09825-90000 09885-90030

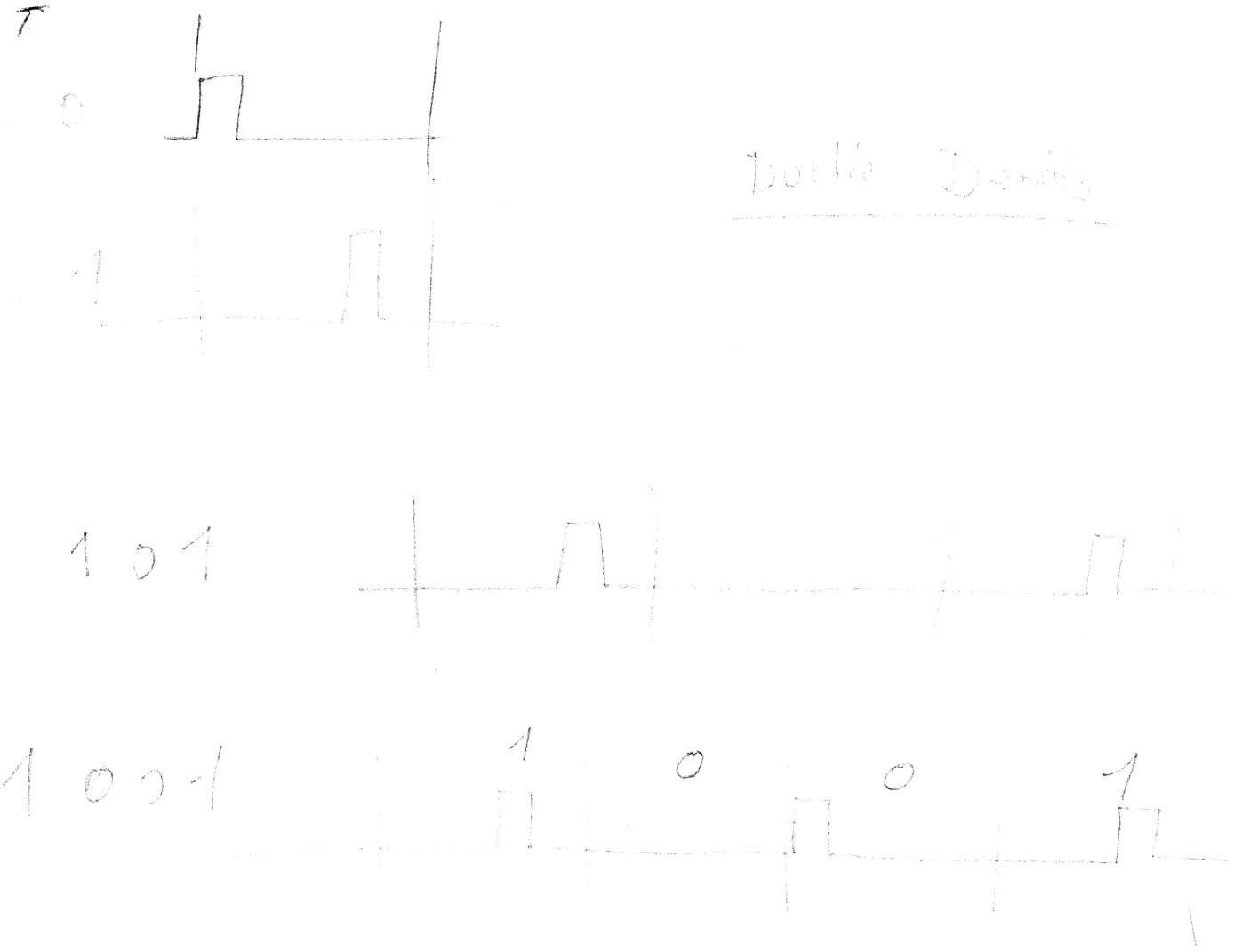
track 0 - 66 09825-90035

Drive Select leuchtet wenn das Gerät vom Calc angewählt wird

M = Master

S = Slave → keine Elektronik

Es können bis zu 3 Slaves von 1 Master gesteuert werden mit 1 Taktflankenkante



9885 FLEXIBLE DISC

Algemeines:

Die Floppy-Disc ist ein zusätzlicher Programmspeicher für die Modelle 9825 und 9831. Die Programme und Daten werden auf eine flexible schallplatten-ähnliche Scheibe geschrieben (Diskette). Auf einer Diskette befinden sich 72 Tracks. Davon werden 2 Trk's für Directory und Space System Area Track 1-4 sind Bootstraps (Bei Modell 9831 sind diese Bootstraps im Rom enthalten) ~~An der Rück~~ Es gibt 2 Arten von Geräten: 1. 9885 M M = Master und 2. 9885 S S = Slave

Der Unterschied zwischen Master und Slave besteht darin, daß im Slave keine Kontrol-Elektronik enthalten ist. Mit einem Master können max 3 Slaves gesteuert werden (von 1 Interface Karte). Da der 9825 3 Interface slots besitzt, können also maximal mit 1 calc. 9 Floppy's betrieben werden An der Frontplatte befinden sich 3 Lampen: Power on, Drive Select und Write protect. Drive Select gibt an ob die im Rechner eingegebene Select-Nummer 0-3 mit der auf der Rückseite des Gerätes eingestellten Nummer übereinstimmt. Da von einem Master 3 Slaves gesteuert werden können, wird durch diese Nummer erkannt welche Disc angewählt wird. Bei der Floppy können auf einer Diskette maximal 67 (0-66) Tracks verwendet werden. 1 Track kann maximal 30 Records beinhalten (1 Record = 256 Bytes). Es können auch einzelne Programmlines auf die Diskette gespeichert werden.

Wenn eine neue Diskette verwendet wird, so muß diese zuerst initialisiert werden, d.h. es müssen die Tracks markiert werden.

Das Initialisieren einer Diskette geschieht mit der Floppy System Cartridge (09825 - 90035). Nach dem Initialisieren druckt der Rechner aus, wieviel Defektiv-Tracks enthalten waren, d.h. ein Defektiv-Track ist eine Track, das durch Kratzer nicht verwendet werden kann.
Es sind bis zu 6 Defektive Tracks zulässig. Die Floppy schreibt sich die Defektive Tracks in das Directory Track(0), und beschreibt diese Tracks automatisch nicht. Es braucht also von der Programmierung her nicht auf Defektive Tracks Rücksicht genommen werden.

LOW COST MASS STORAGE FOR 9825A

- $70 FOR 5 DISKS
- $ 3.250 FOR 9885M OPT. 025
- $ 2.500 FOR 9885S

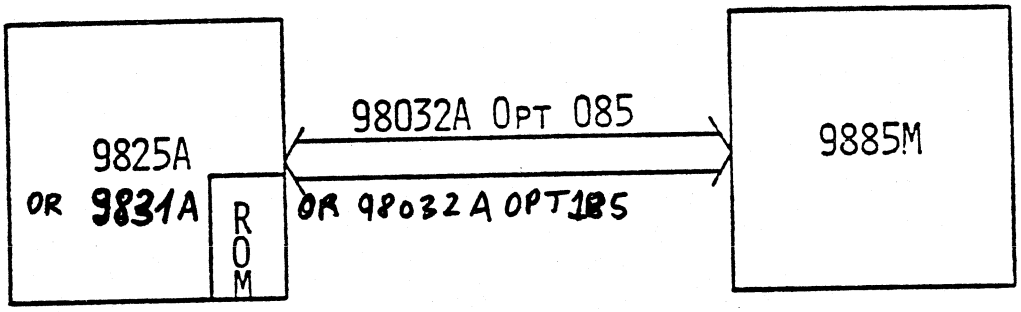
OPTIONS

001	50 Hz
002	RACK MOUNTS
025	9825A CALCULATOR INTERFACE
031	9831A CALCULATOR INTERFACE

RACK MOUNT SEPARATE:

98024F

SYSTEM CONFIGURATION



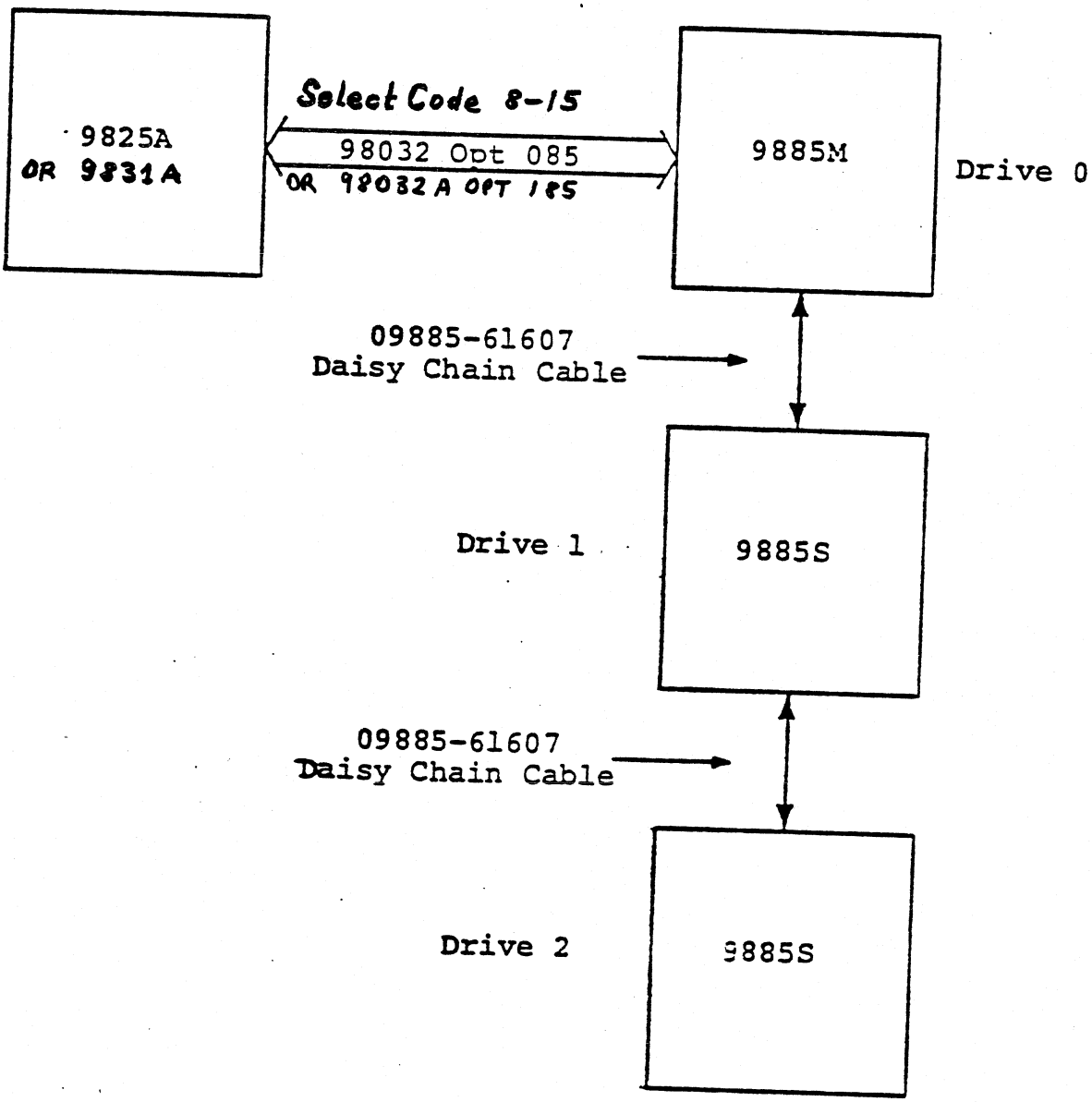
9885M OPT. 025

- 9885M FLEXIBLE DISK DRIVE
- 98032A OPT 085 INTERFACE
- 98217A MASS MEMORY ROM
- 09885-90035 SYSTEM TAPE CARTRIDGE
- MISCELLANEOUS EXTRA DISKS

