



ICOM[®] 200/201/241

About this manual

1

ICOM-200 / 201

2

ICOM-241

3

Advice and support

4

Register

5

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Krefelder Str. 147
52070 Aachen / Germany

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Contents

Contents

1 About this manual	1-1
Typographic conventions and symbols	1-2
2 ICOM-200 / 201	2-1
Versions	2-1
Differences between ICOM-200 and ICOM-201	2-1
First steps	2-2
Power supply	2-2
PC mode	2-2
RUN mode	2-3
Program download	2-3
SLEEP mode	2-4
Keyboard	2-6
LC display	2-8
Serial Interface	2-9
RS232	2-9
RS485	2-10
Opto inputs	2-11
Power outputs	2-13
Analog inputs	2-15
Analog inputs	2-15
Configuration 0...5V	2-16
Configuration 0...10V	2-17
Configuration 0...20mA	2-17
Setting the amplification	2-18
MF-2 Keyboard	2-20
TINY-Tiger® Pins	2-24
Pin layout 37-ch. D-Sub connector	2-24
Technical data	2-25
3 ICOM-241	3-1
First steps	3-2
Power supply	3-2
PC-Mode	3-2
RUN mode	3-3
Program download	3-3

Contents

Opto inputs	3-4
Power outputs	3-6
Serial interface	3-7
RS232	3-7
RS 485	3-8
Analog inputs	3-11
Pin layout 25-pin D-Sub connector	3-14
Technical data	3-15
ICOM 241 – 24V	3-16
Connection to PC	3-17
Technical data	3-17
4 Hints and help	4-1
BASIC-Tiger® Service Hotline:	4-1
5 Register	5-1

1 About this manual



This manual does introduce you into the control of the ICOM industry computer family for a fast and easy use.

The ICOM industry computer family combines the performance of BASIC/TINY-Tiger[®] Computers with steadily needed I/O peripherals in an elegant aluminum chassis. For programming the ICOM industry computers a BASIC-Tiger[®] development system is needed.

This manual only describes the usage of the ICOM industry computers. You can read about the programming of Tiny-Tigers[®] in the BASIC/TINY-Tiger[®] user manuals.

1

Typographic conventions and symbols

Following fonts and symbols are used for fast identification of important informations:

Element	Meaning
KEY	Key description, e.g. RETURN
<code>Program listing</code>	Tiger-BASIC® program listing
Instruction	Tiger-BASIC® instruction
<i>Variable</i>	Variables or constants you have to enter according to your application.
[]	Elements which can be entered optional.
!	Important remark: Please note!
Tip	Tips and hints simplifying your work.

2 ICOM-200 / 201

Versions

This manual describes the ICOM200 and ICOM201 til version V1.3. Newer versions are described in separate data sheets. At ICOM versions V1.4 or newer, the version number is printed on the right hand side of the device.

2

Differences between ICOM-200 and ICOM-201

The ICOM-201 is a special version of the ICOM-200. The following decription shows where the differences between the ICOM-200 and ICOM-201 are.

Feature	ICOM-200	ICOM 201
Graphic LCD	•	-
20 key matrix keyboard	•	-
Serial interfaces RS232 / RS485	•	•
MF2 keyboard connector	•	•
Eight opto inputs	•	•
Four analog inputs	•	•
Eight power outputs	•	•
Battery backup	•	•
Sleep function	Optional	Optional

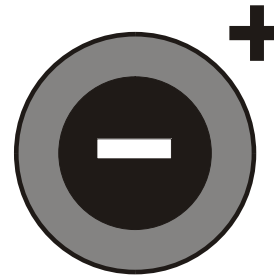
Note: The sleep function is available if the ICOM contains a TINY-Tiger® with real time clock. It is not available, if internally e.g. a TINY-Tiger® TNN-R/4 is used.

First steps

Power supply

2

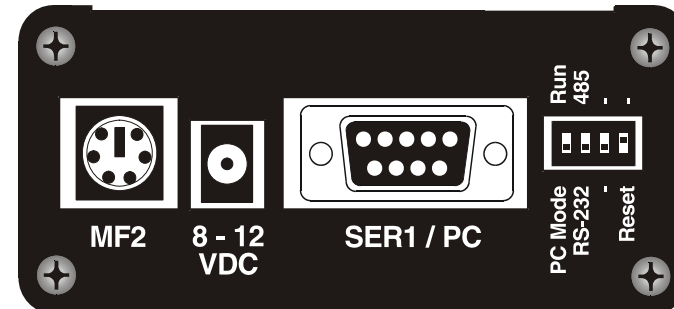
The ICOM-200/201 uses a power supply with 8-12 VDC, 1A. Minus is placed on the pin of the power supply connector. The current consumption is, depending on the application, up to 400mA.



8...12 V DC
1A min

PC mode

After a reset or power-down the Tiny-Tiger[®] inside the ICOM-200/201 is testing if the PC mode pin is „low“. In this case, the ICOM switches to PC mode/Debug mode. Is the pin „high“, the ICOM starts in run mode. The time between power-on and first activity on the I/O pins is approx. 230 msec.



To set the ICOM-200/201 to PC mode, a reset or power-down is needed. Setting the DIP switch to PC mode while in run mode is not sufficient.

RUN mode

If the DIP-switch "PC/Run" is in position "Run", the program in the ICOM-200/201 is executed immediately after a reset. Debugging is not possible in this mode.

Program download

A program created with the Tiger software is downloaded into ICOM-200/201 through the 9-pin Sub-D connector. To download the following has to be done:



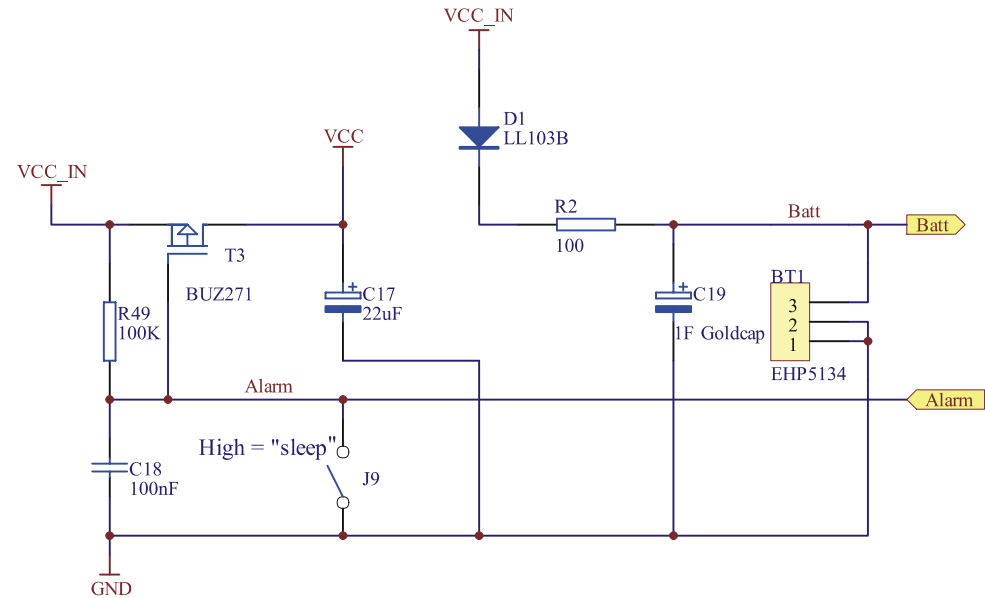
- Connect a power supply 8-12 V DC (Polarity: Inner contact = minus, outer contact = plus)
- Connect ICOM-200/201 and PC with 9-pin D-Sub cable
- Set DIP switch of ICOM-200/201 to PC mode
- Set the reset DIP switch to „Reset“ and back to original position
- Start download at the PC.

