# MVP/LVP/SVP

| BOARD | CURRENT E-REV | E-REV | CURRENT PROM REV | PROM REV | |
|---|---|---|---|---|---|
| 6793-1 | 4 | | N/A | | REQUIRED TO ACCESS MEMORY BEYOND 256K (512K MAX) |
| | | 1 | | | REQUIRED TO ACCESS MEMORY BEYOND 64K (256K MAX) |
| 6791 | 3 | | N/A | | REQUIRED TO ACCESS MEMORY BEYOND 64K (512K MAX) |
| 6790 | 7 | | | | |
| | | 5 | | | REQUIRED TO ACCESS MEMORY BEYOND 64K (256K MAX) |
| 6789 | Ø | | R5 | | |
| | | | | R3 | REQUIRED TO ACCESS MEMORY BEYOND 256K (512K MAX) |
| | | | | R2 | REQUIRED TO ACCESS MEMORY BEYOND 64K (256K MAX) |
| 7588-1 | 3 | | N/A | | REQUIRED W/ R3 PROM (6789) & TO ACCESS MEMORY BEYOND 256K REPLACING THE 6788 AND 6788-1. REQUIRED WITH MVP 2.4 O/S. |
| 7[illegible]-x | 1 | | N/A | | |
| | | 0 | | | REPLACES THE 6787/-1 BOARDS WHEN USING R3 PROM (6789) |
| 6798 | 6 | | N/A | | |
| | | 4 | | | REQUIRED TO USE 7588 CONTROL MEM + 7587 DATA MEM BDS |
| | | 3 | | | REQUIRED TO ACCESS MEMORY BEYOND 64K (256K MAX) |
| 8694 | 3 | | N/A | | ELIMINATE I93 ERRORS AND IMPROVES PLL STABILITY |
| 8695A | 3 | | R2 | | CORRECT PROBLEMS WRITING TO DISK |
| 8696 | Ø | | R9 | | IMPROVES DPU RELIABILITY |
| 8794 | 3 | | N/A | | |
| | 2 | | | | ELIMINATES I93 WITH FIXED DRIVE AND IMPROVES PLL STABILITY |
| 7925 | 3 | | R2 | | IMPROVES DPU RELIABILITY |
| 7890 | 4 | | R2 | | PREVENTS DISK ERRORS |
| 7887 | 7 | | N/A | | IMPROVES REGULATOR RELIABILITY |

# MVP 128/512/MicroVP/CS

~~No CRITICAL ECO's SPECIFIC TO THESE PRODUCTS~~

| | | | | |
|---|---|---|---|---|
| 9558 | ø | R3 | | NEEDED FOR 150 MEG INTERNAL 5¼" TAPE DRIVE |
| | | | R2 | CORRECT HANG, I90, AND FORMAT PROBLEMS |

## CS/386

| BOARD | CURRENT E-REV | E-REV | CURRENT PROM REV | PROM REV | |
|---|---|---|---|---|---|
| 9558 | ø | | R3 | | NEEDED FOR 150 MEG INTERNAL 5¼" TAPE DRIVE |
| | | | | R2 | CORRECT HANG, I90, AND FORMAT PROBLEMS |

## I/O CONTROLLERS

| | | | | |
|---|---|---|---|---|
| 8824 | 4 | | N/A | | CORRECTS HANGS AND I90's UNDER HEAVY USE (CRITICAL FOR 386) |
| 7715 | 10 | | N/A | | TO ELIMINATE HANGS AND I92's (CRITICAL FOR 386) |

## DS

| | | | | |
|---|---|---|---|---|
| 8396 | ϕ | | R3 | | NEEDED TO SUPPORT 150 MEG 5¼" TAPE DRIVE |
| | | | | R2 | CORRECTS HANGS, I90, AND FORMAT PROBLEMS (CRITICAL FOR 386) |

## 2275

| | | | | |
|---|---|---|---|---|
| 8396 | 6 | | R5 | |
| | | 5 | R4 | TO PREVENT INTERMITTENT I90, I92, I93, AND I96 WITH 210-7342 DUAL |

## 2280 DPU

| | | | | |
|---|---|---|---|---|
| 7416 | 2 | | N/A | ELIMINATE RIPPLE ON THE -15V |
| 7421 | 4 | | N/A | HANGS, I90, AND I92 |
| 7422 | 5 | | N/A | HANGS AND INCORRECT DRIVE SELECTION |
| 7423 | 4 | | R10 | TO CORRECT DISK INTEGRITY PROBLEMS W/ R8 & R9. SEE TSB HWT6256 |
| | 4 | | R9 | R7 MOST RELIABLE. SEE TSB HWT6256. |
| 7424 | 9 | | N/A | CORRECTS TIMING PROBLEM BETWEEN DPU AND PHOENIX DRIVE |
| 7717 | 3 | | N/A | CORRECTS I90 AND I92 ERRORS IN A MULTIPLE CPU ENVIRON |

TAC

INFORMATION CALL

CONTROL NUMBER C7209078

CONTACT NAME PETER MALECKI POSITION DTS
RCB # 3150 TDX # PHONE # 203 356 7914 EXT #

SYSTEM TYPE 2200LVP DEVICE TYPE CPU
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, B = BOTH, N = NONE
IS THIS INQUIRY PERTAINING TO A NATIONAL ACCOUNT ?
U Y = YES, N = NO, U = UNKNOWN

USE THE FOLLOWING AREA TO DESCRIBE THE SITE THAT CREATED THIS REQUEST
CUST/OFFICE NAME FALLSBURG GAS PHONE #
ADDRESS 3AC1 CITY STATE
ON SITE CONTACT NAME

QUESTION (*) / ANSWER (+)

*(FALLSBURG, NY) SITE# 914-434-7710.
*EMPL# 22093 DISP# 037225
*NEEDS THE PASSWORD FOR THE 2200 DIAGNOSTIC PACKAGE REVISION
*6591 FOR THE MULTI-DISK.
07/28/87: MIKE,CAN YOU HELP THIS DTS ON SITE.PHEONIX (I92'S)
7/28 2:25 PLEASE CALL ASAP! BRENDA
+PASSWORD IS DEPT52.
7/28/87: FOR THE LAST 3 WEEKS CUST HAS BEEN GETTING INT I92 ERRS. ALIGN HAS BEEN CHECKED, ALL SURFACES REFORMATTED SEVERAL TIMES, & POWER HAS BEEN CHECKED. THE CPU, DISK CONTROLLER, & DISK CABLES HAVE BEEN REPLACED. PROBLEM DOES NOT APPEAR SURFACE OR PROG RELATED. CAN NOT GET TO FAIL W/ DISK DIAGS OR FTU. HAD DTS CHECK V'S & RIPPLE WHILE ACCESSING DISK & LOOK GOOD. MAY HAVE 2 BRDS CAUSING PROBLEM. HAS ALSO TRIED REMOVING ALL XTRA I/O BRDS & REPLACED THE 6793 & 6792. SUGGESTED TESTING BY RUNNING RANDOM R/W'S FROM ALL TERM'S TO GET TO FAIL. MOST LIKELY CONTROLLER (SHOULD NOT USE DUAL), CPU BRD, OR PX I/C OR CNTRL MX. IF PROBLEMS CONTINUE SUGGEST RECHECK POWER & INSURE ANALYZER INSTALL WHEN FAILURE OCCURS TO SEE IF POWER PART OF PROB.
(1HR) MIKEB
7/29/87: CUST RAN DAY END PROG THIS AM FOR YESTERDAY & GOT 192 & PROG CONSISTENTLY FAILED. CUST PROGRAMMER FOUND DATA PROB IN TRYING TO STEP AROUND PROB. REWROTE SOME DATA & WAS ABLE TO CONTINUE. DTS GOING BACK ON SITE THIS AFTER. SUGGESTED REPLACING 7423 BRD IN CPU & REFORMATTING. (20MIN) MIKEB
>DTS ON SITE. FAILED AGAIN W/ I92 AROUND NOON & AGAIN PROGRAMMER HAD CUST REWRITE TO DISK. SUGGESTED TESTING DISK FROM MULTIPLE TERMINALS W/ RANDOM R/W'S, REPLACE THE 7423, & TEST AGAIN W/ MULTIPLE TERMINALS. CPU NOW HAS R7 PROMS. 7423 HAS R10 PROMS. WILL USE R7 PROMS FROM CURRENT BRD WHEN SWAPS TO AVOID FORMATTING AS CUST PRESSED FOR TIME. (10MIN) MIKEB
7/30/87: COULD NOT GET TO FAIL, REPLACE 7423 & STILL WOULD NOT FAIL. THIS MORNING IT AGAIN FAILED 5 STRAIGHT TIMES W/ THE DAY END PROGRAM. INSTALLED NEW CPU W/ R10 PROMS, REFORMATTED ALL SURFACES & NO ERRORS SO FAR. MONITORING. (10MIN) MIKEB
7/31/87: 11:30 DTS CALLED. NO ERRORS SO FAR. (5MIN) MIKEB
8/10/87: LEFT MESSAGE AT OFFICE TO CALL. (5MIN) MIKEB
+NO PROBLEMS SINCE REPLACING CPU. DUE TO POLITICS IS LEAVING
+CPU ON SITE. CLOSE CALL.
(5MIN) MIKEB

MEMORANDUM

TO: MIKE THOMPSON

FROM: SKIP ALLEN

DATE: 02/19/86

SUBJECT: 2200 ISSUES AND STATUS.

---

2229 CARTRIDGE TAPE UNIT.

THE PRESENT PROBLEMS WITH THE TAPE UNIT INCLUDE SCRAMBLED DATA AND NON RECOVERABLE READ ERRORS WHEN RESTORING DATA TO THE DISK FROM THE TAPE.
FIX - ECO# 39188.
THIS ECO FIXES TIMING PROBLEMS IN THE CONTROLLER THAT CAUSED DATA TO BE INCORRECTLY GATED TO THE TAPE UNIT. THIS FIX HAS BEEN TESTED EXTENSIVELY AND IS A GOOD ONE. ALL 212-3037 CONTROLLERS IN THE FIELD WILL BE UPGRADED ON A MANDATORY BASIS. ALSO THERE WILL BE A NEW RELEASE OF THE TAPE UTILITIES WHICH WILL HAVE SOME FORM OF DIAGNOSTIC INCLUDED IN THE PACKAGE.

2436DE/DW WORKSTATION.

THIS IS A NEW LOW COST 2200 WORKSTATION WHICH INCLUDES A PM004L MONITOR, A 2336 KEYBOARD AND A 4230 TYPE BASE. FUNCTIONALLY IT IS EQUIVALENT TO THE 2236/2336 WORKSTATIONS.

2280/2280 DPU.

PROBLEMS INCLUDE I-90, I-91 AND I-92 ERRORS. I-90 ERRORS OCCUR WHEN DOING BACKUPS. I-91 ERRORS ARE RANDOM AND I-92 ERRORS SHOW UP ON THE FIRST SEEK WHEN A PLATTER IS MOUNTED. SOME OF THE PROBLEMS ARE DUE TO THE USE OF THE PRINTER/DISK CONTROLLER. THE 210-7717 MASTER MUX BOARD IS ALSO A SOURCE OF PROBLEMS.WE ARE PRESENTLY TESTING CHANGES ON THE MUX BOARD TO SEE IF TIMING PROBLEMS CAN BE CURED THAT CAUSE SOME OF THE I-90/91 ERRORS. MANY OF THE CUSTOMERS IN THE FIELD HAVE DOWN GRADED PROMS ON THE 7423 BOARD TO R-7 FROM R-10 TO OVERCOME THESE PROBLEMS. AT PRESENT, R & D IS NOT INVOLVED WITH THESE PROBLEMS ON A DEDICATED BASIS AND THERE MAY NOT BE A FIX FOR SOME PERIOD OF TIME.

220-036X CABLES.

PRESENTLY THE NEW PARALLEL CABLES BEING SHIPPED TO THE FIELD WITH THE 2275, 2280, 2229 AND ANY PRINTER ARE STILL CAUSING PROBLEMS. THE CONNECTORS ON THE CABLE DO NOT MATE PROPERLY WITH ANY OF THESE DEVICES. THE PROBLEM HAS BEEN PRESENTED TO MFG AT LEAST ONE TIME, AND THE RESULTS ARE THAT THEY THINK THE CABLES ARE OK. (CABLES ARE TESTED WITH A CABLE TESTOR). IF CABLES ARE SUSPECT HAVE THE CE TRY AN OLD STYLE PRINTER CABLE TO TEST THE DEVICE IN QUESTION. (CABLE IS P/N 220-0105).

2258 VS INTERFACE.

THE VS INTERFACE BOARD IS NOW BEING TESTED. SOFTWARE IS IN PROCESS OF WRITING UTILITIES FOR THE 2258.

REGARDS,

S Skip Allen

SKIP ALLEN.

KEY * THEN TYPE IPL OR MVU

REMOTE LINES 60759
60760
PASSWORD RTI

# IPL INSTRUCTIONS FOR SYSTEM III

## CURRENT SYSTEM CONFIGURATION IS CE-SYS 3

| SYSTEM OPERATOR | SYSTEM RESPONSE |
|---|---|
| GO TO TERMINAL # 1 AND PRESS SHIFT RESET. TYPE IN $INIT ''CE-SYS'' | |
| | MOUNT SYSTEM PLATTER<br>PRESS RESET |
| PRESS SHIFT AND RESET | |
| | KEY SF''? |
| PRESS KEY SF00 TO LOAD FROM D11 | |
| | LOADING 2200 SYSTEM MENU ETC. |
| | VP BASIC-2<br>MVP BASIC-2<br>DIAGNOSTICS |
| SPACE DOWN TO MVP BASIC-2<br>PRESS RUN/EXECUTE KEY | |
| | NOTE:<br>SCREEN WILL CHANGE IN 12 SECONDS |
| | DO YOU WANT TO CONFIGURE THE SYSTEM Y OR N N |
| | NOTE:<br>VALID CONFIGURATIONS ARE<br>''CE-SYS 3'' AND ''CE-DEBUG''<br>SEE CONFIGURATION AT TOP OF PAGE |
| PRESS RETURN | |
| | RECONFIGURATION PASSWORD? CE-SYS |
| PRESS RETURN | |
| | SET TIME AND DATE ON WORKSTATION 2 |
| GO TO TERMINAL # 2<br>(NUMBER IS ON SCREEN) | |
| | TIME AND DATE ARE INCORRECT<br>SYSTEM WILL NOT OPERATE<br>WITHOUT CORRECT TIME AND DATE |
| | CR/LF TO SET TIME AND DATE |
| PRESS RETURN KEY | |

ENTER DATE MM/DD/YY

TYPE IN CORRECT DATE
PRESS RETURN KEY

ENTER TIME HH:MM:SS

TYPE IN CORRECT TIME
PRESS RETURN KEY
PRESS TAB KEY

NOTE:
CLOCK SCREEN APPEARS ON TERMINAL #1

PRINTER ADDRESS IS 005

PRESS RETURN KEY

IS SYSTEM IN TEST MODE -- Y OR N ?

TYPE IN LETTER N
PRESS RETURN KEY

PARTITION MONITOR SCREEN
PRINTS ON TERMINAL 2

PARTITION # 8 SHOWS USER MSG
CE-TRACE

PRESS PF KEY 0

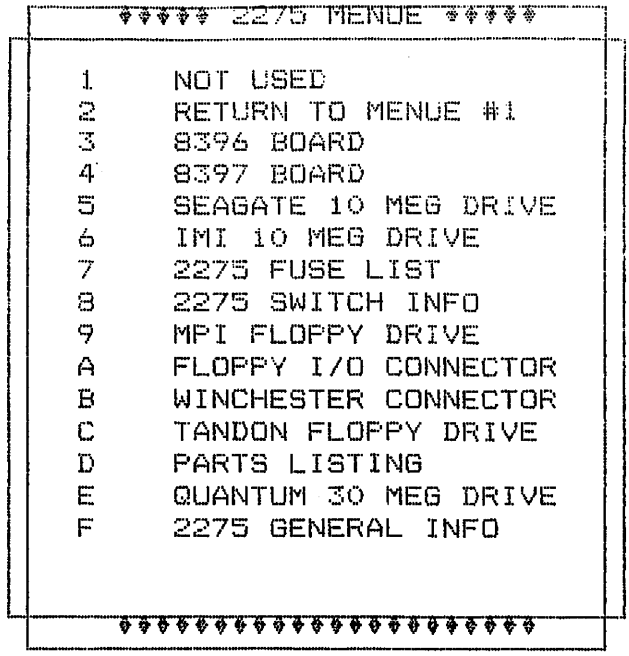
SCREEN DISPLAYS STATUS OF
PORTS 3 AND 4

PRESS RETURN KEY

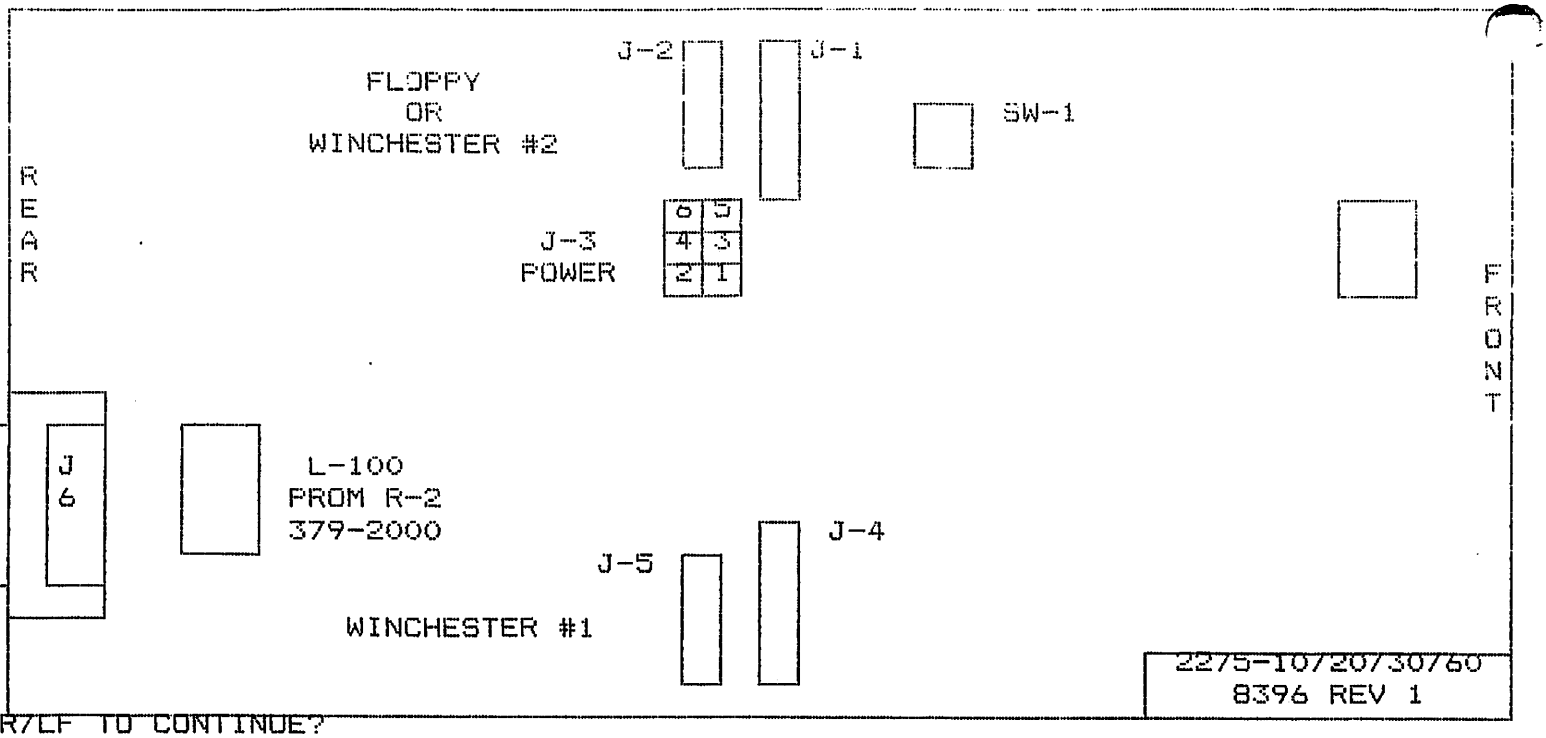
PARTITION MONITOR SCREEN
PRINTS ON TERMINAL 2

PARTITION # 8 SHOWS USER MSG
TRACE #3 AND TRACE #4 ALTERNATELY

SYSTEM IS NOW OPERATIONAL

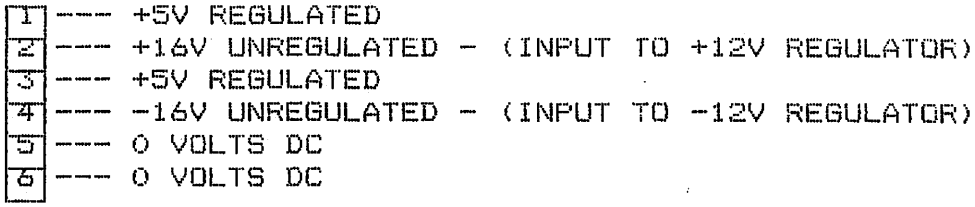



KEY IN HEX CHARACTER TO SELECT ITEM ON MENUE

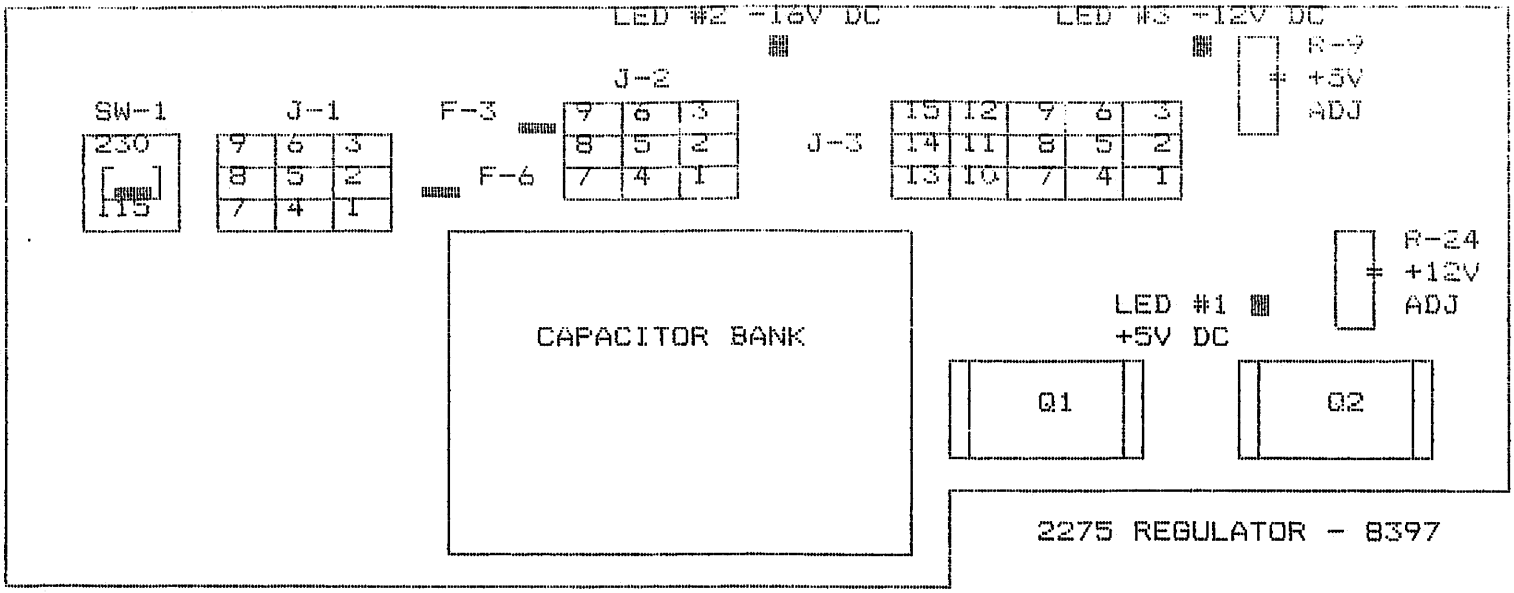



CR/LF TO CONTINUE?

8396 BOARD
CONNECTOR J-3




CR/LF TO RESTART -- FN/TAB TO RETURN TO MENUE?




CR/LF TO CONTINUE?

8397 REGULATOR
CONNECTOR J-1

| | | |
|---|---|---|
| 1 | --- | AC IN FROM FUSE AND LINE SWITCH * |
| 2 | --- | NOT USED |
| 3 | --- | 110/220VAC |
| 4 | --- | 110/220VAC |
| 5 | --- | AC IN FROM LINE SWITCH |
| 6 | --- | 110/220VAC |
| 7 | --- | 110/220VAC |
| 8 | --- | AC TO FAN |
| 9 | --- | AC TO FAN |

* NOTE:
PIN #1 GOES TO THERMAL CIRCUIT BREAKER ON HEATSINK OF Q1 THEN RETURNS TO SWITCH S-1

CR/LF TO CONTINUE?

8397 REGULATOR
CONNECTOR J-2

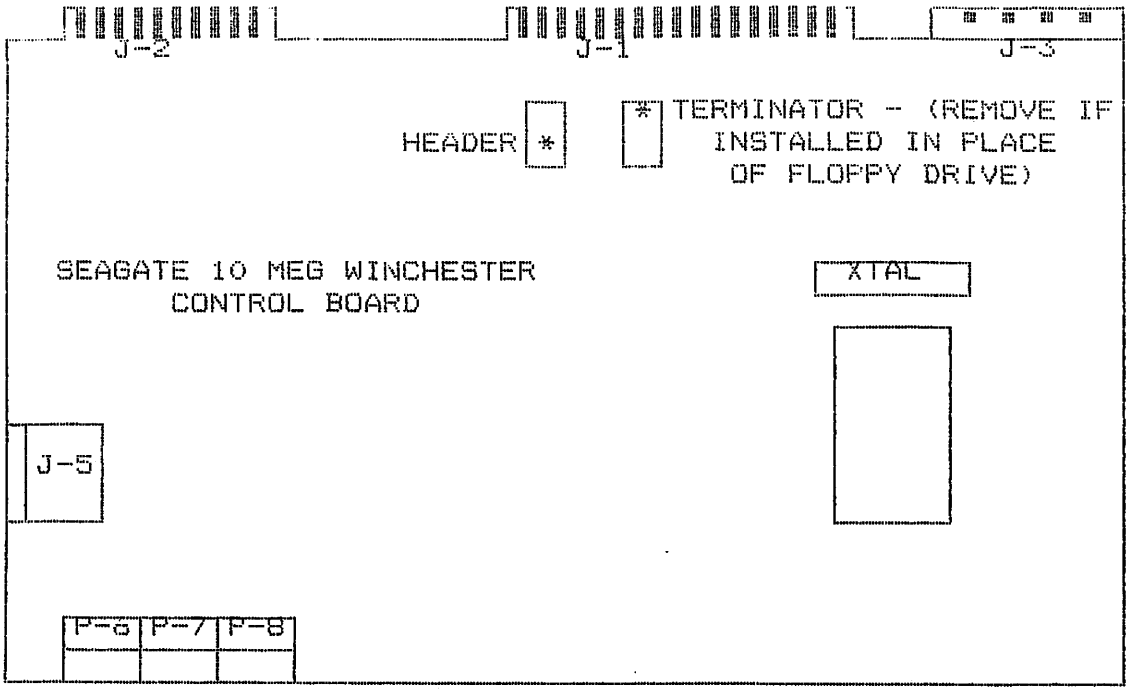
| | |
|---|---|
| 1 | --- 0 VOLTS DC |
| 2 | --- AC 1 |
| 3 | --- AC 2 |
| 4 | --- 0 VOLTS DC |
| 5 | --- 0 VOLTS DC |
| 6 | --- NOT USED |
| 7 | --- AC 4 |
| 8 | --- AC 5 |
| 9 | --- AC 3 |

CR/LF TO CONTINUE?

97 REGULATOR
CONNECTOR J-3

| | |
|---|---|
| 1 | --- +12 VOLTS OUT |
| 2 | --- +5 VOLTS OUT |
| 3 | --- +5 VOLTS OUT |
| 4 | --- +12 VOLTS OUT |
| 5 | --- +5 VOLTS OUT |
| 6 | --- +5 VOLTS OUT |
| 7 | --- 0 VOLTS DC |
| 8 | --- 0 VOLTS DC |
| 9 | --- 0 VOLTS DC |
| 10 | --- 0 VOLTS DC |
| 11 | --- 0 VOLTS DC |
| 12 | --- 0 VOLTS DC |
| 13 | --- +16 VOLTS UNREGULATED |
| 14 | --- NOT USED |
| 15 | --- -16 VOLTS UNREGULATED |

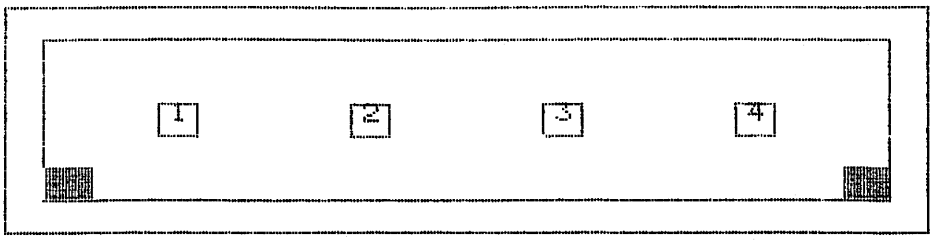
CR/LF TO START PROGRAM AGAIN - FN/TAB TO RETURN TO MENUE?




NOTE:
ALL CONNECTORS ARE KEYED.

CR/LF TO CONTINUE
?

J-3 VOLTAGE CONNECTOR




PIN #1 = +12V DC

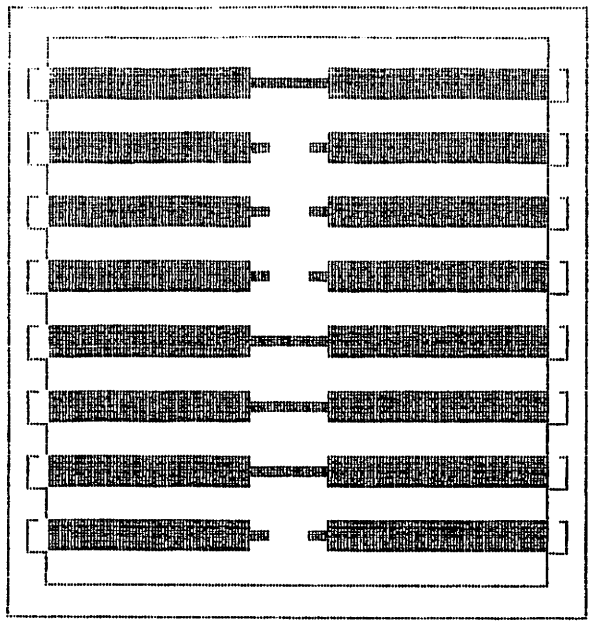
PIN #2 = +12V RETURN

PIN #3 = +5V RETURN

PIN #4 = +5V DC

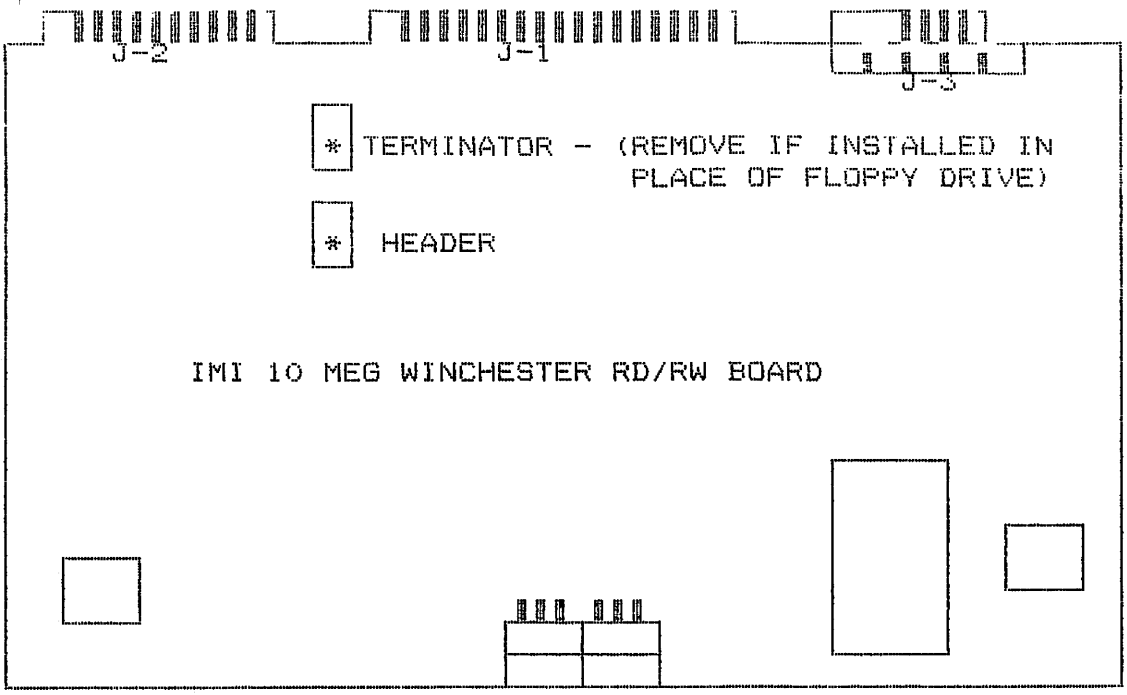
CR/LF TO CONTINUE?

HEADER FOR SEAGATE WINCHESTER



| | | | |
|---|---|---|---|
| 9 | 8 | ** | DRIVE SELECT #1 |
| 10 | 7 | ** | DRIVE SELECT #2 |
| 11 | 6 | ** | DRIVE SELECT #3 |
| 12 | 5 | ** | DRIVE SELECT #4 |
| 13 | 4 | ** | GROUND - NO CONNECTION |
| 14 | 3 | ** | GROUND - NO CONNECTION |
| 15 | 2 | ** | GROUND - NO CONNECTION |
| 16 | 1 | ** | DRIVE ALWAYS SELECTED |

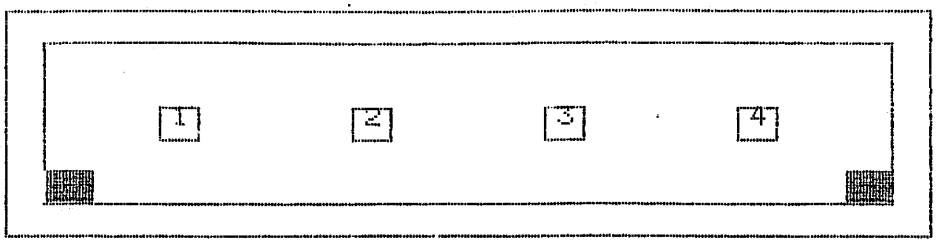
FN/TAB TO RETURN TO MENUE




NOTE:
ALL CONNECTORS ARE KEYED.

CR/LF TO CONTINUE
?

J-3 VOLTAGE CONNECTOR




PIN #1 = +12V DC

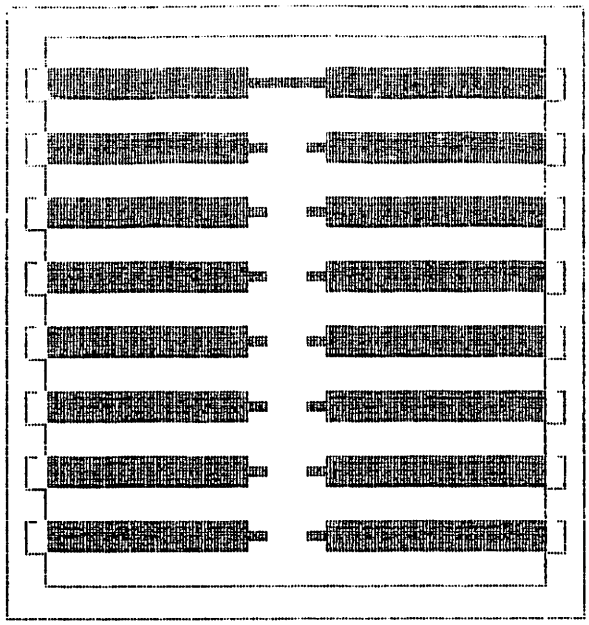
PIN #2 = +12V RETURN

PIN #3 = +5V RETURN

PIN #4 = +5V DC

CR/LF TO CONTINUE?

HEADER FOR IMI WINCHESTER



| | | | |
|---|---|---|---|
| 1 | 16 | ** | DRIVE SELECT #1 |
| 2 | 15 | ** | DRIVE SELECT #2 |
| 3 | 14 | ** | DRIVE SELECT #3 |
| 4 | 13 | ** | DRIVE SELECT #4 |
| 5 | 12 | ** | OPTIONAL RESET |
| 6 | 11 | ** | SIZE SELECT 0 |
| 7 | 10 | ** | SIZE SELECT 1 |
| 8 | 9 | ** | DRIVE ALWAYS SELECTED |

FN/TAB TO RETURN TO MENUE

?

2275 FUSE LIST

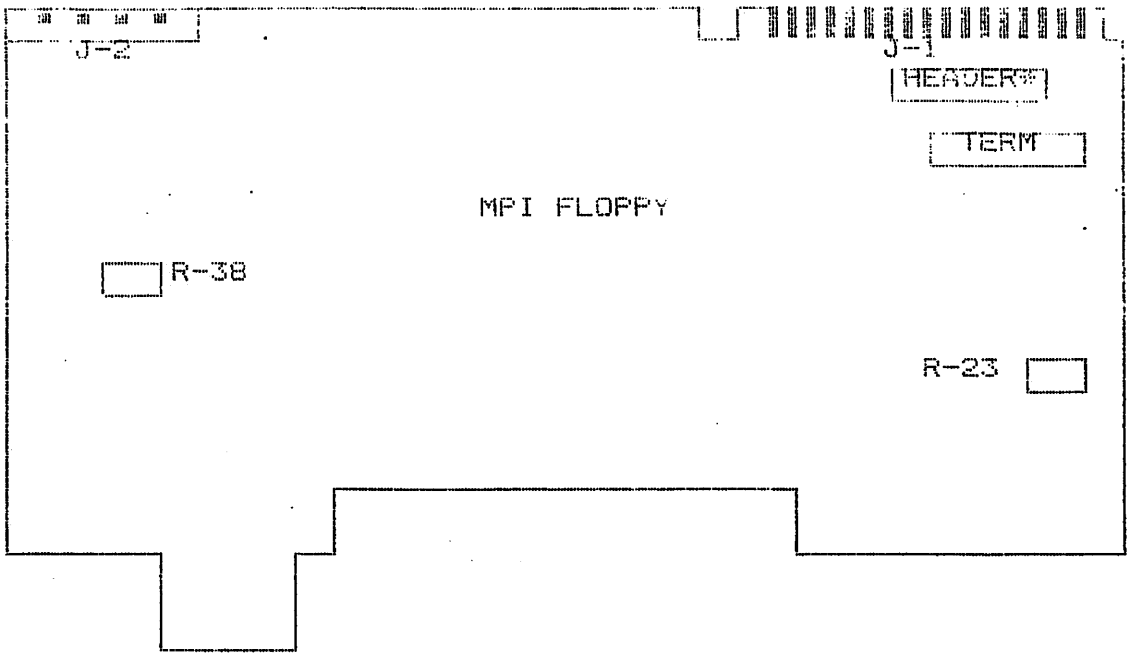
MAIN LINE FUSE - 115 VOLTS AC = 2.3 AMPS
" " " 220 VOLTS AC = 1.6 AMPS
FUSE #1 - JUMPER - NEXT TO J-2
FUSE #2 - JUMPER - NEXT TO J-2
FUSE #3 - 24 VOLTS = 4A * NO FUSE ON R-0 BOARDS
FUSE #3 - 24 VOLTS = 4A * FUSE ON R-2 BOARDS
FUSE #4 - JUMPER - NEXT TO J-2
FUSE #5 - JUMPER - NEXT TO J-2
FUSE #6 - 8.5 VOLTS = 4A * NO FUSE ON R-0 BOARDS
FUSE #6 - 8.5 VOLTS = 4A * FUSE ON R-2 BOARDS

FN/TAB TO RETURN TO MENUE?

| 2275 - XX | SWITCH CONFIGURATION 8396 BOARD | | | |
|---|---|---|---|---|
| - 10 | ON | ON | ON | ON |
| - 30 | ON | ON | ON | OFF |
| - XX | ON | ON | OFF | ON |
| - 20 | OFF | ON | ON | ON |
| - XX | OFF | ON | ON | OFF |
| - XX | OFF | ON | OFF | ON |
| - 60 | OFF | ON | OFF | OFF |
| SWITCH # | SW-4 | SW-3 | SW-2 | SW-1 |

SWITCH ON = SWITCH CLOSED

FN/TAB TO RETURN TO MENUE
?

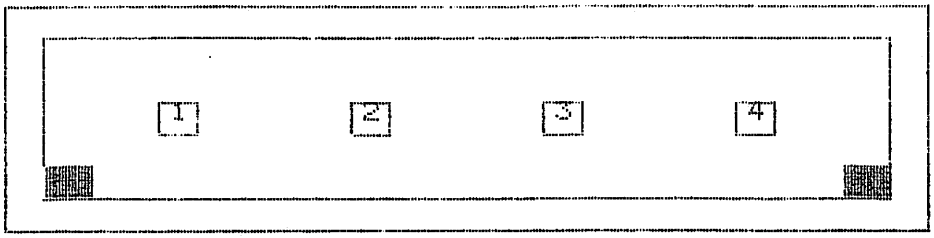



NOTE:
ALL CONNECTORS
ARE KEYED.

* HEADER
JUMPER 2-13
AND 7-8

CR/LF TO
CONTINUE
?

J-2 VOLTAGE CONNECTOR




PIN #1 = +12V DC

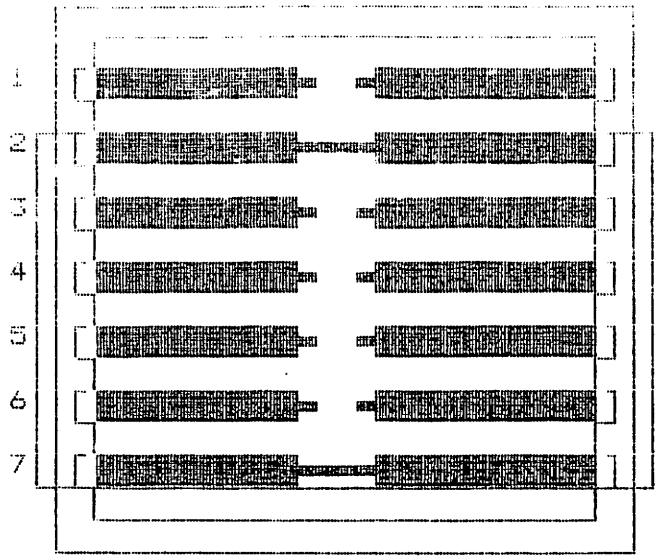
PIN #2 = +12V RETURN

PIN #3 = +5V RETURN

PIN #4 = +5V DC

CR/LF TO CONTINUE?

HEADER FOR MPI 3.25 FLOPPY

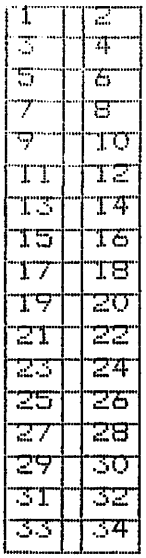



| | | | |
|---|---|---|---|
| 14 | ** | HEAD SOLONOID WITH DRIVE SELECT |
| 13 | ** | DRIVE SELECT #1 |
| 12 | ** | DRIVE SELECT #2 |
| 11 | ** | DRIVE SELECT #3 |
| 10 | ** | MUX |
| 9 | ** | DRIVE SELECT #4 |
| 8 | ** | HEAD SOLONOID WITH MOTOR ON |

HEADER IS A 12 PIN BLOCK
IN A 14 PIN SOCKET

FN/TAB TO RETURN TO MENUE?

## 5.25'' FLOPPY DRIVE P1/J1 I/O SIGNAL CONNECTOR



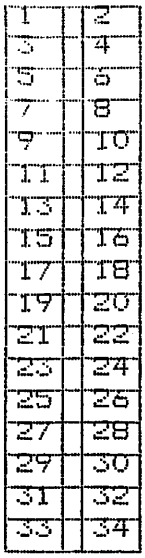
| | |
|---|---|
| 1 | 2 |
| 3 | 4 |
| 5 | 6 |
| 7 | 8 |
| 9 | 10 |
| 11 | 12 |
| 13 | 14 |
| 15 | 16 |
| 17 | 18 |
| 19 | 20 |
| 21 | 22 |
| 23 | 24 |
| 25 | 26 |
| 27 | 28 |
| 29 | 30 |
| 31 | 32 |
| 33 | 34 |

---- PIN 2 = NOT USED
---- PIN 4 = MAY BE USED AS DOOR LOCK OR INDICATOR
---- PIN 6 = DRIVE SELECT #4
---- PIN 8 = INDEX
---- PIN 10 = DRIVE SELECT #1
---- PIN 12 = DRIVE SELECT #2
---- PIN 14 = DRIVESELECT #3
---- PIN 16 = MOTOR ON
---- PIN 18 = DIRECTION SELECT
---- PIN 20 = STEP
---- PIN 22 = WRITE DATA
---- PIN 24 = WRITE GATE
---- PIN 26 = TRACK 00
---- PIN 28 = WRITE PROTECT
---- PIN 30 = READ DATA
---- PIN 32 = SIDE SELECT
---- PIN 34 = NOT USED

FN/TAB TO RETURN
TO MENUE?

NOTE: ALL ODD NUMBERED PINS ARE 0 VOLT DC RETURN LINES

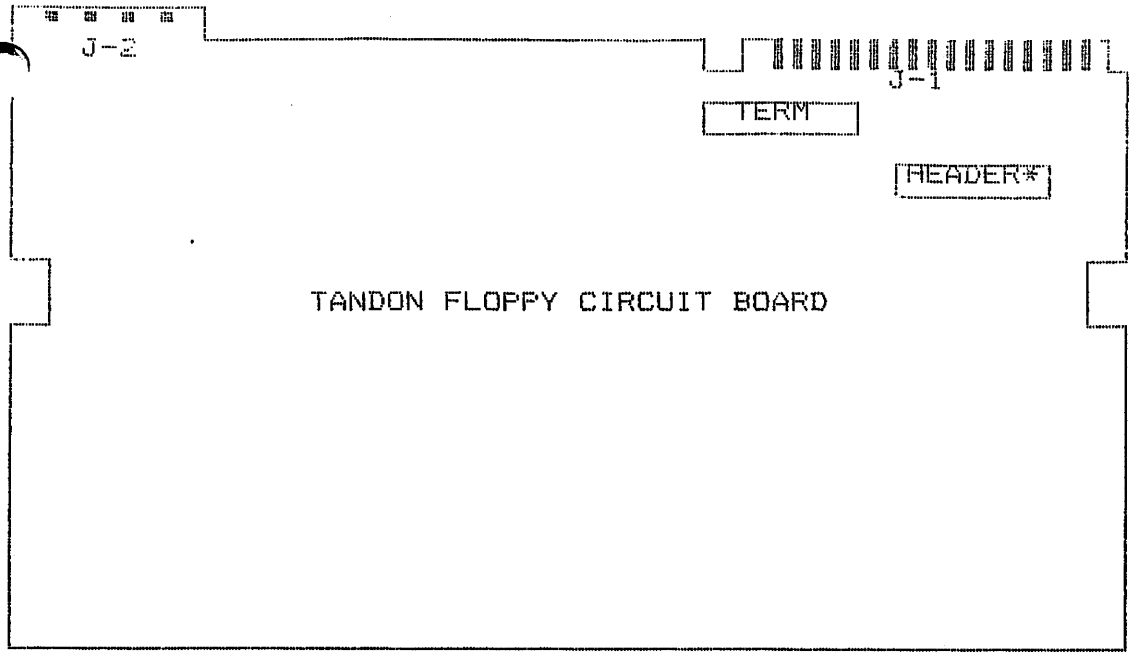
10 MEG WINCHESTER DRIVE P1/J1 I/O SIGNAL CONNECTOR




---- PIN 2 = RESERVED
---- PIN 4 = HEAD SELECT 2
---- PIN 6 = WRITE GATE
---- PIN 8 = SEEK COMPLETE
---- PIN 10 = TRACK 00
---- PIN 12 = WRITE FAULT
---- PIN 14 = HEAD SELECT 0
---- PIN 16 = RESERVED
---- PIN 18 = HEAD SELECT 1
---- PIN 20 = INDEX
---- PIN 22 = READY
---- PIN 24 = STEP
---- PIN 26 = DRIVE SELECT #1
---- PIN 28 = DRIVE SELECT #2
---- PIN 30 = DRIVE SELECT #3
---- PIN 32 = DRIVE SELECT #4
---- PIN 34 = DIRECTION SELECT

FN/TAB TO RETURN
TO MENUE?

NOTE: ALL ODD NUMBERED PINS ARE 0 VOLT DC RETURN LINES

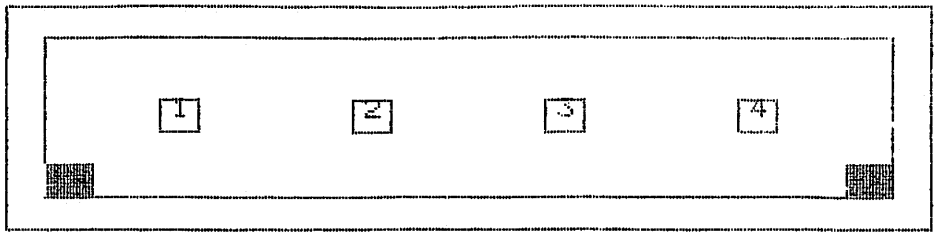



NOTE:
ALL CONNECTORS
ARE KEYED.

* HEADER
JUMPER 2-15
AND 8-9

CR/LF TO
CONTINUE
?

J-2 VOLTAGE CONNECTOR




PIN #1 = +12V DC

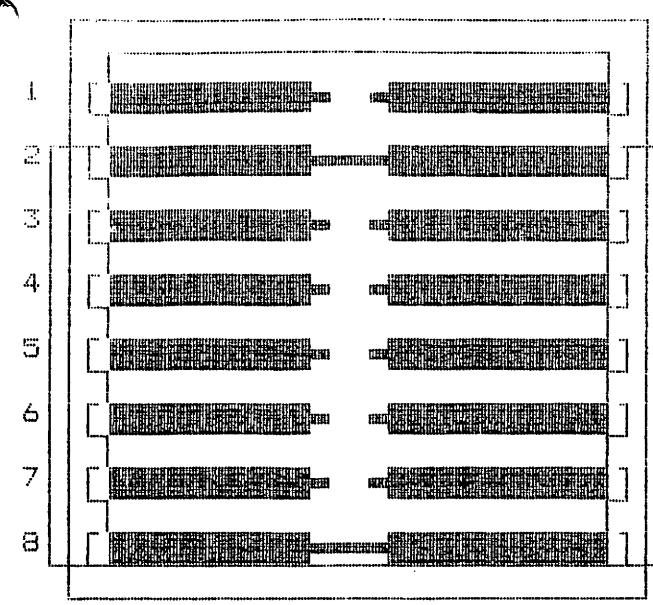
PIN #2 = +12V RETURN

PIN #3 = +5V RETURN

PIN #4 = +5V DC

CR/LF TO CONTINUE?

HEADER FOR TANDON 5.25" FLOPPY



| | | | |
|---|---|---|---|
| 1 | 16 | ** | HEAD SOLONOID WITH DRIVE SELECT |
| 2 | 15 | ** | DRIVE SELECT #1 |
| 3 | 14 | ** | DRIVE SELECT #2 |
| 4 | 13 | ** | DRIVE SELECT #3 |
| 5 | 12 | ** | DRIVE SELECT #4 |
| 6 | 11 | ** | MUX |
| 7 | 10 | ** | NOT USED |
| 8 | 9 | ** | HEAD SOLONOID WITH MOTOR ON |

HEADER PLUG IS 14 PINS
IN A 16 PIN SOCKET

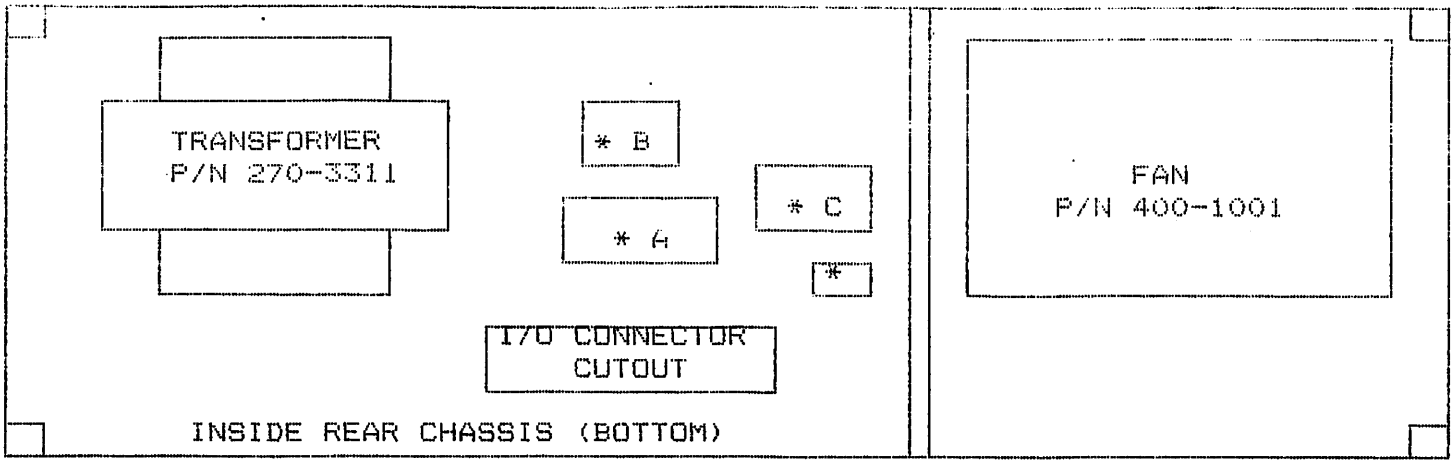
FN/TAB TO RETURN TO MENUE?

## 2275 PARTS LISTING

| | |
|---|---|
| P/N 270-0870 | CHASSIS AND POWER SUPPLY ASSEMBLY |
| P/N 278-4030 | WINCHESTER 10 MEG DRIVE |
| P/N 278-4034 | 30 MEG QUANTUM DRIVE |
| P/N 278-4026 | 5 1/4 FLOPPY DRIVE DSDD - (HAS DOOR SWITCH) |
| P/N 330-0842 | TERMINATOR - FLOPPY DRIVE (150 OHM) |
| P/N 210-8396 | DISK CONTROLLER BOARD |
| P/N 210-8397 | REGULATOR BOARD |
| P/N 220-2013 | CABLE - POWER SUPPLY REG TO DRIVES AND 8396 BOARD |
| P/N 220-3313 | RIBBON CABLE - SMALL 8396 BOARD TO WINCHESTER |
| P/N 220-3239 | RIBBON CABLE - LARGE 8396 BOARD TO WINCHESTER OR FLOPPY |
| P/N 220-3324 | RIBBON CABLE - LARGE DAISY CHAIN 2 WINCHESTERS |
| P/N 379-2000 | R-2 PROM ON 8396 BOARD. (FCO KIT # 728-0129) |

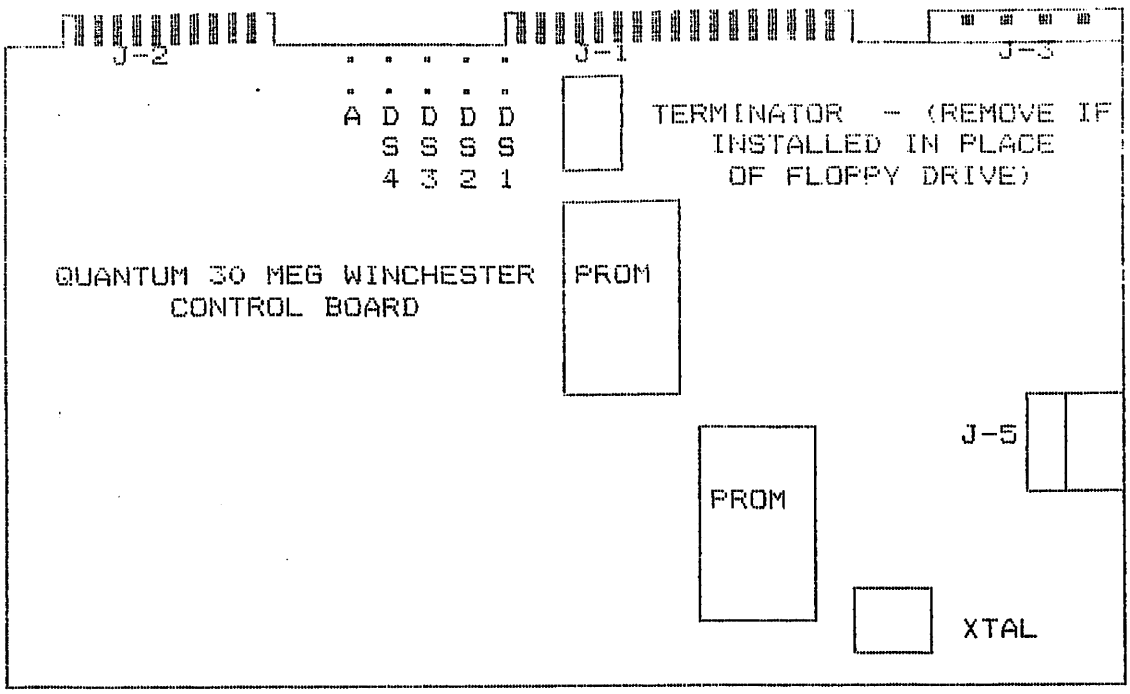
CR/LF TO CONTINUE?

2275 POWER SUPPLY AND CHASSIS ASSEMBLY P/N 270-0870




* = FUSE HOLDER P/N 360-0018 *A = LINE FILTER P/N 410-2024
*B = LINE SWITCH P/N 325-0059 *C = RECTIFIER P/N 380-4005
NOTE: - IF ANY COMPONENT IS DEFECTIVE ORDER COMPLETE CHASSIS ASSEMBLY

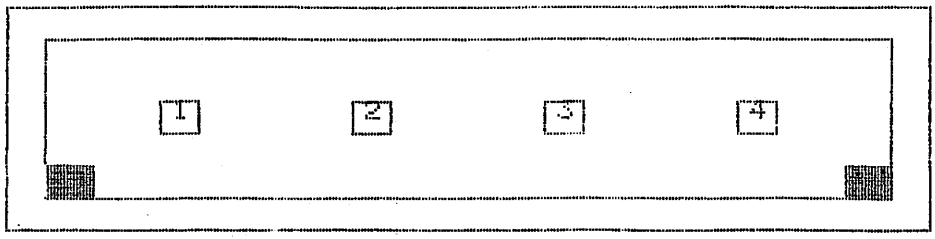
FN/TAB TO RETURN TO MENUE - CR/LF TO RESTART?




NOTE:
ALL CONNECTORS ARE KEYED.

CR/LF TO CONTINUE
?

J-3 VOLTAGE CONNECTOR




PIN #1 = +12V DC

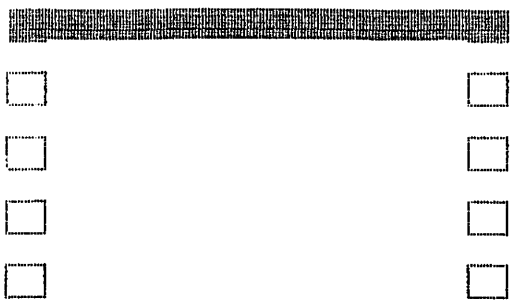
PIN #2 = +12V RETURN

PIN #3 = +5V RETURN

PIN #4 = +5V DC

CR/LF TO CONTINUE?

DRIVE SELECT JUMPERS



** DRIVE SELECT #1

** DRIVE SELECT #2

** DRIVE SELECT #3

** DRIVE SELECT #4

** ALWAYS SELECTED

FN/TAB TO RETURN TO MENUE

?

# GENERAL 2275 INFORMATION

## ADDRESS AND SECTOR INFORMATION

1) 5.25 INCH FLOPPY HAS 1279 SECTORS

2) 10 MEG WINCHESTER HAS 38911 SECTORS

3) 30 MEG QUANTUMS HAVE 64023 SECTORS PER PLATTER (2 PLATTERS)

4) IF 2275 ADDRESS IS 310

   A) 2275-10 - FLOPPY IS D10 AND 10 MEG IS D11

   B) 2275-20 - #1 10 MEG IS D10 AND #2 10 MEG IS D11

   C) 2275-30 - FLOPPY IS D10 AND 30 MEG IS D11 AND D12

   D) 2275-60 - 2 30 MEG DRIVES. ADDRESSES D10,D11,D12,D13.

CR/LF TO CONTINUE?

## GENERAL 2275 INFORMATION

### ADDRESS AND SECTOR INFORMATION

5) IF 2275 ADDRESS IS 320

A) 2275-10 - FLOPPY IS D20 AND 10 MEG IS D21

B) 2275-20 - #1 10 MEG IS D20 AND #2 10 MEG IS D21

C) 2275-30 - FLOPPY IS D20 AND 30 MEG IS D21 AND D22

D) 2275-60 - 2 30 MEG DRIVES. ADDRESSES D20,D21,D22,D23.

CR/LF TO CONTINUE?

# GENERAL 2275 INFORMATION

## ADDRESS AND SECTOR INFORMATION

6) IF 2275 ADDRESS IS 330

A) 2275-10 - FLOPPY IS D30 AND 10 MEG IS D31

B) 2275-20 - #1 10 MEG IS D30 AND #2 10 MEG IS D31

C) 2275-30 - FLOPPY IS D30 AND 30 MEG IS D31 AND D32

D) 2275-60 - 2 30 MEG DRIVES. ADDRESSES D30,D31,D32,D33.

NOTE: 2275-60 ADDRESSES. THE FIRST DRIVE IS DX0 AND DX3.
THE SECOND DRIVE IS ADDRESSED DX1 AND DX2

CR/LF TO CONTINUE?

# CS/386 IDIOSYNCRASIES

Over 100 CPU upgrades or new CS/386 CPUs have been delivered. Most are running very well and we are getting good reports of increased throughput. However, we have found some minor bugs or idiosyncrasies versus a VLSI/2200 CPU/OS. For your information, we have found the following:

## HARDWARE

### Disk Related

1*. The DS &/or the DPU board in a CS-D needs a Rev 2 or greater firmware prom. Which Rev level you have can be determined by running the DS configuration utility. FCO 1375, kit p/n 728-0386 should be orered for the DS & FCO 1376, kit p/n 728-0387 for the CS-D DPU Brd.

2*. When multiplexing CPUs to disk using a 2275MUX (210-8824), the 2275MUX must be E-Rev 4 or better. The 22C80 (210-7715) needs to be E-Rev 10.

3*. If experiencing strange errors loading or accessing from disk using a 22C11 (210-7342 Printer/Disk Controller), try a different type disk controller such as Single Disk Controller (210-6541-2), Triple Controller (212-3012), or either of 2 other Dual Controllers, the 210-7042-2 or the latest version 210-9746 which is just going into prouction.
6541-2 A01

### Tape Related

4*. If using a DS Cabinet and the message "Not a DS Tape Cassette" comes up using the DS Utility Backup to Tape, the problem may be the Disk Controller. As in # 3 above, try another type Disk Controller. The problem appears to be related to the 210-6541-2 Single Disk Controller.

5*. The DS-TS150(A) (150 Meg Tape Drive) needs a Rev 3 or greater prom on the DS or DPU board in a CS-D. Use same FCO kits referenced in 1 above.

### Workstation/Printer Related

6*. If you have a 2536DW and at 38.4 baud rate your printer hesitates, an update to the MXE code is needed. For VLSI, the update is in O.S. Rel 3.4. For CS/386 systems, the update is in O.S. Release 1.0 or greater. Outside the US, the 2536DW should have a Rev 1 prom, p/n 379-8504 per ECO 55643, to correct problems when using foreign languages. There is no FCO.

7*. If you have a 2536DW with a daisy wheel printer as a local printer (device 204), and you are dropping characters, your terminal needs an E-Rev 2 circuit board (210-9557A).

### Printer Related

8*. If using a 2273 band printer (appears to be 600 LPM only) and the printer is adding and dropping characters intermittently, you need the next level of the CS/386 O.S. above Rel 1.0 (when available). A maintenance release is available now on an as needed basis.

Workstation Related

9*. When powering up a terminal (especially in the middle of the day) attached to a CS/386 system, wait for the 'READY (BASIC-2) PARTITION #' message to show before depressing any keys, especially "SHIFT/RESET." You can blow the O.S.

10. PC2200 (195-7560-X) is the recommended Terminal Emulator if using a PC (XT or AT compatible) as a workstation. PC2200 emulates a 2536DW workstation.

General

11. The problem of not having proper Rev levels is very common where an account is not under Wang Maintenance.

40 UNDEFINED
40 PROG FILE
50 PROTECTED
60 386 DRAM OR WRAP
70 386 PROT
DATA IS UNDEFINED

— CAN NOT USE DIRECT SECTOR ADDRESSING. DATALOADCOPEN MUST BE USED W/ FILENAME. DATASAVEDCOPEN

— IF DISK FORMATTED ON 2200T DISK COULD HAVE SECTORS W/ HEADER BEGINNING W/ 4B. WILL CAUSE A01 ROS ON 386. 1ST SECTOR OF EACH PROGRAM OR DATA FILE HEADER MUST BE 40, 60 OR 80.

SOFTWARE:

1. For any vendor's software package that looks for CPU type, the partition status line byte 9 is coded "W" on CS/386, "V" on VP, "M" for LVP/MVP. On certain versions of TOM software for example, the system won't come up (using VLSI software) as it sees the CS/386 as a wrong CPU. Contact TOM or the appropriate vendor for a fix.

2. If your 2200/VLSI software makes decisions on the partition status line bytes 10 and 11, your software may require an update to run on the CS/386. Under the MVP operating system, byte 10 denotes memory bank, byte 11 denotes the amount of partition memory. On the CS/386, partition status bytes 10 and 11 signify the amount of partition memory (there are no banks).

3*. Within "@GENPART" the device table should have only one entry per disk controller address. There are three possible disk controller addresses on a system: /310, /320, or /330. For example, for controller /310, make a single entry /310, not an entry for each specific platter or tape streamer address like /D14 or /D5F.

4. Printer drivers - Rev 1 of the 386 operating system has a bug when executing printer drivers. If experiencing these problems you need the next level of O.S. above Rel. 1.0 (when available).

5. The floating point mathematics on the CS/386 assures accuracy to 10 digits compared to the VLSI floating point math. of 13 digits. THERE HAS BEEN A MATH PROB IDENTIFIED & R+D IS WORKING ON FIX.

6*. The amount of memory space per partition on the CS/386 should be doubled when compared with the VLSI as a general rule of thumb. Variables for example, require more space for coding with the 386 board which will result in most programs requiring a larger partition size.

7. Any partition(s), of any size, can be global to any other partition. You do not have the concept of bank partitions.

8. Any partition can be any size up to the maximum available memory (8MB). However, certain TOM sort modules will not work due to the fact the software is expecting 56KB partition sizes. Contact TOM.

9. IF KEY EDIT/RECALL ON A LONG LINE GET ERROR A05. R+D WORKING ON.

If you need assistance or further information, contact Tyler Olsen at 508-967-0339 or Mike Riley at 508-967-0524.

LED 1 on 386 DAUGHTERBRD – ON DURING SELFTEST, OFF IF SELFTEST PASSES

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# TECHNICAL SERVICE BULLETIN

## SECTION: HardWare General

NUMBER: HWG 9019 REPLACES: _____ DATE: ~~08~~ 9/~~23~~ 26/89 PAGE 1 OF 2

MATRIX ID. 4103 PRODUCT/RELEASE# CS-D, CS-N, CS, MICROVP

TITLE: 2200 Update - New 386 Prom Based CPU Board

PURPOSE:

To inform the field of a new CPU Board for the 2200 Product line and supply information for installing and testing.

EXPLANATION:

A new CPU mother/daughterboard for the 2200 has been designed using an Intel 80386-16 microprocessor. With the 386 microprocessor, CPU processing speed has been on the average doubled. The new CPU board, 212-7129-A/B/C/D, comes in 4 sizes and consists of a 210-9561 motherboard & a 210-9562 daughterboard. The only differences between the 4 are:

| Part # | Mem Size | PAL at L62 | SIMM Modules | JP3 Jpr J5 |
|---|---|---|---|---|
| 212-7129-A | 1 Meg | 377-3776 | 4 256K in L10/L14/L27/L43 | left |
| 212-7129-B | 2 Meg | 377-3777 | 8 256K (full) | left |
| 212-7129-C | 4 Meg | 377-3778 | 4 1M in L10/L14/L27/L43 | right |
| 212-7129-D | 8 Meg | 377-3779 | 8 1M (full) | right |

J2 TEST PURPOSES ONLY

COMPATIBILITY

The 386 board can be used in any of the CPU chassis' built for the single board CPU's which includes: MicroVP, CS, CS-N, & CS-D and is compatible to all boards used with those units. The 386 CPU cannot be used in MVP's or LVP's including those MVP's upgraded to use the VLSI single board CPU.

SOFTWARE

Using the 386 board requires a new Operating System. Basic-2/386 Multi-user O/S Rel 1.0 will be shipped with the board. This new O/S supports all existing Basic-2 statements making it compatible to existing software for the VP/MVP/SVP/LVP/MicroVP/CS CPU's. It can only be used to boot a CPU with a 386 board. The 386 O/S may be resident on the same disk with a standard Basic-2 O/S by making some minor changes to @BOOT and renaming the @MVP file for 1 of the O/S's. This would allow both a standard 2200 Basic-2 CPU and a 386 CPU when mux'd to the same disk unit, to boot from the same disk address. Wang does not at this time ship an O/S disk with both type O/S's resident because there is not enough room on a single floppy disk. Loading the 386 O/S is quite similar to the existing process for loading a standard O/S. If familiar with booting from the standard 2200 O/S, you should have no problem loading the 386 O/S if following the prompts.

over

GROUP: VS On-Line Support MAIL STOP: 001-330

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# TECHNICAL SERVICE BULLETIN

## SECTION: HardWare General

NUMBER: HWG 9019 REPLACES: _____ DATE: ~~08~~ 9/23/89 PAGE 2 OF 2

MATRIX ID. 4103 PRODUCT/RELEASE# CS-D, CS-N, CS, MICROVP

TITLE: 2200 Update - New 386 Prom Based CPU Board and other General Information

ADDITIONAL INFORMATION:

DIAGNOSTICS

As the 386 CPU is compatible to existing software, all current on-line diagnostics can be used. To test the CPU properly, the 2200 CPU Instruction Exerciser must be used as it should be with the VP/MVP/SVP/LVP/CS. The 2200 Diagnostic Package includes diagnostics for the CPU and most peripherals. The part # for the Package which includes documentation is:

195-2956-0 2200 Diagnostic Package rev 18A4

Problem running Multi-Disk Diagnostics with the 386 Board.

Some versions of Multi-Disk Diagnostics will not run as is with the 386 board. The message "CPU SOFTWARE MUST BE UPGRADED TO RUN THIS PROGRAM" will come up. Should you get this error, take the following steps to circumvent. When this error comes up, immediately key SHIFT/RESET and then LISTS. This will list out the first full screen of the program. Look for the line that has the message "CPU SOFTWARE MUST BE UPGRADED TO RUN THIS PROGRAM". If not on the screen key RETURN to load the next screen and continue this until the message is found. It should be on the 1st or 2nd screen. With ver 64A5 of Multi-Disk the line # is 140. The line begins:

140 P$=$PSTAT(1): IF STR(P$,10).....etc.

Two ways to temporarily circumvent would be:

1. Type in line #, 140 in above case, key RETURN, then RUN & RETURN.

or

2. Type in line #, 140 in the above case, key EDIT, then RECALL. Backspace to the 1st position after the 1st colon (:), and add the following instruction by keying INSERT to create space and typing in:

IF STR(P$,9,1)="W" THEN 150:

The 150 is the line number of the next statement line. This number may change dependent on version. Do not type in over any of the existing program. As shown, the above steps would only circumvent the problem and would have to be repeated each time the program is loaded. If familiar with Saving and Renaming files, the changes could be made permanent. If the changes are saved the 2nd method should be used.

GROUP: VS On-Line Support MAIL STOP: 001-330

To: Joe Costello MSO216/LOWELL
From: SHIH-MING CHIOU
Subject: CS/386 Jumpers Date: 06/19/89

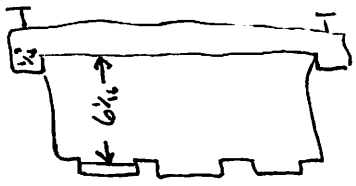
Distribution:
CC: M. L. Lee

Joe,
I received 1 of 9561 RO board and artwork vendor had renamed the all jumper location as following:

| Item | RO location | old location | description |
|---|---|---|---|
| 1. | J4 | JP2 | reset moment touch for debug use only |
| 2. | J5 | JP3 | indicates type of SIMM used (256KB or 1MB) |
| 3. | J6 | JP1 | oscillator jumper for testing only. |
| 4. | J7 | JP4 | for BIT test. |

Best regards,
S.M.Chiou

7/16 TOTAL
1/8 LEFT



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# TECHNICAL SERVICE BULLETIN

## SECTION: HardWare Technical

NUMBER: HWT 9373 REPLACES: _____ DATE: ~~11~~ 12/~~22~~ 13/89 PAGE 1 OF 4

MATRIX ID. 4103 PRODUCT/RELEASE# MICROVP/CS/CS-D/CS-N

TITLE: Idiosyncrasies when using the 386 Prom Based CPU Board (212-7129x)

PURPOSE:

To aid the field in troubleshooting problems and idiosyncracies which may result or occur when using the 386 CPU board.

EXPLANATION:

Over 100 386 CPU Boards have been shipped in new CPU's and as upgrades. Most are running very well and we are getting good reports of increased throughput. However, there are certain issues that need to be made clear and possible problem areas that need to be identified. The following is a list of hardware concerns associated with the 386 Board. Look for TSB SWT 9225, Matrix 4301 in the next week or two for a current list of software concerns.

General

1. Environment: The 386 CPU Board has a much faster clock than the VLSI single board CPU's (210-8937x & 210-8034) and as such could be more sensitive to environmental issues such as power, grounding, and static. The 386 board meets all FCC requirements. However, it is possible that marginal interference that could sneak in between time slices on a VLSI board could cause a failure with the 386 Board. If a customer has environmental problems, they must be addressed before installation if at all possible. Existing sites with environmental issues, even when they do not appear to be affecting performance, must have those issues documented and made known to the customer. The customer must be made aware of environmental concerns which at some point could present a problem.

2. E-rev: The problem of not having boards at the latest E-rev level is very common, especially when an account is not under Wang Maintenance. Although having the latest E-rev is preferrable, the latest E-rev level is not always critical. Those boards that have been found to be critical are listed in this TSB. Other boards may need to be added to the list in the future.

M-O-R-E

GROUP: VS Systems Hardware MAIL STOP: 001-330

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# TECHNICAL SERVICE BULLETIN
## SECTION: HardWare Technical

NUMBER: HWT 9373 REPLACES: _____ DATE: ~~11~~ 12 ~~/22~~ 12/89 PAGE 2 OF 4

MATRIX ID. 4103 PRODUCT/RELEASE# MICROVP/CS/CS-D/CS-N

TITLE: Idiosyncrasies when using the 386 Prom Based CPU Board (21~~8~~2-7129x)

3. Upgrades: When upgrading to a 386 Board, a much faster clock is being used. This could magnify a marginal problem with a controller board not seen with a slower CPU. Do not automatically assume the problem is the 386 board because all the controllers worked with the previous CPU.

4. Installation: There is some vertical play when inserting the 386 board into the CPU motherboard, possibly as much as 1/8". When inserting the 386 Board visually line up the contacts on the board with the contacts in the motherboard connectors to insure proper seating. There have been board failures in the field directly related to seating.

5. Addressing: All controller boards must have legal address switch settings even if not being used and not causing a problem in the current configuration. All switches off is not a legal address. For example, the only legal addresses for disk controllers are 310, 320, and 330.

Operating System

6. Within "@GENPART" the device table should have only one entry per disk controller address. There are three possible disk controller addresses on a system: /310, /320, and /330. For example, for controller /310, make a single entry /310, not an entry for each specific platter or tape streamer address like /D11, /D12, /D13, /D14, /D1F, /D51, or /D5F, etc. Additional entries could cause I92 errors if RESET is keyed while accessing disk.

7. Printer drivers - The CS/386 Rel 1.0 operating system has a bug when executing printer drivers. If experiencing these problems you need the next level of O.S. above Rel. 1.0 (when available).

8. The amount of memory space per partition on the CS/386 should be doubled when compared with the VLSI as a general rule of thumb. Variables for example, require more space for coding with the 386 board which will result in most programs requiring a larger partition size. If additional memory is not partitioned, it is possible A01 and A02 errors may occur.

M-O-R-E

GROUP: VS Systems Hardware MAIL STOP: 001-330

# TECHNICAL SERVICE BULLETIN

## SECTION: HardWare Technical

NUMBER: HWT 9373 REPLACES: _____ DATE: ~~11~~ 12/~~22~~ 12/89 PAGE 3 OF 4

MATRIX ID. 4103 PRODUCT/RELEASE# MICROVP/CS/CS-D/CS-N

TITLE: Idiosyncrasies when using the 386 Prom Based CPU Board (210-7129x)

Disk Related

9. Both the DS board & the DPU board in a CS-D need a Rev 2 or greater prom. The prom rev level can be determined by running the DS Configuration Utility. Order FCO 1375, kit p/n 728-0386 for the DS & FCO 1376, kit p/n 728-0387 for the CS-D DPU Brd. This corrects a problem where a disk could hang or an error could occur if RESET is keyed while accessing disk.

