The chapter explaining how to create test vectors in the ALL02 programmer.
In the page 2 you'll find a schematic (done with trial and error) of the pin to port assignments of the ALL02, this information is crucial in order to understand the process.

APPENDIX 3

CREATING TEST PATTERNS

The MOD-MUP allows you to customize test patterns to determine the signal input to each pin, as well as the output of each pin. Although a complete and accurate test can be conducted by writing and reading values according to the chip's spec sheet, you can save time by testing only certain functions or addresses. The tester socket slots are grouped into 3 bidirectional I/O ports: PA, PB, and PC, through which the input and output values are read and written.. To create a test pattern, you must do the following:

(1) Select Vcc and GND code.
(2) Set port directions.
(3) Set port test patterns.
(4) Determine total sets of test patterns.
(5) Load test pattern into buffer.
(6) Test the chip.

(1) SELECT Vcc AND GND CODE

Vcc and GND codes are determined by number of pins the chip has. The table below gives the pin numbers and the corresponding code.

CHIP	CODE
14 - pin	00
16 - pin	01
18 - pin	02
20 - pin	03
22 - pin	04
24 - pin	05

(2) SET PORT DIRECTION

Each slot of the tester socket is matched with a chip pin which has a given function. Each chip pin function is assigned a code. The possible functions and the corresponding codes are given in the table below.

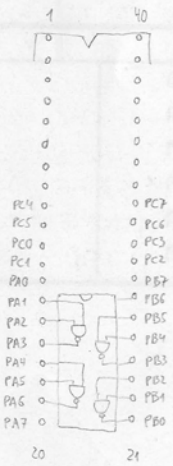
FUNCTION	CODE
Vcc	0
GND	0
INPUT	1
OUTPUT	0
DON'T CARE	1

The direction code is determined by examining one port at a time. You must determine the chip pin function for each port slot. Next, use the table above to determine the code. Then, using the port slots as bits, form a binary number with PA0 as the least significant bit and PA7 as the most significant bit. Finally convert the resulting binary number to hexadecimal. For example, to set the direction of port A: All the explanation is based on 74LS00

PORT A:	PA7	PA6	PA5	PA4	PA3	PA2	PA1	PA0
	GND	OUT	IN	IN	OUT	IN	IN	X
	0	0	1	1	0	1	1	1

=37HEX

40 pin ZIP socket



Example to test 74LS00

Can be a total of 128 sets of test patterns

DIR A = 37

Example to test 74LS244

Vcc (Vcc & GND code) = 03

DIRA = 2A

DIRB = 55

DIRC = F7

TPA = 7F 00

TPB = FF 00

TPC = 0A 08

NO = 2 (can be a maximum of 128 -80 HEX-)

Follow the same procedure for each of the other ports:

PORT B:	PB7	PB6	PB5	PB4	PB3	PB2	PB1	PB0
	X	Vcc	IN	IN	OUT	IN	IN	OUT
	1	0	1	1	0	1	1	0

=B6HEX

DIR B = B6

Port C is not used in this example.

(3) SET PORT TEST PATTERNS

The next step is to determine combinations of inputs and the desired ouputs. The following table shows the codes for the possible states.

STATE	CODE
HIGH LEVEL	1
LOW LEVEL	0
GND	0
VCC	1
DON'T CARE (X)	0

Again, examine one port at a time. For each slot designated earlier as an input, enter a combination of HIGH and LOW signals. Then, at the sockets designated as outputs, enter the expected output. Next, determine the codes for the pins designated as GND, Vcc, or DON'T CARE (x). Form a binary number as in the determination of the direction code, and convert to HEX to get a test pattern set. An example test pattern set is shown below.

PORT A:

	PA7 GND	PA6 OUT	PA5 IN	PA4 IN	PA3 OUT	PA2 IN	PA1 IN	PA0 X
input			0	0		0	0	
output		1			1			
COMB.	0	1	0	0	1	0	0	0

= 48HEX

Repeat this process for all desired combinations.

