Durst OPTOSCAN

Service manual

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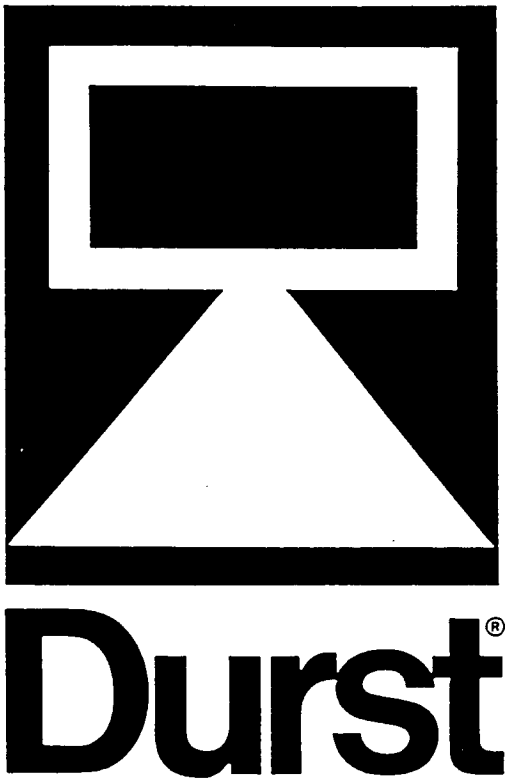


G E N E R A L C H A R A C T E R I S T I C S

The OPTOSCAN delivers filtration values in the VCNA format.

It scans a negative or positive and compares its blue, green and red content to a programmed reference. The reference must have been programmed by the user.

The film is projected into a reading compartment which is scanned by a photocell row.

The measuring sequence is repeated 3 times: the blue, green and red filters are switched sequentially into the light path.

The measured points are logarithmized and averaged; the corresponding VCNA values are displayed.

The values can be transferred to a bar-code printer, matrix printer, PC or directly to either OPTIMO / OPTOPIA or HL 2501.

S u b d i v i s i o n s

1. PCB microprocessor AD95251

   The PCB incorporates a bootstrap possibility for future applications; the bootstrap is not used in the OPTOSCAN.

   Only one RAM (V4) is mounted.

   Code_switches:

S1	S2	S3	S4
ON	OFF	ON	OFF

2. PCB interface AD95201

   The board accomplishes the following tasks:

   - A/D conversion
   - Stepper motor control
   - Filter motor control
   - Serial interfacing

3. PCB filter sensor AD95451

   The filterwheel position sensors are mounted on it.

4. PCB lamp stabilizer AD95401

   Supplies the lamp with constant voltages:

   5.1 V DC at standby (preheat)
   12 V DC at full brightness

5. PCB keyboard AD95301

   Contains keys and display.

6. PCB scan sensor AD95351

   Contains photocells, amplifiers and multiplexers.

The testprogram consists of following parts:

Part 1: Display and keyboard test

Part 2: A/D converter test

Part 3: Measuring cells, anplifier and multiplexer test, lamp driver, filter + stepper motor test

Part 4: Interface test

Part 5: Densitometer channels test, densitometer sensor test

The testprogram can be started in 2 ways:

1. Short circuit the contacts of the footswitch plug and power on

2. - Connect the Z 80 Test Unit to the microprocessor
   - Power on
   - Press the "test" key on the TU

PART 1: DISPLAY AND KEYBOARD TEST

After the testprogram has been started, the following events take place:

The display is loaded with data:

H H H H H H H H (for the complete first and second row)

About ½ second. Then the display is loaded with:

I I I I I I I I (for the complete first and second row)

About ½ second. Then the display is loaded with:

(for the complete first and second row)

About ½ second.

The display changes to:

OPERATING TIME Measurings:

Program version:

After 3 seconds, it changes to:

The display changes to:

KEYBOARD CHECK: Key =

The unit is ready for a keyboard check.

Press any key: The corresponding code is displayed.

If a number is pressed, the corresponding numeric code is displayed.
If any other key is pressed, a character code is displayed according to the following table.

Key	Code	Key	Code
numbers 0-9	0-9	C1	E
.	.	C2	I
Clear	Z	C3	W
Yellow	Y	C4	A
Blue	B	C5	U
Magenta	M	C6	V
Green	G	Film	F
Cyan	C	Order	O
Red	R	Print	P
Light	L	Corr	K
Dark	D	Lamp	T
Start	S		

If the "start" key is pressed, the unit jumps to the next step, which is an interface test.

Refer to PART 4 if you want to perform the interface test.

PART 2: A/D CONVERTER TEST

Press "start". The display shows:

SCM: 0 CHM: 0 AMP: 0 Count: nnnn
CE: X RD: X CY: X PA: X FS: X NC: 1 FS: X F1: X

This step enables you to check the measuring cells, amplifiers, A/D conversion, gain and offset.

EXPLANATIONS: (see block diagram)

SCM: scan multiplexer
There are 2 groups of 8 photocells. A single cell can be selected by entering a number from 1 to 8 and pressing the yellow key.

1 ..... 8 9 15
group 1 group 2

Each group is selected with the CHM function. In each group, a cell can be selected with the SCM function.

By using the numeric keys and the "magenta" key, measuring channel 6 (= group 2) or measuring channel 7 (= group 1) can be selected.

