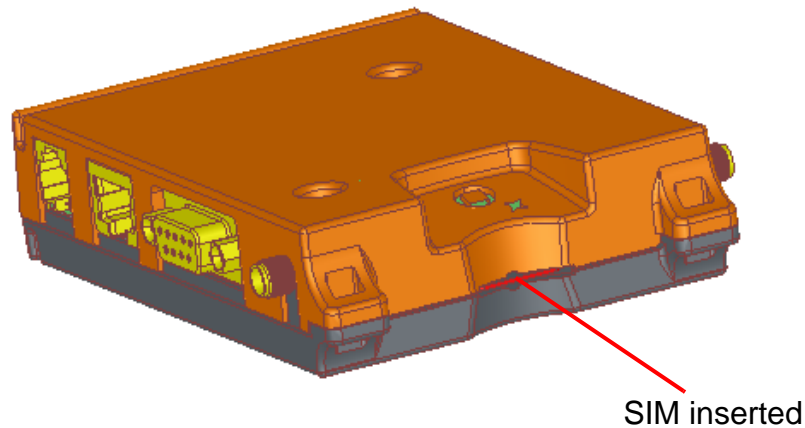


Figure 15: SIM interface

The SIM - with the circuit side facing upwards - is inserted by gently pushing it into the SIM card holder until it snaps hold. It is now protected from accidental removal. The SIM can be removed from the card holder by using a flat object such as a screwdriver to carefully press the inserted SIM until it snaps out again.

All signals of the SIM interface are protected from electrostatic discharge.

Removing and inserting the SIM card during operation requires the software to be reinitialized. Therefore, after reinserting the SIM card it is necessary to restart Java Terminals.

**Note:** No guarantee can be given, nor any liability accepted, if loss of data is encountered after removing the SIM card during operation. Also, no guarantee can be given for properly initializing any SIM card that the user inserts after having removed a SIM card during operation. In this case, the application must restart the Java Terminals.

### 3.15 Status LEDs

Java Terminals have two LEDs indicating its operating states through the semitransparent casing:

- A green LED indicates whether the Java Terminals are ready to operate and reports certain watchdog operations.
- A yellow LED indicates the network registration state of the Java Terminals.

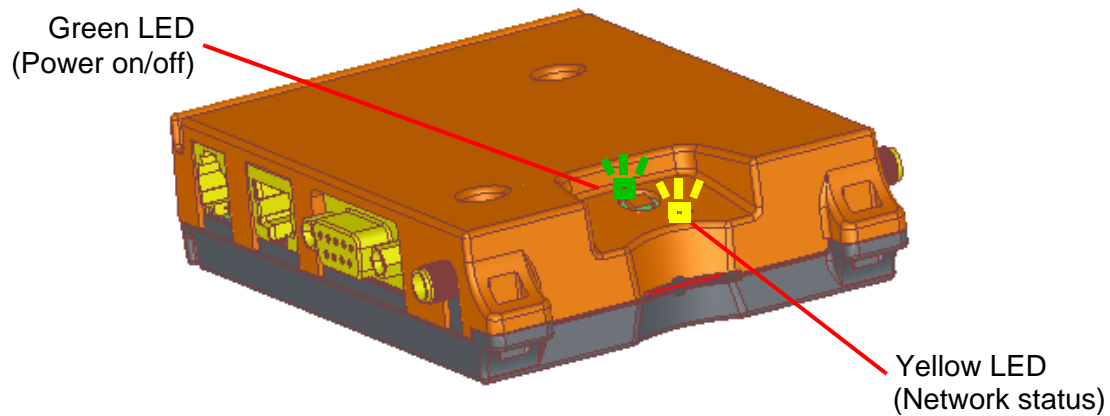
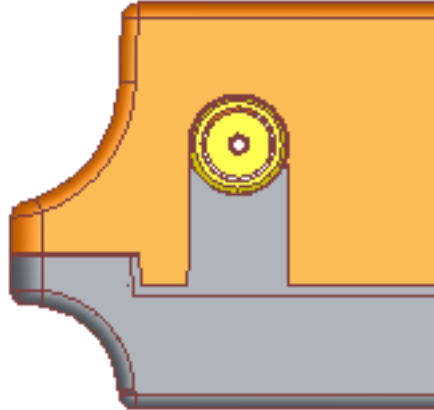


Figure 16: Status LED

The yellow LED can be configured by using the AT<sup>^</sup>SLED command to either light permanently or to flash. For details on the AT command please refer to [\[1\]](#).

### 3.16 RF Antenna Interface

An external RF antenna is connected via the Java Terminals's female SMA connector that is also the antenna reference point (ARP).



**Figure 17:** Antenna connector

The system impedance is  $50\Omega$ . In any case, for good RF performance, the return loss of the customer application's antenna should be better than 10dB (VSWR < 2). Java Terminals withstand a total mismatch at this connector when transmitting with maximum RF power.

Additional ESD protection to the antenna connector is provided. No DC voltage must be applied to the antenna circuit to protect it from damage.

Please note that the terminal should be installed and operated with a minimum distance of 20cm between the antenna connected to the terminal and any human bodies. Also, the transmitter must not be co-located or operating in conjunction with any other antenna or transmitter. The allowed maximum antenna gain (including cable loss) for stand-alone situation is given below in [Table 17](#).

**Table 17:** Allowed maximum antenna gain (including cable loss)

Module	850MHz	900MHz	1800MHz	1900MHz	2100MHz
EHS6T USB EHS6T LAN	3.42dBi	4.18dBi	9.64dBi	2.51dBi	15.54dBi
BGS5T USB	2.15dBi	2.15dBi	2.15dBi	2.15dBi	na
EHS5T RS485 and EHS5T-US RS485	3.10dBi	6.10dBi	12.30dBi	2.50dBi	12.30dBi

## 4 Electrical and Environmental Characteristics

### 4.1 Absolute Maximum Ratings

**Table 18:** Absolute maximum ratings

Parameter	Port / Description	Min.	Max.	Unit
Supply voltage	PLUS	-40	30	V
Overvoltage	PLUS / for 1 min		33	V
Input voltage for on/off control lines	IGT_IN, RST_IN	-5	30	V
RS-232 input voltage	TXD0, DTR0, RTS0	-25	+25	V
GPIO connector pins input voltage (incl. VCCref)	8-pin and 12-pin connectors (if pins specified/configured as input pins)	-0.3	6	V
GPIO connector pins output current	8-pin and 12-pin connectors (if pins specified/configured as output pins)	0	50mA drawn @each pin <sup>1</sup>	--
USB interface	All electrical characteristics according to USB Implementers' Forum, USB 2.0 Specification.	--	--	--
Immunity against discharge of static electricity	All interfaces (lines) Contact discharge Air discharge	-4 -8	+4 +8	kV kV

1. Please note that if the VCCref pin is connected to the +5Vout pin, no more than 100mA should be drawn by **all** pins. In this case it is no longer allowed to draw a maximum of 50mA for each pin.

**Table 19:** Operating supply voltage for Java Terminals

Parameter	Min	Typ	Max	Unit
Supply voltage PLUS measured at (6-pole) western jack plug (1 to 6)	8	12	30	V
Minimum supply voltage PLUS measured at (6-pole) western jack plug (1 to 6) @any time, incl. all ripple, drops and temperature fluctuations	7.6			V

## 4.2 Electrical Specifications of the Application Interface

## 4.2 Electrical Specifications of the Application Interface

## 4.2.1 On/Off Control

Table 20: On/Off control line specifications

Parameter	Description	Conditions	Min.	Typ	Max.	Unit
$V_{high}$	Input voltage IGT_IN, RST_IN	active high	8		30	V
$V_{low}$			0		2	V
$R_{IN}$	Input resistance of IGT_IN, RST_IN		1			M $\Omega$
$V_{high}$	Input voltage DTR	active high	2.4		+25	V
$V_{low}$			-25		0.8	V
$R_{IN}$	Input resistance of DTR		3	5	7	k $\Omega$

## 4.2.2 RS-232 Interface

Table 21: RS-232 interface specifications

Parameter	Description	Conditions	Min.	Typ	Max.	Unit
$V_{OUT}$	Transmitter output voltage swing for RXD0, CTS0, DSR0, DCD0, RING0	@ 3k $\Omega$ load	$\pm 5$	$\pm 5.4$		V
$R_{OUT}$	Transmitter output resis- tance RXD0, CTS0, DSR0, DCD0, RING0		300			$\Omega$
$V_{in}$	Receiver input voltage range TXD0, RTS0, DTR0		-25		+25	V
$R_{IN}$	Receiver input resistance TXD0, RTS0, DTR0		3	5	7	k $\Omega$
$V_{low}$	Input threshold low		0.8	1.5		V
$V_{high}$	Input threshold high			1.8	2.4	V
Baudrate		Autobauding	1.2		960	kbps
		Fixed range	1.2		960	kbps
$LE_{Cable}$	Length of RS-232 cable			1.8	2	m

## 4.2.3 USB Interface

All electrical characteristics according to USB Implementers' Forum, USB 2.0 Specification.

## 4.2 Electrical Specifications of the Application Interface

## 4.2.4 GPIO Interface

Table 22: GPIO interface specifications (requirements)

Function	Signal name	IO	Signal form and level	Comment
8-pin, 12-pin connectors for: GPIO, Power, DAI, I <sup>2</sup> C and ASC1, SPI, RS-485	GPIO 6-8 GPIO 11-13 GPIO 20-21 GPIO22-23	IO	$V_{OLmax} = 0.1V$ at $I = 100\mu A$ $V_{OLmax} = 0.55V$ at $I = 32mA$ $V_{OHmin} = VCCref - 0.1V$ at $I = 100\mu A$ $V_{OHmin} = VCCref - 0.4V$ at $I < 12mA$ $V_{OHmin} = VCCref - 0.7V$ at $I < 32mA$ $V_{ILmax} = 0.3 * VCCref$ $V_{IHmin} = 0.7 * VCCref$	<p>If unused keep lines open.</p> <p>Please note that some GPIO lines can be configured for functions other than GPIO:            GPIO6/GPIO7: PWM            GPIO8: Pulse Counter/            WD_RETRIG            GPIO20-23: PCM/DAI</p>
	VCCref	I	$V_{imax} = 5.5V$ $V_{imin} = 1.8V$  Input current has to at least match the positive output current required by all configured and used GPIO lines.	<p>For level adjustment. E.g., connect 5Vout for 5V IO operation.</p> <p>Must be connected to 1.8...5.5V if employing signals from GPIO connector.</p>
	GND	--	--	
	TXD1/ SPI_MISO	I	$V_{OLmax} = 0.1V$ at $I = 100\mu A$ $V_{OLmax} = 0.55V$ at $I = 32mA$ $V_{OHmin} = VCCref - 0.1V$ at $I = 100\mu A$ $V_{OHmin} = VCCref - 0.4V$ at $I < 12mA$ $V_{OHmin} = VCCref - 0.7V$ at $I < 32mA$ $V_{ILmax} = 0.3 * VCCref$ $V_{IHmin} = 0.7 * VCCref$	<p>If unused keep lines open.</p> <p>SPI interface is not available for EHS5T RS485 and BGS5T.</p>
	RXD1/ SPI_MOSI	O		
	CTS1/A+/ SPI_CS	O		
	RTS1/B-	I		
	+5Vout	O	$5V, +0.05V, -0.2V$ $I_{outmax} = 100mA$	<p>Regulated output for external supply. Can be connected to VCCref.</p> <p>If unused, keep open.</p>
	DSR0/ ADC1_IN (Analog-to-Digital converter)/ SPI_CLK	I	$R_I = 1M\Omega$ $V_{Imax} = 0V...VCCref + 0.3V$ Valid range 0V...5V  Resolution 1024 steps Tolerance 0.3%	<p>ADC1_IN can be used as input for external measurements.</p> <p>If unused keep line open.</p>

## 4.2 Electrical Specifications of the Application Interface

**Table 22:** GPIO interface specifications (requirements)

Function	Signal name	IO	Signal form and level	Comment
8-pin, 12-pin connectors for: GPIO, Power, I <sup>2</sup> C and ASC1, SPI, RS-485	I2CDAT	IO	Open drain IO $V_{OLmin} = 0.3V$ at $I = -3mA$ $V_{OHmax} = VCCref$ $R_{pullup} = 2.2k\Omega$  $V_{ILmax} = 0.35V$ $V_{IHmin} = 1.3V$ $V_{IHmax} = 1.85V$	According to the I <sup>2</sup> C Bus Specification Version 2.1 for the fast mode a rise time of max. 300ns is permitted. There is also a maximum $V_{OL}=0.4V$ at 3mA specified.  The value of the pull-up depends on the capacitive load of the whole system (I <sup>2</sup> C Slave + lines). The maximum sink current of I2CDAT and I2CCLK is 4mA.  If unused keep lines open.
	I2CCLK	IO		

## 4.2.5 RS-485 Interface

**Table 23:** RS-485 interface specifications (requirements)

Parameter	Description	Conditions	Min.	Typ	Max.	Unit
$V_{OUT}$	Transmitter output voltage for RS485-A, -B	$R_{Diff} = 100\Omega$	2		5	V
$R_{IN}$	Resistance RS485-A, -B			48		k $\Omega$
$V_{In}$	Receiver input voltage range RS485-A, -B		-7		+12	V
$V_{RIHYS}$	Input hysteresis			25		mV
Threshold voltage	Receiver diff. threshold voltage		-200		+200	mV
Bus termination				120		$\Omega$
Baudrate		Autobauding	1.2		230	kbps
		Fixed range	1.2		230	kbps
$LE_{Cable}$	Length of RS-485 indoor cable				10	m

## 4.2.6 Ethernet Interface

The Ethernet interface is implemented as 10/100 Base-T RJ45 Ethernet according to the IEEE 802.3 Ethernet standards.

Please refer to [Appendix B: Ethernet Setup and Configuration](#) for details on how to setup and configure the Java Terminals via Ethernet connection.

## 4.3 Power Supply Ratings

## 4.3 Power Supply Ratings

Table 24: Power supply specifications

Parameter	Description	Conditions		Typical			Unit
				EHS5T RS485	EHS6T USB <sup>1</sup>	BGS5T USB	
V <sub>PLUS</sub>	Allowed voltage ripple (peak-peak), drop during transmit burst peak current	Power control level for P <sub>out</sub> max <sup>2</sup>		1	1	1	V
I <sub>PLUS</sub> <sup>3</sup>	Average supply current (average time 3 min.)	Power Down mode	@8V	40	21	18	mA
			@30V	15	10	10	
	Average GSM supply current (average time 3 min.) <sup>4</sup>	IDLE mode (GSM/GPRS, 850/900MHz, 1800/1900MHz)	@8V	25	40	40	mA
			@30V	11	16	13	
		GPRS DATA mode(1 Tx, 4 Rx, 850/900MHz)	@8V	170	175	180	mA
			@30V	47	50	50	
		GPRS DATA mode(1 Tx, 4 Rx, 1800/1900MHz)	@8V	120	140	135	mA
			@30V	21	38	40	
		GPRS DATA mode(4 Tx, 1 Rx, 850/900MHz)	@8V	225	245	370	mA
			@30V	67	100	100	
		GPRS DATA mode(4 Tx, 1 Rx, 1800/1900MHz)	@8V	160	190	240	mA
			@30V	50	56	70	
		EDGE DATA mode(1 Tx, 4 Rx, 850/900MHz)	@8V	175	175	200	mA
			@30V	48	50	50	
		EDGE DATA mode(1 Tx, 4 Rx, 1800/1900MHz)	@8V	125	130	140	mA
			@30V	40	40	40	
EDGE DATA mode(4 Tx, 1 Rx, 850/900MHz)	@8V	235	240	370	mA		
	@30V	67	70	100			
EDGE DATA mode(4 Tx, 1 Rx, 1800/1900MHz)	@8V	160	190	240	mA		
	@30V	50	56	70			
Peak supply current (during 577µs transmission slot every 4.6ms)	Power control level for P <sub>out</sub> max (850/900MHz)	@8V	1100	1130	1200	mA	
		@30V	260	270	260		
	Power control level for P <sub>out</sub> max (1800/1900MHz)	@8V	815	820	630	mA	
		@30V	195	200	160		



## 4.3 Power Supply Ratings

Table 24: Power supply specifications

Parameter	Description	Conditions		Typical			Unit
				EHS5T RS485	EHS6T USB <sup>1</sup>	BGS5T USB	
I <sub>PLUS</sub>	Average UMTS supply current (average time 3 min.)	IDLE mode	@8V	27	79	---	mA
			@30V	11	12	---	
		UMTS DATA (Band I; 23dBm)	@8V	315	410	---	mA
			@30V	90	115	---	
		UMTS DATA Band II; 23dBm	@8V	---	450	---	mA
			@30V	---	125	---	
		UMTS DATA Band V/VI; 23dBm	@8V	---	415	---	mA
			@30V	---	115	---	
		UMTS DATA Band VIII; 23dBm	@8V	370	410	---	mA
			@30V	105	115	---	
		HSPA DATA (Band I; 23dBm)	@8V	315	415	---	mA
			@30V	90	115	---	
		HSPA DATA Band II; 23dBm	@8V	---	450	---	mA
			@30V	---	125	---	
		HSPA DATA Band V/VI; 23dBm	@8V	---	415	---	mA
			@30V	---	115	---	
		HSPA DATA Band VIII; 23dBm	@8V	370	410	---	mA
			@30V	105	115	---	

1. Power supply ratings for EHS6T LAN are not as yet available.
2. Lowest voltage (minimum peak) incl. all ripple and drops >7.6V including voltage drop, ripple and spikes, measured at western jack (6-pole) pins.
3. Typical values measured with antenna impedance = 50 Ohm (return loss >20dB).
4. BGS5T USB does not support EDGE.

