
RTOS Debugger for FreeRTOS

RTOS-FreeRTOS

ARC
ARM
AVR32
Beyond
ColdFire
H8S
HC12
MICROBLAZE
MIPS
POWERPC

- Display of all FreeRTOS System Resources
- Task Related Breakpoints
- Task Stack Coverage
- Dynamic Thread Performance Measurement
- FreeRTOS Specific Display of Trace Listing
- Statistic Evaluation and Graphic Display of Task Run Times
- Statistic Evaluation and Graphic Display of Function Run Times
- PRACTICE Functions for OS Data
- FreeRTOS related Pull-Down Menu

The TRACE32 System includes a configurable RTOS debugger to provide symbolic debugging in real time operating systems. Our software package contains a ready-to-run configuration for the FreeRTOS Real Time Kernel.

The FreeRTOS awareness provides easy access to task lists and other kernel information, generates performance analysis data and enables you to do a most effective debugging with the TRACE32 systems on targets running FreeRTOS.

RTOS Awareness on TRACE32 with FreeRTOS

Real Time, Non-Intrusive Display of FreeRTOS System Resources

The TRACE32 RTOS debugger for FreeRTOS provides display functions to show the system resources of FreeRTOS. All objects, such as tasks and queues can be displayed and inspected. In addition, by using the processors capability of reading the target

memory while the application is running, or by using the emulators dual-port memory (if available), the display of all these regions can be viewed non-intrusively in real time. The tables are updated permanently ("On The Fly"), without affecting the application at all.

The image shows two overlapping windows from the TRACE32 debugger. The background window is titled 'B::TASK.TaskList' and displays a table of tasks. The foreground window is titled 'B::TASK.Queue data.long(xSuspendedTestQueue)' and displays a table of queue data.

magic	name	num	prio	state
00007878	LEDx	3.	3.	running
00007AD4	LEDx	4.	3.	ready
00007D30	LEDx	5.	3.	ready
0000B65C	QConsB4	28.	2.	ready
0000761C	COMRx	2.	2.	ready
00008000	QConsNB	6.	2.	ready
0000825C	QProdNB	7.	2.	ready
0000AEC0	QConsB1	25.	2.	ready
0000A4CB	LIM_INC	21.	1.	ready
000073C0	COMTx	1.	1.	ready
00009D50	BIKSEM1			
00009FAC	BIKSEM2			

magic	length	itemsize	msgs	waiting
0000A208	1.	4.	0.	

Task list window and detailed queue window

Task Related Breakpoints

Any breakpoint set in the TRACE32 debugger can be set dependent to a specific task. This means, that the

breakpoint will then only halt, if hit by the specified task. This allows task related debugging even in shared code.

The image shows the 'B::Break.List' window in the TRACE32 debugger. It contains a table of breakpoints with columns for address, type, implementation, task, and a description. The table shows two task-dependent breakpoints.

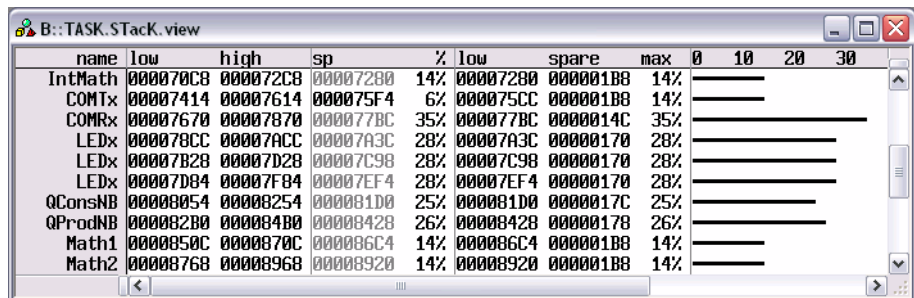
address	types	impl	task	
R:0000C20	Program	SOFT	COMTx	xSerialPutChar
R:00004AE0	Program	SOFT	QConsB4	xQueueSend

Breakpoint list with task dependent breakpoints

Task Stack Coverage

In real time systems it is quite important to know, how much stack space each task consumes. For this purpose,

a special window shows the current and the maximum usage of the stack of each separate task

