7.13 RWC-SCD : STANDARD CURRENT DRIVE

Preliminary Specifications

7.13.1 FUNCTIONAL DESCRIPTION

The RWC-SCD Real-World interface module switches a fully compensated 10mA constant current through one of sixteen software selectable output channels. It is ideally suited for applications requiring constant current driven variable resistance parameter measurements, such as with platinum resistance thermometers, displacement potentiometers, position transducers etc.

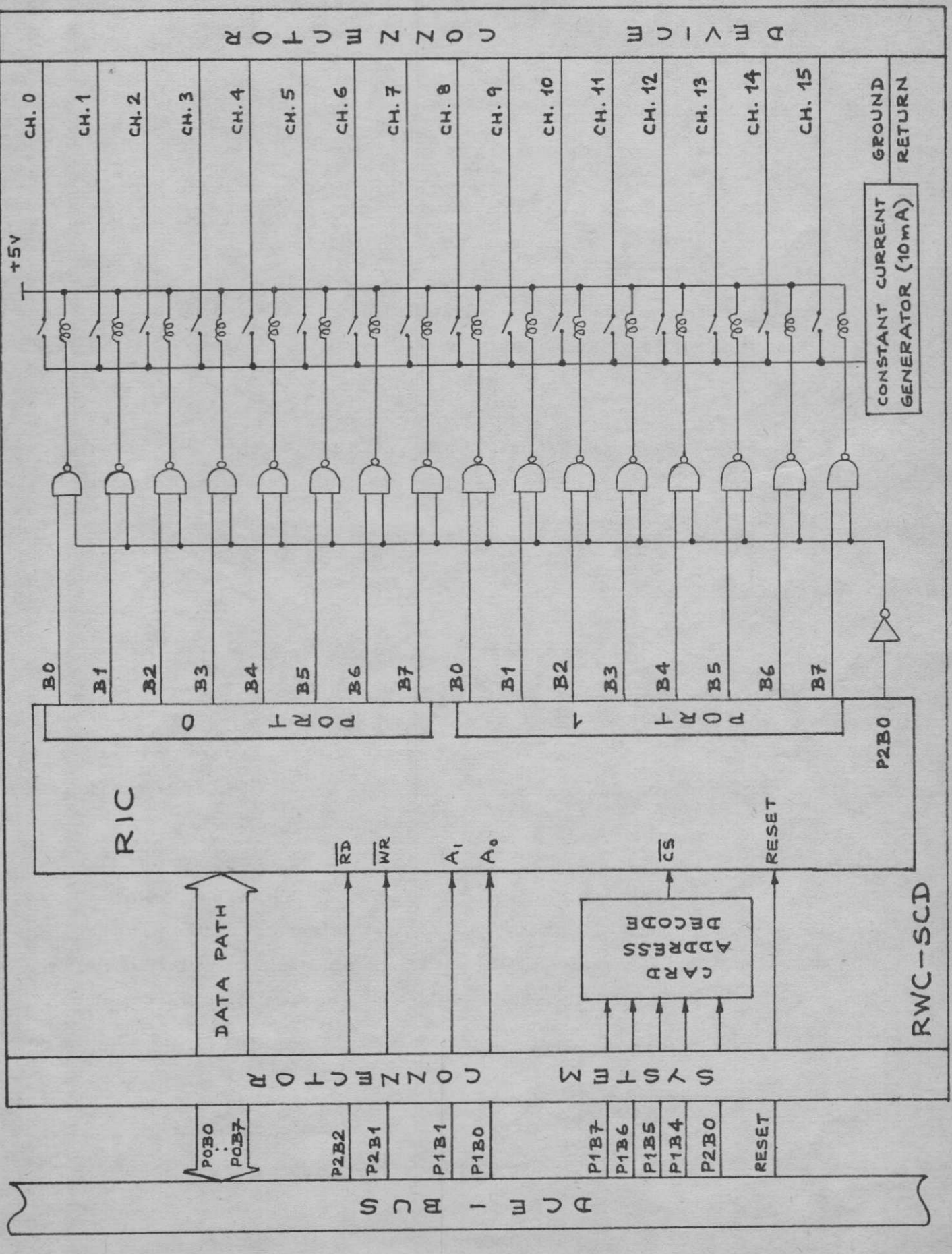
The output of the fully compensated 10mA constant current generator can be switched through one of sixteen channels via 16 reed relays resident on the module.