## 4.4 Operating Temperatures

**Table 25:** Temperature characteristics

Parameter	Min	Typical	Max	Unit
Normal operation <sup>1</sup>	-30		+85	°C
Extended operation <sup>1, 2</sup>	-40 to -30		+85 to +90	°C
Automatic thermal shutdown <sup>1, 3</sup>	<-40		>+90	°C
Thermal resistance ( $R_{th}$ ) <sup>4</sup> 2G operation (with $P_{th} = 1.5W$ ) 3G operation (with $P_{th} = 3.5W$ )		10 11.5		K/W

1. Board temperature of Java module.
2. Extended operation allows normal mode speech calls or data transmission for limited time until automatic thermal shutdown takes effect. Within the extended temperature range (outside the normal operating temperature range) the specified electrical characteristics may be in- or decreased.
3. Due to temperature measurement uncertainty, a tolerance of  $\pm 3^{\circ}C$  on these switching thresholds may occur.
4. Thermal resistance ( $R_{th}$ ) of the Java Terminals at the highest possible thermal power ( $P_{th}$ ) dissipation, i.e., at the worst possible network conditions. Measured in still air with an air gap of at least 100mm between the Java Terminals and other objects.

Note: Within the specified operating temperature ranges the board temperature may vary to a great extent depending on operating mode, used frequency band, radio output power and current supply voltage. Note also the differences and dependencies that usually exist between board (PCB) temperature of the Java module and its ambient temperature.

## 4.5 Antenna Interface

Table 26 lists RF antenna interface specifications for the Java Terminals. Please note that the specified conditions may not apply to or be supported by all terminals.

**Table 26:** RF Antenna interface GSM / UMTS

Parameter	Conditions	Min.	Typical	Max.	Unit
UMTS/HSPA connectivity	Band I, II, V, VI, VIII (not every module variant supports all bands)				
Receiver Input Sensitivity @ ARP	UMTS 800/850 Band VI/V	-104.7/ -106.7	-110		dBm
	UMTS 900 Band VIII	-103.7	-110		dBm
	UMTS 1900 Band II	-104.7	-109		dBm
	UMTS 2100 Band I	-106.7	-110		dBm
RF Power @ ARP with 50Ohm Load Board temperature <85°C	UMTS 800/850 Band VI/V	+21	+24	+25	dBm
	UMTS 900 Band VIII	+21	+24	+25	dBm
	UMTS 1900 Band II	+21	+24	+25	dBm
	UMTS 2100 Band I	+21	+24	+25	dBm
GPRS coding schemes	Class 12, CS1 to CS4				
EGPRS	Class 12, MCS1 to MCS9				
GSM Class	Small MS				
Static Receiver input Sensitivity @ ARP	GSM 850 / E-GSM 900	-102	-109		dBm
	GSM 1800 / GSM 1900	-102	-108		dBm
RF Power @ ARP with 50Ohm Load	GSM		33		dBm
			30		dBm

## 4.5 Antenna Interface

**Table 26:** RF Antenna interface GSM / UMTS

Parameter		Conditions	Min.	Typical	Max.	Unit
RF Power @ ARP with 50Ohm Load, (with maximum power reduction)	GPRS, 1 TX	GSM 850 / E-GSM 900		33		dBm
		GSM 1800 / GSM 1900		30		dBm
	EDGE, 1 TX	GSM 850 / E-GSM 900		27		dBm
		GSM 1800 / GSM 1900		26		dBm
BGS5T USB does not support EDGE, deviating values are given in brackets	GPRS, 2 TX	GSM 850 / E-GSM 900		30		dBm
		GSM 1800 / GSM 1900		27 (28.3)		dBm
	EDGE, 2 TX	GSM 850 / E-GSM 900		24		dBm
		GSM 1800 / GSM 1900		23		dBm
	GPRS, 3 TX	GSM 850 / E-GSM 900		28.2 (27.7)		dBm
		GSM 1800 / GSM 1900		25.2 (27.4)		dBm
	EDGE, 3 TX	GSM 850 / E-GSM 900		22.2		dBm
		GSM 1800 / GSM 1900		21.2		dBm
	GPRS, 4 TX	GSM 850 / E-GSM 900		27 (25.4)		dBm
		GSM 1800 / GSM 1900		24 (25.2)		dBm
	EDGE, 4 TX	GSM 850 / E-GSM 900		21		dBm
		GSM 1800 / GSM 1900		20		dBm

## 4.6 Storage Conditions

**Table 27:** Storage conditions

Type	Condition	Unit	Reference
Air temperature: Low High	-30 +75	°C	ETS 300 019-2-1: T1.2, IEC 60068-2-1 Ab ETS 300 019-2-1: T1.2, IEC 60068-2-2 Bb
Humidity relative: Low High Condens.	10 90 at 30°C 90-100 at 30°C	%	--- ETS 300 019-2-1: T1.2, IEC 60068-2-56 Cb ETS 300 019-2-1: T1.2, IEC 60068-2-30 Db
Air pressure: Low High	70 106	kPa	IEC TR 60271-3-1: 1K4 IEC TR 60271-3-1: 1K4
Movement of surrounding air	1.0	m/s	IEC TR 60271-3-1: 1K4
Water: rain, dripping, icing and frosting	Not allowed	---	---
Radiation: Solar Heat	1120 600	W/m <sup>2</sup>	ETS 300 019-2-1: T1.2, IEC 60068-2-2 Bb ETS 300 019-2-1: T1.2, IEC 60068-2-2 Bb
Chemically active substances	Not recommended		IEC TR 60271-3-1: 1C1L
Mechanically active substances	Not recommended		IEC TR 60271-3-1: 1S1
Vibration sinusoidal: Displacement Acceleration Frequency range	1.5 5 2-9 9-200	mm m/s <sup>2</sup> Hz	IEC TR 60271-3-1: 1M2
Shocks: Shock spectrum Duration Acceleration	semi-sinusoidal 1 50	ms m/s <sup>2</sup>	IEC 60068-2-27 Ea

The conditions stated above are only valid for devices in their original packed state in weather protected, non-temperature-controlled storage locations. Normal storage time under these conditions is 12 months maximum.

## 5 Mechanics, Mounting and Packaging

### 5.1 Mechanical Dimensions

Figure 18 shows a 3D view of the Java Terminal and provides an overview of the mechanical dimensions of the board. For further details see Figure 19 and Figure 20. To allow for an easier mechanical implementation into an external application a set of 3D STP data for the Java Terminals is attached to this PDF. Please open the [Attachments](#) navigation panel to view and save these files.

Length: 113.5mm (including fixtures for cable straps)  
Width: 75mm (excluding antenna and serial interface connectors)  
Height: 25.5mm  
  
