

## PREFACE

This manual describes the operating characteristics of the AVA Instrumentation Model 103D Winchester/Floppy Disk Exerciser. Users are cautioned that the Model 103D specifications are subject to change at any time, and without prior notification by AVA Instrumentation, Inc.

This manual is primarily written for use with the Shugart series of Floppy (Diskette) Drives. Operation is similar for use with manufacturers of drives with the same interface as the Shugart.

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## 1.0 INTRODUCTION

The Model 103D Winchester/Floppy Disk Exerciser is the first low cost, lightweight portable exerciser for checkout of Floppy Disk and Winchester Disk Drives, both 5¼" and 8". The inherent flexibility of the design allows the Model 103D to interface with most popular models of Floppy and Winchester drives, as follows:

Floppy Disk Drives: all drives using the ANSI standard X3T9 interface (i.e., Shugart interface), both 5¼" and 8".

Winchester Disk Drives: all 5¼" drives using the Seagate ST506 interface; requires adapter card P/N 10326.

all 8" drives using the Shugart SA1000 interface; requires adapter card P/N 10332.

Whether in the field, the lab, or in incoming inspection, the Model 103D can be used to operate the drive off-line to examine and/or adjust:

- Head Alignment
- Servo Alignment
- Index Detector Adjustment
- Track 0 Adjustment
- Write Amp/Read Amp Operation

The compact size of the Model 103D enables the field engineer to carry the unit in his tool kit without having to carry an additional, bulky, suitcase-size tester.

## 2.0 SPECIFICATIONS

### 2.1 Electrical Characteristics

Unless otherwise noted, all I/O lines are terminated in the Model 103D, and are assumed to be TTL compatible, with 0v = true.

### INPUT REQUIREMENTS

Index	pulse; once per revolution of the disk
Ready	level; operates LED status indicator only
Write Protect	level; operates LED status indicator only
Track 0	level; indicates heads are positioned over track 0 and resets track counter. Operates LED status indicator.
+5 volts	approximately 650 ma dc

## OUTPUT SIGNALS

### Step

pulse; 5 $\mu$ s width. Repetition rate front panel switch selectable as follows:

SWITCH POSITION	REPETITION RATE	
	BUFFERED SEEK OFF	BUFFERED SEEK ON
3	3ms	20 $\mu$ s
10	10ms	60 $\mu$ s
40	40ms	230 $\mu$ s

3/10ms and 20/60 $\mu$ s are internally adjustable to:

3ms: adjustable from 2 to 6 ms  
10ms: adjustable from 10 to 20 ms  
20 $\mu$ s: adjustable from 15 to 45  $\mu$ s  
60 $\mu$ s: adjustable from 55 to 160 $\mu$ s

If other step rates are required, please consult factory.

### Seek Settle Time

approximately 20 ms delay on directional change, only

In BUFFERED SEEK mode, settle time delay is 0 ms. Exerciser responds immediately to SEEK COMPLETE signal generated by drive.

### Direction

level; + out, - in

### Motor On

level; determined by front panel switch. Activates mini-floppy interface, pin 16 (Motor On); 8" floppy interface pin 18 (Head Load).

### Drive Select

level; determined by front panel switch. Activates all 3 mini-floppy and all 4 8" floppy select lines at once.

### Write Gate

level; remains true as long as WRITE button depressed and terminates at the next Index pulse after button is released. Inhibited by Write Protect and inhibited during SEEK operations.

### Head Select

level; determined by front panel switch

### Write Data

pulse; for 5 $\frac{1}{4}$ " drives:

1F = 125 Khz  $\pm$  2%  
2F = 250 Khz  $\pm$  2%

for 8" drives:

1F = 250 Khz  $\pm$  2%  
2F = 500 Khz  $\pm$  2%

### Head Current Switch

level; true for all track addresses 43 and greater or 128 and greater (jumper selectable). Factory set for track 43 (for use with floppy disk drives). Output available at either pin 2 or 10 (factory setting) on the 8" interface connector.