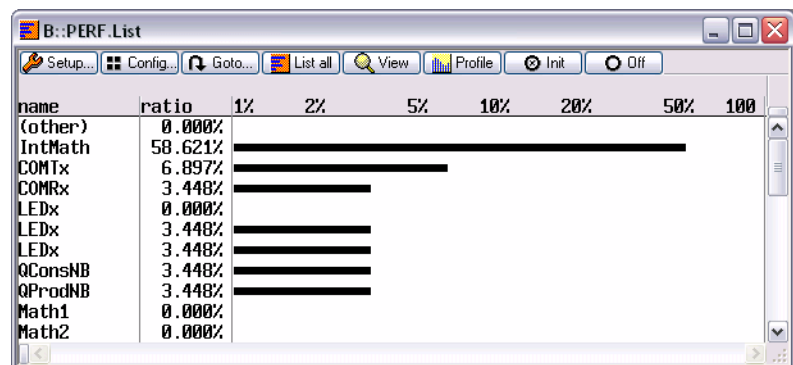


Task stack coverage window

Dynamic Task Performance Measurement

While FreeRTOS is running, TRACE32 is capable of recurrently evaluating the current running task and collecting the results. The percentage, each task consumes of the system, is then dis-

played graphically and updated permanently. The longer time you let the measurement run, the more exact are the results. This feature is available even without any hardware trace.



Performance measurement list

FreeRTOS Specific Display of Trace Listing

The data recorded in the real time trace buffer (if available) can be displayed and interpreted specific to the operat-

ing system. The task switches are displayed symbolically, either exclusively or in addition to other information.

```

[B::Trace.List List.TASK Default /Track]
record run address cycle data symbol ti.back
545                                     pxCurrentTCB = pxNewTCB;
-000225 ldr r2, #0x3390
D:00003590 rd-long 00006F64 ..o\tasks\TaskCreate+0x224 0.200us
-000223 ldr r3, [r11, #0x281]
D:0003FB9C rd-long 00007AD4 ..lobal\_bss_end\_+0x3270C 0.200us
str r3, [r2]
TASK magic = 00007AD4 name = LEDx ---
-000221 D:00006F64 wr-long 00007AD4 ..sdemo\Global\pxCurrentTCB 0.100us
}
}
}
/* Remember the top priority to make context switch
the priority in pxNewTCB as this has been capped to
if(pxNewTCB->uxPriority > uxTopUsedPriority)
552
-000219 ldr r3, [r11, #0x281]
D:0003FB9C rd-long 00007AD4 ..lobal\_bss_end\_+0x3270C 0.200us
ldr r2, #0x3390

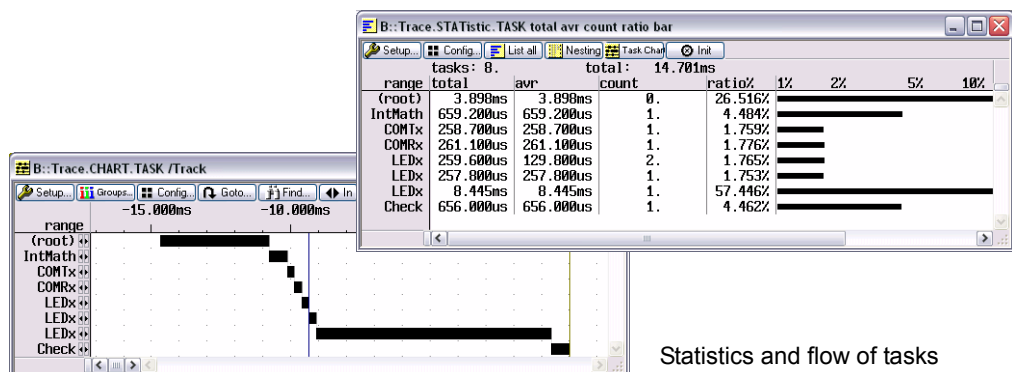
```

Trace listing, task switch, memory accesses, assembler and HLL information

Statistic Evaluation and Graphic Display of Task Run Times

Out of the real time trace buffer (if available), the analyzer can calculate statistic tables of task run times and task switches. A graphical diagram shows

which task was active at a specific time, giving a clear view of the behaviour of the system.