Weight: 120g

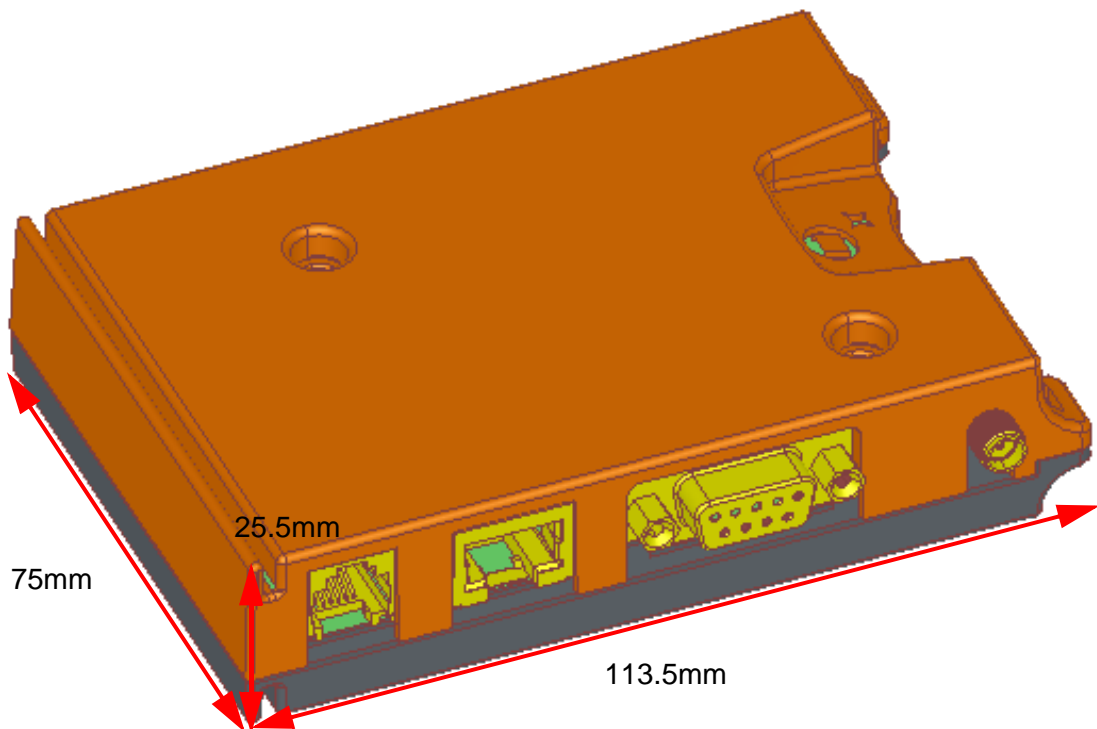


Figure 18: Java Terminals 3D overview

5.1 Mechanical Dimensions

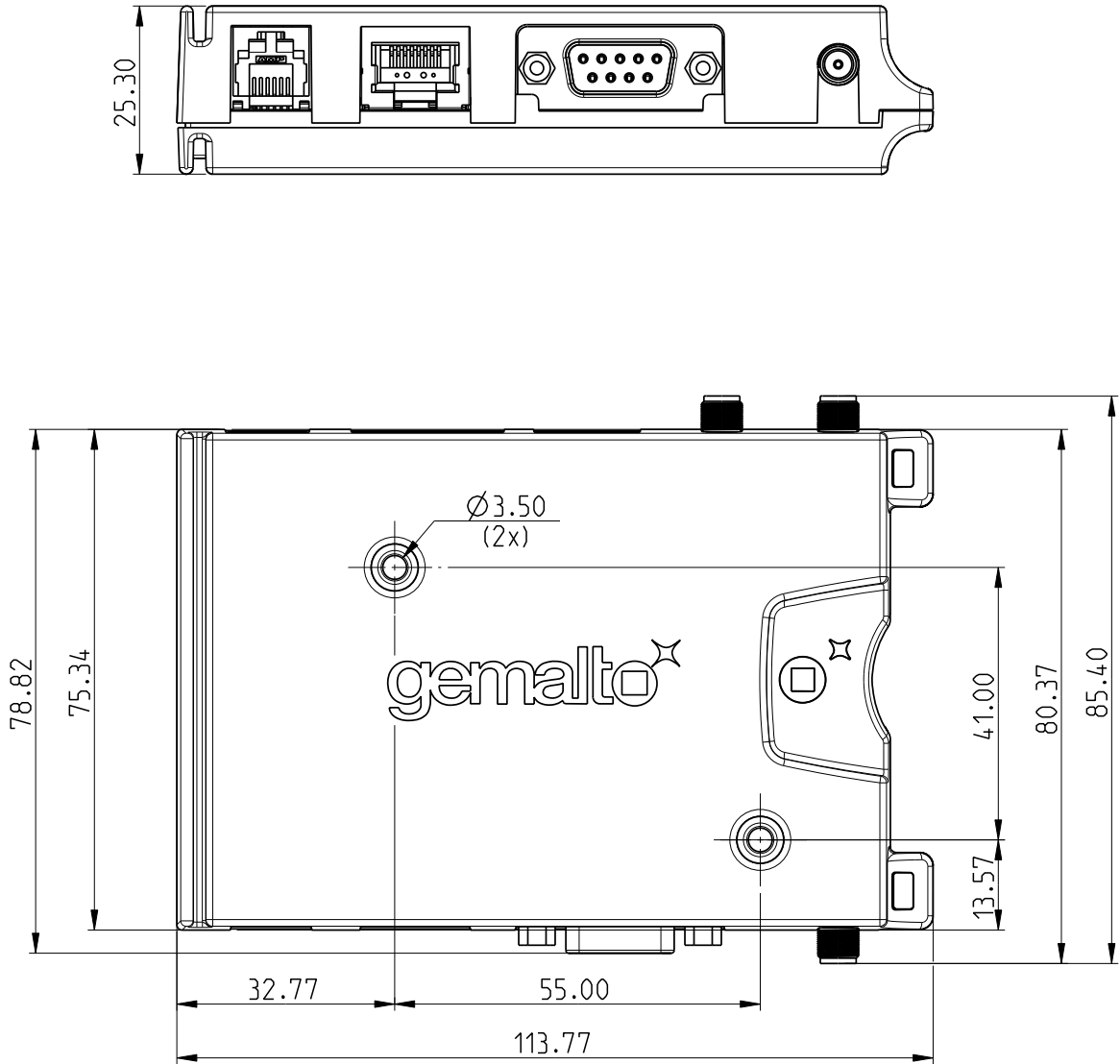


Figure 19: Java Terminals mechanical dimensions

5.1 Mechanical Dimensions

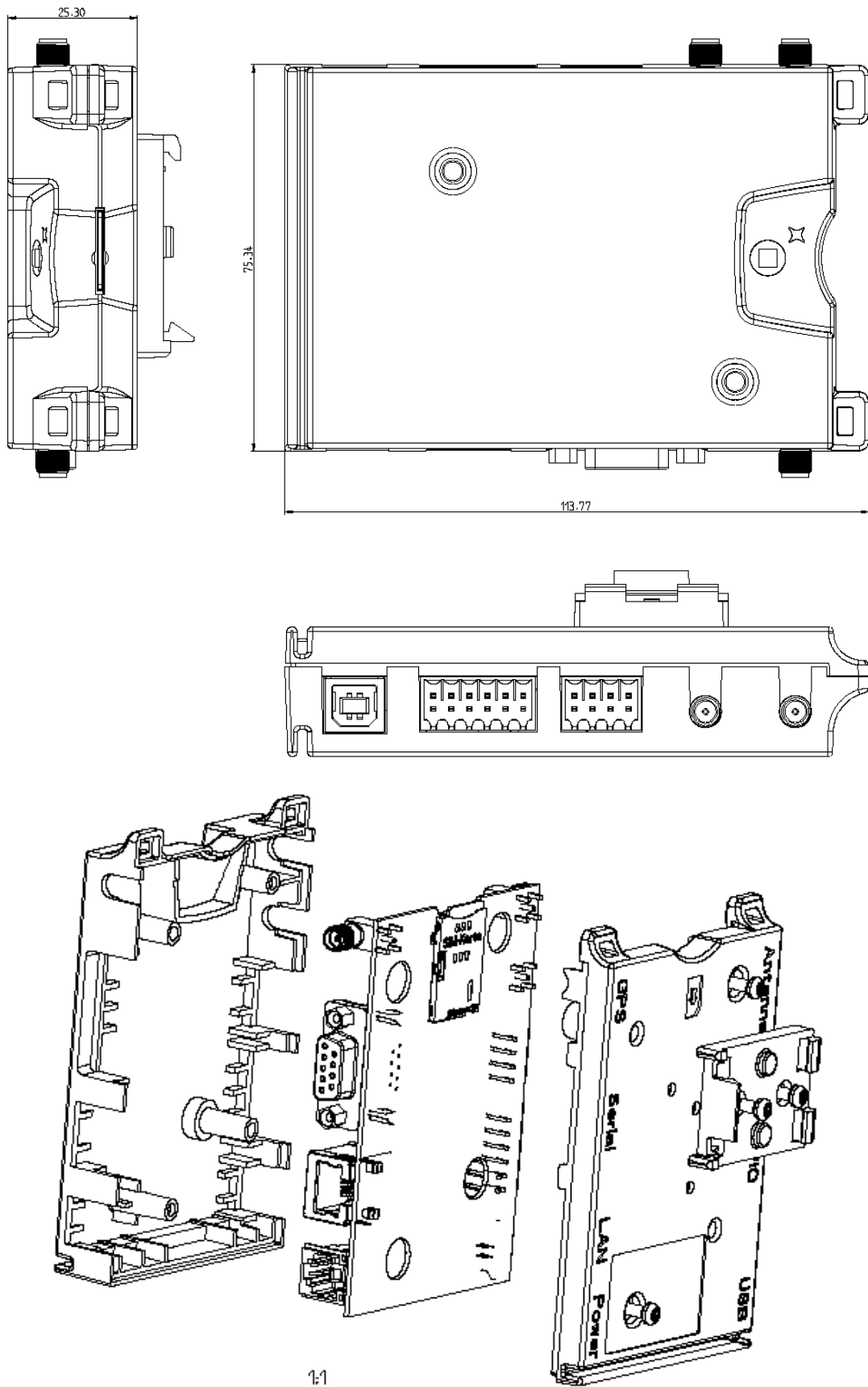


Figure 20: Java Terminals exploded view

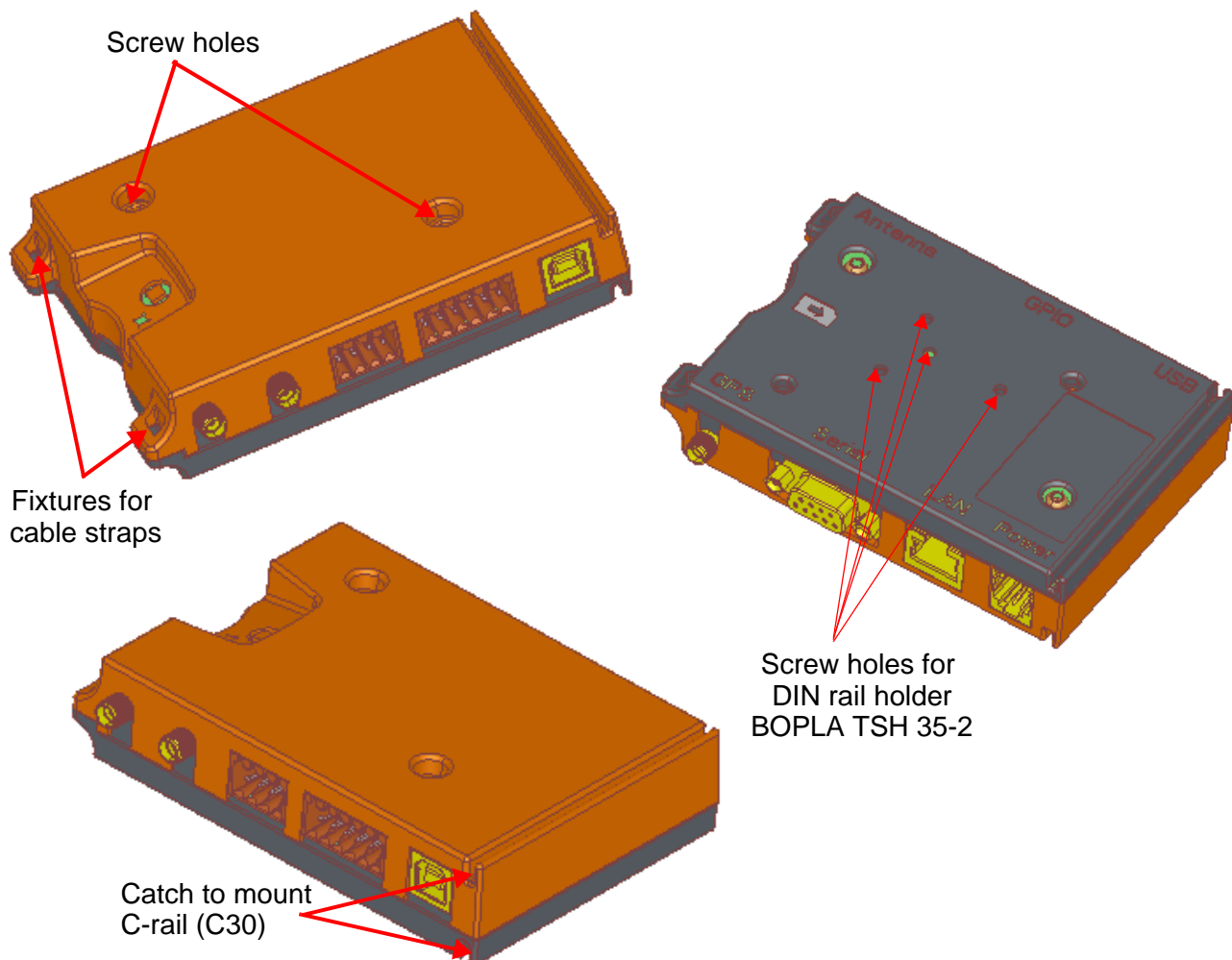


## 5.2 Mounting the Java Terminals

There are a number of ways to mount the Java Terminals:

- Java Terminals can be attached to a rail installation or other surface using the two provided screw holes for screws, e.g., size M3.
- Java Terminals can be fastened to a rack or holding using the two provided fixtures for cable straps.
- Java Terminals can be slid onto a specific DIN rail made according to DIN EN 60715 - C section, C30 format. A catch at the terminal's bottom side will have to be removed to slide multiple terminals onto a single rail.
- Using a BOPLA TSH 35-2 universal DIN rail holder the Java Terminals can be fitted onto another special type of DIN rail made according to DIN EN 60715 - Top hat section, 35mm (e.g., Wago 210-113 steel carrier rail).

The following figure shows the various possibilities provided to mount the Java Terminals.



**Figure 21:** Mounting the Java Terminals

The various ways to mount the Java Terminals may be combined where appropriate. It is for example possible to slide the terminal onto a DIN rail and in addition use cable straps to fasten it to a holding.

## 5.3 Packaging

Java Terminals come in terminal boxes:

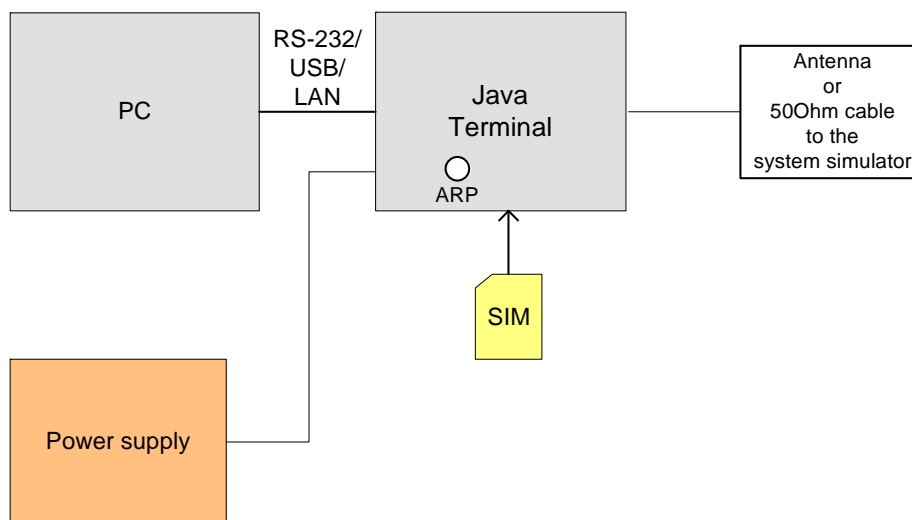
- Terminal box size: 191mm x 143mm x 44mm.

## 6 Full Type Approval

### 6.1 Gemalto M2M Reference Setup

The Gemalto M2M reference setup submitted to type approve Java Terminals consists of the following components:

- Java Terminals with approved Java module
- PC as MMI
- Power Supply



**Figure 22:** Reference equipment for approval

For ordering information please refer to [Chapter 7](#).

## 6.2 Restrictions

Later enhancements and modifications beyond the certified configuration require extra approvals. Each supplementary approval process includes submittal of the technical documentation as well as testing of the changes made.

- No further approvals are required for customer applications that comply with the approved Java Terminals configuration.
- Extra approval must be obtained for applications using other accessories than those included in the approved Java Terminals configuration (power supply, MMI implementation supported by AT commands).

## 6.3 CE Conformity

The Java Terminals meet the requirements of the EU directives listed below:

- R&TTE Directive 1999/5/EC

The Java Terminals are marked with the CE conformity mark (including notified body number):

EHSxT	BGS5T USB
CE 0682	CE 1588

## 6.4 EMC

The Java Terminals comply with the equipment requirements specified in EN 301489-1, -7 and -24 are covered by the R&TTE Directive. For details see [Section 1.3](#).

## 6.5 Compliance with FCC and IC Rules and Regulations

As an integrated product, the Java Terminals EHS5T-US RS485, EHS6T USB, EHS6T LAN and BGS5T USB are fully compliant with the grant of the FCC Equipment Authorization and the Industry Canada Certificates issued for the built-in Java modules, and therefore, bear the labels “Contains FCC ID: QIPEHS6” or “Contains FCC ID: QIPBGS5” or “Contains FCC ID: QIPEHS5-US”.

The Equipment Authorization Certification for the Cinterion® Java modules is listed under the following identifiers:

*FCC Identifier: QIPEHS6 or QIPBGS5 or QIPEHS5-US*

*Industry Canada Certification Number: 7830A-EHS6 or 7830A-BGS5 or 7830A-EHS5US*

*Granted to Gemalto M2M GmbH*

### Notes (FCC):

Radiofrequency radiation exposure Information:

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance of 20 cm between the radiator and your body. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

This terminal equipment has been tested and found to comply with the 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 in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Changes or modifications made to this equipment not expressly approved by Gemalto M2M may void the FCC authorization to operate this equipment.

This device contains UMTS, GSM and GPRS class functions in the 900, 1800 and 2100MHz bands that are not operational in U.S. Territories. This device is to be used only for mobile and fixed applications.

Users and installers must be provided with antenna installation instructions and transmitter operating conditions for satisfying RF exposure compliance: For more information on the RF antenna interface please refer to [Section 3.16](#) and [Section 4.5](#).

**Notes (IC):**

(EN) This Class B digital apparatus complies with Canadian ICES-003 and RSS-210. Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

(FR) Cet appareil numérique de classe B est conforme aux normes canadiennes ICES-003 et RSS-210. Son fonctionnement est soumis aux deux conditions suivantes: (1) cet appareil ne doit pas causer d'interférence et (2) cet appareil doit accepter toute interférence, notamment les interférences qui peuvent affecter son fonctionnement.

**(EN) Radio frequency (RF) Exposure Information**

The radiated output power of the Wireless Device is below the Industry Canada (IC) radio frequency exposure limits. The Wireless Device should be used in such a manner such that the potential for human contact during normal operation is minimized.

This device has also been evaluated and shown compliant with the IC RF Exposure limits under mobile exposure conditions. (antennas are greater than 20cm from a person's body).

**(FR) Informations concernant l'exposition aux fréquences radio (RF)**

La puissance de sortie émise par l'appareil de sans fil est inférieure à la limite d'exposition aux fréquences radio d'Industry Canada (IC). Utilisez l'appareil de sans fil de façon à minimiser les contacts humains lors du fonctionnement normal.

Ce périphérique a également été évalué et démontré conforme aux limites d'exposition aux RF d'IC dans des conditions d'exposition à des appareils mobiles (les antennes se situent à moins de 20cm du corps d'une personne).

## 7 List of Parts and Accessories

**Table 28:** List of parts and accessories

Description	Supplier	Ordering information
Java Terminals	Gemalto M2M	Ordering number EHS5T RS485: L30960-N2730-A100 EHS5T-US RS485: L30960-N2760-A100 EHS6T USB: L30960-N2740-A100 EHS6T LAN: L30960-N2750-A100 BGS5T USB: L30960-N2720-A100
Power supply unit Input: 100-240V / 47-63Hz / 400mA Output: 12V / 1,25A 	Gemalto M2M	Terminal Power Supply (incl. EU adapter) Ordering number: L36880-N8490-A12  UK adapter for above Terminal Power Supply Ordering number: L36880-N8490-A13  US adapter for above Terminal Power Supply Ordering number: L36880-N8490-A14  AU adapter for above Terminal Power Supply Ordering number: L36880-N8490-A15
DIN rail holder - BOPLA TSH 35-2 	BOPLA	Ordering number: 20035000 BOPLA Gehäuse Systeme GmbH Borsigstr. 17-25 D-32257 Bünde Phone: +49 (0)5223 / 969 - 0 Fax: +49 (0)5223 / 969 - 100 Email: <a href="mailto:info@bopla.de">info@bopla.de</a> Web: <a href="http://www.bopla.de">http://www.bopla.de</a>
Antenna - SMARTEQ-MiniMAG Dualband, 0dBd, 2.6m RG174, SMA (m)	KÖBEL Mobile Communication	Ordering number: 1140.26 with crimped SMA connector KÖBEL Mobile Communication Sesamstrasse 12 D-24632 Lentföhrden
RS-232 cable with 9-pin D-sub connector (male)	Tecline	Tecline GmbH Behrener Straße 8 D-66117 Saarbrücken Phone: +49-681-926-78-70 Fax: +49-681-926-78-555 Web: <a href="http://www.tecline-edv.de/">http://www.tecline-edv.de/</a>
8-pin and 12-pin header GPIO connector (female plug) for GPIO interface Type: 8-pin: B2CF 3.50/08/180 SN BK BX 12-pin: B2CF 3.50/12/180 SN BK BX 	Weidmueller	Ordering number (12-pin): 1277510000 Ordering number (8-pin): 1277480000 Weidmüller Interface GmbH & Co. KG Klingenbergstraße 16 D-32758 Detmold  Phone: +49 5231 14-0 Fax: +49 5231 14-2083 Email: <a href="mailto:info@weidmueller.de">info@weidmueller.de</a> Web: <a href="http://www.weidmueller.com">http://www.weidmueller.com</a>

## 8 Appendix A: (Hardware) Watchdog

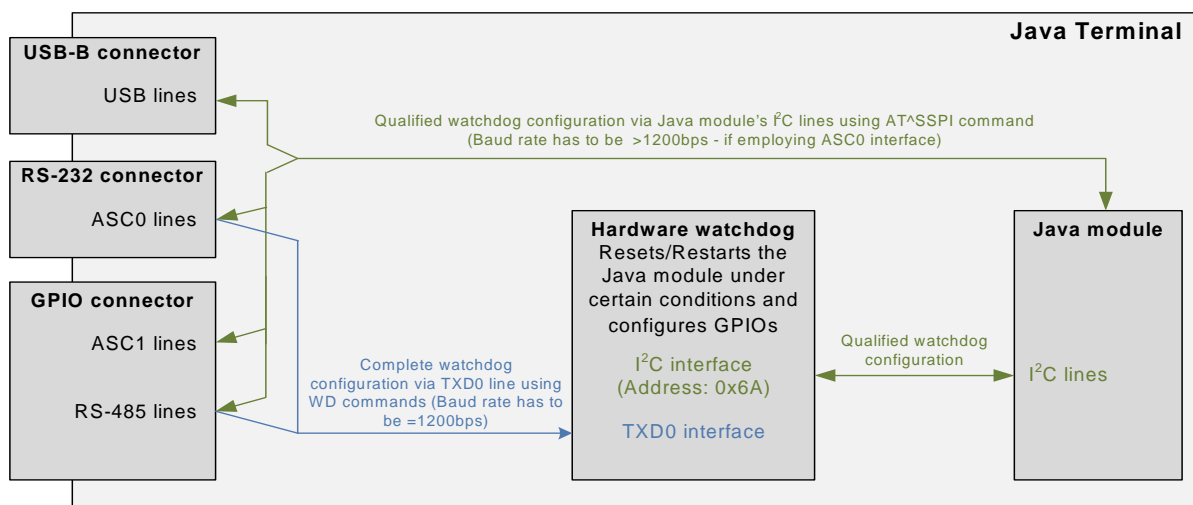
The watchdog is part of the Java Terminals and connected to the Java module itself (see also [Figure 4](#)). It can be used to

- Safely reset the module in certain conditions
- Restart the module when it has turned off
- Configure level shifter's GPIO directions and DSR0/ADC1\_IN availability at the GPIO connector

The complete watchdog functionality can be configured by means of special watchdog configuration commands (i.e., WD commands) that are passed to the watchdog via the serial TXD0 line. For details on how to configure the complete watchdog functionality see [Section 8.3](#).

A qualified set of configuration commands - level shifter's GPIO directions, DSR0/ADC1\_IN usage, trigger delay and firmware infos - can be specified by means of a special write/read protocol handled by the watchdog's I<sup>2</sup>C interface. For details on how to configure the watchdog via I<sup>2</sup>C interface see [Section 8.4](#).

The below [Figure 23](#) illustrates the various ways the watchdog may be accessed and configured.



**Figure 23:** Hardware watchdog configuration

Note: Unless the complete configuration scope is required, the qualified watchdog configuration via I<sup>2</sup>C interface should be used.



