

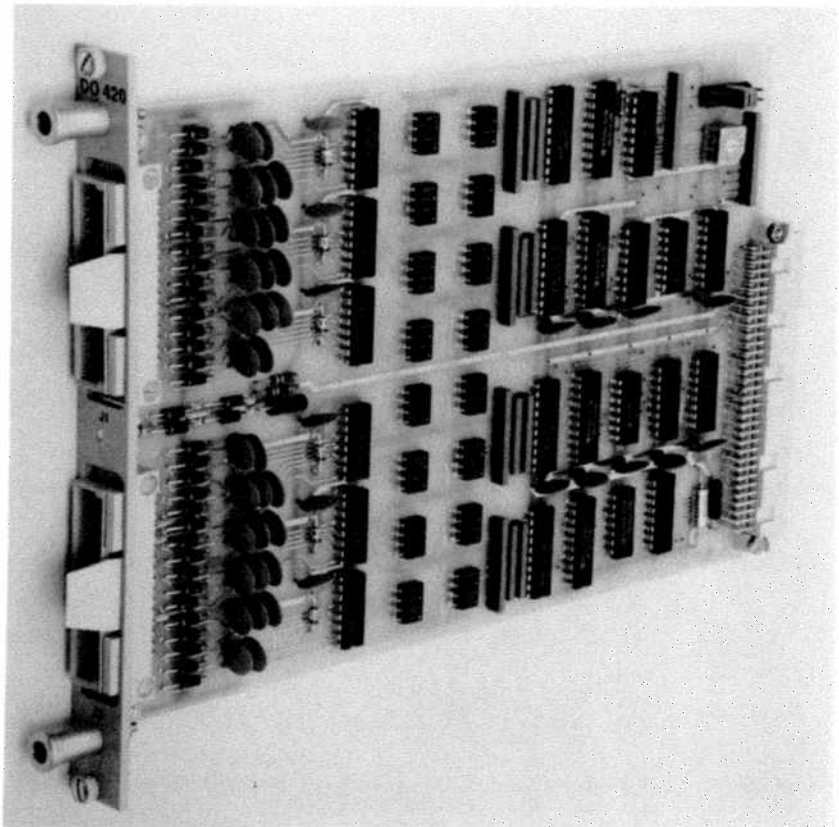
OPERATING INSTRUCTIONS

DIGITAL OUTPUT

DO 420

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1. Introduction

The DO 420 digital output module provides control of peripherals such as relays or the equivalent.

The module contains 32 driver stages with overvoltage and polarity reversal protection. The driver stages are galvanically isolated from the system ground by optocouplers. It is program controlled via the standard interface to the BS system bus.

2. Features

- 32 outputs 24 V / 100 mA DC
- isolated from bus
- open collector driver groups with 5 or 6 bits
- common emitter for each driver group
- automatic initialization

3. Specifications

General

Designation	DO 420
Parts list/order nr.	BG 512 840 -T
Diagram Nr.	BG 541 181 -S
Drawing Nr.	BG 512 841 -Z
Board format	SC 420 format
Space requirements	1 slot
Voltage supply	+ 5 V / 0.4 A typical

Bus interface

as for BS 420

Bus load	1 DC load, 1 AC load
Addressing	whole IO page, selection with switches and jumpers
Register	2 words with 16 bits each DODBR0 for connector J1 DODBR1 for connector J2
Data transfer	DATO (write only) DATI generates BRPLY data = 0 no bytes transfers
Initialization	BINIT clears all output

