DIC113

(DO32-5)
MicroPC Isolated
Digital Output Card

User Manual

Rev. 001 E

March 2009

P R E L I M I N A R Y

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Table of Contents

Notation Conventions

Warning, ESD Sensitive Device!

This symbol draws your attention to the information related to electro static sensitivity of your product and its components. To keep product safety and operability it is necessary to handle it with care and follow the ESD safety directions.

Warning!

This sign marks warnings about hot surfaces. The surface of the heatsink and some components can get very hot during operation. Take due care when handling, avoid touching hot surfaces!

Caution: Electric Shock!

This symbol warns about danger of electrical shock (> 60 V) when touching products or parts of them. Failure to observe the indicated precautions and directions may expose your life to danger and may lead to damage to your product.

Warning!

Information marked by this symbol is essential for human and equipment safety.
Read this information attentively, be watchful.

Note...

This symbol and title marks important information to be read attentively for your own benefit.

General Safety Precautions

This product was developed for fault-free operation. Its design provides conformance to all related safety requirements. However, the life of this product can be seriously shortened by improper handling and incorrect operation. That is why it is necessary to follow general safety and operational instructions below.

Warning!

All operations on this device must be carried out by sufficiently skilled personnel only.

Warning!

When handling this product, special care must be taken not to hit the heatsink (if installed) against another rigid object. Also, be careful not to drop the product, since this may cause damage to the heatsink, CPU or other sensitive components as well.

Please, keep in mind that any physical damage to this product is not covered under warranty.

Note:

This product is guaranteed to operate within the published temperature ranges and relevant conditions. However, prolonged operation near the maximum temperature is not recommended by Fastwel or by electronic chip manufacturers due to thermal stress related failure mechanisms. These mechanisms are common to all silicon devices, they can reduce the MTBF of the product by increasing the failure probability. Prolonged operation at the lower limits of the temperature ranges has no limitations.

Caution, Electric Shock!

Before installing this product into a system and before installing other devices on it, always ensure that your mains power is switched off.

Always disconnect external power supply cables during all handling and maintenance operations with this module to avoid serious danger of electrical shock.

Unpacking, Inspection and Handling

Please read the manual carefully before unpacking the module or mounting the device into your system. Keep in mind the following:

ESD Sensitive Device!

Electronic modules and their components are sensitive to static electricity. Even a non-perceptible by human being static discharge can be sufficient to destroy or degrade a component's operation! Therefore, all handling operations and inspections of this product must be performed with due care, in order to keep product integrity and operability:

- Preferably, unpack or pack this product only at EOS/ESD safe workplaces. Otherwise, it is important to be electrically discharged before touching the product. This can be done by touching a metal part of your system case with your hand or tool. It is particularly important to observe anti-static precautions when setting jumpers or replacing components.
- If the product contains batteries for RTC or memory back-up, ensure that the module is not placed on conductive surfaces, including anti-static mats or sponges. This can cause short-circuit and result in damage to the battery and other components.
- Store this product in its protective packaging while it is not used for operational purposes.

Unpacking

The product is carefully packed in an antistatic bag and in a carton box to protect it against possible damage and harmful influence during shipping. Unpack the product indoors only at a temperature not less than +15°C and relative humidity not more than 70%. Please note, that if the product was exposed to the temperatures below 0°C for a long time, it is necessary to keep it at normal conditions for at least 24 hours before unpacking. Do not keep the product close to a heat source.

Following ESD precautions, carefully take the product out of the shipping carton box. Proper handling of the product is critical to ensure correct operation and long-term reliability. When unpacking the product, and whenever handling it thereafter, be sure to hold the module preferably by the front panel, card edges or ejector handles. Avoid touching the components and connectors.

Retain all original packaging at least until the warranty period is over. You may need it for shipments or for storage of the product.

Initial Inspection

Although the product is carefully packaged, it is still possible that shipping damages may occur. Careful inspection of the shipping carton can reveal evidence of damage or rough handling. Should you notice that the package is damaged, please notify the shipping service and the manufacturer as soon as possible. Retain the damaged packing material for inspection.

