1. REASON FOR CHANGE

To provide protection to heads and media in the event of severely restricted air flow or blower motor failure.

2. DESCRIPTION OF CHANGE

This change adds an air pressure sensor and associated connecting materials to sense air pressure at the outlet of the absolute filter. If air pressure approaches minimum acceptable operating level, the interlock circuitry will open causing the unit to unload heads and spindle down.

3. DOCUMENTATION AFFECTED

Phoenix Hardware Maintenance Manual WL# 729-0198A.

4. PREREQUISITE (S)

This change should be installed on Control Data Corporation's series code/block point 2 units S/N 300 to S/N 21,999 and series code/block point 3 units S/N 22,000 to S/N 74,999.

5. INSTALLATION PROCEDURE

CAUTION:

The circuit assemblies contained in this equipment can be degraded or destroyed by ELECTRO-STATIC DISCHARGE (ESD).

Static electrical charges can accumulate quickly on personnel, clothing and synthetic materials. When brought in close proximity to, or in contact with delicate components, ELECTRO-STATIC DISCHARGE OR FIELDS can cause damage to these parts. This damage may result in degraded reliability or immediate failure of the affected component or assembly.
5. INSTALLATION PROCEDURE (CONT.)

To insure optimum/reliable equipment operation, it is required that technical support personnel discharge themselves by periodically touching the chassis ground prior to and during the handling of ESD susceptible assemblies. This procedure is very important when handling printed circuit boards.

A. Perform procedures 6.7.1 and 6.7.2 in the Hardware Maintenance Manual (WL#729-0198A) to gain access to the base pan.

B. Remove the absolute filter from the base pan and discard.

C. Install Items 1-13 from FCO Pressure Sensor Kit (for listing of parts see Section 10 - MISCELLANEOUS) as described by this and subsequent paragraphs. Refer to Figure 2. Mount pressure sensor (Item 9) to the sensor bracket (Item 1). Fasten using machine screw (Item 6), washer (Item 7) and hex nut (Item 8). Be sure that spade lugs on sensor (Item 9) are mounted upward as shown in Figure 2.

D. Refer to Figure 2. Loosen but do not remove the screws at D and E. Remove and save the screw at F.

E. Install the sensor bracket (Item 1) with attached sensor (Item 9) in the base pan by sliding the bracket under the air deflector at Hole D. Reinstall the screw at F. Tighten the screws D and E.

F. Refer to Figure 1. Disconnect eight-pin connector OPJ2 from the operator control panel at the left front of the base pan. Extract terminal at OP02-03. Refer to View S, Figure 1. To extract terminal, lift retaining tab slightly using a narrow pointed object such as a small, very thin knife blade, and with a small pull force on the wire, slide the terminal from the connector body. Now refer to Figure 2. Disconnect opposite end of the wire at SW1-0C (deck down switch) located near the electronics module under the left side of the deck. Cut the ends of the disconnected wire and leave in the harness.
5. INSTALLATION PROCEDURE (CONT.)

G. Insert the crimped connector end of jumper lead (Item 11) into OPJ2-03 in the same position as the wire removed in Step F. Reconnect OPJ2 to the operator control panel. Route the jumper lead along the left side of the base pan wall using the plastic wire clips for containment. From the second clip on the left wall, route the jumper lead behind absolute filter retaining clip, under the air hose and terminate at the pressure sensor's (Item 9) "B" terminal.

H. Remove the switch mounting bracket* (see note) and connect "A" jumper lead (Item 12) to SWL-0C in the same position as wire removed in Step F. Replace the switch bracket. Route the "A" jumper lead on the bottom the base pan between RFI filter and resistor mounting bracket, and then along the right side of the resistor mounting bracket. TY Wrap (Item 13) to cable bundle at forward edge of bracket. Terminate at the "A" terminal of the pressure sensor (Item 9).

* NOTE: A mark made on the base deck parallel to the top edge of the switch bracket and level with that surface can serve as a reference point to realign the switch mounting bracket when replacing.

I. Refer to Figure 3 for steps involving items 2, 3, and 4. Insert O-ring (Item 3) into groove of filter fitting (Item 2). Press the O-ring to the bottom of the groove.

J. Insert and seat the air tube (Item 4) into the rim of filter fitting (Item 2).

K. Remove the plug from the left side of the absolute filter.

L. Insert the filter fitting (Item 2) into the hole of the absolute filter where the plug was removed. The filter fitting should fit flush with the filter.

M. Install the absolute filter from kit (WL# 726-6847), into base pan. Exercise care to align filter inlet and air manifold outlet; also take care that the filter is properly positioned in the retaining clip. Cover the filter outlet hole with a sheet of paper to prevent contamination.

N. Refer to Figure 3. Insert set screw (Item 10) 1.00 + or -.12 inches (25.4 + or -3 mm) from one end of air tubing (Item 5).
5. INSTALLATION PROCEDURE (CONT.)

O. Refer to Figure 2. Install the end of the air tubing (Item 5) with the set screw onto the air tube (Item 4). Route the air tubing down to the base pan, around the absolute filter, under the air deflector and over to the pressure sensor (Item 9). Plug on to the stem of the pressure sensor.

P. Remove the cover from the outlet hole of the absolute filter.

Q. Lower the deck per manual section 6.7.2. Verify that the deck down switch activates when the deck is lowered. If activation does not occur, adjust per section 6.8.3.3 of the manual.

R. Make sure that the pre-filter is seated against the gasket on the front of the base pan (bend straight if required).

S. Cover entire surface of pre-filter with paper. Turn on AC power. Operate the START/STOP switch to start position. The spindle should NOT start rotating. Release the START/STOP switch and turn AC power OFF.

T. Remove the paper. Remove power to the voice coil by disconnecting its drive power at connector A1P1. Operate the START/STOP switch to start. The spindle should rotate. Allow drive to purge for 20 minutes. Release START/STOP switch and turn AC power OFF.

U. Reconnect A1P1. Turn on AC power. Operate the START/STOP switch to start unit. With heads loaded at track "0", cover the entire surface of the pre-filter with paper. The heads should unload and the spindle stop rotating.

V. Log the WANG LABORATORIES FCO# 1004 on the unit FCO log on the side of the electronics module. Insert Figures 1, 2, 3 and the FCO kit parts list (Section 7) behind page 7-8 in the Hardware Maintenance Manual (WL# 729-0198A). Insert page 8 of this FCO in the manual in front of page 7-23 and cross out the old 7-23, but do not remove it as there is valid information on the other side.

W. Replace the top cover per Manual Section 6.7.1.

X. Return disk to normal operation.
Figure 1. Views Showing Location of Wire to be Replaced for this FCO.
Figure 2. Installation of sensor and Routing of Wires.
Equipment Affected: 2280 AND 6580 PHOENIX DRIVES (BLOCK POINT 3 AND BELOW)

Class: NEXT CALL

Org. Code: III.A.7

Est. Install. Time: 45 MINUTES

FCO Kit #: 728-0018-25

FCO Doc. #: 729-1990

Ref. ECO #: CDC# 33779

Approval Date: JUN 28 1982

Figure 3. Installation of Filter Fitting to Pick Off Air Pressure to Route to Sensor
WANG

FIELD CHANGE ORDER

Equipment Affected: 2280 AND 6580 PHOENIX DRIVES (BLOCK POINT 3 AND BELOW)

Class: NEXT CALL

Org. Code: III.A.7

Est. Install. Time: 45 MINUTES

FCO Kit #: 728-0018-25

FCO Doc. #: 729-1090

Ref. ECO #: CDC#: 33779

Approval Date: JUN 28 1982

FIGURE 7-21. CMD HARNESSES
6. CHECK-OUT PROCEDURE
   A. See Steps R through U of Section 5 above.
   B. Depress "START" button on operator's control panel. "READY" light will indicate proper installation of this change.

7. FCO KIT PARTS LISTING

<table>
<thead>
<tr>
<th>Item #</th>
<th>Item Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>WL# 729-1090</td>
<td>FCO# 1004</td>
</tr>
<tr>
<td>WL# 726-6846</td>
<td>Filter, Air Fine</td>
</tr>
<tr>
<td>WL# 726-6847</td>
<td>Pressure Sensor Kit</td>
</tr>
</tbody>
</table>

8. FCO KIT AVAILABILITY DATE

FCO Kit# 728-0018-25 will be available August 13, 1982. It can be obtained by placing a routine order through the Logistics Order Processing System. See MISCELLANEOUS "NOTE" - Section 10.

9. REMOVED PARTS DISPOSITION

Removed parts should be scrapped.

10. MISCELLANEOUS

<table>
<thead>
<tr>
<th>Item</th>
<th>CDC ID Number</th>
<th>Title</th>
<th>Qty</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>77643194</td>
<td>Bracket, Sensor</td>
<td>1 ea</td>
</tr>
<tr>
<td>2</td>
<td>75899165</td>
<td>Fitting, Filter</td>
<td>1 ea</td>
</tr>
<tr>
<td>3</td>
<td>92074007</td>
<td>O-Ring</td>
<td>1 ea</td>
</tr>
<tr>
<td>4</td>
<td>77649250</td>
<td>Air Tube</td>
<td>1 ea</td>
</tr>
<tr>
<td>5</td>
<td>77668546</td>
<td>Air Tubing</td>
<td>1 ea</td>
</tr>
<tr>
<td>6</td>
<td>10127170</td>
<td>Screw, Mach Pan</td>
<td>2 ea</td>
</tr>
<tr>
<td>7</td>
<td>10126100</td>
<td>Washer</td>
<td>2 ea</td>
</tr>
<tr>
<td>8</td>
<td>10125102</td>
<td>Nut, Hex</td>
<td>2 ea</td>
</tr>
<tr>
<td>9</td>
<td>77619634</td>
<td>Sensor Press</td>
<td>1 ea</td>
</tr>
<tr>
<td>10</td>
<td>92006029</td>
<td>Screw, Set (one spare)</td>
<td>2 ea</td>
</tr>
<tr>
<td>11</td>
<td>77664315</td>
<td>Jumper Leads (34 in.)</td>
<td>1 ea</td>
</tr>
<tr>
<td>12</td>
<td>77664316</td>
<td>Jumper Leads (15 in.)</td>
<td>1 ea</td>
</tr>
<tr>
<td>13</td>
<td>94277400</td>
<td>Ty Wrap</td>
<td>2 ea</td>
</tr>
</tbody>
</table>

NOTE: This change may decrease normal demand for filters required for Preventative Maintenance.
PERIPHERALS–DISK DRIVES–CDC PHOENIX

TOPIC: PHOENIX CENTER RAIL TORQUE SPECIFICATION

We have had reports of the center rail becoming loose and causing head crashes. The screw holding the rail is supposed to be lock-tited. If you have a rail come loose, place lock tite (P/N 660-0194) on the threads and torque to 1.25 inch pounds, (which is almost finger tight). Refer to manual 729-0198B, page 6-36, section 6-7-19 for instructions.

Caution: If you over torque the center rail, the alignment will be affected and you may not be able to get it within specifications.
PERIPHERALS—DISK DRIVES—CDC PHOENIX

TOPIC: FUNCTION OF BLOCK POINT 4 JUMPERS IN SERVO COURSE BOARD

The purpose of this newsletter is to clarify the function of the selectable jumpers in the center of the servo course board, Wang part number 726-5780, CDC part # 77682950. There are a total of four selectable pins. Positions 1 and 2 are for changing the purge time on power up. With the jumper for pins 1 and 2 removed, the optional 120 second purge is selected. With the jumper in place, the normal purge is selected.

Pins 3 and 4 monitor loss of Automatic Gain Control (AGC). With this jumper in place and a loss of AGC is sensed, the heads will unload and a seek error code will be set. To recover, an operator can clear via the operators panel or issue an Return To Zero (RTZ) command. The drive can then be restarted or the pack removed from the drive.

With the jumper removed and loss of AGC is sensed, the drive will be dead! The operator will not be able to clear the error from the operator panel or by issuing an RTZ command. The cartridge receiver door will be locked, preventing anyone from removing the cartridge. This is a safety feature designed to prevent an operator from propagating a head crash to other drives. The only way to clear this condition is to power the drive off and on.

Drives are currently being shipped with both jumpers installed.
PERIPHERALS–DISK DRIVES–CDC PHOENIX

TOPIC: PHOENIX SERVO COARSE PCB'S CORRECTED JUMPER SETTINGS
FROM TAC N/L 40306, CATEGORY 3105, TOPIC: SAME

Due to incorrect information, the above mentioned N/L was in error. The disable jumper was mis-stated as being the load timing jumper. The correct jumper settings are stated below. We are sorry for any inconvenience this may have caused.

There is a new servo Coarse PCB CDC #77682950 that is being shipped with the new units. It is completely compatible with the other Servo Coarse PCB's (726–5780).

This new Servo Coarse board has a jumper (J1) located near the right hand PCB extractor lever. This jumper is for the Servo Disable. With the jumper to the left side, the Servo is disabled; with the jumper to the right side, the Servo is enabled.

The Head load timing jumper (J2 4 pin) is located in the middle of the PCB between U22 and U27.

This delay was incorporated to allow extra purge and stabilization time for the cartridge; the lower particle count can reduce head crashes.

```
PCB =

<table>
<thead>
<tr>
<th>XX YY</th>
</tr>
</thead>
<tbody>
<tr>
<td>I I I</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>AA BB</th>
</tr>
</thead>
<tbody>
<tr>
<td>U22 II II U27</td>
</tr>
</tbody>
</table>

J1

J2

XX= Disabled, YY= Enabled
AA= 120 Seconds, BB= 90 Seconds
```
The "ERROR" and "ACTION" items on the following pages represent possible solutions to drive problems. They are not to be construed as a guarantee to all problems, but to be used as a guide to problem resolution.

The "PHASE" and "FAULT" indications are derived from the MICRO-PROCESSOR on the CONTROL-MUX PCB, LED's CR3 through CR7. A description and explanation on its use is shown in section 6, tables 6-6, 6-7 and 6-8 in the CMD maintenance manual. "PHASE" represents the phase of operation the drive was in when it acquired a "FAULT".

<table>
<thead>
<tr>
<th>PHASE</th>
<th>FAULT</th>
<th>ERROR DESCRIPTION</th>
<th>ACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td></td>
<td>Spindle start greater than 70 seconds.</td>
<td>PRIMARY:</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1) Check drive belt.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2) Replace motor starter capacitor.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>3) Replace Solid State Relay.</td>
</tr>
<tr>
<td>0F</td>
<td></td>
<td>Spindle did not start/stop in 2 minutes after ERSLO/ERSTP was noted.</td>
<td>PRIMARY:</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1) Same as fault 10.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>SECONDARY:</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>a) Check Relay Control PCB and cabling.</td>
</tr>
<tr>
<td>11</td>
<td></td>
<td>No spindle movement.</td>
<td>PRIMARY:</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1) Replace Servo Coarse</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2) Replace Relay Cntrl</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>3) Replace Solid State Relay.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>SECONDARY:</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>a) Check Speed Sensor</td>
</tr>
<tr>
<td>12</td>
<td></td>
<td>No drive to solid state relay.</td>
<td>PRIMARY:</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1) Replace Servo Coarse</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2) Replace Relay Cntrl</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>SECONDARY:</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>a) Check cabling b/w PCB's and SSR.</td>
</tr>
<tr>
<td>13</td>
<td></td>
<td>Solid state relay failure.</td>
<td>PRIMARY:</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1) Replace Solid State RELAY.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2) Replace Servo Coarse</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>3) Replace Relay Ctl</td>
</tr>
<tr>
<td>PHASE</td>
<td>FAULT</td>
<td>ERROR DESCRIPTION</td>
<td>ACTION</td>
</tr>
<tr>
<td>-------</td>
<td>-------</td>
<td>-------------------</td>
<td>--------</td>
</tr>
</tbody>
</table>
| 14    | 14    | Stop Timeout.     | PRIMARY:  
|       |       |                   | 1) Replace Servo Coarse  
|       |       |                   | 2) Check drive belt  
|       |       |                   | 3) Check Relay Control |
| 15    | 15    | Emergency retract failure. | PRIMARY:  
| 1D    | 1D    | Allowed time expired. | 1) Replace Power Amp  
|       |       |                   | 2) Replace Servo Coarse |
| 16    |       | Normal retract failure | PRIMARY:  
|       |       |                   | 1) Replace Power Amp  
|       |       |                   | 2) Replace Servo Coarse |
| 17    |       | Cylinder address greater than 822. | PRIMARY:  
|       |       |                   | 1) Replace I/O  
|       |       |                   | 2) Replace Servo Coarse  
|       |       |                   | SECONDARY:  
|       |       |                   | a) Check host IOP and software. |
| 1B    | 1B    | RPM fault.        | PRIMARY:  
|       |       |                   | 1) Check Speed Sensor  
|       |       |                   | 2) Check Motor, Pulley, Belt.  
|       |       |                   | 3) Replace Servo Coarse  
|       |       |                   | 4) Replace SSR. |
| 1C    | 1C    | Lost speed pulses. | PRIMARY:  
|       |       |                   | 1) Replace Speed Sensor  
|       |       |                   | 2) Replace Servo Coarse  
|       |       |                   | 3) Check Sensor cabling |
| 1D    | 1D    | Allowed time expired. | PRIMARY:  
|       |       |                   | 1) Replace Servo Coarse  
|       |       |                   | 2) Replace Power Amp |
| 01    | 1D    | Return to track center Allowed time expired. (80 MS). | PRIMARY:  
|       |       |                   | 1) Replace Servo Coarse  
|       |       |                   | 2) Replace Servo Fine  
<p>|       |       |                   | 3) Replace Power Amp |</p>
<table>
<thead>
<tr>
<th>PHASE</th>
<th>FAULT</th>
<th>ERROR DESCRIPTION</th>
<th>ACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>02</td>
<td>1A</td>
<td>Wait for coarse seek completion. Lost AGC.</td>
<td>PRIMARY:</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1) Possible head crash. Inspect heads and</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>media.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2) Possible bad servo head.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>SECONDARY:</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>a) Replace Servo Coarse</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>b) Replace Servo Fine</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>c) Replace Power Amp</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>d) Replace Cartridge</td>
</tr>
<tr>
<td>02</td>
<td>1D</td>
<td>Wait for coarse seek completion. Allowed time</td>
<td>PRIMARY:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>expired.</td>
<td>1) Same as SECONDARY of 02-1A.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>SECONDARY:</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>a) Check bearing plate</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>b) Check bearings</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>c) Check rail</td>
</tr>
<tr>
<td>03</td>
<td>1A</td>
<td>After seek settling. Lost AGC.</td>
<td>PRIMARY:</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1) Same as SECONDARY of 02-1A.</td>
</tr>
<tr>
<td>03</td>
<td>1D</td>
<td>After seek settling. Allowed time expired.</td>
<td>PRIMARY:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(80 ms)</td>
<td>1) Same as SECONDARY of 02-1A.</td>
</tr>
<tr>
<td>03</td>
<td>1E</td>
<td>After seek settling. No track lock in settling.</td>
<td>PRIMARY:</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1) Same as 02-1D</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>SECONDARY:</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>a) Same as 02-1D</td>
</tr>
<tr>
<td>03</td>
<td>1D</td>
<td>After seek settling. Allowed time expired.</td>
<td>PRIMARY:</td>
</tr>
<tr>
<td></td>
<td>1E</td>
<td>No track lock in settling. (80 ms)</td>
<td>1) Same as 02-1D.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>SECONDARY:</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>a) Same as 02-1D.</td>
</tr>
<tr>
<td>04</td>
<td>18</td>
<td>Idle loop. Off track greater than 1200 u sec.</td>
<td>PRIMARY:</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1) Same as 02-1D.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>SECONDARY:</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>a) Same as 02-1D.</td>
</tr>
</tbody>
</table>
### Customer Engineering
**Technical Assistance Center**
**Newsletter #41120**