CHM: measuring channel. There are 8 measuring channels:

0: UREF = 0 V 1: UREF = 30 mV
2: UREF = 0.33 V

3 = blue 4 = green 5 = red
densitometer channels

6: USCAN 2 (cells 9 thru 15)
7: USCAN 1 (cells 1 thru 8)

To select a measuring channel, enter the corresponding number and press the "magenta" key.

AMP: Sets the gain of amplifier V31 on the interface PCB. Enter the number and press the "cyan" key.

0: gain = 1
1: gain = 8
2: gain = 64

COUNT: shows the count of the A/D converter.

A/D CONVERTER TEST

Action	Result	Check if:
Press "0" and "magenta"	Selects reference voltage 0 V	
Press "0" and "cyan"	gain = 1	COUNT = 0014 Tol. ±7 Note this value (Co)
Press "1" and "cyan"	gain = 8	COUNT = 8 * Co
Select gain of 1 again: Press "0" and "cyan"	gain = 1	
Press "1" and "magenta"	Selects reference voltage 33 mV	COUNT = 55 Tol. ±10
Press "2" and "magenta"	Selects reference voltage 0.33 V	COUNT = 455 Tol. ±30 Note the value (= C2)
Press "1" and "cyan"	gain = 8	COUNT = C2 * 8 Tol. ±80

If this test can be performed, the A/D converter is operational.

PART 3: SCAN SENSOR CHECK

SECTION 1: MEASURING CHANNELS CHECK

Action	Result	Check if:
Enter "7" and press "magenta"	Selects photocells group 1 to 8	
Enter "7" and press "yellow"	Selects cell no. 8	
Enter "0" and "cyan"	Selects gain of 1	COUNT = 15 Tol. ±12 (If no light falls on the cells)
Enter "6" and press "magenta"	Selects photocells group 9 to 15	COUNT = 15 Tol. ±7

SECTION 2: LAMP DRIVER TEST

Action	Result	Check if:
Press key C5	Lamp lights up in standby intensity	
Press key C6	Lamp switches off and then switches on in full intensity	
Press key C5	Lamp switches off	

SECTION 3: FILTER MOTOR TEST

Action	Result	Check if:
Press the "corr" key	The filter wheel advances 1 position	F1 = 1 if wheel is in measuring pos. (else F1 = 0) F2 = 1 if wheel is in standby (else F2 = 0)

SECTION 4: STEPPER MOTOR TEST

The stepper motor can be moved in 2 directions.

Action	Result	Check if:
Press the "film" key	The scan sensors go into the "park" position	
Press the "order" key	The sensors move into the projection	

SECTION 5: PARK SENSOR TEST

Action	Result	Check if:
Press the "film" key	The sensor bar moves into the park position	PA = 0 if sensor is in park position PA = 1 if sensor is in measuring pos.

SECTION 6: MEASURING CELL TEST

During this test, parts under test are:

1. photocells with amplifiers
2. multiplexers
3. filters and filter motor

Procedure:

Action	Result	Check if:
Remove top cover Position sensor bar into the middle of the projection		
Press C6	Lamp turns on	
Press "corr"	Blue filter enters the light path	
Press "0", then "cyan"	Selects low gain	

The following procedure can be repeated with the red and green filter in the light path.

Action	Result	Check if:
Replace top cover		
Press "0", then "yellow"	Selects cell 1	
Press "7", then "magenta"	Selects group 1 to 8	1000 < COUNT < 3500
Press "1", then "yellow"	Selects cell 2	1000 < COUNT < 3500
Press "2", then "yellow"	Selects cell 3	1000 < COUNT < 3500
Press "3", then "yellow"	Selects cell 4	1000 < COUNT < 3500
Press "4", then "yellow"	Selects cell 5	1000 < COUNT < 3500
Press "5", then "yellow"	Selects cell 6	1000 < COUNT < 3500
Press "6", then "yellow"	Selects cell 7	1000 < COUNT < 3500
Press "7", then "yellow"	Selects cell 8	1000 < COUNT < 3500
Press "6", then "magenta"	Selects group 9 to 15	
Press "0", then "yellow"	Selects cell 9	1000 < COUNT < 3500
Press "1", then "yellow"	Selects cell 10	1000 < COUNT < 3500
Press "2", then "yellow"	Selects cell 11	1000 < COUNT < 3500
Press "3", then "yellow"	Selects cell 12	1000 < COUNT < 3500
Press "4", then "yellow"	Selects cell 13	1000 < COUNT < 3500
Press "5", then "yellow"	Selects cell 14	1000 < COUNT < 3500
Press "6", then "yellow"	Selects cell 15	1000 < COUNT < 3500

In case the COUNT is too small for some cells:

1. Replace corresponding amplifier
2. Check light distribution (refer to "mechanical adjustments")

PART 4: INTERFACE TEST

Prerequisites:

A dummy connector is necessary. Use a 25 pin RS232 connector and short circuit following pins:

2 to 3
9 to 18
11 to 25

Action	Result	Check if:
Short circuit the contacts of the foot switch plug		
Power on	Unit enters the test-program	
Connect dummy plug to serial channel A		Unit displays: The quick brown fox jumps over the dog! Serial channel B not working
Connect dummy plug to serial channel B		Unit displays: The quick brown fox jumps over the dog! Serial channel A not working

