



Technical Information

CP4-SCAT • **CompactPCI**[®] • Wireless Technologies Carrier Board

GSM-R Railway Radio Module
PCI Express[®] Mini Card Socket

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Contents

About this Manual	4
Edition History	4
Related Documents	5
Nomenclature	5
Trade Marks	5
Legal Disclaimer - Liability Exclusion	5
Standards	6
CP4-SCAT Features	7
Short Description	9
Block Diagram	10
Assembly Drawing	11
Front Panel	12
Theory of Operation	13
Front Panel Connectors	14
Front Panel Switch	14
On-Board Connectors	15
On-Board Switch	15
CompactPCI® Backplane Connector	16
Installing and Replacing Components	17
Before You Begin	17
Warnings	17
Caution	17
Installing the Board	18
Removing the Board	19
EMC Recommendations	20
Technical Reference - Connectors	21
Caution	21
Please Note	21
Front Panel Connectors	22
Antenna Connectors	22
USB Connectors	22
On-Board Connectors	23
PCI Express® Mini Card Related Connectors	24
MC	24
SIM1	26
UFL1-3	26
GSM-R Radio Related Connectors	27
About the TRM-3a	27
J-GSM	28
P-G1	30
P-G2	30
P-G3	30
RJG	31
SIM2	32
UFL4	32
UART Related Connectors	33
About the OXPCIe952 UART	33

P-SP1 P-SP2	34
CompactPCI Connector J1	35
DC/DC 3.3V Regulator Option	37
Ruggedized Versions	38
Schematics	38

About this Manual

This manual is a short form description of the technical aspects of the CP4-SCAT, required for installation and system integration. It is intended for the advanced user only.

Edition History

EKF Document	Ed.	Contents/Changes	Author	Date
Text # 6165 cp4_ti.wpd	1	Technical Information CP4-SCAT English, Preliminary Edition	jj	29 October 2010
	2	Added photos	jj	3 May 2011
	3	Added detail photos	jj	10 May 2011
	4	Added photo of half-width 19-Inch system	jj	14 June 2011

Related Documents

The CP4-SCAT acts as a carrier card for third party hardware. Regarding the PCI Express Mini Card optionally in use, please refer to the particular manufacturers website. With respect to the optional GSM-R radio module please visit www.triorail.com (TRM-3a) and in addition www.cinterion.com (mc55i).

Nomenclature

Signal names used herein with an attached '#' designate active low lines.

Trade Marks

Some terms used herein are property of their respective owners, e.g.

- ▶ PCI Express®: ® PCI-SIG
- ▶ Intel, Core 2 Duo, i7: ® Intel
- ▶ **CompactPCI®**: ® PICMG
- ▶ Windows XP, Windows 7: ® Microsoft
- ▶ EKF, ekf system: ® EKF

EKF does not claim this list to be complete.

Legal Disclaimer - Liability Exclusion

This manual has been edited as carefully as possible. We apologize for any potential mistake. Information provided herein is designated exclusively for the proficient user (system integrator, application engineer). EKF can accept no responsibility for any damage caused by the use of this manual.

Standards

Specifications/Standards	
PCIe Mini Card	PCI Express®Mini Card Electromechanical Specification Revision 1.2 October 26, 2006 PCI SIG (www.pcisig.com)
GSM-R EIRENE ASCI	Global System for Mobile Communications - Rail(way) European Integrated Railway Radio Enhanced Network Advanced Speech Call Items International Union of Railways (www.uic.org)
CompactPCI®	PICMG 2.0 (www.picmg.org)
PCI Local Bus	PCI 2.2/2.3/3.0 Standards (PC-SIG www.pcisig.com)
USB	Universal Serial Bus Revision 2.0 specification (www.usb.org/developers)
PCI Express®	PCIe Base Specification (PCI-SIG www.pcisig.com)

CP4-SCAT Features

Feature Summary	
Form Factor	<ul style="list-style-type: none"> ▶ Single size Eurocard (160x100mm²) ▶ Front panel width 4HP (20.3mm)
CompactPCI®	<ul style="list-style-type: none"> ▶ 32-bit ▶ 33MHz ▶ Suitable for CPCI backplanes with +5V or +3.3V VIO (J1 w/o key)
PCI Express® Mini Card	<ul style="list-style-type: none"> ▶ 1 x PCI Express® Mini Card socket ▶ Suitable for WLAN, LTE, WiMax, GSM, GPS and other PCIe Mini Cards ▶ Suitable for USB and PCI Express® controlled Mini Cards ▶ UIM port wired to on-board SIM card holder
GSM-R Radio Module (Optional)	<ul style="list-style-type: none"> ▶ Approved quad-band GSM-R radio module Triorail TRM-3a, based on Cinterion MC55i (formerly Siemens) ▶ 850/900/1800/1900 MHz, GPRS multi-slot class 10, TCP/IP, UDP, HTTP, FTP, SMTP, POP3, Hayes AT commands ▶ EIRENE features: FN supported (Functional Number), PFN supported (Presentation Functional Number), REC (Railway Emergency Call) ▶ ASCI features: VGCS (Voice Group Call Service), VBS (Voice Broadcast Service), UUS1 (User-to-User Signalling type 1), eMLPP (Enhanced Multi-Level Precedence and Preemption) ▶ UIM port wired to on-board SIM card holder
Antenna Connectors	<ul style="list-style-type: none"> ▶ 3 x SMA/RP front panel connectors assigned to the Mini Card module, wired to on-board U.FL receptacles, suitable for double ended U.FL plug cable assemblies from Mini Card to CP4-SCAT carrier board ▶ 1 x SMA/RP front panel connector assigned to the GSM-R radio module
USB Connectors	<ul style="list-style-type: none"> ▶ 3 x USB 2.0 front panel connectors for external devices
Main Components	<ul style="list-style-type: none"> ▶ PCI to PCI Express® bridge (CompactPCI® backplane) ▶ PCI Express® packet switch, three ports ▶ PCI Express® USB 2.0 host controller, quad-port ▶ PCI Express® UART, dual-channel (TTL level, tied to the GSM-R module AT command input) ▶ Option on-board DC/DC regulator 5V to 3.3V 10A (can feed +3.3V to the CompactPCI® backplane in systems with a single +5V power supply)
Thermal Conditions	<ul style="list-style-type: none"> ▶ Operating temperature: 0°C ... +70°C ▶ Storage temperature: -40°C ... +85°C, max. gradient 5°C/min ▶ Humidity 5% ... 95% RH non condensing
Environmental Conditions	<ul style="list-style-type: none"> ▶ Altitude -300m ... +3000m ▶ Shock 15g 0.33ms, 6g 6ms ▶ Vibration 1g 5-2000Hz ▶ Coating/sealing available on customers request
EC Regulations	<ul style="list-style-type: none"> ▶ EN55022, EN55024, EN60950-1 (UL60950-1/IEC60950-1) ▶ 2002/95/EC (RoHS)
MTBF	tbd
Power Requirements	tbd



Short Description

The CP4-SCAT is a 3U/4HP CompactPCI® peripheral board, intended for industrial and railway wireless communication.

