COLECO INDUSTRIES, Inc.
945 ASYLUM AVE., HARTFORD, CONN. 06105

ENGINEERING PROCEDURE NO.

DATE: 9/23/84

FROM:

REV.: B

REVISIONS						
SYM.	DATE	ECN	SHT	DESCRIPTION	BY	CH	AP

SPEC. NO.: QC-320

DISK DRIVE TEST PROCEDURE

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CODE IDENT. NO.:	TITLE: ADAM DISK DRIVE TEST PROCEDURE					DISTRIBUTION:
OPERATION NO.:						
SUPERSEDES:	SPECIFICATION NUMBER: QC-320				REVISION: B	
SUPERSEDED BY:	SHEET 1 OF 12					
	WRITTEN	CHECKED	ENG. APP.	Q.C. APP.	MFG. APP.	MFG. OPER.
BY						

INDEX

1.0 PURPOSE

1.1 This specification established the IQC inspection test to be performed on the ADAM disk drive final assembly and power supply.

2.0 APPLICABLE DOCUMENTS

#04040-001	5.25" Disk Drive Schematic
#04041-001	5.25" Disk Drive Assembly Drawing
EDP #7817	5.25" Disk Drive Bill of Materials Instruction Manual
#03029-001	MPI 5.25" Slimline Product Manual
QC	Coleco Home and Office Products Standards
NSTA	Preshipment Procedures, Project 1A
LTPD Ref:	Quality Control Handbook, J. Juran and F. Gryna, 3rd Ed., 1979 McGraw and Hill Pg. 21 - 27.
EPS-227	Adamnet
EPS-251	5.25" Floppy Disk Drive
EPS-265	5.25" Disk Cartridge
QC-111	Label and Graphic Standard
QC-113	PCB Assembly Standard
QC-114	PCB Workmanship Standard
Part 15	FCC Regulatory Standard
UL-114	For U.S. Systems (Office and Business Equipment).
CSA 22.2	No. 154 for Canadian Systems (Data Processing Equipment).
SQA-1	Supplier Quality Assurance Specification.
QC-102	Transportation Test Procedure

3.0 ACCEPTANCE CRITERIA

Lot acceptance limits will be as established per the purchase order.

4.0 ENVIRONMENTAL CRITERIA

4.1 Operating Temperature:

Range 10°C (50°F) to 40°C (104°F) at 20% to 80% relative humidity, non condensing.

4.2 Storage Temperature:

Range -40°C (-40F) to 51.7°C (125°F) at 8% to 90% relative humidity, non condensing.

ACCEPTANCE: There shall be no product performance deterioration after a minimum of 48 hrs. at each extreme.

5.0 SPECIAL EQUIPMENT REQUIREMENTS

5.1 ADAM System including Color T.V. or Monitor (Figure 1)

5.2 Disk Drive W/R Test Cartridge

5.2.1 Description W/R Disk Drive Test

Performed on all tracks, each track is written to and read back, beginning on track Ø and ending with track 39. Then the tracks are call verified by reading them back starting with track 39, and ending with Ø. This test is performed with two patterns.

1) 32 random bytes modified to test 1K Ram Buffer.

2) Worst case bit shift pattern DB, 6D, DB, 6D, B6, EE, EE, F7, BD, EF, 7B, DE, FB, EF.

5.2.2 Read Test

Tracks Ø through 39 are read and compared to last write/read data, then 39 thru Ø are read and compared.

5.2.3 Step Test

The head is stepped from track Ø to 28 to 39 to 12, reading and verifying each track exists

5.2.4 Erase Test

Three tracks are written at the outside and inside of the disk, and then verified to be correct. The center track of each of 3 tracks is written with new data and then all 6 tracks are read and verified to contain appropriate data.

5.3 Formatted Blank Adam Diskette

5.4 Smart Basic Program Tape

5.5 DyMec "RID" diskette (Recording Interchange Diagnostic)

5.5.1 Description of "RID" diskette.

1. Write Protect Test
2. Disk Drive Speed Test
3. Absolute Track Position Test
4. Track to Tract Test
5. Tunnel Erase Test
6. Head Azimuth Test
7. Signal to Noise Test
8. Drive Clamping Test

5.6 Oscilloscope 100 MHZ Dual Trace.

5.7 Frequency Counter

5.8 Brikon Disk Drive Tester or Equivalent (Figure 2)

5.9 DyMec Certified Alignment Diskette DK 501-1.

5.9.1 Description Alignment Diskette
DK 501-1 is an alignment disk for use in single-sided 48 TPI 5-1/4 inch flexible disk drives.