PORT A:

	PA7 GND	PA6 OUT	PA5 IN	PA4 IN	PA3 OUT	PA2 IN	PA1 IN	PA0 X
input			0	1		0	1	
output		1			1			
COMB.	0	1	0	1	1	0	1	0

= 5AHEX

PORT A:

	PA7 GND	PA6 OUT	PA5 IN	PA4 IN	PA3 OUT	PA2 IN	PA1 IN	PA0 X
input			1	0		1	0	
output		1			1			
COMB.	0	1	1	0	1	1	0	0

= 6CHEX

PORT A:

	PA7 GND	PA6 OUT	PA5 IN	PA4 IN	PA3 OUT	PA2 IN	PA1 IN	PA0 X
input			1	1		1	1	
output		0			0			
COMB.	0	0	1	1	0	1	1	0

= 36HEX

The complete test pattern for this port consists of a combination of the sets of derived test patterns. The above example has a total of four sets: TPA = 48 5A 6C 36. Following the above example, repeat the procedure for all the other ports:

PORT B:

	PB7 X	PB6 Vcc	PB5 IN	PB4 IN	PB3 OUT	PB2 IN	PB1 IN	PB0 OUT
input			0	0		0	0	
output					1			1
COMB.	0	1	0	0	1	0	0	1

= 49HEX

PORT B:

	PB7 X	PB6 Vcc	PB5 IN	PB4 IN	PB3 OUT	PB2 IN	PB1 IN	PB0 OUT
input			0	1		0	1	
output					1			1
COMB.	0	1	0	1	1	0	1	1

= 5BHEX

PORT B:

	PB7 X	PB6 Vcc	PB5 IN	PB4 IN	PB3 OUT	PB2 IN	PB1 IN	PB0 OUT
input			1	0		1	0	
output					1			1
COMB.	0	1	1	0	1	1	0	1

= 6DHEX

PORT B:

	PB7 X	PB6 Vcc	PB5 IN	PB4 IN	PB3 OUT	PB2 IN	PB1 IN	PB0 OUT
input			1	1		1	1	
output					0			0
COMB.	0	1	1	1	0	1	1	0

= 76HEX

TPB = 49 5B 6D 76

No example is given for Port C.

(4) DETERMINE TOTAL SETS OF PATTERNS

The total sets of test patterns is the number of input combinations used. In the examples given above, four input combinations were used.

At this point you should have the following codes and patterns derived:

Vcc (Vcc & GND code)	= 00
DIRA (direction of PA	= 37
DIRB (direction of PB	= B6
DIRC (direction of PC)	= DON'T CARE
TPA (test pattern of PA)	= 48 5A 6C 36
TPB (test pattern of PB)	= 49 5B 6D 76
TPC (test pattern of PC	= DON'T CARE
NO. (**total sets of test patterns**)	= 4 (can be a maximum of 128)

(5) ENTER TEST PATTERN INTO BUFFER

After determining test pattern codes, the next step is to load these codes into the memory buffer. The table below shows the buffer address assignments for the different codes and patterns.

BUFFER ADDRESS	ASSIGNMENT
0 - 7F	TPA
80 - FF	TPB
100 - 17F	TPC
180	DIRA
181	DIRB
182	DIRC
183	VCC
184	NO.

From the main menu, type **4** to enter the DEBUG program. Refer to your DOS manual for instructions on how to use the DEBUG program and enter the codes and patterns at the addresses assigned in the table above.

(6) TEST THE CHIP

With the test pattern entered into the memory buffer, insert a chip into the ZIF socket and press 5: the program will display the following chip information:

```
1: Total pattern sets : 4
2: VCC & GND code : 00
3: port (A) in/out code : 37
4: port (B) in/out code : B6

Put IC on socket, then press any key
to test by step,
or press <ESC> to quit.
```

Next, press any key. The program will begin testing the chip, displaying each test pattern set as it tests. Press ENTER to proceed to the next test pattern set. An error message will be displayed with each set that the chip does not pass. An example of a test pattern debug is shown below:

```
1: pattern write      port (A)=48    port (B)=49
              read    port (A)=48    port (B)=49
2: pattern write      port (A)=5A    port (B)=5B
              read    port (A)=5A    port (B)=5B
3: pattern write      port (A)=6C    port (B)=6D
              read    port (A)=FF    port (B)=6D
— ERROR
4: pattern write      port (A)=36    port (B)=76
              read    port (A)=36    port (B)=76

******** END    Press any key to continue.
```