

EXDUL-142

EDP No.: A-380060

24 TTL Inputs/Outputs

wasco[®]

user's guide

Copyright© 2008 by Messcomp Datentechnik GmbH

This documentation is protected by copyright of Messcomp Datentechnik GmbH. All rights are reserved.

Messcomp Datentechnik GmbH reserves the right to modify the products described in this manual at any time and without announcement.

No part of this manual is allowed to be reproduced, copied, translated or transmitted in any way without the prior written consent of Messcomp Datentechnik GmbH.

Registered Trademarks

Windows®, Visual Basic®, Visual C++®, Visual C#® are registered trademarks of Microsoft.

Delphi® is registered trademark of Borland.

wasco® is registered trademark.

EXDUL® is registered trademark.

Disclaimer

The information in this manual is intended to be accurate and reliable. The company Messcomp Datentechnik GmbH assumes no liability for the use of the multi functional module EXDUL-142 and this documentation, neither for direct nor indirect damages.

Table of Contents

- 1. Description**
- 2. Connector Plug**
 - 2.1 Pin Assignment of CN1
- 3. System Components**
 - 3.1 Block Diagram
 - 3.2 TTL Inputs/Outputs
- 4. Initial Start-up**
 - 4.1 Connecting to a USB Port
 - 4.2 Power Supply
- 5. Installing the Windows[®] drivers**
- 6. Programming under Windows[®]**
 - 6.1 Overview
 - 6.2 Communication with EXDUL-142
 - 6.3 Windows[®] Functions for Programming
 - 6.4 Command and Data Format
 - 6.5 Register Config, HW Identification, User A, User B, Serial Number
 - 6.6 Overview of Commands
 - 6.7 Structure of Commands
- 7. Accessories**
 - 7.1 Suitable **wasco**[®] Accessories
 - 7.2 Connection Technique (Application Examples)
 - 7.3 Single Components for own Assembly
- 8. Specifications**
- 9. ASCII Table**
- 10. Product Liability Act**
- 11. CE Declaration of Conformity**

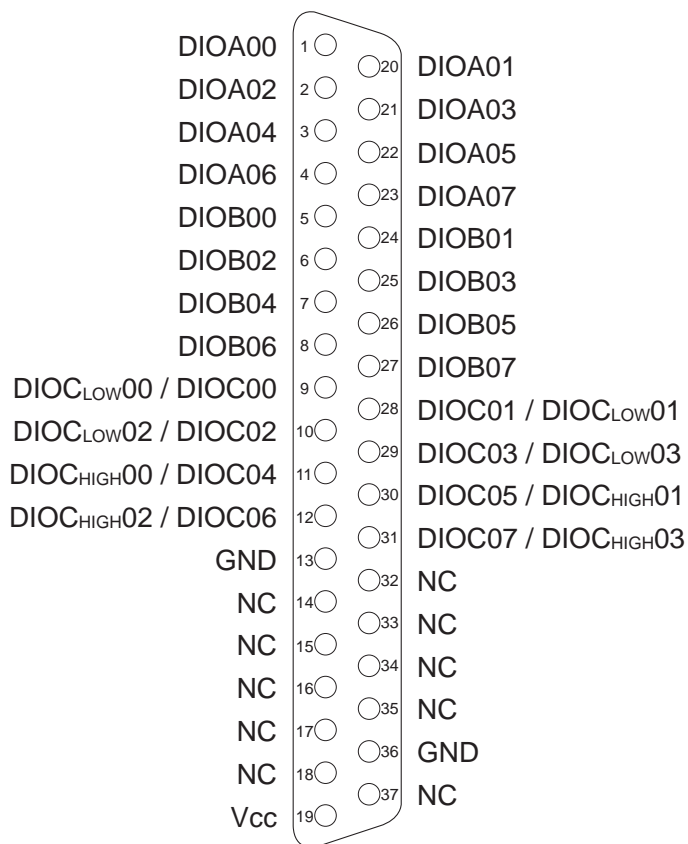
1. Description

The digital metering and control adapter EXDUL-142 features 24 digital input and output channels with TTL level. The three input/output ports are programmable in groups of eight channels, the third port additionally is programmable in two groups of four channels to be input or output.

The compact and absolutely robust metal casing integrates the entire control logic as well as the 37-pin Sub-D socket to connect to peripheral devices. Connection to a PC is made easily and conveniently Plug-and-Play via a USB interface also used for the required voltage supply.

2. Connector Plug

2.1 Pin Assignment of CN1



Vcc:

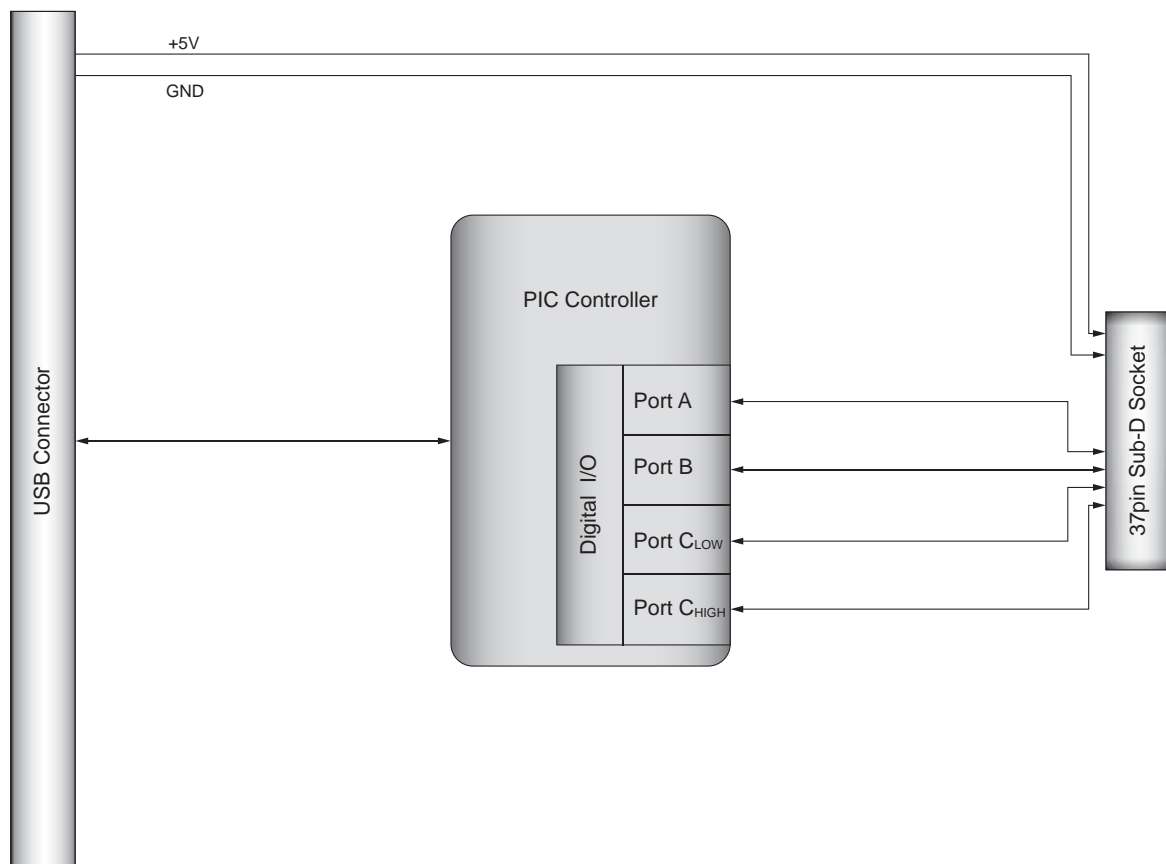
Connector for internal voltage source (+ 5V). Never apply an external voltage across this pin!

GND:

Ground connection

3. System Components

3.1 Block Diagram



3.2 TTL Inputs / Outputs

24 channels, TTL compatible

structured in three eight-channelled ports, one of which being programmable in two groups with four channels to be input or output

Logic level: Low (0...1 V)
 High (3...5 V)

4. Initial Start-up

Connecting to a computer is made easily and conveniently Plug-and-Play via a USB interface. The required operating voltage for the module is supplied via the USB port.

4.1 Connection to a USB Port

The EXDUL-142 features a USB 2.0 interface and can be connected directly to the computer or via a USB hub. The module is hot pluggable, this means you can connect it even during running operations.

4.2 Power Supply via the USB Port

The operating voltage of the module is +5V. The device is powered up via the computer's USB port. It may be necessary to configure your operating system software to obtain appropriate power requirements (see section Specifications).

5. Installation of the Windows® Drivers

When you connect the USB module EXDUL-142 to your computer for the first time, Windows® will automatically detect a new device and search for a suitable driver.

To install the drivers indicate the directory and the file „wascoxmfe.inf“ into the Windows Hardware Wizard.

After the driver database has been updated the Hardware Wizard will inform you about the successful installation of the driver.

The Windows® Device Manager will now show your USB module EXDUL-142 as a Wasco USB Communication Port COMx in its directory connections (COM/LTP) tree. All Windows® software can access the virtual interface as if it were a real COM port.

6. Programming under Windows[®]

6.1 Overview

After successful installation the USB module EXDUL-142 is shown as a Wasco USB Communication Port COMx in your Windows[®] Device Manager. This is a CDC device (Communications Device Class), that is addressed via a virtual COM port.

The software access to this virtual COM port operates like a normal COM interface of default Windows[®] drivers, and it is not necessary to install any additional drivers.

6.2 Communication with EXDUL-142

Data is exchanged by transmitting and receiving zero terminated strings via the virtual COM interface.

Every transmitting or receiving string consists of three elements in ANSI format (1 byte each sign)

Every permitted transmission string will be replied by a defined result or confirmation string.

The last result or confirmation string has to be read before transmitting a new string.

6.3 Windows[®] Functions for Programming

You can program EXDUL-142 either via WIN32 API functions or very easily via an already existing serial port object in a programming language. You can find examples to this in the installation directory on your computer after having installed the software.

Windows functions for programming:

- CreateFile
- GetCommState
- SetCommState
- WriteFile
- ReadFile
- DCB Structure (describes the control parameters of the device)

6.4 Command and Data Format

Data is exchanged by transmitting and receiving zero terminated strings. Every transmitting or receiving string consists of three elements in ANSI format (1 byte each sign).

Configuration or output commands are confirmed by returning the relevant character string. Reading commands are returned by a character string containing the operation code and the read value.

6.5 Register Config, HW Identification, User A, User B, Serial Number

CONFIG	A0 B0 C0 D0 FF FF FF FF FF FF FF FF FF FF FF FF
HW Identifier	E X D U L - 1 4 2 V 2 . 0 FF FF
USER A	E X D U L - 1 4 2 FF FF FF FF FF FF FF FF
USER B	FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
S/N	1 0 4 4 0 3 6 FF FF FF FF FF FF FF E7 20

„CONFIG Register“ enables the user to query and to analyse the configuration state of the TTL ports.