## 2.2 Physical Characteristics

### Size:

8" (20 cm) width  
6 $\frac{1}{2}$ " (16.5 cm) depth  
2 $\frac{1}{2}$ " (6.4 cm) height

### Weight:

approximately 1.5 lbs. (.7 Kg)

### Operating Environment:

50°F to 100°F (10°C to 38°C)

### Input Voltage:

(at connector J1) +5 vdc  $\pm$  5%

## 2.3 Accessories

Interface cables for many popular makes of diskette drives are available and are listed below:

Cable, Shugart 5 $\frac{1}{4}$ " drive, P/N 10303  
Cable, Shugart 8" drive, P/N 10305  
Pertec FD400 Adapter Card, P/N 10816  
5 $\frac{1}{4}$ " Winchester Adapter Card, P/N 10327  
20 pin Interface Cable, P/N 10307  
8" Winchester Adapter Card, P/N 10332  
50 pin Interface Cable (for 8" Winchester) with power adapter, P/N 10333  
Per Sci Adapter Card, P/N 10336  
Per Sci Interface Cable, P/N 10337  
Carrying Case for 103D, P/N 10338

All interface cables are four feet in length, and come with power adapter cables.

## 3.0 OPERATING INSTRUCTIONS

### 3.1 Installation

**CAUTION:** Power to the Drive must be turned off before connecting/disconnecting this exerciser.

Connect the appropriate interface cable to J2 (5 $\frac{1}{4}$ " drive) or J3 (8" drive). See section 2.3 for available interface cables.

Connect the power adapter cable to J1 and insert in series with disk drive power cable.

If power adapter cable is not purchased, apply +5V dc to J1 using AMP connector p/n 1-480318-0 with AMP sockets, p/n 60617-1. Connect +5v to pin 1, ground to pin 2.

On 5 $\frac{1}{4}$ " drives without Index discriminator circuitry, use soft-sectored media only, for proper operation of the write circuitry in the Model 103D.

## 3.2 Operation

**Note:** Abbreviated Operating Instructions are printed on the bottom of the Model 103D.

### DRIVE SELECT

The MOTOR ON/RESET must be ON for exerciser to work. This switch also controls the motor in certain mini-floppy drives.

DRIVE SELECT/OFF selects all drives and/or operates the head load circuits, depending on individual drive configuration.

The DRIVE READY Status LED will illuminate if all appropriate conditions within the drive have been met. Certain drives do not return this status.

### HEAD SELECT

The HEAD select switch is used on dual-sided drives; a "1" results in 0 volts on the interface line. On single-sided drives this switch has no effect.

### TRACK SELECT

Select the TRACK address. After depressing SEEK or RECAL, the 3 digit LED display will indicate the present location of the head.

To access Track -1, SEEK to track 1; while holding TRACK -1 depressed, push RECAL. Note that the display reads 1 and the TRACK 0 LED is ON. Now SEEK to Track 0, forcing the drive to Track -1. The TRACK 0 LED and display should extinguish.

### MOTION CONTROL

Select STEP RATE (3, 10 or 40 ms). If step rate chosen is too fast for drive under test, stepper may not respond and errors will result.

To Recalibrate the drive (find Track 0), depress RECAL.

To Seek to a selected address, use MANUAL SEEK and depress the SEEK button.

ALTERNATE SEEK will cause the drive to alternate between Track 0 and the selected address when the SEEK button is depressed.

The exerciser is primarily designed to alternate between Track 0 and any selected Track, when in the ALTERNATE SEEK mode. To seek between any two desired Tracks, proceed as follows:

MANUAL SEEK to the lower numbered Track of the two, then momentarily turn the MOTOR ON/RESET switch to RESET. This will reset the internal counter to 0 in the exerciser, allowing an alternate seek to be performed starting at that location.

**EXAMPLE:** If an alternate seek between Tracks 10 and 15 is desired, SEEK to Track 10, momentarily turn the Motor On/Reset switch to RESET, then back to ON. Select 5 in the TRACK SELECT switches (the difference between 10 and 15), select ALTERNATE SEEK mode and depress SEEK. The exerciser will now alternate between 10 and 15.

Using this technique, an alternate seek may be performed between any two desired TRACKS. To return to normal operation, depress RECAL.

TRACK 0 Status LED illuminates whenever the drive reaches Track 0.