10. When multiplexing CPUs to disk using a 2275MUX (210-8824), the 2275MUX must be minimum E-Rev 4. The 22C80 (210-7715) needs to be E-Rev 10. This corrects intermittent I90's, I92's, and hangs during heavy access.

11. If experiencing strange errors loading from or accessing disk, or running a program once loaded when using a 22C11 (210-7342 Printer/Disk Controller) or a Single Disk Controller (210-6541-2), try a different type disk controller. Other disk controllers include the Triple Controller (212-3012), or either of 2 other Dual Controllers, the 210-7042-2 or the latest version 210-9746 which is just going into production.

Tape Related

12. If using a DS Cabinet and the message "Not a DS Tape Cassette" comes up using the DS Utility Backup to Tape, the problem may be the Disk Controller. As in # 11 above, try another type Disk Controller. The problem appears to be related to the 210-6541-2 Single Disk Controller.

13. The new 150 Meg Tape Drive for the DS or CS-D requires a rev 3 prom in the DS or on the DPU brd in a CS-D. Use the FCO kits referred to in # 9.

Workstation/Printer Related

14. If using a 2536DW with a daisy wheel printer as a local printer (address 204) and the printer is dropping characters, the terminal needs a minimum E-rev 2 board (210-9557A).

M-O-R-E

GROUP: VS Systems Hardware MAIL STOP: 001-330

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# TECHNICAL SERVICE BULLETIN

## SECTION: HardWare Technical

NUMBER: HWT 9373 REPLACES: _____ DATE: ~~11~~ 12/12/89 PAGE 4 OF 4

MATRIX ID. 4103 PRODUCT/RELEASE# MICROVP/CS/CS-D/CS-N

TITLE: Idiosyncrasies when using the 386 Prom Based CPU Board (210-7129x)

Printer Related

15. If using a 2273 Band printer and it is intermittently adding &/or dropping characters, you need the next level of the CS/386 O/S above Rel 1.0 (when available). A maintenance release is available now on an as needed basis.

16. If the 2273 Band Printer is ON and Selected while the system is being powered on or possibly when just loading the Operating System you may not be able to Deselect or print without first powering the printer off.

Workstation Related

17. When powering up a terminal attached to an operating CS/386 system, wait for the 'READY (BASIC-2) PARTITION #' message to show before depressing any keys, especially "SHIFT/RESET." You can blow the O/S or loose the workstation until the system is rebooted. R&D is working on a fix.

18. The 2536DW should have a minimum Rev 1 prom (379-8504) per ECO 55643. It corrects cursor control problems especially at lower Baud rates and some minor bugs associated with certain foreign languages. There is no FCO.

19. The 2536DW Workstation is basically a modified 4230A VS Workstation. The first shipments of 2536DW went out with VS keyboards. These VS style keyboards make the 2200 system much more vulnerable to static interference. The VS keyboard can be identified by looking at the 1st SF' (Special Function) key. If the key is marked 1 it is VS, 0 it is 2200. There is also a 2nd problem with the keyboard to do with static. The board inside should have foil on it and this can be checked by looking thru the holes on the rear feet of the keyboard. This is being addressed. The correct keyboard is part # 279-0904US.

***If you have a customer experiencing problems with a 386 CPU Board or have questions concerning this TSB, please call Mike Bahia at 508-656-0256.

GROUP: VS Systems Hardware MAIL STOP: 001-330

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WANG Laboratories, Inc.

# TECHNICAL SERVICE BULLETIN
# SECTION: HardWare Technical

NUMBER: HWT 8079 REPLACES: _____ DATE: 05/16/88 PAGE 1 OF 1

MATRIX ID. 4103 PRODUCT/RELEASE# CS, MICROVP, MVP128/512

TITLE: PROBLEM with the 1 MEG CPU/MEMORY BOARD (210-8937C) and GENERAL BOARD INFORMATION

PURPOSE:

To inform the field of a problem with the 1 Meg CPU/Memory board and the resolution. To provide other general information on the 210-8937 board.

EXPLANATION:

A problem has been found with the 1 Meg version only of the new 210-8937 CPU/Memory board usable in any single board 2200 CPU. When more than 8 terminals are used, or if greater than 512K memory is used the system may fail with PEDM errors (Parity Error in Data Memory). The problem has been found to be a Motorola chip, MC74F539N, sometimes used at L45. If L45 is something other than this specific Motorola chip, the board should be good.

CORRECTIVE ACTION:

The problem chips have been purged from manufacturing so all boards now being made will not have the problem. If you have a bad board with the MC74F539N Motorola chip, send it back identifying L45 as the problem. The chip is soldered in so it is not reccomended to replace it in the field.

OTHER INFORMATION:

There are 6 versions of the 8937 board, each with it's own specific programmable array logic chip (PAL) at location L2 as shown below. Operating System 3.1 is required. Lower operating systems may fail during initial system IPL even if only 512K or less of memory is to be used. Use the new 2200 Diagnostics, p/n 195-2956-0, to properly test these boards.

| | | | | JUMPERS | |
|---|---|---|---|---|---|
| Part # | Mem Size | PAL at L2 | SIMM Modules Size | J1 | J2 |
| 210-8937A | 128K | 377-3483 | 256K | in | 2-3 |
| 210-8937B | 512K | 377-3484 | 256K | in | 2-3 |
| 210-8937C | 1Meg | 377-3485 | 256K | in | 2-3 |
| 210-8937D | 2Meg | 377-3486 | 1Meg | in | 1-2 |
| 210-8937E | 4Meg | 377-3487 | 1Meg | in | 1-2 |
| 210-8937F | 8Meg | 377-3488 | 1Meg | in | 1-2 |

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

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# TECHNICAL SERVICE BULLETIN

## SECTION: HardWare General

NUMBER: HWT 9449 REPLACES: _____ DATE: 04/17/90 PAGE 1 OF 2

MATRIX ID. 4103 PRODUCT/RELEASE# 2200 CS-D/N

TITLE: DPU Disk Port & Jumper Information/Part Number Correction

PURPOSE:

To inform the field of the purpose of the disk/mux port and jumper on the 212-7113 DPU Board which is not documented and to provide the field with the correct part numbers for the Power Supply & On/Off switch.

EXPLANATION:

Every CS-D CPU comes with a 212-7113 DPU Board used to control all internal drives. The DPU Board consists of a 210-9558 Motherboard which has two I/O connectors and a 210-9559 Daughter Board. The top connector is a standard system printer port. The bottom connector is a disk/mux port. The disk/mux port is used to allow access to the internal CS-D drives by other CPUs. This port is activated by the MUX/BUS jumper located on the 210-9558 motherboard up next to the rail between the 2 I/O connectors.

Normally this jumper will be in the BUS position. This causes the disk/mux port to be inactive allowing only the internal CPU to have access to it's drives. When the jumper is moved to the MUX position all access must be through the disk/mux port including access by the CS-D CPU itself.

In the MUX position, the drives and DPU Board should be thought of as a separate device much like the DS Cabinet or the 2275. The disk port on the 212-7113 DPU Board is the I/O connector similar to the I/O connectors on the back of the DS & 2275. Any CPU requiring access to these drives must now have a disk controller cabled to this port. Normally when in the MUX position a 2275MUX Master Board, 210-8824, would be installed in the I/O section with a cable from it's disk port to the disk/mux port of the DPU Board. This connection allows the CS-D to access the internal CS-D drives. Other CPU's (up to 16 can be mux'd) using 210-7715 boards can be cabled (100' max) to the 2275MUX Master CPU ports allowing them access to the internal CS-D drives. Of course a standard disk controller in any CPU could be cabled directly to this port, but that would limit access to only that CPU. When used in the MUX position, the disk controller in the CPU accessing the drives determines the device address via the device address switch bank on that board. This overrides the device address set on the CS-D DPU Board. This is the same way it is done on all similar 2200 disk connections. Switch settings are discussed on page 2.

GROUP: 2200 Product Support MAIL STOP: 001-330

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# TECHNICAL SERVICE BULLETIN
## SECTION: SoftWare General

NUMBER: HWT 9449 REPLACES: _____ DATE: 03/06/90 PAGE 2 OF 2

MATRIX ID. 4103 PRODUCT/RELEASE# 2200 CS-D/N

TITLE: DPU Disk Port & Jumper Information/Part Number Correction

EXPLANATION (cont'):

Switch settings for the CS-D DPU Board can be found on a sticker on the right side panel of the CS-D cabinet. These switch settings are correct. Appendix A of the CS Maintenance Manual, 741-1769-2, covers the CS-D & CS-N CPU's and on page A-38 incorrectly shows the drive type switch settings. What is shown as ON should be OFF and vice versa. There is also added confusion as the sticker & manual do not agree on the switch labeling and the male connectors on the sticker do not match the board. Use the side panel for sw settings but beware, labeling may not match. To access, remove the top cover by removing the 2 screws in back. The side panel can then be removed by sliding it up. The correct sw settings are:-

210-9558 Motherboard

SW 1 - Winc Drive Type - between L8 & L13 near bottom of board

| | |
|---|---|
| No Winc = All OFF | 10 Meg Rem Winc = 5 ON only |
| 10 Meg Winc = 6 ON only | 20 Meg Winc = 5,6 ON only |
| 32 Meg Quantum Q540 = 7 ON only | 64 Meg Winc = 5,7 ON only |
| 140 Meg Maxtor = 6,7 ON only | 32/42 Mg Micropolis = 5,6,7 ON |
| 112 Meg Maxtor = 8 ON only | |

SW 2 - Printer Address - next to L69 just above connector J5

215 = 1,3,5 ON only 216 = 2,3,5 ON only 217 = 1,2,3,5 ON only

SW 3 - Drive/s Device Address - between L76 & L77 at top of board

310 = 5 ON only 320 = 6 ON only 330 = 5&6 ON only

210-9559 Daughter Board

SW 1 - Factory Use Only - 8 bank sw at top of board ALL OFF

SW 2 - Floppy/Tape Switch - 4 bank switch at bottom of board

| | |
|---|---|
| 1 OFF = 320 Kb Floppy | 1 ON = 1.2 Meg Floppy |
| 2 OFF = No Tape | 2 ON = Tape Drive installed |
| 3,4 = OFF (not used) | |

ADDITIONAL INFORMATION:

Also in Appendix A of the CS Manual, 741-1769-2, on pages A-54 and A-55 the AC On/Off Switch and the CS-D/N SPS-255 Power Supply have incorrect part numbers. The part numbers shown are for the CS. The On/Off switch is not physically compatible and although both CPU's use the same base Power Supply the harness is different. The correct part numbers are:

CS-D/N On/Off Sw 325-0105 CS-D/N SPS-255 Power Supply 270-0809-1

GROUP: 2200 Product Support MAIL STOP: 001-330

# The 2200 Family Tree

| | | |
|---|---|---|
| PCS-III | . 32K CPU<br>. 2 143 Kbyte Diskettes (1 Optional)<br>. Telecommunications Option<br>. Multiplex Option | Single-User |
| 2200 SVP | . Up to 64K CPU<br>. SSDD diskettes or optional 2 or 4 MB Winchester Drive<br>. Supports one workstation and one printer | Single-User<br>Upgradeable to Multi-User |
| 2200 VP | . Up to 64K CPU<br>. Full range of disk peripherals<br>. Supports full range of peripheral options | Single User<br>Upgradeable to Multi-User |
| 2200 LVP | . Fully compatible to MVP<br>. Up to 128K CPU<br>. 1 Mbyte DSDD Diskette<br>. Optional 2, 4, or 8 Meg Winchester<br>. Up to 4 terminals<br>. Supports TC and full range of peripherals | Multi-User<br>Multi-Processing |
| 2200 MVP | . Up to 256K CPU<br>. Supports up to 16 jobs concurrently<br>. Expandable to 12 terminals<br>. Interfaces to all disk storage types<br>. Has full range of TC capability<br>. Supports all peripherals in family | Multi-User<br>Multi-Processing |

## 2200 CPU STATISTICS

| Features | PCS III | VP | SVP | LVP | MVP |
|---|---|---|---|---|---|
| Minimum Memory Capacity | 32K | 32K | 32K | 32K | 32K |
| Maximum Memory Capacity | 32K | 64K | 64K | 128K | 256K |
| I/O Slots or Ports | 3 Ports | 9 Slots | 3 Ports | 3 Slots<br>9 Slots optional | 9 Slots |
| Number of Potential Users | 1 | 1 | 1 | 4 | 12 |
| Language | BASIC | BASIC-2 | BASIC-2 | BASIC-2 | BASIC-2 |
| Disk Loaded Operating System | No | Yes | Yes | Yes | Yes |
| Size of Control Memory | 42.5K | 48K | 48K | 60K | 60K |
| Upgrade Path (does not refer to memory or CRT expansion) | None | To MVP, potential 12 users | To LVP, potential 4 users | None | None |
| Standard On-Line Storage | 140K mini-diskette (SSDD) | None | 1 MB diskette (DSDD) | 1 MB diskette (DSDD) | None |
| Optional On-line Storage | Second 140K mini-diskette<br>Total = 280K | None* | Second 1 MB DSDD<br>2 or 4 MB hard disk<br>Total: 1,2,3,or 5 MB | 2, 4, or 8 MB Fixed disk<br>Total: 1,3,5,or 9 MB | None* |
| Peripheral Storage Supported | 2260 (Multiplexed) | 2260, 2270A, 2280 | None | 2260, 2270A, 2280 | 2260, 2270A, 2280 |
| Supports TC | Yes | Yes | Yes | Yes | Yes |

*All storage will require I/O controllers and not be packaged within the CPU encasement.

History lesson: CS / 2200 CPU Family Tree

Primary development criteria -- The language will be upward compatible so that any software developed will operate on subsequent machines.

PROM based -- single user systems.
2200-A 16x64 white on black CRT Tape cassettes and printers
Dartmouth BASIC was the language.

The Wang R&D staff and many users contributed ideas to an upward compatible programmers dream language. Wang BASIC-2 began to evolve.

2200-B added diskette and plot statements
KEYIN verb was introduced.

2200-C added hard disks and ROM options.
Option 1 - Math matrix ROM
Option 2 - $GIO ROM
Option 3 - Keyboard edit ROM.
Option 4 - CRT Bell
Option 5 - Business ROM
2200-T Combined ROMS into single CPU.
Other systems -- 2200-S, WCS systems, PCS-1, PCS-2, PCS-3.

Systems above had 16K, 32K, or 64K of user memory.

Wang BASIC-2 evolved alot more.

New technowlegy -- faster CPU, BASIC-2 loads from disk(ette).
Systems with the VP became 4 to 11 times faster than the old systems.

2200-VP Single user, BASIC-2 loads from disk(ette).
2200-MVP Multiple user.
Other systems -- 2200-LVP, 2200-SVP.

New technowledgy -- VLSI techknowlegy.
VLSI -- Very Large Scale Integrated Circuit processor chip.

A VLSI chip allowed a single CPU processor board to be substituted for the nine CPU boards that were incorporated into earlier CPU versions.

2200-MVP A limited number of VLSI based CPUs were shipped. These were the last months production of the MVP series.

MicroVP -- This incorporated the new VLSI board.

CS & DS -- The Wang Computer System & separate Data Storage Cabinet.
CS -- The Wang Computer System.
Incorporates nine (9) I/O slots.
CPU board has room for 8 MB of RAM memory.
User partitionable memory is 1MB max.
16 partitions maximum, 56K maximum per partition.
All non-partitioned memory is available for CPU RAMdisk.

DS -- The Wang Data Storage Cabinet
Room for 32 separate surfaces, 316 MB of random access storzge.
Requires one disk channel into CPU.

CS/D -- Combined CS and small scale DS in a single cabinet.

History lesson: CS / 2200 Disk(ette) Family Tree

. Memorex floppy disk -- Single floppy (incompatible with subsequent models)
(1023 sectors) 64 tracks of 16 sectors. .

..8 inch SSSD white label diskettes.
. 2270 (Shugart) floppy disk -- One, two, or three floppy drives.
(1023 sectors) 64 tracks of 16 sectors. .

. 2270A (Shugart) floppy disk -- One, two, or three floppy drives.
(1231 sectors) 77 tracks of 16 sectors.

. 2270A (Shugart) floppy disk -- One, two, or three floppy drives.
(1231 sectors) 77 tracks of 16 sectors.

..8 inch SSDD Red label diskettes.
. LVP or SVP internal diskette drive.

..5 1/4" inch DSDD (177-0080) diskettes.
. 2275 diskette drive. (1279 sectors)
. DS-320 diskette drive. (1279 sectors)

..5 1/4" inch DSHD (177- ) diskettes.
. DS-1.2 diskette drive. (4159 sectors)

## CS / 2200 Hard Disk Family Tree

.. SVP / LVP Winchester

.. 2230 Series (Diablo)

.. 2260 Series (CDC Hawk)

.. 2280 Series (Phoenix)
(950 watts running, 250 watts standing) BTU 1050 / hour

..DS Winchesters.

| | | |
|---|---|---|
| .. DS 10R | 10 MB Removable | 1 x 10 mb surface. |
| .. DS-20 | 20 MB fixed | 2 x 10 mb surfaces. |
| .. DS-32 | 32 MB fixed | 2 x 16 mb surfaces. |
| .. DS-64 | 64 MB fixed | 4 x 16 mb surfaces. |
| .* DS-112 | 112 MB fixed | 7 x 16 mb surfaces. |
| .. DS-140 | 140 MB fixed | 14 x 10 mb surfaces. |

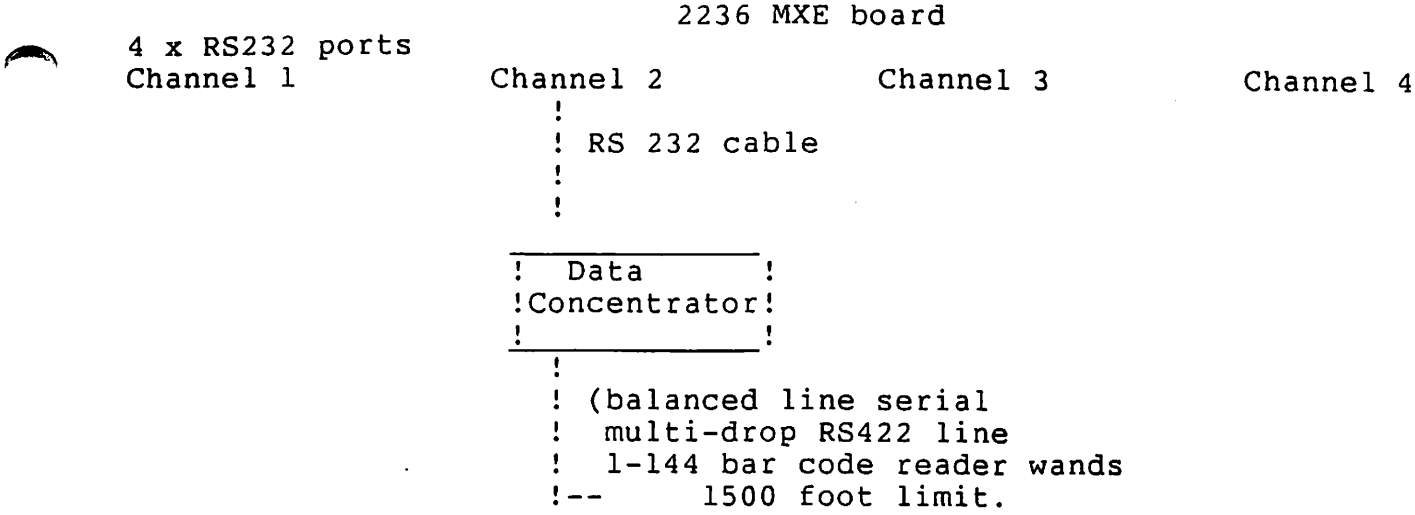
### Disk Multiplexing

. Each CPU can have a maximum of 3 disk controllers.

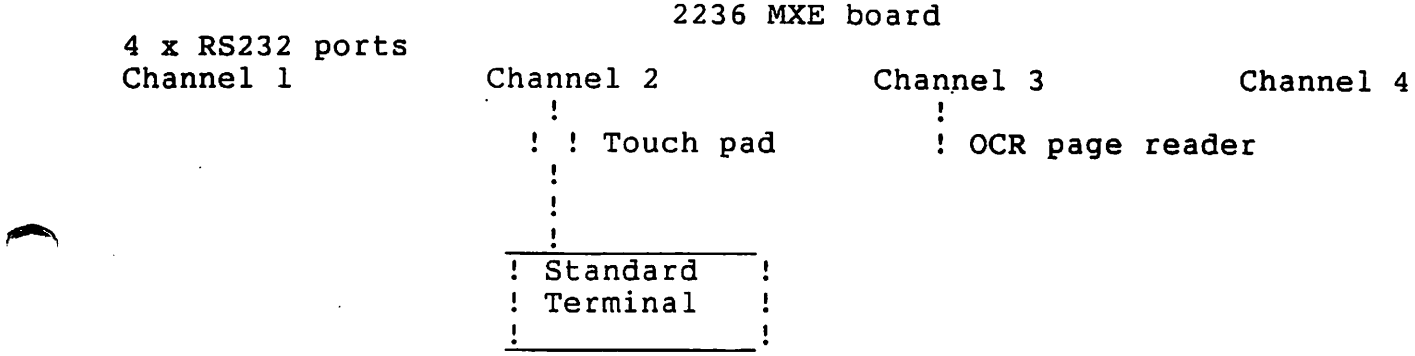
. 2275-MUX.
allows a DS or 2280 drive to be shared with up to 3 other CPUs.
. 2275-MUXE
Extends the 2275-MUX range to 3 more CPUs.

. A single DS cabinet can thus be shared by 1-16 CPUs.

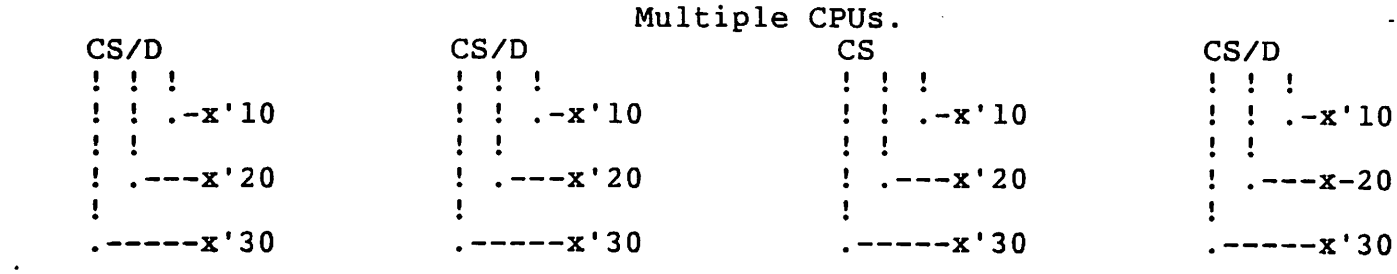
Configurations:




Configurations:




Configurations:




Object: configure trying to mimimize channel bottleneck.
where /340 on each CPU is CPU RAM disk -- avg access time 1.5 ms/sector.
Typical use: program files

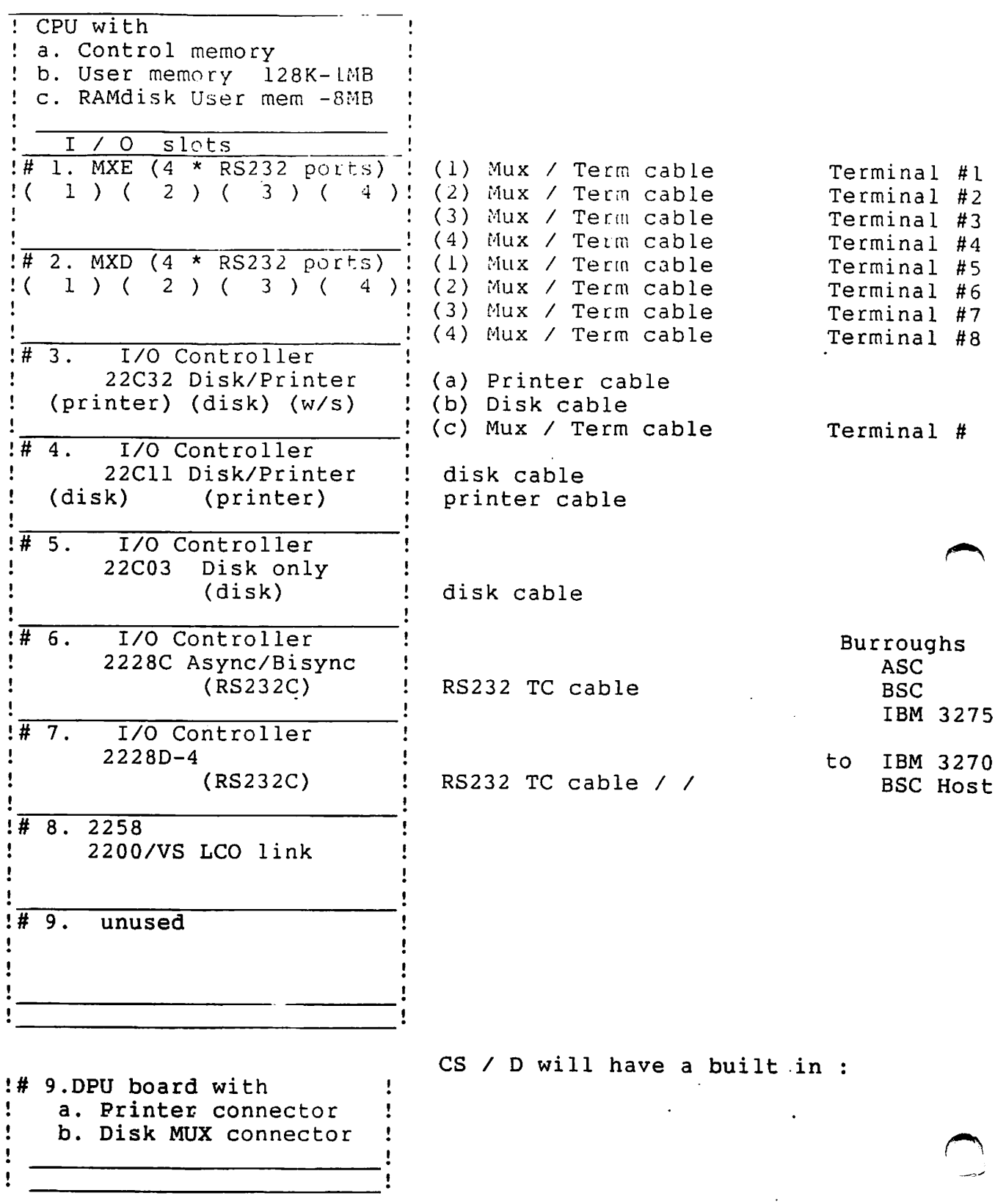
x'10 on each CPU is internal disk (20-140mB)
Typical use: program files or system specific data files.

x'20 on each CPU is shared external disk (20-316MB).

x'30 on each CPU is shared external disk (20-316MB).

Typical Sample Configuration

of the Wang Mini-VP or CS



# 2200A,B,C

## REGULATOR

| | | |
|---|---|---|
| 210-L567 * | | |
| 210-6311 * | | |
| 210-6310 | | |
| 210-6309 | MEMORY JUMPERS | JUMPERS MUST MATCH MEM WHEN TEST END RST |
| 210-6308A | | |
| 210-6307 OR 210-6707 | ½K MEM | 4/ROM |
| 210-6307-1 OR 210-6707-1 | 8K MEM | |
| 210-6325D1 | A2 ROM | A |
| 210-6361D1 | A ROM | A 3 ROMS |
| 210-6527-1A OR 210-6547-1A | A PATCH | A MATCH DIODE |
| 210-6325D2 | B1 ROM | |
| 210-6547 3B OR 210-6547 3E | B SUPERPATCH | MATCH DIODE FIELD |
| 210 6325D3 OR 210-6325C2 | BX2 ROM OR CX1 ROM | ~~MATCH~~ DIODE FIELD |
| 210-6361D2 | B & C ROM | 4 ROMS |
| 210-6325C1 | C1 ROM | |
| 210-6547 5E OR 210-6547 5E | C SUPERPATCH | MATCH DIODE FIELD |
| 212-2216 ? * | CRT CONTROLLER | 005 ADDR. |

# 2200S, T

210-L567 REGULATOR

210-6311

210-6710A

210-6709 MEM. SWP. BK.

210-6708D 291 FOR T FULLY LOADED 259 FOR S OPT. NO S 283 OR 312 W/ SOME OPT

210-6717 8K MEMORY

210-6717-1 16K MEMORY

210-6735A OR 210-7025A OR 210-7125A S ROM

210-6735D OR 210-7025D OR 210-7125D T ROM

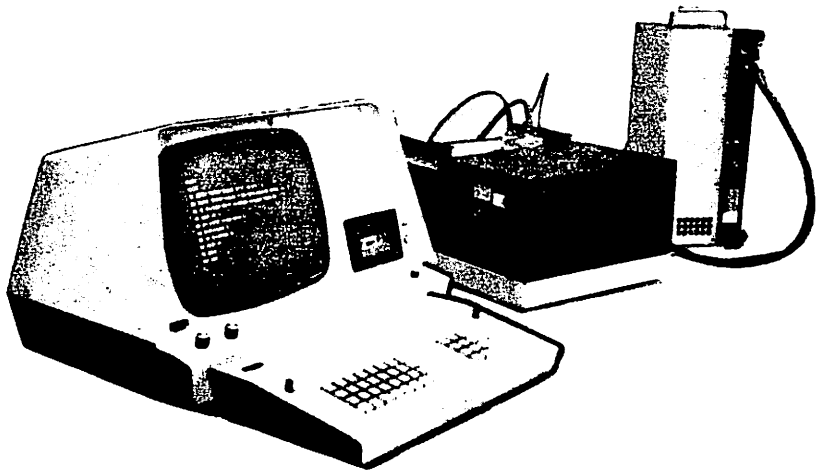
210-7025E OR 210-7125E T ROM W/ 80×24 OPTIC

212-2216 ? CRT CONTROLLER

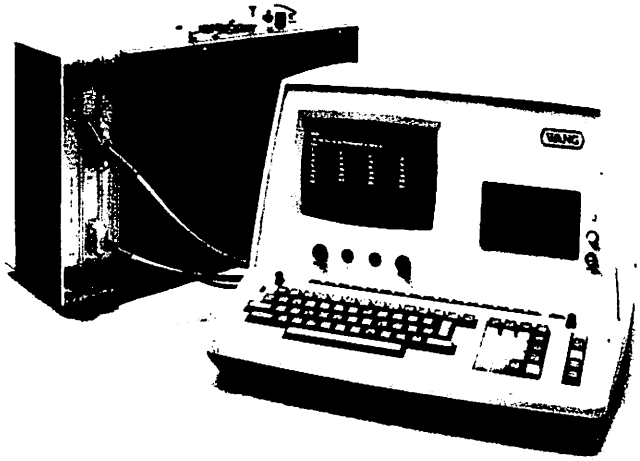
210-7042 KYBRD/PRTR/DISK CONTROLLER

# TYPICAL 2200 SYSTEMS

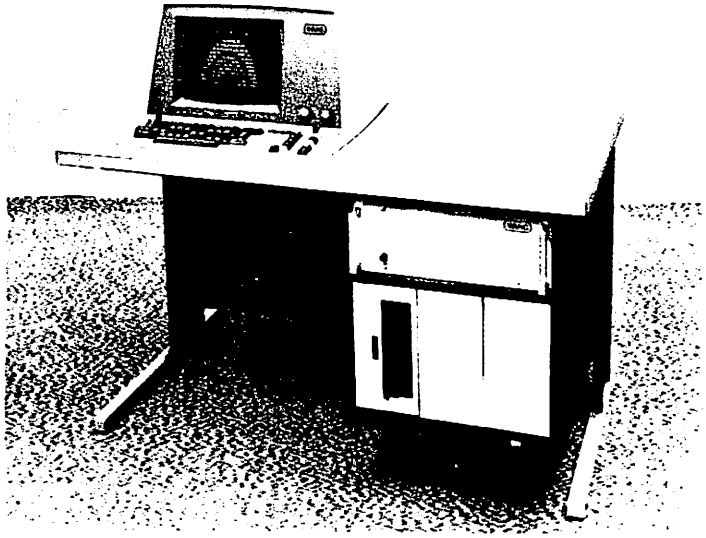
**2200 A/B/C SYSTEMS**



**2200 S/T SYSTEMS**




**WANG COMPUTER SYSTEMS (WCS)**



# APPENDIX B

## LISTING OF ERROR MESSAGES

| | |
|---|---|
| CODE 01 | TEXT OVERFLOW |
| CODE 02 | TABLE OVERFLOW |
| CODE 03 | MATH ERROR |
| CODE 04 | MISSING LEFT PARENTHESIS |
| CODE 05 | MISSING RIGHT PARENTHESIS |
| CODE 06 | MISSING EQUAL SIGN |
| CODE 07 | MISSING QUOTATION MARKS |
| CODE 08 | UNDEFINED FN FUNCTION |
| CODE 09 | ILLEGAL FN USAGE |
| CODE 10 | INCOMPLETE STATEMENT |
| CODE 11 | MISSING LINE NUMBER OR CONTINUE ILLEGAL |
| CODE 12 | MISSING STATEMENT TEXT |
| CODE 13 | MISSING OR ILLEGAL INTEGER |
| CODE 14 | MISSING RELATION OPERATOR |
| CODE 15 | MISSING EXPRESSION |
| CODE 16 | MISSING SCALAR |
| CODE 17 | MISSING ARRAY |
| CODE 18 | ILLEGAL VALUE |
| CODE 19 | MISSING NUMBER |
| CODE 20 | ILLEGAL NUMBER FORMAT |
| CODE 21 | MISSING LETTER OR DIGIT |
| CODE 22 | UNDEFINED ARRAY VARIABLE |
| CODE 23 | NO PROGRAM STATEMENTS |
| CODE 24 | ILLEGAL IMMEDIATE MODE STATEMENT |
| CODE 25 | ILLEGAL GOSUB/RETURN USAGE |
| CODE 26 | ILLEGAL FOR/NEXT USAGE |
| CODE 27 | INSUFFICIENT DATA |
| CODE 28 | DATA REFERENCE BEYOND LIMITS |
| CODE 29 | ILLEGAL DATA FORMAT |
| CODE 30 | ILLEGAL COMMON ASSIGNMENT |
| CODE 31 | ILLEGAL LINE NUMBER |
| CODE 33 | MISSING HEX DIGIT |
| CODE 34 | TAPE READ ERROR |
| CODE 35 | MISSING COMA OR SEMICOLON |
| CODE 36 | ILLEGAL IMAGE STATEMENT |
| CODE 37 | STATEMENT NOT IMAGE STATEMENT |
| CODE 38 | ILLEGAL FLOATING POINT FORMAT |
| CODE 39 | MISSING LITERAL STRING |
| CODE 40 | MISSING ALPHANUMERIC VARIABLE |
| CODE 41 | ILLEGAL STR( ARGUMENTS |
| CODE 42 | FILE NAME TOO LONG |
| CODE 43 | WRONG VARIABLE TYPE |
| CODE 44 | PROGRAM PROTECTED |
| CODE 45 | STATEMENT LINE TOO LONG |
| CODE 46 | NEW STARTING STATEMENT NUMBER TO LOW |
| CODE 47 | ILLEGAL OR UNDEFINED DEVICE SPECIFICATION |
| CODE 48 | UNDEFINED KEYBOARD FUNCTION |
| CODE 49 | END OF TAPE |
| CODE 50 | PROTECTED TAPE |
| CODE 51 | ILLEGAL STATEMENT |
| CODE 52 | EXPECTED DATA (NONHEADER) RECORD |
| CODE 53 | ILLEGAL USE OF HEX FUNCTION |
| CODE 54 | ILLEGAL PLOT ARGUMENT |
| CODE 55 | ILLEGAL BT ARGUMENT |
| CODE 56 | NUMBER EXCEEDS IMAGE FORMAT |
| CODE 57 | ILLEGAL SECTOR ADDRESS |
| CODE 58 | EXPECTED DATA RECORD |
| CODE 59 | ILLEGAL ALPHA VARIABLE FOR SECTOR ADDRESS |
| CODE 60 | ARRAY TOO SMALL |
| CODE 61 | DISK HARDWARE ERROR |
| CODE 62 | FILE FULL |
| CODE 63 | MISSING ALPHA ARRAY DESIGNATOR |
| CODE 64 | SECTOR NOT ON DISK |
| CODE 65 | DISK HARDWARE MALFUNCTION |
| CODE 66 | FORMAT KEY ENGAGED |
| CODE 67 | DISK FORMAT ERROR |
| CODE 68 | LRC ERROR |
| CODE 71 | CANNOT FIND SECTOR |
| CODE 72 | CYCLIC READ ERROR |
| CODE 73 | ILLEGAL ALTERING OF A FILE |
| CODE 74 | CATALOG END ERROR |
| CODE 75 | COMMAND ONLY (NOT PROGRAMMABL |
| CODE 76 | MISSING < OR > (PLOT ENCLOSURE, |
| CODE 77 | STARTING SECTOR > ENDING SECTOR |
| CODE 78 | FILE NOT SCRATCHED |
| CODE 79 | FILE ALREADY CATALOGED |
| CODE 80 | FILE NOT IN CATALOG |
| CODE 81 | /XXX DEVICE SPECIFICATION ILLEGAL |
| CODE 82 | NO END OF FILE |
| CODE 83 | DISK HARDWARE FAILURE |
| CODE 84 | NOT ENOUGH MEMORY FOR MOVE OR COPY |
| CODE 85 | READ AFTER WRITE ERROR |
| CODE 86 | FILE NOT OPEN |
| CODE 87 | COMMON VARIABLE REQUIRED |
| CODE 88 | LIBRARY INDEX FULL |
| CODE 89 | MATRIX NOT SQUARE |
| CODE 90 | MATRIX OPERANDS NOT COMPATIBLE |
| CODE 91 | ILLEGAL MATRIX OPERAND |
| CODE 92 | ILLEGAL REDIMENSIONING OF ARRAY |
| CODE 93 | SINGULAR MATRIX |
| CODE 94 | MISSING ASTERISK |
| CODE 95 | ILLEGAL MICROCOMMAND OR FIELD/ DELIMITER SPECIFICATION |
| CODE 96 | MISSING BUFFER |
| CODE 97 | VARIABLE OR ARRAY TOO SMALL |
| CODE 98 | ILLEGAL ARRAY MODIFIER ARGUMEN |

## 8.4.1 2200 CPU; MODELS A, B, C; 6 I/O SLOTS

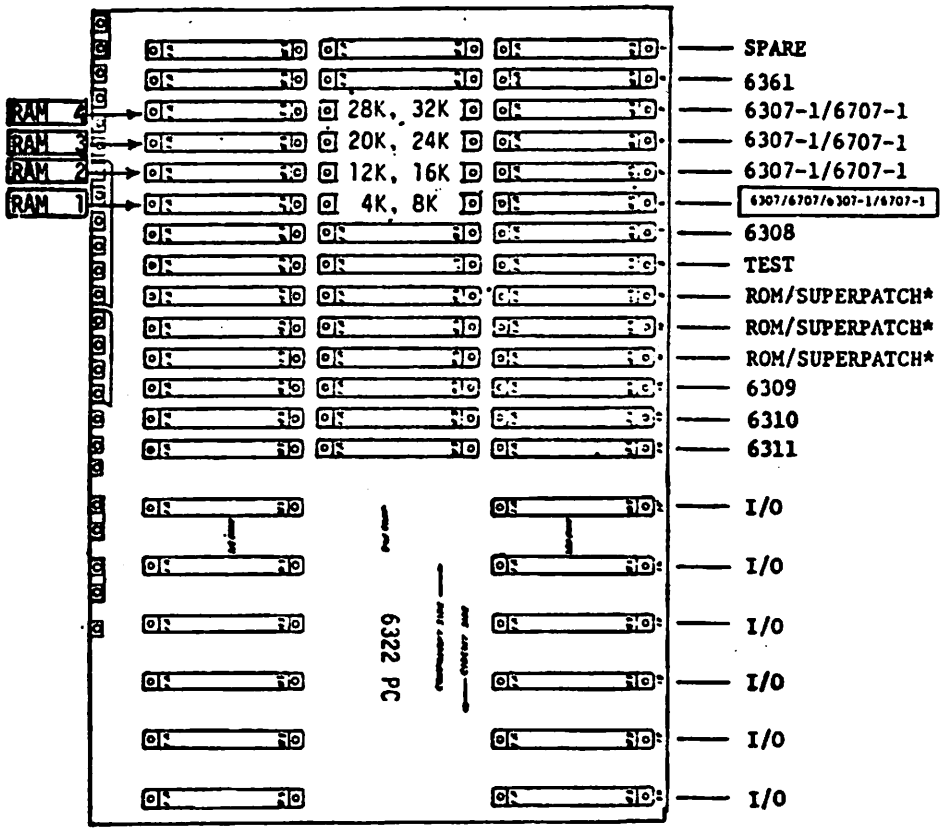



TABLE 8-4

| | RAM SLOT# | | | |
|---|---|---|---|---|
| | RAM 1 | RAM 2 | RAM 3 | RAM 4 |
| 4K | 07 | - | - | - |
| 8K | 07-1 | - | - | - |
| 12K | 07-1 | 07 | - | - |
| 16K | 07-1 | 07-1 | - | - |
| 20K | 07-1 | 07-1 | 07 | - |
| 24K | 07-1 | 07-1 | 07-1 | - |
| 28K | 07-1 | 07-1 | 07-1 | 07 |
| 32K | 07-1 | 07-1 | 07-1 | 07-1 |

07 = 4K 6307/6707 RAM
07-1 = 8K 6307-1/6707-1 RAM

* = 6325/6527/6547

FIGURE 8-37

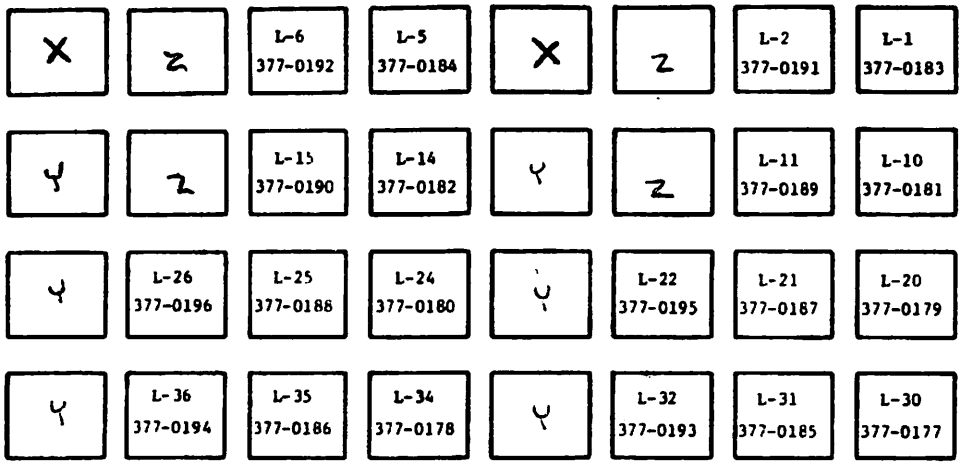
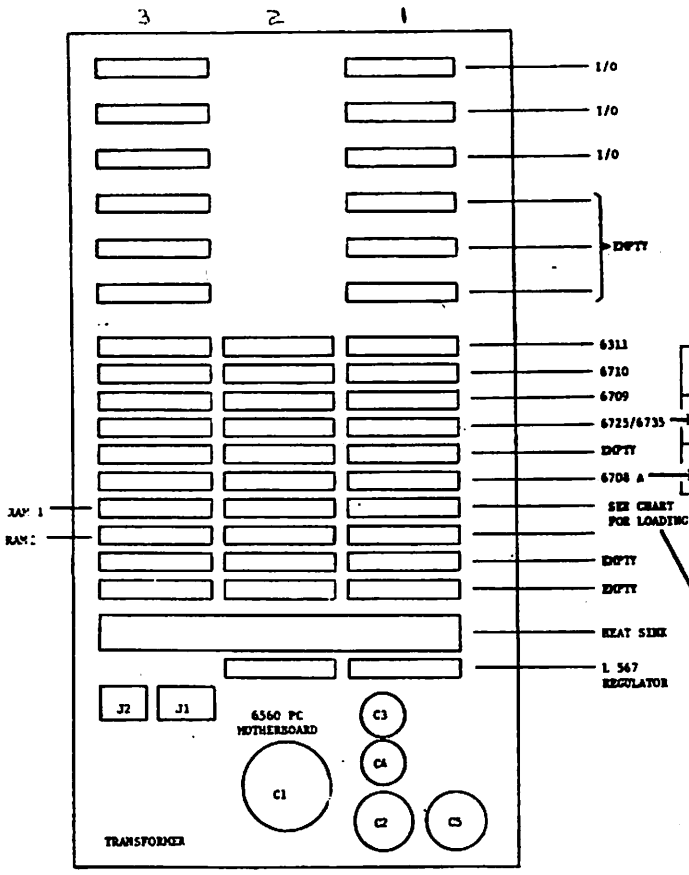



FIGURE 9-20

X - IN FOR C OUT FOR B

Y - IN FOR 610

Z - 224, 222, 223, 221 - MATRIX
268, 266, 267, 265 - SORT




# FIGURE 8-44

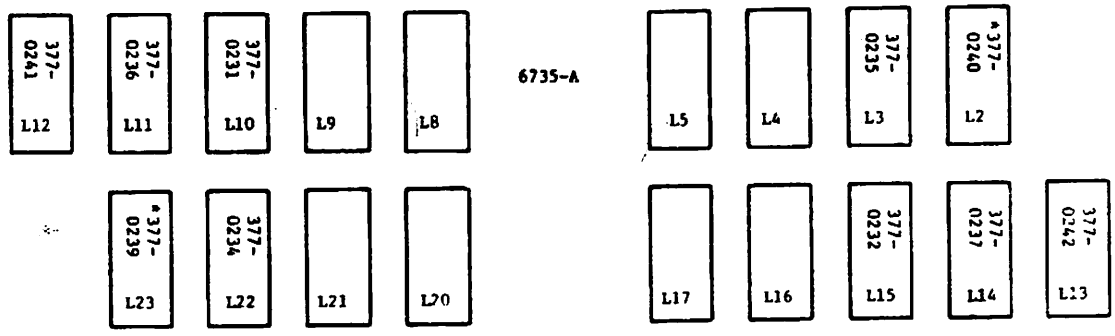
## 2200S/T; 3 SLOT I/O CHASSIS

## TABLE 8-8

| S/T with OPT 21 | S/T with OPT 22 | S/T with OPT 23 | T (S with OPT 24) |
|---|---|---|---|
| 6735 A | 6735 B | 6735 C | 6735 D |
| 6708 B | 6708 C | 6708 C | 6708 D |

Table 8-9 shows the various RAM configurations for the 6707 and 6717 MOS Memory Boards. The 6717 can only be used in 2200 CPUs where ECN 4795 has been implemented. The 6707, 6707-1, 6717 and 6717-1 are 4K, 8K, 8K and 16K MOS Memory Boards respectively.

| MEMORY SIZE / RAM SLOT | 4K | 8K | 12K | 16K | 24K | 32K |
|---|---|---|---|---|---|---|
| 1 | 6307 or 6707 | 6307-1 or 6707-1 or 6717 | 6307-1 or 6707-1 or 6717 | 6307-1 or 6707-1 or 6717-1 | 6717-1 | 6717-1 |
| 2 | OPEN | OPEN | 6307 or 6707 | 6307-1 or 6707-1 or OPEN | 6717 | 6717-1 |




*UPON SUPPLY DEPLETION OF THESE THREE CHIPS, USE THE FOLLOWING:

L26 - 377-0238 Use 377-0292
L23 - 377-0239 Use 377-0293
L2 - 377-0240 Use 377-0294

NOTE: THE ABOVE CHIPS ARE A GROUP AND MUST BE REPLACED TOGETHER.

6309 (version without switches) connections for RAM Capacity

| MEMORY SIZE | 1 BIT L8 - pin 5 | 2 BIT L8 - pin 11 | 4 BIT L7 - pin 5 | 8BIT L7 - pin 11 |
|---|---|---|---|---|
| | TO: | TO: | TO: | TO: |
| 4K | ±0V | +5V | +5V | +5V |
| 8K | ±0V | ±0V | +5V | +5V |
| 12K | ±0V | +5V | ±0V | +5V |
| 16K | ±0V | ±0V | ±0V | +5V |
| 20K | ±0V | +5V | +5V | ±0V |
| 24K | ±0V | ±0V | +5V | ±0V |
| 28K | ±0V | +5V | ±0V | ±0V |
| 32K | ±0V | ±0V | ±0V | ±0V |

6309/6709 Switch Settings for RAM Capacity

| | 0 | 4 | 2 | 6 | 1 | 5 | 3 | 7 |
|---|---|---|---|---|---|---|---|---|
| SWITCH | 4K | 8K | 12K | 16K | 20K | 24K | 28K | 32K |
| 1(ADD 16K) | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 |
| 2(ADD 8K) | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 1 |
| 3(ADD 4K) | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 |
| 4(NOT USED) | X | X | X | X | X | X | X | X |
| 5(NOT USED) | X | X | X | X | X | X | X | X |

Where: 1 = Switch ON
0 = Switch OFF
X = Don't Care

There are two types of device address switches on controller boards:

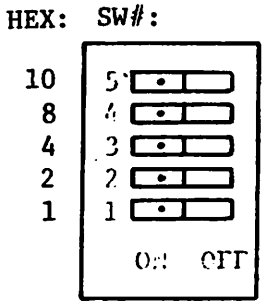



FIGURE 2-1
5-BANK ROCKER TYPE ADDRESS SWITCH

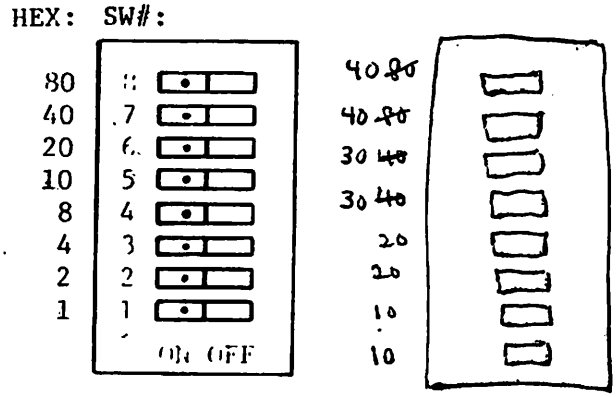



FIGURE 2-2
8-BANK ROCKER TYPE ADDRESS SWITCH

# 2200 PERIPHERAL ADDRESS SETTINGS BY MODEL NUMBER

| DEVICE # | DEVICE NAME | STANDARD ADDRESS(ES) | ALTERNATE ADDRESS(ES) | COMMENTS |
|---|---|---|---|---|
| 2201 | Output Writer | 211 | 212 | Also applies to special order (611, 711) |
| 2202 | Plotting Output Writer | 413 | 414 | |
| 2203 | Paper Tape Reader | 618 | | |
| 2207 | TTY Controller | Input - 019<br>Output - 01D | Input - 01A, 01B<br>Output - 01E, 01F | Note - If no CRT and keyboard on the system, use<br>Input - 001<br>Output - 005 |
| 2212 | Analog Flatbed Plotter | 413 | 414 | |
| 2214 | Card Reader (Manual) | 517 | | |
| 2215 | Basic Keyboard | 001 | 002, 003, 004 | |
| 2216 (2216/2217) | CRT Display<br>CRT from combined CRT/Cassette unit. | 005 | 006, 007, 008 | |
| 2216/2217 | Cassette for combined CRT/Cassette | 10A | 10B, 10C, 10D, 10E, 10F | |
| 2217 | Single Cassette Drive | 10B | 10C, 10D, 10E, 10F | Note - If the system has a (2216/2217) cassette start with 10B, 10C, etc.<br>If the system does not have a (2216/2217) cassette start with 10A, 10B, etc. |
| 2218 | Dual Cassette Drive | 10B/10C | 10D/10E | Note - If the system has a (2216/2217) cassette, start with 10B/10C, 10D/10E.<br>If the system does not have a (2216/2217) cassette start with 10A/10B, 10C/10D etc. |
| 2220 | Display/Cassette Drive/KB Console | | | |
| 2221 | High Speed Printer | 215 | 216 | |
| 2222 | Alphanumeric Keyboard | 001 | 002, 003, 004 | |
| 2224, 2226 | | | | |
| 2227 | Telecommunication Interface | Input - 219<br>Output - 21D | Input - 21A, 21B<br>Output - 21E, 21F | |
| 2230-1,-2,-3 | Fixed/Removable Disk | 310 | 320, 330 | |
| 2230 MXA,B | | | | |
| 2231 | High Speed Printer (80 column) | 215 | 216 | |
| 2232A | Digital Flatbed Plotter | 413 | 414 | |
| 2234, 34A | Hopper Feed Card Reader (300 cpm) | | | |
| | a. without Option 2 (General I/O ROM) | 629 | | |
| | b. with Option 2 (General I/O ROM) | 029 | | |
| 2240-1, -2 | Dual Flexible Disk Drive | 310 | 320, 330 | |
| 2241 | Thermal Printer | 215 | 216 | |
| 2242 | Single Flexible Disk Drive | 310 | 320, 330 | |
| 2243 | Triple Flexible Disk Drive | 310 | 320, 330 | |
| 2244, 44A | Hopper Feed Card Reader (Punch/Mark Sense, 300 cpm) | | | |
| | a. without Option 2 (General I/O ROM) | 629 | | |
| | b. with Option 2 (General I/O ROM) | 029 | | |
| 2250 | Parallel I/O Interface | Input - 23A<br>Output - 23B | Input - 23C, 23E<br>Output - 23D, 23F | |
| 2252 | Input Interface (10 Digit BCD) | 25A | 25B, 25C, 25D, 25E, 25F | |
| 2260 | | | | |
| 2261 | High Speed Printer (132 column, Dual Head) | 215 | 216 | |
| 2262 | | | | |
| 2270 | | | | |
| 2292 | | | | |

TAC

Problem Call

Control Number 08340020

Contact Name TIM TAYLOR Position CE
Rdb # 3414 Tdx # Phone # 703 471 0193 Ext #

System Type 2200 Device Type 2229
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, B = Both, N = None
Is this inquiry pertaining to a National Account ?
U Y = Yes, N = No, U = Unknown

Use the following area to describe the site that created this request
Cust/Office Name Phone #
Address 6510 City State
On Site Contact Name

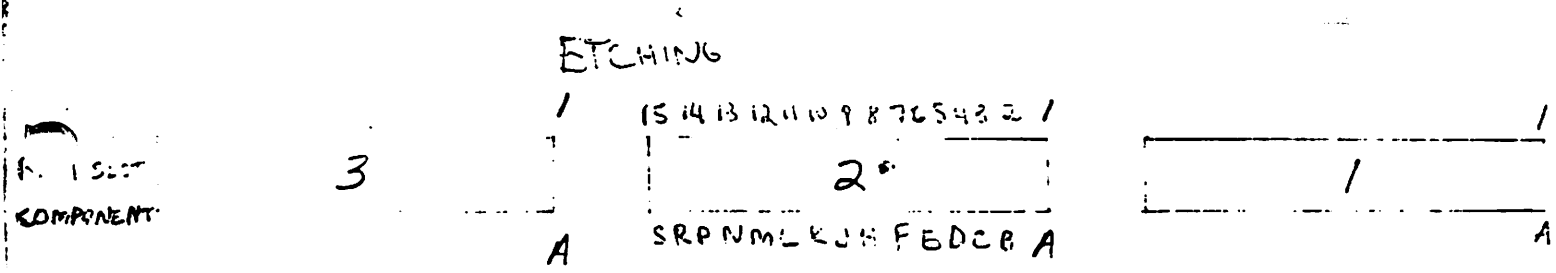
Problem (*) Solution (+)

*EMP#23526
*DSP#N/A
*PROBLEM WITH ERROR 92 TAKING CONTROL OF THE STATUS
*ONSITE# 703-648-1168
12/5/88: GETS I92 TAKING CONTROLLER STATUS W/ CUST S/W.
GETS I92 W/ WANG S/W ALSO. BROUGHT TAPE DRIVE &
CONTROLLER TO ANOTHER SITE & TESTED OK. CE TO
REMOVE ALL EXCESS CONTROLLERS FROM CPU & TEST.
SHOULD ALSO CHECK AC POWER TO TAPE DRIVE & INSURE
BOTH DRIVE & CPU PROPERLY GROUNDED & CABLE BETWEEN
GROUNDED. IF STILL FAILING MAY WANT TO RETRY AT
OTHER SITE &/OR BRING A 2ND UVP TO SITE. HAS TRIED
ALL BRDS EXCEPT CPU & HAS TRIED DIFFERENT SLOTS.
(20MIN) MIKEB
+PROBLEM WAS HAD 4 PRINTER CONTROLLERS AT ADDRESSES 215,
+216, 217, & 218 & 218 WAS CONFLICTING W/ ADDRESS 018 OF
+TAPE DRIVE.
12/7/88: NOW NEED TO KNOW WHAT ARE THE LEGAL PRINTER ADDR'S
IF ANY BESIDES 215 & 216 FOR SYSTEM PRINTERS. LEFT
MESSAGE FOR TO TO CALL ME. (10MIN) MIKEB
12/28/88: ADDRESSES 215,216,217, & 218 ARE ALL LEGAL AS LONG
THE LAST 2 DIGITS DO NOT CONFLICT W/ THE LAST 2
DIGITS ON ANY OTHER CONTROLLER ADDRESS. LEFT
MESSAGE AT OFFICE FOR CE TO CALL. (10MIN) MIKEB
+GAVE CE INFO. ADDRESSES 215, 216, 217, & 218 CAN ALL BE
+USED FOR PRINTERS AS LONG AS THE LAST 2 DIGITS DO NOT CON-
+FLICT W/ THE LAST 2 DIGITS OF ANY OTHER CONTROLLER. CLOSE.
1/17/89 (10MIN) MIKEB

2200A,B,C,S,T

## 2200 VOLTAGE ADJUSTMENTS

| VOLTAGE | PIN LOCATION |
|---|---|
| +5v LOGIC | Pin 14 or 16 of IC (ANY) ON ANY CARD |
| +5v MEMORY | Pin $B_1$ of RAM SLOT |
| +8.5v MEMORY | Pin $E_1$ of RAM SLOT |
| +12v | Pin $7_3$ of RAM SLOT |
| -12v | Pin $6_3$ of RAM SLOT |
| -15v | Pin $A_1$ of RAM SLOT |




COMPONENT SIDE

## 2.3 RAM SIZE SELECTION E|F|PCS II

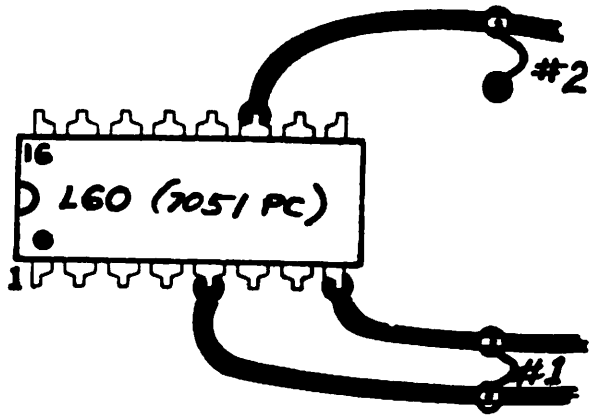
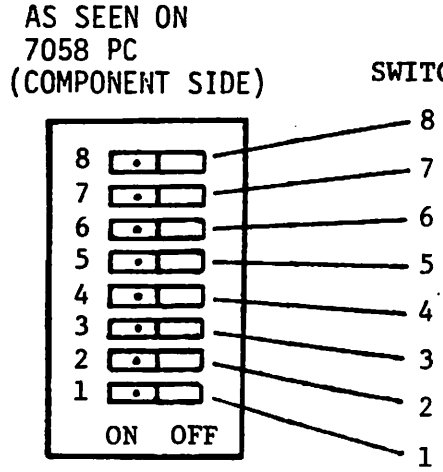



FIGURE 27 RAM SIZE JUMPER CHANGES

| MEMORY SIZE | JUMPER(S) INSTALLED |
|---|---|
| 8K | Neither |
| 16K | '1' only |
| 24K | '2' only |
| 32K | Both |

### 2.2.1 *SETTING THE I/O ADDRESSES (2200E)*

One address switch is mounted on the 7058 I/O controller. The CRT, KB and PRINTER are hardwired to HEX X05, X01 and X15 respectively ("X" is set by 2200 microcode). The switch provides a selectable address for the optional plotter. The switch only provides the low order HEX address digit $Y_2$ for the plotter; the high order address $Y_1$ is hardwired to '10' (i.e., the switch allows 'Y' to be selected in the address X1Y). To set the address, refer to the following list:




| HEX ADDRESS |
|---|
| X (NOT USED) |
| 17 |
| 16 |
| X (NOT USED) |
| 14 |
| 13 |
| 12 |
| 11 |

NOTE: In general HEX $XY_1Y_2$ format:
$Y_1$ = Hardwired
$Y_2$ = Switch Selectable

FIGURE 24

### 2.2.2 *SETTING THE I/O ADDRESS (2200F)*

There are two address switches on the 7054/7059 I/O controller. SW1 is used to set the printer address and SW2 to set the disk address. The KB and CRT are hardwired to X01 and X05 respectively. To set the printer address:

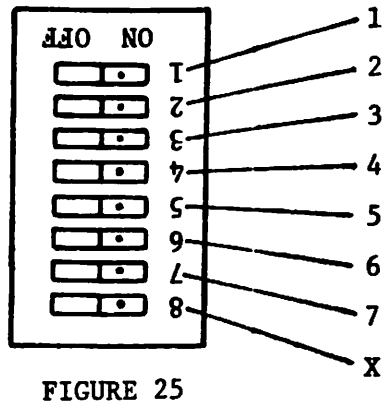



FIGURE 25

NOTE: In general HEX $XY_1Y_2$ format:
$Y_1$ = Hardwired
$Y_2$ = Switch Selectabl

Note that the HEX high order 1 (2nd HEX address digit) is hardwired in this case, and is not selectable. To set the Disk Address for the Work Station: (Note - If two addresses are required such as 310 and 350, BOTH switches must be ON.)

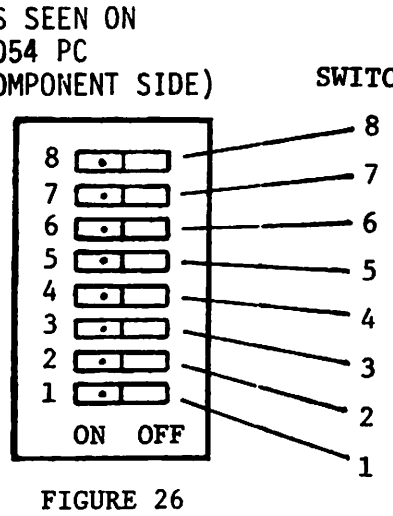



FIGURE 26

NOTE: In general HEX $XY_1Y_2$ format:
$Y_1$ = Switch Selectabl
$Y_2$ = 0

# 2200 E, F, PCS II

| | |
|---|---|
| 210-7057 | E REGULATOR |
| 210-7067-0 OR 210-7156-0 | F REGULATOR PCS II W/ MOTOROLA CRT |
| 210-7067-2 OR 210-7156-2 | PCS II REGULATOR |
| 210-7051 * | CPU BOARD MEM. JUMPERS/V ADJUSTMENTS |
| 210-7052A * | 8K MEMORY |
| 210-7052B | 16K MEMORY |
| 210-7052-1A | 24K MEMORY |
| 210-7052-1B | 32K MEMORY |
| 210-7053 | E TAPE DRIVE CONTROLLER |
| 210-7180 | PCS II DISK CONTROLLER SW1 ON ONLY |
| 210-7058 | E I/O BOARD PCS II |
| 210-7054 | F 16X64 I/O BOARD O/S |
| 210-7059 | F 24X80 I/O BOARD O/S |
| 210-7159 | I/O BOARD FOR PCS II (SOMETIMES 7058 OR 7059) |
| 210-7054-2 | F 16 x 64 I/O BOARD N/S |
| 210-7059-2 | F 24 x 80 I/O BOARD N/S |

| | OLD STYLE | NEW STYLE (MVP FAMILY) | |
|---|---|---|---|
| MUX A - | 210-6785 | 210-7287 | MUST BE USED W/ 7059-2/7054-2 |
| MUX B - | 210-6786 | 210-6786-1 | |

7067/7156 -5 PIN M -12 PIN H ⏚ PIN R

+5 PIN S +12 PIN F

OR TOP OF 7051 BOARD

210-7172 PCS II CARD READER CNTL. SW. 1 & 3 ON

# 2200VP, MVP

| | |
|---|---|
| 210-6797 | REGULATOR |
| 210-7397 + 7397-1 | REGULATOR |
| 210-6793 | VP ONLY |
| 210-6793-1 | EREV 1 OR ↑ FOR >64K TO 256K, EREV 4 OR ↑ FOR > 256K TO 512K<br>TICK, TICK, TICK UPDATE LEFT TOP IC TO TEK INS. 376-0080 |
| 210-6792 | |
| 210-6791 | EREV 3 OR HIGHER FOR > 64K |
| 210-6790 | EREV 5 OR HIGHER FOR > 64K |
| 210-6789 | > 256K NEED R3 PROMS, > 64K NEED R2 PROMS |
| 2) 210-6788 4 ROWS | NOT COMPATIBLE W/ R3 PROMS |
| 210-6788-1 6 ROWS (NOT TO 89) | NOT COMPATIBLE W/ R3 PROMS |
| 210-7588-1 | EREV 3 OR HIGHER FOR > 256K |
| 210-6787 2 ROWS | 16K MEMORY NOT COMPATIBLE W/ R3 PROMS |
| 210-6787-1 4 ROWS | 32K MEMORY NOT COMPATIBLE W/ R3 PROMS |
| 210-75871A AND 210-75871B | 64K AND 32K MEMORY |
| 210-75873A AND 210-75873B | 128K AND 96K MEMORY |
| 177-32361 | MUX D CONTROLLER |
| 210-7796 | EXT. MEM. CONTROLLER |
| 210-7797 (REPL. 6790 IN MVP/LVP) | EXT. INSTRUCTION COUNTER |

DESCRIPTION

| ITEM | VP | MVP | MVPC | LVP | LVPC | MICROVP | SVP | CS | CSD/N | [illegible] | DS |
|---|---|---|---|---|---|---|---|---|---|---|---|
| REL I/O BRD 6793-1 | | * | * | * | * | | OPT * 1 | | | | |
| 6793 | * | | | | | | * 2 | | | | |
| ALU BRD 6792 | * | * | * | * | * | | * | | | | |
| STACK + PC 6791 | * | * | * | * | * | | * | | | | |
| INSTRUCT CTR 6790 | * | * | [illegible] | * | X | | * | | | | |
| MEM CNTRL 6789 | * | * | * | * | * | | * | | | | |
| CONT MEM 7588-(RA)? | * | * | * | * | * | | * | | | | |
| DATA MEM 7587-(RA)? | * | * | * | * | * | | * | | | | |
| DPU BRDS FOR WINC DRIVES 8794 [4] | | | | * | * | | [illegible] 4 | | | | |
| 8694 | | | | * | * | | | | | | |
| 8696 | | | | * | * | | * | | | | |
| 7925 [4] | | | | * | * | | * | | | | |
| 8695 | | | | | | | | | | | |
| REG 7397 | | * 3 | * | | | | | | | | |
| OR 6797 | | * 3 | | | | | | | | | |
| REG 7887 | | | | | | | * | | | | |
| 7697 | | | | * | * | | | | | | |
| DPU BRD F-[illegible]2 FLOP ONLY 7890 | | | | | | | * | | | | |
| TERM/PRINTER CONTROLLER 7789 | | | | | | | * | | | | |
| OPT W BRD 3 TERM CNTLR 7846 | | | | | | | OPT * 1 | | | | |
| 270-0617 ? | | | | * | * | | | | | | |
| EXT INSTRUCT CONTROLLER 7797 | | | * | | * | | | | | | |
| EXT MEM CONTROLLER 7796 | | | * | | * | | | | | | |
| DS PS 270-1094 | | | | | | | | | | | * |
| DS BRD 8826-A | | | | | | | | | | | * |
| CPU 128/512 BRD 8034-(R)? | | | | | | * | | * | * | | |
| 128-3M OL 8937 x | | | | | | * | | * | * | | |
| PS 270-0986 | | | | | | * | | * | * | * | |
| 386 CPU BRD 212.7129 x | | | | | | * OPT | | * OPT | * OPT | * | |

All the chassis are different

1 Used in SVP's with Option W (3 term, 28K CM, MVP O/S)

2 Must use SVP O/S

3 Must use same regulator original w/ CPU

4 Must use if have Quantum Drive, 16 or 32 meg

POWER SUPPLY REGULATORS

MVP - 6797
MVPA - 7397.
LVP - 7697
SVP - 7887

**********DPU BOARDS**********

7696/8696 MICROCOMPUTER & MEMORY BOARDS

Z80A, Z80A-CTC
EPROM-4K
RAM-16K - Buffer - Has switches for specific drives (size)
RAM ADDRESS REGISTER
PARITY LOGIC CIRCUITS
DMA CONTROLLER
I/O PORT ADDRESS DECODER
DATA BUS BUFFER

7694/8694/8794 DISK INTERFACE BOARD - Has switches for disk Address

READ/WRITE CLOCK OSCILLATOR - R/W Timing
* PHASE LOCKED LOOP CIRCUIT
DATA/CLOCK SEPARATOR CIRCUIT
ADDRESS MARK DETECT CIRCUIT

7695/8695/7925 DISK CONTROLLER BOARD

ADDRESS COMPARE CIRCUIT
PARALLEL TO SERIAL CONVERTER
SERIAL TO PARALLEL CONVERTER
CRC GENERATOR
8MHZ CRYSTAL OSCILLATOR/COUNTER
FM/MFM ENCODER CIRCUIT

********** ADDITIONAL BOARDS for Opt. 'C'

7796 EXTENDED MEMORY CONTROL(OPTION 'C' ONLY)

MEMORY SELECT FOR ADDITIONAL 256K

7789 I/O CONTROLLER - SVP

TERMINAL I/O LOGIC
PRINTER I/O LOGIC

7890 DUAL DSDD DISKETTE CONTROLLER - SVP

DISK I/O LOGIC FOR TWO DSDD DISKETTE DRIVES

# 2200 VP/MVP/LVP/SVP CPU BOARDS

## 6793/6793-1 REGISTER & I/O BOARD

K REGISTER
FILE REGISTERS
ADDRESS BUS
I/O CLOCK GENERATORS (ABS/IBS/OBS/CBS)
STATUS REGISTERS
30 msec. TIME SLICE

## 6792 ALU BOARD

ALU - 74181 BASED
FUNCTION DECODER
RAM DATA IN REGISTER
SYSTEM TIMING - 20MHZ

## 6791/6791-1 STACK & PC BOARD

SUBROUTINE STACK REGISTERS
PROGRAM COUNTER AND PC REGISTER
MINI INSTRUCTION DECODER

## 6790/7797 INSTRUCTION COUNTER

INSTRUCTION REGISTER
REFRESH COUNTER
MEMORY BANK SELECT CIRCUITS
WOLF TRAP DECODER

## 6789 MEMORY CONTROL

INSTRUCTION DECODER REGISTER
RAM DATA OUT REGISTER
BOOTSTRAP PROMs
RAM TIMING
RAM PARITY LOGIC

## 6788/7588 CONTROL MEMORY

MEMORY SELECT
ADDRESS BUFFER
I/O BUFFER

## 6787/7587 DATA MEMORY

ADDRESS BUFFER
I/O BUFFER

| | VP | MVP | MVP-Ex Mem (Rev 3) | MVP-A | MVP-C (Option C) | LVP | LVP-C (Option C) | SVP | SVP-W (Option W) |
|---|---|---|---|---|---|---|---|---|---|
| | Max. 64K | Max 64K | Max. 256K | Larger Power Supply | Max. 512K | Max. 256K | Max. 512K | Max. 128K | Max. 128K |
| Printer, Terminal Controller | N/A | N/A | N/A | N/A | N/A | N/A | N/A | 7789 | 7846 |
| DPU -Disk Interface | N/A | N/A | N/A | N/A | N/A | 8794 or 8694 | 8794 | Same DPU as LVP or can have single-board Dual C 7890 for 2 Floppy Drives | |
| DPU -Disk Microprocessor | N/A | N/A | N/A | N/A | N/A | 8696 *Rev 9 | 8696 *Rev 9 | | |
| DPU -Disk Controller | N/A | N/A | N/A | N/A | N/A | 7925 or 8695 | 7925 | | |
| Registers and I/O | 6793 | 6793-1 | 6793-1 Rev. 4 | 6793-1 Rev. 4 | 6793-1 Rev. 4 | 6793-1 Rev. 4 | 6793-1 Rev. 4 | 6793-1 Rev. 4 | 6793-1 Rev. 4 |
| ALU | 6792 | 6792 | 6792 Rev.5 | 6792 Rev.5 | 6792 Rev 5 | 6792 Rev. 5 | 6792 Rev. 5 | 6792 Rev. 5 | 6792 Rev. 5 |
| Stack and PC | 6791 | 6791 | 6791 Rev.3 | 6791 Rev. 3 | 6791-1 | 6791 Rev. 3 | 6791-1 | 6791 | 6791 |
| Instruction Counter | 6790 | 6790 | 6790 Rev.7 | 6790 Rev. 7 | 7797 | 6790 Rev. 7 | 7797 | 6790 | 6790 |
| Memory Control | 6789 | 6789 | 6789 *Rev 3 | 6789 *Rev 3 | 6789 *Rev 3 | 6789 *Rev 3 | 6789 *Rev 3 | 6789 | 6789 |
| Control Memory - 1 | 6788 | 6788-1 ~~7588-1A~~ | 6788-1 7588-1A | 7588 - 1A | N/A | 7588 - 1A | N/A | 7588-1A | 7588-1A |
| Control Memory - 2 | 6788 | 6788 | N/A | N/A | 7588 - 1A | N/A | 7588 - 1A | N/A | N/A |
| Extended Mem. Control | N/A | N/A | N/A | N/A | 7796 | N/A | 7796 | N/A | N/A |
| Data Memory - 1 | 6787-1 | 6787-1 | 7587-3 A | 7587-3 A | 7587 - 3A | 7587 - 3A | 7587 - 3A | 7887-3A | 7887-3A |
| Data Memory - 2 | 6787-1 | 6787-1 | 7587-3 | 7587-3 | 7587 - 3A | 7587 - 3A | 7587 - 3A | N/A | N/A |
| Data Memory - 3 | N/A | N/A | N/A | N/A | 7587 - 3A | N/A | 7587 - 3A | N/A | N/A |
| Data Memory - 4 | N/A | N/A | N/A | N/A | 7587 - 3A | N/A | 7587 - 3A | N/A | N/A |
| .erboard | 6798 | 6798 | 6798 | 7498 | 7798 | 7698 | 7799 | 7788 | 7788 |
| Regulator | 6797 | 6797 | 6797 | 7397-1 | 7397-1 | 7697 | 7697 | 7887 | 7887 |

* PROM REV. LEVELS
REV. LEVELS ARE MINIMUMS

## MVP/LVP & VP/SVP OPERATING SYSTEM RELEASE 2.2/2.4

The following is the memo and marketing release on the new MVP/LVP operating system release 2.2, and the new VP/SVP operating system release 2.4.

One of the new features is the CPU identification number. This number is contained in the PROMs located on the 210-6789 PCB. The PROM numbers and location are as follows:

| | |
|---|---|
| L27 | 378-2045-R3 |
| L28 | 378-2046-R3 |
| L29 | 378-2047-R3 |

These PROMs were updated to R3 in MUB release #19, dated April 30, 1981.

If your customer is using a vendor's software package that is software protected, and the 210-6789 PCB becomes defective and must be replaced, these PROMs must be removed from the defective PCB and installed on the new PCB. Failure to do so will result in the inability to run the vendor's software protected programs.

A new numeric function, #ID, returns the CPU identification number. Each 2200 CPU is assigned a number (a random integar between 1 and 65535) at the time of manufacture. Machines produced prior to the implementation of this feature return a value of 0, but such machines can be field upgraded to have non-zero #ID's. CPU ID's are not guaranteed to be unique, but it is highly unlikely two given machines will have the same number.

This function allows software to tell one CPU from another. The ability to distinguish one CPU from another is useful in restricting software to specific installations and in telling one CPU from another when disk multiplexers are used.

## Option C

Option C which allows up to 64K Control Memory and 512K Data Memory has recently been made available on MVP and LVP CPU's. The extra control memory is ~~necessary to support 6050L and DAP6-3~~ Not.

With both the MVP and LVP a new motherboard is required and in the case of the MVP a chassis as well. The new motherboards have 7 I/O slots.

On all CPU's with option C, 2 new boards are required to handle the increased memory. The new Extended Instruction Counter Board, 210-7797, replaces the 6790 and the new Extended Memory Controller Board, 210-7796, is installed between the 2 Control Memory Slots and the 4 data memory slots.

For proper operation of Option C the following list should be helpful.

1. MVP must have MVPC chassis with motherboard (7 I/O slots) 270-0465
   LVP must have LVPC card cage/motherboard ass'y(7 I/O slots) 270-0467

2. MVPC must have a 210-7397 regulator which will not come with upgrade.

3. MVPC/LVPC must have the Extended Memory Controller Board, 210-7796 (inserted in slot between 2 control memory slots and 4 data memory slots).

