

# iC5700 Debugger & On-Chip Analyzer

V1.6

## User Manual



Enabling Safer Embedded Systems

This document and all documents accompanying it are copyrighted by iSYSTEM AG and all rights are reserved. Duplication of these documents is allowed for personal use. In all other cases, written consent from iSYSTEM is required.

Copyright © iSYSTEM AG.

All rights reserved.

All trademarks are property of their respective owners.

iSYSTEM is an ISO 9001 certified company.

[www.isystem.com](http://www.isystem.com)

# Contents

Introduction .....	1
Important safety notice .....	2
Package content .....	3
Specifications .....	4
Operation.....	5
Device overview .....	5
Device description .....	5
Connecting the iC5700 to the target hardware .....	8
Grounding wire .....	8
Power Supply .....	8
Debug Adapter .....	8
FNET .....	11
IOM6 Hub.....	12
Active Probes .....	12
IOM6 Add-On Modules .....	12
Accessories .....	13
IOM6 product line.....	13
Power supplies and cables .....	13
Standard debug adapters.....	14
Declarations .....	15
Technical support .....	16

# Introduction

The iC5700 BlueBox On-Chip Analyzer is a hardware platform designed for debugging and testing a wide range of embedded microcontroller platforms that are based on a variety of processor architectures.

Functionality can be further extended with the addition of our IOM6 accessories, enabling the synchronous capture of analog and digital signals in parallel to trace information. Such capability is used for advanced debugging of complex applications together with our winIDEA Integrated Development Environment (IDE), as well as for thorough testing in conjunction with our testing environment testIDEA.

Complementing the hardware is a range of software which target three key areas of embedded development: debugging, timing-analysis and testing.

**winIDEA** – The winIDEA Integration Development Environment (IDE) delivers the visual insights required to debug your embedded application. At the simplest level, winIDEA provides all the usual functionality of an IDE, such as breakpoints, stepping and device programming. When supported by a target microcontroller, winIDEA can also visualize the timing and code coverage of the application via the trace interface, as well as combine data captured by the IOM6 accessories. Various third-parties also provide software tools to perform advanced worst-time-execution analysis based upon the data winIDEA can export. When a Real-Time Operating System (RTOS) is in use, the state of the RTOS and its tasks can also be visualized.

**testIDEA** – The testIDEA environment simplifies the development of unit tests for embedded applications. By making use of the winIDEA environment, this application makes it easy to locate source code functions and generate test cases for them. Tests are then executed using the Original Binary Code (OBC) method, testing the object code running on the target microcontroller. The tests, which are stored as YAML files, can easily be added to a project, maintained in a repository, and then automatically executed together with Continuous Integration (CI) tools such as Jenkins.

**isystem.connect** – There are times when it is more efficient to write a script to execute a task that requires many clicks within a visual development environment. This is where our Software Development Kit (SDK) isystem.connect comes in. The well-documented interface provides access to Python, Java, C++ and other languages so that any action available within winIDEA and testIDEA can be scripted. Scripts can also be executed directly from within winIDEA, thereby allowing the developer to extend its functionality.

iSYSTEM BlueBox solutions best run under iSYSTEM winIDEA™ IDE or within the Eclipse IDE environment through a plug-in. winIDEA™ is a native Microsoft® Windows® application and as such best performs on Windows 7 and Windows 10 platforms. It also runs on Linux operating system with help of Wine. All our software can be downloaded from the Downloads page at <http://www.isystem.com>.

# Important safety notice

## General safety instructions

Please read the following safety precautions carefully before putting this device to use to avoid any personal injuries, damage to the instrument, or to the target system.

Use this instrument only for its intended purpose as specified by this manual to prevent potential hazards.

## Use included power cord and power supply

The enclosed power supply has been approved for use by iSYSTEM. Please contact iSYSTEM if you need to consider an alternative power.

## Use grounding wire

Prior to applying power to either the BlueBox or the target, connect the device and the target system together with the included grounding wire. This is to avoid potential damage caused by any voltage difference between the device and the target system.

## Use proper overvoltage protection

Please ensure proper protection to avoid exposing the BlueBox device or the operator to overvoltage surges (e.g. caused by thunderstorm, mains power).

## Do not operate without cover

Do not operate the device with cover removed.

