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In-Circuit Emulators for the C166 and C166S-V2 Architecture

Package Deal

- * EMUL166, 256 low-cost package Package includes the following: POD-167-N256-33, EMUL-PC/EPC or USB, the Getting Started manual, a cable and the Seehau software. **EMUL166-PC/E2Combo-256LC**
- * EMUL166, 256 package deal Package includes the following: POD-167-N256-33, EMUL166-PC/LT-IETR-33, EMUL-PC/EPC or USB, the "Getting Started Manual", a cable and the Seehau software. **EMUL166-PC/E2Combo-256**
- * The package deal listed above is a special that Nohau is offering while supplies last. Please note that the adapters for the package deal are sold separately.

Examples of How to Order EMUL166 Systems

Listed below are three examples of what parts to order for your EMUL166-PC system. Use the examples as a guide to help you in your ordering of a Nohau emulator system. To order a system for a different 166 derivative, select the same component type for that derivative. The following 166 price list contains all the components you will need to order your complete system. There are photos of systems and adapters to help you in your ordering. If you need assistance please contact your local rep, www.nohau.com/rep, or Nohau technical support: support@icetech.com or sales@icetech.com.

C161K System (Without Trace Card)

| | |
|------------------------|--------------------------|
| POD-167-N256-33 | Pod Board |
| EMUL-PC/EPC | Communications Interface |
| ET/AS-C161-QF14YAM-NOH | Target adapter |

C161RI System (With Trace Card)

| | |
|---------------------|--------------------------|
| POD-167E3-256-40 | Pod Board |
| EMUL166-PC/XP161RI | Daughter Card |
| EMUL166-PC/SABRE-40 | Trace Card |
| EMUL-PC/EPC | Communications Interface |
| ES-180-5690-50 | Target adapter |

C167 CR System (With Flex Cable)

| | |
|---------------------------|--------------------------|
| POD-167E3-256-40 | Pod Board |
| EMUL166-PC/SABRE-40 | Trace Card |
| EMUL-PC/EPC | Communications Interface |
| ET/AS-C167-QF10S-NOH | Target adapter |
| EMUL/ADP/FLEX-UNIV | Flex cable |
| EMUL/ADP/FLEX-ST10/166-RB | Rotational Boards |

The systems will also include the power supply, a BNC trace trigger cable, trace probe set, the Getting Started Manual and the Seehau Debugger software.

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Introduction

What this document is and about pricing

This price list is designed to be used by engineers, buyers and purchasing agents. It is widely quoted and used as an information source by Nohau representatives. The latest version is available from the Nohau website or from your local Nohau representative. If this document contains no prices, then it is called the parts list and is designed for distribution outside of the USA. In this case, contact your local Nohau rep for the price list for your country. Your rep may distribute this document with local prices listed. You can find the name of your rep by contacting Nohau as listed on this document.

What an emulator is and what it does

An emulator is a tool designed to assist engineers with software debugging and verification during the hardware/ software integration phase of their development project. The emulator temporarily replaces the microcontroller in the customer target system. The emulator behaves exactly like the processor with the added benefit of allowing you to view data and code inside the processor and control the operation of the CPU. You can load user code, view it in machine code or C source, set breakpoints on addresses and preset variables and registers. You can view data changes in real-time with the Shadow RAM feature. The emulator can be operated in stand-alone mode so development work can begin before the target system is available or complete.

Bondout Chips

The Nohau EMUL166-PC emulator uses an Infineon bondout microcontroller as the emulation processor. This special processor contains a C166 core surrounded with special emulation logic that provides emulator access to the C166 internal busses. The user target application sees the standard C166 microcontroller and the emulator sees a special C166 processor with emulation features including special signals and the internal XBUS, CPU and ROM bus. This allows the emulator visibility into the C166 core and triggers on internal reads, writes and ALU results. The bondout supports internal (single-chip) and external memory modes. Emulation RAM in the emulator provides ROM emulation with the bondout 32 bit ROM bus, program fetch and execution is at full speed. See the "The Embedded Software Engineer's Guide to In-Circuit Emulation" for more detailed information. See the end of this section under "More info is available" on where to get this document.

What the trace does and why people order one

You can set triggers on specified addresses and data which will stop the emulation and/or trace memory when this action occurs. This alerts you that the specified event has occurred and you may now use the information stored by the emulator to find any hardware or software errors. The trace memory records the microcontroller cycles including data reads and writes for user specified conditions. You can view the trace memory to find out what your code was actually doing at a particular time. Most people purchase the optional trace card due to its unique ability to save many hours of engineering time looking for elusive bugs.

Seehau - the Nohau debugger for the emulator

The emulator and its software is designed to be relatively intuitive to use. The Nohau debugging software is called "Seehau" and updates are available by subscription on the website. Seehau is macro based, that enables automatic operation. Seehau operates under Windows 95, 98, NT, XP, ME and 2000Pro. For more information about the benefits of Seehau, see www.icetech.com for the latest data sheets or call your Nohau representative.

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Introduction (Continued)

- OCDS Support** Nohau makes two OCDS (on chip debugging support) debuggers for the Infineon series of parts having this module. Currently these are for the C161 U, the C165 UTAH, the C165 H, the XC161 and the XC164. These debuggers use the JTAG port on these devices. The OCDS is specified for two levels. Level One offers basic program control of the CPU including GO, STOP and LOAD. From this start, the SeeHau software provides more advanced features for your debugging needs. The Nohau OCDS debugger provides this level of support today. Level Two includes trace and trigger features and is not implemented yet.
- Infineon C166, ST ST10 Cross Support** Infineon and STMicroelectronics provide the C166 and ST10 families respectively. These families are related and compatible to some extent. Nohau makes two emulators for the Infineon C166 and C166S-V2 families and three for the ST10 and Super10 families. It is possible to provide support for Infineon chips with the ST10 emulator and vice versa. Contact Nohau technical support for cross support of various devices and their specifications.
- Compiler Support** Nohau supports Altium (formerly Tasking), ChipTools and Keil C compilers and assemblers. Debugging formats supported are IEEE695, Intel HEX and OMF166. Nohau and its representatives are authorized distributors of Altium, ChipTools and Keil and provide technical support. It is possible to make changes to your source code in SeeHau and then call your compiler. The resulting object code is then loaded into the emulator for further debugging.
- RTOS Support** Nohau provides RTOS support through an ActiveX mechanism. Currently Embedded Power and CMX are supported. It is possible to support a customer developed RTOS also. See the Nohau website for details. OSEK support is now available. See DG-OSEK-166 on page 21 of this price list.
- More info is available** For more information on the entire embedded tool chain, get your copy of "The Embedded Software Engineer's Guide to In-Circuit Emulation" from your Nohau rep or from www.icetech.com. ICE Techn has other Nohau informative documents that are available from the same sources. Any questions can be directed to your Nohau rep or sales@icetech.com.

