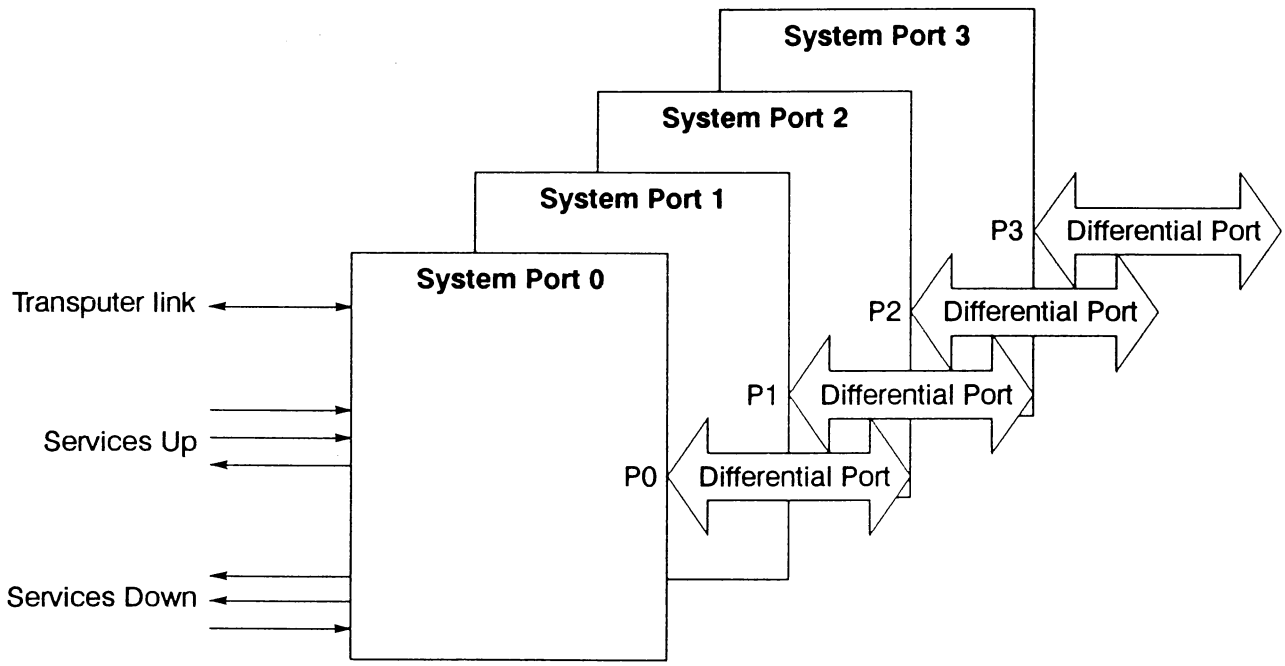
IMS B019
Differential system port board



FEATURES

- Buffers all Link and control signals to RS422 compatible differential signals.
- Handles four systems, each containing one link, sub-system control up and subsystem, control down.
- Capable of 20Mbit/s link operation.
- Links go quiet when disconnected.
- Designed for 100Ω twisted pair cable.
- ±7V common-mode noise rejection.
- Size 233×52mm.

DESCRIPTION

The IMS B019 is a link communication enhancement board which provides two important data communications features. These are improved noise immunity and connections between equipment with different electrical environments. No common ground connection is required, reducing earthing problems. With cable lengths up to 10m, 20Mbit/s link speed is possible. Longer cables up to 100m support lower link speeds.

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Contents

1.1 Description

The IMS B019 is a 6U VME height board incorporating differential drivers/receivers which allow INMOS serial links and control signals to be connected reliably between different pieces of equipment. The board allows the connection of up to four separate systems, each with one link, sub-system control up and sub-system control down signals. It is designed primarily to fit into a VME rack but can be used standalone if necessary.