PART 5: DENSITOMETER CHANNELS TEST, DENSITOMETER SENSOR TEST

SECTION 1: DENSITOMETER CHANNELS TEST

Action	Result	Check if:
Connect Optodens Press "3", then "magenta"	Selects blue measuring channel	
Press "0", then "cyan"	Selects gain of 1	COUNT = 0000
Press "C3"		Densitomter lamp turns on
Place the densitometer onto a white area, and measure		COUNT > 3000
Press "4", then "magenta"	Selects green measuring channel	
Press and measure		COUNT > 3000
Press "5", then "magenta"	Selects red measuring channel	
Press and measure		COUNT > 3000

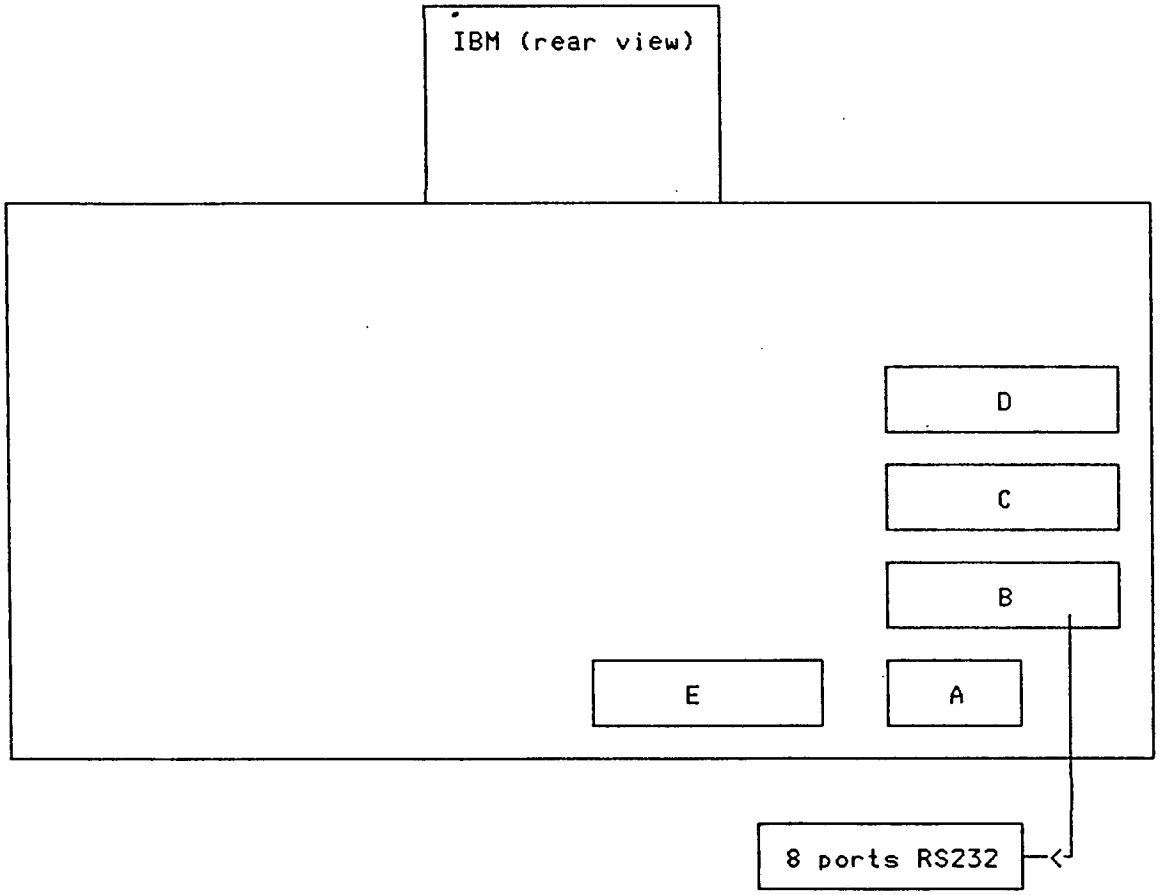
SECTION 2: DENSITOMETER SENSOR TEST

Action	Result	Check if:
Connect densitometer		RD = 0
Disconnect densitometer		RD = 1
Press to measure		CY = 0
Release		CY = 1

Configurations

Following configurations are possible:

1. OPTOSCAN with bar-code printer
2. OPTOSCAN with matrix printer
3. OPTOSCAN with enlarger (OPTOPIA or OPTIMO CL)
4. OPTOSCAN with IBM PC



A: Named COM 1. This port connects to the bar-code printer. Use a RS232 25 pin cable.

B: Named COM 8. This port is used by the digiboard. It is used with an extension that accepts up to 8 RS232 plugs.

C: Named COM 2. This port is used to connect the bar-code reader

D: Named COM 2. This port is used to connect the OPTOSCAN to the PC.

Note that both C and D plugs lead to the same board. Plug C is mounted directly on the board while plug D connects with a flat cable.

E: Parallel port for matrix printer.

Microprocessor board

With the help of the Z 80 Test Unit, the microprocessor board can be checked as a separate unit.

An external power supply must be available in this case, with an output of 5 V (4.75 to 5.25 V).