BUFFERED SEEK mode provides three extremely fast step rates for use with Winchester Drives designed to accept them. Step rates are available from 15 to 230  $\mu$ s and are set at the factory to 20, 60 and 230  $\mu$ s, corresponding to the 3, 10 and 40 ms switch positions. The Buffered Seek mode requires the Seek Complete Signal from the Winchester Adapter Card(s) in order to work properly. All Winchester Adapter Cards shipped after January 1, 1983 will be properly configured to provide the correct signals.

### WRITE DATA

1F/2F selects the Write Frequency. 1F selects a pattern of all zeroes; 2F selects all ones; ERASE dc erases the track. WRITE generates a 1F/2F or ERASE pattern as long as the button is depressed. Writing terminates at Index when button is released, and is locked out during Seek operations or when drive is Write Protected.

WRITE PROTECT Status LED illuminates only when the appropriate conditions have been met in the drive. Certain drives do not return this status.

## 4.0 MAINTENANCE

### 4.1 Enclosure Assembly

All components in the Model 103D Exerciser are located on one double-sided printed circuit board, utilizing sockets for all Integrated Circuits. The circuit board is supported by the top cover of the enclosure assembly by means of the 11 switches soldered to the p.c. board, and the two standoffs mounted on the board.

### 4.2 Disassembly

- 1) Remove the two screws from the rear of the unit.
- 2) Slide the top cover towards the rear approximately 1/2 inch, exposing the internal support strap.
- 3) Remove only one of the two screws securing the strap to the side panels.
- 4) Unfasten the side panel by removing its remaining screw on the bottom of the chassis. Remove panel.
- 5) Slide the top cover with circuit board away from the chassis.

### 4.3 Assembly

Reverse the steps above to reassemble the Model 103D. **CAUTION:** Use care in tightening the screws in the plastic side panels. Excess force will strip the plastic.

### 4.4 Electrical Adjustments

All adjustments are located on the top of the printed circuit board, and are accessible without disassembling the top cover.

#### WRITE DATA ADJUSTMENT

Adjust R5 for 500 Khz  $\pm$  2% measuring at pin 3 of IC 20.

#### STEP RATE ADJUSTMENT

With BUFFERED SEEK OFF:

Adjust R6 for 3 ms  $\pm$  0.1 ms at IC 21 pin 3, with STEP RATE switch in 3 ms position. This same adjustment is used to adjust the 20  $\mu$ s setting when the BUFFERED SEEK is ON; consequently, changing one will affect the other.

Adjust R10 for 10 ms  $\pm$  0.1 ms at IC 21 pin 3, with STEP RATE switch in 10 ms position. This same adjustment is used to adjust the 60  $\mu$ s setting when the BUFFERED SEEK is ON. Likewise, changing one will affect the other.

If step rates other than those set at the factory are used, it is recommended that a label be applied to the front panel to so indicate.

DETAIL NO.	QUAN.	DESCRIPTION	MAT'L	STOCK	REMARKS
1	1	P.C. BOARD PH 10340			REF 10340
2	1	R-PAK, 5 PIN, 1K			RP-1
3	7	R-PAK, 5 PIN, 10K			RP-2,3,4,5,6,7,8
4	4	470 $\Omega$ , 1/4 W, 5%O			R1,2,3,12
5	1	500 $\Omega$			R4
6	2	12K			R13,14
7		NOT USED			
8	1	1N 1/4W, 5%O			R8
9	1	6.8K			R9
10	1	30K			R7
11	1	100K			R11
12	1	500 $\Omega$ POT.			R5
13	1	5K POT.			R6
14	1	50K POT.			R10
15	17	.01 $\mu$ F 75V CAP.			C2,3,4,5,6,7,8,9,10,14,17,18,21,22,23,24,25
16	2	.1 $\mu$ F DISK CAP			C11,13
17	2	1000 P4			C12,26
18	1	1 $\mu$ F DIPPED TANTALUM			C19
19	1	1 $\mu$ F POLYSTYRENE			C20
20	1	10 $\mu$ F DIPPED TANTALUM			C1
21	1	5000 P4			C15
22	1	IN4001 DIODE			CR1
23	2	IN4148 DIODE			CR2-13
24	3	LED HP5082-4050			CR14,15,16
25	3	NUM. DISPLAY MAN 74			C1,4,8
26	1	TURNWHEEL ASM. L20-02M3			S2,3,4
27	3	TOGGLE SWITCH, LAMB 2101			S1,6,7
28	2	TOGGLE SWITCH, LAMB 2101			S10,13
29	1	TOGGLE SWITCH, LAMB 2103			S11
30	1	TOGGLE SWITCH, LAMB 2103			S8
31	4	PUSH BUTTN. ALCO NPS 103F			S5,9,12,14
32	1	50-PIN CONN. 3M13422-1203			J3
33	1	34-PIN CONN. 3M13431-2203			J2
34	1	2-PIN CONN. AMP 350109-1			J1
35	3	ELEV. SOCKET ARIES 4-8400-04WR			
36	13	14-PIN SOCKET (LOW PROFILE)			
37	14	16-PIN SOCKET			
38	2	8-PIN SOCKET			
39	2	STANDOFF, AMATOM D15BA-0440			
40	2	K.H. SCREW 4-40 x 3/8			
41	3	LED STAUER, BIVAR			
42	2	T-10			U1,14,15
43		NOT USED			
44	2	74LS00			U16,24,27
45	1	74LS02			J20
46	1	74LS03			J25
47	5	74LS74			U17,18,19,22,28
48	2	74LS05			J5,6,8,10,12,13
49	1	74LS123			U23,29
50	3	74LS192			J2,9,11
51	2	555			U20,21
52	2	03008			U3,4,7
53	2	WIRE FLAT RIBBON, 5-COND, STRANDED, 28 AWG			