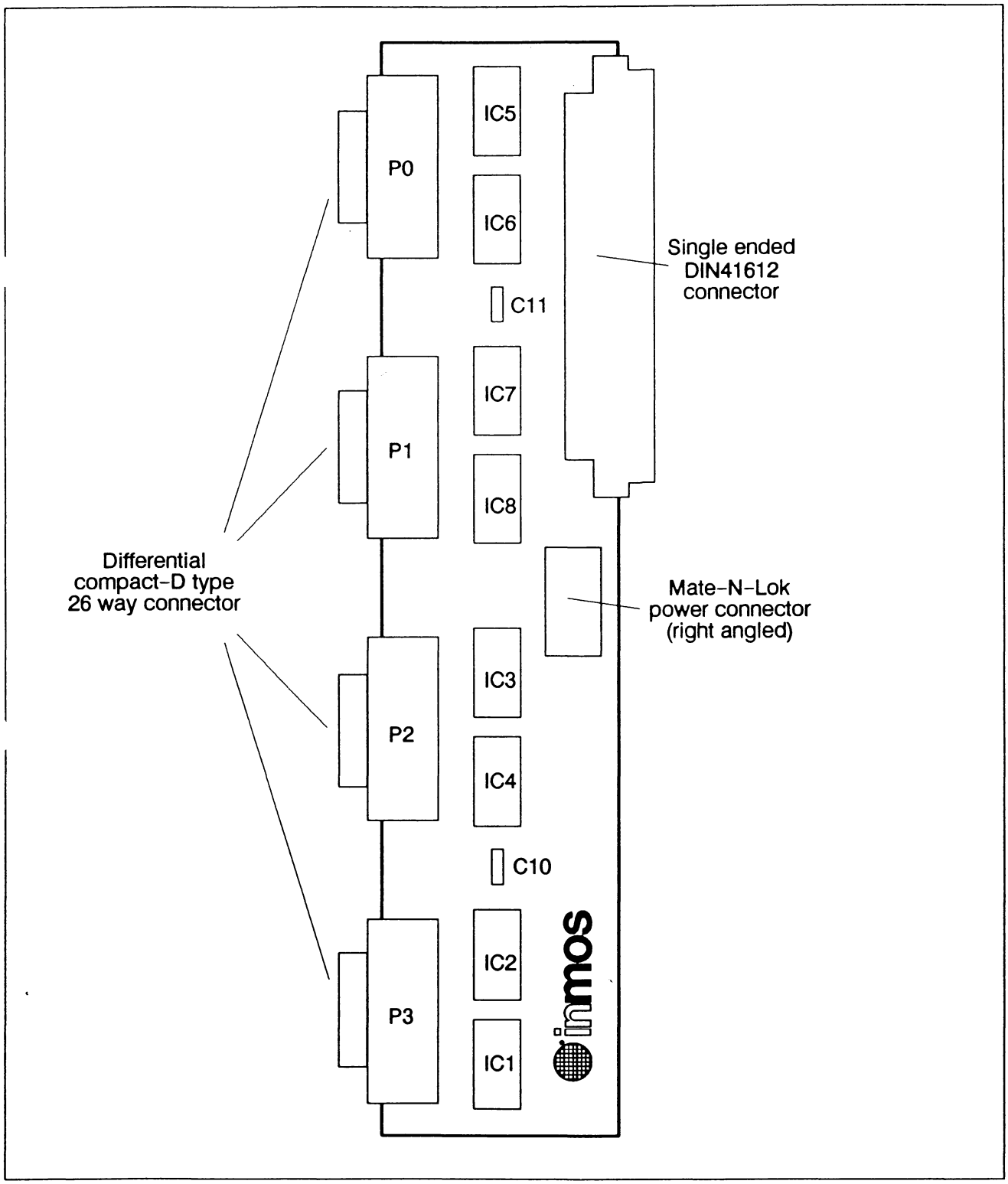

Figure 1.1 Connector positions placement diagram and general layout

1.2 Pin description

1.2.1 Single-ended connectors

Pin	In/Out	Function	Pin No.
VCC		Power supply	a1, b32, b20, b1, c1
GND		Power return	a32, a31, a28, a27, a26, a23, a22, a21, a20, a16, a15, a11, a10, a6, a5, b31, b21, b11, b2, c32, c32, c28, c27, c26, c23, c22, c21, c20, c16, c15, c11, c10, c6, c5
System Port 0			
Link.in	in	INMOS serial link input	a25
Link.out	out	INMOS serial link output	a24
Reset.down	out	'Down' Reset	a12
Analyse.down	out	'Down' Analyse	a13
Error.down	in	'Down' Error	a14
Reset.up	in	'Up' Reset	a2
Analyse.up	in	'Up Analyse	a3
Error.up	out	'Up' Error	a4
System Port 1			
Link.in	in	INMOS serial link input	c25
Link.out	out	INMOS serial link output	c24
Reset.down	out	'Down' Reset	c12
Analyse.down	out	'Down' Analyse	c13
Error.down	in	'Down' Error	c14
Reset.up	in	'Up' Reset	c2
Analyse.up	in	'Up Analyse	c3
Error.up	out	'Up' Error	c4
System Port 2			
Link.in	in	INMOS serial link input	a30
Link.out	out	INMOS serial link output	a29
Reset.down	out	'Down' Reset	a17
Analyse.down	out	'Down' Analyse	a18
Error.down	in	'Down' Error	a19
Reset.up	in	'Up' Reset	a7
Analyse.up	in	'Up Analyse	a8
Error.up	out	'Up' Error	a9
System Port 3			
Link.in	in	INMOS serial link input	c30
Link.out	out	INMOS serial link output	c29
Reset.down	out	'Down' Reset	c17
Analyse.down	out	'Down' Analyse	c18
Error.down	in	'Down' Error	c19
Reset.up	in	'Up' Reset	c7
Analyse.up	in	'Up Analyse	c8
Error.up	out	'Up' Error	c9