Byte	Hex Value	Digital I/O Port
0	A0	Port A (Inputs)
0	AF	Port A (Outputs)
1	B0	Port B (Inputs)
1	BF	Port B (Outputs)
2	C0	Port C _{Low} (Inputs)
2	CF	Port C _{Low} (Outputs)
3	D0	Port C _{High} (Inputs)
3	DF	Port C _{High} (Outputs)

Data in the „CONFIG-Register“ remains stored when you turn off your computer. After every restart the configuration of the digital ports will be overtaken from the „CONFIG-Register“.

The module name is stored in the HW identification register. Here the user can determine the product identity. The hardware identifier ends with a blank (20_{hex}). In each of the register „USER A“ and „USER B“ 16 digits (16 byte) are at your proposal for your own use. Data remains stored when you turn off. The name of the module is located by default in register „USER A“.

Register SERIAL NUMBER serves for internal purposes and can only be read by the user.

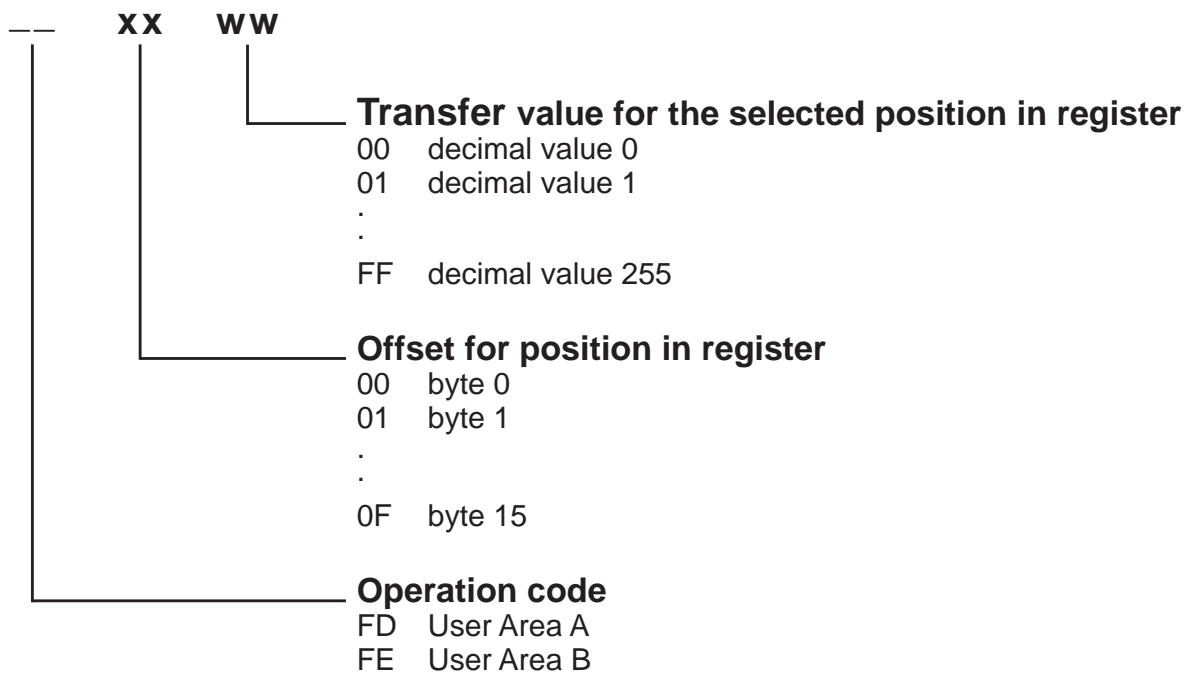
6.6 Overview of Commands

Hexcode	Description
DD 58 4D	EXDUL-142 Default Reset (restoring delivery settings)
FD xx ww	Writing user area A
FE xx ww	Writing user area B
E0 xx 00	Reading configuration area
EC xx 00	Reading HW identifier
ED xx 00	Reading user area A
EE xx 00	Reading user area B
EF xx 00	Reading serial number
21 00 00	Configuration: Digital-I/O Port A (Inputs)
22 00 00	Configuration: Digital-I/O Port B (Inputs)
23 00 00	Configuration: Digital-I/O Port C (Inputs)
27 00 00	Configuration: Digital-I/O Port C _{Low} (Inputs)
2B 00 00	Configuration: Digital-I/O Port C _{High} (Inputs)
A1 00 00	Configuration: Digital-I/O Port A (Outputs)
A2 00 00	Configuration: Digital-I/O Port B (Outputs)
A3 00 00	Configuration: Digital-I/O Port C (Outputs)
A7 00 00	Configuration: Digital-I/O Port C _{Low} (Outputs)
AB 00 00	Configuration: Digital-I/O Port C _{High} (Outputs)

Hexcode	Description
01 00 00	Reading Digital-I/O Port A
02 00 00	Reading Digital-I/O Port B
03 00 00	Reading Digital-I/O Port C
07 00 00	Reading Digital-I/O Port C _{Low}
0B 00 00	Reading Digital-I/O Port C _{High}
81 00 ww	Writing Digital-I/O Port A
82 00 ww	Writing Digital-I/O Port B
83 00 ww	Writing Digital-I/O Port C
87 00 ww	Writing Digital-I/O Port C _{Low}
8B 00 ww	Writing Digital-I/O Port C _{High}