Each module has an identification address defined by a hexadecimal switch, and up to fifteen modules can be directly connected to the DCE-BUS.

7.13.2 FEATURES

- temperature compensated 10mA constant current generator.
- 16 output channels.
- channel switching via 16 reed relay contacts.
- standard hardware and software interface to the DCE-BUS.
- selectable module address.
- single 100 x 160 mm eurocard format.

7.13.3 FUNCTIONAL BLOCK DIAGRAM



7.13.4. SYSTEM DESIGN PARAMETERS

7.13.4.1 Hardware Configuration

The functional block diagram in Section 7.13.3 illustrates the hardware configuration of the RWC-SCD module. Sixteen RIC I/O lines are configured for output and used for relay control.

Another RIC I/O line is configured for output and used for enabling or disabling all 16 relay switching circuits. It also ensures that all 16 relays are automatically disabled on power-on reset.

The constant current generator output can be switched to any one of the 16 output channels simply by setting one of the data lines from RIC Ports 0 and 1 to logic one.

7.13.4.2 Programming Specifications

The RWC-SCD module is addressed via the standard DCE-BUS interface. Programming specifications for driving the DCE-BUS are given in Section 4.1 of this manual.

RIC Device Addresses

The RIC on the RWC-SCD module has 3 data ports and a command register. Different modes of communication between RIC Ports 0, 1, 2 and the DCE-BUS Data Path are established depending on the Device Address received by the RWC-SCD module from the DCE-BUS. Table 7.13.1 shows the Device Addresses needed for different communication modes.

DEVICE ADDRESS (HEX)	$\overline{RD}$	$\overline{WR}$	OPERATION
Y0	0	1	RIC Port 0 → DCE Data Bus
Y1	0	1	RIC Port 1 → DCE Data Bus
Y2	0	1	Not Applicable
Y3	0	1	Illegal Condition
Y0	1	0	DCE Data Bus → RIC Port 0
Y1	1	0	DCE Data Bus → RIC Port 1
Y2	1	0	DCE Data Bus → RIC Port 2
Y3	1	0	DCE Data Bus → RIC Command Register
ZX	X	X	RIC Data Bus in 3-state

Notes:

1. Y is the card address select switch setting in hex (1 to F).
2. Z is any number other than Y.
3. X means don't care.
4. Bits 2 and 3 in the Device Addresses are don't care states.
5. RDRWC and WRRWC software routines provide the $\overline{RD}$ and $\overline{WR}$ signals accordingly.

Table 7.13.1 : Device Address Table for RWC-SCD

RIC Initialization

The RIC on the RWC-SCD module should be initialized by writing control word 80H to the RIC Command Register. This configures all three RIC ports in output mode.

Format and Interpretation of Data

The 16 output signals used for relay control are all active high. They are obtained from RIC Port 0 Bits 0-7 and Port 1 Bits 0-7. Port 2 Bit 0 enables or disables all relay control switching circuits.

RIC Port signal definitions are as follows :

Port 0 : b0 - b7 = switching signal for Channel 0 - 7
(0 = relay open)
(1 = relay closed)

Port 1 : b0 - b7 = switching signal for Channel 8 - 15
(0 = relay open)
(1 = relay closed)

Port 2 : b0 = Channel switching control
(0 = relay switching controlled by Port 0 and Port 1 lines)
(1 = all channel relays open)

Special Considerations

On power-on reset all three RIC Ports are automatically set to input mode. Port 2 Bit 0 will thus appear to be in logic one state, and ensure that all the channel relays are in the open state.

