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USER MANUAL

Model No. **20-210**
20-410

Breadboard & Digital Input/Output Modules

Note: 20-210 has been upgraded to 20-210A with ZIF front panel connectors replacing Elco types.
All other functionality is the same.
Please contact Pickering for new pin-out information

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A full set of operating manuals, application notes and software drivers is available on CD ROM.

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20-410 Digital I/O Module

Section 1
Breadboard & Digital Input/Output Modules

1.1 Features

- Breadboard and Digital I/O Modules Share The Same Architecture
- Choice of 32 or 64 Bits of Digital Input/Output, Programmable by Bit, Byte or Word.
- T.T.L. Output Suitable for Driving External Logic.
- Transistor Outputs Suitable for Driving External Relay Coils.
- Breadboard Has Large Area For Construction Of User Circuits
- Digital I/O Circuitry Mounted on Daughter Boards For Easy Upgrading and Maintenance

1.2 Breadboard Module Overview

The 20-210 Breadboard module has a choice of 64 or 128 digital pins.

20-210 Breadboard Modules:

20-210-021	Breadboard Module with 2 x 16 Bit Input/Output	2 x 75 Way Elco
20-210-022	Breadboard Module with 2 x 32 Bit Output	2 x 75 Way Elco
20-210-023	Breadboard Module with 2 x 32 Bit Input	2 x 75 Way Elco
20-210-041	Breadboard Module with 4 x 16 Bit Input/Output	2 x 75 Way Elco
20-210-042	Breadboard Module with 4 x 32 Bit Output	2 x 75 Way Elco
20-210-043	Breadboard Module with 4 x 32 Bit Input	2 x 75 Way Elco
Options: -O	Open collector transistor output. Alternative Connectors are available to order.	

20-120 modules have been upgraded to 20-120A.
75-way Elco connectors have been replaced by 96-way ZIF connectors. Please consult factory for details.

1.3 Digital I/O Module Overview

The 20-410 Digital I/O module has a choice of 64 or 128 digital pins. Operation is the same as the 20-210 Breadboard Module.

20-410 Digital I/O Modules

20-410-021	High Density Digital Module with 32 Bit Input/Output	2 x DIN 41612
20-410-022	High Density Digital Module with 64 Bit Output	2 x DIN 41612
20-410-023	High Density Digital Module with 64 Bit Input	2 x DIN 41612
20-410-041	High Density Digital Module with 64 Bit Input/Output	2 x DIN 41612
20-410-042	High Density Digital Module with 128 Bit Output	2 x DIN 41612
20-410-043	High Density Digital Module with 128 Bit Input	2 x DIN 41612
Options: -O	Open collector transistor output.	

1.4 T.T.L. Output Driver

Driver I.C. fitted as standard	Xilinx 3030 gate array.
Maximum drive capability	15 TTL inputs.
Current drive	Sink: 10mA max, Source 0.4mA max.
Max Voltage	7V
Operate/Release Time	< 3mS after internal bus DAV true.

1.5 Open Collector Transistor

Driver I.C. fitted as standard	ULS2803, sink driver
Maximum Standoff Voltage	50V
Max Power per O/P	1.0W
Max Power per byte	1.6W
Max Current Drive	500mA.
Operate/Release Time	< 3mS after internal bus DAV true.

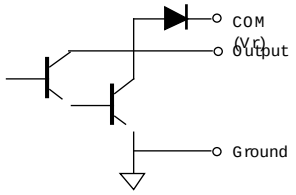


Fig 1.2 Open Collector Output

1.6 Digital Input (all models)

Driver I.C. fitted as standard	Xilinx 3030 gate array.
Maximum Standoff Voltage	7V
Input Current	I_{ih} = 20µA, I_{il} = -0.4mA
Pull up resistor	Pull up to 5V via 10kOhm resistor
Nominal True voltage	> 2.0V
Nominal false voltage	< 0.8V

Data is strobed in when READ? operation is executed.

1.7 Width and Dimensions

All models conform to the 6U height (233mm) Eurocard standard and are housed in a 160mm deep screened plug-in card . Panel width is:

20-210 2.4 Inches for standard versions.

20-410 2.4 Inches

1.8 Precautions

Note: Care must be taken when interfacing the 20-210/410 module with external circuits which may produce high voltage spikes or RF interference. Addition noise protection may be required, please contact Pickering if you wish to discuss your requirement.

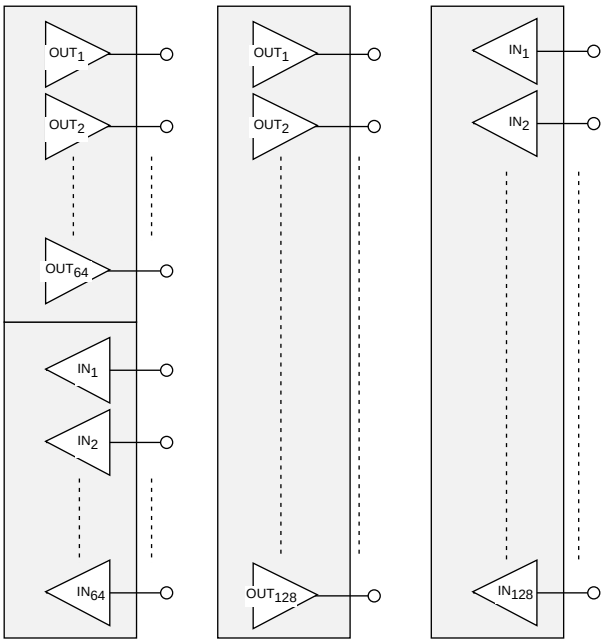


Fig 1.1 128 Bit of Digital I/O



20-210 Breadboard Module

Note: The 20-210 has been upgraded to 20-210A.
75-way Elco connectors have been replaced by 96-pin ZIF types,
please contact Pickering for new pin-out information

Section 2
Programming

2.1 Select Module Address

The module internal address is factory pre-set, please refer to case schematic diagram at front of manual. To change the internal address please refer to separate manual for Reconfiguring Driver Card to Your Application.

2.2 Programming Using the Intelligent GPIB/RS-232 Interface

The 20-210/410 module is simple to program either by single bit or by word.