General Features

Pod Boards

- The C166 Family** The Infineon C166 family started with the original SAB80C166. Nohau does not support this device as its use is not widespread. It had its own bondout. The most famous of the family is the C167 CR with CAN (Controller Area Network) followed by the C165, C161, C163 and the C164. Nohau supports all these devices. Most of these are supported by the EMUL166-PC bondout emulator. These devices have a maximum clock speed from 20 to 40 MHz. The most common clock speed used is 20 MHz.
- C166S-V2** The latest member is the C166S family which includes the C166S-V2 which is targeted initially for the disk drive market. This device is very fast (up to 100 MHz) and uses one clock cycle per instruction. The C166 family uses two. The C166S-V2 has its own bondout. The emulator and trace card are not compatible with the C166 E2 or E3 emulators. The footprint for the target adapter is compatible but the signals generally are not. The C166S-V2 uses advanced pipeline and other techniques to provide very fast processing times. SeeHau is used for both the C166 and C166S-V2 emulators. The trace and triggers operate differently in the two emulator types.
- Do not confuse the C166S-V2 emulator body with the V2 C166 trace card. For unannounced C166S-V2 support, please contact Nohau USA.

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Pod Boards (Continued)

The Emulator or Pod Board for the C166 Emulator

The pod board is the main circuit board. The target adapter plugs into the bottom and the optional trace card plugs into the top. There is a socket for the daughtercard which is used for support of newer derivatives. The communications interface and the 5-volt power supply plugs into the emulator board. The emulator contains the Infineon bondout. There have been four bondouts produced plus, the one supporting the C166S-V2. The first was for the SAB80C166 and Nohau does not support this discontinued device. The E1 is obsolete and was a two-board emulator with two trace cards. The current E2, while still useful for many derivatives, is being replaced by the new E3. See the Nohau application note "Debugging with the E3 Bondout" for more information regarding the differences between the E2 and E3. There is an upgrade path for existing E2 emulators.

Nohau emulators operate in true real time without stealing CPU cycles for housekeeping functions. Nohau makes a new emulator pod for every new Infineon bondout rather than patching the new bondout to old emulator designs. This ensures full access to all bondout features. Nohau supports Altium, ChipTools and Keil C166 compilers and assemblers.

Emulating new XBUS peripherals

The bondout will not incorporate all the C166 family peripherals of a particular derivative to be supported. Examples are the I²C, J1850 ports and extra XRAM. These are all situated on the XBUS which is an internal representation of the external bus. The problem of providing these peripherals is solved with the Infineon two-chip emulation system. A daughtercard containing a production chip which will provide the XBUS peripherals to be emulated is plugged into the emulator. The emulator firmware then places this chip into emulation mode. The bondout can now access these peripherals as if they were in the bondout itself and still at full speed. A major advantage is you are given the latest peripheral modules from the daughtercard chip. For this reason, Nohau will use all the modules from the daughtercard even if these modules are in the bondout. Check the Product Support Table to see if you need to install a daughtercard to support your microcontroller.

Trace Cards

EMUL166-PC Background

Trace boards are optional on C166 and C166S-V2 emulators and they can be purchased and added at any time. Trace boards add trace memory for execution, data read and write history recording, triggers and Shadow RAM. The trace display includes address, data, timestamp, processor status, program flow, special bondout bus states, source code and labels. Shadow RAM displays data writes in real time without stealing emulation cycles. The trace board can be viewed and triggers can be configured without stealing CPU cycles for these housekeeping functions. Triggers can be set in any 1Mbyte range. The new Sabre trace card can trigger anywhere in the 16 MHz memory space.

The Trace boards for the C166 Emulator

There are two trace boards available. The trace is an option that can be added later. The LT can be used with the E2 or E3 emulator and has been available for about three years. Its part number is EMUL166-PC/LT-IETR-33. It works to 33 MHz. The Sabre, which became available January 2001, offers advanced triggering capabilities on many more events, especially events internal to the C166 part. It works only with the E3 emulator pod and not the E2. There is an upgrade path from the LT to the Sabre trace. Its part number is EMUL166-SABRE-40 and operates to 40 MHz.

The Trace card for the C166S-V2

The C166S-V2 is a new C166 CPU core. The "S" is the key difference. This core is not compatible with the regular C166 family. It is emulated with its own bondout and a new Nohau emulator. The trace card for the C166S-V2 plugs into the emulator as in the C166 emulator. It provides 128K frames of recorded executed instructions, Shadow RAM, filtering and three levels of advanced triggers. The triggers operate differently than those found on the C166 emulator and have more features. They are the same type as found on the ST10 bondout emulators. This trace card operates to 100 MHz and while it is an option, most people order the emulator with this trace card.

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Target Adapters and Evaluation Boards

- Target Adapter Basics** Target adapters are used to connect the emulator to your target system. Adapters should be carefully chosen in terms of cost, reusability, reliability and mechanical sturdiness. Each application requires different solutions. There are many methods used to connect Nohau C166 emulators to the target boards. For detailed information, please see the Nohau application note "Adapter Guide for the C167 and ST10 Emulator Families". It is available on the Nohau website or from your Nohau representative. There are four main methods to connect to your target as described below.
- Solder-down Adapters** The solder-down adapter is the most reliable, but needs special preparation of the target board. This adapter normally comes in two parts: the part that solders to the target board in place of the target chip, and a circuit board assembly that connects this part to the emulator. There are photos of these parts starting on page 13. The cost can be high and the part soldered down can't be easily removed and reused. This part can be purchased separately for replacement purposes.
- There are three types of solder down adapters: Emulation Technology (ET), Tokyo-Eletech, and Yamaichi. The Emulation Technology adapters are very common. The Tokyo-Eletech are similar and offer the ability to plug in the real production chip. The Yamaichi can also plug in the real chip, but it requires a slightly larger circuit board pad size for secure electrical connection; and this can cause some design problems especially, for the 144 pin versions. All these solutions offer excellent electrical connections and sturdiness.
- Dedicated headers** These are headers placed on the target board by the hardware designer. They are inexpensive and sturdy, but require circuit board space around the target. An example is the connector for PHYTEC kitCON boards and can be found on page 19.
- Clipover adapters** The Nohau clipover uses the Delta Probe concept which reduces many concerns normally found with clipover adapters. The Nohau Delta Probe features direct metallic connections that provide intermittent-free operation. The Delta Probe can be removed and reinstalled many times with the proper amount of care and skill. If damaged, they can be repaired for a modest fee by JM Engineering, the manufacturer of the Delta Probe. The interface board assembly between the Delta Probe and the emulator is made by Nohau. See www.jmecorp.com for more information.
- Flex Cables** Nohau has designed and made a high speed flex cable. This economical and popular cable works at speeds in excess of 100 MHz and can be used with every Nohau C166 target adapter. This cable is a true Faraday cage being entirely shielded even on its edges. This cable is a 50 ohm transmission line and is made of several layers for excellent crosstalk reduction. This cable consists of the cable itself and two rotational boards. One board connects the emulator at one end of the cable and the other connects any standard C166 or ST10 target adapter to the cable. By rotating these boards, the cable can approach the target from any of the four quadrants providing access no matter what the hardware configuration. These two boards can be replaced to use the cable for other microcontroller families. A photo of this cable system is on page 18.
- Extender Boards** Nohau supplies a number of extender boards that raise the emulator away from the target by 0.5 to a few inches for access purposes. One board provides a way to disconnect any signal path and to connect other test equipment. Another provides 3-volt support and more are planned. These boards generally fit between the emulator and any standard target adapter.
- PHYTEC kitCON evaluation boards** The Phytec series of evaluation boards for the C161, C163, C165, C164 and C167 are easily connected to Nohau emulators. These economical boards make excellent reference designs, offering a stable platform for comparison purposes. These are the official Infineon evaluation boards and are available through Nohau or Phytec directly. See page 19 for more details of www.phytec.com.
- PHYTEC phyCore Kit** Phytec manufactures the phyCORE system. The phyCORE target boards are used in customer series production and have no easy method of connection to the emulators. This allows for compact, inexpensive designs with low EMI emissions. A special board, called a phyCORE Debugging Module, is the same as the series version, but with special headers to allow fast and reliable connections to the Nohau emulator. See www.phytec.com for more information. Please refer to page 19 in this price list for more Phytec information.