4. MVPC/LVPC must have the new Instruction Counter Board 210-7797 (replaces the 210-6790 board)

5. MVPC/LVPC with data memory greater than 256K must have a 210-6793-1 updated to at least E-REV 4.

6. [redacted] only 1 Control Memory Board is needed it must be installed in control memory slot #2 next to the 210-7796 boards.
   210-7588 AT LEAST 6 REV 3

7. MVPC/LVPC with data memory greater then 256K must have a 210-6789 board with at least R4 proms. (R3 [redacted] work [redacted])

   R3 OK

8. MVPC/LVPC with 64K control memory or greater than 256K of data memory must use software release MVP 2.3 to utilize the added memory.

9. ~~The 210-6790 must be at least E REV 5 and~~ the 210-6791 must be at least E-REV 3 to support greater than 64K data memory.

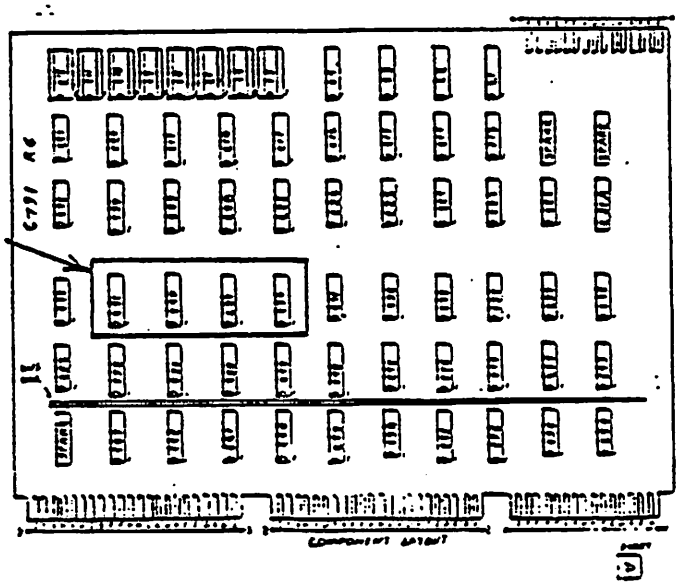
10. All LVPs use +5V2 for any I/O slot after the first 3 I/O slots. This voltage can be measured at connector J3 pins 1 and 3 on the regulator board or pin [redacted] of the I/O connectors.

INTERMITTENT PARITY ERRORS (PEDM) WITH C CHASSIS

If experiencing intermittent parity errors with a C chassis, updating the 6791 board to a 6791-1 might help. Although any board in the CPU can cause a PEDM, a problem has been found with some 6791 boards which updating should correct. To upgrade from a 6791 to a 6791-1 change the 4 chips at L38, L39, L40, and L41 to Fairchilds. The 6791 board must be at least an E-REV 3 to be used in a LVPC. All C chassis should have the 6791-1 board.

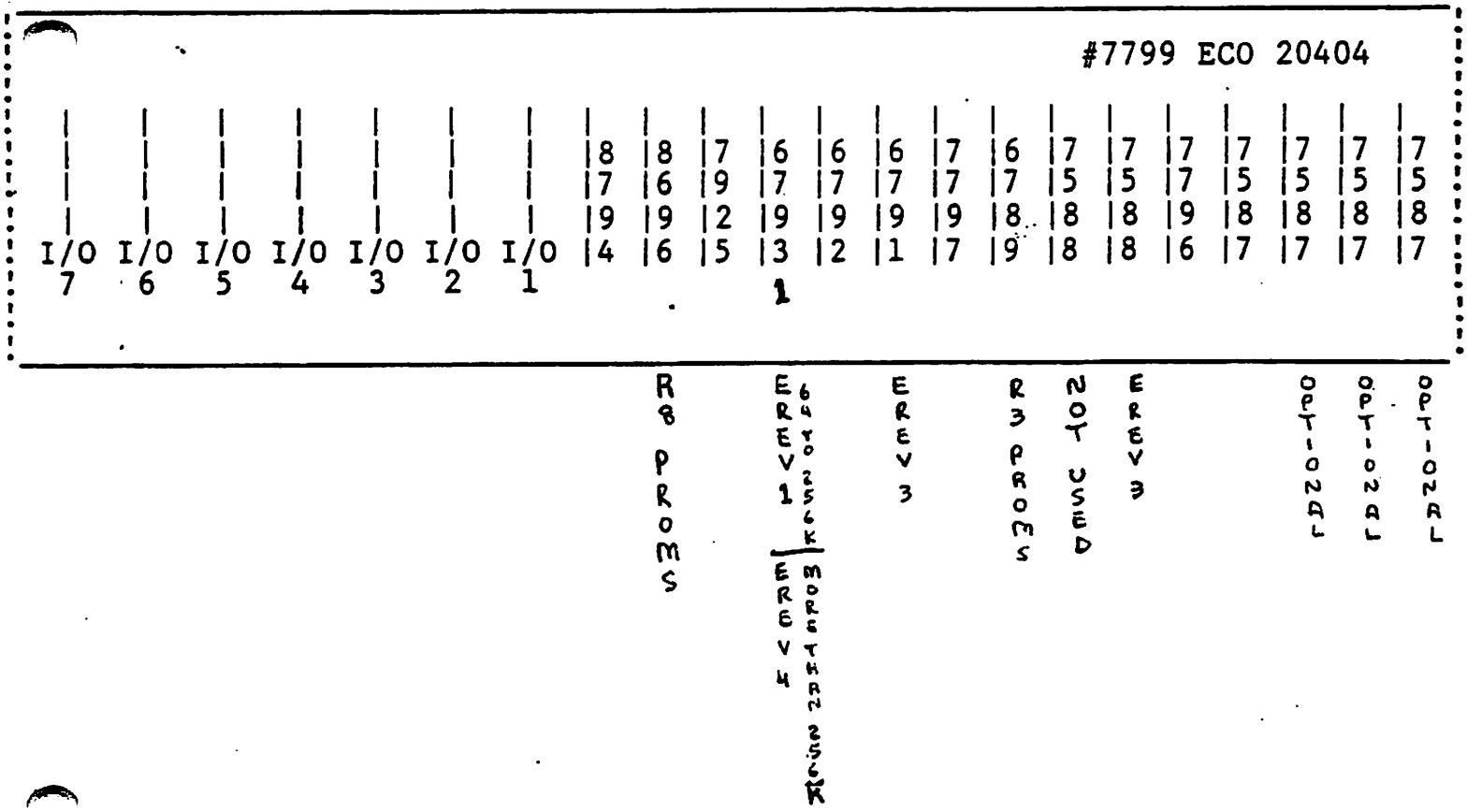
Fairchild Chip - 376-0203-1

Fairchild chips can be identified by the letter F on them followed by the number 74191 PC.



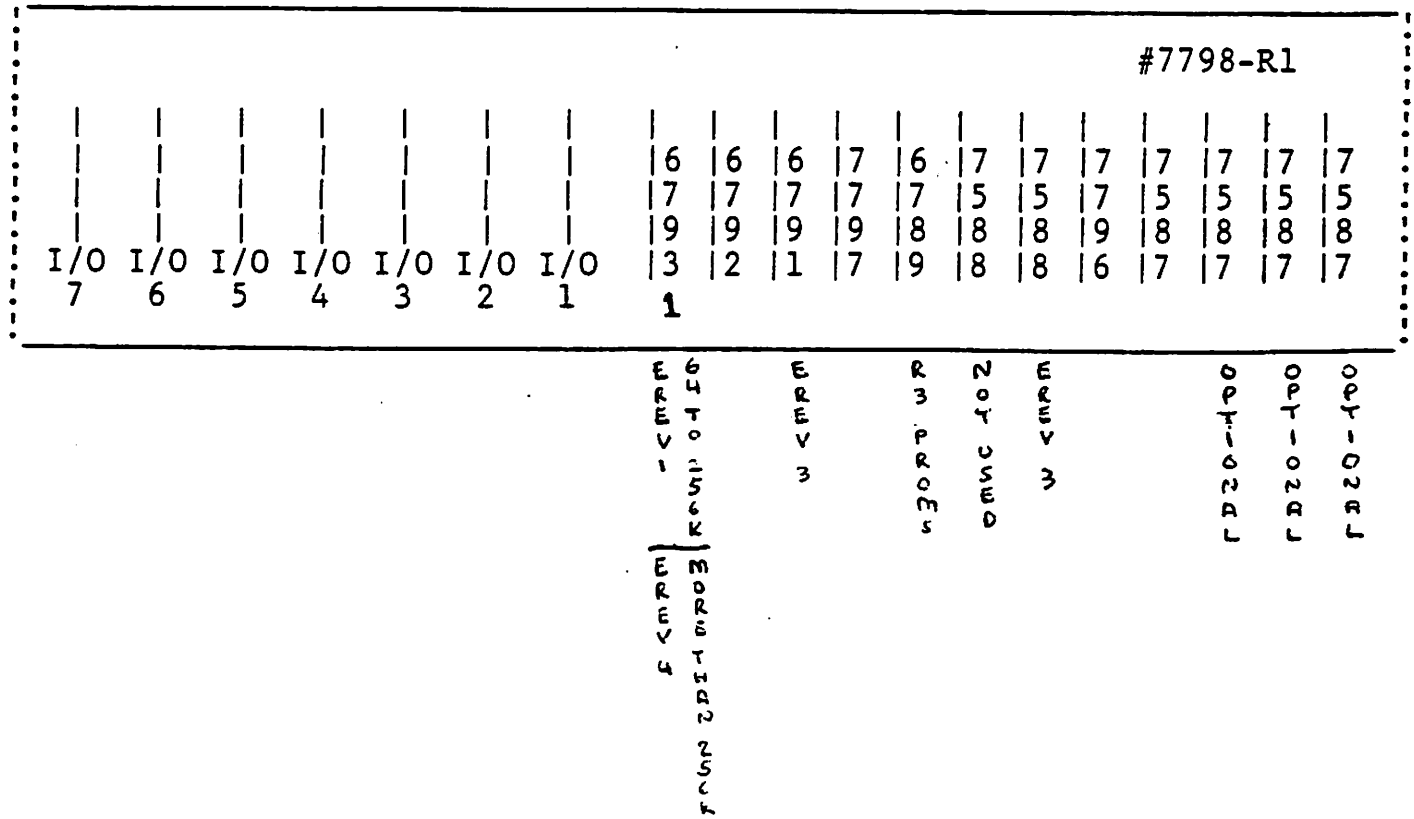
4.3 LVPC Board layout

PC Boards are inserted in the LVPC Motherboard as follows:

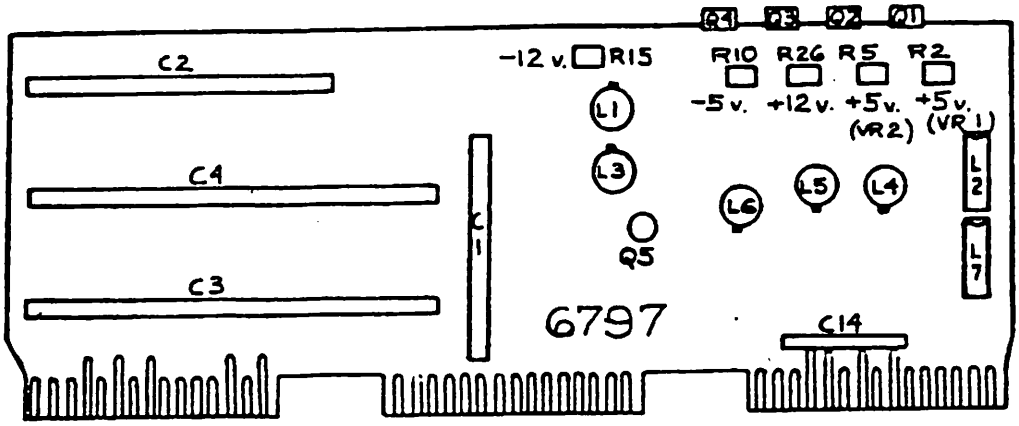



4.2 MVPC Board layout

PC Boards are inserted in the MVPC Motherboard as follows:



# 2200 VP-MVP




NOTE: THIS REGULATOR SHOULD BE PUT ON AN EXTENDER PCB.

| LOCATION | VOLTAGE | LIMITS | ADJ | RIPPLE |
|---|---|---|---|---|
| 6797 Pin $8_1$ | +5VR1 | +4.95 vdc to +5.05 vdc | R2 | 15 mvp-p |
| 6797 Pin $10_1$ | +5VR2 | +4.95 vdc to +5.05 vdc | R5 | 15 mvp-p |
| 6797 Pin $11_1$ | +12VR | +11.95 vdc to +12.05 vdc | R26 | 15 mvp-p |
| 6797 Pin $12_1$ | -12VR | -11.95 vdc to -12.05 vdc | R15 | 35 mvp-p |
| 6797 Pin $15_1$ | -5VR | -4.95 vdc to -5.05 vdc | R10 | 25 mvp-p |

## 2600 VP VOLTAGE CHECKS

Below is a list of check points which could be used for adjusting the VP power supplies.

| SUPPLY | LOCATION | ADJ.POT |
|---|---|---|
| +5V R1 | Pin 14 any IC on top of PC 6789 | R2 |
| +5V R2 | Pin 14 of L10 on PC 6787 | R5 |
| +12V R | Pin 10 of RAM chip on PC 6788 | R26 |
| -12VR | Pin N connector 3 of any I/O slot | R15 |
| -5VR | Pin 1 of any RAM chip on PC 6787 | R10 |
| $\pm$ OV | Neg. side of 1150uf cap on top left hand corner of PC 6797 | |

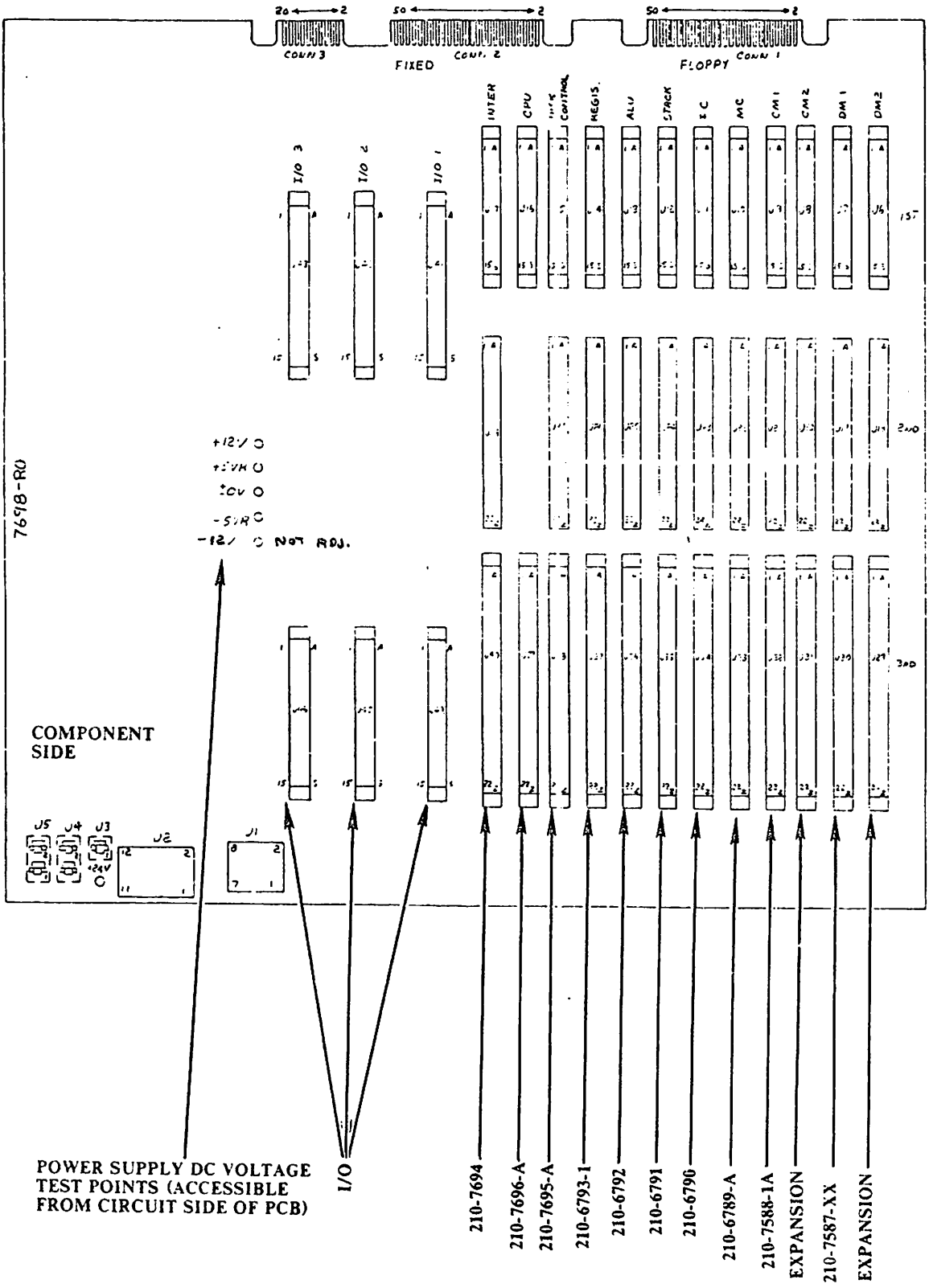



FIGURE 8-16 CIRCUIT BOARD LAYOUT AND VOLTAGE TEST POINTS

LVP

TABLE 11-1 DC VOLTAGE SPECIFICATIONS

| | VOLTAGE | LIMITS |
|---|---|---|
| | +5V1 * | +4.95 to +5.05 |
| 9 SLOT ONLY | +5V2 ** | +4.95 to +5.05 CONN. J3 PINS 1 & 3 REG. BRD. (B1-2, 1 of 1/0) |
| | +12V | +11.95 to +12.05 15, of 1/0 |
| | +24V | +21.60 to +26.40 |
| | -5V | -4.95 to -5.05 |
| NOT ADJ | -12V *** | -11.50 to -12.50 |
| | GRND | 13 3 of 1/0 |

* If +5V1 drops below +4.7V dc, +24V will be shut off.

** +5V2 is only used in the 9 I/O-slot version of the LVP-- +5V2 supplies the last 6 I/O slots. This voltage does not have to be correct for the 3-slot version of the LVP.

*** -12V is not adjustable.

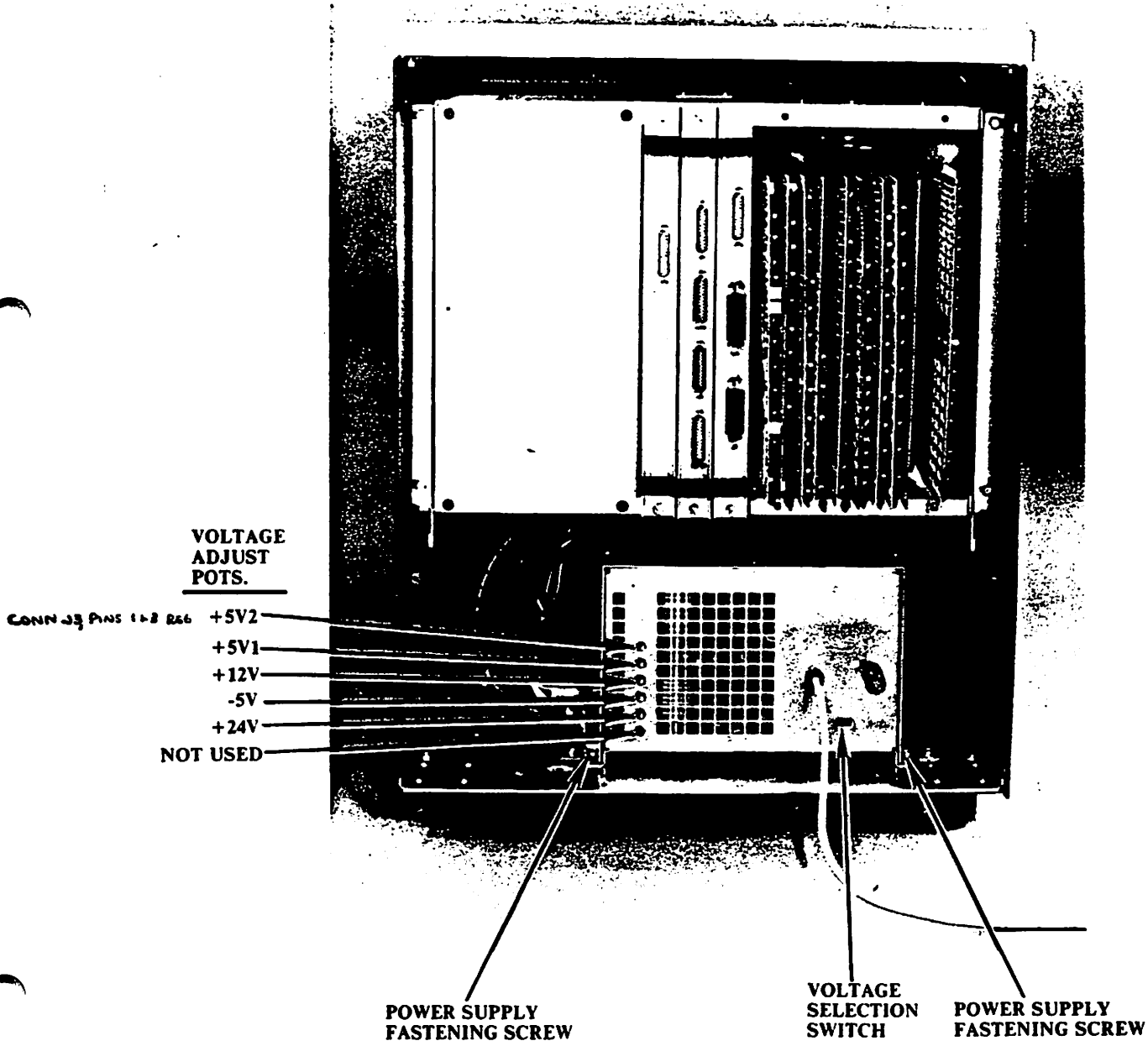



**FIGURE 11-1 POWER SUPPLY REGULATOR ADJUSTMENT POTENTIOMETERS**

WANG LABORATORIES, INC.

TO: ALL KEY COMPUTER PEOPLE

FROM: KEITH JONES

SUBJECT: 2200 MVP CONVERSIONS

DATE: MARCH 19, 1978

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Conversions for the 2200 MVP are now being shipped from the home office. There is only one minor problem, which is that they are only shipping the appropriate memory boards.

E.C.N.s must be performed to the 6790, 6791, 6793-1, and the 6798 P.C. boards. These changes must be done at the local service office prior to installing the conversion at the customer's site. The E.C.N.s to the 6790 and the 6791 have some parts that are normally not stocked at the local office level. Therefore, if you need the parts for the conversion, order them via the Rush Request system, UO-2, "MVP SMALL PARTS CONVERSION KIT."

In addition to the E.C.N.s, the bootstrap proms (378-2045, 2046, and 2047, on the 6789 board), must be at revision level 1, and the MVP operating system can be no lower than revision 1.6. Order these UO-2 if you need them.

If the need ever arises, when ordering boards for a customer down situation, please specify, on the Telex, the memory size of the unit that you are working with, to insure that you receive boards that have the proper E.C.N.s installed.

If there are any questions please feel free to contact me.

REGARDS,

KEITH JONES
EASTERN AREA TECHNICAL SPECIALIST

cc: AREA STAFF
ERIK GARTHE
ALAN DONATI

20 SOUTH AVENUE, BURLINGTON, MASSACHUSETTS 01803 • TEL. (617) 851-4111 • TWX 710-343-6769 • TELEX 94-7421

WANG LABORATORIES, INC.

## MVP CONVERSION PARTS LIST

1 - 300-1909 .0033 uf capacitor
1 - 376-0123 7427 I.C.
2 - 330-3022 2.2K ohm resistor

WANG LABORATORIES, INC.

## 2200 MVP BOARD LAYOUT

I/O

6793-1

6792

6791

6790

6789

6788 (CM1)

6788 (CM2)

6787 (DM1)

6787 (DM2)

P.S.

WANG LABORATORIES, INC.

210-6790 E-Rev 5

1. Change C4 to .0033 uf (300-1909). C4 is located on the schematic at coordinates I3.
2. Add a wire from L51 pin 7 to connector pin $X_3$.
3. Add a wire from L51 pin 9 to connector pin $20_3$.
4. Cut the etch between L18A pin 9 and connector pin $12_2$.
5. Add a wire from L49 pin 9 to connector pin $12_2$.
6. Add a wire from L49 pin 10 to L28 pin 6.
7. Add a wire from L49 pin 11 to L39 pin 8.
8. Change the E Rev level sticker from 4 to 5.

210-6791 E-Rev 3

1. Insert a 7427 (376-0125) into location L21A. Pin 1 should be located toward the bottom of the board. Connect pin 7 to $\pm$ 0V and pin 14 to + 5V.
2. Cut the etch connected to L53 pin 2 at pin 2.
3. Add a wire from L32 pin 13 to L53 pin 2.
4. Add a wire from L32 pin 12 to connector pin $H_2$.
5. Add a wire from L32 pin 12 to L21A pin 12.
6. Jumper L21A pins 3 and 13 together.
7. Add a wire from L32 pin 11 to L21A pin 6.
8. Add a wire from L21A pin 1 to L41 pin 2.
9. Add a wire from L21A pin 2 to L41 pin 6.
10. Add a wire from L21A pin 13 to L41 pin 7.
11. Add a wire from L21A pin 4 to L22 pin 4.
12. Add a wire from L21A pin 5 to L22 pin 6.
13. Add a wire from L22 pin 3 to connector pin $8_2$.
14. Add a wire from L22 pin 5 to connector pin $1_3$.
15. Add a 2.2K resistor (330-3022) between L22 pin 3 and +5V.
16. Add a 2.2K resistor (330-3022) between L22 pin 5 and +5V.
17. Change the E Rev level sticker from 2 to 3

WANG LABORATORIES, INC.

210-6793-1 E-Rev 0

1. Add a wire from L39 pin 3 to L35 pin 10.
2. Add a wire from L39 pin 4 to connector pin $R_3$.
3. Add a wire from L39 pin 5 to L35 pin 6.
4. Add a wire from L39 pin 6 to connector pin $H_3$.
5. Change the E Rev level sticker from 0 to 1.

210-6798 E-Rev 0

1. Add a wire from 6793-$H_3$ to 6791-$8_2$ to 6787 (DM1) - $M_2$ to 6787 (DM2) - $M_2$.
2. Add a wire from 6793-$R_3$ to 6791-$1_3$ to 6787 (DM1) - $N_2$ to 6787 (DM2) - $N_2$.
3. Add a wire from 6791-$H_2$ to 6787 (DM1)-$L_2$ to 6787 (DM2)-$L_2$.
4. Add a wire from 6790-$20_3$ to 6788 (CM1)-$N_2$.
5. Add a wire from 6790-$X_3$ to 6788 (CM1)-$R_2$.
6. Add a wire from 6788 (CM1)-$E_2$ to 6788 (CM2)-$E_2$.
7. Add a wire from 6790-$12_2$ to 6787 (DM1)-$J_2$ to 6787 (DM2)-$J_2$.
8. Add a wire from 6788 (CM2)-$2_3$ to 6787 (DM1)-$K_2$ to 6787 (DM2)-$K_2$.
9. Add a wire from 6787 (DM1)-$14_2$ to 6787 (DM2)-$R_2$.
10. Add a wire from 6787 (DM1)-$S_2$ to $\pm$0V.
11. Add a wire from 6790-$C_2$ to 6788 (CM1)-$S_2$.
12. Add a wire from 6790-$17_2$ to 6788 (CM1)-$16_2$.
13. Add a wire from 6790-$16_2$ to 6788 (CM1)-$15_2$.
14. Change the E REV level from 2 to 3.

LVP/SVP

## Compatibility Problem Between Single And Three Board DPU's

A compatibility problem has been found between the single board DPU (210-7890A) and the three board DPU. Platters created on the three board DPU will give intermittent I93 and I96 errors when read by the single board. Until the problem is resolved by R & D, all platters to be used with the single board DPU will need to be formatted and written by the single board DPU. With a two floppy drive system, this usually can be easily done by formatting a new disk and copying the platter created by the three board DPU onto it. If you have this problem, please call the District.

## Single Board DPU PLL Adjustment (210-7890A)

IF 3 TPs USE MIDDLE

While in the idle state monitor TP2 (lower test point between L11 and L12) and adjust pot for a 500 nanosecond duty cycle. Power on and off and insure signal remains steady.

Scope Settings: CH 1 at 2V/Div to TP2 of 7890A
Trig. CH 1 Normal DC + .1 msec/Div

To check out, format a platter, write the worst case test pattern on it using the PLL program, SF key 5 for R and SF 6 for F, and verify that pattern, SF key 1 for R and SF 2 for F, but do not adjust unless it fails. If using a two floppy unit, swap platters between the drives and again VERIFY using SF 1 and 2. Finish testing with a copy and 10-15 minutes of random R/W. Use PLL adjustment disk 732-0009A.

## Three Board DPU PLL Adjustment

To do a proper adjustment of the phase lock loop a PLL adjustment disk is needed, Part # 732-0009A, and a platter formatted on an aligned and properly adjusted drive with a worst case test pattern on it. This will be your master disk.

1. Ground TP1 of the 94 board and, while monitoring L5 pin 1 or 2, adjust the left most pot (connectors down, component side) for 4V. If system was in use, record previous voltage reading.
2. Load PLL adjustment program, insert master disk, select "Adjust Floppy," and adjust center pot midway between each end where it starts to error.
3. Once centered, let run for a full screen of dots.
4. Insert a good scratch disk, select number 5, and write worst case test pattern on floppy.
5. Select "Adjust Floppy" and again adjust center pot midway between each end where it starts to fail. If there is not at least one full turn between erroring points, there is something wrong and intermittent errors will probably result. One and a half turns or more is very good. Again get a full screen of dots without errors.
6. If 4 volts was off, the Quantum or Winchester should be formatted, then select SF 6 and write the worst case test pattern on the fixed. No data is disturbed by writing or verifying the worst case test pattern.
7. Select "Adjust Winchester" and center right most pot (connectors down, component side) between each end where errors start to occur. Must get at least one full error free turn and a full screen of dots. "Winchester," as referred to in the PLL program, is misleading as it really should say fixed because it will also work with a Quantum or fixed floppy.

** If these adjustments are found off all disks created by that drive shoulf be reformated. On every LVP and SVP installation, these adjustments should be checked or whenever experiencing disk errors.

LVP/SVP

No Mount System Platter Message With Power On

A recent TAC Newsletter has reported a problem with no "Mount System Platter" message with power on due to the new Shugart Winchester Drives (only one board mounted on drive). This could be tested by removing the I/O cables from the Winchester and powering on.
This problem should be correctable by a second or third power on. R and D is working on the problem and the drive should not be replaced unless the problem is very persistant and requires a number of power ons to work properly.

Heat Related I93's and I96's

There have been frequent heat problems that have arisen with the 210-7694/8694 DPU boards in the SVP/LVP systems. The symptoms are:

I93 or I96 when trying to read or write to the disks, especially the DSDD floppy drives. Ususally, leaving off the card cage cover would resolve this problem.

There is a known fix for this. IC 'L5', which is the pluggable chip on the 7694, 8694, is a plastic coated chip which is heat sensitive. We now have a ceramic chip which can withstand the heat in the card cage. The identifying numbers on these chips are as follows:

Plastic - 745124 [illegible]N WPN 376-0273
Ceramic - 745124 [illegible]J WPN 376-0273-1

If you are experiencing this problem, please notify the District office before replacing chips or boards.

LVP/SVP

MASTER DISK AVAILABLE FOR 3 BOARD DPU ADJUSTMENT

Release 2.5 of the Basic-2 multi-user operating system for the LVP/MVP and the SVP with option W has been released for distribution. The diskette part numbers are as follows: 701-2294S (SSSD) and 731-0058B (DSDD).

Part number 731-0058B for DSDD drives has a unique data pattern on the innermost tracks for the phase lock loop adjustment. This data pattern can't be reproduced in the field. This diskette should never be formatted nor have another data pattern written to the innermost tracks. Should this happen or the diskette become non-operational a replacement diskette will have to be ordered.

This diskette is to be used as your "Master Disk" when adjusting the PLL on the 3 board DPU as described in the following procedure taken from District Newsletter # 25. There is a limited quantity of these disks in the Boston District. If needed immediately call Mike Bahia in the Boston office, Telephone # 423-2588, or otherwise order from Software Literature Control.

DSDD SHUGART SA850/851

JUMPER SETTINGS

A. Use the following assembly numbers found on the PC board of the drive to determine the necessary jumpers for 2200 or VS. This encompasses the latest drives.

| | *****For 2200 LVP/SVP**** | | | ! | *******For VS-AWS******* | | |
|---|---|---|---|---|---|---|---|
| Assembly No. | 25189-2 ! 25190-2 | 25201-2 ! 25202-3 | 25216-0 | ! | 25189-2 ! 25190-2 | 25201-2 ! 25202-3 | 25216-0 |
| Jumpers (X=Installed) | | | | | | | |
| 850 | X | X | X | ! | X | X | X |
| IW | X | X | X | ! | X | X | X |
| 2S | X | X | X | ! | X | X | X |
| DC | X | X | X | ! | X | X | X |
| C TO HI | X | X | X | ! | X | X | X |
| S2 | X | X | X | ! | X | X | X |
| IT | X | X | X | ! | X | X | X |
| FM | | | X | ! | | | X |
| MFM | | | X | ! | | | X |
| RS | X | X | X | ! | X | X | X |
| M | X | X | X | ! | X | X | X |
| AF | * | X | | ! | * | X | |
| In position 4F cut shunt at positions | 2/4 | 2/4 | 2/4 | ! | 2/4 | 2/4 | 2/4 |

*Install jumper from "F" to pin 11 on IC located at position 8D. IC at location 8D also needs pin 3 and 11 jumpered together.

B. Unique Jumpers:
Jumper TS/FS

| **********For 2200 LVP/SVP********* | | ********For VS-AWS******* | |
|---|---|---|---|
| FS | ON | ~~FS~~ | ON |
| DS2 (R drive of any 2 disk LVP/SVP)<br>DS1 (IF only drive or for F drive) | ! | DS2 | ON |
| Remove terminator block at location 5E. UNLESS NO FIXED, OR IS Fixed | ! | Insert terminator block at location 5E. | |
| * Remove wire from jumper 851 to pin 1 of IC-3F | ! | Solder jumper wire from jumper 851 to pin 1 of the IC-3F | |
| * Insure etch in place between pin 8 of IC-3E and pin 1 of IC-3F. | ! | The etch on the non-componet side of the board between pin 8 of IC-3E and pin 1 of IC-3F must be cut. | |

C. Drive Configuration:
SA 850/851 configurated for LVP/SVP, the WLN is 278-4015 (60 Hz).
SA 850/851 configurated for LVP/SVP, the WLN is 279-4015-1 (50 Hz).
SA 850/851 configurated for VS-AWS, the WLN is 278-4021 (60 Hz).
SA 850/851 configurated for VS-AWS, the WLN is 278-4021-1 (50 Hz).

D. 278-4015 and 278-4021 can be interchanged providing the proper jumpers on table A & B get implemented.

VS 25/45

Jumper settings for floppy

| JUMPERS | PCB E-REV'S 25189-2/ 25190-2 | 25201-3/ 25202-3 | 25216-0 |
|---|---|---|---|
| Y | X | X | X |
| 850 | X | X | X |
| IW | X | X | X |
| 2S | X | X | X |
| DC | X | X | X |
| C to HI | X | X | X |
| S2 | X | X | X |
| IT | X | X | X |
| FM | | | X |
| MFM | | | X |
| RS | X | X | X |
| M | X | X | X |
| AF | * | X | |
| In position 4F cut shunt at position | 1/2/4 | 1/2/4 | 1/2/4 |
| FS | X | X | X |
| DSI | X | X | X |
| Terminator at location 5E | In | In | In |
| Jumper from 851 to PIN 1 of IC 3F | Cut | Cut | Cut |

Must have short between pin 8 of IC 3E and Pin 1 of IC 3F.

X = Insert jumpers

* = Install jumper from F to pin 11 on IC located at position 8D. IC at location 8D also needs pins 3 and 11 jumpered together.

The 278-4015 (2200 configured), the 278-4021 (VS-AWS configured), and the 278-4028 (VS 25/45 configured) DSDD floppy drives are interchangeable by correcting the jumper settings. See newsletter 18 for 2200/VS AWS jumper settings. The last item in Table B of that newsletter should read pin 8 of IC 3E and not pin 2.

VS25/45 & LVP (JUMPERS WRITTEN IN)



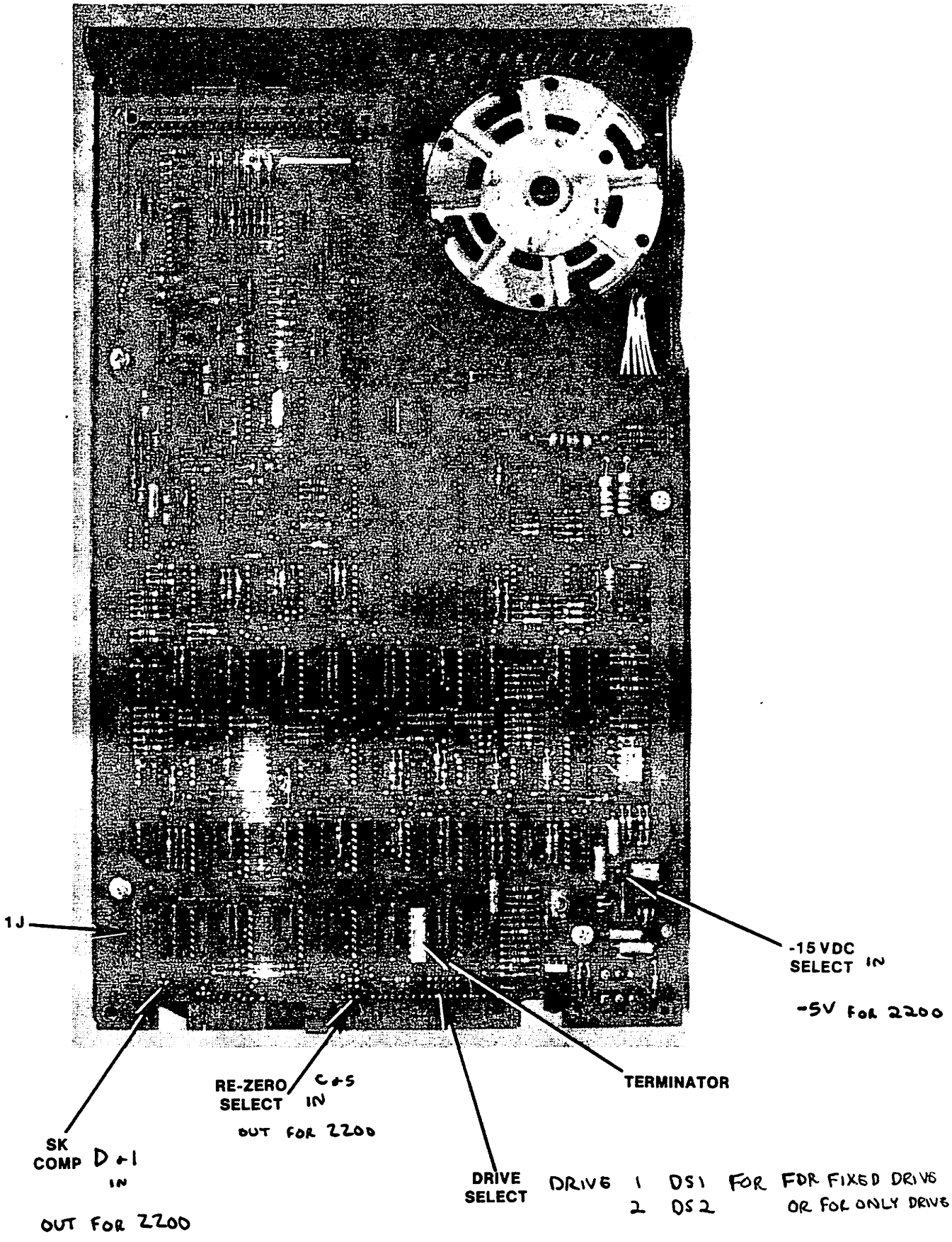



Figure 5-29. Quantum Drive Jumper Options

LVPC
Quantum Drive (must be a chassis)

The new Quantum Disk Drive is now in the field. The drive comes in 2 models, a 16 meg and a 32 meg. The 2 cables from the Quantum should connect to the middle 2 connectors on top of the motherboard. (red wire is pin 1)
(FIXED 1; CONN 2 & 3)

| MODEL | PLATTERS | ADDRESSING | PART NUMBER |
|---|---|---|---|
| Q2020 (16 Meg) | 2 | 310,320,330 sectors 0 to 65407 | 278-4024 |
| Q2040 (32 Meg) | 4 | D11,D21,or D31 sectors0 to 65407<br>D12,D22, or D32 sectors 0 to 65407 | 278-4025 |

The drive is shipped with 2 locks, one on the actuator and one on the spindle. Both locks are found on the side opposite the PC board.

Spindle Lock

Loosen 11/32 hex nut, rotate away from pulley and tighten. (do not rotate pulley)

Actuator Lock

Unlock by turning with a straight edge screwdrive counterclockwise as far as it will go which is approximately 1/4 turn.

When power is turned on to the Quantum under proper operation, the heads should raise up, lower down, raise again in 5 or 6 stepping motions, and once again lower. This can seen by looking down through the glass between the spindle motor and the PC board.

The 16 meg Quantum is addressed as any single fixed disk would be and takes approximately 30 minutes to format. The 32 meg Quantum is addressed the same way the first two fixed surfaces of a Phoenix would be addressed. Using address 310 as selected by the 94 board, the 32 Meg Quantum would be addressed by using D11 and D12 and each address requires 30 minutes to format. All Quantum addresses should be formatted upon installation.

DPU Boards for the Quantum
-210-7694/210-8694/210-8794 (next to I/O connectors)
9/4/86 3 3

The 210-8794 should be used with all Quantums and must be used to access both addresses of the 32 meg. The 210-8694 could be used for test purposes or with the 16 meg temporarily but should be at E-REV 3. A 210-7694 might also possibly be used but should be the equivalent of an 8694 E-REV 3. The 76 series boards are being phased out.

The 94 contains the device address switch. 4 on=310, 3 on=320, and 3 and 4=330.
The 94 board also has the pots on it for the PLL adjustment and the new PLL adjustment diskette, 732-0009A, is needed with the Quantum.

-210-7696/218-8696 (middle board of DPU)

9/4/86

The 210-8696 with R8 proms should be used. Do not use R7 or R6 proms as these proms have a known problem. R5 proms may work but you might not be able to access the second address on the 32 meg. The 7696 will probably work the same but you should try to stay with the 86 series.

The switch bank on the 96 board indentifies what disk drives are installed and should be set as follows:

| | | |
|---|---|---|
| Switches | #1, #5, #7 | Always On |
| | #3 | Always Off |
| | #6 | On=No Floppy, Off=Floppy installed |
| | #2, #4, #8 | All On=No Fixed Drive<br>2 and 8 On=2 meg or 4 meg Winchester<br>4 and 8 On=8 meg Winchester<br>2 and 4 On=16 Meg Quantum<br>4 On=32 Meg Quantum<br>8 On = Floppy in Fixed |

-210-7695/210-8695/210-7925 (next to 6793-1 board)

9/4/86

The 210-7925 should be used with all Quantums and is mandatory to access both addresses on the 32 meg. Again a 210-8695 or even possibly a 7695 with at least R2 proms at L1 and L2 should work as a temporary fix or for test purposes. The 7925 board also corrects a possible I93 problem that may occur with the 8695.

In conclusion the DPU for the Quantum should consist of a 210-8794, a 210-8696 with R8 proms, and a 210-7925 although other combinations may work.



LVP/SVP

Proms on 8696 Board

Proms on the 8696 board are now at revision R8. Revision R5 may still be used but do not use R6 or R7. A new phase Lock Loop Diskette is needed with the R8 proms as the older version PLL diskette, part number 732-0009, will not operate properly with the Winchester. The new PLL alignment disk is part number 732-0009A.

SVP

OPTION W

Option W allows the use of 3 terminals on an SVP. To utilize Option W the operating system must be MVP 2.4 or higher, a 32K control memory board is needed, and the proms on the 6789 should be R3 to R5. The option board replaces the SVP terminal/printer controller board, part number 210-7789. The installation involves attaching 2 more RS232 connectors on the rear plate connecting to the Option W board (P/N 210-7846) via cabling. If the SVP does not have holes on the rear plate for the 2 extra RS232 connectors a new mounting rear plate will be needed.

Option W Board - 210-7846
3 Hole Rear Mounting Plate - 270-0683

There are 3 switch banks on the Option W board, each containing 4 switches.

Switch Bank 1 (baud rate for port 2) and Switch Bank 2 (baud rate for port 3) are set as follows:

| Baud Rate | SW1 | SW2 | SW3 | SW4 |
|---|---|---|---|---|
| 110 | | | | |
| 134.5 | X | | | |
| 150 | | X | | |
| 200 | X | X | | |
| 300 | | | X | |
| 600 | X | | X | |
| 1200 | | X | X | |
| 2400 | | | | X |
| 4800 | | X | | X |
| 9600 | | | X | X |
| 19.2K | X | | X | X |

Port #1 is automatically set at 19.2 K.
Switch 3 is for device address and should have all switches off.
↑ BANK

OPT W HANG PROBLEM - IF ALL WORKSTATIONS ARE INACTIVE FOR AN EXTENDED PERIOD (3 MINUTES OR MORE), WORKSTATION MAY HANG.
SEEMS TO BE PROBLEM WITH CHIPS L7, L8, L9, L10, L29, L30, L31, L32
IF TEXAS INSTRUMENT BAD TMS4164-15NL
MOTOROLA CHIPS GOOD

SVP

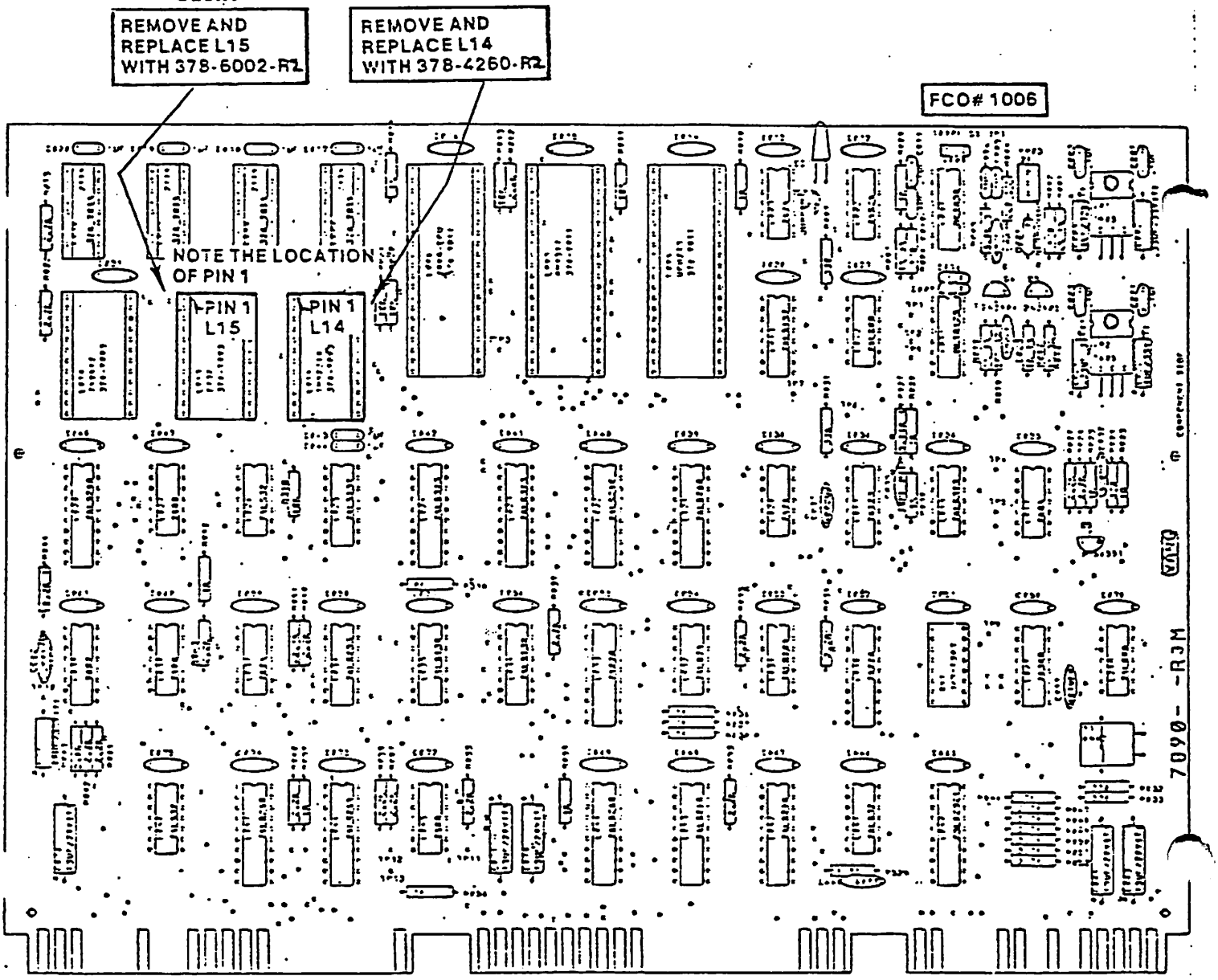
New Proms for 210-7890A Board

The 210-7890A is the single board controller used in SVP's with only DSDD floppy drives, whether it be one drive or two. There are several problems with the board which include:

1. Record handling problems with IBM routine.
2. Intermittent I94 and I98 errors.
3. Intermittent errors in 26th sector after formatting.

To correct these problems new proms have been released and may be ordered under a kit number 728-0012. The new proms are 378-6002-R2 and 378-4260-R2 to be installed in location L15 and L14 respectively. The 210-7890A board should be at E-REV 4 before installation and installed on a next call basis.

Enhancements provided with these proms include an increase in speed while verifying and while sequentially reading and writing with disk.




210-7890

CUSTOMER ENGINEERING
TECHNICAL ASSISTANCE CENTER
NEWSLETTER

#40807

4103

2200 SYSTEMS-MAINFRAMES-VP/MVP/LVP/SVP

TOPIC: 2200 SYSTEM - MAINFRAMES VP/MVP/LVP/SVP

Within the last several months, there have been numerous inquiries regarding problems with Wang supplied diskettes and the SVP's single board Disk Processing Unit (DPU) #2110-7890.

A format problem was found in Wang's duplicator for the 8" DSDD diskette.

The symptom found is that the diskette would not VERIFY on the 7890 controller but, works on the three board DPU.

The diskette duplicator has been fixed and all disks in stock should work on both the single and the three board DPU's.

If you have any customer's with problems with the Wang supplied diskettes, there are two (2) ways to solve the problem.

(°) Reorder the diskettes.

(2) Copy the customer's diskette, reformat the customer's diskette, then recopy the data back from the copied diskette to the original.

The #2110-7890 PCB has another problem. Using the Phase LockLoop Adjustment Program (732-0009-A/B), the FORMAT PLATTER (SFO) will error out with an I93 on the floppy if the diskette has never been formatted using a three board DPU.

R&D is planning, in the future, to change the #2110-7890 PROM to incorporate the formatting of the inner two tracks of the diskette.

WANG LABORATORIES, INC.

MEMO TO: DISTRIBUTION

FROM: SAM GAGLIANO - 2200 COMPUTER MARKETING

SUBJECT: CONFIGURING 2200 SYSTEMS

DATE: JANUARY 18, 1979

This memo is to serve as an update to my memo of October 2, 1978, regarding the need for the VP/MVP-A Extended Configuration Chassis when configuring 2200 VP or MVP systems. If you recall, it was initially stated that an "A" chassis was mandatory if over 64k of memory and/or a Model 2280 disk system were contained in any new configuration. Effective today, we will modify this rule somewhat as a result of information obtained from our Research and Development group. The limitation still remains but is nowhere as restrictive as before and much more clearly defined.

We would like to introduce a new method of configuring VP and MVP systems. This method is a positive way of determining whether or not an "A" type chassis will be required in configuring your systems. The procedure is based on assigning each peripheral controller a "configuration weight". In configuring your systems simply add all of the peripheral "configuration weights" to arrive at a total system "weight". The standard VP/MVP CPU will support up to a configured weight of 100. If your total configured weight exceeds 100 a VP-A or MVP-A Extended Chassis must be used. You can use these basic rules to configure "T" systems also. The maximum configured weight for a "T" system is 65. If this value is exceeded, then a VP system must be used. In all cases user memory will not contribute any configuration weight to the overall system. This includes MVP memory to 256KB.

The following listing specifies the "configuration weight" of most of the available 2200 peripherals.

| | Description | Controller | Rating |
|---|---|---|---|
| CRT | | | |
| 2226A | CRT Size 64x16 | 22C34 | 17 |
| 2226B | CRT Size 80x24 | 22C33 | 22 |
| Card Readers | | | |
| 2244A | Card Reader | 22C06 | 14 |

WANG LABORATORIES, INC.

CONFIGURING 2200 SYSTEMS
Page 2

| | Description | Controller | Rating |
|---|---|---|---|
| **Keyboards** | | | |
| *2223 | Keyboard | | 8 |
| *2215/15E | Keyboard | | 7 |
| *2222/22E | Keyboard | | 8 |
| **Mass Storage Devices** | | | |
| 2209 | 9-Track 800 BPI | 2250 | 8 |
| 2209A | Buffered 9-Track 1600 BPI | | 17 |
| *2230 | Disk Drive | 22C03 | 4 |
| 2230 MXA/A-1 | Disk Multiplexer | -- | 8 |
| 2230 MXB/B-1 | Disk Multiplexer | -- | 5 |
| *2240 | Diskette Drive | 22C03 | 4 |
| *2260(-2) | Disk Drive | 22C03 | 6 |
| *2260B(-2) | Disk Drive | 22C03 | 6 |
| 2260BC(-2) | Disk Drive | 22C13 | 28 |
| 2260C(-2) | Disk Drive | 22C12 | 28 |
| 2270 | Diskette Drive | 22C03 | 4 |
| 2270A | Diskette Drive | 22C03 | 4 |
| 2270A-D | Diskette Drive | 22C03 | 4 |
| 2280 | Disk Drive | 22C14 | 5 |

(-2 versions require rating of single version disk)

| | | | |
|---|---|---|---|
| **Output Devices** | | | |
| *2201 | Output Writer | 22C01 | 8 |
| 2201L | Output Writer | 22C02 | 6 |
| *2202 | Plotting Output Writer | 22C01 | 8 |
| 2221W | Matrix Printer | 22C02 | 6 |
| 2231W (All) | Matrix Printer | 22C02 | 6 |
| 2251 | Matrix Printer | 22C02 | 6 |
| 2261W | High Speed Matrix | 22C02 | 6 |
| 2263-1/2 | High Speed Matrix | 22C02 | 6 |
| 2281(P) | Daisy Wheel | 22C02 | 6 |
| 2272-1/2 | Drum Plotter | 22C02 | 6 |
| 2282 | Graphic CRT | 22C02 | 6 |
| 2232B | Flatbed | 22C01 | 8 |
| **Interfaces** | | | |
| 2207A | RS232C | -- | 8 |

| | Description | Controller | Rating |
|---|---|---|---|
| Interfaces (cont.) | | | |
| 2250 | 8 Bit Parallel | -- | 8 |
| 2252A | BCD | -- | 6 |
| 2254 | IEEE | -- | 7 |
| 2227/B | Async TC | -- | 8 |
| 2228/B | Async, Bysnc TC | -- | 16 |
| 2228/C | Async, Bysnc TC | -- | 18 |
| 2236 MXD | MVP Terminal Multiplexer | -- | 18 |
| Multiple Controllers | | | |
| 22C31 | Triple Controller- Printer, Keyboard, Diskette | -- | 13 |
| 22C11 | Dual Controller - Printer, Diskette | -- | 5 |

*discontinued products

This table should be used in the following way. First, make a list of all the peripherals that the configuration will have. Then determine if either the triple or the dual controller can be used; if these controllers can be used then substitute their ratings in place of the ratings for the individual devices (keyboard, disk, printer). Then add the ratings of all other devices. Please note that the 2260BC disk drive might include a 2230 MXA (rating of 8).

A few statements on the above listing:

- Model 2236D's are not listed as they use the MXD for a controller.
- We have listed certain discontinued products because of the large number of "upgrades" we are booking. Be sure the particular devices you are including are compatible if using an MVP.
- Be certain to include in your configuration weight the multiple controllers since they encompass up to three peripherals in one I/O slot. If a triple or double

controller is used always reflect the configuration of the overall controller.

- On upgrade or add-on, this chart should be used to determine if the new configuration still fits into the maximum configuration weight.
- Printers connected to consoles do not contribute to total system configuration weight.
- Model 2210 consoles require CRT, keyboard and floppy disk controllers.
- Memory size of any CPU does not carry any configured weight.
- Good judgement must be used on any configurations bordering the maximum. Ask yourself, "What are the possibilities of an upgrade in the future?"
- Note that you must not exceed the number of I/O slots provided in the CPU you are working with.

One other consideration is the use of 2228B or 2228C controllers and, on the MVP, the use of the 2236MXD. In all cases never configure a system which contains more than a grand total of three (3) of the above controllers in a T, VP, or MVP, or five (5) such controllers in a VP-A or MVP-A.

Now that we've got a procedure, a few sample configurations should illustrate how the configurating system works.

1. Average VP System

| Component | | Configured Weight |
|---|---|---|
| VP-8 CPU | | 0 |
| 2226B Console | | 22 |
| 2270-2 Diskette | Triple Controller | 13 |
| 2221W Printer | Triple Controller | |
| 2260C Disk | 22C13 | 28 |
| Total Configured Weight | | 63 |
| Total Number of I/O Slots | | 3 |

VP-A not required

2. Average MVP System

| Component | | Configured Weight |
|---|---|---|
| MVP-8 CPU | | 0 |
| 2236MXD Terminal Multiplexer | | 18 |
| 3x2236D Console | | 0 |
| 2270A-1D Diskette | Dual Controller | 5 |
| 2261W Printer | Dual Controller | |
| 2260BC Disk | 22C13 | 28 |
| Total Configured Weight | | 51 |
| Total Number of I/O Slots | | 4 |

MVP-A not required

3. Large MVP System

| Component | Configured Weight |
|---|---|
| MVP-64 CPU | 0 |
| 2236MXD | 18 |
| 2236MXD | 18 |
| 8x2236D | 0 |
| 2280 | 5 |
| 2260BC | 28 |
| 2230 MXA-1 | 8 |
| 2228B | 16 |
| 2209A | 17 |
| 2261W | 6 |
| Total Configured Weight | 116 |
| Total Number of I/O Slots Required | 8 |

MVP-A is required

4. Large "T" System

| Component | | Configured Weight |
|---|---|---|
| 2200T-8 -- | | 0 |
| 2226B | | 22 |
| 2270-3 | Triple Controller | 13 |
| 2221W | Triple Controller | |

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4. Large "T" System

| Component | Configured Weight |
|---|---|
| 2260BC | 28 |
| 2230 MXA-1 | 8 |
| 2200WS-4 | 0 |
| Total Configured Weight | 71 |
| Total Number I/O Slots Required | 4 |

A VP or MVP is recommended in this configuration.

Hopefully, this configuration scheme will serve not to confuse but rather help you determine whether or not the proper CPU has been selected. The near term benefit, particularly in the case of the VP or MVP, will be quicker deliveries. Extended Configuration Chassis for the VP/MVP-A will not begin to be deliveried for at least 4-6 weeks. At that time we will begin working on a very large backlog. Therefore, if we can ship standard MVP's rather than MVP-A's we will be in a better position to fill orders more rapidly.

Although we have attempted to list as many popular peripheral devices as possible, there are some minor ones including special products not listed as of yet. For any not listed, please feel free to contact me on those.

Sam Gagliano
2200 Product Marketing

SG:pn

SINGLE BOARD UNITS ONLY

# APPENDIX I

# CPU/MEMORY PCB UPGRADE OPTIONS

## I.1.1 INTRODUCTION

### I.1.1.1 Scope and Purpose

The scope and purpose of this manual is to provide the Wang Customer Engineer with the information necessary to install, troubleshoot, and repair the Wang 2200 Computer System in the field. Familiarity with the Wang 2200 product line is recommended for effective use of this manual.

The 2200 Computer System is an interactive, multi-user, multi-task, disk-based computer system, utilizing VLSI [Very Large Scale Integration] technology. The 2200 Computer System supports up to 16 terminals and 16 jobs [partitions] concurrently as well as a wide range of peripheral devices, such as printers, plotters, disk drives, tape drives, and TC devices. Disk drive sharing for up to 15 additional CPUs is also available as an option.

By utilizing VLSI, the 2200 Computer System processor design is incorporated into a single chip. This allows the 2200 CPU, control memory, and user memory to reside on a single PC board. The two models of the 2200 Computer System offered are the 2200 MVP-128 that contains 128KB of Data Memory and the 2200 MVP-512 which contains 512KB of Data Memory. Both systems, however, contain 32K of Control Memory. In addition, these two existing 128KB or 512KB CPU PCBs may be upgraded to Enhanced CPU/Memory configurations via upgrade kits.

## I.2.1 DIAGNOSTIC ERROR MESSAGES

### I.2.1.1 AEDM Errors (Addressing Error in Data Memory)

NOTE

When memory exceeds 512KB, the address information that is displayed for memory error at boot time is invalid.

This error is displayed as:

AEDM ss.aaaa ss.bbbb xx

Where:
ss=Memory bank containing the error.
aaaa=Address of the data in error.
bbbb=Conflicting Address
xx=XOR of the "expected" and "actually read" data.

This error indicates that writing to location "bbbb" seems to modify location "aaaa". The "1" bits in the "xx" field of the display indicate which bits have been modified. The error could also occur if a chip at location "aaaa" had a marginal failure.

# DATA MEMORY (6787 BOARD) DIAGNOSTIC DIAGRAM

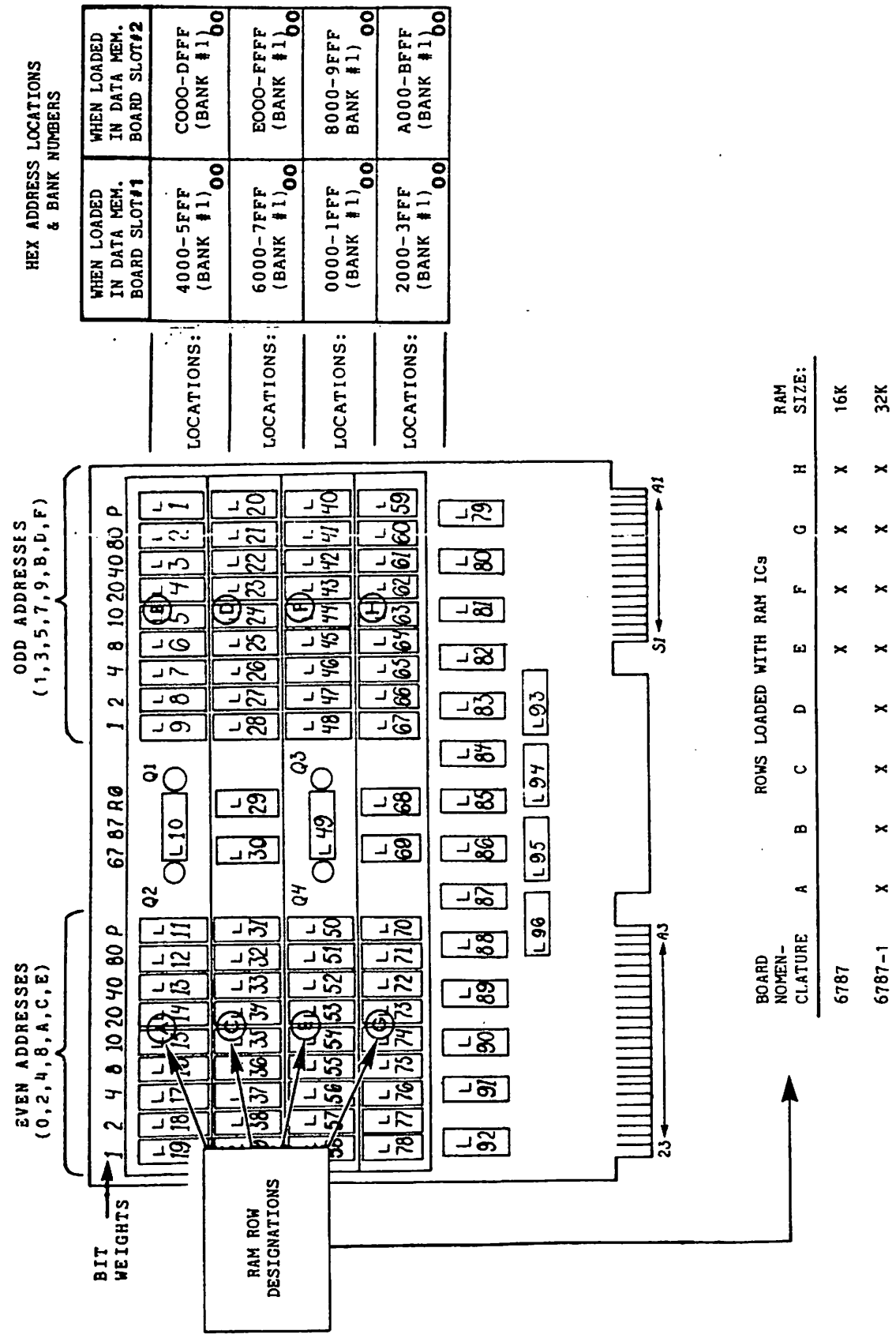



FIGURE 11-3

## CONTROL MEMORY DIAGNOSTIC INTERPRETATION

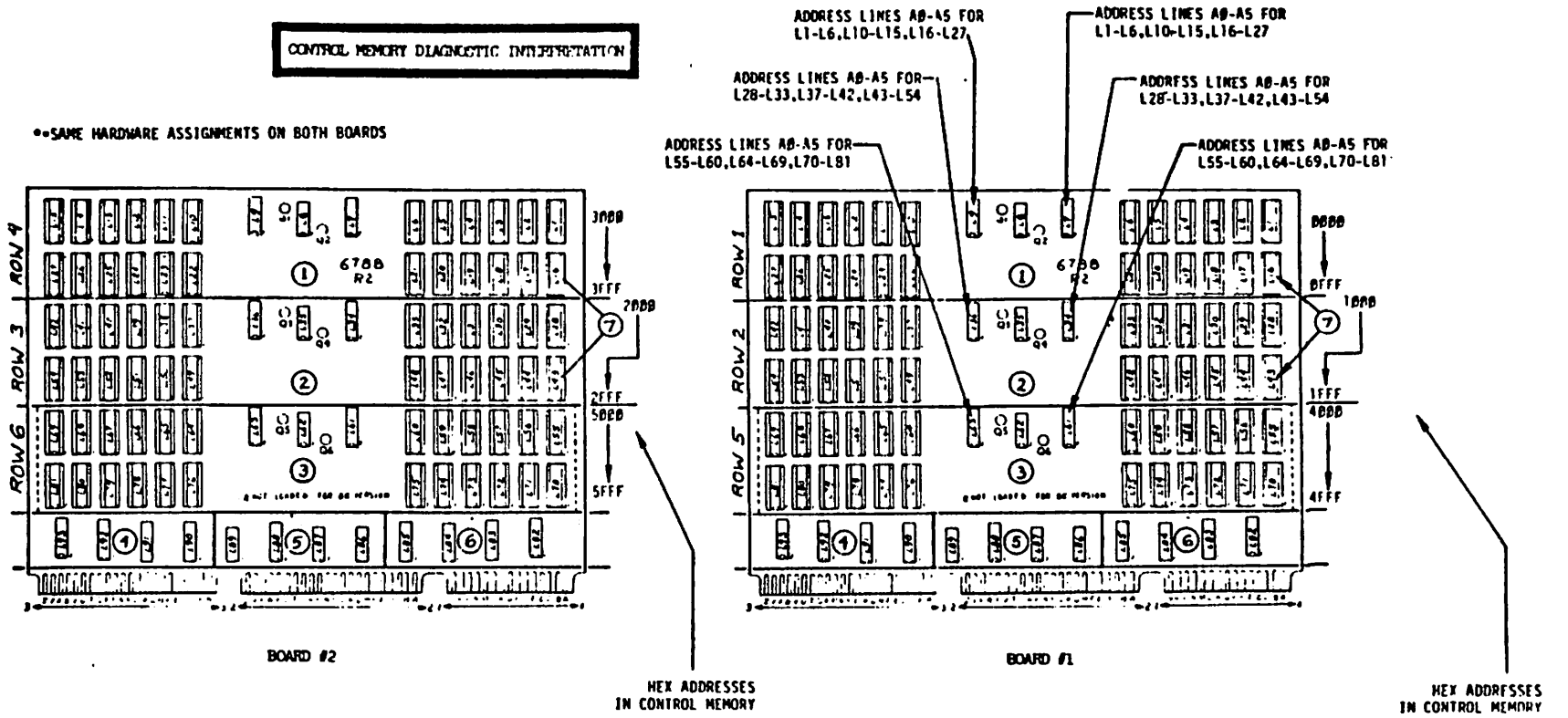


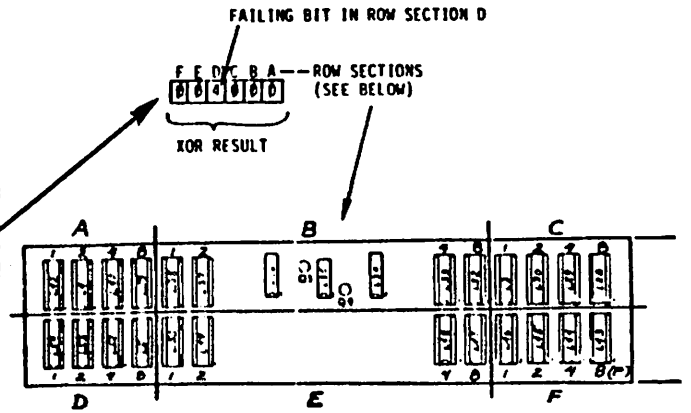

FIGURE 8-2

EXAMPLE DIAGNOSIS:

ERRORS DISPLAYED DURING CONTROL MEMORY DIAGNOSTIC:

| SF0: | TEST: | RESULT DISPLAYED: | MESSAGE | PASS # |
|---|---|---|---|---|
| 01 | ADDRESS 24 | "ERROR BETWEEN 2BBF AND 2BC0 (004000) | | #0000" |
| 02 | MAT C&S 24 | "ERROR-PC'S=2BA0 (0D0D0D/0D4D0D) XOR=004000 | | #0000" |
| 03 | ROWPAT 24 | "FAILURE AT PC'S 2BAD (000000/004000) XOR=004000 | | #0000" |

NOTE THAT IN EACH TEST, XOR YIELDS 004000 BETWEEN CONTROL MEMORY LOCATIONS 2BBF AND 2BC0, LOCATED IN ROW #3 (BOARD #2).




FROM BOARD FIGURES ABOVE:

1. CHIP ENABLES FOR ROWS 1&4 (4096x24 BITS EACH)
2. CHIP ENABLES FOR ROWS 2&3 (4096x24BITS EACH)
3. CHIP ENABLES FOR ROWS 5&6 (RAM NOT LOADED ON 8K BOARDS)
4. I/O BUFFER
5. SELECT DECODER
6. I/O BUFFER
7. PARITY BIT(S)

## VISUAL CONTROL MEMORY SYSTEM ERROR DIAGNOSTICS

A Control Memory error is reported by an audible tone at each terminal of the complete system installation and a display on the CRT of Terminal #1 (the terminal at the technician's workstation).

### 6788 SERIES OF MEMORY CONTROL DISPLAYS (See Figure 8-2)

A Control Memory failure will cause one of the following messages to appear at the workstation CRT:

```
***SYSTEM ERROR (MMMM XXXX)***
PRESS RESET
```

where MMMM =
- AECM - Addressing Error Control Memory
- BECM - Bit Error Control Memory
- PECM - Parity Error Control Memory
- VECM - Verify Error Control Memory

and XXXX = Location and Nature of Error (Refer to Diagnostic Charts in this section).

### 7588 SERIES OF CONTROL MEMORY DISPLAYS (See Figure 8-3)

This display is similar to that found in the 6788 series of Control Memory Boards with the exception that the coding is changed as printed below:

PECM 4010 - 00 - 80 - 00

4010 means either Row 1 or 2

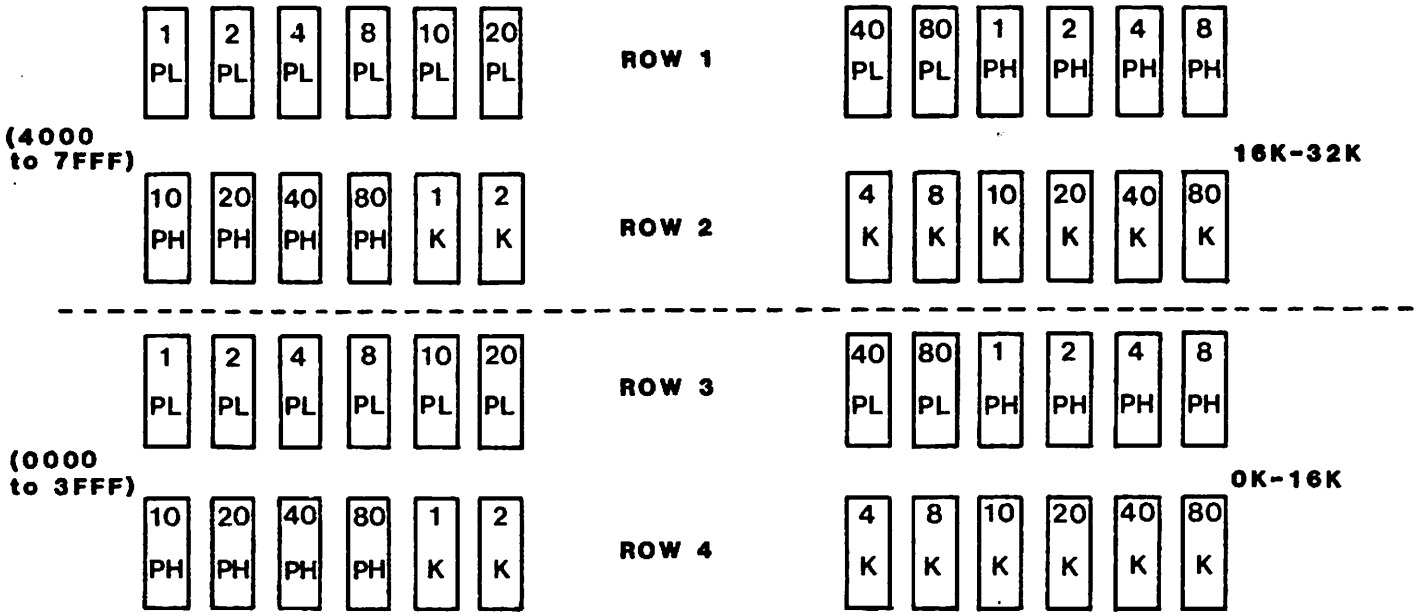
The first set of two digits (00) signify K chips

The second set of two digits (80) signify PH chips

The third set of two digits (00 signify PL chips

Therefore the visual is broken down as follows:

4010 means Row 1 or 2
80 means a PH chip
The 80 PH chip in Row 2 is faulty.




| 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 80 | 40 | 20 | 10 | 8 | 4 | 2 | 1 | 80 | 40 | 20 | 10 | 8 | 4 | 2 | 1 | 80 | 40 | 20 | 10 | 8 | 4 | 2 | 1 |
| K | | | | | | | | PH | | | | | | | | PL | | | | | | | |

FIGURE 8-3

# DATA MEMORY (7587 BOARD) DIAGNOSTIC DIAGRAM

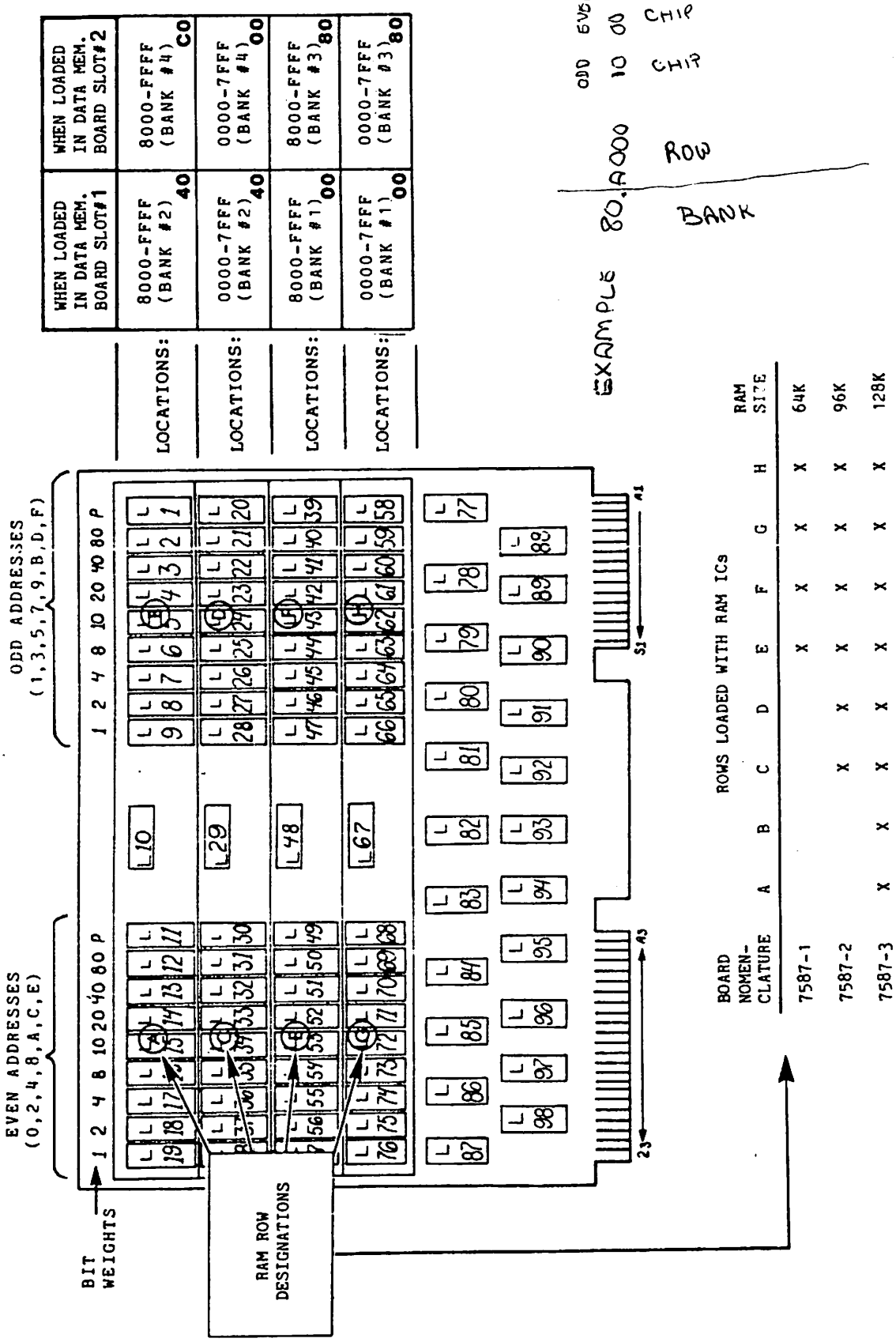



FIGURE 11-4

# TECHNICAL SERVICE BULLETIN

## SECTION: HardWare Technical

NUMBER: HWT 5081 REPLACES: _____ DATE: 04/16/85 PAGE 1 OF 2

MATRIX ID. 4103 PRODUCT/RELEASE# 2200 MVP-128/512

TITLE: NEW 2200 MVP-128 and 2200 MVP-512 INFORMATION

PURPOSE:

Provide information to the field about the NEW 2200 MVP MODELS.