When the RIC is initialized by writing the correct control word to its Command Register, all lines configured as output automatically go to logic zero. All output signals from Ports 0, 1 and Bit 0 of Port 2

will therefore be in the logic zero state. As a result, all of the channel relays will remain in the open state. Any individual channel relay can then be closed simply by writing a logic one to the corresponding bit of Port 0 or 1. Port 2 Bit 0 will remain in the logic zero state, unless changed by DCE software.

The constant current generator will output 10mA only if one channel is switched on at a time.

In variable resistance parameter measurements, a 10mA constant current will be driven through the connected variable resistance on the selected channel. The voltage generated across such a measuring element can be read into the DCE system using a RWC-AI 16 analog input module or equivalent.

RWC-SCD / DCE-BUS Protocol

The RWC-SCD module RIC should first be initialized by writing control word 80H to its Command Register.

After RIC initialization Port 2 Bit 0 will be at logic zero, and the channel relays can be controlled by writing a logic one to one of the bits of Port 0 or 1. Ensure that only one channel is switched on at a time.

The status of the relay control output signals at RIC Ports 0 and 1 can be read back if necessary.

Port 2 Bit 0 may be used if desired to prevent inadvertant channel switching. Writing a logic one to this bit will ensure that all sixteen channel relays are in the open state, irrespective of the state of the outputs from Ports 0 and 1.

7.13.4.3 Module Connector Definitions

System Connector

See Section 6.1.4 for the pin definitions.

Device Connector

Pin definitions for the 25-pin D-type female connector are as follows:

Pin Number	Signal
1	Channel 10
2	" 8
3	" 9
4	" 12
5	" 13
6	" 15
7	" 14
8	" 0
9	" 1
10	" 3
11	" 2
12	" 7
13	" 6
14	" 11
15 - 23	ground return
24	Channel 4
25	" 5

7.13.4.4 Operational Requirements

Signal Characteristics

Constant Current Source

temperature coefficient	=	0.002% per °C
long term stability	=	40 ppm
warm-up time to 0.05%	=	10 seconds typical at 25°C

Relay Outputs

Output contact rating	:	10VA max. 100V DC max. 500mA max. resistive switching carry load 1500mA
Dielectric rating	:	250V DC on open contacts
Closing time	:	550 µsec
Release time	:	150 µsec
Max. repetition rate	:	700 Hz
Life expectancy	:	25 million operations at rated load
Min. isolation between coil and contact	:	500V DC or 350V AC at 50 Hz

Environmental Requirements

Operating temperature	:	0°C to 55°C
Storage temperature	:	-25°C to +85°C
Relative humidity	:	95% non condensing (isolation may be reduced with high humidity)

Bus Loading

The RWC-SCD module presents 1 unit-load to the DCE-BUS (see Section 4.4).

7.13.5 ORDERING INFORMATION

RWC-SCD : Standard Version

7.14 RWC-HC/DC : HIGH CURRENT D.C. DRIVER

7.14.1 FUNCTIONAL DESCRIPTION

The RWC-HC/DC Real-World interface module provides eight opto-isolated independent channels for driving D.C. currents up to 3A. It enables direct isolated DCE control of high D.C. current devices such as magnetic valves, solenoids, stepping motors, heating elements and similar devices normally found in industrial control environments.

Due to the total isolation between each output channel and the DCE system, the RWC-HC/DC module is ideal for precision control environments where industrial noise and ground loops make accurate control difficult.

