

# Integrated Communication Optical Module ICOM

## Vehicle Interface User Guide



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## **1. Purpose of User's Guide**

This user's guide contains the information required for using the ICOM (Integrated Communication Optical Module) interface in the manner for which it was specifically designed. It characterizes the individual components according to their technical properties and describes their application for vehicle diagnosis. It also provides supplementary information on the application and storage conditions and an overview with regard to required approval and certifications.

This user's guide will not be updated; the latest version can be found on the ISPI documentation DVD.

## 2. Special Markings

### Technical abbreviations

CAN	Controller Area Network
FCC	Federal Communications Commission
ICOM	Integrated Communication Optical Module
ICM	Integrated Connection Management
KL15	Terminal 15
KL30	Terminal 30
LAN	Local Area Network
LED	Light-Emitting Diode
MOST	Media Oriented Systems Transport
OBD	On-Board Diagnosis
UL	Underwriters Laboratories
USB	Universal Serial Bus
WLAN	Wireless Local Area Network
WSM	Workshop System Management

### Notes



Instructions specially highlighted with this symbol help to avoid risks to the health of personnel and to prevent property damage.



Instructions marked with this symbol indicate important information that requires particular attention.

### 3. Safety Instructions

#### 3.1 Instructions in accordance with certification complying with UL standard

1. Read all instructions.
2. Do not operate equipment with a damaged cable or if the equipment has been damaged - until it has been examined by a qualified serviceman.
3. To protect against risk of fire, do not operate equipment in the vicinity of open containers of fuel (gasoline).
4. To reduce the risk of electric shock, do not use on wet surfaces or expose to rain.
5. Adequate ventilation should be provided when working on operating combustion engines.
6. Use only as described in this manual. Use only manufacturer's recommended attachments.
7. "WARNING" and the following or the equivalent: "Risk Of Explosion" This Equipment Has

Internal Arcing Or Sparking Parts Which Should Not Be Exposed To Flammable Vapor. This Equipment Should Be Located At Least 460 mm (18 Inches) Above The Floor."

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

### 3.2 Information regarding handling, storage and transport

Detailed knowledge and technically correct implementation of the safety instructions and functions described in this user's guide are a precondition for operational safety.



- The safety of the product presupposes proper and adequate transport, storage, installation and operation.
- The devices may only be commissioned by qualified personnel who are familiar with the contents of this user's guide.
- The devices are only to be used for the permitted purpose on the vehicle.

If the handling regulations and technical safety instructions are complied with, the product is normally not a source of danger with regard to property damage or personal injury.

For the use case, the following must be observed:



- National safety regulations
- National accident prevention regulations
- Generally recognized rules of engineering
- Safety instructions in this user's guide
- Specified operation conditions of the devices
- Additional instruction plates on the device.
- Only the software intended by the manufacturer for the application case is to be used.

For handling, the following must be observed:



- The devices must not be exposed to direct sunlight.
- Avoid splashing fluids (water, acid, solvent etc.).
- Do not expose the devices to extreme mechanical stresses (e.g. dropping from high heights).
- Only the cables described in this user's guide are to be used for operation.
- Before commissioning, check whether a device or cable shows any signs of mechanical damage. Should this be the case, it is no longer permitted to use the device or cable concerned.
- Additional instruction plates on the device.
- No unauthorized interventions on the devices are permitted.
- Before and after use, the devices - including accessories - are to be placed in storage in such a way that there is no danger of injury or damage.

## 4. ICOM Family

### 4.1 Overview

ICOM is a multifunctional vehicle interface intended for worldwide application in the BMW Group dealer organization. It has been specially developed for application in the workshop and service departments to support the processes of service consulting, diagnosis and vehicle programming. The philosophy is to create universal deployment options independently of the type of vehicle and communication interface. For this purpose, the unit of the interface is distributed across a number of components. Each individual assembly is conceived for special tasks in the composite unit.

The ICOM system consists of the components A, B and C. The following illustration shows an overview of all the devices.



