PROBLEMS:
I-90 ERRORS, DPU/SYSTEM HANGS, INCORRECT DRIVE SELECTED.

NOTE:
AN I-90 ERROR INDICATES THAT THE 2280 DPU CAN NOT COMMUNICATE WITH THE CPU.
AN I-91 ERROR INDICATES THAT THE DRIVE CAN NOT COMMUNICATE WITH THE DPU.

CONDITIONS:
SOURCE OF PROBLEM WAS DUE TO NOISE ON THE (READY LINE) AND ON THE (ON CYLINDER LINE) FROM THE DRIVES TO THE DPU. NOISE ON THESE LINES EXTENDED BEYOND THE 4 US READY SIGNAL OF DRIVE 1 INTO THE AREA OF WHERE THE DRIVE 2 READY SIGNAL WOULD BE. THIS CAUSED SELECTION OF DRIVE #2 TO TAKE PLACE. IF THIS HAPPENS AND DRIVE 2 IS NOT AVAILABLE, THE SYSTEM HANGS. IF THE DRIVE IS AVAILABLE, THEN DATA IS READ FROM OR WRITTEN TO DRIVE 2 CAUSING DATA INTEGRITY PROBLEMS.

DRIVER/RECEIVER CIRCUITS ARE BALANCED LINE TYPE WITH AN UNBALANCED INPUT SIGNAL WHICH DEFEATS NOISE IMMUNITY IN THE DIFFERENTIAL AMPLIFIER INPUTS. (SIGNAL BALANCE VARIATIONS ARE CAUSED BY TERMINATORS, CABLES AND CIRCUIT BOARDS. TERMINATORS SHOWED SIGNAL VARIATIONS OF AS MUCH AS 160 MILLIVOLTS AT THE RECEIVER INPUTS).

TO PREVENT THE NECESSITY OF AN ARTWORK CHANGE TO THE BOARD, THE TERMINATING RESISTORS ON THE + INPUT SIDE OF THE RECEIVERS WERE INCREASED IN VALUE TO ALLOW PROPER SIGNAL BALANCE AND NOISE REJECTION. A BETTER FIX WOULD HAVE USED A VOLTAGE DIVIDER NETWORK WITH A PULL-UP RESISTOR, BUT THIS WOULD HAVE ADDED EXTRA COMPONENTS TO THE BOARD.

TESTING:
INITIAL TESTING WAS CARRIED OUT IN MANUFACTURING IN ORDER TO OBTAIN DEFECTIVE 210-7422 BOARDS. FAILING BOARDS WERE BROUGHT TO R & D. THE BOARDS WERE TESTED AGAIN, MODIFIED AND RETESTED FOR SEVERAL HUNDRED HOURS WITH DIFFERENT REV'S, (REV-7 TO REV-0C), CABLE LENGTHS UP TO 50' AND VARIOUS TERMINATORS. EVERY CONFIGURATION CHANGE PRODUCED VARIOUS RESULTS WITH UNMODIFIED BOARDS. ALL MODIFIED BOARDS GAVE CONSISTANT RESULTS, WITH CLEAN SIGNALS AND NO FAILURES. ALL DEFECTIVE BOARDS OBTAINED FROM MANUFACTURING WORKED PROPERLY WITH THE CHANGE INSTALLED.

RESOLUTION:
CHANGE TERMINATION RESISTORS ON 210-7422 BOARD AT LOCATIONS R46 AND R48. RESISTORS WERE CHANGED FROM 56 OHMS TO 510 OHMS.

NOTE:
SEE ATTACHED ECO #36643 FOR BOARD CHANGE.
**ECO NO. 3645**

<table>
<thead>
<tr>
<th>ORIGINATOR</th>
<th>Sau Cai</th>
<th>M/S 1439</th>
<th>EXT. 77332</th>
<th>DATE 05/08/85</th>
</tr>
</thead>
<tbody>
<tr>
<td>WRITTEN BY</td>
<td>Jeannine Roy</td>
<td>M/S 1218B</td>
<td>EXT. 76930</td>
<td>DATE 05/08/85</td>
</tr>
</tbody>
</table>

**PART NO.** 210-7422  
**DESCRIPTION** 2200 SMD ECC/Device Interface  
**DWG NO.** 7422  
**MODEL NO.** 2280  
**CLASS** I (2) (3)  
**TYPE** × HARDWARE  
**PEP #** PE133A

**DESCRIPTION OF CHANGE**

Change assembly drawing, schematic and sample board per attached prints.

Change BOM 210-7422 as follows:

<table>
<thead>
<tr>
<th>WL#</th>
<th>DESCRIPTION</th>
<th>UM</th>
<th>COMP</th>
<th>QTY</th>
<th>QTY</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHANGE</td>
<td>Res 56 Ohm 1/4w 5%</td>
<td>EA</td>
<td>1</td>
<td>From: 96</td>
<td>1</td>
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<tr>
<td>ADD</td>
<td>Res 510 Ohm 1/4w 5%</td>
<td>EA</td>
<td>1</td>
<td>To: 94</td>
<td>1</td>
</tr>
</tbody>
</table>

Note to EDD: Create a 210 History Sheet for this board and create a VS laser parts list for 210-7422. Delete parts list on sheet 6 of 6 of schematics and change parts list as follows:

Change R46 and R47 from 56 Ohm Res 1/4 5% (330-1057) to 510 Ohm Res 1/4w 5% (330-2052)

**REASON/SYMPATOM FOR CHANGE**

To eliminate noise on the ready line.  
To correct intermittent hangs and incorrect drive selection.

**APPROVALS**

<table>
<thead>
<tr>
<th>ECO MGR.</th>
<th>Sau Cai</th>
<th>DATE 5/8/85</th>
</tr>
</thead>
<tbody>
<tr>
<td>DES. ENGR.</td>
<td>Sau Cai</td>
<td>5/8/85</td>
</tr>
<tr>
<td>CUST. ENGRG.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MFG. ENGRG.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ORIGINATOR</td>
<td>Sau Cai</td>
<td>5/8/85</td>
</tr>
<tr>
<td>F.C.C.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
MICROCODE REVISION R-09:
ALL BOARDS WERE TESTED WITH R-09 PROMS AND RELEASE 2.1 OPERATING SYSTEM AS THESE CONDITIONS CAUSED THE MOST PROBLEMS IN THE FIELD. PROBLEMS INCLUDE I-90/I-91 ERRORS, SYSTEM HANGS, DATA INTEGRITY, INCORRECT DRIVE SELECTION AND THE AMBI SPIN UP PROBLEM.

MICROCODE REVISION R-0A:
THIS WAS AN INTERIM CHANGE THAT WILL NOT BE USED IN THE FIELD.

MICROCODE REVISION R-0B:
THIS WAS ALSO AN INTERIM CHANGE.

MICROCODE REVISION R-0C:
THIS VERSION OF CODE CURED PROBLEMS ASSOCIATED WITH R-09 AND THE PREVIOUS INTERIM CHANGES. FURTHER INVESTIGATION OF THE CODE REVEALED THAT IT WOULD INTERMITTENTLY FAIL TO LOAD THE ALTERNATE SECTOR MAPS DURING POWER UP SEQUENCES. ALSO THE SPIN UP PROBLEM WAS NOT FIXED IN THE CODE.

MICROCODE REVISION R-0D:
AFTER A COMPLETE ARCHITECTURAL REDesign, THIS REVISION CURED THE SPIN UP AND MAP LOADING PROBLEMS AND TESTED OK FOR SEVERAL HOURS. FURTHER TESTING REVEALED THAT I-90 ERRORS WOULD BE ENCOUNTERED IF DELAYED SEQUENTIAL READ OR WRITE OPERATIONS WERE DONE ON CERTAIN DRIVES. (IF A DELAY IS INSERTED INTO A PROGRAM, THIS ALLOWS THE MICROCODE TO GO TO WAIT LOOP BETWEEN OPERATIONS AND PERFORM DIAGNOSTICS). THE DIAGNOSTICS WOULD FAIL DURING TESTING OF THE ALT. SECTOR MAP LOCATIONS IN MEMORY. INVESTIGATION REVEALED THAT THE MAPS WERE NOT IN THE CORRECT LOCATION FOR THE CORRESPONDING DRIVE AND THEREFORE WOULD FAIL ONLY IF THE DRIVE HAD ALT. SECTORS ASSIGNED AND THE DPU WAS IN AN IDLE STATE. A DRIVE WITHOUT ALT. SECTORS WOULD WORK CORRECTLY. THIS CHANGE ALSO NEGATED THE NEED FOR THE HARDWARE SPIN UP CHANGE ON THE 210-7422 BOARD.

MICROCODE REVISION R-0E: \((R_{10})\)

THIS REVISION CURED THE ALT. SECTOR MAP PROBLEM AND TESTED 100% ERROR FREE. ALT. SECTOR MAPS WERE VERIFIED AND EXTENSIVELY TESTED. THIS IS THE FINAL REVISION AND WILL BE RELEASED TO THE FIELD AS RELEASE R-0A, PROVIDING PROBLEMS ARE NOT ENCOUNTERED DURING BETA TEST AT AMBI.

BETA TESTING

THE PREVIOUS CHANGES HAVE BEEN INCORPORATED INTO A BETA PACKAGE FOR AMBI. 4 SETS OF BURNED IN R-0E PROMS (PRE-RELEASE R-0A) AND 4 BURNED IN 210-7422 BOARDS ARE BEING SHIPPED TO AMBI ON 05/13/85 AS PROPERTY PASSES CAN NOT BE SIGNED OFF IN TIME TO SEND THE PACKAGE ON 05/10/85. WHEN TEST RESULTS INDICATE THAT THE CHANGES ARE CORRECT, THEY WILL BE RELEASED TO THE FIELD.

IT SHOULD BE NOTED THAT OS REL 2.6 HAS CURES FOR THE MULTIPLEXER PROBLEMS IN THE 2280 DPU. THIS RELEASE OF OS MUST BE USED WHEN MULTIPLE CPU INSTALLATIONS ARE USING A SINGLE 2280 DPU.
PROBLEM:
DRIVE SPIN UP AFTER A PACK CHANGE AND SIMULTANOUS
INTERROGATION OF DRIVE READY, CAUSES DRIVE TO SEEK TO TRACK 0
AND RETRACT. THIS IS A CONTINUOUS CYCLE CAUSING POWER AMPLIFIER
FAILURE IN THE DRIVE IF ALLOWED TO CONTINUE. AT BEST THE DRIVE
WILL NEVER COME READY AS SEEK COMPLETE IS NEVER ACTIVE.

CONDITIONS:
ALL LINES FROM THE DRIVE ARE GATED WITH THE UNIT SELECT SIGNAL
INCLUDING THE READY LINE. MICROCODE SEQUENCES HAVE TO BE USED
TO DETERMINE THE STATUS OF THE DRIVE AT ANY GIVEN TIME. IN
ORDER TO PREVENT THESE SEQUENCES TO THE DRIVE, THE UNUSED SEEK
COMPLETE SIGNAL IN THE B CABLE WAS ANDED WITH UNIT SELECTED TO
GATE THE TAG-3 SIGNAL TO THE DRIVE. THIS WAS DONE AT PORT 1
AND PORT 2 AND THE SIGNALS COMBINED WITH AN OR CIRCUIT. (THE
SEEK COMPLETE LINE IS THE ONLY HARDWARE LINE AVAILABLE WITHIN
THE CABLE TO THE DPU NOT GATED WITH UNIT SELECT). THE END
RESULT IS, IF THE MICROCODE TESTED THE DRIVE FOR READY DURING
FIRST SEEK AND FOUND IT NOT READY, A RESTORE COULD NOT BE
ISSUED TO THE DRIVE. (NORMAL SEQUENCE IN THE MICROCODE IS TO
DESELECT DRIVE, SELECT DRIVE, TEST FOR READY AND DESELECT
AGAIN IF THE DRIVE IS NOT READY. IF THE DRIVE IS DOING FIRST
SEEK TO COME READY AND IT IS DESELECTED, A RESTORE IS ISSUED
TO THE DRIVE CAUSING A RETRACT)

TESTING:
A SIMPLE PROGRAM TO READ A SECTOR OF DATA WAS USED TO CHECK
THIS CONDITION DURING DRIVE SPIN UP. ALL DIAGNOSTIC TEST
PROCEDURES WERE RUN FOR EXTENSIVE PERIODS OF TIME TO ELIMINATE
THE POSSIBILITY OF TIMING PROBLEMS CAUSED BY THIS MODIFICATION.

RESOLUTION:
MAJOR CHANGES HAD TO BE MADE TO THE 210-7422 BOARD. THIS WILL
REQUIRE AN ARTWORK REVISION TO THE BOARD WHICH WILL TAKE
SEVERAL MONTHS TO COMPLETE. IF THE PROBLEM CAN BE RESOLVED IN
THE MICROCODE, THE BOARD CHANGE WILL NOT BE NECESSARY.

NOTE:
SEE ATTACHED LOGIC DIAGRAM AND CHANGE INSTRUCTIONS.
210-7422 BOARD
HARDWARE SPIN UP FIX

COMPONENT LIST

<table>
<thead>
<tr>
<th>QTY</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>56 OHM 5% RESISTOR</td>
</tr>
<tr>
<td>2</td>
<td>680 OHM 5% RESISTOR</td>
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DELETES

<table>
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<tr>
<th>FROM</th>
<th>TO</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>L20-1</td>
<td>L10-15</td>
<td>ETCH ON BACK SIDE OF BOARD</td>
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ADD WIRING/COMPONENTS

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<thead>
<tr>
<th>FROM</th>
<th>TO</th>
<th>DESCRIPTION</th>
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</thead>
<tbody>
<tr>
<td>J2-10</td>
<td>L3-9</td>
<td>WIRE</td>
</tr>
<tr>
<td>J2-23</td>
<td>L3-10</td>
<td>WIRE</td>
</tr>
<tr>
<td>L3-9</td>
<td>GROUND</td>
<td>RESISTOR 56 OHMS</td>
</tr>
<tr>
<td>L3-10</td>
<td>GROUND</td>
<td>RESISTOR 56 OHMS</td>
</tr>
<tr>
<td>L3-6</td>
<td>+5 VOLTS</td>
<td>RESISTOR 680 OHMS</td>
</tr>
<tr>
<td>J1-10</td>
<td>L1-9</td>
<td>WIRE</td>
</tr>
<tr>
<td>J1-23</td>
<td>L1-10</td>
<td>WIRE</td>
</tr>
<tr>
<td>L1-6</td>
<td>+5 VOLTS</td>
<td>RESISTOR 680 OHMS</td>
</tr>
<tr>
<td>L3-11</td>
<td>L26-4</td>
<td>WIRE</td>
</tr>
<tr>
<td>L51-8</td>
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<td>L1-11</td>
<td>L26-13</td>
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<td>L49-1</td>
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<tr>
<td>L20-3</td>
<td>L28-13</td>
<td>WIRE</td>
</tr>
<tr>
<td>L28-11</td>
<td>L10-15</td>
<td>WIRE</td>
</tr>
</tbody>
</table>
Equipment: 2280 DPU/Mux
Product Line: 2200 VP/MVP/LVP
Prerequisite to Installation: Back up all fixed surfaces.
Problem: Special considerations and operation of newly released DPU proms on the RAM/Prom Control Board (210-7423-A).

L 13 - 378-4083  R9
L 14 - 378-4084  R9
L 15 - 378-4085  R9
L 16 - 378-4086  R9

Problem Corrected: 1. Intermittent problems due to alternate sector problems. Usually generating one or all of the following symptoms.
   a. DB2 errors
   b. DB8 errors
   c. Disk hangs

2. In a two drive Daisy configuration, the problem of writing the same file to both Disks (same sector) when the file is larger than previously written to Disk.

Special Considerations: When installing R9 proms, the following conditions must be met:

1. All PCB's must be up to proper Rev. levels. Note: Very Important.

   210-7718  E-Rev 1  Mux Slave
   210-7717  E-Rev 2  Mux Master
   *210-7422  E-Rev 4  ECC Device Interface
   210-7421A E-Rev 3  ALU Mux Interface
   210-7423A E-Rev 4  RAM/Prom Control
   210-7424  E-Rev 9  I/O Controller
   210-7415  E-Rev 0  Prime Circuit
   210-L567  E-Rev 7  Regulator
   210-7416  E-Rev 2  Motherboard
   210-7215  E-Rev 6  Mux Disk Controller
   210-7716  E-Rev 1  Motherboard
*Note: There may be a compatibility problem with the 7422 board and the new R9 Proms. An ECO is forthcoming. (Refer to Item 1a Note Special Procedures).

2. All cables must be shielded and appropriately clamped and/or fastened to DPU, Disk Drive, and CPU.

Special Procedures:

The following represents some observations that must be made to ensure the R9 prom are functioning properly and procedures for installing R9.

1. After installing R9 proms one must observe the Drive(s) operation on the first access. The Drive(s) will be expected to perform or respond as follows:

   a. The heads will seek to the maximum cylinder and restore two times per Drive. The purpose for this is to load the alternate sector maps of the Fixed surfaces and the removable surfaces into DPU memory.

Note: If the Drive does not respond as stated and performs only one sequence of seek/restore, it has not loaded the alternate sector map of the removable. In this case suspect a compatibility problem with the 210-7422 board. Try another 7422. (It may take several)

2. After verification of Basic Prom functionality, the CE must format all Fixed surfaces with the new proms installed and then cycle all Removable packs through the Format process, by first copying to Fixed, Format then restore to the Removable.

3. Due to changes in Prom operation and handling of alternate sectors the maximum allowable alternates per surface is 16 versus the previously allowed 32 alternates per surface. This fact can in some cases causes the requirement of Fixed Module or Removable Pack replacement. In the case that in formatting or reading a particular surface previously created on R7 proms, one encounters an error on the R9 proms where there was none on R7 one must assume that the Disk surface has something greater than 16 sector defects. In this case the defective module must be replaced.

CAT 3107
TO: D.T.S.M.'s/D.T.S.'s
FROM: John Forbes
DATE: July 19, 1984
SUBJECT: FCO 1086 (2280 DPU)

Due to a number of problems in the proms released with FCO 1086, the
shipping of this FCO has been stopped.

There is a new FCO being developed to correct problems found in the
R8 proms. In the meantime, do not install the R8 proms in FCO 1086.
I will pass along any information as it becomes available.

Thanks to John Murdock, D.T.S. from Connecticut, for passing this
information along.

Regards,

John Forbes
Area Technical Specialist

JF:0109L
TO: ALL COMPUTER PERSONNEL

FROM: KEITH JONES
      JOE McDERMOTT
      TIM DAWSON
      DICK KNAPP

SUBJ.: WEEKLY COMPUTER TELEX #35

DATE: APRIL 28, 1980

Phoenix 2280

R5 proms are now available for the 210-7483 board in the Phoenix microprocessor. ECN 14856 gives all pertinent information regarding the installation of these proms. They are as follows.

1. ECN #14561 must be done on the 210-7423.
2. ECN #14563 must be done on the 210-7424.
3. ECN #14564 must be done on the 210-7422.

The proms are: 378-4083-R5
                       378-4084-R5
                       378-4085-R5
                       378-4086-R5

Also R5 proms allow us to do Phoenix Alignments without the F.T.U., using the alignment program distributed with the new diagnostics.

2246R

All locations running remote workstations should have a system which contains all of the below.

1. Operating System - Upgrade to 4.1.10 (pre-release)
2. 2246 Remote WS - ECN 14855
3. 22V06 IOP - ECN 14158

Any questions on these ECN's should be directed to the Area Office.

F.T.U. Software

F.T.U. simulator software for an all serial systems is available at the Area Office. These packages are stand alone simulators which enable you to get to a drive even if you cannot I.P.L. the system because of a drive problem.
Phoenix
Problems with R8 Proms in DPU

Some problems have been reported with the R8 proms found on the 7423 board in the DPU. One problem has been a hang on first access. If having problems revert back to the R7 proms or upgrade to R9.
Compatibility Problem With R9 Proms

A compatibility problem has been found with the new R9 proms used on the 210-7423 board and the 210-7422 board. The problem appears to be the 7422 board in most cases although it may not display a problem with lower revision proms.

The symptoms observed have been PECM errors, screen resetting when accessing the Phoenix and hangs.

If using the R9 proms thoroughly test the DPU after installing as follows:

1. With the phoenix connected and powered on, but no up to speed every attempted access should result in an I91. Repeat 10-20 times.

2. Check voltages and ripple in the backplane of the DPU after the drive has been up to speed with heads loaded for 10 to 15 minutes. Ripple should be less than 30 mil V.

3. Run a program to do random R/W's to a scratch surface for several minutes then copy some programs to that surface and run them.

4. If using a MDPU test from all CPU's.

If a problem is found, it is possible to be something other than the 7422 board or R9 proms. If it appears to be the compatibility problem try to replace the 7422 board before down-grading the proms.
PHOENIX

There is a new cable out which is shielded to replace the cable running between the CPU and DPU. The part number is *220-0105-3*

The part number for the rail kit needed to ground shielded A and B cables at the DPU is *728-0004*
This may include A & B cables: 220-3041-7 A cable and 220-3033-21 B Cable

The A and B shielded cables for 2200 are not available yet. However, you may use the following shielded cables:

15' A cable-220-3041-1
15' B cable-220-3033-6
TO: D.T.S.M.'s

FROM: John Forbes

DATE: October 23, 1984

SUBJECT: 2280 DPU/MUX FCO

FCO #1114 released August 29, 1984, calls for the replacement of four proms on the 210-7423 board in the 2280 DPU. The first installation of these proms met with little success and it appeared as if the proms were bad.

Further testing showed that the 210-7422 board was in fact the problem and not the proms. This was verified by Product Support who stated that the new proms would not run properly with marginal 7422 boards.

Several symptoms observed were PECM errors, software reset when accessing 2280 and disk hangs. At this time, there is no way of knowing which 7422 will run with the R9 proms. Product Support and R&D are working on a resolution and expect one shortly.

Should it become necessary to install a 7423 board with R-9 proms, insure C.E.'s thoroughly test DPU to insure compatibility. Further information will be distributed via TAC. I will pass along information as it becomes available. Should you have any questions, please don't hesitate to call.

Regards,

John Forbes
Area Technical Specialist

JF:0056y
SUBJ: Total 2280DPU/MUX Static Changes

This memo is regarding all the static and operational changes going into the 2280DPU/MUX disk processing unit......

Cable Changes:

<table>
<thead>
<tr>
<th>Cable Description</th>
<th>Old P/N</th>
<th>New P/N</th>
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</thead>
<tbody>
<tr>
<td>CPU to DPU cable</td>
<td>220-0138</td>
<td>220-0105-3</td>
</tr>
<tr>
<td>DPU to Disk, 'A' cable</td>
<td>220-3032</td>
<td>*220-3041-22</td>
</tr>
<tr>
<td>DPU to Disk, 'B' cable</td>
<td>220-3033-5</td>
<td>*220-3033-36</td>
</tr>
<tr>
<td>2280 MUX jumper cable</td>
<td>220-0257</td>
<td>**220-0257</td>
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Board Changes:

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<tr>
<th>Board P/N</th>
<th>Change Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>210-7422</td>
<td>Shielded cable clamps were added to rail.*</td>
</tr>
<tr>
<td>210-7715</td>
<td>Termination resistors changed to 220 ohms.</td>
</tr>
<tr>
<td>210-7717</td>
<td>Termination resistors changed to 220 ohms. MUX reset changed from async signal to sync signal.</td>
</tr>
<tr>
<td>210-7718</td>
<td>Termination resistors changed to 220 ohms.</td>
</tr>
</tbody>
</table>

DPU Chassis Changes:

A line filter is added to the DPU chassis to filter out line noise.

* - These parts can be routine ordered by using the ECO kit part number 728-0004......

**- All new 220-0257 cables will have braided shields......

Software changes:

Operating System - The VP & MVP operating systems will be changed in the next release to include retries for I96 errors on a write to the 2280 disk drive.

Problems to Check For:

1) MVP Chassis - Make sure all covers are on and screwed down tight. Check all I/O card rails with Ohm meter to assure the metal is conductive, (non-anodized). Tighten down all I/O cards and cables.

2) DPU Chassis - Same as above.

3) Disk Drive - Assure all grounds between cover, drive, and base, are connected. Make sure cables make contact with drive, (conductive strip on back of drive may, after some time, go non-conductive).

4) Power - Check all outlets for good grounds and wiring.

5) Printer - On printers with detachable cables, shielded cables should be used.

6) TC - on TC cards and remote terminal applications make sure shielded cables are used, and they are grounded on both ends.
ECO Listings:

Listed below are the ECO's and the parts that incorporate the mux static changes.

<table>
<thead>
<tr>
<th>ECO #</th>
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</thead>
<tbody>
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<td>210-7717</td>
<td>N/A</td>
<td>2280MUX Master Card</td>
</tr>
<tr>
<td>21759</td>
<td>210-7715</td>
<td>N/A</td>
<td>22C80 Mux Controller</td>
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<tr>
<td>21760</td>
<td>210-7718</td>
<td>N/A</td>
<td>2280MUX Expander Card</td>
</tr>
<tr>
<td>20771</td>
<td>220-0138</td>
<td>220-0105-3</td>
<td>CPU To DPU Cable</td>
</tr>
<tr>
<td>17671</td>
<td>728-0004*</td>
<td>N/A</td>
<td>DPU To Disk Shielded Cable Clamp Kit</td>
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<td>22430</td>
<td>410-2005</td>
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<td>Line Filter 5 Amp</td>
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<td>451-4916</td>
<td>N/A</td>
<td>Filter bracket</td>
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<td>220-1769</td>
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<td>Wire &amp; Lug Assy.</td>
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<td>220-1780</td>
<td>N/A</td>
<td>AC Cable</td>
</tr>
</tbody>
</table>

* - ECO Kit 728-0004 comes with cables 220-3033-36, 220-3041-22, and clamp-rail assy. 279-0485......

Regards,

Gilles Carrier
2200 Product Support

cc: Earl Emerick
    George Debin
    Mike Riley
    All ATS's

Dick Fischer
Don Pauling
All ATQM's
<table>
<thead>
<tr>
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TECHNICAL SERVICE BULLETIN
SECTION: Hardware Technical

NUMBER: HWT 6256    REPLACES: _______    DATE: 11/11/86    PAGE 1 OF 1
MATRIX ID: 3104    PRODUCT/RELEASE# 2280/2280 DPU

TITLE: R10 Prom Problem

PURPOSE:
To inform the field of an existing problem with R10 Proms.

EXPLANATION:
A problem has been identified with the R10 Proms located on the 210-7423A board in the Phoenix DPU. With some Phoenix drives on "first access only" after a power up or spin up, a hang or 192 error may result. This problem may occur intermittently, or consistently. Most drives work fine. The problem does seem more prevalent with Blockpt 3 drives than Blockpt 4. A drive would have to be formatted and tested with R10 Proms to insure compatibility.

Some systems require the DPU to be powered off and on to correct the error, while others can be "Reset" from the terminal. Once this is done, the system will work error free. The 'first access' problem is the only known problem with R10 Proms. All other problems should be fixable. R&D is aware of the problem and is working on a fix.

Please be aware that when using R10 proms, all surfaces must be formatted with the R10 Proms. If not, the 'first access' problem and/or other problems may result. This is true even if only accessing the surfaces formatted with R10 Proms. The reason is with R10 Proms only, the alternate sector map for each surface is read each time the heads are loaded.

The only other proms that could be used are the R7 Proms. The R7 Proms have a different number of alternate sectors (twice that of R10's). If using R7 Proms, all platters should be formatted with the R7 Proms as a precaution. R7 Proms do not have the 'first access' problem but may present a data integrity problem on a surface with alternate sectors. Most R7's work fine. R7 Proms will read platters formatted with R10 Proms but must not be left in without formatting.

R7 Proms cannot be ordered from Logistics. Please call On Line Product Support (TAC) with any questions concerning this TSB.

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 6044  REPLACES: _______  DATE: 03/04/86  PAGE 1 OF 1

MATRIX ID: 3107  PRODUCT/RELEASE#: 2200 Disk Function

TITLE: FCO 1161A, 2280

PURPOSE:

To inform the field that FCO 1161A was released February 18, 1986 and that it replaces FCO 1161.

EXPLANATION:

This FCO changes R46 and R48 on the 210-7422 PCB. Although the resistors shown in the illustration included with the installation procedure in FCO 1161 are the correct resistors, the drawing of the connector above the resistors is not correct. It has been brought to our attention that this connector is being used as a reference point to locate the resistors; therefore we have reissued the FCO with a more accurate drawing of the connector and a more specific description of the resistors being changed. There are no other changes to the FCO.

FCO kit #728-0177A containing parts and documentation will be available March 3, 1986 and can be obtained by placing a special order. Special orders for FCO kits are exempt from the established approval loop. They should be mailed directly to:

Logistics Order Processing
Wang Laboratories
45 Computer Drive
Haverhill, MA 01830

Att’n: Order Services
TECHNICAL SERVICE BULLETIN
SECTION: Hardware Technical

NUMBER: HWT 5160   REPLACES:    DATE: 08/13/85   PAGE 1 OF 1
MATRIX ID. 3107   PRODUCTRELEASE# 2200 Disk Function

TITLE: FCO 1168, 2280 DPU/MUX

PURPOSE:
To inform the field that FCO 1168 has been released.

EXPLANATION:
FCO 1168, released July 17, 1985, documents ECO 37156 and informs the
field that FCO's 1086 and 1114 have been replaced by FCO 1168. Four
EPROM's on the 210-7423-A PCB are changed. The reasons for the change are
as follows:

1. Multi-sector writes that end on relocated alternate sectors can cause
   extra sectors to be written.

2. When the first operation of a DPU is multi-sector write, the DPU will
   return an I91 on this and all other subsequent requests. The I91 will
   be returned until a reset is issued followed immediately by a
   non-multisector write operation.

3. The DPU will hang if a data transmission error occurs during the
   "Compare" sequence of a "Read After Write" command.

4. Attempts to access the drive while it was seeking to track "0" during
   the power-up (or spin-up) sequence causes the drive to retry the
   seek. If this happens several times in a row, the drive will hang and
   have to be shut down to clear the condition.

The upgraded EPROM's in FCO Kit #728-0184 are designed to fix the problems
 cited in both FCO 1086 and FCO 1114.

FCO Kit #728-0184 will be available August 5, 1985 and can be obtained by
placing a routine order through the Logistics Order Processing system.

NOTE: FCO 1161, which adds two resistors to the 210-7422 PCB, must be
done in conjunction with FCO 1168. Refer to FCO 1161 for further
information.

GROUP: ECO Support Group                        MAIL STOP: 0139
COMPANY CONFIDENTIAL
Wang Laboratories, Inc.
TECHNICAL SERVICE BULLETIN
SECTION: Hardware Technical

NUMBER: HWT 5140  REPLEACES: _______  DATE: 07/09/85  PAGE 1 OF 1

MATRIX ID: 3107  PRODUCT/RELEASE# 2200 Disk Function

TITLE: FCO 1161, 2280

PURPOSE:
To inform the field that FCO 1161 has been released.

EXPLANATION:
FCO 1161, released June 26, 1985, documents ECO 36643. Two resistors on the 210-7422 PCB are changed. The reasons for the change are to eliminate noise on the ready line and to correct intermittent hangs and incorrect drive selection. The FCO kit will be available July 8, 1985, and can be obtained by placing a routine order through the Logistics Order Processing system for kit #728-0177.
PERIPHERALS—DISK DRIVES—2200 DISK FUNCTION

TOPIC: FCO 1114, 2280 DPU/MUX

FCO 1114, released August 29, 1984, documents ECO 33310 and informs the field that FCO Kit #728-0104 (referenced in FCO 1086) has been replaced by Kit #728-0131. Four EPROM's are changed on the 210-7423-A PCB. The upgraded EPROM's in kit #728-0131 are designed to fix the problems cited in both FCO 1086 and FCO 1114. The reason for changes made in FCO 1086 are 1) to prevent read cache from being lost when a reset is issued from one of the terminals on the system, and 2) to allow the DPU to reselect the destination drive when dumping the multi-sector write cache to one of the drives. The reason for the change made in FCO 1114 is to correct start-up problems which result in DPU hangs by making sure that the state of the drives is properly determined before normal processing is continued. The hangs are caused by the DPU registers left in an unknown state after trying to read the Alternate Sector Map from a non-existent disk. FCO Kit #728-0131 will be available September 17, 1984, and can be obtained by placing a routine order through the Logistics Order Processing System.

*Note: Prior to installing R9 EPROM's, back up customer's data. After installing R9 EPROM's, reformat all surfaces.
4202

2200 SYSTEMS–INTERFACE–DISK Multiplexer

TOPIC: 2280 DPU PROM PROBLEMS (DISK MULTIPLEXERS)

There have been several reports regarding the 2280 DPU R8 PROMS creating a disk hang problem. R&D retested the R8 PROMS and found that in a single disk system, the R8 PROMS will cause a disk hang upon the first disk access, after powering on the DPU or bringing the disk to a ready state.