What parts do I need to order?

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What parts do I need to order?

A C166 emulator system consists of the emulator pod or body, a communications system to your PC, and the optional trace card. A daughtercard may be needed depending on the C166 derivative you want to support. See the Product Support Table. A target adapter will normally be needed to connect the emulator to the target system. There are various types of these components that you will select to configure your desired system. Your local Nohau representative or the Nohau technical support team are able to assist you with selecting the appropriate components. The Seehau debugging software, technical support, warranty, accessories and manuals are automatically included and need not be specified in your order.



Minimum System Requirements

- Pentium 200 or higher for optimum performance
- 2x or better CD ROM
- 40 MB Free Hard Disk Space
- Windows 95, 98, 2000Pro, Me, XP or NT
- RAM for Windows 95/98/Me: 64MB
- RAM for Windows NT/2000Pro/XP: 128MB

It is possible to run Seehau on slower and smaller machines such as laptops. Nohau technical support reports that Seehau, as any large Windows based program, runs more reliably on larger and faster machines.

Application Notes on our website

The following is a list of information that can be found on Nohau's website. Go to www.icetech.com/documents and then select either the Technical Publications link, the Technical Application Notes link or the Nohau Manual link. There are also data sheets available on our website for the emulator and the Seehau software.

Materials listed under the Technical Publications link:

The Software Engineer's Guide to In-Circuit Emulation: Increase Your Debugging Skills!

Debugging with the Infineon E3 Bondout for the C166 family.

Product Focus: Nohau gives RTOS users easy access to the Seehau Interface.

Adapter for kitCON-C167CR for the Infineon C167 family.

Pinouts for the C166 and ST10 emulator direct connect headers.

Materials listed under the Technical Application Notes link:

Adapter guide for C167 and ST10 Emulator Families.

Case Studies - Connecting to targets.

Connecting the EMUL166 & EMUL-ST10 Emulators to your target system.

How to connect to the Keil MCB167 board with the Nohau emulator.

Configuring the External Access for the EMUL166 & EMUL-ST10 Families.

Materials listed under Nohau Manuals / EMUL166-PC:

Seehau 16x -the EMUL166-PC In-circuit Emulation Getting Started Manual.

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Product Support Tables

These charts display how the Infineon C166 family parts are supported by Nohau emulators. These tables list parts supported by the E2 and E3 emulators, the OCDS debugger and the C166S-V2 emulator respectively. Package types, speeds, ROM, ROMless and temperature ranges are not listed. Nohau emulators support all these derivatives. There are unannounced Infineon derivatives that Nohau currently supports or will support. Contact Nohau technical support in the USA at support@icetech.com for information on these parts.

A complete system consists of the following: an emulator, a daughtercard (if required), a communication interface, and an optional trace card.

C167 E2 and C167 E3 Table

| C161 | C163 | C164 | C165 | C167 |
|---|--------|---------|--------------------|---|
| C161 V/K/OR ▲ C161 RI ▲ C161 PI ▲ C161 PI-3V ▲ C161 JI ▲ C161 JC ▲ C161 CS C161 O C161 O-3V | ▲ C163 | C164 CI | C165 C165 Lx-3V | C167 S C167 SR C167 CR C167 CS |

▲ = Pods that need a daughtercard. Please refer to page 11 for the list of daughtercards.

OCDS Debugger Table

| C161 | C163 | C164 | C165 | C167 | XC161 | XC164 |
|--------|------------|------------|---------------------|------|-------|-------|
| C161 U | Call Nohau | Call Nohau | C165 UTAH C165 H | N/A | XC161 | XC164 |

C166S-V2 Table

| C164 | C166 |
|------------|----------|
| Call Nohau | C166S-V2 |

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Pod Boards

C167 E2 and C167 E3 Pod Boards

| | | |
|-----------------------------|--|-------------------------|
| E2 33 MHz pod with 256K RAM | A handheld E2 bondout emulator pod operating to 33 MHz supporting all devices listed in the "C167 E2 and C167 E3 Product Support Table". This pod has 512 Kbytes 32 bit ROM emulation memory and 256K general purpose 16 bit emulation memory. Features include unlimited hardware and software breakpoints, chip select or memory mapping and full access to the E2 bondout features. Requires a 5-volt supply, Seehau debugger software (both included) and comes with a "Getting Started Manual". Triggers, Trace Memory and Shadow RAM are supplied by the optional Sabre trace board. The 256K version is the most ordered E2 emulator model. | POD-167-N256-33 |
| E2 33 MHz pod with 1M RAM | As above with 1Mbyte general purpose emulation memory. | POD-167-N1M-33 |
| E3 40 MHz pod with 256K RAM | A handheld E3 bondout emulator pod operating to 40 MHz. This emulator has all the features of the E2 with the addition of a software adjustable clock source and a E3 specific design. The E3 emulator is replacing the E2 emulator. The E2 is still a viable emulator. The 256K version is the most ordered E3 emulator model. | POD-167E3-256-40 |
| E3 40 MHz pod with 1M RAM | As above with 1Mbyte general purpose emulation memory. | POD-167E3-N1M-40 |

C167 E2 and C167 E3 Trace Card

| | | |
|---|---|-------------------------------|
| LT 33 MHz trace board | 33 MHz trace with 128K deep buffer. This trace can trigger and filter on fetch, read and write addresses and on data values. (LT = "Large Trigger" within a 1MB trig range). This trace board is for E2 and E3 pods. Known as the "LT". | EMUL166-PC /LT-IETR-33 |
| Sabre 40 MHz trace card for the E3 emulator | The Sabre trace board offers advanced triggering capabilities over the entire 16Mbyte addressing space. The Sabre can record up to 128K frames of executed instructions and/or data or with user-specified filters. The trace display includes a timestamp, source and assembly (Mixed Mode), addresses, data and disassembled instructions. The trace window also displays the internal CPU bondout busses. The Sabre trace card plugs into the top of the emulator. | EMUL166-PC - SABRE-40 |

An application note for the E3 emulator ("Debugging with the E3 emulator") is available on Nohau's website.

