

# User Manual

July 2022



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

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# iC5000 BlueBox

**iC5000 CI BlueBox On-Chip Analyzer** - Hardware and software 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 the I/O Module, 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** - 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 (breakpoints, stepping and device programming). 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. More information [isystem.com/winideaide](http://isystem.com/winideaide).

**testIDEA** - 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. More information [isystem.com/testidea](http://isystem.com/testidea).

**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, 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. More information [isystem.com/sdk](http://isystem.com/sdk).

iSYSTEM's solutions run under Microsoft® Windows®, GNU, Linux OS; or optionally within the Eclipse environment via a plugin. 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 iC5000 order is delivered with the following components:

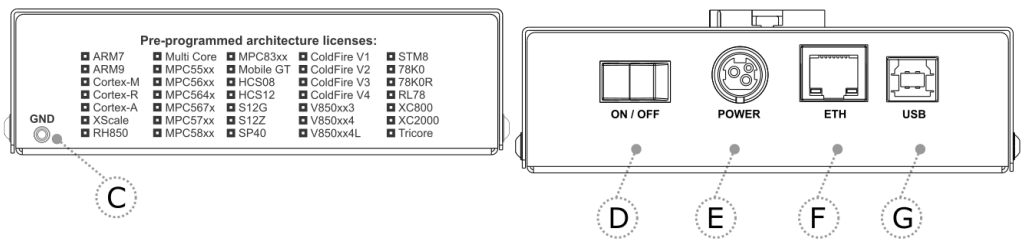
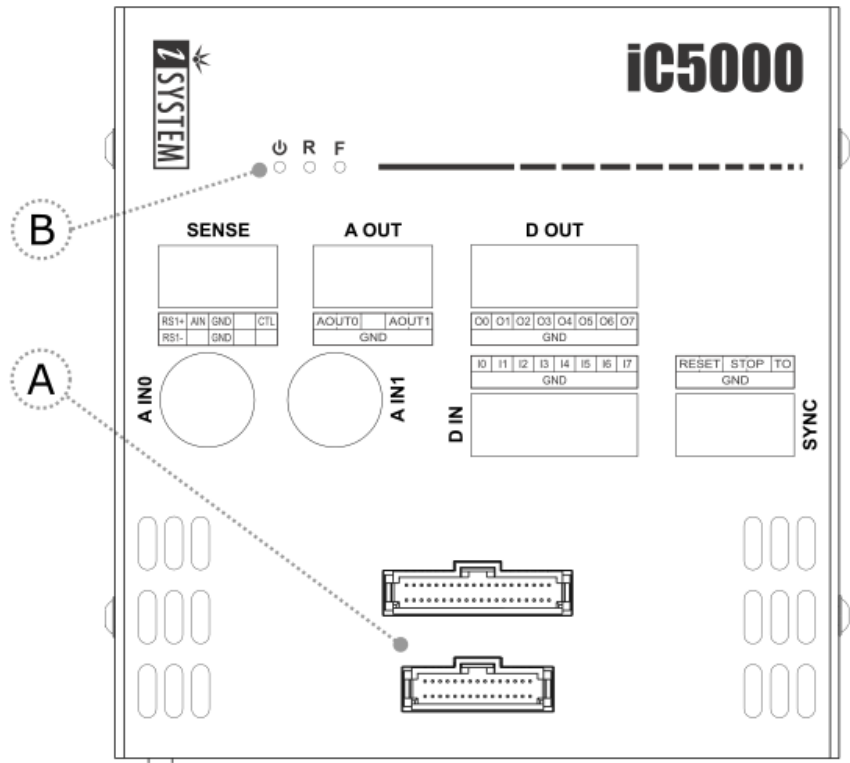
<b>iC5000 Base Unit including pre-assembled DTM module</b> Ordering code: IC50000 + IC50020	<b>25 cm 40-pin ribbon cable</b> Ordering code: IC50020-25	<b>Power supply</b> Ordering code: IC30000-PS
		
<b>USB 2.0 cable</b> Ordering code: BB-USB20-180	<b>Ethernet cable</b> Ordering code: BB-ETHCAT5-200	<b>Grounding wire</b> Ordering code: BB-WIRE
		