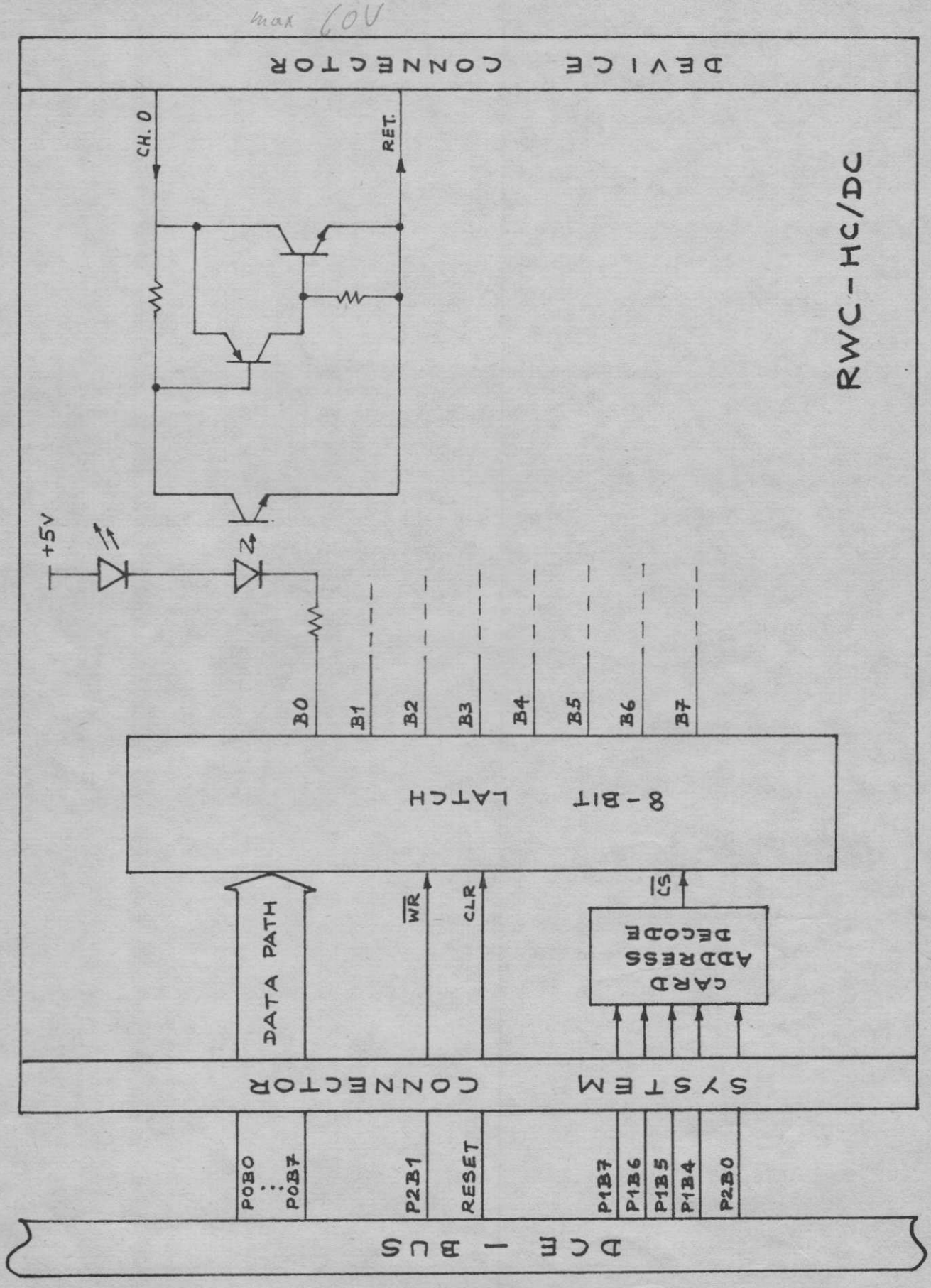
The RWC-HC/DC module can be easily configured as an opto-isolated high-current single-channel D/A converter with 8-bit resolution, by connecting a binary ratioed resistance network (R:2R:4R:8R.....) externally.

Each module has an identification address defined by a hexadecimal switch and up to fifteen modules can be directly connected to the DCE-BUS.