EXPLANATION:

The 2200 MVP-128/512 System will be a single board version of the existing 2200 MVP System. The new system will utilize VLSI (Very Large Scale Integration) technology to incorporate the 2200 discrete processor design into single chip form. This will allow the 2200 CPU, control memory and user memory to reside on one circuit board. This single CPU/MEM board will be incorporated into a modified version of the 2200 MVP package. The 2200 MVP-128/512 Systems will run existing 2200 MVP software, diagnostics and I/O options without modification (Operating System Rev. 2.6 recommended).

There will be two versions of the CPU/MEMORY board; 32k Control-128K Data Memory and 32k Control-512K Data Memory. The difference between these two boards is the type of memory chip loaded in the data memory section. There are no field replaceable components on the CPU/MEM board.

Regardless of which version of the CPU/MEM board is being used, it must be inserted in the motherboard slot previously allotted for the REGISTER and I/O board (the old 210-6793 slot). This is the slot closest to the I/O slots.

There will be two new 2200 MVP models using the new CPU/MEMORY board they are: 2200 MVP-128 (128K data memory) and 2200 MVP-512 (512K data memory). The difference between the NEW MVP and the OLD MVP is the motherboard and the CPU/MEM board. The other parts are the same (power supply,etc.).

GROUP: VS/2200/PC Hardware Support Group MAIL STOP: 0122

# TECHNICAL SERVICE BULLETIN

## SECTION: HardWare Technical

NUMBER: HWT 5081 REPLACES: _____ DATE: 04/16/85 PAGE 2 OF 2

MATRIX ID. 4103 PRODUCT/RELEASE# 2200 MVP-128/512

TITLE: NEW 2200 MVP-128 and 2200 MVP-512 INFORMATION

EXPLANATION (cont'):

Note that the old CPU and Memory boards will not work in the new models and the new CPU/MEM board will not work in the old models. Part number information for the new 2200 MVP-128 and 2200 MVP-512:

| | |
|---|---|
| CPU/MEM board 128K version: | 210-8034-1A |
| CPU/MEM board 512K version: | 210-8034-2A |
| MOTHERBOARD for both versions: | 210-7498-1 |
| POWER SUPPLY | 270-0986 |

The troubleshooting instructions for the 2200 MVP-128/512 system are identical to the instructions given in section 7.4 of the maintenance manual for the 2200 MVP (729-0584-A) with the following exceptions;

1) When following the troubleshooting instructions in the maintenance manual 729-0584-A, disregard references to the individual CPU and Memory boards which are no longer in the system. These boards are:

| | |
|---|---|
| 210-6789 | Memory Controller |
| 210-6790 | Instruction Counter |
| 210-6791 | Stack |
| 210-6792 | ALU |
| 210-6793 | Register I/O |
| 210-6788 | Control Memory |
| 210-7588 | Control Memory |
| 210-6787 | Data Memory |
| 210-7587 | Data Memory |

2) Wherever instructed to replace these boards, replace the new CPU/MEMORY board (210-8034), in it's place.

3) When a memory error has been diagnosed, do not attempt to replace the failed memory chip. These are not field-replaceable items. Replace the entire board.

GROUP: VS/2200/PC Hardware Support Group MAIL STOP: 0122

WANG 5/14

# ECO 5/13

ECO NO. 36 [illegible]

SHEET 1 OF 3

| | | | | | |
|---|---|---|---|---|---|
| ORIGINATOR | JACK MANION | M/S 2522 | EXT. 1-44-86796 | DATE | 5/13/85 |
| WRITTEN BY | JACK MANION | M/S 2522 | EXT. 1-44-86796 | DATE | 5/13/85 |

| | |
|---|---|
| PART NO. 209-8034/1/2 | DESCRIPTION 2200 VLSI CPU MEM PCB |
| DWG NO. N/A | |
| MODEL NO. VLSI CPU | PEP # H0133A |
| CLASS (I) II III | TYPE ☑ HARDWARE ☐ SOFTWARE |

## DESCRIPTION OF CHANGE

Change assembly drawing, schematic and sample boards as follows:

Delete (1) 2N3904 Transistor 375-1080 at location Q1.
(1) 4.7K Resistor 330-3048 at location R7 .

PRELIMINARY

[illegible] PART 209-8034, 209-8034-1 and 209-8034-2 as follows

| | WLI # | DESCRIPTION | UM | COMP TYPE | QTY | QTY TYPE |
|---|---|---|---|---|---|---|
| DELETE: | 375-1080 | XSTR 2N 3904 TO-92 | EA | 1 | 1 | 1 |
| | 330-3048 | RES 4.7K OHM 1/4W 5% FIXE | EA | 1 | 1 | 1 |

## REASON/SYMPTOM FOR CHANGE

The intermittent power up failure of the 8034 is the result of the timing of the POR pulse generated by the 7397 power card. The manufacturers spec. for the 4501 DRAM Controller states that the RESET input may be left open due to an internal pull up. Removing the transistor and resistor allows the 4501 to power up correctly without failure.

## DOCUMENTS

| DOCUMENTS | REVISIONS F | REVISIONS T |
|---|---|---|
| BOM | | |
| ARTWORK | | |
| E-REV | 1 | 2 |
| SAMPLE BD | 1 | 2 |
| ASSY. DWG. | | |
| DRILL DWG. | | |
| SCHEM. DWG. | | |
| MECH DWG. | | |
| CBL ASSY. DWG. | | |
| S.P.I. | | |
| MECH ASSY. DWG. | | |
| COMPONENT SPEC | | |

| EFFECTIVITY | RE-MFG. | C.E. | DIST | FINAL ASSY AREA | SUB ASSY AREA | FUTR MFG |
|---|---|---|---|---|---|---|
| TO CONFORM | X | X | X | X | X | |
| USE AS IS TO PREVIOUS REV. | | | | | | |

## APPROVALS

| APPROVALS | DATE |
|---|---|
| ECO MGR. | |
| DES. ENGRG. [signature] | 5-13-85 |
| CUST. ENGRG | |
| MFG ENGRG | |
| ORIGINATOR [signature] | |
| F.C.C. [signature] | |

Table 6. 2200 Cathode Ray Tube Units

| Terminal | Screen Size | Lines and Characters per Line | Total Character Capacity | CPU Compat. | Character Set |
|---|---|---|---|---|---|
| 2210A | 12" | 16 x 64 | 1024 | T, VP | 128 |
| 2210B | 12" | 24 x 80 | 1920 | T, VP | 128 |
| 2226A | 12" | 16 x 64 | 1024 | T, VP | 128 |
| 2226B | 12" | 24 x 80 | 1920 | T, VP | 128 |
| 2236D | 12" | 24 x 80 | 1920 | VP, MVP | 128 |
| 2236DE | 12" | 24 x 80 | 1920 | VP, MVP, LVP | 128 Char. 64 Graphic |

Table 7. 2200 I/O Controllers

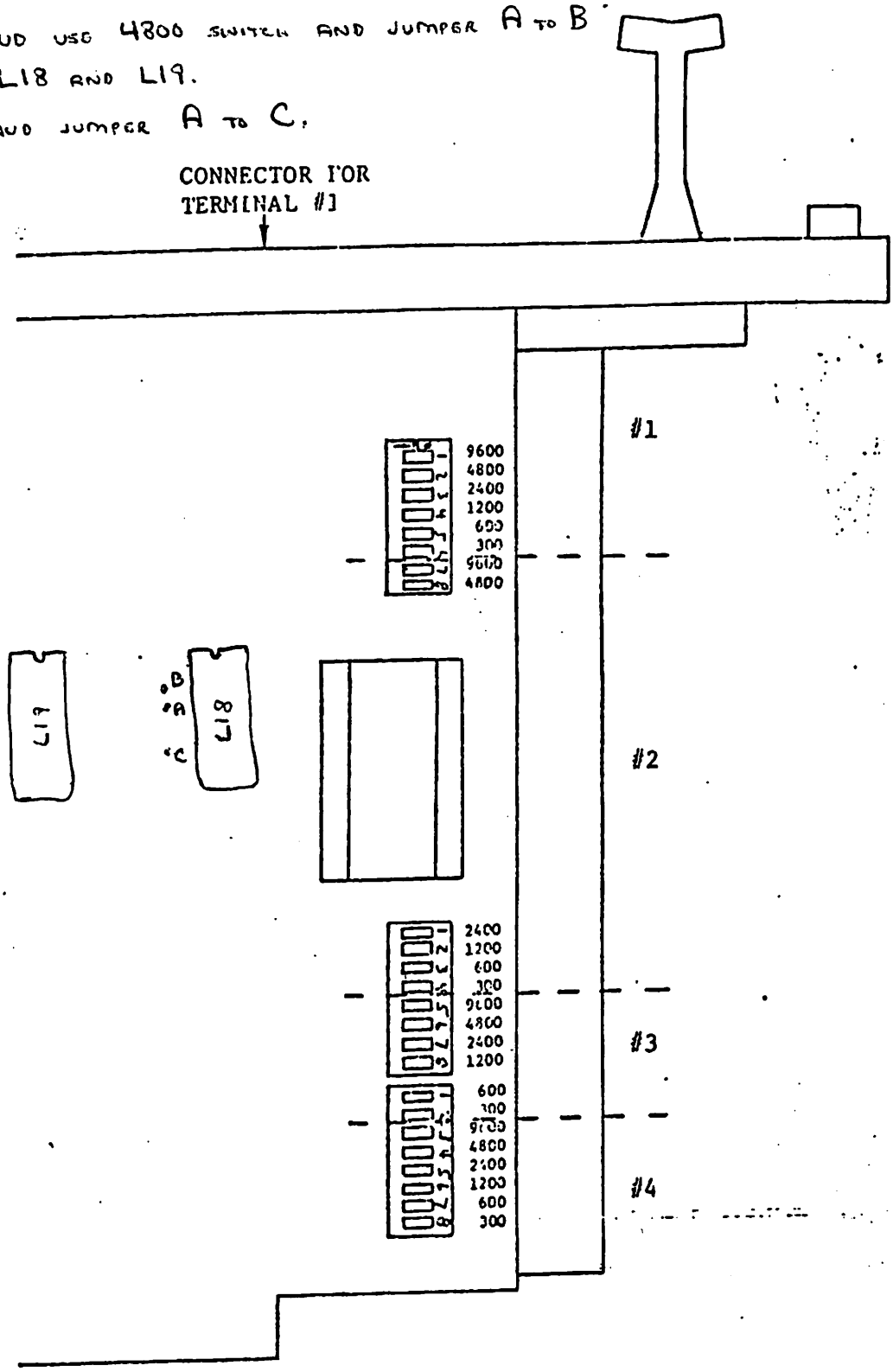
| Controller | Device | | | | |
|---|---|---|---|---|---|
| | Disk/ Diskette | Printer | Terminal | TC | Comments |
| 22C02 | | • | | | |
| 22C03 | • | | | | |
| 22C11 | • | • | | | Dual Contr. |
| 22C32 | • | • | • | | Triple Contr. |
| 2236MXD | | | • | | 1-4 2236DE terminals |
| 2211M | | • | | | Multiplex |
| 2230MXA-1 | • | | | | Multiplex |
| 2230MXB-1 | • | | | | Multiplex |
| 2227B | | | | • | |
| Option 62 | | | | • | |
| 2228B | | | | • | |
| Option 62B | | | | • | |
| 2228C | | | | • | |

# 2236MXD CONTROLLER

177-3236-1

For 19.2 Baud use 4800 switch and jumper A to B between L18 and L19.

For 4800 Baud jumper A to C.




7290 BAUD RATE SWITCH IDENTIFICATION

FIG. 2.1

5 Bk Sw.

ALL OFF — BRD 1
1 ON — BRD 2
2 ON — BRD 3
1 & 2 ON — BRD 4

LVP/MVP

## HANG UP PROBLEM WITH MUXD CONTROLLER

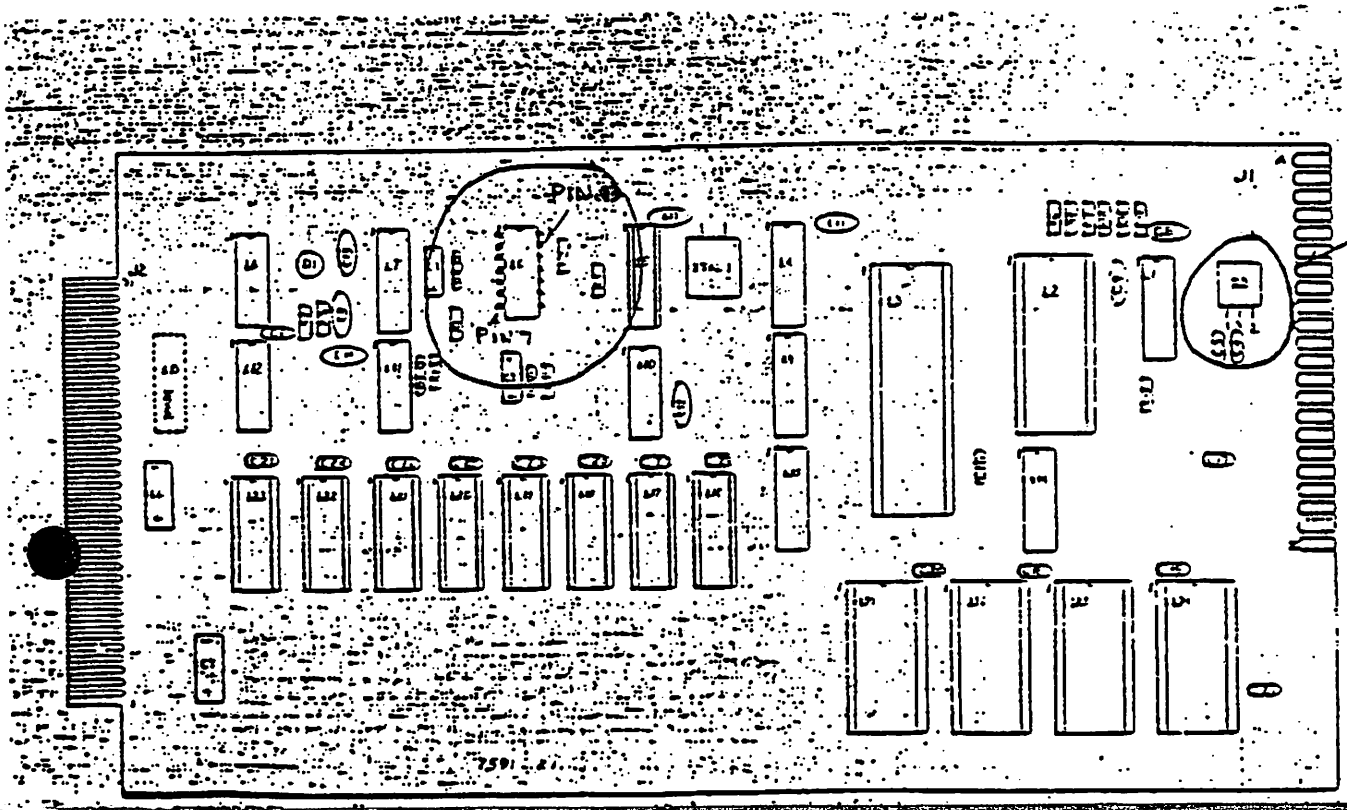
A legitimate solution has been found for terminals hanging up using the MUXD board with 210-7591 daughterboard and R7 proms. Previously the solution was to either downgrade the proms or the daughterboard if both weren't needed for 2200 Word Processing.

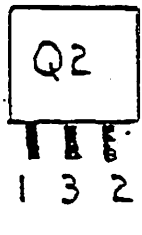
The fix involves installing two capacitors on the 210-7591 PCA (see picture)

1 Add a 390 pf capacitor (WLI 300-1390) between L6-pin 13 and plus/minus 0 volts. (use L6 pin 7 for +/- 0V)

2 Add a 35uf capacitor (WLI 300-3009), negative side to Q2 - pin 2 (-5V output) and positive side to plus/minus 0V. (use Q2 pin 1 for +/- 0V).

Another aid in eliminating intermittent hangups may be to insert the MUX D Board into the first I/O slot closest to 210-6793 board of the CPU section. After insertion, adjust 12 volts at the last I/O slot to approximately 12.1 volts. 12 volts can be adjusted at connector 3, bottom connector, of I/O slot, pin 15. (bottom pin). Ground reference is pin 13 (3rd from bottom).



MVP/LVP

2236MXE CONTROLLER 212-3032

The 2236MXE Terminal Controller has recently hit the field and will support 2236D, DE, DW and 2336DW terminals. The controller has its own 48K of RAM to allow it to perform several functions previously performed by the CPU. Some of the enhancements provided with this controller are:

1. "Time of Day" clock circuitry (optional battery back-up).
2. Baud Rate for each port switch and software selectable.
3. 8K prom provides bootstrap functions, power up diagnostics, and remote diagnostics.
4. Ability to set any terminal as Primary User.

With initial power on, the power on diagnostics will be run, which takes about 6 seconds and checks the majority of the MXE hardware.. While this is taking place an LED at the top of the external edge is lit and if there are no problems the LED will go out after the 6 seconds.
To use the MXE board however, MVP 2.4 operating system is necessary as otherwise when RUN is keyed from the LOAD MVP/LOAD diagnostic menu the system will just hang up. Thanks to Tim Coughlin of the Providence office for his help with this information.

Switch settings

| | Switch Bank 1 | | | |
|---|---|---|---|---|
| # of MXE | 1 | 2 | 3 | 4 |
| First | off | off | off | off |
| Second | on | off | off | off |
| Third | off | on | (off | off) |
| | | | (not | used) |
| Fourth | on | on | off | off |

-over-

# 2136 MXE

# HARDWARE SWITCH SETTINGS

| BAUD RATE | SWITCH 3 | | | | | | | | SWITCH 2 | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PORT 1 | | | | PORT 2 | | | | PORT 3 | | | | PORT 4 | | | |
| BAUD RATE | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| 110 [0] | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF |
| 134.5 [1] | ON | OFF | OFF | OFF | ON | OFF | OFF | OFF | ON | OFF | OFF | OFF | ON | OFF | OFF | OFF |
| 150 [2] | OFF | ON | OFF | OFF | OFF | ON | OFF | OFF | OFF | ON | OFF | OFF | OFF | ON | OFF | OFF |
| 200 [3] | ON | ON | OFF | OFF | ON | ON | OFF | OFF | ON | ON | OFF | OFF | ON | ON | OFF | OFF |
| 300 [4] | OFF | OFF | ON | OFF | OFF | OFF | ON | OFF | OFF | OFF | ON | OFF | OFF | OFF | ON | OFF |
| 600 [5] | ON | OFF | ON | OFF | ON | OFF | ON | OFF | ON | OFF | ON | OFF | ON | OFF | ON | OFF |
| 1200 [6] | OFF | ON | ON | OFF | OFF | ON | ON | OFF | OFF | ON | ON | OFF | OFF | ON | ON | OFF |
| UNDEFINED [7] | ON | ON | ON | OFF | ON | ON | ON | OFF | ON | ON | ON | OFF | ON | ON | ON | OFF |
| 2400 [8] | OFF | OFF | OFF | ON | OFF | OFF | OFF | ON | OFF | OFF | OFF | ON | OFF | OFF | OFF | ON |
| UNDEFINED [9] | ON | OFF | OFF | ON | ON | OFF | OFF | ON | ON | OFF | OFF | ON | ON | OFF | OFF | ON |
| 4800 [A] | OFF | ON | OFF | ON | OFF | ON | OFF | ON | OFF | ON | OFF | ON | OFF | ON | OFF | ON |
| UNDEFINED [B] | ON | ON | OFF | ON | ON | ON | OFF | ON | ON | ON | OFF | ON | ON | ON | OFF | ON |
| 9600 [C] | OFF | OFF | ON | ON | OFF | OFF | ON | ON | OFF | OFF | ON | ON | OFF | OFF | ON | ON |
| 19,200 [D] | ON | OFF | ON | ON | ON | OFF | ON | ON | ON | OFF | ON | ON | ON | OFF | ON | ON |
| | LSD | | | MSD | LSD | | | MSD | LSD | | | MSD | LSD | | | MSD |
| BINARY | 1 | 2 | 4 | 8 | 1 | 2 | 4 | 8 | 1 | 2 | 4 | 8 | 1 | 2 | 4 | 8 |

BAUD RATE SWITCH SETTINGS

[redacted]CTION CRITERIA

| | | | |
|---|---|---|---|
| PTR NUMBER - | START: C200008823 | | END: C200009999 |
| PRIORITY: | ALL | | |
| PROBLEM TYPE: | INFO | | |
| RDB - | ASSIGN RDB: 8760 | CUST RDB: ALL | ORIG RDB: ALL |
| HW/SW INDICATOR: | ALL | | |
| STATUS TYPE: | C | | |
| STATUS CODE: | ALL | | |

---

| | | | |
|---|---|---|---|
| PROBLEM NUMBER: | C200008926 | CUST NAME: | PRITCHARD & JERDEN INC |
| PRIORITY | P3 | CUST NUMBER: | 00 00000438564 |
| PROBLEM TYPE: | INFO | CUST CONTACT: | ROBERT WILLIAMS - SCE ONSIT |
| PRODUCT PROB NO: | NOT LINKED | CUST CONT PHONE: | -404-238-9090 |
| | | CUST ADDRESS 1: | 2250 N DRUID HILLS RD NE ST22 |
| | | CUST ADDRESS 2: | |
| | | CUST ADDRESS 3: | |
| SYSTEM MODEL NO: | 2200F | CUST CITY: | ATLANTA |
| GEN SYST MODEL: | 2200 | CUST ST/PROV: | GA |
| O. S. VERSION: | | CUST ZIP: | 30329-0000 |
| HW MODEL NUMBER: | CS-10 | CUST COUNTRY: | |
| SW MODEL NUMBER: | | RDB ASSIGNED: | 8760 |
| [redacted]VERSION: | | PERSON ASSIGNED: | BAHIA MICHAEL E |
| [redacted]NUMBER: | | ORIG NAME: | BAHIA MICHAEL E |
| PART NUM REV: | | ORIG PHONE: | - - - |
| CALL TRKG DATE: | 00/00/00 | NETWORKED: | N |
| CALL TRKG NO: | | RES DEPLOYED: | |
| ORG ACT/SYM/ACN: | | DATE ENTER PTR: | 06/30/89 |
| STATUS DATE: | 06/30/89 | DATE TO R&D: | |
| STATUS CODE: | H C 643 | WKDYS IN R&D: | |
| STATUS ABBREV: | RP SU FAIL | TOT WKDYS OPEN: | |

PROBLEM SUMMARY :BAHIA MICHAEL E DATE: 06/30/89 TIME: 10:22
OPER: MARI X66355 SCE EE: 11915 OFFICE: 404-392-5867 DEVICE: MXE
Can he get 16 terminals on the CS.

ASSIGNED: BAHIA MICHAEL E DATE: 06/30/89 TIME: 11:29
IF PUTS A 4TH MXE IN CPU MOST TIMES CANNOT GET MOUNT SYS PLATTER. SHOULD WORK. CE SHOULD VERIFY V'S ON MBRD TP'S & IF OK & STILL FAILING TRY ANOTHER PS. VERIFIED SW SETTING FOR 4TH MXE, SW 1&2 ON ON 4 PK SW. (15MIN) MIKEB

ASSIGNED: RAMSDELL MARI-ANNA DATE: 06/30/89 TIME: 10:22

RESOLUTION TEXT :BAHIA MICHAEL E DATE: 06/30/89 TIME: 11:39
HC 643. REPLACED PS & TESTED OK. CLOSE CALL /CE. (5MIN) MIKEB

To: Mike Bahia MS0126/LOWELL
From: Customer Service/Spokane
Subject: CS386 Date: 04/18/90

Distribution:

Not Requested

---

Mike I called you this AM on 2236DEs not working on the MXE that I brought over from a MVP. The problem was the switch on the 210-7592 PCB. With switch 3 on only the 2236DE will run at 19200bps and NO parity. With switch 1 and 3 on it runs at 19200bps and odd parity. The no parity was the problem. They work fine now on the 386. It still does not explain why the terminals worked on the MXE in the MVP!? Thanks for your help. Lee Sorenson Spokane,Wa.

# 2336DW ERGO TERMINAL
## PART NUMBERS AND SWITCH SETTINGS

The new Ergo Workstation is out in the field and is basically the same as a 2236DW with the added Ergo features of tilting screen and detachable keyboard. Local terminals on MVP/LVP may be a maximum of 2000' while on VP/SVP maximum local distance is 50'. The controller board for these terminals must have it's proms up to current standards to support these terminals.

1. MUX D daughterboard - 210-7591A R7 proms 378-2140/41/42/43
2. Triple controller daughterboard - 210-7516A R1 proms 378-4092/93
3. Triple controller daughterboard - 210-7816A R1 proms 378-2591/2449/50/51
4. SVP controller board - 210-7789A R1 proms 378-4092/93

### Parts List

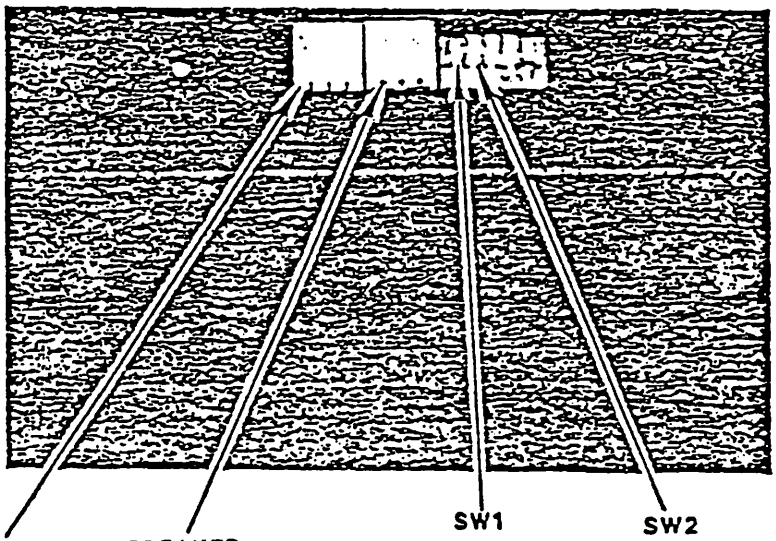
- Terminal Control Board 270-0753 [redacted] (should have following proms - 378-5080R1, 378-6013R5, and 378-6014R5) 270-0817 FOR D6 (CHANGE 6014RS TO 6079RS)
- Standard Keyboard 725-2637 726-2618 FOR D6
- Expanded Keyboard 725-2652 (indentified by uppercase characters on numeric keypad)
- 12" Monitor Board 210-7456
- 12" Tilting CRT Assembly 270-0633
- Power Supply 270-0734

KEYBOARD CABLE 220-1246

The first Ergo teminals released on the 2200 product line were actually repackaged 2236DE/DW's using the same 7592 board. The model number on this unit should be 2886. There seems to have been some mislabeling with model numbers with some 2336DW's being labeled 2886.

### Switch Settings

Use odd parity, 8 data bits




| SWITCH 3 | SWITCH 4 | SWITCH 5 | BAUD RATE |
|---|---|---|---|
| DOWN | DOWN | DOWN | 300 |
| ~~DOWN~~ UP | DOWN | ~~DOWN~~ DOWN | 600 |
| DOWN | UP | DOWN | 1200 |
| ~~DOWN~~ UP | UP | ~~DOWN~~ DOWN | 2400 |
| ~~DOWN~~ DOWN | DOWN | ~~DOWN~~ UP | 4800 |
| UP | DOWN | UP | 9600 LOOPBACK TEST |
| ~~DOWN~~ DOWN | UP | ~~DOWN~~ UP | 19.200 |

| UP | DOWN |
|---|---|
| EVEN PARITY | ODD PARITY ☆ |

| UP | DOWN |
|---|---|
| 8 DATA BITS ☆ | 7 DATA BITS |

V CHECKS - RS232 PIN 16 +5V PIN 19 +12V PIN 7 ±0V

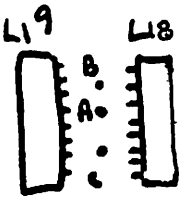
2236 MUX D - FOR 19.2 K

SWITCH SET AT 4800 + JUMP. BETWEEN L18 + L19 FROM A - B FOR 4800 FROM A - C

WANG LABORATORIES, INC.

210-7592A DE
210-7592-1A DW
725-2618 DE
725-2637 DW KEYBRD

## 2236DE BAUD RATE SWITCHES




| | SWITCH NUMBER 5 | 4 | 3 | 2 | 1 | PARITY | DATA BITS | BAUD RATE |
|---|---|---|---|---|---|---|---|---|
| | OFF | OFF | ON | OFF | OFF | NONE | 8 | 19.2K |
| X | OFF | OFF | ON | OFF | ON | ODD | 8 | 19.2K |
| | OFF | OFF | ON | ON | OFF | EVEN | 7 | 19.2K |
| | OFF | OFF | ON | ON | ON | ODD | 7 | 19.2K |
| | OFF | ON | OFF | OFF | OFF | NONE | 8 | 9600 |
| X | OFF | ON | OFF | OFF | ON | ODD | 8 | 9600 |
| | OFF | ON | OFF | ON | OFF | EVEN | 7 | 9600 |
| | OFF | ON | OFF | ON | ON | ODD | 7 | 9600 |
| | OFF | ON | ON | OFF | OFF | NONE | 8 | 4800 |
| X | OFF | ON | ON | OFF | ON | ODD | 8 | 4800 |
| | OFF | ON | ON | ON | OFF | EVEN | 7 | 4800 |
| | OFF | ON | ON | ON | ON | ODD | 7 | 4800 |
| | ON | OFF | OFF | OFF | OFF | NONE | 8 | 2400 |
| X | ON | OFF | OFF | OFF | ON | ODD | 8 | 2400 |
| | ON | OFF | OFF | ON | OFF | EVEN | 7 | 2400 |
| | ON | OFF | OFF | ON | ON | ODD | 7 | 2400 |
| | ON | OFF | ON | OFF | OFF | NONE | 8 | 1200 |
| X | ON | OFF | ON | OFF | ON | ODD | 8 | 1200 |
| | ON | OFF | ON | ON | OFF | EVEN | 7 | 1200 |
| | ON | OFF | ON | ON | ON | ODD | 7 | 1200 |
| | ON | ON | OFF | OFF | OFF | NONE | 8 | 600 |
| X | ON | ON | OFF | OFF | ON | ODD | 8 | 600 |
| | ON | ON | OFF | ON | OFF | EVEN | 7 | 600 |
| | ON | ON | OFF | ON | ON | ODD | 7 | 600 |
| | ON | ON | ON | OFF | OFF | NONE | 8 | 300 |
| X | ON | ON | ON | OFF | ON | ODD | 8 | 300 |
| | ON | ON | ON | ON | OFF | EVEN | 7 | 300 |
| | ON | ON | ON | ON | ON | ODD | 7 | 300 |

VOLT. +5 J15 PIN 1,2 R66 . THE 2 LOOPBACK MOLEX CONNECTORS ABOVE THE HEAT SINK.

+12 J14 PIN 1 R72

GRND USE BOTTOM OF LEFT-MOST L6 CAP OF 4 TOGETHER

20 SOUTH AVENUE, BURLINGTON, MASSACHUSETTS 01803 • TEL. (617)851-4111 • TWX 710-343-6769 • TELEX 94-7421

2236D

BOARDS 210-7292-1 210-7158 210-7067-0 OR 7156-0

KEYBRD 271-1130
725-2524★

SWITCH SETTINGS FOR THE 2236D TERMINALS

| BAUD RATE | 7292-1 E-REV3 SWITCH 1 | 2 | 3 | 4 | 5 | 7292-1 E-REV 4 SWITCH 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|---|---|---|---|---|
| 19.2K | N/A | | | | | ON | ON | ON | OFF | ON |
| 9600 | ON | ON | ON | OFF | ON | ON | ON OFF | ON | OFF | OFF ON |
| 4800 | ON | ON | ON | OFF | OFF | N/A | | | | |
| 2400 | ON | ON | ON | ON | ON | ON | ON | OFF | ON | OFF |
| 1200 | ON | ON | OFF | ON | OFF | ON | ON | OFF | OFF | ON |
| 600 | ON | ON | OFF | OFF | ON | ON | ON | OFF | OFF | OFF |
| 300 | ON | ON | OFF | OFF | OFF | ON | OFF | OFF | OFF | OFF |

2236DE

7592-1A FOR DW

210-7592A FOR DE

KEYBOARD 725-2637 FOR DW

725-2618 FOR DE

ON = X

V = ?

| | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| 19200 | X | | X | | |
| 9600 | X | | | X | |
| 4800 | X | | X | X | |
| 2400 | X | | | | X |
| 1200 | X | | X | | X |
| 600 | X | | | X | X |
| 300 | X | | X | X | X |

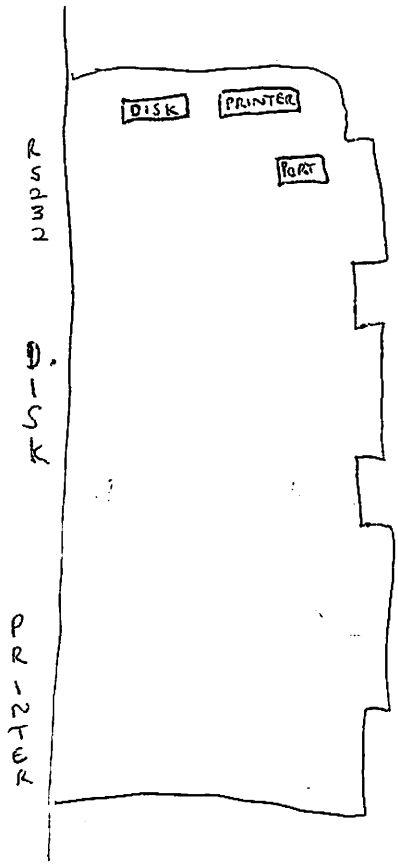
DIFFERENCE BETWEEN
210-7592A & 1A

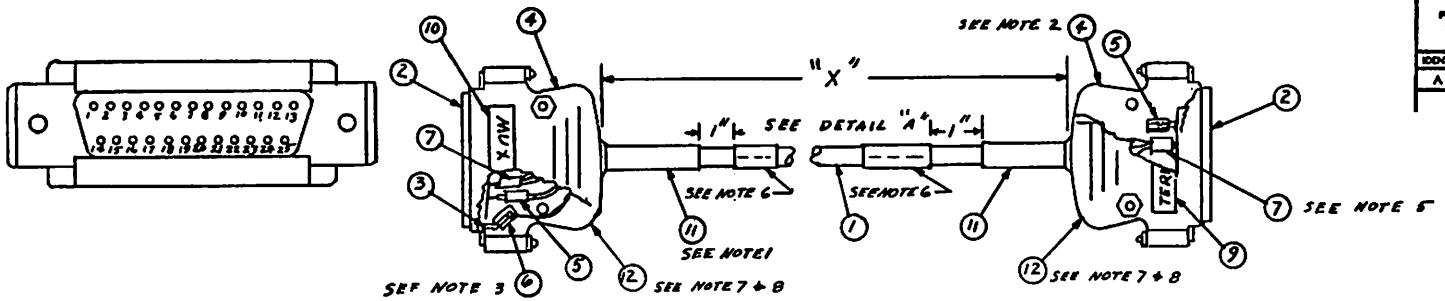
| | DE | DW |
|---|---|---|
| ONLY DIFFERENCE L16 PROM | 2446 | 3067 |

# MVP Triple Controller (Terminal/Printer/Disk) 212-3012

Always used as last port which would be port 1, 5, 9, or 13

| Switch Settings | SW1 (1) | SW2 (2) | SW3 (4) | SW4 (8) | SW5 (16) |
|---|---|---|---|---|---|
| Port 1 | ON | | | | |
| Port 5 | ON | | | ON | |
| Port 9 | ON | | | | ON |
| Port 13 | ON | | | ON | ON |





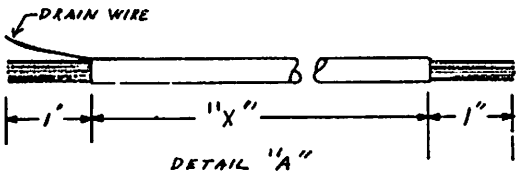

| HOLE LEGEND | | |
|---|---|---|
| | HOLE DIA. | TOL. |
| DRILLED OR PUNCHED HOLE TOLERANCES: | .0135 to .125 | ± .005 |
| | .126 to .250 | ± .005 |
| | .251 to .500 | ± .005 |

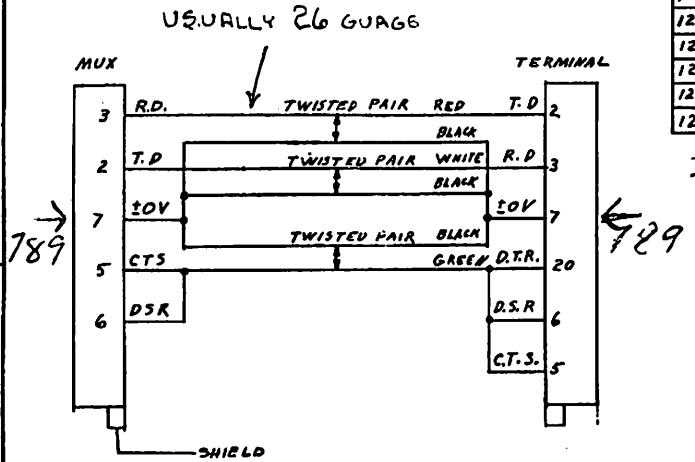
| IDENT. | DESCRIPTION | QTY. |
|---|---|---|
| A | | |

| W. L. PART NO. | "X" LENGTH | SLEEVE MARKER |
|---|---|---|
| 220-2236-25 | 25' ± 3" | 606-2236-25 |
| 120-2236-50 | 50' ± 3" | 606-2236-50 |
| 120-2236-1 | 100' ± 3" | 606-2236-1 |
| 120-2236-2 | 200' ± 3" | 606-2236-2 |
| 120-2236-3 | 300' ± 3" | 606-2236-3 |
| 120-2236-4 | 400' ± 3" | 606-2236-4 |
| 120-2236-5 | 500' ± 1' | 606-2236-5 |
| 120-2236-6 | 600' ± 1' | 606-2236-6 |
| 120-2236-7 | 700' ± 1' | 606-2236-7 |
| 120-2236-8 | 800' ± 1' | 606-2236-8 |
| 120-2236-9 | 900' ± 1' | 606-2236-9 |
| 120-2236-10 | 1000' ± 3' | 606-2236-10 |

220-0447 25' TERM CABLE

NOTE:-
1. ASSEMBLE ITEM 11 TO ITEM 1 BEFORE WIRING
2. HARDWARE SUPPLIED WITH ITEM 4
3. USE SLEEVING ITEM 6 OVER DRAIN WIRE
4. SOLDER DRAIN WIRE TO ITEM 3
5. USE SLEEVING ITEM 7 OVER 3 BLACK WIRES
6. APPLY HEATSHRINK MARKER APPROX WHERE SHOWN (2 PER CABLE)
7. ITEM 12 NOT SHOWN.
8. ITEM 12 APPLIED AFTER INSPECTION
9. CUT OFF DRAIN WIRE ON TERMINAL END




| WANG PART NO | ITEM | QTY. | NAME | MATERIAL | DESCRIPTION |
|---|---|---|---|---|---|
| 685-0099 | 12 | 2 | BUBBLE BAG | | 5¼" X 4" |
| | | | HEATSHRINK MARKER | | ⅛" DIA |
| 350-4102 | 11 | 2 | #3 BUSHING | | |
| 615-1343 | 10 | 1 | CABLE LABLE | | MUX. |
| 615-1399 | 9 | 1 | CABLE LABLE | | TERMINAL |
| 660-0022 | 8 | AR | SOLDER | | 62/37 ALLOY |
| 605-0000 | 7 | 2 | SLEEVE | | #10 TUBING ½" LONG |
| 605-0002 | 6 | 1 | SLEEVE | | #15 TUBING 1" LONG |
| 605-0002 | 5 | N/P | SLEEVE | | #15 TUBING ½" LONG |
| 350-4215 | 4 | 2 | CONNECTOR SHELL | | CANNON # DB 51226-1 |
| 458-0361 | 3 | 1 | GROUND LUG | | CGB15-28 |
| 350-1030 | 2 | 2 | CONNECTOR 25 POS | | |
| 420-0071 | 1 | YR | CABLE SHIELDED | | 3 TWISTED PAIR |

| WANG PART NO | FIRST USED ON | ASSY USED ON |
|---|---|---|
| | | |

WANG LABORATORIES, INC. TEWKSBURY, MASS. U.S.A.

| MATERIAL | MODEL NO 2236 |
|---|---|
| | SEE ENGRG SPECIFICATIONS No. |
| FINISH | TOL. EX. AS NOTED XX ± .010 FRAC ± 1/64 XXX ± .005 ANG ± 1°30' |
| SCALE FULL | SHT 1 OF 1 |

| BY | DATE | APPROVED BY | DATE |
|---|---|---|---|
| DWN | 11-19-77 | E ENGR | |
| CHK | | M ENGR | |
| E C CONTROL | | MFG ENGR | |

TITLE: 2236 DIRECT CABLE ASS'Y

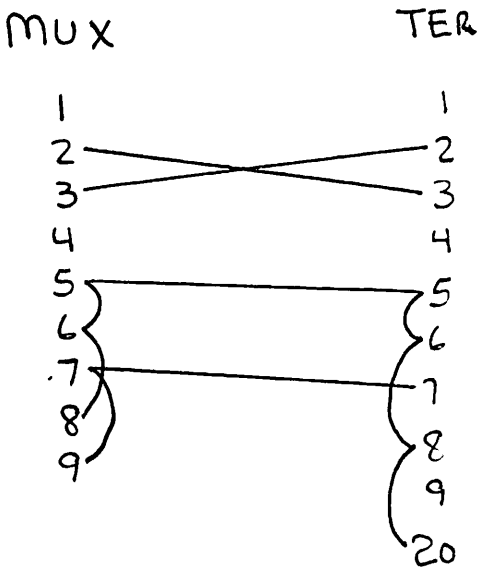
| SEE CHART | C | 6482-220 | 4 |
|---|---|---|---|
| WANG PART NUMBER | SIZE | DRAWING NUMBER | REV |

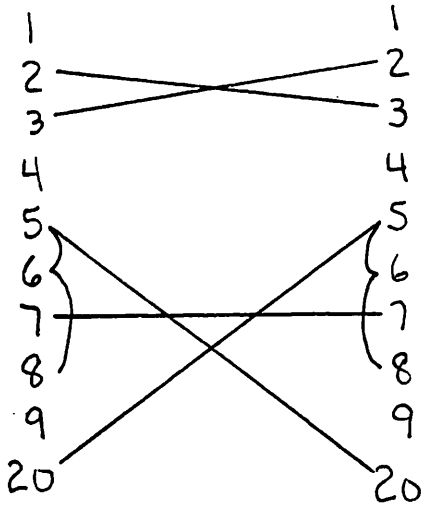
6482-220 C

| NO | BY | G.D. | G.D. | SD | LB |
|---|---|---|---|---|---|
| | REVISION | DATE PER ECN # 392 | DATE | DATE | DATE |
| 1 | REV PER ECN #9129 JAS 8-9-78 | 8/2/78 | 8/2/78 | 2-1-78 | 9-12-78 |
| 2 | REV PER ECN #9254 JAS 8-9-78 | 8/2/78 | 8/2/78 | | |
| 3 | REN. PER ECN #10448 APPD: 11/3-13-79 | | | | |
| 4 | REV. PER ECN #10607 APPD: 11/3-13-79 | | | | |

F-84

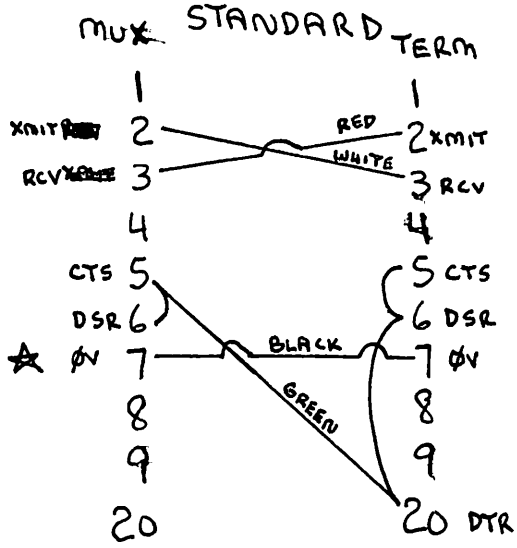
# TERMINAL CABLES




CORRECT VERSION FOR MXR

## 2200 CABLE

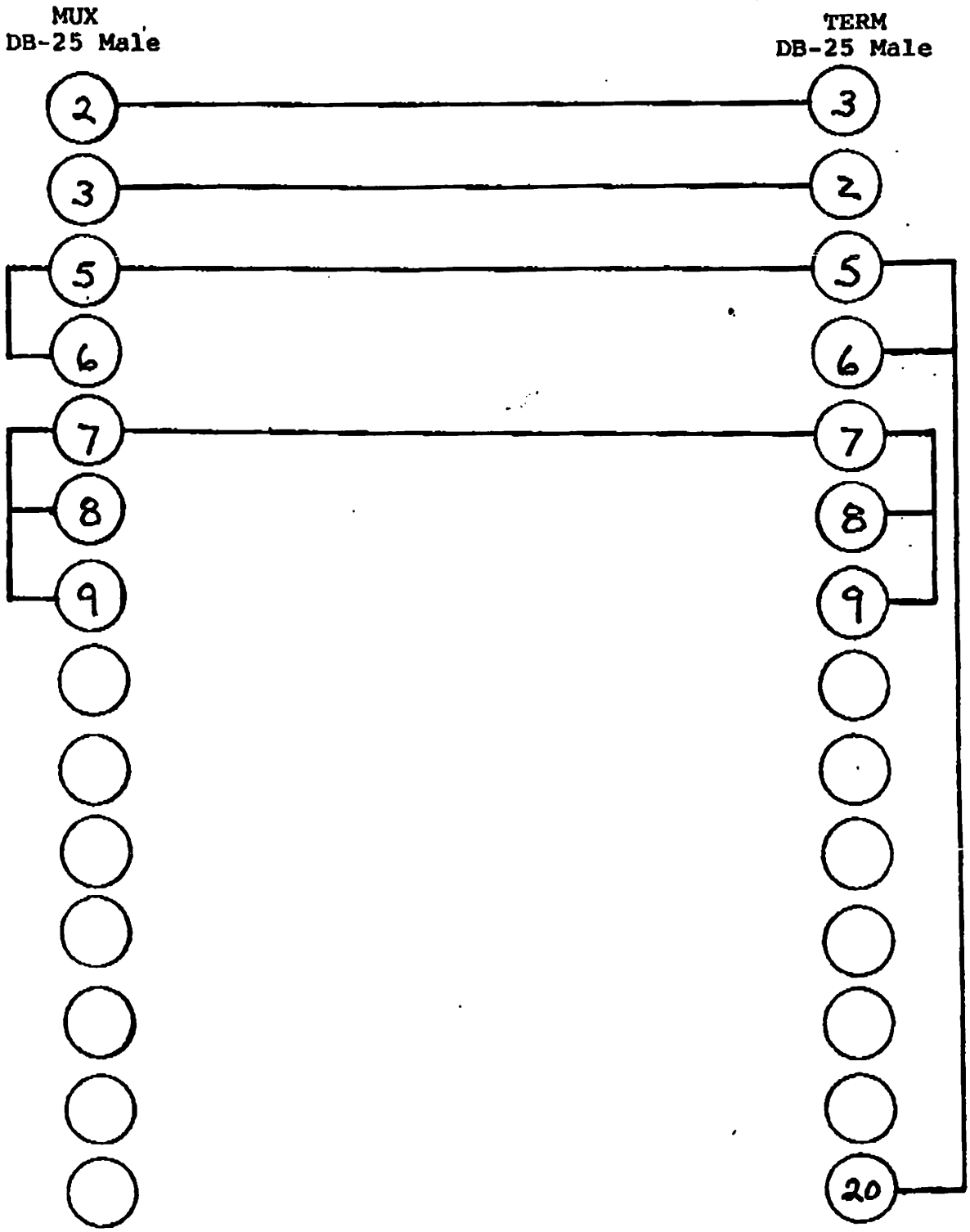



★ THERE ARE ACTUALLY 3 BLACK ØV WIRES ALL TIED TOGETHER. EACH OF THE 3 SHOULD FORM A TWISTED PAIR WITH WITH EACH OF THE OTHER 3 SIGNAL WIRES, RED, WHITE, & GREEN.

WANG 2200 System

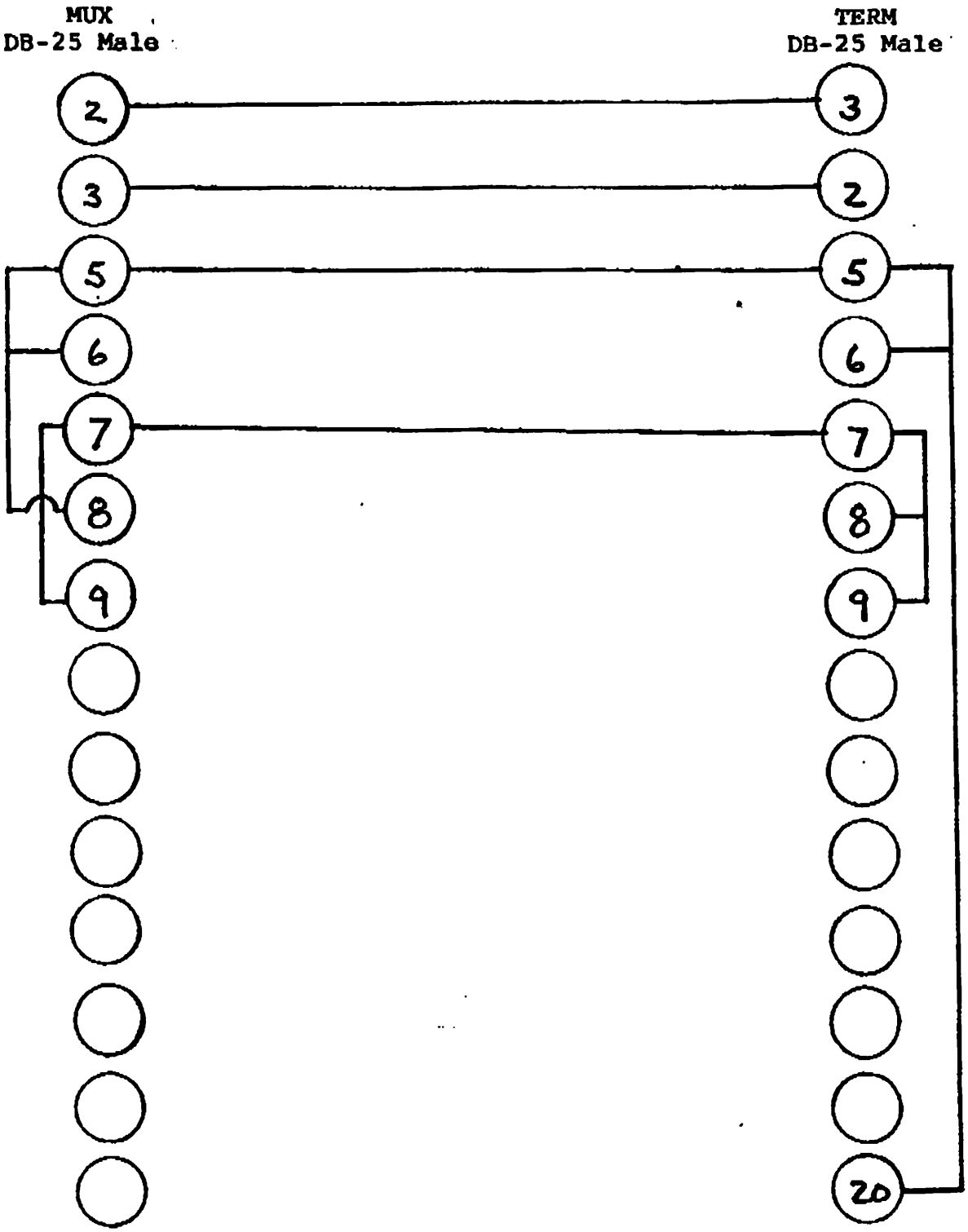
FROM ERIC ADLER
STAMFORD, CT.

Terminal cable yielding "LOCAL" terminal status



WANG 2200 System

.minal cable yielding "REMOTE" terminal status



## Table 1. History of 2200 Storage Devices

| Device | Date Introduced | Date Withdrawn (A = Available) | Price (Approximate) as of Jan. 1980 | Capacity | CPUs Compatible With | Comments |
|---|---|---|---|---|---|---|
| 2217 Single Drive Tape Cassette | With the 'A' 1972 | 12/77 | $1,200 | 75 ft tape = 39KB<br>150 ft tape = 78KB | A,B,C,S,T | Available in combination with CRT; Model 2216/ 2217. |
| 2218 (Two Cassette Drives) | Shortly After 2217 | 6/77 | $2,300 | Double that of 2217 | A,B,C,S,T | |
| 2230 Fixed-Removable Disk Drive | 1/73 | 3/77 | $9,500<br>$11,500<br>$13,500 | 1.5MB<br>2.5MB<br>5.0MB | B,C,T<br>VP<br>(Not S) | |
| 2240 Series Memorex Floppy Drives: | | | | | | |
| 2240-1 Dual Drives | 11/73 | 10/75 | $6,000 | 0.25MB | B,C,T | Capacity of 2240-1 dual drives is only 0.25 MB. Made obsolete by introduction of 2242 in 3/74. |
| 2240-2 Dual Drives | 11/73 | 10/75 | $7,000 | 0.5MB | B,C,T | |
| 2242 Single Drive | 3/74 | 10/75 | $4,000 | 0.25MB | B,C,T | |
| 2243 3 Drives | 2/74 | 10/75 | $8,000 | 0.75MB | B,C,T | |
| 2260 Series Fixed-Removable Disk Drives: | 10/74 | | | | | Originally offered in 10 Meg only (support at lower total storage provided by 2230 series). |
| 2260C-¼ | | A | $7,200 | 2.5MB | T,VP,MVP | |
| 2260C-½ | | A | $9,200 | 5.0MB | T,VP,MVP | 2260BC can be multiplexed - same storage increments at add'l cost of $800 per drive. |
| 2260C | | A | $11,200 | 10MB | T,VP,MVP | |
| 2260C-2 | | A | $18,400 | 20MB | T,VP,MVP | 2260C-2 is two drives daisy-chained together. |
| 2209 Tape Drive | 2/75 | A | $10,400 | Variable | C,T,VP | |

## Table 1. History of 2200 Storage Devices (Cont.)

| Device | Date Introduced | Date Withdrawn (A = Available) | Price (Approximate) as of Jan. 1980 | Capacity | CPUs Compatible With | Comments |
|---|---|---|---|---|---|---|
| **2270 Series Floppy Diskette Drives:** | | | | | | |
| 2270-1 | 4/75 | A | $3,200 | 0.25MB | T,VP | Improved reliability, lower cost than 2240 series. |
| 2270-2 | 4/75 | A | $4,700 | 0.5MB | T,VP | |
| 2270-3 | 4/75 | A | $6,200 | 0.75MB | T,VP | |
| 2270A-1 | 3/77 | A | $3,600 | 0.25MB | T,VP,MVP | Buffered, compatible w/MVP, can read IBM 3740 type diskettes. |
| 2270A-2 | 3/77 | A | $5,100 | 0.5MB | T,VP,MVP | |
| 2270A-3 | 3/77 | A | $6,600 | 0.75MB | T,VP,MVP | |
| 2209A Tape Drive | 9/77 | A | $15,000 | Variable | T,VP,MVP | |
| 2280 Series Fixed-Removeable Disk Drives: | 10/78 | | | | | 2280N series is available for customers already owning a 2280 — used to daisy chain. |
| 2280-1 | | A | $19,000 | 26.8MB | VP,MVP | |
| 2280-2 | | A | $20,000 | 53.6MB | VP,MVP | |
| 2280-3 | | A | $21,000 | 80.4MB | VP,MVP | |

Table 3. Disk Storage

| Device | Medium | Multi-plexing | Access Time | Storage | CPU | Sectors per Track |
|---|---|---|---|---|---|---|
| Mini-diskette | Mini floppy | No | 533ms | 89.6KB/ drive | T, VP | 10 |
| 2270 Diskette | Diskette | No | 363ms | 262KB<br>524KB<br>786KB | T, VP | 16 |
| 2270A | Diskette | No | 363ms | 315.9KB*<br>631KB<br>946KB | T, VP<br>MVP, LVP | 16 |
| 2260C (Fixed-Removable) | Disk-Cartridge | No | 40ms | 2.5MB<br>10MB<br>5MB<br>20MB | T, VP<br>MVP, LVP | 24 |
| 2260BC (Fixed-Removable) | Disk-Cartridge | Yes | 40ms | 2.5MB<br>10MB<br>5MB<br>20MB | T, VP<br>MVP, LVP | 24 |
| 2280 (Fixed-Removable) | Disk-Cartridge | Yes | 30ms | 26.8MB<br>53.6MB<br>80.8MB | VP, MVP<br>LVP | 64 |

## 2200 TAPES AND DISKS

Wang offers two nine-track, reel-to-reel magnetic tape drives for the 2200 computer: the 2209 and 2209A. Both are used primarily for remote storage, backup, or interfacing other computer systems to a 2200. The central features for these tape drives are presented in Table 2.

Table 2. 2200 Tape Storage Devices

| Drive | Density | Medium | CPU | Transfer | Storage |
|---|---|---|---|---|---|
| 2209 | 800 bytes per inch | 2400' 1/2" reels | T, VP | 10KB per second | 17MB |
| 2209A | 1600 bytes per inch | 2400' 1/2" reels | T, VP, MVP, LVP | 120KB per second | 35MB |

Table 3. Salient Features of 2200 Disk Drives

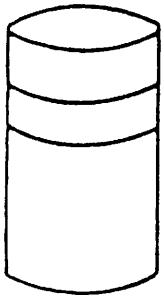
| Model | Min/Max Storage | Tracks Per Surface | Sectors Per Surface | Rotation Speed | Access Time | Latency Time | Read/Write Time | Move/Copy Time for One Platter | Multi-plexed |
|---|---|---|---|---|---|---|---|---|---|
| 2270A | 315KB to 946KB | 77 | 1,231 | 360 rpm | 363 ms | 84 ms | 21.8 ms | 2 min | No |
| 2260 | 2.5MB to 20MB | 816 | 19,584 | 2400 rpm | 40 ms | 12.5 ms | 20 ms | 10 min | 2260BC Yes 2260C No |
| 2280 | 26.8MB to 80.4MB | 822 | 52,608 | 3600 rpm | 30 ms | 8.3 ms | 9.3 ms | 3 min | Yes |

Table 4. Platter Parameters For Models 2260 and 2270 Disk Drives

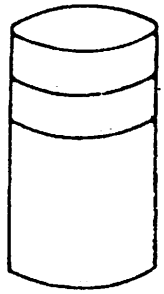
| Parameter | 2260C 2260BC | 2270-1 2270A-1 | 2270-2 2270A-2 | 2270-3 2270A-3 |
|---|---|---|---|---|
| F | Fixed Platter | Drive 1 | Drive 1 | Drive 1 and 3 |
| R | Removable Platter | Not Used | Drive 2 | Drive 2 |

Table 5. Platter Specification and Device Addresses For 2280 Models

| Model | Platter or Recording Surface | Device Address |
|---|---|---|
| 2280-1 | Removable<br>Fixed | D10 (or B10)<br>D11 (or 310) |
| 2280-2 | Removable<br>#1 Fixed<br>#2 Fixed<br>#3 Fixed | D10 (or B10)<br>D11 (or 310)<br>D12<br>D13 |
| 2280-3 | Removable<br>#1 Fixed<br>#2 Fixed<br>#3 Fixed<br>#4 Fixed<br>#5 Fixed | D10 (or B10)<br>D11 (or 310)<br>D12<br>D13<br>D14<br>D15 |



# DISK STORAGE



| Device | MPX | Media | Storage | CPU |
|---|---|---|---|---|
| 2210 | No | Mini- | Up to (2) 89.6KB Drives | T, VP |
| 2270 | No | Diskette | Up to (3) 256KB Drives | T, VP |
| 2270A | No | Diskette | Up to (3) 256KB Drives | T, VP, MVP (IBM Com) |
| 2260C | No | Disk-Cart | 2.5M, 5M 10M, 20M | T, VP, MVP Fixed/ Removable |
| 2260B,C | Yes | Disk-Cart | 2.5M, 5M 10M, 20M | T, VP, MVP, Fixed/ Removable |
| 2280 | No | Disk Pack | 27.2M, 54.5M 81.6M | VP, MVP Fixed/ Removable |

**WANG LABORATORIES, INC.**
ONE INDUSTRIAL AVENUE, LOWELL, MA 01851 • TEL: 617/459-5000, TWX 710-343-6769, TELEX 94-7421

To: Earl Emerick
cc.B. Patterson, M. Blomme, P. Congo, R. Kirk

From: Jerry Sevigny

Date: 22 September 1983

Subject: VERIFY Function

Wang Laboratories has recently been put into an embarassing situation with a very large account (Northwest Mutual Life) due in part to unsubstantiated claims by some members of the Customer Engineering organization.

Carson Clark claims to have heard during a trainning course that the 2200 verifies the data of every sector, however, only every fourth header is checked. This fact has been further spread to other members of the CE staff. Perhaps the misunderstanding surrounding every fourth sector comes about because of the "staggered sectoring" of the 2270 style disk unit (there are 3 sectors physically positioned between any two consecutive sectors ie. sectors 0 and 1 and so forth).

Therefore, I am compiling this memo to inform you of R&D's understanding and ask that this information be distributed throughout the CE organization. Should any of the CE people be able to demonstrate that our understanding is wrong, please arrange for them to demonstrate this so that the necessary action can take place.

The procedure is slightly different for the 'D0' style DPU (2280, LVP, SVP, 2275) and the non 'D0' style (2270A):

2270A Style Disk

A CRC check is made on both the header and the data for EVERY sector. In addition, since the data for each sector is transmitted to the 2200 CPU an LRC check is also made.

2280, LVP, SVP and 2275 DPU

A CRC check is made on both the header and the data for EVERY sector. However, since this style disk performs an internal (to the DPU) verify, no LRC check is made.

In particular, in the SVP DPU the VERIFY function is a function the a chip and not a software function.

Northwest Mutual Life.

In the case of NML, a check should be made to determine if their DPUs have all the current ECOs as there was an ECO made which might account for their I93s on the Quantum which are not trapped by the VERIFY operation. The ECO involved changes to the Min and MAX counts used for timings.

R. Kirk

MS 1489

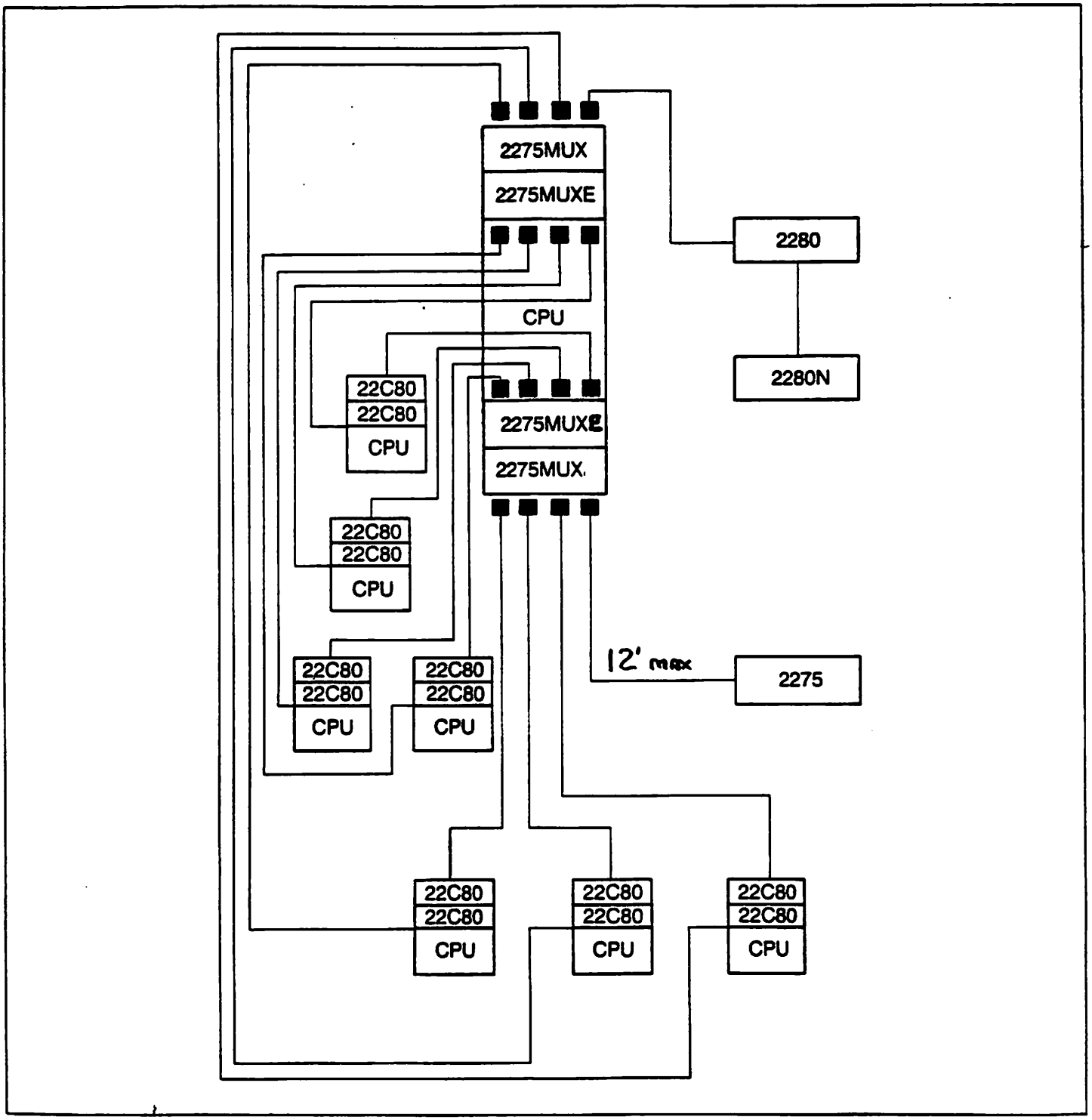
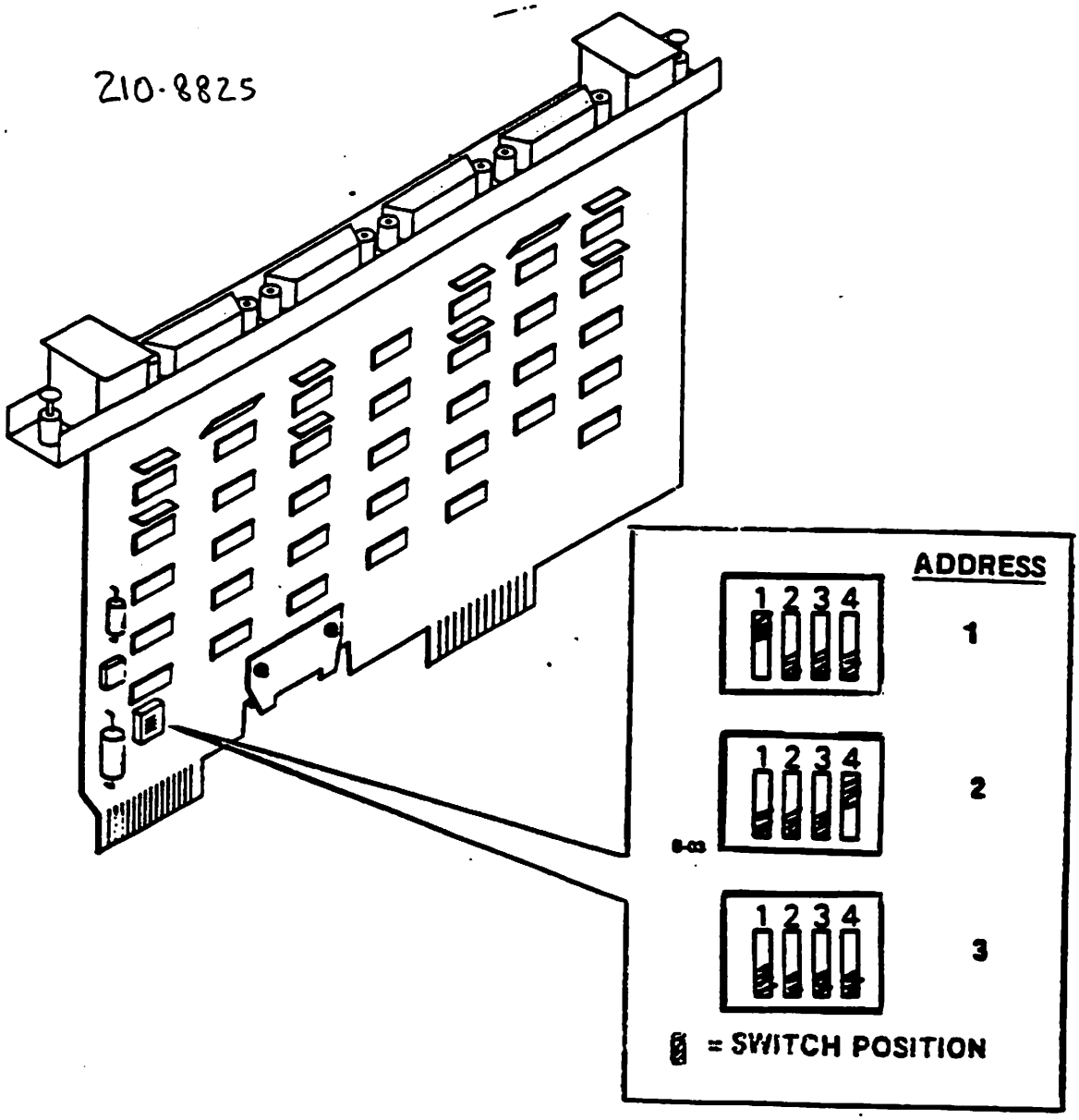



**Figure 3. Multiplexing Eight CPUs with Two Disk Units**

**Switch Settings (cont)**

Each expander board has an address switch that determines which of the three board addresses it will respond to. No two expander boards may have the same address; set switches accordingly.

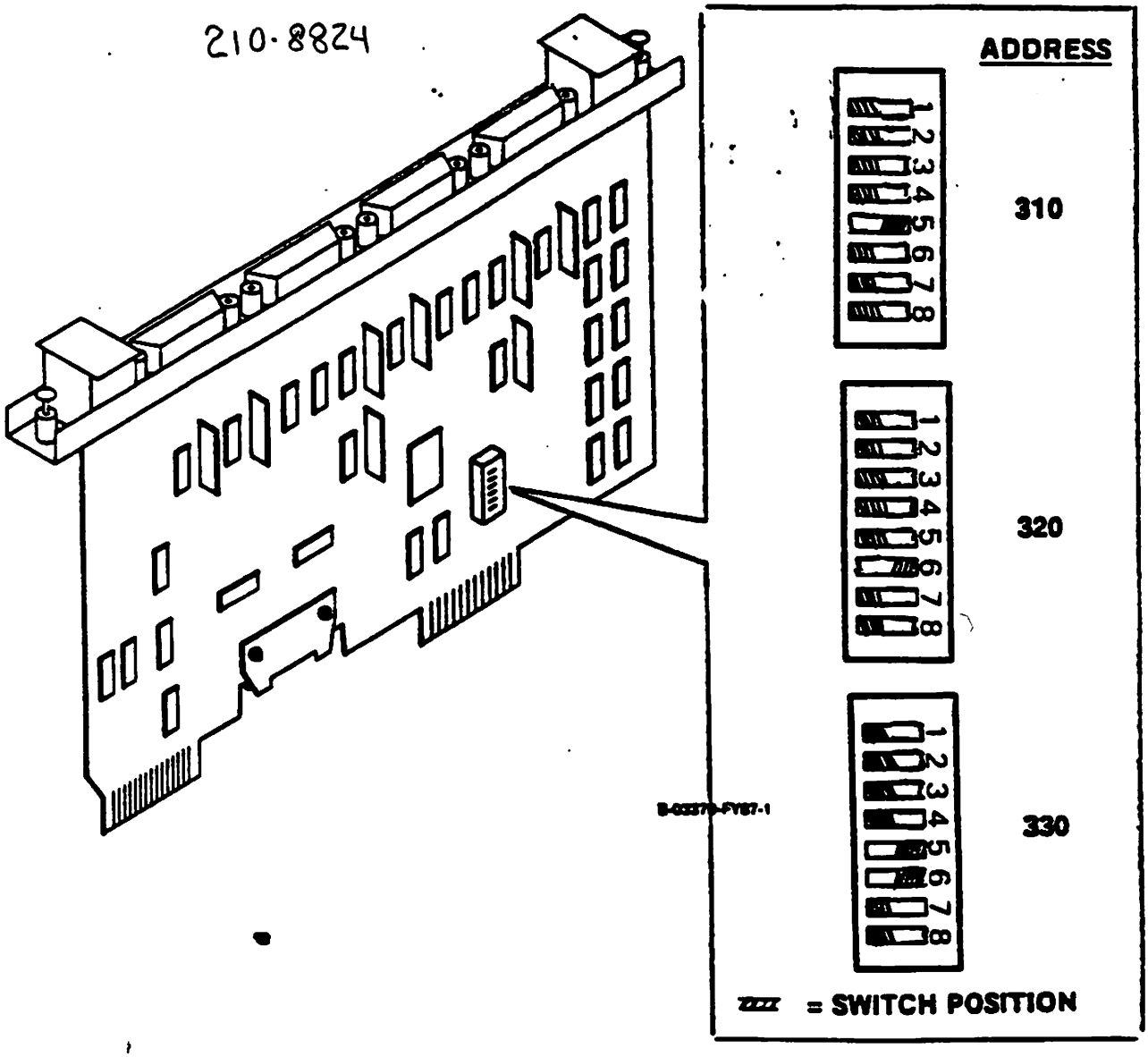


## Installation

Installation of the multiplexer board and expansion board(s) comprise the ensuring of address switch settings, and the completion of (multiplexer) system hookup. Both the multiplexer and expansion boards plug into the Micro VP system bus in the same manner as any other option boards.

### Switch Settings

In accordance with system requirements, set multiplexer board address as shown.



**System Hookup**

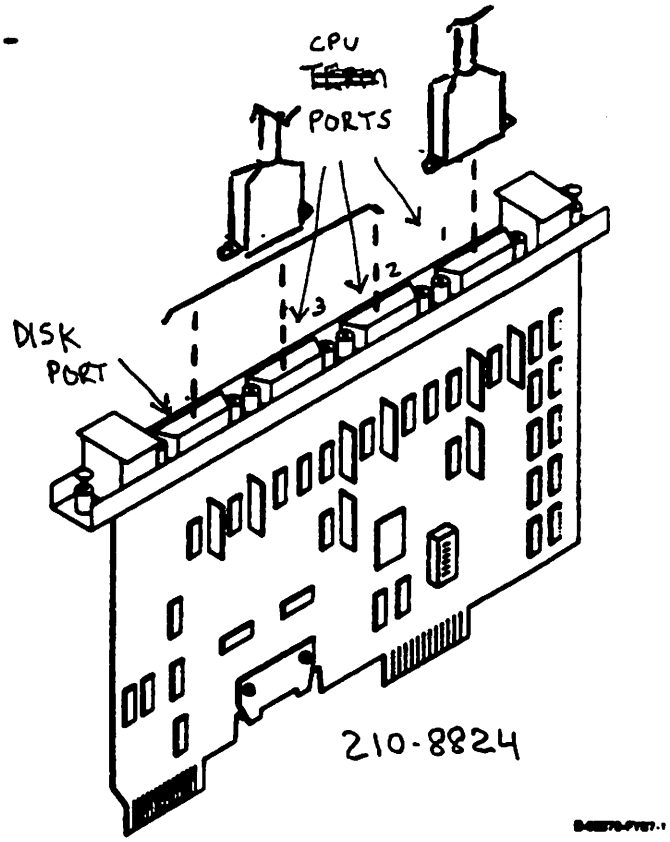
For cabling connections to associated CPUs and disk drive, refer to respective appropriate installation instructions.