**Fig. 1 Overview of the ICOM hardware family**

## 4.2 ICOM A



**Fig. 2 ICOM A**

### 4.2.1. Operating and storage conditions

#### Electrical operation:



Power supply KL30:	8V ... 18V
Max. current consumption:	1.5 A (including ICOM B)

#### Environmental conditions during operation:



Ambient temperature range:	0°C ... +45°C
Relative atmospheric humidity at max. 25°C:	10% ... 80%, non-condensing
Temperature gradient:	5°C/h

#### Environmental conditions for mount:



Ambient temperature range:	-20°C ... +60°C
Relative atmospheric humidity at max. 25°C:	10% ... 80%, non-condensing
Temperature gradient:	5°C/h



#### 4.2.2. Function

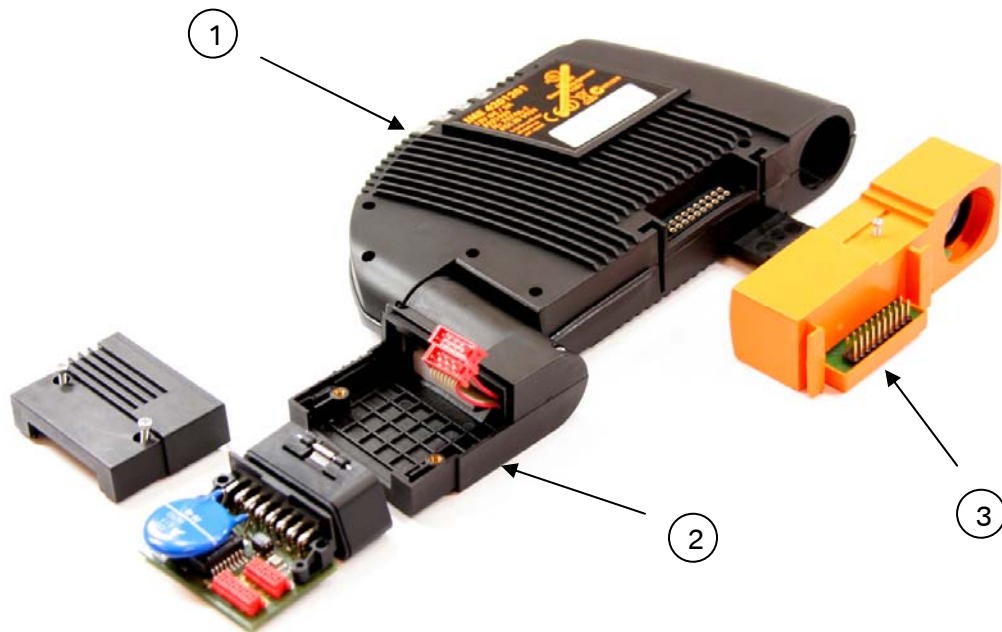
The ICOM A is the basic component. Physically, it provides the interfaces for connection to the vehicle OBD II diagnostic interface on the one hand and the interfaces for adaptive integration into the workshop network on the other. A powerful computer core enables it to work as a protocol converter to assume the data interchange between the tester and the vehicle control units as well as the signal processing for connection of the measurement system. The power supply is fed via KL30 across the vehicle interface.



The ICOM A is specified in electrical operation for a minimum voltage of 8 V. Stable operation is only ensured if the power supply is above the minimum limit.

#### 4.2.3. Modular structure

Due to a limited number of connect cycles, contact elements to connect assemblies are subject to mechanical wear. The ICOM A concept enables replacement of wear parts, if required, with minimum overhead in order to preserve full functions of the overall device over a sustained period. Fig. 3 shows all the individual parts in an exploded view; these are then assembled to form the complete device.



**Fig. 3 Exploded view of ICOM A**

- 1 ... ICOM A base module
- 2 ... OBD module
- 3 ... Connector module

Wear parts are the OBD II module and the connector module.

#### 4.2.4. Vehicle connectivity

For vehicle diagnosis, the device is to be connected via the OBD II plug module with the OBD II diagnosis socket.