ARESET a	Clear all outputs on module **a**
CLOSE a,b	Set bit number **b** on module **a**
DELAY t	Force a minimum delay of **t** milliseconds between two instructions
OPEN a,b	Clear bit number **b** on module **a**
RESET	Clear all bits/switches on all modules
READ? a,c	Read word from module **a** block position **c** (word size is a set with the SIZE command)
READ? a,c,b	Read bit **b** from module **a** block position **c**
SIZE s	This is used to specify the word size: **s** = 1 for byte, **s** = 2 for 16 bit word and **s** = 3 for 32 bit word *(16 bit is usually the factory default)*.
VIEW? a[,b]	View status of module **a**, can be viewed at any time either as a word or by bit **b** as a logical value (1 or 0)
WRITE a,c,w	Send word **w** to module **a** block position **c** (word size is a set with the SIZE command)

The module is programmed as an 8 bit output port using either single bit, byte (8 bits), 16 bit word or 32 bit word:-

To set bit number 55 on module 11.

```
CLOSE 11,55
```

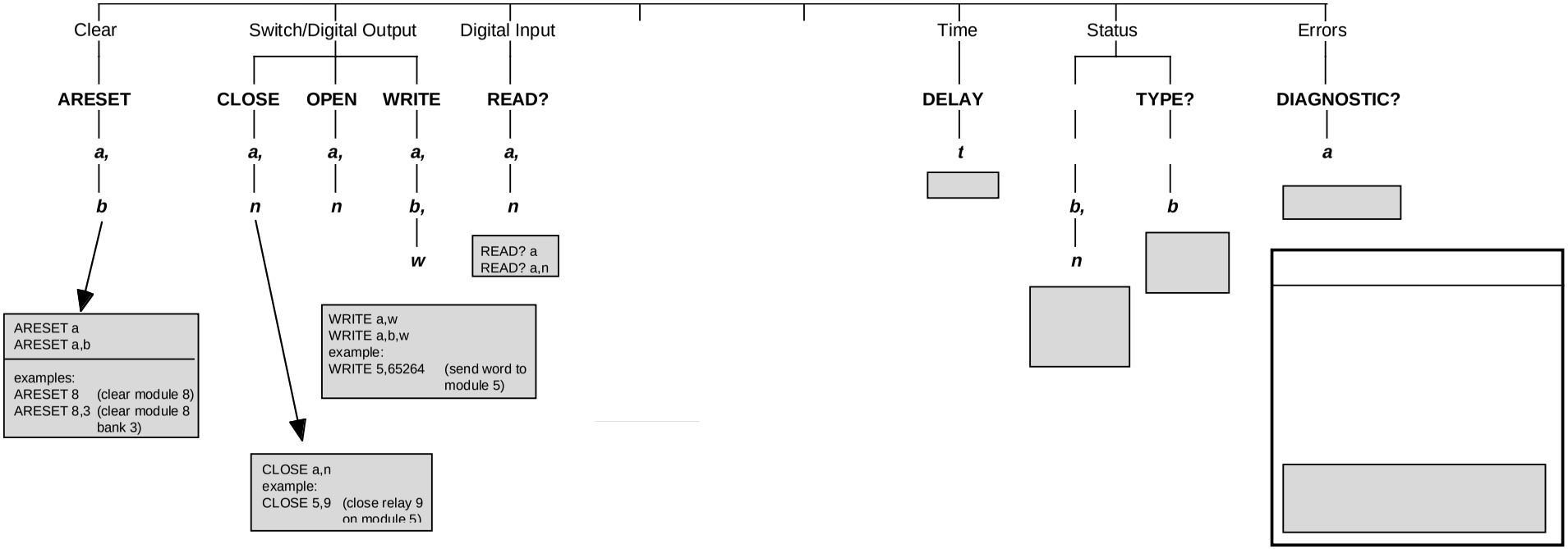
Or to close first 16 bits on module 9.

```
SIZE 2 (this selects byte length words)
WRITE 8,1,65535
```

For more details on programming see the programming manual for the IEEE-488.2/RS-232 interface module.

2.3 Operating Speed

Module operating speed, i.e. the time taken to open or close a bit, is approximately 7mS using the 10-921 IEEE-488.2/ RS-232 interface module.


Clear
Switch/Digital Output
Digital Input
Time
Status
Errors
ARESET
CLOSE
OPEN
WRITE
READ?
DELAY
TYPE?
DIAGNOSTIC?
a,
b
n
b,
w
t
a
ARESET a
ARESET a,b
examples:
ARESET 8 (clear module 8)
ARESET 8,3 (clear module 8 bank 3)
WRITE a,w
WRITE a,b,w
example:
WRITE 5,65264 (send word to module 5)
READ? a
READ? a,n
CLOSE a,n
example:
CLOSE 5,9 (close relay 9 on module 5)

Section 3
Self Test

3.1 Self-Test Function

Self-Test is invoked at power on and may also be operated under software (*TST?). Self-Test pass is indicated on a front panel LED with a full pass/fail description available using the DIAGNOSTIC? command.

Self-Test comprises 1 levels, see diagram below:-

1. **Logic Test**: Checks all logic including on-board microprocessor, relay drivers etc.

3.2 Self-Test Operation

If self test is run under software control it will firstly **clear the whole module**.

When the selftest has finished the module will be returned to an all clear state (i.e. the previous state will not be remembered!).

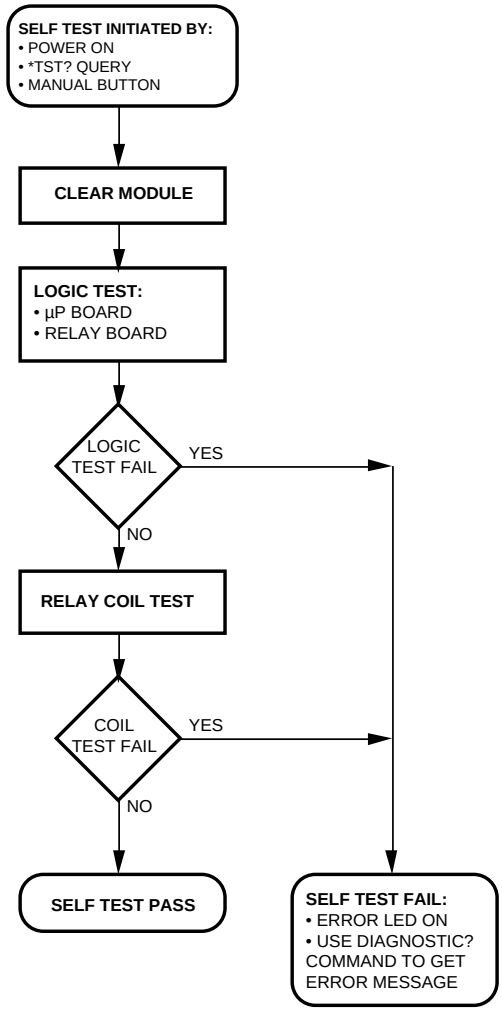
3.3 Detailed Self Test Reporting using the DIAGNOSTIC? Query

The DIAGNOSTIC? query will give an ASCII string detailing any self test failures. These will include:-

Logic: µP, RAM, EPROM, Relay Drivers, Invalid Link Settings etc.

