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DATA SHEET

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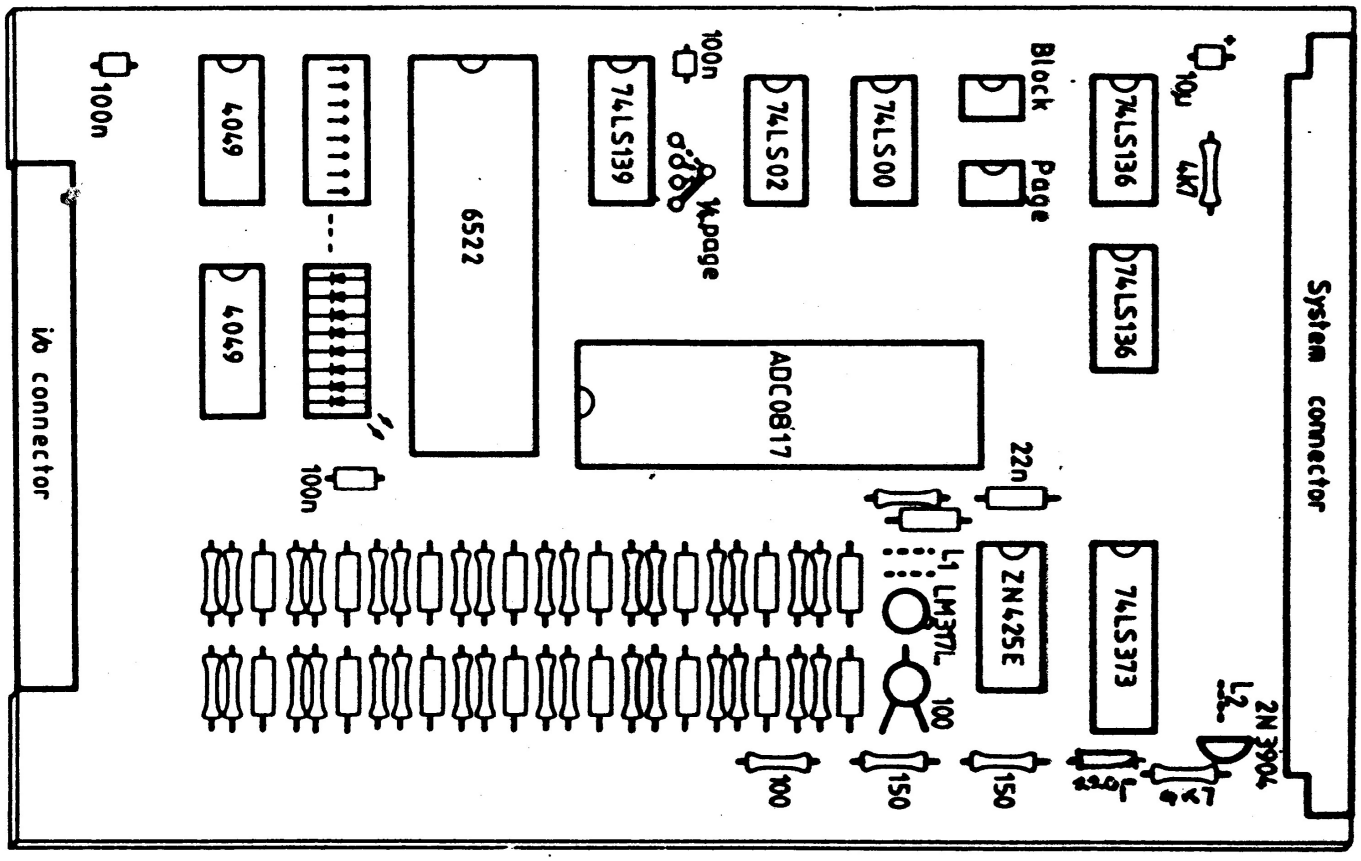


CUBAN

Universal Analog and Digital Microprocessor Interface

CUBAN is the name given to the interface card developed by Control Universal Ltd and Microelectronics Educational Development Centre, Paisley College of Technology. This Eurocard sized module includes a 16 channel 8-bit Analog to Digital port, a single channel Digital to Analog port and a 16 channel digital input/output port.

The microprocessor bus is on a 64 pin standard DIN euro-connector and consists of the standard Acorn 6502 data highway, plus IRQ generated by the end-of-conversion signal on the analog-to-digital converter chip, the ADC0817 (or ADC0816). At the opposite end of the card is a 40 pin connector, which mates to a 40 way ribbon cable socket, and carries the 16 a to d channels, the d to a channel and the 16 digital i/o lines with 4 control lines, plus the 5 volt and ground connections.

Further on-board facilities include sockets for an optional 8 way DIL switch to simulate digital inputs, and for 8 optional LEDs to indicate digital outputs, address decoding to a precision of 1/4 page (64 bytes), 2 timers, a counter and a serial/parallel/serial converter, optional shunt resistors and filter capacitors for analog current inputs, and an optional variable regulator to provide a selectable output voltage for the analog input.

