

HiCO.nect

**Design Guidelines
Connection of CORE with BASE boards**

**HiCO.nect.DOC
Manual**

Copyright

emtrion

© Copyright 2003 emtrion

All rights reserved. Without written permission, this document may neither be copied nor saved on electronic media. The information contained in this documentation is subject to change without prior notification. We do not assume any liability for erroneous information or its consequences. The trademarks of other companies that are used to identify the products of these companies are used exclusively.

| Manual Revision number | Modifications | Date |
|------------------------|---|------------------|
| 1 | First edition | 26.11.02/ Bue |
| 2 | Names changed Section 6.1 SDA5 and SCL4 on J1 exchanged Section 3 Data lines D[15 .. 0] | 21.03.03/ Bue |
| 3 | Change to emtrion | 07.07.03 / Bue |
| 4 | maximum input Level of RXD2, CTS2, RXD3 and CTS3 reduced to 3.3V Pullup value of WAIT# changed to 330R | 2005-05-04 / Bue |
| 5 | color information added | 2007-08-22 / Bue |
| 6 | color informations for HiCO.ARM9 added | 2007-10-29 / ie |

This manual is published by:

emtrion GmbH
Greschbachstr. 12
D-76229 Karlsruhe
Germany
<http://www.emtrion.com>

Phone: 0049 - 721 62 72 5-20

Fax: 0049 - 721 62 72 5-19

E-mail: <mailto:mail@emtrion.de>

October 2007 – 006

Table of Contents

| | | |
|-----|---|----|
| 1 | Introduction | 4 |
| 2 | Plug Connectors | 5 |
| 3 | Signal Characteristics | 6 |
| 4 | AC Characteristics of the Signals | 11 |
| 5 | Locations of Plug Connectors and Mounting Holes | 13 |
| 6 | Connector Assignments | 14 |
| 6.1 | J1..... | 14 |
| 6.2 | J2..... | 15 |
| 6.3 | J3..... | 16 |

| | |
|----------------|---------------------------|
| Type | Manual |
| Title | HiCO Connect Richtlinie |
| Language | English |
| Version Number | October 2007 – 006 |
| Print Date | 03.07.2008 12:51:00 |
| File Name | hico_nect_v006en.doc |
| Template | normal.dot |
| Print | Two-sided |
| Page | 3/16 |
| Author | Maurer |

1 Introduction

HiCO.nect is a plug definition for the connection of CPU modules, so-called CORE modules, with carrier boards, so-called BASE modules.

This document describes the three plug connectors and their allocation, and includes information to enable the development of new, pin-compatible modules. For this, the plugs and signals are described as follows:

Up to now, the pin definitions were used for CORE modules with Hitachi Super-H and ARM9 processors. It must be checked if an expansion to other processor types, such as XSCALE, or PowerPC is possible.

To remain open for other designs, a series of pins on the plugs J2 and J3 are reserved optionally. The plug allocation, section 6, shows these pins with grey shading. The white fields are defined as mandatory signals. If the allocation is done differently than specified, it must be observed that there are no signal conflicts with existing modules.

| | |
|----------------|---------------------------|
| Type | Manual |
| Title | HiCO Connect Richtlinie |
| Language | English |
| Version Number | October 2007 – 006 |
| Print Date | 03.07.2008 12:51:00 |
| File Name | hico_nect_v006en.doc |
| Template | normal.dot |
| Print | Two-sided |
| Page | 4/16 |
| Author | Maurer |

2 Plug Connectors

The connection between the CORE and the BASE takes place via three plug connectors type Hirose FX6.

The signals of the processor bus and the supply voltages are directed via an 80-pin plug J1.

A series of input and output signals are directed via the two 50-pin plug connectors J2 and J3. On each plug, some pins are reserved for board-specific signals; the others are fixed.

On the CORE modules, a header type Hirose FX6-80P-0.8SV2 and two headers type Hirose FX6-50P-0.8SV2 are reserved.

On the carrier board, respective receptacles type Hirose FX6-80S-0.8SVx and FX6-50S-0.8SVx are reserved.

SVx stands for SV, SV1, or SV2. By choosing the receptacle type, the distance between the CORE and the carrier board can be fixed to 7 mm (SV), 8 mm (SV1), or 9 mm (SV2). All three receptacles must be of the same type.