9885 M OPT. 031

- 9885 M FLEX. DISC DRIVE
- 98032 A OPT 085 INTERFACE
- 98218 A MASS MEMORY ROM
- 09885-10001 SYST. TAPE
- MISCELLANEOUS DISKS

USE OF SLAVES



Max: 3 Slaves per 1 Master

SLAVE DRIVE

- IDENTICAL TO MASTER EXCEPT SOME CONTROLLING ELECTRONICS ARE DELETED

- CASE DIFFERS, ALL ELSE IS THE SAME

VARIABLE SELECT CODE

- SELECT CODE OF MASTER USER SETABLE FROM 8 TO 15
- NOT DEDICATED TO 1 SELECT CODE AS 9880B SYSTEM
- ALLOWS A POSSIBLE SYSTEM OF 32 DRIVES
- MASTER UNITS WILL BE SET FOR SELECT CODE 8 (ON 98032A INTERFACE) BEFORE SHIPMENT

INTERESTING SERVICE FEATURES

- SELF TEST
- DIAGNOSTIC ON USER CARTRIDGE
- DATA RECOVERY ROUTINES ON USER CARTRIDGE
- SIMPLE DRIVE MECHANISM
- NO INSTALLATION
- ANNUAL PREVENTIVE MAINTENANCE

HARDWARE

MEDIUM	-	FLEXIBLE MYLAR DISK COATED WITH MAGNETIC OXIDE
R/W HEAD	-	CERAMIC; IN CONTACT WITH DISK DURING READ
HEAD POSITIONING	-	STEPPER MOTOR/WORM GEAR
ROTATIONAL SPEED	-	360 RPM
RECORDING TECHNIQUE	-	DOUBLE DENSITY

DISK STRUCTURE

67 TRACKS (Ø TO 66)

30 RECORDS PER TRACK

SYSTEM AREA: TRACK Ø

* BOOTSTRAPS: TRACKS 1 TO 4

SPARE SYSTEM AREA: TRACK 5 WITH 9825A
TRACK 1 WITH 9831A

* BOOTSTRAPS ARE IN ROM (98218A) IN 9831A/9885M SYSTEM.

OPT 025 SOFTWARE

- SIMILAR TO 9880B
- ROM FOR 9825A WITH DRIVERS
- BOOTSTRAPS ON DISK WITH MAJORITY OF COMMANDS
- BOOTSTRAPS LOADED FROM TAPE CARTRIDGE
- EXTENSIVE ERROR MESSAGES
- QUICK (5 MINUTES) DISK INITIALIZATION

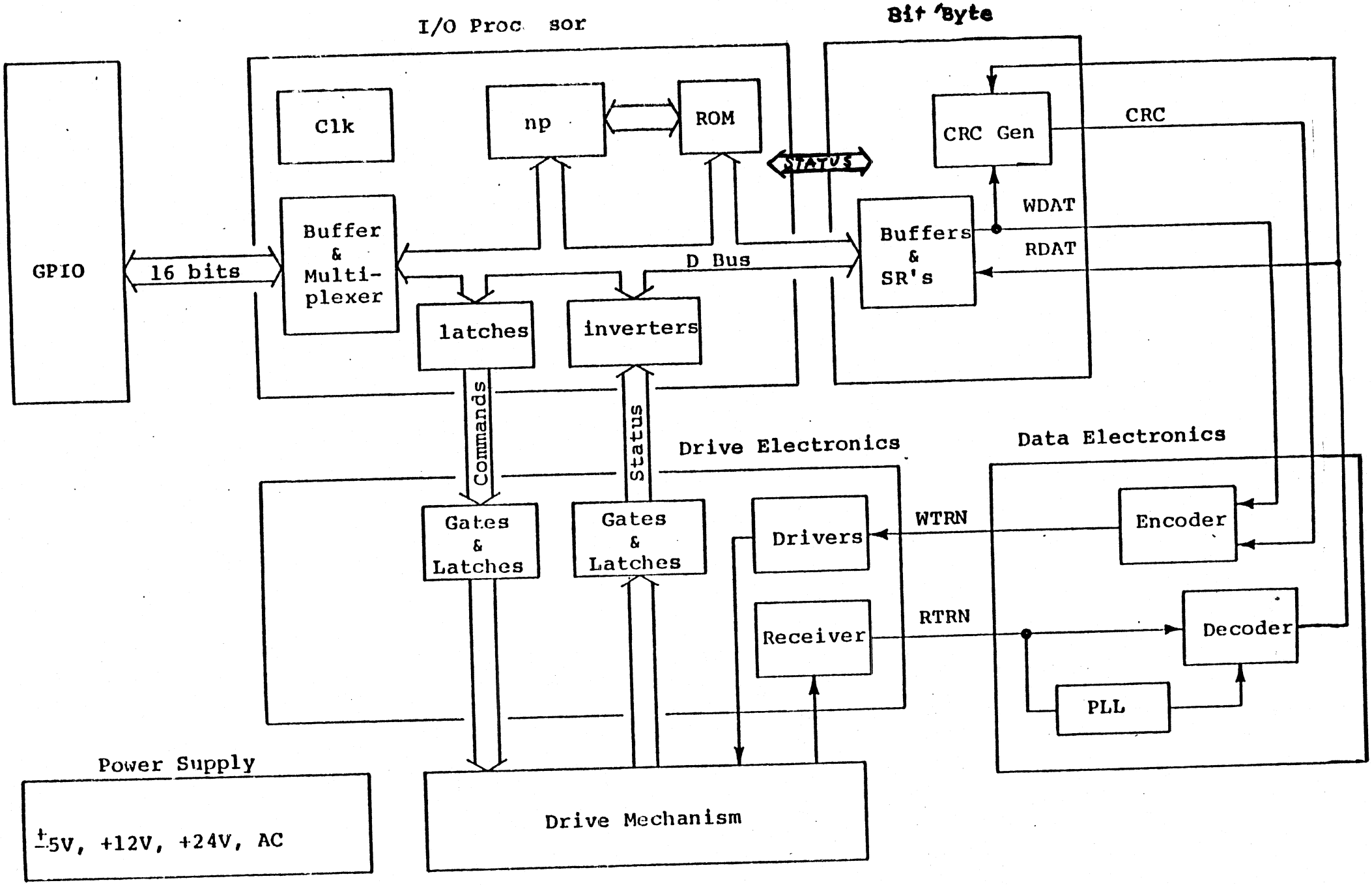
OPT 031 SOFTWARE

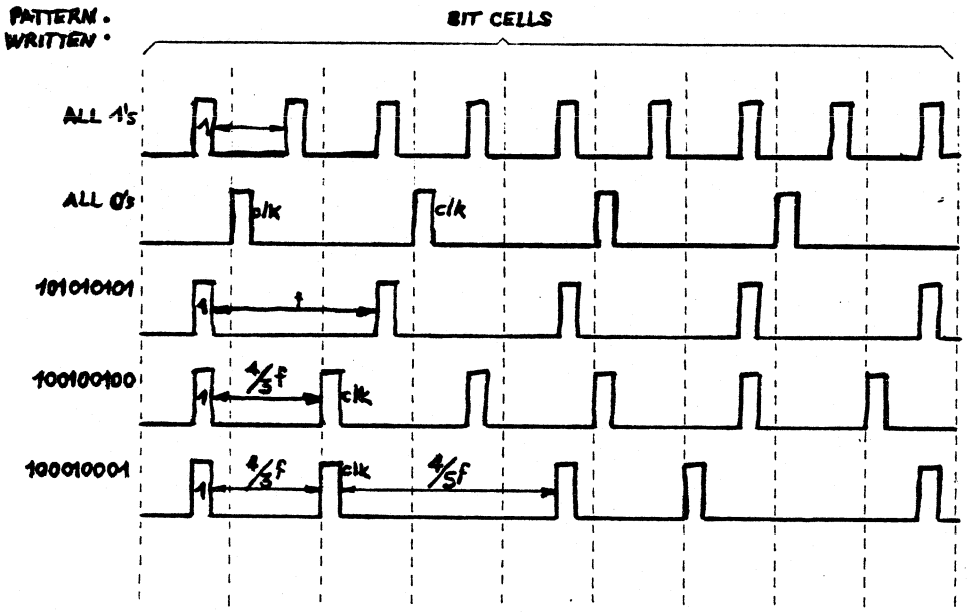
- SIMILAR TO 9880 B
- ROM FOR 9831 WITH BOOTSTRAPS
- EXTENSIVE ERROR MESSAGES
- QUICK DISK INITIALIZATION (≈ 5 MIN)

FEATURES

1. FILES - BY - NAME
* 2. VERIFY
3. COMMAND SET EXPANDABILITY
* 4. MULTI-UNIT/MULTI-SELECT CODE
* 5. DMA, INTERRUPT WITH 9825A ONLY
* 6. DEFECTIVE TRACKS MASKED AUTOMATICALLY
7. EXPANDABLE TO OTHER DISCS
* 8. TRANSFER RATE IMPROVED BY USING INITIAL ADDRESS ONLY
* 9. SPARE DIRECTORY
*10. SOFT ERROR RECOVERY
*11. INTERLEAVING

* INCREMENTAL OVER 9880


I/O Proc sor
Bit Byte
GPIO
16 bits
Buffer & Multi-plexer
Clk
np
ROM
STATUS
CRC Gen
CRC
WDAT
RDAT
Buffers & SR's
D Bus
latches
inverters
Commands
Status
Drive Electronics
Data Electronics
Gates & Latches
Gates & Latches
Drivers
WTRN
Encoder
Receiver
RTRN
Decoder
PLL
Power Supply
±5V, +12V, +24V, AC
Drive Mechanism



Double Density Recording Technique

Double Density Recording

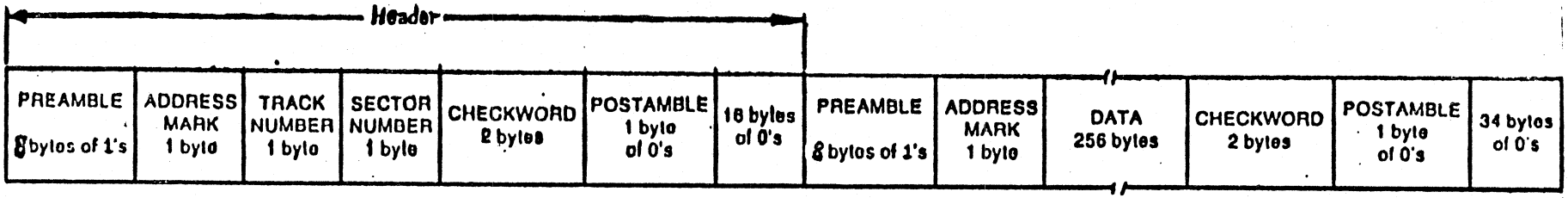
Note that there is a difference between recording technique used in 9880 System and that of 9885.