After unpacking the product, you should inspect it for visible damage that could have occurred during shipping or unpacking. If damage is observed (usually in the form of bent component leads or loose socketed components), contact Fastwel's official distributor from which you have purchased the product for additional instructions. Depending on the severity of the damage, the product may even need to be returned to the factory for repair. DO NOT apply power to the product if it has visible damage. Doing so may cause further, possibly irreparable damage, as well as result in a fire or electric shock hazard.

If the product contains socketed components, they should be inspected to make sure they are seated fully in their sockets.

Handling

In performing all necessary installation and application operations, please follow only the instructions supplied by the present manual.

In order to keep Fastwel's warranty, you must not change or modify this product in any way, other than specifically approved by Faswel or described in this manual.

Technical characteristics of the systems in which this product is installed, such as operating temperature ranges and power supply parameters, should conform to the requirements stated by this document.

Retain all the original packaging, you will need it to pack the product for shipping in warranty cases or for safe storage. Please, pack the product for transportation in the way it was packed by the supplier.

When handling the product, please, remember that the module, its components and connectors require delicate care. Always keep in mind the ESD sensitivity of the product.

Three Year Warranty

Fastwel Co. Ltd. (Fastwel), warrants that its standard hardware products will be free from defects in materials and workmanship under normal use and service for the currently established warranty period. Fastwel's only responsibility under this warranty is, at its option, to replace or repair any defective component part of such products free of charge.

Fastwel neither assumes nor authorizes any other liability in connection with the sale, installation or use of its products. Fastwel shall have no liability for direct or consequential damages of any kind arising out of sale, delay in delivery, installation, or use of its products.

If a product should fail through Fastwel's fault during the warranty period, it will be repaired free of charge. For out of warranty repairs, the customer will be invoiced for repair charges at current standard labor and materials rates.

Warranty period for Fastwel products is 36 months since the date of purchase.

The warranty set forth above does not extend to and shall not apply to:

1. Products, including software, which have been repaired or altered by other than Fastwel personnel, unless Buyer has properly altered or repaired the products in accordance with procedures previously approved in writing by Fastwel.
2. Products, which have been subject to power supply reversal, misuse, neglect, accident, improper installation or storage.

Returning a product for repair

1. Apply to Fastwel company or to any of the Fastwel's official representatives for the Product Return Authorization.
2. Attach a failure inspection report with a product to be returned in the form, accepted by customer, with a description of the failure circumstances and symptoms.
3. Carefully package the product in the antistatic bag, in which the product had been supplied. Failure to package in antistatic material will VOID all warranties. Then package the product in a safe container for shipping.
4. The customer pays for shipping the product to Fastwel or to an official Fastwel representative or dealer.

1 Brief Description

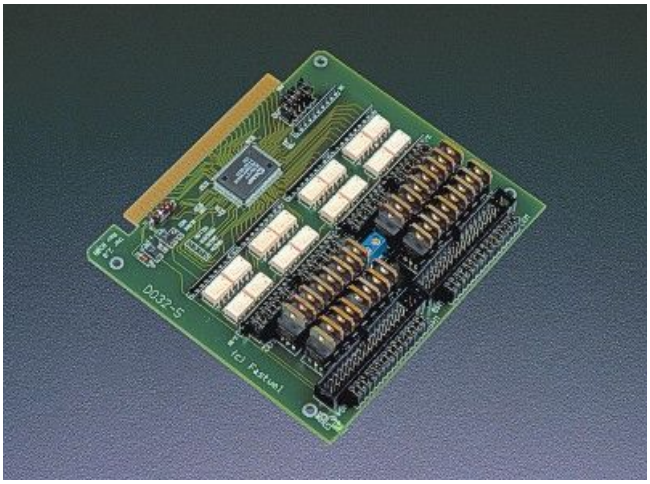
1.1 Module Introduction

The DIC113 (DO32-5) card is designed in Micro PC format for switching of 32 DC outputs with loads of up to 60 VDC @ 500 mA. All lines are isolated from system and from each other. All outputs are switched off on power-up and hardware reset.

Output lines status monitoring is available (before opto-isolation).

The TB-34 series terminal boards and FC34 ribbon cables are used to connect to DO32 card.

Figure 1.1: DIC113 Module Appearance



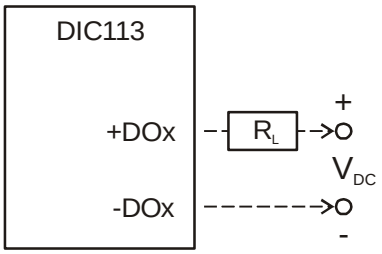
The appearance may vary for different versions of the module.