#### 3105 Peripherals-Disk Drives-CDC Phoenix

**Topic:** CMD Control-Mux Error Conditions (continued)

<table>
<thead>
<tr>
<th>Phase</th>
<th>Fault</th>
<th>Error Description</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>04</td>
<td>18</td>
<td>Idle loop.</td>
<td>PRIMARY: 1) Same as 02-1D. SECONDARY: a) Same as 02-1D.</td>
</tr>
<tr>
<td>04</td>
<td>1E</td>
<td>Off track GT1200 u sec No track lock in settling.</td>
<td>PRIMARY: 1) Replace Servo Coarse 2) Replace Power Amp 3) Check Voice Coil and cabling.</td>
</tr>
<tr>
<td>05</td>
<td>1D</td>
<td>Return to zero motion. Allowed time expired. (500 ms)</td>
<td>PRIMARY: 1) Replace Servo Coarse 2) Replace Servo Fine 3) Replace Servo Preamp</td>
</tr>
<tr>
<td>06</td>
<td>1A</td>
<td>End of velocity table. Lost AGC.</td>
<td>PRIMARY: 1) Replace Servo Coarse 2) Replace Servo Fine 3) Replace Servo Preamp</td>
</tr>
<tr>
<td>06</td>
<td>1D</td>
<td>End of velocity table. Allowed time expired. (80 ms)</td>
<td>PRIMARY: 1) Replace Servo Coarse 2) Replace Servo Fine SECONDARY: a) Check Bearing Plate b) Servo Head Alignment c) Carriage Bearings d) Rail</td>
</tr>
</tbody>
</table>
### PERIPHERALS—DISK DRIVES—CDC PHOENIX

**TOPIC:** CMD CONTROL—MUX ERROR CONDITIONS (continued)

<table>
<thead>
<tr>
<th>PHASE</th>
<th>FAULT</th>
<th>ERROR DESCRIPTION</th>
<th>ACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>07</td>
<td></td>
<td>Head load.</td>
<td>PRIMARY: 1) Replace Servo Coarse 2) Replace Power Amp 3) Replace Relay Cntrl</td>
</tr>
<tr>
<td>08</td>
<td></td>
<td>Await AGC during head load.</td>
<td>PRIMARY: 1) Replace Servo Fine 2) Replace Servo Coarse 3) Replace Servo Preamp SECONDARY: a) Check Servo Head and Cable.</td>
</tr>
<tr>
<td>08</td>
<td>1D</td>
<td>Await AGC during head load. Allowed time expired. (300 ms)</td>
<td>PRIMARY: 1) Replace Servo Fine 2) Replace Servo Preamp SECONDARY: a) Check Servo Head and Cable.</td>
</tr>
<tr>
<td>09</td>
<td></td>
<td>Await track center-load or RTZ.</td>
<td>PRIMARY: 1) Replace Servo Coarse 2) Replace Servo Fine SECONDARY: a) Check Servo Head and Cable. b) Check Velocity Transducer.</td>
</tr>
<tr>
<td>09</td>
<td>1D</td>
<td>Await track center-load or RTZ. Allowed time expired. (300 ms)</td>
<td>PRIMARY: 1) Replace Servo Fine 2) Replace Servo Coarse 3) Replace Servo Preamp SECONDARY: a) Same as Phase 09</td>
</tr>
<tr>
<td>0A</td>
<td></td>
<td>Settling—load or RTZ.</td>
<td>PRIMARY: 1) Same as 09—1D SECONDARY: a) Same as 09—1D</td>
</tr>
<tr>
<td>0A</td>
<td>1A</td>
<td>Settling—load or RTZ. Lost AGC.</td>
<td>PRIMARY: 1) Same as 09—1D SECONDARY: a) Same as 09—1D</td>
</tr>
<tr>
<td>PHASE</td>
<td>FAULT</td>
<td>ERROR DESCRIPTION</td>
<td>ACTION</td>
</tr>
<tr>
<td>-------</td>
<td>--------</td>
<td>-------------------------</td>
<td>-----------------------------</td>
</tr>
<tr>
<td>0B</td>
<td></td>
<td>Offset active.</td>
<td>PRIMARY:</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1) Replace Servo Coarse.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2) Replace Servo Fine</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>3) Replace Servo Preamp.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>4) Replace Power Amp</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>SECONDARY:</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>a) Check Voice Coil and</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>associated cabling.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>b) Check servo head and</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>cabling.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>c) Check Velocity Transducer.</td>
</tr>
<tr>
<td>0B</td>
<td>1A</td>
<td>Offset active. Lost AGC.</td>
<td>PRIMARY:</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1) Same as Phase 0B</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>SECONDARY:</td>
</tr>
<tr>
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<td></td>
<td></td>
<td>a) Same as Phase 0B</td>
</tr>
<tr>
<td>0C</td>
<td></td>
<td>Clear offset settling.</td>
<td>PRIMARY:</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1) Same as Phase 0B</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>SECONDARY:</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>a) Same as Phase 0B</td>
</tr>
<tr>
<td>0C</td>
<td>1A</td>
<td>Clear offset settling.</td>
<td>PRIMARY:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Lost AGC.</td>
<td>1) Same as Phase 0B</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>SECONDARY:</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>a) Same as Phase 0B</td>
</tr>
</tbody>
</table>
TECHNICAL SERVICE BULLETIN
SECTION: Hardware Technical

NUMBER: HWT 5131  REPLACES: N/A  DATE: 07/02/85  PAGE 1 OF 1

MATRIX ID. 3105  PRODUCT/RELEASE# 2280/6580/2280V

TITLE: FIXED MODULE REPLACEMENT (WLN 726-6506)

PURPOSE:
To inform field personnel of possible fixed module difficulties.

EXPLANATION:
Approximately 60 defective fixed modules were delivered by Magnetic Data to Wang. The servo signals were written incorrectly, by five tracks, from the correct location. The problem was caused by a process error during March and April. Logistics is working with Magnetic Data to purge all field stock.

To recognize these fixed modules the CE, after replacing a fixed module, will have problems performing the head alignment in the drive. The CE will be unable to locate the alignment signals on the CE alignment cartridge with the head tool. The servo signal in the defective fixed modules is recorded in the incorrect location, which creates difficulty in aligning the heads of the removable cartridge. These fixed modules are under warranty. Currently the serial numbers of the defective modules are unknown.

In case of an emergency these fixed modules can be used by the field. The CE alignment cartridge signals can be reached by moving the heads (the servo and data heads) with a screwdriver. These fixed modules will then operate without any problem.

To return the recalled fixed modules contact Diana Nelson in Wang Purchasing (Tel. 617-794-6830 or FAX 617-794-7045). The information required from the field is quantities of recalled modules, serial numbers of the modules, branch address or country, and person to contact.

Purchasing will supply the field with the vendor return authorization number, the debit number, the shipping address and the instructions on how to prepare the material for shipment. The vendor will drop ship the replacement fixed modules to your location after they receive the recalled fixed modules from you.

GROUP: Peripheral Hardware Support Group  MAIL STOP: 0125

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TECHNICAL SERVICE BULLETIN
SECTION: HardWare Technical

NUMBER: HWT 7029   REPLACES: _______   DATE: 02/24/87   PAGE 1 OF 1
MATRIX ID: 3105   PRODUCT/RELEASE#: CDC Phoenix (2280)

TITLE: Cartridge Release Shaft (WLI #726-1398)

PURPOSE:
To inform the field of a potential problem with the old style cartridge release shaft on the CDC Phoenix Disk Drive (Model 2280), and make the field aware of the new style shaft assembly (WLI #726-1398).

EXPLANATION:
There is a potential problem in the CDC Phoenix Disk Drive with the Cartridge Release Shaft assembly (CDC Cartridge Module Drive Manual WLI #741-1063 page 7-8, figure 7-4; items 471, 472 & 473). The problem is with the plastic bearing and spacers on the end of the shaft. Over a period of time, the plastic can crack from the heat generated inside the drive and also from the force of hitting the bottom of the cartridge each time the door is opened to remove the cartridge. With the cracking of the plastic, pieces could find their way into the fixed module area and damage the platters. This could possibly lead to a head crash if enough damage is done.

The old style plastic bearings and spacers are on the BP3 (Block Point 3) and possibly some of the early BP4 (Block Point 4) models and are white in color. The new style shaft assembly has a dark brown nylon bearing with a washer and "C" clip to hold it on the shaft.

This assembly (bearing and spacers) should be checked for signs of wear on a next call basis and replaced if necessary. The new assembly can be ordered through Logistics using WLI #726-1398 and can be used on the BP4 as well as the BP3 drives.

GROUP: Desktop Systems/Peripherals Group   MAIL STOP: 001-140
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TECHNICAL SERVICE BULLETIN
SECTION: Hardware Technical

NUMBER: HWT 7021      REPLACES: _______      DATE: 03/10/87      PAGE 1 OF 2

MATRIX ID. 3105      PRODUCT/RELEASE# PHOENIX

TITLE: Phoenix board compatibility

PURPOSE:
To make the field aware of possible compatibility issues with Phoenix boards.

EXPLANATION:
Several calls have been received by On Line Product Support from the field concerning compatibility with Phoenix boards. The boards in question are: the I/O, the Control Mux, and the Servo Coarse. For the most part these boards should be upward and downward compatible. If experiencing a problem two general rules may help:

1. Avoid using the early version boards in the Blockpoint 4 drives (identified by pluggable harness on power amp and relay board) due to timing differences with Wang controllers. (See boards noted with single * from list.)
2. Avoid intermixing the new I/O Board (726-6669), the new Control Mux (726-6668), and the Servo Coarse (726-6887) with older version boards. (See boards noted with ** from list.)

The following list contains most of the CDC part numbers associated with the I/O boards, the Control Mux boards, and the Servo Coarse boards used by Wang Labs.

<table>
<thead>
<tr>
<th>I/O Board</th>
<th>726-5778</th>
<th>I/O Board</th>
<th>726-6669</th>
</tr>
</thead>
<tbody>
<tr>
<td>* 75891850</td>
<td>series code 2</td>
<td>** 77665650</td>
<td>series code 4</td>
</tr>
<tr>
<td>* 77616751</td>
<td>series code 2/3</td>
<td></td>
<td>(universal)</td>
</tr>
<tr>
<td></td>
<td>(unique to Wang)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>77616770A</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>77616790</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>77622500-1</td>
<td>series code 3</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(universal)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Control Mux</th>
<th>726-5779</th>
<th>Control Mux</th>
<th>726-6668</th>
</tr>
</thead>
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<tr>
<td>77616600</td>
<td></td>
<td>** 77666950</td>
<td></td>
</tr>
<tr>
<td>77624700</td>
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</tr>
</tbody>
</table>

OVER

GROUP: VS/2200/PC On Line Hardware Support Group      MAIL STOP: 001-260
                                               COMPANY CONFIDENTIAL
                                               WANG Laboratories, Inc.
TECHNICAL SERVICE BULLETIN
SECTION: Hardware Technical

NUMBER: HWT 7021    REPLACES:  DATE: 03/10/87    PAGE 2 OF 2
MATRIX ID. 3105    PRODUCT/RELEASE# PHOENIX

TITLE: Phoenix board compatibility

Servo Coarse 726-5780
*  75885600
  77622400/01/02/03
  77622420
  77622750
  77666800/01

Servo Coarse 726-6887
**  77682950 has jumpers J1 (top rt) & J2
    (between U22 and U27)
    set J1 in (loss of AGC recoverable
    without power down)
    set J2 out (120 sec purge)
    in (90 sec purge)

NOTE: THE NEWER REV BOARDS ARE VERY SIMILAR TO THE OLDER VERSION
      BOARDS. BOARDS IN STOCK COULD BE MIXED. IF A PARTICULAR REV
      BOARD IS NEEDED, VERIFY THE REV WHEN TAKEN FROM STOCK. WHEN
      ORDERING BOARDS- SPECIFY THE CDC NUMBER AND VERIFY CORRECT UPON
      RECEIPT.

ADDITIONAL INFORMATION:
There are 3 different Relay Boards for the Phoenix. Two of the boards are
for Blockpoint 4 drives (pluggable terminal strip). If replacing a Relay
Board in a Blockpoint 4 drive, the same type Relay Board should be used as
identified by the CDC part number on the board. Do not replace one type
with another.

Blockpoint 3 Relay Board
726-5786 CDC # 75898850/77634490

Blockpoint 4 Relay Boards
726-6724 CDC # 77680650
726-6724A CDC # 77713900

GROUP: VS/2200/PC On Line Product Support Group
MAIL STOP: 001-260

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WANG Laboratories, Inc.
TECHNICAL SERVICE BULLETIN
SECTION: Hardware Technical

NUMBER: HWT 7087  REPLACES: HWT 7021  DATE: 05/05/87  PAGE 1 OF 2

MATRIX ID. 3105  PRODUCT/RELEASE: PHOENIX

TITLE: Phoenix board compatibility

PURPOSE:
To clarify information supplied in TSB 7087 by further identification of the boards which could present compatibility issues with the Phoenix.

EXPLANATION:
Several calls have been received by On Line Product Support from the field concerning compatibility with Phoenix boards. The boards in question are: the I/O, the Control Mux, and the Servo Coarse. For the most part these boards should be upward and downward compatible. If experiencing a problem the following may help:

1. Avoid using the early version boards in the Blockpoint 4 drives due to timing differences. Blockpoint 4 drives can be identified by the pluggable harness on the power amp and relay board. Early version boards are noted with a single * in the list.
2. Avoid intermixing the new I/O Board (726-6669), the new Control Mux (726-6668), and the new Servo Coarse (726-6887) with other versions of these same type boards. The new I/O, Control Mux, and Servo Coarse boards are noted with ** in the list.
3. Those boards without asterisks are upward and downward compatible to all drives but should not be used with the new I/O, Control Mux, and Servo Coarse boards as stated in 2.

The following list contains most of the CDC part numbers associated with the I/O boards, the Control Mux boards, and the Servo Coarse boards used by Wang Labs.

<table>
<thead>
<tr>
<th>I/O Board</th>
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<tr>
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<td>series code 2/3 (unique to Wang)</td>
<td></td>
</tr>
<tr>
<td>77616770A</td>
<td></td>
<td></td>
</tr>
<tr>
<td>77616790</td>
<td></td>
<td></td>
</tr>
<tr>
<td>77622500-1</td>
<td>series code 3 (universal)</td>
<td></td>
</tr>
</tbody>
</table>

OVER

GROUP: VS On-Line Support  MAIL STOP: 001-260

WANG Laboratories, Inc.
TECHNICAL SERVICE BULLETIN
SECTION: Hardware Technical

NUMBER: HWT 7087
REPLACES: HWT 7021
DATE: 05/05/87

MATRIX ID. 3105
PRODUCT/RELEASE# PHOENIX

TITLE: Phoenix board compatibility

Control Mux 726-5779
77616600
77624700

Control Mux 726-6668
** 77666950

Servo Coarse 726-5780
* 75885600
77622400/01/02/03
77622420
77622750
77666800/01

Servo Coarse 726-6887
** 77682950 has jumpers J1 (top rt) & J2 (between U22 and U27)
set J1 in (loss of AGC recoverable without power down)
set J2 out (120 sec purge) in (90 sec purge)

NOTE: THE NEWER REV BOARDS ARE VERY SIMILAR TO THE OLDER VERSION
BOARDS. BOARDS IN STOCK COULD BE MIXED. IF A PARTICULAR REV
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ADDITIONAL INFORMATION:
There are 3 different Relay Boards for the Phoenix. Two of the boards are
for Blockpoint 4 drives (pluggable terminal strip). If replacing a Relay
Board in a Blockpoint 4 drive, the same type Relay Board should be used as
identified by the CDC part number on the board. Do not replace one type
with another.

Blockpoint 3 Relay Board
726-5786 CDC # 75898850/77634490

Blockpoint 4 Relay Boards
726-6724 CDC # 77680650 NO A/2
726-6724A CDC # 77713900 LO A/2 OPTION

GROUP: VS On Line Support
MAIL STOP: 001-260

COMPANY CONFIDENTIAL
WANG Laboratories, Inc.
CDC Disk Cartridge
Product Specification Manual for

Model No. 1204/91204
Manual No. 76204375

Information contained in this publication is not company restricted
PREFACE

This manual describes the physical dimensions of the media which are necessary for interface with the drives. Signal characteristic requirements and other media requirements necessary for reliable operation with the drives have also been defined in this manual.

MANUAL REVISION A DATE 7/26/78

This revision makes all previous revisions of this manual (manuals having the same model number and manual number on the cover sheet) obsolete. This revision should be reviewed in its entirety. The information in this manual is current as of the date of the revision, but is subject to future change by CDC without notice.

Contents in this manual may cover items which have been patented or have a patent pending, and the distribution of this manual, under no circumstances, constitutes or implies a grant of a license.
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1.0 SCOPE

This specification describes the characteristics and usage of the CONTROL DATA Preformatted 1204 (91204) Disk Cartridge, P/N 76204000 (76204001). This disk cartridge is used on the Control Data 9448 series front-loading Cartridge Module Drive (CMD).