Serial port 1 / Download	DB-9 plug
TXD	2
RXD	3
GND	5

SLEEP mode

The ICOM-200/201 can be put into sleep mode if the Tiny-Tiger® inside has a real time clock. In sleep mode the power consumption of the ICOM-200/201 is decreased significantly to just approx. 25mA. While in sleep mode, no BASIC program is executed by the ICOM-200/201.

2

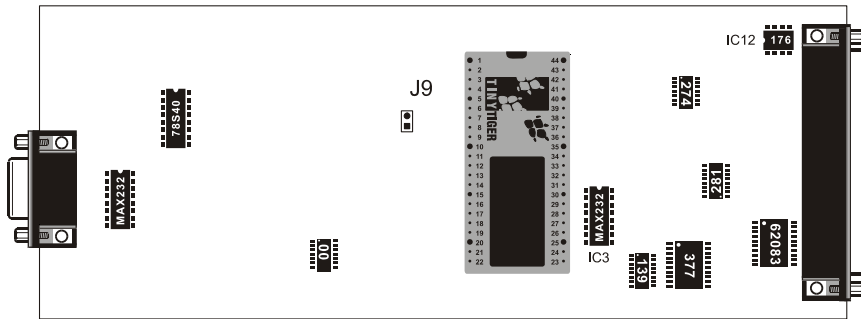


Sleep circuit

The internal clock and SRAM of the Tiny-Tiger® are buffered through a Goldcap. The power consumption of clock and SRAM is approx. 70µA, with a fully loaded Goldcap this is enough for about 3 hours.

To use the SLEEP mode of the ICOM-200/201 Jumper J9, which is located under the LC display, has to be drawn. On delivery the jumper is inserted, so SLEEP mode is disabled.

ICOM-200 / 201



2

To put the ICOM-200/201 into sleep mode, the alarm time for the Tiny-Tiger[®] clock has to be set. Following that the ICOM-200/201 falls into sleep mode and wakes up again at alarm time. More detailed information on how to set the alarm time can be found in the BASIC-Tiger[®] „Device driver“ manual.

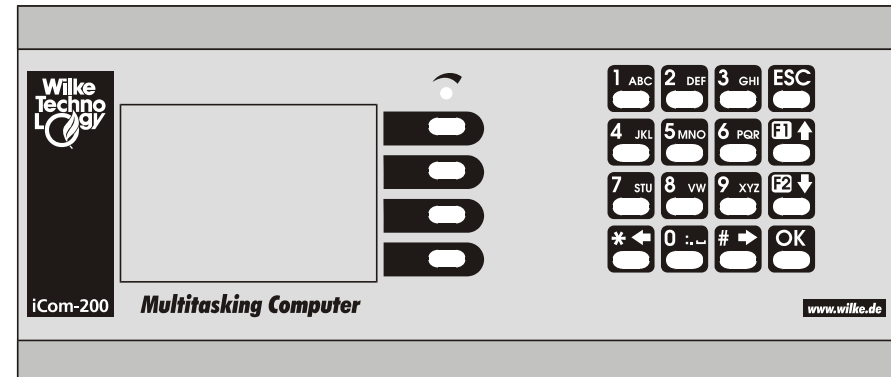
If jumper J9 has been drawn and the Goldcap is unloaded, it takes about 30 seconds from connecting the power supply before the ICOM-200/201 switches on.

Keyboard

The ICOM-200 has a 20 key matrix keyboard. The keyboard is divided into two blocks. The first block has four vertically arranged keys placed directly on the right side of the LC display. Those keys can e.g. be assigned to a menu on the LC display. The second block consists of 16 labeled keys.

Reading the keyboard is done with the device driver „LCD1.TDD“. The following example scans the keyboard and gives back a numeric code for the pressed key. Additionally a character can be assigned to the numeric code. Read the „Device driver“ manual of the BASIC-Tiger® on how it is done.

2



With a physical offset of -10h the keyboard columns are at the addresses 19h to 27h. In order to scan the keyboard, the following settings have to be implemented into the program.

```
USER_EPORT LASTLADR, 10h
USER_EPORT PHYSOFFS, 0F0h
```

```

-----
'----- ICOM_KEYB.TIG
-----

#define keyb          20      ' keyboard device nummer

#include define_a.inc
user_var_strict
TASK Main
word x,n,i
string a$
    user_eport lastladr,10h
    user_eport physoffs, 0f0h
    Dir_port 8,0
INSTALL DEVICE #lcd,"LCD2.TDD",0,0,0EEH,1,150,11H' LCD-1=128x64, 150
KB/s
Install device #keyb, "LCD1.tdd", 0, 0, 0, 0, 0, 0, 80h, 8

    print #keyb,&                                ' Definiert alle Scan-Spalten
"<1BH>D<16><1><1><1><1><0><0><0><0>&
' als Tastaturtasten
<0><0><0><0><0><0><0><0><0><0F0H>";
    print #keyb,&
    "<1Bh>k<18h><19h><1ah><1bh><1ch>&
' Legt die Tastaturadresse fest
<1dh><1eh><1fh><20h><21h><22h>&
<23h><24h><25h><26h><27h><0f0h>";

keys:
USING "UD<2><1>  0.0.0.0.2UH<2><2>  0.0.0.0.2"  ' Format-String
FOR X=0 TO 0 STEP 0
' Endlosschleife
FOR N=0 TO 0 STEP 0
' Endlosschleife bis N=1(GET!)
RELEASE_TASK
' Rest der Task-Zeit freigeben
GET #keyb, #0, #1, 1, N
' N=Zeichen in Tastatur-Buffer
NEXT
' Ende Endlosschleife
GET #keyb, 1, A$
' Tastatur-Buffer auslesen
PRINT #lcd, "<2><10>Key-No.=";
' Ausgabe auf LC-Display
PRINT USING #1, ASC(A$);"($";ASC(A$);)"
' zeige Tasten-Nr
NEXT
goto keys
end

```

LC display

The ICOM-200 has a graphic LC display with a resolution of 128 x 64 pixel. There's a special device driver to control this display. By using this device driver it is possible to control the LC display with simple BASIC commands.

Detailed information about usage of this device driver „LCD-6963.TDD“ is part of the „Device driver“ manual of the BASIC-Tiger®.

The LC display has LED backlight. The backlight's power consumption is approx. 250mA. Power supply is 5V. To save energy backlight can be turned off by software. For this Tiger pin P86 is used. Setting the pin to „1“ activates the backlight, when set to „0“ backlight is off.

```

-----
-----  ICOM_DISPLAY_ON_OFF.TIG
-----

#define display_off      0          ' LCD ausschalten mit P86
#define display_on      255        ' LCD anschalten mit P86

#include define_a.inc
user_var_strict
TASK Main
Dir_port 8,0
INSTALL DEVICE #lcd,"LCD2.TDD",0,0,0EEH,1,150,11H' LCD-1=128x64, 150
KB/s

print #lcd, "start"
wait_duration 2000
out 8,mask(6),display_off      ' Display ausschalten
wait duration 2500             ' 2,5 sec warten
out 8,mask (6),display_on      ' Display einschalten

print #lcd, "OK"
End

```


Serial Interface

As a standard the ICOM-200 and ICOM-201 have two serial interfaces. From these the port Ser0 can by choice be configured as RS232 or RS485 interface. The port Ser1 always is a RS232 interface. In PC mode this port is used for downloading the program into the ICOM 200/201. In Run mode it can be used as a usual RS232 interface.