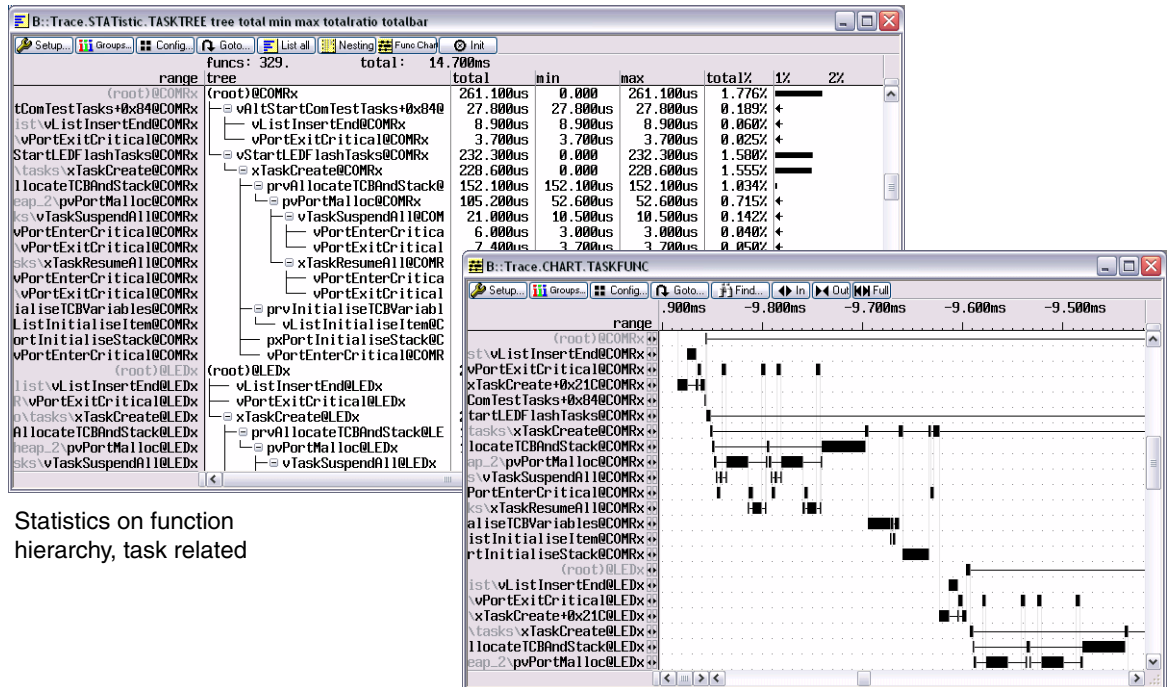


Statistics and flow of tasks

Task Related Evaluation of Function Run Times

The statistic and graphic evaluation of function calls and function run times (if available) can be done dependant to the actual running task. This is neces-

sary, if different tasks call one single function at the same time, or if a task switch occurs in between the function.



Statistics on function hierarchy, task related

Flow of functions, related to the calling tasks

PRACTICE Functions for OS Data.

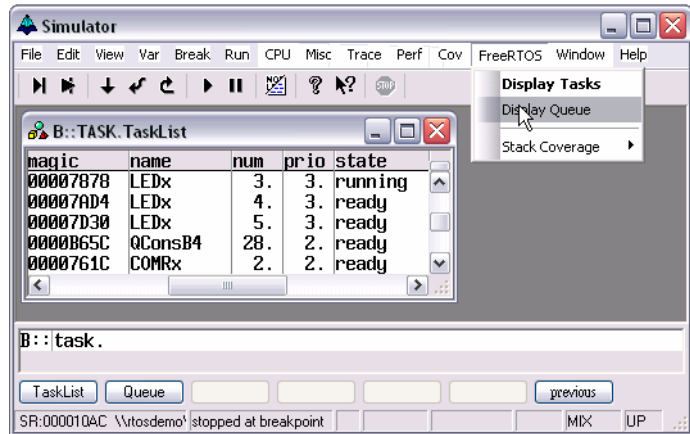
The support includes extended PRACTICE functions for FreeRTOS specific data, to be used in setup and test scripts. E.g. the function "task.con-

fig(magic)" returns the address of the so called magic value, which corresponds to the id of the current executing task.