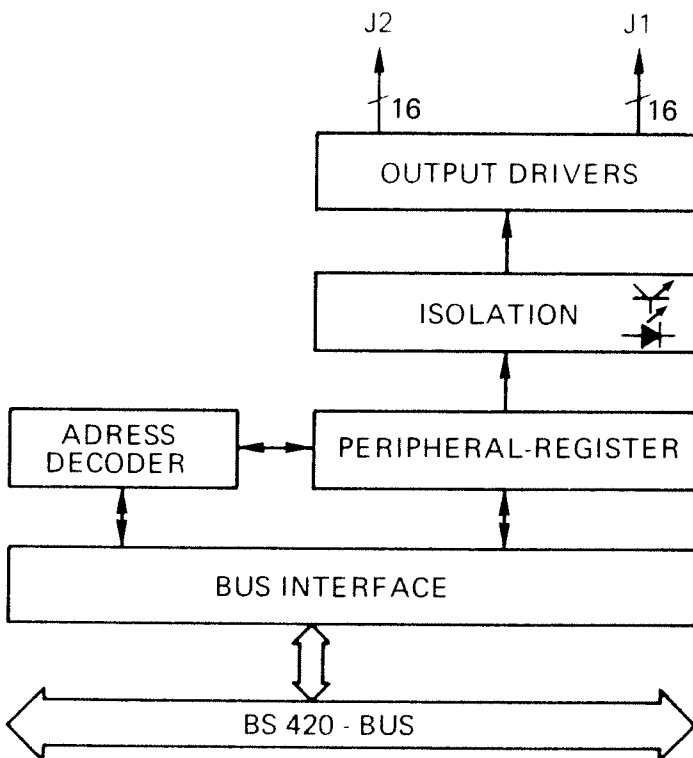
Digital outputs

Type	open collector Darlington drivers
Circuit	common emitter for each driver group (5 or 6 bits each)
Voltage	24 V DC, + 20% / - 100%
Load current	100 mA DC

Short circuit current	not limited
Saturation voltage	< 1.7 V at 100 mA
Overtoltage protection	with one Zener diode (33 V / 1 W) per driver group
Reverse polarity protection	with parallel diode (current 1 A, peak current 30 A/8.3 ms)
Isolation	Between bus and driver groups and between the individual driver groups Operation: 42.4 V (DC or peak) Test voltage: 200 V peak with reference to the instrument's ground
RF filter	6 x 10 nF (total) to housing
Connector	two 32-pole male multipoint connectors as per DIN 41612, C/2 styling for 16 outputs each

4. Description

Digital output module DO 420



The data to be output is transferred from the BS 420 bus to the peripheral register via the bus interface circuits and the address decoder (DO data buffer DODBR). The data are stored in the peripheral register

in word form and from there transferred via optocouplers to the output drivers. From the output drivers the signals are transmitted via protective circuits to outputs J1 and J2.

Elements to be driven (such as relays) require an externally supplied DC voltage – the usual level is 24 V.

5. Configuration

5.1 Factory configuration

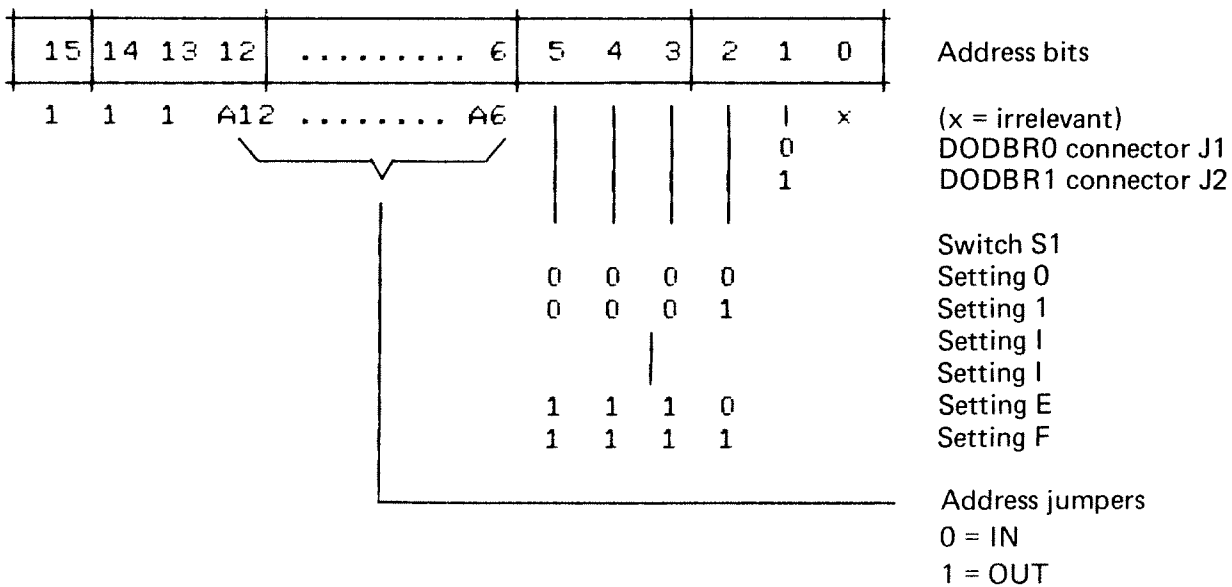
The position of the address jumpers and switch S1 can be taken from the layout (Appendix A).