6.7 Structure of Commands

6.7.1 Writing in User Area A and B

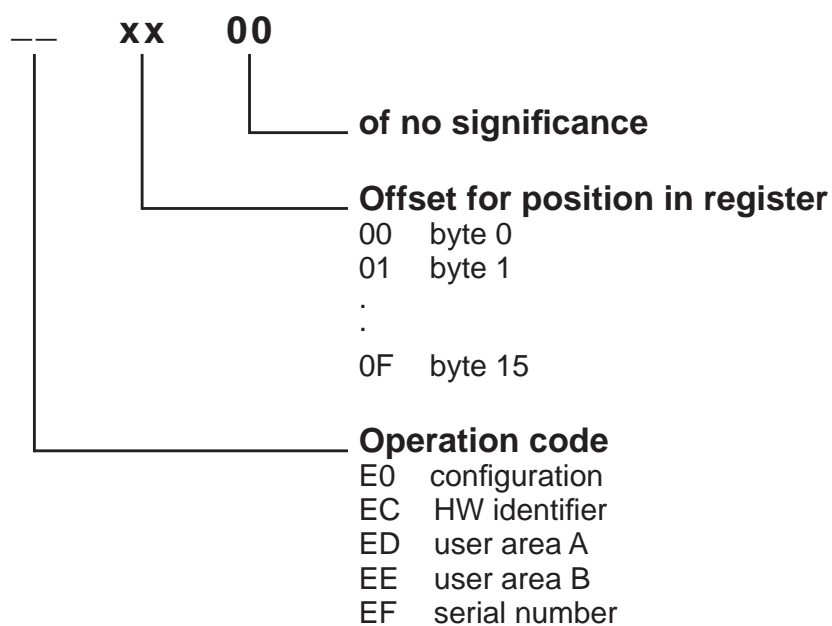


Areas User A and User B comprise of 16 digits each (16 bytes), both of the areas will be written byte by byte.

For example: Type STEUERUNG in User area A

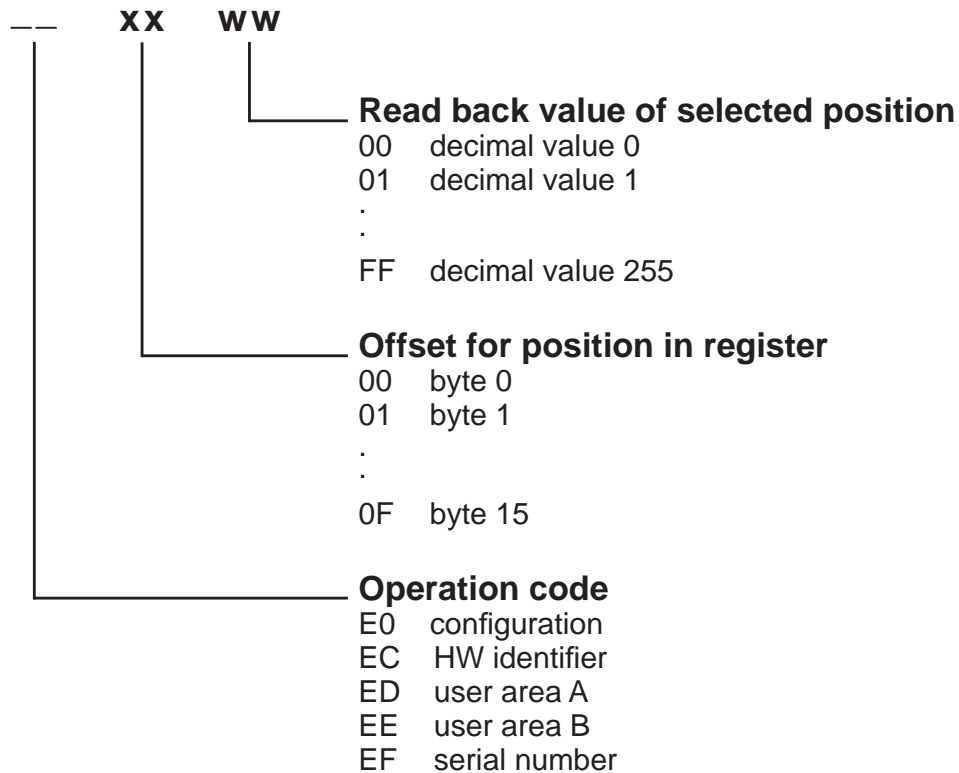
Writing	Response
FD _{hex} 00 _{hex} 53 _{hex}	FD _{hex} 00 _{hex} 53 _{hex}
FD _{hex} 01 _{hex} 54 _{hex}	FD _{hex} 01 _{hex} 54 _{hex}
FD _{hex} 02 _{hex} 45 _{hex}	FD _{hex} 02 _{hex} 45 _{hex}
FD _{hex} 03 _{hex} 55 _{hex}	FD _{hex} 03 _{hex} 55 _{hex}
FD _{hex} 04 _{hex} 45 _{hex}	FD _{hex} 04 _{hex} 45 _{hex}
FD _{hex} 05 _{hex} 52 _{hex}	FD _{hex} 05 _{hex} 52 _{hex}
FD _{hex} 06 _{hex} 55 _{hex}	FD _{hex} 06 _{hex} 55 _{hex}
FD _{hex} 07 _{hex} 4E _{hex}	FD _{hex} 07 _{hex} 4E _{hex}
FD _{hex} 08 _{hex} 47 _{hex}	FD _{hex} 08 _{hex} 47 _{hex}

6.7.2 Reading of Areas User A and User B, Serial Number, Config Area and HW Identifier



All above mentioned areas comprise of 16 digits each (16 bytes) and are read byte by byte. Hardware identifier ends with a blank (20_{hex}).