2.0 APPLICABLE DOCUMENTS

PUBL. 76888221 - 9448 Product Specification 3600 RPM

3.0 REQUIREMENTS

3.1 General

The CONTROL DATA 1204 Disk Cartridge is a removable, high density, single disk data storage cartridge designed for use with the CONTROL DATA 9448 Drive. When removed from the drive, the cartridge is protected from contamination by a removable bottom cover. The cartridge consists of an oxide-coated disk clamped to a magnetic hub and encased in a plastic housing. The lower surface of the disk is used for data storage and the upper surface for servo positioning and index/timing. Pre-recorded data includes servo surface positioning data and pre-initialized data surface with alternate track assignments.

3.2 Cartridge Mechanical Characteristics

3.2.1 Components

The disk cartridge consists of the following components (See Fig. 1):

1. Top Cover Assembly
2. Hub
3. Recording Disk
4. Clamp Ring
5. Fixed Bottom Cover
6. Removable Cover

3.2.2 Housing

When the cartridge is not in use, the disk is enclosed by a housing (top cover assembly and fixed bottom cover) and the removable cover. A latch releases the removable cover so the cartridge can be lifted out before insertion into the drive. Pins and shoulder stops in the top cover assembly engage a mating feature in the drive that locates guides and supports the cartridge. It is inserted and removed from the drive. The cartridge is designed for a minimum of 10,000 insertion removal cycles. A recess and handle in the top cover are provided to aid in handling the cartridge. The top and removable covers are designed to interlock and allow cartridge stacking. When not in the
3.2.2 (Continued)

The drive, the cartridge is protected by attaching the removable cover. The disk and hub are constrained to prevent disk contact with the interior of the housing during all phases of normal handling. Housing dimensions are given in Figures 2 & 3.

3.2.3 Cartridge Hub

The critical dimensions and relationship of the recording disk and hub are shown in Fig. 4.

3.2.4 Weight

The weight of the cartridge without the removable cover is 4.5 lbs. (2.04 Kg).

3.2.5 Balance

Rotating components are balanced within 4 in.-gm. in a single plane parallel to the armature plate and .311 (7.90) above the bottom surface of the armature plate.

3.2.6 Hub Holding Force

The drive spindle magnetic chuck exerts a gross force of 35 ± 5 lbs. (156 ± 22N) which provides attraction for the hub armature plate.

3.2.7 Cartridge Operating Speed

The cartridge is designed to operate at 3600 RPM, ±2.5% -3.5%. The hub-disk assembly rotates in a counterclockwise direction when viewed from above.
FIGURE 2: TOP VIEW.
FIGURE 4: HUB & DISK ASSEMBLY.

This dimension shall be satisfied with a centrally applied load of 6.5 to 20.5 pounds (3.86 to 9.31 kilograms) as shown. In the absence of a load, dimension shall be .012 (0.30).

TOTAL AXIAL RUNOUT AT 6.75 (17.15) R.
RUNOUT WILL BE CONTAINED WITHIN THE TOLERANCE LIMITS OF THE .387 (9.83) DIMENSION.
3.3 Individual Disk Physical Characteristics

3.3.1 Dimensions (Nominal)

The recording disk has an outside diameter of 14.025 (356.24). Disk thickness is .075 (1.905).

3.3.2 Material

The material and construction of the disk cartridge is such that the dimensional, inertial, balance and other functional operating requirements are met. Each disk is composed of a base material of aluminum coated with a layer of ferromagnetic material dispersed in an organic binder.

3.3.3 Magnetic Characteristics

The oxide used in the magnetic recording surface has the following magnetic characteristics when measured circumferentially in a field of 1000 oersteds.

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coercivity (Hc)</td>
<td>300 Oersteds</td>
</tr>
<tr>
<td>Saturation (Bm)</td>
<td>3200 Gauss</td>
</tr>
<tr>
<td>Residual Saturation (Br)</td>
<td>1700 Gauss</td>
</tr>
</tbody>
</table>

3.3.4 Dynamic Disk Surface Characteristics

The axial disk runout does not exceed .004 (.102) TIR when measured at the 6.75 (171.45) radius.

3.3.5 Disk Surface Roughness

The finished magnetic coating surface is less than 2.0 ulin. (arithmetic average) when measured with a 0.0001 in. radius stylus over a 0.030 in. cutoff range with a stylus speed of 0.01 in./sec. and a weight of 100 mg.
3.3.6 Head Gliding Requirements

Each disk surface is burnished with a burnishing head to ensure that, when the disk is installed on a CONTROL DATA 9448 Drive, the recording surfaces are free of surface irregularities or protrusions that could cause head-to-disk interference if the heads are flown at a minimum spacing of 20 μm.

3.3.7 Recording Surface Durability

The magnetic coating is compatible with CONTROL DATA read/write heads used in the 9448 Drive operated within the specified environments. The coating will not chip, peel or adversely affect the read/write heads as a result of normal operation and will withstand 50,000 head loadings.

3.4 Data Surface Recording Characteristics and Track Format

3.4.1 General

The CDC 1204 cartridge is designed to operate with a recorded track density of 384 tracks/in. Tracks are referenced to the servo surface and to the 1204-51 Control Data CE cartridge (P/N 76204400). The maximum bit density is 6038 bits/in., and the nominal data bit rate is 9.677 megabits/sec. To assure pack interchangeability, the oxide coating characteristics are designed for saturation mode recording when used with the CDC 9448 drive.

3.4.2 Capacity

The recording surface on the cartridge can contain up to 808 primary data tracks. There are also 15 alternate tracks available on the surface to be used as an alternate for any primary track that is defective. The primary tracks are located in cylinders 0 through 807 and the alternate tracks in cylinders 808 through 822. Each track is addressed by a cylinder and head number which is pre-recorded in the home address area of the track.

3.4.3 Read Errors

3.4.3.1 Definition

Read errors normally occur if a bit is absent (reduced in amplitude) or shifted significantly from its nominal position. The cartridge is designed to operate with systems having error correction capabilities of up to eleven bits of errors within one burst location providing the rest of the track is error free. Therefore, a data track containing one or more errors within eleven bits is considered
3.4.3.1 (Continued)

A correctable error track. A track which contains errors that exceed 11 bits is considered an uncorrectable error track.

3.4.3.2 Read Error Acceptance Criteria

- No read errors of any type at cylinders 000 & 822, Hd 00 (Data Surface).
- Not more than 6 correctable error tracks per cartridge.
- No uncorrectable error tracks per cartridge.

3.4.4 Data Surface Format and Initialization Requirements

3.4.4.1 General Format Requirements

All data tracks are formatted with Home Address (HA) and Record Zero (RO). Format data for each track starts at Index which is derived from the servo surface signal. The basic recording unit is the eight-bit hexadecimal byte which corresponds to 0.83 usec. Figure 3 shows the sequential pre-recorded format required of every data track in a disk cartridge.

3.4.4.2 Pre-Initialization Requirements

Each data track is analyzed for correctable and uncorrectable error conditions. If no uncorrectable error conditions are detected, the track is considered flag free and the Home Address and Record Zero are written. The flag byte of the Home Address is equal to 00 and Record Zero contains an eight-byte data field of all zeros. If an uncorrectable error condition is detected after usage, the track is considered defective and an alternate track can be assigned. Defective tracks are also written with Home Address and an eight-byte Record Zero; however, the flag byte of the Home Address contains 02 and the count field of Record Zero contains the address of the alternate track assigned. The first alternate track assigned is cylinder 808, head 00. Assigned alternate tracks must also be flag free. If the alternate is flag free, the Home Address and Record Zero are written with the flag byte of the Home Address equal to 01 and the count field of the Record Zero containing the address of the defective track. If after usage, the alternate track is not flag free, the Home Address must contain 03 and the count field of Record Zero assigns the track to itself. Flag format and typical initialization data is shown in Figure 7.
<table>
<thead>
<tr>
<th>INDEX</th>
<th>GAP 3</th>
<th>NONE ADDRESS</th>
<th>GAP 2</th>
<th>RO COUNT</th>
<th>GAP 2</th>
<th>RO DATA</th>
<th>FILLER GAP</th>
<th>INDEX</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>&quot;0&quot;</td>
<td>&quot;00&quot;</td>
<td>&quot;00&quot;</td>
<td>&quot;00&quot;</td>
<td>&quot;00&quot;</td>
<td>&quot;00&quot;</td>
<td>&quot;00&quot;</td>
<td>&quot;00&quot;</td>
</tr>
</tbody>
</table>

### NONE ADDRESS

- **PA**: 2 bytes (Note 2)
- **FLAG**: 1 byte (Note 3)
- **CCHN**: 4 bytes (Note 4)
- **ECC**: 7 bytes (Note 5)

### GAP 2

- **1 BYTE**: "FF"
- **4 BYTES**: "00"
- **2 BYTES**: "00"

### RO COUNT

- **PA**: 2 bytes (Note 2)
- **FLAG**: 1 byte (Note 3)
- **CCHN**: 4 bytes (Note 4)
- **RECORD LENGTH**: 1 byte ("00")
- **KEY LENGTH**: 1 byte ("00")
- **DATA LENGTH**: 2 bytes ("0000")
- **ECC**: 7 bytes (Note 5)

### RO DATA

- **6 BYTES**: "00"
- **ECC**: 7 bytes (Note 5)

| FILLER GAP | 1 BYTE | APPROX 14-15 | BYTES | "00" |
|-------------|--------|--------------|--------|

### NOTES

1. SINGLE QUOTATION MARKS INDICATE HEXADECIMAL EXPRESSIONS.

2. **PA** = PHYSICAL ADDRESS (EXPRESSED IN HEXADECIMAL)

   - **FIRST BYTE** = LOW ORDER CYLINDER ADDRESS
   - **SECOND BYTE** = BIT 0 = HIGH ORDER CYLINDER ADDRESS, S12
     - **BIT 1** = HIGH ORDER CYLINDER ADDRESS, 25%
     - **BIT 2 TO 4** = 0
     - **BIT 5 TO 7** = 000 HEAD ADDRESS 0

3. **FLAG FORMAT**

   - **BIT 0=0**: 0
   - **BIT 1 = 0**: IF TRACK IS NORMAL
   - **BIT 1 = 1**: IF TRACK CONTAINS A NON-CORRECTABLE ERROR
   - **BIT 2 = 0**: IF TRACK IS NON-CORRECTABLE
   - **BIT 3 = 1**: IF TRACK IS "ASSIGNED" AS AN ALTERNATE TRACK

4. **RO COUNT FIELD FORMAT**

   - **TRADE**: 2 bytes
   - **CCHN**: 7 bytes

5. **CCHN** = TWO BYTES OF CYLINDER ADDRESS AND TWO BYTES OF HEAD ADDRESS AS FOLLOWS:

   - **LOW ADDRESS** = CCHN INFORMATION MUST EQUAL PHYSICAL ADDRESS INFORMATION.

6. **ECC** = A SEVEN BYTE ERROR CORRECTION CODE WHICH ENABLES DETECTION AND CORRECTION OF ERRORS IN THE DATA READ FROM THE DISK. THE ECC IS A NON-CORRECTABLE CODE WITH A CYCLE ERROR CHECKING CODE WITH A DIVIDE POLYNOMIAL OF:

   \[ x^7 + x^5 + x^4 + x^3 + x^2 + 1 \]

   - THE SYNC BYTES ARE USED TO INDICATE THE START OF DATA.

---

**Figure 8: Initialised Data Track Format**
FIGURE 9. TYPICAL DIBIT CONFIGURATION

- FLUX REVERSALS

MINUS-EVEN TRACK SIGNAL

PLUS-ODD TRACK SIGNAL

- EVEN + ODD

SERVO TRACK SIGNAL

-50%

+50%

T2 T3 TO DUAL INTERVAL T2 T3

T0 TO NEXT T0 ------ 2400 NS
T2 TO T0 ------ 1240 NS
T3 TO T2 ------ 330 NS
T3 TO T0 ------ 330 NS

Issued: 3/1/77

CONTROL DATA CORPORATION
MEMORY PRODUCTS, ENGINEERING DIVISION

SPEC 76204375
CD REV A
DATE 7/26/48
PAGE 14
3.5 Servo Surface Pre-Recorded Tracks

3.5.1 General

The upper surface of the disk cartridge is pre-recorded with servo positioning data and is used as an electrical and physical reference for the data (lower) surface when the cartridge is used on a CDC 9448 Drive. Ref. Figure 4.

3.5.2 Definitions

3.5.2.1 Dibit

A dibit is the readback signal produced from a magnetic head that has a magnetic surface with two closely spaced saturation flux reversals passed under it. A typical dibit configuration is shown in Figure 9.

3.5.2.2 Plus-Odd Track

A plus-odd track is a magnetic surface which produces dibits with the leading pulse positive and the trailing pulse negative when read by a correctly polarized servo head. The dibit must occur at an odd numbered interval.

3.5.2.3 Minus-Even Track

A minus-even track is a magnetic surface which produces dibits with the leading pulse negative and the trailing pulse positive when read with a correctly polarized servo head. The dibit must occur at an even numbered interval.

3.5.2.4 Interval

An interval is the time between leading peaks of successive minus-even and plus-odd dibits when read on a servo track. This is nominally equal to 1.24 usec.

3.5.2.5 Dual Interval

A dual interval is the combined time between the beginning of an odd interval and the end of an even interval as shown in Figure 9.
3.5.2.6 Track Center

The head position for which the read signal contains equal amplitudes of plus-odd and minus-even signal components derived from two adjacent tracks, necessitating concentric tracks to be recorded without areas void of magnetic transitions. Equal amplitude refers to the leading peak of a dibit, and is nominally the condition with the head center between plus-odd and minus-even track centers. This is further referred to as servo track center.

3.5.3 Servo Surface Track Location and Characteristics

3.5.3.1 Track Locations and Spacing

All servo positioning tracks are referenced to Track 404 of the CE cartridges and have a nominal track-to-track spacing of 0.0026 in. measured radially from cartridge center. The actual magnetic center of Track 404 with the disk cartridge at 68°F (20°C) is located along a line whose (nominal) coordinates with respect to spindle center are \( X = 5.3307 \), \( Y = 0.000 \) inches.

3.5.3.2 Servo Zone

A servo track consists of a combination of plus-odd and minus-even tracks. The track electrical center is precisely located when the read head signal contains equal amplitudes of plus-odd and minus-even signal components. The servo zone thus consists of 823 servo tracks created by writing 824 tracks alternating between plus-odd and minus-even, from track -0.5 through 822.5 respectively. There are also guard bands located on either side of the servo zone which consists of 24 plus-odd tracks recorded at track -24.5 through -1.5 and 36 minus-even tracks recorded at Track 823.5 through 858.5. There must also be a non-recorded area of the disk used as a head loading zone located between the outer guard band and a radius of 6.675 inches.

3.5.3.3 Dibit Timing

As read by a read head, each track is divided into 13,440 equal intervals; and when rotating counterclockwise at 3600 rpm, the tracks have the dibit timing relationships as shown in Figure 9.
3.5.3.4 Missing Dibits

The servo track, as read by a servo positioning transducer, has no consecutive dual interval missing dibits and has no more than four non-consecutive dual intervals with missing dibits. (A dibit is considered missing when the pulse amplitude is less than prescribed percentage of the agc/reference amplitude as derived on a CONTROL DATA 9448 Drive.)

3.5.3.5 Servo Track Eccentricity

Servo track eccentricity does not exceed 150 ulm. maximum TIR with the pack installed at any angular position on the spindle, when checked on a spindle with less than 20 ulm. TIR.

3.5.3.6 Index Pattern

Each servo track has one index pattern encoded on it. An index pattern consists of a 1111010101 pattern of dibits on both plus-odd and minus-even tracks. The order of occurrence of the missing dibits must be left-to-right; each zero represents a dual interval which has no dibits written in it.

3.6 Cartridge Environmental Requirements

3.6.1 Temperature Range

Operating: -50°F (-46°C) to +135°F (57°C)

Maximum rate of temperature change shall not exceed 0.2°F (0.1°C) per minute.

Non-operating (Storage & Transit): -30°F (-35°C) to +150°F (+65°C)

Maximum rate of temperature change shall not exceed 20°F (11°C) per hour.

3.6.2 Relative Humidity

Operating and nonoperating: 8 to 80% RH.

3.6.3 Wet Bulb Reading

Operating: 78°F Maximum

Storage conditions in shipping carton: 85°F maximum.
3.6.4 Altitude

Operating: Mean sea level to 10,000 ft.

Nonoperating: Mean sea level to 40,000 ft. above sea level or a simulated equivalent.

3.6.5 Shock

Nonoperating: The cartridge will not suffer damage or fail to perform as specified herein when subjected to 18 impact shocks of 5 (+0.5) g, consisting of 3 shocks in opposite directions along each of 3 mutually perpendicular axes. Each shock impulse will have a time duration of 11 (±1) ms. The maximum "g" will occur at approximately 5± ms.

3.6.6 Vibration

Nonoperating: The cartridge with removable cover latched in place will withstand a peak displacement of ±0.005 in. In the frequency range of 5 to 60 Hz and ±2 g in the range of 60 to 500 Hz.

3.6.7 Cleaning

Cartridge cleaning is to be performed only in a manner as described in the applicable 9448 maintenance manual.

3.6.8 Rework

If during normal use, data areas of the pack become defective, the user may flag these defective areas and assign alternate tracks by the use of one of several available utility programs. If the factory pre-recorded servo positioning tracks of the disk specified in this document are destroyed, they cannot be regenerated by field personnel and must be reworked at the plant of manufacture.
PHOENIX ALIGNMENT

1. PURGE UNIT and ALIGNMENT PACK (up to speed, servo disconnected)

2. CABLEING (Disk and FTU off)
   A. Install alignment extender brd in drive, slot 4, and alignment board into extender
   B. Install 2 wire cable from Servo Fine (white to front) to R/W Preamp (white on top)
   C. Install 8 wire cable from Servo Fine (Arrow points up and towards wire) to Alignment Extender Brd (Arrow points to rear of drive away from wire)
   D. Install 3 ribbon cables between FTU and Drive.
      Small cable from J1 of Brd 2 in FTU (red wire to right) to I/O Brd (red wire on top) bottom of A connector via adapter cable.
      Medium cable from J3 of Brd 2 in FTU (red wire to right) to CONTROL/MUX Brd, B connector (red wire on top)
      Large cable from J2 of Brd 2 in FTU (red wire to right) to I/O Brd (red wire on top) top of A connector via adapter cable.