## Avoid circuit and wire exposure

Do not touch exposed components or wires when the device is powered.

## Do not operate with suspected damage

If you suspect damage may have occurred, the BlueBox device must be inspected by qualified service personnel before further operation.

## Do not operate the device outside its rated supply voltage or environmental range

Consult with iSYSTEM before using equipment outside of the parameters provided in this manual.



This symbol is used within the manual to highlight further safety notices.

# Package content

The standard iC5700 order is delivered with the following components:

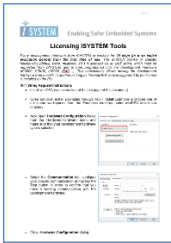
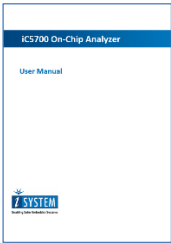
iC5700 Base Unit (including DTM)	25 cm 40-pin ribbon cable	Power supply
Ordering code: IC57000	Ordering code: IC50020-25	Ordering code: IC30000-PS



USB 3.0 cable	Ethernet cable	Grounding wire
Ordering code: BB-USB30-180	Ordering code: BB-ETHCAT5-200	Ordering code: BB-WIRE



winIDEA installation DVD	User manual	License request instructions
--------------------------	-------------	------------------------------



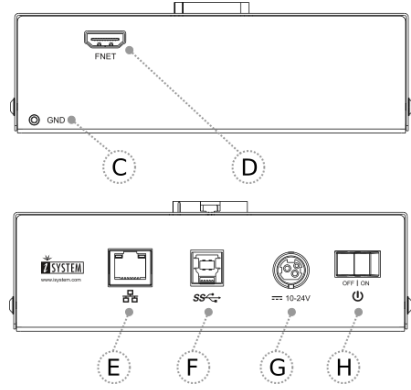
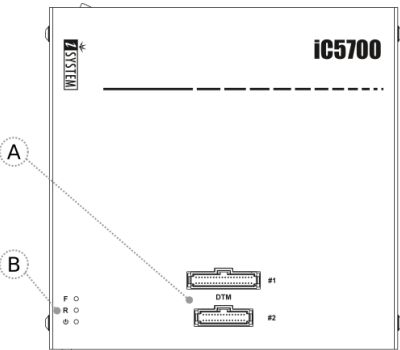
# Specifications

GENERAL	
Operating temperature	10°C to 40°C
Storage temperature	-10°C to 60°C
Humidity	5% to 80% RH
MECHANICAL	
Size	155 x 155 x 65 mm
Weight	approx. 800g
OPERATION	
Communication interfaces to PC	USB 2.0, USB 3.0, 10/100 Ethernet
Supply voltage	10V to 24V DC
Power consumption	< 15W
ELECTRICAL	
Debug signal valid input voltage range	1.8V to 5.5V DC
Debug signals	47Ω series termination/protection resistors, ESD protection devices, 100mA resettable fuses
All inputs except the TDO	10kΩ pull-up resistor
TDO input	10kΩ pull-down resistor
TMS and TDI debug signals	10kΩ pull-up resistor
RESET	1kΩ pull-up resistor, buffer-driven to prevent current flow into an unpowered iC5700 from a powered target board
TAR_VREF (target reference voltage) pin	100kΩ input impedance

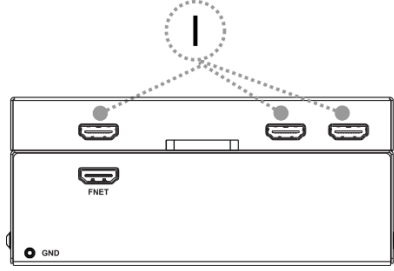
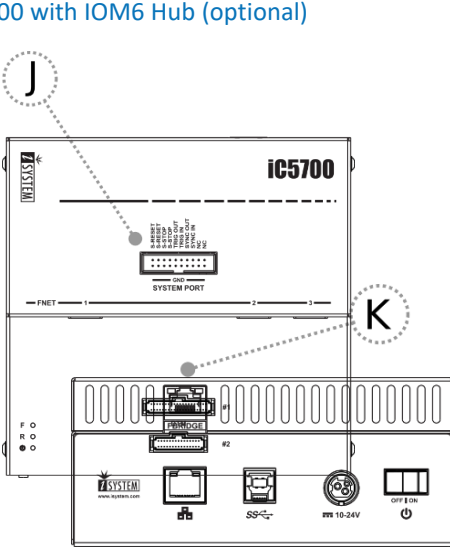
# Operation

