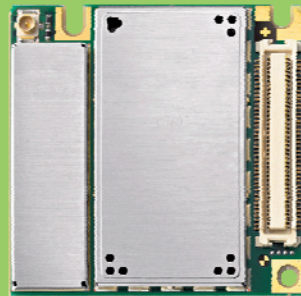




CINTERION
WIRELESS MODULES

Migrating from TC65 to TC65i

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Migration Guide

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Contents

| | | |
|----------|---|-----------|
| 1 | Introduction | 4 |
| 1.1 | Related Documents | 4 |
| 2 | Hardware Related Differences | 5 |
| 2.1 | Mechanical..... | 5 |
| 2.1.1 | Mounting Clip | 6 |
| 2.2 | Electrical Characteristics | 6 |
| 2.2.1 | Reduced Current Consumption | 6 |
| 2.2.2 | Measuring the Supply Voltage | 6 |
| 2.2.3 | Charging | 7 |
| 2.2.4 | Extended Low Temperature Range | 7 |
| 2.3 | Application Interfaces | 8 |
| 2.3.1 | Audio Interfaces..... | 8 |
| 2.3.2 | Voiceband Receive Path..... | 8 |
| 2.3.3 | TTY/CTM Support..... | 8 |
| 2.4 | Antenna Interface | 9 |
| 3 | Software Related Differences | 10 |
| 3.1 | Manufacturer Name, USB Vendor ID..... | 10 |
| 3.2 | Improved Quadband Selection | 11 |
| 3.3 | Bit Rate of the Local Asynchronous Serial Interface | 12 |
| 3.4 | Temperature Control..... | 12 |
| 3.5 | AT^SNFTTY..... | 13 |
| 3.6 | AT^SSTA Remote SAT Interface Activation | 13 |
| 3.7 | AT^SSTR Remote SAT Response Commands..... | 13 |
| 3.8 | AT^SOPS..... | 14 |
| 3.9 | AT^SMONC | 14 |
| 3.10 | AT^SCNI | 14 |
| 3.11 | Removed AT Commands..... | 15 |
| 4 | Java Features | 16 |
| 4.1 | Incremental Update | 16 |
| 4.2 | New Interface APIs | 16 |

1 Introduction

This migration guide¹ compares the following Cinterion wireless modules:

- **TC65 03.000 and TC65i 01.000.**

The aim of the document is to help system engineers efficiently migrate their existing GSM application design to the next generation series TC65i.

1.1 Related Documents

This section lists the documents referenced in this migration guide. For other related documents please refer to the Release Notes supplied with your Cinterion wireless module.

- [1] TC65i Hardware Interface Description, 01.000
- [2] TC65 Hardware Interface Description, v03.000
- [3] TC65i AT Command Set, v01.000
- [4] TC65 AT Command Set, v03.000

- [5] Application Note 02: Audio Interface Design for GSM Applications
- [6] Application Note 07: Rechargeable Lithium Batteries in GSM Applications
- [7] Application Note 22: Using TTY/CTM Equipment
- [8] Application Note 32: Integrating USB into GSM Applications
- [9] Application Note 45: Jamming Detection – Radio Link Stability Monitor
- [10] Remote SAT User's Guide
- [11] Application Note 46: Incremental Java Update
- [12] Java User's Guide
- [13] Java doc \wtk\doc\html\index.html