FreeRTOS related pull-down menu

Because the menu bar of the TRACE32 user interface can be fully customized, you can create a new pull-down menu, including operating system specific commands. We deliver

FreeRTOS support with an example for such specific menus, which provides fast access to the FreeRTOS awareness features.



TRACE32 with FreeRTOS menu

Contact

International Representative

Argentina

Anacom Eletronica Ltda.
Mr. Rafael Sorice
Rua Nazareth, 807, Barcelona
BR-09551-200 São Caetano do Sul, SP
Phone: +55 11 3422 4200
FAX: +55 11 3422 4242
EMAIL: rsorice@anacom.com.br

Australia

Embedded Logic Solutions P/L
Mr. Ramzi Kaffan
Suite 2, Level 3
144 Marsden Street
Parramatta NSW 2150
Phone: +61 2 9687 1880
FAX: +61 2 9687 1881
EMAIL: sales@emlogic.com.au

Austria

Lauterbach GmbH
Altlaufstr. 40
D-85635 Höhenkirchen-Siegertsbrunn
Phone: +49 8102 9876 0
FAX: +49 8102 9876 999
EMAIL: info@lauterbach.com

Belgium

Tritec Benelux B.V.
Mr. Robbert de Voogt
Stationspark 550
NL-3364 DA Slidrecht
Phone: +31 184 41 41 31
FAX: +31 184 42 36 11
EMAIL: software@tritec.nl

Brazil

Anacom Eletronica Ltda.
Mr. Rafael Sorice
Rua Nazareth, 807, Barcelona
BR-09551-200 São Caetano do Sul, SP
Phone: +55 11 3422 4200
FAX: +55 11 3422 4242
EMAIL: rsorice@anacom.com.br

Canada

Lauterbach Inc.
Mr. Udo Zoettler
4 Mount Royal Ave.
USA-Marlborough, MA 01752
Phone: +1 508 303 6812
FAX: +1 508 303 6813
EMAIL: info_us@lauterbach.com

China Beijing

Lauterbach Technologies Co., Ltd
Mr. Linglin He
Beijing Office
A3, South Lishi Road, XiCheng District
Beijing 100037, P.R. China
Phone: +86 10 68023502
FAX: +86 10 68023523
EMAIL: linglin.he@lauterbach.com

China Shenzhen

Lauterbach Technologies Co., Ltd
1406/E Xihaimingzhu Building
No.1 Taoyuan Road, Nanshan District
Shenzhen 518052, P.R. China
Phone: +86 755 8621 0671
FAX: +86 755 8621 0675
EMAIL: emily.zhang@lauterbach.com

China Suzhou

Lauterbach Technologies Co., Ltd
Mr. Linglin He
Hengyu Square, Rm 709
No. 188, Xing Hai Street
Suzhou, 215021 P.R. of China
Phone: +86 512 6265 8030
FAX: +86 512 6265 8032
EMAIL: info_cn@lauterbach.com

Czech. Republic

Lauterbach GmbH
Altlaufstr. 40
D-85635 Höhenkirchen-Siegertsbrunn
Phone: +49 8102 9876 0
FAX: +49 8102 9876 999
EMAIL: info@lauterbach.com

Denmark

Nohau Danmark A/S
Mr. Flemming Jensen
Klausdalsbrovej 493
DK-2730 Herlev
Phone: +45 44 52 16 50
FAX: +45 44 52 26 55
EMAIL: info@nohau.dk

Egypt

Wantech Egypt
Mr. Wagih A. Nawara
5 Shafik Ghalie St., Suite 2
Off Pyramids Road, Giza
Cairo 12111
Phone: +20 100 1251955
FAX: +20 100 1250349
EMAIL: sales@wantech.net.com

Finland

Nohau Solutions Finland
Mr. Martti Viljainen
Teknobulevardi 3-5
FI-01531 Vantaa
Phone: +358 40 546 1469
FAX: +358 9 2517 8101
EMAIL: sales@nohau.fi