This string is not intended to be processed by the user's software, it is suitable for copying directly onto the screen of your control computer. This information will then indicate the maintenance required (please contact Pickering for further help).

Self-Test: Basic Flow Diagram



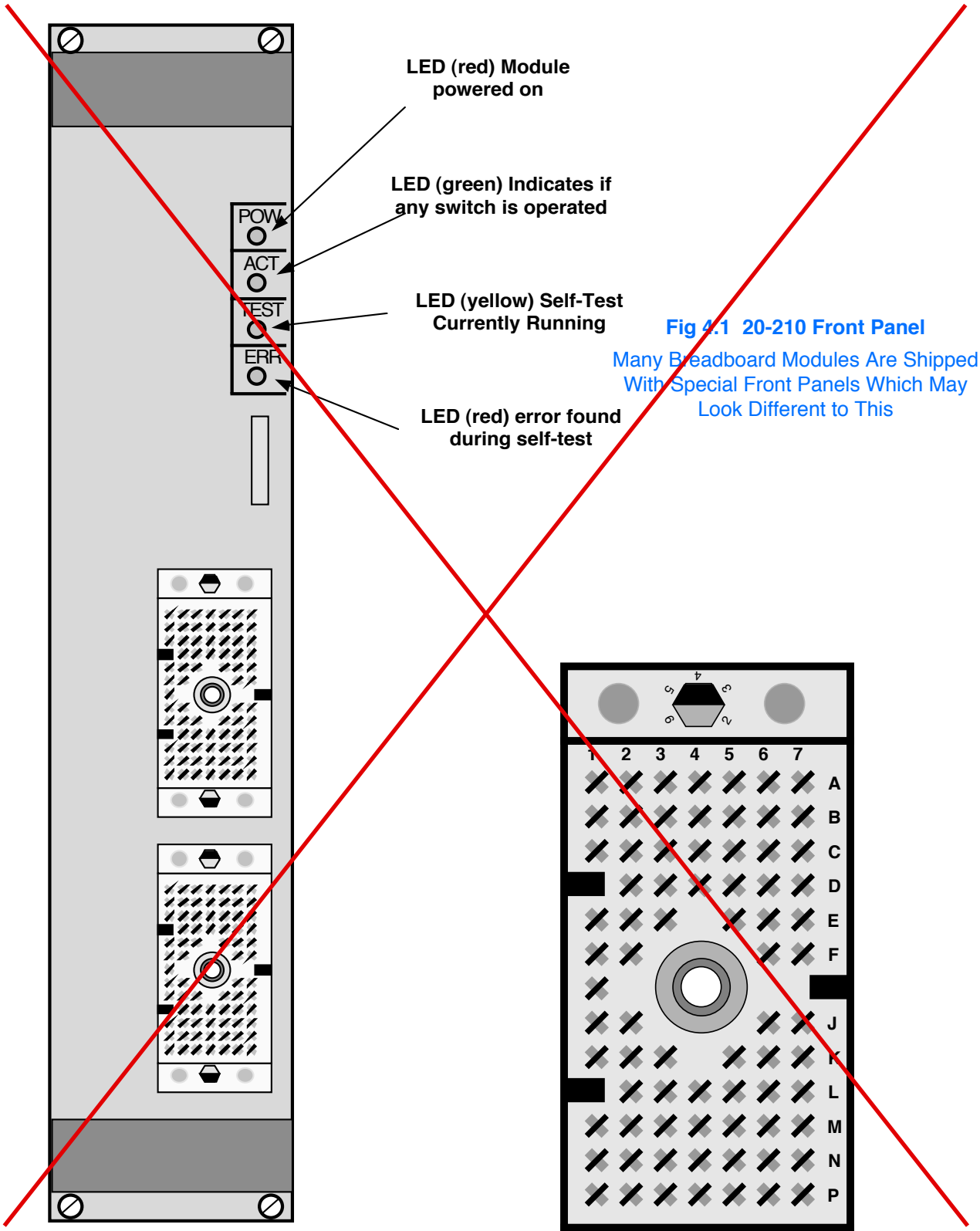


Fig 4.1 20-210 Front Panel

Many Breadboard Modules Are Shipped With Special Front Panels Which May Look Different to This

Fig 4.2 Elco Connector Pin Out

Note: The 20-210 has been upgraded to 20-210A. 75-way Elco connectors have been replaced by 96-pin ZIF types, please contact Pickering for new pin-out information