Main features:

- 32 isolated output channels
- Differential or single-ended connection
- Output voltage and current: 60 V @ 500 mA (Darlington transistor TIP122)
- Peak output voltage and current: 100 V @ 5 A
- Maximum on/off time: 3 ms
- Input delay: 25 µs max
- 1500 V isolation from system and between channels
- Extended operating temperature range from -40°C to +85°C
- Automatic reset on power-up and hardware Reset.
- Output lines status monitoring before opto-isolation

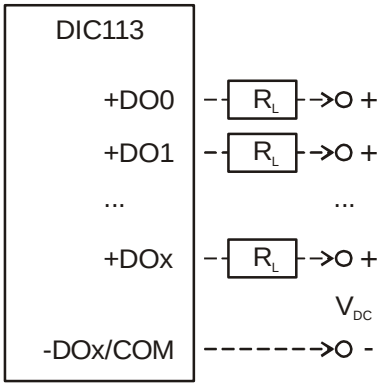
1.2 Signals Connection

The signal lines are connected to the module via J1 and J2 IDC-34 headers. Two TB-34 series terminal boards and two FC34 ribbon cables are used for external connections.



Two-wire load connection

Each input signal is connected via a pair of wires (with no common wire) to the contacts +DOx and –DOx, where x = 0 … 31.



Single-wire load connection

This connection type is used when signals have a common wire (ground or other potential), and signals are isolated only from system. Each signal is connected to an appropriate +DOx contact, where x = 0 … 31, and the common wire – to one of the COM contacts of J1, J2, or J3 connectors or to any of –DOx contacts.

Attention!

Changing of the connection type requires appropriate setting of W33 … W64 jumpers!

2 Installation

The module can be installed in MicroPC card cages, in IBM PC ISA slots, or can be connected to other modules using a flexible cable.

ESD Sensitive Device!

The module contains components sensitive to static electricity.

Installation or removal of the module, cables connection while the power is on can damage the module.

Attention!

When installing the module in a 62-contact ISA connector is is necessary to observe correct orientation of the module. Incorrect orientation (with 180° rotation) leads to serious damage to the module!

Attention!

Before switching the module on, make sure that jumpers BA[5:0], W[32:1], and W[64:33] are set correctly!

1.3 Base Address Setting

The jumpers BA[5:0] allow setting the module's Base Address or the input-output area address segment, in which the module will be accessible by the system. The module is accessed, when SA[9:4] address bits match BA[5:0]; the Access Indicator is lit.

Base Address (Hex)	BA5	BA4	BA3	BA2	BA1	BA0
000h	0	0	0	0	0	0
010h	0	0	0	0	0	1
…	…	…	…	…	…	…
100h	0	1	0	0	0	0
110h(*)	0	1	0	0	0	1
…	…	…	…	…	…	…
200h	1	0	0	0	0	0
…	…	…	…	…	…	…
3E0h	1	1	1	1	1	0
3F0h	1	1	1	1	1	1

(*) Factory setting; 1 = closed; 0 = open

Attention!

Incorrect Base Address setting can lead to system conflicts. Before switching the module on, make sure that the set Base Address is not used in your system.

1.4 Output Switches Jumpers

The W1…W32 Load Type jumpers are closed on delivery and are used only for connection of low-resistance inductive load to DC switches. These jumpers should be disconnected, if the average current through the inductive load is more than 400 mA and switching frequency exceeds 200 Hz with duty factor less than 4.

The W33…W64 are used for selecting the signal connection type (single- or two-wire) for each channel or for groups of channels. The card is supplied with these jumpers closed.

