## TABLE OF CONTENTS

3.1 Maintenance Features .............................................. 3-1
3.2 Diagnostic Techniques ............................................. 3-2
3.3 Preventive Maintenance ........................................... 3-11
3.4 Removals, Adjustments ........................................... 3-12
3.5 SA902 Maintenance .................................................. 3-19
3.6 Physical Locations .................................................. 3-22
3.7 PCB Component Locations ........................................ 3-24
3.8 900/901 Logic Manual .............................................. 3-27
3.9 902 Logic Manual ................................................... 3-37
3.10 900/901 Schematic Diagrams ................................... 3-49
3.11 902 Schematic Diagrams .......................................... 3-53
3.1 MAINTENANCE FEATURES

3.1.1 Alignment Diskette

The SA120 Alignment Diskette is used for alignment of the SA900/901/902. The following adjustments can be made using the SA120.

1. R/W Head radial alignment using track 38.
2. Index Photo-transistor alignment using tracks 01 and 76.
3. Track 00 is recorded with standard IBM 3740 format.

Caution should be exercised in using the SA120 Alignment Diskette. Tracks 00, 01, 36, 37, 38, 39, 40, 75, and 76 should not be written on. To do so will destroy pre-recorded tests.

3.1.2 SA809 Exerciser

The SA809 Exerciser was designed as a piece of test equipment for the SA900/901 Diskette Drive. The Exerciser is capable of performing the following functions

1. Seek - Incremental or alternate tracks
2. Read
3. Write - 1F or 2F
4. Load Head
5. Recalibrate to track zero

The exerciser is provided with switches and indicators to perform the listed functions.

3.1.3 Special Tools

The following special tools are available for performing maintenance on the SA900/901/902.

<table>
<thead>
<tr>
<th>Description</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alignment Diskette</td>
<td>SA120</td>
</tr>
<tr>
<td>Cartridge Guide Adj. Tool</td>
<td>50377-0</td>
</tr>
<tr>
<td>Head Penetration Gauge</td>
<td>50380-0</td>
</tr>
<tr>
<td>Head Load Ball Gauge (old)</td>
<td>50383-0</td>
</tr>
<tr>
<td>Load Ball Gauge (new)</td>
<td>50391-0</td>
</tr>
<tr>
<td>Load Button Pliers</td>
<td>50933-0</td>
</tr>
<tr>
<td>Head Cable Extender (902)</td>
<td>50466-0</td>
</tr>
<tr>
<td>Drive Cable Extender (902)</td>
<td>50467-0</td>
</tr>
<tr>
<td>Extended Belt (902)</td>
<td>50464-0</td>
</tr>
<tr>
<td>Exerciser</td>
<td>50620-0</td>
</tr>
<tr>
<td>Spanner Wrench</td>
<td>50752-0</td>
</tr>
</tbody>
</table>
3.2 DIAGNOSTIC TECHNIQUES

3.2.1 Introduction
Incorrect operating procedures, faulty programming, damaged diskettes, and “soft errors” created by airborne contaminants, random electrical noise, and other external causes can produce errors falsely attributed to drive failure or misadjustment.

Unless visual inspection of the drive discloses an obvious misalignment or broken part, attempt to repeat the fault with the original diskette, then attempt to duplicate fault on second diskette.

3.2.2 “Soft Error” Detection and Correction
Soft errors are usually caused by:

1. Airborne contaminants that pass between the read/write head and the disk. Usually these contaminants can be removed by the cartridge self-cleaning wiper.

2. Random electrical noise that usually lasts for a few $\mu$ sec.

3. Small defects in the written data and/or track not detected during the write operation that may cause a soft error during a read.

The following procedures are recommended to recover from the above mentioned soft errors:

1. Reread the track ten (10) times or until such time as the data is recovered.

2. If data is not recovered after using step 1, access the head to the adjacent track in the same direction previously moved, then return to the desired track.

3. Repeat step 1.

4. If data is not recovered, the error is not recoverable.

3.2.3 Write Error (Reference Figure 1B)
If an error occurs during a write operation, it will be detected on the next revolution by doing a read operation, commonly called a “write check.” To correct the error, another write and write check operation must be done. If the write operation is not successful after ten (10) attempts have been made, a read operation should be attempted on another track to determine if the media or the drive is failing. If the error still persists the Diskette should be swapped and the above procedure repeated. If the failure still exists, consider the drive defective. If the failure disappears, consider the original diskette defective and discard it.
3.2.4 Read Error (Reference Figure 1A)
Most errors that occur will be “soft” errors. In these cases, performing an error recovery procedure will recover the data.