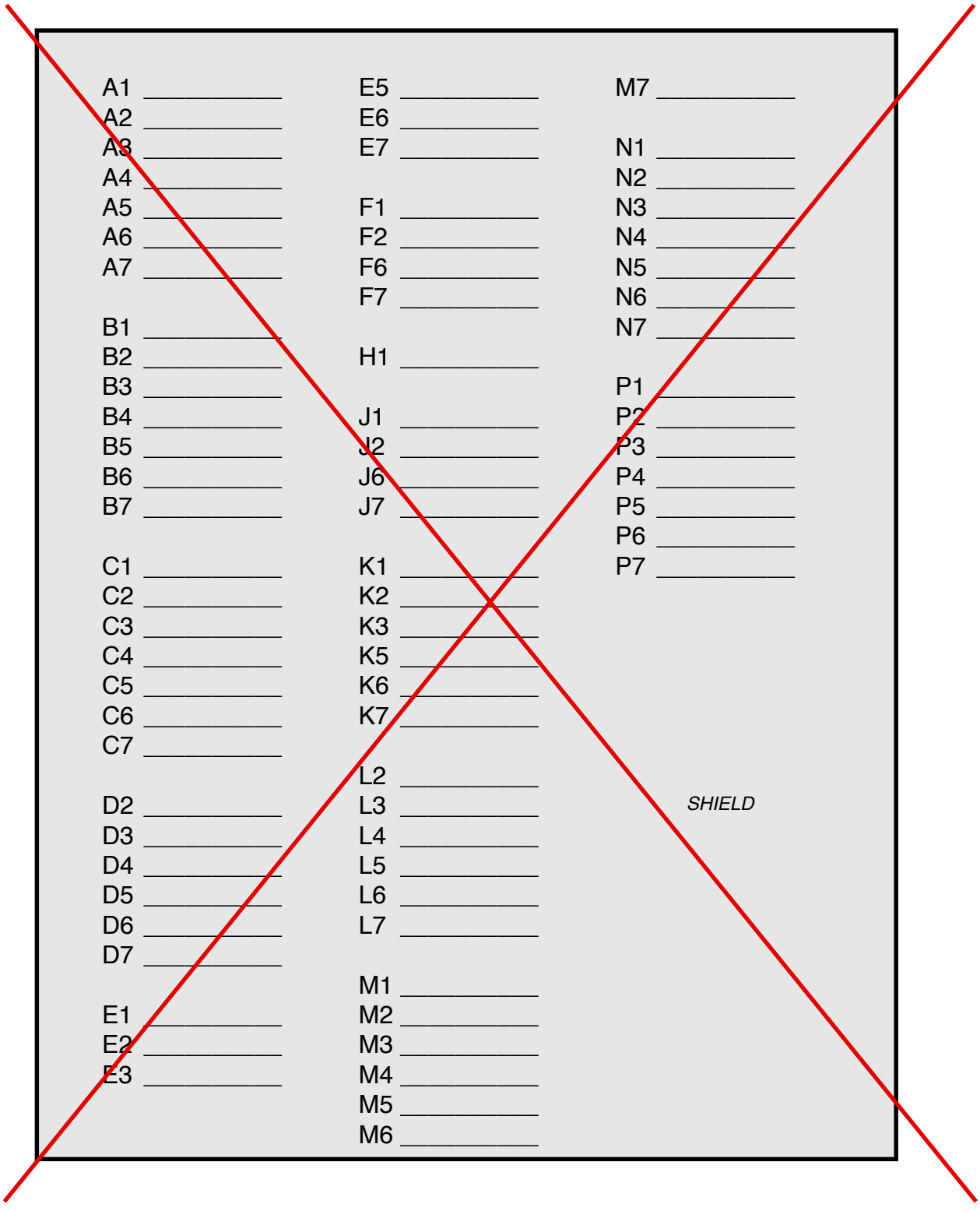


Table 4.1 Documentation Table for 75 Way Connector (Suitable for Photocopying)

Note: The 20-210 has been upgraded to 20-210A.
75-way Elco connectors have been replaced by 96-pin ZIF types,
please contact Pickering for new pin-out information

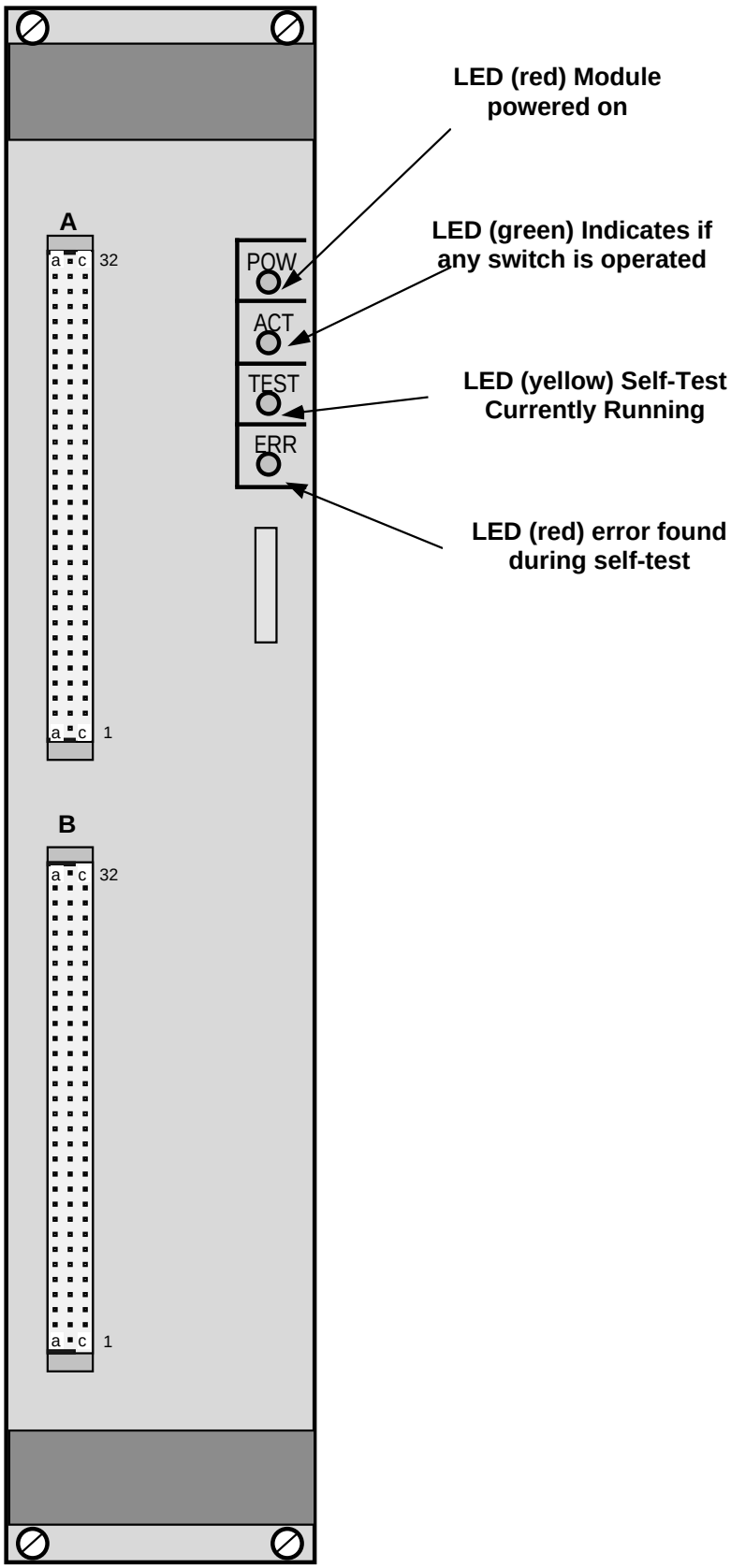


Fig 4.3 20-410 Front Panel

	A	B	C
32	Out 1	Out 2	Out 3
31	Out 4	Out 5	Out 6
30	Out 7	Out 8	Out 9
29	Out 10	Out 11	Out 12
28	Out 13	Out 14	Out 15
27	Out 16	Out 17	Out 18
26	Out 19	Out 20	Out 21
25	Out 22	Out 23	Out 24
24	Out 25	Out 26	Out 27
23	Out 28	Out 29	Out 30
22	Out 31	Out 32	-
21	COM1	COM1	GND
20	GND	GND	GND
19	-	-	-
18	-	-	-
17	-	-	-
16	-	-	-
15	-	-	-
14	-	-	-
13	GND	GND	GND
12	GND	COM2	COM2
11	-	Out 33	Out 34
10	Out 35	Out 36	Out 37
9	Out 38	Out 39	Out 40
8	Out 41	Out 42	Out 43
7	Out 44	Out 45	Out 46
6	Out 47	Out 48	Out 49
5	Out 50	Out 51	Out 52
4	Out 53	Out 54	Out 55
3	Out 56	Out 57	Out 58
2	Out 59	Out 60	Out 61
1	Out 62	Out 63	Out 64