3. SWITCH SETTINGS (Setting up for removable servo alignment)
   A. Alignment extender board: S1 to FXD (Load off fixed servo)
   B. Alignment Board: S1 to N (negative polarity of alignment voltage)
      S2 to RW (always RW with Phoenix)
      S3 to X1 (Attenuation factor of alignment voltage)
   C. Servo Fine: S1 to S (looking at servo head) ALWAYS LOOKING AT REMOVABLE SERVO TO ALIGN FIXED SERVO TO REMOVABLE, SWAP CONNECTIONS ON SERVO PREAMP FOR SERVO HEADS.
   D. FTU: Data Entry to Device Type; R/W Select to Alignment; Access Select To Direct Seek

   HEAD and RECORD to manual, START and RUN off
   STEP-down; SINGLE/CONT.-cont; -> to center; LATE/EARLY-center
   WRITE FLAG-off; WRITE PROTECT-on; AH/SECTOR-sector; EOT STOP-off
   ERROR OVERRIDES-off; SHIFT PATT/DATA PATT-data patt; SEQ PWR-off
4. INITIAL POWER ON

A. Power on FTU

B. Pull out card cage, loosen removable heads to 4 lb/(if fixed servo has been loosened, it should be centered and tightened to 12 lb/)

C. Power on drive to LOAD (Alignment pack previously installed and purged)

D. FTU-START and RUN switches to ON(3rd row down, 7 right most lites come on)

E. FTU-key in 8905 (90 Meg), 8903 (60 Meg), 8901 (30 Meg)
   Key LOAD then SEL DRIVE (Busy light will flash till drive ready) set DATA Entry switch to destination

F. Bring Drive to READY (Busy light stops blinking on FTU)

5. SCOPE and METER SET UP

A. Scope: Ch 1- 50 mV/div to READ SIGNAL on Alignment Board
   Ground to chassis
   Sync on Ch 1,1 microsec/div

B. Volt Meter: 500 milV scale
   Positive lead to + TP. of Align Brd., Neg lead to - TP of Align Brd.
6. ALIGNMENT of REMOVABLE SERVO to FIXED SERVO

A. Key RTZ on FTU (heads should move slightly)

B. Move R Servo Head to the outer guard band and back to track 0 using scope (first balanced dibit pattern) heads previously loosened to 4 lb/ (See diagram on next page)

C. Key in CLR, 0404, LOAD, GO

D. Rough Adj-Adjust head till dibit pattern on scope is balanced.

E. Fine Adj-fine adjust head for meter reading as close to 0 Mil V as possible.

F. Calculate offset-record meter reading, switch S1 of Align Brd. to P. Record reading, subtract readings, should be less than 50 Mil V (if off, loosen, Fine Adj again)

   EXAMPLE:
   P reading (+25 milV)-N reading (+5 milV)=20 milV offset
   P reading (+25 milV)-N reading (-10 milV)=35 milV offset
   P reading (-5 milV)-N reading (-10 mil V)= 5 milV offset

G. Tighten down head to 12 lb/ making sure meter reading is less than +/- 50 milV while guiding carriage with other hand and then recheck offset.

H. Seek track 0 (key CLR, RTZ) and check for dibit pattern (not in outer guard band)

I. Seek track 822 (key 0822, LOAD,GO) and check for bal. dibit pattern (if either step B. or I does not show bal. dibit pattern you are off a track, restart at A)

J. Recheck track 404 (key RTZ, CLR,.0404, LOAD,GO, CALCULATE OFFSET, LESS THAN 50 MILV, if not loosen head, fine adj. again)

K. Check offset at track 8 for less than 350 milV (key CLR,008, LOAD,GO)

L. Check offset at track 800 for less than 350 milV (key CLR,0800, LOAD, GO)(if step L or M off, fine adj.)
ALIGNMENT of REMOVABLE DATA to REMOVABLE SERVO

A. S1 of servo fine to D (looking at data head), S1 of align ext brd to normal (seeking off removable servo), seek track 0 (key RTZ) (data head previously loosened to 4 lb/)

B. Seek track 404 (key CLR,0404,LOAD,GO)

C. Rough adjust-adjust head till dibilit pattern on scope is balanced

D. Fine adjust-adjust head for meter reading as close to 0milV as possible

E. Calculate offset-(as in step 6.f.) should be less than 50 milV

F. Tighten down head to 12 lb/ guiding carriage making sure meter reading is less than +/- 50 milV and recheck offset (if off redo fine adjust)

G. Key RTZ then recheck offset at 404 (key CLR,0404,LOAD,GO)

H. Check offset at track 8 for less than 350 milV (key CLR,0008,LOAD,GO)

I. Check offset at track 800 for less than 350 milV(key CLR,0800,LOAD,GO)(if step H or I is off, fine adjust again.)

OUTER GUARD BAND

Oscilloscope Settings
Logic GND to Scope GND
Volts/Div
CH 1 - 0.5 V
CH 2 - NOT USED
Time/Div
A - 0.5 ms
B - NOT USED
Triggering
A - Internal Positive
B - NOT Used
Probe Connections (Use 1X10 Probe)
CH 1 TO FLU DIBITS JACK
CH 2 NOT USED

Balanced Dibilit Pattern (On Track)
**Phoenix Bros**

**I/O Board**
- 626462
- 7265778
  - 75891850 Series Code 2 (Unique to Wang)
  - 77616751 Series Code 2/3 (Unique to Wang)
  - 77616770A
  - 77616790
  - 77622500 Series Code 3 (Universal)
  - 7266669
  - C2501 * 77655650 Series Code 4 (Universal)

**Control Mux**
- 7265179
  - 77616600
  - 77624700
  - 7266668
  - * 77666950

**Servo Coarse**
- 7265580
  - 75885600
  - 77622400
  - 77622401
  - 77622402
  - 77622403
  - 77622750
  - 7766800
  - 77666801
  - 77682950

**Relay Board**
- 7265886
- 75898850
- * 77656724A
  - 7266724
  - 7266724
  - 77680650
  - 77713900

7266669
77634490
5011  984-684
726-5780
726-5778  77616791
726-5779  77616600

5013  987  966
726-5780
726-6669  77622500
726-6668  77624700
TB2
Blk 1
Blk 6 80 VAC 1.7 momentarily 111 VAC
Whit 5
Yel 4 80 VAC 2.2 VAC 1.88 VAC
Red 3 80 VAC 1.7 momentarily 173 VAC
Blk/Bul 2 80 VAC 1.7 momentarily 111 VAC

PROBLEM SUMMARY: PETRIV YURI S  DATE: 09/20/89  TIME: 08:17
The system is up and running all night. When the Cust. comes in, in the morning, the disk drive has the fault light lite or they get an I91 at first access. They then spin down, spin up and away they go. This does not happen every day only about once or twice a week.

ASSIGNED: BAHIA MICHAEL E  DATE: 02/01/90  TIME: 14:43
Update acknowledged.

ASSIGNED: PETRIV YURI S  DATE: 02/01/90  TIME: 13:13
D.S. installed scheduled to switch over in two weeks or so. (I don't know. It has become a non-issue no failures reported by C.E. or cust. why don't we close it?)

ASSIGNED: HALEY JOHN L  DATE: 02/01/90  TIME: 08:05
Yuri, why are we dragging our feet on this?

ASSIGNED: BAHIA MICHAEL E  DATE: 01/08/90  TIME: 13:22
ASSIGNED: PETRIV YURI S  DATE: 01/08/90  TIME: 08:59
The drive has had only one malfunction since Barry was on site, but Julie was out that day so the report was sketchy at best.
The D.S. has arrived and is soon to be installed making this problem mute. We plan to take that drive to the shop to work on the motor problem after the cust is up on the D.S. thank for your help and I'LL call you the results of the motor problem.

ASSIGNED: BAHIA MICHAEL E  DATE: 01/04/90  TIME: 13:17
Current status please? If still running error free call should probably be closed. Talked to Barry Fish & he has told me he cannot get anyone from CDC to respond on motor problem & will not be pursuing the problem. If the drive fails again, the motor should be replaced as the next easiest & logical step. Otherwise based on what has previously been done your looking at replacing the head positioner ass'y (carriage & coil ass'y & magnet), the harnesses, or drive.

ASSIGNED: BAHIA MICHAEL E  DATE: 12/14/89  TIME: 09:33
No faults since tried to replace spindle mtr on 11/30. At time only thing done besides motor was to replace relay brd again & reseat wires. No progress on motor problem as far as being able to replace. Called BFish & asked for update as problem likely to occur at other sites. Will call me Mon as on way out at this time.

ASSIGNED: PETRIV YURI S  DATE: 12/13/89  TIME: 11:57
Since the visit by Barry fish and mark harris the cust reports no fault lights no problems and we are in monitor mode

ASSIGNED: BAHIA MICHAEL E  DATE: 12/07/89  TIME: 15:02
DATE ACKNOWLEDGED. HAS ANY NEW INFO COME DOWN ON MTR PROB.

ASSIGNED: PETRIV YURI S  DATE: 12/07/89  TIME: 15:00
CDC no longer supports it or so I'm told

ASSIGNED: PETRIV YURI S  DATE: 12/07/89  TIME: 09:52
I'm back from lunch. We are pulling the drive to the lab and loaning the cust. ours until this is resolved.

ASSIGNED: BAHIA MICHAEL E  DATE: 12/01/89  TIME: 17:41
PROBLEM NUMBER: C410002001  CUST NAME: CATALANO INSURANCE AGENCY INC
PRIORITY: P1  CUST NUMBER: 00 00000305904
CUST RDB: 3141

TALKED W/ DTS. MTR WAS 50/60 HZ. ONSITE W/ BARRY FISH. 3RD MTR INITIALLY FAILED THEN STARTED WORKING. FAILED AGAIN W/ SAME PROB OF BLOWING CB. OLD MTR TO BE RE-INSTALLED.

ASSIGNED: BAHIA MICHAEL E  DATE: 11/30/89  TIME: 17:00
Update acknowledged. Was motor a 50/60 Hz. Left message for DTS to call.

ASSIGNED: HARRIS MARK A  DATE: 11/30/89  TIME: 07:24
Motor has been replaced, will monitor drive and report any failures.

ptr # for motor prob on Px is C410002704. Checked audit trail & appears Jack Haley has call. Call should be sent to rdb 8765 / Barry Fish. Left message for DTS to call.

ASSIGNED: PETRIV YURI S  DATE: 11/27/89  TIME: 07:49
ptr on motor prob is 410002708

ASSIGNED: BAHIA MICHAEL E  DATE: 11/22/89  TIME: 13:54
REQUESTED PERIPHERAL GROUP CALL CDC FOR INFO ON MTR PROB. DTS TO ENTER PTR ON MTR PROB PER PERIPH GROUP REQUEST.

ASSIGNED: BAHIA MICHAEL E  DATE: 11/21/89  TIME: 17:12
TALKED W/ DTS ON SITE. UNABLE TO INSTALL MTR AS THIS MTR TOO CAUSING CB TO POP ON SPIN UP. MTR WAS AGAIN A 50/60 HZ, VENDOR # 2834355008 (UNSURE OF 1ST #) & HAD EXACT SAME LABEL AS EXISTING DRIVE. OHMED OUT DRIVE:
BLUE - RED BOTH WAYS = 10.5 OHMS
RED - YELLOW BOTH WAYS = 7.7 OHMS
BLUE - YELLOW BOTH WAYS = 2.8 OHMS
BARRY FISH ON VAC THIS WEEK. LMTC. UNABLE TO GET HELP DIRECT FROM CDC.
TALKED W/ KT. SUGGESTED TRYING LM TOMORROW OR WAIT TIL MON FOR-BF.

going on site to replace motor and relay pcb today 3:00 pm

ASSIGNED: PETRIV YURI S  DATE: 11/20/89  TIME: 08:36
cust. had another fault light problem late friday . we will schedule motor replacement with cust.

ASSIGNED: PETRIV YURI S  DATE: 11/16/89  TIME: 09:30
SELECTION CRITERIA

PTR NUMBER - START: C410002001 END: C410002001
PRIORITY: ALL PROBLEM TYPE: ALL
RDB - ASSIGN RDB: ALL CUST RDB: ALL ORIG RDB: ALL
HW/SW INDICATOR: ALL
STATUS TYPE: 0
STATUS CODE: ALL

PROBLEM NUMBER: C410002001 CUST NAME: CATALANO INSURANCE AGENCY INC
PRIORITY: P1 CUST NUMBER: 00 00000305904 CUST RDB: 3114

Still running fine. No problems.

ASSIGNED: BAHIA MICHAEL E DATE: 11/14/89 TIME: 17:25
On site w/ DTS Fri. Tried to change spindle mtr for spin down prob. New mtr which appeared to be exactly same as in drive would pop CB on spin up. Had to put old mtr back. Have seen this mtr prob before. DTS to contact B Fish on mtr prob. Need more info from cust on prob. Requested cust follow specific procedure on hang failure. Should reset ea w/s by 1 & try to list disk. Need to document which w/s if any when reset cleared prob & if so what prog & surface was it accessing. Also need to document what removable pack in drive at time of failure. Some recent problems appear to be due to 1 particular pack. Environment does not appear to be problem presently but could be in future because of cabling, carpeting, & equipment setup in small room. Also, conditioner is humming. Will look into that. The line analyzer showed some marginal problems which appeared to be associated w/ powering drive up & down. No failures could be linked to power. Will try to replace mtr again should the spin down prob re-occur.

ASSIGNED: PETRIK YURI S DATE: 11/14/89 TIME: 09:38
Still ok no problems

ASSIGNED: PETRIK YURI S DATE: 11/13/89 TIME: 09:03
We were on site friday pm and changed relay pcb in the drive as it had not b been tried before. Also the regulator in the dpu was change for exesive rippl e 54mv on the +12. The system was fine this A.M. and I will monitor and update at next occurrence.

ASSIGNED: BAHIA MICHAEL E DATE: 11/09/89 TIME: 08:16
Site visit arranged for 3 pm Friday.

ASSIGNED: PETRIK YURI S DATE: 11/08/89 TIME: 12:42
Friday @ 3:00 pm ok

ASSIGNED: BAHIA MICHAEL E DATE: 11/06/89 TIME: 08:21
Just back from week in training. Will phone to co-ordinate site visit.

ASSIGNED: PETRIK YURI S DATE: 11/02/89 TIME: 15:17
Drive pwr off by ce installing line analyzer before message got through. Today the customer had another fault light and 91 in the incident they spun down. Wred off and on to clear problem scheduleing on site next wed or thursday
PROBLEM NUMBER: C410002001
CUST NAME: CATALANO INSURANCE AGENCY INC
CUST NUMBER: 00 0000305904
CUST RDB: 3114

afternoon would you care to come along and see if there's any thing I've mis
sed The pwr strip is on the way to the Area but it sounded ok as read by CE

ASSIGNED: BAHIA MICHAEL E DATE: 10/26/89 TIME: 09:42
If that is the case the microprocessor should still have the flt. If the
cust has not powered off the drive we can still get the flt. If this is the
case please document the flt & update call.

ASSIGNED: PETRIV YURI S DATE: 10/26/89 TIME: 08:39
They just spun down and up and resumed running.

ASSIGNED: BAHIA MICHAEL E DATE: 10/25/89 TIME: 13:01
Talked w/ DTS. Flt lite on drive this AM & of course got error I91 when
tried to access. Powered drive off & on & ok. No prob for about 2 weeks.
Most likely environmental. Action plan is to leave Line Analyzer on drive
until after next prob. Could be caused by power brown out. Must have cust
notify us immediately on failure. Need to check upproc leds in drive before
powered off.

ASSIGNED: PETRIV YURI S DATE: 10/25/89 TIME: 10:04
This morning the cust had a fault light on the drive and got an I 91 when
they accsesed it . I propose that we reinstall a line analyzer, jumper out
the interlocks . any more suggestions?

ASSIGNED: BAHIA MICHAEL E DATE: 10/17/89 TIME: 08:54
TALKED W/ DTS. CUST SEEMS TO BE RUNNING FINE. DID HAVE I I91 (DRIVE NOT
READY) ERROR DURING BACKUP LAST WEEK. THE I91 MAY HAVE BEEN A FLUKE ERROR
CAUSED BY ELEC NOISE OR ENVIRONMENTAL INTERFERENCE OR POSSIBLY ACCESSING
DRIVE INADVERTENTLY WHEN NOT READY. CUST HAS COMPLAINED ALSO OF THE SYSTEM
SOMETIMES RUNNING SLOW. THIS MOST LIKELY IS DO TO WHAT IS BEING RUN ON THE
SYS OR POSSIBLY DISK RETRIES. IF VERIFY EA SURFACE OF DISK & MINIMAL OR NO
RETRIES OCCUR THAN THE PROB IS UNLIKELY TO BE RETRIES. IF CUST IS CONCERNED
& NEEDS HELP WILL NEED TO DOCUMENT WHAT EA W/S IS DOING WHEN SYS SLOWS & IF
AGREEABLE SHOULD KEY HALT AT EA W/S 1 AT A TIME TO SEE IF ANY 1 W/S FREES UP
SYSTEM. WHEN HALTING W/S MUST WAIT TILL BOTH THE COLON & CURSOR RETURN TO BE
SURE HALT HAS OCCURRED. CUST HAS BEEN RELUCTANT TO GIVE US SYSTEM SO FAR.

ASSIGNED: PETRIV YURI S DATE: 10/11/89 TIME: 11:59
The cust. reports system running fine and has had no I91's in the morning.
Backup's have run fine except for that one occurence. We will go back to
SELECTION CRITERIA

PROBLEM NUMBER: C410002001  CUST NAME: CATALANO INSURANCE AGENCY INC
PRIORITY: P1  CUST NUMBER: 00 00000305904
PROBLEM TYPE: ALL  CUST RDB: 3114
RDB: ASSIGN RDB: ALL ORIG RDB: ALL
SW/SM INDICATOR: ALL
STATUS TYPE: 0
STATUS CODE: ALL

 monitor mode.

ASSIGNED: PETRIV YURI S  DATE: 10/10/89  TIME: 08:45
yeah most likely one of the servo heads we put in has slipped or is a little flaky I'll schedule time with the cust. and me and mat go in.

ASSIGNED: BAHIA MICHAEL E  DATE: 10/06/89  TIME: 16:04
SOUNDS LIKE A PX PROB. HAVE CUST DOC EXACTLY WHAT SURFACE WAS BEING BACKED UP & WHAT SURFACED COPIED TO. WILL BE IN TRAINING NEXT WEEK BUT WILL BE CALLING IN. RUNNING SLOW COULD BE DUE TO RETRIES ACCESSING DISK. WILL NEED TO VERIFY ALL SURFACES WATCHING FOR RETRIES & HEAVILY TEST BY RUNNING RANDOM R/W BETWEEN SERVOS.