Adapter Response

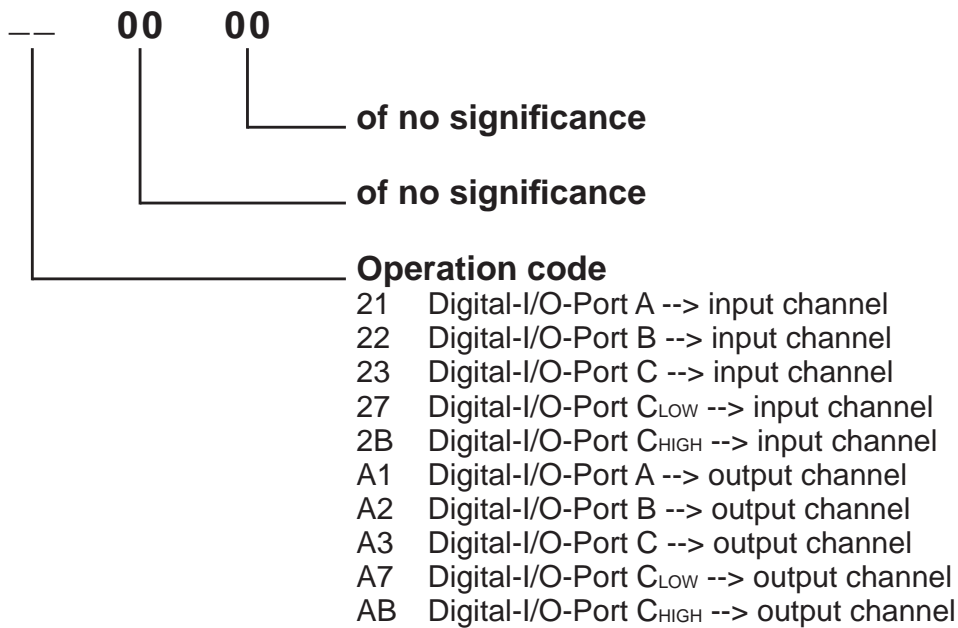


For Example:

Reading the first 9 digits of the register user area A. The response given is valid for the word **STEUERUNG** (see register's example in section 6.7.1 Writing in User Area A)

Reading	Response
ED _{hex} 00 _{hex} 00 _{hex}	ED _{hex} 00 _{hex} 53 _{hex}
ED _{hex} 01 _{hex} 00 _{hex}	ED _{hex} 01 _{hex} 54 _{hex}
ED _{hex} 02 _{hex} 00 _{hex}	ED _{hex} 02 _{hex} 45 _{hex}
ED _{hex} 03 _{hex} 00 _{hex}	ED _{hex} 03 _{hex} 55 _{hex}
ED _{hex} 04 _{hex} 00 _{hex}	ED _{hex} 04 _{hex} 45 _{hex}
ED _{hex} 05 _{hex} 00 _{hex}	ED _{hex} 05 _{hex} 52 _{hex}
ED _{hex} 06 _{hex} 00 _{hex}	ED _{hex} 06 _{hex} 55 _{hex}
ED _{hex} 07 _{hex} 00 _{hex}	ED _{hex} 07 _{hex} 4E _{hex}
ED _{hex} 08 _{hex} 00 _{hex}	ED _{hex} 08 _{hex} 47 _{hex}

6.7.3 Configuration of the Digital I/O Ports



Example:

Configuration of the digital I/O Port A to be inputs, digital I/O Port B to be outputs, digital I/O Port C_{LOW} to be inputs and digital I/O Port C_{HIGH} to be outputs

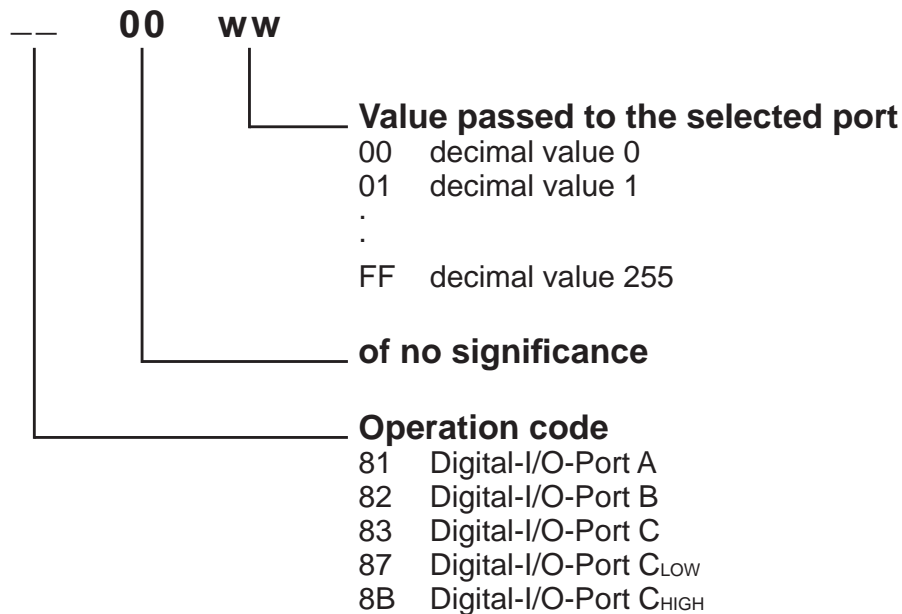
Writing

21_{hex} 00_{hex} 00_{hex}
 A2_{hex} 00_{hex} 00_{hex}
 27_{hex} 00_{hex} 00_{hex}
 AB_{hex} 00_{hex} 00_{hex}

Response

21_{hex} 00_{hex} 00_{hex}
 A2_{hex} 00_{hex} 00_{hex}
 27_{hex} 00_{hex} 00_{hex}
 AB_{hex} 00_{hex} 00_{hex}

6.7.4 Writing of the Digital I/O Ports



Example:

Enabling outputs 3 and 4 (channel 3 and channel 4 = 1; channel 0...2, channel 5...7 = 0) to digital I/O Port B and enabling all outputs (channels 4...7) to digital I/O Port C_{HIGH}. This example assumes the programming of Port B and Port C_{HIGH} to be outputs (as discussed in example in section 6.7.3 Configuration).