To recover from the hang, press RESET and execute the program. Once the disk hang has been recovered, the problem will not reoccur until either the DPU or the disk loses ready. Only the single disk systems (one disk and a DPU) are effected. Daisy chained drives work with no problem.

R&D is working on R9 PROMS and hope to have them released shortly.

All single disk systems should remain at R7 PROMS until the new PROMS are released.
PERIPHERALS—DISK DRIVES—2200 DISK FUNCTION

TOPIC: FCO 1086, 2280 DPU

FCO 1086, released April 23, 1984, documents ECO 31181. The change: 1) prevents read cache from being lost when a reset is issued from one of the terminals on the system, and 2) allows the DPU to reselect the destination drive when dumping the multi-sector write cache to one of the drives. Four PROM's are changed on the 210-7423-A PCA. To obtain the FCO kit, place a routine order through the Logistics Order Processing System for Kit #728-0104.
2200 SYSTEMS-INTERFACE-DISK MULTIPLEXER.

**TOPIC: 2280 DPU/MUX CABLES**

The question of maximum cable lengths has arisen for the cable between the 2280 DPU/MUX and the 2200 CPU. Below is a list of cables that are supported.

When using unmuxed DPU to CPU (12' maximum) use:
- 220-0105-2  12'
- 220-0105-3  8'

When using DPU/MUX to CPU (2000' maximum) use:
- 220-0105-2  12'
- 220-0105-3  8'
- 120-2280-01  25'
- 120-2280-02  50'
- 120-2280-03  100'
- 120-2280-04  250'
- 120-2280-05  500'
- 120-2280-06  750'
- 120-2280-07  1000'
IV.B.3
2200 SYSTEMS-INTERFACE-DISK MULTIPLEXER.

IQPIC: 2280_DISK_MULTIPLEXER

When updating a 2280DPU MUX to an expanded MUX and the motherboard (210-7716) is an R0 artwork, pin D of J19, J20, J21, and J22 must be tied together. If this is not done the DPU will hang as soon as you install the expanded MUX card (210-7718).
IV.B.3
2200 SYSTEMS-INTERFACE-DISK MULTIPLEXER.

TOPIC: CHANGES TO TAC NEWSLETTER #10414

TAC Newsletter #10414 contained information on ECOs which cured about 99% of all problems on the 2280 DPU. However the Newsletter did not contain the part numbers of the PCBs which the ECOs were on. So saying, this is a reprint of that article with the PCB numbers included.

This TAC Newsletter is to inform the field of known problems on the 2280 MUX/DPU and the changes to correct them.

1. There is a problem with R6 proms when the DPU is trying to access an alternate sector for a write, the alternate sector map is not properly set up, and the DPU lost where it was. There was an ECO (#18418) written to update the proms to R7.

ECO #18418 PCB 210-7423A

CHANGE: FROM TO
378-4083-R6 378-4083-R7
378-4084-R6 378-4084-R7
378-4085-R6 378-4085-R7
378-4086-R6 378-4086-R7

2. There is an incompatibility problem between disk drives and the 2280 MUX/DPU. The next four ECO's (#18091, 18092, 18093 and 18094) correct this problem.

ECO #18091 PCB 210-7421

a. Add a 470 ohm resistor (330-2047) between L22 pin 14 and plus 5VR.
b. Add a 150 PF cap (300-1150) between L22 pin 14 and plus/minus 0V.
c. Remove R27 1K ohm resistor.
d. Remove C2 .001uf cap.
e. Tie L29 pin 12 to L29 pin 13.
IV.B.3
2200 SYSTEMS-INTERFACE-DISK MULTIPLEXER.

TOPIC: CHANGES TO TAC NEWSLETTER #10414 (Continued)

ECO #18092  PCB 210-7422

a. Change L46 from a 74S00 (376-0228) to a 7400 (378-0002).

ECO #18093  PCB 210-7423

a. Cut etch from L49 pin 3 to L45 pin 12.
b. Add jumper from L49 pin 3 to L32 pin 9.
c. Cut etch from L49 pin 2 to plus and minus OV.
d. Add jumper from L49 pin 2 to L38 pin 4.
e. Add jumper from L49 pin 1 to L49 pin 4.
f. Cut etch from L46 pin 3 to L49 pin 4.
g. Cut etch from R1 to L46 pin 3.
h. Add jumper from L49 pin 6 to R1.
i. Add jumper from L49 pin 4 to L31 pin 3.
j. Add jumper from L38 pin 3 to L46 pin 3.

ECO #18094  PCB 210-7424

a. Change L12 from a 7404 (376-0010) to a 7414 (376-0139).

3. There is a problem with the 210-7715 cards. The boards are sometimes shipped out with R1 artworks which are not necessarily updated properly and will not access a daisy chain disk drive. These R1 artwork boards also are vulnerable to I96 errors. From this time on, only R3 or above artwork 210-7715 cards will be shipped. If any of these problems occur with R1 artwork cards, please order R3 artwork cards.

4. There are registration problems on the 210-7717 and the 210-7718 where the pins on the connectors are shifted over, but only on one connector. There is a possibility of shorting plus 5V and plus and minus OV. An ECO has been written and all cards manufactured in the future will be corrected. In the meantime, when installing any of these cards, look down into the chassis to see if you are shorting and if you are, re-seat the card. Chances of shorting out are slim but do not take chances.
IV.B.3

2200 SYSTEMS-INTERFACE-DISK MULTIPLEXER.

TOPIC: CHANGES TO 2280_MUX/DPU

This TAC Newsletter is to inform the field of known problems on the 2280 MUX/DPU and the changes to correct them.

1. There is a problem with R6 proms when the DPU is trying to access an alternate sector for a write, the alternate sector map is not properly set up, and the DPU lost where it was. There was an ECO (#18418) written to update the proms to R7.

ECO #18418

CHANGE: FROM TO
378-4083-R6 378-4083-R7
378-4084-R6 378-4084-R7
378-4085-R6 378-4085-R7
378-4086-R6 379-4086-R7

2. There is an incompatibility problem between disk drives and the 2280 MUX/DPU. The next four ECO's (#18091, 18092, 18093 and 18094) correct this problem.

ECO #18091

a. Add a 470 ohm resistor (330-2047) between L22 pin 14 and plus 5VR.
b. Add a 150 PF cap (300-1150) between L22 pin 14 and plus/minus 0V.
c. Remove R27 1K ohm resistor.
d. Remove C2 .001uf cap.
e. Tie L29 pin 12 to L29 pin 13.
IV.B.3
2200 SYSTEMS-INTERFACE-DISK MULTIPLEXER.

IQEISI_CHANGES.1D.2589_MUX/DEY (Continued)

ECO #18022

a. Change L46 from a 74600 (376-0229) to a 7400 (378-0002).

ECO #18023

a. Cut etch from L49 pin 3 to L45 pin 12.
b. Add jumper from L49 pin 3 to L32 pin 9.
c. Cut etch from L49 pin 2 to plus and minus 0V.
d. Add jumper from L49 pin 2 to L38 pin 4.
e. Add jumper from L49 pin 1 to L49 pin 4.
f. Cut etch from L46 pin 3 to L49 pin 4.
g. Cut etch from K1 to L46 pin 3.
h. Add jumper from L49 pin 6 to K1.
i. Add jumper from L49 pin 4 to L31 pin 3.
j. Add jumper from L38 pin 3 to L46 pin 3.

ECO #18029

a. Change L12 from a 7404 (376-0010) to a 7414 (376-0139).

3. There is a problem with the 210-7715 cards. The boards are sometimes shipped out with R1 artworks which are not necessarily updated properly and will not access a daisy chain disk drive. These R1 artwork boards also are vulnerable to I9A errors. From this time on only R3 or above artwork 210-7715 cards will be shipped. If any of these problems occur with R1 artwork cards, please order R3 artwork cards.

4. There are registration problems on the 210-7717 and the 210-7718 where the pins on the connectors are shifted over, but only on one connector. There is a possibility of shorting plus 5V and plus and minus 0V. An ECO has been written and all cards manufactured in the future will be corrected. In the meantime, when installing any of these cards, look down into the chassis to see if you are shorting and if you are, re-seat the card. Chances of shorting out are slim but do not take chances.
2200 SYSTEMS-MAINFRAMES-A/B/C/S/T CPU'S.

TOPIC: DISCREPANCIES IN L567 POWER SUPPLY REGULATORS

There has been problems out in the field with the 210-L567 working on the 2200T and 2280 DPU. Below is a chart on which boards work on what systems.

1. For boards with R949 artwork.
   a. Check if board has been reworked per ECN 16283. If it hasn't, mark board L567-1. (These can only be used on the PAG tester.)
   b. Any board shipped from now on with R949 artwork will work on 2200T and 2280 DPU.

2. For boards with R948 artwork.
   a. Cut etch between L4 pin 6 and L4 pin 10.
   b. Cut jumper between L4 pin 6 and L4 pin 10. (Some of these boards have both jumper and etch.)
   c. When this is done, these boards will work on both the 2200T and 2280 DPU.

3. For boards with R7 or lower artwork.
   a. Cut jumper between L4 pin 6 and L4 pin 10.
   b. When this is done, these boards will work on both the 2200T and 2280 DPU
2280 MICROPROCESSOR ECN'S

210-7415 (small regulator PCB) E Rev 0

Remove L2 (7407). Add jumper tying pins 12 and 13 of location L2.

REASON: Buffer no longer needed.

210-7416 (mother PCB) E Rev 1

0 to 1: On the L567 connector tie 10UF 35V cap (300-4041) pin 7a to ground (plus side to ground).

REASON: To prevent oscillation on -15V regulator.

210-7421 E Rev 2

0 to 1: Cut etch at L6 pin 9. Add etch from L6 pin 9 to L15 pin 23.

REASON: To compensate for different speeds of the 74181's.

1 to 2: See Below.

REASON: Data set up time for carry bit.

210-7422 E Rev 2

0 to 1: Change resistors on pins 26 and 56 of J3 from 20K (330-4021) to 680 ohm (330-2068).

REASON: To prevent wrong disk selection.
210-7422

1 to 2: Cut etch going to L13 pin 5 and add etch from L13 pin 5 to L2 pin 5.

REASON: To ensure clock/data relationship is correct.

210-7423 E Rev 2

0 to 1: Add 100PF cap (300-1100) from L10 pin 5 to +5 volts.

REASON: To prevent noise spikes on address.

1 to 2: Prom change S/B to R4 (378-4083-84-85-86)

REASON: To correct format problems.

210-7424 E Rev 7

0 to 1:
1. Cut etch from L46 pin 4 and L46 pin 8.
2. Add etch from L46 pin 3 and tie to L46 pin 8.
4. Add etch from L35 pin 6 and tie to L48 pin 15.

REASON: Artwork errors on R1 and R2 boards.

1 to 2:
Tie L3 pins 1-2-13 together (from L6 pin 6)
Cut etch L3 pin 9
Tie L3 pin 12 to L3 pin 9

REASON: To prevent format errors.

Rev 2-3: Add 220pf cap (300-1220) from L3 pin 6 to 0 volts.

REASON: Timing problem on write.

Rev 3 to 4: Cut etch going to L32 pin 9.

REASON: Change CRESET from 50 NSEC to 100 NSEC for better compatibility with 7423 PCB.
Rev 4 to 5: 1. Change C1 from 220PF to 470PF cap (300-1470)  
2. Cut etch between L5 pin 4 and L5 pin 13.  
4. Tie L6 pin 4 to 5 volts.

REASON: To prevent errors during format.

Rev 5 to 6: 1. Change L43 to a 7420 IC (376-0004).  
2. Cut etch from L43 pin 1 to L12 pin 2.  
3. Cut etch to L12 pin 1.  
4. Add wire from etch at L12 pin 1 (not pin 1) to L23 pin 12 & 13.  
5. Add wire to L23 pin 12 to L31 pin 9.  
7. L31 pin 10 to L43 pin 1.

REASON: To correct reading sector errors due to noise on sync-byte.


REASON: Disk drive selection problem due to select timing problem.
**DOCUMENTS**

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<tr>
<th>DOCUMENTS</th>
<th>REVISIONS</th>
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**CONFORMANCE DATE**

8-21-87

---

**APPROVALS**

**REASONS/SYMPOTM FOR CHANGE**

To stop R/B from reaching the CPU later.
DESCRIPTION OF CHANGE

Delete schematic software loading chart and create a parts list loading variation table and change as follows:
Change sample board as follows:

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<tr>
<td>L13 378-4083-R9</td>
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Note to EDD: Create a 210 History Sheet and a VS laser parts list for this board. Also delete parts list on sheet 5 of 5 of schematics.
Continued on next page

REASON/SYMPOTM FOR CHANGE

This revision of the 2280 DPC microcode corrects four bugs that are causing serious customer problems.
Continued from page one

Change BOM 210-7423-A as follows:

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<td>378-4086-R9</td>
<td>Prom</td>
<td>EA</td>
<td>5P</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>ADD</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>378-4083-R10</td>
<td>Prom</td>
<td>EA</td>
<td>5P</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>378-4084-R10</td>
<td>Prom</td>
<td>EA</td>
<td>5P</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>378-4085-R10</td>
<td>Prom</td>
<td>EA</td>
<td>5P</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>378-4086-R10</td>
<td>Prom</td>
<td>EA</td>
<td>5P</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

Delete the Product Structures and Part Numbers from the Data Base for the following proms:

- 378-4083-R9
- 378-4084-R9
- 378-4085-R9
- 378-4086-R9
ENGINEERING CHANGE ORDER
MANUFACTURING IMPACT SHEET

<table>
<thead>
<tr>
<th>MATERIAL DISPOSITION</th>
<th>QUANTITY</th>
<th>DISP</th>
<th>COST</th>
</tr>
</thead>
<tbody>
<tr>
<td>PARTS ON HAND</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PARTS ON ORDER</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ASSEMBLIES IN PROCESS</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FINISHED SUB ASSEMBLIES</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ASSEMBLIES IN UNITS</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PREPARATION, IMPLEMENTATION COSTS</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

COST OF INCORPORATION

PRODUCT COST CHANGE PER UNIT

PRODUCTION QUANTITY FROM MPP IN WKS ___ WKS

PRODUCT COST CHANGE (EXTENDED)

TOTAL COST (OR COST SAVINGS) OF ECO

REMARKS

WIP = (131); (59) @ STA 1, (10) STA 5, (1)0 STA 31, (79) STA 54

@ BUILD SCHEDULE = (31); (13) BOS IN STOCK

MATERIAL AVAILABLE - 6/25

CE SPARES SHIPPED AFTER 6/28/85 WILL BE REWORKED

SMS EFFECTIVITY DATE 7/24

DOCUMENTATION ONLY □
**ENGINEERING CHANGE ORDER**
**CUSTOMER ENGINEERING IMPACT SHEET**

### ALL UNITS
- [x] All Units
- [ ] Prob Only
- [ ] Info

### FCO REQUIRED
- [x] IMMED
  - Next Call
  - [ ]

### IS A MUB REQUIRED FOR FSC REWORK
- [x]

### IMPACT COMMENTS
- Purge stock.
- FCO for field
- Rework during HR

### EST. COST IMPACT

<table>
<thead>
<tr>
<th></th>
<th>Domestic</th>
<th>International</th>
</tr>
</thead>
<tbody>
<tr>
<td>EST. UNIT POP</td>
<td>8413</td>
<td>7755</td>
</tr>
<tr>
<td>EST. SPARE POP</td>
<td>661</td>
<td>264</td>
</tr>
<tr>
<td>TOTAL</td>
<td>9074</td>
<td>8017</td>
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</table>

### APPROVALS

<table>
<thead>
<tr>
<th>Material</th>
<th>$43,071.00</th>
<th>Tech Ops</th>
<th>6/25/85</th>
<th>Signatures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Labor</td>
<td>$429,757.00</td>
<td>Logistics</td>
<td>7/25/85</td>
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</tr>
<tr>
<td>Total</td>
<td>$472,828.00</td>
<td>FSC Support</td>
<td></td>
<td></td>
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</table>

### IMPLEMENTATION PERIOD
- Final: 6/25/85
- Other: ---

### GENERAL COMMENTS
Install this FCO with ECO 36643 (FCO 1161)
SUMMARY DATA

Release Memo #: 194
Release Coordinator: Elaine Roux M/S1489
Date: June 5, 1985
Product Line: 2200
Product Name: 2280 Disk Processing Unit
Version Number: 10
Customer Version Number: 10
Maximum Memory Requirement: N/A
Release Type: ( ) Initial Release ( ) Pre-Release
( ) Internal Release (X)Customer Release
Release Purpose: (X) Problem Correction ( ) Enhancement
Submission Type: ( ) Preliminary (X)Critical
Part Number:
Board Number:
Pep Number: N/A
Total Number of Diskettes: (1)

GENERAL DESCRIPTION

This revision of the 2280 DPC microcode corrects four bugs that are causing serious Customer problems and costing the company much in the way of time, effort, money, and Customer confidence. This code has been tested by the developer, by Customer Engineering at Beta test sites, and by Continuation Engineering.

PREREQUISITE HARDWARE

The Wang 2280 DPC with hardware ECO 36643 installed on PC board # 210-7422 is required.

2716 EPROMS are required and are installed on PC board #210-7423.

PREREQUISITE SOFTWARE  (Enter Name, Version, Model Numbers If Applicable)

None

TECHNICAL DOCUMENTATION

None

ECO NO. 3765-6
SH/T. 5 OF 2
WHERE TO OBTAIN THIS RELEASE

Via corporate WISE network, 8th Floor, Tower I/II Lab or Tower II Resource Room.

Software

Proms

Release Memorandum

Library: rmlib
ID: 194

Technical Documentation
None

RESTRICTIONS
None

SPECIAL CONSIDERATIONS

Revision 10 should be integrated into manufacturing stock ASAP.

INTERNATIONAL CONSIDERATIONS
None

ENHANCEMENTS
None

PROBLEMS CORRECTED (Enter P.R.O.B.E Number If Applicable)

Multisector writes that end on a relocated sector write extra sectors to disk under certain conditions causing a loss of data integrity.

When the first operation requested of a DPU is multisector write, the DPU will return an 191 on this and all other subsequent requests. The 191 will be returned until a reset is issued followed immediately by a non-multisector write operation.

The DPU will hang if a data transmission error occurs during the "Compare" sequence of a "Read After Write" command.

Attempts to access the drive while it was seeking to track 0 during the power-up (or spin-up) sequence causes the drive retry the seek. If this happens several times in a row the drive will hang and have to be shut down to clear the condition.
**KNOWN ANOMALIES**

None

**MEDIA**

One White Label diskette containing:

<table>
<thead>
<tr>
<th>File</th>
<th>Part Number</th>
<th>Chip Location</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>84083R10</td>
<td>311-4083 R10</td>
<td>L13</td>
<td>EPROM 4 microcode</td>
</tr>
<tr>
<td>84084R10</td>
<td>311-4084 R10</td>
<td>L14</td>
<td>EPROM 2 microcode</td>
</tr>
<tr>
<td>84085R10</td>
<td>311-4085 R10</td>
<td>L15</td>
<td>EPROM 1 microcode</td>
</tr>
<tr>
<td>84086R10</td>
<td>311-4086 R10</td>
<td>L16</td>
<td>EPROM 3 microcode</td>
</tr>
</tbody>
</table>

Total Files (4)

All EPROMs are to be TMS-2716's.
Change artwork, assembly drawing and schematic as follows:

Connector for L567 Regulator Card

B1-15R

\[ \text{±0V} \]

\[ +10\mu F \]

Modify BOM as follows:

<table>
<thead>
<tr>
<th>WL#</th>
<th>QTY</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Add</td>
<td>300-4041</td>
<td>10uf 35 V Tant Cap</td>
</tr>
</tbody>
</table>

RECEIVED
JUL 9 1979
PRINT ROOM
0010M/55

Reason for change:

To prevent oscillation on -15V regulator.
**ECN No. 11283**

**ORIGINATOR:** Alan Waldrip  
**DEPT.:** 16  
**EXT.:** 2068  
**DATE:** 3/30/79

**MODEL NO.:** 220SMD  
**TITLE:**

<table>
<thead>
<tr>
<th>PART NO.</th>
<th>PART NAME</th>
<th>REV.</th>
<th>PC.REV.</th>
<th>ELEC.REV.</th>
</tr>
</thead>
<tbody>
<tr>
<td>210-7416</td>
<td>Motherboard</td>
<td>-</td>
<td>-</td>
<td>0-1</td>
</tr>
</tbody>
</table>

**ASSY. NO.:** 7416  
**ASSY. TITLE:**

**DESCRIPTION OF CHANGE**

Change artwork, assembly drawing and schematic per attached print

Change BOM as follows:

<table>
<thead>
<tr>
<th>WL#</th>
<th>QTY</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Add: 300-4032</td>
<td>1</td>
<td>10 uf 35V Tant Cap</td>
</tr>
</tbody>
</table>

**RECEIVED**

APR 06 1979

PRINT ROOM

**REASON FOR CHANGE**

To eliminate one volt ripple on -12V line

28423/47

**CUSTOMER ENGINEERING**

☐ IMEDIATE CUST.  
☐ CUST. PER NEXT CALL  
☐ INFORMATION ONLY  
☐ NONE

**ACKNOWLEDGE**

<table>
<thead>
<tr>
<th>BY:</th>
<th>DATE:</th>
</tr>
</thead>
</table>

**DISPOSITION**

<table>
<thead>
<tr>
<th>Bonded</th>
<th>FINAL AREA</th>
<th>SUB ASSEMBLY</th>
<th>PARTS</th>
<th>IN House</th>
<th>Outside Vendor</th>
<th>Future MFG.</th>
</tr>
</thead>
</table>

**USE AS IS TO PREVIOUS REV.**

| ☒ | ☒ |

**TO CONFORM**

| ☒ | ☒ | ☒ |

**TO CONFORM IF NOT BEYOND OPERATIONS**

**MANDATORY CHANGE**

[ ] DOCUMENTATION CHANGE (PL, BOM, DWG)

[ ] EASE OF MFG., COST REDUCTION

[ ] PRODUCT IMPROVEMENT

**FINAL APPROVAL**

[ ] APPROVED DESIGN ENGRG.

[ ] APPROVED MFG. ENGRG.

**WRITTEN BY:**

[Signature]

**RECEIVED BY:**

[Signature]

[Date]

[Stamp]
ECO NO. 18091

ORIGINATOR: Ken Dillon
WRITTEN BY: Laurie David
M/S: 1339
EXT: 2578
DATE: 01/23/81

PART NO./ITEM NO.: 209-7421
TITLE: ALU/MUX Interface

NEXT ASSY. EFFECTED: N
210-7421-A

MODEL NO.: 224U

DESCRIPTION OF CHANGE:
Engineering has decided that the artwork will not be modified at this time.

Change assembly drawing, schematic and sample board per attached prints
and as follows:
- Tie a 470 ohm res (330-2047) from L22 pin 14 to +5VR
- Tie a 150pf cer cap (300-1150) from L22 pin 14 to +0v
- Cut etch between L20 pin 6 and L29 pin 12
- Remove R27 1K ohm res (330-3010)
- Remove C2 .001uf cer cap (300-1906)
- Tie L29 pin 12 to L29 pin 13

Change BOM as follows:

<table>
<thead>
<tr>
<th>WLI #</th>
<th>DESCRIPTION</th>
<th>QTY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Delete</td>
<td>300-1906</td>
<td>.001uf cer cap</td>
</tr>
<tr>
<td>Change</td>
<td>330-3010</td>
<td>1K ohm res</td>
</tr>
<tr>
<td>Add</td>
<td>330-2047</td>
<td>470 ohm res</td>
</tr>
<tr>
<td></td>
<td>300-1150</td>
<td>150pf cer cap</td>
</tr>
</tbody>
</table>

NOTE: Customer Engineering may want to install this ECO at sites where there are frequent unexplained disk errors

REASON/SYMPTOM FOR CHANGE:
To correct incompatibility between disk drives and 2280 DPU

RECEIVED: MAR 09 1981

APPROVALS:

FINAL: 2/26/81
DES. ENG: 2/20/81
MFG. ENGRG: 2/24/81
CUST. ENGRG: J. Proulx
OTHER SIGN:

DRAWING UPDATED:

224U/130 VENDOR REQUEST P
Purpose / Symptom

TO PREVENT WRONG DISK SELECTION.

Prerequisite

ECN Kit Required

Mandatory X Info Fig. Included X Est. Comp. Time .15 Hour(s)

Procedure

1. REMOVE AND REPLACE THE 20K RESISTOR (WL#330-4021) CONNECTED TO PINS 26 AND 56 OF CONNECTOR J3 WITH A 680 OHM RESISTOR (WL#330-2068).
Change R44 from 1420k ohms

to 680 ohms.
CUSTOMER ENGINEERING DIVISION
ECN UPDATE BULLETIN

1.U.B. Release Date  053180   Model  2280   Release #  9
Ass'y #  210-7422    ECN #  11638    Latest Artwork  2
Applies To Artwork Revisions 0-2  E-REV 1 To 2  Page 1 Of 2

Purpose / Symptom

TO ENSURE THAT CLOCK/DATA RELATIONSHIP IS CORRECT.

Prerequisite

ECN Kit Required

Mandatory  X   Info  Fig. Included  X  Est. Comp. Time .15 Hour(s)

Procedure

1. CUT ETCH AT L13-5.
2. JUMPER L13-5 TO L2-5.
CUSTOMER ENGINEERING DIVISION
ECN UPDATE BULLETIN

m.u.b. Release Date 053180 Model 2280 Release # 9
Ass'y # 210-7422 ECN # 14564 Latest Artwork 4
Applies To Artwork Revisions 1-4 E-REV 2 To 3 Page 1 Of 3

Purpose / Symptom

THIS ECN WILL ENABLE ECC TO CORRECT MULTI-BIT ERRORS AND TO
ALLOW FOR GROSS ECC ERRORS ( 12 BIT ).

Prerequisite

THIS ECN IS REQUIRED ON DPU'S USING R5 PROMS.

ECN Kit Required

Mandatory X Info Fig. Included X Est. Comp. Time 1 Hour(s)

Procedure

1. JUMPER L37-1 TO L37-2.
3. JUMPER L37-10 TO L37-11 AND JUMPER L37-17 TO L38-11.
4. JUMPER L37-19 TO L38-19 AND JUMPER L38-1 TO L38-3.
5. JUMPER L38-3 TO THE 2.2K RES LEG NEAREST TO L38-19.
6. JUMPER L38-17 TO THE PLATE THRU BETWEEN L39-10 AND L40.
7. CUT THE CENTER ETCH BETWEEN L37 AND L38.
8. JOIN L27-11+12 AND JUMPER PIN 12 TO SECOND PLATE THRU ABOVE
CONNECTOR 2 PINS K AND L.
Cut etch to isolate L37-1.

Cut etch to isolate L37-2.

Cut etch to isolate L37-19.

Cut etch to isolate L38-19.
ECO NO. 18092

ORIGINATOR: Ken Dillon
WRITTEN BY: Laurie David

PART NO./ITEM NO.: 210-7422
DWG. NO./P. L. NO.: 7422
NEXT ASSY. Y
EFFECTED N
MODEL NO.: 2280

DESCRIPTION OF CHANGE

Change assembly drawing, schematic and sample board per attached print and as follows:

Change L46 from a 74S500 (376-0228) to a 7400 (376-0002)

Change BOM as follows:

<table>
<thead>
<tr>
<th>WLI #</th>
<th>DESCRIPTION</th>
<th>QTY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Delete</td>
<td>376-0228</td>
<td>IC 74S500</td>
</tr>
<tr>
<td>Change</td>
<td>376-0002</td>
<td>IC 7400</td>
</tr>
</tbody>
</table>

Next assemblies effected 167/187-2200-79/-80, 212-2280

NOTE: Customer Engineering may want to install this ECO at sites where there are frequent unexplained disk errors

REASON/SYMPTOM FOR CHANGE

To correct incompatibility between disk drives and 2280 DPU

2249W/130

MAR 09 1981

Printed in USA 13-8643A 9-80
CUSTOMER ENGINEERING DIVISION
ECN UPDATE BULLETIN

M.U.B. Release Date 053180  Model 2280  Release # 9
Ass'y # 210-7423  ECN # 11586  Latest Artwork 1
Applies To Artwork Revisions 1  E-REV 0 To 1  Page 1 Of 1

Purpose / Symptom

TO PREVENT NOISE SPIKE ON ADDRESS INCREMENT.

Prerequisite

ECN Kit Required

Mandatory  Info X  Fig. Included  Est. Comp. Time 0 Hour(s)

Procedure

THIS ECN SHOWS A 100PF CER CAP TO BE ADDED FROM L10-5 TO +5V.
HOWEVER ECN 11671 (E-REV 1/2) STATES TO REMOVE THIS CAP.
CUSTOMER ENGINEERING DIVISION
ECN UPDATE BULLETIN

M.U.B. Release Date 053180       Model 2280       Release # 9
Ass'y # 210-7423              ECN # 11671       Latest Artwork 1
Applies To Artwork Revisions 1 E-REV 1 To 2 Page 1 Of 2

Purpose / Symptom

TO CORRECT FORMAT PROBLEMS AND ENSURE PROPER LOADING OF THE INSTRUCTION REGISTER.

Prerequisite

ECN Kit Required

Mandatory X Info Fig. Included X Est. Comp. Time .50 Hour(s)

Procedure

1. CUT ETCH CONNECTING TO L10-5.
2. JUMPER L35-7 TO L51-8+9 AND TO L52-13.
3. JUMPER L10-5 TO L52-11.
4. REMOVE 100 PF CAP ON L10-5 (PER ECN 11586).
5. CUT ETCH BETWEEN L58-2+5.
7. JUMPER L51-8 TO L51-9.
Purpose / Symptom

TO CORRECT FORMAT PROBLEMS AND ENSURE PROPER LOADING OF THE INSTRUCTION REGISTER.

Prerequisite

ECN Kit Required
Mandatory X Info Fig. Included X Est. Comp. Time .50 Hour(s)

Procedure

1. CUT ETCH CONNECTING TO L10-5.
2. JUMPER L35-7 TO L51-8+9 AND TO L52-13.
3. JUMPER L10-5 TO L52-11.
4. REMOVE 100 PF CAP ON L10-5 (PER ECN 11586).
5. CUT ETCH BETWEEN L58-2+5.
7. JUMPER L51-8 TO L51-9.
CUSTOMER ENGINEERING DIVISION
ECN UPDATE BULLETIN

U.B. Release Date..082980A Model..228C Release #.. 11
Ass'y #..210-7423 ECN #..14561 Latest Artwork.. 2
Applies To Artwork Revisions..1/2 E-Rev. 2 To. 3 Page 1 Of.. 3

Purpose / Symptom

PRIME WILL NOT ALWAYS TRAP TO LOCATION 0000 (2911 DESIGN ERROR).

Prerequisite

ECN Kit Required.. Scrape Board.. Scrape Board.. Mandatory..X Info.. Fig. Included..X Est. Comp. Time .50 Hour(s)

Procedure

1. JUMPER L49-4 TO L46-3.
2. CUT ETCH BETWEEN L31-9 AND L46-3.
3. JUMPER L49-6 TO L31-9 AND L58-1.
4. JUMPER L49-3 TO L45-12.
5. JUMPER L49-2 TO L49-7.
6. NO COMPONENT SIDE.
7. CUT ETCHES ON EITHER SIDE OF L58-1.
8. JUMPER L57-4 TO L59-3.
Jumper L49-2 to L49-7
Jumper L49-6 to L31-9
Jumper L49-6 to L59-1
ECO NO. 18043

ORIGINATOR: Ken Dillon
WRITTEN BY: Laurie David

PART NO./ITEM NO.: 510-7423
DWG. NO./P. L. NO.: 7423
NEXT ASSY.: Y
EFFECTED: N
MODEL NO.: 2280

DESCRIPTION OF CHANGE:
Change artwork, assembly drawing, schematic and sample board per attached print and as follows:

- Cut etch from L49 pin 3 to L45 pin 12
- Tie L49 pin 3 to L32 pin 9
- Cut etch from L49 pin 2 to +0V
- Tie L49 pin 2 to L38 pin 4
- Tie L49 pin 1 to L49 pin 4
- Cut etch from L46 pin 3 to L49 pin 4
- Cut etch from K1 to L46 pin 3
- Tie L49 pin 6 to K1
- Tie L49 pin 4 to L31 pin 3
- Tie L38 pin 3 to L46 pin 3

NOTE: Customer Engineering may want to install this ECO at sites where there are frequent unexplained disk errors.