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

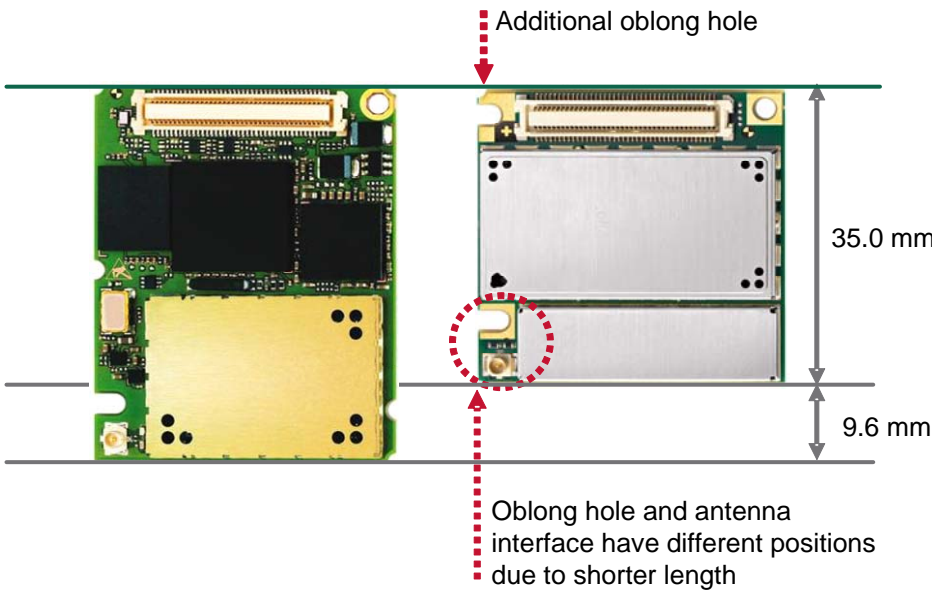
2 Hardware Related Differences

The focus of this chapter is on hardware differences between TC65 and TC65i.

2.1 Mechanical

TC65 and TC65i are different in length and have different shieldings. This implies that the mounting holes have changed, except for the round hole.

| TC65 | TC65i |
|--|--|
| Length and width: 44.6 mm x 33.9 mm | Length and width: 35 mm x 33.9 mm |
| Height: 3.3 mm excluding application connector | |
| Weight: 7.5 g | |
| Same board-to-board connector at same position, same pin layout. | |
| Shielding on RF components, no shielding on baseband components | Two shieldings protecting baseband and RF components. An additional benefit is that two shieldings increase the module's mechanical stability. |
| 1 round hole 1 oblong hole 2 half-round holes | 1 round hole (same as TC65) 2 oblong holes no half-round holes |



Additional oblong hole

35.0 mm

9.6 mm

Oblong hole and antenna interface have different positions due to shorter length

Reference:

- “Hardware Interface Description” : Section “Mechanics”

2.1.1 Mounting Clip

For TC65i, an optional mounting clip with mating board-to-board connectors has been designed to connect the TC65i module to the application platform. The mounting clip provides for an easy module exchange or replacement and eliminates the need for other types of fasteners, such as screws, clamps, brackets etc.

The mounting clip will be provided through GTT Europe Limited. Please contact Cinterion Wireless Modules GmbH for details.

Reference:

- “Hardware Interface Description”: Section “Mounting TC65i to the Application Platform”, Section “Mounting Clip”

2.2 Electrical Characteristics

Electrical characteristics of TC65i and TC65 are almost the same. Some slight differences can be found in the sections below and in the “Hardware Interface Description”, Section “Pin Assignment and Signal Description”.

2.2.1 Reduced Current Consumption

A major benefit of TC65i is an ultra low current consumption in all SLEEP modes, cut down to less than half the range of TC65. IDLE mode current is about 40% lower than with TC65. In transfer modes the current consumption has been minimized up to 50% depending on the connection type.

The off-state supply current (in POWER DOWN mode) has not changed, but with TC65i it is no longer necessary to switch the module on and off in order to achieve the minimum off-state supply current.

Reference:

- “Hardware Interface Description”: Section “Power Supply Ratings”

2.2.2 Measuring the Supply Voltage

Unlike TC65, the TC65i modules have no extra BATT+ and GND test points. To measure the supply voltage you can use one of the five BATT+ pins of the board-to-board connector and a nearby ground pad as reference.

Reference:

- “Hardware Interface Description”: Section “Measuring Supply Voltage”

2.2.3 Charging

| TC65 | TC65i |
|--|---|
| Output voltage of DC battery chargers is limited to $5.2V \pm 0.2V$. | DC battery chargers with output voltages of up to 7V are now accepted, too. |
| Two charging timers are implemented: software controlled timer set to 4 hours and a hardware controlled timer set to 4.66 hours. | 4-hour software controlled charging timer is the same as with TC65. The hardware controlled timer is not implemented. |

Reference:

- "Hardware Interface Description": Sections "Charger Requirements", "Implemented Charging Technique"
- Application Note 07: Rechargeable Lithium Batteries in GSM Applications

2.2.4 Extended Low Temperature Range

Compared to TC65, the low temperature range has been extended for TC65i to support restricted operation down to -40°C .