1. Insert multiplexer board into available CPU option slot.

2. Connect cable from disk drive to connector marked **DISK DRIVE.**

3. Connect cable(s) from associated CPU(s) to available connectors.

2275mux



# PREREQUISITES FOR 2275 MUX/MUE OPERATION

FOR USE WITH THE 2280 (PHOENIX)

ECO FOR THE 2280 DPU:
ON THE 210-7421 PCB: E-REV 3 CURRENTLY

ADD WIRE

| FROM | TO |
|---|---|
| L29-4 | L12-3 |
| L29-5 | L3-6 |
| L29-6 | L4-12 |

CUT ETCH

| FROM | TO |
|---|---|
| L12-3 | L4-12 |

FOR USE WITH THE 2275:

THE 210-8396 PCB MUST BE AT EREV 5 (ECO # 42907 IMPLIMENTED).

THE PROM MUST BE A REV 4.

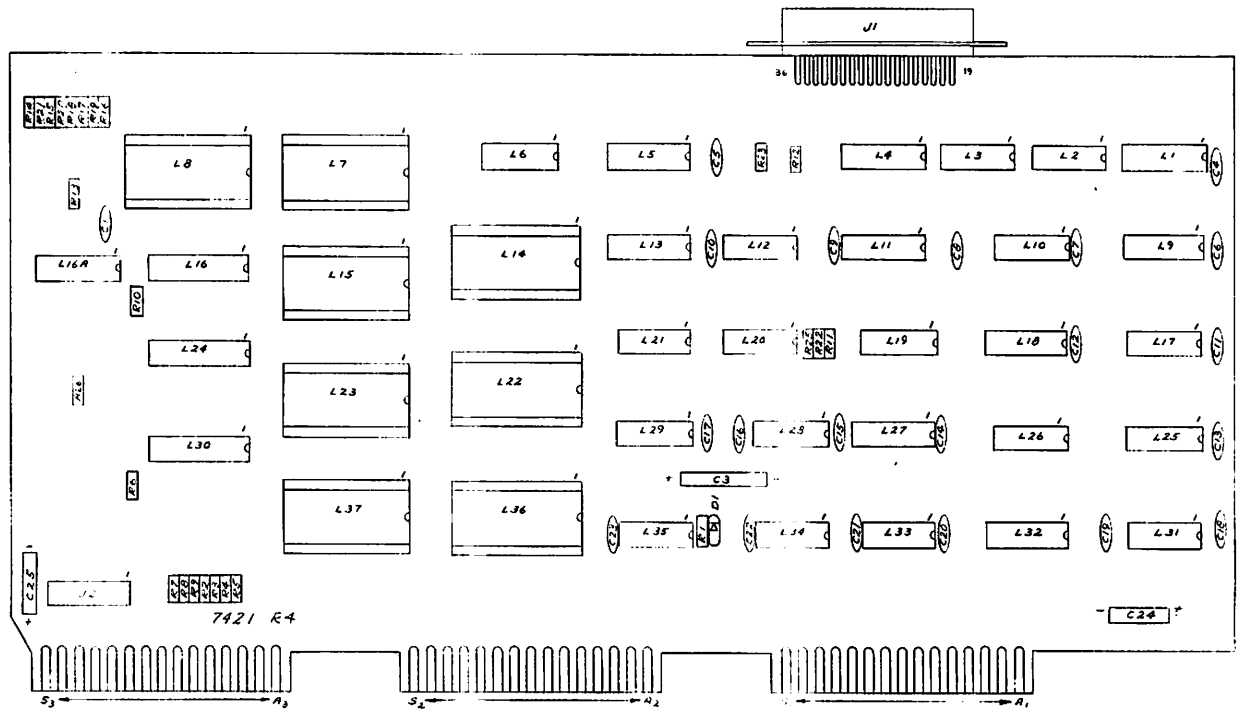
6/8 KING CARMEL, MIAMI — JOSE ALANIZ — 8V LOW ADJ. TO 8.5 FROM 8.06
6/10 B+Y INSURANCE VANCOUVER — ABE SPICER I92 1ST ACCESS — NO CHANGE.
6/23 AL FABRA, NASHVILLE — JEFF BROOM — HANGING ON VIRGIN PLATTERS TRYING TO FORMAT

FIX TO 2275 MUX BETA BRD

REMOVE WIRE FROM L53 PIN 1 & RECONNECT PIN 1 TO BRD. ~~ETCH CUT AT OTHER END OF WIRE.~~
THIS RETIES L53 PIN 1 TO L34 PIN 10.

CUT L34 PIN 8

TIE LIFTED PIN 8 OF L34 TO PIN 9 OF L34




| | | | | | |
|---|---|---|---|---|---|
| WANG LABORATORIES, INC. | BY | DATE | APPROVED BY | DATE |
| | DWN F. S. S. | 5-1979 | ENGR | |
| | CHK | | ENGR | |
| MATERIAL | MODEL NO. 2200 SMD | | ENGR | |
| | SEE ORDER SPECIFICATIONS | TITLE | ALU/MUX INTERFACE MTH | |
| FINISH | TOL ON ALL DECIMALS .XX ± .FRAC ± .XXX ± .ANG ± FINISH | 210-7421 | D | 7421 | 7 |
| | SCALE | SHT # OF # | WANG PART NUMBER | SIZE | DRAWING NUMBER | REV |

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ONE INDUSTRIAL AVENUE, LOWELL, MA 01851 • TEL: 617/459-5000, TWX 710-343-6769, TELEX 94-7421

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# TECHNICAL SERVICE BULLETIN
## SECTION: HardWare Technical

NUMBER: HWT 7093 REPLACES: _____ DATE: 05/05/87 PAGE 1 OF 2

MATRIX ID. 4202 PRODUCT/RELEASE# 2275MUX AND 2275MUXE

TITLE: 2275MUX/MUXE NEW PRODUCT INFORMATION

PURPOSE:

To inform the field of the 2275MUX and 2275MUXE.

EXPLANATION:

The 2275 Multiplexer (2275MUX) is a 2200 option board that will allow up to four 2200 MVP-type, MicroVP, or CS CPUs to share a single disk system. The 2275MUX provides the disk interface for the CPU in which it resides. Three additional CPUs may be connected to ports on the 2275MUX through a 22C80 board in each satellite CPU.

The 2275 Multiplexer Extender (2275MUXE) may be used with the 2275MUX to allow four more CPU's to share a disk system. Up to three 2275MUXEs may be used with a 2275MUX creating a maximum configuration of sixteen CPUs sharing a disk system. The 2275MUXE is placed in the CPU with the 2275MUX and is connected to the 2275MUX by a ribbon cable.

SOFTWARE:

The 2275MUX/MUXE is supported by the current release of the Operating System (Rev. 2.7).

DIAGNOSTICS:

The 2275MUX/MUXE is supported by Revision 64A5 of the Mult Disk Exerciser. This diagnostic is part of Diagnostics Package 195-2956-0

PART NUMBER INFORMATION:

| | |
|---|---|
| 2275MUX | 210-8824 |
| 2275MUXE | 210-8825 |
| Interconnect Cable (MUX to MUXE(s) | 220-3588 |

GROUP: VS New Products Hardware MAIL STOP: 001-220

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# TECHNICAL SERVICE BULLETIN

## SECTION; HardWare Technical

NUMBER: HWT 7093 REPLACES: _____ DATE: 05/05/87 PAGE 2 OF 2

MATRIX ID. 4202 PRODUCT/RELEASE# 2275MUX AND 2275MUXE

TITLE: 2275MUX/MUXE NEW PRODUCT INFORMATION

EXPLANATION (cont'):

SWITCH SETTINGS:

2275MUX SW1:

| ADDRESS 310 | ADDRESS 320 | ADDRESS 330 |
|---|---|---|
| SW. #1 = OFF | SW. #1 = OFF | SW. #1 = OFF |
| #2 = OFF | #2 = OFF | #2 = OFF |
| #3 = OFF | #3 = OFF | #3 = OFF |
| #4 = OFF | #4 = OFF | #4 = OFF |
| #5 = ON | #5 = OFF | #5 = ON |
| #6 = OFF | #6 = ON | #6 = ON |
| #7 = OFF | #7 = OFF | #7 = OFF |
| #8 = OFF | #8 = OFF | #8 = OFF |

2275MUXE SW1:

| EXTENDER #1 | EXTENDER #2 | EXTENDER #3 |
|---|---|---|
| SW #1 = ON | SW #1 = OFF | SW #1 = OFF |
| #2 = OFF | #2 = OFF | SW #2 = OFF |
| #3 = OFF | #3 = OFF | #3 = OFF |
| #4 = OFF | #4 = ON | #4 = OFF |

DOCUMENTATION:

PUB 741-1668-1

UP: VS New Products Hardware MAIL STOP: 001-220

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# TECHNICAL SERVICE BULLETIN

WANG

## SECTION: HardWare Technical

NUMBER: HWT 7179 REPLACES: _____ DATE: 09/08/87 PAGE 1 OF 1

MATRIX ID. 4202 PRODUCT/RELEASE# 2275MUX and 2275MUXE

TITLE: CABLING RESTRICTIONS

PURPOSE:

To inform the field of the maximum supported distances between the disk unit and CPUs multiplexed to it, and to alert the field of previously released documentation incorrectly listing cable lengths that exceed supportable distances.

EXPLANATION:

The sales brochure titled 'Model 2275MUX Multiplexer and Model 2275MUXE Extender', part number 715-0910, dated 11/86 is in error. It incorrectly lists under 'SPECIFICATIONS' extension cables of 200, 500, 750, and 1000 feet (76, 153, 228, and 305 meters). The maximum supported distance between the master CPU (directly connects to the disk) and up to 15 other CPUs multiplexing to the disk via the 2275MUX or the 2275MUXE is 100 feet (30.5 meters). Maximum supported distance between the 2275MUX (in master CPU) and the disk unit is 12 feet.

ADDITIONAL INFORMATION:

| | Part Number |
|---|---|
| 2275MUX Board (in master CPU supporting master & 3 additional CPU's) | 210-8824 |
| 2275MUXE Board (in master CPU, up to 3 brds /2275MUX, 4 CPUs /brd which combined with the 2275MUX allows for a maximum of 16 CPUs to multiplex with 1 disk unit) | 210-8825 |
| 22C80 Board (in each CPU but the master, to connect the CPU to the 2275MUX or 2275MUXE) | 210-7715 |
| Ribbon Cable to connect from 1-3 2275MUXE/s to the 2275MUX | 220-3588 |
| 8 Foot cable from 2275MUX to disk unit | 220-0365 |
| 8 Foot cable from 2275MUX or 2275MUXE to 22C80 | 220-0365 |
| 12 Foot cable from 2275MUX to disk unit | 220-0364 |
| 12 Foot cable from 2275MUX or 2275MUXE to 22C80 | 220-0364 |
| *25 Foot Extension cable from 2275MUX or 2275MUXE to 22C80 | 120-2281-01 |
| *50 Foot Extension cable from 2275MUX or 2275MUXE to 22C80 | 120-2281-02 |
| *100 Foot Extension cable from 2275MUX or 2275MUXE to 22C80 | 120-2281-03 |

* These parts can only be ordered through supplies.

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

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# TECHNICAL SERVICE BULLETIN
## SECTION: HardWare Technical

NUMBER: HWT 9449 REPLACES: _____ DATE: 05/22/90 PAGE 1 OF 2

MATRIX ID. 4103 PRODUCT/RELEASE# 2200 CS-D/N

TITLE: DPU Disk Port & Jumper Information/Part Number Correction

PURPOSE:

To inform the field of the purpose of the disk/mux port and jumper on the 212-7113 DPU Board which is not documented and to provide the field with the correct part numbers for the Power Supply & On/Off switch.

EXPLANATION:

Every CS-D CPU comes with a 212-7113 DPU Board used to control all internal drives. The DPU Board consists of a 210-9558 Motherboard which has two I/O connectors and a 210-9559 Daughter Board. The top connector is a standard system printer port. The bottom connector is a disk/mux port. The disk/mux port is used to allow access to the internal CS-D drives by other CPUs. This port is activated by the MUX/BUS jumper located on the 210-9558 motherboard up next to the rail between the 2 I/O connectors.

Normally this jumper will be in the BUS position. This causes the disk/mux port to be inactive allowing only the internal CPU to have access to its drives. When the jumper is moved to the MUX position all access must be through the disk/mux port including access by the CS-D CPU itself.

In the MUX position, the drives and DPU Board should be thought of as a separate device much like the DS Cabinet or the 2275. The disk port on the 212-7113 DPU Board is the I/O connector similar to the I/O connectors on the back of the DS & 2275. Any CPU requiring access to these drives must now have a disk controller cabled to this port. Normally when in the MUX position a 2275MUX Master Board, 210-8824, would be installed in the I/O section with a cable from its disk port to the disk/mux port of the DPU Board. This connection allows the CS-D to access the internal CS-D drives. Other CPUs (up to 16 can be mux'd) using 210-7715 boards can be cabled (100' max) to the 2275MUX Master CPU ports allowing them access to the internal CS-D drives.

GROUP: 2200 Product Support MAIL STOP: 001-330

WANG

# TECHNICAL SERVICE BULLETIN

## SECTION: Hardware Technical

NUMBER: HMT 9449 REPLACES: _____ DATE: 05/22/90 PAGE 2 OF 2

MATREX ID: 4103 PRODUCT/RELEASE# 2200 CS-D/N

TITLE: DPU Disk Port & Jumper Information/Part Number Correction

EXPLANATION (cont'):

Of course, a standard disk controller in any CPU could be cabled directly to this port, but that would limit access to only that CPU. When used in the MUX position, the disk controller in the CPU accessing the drives determines the device address via the device address switch bank on that board. This overrides the device address set on the CS-D DPU Board. This is the same way it is done on all similar 2200 disk connections.

Switch settings for the CS-D DPU Board can be found on a sticker on the right side panel of the CS-D cabinet. These switch settings are correct. Appendix A of the CS Maintenance Manual, 741-1769-2, covers the CS-D & CS-N CPUs and on page A-38 incorrectly shows the drive type switch settings. What is shown as ON should be OFF and vice versa. There is also added confusion as the sticker & manual do not agree on the switch labeling and the male connectors on the sticker do not match the board. Use the side panel for sw settings but beware, labeling may not match. To access, remove the top cover by removing the two screws in back. The side panel can then be removed by sliding it up. The correct sw settings are:

210-9558 Motherboard

SW 1 - Winc Drive Type - between L8 & L13 near bottom of board

| | |
|---|---|
| No Winc = All OFF | 10 Meg Rem Winc = 5 ON only |
| 10 Meg Winc = 6 ON only | 20 Meg Winc = 5,6 ON only |
| 32 Meg Quantum Q540 = 7 ON only | 64 Meg Winc = 5,7 ON only |
| 140 Meg Maxtor = 6,7 ON only | 32/42 Mg Micropolis = 5,6,7 ON |
| 112 Meg Maxtor = 8 ON only | |

SW 2 - Printer Address - next to L69 just above connector J5

215 = 1,3,5 ON only 216 = 2,3,5 ON only 217 = 1,2,3,5 ON only

SW 3 - Drive/s Device Address - between L76 & L77 at top of board

310 = 5 ON only 320 = 6 ON only 330 = 5&6 ON only

210-9559 Daughter Board

SW 1 - Factory Use Only - 8 bank sw at top of board ALL OFF

SW 2 - Floppy/Tape Switch - 4 bank switch at bottom of board

| | |
|---|---|
| 1 OFF = 320 Kb Floppy | 1 ON = 1.2 Meg Floppy |
| 2 OFF = No Tape | 2 ON = Tape Drive installed |
| 3,4 = OFF (not used) | |

ADDITIONAL INFORMATION:

Also in Appendix A of the CS Manual, 741-1769-2, on pages A-54 and A-55 the AC On/Off Switch and the CS-D/N SPS-255 Power Supply have incorrect part numbers. The part numbers shown are for the CS. The On/Off switch is not physically compatible and although both CPUs use the same base Power Supply the harness is different. The correct part numbers are:

CS-D/N On/Off Sw 325-0105 CS-D/N SPS-255 Power Supply 270-0890-1

WANG LABORATORIES, INC., 59 ELECTRONICS AVENUE, LOWELL, MA 01851 • TEL: 617/656-0208

# TECHNICAL SERVICE BULLETIN
## SECTION: HardWare Technical

NUMBER: HWT 6152 REPLACES: _____ DATE: 06/18/86 PAGE 1 OF 1

MATRIX ID. 4201 PRODUCT/RELEASE# 2200 all

TITLE: Problems with the 210-7342 Printer/Disk Controller 210-9746 NEW DUAL CONTROLLER

PURPOSE:

To inform the field of problems associated with the 7342 printer/disk controller and possible circumventions.

EXPLANATION:

When using the 210-7342 printer/disk controller with a Phoenix Disk Drive or a 2275 Disk Unit, I90, I91, I92, and possibly I96 errors may be experienced. The problem could be intermittent or solid dependent on types of chips used on the board and where the board is positioned in the I/O section of the CPU. This is a design problem with the board for which R&D has a fix. Updated boards are being Beta tested at this time. Once the fix is verified an ECO will be issued.

CORRECTIVE ACTION:

There are several circumventions for this problem:

1. Install the 7342 controller in the last I/O slot farthest from the CPU boards. In testing it was found that a board failing solidly when near the CPU boards would run error free in the last slot.

2. Replace the 7342 controller temporarily with a 210-6541-2 single disk controller and a 210-7079 single printer controller.

3. Replace the 7342 controller with the older style 210-7042-2 printer/disk controller if available.

4. Replace the 7342 controller temporarily with the 212-3012 triple controller. See note 1.

Note 1: Although no problems have been reported with the 212-3012 triple controller (term/printer/disk), this board has the same circuit design and could be subject to the same problems. This board will also be updated.
Note 2: A number of newer disk cables (220-0364/0365) have twisted pair wiring. These cables may seem to work fine but should only be used with the Phoenix Mux boards, the 210-7715 and the 7717. The older cables (220-0105-4/0138) should be used if a newer cable with 1 to 1 wiring is not available. Check the cable by disassembling the connector.

GROUP: VS/2200 Hardware Support Group MAIL STOP: 0126

7342 FIX.
MIKE BAHIA

2275

8396 MAKES E-REV 5 NOW E-REV 6

LIFT PIN 6 OF L127

TIE L118 PIN 1 TO L118 PIN 10

57Ω BETWEEN L118 PIN 10 & GRND

7421

LIFT PIN 6 OF L3

TIE L11 PIN 1 TO L11 PIN 8

WJ 10/2

~~8396 FIX ARTWORK 4 ONLY~~
E-REV 4

~~REMOVE 3 WIRES TO L126~~

~~ADD WIRE FROM L116-13 TO~~
~~L116 TO~~

L9, L17
MUST NOT BE

HYB4164
PZ LF

WANG LABORATORIES, INC.

## 2200 SYSTEMS DISK DRIVES

AVP LAST R 3873

| DISK DRIVE | REM. CAPACITY | FIXED CAPACITY | REM.* ADDRESS | FIXED* ADDRESS | SECTORS** /ADDRESS | PART NUMBERS |
|---|---|---|---|---|---|---|
| PHOENIX 2280-1 | 13.5MB | 13.5MB | D10 | D11 | 52607 | Rem.Cart. 725-0711<br>Fix.Mod. 726-6506 |
| PHOENIX 2280-2 | 13.5MB | 41.5MB | D10 | D11,D12<br>D13 | 52607 | Rem.Cart. 725-0711<br>Fix.Mod. 726-6506 |
| PHOENIX 2280-3 | 13.5MB | 66.5MB | D10 | D11,D12<br>D13,14,15 | 52607 | Rem.Cart. 725-0711<br>Fix.Mod. 726-6506 |
| QUANTUM 2020 | | 16 MB | | 310 | 65408 | 278-4024 |
| QUANTUM 2040 | | 32 MB | | D11,D12 | 65408 | 278-4025 |
| DIABLO 2260 | 5 MB | 5 MB | B10 | 310 | 19583 | Rem.Cart. 725-0704<br>Fix.Pltr. 726-0350 |
| DIABLO 2260.5 | 2.5MB | 2.5MB | B10 | 310 | 9798 | Rem.Cart. 725-0704<br>Fix.Pltr. 726-0350 |
| DIABLO 2260.25 | 1.25MB | 1.25MB | B10 | 310 | 4899 | Rem.Cart. 725-0704<br>Fix.Pltr. 726-0350 |
| WINCH. SA1000 | | 2 MB | | 310 | 8128 | 278-4013 |
| WINCH. SA1000 | | 4 MB | | 310 | 16320 | 278-4013 |
| WINCH. SA1000 | | 8 MB | | 310 | 32640 | 278-4014 |
| SHUGART DSDD | 1 MB | 1 MB | B10 | 310 | 3873 | 278-4015 |
| SHUGART 2270-1 | | .25 MB | | 310 | 1023 | 278-4003 |
| SHUGART 2270-2 | .25 MB | .25 MB | B10 | 310 | 1023 | 278-4003 |
| SHUGART 2270A-1 | | .25 MB | | 310 | 1231 | 278-4003 |
| SHUGART 2270A-2 | .25 MB | .25 MB | B10 | 310 | 1231 | 278-4003 |
| SHUGART MINI FLPY | 89 KB | 89 KB | B10 | 310 | 348 | 278-4004 |
| 2275 | | | D10 | D11 | 1279<br>38911<br>64023 | |

* 2200 Disk Drives may have a system address of 310,320,330 or 350,360 370, depending on the configuration.

** To verify a disk, key VERIFY T/XXX,(0,YYYY) X = fixed or rem. address
Y = last sector

# 2270 (2200C, T, or VP)

210-6718 or 210-7018 MICROPROCESSOR BOARD

210-6541/-1/-2 CONTROLLER BOARD (WITH A 6718 BOARD, THE 6541 MUST BE UPDATED. THIS CAN BE DETERMINED BY THE REMOVABLE OF ABOUT 1/3 OF THE RESISTORS ALONG THE CENTER OF THE BOARD.)

VOLTAGE ADJ. ON 7018 BRD.

FLOPPY RIBBON CABLE CONNECTORS PIN 15 +5V PIN 14 +24V PIN 13 -5V
PIN 11 ⏚ L115 PIN 1, 6, OR 10 +12V

## 2270A (IBM COMPATIBLE, MANDATORY WITH MVP/LVP)

210-7218A OR C MICROPROCESSOR BOARD.

TO CONVERT 2270 TO 2270A

1. CHANGE 6718 OR 7018 TO 7218A OR C
2. CUT PIN 11 ON I/O CABLE ~~[illegible]~~ AT FLOPPY END. (IF NOT CUT WHEN POWERED ON BOARD DAMAGE IN FLOPPY UNIT OR CPU MAY RESULT)
3. RIBBON CABLES TO DRIVES MUST BE 6766 R2 OR R3 (220-3011)

VOLTAGE ADJ. ON 7218 BRD. (SAME AS ABOVE EXCEPT FOR +12V)

L103 PIN 1, 6, OR 10 +12V

LAST IO LEG CAN ALONG LEFT SIDE

# SHUGART ALIGNMENT

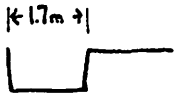
1. Visual Checkout - clean head, head load pad, head load bail
2. Adjust Door
3. Check for head load, and that head seeks

## ELECTRICAL ADJUSTMENTS

**1. Index Width** 1.7 mil. sec. neg. pulse Insert Alignment Platter

Ch. 1-TP12 2V/Div. DC Sync. Ch. 1 DC Neg.

Adj. Index Pot

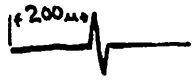



**2. Index** 200u sec. ± 50u sec. Ground Pin 11, Seek Track 1

Ch. 1-TP1 .2V/Div. Ch. 2-TP2 .2V/Div. ADD & INVERT

Sync. TP12 Neg. Slope DC

Adj. Index Ass'y




**3. Radial Head Adjustment** Cat's eyes even and .4V pp Seek Track 38

Ch. 1-TP1 .2V/Div. Ch. 2-TP2 .2V/Div. ADD & INVERT Ground Pin 11

20 mil. sec./Div. Sync. TP12 Neg. Scope DC

Turn stepping motor, restore, seek track 38

BALANCED CAT'S EYES

**4. Home Position** Head at track 0 or 1 = 5V level

All other tracks = 0V level

Ch. 1-TP26 1V/Div. DC

Adj. Flag

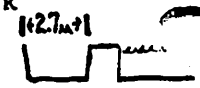
**5. POT Adjustments**

a. 2.7u sec. ± .05 Remove Alignment Platter, Insert Formatted Disk

Seek track 38 Ground Pin 11

Ch. 1-TP21 2V/Div. DC .5u sec./Div. Sync. Ch. 1 Neg.

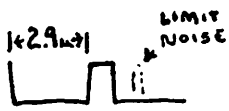
Adj. Right Vertical Pot




b. 2.9u sec. ± .05, limit noise Seek Track 38 Ground Pin 11

Ch. 1-TP24 2V/Div. DC .5u sec./Div. Sync. Ch. 1 Neg.

Adj. Left Vertical Pot for 2.9u sec., Adj. Horizontal Pot to limit noise to minimum




## 2200 ALIGNMENT PROGRAM

```
10 DEFFN'00
20 VERIFY F R(0,0)      TRK 0
30 GOTO 20
40 DEFFN'01
50 VERIFY F R(24,24)    TRK 1
60 GOTO 50
70 DEFFN'02
80 VERIFY F R(36,36)    TRK 2
90 GOTO 80
100 DEFFN'03
110 VERIFY F R(608,608) TRK 38
120 GOTO 110
```

| | |
|---|---|
| DOOR ADJUSTMENT TOOL | 726-9612 |
| ALIGNMENT DISK | 726-9611 |

## 2275 DISK UNIT

### General Information

The 2275 was recently released to the field and comes in 2 models, the -10 (A 10MB 5 1/4" Winchester and a 320 KB floppy) and the -20 (2 Winchester drives).

Along with 2 drives there are also 2 boards in this unit, a regulator and a controller board. The part numbers are as follows:

| | | |
|---|---|---|
| | 210-8397 | Power Supply Regulator Board |
| | 210-8396 | Disk Controller Board |
| | 278-4030 | 10 MB Winchester (same as PC) |
| | 278-4026 | 320 KB Floppy (same as PC) |
| | 220-2013 | Internal Cable |
| | 220-3324 | DAISY CHAIN CABLE NEEDED WHEN USING 2 WINC's. D11 1ST DRIVE. |
| | 220-0105-4 | I/O Cable |
| I/O Controller | 210-6541 rev 3 | Disk Controller (in CPU) or |
| | 210-3012 | MVP Triple Controller |
| | 226-1882 | TERMINATOR 150Ω |

MVP 2.4 or higher is required.

Switch Settings:

8396 Board - SW 1, 2, 3, 4 closed (Winc. and Floppy) SW 1, 2, 3 closed, 4 open (2 Winc. ) 2 30 MEG SW 3 CLOSED SW.1,2,4 OPEN
30 MEG F/10 MEG R SW 2,3 CLOSED SW 1,4 OPEN
30 MEG F/FLOPPY SW 2,3,4 CLOSED SW.1 OPEN

278-4030 - If an IMI Winchester - SW 1 on only (no switches on other drives)

Voltages

| | | |
|---|---|---|
| -12V regulated | 8396 brd, base of Q2 | Not adjustable |
| +12V regulated | 8396 brd, base of Q1 | Not adjustable |
| +5V regulated | 8397 brd, see picture | Pot on 8397, see picture |
| +12V regulated | 8397 brd, see picture | Pot on 8397, see picture |
| -16V unregulated | 8397 brd, see picture | Not adjustable |
| +16V unregulated | 8397 brd, see picture | Not adjustable |
| ±0V | 8397 brd, see picture | |

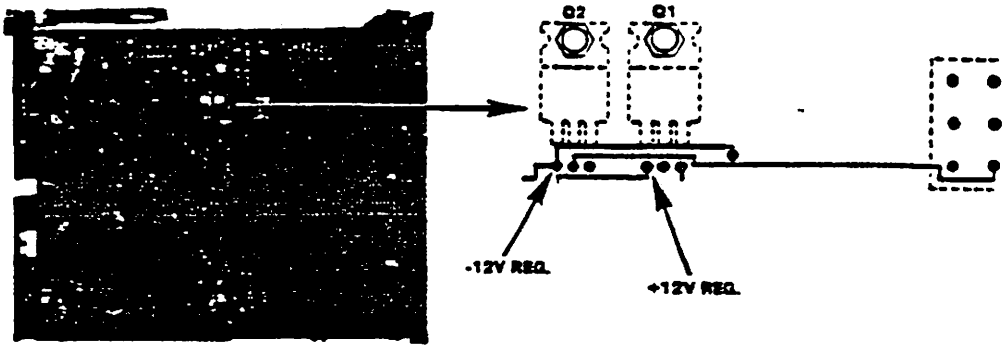
## WINCHESTER ADDRESSING

WINC. 1 D10 D13 OR FLOPPY D10

WINC. 2 D11 D12

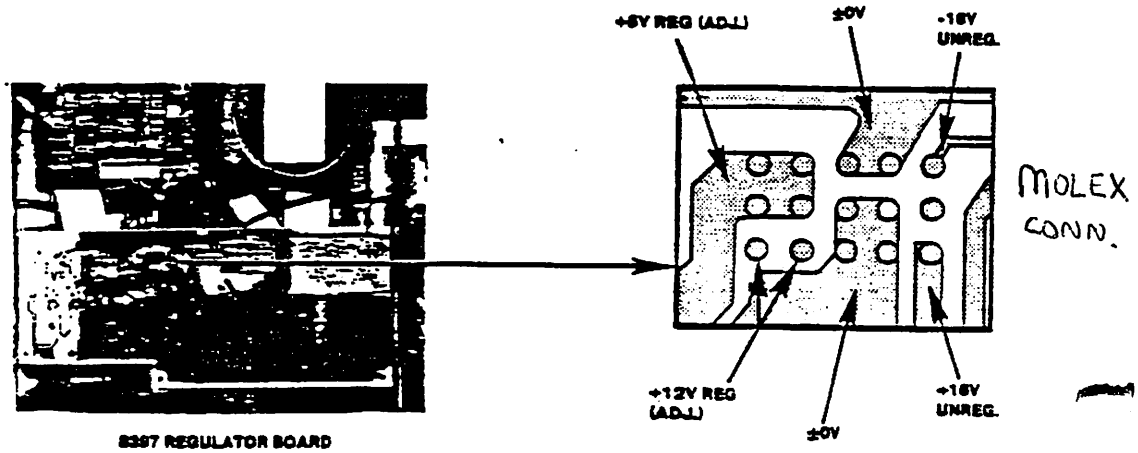
LAST SECTOR

FLOPPY 1279 10MEG 38911 30MEG 64023 (2 SURFACES)



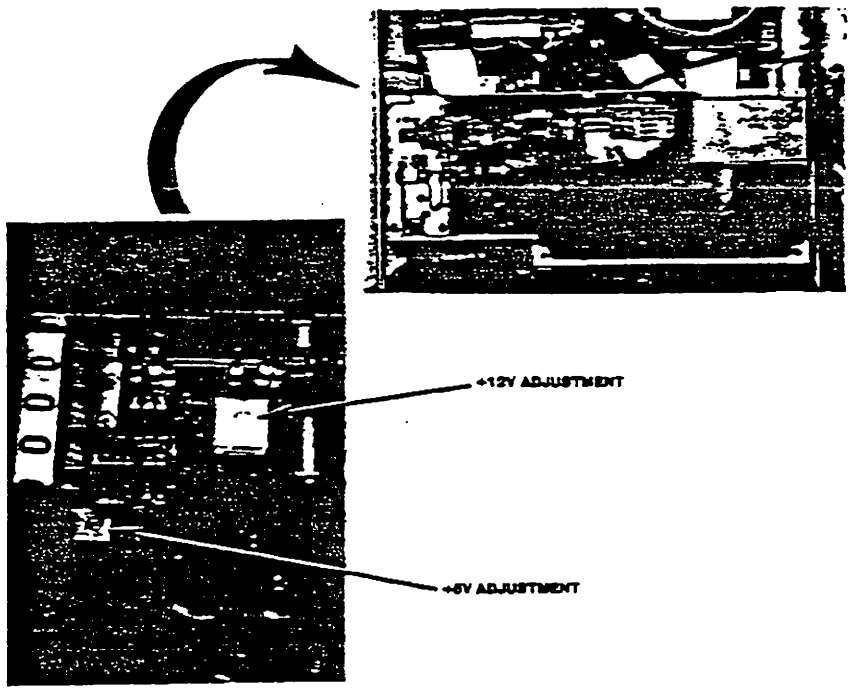

8396 CONTROLLER BOARD

FRONT EDGE OF BRD




8397 REGULATOR BOARD

Voltage Test Points



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WANG

# TECHNICAL SERVICE BULLETIN
## SECTION: HardWare Technical

NUMBER: HWT 5012 REPLACES: _____ DATE: 01/22/85 PAGE 1 OF 1

MATRIX ID. 3110 PRODUCT/RELEASE# 2275

TITLE: 2275 General Information

PURPOSE:
To inform field of undocumented switch settings as well as additional information on configurations and addressing.

EXPLANATION:
Wang is now offering four (4) versions of the 2275, dependent on the disk drives. The switch bank on the 210-8396 Disk Controller Board should be set as follows:

| VERSION | FIXED | ADDRESS | LAST SECTOR | REMOVABLE | ADDRESS | LAST SECTOR | SW1 | SW2 | SW3 | SW4 |
|---|---|---|---|---|---|---|---|---|---|---|
| -10 | 10 MEG | D11 | 38911 | FLOPPY | D10 | 1279 | ON | ON | ON | ON |
| -20 | 10 MEG | D11 | 38911 | 10 MEG | D10 | 38911 | ON | ON | ON | OFF |
| -30 | 30 MEG | D11/D12 | 65023 | FLOPPY | D10 | 1279 | OFF | ON | ON | ON |
| -60 | 30 MEG | D11/D12 | 65023 | 30 MEG | D10/D13 | 65023 | OFF | OFF | ON | OFF |
| | 30 MEG | D11/D12 | 65023 | 10 MEG | D10 | 65023 | OFF | ON | ON | OFF |

At this time the only manufacturer for 30 Meg drives that we are using is Quantum, model #5040, and this is the only 5 1/4" model we are using from them. This means if you have a 5 1/4" fixed drive and it is a Quantum, then it is a 30 Meg, and if is not a Quantum, it is a 10 Meg.

ONLY 1ST WINCHESTER TERMINATED (FIXED LEFT) D11
DS1 SELECTED ON BOTH WINCHESTERS
FLOPPY ALWAYS TERMINATED & DS1

★ 220-3324 DAISY CHAIN CABLE NEEDED WHEN USING 2 WINC'S. D11 IS 1ST DRIVE ON CABLE.

GROUP: Technical Assistance Center P.C. Group MAIL STOP: 0126

COMPANY CONFIDENTIAL

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WANG

# TECHNICAL SERVICE BULLETIN

## SECTION: HardWare Technical

NUMBER: HWT 9192 REPLACES: _____ DATE: 06/06/89 PAGE 1 OF 1

MATRIX ID. 3107 PRODUCT/RELEASE# 2200 DS/CS-D

TITLE: New CDC (Imprimus) Magnetic Peripherals 42 MB HH Winc Disk Drive

PURPOSE:

To provide the field with the necessary information to install this drive properly in the 2200 DS Disk Cabinet or in the CS-D CPU.

EXPLANATION:

A new 42 Meg drive from CDC (Imprimus) Magnetic Peripherals (MN 94205-53) is now being shipped to the field as a replacement for the 32 Meg full height drives (Quantum Q540 and the Micropolis 1323). Although the drive has 42 Meg, it is being used as a 32 Meg (2 16 Meg addresses with 65024 sectors). The following information should allow successful installation:

Drive Type Switch Settings: same as 32 Meg Micropolis

DS 210-8826A DPU Brd, Sw Bk 1 &/or 2 - 8 Off, 7,6,5 On for DR1 or DR3
4 Off, 3,2,1 On for DR2 or DR4

CS-D 212-7113 DPU Brd, Sw Bk 3 - 8 Off, 7,6,5 On (1-4 off, n/a)

NOTE: The 32 Meg Quantum Q540 has different switch settings which will not work with the CDC (Imprimus) Magnetic Peripherals 42 Meg drive.

Jumpers: Drive 1 Select only in all cases. A series of 7 jumpers are located behind the A & B cable connectors. The Drive Select 1 jumper is on the end, B Cable side, farthest from the power plug.

Terminator: IN for CS-D or DR1 in DS. OUT for DR2, DR3, & DR4 in DS. DR1/DR2/DR3/DR4 (Drive Select 1/2/3/4) refer to the connector position on the A cable. The Terminator is located behind A Cable Connector.

Addressing: 2 addresses, each with sectors 0-65023.

Part Numbers:

| | |
|---|---|
| CDC Magnetic Peripherals MN 94205-53 Half Height 42 Meg | - 725-3493 |
| Micropolis 1323 Full Height 32 Meg | - 725-0254 |
| Quantum Q540 Full Height 32 Meg | - 725-0144 |

Once installed properly, it would be transparent to the user which winchester was being used.

GROUP: VS On-Line Support MAIL STOP: 001-330

# 2275 PROBLEM UPDATE

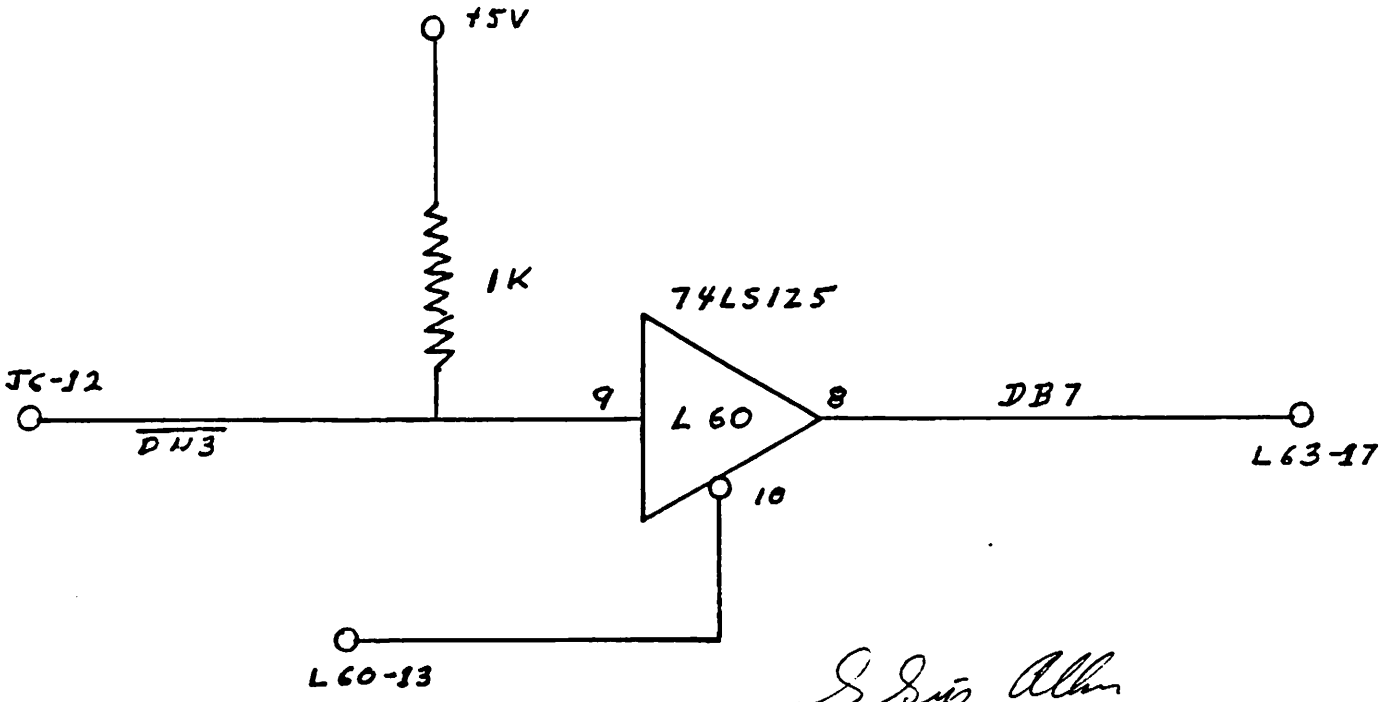
PROMS

PRE-RELEASE R-56 PROMS ARE BEING BETA TESTED. IF NO PROBLEMS ARE ENCOUNTERED, THESE PROMS WILL BE RELEASED AS R-3 PROMS.

210-8396A CIRCUIT BOARD

A CIRCUIT REVISION TO THIS BOARD HAS BEEN COMPLETED. (AN ECO NUMBER HAS NOT BEEN ASSIGNED AS OF THIS TIME). THE CHANGE USES THE HIGH ORDER 40 ADDRESS BIT FROM THE CONTROLLER (NOT DN3), (0100 0000), AND PUTS IT ON THE DATA BUS (DB-7) FOR INTERROGATION BY THE MICROCODE. THIS ALLOWS THE 2275 TO DISCRIMINATE BETWEEN ADDRESSES 10 AND 50, 20 AND 60, 30 AND 70. PREVIOUSLY A 2275 WITH AN ADDRESS OF 20 WOULD RESPOND INCORRECTLY TO AN ADDRESS OF 60.

DIAGRAM BELOW IS CHANGE TO THE 8396A BOARD. IT SHOULD BE NOTED THAT THE MICROCODE MUST BE AT REV 3 FOR THIS CHANGE TO BE EFFECTIVE.




SKIP ALLEN, 2200/VS/PC
TECHNICAL ASSISTANCE CENTER

# 2230A 1500RPM

| | | |
|---|---|---|
| 726-0451 | | AL1 |
| 726-0452 | | AL2 |
| 726-0466 | | SO |
| 726-0454 | | SR (IF CHANGES BRD CHECK ALIGNMENT TRY TO KEEP SAME REVISION BRD/CHANGES BRD) |
| 726-0491 | ★ | SL |
| 726-0455 | ★ | OR 11414 } MUST STAY W/ SAME STYLE |
| 726-0493 | | OR 11873 } MUST STAY W/ SAME STYLE |
| 726-0464 | | SD |
| 726-0465 | | OLD STYLE HEAT SINK |
| 726-0483 | | NEW STYLE HEAT SINK |
| 726-0463 | ★ | R/W |
| 726-0461 | | SC |
| 726-0468 | ★ | RDR1 |
| 726-0469 | ★ | RDR2 |
| 726-0467 | | D/CS |
| 210-341 | | REGULATOR |
| 210-6295 | | |
| 210-6296 | | |
| 210-6297-1 | | |
| 210-6298 1C | | 5 MEG PROM BOARD |
| 210-6398 | ★ | 6.25 HZ OSCILLATOR |
| 210-6541 OR 210-6541-1 | | DISK CONTROLLER |

210-341 VOLTAGE ADJ.

+7 PIN C,3 OF 341 / +5 PIN 14 OF IC ON 6295

-10.5 PIN 24 OF PROMS ON 6298

# 2260A

| | |
|---|---|
| 726-0471 | AL1 |
| 726-0472 | AL2 |
| 726-0473 | SO |
| 726-0454 | SR |
| 726-0492 | SL |
| 726-0482 | TC |
| 726-0495 | OR 11414 } MUST USE SAME STYLE |
| 726-0497 | OR 11893 } |
| 726-0464 | SD |
| 726-0465 | OLD STYLE HEAT SINK |
| 726-0483 | NEW STYLE HEAT SINK |
| 726-0476 | R/W |
| 726-0461 | SC |
| 726-0468 | RDR1 |
| 726-0470 | RDR2 |
| 726-0481 | D/CS |
| 210-341 | REGULATOR |
| 210-6295 | |
| 210-6296 | |
| 210-6297-3 | |
| 210-6298-1F | 10 MEG PROM BOARD |
| 210-6398-1 | 10 MEG HZ OSCILLATOR |
| 210-6541 or 210-6541-1 | DISK CONTROLLER |
| 725-0034-9 | POWER SUPPLY |

# IMMEDIATE SERVICE NOTICE

**NO.** 31 | DATE: 11/20/74

ITEM(S) / PRODUCT(S):

MDL 2260 TEN MEGABYTE DISK UNIT

NEW PRODUCT:

1. GENERAL:

The WANG Model 2260 Ten Megabyte Disk unit is a 200 track-per-inch (200 TPI) Diablo Model 44 disk drive, combined with a WANG Microprocessor. The data storage capacity doubles that of the Model 2230-3 (a total of 10,027,008 bytes are available on the 2260). As with the 2230, storage allocation is evenly distributed between a fixed disk and a removable disk.

With fast rotational speed (2400 rpm) and high track density (200 TPI) of the Diablo model 44 combined, the WANG 2260 yields an average access time of 38 ms; the total number of sectors is 39,168 (19,584 sectors per disk).

2. HARDWARE DIFFERENCES:

The 2230 and 2260 are very similar. Most of the PC board compliment for both the Diablo Model 44 Disk Drive and the WANG 2260 microprocessor unit is compatible with WANG 2230 units. (Slight modifications to 2230 PC boards are necessary.)

The major difference between 2230 and 2260 units appear in the Head Positioner and Head Assemblies: Due to a lower track-per-inch density, the Head Positioner for the 2230 (Diablo part number 16010-10) does not meet the same specifications for track linearity that the 2260 head positioner does (Diablo part number 16010-20). (Tracks are twice as wide on the 100 TPI 2230, as they are on the 200 TPI 2260.) The magnetic pickup heads in the 2230 (Diablo #16272-03 or -04) are 7 mils wide; 2260 heads (Diablo #16272-05 or -06) are 3.5 mils wide.

2.1 2230/2260 PC BOARD COMPATIBILITY

The following tables list PC boards used in a 2230, and the changes which are required for use in a 2260. Table 1 covers the Diablo Disk Drive; Table 2, the WANG Microprocessor.

TABLE 1 - DISK DRIVE PC BOARDS

| WANG 2230 (Diablo Model 43) Designation/ Diablo #: | WANG 2260 (Diablo Model 44) Designation/ Diablo #: | Changes: |
|---|---|---|
| AL-1-CB 11404-00 | AL-1-CB 11404-20 | Added 10Ω resistor at location D3. |
| AL-2-CB 11407-00 | AL-2-CB 11407-20 | Moved 10Ω jumper resistors at J-55 and J-57 to J-54 and J-56. |
| SO-CB 11633-00 | SO-CB 11633-20 | a) Added a .47 µf, 50V capacitor at location E-37.<br><br>b) Added a 1.21 Meg, 1/4 watt, 1% resistor at location E-38. |
| SR-CB 11411-01 SEE ISN 116 | SR-CB 11411-01 | No changes; directly compatible. |
| SL-CB ISN116 11471-00 | SL-CB 11471-01 | A 11471-00 from a 2230 *may* be used in a 2260 without modification; but a 11471-01 *may not* be used in a 1500 RPM 2230. |
| OR-CB ISN116 11414-00<br><br>11303<br>FOR 2260 TAKE OUT JUMPER AT E46 | OR-CB 11414-01 | Added a 10Ω jumper resistor* at location H-22.<br><br>IMPORTANT: The spindle speed variant resistors* at locations J50 thru J-57 must be in the same configuration as the board being replaced.<br><br>*10Ω, 1/4W, 5% Diablo #10021-10. |
| SD-CB 11613-01 | SD-CB 11613-01 | No changes; directly compatible. |
| MB 11635 | MB 11635 | No changes; directly compatible. |
| HS-CB 11631-01 | HS-CB 11631-01 | No changes; directly compatible. |
| RW-CB 11486-02 | RW-CB 11486-20 | 11486-20 (new board) is *not* compatible with 11486-02. |
| PD-CB 11499-00 | PD-CB 11499-00 | No changes; directly compatible. |

TABLE 1 CONTINUED NEXT PAGE:

TABLE 1 - (Continued)

| WANG 2230 (Diablo Model 43) Designation/ Diablo #: | WANG 2260 (Diablo Model 44) Designation/ Diablo #: | Changes: |
|---|---|---|
| AW-CB<br>11435-20 | AW-CB<br>11435-20 | No changes; directly compatible |
| IO1-CB<br>11431-01<br>or<br>RDR1-CB<br>11643-01 | IO1-CB<br>11431-01<br>or<br>RDR1-CB<br>11643-01 | No changes; directly compatible. |
| IO2-CB<br>1433<br>or<br>RDR2-CB<br>11645-00 | IO2-CB<br>11504<br>or<br>RDR2-CB<br>11647-00 | 11504 (new board) is *not* compatible with 11433.<br>11647-00 (new board) is *not* compatible with 11645-00. |
| D/CS-CB<br>11429-00<br>11637-00 | D/CS-CB<br>11429-01<br>11637-01 | 11429-01 11637-01 are *not* compatible with:<br>11429-00 or 11637-00 |
| SC-CB<br>11459 | SC-CB<br>11459 | No changes; directly compatible. |
| IO-MB<br>11400-01<br>11521 | IO-MB<br>11400-01<br>11521 | No changes; directly compatible. |
| TC-CB<br>(NOT USED IN DIABLO MOD. 43) | TC-CB<br>11537 | Not interchangeable between 2260's; requires unique calibration for temperature compensation. |

TABLE 2 - WANG MICROPROCESSOR PC BOARDS

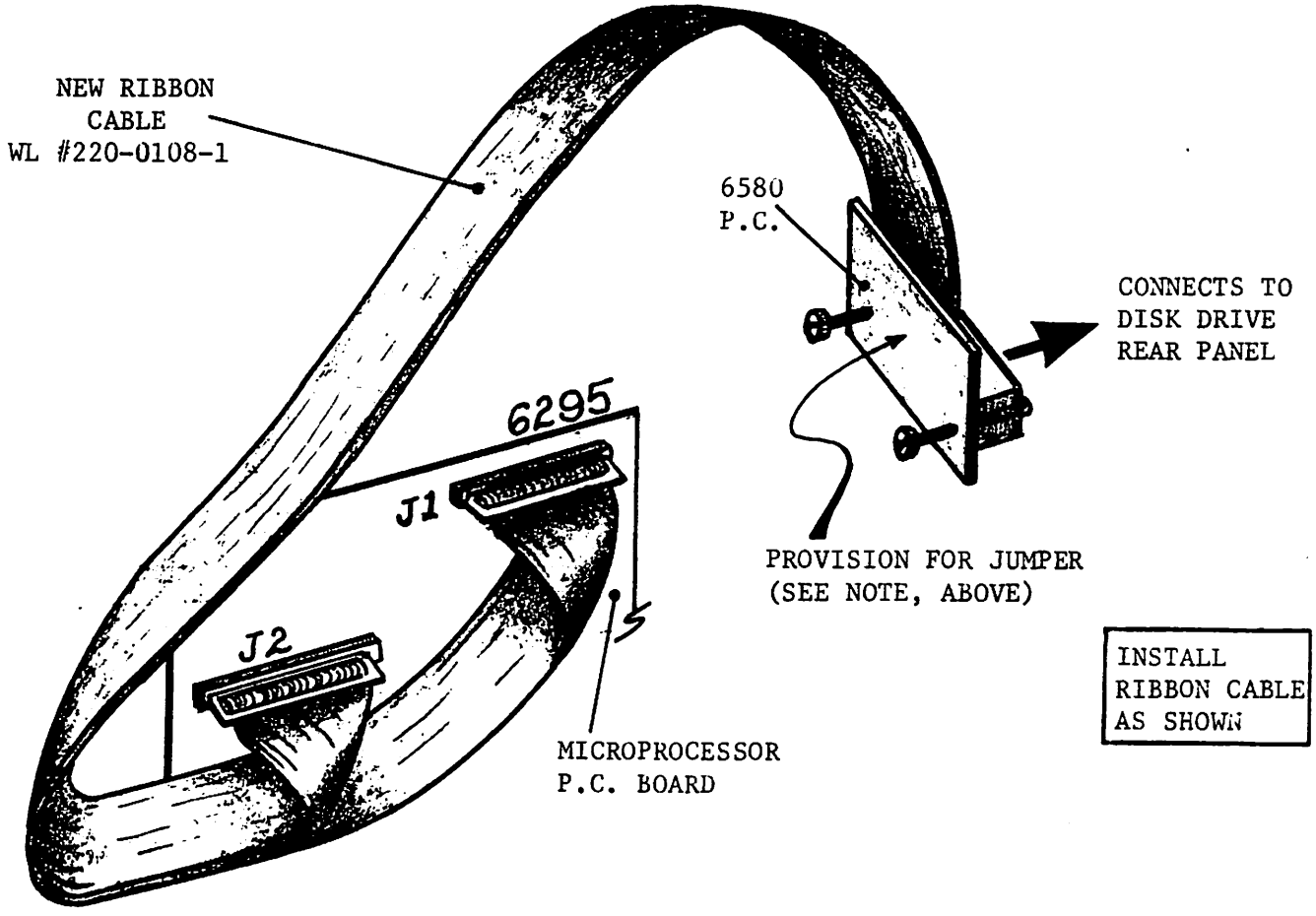
| 2230 Micro-processor/WL# | 2260 Micro-processor/WL# | Changes: |
|---|---|---|
| 6295 PC<br>#210-6295 | 6295 PC<br>#210-6295 | No changes; directly compatible. |
| 6296 PC<br>#210-6296 | 6296<br>#210-6296 | No changes; directly compatible. |
| 6297-1 PC<br>#210-6297-1<br>or<br>6597*<br>#210-6597 | 6297-1PC<br>#210-6297-1<br>or<br>6597*<br>210-6597 | Both 6297 and 6597 must be changed as follows, for use of either PC in a 2260.<br>Cut etches from L14-11 and from L2-3. Add a jumper wire from L24-2 to L2-2. Add another jumper wire from L1-13 to L2-3. |
| 6298 PC<br>#210-6298 | 6298 PC<br>210-6298 | Must insert PROMs for 2260. See loading diagram, page 6. |
| 6299<br>210-6299<br>or<br>6398<br>210-6398<br>6.25 MHz XTAL | 6299<br>210-6299<br>or<br>6398<br>210-6398 | To use either 6299 or 6398 in 2260, change 6.25 MHz XTAL to 10 MHz XTAL. |
| 341 PC<br>210-0341 | 341 PC<br>210-0341 | No changes; directly compatible. |
| 6349 (Motherboard) | 6349 | Add a jumper wire from 6299 socket pin $9_2$ to I/O connector pin 9. |

*See NOTE, page 5.

NOTE:

The 6297-1 PCB will be superceded by a 6597 PCB in the near future. The 6597 will be a universal board for use with all disks except the 740. The jumpers presently incorporated in the 6297-1 at locations L16, L17 and L18 will be replaced by etches on the 6597.

The interface cable (WL #220-0108) between the Diablo disk drive and the WANG microprocessor will be phased out and superceded by a ribbon-type cable (WL #220-0108-1; see Figure below). This new ribbon cable will have provisions for a jumper wire insertion between two plate-through eyelets, located on the backside of the 6580 connector board PC. This jumper wire *must* be installed when the ribbon cable is used in a Model 2260. This jumper should be *removed* from the 6580 connector PC, for use of a ribbon cable in the 2230-1, -2, or -3. The previous cable (WL #220-0108) can also be used on a 2260 by *adding* a spare wire from J2 finger-board connector pin 23 to Winchester connector pin small "m".



### 2.2 PROM LOADING OF 6298 PC - 2260

On the 6298 PCB there has been a recent ECN (#4464). This ECN *must* be complied with before the 6298 PCB can be used with a 2260; however, the ECN pertains to all 6298 PC boards.

Change R8 (1K 1/4W) to a 2.7K 1/4W resistor (330-3027) and change C3 (.003 µf ceramic capacitor) to a .001 µf mylar capacitor (300-2010). See Schematic Manual.

6298 PROM loading for 2260 is as follows:

| L8 | L7 | L6 | L5 | L4 | L3 | L2 | L1 |
|---|---|---|---|---|---|---|---|
| 378-0359 | 378-0357 | | 378-0361 | 378-0358 | 378-0356 | | 378-0360 |

6298 PC

## 3. DISK CARTRIDGES

### 3.1 REMOVABLE CARTRIDGES

Removable disk cartridges presently being used (WL #177-0041) are *not* certified for 200 TPI use. Some of these cartridges have a 200 TPI stamp. These "200 TPI" stamped disks are also not certified for Customer use. The 200 TPI cartridges presently in the field are only certified for a maximum of 400 tracks. The 2260 uses *408* tracks. In the future, Nashua Corp. will certify all 408 track disks. The new Wang part number for these cartridges will be WL #177-0062.

### 3.2 ALIGNMENT CARTRIDGES

Head alignment and Index alignment are covered in the Diablo Maintenance Manual for the 200 TPI, 2400 RPM Model 44 Disk Drives. These adjustments must be done with a Diablo alignment cartridge. After comparing the CDC alignment cartridges against the Diablo CE pack (P.N. 70709) it has been determined that Diablo CE packs will be ordered for the Model 44 disk drive alignments. These CE packs will be sent to area offices as soon as they are received from Diablo, Inc. A detailed description of these alignments will be covered in a future bulletin.

## 4. 2260 SOFTWARE DIFFERENCES

The 2260 uses the same BASIC statements that the 2230-1, -2 and -3 uses. From a software point of view, the only difference is an increased number of available sectors. The highest address for both fixed and removable 2260 disks is 19,583 as compared with 2399, 4799, and 9791 for the 2230-1, -2 and -3, respectively.

PRODUCT NO 11950

PRODUCT NO 11950 DEVELOPMENT REV D1

I/O MOTHER BOARD
I/O MB 11985

P10 I/O RECP SOCKET
P9 I/O PINS SOCKET

FF 4
EE 3
DD 2
CC 1
[4]
ATTENTION LINE

m TRACK ADDRESS LINE-BIT 256
BB TRACK ADDRESS LINE-BIT 128
b TRACK ADDRESS LINE-BIT 64
T TRACK ADDRESS LINE-BIT 32
f TRACK ADDRESS LINE-BIT 16
X TRACK ADDRESS LINE-BIT 8
J TRACK ADDRESS LINE-BIT 4
s TRACK ADDRESS LINE-BIT 2
N TRACK ADDRESS LINE-BIT 1
t STROBE LINE
w RESTORE LINE
y SEEK ERROR
u ADDRESS ACKNOWLEDGE LINE
p READY TO S/R/W LINE
F 200 TPI LINE
z

RECEIVER-DRIVER
RDR2-CB-200TPI
CIRCUIT 2
SLOT I/O 2
11647-XX

10 B 9 D H C E K 3 J 8 7 5 4 2 L M

18 BIT 256
19 BIT 128
17 BIT 64
W BIT 32
U BIT 16
Y BIT 8
16 BIT 4
21 BIT 2
S BIT 1
14 LOGICAL ADDRESS INTERLOCK OUTPUT
R ADDRESS ACKNOWLEDGE OUTPUT
X STROBE
20 RESTORE
N SELECTED
12 INITIAL RESET
15 SPINDLE ENABLE
T HEADS LOADED
11 SEEK INCOMPLETE OUTPUT
V READY TO S/R/W OUTPUT
13 WRITE CHECK

+5V
-24V
GND

P5A
14 16 12 13 24 20 26 22 9 32 31 15 18 8 10 30 28 6 11 23

SHEET 2

d (NOT USED)
v SECTOR ADDRESS BIT 16 LINE
n SECTOR ADDRESS BIT 8 LINE
k SECTOR ADDRESS BIT 4 LINE
j SECTOR ADDRESS BIT 2 LINE
c SECTOR ADDRESS BIT 1 LINE
W SECTOR MARK LINE
INDEX MARK LINE

[5]
SECTOR COUNTER
SC-CB
SLOT I/O3
11459

E H 2 9 K E D 5

V LOWER INDEX MARK OUTPUT
Y UPPER SECTOR MARK N
W SECTOR MARK LOWER
N SELECTED
21 FILE READY OUTPUT
X UPPER INDEX PULSE
8 SELECT DISK
J UPPER SECTOR PULSE

P6A
6 14 28 27 2 17 30 31 11 8 25 24 15 18 23 22 21 19 29 20 32 34 33

SHEET 3

B WRITE DATA LINE
H WRITE PROTECT INPUT LINE
Y INDEX MARK LINE
E READ GATE LINE
K ERASE GATE LINE
P WRITE PROTECT STATUS LINE
U FILE READY LINE
q HEAD SELECT LINE
g WRITE GATE LINE
h WRITE CHECK LINE
AA DISK SELECT LINE
D
Z
V
R
L
SELECT LINE (D0)
SELECT LINE (D1)
r
HH
S
A
+8V
[1]
[4]
4 3 2 1

RECEIVER DRIVER
CIRCUIT 1
RDR1-CB
SLOT I/O1
11988

K C 5 3 D 16 4 E 7 H 9 W B L T 8 M

J UPPER SECTOR PULSE
8 SELECT DISK
X UPPER INDEX PULSE
13 WRITE CHECK
R SELECTED INDEX MARK OUTPUT
21 FILE READY OUTPUT
11 WRITE FAULT
14 VOLTAGE CHECK
12 FILE READY
15 WRITE CHECK OUTPUT
P DISK SELECT
20 HEAD SELECT
U WRITE GATE
17 ERASE GATE
Z
19 WRITE DATA
22
2 WRITE PROTECT INPUT
Y WRITE PROTECT STATUS
18 READ GATE
N SELECTED
10 DATA/CLOCK GATE

A D C F L N H K P R J M
P11 POWER CONNECTOR
[6]
-24 V (PWR)
+24 V (PWR)
-24 V (CKT)
+24 V (CKT)
-24 V (R/W)
+24 V (R/W)
GND
+5V

NOT USED NOT USED

- READ CLOCK LINE
- READ DATA LINE
21 READ DATA AND CLOCK
- SET PHASE
+ IF REF
- IF REF
+ START OSC
- READ CLK
- READ DATA
- LAG ERR
- LEAD ERR
- HI GAIN
+ LAG LT
- OSC START
- RST LAG LT
+ 2F REF
- DATA GT INHIBIT
- 2F REF

VFC 1/05 [5]
8 7 N 10 5
C R 14 Y 9 K 2 B 4 H 12 9 17 15 18 11

VFO 1/06 [5]
2 B 4 9 12 5 17 21 18

1/04 [5]
C R 14 Y 9 K U
7 8 Z 22

DATA CLOCK SEPARATION D/C S-CB [5]

2400 RPM 200TPI

Diablo Systems Incorporated

DG-WIRING DIAGRAM
44 DISK DRIVE

MODEL 40

PRODUCT NO 11950 | REFERENCE DESIGNATORS NOT USED | REFERENCE DESIGNATORS LAST USED

REV J | H | G | F | E | D | C | B | A

SHEET 1 3 D | PRODUCT NO 11950 | REV A

PRODUCT NO 11950 — PRODUCT NO 11950 — DEVELOPMENT REV D1

MOTHER BOARD MB 11638

ADDRESS LOGIC 1 ALI-CB 200 TPI 11404-XX M09

ADDRESS LOGIC 2 AL2-CB 200 TPI 11407-XX M08

SERVO CIRCUIT SO-CB 11633-XX M07

OSCILLATOR OR-CB 11873-01 M02

SPINDLE DRIVE SD-CB 11613-XX M01

SEQUENCE LOGIC SL-CB 11471-03 M05

SENSOR CIRCUITS SR-CB 11411-xx M06

TEMP COMPENSATOR TC-CB 11537 M04

+5V
+5V
GND

P5

BIT 256
BIT 128
BIT 64
BIT 32
BIT 16
BIT 8
BIT 4
BIT 2
BIT 1
LOGICAL ADDRESS INTERLOCK OUTPUT
ADDRESS ACKNOWLEDGE OUTPUT
STROBE
RESTORE
SELECTED
INITIAL RESET
READY TO S/R/W
TRACK 256

SHEET 1

CONTROL LEVEL C
CONTROL LEVEL D
SUM BIT 1
SUM BIT 2
SUM BIT 4
SUM BIT 8
SUM BIT 16
SUM BIT 32
SUM BIT 64
SUM BIT 128
SUM BIT 256
COUNTER INTERLOCK
INPUT INHIBIT
[illegible] ON CONTROL
RETRACT SPEED
BIT NO 1
BIT NO 2
READY TO S/R/W
INITIAL RESET
READY TO S/R/W OUTPUT
FILE READY

PICK A
PICK A
PICK B
PICK B
Ø 1
Ø 2
Ø 3
Ø 4
MINIMUM SPEED
SPEED INCREMENT 1
SPEED INCREMENT 2
SPEED INCREMENT 3
SPEED INCREMENT 4
SPEED INCREMENT 5
SPEED INCREMENT 6
SPEED INCREMENT 7
POSITION TERM
DISK PACK SAFETY

CHANNEL A -1
CHANNEL A -2
CHANNEL B -1
CHANNEL B -2
DEMOD SIGNAL
60 Hz
INITIAL RESET
PHASE 1
PHASE 2
INDEX MARK LOWER

TRANSDUCER DRIVE
TRANSDUCER DRIVE RETURN

PHASE 2
PHASE 1
INITIAL RESET
POS SPINDLE DRIVE CUT OFF
NEG SPINDLE DRIVE CUT OFF
SPINDLE DRIVE ON
UNLOCK DRIVER
SPEED OK

DISK PACK
BRUSH HOME

DISK PACK SAFETY SW

SPEED OK
UNLOCK DRIVER
SPINDLE DRIVE ON
INITIAL RESET
60 Hz

HEADS OVER TRACKS
SPINDLE ENABLE
HEADS LOADED
HEADS RETRACTED
VOLTAGE CHECK
SELECTED

SEEK INCOMPLETE
+24 V (CKT)
-24 V (CKT)
CURRENT DETECTOR
SERVO DISABLE
POS SPINDLE DRIVE CUT OFF
NEG SPINDLE DRIVE CUT OFF
SELECTED SECTOR MARK
INDEX MARK LOWER
HEADS OVER DISK

HEADS OVER TRACKS
ZERO TRACK SENSING
VOLTAGE CHECK

INITIAL RESET
SELECTED
RESTORE
STROBE
FILE READY
SEEK INCOMPLETE OUTPUT
LOWER INDEX MARK OUTPUT
UPPER SECTOR MARK IN
SECTOR MARK LOWER
SELECTED INDEX MARK OUTPUT
DISK SELECT

TEMP COMP VOLTAGE
TEMP SENSING "B"
TEMP SENSING "A"

DISK PACK SAFETY SWITCH

UPPER INDEX MARK TRANSDUCER
LOWER INDEX MARK TRANSDUCER
HOME SENSOR "A"
HOME SENSOR COMMON
HOME SENSOR "B"
HOME SENSOR LED

P4 (SHIELDED)

DRAWER UNLOCK PICK
DRAWER UNLOCK ENABLE
SPEED SENSE A
SPEED SENSE B
SPINDLE MOTOR CURRENT CONTROL
SPINDLE MOTOR CURRENT CONTROL
PHASE 1A
PHASE 1B
PHASE 2A
PHASE 2B

P2

SERVO DRIVE SIGNAL RET
SERVO DRIVE SIGNAL
+24 V (CKT)
-24 V (CKT)
CURRENT DETECTOR
SERVO DISABLE

6 POWER BUSES
+5V
+15V
-15V

SHEET 3

HEAD LOAD ENABLE
HEAD LOAD PICK
BRUSH MOTOR A
BRUSH MOTOR B

P3

RETRACT SWITCH B
RETRACT SWITCH A
BRUSH SWITCH A
BRUSH SWITCH B
LOAD/RUN SWITCH B
LOAD/RUN SWITCH A
DISK PACK INTERLOCK SWITCH

P1

2400RPM 200TPI

Diablo Systems Incorporated

TITLE DG-WIRING DIAGRAM
44 DISK DRIVE

MODEL 40

PROPRIETARY - INFORMATION UNAUTHORIZED DISCLOSURE OR USE PROHIBITED

SYSTEM LOGIC NO

PRODUCT NO 11950 | REFERENCE DESIGNATORS NOT USED | REFERENCE DESIGNATORS LAST USED

REV J ECO NO | REV H ECO NO | REV G ECO NO | REV F ECO NO | REV E ECO NO | REV D ECO NO | REV C ECO NO | REV B ECO NO | REV A ECO NO | MFG | DATE | ENG | DATE | CHECKED | DATE | DRAWN | DATE

SHEET 2 | TOTAL SHEETS 3 | SIZE D | PRODUCT NO 11950 | REV A

PROJECT NO. 11950 | PROJ. NO. 11950 | DEVELOPMENT NO. D1

M1 — READ/WRITE AMPLIFIER 2400 RPM 200 TPI 11486-XX

P8 (M1 side):
- 6 TRACK 256
- 14 READY TO S/R/W
- 28 FILE READY OUTPUT
- 27 WRITE FAULT
- 2 VOLTAGE CHECK
- 17 INITIAL RESET
- 30 SPINDLE ENABLE
- 31 FILE READY
- 11 HEADS LOADED
- 8 WRITE CHECK OUTPUT
- 29 DISK SELECT
- 24 HEAD SELECT
- 16 WRITE GATE
- 18 ERASE GATE
- 23
- 22 WRITE DATA
- 21
- 19 WRITE PROTECT INPUT
- 29 WRITE PROTECT STATUS
- 13 WRITE PROTECT STATUS OUTPUT
- 20 READ GATE
- 34
- 32 READ DATA AND CLOCK
- 33
- 1

READ/WRITE AMPLIFIER:
- WRITE PROTECT DISABLE
- READY INDICATOR
- WRITE CHECK INDICATOR
- WRITE PROTECT INDICATOR
- WRITE PROTECT SWITCH

P8 (M1 side): 8, 7, 10, 9, 6

P8A (PANEL DISTRIBUTOR side): 8, 7, 10, 9, 6

PANEL DISTRIBUTOR PD-CB 8

PUR — R — BLK — GND

- Y YEL — READY
- O ORN — CHECK
- R RED — PROTECT
- G GRN
- B BLU

+24V

P14 — LOWER INDEX TRANSDUCER

P15 — UPPER INDEX TRANSDUCER

P12: 8, 10, 6, 14, 12

P12A: GRY 2, GRN 1, GRY 13, YEL 4, BLK 5

ACTUATOR WIRING AW-CB 11435

GND

LOAD 2

W WHT
B BLU — TO OTHER INDICATORS — DRAWER UNLOCK SOLENOID
GRY
+24V YEL — DISK PACK SAFETY SOLENOID

DRAWER INTERLOCK BLK
DISK INTERLOCK SWITCH
PUR 4

2 5
1
GRY 6
LR-B 7
BLK 12
LR-C
YEL
LR-A

RUN — LOAD/RUN SWITCH — LOAD

11499-XX

BLU 9
BLK 10
GRY 8
BLK 3

RED TS1 — BRUSH MOTOR — BRUSH SWITCH NC NC
WHT 2

P1A (M1 side):
- 16 DRAWER UNLOCK PICK
- 15 DRAWER UNLOCK ENABLE
- 2 SPEED SENSE A
- 5 SPEED SENSE B
- 14 SPINDLE MOTOR
- 3 CURRENT CONTROL
- 4 PHASE 1A
- 6 PHASE 1B
- 7 PHASE 2A
- 9 PHASE 2B

P2A (M1 side):
- 7 SERVO DRIVE SIGNAL RET
- 8 SERVO DRIVE SIGNAL
- 4 +24V(CKT)
- 16 −24V(CKT)
- 5 CURRENT DETECTOR
- 10 SERVO DISABLE
- 1
- 2 +5V
- 6
- 11 +15V
- 3
- 14 −15V
- 9 HEAD LOAD ENABLE
- 13 HEAD LOAD PICK
- 12 BRUSH MOTOR A
- 15 BRUSH MOTOR B

HEAT SINK HS-CB 11890-00

MANUAL POSITION SWITCH

SPINDLE MOTOR

+5V
+15V
−15V

LOAD INDICATOR 16
DRAWER UNLOCK SOLENOID 14
+24V(CIRCUIT) 9
HEAD LOAD SOLENOID 15
+24V(CKT)
GROUND 3
BRUSH MOTOR 4
12
13

(P7)
10 LOAD — PUR
9 SOL — BLK
11 BLU — TS3 2
12 GRN — 1
YEL

HEAD LOAD SOLENOID

P8 (M1 side): 6, 5, 4, 2, 1

P8A (PANEL DISTRIBUTOR side): 6, 5, 4, 2, 1

- ORN 3 — BLU
- BRN 4 — YEL
- YEL 5 — GRN
- BLU 2 — RED

SPINDLE MOTOR

P8 (M1 side): 8, 7

P8A (PANEL DISTRIBUTOR side): 8, 7

PLUS WHT 3
MINUS BLK 4 — TS3

SERVO POSITIONER

TB1
OLD STYLE HEAT SINK
NEW STYLE HEAT SINK

P4A (SM2 side):
- 9 TRANSDUCER DRIVE RET
- 8 TRANSDUCER DRIVE
- 2 CHANNEL A-1
- 10 CHANNEL A-2
- 16 CHANNEL B-1
- 1 CHANNEL B-2
- 11 HOME SENSOR LED
- 3 UPPER INDEX MARK TRANSDUCER
- 14
- 4 LOWER INDEX MARK TRANSDUCER
- 13
- 10
- 12 HOME SENSOR "A"
- 5
- 7 HOME SENSOR "B"
- 6

P3A (SM2 side):
- 6
- 9
- 11
- 12 DISK PACK SAFETY SWITCH
- 4 RETRACT SWITCH B
- 14 RETRACT SWITCH A
- 2 BRUSH SWITCH A
- 3 BRUSH SWITCH B
- 7 LOAD/RUN SWITCH B
- 5 LOAD/RUN SWITCH A
- 15 DISK PACK INTERLOCK SWITCH
- 1 TEMP SENSING "B"
- 16 TEMP SENSING "A"

RP

RM

PHOTO SENSOR HPC-2

RED HX-A
BLK HX-C
RED HX-B
GRY HX-G
GRY HX-L

LED TIXL-26

HOME TRANSDUCER ASSEMBLY

P15: BLK, YEL, WHT, BLK

POSITION TRANSDUCER MOVING MEMBER

POSITION TRANSDUCER STATIONARY MEMBER

BLK DS-C
WHT DS-B — DISK PACK SAFETY SWITCH NO
GRY RT-A — NC
BLK RT-C
WHT RT-B — RETRACT SWITCH NO

B
A — THERMISTOR

NOTES:
1. DRIVES ARE TYPE ALTA (10101-01).
2. INDICATOR LAMPS ARE TYPE #47.
3. CONNECTOR TYPES ARE AS FOLLOWS:
   - 3.1 - P8 IS WINCHESTER #MRAC 36 P16 WITH #1024P CONTACTS.
   - 3.2 - P1 IS WINCHESTER #MRAC 40 S36 WITH #1024S CONTACTS.
   - 3.3 - P12 IS WINCHESTER #MRAC 14 P1 WITH #1014P CONTACTS.
4. INSTALL JUMPER PLUG (10634) IN POSITION CORRESPONDING TO MACHINE NUMBER.
5. OPTIONAL FEATURES:
   - 5.1 - WRITE PROTECT
     - 5.1.1 - FOR WRITE PROTECT FEATURE, NO COMPONENT IS USED BETWEEN PADS MARKED "PUR" AND "BLK" ON PD-CB (11499-01).
     - 5.1.2 - FOR NO WRITE PROTECT FEATURE, USE 10%, 1/4 W RESISTOR (10021-470) BETWEEN PADS MARKED "PUR" AND "BLK" ON PD-CB (11499-01).
   - 5.2 - SECTOR COUNTER
     - 5.2.1 - STANDARD MACHINE NO SECTOR COUNTER) DOES NOT USE SC-CB (11356).
     - 5.2.2 - FOR SECTOR COUNTER, INSTALL SC-CB (11356) AND USE THE PROPER VERSION OF SR-CB (11311-XX) AND RDR1-CB (11561-XX) AS SHOWN ON THEIR SCHEMATICS.
   - 5.3 - DATA CLOCK SEPARATION
     - 5.3.1 - FOR ONE SHOT SEPARATOR USE IN POSITION U-5 THE PROPER VERSION OF D-CB (11357-XX) AS SHOWN ON ITS SCHEMATIC.
     - 5.3.2 - FOR VFO SEPARATOR USE IN POSITION U-6, VFI-CB (11351) OR VFS-CB (11257) IN POSITION U-5 USE VFO-CB (11256) IN POSITION U-6. USE VFO-CB (11357), AS SHOWN ON SHEET 1 OF THIS DRAWING. FOR EITHER SEPARATOR USE THE APPROPRIATE R/W-CB (11356-XX) VERSION AS SHOWN ON ITS SCHEMATIC.