Table 1.1 P2 Connector Pinout

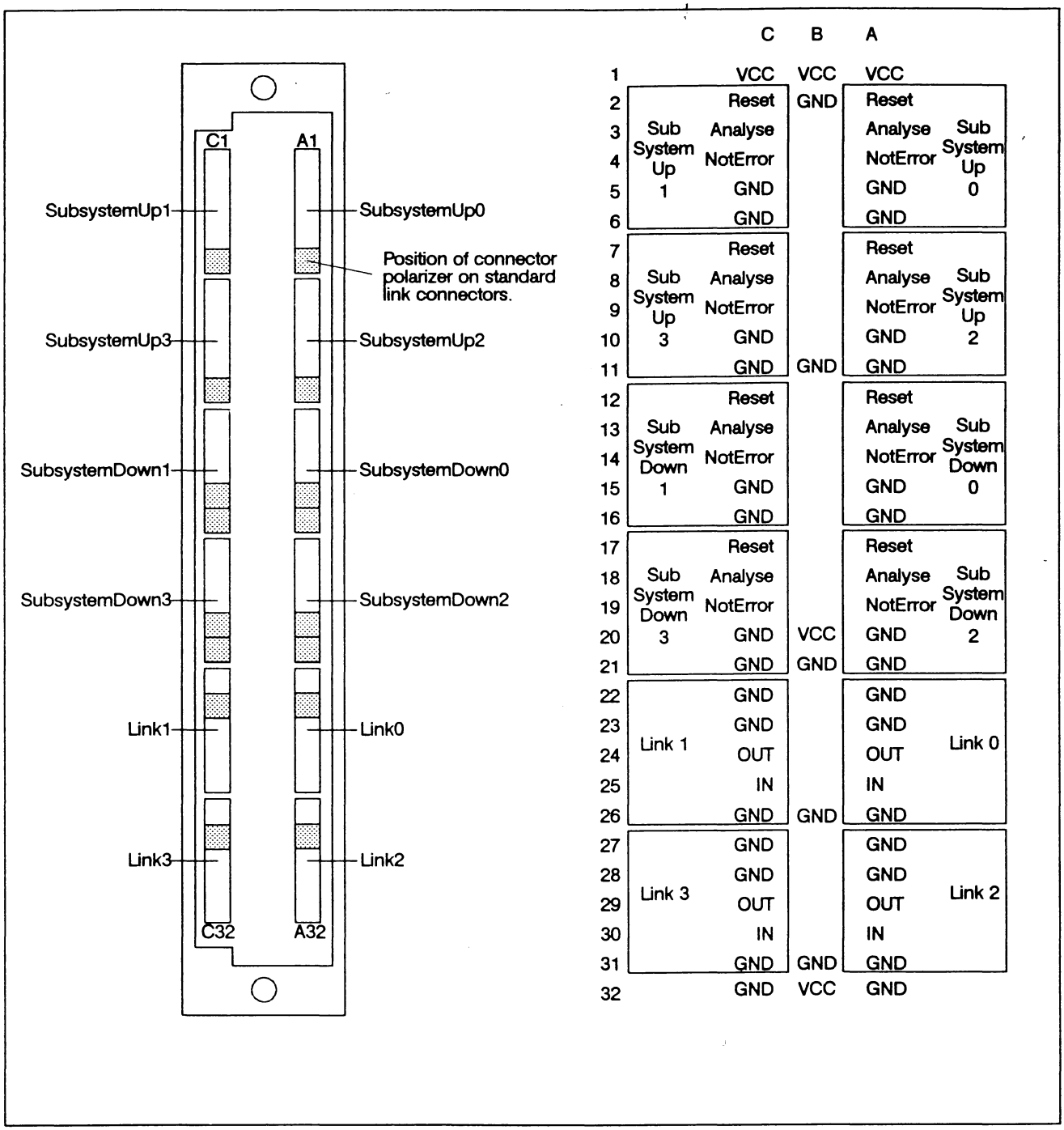

Figure 1.2 Link, subsystem and pinout locations on the IMS B019 rear connector

1.2.2 Differential connectors

Pin	In/Out	Function	Pin No.
GND		GROUND	9, 10, 11, 12, 13, 14, 15, 16, 17,18
Links			
Link.in+	in	Positive Differential INMOS serial link input	8
Link.in-	in	Negative Differential INMOS serial link input	26
Link.out+	out	Positive Differential INMOS serial link output	7
Link.out-	out	Negative Differential INMOS serial link output	25
'Down' Services			
Reset.down+	out	Positive Differential 'Down' Reset	1
Reset.down-	out	Negative Differential 'Down' Reset	19
Analyse.down+	out	Positive Differential 'Down' Analyse	2
Analyse.down-	out	Negative Differential 'Down' Analyse	20
Error.down+	in	Positive Differential 'Down' Error	3
Error.down-	in	Negative Differential 'Down' Error	21
'Up' services			
Reset.up+	in	Positive Differential 'Up' Reset	4
Reset.up-	in	Negative Differential 'Up' Reset	22
Analyse.up+	in	Positive Differential 'Up' Analyse	5
Analyse.up-	in	Negative Differential 'Up' Analyse	23
Error.up+	out	Positive Differential 'Up' Error	6
Error.up-	out	Negative Differential 'Up' Error	24

Table 1.2 Compact D-type Connector Pinout

1.3 Introduction to the IMS B019

The IMS B019 is designed to allow transputer links and system services to be connected between pieces of equipment which do not share a common power supply. It uses differential drivers and receivers which comply with the voltage levels used in IEC specification RS422. Link speeds of up to 20Mbits/s are possible (with the correct cable) and common mode voltages of up to 7V are accommodated. The IMS B019 provides a simple and reliable method for connecting various transputer-based systems together, and is ideal when connecting VME target systems (for example the IMS B014) to the IMS B300 TCPlink connection system. When the target system is some distance from the source or where there is no mains earth joining the two systems it is important to use some kind of isolated or differential signalling, such as the IMS B019 or IMS B415 provide. The IMS CA15 differential cable is supplied with the IMS B019 for connection to another IMS B019 on an IMS B300 system.