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Pod Boards (Continued)

E2 to E3 and LT to Sabre Upgrades

| | | |
|---------------------|---|--|
| E2 to E3 upgrade | Exchange your POD-167-N256-33 for POD-167E3-256-40. See POD-167E3-256-40 for a description. Your pod should be in good working condition as determined by Nohau to be eligible for an exchange. | E2 to E3 Pod Board Upgrade |
| LT to Sabre upgrade | An LT to Sabre upgrade is available. Please call Nohau USA for more information. | LT to Sabre Trace Board Upgrade |

C166S-V2 Pod Boards

| | | |
|--|---|-------------------------|
| 100 MHz C166S-V2 pod with 256K RAM | This handheld pod has a maximum speed of 100 MHz and contains 256 Kbytes of user configurable 8 or 16 bit general purpose external emulation memory. There is 512 Kbytes of 64 bit ROM emulation RAM contained in the bondout. The emulator contains the Infineon C166S-V2 bondout controller. This emulator is normally purchased with the optional trace board for maximum benefits. Includes hardware and software breakpoints, chip select or memory mapping and full access to the bondout features. Requires a 5-volt supply, Seehau debugger software (both included) and comes with a "Getting Started Manual". Triggers, Trace Memory and Shadow RAM are supplied by the optional trace board. The 256K version is the most ordered model. | POD-C166SV2-256K |
| 100 MHz C166S-V2 pod with 1 M external RAM | As above with 1Mbyte general purpose emulation memory. | POD-C166SV2-1M |

C166S-V2 Trace Card

| | | |
|------------------------------|---|----------------------------------|
| C166S-V2 100 MHz trace board | 100 MHz trace with 128K deep buffer for the C166S-V2 pod. | EMUL-166S-V2-PC/TR128-100 |
|------------------------------|---|----------------------------------|

For additional C166S-V2 support, please contact Nohau technical support in the U.S.A.

C166S-V2 emulator sales and trials are restricted to firms and individuals who have signed the appropriate C166S-V2 NDA (non-disclosure agreement) with Infineon. Contact Nohau technical support in San Jose, California (support@icetech.com) for further details.

OCDS Debuggers

C161U, C165H and C165 UTAH

OCDS
debugger

This JTAG debugger supports Infineon OCDS microcontrollers such as the C161 U, C165 UTAH and C165 H. Call Nohau for support of the other devices. This product currently supports OCDS Level 1. Level 2 will be added as it becomes available for the Infineon microcontrollers. The debugger operates through the LPT port or with the included "wiggler" cable. The "wiggler" cable adheres to the Infineon target adapter specification JTAG Connector V2.1. The standard SeeHau user interface is used. This debugger does not need a communication interface or target adapter.

**EMUL166-OCDS-
PC**



Notes on OCDS C161U, C165H and C165 UTAH

The C161 U, C165 H and the C165 UTAH are best emulated with the Nohau OCDS debugger. This OCDS emulator supports all three devices. OCDS means "on chip debugging support". The E2 or E3 bondout controllers are not designed to support these OCDS parts. The C165 UTAH has a USB and HDLC module. This is the superset part. It has everything. The C161 U is the same without the HDLC module. The C165 H is the same as the UTAH but without the USB.

Nohau could make a daughtercard for emulation of the USB and HDLC controllers since they are on the XBUS; and the Infineon two-chip emulation scheme will work. In normal designs, the movement of data to and from these modules will be done using the PEC (peripheral event controller) for fast and efficient transfer rates. The issue is that the PEC that is used to transfer data to/from the USB or HDLC controller is different than the one in the Infineon bondout.

These three OCDS parts actually have two PEC channels - a DPEC and a EPEC. The HDLC uses the DPEC and the USB uses the EPEC. We are unable to access the DPEC on the daughtercard since it is not a XBUS module, and this PEC will go dead preventing emulation using PEC transfers. Throughput of data is too small to make the HDLC useful at high speeds. The EPEC (for USB) is mostly (but maybe not all) on the XBUS and not the core, and this will cause problems similar to those with the DPEC.

The Nohau OCDS debugger uses a production chip mounted on your target board, so all PECs are available for program use. The Nohau OCDS is called a debugger rather than an emulator since it is not always non-intrusive, does not have bondout device-like access to the CPU core and internal busses, and does not have trace and triggers like the full emulators.

XC161 and XC164

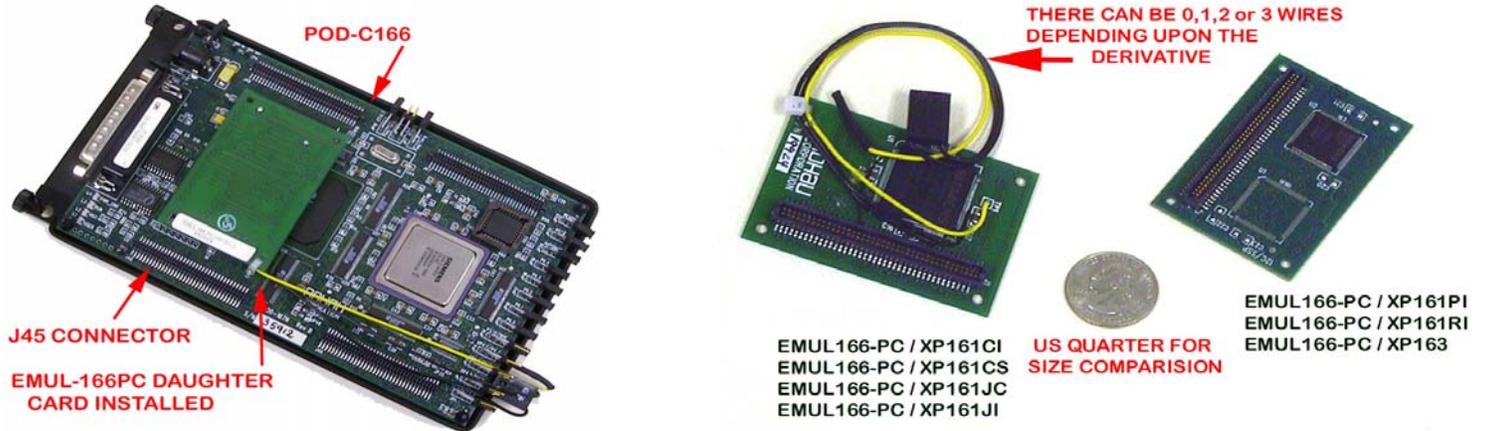
OCDS
debugger "x"

This JTAG debugger supports Infineon OCDS microcontrollers such as the XC161 and the XC164. Call Nohau for support of the other devices. This product currently supports OCDS Level 1 including watchpoints. Level 2 will be added as it becomes available for the Infineon microcontrollers. The debugger operates through the LPT port or with the included "wiggler" cable. The "wiggler" cable adheres to the Infineon target adapter specification JTAG Connector V2.1. The standard SeeHau user interface is used. This debugger does not need a communication interface or target adapter.