The single sided alignment disk provides the following features:

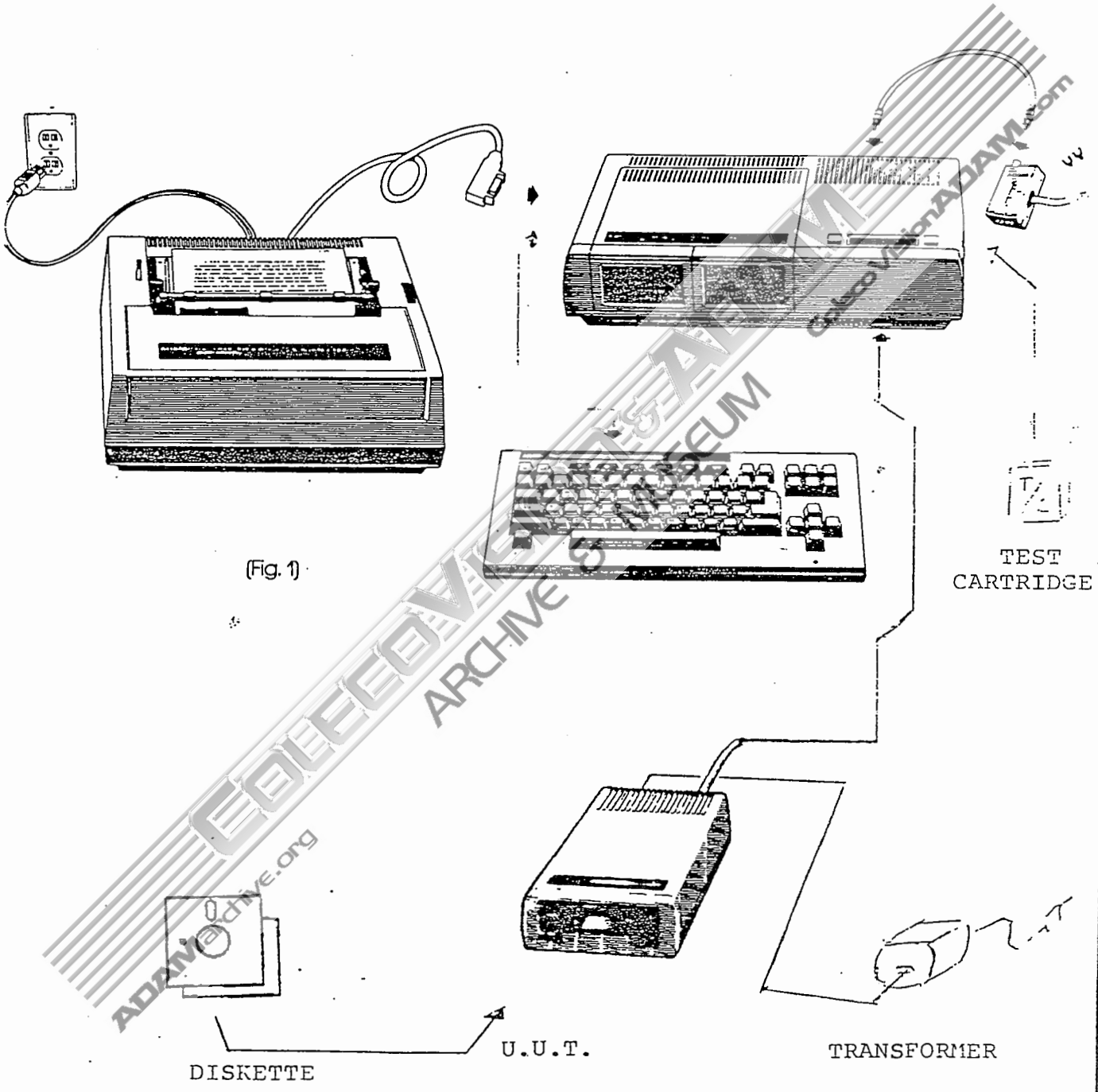
TRACK	FEATURE
00	Head Loading Settling Time Adjustment Track 00 detector alignment.
01	Index Photo Transducer Alignment.
16	Head Radial Position Alignment.
32	1F (62.5 KHz) Read Amplitude Check.
33	2F (125 KHz) Read Amplitude Check
34	Azimuth Alignment of the Read/Write Head.

General Requirements

Diskette - The diskette shall meet or exceed requirements of the American National Standards for Unrecorded Flexible Disk Cartridges X3.82-1980.