## Device overview

### iC5700



### iC5700 with IOM6 Hub (optional)




## Device description

The top face of the iC5700 features two key areas; the DTM connectors **A** and the indicator lights **B**:

- **A** – The Debug Trace Module (DTM) provides two connectors, marked **#1** and **#2**. These connectors are the interface to the target microcontroller. Depending on the target



microcontroller debug features, the supplied ribbon-cables will need to be connected to either connector #1 only or connectors #1 and #2.

- **B** – The indicator lights provide the status of the iC5700 hardware as follows:
  -  - Power Indicator – Green
    - On – powered on
    - Off – powered off
  - **R** - Running Indicator – Red
    - On – target microcontroller is executing code
    - Off – target microcontroller is halted
  - **F** - Free Indicator – Yellow
    - On – iC5700 is available for a connection from a host PC
    - Off – an active connection to the iC5700 from a host PC exists

The front face of the iC5700 features:

- **C** – The grounding socket (marked GND) should be used, together with the supplied Grounding Wire to create an electrical connection between the iC5700 and the target circuitry. The socket is suitable for a 2 mm Multi Contact Plug (also known as a Banana Plug) if building a longer or a replacement cable on your own.
- **D** – The FNET Port provides an interface for the iSYSTEM's range of IOM6 accessories. See also [Accessories](#) chapter.

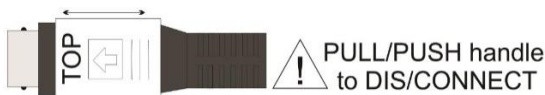
The rear face of the iC5700 features the remaining connectors as follows:

- **E** – 10/100 Ethernet Socket
- **F** – USB 3.0 Socket

It is **highly recommended** to use the supplied USB 3.0 cable delivered with your iC5700 as it has been confirmed to fulfil the maximum USB 3.0 transfer rate (5Gbit/s). Use of alternate cables must be undertaken at your own risk.

- **G** – Power Supply Socket

The socket and plug are latching to stop the plug from being accidentally pulled out of the socket. To remove the power plug from the socket, **always** pull gently of the sleeve of the plug and **never** on the wire.



- **H** – Power Switch

Both the 10/100 Ethernet Socket (E) and the USB 3.0 Socket (F) can be connected to a network/PC simultaneously. The active interface will be determined by whichever interface winIDEA connects to first.

The USB 3.0 interface provides the highest possible data transfer rate of the two available interfaces. It is **highly recommended** to use the USB 3.0 when using the trace feature due to the quantity of data to be uploaded to the PC.



Information label with the MAC address and the serial number is placed on the bottom of your device.

iC5700 with IOM6 Hub

- I – Three additional FNET ports
- J – System port
- K – FBridge port (not Ethernet port!) provides synchronization between two iC5700 units



When powering on the system, switch the iC5700 on before powering on the target system. When powering down the system, power off the target before powering off the iC5700!

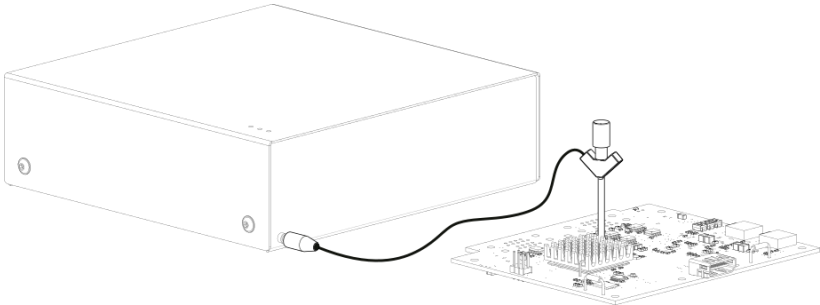
FBridge port is not Ethernet port!

Use only original iSYSTEM accessories for powering and connecting with the iC5700.  
Consult with iSYSTEM before attempting to use any other accessory.