Writing

82_{hex} 00_{hex} 18_{hex}
8B_{hex} 00_{hex} 0F_{hex}

Response

82_{hex} 00_{hex} 18_{hex}
8B_{hex} 00_{hex} 0F_{hex}

Following levels are available (0 = Low = 0...1 V; 1 = High = 4...5 V):

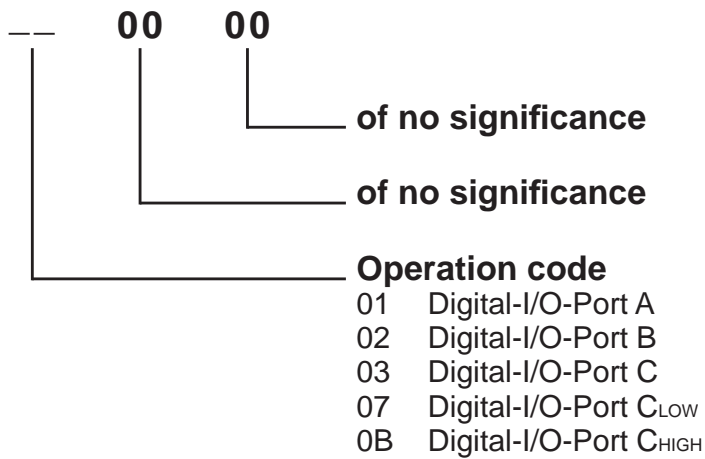
Port A:

Output channel	7	6	5	4	3	2	1	0
Output level	0	0	0	1	1	0	0	0

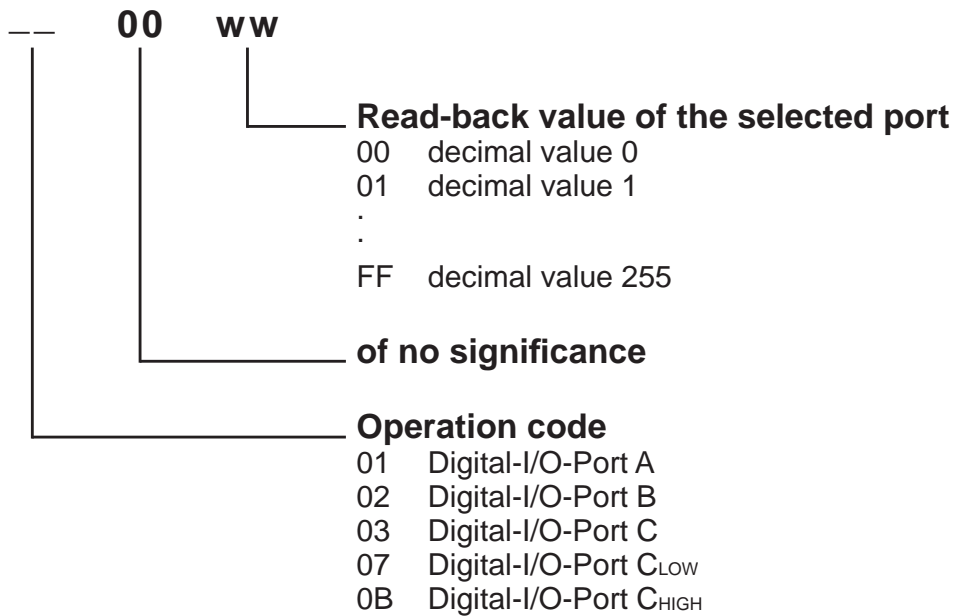
Port C_{High}:

Output channel	3	2	1	0
Output level	1	1	1	1

6.7.5 Reading of Digital I/O Ports



Adapter Response



Example:

Reading inputs from digital I/O Port A and digital I/O Port C_{LOW}. This example assumes the programming of Port A und Port C_{LOW} to be inputs (as described in example in section 6.7.3 Configuration) and applying the input levels (0 = Low = 0...1 V; 1 = High = 4...5 V) at every single input along following tables:

Port A:

Input channel	7	6	5	4	3	2	1	0
Input level	0	0	0	1	1	1	1	1

Port C_{LOW}:

Input channel	3	2	1	0
Input level	1	0	0	0

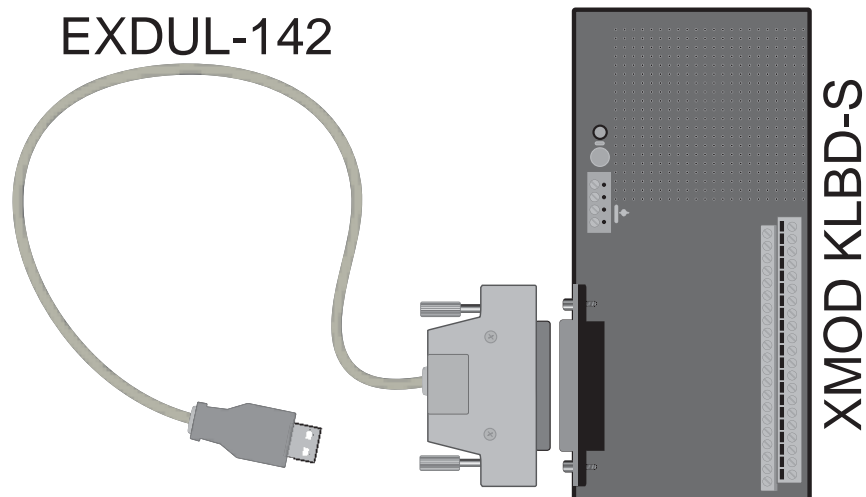
Writing01_{hex} 00_{hex} 00_{hex}07_{hex} 00_{hex} 00_{hex}**Response**01_{hex} 00_{hex} 1F_{hex}07_{hex} 00_{hex} 08_{hex}