## 8.1 Reset Conditions

The watchdog implements three conditions, under which a reset of the module is automatically performed:

- **Repetitive:** A module reset is performed frequently and repetitive. This reset condition can be used to force the module to reconnect to the mobile network once in a while. Typical frequencies can be 24h or longer. This feature can be configured via the RST\_REP timeout.
- **UART activity:** The watchdog can be used to reset the module, when no response from the module on AT commands is recognized for a specified amount of time. To prevent the reset, the module has to be active frequently on the UART interface. This reset condition can be configured via the RST\_UART timeout, it is deactivated when timeout parameter = 0.
- **GPIO activity:** The watchdog can be used to reset the module, when no activity on the designated GPIO signal is recognized for a specified amount of time. To prevent the reset, the module has to be active frequently by toggling this GPIO signal. This reset condition can be configured via the RST\_GPIO timeout, it is deactivated when timeout parameter = 0.

When the watchdog is enabled, it will observe the activities on the UART and GPIO interfaces as well as the Java module status, depending on timeout parameter settings and perform frequent resets, if it is configured to do so.

### 8.1.1 Reset stages

Basically, there are up to two escalation stages during a module reset:

- **First stage (regular fast shutdown):** The watchdog shuts down the module via an internal fast shutdown signal. The fast shutdown procedure will then still finish any data activities on the Java module's flash file system, thus ensuring data integrity, but will no longer deregister gracefully from the network, thus saving the time required for network deregistration. Afterwards, i.e. after an internal signalling has gone low, the module is regularly restarted.
- **Second stage (emergency restart):** If the module can for some reasons not be switched off successfully during the first stage, the watchdog resets the module via an internal EMERG\_RST signal. The emergency restart procedure includes disconnecting the power supply lines, and causes the loss of all information stored in the Java module's volatile memory.

During the first stage the watchdog waits for up to three seconds for the internal signalling to go low. If the internal signalling does not change, the watchdog escalates to the second stage in order to switch off and restart the module.

The watchdog can also be configured to automatically switch on resp. power up the module following a shutdown and a configured delay time (always-on mode).

### 8.1.2 Reset Delay

The watchdog implements a protection mechanism to prevent too frequent module resets. When the delayed reset mechanism is enabled, the watchdog will start its activity only after the specified amount of time, MIN\_START\_TIME. A reasonable value for this timeout is 30 minutes. After the watchdog startup, after a module reset and also after enabling the watchdog, no reset of the module is performed before the timeout of MIN\_START\_TIME. The reset delay mechanism may be useful for software updates.

When the watchdog is enabled, resets can be prevented once for a certain amount of time. This timeout, TRG\_DEL, can be configured via the I<sup>2</sup>C interface. It can be particularly useful when a software update is performed. Using the TRG\_DEL timeout will prevent the watchdog from resetting the module during the running TRG\_DEL timeout, so that the update can be performed safely. An upcoming reset event will be shifted and catch up after the TRG\_DEL timeout.

## 8.2 Restart Conditions

When the watchdog is enabled, it will observe the modules on/off state. When it is configured to keep the module "always on", it will restart the module after the specified amount of time after it has discovered that the module has turned off. This important feature is useful in rough environments with often power losses and out-of-temperature conditions where it secures a safe module operation. The timeout condition for the restart feature is called ALWAYS\_ON.

## 8.3 Complete Watchdog Configuration

The complete hardware watchdog functionality can be configured via the TXD0 line of the serial interface ASC0 as described in this section.

The watchdog listens on the TXD0 line exclusively at the low baudrate 1200bps. This means that if using the watchdog this low baud rate is reserved and should not be configured for the module's asynchronous serial interface ASC0. The TXD0 line can be accessed either via RS-232 interface or via RS-485 interface (in conjunction with an RS232-to-RS485 adapter). Note that in this case the watchdog gives no feedback via an output line. Commands are acknowledged by green ON LED - see [Section 8.3.1](#).

So, to control and configure the watchdog, a terminal program MUST be set to 1200bps, before a command can be sent to the watchdog. See [Section 8.3.1](#) for the watchdog's configuration command specification. Once completed, the terminal program should be changed to higher baud rates again to enable proper communication with the module. Note that the Java module has to be up and running for this type of configuration.

Please note that a qualified set of configuration commands can also be configured via I<sup>2</sup>C interface. See [Section 8.4](#) for details.

### 8.3.1 Watchdog (WD) Command Specification

The general watchdog command syntax is as follows:

WD=<command>,<argument>,<checksum><NL>

Where

- <command> specifies the command name
- <argument> gives the numeric argument
- <checksum> is the sum of the digits of the argument. (e.g. the argument 124 produces a checksum 7, because  $1+2+4=7$ ).

Whenever a non-volatile command is executed, it is saved in the watchdog's flash memory. At watchdog start, the last state is loaded from flash memory.

If a config command was successfully executed by the watchdog, the green ON LED flashes two times. The watchdog commands are implemented as text commands. In case a command error occurs - e.g., a checksum failure - the green ON LED flashes 4 times.

## 8.3 Complete Watchdog Configuration

The following watchdog configuration commands are available:

- Watchdog on/off - see [Section 8.3.1.1](#)
- Test mode - see [Section 8.3.1.2](#)
- Repetitive module reset - see [Section 8.3.1.3](#)
- UART reset - see [Section 8.3.1.4](#)
- GPIO reset - see [Section 8.3.1.5](#)
- Restart delay - see [Section 8.3.1.6](#)
- Always on - see [Section 8.3.1.7](#)
- Load default values - see [Section 8.3.1.8](#)
- Change the Watchdogs I<sup>2</sup>C Address - see [Section 8.3.1.9](#)
- Set GPIO Direction - see [Section 8.3.1.10](#)
- Configure ADC1\_IN/DSR0/SPI\_CLK Line - see [Section 8.3.1.11](#)

Note: Changing the watchdog configuration using any of the following commands disables the watchdog: Repetitive module reset, UART reset, GPIO reset, Restart delay and Always on. With these commands the new configuration setting becomes effective only after the hardware watchdog is enabled again.

### 8.3.1.1 Watchdog On/Off

Command	ON
Parameter	<on off>
Type	Boolean
Range	0: Off (watchdog disabled) 1: On (watchdog enabled)
Default	0: Off
Non-volatile	Yes
Example	WD=ON,0,0 // disables the watchdog WD=ON,1,1 // enables the watchdog

This command is used to enable or disable the watchdog function. When disabled, all timers are stopped and the watchdog doesn't perform a module reset. When enabled, all configured timers start after a delay time of MIN\_START\_TIME. If MIN\_START\_TIME=0, all reset timers start immediately. Also, when the watchdog is enabled and ALWAYS\_ON>0, the watchdog observes the modules on/off state, and starts the module in case it detects that the module is off.

### 8.3.1.2 Test Mode

Command	TEST_MODE
Parameter	<on off>
Type	Boolean
Range	0: Off (Exit test mode) 1: On (Enter test mode)
Default	0: Off
Non-volatile	Yes
Example	WD=TEST_MODE,0,0 // Exit test mode WD=TEST_MODE,1,1 // Enter test mode

This commands configures the watchdog's test mode. In test mode the watchdog operates normally, but does not actually perform a module reset. Instead, it signals the (simulated) reset via the LED by flashing the green ON LED two times to visualize the watchdog trigger. Entering the test mode disables the actual watchdog functionality.

### 8.3.1.3 Repetitive Module Reset

Command	RST_REP
Parameter	<timeout>
Type	Milliseconds
Range	0 .. $2^{32}-1$
Default	0: Feature is disabled
Non-volatile	Yes
Example	WD=RST_REP,1800000,9 // Reset every 30 minutes

This command configures a repetitive module resets, if the watchdog is enabled. The parameter sets the RST\_REP timeout value. If the watchdog is enabled, an unconditional module reset every RST\_REP milliseconds is performed.

Changing this configuration disables the watchdog. The feature becomes active, if the watchdog is enabled again, and after the MIN\_START\_TIME has passed.

For normal operation, this value should be set to a value greater than 30 minutes, some use cases may even require a setting > 24h.

## 8.3 Complete Watchdog Configuration

**8.3.1.4 UART Reset**

Command	RST_UART
Parameter	<timeout>
Type	Milliseconds
Range	0 .. $2^{32}-1$
Default	0: Feature is disabled
Non-volatile	Yes
Example	WD=RST_UART,600000,6 // Resets the module if there was no activity on the RXD0 line for 10 minutes

This command configures a module reset, if no UART activity from the module was observed for the specified amount of time - RST\_UART. The module has to be active on the RXD0 signal within the specified time period; otherwise the watchdog will reset the module.

Changing this configuration disables the watchdog. The feature becomes active, if the watchdog is enabled again, and after the MIN\_START\_TIME has passed.

For normal operation, this value should be set to a value greater than 10 minutes (600000).

**8.3.1.5 GPIO Reset**

Command	RST_GPIO
Parameter	<timeout>
Type	Milliseconds
Range	0 .. $2^{32}-1$
Default	0: Feature is disabled
Non-volatile	Yes
Example	WD=RST_UART,600000,6 // Resets the module if there was no activity on the WD_RETRIG line for 10 minutes

This command configures a module reset, if no activity from the module was observed on the signal WD\_RETRIG for the specified amount of time (see [Figure 4](#) for WD\_RETRIG (GPIO8) line). The module has activate the WD\_RETRIG signal by toggling the GPIO8 module output within the specified time period. Otherwise the watchdog will reset the module. If enabled, each GPIO8 toggling resets the timer to its configured value. Note that for this feature to work, GPIO8 has to be available and enabled, and its direction must be set to output. Please refer to [Section 8.3.1.10](#), [Section 8.4](#) and [Section 8.5](#) for details on how to configure GPIO directions. If configured as WD\_RETRIG signal, GPIO8 cannot be used for any other purpose.

Changing this configuration disables the watchdog. The feature becomes active, if the watchdog is enabled again, and after the MIN\_START\_TIME has passed.

For normal operation, this value should be set to a value greater than 10 minutes (600000).

### 8.3.1.6 Restart Delay

Command	MIN_START_TIME
Parameter	<timeout>
Type	Milliseconds
Range	0 .. $2^{32}-1$
Default	18000000ms (30 minutes)
Non-volatile	Yes
Example	WD=MIN_START_TIME,18000000,9 // Prevents module resets for 30 minutes after each module startup, and after the watchdog becomes active

This command configures the MIN\_START\_TIME timeout value. By setting the MIN\_START\_TIME, the watchdog no longer performs a module reset for the given amount of time, after module startup. Whenever the module has been reset and restarted, as well as after the watchdog has been enabled, the watchdog will wait for MIN\_START\_TIME before performing any (further) resets. The watchdog's reset timer only starts after the MIN\_START\_TIME has expired.

Changing this configuration disables the watchdog. The feature becomes active, if the watchdog is enabled again.

It is strongly recommended to set this value to a time period of more than 30 minutes for normal operation. During development it may be set to values of less than 30 minutes, but should always be greater than the time the module needs for a complete start up including Java. Also, a Java module firmware or userware update right after startup should be taken into account which may take up to 15 min.

### 8.3.1.7 Always On

Command	ALWAYS_ON
Parameter	<timeout>
Type	Milliseconds
Range	0 .. $2^{32}-1$
Default	0: Feature is disabled
Non-volatile	Yes
Example	WD= ALWAYS_ON,60000,6 // Observes the module and restarts it 60 seconds after it has been turned off

This command configures the on/off-state observation of the module by specifying a timeout value for ALWAYS\_ON. If enabled, the watchdog observes the module's internal signalling. If the watchdog detects that the module is OFF, it will restart the module after the timeout of ALWAYS\_ON milliseconds.

Changing this configuration disables the watchdog. The feature becomes active, if the watchdog is enabled.

It is strongly recommended to set this value to a time period of more than 1 minute for normal operation to avoid oscillation in e.g. out-of-temperature events. In case of over/under temperature shut down it can be expected that the temperature does not change significantly within a minute. During development the timeout may be set to a period of less than 1 minute.

### 8.3.1.8 Load Default Values

Command	DFT_VAL
Parameter	<1>
Type	Fixed
Range	1
Default	---
Non-volatile	No
Example	WD= DFT_VAL,1,1 // Loads the default values

This command loads the default configuration values. This disables the watchdog. If the watchdog is enabled, the reset timeout values, the MIN\_START\_TIME timeout and the ALWAYS\_ON timeout become active. Other configuration values become active immediately. The loaded default values are also persistent, i.e. written to the flash memory.



### 8.3.1.9 Change the Watchdog's I<sup>2</sup>C Address

Command	I2C_ADDR
Parameter	<address>
Type	Number
Range	1-127
Default	106 (0x6A)
Non-volatile	Yes
Example	WD= I2C_ADDR,87,15 // Changes the I <sup>2</sup> C address to 87d (0x57)

The watchdog's I<sup>2</sup>C slave address can be changed to any 7-bit address. This may become necessary to avoid address conflicts on the I<sup>2</sup>C bus, if used in an environment, where the default I<sup>2</sup>C address "0x6A" is already in use by other slave devices connected to the Java Terminals.

Changing the I<sup>2</sup>C address takes effect immediately and has no impact on the watchdog's enabled/disabled state.

## 8.3 Complete Watchdog Configuration

**8.3.1.10 Set GPIO Direction**

Command	GPIO_DIR	
Parameter	<pin-config>	
Type	Number	
Range	0-1023	
Default	0 (0x000, 0000000000b)	
Non-volatile	Yes	
Example	WD= GPIO_DIR,682,16 // Sets the GPIOs alternating to output and input (binary value: 1010101010b)	

This command configures the input/output direction of level-shifters to the module's externally available GPIO pins. The argument is a 10-bit number, representing the 10 adjustable directions of the GPIO level-shifters. A set bit (value 1) sets the respective level-shifter to the output direction. A cleared bit changes the respective level-shifter to input direction. The following table describes the connection between the 10-bit argument number, the modules GPIO pins, and the Java Terminals GPIO connectors 8-pin and 12-pin:

10-Bit number	GPIO	8-pin connector	12-pin connector	Default
0	GPIO6	1	-	Input
1	GPIO7	2	-	Input
2	GPIO8	3	-	Input
3	GPIO11	4	-	Input
4	GPIO12	5	-	Input
5	GPIO13	6	-	Input
6	GPIO22	7	-	Input
7	GPIO23	8	-	Input
8	GPIO21	-	12	Input
9	GPIO20	-	11	Input

Changing the directions of the level-shifters must be executed with great care. They may only be set in accordance with the Java modules' GPIO input/output configuration. Special care must be taken that no outputs are cross-connected during the switching phase.

Configuring a Java Terminal output, the level shifter output should be set first, followed by the module output configuration. Configuring an input, the module input should be set first, followed by the level shifter input. Please refer to [Section 8.5](#) for more information on how to configure GPIO directions.

Please note that the GPIO direction can also be configured via I<sup>2</sup>C interface (see [Section 8.4](#)). It is recommended to use the I<sup>2</sup>C interface to configure the GPIO direction.

Note: Not every GPIO is supported by every Java Terminal variant - see [Section 3.7](#).

### 8.3.1.11 Configure ADC1\_IN/DSR0/SPI\_CLK Line

Command	ADC_DSR0	
Parameter	<input/output>	
Type	Boolean	
Range	0: Analog input (ADC1_IN) 1: Digital output (DSR0/SPI_CLK)	
Default	0: Analog input (ADC1_IN)	
Non-volatile	Yes	
Example	WD= ADC_DSR0,0,0 // Configures the line to be analog input WD= ADC_DSR0,1,1 // Configures the line to be digital output	

This command configures the the ADC/DSR0/SPI\_CLK signal on the GPIO connector to be either an analog input line (ADC) or a digital output line (DSR0/SPI\_CLK). If configured as analog input, the signal is connected to the Java module's ADC1\_IN line. If configured as digital output, the signal is connected to the Java module's DSR0/SPI\_CLK line that can be configured to be either DSR0 or SPI\_CLK (SPI\_CLK not available for BGS5T USB).

Note: If configuring the ADC1\_IN/DSR0/SPI\_CLK line please take great care to be in accordance with the Java module's current configuration of the ADC1\_IN and DSR0/SPI\_CLK signals.

## 8.4 Qualified Watchdog Configuration

While the complete watchdog functionality may be configured via TXD0 line of the ASC0 interface (for details see [Section 8.3](#)), a qualified set of configuration commands can also be specified via the watchdog's I<sup>2</sup>C interface as described in this section. The Java module has to be up and running for this type of configuration.

The watchdog's I<sup>2</sup>C interface is accessible by means of the Java module's I<sup>2</sup>C lines, and either via the Java module's AT command interface, or through a Java MIDlet during runtime (see [Figure 23](#)).

The I<sup>2</sup>C interface implements the write and the read protocol as described in [Section 8.4.1](#). The 7-bit device address is 0x6A (binary: 1101010). The default address can be changed by configuration command (see [Section 8.3.1.9](#)).

### 8.4.1 I<sup>2</sup>C Interface Command Specification

#### 8.4.1.1 WRITE Command Syntax

S	Slave address (including write bit "W")	A	Register address	A	Data byte	A	P
---	--	---	------------------	---	-----------	---	---

Example setting the GPIO12 signal direction to "output" (see also section [Examples](#)):

S	0xD4 (including write bit "0")	A	0x14	A	0x01	A	P
---	-----------------------------------	---	------	---	------	---	---

Legend:

S: Start Condition, W: Write bit (=0), A: Acknowledge, P: Stop Condition.