The CP4-SCAT is provided with a PCI Express® Mini Card socket. Based on both, the PCI Express® and USB standards, PCI Express® Mini Cards became very popular for wireless industrial applications, such as WiFi (WLAN), LTE, WiMAX, GSM, GPS.

The CP4-SCAT is equipped in addition with a socket for the MC55i TRM-3a GSM-R (Railway Radio) module. GSM-R features include EIRENE and ASCI.

Up to 3 antenna connectors (SMA/RP style) in the CP4-SCAT front panel allow for MIMO (RF multiple-input multiple-output) Mini Card employment. Typically, wireless Mini Cards provide U.FL style antenna receptacles. A double ended U.FL plug coaxial cable assembly will be required for each Mini Card receptacle as interconnection to its associated front panel SMA connector. Another SMA connector is provided for the optional GSM-R module.

Furthermore, the CP4-SCAT front panel is populated with three USB 2.0 connectors for attachment of external devices.



Sample GSM/GPS
PCIe Mini Card



Sample LTE
PCIe Mini Card

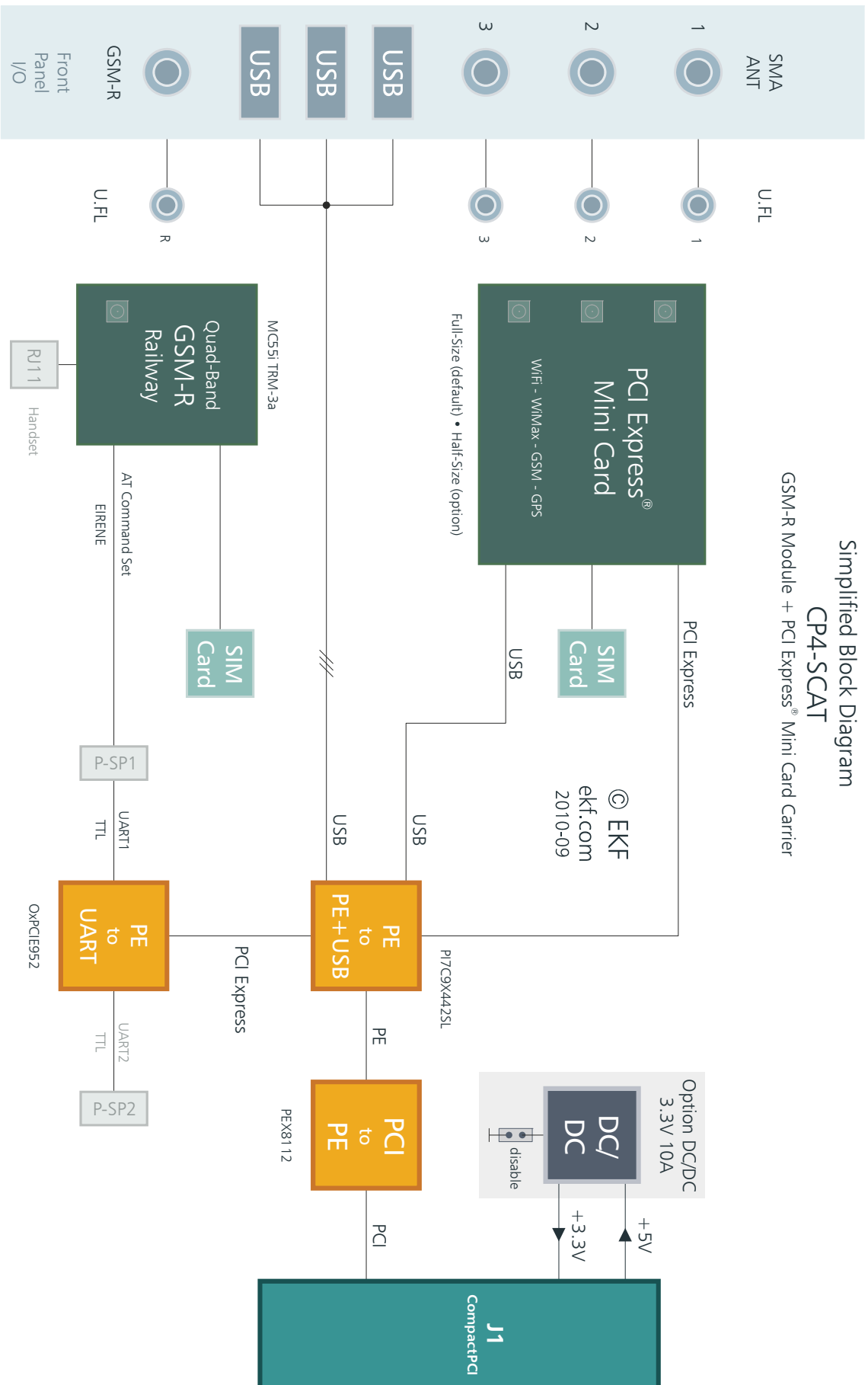


Sample WLAN (WiFi)
PCIe Mini Card

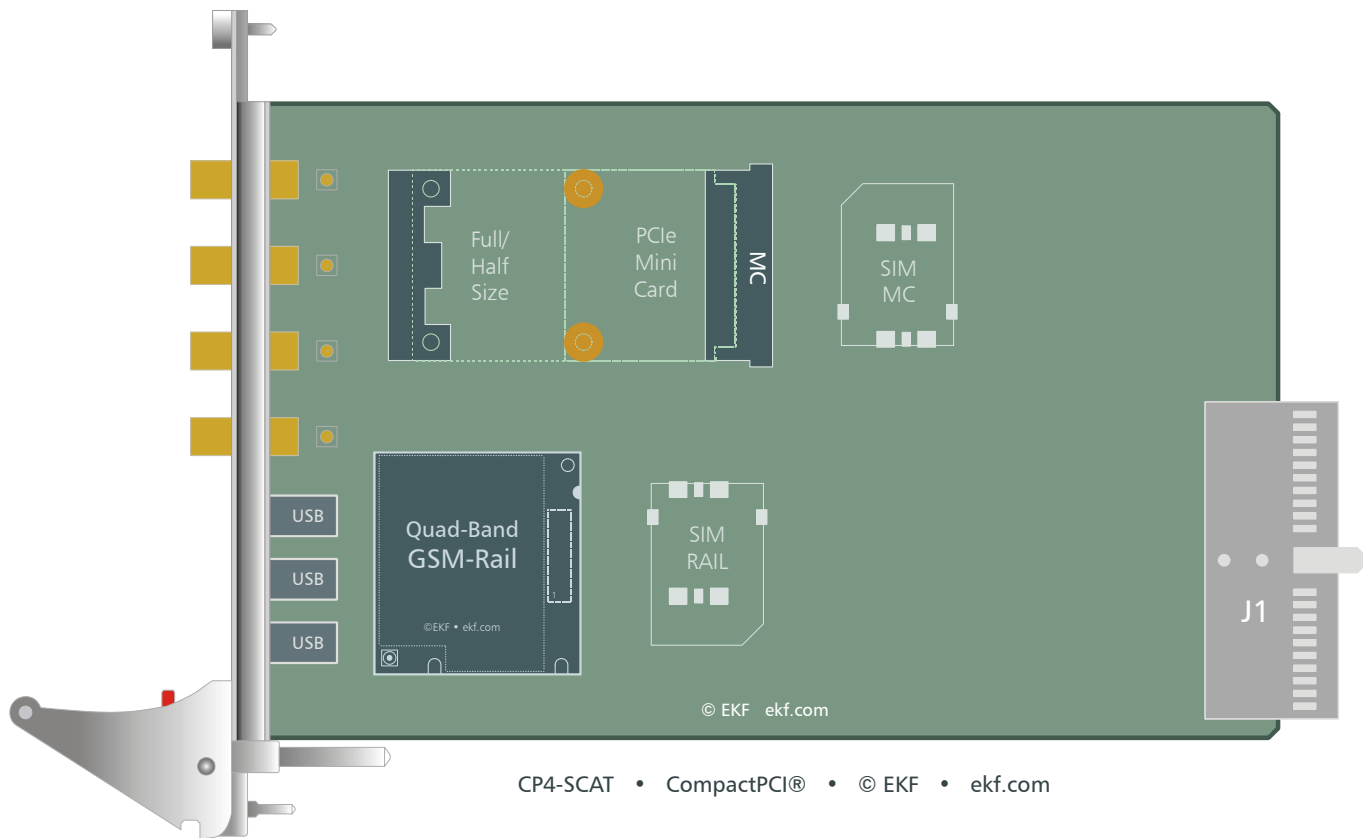


MC55i/TRM-3a
GSM-R Module

Block Diagram



Assembly Drawing



Front Panel



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CP4-SCAT

Theory of Operation

The main building blocks of the CP4-SCAT are the PCI Express Mini Card socket (based on USB and PCI Express I/O), and the GSM-R modem (relies on a UART port).

A PCI to PCI Express® bridge on the CP4-SCAT converts the parallel PCI signals of the CompactPCI® backplane to serial PCI Express® data. Since the bridge provides only a single PCI Express® lane, it is fed to the upstream port of a multi-port PCIe switch for replication.

The so called SWIDGE, a combined PCI Express® packet switch and PCIe to USB bridge, has two PCIe downstream ports. One lane is used for the PCI Express Mini Card socket, the other for the PCIe based UART (Universal Asynchronous Receiver/Transceiver), which is the gateway to the MC55i/TRM-3a GSM-R module.

The SWIDGE component contains not only a PCIe switch, but also a PCIe to USB bridge. One of the channels of the quad-port USB 2.0 controller is wired to the PCIe Mini Card socket, and the remaining to the USB front panel receptacles.

PCI Express® Mini Cards are controlled either via their USB interface, or by a single lane PCIe link. Both data paths are derived from the SWIDGE component as described above, and allow for application of either type Mini Card.

The optional GSM-R modem module is controlled by AT commands via its serial interface. This is the reason why the CP4-SCAT is also equipped with a PCI Express® based UART. If no GSM-R radio is required, the UART can be either omitted, or optionally used in combination with the EKF CU7 or CU8 PHY modules for RS-485 or RS-232 I/O.