Reference:

- "Hardware Interface Description": Section "Operating Temperatures"

2.3 Application Interfaces

2.3.1 Audio Interfaces

Due to a different chip design, the internal gain of the power amplifier behind EPP1/EPN1 in TC65i is 6dB higher than in TC65. This additional gain is compensated internally in the audio modes 1, 4 and 5 intended to be used in conjunction with EPP1/EPN1. If AT^{SAIC} is used to switch between the audio outputs EPP1/EPN1 and EPP2/EPN2 in any audio mode, EPP1/EPN1 will always have a 6dB higher gain compared to EPP2/EPN2. In TC65 there is no such a difference.

Reference:

- “Hardware Interface Description”: Section “Characteristics of Audio Modes”
- “AT Command Set”: Section “AT^{SNFO}”
- “Application Note 02: Audio Interface Design for GSM Applications” [5]

2.3.2 Voiceband Receive Path

At board temperatures above 85°C the power dissipation of audio interface 1 shall be limited to max. 230 mW. That means the differential voltage at EPP1/EPN1 for a sine wave must not exceed 3.8 V_{pp} at 8 Ohm. At 16 Ohm it can be 6 V_{pp} as before.

Reference:

- “Hardware Interface Description”: Sections “Voiceband Receive Path” and “Signal Description”

2.3.3 TTY/CTM Support

| TC65 | TC65i |
|--|--|
| CTM equipment can be connected to one of the three audio interfaces. | CTM equipment can be connected to one of the three audio interfaces. In addition, TC65i supports an internal TTY/CTM-Modem. TTY equipment can therefore be connected directly to one of the three audio interfaces. |

Reference:

- “AT Command Set”: Section “AT^{SNFTTY}”
- “Application Note 22: Using TTY/CTM Equipment”
- See also this document, Section 3.5

2.4 Antenna Interface

TC65i contain different radio frequency parts than TC65, meaning that the matching between module and antenna might be slightly different.

Application manufacturers should check their application for radiated harmonic emissions in TX operation when using TC65i in the same application as TC65 and with the same antenna.

Reference:

- “Hardware Interface Description”: Section “Antenna Interface”

3 Software Related Differences

This chapter provides information on new or improved software features introduced with TC65i.

3.1 Manufacturer Name, USB Vendor ID

| TC65 | TC65i |
|--|--|
| <p>The product identification commands ATI, AT+CGMI and AT+GMI return the company name "Siemens".</p> <p>Example: ATI SIEMENS TC65 REVISION 03.000 OK</p> | <p>The product identification commands ATI, AT+CGMI and AT+GMI return the company name "Cinterion".</p> <p>Example: ATI Cinterion TC65i REVISION 01.000 OK</p> |
| <p>The USB descriptors of the AT^SCFG "Serial/USB/DDD" feature and the supplied USB inf files contain the Siemens Vendor ID, Siemens company name and the product name TC65.</p> <p>Example: AT^SCFG? ... ^SCFG: "Serial/USB/DDD","0","0", "0409","0681","0034","Siemens AG Wireless Modules", "TC65", " ...</p> | <p>The USB descriptors of the AT^SCFG "Serial/USB/DDD" feature and the supplied USB inf files contain the Cinterion Vendor ID, Cinterion company name and the new product name TC65i.</p> <p>Example: AT^SCFG? ... ^SCFG: "Serial/USB/DDD","0","0", "0409","1E2D","004F","Cinterion", "TC65i", " ...</p> |

Due to the changed USB descriptors TC65i comes with a "usbmodem.inf" file of its own. This means that you cannot use the TC65 "usbmodem.inf" file for a TC65i module. Of course, you can use both modules in parallel on the same system if you have both "usbmodem.inf" files installed.