ASSIGNED: PETRIV YURI S  DATE: 10/06/89  TIME: 14:54
The cust is back to leaving the system up at night we will see monday what happens. The bad news is that the system is running slow and they reported that the system froze during backup they hit reset load run return and got an 91. Maybe servo to servo?

ASSIGNED: BAHIA MICHAEL E  DATE: 09/29/89  TIME: 15:25
UPDATE ACKNOWLEDGED.

ASSIGNED: PETRIV YURI S  DATE: 09/29/89  TIME: 12:46
No I91 yesterday or today  But the cust. is going to shut down over the weekend so monday will not be a valid test. The reason for the shut down is a file corruption issue from 3 weeks ago that redshaw is working. The cust. wants no more hardware work done until redshaw finishes cleaning out bad risk files and figures if they shut down there will be no I91 and no reason for us to work on it. so we are on hold and monitoring.

ASSIGNED: BAHIA MICHAEL E  DATE: 09/27/89  TIME: 12:16
SPOKE W/ DTS ON PHONE. SYS SEEMS TO BE RUNNING FINE AT THIS TIME. MONITORING.

ASSIGNED: PETRIV YURI S  DATE: 09/27/89  TIME: 10:24
oops! then the dpu dropped dead. It gave us I92's on first seek then work finn. As we trouble shoot this it changed to I91 on first seek then hang then it would work for 1 minute and end with an I90. We eliminated very thing but the dpu and fixed moduale then went home. We returned with my dpu hooked it up and reformated the suraces,restored the cust data and every thing worked


fine. This morning 9/27 no error where recorded we will continue monitoring every morning.

ASSIGNED: PETRIV YURI S DATE: 09/27/89 TIME: 09:50
We went onsite 9/26 4:00pm changed: pwr supply, pwr amp, fixed moduale,and b both servo heads then the dpu

ASSIGNED: PATTERSON MARY SUE DATE: 09/25/89 TIME: 16:28
escalating. district has been onsite three times, problem still occuring. "phantom 91", yuri has spoken with Mike Bahia. requesting assistance.

ASSIGNED: PETRIV YURI S DATE: 09/25/89 TIME: 09:00
Onsite this morning , A user got on the system got in to the soft ware tried d to asscess a risk file then got an 91. There was no external fault on the drive but the micro fault inside was the same except a different address . spun down and up and it work fine . We will go back at 4:00 pm to change servo heads , and pwr supply as not to impact cust operation.

ASSIGNED: PETRIV YURI S DATE: 09/21/89 TIME: 12:32
Cust. went down with I91 on 9/20 @ 4:00 pm while users where on the system.

The micro. processor fault was the same, off track greater than 1200 micro seconds. I checked the ripple on the voltages in the dpu, they were fine, then I checked the rev's of the pcb, they were fine except the 7424. @ rev 7. When I put the dpu online to test it was dead. Not having dpu parts onsite I had to return in the morning. The 7424 pcb was the failing component and is now a rev 9 . Because the 7424 will not cause a servo fault in the drive we also replaced the servo preamp but not the heads as planned due to cust down time . Most of the down time was caused by a W.S. (believe it or not).

It was hanging the the system at different points in IPL of redshaw software and giving p48,p57, and x75 on W.S.1 until it was shut off . This W.S.(#5) is usually the first one on in the morning and has caused 2 hangs of the printer doing hot print . IT is offline . We will be onsite in the mornings for the next few day to monitor.

ASSIGNED: PETRIV YURI S DATE: 09/20/89 TIME: 09:56
went on site to check out mach. alignment was out of spec. static elimenator dirty,found losse wire on bottom of card cage,tighten and reseat all connecti on. will monitor @ next failure will change servo preamp.and servo heads.

 decode of micro processor fault was off cyclinder for greater than 128

00 i
SELECTED CRITERIA

PTR NUMBER - START: C410002001 END: C410002001
PRIORIT Y: ALL
PROBLEM TYPE: ALL
RDB - ASSIGN RDB: ALL CUST RDB: ALL ORIG RDB: ALL
HW/S W INDICATOR: ALL
STATUS TYPE: 0
STATUS CODE: ALL

PROBLEM NUMBER: C410002001 CUST NAME: CATALANO INSURANCE AGENCY INC
PRIORIT Y: P1 CUST NUMBER: 00 00000305904
CUST RDB: 3114

ASSIGNED: PETRIV YURI S DATE: 09/20/89 TIME: 08:17
not reproduceable except by problem discrision

RESOLUTION TEXT: BAHIA MICHAEL E DATE: 02/01/90 TIME: 15:04
HC634. Last reported problem occurred before 1/8 & only 1 prob since mid Dec. DTS called in & wants to close call. Appears problem most likely caused by some outside disturbance. Motor replacement prob still exists but is no longer required here since drive is no longer failing. Transfering call back to field to be closed.
O-823 tracks   64 sectors/track
823 reserved for 1st sector
2280 PROGRAMMING

<table>
<thead>
<tr>
<th>ADDRESSING</th>
<th>PLATTER</th>
<th>DRIVE 1</th>
<th>DRIVE 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>2280-1</td>
<td>26.9 sec</td>
<td>REMOVABLE</td>
<td>/D10 OR /B10</td>
</tr>
<tr>
<td></td>
<td>1st FIXED</td>
<td>/D11 OR /310</td>
<td></td>
</tr>
<tr>
<td>2290-2</td>
<td>53.8 sec</td>
<td>2nd FIXED</td>
<td>/D12</td>
</tr>
<tr>
<td></td>
<td>3rd FIXED</td>
<td>/D13</td>
<td></td>
</tr>
<tr>
<td>2280-3</td>
<td>80.0 sec</td>
<td>4th FIXED</td>
<td>/D14</td>
</tr>
<tr>
<td></td>
<td>5th FIXED</td>
<td>/D15</td>
<td></td>
</tr>
</tbody>
</table>

$FORMAT DISK 7/93$
The 2280 DPU and MUX DPU

Make sure that all the FCO's and ECO's are done. Verify them with the enclosed ECO History Report. If they aren't done, do them. Bear in mind that it is imperative that all the customers platters be re-formatted after the installation of FCO 1168 (Rev. 10 Proms on the 7423A board) and that when doing FCO 1168, FCO 1161 (510 Ohm resistors at R46 and R48 on the 7422 board) must be done as well.

Check to make sure that the "A" and "B" cables are shielded and that the cables are properly installed as shown in the attached figures. Check continuity between the I/O Controller rail and the Phoenix chassis.

Check with an Ohmmeter that the Logic Ground is connected to the DPU chassis. Logic Ground and Frame Ground should have approximately zero Ohms on the drive, the DPU and the CPU. If there is resistance there a ground strap should be installed. (MAKE SURE YOU USE LOGIC GROUND AND NOT A VOLTAGE ETCH).

Check all the screws on the power supply capacitors to make sure they are not loose. Also check all the screws and nuts that mount the power transistors and diodes to the heat sink. If there are any loose, tighten them and then recheck the voltages.

Check the D.C. Voltages with a digital voltmeter. They should be checked on the 210-L567 Motherboard connector on the bottom of the motherboard and then verified on the motherboard etches at the last I/O connector. Use only Logic Ground not the Controller rails or the chassis when checking voltages.

Check the A.C. ripple on the D.C. Voltages using an Oscilloscope (NOT A DIGITAL MULTIMETER) and be sure to ground the scope on Logic Ground, not on the metal of the chassis.

Make sure that the screws on all parallel cables are snuggly screwed to the connectors on the controllers. Extension cables from 25 to 1000 feet from DPU to CPU are only allowed on the Multiplexed systems between the 210-7717 Mux Master in the DPU and the 210-7715 Mux slave in the CPU. They must be securely screwed together with the screws and offsets. (NOT TAPED TOGETHER) The reason for screwing them together is to ground them as well as to hold them together.

Extension data cables are not allowed on non Multiplexed systems.
I have found that most of the problems that are encountered with the 2200 Phoenix disk drives are either Servo problems or Communications/Timing problems between the Drive and DPU or the DPU and CPU. Following is a list of the things that we have found and therefore these things should be checked when working on a Phoenix problem whether intermittent or solid.

Though this document was written with the 2200 System in mind the Adjustments, Grounding Procedures and troubleshooting techniques for the Phoenix Drive could be applied to the VS and OIS Systems.
Things to Try and to Look For

Try to make the drive fail:

NOTE
(THE FIRST AND MOST IMPORTANT THING TO DO IS MAKE SURE THAT THE
FIXED VOLUME AND ANY CUSTOMER'S REMOVABLE PLATTERS THAT YOU WILL USE
TO TEST THE DRIVE ARE BACKED UP)

If there is an intermittent hang or heads unload or a
symptom of that nature, during backup or an application that does
long seeks and rapid volume switches, there may be a servo to servo
type problem. The first thing to do is to check all the drive
adjustments. If they are all "perfect", (within spec may not always
be close enough), Then there may be a board problem. There are no
diagnostics that will switch volumes rapidly and the FTU accesses
only one volume at a time. The following program will sometimes do
the trick:

10 VERIFY T/D10,(0,0)
20 VERIFY T/D11,(52607,52607)
30 GOTO 10

If the drive is at 320 substitute D20 and D21 for D10 and D11

This makes the drive read sector 0 on the removable and
sector 52607 on the fixed causing a maximum seek and a volume
change. If there is a Servo to Servo problem it may show itself.
If it doesn't hang or unload with a C.E. Scratch pack try
some of the Customer's packs. It may be a surface problem if not
something in the drive. (Be sure any customer Rem packs are backed
up)

If it only happens intermittently have the customer note
which Removable Pack is in the drive at the times of the problems.
Maybe some packs need cleaning.
Alternate Sector Maps:

Each platter on the drive has its own Alternate Sector Map. With Rev. 10 Proms in the DPU, when the drive is first accessed after power-up the DPU reads the Alternate Sector Maps of all the Platters and keeps them in memory in the DPU. (This is why if you power up the drive, then LIST DCF, the drive does a couple of seeks. It goes to sector 52608 of the Rem. Cart. to get the Map, does a Return To Zero then a seek to the inner cylinder again to read all the maps for all the fixed platters).

To read the Alternate Sector Map for a platter this program will do it:

10 DIM A$(4)64
20 DATALOAD BAT/Dxx,(52608,L)A$(6)
30 PRINT HEXOF(A$(6))
Where "/Dxx" is the platter address.

If there are any alternate sectors on the platter the resulting printout will be of the form:

0000000000400000024130124140224703247D0400000000000000000000000000000000000
000000000000000000000000000000000000000000000000000000000000000000000000000
000000000000000000000000000000000000000000000000000000000000000000000000000
000000000000000000000000000000000000000000000000000000000000000000000000000
000000000000000000000000000000000000000000000000000000000000000000000000000
000000000000000000000000000000000000000000000000000000000000000000000000000
000000000000000000000000000000000000000000000000000000000000000000000000000
000000000000000000000000000000000000000000000000000000000000000000000000000

Where for example:

<table>
<thead>
<tr>
<th>Byte No.</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 = 04</td>
<td>4 Alternate Sectors</td>
</tr>
<tr>
<td>9 &amp; 10 = 2413</td>
<td>Location In Hex of a faulty sector</td>
</tr>
<tr>
<td>11 = 01</td>
<td>Offset from 52608 of replacement sector. In the case of this platter there are four Alternate sectors, there is a bad sector at location 2413 and its replacement is at 52608+1=52609. There is another bad sector at 2414 and its replacement is at 52608+2=52610. Bear in mind that all the values in the Alternate Sector Map are in hex.</td>
</tr>
</tbody>
</table>

If there are no Alternate Sectors, Sector 52608 should give an error when it is verified.
Phoenix Alignments and Adjustments

Check the option switches. There is a switchbank on the Control Mux. Board and on the I/O Board for system options and sectors per track switches on the Servo Coarse Board.

Make sure that all the ground straps are in place and that the system is properly grounded. AC and DC grounds must be strapped together at the rear of the basepan. The "A" and "B" cables must be shielded and their shielding must make good contact with the unpainted surface at the rear of the basepan. Do not use the green ground wire to ground the Phoenix to the DPU or System as well or there may be ground loops.

Check the voltages at the bottom of the Phoenix card cage making sure you use a good logic ground point.

Check the fixed module runout. There should be less than 2 volts peak to peak on test point 10 of the Servo Coarse board with test point 9 of Servo Coarse Board grounded, and a fixed data head selected. The symptoms will be servo problems such as heads unloading or drive hangs when rapidly switching volumes during seeks.

Check the Carriage Restraint Block Adjustment. A 0.001 shim stock should fit between the set screw and the block but a 0.003 should not. Could cause heads to unload and drive hangs and servo to servo alignment will not stay in.

Check the Fixed Servo to Cartridge Servo Head Alignment. Though the specifications state that 50 millivolts of offset is good enough we have found that with drives that have intermittent problems it is best to get the Servo to Servo to less than 20 millivolts. (As close to zero millivolts as possible) It is also easier to check this alignment with a null meter than it is using a digital multimeter.

Check that the heads are clean. Each district office has the new disk head inspector that works very well.

Verify the servo surfaces of the platters by monitoring the dibit signal with a scope and doing a cylinder by cylinder seek from 0 to 822. Surfaces that have a fuzzy or distorted dibit signal could cause servo problems such as hangs or heads unloading. Check to see if the customer has problems with all of his removable cartridges or only some of them. Maybe he could keep a log. Servo problems are most common during backup when the drive is constantly switching servo heads. If there are any suspect cartridges suggest that the customer remove them from use or have them cleaned.

Don't forget to check the Average Seek Adjustment.
EQUIPMENT CATEGORY III A.7

PHOENIX DISK DRIVE

PROM COMPATIBILITIES - SERVO COARSE PCB

OLD PROMS

5011 984 964 used in Servo Coarse PCB 726-5780

these PROMS are)

I/O PCB 726-5778 -- CDC 77616791
used with

C/M PCB 726-5779 -- CDC 77616666

NEW PROMS

5013 987 966

----used in Servo Coarse PCB 726-578C-1

these PROMS are)

I/O 726-6669 (CDC 776-22500
used with ) OR

C/M 726-6668 (CDC 776-22501

CDC 776-24700

when old and new PCB's are mixed the following faults can
sometimes be produced, particularly on VS drives:--

1. Fault Light
2. Head Select
3. Servo Problems
4. Alignment Problems

*****
COURSE HANDOUT

EQUIPMENT CATEGORY III A.7

PHOENIX DISK DRIVE

PROM COMPATIBILITIES - SERVO COARSE PCB

OLD PROMS

5011 984 964
--- used in Servo Coarse PCB 726-5780
these PROMS are) I/O PCB 726-5778 CDC 77616791
used with ) C/M PCB 726-5779 CDC 7761660

NEW PROMS

5013 987 966
---used in Servo Coarse PCB 726-5780-1
these PROMS are) I/O 726-6669 (CDC 776-22500
used with ) C/M 726-6668 (OR CDC 776-22501
(CDC 776-24700

When old and new PCB's are mixed the following faults can
sometimes be produced, particularly on VS drives:-
1. Fault Light
2. Head Select
3. Servo Problems
4. Alignment Problems.

*****

From: Jerry Spencer
RS# 3030
I/O Boards

75891890 Series Code 2 UNIQUE TO WANG

REPLACED BY
77616751 S.C. 3 UNIQUE WANG BOARD

77616790

REPLACED BY
7265178 * 77622500 S.C. 3 UNIVERSAL BOARD

ON 2-4 off

WAS THIS REPLACED BY 2501?

7266669  * 77665650 S.C. 4 UNIVERSAL BOARD

ALL BOARDS ARE UPWAND/OWNWAND COMPATIBLE
IT IS RECOMMENDED NOT TO USE OLD
BOARDS IN NEW MACHINES DUE TO TIMING
DIFFERENCES IN WANGS CONTROLLER (COP)

? * ALL SWITCHES OFF FOR WANG
Phoenix PCB

Serve Course - 726.5780

C/D C #
- 776.22750
- 776.66.800
- 75.885600
- 776.22400
- 776.22402
- 776.66.800
- 776.66.801
- 776.8.2950

Rep by
- 776.66.800
- 776.22401
- 776.22402
- 776.66.800
- 776.22403

is inter changeable with 776.66.801
is inter changeable with 776.22402
is inter changeable with 776.22403

Norm - both jumpers in 1-2 3-4

Relay Control - 726.0686

76.89.8850 rep by 776.34490

776.34490 rep by 776.33300 (726.667) 50Hz

Block 4, unit - 726.6724

776.09.6050 rep by 777.13900 (726.6744)

A/W - 726.5783 - none
A/W Pre Amp 726.5784 - none
A/W Power Amp 726.5785 - none BP 3 + below

I/O - 776.66.800 rep by 776.22500 - 726.6669

Cntl Mux - 726.5787
- 776.66.800 rep by 776.24700 - 726.6668
TAC

INFORMATION CALL

CONTROL NUMBER 06322000

CONTACT NAME LARRY MILLER  POSITION CE
ROG # 3412  TDX #
PHONE # 301 296 1663  EXT #

SYSTEM TYPE VS 85  DEVICE TYPE 2280-3
UTILITY NAME SOFTWARE LEVEL

METHOD OF CALL T = TELEX, P = PHONE, M = MEMO, E = EMS
HAS THE AREA OR DISTRICT BEEN CONTACTED
N A = AREA, D = DISTRICT, B = BOTH, N = NONE
IS THIS INQUIRY PERTAINING TO A NATIONAL ACCOUNT?
U Y = YES, N = NO, U = UNKNOWN

USE THE FOLLOWING AREA TO DESCRIBE THE SITE THAT CREATED THIS REQUEST
CUST/OFFICE NAME
ADDRESS 3310
CITY
STATE
ON SITE CONTACT NAME

QUESTION (*) / ANSWER (+)

*EMP. # 32527.
*RE: OLD STYLE I/O BOARD ON THE PHOENIX CAUSING PROBLEMS.
11/18/86: CALLING IN TO DOCUMENT A PROBLEM.
+A COMPATIBILITY PROBLEM HAS BEEN FOUND W/ CERTAIN VERSIONS
+OF THE PX I/O BRD WHEN USED W/ CERTAIN SYSTEMS OR WANG DISK
+CONTROLLERS. IN THIS PARTICULAR CASE A WORKING BP3 PX WAS
+INSTALLED ON A VS85 AND SOFT ERRORS WERE GENERATED WHENEVER
+VOLUMES WERE SWITCHED. THE ALIGNMENT OF THE DRIVE WAS
+CHECKED 3 TIMES & WAS ALWAYS WELL WITHIN SPECS. CAUSE OF
+THIS PROBLEM WAS THE I/O BRD, CDC # 77616770A. THIS IS AN
+OLDER STYLE BRD W/ NO SW BANK & BLK CONNECTORS FOR THE A
+CABLE & TERMINATOR. WHEN THE BRDS WERE 1ST REPLACED FOR
+THIS PROBLEM A SIMILAR VERSION I/O BRD WAS USED & THE PROB-
+LEM WAS STILL PRESENT. ANOTHER BP3 PX FROM THE OFFICE WAS
+BROUGHT IN & USING THIS SAME TYPE I/O BRD ALSO FAILED. THE
+PROBLEM OCCURRED W/ BOTH A 22V88 & THE 22V28, BUT THESE
+SAME DRIVES WORKED FINE ON A VS65. ONCE THE CURE WAS FOUND
+TO BE A NEWER VERSION OF THE I/O BRD W/ THE SW BK, OLDER &
+NEWER VERSIONS OF THE OTHER CARD CAGE BRDS WERE TESTED BUT
+NO DIFFERENCE WAS FOUND. THE CDC 77516770A I/C BRD WOULD
+CAUSE SOFT ERRORS WHEN CHANGING VOLUMES W/ EITHER OLD OR
+NEW CDC BRDS ON THE VS85 W/ EITHER A 22V28 OR A 22V88.
+GIVING COPY OF CALL TO DJ.