1.4 Principles of operation

The IMS B019 provides differential buffers for four system ports, each port containing one link, sub-system up and sub-system down control lines (Reset, Analyse and Error). The buffers used provide the very low skew levels necessary for reliable link operation at 20Mbits/s. The IMS B019 can be connected differentially to either another IMS B019 or an IMS B415 differential buffer TRAM.

The standard single-ended TTL signals provided by transputer motherboards and TRAMs are prone to noise corruption if communicating along long cables or in noisy environments. The IMS B019 converts

these TTL signals passed in through a DIN41612 connector to the rear of the board, into RS422 compatible differential signals. These signals are passed out through 26 way compact-D connectors on the front panel of the board. Differential signals offer far greater noise immunity allowing communication over further distances. Also, no common earth is required as in single-ended communications so earth loop problems are reduced.

The IMS B019 contains only differential drivers/receivers and associated line conditioning components. This means that the logical behaviour of the link is maintained and no software changes are required. The resulting system is equivalent to connecting the two systems together using standard link cables, but now has the added advantage of increased reliability over longer distances. The IMS B019 schematic is provided for users to understand the operation of the board.

The differential drivers in the IMS B019 can also be used in single-ended mode such that single-ended signals are passed in through the 26 way compact 'D'-type connector and through the rear panel connector, thus using the IMS B019 as a simple single-ended buffer. To use the IMS B019 in single ended mode simply connect the single-ended cable to the positive side of the differential signals on the differential connector. This does not give the high noise immunity of the differential signal so increasing the data error rate. This use of the IMS B019 is not recommended for any data critical applications.

1.5 Cables

The IMS B019 is designed to operate with cables which have a characteristic impedance of 100Ω. Long cables will degrade the signal and cables longer than 10m are unlikely to give reliable operation at 20Mbit/s. INMOS recommends that cables are of the twisted-pair variety. However, many different cable configurations are possible at the discretion of the user. Note that FCC electromagnetic emissions requirements will not be met unless screened cable is used in an unshielded enclosure. See references [1] and [2] for a detailed treatment of the issues involved. For normal operation between two IMS B019s, cables wired as in table 1.3 should be used. Note that adjacent pins must always be wired as a twisted pair.

Signal Pairs	
First B019	**Second B019**
1, 19	4, 22
2, 20	5, 23
3, 21	6, 24
4, 22	1, 19
5, 23	2, 20
6, 24	3, 21
7, 25	8, 26
8, 26	7, 25

Table 1.3 Differential Cable Example Wiring Pinout

1.6 Mechanical details

Figure 1.3 indicates the vertical dimensions of a single IMS B019 board, and the outline drawing of the IMS B019 and connector positions.

The IMS B019 is supplied with a VME front panel for mounting into a VME rack system. The panel is a 6U×4H single width, double height panel. Figure 1.4 shows the dimensions of this panel.