3.2.5 Seek Error (Reference Figure 1C)
Stepper malfunction.

3.2.6 Index/Sector Error (Not Ready) (Reference Figure 1D)
Initial indication is usually a not ready.

3.2.7 Test Points — 900/901
TP 0 + Door Closed
   1 Read Data Signal
   2 Read Data Signal
   3 Read Data (Differentiated)
   4 Read Data (Differentiated)
   5 Ground
   6 Ground
   7 + Power On Reset
   9 ((Head Load + Door Closed) ● Write
       Gate]
   11 – Load Head
   12 – Index and 901 Sector Pulses
   13 + File Inop
   15 + Write Gate ● Write Protect
   16 + Read Data
   21 – Data Window
   24 – Data Window
   25 + Write Protect
   26 + TRK Ø
   27 – STEP ● WRITE GATE
   35 – Write Gate ● File Inop

3.2.8 Test Points — 902
TP 1 Read Data Signal
   2 Read Data Signal
   3 Read Data (Differentiated)
   4 Read Data (Differentiated)
   5 Ground
   6 Ground
   8 Ground
   12 – Index
   16 + Read Data
   21 – Data Window
   24 – Data Window
   26 + Track Zero Drv 1
   27 + Track Zero Drv 2

---

CAUTION
TURN POWER OFF
BEFORE REMOVING DISKETTE
DRIVE FROM USING SYSTEM
AND/OR WHEN REMOVING PCB
READ ERROR

Is head loaded? (Visually Check)

Is +24V present at P2L7 or TP11?

No

Yes

Check for Hd Ld
Solvnd arm open Hd Ld
Solvnd coil, or loose cntrs.
Replace Solvnd.

Install a known good written diskette.

Int. A

More than 1 track?

More than 1 track?

No

Yes

Visually inspect diskette
for wear. If worn, discard diskette.

Do a Recal Back to TRK 00
and then SK to the same trk,
to insure proper positioning
of R/W head.

Is read data present at P3 pin 1 or 5?

No

Yes

No data is written on this trk. Do wrt and chk
again.

Is -Hd Ld present at P1L18?

No

Yes

Problem in using sys

Check for proper door
closer and door clsd sw
oper. Replace door clsd sw.

Replace PCB.

Is +24V present at P1L2?

No

Yes

Check +24V Supply
in using sys

Figure 1A
Figure 1A (Continued)
WRITE ERROR

Is head loaded? (Visually check)

Yes

Solid or intermittent?

Int.

Check Rd. Sig. A modifd. sig. indicates an intmnt write amp.

Check P1 connector. Problem in using sys.

No

Write Gate present at P1L7?

Yes

Check for open R/W coil.

No

Write Data present at P1L10?

Yes

Is the output of Wrt. Amp. present at P3 pins 1 and 5?

No

File Inop active at TP13?

Yes

Replace PCB.

No

Is +24V present at P1L2?

Yes

F

E

Install a known good blank diskette.

No

1

1

Figure 1B

3-6
Figure 1B (Continued)
SEEK ERROR

- Remove power from unit and manually turn step. motor.

Mechanical binding?

- Yes
- Determine which unit is binding, the step. motor or carr. asm.
- Reapply power to unit.

Perform a Recal. back to track 00.

Did step motor move on the Recal?

- No
- Visual check that carr. has moved back to stop and Flag is covering Trk 0 LED.

- Yes

Figure 1C
Figure 1C (Continued)
INDEX/SECTOR ERROR (Not Ready)

1. Insure diskette is installed properly. Is diskette turning?
   - Yes
     - Is motor running?
       - Yes
         - Are Sector/Index pulses at P1L5?
           - No
             - Problem in using sys.
           - Yes
             - Are Sector/Index pulses at P2R7?
               - No
                 - Replace PCB.
               - Yes
                 - Is LED voltage of +1.3V present at P2R4?
                   - No
                     - Replace Phototransistor Asm.
                   - Yes
                     - Replace LED Asm.
     - No
       - Replace belt.
       - Check for binds in spindle and disk clamp asms.
       - Check cntr. P4. Problem is in using system.
   - No
     - Is AC voltage present at P4?
       - No
         - Replace motor.
       - Yes
         - 1

Figure 1D
3.3 PREVENTIVE MAINTENANCE

3.3.1 Introduction
The prime objective of any preventive maintenance activity is to provide maximum machine availability to the user. Every preventive maintenance operation should assist in realizing this objective. Unless a preventive maintenance operation cuts machine downtime, it is unnecessary.

Visual inspection is the first step in every scheduled maintenance operation. Always look for corrosion, dirt, wear, binds, and loose connections. Noticing these items during PM may save downtime later.

Remember, do not do more than recommended preventive maintenance on equipment that is operating satisfactorily.

3.3.2 Preventive Maintenance Procedures
Details of preventive maintenance operations are listed in Figure 2. During normal preventive maintenance, perform only those operations listed on the chart for that preventive maintenance period. Details on adjustments and service checks are found listed in the chart. Observe all safety procedures.

3.3.3 Cleanliness
Cleanliness cannot be overemphasized in maintaining the SA900/901. Do not lubricate the SA900/901; oil will allow dust and dirt to accumulate. The read/write head should be cleaned but only when signs of oxide build up are present.

<table>
<thead>
<tr>
<th>UNIT</th>
<th>FREQ MONTHS</th>
<th>CLEAN</th>
<th>OBTERVE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Read/Write Head</td>
<td>12</td>
<td>Clean Read/Write Head ONLY IF NECESSARY Replace</td>
<td>Oxide build up and scratches</td>
</tr>
<tr>
<td>R/W Head Load Button</td>
<td></td>
<td>Clean off all oil, dust, and dirt</td>
<td>Inspect for nicks and burrs</td>
</tr>
<tr>
<td>Stepper Motor and Lead Screw Belt</td>
<td></td>
<td>Clean base</td>
<td>Frayed or weakened areas</td>
</tr>
<tr>
<td>Base</td>
<td>Initially 3 Thereafter 12</td>
<td>Clean base</td>
<td>Inspect for loose screws, connectors, and switches</td>
</tr>
<tr>
<td>Read/Write Head</td>
<td></td>
<td></td>
<td>Check for proper alignment</td>
</tr>
</tbody>
</table>

Fig 2 PM Procedures

3-11
3.4 REMOVALS, ADJUSTMENTS
   For parts location, see Section 3.6.