Connector A

	A	B	C
32	Out 65	Out 66	Out 67
31	Out 68	Out 69	Out 70
30	Out 71	Out 72	Out 73
29	Out 74	Out 75	Out 76
28	Out 77	Out 78	Out 79
27	Out 80	Out 81	Out 82
26	Out 83	Out 84	Out 85
25	Out 86	Out 87	Out 88
24	Out 89	Out 90	Out 91
23	Out 92	Out 93	Out 94
22	Out 95	Out 96	-
21	COM3	COM3	GND
20	GND	GND	GND
19	-	-	-
18	-	-	-
17	-	-	-
16	-	-	-
15	-	-	-
14	-	-	-
13	GND	GND	GND
12	GND	COM4	COM4
11	-	Out 97	Out 98
10	Out 99	Out 100	Out 101
9	Out 102	Out 103	Out 104
8	Out 105	Out 106	Out 107
7	Out 108	Out 109	Out 110
6	Out 111	Out 112	Out 113
5	Out 114	Out 115	Out 116
4	Out 117	Out 118	Out 119
3	Out 120	Out 121	Out 122
2	Out 123	Out 124	Out 125
1	Out 126	Out 127	Out 128

Connector B

Table 4.2 Pin Out Table For 20-410 - 128 Bit Output Configuration

	A	B	C
32	In 1	In 2	In 3
31	In 4	In 5	In 6
30	In 7	In 8	In 9
29	In 10	In 11	In 12
28	In 13	In 14	In 15
27	In 16	In 17	In 18
26	In 19	In 20	In 21
25	In 22	In 23	In 24
24	In 25	In 26	In 27
23	In 28	In 29	In 30
22	In 31	In 32	-
21	COM1	COM1	GND
20	GND	GND	GND
19	-	-	-
18	-	-	-
17	-	-	-
16	-	-	-
15	-	-	-
14	-	-	-
13	GND	GND	GND
12	GND	COM2	COM2
11	-	In 33	In 34
10	In 35	In 36	In 37
9	In 38	In 39	In 40
8	In 41	In 42	In 43
7	In 44	In 45	In 46
6	In 47	In 48	In 49
5	In 50	In 51	In 52
4	In 53	In 54	In 55
3	In 56	In 57	In 58
2	In 59	In 60	In 61
1	In 62	In 63	In 64

Connector A

	A	B	C
32	In 65	In 66	In 67
31	In 68	In 69	In 70
30	In 71	In 72	In 73
29	In 74	In 75	In 76
28	In 77	In 78	In 79
27	In 80	In 81	In 82
26	In 83	In 84	In 85
25	In 86	In 87	In 88
24	In 89	In 90	In 91
23	In 92	In 93	In 94
22	In 95	In 96	-
21	COM3	COM3	GND
20	GND	GND	GND
19	-	-	-
18	-	-	-
17	-	-	-
16	-	-	-
15	-	-	-
14	-	-	-
13	GND	GND	GND
12	GND	COM4	COM4
11	-	In 97	In 98
10	In 99	In 100	In 101
9	In 102	In 103	In 104
8	In 105	In 106	In 107
7	In 108	In 109	In 110
6	In 111	In 112	In 113
5	In 114	In 115	In 116
4	In 117	In 118	In 119
3	In 120	In 121	In 122
2	In 123	In 124	In 125
1	In 126	In 127	In 128

Connector B

Table 4.3 Pin Out Table For 20-410 - 128 Bit Input Configuration

	A	B	C
32	Out 1	Out 2	Out 3
31	Out 4	Out 5	Out 6
30	Out 7	Out 8	Out 9
29	Out 10	Out 11	Out 12
28	Out 13	Out 14	Out 15
27	Out 16	In 17	In 18
26	In 19	In 20	In 21
25	In 22	In 23	In 24
24	In 25	In 26	In 27
23	In 28	In 29	In 30
22	In 31	In 32	-
21	COM1	COM1	GND
20	GND	GND	GND
19	-	-	-
18	-	-	-
17	-	-	-
16	-	-	-
15	-	-	-
14	-	-	-
13	GND	GND	GND
12	GND	COM2	COM2
11	-	Out 33	Out 34
10	Out 35	Out 36	Out 37
9	Out 38	Out 39	Out 40
8	Out 41	Out 42	Out 43
7	Out 44	Out 45	Out 46
6	Out 47	Out 48	In 49
5	In 50	In 51	In 52
4	In 53	In 54	In 55
3	In 56	In 57	In 58
2	In 59	In 60	In 61
1	In 62	In 63	In 64

Connector A

	A	B	C
32	Out 65	Out 66	Out 67
31	Out 68	Out 69	Out 70
30	Out 71	Out 72	Out 73
29	Out 74	Out 75	Out 76
28	Out 77	Out 78	Out 79
27	Out 80	In 81	In 82
26	In 83	In 84	In 85
25	In 86	In 87	In 88
24	In 89	In 90	In 91
23	In 92	In 93	In 94
22	In 95	In 96	-
21	COM3	COM3	GND
20	GND	GND	GND
19	-	-	-
18	-	-	-
17	-	-	-
16	-	-	-
15	-	-	-
14	-	-	-
13	GND	GND	GND
12	GND	COM4	COM4
11	-	Out 97	Out 98
10	Out 99	Out 100	Out 101
9	Out 102	Out 103	Out 104
8	Out 105	Out 106	Out 107
7	Out 108	Out 109	Out 110
6	Out 111	Out 112	In 113
5	In 114	In 115	In 116
4	In 117	In 118	In 119
3	In 120	In 121	In 122
2	In 123	In 124	In 125
1	In 126	In 127	In 128

Connector B

Table 4.4 Pin Out Table For 20-410 - 64 Bit Input/Output Configuration

PIN	FUNCTION
1	COM
2	COM
3	GND
4	GND
5	I/O BIT 1
6	I/O BIT 2
7	I/O BIT 3
8	I/O BIT 4
9	I/O BIT 5
10	I/O BIT 6
11	I/O BIT 7
12	I/O BIT 8
13	I/O BIT 9
14	I/O BIT 10
15	I/O BIT 11
16	I/O BIT 12
17	I/O BIT 13
18	I/O BIT 14
19	I/O BIT 15
20	I/O BIT 16
21	I/O BIT 17
22	I/O BIT 18
23	I/O BIT 19
24	I/O BIT 20
25	I/O BIT 21
26	I/O BIT 22
27	I/O BIT 23
28	I/O BIT 24
29	I/O BIT 25
30	I/O BIT 26
31	I/O BIT 27
32	I/O BIT 28
33	I/O BIT 29
34	I/O BIT 30
35	I/O BIT 31
36	I/O BIT 32
37	5V
38	5V
39	COM
40	COM
41	GND
42	GND
43	D0
44	D1
45	D2
46	D3
47	D4
48	D5
49	D6
50	D7
51	CS6
52	WR
53	A0
54	A1
55	A2
56	BA1
57	BA2
58	LCLK
59	LDATA
60	RDATA1
61	RESET OUT
62	SEN1
63	CS5
64	CS (5832)
65	-
66	-
67	5V
68	5V
69	GND
70	GND
71	GND
72	GND