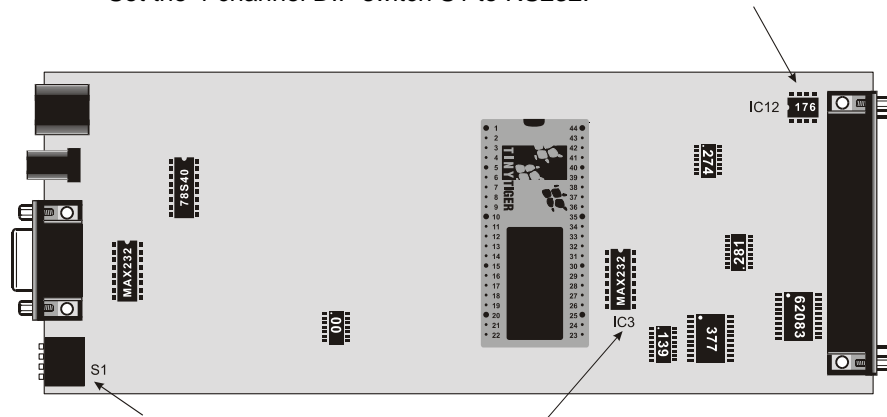
2

Detailed information about the serial interfaces can be read after in the BASIC-Tiger[®] „Device driver“ manual.

RS232

Serial port 0 can be configured as RS232 interface with three easy steps:

- Remove IC12 from its socket
- Please IC3 (MAX232) into the appropriate socket
- Set the 4-channel DIP switch S1 to RS232.



Attention: Never place IC3 and IC12 at the same time, as this could lead to destruction of port 0 !!!

ICOM-manual

The pins of serial port 0 are located on the DB-37 connector:

RS232	DB-37
TXD0 (Output)	16
RXD0 (Input)	17
RTS0	36
CTS0	35

2

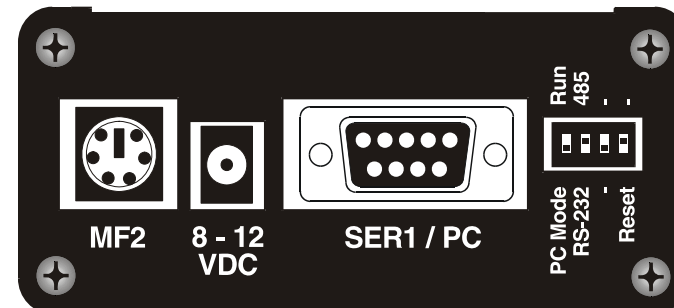
RS485

The configuration of port 0 as RS485 interface is done by removing the IC3 (MAX232) and placing the IC12 (SN75176) into the 8-channel DIL socket. The DIP switch on the left side plate of the ICOM-200/201 has to be set to RS485.

Removing or placing the ICs is only allowed without power supply. Never place both ICs at the same time, this could lead to the destruction of the ICOM-200/201.

RS485	DB37
TXD0 (A)	16
RXD0 (B)	17

Layout of DB37 connector (RS485)



Opto inputs

The ICOM-200/201 has eight optocoupler inputs suited for an input voltage range of 5...12 VDC. To use higher input voltages, as 24V for example, an additional serial resistor in the input line is used. The resistor value is selected in accordance to 4...50mA input current needed for the logical "1" level.

The internal resistance is 680 Ohm / 0,25 W. If now another input voltage is needed, the totally required resistance can be calculated with the following formula:

$$R_{ges} = (U_E - 1,3V) / I_D$$

U_E = Input voltage
 I_D = Current into the optocoupler
 R_{ges} = Total resistance

Example:

Is e.g. an input voltage of 24 V with a current of 10 mA wanted, you get from the above formula $R_{ges} = 2270$ Ohm. This means either the internal 680 Ohm resistor has to be replaced with a 2200 Ohm resistor (rounded to norm value), or a resistor of 1500 Ohm has to be connected in series.

The optocoupled inputs are realized as extended inputs of the Tiny Tiger. They can be accessed under logical port address 11h (physical 1).

Both USER_EPORT instructions in the sample program are urgent.

Optocoupler pin	DB37 socket
Opto In0	6
Opto In1	25
Opto In2	7
Opto In3	26
Opto In4	8
Opto In5	27
Opto In6	9
Opto In7	28
GND	10



2

```

-----
----- ICOM200_OPTOIN.TIG
-----

#include define_a.inc
user_var_strict
TASK Main

BYTE wert

USER_EPORT lastladr,10h
USER_EPORT physoffs, 0f0h
DIR_PORT 8,0
DIR_PORT 7,0
INSTALL_DEVICE #lcd,"LCD2.TDD",0,0,0EEH,1,150,11H' LCD-1=128x64,150
KB/s

OUT 8,11111111b,11011111b      ' set CTRL-Pins of T6963C
OUT 8,10000000b,255           ' Buzzer "off"

-----
----- Optokoppler Inputs -----
-----

OP:
IN 1h,wert                    ' Optokoppler Inputs einlesen
PRINT #lcd, "wert=";wert      ' Wert auf LCD ausgeben
GOTO op                       ' Sprung nach "OP"
END

```

Power outputs

The power outputs of the ICOM-200/201 are extended outputs of the Tiny-Tiger[®], which are equipped with a driver IC type TD62083 or compatible. The outputs have the physical address 00h and can be (with an offset of -10h) accessed with the port address 10h by the software.

The power outputs are lead to the 37-ch. Sub-D connector. The pin OVCC is connected to a internal protector diode, so the outputs are secured against overvoltage. This pin normally should have the same voltage potential as the voltage to be switched.



Power outputs	DB-37 Pin
Out 0	23
Out 1	4
Out 2	22
Out 3	3
Out 4	21
Out 5	2
Out 6	20
Out 7	1
OVCC	5

2

```

'----- ICOM200_OUTPUTS.TIG
'-----

#include define_a.inc
user_var_strict
TASK Main
WORD i

    USER_EPORT lastladr,10h
    USER_EPORT physoffs, 0f0h

    DIR_PORT 8,0
    INSTALL_DEVICE #lcd,"LCD2.TDD",0,0,0EEH,1,150,11H' LCD-1=128x64, 150
KB/s
    OUT 8,11111111b,11011111b           ' set CTRL-Pins of T6963C
    OUT 8,10000000b,255                 ' Buzzer aus !

'-----
--
'----- OpenCollector Outputs -----
--
'-----
--
    FOR i = 0 to 7                       ' 8 Pins
        OUT 10h,mask (i),255             ' Pin auf "1" setzen
        WAIT_DURATION 1000               ' 1 sec warten
        OUT 10h,mask (i),0               ' Pin auf "0" setzen
        WAIT_DURATION 1000               ' 1 sec warten
    NEXT
END

```

Analog inputs

The analog inputs have a hardware resolution of 10 bit, nevertheless by software interpolation a resolution of 12 bit can be achieved. More detailed information can be found in the BASIC-Tiger[®] „Device driver“ manual.

To allow the universal use of Tiny-Tiger[®] analog inputs, each channel is equipped with an OpAmp. With this circuitry not only an amplification factor can be set, but also a different configuration of the inputs is possible. Three different configurations can be set:



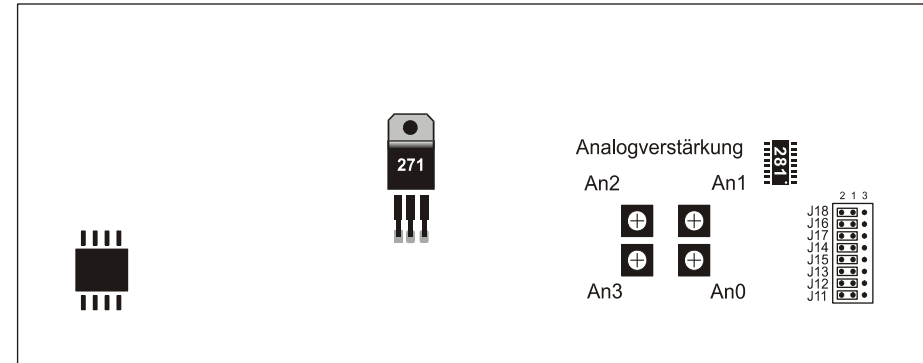
- 0...5V DC
- 0...10V DC
- 0...20mA

Analog channel	DB37 socket
An0	32
An1	14
An2	33
An3	15
AGND	34

ICOM-manual

The configuration is done with jumpers on the backside of the board (see picture). To alter the configuration it is necessary to open the device. This should only be done by a qualified person. How the jumpers have to be placed for the specific configurations is shown in the following table and pictures.