7. Accessories

7.1 Suitable **wasco**[®] Accessories

Article Description	EDP No.
XMOD KLBD-S Screw Terminal Module	A-330600

7.2 Connection Technique (Application Examples)



7.3 Single Components for own Assembly

Description	EDP No.
DSS37L Sub-D plug 37pin for solder connection	A-5506
DSH37L Junction shell 37pin (fitting to DSS37L)	A-5586
DSS37F Sub-D plug 37pin for flat ribbon cable	A-5526
DSB37F Sub-D female socket 37pin for flat ribbon cable	A-5566
PBZ40F Female box header 40pin for flat ribbon cable	A-5642
FBL37 Flat ribbon cable 37pin	A-5718

8. Specifications

Digital Inputs/Outputs

Channels:	24 channels, TTL compatible
Organisation:	three Ports with eight channels each, one of the ports programmable in two groups with four channels to be input or output
Logic level:	Low 0...1 V High 4...5 V
Max output current:	max. 5 mA (per one digital output) max. 20 mA (total sum of all outputs)

Operating Voltage

+ 5V (USB-connected to PC)
power consumption max. 100 mA

Connector

1 * 37pin Sub-D female socket
1 * USB plug Typ A

USB Interface

USB 2.0 compatible

Product dimensions

Metal casing with Sub-D socket:
72 mm x 58 mm x 15 mm
USB cable incl. plug: ca. 2,5 m

Casing

Compact EMV full metal casing made of zinc die-cast with silver surface and knurled screws for tightening, extremely robust and mechanically durable

9. ASCII Table

Hex	Dec	Binary	sign
00	0	00000000	
01	1	00000001	
02	2	00000010	
03	3	00000011	
04	4	00000100	
05	5	00000101	
06	6	00000110	
07	7	00000111	
08	8	00001000	
09	9	00001001	
0A	10	00001010	
0B	11	00001011	
0C	12	00001100	
0D	13	00001101	
0E	14	00001110	
0F	15	00001111	
10	16	00010000	
11	17	00010001	
12	18	00010010	
13	19	00010011	
14	20	00010100	
15	21	00010101	
16	22	00010110	
17	23	00010111	
18	24	00011000	
19	25	00011001	
1A	26	00011010	
1B	27	00011011	
1C	28	00011100	
1D	29	00011101	
1E	30	00011110	
1F	31	00011111	
20	32	00100000	[Blank]
21	33	00100001	!
22	34	00100010	"
23	35	00100011	#
24	36	00100100	\$
25	37	00100101	%
26	38	00100110	&
27	39	00100111	'

Hex	Dec	Binary	sign
28	40	00101000	(
29	41	00101001)
2A	42	00101010	*
2B	43	00101011	+
2C	44	00101100	,
2D	45	00101101	-
2E	46	00101110	.
2F	47	00101111	/
30	48	00110000	0
31	49	00110001	1
32	50	00110010	2
33	51	00110011	3
34	52	00110100	4
35	53	00110101	5
36	54	00110110	6
37	55	00110111	7
38	56	00111000	8
39	57	00111001	9
3A	58	00111010	:
3B	59	00111011	;
3C	60	00111100	<
3D	61	00111101	=
3E	62	00111110	>
3F	63	00111111	?
40	64	01000000	@
41	65	01000001	A
42	66	01000010	B
43	67	01000011	C
44	68	01000100	D
45	69	01000101	E
46	70	01000110	F
47	71	01000111	G
48	72	01001000	H
49	73	01001001	I
4A	74	01001010	J
4B	75	01001011	K
4C	76	01001100	L
4D	77	01001101	M
4E	78	01001110	N
4F	79	01001111	O

Hex	Dec	Binary	sign
50	80	01010000	P
51	81	01010001	Q
52	82	01010010	R
53	83	01010011	S
54	84	01010100	T
55	85	01010101	U
56	86	01010110	V
57	87	01010111	W
58	88	01011000	X
59	89	01011001	Y
5A	90	01011010	Z
5B	91	01011011	[
5C	92	01011100	
5D	93	01011101]
5E	94	01011110	^
5F	95	01011111	_
60	96	01100000	`
61	97	01100001	a
62	98	01100010	b
63	99	01100011	c
64	100	01100100	d
65	101	01100101	e
66	102	01100110	f
67	103	01100111	g
68	104	01101000	h
69	105	01101001	i
6A	106	01101010	j
6B	107	01101011	k
6C	108	01101100	l
6D	109	01101101	m
6E	110	01101110	n
6F	111	01101111	o
70	112	01110000	p
71	113	01110001	q
72	114	01110010	r
73	115	01110011	s
74	116	01110100	t
75	117	01110101	u
76	118	01110110	v
77	119	01110111	w
78	120	01111000	x
79	121	01111001	y
7A	122	01111010	z
7B	123	01111011	{

Hex	Dec	Binary	sign
7C	124	01111100	
7D	125	01111101	}
7E	126	01111110	
7F	127	01111111	
80	128	10000000	
81	129	10000001	
82	130	10000010	
83	131	10000011	
84	132	10000100	
85	133	10000101	
86	134	10000110	
87	135	10000111	
88	136	10001000	
89	137	10001001	
8A	138	10001010	
8B	139	10001011	
8C	140	10001100	
8D	141	10001101	
8E	142	10001110	
8F	143	10001111	
90	144	10010000	
91	145	10010001	
92	146	10010010	
93	147	10010011	
94	148	10010100	
95	149	10010101	
96	150	10010110	
97	151	10010111	
98	152	10011000	
99	153	10011001	
9A	154	10011010	
9B	155	10011011	
9C	156	10011100	
9D	157	10011101	
9E	158	10011110	
9F	159	10011111	
A0	160	10100000	
A1	161	10100001	
A2	162	10100010	
A3	163	10100011	
A4	164	10100100	
A5	165	10100101	
A6	166	10100110	
A7	167	10100111	