6.0 EQUIPMENT SET-UP

ADAM™ SET-UP PROCEDURE



(Fig. 1)

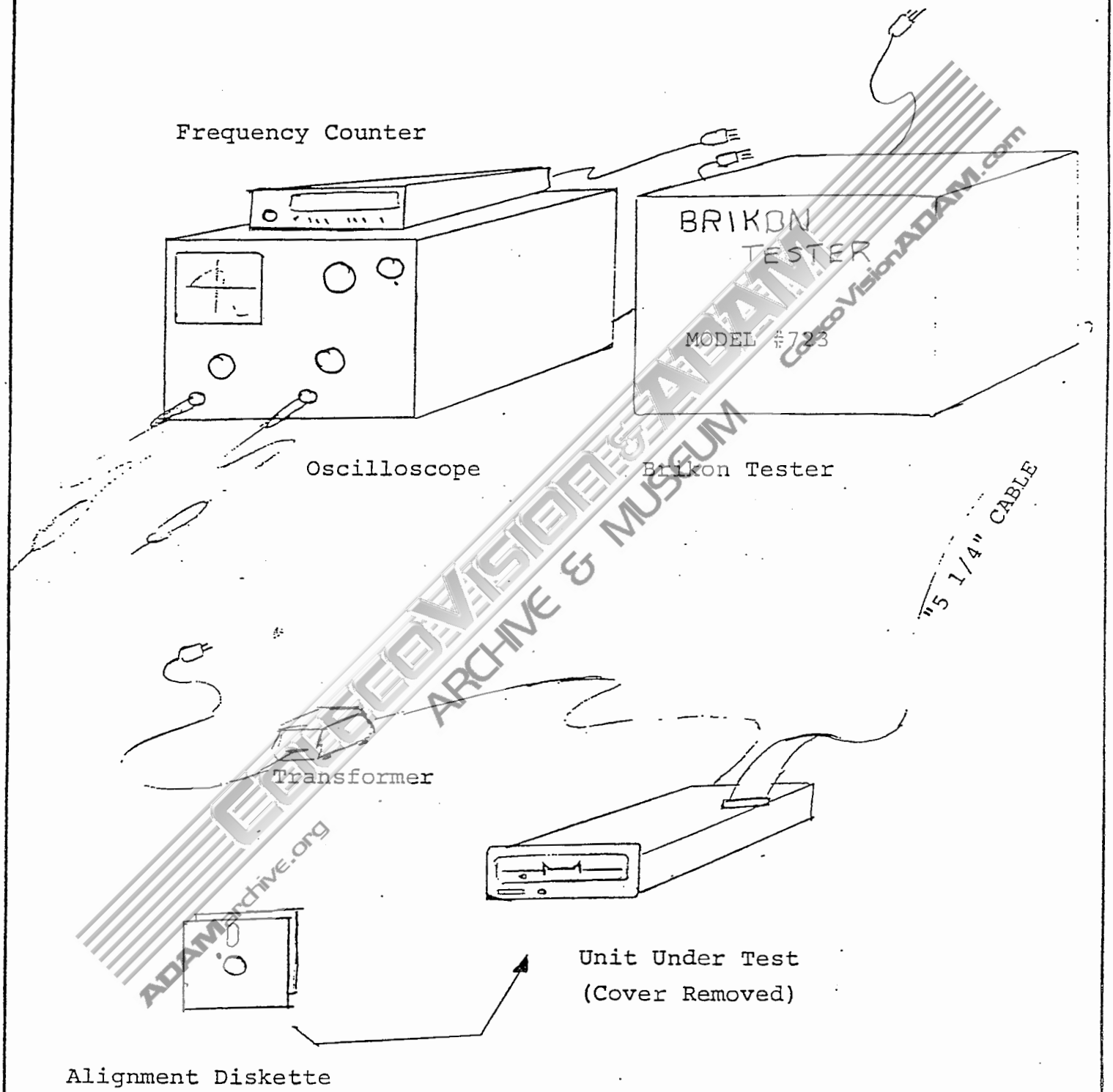


FIGURE #2

BRIKON DISK DRIVE TEST PROCEDURE FIGURE #3

Equipment Needed: Brikon FDD Tester Model #723
Oscilloscope Hitachi V1050F 100 MHZ
10X Scope Probes
DyMek Disk
E-Z Hook Jumper

SET-UP
1. Remove disk drive cover by unscrewing six phillips head screws.
2. Loosen screw on R/W Board.
3. Remove 34 Pin Edge Connector from End of R/W Board.
4. Place 34 Pin Edge Connector from Brikon onto Disk Drive.
5. Connect channel one input from scope to TP2 of disk drive.
6. Connect channel two input from scope to TP3 of disk drive.
7. Connect channel three input from scope to pin six of J2A (blue connector) of R/W Board.
8. Connect grounds of probes from channel 1 and channel 2 together then connect chassis, then connect E-Z Hook jumper to channel 1 and 2 probe ground and connect to Pin 8 of U-8.
9. Proceed according to DyMek Corporation Alignment Disk Specification DK-501-1.
10. At end remove Brikon Tester, reinsert 34 pin Edge Connector.

Controller PCB Check (Brikon Not Required)

NOTE: All timing measurements in the following paragraphs are to be made at a +1.0V reference.