# Connecting the iC5700 to the target hardware

## Grounding wire

Always start by connecting the iC5700 to the target hardware with the enclosed grounding wire.



If the grounding wire is not connected, the ground potential difference between the BlueBox hardware and the target can exceed well over 1000V even before any of the devices are powered up. This voltage difference is discharged over the BlueBox hardware and the target system, leading to the possible destruction of electronic components within the BlueBox hardware, the target or both.

## Power Supply

The iC5700 unit accepts a wide input voltage range from 10V to 24V DC, thus enabling the BlueBox hardware to work also with a 12V or 24V vehicle battery.

The necessary power supply (Part No. IC30000-PS) is delivered with the iC5700 unit. The power supply comes with the EU (type F power plug), USA (type B power plug), India (type D power plug) or China (type I power plug) power cord depending on the delivery address.

Refer to the [Accessories](#) chapter for a spare power cord when required.

An optional 12V power supply adapter suitable for use in a vehicle can be ordered using the ordering code IC30000-PS-CAR12V.

## Debug Adapter

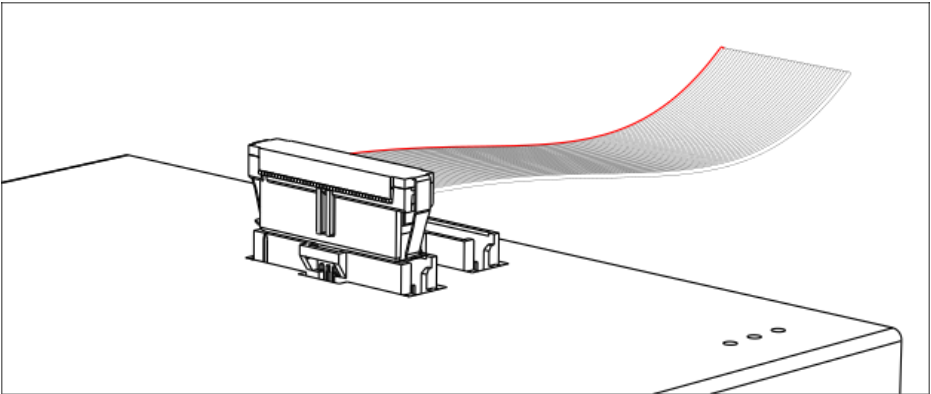
Depending on the target microcontroller, iSYSTEM will have supplied one of two different types of connection system to link the BlueBox hardware with the target microcontroller.

The first connection system consists of a single 40-pin ribbon cable together with a debug adapter suited to the debug connector of the target development board. The picture below shows an example of such adapter.



The debug adapter should be connected to one end of the 25-cm, 40-pin ribbon cable (included in your iC5700 delivery), with the other end being connected to the DTM #1 socket as described below:

1. Connect the 40-pin ribbon cable connector to the iC5700 DTM #1 socket.



The ribbon cable must **always** be guided towards the iC5700 front panel with the red wire on the side of the ‘#1’ marking. Align the orientation key of the cable connector with the notch on the iC5700’s 40-pin socket – the wider of the two sockets. Carefully press the cable connector straight down, keeping the connector parallel to the upper face of the iC5700, until the side latches lock.

2. Connect the debug adapter to the other end of the 25 cm 40-pin ribbon cable. Align the notch on the 40-pin debug adapter with the orientation key of the connector of the 40-pin ribbon cable. Press the cable carefully straight down until the latches lock.
3. Ensuring that both the iC5700 and target **are not powered**, and that the Ground Wire is **securely connected**, connect the debug adapter to the target system.



Do not use any excessive force when pressing the connector onto the target system’s connector. The connector requires minimal force if it is correctly aligned.

Observe the orientation key (either on the connector itself or implemented through a missing “key” pin) or the position of pin 1 as indicated by the ribbon cable’s red marker wire!

To disconnect the ribbon cable, squeeze the two metal latches on the cable connector inwards and pull the connector gently from the socket.

If the delivered ribbon cable does not meet your needs, iSYSTEM offers a range of alternative lengths. Please refer to the [Accessories](#) chapter for available ribbon cables.