Connections

Bus Connector

a1	a2	a3	a4	a5	a6	a7	a8	a9	a10	a11	a12	a13	a14	a15	a16
Vcc	A15	A14	NWDS	NRDS	NRST	A8	A7	A6	A5	A4	A3	A2	A1	A0	D7

a17	a18	a19	a20	a21	a22	a23	a24	a25	a26	a27	a28	a29	a30	a31	a32
D6	D5	D4	D3	D2	D1	D0	A13	A12	A11	A10	A9	D2	R/W	BLK	GND

Row b is generally not connected, but a link is available to join the IRQ signal on pin 28 of row b to the end-of-conversion signal on the A-D converter.

Applications Connector

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
PA0	PA1	PA2	PA3	PA4	PA5	PA6	PA7	CA1	CA2	GND	1N9	1N10	1N11	1N12	1N13	1N14	1N15	D-A	+5V

21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
1N8	1N7	1N6	1N5	1N4	1N3	1N2	1N1	1N0	GND	CB2	CB1	PB7	PB6	PB5	PB4	PB3	PB2	PB1	PB0

Address Decoding

Block select switch
1st digit
0 - F full choice

page select switch
2nd digit
0 - F full choice

3rd digit

0	4	8	C	VIA
1	5	9	D	A-D
2	6	A	E	D-A
0	1	2	4	

1/4 page link

4th digit
as required

The three devices on CUBAN are positioned in the memory map by setting the block and page select switches to any convenient place in the map of the host computer. They represent the first two digits of the hexadecimal address. The third digit can be one of four options set by the 1/4 page link, which is supplied set to 0. The fourth digit is determined by the by the use of the devices. eg., if block = 7, page = 3, link = 0, then the digital port B of the VIA is read on $7300, and on the same setting, a value is output to the d - a converter on $7320.

Devices

Some brief details are given on the two analog circuits used. Control Universal Ltd will be pleased to supply further data on these and other devices used upon request.

ADC0817CCN/ADC0816CCN

The difference between these two devices is the accuracy, which on the 817 is +- 1 bit, and on the 816 +- 1/2 bit at 25 deg C. This includes offset, full scale and linearity errors.

Input 0 - Vref corresponds to 00 - FF hex output.

Conversion time approx 100 microseconds

ZN425E

Output: 0 - Vref is output from this device to correspond to hex input of 00 - FF.

Vref = 2.5 volts as supplied.

Accuracy = +- 0.19%

Offset 3mV

Linearity +- 0.5 LSB

Temperature coefficient 7.5 ppm/deg C

Links

1. Quarter page select - for details see address decoding.

2.Power to LEDs. By making this link the 5v line is made available to the LED socket. Note that each LED will add about 15mA to the power consumption of the board.

3. Optional LM317L voltage regulator. Note that R36, R37 and RV1 must also be added - see circuit diagram. This regulator allows the user to provide an alternative voltage for the analog input.

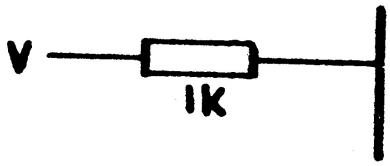
4. IRQ link - from the end of conversion signal on the A-D device to pin b28 on the DIN connector, which is IRQ on the computer bus.

Notes on the Computer Bus

This is the standard Acorn bus which makes all signals available from the CPU. CUBAN requires no special signals apart from the usual CPU highway.

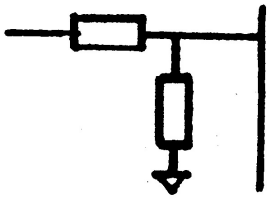
Input signal conditioning

For each of the 16 analog input lines the following circuit represents the as-supplied signal conditioning.

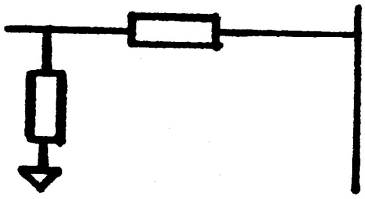


Further optional possibilites, with on board provision, are as follows. These circuits may be combined.

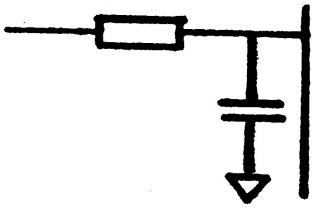
Attenuator



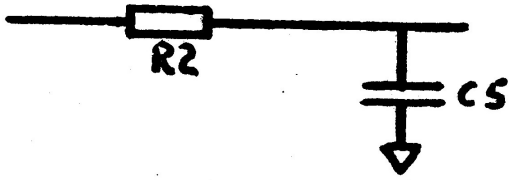
Convert current to voltage



Filter



In addition, the circuit below may be added in between the de-multiplexer and the A-D conversion direct input, to apply the same filtering arrangement to all of the 16 channels. Note that if this facility is used, at least ten times the filter time constant should be allowed between reading one channel and another, to allow the filter to settle.