Hex	Dec	Binary	sign
A8	168	10101000	
A9	169	10101001	
AA	170	10101010	
AB	171	10101011	
AC	172	10101100	
AD	173	10101101	
AE	174	10101110	
AF	175	10101111	
B0	176	10110000	
B1	177	10110001	
B2	178	10110010	
B3	179	10110011	
B4	180	10110100	
B5	181	10110101	
B6	182	10110110	
B7	183	10110111	
B8	184	10111000	
B9	185	10111001	
BA	186	10111010	
BB	187	10111011	
BC	188	10111100	
BD	189	10111101	
BE	190	10111110	
BF	191	10111111	
C0	192	11000000	
C1	193	11000001	
C2	194	11000010	
C3	195	11000011	
C4	196	11000100	
C5	197	11000101	
C6	198	11000110	
C7	199	11000111	
C8	200	11001000	
C9	201	11001001	
CA	202	11001010	
CB	203	11001011	
CC	204	11001100	
CD	205	11001101	
CE	206	11001110	
CF	207	11001111	
D0	208	11010000	
D1	209	11010001	
D2	210	11010010	
D3	211	11010011	

Hex	Dec	Binary	sign
D4	212	11010100	
D5	213	11010101	
D6	214	11010110	
D7	215	11010111	
D8	216	11011000	
D9	217	11011001	
DA	218	11011010	
DB	219	11011011	
DC	220	11011100	
DD	221	11011101	
DE	222	11011110	
DF	223	11011111	
E0	224	11100000	
E1	225	11100001	
E2	226	11100010	
E3	227	11100011	
E4	228	11100100	
E5	229	11100101	
E6	230	11100110	
E7	231	11100111	
E8	232	11101000	
E9	233	11101001	
EA	234	11101010	
EB	235	11101011	
EC	236	11101100	
ED	237	11101101	
EE	238	11101110	
EF	239	11101111	
F0	240	11110000	
F1	241	11110001	
F2	242	11110010	
F3	243	11110011	
F4	244	11110100	
F5	245	11110101	
F6	246	11110110	
F7	247	11110111	
F8	248	11111000	
F9	249	11111001	
FA	250	11111010	
FB	251	11111011	
FC	252	11111100	
FD	253	11111101	
FE	254	11111110	
FF	255	11111111	

10. Product Liability Act

Information for Product Liability

The Product Liability Act (Act on Liability for Defective Products - Prod-HaftG) in Germany regulates the manufacturer's liability for damages caused by defective products.

The obligation to pay compensation can be given, if the product's presentation could cause a misconception of safety to a non-commercial end-user and also if the end-user is expected not to observe the necessary safety instructions handling this product.

It therefore always must be provable, that the not-commercial end-user was made familiar with the safety rules.

In the interest of safety, please always advise your non-commercial customer of the following safety instructions:

Safety Instructions

The valid VDE instructions must be observed, when handling products that come in contact with electrical voltage.

Especially the following instructions must be observed:
VDE100; VDE0550/0551; VDE0700; VDE0711; VDE0860.

The instructions are available from:

Vde-Verlag GmbH
Bismarckstr. 33
10625 Berlin

- * unplug the power cord before you open the unit or make sure, there is no current to/in the unit.
- * You only may start up any components, boards or equipment, if they are installed inside a secure touch-protected casing before. During installation there must be no current to the equipment.
- * Make sure that the device is disconnected from the power supply before using any tools on any components, boards or equipment. Any electric charges stored in any components in the device are to be discharged prior.
- * Voltaged cables or wires, which are connected with the unit, the components or the boards, must be tested for insulation defects or breaks. In case of any defect the device must be immediately taken out of operation until the defective cables are replaced.
- * When using components or boards you must strictly comply with the characteristic data for electrical sizes specified in the related description
- * As a non-commercial end-user, if it is not clear whether the electrical characteristic data given in the provided description is valid for a component you must consult a specialist.

The compliance with building and safety instructions of every kind (VDE, TÜV, industrial injuries corporation, etc.) are entirely subject to the user/customer.

11. CE Declaration of Conformity

This is to certify, that the product

EXDUL-142
EDP Number A-380060

comply with the requirements laid down by the related EC directives.
This declaration will lose its validity, if the instructions given in this manual for the intended use of the products are not fully complied with.

EN 5502 Class B
IEC 801-2
IEC 801-3
IEC 801-4
EN 50082-1
EN 60555-2
EN 60555-3

The following manufacturer is responsible for this declaration:

Messcomp Datentechnik GmbH
Neudecker Str. 11
83512 Wasserburg

given by

Dipl.Ing.(FH) Hans Schnellhammer

Wasserburg, 29.10.2007



Reference system for intended use

This multifunctional adapter EXDUL-122 is not stand-alone device. The CE-conformity only can be assessed when using additional computer components simultaneously. Thus the CE conformity only can be confirmed when using the following reference system for the intended use of the multifunctional module:

Control Cabinet:	Vero IMRAK 3400	804-530061C 802-563424J 802-561589J
19" Casing:	Vero PC Casing	145-010108L
19" Casing:	additional electronic	519-112111C
Motherboard:	GA-586HX	PIV 1.55
Floppy Controller:	on Motherboard	
Floppy:	TEAC	FD-235HF
Graphic card:	Advantech	PCA-6443
Interface:	EXDUL-142	A-380060