6. FOR DC POWER DISTRIBUTION REFER TO DWG NO. 11691

2400RPM 200TPI

Diablo Systems Incorporated

DG-WIRING DIAGRAM
44 DISK DRIVE
40

3 3 D 11950 A

11950

# Service Newsletter

#51

July 9, 1976

MASS STORAGE DEVICES #5

DIABLO WIRING HARNESS CHANGES

44A OLD STYLE

ISN #81 described the Diablo 11890 Heat Sink and provided a wire run list in item 5. Effective with approximately Diablo Serial Number 6093, that wire list is not correct and reference to the following list is required:

| Terminal | Location | Color |
|---|---|---|
| 1 | P7-4 | Yellow/Brown |
| 2 | P7-5/P7-6 | Blue/Brown |
| 3 | P7-8 ⏚ | Small Pink } BRUSH MOTOR |
| 4 | P7-7 | Small White } BRUSH MOTOR |
| 5 | -24 PWR | Brown |
| 6 | P7-2/P7-3 | Red |
| 7 | P7-1 | Green |
| 8 | +24 PWR | Orange |
| 9 | P7-11 | Blue HEAD LOAD SOLENOID +24 |
| 10 | +24 CKT | Small Yellow and Large Yellow |
| 11 | -24 CKT | Pink |
| 12 | PLUS | White } SERVO MOTOR |
| 13 | MINUS | Black } SERVO MOTOR |
| 14 | P7-9 | Small Black DRAWER UNLOCK SOLENOID |
| 15 | P7-12 | Green HEAD LOAD SOLENOID |
| 16 | P7-10 | Violet LOAD LITE |

WANG LABORATORIES, INC.
836 NORTH STREET, TEWKSBURY, MASSACHUSETTS 01876, TEL (617) 851-4111, TWX 710 343 6769, TELEX 94 7421

Printed in U.S.A
13-266

K75 - TIED TO PIN 14 OF CONN. AT RESISTOR F11

# 44B ALIGNMENT

## TRACK Ø

SEEK TO TRACK Ø. -5V DISCONNECTED.

ADJUST TRACK Ø ASS'Y FOR READING OF 2.65V ± .25 MEASURED AT:

| LOGIC BRD. | | |
|---|---|---|
| 12177 | 12176 | E17 |
| 12141 | 12140 | F75 |
| 12066-XX | 12065-01 | F75 |
| 12066 | 12065 | K75 (MAY HAVE TO BE UPDATED) |

SHOULD NOT CHANGE MORE THAN .1V FROM HIGHEST TO LOWEST READING.

## RADIAL HEAD

SEEK TRACK 146. PLUG IN HEAD. CONNECT -5V.

TRIBIT CH 1 - TP1 .2V/DIV AC 2 μ/DIV AUTO

← BALANCE PEAKS

CATSEYE w/ LINES CH 1 - TP1 .2V/DIV AC 1 OR 2 MSEC/DIV

SYNC AC EXT UPPER INDEX (LOGIC BRD 12065) F75

12065-1 E76

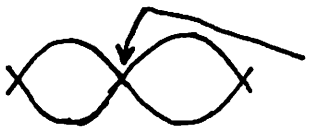
BALANCE LINES ON EITHER SIDE OF CROSSOVER

CATSEYE CH. 1 - TP1 .2V/DIV AC 20 μSEC/DIV

SYNC AC EXT UPPER INDEX (LOGIC BRD. 12065) F75

12065-1 E76

MAY HAVE NO INDEX SIGNAL ON 402



CROSSOVER SMALL AS POSSIBLE

## INDEX TO DATA BURST

SEEK TRACK 402. PLUG IN HEAD. CONNECT -5V.

CH. 1 - TP1 .2V/DIV. AC 5 μSEC/DIV. SYNC EXT NEG AC UPPER INDEX

19 ± 3 μSEC.

LOGIC BRD.

12065-1 E76

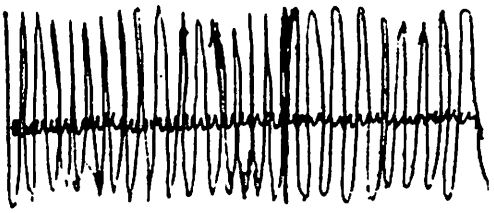
12065 F75

SEEK TRACK 10.

450 mil V

SAMEL 50mV/ 10mil/

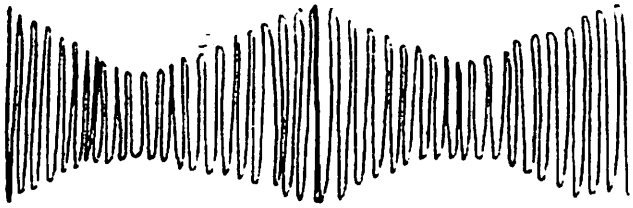
: UPPER



GOOD

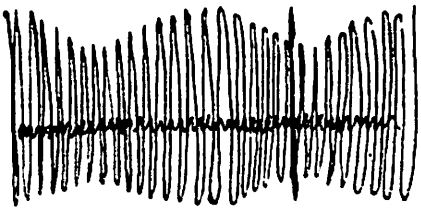
NH

UPPER

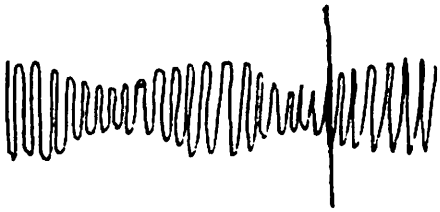


BAD

LOWER



LOWER

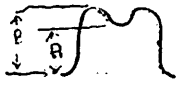


UPPER INDEX J14 PIN 1
LOGIC BRD. 12141 E77

LOWER INDEX J13 PIN 1
LOGIC BRD 12141 F14

# 44A ALIGNMENT

TRK Ø CH 1 - SO TP13 SYNC SO TP 14

DOING A CONSTANT RESTORE .5V/DIV. 2 MILS/DIV 

A MUST BE 70-80% OF B

RADIAL HEAD SAME AS 44B (-5V) LAST LEG (CLOSEST TO REAR) OF TWO XSISTORS ON R/W BOARD

INDEX - CH 1 - TP 1 OF EXER. SYNC. SR PIN 11 NBG
5V/DIV. 5 μSEC/DIV 19±3 μSEC - 30±6 μSEC.

1. Open the drawer with the power off.

2. Opening the cartridge clamps: With the top cover removed, the cartridge clamps can be spread under any conditions of power, head position, or brush position by manually moving the cartridge clamp interlock link forward. This is most easily accomplished by pulling forward on the link pin of the cartridge interlock solenoid located beneath the bowl on the left side.

3. Operating the Spindle with drawer open and no cartridge installed: The spindle motor can be operated by manual operation of the cartridge interlock switch located inside of the left hand cartridge clamp.

### 5.6.3 Level 1 Adjustments

There are no adjustments to be performed under Level 1 Maintenance.

### 5.6.4 Level 2 Adjustments

#### 5.6.4.1 Brush Mechanism Adjustment

1. Lower the front panel to the maintenance position as described in 5.7.1.6.

2. Loosen the three hex head screws which fasten the brush motor plate to right front corner of the baseplate.

3. Remove the plenum chamber by removing the two plenum chamber holding screws.

4. Exerting a light clockwise pressure on the upper brush arm, measure the clearance between the brush bristles and the bowl wall. If the clearance is not .062 $\pm$ .031, loosen the jam nut on the eccentric (A) in Figure 5-4, and rotate the eccentric until proper brush-to-wall clearance is obtained. Tighten the jam nut.

5. If the brush motor arm is not in the position as shown in Figure 5-4, manually rotate the brush motor arm clockwise to that position. Insure that the pin is detented in the rear end of the slot in the brush mechanism link, as shown in Figure 5-4.

6. Slide the brush motor plate backward or forward to set the clearance between the eccentric and the brush lever to 0.005 $\pm$ .004. Tighten the three brush motor plate screws.

7. Loosen the two screws holding the brush switch. With the brush mechanism still in the position described in Ste 5, adjust the switch lever to be depressed .030 $\pm$ .005 beyond the "make" point. Tighten the two screws.

8. With the cartridge interlock defeated as described in 5.6.2(3), place the drive in the RUN mode, and check for proper operation of the brush mechanism. Brushes should make one cycle and then stop.

#### 5.6.4.2 Lower Index Transducer Adjustment

Place the drive in the RUN mode, and observe the signal at pin 12 of the Logic PCB. The amplitude of the positive peaks should be between 400 and 1200

WHEN THE BRUSH SWITCH IS MADE 2 THINGS NEED TO BE CHECKED:

1. THE PIN ON THE BRUSH MOTOR ARM IS FULLY ENGAGED AT THE END OF THE SLOT. ENSURES ARM DOES NOT SLIP BACK FROM VIBRATION.
2. IF A NEW BRUSH CYCLE IS INITIATED, INITIALLY THE ECCENTRIC WILL FURTHER DEPRESS ON THE SWITCH WHEN MOVING BEFORE RELEASING SWITCH.

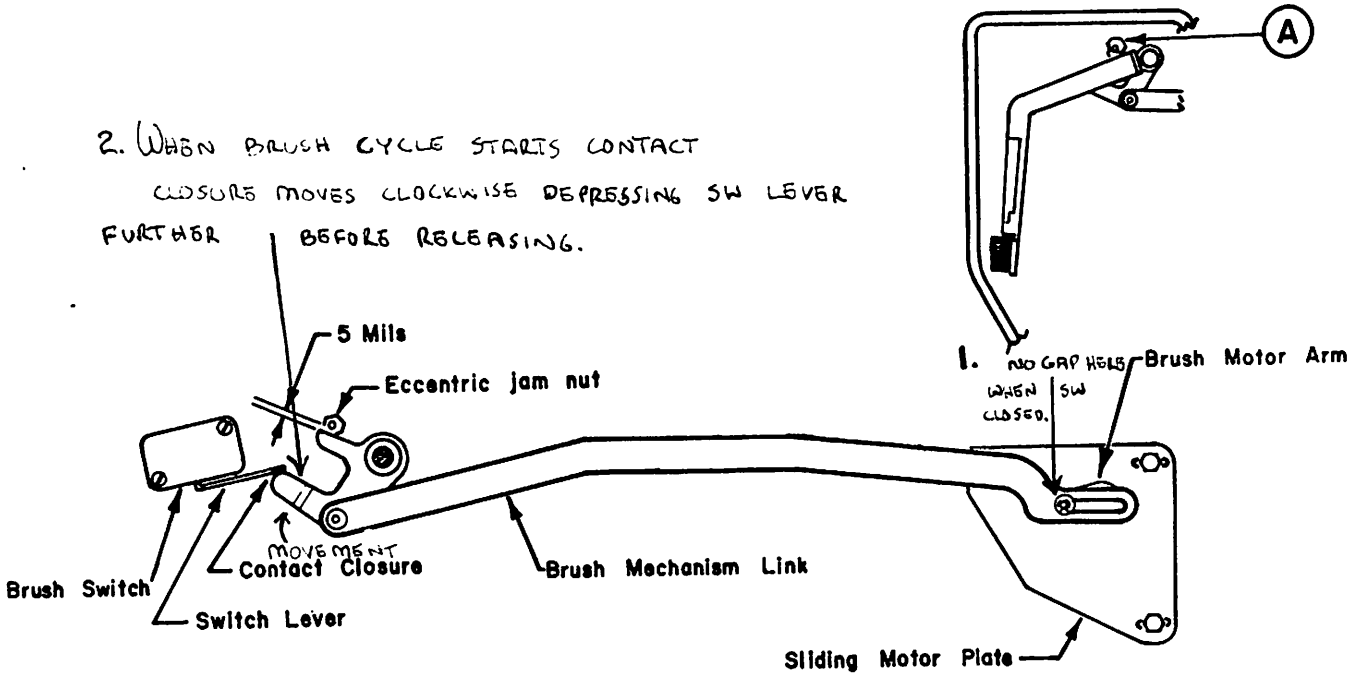



Figure 5-4. BRUSH MECHANISM ADJUSTMENTS

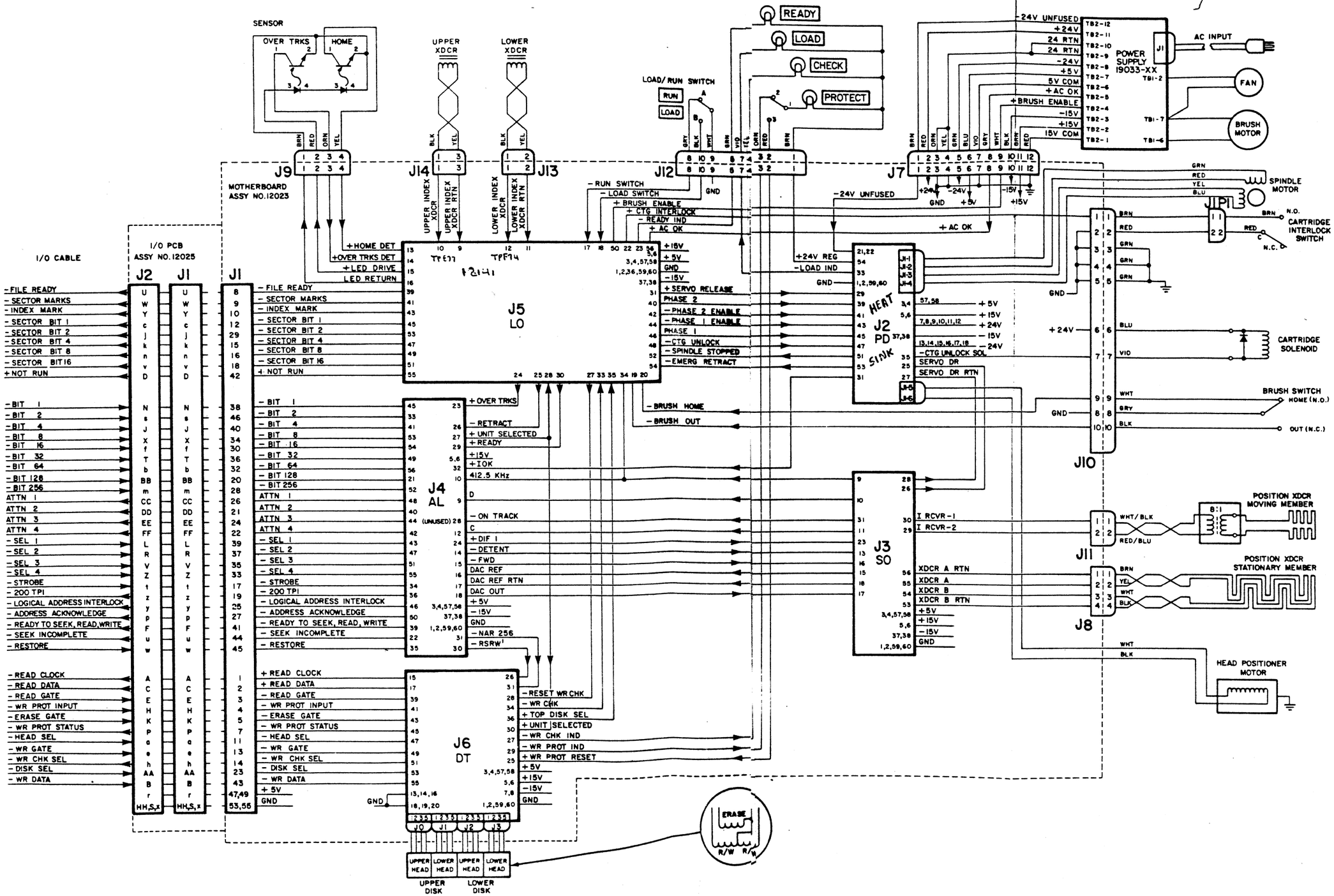



FIGURE 7-1. INTERCONNECTION DIAGRAM #19033

# 2260B, C

| | |
|---|---|
| 726-5215 | DATA TRANSFER |
| 726-0440 OR 726-5343 | LOGIC (12141 ✡ 12566) OR LOGIC (12177) |
| 726-0431 OR 726-5254 OR 726-5342 | ADDR. LOGIC (12101) OR (12152) OR (12133) |
| 726-0441 OR 726-0432 | SERVO (12064 ✡) OR (12099) |
| 726-0443 | HEAT SINK |
| 210-341 | REGULATOR |
| 210-6295 | |
| 210-6296 | |
| 210-6297-3 | L7 - CHANGES FOR CAPACITY |
| 210-6298-1F | 10 MEG PROM BOARD MVPS 500 SERIES RL PROMS |
| 210-6398-1 | 10 MEG. HZ. OSCILLATOR |
| 210-2260C* | 10 MEG C DISK CONTROLLER |
| 210-6541 OR 210-6541-1 | DISK CONTROLLER |

| | 1 | 2 | 3 | 4 | |
|---|---|---|---|---|---|
| DATA TRANSFER | ON | ON | ON | | |
| LOGIC | | | | ON | (FOR ALIGN. PACK 1 & 4 ON) |
| ADDRESS LOGIC | | | ON | ON | (FOR SLAVE 3 ON ONLY) |

726-5250 N/S POWER SUPPLY

726-0438 O/S POWER SUPPLY FAN 2 & 7 BRUSH MTR 6 & 7

# PHOENIX 2280

| | | |
|---|---|---|
| 726-5778 | | I/O BOARD 1 ON 2,3,4 OFF |
| 726-5779 | | CNTRL MUX 1 OFF 2,3 ON |
| 726-5780 | | SERVO COARSE 2200 7 OFF VS 1,4 OFF |
| 726-5782 | | SERVO FINE |
| 726-5783 | | READ/WRITE |
| 726-5784 | | R/W PREAMP |
| 726-5792 | | SERVO PREAMP |
| 726-5785 | | POWER AMP |
| 726-6723 | | BLOCK PT. 4 POWER AMP |
| 726-5786 | | RELAY BRD. |
| 726-6724 | NOT COMPATIBLE | BLOCK PT 4 RELAY BRD. 7768 0650 O/S |
| 726-6724A | NOT COMPATIBLE | BLOCK PT 4 RELAY BRD. 7771 3900 N/S |
| 726-5787 | | CONTROL PANEL |
| 726-8017 | | TERMINATOR |
| 210-L567 1 | | DPU REGULATOR |
| 210-7415 2 | | DPU BOARDS |
| 210-7421 5 | | |
| 210-7422 6 | | |
| 210-7423 4 | | |
| 210-7424 3 | | |
| 210-6541-2 | (CAN USE 6541-2) | DISK CONTROLLER |

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WANG

# TECHNICAL SERVICE BULLETIN
## SECTION: HardWare Technical

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

MATRIX ID. 3105 PRODUCT/RELEASE# PHOENIX

TITLE: Phoenix board compatibility

PURPOSE:

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

EXPLANATION:

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

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

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

I/O Board 726-5778
* 75891850 series code 2 (unique to Wang)
* 77616751 series code 2/3 (unique to Wang)
77616770A
77616790
77622500-1 series code 3 (universal)

I/O Board 726-6669
** 77665650 series code 4 (universal)

Control Mux 726-5779
77616600
77624700

Control Mux 726-6668
** 77666950

OVER

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

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# TECHNICAL SERVICE BULLETIN
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77616770A
77616790
77622500-1 series code 3 (universal)

I/O Board 726-6669
** 77665650 series code 4 (universal)

Control Mux 726-5779
77616600
77624700

Control Mux 726-6668
** 77666950

OVER

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

III.A.10 M-2

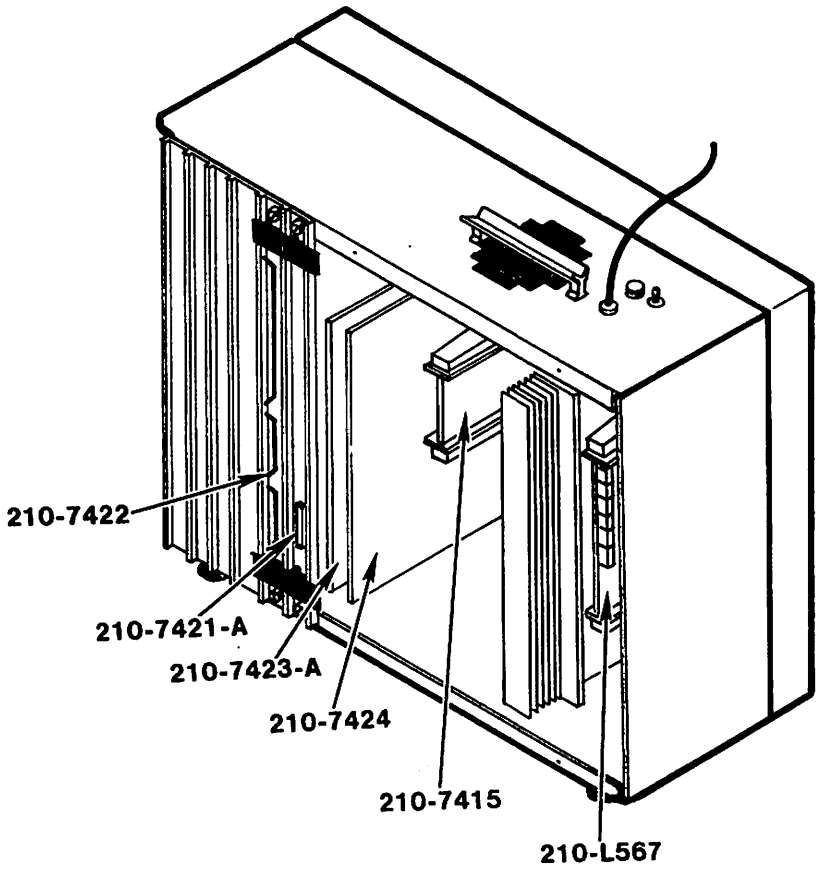


Figure 2-10. Circuit Board Loading

# SHIELDED CABLE KIT

Contents of Kit 728-0004 for ECO 17671 for 2280

| PART NUMBER | DESCRIPTION | QTY |
|---|---|---|
| 449-0247 | Handle Faceplate | 2 |
| 452-2095-35 | Faceplate 2200 Phoenix | 1 |
| 452-2690 | Wide Clamp | 1 |
| 452-2691 | Narrow Clamp | 2 |
| 458-0786 | Ground Strap Cable (Wide) | 1 |
| 458-0787 | Ground Strap Cable (Narrow) | 2 |
| 458-0826 | Retainer Ribbon (Wide) | 1 |
| 458-0827 | Retainer Ribbon (Narrow) | 2 |
| 458-0828 | Retainer Cable Clamp (Narrow) | 2 |
| 458-0829 | Retainer Cable Clamp (Wide) | 1 |
| 461-3140 | Screw Cap 8-32 | 2 |
| 461-3141 | Screw Cap Housing | 2 |
| 651-0030 | Screw Self Tap T-B 4 X 1/2 L PN HD PH | 4 |
| 651-0401 | Rivet Pop 1/8 X 3/16 | 12 |
| 650-3120 | 6-32 X 3/8 PAN HD PHL MS SS SEMS | 6 |
| 220-3041-7 | 'A' Cable 15' | 1 |
| 220-3033-21 | 'B' Cable 15' | 1 |

CUSTOMER ENGINEERING
TECHNICAL ASSISTANCE CENTER
NEWSLETTER

#3061.4

.202

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' |

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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 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

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# 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

GROUP: ECO Support Group MAIL STOP: 0139

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# TECHNICAL SERVICE BULLETIN
## SECTION: HardWare Technical

NUMBER: HWT 5160 REPLACES: _____ DATE: 08/13/85 PAGE 1 OF 1

MATRIX ID. 3107 PRODUCT/RELEASE# 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

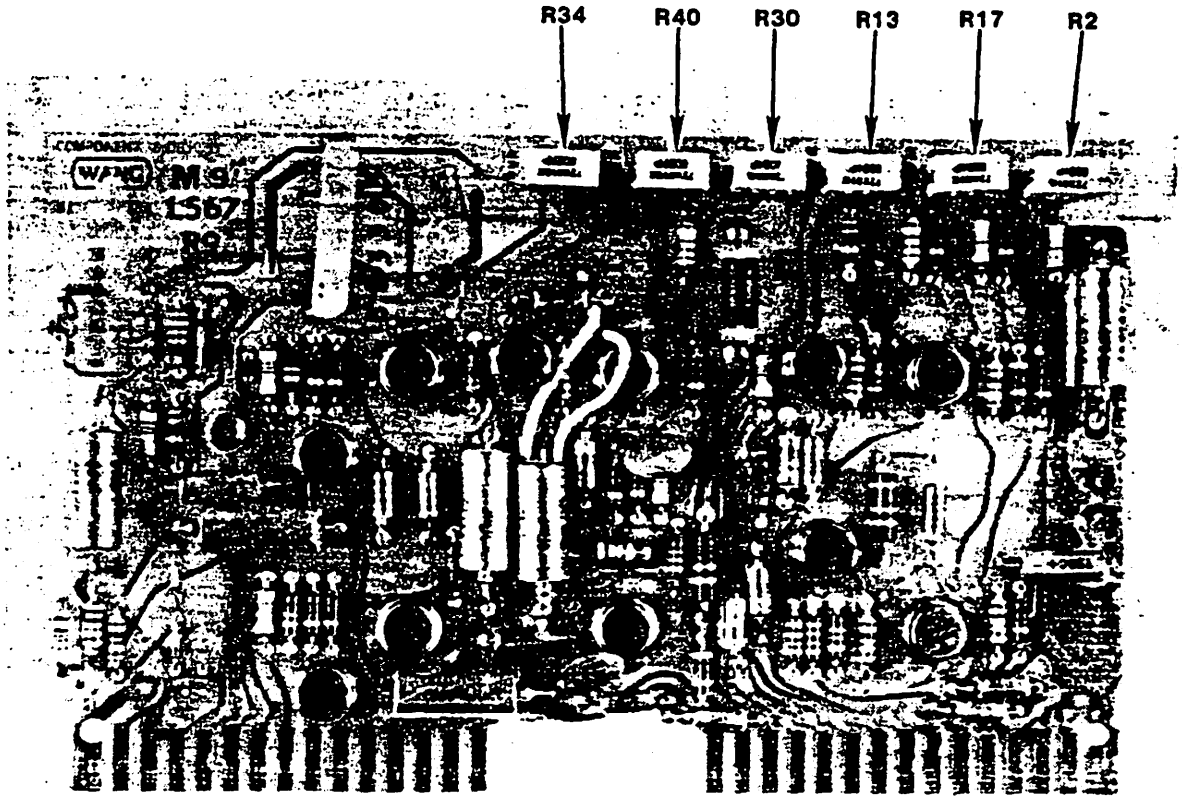
# PHOENIX DPU



TABLE 4-1 DC VOLTAGE SPECIFICATIONS

| VOLTAGE | L567 TEST POINT | L567 ADJUST | LIMITS | |
|---|---|---|---|---|
| | | | VOLTAGE | RIPPLE |
| +5VRM | Pin $1_1$ | R17 | +4.90 to +5.10 | 15 mv p-p |
| +5VRL | Pin $2_1$ | R2 | +4.90 to +5.10 | 15 mv p-p |
| +8VR | Pin $12_1$ | R13 | +8.50 to +8.80 | 20 mv p-p |
| ✱ +12VR | Pin $15_1$ | R30 | +11.80 to +12.20 | 15 mv p-p |
| -12VR | Pin $5_2$ | R34 | -11.80 to -12.20 | 15 mv p-p |
| ✱ -15VR | Pin $6_2$ | R40 | -14.80 to -15.20 | 25 mv p-p |

GROUND $3_1$




RIPPLE ON -15V — SOLDER 10MF CAP (300-4041) (-) SIDE TO PIN 7 OF CONN. 2 OF THE L567 ON THE MB & THE (+) SIDE TO 7

ANG LABORATORIES, INC.

CUSTOMER ENGINEERING
TECHNICAL ASSISTANCE CENTER
NEWSLETTER

#01125

L4 - BOTTOM RIGHT COMPONENT SIDE

.n.1
2200 SYSTEMS-MAINFRAMES-A/B/C/S/T CPU'S.

TOPIC:__DISCREPENCIES_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 R9M9 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 PAC tester.)

   b. Any board shipped from now on with R9M9 artwork will work on 2200T and 2280 DPU.

2. For boards with R8M8 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 2288 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 2280DPU

WANG LABORATORIES, INC.

# 2280 MICROPROCESSOR ECN'S

210-7415 (small regulator PCB) E Rev 0

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

REASON: Buffer no longer needed.

210-7416 (mother PCB) E Rev 1

L567

0 to 1: On the L567 connector tie 10UF 35V cap (300-4041) pin $7_2$ to ground (plus side to ground).

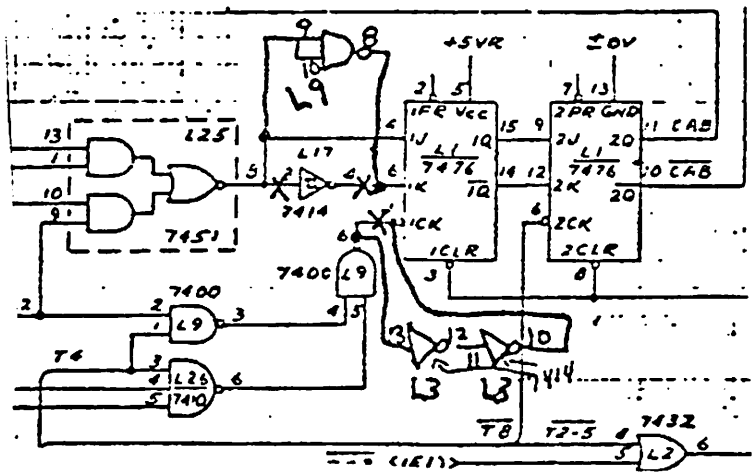
REASON: To prevent oscullation on -15V regulator.

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.

WANG LABORATORIES, INC.



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 UP TO R8 PROMS (USE R7)

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.
3. Cut etch to L35 pin 6.
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.
3. Cut etch between L5 pin 13 and L6 pin 4.
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.
6. L23 pin 11 wire to L31 pin 8.
7. L31 pin 10 to L43 pin 1.

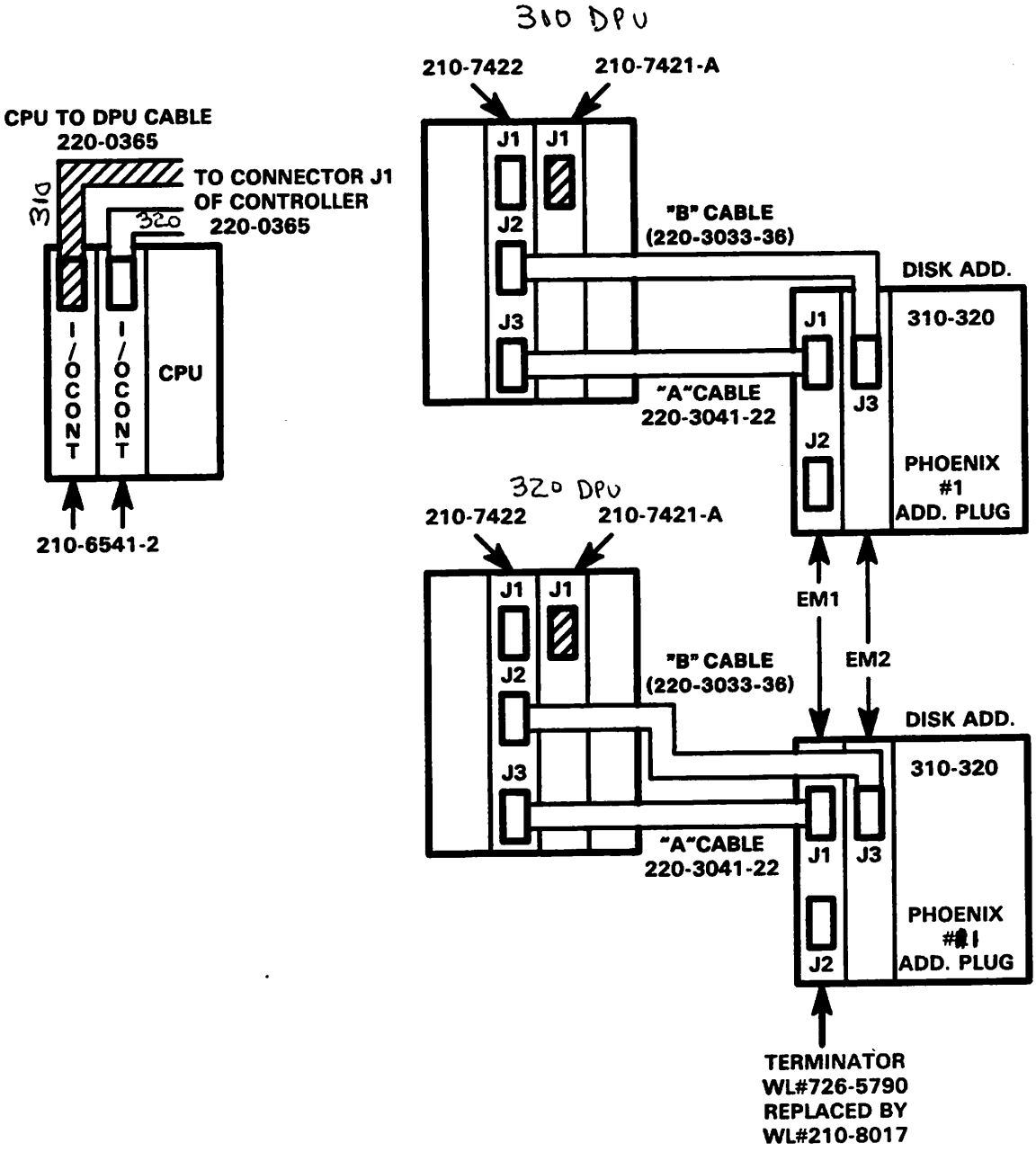
REASON: To correct reading sector errors due to noise on sync-byte.

Rev 6 to 7:
1. Cut etch from L36 pin 3 to L36 pin 9.
2. Jump L36 pin 3 to L26 pin 4.

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

A & B CABLES
PIN 1's UP 1 SIDE
DOWN ON OTHER






See Table 2-2 for cable identification

**FIGURE 2-12A SYSTEM INTERCONNECTION DIAGRAM WITH TWO DPU'S**

## 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:

| LENGTH (FEET) | LENGTH (METERS) | WL # |
|---|---|---|
| 25 | 7.6 | 120-2280-01 |
| 50 | 15.2 | 120-2280-02 |
| 100 | 30.3 | 120-2280-03 |
| 250 | 75.8 | 120-2280-04 |
| 500 | 151.5 | 120-2280-05 |
| 750 | 227.3 | 120-2280-06 |
| 1000 | 303.0 | 120-2280-07 |

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.

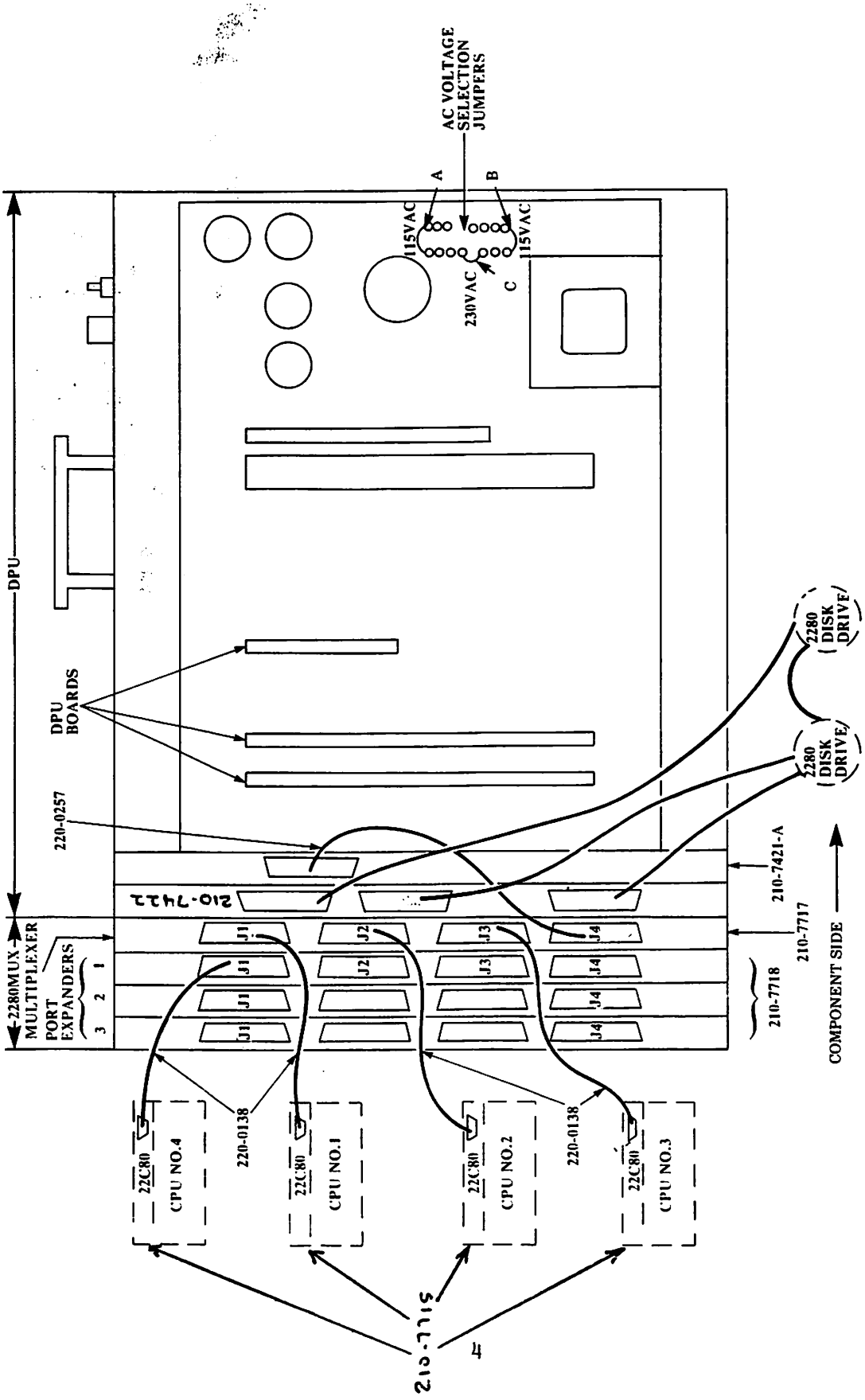



FIGURE 1 2280 DPU/MUX SYSTEM CONFIGURATION AND BOARD LAYOUT

## 1. GENERAL DESCRIPTION

The Model 22C80 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.

210-7715

NOTE:

The HEX values given in FIGURE 1 are correct only for boards at Revision 2 and above. For R0 and R1 boards (limited distribution) the HEX values are as follows.

| SWITCH # | HEX VALUE (R0, R1) | HEX VALUE (R2 + ABOVE) |
|---|---|---|
| 1 | 01 | 01 |
| 2 | 80 | 02 |
| 3 | 20 | 04 |
| 4 | 10 | 08 |
| 5 | 08 | 10 |
| 6 | 04 | 20 |
| 7 | 02 | 40 |
| 8 | NOT USED | 80 |

## 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.

R2 + ABOVE ONLY

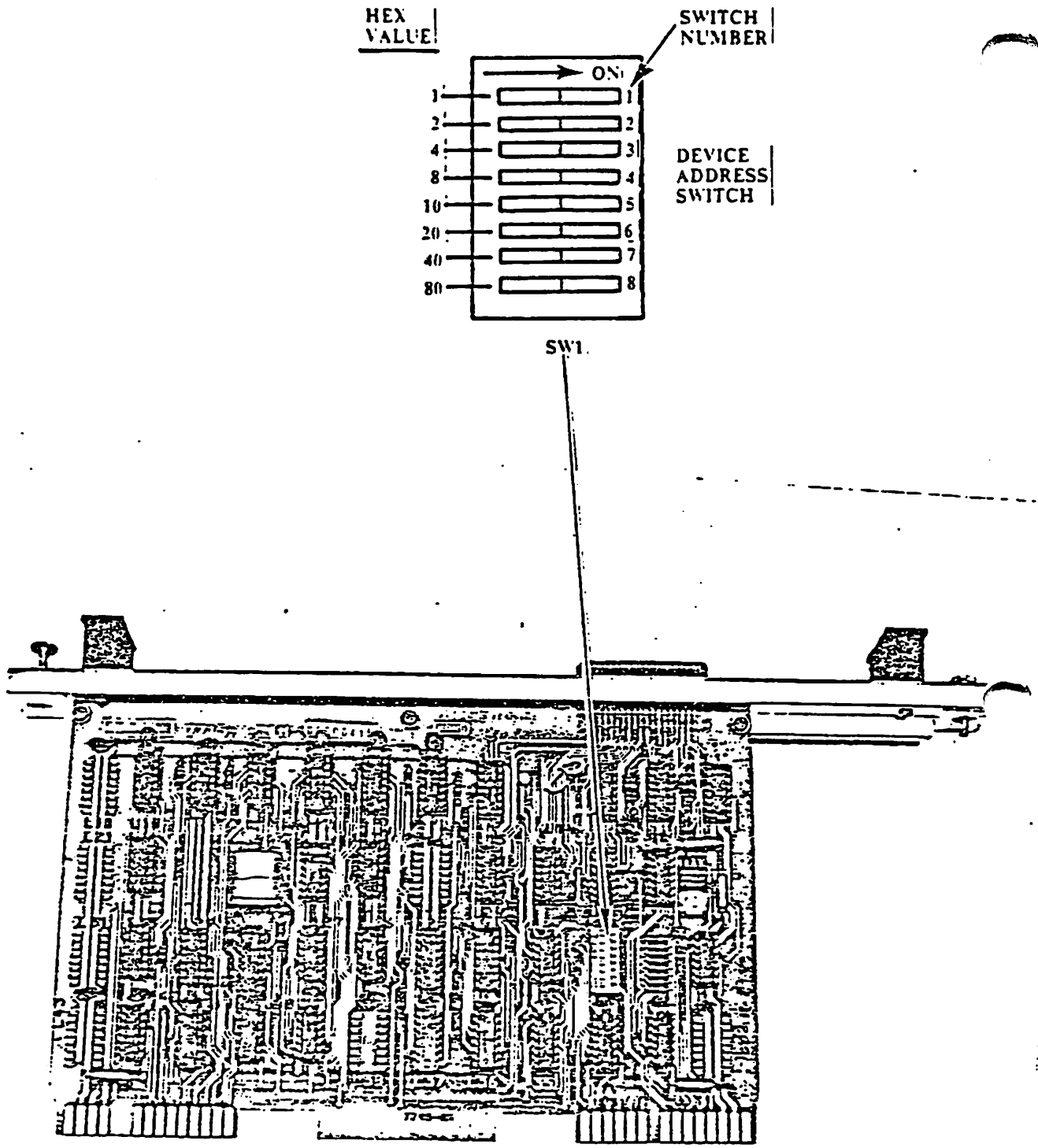



FIGURE 1 WL NO. 210-7715 22CS0 INTERFACE BOARD

MOTHER BOARD

CHASSIS MOUNTED

115/230V 50/60 Hz

L567

HEAT SINK

MOTHER BOARD

C4 (NEXT TO L567) OPEN +5VRM = 10V
+8V = 11V

C4 - +12V AT 10V ± CNNT ADJ.

C3 - TROUBLE ADJ DOWN TO 12V
VERY HIGH RIPPLE +12V
50 mV RIPPLE ON +5VL

COMPONENT LAYOUT

C1 - 300-3049

C3, C4 - 300-3019

Q5, Q7 (40251) 375-1008

Q3, Q11 (2N5956) 375-1030

Q1, Q2, Q8, Q9, Q4, Q10 (40250) 375-1022

NOTE: FOR PARTS LIST, REFER TO ORIGINAL DRAWINGS.
SEE D6439 FOR L567 BD.
SEE E6560 FOR MOTHER BD.
SEE C6627-998 FOR HEAT SINK

SIGNAL-TERMINAL DESIGNATIONS, VIEW FROM BOTTOM (WIRING) SIDE OF CONNECTOR

| WANG PART NO. | ITEM | QTY | NAME | MATERIAL | DESCRIPTION |
|---|---|---|---|---|---|
| DWN | | | WANG LABORATORIES, INC. | BY | DATE / APPROVED BY / DATE |
| CHK | | | MATERIAL | E ENGR | M ENGR |
| | | | FINISH | E C CONTROL | MFG ENGR |

MODEL NO 22005 3 or 6 I/O

TITLE SCHEMATIC LOGIBLOC INTERCONNECTION DIAGRAM

D 6627-377 1

SCALE — SHT 4 OF 5

WANG

# ECO

ECO NO. 36643

SHEET 1 OF

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ORIGINATOR | Sau Cai | M/S | 1439 | EXT. | 77332 | DATE | 05/08/85 |
| WRITTEN BY | Jeannine Roy | M/S | 1218B | EXT. | 76930 | DATE | 05/08/85 |

| | |
|---|---|
| PART NO. 210-7422 | DESCRIPTION 2200 SMD ECC/Device Interface |
| DWG NO. 7422 | |
| MODEL NO. 2280 | PEP # PEP# H0133A |
| CLASS I (II) III | TYPE [X] HARDWARE [ ] SOFTWARE |

## DESCRIPTION OF CHANGE

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

Change BOM 210-7422 as follows:

| | WLI# | DESCRIPTION | UM | COMP TYPE | | QTY | QTY TYPE |
|---|---|---|---|---|---|---|---|
| CHANGE | 330-1057 | Res 56 Ohm 1/4w 5% | EA | I | From: | 96 | I |
| | | | | | To: | 94 | |
| ADD | 330-2052 | Res 510 Ohm 1/4w 5% | EA | 1 | | 2 | 1 |

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 R48 from 56 Ohm Res 1/4 5% (330-1057)
to 510 Ohm Res 1/4w 5% (330-2052)

## REASON/SYMPTOM FOR CHANGE

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

| DOCUMENTS | REVISIONS F | REVISIONS T |
|---|---|---|
| BOM | | |
| ARTWORK | | |
| E-REV | 4 | 5 |
| SAMPLE BD | 4 | 5 |
| ASSY. DWG. | | |
| DRILL DWG. | | |
| SCHEM. DWG. | | |
| MECH. DWG. | | |
| CBL ASSY. DWG. | | |
| S.P.I. | | |
| MECH ASSY. DWG. | | |
| COMPONENT SPEC | | |

| EFFECTIVITY | RE-MFG. | C.E. | DIST. | FINAL ASSY AREA | SUB ASSY AREA | FUTR MFG. |
|---|---|---|---|---|---|---|
| TO CONFORM | X | X | | | X | |
| USE AS IS TO PREVIOUS REV. | | | X | X | | |

| APPROVALS | DATE |
|---|---|
| ECO MGR. | |
| DES. ENGRG. L. Comaro Sau Cai | 5/8/85 |
| CUST. ENGRG. | |
| MFG. ENGRG. | |
| ORIGINATOR Sau Cai | 5/8/85 |
| F.C.C. | |

WANG

# ECO

ECO NO. 4106 SHEET 1 OF 7

| | | | | | |
|---|---|---|---|---|---|
| ORIGINATOR | Gilles Carrier | M/S 1439 | EXT. 74478 | DATE | 05/29/86 |
| WRITTEN BY | Elly Gilks | M/S 1218B | EXT. 73230 | DATE | 05/29/86 |

| | |
|---|---|
| PART NO. 210-7717 | DESCRIPTION DISK MUX MASTER |
| DWG NO. 7717 | |
| MODEL NO. 2280 MUX | PEP # |
| CLASS I (II) III | |

## 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:

ECO TO G

JUN 2 5 1986

REVIEWED

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.
X Tie L34 pin 8 to L34 pin 5 and to L36 pin 3. (schem. zone 2A9,1C6)
Tie L19 pin 9 to L19 pin 10. (schem. zone 2B3)

NOTE TO EDD: Create 210-7717 History Sheet.

Continued on next page

## REASON/SYMPTOM FOR CHANGE

COMPANY CONFIDENTIAL

To stop I90 and I92 errors due to ring counter hangs in Mux.

## DOCUMENTS

| | REVISIONS FROM | REVISIONS TO |
|---|---|---|
| HISTORY SHT. 510 | | |
| HISTORY SHT. 210 | See Below | |
| ARTWORK | | |
| E-REV. | 2 | 3 |
| ASSY. DWG. | | |
| DRILL DWG. | | |
| SCHEM DWG. | | |
| MECH. DWG. | | |
| CBL DWG. | | |
| S.P.I. | | |
| SPECIFICATION | | |

PRELIMINARY

| CONFORMING AREA | C.E. | REMFG. | DIST. | FINAL ASSY. AREA | SUB ASSY AREA | NEXT ORDER | INFO ONLY |
|---|---|---|---|---|---|---|---|
| | X | X | X | X | X | | |

CONFORMANCE DATE

## APPROVALS

| | DATE |
|---|---|
| ECO CHAIRPERSON | |
| DES. ENGRG Gilles Carrier | 6/3/86 |
| CUST. ENGRG | |
| MFG. | |
| MTO | |
| PP&M | |
| F.C.C. Michael Butler | |
| PROD. SAFETY Dick Bernier | |
| SECURE SYS. | |
| ORIGINATOR | |
| OTHER | |

14-19030 Printed in U.S.A. 5 85 7M

**TECHNICAL SERVICE BULLETIN**
**SECTION: HardWare Technical**

NUMBER: HWT REPLACES: HWT 9942 DATE: 10/05/95 PAGE 1 OF 2

MATRIX ID. 3110 PRODUCT/RELEASE# VS5/6/75E/5000/6000 & 2200 CS-D/DS

TITLE: VS/2200 5 1/4" 1.2MB Floppy Drive Compatibility & Configuration Issues

PURPOSE:

To alert the Field to possible configuration problems with the 5 1/4" 1.2MB floppy drive used with the VS and 2200 due to an incorrect jumper which may be soldered in or to a switch change required on the VS5000/6000 RCU Brd when changing drive manufacturers, and to provide specific information on which drives are compatible and how to jumper those drives.

EXPLANATION:

There are several different 5 1/4" 1.2MB Floppy Drives that are usable with the VS (2270V7) and also with the 2200. The jumper configuration is the same for both product lines. Several part numbers have been associated with these drives. Those part numbers include:

| | |
|---|---|
| 278-4055 | tested drive with black bezel |
| 725-0232 | vendor part # with black bezel (replaced by 278-4055) |
| 725-0258 | vendor part # with black bezel (replaced by 278-4055) |
| 725-0258G | vendor part # with gray bezel |
| 270-5162 | tested drive with gray bezel |
| 725-5083VS | vendor part # with gray bezel (replaced by 270-5162) |

Under any of these part #s, there are only 4 specific models numbers that should be found. Any other models from these Manufacturers or any other companies including Chinon are not compatible. The 4 models are:

**Panasonic JU-475-1xxx**
**Panasonic JU-475-2xxx**
**Panasonic JU-475-3xxx**
**Mitsubishi MF504C-327Ux Rev P only**

**Recently a large number of 1.2M drives have been returned to stock, taken from hardware returned to Asset Recovery. As these and similar drives are also used in many PCs which may require different jumper settings, the model numbers and jumpers need to be checked carefully when replacing.**

CORRECTIVE ACTION:

PANASONIC JU-475-1xxx Jumpers: p/n 278-4055/725-0258G

A problem was found with several Panasonic JU-475-1xxx drives. A soldered jumper, DR, had to be cut. With the DR jumper in, the 'door closed' signal is tied to 'drive select'. This causes the floppy LED to stay on and the spindle to continuously spin if the door is open on power up. The drive is then inaccessible. On a 2200 system the symptom is the same if the door is open, but with a diskette installed & the door closed, the drive will pass the power up self-test and appear to work ok. Be sure when replacing this drive to check this jumper and cut it if it's closed.

OVER

MATRIX ID. 3110 PRODUCT/RELEASE# VS5/6/75E/5000/6000 & 2200 CS-D/DS

TITLE: VS/2200 5 1/4" 1.2MB Floppy Drive Compatibility & Configuration Issues

CORRECTIVE ACTION (cont):

The DR jumper is found between rows 'A' & 'B' and chips 4 & 5, next to the DD jumper. The correct jumpers settings are:

DS1 in, DS2,3,4 out
DO in, DC,LR out
AX/AT - AX
IRD out
HA out
DS/MX - DS
BX/CX - BX
SP,IX,DD all out
MM,DA in, MS,OA,UA out

150 OHM Terminator Chip in at location C1 (next to the I/O cable conn)

** VS5000/6000: if replacing a Mitsubishi, RCU Sw Bk 2, sw 6 must be set to ON

PANASONIC JU-475-2xxx Jumpers: p/n 278-4055/725-0258G

DS1 in, DS2,3,4 out
DO in, DR,DC,LR,RD all out
IRD out
BX/CX - BX
DS/MX - DS
AX/AT - AX
SP out
MM,DA in, MS,HA,OA,UA all out

150 OHM Terminator Chip in (located next to the I/O cable connector)

** VS5000/6000: if replacing a Mitsubishi, RCU Sw Bk 2, sw 6 must be set to ON

PANASONIC JU-475-3xxx Jumpers: p/n 278-4055/725-0258G

DS1 in, DS2,3,4,MX all out
DA in, PA,UA,HA,LA,IM all out
MS/MM MM
BX in
PH/HH - PH
TM in (jpr for termination)
TH in, MDA,MDB,DD out
NAX in

** VS5000/6000: if replacing a Mitsubishi, RCU Sw Bk 2, sw 6 must be set to ON

MITSUBISHI MF504C-327U REV P Jumpers: p/n 270-5162/725-5083VS

The Mitsubishi drives have a silver label on either the top or bottom edge near the rear with the Mitsubishi name, model #, and revision. Only the P rev drives with a special terminator sip are usable with the VS or 2200. There are other floppy drives that fall under the 725-5083 part #, but only the Mitsubishi MF504C-327U Rev P can be converted. If you have a 270-5162 or 725-5083VS, it should be jumpered correctly with the right terminator. If it is jumpered incorrectly you should assume it is a 725-5083 and has the wrong terminator. These incorrect terminators can be used by cutting pin 4 & soldering a wire to pin 2 that inserts into the hole for pin 4. The new terminator is p/n 333-0988, has no missing legs, and is marked 4609X-N74. The correct jumper settings are:

MX in, DS3,0,1,2 out
SS in, ND,SB,SG,IP out
SR,RD,RI,IU,IR,MM,IS,HR in, DC,MS,IL,DD out
TPA out

Terminator Sip, p/n 333-0988, in (located next to the I/O cable conn)

** VS5000/6000: RCU Sw Bk 2, sw 6 OFF (ON for Panasonic). Min @MCRCU@ 1.06.03

For questions concerning this TSB contact: Mike Bahia 508-858-7095

GROUP: Continuation Engineering MAIL STOP: 027-G1D

# TECHNICAL SERVICE BULLETIN
# SECTION: HardWare Technical

NUMBER: HWT 9524 REPLACES: _____ DATE: 11/ /90 PAGE 1 OF 2

MATRIX ID. 3107 PRODUCT/RELEASE# 2200 DS & CS-D TEAC Tape Drive

TITLE: Backup problem with 500/600' tapes & other tape related info

PURPOSE:

To inform the field of a problem using 500' or 600' tapes with the 45 Meg TEAC Tape Drive, and to provide some information on the 150 Meg Tape Drive.

EXPLANATION:

A problem can occur using 500' or 600' tapes with the 45 Meg TEAC Tape Drive. The symptom is for the tape drive to hang during 'backup' with the message "Positioning to last block" on the screen. This only happens when adding a 2nd backup to a tape where the first address backed up was approximately 22500-26000 sectors long. The problem is fixed with a new prom on the drive. This problem does not occur on the 150 Meg Tape Drive.

With the 45 Meg Tape Drive, the tape is divided into 9 serial tracks, 1 used for a directory and 8 for data. The directory track details the disk address, name if desired, and starting and ending sectors/blocks for each address stored. When Backup is selected, the user must decide to either erase or append to the tape. On a blank tape, an erase is always done. The initial backup then starts on the 1st data track. If the end of tape is reached, tape movement reverses and writing starts on the 2nd track. Once track 2 is full, direction again reverses and track 3 begins and this continues until the backup is completed. Once all data from an address is copied, an entry is made in the directory. If more data is to be stored on the same tape, the directory is checked. The last directory entry indicates where the backup ended and the tape is positioned there to start the new backup. Originally, tapes used with this drive were 450'. The problem occurs with 600' and some 500' tapes if the first address saved has approximately 22500-26000 sectors and a 2nd address is added. A 600' tape can save about 26000 sectors on the 1st track. The drive was programmed to start looking at the begining of the 2nd track for the end of data after 22526 sectors. When it finds no data at the start of the 2nd track, the drive times out and hangs with the message, "Positioning to last block". A 500' tape will probably only fail if the 1st address stored is in the 22500-23000 sector range while the 600' tapes could fail anywhere from 22500 to approximately 26000. The exact number of sectors to cause a problem can vary between tapes of the same length because of variances with actual physical tape length and the number of bad blocks.

GROUP: 2200 Product Support MAIL STOP: 014-A3A

# TECHNICAL SERVICE BULLETIN
# SECTION: HardWare Technical

NUMBER: HWT 9524 REPLACES: _____ DATE: 11/ /90 PAGE 2 OF 2

MATRIX ID. 4103 PRODUCT/RELEASE# 2200 DS & CS-D TEAC Tape Drive

TITLE: Backup problem with 500/600' tapes & other tape related info

CORRECTIVE ACTION:

There are several circumventions as well as a fix to this problem. TEAC is currently in the process of implementing the fix for Wang and 25 drives should be in CE stock by the time this TSB is published. The fix involves replacing a 28 pin prom usually soldered in at location U3 of the PCBA-IC board. The good drives will have a 'D' on the prom, problem drives a 'C'.

Corrected Drives: U3 PCBA-IC Board - D 0067-01
Problem Drives: U3 PCBA-IC Board - C 0067-01

Due to the limited nature of this problem, drives should be replaced on a problem only basis. To insure getting an updated drive domestically, orders should be sent to Lowell as Second Level Centers are not purged.

Circumventions: If using the standard DS Utility Backup:

1. Select a surface with less than 22500 or more than 26000 sectors to be the 1st backup. Surface size can be checked by listing each disk & noting the "CURRENT END" sector: LISTDCT/xxx (xxx = disk address).
2. Change the end sector on the 1st Backup from the 22500-26000 range to 27000. This will use additional tape writing blanks and a few more seconds of time, but will be otherwise transparent to the user.
3. One line change to @DSTAPEB. Contact Mike Bahia, 508-656-0256.

ADDITIONAL INFORMATION:

150 Meg Tape Drive: The only requirement is the R3 prom. Prom rev can be checked using the DS Utility Disk & selecting the Configuration pick from the main menu. Switch settings & cabling are identical to the 45 Meg.

| | |
|---|---|
| 150 Mg TEAC Tape Drive (MT-2ST/N65 - 4" drive on HH assy) | 725-4893 |
| 45 Meg TEAC Tape Drive (MT-2ST - true half height device) | 725-1481 |
| R3 Prom FCO 1375 for DS/FCO 1376 for CS-D | 728-0386/0387 |

Tape Compatibility: There has been some confusion over the tapes used with the 45 & 150 Meg TEAC Tape Drives. The following table should help:

| | |
|---|---|
| 600' Extra Density Tape (read/write - 150 Meg Drive only) | 725-7548 |
| 600' High Density Tapes (r/w - 45 Meg; read only - 150) | 725-4055-1 |
| 450'/500' High Density (r/w - 45 Meg; read only - 150) | 725-1482-1 |

Write Protect: To write, the hole toward the end of the tape inserted into the drive first must be covered. With the slide version the tab must be toward the corner. Writing to a protected tape should give an error T12. With a 150 Meg you may incorrectly see a T1B error (Illegal command). A fix should be in the next release of the DS Utility after 2.0.

GROUP: 2200 Product Support MAIL STOP: 014-A3A

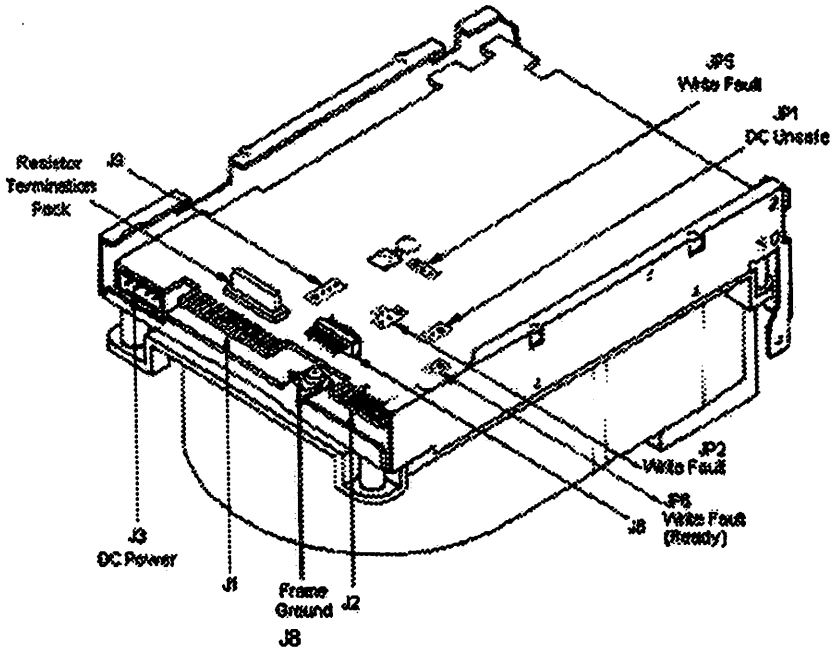
# ST4096 730-767 1MVPS

## ST412 Family

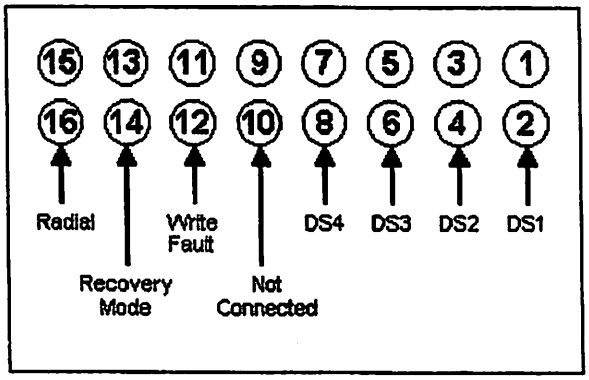
WILL WORK IN PLACE OF 64M

Cylinders: 1024
Heads: 9
Sectors: 17

Capacity: 80.2 MB
Speed: 3600 rpm
Seek time: 28 ms avg
SeaFAX#: 4096




J8



**PRINTER OPTIONS:**

There are six options available for the thirteen types of printers that Redshaw supports. These options are summarized in the table below.

| PRINTER | MODEL | CHARACTER PITCH | PRINT QUALITY | LINES PER INCH | LINES PER FORM |
|---|---|---|---|---|---|
| 7231w-1 | 31 | N/A (PICA ONLY) | N/A (STD. ONLY) | N/A | N/A |
| 2[illegible]w-6 | -6 | PICA, ELITE | N/A (STD. ONLY) | 6,8 | N/A |
| P-75W | 33 | PICA, ELITE | STD, ALT | 6,8 | 66,88 |
| P-150W | 35 | PICA, ELITE | STD, ALT | 6,8 | 66,88 |
| P-50 | 45 | PICA, CONDENSED | STD, ALT, LET | 6,8 | N/A |
| P-75<br>P-150 | 53 | PICA, ELITE, CONDENSED | STD, LET | 6,8 | 66,88 |
| P-3/600 | 73 | N/A (PICA ONLY) | N/A (STD. ONLY) | N/A | 66,88 |
| P-80 | 80 | PICA, ELITE, CONDENSED | STD, LET ITAL, PROP | 6,8 | 66,88 |
| P-85X | 8X | PICA, ELITE, CONDENSED | STD, LET ITAL, PROP* | 6,8 | 66,88 |
| Daisy | 81 | N/A (PICA ONLY) | N/A (STD. ONLY) | 6,8 | 66,88 |
| P-400 | L4 | N/A (PICA ONLY) | N/A (STD. ONLY) | N/A | 66,88 |
| ***P-120<br>P-240 | 40 | PICA, ELITE, CONDENSED | STD, LET | 6,8 | 66,88 |
| **P-90+ | 90 | PICA, ELITE CONDENSED | STD, LET | 6,8 | 66,88 |
| LaserJet | W8 | PICA, ELITE, CONDENSED | LET, ITAL | 6,8 | 66,88 |

* Proportional print quality is only available in the PICA character pitch mode.

** This is a color printer; therefore, you can also select the color you want to use (see page I44.).

*** The Redshaw P-120 Printer is also known as the Centronics 240.

# Lidingö Import AB

LI AB

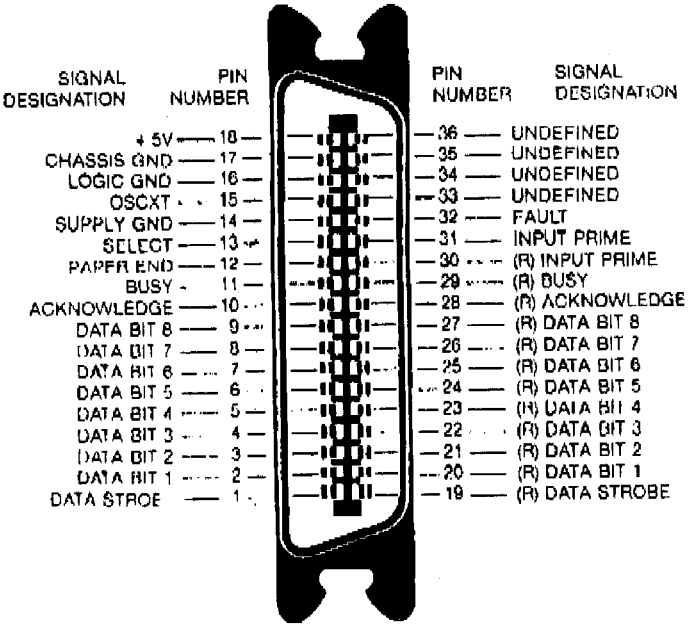
TO:
MIKE BAHIA

FROM:
LARS WALLENSTROM

| | |
|---|---|
| SELECT | P13 |
| PAPER END | P12 |
| BUSY | P11 |
| ACK | P10 |

The Centronics® Parallel Interface is a 36-pin, byte-wide interface that has become a widely accepted standard for computer-to-printer communications. The interface has eight lines which carry their respective binary bits in parallel. The transmission of these data bits is controlled by the computer-supplied STROBE pulse. Handshaking (flow control) is achieved by asserting or deasserting either the ACKNLG or BUSY leads or both. All Centronics Parallel logic levels are TTL. For your convenient reference, we have included a diagram of the Centronics connector and a chart that covers the most commonly used leads.

## Parallel Interface (Centronics type)




(R) INDICATES SIGNAL GROUND RETURN

| SIGNAL PIN NO | RETURN PIN NO | SIGNAL | DIRECTION (with ref. to printer) | DESCRIPTION |
|---|---|---|---|---|
| 1 | 19 | STROBE | In | STROBE pulse (negative going) enables reading data. |
| 2 | 20 | DATA 1 | In | 1st to 8th bits of parallel data. Each signal is at "HIGH" level when data is logical "1" and "LOW" when logical "0". |
| 3 | 21 | DATA 2 | In | |
| 4 | 22 | DATA 3 | In | |
| 5 | 23 | DATA 4 | In | |
| 6 | 24 | DATA 5 | In | |
| 7 | 25 | DATA 6 | In | |
| 8 | 26 | DATA 7 | In | |
| 9 | 27 | DATA 8 | In | |
| 10 | 28 | ACKNLG | Out | "LOW" indicates that data has been received and that the printer is ready to accept other data. |
| 11 | 29 | BUSY | Out | "HIGH" indicates that the printer cannot receive data. |

NOTE: Pins 12, 13, 14, 15, 18, 31, 32, 34, 35, and 36 vary in function depending upon application; they are commonly used for printer auxiliary controls, and error handling and indication.

Pins 16 and 17 are commonly used for logic ground and chassis ground, respectively.

# WANG PRINTERS

| Device | Type | Image Quality | Speed | Character Set | Pitch | Line Length | # of Copies | Usage/ |
|---|---|---|---|---|---|---|---|---|
| 2201L | Selectric | Excellent | 15 cps | 88 | 12 | 156 | 4 | 2 hrs/da |
| 2221W | Matrix | Acceptable | 200 cps | 96 | 10 | 132 | 4 | 3 hrs |
| 2231W-1 | Matrix | Acceptable | 120 cps | 96 | 10 | 112 | 3 | 3 hrs |
| 2231W-2 | Matrix | Good | 120 cps | 96 | 12 | 132 | 3 | 3 hrs |
| 2231W-6 | Matrix | High Density | 70 cps | 96 | 12 | 132 | 3 | 3 hrs |
| 2251 | Matrix | Good | 90 lines/min-Bl<br>85 lines/min-Rd | 111 | 14 | 40 | 0 | 3 hrs |
| 2261W | 4 Head | Good | 220 lpm | 96 | 10<br>12 | 136<br>160 | 4 | 3 hrs |
| 2263-1 | Chain/Train | Good | 400 lpm | 64 | 12 | 132 | 4 | 6 hrs |
| 2263-2 | Chain/Train | Good | 600 lpm | 64 | 12 | 132 | 4 | 6 hrs |
| 2263-3 | Chain/Train | Good | 430 lpm | 96 | 12 | 132 | 4 | 6 hrs |
| 2273-1 | Band | Good | 250 lpm | 48<br>64<br>96 | 10<br>12 | 132<br>132 | 5 | 3 hrs |
| 2273-2 | Band | Good | 600 lpm | | | | 5 | 3 hrs |
| 2281P | Daisy | Excellent | 30 cps | 86 | 10<br>12 | 132<br>157 | 4 | 2 hrs |
| IP41L | Electro-Static Light | Excellent | 18 pg/min | 128 | 10<br>12 | 80<br>156 | 1 | Continuous |
| 2273-1 | Band | Good | 250 lpm | 48<br>64<br>96 | 10<br>15 | 11.2 | 5 | 3 hrs |
| 2273-2 | Band | Good | 600 lpm | | | | 5 | |

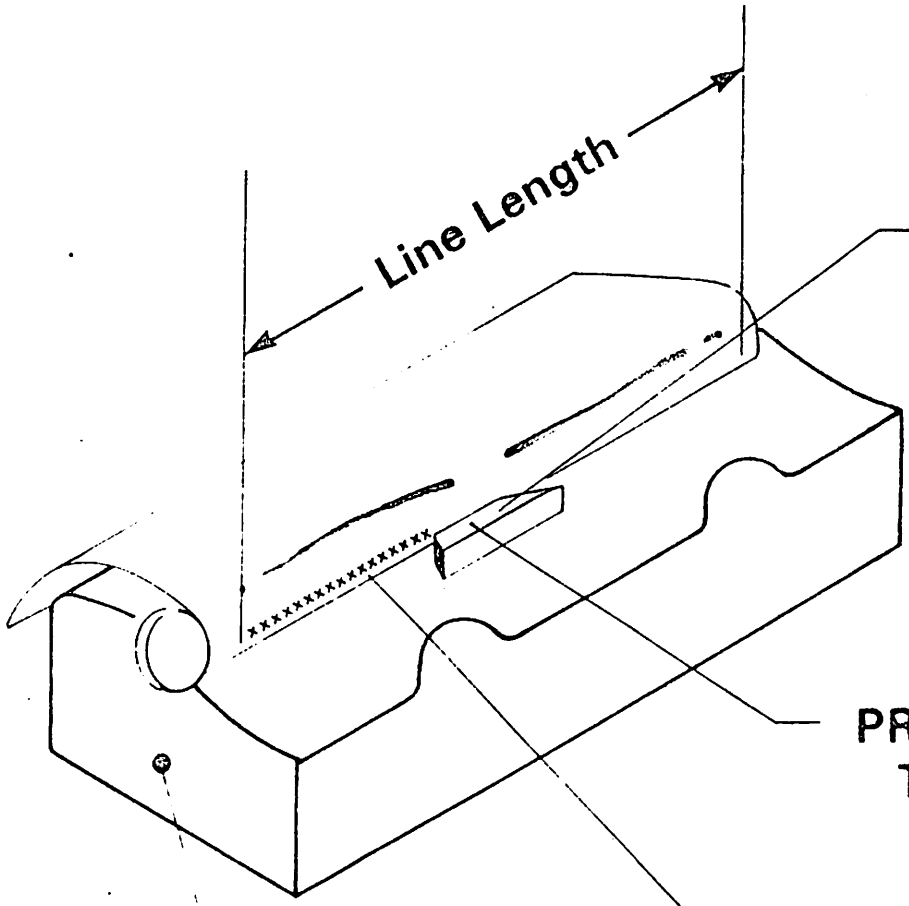
Notes:

PRINTE

# PRINTER BASICS

| Device | Type | Speed | Line Length | Usage/Da |
|---|---|---|---|---|
| 2221W | Matrix | 200 cps | 132 | 3 hrs |
| 2231W-1 | Matrix | 120 cps | 112 | 3 hrs |
| 2231W-2 | Matrix | 120 cps | 132 | 3 hrs |
| 2231W-6 | Matrix | 70 cps | 132 | 3 hrs |
| 2251 | Matrix | 90 BL<br>85 Rd | 40 | 3 hrs |
| 2261W | 4 Head | 220 lpm | 136<br>160 | 3 hrs |
| 2263-1 | Chain | 400 lpm | 132 | 6 hrs |
| 2263-2 | Chain | 600 lpm | 132 | 6 hrs |
| 2263-3 | Chain | 430 lpm | 132 | 6 hrs |
| 2281P | Daisy | 30 cps | 132<br>157 | 2 hrs |
| IP41L | EL/Light | 18 pg/min | 80<br>156 | Continuou |

# PRINTERS CHARACTERISTICS




ALSO:
- PITCH 12 - 18
- # of Copies,
- USAGE/DAY
- CHARACTER SET 64 - 128

Table 5. Wang Printers

| Model | Type | Image Quality | Rated Speed | Char./Hr. | Character Set | Pitch | Line Length | Copies |
|---|---|---|---|---|---|---|---|---|
| 2221W | Matrix | Acceptable | 200 cps | 514,800 | 96 | 10 | 132 | 4 |
| 2231W-1 | Matrix | Acceptable | 120 cps | 316,800 | 96 | 10 | 112 | 3 |
| 2231W-2 | Matrix | Good | 120 cps | 316,800 | 96 | 12 | 132 | 3 |
| 2231W-3 | Matrix | Acceptable | 120 cps | 316,800 | 96 | 10 | 132 | 3 |
| 2231W-6 | Matrix | High Density | 70 cps | 237,600 | 96 | 12 | 132 | 3 |
| 2251 | Matrix | Good | 90 lpm | 216,000 | 111 | 14 | 40 | 1 |
| 2261W | 4-Head Matrix | Good | 220 lpm | 1,742,400 | 96 | 10<br>12 | 136<br>160 | 4 |
| 2263-1 | Chain | Good | 400 lpm | 3,168,000 | 64 | 12 | 132 | 4 |
| 2263-2 | Chain | Good | 600 lpm | 4,752,000 | 64 | 12 | 132 | 4 |
| 2263-3 | Chain | Good | 430 lpm | 3,405,600 | 96 | 12 | 132 | 4 |
| 2273-1 | Band | Good | 250 lpm | 1,980,000 | 48, 64, 96 | 10 | 132 | 5 |
| 2273-2 | Band | Good | 600 lpm | 4,752,000 | 48, 64, 96 | 10 | 132 | 5 |
| 2281W | Daisy | Excellent | 40 cps | 144,000 | 86 | 10<br>12 | 132<br>157 | 4 |
| 1P41L | Electro-Static Light | Excellent | 18 pages minute | Not Applicable | 128 | 10<br>12 | 80<br>156 | 1 |

## PRINTER CHART

| MODEL | QUALITY | SPEED | PITCH | PRINT POSITIONS | PAPER WIDTH | FONTS | PIN FEED | SHEET FEEDER | Db (1) | AVAILABILITY | LIST PRICE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 2245 | Draft | 80 cps | 10 | 80 | 4-10" | Matrix | Inc. | N.A. | 58 | Immed. | $1,000.00 |
| | | | 16.5 | 132 | | | | | | | |
| 2233 | Draft | 100 cps | 10 | 132 | 3.5-14.9" | Matrix | Inc. | N.A. | 58 | Immed. | 2,500.00 |
| | | 120 cps | 12.2 | 158 | | | | | | | |
| DW/22-20 | Letter | 20 cps | 10 | 132 | 3.5-15" | Daisy | Opt. | Opt. | 58 | 4/82 | 2,695.00 |
| | | | 12 | 157 | | | | | | | |
| 2231W-6 | High Density | 70 cps | 10 | 110 | 3.5-13.5" | Matrix | Inc. | N.A. | 58 | Immed. | 3,300.00 |
| | | | 12 | 132 | | | | | | | |
| 2235 | Draft | 180 cps | 10 | 132 | 3.5-14.9" | Matrix | Inc. | N.A. | 58 | Immed. | 3,500.00 |
| 2281W | Letter | 30 cps | 10 | 132 | 3.5-15" | Daisy | Opt. | Opt. | 58 | Immed. | 4,500.00 |
| | | | 12 | 157 | | | | | | | |
| 2277 | Letter | 40 cps | 10 | 132 | 3.5-14.9" | Software Loadable 8 fonts | Opt. | Opt. | N/A | 5/82 | 6,000.00(2) |
| | | 48 cps | 12 | 158 | | | | | | | |
| | | 60 cps | 15 | 198 | | | | | | | |
| | Draft | 160 cps | 10 | 132 | | | | | | | |
| | | 192 cps | 12 | 158 | | | | | | | |
| 2273-1 | Solid Char. | 250 LPM | 10 | 132 | 3-16" | Bands | Inc. | N.A. | 72 | Immed. | 8,500.00 |

1. Db ratings taken in anachronic chambers
2. Price of 2277 is estimated (unannounced)

## PRINTER OPTIONS

| | | |
|---|---|---|
| TSF-21 | Twin Sheet Feeder | $2,000.00 |
| FT-1 | Forms Tractor | 250.00 |
| 8005-5 | Printer Stand (2233, 2235) | 250.00 |
| 8006-5 | Printer Stand (2231W-6) | 250.00 |

Envelope feeder

← Laser printer →  #30K

via WANGNET
RWF

or an OES 105
w/a TC option

NML

33 DW-20 1/82

81W - options (feeders) – transportable to DW20

Carrier detect - on MXE only
if line drops, the session is reset,
~~selects 4~~

VS OFFICE Electronic Mail  Monday  10/01/90  08:56 am

To: 2200 MAILBOX CLUB  MSO14-A3A/LOWELL
From: Mike Riley
Subject: 2200 : info required  Date: 09/11/90

Distribution:

Not Requested

---

Erwin De Smedt
Wang Belgium
Wang does not have a Standard Printer Driver... What we have is a Printer Driver Editor that let us build printer drivers for individual printers... Ex, MP017 uses @PM017V3 LDP8 uses @LASRJV1 ....Each of these drivers are built by the Printer Driver Editor...
Wang did agree to let VARs and Vendors make their own printer drivers for printers that Wang has not built drivers for at this time...The VAR or Vendor built printer driver is the sole responsibility of that VAR or Vendor....