#### 8.4.1.2 READ Command Syntax

S	Slave address (including read bit "R")	A	Register address	A	Data length (only one byte)	N	P
---	---	---	------------------	---	--------------------------------	---	---

Example reading the last status = OK (see also section [Examples](#)):

S	0xD5 (including read bit "1")	A	0x00	A	0x01 (only one byte)	N	P
---	----------------------------------	---	------	---	-------------------------	---	---

Legend:

S: Start Condition, R: Read bit (=1), A: Acknowledge, N: Not Acknowledge, P: Stop Condition.

### 8.4.1.3 I<sup>2</sup>C Protocol Overview

In write mode (i.e., slave address “0xD4”), one address byte and one data byte is sent to the Java Terminal/Watchdog. The address byte specifies a register to write the data byte to. The data byte value is only written, if it is valid, i.e., in the specified range. After a write attempt, the status code of the operation is saved and the read address register (RAR) is automatically set to the status register address (SR). A subsequent read command from the status register (SR) will then return the latest status code (see [Table 30](#)). Only when the address byte is the RAR, i.e. another register is selected to be read, the RAR is not automatically set to the SR register. See [Section 8.4.1.4](#) for sample watchdog configurations via I<sup>2</sup>C.

In read mode, one data byte can be read from the Java Terminal/Watchdog. Attempts to read more bytes will result in undefined values being returned by the device. The device will always return the value that is addressed by the RAR. To read a specific register, a write command with RAR as the address byte and the register to be read as the data byte has to be issued first. The next read will then return the value at this address. Note that there are only a few registers that can be read (see register table - [Table 29](#)). When the RAR is written with a non-read address, the RAR is set to the SR, and the status code ILLEGAL\_ARGUMENT is saved. Note also that a consecutive read is not valid, as the return value will be ILLEGAL\_ARGUMENT, but the caller cannot determine whether the result is the value at the faulty address or an error status code. See [Section 8.4.1.4](#) for sample watchdog configurations via I<sup>2</sup>C.

### 8.4.1.4 I<sup>2</sup>C Commands

The following table lists the address register for configuration commands via I<sup>2</sup>C interface.

**Table 29:** Address register for I<sup>2</sup>C commands

Register address	Read/Write	Description	Name	Non-volatile	Default	Value range
0x00	R	Status; only address register to read directly from.	SR	-	OK	See result codes <a href="#">Table 30</a>
0x10	W	GPIO6	GPIOxR	Yes	0	Level shifter's GPIO direction: 0: Input 1: Output
0x11	W	GPIO7		Yes	0	
0x12	W	GPIO8		Yes	0	
0x13	W	GPIO11		Yes	0	
0x14	W	GPIO12		Yes	0	
0x15	W	GPIO13		Yes	0	
0x16	W	GPIO22		Yes	0	
0x17	W	GPIO23		Yes	0	
0x18	W	GPIO21		Yes	0	
0x19	W	GPIO20		Yes	0	
0x30	R	GPIO direction Low Byte: Read out 8 bits for the GPIOs [15,14,13,12,11,8,7,6]	GPIO_LBR	-		[0..0xFF]
0x31	R	GPIO direction High Byte: Read out 2 bits for the GPIOs 20 and 21 in the representation: [0,0,0,0,0,0,<20>,<21>]	GPIO_HBR	-		[0..0xFF]

## 8.4 Qualified Watchdog Configuration

**Table 29:** Address register for I<sup>2</sup>C commands

Register address	Read/Write	Description	Name	Non-volatile	Default	Value range
0x50	R/W	ADC1_IN/DSR0	ADCDSRR	Yes	0x00	0: Analog In 1: Digital Out
0x80	W	Trigger delay. Specifies delay time for a reset. If a trigger delay time is specified, the watchdog is prevented from resetting the module for the given time.	TDR	No	0x00	Set time in minutes. 1...255: Minutes 0: Disable
0xFD	R	Hardware watchdog's firmware version	VER	--		[0x00..0x99] [MAJ MIN] 4:MSB: MAJ 4:LSB: MIN  MAJ: Main release number (e.g., 1.x) MIN: Sub release number (e.g., x.0) as in version v1.0
0xFF	W	Read address register (RAR)	RAR	No	0x00	0x00..0xFF Only valid addresses contain valid values

Possible result codes for status command (see [Section 8.4.1.3](#) and above [Table 29](#)):

**Table 30:** I<sup>2</sup>C status result codes

Result	Code	Comment
OK	0x00	Last command was executed successfully
PROTOCOL_ERROR	0x01	Protocol error, i.e. wrong number of bytes
ILLEGAL_ADDRESS	0x02	Illegal register address
ILLEGAL_ARGUMENT	0x03	Illegal argument. Argument is out of allowed range.
UNDEFINED	0xFF	

## Examples

The following two samples show how the watchdog can be configured by means of the watchdog's I<sup>2</sup>C interface and using the AT^SSPI command over RS-232/ASC0 to transfer the I<sup>2</sup>C user data. Please refer to [1] for more information on the AT command AT^SSPI and on how to configure and control the data transfer over the Java module's I<sup>2</sup>C interface.

The above Table 29 specifies the address register that can be used in I<sup>2</sup>C configuration commands.

The **first** example sets the level shifter's GPIO12 direction to "output". It therefore configures a write register marked as "W" in Table 29. For more information on the configuration of GPIO directions see Section 8.5.

AT^SSPI=	Open the Java Terminals I <sup>2</sup> C data connection.
CONNECT	Indicates that the connection is open.
<aD41401>	WRITE command enclosed by <>: "a" is a command ID to better identify and match acknowledgments, "D4" indicates the slave address (write mode), "14" specifies the address register GPIO12, and "01" sets the data byte (i.e., line is "output"). <b>Note:</b> The data byte value is only written if valid, i.e., if in the specified range. After a WRITE command, the status code of the operation is saved to the status register (SR) and a subsequent READ command from the status register will then return the latest status code as listed in Table 30.
{a+}	Acknowledgement enclosed in curly brackets of a successful data transmission.
<bD50001>	READ command enclosed by <>: "b" is a command ID to better identify and match acknowledgments, "D5" indicates the slave address (read mode), "00" specifies the address register SR, and "01" sets the data length to be read. <b>Note:</b> The READ command can only be called in conjunction with the SR address "00" and the data length of one byte "01".
{b+00}	Acknowledgement enclosed in curly brackets of a successful data transmission, together with the response code "00" indicating that the command was successfully executed.
#	Close data connection.
OK	Connection closed.

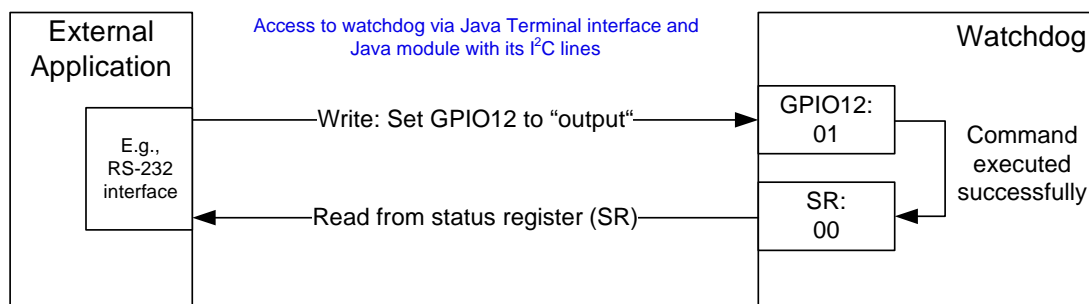


Figure 24: Write data to address register

8.4 Qualified Watchdog Configuration

The **second** example listed below reads out the hardware watchdog’s firmware version, it therefore uses a read register marked as “R” in [Table 29](#).

However, except for the status address register (SR) no information can be directly retrived from an address register itself, but only indirectly by means of a so-called read-address-register (RAR). An initial WRITE command has to link the register to be read to the RAR first. Now the RAR is linked to the register to be read, and the content of this register can be read from the SR.

AT^SSPI=	Open the Java Terminals I <sup>2</sup> C data connection.
CONNECT	Indicates that the connection is open.
<aD4FFFD>	WRITE command enclosed by <>: “a” is a command ID to better identify and match acknowledgments, “D4” indicates the slave address (write mode), “FF” specifies the read address register RAR, and “FD” sets the data byte to the watchdogs firmware version register VER (i.e., RAR and VER are linked by this command). <b>Note:</b> The data byte value is only written if valid, i.e., if in the specified range. After a WRITE command, the status code of the operation, in this case, i.e., where the register address is the RAR, the content of the register given as data byte is saved to the status register (SR) and a subsequent READ command from the status register will then return the register value, i.e., the hardware watchdog’s firmware version.
{a+}	Acknowledgement enclosed in curly brackets of a successful data transmission.
<bD50001>	READ command enclosed by <>: “b” is a command ID to better identify and match acknowledgments, “D5” indicates the slave address (read mode), “00” specifies the address register SR, and “01” sets the data length to be read. <b>Note:</b> The READ command can only be called in conjunction with the SR address “00” and the data length of one byte “01”.
{b+10}	Acknowledgement enclosed in curly brackets of a successful data transmission, together with the response code “10” indicating that the command was successfully executed. The resposne code gives the watchdog’s firmware version as v1.0.
#	Close data connection.
OK	Connection closed.

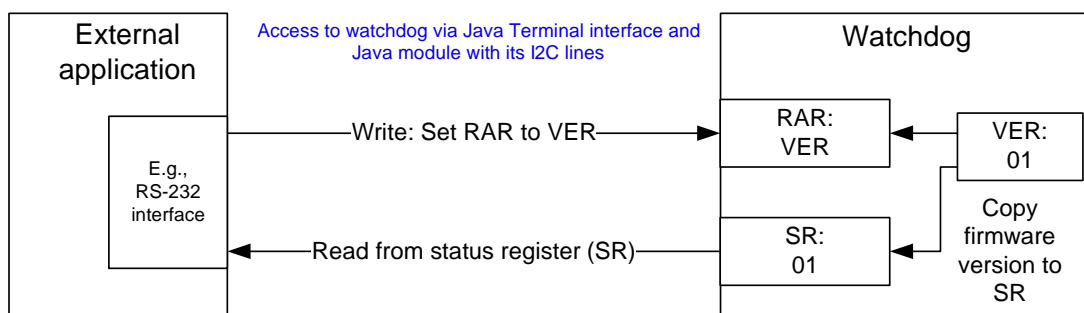


Figure 25: Read data from address register



## 8.5 Configuring GPIO Directions

As already shown in [Figure 4](#) and mentioned in [Section 8.3.1.10](#) the GPIO pins at the Java Terminals' GPIO connector are not electrically identical to the GPIO lines at the integrated Java module. A built-in level shifter needs to ensure that the voltage level is correctly converted.

Because of that it is necessary to not only configure the Java modules' GPIO settings by AT command, but to also configure the the built-in level shifter's GPIO directions by means of the watchdog.

As described in [Section 8.3](#), [Section 8.4](#) and shown in [Figure 23](#) there are various ways to configure the watchdog and therefore the level shifter's GPIO directions:

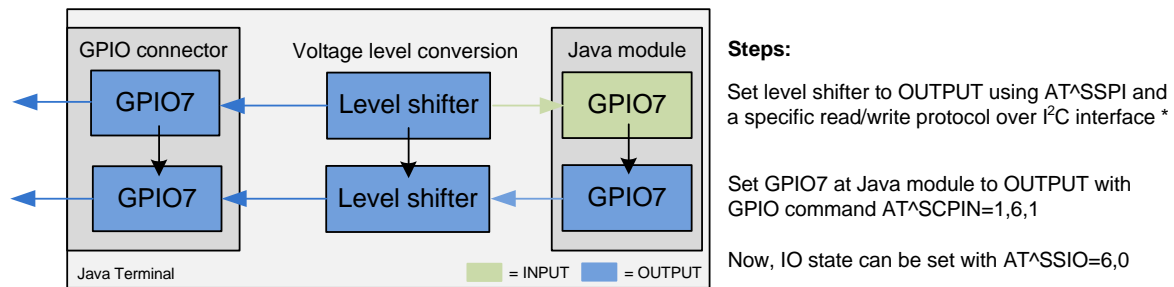
- A qualified configuration including GPIO directions can be done using the watchdog's I<sup>2</sup>C interface. For details see [Section 8.5.1](#). This is the recommended method to set the level shifter's GPIO direction.
- A complete configuration can be done using the TXD0 line of the ASC0 interface. For details see [Section 8.5.2](#).

Notes: The VCCref signal at the Java Terminals's GPIO connector needs to be connected - for instance to the +5Vout signal - for the level shifters to be active. Also note that in order to have a defined level for GPIOs configured as inputs, external pull-ups or pull-downs will have to be implemented at the GPIO lines.

### 8.5.1 Configuration using I<sup>2</sup>C Interface

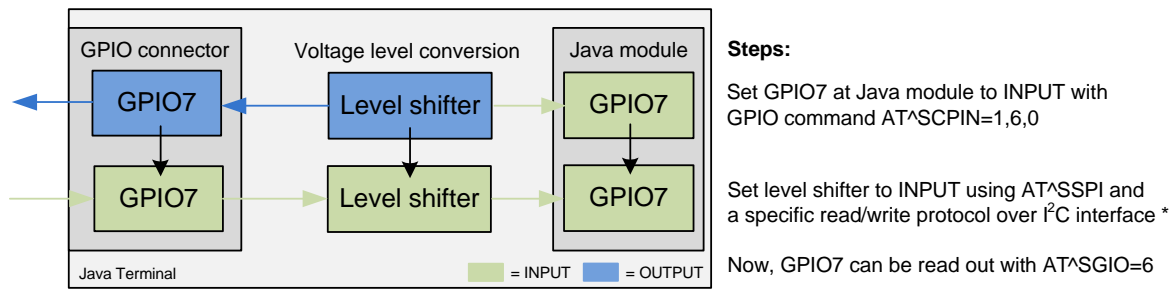
Please refer to [Section 8.4](#) for more information on how to configure the watchdog via I<sup>2</sup>C interface.

[Figure 26](#) explains the configuration steps required to set the Java Terminals's GPIO7 signal direction to OUTPUT (default direction is INPUT):



**Figure 26:** Setting GPIO direction to OUTPUT via I<sup>2</sup>C interface

[Figure 27](#) shows the configuration steps required to re-set the Java Terminals's GPIO7 signal direction to INPUT:



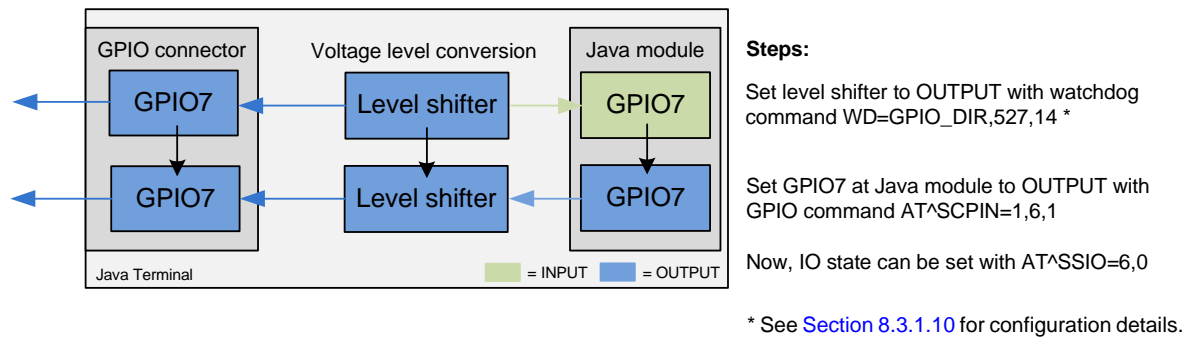
**Figure 27:** Setting GPIO direction to INPUT via I<sup>2</sup>C interface

For more information on the AT commands mentioned in the above figures see also [\[1\]](#).

### 8.5.2 Configuration using TXD0 Line of ASC0 Interface

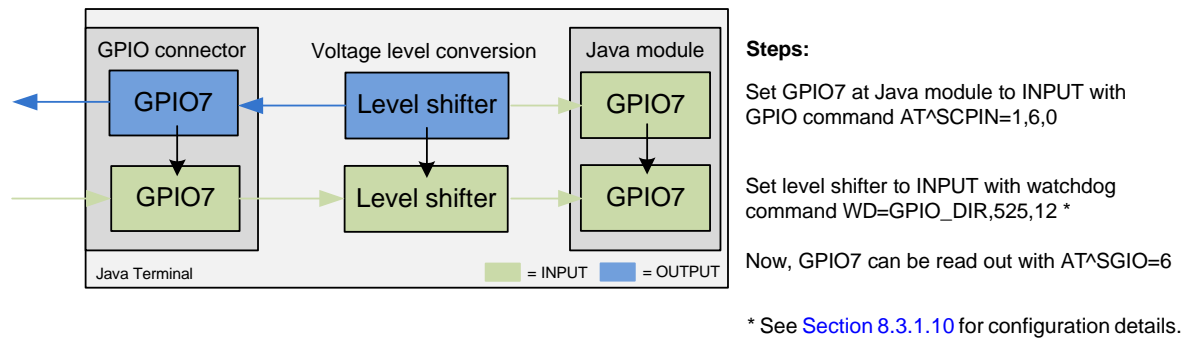
Please refer to [Section 8.3](#) for more information on how to configure the watchdog via TXD0 line of ASC0 interface interface.