1. Controller

Power up the controller/power supply PCBA (this resets 6801 and 2793).

1.1 Write Precompensation Adjustments

NOTE: All Pin numbers mentioned 1.1 and 1.2 refer to U11 (2793) on controller/power supply.

a. Put a 40 Pin IC Clip on U11 (2793)
b. Jumper TP1 and TP2 for setting (Pin 22) TEST to a logic low.
c. Observe that the frequency on Pin 16-U11 (DIR) reads value identified per attached Table ± 650 Hz.
d. Observe the pulse width at WD (Pin 31) is 188 ± 20 ns (time base - 50 ns/div.).

1.2 Data Separator Adjustment

a. Observe the pulse width at pin 29 is 475 ±5ns (time base = 50 ns/div).

1.3 WE Adjustment

a. Attach probe #1 to P40 of U6 (6801); scope trigger on channel 1, rising edge trigger; chop mode; 50 ns/div. = time base.

b. Attach probe #2 to P2 of U11 (2793).

c. Observe the pulse width from rising edge of P40 signal to rising edge of P2 signal is 400 ± 5ns.

d. Remove jumper TP1 and TP2.

(FIGURE #3 Continued)

VCO FREQUENCY CHART

°C (°F) \ TIME Min	2 Min.	8 Min.
	KHZ	KHZ
20 (68)	254.25	253.25
21 (69.8)	253.60	252.60
22 (71.6)	252.95	251.95
23 (73.4)	252.30	251.30
24 (75.2)	251.65	250.65
25 (77)	251.0	250.0
26 (78.8)	250.35	249.35
27 (80.6)	249.70	248.70
28 (82.4)	249.05	248.05
29 (84.2)	248.40	247.40
30 (86)	247.75	246.75

7.0 TEST PROCEDURES

7.1 Transformer Test:
Ref. Log. #127

7.2 Write/Read Test
Ref. Log. #127

7.3 "RID" Disk Test
Ref. Log. #131.0

7.4 Brikon Audit
(Mechanical/Electrical Alignment)
See Attached Figure #3.

7.5 24-Hour Burn-In Test
Ref. Log. #120

8.0 CLASSIFICATION OF FUNCTIONAL DEFECTS

Major

Transformer

Primary Current-High
Primary Current-Low
Secondary voltage at no load, 108VAC-High
Secondary Voltage at no load, 108 VAC-Low
Secondary Voltage at no load, 132 VAC-High
Secondary Voltage at no load, 132 VAC-Low
Secondary Voltage at full load, 108 VAC-High
Secondary Voltage at full load, 108 VAC-Low
Secondary Voltage at full load, 132 VAC-High
Secondary Voltage at full load, 132 VAC-Low
Hi-Pot Failure

Disk-Drive

I/O Error
Read Error
Write Error
Diskette in place failure
Write-Readback Error
Overwrite Error
Glitch Protect Failure
Power LED Failure
In Use LED Failure
Aux. A-Net Failure
Transfer Error
File Response Error
Drive 1/2 Failure
Overwrite Protection Failure
Speed Failure
Azimuth Failure
Alignment Failure
Hysterisis Failure

COLECO INDUSTRIES, INC. POST OFFICE BOX 1100 GLOVERSVILLE, NY 12078 (518) 725-860

TO: G. CAUFIELD

cc. T. KING
F. HICKEY
M. STRONG
D. J. ELLOIAN

FROM: P. MECCA

DATE: OCTOBER 17, 1984

SUBJECT: Q.C. #320 ALIGNMENT CHANGES

Please change Q.C. #320 Alignment Specifications for the interface PCB to the following:

VCO frequency - 250KHZ ± 650HZ at 25°C after 8 minutes warm-up. (for values at 2 minutes and other temperatures, consult attached table).

Write pre-comp - 188 ± 20NS

Data separator - 475 ± 15NS

Write enable - 400 ± 5NS

Regarding IQC inspection criteria, please generate an Upstate IQC inspection document that specifies the following:

VCO frequency - same as above

Write pre-comp - 188 ± 50NS

Data separator - 475 ± 20NS

Write enable - 400 ± 10NS

Paul Mecca

PAUL MECCA

PM:bb

1.0 Scope

This document describes an alignment disk for use in single-sided 48 TPI 5-1/4 inch flexible disk drives.

The single-sided alignment disk provides the following features:

Track	Feature
00	Head Load Settling Time Adjustment Track 00 detector alignment
01	Index Photo Transducer Alignment
16	Head Radial Position Alignment
32	1F (62.5 KHz) Read Amplitude Check
33	2F (125 KHz) Read Amplitude Check
34	Azimuth Alignment of the Read/Write Head

2.0 General Requirements

2.1 Diskette - The diskette shall meet or exceed requirements of the American National Standards for Unrecorded Flexible Disk Cartridges X3.82-1980.