REASON/SYMPOTON FOR CHANGE:
To correct incompatibility between disk drives and 2280 DPU

2250M/130
**ECO No.** 18-418

**Sheet 1 of 3**

**Originator:** Max Blomme  
**Written By:** Judy Mulno  
**Part No./Item No.:** 210-7423-A  
**Title:** RAM/PROM Cntlr  
**Dwg. No./P. L. No.:** 7423  
**Next Assy.:** Y  
**Effective:** N  
**Model No.:** 2280

**Description of Change:**
Change schematic and software-loading chart as follows:

<table>
<thead>
<tr>
<th>FROM</th>
<th>TO</th>
</tr>
</thead>
<tbody>
<tr>
<td>378-4083-R6</td>
<td>378-4083-R7</td>
</tr>
<tr>
<td>378-4084-R6</td>
<td>378-4084-R7</td>
</tr>
<tr>
<td>378-4085-R6</td>
<td>378-4085-R7</td>
</tr>
<tr>
<td>378-4086-R6</td>
<td>378-4086-R7</td>
</tr>
</tbody>
</table>

Change BOM as follows:

<table>
<thead>
<tr>
<th>WLI #</th>
<th>DESCRIPTION</th>
<th>QTY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Delete</td>
<td></td>
<td></td>
</tr>
<tr>
<td>378-4083-R6</td>
<td>PROM</td>
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</tr>
<tr>
<td>378-4084-R6</td>
<td>PROM</td>
<td>1</td>
</tr>
<tr>
<td>378-4085-R6</td>
<td>PROM</td>
<td>1</td>
</tr>
<tr>
<td>378-4086-R6</td>
<td>PROM</td>
<td>1</td>
</tr>
<tr>
<td>Add</td>
<td></td>
<td></td>
</tr>
<tr>
<td>378-4083-R7</td>
<td>PROM</td>
<td>1</td>
</tr>
<tr>
<td>378-4084-R7</td>
<td>PROM</td>
<td>1</td>
</tr>
<tr>
<td>378-4085-R7</td>
<td>PROM</td>
<td>1</td>
</tr>
<tr>
<td>378-4086-R7</td>
<td>PROM</td>
<td>1</td>
</tr>
</tbody>
</table>

Next Assemblies Effected: 167/187-2200-79/80, 212-2280

**Reason/Symptom for Change:**
The alternate map read was not set up properly in write so that the DPU lost where it was and failed to do the write.

**2413M/137**

**Documents:**
- BOM
- ARTWORK
- E-REV
- SAMPLE BD
- ASSY. DWG.
- DRILL DWG.
- SCHEM. DWG.
- MECH. DWG.

**Disposition:**
- PRINT ROOM
- RECEIVED: MAR 10 1981
- PRINT ROOM

**Use As Is To:**

**To Conform:**

**To Conform Where Feasible:**

**Approvals:**
- Final: Paul Ritch 3/4
- Des. Eng.: [Signature]
- Cust. Engr.: J. Proulx 2/27/81
- Mfg. Eng.: R. Pearce 2/26/81

**Other Sign:**

**Drawing Updated:**
Purpose / Symptom

TO CORRECT ARTWORK ERRORS ON R1 BOARDS.

Prerequisite

ECN Kit Required

Mandatory X Info Fig. Included X Est. Comp. Time .25 Hour(s)

Procedure

1. CUT ETCH OF L35-6.
2. JUMPER L35-6 TO L48-15.
Purpose / Symptom

TO CORRECT ARTWORK ERRORS ON R2 BOARDS.

Prerequisite

ECN Kit Required

Mandatory X Info Fig. Included X Est. Comp. Time .5 Hour(s)

Procedure

1. CUT ETCH FROM L46-4 TO L46-8.
2. JUMPER L46-3 TO L46-8.
3. CUT ETCH AT L35-6.
4. JUMPER L35-6 TO L48-15.
Jumper L35-6
To L48-15

Cut etch
From L46-4 to L46-8

Cut etch
To L35-6
CUSTOMER ENGINEERING DIVISION
ECN UPDATE BULLETIN

M.U.B. Release Date 053180 Model 2280 Release # 9
Ass'y # 210-7424 ECN # 11832 Latest Artwork 2
Applies To Artwork Revisions 1,2 E-REV 1 To 2 Page 1 Of 2

Purpose / Symptom

FORMAT ERRORS WILL OCCUR IF THIS ECN IS NOT PERFORMED.

Prerequisite

ECN Kit Required

Mandatory X Info Fig. Included X Est. Comp. Time .5 Hour(s)

Procedure

COMPONENT SIDE
1. JUMPER L3-9 TO L3-12.
2. JUMPER L3-1,2,13 TO L6-6 AS ILLUSTRATED.

NON-COMPONENT SIDE
3. CUT ETCH AT L3-9.
Purpose / Symptom

TO CORRECT TIMING PROBLEM ON WRITE.

Prerequisite

ECN Kit Required

Mandatory X Info Fig. Included X Est. Comp. Time .25 Hour(s)

Procedure

INSTALL A 220 PF CAP (WL#300-1220) FROM L3-6 TO +OV.

Add 220 pf CAPactor From L3-6 to +OV
CUSTOMER ENGINEERING DIVISION
ECN UPDATE BULLETIN

M.U.B. Release Date 053180    Model 2280    Release # 9
Ass'y # 210-7424              ECN # 12191    Latest Artwork 3
Applies To Artwork Revisions 1-3   E-REV 3 To 4    Page 1 Of 1

Purpose / Symptom

TO INCREASE COMPATIBILITY WITH 7423 BOARD.

Prerequisite

ECN Kit Required

Mandatory X    Info Fig. Included X    Est. Comp. Time .1 Hour(s)

Procedure

NON-COMPONENT SIDE
1. CUT ETCH AT BASE OF L32-9.
CUSTOMER ENGINEERING DIVISION
ECN UPDATE BULLETIN

M.U.B. Release Date 053180 Model 2280 Release # 9
Ass’y # 210-7424 ECN # 12231 Latest Artwork 3
Applies To Artwork Revisions 1-3 E-REV 4 To 5 Page 1 Of 2

Purpose / Symptom

1. TO PREVENT ERRORS DURING A FORMAT OPERATION.
2. TO CORRECT ARTWORK ERRORS ON LOADING SKETCH.

Prerequisite

ECN Kit Required
Mandatory X Info Fig. Included X Est. Comp. Time .5 Hour(s)

Procedure

COMPONENT SIDE
1. CHANGE C1, LOCATED TO THE LEFT OF L6, FROM A 220 PF CAP TO A
   470 PF CAP ( WL#300-1470 ).
2. JUMPER L6-4 TO L5-4.
NON-COMPONENT SIDE
Purpose / Symptom

NOISE ON SYNC-BYTE CAN CAUSE FORMAT ERRORS.

Prerequisite

ECN Kit Required

Mandatory X  Info Fig. Included X  Est. Comp. Time .75 Hour(s)

Procedure

1. CHANGE L43 FROM A 74S20 TO A 7420 ( WIL #375-0004 ).
2. JUMPER L31-8 TO L23-11.
3. JUMPER L31-9 TO L23-12.
4. JUMPER L31-10 TO L43-1.
6. CUT ETCH AT BASE OF L12-2.

[Diagram showing cut etch at L12-2]
CUSTOMER ENGINEERING DIVISION
ECN UPDATE BULLETIN

M.U.B. Release Date 053180  Model 2280  Release # 9
Ass'y # 210-7424  ECN # 12497  Latest Artwork 3
Applies To Artwork Revisions 1-3  E-REV 6 To 7  Page 1 of 2

Purpose / Symptom

ARTWORK ERROR CAUSED TIMING TO BE OUT OF SPEC THEREFORE SOME DISK DRIVES COULD NOT BE SELECTED BY THE 2280.

Prerequisite

ECN Kit Required

Mandatory X  Info Fig. Included X  Est. Comp. Time .15 Hour(s)

Procedure

COMPONENT SIDE
1. JUMPER L36-3 TO L26-4.

NON-COMPONENT SIDE
2. CUT ETCH CONNECTING L36-3 TO L36-9.
Purpose / Symptom

THE READ FIELD IS ONE BYTE TOO LONG.

Prerequisite

THIS ECN IS REQUIRED ON DPU'S USING R5 PROMS.

ECN Kit Required

Mandatory X  Info  Fig. Included X  Est. Comp. Time .15 Hour(s)

Procedure

COMPONENT SIDE
1. CONNECT L43-9 TO L43-10.
NON COMPONENT SIDE
2. CUT ETCH AT L43-10 TO ISOLATE THAT CONNECTION FROM L5-7.
ECO NO. 18094

ORIGINATOR: Ken Dillon
WRITTEN BY: Laurie David
PART NO./ITEM NO.: 210-7424
DWG. NO./P. L. NO.: 7424
NEXT ASSY. EFFECTED: Y
MODEL NO.: 2280

TITLE: I/O Controller

DESCRIPTION OF CHANGE:
Change assembly drawing, schematic and sample board per attached prints and as follows:

Change L12 from a 7404 (376-0010) to a 7414 (376-0139)

Change BOM as follows:

<table>
<thead>
<tr>
<th>WLI #</th>
<th>DESCRIPTION</th>
<th>QTY</th>
</tr>
</thead>
<tbody>
<tr>
<td>376-0010</td>
<td>IC 7404</td>
<td>from 4 to 3</td>
</tr>
<tr>
<td>376-0139</td>
<td>IC 7414</td>
<td>1</td>
</tr>
</tbody>
</table>

Next assemblies effected 167/187-2200-79/-80, 212-2280

NOTE: Customer Engineering may want to install this ECO at sites where there are frequent unexplained disk errors

REASON/SYMPOTON FOR CHANGE:
To correct incompatibility between disk drives and 2280 DPU

APPROVALS:

FINAL: N. Troun
DES. ENG.:
CUST. ENGRG.: J. Proulx
MFG. ENGRG.: R. Pearce

Printed in U.S.A. 13-8544A 9-80
TO: All Northeast Area Computer DTS's
FROM: John Forbes
DATE: April 7, 1981
SUBJECT: 2280 DPU ECN's

Attached is a copy of all ECN's necessary to bring the 2280 DPU up to current E-Rev level as of March, 1981. Implementation of these ECN's will cure the intermittent problems with the 2280 DPU.

The following is a list of the schematic release in which the print and board layout of all PCB's are found.

<table>
<thead>
<tr>
<th>PCB</th>
<th>Release Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>210-7421</td>
<td>18</td>
</tr>
<tr>
<td>210-7422</td>
<td>14</td>
</tr>
<tr>
<td>210-7423</td>
<td>12</td>
</tr>
<tr>
<td>210-7424</td>
<td>13</td>
</tr>
<tr>
<td>210-7416</td>
<td>20</td>
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</table>

The current E-Rev of boards in DPU should be:

<table>
<thead>
<tr>
<th>PCB</th>
<th>E - Rev.</th>
</tr>
</thead>
<tbody>
<tr>
<td>210-7415</td>
<td>0</td>
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<tr>
<td>210-L567</td>
<td>7</td>
</tr>
<tr>
<td>210-7416</td>
<td>2</td>
</tr>
<tr>
<td>210-7421</td>
<td>3</td>
</tr>
<tr>
<td>210-7422</td>
<td>4</td>
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<tr>
<td>210-7423</td>
<td>4</td>
</tr>
<tr>
<td>210-7424</td>
<td>9</td>
</tr>
</tbody>
</table>

If you have any questions, you can contact me at extension 274.

Regards,

John Forbes
Area Technical Specialist

cc: Joe McDermott
    Bill Dini
    JF: LCM:0325A
REV 7-8

CUT ETCH FROM L43 PIN 10 TO L5 PIN 7
TIE L43 PINS 9 & 10

REV 2-3

CUT ETCH AT L31 PIN 9 & L46 PIN 3
- ISOLATE L58 PIN 1 (CUT ETCH ON EITHER SIDE OF PIN 1 & CONNECT ETCHES)
- RUN WIRE FROM L58 PIN 1 TO L49 PIN 6
- RUN WIRE FROM L58 PIN 1 TO L29 PIN 9
- RUN WIRE FROM L49 PIN 4 TO L46 PIN 3
- RUN WIRE FROM L49 PIN 3 TO L45 PIN 32
- RUN WIRE FROM L49 PIN 2 TO L49 PIN 7

REV 2-3

CUT ETCH NON-COMPONENT SIDE AT L37 PIN 1
- ISOLATE L37 PIN 1 & REJOIN ETCH
- ISOLATE L38 PIN 1 & REJOIN ETCH

DO NOT CUT ETCH GOING TO L37 PIN 8 (BETWEEN L37 & L38 PINS)
- RUN WIRE FROM PLATE THRU OFF P1 TO L27 PIN 12 & 11
- RUN WIRE FROM L27 PIN 13 TO L37 PIN 19
- L37 PIN 19 TO L38 PIN 19
- L37 PIN 11 TO L37 PIN 10 (±OV)
- L38 PIN 11 TO L37 PIN 17
- L38 PIN 17 TO 93 (PLATE THRU TO LEFT OF L39)
- L37 PIN 1 TO L37 PIN 2
- L38 PIN 1 TO L38 PIN 2

- ENSURE L38 PIN 4 DOES NOT CONNECT TO L38 PIN 1
- ENSURE L38 PIN 4 & 5 6500 ±OV
- CUT ETCH GOING TO L37 PIN 8 (BETWEEN L37 & L38 PINS)

REV 8-9

WIRE FROM L38 PIN 1 & 3 & 8 TO 105704
CUT ETCH BETWEEN L38 PIN 2 & PIN 19
CUT ETCH BETWEEN L38 PIN 19 & 105704
CUT ETCH BETWEEN L37 PIN 2 & PIN 19
CUT ETCH BETWEEN L37 PIN 19 & 106704
ECO NO. 18091

ORIGINATOR: Ken Dillon
WRITTEN BY: Laurie David

PART NO./ITEM NO.: 209-7421
DWG. NO./P. L. NO.: 7421
NEXT ASSY.: Y
EFFECTED: N
MODEL NO.: 2280

DESCRIPTION OF CHANGE:
Engineering has decided that the artwork will not be modified at this time. Change assembly drawing, schematic and sample board per attached prints and as follows:

- Tie a 470 ohm res (330-2047) from L22 pin 14 to +5V
- Tie a 150pF cer cap (300-1150) from L22 pin 14 to +0V
- Cut etch between L20 pin 6 and L29 pin 12
- Remove R27 1k ohm res (330-3010)
- Remove C2 .001uf cer cap (300-1906)
- Tie L29 pin 12 to L29 pin 13

Change BOM as follows:

<table>
<thead>
<tr>
<th>WLI #</th>
<th>DESCRIPTION</th>
<th>QTY</th>
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</thead>
<tbody>
<tr>
<td>Delete</td>
<td>300-1906 .001uf cer cap</td>
<td>1</td>
</tr>
<tr>
<td>Change</td>
<td>330-3010 1k ohm res from 10 to 9</td>
<td></td>
</tr>
<tr>
<td>Add</td>
<td>330-2047 470 ohm res</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>300-1150 150pF cer cap</td>
<td>1</td>
</tr>
</tbody>
</table>

NOTE: Customer Engineering may want to install this ECO at sites where there are frequent unexplained disk errors

REASON/SYMPTOM FOR CHANGE:

To correct incompatibility between disk drives and 2280 DPU

PRINT ROOM

DATE: 01/23/81

APPROVALS

FINAL

DES. ENG.
CUST. ENGRG.
MFG. ENGRG.
OTHER SIGN

DATE: MAR 09 1981

22404/130

REVIEWER

DRAWING UPDATED
SPECIAL INSTRUCTIONS

☐ Total Number of Units Affected

☐ All Units Prior to Being Shipped On or Before

☐ All Units Prior to Packaging On or Before

☐ All Units Prior to Final Electrical Test On or Before

☐ All Units Prior to System Level Electrical Test On or Before

☐ All Units Prior to Assembly On or Before

☐ RCO All Open Orders

☐ Scrap

☐ Rework

☐ Not to Affect Finished Parts.

☐ Material Disposition

☐ Scrap

☐ Rework

☐ Use As Is

☐ Next Buy

☐ Special Instructions – See Note (*)

☐ Documentation Only

☐ VALUE ENGINEERING**

---

COMMITTEE

CHAIRMAN: R. E. Pearce 2/24/81

QUALITY

CONTROL: B. Houston 2/24/81

MATERIAL

PLANNING: J. Mantey 2/24/81

MANUFACTURING

ENGINEER: W. Delloglese

PRODUCT

LINE

MANAGER: W. Delloglese

---

EFFECTIVE: 3/6/81

---

COST IMPACT

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<td>TOTALS</td>
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</tbody>
</table>
### SPECIAL INSTRUCTIONS

- Total Number of Units Affected
- All Customer Engineering Units, ASAP
- All Customer Engineering Units at Next Maintenance Visit
- All Customer Engineering Units Having Problem Only
- Information Only
- Special Instructions — See Note (*)

### COST IMPACT

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<tr>
<td>TOTALS</td>
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</tr>
</tbody>
</table>
**Description of Change**

Change artwork, assembly drawing, schematic and sample board per attached print. Zone F-6

No BOM changes required

**Reason for Change**

ECC as is will not correct multi bit errors. These changes will allow for gross ECC error (12 Bit)

0740M/89
ECO NO. 18096

ORIGINATOR: Ken Dillon
WRITTEN BY: Laurie David

PART NO./ITEM NO.: 210-7422
DWG. NO./P. L. NO.: 7422
NEXT ASSY. EFFECTED: Y, See Below
MODEL NO.: 2280

TITLE: ECC/Device Interface

DESCRIPTION OF CHANGE:
Change assembly drawing, schematic and sample board per attached print and as follows:

- Change L46 from a 74500 (376-0228) to a 7400 (376-0002)
- Change BOM as follows:
  - Delete 376-0228 IC 74500
  - Change 376-0002 IC 7400 from 2 to 3

Next assemblies effected 167/187-2200-79/-80, 212-2280

NOTE: Customer Engineering may want to install this ECO at sites where there are frequent unexplained disk errors

REASON/SYMPOTON FOR CHANGE:
To correct incompatibility between disk drives and 2280 DPU

APPROVALS:
FINAL: John Doe
DES. ENG.: Ken Dillon
CUST. ENGRG.: J. Proulx
MFG. ENGRG.: R. Pearce

RECEIVED: MAR 09 1981

DESIGN IMPROVEMENT ☐ VENDOR REQUEST ☐ ☐ VALUE ENGRG NO. PRINT ROOM

DRAWING UPDATED

Printed in U.S.A. 13-8643A 9-80
SPECIAL INSTRUCTIONS

- All Units Prior to Being Shipped On or Before
- All Units Prior to Packaging On or Before
- All Units Prior to Final Electrical Test On or Before
- All Units Prior to System Level Electrical Test On or Before
- All Units Prior to Assembly On or Before

- RCO All Open Orders
  - Scrap
  - Rework
  - Not to Affect Finished Parts

- Material Disposition
  - Scrap
  - Rework
  - Use As Is
  - Next Buy

- Special Instructions – See Note (*)
- Documentation Only
- VALUE ENGINEERING #

<table>
<thead>
<tr>
<th>COMMITTEE CHAIRMAN</th>
<th>R.C. Pearson 2/24/81</th>
</tr>
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<tr>
<td>QUALITY CONTROL</td>
<td>Bob Thompson 3/24/81</td>
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<tr>
<td>MATERIAL PLANNING</td>
<td>Sean Elliott</td>
</tr>
<tr>
<td>MANUFACTURING</td>
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<tr>
<td>ENGINEER</td>
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<td>PRODUCT LINE MANAGER</td>
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COST IMPACT

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<tr>
<td>TOTALS</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Change: assembly drawing, schematic and sample board per attached print

No BOM changes required

NOTE: At the request of Manufacturing the artwork will not be modified per this ECN

RECEIVED
MAR 1, 1980
PRINT ROOM

REASON FOR CHANGE

To ensure RESET to 2911 will not switch while the chips are in an indeterminate state. Prime will not always trap to location C2CO 2911 design error

0738M/89
Change schematic, software loading chart and BOM as follows:

FROM | TO | QTY
---|---|---
378-4083-R4 | 378-4083-R5 | 1
378-4084-R4 | 378-4084-R5 | 1
378-4085-R4 | 378-4085-R5 | 1
378-4086-R4 | 378-4086-R5 | 1

NOTE: The following ECNs must also be installed
- ECN 14561 on the 209-7423
- ECN 14563 on the 210-7424
- ECN 14564 on the 210-7422

No artwork, assembly drawing or sample board changes required

REASON FOR CHANGE

See attached descriptions of corrections and enhancements.

0835W/91
Corrections:

1. The sector buffers were not flushed when a disk cartridge was changed. This could result in data from the old cartridge to be read rather than data from the cartridge currently mounted.
2. Ready/Busy was not always set properly. This could have resulted in ERR 92.
3. VERIFY beyond end of platter did not return proper errors.
4. COPY beyond end of platter did not return proper errors.

Enhancements:

1. Error correction (ECC) on sector data.
2. Power on diagnostic including RAM test. If diagnostic fails, CPU will receive ERR 90 whenever disk is accessed.
3. CPU readable microprogram revision number.
4. CPU readable soft error counts.
5. Compatibility with proposed 2280 multiplexer.
6. Field service alignment command for disk alignment without an FTU.
7. Write protect switches now fully operable.

E.C.N. No. 14856
Sheet No. 2 of 20
Dwg. No. ———
ORIGINATOR: Ken Dillon  
WRITTEN BY: Laurie David

PART NO./ITEM NO.: 510-7423  
DWG. NO./P. L. NO.: 7423  
NEXT ASSY. EFFECTED: Y  
MODEL NO.: 2280

DESCRIPTION OF CHANGE:
Change artwork, assembly drawing, schematic and sample board per attached print and as follows:
1. Cut etch from L49 pin 3 to L45 pin 12
2. Tie L49 pin 3 to L32 pin 9
3. Cut etch from L49 pin 2 to +0V(L49 pin 7)
4. Tie L49 pin 2 to L38 pin 4
5. Tie L49 pin 1 to L49 pin 4
6. Cut etch from L46 pin 3 to L49 pin 4
7. Cut etch from K1 to L46 pin 3
8. Tie L49 pin 6 to K1
9. Tie L49 pin 4 to L31 pin 3
10. Tie L38 pin 3 to L46 pin 3

NOTE: Customer Engineering may want to install this ECO at sites where there are frequent unexplained disk errors.

REASON/SYMPTOM FOR CHANGE:
To correct incompatibility between disk drives and 2280 DPU

2250M/130
ENGINEERING CHANGE ORDER
(EFFECTIVE)
MANUFACTURING

SPECIAL INSTRUCTIONS

☐ Total Number of Units Affected
☐ All Units Prior to Being Shipped On or Before
☐ All Units Prior to Packaging On or Before
☐ All Units Prior to Final Electrical Test On or Before
☐ All Units Prior to System Level Electrical Test On or Before
☐ All Units Prior to Assembly On or Before
☐ RCO All Open Orders
  ☐ Scrap
  ☐ Rework
  ☐ Not to Affect Finished Parts
☐ Material Disposition
  ☐ Scrap
  ☐ Rework
  ☐ Use As Is
  ☐ Next Buy
☐ Special Instructions — See Note (*)
☐ Documentation Only
☐ VALUE ENGINEERING*

COMMITTEE
CHAIRMAN
R. E. Pearce 4/24/81

QUALITY
CONTROL

MATERIAL
PLANNING

MANUFACTURING
ENGINEER

PRODUCT
LINE
MANAGER

MANCOAST 3-24-81

COST IMPACT

<table>
<thead>
<tr>
<th></th>
<th>MAT'L.</th>
<th>LABOR</th>
<th>TOTAL</th>
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<tbody>
<tr>
<td>MFG.</td>
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</tr>
<tr>
<td>TOTALS</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>
SPECIAL INSTRUCTIONS

☐ Total Number of Units Affected
☐ All Customer Engineering Units - ASAP
☒ All Customer Engineering Units at Next Maintenance Visit.
☐ All Customer Engineering Units - Having Problem Only.
☐ Information Only.
☐ Special Instructions — See Note (*)

<table>
<thead>
<tr>
<th>COST IMPACT</th>
</tr>
</thead>
<tbody>
<tr>
<td>MAT'L.</td>
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<tr>
<td>C.E.</td>
</tr>
<tr>
<td>TOTALS</td>
</tr>
</tbody>
</table>
**DESCRIPTION OF CHANGE**

Change schematic and software-loading chart as follows:

**FROM**
- 378-4083-R6
- 378-4084-R6
- 378-4085-R6
- 378-4086-R6

**TO**
- 378-4083-R7
- 378-4084-R7
- 378-4085-R7
- 378-4086-R7

**PRINT ROOM**

**DATE TO DOCUM**
- 3-4-81

**DISPOSITION**
- Boarded
- Final Assy. Area
- Parts In House
- Outside Vendor

**USE AS IS TO PREVIOUS REV.**
- ☒

**TO CONFORM**
- ☒

**TO CONFORM WHERE FEASIBLE**
- ☒

**APPROVALS**

<table>
<thead>
<tr>
<th>DES. ENG.</th>
<th>DATE</th>
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</thead>
<tbody>
<tr>
<td>Paul Riche</td>
<td>3/1</td>
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<thead>
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<th>CUST. ENGRG.</th>
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<tr>
<td>J. Proulx</td>
<td>2/27/81</td>
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<table>
<thead>
<tr>
<th>MFG. ENGRG.</th>
<th>DATE</th>
</tr>
</thead>
<tbody>
<tr>
<td>R. Pearce</td>
<td>2/26/81</td>
</tr>
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</table>

**REASON/SYMPTOM FOR CHANGE**

The alternate map read was not setup properly in write so that the DPU lost where it was and failed to do the write.

2413M/137
SPECIAL INSTRUCTIONS

☐ Total Number of Units Affected

☐ All Units Prior to Being Shipped On or Before

☐ All Units Prior to Packaging On or Before

☐ All Units Prior to Final Electrical Test On or Before

☐ All Units Prior to System Level Electrical Test On or Before

☐ All Units Prior to Assembly On or Before

☐ RCO All Open Orders

☐ Scrap

☐ Rework

☐ Not to Affect Finished Parts

☐ Material Disposition

☐ Scrap

☐ Rework

☐ Use As Is

☐ Next Buy

☐ Special Instructions – See Note (*)

☐ Documentation Only

☐ VALUE ENGINEERING*
SPECIAL INSTRUCTIONS

- Total Number of Units Affected
- All Customer Engineering Units, ASAP
- All Customer Engineering Units at Next Maintenance Visit.
- All Customer Engineering Units Having Problem Only.
- Information Only.
- Special Instructions – See Note (*)

**COST IMPACT**

<table>
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<th>TOTAL</th>
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<tr>
<td><strong>TOTALS</strong></td>
<td></td>
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</tr>
</tbody>
</table>
DESCRIPTION OF CHANGE

Change assembly drawing, schematic and sample board as follows:

Cut etch from L43 pin 10 to L5 pin 7
Tie L43 pins 9 and 10 together

No BOM changes required

NOTE: This ECN is required on controllers using R5 PROMS

NOTE: At the request of Manufacturing the artwork will not be modified per this ECN

REASON FOR CHANGE

The READ field is 1 byte too long when doing ECC.

0739M/89

NEW PURCHASE REQ'D. □ SHOP REWORK REQ'D. □ VENDOR REWORK REQ'D. □
**DESCRIPTION OF CHANGE**

Change assembly drawing, schematic and sample board per attached prints and as follows

- Change L12 from a 7404 (376-0010) to a 7414 (376-0139)
- Change BOM as follows:
  - Change: 376-0010, IC 7404 from 4 to 3
  - Add: 376-0139, IC 7414

Next assemblies effected 167/187-2200-79/-80, 212-2280

**NOTE:** Customer Engineering may want to install this ECO at sites where there are frequent unexplained disk errors

**REASON/SYMPOTON FOR CHANGE**

To correct incompatibility between disk drives and 2280 DPU

<table>
<thead>
<tr>
<th>WLI #</th>
<th>DESCRIPTION</th>
<th>QTY</th>
</tr>
</thead>
<tbody>
<tr>
<td>376-0010</td>
<td>IC 7404</td>
<td></td>
</tr>
<tr>
<td>376-0139</td>
<td>IC 7414</td>
<td>1</td>
</tr>
</tbody>
</table>

**APPROVALS**

<table>
<thead>
<tr>
<th>FINAL</th>
<th>DES. ENG.</th>
<th>CUST. ENGRG.</th>
<th>MFG. ENGRG.</th>
</tr>
</thead>
<tbody>
<tr>
<td>N. Lourie</td>
<td>D. Pugh</td>
<td>J. Proulx</td>
<td>R. Pearce</td>
</tr>
</tbody>
</table>

**DATE**

- 2/20/81
- 2/24/81

**DRAWING UPDATED**

**REV. EFFECTED**

| BOM | ARTWORK | E-REV | SAMPLE BD | ASSY. DWG. | DRILL DWG. | SCHEM. DWG. | MEC. DWG. |
| F | T | Y | N | Y | Y | Y | Y |

**DATE TO DOCUM**

2-27-81
SPECIAL INSTRUCTIONS

- Total Number of Units Affected
- All Units Prior to Being Shipped On or Before
- All Units Prior to Packaging On or Before
- All Units Prior to Final Electrical Test On or Before
- All Units Prior to System Level Electrical Test On or Before
- All Units Prior to Assembly On or Before
- RCO All Open Orders
  - Scrap
  - Rework
  - Not to Affect Finished Parts
- Material Disposition
  - Scrap
  - Rework
  - Use As Is
  - Next Buy
- Special Instructions — See Note (*)
- Documentation Only

### COMMITTEE

<table>
<thead>
<tr>
<th>CHAIRMAN</th>
<th>R.E. Pearce 2/4/81</th>
</tr>
</thead>
<tbody>
<tr>
<td>QUALITY CONTROL</td>
<td>B. Thoiten</td>
</tr>
<tr>
<td>MATERIAL PLANNING</td>
<td>J. M. Enloe</td>
</tr>
<tr>
<td>MANUFACTURING ENGINEER</td>
<td>W. Shalvey</td>
</tr>
<tr>
<td>PRODUCT LINE MANAGER</td>
<td>W. Shalvey</td>
</tr>
</tbody>
</table>

### COST IMPACT

<table>
<thead>
<tr>
<th>MAT'L.</th>
<th>LABOR</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>MFG.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C.E.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TOTALS</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

VALUE ENGINEERING**
SPECIAL INSTRUCTIONS

☐ Total Number of Units Affected

☐ All Customer Engineering Units ASAP

☒ All Customer Engineering Units at Next Maintenance Visit.

☐ All Customer Engineering Units Having Problem Only.

☐ Information Only.

☐ Special Instructions – See Note (*)

<table>
<thead>
<tr>
<th>COST IMPACT</th>
</tr>
</thead>
<tbody>
<tr>
<td>MAT'L.</td>
</tr>
<tr>
<td>MFG.</td>
</tr>
<tr>
<td>C.E.</td>
</tr>
<tr>
<td>TOTALS</td>
</tr>
</tbody>
</table>
DESCRIPTION OF CHANGE

NOTE 1: Engineering has decided that the artwork will not be modified at this time, it is not cost justifiable.

Change assembly drawing, schematic, parts list and sample per attached prints and as follows:

- Change L34 from IC 7432 (376-0093)
  to IC 7408 (376-0081).
- Cut etch at L42 pin 8. (schem. zone 2A11, component side)
- Cut etch at L42 pin 10. (schem. zone 2A11, component side)
- Cut etch at L42 pin 9. (schem. zone 2A11, circuit side)
- Cut etch at L18 pin 5. (schem. zone 2D4, circuit side)
- Lift pins L37 pin 12 and L37 pin 13. (schem. 2A10)
- Tie L39 pin 1 to L34 pin 10.
- Tie L39 pin 13 to L34 pin 9.
- Tie L34 pin 8 to L34 pin 5 and to L36 pin 3. (schem. zone 2A9,106)
- Tie L19 pin 9 to L19 pin 10. (schem. zone 2B3)

NOTE TO EDD: Create 210-7717 History Sheet.
Continued on next page

REASON/SYMPOTM FOR CHANGE

COMPANY CONFIDENTIAL

To stop I90 and I92 errors due to ring counter hangs in Mux.
Change BOM 210-7717 as follows:

<table>
<thead>
<tr>
<th>WLI#</th>
<th>DESCRIPTION</th>
<th>UM</th>
<th>COMP</th>
<th>QTY</th>
<th>QTY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Change:</td>
<td></td>
<td></td>
<td>From</td>
<td></td>
<td></td>
</tr>
<tr>
<td>376-0093</td>
<td>IC 7432</td>
<td>EA</td>
<td>1</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Add:</td>
<td></td>
<td></td>
<td>To</td>
<td></td>
<td></td>
</tr>
<tr>
<td>376-0081</td>
<td>IC 7408</td>
<td>EA</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>
# Engineering Change Order

## Manufacturing Impact Sheet

### Disposition

<table>
<thead>
<tr>
<th>Material Disposition</th>
<th>Quantity</th>
<th>Disp</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parts on Hand</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Parts on Order</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Assemblies in Process</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Finished Sub Assemblies</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Assemblies in Units</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Affected Sites

<table>
<thead>
<tr>
<th>Site</th>
<th>Yes</th>
<th>No</th>
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</thead>
<tbody>
<tr>
<td>Tewks</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bos</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Hong</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MEX</td>
<td></td>
<td></td>
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<tr>
<td>Tewks</td>
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<tr>
<td>Bos</td>
<td></td>
<td></td>
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<tr>
<td>Hong</td>
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<tr>
<td>MEX</td>
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<tr>
<td>Low</td>
<td></td>
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<tr>
<td>Scot</td>
<td></td>
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<tr>
<td>Hlok</td>
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<tr>
<td>Aust</td>
<td></td>
<td></td>
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<tr>
<td>Pt Blvd</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tw</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Approvals

- ECO Admin: [Signature]
- Mfg Eng: [Signature]
- Quality: [Signature]
- Materials: [Signature]
- Prod Control: [Signature]
- Finance: [Signature]
- Re-Mfg: [Signature]
- Other: [Signature]

### Remarks

- Doesn't impact quotes. This board is now being built in P.B. OEM.
- CE spaces shipped after 7/23/86 will conform.