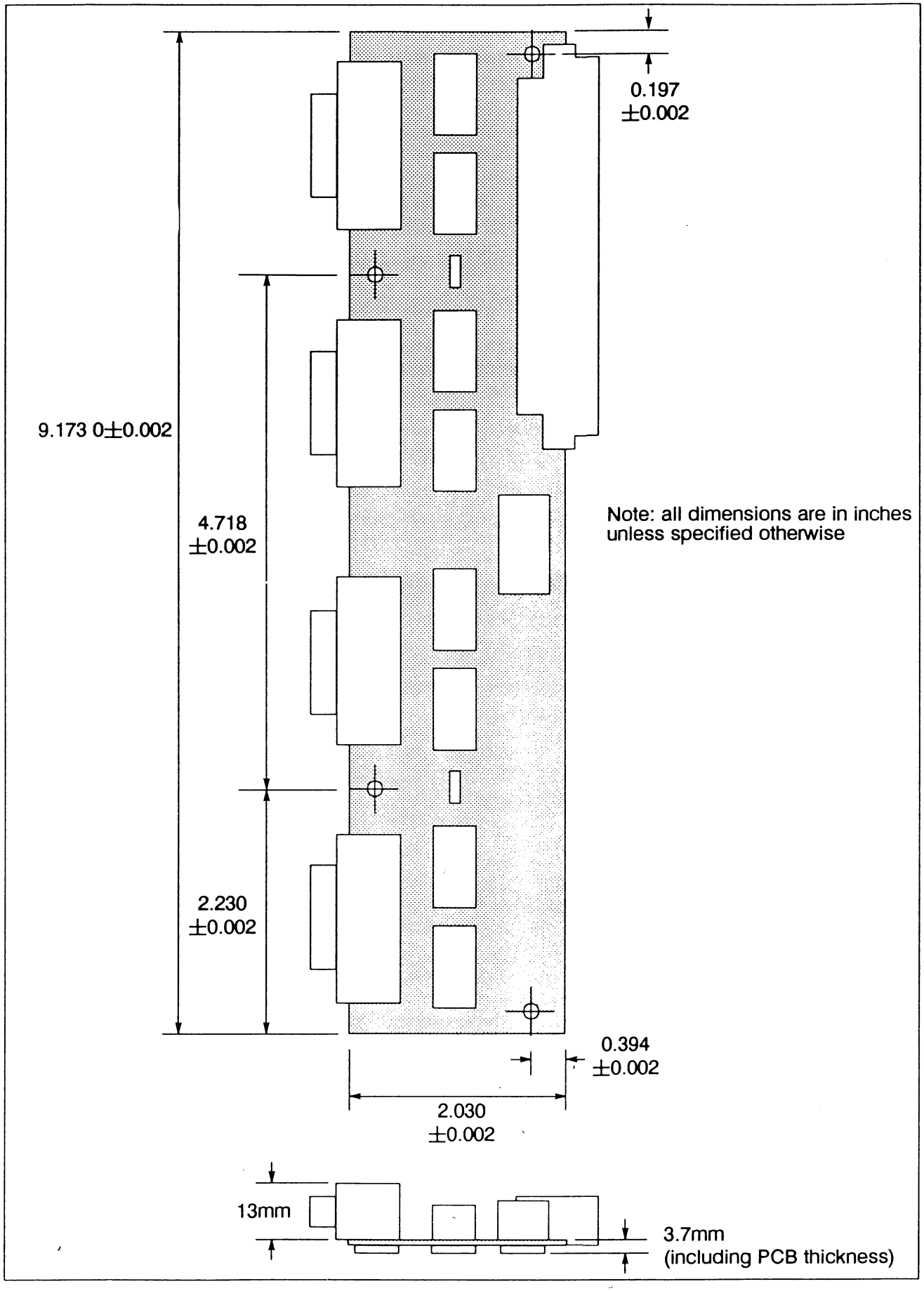

Figure 1.3 PCB profile drawing

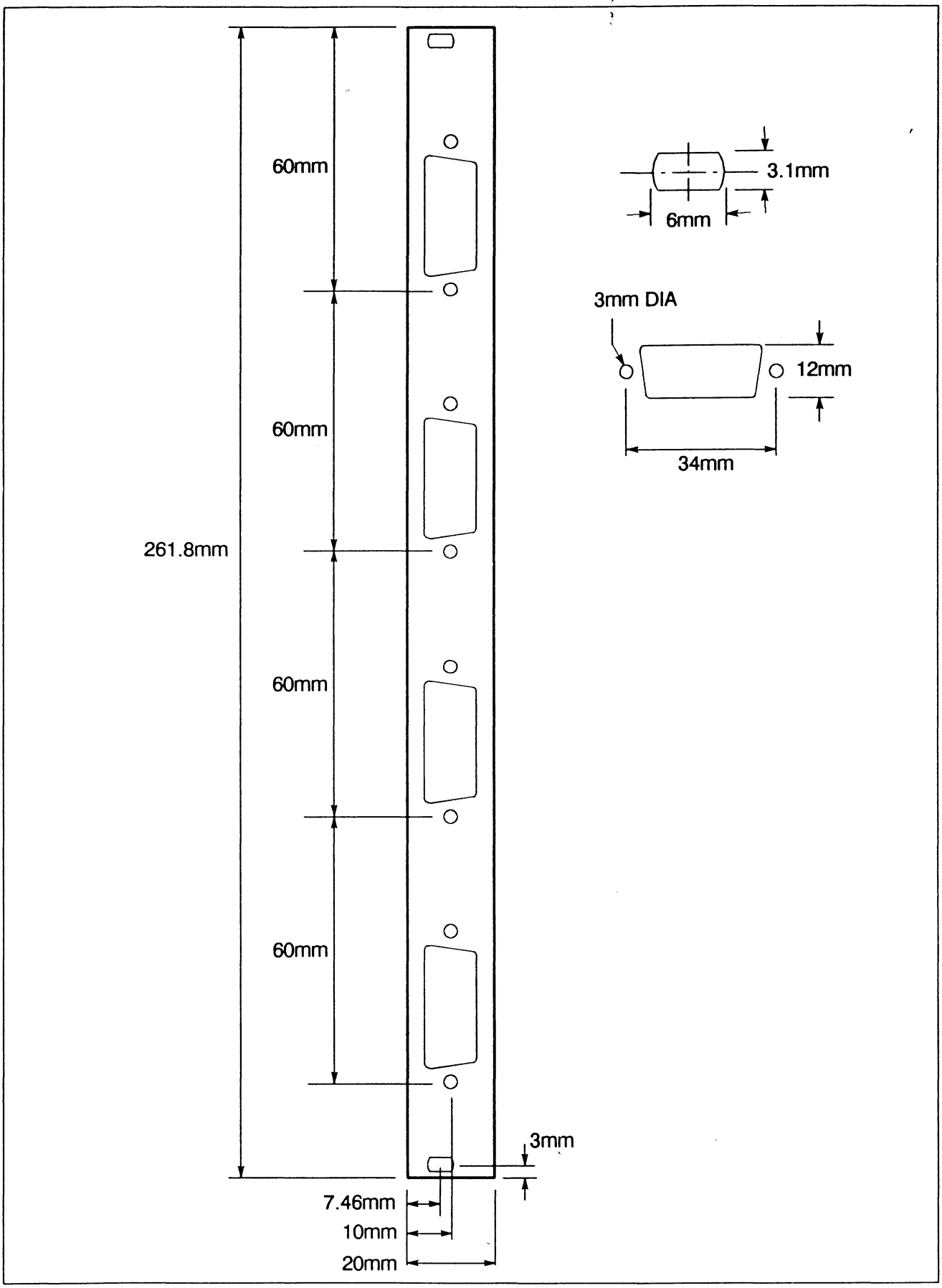

Figure 1.4 B019 VME panel dimensions

1.7 Installation

The IMS B019 requires a 0 and 5V power supply in positions 3 and 4 respectively in a standard disk drive power connector (See Figure 1.5). If the target systems are VME rack based, such as the IMS B014, the IMS B019 should be mounted in a free slot in the VME rack that the target systems are held in and a spare disk drive power connector used to supply power. The board should be screwed in place using the mounting screws located at the top and bottom of the front panel. The IMS B019 may be used with non-VME target systems, such as the IMS B008, but care must be taken to ensure that no metal makes contact with the circuit board.