(30MIN) MIKEB
TECHNICAL SERVICE BULLETIN

SECTION: Hardware Technical

NUMBER: HWT 6140       REPLACES: N/A       DATE: 06/17/86       PAGE 1 OF 1

MATRIX ID. 3112       PRODUCT/RELEASE# CDC Storage

TITLE: CDC Phoenix Voice Coils

PURPOSE:
To inform the field of the possibility of voice coils wired incorrectly.

EXPLANATION:
Recently a batch of Phoenix voice coils was received from the vendor wired backwards. The Lawrence stockroom has been checked, and all incorrectly wired voice coils have been purged from stock. This is believed to be an isolated incidence; however, some of these voice coils may have been shipped to the field.

To check if a voice coil is wired CORRECTLY, observe the voice coil where the copper wires are joined to the copper flex leads. One of the copper wires from the voice coil will be tagged with a No. 1. The wire tagged No. 1 will go to the black wire via the copper flex lead.

If you have received an incorrectly wired voice coil, return it to:

Wang Laboratories, Inc.
45 Computer Drive
Haverhill, MA 01830
Attn: Diana Nelson – M/S 4116C
CE experienced a problem with a Phoenix drive taken from a VS-80 and installed on a VS-650.

It was experiencing intermittent VTDC errors.

CE corrected the problem by setting the S2 switches on the control board to the proper positions:

- Pos 1 = off
- Pos 243 = on.

Information found in handbook.

Bel C
TECHNICAL SERVICE BULLETIN
SECTION: Hardware Technical

NUMBER: HWT 5049 REPLACES: N/A DATE: 03/05/85 PAGE 1 OF 01
MATRIX ID. 3105 PRODUCT/RELEASE# Phoenix Disk

TITLE: Absolute Filter Causing Airflow Problems

Wang has been delivering an improved Phoenix absolute filter for approximately nine months. This filter is distinguished by new packaging and an orange gasket around the exhaust outlet. Another distinguishing feature is the stabilizing "toes" at the underside of the exhaust outlet. It has been reported that the air hose from the no-air plenum will sometimes get caught under one of the stabilizers. The air pressure will then be cut off and the drive disabled. Care should be exercised when installing a new filter to prevent the air hose from being cut off.

GROUP: Peripheral Hardware Support Group MAIL STOP: 0125

WANG Laboratories, Inc.
TCN

PROBLEM CALL

CONTACT NAME  TONY LCA
POSITION  FET
RB #  3416  TDY #  PHONE #  703 276 0034  EXT #

SYSTEM TYPE  VS 75E  DEVICE TYPE  PHOENIX
UTILITY NAME  SOFTWARE LEVEL

METHOD CF CALL  P  T = TELE, P = PHONE, M = MEMO, E = EMS
HAS THE AREA OR DISTRICT BEEN CONTACTED?
N  A = AREA, C = DISTRICT, E = BOTH, N = NCNE
IS THIS INQUIRY PERTAINING TO A NATIONAL ACCOUNT?
L  Y = YES, N = NC, L = UNKNOWN

USE THE FOLLOWING AREA TO DESCRIBE THE SITE THAT CREATED THIS REQUEST
CUSTOMER NAME  UNITED LITHO
ADDRESS  3215 CITY ARLINGTON STATE VI
ON SITE CONTACT NAME

PROBLEM (*) SOLUTION (+)

#EMERGENCY#:  52848
#DISPATCH#:  555154

*HAVING PROBLEMS WITH PHOENIX DRIVE. WILL NOT WORK.
9/8/88:  TRYING TO RUN A PX FROM A VSBC ON A VS75E. SEEMS TO RUN VERY SLOW. HAVE HAD PROBLEMS BEFORE MOVING THE PX FROM 1 CP TYPE TO ANOTHER. NEVER RESOLVED. MAY NEED TO INITIALIZE TO CORRECT. IS USING THE 5416 IRC. POSSIBILITY IT MAY NOT BE SUPPORTED.
LEFT CVX FOR MS TO CALL ME ON THIS. 3RD POSSIBLE PROBLEM IS THERE IS A PROBLEM W/ THE DA CR CONTROLLER. (20MIN) MIKEB

9/9/88:  TALKED W/ MS. THE PX IS SUPPORTED ON THE VS75E AS WELL AS THE 5416 EISK CONTROLLER. CALLED CE'S OFFICE & GAVE INFO TO BM TO PASS ON. (5MIN) MIKEE

9/9 1:50 AFTER BACKING UP SYS AND RE-INITIALIZING IT AND DRIVE IS WRK'G FINE. CLOSE CALL VSP

+PROBLEM WAS ONLY W/ FIXED MODULE. INITIALIZING THE FIXED MODULE RESOLVED PROBLEM. CLOSE CALL /CE. (5MIN) MIKEB
From: Jack L Haley  
Subject: Pheonix Fixed Modules

Jack - Please see attached trip report for current status on Mag Data. As Barry Fish has informed you, our next step is to review Xidex's repair procedure, as this too, is a repair source for fixed modules.

I realize the Field time and frustration involved with this quality problem however, I think you'll agree, I cannot "alert" the Field to a problem until I have facts to report. Since Barry's return from Mag Data, 2/18, we have initiated a purge notice and are in the process of publishing a TSB denoting the exact s/n's of modules that are defective.

Last Friday, Barry rejected most of the inventory in Tewksbury but can assist you in obtaining a good module if you still have a down situation (I couldn't find a TAC call). As with most purges, stock will be available on a limited basis until the vendor can rework defective stock. If Xidex is experiencing similar problems, another purge notice/TSB will be generated. Kim

------------------------------------------------------------- Original Memo -------------------------------------------------------------

Kim:
As you may already be aware of the field is experiencing severe problems with the replacement fixed modules from stock. A recent incident in Conn. where 5 modules had to to be tried to obtain one which barely was within spec (servo adj) and now, per the attached memo, where we are on the sixth module and no progress. Barry Fish has been aware of these problems but the situation continues to deteriorate. What is the action plan to deal with this problem, I would like a call tomorrow defining the solution and an alert to the field so that many hundreds of man hours are not wasted trying trying to fix problems that cannot be fixed.

Jack Haley  
Rtom NE Region

REGARDING THE PHOENIX FIXED MEDIA PROBLEM. THE RANGE OF SERIAL #'S FOR THE MAGNETIC DATA INC. FIXED MEDIA THAT IS CAUSING PROBLEMS IS THE FOLLOWING:

* MA532287 TO MA569208

I WAS INFORMED THAT THE OTHER VENDOR, XIDEX, IS OF QUESTIONABLE RELIABILITY BUT ACCORDING TO PRODUCT SUPPORT, LESS OF A RISK. I HAVE A TAC CALL OPEN NOW WHERE A CE HAS TRIED 2 FIXED MODULES AND IS EXPERIENCING SIMILAR PROBLEMS AS MAGNETIC DATA. I BELIEVE THESE ARE XIDEX PACKS BUT NOT SURE. THE SERIAL #'S THE CE HAD WERE X00009536 AND X00009540. I AM MAKING AN ASSUMPTION THAT THE "X" REPRESENTS XIDEX. IF ANYONE CAN VERIFY THIS, LET US KNOW.

* MAGNETIC DATA MEDIA HAS BEEN PURGED AND GOOD MEDIA SHOULD BE AVAILABLE ACCORDING TO PRODUCT SUPPORT. BILL C
SKANSKA

Setuo to Setuo +100mv -90mv
Cyl 8 150mv -200 mil V
Cyl 404 112mv -15 mil V
Cyl 800 135mv -55 mil V
data read out of specs on Rem.

DATA 400 400 mil V

716 -232 -410 DATA 8 -225milV
404 -10milV
800 -25milV

Y.U.H J N M
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PHOENIX ALIGNMENT

1. PURGE UNIT and ALIGNMENT PACK (up to speed, servo disconnected)

2. CABLEING (Disk and FTU off)
   A. Install alignment extender brd in drive, slot 4, and alignment board into extender
   B. Install 2 wire cable from Servo Pine (white to front) to R/W Preamp (white on top)
   C. Install 8 wire cable from Servo Pine (Arrow points up and towards wire) to Alignment Extender Brd (Arrow points to rear of drive away from wire)
   D. Install 3 ribbon cables between FTU and Drive. Small cable from J1 of Brd 2 in FTU (red wire to right) to I/O Brd (red wire on top) bottom of A connector via adapter cable. Medium cable from J3 of Brd 2 in FTU (red wire to right) to CONTROL/MUX Brd, B connector (red wire on top) Large cable from J2 of Brd 2 in FTU (red wire to right) to I/O Brd (red wire on top) top of A connector via adapter cable.

3. SWITCH SETTINGS (Setting up for removable servo alignment)
   A. Alignment extender board: S1 to FXD (Load off fixed servo)
   B. Alignment Board: S1 to N (negative polarity of alignment voltage) S2 to RW (always RW with Phoenix) S3 to X1 (Attenuation factor of alignment voltage)
   C. Servo Pine: S1 to S (looking at servo head)
   D. FTU: Data Entry to Device Type; R/W Select to Alignment; Access Select To Direct Seek

READ and RECORD to manual, START and RUN off
STEP-down; SINGLE/CONT.—cont; ++ to center; LATE/EARLY—center
WRITE FLAG-off; WRITE PROTECT-on; AM/SECTOR-sector; EOT STOP-off ERROR OVERRIDES-off; SHIFT PATT/DATA PATT-data patt; SEQ PWR-off
4. INITIAL POWER ON

A. Power on FTU

B. Pull out card cage, loosen removable heads to 4 lb/(if fixed servo has been loosened, it should be centered and tightened to 12 lb/)

C. Power on drive to LOAD (Alignment pack previously installed and purged)

D. FTU-START and RUN switches to ON(3rd row down, 7 right most lites come on)

E. FTU-key in 8905 (90 Meg), 8903 (60 Meg), 8901 (30 Meg)
   Key LOAD then SEL DRIVE (Busy light will flash till drive ready) set DATA Entry switch to destination

F. Bring Drive to READY (Busy light stops blinking on FTU)

5. SCOPE and METER SET UP

A. Scope: Ch 1- 50 mV/div to READ SIGNAL on Alignment Board
   Ground to chassis
   Sync on Ch 1,1 microsec/div

B. Volt Meter: 500 milV scale
   Positive lead to + TP. of Align Brd., Neg lead to - TP of Align Brd.
"CAUTION: WHEN TIGHTENING OR LOOSENING HEADS IT'S A GOOD IDEA TO HAVE HEADS UNLOADED"
ALIGNMENT of REMOVABLE DATA to REMOVABLE SERVO

A. Sl of servo fine to D (looking at data head), Sl of align ext brd to normal (seeking off removable servo), seek track 0 (key RTZ) (data head previously loosened to 4 lb/)

B. Seek track 404 (key CLR,0404,LOAD,GO)

C. Rough adjust-adjust head till dabit pattern on scope is balanced

D. Fine adjust-adjust head for meter reading as close to 0milV as possible

E. Calculate offset-(as in step 6.f.) should be less than 50 milV

F. Tighten down head to 12 lb/ guiding carriage making sure meter reading is less than +/- 50 milV and recheck offset (if off redo fine adjust)

G. Key RTZ then recheck offset at 404 (key CLR,0404,LOAD,GO)

H. Check offset at track 8 for less than 350 milV (key CLR,0008,LOAD,GO)

I. Check offset at track 800 for less than 350 milV(key CLR,0800,LOAD,GO)(if step B or I is off, fine adjust again.)

OUTER GUARD BAND

OSCILLOSCOPE SETTINGS
LOGIC GND TO SCOPE GND
VOLTS/DIV
CH 1 - 0.5 V
CH 2 - NOT USED
TIME/DIV
A - 0.5 us
B - NOT USED
TRIGGERING
A - INTERNAL POSITIVE
B - NOT USED
PROBE CONNECTIONS (USE X10 PROBE)
CH 1 TO FTU DIGITS JACK
CH 7 NOT USED

BALANCED DIBIT PATTERN (ON TRACK)
Title: TO BE ASSIGNED

Affects: CMD ALL HPC'S

1. Reason for the Change:
1. PROVIDES OPTION TO ALLOW CAPABILITY TO SAFELY UTILIZE ABSOLUTE FILTER FOR MAXIMUM LIFE REDUCING MAINTENANCE COST.
2. TO IMPROVE MAINTENANCE AND REDUCE MEAN TIME TO REPAIR (ENHANCED MTTR).
3. ENHANCEMENTS FOR CONSISTENT AND IMPROVED QUALITY.
4. RELOCATE ±32 VOLT SENSE POINT TO A MORE EFFECTIVE AND ACCESSABLE LOCATION.
5. INTRODUCE NON ADJUSTABLE DECK-IN-PLACE SWITCH.

2. This Change Affects the Following (where checked):
☐ a. Unit Specification (to meet)
☐ b. Unit Interface
☐ c. Unit Exterior Appearance
☐ d. Unit Interchangeability
☐ e. Spare Parts List
☐ f. T & D Spec

3. Brief Summary of the Change:
1. MODIFIED DESIGN TO ALLOW AS AN OPTION, LOW AIR/NO AIR INDICATION & UNIT SHUT DOWN AT END OF FILTER LIFE.
2. RELAY CONTROL PWA REDESIGNED TO FUNCTION WITH 50 OR 60 HZ POWER & SCREW ON TERMINALS CHANGE TO PLUG CONNECTORS.
3. IMPROVED DESIGN OF CARTRIDGE RECEIVER ASSEMBLY.
4. IMPROVED DESIGN OF ELECTRONICS MODULE.
5. INTERNAL CABLES REROUTED & TERMINATIONS TO RELAY CONTROL AND POWER AMP PWA CHANGED TO QUICK, RELIABLE, PUSH-ON CONNECTORS.
6. MODIFIED DESIGN OF POWER AMP PWA TO RELOCATE ± 32 VOLT SENSE POINT.
7. CHANGE MECHANICALLY OPERATED DECK-IN-PLACE SWITCH TO MAGNETICALLY OPERATED SWITCH FOR ENHANCED PRODUCT RELIABILITY.

4. Specific Change to the Unit and/or Part Numbers, and Special Comment, as Follows:

SEE ATTACHMENT "A"

5. Effectivity (ECO/FCO, Class):

DUE TO TIME REQUIRED TO ALLOW FOR ADEQUATE TESTING AND MATERIAL AVAILABILITY, THIS BLOCK POINT CHANGE (SERIES CODE 4) WILL BE CUT-IN TO PRODUCTION DURING THE 4TH QUARTER, 1981.

CLASS II NEC — INFORMATION ONLY

MPI Originator: [Signature] Date: 7-9-81
MPI Approval: [Signature] Date: 7-10-81

KOR-0590
LOW AIR/NO AIR OPTION

1. PROVIDES, AT ADDITIONAL CHARGE, FACTORY INSTALLED OPTION WHICH IS DESIGNED TO PROVIDE THE CUSTOMER A WARNING WHEN THE ABSOLUTE FILTER Requires CHANGING. IF THE FILTER IS NOT CHANGED PRIOR TO REACHING MINIMUM AIR PRESSURE, OR IF THE BLOWER MOTOR FAILS, THE UNIT WILL SPINDLE DOWN. CONTACT YOUR CDC OEM SALES REPRESENTATIVE, OR ACCOUNT MGR FOR PRICING AND AVAILABILITY INFO.

THEORY OF OPERATION

THE LOW AIR OPTION LOGIC IS ENABLED AFTER THE HEADS ARE LOADED. IF THE AIR PRESSURE IS LOWER THAN THE SETTING OF THE FIRST PRESSURE SENSOR, THE FRONT PANEL FAULT LED WILL FLASH AT A TWICE PER SECOND RATE TO GIVE THE OPERATOR AN INDICATION THAT SERVICE IS REQUIRED. THE UNIT WILL REMAIN OPERATIONAL TO ALLOW A ROUTINE SERVICE CALL FOR REPLACEMENT OF THE FILTER.


POWER AMP PWA (ILLUSTRATION ON PAGE 5) 726-6723

1. REPLACE TERMINAL STRIP AND DIP SOCKET WITH THREE INDIVIDUAL CONNECTORS (ELIMINATES MISWIRES AND DAMAGED PINS, REDUCES MTTR & IMPROVES MAINTAINABILITY).

2. MOVE POWER RESISTOR FROM BASE PAN TO POWER AMP PWA (DELETES WIRES).

3. THE ±32 VOLTS IS CRITICAL TO THE OPERATION OF THE SERVO SYSTEM. THEREFORE, THE ±32 VOLT SENSING POINT WAS MOVED FROM THE COMPONENT PWA TO THE POWER AMP PWA WHERE IT IS MORE EFFECTIVE AND ACCESSIBLE.