3.4.1 Motor Drive

3.4.1.1 Drive Motor Assembly: Removal and Installation
   a. Extract 3 contacts to disconnect motor from AC connector.
   b. Loosen two screws holding capacitor clamp to the base. Remove rubber boot and disconnect motor leads from capacitor.
   c. Remove connectors from PCB and remove PCB.
   d. Remove belt from drive pulley.
   e. Remove 4 screws holding the motor to the base casting and remove motor.
   f. Reverse the procedure for installation.
   Note: Insure ground lead is installed between capacitor clamp and base.

3.4.1.2 Motor Drive Pulley
   a. Loosen set screw and remove pulley.
   b. Reverse procedure for installation.
   Note: When installing a new pulley, the drive pulley must be aligned with the spindle pulley so that the belt tracks correctly.

3.4.2 Side Cover: Removal
   a. Retract screw from upper casting wall sufficiently to allow the side cover to be rocked out.
   b. Lift cover off screw in lower casting wall.

3.4.3 Cartridge Guide Access
   a. Remove side cover (Section 3.4.2).
   b. Position head to approximate center of head load bail (to prevent load arm tab from slipping off end of bail).
   c. Loosen 2 screws holding cartridge guide to door latch plate.
   d. Swing cartridge guide out.
   e. When the guide is swung in, it must be adjusted as per Section 3.4.9.2.

3.4.4 Light Emitting Diode Assembly: Removal and Installation
   a. Remove side cover (Section 3.4.2).
   b. Disconnect the wires to the LED terminals (solder joints).
c. Swing out the cartridge guide assembly
   (Section 3.4.3).

d. Remove the screw and nut holding the LED
   assembly to the cartridge guide.

e. Reverse the procedure for installation.

f. Check index timing and readjust if necessary.

3.4.5 Write Protect Detector: Removal and Installation

a. Remove connectors from PCB and remove PCB.

b. Extract wires from P2 connector, pins L3, L4,
   R5 (E), and R8 (S).

c. Remove cable clamps.

d. Remove side cover (Section 3.4.2).

e. Swing out cartridge guide assembly (Section
   3.4.3).

f. Remove screw holding the detector bracket and
   remove assembly.

g. Reverse procedure for reinstalling. Connect the
   wires to P2 by the following: Red to ‘3’ (L3),
   Grey to ‘4’ (L4), Black to ‘E’ (R5) and White to
   ‘J’ (R8).

3.4.5.1 Write Protect Detector Adjustment

a. Insert SA101 diskette into drive. Write protect
   hole must be open.

b. Set oscilloscope to AUTO sweep, 2V/div. and
   monitor P2L4.

c. Loosen screw on detector assembly and adjust
   until maximum amplitude is achieved. Tighten
   screw.

3.4.6 Head Load Actuator

3.4.6.1 Head Load Actuator: Removal and
   Installation

a. Remove side cover (Section 3.4.2).

b. Disconnect the wires to the actuator terminals
   (solder joints).

c. Swing out the cartridge to guide assembly
   (Section 3.4.3).

d. Remove screw holding the actuator to the
   cartridge guide.

   CAUTION: Restrain the head load arm to
   prevent its impact with the head.

e. Reverse the procedure for installation.

3.4.6.2 Head Load Actuator Physical
   Adjustment (old style)

a. Remove side cover.

b. Step carriage to Track 00.

c. Energize coil either using tester or manually
   grounding pin L18 on connector P1.

d. Loosen bail screw on Head Load Bail.

e. Using Bail Gauge (p/n 50383), adjust bail
   so that Head Load Arm just touches shim.
   Tighten screw until just snug. Insure that
   load arm is over bail when carriage is at
   Track 00.

f. Step carriage to Track 76 and check that arm
   still just touches shim. (This will result in
   Head Load Bail to Head Load Arm clearance
   of .020”). Insure that load arm is over bail
   when carriage is at Track 76. Reference fig-
   ures below.

g. Tighten Head Load Bail screw.

h. Replace side cover.

3.4.6.3 Head Load Actuator Physical Adjustment
   (new style)

a. Remove side cover.

b. Energize Head Load Coil by grounding TP11.

c. Place Head Load Actuator adjustment tool,
   P/N 50391, on platen.

d. Adjust down stop so as the top of Head Load
   Bail is flush with top of tool within ± .005” at
   track 76. Reference Figure 6.

e. Step carriage to track 38.

f. De-energize Head Load Coil.
g. Place adjustment tool onto R/W Head and place load button in cup of tool.

h. Adjust up stop on actuator so that bail just touches Head Load Arm within ±.005". Reference Figure 5.

i. Energize Head Load Coil and step carriage between track 00 and 76. Insure that there is a clearance of a minimum of .010" between Head Load Bail and Head Load Arm.

j. Replace side cover.