7.14.2 FEATURES

- 8 identical simultaneous independent current output channels.
- up to 3A D.C. current output per channel.
- total opto-isolation between each output channel and DCE system.
- 8 indicator LEDs for visually monitoring channel switching.
- can be configured as an opto-isolated high-current single-channel D/A converter.
- standard hardware and software interface to the DCE-BUS.
- selectable module address.
- single 100 x 160 mm eurocard format.

7.14.3 FUNCTIONAL BLOCK DIAGRAM



7.14.4 SYSTEM DESIGN PARAMETERS

7.14.4.1 Hardware Configuration

The functional block diagram in Section 7.14.3 illustrates the hardware configuration. The module does not use a RIC device for interfacing to the DCE-BUS. External power sources are required by the current drivers.
It has an eight bit latch for the 8 channel switching control signals received from the DCE-BUS Data Path. The outputs of the 8-bit latch follow the data input from the DCE-BUS Data Path, while the $\overline{WR}$ signal is active and the module is correctly addressed. Latching will occur when either becomes inactive.

No software initialization is required for this DCE-BUS interface. It does not use the $\overline{RD}$ signal from the DCE-BUS, and therefore only software Write operations are recognized by the module.

7.14.4.2 Programming Specifications

The RWC-HC/DC module is addressed via the standard DCE-BUS interface. Programming specifications for driving the DCE-BUS are given in Section 4.1 of this manual.

Since the module does not use the $\overline{RD}$ signal from the DCE-BUS, software Read operations are not recognized by it.

The module will accept and latch data from the DCE-BUS Data Path during Write operations ($\overline{WR}$ active), when the upper four bits of the card/device address received from the DCE GIC Port 1 via the DCE-BUS correspond to the setting of the module address select switch (1 to F).

Each of the eight bits of data read from the DCE-BUS Data Path are

latched, and are used to control the eight output channels. Bit allocation is as follows :

b0 - b7 = switching signal for output Channel 0 -7.
(0 = channel ON)
(1 = channel OFF)

After power-on or system reset, all 8 channels will be switched OFF automatically. No software initialization is necessary.

RWC-HC/DC - DCE-BUS Protocol

Channel switching is carried out by writing the appropriate control word to the RWC-HC/DC module. For example, the following sequence will switch channels 0 and 2 ON (module address switch set to 'E') :

```
MVI     A,0E0H      bits 7 - 4 = module address;
                    bits 3 - 0 are irrelevant.
STGI    1           select RWC-HC/DC module
MVI     A,5         b0 = 1 ; b2 = 1
CALL    WRRWC
```

7.14.4.3 Module Connector Definitions

System Connector

See Section 6.1.4 for the pin definitions.

Device Connector

Pin definitions for the 25-pin D-type male connector are as follows.

Pin Number	Signal
1	Channel 6 Return
2	" 6
3	" 5 Return
4	" 5
5	" 4 Return
6	" 4
7	" 3 Return
8	" 3
9	" 2 Return
10	" 2
11	" 1 Return
12	" 1
13	" 0 Return
14	" 7
15	" 7 Return
16 - 24	not used
25	Channel 0

7.14.4.4 Operational Requirements

Signal Characteristics

Channel Power Transistors

Absolute maximum ratings at 25°C case temperature :

collector-emitter voltage	= 60V
continuous collector current	= 6A
peak collector current	= 10A

Recommended maximum continuous operating current (free-air cooling) = 3A

Power Requirements

The RWC-HC/DC uses a single +5V power supply from the DCE-BUS. A typical power requirement in the quiescent state is given below. Active state values are typically 20% higher.

+5V : 140 mA

Environmental Requirements

Operating temperature	: 0°C to 55°C
Storage temperature	: -25°C to +85°C
Relative humidity	: up to 95% non condensing

Bus Loading

The RWC-HC/DC module presents 1 unit-load to the DCE-BUS (see Section 4.4)

7.14.5 ORDERING INFORMATION

RWC-HC/DC : Standard Version