Note that the quality of electrical signals degrades with prolonging the cable. iSYSTEM gives no assurance for BlueBox operation with such cable. The cable is meant to be used only for boundary cases where BlueBox cannot be connected to the target hardware through the standard 25 cm long ribbon cable, for example due to the physical obstacles of the target system. In such cases, operating the BlueBox at lower JTAG scan speeds and not using the trace functionality at all, might be still an acceptable compromise. It's up to the user to thoroughly test and qualify the BlueBox operation using longer ribbon cable and to determine working winIDEA™ settings for his system.

The second connection system consists of two pin ribbon cables, one 30-pin and one 40-pin, with a permanently fitted debug adapter. An example of such debug adapter is shown below:



When fitting the ribbon cable to the iC5700, the connector must **always** be guided towards the iC5700 front panel with the red (edge) wire on the side of the '#1' or '#2' marking. Ensure the orientation key of the connector aligns with the notch on the socket of the iC5700. Carefully press the cable connector straight down, keeping the connector parallel to the upper face of the iC5700, until the side latches lock.

1. Start by connect the 30-pin ribbon cable to the iC5700's #2 connector, being sure to use minimal force and following the advice given above.
2. Follow up by connecting the 40-pin ribbon cable to the iC5700's #1 connector, again being sure to use minimal force and following the advice given above.
3. Ensuring that both the iC5700 and target **are not powered**, and that the Ground Wire is **securely connected**, connect the connector at the opposite end of the ribbon cable to the target system.



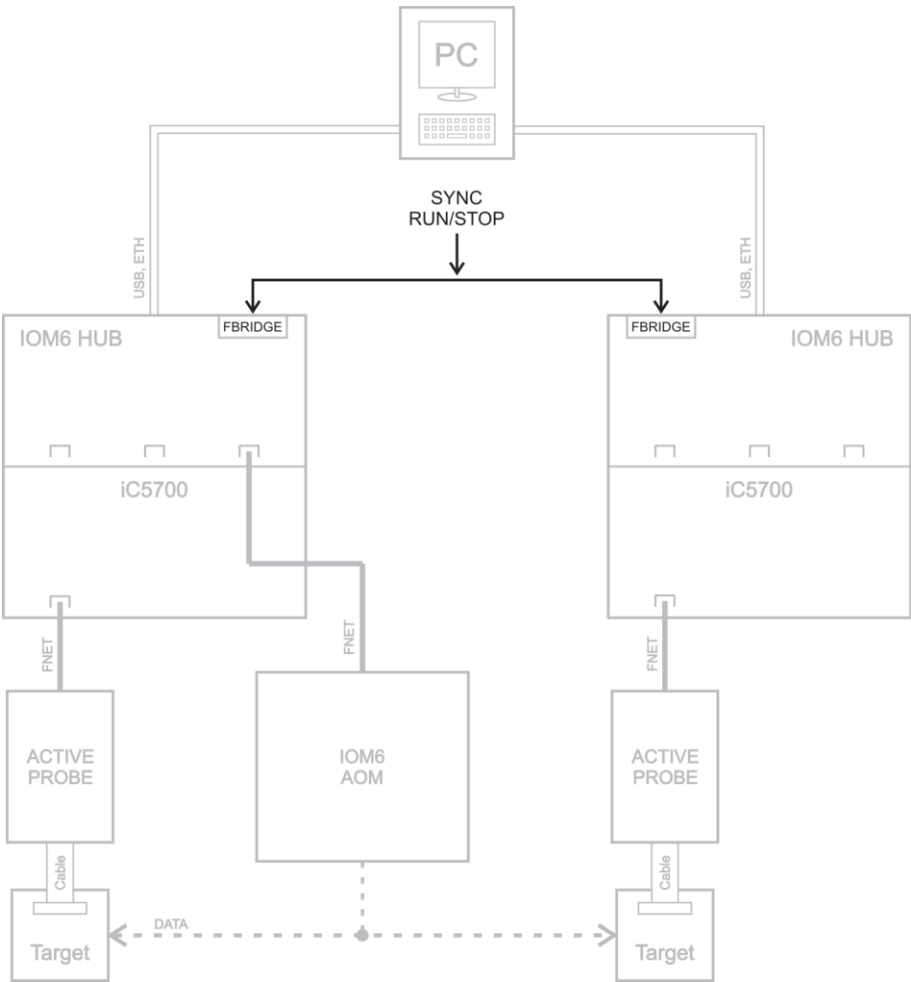
Do not use any excessive force when pressing the connector onto the target system's connector. The connector requires minimal force if it is correctly aligned.