**Fig. 4 OBD II interface ICOM A**

#### 4.2.5. Integration in the workshop network

The cable-bound variant via Ethernet and a radio-oriented WLAN interface are provided for integration of the ICOM system into the workshop network.



**Fig. 5 Ethernet connection ICOM A**

#### 4.2.6. Connection of external measurement system

The IMIB is connected via a corresponding LEMO plug connector with the ICOM A.



**Fig. 6 LEMO interface ICOM A**

#### 4.2.7. LEDs

For visualization of various device and communication states, four two-color (red and green) LEDs are provided. A separate group of possible states and events has been defined for each LED. There is a short description on the top of the housing beside each LED; the name used already implies the meaning in each case. For special cases, all the LEDs are combined to form a coded light pattern.



**Fig. 7 LEDs on the top of the ICOM A device**

General assignment:

- LED *SYSTEM*: display of the general device status
  - green                      Operational
  - flashing green            ICOM A starting
  - red                         Fault
  - off                         ICOM A is not being supplied with voltage
- LED *LAN*: status of the cable-bound communication tester / Ethernet
  - green                      Ethernet connection active (with data traffic flashing)
  - off                         Ethernet connection inactive
- LED *WLAN*: status of the radio communication tester / Ethernet via WLAN
  - green                      Infrastructure (with traffic, flashing)
  - yellow\*<sup>1</sup>                 Ad-hoc (with traffic, flashing)
  - off                         Without WLAN communication
- LED *COMM*: status of the communication via communication line, D-CAN or vehicle Ethernet

Special cases:

- Running lights: all LEDs come on and go out in succession
  - red                         Software update of the ICOM

\*<sup>1</sup> yellow = the relevant LED lights up simultaneously red and green



#### 4.2.8. Software update

For the software update, refer to the corresponding sources (documentation for WSM).

#### 4.2.9. Temperature in working environment

High temperatures in the working environment of the ICOM A can have negative effects on the hardware during regular operation and increase heat development in the device. A separate fan for the hardware that is activated depending on the temperature increase inside the device ensures that the air is circulated, thus protecting the device against heat damage.

The following must be borne in mind:



The maximum permitted outside temperature is 45°C. If this limit value is exceeded, an irreparable malfunction in the hardware can occur.



It must be ensured that the recirculation channel (see Fig. 8) of the fan is not blocked by any objects during regular operation.



The fan is activated if the temperature inside the device exceeds a certain value, and it remains in or returns to the idle state when the temperature falls short of this limit value.



**Fig. 8 Connector module with fan**

1 ... Fan channel

### 4.3 ICOM B



Fig. 9 ICOM B

#### 4.3.1. Operating and storage conditions

##### Electrical operation:



Power supply via USB 2.0 interface:	5 V
Max. current consumption:	250 mA

##### Environmental conditions during operation:



Ambient temperature range:	0°C ... +45°C
Relative atmospheric humidity at max. 25°C:	10% ... 80%, non-condensing
Temperature gradient:	5°C/h

##### Environmental conditions for mount:



Ambient temperature range:	-20°C ... +60°C
Relative atmospheric humidity at max. 25°C:	10% ... 80%, non-condensing
Temperature gradient:	5°C/h



#### 4.3.2. Function

The ICOM B is the external MOST (Media Oriented Systems Transport) interface of the ICOM A. It is connected to the ICOM A using the supplied cable or a commercially available USB cable of the type A-B. The power supply is fed across the ICOM A via USB.



During electrical operation, the ICOM B is only operational when the ICOM A is being supplied with a minimum voltage of 8 V.



If a cable other than that supplied as standard is used for the data connection to the ICOM A, it must be ensured that it complies with the USB 2.0 HighSpeed specification and is free of mechanical damage of any kind.



**Fig. 10 Connection if ICOM A with B**

#### 4.3.3. Vehicle connectivity

On the vehicle, the ICOM B is connected via the standardized MOST connection.