In 9880 System clock pulses were written regardless of whether a bit was a 1 or a zero. In double density scheme clocks are not written unless the bit is a zero, but not for each zero bit.

Rules for double density

1) If the bit is a 1, write a pulse in the center of the bit cell.

2) If the bit is a zero write a clock at the leading edge of the bit cell if there was no clock or data in the previous cell.



Note: The header is written on the disk only during initialization.

DISK RECORD STRUCTURE

RULES FOR DOUBLE DENSITY

WRITE DATA BITS IN CENTER OF THE BIT CELL.

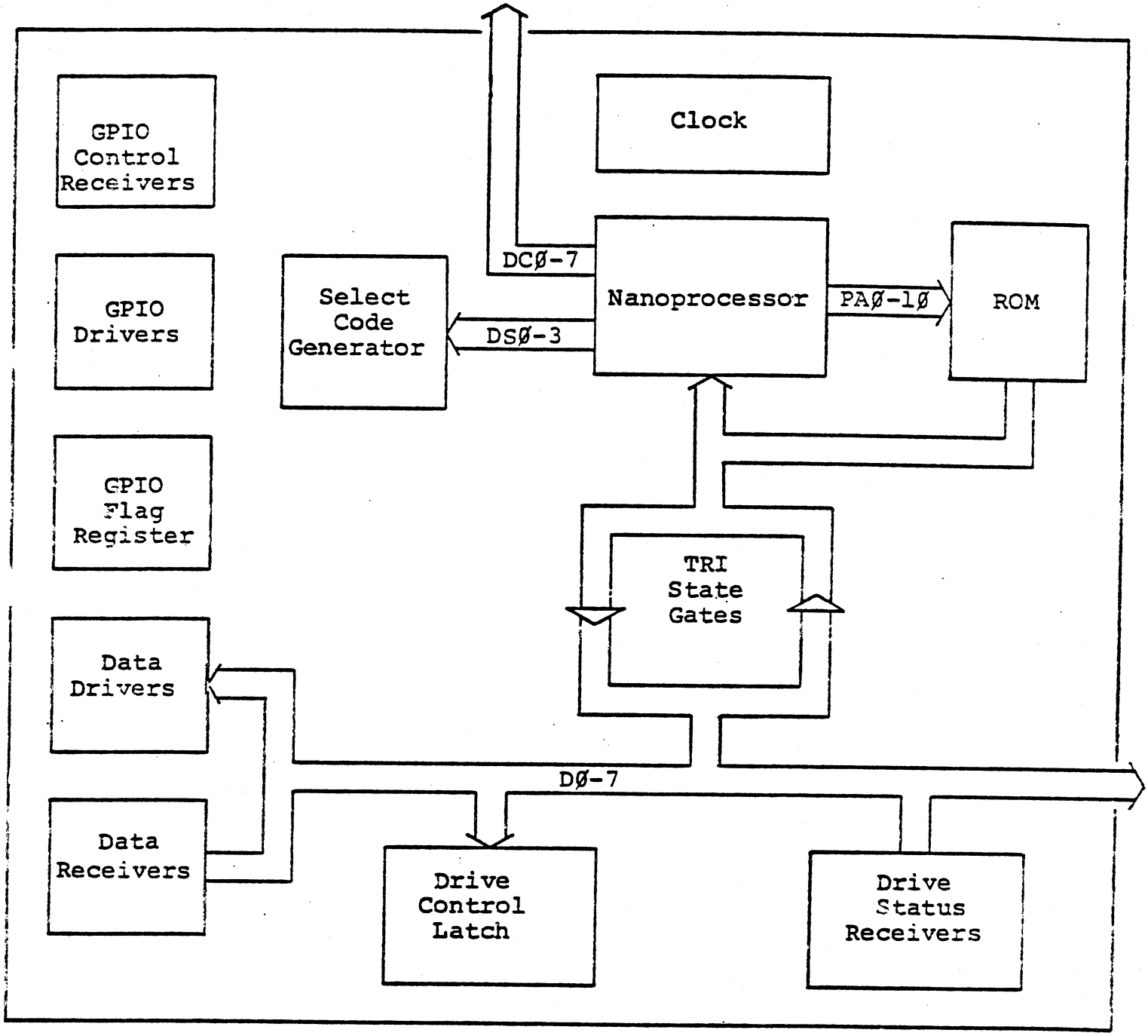
WRITE CLOCKS AT LEADING EDGE OF BIT CELL IF:

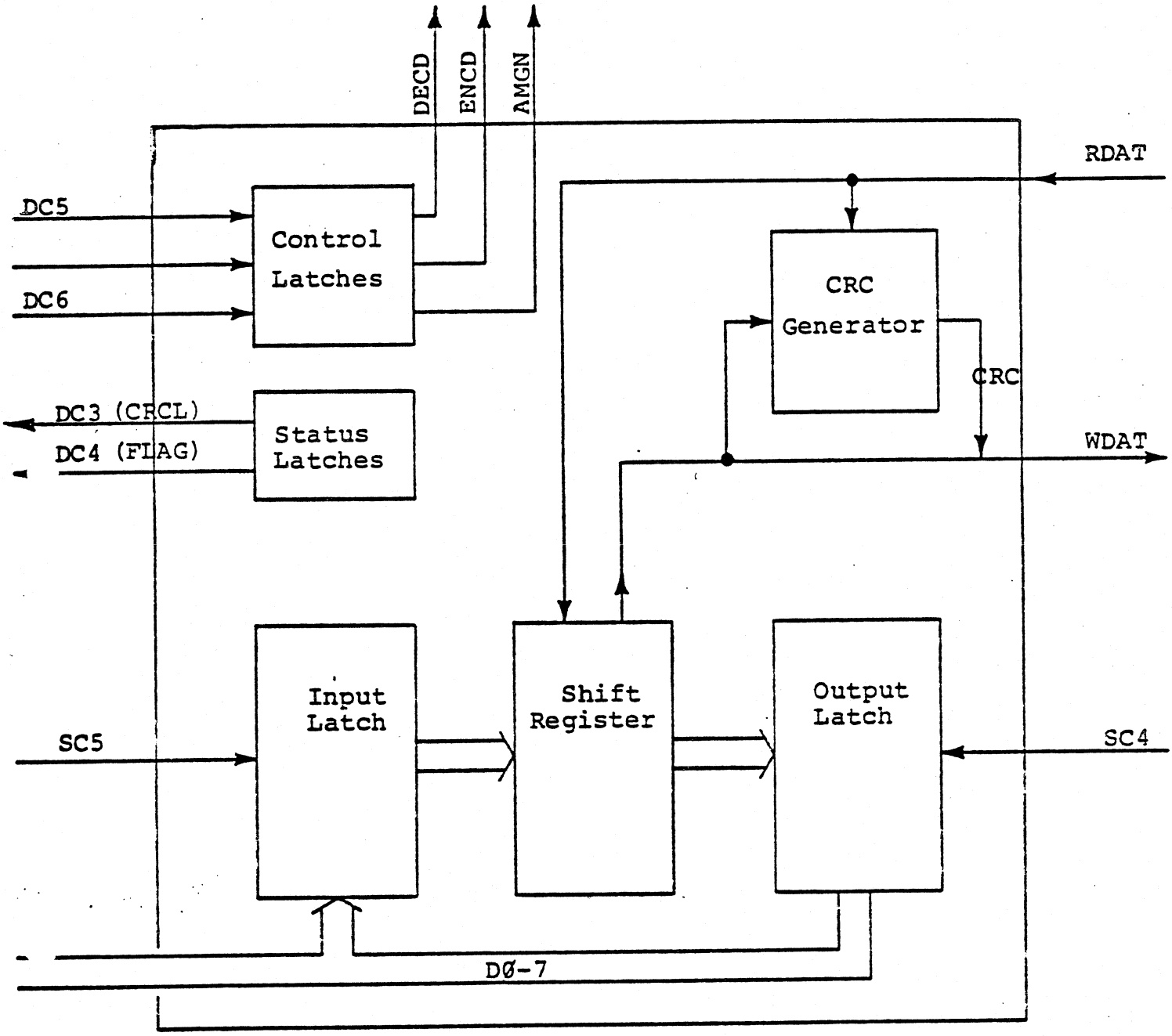
1) NO DATA OR CLOCK BIT WRITTEN IN PREVIOUS CELL

AND

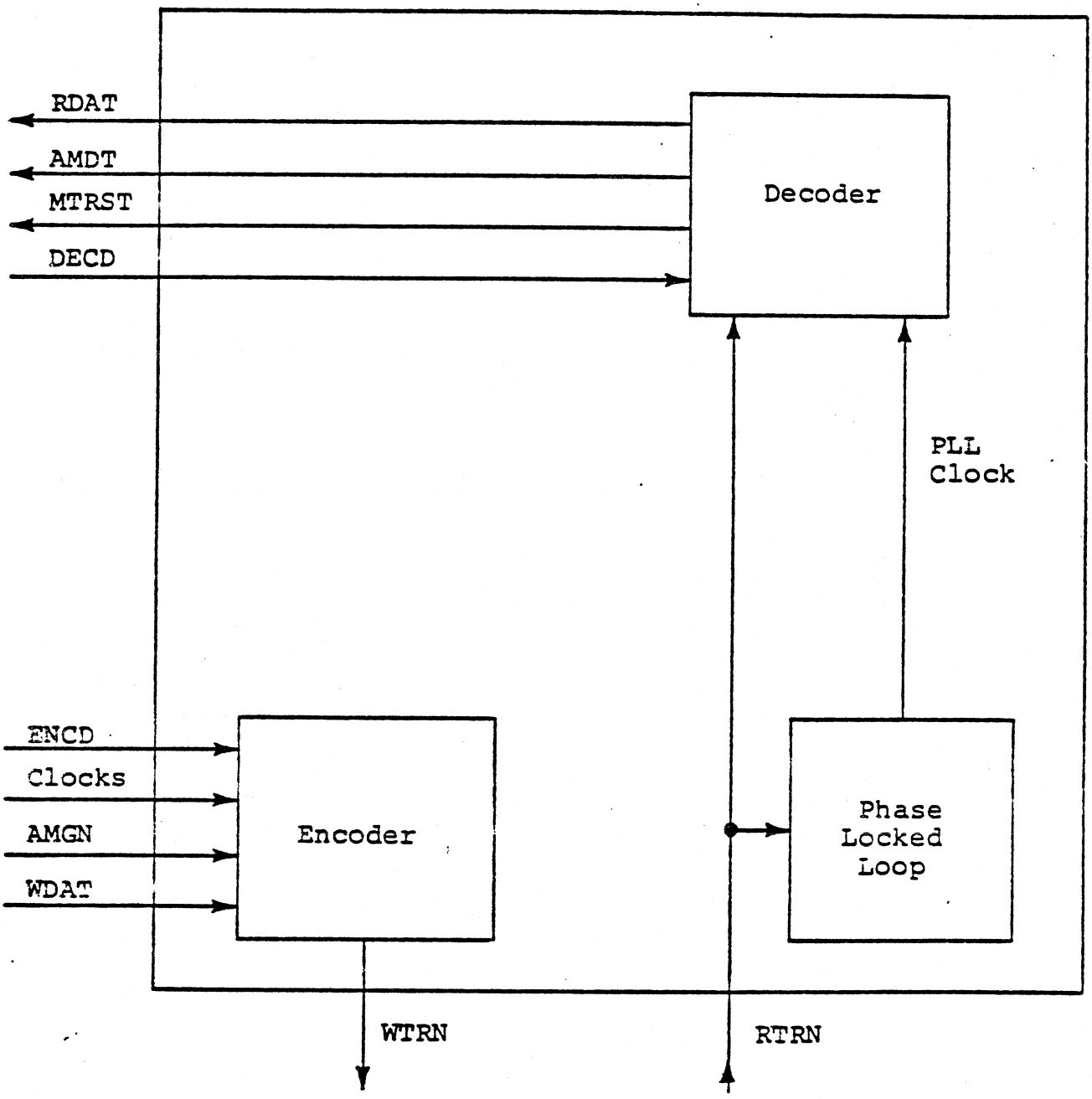
2) NO DATA BIT WILL BE WRITTEN IN PRESENT CELL.