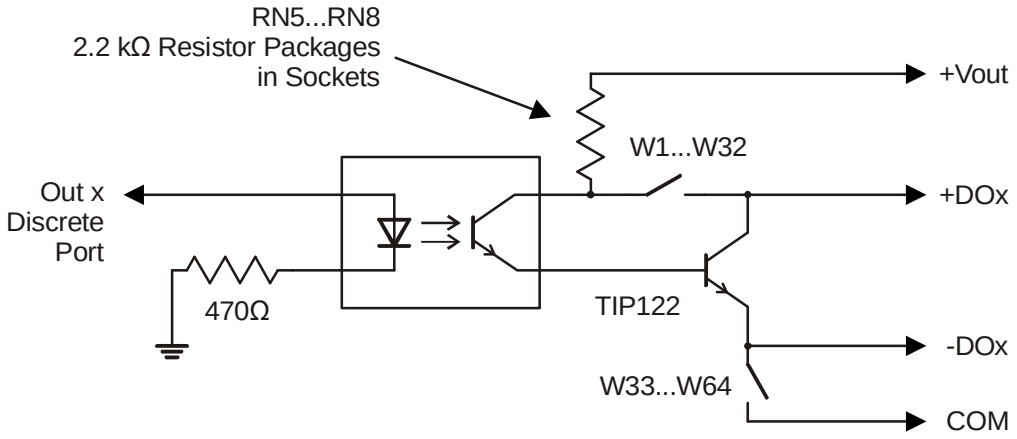
Output Channel Number	Jumper	Two-Wire Connection	Single-Wire Connection
0	W33	Off	On
1	W34	Off	On
...	...	...	...
15	W48	Off	On
...	...	...	...
30	W63	Off	On
31	W64	Off	On

Attention!

If the two-wire connection type is selected (W33…W64 are open), it is necessary to remove the RN5…RN8 SIP resistor arrays from the sockets!

2.1 Output Channel Cirquit

The output channel cirquit diagram is shown on the picture below. Incoming discrete signal from J1 port comes to the optocoupler. Output of the optocoupler is connected to the DC switch. W1…W64 jumpers allow to select the connection type (two-wire, single-wire) and load type.



3 Module Control

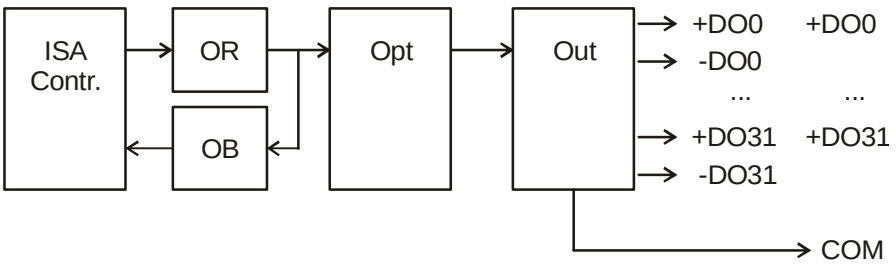
The module is controlled via I/O ports, whose designation is described below.

3.1 Main Functional Units

The module contains the following main functional units:

- ISA bus interface
- Outputs Registers (OR)
- Outputs Buffer (OB)
- Opto-isolation unit (Opt)
- Output switches (Out)

DIC113 functional diagram:



3.2 I/O Ports Description

The module is controlled via I/O ports. The addresses of the ports are defined in relation to the Base Address (BA) of the module, which is set using the jumper group BA5…BA0.

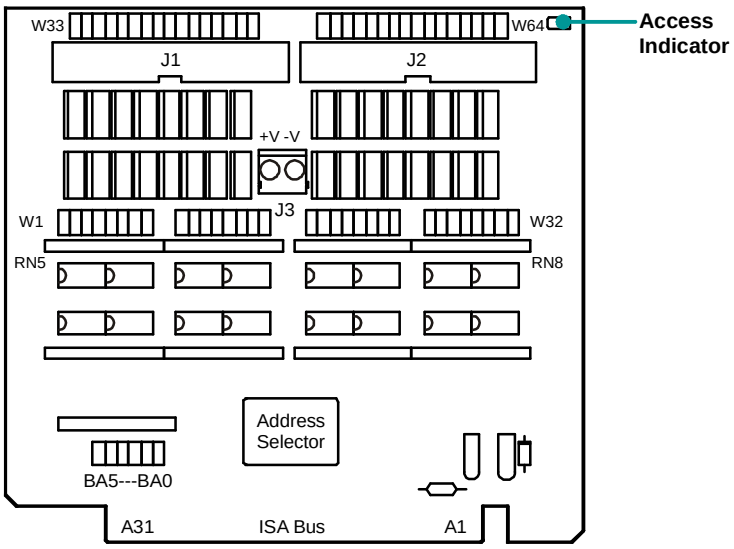
The outputs register is available for read and write via the word ports with addresses BA+0, BA+2 or via byte ports with addresses BA+0 … BA+3. Switching of the channel “x” is performed by setting the appropriate bit in the outputs register. Reading the Outputs Buffer allows to get information on the current output channel state: 1 – closed, 0 – open.