Observe the orientation key (either on the connector itself or implemented through a missing "key" pin) or the position of pin 1 as indicated by the ribbon cable's red marker wire!


To disconnect the ribbon cable, squeeze the two metal latches on the cable's connectors inwards and pull the connector gently from the socket.

# FNET

IOM6 accessories (Add-On Modules and Active Probes), when used, connect to the FNET ports. Connect and remove IOM6 accessories only when the iC5700 is powered down.



Two iC5700 units connected via FBridge port for synchronized run/stop operation



Although it looks like the HDMI interface, the FNET Port is **not compatible** with HDMI or any HDMI accessories.

Connecting iSYSTEM hardware to the HDMI devices will damage the hardware and will render the iSYSTEM hardware warranty void.

### ***IOM6 Hub***

IOM6 Hub extends iC5700 with additional three FNET ports and one FBridge port. Through the FBridge port run/stop control of two iC5700 can be synchronized. 1m long FBridge (Ethernet alike) cable comes along the IOM6 HUB and connects to the FBridge port on each iC5700.



If you ordered the IOM6 Hub to extend the operation of your previously bought iC5700, please refer to the IOM6 Hub installation guide that came with your IOM6 Hub package.

### ***Active Probes***

iSYSTEM Active Probes enable debugging, tracing and testing of different microcontroller architectures. Its small and compact hardware size allows for connecting to a target microcontroller in a confined space as far as 5m away.



Please refer to your Active probe user manual for further instructions on its operation.

### ***IOM6 Add-On Modules***

iSYSTEM Add-On modules deliver new insights into your embedded application. Through the IOM6 CAN/LIN the CAN and LIN bus network data can be captured and displayed in parallel to the microcontroller code execution domain. Through the IOM6 ADIO analog and digital signals can be captured and displayed in parallel to the microcontroller code execution domain.



Please refer to your AOM user manual for further instructions on its operation.

# Accessories

## IOM6 product line

The functionality of the iC5700 can be extended through the use of various modules from IOM6 product line. This enables various capabilities from parallel debugging of multiple targets, monitoring of network traffic and monitoring and manipulation of analog and digital signals.

Ordering Code	Description
IC57031	IOM6 HUB (3 x FNET & FBridge)
IC57040	CAN/LIN AOM (Add-On Module)
IC57041	Analog/Digital AOM (Add-On Module)
IC57125	Active probe ARM HSSTP
IC57163	Active Probe Infineon DAP
IC75164	Active Probe Infineon AGBT

## Power supplies and cables

Ensure proper operation of your iC5700 operation by using approved iSYSTEM power supplies and cables.

Ordering Code	Description
IC30000-PS	19V Power Supply
IC30000-PS-CAR12V	12V Car Power Supply
BB-PSC-EU	Power Supply Cord - EU Plug (type F Plug)
BB-PSC-US	Power Supply Cord - USA Plug (type B Plug)
BB-PSC-IN	Power Supply Cord - India Plug (type D Plug)
BB-PSC-CN	Power Supply Cord - China Plug (type I Plug)
IC50020-10	10 cm 40-pin Ribbon Cable
IC50020-25	25 cm 40-pin Ribbon Cable
IC50020-40	40 cm 40-pin Ribbon Cable
IC50020-60	60 cm 40-pin Ribbon Cable
IC50020-100	100 cm 40-pin Ribbon Cable
IC50020-150	150 cm 40-pin Ribbon Cable
BB-USB20-180	1.8 m USB 2.0 Cable
BB-USB30-180	1.8 m USB 3.0 Cable
BB-ETHCAT5-100	1 m Cat 5 Ethernet Cable
BB-ETHCAT5-200	2 m Cat 5 Ethernet Cable
BB-WIRE	Grounding Wire
BB-FNET-100	1 m FNET Cable (for use with AOM accessories)
BB-FNET-300	3 m FNET Cable (for use with AOM accessories)
BB-FNET-500	5 m FNET Cable (for use with AOM accessories)
BB-FNETMICRO-100	1 m FNET Micro Cable (for use with Active Probe accessories)
BB-FNETMICRO-300	3 m FNET Micro Cable (for use with Active Probe accessories)
BB-FNETMICRO-500	5 m FNET Micro Cable (for use with Active Probe accessories)



## Standard debug adapters

Various debug adapters are available to connect the iC5700 to a wide range target debug connectors as commonly found on microcontroller development boards.