4. NEW POWER AMP PWA IS COMPATIBLE WITH PREVIOUS SERIES CODE UNITS VIA ADAPTER KIT AVAILABLE AT NOT CHARGE.

5. PREVIOUS SERIES CODE-POWER AMP PWA IS NOT COMPATIBLE WITH SERIES CODE FOUR POWER AMPS.

RELAY CONTROL PWA (ILLUSTRATION ON PAGE 6) 726-6724

1. REPLACE TERMINAL STRIP AND DIP SOCKET WITH SEVEN INDIVIDUAL CONNECTORS (ELIMINATES MISWIRES AND DAMAGED PINS DURING PRODUCTION AND FIELD REPLACEMENT. REDUCES MTTR & IMPROVES MAINTAINABILITY).

2. PROVIDES COMMON HIGH VOLTAGE/LOW VOLTAGE CIRCUITRY WITH VOLTAGE SELECTABLE JUMPER PLUG (REDUCES SPARE PWA TYPES REQUIRED).
3. LOW AIR/NO AIR OPTION LOGIC AVAILABLE ON RELAY CONTROL PWA-(SEE LOW AIR/NO AIR OPTION ABOVE).

4. NEW RELAY CONTROL PWA WITHOUT LOW AIR/NO AIR OPTION IS COMPATIBLE WITH PREVIOUS SERIES CODE UNITS VIA ADAPTER KIT AVAILABLE AT NO CHARGE.

5. PREVIOUS SERIES CODE RELAY CONTROL PWA IS NOT COMPATIBLE WITH SERIES CODE FOUR RELAY CONT. PWA.

6. PROVIDES TWO STYLES OF RELAY CONTROL PWA - (A) LOW AIR/NO AIR OPTION INCLUDED AND (B) LOW AIR/NO AIR OPTION NOT INCLUDED.

MOLDED RECEIVER ASSEMBLY

1. REPLACE MULTIPLE PIECE ASSEMBLY WITH INJECTION MOLDED ASSEMBLY.
   (A) ENHANCES PRODUCT QUALITY AND REDUCES MTTR.
   (B) IMPROVED TOP COVER/RECEIVER ASSEMBLY CLEARANCE.

MOLDED ELECTRONICS MODULE ASSEMBLY (ILLUSTRATION ON PAGE 7) 726-6725

1. REPLACE MULTIPLE PIECE ASSEMBLY WITH INJECTION MOLDED ASSEMBLY.

2. ELECTRONICS MODULE RAISES WITH BASE DECK AND/OR LIFTS OUT PER CURRENT MAINTENANCE POSITION, THUS MINIMIZING POTENTIAL FOR CABLE DAMAGE.

3. ENHANCED CABELING THROUGH NEW HARNESS DESIGN AND ROUTING:
   (A) READ/WRITE PRE-AMP TO ELECTRONICS MODULE.
   (B) BASE PAN TO ELECTRONICS MODULE.
   (C) DECK TO ELECTRONICS MODULE.
   (D) POWER AMP TO ELECTRONICS MODULE.

4. REDUCES MTTR AND ENHANCES PRODUCT QUALITY, IMPROVES MAINTAINABILITY OF 2 & 3 ABOVE.

5. SERIES CODE FOUR ELECTRONICS MODULE INCLUDING BACKPANEL IS NOT COMPATIBLE WITH PREVIOUS SERIES CODE UNITS.

6. PREVIOUS SERIES CODE ELECTRONICS MODULE, INCLUDING BACKPANEL ARE NOT COMPATIBLE WITH SERIES CODE FOUR UNITS.
DECK-IN-PLACE SWITCH

(A) REPLACE CURRENT DECK-IN-PLACE MICRO SWITCH LOCATED IN THE BASEPAN WITH A MAGNETICALLY ACTUATED REED SWITCH MOUNTED ON THE COMPONENT BD. MAGNET USED TO ACTUATE THE REED SWITCH WILL BE MOUNTED TO THE BASEDECK ABOVE THE COMPONENT BD.

(B) IMPROVES PRODUCT QUALITY AND RELIABILITY, REDUCES MTTR.

(C) SERIES CODE FOUR DECK-IN-PLACE SWITCH IS NOT COMPATIBLE WITH PREVIOUS SERIES CODE UNITS.

(D) PREVIOUS SERIES CODE SWITCHES ARE NOT COMPATIBLE WITH SERIES CODE FOUR UNITS.

(E) REFER TO SERIES CODE FOUR PRODUCT MAINTENANCE MANUAL FOR NEW SWITCH ID.
TO POWER SUPPLY & SSR

TO DOOR SOLENOID

VOLTAGE SELECTION PLUG
(HIGH, LOW VOLTAGE)

AC POWER INPUT

TO E-MODULE

TO DRIVE MOTOR

COMPONENT POSITION OF
RELAY CONTROL BOARD

SERIES CODE FOUR
WITH LO AIR/NO AIR OPTION

TO POWER-AMP
Notification of Engineering Change

SERIES CODE FOUR
E-MODULE ASSY.

"E" MODULE (NEW)

BASE DECK CASTING

PLASTIC WASHER (4)

E-RING (2)

PIN

SCREW (4)

BRACKET (NEW)

PANHEAD SCREW AND WASHER (4)

BRACE BETWEEN BASE DECK CASTING AND "E" MODULE (NEW)
FROM: DON CARSON/LAWRENCE/MS2236A
DATE: February 24, 1982
SUBJECT: PHOENIX BLOCK POINT 4 PART NUMBERS

The part numbers for the parts used in the Block Point 4 Phoenix Disk Drive are as follows:

- Power Amp BP4 726-6723
- Relay Board BP4 726-6724
- Card Cage BP4 726-6725
- Drive Mtr. Assy BP4 726-6726

As there is no stock at this time in Home Office supply, please use discretion when ordering as they have to be drop shipped from CDC.

Regards,

Don Carson

CO/sd/0236A
Spindle Height Measurement

It is generally recommended to check stack height at six month intervals. However, adverse conditions such as heavy usage or a recent move may require more frequent measurements.

1. Remove the cartridge receiver assembly and place the bar gauge on the spindle so that the ends overlap the edge of the deck assembly.

2. Place the dial gauge on the bar. While holding it steady, depress the top plunger and check that it calibrates to zero. If not, loosen thumb screw and rotate the face until it does.

3. Position the dial gauge on the bar so that it will penetrate the end hole and touches the drive casting.

4. Again, while holding the dial gauge steady, depress the plunger and take measurements at the following locations:
   a. Head load area
   b. Front door latch area
   c. Left side
   d. Right side

All readings should be .313± .004

5. If any reading was out of spec, the spindle should be replaced.

   A. If the spindle was just installed, check measurements again without the drive belt in place. If the reading changes, the spindle may have to be replaced again.
III.A.7
PERIPHERALS-DISK DRIVES-CDC PHOENIX 9448 CMD.

TOPIC: PHOENIX: BLOCK POINT 4

The new Phoenix Drive is arriving in the field at this time. There are a few changes with the drive that make it a little different from the old Phoenix.

A. The chances of a head crash due to lack of or restricted air flow through the filter has been reduced. When the absolute filter (726-5758) reaches the end of usefulness or the blower motor fails, an air pressure sensor will cause the heads will retract and bring the drive down. The drive will not come ready until the problem has been corrected. Only use the filters that have the red plug at the exhaust end of the filter. This is where the sensing tube is placed.

B. There are three new boards in the drive that are not compatible with the older units. The Relay Board, Component PCB and the Power Amp all now have plug connectors on them and cannot, at this time, be used in series code 3 and below drives. New Wang part numbers have been issued for the following boards:

- Power Amp BP4 726-6723
- Relay PCB BP4 726-6724.
- Component PCB. BP4 (not yet available.)

C. Cabling internal to the drive has been changed to accommodate the plug connectors on the new Power Amp and Relay Boards. The component PCB has a new deck down switch attached to it. Which is activated by a magnet on the deck assembly.


A This new manual is now in printing and should be available soon.
TECHNICAL SERVICE BULLETIN
SECTION: Hardware Technical

NUMBER: HWT 5002           REPLACES: N/A           DATE: 01/08/85           PAGE 1 OF 01
MATRIX ID: 3105           PRODUCT/RELEASE#: CD6 Phoenix

TITLE: Phoenix Disk Filter

PURPOSE:
To alert Field of head crash possibility.

An error in the manufacturing process of the Phoenix Disk Filter, WLI P/N 726-6846, has been discovered. The problem is the hole where the no-air plenum plugs into the filter. Drilling the hole caused a burr. When the orange plug is installed, it breaks off the burr introducing it into the exhaust cavity of the filter. If the filter is installed in a Phoenix it can cause a crash condition.

This problem is with filters manufactured by International Filter Corporation only!

These filters can be identified by a sticker with the logo IFC International Filter printed on it. The sticker is on the side of the filter, just behind the air plenum plug.

If you must open the box to identify the filters in question, DO NOT open the plastic bag.

Return any of these filters to your local Logistics Group.
PURGE OF SPINDLE MOTOR (WPN 726-6726)

PURPOSE:

To inform the field of Purge Notice #880016.

EXPLANATION:

For an undetermined time, Logistics was stocking and shipping the Phoenix Spindle Drive Motor (WPN 726-6726, CDC P/N 77638604) with a 50Hz pulley instead of a 60Hz pulley. To identify which Spindle Drive Motors to purge, note the CDC part number stamped on the pulley itself. The following are the pulley part numbers:

- Correct 60Hz Pulley  CDC Part Number - 75899707
- Incorrect 50Hz Pulley  CDC Part Number - 75899706

If you have a motor with the wrong pulley, please ensure it is purged from local stock according to the purge notice.
Phoenix BP4  Spindle Motor 126-6726
w/ Motor Suppressor Brd (partially under relay box)

1 wire from Start Cap goes to it.
60 Hz Motor worked } same p/n
50/60 Hz Motor would not work

Capacitance was different between MTR
blows CB trying to spin up after 10-15 sec

Cal Blackburn had prob w/ 2 Rx's
### REVISION STATUS OF SHEETS

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### CARD INTERCHANGEABILITY CHART

- **A**: Assembly P/N
- **B**: Card Identifier
- **C**: Special Information
- **D**: FCO IF Applicable

- **X** will replace **Z** only if FCO **Z** is installed.
- **X** will replace **Z** only if changes indicated by note are installed.
- **X** will replace **Z** only if changes indicated by note, and backpanel changes indicated by **M**, are installed.

- **Y** will replace **Z**.
- **X** will replace **Y**.
- **Y** will replace **Z**, log FCO **Z**.
- **Y** will replace **Z**, (no FCO).
Spindle Height Measurement

It is generally recommended to check stack height at six month intervals. However, adverse conditions such as heavy usage or a recent move may require more frequent measurements.

1. Remove the cartridge receiver assembly and place the bar gauge on the spindle so that the ends overlap the edge of the deck assembly.

2. Place the dial gauge on the bar. While holding it steady, depress the top plunger and check that it calibrates to zero. If not, loosen thumb screw and rotate the face until it does.

3. Position the dial gauge on the bar so that it will penetrate the end hole and touches the drive casting.

4. Again, while holding the dial gauge steady, depress the plunger and take measurements at the following locations
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   c. Left side
   d. Right side

All readings should be .313± .004

5. If any reading was out of spec, the spindle should be replaced.
   A. If the spindle was just installed, check measurements again without the drive belt in place. If the reading changes, the spindle may have to be replaced again.
SELECTION CRITERIA
---------------------
PTR NUMBER - START: C200006422 END: C200006422
PRIORITY: ALL
PROBLEM TYPE: ALL
RDB - ASSIGN RDB: ALL CUST RDB: ALL ORIG RDB: ALL
HW/SW INDICATOR: ALL
STATUS TYPE: 0
STATUS CODE: ALL
---------------------

PROBLEM NUMBER: C200006422 CUST NAME: FIRST OHIO SAVINGS BANK FSB
PRIORITY P3 CUST NUMBER: 00 00001627298

PROBLEM TYPE: INFO CUST CONTACT: MIKE BIRON CE ONSITE
PRODUCT PROB NO: NOT LINKED CUST CONT PHONE: -513-641-1891
CUST ADDRESS 1: 4921 VINE ST
CUST ADDRESS 2: CUST ADDRESS 3: 

SYSTEM MODEL NO: 2200MVP-12 CUST CITY: CINCINNATI
GEN SYST MODEL: 2200 MVP CUST ST/PROV: OH
O. S. VERSION: CUST ZIP: 45217-0000
HW MODEL NUMBER: 2280-3 CUST COUNTRY:

SW MODEL NUMBER: RDB ASSIGNED: 8760
SW VERSION: PERSON ASSIGNED: BAHIA MICHAEL E
PART NUMBER: ORIG NAME: PLANTE VIRGINIA
PART NUM REV: ORIG PHONE: - - -

CALL TRKG DATE: 00/00/00 NETWORKED: Y
CALL TRKG NO: RES DEPLOYED:
ORG ACT/SYM/ACN: DATE ENTER PTR: 05/05/89
STATUS DATE: 05/05/89 DATE TO R&D:
STATUS CODE: H O 495 WKDYS IN R&D:
STATUS ABBREV: NEW PROBLM TOT WKDYS OPEN: 30.17

PROBLEM SUMMARY : PLANTE VIRGINIA DATE: 05/05/89 TIME: 12:49
ee 21920 DISP 494275 OFC 513-786-8265 HAVING TRBL WITH SPINDLE MOTOR

ASSIGNED: BAHIA MICHAEL E DATE: 06/19/89 TIME: 10:32
PLEASE CLOSE CALL: CLOSE CODE IS HC142. (5MIN) MIKEB

ASSIGNED: BAHIA MICHAEL E DATE: 05/10/89 TIME: 12:23
HAVE SEEN PROB BEFORE ON BP4 PX W/ MOTOR SUPPRESSOR BRD. THIS BRD IS FOUND
PARTIALLY UNDER:RELAY BRD & HAS WIRE FROM START CAP TO IT. PROB PREVIOUSLY
FOUND WAS 50/60HZ MTR WOULD POP THE BREAKER WHILE THE 60 HZ MTR UNDER SAME
P/N WORKS. CE: TO CHECK PX FOR MTR SUPPRESSOR BRD & TRY TO HAVE LOGISTICS HAND
PICK 60 HZ DRIVE FROM STK. IF THIS IS CASE AGAIN WILL TRY TO GET BF TO SETUP
SEPARATE P/N'S FOR 50/60HZ & 60 HZ MTRS. MTR P/N IS 726-6726..(45MIN) MIKEB

ASSIGNED: PLANTE VIRGINIA DATE: 05/10/89 TIME: 09:10
HE IS THE SHOP # 516-786-8265 or digital pager is 513-589-9565

ASSIGNED: BAHIA MICHAEL E DATE: 05/05/89 TIME: 15:56
SELECTION CRITERIA

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PTR NUMBER - START: C200006422 END: C200006422
PRIORITY: ALL
PROBLEM TYPE: ALL
RDB - ASSIGN RDB: ALL CUST RDB: ALL ORIG RDB: ALL
HW/SW INDICATOR: ALL
STATUS TYPE: 0
STATUS CODE: ALL

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PROBLEM NUMBER: C200006422 CUST NAME: FIRST OHIO SAVINGS BANK FSB
PRIORITY: P3 CUST NUMBER: 000001627298

TALKED W/ THE CE- CAUS HAD A NOISEY SPINDEL MOTOR. THEY REPLACED IT W/2 NEW ONES THE NEW ONES WILL TRIP THE BREAKER OVER A PERIOD OF TIME. USUALLY WHEN THE CUST DOES A BACKUP AND THE MOTOR HAS TO SPIN UP. CE WANTS TO KNOW WHAT THE READING IS ON THE WINDINGS TRIED CALLING B FISH FOR ANY INFO ON THE PX MOTOR.

ASSIGNED: PLANTE VIRGINIA DATE: 05/05/89 TIME: 12:49

RESOLUTION TEXT :BAHIA MICHAEL E DATE: 06/19/89 TIME: 10:28
HC 142. REINSTALLED ORIGINAL MTR & TIGHTENED UP & NOT AS NOISY. DOES NOT KNOW IF DRIVE HAS MTR SUPPRESSOR BRD OR NOT. CLOSE CALL /CE. CUST LIVING W/ SOME NOISE. (5MIN) MIKEB
ENGINEERING CHANGE ORDER

OLD EQUIPMENT IDENTIFICATION NUMBER

NEW EQUIPMENT IDENTIFICATION NUMBER

CLASS OF CHANGE
CLASS I ☐ CLASS II ☒

RECORD CHANGE ONLY ☒

MISCELLANEOUS ITEMS ☐

ECO REQUIRED ☒

PUBLICATIONS AFFECTED ☒

SOFTWARE AFFECTED ☒

EQUIPMENT SPEC AFFECTED ☒

SPEC PARTS AFFECTED ☒

SAFETY AFFECTED (UL/CSA) ☒

TOOLING AFFECTED ☒

TEST EQUIPMENT ☒

WORKSHEET AFFECTED ☒

ERG AFFECTED ☒

REASON FOR CHANGE

IN ORDER TO ALLOW CUSTOMERS TO RETROFIT THE "LO-AIR" OPTION EASIER AND TO AVOID ANY PROBLEMS AND CONFUSION BECAUSE OF TWO DIFFERENT RELAY CONTROL PWAs, ONLY ONE NEW RELAY CONTROL WAS DEVELOPED. THE NEW LO-AIR RELAY CONTROL (7776-5760*) WILL NOW BE POSITIVE QUANTITY ON ALL AIR OPTION KITS. DUE TO THE NEW BOARD DESIGN, A NEW RELAY CONTROL COVER IS BEING DEVELOPED.

REASON CATEGORY

1. DRAFTING Error CORRECTION
2. DESIGN Error CORRECTION
3. MANUFACTURING REQUESTED CHANGE
4. MARKETING REQUEST CUSTOMER REQUIREMENT
5. PRODUCT IMPROVEMENT-MANUFACTURER RELIABILITY
6. COST IMPROVEMENT-PLANNED PROGRAM & UNPLANNED
7. INITIAL RELEASE

INTERCHANGEABILITY CODES
A NOT INTERCHANGEABLE
B INTERCHANGEABLE
C RECORD

DESCRIPTION OF CHANGE

SEE FOLLOWING PAGES.

NOTE: RELAY CONTROL TEST SPEC UPDATED BY ECO 33982.