Outputs register:

Address	D7	D6	D5	D4	D3	D2	D1	D0
BA+0	*DO7*	*DO6*	*DO5*	*DO4*	*DO3*	*DO2*	*DO1*	*DO0*
BA+1	*DO15*	*DO14*	*DO13*	*DO12*	*DO11*	*DO10*	*DO9*	*DO8*
BA+2	*DO23*	*DO22*	*DO21*	*DO20*	*DO19*	*DO18*	*DO17*	*DO16*
BA+3	*DO31*	*DO30*	*DO29*	*DO28*	*DO27*	*DO26*	*DO25*	*DO24*

4 Technical Information

4.1 Components Layout



4.2 Technical Specifications

Power voltage:	5V ± 5% @ 200 mA
Switched voltages:	up to 60 V @ 500 mA
Outputs isolation voltage:	1500 V
Operating temperature range:	–40 ...+85°C
Storage temperature:	–55 ...+90°C
Humidity:	up to 95% at +25°C

4.3 Connectors' Pinouts

ISA connector, rows A and B:

#	Signal	Type	#	Signal	Type
A1	IOCHK*	-	B1	0V	In
A2	SD7	In/Out	B2	RESET	In
A3	SD6	In/Out	B3	+5V	In
A4	SD5	In/Out	B4	IRQ9	-
A5	SD4	In/Out	B5	-5V	-
A6	SD3	In/Out	B6	DRQ2	-
A7	SD2	In/Out	B7	-12V	-
A8	SD1	In/Out	B8	0WS*	-
A9	SD0	In/Out	B9	+12V	-
A10	IOCHRDY	-	B10	AGND	-
A11	AEN	In	B11	SMEMW*	-
A12	SA19	-	B12	SMEMR*	-
A13	SA18	-	B13	IOW*	In
A14	SA17	-	B14	IOR*	In
A15	SA16	-	B15	DACK3*	-
A16	SA15	-	B16	DRQ3	-
A17	SA14	-	B17	DACK1*	-
A18	SA13	-	B18	DRQ1	-
A19	SA12	-	B19	DACK0*	-
A20	SA11	-	B20	BCLK	-
A21	SA10	-	B21	IRQ7	-
A22	SA9	In	B22	IRQ6	-
A23	SA8	In	B23	IRQ5	-
A24	SA7	In	B24	IRQ4	-
A25	SA6	In	B25	IRQ3	-
A26	SA5	In	B26	DACK2*	-
A27	SA4	In	B27	TC	-
A28	SA3	In	B28	BALE	-
A29	SA2	In	B29	+5V	-
A30	SA1	In	B30	OSC	-
A31	SA0	In	B31	0V	In

In the table above: *In = Input*
In/Out = Input/Output

J1, J2, J3 connectors:

#	J1 Signal	J2 Signal	J3
1	+DO0	+DO16	COM
2	-DO0	-DO16	+Vout
3	+DO1	+DO17	
4	-DO1	-DO17	
5	+DO2	+DO18	
6	-DO2	-DO18	
7	+DO3	+DO19	
8	-DO3	-DO19	
9	+DO4	+DO20	
10	-DO4	-DO20	
11	+DO5	+DO21	
12	-DO5	-DO21	
13	+DO6	+DO22	
14	-DO6	-DO22	
15	+DO7	+DO23	
16	-DO7	-DO23	
17	+DO8	+DO24	
18	-DO8	-DO24	
19	+DO9	+DO25	
20	-DO9	-DO25	
21	+DO10	+DO26	
22	-DO10	-DO26	
23	+DO11	+DO27	
24	-DO11	-DO27	
25	+DO12	+DO28	
26	-DO12	-DO28	
27	+DO13	+DO29	
28	-DO13	-DO29	
29	+DO14	+DO30	
30	-DO14	-DO30	
31	+DO15	+DO31	
32	-DO15	-DO31	
33	COM	COM	
34	COM	COM	