![Figure 5: Head Load Actuator Up Stop Adjustment](image)

![Figure 6: Head Load Actuator Down Stop Adjustment](image)

### 3.4.6.4 Head Load Actuator Timing

a. Insert Alignment Diskette (SA120)

b. Step carriage to Track 0.

c. Sync oscilloscope on TP11 (Load Head). Set time base to 10MSEC/division.

d. Connect one probe to TP1 and the other to TP2. Ground probes to the PCB. Set the inputs to Add and invert one input.

e. Energize the Head Load solenoid and observe the read signal on the oscilloscope. The signal must be at 50% of full amplitude by 50Msec. Reference Figure 7.

f. If this is not met, continue on with the procedure.

g. Check adjustments outlined in paragraph 3.4.6.2 or 3.4.6.3.

h. If item 'g' is ok, adjust down stop screw (Figure 6) CW until timing is met. Note, not to exceed ¾ turn.

### FIGURE 7 HEAD LOAD ACTUATOR TIMING

#### 3.4.7 Index/Sector Photo Transistor Assembly

##### 3.4.7.1 Index/Sector Photo Transistor Assembly: Removal and Installation

a. Disconnect P2 connector from PCB.

b. Remove wires from Door Closed switch and extract wires from P2 connector pin 9 (L9) Black, H (R7) Brown, 6 (L6) Red and B (R2) Orange.

c. Remove cable clamp holding wires from detector.

d. Remove screw holding detector to the base plate and remove assembly.

e. To install reverse procedure. If replacing old style phototransistor assembly with new style (potentiometer on assembly), use Field Kit P/N 50928.

##### 3.4.7.2 Index/Sector Photo Transistor Potentiometer Adjustment

a. Insert Alignment Diskette (SA120).

b. Using oscilloscope monitor TP-12 (-Index), sync internal negative, DC coupled, set vertical scale to 2 V/cm.

c. Adjust the potentiometer on the Sector/Index Phototransistor to obtain a pulse of 1.7 msec. ±.5 msec. duration.

d. Continue adjustment in section 3.4.7.3.

##### 3.4.7.3 Index/Sector Adjustment

a. Insert Alignment Diskette (SA120).

b. Step carriage to Track 1.

c. Sync oscilloscope on TP 12 (-Index). Set time base to 50 μsec/division.

d. Connect one probe to TP 1 and the other to TP 2. Ground probes to the PCB. Set the inputs to AC, Add and invert one channel. Set vertical deflection to 500 MV/division.

e. Channels 1 and 2 should be added and one of the channels inverted.
f. Observe the timing between the start of the sweep and the first data pulse. This should be 200 ± 100 μsec. If the timing is not within tolerance, continue on with the adjustment. Reference Figure 8.

g. Loosen the holding screw in the Index Transducer until the Transducer is just able to be moved.

h. Observing the timing, adjust the Transducer until the timing is 200 ± 50 μsec. Insure that the Transducer Assembly is against the registration surface on the base casting.

i. Tighten the holding screw.

j. Recheck the timing.

k. Seek to Track 76 and reverify that the timing is 200 ± 100 μsec.

b. Pull up on the upper pivot cap screw until the shoulder contacts the base casting. Push up on the cartridge guide until the lower pivot clears the casting.

NOTE: On some units a "C" clip will have to be removed in place of lifting pivot screw. Figure 9.

c. Tilt the cartridge guide slightly, and remove it from the upper pivot.

d. To install the cartridge guide, reverse the procedure.

NOTE: When swinging cartridge guide in, insert a small screwdriver through the access slot and load the torsion spring. (Force the torsion spring roller toward the rear of the spring.)

3.4.9.2 Cartridge Guide Adjustment

a. Insert the shoulder screw (tool p/n 50377) through the adjustment hole in the cartridge guide and screw completely into the base casting (hand tight). Reference Figure 10.

NOTE: Starting with drives manufactured in Dec. '73 the base casting has been machined in the adjustment hole area. This can be easily seen. On the machined castings the long shoulder (#2) should be used. On files where the casting was not machined the short shoulder (#1) should be used.

b. Move the handle into the latched position and hold it lightly against the latch.

c. Tighten two screws holding the cartridge guide to the latch plate.

3.4.8 Spindle Assembly

a. Remove side cover (Section 3.4.2).

b. Swing out cartridge guide (Section 3.4.3).

c. Remove the nut and washer holding the spindle pulley. Use spanner wrench, P/N 50572, to hold spindle.

CAUTION: The pre-loaded rear bearing may fly out when spindle pulley is removed.

d. Withdraw spindle hub from opposite side of baseplate.

e. Reverse the procedure for installation.

f. Tighten nut to 20 in./lbs.

3.4.9 Cartridge Guide

3.4.9.1 Cartridge Guide Removal

a. Perform steps 3.4.3 through 3.4.6.
FIGURE 10 CARTRIDGE GUIDE ADJUSTMENT

d. Remove the tool and check to determine the flange on the clamp hub clears the cartridge guide when the spindle is rotating. If the clamp hub rubs on the cartridge guide, repeat the adjustment procedure.

e. Check index alignment per Section 3.4.7.3.
f. Insert diskette, close and open door, then check for proper operation.