The following procedure is based on a step by step analysis. Following aspects will be covered:

- all ICs
- address lines
- data lines
- short sections of the program

This procedure can not determine

1. Whether the unit was programmed correctly
2. Software problems of the specific release
3. partial erasure of the eprom

Functional description

OPTOSCAN microprocessor board:

Microprocessor:	Z 80
RAM memory:	32 KByte, expandable to 64 KByte
RON memory:	32 KByte
Processor clock frequency:	2 • 458 MHz crystal controlled

Configuration

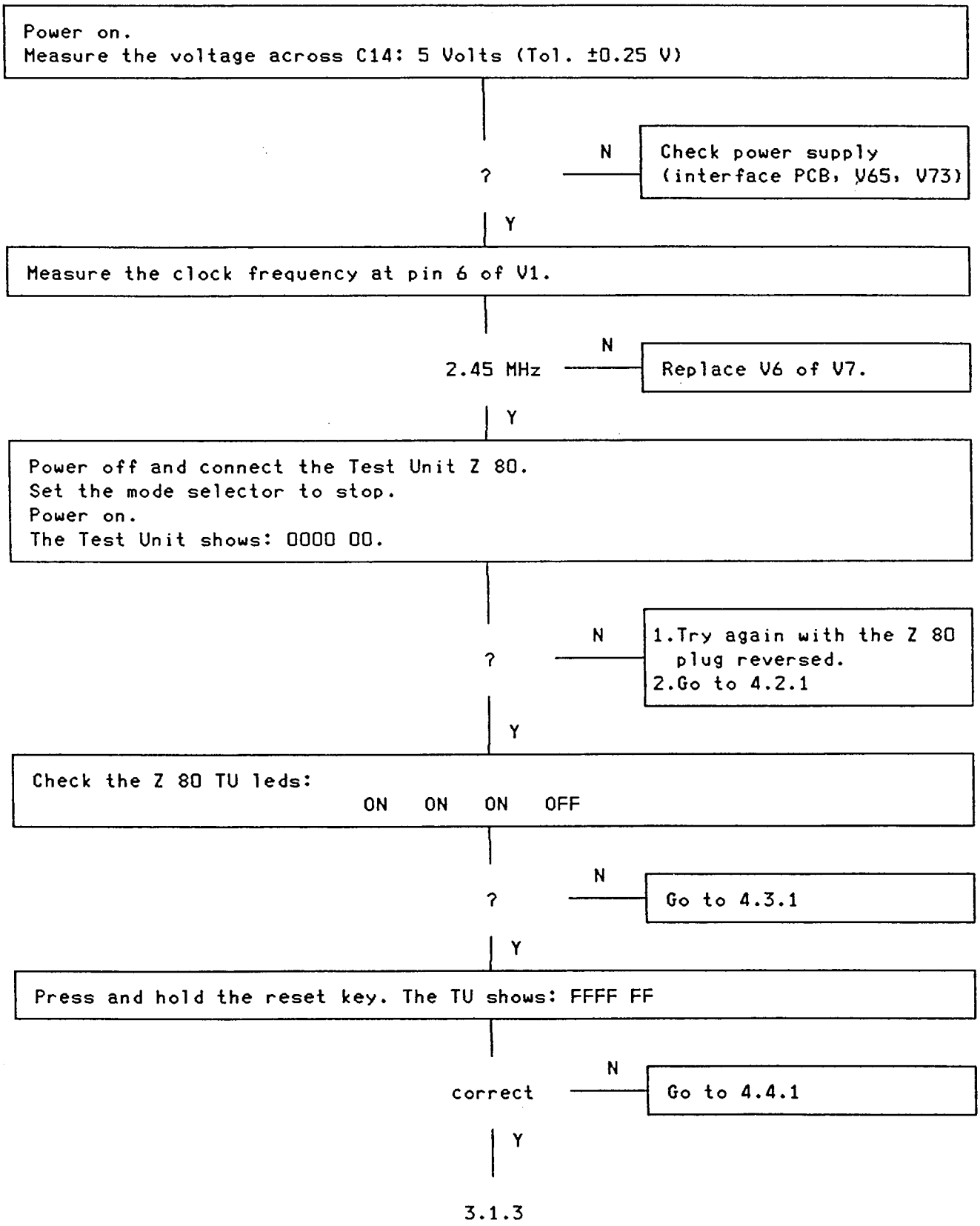
To be installed on the OPTOSCAN, the dip switches must be configured as follows:

S1	S2	S3	S4
ON	OFF	ON	OFF

Address mapping

A15 and MREQ select RAM, RON or interface PCB
X = don't care

active signals	addresses	selected IC / section	part
MREQ	0000 - 7FFF	EPROM V2	memory
MREQ	8000 - FFFF	RAM V4	memory
IORQ	XX40 - XX43	V3 / S10	interface
IORQ	XX48 - XX4B	AD converter	interface
IORQ	XX51 - XX42	Analog multiplexer	interface
IORQ	XX58	Motor controllers	interface
IORQ	XX60, XX68, XX70	Keyboard	interface
IORQ	XX78	Densitometer inputs	interface


Power on.
Measure the voltage across C14: 5 Volts (Tol. ±0.25 V)
?
N
Check power supply (interface PCB, V65, V73)
Y
Measure the clock frequency at pin 6 of V1.
2.45 MHz
N
Replace V6 of V7.
Y
Power off and connect the Test Unit Z 80.
Set the mode selector to stop.
Power on.
The Test Unit shows: 0000 00.
?
N
1.Try again with the Z 80 plug reversed.
2.Go to 4.2.1
Y
Check the Z 80 TU leds:
ON ON ON OFF
?
N
Go to 4.3.1
Y
Press and hold the reset key. The TU shows: FFFF FF
correct
N
Go to 4.4.1
Y
3.1.3

During the next steps, the first 20 steps of the program are analysed with the help of the Z 80 Test Unit.