The CP4-SCAT has been designed for +5V only operation. As an option, an on-board switching regulator from +5V to +3.3V is available, which can be used to feed back +3.3V/10A to the CompactPCI® backplane in systems with a single +5V power supply.

Front Panel Connectors

ANT (3)	SMA/RP (reverse polarity) antenna connectors, each routed to an on-board U.FL receptacle. Each of ANT 1-3 replicates the respective antenna I/O connector of a wireless PCI Express Mini Card. Popular MIMO based Mini Cards such as the Intel 4965AGN Wireless WiFi Link are provided with 3 antenna receptacles. Small external swivel/angle type SMA/RP plug antennas can be attached directly to the front panel (if there are no conflicts with connectors from neighboured CPCI cards), whereas systems in a closed cabinet would require remote external antennas, connected to ANT 1-3 by means of suitable coaxial cables.
ANT GSM	SMA/RP (reverse polarity) antenna connector assigned to the GSM-R module
USB (3)	USB 2.0 receptacles for general usage

Front Panel Switch

SWG	Front panel tactile switch, turns GSM-R modem manually on (automatically on after power up)
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On-Board Connectors

PCI Express® Mini Card	
MC	PCI Express Mini Card socket, USB and PCI Express interface, latch provided for attachment of a full size Mini Card, fixing screws required for a half size Mini Card, corresponding SIM card socket SIM1
SIM1	SIM card holder, hinge style, 6 contacts, GSM 11.11 Europe, corresponds with Mini Card Socket MC
UFL1-3	U.FL style coaxial RF receptacles, each wired to its associated ANT1-3 SMA/RP front panel connector, usage together with a U.FL/MHF style plug cable harness (available from e.g. Hirose, I-Pex, Wieson), which has to be strapped from the particular Mini Card antenna receptacle to the on-board receptacle.

Railway Radio GSM-R	
J-GSM	Socket for MC55i / TRM-3a GSM-R radio module, 2 x 25 lead receptacle Hirose DF12
P-G1	Optional 1 x 2 jumper / pin header 2.54mm pitch, when set momentarily, the GSM-R modem is deactivated, not populated by default (debug only)
P-G2	Optional 1 x 6 pin header 2.54mm pitch, can be used to attach audio circuitry or a headset (microphone 1, earphone 1) to the GSM-R radio module, not populated by default
P-G3	Optional 1 x 6 pin header 2.54mm pitch, can be used to establish a secondary serial port (AT command interface) to the GSM-R radio module, not populated by default
RJG	Optional RJ11 jack, can be used to attach a primary headset (microphone 2, earphone 2) to the GSM-R radio module, suitable e.g. for the Votronic handset HH-SI-30.3 (EKF part #819.30.00550.50), not populated by default
SIM2	SIM card holder, hinge style, 6 contacts, GSM 11.11 Europe, corresponds with GSM-R radio module
UFL4	U.FL style coaxial RF receptacle, wired to the ANT4 (GSM-R) front panel connector, for MC55i GSM modem application