2.2 Write Frequencies - The disk shall be recorded with the following frequencies:

Frequencies	Where Used
62.5 KHz (1F)	TK 00 full track TK 16 Radial Alignment Track TK 32 full track TK 01 and 34, index bursts
125 KHz (2F)	TK 33 full track TK 34 Azimuth bursts

2.3 Recorded Track Width - A special recording head shall be used where the core writes a track width of .0170 ± .0005 inches.

2.4 Environment - The prerecorded information will be within tolerance under the following conditions:

Temperature	70 ± 5° F
Humidity	50 ± 5% R.H.

Before measurement, the disk must acclimate one hour per each 5 degrees of temperature and/or 5% of relative humidty deviation from the above values.

3.0 Recorded Track Description

3.1 Track 00 - This track is recorded completely around with 1F data and is used for track zero recognition when setting the track zero detector.

3.2 Track 01 - This track is recorded with 62 ± 5 transitions of 1F data which typically appear at 200 ± 50 micro-seconds following the leading edge of the index pulse on a correctly aligned drive. See Figure 1 for the disk signal locations.

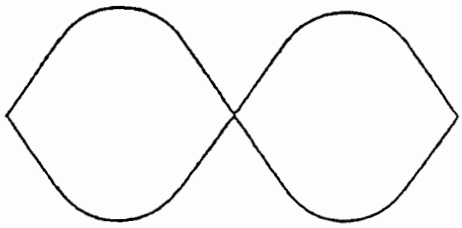
3.3 Track 16 - This track location is used to prerecord two tracks written eccentrically by .0080 ± .0005 inches where the two tracks are separated by an unrecorded space of width .0125 ± .0005 inches. It is the average center between these two tracks that signifies the track 16 location of 1.9167 ± .0003 inches when the disk is constrained as a flat plane.

The head, when properly aligned, produces two amplitude lobes per revolution of the disk. Proper alignment occurs when the two lobes or "cats-eyes" are equal in amplitude.

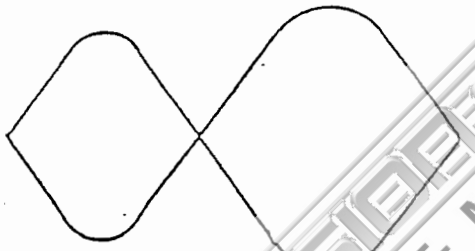
The first lobe of the "cats-eye" pattern shall have its zero cross-over from 10 to 30 msec after the leading edge of the Index pulse. The amplitude of this first lobe shall be lower relative to the amplitude of the second lobe when the head is positioned off track 16 in the direction of track 15.

See Figure 2 for a graph of alignment error versus lobe amplitude ratio.

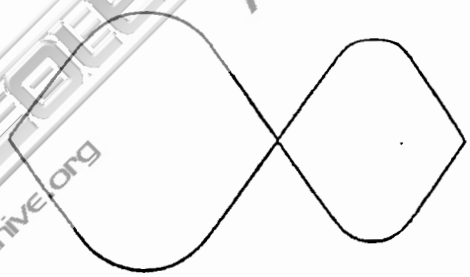
CATS-EYE ILLUSTRATIONS



Exact Alignment



.001 in the direction of Track 15



.001 in the direction of Track 17

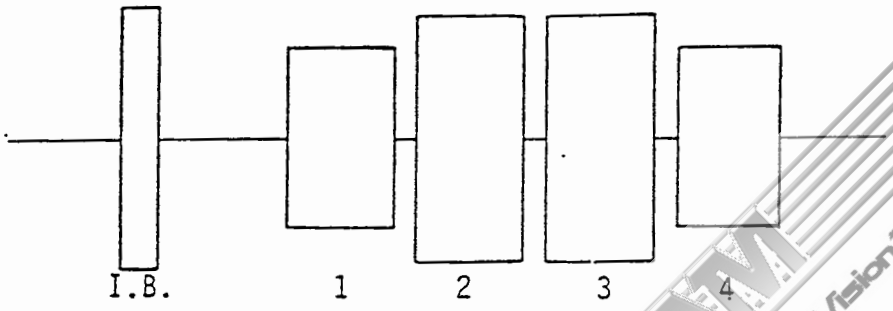
3.4 Track 32 - Track 32 contains 1F data recorded completely around the disk for 1F amplitude measurement purposes.

3.5 Track 33 - Track 33 contains 2F data recorded completely around the disk for 2F amplitude measurement purposes.

Note that playback resolution can be determined by dividing the track 33 value by the track 32 value. This determines the 2F/1F amplitude ratio for the head and is a measure of playback efficiency.

3.6 Track 34

3.6.1 Track 34 contains the following information:



The I.B. (Index Burst) consists of 8 transitions of 1F frequency.