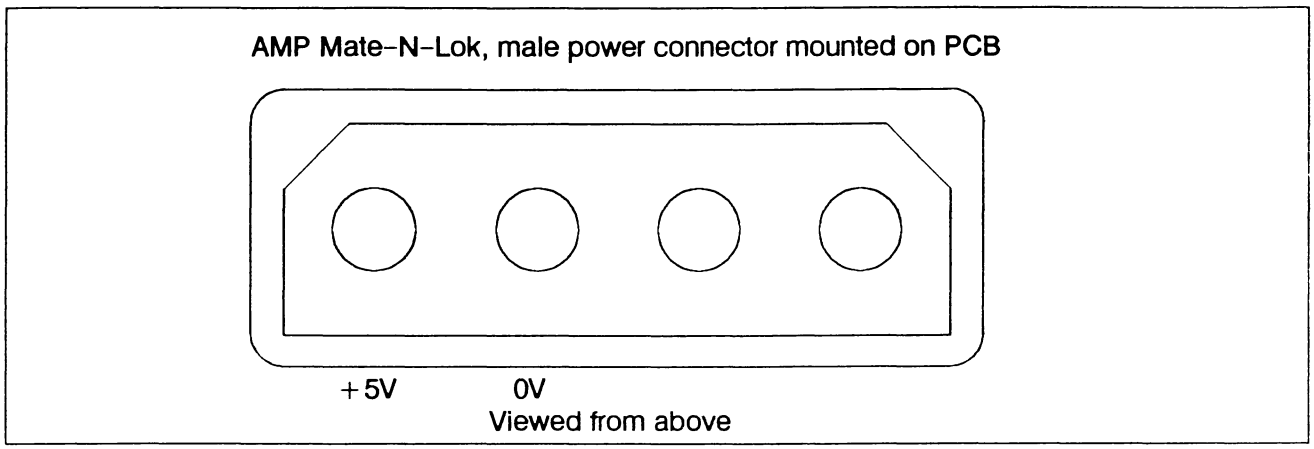

Figure 1.5 IMS B019 power connector pinout

Standard link and subsystem cables can be connected directly into the rear board connector if the connector polarizers are removed. The source and target IMS B019s should be connected up such that the **link.in** of the source IMS B019 flows through to the **link.out** of the target IMS B019 and vice-versa. Similarly, the **sub-system.up** signals of the source IMS B019 should pass the signals through to the **sub-system.down** signals of the target IMS B019. This gives a system such as that in Figure 1.6.