UART Asynchronous Serial I/O	
P-SP1	Optional pin header 2x5 2.0mm pitch, UART TTL level signals (channel 0), suitable for attachment of a CU-series PHY module by micro ribbon flat cable, special 8HP front panel with additional 2 x DSUB9 connectors available on request. Please note: This communication channel is not available for external I/O, if the GSM-R radio module is populated - required for GSM modem AT commands and data transfer.
P-SP2	Optional pin header 2x5 2.0mm pitch, UART TTL level signals (channel 1), suitable for attachment of a CU-series PHY module by micro ribbon flat cable, special 8HP front panel with additional 2 x DSUB9 connectors available on request

3.3V Power to the Backplane	
J-Q	Optional 1 x 2 jumper / pin header 2.54mm pitch, when installed the DC/DC regulator 3.3V/10A is disabled

On-Board Switch

DSW	Optional dip switch to simulate the geographic address (unique address of 0-7 corresponding with a particular card slot, to be used only once in a system), required to select optional I2C (SMBus) circuitry
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CompactPCI® Backplane Connector

J1	2.00mm unkeyed hard metric female connector, according to CompactPCI® 2.0 standards
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Installing and Replacing Components

Before You Begin

Warnings

The procedures in this chapter assume familiarity with the general terminology associated with industrial electronics and with safety practices and regulatory compliance required for using and modifying electronic equipment. Disconnect any telecommunication links, networks or procedures described in this chapter. Failure links before you open the system or perform or equipment damage. Some parts of the the power switch is in its off state.



the system from its power source and from modems before performing any of the to disconnect power, or telecommunication any procedures can result in personal injury system can continue to operate even though

Caution

Electrostatic discharge (ESD) can damage components. Perform the procedures described in this chapter only at an ESD workstation. If such a some ESD protection by wearing an metal part of the system chassis or board original ESD protected packaging. Retain the antistatic box) in case of returning the board to EKF for repair.



station is not available, you can provide antistatic wrist strap and attaching it to a front panel. Store the board only in its original packaging (antistatic bag and

Installing the Board

Warning

This procedure should be done only by qualified technical personnel. Disconnect the system from its power source before doing the procedures described here. Failure to disconnect power, or telecommunication links before you open the system or perform any procedures can result in personal injury or equipment damage.

Typically you will perform the following steps:

- Switch off the system, remove the AC power cord
- Attach your antistatic wrist strap to a metallic part of the system
- Remove the board packaging, be sure to touch the board only at the front panel
- Identify the related CompactPCI slot (peripheral slot for I/O boards, system slot for CPU boards, with the system slot typically most right or most left to the backplane)
- Insert card carefully (be sure not to damage components mounted on the bottom side of the board by scratching neighbored front panels)
- A card with onboard connectors requires attachment of associated cabling now
- Lock the ejector lever, fix screws at the front panel (top/bottom)
- Retain original packaging in case of return



Removing the Board

Warning

This procedure should be done only by qualified technical personnel. Disconnect the system from its power source before doing the procedures described here. Failure to disconnect power, or telecommunication links before you open the system or perform any procedures can result in personal injury or equipment damage.

Typically you will perform the following steps:

- Switch off the system, remove the AC power cord
- Attach your antistatic wrist strap to a metallic part of the system
- Identify the board, be sure to touch the board only at the front panel
- unfasten both front panel screws (top/bottom), unlock the ejector lever
- Remove any onboard cabling assembly
- Activate the ejector lever
- Remove the card carefully (be sure not to damage components mounted on the bottom side of the board by scratching neighbored front panels)
- Store board in the original packaging, do not touch any components, hold the board at the front panel only



Warning

Do not expose the card to fire. Battery cells and other components could explode and cause personal injury.



EMC Recommendations



In order to comply with the CE regulations for EMC, it is mandatory to observe the following rules:

- The chassis or rack including other boards in use must comply entirely with CE
- Close all board slots not in use with a blind front panel
- Front panels must be fastened by built-in screws
- Cover any unused front panel mounted connector with a shielding cap
- External communications cable assemblies must be shielded (shield connected only at one end of the cable)
- Use ferrite beads for cabling wherever appropriate
- Some connectors may require additional isolating parts

Technical Reference - Connectors

Caution

Some of the connectors may provide operating voltage (e.g. +12V, +5V and +3.3V) to devices inside the system chassis, such as internal peripherals. These connectors may not be protected against a short circuit situation. Do not use these connectors for powering devices external to the computer chassis. A fault in the load presented by the external devices could cause damage to the board, the interconnecting cable and the external devices themselves.

Please Note

The CP4-SCAT mezzanine module may be equipped with several on-board connectors for system internal usage. Not all of these connectors may be present on a particular board. Be sure to specify your individual needs when ordering the CP4-SCAT board. Characteristic features and the pin assignments of each connector are described on the following pages.

Front Panel Connectors

Antenna Connectors

Wireless PCI Express® Mini Cards (WLAN, WiMAX, GSM) require an *external* antenna, due to the metal (shielding) CompactPCI® encasement. Popular WLAN antennas are available with a reverse polarity (RP) SMA plug (FCC part 15 compliant). The CP4-SCAT therefore is equipped with the mating SMA RP 50 Ohm front panel jacks (PCB mount style, isolated from F/P). Hence an external angled/swivel antenna may be attached directly to the front panel SMA connectors. Suitable antennas are available e.g. from Linx (www.linxtechnologies.com), or Pulse (www.pulseeng.com), for a variety of applications.


Typically, wireless PCI Express Mini Cards are provided with one or more Hirose U.FL-R-SMT radio frequency connectors as antenna I/O. Therefore one or more double-ended U.FL-2LP cable harnesses (plug) are needed in addition, strapped from each particular Mini Card RF input/output, to the corresponding U.FL receptacle near each CP4-SCAT antenna connector position. Suitable cable assemblies are available from Hirose (www.hirose.com) and several other manufacturers, and can also be supplied by EKF as an accessory.

For optimum results, Mini Cards such as the Intel 4965AGN WiFi Link operated in 2 x 3 MIMO mode would require three antennas. Consequently, the CP4-SCAT front panel offers 3 SMA antenna connectors, dedicated to the Mini Card.

Another SMA antenna connector is provided for use together with the GSM-R radio module.

USB Connectors

The CP4-SCAT contains a PCI Express® to USB 2.0 bridge (provided by the SWIDGE component). One USB channel is assigned to the Mini Card socket, the other three ports are available for front panel I/O.