I will send a copy of the Printer Driver Editor to each of the European RSCs so thay can distribute to the VARs and Venders of Europe... Wang Home Office will distribute to VARs Vendors in North America...
Michael Riley

To:
Subject: 2200 Lasers

Distribution:

None, this item is In Progress

---

To: Mike Bahia From: William J. Tumbleson
Subject: 2200 Lasers Date Sent: 05/24/90

Mike:
As a 2200 product specialist your answer does not give me a lot of confidence about the use of laser printers with 2200's. Who would you suggest talking to to find out if we have these printers in use at customer sites? This is a Redshaw account so I called Redshaw but I drew a blank when I asked if they supported laser printers? I also have a commercial account (the local chamber of commerce) that might be interested. As you know our sales people don't talk to 2200 users. HELP!

Bill T.

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

To: William J. Tumbleson From: Mike Bahia
Subject: 2200 Lasers Date Sent: 05/23/90

Bill,
According to the Pricing Manual both the LCS15 & the LDP8 are supported on the 2200. I am not familiar with either of these printers but they would have a Centronics interface for 2200 support & possibly other minor differences with similar versions used on other product lines. In other words the 2200 version is different from the serial versions. If I can be of further assistance pleas e let me know.

Regards,
Mike Bahia
Product Support
508-656-0256

---------- Reply ----------

Bill,
I'm a little confused. These are the supported lasers on 2200. I do not know or except that Wang Sales people will not talk to 2200 customers. If they cannot provide at least some cordial assistance there is a serious problem. If need be we could talk to the Sales manager. I would imagine there is a data sheet on these lasers. Sales should be able to provide the answers or get the answers. Harris Gates is the Marketing Guru for 2200 and I am sure he would be glad to help them (508-947-3797). Gene Schultz is the Product Line Manager. Though I am not familiar with these lasers, that has no bearing on whether they are supported. Bob Henrichs is the Hardware Product Support Engineer on the Laser printers. Please call me if necessary at 508-656-0256. I will be on vacation next week.

Regards,
Mike

# 21W MATRIX PRINTER

GENERAL OPERATION
CARRIAGE MOVEMENT

A carriage assembly moves the print head across the paper. Printing is performed by selectively firing the solenoids of the print head as it moves from left to right. Synchronoization of the print process and the carriage movement is provided by an optical photocell located on the carriage. The optical photocell moves across the timing fence which has vertical bars that interrupt the light to the phototransistor generating a video signal. This signal is used to generate a strobe for print timing.

The carriage is driven by a servo motor which results in fewer mechanical parts and quieter operation (refer to fig. 1). Feedback via a tachometer mechanically linked to the motor helps maintain stability and constant speed.

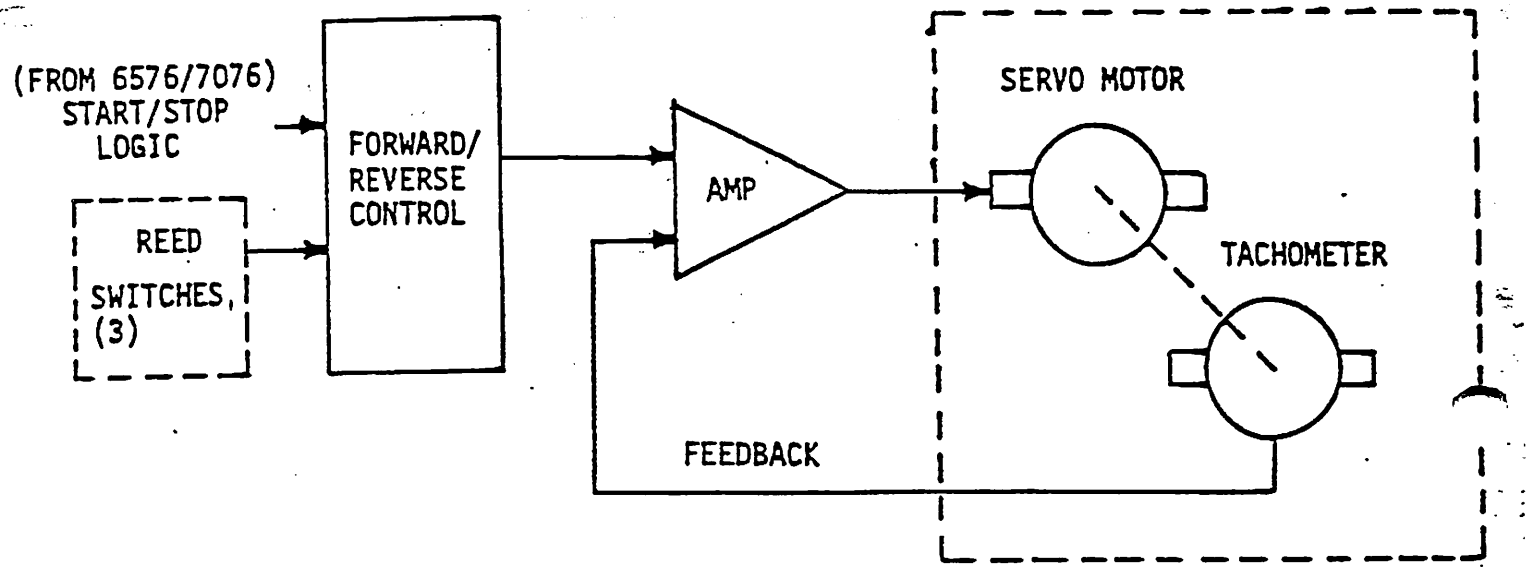



FIGURE 1 CARRIAGE SERVO MOTOR

There are three reed switches located on the frame of the carriage block. These switches are activated by a magnet located on the underside of the carriage. The outputs of these switches and Start/Stop logic from the 6576 board are used to control forward and reverse logic for the servo motor.

PAPER MOVEMENT

Paper movement is originated by three separate functions: line feed, vertical tab and form feed. Each of these functions causes paper movement by activating a stepping motor. For vertical tab and form feed, the motor will step until a hole is detected in the appropriate channel of the vertical format paper tape by the tape reader.

The Vertical Format Unit (VFU) consists of a 3 channel optical tape reader using channels 2, 5, and 7. Movement of the tape in the VFU is caused by direct mechanical linkage to the gear train that feeds the paper.

LINE FEED — A line feed can be generated by any of the following three conditions

a. Automatic line feed after each carriage return.(2200)

b. Receiving a line feed code (HEX (0A) on 2200) via the system as decoded by the function decoder.

c. Depressing the line feed key on the control panel of the printer (2200) (In this case, the printer must be deselected.)

VERTICAL TAB — A vertical tab can be generated only by receiving a vertical tab code. (HEX (0B) on 2200)

FORM FEED — A form feed can be generated by any of the following three conditions:

a. Receiving a form feed code (HEX (0C) on 2200) from the system decoded by the function decoder.

b. Pressing the Top of Form key on the control panel. (Printer must be deselected.)

c. When an end of document hole is detected by the VFU.

## RIBBON MOVEMENT

Ribbon movement is accomplished with logic controlled, triac driven 24 VAC gear motors, one for each direction. Only one motor is active at any one time. When an end of ribbon is detected, control is switched to the opposite motor. End of ribbon is sensed when a rivet on the ribbon catches and pulls the ribbon reverse actuator. This actuator closes a switch which toggles a flip-flop reversing the control logic.

Each ribbon motor assembly consists of a gear motor and a hold-in solenoid. The motor, when off, is not engaged in the gear box. However, when power is applied, motor action draws the armature up to engage the gears. When the printer is idle, the ribbon mechanism is disabled, and the motor drops from the gear box. To reduce wear on the gear motor, a hold-in solenoid is used to keep the driving motor engaged.

# 21W COMPATIBILITY CHART

| | | |
|---|---|---|
| **1. Memory and Regulator Board** | | |
| 210-7028 or 210-6728 6727Z | Need 7028 for Underscore | ALL PARALLEL |
| 210-6727D | Sw. Settings - 1 and 5 OFF; 2, 3, 4 ON | ALL SERIAL |
| **2. Format and Print Control Board** | | |
| 210-6577 | Jumper A to B and D to E | 2200 |
| 210-6577 | Jumper B to C and E to F | ALL VS and WP |
| **3. I/O Control and Data Storage Board** | | |
| 210-7076 or 210-6576 | Need 7076 for Underscore | ALL PARALLEL |
| 210-7076-1 | | 200W |
| 210-7076-2 | | ALL SERIAL |
| **4. Heat Sink** | | |
| 270-0261 | | ALL |
| **5. Control Panel** | | |
| 210-6734 | | ALL PARALLEL |
| 210-7038 | | ALL SERIAL |
| **6. Chassis** | | |
| 270-0260 | | 2200 |
| 270-0260 | Jumper I/O slot $D_1$ to 7076 slot $L_1$<br>I/O slot $B_2$ to 7076 slot $B_2$<br>I/O slot $L_2$ to 7076 slot $10_2$ | VS PARALLEL |
| 270-0260 | Add Canon Connector | ALL SERIAL |
| **7. 21V Converter Board** | | |
| 210-7231 | Insert in I/O slot J12 | VS PARALLEL ONLY |

## TOP FEED/BOTTOM FEED COMPATIBILITY

| Description | Top Feed | Bottom Feed |
|---|---|---|
| Carriage Assembly | 279-5070-42 | 279-5070-19 |
| Carriage Drive Motor and Tach A'ssy | 279-5070-54 | 279-5070-17 |
| Tach Belt | 656-0223 | 656-0227 |

## ELECTRICAL ADJUSTMENTS

To prevent damage to the print head while making the following adjustments, disconnect the print head electrically by disconnecting the finger board providing solenoid current. Then run a program for continuous printing. Each adjustment required for print timing is listed in Table 1. Perform the +5VR and -12VR adjustments before proceeding to print timing.

NOTE:

Whenever the 6577 or 6728/7028 board are changed, these adjustments must be checked.

TABLE 1

| LEVEL OR SIGNAL | BOARD | LOCATION | MEASUREMENT | ADJUSTMENT |
|---|---|---|---|---|
| +5VR | 6728/7028 | Pin $B_1$ | +5 volts ± .10 volts | R82 |
| -12VR | 6728/7028 | Pin $13_1$ | -12 volts ± .10 volts | R103 |
| WS | 6577 | Pin $L_3$ | 925 us ± 25 us full cycle | R38 |
| | | | squarewave (50% duty cycle) | R11 |
| WS(TRAILING EDGE) FOR PARALLEL | 6728/7028 | Pin $C_2$ | 425-435 us positive pulse | R44 |
| WS(LEADING EDGE) | 6728/7028 | Pin $S_1$ | 425-435 us positive pulse | R39 |
| LEADING & TRAILING FOR SERIAL | 6727D | L34 Pin 6 | 425-435 us positive pulse | R14 |
| | 6727D | L34 Pin 10 | 425-435 us positive pulse | R15 |

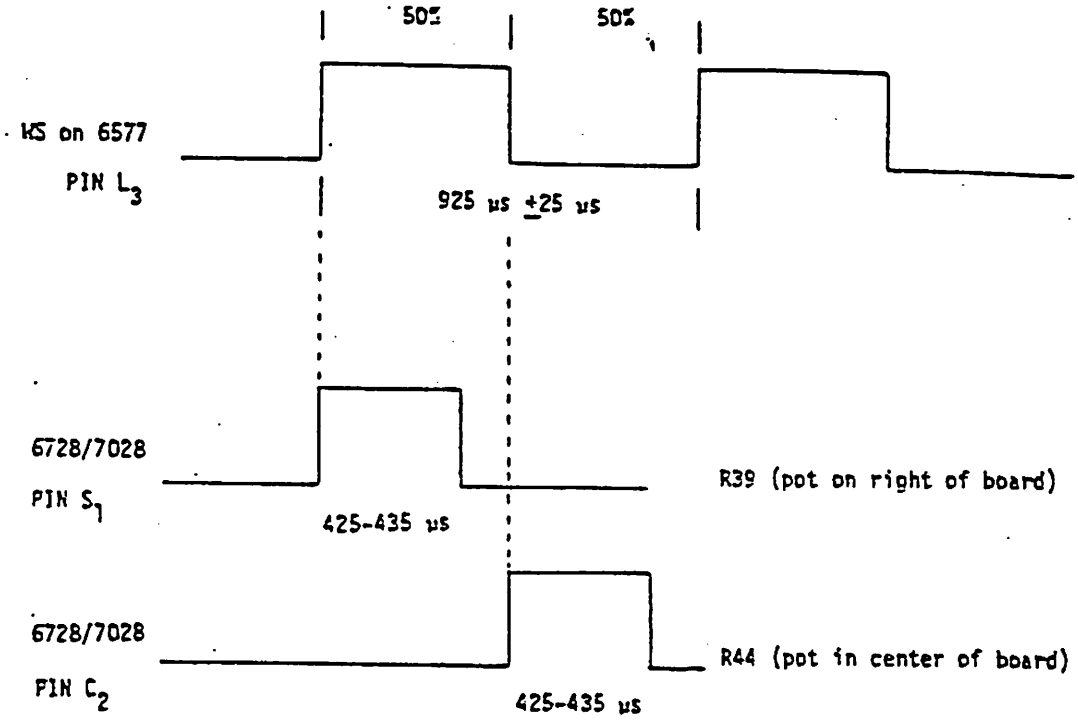
1) WS Adjustments - WS is generated by the optical sensor as it passes the timing fence marks. This signal must be adjusted by R38 on the 6577 board for a complete cycle of 925 us ± 25 us monitored at Pin $L_3$ of the 6577 board. R11 must then be adjusted to obtain a squarewave (50% duty cycle).

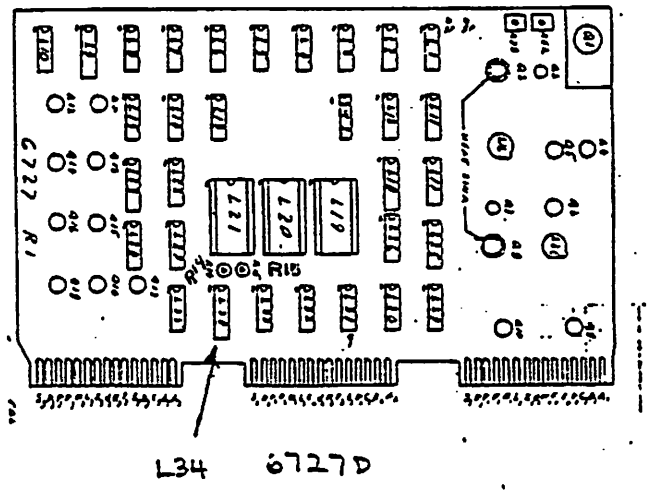
2) After obtaining the proper waveform for WS (Figure 1), the following pulses should be checked and/or adjusted.

WS trailing edge - Adjust R44 on the 6728/7028 board for a 425-435 us positive pulse at $C_2$ of the 6728/7028 board.
WS leading edge - Adjust R39 on the 6728/7028 board to obtain a 425-435 us positive pulse at $S_1$ of the 6728/7028 board.

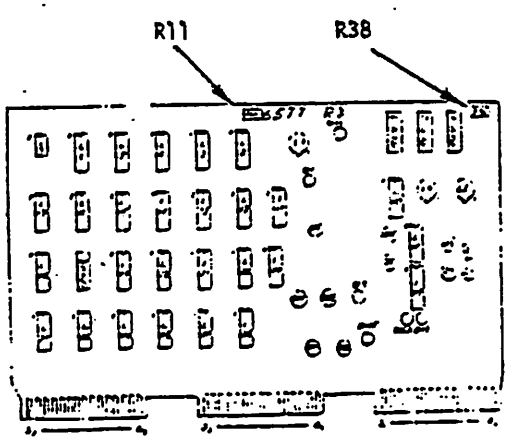
6727D - Adjust R14 for a 425-435 us positive pulse at L34 pin 6.
Adjust R15 for 425-435 us positive pulse at L34 pin 10.

The WS leading and trailing edge strobes are only present during the printing period. Replace print head solenoid finger board connector.




6577




6728

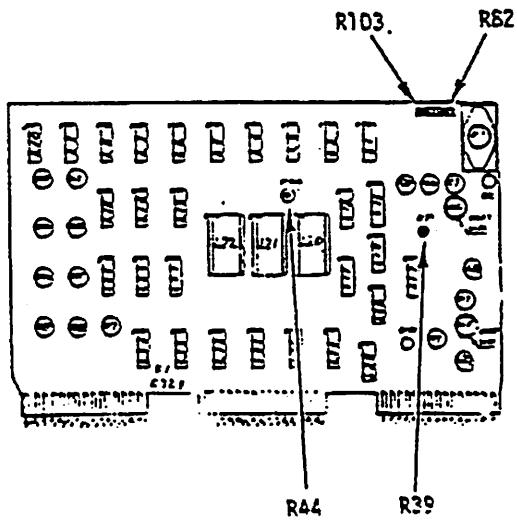



FIGURE 2 VOLTAGE AND WS TIMING ADJUSTMENTS

1. STRIKER BAR

With the head penetration knob turned fully clockwise so that the head is as close as possible to the striker bar and with the ribbon removed there should be a .005" gap between the print head and striker bar on both the left and right side.
Loosen the screws on either side of the striker bar to adjust.

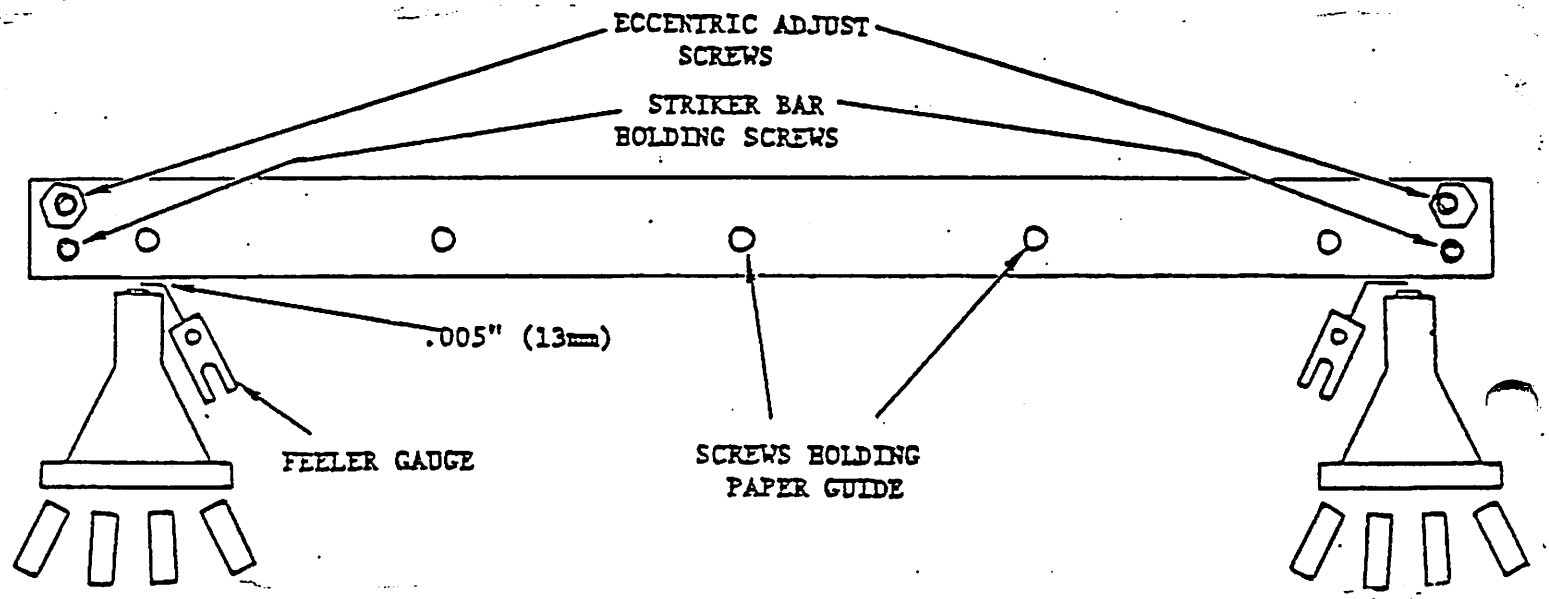



FIGURE 3 STRIKER BAR ADJUSTMENT

2. PAPER GUIDE PAN

The movable guide pan must be parallel to the fixed guide pan along the entire exit point under the striker bar. See figure 4. Adjust by loosening and moving the slotted pivot supports.

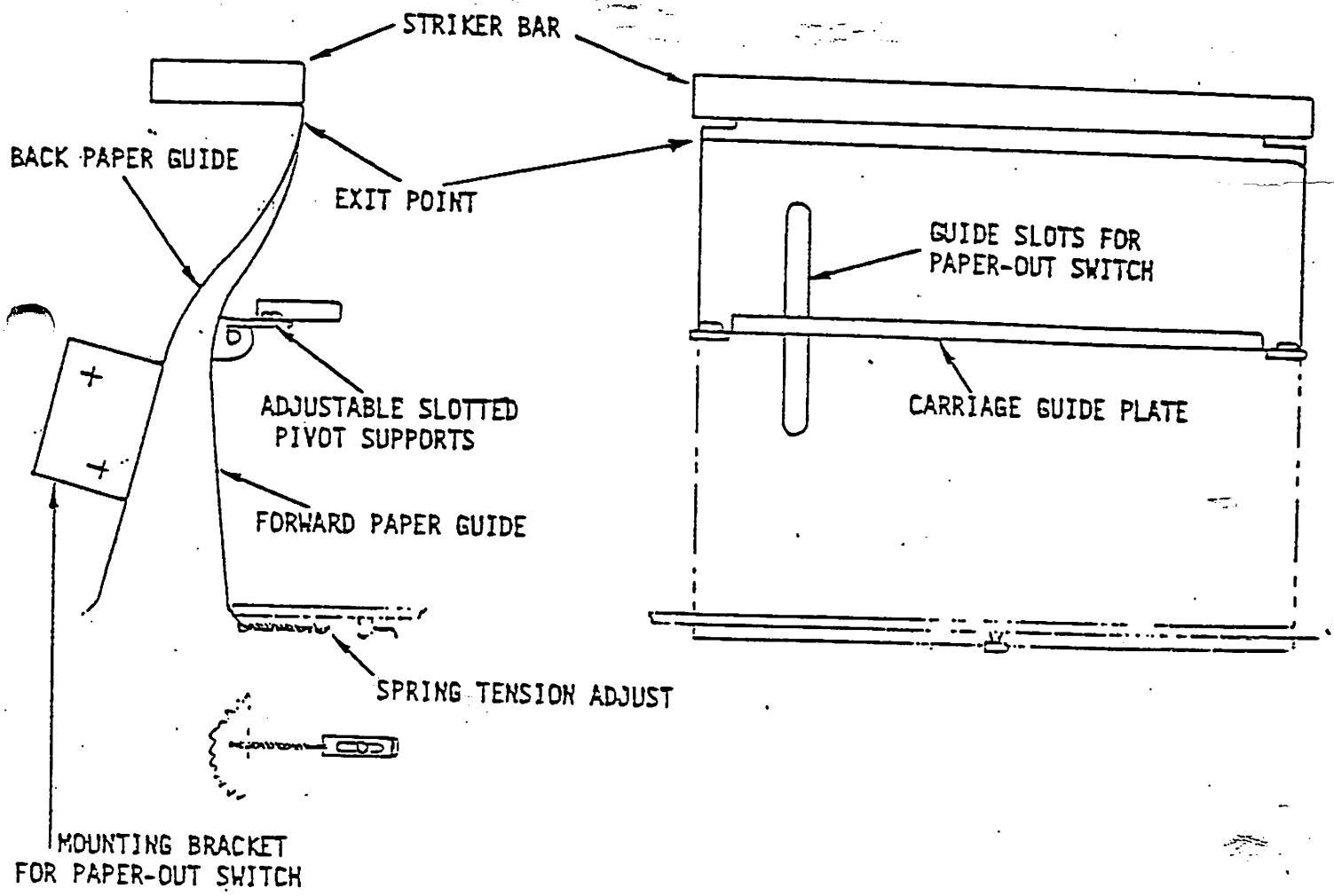



FIGURE 4 BOTTOM FEED PAPER GUIDE

3. PRINT HEAD SOLENOIDS

A. The basic adjustment of the solenoids is to have the tip's of the solenoid wires flush with the print head bearing.

B. To fine tune the solenoids have the printer continuously print and adjust the head penetration knob to the farthest setting from the striker bar at which most of the solenoids can still be seen printing. Adjust solenoids which are to lite or dark respectively in or out until the dots are basically of the same intensity by moving the entire solenoid, remembering that no solenoid should stick out past the bearing more than a slight amount. This adjustment should be done with a good ribbon on standard 1 part paper.

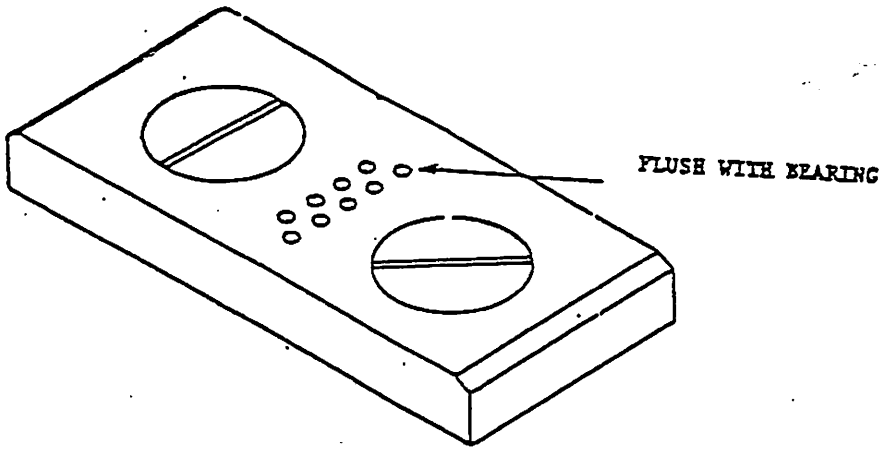



FIGURE 5 SOLENOID WIRE ADJUSTMENT

NOTE:

At times it may; be necessary to make one further adjustment to a solenoid which involves truning the nylon cap. If, for example, a solenoid is intermittently not firing after fine tuning turn the nylon cap clockwise 1/4 turn at a time and test. If this corrects the problem insure the tip of the solenoid does not protrude more than a slight amount past the bearing. If it does protrude too much readjust to flush and check again. With a solenoid that will not fire until head penetration is brought way in, adjust the nylon cap counter clockwise 1/4 turn at a time and test. No improvement in either case would call for replacement of the solenoid.

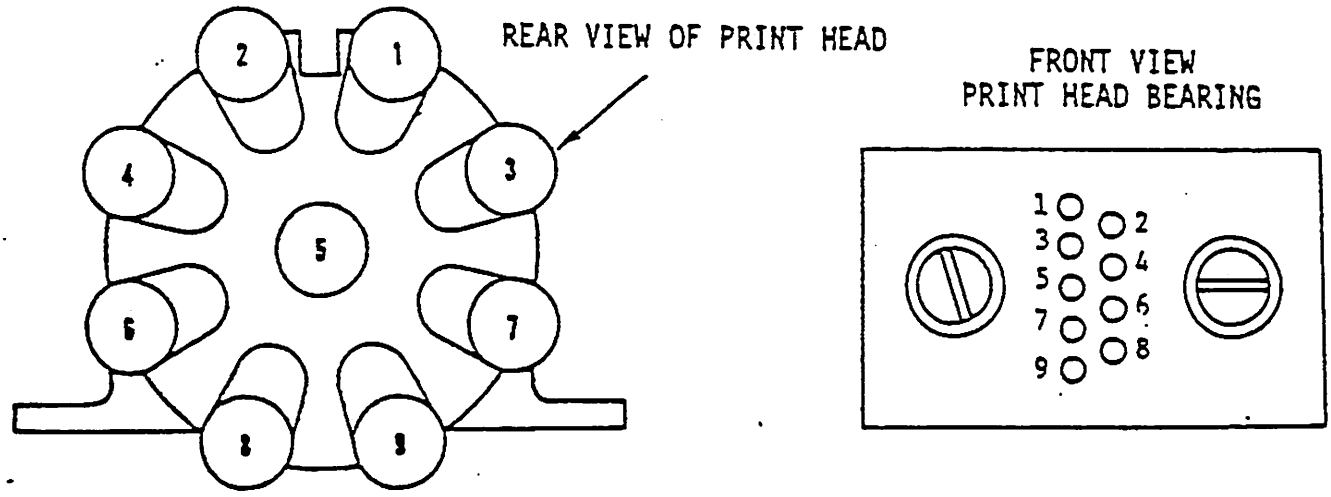
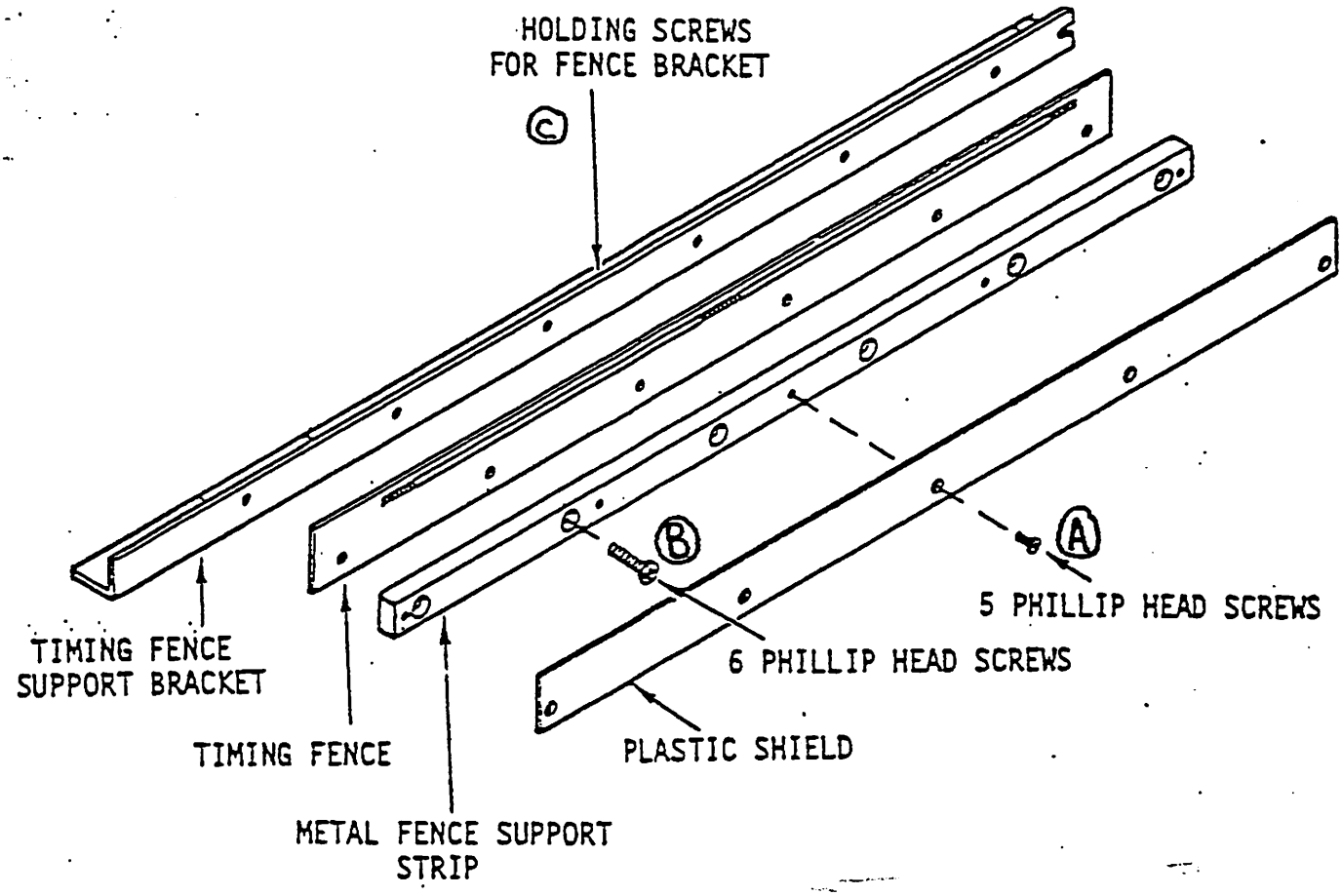



FIGURE 6 IDENTIFICATION OF SOLENOIDS

## TIMING FENCE

The timing fence should be straight and the distance between the fence and the photocell on the mask side should be .010" to .012" along the entire length. Mask should be on front side of photocell. To straighten a warped timing fence loosen screws (B), then while pulling from each end of the fence tightly, retighten screws. Loosen screws (C) to adjust fence parallel to sensor.



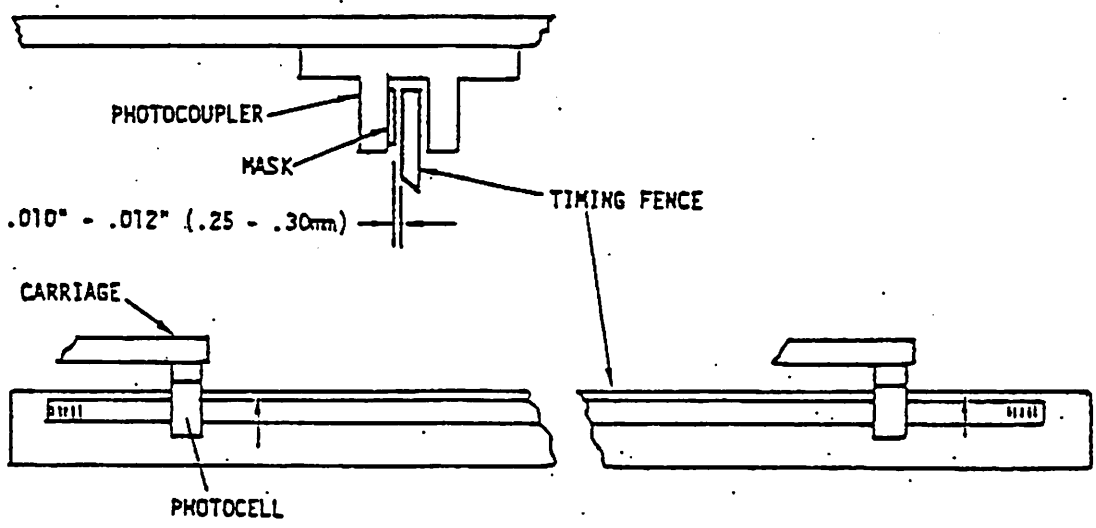




FIGURE 7 TIMING FENCE ADJUSTMENT CHECKS

5. REED SWITCHES

A. SW0 - With power off move carriage against left bumper. SW0 should be as far left as possible making sure the Servo Breaker does not open with power on.

B. SW1 - With power off move carriage to center of the striker bar. Upon powering on, the carriage should return to the left with the right side of the timing fence photocell stopping .125" to .25" from the left side of the first character position on the timing fence.

WARNING:

During the following procedure, as the carriage reaches the right hand limit switch it will automatically generate a carriage return. Use your left hand to hold the head cover and pull the carriage to the right. This allows the head to slip from your hand easily. AVOID PERSONAL INJURY.

C. SW2 - A carriage return should occur automatically when the left side of the photocoupler is between .125" and .25" (.32 cm and .64 cm) after the last character position on the timing fence. Check by slowly pulling the carriage from left to right and watching the photocoupler position in relation to the timing fence.

WARNING:

Because the screwdriver used may be magnetic, always adjust the reed switches with power off. The accidental closing of these switches could be hazardous.

Loosen screws in wafer boards with power off to adjust.

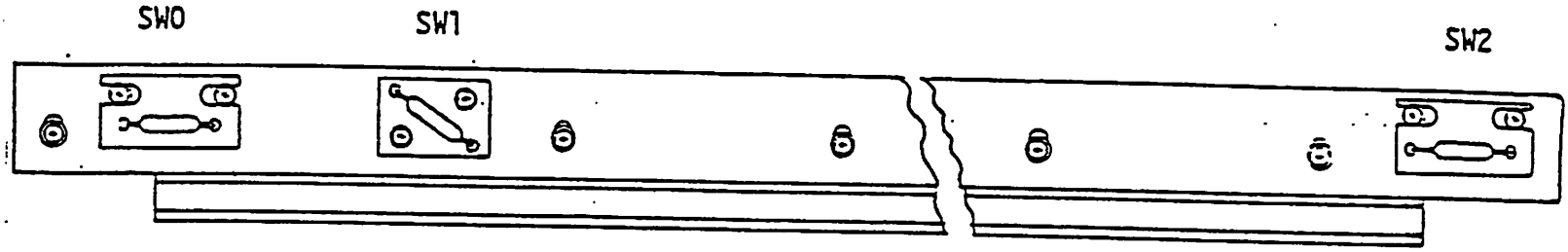



FIGURE 8 REED SWITCHES

6. REED SWITCH MAGNET

Looking from the side of the carriage, the magnet should be centrally located over the reed switches, and the slot of the magnet should face the front of the machine.

Loosen the magnet holding screw while holding the hex spacer and move the magnet to desired location. See figure 9.

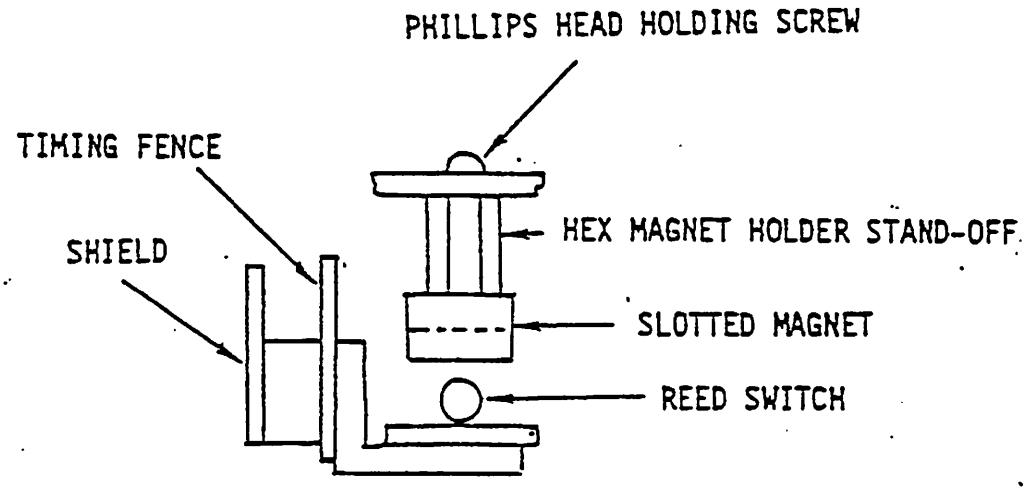



FIGURE 9 REED SWITCH MAGNET ADJUSTMENT

7. VERNIER CLUTCH

By using the manual paper adjust knob, push the vernier clutch in and out. With the use of a feeler gauge check for a clearance of .002" to .005" between the idler shaft pulley flange and the side frame as shown on Figure 10. Also when the knob is released after paper advancement the vernier clutch should fully reengage.
Loosen the allen set screw on the idler shaft to adjust.

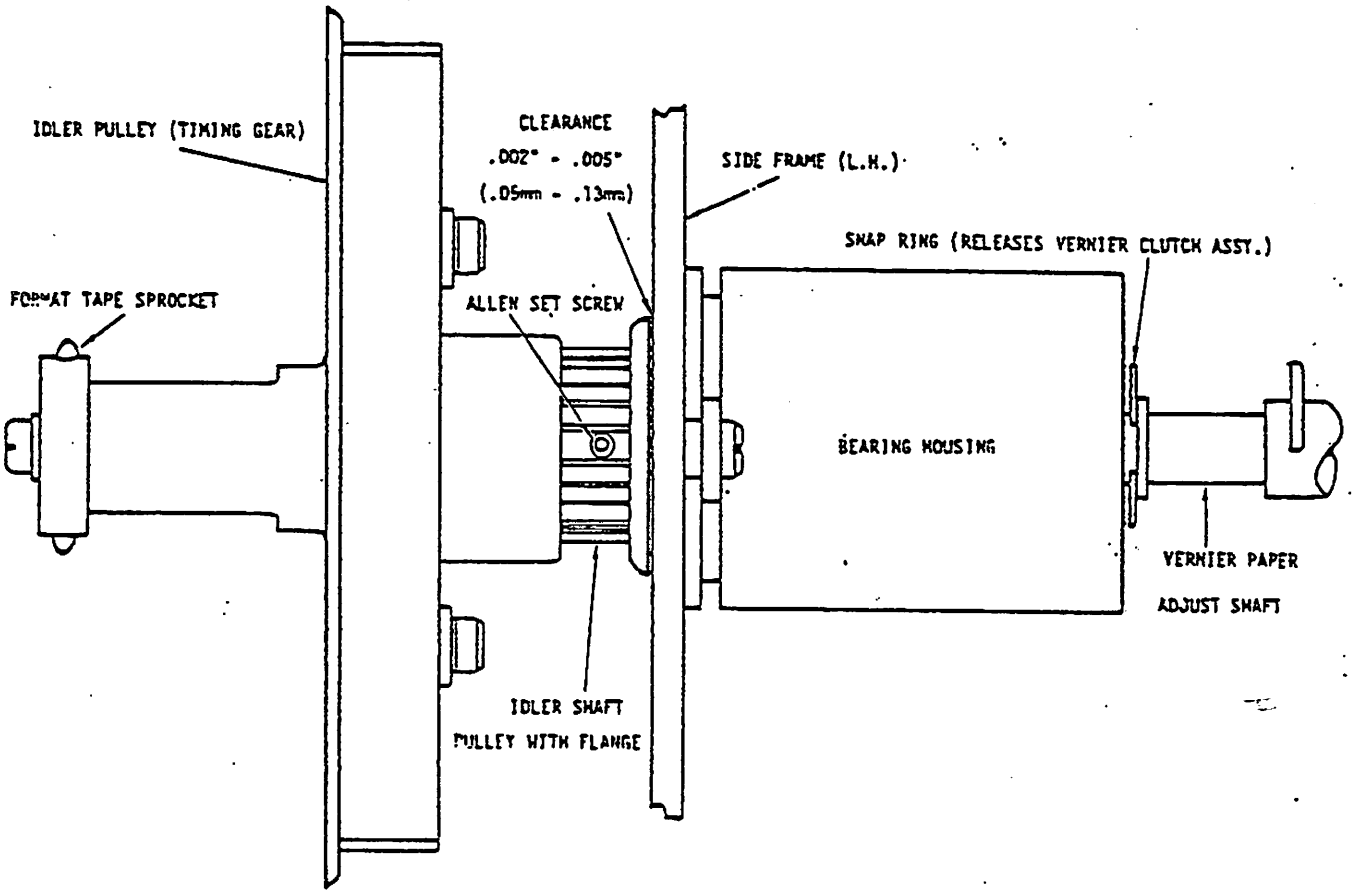



FIGURE 10 VERNIER CLUTCH ADJUSTMENTS

## 8. VERTICAL FORMAT UNIT

A. With the VFU closed there should be a uniform .010" to .015 clearance between the cover and housing. See figure 11A. Normally this can be adjusted by loosening the two screws holding the housing and adjusting the housing. If this does not succeed you may have to adjust the cover stop eccentric and/or raise or lower the cover all in combination. If the cover is raised or lowered make sure it is parallel along the recessed edge of the housing after tightening.

B. The curve of the sprocket gear should be flush and parallel with the curve of the housing allowing plenty of tooth height. See figure 11B and D. This usually can be adjusted by loosening the four screws which hold the plate to which the VFU is mounted. If you can not adjust correctly this way loosen the housing and redo step A.

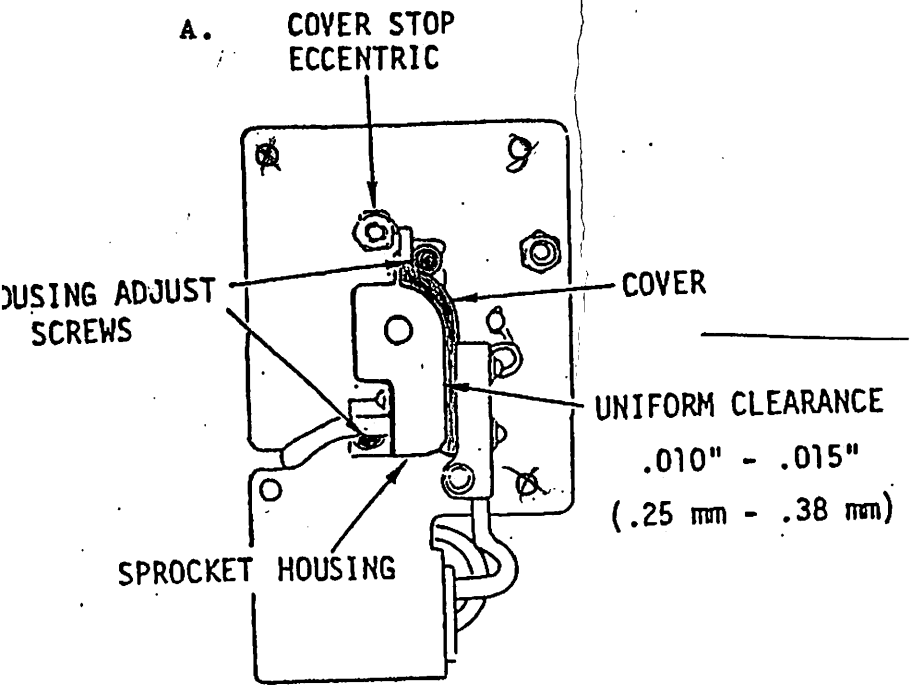
C. The format tape should be centered in the indented part of the housing. See figure 11C. Turn screw on end of shaft accessed thru hole in side of VFU.

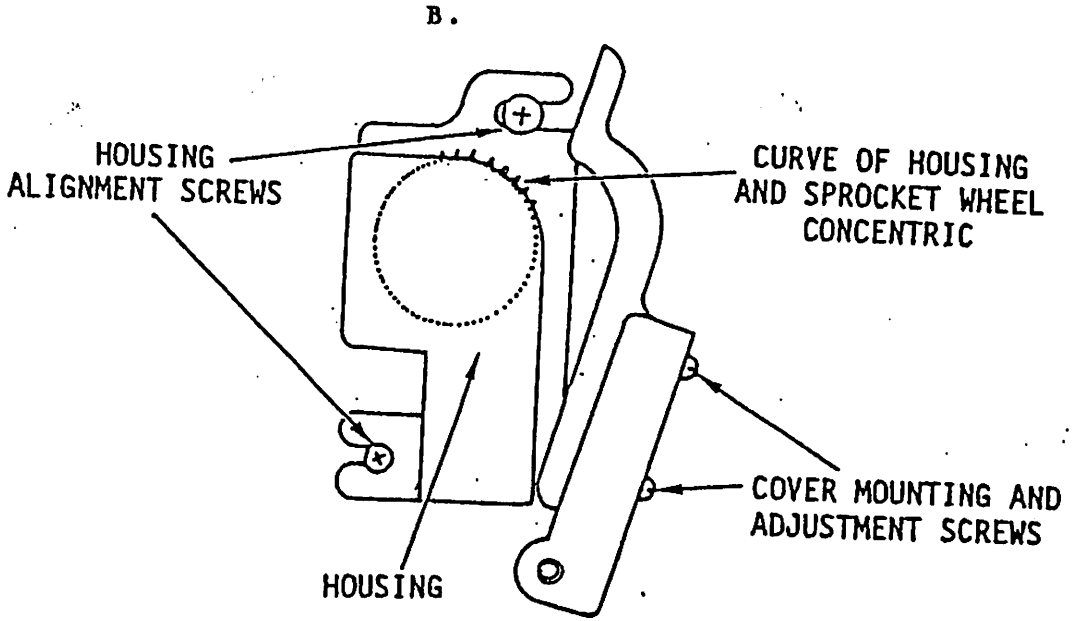
D. The output of the phototransistors should be at least 4V. Remove tape and check the following pins on the 6577 board.

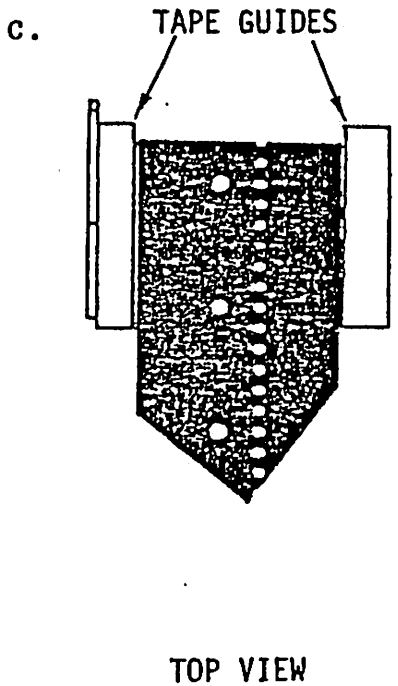
Channel 2 (End of Page) $M_1$
Channel 5 (Vertical Tag) $R_1$
Channel 7 (Top of Form) $P_1$

If less than 4V make sure LED's are clean then try adjusting the VFU cover up and down or side to side. If this corrects problem recheck all VFU adustments.
Now check voltages with tape in.
Use same adjustment as step C to correct.

E. The stepping motor and VFU should be in phase. Connect a scope probe (channel 1) to pin $R_1$ of the 6577 and another probe to pin $S_2$. Trigger on channel 1. Key Top of Form continuously. Channel 1 of the scope is the output of channel 5 of the VFU and channel 2 of the scope is the 8th step signal ($\overline{LFE}$) from the motor circuit. The 8 step pulse should appear just left of center of the VFU signal. See figure 12. If phase is off by more than a centimeter, a course alignment is necessary. Remove the belt between the stepping motor and timing gear (Vernier Clutch Assembly) and rotate the clutch assembly behind the VFU in desired direction several teeth and replace the belt. If the VFU signal is (channel 5) ahead of the 8th step pulse (Figure 12B), turn the Vernier Clutch Assembly counterclockwise. If phase is off by a centimeter or less, lossening the motor retaining screw(s) (four on early model and one on late model) and then turning the motor in desired direction will correct phase error.



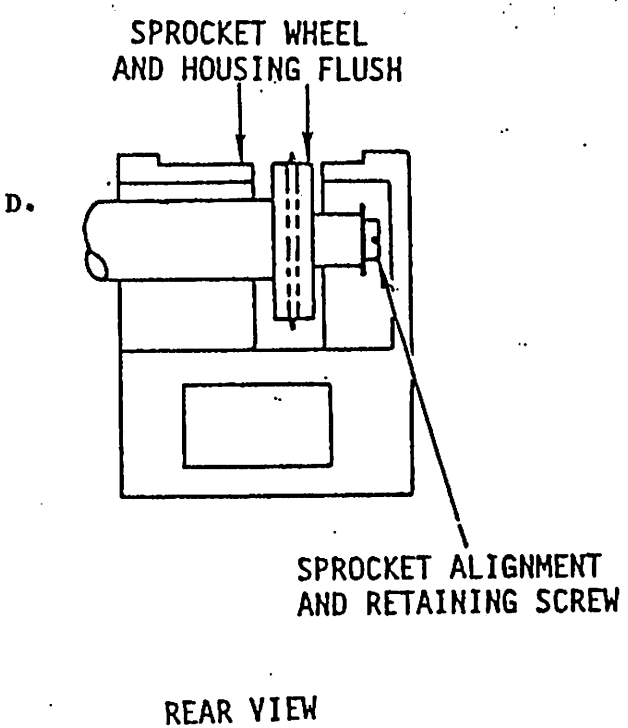




FIGURE 11 VFU ADJUSTMENTS

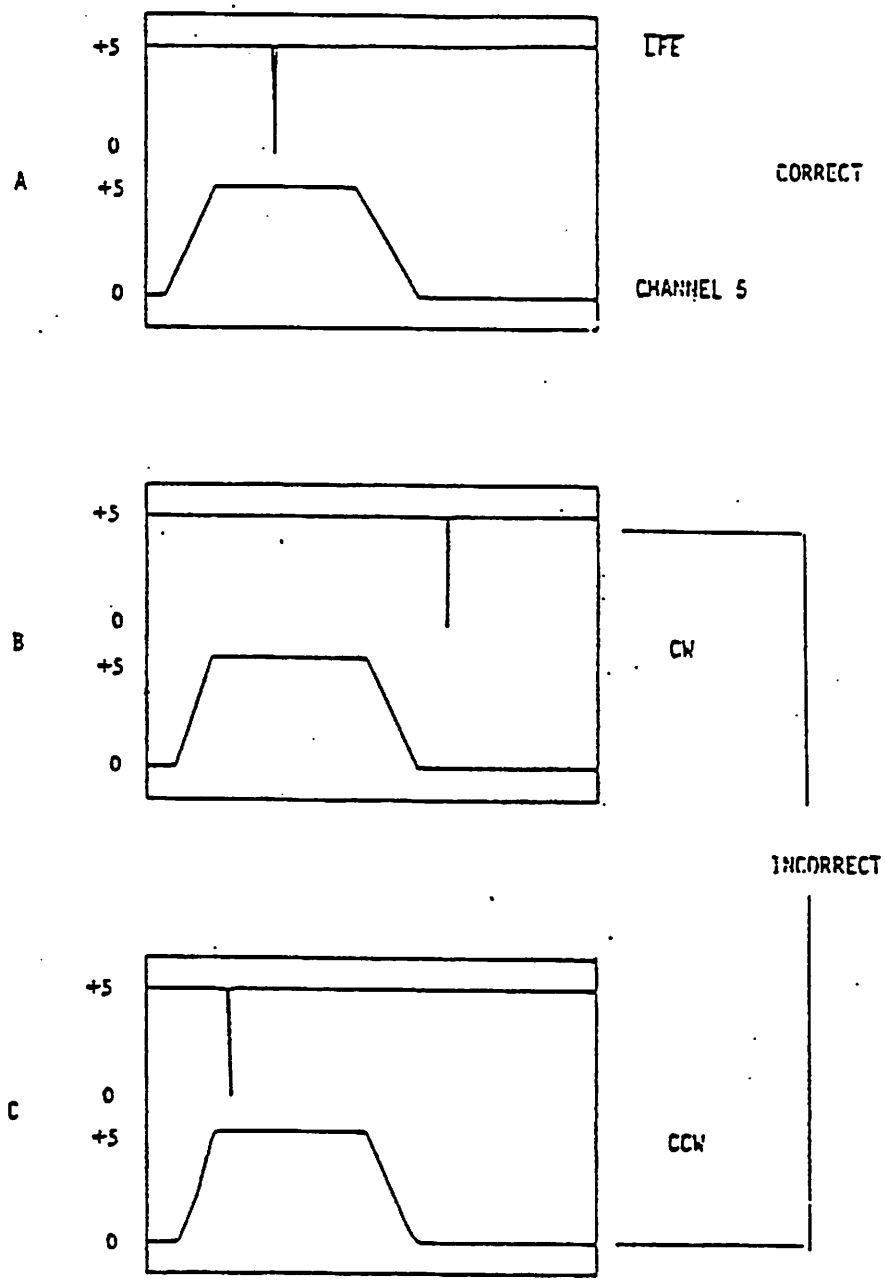



FIGURE 12 VFU AND STEPPER MOTOR PHASE CHECK

7. RIBBON ADJUSTMENTS

A. The ribbon should be slightly above the striker bar where the first character is printed and slightly below where the last character is printed. With power off wind one ribbon spool several turns to check. Raise or lower the appropriate ribbo assembly to adjust.

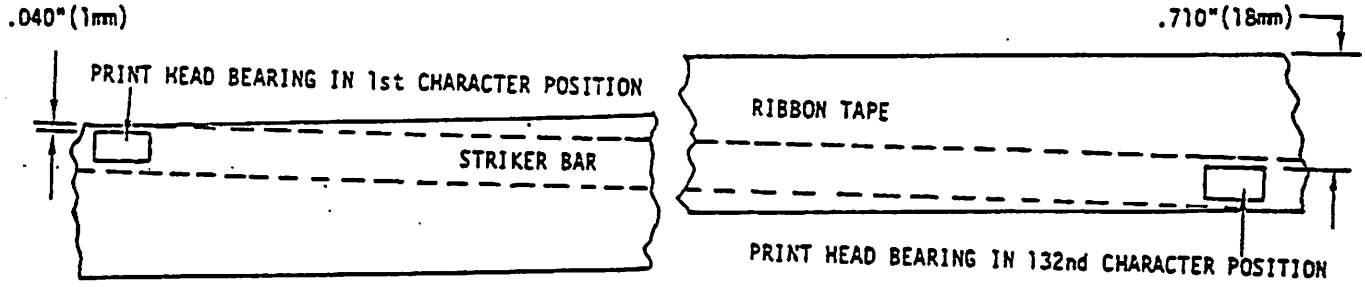



FIGURE 13 RIBBON HEIGHT AND ANGLE ADJUSTMENTS

B. The ribbon should not slack up in front of the striker bar while printing. Check tension while continuously printing. Adjust ribbon tension eccentrics to correct.

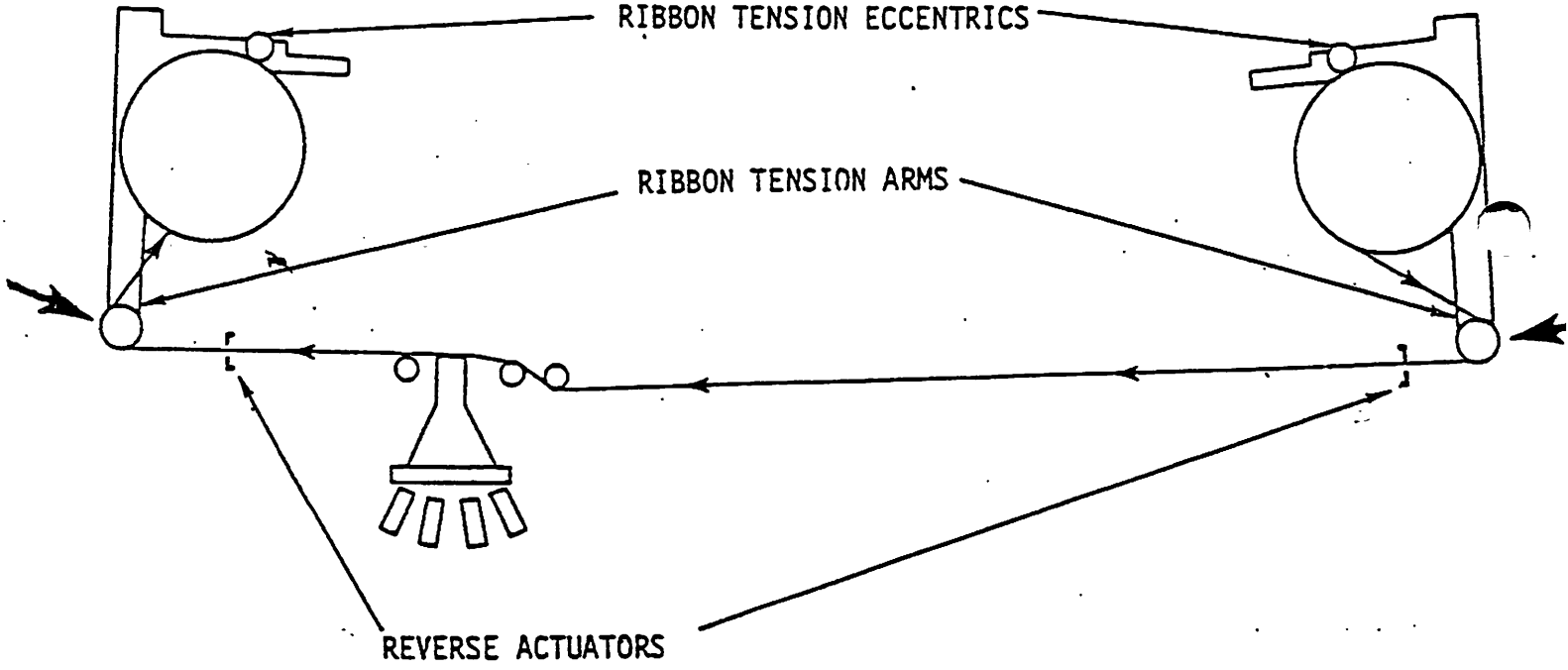



FIGURE 14 RIBBON LAYOUT

C. The ribbon should not fold over as it runs from the tension arms on to the ribbon spools.

To correct for a ribbon folding over at the top, pivot the associated ribbon assembly so that the front is approximately 1/4" lower than the rear, a bit more if necessary. If problem still persists try coning the top of the tension arm. This is done by placing a 1/2" piece of electrical tape 3/4 to a full revolution around the top of the tension arm flush with the top. Then do exactly the same with a 3/8" wide piece of electrical tape, then 1/4", then 1/8". If folding over at the bottom raise front of ribbon assembly in repect to back but never having the front of the assembly higher than the back.

## TROUBLESHOOTING HINTS

| SYMPTOM | CAUSE | SOLUTION |
|---|---|---|
| 1. Power turn on and no lights. | 1A. Fuse blown. | 1A. Replace fuse. |
| | 1B. +5V low. | 1B. Check and adjust +5V. |
| | 1C. No voltage. | 1C. Replace 6728/7028. |
| | 1D. Q15 (heat sink) bad. No +5V to logic. | 1D. Replace Q15. |
| 2. Power turn on and alarm light | 2A. Servo circuit breaker switch set in Off position. | 2A. Reset switch. |
| | 2B. Repeated setting On/Off of servo circuit breaker switch. | 2B1. Adjust SW0 and SW1. |
| | | 2B2. +5V not high enough for servo circuit to work. |
| 3. During power prime solenoid fire. | 3A. Defective 6728/7028. | 3A. Replace 6728/7028. |
| | 3B. Q1 on 6728/7028 not switching +9V. | 3B. Replace Q1 on 6728/7028. |
| 4. Power prime and carrilage does not return to left margin. | 4A. Check servo circuit breaker. | 4A. Reset switch. |
| | 4B. Check for paper jam in paper guide preventing carriage from returning. | 4B. Remove paper. Check paper guides for alignment and tension. |
| | 4C. Main drive belt and pulleys binding. | 4C. Correct bind. |
| | 4D. Defective 6577. | 4D. Replace 6577. |
| | 4E. Defective reed switch 0. | 4E. Replace reed switch 0. |
| | 4F. Defective reed switch 1. | 4F. Replace reed switch 1. |
| 5. Power on; depress select button and select lamp does not come on. | 5A. Defective lamp. | 5A. Replace lamp. |
| | 5B. Defective switch. | 5B. Replace switch. |
| | 5C. Defective connection switch. | 5C. Continuity check. |
| | 5D. Defective 6576/7076. | 5D. Replace 6576/7076. |
| | 5E. Broken wire in harness at carriage drive gear. | 5E. Repair wire and tie the harness back from gear. |

NOTE:
Use the same procedure for checking Top of Form, clear linefeed switches.

| SYMPTOM | CAUSE | SOLUTION |
|---|---|---|
| 12. Intermittent loss of servo drive during printing. | 12A. Bad connection. | 12A. Check seating of all pins and connectors. |
| | 12B. Heat sink. | 12B. Q17 or Q18 is intermittently shorting out. |
| 13. No power to servo drive mechanism, but power lights on. | 13A. Servo circuit breaker off. | 13A. Reset breaker. |
| | 13B. Bad connection. | 13B. Check seating of pins and connectors. |
| | 13C. +5V logic not up. | 13C. Adjust +5V logic. |
| 14. Printing consecutive short lines of 1 to 10 characters per line and circuit breaker goes off. | 14A. Defective timing on 6576. | 14A. Fix cap as per ISN 108.1. |
| | 14B. Too much slack in carriage drive belts. | 14B. Adjust. |
| | 14C. Carriage moving too fast. | 14C. Adjust window strobe to 925 micro sec. |
| 15. No printing, but carriage movement. | 15A. No video signal. | 15A. Check timing fence photo coupler signal. |
| | 15B. Timing fence scratched. | 15B. Replace timing fence. |
| | 15C. Timing on 6577. | 15C. Adjust 50% duty cycle on 657 |
| | 15D. No +9V | 15D. Replace 6728/7028, check chassis for open ETCH. |
| | 15E. Defective 6577. | 15E. Replace 6577. |
| 16. No delays between manual linefeeds. | 16A. 6576/7076 defective. | 16A. Replace 6576/7076. |
| 17. No linefeeds except under program control. | 17A. Defective linefeed switch. | 17A. Replace switch. |
| | 17B. Defective 6576. | 17B. Replace 6576/7076. |
| 18. Continuous paper feed when top of form executed. | 18A. Defecttive 6577. | 18A. Replace 6577. |
| | 18B. VFU defective. | 18B1. Adjust VFU.<br>18B2. Replace paper tape.<br>18B3. Replace LED.<br>18B4. Replace photocell. |
| | 18C. No VFU tape. | 18C. Install tape. |
| 19. Poor print quality at one specific location. | 19A. Burr on chassis. | 19A. Check carriage bearing guide shaft or plate for dirt or burrs at that location. |
| | 19B. Defective timing fence. | 19B. Replace timing fence. |

| SYMPTOM | CAUSE | SOLUTION |
|---|---|---|
| 6. Front cover is open; CPU tells printer to print but no carriage movement. | 6A. Cover open switch is on. | 6A. Manually pull switch to clos position. |
| 7. Front cover is closed; CPU tells printer to print but no carriage movement. | 7A. Cover open switch wired wrong | 7A. Check wiring. |
| | 7B. Cover open switch defective. | 7B. Replace switch. |
| | 7C. Defective 6576/7076. | 7C. Replace 6576/7076. |
| | 7D. Defective 6728. | 7D. Replace 6728. |
| 8. Ribbon is at the end, but does not change direction. | 8A. Ribbon rivot on ribbon broken off. | 8A. Replace ribbon. |
| | 8B. Ribbon direction switches not working. | 8B. Replace switches. |
| | 8C. Ribbon direction circuit not working. | 8C. 6577 defective. |
| | 8D. Ribbon drive motor not working. | 8D1. Check voltage to motor. |
| | | 8D2. Triac blown |
| | | 8D3. Replace ribbon drive motor. |
| | 8E. Ribbon jumped ribbon guide arm. | 8E. Replace ribbon to proper position in guide arm. |
| 9. Erratic forward motion of carriage during printing. | 9A. Oversized countersink holes on tachometer mounting bracket | 9A. Shim mounting screws with #2 lock washers to lift screws away from tachometer. |
| | 9B. Loose or worn tachometer belt | 9B. Adjust or replace. |
| | 9C. Defective tachometer. | 9C. Replace tachometer. |
| | 9D. Defective servo. | 9D. Replace servo motor. |
| | 9E. Defective servo circuit. | 9E. Replace 6577. |
| 10. Carriage assembly returning at slow speed after printing a | 10A. SW1 reed switch appears defective. | 10A. Replace reed switch or align magnet. |
| | 10B. 6577 PCB defective. | 10B. Replace 6577. |
| | 10C. Defective 7028 | 10C. Replace 7028. |
| 11. Carriage return fast with no deceleration. | 11A. Defective 6577. | 11A. Replace 6577. |
| | 11B. SW1 defective. | 11B. Replace SW1. |
| | 11C. Belts and or pulleys slipping. | 11C. Check belt tension and assu pulleys aren't slipping. |
| | 11D. Worn tach belt. | 11D. Replace tach belt. |

| SYMPTOM | CAUSE | SOLUTION |
|---|---|---|
| 20. Poor print quality everywhere (characters not symmetrical). | 20A. Timing on 6577. | 20A. Adjust 50% duty cycle on 657 |
| | 20B. Photocoupler. | 20B. Replace photocoupler. |
| | 20C. Head penetration. | 20C. Adjust head penetration. |
| | 20D. Solenoids in head maladjusted. | 20D. Remove head assembly and adjust print head to specification. |
| | 20E. Print head loose. | 20E. Tighten head. |
| | 20F. Timing fence dirty and/or warped. | 20F. Clean and/or straighten. |
| 21. Missing dots in character. | 21A. Defective ROM on 6728. | 21A. Replace ROM in 6728. |
| | 21B. Defective pwr. transistor on heat sink. | 21B. Replace transistor on heat sink. |
| | 21C. Maladjusted solenoid. | 21C. Adjust solenoid. |
| | 21D. Broken solenoid wire. | 21D. Replace solenoid. |
| 22. Print head catching ribbon during printing. | 22A. Head penetration exceeds .005" | 22A. Check striker bar adj. and adj. penetration. |
| | 22B. Ribbon worn out with too much head penetration. | 22B. Replace ribbon-Adjust penetration. |
| | 22C. Solenoid staying in fixed position. | 22C1. Replace solenoid. |
| | | 22C2. Replace pwr. transistor on heat sink. |
| | | 22C3. Replace 6728. |
| | 22D. Strobe too long. | 22D. Adjust window strobe and leading trailing edge signal |
| 23. Print quality light on one side. | 23A. Striker bar maladjusted | 23A. Adjust striker bar. |
| | 23B. Ribbon height maladjusted. | 23B. Adjust ribbon height. |
| 24. Paper streaked during print. | 24A. Head penetration to close. | 24A. Increase head to striker bar gap. |
| | 24B. Paper not within usable specs. | 24B. Advise user to replace with paper meeting specifications |
| | 24C. Print solenoid dragging on paper. | 24C. Adjust solenoid. |
| | 24D. Ribbon guides maladjusted. | 24D. Adjust ribbon guides. |
| | 24E. Ribbon drive assembly tilted causing ribbon to lean. | 24E. Adjust ribbon drive assembly |
| | 24F. Paper pan not adjusted properly. | 24F. Adjust. |

| SYMPTOM | CAUSE | SOLUTION |
|---|---|---|
| 25. Double spacing. | 25A. Reed switch 0 out of adjustment. | 25A. Adjust. |
| | 25B. On VS and WP. 6577 jumpered for 2200. | 25B. Jumper 6577 for VS and WP. |
| 26. Expanded print changing to normal. | 26A. Timing off. | 26A. Adjust window strobe signals |
| | 26B. Defective 7028. | 26B. Replace 7028. |
| 27. Intermittently skips line. | 27A. Defective 6577. | 27A. Replace 6577. |
| | 27B. Screws not tight on caps. | 27B. Tighten down all caps. |
| 28. Characters breaking up. | 28A. Ripple on 5V. | 28A. Tighten down caps. |
| 29. Carriage slams right. | 29A. Defective 7076. | 29A. Replace 7076. |
| | 29B. Defective 6728. | 29B. Replace 6728. |
| | 29C. Defective heat sink.. | 29C. Replace heat sink. |
| 30. Trouble moving paper, grinding noise. | 30A. Defective 6577. | 30A. Replace 6577. |
| 31. Resistor burning up on 6568 board. | 31A. Shorted solenoid. | 31A. Replace solenoid. |
| | 31B. Defective 7028. | 31B. Replace 7028. |
| | 31C. Defective heat sink. | 31C. Replace heat sink. |
| 32. When selected carriage jitters. | 32A. Defective 6577. | 32A. Replace 6577. |
| 33. Carriage slams right and blows fuse. | 33A. Defective heat sink. | 33A. Replace heat sink. |
| 34. Overdriving solenoids. | 34A. Defective 7028. | 34A. Replace 7028. |
| 35. Won't feed paper in remote. | 35A. Defective 6577. | 35A. Replace 6577. |
| 36. Select lite comes on with power on. | 36A. Defective 7076. | 36A. Replace 7076. |
| 37. First few characters smudging. | 37A. Reed switch 0 too far right. | 37A. Adjust. |

| SYMPTOM | CAUSE | SOLUTION |
|---|---|---|
| 38. Not linefeeding properly. | 38A. Loose gear | 38A. Tighten. |
| | 38B. Defective 6577. | 38B. Replace 6577. |
| | 38C. Defective 6728. | 38C. Replace 6728. |
| | 38D. Screws not tight on caps. | 38D. Tighten screws on caps. |
| | 38E. Can't adjust phasing. | 38E. Replace stepper motor. |
| | 38F. Long lines. | 38F. Adjust reed switch 2. |
| 39. Printer keeps doing a Top of Form. | 39A. Defective 7076. | 39A. Replace 7076. |
| 40. Carriage slams back and forth. | 40A. Broken tach belt. | 40A. Replace tach belt. |
| 41. Carriage hitting left bumper. | 41A. Loose carriage drive gear. | 41A. Tighten gear. |
| | 41B. Worn tach belt. | 41B. Replace tach belt. |
| 42. Prints wrong character and does a Top of Form. | 42A. Defective 7076. | 42A. Replace 7076. |
| 43. Intermittently bouble spaces on full lines, especially expanded print. | 43A. Reed switch 2 out of adjustment. | 43A. Adjust. |
| 44. When power on beep distorted. | 44A. Loose connection on cap. | 44A. Tighten down screws on cap. |
| 45. Unable to adjust WS slower than 850 micro sec. | 45A. Defective tach motor. | 45A. Replace tach motor. |
| 46. First few characters breaking up. | 46A. Tach motor gear slipping in and out on shaft. | 46A. Replace. |

2235

TABLE 1-1. PRINTED CIRCUIT BOARDS USED IN VARIOUS SYSTEMS

| TITLE | BOARD NO. | 2235 | 5535 | |
|---|---|---|---|---|
| CPU/IO | 210-7593A/B | X | | |
| CPU/IO | 210-7593-1A/1B | | X | |
| DRIVER/PS REG | 210-7594 | X | X | |
| MOTHERBOARD | 210-7595 | X | | |
| MOTHERBOARD | 210-7595-1 | | X | |
| KEYBOARD | 210-7596 | X | | |
| KEYBOARD | 210-7596-1 | | X | |
| ENCODER AMP | 210-7597 | X | X | |
| DATA LINK BD. | 210-7446 | | X | ALL SW. OFF JUMPER A-C, D-E, H-J |
| 32K RAM MEMORY | 210-7547 | | X | |
| PIO CPU BD | 210-7348 | | X | SW 3 & 4 ON ONLY |

## 33/35 MATRIX PRINTER

### Blown Fuse Due To Paper Jams

There is a new board available, Part Number 210-8393, to replace the 210-7593 board. The new board incorporates a fuse protect circuit, as the old board would often blow the fuse if a paper jam was experienced.

New Board 210-8393

Old Board 210-7593

| | | L38 | L37 | L36 | JP3 (KYBD) | JP2 (KYBD) | PS(JP1) (SPEED?) |
|---|---|---|---|---|---|---|---|
| 210-8393B | PARALLEL | 6125 | 6100 | 6126 | 1-2 | 1-2 | IN (FOR HI SPEED) |
| 210-8393-1B | SERIAL | 6131 | 6114 | 6132 | 2-3 | 2-3 | |

DEEALIS

SWITCH #5 ON THE CONTROL PANEL SWITCH BANK IS FOR PITCH SELECTION. ON THE 2233/5533 MODELS, THE PRINTER AUTOMATICALLY DEFAULTS TO 12.2 PITCH AND ONLY SOFTWARE CAN OVERRIDE TO 10 PITCH. ON THE 2235/5535 MODELS SETTING SWITCH #5 ON-------PRINTER DEFAULTS TO 12.2 PITCH
#5 OFF------PRINTER DEFAULTS TO 10 PITCH
SEE TABLE BELOW

VS - Forms control (pitch select)

PRINTER POWER-UP DEFAULT FONTS .