Table 4.5 Pin Out For Digital I/O SIM Card

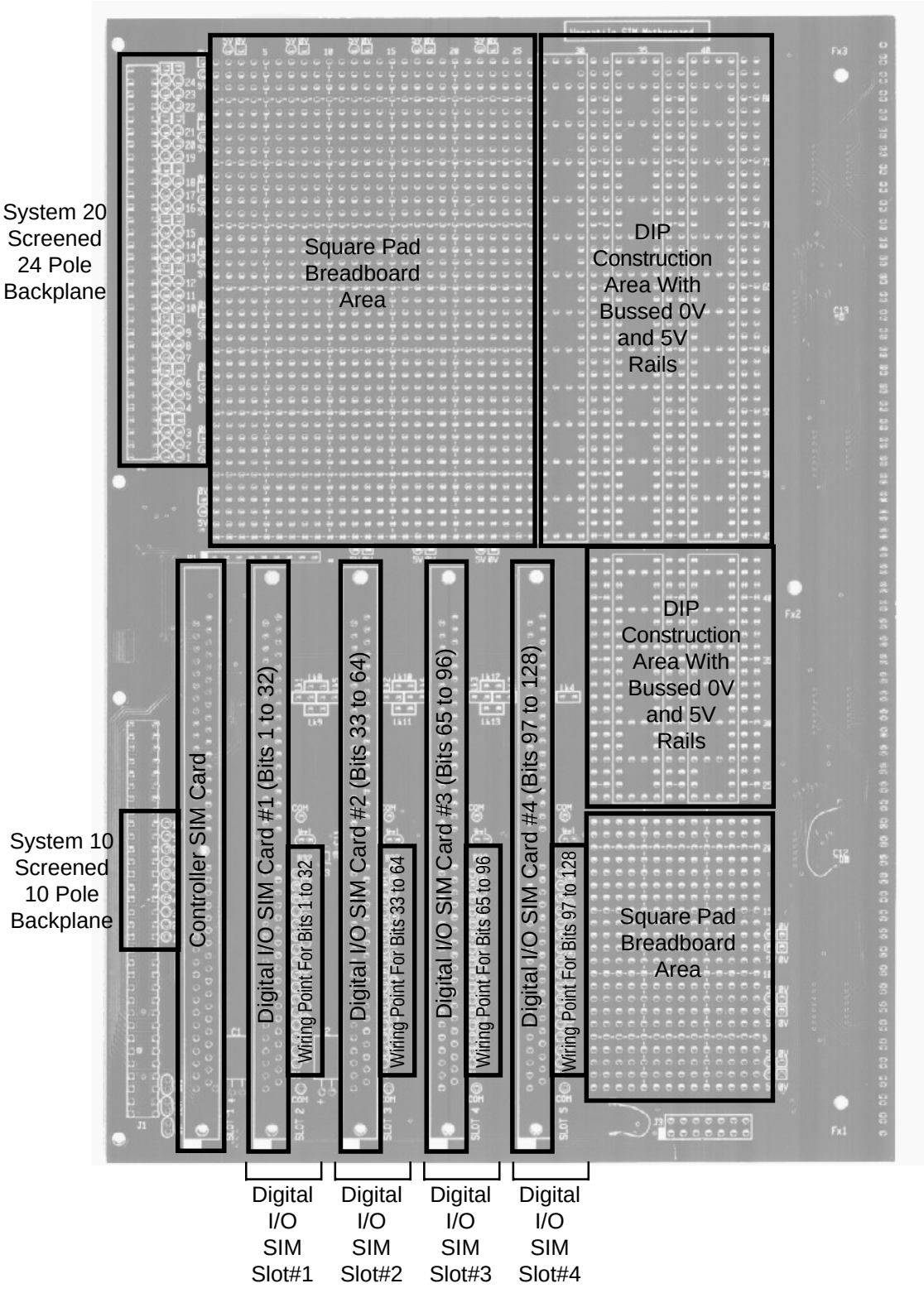


Fig 5.1. 20-210 Breadboard PCB - Main Functional Blocks Shown

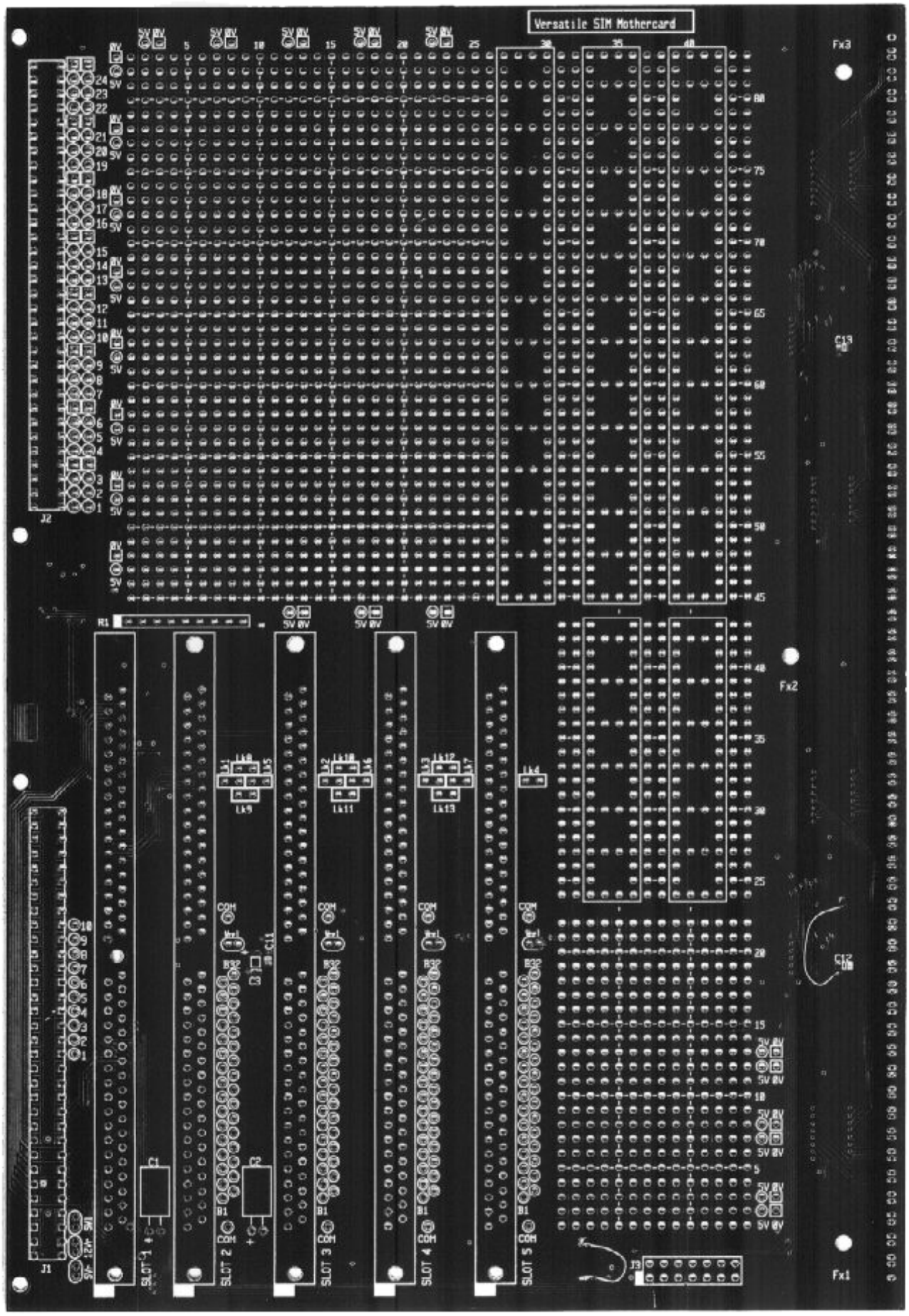


Fig 5.2 Top Side Of Main PCB For 20-210/410 Module (see Fig 5.1 for description)