### SMS Effectivity Date

- 7-18-85
**ENGINEERING CHANGE ORDER**
**CUSTOMER ENGINEERING IMPACT SHEET**

| ALL UNITS | ☐ |
| PROB ONLY | ☒ |
| INFO | ☐ |
| FCO REQUIRED | ☐ |
| IMMED | ☐ |
| NEXT CALL | ☐ |

**IS A MUB REQUIRED FOR FSC REWORK** ☒

**IMPACT COMMENTS**

Rework during FSC repair
\[\text{Signature}\]

<table>
<thead>
<tr>
<th>EST. COST IMPACT</th>
<th>APPROVALS</th>
<th>DATE</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATERIAL</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LABOR</td>
<td></td>
<td>7/8</td>
</tr>
<tr>
<td>TOTAL</td>
<td></td>
<td>7/8</td>
</tr>
</tbody>
</table>

**IMPLEMENTATION PERIOD** 7.8 yrs

**ANNUAL COST** 561.00

<table>
<thead>
<tr>
<th>GENERAL COMMENTS</th>
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</thead>
</table>
# TEMPORARY MANUFACTURING DEVIATION

<table>
<thead>
<tr>
<th>Originator</th>
<th>Date</th>
<th>M/S</th>
<th>Ext.</th>
<th>Ref. TMD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Barbara Kendall</td>
<td>12/17/87</td>
<td></td>
<td>6-4161</td>
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</table>

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Description</th>
<th>Model</th>
<th>ECO Pending?</th>
<th>If yes, enter ECO Number</th>
<th>Temporary Change?</th>
</tr>
</thead>
<tbody>
<tr>
<td>210-7715</td>
<td>Disk Controller</td>
<td>2280</td>
<td>Y733</td>
<td>42957</td>
<td>No</td>
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</table>

<table>
<thead>
<tr>
<th>SWO or CWO Number</th>
<th>SWO or CWO Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Effectivity Date</th>
<th>Expiration Date</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Affected Areas</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Complete description of the deviation:**

Stop ECO # 41615

because of component incompatibility with the change.

**Change E & Rev from 7 to 8.**

**NOTE:**

ECO 42957 voids out ECO 41615.

## APPROVALS

<table>
<thead>
<tr>
<th>Quality Control</th>
<th>Date</th>
<th>Resident Comp. Eng.</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>P. Keenan</td>
<td>12-17-86</td>
<td>N/A</td>
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</table>

<table>
<thead>
<tr>
<th>Material Control</th>
<th>Date</th>
<th>CATA</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dave Sousa</td>
<td>12-17-86</td>
<td>N/A</td>
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<table>
<thead>
<tr>
<th>Operations Manager</th>
<th>Date</th>
<th>Mfg. Engineering</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shirley Lawson</td>
<td>12-17-86</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
**DESCRIPTION OF CHANGE**

NOTE 1: Manufacturing has decided that the artwork will not be modified at this time, it is not cost justifiable.

Change schematic and sample board per attached print and as follows:

- Cut etch going to L30 pin 6. (Zone 2F4)
- Tie L30 pin 8 to L29 pin 2.

**REASON/SYMPTOM FOR CHANGE**

To correct the problem of an I92 error occurring with 2280 MUX.
NOTE 1: Engineering has decided that the artwork will not be modified at this time, it is not cost justifiable.

Change schematic and sample board per attached prints and as follows:

Cut etch leading to L12 pin 3 on circuit side.

On component side:
Tie L12 pin 3 to L29 pin 5. (zone 1E3)
Tie L3 pin 6 to L29 pin 4.
Tie L4 pin 12 to L29 pin 6.

NOTE TO EDD: Create 210 History sheet

AUG 06 1987

REASON/SYMPTOM FOR CHANGE

To stop R/B from reaching the CPU late.

COMPANY CONFIDENTIAL
## Engineering Change Order

### Manufacturing Impact Sheet

#### Disposition

<table>
<thead>
<tr>
<th>Disposition</th>
<th>1. Use As Is</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2. Rework</td>
</tr>
<tr>
<td></td>
<td>3. Scrap/Salvage</td>
</tr>
<tr>
<td></td>
<td>4. Next Order</td>
</tr>
<tr>
<td></td>
<td>5. See Remarks</td>
</tr>
</tbody>
</table>

#### Affected Sites

- TEWKS □
- BOS □
- HONG □
- PKWD □
- IR □
- MEX □
- METH □
- PR □
- LOW □
- SCOT □
- HLOK □
- AUST □
- PT BLVD □
- TW □

#### Approvals

- ECO ADMIN
- MFG ENG
- QUALITY
- MATERIALS
- PROD. CONTROL
- FINANCE
- RE-MFG
- OTHER

### Remarks

210 INV = 32
WIP = 4
BAL 4  SKU # = 64
NEXT SKU = 8/14/87

### SMS Effectivity Date

8/14/87

### Documentation Only

☑

8/14/87
### Engineering Change Order

**Customer Engineering Impact Sheet**

**ECO No.** 45153

**Sheet No.** 4 of 4

**Impact Comments**

- Normal Repair Cycle

**Est. Cost Impact**

<table>
<thead>
<tr>
<th></th>
<th>Domestic</th>
<th>International</th>
</tr>
</thead>
<tbody>
<tr>
<td>Est. Unit Pop</td>
<td>106</td>
<td>403</td>
</tr>
<tr>
<td>Est. Spare Pop</td>
<td>479</td>
<td>195</td>
</tr>
<tr>
<td>Total</td>
<td>1487</td>
<td>595</td>
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**Approvals**

<table>
<thead>
<tr>
<th></th>
<th>Tech Ops</th>
<th>Logistics</th>
<th>FSC Support</th>
<th>Final</th>
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<tbody>
<tr>
<td>Material</td>
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</tr>
<tr>
<td>Labor</td>
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<td>Total</td>
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<tr>
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<td>Annual Cost</td>
<td>$796.00</td>
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</table>

**General Comments**

- (Blank space for general comments)
DESCRIPTION OF CHANGE

Change artwork, assembly drawing, fabrication drawing, schematic, parts list and sample board per attached prints and as follows:

Remove L25 and L37 (376-0098).74174
Remove L23 and L42 (376-0242).74LS280

On component side:
Cut etch leading to L6 pin 11.
Tie L39 pin 2 to L39 pin 3.
Remove wire between L30 pin 8 and L29 pins 2 & 3.
Tie L30 pin 6 to L29 pins 2 & 3.
Tie L35 pin 1 to R31 (signal side).

Change BOM 210-7715 as follows:

<table>
<thead>
<tr>
<th>WL#</th>
<th>DESCRIPTION</th>
<th>UM</th>
<th>COMP</th>
<th>QTY</th>
<th>QNTY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Add</td>
<td>376-0098</td>
<td>EA</td>
<td>1</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>74174 IC</td>
<td></td>
<td></td>
<td>From:</td>
<td></td>
</tr>
<tr>
<td>Delete:</td>
<td>376-0242</td>
<td>EA</td>
<td>1</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>74LS280 IC</td>
<td></td>
<td></td>
<td>To:</td>
<td></td>
</tr>
</tbody>
</table>

CONFORMANCE

CONFORMING DATE: 6-3

REASONS/SYMPTOM FOR CHANGE

For cost reduction and elimination of hang problems.
<table>
<thead>
<tr>
<th>REF. DES.</th>
<th>MANG PART NO.</th>
<th>VALUE/TYPE</th>
<th>DESCRIPTION</th>
<th>QTY.</th>
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<tbody>
<tr>
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<td>7451</td>
<td>IC DUAL 2-WIDE 2-INPUT AND-OR-INVERT GATE</td>
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<tr>
<td>L7</td>
<td>376-0016-</td>
<td>7402</td>
<td>IC QUAD 2-INPUT NOR GATE</td>
<td>1</td>
</tr>
<tr>
<td>L40</td>
<td>376-0028-</td>
<td>7403</td>
<td>IC QUAD 2-INPUT NAND GATE O/C OUTPUTS</td>
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<tr>
<td>L38</td>
<td>376-0080-</td>
<td>74123</td>
<td>IC DUAL RETRIGGERABLE MONOSTABLE MULTIVIBRATOR</td>
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<tr>
<td>L6</td>
<td>376-0081-</td>
<td>7408</td>
<td>IC QUAD 2-INPUT AND GATE</td>
<td>3</td>
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<tr>
<td>L8</td>
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<tr>
<td>L17</td>
<td>376-0082-</td>
<td>74157</td>
<td>IC QUAD 2-INPUT MULTIPLEXER</td>
<td>1</td>
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<tr>
<td>L10</td>
<td>376-0093-</td>
<td>7432</td>
<td>IC QUAD 2-INPUT POSITIVE OR GATE</td>
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</tr>
<tr>
<td>L18</td>
<td>376-0096-</td>
<td>9321</td>
<td>IC DUAL 1 OF 4 DECODER</td>
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<tr>
<td>L24</td>
<td>376-0098-</td>
<td>74174</td>
<td>IC HEX D FLIP-FLOP</td>
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</tr>
<tr>
<td>L36</td>
<td>376-0148-</td>
<td>74LS266</td>
<td>IC QUAD 2-INPUT EXCLUSIVE-NOR GATE O/C OUTPUTS</td>
<td>2</td>
</tr>
<tr>
<td>L22</td>
<td>376-0180-</td>
<td>74LS04</td>
<td>IC HEX INVERTER</td>
<td>1</td>
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<tr>
<td>L27</td>
<td>376-0204-</td>
<td>74LS257A</td>
<td>IC QUAD 2-LINE TO 1-LINE DATA SEL/MUX</td>
<td>2</td>
</tr>
<tr>
<td>L34 - L35</td>
<td>376-0247-</td>
<td>74LS390</td>
<td>IC 6-BIT ODD/EVEN PARITY GENERATOR/CHECKER</td>
<td>1</td>
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<tr>
<td>L29</td>
<td>376-0248-</td>
<td>74LS195A</td>
<td>IC 4-BIT UNIVERSAL SHIFT REGISTER</td>
<td>5</td>
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<tr>
<td>L4</td>
<td>376-0256-</td>
<td>75113</td>
<td>IC DUAL LINE DRIVER 16 PIN DIP</td>
<td></td>
</tr>
<tr>
<td>L12 - L15</td>
<td>376-0275-</td>
<td>MC3450</td>
<td>IC QUAD LINE RECEIVER 16 PIN DIP</td>
<td>3</td>
</tr>
<tr>
<td>L1 - L3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>E2 - E3</td>
<td>449-0247-</td>
<td>FACEPLATE</td>
<td>FACEPLATE</td>
<td>2</td>
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<tr>
<td>E19</td>
<td>452-2095-36</td>
<td>SCREW</td>
<td>SCREW CAP</td>
<td>1</td>
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<tr>
<td>E4 - E5</td>
<td>461-3140-</td>
<td>SCREW</td>
<td>SCREW CAP HANDLE</td>
<td>2</td>
</tr>
<tr>
<td>E6 - E7</td>
<td>461-3141-</td>
<td>STANDOFF</td>
<td>STANDOFF</td>
<td>2</td>
</tr>
<tr>
<td>E8 - E9</td>
<td>462-0291-</td>
<td>PCB</td>
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</tr>
<tr>
<td>E10 - E12</td>
<td>650-2120-</td>
<td>24AWG</td>
<td>WIRE 24AWG SOLID BARE TINNED COPPER</td>
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<tr>
<td>E13</td>
<td>650-3087-</td>
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<tr>
<td>E14 - E17</td>
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<td>E18</td>
<td>652-3002-</td>
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489/9

27
## ENGINEERING CHANGE ORDER
### MANUFACTURING IMPACT SHEET

<table>
<thead>
<tr>
<th>WT NO/ASSY NO.</th>
<th>MATERIAL DISPOSITION</th>
<th>QUANTITY</th>
<th>DISP</th>
<th>COST</th>
<th>DISPOSITION</th>
<th>AFFECTED SITES</th>
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<td>1. USE AS IS</td>
<td>TENVK □</td>
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<td>3. SCRAP/SALVAGE</td>
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<td>MLOC □</td>
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<td>PT BLVD □</td>
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### COST OF INCORPORATION

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<th>PRODUCT COST CHANGE PER UNIT</th>
<th>PRODUCTION QUANTITY FROM MPP IN WKS</th>
<th>WKS</th>
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<table>
<thead>
<tr>
<th>PRODUCT COST CHANGE (EXTENDED)</th>
<th>TOTAL COST (OR COST SAVINGS) OF ECO</th>
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<tr>
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</table>

### REMARKS

- WPR's response 6/18 - Sub Assy Cnf 6-1-88
- Next order 7-5-88
- Sheland's response 5/18 - Cnf 5/20

ECO ADMIN: D. Goff
MFG ENG: 
QUALITY: 
MATERIALS: 
PROD. CONTROL: 
FINANCE:
RE-MFG:
OTHER:

Approval Date: 6-3-88
ENGINEERING CHANGE ORDER
CUSTOMER ENGINEERING IMPACT SHEET

IMPACT COMMENTS
MUD for Repair
Purge

EST. COST IMPACT

<table>
<thead>
<tr>
<th>Material</th>
<th>Labor</th>
<th>Total</th>
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<tr>
<td></td>
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IMPLEMENTATION PERIOD: 3.39 months

ANNUAL COST: $23,000

APPROVALS

TECHOPS: [Signature]
LOGISTICS: [Signature]
ESC SUPPORT: [Signature]
FINANCIAL: [Signature]
OTHER: [Signature]

GENERAL COMMENTS
TSB for field
This FCO replaces FCO's 1086 and 1114.

1. **REASON FOR CHANGE**

   This revision of the 2280 DPU microcode corrects four bugs that are causing serious customer problems. The problems corrected are the following.

   A. Multi-sector writes that end on relocated alternate sectors can cause extra sectors to be written.

   B. When the first operation of a DPU is multi-sector write, the DPU will return an I91 on this and all other subsequent requests. The I91 will be returned until a reset is issued followed immediately by a non-multisector write operation.

   C. The DPU will hang if a data transmission error occurs during the "Compare" sequence of a "Read After Write" command.

   D. Attempts to access the drive while it was seeking to track "0" during the power-up (or spin-up) sequence causes the drive to retry the seek. If this happens several times in a row, the drive will hang and have to be shut down to clear the condition.

2. **DESCRIPTION OF CHANGE**

   Four EPROM's on the 210-7423-A PCB are changed.

3. **DOCUMENTATION AFFECTED**

   N/A
4. **PREREQUISITE(S)**

A. Hardware

1. This FCO must be done in conjunction with FCO 1161.

2. Before installing this FCO, insure that customer has backed up data.

B. Software

\[N/A\]

**INSTALLATION PROCEDURE**

A. Power off. Remove AC plug at wall.

B. Refer to the Customer Engineering Product Maintenance Manual, "2280 DPU" (729-0971) p. 4.3, sections 4.5 through 4.5.1 for top cover removal/replacement procedures.

C. Refer to Figure 1. Remove the 210-7423-A PCB from the Disk Processing Unit (DPU).

D. Refer to Figure 2. Change the four EPROM's on the 210-7423-A PCB as follows:

   1. Component Side:

E. Reassemble the unit by reversing the procedures in Steps B through D.

F. Perform check-out procedure described in Section 6 below.

G. Document installation of this FCO by completing a Call Report or Activity Report.
6. **CHECK-OUT PROCEDURE**

Power up. Observe normal operation.

7. **FCO KIT PARTS LISTING**

<table>
<thead>
<tr>
<th>Item</th>
<th>Qty</th>
<th>Item Description</th>
</tr>
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<tbody>
<tr>
<td>729-1598</td>
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<td>378-4083-R10</td>
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<td>378-4084-R10</td>
<td>1</td>
<td>EPROM</td>
</tr>
<tr>
<td>378-4085-R10</td>
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<td>EPROM</td>
</tr>
<tr>
<td>378-4086-R10</td>
<td>1</td>
<td>EPROM</td>
</tr>
</tbody>
</table>

8. **FCO KIT AVAILABILITY DATE**

FCO Kit #728-0184 will be available August 5, 1985 and can be obtained by placing a routine order through the Logistics Order Processing System.

9. **REMOVED PARTS DISPOSITION**

Recycle removed EPROM's through your FSC.

10. **MISCELLANEOUS**

The upgraded EPROM's in FCO Kit #728-0184 are designed to fix the problems cited in both FCO 1086 and FCO 1114.

The reasons for change made in FCO 1086 are as follows.

A. To prevent read cache from being lost when a reset is issued from one of the terminals on the system.

B. To allow the DPU to reselect the destination drive when dumping the multi-sector write cache to one to the drives.

The reason for change made in FCO 1114 is as follows.

To correct start-up problems which result in DPU hangs by making sure that the state of the drives is properly determined before normal processing is continued. The hangs are caused by DPU registers left in an unknown state after trying to read the Alternate Sector Map from a non-existent disk.
This FCO replaces FCO 1161.

1. REASON FOR CHANGE
   A. To eliminate noise on the ready line.
   B. To correct intermittent hangs and incorrect drive selection.

2. DESCRIPTION OF CHANGE
   Two resistors on the 210-7422 PCB are changed.

3. DOCUMENTATION AFFECTED
   N/A

4. PREREQUISITE (S)
   A. Hardware
      210-7422 should be at E-Rev 4 prior to installing this FCO.
      Quick Check: Ensure that L46 is a 7400 (376-0002) IC.
   B. Software
      N/A

5. INSTALLATION PROCEDURE
   A. Power off. Remove AC from unit.
   B. Remove the top cover of the Disk Processing Unit (DPU).
      Refer to p. 4-3, Sections 4.5 through 4.5.1 of the Customer
      Engineering Product Maintenance Manual, "2280 DPU"
      (729-0971) for removal/replacement procedures.
   C. Remove the 210-7422 PCB from the DPU. (Figure 1)
D. Make the following changes to the 210-7422 Artworks R1-R6 board. (Figure 2)

Component Side:

1. Change R48 and R46 to 510 ohm resistors (330-2052). (The top of R46 is connected to L7-14 on the circuit side; the top of R48 is connected to L7-2 on the circuit side)

Non-Component Side:

2. Place E-Rev 5 sticker in upper right corner of board.

E. Reassemble the unit by reversing Steps B and C.

F. Perform check-out procedure described in Section 6 below.

G. Document installation of this FCO by completing a Call Report or Activity Report.
6. CHECK-OUT PROCEDURE

Power up. Observe normal operation.

*7. FCO KIT PARTS LISTING

KIT #728-0177A

<table>
<thead>
<tr>
<th>Item</th>
<th>Qty</th>
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<tr>
<td>330-2052</td>
<td>2</td>
<td>510 ohm resistors</td>
</tr>
<tr>
<td>615-1283-5</td>
<td>1</td>
<td>E-Rev 5 sticker</td>
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</table>

*8. FCO KIT AVAILABILITY DATE

FCO Kit #728-0177A will be available March 3, 1985 and can be obtained by placing a routine order through the Logistics Order Processing system.

9. REMOVED PARTS DISPOSITION

Discard removed resistors.

*10. MISCELLANEOUS

Return Artwork R0 to FSC for rework.
FIELD CHANGE ORDER

Equipment Affected: 2280 DPU/MUX
FCO Class: All Units
Documentation Class Code: 3107
Est. Install Time: 30 Minutes

FCO Kit No.: 728-0131
FCO Doc. No.: 729-1533A
Ref. ECO No.: 33310

Approval Date: JUL 17 1985

*This FCO voids FCO 1114; refer to FCO 1168.

1. REASON FOR CHANGE

To correct start-up problems which result in DPU hangs by making sure that the state of the drives is properly determined before normal processing is continued. The hangs are caused by DPU registers left in an unknown state after trying to read the Alternate Sector Map from a nonexistant disk.

2. DESCRIPTION OF CHANGE

Four EPROM's are changed on the 210-7423-A PCB.

3. DOCUMENTATION AFFECTED

N/A.

4. PREREQUISITE (S)

210-7423 should be at E-Rev 4.

5. INSTALLATION PROCEDURE

A. Back up customer's data. (Must be done prior to installing R9 EPROM's)

B. Power off. Remove AC plug at wall.

C. Refer to "2280 DPU Customer Engineering Product Maintenance Manual" (729-0971) p. 4.3, sections 4.5 through 4.5.1 for top cover removal/replacement procedures.
D. Refer to Figure 1. Remove the 210-7423-A PCB from the Disk Processing Unit (DPU).

E. Refer to Figure 2. Change the four EPROM's on the 210-7423-A PCB as follows:

1. Component Side:

F. Reformat all surfaces.

G. Reassemble the unit by reversing the procedures in Steps B through D.

H. Perform check-out procedure described in Section 6 below.

I. Reinstall customer's data.

J. Document installation of this FCO by completing a Call Report or Activity Report.
6. **CHECK-OUT PROCEDURE**

From the 2200 Diagnostics Package #195-2956-0, run "Pseudo-random Verifies" by accessing a) "Magnetic Media", b) "General Disk Exerciser", c) "Special Function 07".

7. **FCO KIT PARTS LISTING**

**KIT #728-0131**

<table>
<thead>
<tr>
<th>Item</th>
<th>Qty</th>
<th>Item Description</th>
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<td>378-4084-R9</td>
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<td>378-4085-R9</td>
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<td>378-4086-R9</td>
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</tr>
</tbody>
</table>

8. **FCO KIT AVAILABILITY DATE**

FCO Kit #728-0131 is no longer available effective August 5, 1984. It has been replaced by FCO Kit #728-0184 (referenced in FCO 1168). Kit #728-0184 will be available August 5, 1985 and can be obtained by placing a routine order through the Logistics Order Processing System.

9. **REMOVED PARTS DISPOSITION**

Recycle removed EPROM's through your FSC.

10. **MISCELLANEOUS**

FCO Kit #728-0104 (referenced in FCO 1086) is replaced by FCO Kit #728-0131 (referenced in FCO 1114). The upgraded EPROM's in FCO Kit #728-0131 are designed to fix the problems cited in both FCO 1086 and FCO 1114.

The reasons for change made in FCO 1086 are as follows.

A. To prevent read cache from being lost when a reset is issued from one of the terminals on the system.

B. To allow the DPU to reselect the destination drive when dumping the multi-sector write cache to one to the drives.
FIELD CHANGE ORDER

Equipment Affected: 2280 DPU/MUX

Class: All Units  FCO Kit #: 728-0131  Page 1 of 5
Est. Install. Time: 45 Minutes  Ref. ECO #: 33310

Approval Date: AUG 29 1984

*This FCO voids FCO 1086

*See Miscellaneous for information related to FCO 1086

1. REASON FOR CHANGE

To correct start-up problems which result in DPU hangs by
making sure that the state of the drives is properly determined
before normal processing is continued. The hangs are caused by
DPU registers left in an unknown state after trying to read the
Alternate Sector Map from a non-existent disk.

2. DESCRIPTION OF CHANGE

Four EPROM's are changed on the 210-7423-A PCB.

3. DOCUMENTATION AFFECTED

N/A.

4. PREREQUISITE (S)

210-7423 should be at E-Rev 4.

5. INSTALLATION PROCEDURE

A. Power off. Remove AC plug at wall.

B. Refer to "2280 DPU Customer Engineering Product Maintenance
Manual" (729-0971) p. 4.3, sections 4.5 through 4.5.1 for
top cover removal/replacement procedures.

C. Refer to Figure 1. Remove the 210-7423-A PCB from the Disk
Processing Unit (DPU).
D. Refer to Figure 2. Change the four EPROM's on the 210-7423-A PCB as follows:

1. Component Side:

E. Reassemble the unit by reversing the procedures in Steps A through C.

F. Perform check-out procedure described in Section 6 below.

G. Document installation of this FCO by completing a Call Report or Activity Report.
6. CHECK-OUT PROCEDURE

From the 2200 Diagnostics Package #195-2956-0, run "Pseudo-random Verifies" by accessing a) "Magnetic Media", b) "General Disk Exerciser", c) "Special Function 07".

7. FCO KIT PARTS LISTING

KIT #728-0131

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8. FCO KIT AVAILABILITY DATE

FCO Kit #728-0131 will be available September 17, 1984. It can be obtained by placing a routine order through the Logistics Order Processing System.

9. REMOVED PARTS DISPOSITION

Recycle removed EPROM's through your FSC.

10. MISCELLANEOUS

FCO Kit #728-0104 (referenced in FCO 1086) is replaced by FCO Kit #728-0131 (referenced in FCO 1114). The upgraded EPROM's in FCO Kit #728-0131 are designed to fix the problems cited in both FCO 1086 and FCO 1114.

The reasons for change made in FCO 1086 are as follows.

A. To prevent read cache from being lost when a reset is issued from one of the terminals on the system.

B. To allow the DPU to reselect the destination drive when dumping the multi-sector write cache to one of the drives.
*This FCO voids FCO 1086; Refer to FCO 1114.

1. REASON FOR CHANGE
   A. To prevent read cache from being lost when a reset is issued from one of the terminals on the system.
   B. To allow the DPU to reselect the destination drive when dumping the multi-sector write cache to one of the drives.

4. DESCRIPTION OF CHANGE
   Four PROM's on the 210-7423-A PCA are changed.

3. DOCUMENTATION AFFECTED
   N/A

4. PREREQUISITE (S)
   Refer to Step 10 for a list of serial numbers of units requiring this change.

5. INSTALLATION PROCEDURE
   A. Power off. Remove AC plug at wall.
   B. Refer to "Customer Engineering Maintenance Manual" (729-0971) p.4.3, sections 4.5 through 4.5.1 for top cover removal/replacement procedures.
   C. Refer to Figure 1. Remove the 210-7423-A PCA from the Disk Processing Unit (DPU).
D. Refer to Figure 2. Change PROM's on the 210-7423-A PCA as follows:

1. Component Side:

E. Reassemble the unit by reversing the procedures in Steps A through C.

F. Perform check-out procedure described in Section 6 below.

G. Document installation of this FCO by completing a Call Report or Activity Report.
6. CHECK-OUT PROCEDURE

Run 2280 Disk Diagnostics from 2200 Diagnostics Package #195-2956-0.

7. FCO KIT PARTS LISTING

**KIT #728-0104**

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<td>378-4085-R8</td>
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<td>378-4086-R8</td>
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<td>PROM</td>
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*8. FCO KIT AVAILABILITY DATE*

FCO Kit# 728-0104 is no longer available effective September 17, 1984. It is replaced by FCO Kit #728-0131 (referenced in FCO 1114) which can be obtained by placing a routine order through the Logistics Order Processing System.

9. REMOVED PARTS DISPOSITION

Recycle removed PROM's through your FSC.

10. MISCELLANEOUS

This FCO applies to units that fall within the following serial number ranges.

026513
135033 through 135984
687297
941797
DL5772
EB1277
EB1339 through EB1341
EB2626 through EB2632
FY1038
GM1706
GU1341
HN2809
HU1505
HU2465
HU3775
HU5714
HU8365
HV1955

IC5325 through IC5328
IG5042
IN1002 through IN3138
IN7407
KH1380
KR6959
KV1701
KV3474
KV4680 through KV4813
KV5354 through KV5608
KY1002 through KY6572
KY7250 through KY7822
KY8056 through KY8454
KY9330 through KY9654
LI2427
LS1747
LY2317
NS17464 through NS17468
NY1619
PRODUCT SERVICE NOTICE

DATE: 9/22/80

CLASSIFICATION: 2200 SYSTEMS
CATEGORY: INTERFACE
PRODUCT/DEPARTMENT: I/O CONTROLLERS
SEQUENCE: # 5

TITLE:
MODEL 22C80 DISK MULTIPLEXER INTERFACE CONTROLLER (WL# 177-2280C)

This PSN contains the following 2280 Disk Multiplexer Interface Controller information:

1. GENERAL DESCRIPTION
2. SWITCH SETTINGS
3. INSTALLATION
4. SYSTEM INTERCONNECTION
5. DIAGNOSTICS
6. TROUBLESHOOTING
7. HARDWARE THEORY OF OPERATION (MAJOR-FUNCTION LEVEL)

Following is a list of documentation categories referenced by this PSN. Documentation from these other categories is required for the performance of certain installation/maintenance tasks.

Device Address Switch Settings -- IV.B.1-3
CPU Power Supply Voltage Adjustments -- IV.A.3
2280MUX System Interconnection -- IV.B.3
2280 Disk Diagnostic -- IV.C.1
1. GENERAL DESCRIPTION

The Model 22C30 I/O controller (WL# 177-2280C or WL# 210-7715) provides the input/output interface between a 2200VP/LVP/MVP Central Processing Unit and a 2280 Disk Multiplexer (2280MUX).

2. SWITCH SETTINGS

See FIGURE 1 for information concerning the setting of device address switch SW1. The device addresses normally used for the 2280 Disk Drive are HEX 10 (primary address), HEX 20 (secondary address), or HEX 30 (secondary address). Refer to PSN IV.B.1-3 for more information concerning the setting of device address switches.

NOTE:

The HEX values given in FIGURE 1 are correct only for boards at Revision 2 and above. For RO and R1 boards (limited distribution) the HEX values are as follows:

<table>
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<th>RO, R1</th>
<th>R2 &amp; ABOVE</th>
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</thead>
<tbody>
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<td>01</td>
</tr>
<tr>
<td>2</td>
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<td>6</td>
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</tr>
<tr>
<td>7</td>
<td>02</td>
<td>50</td>
</tr>
<tr>
<td>8</td>
<td>NOT USED</td>
<td>80</td>
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</table>

3. INSTALLATION

The 22C80 can be installed in any available I/O slot in the 2200VP/LVP/MVP CPU. Be certain to power-off the CPU before installing the controller. Prior to inserting the 22C80 in a CPU, ensure that all switches on that board are set correctly (ref: Section 2). Also check to see that the fingerboard connectors are clean.

After installing the 22C80 in a unit, be certain to recheck and adjust, if necessary, CPU power supply voltages +5V (I/O) and -12V. Refer to documentation category IV.A.3 for the appropriate CPU voltage adjustment procedures.
FIGURE 1 WL NO. 210-7715 22C80 INTERFACE BOARD
4. SYSTEM INTERCONNECTION

The I/O cables (WL# 220-0138) attached to jacks J1-J3 on the 2280MUX Multiplexer board (WL# 210-7717), and to jacks J1-J4 on the 2280MUX Port Expander boards (WL# 210-7718) connect to the 22C80 controller in each CPU of the multiplex system (see "Star" configuration below). Refer to documentation category IV.B.3 for more information concerning 2280MUX system interconnection.
5. DIAGNOSTICS

Up to the date of this publication, diagnostics designed to test all 2280MUX functions, as well as the associated 22C80 controllers, had not been completed. It is possible to test a majority of the 2280MUX and 22C80 functions with the standard 2280 Disk Diagnostic (WL# 701-2555). This is accomplished by running the diagnostic at several (a predetermined number) CPU's at the same time, with each CPU addressing a different disk surface (one surface only) in the drive. The predetermined number of CPU's at which the diagnostic can be run is equal to the number of data surfaces present in the drive under test (that is, 2280-1: two surfaces; 2280-2: four surfaces; 2280-3: six surfaces). Refer to documentation category IV.C.1 for detailed information concerning the standard 2280 Disk Diagnostic.