Data sheet regarding the plug connectors can be found at: www.hirose.com

| | |
|----------------|---------------------------|
| Type | Manual |
| Title | HiCO Connect Richtlinie |
| Language | English |
| Version Number | October 2007 – 006 |
| Print Date | 03.07.2008 12:51:00 |
| File Name | hico_nect_v006en.doc |
| Template | normal.dot |
| Print | Two-sided |
| Page | 5/16 |
| Author | Maurer |

3 Signal Characteristics

| Con | Name | Direction on CORE | Volt [V] | Current [mA] | Function |
|-----|-------------|-------------------|----------|--------------|--|
| J1 | A[25 .. 0] | O | 3.3 | > 24 | Processor address bus |
| J1 | D[15 .. 0] | I/O | 3.3 | > 24 | Processor data bus |
| J1 | RD# | O | 3.3 | > 24 | Read signal |
| J1 | WR# | O | 3.3 | > 24 | Write signal |
| J1 | WE0# | O | 3.3 | > 24 | Write enable 0 shows write access on low byte |
| J1 | WE1# | O | 3.3 | > 24 | Write enable 1 shows write access on high byte |
| J1 | CLK | O | 3.3 | > 24 | Bus signal pulse |
| J1 | BS# | O | 3.3 | > 24 | BS# shows the start of a bus cycle |
| J1 | IRQ[3 .. 0] | IPU 10K | 3.3 | - | Interrupt inputs |
| J1 | NMI | IPU 10K | 3.3 | - | NMI interrupt |
| J1 | DRQ | I | 3.3 | - | DMA request |
| J1 | DACK# | O | 3.3 | 2 | DMA acknowledge |
| J1 | RDY/WAIT# | IPU 330R | 3.3 | - | Ready/Wait# Input |
| J1 | CS[2 .. 0]# | O | 3.3 | 2 | Chip selects 2.. 0, CS0# is for boot prom |
| J1 | RESI# | IPU 10K | 3.3 | - | Reset input |
| J1 | RESO# | O | 3.3 | 4 | Reset output |
| J1 | ID[3.. 0] | IPU | 3.3 | - | 4-bit carrier board ID |
| J1 | SCL5 | I/O | 5 | - | PC bus SCL, 5 V-compatible, external pull-up 4k7 necessary |
| J1 | SDA5 | I/O | 5 | 10 | I ² C bus SDA, 5 V-compatible, external pull-up 4k7 necessary |

Type Manual
 Title HiCO Connect Richtlinie
 Language English
 Version Number **October 2007 – 006**

Print Date 03.07.2008 12:51:00
 File Name hico_nect_v006en.doc
 Template normal.dot
 Print Two-sided
 Page 6/16
 Author Maurer

| Con | Name | Direction on CORE | Volt [V] | Current [mA] | Function |
|-----|-------------|-------------------|----------|--------------|---|
| J1 | BOOT8# | IPU 11K | 3.3 | - | BOOT8# switches data bus width for boot prom to 8-bit |
| J1 | MD4 | IPU 10K | 3.3 | - | Configuration bit MD4 from SH4 |
| J2 | ENAVEE | O | 3.3 | 2 | LCD, enable VEE |
| J2 | ENAVDD | O | 3.3 | 2 | LCD, enable VDD |
| J2 | M | O | 3.3 | 2 | LCS, AC signal for LCD display |
| J2 | FLM | O | 3.3 | 2 | LCD, VSYNC |
| J2 | DOFF# | O | 3.3 | 2 | LCS, display off, 0 = off |
| J2 | CL1 | O | 3.3 | 2 | LCD, HSYNC |
| J2 | CL2 | O | 3.3 | 2 | LCD pixel clock |
| J2 | LCD[7 .. 0] | O | 3.3 | 2 | LCD, data bits [7 .. 0] |
| J2 | REG# | O | 3.3 | 2 | PCMCIA, REG# |
| J2 | VS1#, VS2# | I | 3.3 | - | PCMCIA, VS1#, VS2# |
| J2 | CE1#, CE2# | O | 3.3 | 2 | CE1#, CE2#, CE2# |
| J2 | RDY/BSY# | I | 3.3 | - | PCMCIA, RDY/BSY# |
| J2 | RESET | O | 3.3 | 2 | PCMCIA, RESET |
| J2 | BVD[2 ..1] | I | 3.3 | - | PCMCIA, BVD[2 ..] 1] |
| J2 | CD[2 .. 1]# | I | 3.3 | - | PCMCIA, CD[2 ..] 1]# |
| J2 | WAIT | IPU 10K | 3.3 | - | PCMCIA, WAIT |
| J2 | IOIS16# | I | 3.3 | - | PCMCIA, IOIS16# |
| J2 | IORD# | O | 3.3 | 2 | PCMCIA, IORD# |
| J2 | IOWR# | O | 3.3 | 2 | PCMCIA, IOWR# |
| J2 | PDRV# | O | 3.3 | 2 | Enable for PCMCIA signal driver |
| J2 | I_CE1# | O | 3.3 | 2 | ISA Bus Interface, bus low enable |