[Figure 26](#) explains the configuration steps required to set the Java Terminals’s GPIO7 signal direction to OUTPUT (default direction is INPUT):



**Figure 28:** Setting GPIO direction to OUTPUT via TXD0 line (at 1200bps)

[Figure 26](#) shows the configuration steps required to re-set the Java Terminals’s GPIO7 signal direction to INPUT:



**Figure 29:** Setting GPIO direction to INPUT via TXD0 line (at 1200bps)

For more information on the AT commands mentioned in the above figures see also [\[1\]](#).

## 9 Appendix B: Ethernet Setup and Configuration

Once EHS6T LAN is started and an Ethernet cable is plugged as described in [Section 9.1](#), the Ethernet connection can be used to exchange data.

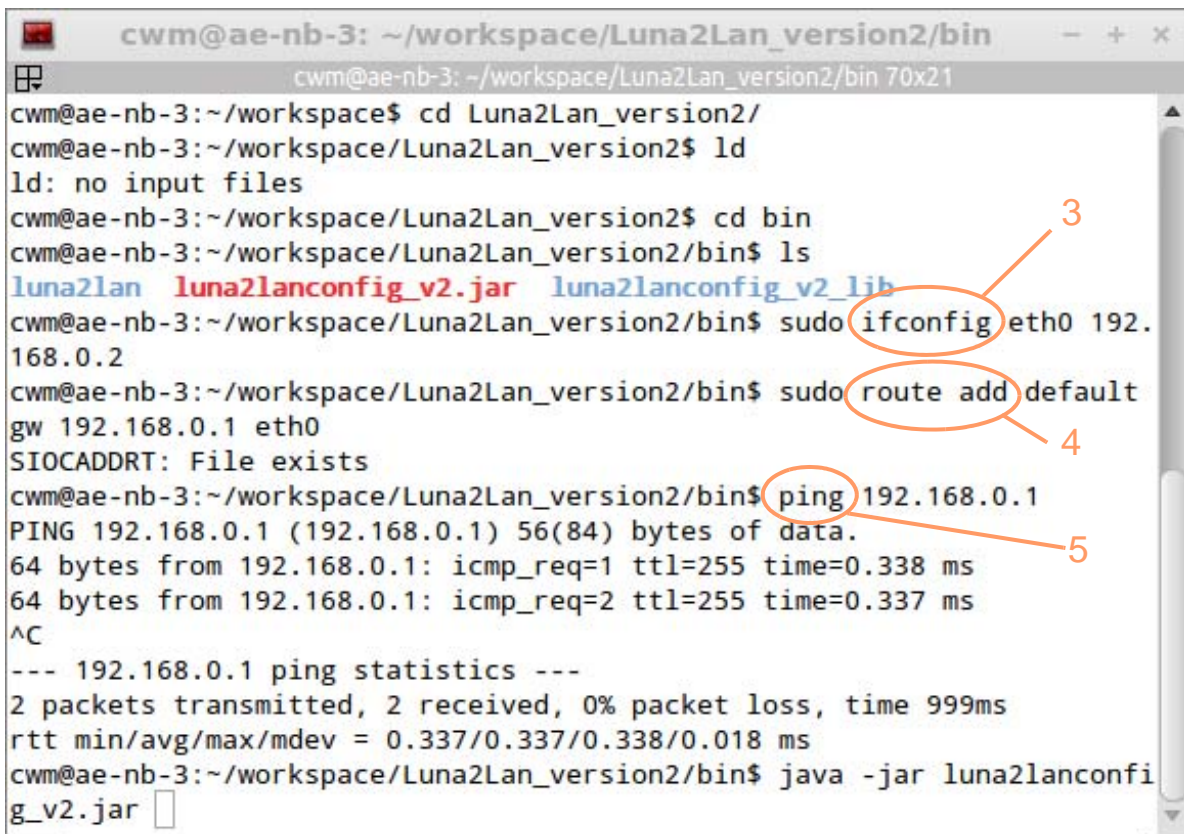
Via Ethernet link it is also possible to configure some aspects of the Java Terminals' external links or to update the Java module MCU's firmware. The following sections describe the default configuration settings (see [Section 9.2](#)), the proprietary data packets that can be employed to configure these settings or to upgrade the MCU's firmware (see [Section 9.3](#)) as well as a proprietary configuration tool to exchange these packets with EHS6T LAN (see [Section 9.4](#)).

### 9.1 Connection Setup

To initially set up an Ethernet connection to the EHS6T LAN, a static route between the external application (e.g., a PC) and EHS6T LAN has to be established, completing the following steps:

1. Plug the Ethernet cable between external application and EHS6T LAN.
2. Start up external application and EHS6T LAN.
3. Assign IP address to external application's Ethernet interface.
4. Add static route between external application's Ethernet interface IP address and EHS6T LAN's default IP address. DHCP is by default disabled, but can be enabled via Ethernet connection later (see [Section 9.3](#)).
5. Check Ethernet connection by sending a ping from external application to EHS6T LAN.

[Figure 30](#) shows the above described setup steps 3 to 5 for a Linux based external application (requires administrator permissions).



```
cwm@ae-nb-3: ~/workspace/Luna2Lan_version2/bin
cwm@ae-nb-3:~/workspace/Luna2Lan_version2/bin 70x21
cwm@ae-nb-3:~/workspace$ cd Luna2Lan_version2/
cwm@ae-nb-3:~/workspace/Luna2Lan_version2$ ld
ld: no input files
cwm@ae-nb-3:~/workspace/Luna2Lan_version2$ cd bin
cwm@ae-nb-3:~/workspace/Luna2Lan_version2/bin$ ls
luna2lan luna2lanconfig_v2.jar luna2lanconfig_v2_lib
cwm@ae-nb-3:~/workspace/Luna2Lan_version2/bin$ sudo ifconfig eth0 192.
168.0.2
cwm@ae-nb-3:~/workspace/Luna2Lan_version2/bin$ sudo route add default
gw 192.168.0.1 eth0
SIOCADDRT: File exists
cwm@ae-nb-3:~/workspace/Luna2Lan_version2/bin$ ping 192.168.0.1
PING 192.168.0.1 (192.168.0.1) 56(84) bytes of data.
64 bytes from 192.168.0.1: icmp_req=1 ttl=255 time=0.338 ms
64 bytes from 192.168.0.1: icmp_req=2 ttl=255 time=0.337 ms
^C
--- 192.168.0.1 ping statistics ---
2 packets transmitted, 2 received, 0% packet loss, time 999ms
rtt min/avg/max/mdev = 0.337/0.337/0.338/0.018 ms
cwm@ae-nb-3:~/workspace/Luna2Lan_version2/bin$ java -jar luna2lanconfi
g_v2.jar
```

**Figure 30:** Configuring static route between external application and Java Terminal

## 9.2 Default Configuration Settings

This section lists non-volatile default configuration settings for EHS6T LAN. These settings may be adapted using Ethernet packets as described in [Section 9.3](#) and [Section 9.4](#).

### Default APN database entries:

After the debut EHS6T LAN startup, or after a firmware update (see [Section 9.3.3.5](#)) for the Java Terminal's MCU that includes a modification of the APN database structure, the APN entries listed in [Table 31](#) are available by default and used for connection setup.

**Table 31:** APN database initial default entries

Idx	MCC	MNC	Operator Name	APN	Username	Password	DNS1 and DNS2
1	234	10	O2-UK	mobile.o2.co.uk	o2web	password	192.168.002.001
2	234	33	Orange	m2mdata	""	""	192.168.002.001
3	234	15	vodafone UK	internet	web	web	192.168.002.001
4	262	1	T-Mobile	internet.t-mobile	User	Pass	192.168.002.001
5	262	2	Vodafone	web.vodafone.de	User	Pass	192.168.002.001
6	262	3	Eplus	internet.eplus.de	User	Pass	192.168.002.001
7	262	7	Telefonica	internet	User	Pass	192.168.002.001
8	0	0	None	APN	User	Pass	192.168.002.001
9	262	95	3G Test Network	APN	User	Pass	192.168.002.001
10	234	5	2G Test Network	APN	User	Pass	192.168.002.001

The initial default APN entries are usually replaced by a more comprehensive set of frequently used APNs - either during the Java Terminal's production and customization process or after a possible later modification of the APN database structure.

Both, the initial small default APN assemblage listed in [Table 31](#) as well as a more comprehensive set of APNs, can be modified by adding missing APNs or changing outdated ones. Please refer to [Section 9.3.2.5](#) for more information.

### Default MAC address:

00:01:02:03:04:05

### Default DHCP State:

DHCP is disabled.

The static IP address is: 192.168.0.1

### Default Password:

The password is pa55w0rd - where 0 is the number zero.

Default wrong password lockout is 0 - meaning there is no lockout. A value greater than 0 specifies the delay in seconds before a further attempt to enter the password is accepted.

Note: The configured (default) values for the above mentioned settings are non-volatile and will persist even if the Java Terminal is powered off. They are also in a proprietary format, password protected and check summed to prevent accidental alteration.

## 9.3 Configuration

The above described default configuration settings can be adapted using proprietary data packets over the Ethernet link via the special TCP port 50005.

For more information on a Java based Gemalto M2M tool that can be employed to configure the Ethernet connection please refer to [Section 9.4](#).

### 9.3.1 Packet Structure

The general data packet structure looks as follows:

**Table 32:** Packet structure

Description	Size	Additional Information
Header	2 bytes	Fixed as 0xdead
Type	2 bytes	Packet type
Length	4 bytes	Length of the data in the packet
Checksum	4 bytes	Checksum of the data part of the packet
Data	n bytes	Data part of the packet
Footer	2 bytes	Fixed as 0xbeef

### 9.3.2 Packet Overview

This section lists the various data packets that can be employed to configure certain aspects of the Java Terminals. Please refer also to [Section 9.3.3](#) for more information on the data packet flow during configuration.

The following packets are available:

- Password - see [Section 9.3.2.1](#)
- Set password - see [Section 9.3.2.2](#)
- MAC address - see [Section 9.3.2.3](#)
- DHCP status - see [Section 9.3.2.4](#)
- APN database - see [Section 9.3.2.5](#)
- Firmware header - see [Section 9.3.2.7](#)
- Firmware data - see [Section 9.3.2.8](#)
- Firmware action - see [Section 9.3.2.9](#)
- Response ACK / NACK - see [Section 9.3.2.10](#)
- Response data request packets - see [Section 9.3.2.11](#)
- Finish - see [Section 9.3.2.12](#)

### 9.3.2.1 Password

The initial packet sent must be a correct password packet. The password is parsed and compared to the configured Java Terminals' (default) password. If both passwords match an ACK packet is returned over the connection and the Java Terminal will enter a configuration mode. If the passwords do not match or the data packet is incorrect a NACK packet is returned. In addition a programmable delay (in seconds) will stop any further attempts to verify a password until the delay has expired. Sending a password packet (even a valid one) during this delay time will result in the delay time being set again and another NACK being sent.

**Table 33:** Password packet

Description	Size	Additional Information
Header	2 bytes	Fixed as 0xdead
Type	2 bytes	0x0001
Length	4 bytes	Length of the data in the packet
Checksum	4 bytes	Checksum of the data part of the packet
Data	n bytes	The data part of the packet contains the password obfuscated by XORing each byte of the plaintext password with 0x55. The checksum is carried out on this obfuscated data.
Footer	2 bytes	Fixed as 0xbeef

### 9.3.2.2 Set Password

The set password packet sets a new password and password delay (in seconds).

**Table 34:** Set password packet

Description	Size	Additional Information									
Header	2 bytes	Fixed as 0xdead									
Type	2 bytes	0x0005									
Length	4 bytes	Length of the data in the packet									
Checksum	4 bytes	Checksum of the data part of the packet									
Data	n bytes	<p>The data part of the set password packet contains the wrong password delay interval in seconds and the new password</p> <table border="1"> <thead> <tr> <th>Data field</th> <th>Size</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>Wrong password delay</td> <td>2 bytes</td> <td>0 sets the delay to the default value of 0. seconds. Delay is not obfuscated.</td> </tr> <tr> <td>New password</td> <td>n bytes</td> <td>Obfuscated by XORing with 0xaa.</td> </tr> </tbody> </table>	Data field	Size	Description	Wrong password delay	2 bytes	0 sets the delay to the default value of 0. seconds. Delay is not obfuscated.	New password	n bytes	Obfuscated by XORing with 0xaa.
Data field	Size	Description									
Wrong password delay	2 bytes	0 sets the delay to the default value of 0. seconds. Delay is not obfuscated.									
New password	n bytes	Obfuscated by XORing with 0xaa.									
Footer	2 bytes	Fixed as 0xbeef									



### 9.3.2.3 MAC Address

The MAC address packet configures the Java Terminals' MAC address. The default MAC address may cause issues with certain networks.

**Table 35:** MAC address packet

Description	Size	Additional Information
Header	2 bytes	Fixed as 0xdead
Type	2 bytes	0x0003
Length	4 bytes	Fixed length of 6 bytes
Checksum	4 bytes	Checksum of the data part of the packet
Data	6 bytes	The data part of the MAC address packet contains the MAC address itself as binary data.
Footer	2 bytes	Fixed as 0xbeef

### 9.3.2.4 DHCP Status

The DHCP status packet specifies whether DHCP is to be used by the Java Terminal over the Ethernet connection or a static IP address. By default DHCP is disabled and the static IP address is used. If DHCP is enabled, the static IP address must be present nonetheless, but is ignored. In order for a changed static IP address to be stored correctly, the Finish packet (see [Section 9.3.2.12](#)) needs to be sent and the Java Terminal has to be restarted.

**Table 36:** DHCP status packet

Description	Size	Additional Information
Header	2 bytes	Fixed as 0xdead
Type	2 bytes	0x0004
Length	4 bytes	Fixed length of 17 bytes
Checksum	4 bytes	Checksum of the data part of the packet

## 9.3 Configuration

**Table 36:** DHCP status packet

Description	Size	Additional Information									
Data	17 bytes	<p>The data part of the DHCP status packet contains a Boolean style switch and the static IP address. The IP address is ignored (but must be present and can be zero padded) if DHCP is enabled.</p> <table border="1"> <thead> <tr> <th>Data field</th> <th>Size</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>DHCP enable</td> <td>1 byte</td> <td>0 – DHCP Disabled Non zero value – DHCP enabled</td> </tr> <tr> <td>Static IP address</td> <td>16 bytes</td> <td>0 terminated ASCII string. Dotted quad e.g., 192.168.002.002 Note 1: Do not zero pad the IP octets e.g. '002'. Note 2: Data size for the static IP address must be 16 bytes. Pad with NULL's if required.</td> </tr> </tbody> </table>	Data field	Size	Description	DHCP enable	1 byte	0 – DHCP Disabled Non zero value – DHCP enabled	Static IP address	16 bytes	0 terminated ASCII string. Dotted quad e.g., 192.168.002.002 Note 1: Do not zero pad the IP octets e.g. '002'. Note 2: Data size for the static IP address must be 16 bytes. Pad with NULL's if required.
Data field	Size	Description									
DHCP enable	1 byte	0 – DHCP Disabled Non zero value – DHCP enabled									
Static IP address	16 bytes	0 terminated ASCII string. Dotted quad e.g., 192.168.002.002 Note 1: Do not zero pad the IP octets e.g. '002'. Note 2: Data size for the static IP address must be 16 bytes. Pad with NULL's if required.									
Footer	2 bytes	Fixed as 0xbeef									

### 9.3.2.5 APN Database

The APN database stores APNs together with their associated MCCs and MNCs. MCC and MNC from the EHS6T LAN's current IMSI can then be matched against APN database entries to determine the appropriate APN to be used for EHS6T LAN data connections.

APN database packets write APN entries to the APN database at the specified index position (1-499). Sending an APN database packet with APN index 0 deletes all entries from the APN database. Existing APN entries at a given index cannot be overwritten. Therefore, to change or delete specific APN entries, it is necessary to delete all entries before writing the corrected entries again.

However, APN's can be written to unused index positions without the need to erase the entire database. For example, APNs can be written at index positions 1,2,3,4, afterwards at positions 10,11,12,13, and finally at 5,6,7,8,9.

Writing to an empty APN index position will result in an ACK response upon success. Attempting to overwrite an existing APN entry will result in a NACK response.