**Fig. 11 MOST interface ICOM B**

#### 4.3.4. LEDs

For visualization of certain device and communication states, two two-color (red and green) LEDs are provided. A separate group of possible states and events has been assigned to each LED. Similarly to the ICOM A, short descriptions with names according to the relevant function can be found on the top of the housing beside each LED.



**Fig. 12 Light-emitting diodes on the ICOM B housing**

The following light and flash codings are defined:

- LED *SYSTEM*: display of the general device status:
  - Off Device is not being supplied with voltage
  - yellow \*<sup>1</sup> ICOM B is being initialized
  - red Start / initialization problems
  - green Device is operational
  - flashing green Communication
- LED *MOST*: status of the MOST communication:
  - Off No light on the MOST interface
  - red Light that cannot be locked
  - green Stable LOCK
  - yellow \*<sup>1</sup> Unstable LOCK

\*<sup>1</sup> yellow = the relevant LED lights up simultaneously red and green

## 4.4 ICOM C



Fig. 13 ICOM C

### 4.4.1. Operating and storage conditions

#### Electrical operation:



Power supply KL30:

8V ... 18V

Max. current consumption:

1.5 A (including ICOM B)

#### Environmental conditions during operation:



Ambient temperature range:

0°C ... +45°C

Relative atmospheric humidity at max. 25°C:

10% ... 80%, non-condensing

Temperature gradient:

5°C/h

#### Environmental conditions for mount:



Ambient temperature range:

-20°C ... +60°C

Relative atmospheric humidity at max. 25°C:

10% ... 80%, non-condensing

Temperature gradient:

5°C/h

#### 4.4.2. Function

The ICOM C is an intelligent interface adapter that adapts the physical OBD II to the BMW circular socket. As an extended supplementary module, it connects ICOM A to vehicles without an OBD II interface. The power supply is fed at the vehicle via KL30 from the circular socket.



The ICOM C is specified in electrical operation for a minimum voltage of 8 V. The voltage at KL30 is routed inside the device to the OBD II and thus provided to ICOM A for supply. Stable interaction of both devices is only ensured when the battery voltage of the vehicle lies above the minimum limit.



**Fig. 14 Connection of ICOM A with C**

#### 4.4.3. Vehicle connectivity

On the vehicle, the ICOM C is connected via the circular connector.



**Fig. 15 Circular connector ICOM C**

## 5. Wearing Parts

### 5.1 Replacement of ICOM A (connector module)

The OBD II module is to be replaced in the corresponding order, complying with the following work steps and safety instructions:



All work is only to be carried out when the device voltage is not applied. It is only permitted to use standardized screwdrivers and spanners that are exclusively intended for this purpose and where the size of the tool matches the screw / bolt head to work on bolt / screw connections.

1. Remove the screw on the back of the ICOM A (see Fig. 16)
2. Turn the ICOM A around and pull out the orange LAN module straight upwards (see Fig. 17)
3. Snap the new LAN module into place in the guide rails
4. Reinsert the screw on the back of the ICOM A and tighten it (see Fig. 18)



It must be ensured that the screw is **NOT** tightened excessively!

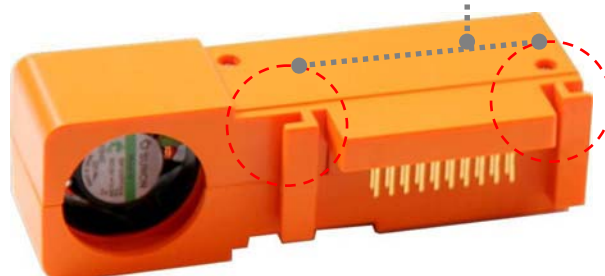


**Fig. 16 Removing / tightening the retaining screw**





**Fig. 17 Reinserting the connecting strip**



Guide rails

**Fig. 18 Back of the connector module**



## 5.2 Replacement of ICOM A OBD II module

The OBD II module is to be replaced in the corresponding order, complying with the following work steps and safety instructions:



All work is only to be carried out when the device voltage is not applied. It is only permitted to use standardized screwdrivers and spanners that are exclusively intended for this purpose and where the size of the tool matches the screw / bolt head to work on bolt / screw connections.