France

Lauterbach S.A.R.L.
Mr. Jean-Pierre Paradiso
Europarc - Le Hameau B
135 Chemin Des Bassins
F-94035 Créteil Cedex
Phone: +33 1 49 56 20 30
FAX: +33 1 49 56 20 39
EMAIL: info_fr@lauterbach.com

Germany

Lauterbach GmbH
Altlaufstr. 40
D-85635 Höhenkirchen-Siegertsbrunn
Phone: +49 8102 9876 0
FAX: +49 8102 9876 999
EMAIL: info@lauterbach.com

Germany North

Lauterbach GmbH
Mr. Klaus Hommann
Leonhardring 5
D-31319 Sehnde
Phone: +49 8102 9876 174
FAX: +49 5138 6185 3
EMAIL: klaus.hommann@lauterbach.com

Germany South

Lauterbach GmbH
 Andreas Grimm
 Altlaufstr. 40
 D-85635 Höhenkirchen-Siegersbrunn
 Phone: +49 8102 9876 190
 FAX: +49 8102 9876 187
 EMAIL: andreas.grimm@lauterbach.com

Greece

Lauterbach GmbH
 Altlaufstr. 40
 D-85635 Höhenkirchen-Siegersbrunn
 Phone: +49 8102 9876 0
 FAX: +49 8102 9876 999
 EMAIL: info@lauterbach.com

Hungary

Lauterbach GmbH
 Altlaufstr. 40
 D-85635 Höhenkirchen-Siegersbrunn
 Phone: +49 8102 9876 0
 FAX: +49 8102 9876 999
 EMAIL: info@lauterbach.com

India-Bangalore

Electro Systems Associates Pvt. Ltd.
 Mr. G. V. Gurunatham
 S-606, World Trade Center
 Malleswaram West, No.26/1, Dr. Rajkumar
 Road
 India - Bangalore 560055
 Phone: +91 80 67648888
 FAX: +91 80 23475615
 EMAIL: Trace32sales@esaindia.com

India-Chennai

Electro Systems Associates Pvt. Ltd.
 Mr. D. Kannan
 No.109/59A, Ground Floor
 IV Avenue, Ashok Nagar
 India - Chennai - 600 083 Tamilnadu
 Phone: +91 044-24715750
 FAX: +91 44 24715750
 EMAIL: chennai@esaindia.com

India-Delhi

Electro Systems Associates Pvt. Ltd.
 Mr. R.K. Bhandari
 No. 705, 7th Floor, Laxmi Deep
 Shivajinagar
 India - Delhi - 110 092
 Phone: +91 11-22549351
 FAX:
 EMAIL: delhi@esaindia.com

India-Hyderabad

Electro Systems Associates Pvt. Ltd.
 Mr. C.V.M. Sri Ram Murthy
 Shop No. 14, "Global Enclave"
 Bhagyanager Colony, Kukat pally
 India - Hyderabad 500 072
 Phone: +91 40-23063346
 FAX: +91 40-23063346
 EMAIL: hyderabad@esaindia.com

India-Pune

Electro Systems Associates Pvt. Ltd.
 Mr. R K Bhandari
 Shriram Complex, 1126/1, Model Colony
 Shivajinagar
 India - Pune - 411 016
 Phone: +91 20 - 30462035 / 25663
 FAX: +91 20-25677202
 EMAIL: pune@esaindia.com

Ireland

Lauterbach Ltd.
 Mr. Barry Lock
 11 Basepoint Enterprise Centre
 Stroudley Road
 Basingstoke, Hants RG24 8UP
 Phone: +44-1256-333-690
 FAX: +44-1256-336-661
 EMAIL: info_uk@lauterbach.com

Israel

Itec Ltd.
 Mr. Mauri Gottlieb
 P.O. Box 10002
 IL-Tel Aviv 61100
 Phone: +972 3 6491202
 FAX: +972 3 6497661
 EMAIL: general@itec.co.il

Italy

Lauterbach Srl
 Mr. Maurizio Menegotto
 Via Enzo Ferrieri 12
 I-20153 Milano
 Phone: +39 02 45490282
 FAX: +39 02 45490428
 EMAIL: info_it@lauterbach.com