Type
Title
Language
Version Number

Manual
HiCO Connect Richtlinie
English
October 2007 – 006

Print Date
File Name
Template
Print
Page
Author

03.07.2008 12:51:00
hico_nect_v006en.doc
normal.dot
Two-sided
7/16
Maurer

| Con | Name | Direction on CORE | Volt [V] | Current [mA] | Function |
|-----|---------------|-------------------|----------|--------------|---|
| J2 | I_CE2# | O | 3.3 | 2 | ISA Bus Interface, bus high enable |
| J2 | MMC_IRQ | IPU 10K | 3.3 | - | MMC, interrupt |
| J2 | MMC_CS# | O | 3.3 | 2 | MMC, SPI mode chip select |
| J2 | MMC_SCLK | O | 3.3 | 2 | MMC, SPI mode SCLK |
| J2 | MMC_DO | I | 3.3 | - | MMC, SPI mode DO |
| J2 | MMC_DI | O | 3.3 | 2 | MMC, SPI mode DI |
| J2 | TOUCH_X1 | A I/O | 3.3 | - | 4-conductor touch controller, X1 |
| J2 | TOUCH_X2 | A I/O | 3.3 | - | 4-conductor touch controller, X2 |
| J2 | TOUCH_Y1 | A I/O | 3.3 | - | 4-conductor touch controller, Y1 |
| J2 | TOUCH_Y2 | A I/O | 3.3 | - | 4-conductor touch controller, Y2 |
| J2 | ANA[1 .. 0] | AO | 3.3 | 5 | Analogue outputs [1 .. 0], 0 .. + 3.3 V |
| J3 | GPIO[14 .. 0] | I/O | 3.3 | -1.5/10 | General Purpose I/O [14 .. 0] |
| J3 | TXD# | O | RS232 | 2 | COM1, TXD |
| J3 | RXD# | I | RS232 | - | COM1, RXD |
| J3 | RTS | O | RS232 | 2 | COM1, RTS |
| J3 | CTS | I | RS232 | - | COM1, CTS |
| J3 | DTR# | O | RS232 | 2 | COM1, DTR |
| J3 | DCD | I | RS232 | - | COM1, DCD |
| J3 | TXD2 | O | 3.3 | 2 | COM2, TXD |
| J3 | RXD2 | I | 3.3 | - | COM2, RXD |
| J3 | RTS2 | O | 3.3 | 2 | COM2, RTS |
| J3 | CTS2 | I | 3.3 | - | COM2, CTS |
| J3 | TXD3 | O | 3.3 | 2 | COM3, TXD |

Type Manual
Title HiCO Connect Richtlinie
Language English
Version Number **October 2007 – 006**

Print Date 03.07.2008 12:51:00
File Name hico_nect_v006en.doc
Template normal.dot
Print Two-sided
Page 8/16
Author Maurer

| Con | Name | Direction on CORE | Volt [V] | Current [mA] | Function |
|-----|-----------|-------------------|----------|--------------|---|
| J3 | RXD3 | I | 3.3 | - | COM3, RXD |
| J3 | RTS3 | O | 3.3 | 2 | COM3, RTS |
| J3 | CTS3 | I | 3.3 | - | COM3, CTS |
| J3 | MIC | A I | - | - | Audio:, microphone input |
| J3 | LINE_L | A I | - | - | Audio:, left line input |
| J3 | LINE_R | A I | - | - | Audio:, right line input |
| J3 | HEAD_L | A O | 5 | 40 | Audio, left head set output |
| J3 | HEAD_R | A O | 5 | 40 | Audio, right head set output |
| J3 | ETH_TDP | A O | - | - | Ethernet, transmit data positive |
| J3 | ETH_TDM | A O | - | - | Ethernet, transmit data negative |
| J3 | ETH_RDP | A I | - | - | Ethernet, receive data positive |
| J3 | ETH_RDN | A I | - | - | Ethernet, receive data negative |
| J3 | ETH_LED0# | O | 3.3 | 10 | Ethernet, link LED |
| J3 | ETH_LED1# | O | 3.3 | 10 | Ethernet, 10/100 Mbit LED |
| J3 | USBF_5V | I | 5 | - | USB Function, Vbus recognition |
| J3 | USBF_PU | O | 5 | - | USB Function, full speed pull-up resistor |
| J3 | USBF_DP | I/O | 5 | - | USB Function, data positive |