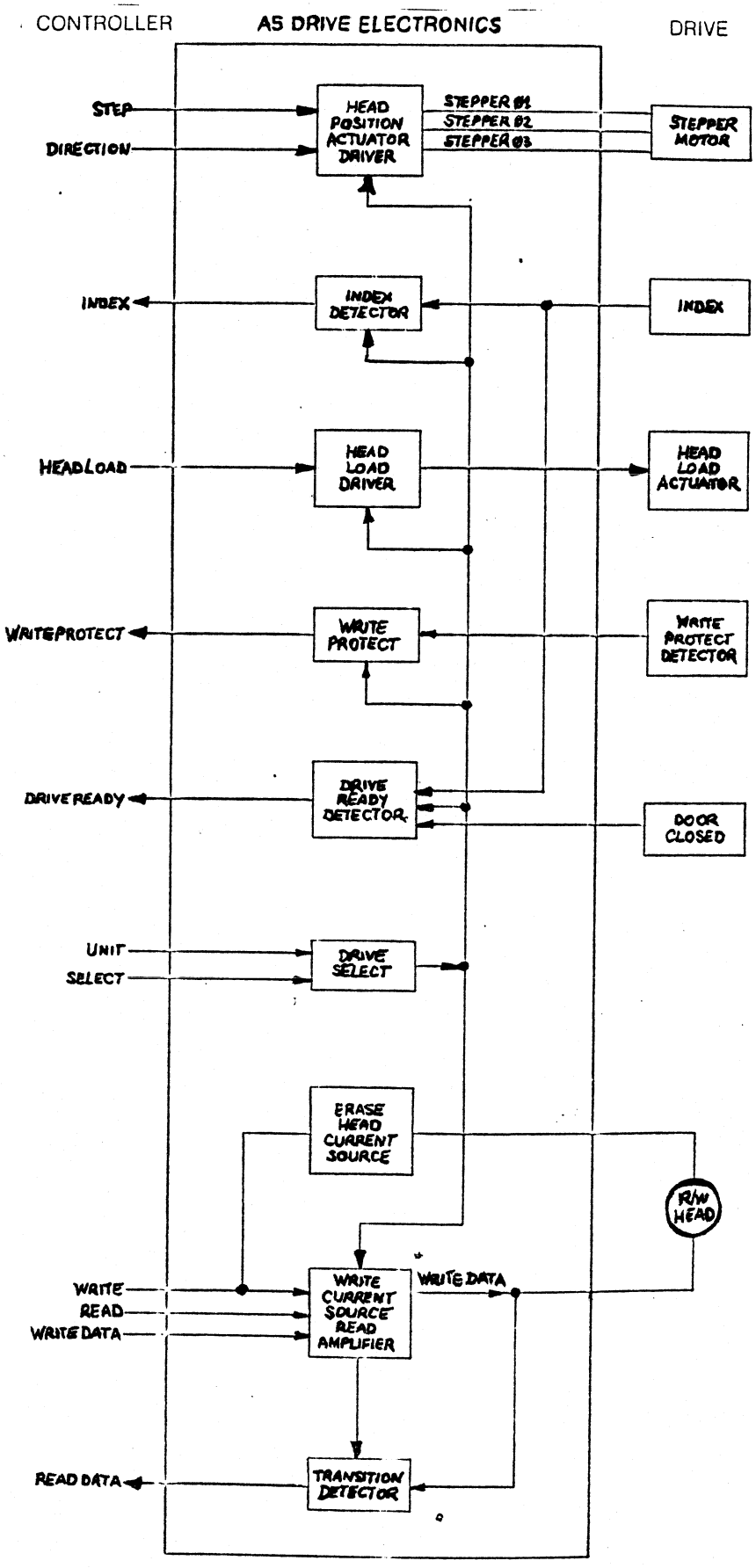
I/O PROCESSOR




DECD
ENCD
AMGN
RDAT
DC5
DC6
Control
Latches
CRC
Generator
CRC
DC3 (CRCL)
DC4 (FLAG)
Status
Latches
WDAT
Input
Latch
Shift
Register
Output
Latch
SC5
SC4
DØ-7

Data Electronics





Drive Block Diagram

9885M/S ADJUSTMENTS AND PERFORMANCE CHECKS

MECHANICAL

- HEAD ALIGNMENT
- TRACK 0 FLAG
- TRACK 0 STOP
- INDEX PULSE
- HEAD LOAD ACTUATOR
- CARRIAGE
- DISK GUIDE
- HEAD LOAD BUTTON
- WRITE PROTECT

ELECTRICAL

- HEAD AMPLITUDE CHECK
- READ AMPLIFIER BALANCE

9885 M/S Adjustments and Performance Checks

Each adjustment should be explained briefly. Each will be covered in greater detail later.

Head Alignment - probably the most important adjustment. Necessary to ensure compatibility between 9885 systems. Track locations should be in the same radial positions on all drives.

Track Zero Flag - adjustment of a metal shield which breaks a light beam generating a signal indicating that the R/W head is positioned over track zero.

Track Zero Stop - adjustment of a mechanical stop which limits the motion of the R/W head assembly. The stop prevents the head from moving past track -1 and striking the drive casting.

Index Pulse - an index pulse is generated by the drive each time the disk rotates into sector zero. This adjustment ensures that the pulse is of proper duration and that it occurs when the R/W head is actually reading sector zero. It is similar to the sector circumferential adjustment done by reading track 95 on the alignment disk for the 9880 system.

Head Load Actuator - the R/W head is loaded by a solenoid on the drive mechanism. This adjustment sets the mechanical limits for the solenoid motion and ensures that the head can read data within a specified time after a load command is sent to the drive.

Carriage - This is a rough adjustment done only when the carriage/head assembly is replaced. It ensures that the head is positioned in approximately the correct radial position prior to doing a head alignment.

Disk Guide - ensures that there is proper clearance between the disk guide and the flexible disk. It is normally done only when the disk guide is removed for service or the front door is detached from the disk guide.

Head Load Button - the head load button contacts the disk when the head is loaded and provides proper pressure for the head against the disk. The alignment ensures that the signal output from the R/W head is of maximum value.

Head Amplitude - ensures that the signal amplitude from the R/W head is within tolerance.

Read Amplifier Balance - adjustment of read amplifier for optional balance to provide the greatest read error margin.

TOOLS REQUIRED FOR ALIGNMENTS

OSCILLOSCOPE (DUAL TRACE)

3 10:1 PROBES

DISK SERVICE FIXTURE

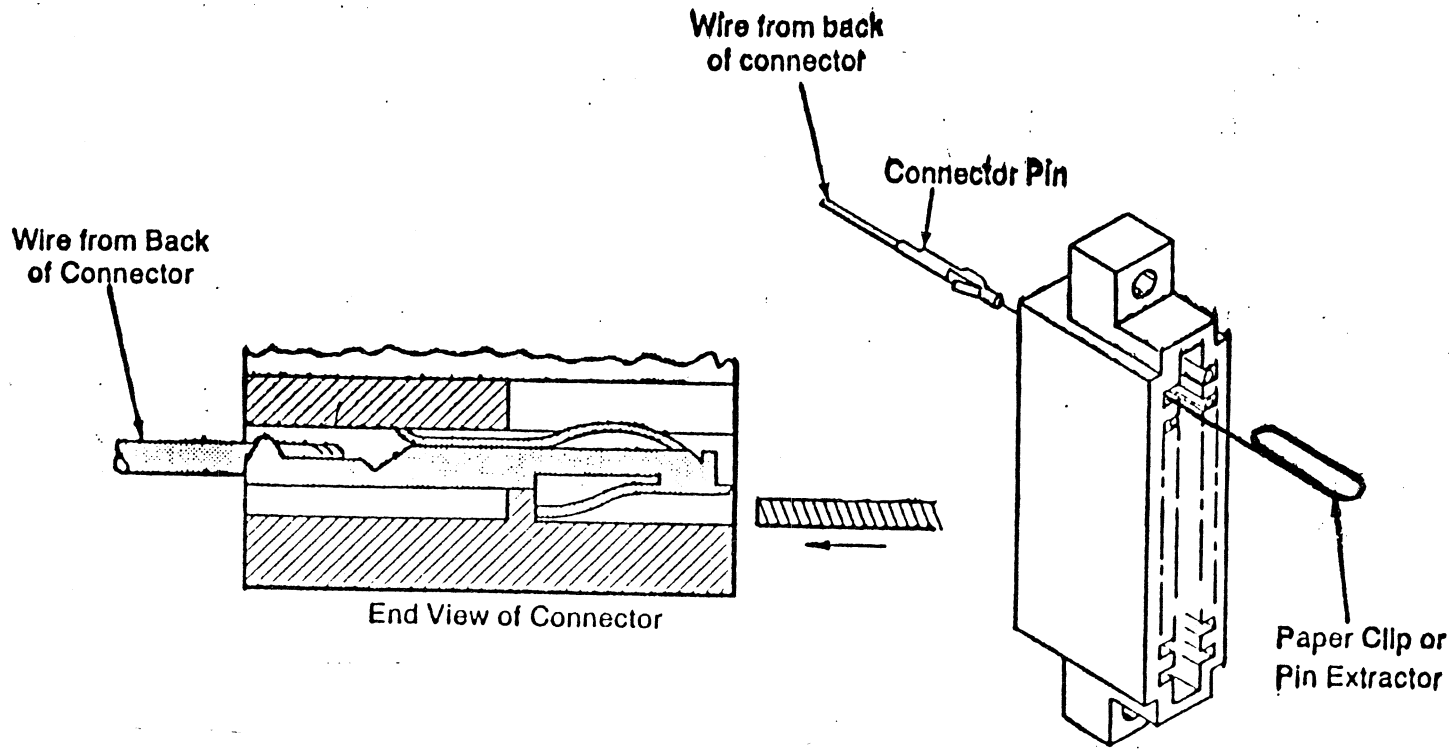
ALIGNMENT DISK

DISK GUIDE ALIGNMENT TOOL

HEAD LOAD ACTUATOR ALIGNMENT TOOL

VOLTMETER

HEAD ALIGNMENT CLAMP



REMOVING PINS FROM DRIVE BD CONNECTOR

Tools Required

Oscilloscope - a good quality scope is necessary. Must be able to input two channels, invert one channel, and display the sum.