DO 420 standard address: DODBR0 = 174700 (octal)

Address octal	Jumpers							Switch S 1
	A12	A11	A10	A9	A8	A7	A6	
174 700	OUT	OUT	IN	IN	OUT	OUT	OUT	0

The address is the only selection necessary for the DO 420

5.2 Address selection



The device addresses (referred to connector J1) are selected with jumpers and switch S1 as shown in the following table.

Address octal	Jumpers							Switch S 1	Comments		
	A12	A11	A10	A9	A8	A7	A6				
160 000	IN	IN	IN	IN	IN	IN	IN	0	103 possible groups with 16 addresses each		
160 004	IN	IN	IN	IN	IN	IN	IN	1			
.			
174 670	OUT	OUT	IN	IN	OUT	OUT	IN	E			
174 674	OUT	OUT	IN	IN	OUT	OUT	IN	F			
174 700	OUT	OUT	IN	IN	OUT	OUT	OUT	0		Group DO 420: Module 0	
174 704	OUT	OUT	IN	IN	OUT	OUT	OUT	1			1
174 710	OUT	OUT	IN	IN	OUT	OUT	OUT	2			2
174 714	OUT	OUT	IN	IN	OUT	OUT	OUT	3			3
174 720	OUT	OUT	IN	IN	OUT	OUT	OUT	4			4
174 724	OUT	OUT	IN	IN	OUT	OUT	OUT	5			5
174 730	OUT	OUT	IN	IN	OUT	OUT	OUT	6			6
174 734	OUT	OUT	IN	IN	OUT	OUT	OUT	7			7
174 740	OUT	OUT	IN	IN	OUT	OUT	OUT	8			8
174 744	OUT	OUT	IN	IN	OUT	OUT	OUT	9			9
174 750	OUT	OUT	IN	IN	OUT	OUT	OUT	A			10
174 754	OUT	OUT	IN	IN	OUT	OUT	OUT	B	11		
174 760	OUT	OUT	IN	IN	OUT	OUT	OUT	C	12		
174 764	OUT	OUT	IN	IN	OUT	OUT	OUT	D	13		
174 770	OUT	OUT	IN	IN	OUT	OUT	OUT	E	14		
174 774	OUT	OUT	IN	IN	OUT	OUT	OUT	F	15		
175 000	OUT	OUT	IN	OUT	IN	IN	IN	0	24 possible groups with 16 addresses each		
175 004	OUT	OUT	IN	OUT	IN	IN	IN	1			
.			
177 770	OUT	OUT	OUT	OUT	OUT	OUT	OUT	E			
177 774	OUT	OUT	OUT	OUT	OUT	OUT	OUT	F			

6. Installation

6.1 Installation in the SC 420

Please refer to the section "Installing modules" in the SC 420 operating instructions.