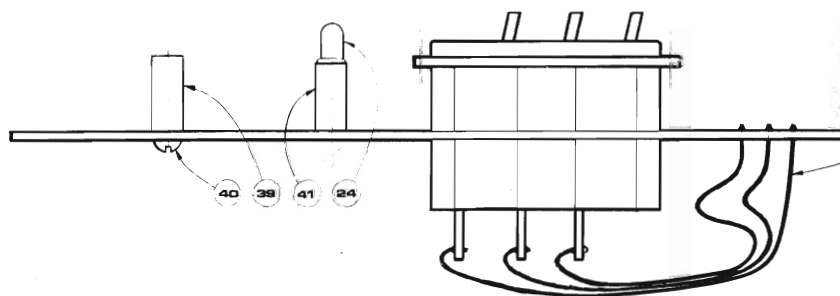
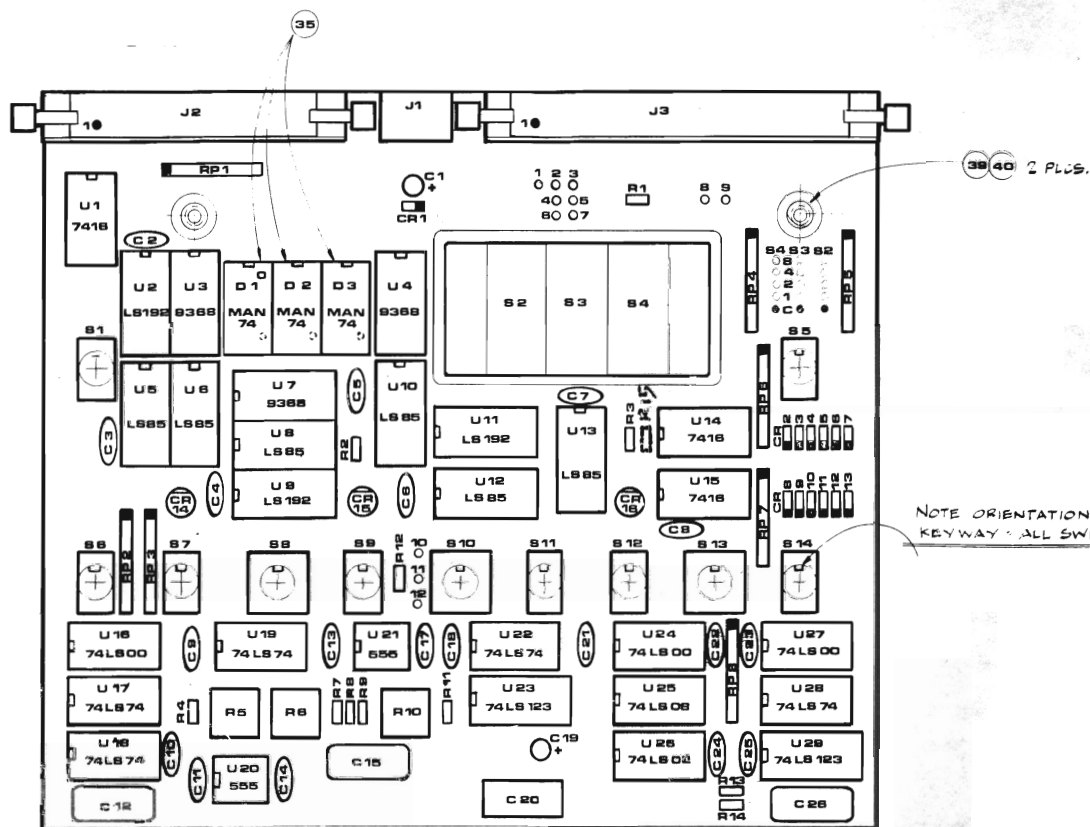
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QTY	QTY	DESCRIPTION	MAT'L	STOCK	REMARKS
1	1	P.C. BOARD PH 10340			REF 10340
2	1	R-PAK, 5 PIN, 1K			RP-1
3	7	R-PAK, 5 PIN, 10K			RP-2, 3, 4, 5, 6, 7, 8
4	4	470Ω, 1/4 W, 5%O			R1, 2, 3, 12
5	1	500Ω			R4
6	2	12K			R13, 14
7		NOT USED			
8	1	1K 1/4 W, 5%O			R9
9	1	50K			R3
10	1	30K			R7
11	1	100K			R11
12	1	500Ω POT.			R5
13	1	5K POT.			R6
14	1	50K POT.			R10
15	17	.01μF DISK CAP.			C2, 3, 4, 5, 6, 7, 8, 9, 10, 14, 17, 18, 21, 22, 23, 24, 25
16	2	1μF DISK CAP			C11, 13
17	2	1000 P.F.			C12, 26
18	1	1μF - DIPPED TANTALUM			C19
19	1	1μF - POLYSTYRENE			C20
20	1	10μF - DIPPED TANTALUM			C1
21	1	5000 P.F.			C15
22	1	IN 4001 DIODE			CR1
23	1	IN 4148 DIODE			CR2 - 13
24	3	LED HP 5002-4050			CR 14, 15, 16
25	3	NUM. DISPLAY MAN 74			C1, 2, 3
26	1	THUMB WHEEL ASM. L20-02M3			S2, 3, 4
27	3	TOGGLE SWITCH, LAMB 3101			S1, 6, 7