2

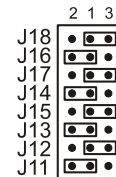


Backside of board

Configuration 0...5V

On delivery of the ICOM-200/201 the analog inputs are configured for input voltages of up to 5V. The placement of the jumpers is shown in the picture below.

Please pay attention that the keys are free and may fall out while opening the case. Please open it bottom side up !



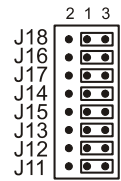
	Analog 0		Analog 1		Analog 2		Analog 3	
	J11	J12	J13	J15	J14	J17	J16	J18
0-5V	1 - 3	1 - 2	1 - 3	1 - 2	1 - 3	1 - 2	1 - 3	1 - 2

Configuration 0...10V

To use the analog inputs with voltages of up to 10V DC, it is necessary to change the jumper configuration. Please pay attention that the keys are free and may fall out while opening the case. To avoid this, place the device keys down on the table and then gently pull the board out of the case.



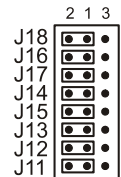
Following the jumper configuration for input voltages of up to 10 V.



	Analog 0		Analog 1		Analog 2		Analog 3	
	J11	J12	J13	J15	J14	J17	J16	J18
0-10V	1 -3	1 -3	1 -3	1 -3	1 -3	1 -3	1 -3	1 -3

Configuration 0...20mA

The past configurations have been voltage inputs. The following configuration makes it possible to realize current inputs.

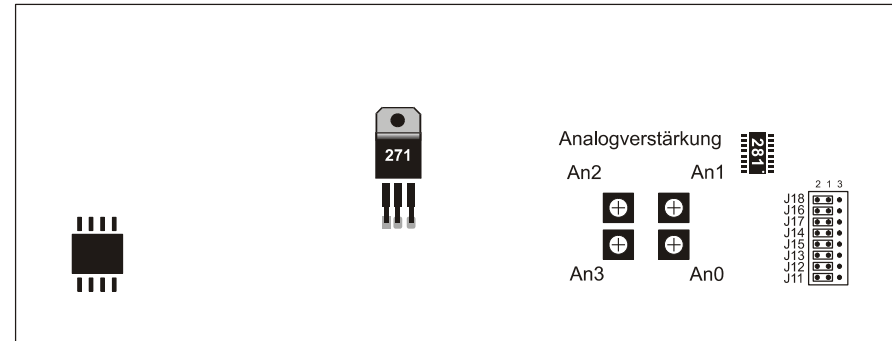


	Analog 0		Analog 1		Analog 2		Analog 3	
	J11	J12	J13	J15	J14	J17	J16	J18
0-20mA	1 -2	1 -2	1 -2	1 -2	1 -2	1 -2	1 -2	1 -2

Setting the amplification

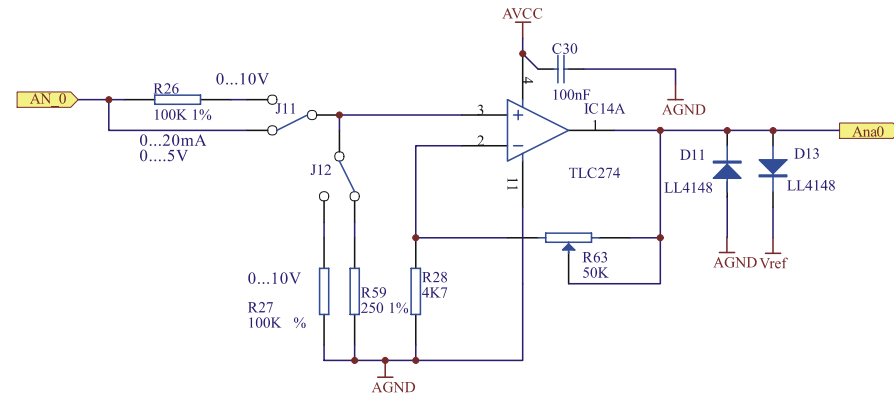
The analog inputs of the ICOM-200 / 201 have an adjustable input amplifier. The amplification can be set to a factor between 1 and 10. This is done continuously with potentiometers on the backside of the board.

2



Backside of board

The schematic below shows the input circuit available for each analog channel. The diodes protect the Tiny-Tiger® pins against negative voltages and voltage peaks.



```

----- ICOM200_AD.TIG
-----

#include define_a.inc
user_var_strict
TASK Main
  BYTE k
  ARRAY Value(4) OF WORD
  DIR_PORT 8,0
  DIR_PORT 7,0
  INSTALL_DEVICE #lcd,"LCD2.TDD",0,0,0EEH,1,150,11H' LCD-1=128x64, 150
  KB/s
  INSTALL_DEVICE #4, "ANALOG1.TDD"      ' Analog-Inputs installieren

  OUT 8,11111111b,11011111b           ' set CTRL-Pins of T6963C
  OUT 8,10000000b,255

LOOP 99999
  FOR K = 0 TO 3                      ' 4 Kanale
    GET #4, #K, 2, Value(K)           ' Wert aus AD-Wandler lesen
  NEXT                                ' naechster Kanal
  PRINT #lcd, "<1>";                  ' Bildschirm loeschen
  FOR K = 0 TO 3                      ' 4 Kanale
    PRINT #lcd, "AD"; K; ":";         ' Kanal-Nr. anzeigen
    PRINT #lcd, Value(K)              ' Wert auf LC-Display ausgeben
  NEXT                                ' naechster Kanal
  WAIT_DURATION 100                   ' 100 ms warten
ENDLOOP
END

```

2

MF-2 Keyboard

The ICOM-200 and ICOM-201 both have a connector for a MF2 keyboard. With this it is possible to connect a common PC keyboard to the ICOM.

2

For the connection of a MF2 keyboard two pins of the Tiny-Tiger[®] are needed. For the ICOM-200/201 those are pins P84 and P85 of the Tiny-Tiger[®] module. These pins are directly lead to the MF2 plug on the left side of the ICOM.

```

----- ICOM200_MF2.TIG
-----

USER_VAR_STRICT

#project_model pm_min

#include mf2_tr.inc          '' subroutines of the Transport Layer

#define LCD      1
#define KEYB1    20

                                '' Set of Keyboard Variables;
WORD wKeybDevId1             '' Keyboard Device Number
LONG lKeybExtFlags1          '' Keyboard Flags
BYTE bKeybActLang1          '' Keyboard Layout( Language )

TASK Main
  WORD wKey
  BYTE bIsActive
  LONG lComplexMask

  dir_port 8, 00000000b
  out 8,00010000b, 0
                                ' LCD-4=240x128, 150 KB/s
  install_device #lcd,"LCD2.TDD",0,0,0EEH,1,150,11H
  INSTALL DEVICE #KEYB1, "MF2_8485.TDD" '' L84=clock, L85=data

                                '' Initialize the Keyboard Variables
  wKeybDevId1 = KEYB1
  lKeybExtFlags1 = 0
  bKeybActLang1 = LANG_GERMAN
  CALL InitKeybTables( bKeybActLang1 )
  CALL InitKeybDev( wKeybDevId1 )
  PRINT #LCD,"<1>";
  PRINT #LCD,"<1Bh>c";CHR$(0);"<F0h>";
  USING "UH<3><2> 0.0,0.0.3"
  CALL SetLcdOutputPos( LCD, 0, 0 )
  PRINT #LCD, "LowByte : "
  CALL SetLcdOutputPos( LCD, 0, 1 )
  PRINT #LCD, "HighByte: "
  CALL SetLcdOutputPos( LCD, 0, 2 )
  PRINT #LCD, "Ctrl Key: "
  CALL SetLcdOutputPos( LCD, 0, 3 )
  PRINT #LCD, "Status : "
  run_task p8
  WHILE 1 = 1
    '' Read a key from keyboard buffer and translate it into ASCII
    CALL GetAsciiKey( wKeybDevId1, lKeybExtFlags1, bKeybActLang1, wKey)
    IF wKey <> 0 THEN