<b>User Manual</b>		



# Specifications

GENERAL	
Operating temperature	10°C to 40°C
Storage temperature	-10°C to 60°C
Humidity	5% to 80% RH
MECHANICAL	
Size	122 x 127 x 45 mm (W x D x H)
Weight	approx. 500g
OPERATION	
Communication interfaces to PC	USB 2.0, 10/100 Mbps Ethernet
Supply voltage	10V to 24V DC
Power consumption	< 8W
ELECTRICAL	
Debug signal valid input voltage range	1.8V to 5.5V DC
Debug signals	47Ω series termination/protection resistors, ESD protection devices. Depending on the specific debug adapter, termination might be different from 47Ω on some critical signals.
All inputs except the TDO	10 kOhm pull-up resistor
TDO input	10 kOhm pull-down resistor
TMS and TDI debug signals	10 kOhm pull-up resistor
RESET	1 kOhm pull-up resistor, buffer-driven to prevent current flow into an unpowered iC5000 from a powered target board
TAR_VREF (target reference voltage) pin	100 kOhm input impedance

Device overview



Pre-programmed architecture licenses:

- |          |            |           |             |         |
|----------|------------|-----------|-------------|---------|
| ARM7     | Multi Core | MPC83xx   | ColdFire V1 | STM8    |
| ARM9     | MPC55xx    | Mobile GT | ColdFire V2 | 78K0    |
| Cortex-M | MPC56xx    | HCS08     | ColdFire V3 | 78K0R   |
| Cortex-R | MPC564x    | HCS12     | ColdFire V4 | RL78    |
| Cortex-A | MPC567x    | S12G      | V850xx3     | XC800   |
| XScale   | MPC57xx    | S12Z      | V850xx4     | XC2000  |
| RH650    | MPC58xx    | SP40      | V850xx4L    | Tricore |




## Device description

The **top face** of the iC5000 features two key areas; the DTM connectors A and the indicator lights B:

**A** – 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 hardware:

 Power Indicator

- On – Powered on
- Off – Powered off

 R – Running Indicator

- On – Target microcontroller is executing code
- Off – Target microcontroller is halted

 F –Free Indicator

- On – BlueBox is available for a connection from a host PC
- Off – Active connection to the BlueBox from a host PC exists

The **front face** of the iC5000 features:

**C** – The grounding socket (marked GND) should be used, together with the supplied Grounding wire to create an electrical connection between the BlueBox 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.

The **rear face** of the iC5000 features:

**D** – Power Switch

**E** – 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.



## F – 10/100 Ethernet Socket

## G – USB 2.0 Socket

It is **recommended** to use the supplied USB 2.0 cable delivered with your iC5000 as it has been confirmed to fulfill the maximum USB 2.0 transfer rate. Use of alternate cables must be undertaken at your own risk. The USB 2.0 interface provides the highest possible data transfer rate of the two available interfaces. It is **highly recommended** to use the USB 2.0 when using the trace feature due to the quantity of data to be uploaded to the PC.

Both the 10/100 Ethernet Socket and the USB 2.0 Socket can be connected to a network/PC simultaneously. The active interface will be determined by whichever interface winIDEA connects to first.



*When powering on the system, switch the BlueBox unit on **before** powering on the Target. When powering down the system, power off the Target before powering off the BlueBox unit!*

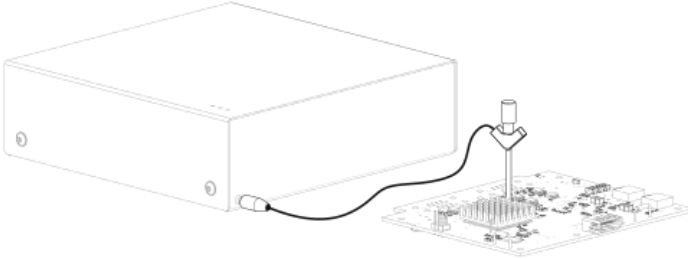
*FBridge port is not Ethernet port!*

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

# Connecting the iC5000 to the Target

## Grounding wire

Always start by connecting the BlueBox to the Target with the Grounding wire. Refer to [www.isystem.com/groundingwire](http://www.isystem.com/groundingwire) for more information or scan the **QR code** below for a visual representation on how to connect iSYSTEM Hardware.