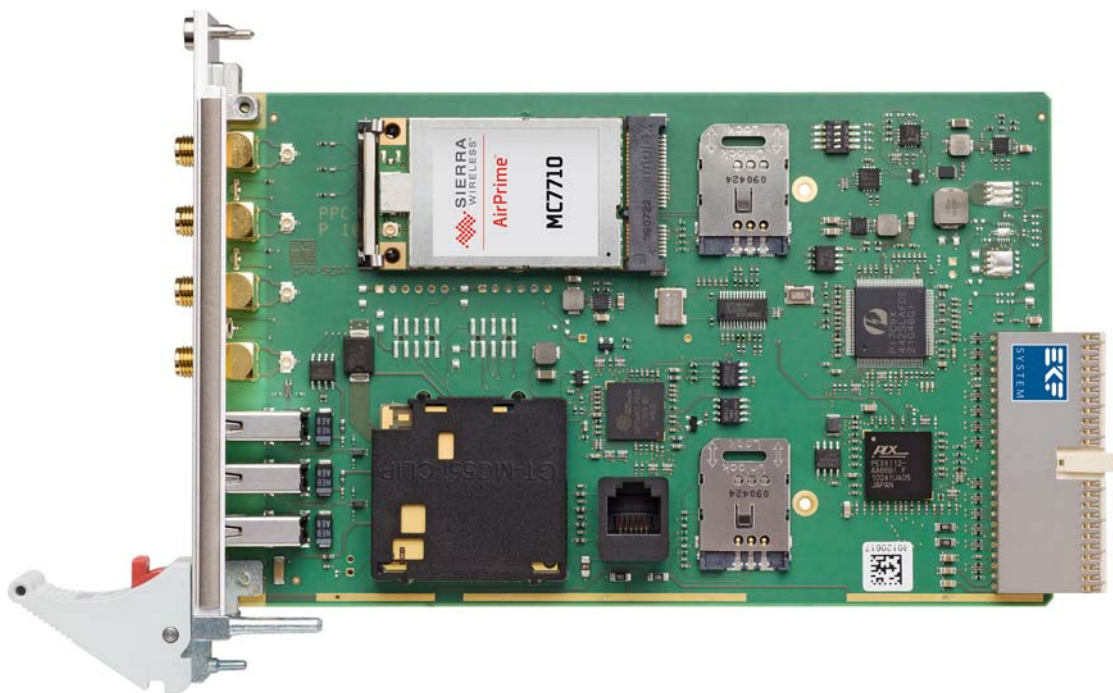
USB 1-3 EKF Part #270.20.04.2		
 <p>#270.20.04.2 ©EKF • ekf.com</p>	1	+5V/0.5A
	2	USB DATA (N)
	3	USB DATA (P)
	4	GND

The +5V USB power outputs are protected against overcurrent situations by fast electronic switches (LM3526 series). Any power rail may be switched off by software independently for each port.

On-Board Connectors

The CP4-SCAT can be equipped with several on-board connectors. Some of these connectors are available as an option only or exclusive to each other, and therefore may not be functional or even present on your actual board.

Assembly of these connectors is partially custom specific. Discuss your needs with EKF before ordering, so that the optimum board configuration for your application will be chosen.



PCI Express® Mini Card Related Connectors

A main functional component of the CP4-SCAT is the PCI Express® Mini Card socket. PCI Express® Mini Cards are controlled either via their USB interface, or by a single lane PCIe link. Both data paths are provided, thus allowing for application of either type Mini Card. GSM modems often rely on the USB port, while WLAN cards are typically available with a PCI Express® interface.

MC

The CP4-SCAT is provided with a socket for PCI Express® Mini Cards (e.g. such as wireless cards or Turbo Memory). For GSM telephone modules, an on-board SIM card holder is associated with the connector MC in addition. Full size Mini Cards are fixed by a latching (snap-in) element at the module end. A half size Mini Card must be fastened manually by screws M2.5x6mm through corresponding M2.5 soldered nuts provided on the CP4-SCAT PCB. 1.5mm height nylon washers are required in addition as spacing elements between the PCB nuts and the half size Mini Card.

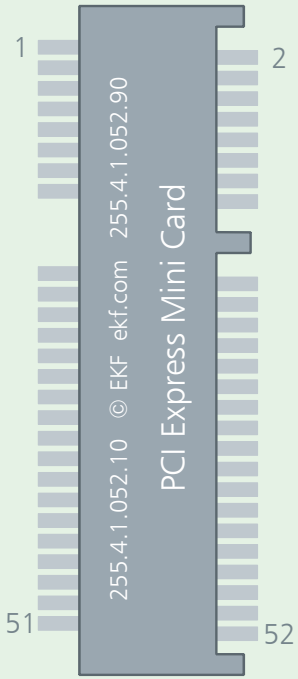
Part Numbers for Fixing a Half Size Mini Card		
2	440.45.025.015	M2.5 PCB soldered nut/insert, max. mounting height 1.63mm (populated on CP4-SCAT by default)
2	440.26.025.015	Self retaining nylon washer 1.5mm height (spacer)
2	440.28.025.000	Locking washer
2	440.08.025.006	Screw M2.5 x 6mm



Half Size Mini Card

Some on-board LEDs are provided as status indicator for wireless Mini Cards:

LEDM1	LED_WWAN_MC
LEDM2	LED_WLAN_MC
LEDM3	LED_WPAN_MC

MC				
PCI Express Mini Card Socket (255.4.1.052.10) & Latch (255.4.1.052.90)				
	PCIE_WAKE#	1	2	+3.3V
	NC <i>BT_DATA</i>	3	4	GND
	NC <i>BT_CHCLK</i>	5	6	+1.5V
	CLKREQ#	7	8	MC_UIM_C1
	GND	9	10	MC_UIM_C7
	PCIE_CLK-	11	12	MC_UIM_C3
	PCIE_CLK+	13	14	MC_UIM_C2
	GND	15	16	MC_UIM_C6
	NC	17	18	GND
	NC	19	20	WDIS# 1)
	GND	21	22	RST#
	PCIE_RN	23	24	+3.3V
	PCIE_RP	25	26	GND
	GND	27	28	+1.5V
	GND	29	30	SMB_CLK 2)
	PCIE_TN	31	32	SMB_DAT 2)
	PCIE_TP	33	34	GND
	GND	35	36	USB_D-
	NC	37	38	USB_D+
	NC	39	40	GND
NC	41	42	LED_WWAN#	
NC	43	44	LED_WLAN#	
NC <i>Intel WiFi Link CLK</i>	45	46	LED_WPAN#	
NC <i>Intel WiFi Link DAT</i>	47	48	+1.5V	
NC <i>Intel WiFi Link RST#</i>	49	50	GND	
NC	51	52	+3.3V	

- 1) WDIS# is permanently set to high
- 2) SMBus is an option only, not available on the CP4-SCAT by default

SIM1

The SIM card holder SIM1 on the CP4-SCAT is wired to the MC Mini Card connector, for applications which require subscriber identification.