```

```

CALL SetLcdOutputPos( LCD, 9, 0 )
PRINT_USING #LCD, wKey BITAND 0ffh
CALL SetLcdOutputPos( LCD, 9, 1 )
PRINT_USING #LCD, ( wKey SHR 8 ) BITAND 0ffh
' ' Check whether a control key is pressed
CALL SetLcdOutputPos( LCD, 11, 2 )
CALL CheckKeybFlags(__KF_SHIFTRIGHT_DOWN,lKeybExtFlags1,bIsActive)
IF bIsActive = TRUE THEN
    PRINT #LCD, "Shift_R"
ENDIF
CALL CheckKeybFlags(__KF_SHIFTLEFT_DOWN,lKeybExtFlags1,bIsActive)
IF bIsActive = TRUE THEN
    PRINT #LCD, "Shift_L"
ENDIF
CALL CheckKeybFlags(__KMT_CTRLRIGHT_DOWN,lKeybExtFlags1,bIsActive)
IF bIsActive = TRUE THEN
    PRINT #LCD, "Ctrl_R "
ENDIF
CALL CheckKeybFlags(__KF_CTRLLEFT_DOWN,lKeybExtFlags1,bIsActive)
IF bIsActive = TRUE THEN
    PRINT #LCD, "Ctrl_L "
ENDIF
CALL CheckKeybFlags(__KMT_ALTRIGHT_DOWN,lKeybExtFlags1,bIsActive)
IF bIsActive = TRUE THEN
    PRINT #LCD, "Alt_R "
ENDIF
CALL CheckKeybFlags(__KF_ALTLEFT_DOWN,lKeybExtFlags1,bIsActive)
IF bIsActive = TRUE THEN
    PRINT #LCD, "Alt_L "
ENDIF
lComplexMask = &
    __KF_SHIFTRIGHT_DOWN BITOR __KF_SHIFTLEFT_DOWN BITOR &
    __KMT_CTRLRIGHT_DOWN BITOR __KF_CTRLLEFT_DOWN BITOR &
    __KMT_ALTRIGHT_DOWN BITOR __KF_ALTLEFT_DOWN
CALL CheckKeybFlags( lComplexMask, lKeybExtFlags1, bIsActive)
IF bIsActive = FALSE THEN
    PRINT #LCD, "No Spec"
ENDIF
' ' Is Code extended or normal ?
CALL SetLcdOutputPos( LCD, 11, 3 )
IF wKey BITAND 0ffh = 0 THEN
    PRINT #LCD, "Extended"
    CALL SetLcdOutputPos( LCD, 13, 0 )
    PRINT #LCD, "Null "
    CALL SetLcdOutputPos( LCD, 13, 1 )
    PRINT #LCD, "EScan"
ELSE
    PRINT #LCD, "Normal "
    CALL SetLcdOutputPos( LCD, 13, 0 )
    PRINT #LCD, "Ascii"; ";" ; CHR$( wKey BITAND 0ffh )
    CALL SetLcdOutputPos( LCD, 13, 1 )
    PRINT #LCD, "Scan "
ENDIF
ENDIF

```

```
ENDIF
ENDWHILE
END
SUB SetLcdOutputPos( WORD wDevId; BYTE Column, Row )
  PRINT #wDevId, "<1BH>A";CHR$( Column );CHR$( Row );"<0F0H>";
END

Task p8
  BYTE ever

  for ever = 0 to 0 step 0
    out 8,00010000b, 0
  next
END
```

2

TINY-Tiger® Pins

The ICOM-200/201 has, in addition to the extended I/O pins with optocouplers and transistors, some standard pins of the TINY-Tiger®.

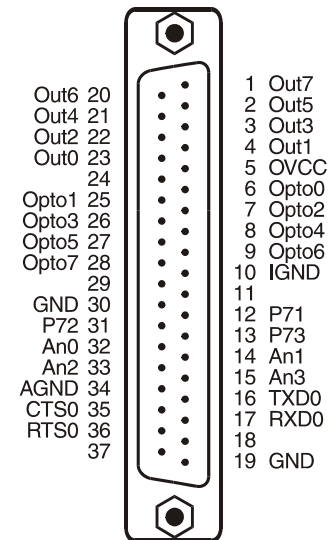
At the DB37 connector the pins P71, P72 and P73 are lead out.



Tiny-Tiger pin	DB37 connector
P71	12
P72	31
P73	13

Pin layout 37-ch. D-Sub connector

The 37-ch. D-Sub connector carries all available I/O pins except for serial port 1.



Technical data

- LCD:** Graphical display with 128 x 64 pixel and LED backlight.
- Keyboard:** Keyboard matrix with 20 keys and additional connection for MF2 keyboard
- Sound:** Beeper, e.g. as keyboard click.
- Interface:** 1 x RS232
1 x RS232/RS485 selectable.
- Analog In:** Settable to
4 x 0...5V resp. 0...10V or 0...20mA
Input amplifier:
1 < V < 10
Resolution 10 bit.
- Inputs:** 8 x opto in 5 to 12V (higher range possible through external resistor).
- Outputs:** 8 x Darlington, with protective diode.
max 50V/500mA @ 1 chanel, duty = 10%
50mA @ 8 chanel, duty = 100%
- Supply:** **RUN:** 8...12V DC, 450mA
SLEEP: approx. 25mA
- Size:** approx. 196 x 88,5 x 40mm(LxBxH)
- Connections:** RS232 with DB9
All other with DB37
- Temp. range:** -20° to 50°C
expanded temp range on request

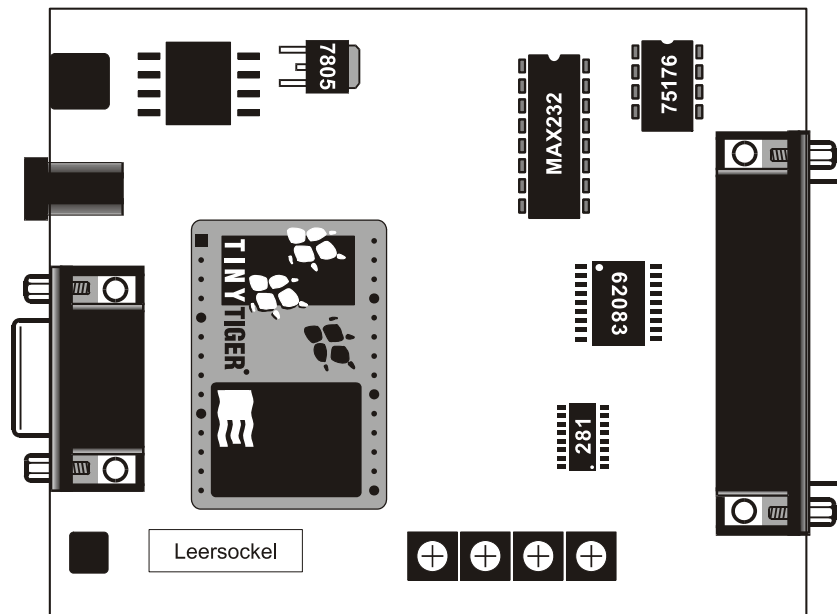


3 ICOM-241

The ICOM-241 is the most cost effective solution of the ICOM family. The processor used is a Tiny-Tiger[®] Economy.