CAUTION:

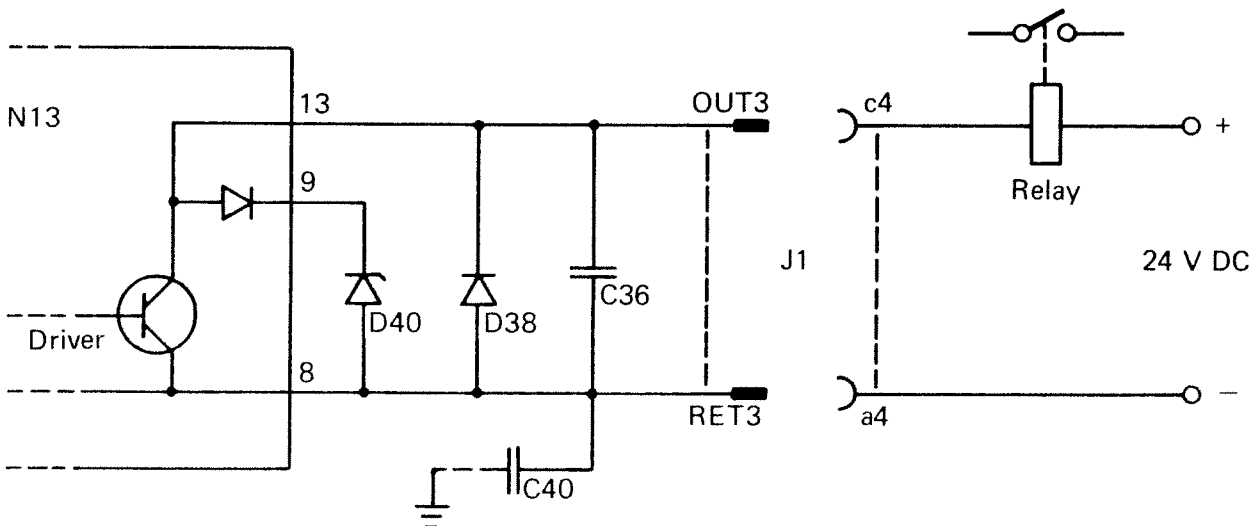
- Before any manipulations are made on the module or its connections, the unit and any external voltage supplies must be turned off
- Don't use cables from other modules.

6.2 Connections

Pin assignment for output connectors J1 and J2:

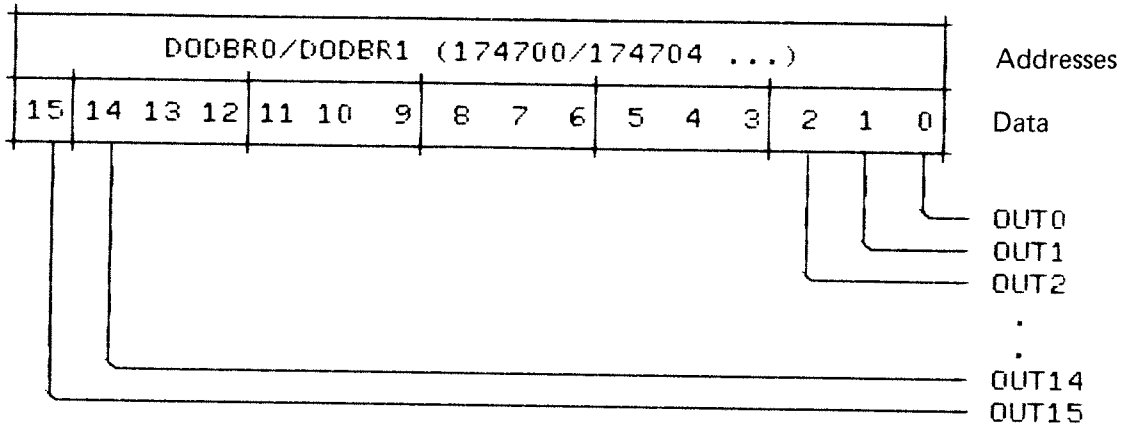
	Row	Pin		
	a	c	Nr.	
not assigned	o	o	16	OUT15 - J1 upper / J2 lower
RET14	o	o	15	OUT14
RET13	o	o	14	OUT13 - View of the back of the module (pins)
RET12	o	o	13	OUT12
RET11	o	o	12	OUT11
RET10	o	o	11	OUT10 - RET 0,1,2,3,4
RET9	o	o	10	OUT9 RET 5,6,7,8,9
RET8	o	o	9	OUT8 RET 10,11,12,13,14
RET7	o	o	8	OUT7 are common within the group
RET6	o	o	7	OUT6
RET5	o	o	6	OUT5
RET4	o	o	5	OUT4 - RET 15 does not have its own pin
RET3	o	o	4	OUT3
RET2	o	o	3	OUT2
RET1	o	o	2	OUT1
RET0	o	o	1	OUT0