**EMUL166-OCDS-
XC16x -PC**



Daughterboards for Xperipherals and XRAM



| | | |
|--------------------------------------|---|-----------------------------------|
| <p>Daughterboard for the C161 RI</p> | <p>This daughterboard is required to emulate the C161 RI. It fits on header J45 of the pod and gives the ability to emulate the I2C and XRAM of the C161 RI.</p> | <p>EMUL166-PC /XP161RI</p> |
| <p>Daughterboard for the C161 JI</p> | <p>This daughterboard is required to emulate the C161 JI. It fits on header J45 of the pod and gives the ability to emulate the I2C, XRAM and J1850 ports of the C161 JI.</p> | <p>EMUL166-PC /XP161JI</p> |
| <p>Daughterboard for the C161 JC</p> | <p>This daughterboard is required to emulate the C161 JC. It fits on header J45 of the pod and gives the ability to emulate the I2C, XRAM and 2 CAN modules of the C161 JC.</p> | <p>EMUL166-PC /XP161JC</p> |
| <p>Daughterboard for the C161 CS</p> | <p>This daughterboard is required to emulate the C161 CS. It fits on header J45 of the pod and gives the ability to emulate the I2C, XRAM and 2 CAN modules of the C161 CS.</p> | <p>EMUL166-PC /XP161CS</p> |
| <p>Daughterboard for the C161 PI</p> | <p>This daughterboard is required to emulate the C161 PI. It fits on header J45 of the pod and emulates the I2C and XRAM of the C161 PI.</p> | <p>EMUL166-PC /XP161PI</p> |
| <p>Daughterboard for the C163</p> | <p>This daughterboard is required to emulate the C163. It fits on header J45 of the pod and gives the ability to emulate the SSP and XRAM of the C163.</p> | <p>EMUL166-PC /XP163</p> |

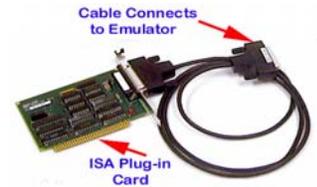
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Communication Interfaces

These communication interfaces must be connected to a pod board to operate (order separately). The communication interface includes a cable that connects to the pod board.

ISA plug-in board This communication interface is an ISA plug-in board (EMUL-LC/ISA) that communicates with the pod board.

EMUL-PC / LC-B



EPC - LPTx printer port Emulator Parallel Cable which communicates with the pod through a standard PC parallel port (LPTx).

EMUL-PC / EPC



USB Interface The new USB interface is available now. This cable connects to the USB connector on the appropriately equipped PC and to the emulator with the standard 25-pin D shell connector. This cable will work with all Windows versions that support USB and such as Windows 98 and 2000Pro/XP.

EMUL-PC/USB



Communications Interface Upgrade

EPC to USB upgrade Exchange your ⁺EPC for the new USB cable.

EPC to USB upgrade

⁺EPC must be in working condition as determined by Nohau's Technical Support.

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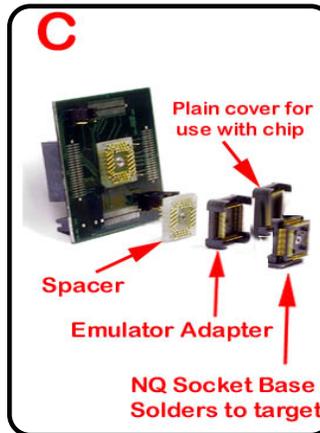
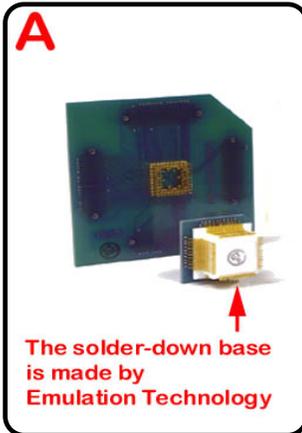
Emulator to Target Adapters and Accessories

Adapter Summary - Use this chart to select the correct adapter

The capital letters in the chart below correspond to the pictures below the chart. The photos below may not be exactly as illustrated. Note: Flex cables are available. Please see the "Extender Flex Cable Assemblies" section in this price list. You can use the flex cables with all the adapters.

If you purchase an emulator and you have (or purchase) a Phytect board, the adapters for the kitCON 16x are free.

| MCU | C161 | C163/C165 | C164 | C167 |
|--------------------------------|---|--|---|---|
| Adapters for kitCON 16X | EMUL166-PC/ADP-EVAL-161 O/V/K See photo D. | A solder-down adapter has to be used. | EMUL166-PC/EVAL-164CI See photo D. | EMUL166-PC/ADP-EVAL-167CR See photo D. |
| MCU | C161 | C163/C165 | C164 | C167 |
| Solder-Down Adapter | ET/AS-C161-QF14S-NOH 80 Pin Package. See photo A. Square ES/180-5690-50 | ET/R163/C165-QF49S-NOH 100 Pin Package. See photo A. Square ET/C165-QF06S-NOH | ES/180-5550-20 \$0 80 Pin Package. See photo C. | ET/AS-C167-QF10S-NOH 144 Pin Package. See photo A. |
| | 100 Pin Package. See photo C. Rectangle ES/180-5680-10 | 100 Pin Package. Photo A. Rectangle | | |
| | 100 Pin Package. See photo C. Square ES/180-5785-10 | | | |
| | 128 Pin Package. See photo C. Square | | | |
| | | | | |
| Yamaichi Adapter | ET/AS-C161-QF14YAM-NOH 80 Pin Package. See photo B. Square | ET/R163/C165-QF49YAM-NOH 100 Pin Package. See photo B. Square | ES-180-5550-30 80 Pin Package. See photo B. Square | ET/AS-C167-QF10YAM-NOH 144 Pin Package. See photo B. |
| Replacement Socket | ET/EPP-080-QF14A-SM 80 Pin Package. See photo A. ES/180-000-2233 100 Pin Package. Photo C. Rectangle ES/180-000-2225 100 Pin base. See photo C ES/180-000-2226 100 Pin IC cover. See photo C. ES/180-000-2227 100 Pin adapter cover. See photo C. ES/180-000-3706 Spacer. See photo C. | ET/EPP-100-QF49-SM 100 Pin Package. See photo A. ET/EPP-100-QF06-SM 100 Pin Package. See photo A. | ES-000-2177-00 80 Pin Package. See photo C. | ET/EPP-144-QF10-SM 144 Pin Package. See photo A. |



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Emulator to Target Adapters and Accessories (Continued)

For detailed adapter information, please refer to page 4 of this price list.

The Yamaichi solder down adapter is available from Adapters.com

Tokyo Eletech NQ Adapter Section

The Tokyo Eletech NQ adapter is made up of three parts. The bottom part solders to the target board in place of the target CPU. The next part connects the emulator to this solder down adapter. The third part allows a real C16x chip to be used in the target instead of the emulator for final testing. There is also an optional sacrificial spacer that is used to protect the solder-down adapter male pins and to provide about 1/8" (3.75mm) of clearance. Replacement solder down parts can be purchased separately. Tokyo Eletech makes a TQ adapter without the third part that is not used in the C166 family at this time.

C161

C161 O/V/K Phytec kitCON Adapter This adapter fits between the pod bottom connectors and the target. It is used by C161 O/V/K target boards and Phytec kitCON C161 board. See picture D on page 13.

EMUL166-PC/ADP-EVAL-161 O/V/K

C161 eval board adapter This adapter connects the Nohau emulator to a user defined C161 target board. The specs are available from Nohau technical support in the USA.