The ICOM-241 has eight transistor outputs and four optocoupler inputs. From both serial ports, port 0 can be configured as RS485 interface as well.

For measurement of analog signals the ICOM-241 possesses four analog inputs with a hardware resolution of 10 bit (12 bit by software interpolation). The maximum input voltage for the analog inputs is 5V DC.



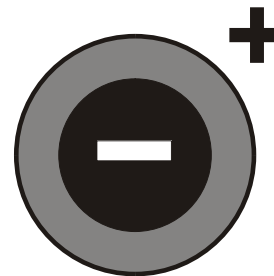
Components side ICOM-241

First steps

Power supply

The ICOM-200/201 uses a power supply with 8-12 VDC, 1A. Minus is placed on the pin of the power supply connector. The current consumption is, depending on the application, up to 400mA.

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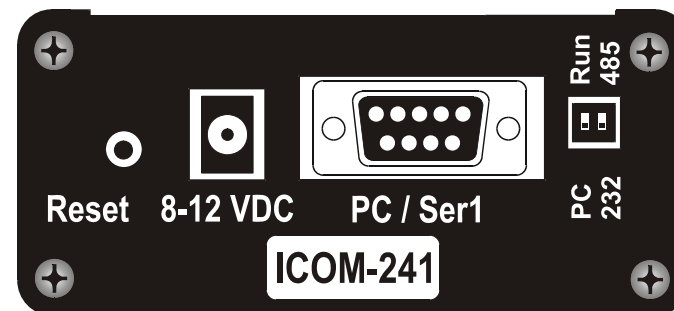


8...12 V DC
1A min

PC-Mode

After a reset or power-down the Tiny-Tiger[®] Economy inside the ICOM-241 is testing if the PC mode pin is „low“. In this case, the ICOM switches to PC mode/Debug mode. Is the pin „high“, the ICOM starts in run mode. The time between power-on and first activity on the I/O pins is approx. 230 msec.

To set the ICOM-241 to PC mode, a reset or power-down is needed. Setting the DIP switch to PC mode while in run mode is not sufficient.



Side view ICOM-241

RUN mode

If the DIP-switch "PC/Run" is in position "Run", the program in the ICOM-241 is executed immediately after a reset. Debugging is not possible in this mode.

Program download

A program created with the Tiger software is downloaded into ICOM-241 through the 9-pin Sub-D connector. To download the following has to be done:

- Connect a power supply 8-12 V DC (Polarity: Inner contact = minus, outer contact = plus)
- Connect ICOM-241 and PC with 9-pin D-Sub cable
- Set DIP switch of ICOM-241 to PC mode
- Set the reset DIP switch to „Reset“ and back to original position
- Start download at the PC.



Serial port 1 / Download	DB-9 plug
TXD	2
RXD	3
GND	5

Opto inputs

The ICOM-241 has eight optocoupler inputs suited for an input voltage range of 5...12 VDC. To use higher input voltages, as 24V for example, an additional serial resistor in the input line is used. The resistor value is selected in accordance to 4...50mA input current needed for the logical "1" level.

The internal resistance is 680 Ohm / 0,25 W. If now another input voltage is needed, the totally required resistance can be calculated with the following formula:

3

$$R_{ges} = (U_E - 1,3V) / I_D$$

U_E = Input voltage

I_D = Current into the optocoupler

R_{ges} = Total resistance

Example:

Is e.g. an input voltage of 24 V with a current of 10 mA wanted, you get from the above formula $R_{ges} = 2270$ Ohm. This means either the internal 680 Ohm resistor has be replaced with a 2200 Ohm resistor (rounded to norm value), or a resistor of 1590 Ohm has to be connected in series.

Attention:

When calculating the protective resistance the maximum dissipation of the resistor has to be considered!

Tiny-Tiger® Port	Optokoppler	DB-25 socket
P80	Opto In0	1
P81	Opto In1	14
P82	Opto In2	2
P83	Opto In3	15
-	Opto GND	3

The following program reads the status of the optocoupler inputs into a variable and sends it out through serial port 0.

```
'----- ICOM241_OPTOIN.TIG
'-----

#include define_a.inc
user_var_strict
TASK Main

BYTE wert

DIR_PORT 8,0fh          ' low nibble als Input
INSTALL_DEVICE #SER, "SER1B_K1.TDD",&
BD_9_600, DP_8N, JA, BD_9_600, DP_8N, JA

'-----
'-----          Optokoppler Inputs          -----
'-----

OP:
IN 8,wert              ' Optokoppler Inputs einlesen
wert = wert & 00001111b ' High nibble ausblenden
put #ser, #0, wert     ' Wert auf Ser 0 ausgeben
GOTO op               ' Sprung nach "OP"
END
```

3

Power outputs

The power outputs of the ICOM-241 are extended outputs of the Tiny-Tiger[®] Economy, which are equipped with a driver IC type TD62083 or compatible. This IC has got eight open collector outputs.

The power outputs are lead to the 25-ch. Sub-D connector. The pin OVCC is connected to a internal protector diode, so the outputs are secured against overvoltage. This pin normally should have the same voltage potential as the voltage to be switched.



Tiny-Tiger [®] Port	Power-Outputs	DB-25 Pin
P60	Out 0	12
P61	Out 1	11
P62	Out 2	10
P63	Out 3	9
P64	Out 4	8
P65	Out 5	7
P66	Out 6	6
P67	Out 7	5
	OVCC	13

```

'-----
' Demoprogramm ICOM-241
' Name: ICOM241_powerout.tig
'-----

TASK MAIN

BYTE X, I

LOOP 99999999          ' Schleife
  FOR I = 0 to 255     ' For Next Schleife
    OUT 6,255,I       ' Bitmuster ausgeben1
  NEXT                ' Ende For Next Schleife
ENDLOOP
END
    
```


Serial interface

As a standard the ICOM-241 has two serial interfaces. From these the port Ser0 can by choice be configured as RSR232 or RS485 interface. The port Ser1 always is a RS232 interface. In PC mode this port is used for downloading the program into the ICOM 241. In Run mode it can be used as a usual RS232 interface.

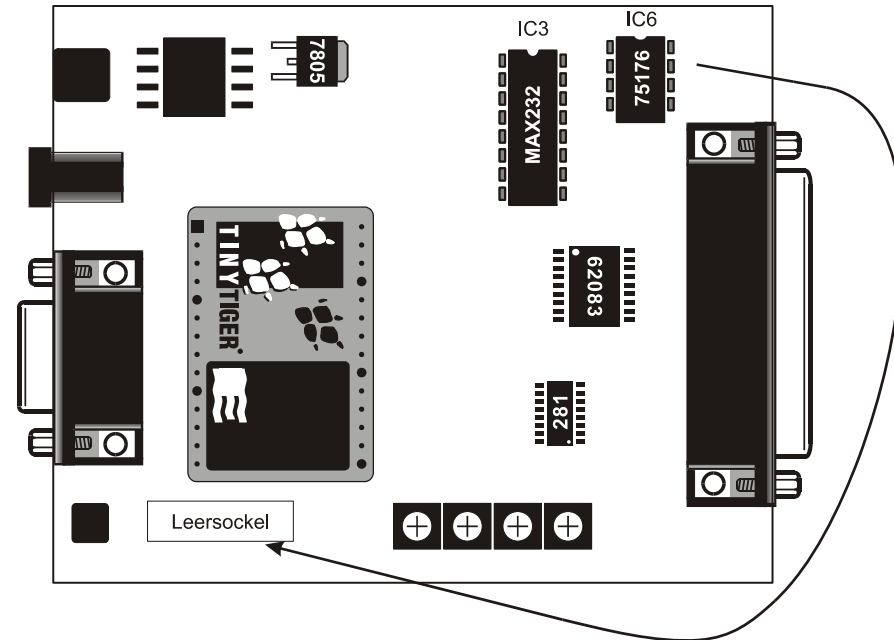
Detailed information about the serial interfaces can be read after in the BASIC-Tiger® „Device driver“ manual.