Connection example: Relay driven with OUT3 from connector J1



7. Programming

Loading the outputs OUT0 ... OUT15 (connectors J1 / J2)



Functions:

OUT_n = 0: Output open (high impedance)

OUT_n = 1: Output closed (low impedance)

This is, strictly speaking, a read/write register; however, the data read are always zero

Initialization:

BINIT sets all the bits to 0.

8. Maintenance

No periodic maintenance is necessary

8.1 Troubleshooting

For testing purposes, the individual outputs can be checked and simulated by the DT 020 (digital IO tester). Some program packages allow the outputs to be operated directly in service mode. For units without a service mode, each output bit can be easily tested with ODT (refer to LSI 11 dokumentation).

IMPORTANT:

Outside influences such as incorrect wiring or defective relay circuits in the power distributor can destroy the output driver. For this reason the connected parts should be tested with a DT 020 before a trial exchange of the DO 420 is attempted.

9. Detailed description

The drivers are controlled via the interface to the SC420 bus. This interface (only suited for WRITE transfers) consists of the address decoders N16, N22 with address selection with jumpers A6 ... A12 and switch S1, the control logic N17 (3, 6, 8, 11), N9 (8) with bus transceiver N18 for the BSYNC, BRPLY, BDIN, BDOOUT and the bus receivers N5, N10, N11 for the address/data line BDAL0 ... BDAL15 and the BINIT initialization signal. The data on the bus are loaded in word form either in output register N15, N21 (connector J1) or in output register N3, N8 (connector J2). This process is controlled by detector N4 (5, 6), N9 (3, 6).

The data in the output register is transferred to the optocouplers A1 ... A16 via buffer stages N7, N2, N20 and N14. Resistor pairs R6 (1, 7), R7 (5, 6) ... R15 (1, 4), R17 (3, 4) set the LED current for the optocoupler and appropriately limit the displacement currents flowing through the coupling capacity of the optocouplers.

The 32 driver switches grouped together at the five or six outputs are identical. The numbering in the following description refers to output OUT3 (Connector J1):

Darlington driver N13 (13) driven by optocoupler A10 (5, 6)'s phototransistor is in the main circuit. The Darlington driver is protected from overvoltage by a clamp diode in transistor array N13. The clamp diode's cathode N13 (9) is connected to Zener diode D40. Diode D38 provides protection from reverse polarity. Its relatively low voltage drop compared to the substrate diode in array N13 prevents high currents, which could negatively influence the function of the drivers in the array, from flowing through the substrate in the event of reverse polarity.

RF interference conducted through the cable to the outputs is appropriately damped or conducted to the chassis ground via network L1, D1, D2, D3, D4, R1, R2 by capacitors C3 ... C40.

The standard circuit details (e.g. bypass capacitors, pull-up resistors, etc.) have not been included in this description.

10. Accessories

Separately available are:

- | | |
|-----------------------------|--------------------------------------|
| – DT 020 digital I/O tester | BG 531 194 -T |
| – Connector consisting of | |
| Connector housing | B 4717 354 SC (1 piece) |
| Receptacle body | B 4717 354 AS (1 piece) |
| Contact | B 4717 354 KG (1 piece, 32 required) |