1. Remove the two screws on the top of the housing of the OBD module (see Fig. 19).
2. The top of the housing has been adapted to the bottom via guide rails. For this reason, pull the top upwards carefully and separate it from the bottom.



3. Unplug the two ribbon cables (see Fig. 20).
4. Use the coded ribbon cables to connect the new OBD connector to the ICOM.
5. Carefully rejoin the two shells of the housing over the guide rails (see Fig. 21).

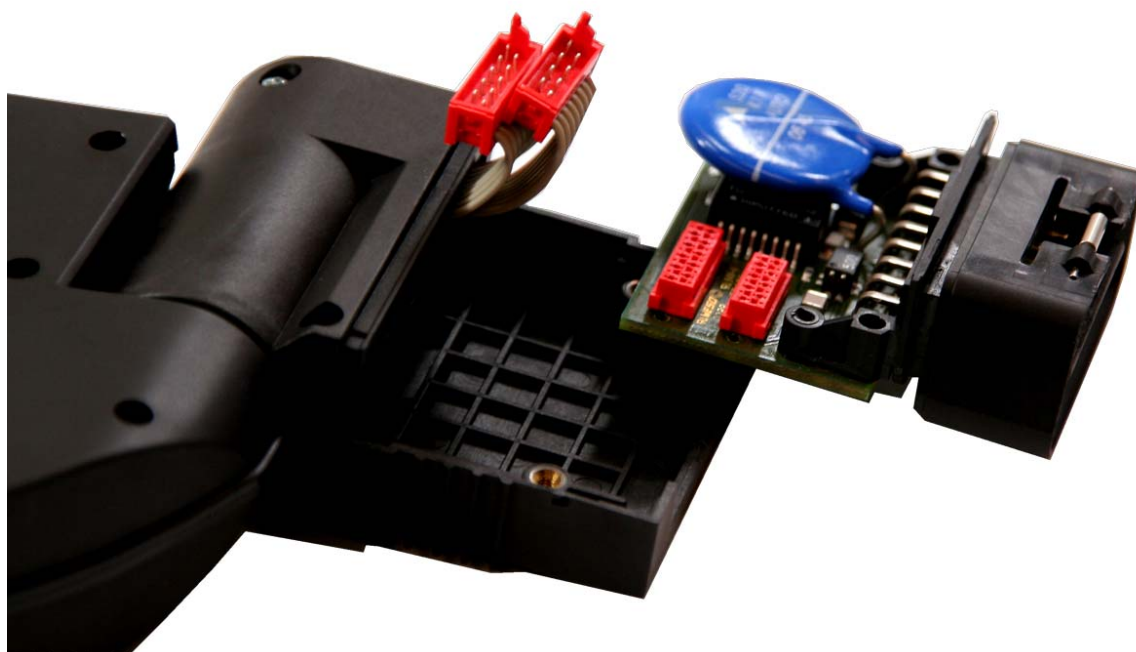


Make sure that neither of the ribbon cables is jammed between the shells of the housing!

6. Reinsert the two housing screws on the OBD connector and tighten them.



**Fig. 19 Opening the OBD II module**



**Fig. 20 Ribbon cable connection**



**Fig. 21 OBD module with opened shells of the housing**

## 6. Certifications

### 6.1 Instructions in accordance with FCC certification compliance

Note: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:--Reorient or relocate the receiving antenna.--Increase the separation between the equipment and receiver.--Connect the equipment into an outlet on a circuit different from that to which the receiver is connected. --Consult the dealer or an experienced radio/TV technician for help.

## 7. Scope of Delivery

### ICOM A:

- ICOM A device
- Ethernet cable

### ICOM B :

- ICOM B device
- USB 2.0 HighSpeed cable

### ICOM C:

- ICOM C device

Accompanying papers and ICOM user's guide in various languages on CD.