EMUL166-PC/ADP-EVAL-161 CI

80-pin adapter for the C161 (square) An 80-pin MQFP adapter for the square C161. The bottom portion solders to the user board. An additional solder-down base is available: part number ET/EPP-080-QF14A-SM. See picture A on page 13.

ET / AS-C161-QF14S-NOH

Replacement solder-down adapter A replacement 80-pin MQFP solder-down adapter for the ET/AS-C161-QF14S-NOH, listed above.

ET / EPP-080-QF14A-SM



80-pin adapter for the C161 V/K/O An 80-pin MQFP adapter for the square C161 V/K/O. The bottom portion of this adapter screws down to the top of the Yamaichi 80-pin socket (solder-down adapter IC149-080-017-B5 is not included, it can be purchased through Adapters.com). The top board connects to the bottom of the pod. See picture B on page 13.

ET / AS-C161-QF14YAM-NOH

100-pin adapter for the C161 RI (rectangular) A 100-pin MQFP adapter for the rectangular C161 RI package. It is a Tokyo Eletech NQ adapter. Refer to the Tokyo Eletech NQ Adapter section above for a description. See the picture C on page 13.

ES/180-5690-50

Replacement solder-down adapter A replacement 100-pin MQFP solder-down adapter for the ES-180-5690-50. See picture C on page 13.

ES/180-000-2233

128-pin adapter for the 161 Cx (square) A 128-pin TQFP adapter for the square C161 Cx package. It is a Tokyo Eletech NQ adapter. Refer to the Tokyo Eletech NQ Adapter section above for a description. See the picture C on page 13.

ES/180-5785-10

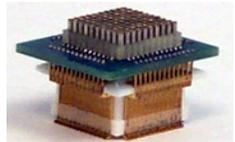
Emulator to Target Adapters and Accessories (Continued)

C161 (continued)

| | | |
|--|---|------------------------|
| 100-pin adapter for the C161 RI (square) | A 100-pin TQFP adapter for the square C161 RI package. It is a Tokyo Eletech NQ adapter. Refer to the Tokyo Eletech NQ Adapter section above for a description. See the picture C on page 13. | ES-180-5680-10 |
| Replacement solder-down adapter base | A replacement 100-pin NQ TQFP solder-down adapter base for the ES-180-5680-10. See picture C on page 13. | ES/180-000-2225 |
| Replacement IC cover | A replacement 100-pin TQFP plain IC cover for the ES-180-5680-10. See picture C on page 13. | ES/180-000-2226 |
| Replacement adapter cover | A replacement 100-pin TQFP emulator adapter cover for the ES-180-5680-10. See picture C on page 13. | ES/180-000-2227 |
| Replacement spacer | A replacement 100-pin TQFP spacer for the ES-180-5680-10. See picture C on page 13. | ES/180-000-3706 |

C163 and C165

| | | |
|--|--|-------------------------------------|
| 100-pin adapter for the C163 and C165 | A 100-pin TQFP adapter for the square C163 and C165. The bottom portion solders to the user board. Additional solder-down base is available, part number ET/EPP-100-QF49-SM. See picture A on page 13. | ET / R163/C165-QF49S-NOH |
| Replacement solder-down adapter | A replacement 100-pin TQFP solder-down adapter for the ET/R163/C165-QF49S-NOH, listed above. | ET / EPP-100-QF49-SM |
| 100-pin adapter for the C163 and C165 YAM (square) | A 100-pin TQFP adapter for the square C163 and C165. The bottom portion of this adapter screws down to the top of the Yamaichi 100-pin socket (solder-down adapter IC149-100-014-S5 is not included; it can be purchased through Adapters.com). The top board connects to the bottom of the pod. See picture B on page 13. | ET / R163 / C165-QF49YAM-NOH |
| 100-pin adapter for the C165 (rectangular) | A 100-pin MQFP adapter for the rectangular C165. The bottom portion solders to the user board. An additional solder-down base is available, part number ET/EPP-100-QF06-SM. See picture A on page 13. | ET / C165-QF06S-NOH |
| Replacement solder-down adapter | A replacement 100-pin MQFP solder-down adapter for the ET/C165-QF06S-NOH, listed above. | ET / EPP-100-QF06-SM |



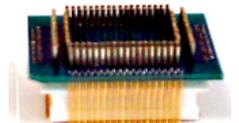
Emulator to Target Adapters and Accessories (Continued)

C164

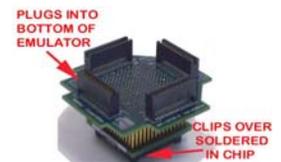
| | | |
|---|---|----------------------------------|
| C164 CI Phytec kitCON Adapter | This adapter fits between the pod bottom connectors and the target. It is used by the C164 CI and Phytec kitCON C164CI board. See picture D on page 13. | EMUL166-PC/ADP-EVAL-164CI |
| 80-pin adapter for the C164 CI. Solder-down base (square) | An 80-pin TQFP adapter for the square C164 CI package. It is a Tokyo Eletech NQ adapter. Refer to the Tokyo Eletech NQ Adapter section on page 13 for a description. See picture C on page 13. | ES-180-5550-20 |
| Replacement solder-down socket | A replacement 80-pin TQFP solder-down adapter for the ES-180-5550-20. See picture C on page 13. | ES-000-2177-00 |
| 80-pin adapter for the C164 CI Yamaichi (square) | An 80-pin MQFP adapter for the square C164 CI. The bottom adapter screws down to the top of the Yamaichi 80-pin socket (IC149 series). The top board connects to the bottom of the pod. See picture B on page 13. | ES-180-5550-30 |

C167

| | | |
|--|--|------------------------------------|
| C167 CR Phytec kitCON adapter | A 144-pin adapter with 4*40-pin connectors (female) on both sides. It fits between the pod bottom connectors and the target. It is used by C167/C167 CR target boards and Phytec kitCON C167 CR board. See picture D on page 13. | EMUL166-PC/ADP-EVAL-167CR |
| 144-pin adapter for the C167 /CR/SR (square) | A 144-pin MQFP adapter for the square C167 /CR/SR. The bottom adapter solders to the user board. Additional solder-down base is available, part number ET/EPP-144-QF10-SM. See picture A on page 13. | ET / AS-C167-QF10S-NOH |
| Replacement solder-down adapter | A replacement 144-pin MQFP solder-down adapter for the ET/AS-C167-QF10S-NOH, listed above. | ET / EPP-144-QF10-SM |
| 144-pin Yamaichi adapter for the C167 (square) | A 144-pin MQFP adapter for the square C167. The bottom portion of this adapter screws down to the top of the Yamaichi 144-pin socket (solder-down adapter IC149-144-K11453-05 is not included; it can be purchased through Adapters.com). The top board connects to the bottom of the pod. See picture B on page 13. | ET / AS-C167-QF10S-YAM-NOH |
| Clipover adapter | A clipover Delta Probe for the Infineon C167 and STMicroelectronics ST10 144-pin microcontrollers such as C167 CR and ST10-F168. | EMUL166-PC/ADP-144PIN-DELTA |



ET / AS-C167-QF10S-YAM-NOH



EMUL166-PC/ADP-144PIN-DELTA

Emulator to Target Adapters and Accessories (Continued)

Isolator/Extender and Conversion Cards

Isolator and
extender for all
C16x pods

An isolator/extender for all C16x pods. Adds about 2" (50.8mm) of clearance between the pod and the target and has jumpers allowing individual isolation of each pin to the target. Comes with comprehensive pinout specifications which are also available on our website.