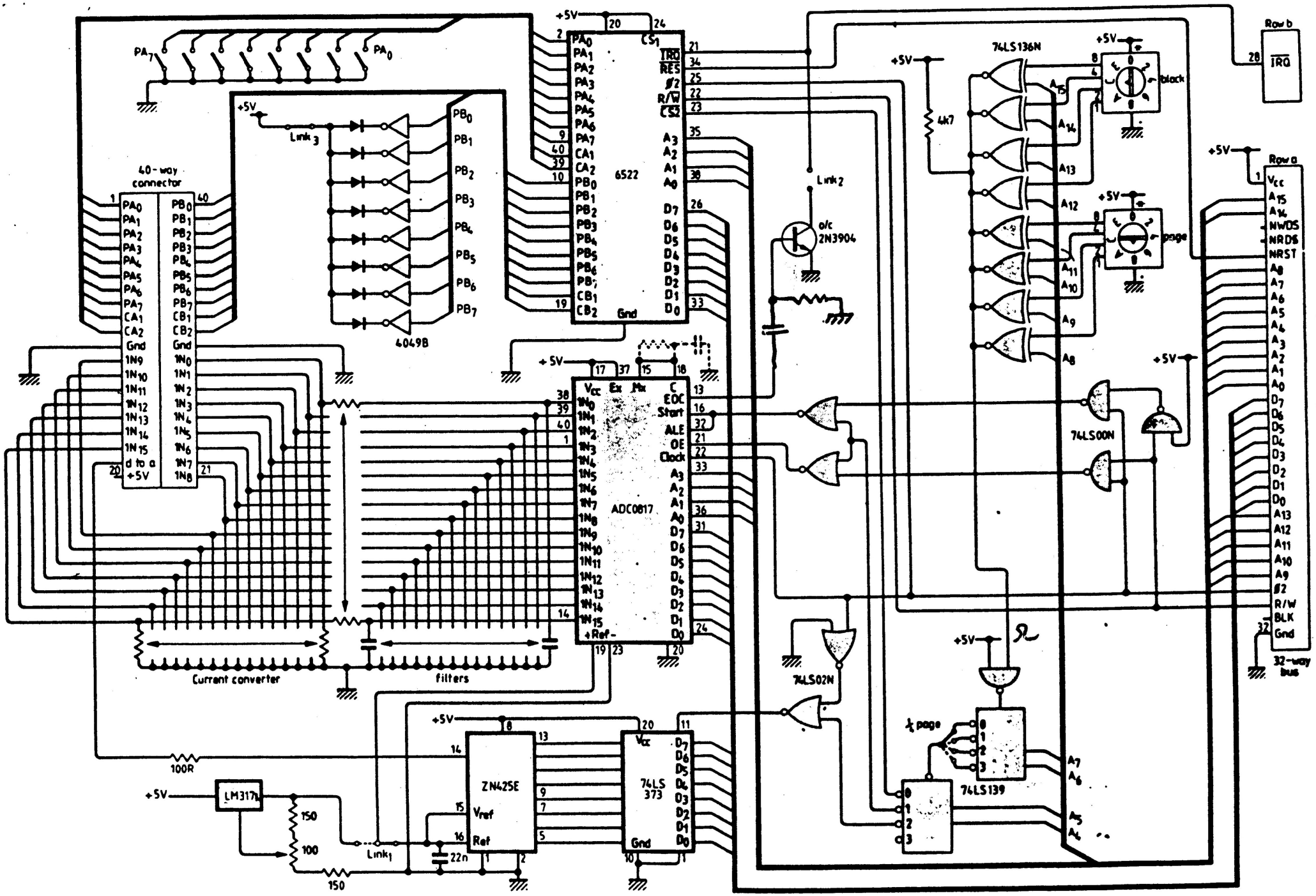
Application Program Example

```
A2 03          LDX   #CHAN     select channel
9D 10 XX       STA   ADC,X     start conversion
A0 14          LDY   #$14
88       DELAY DEY             5 x 20 uS delay
10 FD          BPL   DELAY
BD 10 XX       LDA   ADC,X     read coverted output


output to DAC

A9 ZZ          LDA   #$VALUE
8D 20 XY       STA   DAC   (XY20)
```

NOTE. Inputs should be stable when converting, or moving at less than 1/2 LSB per 100 uS.


PA7
PA0
+5V
Link 3
PB0
PB1
PB2
PB3
PB4
PB5
PB6
PB7
4049B
40-way connector
6522
CS1
IRQ
RES
ϕ2
R/W
CS2
A3
A2
A1
A0
D7
D6
D5
D4
D3
D2
D1
D0
Gnd
Link 2
o/c 2N3904
4k7
74LS136N
block
page
A15
A14
A13
A12
A11
A10
A9
A8
Row b
IRQ
Row a
Vcc
A15
A14
NWDS
NRDS
NRST
A8
A7
A6
A5
A4
A3
A2
A1
A0
D7
D6
D5
D4
D3
D2
D1
D0
A13
A12
A11
A10
A9
ϕ2
R/W
BLK
Gnd
32-way bus
ADC0817
Vcc
Ex
Mx
C
EOC
Start
ALE
OE
Clock
+Ref
-Ref
74LS00N
74LS02N
74LS139
¼ page
Current converter
filters
100R
LM317L
150
100
150
Link1
22n
ZN425E
Vref
Ref
74LS 373
Gnd