Press SSTEP and compare:

		MEM	M1	RD	WR
0001	21	X	X	X	
2	55	X		X	
3	55	X		X	
4	7E	X	X	X	
5555	FF	X		X	
5	29	X	X	X	
6	18	X	X	X	
7	33	X		X	
3b	7E	X	X	X	
AAAA	00	X		X	
3C	3E	X	X	X	
3d	0d	X		X	
3E	d3	X	X	X	
3F	60	X		X	
0d60	0d				X
0040	18	X	X	X	
0041	27	X		X	

correct — N → Go to 4.4.1

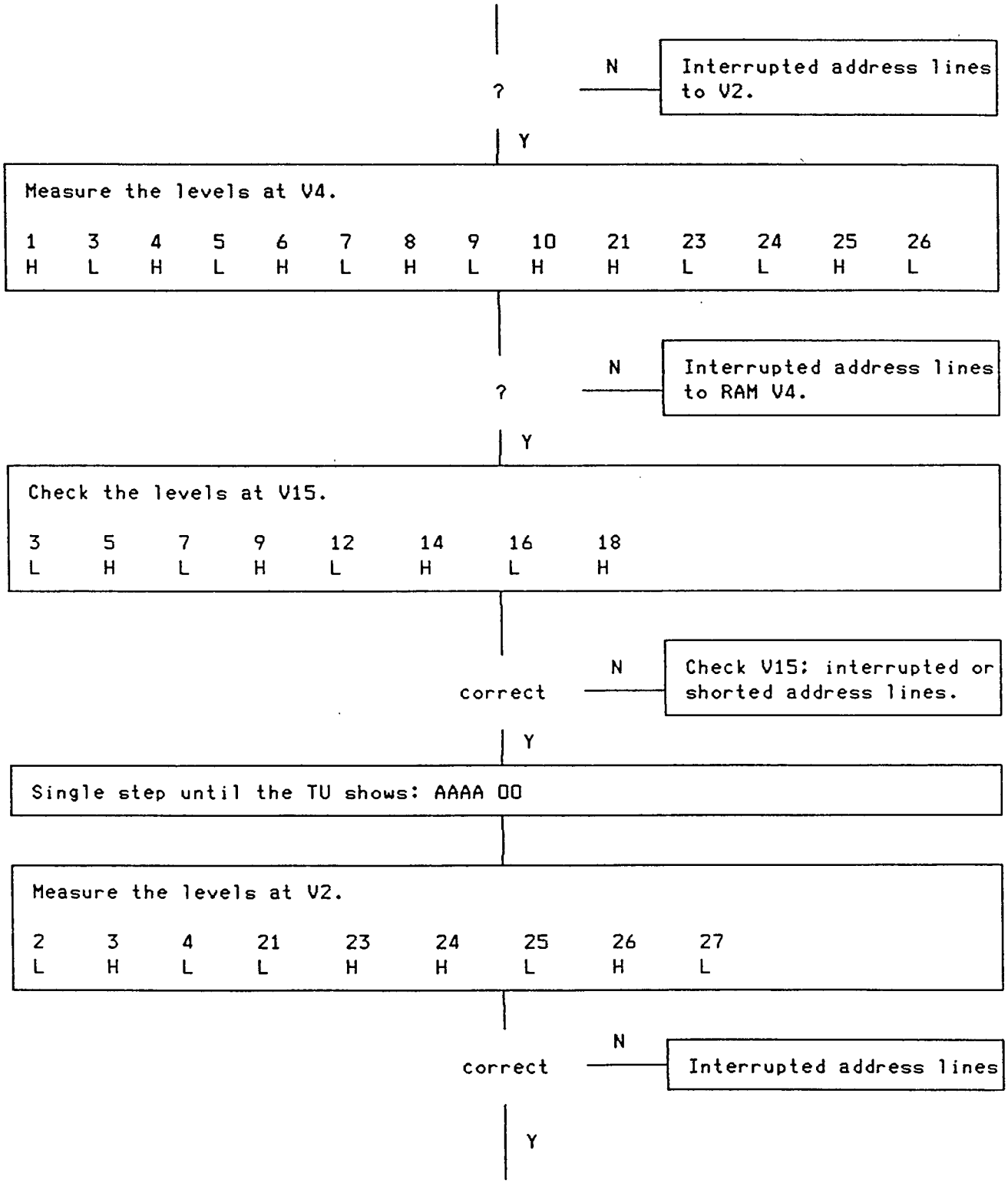
Y

Following is a memeory I/O test.
It is checked whether no address or data line is interrupted.