Type
Title
Language
Version Number

Manual
HiCO Connect Richtlinie
English
October 2007 – 006

Print Date
File Name
Template
Print
Page
Author

03.07.2008 12:51:00
hico_nect_v006en.doc
normal.dot
Two-sided
9/16
Maurer

| Con | Name | Direction on CORE | Volt [V] | Current [mA] | Function |
|-----|---------|-------------------|----------|--------------|-----------------------------|
| J3 | USBF_DM | I/O | 5 | - | USB Function, data negative |
| J3 | USBH_5V | O | 5 | 500 | USB Host, 5 V output |
| J3 | USBH_DP | I/O | 5 | - | USB Host, data positive |
| J3 | USBH_DM | I/O | 5 | - | USB Host, data negative |
| J1 | BAT | - | 3.0 | 10 μ A | 3 V battery input |
| J1 | VCC3 | - | - | - | + 3.3 V supply |
| J1 | VCC5 | - | - | - | +5 V supply, for USB |
| J1 | GND | - | - | - | Ground |
| J3 | AGND | - | - | - | Ground for audio signals |

| | |
|----------------|---------------------------|
| Type | Manual |
| Title | HiCO Connect Richtlinie |
| Language | English |
| Version Number | October 2007 – 006 |
| Print Date | 03.07.2008 12:51:00 |
| File Name | hico_nect_v006en.doc |
| Template | normal.dot |
| Print | Two-sided |
| Page | 10/16 |
| Author | Maurer |

4 AC Characteristics of the Signals

No specifications regarding the AC characteristics of the signals are available as yet.

The timing is determined by the used processors. For the processor SH-4 by RENESAS, the bus timing is adjustable through registers in a very flexible way; for the SH-3 by RENESAS processor it is fixed.

Whether the timing characteristics of the CORE and the carrier board match, must be determined for each individual case.

| | |
|----------------|---------------------------|
| Type | Manual |
| Title | HiCO Connect Richtlinie |
| Language | English |
| Version Number | October 2007 – 006 |
| Print Date | 03.07.2008 12:51:00 |
| File Name | hico_nect_v006en.doc |
| Template | normal.dot |
| Print | Two-sided |
| Page | 11/16 |
| Author | Maurer |