RS232

To configure port Ser0 as RS232 interface, the IC3 (MAX232) must be placed into the appropriate socket and IC6 (SN75176) has to removed from its socket. After that the DIP switch at the left side of the chassis has to be switched to RS232. It is recommended to place the IC 6 (SN75176) into the dummy socket, so it's always available when needed again.



3



The pins of serial port Ser0 are located on the DB25 connector. The pin layout is shown in the table below:

RS232 Pin	DB25 socket
TxD0	18
RxD0	17
CTS0	19
RTS0	20

Layout of DB25 connector (RS232)

RS 485

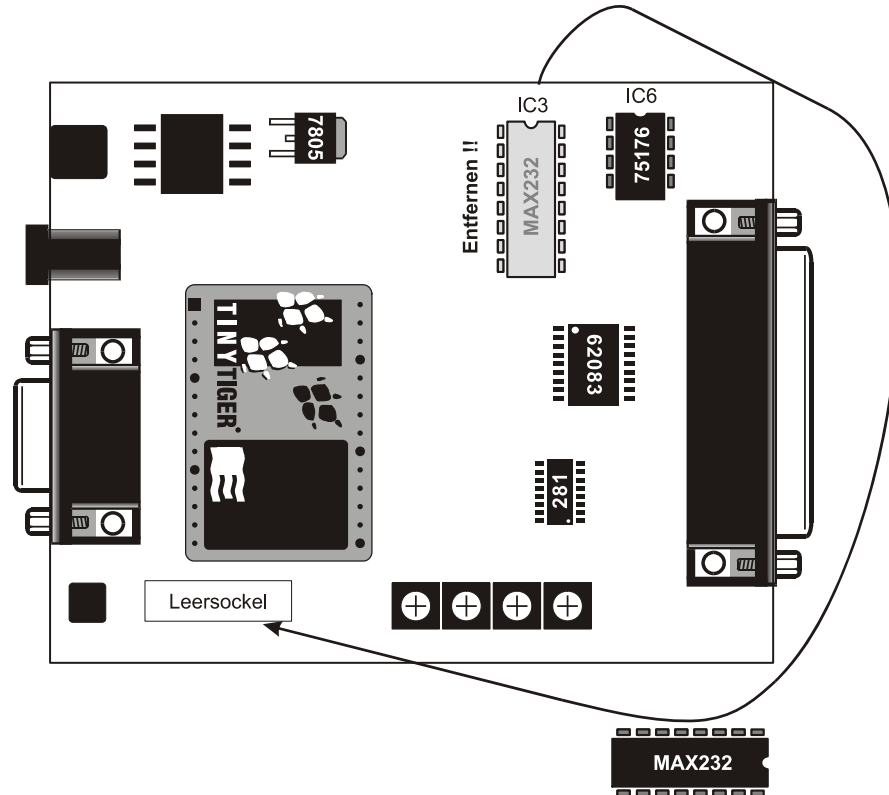
The configuration of port Ser0 as RS485 interface is done by placing the IC6 (SN75176) into the 8 pin DIL socket. The IC3 (MAX232) has to be removed and placed into the dummy socket. The DIP switch on the left side of the chassis has to be switched to RS485 position.

Placing or removing of the ICs is only allowed without power supply.



RS485 Pin	DB25 socket
TXD0 (A)	18
RXD0 (B)	17

Layout of DB25 socket (RS485)



3

Attention: Never place IC3 and IC6 at the same time, as this could lead to destruction of the serial port or the driver ICs !

The following sample program receives serial data through serial port 0.

```
'----- ICOM200_RS232.TIG
'-----

#include define_a.inc
user_var_strict
TASK Main
  BYTE i,k
  DIR_PORT 8,0

  INSTALL DEVICE #lcd,"LCD2.TDD",0,0,0EEH,1,150,11H' LCD-1=128x64, 150
  KB/s
  INSTALL DEVICE #SER, "SER1B_K1.TDD",&
    BD_9_600, DP_8N, JA, BD_9_600, DP_8N, JA

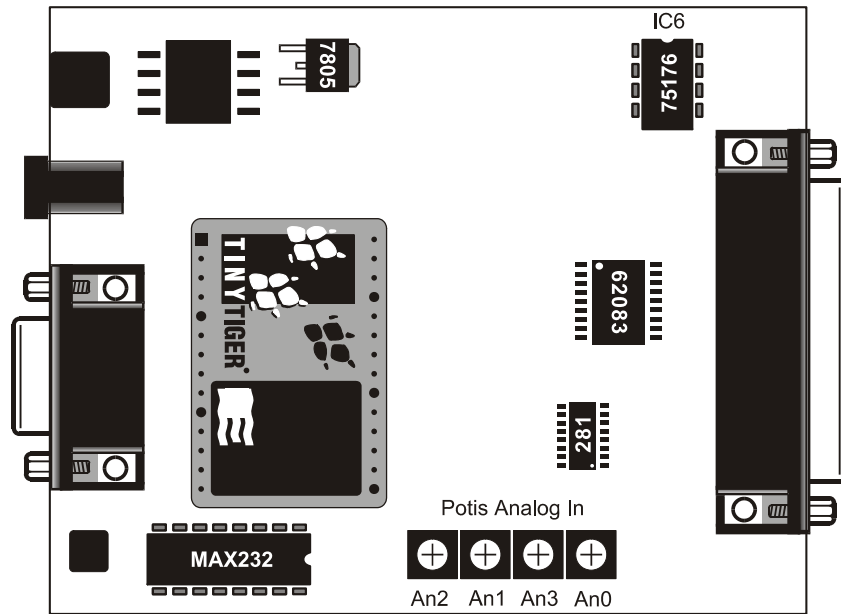
  OUT 8,11111111b,11011111b           ' set CTRL-Pins of T6963C
  OUT 8,10000000b,255                 ' Buzzer off !

  LOOP 99999999                       ' Endlosschleife
    GET #ser,#0,#1,1,i                 ' Eingangsbufferfüllstand
    IF I > 0 THEN
      GET #ser,#0,1,k                 ' Seriellen Eingangsbuffer lesen
      PRINT #lcd,"Taste = "; chr$(k)   ' Ausgabe auf dem LCD
    ENDIF
  ENDLOOP
END
```

Analog inputs

The analog inputs of the ICOM-241 have an input range from 0...5V DC. The hardware resolution is 10 bit and can be raised to 12 bit by software interpolation when needed. To be able to measure small signals each analog input is equipped with an OpAmp. The amplification can be set to a value between 1 and 10 by potis.