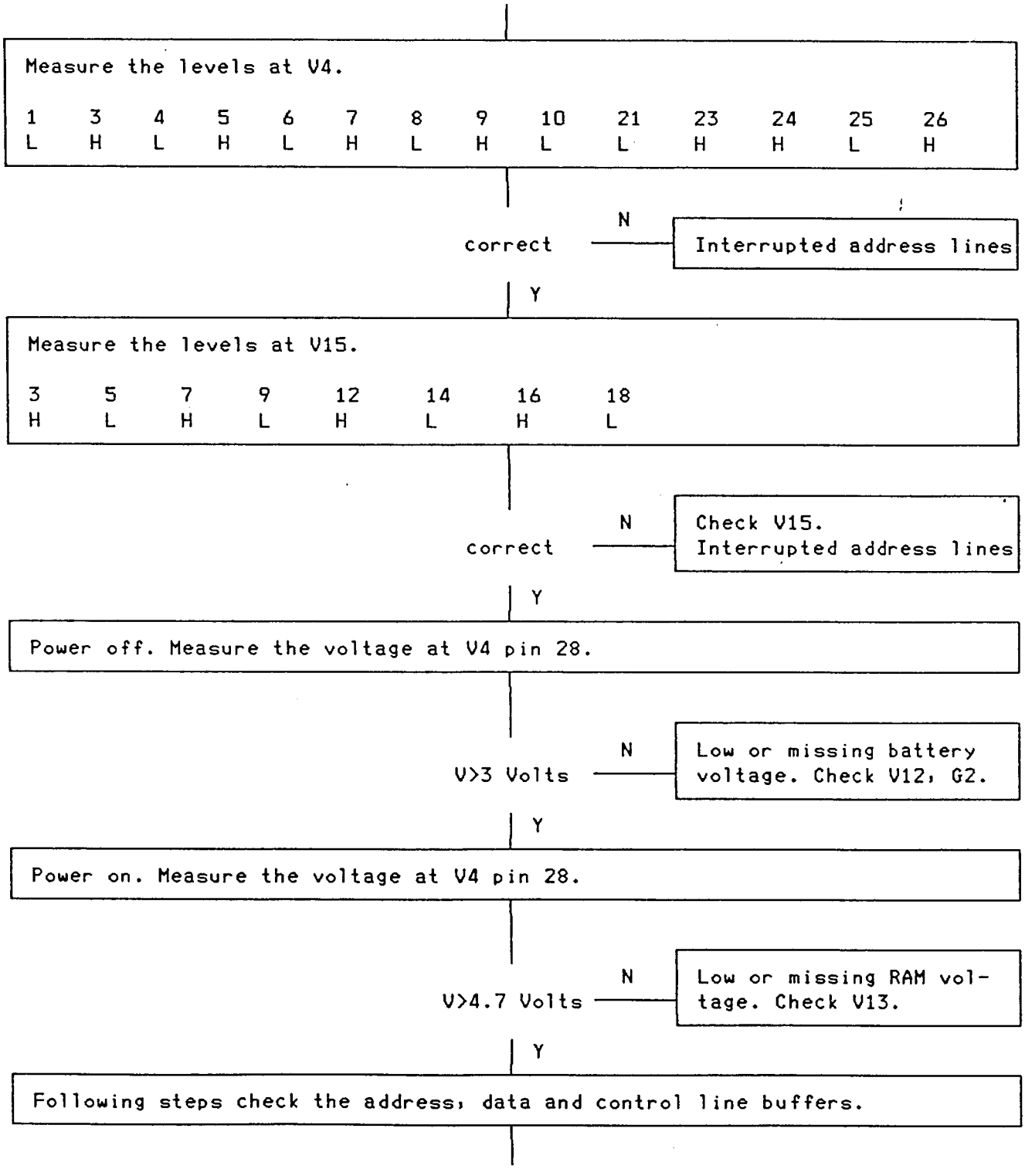
Press reset:
SSTEP until the TU displays: 5555 Measure the levels at V2.