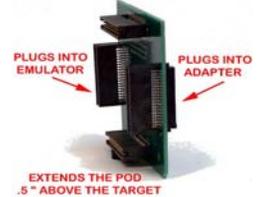
ISO166/ST10-EXT



Extender
board

This board fits between the pod and the adapter to give additional clearance between the pod and the target. It raises the pod an additional 0.50" (12.7mm) above the target. It does not support the 10-pin XBUS connector (JP46) used by some Xperipheral daughtercards.

EMUL166-PC/Extender-144



80-pin
conversion
adapter

An emulator conversion adapter, 80-pin, .65mm pitch. This adapter plugs into/covers a Yamaichi 80-pin socket part # IC149-080-117/017-B5/S5 to Adapters.com's 80-pin .65mm pitch TQ and NQ male pin patterns (000-4532 = TQ/000-2177-00 = NQ).

ES-110-7400-15



Socket
adapter

A PQFP socket adapter, base solders down into 144-pin QFP AMP production socket footprint.

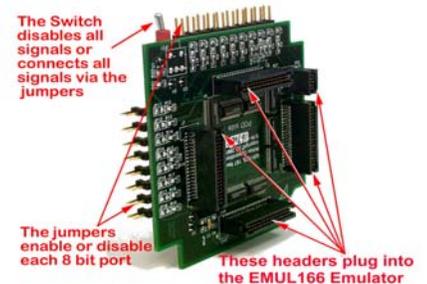
EMUL166-PC/ADP-PGA144



3V Adapter /
Isolator

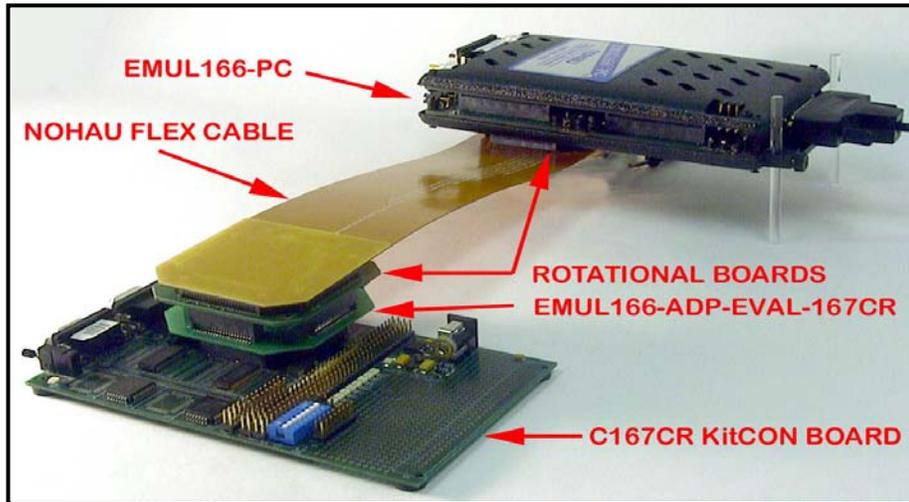
This mezzanine board inserts between the emulator and the target adapter to provide 3-volt target operation. Currently this supports the C161 and C165 3-volt parts, but will support all future C166 and ST10 3-volt versions. There are jumpers to allow any parallel port in its entirety to be disconnected from the target.

EMUL166-PC/ADP-3V



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Extender Flex Cable Assemblies



Nohau 10-inch flex cable A 10-inch flex cable used to extend an adapter away from the emulator board. This flex cable is made by Nohau and is a 50 ohm transmission line that works at speeds in excess of 100 MHz. Requires a rotational board pair (EMUL/ADP/FLEX-ST10/166-RB) for connection at each end. The combined assembly is inserted between the emulator and the target adapter. By rotating these boards, the cable can approach the target from any of four quadrants providing access no matter what the hardware configuration.

**EMUL / ADP /
FLEX-UNIV**

Rotational boards Set of two rotational boards to use with the flex cable to extend the adapter away from the emulator. One of the boards fits between the pod and flex cable, and the other board fits between the flex cable and the target adapter. Rotational boards for other microcontroller families are available through Nohau. Mechanical specifications are available for the custom rotational boards.

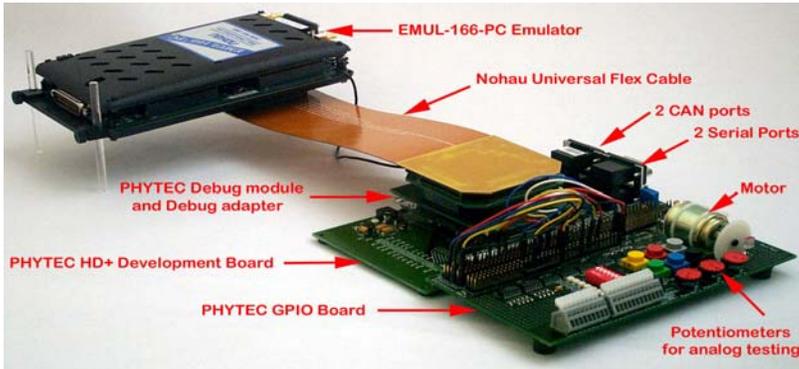
**EMUL / ADP /
FLEX-ST10/166-
RB**

Adapters.com 80-pin flex cable This cable is made by Adapters.com for connection to the Tokyo Eletech NQ solder-down sockets. This is an 80-pin, .65mm pitch high-speed emulator flex cable. Interfaces to Adapters.com's 80-pin TQ Series part # 000-4532 and NQ Series part # 000-2177-00.

ES-110-8135-40

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Evaluation Boards From PHYTEC



Evaluation boards from PHYTEC can be purchased through Nohau, your Nohau representative or directly from PHYTEC: www.phytec.com or 1-800-278-9913.

These are the same starter kits as sold by Infineon.