*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, leading to the possible destruction of electronic components within the BlueBox hardware, the Target or both.*

## Power Supply

The BlueBox 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 BlueBox. 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.



*When powering on the system, switch the BlueBox unit on **before** powering on the Target. When powering down the system, power off the target before powering off the BlueBox unit!*

*FBridge port is not Ethernet port!*

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

## Debug Adapter

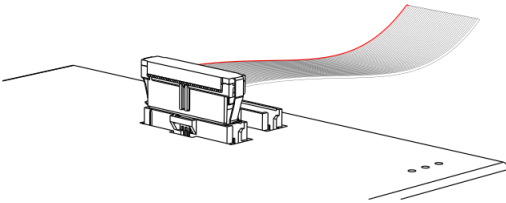
Depending on the Target microcontroller, iSYSTEM supplies one of two different types of connection system to link the BlueBox hardware with the Target microcontroller:

- **Single** 40-pin ribbon cable together with a debug adapter suited to the debug connector of the Target development board. The debug adapter should be connected to one end of the 25-cm, 40-pin ribbon cable (included in your BlueBox delivery), with the other end being connected to the DTM #1 socket; or
- **Two ribbon** cables, one 30-pin and one 40-pin, with a permanently fitted to the debug adapter.

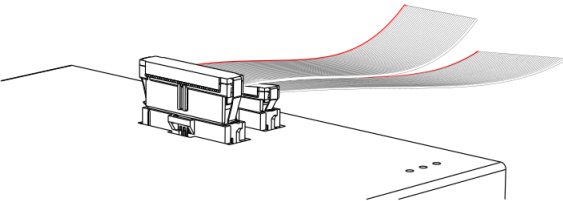


1. Connect the 40-pin ribbon cable connector to the DTM #1 socket.

The ribbon cable must **always** be guided towards the BlueBox front panel with the red wire on the side of the '#1' marking (optional '#2'). Align the orientation key of the cable connector with the notch on the BlueBox'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 BlueBox, until the side latches lock.



(Optional) The second connection system consists of two pin ribbon cables, one 30-pin and one 40-pin, with a permanently fitted debug adapter. For the second connection repeat step 1.



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 the BlueBox and the Target are not powered, and that the Grounding wire is securely connected, connect the debug adapter to the Target.



*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.



*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 you to thoroughly test and qualify the BlueBox operation using longer ribbon cable and to determine working winIDEA settings for the system.*

# Accessories

## Power supplies and cables

Ensure proper 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-USB30-A10M	10 m Active USB 3.0 Cable (type A-A)
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 connector as commonly found on microcontroller development boards.

Ordering Code	Description
IC50111-1	20-pin 2.54mm ARM Debug Adapter
IC50111-2	20-pin 2.54mm Cortex Debug Adapter
IC50112	14-pin 2.54mm ARM Debug Adapter
IC50112-ECU14	10-pin 1.27mm ARM ECU14 Debug Adapter
IC50113-AMP	20-pin 1.27mm AMP CoreSight Debug Adapter
IC50115	38-pin Mictor ARM Parallel 16-bit Debug Adapter
IC50115-LV	38-pin Mictor Low Voltage ARM Parallel 16-bit Debug Adapter
IC50116-2	10-pin 1.27mm CoreSight Debug Adapter
IC50116-CUST2	10-pin 1.27mm Custom CoreSight Debug Adapter
IC50118-2	20-pin 1.27mm CoreSight Debug Adapter
IC50118-NETX90	20-pin 1.27mm Cortex SWD + Trace Debug Adapter
IC50118-LV	20-pin 1.27mm Low Voltage CoreSight Debug Adapter
IC50119	20-pin 1.27 x 2.54mm Compact TI-20 Debug Adapter
IC50120	16-pin 1.27mm Custom ARM 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
IC50156	50-pin ERF8 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
IC50165	6-pin 2.54mm Infineon CoreSight SP49 Debug Adapter
IC50176	14-pin 2.54mm Renesas RH850 Debug Adapter
IC50176-EPS	10-pin 1.27mm Renesas RH850 Debug Adapter
IC50177	38-pin Mictor RH850 Nexus 16-bit Debug Adapter

## 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:**

BlueBox 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 to:**

- 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:  
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