6. TROUBLESHOOTING

If only one channel of a 2280MUX system fails (I/O error indication), it is possible to isolate the cause of the failure by interchanging the I/O cables at the Port Expander board or Multiplexer board (as applicable) in the 2280 DPU/MUX. If, after swapping CPU-to-MUX cables, the problem remains with the same 2280MUX channel, conclude that the Port Expander/Multiplexer is defective; if the problem moves with the suspected 2200 CPU to the different 2280MUX channel, conclude that the 2200 CPU is defective—the most likely cause being the 22C80 I/O controller. If all channels fail, the 2280 DPU, the DPU/MUX power supply, the 2280MUX multiplexer board, the disk cables, or the 2280 disk itself may be defective.

7. HARDWARE THEORY OF OPERATION (MAJOR-FUNCTION LEVEL)

Address Bus and Control Circuitry (ref: FIGURE 2 and MNEMONICS)

Device Address Switch—

Represents the device address of the 2280 Disk Drive. This address is chosen by the customer and set by the Customer Engineer. The outputs of the switch are inputs to the Address Compare Circuit.
Address Compare Circuit---

Verifies the device address received from the CPU via the Address Bus (AB1-AB8) against the address represented by the Device Address Switch. The output of the compare circuit is input to the Select Latch. The output also enables operation of the DN3 Latch.

Select Latch---

Produces a Select (SEL) signal if the device address received from the CPU and the address represented by the Device Address Switch setting are identical. This Select signal in turn generates a Request (REQ) signal, which is sent to the 2280 Disk Multiplexer (2280MUX) indicating the CPU requires disk access. The Select signal also enables operation of the Control Decoder, and the OBS Latch.

DN3 Latch---

Monitors CPU Address Bus bit 7 (HEX 40) to determine whether access to the second 2280 Disk Drive in a daisy-chain configuration is requested. If the second drive is specified, a DN3 signal is sent to the 2280MUX indicating such.

Control Decoder---

Decodes control data received from the CPU via the Output Bus (OB1, and OB8) into the desired command as follows:

<table>
<thead>
<tr>
<th>COMMAND</th>
<th>LOGIC LEVEL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clear</td>
<td>&quot;0&quot;</td>
</tr>
<tr>
<td>Parity</td>
<td>&quot;0&quot;</td>
</tr>
<tr>
<td>Error</td>
<td>&quot;0&quot;</td>
</tr>
<tr>
<td>Hog</td>
<td>&quot;1&quot;</td>
</tr>
<tr>
<td>Reset</td>
<td>&quot;1&quot;</td>
</tr>
<tr>
<td>Release</td>
<td>&quot;1&quot;</td>
</tr>
<tr>
<td>Disk</td>
<td>&quot;1&quot;</td>
</tr>
<tr>
<td></td>
<td>&quot;0&quot;</td>
</tr>
</tbody>
</table>

Hog Latch---

When a "Hog" command is decoded (see Control Decoder), the Hog Latch produces a Request (REQ) signal which is sent to the 2280MUX indicating the CPU requires exclusive use of the disk.
When a "Release Disk" command is decoded, the Hog Latch terminates the Request signal.

Disk Ready/Busy Circuit--

Monitors the Ready/Busy signal received from the disk (DRSY), and relays that status to the CPU.

OBS Latch--

Generates an Output Data Strobe (ODS) which strobes the Output Data to the 2280MUX.

Shift Register--

Produces the timing pulses required for controlling the transfer of data between the CPU and the 2280MUX.

Level Converters (Line Receivers/Drivers)--

Convert TTL voltage levels to the differential voltage levels (Emitter Coupled Logic--ECL--levels) required by the 2280MUX Port Expander board. Use of ECL in this application allows each CPU disk I/O logic to operate at optimum speed even with the greater distance from CPU to multiplexer, as compared to the driver/receiver distances possible with TTL.
FIGURE 2 22C80 BLOCK DIAGRAM (ADDRESS BUS AND CONTROL CIRCUITRY)
Input Bus Circuitry (ref: FIGURE 3 and MNEMONICS)

Input Data Demultiplex Latches (Data)--

Receives the read data that is to be sent to the CPU from the 2280MUX Port Expander board. On the leading edge of the Input Data Strobe (IDS), the low order Input Data bits (ID1-ID4) are selected through the demultiplexer, and are then sent to the Parity Checker and the Input Bus Mux. On the trailing edge of IDS, the high order bits (ID5-ID8) are selected through the demultiplexer.

Input Data Demultiplex Latches (Disk Status)--

Receives the disk status from the 2280MUX Port Expander board. On the leading edge of the Status Request Strobe (SRB), the low order Input Data bits (ID1-ID4) are selected through the demultiplexer as S1-S4, and the are sent to the Input Bus Mux for transmission to the CPU. On the trailing edge of SRB, the high order bits (ID5-ID8) are selected through the demultiplexer as S5-S8.

Input Bus Mux--

Selects either disk status or data as Input Bus bits ID1-ID8, and transmits the information to the CPU.

Parity Checker--

Verifies the parity bit, which is received along with the Input Data for integrity. If the parity bit is incorrect the Parity Error Latch is set.

Parity Error Latch--

Indicates a parity error occurring during transfer of data between the 2280MUX and the 22C80 Interface.
Level Converters (Line Receivers/Drivers)--

Convert differential voltage levels (Emitter Coupled Logic--ECL--levels) received from the 2280MUX Port Expander board to the TTL levels required by the 22C80 Interface board. Use of ECL in this application allows each CPU disk I/O logic to operate at optimum speed even with the greater distance from CPU to multiplexer, as compared to the driver/receiver distances possible with TTL.
FIGURE 3 22C80 BLOCK DIAGRAM (INPUT BUS CIRCUITRY)
Output Bus Circuitry (ref: FIGURE 4 and MNEMONICS)

Output Bus Mux--

Receives the write data that is to be sent to the disk from the CPU Output Bus (OB1–OB8). During the first half of the Output Bus Strobe (OBS), the low order bits (OB1–OB4) are selected through the Output Bus Mux as Output Data bits OD1–OD4. During the second half of the OBS, the high order bits (OB5–OB8) are selected through the multiplexer. The Output Data bits are sent to the 2280MUX for transmission to the disk drive.

Parity Generator--

Accepts the write data that is to be sent to the disk from the CPU Output Bus (OB1–OB8), and generates a parity bit (OD5) which is sent to the 2280MUX along with the Output Data.

Level Converters (Line Receivers/Drivers)--

Convert TTL voltage levels to the differential voltage levels (Emitter Coupled Logic--ECL--levels) required by the 2280MUX Port Expander board. Use of ECL in this application allows each CPU disk I/O logic to operate at optimum speed even with the greater distance from CPU to multiplexer, as compared to the driver/receiver distances possible with TTL.
FIGURE 4 22C80 BLOCK DIAGRAM (OUTPUT BUS CIRCUITRY)
DATE: 9/22/80

CLASSIFICATION 2200 SYSTEMS
CATEGORY INTERFACE
PRODUCT/APPL. DISK MULTIPLEXERS
SEQUENCE # 1

TITLE:

MODEL 2280 DISK MULTIPLEXER

This PSN contains the following 2280 Disk Multiplexer information.

1. GENERAL DESCRIPTION
2. PHYSICAL CHARACTERISTICS
3. INSTALLATION
4. DIAGNOSTICS
5. TROUBLESHOOTING
6. HARDWARE THEORY OF OPERATION (MAJOR-FUNCTION LEVEL)

Following is a list of documentation categories referenced by this PSN. Documentation from these other categories is required for the performance of certain installation/maintenance tasks.

22C80 Disk Multiplexer Interface -- IV.B.1
2280 DPU-to-2280 DPU/MUX Conversion -- I.B.2
2280 DPU Power Supply Voltage Adjustments -- III.A.7
2280 Disk Diagnostic -- IV.C.1
1. GENERAL DESCRIPTION

The Model 2280 Disk Multiplexer (hereinafter referred to as the 2280MUX) is optionally resident in the 2280 Disk Processing Unit (DPU) and permits two to fifteen 2200VP/LVP/MVP Central Processing Units to share one or two Model 2280 Disk Drives (Phoenix Drive or CDC 9448 Cartridge Module Drive—CMD). Unlike earlier disk multiplexers, which were of the "daisy-chain" type, the 2280MUX is a "star" type multiplexer. In a "star" configuration, the CPU's are individually connected directly to the multiplexer. (See FIGURE 1.)

The 2280MUX allocates disk time to multiple systems in a manner that enables all systems to have virtually concurrent access to the disk. The multiplexer sequentially polls all systems until one of the systems attempts to access the disk. At that point, the multiplexer momentarily ceases polling and passes control of the disk to the inquiring system, which is permitted to execute a single disk statement or command. The multiplexer does not monitor the amount of time required to execute each statement, nor does it limit the number of sectors transferred by a statement. A single statement may read or write only one sector, or may carry out multi-sector transfers. (For example, a MOVE or COPY statement might transfer the contents of an entire disk platter to a second platter; however, major file maintenance operations should be executed only by a system in Hog Mode—see following). When execution of the single disk operation is completed, sequential polling of on-line CPU's resumes from the last requesting CPU.

Some disk operations, such as the on-line updating of a shared common file, require that one system have a period of exclusive, uninterrupted access to the disk. For such operations, the $OPEN statement from the Wang BASIC-2 language should be used (ref: 2200VP BASIC-2 Language Reference Manual, WL# 700-4080, IV.C.2). In this mode of operation, one system temporarily monopolizes or "hogs" the disk, locking out all other systems. Critical file maintenance operations may then be carried out by the privileged system without interruption. After file maintenance has been completed, the $CLOSE statement should be used to release the disk, restoring all CPU's to equal disk-access priority.
2. PHYSICAL CHARACTERISTICS

The 2280MUX consists of the following:

--- A Multiplexer board (WL# 177-2280-X or WL# 210-7717) containing the polling and port selection circuitry, which interfaces the 2280 Disk Processing Unit (DPU) and up to three CPU's.

--- Up to three Port Expander boards (WL# 177-2280-XE or WL# 210-7718), each of which interfaces up to four additional CPU's.

The 2280MUX circuit boards install directly into a Model 2280 Disk Processing Unit. (A special DPU motherboard (WL# 210-7716) is required. More detailed information follows.)

Each CPU connected to the 2280MUX must have a Model 22C80 I/O controller (WL# 177-2280-C or WL# 210-7715) to interface the 2280MUX.

NOTE:

Refer to documentation category IV.B.1 for information concerning the required 22C80 I/O controller.

For system interconnection, standard 12-foot (3.6-meter) I/O cables (WL# 220-0138) are supplied with the multiplexer. Extension cables are available, allowing for a maximum distance between CPU and 2280MUX of 1,012 ft (306.7 m). Extension cable lengths and part numbers are as follows:

<table>
<thead>
<tr>
<th>LENGTH (FEET)</th>
<th>LENGTH (METERS)</th>
<th>WL #</th>
</tr>
</thead>
<tbody>
<tr>
<td>25</td>
<td>7.6</td>
<td>120-2280-01</td>
</tr>
<tr>
<td>50</td>
<td>15.2</td>
<td>120-2280-02</td>
</tr>
<tr>
<td>100</td>
<td>30.3</td>
<td>120-2280-03</td>
</tr>
<tr>
<td>250</td>
<td>75.8</td>
<td>120-2280-04</td>
</tr>
<tr>
<td>500</td>
<td>151.5</td>
<td>120-2280-05</td>
</tr>
<tr>
<td>750</td>
<td>227.3</td>
<td>120-2280-06</td>
</tr>
<tr>
<td>1000</td>
<td>303.0</td>
<td>120-2280-07</td>
</tr>
</tbody>
</table>

A 15-inch (37.5-cm) cable (WL# 220-0257) is also provided for connecting the Multiplexer board (WL# 210-7717) to the ALU/MUX board (WL# 210-7421-A) in the DPU.
FIGURE 1 below illustrates a typical four-system, dual-drive configuration. Two unused (not required) Port Expander boards are also shown in the figure.
3. INSTALLATION

NOTE:
Be sure to power-off the 2280 DPU/MUX before performing any installation procedure.

3.1 MOTHERBOARD REQUIREMENTS

The 2280MUX requires that a WL# 210-7716 motherboard be resident in the 2280 Disk Processing Unit (DPU). Model 2280 DPU's sold with the MUX have a WL# 210-7716 motherboard. All newly manufactured 2280 DPU's also have this motherboard installed, providing for easier installation of a MUX upgrade.

If an older-version 2280 DPU is to be upgraded to add multiplex capabilities, the entire 2280 DPU chassis must be replaced with the newer-version chassis (WL# 270-0688-60 for 60 Hz, or WL# 270-0688-50 for 50 Hz), containing a WL# 210-7716 motherboard.

Refer to documentation category I.B.2 for detailed conversion procedures, and then continue with Section 3.2 of this installation procedure.

3.2 MOTHERBOARD AC INPUT VOLTAGE SELECTION JUMPERS

Jumper wires are provided on the WL# 210-7716 motherboard for ac input voltage (115V or 230V) selection. Two jumpers are installed for 115VAC and one jumper for 230VAC. FIGURE 1 shows the positions of these jumpers. Be certain the jumper configuration is correct for the supplied ac voltage (see following chart).

<table>
<thead>
<tr>
<th>VOLTAGE SELECTION JUMPERS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>115VAC</strong></td>
</tr>
<tr>
<td>JUMPER A</td>
</tr>
<tr>
<td>JUMPER B</td>
</tr>
<tr>
<td>JUMPER C</td>
</tr>
</tbody>
</table>

3.3 MOTHERBOARD/PCB LAYOUT

The locations of the 2280MUX circuit boards in relation to the motherboard/chassis are shown in FIGURE 1. Ensure that all fingerboard connectors are clean prior to installing the boards in the DPU. (An ink eraser should be used to clean the pins if necessary.)
After installing the 2280MUX circuit boards, be certain to recheck and adjust, if necessary, DPU power supply voltages +5V and -12V. Refer to Wang Cartridge Module Disk Drive Field Level Maintenance Manual Addendum One, CE #03-0080-A (III.A.7), for 2280 DPU voltage adjustment procedures.

3.4 SYSTEM INTERCONNECTION

Refer to FIGURES 1, 2, 3, and the following table when interconnecting CPU's and 2280MUX.

<p>| TABLE 1 2280MUX SYSTEM CABLE CONNECTIONS |</p>
<table>
<thead>
<tr>
<th>CABLE #</th>
<th>FROM</th>
<th>TO</th>
</tr>
</thead>
<tbody>
<tr>
<td>220-0138</td>
<td>210-7717 Multiplexer--J1</td>
<td>CPU #1--22C80</td>
</tr>
<tr>
<td>220-0138</td>
<td>210-7717 Multiplexer--J2</td>
<td>CPU #2--22C80</td>
</tr>
<tr>
<td>220-0138</td>
<td>210-7717 Multiplexer--J3</td>
<td>CPU #3--22C80</td>
</tr>
<tr>
<td>220-0138</td>
<td>210-7718 Port Expander #1--J1</td>
<td>CPU #4--22C80</td>
</tr>
<tr>
<td>220-0138</td>
<td>210-7718 Port Expander #1--J2</td>
<td>CPU #5--22C80</td>
</tr>
<tr>
<td>220-0138</td>
<td>210-7718 Port Expander #1--J3</td>
<td>CPU #6--22C80</td>
</tr>
<tr>
<td>220-0138</td>
<td>210-7718 Port Expander #1--J4</td>
<td>CPU #7--22C80</td>
</tr>
<tr>
<td>220-0138</td>
<td>210-7718 Port Expander #2--J1</td>
<td>CPU #8--22C80</td>
</tr>
</tbody>
</table>

4. DIAGNOSTICS

Up to the date of this publication, diagnostics designed to test all 2280MUX functions had not been completed. It is possible to test a majority of the 2280MUX functions with the standard 2280 Disk Diagnostic (WL# 701-2555). This is accomplished by running the diagnostic at several (a predetermined number) CPU's at the same time, with each CPU addressing a different disk surface (one surface only) in the drive. The predetermined number of CPU's at which the diagnostic can be run is equal to the number of data surfaces present in the drive under test (that is, 2280-1: two surfaces; 2280-2: four surfaces; 2280-3: six surfaces).

Refer to documentation category IV.C.1 for detailed information concerning the standard 2280 Disk Diagnostic.
FIGURE 2  WL NO. 210-7717 MULTIPLEXER BOARD
FIGURE 3 WL NO. 210-7718 PORT EXPANDER BOARD
5. TROUBLESHOOTING

If only one channel of a 2280MUX system fails (I/O error indication), it is possible to isolate the cause of the failure by interchanging the I/O cables at the Port Expander board or Multiplexer board (as applicable) in the 2280 DPU/MUX. If, after swapping CPU-to-MUX cables, the problem remains with the same 2280MUX channel, conclude that the Port Expander/Multiplexer is defective; if the problem moves with the suspected 2200 CPU to the different 2280MUX channel, conclude that the 2200 CPU is defective—the most likely cause being the 22C80 I/O controller.

If all channels fail, the 2280 DPU, the DPU/MUX power supply, the 2280MUX multiplexer board, the disk cables, or the 2280 disk itself may be defective.

6. HARDWARE THEORY OF OPERATION (MAJOR-FUNCTION LEVEL)

Port Expander Board (WL #210-7718) (ref: FIGURE 4 and MNEMONICS)

Port Selector—

Decodes the port-select signals \(SO_1-7\), received from the Multiplexer board, into port-select signals \(P_{1-4}\). These signals enable one of four CPU I/O ports on the Port Expander board.

Reset Mux—

Selects the appropriate Reset pulse (RESET1-4), received from the CPU's, for output to the Multiplexer board as ICAPM. The Reset pulse is used to initialize the DPU, the MUX, and the disk drive.

Request Latch—

Selects the appropriate Request signal (REQ_{1-4}), received from the CPU's, for output to the Multiplexer board as RQ_{1-4}. The Request line informs the DPU that a CPU requires disk access.
Input Bus Mux--

Receives the read data (IB₁⁻₈) that is to be sent to the CPU. During the first half of the Input Data Strobe (IDS), the low order bits (IB₁⁻₄) are selected through the Input Bus Mux as Input Data bits ID₁-ID₄. During the second half of the IDS, the high order bits (IB₅⁻₈) are selected through the multiplexer. The Input Data bits are sent to the CPU's, via the 22C80 I/O controller.

Level Converters (Line Receivers/Drivers)--

Convert differential voltage levels (Emitter Coupled Logic--ECL--levels) received from the CPU's (22C80) to the TTL levels required by the Multiplexer board. Convert TTL voltage levels received from the Multiplexer board to the differential driving levels required by the CPU's (22C80). Use of ECL in this application allows each CPU disk I/O logic to operate at optimum speed even with the greater distance from CPU to multiplexer, as compared to the driver/receiver distances possible with TTL.

PORT EXPANDER SIGNAL MNEMONICS

ACK₁⁻₄ (Acknowledge):

Acknowledgement of CPU request for disk use -- from MUX (210-7717)

ACK (Acknowledge):

Acknowledgement of CPU request for disk use -- to CPU's (22C80)

CLK (Clock):

Clocks Request Latch -- from MUX (210-7717)

CPB (Central Processor Busy):

CPU ready/busy status -- from CPU's (22C80)

CPB (Central Processor Busy):

CPU ready/busy status -- to MUX (210-7717)
DN3 (Disk Number 3):
Indicates access to second drive is required -- from CPU's (22C80)

DN3 (Disk Number 3):
Indicates access to second drive is required -- to MUX (210-7717)

DOD1-DOD4 (Data Out to Disk):
Write data to be sent to disk -- to MUX (210-7717)

DRB (Disk Ready/Busy):
Disk ready/busy status -- to CPU's (22C80)

DS (Data Select):
Selects IB1-4 or IB5-8 for output -- from MUX (210-7717)

IB1-8 (Input Bus):
Read data to be sent to CPU's -- from MUX (210-7717)

ICAPM (Input Calculator Prime):
Resets DPU and disk -- to MUX (210-7717)

ID1-ID4 (Input Data):
Read data to be sent to CPU's -- to CPU's (22C80)

IDS (Input Data Strobe):
Strobes read data from disk to CPU's -- to CPU's (22C80)

IOB1 (Input/Output Bit 1):
Parity bit for write data to be sent to disk -- from CPU's (22C80)

IOB1 (Input/Output Bit 1):
Parity bit for write data to be sent to disk -- to MUX (210-7717)

OBS (Output Bus Strobe):
Strobes write data from CPU's to disk -- from CPU's (22C80)

OBS (Output Bus Strobe):
Strobes write data from CPU's to disk -- to MUX (210-7717)

OD1-OD4 (Output Data):
Write data to be sent to disk -- from CPU's (22C80)
**P**\textsubscript{1-4} (Port):

Select appropriate CPU port circuitry -- internal

**RB** (Ready/Busy):

Disk ready/busy status -- from MUX (210-7717)

**REQ\textsubscript{1-4} (Request):**

Request by CPU for disk use -- from CPU's (22C80)

**RESET\textsubscript{1-4}:**

Reset DPU and disk -- from CPU's (22C80)

**RQ\textsubscript{1-4} (Request):**

Request by CPU for disk use -- to MUX (210-7717)

\textbf{S}\textsubscript{0-1} (Select):

Decoded into port select signals -- from MUX (210-7717)

**STR (Strobe):**

Strobes read data from disk to CPU's -- from MUX (210-7717)
FIGURE 4  PORT EXPANDER BLOCK DIAGRAM
Multiplexer Board (WL #210-7717) (ref: FIGURE 5 and MNEMONICS)

Output Data Latch--

Receives the write data (DOD1-DOD4) that is to be sent to (written on) the disk. During the first half of the Output Bus Strobe (OBS), the data-out bits are clocked through the Output Data Latch as KS0-KS3. During the second half of OBS, the data-out bits are clocked through the latch as KS4-KS7. The KS bits are sent to the disk via the DPU.

Reset Mux--

Selects the appropriate (desired) Reset pulse (RESET1-RESET3) received from the CPU's for output to the DPU as ICAPM. The Reset pulse is used to initialize the DPU and disk drive.

Request Latch--

Selects the appropriate (desired) Request signal (REQ1-REQ3) received from the CPU's. The Request line informs the DPU that a CPU requires disk access.

Polling Circuit--

Scans the CPU request lines (RQ1-4) to determine whether disk access is desired. When a request is received, the multiplexer sends an acknowledge signal (ACK1-4) to the requesting CPU, and the polling sequence is momentarily halted until that CPU completes its disk operation. Polling resumes with the next sequential channel. RESET initializes the polling circuit to a count of one (channel #1 of the WL # 210-7717 Multiplexer board).

Clock--

Increments the CPU polling circuit.

Decode Control Circuit--

Monitors the acknowledge signals (ACK1-4), and decodes these signals
into the appropriate Board Select (BS1-BS4), Port Select (P1-P3), and Select (S0-S1) signals.

Port Selector--

Decodes the port-select signals (S0-S1) into port-select signals P1-P3. These signals enable the port circuitry for the CPU requiring disk access.

CPU Ready/Busy Latch--

Provides the DPU with the CPU ready/busy status.

Input Bus Strobe Latch--

Receives the Input Bus Strobe from the DPU, and retransmits the strobe to each CPU at the appropriate time.

Input Bus Mux--

Receives the read data (IB1-IB8) that is to be sent to the CPU. During the first half of the Input Bus Strobe (IBS), the low order bits (IB1-IB4) are selected through the Input Bus Mux as Input Data bits ID1-ID4. During the second half of the IBS, the high order bits (IB5-IB8) are selected through the multiplexer. The Input Data bits are sent to the CPU's via the 22C80 I/O controller.

Level Converters (Line Receivers/Drivers)--

Convert differential voltage levels (Emitter Coupled Logic--ECL--levels) received from the CPU's (22C80) to the TTL levels required by the Multiplexer board. Convert TTL voltage levels received from the Multiplexer board to the differential driving levels required by the CPU's (22C80). Use of ECL in this application allows each CPU disk I/O logic to operate at optimum speed even with the greater distance from CPU to multiplexer, as compared to the driver/receiver distances possible with TTL.
MULTIPLEXER SIGNAL MNEMONICS

\textbf{ACK}_{1-3} (Acknowledge):

Acknowledgement of CPU request for disk use -- internal

\textbf{ACK}_{2-4} (Acknowledge):

Acknowledgement of CPU request for disk use -- to Port Expanders (210-7718)

\textbf{ACK} (Acknowledge):

Acknowledgement of CPU request for disk use -- to CPU's (22C80)

\textbf{BS2-BS4 (Board Select)}:

Selects the appropriate Port Expander -- to Port Expanders (210-7718)

\textbf{CLK (Clock)}:

Clocks Request Latch -- internal

\textbf{CPB (Central Processor Busy)}:

CPU ready/busy status -- from CPU's (22C80)

\textbf{CPB (Central Processor Busy)}:

CPU ready/busy status -- to DPU (210-7421-A)

\textbf{DN3 (Disk Number 3)}:

Indicates access to second drive is required -- from CPU's (22C80)

\textbf{DN3 (Disk Number 3)}:

Indicates access to second drive is required -- to DPU (210-7421-A)

\textbf{DOD1-DOD4 (Data Out to Disk)}:

Write data to be sent to disk -- internal

\textbf{DRB (Disk Ready/Busy)}:

Disk ready/busy status -- to CPU's (22C80)

\textbf{DS (Data Select)}:

Selects IB1-IB4 or IB5-IB8 for output -- internal

\textbf{GISO}:

Strobes write data from CPU's to disk -- to DPU (210-7421-A)
GKB\(D\):

CPU ready/busy status -- to DPU (210-7421-A)

IBS (Input Bus Strobe):

Strobes read data from disk to CPU's -- from DPU (210-7421-A)

IB1-IB8 (Input Bus):

Read data to be sent to CPU's -- from DPU (210-7421-A)

ICAPN (Input Calculator Prime):

Resets DPU and disk -- to DPU (210-7421-A)

ID1-ID4 (Input Data):

Read data to be sent to CPU's -- to CPU's (22C80)

IDS (Input Data Strobe):

Strobes read data from disk to CPU's -- to CPU's (22C80)

IOB1 (Input/Output Bit 1):

Parity bit for write data to be sent to disk -- from CPU's (22C80)

IOB1 (Input/Output Bit 1):

Parity bit for write data to be sent to disk -- to DPU (210-7421-A)

KSO-KS7:

Write data to be sent to disk -- to DPU (210-7421-A)

OBS (Output Bus Strobe):

Strobes write data from CPU's to disk -- from Port Expanders (210-7718)

OD1-OD4 (Output Data):

Write data to be sent to disk -- from CPU's (22C80)

ODS (Output Data Strobe):

Strobes write data from CPU's to disk -- from CPU's (22C80)

FI-F3 (Port):

Select appropriate CPU port circuitry -- internal

RB (Ready/Busy):

Disk ready/busy status -- from DPU (210-7421-A)
IV.B.3-1

REQ1-REQ3 (Request):
Request by CPU for disk use -- from CPU's (22C80)

RESET1-RESET3:
Reset DPU and disk -- from CPU's (22C80)

RQ1-3 (Request):
Request by CPU for disk use -- internal

RQ2-41-4 (Request):
Request by CPU for disk use -- from Port Expanders (210-7718)

S0-S1 (Select):
Decoded into port select signals -- internal

STR (Strobe):
Strobes read data from disk to CPU's -- to Port Expanders (210-7718)
FIGURE 5 WL. NO. 210-7717 MULTIPLEXER BLOCK DIAGRAM

*1 - D01-D04, D01, D03, CPU, D05
*2 - D01, D03, CPU, G03
*3 - B01-B03, B01-5, C01-C03
*4 - D03, D05
There has been some confusion over proper prom levels for the 2280 DPU. R&D is in the process of an intensive evaluation of the DPU performance. This study will inevitably lead to extensive ECO changes in the near future. The latest information from TAC suggest that R9 proms should now be currently installed. Our experience at the Area has convinced me that R9's produce more problems than they resolve. After installation, reports of random execution and program errors (ex. X75, P55) starts to occur.

I am endeavoring to stay in close contact with Product Support on all ECO and FCO information concerning this subject. If you have any questions, please contact Dennis Ivey At the Area.

R7 Proms are the only stable version I can currently sanction at this time. Do not upgrade to R9's until further noticed.
2280 DPU STATUS REPORT

<table>
<thead>
<tr>
<th>RDB</th>
<th>Total</th>
<th>R10</th>
<th>R7</th>
</tr>
</thead>
<tbody>
<tr>
<td>3463</td>
<td>7</td>
<td>1</td>
<td>6</td>
</tr>
<tr>
<td>3486</td>
<td>4</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>3496</td>
<td>10</td>
<td>5</td>
<td>10</td>
</tr>
<tr>
<td>3469</td>
<td>10</td>
<td>2</td>
<td>8</td>
</tr>
<tr>
<td>3468</td>
<td>25</td>
<td>3</td>
<td>22</td>
</tr>
<tr>
<td>3462</td>
<td>22</td>
<td>11</td>
<td>11</td>
</tr>
<tr>
<td>3461</td>
<td>24</td>
<td>7</td>
<td>17</td>
</tr>
<tr>
<td>------</td>
<td>-----</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>3460 Total</td>
<td>107</td>
<td>30</td>
<td>77</td>
</tr>
</tbody>
</table>

PROBLEMS ENCOUNTERED

Had a situation where we tried to upgraded dpu from R7 to R10. We were able to format disk with R10 Proms but when verify was run we got sector errors on two particular sectors, even after reformatting the disk platter. We installed a 7423 and 7422(rev 5), both the pcb's were at the proper rev. level. We tried two different sets of boards and got the same problems. We went back to the R7 proms and found that the sectors in question we flagged as alternate sectors by the R7 proms. We did not have to reformat with the R7 proms. It looked as if the R10 proms did not flag the bad sectors and they were picked up as header errors on a verify(0,52607). The pcb's were shipped out by the ce before I could test them out at the District Office.

I have noticed another situation where when you verify a disk platter(0,52608) which have know alternate sectors that you get an error in a sector outside the normal max. sector limits. These are not alternate sectors that have been flagged by the format routine. Sometime the error is outside the alternate range(64 higher than 52607). I have noticed this on both R7 and R10 proms. This does not seem to cause problems with the system operating properly.