If you purchase an emulator and you have (or purchase) a PHYTEC kitCON board, the adapters for kitCON 16x are free.

| | | |
|------------------------------------|--|---------------------------|
| Evaluation board for the C161 | kitCON161 evaluation board. Used with the ADP/EVAL-161 O/V/K adapter. (Includes this 161 adapter with an emulator and trace board purchase.) | Infineon / SABC1610START |
| Evaluation board for the C163/C165 | kitCON163 evaluation board. Same board used for C165 CPU. You need to use a solder-down adapter. | Infineon / SABC163FSTART |
| Evaluation board for the C164 | kitCON164 evaluation board. Used with the ADP/EVAL-164 CI adapter. (Includes this 164 adapter with an emulator and trace board purchase.) | Infineon / SABC164CISTART |
| Evaluation board for the C167 | kitCON167 evaluation board. Used with the ADP/EVAL-167CR adapter. (Includes this 167 adapter with an emulator and trace board purchase.) | Infineon / SABC167CRSTART |
| C167 CR Phytec kitCON adapter | A 144-pin adapter with 4*40-pin connectors (female) on both sides. It fits between the pod bottom connectors and the target. It is used by C167/C167 CR target boards and Phytec kitCON C167 CR board. See picture D on page 13. The four headers to be soldered to the kitCON board are included. | EMUL166-PC/ADP-EVAL-167CR |

| MCU | C161 | C163/C165 | C164 | C167 |
|-------------------------|-------------------------------|--|-----------------------|---------------------------|
| Adapters for kitCON 16X | EMUL166-PC/ADP-EVAL-161 O/V/K | A solder-down adapter has to be used, see page 13. | EMUL166-PC-EVAL-164CI | EMUL166-PC/ADP-EVAL-167CR |

| | | |
|-------------------------------|---|-------------|
| phyCORE Rapid Development Kit | This is a series production module designed for use in a customer final product or a PHYTEC development board. This phyCORE module contains a C167 CR Infineon controller, FLASH, RAM and support circuitry in a compact package. To connect a Nohau emulator for program development, a special debug module is available. | KPCM-009 |
| Debug Kit | This module has the same electrical characteristics and pinout as the phyCORE module and is used in its place during the debugging phase. The Nohau emulator plugs into the debug module via the DA-004-C1 converter adapter. No additional target adapter is needed, although the Nohau Flex cable and isolator boards can be used. This part (KDCM-009-C1) consists of part numbers: DCM-009 and DA-004-C1. | KDCM-009-C1 |
| GPIO | This board connects to the Development board to add useful devices such as a DC motor, potentiometers, pushbuttons, LEDs, dipswitches, and connection for a serial LCD. A wire wrap and breadboard areas are provided, as well as all microcontroller signal lines. | PCM-989 |

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Software Support Packages

Compiler Packages

Contact the individual vendor for software upgrades.

Altium (Formerly Tasking)

Assembler; C Compiler; Linker; Simulator; EDE

* 80C166 C-compiler, assembler, linker, simulator and EDE plus C++ Preprocessor.

**TASKING/TK019
012**

* 80C166 C-compiler, assembler, linker, simulator and EDE.

**TASKING/TK019
002**

80C166 C-compiler, assembler, linker, simulator and EDE plus C++ Preprocessor.

**TASKING/TK019
024**

Tasking is a registered trademark of Altium Software BV.
Keil Software is a registered trademark of Keil Software, Inc.

RTOS Packages

CMX Systems, Inc.

CMX-RTX is a truly preemptive, multi-tasking, RTOS supporting the entire Infineon C166 microcontroller family. This RTOS offers the smallest footprint, the fastest context switching times, and the shortest interrupt latency times available on the market today. Each additional user is \$2,300 each. A smaller version called Tiny+ is available for \$3,000.

**80C16x-CMX-
RTX**

CMX-RTX is a truly preemptive, multi-tasking, RTOS supporting the entire Infineon C166S-V2 micro-controller family. This RTOS offers the smallest footprint, the fastest context switching times, and the shortest interrupt latency times available on the market today. Each additional user is \$2,300 each.

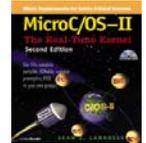
**80C166S-V2-
CMX-RTX**

CMX Systems is a trademark of CMX Systems, Inc.

* Micrium, Inc.

* MicroC/OS-II RTOS 600-page book by Jean Labrosse. This includes a CD-ROM with source code.
ISBN 1-57820-103-9.

MicroC/OS-II



Micrium is a trademark of Micrium, Inc.

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Software Support Packages (Continued)

RTOS Aware Debugger Extensions

CMX Systems, Inc.

CMXKAware is an Active X object that runs in conjunction with the Seehau debugger software. It presents all of the RTOS specific information on the screen. This RTOS debugging module can control the emulator. This feature can be previewed in the standard Seehau software package. Access it by clicking on - View/Realtime OS/Select/CMXKAware. No target resources are used.

**80C16x-
CMXKAware**

CMX Systems is a trademark of CMX Systems, Inc.

This is an Active-x control for OSEK/VDX kernel aware debugging. It provides task, stack, timer, event and message information. The realtime graph displays of task/services, service coverage and stack coverage require the trace card.

DG-OSEK-166

DG is a trademark of the Dearborn Group, Inc.

Extended Hardware Warranties

Purchase of each major EMUL166-PC item is covered by a one-year warranty as described elsewhere in this list. At the end of the first year, an additional year of hardware service coverage is available. Coverage must be continuous and is not available if coverage has been allowed to lapse. An additional year of coverage may also be purchased each year at the time an additional paid year's coverage ends. It is the customer's responsibility to renew hardware warranties.

No warranty expiration reminder notices will be sent to customers by Nohau.

Communication interface extended warranty coverage, 1 year

Communication interface

Trace extended warranty coverage, 1 year

Trace

****Pod extended warranty coverage, 1 year**

Pod

**Bondout pods are warranted for one replacement if Nohau determines the failure was not due to damage caused by the user's action.

Non-Warranty Repairs

Repair service is for units beyond an applicable initial one-year warranty period, repairs not covered by that warranty, or for customers who have elected to not carry an extended hardware warranty.

Hourly rate

Minimum charge

Maximum charge

One Half the purchase price.

Where to get help

For help in configuring your system, choosing an emulator, a pod board, adapters, a trace card or any other items please contact Nohau or your local representative.

Telephone: 800 686-6428 or 650.375.0409

Email: sales@icetech.com

* Denotes new item since last price list. Prices listed are valid in the U.S.A. only.

Support: support@icetech.com

PH: 650.375.0409 **PH:** 800.686.6428 **Fax:** 650.375.8666 **Email:** sales@icetech.com **Web:** www.icetech.com

Website: www.icetech.com

~ Please use this fax number to fax purchase orders

Prices, specifications, and availability are subject to change without notice. Depending on stock availability, orders placed before 12 noon Pacific Time according to ICE Technology terms and conditions are shipped the same day. Orders placed after noon are shipped the following business day. The EMUL166-PC Communication interface, Trace board, Communication interface Cable, and Pod (excluding the bondout processor) are sold with a one-year warranty starting from the date of purchase. The bondout processor on the POD is warranted for one replacement if Nohau determines the failure was not due to damage caused by the user's action. Each optional adapter, cable, and extender is sold with a 90-day warranty, except that it may be subject to repair charges if damage was caused by the user's actions. The SeeHau Debugger software is sold with no warranty. Upgrades will be distributed to all customers up to one year from the date of purchase and are also available on the website with a maintenance subscription. ICE Technology makes no warranties, express or implied, including, but not limited to, the implied warranties of merchantability and fitness for a particular use. In no event will Nohau Corporation be liable for consequential damages.

Third-party software sold by ICE Technology carries the manufacturer's warranty. EMUL166-PC is a trademark of ICE Technology. 80C166 is a registered trademark of Infineon Corporation. ST10 is a trade-mark of STMicroelectronics. Windows is a registered trademark of Microsoft Corp.

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