3.4.10 Front Plate Assembly: Removal

a. Remove side cover (Section 3.4.2).
b. Swing out the cartridge guide assembly (Section 3.4.3).
c. Remove 4 screws holding the front plate assembly to the base casting.
d. Reverse the procedure for installation.
e. Insert the cartridge guide assembly per Sections 3.4.9.1 and 9.2.

3.4.11 Stepper/Carriage

3.4.11.1 Stepper/Carriage Assembly: Removal and Installation

a. Disconnect the connectors from PCB and remove PCB.
b. Remove cable clamp holding R/W head cable.
c. Remove side cover (Section 3.4.2).
d. Swing out cartridge guide (Section 3.4.3).
e. Extract stepper cable contacts from P2 connector. Black 10 (L10), Red 2 (L2), Brown 5 (L5), and Orange 8 (8). Note: This step is only necessary if the stepper motor is to be replaced.
f. Loosen (3) motor clamp screws and rotate clamps to allow withdrawal of motor. On new production units, with redesigned stepper mounting clamp, loosen (2) screws and swing clamp down to allow withdrawal of motor.

CAUTION: DO NOT LOOSEN THREE SCREWS COATED WITH GLYPTOL.

g. Remove cable clamp and spacer holding R/W head cable on cartridge guide side of unit. On new production units a grommet on the cable is inserted into a slot on the Track 0 Detector bracket.
h. To install stepper/carriage assembly reverse procedure. Note steps "i" and "j".
i. If installing a new carriage, set the pre-load nut in the #3 notch. Reference figure 11.
j. When threading lead screw into carriage assembly, press the pre-load nut slightly against spring in order to start thread. After threading, insure there is a gap between pre-load nut and rear of carriage.

k. Adjust index (Section 3.4, 7.3).
l. Adjust radial head alignment (Section 3.4.11.2).
m. Adjust Track 0 stop (Section 3.4.11.7/8).
n. Adjust Track 0 flag (Section 3.4.11.9).

3.4.11.2 Head Radial Alignment

NOTE: Head radial alignment should be checked prior to adjusting index/sector, Track 00 flag or carriage stop.

a. Load alignment diskette (SA120). (Note: Alignment diskette should be at room conditions for at least twenty minutes before alignment.)
b. Step the carriage to Track 38.
c. Sync the oscilloscope on TP 12 (~ CE Index). Set the time base to 20 Msec per division. This will display over one revolution.
d. Connect one probe to TP 1 and the other to TP 2. Ground the probes on the PCB. Set the inputs to AC. Add and invert one channel. Set the vertical deflection to 200 MV/dev.
e. The two lobes must be within 70% amplitude of each other. If the lobes do not fall within the specification, continue on with the procedure. Reference Figure 12.

f. Loosen the three mounting screws which hold the motor to the mounting plate.

CAUTION: DO NOT LOOSEN THREE SCREWS COATED WITH GLYPTOL.

g. Rotate the stepper motor to radially move the head in or out. If the left lobe is less than 70% of the right, turn the stepper motor ccw as viewed from the rear. If the right lobe is less than 70% of the left lobe, turn the stepper motor clockwise as viewed from the rear.

h. When the lobes are of equal amplitude, tighten the motor mounting screws. Reference Fig. 12.

i. Check the adjustment by stepping off track and returning. Check in both directions.

j. Whenever the Head Radial Alignment has been adjusted, the Track 00 detector adjustment (Section 3.4.11.9) and Track 00 stop must be checked (Section 3.4.11.8)

d. To remove the old button on molded plastic arm, hold the arm out away from head, squeeze the locking tabs together with a pair of needle nose pliers and press forward.

e. To install load button on metal arm, place the new button on the arm. On the back of the arm place the rubber grommet. Holding the button, push the clip over the plastic stud until it is tight against the rubber grommet. Reference Figure 13.

f. To install load button on molded plastic arm, press the button into the arm, from the head side, and it will snap in place.

g. Adjust according to Section 3.4.11.4.

NOTE: The load arm should never be opened over 90° from carriage assembly to prevent possible damage to torsion spring.

![Figure 13](image)

3.4.11.4 Read/Write Head Load Button Adjustment Adjustment

a. Insert Alignment Diskette (SA120).

b. Connect oscilloscope to TP 1 and 2, added differentially and sync negative external on TP 12 (-INDEX)

c. Step carriage to Track 75.

d. Observing read signal on oscilloscope, rotate the load button CCW in small increments (10°) until maximum amplitude is obtained.

3.4.11.5 Head Penetration Adjustment

NOTE: This adjustment is not normally done in the field. The only time that this adjustment need be done is when the stepper mounting plate has been loosened or removed.

a. Place the penetration tool (P/N 50380) on the gauge block and insures the gauge reads .03 (3 on the small hand) and zero the dial for the large hand. This results in a reading of .030”.

b. Swing open the cartridge as per Section 3.4.3.

c. Place the penetration tool on the base assembly with the short leg on the platen, the long leg on the carriage guide bar, and the plastic tip in the center of the R/W head.
d. The head penetration should be .030\" ± .003\" read on the gage.

e. If the head does not meet this adjustment, move the stepper plate laterally until the gage reads .030\".

f. Tighten the screws and recheck the adjustment.

g. Return cartridge guide and adjust as per Section 3.4.9.2.