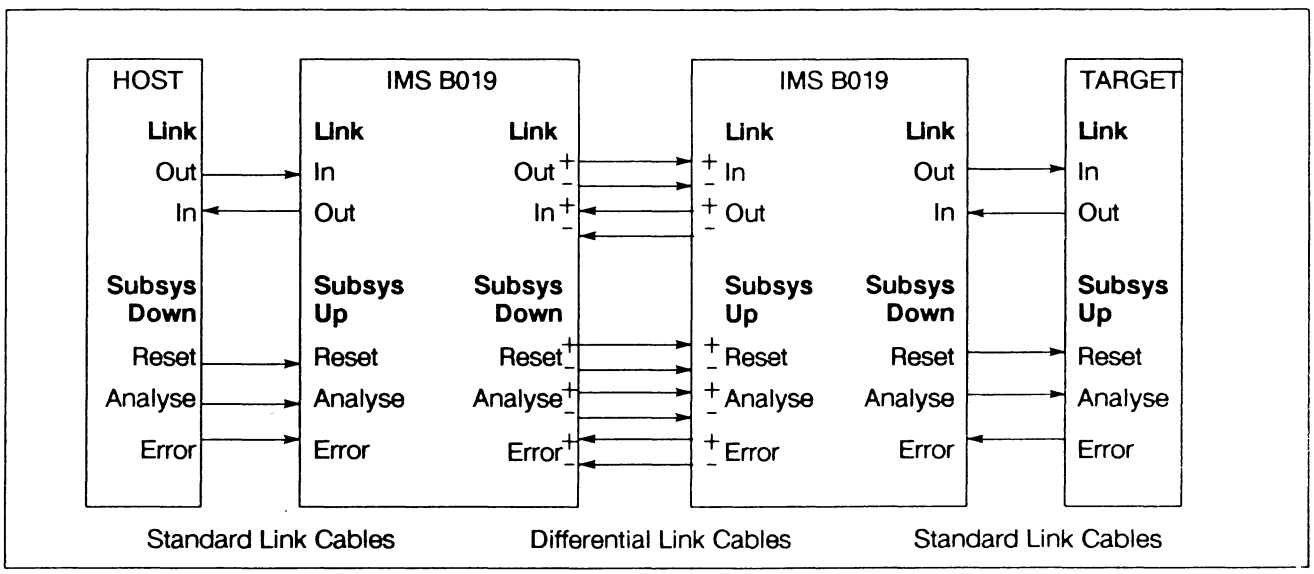

Figure 1.6 IMS B019 connection block diagram

1.8 Specification

Function	IMS B019-0	Unit	Notes
Number of system ports	4		
Per system port			
Number of INMOS serial links	1		
Subsysem 'Up' control	1		
Subsystem 'Down' control	1		
Length	9.17	inch	
Width	2.03	inch	
Component height above PCB	13	mm	
Component height below PCB	3.7	mm	1
Weight	125 (160)	g	2
Storage temperature	0-70	°C	3
Operating temperature	0-50	°C	
Power supply voltage (VCC)	4.75-5.25	Volt	
Power consumption	4.5	W	4
Common mode noise rejection	7	Volt	
Propagation delay	10	ns	
Differential cables supplied	1		

Table 1.4 IMS B019 specification

Notes

1 This dimension includes the PCB thickness.

2 The two weights given are for the board without VME panel, and with panel in parenthesis

3 The figure quoted refers to the ambient air temperature.

4 The power consumption is worst case value obtained when a sample of IMS B019 boards were tested (With differential outputs terminated in 100Ω) at a supply voltage (VCC) of 5.25Volts.