Regards,
Charles A. Perkins
Atl.East DTS

ATTN: Mike Bahia
"M1S 001-260"
59 Electronics Ave.
Lowell, MA 01851
Branch DPU PROM Summary

Branch: Bloomington RDB: 3531

Known R7 DPU prom: ........................................ 18
Known R10 DPU prom: ...................................... 17
Total Branch DPU population: .......................... 35

R10 to R7 Downgrade for problems: .................... 0

Present DPU Problem Accounts:

Dacomned
Freidman(AdCom Express)
Universal Title
Miller Schroeder Finance
Marquette-Holm
City of Bloomington

Branch: St. Paul RDB: 3538

Known R7 DPU proms: ...................................... 20
Known R10 DPU proms: .................................... 3
Total Branch DPU population: .......................... 23

R10 to R7 Downgrade for problems: .................... 0

St. Paul Problem accounts:

<table>
<thead>
<tr>
<th>CUSTOMER</th>
<th>PROM LEVEL</th>
</tr>
</thead>
<tbody>
<tr>
<td>William Mitchell</td>
<td>R10 PROMS</td>
</tr>
<tr>
<td>Juran and Moody</td>
<td>R7 PROMS</td>
</tr>
<tr>
<td>Sanger Corporation</td>
<td>R7 PROMS</td>
</tr>
</tbody>
</table>
Branch: Rock Island

Known R7 DPU proms: ................................................. 5
Known R10 DPU proms: ............................................... 7
Total Branch DPU population: ......................................... 12

R10 to R7 Downgrades for problems: .................. 1

Present DPU Problem Accounts:
See Iowa Rollup

Branch: Des Moines

Known R7 DPU proms: ................................................. 8
Known R10 DPU proms: ............................................... 6
Total Branch DPU population: ......................................... 14

R10 to R7 Downgrades for problems: .................. 0

Branch: Cedar Rapids

Known R7 DPU proms: ................................................. 0
Known R10 DPU proms: ............................................... 2
Total Branch DPU population: ......................................... 2

R10 to R7 Downgrades for problems: .................. 0

IOWA Problem Account Rollup(3533, 3534, 3536):

<table>
<thead>
<tr>
<th>CUSTOMER</th>
<th>PROM LEVEL</th>
</tr>
</thead>
<tbody>
<tr>
<td>COBBS MANF.</td>
<td>R10</td>
</tr>
<tr>
<td>Iowa Muscular Skeletal</td>
<td>R10</td>
</tr>
<tr>
<td>CONT.WEST. INS</td>
<td>R10</td>
</tr>
<tr>
<td>RADIOLOGIST/MC</td>
<td>R10</td>
</tr>
<tr>
<td>GRINNELL INS</td>
<td>R10</td>
</tr>
<tr>
<td>Q.C. Pathology</td>
<td>R7</td>
</tr>
<tr>
<td>Beling Consultants</td>
<td>R10</td>
</tr>
<tr>
<td>Republic Electric</td>
<td>R10</td>
</tr>
<tr>
<td></td>
<td>Accounts</td>
</tr>
<tr>
<td>-------</td>
<td>----------</td>
</tr>
<tr>
<td>3531</td>
<td>35</td>
</tr>
<tr>
<td>3533</td>
<td>12</td>
</tr>
<tr>
<td>3534</td>
<td>14</td>
</tr>
<tr>
<td>3536</td>
<td>2</td>
</tr>
<tr>
<td>3538</td>
<td>23</td>
</tr>
<tr>
<td>Totals</td>
<td>86</td>
</tr>
</tbody>
</table>

*est=estimated problem distribution between Iowa branches*
Mike, three of the four branches have provided input, the number look like this;
Total DPUs: 220
R7 Proms: 209
R10 Proms: 11
Dgraded to R7: 9

As a side note the software vendor REDSHAW is having their customers request
down grading to R7 Proms when we install the systems.
Hope this helps.
Regards, Tony 3/31
In talking to Mike Lyons he didn't know about this request either. He, too, thinks that if you have 70% of the Districts that you should have enough data to measure the extent of the problem. I don't mean to to be uncooperative but like I told you on the phone we are being inundated at the Branch level for information. The timing is bad.
<table>
<thead>
<tr>
<th>TYPE</th>
<th>CONTROL</th>
<th>DATE</th>
<th>TIME</th>
<th>SYSTEM</th>
<th>DEVICE</th>
<th>PERSON ASSIGNED</th>
</tr>
</thead>
<tbody>
<tr>
<td>E</td>
<td>10037000</td>
<td>01/27</td>
<td>08:53</td>
<td>2200</td>
<td>2275</td>
<td></td>
</tr>
<tr>
<td>E</td>
<td>19207000</td>
<td>01/23</td>
<td>15:24</td>
<td>2200MVP</td>
<td>2280-3</td>
<td>VARICARE</td>
</tr>
<tr>
<td>E</td>
<td>26032002</td>
<td>01/27</td>
<td>03:13</td>
<td>2200</td>
<td>2275-60</td>
<td></td>
</tr>
<tr>
<td>E</td>
<td>55123002</td>
<td>12/22</td>
<td>15:53</td>
<td>MVP</td>
<td>2280-3</td>
<td></td>
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<tr>
<td>E</td>
<td>56022002</td>
<td>01/29</td>
<td>16:42</td>
<td>2200MVP</td>
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<td>MVP-5, JUNIOR</td>
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<tr>
<td>E</td>
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<td>13:05</td>
<td>MICRO-V</td>
<td>2280-3</td>
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</tr>
<tr>
<td>E</td>
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<td>11/11</td>
<td>07:22</td>
<td>2200MVP</td>
<td>2230CPU</td>
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<tr>
<td>E</td>
<td>56397003</td>
<td>01/13</td>
<td>09:39</td>
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</tr>
<tr>
<td>E</td>
<td>56310006</td>
<td>01/13</td>
<td>07:12</td>
<td>2200MVP</td>
<td>2280-3</td>
<td></td>
</tr>
<tr>
<td>E</td>
<td>56336005</td>
<td>12/30</td>
<td>14:12</td>
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<td>CPU</td>
<td>PER/WORTHINGTON</td>
</tr>
<tr>
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<td>09:49</td>
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<td>CPU</td>
<td></td>
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<tr>
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<td>46022004</td>
<td>01/03</td>
<td>17:13</td>
<td>2200</td>
<td>2280CPU</td>
<td></td>
</tr>
<tr>
<td>E</td>
<td>55343000</td>
<td>11/12</td>
<td>10:25</td>
<td>2200MVP</td>
<td>CPU</td>
<td>OS</td>
</tr>
<tr>
<td>E</td>
<td>62263001</td>
<td>01/14</td>
<td>08:57</td>
<td>2200CPU</td>
<td>2230ORI</td>
<td>T22/MIKE 3</td>
</tr>
<tr>
<td>TYPE</td>
<td>CONTROL</td>
<td>DATE</td>
<td>TIME</td>
<td>SYSTEM</td>
<td>DEVICE</td>
<td>PERSON ASSIGNED</td>
</tr>
<tr>
<td>------</td>
<td>----------</td>
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<td>--------</td>
<td>--------</td>
<td>---------------------------</td>
</tr>
<tr>
<td>P</td>
<td>07051013</td>
<td>02/23</td>
<td>12:12</td>
<td>2200</td>
<td>2290-3</td>
<td>TVS/SANDERS, JAC</td>
</tr>
<tr>
<td>E</td>
<td>16097000</td>
<td>03/32</td>
<td>15:04</td>
<td>2200</td>
<td>2275</td>
<td>+</td>
</tr>
<tr>
<td>E</td>
<td>16307003</td>
<td>02/26</td>
<td>03:23</td>
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<td>2230-3</td>
<td>+ MVP-3, JUNIOR</td>
</tr>
<tr>
<td>E</td>
<td>26062002</td>
<td>02/23</td>
<td>10:07</td>
<td>2200</td>
<td>2275-60</td>
<td></td>
</tr>
<tr>
<td>E</td>
<td>55312002</td>
<td>02/13</td>
<td>03:47</td>
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<td>2280-3</td>
<td>+</td>
</tr>
<tr>
<td>E</td>
<td>56022002</td>
<td>02/09</td>
<td>14:52</td>
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<td>2280-3</td>
<td>+ VAMCO 2280 DPU</td>
</tr>
<tr>
<td>E</td>
<td>56055001</td>
<td>12/12</td>
<td>13:03</td>
<td>MICRO-VP</td>
<td>2280-3</td>
<td>+</td>
</tr>
<tr>
<td>E</td>
<td>56170007</td>
<td>02/09</td>
<td>14:41</td>
<td>2200MVP</td>
<td>2280DPU</td>
<td>+</td>
</tr>
<tr>
<td>E</td>
<td>36297003</td>
<td>02/09</td>
<td>15:12</td>
<td>2200MICR</td>
<td>2280DPU</td>
<td>+</td>
</tr>
<tr>
<td>E</td>
<td>87055001</td>
<td>03/09</td>
<td>12:29</td>
<td>2200LVP</td>
<td>CPU</td>
<td>TVS/US NAVY</td>
</tr>
<tr>
<td>E</td>
<td>46022004</td>
<td>02/09</td>
<td>15:30</td>
<td>2200</td>
<td>2280CPJ</td>
<td>+</td>
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<tr>
<td>E</td>
<td>53430000</td>
<td>11/12</td>
<td>10:25</td>
<td>2200MVP</td>
<td>DPU</td>
<td>+ D5</td>
</tr>
<tr>
<td>E</td>
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<td>03/36</td>
<td>03:13</td>
<td>2200CPU</td>
<td>2280 DRI</td>
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<tr>
<td>E</td>
<td>70430000</td>
<td>02/25</td>
<td>08:25</td>
<td>2200</td>
<td>2280</td>
<td></td>
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</tbody>
</table>
### Memo to Lou Cornish

**Request R&D Assistance**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>P#</strong></td>
<td>I92</td>
</tr>
<tr>
<td><strong>On First Seek</strong></td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Call #</strong></td>
<td>06164195</td>
</tr>
<tr>
<td><strong>Contact</strong></td>
<td>Dan Sullivan</td>
</tr>
<tr>
<td><strong>Position</strong></td>
<td>DTS</td>
</tr>
<tr>
<td><strong>Customer</strong></td>
<td>Hazen Patel</td>
</tr>
<tr>
<td><strong>Locale</strong></td>
<td>Holyoke, MA</td>
</tr>
<tr>
<td><strong>Do R#s Work</strong></td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Error Code</strong></td>
<td>192</td>
</tr>
<tr>
<td><strong>Instruction</strong></td>
<td>List</td>
</tr>
<tr>
<td><strong>Power Up/Spin Up</strong></td>
<td>21^2 23° 24'</td>
</tr>
<tr>
<td><strong>How Often</strong></td>
<td>98%</td>
</tr>
<tr>
<td><strong>Type of R#/Issue</strong></td>
<td>BP3 REFUMB</td>
</tr>
<tr>
<td><strong>DPU E-Adj D</strong></td>
<td>7712.2 - 23° 24'</td>
</tr>
<tr>
<td><strong>Cabling Kit</strong></td>
<td>Y</td>
</tr>
<tr>
<td><strong>Disk Controller</strong></td>
<td>7715</td>
</tr>
<tr>
<td><strong>Status</strong></td>
<td>New</td>
</tr>
<tr>
<td><strong>F &amp; R</strong></td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Daisy Chain</strong></td>
<td>No</td>
</tr>
<tr>
<td><strong>Either Drive</strong></td>
<td>No</td>
</tr>
<tr>
<td><strong>Term #</strong></td>
<td>210-2017</td>
</tr>
<tr>
<td><strong>Chip #</strong></td>
<td>9164-300X2PE</td>
</tr>
<tr>
<td><strong>Chip Color</strong></td>
<td>Black</td>
</tr>
<tr>
<td><strong>Offsets Bored</strong></td>
<td>300 50 150 300</td>
</tr>
<tr>
<td><strong>After</strong></td>
<td>121/11/11</td>
</tr>
</tbody>
</table>

### Additional Notes

- **Explanation:**
  - 192: Handle on 1st seek, fix but may require recalibrating.
  - BP3: Refurb.
  - 7715: New.
  - 9164-300X2PE:
    - 300 50 150 300:
    - 121/11/11:

---

**Jumpers**

- Jumper Plus: 76320101
- Jumper Plus: 76320101
- Jumper Plus: 76320101
- Jumper Plus: 76320101

---

**Parts:**

- 75886102B
- 892-1-R56

---

- **DPU**:
  - Yes: 129 100 175
  - No: 70 20 140
- **DPU**:
  - Yes: 163 7603
  - No: 8705101

---

**Contact List:**

- Rich Lyon/Bruce Knoel
- Gary Lodge
- DTS
- DTS
- AALFSC
- Albany
- Sandi Jacob
- West Reg
Daisy Chained Rx' w/ First Seek Problems

Recommended Team: 726, 6453

Until All Surface AFRs Vibrant, May Have Problems

Steve Shulsky
DTS
Imperial HeadWay
Denver, CO

Gary Looper
G Lennke (MS)
Luvan
Belding, Mi

R7's Not Taken
I90/I91

Backup Only
Spin

50%
CDD BP 4
WRK OP 3

1/6 7/7 16/15 3/7 6/5 5/4
2/4 1/3 2/3 4/4 3/3

Frequent

Bbp 4 new

6541-2°

Using R7's

Y

6541-2
Loader DPU Running, Functions OK. Ret seek.

Cust DPU in Snap testing using R7's.

3/4 fails w/ DSS only

Y

Now but still fails
Problem only on R
Packs. Started on Wrong drive.

Y

Y

Y

Y

Y

N

DSS added 2 20x24 R
75226:20E

CTS 8234

Black

Hi, Requested

Y

Remains

M/installed

4/1006 +

OK so far
Monitoring

41006 7717 2-3
2200 HARDWARE DESIGN ISSUES

1. PROBLEM: Intermittent hangs, I90, and I92 errors after powering up the drive/s when using the R10 DPU proms. I90 and I92 are disk hardware errors caused by the disk drive not responding properly to the system.

CIRCUMVENTION: a. Downgrade to R7 proms. R7 proms may present a data integrity problem on a surface with alternate sectors.
   b. Key reset on workstation.
   c. Have a DPU installed for each Phoenix drive if daisy-chained.
   d. Try an old CDC Terminator with the black chips or possibly one with the white chips. The newer terminators, especially from Wang are noisy and may have a relationship to the problem.
   e. Power DPU on and off every time a drive is powered up. The DPU should not be powered on and off when the attached Phoenix is on-line and ready.

R & D CONTACT: Mike Riley, Lou Cornaro, S.K. Ho

STATUS: On August 13th, 1986 a trip was personally made to Hazen Paper in Holyoke, Ma to install an updated 7422 board. On site after speaking with the CE it was realized that this customer did not have the exact problem they were thought to have. Only one drive had a problem and whether configured as a single drive or daisy-chained it would fail consistently with an I92 on first seek after a spin-up. Tried both 7422 boards in any case but they did not correct the problem but did functionally work. Imperial Head Wear then became the primary site. On Friday, September 5th the board was tested on-site. A back-up was done to test, the fix and on the 3rd spin-up the system hung which is exactly what has been happening on this site.

On September 12th I met with Lou Cornaro, Manager of Continuation Engineering to discuss the problem. At this time I am collecting specific data defining the problem and the exact hardware involved at each site, from all sites experiencing problems with R10's where R7's work error free. This information will then be given to R&D. The R10 proms are the catalyst for the problem and Lou will be sitting down with Dave Barrett who wrote the code for the R10's to determine what may need to be done. R&D has requested the 7422 board from Imperial Head Wear which I have requested from the field. This may be a problem at this time as the system is being heavily used. Right now the board will be removed at a next call basis. This may need to change if not agreeable with R&D. Looking into the possibility of either having equipment experiencing the problem sent in or possibly having R&D go on site if a local site can be made available.
ACTIVE CALLS: ESCALATIONS: (daisy-chained drives)
06143042 TABB, BROCKENBROUGH
66170007 LUVAN
86007000 IMPERIAL HEAD WEAR
H6022004 NAVAL SEA SYSTEMS
P5343000 TAIWAN
P6083000 TESTRITE COMPANY, LTD
(single drives)
06164095 HAZEN PAPER
66022002 VAMCO MACHINE
P6226001 AALFSC

2. PROBLEM: When using a printer/disk controller (210-7342) with the Phoenix Disk Drive or the 2275, intermittent I90, I91, I92, and possibly I96 errors occur. I90, I91, and I92 errors are caused by the disk unit not properly responding to the system. I96 is a read error.

CIRCUMVENTION: a. Place the 7342 printer/disk controller in the last I/O slot of the CPU farthest from the CPU boards. In testing for this problem it was found that boards which fail solidly when next to the CPU boards ran error free when placed in the last I/O slot.
b. Replace the printer/disk controller with the older version printer/disk controller (210-7042-2) if available.
c. Replace the printer/disk controller with a single disk and a single printer controller.
d. Replace the printer/disk controller with a triple controller (212-3012), workstation/printer/disk. Although no problems have been reported with this board the design is the same as the 7342 printer/disk controller. As such this board may also exhibit the same problems.

R & D CONTACT: Gil Carrier, Lou Cornaro, Mike Riley

STATUS: R & D has identified the problem with this board. The problem is related to the design of the line driving circuit and the speed of the chips used. R & D has updated 25 boards, thirteen which have been domestically distributed. All domestic boards are currently installed at beta sites and all have reportedly been running error free.

A limited number of new artwork boards are being prepared at this time and hopefully will be ready by November. At that time the new boards will replace some of the updated boards now being beta tested and serve as beta boards themselves. Once the new beta boards prove successful all the updated boards now being beta tested will be returned and replaced with the new artwork boards. The new boards will then go into mass production and production on the 7342 board will be stopped.
On Wednesday, August 20th a meeting was held w/ R&D, Logistics, and Product Support in attendance to determine the fate of the 7342 board. Since many of the boards work without error the board will still be available. As new boards become available many of the old boards will end up on stockroom shelves unused where eventually a decision will be made probably to junk the greater majority.

A similar fix will also be needed for the 212-3012 Triple Controller (terminal/printer/disk) as this board has the same design issue.

A TSB was sent out with the July 1st issue on the status and circumventions with the 7342 board.

**ACTIVE CALLS: ESCALATIONS:**

- 16097000 NORTHWEST SAVINGS (beta)
- 26062002 OCEAN CITY POLICE (beta)
- 65312002 GEORGE JR REP (beta)
- 66066001 ASSOCIATION OF DERMATOLOGY (beta)

**3. PROBLEM:** Poor mating connection between the I/O cable and the I/O port on the 8396 board of the 2275.

**CIRCUMVENTION:**

a. A shorter standoff (462-0452) can be ordered and used to replace the larger standoffs.

b. Extra care taken to insure proper connection and unit operating properly.

c. Trying a different I/O cable may help.

**R & D CONTACT:** Steve Caparella, Mario Palmeri, Harvey Worthington

**STATUS:** A shorter standoff (462-0452) is being used to replace the current standoff. This should allow the cable to firmly mate. Steve Caparella is suppose to write a TMD which is used in manufacturing to incorporate the change. He will also write the ECO. Have been trying to contact Steve to verify the TMD and ECO are done but there has been no answer at his extension. Harvey Worthington was going to write a TSB informing the field of the new standoff but as of now has not. Will followup with both to insure at least the TMD and ECO are done.

**ACTIVE CALLS: ESCALATIONS:**

- 26062002 OCEAN CITY POLICE

Mike Bahia
Product Line Engineer
Technical Assistance Center

September 18, 1986

0980D
**I/O Board**

- **726-5178**
  - Series Code 2 (Unique to Wane)
  - LOC NORM
    - 1 on
    - 2, 3, 4 off
  - 75891850
  - 77616751
  - No Switch 77616776R
  - 77616790
  - 77622500
  - Series Code 3 (Universal)
  - 726-6669
  - *77656650 Series Code 4 (Universal)

**Control Mux**

- **726-5179**
  - U33 from bottom 90° 60° 30° 77616600
  - 1 off
  - 77624700
  - 2, 3 on (2 off, invert, vol) 726-6668
  - *77666950

**Servo Coarse**

- **726-5180**
  - VS sw 4 off 2, 3, 5, 6, 7, 8 on
  - 2200/015 sw 7 off only
  - 75885600
  - 77622400
  - 77622401
  - 77622402
  - 77622403
  - 77622750
  - 77666800
  - *77666801
  - 77682950

**Relay Board**

- **726-5686**
  - BP 3 only
  - 75898850
  - 77634490

- **726-6724**
  - BP 4 only
  - 726-6724A
  - 77680650
  - 77713900

---

Potential issues with mixing old and new boards:

- **Possible problems if intermix**
- **New boards w/ old boards**
INFORMATION CALL

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

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

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

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

CUESTION (*) / 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
+CONTROLERS. 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 BRD'S 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 CURVE WAS FOUND
+TO BE A NEWER VERSION OF THE I/O 2RD W/ THE SW BK, OLDER &
+NEWER VERSIONS OF THE OTHER CARDS CAGE BRD'S WERE TESTED BUT
+NO DIFFERENCE WAS FOUND. THE CDC 77516770A I/O BRD WOULD
+CAUSE SOFT ERRORS WHEN CHANGING VOLUMES W/ EITHER OLD OR
+NEW CDC BRD'S ON THE VS85 W/ EITHER A 22V28 OR A 22V88.
+GIVING COPY OF CALL TO DJ.

(30MIN) MIKE
3. PROBLEM: I92 error followed by I90 a couple of times a week on systems with more than 1 CPU multiplexed to the same Phoenix drive. I92 and I90 errors are generated by the Phoenix DPU not properly responding to the system.

FIX: ECN 41006 has been released and all boards sent in for repair will now have this fix incorporated.

R & D CONTACT: Gilles Carrier

ACTIVE CALLS: ESCALATIONS:

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4. PROBLEM: Poor mating connection between the I/O cable and the I/O port on the 8396 board of the 2275.

CIRCUMVENTION: a. A shorter standoff (462-0452) can be ordered and used to replace the larger standoffs.
b. Extra care taken to insure proper connection and unit operating properly.
c. Trying a different I/O cable may help.

R & D CONTACT: Steve Caparella, Mario Palmeri, Harvey Worthington

STATUS: A shorter standoff (462-0452) is being used to replace the current larger standoff. This should allow the cable to firmly mate. Steve Caparella is writing a TMD which is used in manufacturing to incorporate the change. He will also write the ECO. Harvey Worthington will write a TSB informing the field of the new standoff. Waiting for both Steve and Harvey to followup.

ACTIVE CALLS: ESCALATIONS:

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Mike Bahia
Product Line Engineer
Technical Assistance Center

0974D

August 5, 1986
TECHNICAL SERVICE BULLETIN
SECTION: HARDWARE TECHNICAL

NUMBER: HWT6291       REPLACES: _______       DATE: 11/18/86       PAGE 1 OF 1
MATRIX:  3110          PRODUCT/RELEASE #  2275

TITLE: 2275 I/O CABLE PROBLEM

PURPOSE:
To inform the field on some cases of poor mating connection between the
I/O cable and the I/O port connector on the 210-8396A board.

EXPLANATION:
Manufacturing has used some standoffs on the 2275 port connector that
prevent the I/O cable from making a good electronic contact with the
210-8396A port connector on the board causing I-92 errors.

The circumvention are:
- Reinsert the I/O cable into the port of the 2275 unit.
- Try a different I/O cable.

Boards with the wrong standoffs can be identified by observing the I/O
cable connector sitting too high on the 210-8396 port connector.

To correct this problem, the correct standoff, HLN 462-0452, can be ordered
from stock.
McElven Insurance

1. NEED TO KNOW EXACT ERRORS? I90
2. WHEN EXACTLY ERRORS OCCUR?
3. HOW OFTEN DO THEY OCCUR?
4. CAN WE MAKE IT FAIL?

FIELD TO DO

1. INSURE NO RIPPLE ON DPU VOLTAGES.
   Check using DVM while drive is up & READY & BEING ACCESSED. Use a loop on a LIST command. All ripple should be less than 30 mil V on all voltages. Check a 2nd time after running 10-15 min consecutively.

2. INSURE IF TRY TO ACCESS DRIVE WHEN NOT READY, BUT BLOWER ON, ALWAYS RESPONDS W/ I91. Use a LIST & TRY 15-20 TIMES IN A ROW.

3. VERIFY DRIVES WORK FINE, RUNNING RANDOM R/W's & IF HAVE 1ST SEEK SYMPTOMS & REPRODUCE

1. TRY DRIVES INDIVIDUALLY. IF PROB NOT
Reproducible with 1 drive & was with 2, may have terminator problem.

2. If reproducible with only 1 drive, test again w/ 2nd set of DPU brds & then w/ 2nd set of PX brds. If still failing align drive to tightest specs reasonably possible, even if in alignment. Reformat all surfaces including removable & retest.

3. If both drives fail repeat step 2 on 2nd drive.

If still failing w/ first seek circumventions are:

R? proms - Must reformat all surfaces
different drives - Not all drives have 1st seek prob.
Argus Insurance, Yakima, WA  RDB 3830  86297003
Downgraded to R7 PROMS & ERROR-FREE. Did format all surfaces but kept failing w/ R10's PROMS. Trying to run RedShaw SW/Pack.

Naval Sea Systems, Indian Head, MD  RDB 3492  H6022004
Running error-free w/ 2 DPU's. Now on 3rd party maintenance.

Sanders Jacob, GRI  CA  RDB 3810  07051018
Downgraded to R7 PROMS & ERROR-FREE
I92 on 'First Access' can reset at terminal.
Alignment off, was at 800 - 1000 mV, best could get 800 mV.

Mutual Insurers, Richmond, VA  RDB 3432  07065045
Aligned, drive & tested OK  approx 100 mV before, 15 mV after.
I92 on 'First Access' 75% of time

Testrite, Taiwan  RDB 9908  PS343000
Downgraded to R7 PROMS & ERROR-FREE
Hangs I90, I92 during sort program 'First Access'?
Mike,

I know that R&D does not want to hear that there are any 2280 DPU's with PROM's below R-7, but the reality is there are some out in the field. Up until now, going from below R-7 PROMs to R-10 PROM's has resulted in basically an operational inconvenience or problem. However, as the enclosed memo points out, there also appears to be a risk of losing data when working with Redshaw software systems. I am forwarding this information to you for general info., as I understand you are pursuing the R-10 update situation.

Regards, Cal Blackburn DTS (206-340-6129)
A problem has occurred in the Northwest District after updating a 2280 DPU from R-5 to R-10 PROM's on a Redshaw software system. The DPU was first updated to R-7 PROM's and the fixed platters were reformatted. This then allowed the DPU to be updated to R-10 PROMs and the fixed platters were then reformatted again. Software and data were restored, and system appeared to be operating normally. One week later, upon restoring data following a software update, it was found that from 1/3 to 1/2 of the Risk File data was missing. Redshaw software was contacted and they said they were aware of this problem. It is a result of the backup routine writing to removable platters that were still formatted from the R-5 PROMs. No errors were generated during backup routines following the R-10 PROM update. CE is presently trying to recover the lost data by taking the DPU back down to R-5 PROMs.

This is another instance of "BEWARE", when updating to R-10 PROMs in the 2280 DPU.
TAC
CRITICAL ACCOUNT

CONTACT NAME: PETER MALECKI
POSITION: DTS
RDB #: 3150
TDX #: PHONE #: 208-356-7944
EXT #: 

SYSTEM TYPE: 2200MVP
DEVICE TYPE: CPU
UTILITY NAME: SOFTWARE LEVEL

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

USE THE FOLLOWING AREA TO DESCRIBE THE SITE THAT CREATED THIS REQUEST
CUST/office NAME: SKANsKA
PHONE #: 203 869 1760
ADDRESS: 3A CITY GREENWICH STATE CT
ON SITE CONTACT NAME: #2200 FS2

PROBLEM (#) SOLUTION (#)

*THIS MACHINE HAS HAD MANY PROBLEMS. NOW IT HANGS WHEN THE
*HANGS WHEN CUST TURNS IT ON, OR WILL HANG DURING THE DAY.
08/12/86: HAVE BEEN WORKING WITH JOHN MURDOCK OVER THE PAST
FEW WEEKS. THIS HAS BEEN AN INTERMITTENT PROBLEM.
ALL HAS BEEN GOOD FOR THE LAST TWO WEEKS.
08/12/86: SPOKE WITH PETER AND THE CE YESTERDAY, THE CE IS
TO CALL ME NEXT TIME HE IS ON SITE. J.MURDOCK
08/13/86: SPOKE WITH JOE ADELIZZI DPU HAS HIGH AC RIPPLE ON
+12V (B3MV) HE IS ORDERING A CHASSIS AND REG IF
NOT IN STOCK. THE RIPPLE IS A RE-OCcurrent PROBLEM.
THE PROBLEM IS NOW DURING POWER-UP ONLY, THE DPU
IS ALL THAT NEEDS TO PWR OFF/ON. JOE CHANGED THE
210/7421 TODAY AND WILL MAKE MORNING MONITORS FOR
SYSTEM PWR UP IN AM TO SEE THE OUT COME.
J.MURDOCK
08/22/86: STATUS?
J.FORBES
09/03/86: SEEMS TO BE WORKING WILL MONITOR FOR ANOTHER WEEK
TO SEE IF IT WILL WORK. R.ROBERTO
09/05/86: WORKING OK. (R.ROBERTO)
09/11/86: HAD ANOTHER HANG. WITH I 92 ERRORS, AND PROGRAM
ERRORS. CUSTOMER GETTING HOT. THIS HAS BEEN AN
INTERMITTENT ONE IT WILL GO TWO TO THREE WEEKS
WITH NO PROBLEM. WE CAN NOT AT THIS TIME WAIT FOR
ANOTHER HANG. CAN WE FORCE A HANG TO TRY TO FIX
IT, I ALSO AM REQUESTING ON SITE SUPPORT TO HELP
US GET TO THE BOTTOM OF THIS. (R.ROBERTO)
09/22/86: COMPLETED ALL TESTS THAT WERE NEEDED TO BE DONE.
TEST DID NOT SHOW ANYTHING WE COULD NOT REPRODUCE
THIS PROBLEM. REQUEST ON SITE SUPPORT. R.ROBERTO
09/22/86: TALKED WITH CE W.MECHEN THE DIAG RAN OVER NITE,
SYSTEM HAS NOT FAILED SINCE 11TH, WHEN THE CE WAS
ON SITE HE HAD A HANG ONCE AND A I-90 ONCE DURING
A WARM BOOT, RESET AND A 2ND TRY WORKED. GOING BY
09/23/86: 

J. MURDOCK:
ESCALATING CALL TO H.O. J. MURDOCK IS ON VACATION FOR TWO WEEKS. DISTRICT IS REQUESTING ADDITIONAL SUPPORT. WOULD LIKE TO HAVE J. FORBES REVIEW THIS CALL WITH PRODUCT SUPPORT TO DETERMINE ADDITIONAL PLAN TO ADDRESS THIS HIGHLY INTERMITTENT PROBLEM.

G. McMANN

$10/02/86:
WENT ONSITE WITH P. MALECKI 10/1. SYSTEM WAS RUNNING 6789 + 6790 REPLACEMENT, SEE IF PROBLEM CAN BE.
IF NEEDED CHANGE THE 6791, 6792.

$10/02/86: 

POWERED 2280 & DPU OFF, BROUGHT THEM BOTH UP AND COULD NOT ACCESS DRIVE. DISABLED DRIVE I/O AND PWR DPU OFF/ON AND WAS ABLE TO ACCESS DRIVE. FOUND SOME BROKEN CAPS AND LOOSE ECN WIRES ON THE 7422 BD.
REPLACED 7422 BD AND COULD NOT REPRODUCE HANG. RAN RND VERIFY BETWEEN FIXED AND REM NO PROBLEM.
CHECKED VOLTAGES, ALL WITHIN TOLERANCES WITH MIN. RIPPLE. ALL BDS AT CURRENT E-REV. SYSTEM RUNNING 2.5 SOFTWARE. WILL BURN IN A DPU IN DISTRICT OFFICE.

$10/02/86:
CUSTOMER HAD ANOTHER HANG AROUND 8:30 THIS MORNING WE ARE WORKING ON DPU TO REPLACE AT CUSTOMERS SITE WE HAVE REPLACED THIS DPU BEFORE. WE NEED A ACTION PLAN OF ON SITE SUPPORT IF THIS CUSTOMER HAS ANOTE HANG WITH THIS NEWLY REPLACED DPU. TIM HEALD

$10/02/86:
REQUESTING PRODUCT SUPPORT ON-SITE ASSISTANCE IN IDENTIFYING THIS HIGHLY INTERMITTENT PROBLEM. RTS ON SITE YESTERDAY. COULD NOT IDENTIFY ANY ISSUES. SPOKE TO M. THOMPSON AND PLANNING TO HAVE ON SITE VISIT PLANNED FOR MONDAY, 10/6.

G. McMANN

$10/3/86:
9:00 SPOKE W/ J FORBES. APPEARS TO BE 2 VERY INTERMITTENT PROBLEMS. 1. INTERMITTENTLY ON FIRST ACCESS AFTER A POWER UP OR SPIN UP SYS MAY HANG & THE DPU NEEDS TO BE RESET BY POWERING IT ON & OFF & TO CORRECT. THERE IS A GOOD CHANCE THIS MAY BE DUE TO THE R10 PROMS IN THE DPU. IF USING R10 PROMS ALL SURFACES INCLUDING ALL REMOVABLE PACKS MUST BE FORMATTED W/ R10 PROMS OR THIS TYPE PROBLEM COULD RESULT. IF ALL SURFACES INCLUDING ALL REMOVABLE SURFACES HAVE BEEN FORMATTED DOWNGRADING TO R7 PROMS WILL RESOLVE IT IF THE PROBLEM IS THE R10 PROMS. THIS IS A PROBLEM R&D IS CURRENTLY WORKING ON. LESS LIKELY IS THERE IS A FLAKEY PROBLEM IN THE DRIVE OR DPU WHICH NEEDS TO BE CORRECTED. IN THIS CASE WE WOULD NEED TO SYSTEMATICALLY GO THRU THE DRIVE & DPU REPLACING FRU'S.

2. THE 2ND PROBLEM ASSUMING R10 PROMS ARE THE 1ST IS INTERMITTENTLY THE SYSTEM WILL HANG DURING OPERATION. THE 7422 BRD JF REPLACED ON 10/1 MAY HAVE BEEN THE CAUSE. OTHERWISE ALIGNMENT NEEDS TO BE VERIFIED, ALL SURFACES SHOULD BE REFORMATTED AGAIN, & IF STILL OCCURRING WE WOULD NEED TO SYSTEMATICALLY GO THRU THE DRIVE & DPU AS ABOVE. IF NO ERROR MESSAGE IS PRESENT MAY BE A CPU PROBLEM, MOST LIKELY THE 6791. IN ANY CASE EVERY ERROR AT THIS TIME NEEDS TO BE ACCURATELY DOCUMENTED INCLUDING ERROR CODE, WHAT WAS BEING DONE WHEN FAILED, WHAT SURFACE WAS BEING ACCESS IF KNOWN, & WHAT REMOVABLE PACK WAS MOUNTED.