Ordering Code	Description
IC50111-1	20-pin 2.54mm ARM Debug Adapter
IC50112	14-pin 2.54mm ARM Debug Adapter
IC50113-AMP	20-pin 1.27mm AMP Cortex Debug Adapter
IC50115	38-pin Mictor ARM ETM 16-bit Debug Adapter
IC50116-2	10-pin 1.27mm Cortex Debug Adapter
IC50118-2	20-pin 1.27mm Cortex Debug Adapter
IC50119	20-pin 1.27 x 2.54mm Compact TI-20 Debug Adapter
IC50150	14-pin 2.54mm MPC5xxx Debug Adapter
IC50152	38-pin Mictor MPC5xxx Nexus 16-bit Debug Adapter
IC50152-12	38-pin Mictor MPC5xxx Nexus 16-bit Debug Adapter, 12cm length
IC50156	50-pin Samtec MPC5xxx Nexus 16-bit Debug Adapter
IC50160	16-pin 2.54mm Infineon JTAG Debug Adapter
IC50160-ECU14	10-pin 1.27mm Tricore ECU14 Debug Adapter
IC50160-MEDC17	10-pin 1.27mm Tricore MEDC17 Debug Adapter
IC50162	6-pin 2.54mm Infineon I2C Debug Adapter
IC50163-2	10-pin 1.27mm Infineon DAP2 Wide Debug Adapter
IC50164	22-pin Samtec ERF8 DAP2 Debug Adapter
IC50171	20-pin 2.54mm Renesas V850/RH850 Debug Adapter
IC50176	14-pin 2.54mm Renesas RH850 Debug Adapter
IC50176-EP5	10-pin 1.27mm Renesas RH850 Debug Adapter
IC50177	38-pin Mictor Renesas RH850 Nexus 16-bit Debug Adapter

Refer to the Debug Adapters User Manual for technical details on the listed debug adapters.



More information can be found on our website at [www.isystem.com](http://www.isystem.com) or simply contact our sales team via [sales@isystem.com](mailto:sales@isystem.com)

## EU Declaration of Conformity (DoC)

### **We**

iSYSTEM AG für Informatiksysteme  
Carl-Zeiss-Str. 1  
85247 Schwabhausen  
Germany

**declare that the DoC is issued under our sole responsibility and belongs to the following product:**

Blue Box - debugger and analyzer solution  
Type: iC3000, iC5000, iC5500, iC5700, iC6000, iTAG.2K

### **Identification allowing traceability:**

Object of the declaration is identified by a product type and unique serial number for each individual device.

**The object of declaration described above is in conformity with the relevant Union harmonization legislation:**

EMC directive 2014/30/EU and RoHS directive 2011/65/EU

**The following harmonized standards and technical specifications have been applied:**

- EN 55032: 2012
- EN 55024: 2010
- EN 61000 - 3 - 2: 2014
- EN 61000 - 3 - 3: 2013

**Signed for and on behalf of:**



Martin Gröstenberger, CFO



Werner Fischer, COO

Schwabhausen, 21. March 2017

iSYSTEM AG f. Informatiksysteme - Carl-Zeiss-Str. 1 - 85247 Schwabhausen - USt-IdNr. DE128231221  
Vorstand: Erol Simsek, Werner Fischer, Martin Gröstenberger - AG: München HRB 148751 - St-Nr.: 115/120/30027  
Bank: Sparkasse Dachau BLZ 70051540 Account 904045 - IBAN: DE82700515400000904045 - BIC: BYLADEM1DAH

## Technical support

To reach for technical support please visit [www.isystem.com/support](http://www.isystem.com/support).

iSYSTEM has made every effort to ensure the accuracy and reliability of the information provided in this document at the time of publishing. While iSYSTEM reserves the right to make changes to its products and/or the specifications detailed herein, it does not make any representations or commitments to update this document.

**© iSYSTEM. All rights reserved.**