SIM1 SIM card socket hinge (top load) EKF Part #219.51.006.20	
c1	UIM Power
c2	UIM Reset
c3	UIM Clk
c4	nc
c5	GND
c6	UIM Vpp
c7	UIM Data
c8	nc

The SIM card holder is a 6-lead hinge style socket, providing a shielding cover with mechanical lock/unlock function.

UFL1-3

By specification*, the PCIe Mini Card socket does not provide pins for the RF input/output of a wireless module, thus at least one double-ended U.FL-2LP cable assembly is required in addition, running from any Mini Cards U.FL style antenna input/output connector, to the corresponding U.FL receptacle on the CP4-SCAT printed circuit board, which is in turn assigned to a front panel SMA/RP antenna connector (for details refer to chapter Front Panel Connectors / Antenna). Up to three antenna connectors are available for the Mini Card slot. This reflects a typical WiFi (WLAN) module MIMO configuration.

* PCI-SIG PCI Express Mini Card Electromechanical Specification, Rev.1.1

GSM-R Radio Related Connectors

About the TRM-3a

A main functional component of the CP4-SCAT is the GSM-R (Railway) modem. The MC55i based TRM-3a module appears to be the most popular GSM-R solution (as of current, no GSM-R modem were found to be available on a Mini Card).

For fully understanding the cellular engine, the system integrator and software developer should refer to the following documents, available either from Triorail or Cinterion:

GSM-R Application Specific Documents	
Hardware Interface Description	Cinterion MC55i Siemens Cellular Engine Version: 01.003 DocId: MC55i_HD_v01.003
Amendment Air Interface	Triorail MC55i Hardware Interface Description Amendment for Triorail TRM-3 5.8 Air Interface
AT Command Set	Cinterion MC55i Siemens Cellular Engine Version: 01.003a DocId: MC55i_ATC_V01.003a
Additional AT Commands for EIRENE	Triorail Reference Manual Additional AT commands for EIRENE V 0.02 Draft 2008-05-26 TR.AT-EIRENE.001
Additional AT Commands for ASCI	Triorail Reference Manual Additional AT commands for ASCI V 1.02 Version for work 2008-05-26 TR.AT_ASCI.001

The TRM-3a is a quad-band cellular engine for railway applications with ASCI and EIRENE support, to be ordered directly from Triorail (www.triorail.com), or from EKF (part #819.30.000550.10).

The GSM-R module is supplied with ~ +4.7V derived from the CP4-SCAT +5V rail; no battery support is available. The TRM-3a starts operation automatically when power is applied to the board. In addition, the module can be fired up manually by a tactile switch in the front panel, e.g. after the module has been shut down by the AT^SMSO command.

A serial port (asynchronous interface) in the MC55i is used for executing GSM-R modem commands and data transfer. For this reason the CP4-SCAT is provided with a PCI Express® to UART bridge (aka COM port), which is tied to the cellular engine serial port.

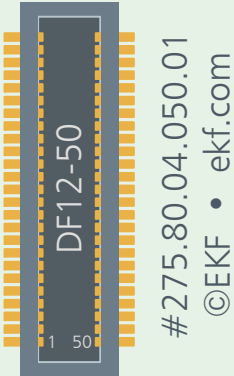
For voice applications, a handset is available as accessory.

Two front panel LEDs are provided as status indicator for the MC55i:

LEDG1	MC55i Switched On
LEDG2	Modem Active

J-GSM

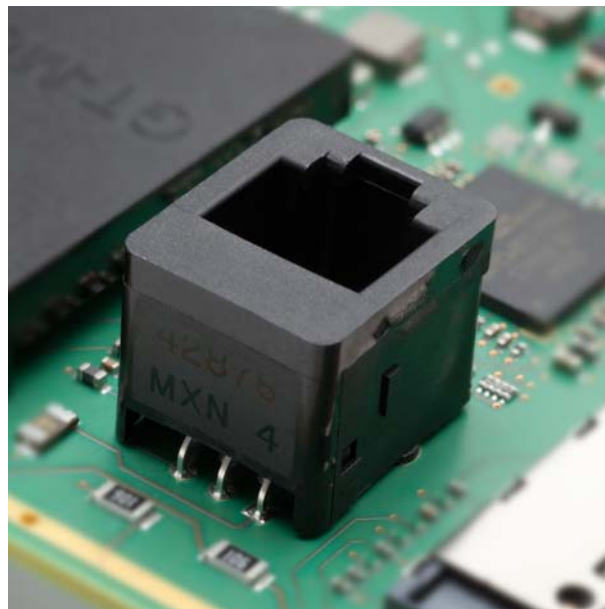
Since the MC55i based TRM-3a module appears to be the most popular GSM-R solution, the CP4-SCAT provides a matching socket.

J-GSM MC55i Module Socket (HRS DF12-50) • EKF Part #275.80.04.050.01				
	GND	25	26	BATT+
	GND	24	27	BATT+
	GND	23	28	BATT+
	GND	22	29	BATT+
	GND	21	30	BATT+
	NC CHARGE	20	31	VDD
	NC POWER	19	32	RI0
	VDDL1	18	33	DSR0
	TXD0	17	34	RTS0
	TXD1	16	35	DTR0
	RXD0	15	36	RTS1
	RXD1	14	37	CTS0
	SYNC	13	38	CTS1
	NC BATT_TEMP	12	39	DCD0
	NC RFSDAI	11	40	EMERGOFF
	NC TXDDAI	10	41	IGT
	NC SCLK	9	42	NC AGND
	NC TFSDAI	8	43	MICN1
	NC RXDDAI	7	44	MICP1
	SIMGND	6	45	MICP2
SIMIN	5	46	MICN2	
SIMRST	4	47	EPN1	
SIMIO	3	48	EPP1	
SIMVCC	2	49	EPP2	
SIMCLK	1	50	EPN2	

The MC55i / TRM-3a module can be fixed on the CP4-SCAT PCB by means of a special mounting clip (EKF part #819.30.000550.90).




TRM-3a Module Covered by Mounting Clip



Handset Connector (Option)


P-G1

As an option (e.g. for debug), the CP4-SCAT may be equipped with a 2 x 1 pin header (jumper), which is connected to the emergency off input of the MC55i. Setting this jumper momentarily, the GSM-R module will be switched off.

P-G1 • Manual Emergency Off		
EKF Part #240.01.02 • 2.54mm Pitch Pin Header		
 #240.1.02 ©EKF • ekf.com	1	EMERGOFF
	2	GND


P-G2

As an option, the CP4-SCAT may be equipped with a 6 x 1 pin header, which is connected to the microphone 1 input and earphone 1 output of the MC55i. By default, this headset port is not in use.