28	2	TOGGLE SWITCH, LAMB 3101			S10, 13
29	1	TOGGLE SWITCH, LAMB 3103			S11
30	1	TOGGLE SWITCH, LAMB 3103			S8
31	4	PUSH BUTTON ALCO NPS 103F			S5, 9, 12, 14
32	1	50-PIN CONN. 3N 3433-2203			J3
33	1	34-PIN CONN. 3N 3431-2203			J2
34	1	2-PIN CONN. AMP 350209-1			J1
35	3	ELEV. SOCKET ARIES 14-2440-1W			
36	13	14-PIN SOCKET (LOW PROFILE)			
37	14	16-PIN SOCKET			
38	2	8-PIN SOCKET			
39	2	STANDOFF, AMATON 0158A-0440			
40	1	K.H. SCREW 4-40 X 3/8			
41	3	LED STALKER, BIVAR			
42	3	7-10			U1, 14, 15
43		NOT USED			
44	2	74LS00			U16, 24, 27
45	1	74LS02			U20
46	1	74LS03			U25
47	5	74LS74			U17, 18, 19, 22, 28
48	6	74LS85			U5, 6, 8, 10, 12, 13
49	1	74LS123			U23, 29
50	3	74LS192			U2, 9, 11
51	2	555			U20, 21
52	3	9308			U3, 4, 7
53	2	WIRE, FLAT RIBBON, 5-COND, STRANDED, 20 AWG			

ASSEMBLY - PCB

A	RELEASE TO PRODUCTION
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REVISION	
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A	RELEASED TO PRODUCTION
LTR	DESCRIPTION
	REVISION