10:1 Probes - needed to avoid loading some low amplitude lines.

Disk Service Fixture - DSF. Used to seek drive without direction from the 9825 or other controlling device. More on the DSF later.

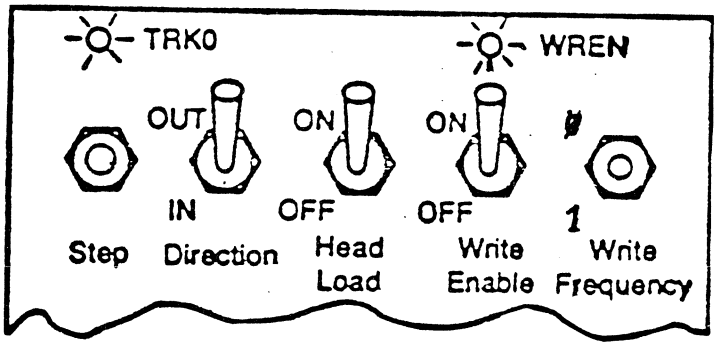
Alignment Disk - special formatted disk used as an alignment standard.

Disk Guide Tool - used only when the disk guide adjustment is necessary.

Head Load Actuator Tool - used only when actuator is adjusted.

Voltmeter - necessary if supply voltages are to be checked.

Head Alignment Clamp - used to grip the Stepper Motor when performing head radial alignment. Th motor can be gripped by hand, but it does get hot.


TRK0
WREN
OUT
IN
ON
OFF
ON
OFF
1
Step
Direction
Head Load
Write Enable
Write Frequency

DSF (Disk Service Fixture)

This is used to permited CE to operate the drive mechanism without needing calculator. It is used with several of the alignments and adjustments.

DSF Switches

WRITE - determine the type of data which will be written on the disk. If the switch is in the 1 position, a pulse train representing all 1's is written, if the 0 position, all 0's are written, if the OFF position current track contents are erased.

WRITE ENABLE - determines whether a write or a read is being performed on the disk. If in the ON position, the type of information set by the WRITE switch is written on the disk.

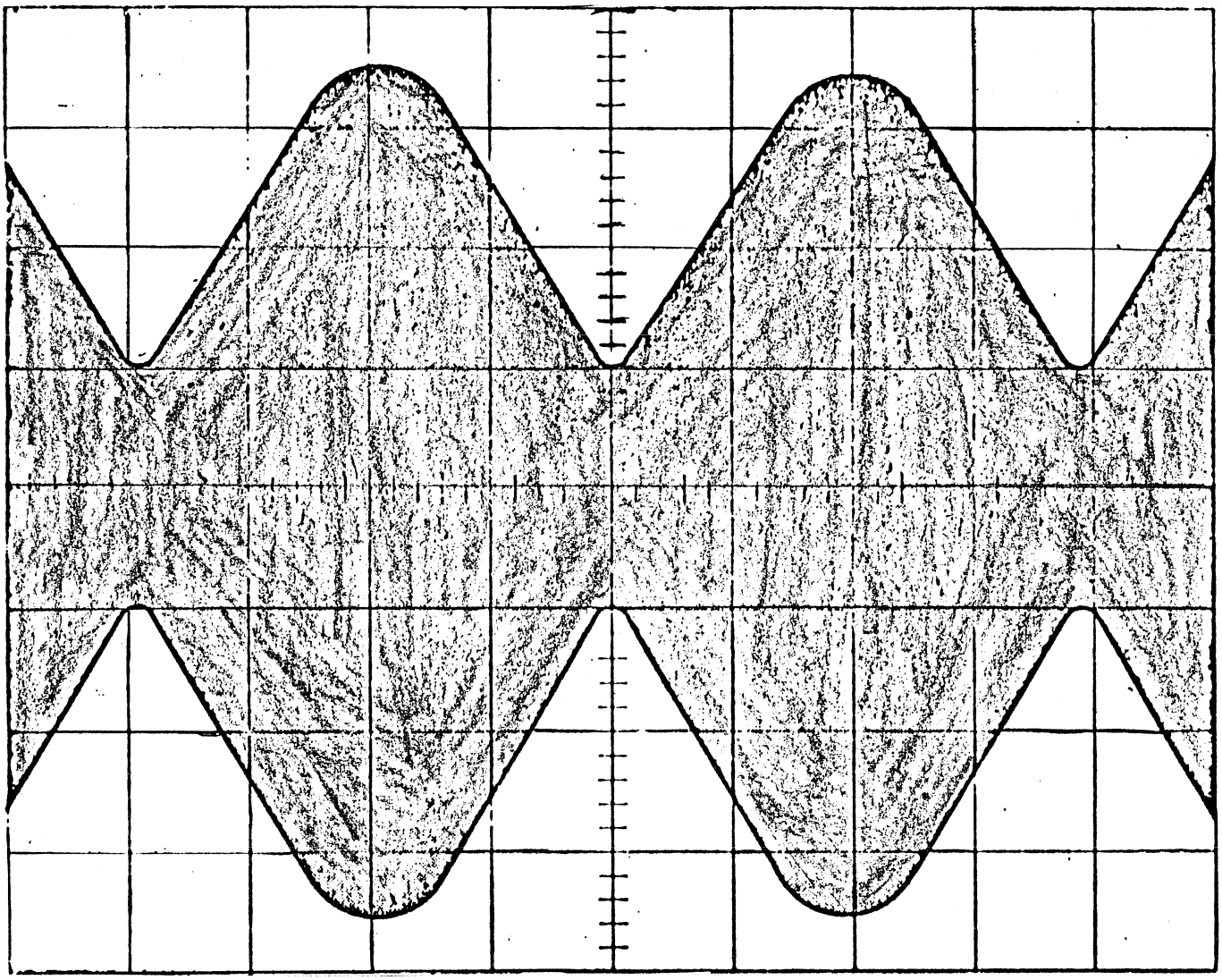
Regardless of the position of the write enable switch, it is not possible to write on a protected disk.

If the OFF position, a read of disk data is performed. An LED is used as an indicator to show whether the disk is WRITE enabled.

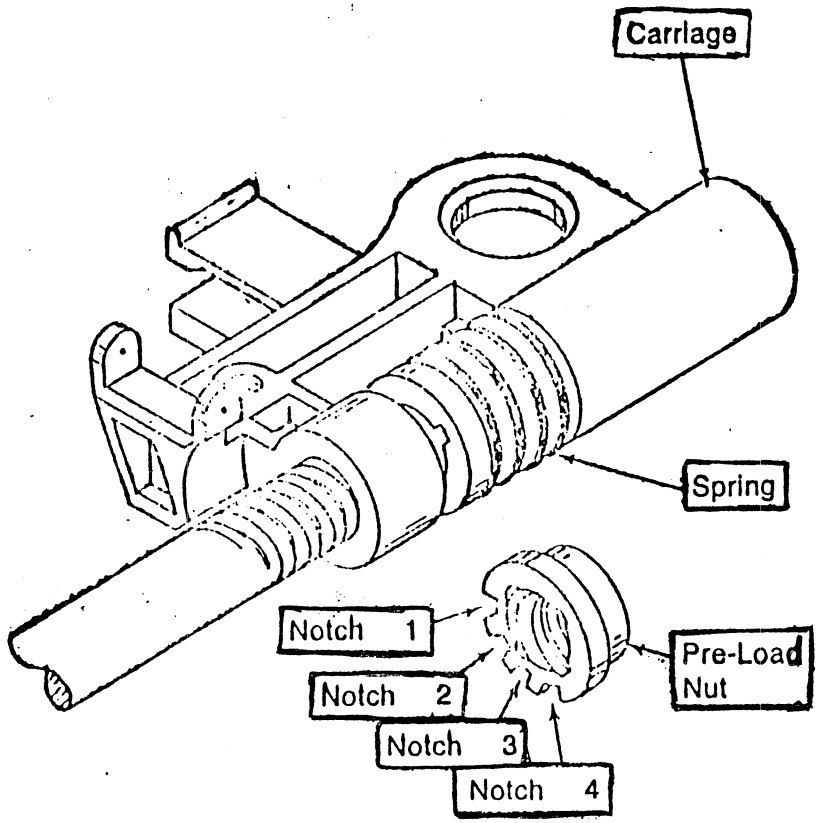
Head Load - used to load and unload the R/W head on the drive mechanism.

Direction - used to set the direction of head motion when the stepper motor is pulsed. The Track Ø LED indicates when the head is positioned over track Ø. This LED tests both the output of the track Ø detector and the phase 1 winding of the stepper motor.

STEP - used to pulse the stepper motor. If the button is pressed once, the stepper motor will take one step (and the head will move 1 track). If the button is held down, the motor will step continuously.



HEAD RADIAL ALIGNMENT WAVEFORM



HEAD/CARRIAGE ASSEMBLY

Head Radial Alignment

Need: Scope
3 10:1 probes
alignment disk
DSF
head alignment clamp

Use a 9885M with the top cover off to point out adjustment locations.

This ensures compatibility between drives, accomplishes same thing as using alignment disk and cylinder 100 on 9867B.

Use A and B inputs to scope, invert one, and display sum. Use external trigger on index pulse.

Adjust to get smaller lobe to within 90% of large lobe. Adjustment is made by loosening the screws that fasten the stepper motor to the drive chassis and then rotating the stepper motor body relative to the chassis until the alignment is correct. The alignment clamp is useful for this procedure because the motor will get extremely hot while remaining on the alignment track. Note that the preload nut should be in notch 3.

The alignment pattern is on track 38.

Alignment should also be verified at track Ø by observing that track Ø data on the alignment disk is present when the track Ø LED is lit.

Head alignment should be checked once per year during a PM call.

Note that the disk should be at room temperature for at least 20 minutes before attempting alignment.

TRACK ZERO FLAG

ENSURES TRACK 0 DETECTOR HAS OUTPUT ON TRACKS 0 AND 1.

DO ONLY IS HEAD RADIAL ALIGNMENT IS CORRECT.