P-G2 • Headset 1		
EKF Part #240.01.06 • 2.54mm Pitch Pin Header		
 #240.1.06 • ©EKF • ekf.com	1	+5V
	2	MICN1
	3	EPN1
	4	EPP1
	5	MICP1
	6	GND

P-G3

As an option, the CP4-SCAT may be equipped with a 6 x 1 pin header, which is connected to the secondary serial interface of the MC55i. By default, this asynchronous port is not in use.

P-G3 • Secondary Serial Port		
EKF Part #240.01.06 • 2.54mm Pitch Pin Header		
 #240.1.06 • ©EKF • ekf.com	1	+3.3V
	2	TXD1
	3	RXD1
	4	RTS1#
	5	CTS1#
	6	GND

RJG

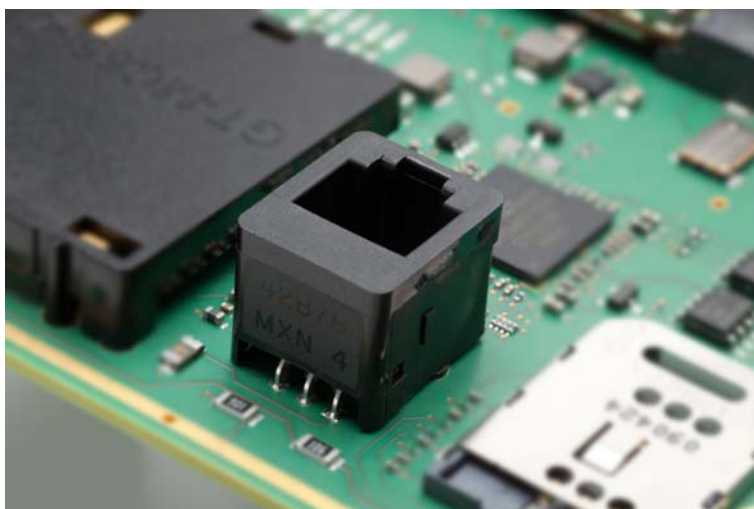
As an option, the CP4-SCAT may be equipped with a RJ11 jack, which is wired to the secondary headset interface of the MC55i. This connector can be used to attach the Votronic headset HH-SI-30.3 (approved by Siemens), which can be ordered directly from Votronic (www.votronic.com) or from EKF (part # 819.30.000550.50).

RJG • Secondary Headset Port EKF Part #240.01.06 • RJ11 Jack 6		
 <p>#270.10.06.00 ©EKF • ekf.com</p>	1	+5V
	2	MIC- (MICN2)
	3	SPK- (EPN2)
	4	SPK+ (EPP2)
	5	MIC+ (MICP2)
	6	GND

The RJ11 jack provided on the CP4-SCAT has 6 contacts loaded, but is also suitable for 4 position western style plugs (the Votronic headset is equipped with a 4/4 connector e.g.).



Votronic Headset



SIM2

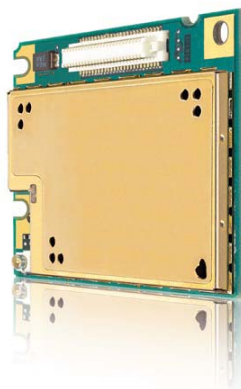
The SIM card holder SIM2 on the CP4-SCAT is wired to the GSM-R module connector, for subscriber identification.

SIM2 SIM card socket hinge (top load) EKF Part #219.51.006.20	
c1	SIMVCC
c2	SIMRST
c3	SIMCLK
c4	nc
c5	SIMGND
c6	nc
c7	SIMIO
c8	nc

The SIM card holder is a 6-lead hinge style socket, providing a shielding cover with mechanical lock/unlock function.

UFL4

The GSM-R module socket does not provide pins for the RF antenna input/output. Hence, a double-ended U.FL-2LP cable assembly is required in addition, running from the MC55i U.FL style antenna input/output connector, to the corresponding U.FL receptacle on the CP4-SCAT printed circuit board, which is in turn assigned to a front panel SMA/RP antenna connector (for details refer to chapter Front Panel Connectors / Antenna).



MC55i

UART Related Connectors

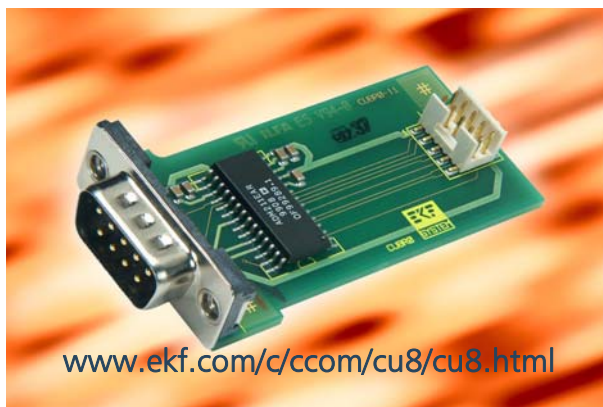
About the OXPCIe952 UART

The MC55i cellular engine requires a serial interface (aka COM port) for control and data transfer. The CP4-SCAT is equipped with the OXPCIe952 PCI Express® dual port UART for this reason. Consequently, one of the two UART channels is wired to the GSM-R radio module socket. The other UART port is available for user I/O. If the GSM-R modem is not intended for use, both UART channels would be available for user applications.

Two connectors P-SP1 and P-SP2 are provided on the CP4-SCAT for attachment of EKF series CU7-RS485 or CU-RS232 PHY modules by means of a flat ribbon cable. These modules can be fixed at a custom specific 8HP front panel.



CU7-RS485



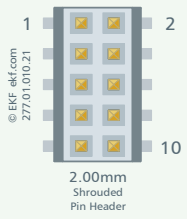
CU8-RS232

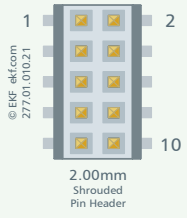
Suitable device drivers for the OXPCIe952 UART are available for Windows and Linux from the PLX website (www.plxtech.com).

P-SP1 P-SP2

Up to two UARTs are available on the CP4-SCAT from the optional pin headers P-SP1 and P-SP2 (TTL-level on all signals). P-SP1 and P-SP2 are suitable for attachment of EKF CU-series PHY modules via a micro ribbon flat cable assembly. A PHY module is a transceiver from TTL level signals to a specific symmetric or asymmetric interface standard, e.g. EIA-485 or RS-232E, with or w/o galvanic isolation. Please contact sales@ekf.de for availability of different CU-series modules (inquiries for custom specific PHY or transition modules welcome). Also custom specific front panel design can be done.