2	3	4	21	23	24	25	26	27
H	L	H	H	L	L	H	L	H

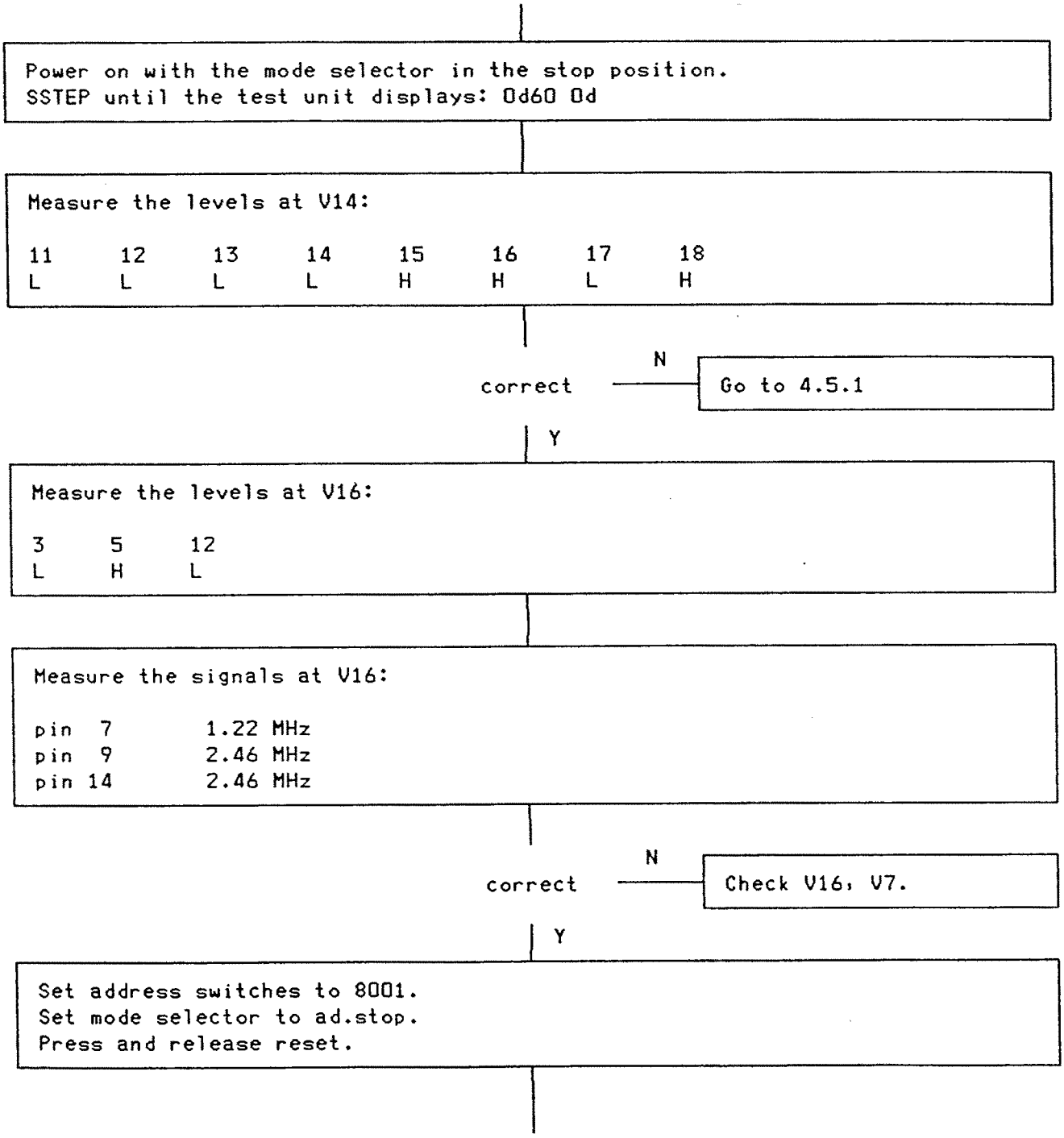
3.1.4


?
N
Interrupted address lines to V2.
Y
Measure the levels at V4.
1 3 4 5 6 7 8 9 10 21 23 24 25 26
H L H L H L H L H H L L H L
?
N
Interrupted address lines to RAM V4.
Y
Check the levels at V15.
3 5 7 9 12 14 16 18
L H L H L H L H
correct
N
Check V15; interrupted or shorted address lines.
Y
Single step until the TU shows: AAAA 00
Measure the levels at V2.
2 3 4 21 23 24 25 26 27
L H L L H H L H L
correct
N
Interrupted address lines
Y

3.1.5


Measure the levels at V4.
1 3 4 5 6 7 8 9 10 21 23 24 25 26
L H L H L H L H L L H H L H
correct
N
Interrupted address lines
Y
Measure the levels at V15.
3 5 7 9 12 14 16 18
H L H L H L H L
correct
N
Check V15.
Interrupted address lines
Y
Power off. Measure the voltage at V4 pin 28.
V>3 Volts
N
Low or missing battery voltage. Check V12, G2.
Y
Power on. Measure the voltage at V4 pin 28.
V>4.7 Volts
N
Low or missing RAM voltage. Check V13.
Y
Following steps check the address, data and control line buffers.

3.1.6


Power on with the mode selector in the stop position.
SSTEP until the test unit displays: 0d60 0d
Measure the levels at V14:
11 12 13 14 15 16 17 18
L L L L H H L H
correct
N
Go to 4.5.1
Y
Measure the levels at V16:
3 5 12
L H L
Measure the signals at V16:
pin 7 1.22 MHz
pin 9 2.46 MHz
pin 14 2.46 MHz
correct
N
Check V16, V7.
Y
Set address switches to 8001.
Set mode selector to ad.stop.
Press and release reset.

3.1.7

The TU displays:

		MEM	RD	WR
8001	01	X		X

SSTEP and compare:

8001	01	X	X	
8001	80	X		X
8001	80	X	X	
8001	80	X	X	
8001	FF	X		X
8001	FF	X	X	
8001	FF	X	X	
8001	00	X		X
8001	00	X	X	

correct — N → Check V4, V13.

Y

Set address switches 0060. Press reset:
The TU shows: 0060 00 WR

Measure the levels at V14:

all L — N → Check for interrupted data lines.