**Table 37:** APN database packet

Description	Size	Additional Information																														
Header	2 bytes	Fixed as 0xdead																														
Type	2 bytes	0x0002																														
Length	4 bytes	Fixed length of 198 bytes																														
Checksum	4 bytes	Checksum of the data part of the packet																														
Data	198 bytes	<p>The data part of the packet contains the APN information formatted as listed below. Any unused bytes in the following structure have to be padded with 0x00. The checksum is calculated using all bytes including padding.</p> <table border="1"> <thead> <tr> <th>Data field</th> <th>Size</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>APN index</td> <td>2 byte</td> <td>0 to 499 are valid. Values outside this range cause a NACK. Index 0 deletes all APN database entries.</td> </tr> <tr> <td>MCC</td> <td>2 byte</td> <td></td> </tr> <tr> <td>MNC</td> <td>2 byte</td> <td></td> </tr> <tr> <td>Operator name</td> <td>50 bytes</td> <td>0 terminated ASCII string.</td> </tr> <tr> <td>APN</td> <td>50 bytes</td> <td>0 terminated ASCII string.</td> </tr> <tr> <td>User name</td> <td>30 bytes</td> <td>0 terminated ASCII string.</td> </tr> <tr> <td>Password</td> <td>30 bytes</td> <td>0 terminated ASCII string.</td> </tr> <tr> <td>DNS1</td> <td>16 bytes</td> <td>0 terminated ASCII string. Dotted quad, e.g., 192.168.002.002</td> </tr> <tr> <td>DNS2</td> <td>16 bytes</td> <td>0 terminated ASCII string. Dotted quad, e.g., 192.168.002.002</td> </tr> </tbody> </table>	Data field	Size	Description	APN index	2 byte	0 to 499 are valid. Values outside this range cause a NACK. Index 0 deletes all APN database entries.	MCC	2 byte		MNC	2 byte		Operator name	50 bytes	0 terminated ASCII string.	APN	50 bytes	0 terminated ASCII string.	User name	30 bytes	0 terminated ASCII string.	Password	30 bytes	0 terminated ASCII string.	DNS1	16 bytes	0 terminated ASCII string. Dotted quad, e.g., 192.168.002.002	DNS2	16 bytes	0 terminated ASCII string. Dotted quad, e.g., 192.168.002.002
Data field	Size	Description																														
APN index	2 byte	0 to 499 are valid. Values outside this range cause a NACK. Index 0 deletes all APN database entries.																														
MCC	2 byte																															
MNC	2 byte																															
Operator name	50 bytes	0 terminated ASCII string.																														
APN	50 bytes	0 terminated ASCII string.																														
User name	30 bytes	0 terminated ASCII string.																														
Password	30 bytes	0 terminated ASCII string.																														
DNS1	16 bytes	0 terminated ASCII string. Dotted quad, e.g., 192.168.002.002																														
DNS2	16 bytes	0 terminated ASCII string. Dotted quad, e.g., 192.168.002.002																														
Footer	2 bytes	Fixed as 0xbeef																														

### 9.3.2.6 Data Request

#### Requesting APN Database Entries

APN database entries can be requested using APN data request packets. The corresponding APN entry response packet as described in [Section 9.3.2.11](#) will then contain the requested APN database entry.

**Table 38:** APN database packet

Description	Size	Additional Information																														
Header	2 bytes	Fixed as 0xdead																														
Type	2 bytes	0x0040																														
Length	4 bytes	Fixed length of 198 bytes																														
Checksum	4 bytes	Checksum of the data part of the packet																														
Data	198 bytes	<p>The data part of the packet needs to contain the index only. The remaining bytes are irrelevant and have to be padded with 0x00. The checksum is calculated using all bytes including padding.</p> <table border="1"> <thead> <tr> <th>Data field</th> <th>Size</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>APN index</td> <td>2 byte</td> <td>1 to 499 are valid. Values outside this range cause a NACK.</td> </tr> <tr> <td>MCC</td> <td>2 byte</td> <td></td> </tr> <tr> <td>MNC</td> <td>2 byte</td> <td></td> </tr> <tr> <td>Operator name</td> <td>50 bytes</td> <td></td> </tr> <tr> <td>APN</td> <td>50 bytes</td> <td></td> </tr> <tr> <td>User name</td> <td>30 bytes</td> <td></td> </tr> <tr> <td>Password</td> <td>30 bytes</td> <td></td> </tr> <tr> <td>DNS1</td> <td>16 bytes</td> <td></td> </tr> <tr> <td>DNS2</td> <td>16 bytes</td> <td></td> </tr> </tbody> </table>	Data field	Size	Description	APN index	2 byte	1 to 499 are valid. Values outside this range cause a NACK.	MCC	2 byte		MNC	2 byte		Operator name	50 bytes		APN	50 bytes		User name	30 bytes		Password	30 bytes		DNS1	16 bytes		DNS2	16 bytes	
Data field	Size	Description																														
APN index	2 byte	1 to 499 are valid. Values outside this range cause a NACK.																														
MCC	2 byte																															
MNC	2 byte																															
Operator name	50 bytes																															
APN	50 bytes																															
User name	30 bytes																															
Password	30 bytes																															
DNS1	16 bytes																															
DNS2	16 bytes																															
Footer	2 bytes	Fixed as 0xbeef																														

**Requesting Version Number of Microprocessor Control Unit (MCU)**

The version number of the Java Terminals' MCU can be requested using a version request packet. The corresponding version response packet as described in [Section 9.3.2.11](#) will then contain the version number.

**Table 39:** APN database packet

Description	Size	Additional Information												
Header	2 bytes	Fixed as 0xdead												
Type	2 bytes	0x0041												
Length	4 bytes	Fixed length of 6 bytes												
Checksum	4 bytes	Checksum of the data part of the packet												
Data	6 bytes	<p>The data part of the version request packet should be empty. The bytes are irrelevant and have to be padded with 0x00. The checksum is calculated using all bytes including padding.</p> <table border="1"> <thead> <tr> <th>Data field</th> <th>Size</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>Major</td> <td>2 byte</td> <td></td> </tr> <tr> <td>Minor</td> <td>2 byte</td> <td></td> </tr> <tr> <td>Patch</td> <td>2 byte</td> <td></td> </tr> </tbody> </table>	Data field	Size	Description	Major	2 byte		Minor	2 byte		Patch	2 byte	
Data field	Size	Description												
Major	2 byte													
Minor	2 byte													
Patch	2 byte													
Footer	2 bytes	Fixed as 0xbeef												

## 9.3 Configuration

**9.3.2.7 Firmware Header**

The firmware header packet should be the first packet sent when updating the Java Module MCU's firmware (i.e., the Ethernet controller). The packet contains attribute data for the new MCU firmware. Receipt of this packet will prepare the flash area and reset counters.

**Table 40:** Firmware header packet

Description	Size	Additional Information									
Header	2 bytes	Fixed as 0xdead									
Type	2 bytes	0x0006									
Length	4 bytes	Fixed length of 8 bytes									
Checksum	4 bytes	Checksum of the data part of the packet									
Data	8 bytes	The data part of the firmware header packet contains the firmware's size and checksum. <table border="1" data-bbox="502 801 1385 1003"> <thead> <tr> <th>Data field</th> <th>Size</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>Size of firmware</td> <td>4 bytes</td> <td></td> </tr> <tr> <td>Checksum for firmware</td> <td>4 bytes</td> <td></td> </tr> </tbody> </table>	Data field	Size	Description	Size of firmware	4 bytes		Checksum for firmware	4 bytes	
Data field	Size	Description									
Size of firmware	4 bytes										
Checksum for firmware	4 bytes										
Footer	2 bytes	Fixed as 0xbeef									

**9.3.2.8 Firmware Data**

The firmware data packet contains a maximum of 1024 bytes of MCU firmware data. Data is sent sequentially, if an error occurs (NACK will be sent) the firmware upload attempt must be aborted and restarted from the beginning.

**Table 41:** Firmware data packet

Description	Size	Additional Information									
Header	2 bytes	Fixed as 0xdead									
Type	2 bytes	0x0007									
Length	4 bytes	Up to 1028 bytes									
Checksum	4 bytes	Checksum of the data part of the packet									
Data	8 bytes	The data part of the firmware data packet contains the next chunk of firmware. <table border="1" data-bbox="502 1720 1385 1982"> <thead> <tr> <th>Data field</th> <th>Size</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>Offset for firmware chunk</td> <td>4 bytes</td> <td>The offset is the offset in bytes from the start of the firmware image for this chunk of data.</td> </tr> <tr> <td>Data for firmware chunk</td> <td>1024 bytes or less</td> <td></td> </tr> </tbody> </table>	Data field	Size	Description	Offset for firmware chunk	4 bytes	The offset is the offset in bytes from the start of the firmware image for this chunk of data.	Data for firmware chunk	1024 bytes or less	
Data field	Size	Description									
Offset for firmware chunk	4 bytes	The offset is the offset in bytes from the start of the firmware image for this chunk of data.									
Data for firmware chunk	1024 bytes or less										
Footer	2 bytes	Fixed as 0xbeef									

### 9.3.2.9 Firmware Action

The firmware action packet must be sent when all the MCU firmware data packets have been sent successfully. It initiates the flash procedure that performs a checksum against the whole firmware and compares it to the checksum sent in the firmware header packet. If these checksums match the following actions are triggered: An ACK is sent, the new firmware is flashed to the Java Module's operational memory, the stored update firmware is erased, the Java Terminal is reset. As the Java Terminal is reset, there is no need to send a finish packet (see [Section 9.3.2.12](#)) to close the configuration session. This will be done automatically.

**Table 42:** Firmware action packet

Description	Size	Additional Information
Header	2 bytes	Fixed as 0xdead
Type	2 bytes	0x0008
Length	4 bytes	0 bytes
Checksum	4 bytes	Checksum of the data part of the packet
Data	8 bytes	The data part of the firmware action packet is empty - resulting in a checksum of 0.
Footer	2 bytes	Fixed as 0xbeef

### 9.3.2.10 Response ACK / NACK Packets

The ACK and NACK packets are sent after the receipt of any configuration packet to indicate whether that packet was successfully received and processed or not. An exception to this general rule are data request packets (see [Section 9.3.2.6](#)) that have their individual response packets (see [Section 9.3.2.11](#)).

The following checks are performed to determine whether a packet is valid or not:

- The header bytes are correct
- The footer bytes are correct
- The packet type is valid
- If the packet type has a fixed length the length should be correct.
- The data checksum is correct

If any of these checks fail, a NACK will be sent. If all of these checks pass, an ACK packet will be sent.

**Table 43:** ACK packet

Description	Size	Additional Information
Header	2 bytes	Fixed as 0xdead
Type	2 bytes	0x00FF
Length	4 bytes	0 bytes
Checksum	4 bytes	Checksum of the data part of the packet
Data	8 bytes	The data part of the ACK packet is empty - resulting in a checksum of 0.
Footer	2 bytes	Fixed as 0xbeef

**Table 44:** NACK packet

Description	Size	Additional Information
Header	2 bytes	Fixed as 0xdead
Type	2 bytes	0x0000
Length	4 bytes	0 bytes
Checksum	4 bytes	Checksum of the data part of the packet
Data	8 bytes	The data part of the NACK packet is empty - resulting in a checksum of 0.
Footer	2 bytes	Fixed as 0xbeef



### 9.3.2.11 Response Data Request Packets

#### APN Entry Response

When an APN entry request packet as described in [Section 9.3.2.6](#) is successfully received by the Java Terminal, no ACK packet is returned to the sender, but a response packet containing the APN entry at the queried index position instead. If the index for the APN entry is out of range or empty, a NACK packet is returned.

**Table 45:** APN entry response packet

Description	Size	Additional Information																														
Header	2 bytes	Fixed as 0xdead																														
Type	2 bytes	0x0040																														
Length	4 bytes	Fixed length of 198 bytes																														
Checksum	4 bytes	Checksum of the data part of the packet																														
Data	198 bytes	<p>The data part of the packet contains the APN information formatted as listed below. Any unused bytes in the following structure are padded with 0x00. The checksum is re-calculated using all bytes including padding.</p> <table border="1"> <thead> <tr> <th>Data field</th> <th>Size</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>APN index</td> <td>2 byte</td> <td>1 to 499 are valid.</td> </tr> <tr> <td>MCC</td> <td>2 byte</td> <td></td> </tr> <tr> <td>MNC</td> <td>2 byte</td> <td></td> </tr> <tr> <td>Operator name</td> <td>50 bytes</td> <td>0 terminated ASCII string.</td> </tr> <tr> <td>APN</td> <td>50 bytes</td> <td>0 terminated ASCII string.</td> </tr> <tr> <td>User name</td> <td>30 bytes</td> <td>0 terminated ASCII string.</td> </tr> <tr> <td>Password</td> <td>30 bytes</td> <td>0 terminated ASCII string.</td> </tr> <tr> <td>DNS1</td> <td>16 bytes</td> <td>0 terminated ASCII string. Dotted quad, e.g., 192.168.002.002</td> </tr> <tr> <td>DNS2</td> <td>16 bytes</td> <td>0 terminated ASCII string. Dotted quad, e.g., 192.168.002.002</td> </tr> </tbody> </table>	Data field	Size	Description	APN index	2 byte	1 to 499 are valid.	MCC	2 byte		MNC	2 byte		Operator name	50 bytes	0 terminated ASCII string.	APN	50 bytes	0 terminated ASCII string.	User name	30 bytes	0 terminated ASCII string.	Password	30 bytes	0 terminated ASCII string.	DNS1	16 bytes	0 terminated ASCII string. Dotted quad, e.g., 192.168.002.002	DNS2	16 bytes	0 terminated ASCII string. Dotted quad, e.g., 192.168.002.002
Data field	Size	Description																														
APN index	2 byte	1 to 499 are valid.																														
MCC	2 byte																															
MNC	2 byte																															
Operator name	50 bytes	0 terminated ASCII string.																														
APN	50 bytes	0 terminated ASCII string.																														
User name	30 bytes	0 terminated ASCII string.																														
Password	30 bytes	0 terminated ASCII string.																														
DNS1	16 bytes	0 terminated ASCII string. Dotted quad, e.g., 192.168.002.002																														
DNS2	16 bytes	0 terminated ASCII string. Dotted quad, e.g., 192.168.002.002																														
Footer	2 bytes	Fixed as 0xbeef																														

## 9.3 Configuration

**Version Number Response**

When a version number request packet as described in [Section 9.3.2.6](#) is successfully received by the Java Terminal, no ACK packet is returned to the sender, but a response packet containing the version number of the Java Terminal's MCU instead. If a version request packet could not be successfully processed, a NACK packet is returned.

**Table 46:** APN database packet

Description	Size	Additional Information												
Header	2 bytes	Fixed as 0xdead												
Type	2 bytes	0x0041												
Length	4 bytes	Fixed length of 6 bytes												
Checksum	4 bytes	Checksum of the data part of the packet												
Data	6 bytes	The data part of the response packet. The checksum is re-calculated using all bytes including padding. <table border="1" data-bbox="502 831 1385 1021"> <thead> <tr> <th>Data field</th> <th>Size</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>Major (High)</td> <td>2 byte</td> <td>0 to 999</td> </tr> <tr> <td>Minor (Mid)</td> <td>2 byte</td> <td>0 to 999</td> </tr> <tr> <td>Patch (Low)</td> <td>2 byte</td> <td>0 to 999</td> </tr> </tbody> </table>	Data field	Size	Description	Major (High)	2 byte	0 to 999	Minor (Mid)	2 byte	0 to 999	Patch (Low)	2 byte	0 to 999
Data field	Size	Description												
Major (High)	2 byte	0 to 999												
Minor (Mid)	2 byte	0 to 999												
Patch (Low)	2 byte	0 to 999												
Footer	2 bytes	Fixed as 0xbeef												

**9.3.2.12 Finish Packet**

The finish packet is sent once the configuration has been completed. This exits the configuration mode and closes any existing connections gracefully. Depending on the settings that were changed during the configuration, the Java Terminal is also rebooted.

Note: The Java Terminal also monitors the frequency at which packets arrive. If no packets have been received for 2 minutes, the functionality of the finish packet is executed even without a finish packet having been received.

**Table 47:** Finish packet

Description	Size	Additional Information
Header	2 bytes	Fixed as 0xdead
Type	2 bytes	0x0010
Length	4 bytes	0 bytes
Checksum	4 bytes	Checksum of the data part of the packet
Data	8 bytes	The data part of the finish packet is empty - resulting in a checksum of 0.
Footer	2 bytes	Fixed as 0xbeef

### 9.3.3 Examples

This section gives an example of the packets sent and received during a successful cycle of configuring particular settings for a Java Terminal.

The actual binary data of each packet is not detailed - however, any payload data is explained. The examples are from the point of view of the external application (i.e., a PC) doing the configuration NOT the Java Terminal. Send indicates data sent from the configuration PC to the Java Terminal.

Note: A possible failure will always be signalled by a NACK packet from the Java Terminal to the external application (e.g., PC) doing the configuration. Such a NACK can be dealt with in various ways, the usual being to retry sending the configuration packet until success or a retry count has expired and then presenting an error message.