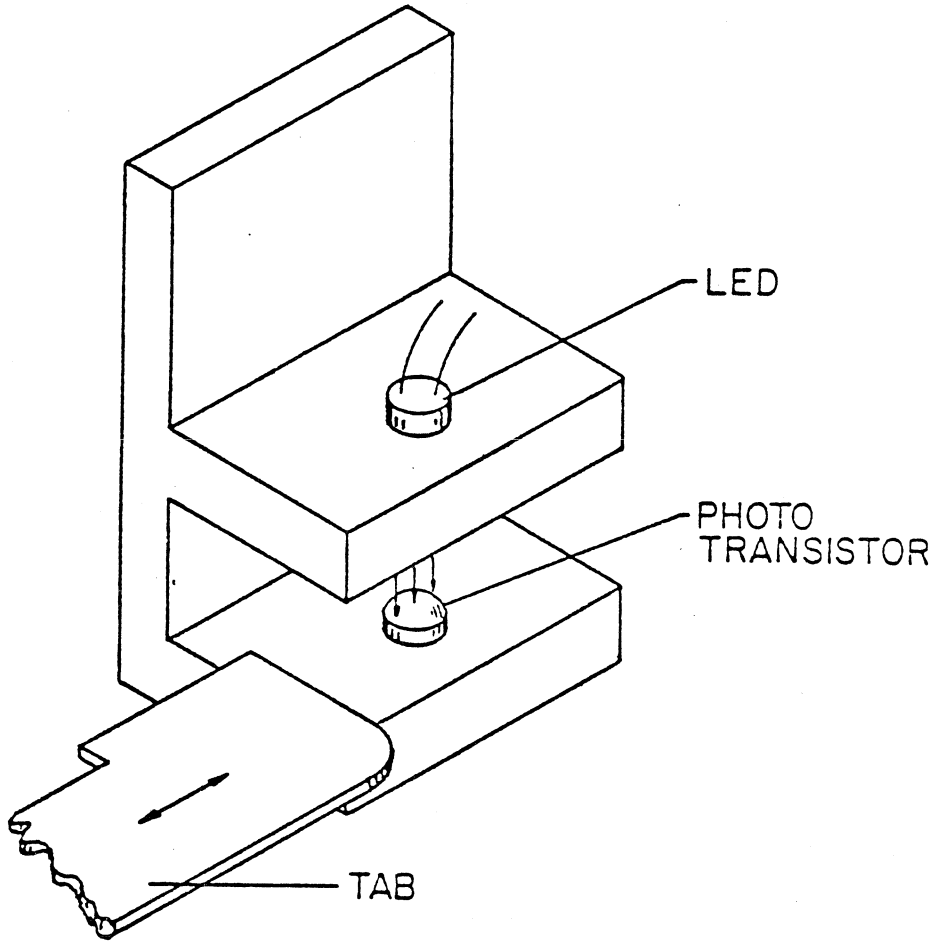
Note that this alignment should not be done unless head radial alignment is correct.

In this case, we are monitoring the output of the detector itself. The detector should have an output on tracks Ø and 1. The output of the track Ø LED on the DSF is an only at track Ø since this is the result of the track Ø detector ANDed with phase 1 of the stepper motor.

The track zero detector is analogous to the C channel encoder on the 9867B (7900A) which senses cylinder Ø.

The track zero detector is comprised of an LED, a photo-cell, and a metal tab.

TRACK Ø DETECTION



When the carriage assembly is positioned to tracks 0 or 1, the tab blocks the light beam from the LED to the phototransistor. The tab is attached to the carriage assembly.

At the other carriage positions, the tab will not block the light beam.

TRACK ZERO STOP

MECHANICAL ADJUSTMENT

PREVENTS DAMAGE TO HEAD/CARRIAGE ASSEMBLY

Track Zero Stop

This adjustment sets some physical limits for the motion of the carriage assembly. Without the stop, it would be possible for the load arm on the carriage assembly to strike the drive casting if the stepper motor was directed to seek past track -1. This could cause the load arm to shear off the carriage.

Show students the stop, the load arm, and the carriage.

It is necessary to use a feeler gauge for the adjustment. Accuracy not that critical however, as long as carriage can move to track -1 and carriage is inhibited from striking the drive baseplate.

INDEX PULSE ADJUSTMENT

SETS THE INDEX PULSE WIDTH

SETS THE RELATIONSHIP BETWEEN HAND POSITION AND INDEX PULSE TIMING

Index Pulse Adjustment

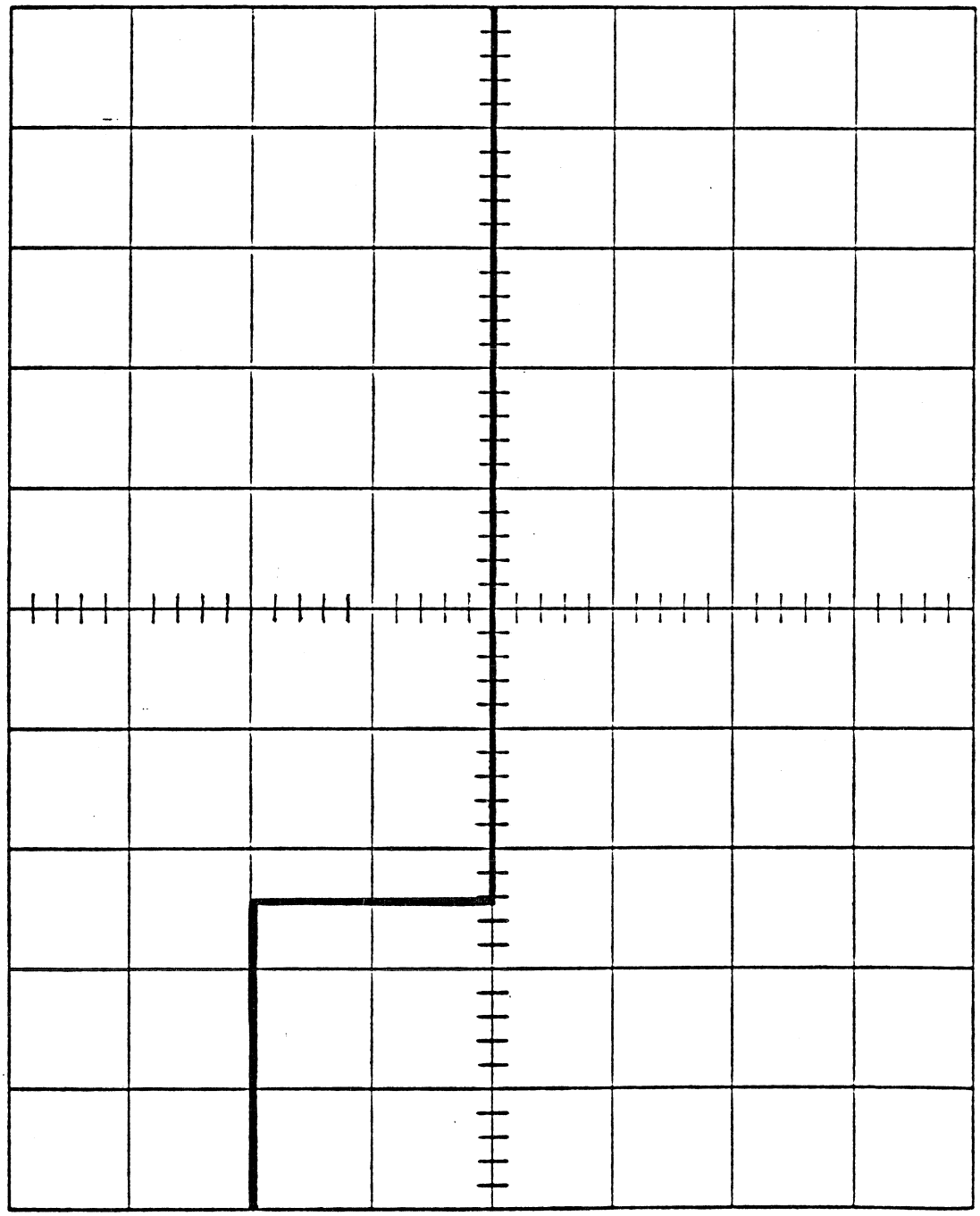
This adjustment similar for circumferential skew made on cylinder 95 for 9880.

Necessary to ensure compativility between various disk drives.

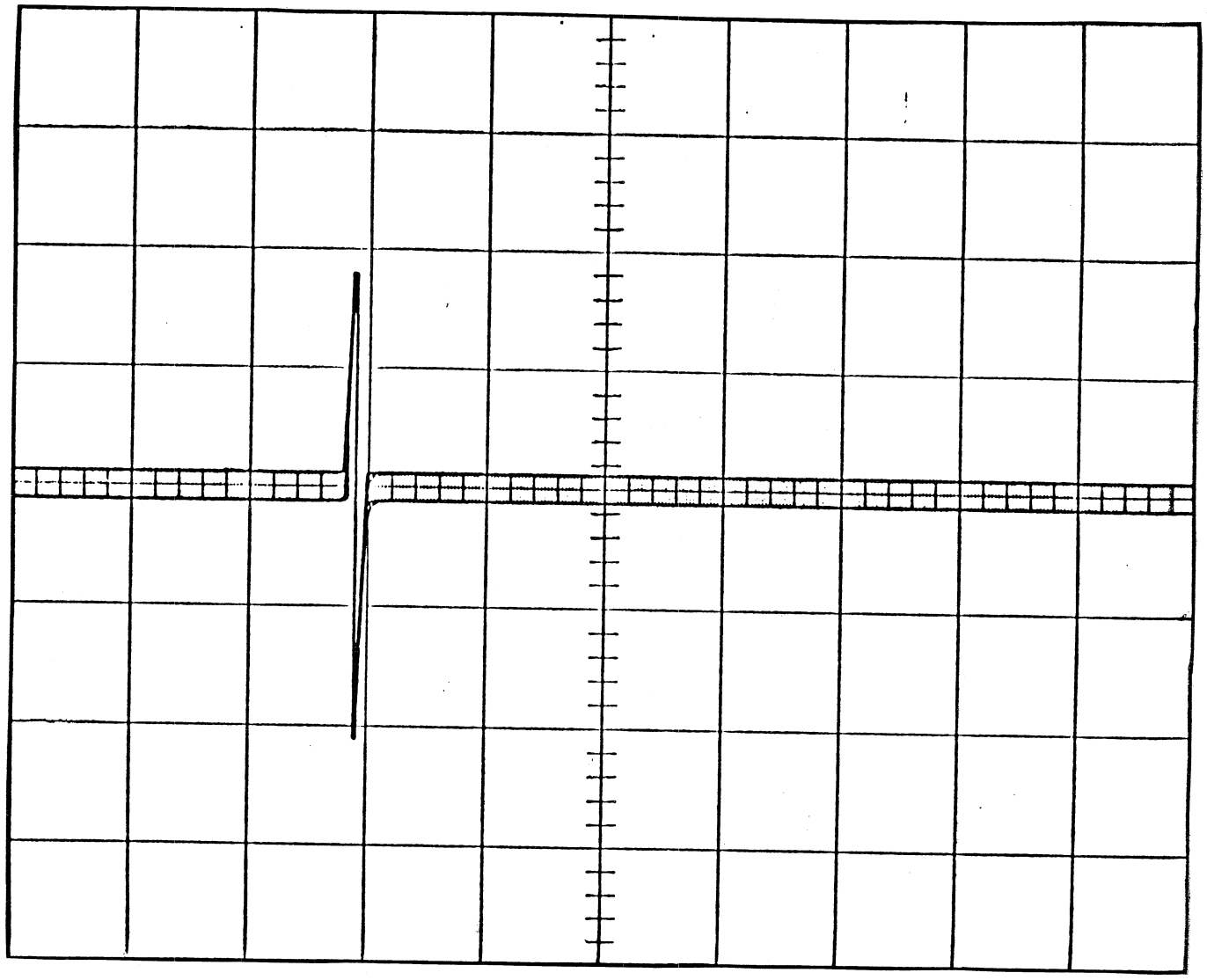
Adjustment done in 2 phases:

1) *Adjust the index width*

2) *adjust the delay between the index pulse and a data burst on the alignment disk.*



INDEX PULSE WAVEFORM



INDEX TIMING WAVEFORM FROM ALIGNMENT DISK

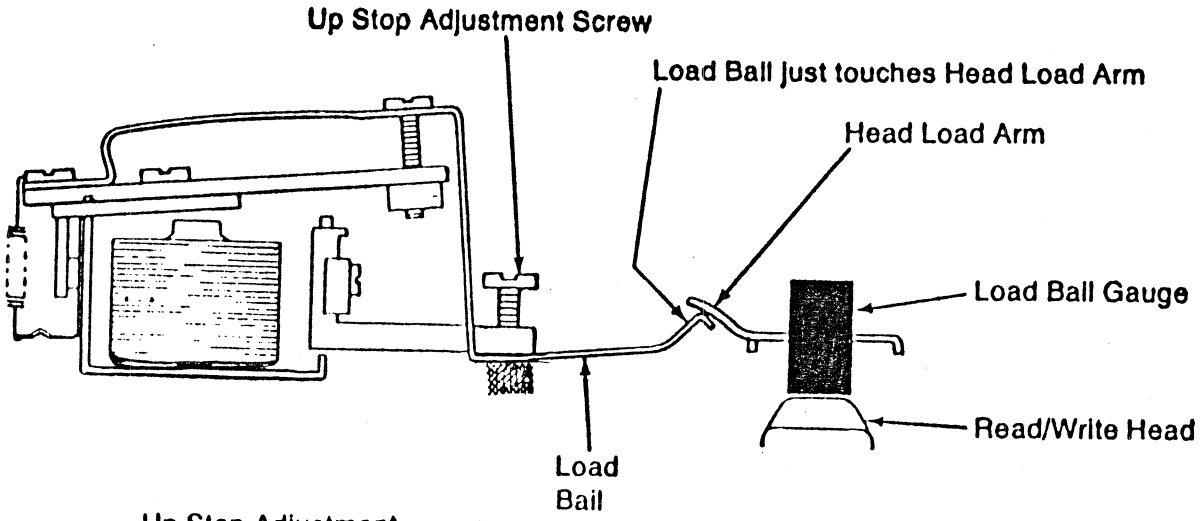
Head Load Actuator

Adjusts some clearances on the solenoid that loads the R/W head. The adjustment is first made mechanically by using a special gauge provided in the service kit. The adjustment is then verified by using a signal on track Ø of the alignment disk to check the time required to load the head.

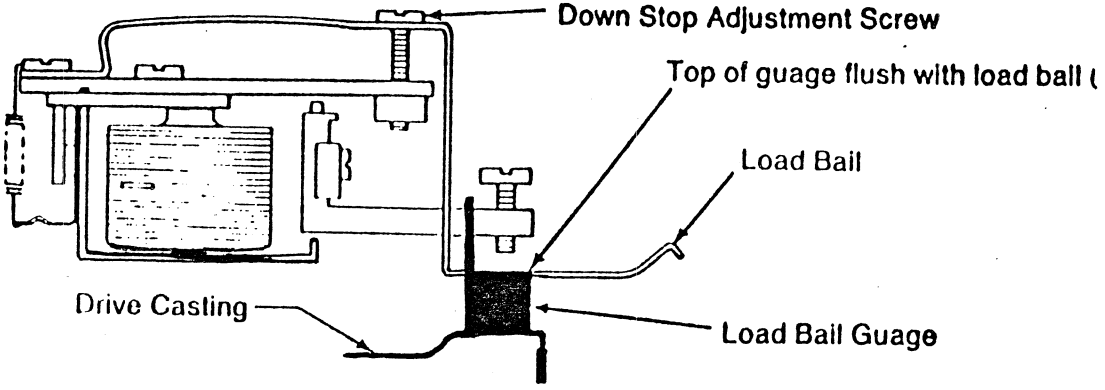
The mechanical adjustment has two portions - the upstop adjustment and the downstop adjustment.

1. Upstage adjustment
   Ensures that the actuator arm containing the load button is the propoer distance above the disk when the head is not loaded. If it is too far above the disk, it may take too long for the head to load after receiving a load command. If it is too close to the disk, the head may be loaded at all times causing excessive wear on both the head and disk.

2. Downstop adjustment
   Ensures that the load button is fully in contact with the disk when the head is loaded. If the actuator load bail is allowed to move too far down, it may come in contact with the disk jacket. If the load bail does not move down far enough, the load button will not fully contact the disk.

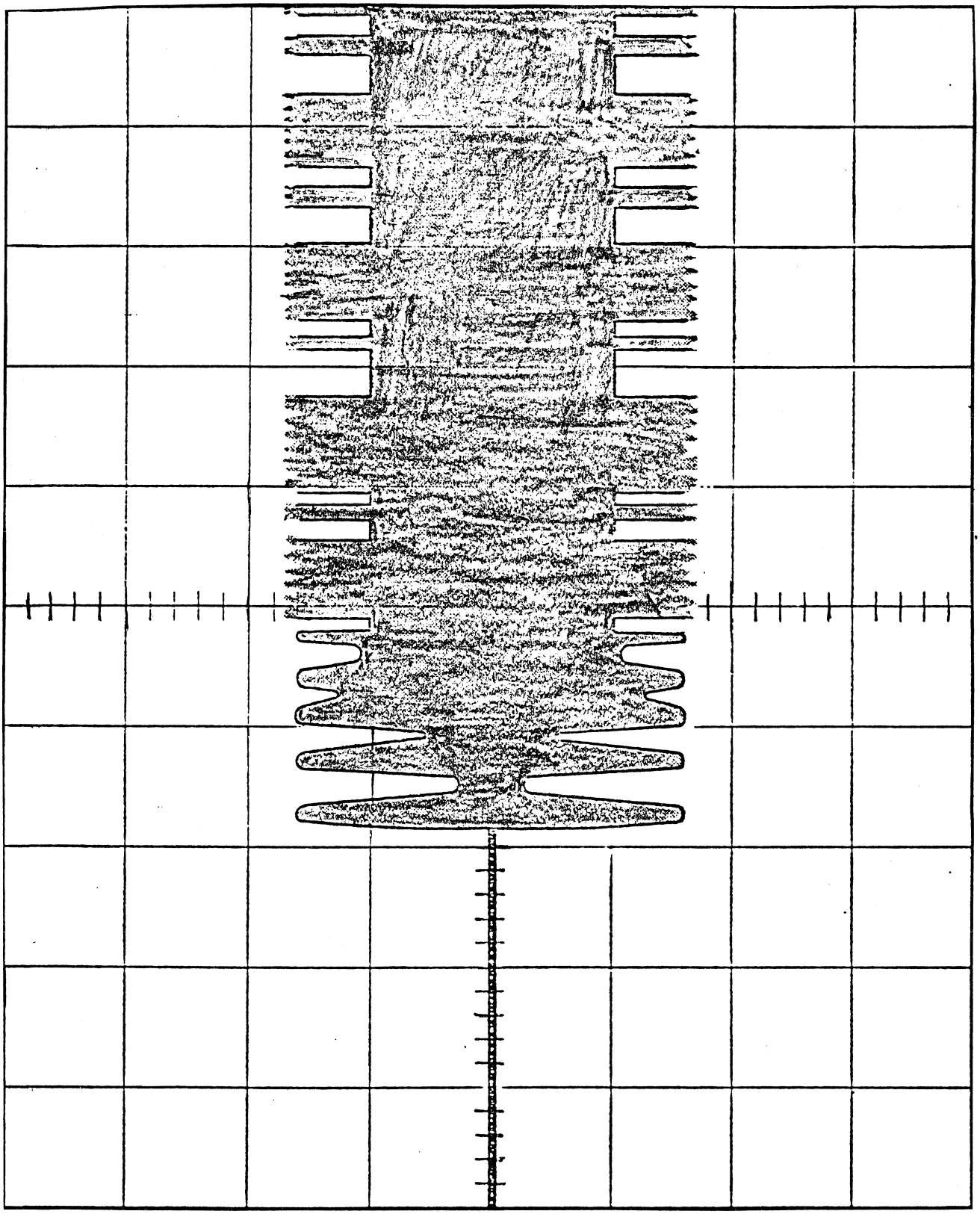


Up Stop Adjustment



Down Stop Adjustment

HEAD LOAD ACTUATOR ADJUSTMENTS



HEAD LOAD TIMING WAVEFORM

Head Load Actuator Timing

This is a verification of the adjustment made with the alignment tool. The amplitude of the read signal should reach full amplitude within 35 ms of the load command. The scope is triggered by the load signal - it is necessary to toggle the load switch a few times to be able to observe the waveforms.

CARRIAGE ADJUSTMENT

ROUGH ADJUSTMENT

DONE IN PREPARATION FOR HEAD RADIAL ALIGNMENT

DONE ONLY WHEN CARRIAGE OR STEPPER IS REPLACED

Carriage Adjustment

Note that this is a rough adjustment to get the carriage/ stepper assembly approximately aligned before closing the head radial alignment. The data pattern on track zero of the alignment disk is used with the track zero LED on the DSF to align electrical track zero to mechanical track zero.

The adjustment does not have to be done when checking head alignment during a PM call.

DISK GUIDE ALIGNMENT

DONE WHEN DISK GUIDE HAS BEEN REMOVED

DONE WHEN DOOR DETACHED FROM DISK GUIDE

NEED TOOL FROM SERVICE KIT

SETS CLEARANCE BETWEEN DISK GUIDE AND DISK JACKET

Disk Guide

Adjustment done only when the disk guide has been removed or the door detached from the disk guide.

The tool is used to set the separation of the disk guide and the base plate casting when the door is closed and latched.

Take care that the door is attached straight to the disk guide - it is possible to attach it in a crooked fashion. If on crooked the door will not be parallel to the base and will not close properly.

HEAD LOAD BUTTON

DO DURING PM AFTER CHANGING BUTTON

ADJUST FOR MAXIMUM AMPLITUDE

Head Load Button Adjustment

Should be done whenever the load button is changed. Button should be changed during the annual PM.

Use needle nose pliers to remove the old button. Use screwdriver to rotate the button until you get maximum read amplitude. There may not be significant difference in amplitude as button is turned. This is OK.

WRITE PROTECT

ADJUST FOR MAXIMUM OUTPUT ON A PROTECTED DISK.

Write Protect

Ensures that the write protect detector is located properly over the protect hole on a protected disk.

The write protect signal is monitored and the detector is adjusted (moved) until this signal is of maximum amplitude.

This adjustment is necessary only when the write protect detector or disk guide is replaced. Not necessary to do during PM.

HEAD AMPLITUDE

VERIFY A NEW HEAD

- SHOULD SEE AT LEAST 120 MV.