Reference:

- "AT Command Set": Sections "ATI", "AT+CGMI", "AT+GMI"
- "AT Command Set": Section "AT^SCFG 'Serial/USB/DDD'"
- "Application Note 32: Integrating USB into GSM Applications"
- "usbmodem.inf" file supplied with your Cinterion wireless module

3.2 Improved Quadband Selection

With TC65i, Cinterion introduces an improved multiband selection procedure. The major difference over TC65 is that the value range of all AT^SCFG "Radio/Band" parameters has been extended to 15 (quadband), enabling the module to scan, at the same time, all frequency bands it is capable of: GSM 850, 900, 1800, 1900 MHz. This allows the subscriber to easily find a suitable network in any country around the world, no matter which frequency bands and band combinations are present in a particular area.

As AT+COPS=0 (automatic mode) is the module's power-up default and 15 is set as factory default both for <rbp> and <rba> of AT^SCFG "Radio/Band", the subscriber may take advantage of a full-featured automatic network selection each time when trying to register.

| TC65 | TC65i |
|--|--|
| <p>The "Radio/Band" parameter <rba> of AT^SCFG supports the values 1, 2, 4 and 8 for single bands, 3, 5, 10, 12 for dual band combinations, 15 for all bands.</p> <p>The "Radio/Band" parameters <rbc> and <rbp> support the values 1, 2, 4 and 8 for single bands, 3, 5, 10, 12 for dual band combinations.</p> | <p>All "Radio/Band", parameters <rba>, <rbc>, <rbp> of AT^SCFG support the values 1, 2, 4, 8 for single bands, 3, 5, 10, 12 for dual band combinations, 15 for quadband selection.</p> |
| <p>Changing the AT^SCFG "Radio/Band" parameters <rbp> (preferred bands) and <rba> (allowed bands) is sometimes necessary for registering to different band combinations, for example when roaming partners are spread on three or four bands in the same area.</p> | <p>The default settings of the "Radio/Band" parameters <rbp> (preferred bands) and <rba> (allowed bands) can be left unchanged for most typical registering scenarios.</p> <p>Changing <rbp> and/or <rba> will now only be needed for application manufacturers who wish to restrict the allowed bands to a specific band or band combination. This may be useful to eliminate unnecessary bands, in particular to speed up the network search and reduce the power consumption.</p> |

The new band selection implementation deprecates the "Radio/FirstScan" feature of AT^SCFG and the AT^SNWS command known from other Cinterion wireless modules. See also Section 3.11.

Reference:

- "AT Command Set": Section "AT^SCFG 'Radio/Band'"

3.3 Bit Rate of the Local Asynchronous Serial Interface

| TC65 | TC65i |
|--|---|
| Maximum fixed bit rate selectable with AT+IPR: 460.800 bps | Maximum fixed bit rate bit rate selectable with AT+IPR: 921.600 bps |
| Maximum bit rate supported by Autobauding (AT+IPR=0): 230400 bps | Maximum bit rate supported by Autobauding (AT+IPR=0): 460800 bps. |

Reference:

- “AT Command Set”: Section “AT+IPR”
- “Hardware Interface Description”: Sections “Serial Interface ASC0” and “Serial Interface ASC1”

3.4 Temperature Control

The AT^SCTM command has been enhanced as follows:

- The additional parameters <p> of the AT^SCTM write command and <temp> of the AT^SCTM? read command enable the TC65i module to display the exact board temperature in degrees Celsius.
- The guard period for deferred shutdown has been extended from 15 seconds to 2 minutes after power-up.

| TC65 | TC65i |
|---|---|
| Write command: AT^SCTM=<n> | Write command: AT^SCTM=<n>[, <p>] |
| Read command: AT^SCTM? ^SCTM: <n> , <m> OK | Read command: AT^SCTM? ^SCTM: <n> , <m>[, <temp>] OK |

Reference:

- “AT Command Set”: Section “AT^SCTM”
- “Hardware Interface Description”: Sections “Thermal Shutdown”, “Operating Temperatures”

3.5 AT^SNFTTY

TC65i incorporates an internal CTM modem. The AT^SNFTTY parameter <audioState> has been enhanced. The new value "2" enables the internal CTM modem.