9:45 TALKED W/ PETER M. CUST RUNNING OK AT THIS TIME. TRYING TO LOCATE AN R7 BRD. WILL ALSO FIND OUT EXACTLY WHAT ERRORS HAVE OCCURRED SINCE 10/1, & INSURE ALL SURFACES INCLUDING ALL REMOVABLE PACKS HAVE BEEN FORMATTED W/ R10'S. MIKEB

$10/03/86:
PER M. BAHIA, P. MALECKI TO INSTALL R7 PROMS AND $10/06/86: MIKE BAHIA (PRODUCT SUPPORT) TO MEET DISTRICT ON SITE AT 11AM PER CONVERSATION WITH RON OLSON.
$10/7/86: MIKE BAHIA ON SITE WITH BM, CE, DTS. WILL ADVISE OF PROBLEMS FOUND AND ACTION PLAN..... RICH ROBERTO

$10/8/86: MACHINE FAILED AGAIN TODAY... PLEASE ADVISE ON WHAT OUR NEXT MOVE SHOULD BE. RICH ROBERTO

$10/08/86: MACHINE FAILED THIS MORNING. CUSTOMER IS VERY UNHAPPY. PRODUCT SUPPORT ON-SITE VISIT PROVED TO BE OF NO VALUE-ADDED. RAISING TO CRITICAL STATUS. IF R-10 PROMS ARE THE PROBLEM, NEED R&D INVOLVEMENT. COMMENT WAS MADE THAT CUSTOMER IS USING A BLOCK-3 PHOENIX DRIVE AND THAT R-10 PROMS DO NOT EXPERIENCE THESE PROBLEMS WHEN RUN WITH A BLOCK-4 DISK DRIVE. IF THAT IS THE CASE, AN EXCHANGE SEEMS THE MOST EXPEDITIOUS APPROACH. G. MCMANN

$10/08/86: SPOKE TO RON OLSON ABOUT POSSIBLE EXCHANGE OF DISK DRIVE FOR BLOCK POINT 4 DRIVE. WAITING HIS INVESTIGATION AS TO WHETHER THAT WILL RESOLVE THE IMMEDIATE CUSTOMER PROBLEM. G. MCMANN

$10/09/86: CUSTOMER THREATENS TO CALL DR. WANG AGAIN. DSSM FORCED TO COMMIT REGION ON SITE AGAIN TODAY. RTS (J. MURDOCK) ON SITE THIS MORNING. WHILE PRODUCT SUPPORT MAY NOT SUPPORT 2200 SYSTEMS ANY LONGER, IF THE PROBLEM IS IN FACT WITH THE R-10 PROMS IN THE DPU, THEN THE FIELD WILL NEVER BE ABLE TO FIX THIS PROBLEM. WOULD AN EXCHANGE OF THE BLOCK POINT 3 DISK DRIVE BE VALUABLE? CAN ANYONE VERIFY THAT SUCH AN EXCHANGE WILL RESOLVE THE PROBLEM FOR THIS CUSTOMER? G. MCMANN

$10/10/86: ON SITE TUES, 10/7. TESTED SYSTEM. COULD NOT DUPE POWER UP PROBLEM. DID FIND A NEW PROBLEM W/ W/S'S HANGING. TRIED BOTH TERMINAL_MUX BRDS USING THE 1ST_MUX_BRD REPLACED TO REPLACE THE 2ND WHEN THE PROBLEM OCCURRED A 2ND TIME. HAD TO REPLACE THE REG_BRD IN DPU FOR RIPPLE PROBLEM ON 12V. NEXT MORNING IT APPEARED THAT BOTH THE 'FIRST ACCESS' PROBLEM THEN THE TERMINAL PROBLEM OCCURRED. BOTH TERMINAL_MUX BRDS HAVE NOW BEEN REPLACED & THE 6792 & 6793 AS WELL ON 10/9. THE TERMINAL PROBLEM HAS NOT OCCURRED SINCE. MOST TERMINALS ON THIS SITE ARE IN CARPETED OFFICES & THE POSSIBILITY OF A STATIC PROBLEM EXIST. SOME OF THE TERMINAL CABLES ARE NOT WANG & MAY ALSO BE A PROBLEM. AM IN THE PROCESS OF LINING UP R7 PROMS IF NEEDED.

>GARY, HAVE DOCUMENTATION ON 7 SITES W/ THE 1ST SEEK PROBLEM. IN ALL CASES THE R7 PROMS HAVE NOT EXHIBITED THE PROBLEM. AT SOME OF THESE SITES THE DRIVE HAS BEEN REPLACED TEMPORARILY W/ THE LOANER WORKING FINE. SOME SITES HAVE 2 DRIVES W/ ONLY 1 EXHIBITING THE PROBLEM. AT THIS TIME THE BLKPT 3 SEEMS MORE LIKELY TO EXHIBIT THE PROBLEM BUT MANY BLKPT 3 DRIVES WORK. WITH EITHER A BLKPT 3 OR 4 IT WOULD HAVE TO BE TESTED TO INSURE IT DID NOT HAVE THE PROBLEM. HAVING THE R7 BRD AVAILABLE WOULD BE A GOOD IDEA. MIKEB

$10/14/86: WHEN ON SITE FOUND W/S CABLES NOT WIRED CORRECTLY, CORRECTED ALL CABLES. ALSO FCO 1161 WAS NOT INSTALLED. THIS IS A PREREQUISITE FOR R-10 PROMS. THE 6793-1 AND 6792 PCB'S IN THE CPU WERE CHANGED FOR POSSIBLE CPU/WS HANG PROBLEM. J. MURDOCK

#10/14/86: MONITOR

$10/15/86: THE SYSTEM FAILED AGAIN. RTS (J. MURDOCK) ON SITE LAST THURSDAY AND FRIDAY. REPAIRED CABLE CONNECTIONS, INSTALLED MISSING FCO AND A NUMBER OF OTHER ISSUES WERE ADDRESSED. AFTER TALKING TO PRODUCT SUPPORT, AM NOT SURE THAT THIS PROBLEM CAN BE RESOLVED USING NORMAL REPAIR PROCESS. R-10 PROMS
AND 'BLOCK POINT 3' PHOENIX DISK DRIVES GET MENTIONED AS ISSUES THAT AFFECT THE SITUATION. DOWNGRADING TO R-7 PROMS SEEM NOT TO BE A GOOD LONG-TERM SOLUTION. EXCHANGING THE BP-3 DRIVE FOR A 'BP-4' DRIVE HAS BEEN SUGGESTED, BUT NO ASSURANCE HAS BEEN MADE THAT PROBLEM WILL BE RESOLVED IF THAT ACTION IS TAKEN. NEED PRODUCT SUPPORT ASSISTANCE TO COME UP WITH ACTION PLAN TO RESOLVE THIS CUSTOMER ISSUE. G. McMANN

CE TO BE ON-SITE EA MORNING FOR POWER UP.

INSTALLED SINGLE BRD DPV FROM SOUTHERN DATA & NO PROBLEMS SINCE.
TECHNICAL SERVICE BULLETIN
SECTION: Hardware Technical

NUMBER: HWT 6256  REPLACES:   DATE: 11/11/86  PAGE 1 OF 1
MATRIX ID. 3104  PRODUCT/RELEASE# 2280/2280 DPU

TITLE: R10 Prom Problem

PURPOSE:
To inform the field of an existing problem with R10 Proms.

EXPLANATION:
A problem has been identified with the R10 Proms located on the 210-7423A board in the Phoenix DPU. With some Phoenix drives on "first access only" after a power up or spin up, a hang or I92 error may result. This problem may occur intermittently, or consistently. Most drives work fine. The problem does seem more prevalent with Blockpt 3 drives than Blockpt 4. A drive would have to be formatted and tested with R10 Proms to insure compatibility.

Some systems require the DPU to be powered off and on to correct the error, while others can be "Reset" from the terminal. Once this is done, the system will work error free. The 'first access' problem is the only known problem with R10 Proms. All other problems should be fixable. R&D is aware of the problem and is working on a fix.

Please be aware that when using R10 proms, all surfaces must be formatted with the R10 Proms. If not, the 'first access' problem and/or other problems may result. This is true even if only accessing the surfaces formatted with R10 Proms. The reason is with R10 Proms only, the alternate sector map for each surface is read each time the heads are loaded.

The only other proms that could be used are the R7 Proms. The R7 Proms have a different number of alternate sectors (twice that of R10's). If using R7 Proms, all platters should be formatted with the R7 Proms as a precaution. R7 Proms do not have the 'first access' problem but may present a data integrity problem on a surface with alternate sectors. Most R7's work fine. R7 Proms will read platters formatted with R10 Proms but must not be left in without formatting.

R7 Proms cannot be ordered from Logistics. Please call On Line Product Support (TAC) with any questions concerning this TSB.

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

COMPANY CONFIDENTIAL

WANG Laboratories, Inc.
TO: Gil Carrier  
FROM: Mike Bahia  
SUBJECT: Phoenix DPU R10/R7 Population  
DATE: April 16, 1987  

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TOTALS: 1996/5 1152/63 204 182 3330

**R7/PROB** - first number is total of DPU's in District with R7 Proms. The number following the slash, if present, indicates systems with R7 Proms experiencing a Phoenix or DPU related problem.

**R10/PROB** - first number is total of DPU's in District with R10 Proms. The number following the slash, if present, indicates systems with R10 Proms experiencing a Phoenix or DPU related problem.

**R10 DWNGRDE** - number of sites where proms were downgraded due to problems with R10 Proms.

**OTHER/UNK** - number of sites where prom level is unknown or lower than R7.

**TOTAL** - total number of DPU's in District.
Purpose:
To inform the field on the model 2275 giving I-92 error running customer applications.

Explanation:
In the last 16 weeks manufacturing built the 210-8396 Rev. 4 with the wrong memory chips at locations L9, L10, L11, L12, L13, L14, L15, L16 and L17. The wrong memory chips are from Siemens – SHY B4164 / P2 LF and are out of specifications.

Boards with these memory chips are causing I-92 errors. The correct WLN for the memory chips is 377-0466.

Boards with the incorrect memory chips can be corrected in the field by replacing the Siemens memory chips.

Manufacturing processed a Purge Notice to correct their stock. CE Logistics and Repair Centers were notified of this problem and will correct boards as they are returned.
ITEM SUBJECT: R-10 PROMS

TO: KEVIN NATHES, DTS
FROM: CAL BLACKBURN, DTS
DATE: NOVEMBER 7, 1986
SUBJECT: RECENT PROBLEMS WITH 2260 DISK SYSTEMS RELATING TO R-10 PROMS IN THE 2280 DPU.

WE HAVE EXPERIENCED SEVERAL PROBLEMS RECENTLY IN THE DISTRICT, WHICH SEEM TO BE RELATED TO THE R-10 PROMs ON THE 210-7423a BOARD, IN THE 2280 DPU. PROBLEMS HAVE OCCURRED DURING NEW SYSTEMS SOFTWARE INSTALL AND FOLLOWING CORRECTIVE MAINTENANCE. THE FOLLOWING SPECIFICS ARE INCLUDED AS EXAMPLES OF SOME OF THE PROBLEMS ENCOUNTERED.

1. CORKERY & JONES INSURANCE, SPOKANE, WA.
   DURING INSTALL OF REDSHAW ADVANTAGE SOFTWARE FOLLOWING NEW EQUIPMENT INSTALL, SOFTWARE WOULD CONSISTENTLY HANG AT THE SAME STEP. SOFTWARE WOULD COMPLETE "PTOC MERGE", BUT FAIL TO CONTINUE ON TO NEXT SET OF DISPLAYED INSTRUCTIONS. SYSTEM CONSISTED OF A 2260 MICROV-P-2, 2230-3 PHOENIX DRIVE, 2280 DPU AND WAS USING THE 2436DE TERMINAL DURING INSTALL. GC REPLACED ORIGINAL 2230 DPU CONTAINING R-10 PROMs WITH A TESTED 2230 DPU CONTAINING R-9 PROMs FROM THE SHOP. INSTALL SOFTWARE RAN NORMALLY, AND SYSTEM CONTINUES TO RUN WITH NO PROBLEMS USING THE R-9 PROMs.

2. ARGUS INSURANCE, YAKIMA, WA.
   DURING INSTALL OF REDSHAW ADVANTAGE SOFTWARE FOLLOWING NEW EQUIPMENT INSTALL, SOFTWARE WOULD CONSISTENTLY HANG AT THE SAME STEP. SOFTWARE WOULD COMPLETE "PTOC MERGE", BUT FAIL TO CONTINUE ON TO NEXT SET OF DISPLAYED INSTRUCTIONS. SYSTEM CONSISTED OF A 2260 MICROV-P-2, 2230-3 PHOENIX DRIVE, 2280 DPU AND WAS USING THE 2436DE TERMINAL DURING INSTALL. PROBLEM WAS ESCALATED TO DISTRICT. DTS VERIFIED THAT SYSTEM WOULD PERFORM STANDARD DRIVE OPERATIONS USING WANG MVP D.S. REL. 2.0.4. NO PROBLEMS WERE ENCOUNTERED IN PERFORMING FORMAT, COPY, MOVE OR VERIFY ROUTINES. A SECOND COPY OF THE SOFTWARE WAS SENT TO THE SITE BY REDSHAW. THIS SOFTWARE ALSO FAILED IN THE SAME MANNER AS THE ORIGINAL COPY. DTS TRIED USING PRETESTED CABLES AND A TESTED 2230 DPU WITH R-10 PROMs WITH NO CHANGE IN PROBLEMS SYMPTOMS. DTS INSERTED R-7 PROMs INTO 7423a BOARD IN ORIGINAL 2280 DPU AND INSTALL SOFTWARE RAN NORMALLY AND TO COMPLETION. AFTER INITIAL SOFTWARE WAS INSTALLED, WE REINSERTED THE R-10 PROMs BACK INTO THE DPU AND THE SOFTWARE WOULD CONSISTENTLY HANG DURING SOFTWARE EXECUTION OF LIBRARIES/DOCUMENTS SETUP. R-7 PROMs WERE REINSERTED IN THE DPU AND SITE HAS CONTINUED TO RUN NORMALLY.
3. **USN/PSNS TOOL CONTROL, BREMERTON, WA.**

During post maintenance procedures on a 2230 Phoenix disk drive, drive could not be successfully accessed for any operations without generating an error and going to a hang condition. System consisted of a 2230 MVP-64, 2230-3 Phoenix, 2230 CPU and three 2236D terminals. Maintenance had consisted of replacement of fixed module, carriage/coil assembly, two fixed heads and one removable head. Drive had been aligned and testing run from a to 210 FTU. Drive would successfully access, format, read and write when using the FTU, but would error when using the system. When accessed from the system, the drive would perform an RTZ, seek to cylinder 322 and hang. System would indicate either an error I-91 or I-93. All attempted drive operations, including format failed in the same manner. Problem was escalated to District. DTS checked drive and ran FTU testing with no problems. However, when connected to system, the same symptoms remained. Tested cables and tested CPU with R-10 PROMs were tried with no change in the problem. All boards in the disk drive were changed with pretested boards. No change in problem occurred. Drive was connected to an operational system and the failing system was connected to operational drives. At this point all drives could be successfully accessed. R-7 PROMs from the operational system were used to format the failing drive. The R-7 PROMs were then returned to the operational CPU, and R-10 PROMs were reinserted back into the failing system CPU. Following the completion of formatting using R-7 PROMs in the CPU, the failing drive could be successfully accessed and formatted. Drive was reformatted using R-10 PROMs and returned to normal system operation.

4. **U.S.C.G., SEATTLE, WA.**

After maintenance on the 2230 CPU, disk operations failed with errors I-90, I-92 and disk hang. System consisted of a 2230 MVP-62, 2230-3, 2230 CPU and three 2236D terminals. Failure of the 2230 CPU resulted in a hard disk hang indication. The 210-7423A board in the 2230 CPU was changed. Original 7423A contained R-5 PROMs and replacement 7423A contained R-10 PROMs. Reformating was attempted per TSD 5000 instructions, at which point problems occurred. Problem was escalated to District. After many parts were changed in both the drive and the CPU, R-7 PROMs were inserted onto the 7423A board and drive functions returned to normal. Drive was then reformatted using the R-7 PROMs, R-10 PROMs were reinserted onto the 7423A board and drive was reformatted successfully.
ADDITIONAL R-10 PROM RELATED PROBLEMS THAT HAVE OCCURRED.

1. SMSG PSNS TOOL CONTROL.
   WHEN PERFORMING BACKUP USING IMMEDIATE MODE COPY STATEMENT, FAULT LIGHT FLASHES ON THE JFF DURING FIRST ACCESS; PROBLEM COULD BE DUPLICATED ON THE DISTRICT 2200 SYSTEM USING ANY MVP OPERATING SYSTEM. OBSERVING DRIVE WHEN FAILURE OCCURS GIVES THE FOLLOWING INDICATIONS:
   A. DRIVE SPINS UP AND HEADS LOAD NORMALLY.
   B. UPON EXECUTION OF THE COPY STATEMENT, HEADS SEEK TO CYLINDER 322, FAULT LIGHT COMES ON. HEADS THEN IMMEDIATELY SEEK TO CYLINDER ZERO, FAULT LIGHT CLEARS AND COPY STARTS RUNNING NORMALLY. DRIVE WILL CONTINUE TO RUN WITHOUT ANY FAULT LIGHTS UNTIL NEXT ACCESS FOLLOWING A SPIN DOWN/UP.
   FROM SYMPTOMS DISPLAYED, IT APPEARS THAT ON FIRST ACCESS, THE DRIVE SEEKS TO CYLINDER 322, GENERATES A SEEK ERROR, INITIATES AN RTZ (WHICH CLEARLS A SEEK ERROR) AND ONCE IT REACHES CYLINDER 0 CLEARLS THE FAULT LIGHT, GENERATES THE CORRECT SEEK COMPLETE AND OPERATIONS RETURN TO NORMAL.
TO: KEVIN MATHES, OTSM
FROM: CAL BLACKBURN, OTS
DATE: DECEMBER 30, 1986

SUBJECT: RESPONSE FROM PRODUCT SUPPORT REGARDING THE ARGUS INSURANCE AND PSNS TOOL CONTROL ESCALATIONS.

HAVING REVIEWED THE RESPONSE TO THE ABOVE ESCALATIONS AS ENTERED IN THE REGIONAL TACNET SYSTEM, I AM FORWARDING THE FOLLOWING COMMENTS.

1. THE ISSUE OF THE FLASHING FAULT LIGHT ON THE DRIVE WHEN EXECUTING A COPY STATEMENT FOLLOWING SPIN UP, WAS ADDRESSED WITH A BLANKET STATEMENT. WE DO NOT FEEL THIS PROBLEM IS RELATED TO ALIGNMENT, AS WE HAVE BEEN ABLE TO READILY DUPLICATE THIS PROBLEM ON A NUMBER OF DRIVES BY INSERTING R-10 PROPS IN THE DPU.

2. THE CONCEPT THAT THE DRIVE ALIGNMENT MAY BE THE ROOT OF THE PROBLEMS BEING EXPERIENCED WITH R-10 PROPS, HAS SEVERAL RELATED ISSUES THAT WERE NOT ADDRESSED.

A. THE DRIVE ALIGNMENT SPECIFICATIONS LISTED IN THE TACNET ENTRY, ARE NOT THE CURRENTLY APPROVED SPECIFICATIONS. THE FOLLOWING SPECIFICATIONS HAVE BEEN GIVEN TO BOTH MYSELF AND SEVERAL CE'S BY THE TAC CENTER, AND ARE ALSO CALLED OUT IN THE CE HANDBOOK, PART NUMBER 741-15524 PHOENIX DISK DRIVE.

   LESS THAN 50MV AT TRACK 404 (SERVO & DATA)
   LESS THAN 600MV AT TRACKS 8 & 300 (SERVO)

B. EXPERIENCE OVER THE LAST SIX MONTHS HAS SHOWN THAT FOLLOWING REPLACEMENT OF THE CARRIAGE ASSEMBLY, EVEN THESE EXPANDED SPECIFICATIONS HAVE OFTEN BEEN DIFFICULT TO ACHIEVE. BOTH THE OTS AND THE CE GROUPS HAVE FOUND THAT WITH THE CARRIAGE ASSEMBLIES BEING SUPPLIED TO THE FIELD, THE BEST ALIGNMENT RESULTS OBTAINABLE ARE APPROXIMATELY AS FOLLOWS:

   30MV AT TRACK 404 (SERVO)
   400MV AT TRACKS 8 & 300 (SERVO)
   10MV AT TRACK 404 (DATA)

GIVEN THE CURRENT QUALITY OF THE CARRIAGE ASSEMBLIES BEING PROVIDED TO THE FIELD, THE "TIGHTENED UP"
SPECIFICATIONS CALLED FOR ARE NOT REALISTICALLY OBTAINABLE.
C. None of the previously documented problems seem to have been addressed. A memos was forwarded listing various problems which have been encountered and are related to the R-10 PROMS. Most of these problems do not appear to be related to drive alignments and were correctable by using R-7 PROMS. Enclosed is a copy of the memo addressing the R-10 PROM related problems.

While the alignment of the drive being used at product support may have cleared up the problem they were experiencing, one drive/one solution is not very convincing. Prior to escalating the R-10 PROM problem, we experienced the same problems/symptoms on a number of drives within the district. At this time and with the current feedback from product support, it appears we will continue to resolve problems using the limited supply of R-7 PROMS available in the district. We will also continue to supply information to the product support group, as they define and request the information they require.

REGARDS,

CAL BLACKBURN, CTS
CAL,

I have read your memo addressed to Kevin Mathes and would like to respond to each item as it seems you have misinterpreted our responses and suggestions.

1. On the issue of the flashing fault light you say product support responded with a blanket statement. What was the statement? "We do not feel this problem is related to alignment".

The flashing fault light is not a symptom that has been brought up before that I recall. If it only occurs with the R10 PROMs then obviously the R10 PROMs are the catalyst either directly or indirectly.

2. On the issue of the drive alignment being the root of the problem: this is not what was said. What was said was this:

When installing R10 PROMs all surfaces must be formatted with R10 PROMs. If even 1 surface is not formatted, a problem with 'first access' could occur. There may be a problem formatting a surface on the very first attempt.

On the second attempt on the same surface the format should run successfully.

All drives in the field previous to the existence of R10 PROMS should have been updated to R7 PROMs. Do not know what would happen trying to go from PROMs other than R7. This obviously created problems in your area. However, since only R7 PROMs should be in the field, we cannot go to R7 with this.

At this time no one has been able to clearly define a problem formatting on the second attempt if coming from R7 PROMs or formatting a virgin pack. The problem on first attempt to format is due to inability to read the alternate sector map. If unable to format on the second attempt or anytime after and hardware is not at fault, then we have an issue according to R7.

Once all surfaces are formatted, some drives have been found to have the 'first access' problem. The problem appears to be related to the alignment. We are not saying the problem is or isn't the alignment. We need input from field to determine this relationship. So far 4 drives with the problem have been aligned and 3 did not fail again. Waiting for more details from the one that failed. We are not changing the alignment specs, but requesting the drives with the 'first access' problem be aligned as perfectly as possible to see if this does in fact impact the problem. The before & after offsets are needed so a determination can be made.

Just verifying the alignment does not tell us if alignment has an impact. If it is found that aligned drives have a problem which can be circumvented by improving the alignment, this would be brought to R&D's attention & hopefully some change would be made to the PROM.

We need to have this input.

Needless to say there is a limited supply of R7 PROMs. The quicker we get feedback from the field the quicker the resolve. If I can help or answer any questions please don't hesitate to call.

Regards,
Mike Bahia
TAC

INFORMATION CALL

CONTROL NUMBER 06329087

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

SYSTEM TYPE 2200MICR  DEVICE TYPE 2280DPU
UTILITY NAME  SOFTWARE LEVEL

METHOD OF CALL P T = TELEX, P = PHONE, M = MEMO, E = EMS
HAS THE AREA OR DISTRICT BEEN CONTACTED
N A = AREA, D = DISTRICT, E = 50TH, 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 3A14  CITY
ON SITE CONTACT NAME

QUESTION (*) / ANSWER (+)

*AVAILABILITY OF THE R11 PROMS.
*EMPLOYEE# 32527
*THEY ARE NO R11 PROMS. HAS INTERMITTENT PROBLEM RUNNING
*BACKUP WHERE AFTER CHANGING PACKS & COMING UP TO SPEED
*FAILS ON FIRST ACCESS W/ EITHER I90, I92, OR A HANG. MUST
*RESET THE DPU TO CORRECT. EXPLAINED CURRENT STATUS OF 1ST
*ACCESS PROBLEM. CLOSE CALL /CE.  (15MIN) MIKEB

DUPLICATE OF CALL H6347010
TAC
INFORMATION CALL

CONTROL NUMBER H6333000

CONTACT NAME LARRY MILLER    POSITION CE
RDS # 3412    TCX #    PHONE # 301 296 1663    EXT #

SYSTEM TYPE 2200 MVP    DEVICE TYPE CPU
UTILITY NAME    SOFTWARE LEVEL

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

USE THE FOLLOWING AREA TO DESCRIBE THE SITE THAT CREATED THIS REQUEST
CUST/OFFICE NAME R. B. BROWN
ADDRESS 33    CITY
ON SITE CONTACT NAME

QUESTION (*) / ANSWER (+)

*012/09 0710: EARLIER THIS YEAR THE CUSTOMER STARTED USING
THEIR DAISY CHAINED DRIVE THEY EXPERIENCED HANGING WHEN
BRINGING UP AFTER BACKUP. WHILE TROUBLESHOOTING CE CALLED
TAC. TAC STATED IT WAS A KNOWN PROBLEM AND WAS BEING AD-
RESSED. SINCE THAT TIME THE CUSTOMER HAS BEEN RESETTING
THE CPU. RECENTLY THE CUSTOMER SAID HE WAS TOLD BY REDSHAW
THAT WANG HAD A "FIX" AND REQUESTED THAT WE INSTALL IT. WE
REFERENCED TS3 #HW5256 AND CALLED TAC AGAIN. WE INFORMED
THE CUSTOMER THAT THE PROBLEM IS STILL BEING WORKED ON AT
RED WITH NO "FIX" AT THIS TIME. TOM P.
12/09 1043: DS9H FORWARDING TO MIKE B IN PRODUCT SUPPORT
EXPEDITING.----------R. COOPER----------

&12/10/85: THIS PROBLEM IS STILL BEING RESEARCHED IN RED. AS
& SOON AS THERE IS A SOLUTION WE WILL LET YOU KNOW.
& HOPEFULLY IT WON'T BE MUCH LONGER. THE INFO IN
& THE TS3 #6256 IS NOT A FIX. CUSTOMER WAS GIVEN
& WRONG INFO BY REDSHAW. (CFS/TAC)

$12/17 0730: I'VE HEARD NOTHING FURTHER FROM CUSTOMER - T.P.
$12/17 1019: TOM TAKE A LOOK AT THE LAST ENTRY ON TAC 
$ H6022004. WE MAY WANT TO GET MARTY TO LOOK AT THESE
$ ADJ AT BROW.----------R. COOPER----------

$12/22/86 PLEASE UPDATE THIS CALL!
$12/22 1245: JIM, THIS TAC IS AWAITING H.Q. RESOLUTION. JIM,
$ PLS DON'T WORRY ABOUT TAC'S NOT BEING UPDATED
$ WHICH HASN'T BEEN ESCALATED TO THE REGION. -CRWC-)
$12/23 0730: I'VE READ H6022004. WHEN RED REQUESTS REALIGN-
$ MENT OF FAILING FIELD UNITS, WE WILL COMPLY -
$ TOM P.

$01/12 1200: REDSHAW CALLED ED WHITNEY REGARDING THIS PROBLEM
$ BE GOING ON SITE TO ADDRESS ALTERNATIVE & GET A
$ FEEL FOR SENSE OF URGENCY.----------R. COOPER------

$1/12 1510: WM/CE GOING TO SITE AT 0800 TOMORROW A.M. TOM P.
$1/13 1030: WM/CE ON SITE THIS A.M. CUSTOMER GENERALLY BACKS
$ UP 3 PACKS DAILY. WOULD NOT HANG WHILE WE WERE
$ THERE BUT SYMPTOMS REPORTED BY CUSTOMER AND CE WHO
$ HAS OBSERVED THIS IN PAST MATCH THOSE IDENTIFIED


IN TS3 # HNT 6255, THE 2 DPU ALTERNATIVE IS NOT VIAL. FOR THIS CUSTOMER WHO HAS 2 CPUS ACCESSING 2 DRIVES THROUGH CPU. IN LAST TWO DAYS CUSTOMER HAS ALSO EXPERIENCED INTERMITTENT I90 ERRORS DURING NORMAL OPERATION. WE INSTALLED OUR TESTED SHOP SPARE DPU TO SEE IF IT WILL AFFECT EITHER SYMPTOM. BM WILL KEEP IN TOUCH WITH CUSTOMER AND UPDATE PROMPTLY. -- TOM P. --

$01/13 1142: THANKS TMJ - I WILL UPDATE ED WHITNEY. LET ME KNOW IF OUR LOANER IMPACTS THE PROBLEM WHO WOULD ED CONTACT ON SITE REGARDING CUSTOMER SATISFACTION WITH RED SHAW? ----------------- R.C. DAPER -------------

$01/14 1000: PER CUSTOMER T MJP, NO PROBLEMS DURING BACK-UP OR NORMAL OPERATION SINCE WE SWAPPED DPUS. WE WILL LEAVE DPU INSTALLED UNTIL WE FEEL WE HAVE DEFINITELY PROVED OR DISPROVED SOMETHING. TMJ P.

$01/87 1355: CUSTOMER PLACED CALL BEFORE NJON FOR SYSTEM HANGING. CUSTOMER HAD TO POWER DOWN SYSTEM AND BRING BACK JP TO RESUME OPERATIONS. I CONTACTED CUSTOMER AND HE REQUESTED WE WAIT UNTIL OBJO TOMORROW TO BEGIN TROUBLESHOOTING SO HE COULD CONTINUE USING SYSTEM THIS AFTERNOON. WE WILL BE TROUBLESHOOTING FOR INTERMITTENT HANGING AND I90 PROBLEM THAT BEGAN LAST FRIDAY AFTERNOON. AS DTS WILL ACCOMPANY ME TO SITE, I WILL ASK HIM TO CON- FIRM OTHER SET OF SYMPTOMS DURING SPIN-JP. TMJ P.

$01/15 0730: I COULD NOT JP DATE YESTERDAY AS I WAS UNABLE TO ATTACH TO REGION IN THE MORNING AND OUR SYSTEM WAS TIED UP WITH LOGISTICS PROCEDURES IN THE AFTERNOON. CE/DTS ON SITE YESTERDAY AT 3800. DTS WILL PROVIDE UPDATE ON TROUBLESHOOTING/REPAIRS THIS MORNING. -- TOM P. --

$01/16 1130 ON 1/15, WE FOUND THAT WHEN ONE CPU WAS ACCESSING EITHER PHOENIX IN THE CHAIN, HITTING RESET ON ANY TERMINAL ON THE OTHER CPU WOULD CAUSE I92'S ON THE TERMINAL THAT WAS ACCESSING THE DRIVE. REPLACING THE 7717 PCB IN THE CPU (REPLACEMENT 7717 WAS A REV 2) CORRECTED THE PROBLEM. THE CUSTOMER FOR THE FIRST TIME YESTERDAY REVEALED THAT THEY HAD BEEN EXPERIENCING INTERMITTENT I92'S DURING NORMAL OPERATATION. THIS MORNING, THE CUSTOMER INDICATED THAT THE INTERMITTENT HANGS AND I92'S SEEM TO HAVE BEEN CORRECTED WITH THE NEW 7717 PCB BUT THAT AFTER THE MORNING BACKUPS THE SYSTEM GAVE A I90 DURING THE FIRST ACCESS. TALKING TO MIKE BAHIA THIS MORNING, HE INDICATED THAT AT THIS TIME, THERE IS NO FIX FOR THE "FIRST ACCESS PROBLEM" OTHER THAN MAKING THE DRIVE ALIGNMENT OFFSETS AS TIGHT AS POSSIBLE. MIKE DID GIVE US THE DETAILS OF ECO 41006 FOR THE 7717 PCB WHICH HAS HELPED OTHER SITES WITH INTERMITTENT SYSTEM HANGS WHEN DEALING WITH MULTIPLEXED DPUS. THE 7717 PCB'S (NOW REV 3) HAVE BEEN ORDERED. IF THE LATEST REV PCB'S ARE NOT READY AVAILABLE, WE WILL ORDER THE 740B IC NEEDED FOR THE ECO AND UPDATE THE PCB'S LOCALLY. WILL CONTINUE TO MONITOR THE CUSTOMER'S OPERATION. -- MARTY DUSHARM --

$01/15 1500: PER MIKE HODGES (P1 SUPERVISOR), REV3 PCB'S WILL BE HERE MONDAY. -- TOM P. --

$01/19 1515: CUSTOMER EXPERIENCED I90 ERRORS AGAIN ON FRIDAY AFTERNOON. PCB'S DID NOT ARRIVE TODAY; PROMISED AGAIN FOR TOMORROW. CUSTOMER DOES NOT APPEAR TO BE UPSET A ONE DAY DELAY. TOM P.