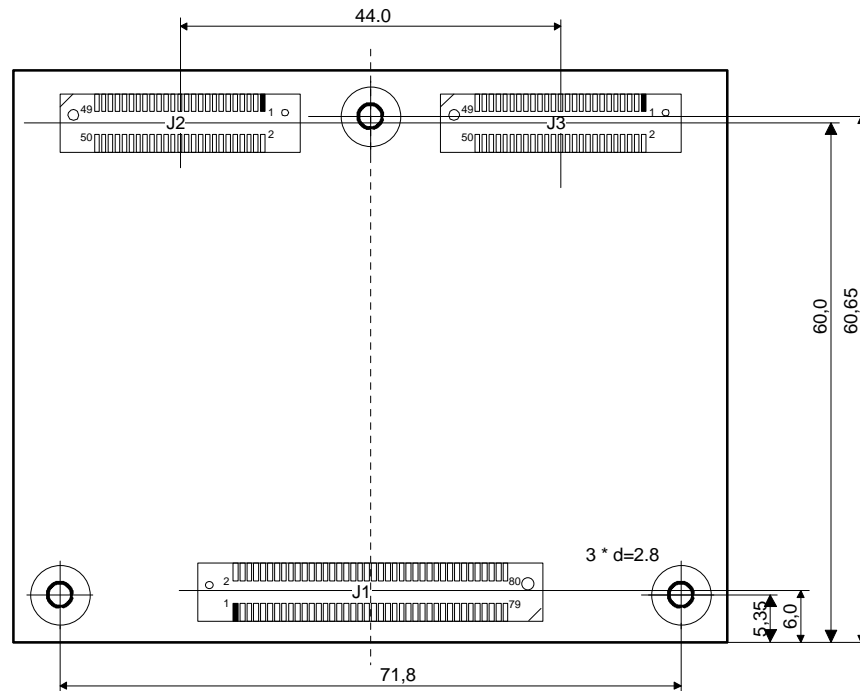
5 LCD Signal Color Table

| Signal | SH7760-TFT | ARM9-TFT |
|--------|------------|----------|
| LCD0 | Blue1 | Blue1 |
| LCD1 | Blue2 | Blue2 |
| LCD2 | Blue3 | Blue3 |
| LCD3 | Blue4 | Blue4 |
| LCD4 | Blue5 | Blue5 |
| LCD5 | Green0 | Green0 |
| LCD6 | Green1 | Green1 |
| LCD7 | Green2 | Green2 |
| GPIO0 | Green3 | Green3 |
| GPIO1 | Green4 | Green4 |
| GPIO2 | Green5 | Green5 |
| GPIO3 | Red1 | Red1 |
| GPIO4 | Red2 | Red2 |
| GPIO5 | Red3 | Red3 |
| GPIO6 | Red4 | Red4 |
| GPIO7 | Red5 | Red5 |
| GPIO8 | N.A. | Blue0 |
| GPIO9 | N.A. | Red0 |

| | |
|----------------|---------------------------|
| Type | Manual |
| Title | HiCO Connect Richtlinie |
| Language | English |
| Version Number | October 2007 – 006 |
| Print Date | 03.07.2008 12:51:00 |
| File Name | hico_nect_v006en.doc |
| Template | normal.dot |
| Print | Two-sided |
| Page | 12/16 |
| Author | Maurer |

6 Locations of Plug Connectors and Mounting Holes

The following diagram shows the locations of the plug connectors and mounting holes. The view is from the top to the CORE module or the carrier module. With a CORE module, the plug connectors are located at the bottom.



| | |
|----------------|---------------------------|
| Type | Manual |
| Title | HiCO Connect Richtlinie |
| Language | English |
| Version Number | October 2007 – 006 |
| Print Date | 03.07.2008 12:51:00 |
| File Name | hico_nect_v006en.doc |
| Template | normal.dot |
| Print | Two-sided |
| Page | 13/16 |
| Author | Maurer |

7 Connector Assignments

7.1 J1

Type Hirose FX6, 80-pin

| Pin | Signal | Pin | Signal |
|-----|--------|-----|--------|
| 1 | GND | 2 | VCC3 |
| 3 | ID0 | 4 | ID1 |
| 5 | ID2 | 6 | ID3 |
| 7 | A0 | 8 | A1 |
| 9 | A2 | 10 | A3 |
| 11 | A4 | 12 | A5 |
| 13 | A6 | 14 | A7 |
| 15 | A8 | 16 | A9 |
| 17 | A10 | 18 | A11 |
| 19 | A12 | 20 | A13 |
| 21 | A14 | 22 | A15 |
| 23 | A16 | 24 | A17 |
| 25 | A18 | 26 | A19 |
| 27 | A20 | 28 | A21 |
| 29 | A22 | 30 | A23 |
| 31 | A24 | 32 | A25 |
| 33 | GND | 34 | VCC3 |
| 35 | D0 | 36 | D1 |
| 37 | D2 | 38 | D3 |
| 39 | D4 | 40 | D5 |

| Pin | Signal | Pin | Signal |
|-----|--------|-----|--------|
| 41 | D6 | 42 | D7 |
| 43 | D8 | 44 | D9 |
| 45 | D10 | 46 | D11 |
| 47 | D12 | 48 | D13 |
| 49 | D14 | 50 | D15 |
| 51 | GND | 52 | VCC3 |
| 53 | DRQ | 54 | CLK |
| 55 | DACK# | 56 | BS# |
| 57 | IRQ0 | 58 | RD# |
| 59 | IRQ1 | 60 | WR# |
| 61 | IRQ2 | 62 | WE0# |
| 63 | IRQ3 | 64 | WE1# |
| 65 | NMI | 66 | WAIT# |
| 67 | RESO# | 68 | CS2# |
| 69 | RESI# | 70 | CS1# |
| 71 | CS0# | 72 | GND |
| 73 | BOOT8# | 74 | SDA5 |
| 75 | MD4 | 76 | SCL5 |
| 77 | BAT | 78 | VCC5 |
| 79 | GND | 80 | VCC3 |