Japan

Lauterbach Japan, Ltd.
 Mr. Kenji Furukawa
 3-8-8 Shinyokohama
 Kouhoku-ku, Nisso 16th Building
 Yokohama-shi, Japan 222-0033
 Phone: +81 45 477 4511
 FAX: +81 45 477 4519
 EMAIL: info@lauterbach.co.jp

Luxembourg

Tritec Benelux B.V.
 Mr. Robbert de Voogt
 Stationspark 550
 NL-3364 DA Sliedrecht
 Phone: +31 184 41 41 31
 FAX: +31 184 42 36 11
 EMAIL: software@tritec.nl

Malaysia

Flash Technology
 Mr. Teo Kian Hock
 No 61, # 04-15 Kaki Bukit Av 1
 Shun Li Industrial Park
 SGP-Singapore 417943
 Phone: +65 6749 6168
 FAX: +65 6749 6138
 EMAIL: teokh@flashtech.com.sg

Mexico

Lauterbach Inc.
 Mr. Udo Zoettler
 4 Mount Royal Ave.
 USA-Marlborough, MA 01752
 Phone: +1 508 303 6812
 FAX: +1 508 303 6813
 EMAIL: info_us@lauterbach.com

Netherlands

Tritec Benelux B.V.
 Mr. Robbert de Voogt
 Stationspark 550
 NL-3364 DA Sliedrecht
 Phone: +31 184 41 41 31
 FAX: +31 184 42 36 11
 EMAIL: software@tritec.nl

New Zealand

Embedded Logic Solutions P/L
 Mr. Ramzi Kattan
 Suite 2, Level 3
 144 Marsden Street
 Parramatta NSW 2150
 Phone: +61 2 9687 1880
 FAX: +61 2 9687 1881
 EMAIL: sales@emlogic.com.au

Norway

Nohau Solutions AB
 Mr. Jörgen Nilsson
 Derbyvägen 4
 SE-21235 Malmö
 Phone: +46 40 592 206
 FAX: +46 40 592 229
 EMAIL: sales@nohau.se

Poland

QUANTUM Sp. z o.o.
 Mr. Aleksander Bil
 ul. Jeleniogorska 6
 54-056 Wrocław
 Phone: +48 71 362 6356
 FAX: +48 71 362 6357
 EMAIL: info@quantum.com.pl

Portugal

Captura Electronica, SCCL
Mr. Juan Martinez
c/Duero, 40
E-08031 Barcelona
Phone: +34 93 429 5730
FAX: +34 93 407 0778
EMAIL: info@captura-el.com

Romania

Lauterbach GmbH
Altlaufstr. 40
D-85635 Höhenkirchen-Siegersbrunn
Phone: +49 8102 9876 0
FAX: +49 8102 9876 999
EMAIL: info@lauterbach.com

Russia

RTSoft
Mr. Alexey Isaev
Nikitinskaya 3
RUS-105037 Moscow
Phone: +7 495 742 6828
FAX: +7 495 742 6829
EMAIL: sales@rtsoft.msk.ru

Singapore

Flash Technology
Mr. Teo Kian Hock
No 61, # 04-15 Kaki Bukit Av 1
Shun Li Industrial Park
SGP-Singapore 417943
Phone: +65 6749 6168
FAX: +65 6749 6138
EMAIL: teokh@flashtech.com.sg

South Korea, Pangyo

MDS Technology Co., Ltd.
Mr. Sangheon Lee
3FL, Hancom Tower
49, Daewangpangyo-ro 644, Bundang-gu
Seongnam-si, Gyeonggi-do, 463-400, ROK
Phone: +82-31-627-3000
FAX: +82-31-627-3100
EMAIL: trace32@mdstec.com

Spain

Captura Electronica, SCCL
Mr. Juan Martinez
c/Duero, 40
E-08031 Barcelona
Phone: +34 93 429 5730
FAX: +34 93 407 0778
EMAIL: info@captura-el.com

Sweden

Nohau Solutions AB
Mr. Jörgen Nilsson
Derbyvägen 4
SE-21235 Malmö
Phone: +46 40 592 206
FAX: +46 40 592 229
EMAIL: sales@nohau.se