3.4.11.6 Track 0 Detector: Removal and Installation

a. Remove side cover (Section 3.4.2).

b. Swing carriage guide open (Section 3.4.3).

c. Manually rotate stepper shaft and move carriage all the way in.

d. Remove 2 screws holding bracket to base casting and remove bracket and detector.

e. Remove PCB connector and remove PCB.

f. Extract cable from P2 connector; Brown, A (R1); Black, C (R3); Red, F (R6); and Orange K (R9).

g. Remove cable clamps and remove Detector assembly.

h. To install, reverse the procedure.

i. Adjust according to Section 3.4.11.9.

Figure 14 R/W Head Radial Alignment
3.4.11.8 Track 00 Stop Adjustment
(Old Style)

a. Remove side cover (Section 3.4.2).
b. Step carriage to Track 00. Verify that carriage is at 00 by checking P1L12 is minus (ground).
c. Check that stop is .005" (+.005" to -.000") clearance between the carriage and the stop.
d. If clearance is not within tolerance, continue on with the adjustment procedure.
e. Loosen the screw in the Track 00 stop.
f. Place a .005" feeler gage between the carriage and the stop. Position the stop against the feeler gage. Tighten the stop screw.
g. Turn off AC and DC power.
h. Manually rotate the lead screw clockwise to insure no interference between the carriage and the stop screw.
i. If interference occurs, loosen screw and rotate stop to avoid the interference.
j. Replace side cover.

3.4.11.8 Track 00 Stop Adjustment
(new style)

a. Remove side cover (Section 3.4.2)
b. Step carriage to Track 00. Verify that carriage is at 00 by checking P1L12 is minus (ground).
c. Check that stop is .030" ± .020" between collar and carriage. Turn DC power OFF, and manually rotate lead screw CW until carriage stops. Check that stop is .020" ± .010" between collar and carriage.
d. If clearances are not within tolerance, continue on with adjustment procedure.
e. Turn DC power ON.
f. Step carriage to Track 02.
g. Loosen Track 00 stop collar.
h. Grasp end of lead screw in back of stepper motor, with a pair of pliers and manually turn lead screw CW to the Track ~01 position. (Next detent position on stepper motor.)
i. Position the stop collar axially along the lead screw so there is .020" ± .010" between collar and carriage. Rotate the collar toward inside until the stop on the collar contacts the carriage stop surface. Tighten screw.
j. Turn DC Power OFF and back ON. Carriage should move to Track 00. Verify that there is data at Track 00.
k. Step carriage between Track 00 and 76 and check for any binding or interference between the carriage, lead screw, stop and head cable.

3.4.11.9 Track 00 Flag Adjustment

a. Remove side cover (Section 3.4.2).
b. Check head radial alignment and adjust if necessary before making this adjustment.
c. Connect oscilloscope probe to TP 26. Set vertical deflection to 1 v/division and sweep to continuous.
d. Step carriage to Track 01. TP 26 should be high (+5 volts).
e. If TP 26 is not high, loosen screw on Track 0 flag and rotate flag counter clockwise until TP 26 just goes high.
f. Step carriage to Track 2. TP 26 should go low. Adjust flag clockwise if not low.
g. Check adjustment by stepping carriage in and returning Track 00, observing that TP 26 is low at Track 02 and high at Tracks 01 and 00.
h. Replace side cover.

3.5 SA902 MAINTENANCE

Maintenance procedures of the SA902 are the same as those outlined in Section 3.4 of this manual. The only special requirement is that the drives may have to be split apart to gain access to components located between drives. This section of the Maintenance Manual describes the procedure for splitting the units apart.

3.5.1 Special Tools

The following special tools are required for maintenance of the SA902 if the units are to be operated while in the split position.

<table>
<thead>
<tr>
<th>P/N</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>50464-0</td>
<td>Extended Maintenance Belt</td>
</tr>
<tr>
<td>50466-0</td>
<td>Head Cable Extender</td>
</tr>
<tr>
<td>50467-0</td>
<td>Drive Cable Extender</td>
</tr>
</tbody>
</table>

3.5.2 Separating Units

a. Remove plate (loosen 4 screws) from bottom holding units together if present.
b. Remove drive belt from right hand motor pulley and place it on hook provided.
   Reference Figure 15.
c. Attach Head Extender Cable (P/N 50466-0) to right hand drive R/W head pigtails (P-5). Insure polarity of cables are matched properly.
   Reference Figure 16.
d. Raise latches (2) at the front of the machine, top and bottom. Screws may have to be loosened. Reference Figure 17.

e. Move right hand drive out and secure into the service position with latch and bracket on top of units. Reference Figure 18. While moving drives apart route right hand R/W head pigtails through left hand drive.

f. Remove P2 from PCB and attach Drive Cable Extender (P/N 50467-0) to it and PCB. Reference Figure 19.

g. Remove drive belt from right drive spindle pulley and hook. Install Extended Maintenance Belt (P/N 50464-0) to right drive and motor pulley.

h. Units are now ready to operate in the split position. Reference Figure 20.

i. To rejoin units reverse procedure. To reinstall right hand drive spindle belt, place belt on spindle pulley and hook provided. Reference Figure 15.