Four azimuth bursts consisting of 125 ± 10 transitions each of 2F frequency follow the start of the I.B. by 350 micro seconds. Each burst is written at an angle determined by the deviation from a radial line passing through the center of the written transition as viewed from the recorded side of the disk.

The azimuth bursts are written at the following angles:

Burst #	Angle
1	0° 62' ± 0° 1' CW
2	0° 38' ± 0° 1' CCW
3	0° 38' ± 0° 1' CW
4	0° 62' ± 0° 1' CCW

3.6.2 Azimuth Burst Interpretation

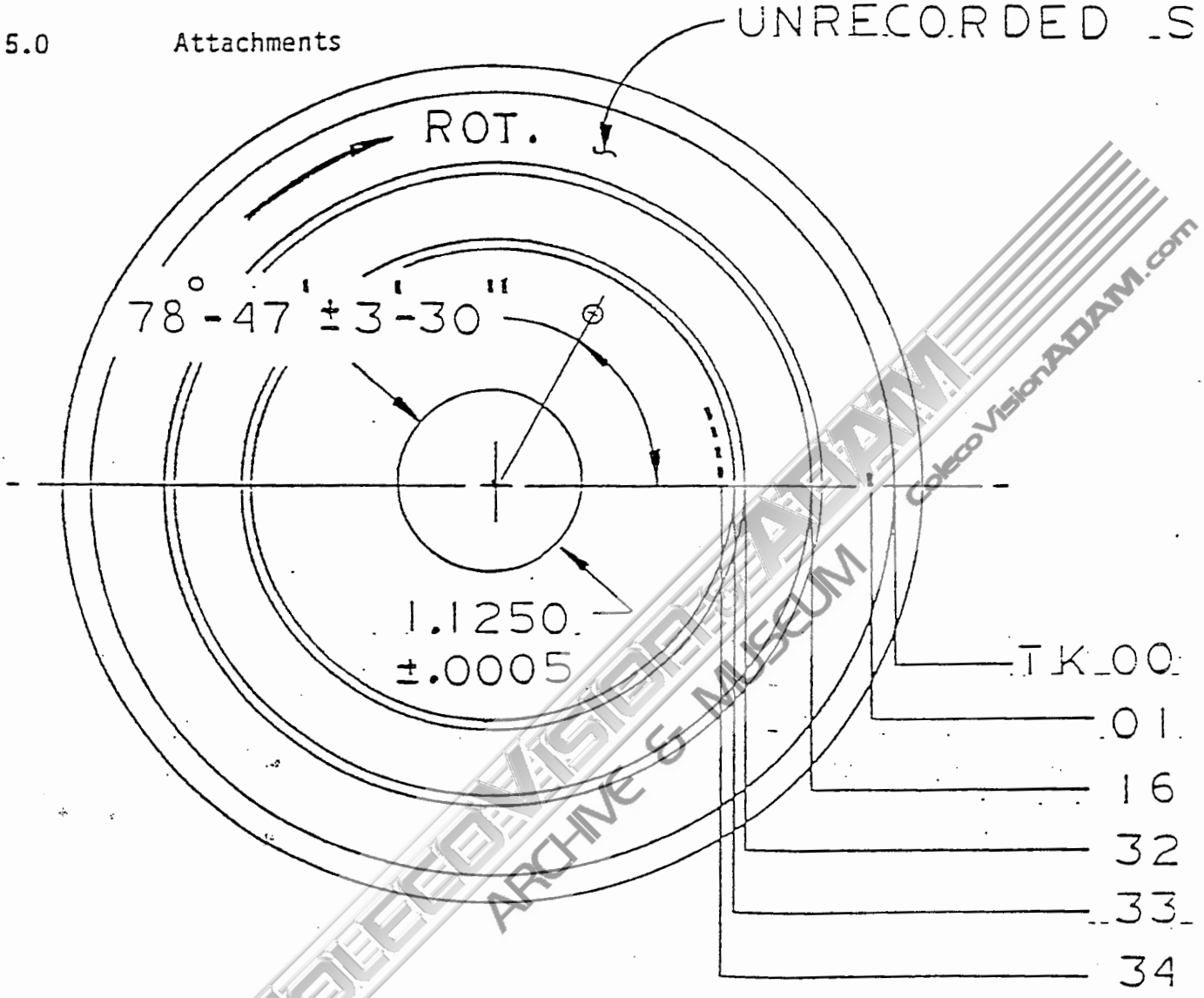
For a head with zero azimuth error, bursts 1 and 4 will be equal in amplitude but less than bursts 2 and 3 which will also be equal in amplitude. For an azimuth error of 12 minutes CW, bursts 1 and 2 become equal in amplitude.

See Figure 3 for a graph of amplitude versus azimuth angle to determine amplitude response to various angles.