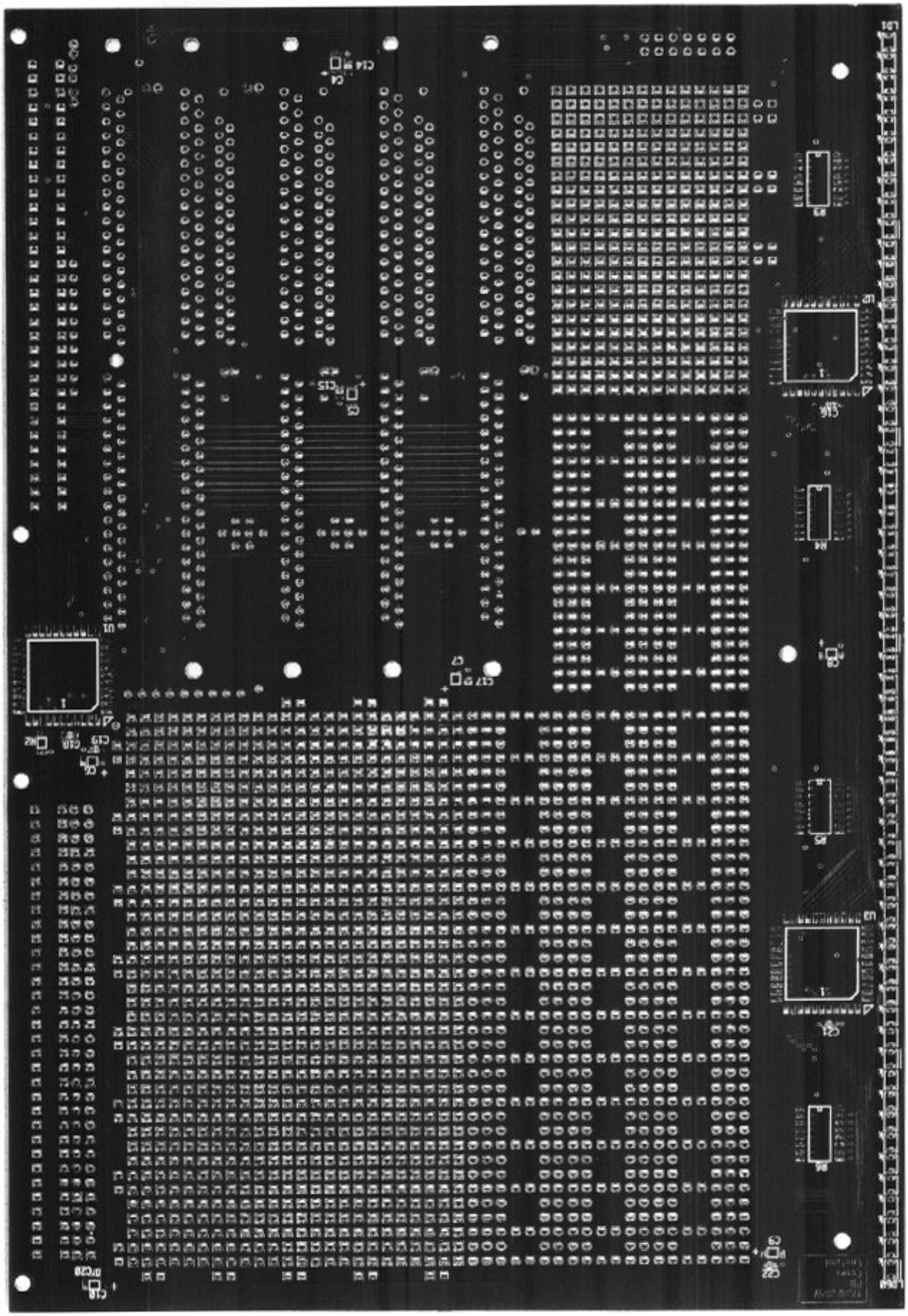


Fig 5.3 Bottom Side Of Main PCB For 20-210/410 Module

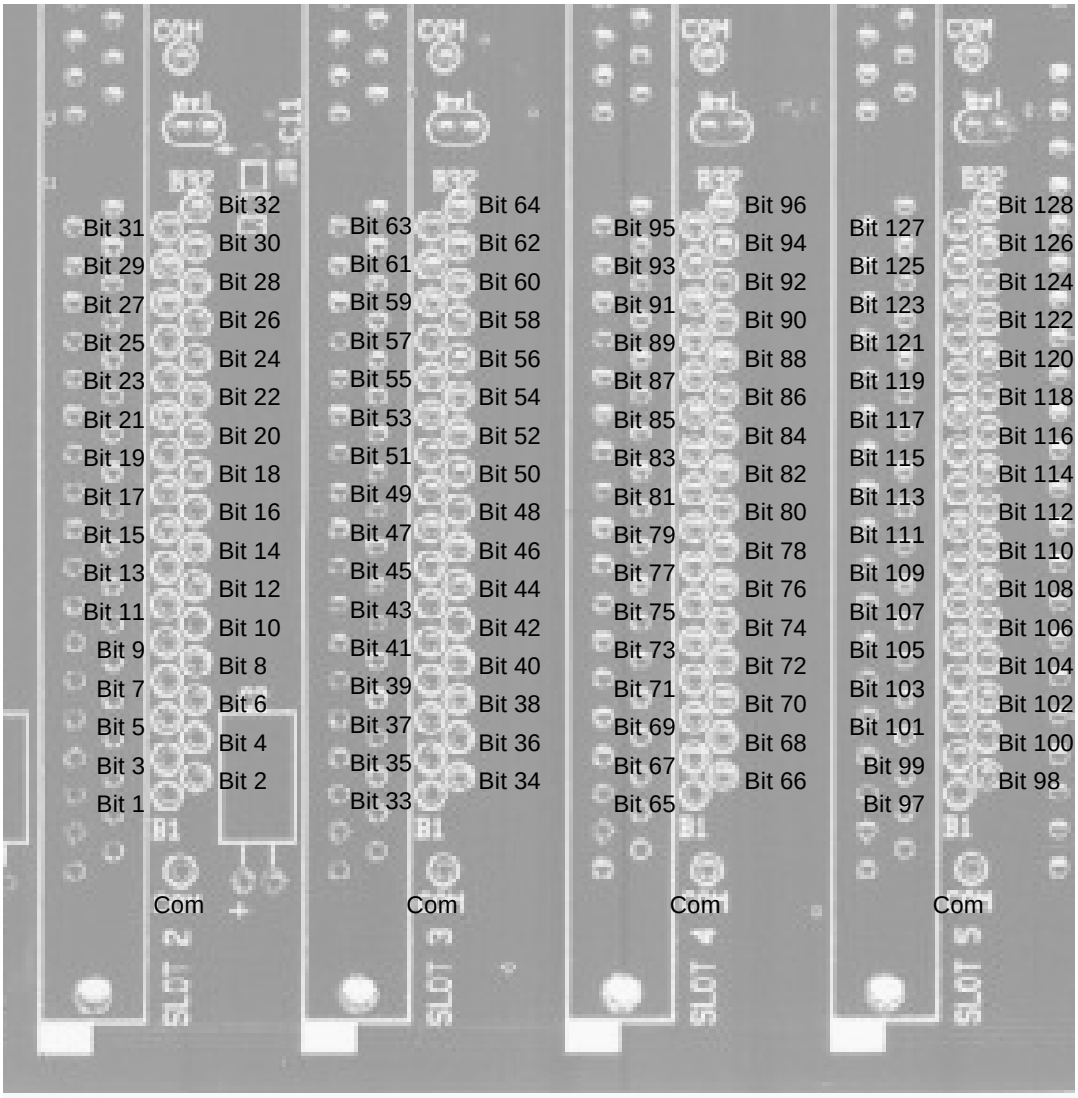


Fig 5.4 Digital I/O Connection Points For 20-210 Module

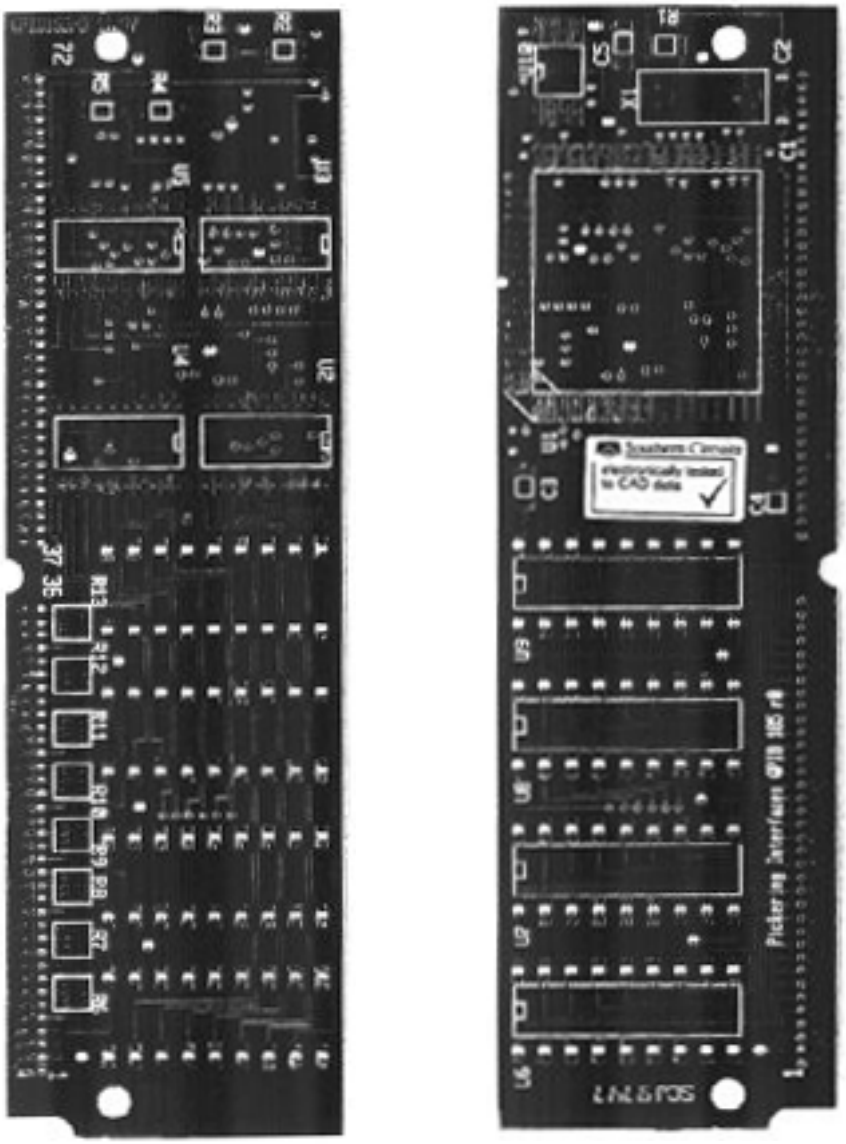


Fig 5.5 Digital I/O SIM Card Top and Bottom Layout

Environmental

Operating Temperature 0°C to 50°C.
Storage Temperature -20°C to 75°C.
Humidity 95% non condensing.

Weight Dimensions and Power Requirements

Approx. Weight/g		1100
Dimensions/mm †		
Front Panel Width		60.
Height		268
Overall Length		189
Power /Current Consumption		
Maximum /mA	5V	250
	12V	0
Minimum	5V	150
	12V	0

† Approx. dimensions. Standard 160mm, 6U, Eurocard, as specified in DIN 41494.

Voltage Supplies

Logic Supply 5Vdc ±5%.

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