A configuration tool exists that is able handle configuration packet traffic between external application and Java Terminal. For details see [Section 9.4](#).

#### 9.3.3.1 Setting an APN

Configuration PC	Java Terminal
Send Password Packet (0x0001) ---> <i>Data is the current password correctly obfuscated.</i>	<-- ACK <i>Started configuration mode.</i>
Send APN Database Packet (0x0002) ---> <i>Data as specified in <a href="#">Section 9.3.2.5</a>.</i>	<--- ACK <i>Stored APN details into APN database.</i>
Send Finish Packet (0x0010) --->	<--- ACK <i>Closed configuration mode.</i>

### 9.3.3.2 Setting a Static IP address

Configuration PC	Java Terminal
Send Password Packet (0x0001) ---> <i>Data is the current password correctly obfuscated.</i>	
	<-- ACK <i>Started configuration mode.</i>
Send DHCP Status Packet (0x0004) ---> <i>Data as specified in <a href="#">Section 9.3.2.4</a>.</i>	
	<--- ACK <i>Stored DHCP settings to be used with next connection setup.</i>
Send Finish Packet (0x0010) --->	
	<--- ACK <i>Closed configuration mode.</i>

### 9.3.3.3 Setting the password

Configuration PC	Java Terminal
Send Password Packet (0x0001) ---> <i>Data is the current password correctly obfuscated.</i>	
	<-- ACK <i>Started configuration mode.</i>
Send Set Password Packet (0x0005) ---> <i>Data as specified in <a href="#">Section 9.3.2.2</a>.</i>	
	<--- ACK <i>Stored new password to be used with next configuration mode.</i>
Send Finish Packet (0x0010) --->	
	<--- ACK <i>Closed configuration mode.</i>

### 9.3.3.4 Setting the MAC address

Configuration PC	Java Terminal
Send Password Packet (0x0001) ---> <i>Data is the current password correctly obfuscated.</i>	
	<-- ACK <i>Started configuration mode.</i>
Send Set MAC address Packet (0x0003) ---> <i>Data as specified in <a href="#">Section 9.3.2.3</a>.</i>	
	<--- ACK <i>Stored MAC address to be used with next Ethernet connection setup.</i>
Send Finish Packet (0x0010) --->	
	<--- ACK <i>Closed configuration mode.</i>

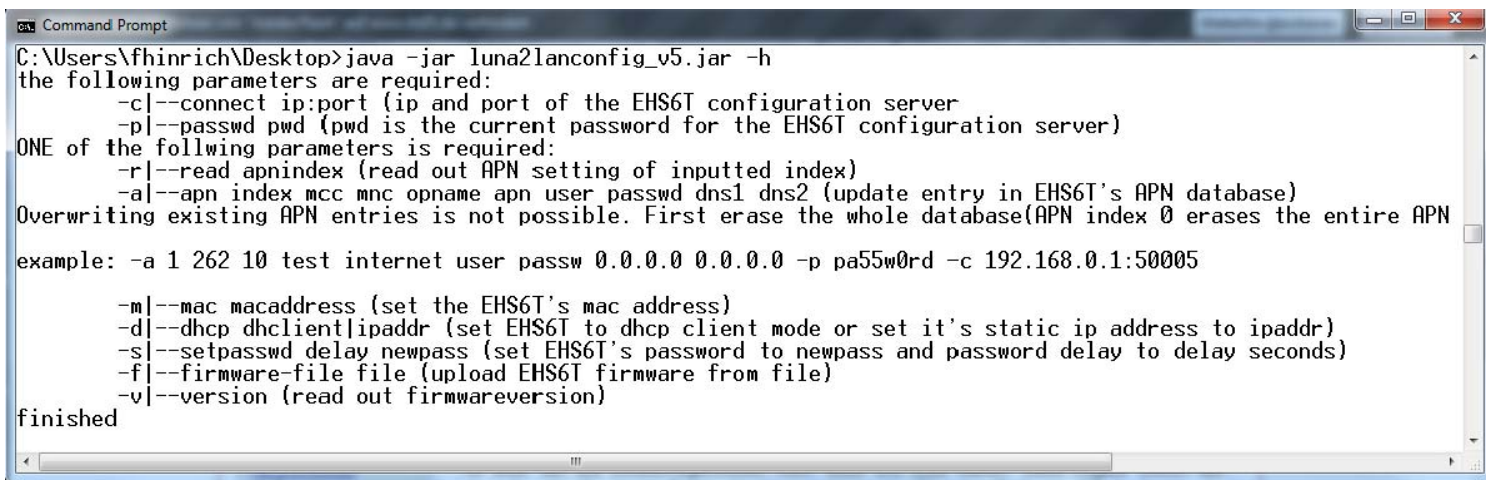
### 9.3.3.5 Updating the Java Terminal MCU Firmware

Configuration PC	Java Terminal
Send Password Packet (0x0001) ---> <i>Data is the current password correctly obfuscated.</i>	<-- ACK <i>Started configuration mode.</i>
Send Firmware Header Packet (0x0006) ---> <i>Data as specified in <a href="#">Section 9.3.2.7</a>.</i>	<--- ACK <i>Received MCU firmware's meta data.</i>
Send first Firmware Data Packet (0x0007) ---> <i>Data as specified in <a href="#">Section 9.3.2.8</a>.</i>	<--- ACK <i>Received the first 1024 bytes of the new MCU firmware and stored it for later use.</i>
Repeat sending Firmware Data Packets ---> <i>Repeat until the complete firmware image has been sent in 1024 or less byte chunks.</i>	
Send Firmware Action Packet (0x0008) ---> <i>Data as specified in <a href="#">Section 9.3.2.9</a>.</i>	<--- ACK <i>Stored MCU firmware image is correct and flashing procedure has begun.</i>
<p>Note 1: No Finish Packet is required as the Java Terminal will be in a severely restricted state whilst flashing the new MCU firmware to minimize the chance for errors.</p> <p>Note 2: If the power is switched off while flashing the new MCU firmware, there is a strong possibility that the Java Terminal will hang up until it can be re-flashed using an internal access interface.</p> <p>Note 3: If a NACK is received during the MCU firmware update process, the process must be abandoned and restarted from the beginning due to flash memory restrictions.</p> <p>Note 4: The proprietary configuration tool provided on request by Gemalto M2M and described in <a href="#">Section 9.4</a> may be used to update the Java Terminal MCU firmware.</p>	

## 9.4 Configuration Tool

The proprietary Gemalto M2M tool luna2lanconfig can be used to exchange configuration packets as described in [Section 9.3](#) between an external application and EHS6T LAN. Please contact Gemalto M2M for more information and the latest version of the luna2lanconfig tool.

The tool has a help page that can be called with the parameter -h as shown in [Figure 31](#) for a Linux system. The help page lists available parameters. The parameters correspond to the configuration packets described in [Section 9.3](#). For configuration samples see also [Figure 32](#) and [Figure 33](#).



```
C:\Users\fhinrich\Desktop>java -jar luna2lanconfig_v5.jar -h
the following parameters are required:
  -c|--connect ip:port (ip and port of the EHS6T configuration server)
  -p|--passwd pwd (pwd is the current password for the EHS6T configuration server)
ONE of the following parameters is required:
  -r|--read apnindex (read out APN setting of inputted index)
  -a|--apn index mcc mnc opname apn user passwd dns1 dns2 (update entry in EHS6T's APN database)
Overwriting existing APN entries is not possible. First erase the whole database(APN index 0 erases the entire APN
example: -a 1 262 10 test internet user passw 0.0.0.0 0.0.0.0 -p pa55w0rd -c 192.168.0.1:50005

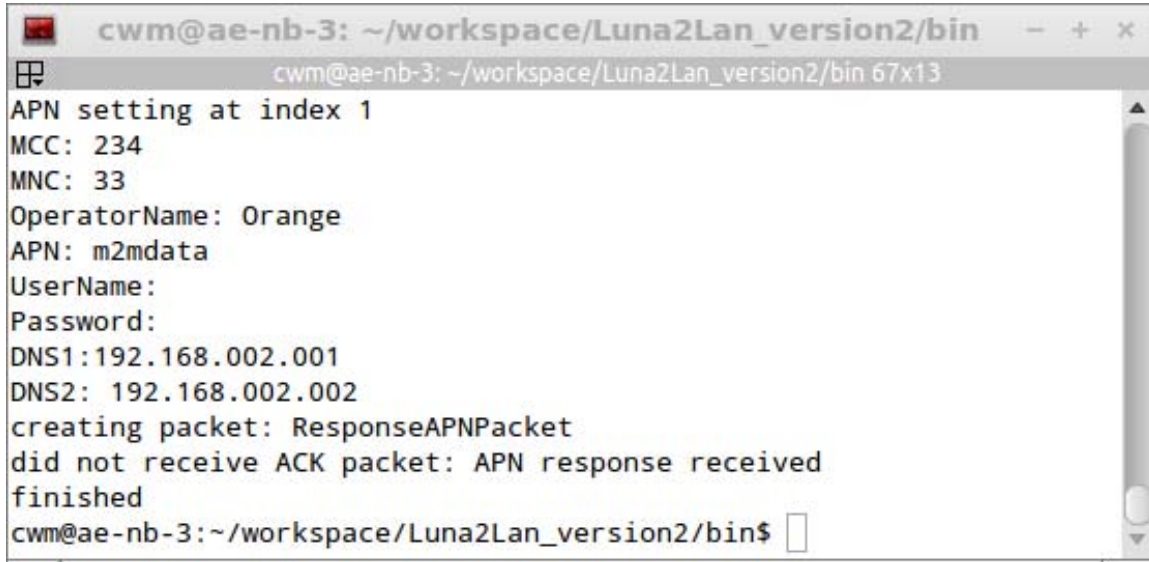
  -m|--mac macaddress (set the EHS6T's mac address)
  -d|--dhcp dhclient|ipaddr (set EHS6T to dhcp client mode or set it's static ip address to ipaddr)
  -s|--setpasswd delay newpass (set EHS6T's password to newpass and password delay to delay seconds)
  -f|--firmware-file file (upload EHS6T firmware from file)
  -v|--version (read out firmwareversion)
finished
```

Figure 31: Configuration tool's help page

Note: The luna2lanconfig tool is provided “as is” and Gemalto M2M disclaims all warranties with regard to this software tool including all implied warranties of merchantability and fitness. In no event shall Gemalto M2M be liable for any special, direct, indirect, or consequential damages or any damages whatsoever resulting from loss of use, data or profits, whether in an action of contract, negligence or other tortious action, arising out of or in connection with the use or performance of this software tool.

Figure 32 shows the response to an APN database query for the APN entry at index 1. The query is entered as follows:

```
...$ java -jar luna2lanconfig_v2.jar -r 1 -c 192.168.000.001:50005 -p pa55w0rd
```



```
cwm@ae-nb-3: ~/workspace/Luna2Lan_version2/bin
cwm@ae-nb-3: ~/workspace/Luna2Lan_version2/bin 67x13
APN setting at index 1
MCC: 234
MNC: 33
OperatorName: Orange
APN: m2mdata
UserName:
Password:
DNS1:192.168.002.001
DNS2: 192.168.002.002
creating packet: ResponseAPNPacket
did not receive ACK packet: APN response received
finished
cwm@ae-nb-3:~/workspace/Luna2Lan_version2/bin$
```

Figure 32: Response to query of APN entry at index 1

Figure 33 shows the response to a query for the Java Terminal's MCU (i.e., Ethernet controller) version. The query is entered as follows:

```
...$ java -jar luna2lanconfig_v2.jar -v -c 192.168.000.001:50005 -p pa55w0rd
```

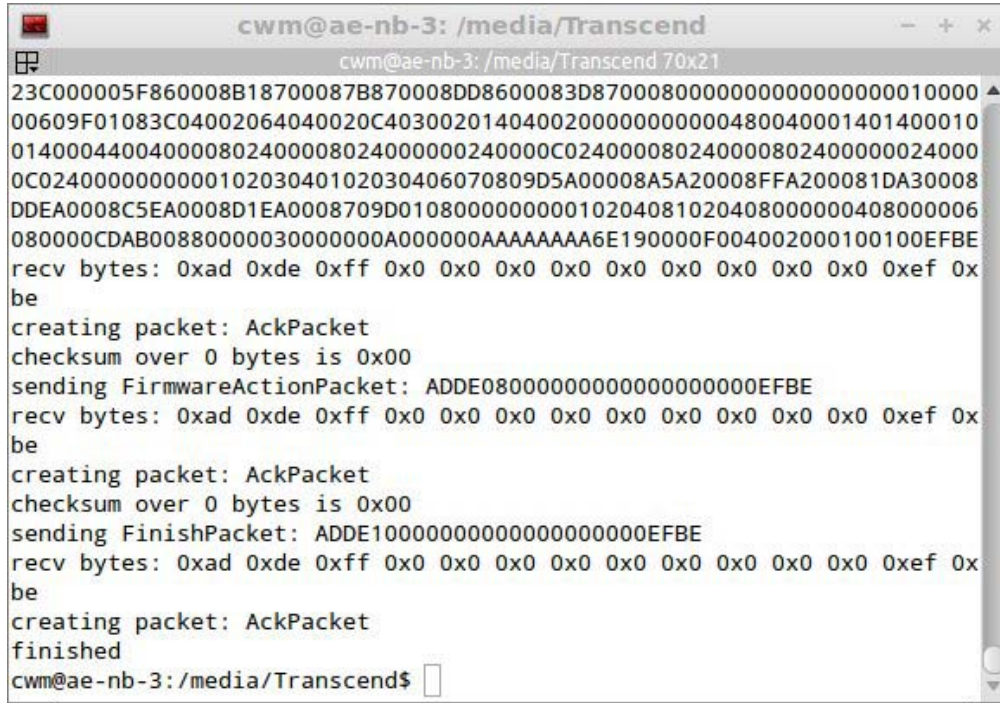


```
cwm@ae-nb-3: ~/works...e/Luna2Lan_version2/bin
cwm@ae-nb-3: ~/workspace/Luna2Lan_version2/bin 63x7
Version high: 1
Version mid: 1
Version low: 10
creating packet: ResponseVerPacket
did not receive ACK packet: Version response received
finished
cwm@ae-nb-3:~/workspace/Luna2Lan_version2/bin$
```

Figure 33: Response to query of Java Terminal MCU's firmware version



Figure 34 shows the response to a firmware update command for the Java Terminal's MCU (i.e., Ethernet controller). The firmware update command is entered as follows:  
...\$ java -jar luna2lanconfig\_v2.jar -f <path\_firmware\_upd\_file> -c 192.168.000.001:50005 -p pa55w0rd



```
cwm@ae-nb-3: /media/Transcend
cwm@ae-nb-3: /media/Transcend 70x21
23C000005F860008B18700087B870008DD8600083D870008000000000000000010000
00609F01083C04002064040020C4030020140400200000000000480040001401400010
014000440040000802400008024000000240000C024000080240000802400000024000
0C024000000000010203040102030406070809D5A00008A5A20008FFA200081DA30008
DDEA0008C5EA0008D1EA0008709D010800000000010204081020408000000408000006
080000CDAB00880000030000000A000000AAAAAAA6E190000F004002000100100EFBE
recv bytes: 0xad 0xde 0xff 0x0 0x0 0x0 0x0 0x0 0x0 0x0 0x0 0x0 0xef 0x
be
creating packet: AckPacket
checksum over 0 bytes is 0x00
sending FirmwareActionPacket: ADDE0800000000000000000000EFBE
recv bytes: 0xad 0xde 0xff 0x0 0x0 0x0 0x0 0x0 0x0 0x0 0x0 0x0 0xef 0x
be
creating packet: AckPacket
checksum over 0 bytes is 0x00
sending FinishPacket: ADDE1000000000000000000000EFBE
recv bytes: 0xad 0xde 0xff 0x0 0x0 0x0 0x0 0x0 0x0 0x0 0x0 0x0 0xef 0x
be
creating packet: AckPacket
finished
cwm@ae-nb-3:/media/Transcend$
```

Figure 34: Response to firmware update command for Java Terminal MCU

## About Gemalto

Gemalto (Euronext NL0000400653 GTO) is the world leader in digital security with 2011 annual revenues of €2 billion and more than 10,000 employees operating out of 74 offices and 14 Research & Development centers, located in 43 countries.

We are at the heart of the rapidly evolving digital society. Billions of people worldwide increasingly want the freedom to communicate, travel, shop, bank, entertain and work - anytime, everywhere - in ways that are enjoyable and safe. Gemalto delivers on their expanding needs for personal mobile services, payment security, authenticated cloud access, identity and privacy protection, eHealthcare and eGovernment efficiency, convenient ticketing and dependable machine-to-machine (M2M) applications.

Gemalto develops secure embedded software and secure products which we design and personalize. Our platforms and services manage these secure products, the confidential data they contain and the trusted end-user services they enable. Our innovations enable our clients to offer trusted and convenient digital services to billions of individuals.

Gemalto thrives with the growing number of people using its solutions to interact with the digital and wireless world.

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