NEW HEAD WILL BE WELL ABOVE 120 MV.

Head Amplitude

Can be used to verify the performance of a new head.

Due to head degradation caused by wear, new heads will show amplitude above 120 mv. 120 mv. is the minimum amplitude for acceptable performance.

It is vital to use good medium to preserve head quality. A bad disk can destroy a head after only a couple of revolutions. Note that customers must use HP approved disks (HP or IBM) or the warranty will be void.

READ AMPLIFIER BALANCE

- DO DURING ANNUAL PM
- WHENEVER YOU CHANGE HEADS
- WHENEVER YOU CHANGE DRIVE BOARDS

Read Amplifier Balance

Should be done during the annual PM and whenever the head or drive board is changed.

Observe the digital read signal from TP 11 on the drive board. Write all 1's on track 66 and read back. Adjust so that the read signal in the center convergers to one pulse.

ANNUAL PM PROCEDURE

CHANGE LOAD BUTTON

CHECK HEAD ALIGNMENT

CHECK INDEX ALIGNMENT

ADJUST READ AMPLIFIER BALANCE

CLEAN HEAD (ONLY IF NECESSARY)

DIAGNOSTICS

SIMILAR TO BIN 11 FOR 9880

ldb 3

ckrd

ptrn tst

WILL RUN WITH OR WITHOUT ROM

Diagnostic

The diagnostic routines are provided to all customers on the system tape cartridge. The diagnostics are binary programs stored on file 3 of the user cartridge. To run do 1 db 3.

The diagnostic is also on tack 1, file 3 and track 0 and 1 file 103. There are thus 4 copies of the diagnostic available to the user. This is true of all files on the system tape cartridge - boots, INI, etc.

If the ROM is present, the diagnostic test will be performed on the drive selected by the last drive statement. If the ROM is not present, the test will default to drive ø on select code 8.

2 diagnostics are provided:

ckrd - which is non-destructive

ptrn tst - which is a destructive test

ckrd ROUTINE

EXAMPLES:

```
ckrd

ckrd 1, 2

ckrd 1, 2, 10

ckrd 5, 1

ckrd 0

ckrd 0, 5, 10
```

ckrd Routine

The ckrd routine is a counterpart to the checkread diagnostic on file 15 of the 9880 Service Cassette.

The ckrd diagnostic will not reread an area (as the normal read routine in the ROM will) if an error occurs. All error messages are printed as they occur. The routine will read each record of a track.

All reads are done under a normal margin.

The ckrd statement is programmable once the binary program has been loaded.

The ckrd statement will accept 3 parameters - all are optional. If no parameters are included, the test is performed once on the entire surface of the disk (67 tracks). The routine assumes there are no defective tracks and that there are thus 67 tracks numbered 0 to 66. If there are defective tracks, the routine will print out a track not found error (d6) for each record of track not existing.

For example, if there are 2 defective tracks, the tracks are numbered 0 to 64. If ckrd is executed, error d6 will be printed 60 times - once for each record of tracks 65 and 66. This is so because tracks 65 and 66 do not exist.

Best way to avoid this is to use the optional parameters.
ckrd 1, 2 - checkread track 2 once.

ckrd 1, 2, 10 - checkread tracks 2 thru 10, inclusively, one time.

ckrd 5, 1 - checkread track 1 5 times.

ckrd 0 - simplifies continuous test. All tracks will be checkread continuously until the routine is halted by pressing stop.

If checkread is done for more than one cycle, the test cycle number is printed after each cycle.

If ckrd passed with no errors, the message ckrd passed is printed at the conclusion of the test.

ckrd is a non destructive test; it performs no writes on the disk.

Ptrn tst

This is a destructive test. The test will run only on a disk that has been initialized, but contains no files. The test will abort and the message "ptrn tst illegal, data on disk" is printed if the user tries to run the test on a disk containing user files. The routine knows there are files on the disk by reading the main directory.

The routine will accept 3 parameters, but all are optional. The parameters have the same definition as in the ckrd test.

PTRN TST ROUTINE

PTRN TST N, S, E

N = NUMBER OF REPETITIONS

S = STARTING TRACK

E = ENDING TRACK

PTRN TST PATTERNS

143306

066154

155555

133333

000000

ptrn tst Patterns

The 5 patterns used are illustrated on the overhead. The patterns were chosen because the transitions for these numbers should be a good test for the 9885 read/write circuits.

The last pattern written is OOOOOO.

If ptrn tst is performed on the entire disk, the disk must be initialized again before it can be used by the customer. This is so because the ptrn tst will destroy the system area on track O. The only way the system area can be recreated is by the initialization routine.

If the ptrn tst is performed on the system area (track Ø), bootstrap area (tracks 1 to 4), or spare system track (track 5), a message is printed warning the user that the tested area has been destroyed

e.g., track O destroyed

Boots destroyed

Track 5 destroyed

If only the boots are destroyed, the user can reboot using the system tape cartridge without doing a complete initialization.

The ptrn tst will respond to the STOP key. If stop is pressed and tracks to O to 5 are not being checked, the routine will stop immediately. If stop is pressed and tracks O to 5 are being checked or have been checked previously, the routine will write zeros into the appropriate places and then stop. This has been included to avoid leaving residual garbage in a system area or bootstrap which could hang up the 9825A when a disk operation is attempted.

ptrn tst does all reads under a tight margin and reads only once.

The test will write a pattern on the disk and then read it back. The 9825A compares each byte read back with the pattern written and prints an error if there is no comparison.

9885 HARDWARE ERROR MESSAGES

dØ	SYNCHRONIZATION ERROR
d1	ALL DRIVES NOT POWERED
d2	DOOR OPEN
d3	DISK NOT IN DRIVE NO SUCH DRIVE NUMBER
d4	DISK PROTECTED
d5	HEADER ERROR
d6	TRACK NOT FOUND
d7	CHECKWORD ERROR
d8	HARDWARE FAILURE
d9	VERIFY ERROR

9885 Hardware Error Messages

Note that there are many error messages - big improvement over error 90 in the 9880 system.

There are error recovery routines which will allow you to recover data after some (not all) of the errors. These error recovery routines will be discussed later.

dØ - the driver is out of synchronization or more than 6 defective tracks in a row have been found.

d1 not all drives powered; e.g., there are 3 drives in system (1 master, 2 slaves) and an operation is attempted on one without having others turned on.

In a multiple drive system all drives must be on or totally disconnected from the interface.

d2 door open

d3 disk not in drive - the door is closed, but no disk is inserted.

A non existent drive has been addressed.

d4 Write attempted on a protected disk.

d5 header error. The 9885 was unable to read a header prior to the record it was seeking. There is an error recovery routine for this error.

d6 track not found. The 9885 could not read any headers on the track it was seeking. Thre may be a way to recover from this error

d7 - *checkwork error. The record was transferred to the 9825A, but there was a checkword error. Some data elements may not be correct. There is a recovery routine for this error.*

d8 - *hardware failure - of a kind that can't be more specifically described by another error message.*

d9 - *verify error. This error occurs only when the verify feature is used (VON). It indicates that the record was read correctly, but that the transitions for the read data were such that there was not much tolerance for error. A read at a later time may result in an error. The user should rewrite the record in an effort to improve his margin. This may be done manually with CONT (line number) or under software control if the user has an extended I/O ROM (by using the on err statement).*

ERROR RECOVERY

d5	HEADER ERROR DUMP TRACK
d6	TRACK NOT FOUND INITIALIZE TRACK
d7	CHECKWORD ERROR INSPECT DATA AND REWRITE

Error Recovery

The error recovery routines are contained on files 1 and 2 of the system tape cartridge.

The routines are self-instructive and will work only if there is a correctable error (d5, d6, or d7).

Each routine covered in detail later.

I f the error is not recoverable or the error number is lost or no error occurred, the program will not run and the message "Error data lost" is printed.

There are two programs involved - one is a binary program, one is a user program. The binary must be loaded first, the user program will provide directions.

ERROR *d5* (HEADER ERROR)

1) LOAD BINARY PROGRAM *(ldb 1)*

2) ERROR TYPE AND LOCATION PRINTED

3) LOAD USER PROGRAM *(ldb 2)* (OPTIONAL)

4) REMOVE SYSTEM TAPE AND INSERT SCRATCH TAPE

5) EXECUTE *dtrk n*

6) EXECUTE *t init*

7) EXECUTE *ldtrk n*

Recovery Routine for Error d5

Note that the program will not run unless an error occurred and that the program must be loaded immediately following the error.

1) load the binary program. The program will run and then

2) print the error type and location. Location will include select code (S), drive number (D), track number (T), and record number (R)

3) load the user program

4) remove the system tape cartridge and insert a scratch cartridge. This will be used to temporarily hold the data from the track with the header error. The cartridge should have enough files marked to hold the entire track (30 files, each 256 bytes long).

5) execute dtrk n where n is the starting file number on the scratch tape where the track is to be stored. The entire track (30 seconds) will be transferred to the tape even if only 1 header (of 30) can be read correctly.

Note that it is not necessary to specify the track number which is to be dumped. The 9825A has previously stored this information.

6) execute tinit. This will initialize the track that had the defective header. Note that it is not necessary once again to specify track number. During the track initialization a pattern test is performed - same test as during long InI.

7) execute ldtrk n. This will load the track from storage on the tape files to the newly initialized track. Here n is the starting file number for the track that is to be loaded onto the track.

ERROR *d7* (CHECKWORD ERROR)

1) LOAD BINARY PROGRAM (*ldb*1)
2) ERROR TYPE AND LOCATION IS PRINTED
3) LOAD USER PROGRAM (*ldb*2)
4) USER PROGRAM ASKS "TRACK#?"
5) ENTER TRACK
6) USER PROGRAMS ASKS "RECORD#?"
7) ENTER RECORD
8) DATA ITEMS ARE REVIEWED ONE BY ONE
9) USER CORRECTS ANY ERRONEOUS DATA
10) AT END OF LIST USER REPRINTS DATA OR REVIEWS AGAIN FROM STEP 8

Recover from a Checkword Error

Note that this is a rather long procedure since each individual data element is reviewed one by one. There could be as many as 32 data elements.

1) load the binary program

2) the error type and location is printed

3) load the user program

4) the user program will ask for track number and record number. The user enters track and record.

8) The elements in the file are printed one by one on the strip printer. The user can edit each data element as it appears.

10) At the end of the data, the program will ask the question "0-back 1-ok?". If the user enters 0, the data elements are again reviewed one by one. If he enters 1, the record is written on the disk in the original location.

SELF TEST ROUTINE

INTERNAL PROCESSOR TEST

WRITE ON MASTER AND ALL SLAVE DRIVES

READ ON MASTER AND ALL SLAVE DRIVES

READS AND WRITES DONE ON TRACKS 0 AND 76

TRACKS 0 AND 76 ARE DESTROYED

TAKES ABOUT 1 MINUTE TO COMPLETE

Self Test

Self test is provided on all 8775M master units. The self test switch on slaves is inoperative.

Test will run both with a disk installed and without.

Without the disk installed.

check processor
check drive control and status
check I/O functions

With disk installed.

same tests as without
plus -

check read/write electronics
check head positioning circuits