4.0 Serialization

Each diskette shall be identified with a unique serial number located on the label.

5.0 Attachments

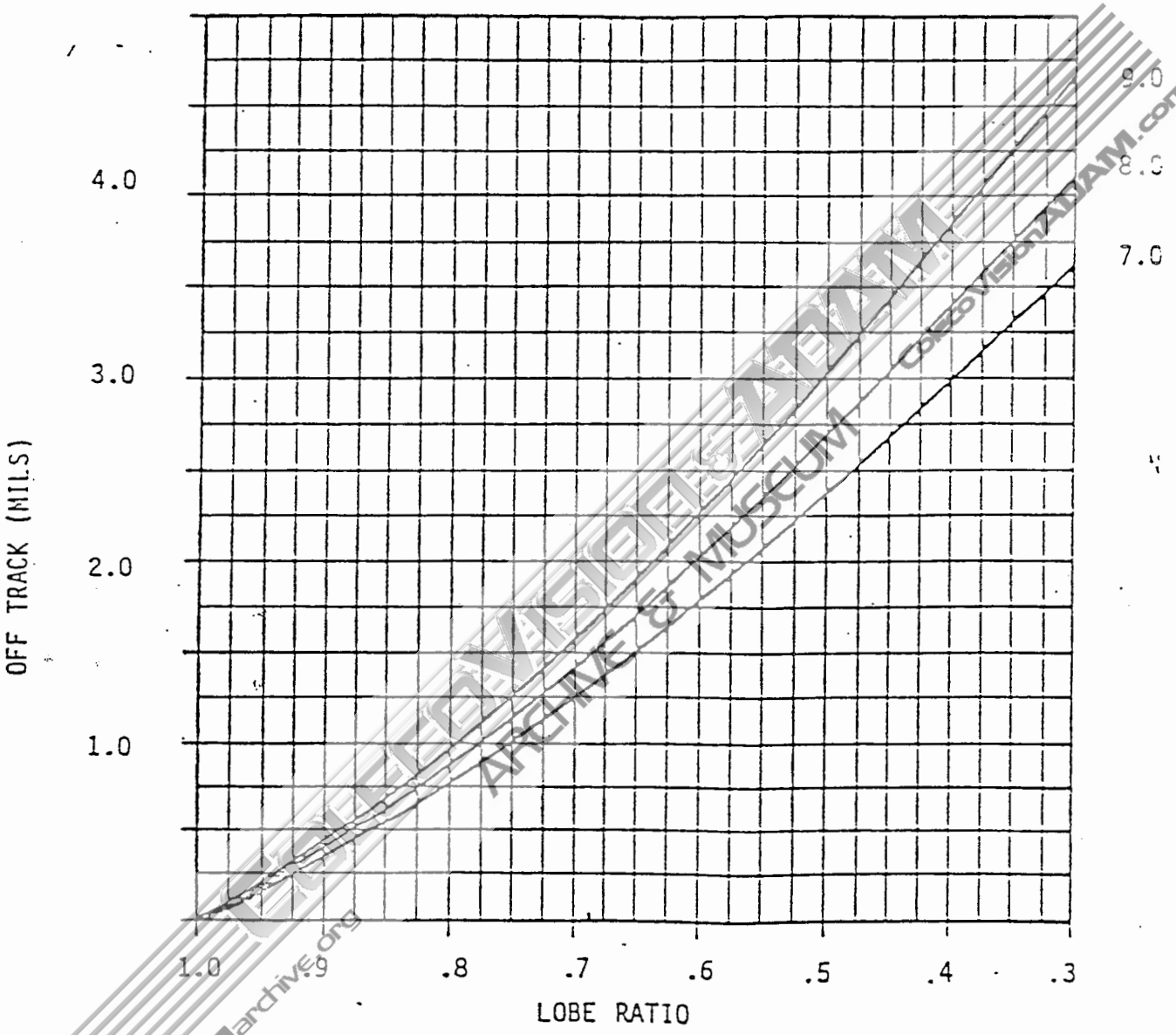


Track 16 radius is 1.9167 + .0003 inches. All other track locations are computed based upon 48 TPI with .002 inch tolerance.

Track 34 Index Burst leading edge shall be within ± .001 inches of a radial line passing through the leading edge of the track 01 burst.