$01/20 1035: PCB'S JUST ARRIVED; WE WILL INSTALL TODAY. PER CUSTOMER, NO I90 ERRORS DURING OPERATION YESTERDAY. WE WILL MONITOR. -- TOM P. --

$01/21 1730: REV3 MUX INSTALLED 1/20. NO I90'S REPORTED SINCE
01/22 0330: PER CUSTOMER THIS AM, NO I90 ERRORS DURING
DAILY OPERATIONS SINCE LAST FRIDAY. THEY ARE MONITORING "BACKUP PROBLEM" FOR TREND THAT MAY BE OF HELP IN DIAGNOSING. -- TOM P. --
HELP IN DIAGNOSING. -- TOM P. --

02/02 0345: TOM, WHAT IS STATUS? -- R. COOPER --

02/02 1320: PER CUSTOMER, NO ERRORS DURING OPERATION SINCE.
REV3 BOARDS WERE INSTALLED ON 1/20. STILL INTERMITTENTLY HANGING WITH I90 DURING BACKUP. RANDY, ARE WE SUPPOSED TO ALIGN DRIVES TO SEE IF WE CAN AFFECT THAT SYMPTOM? -- TOM P. --

02/02 1350: TOM, I WOULD LIKE TO GIVE IT A TRY WITH A DTS. I DON'T LIKE IT AS A PERMANENT RESOLUTION BUT IF IT POSITIVELY IMPACTS THE CUSTOMER THEN IT'S WORTH A TRY. -- R. COOPER --

02/03 0700: WHEN WILL THE DTS BE AVAILABLE? -- TOM P. --

02/03 0850: TOM, I HAVE BEEN MARTY, I WILL HAVE HIM CONTACT YOU & SET JP A TIME. -- R. COOPER --

02/03 1320: PER CUSTOMER WE CAN HAVE THE SYSTEM NEXT WEDNESDAY AT 0300, HOPEFULLY FOR NOT MORE THAN 2 HOURS. -- TOM P. --

02/10 1230: CONFIRMED WITH CUSTOMER THAT HE IS EXPECTING US AT 0300 TOMORROW. -- TOM P. --

02/11 0805: MARTY DIDN'T GET HOME FROM WORK UNTIL ABOUT 0630 THIS AM. MIKE RETTIG WENT ON SITE WITH CE. -- R. COOPER --

02/11 1220: DRIVES ALIGNED BY BRANCH - TN3534 HAD -530 MV OFFSET AT 404, ADJUSTED TO -17. -525 AT 8, ADJ TO -10. -725 AT 803, ADJ TO -55. TN3539 HAD -125 MV OFFSET AT 404, ADJ TO -7. -250 AT 9 ADJ TO -125. +90 AT 800 ADJ TO -250. USED ALIGNMENT PACK S/N T791694. CHECKED ELECTRICAL RUNJUT AND VELJUMP. CITY GAIN ON BOTH DRIVES. WILL CONTINUE TO MONITOR -- MIKE R. --

02/11 1315: PER CUSTOMER SAVED BACKUP UNTIL THEY WERE DONE & EVERYTHING LOOKED GOOD. WE WILL HAVE TO MONITOR TO SEE IF IT WAS A SUCCESS. -- R. COOPER --

02/12 0915: PER CUSTOMER, HE EXPERIENCED SAME SYMPTOMS THIS A.M.; I90 WHEN BRINGING DRIVE UP DURING BACK-UP PROCESS. WHAT'S THE NEXT STEP, RANDY? -- TOM P. --

02/12/1545: TOM, I'M FORWARDING THIS TAC TO THE REGION TO BE DRIVEN. IF POSSIBLE I WOULD LIKE TO GET JIM O & 4 DTS TO GO ON SITE & RE-VERIFY ADJUSTMENTS. (RWC)

02/12 1630: RANDY, LET ME KNOW WHEN YOU WOULD LIKE TO SCHEDULE IT AND I WILL TRY TO SET IT UP WITH CUSTOMER. -- TOM P. --

2/12/87 JIM Q, CONTACT RANDY AND SEE WHAT HELP YOU CAN PROVIDE. I LIKE TO PUT THIS PROBLEM TO BED OR DRIVE IT BACK TO TSO FOR A BETTER FIX. J MCEVoy

02/17 0910: JOHN, THE 3M IS CONFIRMING 2/25 0800AM FOR MARTY & JIM O TO GO ON SITE TO VERIFY THE HARDWARE 53 THAT WE DRIVE THIS PROBLEM TO TSO. -- R. COOPER --

02/18 0315: RANDY, PER CUSTOMER THIS MORNING, HE DOESN'T WANT TO COMMIT TO A TIME RIGHT NOW. HE IS IN THE MIDDLE OF A REDSHAW UPDATE WHICH IS EATING JP'S PRODUCTION TIME. HE HAS ASKED THAT I CALL HIM BACK LATE NEXT WEEK TO SEE HOW HE STANDS AND PERHAPS WE CAN SCHEDULE A TIME THEN. I WILL DO SO. TOM P.

2/24/87 RANDY, CAN WE GET A DATE THIS WEEK??? J MCEVoy

02/25/87 0700: RANDY, PER CUSTOMER'S REQUEST OF LAST WEEK, I WILL CALL HIM TODAY TO SCHEDULE. -- TOM P. --

02/25/87 0900: PER CONVERSATION WITH CUSTOMER THIS A.M., REDSHAW UPDATED PROGRAMS LAST WEEK TO ALLOW THEM MORE RISK FILES. NEW PROCEDURES REQUIRE BACKING UP
TO 9 PLATTERS DAILY, CUSTOMER CAME LIVE LAST FRIDAY MORNING (2/20) WITH NEW PROCEDURES. CUSTOMER HAS NOT EXPERIENCED ANY PROBLEMS DURING BACKUP SINCE THAT TIME. BOTH CUSTOMER AND I FEEL WE SHOULD MONITOR THIS AND NOT DO ANYTHING ELSE UNTIL UNLESS TROUBLE SYMPTOM REOCCURS. -- TOM P. --
$02/25 0915: JOHN, THIS IS A LITTLE STRANGE, I'M GOING TO MOVE THIS BACK TO THE DIST, SEND TO THE HQ & MONITOR FOR A WEEK. -------------------------- R. COOPER------
$03/02 1640: TOM, ANY UPDATE FROM THE CUST. ------- R. COOPER-------
$03/04 0700: RANDY, THE CUSTOMER WAS GOING TO CALL ME IF HE EXPERIENCED ANY FURTHER TROUBLES AND I WAS GOING TO CHECK WITH HIM OCCASIONALLY JUST TO KEEP IN TOUCH. I WILL DO SO TODAY AND UPDATE YOU. -- TOM P. --
$03/04 1110: PER CUSTOMER, HE HASN'T CALLED ME BECAUSE HE HASN'T EXPERIENCED ANY MORE SYSTEM HANGS DURING BACKUPS. HE IS CONVINCED THE PROBLEM IS RESOLVED.
$03/04 1130: WHAT SHOULD WE DO WITH THIS CDA? -- TOM P. --
$03/04 1130: IAG CLOSED-------------------------- R. COOPER------
# REV 3 7717 BRD RESOLVED INTERMITTENT I92 ERRORS DURING OPERATION & ALSO CORRECTED A PROBLEM WHERE I92 WOULD OCCUR IF KEYPAD RESET ON A TERMINAL ON 2ND SYSTEM NOT USING DISK. # REDSHAW UPDATING S/W CIRCUMVENTED 1ST ACCESS PROBLEM DURING BACKUP. BELIEVE MAY HAVE CHANGE IN BACKUP PROGRAM. MIKE
$3/9/37: TALKED W/ OTS. DOES NOT BELIEVE ALL SURFACES WERE FORMATTED AFTER ALIGNING. ALSO TALKED W/ REDSHAW. THEY SAY NO CHANGE TO THE BACKUP PROGRAM. NOW BELIEVE MOST LIKELY WHEN REDSHAW FORMATTED ALL SURFACES, THIS RESOLVED PROBLEM. ALIGNMENT MAY OF ALSO BEEN A FACTOR. MIKE
# MOST LIKELY FORMATTING RESOLVED & ALIGNMENT MAY OF BEEN FACTOR.
TAC

PROBLEM CALL

CONTROL NUMBER: 07C54C69

CONTACT NAME: ESSIE FOWELL
POSITION: CE
ACCOUNT #: 3524
TPX #: 810 377 1130
PHONE #: 214 264 1523
EXT #: 101

SYSTEM TYPE: Z80
DEVICE TYPE: 13
UTILITY NAME: SOFTWARE LEVEL

METHOD OF CALL: T = TELE, P = PHONE, M = MESS, E = EMS
HAS THE AREA OR DISTRICT BEEN CONTACTED?
N, A = AREA, C = DISTRICT, E = YES, M = NO
IS THIS INQUIRY PERTAINING TO A NATIONAL ACCOUNT?
Y = YES, N = NO, L = UNKNOWN

USE THE FOLLOWING AREA TO DESCRIBE THE SITE THAT CREATED THIS REQUEST
CUST/OFFICE NAME: AMERICAN STEEL
ACCESS #: 3401
CITY: DALLAS
STATE: TX
ON SITE CONTACT NAME:

PROBLEM (*) SOLUTION (+)

(*) 28522, DISPATCH: R88184.
ISS ERRORS.
2/23/87: WAS GETTING 191, 192, & 195 ERRORS WITH DAISY-CHAIN CONFIG. REPLACED THE 7422 ERC & 7423. THE 192 ERRORS WERE FIXED. NOW GETTING 199 & 1ST DRIVE. MIGHT BE 7422 ERC. THE ERC INSTALLED HAS NOT YET BEEN CHECKED. IF IT TURNS OUT TO BE A PROBLEM, TRY TO ISOLATE THE PROBLEM TO DRIVE 1 OR 2. (29MIN) MIKEE

---

(*) 28522, DISPATCH: R88184.
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TAC

INFORMATION CALL

CONTACT NAME: STEVE KELLS
POSITION: CE
RCB #: 3115
TO: 
PHONE #: 202-677-5050
EXT #: 

SYSTEM TYPE: 22COLVF
DEVICE TYPE: CPL
UTILITY NAME: 
SOFTWARE LEVEL: 

METHOD OF CALL F = FAX, T = TELELEX, P = PHONE, M = MENG, E = EMS
HAS THE AREA OR DISTRICT BEEN CONTACTED:
A = AREA, C = DISTRICT, E = BOTH, N = NONE
IS THIS INQUIRY PERTAINING TO A NATIONAL ACCOUNT:
Y = YES, N = NO, L = UNKNOWN

USE THE FOLLOWING AREA TO DESCRIBE THE SITE THAT CREATED THIS REQUEST:
CUSTOMER NAME: HARTFORD SYMPHONY
PHONE #: 
ACCESS DATA: 3AIO
CITY: HARTFORD
STATE: CT

IN SITE CONTACT NAME: 

CLESTION (*): ANSWER (+): 

*PROBLEMS WITH A LFV & A PHOENIX DRIVE:
*REFURBISHED DRIVE, NEW INSTALL, DRIVE FAILS W/ I92 OR HANGS:
*ON 1ST ACCESS, NO PROBLEMS OTHERWISE, RED PROBLEM, CE CUT SICK, TALKED W/ EM, EXPLAINED ALL FLATTERS MUST BE FORMATTED, TEC W/ R10 AS THIS WILL CAUSE SAME SYMPTOM, PLANS TO DOWN+GRADE TO R7 PROMS, AS ALL FLATTERS WERE FORMATTED, CLOSE+CALL W/ EM.

(15MIN) MIKEE
GOOD NEWS! THE PROBLEM IS FINALLY RESOLVED.

THE DETAILS ARE GIVEN BELOW:

1) 'REFORMAT ALL DISKS', 'EXECUTE CHKDSK', 'REINSTALL RIPPLE IN CPU', 'RUN-CRT CHECK' FAILED ALL BIRKS PREVIOUSLY WITHOUT SUCCESS.

2) ON FURTHER INVESTIGATION THE PROBLEM WAS FINALLY ATTRIBUTED TO THE FOLLOWING TWO REASONS:

A) ONE OF THE ECLIPSE PIC PACKS WAS USED TO LOAD PROD DATA, AND ECLIPSE REPAIR CENTER WAS USING THIS AS THE MASTER COPY FOR Duplicating PIC PACKS, THIS WAS IDENTIFIED WHEN EACH OF THE PIC PACKS IN ECLIPSE REPAIR CENTER WAS COMPARED AGAINST KNOWN GOOD PIC PACK FROM ECLIPSE.

THIS ECLIPSE PIC PACK ONLY AFFECTS THE REFORMAT OPERATION AND DOES NOT AFFECT NORMAL OPERATING CAPABILITIES. DURING REFORMAT IT DOES NOT FULLY COMPLETE THE OPERATION RESULTING IN ERRORS LEAVING THE ALTERNATE SECTOR MAP IN UNCLEARED STATUS. HOWEVER, SINCE REFORMAT IS DONE RARELY, AND BECAUSE OF NO ERRORS ASSOCIATED THIS PROBLEM WAS NEVER NOTICED UNTIL NOW.

B) THE DRIVE CAPACITY LIMIT IN CONTROL AND EE0C OF THE CHEMIX DRIVE WAS SET INCORRECTLY AT 150 MB FOR THE CHEMIX DRIVE. AGAIN, THIS INCORRECT SETTING DOES NOT CAUSE ANY PROBLEMS WITH RP ICE PACKS, SINCE THEY DO NOT TRY TO WRITE THE ALTERNATE SECTOR ON ALL SURFACES DURING 'FIRST ACCESS'. HOWEVER, ECLIPSE PACKS TRY TO WRITE FROM NEW-EXISTING SURFACES RESULTING IN 152 ERROR.

AFTER USING CORRECT PIC PACKS TO REFORMAT AGAIN, THE CHANGING JUMPER IN CONTROL PLX ITEM FROM 203 TO 204, 'FIRST ACCESS ERROR' DISAPPEARED.

THANK YOU FOR YOUR PATIENCE AND CONTINUED SUPPORT.

REGARDS,
S. PARRAB/AGRL/ASC-PCCL/PIC

---------------------------------------------------------------------
TC: SANGEETA GARG/HARANAMCL L/EDD: JUNE 87
SUBJECT: FEZZEC061 ECLIPSE PROBLEM DATE SENT: 07/06/87

PETER/GCL
I FOUND MIKE SAKIA TODAY AND DISCUSSED THIS CALL. HE MENTIONED THAT SIMILAR ESCALATIONS WERE RECEIVED IN THE PAST, SO IT IS NOT THAT H.C. COULDN'T DUPLICATE THE PROBLEM AS DESCRIBED IN YOUR WEEKLY REPORT.

SC FAF, THE WAYS TO ECLIPSE THE PROBLEMS HAVE BEEN:
1. TC REFORMAT PIC PACKS
   ALTHOUGH YEL CONFIRMED THAT PACKS HAVE BEEN FORMATTED WITH PIC PACKS, THE ECLIPSE EMERGED THAT ALL DISK PACKS HAVE TO BE REFORMATTED. HE INDICATED THAT EVEN IF USER REFORMATS ALL THE DISKS, MUT THEN PUT ANOTHER REFORMATABLE DISK IN AND IT HAS NOT BEEN REFORMATTED. THE ERRORS MAY APPEAR. SC, FAF
MAKE SURE AGAIN THAT THIS IS NOT THE CASE.

2. TO PROPERLY ACCURATE THE READINGS (I.T.M. REFERS TO THE DRIVE).

3. HE IS QUITE CONCERNED ABOUT THE VOLTAGE SETTINGS YOU SUBMITTED AS THEY
   SHOWED A WIDE VARIATION AT DIFFERENT TIMES. HE IS NOT SURE WHETHER THEY
   WERE RECORDED PROPERLY. FOR EXAMPLE,

   +5V 100mv
   +5v 100mv
   +12v 100mv
   -12v 100mv
   +15v 100mv
   -15v 100mv

   (IN FACT, THE +/- SHOULD BE
   +-1.1V)

   * MEANS THE READINGS ARE WITHIN 10%, I.E. < 1.1V.

HE MENTIONED THAT HE RECHECKED THESE SETTINGS A FEW TIMES AND NEVER
GOT READINGS VARYING SO WIDELY. SO, LET CHECK AND ADVISE HIM.

4. HE GAVE ME A DESCRIPTION OF THE CALIBRATION CHECK WHICH IS REQUIRED. IT SAYS:
"THE NEW PROCEDURE TO CHECK ELECTRICAL CALIBRATION IS TO CONNECT SCOPE TO TEST
POINT TC ON THE SERVO CIRCUIT. SET VOLTAGE TO 1 VOLT, TIME FRAME IS 500NS.
CALIBRATE TEST POINT ON THE SERVO CIRCUIT AT SELECT THE REMOVABLE OR A
FIXED K/M HEAD, AC/DC AND TO BE TESTED. OBSERVE THE WAVE FORM AT TC1.
PEAK TO PEAK SHOULD BE LESS THAN 5 VOLTS. IF THE SIGNAL IS LARGE THAN
2 VOLTS THE MCU IS CONSIDERED TO BE OK AND REPLACED.

BASICALLY, he said that if all these are checked correctly, it just confirms
that there is some kind problem with the drive. The only alternatives are to either:

1. REPLACE THE DRIVE, OR
2. GO BACK TO MY FRIENDS. HE CAN SUPPLY THAT.

HE ALSO GAVE ME A SCHEMATIC OF THE RECALIBRATION, WHICH MAY BE USEFUL IF THERE
IS A RIPPLE FASCIN.

IF THERE IS ANYTHING YOU WISH TO RELATE TO THIS. YOU CAN UPDATE THE TAC OR
EXPLAIN TO ME ON THURS.itt TBMAGKM W I CALL, 1SIIERPOST, JACK.
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<thead>
<tr>
<th>Customer Name</th>
<th>DPU Serial No</th>
<th>PROM Revision (R7/R10)</th>
<th>Problems Encountered (Y/N)</th>
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| Salem            | 2        |
| Portland West    | 20       |
| Portland East    | 26       |
| Tacoma           | 21       |
| Southcenter      | 84       |
| Seattle Metro    | 20       |
| Seattle NW       | 28       |

Branch 03/27/87 Update

2280 DPU Survey per Product Support Request:
Kevin, in response to the request from Product Support, the enclosed document lists the approximate count of 2280 DPU's and the associated PROM revision levels. This is the approximate count for the Pacific Northwest District.

Cal (3/27/87)
TO: Gil Carrier  
FROM: Mike Bahia  
SUBJECT: Phoenix DPU R10/R7 Population  
DATE: April 16, 1987

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**TOTALS**

1996/ 5  
1152/ 63  
204  
182  
3330

R7/PROB - first number is total of DPU's in District with R7 Proms. The number following the slash, if present, indicates systems with R7 Proms experiencing a Phoenix or DPU related problem.

R10/PROB - first number is total of DPU's in District with R10 Proms. The number following the slash, if present, indicates systems with R10 Proms experiencing a Phoenix or DPU related problem.

R10_DWNGRDE - number of sites where proms were downgraded due to problems with R10 Proms.

OTHER/UNK - number of sites where prom level is unknown or lower than R7.

TOTAL - total number of DPU's in District.
These are approximate counts for most of the Districts within the United States. If there are any questions please call. Will be in school for 3 weeks. If need to talk with me contact my Manager, Ron Olesen or leave me a DVX. Please keep us posted on the status.

Regards,

Mike Bahia
2200/VS Product Line Engineer

CC: Ron Olesen M/S 001-260
    Henry Schinnagel M/S 001-210

1027D
TO: Gil Carrier
FROM: Mike Bahia

SUBJECT: Phoenix DPU R10/R7 Population

DATE: April 16, 1987

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| TOTALS            | 1996/5  | 1152/63 | 204         | 182       | 3330  |

R7/PROB - first number is total of DPU's in District with R7 Proms. The number following the slash, if present, indicates systems with R7 Proms experiencing a Phoenix or DPU related problem.

R10/PROB - first number is total of DPU's in District with R10 Proms. The number following the slash, if present, indicates systems with R10 Proms experiencing a Phoenix or DPU related problem.

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Regards,

Mike Bahia
2200/VS Product Line Engineer

CC: Ron Olesen M/S 001-260
    Henry Schinnagel M/S 001-210
2200 HARDWARE DESIGN ISSUES

1. PROBLEM: Intermittent I90 errors after powering up the drive/s when running daisy-chained Phoenix drives using the R10 DPU proms. I90 is a disk hardware error caused by the disk drive not responding properly to the system.

CIRCUMVENTION: a. Have a DPU installed for each Phoenix drive.
   b. Downgrade to R7 proms. R7 proms may present a data integrity problem on a surface with alternate sectors.
   c. Power DPU on and off every time a drive is powered up.
   d. Key reset on workstation.
   e. Try an old CDC Terminator with the black chips or possibly one with the white chips. The newer terminators, especially from Wang seem to have a relationship to the problem.

R & D CONTACT: Mike Riley, S.K. Ho

STATUS: The fix to the Phoenix I/O boards has been dropped at this time. As these are not Wang boards and this drive is no longer made by CDC implementing this fix could be a major problem. An updated 210-7422 board was sent to Imperial Head Wear in early July. Problems were encountered with the slave drive on installation and the board was removed. Product Support was not called from site. The board was returned to the Home Office where it was tested without error continuously for several days.

A second board has been made up at our request. One of the 2 boards will be installed at either Imperial Head Wear in Denver or Hazen Paper in Holyoke, Ma, depending on how quickly compliance to certain criteria can be made in Denver. We have requested from the Western Region that all board and prom revisions for the DPU boards at Imperial Head Wear be sent to us and that a complete set of Phoenix and DPU boards be on site at time of installation. The action plan for installation will be developed with Mike Grove (RTS in Western Region) for Imperial Head Wear and Dan Sullivan (DTS in the Farmington, Ct) for Hazen Paper. Once we have a status from the first site a determination can be made on installing the second board. An action plan should be in place by Thursday, 8/7 and hopefully the first board installed by Thursday 8/14.

ACTIVE CALLS: ESCALATIONS:

<table>
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<th>CALLER</th>
<th>PHONE NUMBER</th>
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<td>SINGLE DRIVE</td>
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<tr>
<td>LUVAN</td>
<td>66170007</td>
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<tr>
<td>IMPERIAL HEAD WEAR</td>
<td>86007000</td>
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<tr>
<td>NAVAL SEA SYSTEMS</td>
<td>06022004</td>
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<tr>
<td>TAIWAN</td>
<td>5343000</td>
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<tr>
<td>TESTRITE COMPANY, LTD</td>
<td>06083000</td>
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<tr>
<td>TRIBB BRACKENBROUGH</td>
<td>06143042</td>
</tr>
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</table>
2. PROBLEM: When using a printer/disk controller (210-7342) with the Phoenix Disk Drive or the 2275, intermittent I90, I91, I92, and possibly I96 errors occur. I90, I91, and I92 errors are caused by the disk unit not properly responding to the system. I96 is a read error.

CIRCUMVENTION: a. Place the 7342 printer/disk controller in the last I/O slot of the CPU farthest from the CPU boards. In testing for this problem it was found that boards which fail solidly when next to the CPU boards ran error free when placed in the last I/O slot.
b. Replace the printer/disk controller with a single disk and a single printer controller.
c. Replace the printer/disk controller with the older version printer/disk controller (210-7042-2) if available.
d. Replace the printer/disk controller with a triple controller (212-3012), workstation/printer/disk. Although no problems have been reported with this board the design is the same as the 7342 printer/disk controller. As such this board may also exhibit the same problems.

R & D CONTACT: Gil Carrier, Lou Cornaro, Mike Riley

STATUS: R & D has identified the problem with this board. The problem is related to the design of the line driving circuit and the speed of the chips used. R & D has updated 25 boards, thirteen which have been domestically distributed. Ten of these boards are currently installed at beta sites and all have reportedly been running error free.

A meeting was held Thursday July 31st with representatives of R&D, Product Support, and the ECO group in attendance to discuss the 7342. Results were that by August 15th the needed feedback on beta testing would be significant enough if successful to immediately halt production of the 7342. Meanwhile R&D will draw up the new artwork required for this board, order a minimal number of boards (4 to 8) and prepare for testing the new board. A new part number will be assigned for the new artwork board. I will be looking into the most cost effective way of phasing out the problem 7342 board.

A similar fix will also be needed for the 212-3012 Triple Controller (terminal/printer/disk) as this board has the same design issue.

A TSB was sent out with the July 1st issue on the status and circumventions with the 7342 board.

ACTIVE CALLS: ESCALATIONS:
16097000 NORTHWEST SAVINGS (beta)
26062002 OCEAN CITY POLICE (beta)
65312002 GEORGE JR REP (beta)
66066001 ASSOCIATION OF DERMATOLOGY (beta)
*INT. 190 ERRORS.*

7/22/86: 1 LVPC AND 2 MVPC MIXED TO A DPU DAISY CHAIN 2280.
9 WORKSTATIONS. CE HAS CK V & RIPPLE, RIN OFF ON
DISK REPLACED DPU AND ALL BDS CUST ON R10 PROMS.
SOME DAYS IT RUNS GOOD OTHER DAYS I90'S AND HANGS
DURING THE DAY. CUST HAS VERY GOOD ENVIROMENT HAS
TO TURN OFF CPU'S TO CLEAR IT.

*CE SHOULD RUN MULTI DISK DIAG FROM ALL CPU'S. ONCE PROB CAN
+BE RECREATED FIX SHOULD BE EASIER. ON A HANG TURN ONE CPU
+OFF AT A TIME (ONE SHOULD CLEAR IT) IF THIS DOESN'T HELP.
+BRING NECESSARY BDS AND CONVERT THE SYSTEM TO 1 CPU/ 1 DPU/
+2 CHAINED DRIVES. RUN DIAG. IF ALL THREE PASS INDIVIDUALLY
+PROB IS IN THE MUXING OF THE SYSTEM. 7715 BDS/ 7717/ 7718
+OR CABLES. RUN RANDOM DATA LOAD TEST ON BOTH DRIVES THIS
+WILL CK ALIGN ON DISKS.*

(35 MIN) JOE

7/30/86: CE REPLACED ALL PHOENIX BDS WITH KNOWN GOOD ONES.
REPL ALL 7717 MUX I/O AND 7421 A IN DPU.

+SENT OUT A COPY OF ECN 41006 FOR THE 7717 BD. (20 MIN) JOE

8/11/86: CE IS ON HIS WAY OUT THERE TODAY CUST CAN'T FORMAT
CE IS GOING OUT WITH ALL DPU BDS. CUST HANGS WHEN
HE BRINGS UP THE DRIVE ALSO WHEN HE BACKS UP. CE
WILL CALL WHEN HE GETS OUT THERE. (15 MIN) JOE

08/11/86-4:25- CALL BACK NEEDED. AT THE # ON FRONT. -BOBBIE

8/14/86: CALLED CE GONE (5 MIN) JOE

9/10/86: LEFT MESSAGE AT DISP. (5 MIN) JOE

10/14/86: LEFT MESSAGE AT DISP. 1-800-626-9264. (10 MIN) JOE

10/14/86: CE CALLED BACK, CUST RUNS GOOD DURING THE DAY.
ONLY HAS PROBLEM WITH FIRST ACCESS OF THE DAY
GIVES CUST A HANG, CUST KEEPS SYSTEM UP 24 HRS.
CUST IS NOT TO CONCERNED. (15 MIN) JOE
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<th>Contact</th>
<th>Phone(s)</th>
<th>Tot Pop</th>
<th>R10/Prob</th>
<th>R11/Prob</th>
<th>R12/Prob</th>
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<td>Brian Weir, DTSM</td>
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<td>NH State</td>
<td>Richard Page, DTSM</td>
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<td>Rich Roberto, DTSM</td>
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<td>Clev Dist</td>
<td>Steve Wolfe, DTSM</td>
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<td>Rockies Dist</td>
<td>Tony McDonald, DTSM</td>
<td>303-850-0035</td>
<td>220</td>
<td>209</td>
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<tr>
<td>R.M. Dist</td>
<td>Bob Beasley, DTSM</td>
<td>415-391-9770</td>
<td>79</td>
<td>63</td>
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LA Dist  * Ron Frank, DTSM  213-337-6250  58  30  28
NW Dist  * Kevin Mathes, DTSM  206-340-6123  275  143+  39+  63  34
SCAL Dist  * Mike Morrow, DTSM  714-955-4780  80  30  50/5
MIN Dist  * Clayton Rand, DTSM  801-538-0666  21  9  42
TNT 808  R7/PROB B10/PROB  DOWNGRADED
TO: 2200 TAC GROUP
FROM: JOE SCAGLIONE
DATE: SEPTEMBER 29, 1987
SUBJ.: NEW 2200 CS / DS NOTICE

1) 2200 DS
   Jack Volpini would like to know of any DS installations that were shipped without
   installations instructions.
   Get:
   NAME of CE
   CITY and STATE
   HARDWARE INSTALLED
   CUST. NAME
   VENDOR WHO SOLD THE SYSTEM (if possible)

2) 2200 DATA MEMORY UPGRADES
   Many calls are coming in asking about 1, 2, 4 and
   8 Meg CPU'S.
   Oct 15, 1987 Focus Announcement
   End of Dec. 1st customer ship
   End of Jan. volume ship

   Upgrades can be made to any CS unit and 2200
   Micro-VF's only.

joe scaglione
City of Los Altos, Los Altos, Ca. HANGS on IPL  RUNNING ERROR FREE w/ R7’s
Eric Hamamura

American Steel, Dallas, Tx OK on R7’s
07054069

Yamco Machine, Pittsburgh, Pa. HANGS 1st SEEK, FLT LTE  RUNNING GOOD ON R7’s
66022002 Ralph Pinzer WILL CHECK w/ CUSTOMER  RECEPTIVE

Able Stick, CA HANG w/ 1st access of day SYSTEM LEFT UP 24 HRS.
06203104 Rod Stein

R.B. Brown formatted & OK X
06329087 Larry Miller I90, I92, ok hang

Hartford Symphony I92 ok hang on 1st access.
06288137 Clive Berry, BM. WILL CHECK w/ CUSTOMER ?

DUPLICATABLE PROBLEMS

1. FORMAT REMOVABLE
   a. KEY RESET WHILE FORMATTING
      POWER DRIVE DOWN & UP
      JUST HANGS

   TO CORRECT:
   PLUG REMOVABLE HEAD INTO FIXED LOGIC
   FORMAT
   PLUG BACK INTO REMOVABLE LOGIC

2. POWER UP DRIVE
   EXEC IMMEDIATE MODE COPY
   HEAD SEeks TO 822
   FLT LITE COMES ON
   HEAD SEeks TO Ø
   FLT LITE CLEARs
   COPY RUNS NORMALy
TECHNICAL SERVICE BULLETIN

SECTION: Hardware Technical

NUMBER: HWT 6256        REPLACES: _______        DATE: 11/11/86        PAGE 1 OF 1

MATRIX ID. 3104        PRODUCT/RELEASE# 2280/2280 DPU

TITLE: R10 Prom Problem

PURPOSE:
To inform the field of an existing problem with R10 Proms.

EXPLANATION:
A problem has been identified with the R10 Proms located on the 210-7423A board in the Phoenix DPU. With some Phoenix drives on "first access only" after a power up or spin up, a hang or 192 error may result. This problem may occur intermittently, or consistently. Most drives work fine. The problem does seem more prevalent with Blockpt 3 drives than Blockpt 4. A drive would have to be formatted and tested with R10 Proms to insure compatibility.

Some systems require the DPU to be powered off and on to correct the error, while others can be "Reset" from the terminal. Once this is done, the system will work error free. The 'first access' problem is the only known problem with R10 Proms. All other problems should be fixable. R&D is aware of the problem and is working on a fix.

Please be aware that when using R10 proms, all surfaces must be formatted with the R10 Proms. If not, the 'first access' problem and/or other problems may result. This is true even if only accessing the surfaces formatted with R10 Proms. The reason is with R10 Proms only, the alternate sector map for each surface is read each time the heads are loaded.

The only other proms that could be used are the R7 Proms. The R7 Proms have a different number of alternate sectors (twice that of R10's). If using R7 Proms, all platters should be formatted with the R7 Proms as a precaution. R7 Proms do not have the 'first access' problem but may present a data integrity problem on a surface with alternate sectors. Most R7's work fine. R7 Proms will read platters formatted with R10 Proms but must not be left in without formatting.

R7 Proms cannot be ordered from Logistics. Please call On Line Product Support (TAC) with any questions concerning this TSB.