Switzerland

JDT Jberg DatenTechnik
Mr. Andreas Jberg
Zimmereistrasse 2
CH-5734 Reinach AG
Phone: +41 62 7710 886
FAX:
EMAIL: Andreas.Jberg@jdt.ch

Taiwan

Superlink Technology Corp.
Mr. Sulin Huang
3F-8, No. 77, Sec. 1, Xintaiwu Rd., Xizhi District,
New Taipei City 22101, Taiwan, R.O.C.
Phone: +886 2 26983456
FAX: +886 2 26983535
EMAIL: info.stc@superlink.com.tw

Tunisia

Lauterbach Consulting S.A.R.L.
Mr. Khaled Jmal
Route El Ain Km 3.5
TN-3062 Sfax
Phone: +216-74611730
FAX: +216-74611723
EMAIL: info_tn@lauterbach.com

Turkey-1

Tektronik Muh. ve Tic. A.S.
Mr. Hakan Yavuz
CyberPlaza B-Blok, 702B
Bilkent
06800 Ankara
Phone: +90 312 437 3000
FAX: +90 312 437 1616
EMAIL: info@tektronik.com.tr

Turkey-2

G3TEK Embedded Technologies Ltd.
Mr. Celal Aygun
Ilkyerlesim Mah. 445.
Sok. No: 48
06370 Batikent/Ankara
Phone: +90 312 3324769
FAX: +90 312 3324769
EMAIL: info@g3tek.com

UK

Lauterbach Ltd.
Mr. Barry Lock
11 Basepoint Enterprise Centre
Stroudley Rd
Basingstoke, Hants RG24 8UP
Phone: +44 1256 333 690
FAX: +44 1256 350 301
EMAIL: info_uk@lauterbach.com

USA East

Lauterbach Inc.
Mr. Udo Zoettler
4 Mount Royal Ave.
USA-Marlborough, MA 01752
Phone: +1 508 303 6812
FAX: +1 508 303 6813
EMAIL: info_us@lauterbach.com

USA West

Lauterbach Inc.
Mr. Bob Kupyń
1111 Main Street, Suite 620
USA-Vancouver, WA, 98660
Phone: +1 503 524 2222
FAX: +1 503 524 2223
EMAIL: bob.kupyń@lauterbach.com

Additional Information

<http://www.lauterbach.com>

Lauterbach GmbH

Altlaufstr. 40
D-85635 Höhenkirchen-Siegertsbrunn
Tel. ++49 8102 9876-0 FAX -999
info@lauterbach.com
http://www.lauterbach.de

Lauterbach Inc.

4 Mount Royal Ave.
Marlboro MA 01752
Phone (508) 303 6812 FAX (508) 303 6813
info_us@lauterbach.com
http://www.us.lauterbach.com

Lauterbach Ltd.

11 Basepoint Enterprise Ctre Stroudley Road
Basingstoke, Hants RG24 8UP
Phone ++44-1256-333-690 FAX -661
info_uk@lauterbach.com
http://www.lauterbach.co.uk

Lauterbach S.A.R.L.

135 Chemin Des Bassins
F-94035 Créteil Cedex
Phone ++33-149-562-030
FAX ++33-149-562-039
info_fr@lauterbach.com
http://www.lauterbach.fr

Lauterbach Japan, Ltd.

3-9-5 Shinyokohama Kouhoku-ku
Yokohama-shi Japan 222-0033
Phone ++81-45-477-4511 FAX -4519
info_j@lauterbach.com
http://www.lauterbach.co.jp

Lauterbach s.r.l.

Lauterbach s.r.l.
Via Enzo Ferrieri 12
I-20153 Milano
Phone ++39 02 45490282
FAX ++39 02 45490428
info_it@lauterbach.it
http://www.lauterbach.it

Suzhou Lauterbach Consulting Co.,Ltd.

Room 1605, Xing Hai International Square
No.200, Xing Hai Street
Suzhou, 215021 PR of China
Phone: 0086-512 6265 8030
FAX: 0086-512 6265 8032
info_cn@lauterbach.cn
http://www.lauterbach.cn

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