Figure 1

Disk Signal Locations



N = The extent that the Cats-Eye lobes cover the Read/Write core at the maximum amplitude peaks with balanced lobes.

$$\text{Lobe Ratio} = \frac{N - \Delta}{N + \Delta}$$

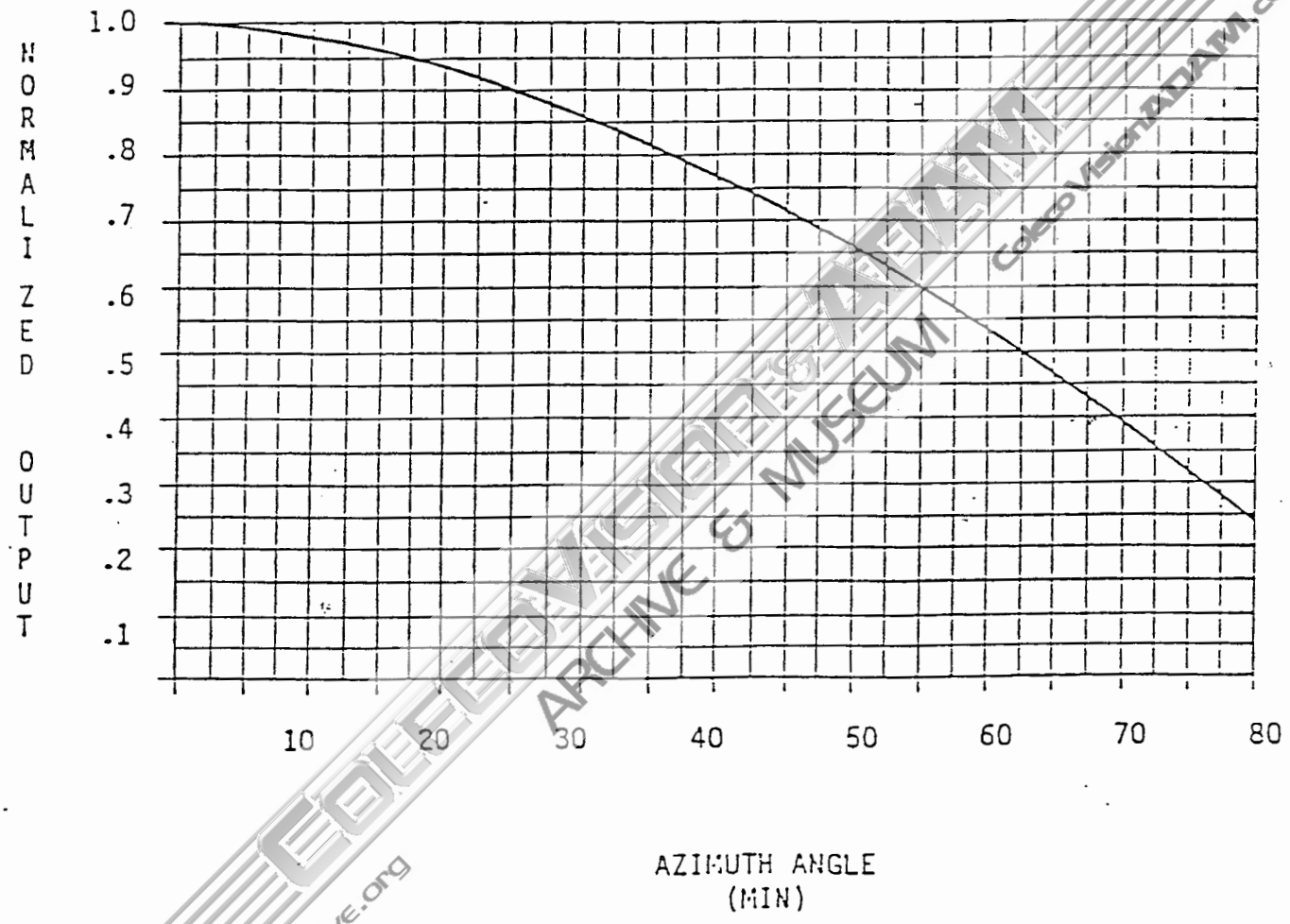
where Δ = the off-track location of the head in mils

Figure 2

Alignment Error vs. Lobe Amplitude Ratio

Figure 3

Signal Amplitude vs. Azimuth Angle



$$\text{AZIMUTH LOSS} = \text{SIN}\left(\frac{\pi \ W \ \text{Tan} \ \Psi}{\lambda}\right) \Big/ \left(\frac{\pi \ W \ \text{Tan} \ \Psi}{\lambda}\right)$$

W = CORE WIDTH
Ψ = AZIMUTH ANGLE
λ = RECORDING WAVE LENGTH

APPENDIX C: ANNOTATED SCHEMATIC

Reference logic schematic 41218 Rev. K.

Circuit Node	Comment
A +5V	
B +12V Inductive	
C +16/18V Unregulated	
D. RESET	Active low power on, or AdamNet reset.
E. U2 - 40	External clock, should be 1.0 MHz.
F. U2 - 13,14,15,16 H. U2 - 17,18,19,20	Active low (0-5V) Motor pulses.
G. J1 - 13,14,15,16 I. J1 - 19,20,21,22	Active low (0-12V) Motor pulses.