FIGURE 15 RIGHT DRIVE BELT REMOVAL

FIGURE 17 LATCH

FIGURE 16 HEAD CABLE EXTENDER

FIGURE 18 LATCHING UNITS TOGETHER
3.6 PHYSICAL LOCATIONS

- DOOR CLOSED SWITCH
- P2 CONNECTOR
- P1 CONNECTOR
- ELECTRONICS
- SPINDLE PULLEY
- P3 CONNECTOR
- DOOR HANDLE
- PUSH BAR
- STEPPER MOTOR
- DRIVE MOTOR PULLEY
- R/W HEAD CABLE
- SECTOR/INDEX PHOTO TRANSISTOR
Figure 21 SA900/901 Component Locations
### INDEX

- **AA001**: INDEX
- **AB010**: FUNCTIONAL DIAGRAM
- **DA010**: READ/WRITE/INOP CKTRY
- **DA020**: STEPPER CONTROL
- **DA030**: DETECTORS
- **DA040**: MOTORS/SOLENOID/SWITCH
- **VA010**: INTERFACE INPUT (J1, J4, AND J5)
- **VA020**: INTERFACE OUTPUT (J1)

### TABLE I

**OPTIONAL FEATURES**

<table>
<thead>
<tr>
<th>PCB ASM NO.</th>
<th>OPTIONAL FEATURES</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>-5V</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>25002</td>
<td>X</td>
</tr>
<tr>
<td>25003</td>
<td></td>
</tr>
<tr>
<td>25004</td>
<td>X</td>
</tr>
<tr>
<td>25005</td>
<td></td>
</tr>
<tr>
<td>25006</td>
<td>X</td>
</tr>
<tr>
<td>25007</td>
<td>X</td>
</tr>
</tbody>
</table>

Write protect can be ordered with any of the above.

### TABLE II

**FACTORY CUT TRACE OPTIONS**

| PCB ASM NO. | TRACE 
<table>
<thead>
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</thead>
<tbody>
<tr>
<td></td>
<td>T1</td>
</tr>
<tr>
<td></td>
<td>TRACEN</td>
</tr>
<tr>
<td></td>
<td>TRACEW</td>
</tr>
</tbody>
</table>

- **25002**: SHORTED OPEN SHORTEO
- **25003**: OPEN
- **25004**: SHORTED
- **25005**: SHORTED
- **25006**: SHORTED SHORTED OPEN
- **25007**: OPEN SHORTED OPEN

### TABLE III

**CUSTOMER CUT TRACE OPTIONS AND HISTORY CHART**

<table>
<thead>
<tr>
<th>DESIGNATOR</th>
<th>DESCRIPTION</th>
<th>OPEN</th>
<th>SHORT</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>DRIVE SELECT I OR HEAD LOAD</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>ALTERNATE DRIVE SELECT PATH</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>RADIAL HEAD LOAD</td>
<td></td>
<td></td>
</tr>
<tr>
<td>D</td>
<td>DRIVE SELECT TERMINATION WITH RADIAL HEAD LOAD</td>
<td></td>
<td></td>
</tr>
<tr>
<td>E</td>
<td>MULTIPLEX OR DRIVE SELECT FEATURE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>F</td>
<td>TERMINATION FOR &quot;WRITE DATA&quot;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>G</td>
<td>TERMINATION FOR &quot;FILE INOP RESET&quot;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>H</td>
<td>TERMINATION FOR &quot;WRITE GATE&quot;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>J</td>
<td>TERMINATION FOR &quot;DIRECTION SELECT&quot;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>K</td>
<td>TERMINATION FOR &quot;STEP&quot;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>M</td>
<td>RADIAL/READY INTERRUPT</td>
<td></td>
<td></td>
</tr>
<tr>
<td>R</td>
<td>STEP WITH HEAD UNLOADED</td>
<td></td>
<td></td>
</tr>
<tr>
<td>S</td>
<td>R.P.S. (RADIAL SECTOR AND INDEX)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>X</td>
<td>DRIVE SELECT INDEPENDENT OF HEAD LOAD</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Y</td>
<td>DRIVE SELECT INDEPENDENT OF HEAD LOAD</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DS</td>
<td>STEPPER POWER FROM DRIVE SELECT</td>
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</tr>
</tbody>
</table>

**FACTORY CUT TRACE OPTIONS AND HISTORY CHART**

- **L**: -5 OR -12 TO -15V SEE TABLE II
- **N**: INPORT ONLY (900) SEE TABLE II
- **P**: INDEX AND SECTOR (901) SEE TABLE II

---

**SHUT-OUTocket INDEX**

MUST CONFORM TO ENGINEERING SPEC: ES 30000-

<table>
<thead>
<tr>
<th>MATERIAL</th>
<th>TOLERANCE UNLESS OTHERWISE NOTED</th>
<th>DATE</th>
<th>NO.</th>
<th>TITLE</th>
</tr>
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<tbody>
<tr>
<td></td>
<td></td>
<td>3/14</td>
<td>014</td>
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</table>

- **CASE DEPTH**: LINEAR
- **HARDNESS**: ANGULARLY
- **SURFACE TREATMENT**: OUTSIDE MAX
- **APPROX. SHEET**: 014

**LOGIC MANUAL INDEX**

<table>
<thead>
<tr>
<th>SHEET</th>
<th>LOGIC MANUAL INDEX</th>
</tr>
</thead>
<tbody>
<tr>
<td>50501-C</td>
<td>0485</td>
</tr>
</tbody>
</table>
NOTES:

1. GND WHEN ACTIVE & +24V WHEN INACTIVE.
2. SEE PAGE VADIO (NOTE 1) FOR AC VOLTAGES.
### INDEX

<table>
<thead>
<tr>
<th>AAO001 INDEX</th>
<th>INDEX</th>
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<tbody>
<tr>
<td>ABO00 BASIC DRIVE</td>
<td></td>
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<tr>
<td>DAO00 READ/WRITE/INOP CKTRY</td>
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</tr>
<tr>
<td>DAO20 STEPPE CONTROL/READ PROTECT</td>
<td></td>
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<tr>
<td>DAO30 INDEX/READY/SELECT</td>
<td></td>
</tr>
<tr>
<td>DAO40 VOLTAGE INTERFACE</td>
<td></td>
</tr>
<tr>
<td>DAO50 DETECTORS</td>
<td></td>
</tr>
<tr>
<td>DAO60 MOTORS/SOLENOIDS/SWITCHES</td>
<td></td>
</tr>
<tr>
<td>VAO00 INTERFACE INPUT</td>
<td></td>
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<tr>
<td>VAO20 INTERFACE OUTPUT</td>
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</table>

### TABLE I

<table>
<thead>
<tr>
<th>PCR</th>
<th>OPTIONAL FEATURES</th>
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</thead>
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<td>ASM NO.</td>
<td>-5V</td>
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<tr>
<td>25037</td>
<td>X</td>
</tr>
<tr>
<td>25038</td>
<td>X</td>
</tr>
<tr>
<td>25039</td>
<td>X</td>
</tr>
<tr>
<td>25040</td>
<td>X</td>
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### TABLE II

<table>
<thead>
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<th>FACTORY CUT TRACE OPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>PCB ASM NO.</td>
</tr>
<tr>
<td>25037</td>
</tr>
<tr>
<td>25038</td>
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<tr>
<td>25039</td>
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<td>25040</td>
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</tbody>
</table>

### TABLE III

**JUMPER AND CUT TRACE CAPABILITY**

<table>
<thead>
<tr>
<th>TRACE</th>
<th>DESCRIPTION</th>
<th>OPEN</th>
<th>SHORT</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>MAINTAIN DRIVE 1/STEPPE POWER INDEPENDENT OF SELECT</td>
<td>[ ]</td>
<td>[ ]</td>
</tr>
<tr>
<td>B</td>
<td>MAINTAIN DRIVE 2/STEPPE POWER INDEPENDENT OF SELECT</td>
<td>[ ]</td>
<td>[ ]</td>
</tr>
<tr>
<td>C</td>
<td>RADIAL/READY INTERRUPT NOTE 2</td>
<td>[ ]</td>
<td>[ ]</td>
</tr>
<tr>
<td>D</td>
<td>RADIAL/READY INTERRUPT NOTE 2</td>
<td>[ ]</td>
<td>[ ]</td>
</tr>
<tr>
<td>E</td>
<td>RADIAL/READY INTERRUPT NOTE 2</td>
<td>[ ]</td>
<td>[ ]</td>
</tr>
<tr>
<td>F</td>
<td>TERMINATION FOR WRITE DATA</td>
<td>[ ]</td>
<td>[ ]</td>
</tr>
<tr>
<td>G</td>
<td>TERMINATION FOR FILE INOP RESET</td>
<td>[ ]</td>
<td>[ ]</td>
</tr>
<tr>
<td>H</td>
<td>TERMINATION FOR WRITE GATE</td>
<td>[ ]</td>
<td>[ ]</td>
</tr>
<tr>
<td>J</td>
<td>TERMINATION FOR DIRECTION SELECT</td>
<td>[ ]</td>
<td>[ ]</td>
</tr>
<tr>
<td>K</td>
<td>TERMINATION FOR STEP</td>
<td>[ ]</td>
<td>[ ]</td>
</tr>
<tr>
<td>M</td>
<td>RADIAL HEAD LOAD NOTE 3</td>
<td>[ ]</td>
<td>[ ]</td>
</tr>
<tr>
<td>N</td>
<td>RADIAL HEAD LOAD NOTE 3</td>
<td>[ ]</td>
<td>[ ]</td>
</tr>
<tr>
<td>P</td>
<td>RADIAL HEAD LOAD NOTE 3</td>
<td>[ ]</td>
<td>[ ]</td>
</tr>
<tr>
<td>R</td>
<td>RADIAL/READY INTERRUPT NOTE 2</td>
<td>[ ]</td>
<td>[ ]</td>
</tr>
</tbody>
</table>

**NOTES:**

1. **AS SHIPPED FROM FACTORY.**
2. **FOR RADIAL READY INTERRUPT OPEN TRACES C,D,E, AND SHORT TRACE R.**
3. **READY 1 OUTPUT IS NOW ON PIN J14-8 AND READY 2 IS NOW ON PIN J14-12.**
4. **WHEN READY IS NOT RADIAL, PIN J14-14 CAN BE USED TO LOAD BOTH HEADS TOGETHER INDEPENDENT OF DRIVE SELECT.**
5. **OPEN TRACES M,P,R, AND SHORT TRACES E,H, ADD JUMPER FROM N TO PIN J1-LM.**

AAO001