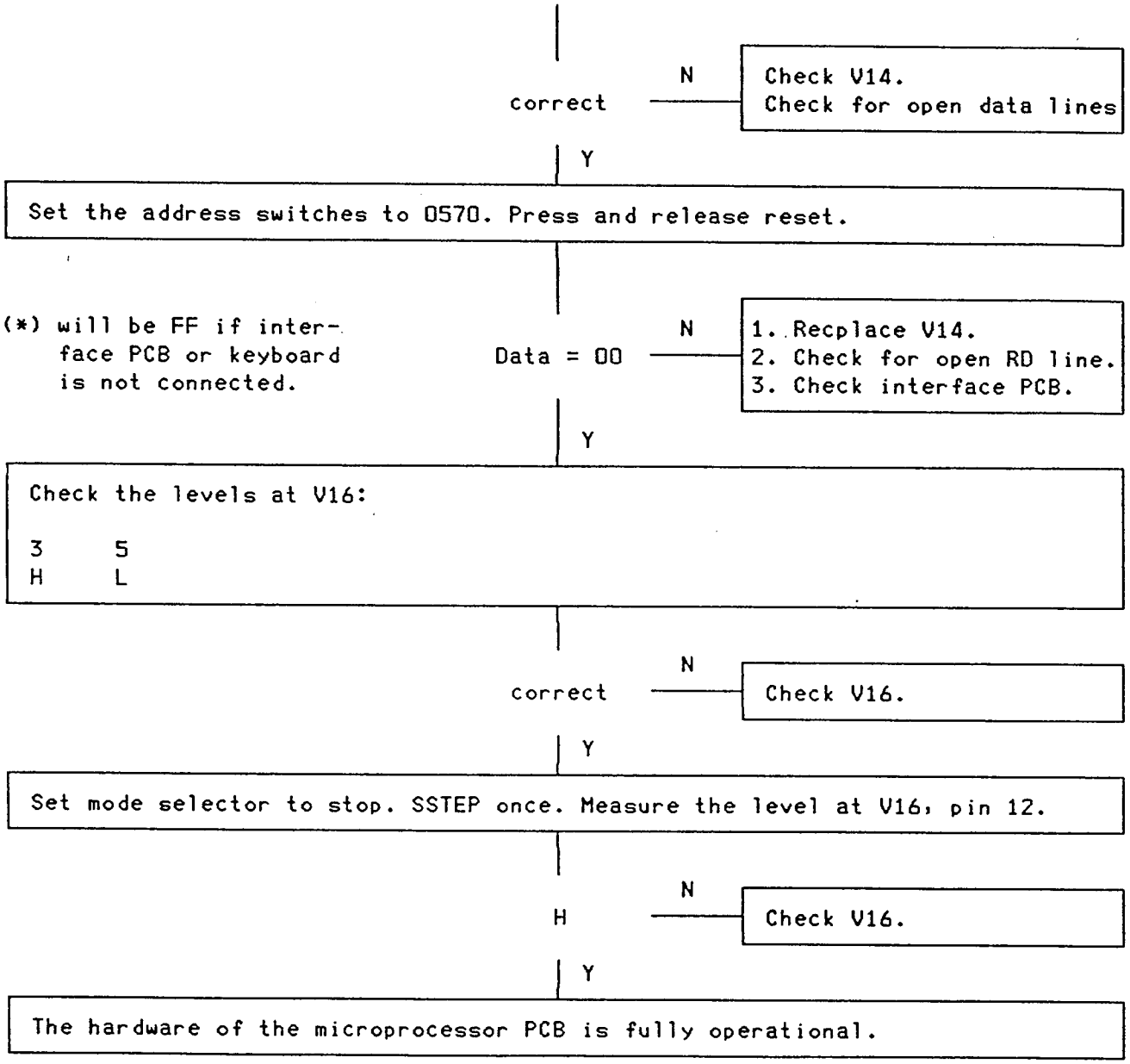
Y

Set the address switches to D843. Set the mode selector to ad.stop.
The TU displays: d843 d8 WR.

Measure the levels at V14:

11	12	13	14	15	16	17	18
H	H	L	H	H	L	L	L

3.1.8


correct
N
Check V14.
Check for open data lines
Y
Set the address switches to 0570. Press and release reset.
(*) will be FF if interface PCB or keyboard is not connected.
Data = 00
N
1. Recplace V14.
2. Check for open RD line.
3. Check interface PCB.
Y
Check the levels at V16:
3 5
H L
correct
N
Check V16.
Y
Set mode selector to stop. SSTEP once. Measure the level at V16, pin 12.
H
N
Check V16.
Y
The hardware of the microprocessor PCB is fully operational.

Lamp replacement

In condensor-systems, lamp position is particularly critical.

In-house tests have proved the relative ease of replacement, but in some cases the different positions of the lamp filaments can cause trouble in the system.

To compensate the difference, perform the following steps.

Calibrating instructions for the OPTOSCAN optical system

To ensure a distortionless projection of the negative, 3 parts of the optical assy must be adjusted:

1. lamp position
2. concentricity of the Fresnel lenses
3. optical centering

1. Lamp position

- Remove negative carrier
- Use a diffusion screen
- Remove the top cover
- Remove the scan sensor PCB
- Put the diffusion screen in place of the scan sensor PCB
  (In case you don't have a diffusion screen, use a glass plate and a tracing paper for drawings)
- Loosen the lamp socket screws (1) and the support screws (2)
- Adjust the height of the lamp with screw (3) to the center of the adjustment range.

Enter the testprogram.

- Lamp on.
- Whitelight (with corr key)
- Close the lamp cover (4)
- Adjust the lamp support by moving it with screws (2) until the light cone is centered in lens (5).

- Now adjust the height of the lamp with screw 3, until the light cone touches the lens only, that is, the metal ring must not be lit.

- Check the correct lamp position on the diffusion screen.

You must have a straight rectangle, evenly illuminated and of greenish-cyan color.

Check that no yellow or blue blurs occur at the corners.

Only the edges may be yellow (less than 1 cm).

2. Adjust the Fresnel-lenses

Starshaped rays are a consequence of unsufficient concentricity of the 2 Fresnel lenses.

- Remove screws (6)
- Turn the upper Fresnel-lens until all rays have dissappeared.

3. Controlling the optical center

- Mount the PCB scan sensor
- Install scanneg 35
- Advance scan sensor PCB to the center.
- Lamp on.

The projection shines thru the PCB.

The 9 closely spaced photocells must lie within the projection.

- Adjust the PCb if not.

If the misalignetment cannot be corrected thru shifting the PCb, check the optical axis of the lamp.

All optical components must be handled with care, no fingerprints or dirt on the lenses or filters can be tolerated.