| TC65 | TC65i |
|--|--|
| Supported values of <audiostate>: AT^SNFTTY=? ^SNFTTY: (0-1) OK | Supported values of <audiostate>: AT^SNFTTY=? ^SNFTTY: (0-2) OK |

Reference:

- "AT Command Set": Section "AT^SNFTTY"
- "Application Note 22: Using TTY/CTM Equipment"
- See also this document, Section 2.3.3

3.6 AT^SSTA Remote SAT Interface Activation

With TC65i, the Remote SAT interface activation via AT^SSTA is able to switch between a default automatic response mode (AR Mode) and an explicit response mode (ER Mode).

- In AR mode (<mode>=0) all commands and responses are exchanged automatically between the module and the SIM application (default). This eliminates the need to enter any Remote SAT AT commands incl. the AT^SSTA command.
If AR mode is enabled the module enters the OFF state (<state>=1) after reboot.
- ER mode (<mode>=1) is intended for use with an MMI. If ER mode is enabled the MMI is required to handle, via the module's Remote-SAT interface, all commands and responses transmitted to or from the SIM.
If ER mode is enabled the module enters the IDLE state (<state>= 2) after reboot.

Reference:

- "Remote SAT User's Guide"

3.7 AT^SSTR Remote SAT Response Commands

With TC65i, all AT^SSTR Remote SAT Response commands include a new parameter referred to as <statAddInfo> and intended for additional status information according to 3GPP TS 51.014.

Reference:

- "Remote SAT User's Guide"

3.8 AT^SOPS

| TC65 | TC65i |
|---|---|
| The AT^SOPS command is usable in Airplane mode. | For consistency with AT+COPS the AT^SOPS command is no longer supported in Airplane mode. |

Reference:

- “AT Command Set”: Section “AT^SOPS”

3.9 AT^SMONC

| TC65 | TC65i |
|--|--|
| The response to the AT^SMONC execute command contains a leading space character. | The leading space character of the AT^SMONC execute command response has been removed. |

Reference:

- “AT Command Set”: Section “AT^SMONC”

3.10 AT^SCNI

| TC65 | TC65i |
|---|---|
| The response to the AT^SCNI execute command contains no empty line between the call number information list and the OK result code. | The response to the AT^SCNI execute command now contains an empty line between the call number information list and the OK result code. |

Reference:

- “AT Command Set”: Section “AT^SCNI”

3.11 Removed AT Commands

Some AT commands known from earlier releases have been removed:

| TC65 | TC65i |
|---|---|
| Supports AT^SPLR and AT^SPLW to read and write the preferred operator list. Limitation: Both commands are not applicable to all SIM types, e.g. new SIMs of the German provider O2. | AT^SPLR and AT^SPLW are no longer supported. Please use the AT+CPOL command instead. |
| Supports AT^SNWS to manually select a specific provider from all GSM bands across the world. Supports AT^SCFG="Radio/FirstScan to initiate a one-time network search across all band combinations when the module is forced to select a network the first time after reboot. | Due to improved quadband selection management both commands are deprecated and no longer supported. |

4 Java Features

4.1 Incremental Update

| TC65 | TC65i |
|--|---|
| OTAP is intended to transfer the entire Java userware. | <p>OTAP gives you the flexibility to transfer either the entire Java userware or only those classes that have been changed.</p> <p>The benefit is that Java OTAP can be performed more efficiently by saving bandwidth for the transfer and thus reducing maintenance costs.</p> <p>Precondition is that the userware is programmed in a modular way using one Midlet jar file and single Liblet files.</p> |

Reference:

- "Application Note 46: Incremental Java Update"
- "Java User's Guide"
- "Java doc \wtk\doc\html\index.html"

4.2 New Interface APIs

| TC65 | TC65i |
|--|---|
| The module's interfaces I ² C, SPI, DAC and ADC can only be handled by the ATCommand Class. | TC65i provides dedicated Java APIs for direct access to module's interfaces I ² C, SPI, DAC and ADC. |

Reference:

- "Java User's Guide"
- "Java doc \wtk\doc\html\index.html"