ORIGINATOR

S. Lucas

DATE 6/21/82

ENGINEER

OKR

DATE 6/21/82

DISTRIBUTION

DRAUGHTER

DATE 6/21/82

EC ADMINISTRATOR

DATE 6/27/82

NOTE: PART NUMBER LISTED FOR DISPOSITION ONLY

NEC REG'D YES ☐ NO ☒ NEC No.

PART DISPOSITION

IN PRODUCTION IN WIP IN STOCK

FACILITY ISSUE WK FG WK

REWORK OKLAHOMA CITY

AUTO OKLAHOMA CITY

CHANGE REQUEST No.

OKR 22932

DATE 6/27/82
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**RELAY CNTL ADPTR KIT**

USA
ENGINEERING CHANGE ORDER

DATE APPROVED: ?? JUN 82

CHANGE NUMBER: N/A

PART DISPOSITION CODES
1. USE AS IS
2. REWORK
3. RESIDUAL - RETAIN FOR OTHER USES
4. NOT APPLICABLE
5. INCORPORATE PEA
6. EFFECTIVITY
7. SCRAP
8. SEE NOTE ON PAGE
9. INITIAL RELEASE

INTERCHANGEABILITY CODES
A NOT INTERCHANGEABLE
B INTERCHANGEABLE
C RECORD

MAGNETIC PERIPHERALS INC.
A subsidiary of CONTRAL DATA CORPORATION

OLD EQUIPMENT IDENTIFICATION NUMBER
NEW EQUIPMENT IDENTIFICATION NUMBER

MFG EFFECTIVITY

K/S 8226-B/S 8244, F/G 8246.

REASON FOR CHANGE

IN ORDER TO ALLOW CUSTOMERS TO RETROFIT THE "LO-AIR" OPTION EASIER AND TO AVOID ANY PROBLEMS AND CONFUSION BECAUSE OF TWO DIFFERENT RELAY CONTROL PAK'S, ONLY ONE NEW RELAY CONTROL WAS DEVELOPED. THE NEW LO-AIR RELAY CONTROL (777/5900) WILL NOW BE POSITIVE QUANTITY ON ALL AIR OPTION KITS. DUE TO THE NEW BOARD DESIGN, A NEW RELAY CONTROL COVER IS BEING DEVELOPED.

DOCUMENTS AFFECTED

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DESCRIPTION OF CHANGE

SEE FOLLOWING PAGES.

NOTE: RELAY CONTROL TEST SPEC. UPDATED BY ECO 33981.

PART NUMBER LISTED FOR DISPOSITION ONLY

ORIGINATOR
S. Lucas
DATE 14 JUNE 82

ENGINEER
L/K S 4/2/82

DATE 6/21/82

CHANGE REQUEST NO.
OKHR 28932

EC ADMINISTRATOR
Date 6/22/82

DATE 6/22/82

NOTE: RELAY CONTROL TEST SPEC. UPDATED BY ECO 33981.

*PART NUMBER LISTED FOR DISPOSITION ONLY
Reply

From: Jack L Haley
Subject: Pheonix Fixed Modules

Jack - Please see attached trip report for current status on Mag Data. As Barry Fish has informed you, our next step is to review Xidex's repair procedur e, as this too, is a repair source for fixed modules.

I realize the Field time and frustration involved with this quality problem however, I think you'll agree, I cannot "alert" the Field to a problem until I have facts to report. Since Barry's return from Mag Data, 2/18, we have initiated a purge notice and are in the process of publishing a TSB denoting the exact s/n's of modules that are defective.

Last Friday, Barry rejected most of the inventory in Tewksbury but can assist you in obtaining a good module if you still have a down situation (I couldn't find a TAC call). As with most purges, stock will be available on a limited basis until the vendor can rework defective stock. If Xidex is experiencing similar problems, another purge notice/TSB will be generated. Kim

Original Memo

Kim:

As you may already be aware of the field is experiencing severe problems with the replacement fixed modules from stock. A recent incident in Conn. where 5 modules had to to be tried to obtain one which barely was within spec (servo adj) and now, per the attached memo, where we are on the sixth module and no progress. Barry Fish has been aware of these problems, but the situation continues to deteriorate. What is the action plan to deal with this problem, I would like a call tomorrow defining the solution and an alert to the field so that many hundreds of manhours are not wasted trying to fix problems that cannot be fixed.

Jack Haley
Rtom NE Region

REGARDING THE PHOENIX FIXED MEDIA PROBLEM, THE RANGE OF SERIAL #'S FOR THE MAGNETIC DATA INC. FIXED MEDIA THAT IS CAUSING PROBLEMS IS THE FOLLOWING:

MA532287 TO MA589208

I WAS INFORMED THAT THE OTHER VENDOR, XIDEX, IS OF QUESTIONABLE RELIABILITY BUT ACCORDING TO PRODUCT SUPPORT, LESS OF A RISK. I HAVE A TAC CALL OPEN NOW WHERE A CE HAS TRIED 2 FIXED MODULES AND IS EXPERIENCING SIMILAR PROBLEMS AS MAGNETIC DATA. I BELIEVE THESE ARE XIDEX PACKS BUT NOT SURE. THE SERIAL #'S THE CE HAD WERE X0009536 AND X0009540. I AM MAKING AN ASSUMPTION THAT THE "X" REPRESENTS XIDEX. IF ANYONE CAN VERIFY THIS, LET US KNOW.

MAGNETIC DATA MEDIA HAS BEEN PURGED AND GOOD MEDIA SHOULD BE AVAILABLE ACCORDING TO PRODUCT SUPPORT.

BILL C
### Reason for Change

The retract velocity may be exceeded due to the loss of logic control on K2 (servo relay) when the heads are loaded on a high cylinder and the power is interrupted.

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CONTINUED ON NEXT PAGE

### Description of Change

See body of this ECO. Possible creation of 77680651 from 77680650; 77680661 from 77680660 and 77680691 from 77680690.

**Note:** This ECO authorizes rework of a maximum of 4500 PWA's listed in this ECO located at MPI OKC.

**Part Number Listed for Disposition Only**

### Effectivity Plan

- **Rev Marking for Assembled BDS:**
  - 77680651 E
  - 77680691 E

- **Rework:**
  - OKLAHOMA CITY

- **Auto:**
  - OKLAHOMA CITY

**Change Request No.:** OKHR 28564

**EC Administrator:**

**Date:** 3/17/92
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ITEM 2:
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SH. 1: UPDATE TO AGREE WITH PAGE 6 OF THIS ECO.

ITEM 4:
SH. 1: UPDATE TO AGREE WITH PAGE 7 OF THIS ECO.
SH. 2: UPDATE TO AGREE WITH PAGE 8 OF THIS ECO.
**ITEM 5:**

SH. 2: UPDATE TO AGREE WITH PAGE 9 OF THIS ECO.
SH. 3: UPDATE TO AGREE WITH PAGE 10 OF THIS ECO.
SH. 4: UPDATE TO AGREE WITH PAGE 11 OF THIS ECO.
SH. 9: UPDATE TO AGREE WITH PAGE 12 OF THIS ECO.
ADD SH. 9.1 AS SHOWN ON PAGE 13 OF THIS ECO.

**ITEM 7:**

CREATE 77680691 SAME AS 77680690 EXCEPT:
PL SAME EXCEPT:

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SH. 1: UPDATE TO AGREE WITH PAGE 14 OF THIS ECO.
**ITEM 8:**

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**ECO-FCO**

**NOTES: UNLESS OTHERWISE SPECIFIED**

1. RESISTOR VALUES ARE IN OHMS, 1/4W, 5%
2. CAPACITOR VALUES ARE IN MICROFARADS

△3. USED ONLY ON ASSEMBLY 77680690-3
△4. CONNECTIONS DEPEND ON RELAY SUPPLIED

△5. J8 CONNECTS TO 77713200 PWA.

**DELETES**

**ADD**
# TEST SPECIFICATION FOR RELAY CONTROL PWA

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TEST SPECIFICATION FOR RELAY CONTROL PWA

1.0 SCOPE

This document describes test requirements for RELAY CONTROL Board PWA 77680650 and 77680660.

1.1 FUNCTIONS

1. Switches head actuator power between a servo power amplifier and an emergency retract amplifier in response to logic commands and loss of either (+) 5 VDC or (+32) VDC.

2. Energizes the pack cover unlock solenoid in response to logic commands.

3. Switches control power to a solid state relay in response to logic commands and a motor thermal overheat interlock.

4. Transfers spindle motor power sources between the AC output of a solid state relay and a bridge rectified DC output in response to logic commands.

5. Provides transistor controlled DC power to a mechanical relay in response to logic commands.

5. Flashes fault LED when air pressure is low leaving absolute filter.

2.0 APPLICABLE DOCUMENTS

Assembly and parts list  77680650, 77680660
Schematic  77680661
Artwork  77680670

3.0 REQUIREMENTS

Requirements for tests of Relay Control Board Assemblies are based on the assumption that all components have been satisfactorily tested prior to PWA Assembly.

CAUTION

Hazardous voltages are present in this PWA when installed in equipment; adequate safety precautions should be observed.
TEST SPECIFICATION FOR RELAY CONTROL PWA

3.1 TEST EQUIPMENT REQUIRED

a. Power Source capable of providing the following: 32.0 volts D.C. ±3% with a load from zero to 0.32 amperes.

b. Power Source capable of providing the following: 5.0 VDC ±2% with a load from zero to 400 milliamperes.

c. A 60 Hz sinusoidal power source capable of providing the following: 35.0 ±5% volts AC RMS with a load from zero to 3.2 amperes.

d. Ohmmeter capable of measuring 1.0 ohm to 1.0 megohm ±2.5% and to 5.0 megohms ±20%.

e. 5.0 ohm - 55 Watt - 5% Resistor (Qty. 2)

f. 150 ohm - 10 Watt - 5% Resistor

g. 160 ohm - 1/2 Watt - 5% Resistor

h. Voltmeter capable of measuring 0.30 to 3.00 volts D.C. ±3% with floating reference.

i. Voltmeter capable of measuring 0.050 to 35.0 volts D.C. ±2% with grounded reference and an input impedance 1.0 megohm or greater.

j. Voltage select plug 1 (connects J7-01 to J7-02, J7-03 to J7-04).

k. 220 ohm - 1/2 Watt - 5% resistor

l. 1K ohm - 1/2 Watt - 5% resistor

3.2 CRITERIA OF ACCEPTANCE

Each board must satisfactorily meet all requirements set forth in this test specification in order to be considered acceptable. Unacceptable units shall be reworked.

3.3 STATIC TEST AND MEASUREMENTS

Visually inspect the board for missing or broken components, diode polarity, conformance to drawings listed in paragraph 2.0, faulty solder joints, and general workmanship.

ADD:

m. POWER SOURCE CAPABLE OF PROVIDING THE FOLLOWING: 2.5 VOLTS D.C. ±2% WITH A LOAD FROM ZERO TO 400 MILLIAMPERES.
TEST SPECIFICATION FOR RELAY CONTROL PWA

3.5.2 Test #2

With conditions as specified in paragraph 3.5.1 above except all logic inputs are "Lo" (grounded), and the 35.0 volt RMS AC supply connected:

a. The voltage at J1-07 (Line OFF/+L) shall be 5.0 ±0.25 Volts D.C.

b. The voltage at Termination "A" with respect to Termination "B" shall be (+) 30.0 ±2.0 Volts D.C.

c. The specified resistances shall be observed between the following terminations with the polarity indicated:

Less than 1.0 ohm between J3-03 (+) and J3-01 (-)

3.5.3 Test #3

With circuits configured as shown in Figure 1 and all logic inputs "Hi" (Floating), and the 35.0 volt RMS AC supply disconnected:

a. The voltage at J6-01 (PK-COV+32) shall be (+)27.5 Volts D.C.

b. The voltage at J1-07 (Line-OFF/+L) shall be 5.0 ±0.25 Volts D.C.

c. The specified resistances shall be observed between the following terminations with the polarity indicated:

Less than 1.0 ohm between J3-03 (+) and J3-01 (-)
Greater than 5.0 megohms between J4-02 (+) and J5-02 (-)

3.5.4 Test #4 (PWA 77680680 ONLY)

a. With the circuits configured as shown in Figure 2, 3, and 4, the voltage at J1-02 shall be 5.0 ±0.25 volts.

b. With the circuits configured as shown in Figure 5, the voltage at J1-02 shall be as in wave form shown in Figure 6.

![Wave Form at TP 4](image)

Figure 6. Wave Form at TP 4.
Test #5

With circuit configured as shown in Figure 6, and J1-05 (PK-COV-UNLOCK/+L), is "LO" (Grounded with all other logic inputs "Hi" (Floating), and the 35.0 volt RMS AC supply disconnected, the resistance observed between J3-03(+) and J3-01(-) shall be less than 1.0 ohms.
REWORK INSTRUCTIONS

CREATE ASSEMBLIES: 77680651 REV E FROM 77680650

77680691 REV E FROM 77680690

REPLACE U3 (15164423-4  1.C. 75A72) WITH 77713200-2 (PWA 'RELAY PIGGYBACK')
MAGNETIC PERIPHERALS INC.

ENGINEERING CHANGE ORDER

OLD EQUIPMENT IDENTIFICATION NUMBER
CMD/9448

NEW EQUIPMENT IDENTIFICATION NUMBER
SAME

MEG EFFECTIVITY
B/S 8223 'F/G 8225

REASON FOR CHANGE
THE RETRACT VELOCITY MAY BE EXCEEDED DUE TO THE LOSS OF LOGIC CONTROL ON K2 (SERVO RELAY) WHEN THE HEADS ARE LOADED ON A HIGH CYLINDER AND THE POWER IS INTERRUPTED.

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DESCRIPTION OF CHANGE
SEE BODY OF THIS ECO
POSSIBLE CREATION OF 77680651 FROM 77680650; 77680661 FROM 77680660 AND 77680691 FROM 77680690.

NOTE: THIS ECO AUTHORIZES REWORK OF A MAXIMUM OF 4500 PWA'S LISTED IN THIS ECO LOCATED AT MPI OKC.

NOTE: THIS ECO AUTHORIZES REWORK OF A MAXIMUM OF 4500 PWA'S LISTED IN THIS ECO LOCATED AT MPI OKC.

*PART NUMBER LISTED FOR DISPOSITION ONLY

ORIGINATOR
B. Wallace Date 3-18-82

ENGINEER
J. H. McCarley Date 3-19/148

REV MARKING FOR ASSEMBLED BDS.
77680651 E
77680691 E

REWORK OKLAHOMA CITY
AUTO OKLAHOMA CITY

CHANGE REQUEST No. OKHR 28564
EC ADMINISTRATOR

DATE 3-19/148
ITEMS 1, 3 & 6:

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SH. 2: UPDATE TO AGREE WITH PAGE 9 OF THIS ECO.
SH. 3: UPDATE TO AGREE WITH PAGE 10 OF THIS ECO.
SH. 4: UPDATE TO AGREE WITH PAGE 11 OF THIS ECO.
SH. 9: UPDATE TO AGREE WITH PAGE 12 OF THIS ECO.
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SH. 1: UPDATE TO AGREE WITH PAGE 14 OF THIS ECO
NOTES:
1. RESISTOR VALUES ARE IN OHMS, 1/4W 5%-5%
2. CAPACITOR VALUES ARE IN MICROFARADS
3. CONNECTORS DEPEND ON RELAY SUPPLIED
4. J18 CONNECTS TO 77113200

DEFINITIONS:
ADJ ECO-FCO
PL 33874BA
### Engineering Change Order

**Old Equipment Identification Number:** CMD/9448  
**New Equipment Identification Number:** SAME

**Reason for Change:**  
The retract velocity may be exceeded due to the loss of logic control on K2 (servo relay) when the heads are loaded on a high cylinder and the power is interrupted.

### Documents Affected

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<th>DOC Type</th>
<th>DWG Size</th>
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**Description of Change:**  
See body of this ECO  
Possible creation of 77680651 from 77680650; 77680661 from 77680660 and 77680691 from 77680690.

**Note:** This ECO authorizes rework of a maximum of 4500 PWA's listed in this ECO located at MPI OKZ.

**Rev Marking for Assembled Bds.:**  
77680651 E  
77680691 E  
77680901 E

**Effectivity Plan:**  
- **Rev Marking for Assembled Bds.:**
  - OKLAHOMA CITY
  - AUTO: IC TAMPA 8224

**Change Request No.:** OKHR 28564  
**EC Administrator:** Ch 3/19/82

**Date:** 5/19/82
*EMP. # 32527.
*RE: OLD STYLE IO BOARD ON THE PHOENIX CAUSING PROBLEMS.
11/18/86: CALLING IN TO DOCUMENT A PROBLEM.
+A COMPATIBILITY PROBLEM HAS BEEN FOUND W/ CERTAIN VERSIONS
+OF THE PX I/O BRD WHEN USED W/ CERTAIN SYSTEMS OR WANG DISK
+CONTROLLERS. IN THIS PARTICULAR CASE A WORKING BP3 PX WAS
+INSTALLED ON A VS85 AND SOFT ERRORS WERE GENERATED WHENEVER
+VOLUMES WERE SWITCHED. THE ALIGNMENT OF THE DRIVE WAS
+CHECKED 3 TIMES & WAS ALWAYS WELL WITHIN SPECS. CAUSE OF
+THIS PROBLEM WAS THE I/O BRD, CDC # 77616770A. THIS IS AN
+OLDER STYLE BRD W/ NO SW BANK & RLK CONNECTORS FOR THE A
+CABLE & TERMINATOR. WHEN THE BRDS WERE 1ST REPLACED FOR
+THIS PROBLEM A SIMILAR VERSION I/O BRD WAS USED & THE PROB-
+LEM WAS STILL PRESENT. ANOTHER BP3 PX FROM THE OFFICE WAS
+BROUGHT IN & USING THIS SAME TYPE I/O BRD ALSO FAILED. THE
+PROBLEM OCCURRED W/ BOTH A 22V88 & THE 22V28, BUT THESE
+SAME DRIVES WORKED FINE ON A VS65. ONCE THE CURE WAS FOUND
+TO BE A NEWER VERSION OF THE I/O BRD W/ THE SW BK, OLDER &
+NEWER VERSIONS OF THE OTHER CARD CAGE BRDS WERE TESTED BUT
+NO DIFFERENCE WAS FOUND. THE CDC 77516770A I/O 3RD WOULD
+CAUSE SOFT ERRORS WHEN CHANGING VOLUMES W/ EITHER OLD OR
+NEW CDC BRDS ON THE VS85 W/ EITHER A 22V28 OR A 22V88.
+GIVING COPY OF CALL TO DJ.

(30MIN) MIKEB