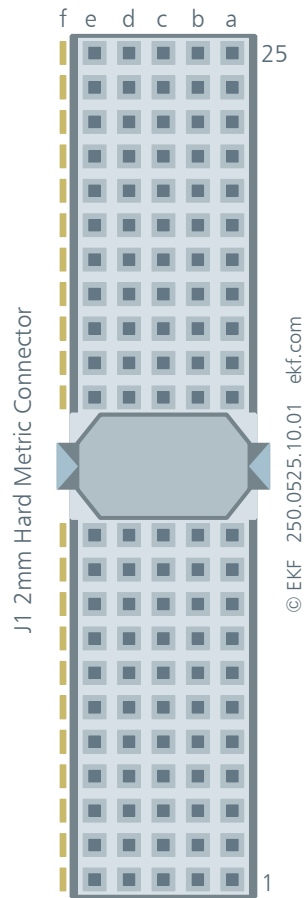
Since the UART wired to P-SP1 is prominently assigned to the GSM-R radio module, P-SP1 must not be used simultaneously for user I/O and also the cellular engine.

P-SP1 TTL-Level Serial I/O 2.00mm Pin Header 2 x 5 (277.01.010.21)					
	+5V_SP1 0.5A ¹	1	2	DSR0#	
	RI0#	3	4	RXD0	
	TXD0	5	6	DTR0#	
	RTS0#	7	8	CTS0#	
	DCD0	9	10	GND	

P-SP2 TTL-Level Serial I/O 2.00mm Pin Header 2 x 5 (277.01.010.21)					
	+5V_SP2 0.5A ¹	1	2	DSR1#	
	RI1#	3	4	RXD1	
	TXD1	5	6	DTR1#	
	RTS1#	7	8	CTS1#	
	DCD1	9	10	GND	

¹ short circuit protection by a PolySwitch resettable fuse

CompactPCI Connector J1



#J1	A	B	C	D	E
25	+5V	REQ64#	ENUM#	+3.3V	+5V
24	AD1	+5V	VI/O	AD0	ACK64#
23	+3.3V	AD4	AD3	+5V	AD2
22	AD7	GND	+3.3V	AD6	AD5
21	+3.3V	AD9	AD8	M66EN	C/BE0#
20	AD12	GND	VI/O	AD11	AD10
19	+3.3V	AD15	AD14	GND	AD13
18	SERR#	GND	+3.3V	PAR	C/BE1#
17	+3.3V	IPMB SCL	IPMB SDA	GND	PERR#
16	DEVSEL#	GND	VI/O	STOP#	LOCK#
15	+3.3V	FRAME#	IRDY#	BD_SEL#	TRDY#
14					
13			Not Keyed		
12					
11	AD18	AD17	AD16	GND	C/BE2#
10	AD21	GND	+3.3V	AD20	AD19
9	C/BE3#	IDSEL	AD23	GND	AD22
8	AD26	GND	VI/O	AD25	AD24
7	AD30	AD29	AD28	GND	AD27
6	REQ#	GND	+3.3V	CLK	AD31
5	BRSVP1A5	BRSVP1B5	RST#	GND	GNT#
4	IPMB PWR	HEALTHY#	VI/O	INTP	INTS
3	INTA#	INTB#	INTC#	+5V	INTD#
2	TCK	+5V	TMS	TDO ¹	TDI ¹
1	+5V	-12V ²	TRST#	+12V ²	+5V

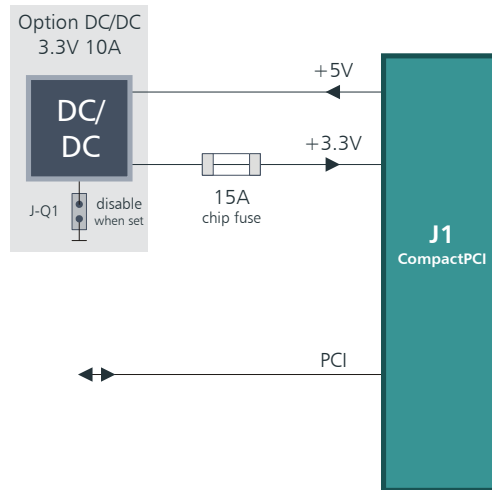
1 TDO - TDI internally connected

2 +12V -12V not in use

+3.3V is an output to the backplane, if the optional +5V to +3.3V DC/DC regulator is populated on the board, otherwise +3.3V is not in use


DC/DC 3.3V Regulator Option

The CP4-SCAT has been designed for +5V only operation. As an option, an on-board switching regulator from +5V to +3.3V is available, which can be used to feed back +3.3V/10A to the CompactPCI® backplane in systems with a single +5V power supply. This can be useful for small and rugged systems which are equipped only with a single +5V power supply, but employing a CPCI card with need for +3.3V in addition, such as many CPU boards.



The switched regulator operates with an efficiency of ~ 95%. Components are dimensioned for an output current of 10A and more. A fast acting 15A chip fuse is provided on the board. Two on-board LEDs are populated for diagnostic: LEDQ1 is lit when the regulator signalizes its power good state, and LEDQ2 is lit when +3.3V backplane power is available. Both LEDs should be normally on simultaneously, however, if the chip fuse has been blown for any reason, LEDQ2 would be off.

The DC/DC regulator begins its soft start phase as soon as +5V are applied to the CP4-SCAT. If the regulator is not required for an application, the jumper JQ1 should be installed, which disables the regulator, for power saving.

J-Q1 • DC/DC Regulator Disable		
EKF Part #240.01.02 • 2.54mm Pitch Pin Header		
 #240.1.02 ©EKF • ekf.com	1	ENABLE
	2	GND

Warning:

There are no additional provisions made against a back-driving situation. A CP4-SCAT with on-board +3.3V regulator must not be used in a system with a multi-voltage output CompactPCI® power supply which delivers also +3.3V to the backplane. Results are unpredictable - damage to the CP4-SCAT and/or the external power supply might occur.

Usage of a CP4-SCAT with on-board DC/DC regulator populated together with a +3.3V supplied CompactPCI® backplane requires the 15A chip fuse to be removed (desoldered). EKF recommends to send the board back in order to have this modification done, since lead free SMD soldering equipment and experienced personnel would be essential.

Please contact sales@ekf.com for availability of a +5V to +3.3V DC/DC regulator only version of the CP4-SCAT board (all other components omitted, only power function 5V to 3.3V provided).

Ruggedized Versions

On special request, the PCB can be coated/sealed/underfilled to withstand harmful environment conditions.

Schematics

Complete circuit diagrams for this product are available for customers on request. Signing of a non-disclosure agreement would be needed. Please contact sales@ekf.de for details.

EKF reserves the right to refuse distribution of confidential information material for any reason that EKF may consider substantial.

Ordering Information

For popular CP4-SCAT SKUs please refer to
www.ekf.com/liste/liste_20.html#CP4



CP4-SCAT in a Rugged Industrial System (Leftmost Card)

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boards. systems. solutions.

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