3

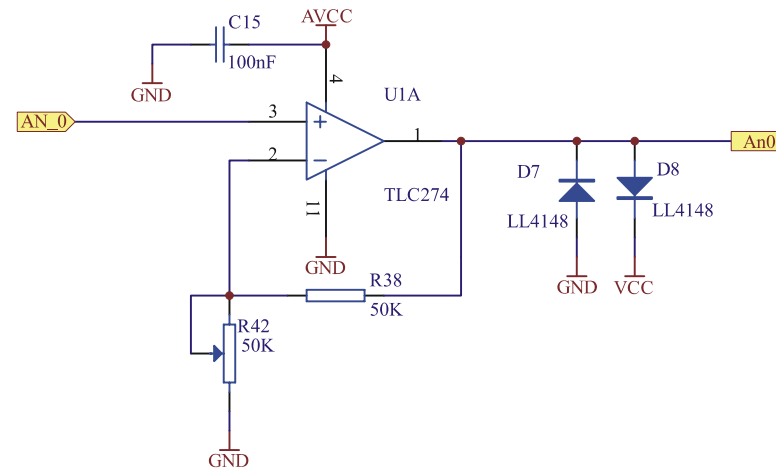


View of components side with potis of analog amplifiers

Analog channels	DB25 socket
An0	22
An1	23
An2	24
An3	25

Pin layout of DB25 connector (analog channels)

3



Circuit of analog inputs

```

'----- ICOM200_AD.TIG
'-----

#include define_a.inc
user_var_strict
TASK Main
  BYTE k
  ARRAY Value(4) OF WORD
  DIR_PORT 8,0
  DIR_PORT 7,0
  INSTALL_DEVICE #lcd,"LCD2.TDD",0,0,0EEH,1,150,11H' LCD-1=128x64, 150
  KB/s
  INSTALL_DEVICE #4, "ANALOG1.TDD"      ' Analog-Inputs installieren

  OUT 8,11111111b,11011111b           ' set CTRL-Pins of T6963C
  OUT 8,10000000b,255

  LOOP 99999
    FOR K = 0 TO 3                    ' 4 Kanäle
      GET #4, #K, 2, Value(K)        ' Wert aus AD-Wandler lesen
    NEXT                              ' naechster Kanal
    PRINT #lcd, "<1>";                ' Bildschirm loeschen
    FOR K = 0 TO 3                    ' 4 Kanäle
      PRINT #lcd, "AD"; K; ":";      ' Kanal-Nr. anzeigen
      PRINT #lcd, Value(K)          ' Wert auf LC-Display ausgeben
    NEXT                              ' naechster Kanal
    WAIT_DURATION 100                ' 100 ms warten
  ENDLOOP
END

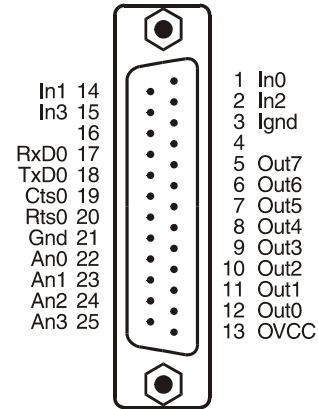
```

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Pin layout 25-pin D-Sub connector

The 25-pin D-Sub connector carries all available I/O pins (except for serial port 0) of the ICOM-241.

3



Technical data

Interface:	1 x RS232 1 x RS232/RS485 selectable.
Analog In:	4 x 0...5V with input amplifier $1 < V < 10$ Resolution 10 bit.
Inputs:	4 x opto in 5 to 12V DC
Outputs:	8 x Darlington, with protective diode. max 50V/500mA @ 1 channel, duty = 10% 50mA @ 8 channels, duty = 100%
Supply:	8...12V DC, 90mA
Size:	approx. 106 x 88,5 x 40mm(LxBxH)
Connections:	RS232 with DB9 All other with DB25

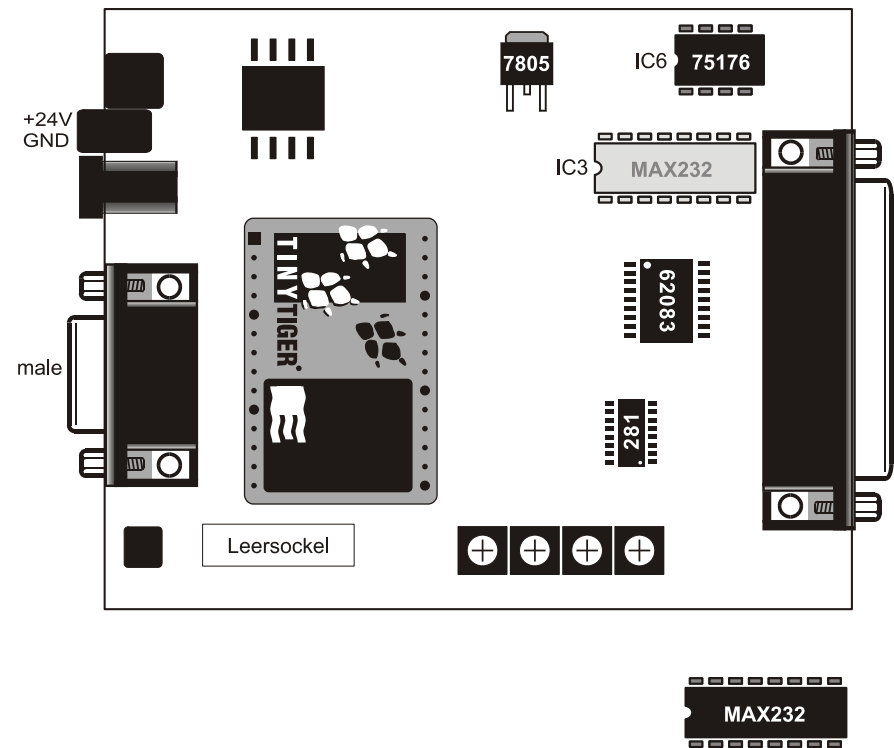
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ICOM 241 – 24V

The ICOM-241 – 24V is a variant of the ICOM 241. It needs a supply voltage between 14V and 24V DC. The serial port SER1 is realized with a male 9 pol. Sub D Connector.

3

serial port 1 / download	DB-9 Connector (male)
TXD	3
RXD	2
GND	5



Connection to PC

For programme download, debugging and other communication with a PC use a crosslinked cable (null modem)

Technical data

Interface:	1 x RS232 1 x RS232/RS485 selectable.
Analog In:	4 x 0...5V with input amplifier $1 < V < 10$ Resolution 10 bit.
Inputs:	4 x opto in 5 to 12V DC
Outputs:	8 x Darlington, with protective diode. max 50V/500mA @ 1 channel, duty = 10% 50mA @ 8 channels, duty = 100%
Supply:	14...24V DC, 95mA
Size:	approx. 106 x 88,5 x 40mm(LxBxH)
Connections:	RS232 with DB9 male All other with DB25



4 Hints and help

When you have problems with a Tiger-BASIC® program:

- Try to reduce the problem to a short and simple sample program. Maximum should be one page, mostly a view lines will do.
- Which version of the compiler do you use (see **About...** in menu **Help**)?
- Which versions have the device drivers involved (see **Device driver list** in menu **View**)?
- Describe the faultive situation as detailed as possible.
- In what context does the error occur?
- Does the error occur always or only occasionally?
- Include all your communication numbers as Fax, Phone etc. in your request, so we can help you as fast as possible.



BASIC-Tiger® Service Hotline:

+49 (0)241 / 15 15 99

Wilke Technology GmbH
Krefelder Str. 147
P.O. Box 1727

D-52070 Aachen / Germany

Phone: +49 (0) 241/918900
Fax: +49 (0) 241/9189044
eMail: support@wilke-technology.com

4

5 Register

Amplification 2-18
analog inputs 2-15, 3-12
Display 2-8
Goldcap 2-4
I/O pins 2-24
ICOM-241 3-1
LC display 2-8
Loading time **2-5**
Matrix keyboard 2-6
MF2 keyboard 2-20

Opto inputs 2-11, 3-4
PC mode 2-2
Power outputs 2-13, 3-6
Power supply 2-2, 3-2
Program download 2-3
RS232 interface 2-9, 3-8
RS485 interface 2-10, 3-9
RUN mode 2-3
Technical data 2-25, 3-16