Type
Title
Language
Version Number

Manual
HiCO Connect Richtlinie
English
October 2007 – 006

Print Date
File Name
Template
Print
Page
Author

03.07.2008 12:51:00
hico_nect_v006en.doc
normal.dot
Two-sided
14/16
Maurer

7.2 J2

Type Hirose FX6, 50-pin

| Pin | Signal | Pin | Signal |
|-----|----------|-----|----------|
| 1 | ENAVEE | 2 | GND |
| 3 | ENAVDD | 4 | REG# |
| 5 | DOFF# | 6 | VS1# |
| 7 | M | 8 | VS2# |
| 9 | FLM | 10 | RDY/BSY# |
| 11 | CL1 | 12 | CE1# |
| 13 | CL2 | 14 | CE2# |
| 15 | LCD0 | 16 | RESET |
| 17 | LCD1 | 18 | PDRV# |
| 19 | LCD2 | 20 | BVD1 |
| 21 | LCD3 | 22 | BVD2 |
| 23 | LCD4 | 24 | CD1# |
| 25 | LCD5 | 26 | CD2# |
| 27 | LCD6 | 28 | WAIT# |
| 29 | LCD7 | 30 | GND |
| 31 | GND | 32 | I_CE1# |
| 33 | ANA0 | 34 | I_CE2# |
| 35 | ANA1 | 36 | IOIS16# |
| 37 | GND | 38 | IORD# |
| 39 | MMC_IRQ | 40 | IOWR# |
| 41 | VCC3 | 42 | GND |
| 43 | MMC_CS# | 44 | TOUCH_X1 |
| 45 | MMC_SCLK | 46 | TOUCH_X2 |
| 47 | MMC_DI | 48 | TOUCH_Y1 |
| 49 | MMC_DO | 50 | TOUCH_Y2 |

Type
Title
Language
Version Number

Manual
HiCO Connect Richtlinie
English
October 2007 – 006

Print Date
File Name
Template
Print
Page
Author

03.07.2008 12:51:00
hico_nect_v006en.doc
normal.dot
Two-sided
15/16
Maurer

7.3 J3

Type Hirose FX6, 50-pin

| Pin | Signal | Pin | Signal |
|-----|-----------|-----|---------|
| 1 | GPIO0 | 2 | GPIO8 |
| 3 | GPIO1 | 4 | GPIO9 |
| 5 | GPIO2 | 6 | GPIO10 |
| 7 | GPIO3 | 8 | GPIO11 |
| 9 | GPIO4 | 10 | GPIO12 |
| 11 | GPIO5 | 12 | GPIO13 |
| 13 | GPIO6 | 14 | GPIO14 |
| 15 | GPIO7 | 16 | TXD2 |
| 17 | GND | 18 | RXD2 |
| 19 | TXD1# | 20 | RTS2 |
| 21 | RXD1# | 22 | CTS2 |
| 23 | RTS1# | 24 | TXD3 |
| 25 | CTS1# | 26 | RXD3 |
| 27 | DTR1# | 28 | RTS3 |
| 29 | DCD1# | 30 | CTS3 |
| 31 | ETH_LED0# | 32 | AGND |
| 33 | ETH_TDP | 34 | MIC |
| 35 | ETH_TDM | 36 | LINE_L |
| 37 | GND | 38 | LINE_R |
| 39 | ETH_RDP | 40 | HEAD_L |
| 41 | ETH_RDM | 42 | HEAD_R |
| 43 | ETH_LED1# | 44 | USBF_PU |
| 45 | USBH_5V | 46 | USBF_5V |
| 47 | USBH_DM | 48 | USBF_DM |
| 49 | USBH_DP | 50 | USBF_DP |

| | |
|----------------|---------------------------|
| Type | Manual |
| Title | HiCO Connect Richtlinie |
| Language | English |
| Version Number | October 2007 – 006 |

| | |
|------------|----------------------|
| Print Date | 03.07.2008 12:51:00 |
| File Name | hico_nect_v006en.doc |
| Template | normal.dot |
| Print | Two-sided |
| Page | 16/16 |
| Author | Maurer |