1.9 Schematic diagrams

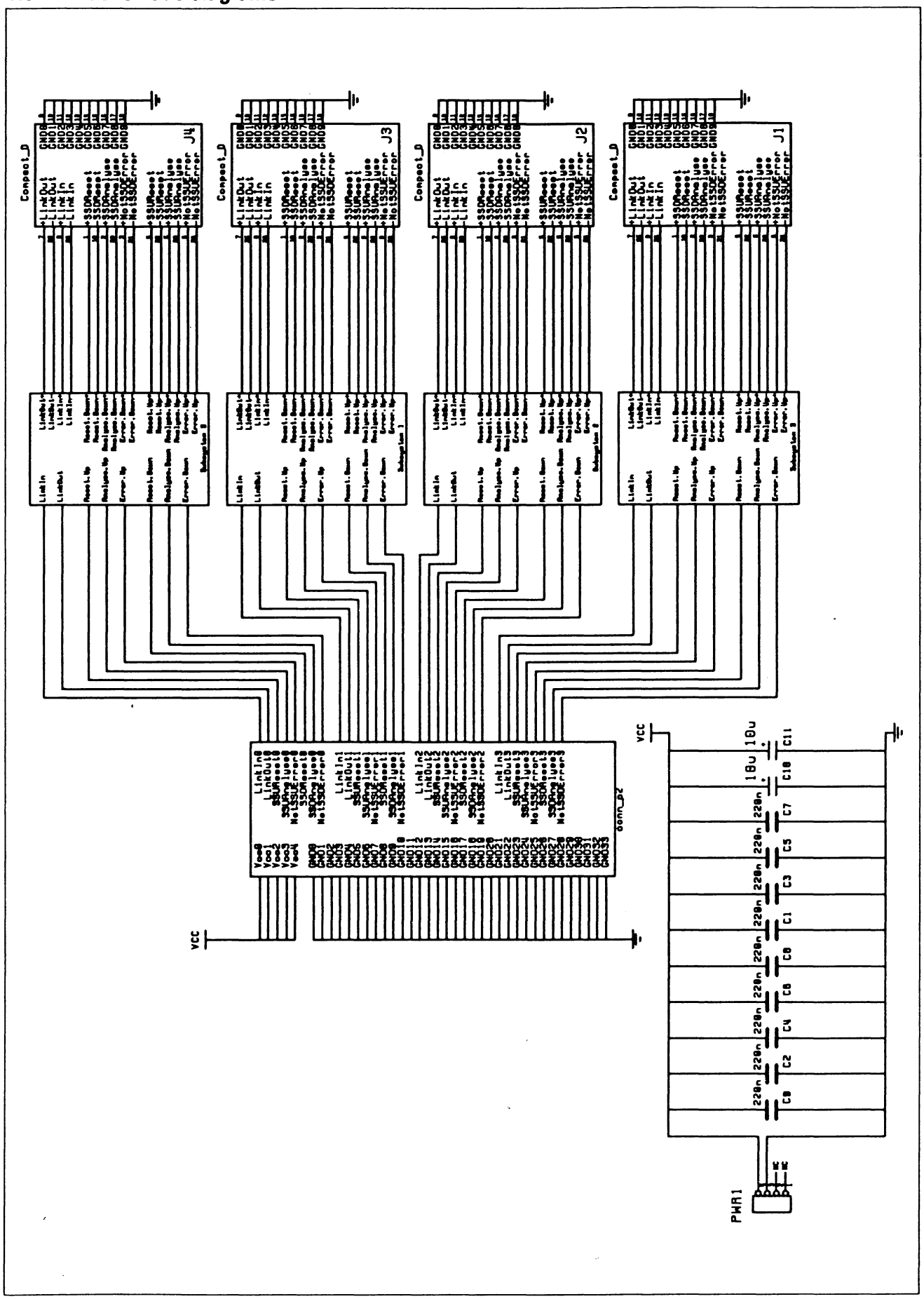

Figure 1.7 Schematic diagram 1 of 2

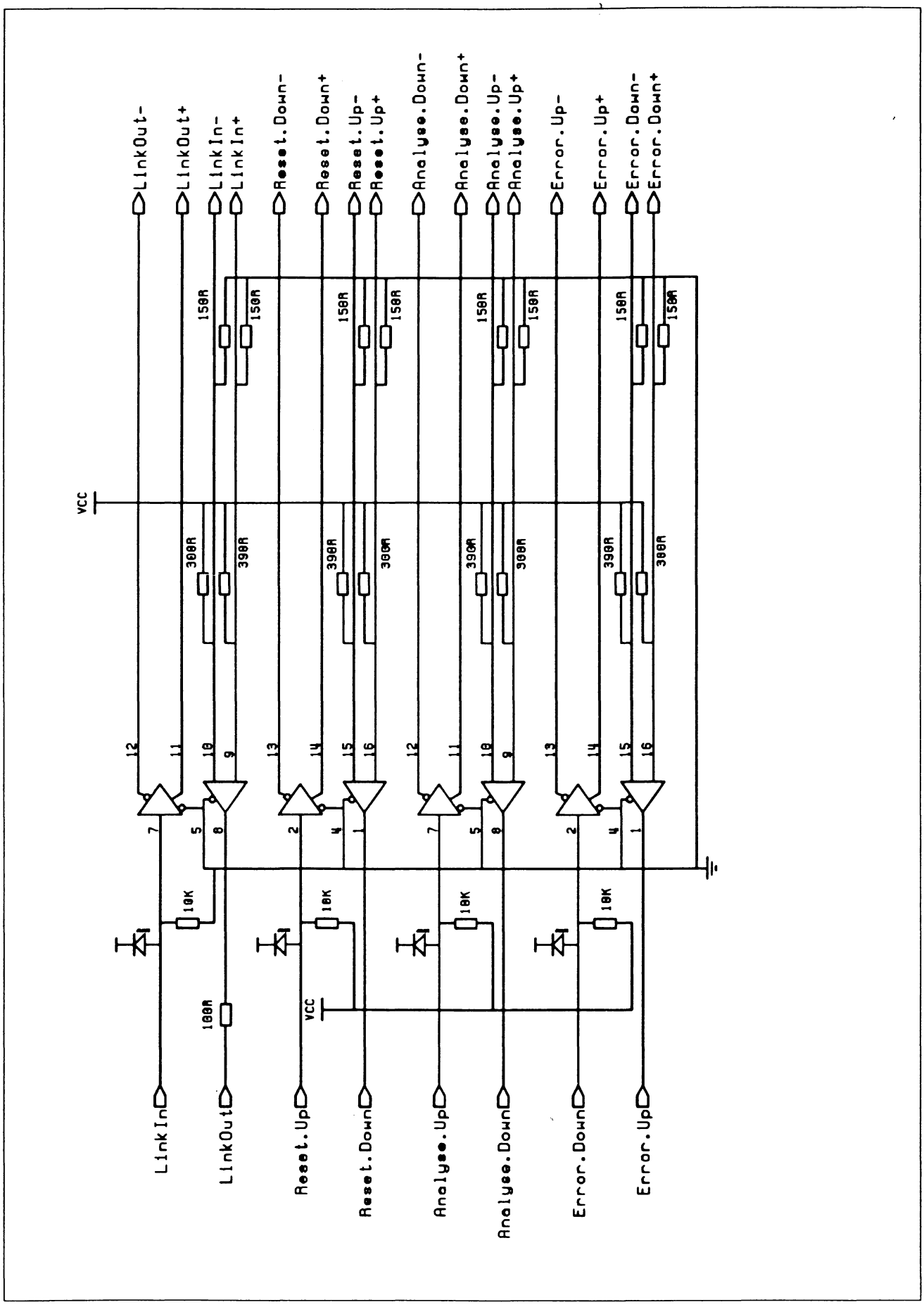

Figure 1.8 Schematic diagram 2 of 2