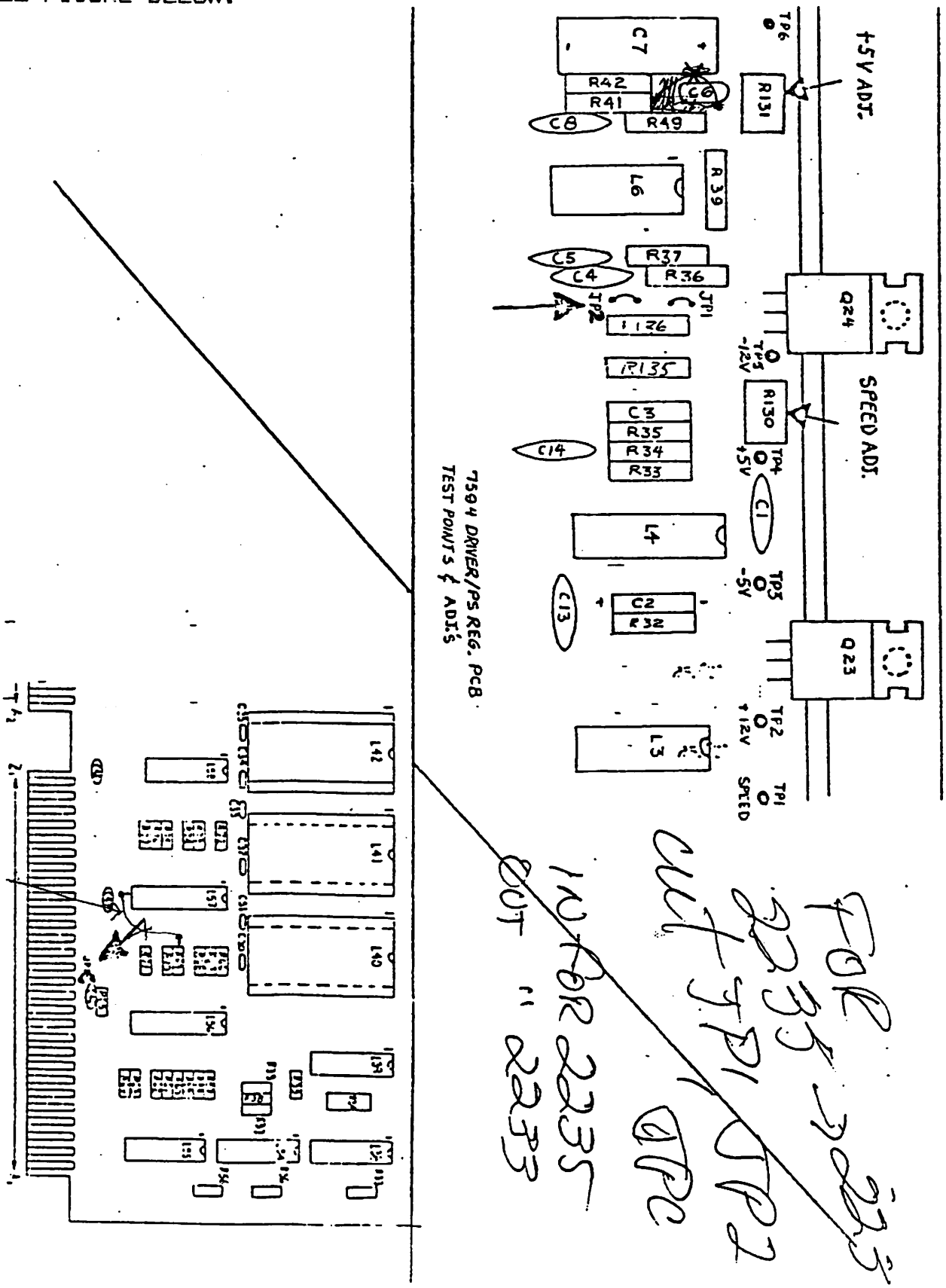
| MODEL | SPEED | PITCH | JUMPERS CPU | JUMPERS DRIVER | PITCH DEFAULT SW #5 |
|---|---|---|---|---|---|
| 2233 | 100 CPS | 10 | OUT | OUT | OFF # |
| | 120 CPS | 12.2 | OUT | OUT | ON # |
| 2235 | 180 CPS | 10 | IN | IN | OFF # |
| | 222 CPS | 12.2 | IN | IN | ON # |
| 5533 | 120 CPS | 12.2 | OUT | OUT | N/A * |
| 5535 | 180 CPS | 10 | IN | IN | OFF # |
| | 222 CPS | 12.2 | IN | IN | ON # |

\# Software selectable also

* Defaults to 12.2 Pitch only

NORMALLY ALL BOARDS TAKEN FROM STOCK WILL BE JUMPERED FOR MODEL 35W PRINTER.

TO CHANGE TO A 33W, 3 JUMPERS MUST BE REMOVED. TWO JUMPERS ARE PRESENT ON THE 210-7594 HEAT SINK BOARD AND ONE ON THE 210-7593B OR 1B CPU/IO BOARD. SEE FIGURE BELOW.




JUMPERS ON OLD STYLE - EITHER SIDE OF LH JUMPER WIRE TO MIDDLE OF RESISTORS

FOR 2233 2235 CUT JP1 JP2 ON PC BOARD 2235 OUT 2233

# 33/35 MATRIX PRINTER

ERROR CODES AND TEST SWITCH SETTINGS
SELF TEST 2200 - FORMS OVERRIDE THEN LINEFEED
0IS/VS - MALF. THEN TOP OF FORM

| ERROR CODES | | CAUSE OF ERROR |
|---|---|---|
| 2233/35 | 5533/351 | |
| 1 | 1 | PROM ERROR |
| 2 | 2 | RAM ADDRESS ERROR |
| 3 | 3 | RAM MEMORY ERROR |
| 4 | * | BIT 6 NOT SET IN VFU DATA |
| 6 | * | TOO MANY VFU DATA BYTES SENT |
| 7 | 7 | STROBE FLIP-FLOP WON'T SET |
| 8 | 8 | STROBE FLIP-FLOP WON'T RESET |
| 9 | * | PRIME FLIP-FLOP WON'T SET |
| 10 | * | PRIME FLIP-FLOP WON'T RESET |
| 11 | 11 | COVER OPEN |
| 12 | 12 | NO COLUMN STROBES |
| 13 | 13 | RIGHT SENSOR NEEDS ADJ. |

## TESTS

| | | |
|---|---|---|
| LED | SW. | 1,2,4, OFF = ALL LED'S WILL LIGHT |
| 5 LINE | SW. | 1 ON 2,4 OFF = PRINTS 5 LINES AT A TIME |
| SPRIRAL PATTERN | SW. | 2 ON 1,4 OFF = PRINTS ALL CHARACTERS |
| DATA STROBE | SW. | 1,2 ON 4 OFF = F/F FAILS TO SET (ERROR 8)<br>F/F FAILS TO RESET (ERROR 9) |
| STAIRCASE | SW. | 1,4 ON 2 OFF = FIRE ALL NINE PINS |
| VERTICAL BAR | SW. | 2,4 ON 1 OFF = TO CHECK RIGHT SENSOR |
| PAPER ADVANCE | SW. | 1,2,4 ON = PAPER ADVANCES 1 LINE AT A TIME |
| CARRIAGE SPEED | SW. | 1,2 OFF 4 ON = LEDs DISPLAY AS FOLLOWS |

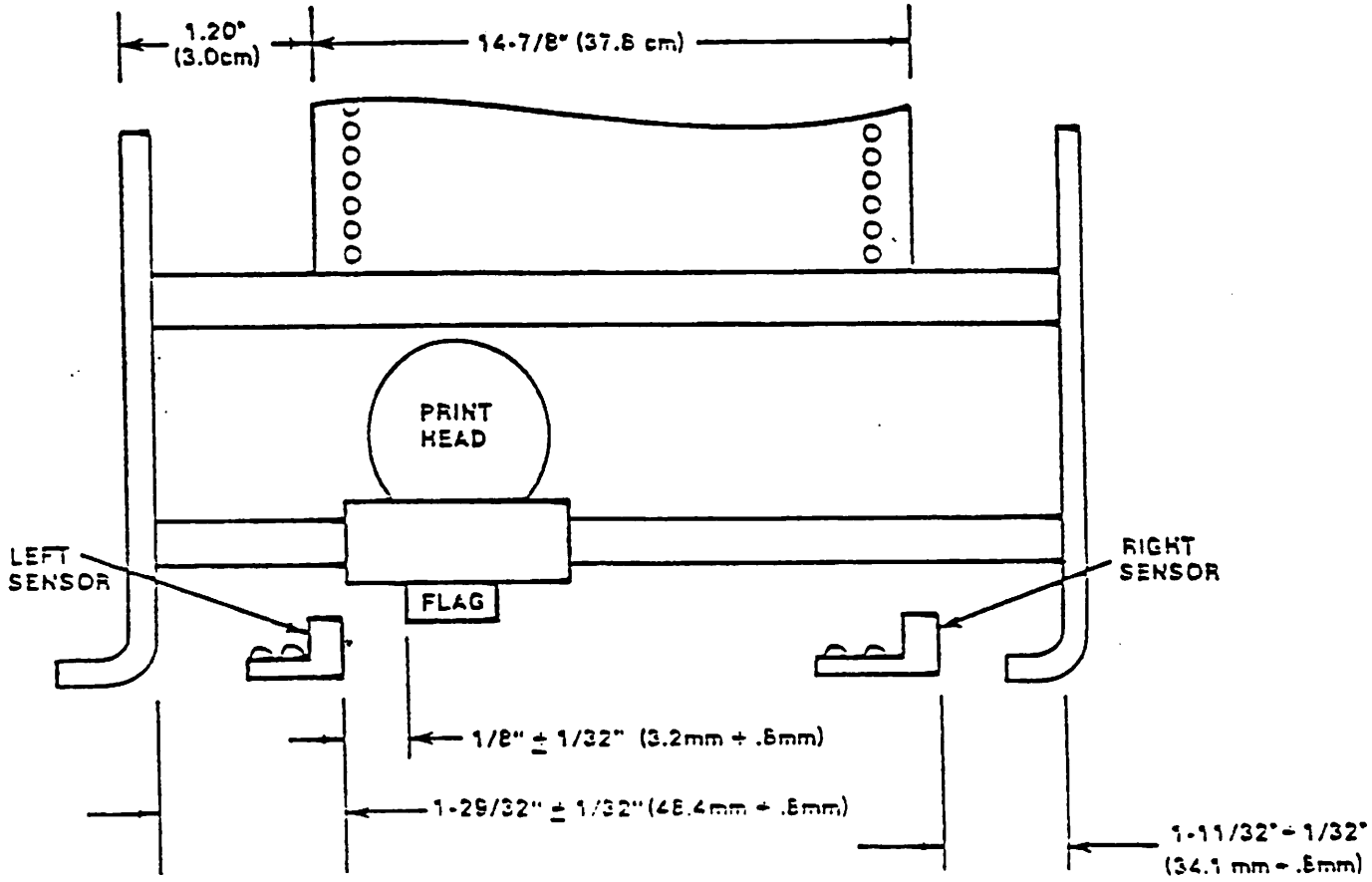
| | | |
|---|---|---|
| X000 | SPEED TO SLOW | X = LIGHT ON |
| 000X | SPEED TO FAST | 0 = LIGHT OFF |
| 0XX0 | SPEED CORRECT | |

## ENCODER DISK INDEX ADJUSTMENT

If the standard procedure for adjusting the encoder wheel index mark has been awkward for you, then you might appreciate the following method:

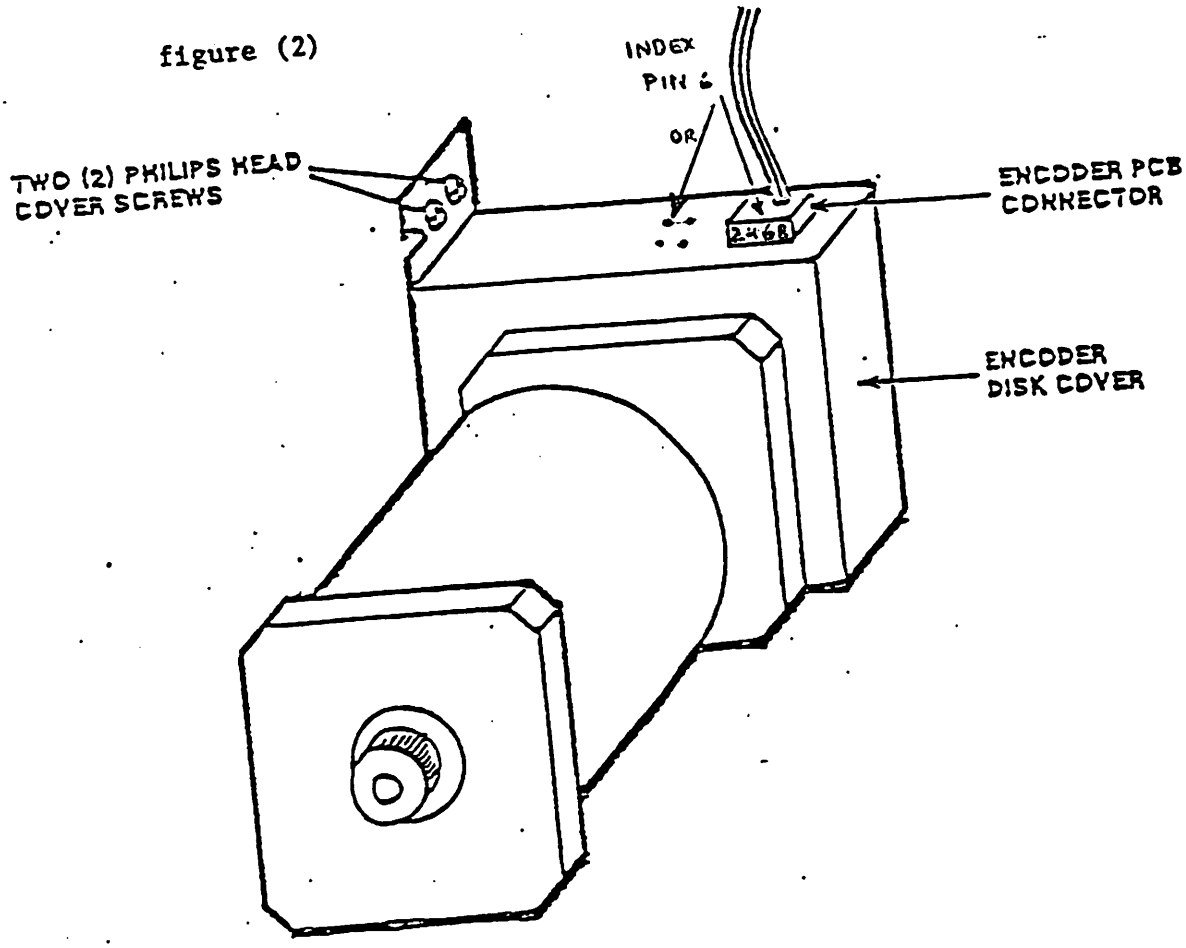
1. Insure both left and right sensors are adjusted properly. (figure 1 below)
2. Find something 1/8" wide, like an allen wrench blade, and lay it across the right side of the left sensor and push the carriage from right to left so that flag is up against it and being held 1/8" to the right of that sensor.
3. Loosen the allen screw securing the encoder disk to the motor shaft.
4. Place one lead of your meter on pin 6 of the 8 pin cable connected to the encoder board mounted on the motor and the other lead to ground. Pin 6 is the second pin in from the outside, front side of the cable. (figure 2 next page)
5. Position the encoder wheel for a reading of.1 Volt, meaning the index is lined up, insure the carriage hasn't moved, and tighten down the allen screw. Pin 6 will read 5V approximately while index is not lined up.
6. RUN VERTICAL BAR TEST TO FINE ADJ. RIGHT REED SWITCH. SW. 2,3, + STROBE ON.

figure (1)




LEFT AND RIGHT SENSOR SETTINGS

figure (2)


INDEX
PIN 6
OR
TWO (2) PHILIPS HEAD
COVER SCREWS
ENCODER PCB
CONNECTOR
ENCODER
DISK COVER

# DW/OS - 20 DAISY PRINTER

## Differences For Use With Different Product Application:

| SYSTEM | CPU BOARD | DRIVER BOARD | INTERFACE BOARD | INTERNAL I/O CABLE |
|---|---|---|---|---|
| 2200/VS Remote | 210-7886-1A<br>Jumpers 6 & 7 out<br>Jumpers 5 & 8 in* | 210-7868 | 210-7885-1<br>Jumper SP1 to SP2 out | 220-3221** |
| WP Serial | 210-7886A<br>Jumpers 5 & 8 out<br>Jumpers 6 & 7 in* | 210-7868 | 210-8197A<br>210-8338 | 220-1751<br>220-3233*** |
| WP Parallel | 210-7886A<br>Jumpers 5 & 8 out<br>Jumpers 6 & 7 in* | 210-7868 | 210-9197A | 220-3216 |
| OIS/VS | 210-7886A<br>Jumpers 5 & 8 out<br>Jumpers 6 & 7 in* | 210-7868 | 210-8038-1A<br>210-7738-1A | 220-1751 |
| Professional Computer | 210-7886-1B<br>Jumpers 6 & 7 out<br>Jumpers 5 & 8 in* | 210-7868 | 210-7885-1<br>Jumper SP1 to SP2 out | 220-3221** |

CPU Board Proms -- All 210-7886 boards can be interchanged by using the correct Proms and Jumpers.

| | 210-7886-1A | 210-7886-A | 210-7886-1B |
|---|---|---|---|
| L5 | 378-7010-R2 | 378-7001-R4 | 378-7001-R4 |
| L6 | 378-7009-R2 | 378-7000-R4 | 378-7000-R4 |
| L7 | 378-7011-R2 | 378-7013-R1 | 378-7013-R1 |
| L8 | Not used; was used with earlier proms | | |

* Jumper 5 is below L51, 6 below 5. Jumper 7 is left of L51, 8 left of 7.

** The red or black wire which normally denotes pin 1 on a cable may be backwards on the 220-3221. This will cause a hang with the PC and constant Top of Form with 2200 if backwards. Try the cable the other way if having a problem.

***The 220-3233 connects the 210-8197A and the 210-8338 together.

DW/22-20

Prom part numbers

Many problems were corrected with the R2 Proms including those with vertical format commands, the TSF, bold print, and character slashing. The part numbers for these proms are:

| | |
|---|---|
| L6 | 378-7009R2 |
| L5 | 378-7010R2 |
| L7 | 378-7011R2 |
| L8 | not used |

*** Order Proms under kit # 728-0035

Problems Underscoring in WP Mode

When attempting to underscore or double underscore in WP mode the underscore will be printed but the intended text is left out. This problem should be eliminated by the correction of 2 printer files, "609PCHAR" and "609P2200" which will be incorporated in Rev. 2.1 of the 2200/WP software package.

TABLE 1-1

PRINTED CIRCUIT BOARDS USED IN VARIOUS SYSTEMS

| TITLE | BOARD NOS. | 2281W | 2281WC | 5541W | 5541WC | 6581W | 5581WC |
|---|---|---|---|---|---|---|---|
| SERVO CONTROL BOARD | 7360 | X | X | X | X | X | X |
| PRINTER CONTROL BOARD | 7361-A | X | X | X | X | X | X |
| MOTHERBOARD | 7462 | X | X | X | X | X | X |
| PS REGULATOR | 7364 | X | X | X | X | X | X |
| DAISY PRINTER KEYBOARD<br>81P PLOTTER KEYBOARD | 7365<br>7570 | X | X | | | | |
| DAISY PRINTER KEYBOARD | 7365-1 | | | X | X | X | X |
| DAISY PRINTER LINE PRINTER AND PUNCH | 7446 | | | | | X | X |
| 32K RAM PRINTER MEMORY | 7547 | | | | | X | X |
| 928 PTR's PIO | 7348 | | | | | X | X |
| TWIN SHEET FEEDER CONTROL | 7449 | | | X | X | | |
| DIABLO PARTS/PLOTTER CONTROL | 7443-1B | X | X | | | | |

81P PLOTTER CNTL 7443-1A
81 PRINTER CNTL 7443-A
81 PRINTER w/ ½ SPACE 7443 B

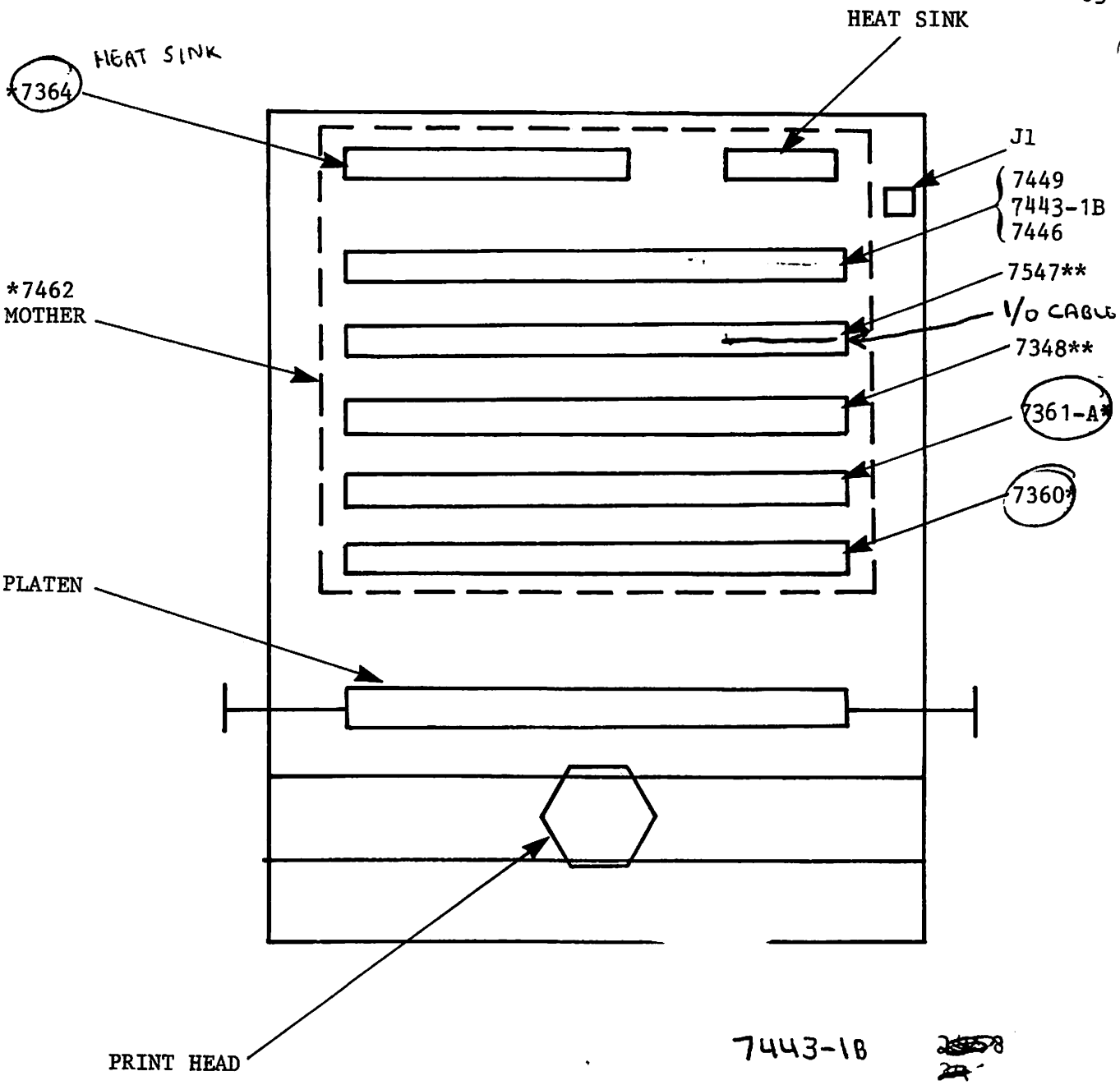




2281W

7726A - KEYBOARD CABLE TO J2
IN CENTER OF BOARD

03-0097




7443-1B

2458 2459 2460 2461

NOTES

MID BRD. KYBRD CABLE TO RIGHT
7170
CAN BE USED FOR TESTING

1. Install all printed circuit boards with component side facing print wheel.

2. Boards with * are used in all systems (2281W/81WC and 6541W/41WC)1 and 6581W/81WC.

3. Boards with ** are used in the 6581W/81WC system only. These slots are left blank in the 2281W/81WC and 5541/41WC systems.

7309A - CNTRL. PAN TO CTR
CABLE TO RIGHT
REF ON TOP

FIGURE 1-2 WANG DAISY PRINTER BOARD LAYOUT

## TWIN SHEET FEEDER

### Installing the Twin Sheet Feeder on the 2281W and 2281WC

When installing a TSF on an existing 2281W or a 2281WC, a 210-7309A is needed to replace the 210-7443A. The proms on the 7309A board should be R4 and located as follows:

| | | |
|---|---|---|
| L1 | 378-2559 R4 | |
| L3 | 378-2590 R4 | |
| L4 | 378-2558 R4 | |
| L5 | 378-2557 R4 | R5 proms are now in release |
| L6 | 378-2556 R4 | |
| L7 | 378-2555 R4 | |
| L8 | 378-2554 R4 | |

The R4 proms have an updated character set adding several new characters and the new proms also correct a couple of bugs. See TAC Newsletter #10407, III.C.6, (attached), for further information on new characters and problems corrected w/R4 proms.

The TSF is electronically connected to the Daisy by a control cable from the TSF to the back of the printer. The cable carries a 24V line for the feeder motor plus control signals.

When shipped to the customer's office, the TSF's will have included with them an upgrade kit (206-3031 for 2281W) or (206-3046 for 2281WC). Listed below are the upgrade kits and the contents of each:

| MODEL | PAPER SIZE | PRINTER | KIT/CONTENTS |
|---|---|---|---|
| TSF-20 | 8 1/2x11 | 2281W | 206-3031: 210-7309-A PC Board<br>550-0767 Key Board Inserts |
| TSF-21 | 8 1/4x11 | 2281W | 206-3031: 210-7309-A PC Board<br>550-0767 Key Board Inserts |
| TSF-22 | 8 1/2x11 | 2281WC | 206-3046: 550-0767 Key Board Inserts |
| TSF-23 | 8 1/4x11 | 2281WC | 206-3046: 550-0767 Key Board Inserts |

NOTE: Because the 2281WC printer already has the 7309 board, it is not included in the kits.

## TWIN SHEET FEEDER

### Preparing the Printer

A. Remove the rear cover

NOTE: If printer is Model 2281WC, go to step (C), if not continue with step (B)

B. Replace 210-7443 PC board with 210-7309-A PC board

C. Install molex connector of cable (WLI#220-1303) into molex connector on 210-7309-A board

D. Attach acorn end of cable (WLI#220-1303) to the printer. Cable is positioned in chassis cut out located next to the printer's power switch

E. Replace rear cover removed in step (A)

NOTE: When using the TSF on the Daisy Printer, the printer's paper scale must be removed.

The special codes that control the feeder operation are:

HEX (02 06 02 0F)-Select Front Bin

HEX (02 06 01 0F)-Select Rear Bin

HEX (02 03 0F)-Clear Platen

HEX (0C)-Form Feed

HEX (02 01 01 08 0F)-Set to Print Line at 0.5 inch (Default is 1.0 inch)

HEX (02 0D 0C 03 0F)-Power on Reset

HEX (02 0C 01 02 YYYY 0F)-Set from length from the top print line

YYYY is a hexidecimal multiple of 1/48 inch increments.

2281W

210-7309-Proms should now be at R5

| PART NUMBER | LOCATION |
|---|---|
| 378-2254R5 | L8 |
| 378-2555R5 | L7 |
| 378-2556R5 | L6 |
| 378-2557R5 | L5 |
| 378-2558R5 | L4 |
| 378-2559R5 | L1 |
| 378-2590R5 | L3 |

This change hopefully will:

1. Allow a deselect code in WP mode to let user insert next sheet of paper **WP software must be at 1.6 level.

2. Correct the problem where if the select key is hit after using the top of form key, the paper will feed backwards.

3. Correct the problem where the left margin is off when the set left margin is used in conjunction with the 2200 suppress linefeed.

**There is a problem with WP 1.6 software. If 12 pitch is selected in the print menu, the printer will not deselect for page breaks. To avoid this problem, select 10 pitch in the print menu and use the 10/12 pitch switch in the printer to change pitches.

## GENERAL OPERATION

The following discussions are primarily keyed to the 31W-1 printer. The other models follow very closely. Consequently, only one Theory-of-Operation is needed to understand the operation of all.

## CARRIAGE MOVEMENT AND PRINT TIMING

A carriage assembly moves the print head across the paper. Printing is performed by selectively firing the print head solenoids as the assembly moves from left to right. Synchronization of the print process and carriage movement is provided by two magnetic reluctance pickups and a timing disk. The disk on the 31W-1 has 780 teeth around its circumference, and one hole drilled through its flat surface. The 31W-2 and -3 have a similar disk with more teeth to correspond to 10; 12, or 14.4 pitch characters.

A magnetic reluctance pickup, located near and perpendicular to the circumference of the disk, senses flux changes as the disk's teeth rotate by. These flux changes create a small voltage pulse used to generate window strobe for print timing, and negative feedback to the servomotor amplifier which controls the carriage motor.

Another magnetic reluctance pickup, located so the hole in the disk passes over it each rotation, generates an index pulse which determines the left-hand margin when printing.

Due to mechanical consideration, the nine print solenoid wires are not in one vertical column. The five odd solenoid wires precede the four even wires as the print head moves across the carriage. Delay latches are used to delay the outputs to the even solenoids. The delay allows the print head to move in line with the dots printed by the odd print wires before printing with the even solenoids. This results in a vertical line of printed dots.

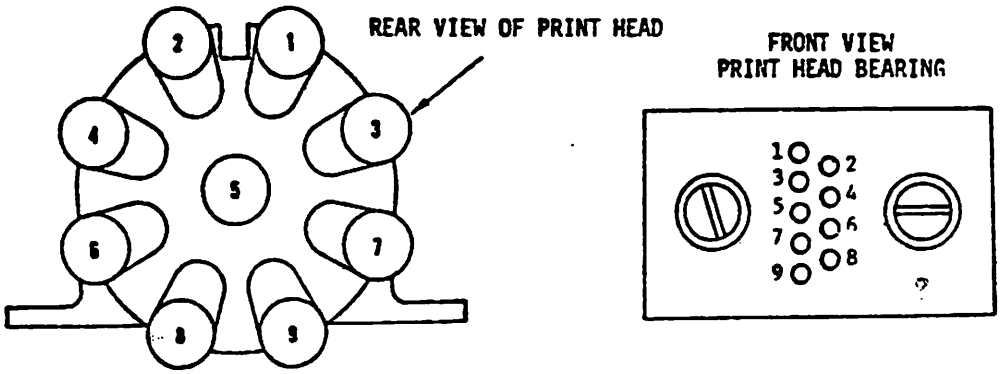



FIGURE 1 IDENTIFICATION OF SOLENOIDS

There are three (four for the 31W-3) reed switches ($SW_0$-$SW_2$) located on the frame under the carriage block. These switches are activated by a magnet located on the underside of the moving carriage. The outputs of the switches and Start/Stop logic are used to control forward and reverse logic for the servomotor.

## PAPER MOVEMENT

Paper movement is produced by three separate functions: line feed, vertical tab and form feed. Each of these functions activates the stepping motor causing paper movement. Vertical tab and form feed will step the motor until a hole in the appropriate channel of the vertical-format paper tape is detected by the tape reader.

A stepping motor, mounted in the rear of the left-hand side of the Printer is used to drive the paper feed mechanism and the Vertical Format Unit (VFU). Each step of the motor accomplishes a 15 degree rotation; there are 4 steps for each line feed.

The Vertical Format Unit (VFU) is an optical tape reader which only reads 2 channels (5 and 7).

LINE FEED-(Moves paper vertically one line at a time) Line feed can be generated by any of the following three conditions:

(a) Automatic line feed during each carriage return
(b) Receiving a line-feed code via the system (HEX (0A) on 2200)
(c) Depressing the line feed key on the control panel of the 2231W (in this case, the printer must be de-selected.)

VERTICAL TAB-Vertical tab can be generated only by receiving a vertical tab code (HEX (0B) on 2200) (Moves paper vertically to next hole in paper tape sensed by Ch.5, 1 inch of paper movement on standard tape)

FORM FEED-Form feed can be generated by:

(a) Receiving a form-feed code, (HEX (0C) on 2200) (paper moves vertically to next hole sensed by ch.7).
(b) Pressing the Top-of-Form key on the control panel (printer must be deselected).

# 31W BOARD AND COMPATIBILITY CHART

## 1. TIMING AND FORMAT CONTROL

| | | |
|---|---|---|
| 210-6761 | Jumper A to B and D to F | (2200 only) |
| 210-6761 | Jumper B to C and E to F | (All VS and WP) |
| 210-6794 | | (2231W-3 Only) |

## 2. I/O, DATA STORAGE

| | |
|---|---|
| 210-7060 or 210-7160 | (All 10 pitch parallel) |
| 210-7160 or 210-7160-1A | (All 12 pitch parallel) |
| 210-7160D | (All 10 pitch serial) |
| 210-7160-1D | (All 12 pitch serial) |
| 210-6795 | (2231W-3 only) |

## 3. HEAT SINK

| | |
|---|---|
| 210-6756 | (All Printers) |

## 4. KEYBOARD CONTROL PANEL

| | |
|---|---|
| 210-6762 | (All parallel) |
| 210-6762-1 | (All serial) |

## 5. CHASSIS

| | |
|---|---|
| 270-0300 | (All parallel) |
| 270-0300A | (All Serial) |
| 270-0300 w/210-7157 motherboard | (2231W-3) |

## 6. PRINTHEAD

| | |
|---|---|
| 279-5060-22 | (All 10 pitch) |
| 279-5060-12 | (All 12 pitch) |
| 279-5060-59 | (2231W-3) |

## 7. CARRIAGE MOTOR/ENCODER ASS'T

| | |
|---|---|
| 279-5060-15 | (All 10 Pitch) |
| 279-5060-16 | (All 12 Pitch) |
| 279-5060-81 | (2231W-3) |

## ELECTRICAL ADJUSTMENTS (REFER TO FIGURE 2)

To prevent damage to the print head while making the following adjustments, disconnect the print head electrically by disconnecting the finger board which plugs into print head ribbon cable. Then run a program for continuous printing. Each adjustment required for print timing is listed in Table 1. Perform the +5VR adjustment before proceeding to print timing.

1. WS Adjustments-(figure 2) WS is generated by the timing disk teeth passing the magnetic reluctance pickup. This signal must be adjusted by R71 on the 6761 board (31W-1,-2) and R67 on the 6794 (31W-3) for a complete cycle of 1600 us ±25 as monitored at L19 Pin 5 of the 6761 board on 31W-1/-2, and 6794 board on 31W-3 (negative trigger in normal trigger mode). R10 must then be adjusted to obtain a squarewave (50% duty cycle).

2. After obtaining the proper waveform for WS (figure 2), the following pulses should be checked and/or adjusted:

   WS trailing edge-Adjust R16/R23 respectively on the 6761/6794 boards for a 550-560 us negative pulse at L19 pin 7.

   WS leading edge-Adjust R19 on the 6761/6794 boards to obtain a 550-560 us negative pulse at L19 pin 9.

The WS leading and trailing edge strobes are only present during the printing period. Replace print head solenoid fingerboard connector when finished adjusting.

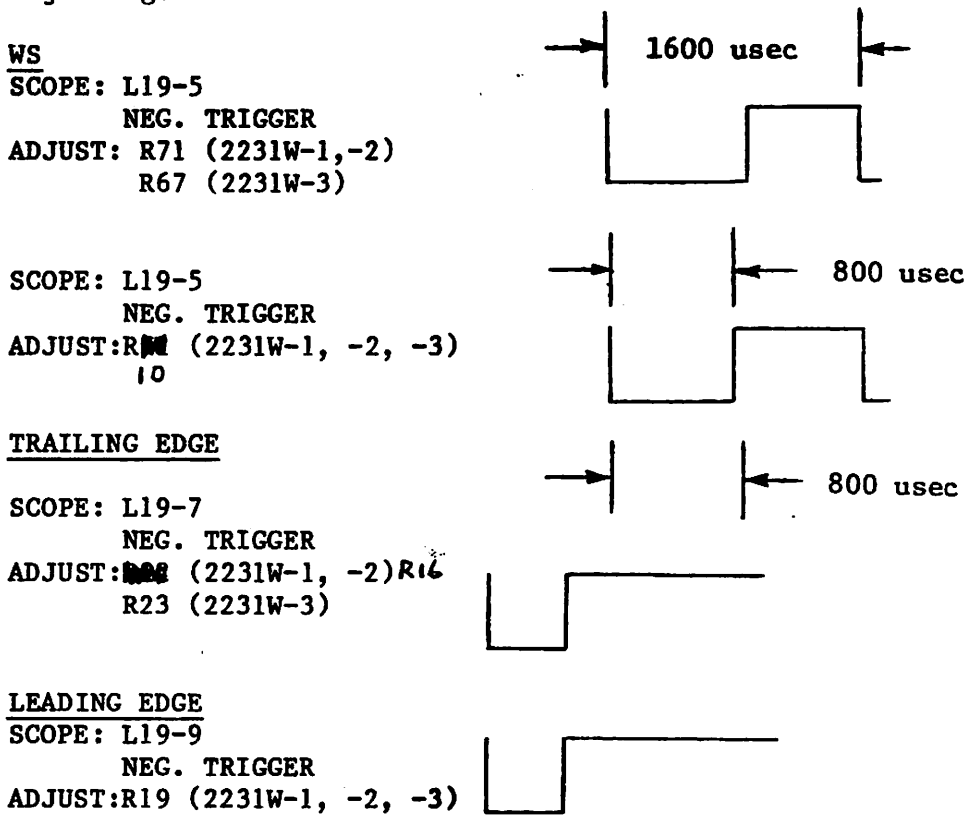



FIGURE 2 WS TIMING ADJUSTMENT

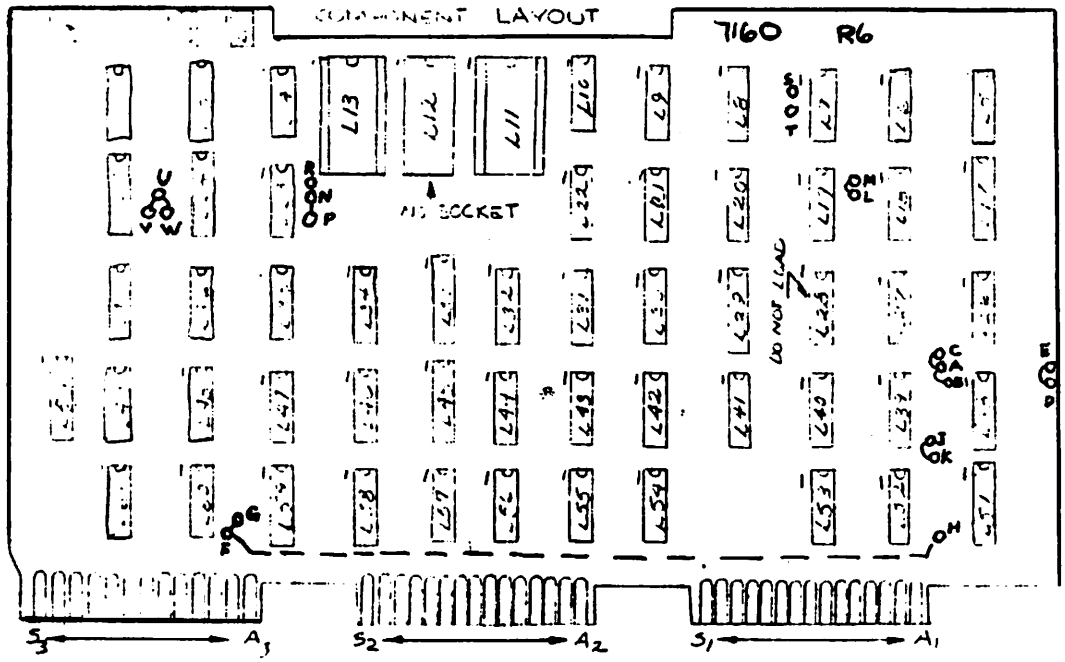
**2231W:**

There are four domestic versions of the 7160:

1. 7160-A - Used in -31W-1 paralled printer (10 pitch) 2200/VS
   - L1, 2, 3, 4, and R8 not loaded
   - L11 = 378-0517, L13 = 378-2041
   - Jumper A-B/D-E/F-G/N-P/U-V/X-Y

   2200
2. 7160-1A - Used in a -31W-2 paralled printer (12 pitch)
   2200VS
   - L15, 16, 24, 25, and R12-19 not loaded
   - L11 = 378-0517, L13 = 378-2041
   - Jumper A-B/D-E/F-G/N-P/U-V/X-Y

   2200 -
3. 7160-D - Used in a -31W-1 serial printer (10 pitch)
   VS/WP
   - L1, 2, 3, 4, and R8 not loaded
   - L11 = 378-0521 (R2), L13 - 378-2050 (R2)
   - Jumper A-C/F-H/J-K/N-P/V-W
4. 7160-1D - Used in a -31W-2 serial printer (12 pitch)
   VS/WP
   - L15, 16, 24, 25, and R12-19 not loaded.
   - L11 = 378-0521 (R2), L13 = 378-2050 (R2)
   - Jumper A-C/F-H/J-K/N-P/V-W




"Y" L43 pin 4
"X" R75 (LOAD SIDE)

| WANG PART NO | ITEM | QTY | NAME |
|---|---|---|---|
| CHG NO | FIRST USED ON | ASSY USED ON | |

WANG LABORATORIES, INC.

MATERIAL

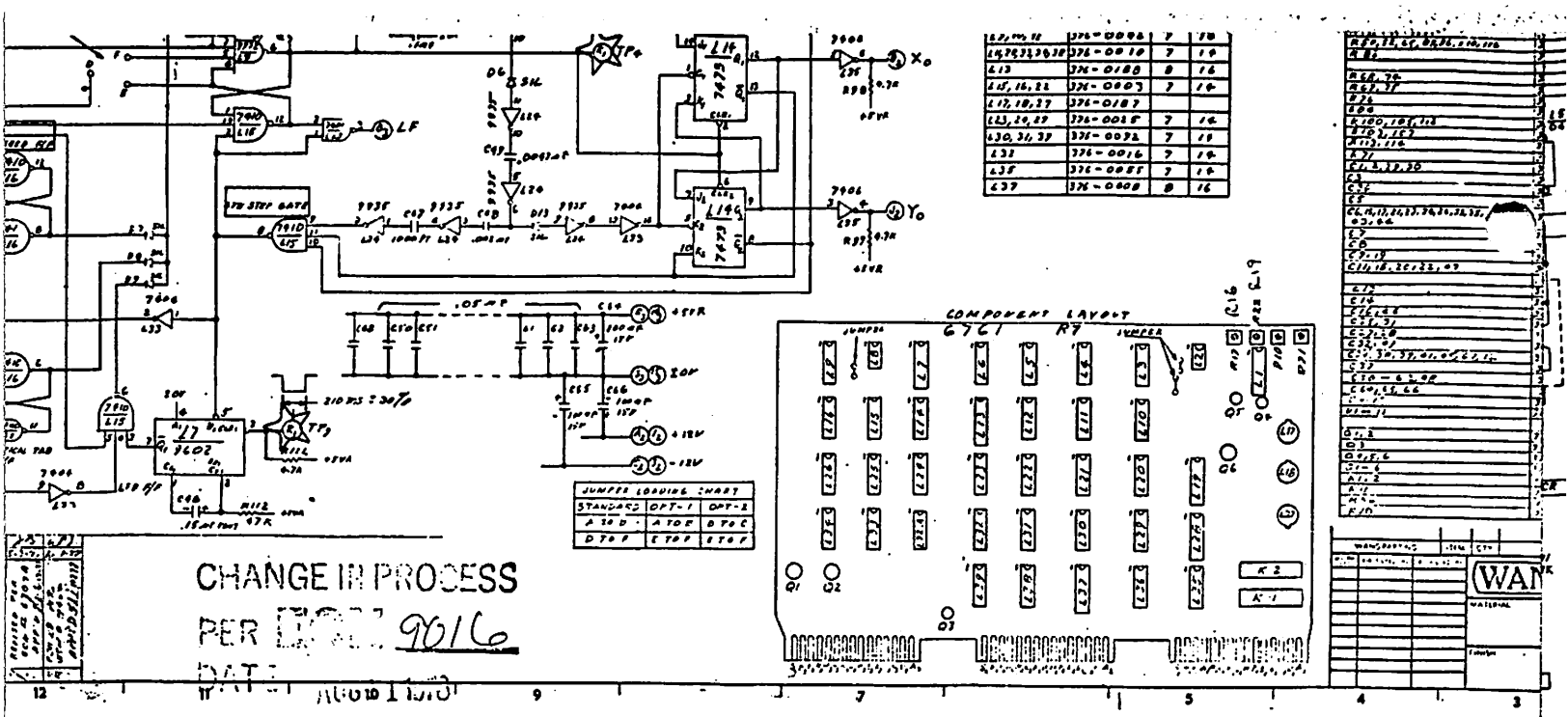
MODEL NO 2231W-2

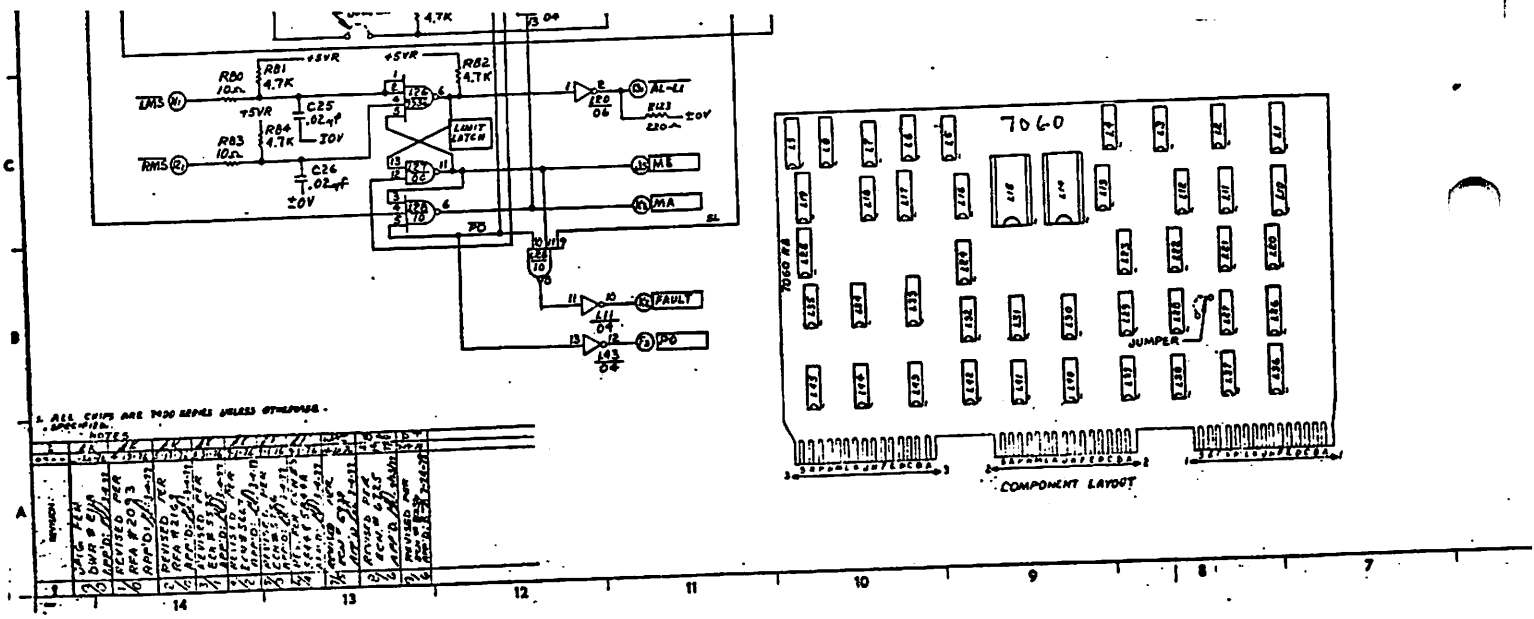
FINISH

7160

DESCRIPTION

APPROVED BY


CHANGE IN PROCESS
PER
DATE
9016
COMPONENT LAYOUT
6761 R7
JUMPERS
JUMPER
K 2
K 1
JUMPER LOADING CHART
STANDARD
OPT-1
OPT-2
A TO D
A TO E
D TO C
D TO F
E TO F
E TO F
WAN


7060
JUMPER
COMPONENT LAYOUT
NOTES
1. ALL CHIPS ARE 7400 SERIES UNLESS OTHERWISE SPECIFIED.

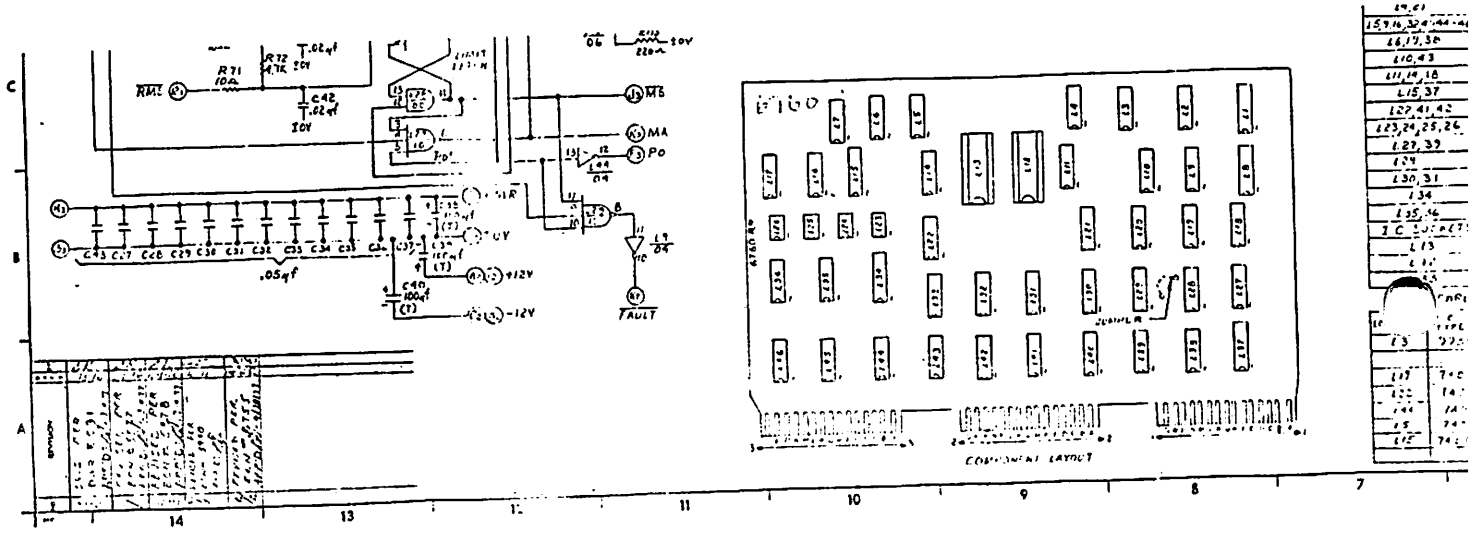
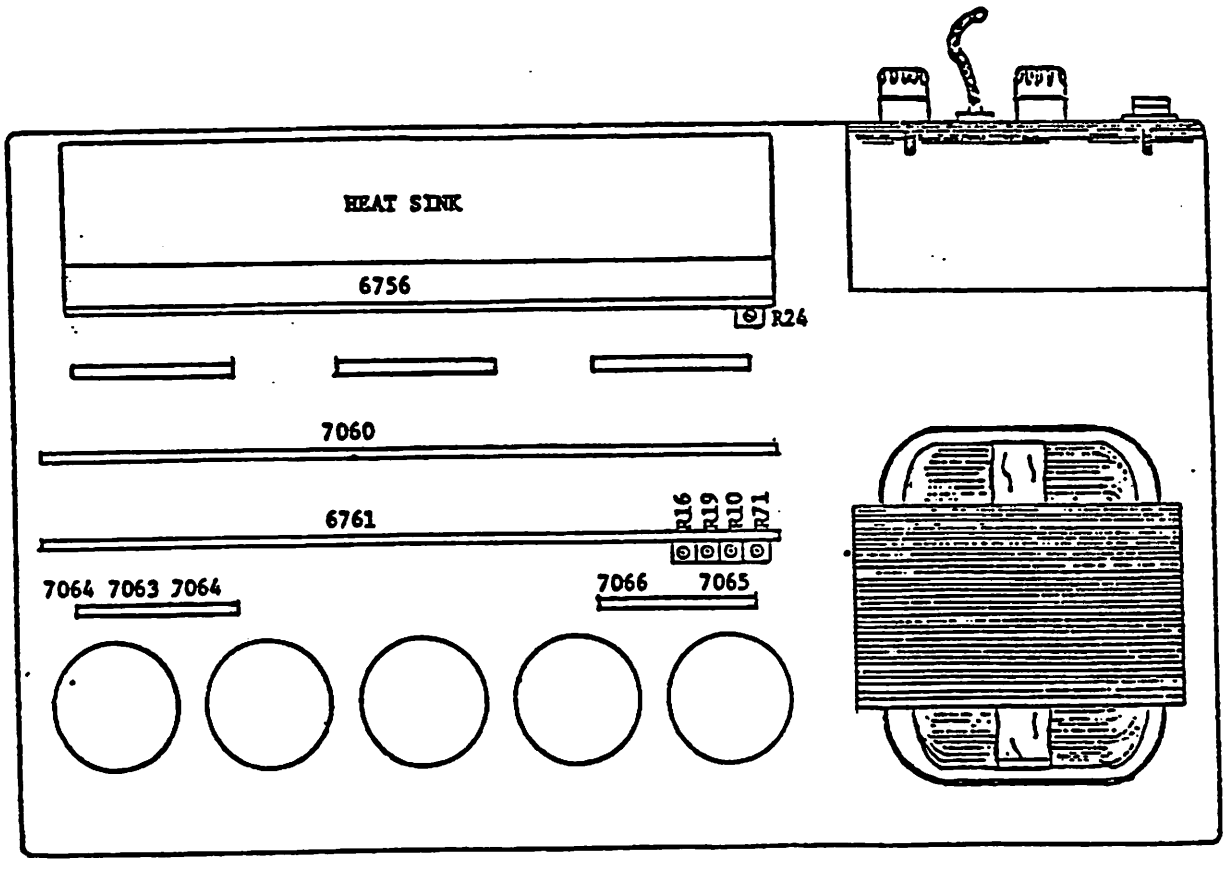

7060
JUMPER
COMPONENT LAYOUT

TABLE 1

| LEVEL OR SIGNAL | BOARD | LOCATION | MEASUREMENT | ADJUSTMENTS 31W -1,-2 | ADJUSTMENTS 31W-3 |
|---|---|---|---|---|---|
| +5VR | 6756 | Pin $C_1$ | +5 volts ± .25 volts | R24 | R24 |
| WS | 6761 | L19 pin 5 | 1600 us ± 25 us full cycle | R71 | R67 |
| | 6794 | L19 pin 5 | square wave 50% duty cycle | R10 | R10 |
| WS(TRAILING EDGE) | 6761 6794 | L19 pin 7 | 550-560 us negative pulse | R~~23~~ 16 | R23 |
| WS (LEADING EDGE) | 6761 6794 | L19 Pin 9 | 550-560 us negative pulse | R19 | R19 |

NOTE: Whenever the 6761 or 6794 boards are changed, all electrical adjustments must be checked. All timing pots should be secured with Glyptal after adjustment to prevent any changes due to vibrations in the printer.




ELECTRICAL CHASSIS ASSEMBLY LAYOUT

MECHANICAL ADJUSTMENTS

1. HEAD ADJUSTMENT ARM

With adjustment arm in position 5, the allen screw in carriage shaft should be straight up.

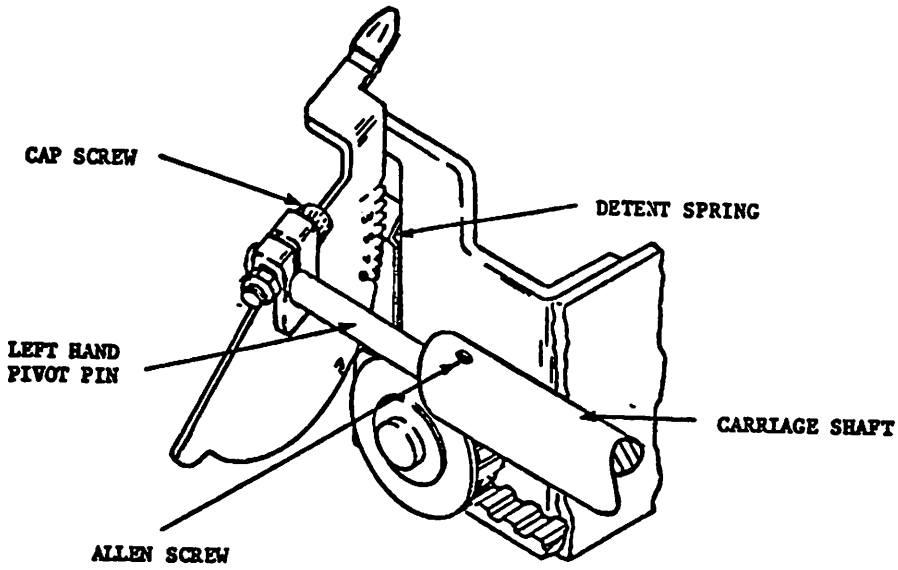



FIGURE 3 HEAD ADJUSTMENT ARM ASSEMBLY

2. STRIKER BAR

With head adjustment arm in position 1 and ribbon removed there should be a .013" gap between print head and striker bar on both the left and right side.

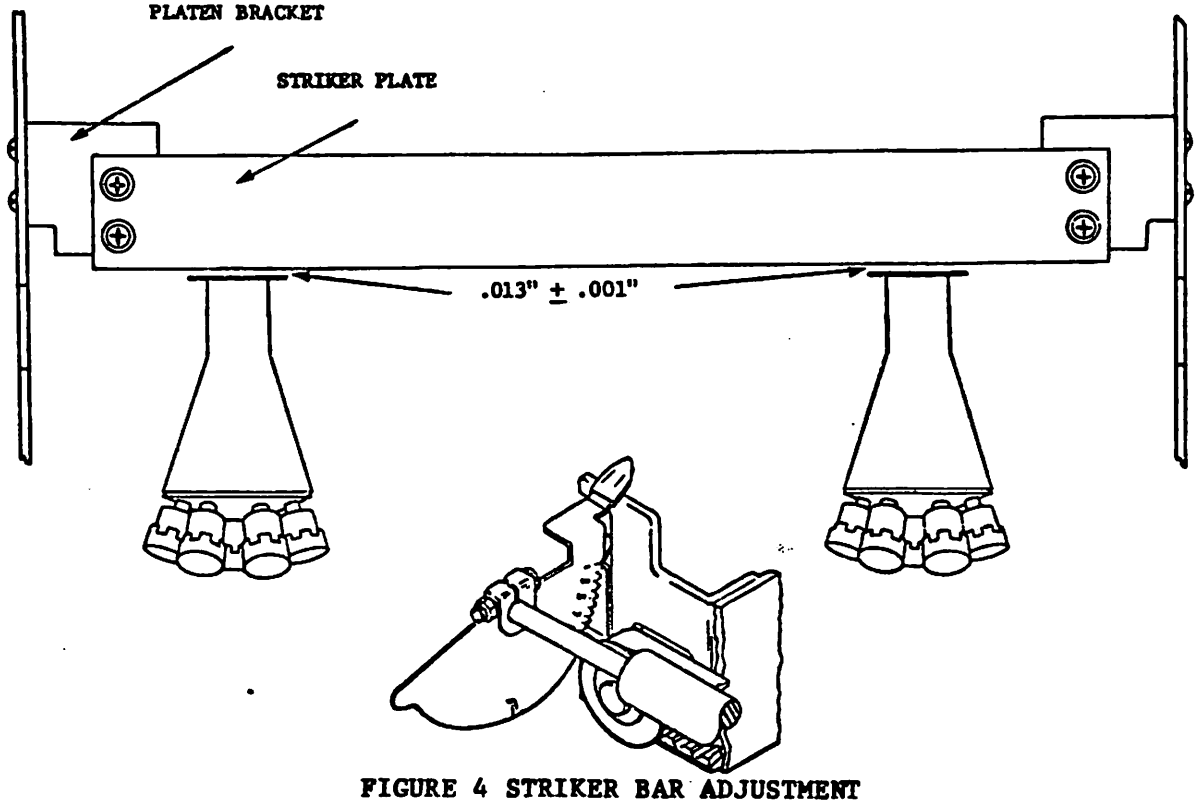



FIGURE 4 STRIKER BAR ADJUSTMENT

3. PRINT HEAD SOLENOIDS

A. The basic adjustment of the solenoids is to have the tip's of the solenoid wires flush with the print head bearing.

B. To fine tune the solenoids have the printer continuously print and set the head adjustment arm to the highest number setting at which most of the solenoids can still be seen printing. Adjust solenoids which are to lite or dark respectively in or out until the dots are basically of the same intensity, remembering that no solenoid should stick out past the bearing more than a slight amount. This adjustment should be done with a good ribbon on standard 1 part paper.

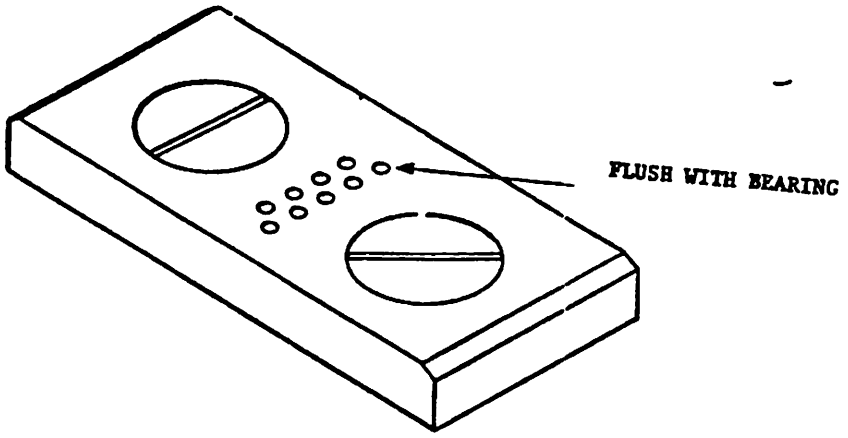



FIGURE 5 SOLENOID WIRE ADJUSTMENT

4. REED SWITCHES & MAGNETIC PICKUP (CHECK AND ADJUST WITH POWER OFF)

| | FROM | TO | MEASURE |
|---|---|---|---|
| A. | LEFT SIDE FRAME | LEFT SIDE OF SW0 | 1.7" ± .015" |
| | LEFT SIDE FRAME | LEFT SIDE OF SW1 | 3.15" ± .015" |
| | RIGHT SIDE FRAME | RIGHT SIDE OF SW2 | .8" ± .05" |

B. The slot in the magnet must run from side to side and the magnet should be .060" ± .015" above the reed switches.

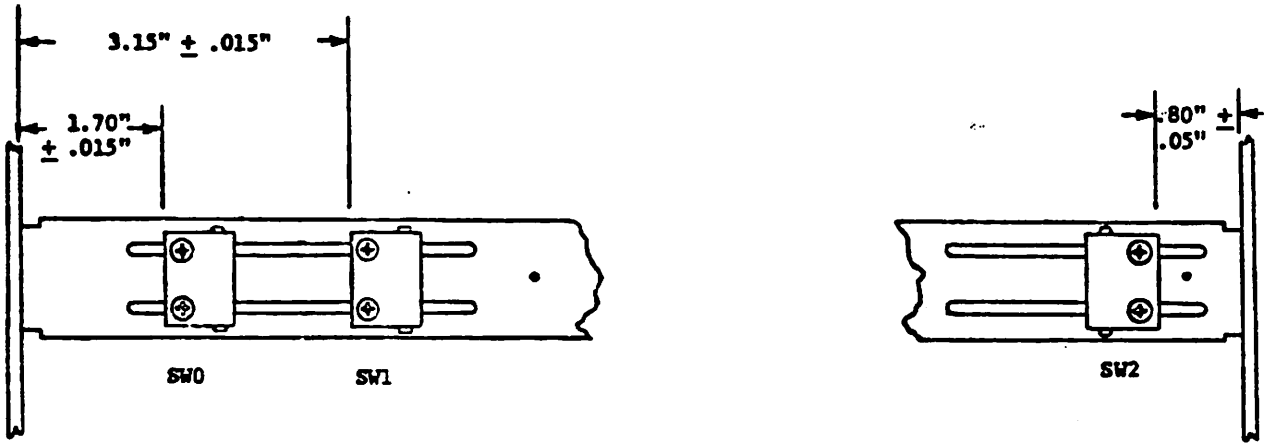



FIGURE 6 REED SWITCHES AND MOUNTING BRACKET

5. MAGNETIC RELUCTANCE PICKUP AND TIMING DISK

A. With pivot plate hole and timing disk hole lined up there should be 1.18" ± .01" between left side frame and left side of carriage ass'y. Loosen timing disk set screw and turn disk to adjust.

B. There should be a consistent .005" ± .001" gap between the pickups and timing disk around the disk's entire circumference.

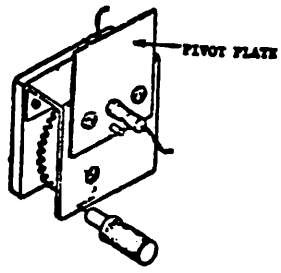



FIGURE 7 FIRST CHARACTER POSITION ADJUSTMENT

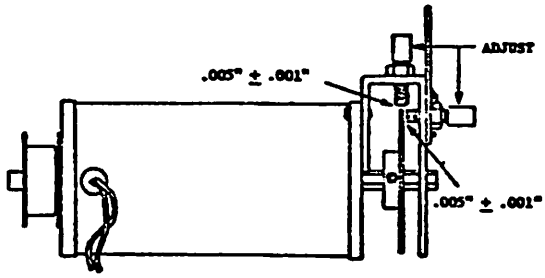



FIGURE 8 MAGNETIC PICKUP ADJUSTMENT

6. VFU

A. With the VFU closed there should be a .012" ± .002" uniform gap between cover and housing, and the base of the sprocket gear which feeds the paper tape must be flush with the housing. Normally this can be adjusted by loosening the two screws holding the housing and adjusting the housing, however, if proper adjustment is not possible by just moving the housing, you may have to adjust the cover stop eccentric and/or possibly raise or lower the cover all in combination. If the cover is raised or lowered make sure it is paralell with the housing when tightened.

B. With a tape in the VFU and the cover closed, the tape should be centered in the indented part of the housing. To adjust remove the cover attached to the back of the housing and advance the paper tape sprocket gear until the allen hold down screw is exposed. Loosen and slide gear in proper direction and retighten. On some older units a screw may be exposed thru a hole in the side of the VFU housing. If this is the case, turning that screw will move the sprocket gear to allow for the centering of the paper tape.

C. The output of the phototransistor should be at least 4 volts on both channels 5 and 7 of the VFU. Check on the 6761, or 6794 on 31W-3, the following connector pins with VFU closed, no tape.

Channel 5 (Vertical Tab) $M_3$
Channel 7 (Top of Form) $P_3$

If voltages are less than 4 volts make sure the LED's are not blocked with dirt. If still off, move VFU cover from side to side while monitoring voltage.

Check voltages with tape in and if less than 4V adjust by moving sprocket gear as in step B.

D. The stepping motor and VFU should be in phase. Connect a scope probe (Channel 1) to pin $M_3$ of the 6761/6794 and another probe to L15 pin 8. Trigger on channel 1. Key Top-of-Form continuously. Channel 1 of the scope is the output of channel 5 of the VFU and channel 2 of the scope is the 4th step signal (L15 pin 8) from the motor circuit. The 4th step pulse should appear just left of center of the VFU signal. See Figure 10. If phase is off by more than a centimeter, a course alignment is necessary. Remove the belt between the stepping motor and timing gear (horizontal vernier clutch assembly) and rotate the Horizontal Vernier Clutch Assembly behind the VFU in desired direction several teeth and replace the belt. If the VFU signal is (Channel 5) ahead of the 4th step pulse (Figure 10B), turn the Horizontal Vernier Clutch Assembly clockwise. If the 4th step pulse is ahead of the VFU signal (Figure 10) then turn the Horizontal Vernier Clutch Assembly counterclockwise. If phase is off by a centimeter or less, loosening the motor retaining screw and then turning the motor in desired direction will correct phase error.

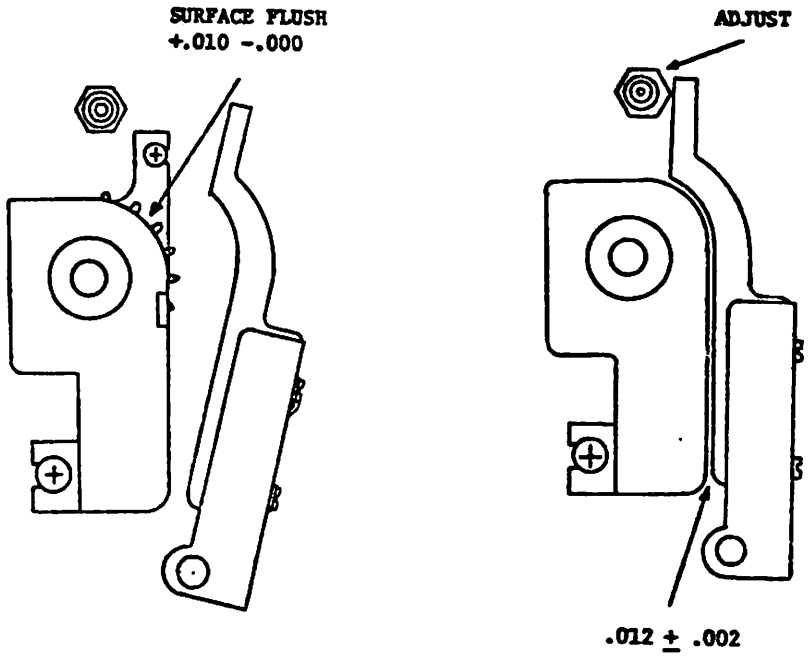



FIGURE 9 VERTICAL FORMAT HOUSING ADJUSTMENTS

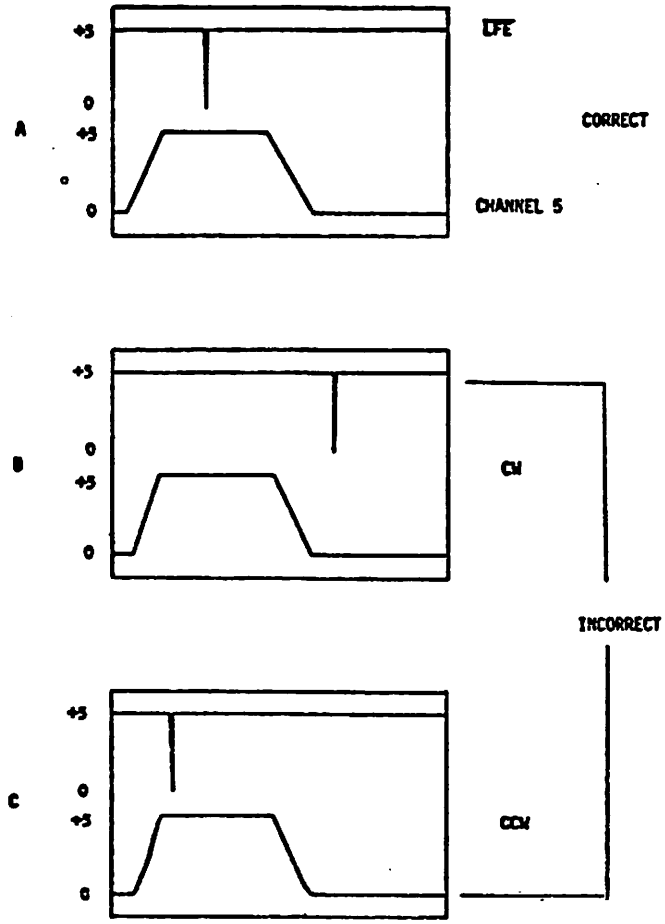



FIGURE 10 VFU AND STEPPER MOTOR PHASE CHECK

## TROUBLESHOOTING CHART

| | SYMPTOM | POSSIBLE CAUSE | | SOLUTION | |
|---|---|---|---|---|---|
| 1. | Power turn on and no lights | 1A. | Power Fuse blown | 1A. | Replace power fuse |
| | | 1B. | +5V low | 1B. | Check and adjust +5V. |
| | | 1C. | No Voltage | 1C. | Replace 6756 |
| | | 1D. | Q1 (heat sink) bad. No +5V to logic | 1D. | Replace Q1. |
| 2. | Power turn on and alarm light. | 2A. | Servo fuse open | 2A. | Replace servo fuse. |
| | | 2B. | Servo fuse blows repeatedly. | 2B. | Adjust SW0 and SW1 |
| 3. | Print is inverted | 3A. | 6758 Fingerboard reversed. | 3A. | Reverse 6758 |
| | | 3B. | 6759 Fingerboard reversed | 3B. | Reverse 6759 |
| 4. | Power prime and carriage does not return to left margin | 4A. | Check servo fuse | 4A. | Replace fuse. |
| | | 4B. | Check for paper jam in paper guide preventing carriage from returning | 4B. | Remove paper. Check paper guides for alignment and tension. |
| | | 4C. | Main drive belt and pulleys binding | 4C. | Check adjustments |
| 5. | Power on; depress select button and select lamp does not come on | 5A. | Defective Lamp | 5A. | Replace lamp |
| | | 5B. | Defective switch | 5B. | Replace switch |
| | | 5C. | Defective connection to switch | 5C. | Continuity check |
| | | 5D. | Defective 7060 | 5D. | Replace 7060 |

NOTE: USE THE SAME PROCEDURE FOR CHECKING TOP OF FORM, CLEAR AND LINEFEED SWITCHES. (THESE SWITCHES ARE CONNECTED TO 6761 PC BOARD)

| | SYMPTOM | | CAUSE | | SOLUTION |
|---|---|---|---|---|---|
| 6. | Front cover is open; CPU tells printer to print but no carriage movement | 6A. | Cover open switch is on | 6A. | Manually pull switch to colsed position. |
| 7. | Front cover is closed; CPU tells printer to print but no carriage movement. | 7A. | Cover open switch wired wrong | 7A. | Check wiring |
| | | 7B. | Cover open switch defective | 7B. | Replace switch |
| | | 7C. | Defective 6761 | 7C. | Replace 6761/6794 |
| 8. | Erratic forward motion of carriage during printing | 8A. | Defective servo circuit | 8A. | Replace 6756 or 6761/6794 |
| | | 8B. | Defective servo | 8B. | Replace servo motor |
| 9. | Carriage assembly returning at slow speed after printing a line | 9A. | SW1 reed switch defective (shorted) | 9A. | Replace reed switch |
| | | 9B. | 6761/6794 PCB defective | 9B. | Replace 6761/6794 |
| 10. | Carriage returns fast with no deceleration. | 10A. | Defective 6761/6794 | 10A. | Replace 6761/6794 |
| | | 10B. | SW1 appears defective.(open) | 10B. | Replace SW1 or align magnet |
| 11. | No power to servo drive Mechanism, but power lights on | 11A. | Servo fuse open | 11A. | Replace fuse |
| | | 11B. | Bad connection | 11B. | Check seating of boards and connectors |
| | | 11C. | +5V logic not set properly | 11C. | Adjust +5V logic |
| 12. | No printing, but carriage movement | 12A. | No WS signal | 12A. | Check magnetic pickup signal |
| | | 12B. | Defective magnetic pickup | 12B. | Replace magnetic pickup |
| | | 12C. | Timing on 6761/6794 | 12C. | Adjust 50% duty cycle on 6761/6794 or replace 6761/6794 |
| 13. | No delays between manual line feeds | 13A. | 6761/6794 (L77) defective | 13A. | Replace 6761/6794(or L7) |
| 14. | No line feeds except under program control | 14A. | Defective line feed switch | 14A. | Replace switch |
| | | 14B. | Defective 6761/6794 | 14B. | Replace 6761/6794 |

| | SYMPTOM | | CAUSE | | SOLUTION |
|---|---|---|---|---|---|
| 15. | Continuous paper feed when top of form executed. | 15A. | Defective 6761 | 15A. | Replace 6761 |
| | | 15B. | VFU defective | 15B.1 | Adjust VFU |
| | | | | B.2 | Replace paper tape |
| | | | | B.3 | Replace LED |
| | | | | B.4 | Replace photocell |
| | | 15C. | No VFU tape | 15C. | Install tape. |
| 16. | Poor print quality at one specific location | 16A. | Burr on chassis | 16A. | Check carriage bearing guide shaft or plate for dirt or burrs at that location. |
| | | 16B. | Defective timing disk | 16B. | Replace timing disk. |
| 17. | Poor print quality everywhere (characters not symmetrical) | 17A. | Timing 6761 | 17A. | Adjust 50% duty cycle 6761. |
| | | 17B. | Magnetic pickup | 17B. | Replace magnetic pickup |
| | | 17C. | Head Penetration | 17C. | Adjust head penetration |
| | | 17D. | Solenoids in head maladjusted | 17D. | Remove head assembly and adjust print head to specification. |
| | | 17E. | Print head loose | 17E. | Tighten head. |
| 18. | Missing dots in character | 18A. | Defective ROM on 7060 | 18A. | Replace ROM in 7060 |
| | | 18B. | Defective pwr. transistor on 6756 | 18B. | Replace transistor on 6756 |
| | | 18C. | Maladjusted solenoid | 18C. | Adjust solenoid |
| | | 18D. | Broken solenoid wire | 18D. | Replace solenoid |
| 19. | Print head catching ribbon during printing | 19A. | Head penetration exceeds.000" | 19A. | Adjust penetration |
| | | 19B. | Ribbon worn out with too much head penetration | 19B. | Replace ribbon and adjust penetration |
| | | 19C. | Solenoid staying in fixed position | 19C.1 | Replace solenoid |
| | | | | .2 | Replace pwr. transistor on 6756 |
| | | | | .3 | Replace 7060 |
| | | 19D. | Strobe too long | 19D. | Adjust strobe length |
| 20. | Print quality light on one side | 20A. | Striker bar maladjusted | 20A. | Adjust striker bar |

| | SYMPTOM | | CAUSE | | SOLUTION |
|---|---|---|---|---|---|
| 21. | Paper streaked during print | 21A. | Head penetration to close | 21A. | Increase head to striker bar gap |
| | | 21B. | Paper not within usable specs | 21B. | Advise user to replace with paper meeting specifications. |
| | | 21C. | Print solenoid dragging on paper | 21C. | Adjust solenoid |
| | | 21D. | Ribbon cartridge guides maladjusted | 21D. | Adjust cartridge ribbon guides. |
| 22. | No printing, but carriage moves to right and fails to return. Servo fuse blows | 22A. | Loss of WS strobe | 22A. | Check adjustment of magnetic pickup A and wires |
| | | 22B. | Missing index pulse | 22B. | Check adjustment of magnetic pickup B and wires. |
| | | 22C. | Defective 6761/6794 PCB. | 22C. | Replace 6761/6794 PCB. |
| 23. | Characters elongated | 23A. | Defective 6761 | 23A. | Replace 6761 |
| 24. | Overdriving solenoids | 24A. | Defective 6761/6756 | 24A. | Replace 6761/6756 |
| 25. | Can hear solenoids fire but no print | 25A. | Head too far from striker bar | 25A. | Adjust penetration, check striker bar gap |
| | | 25B. | Extended solenoid wire caught in ribbon preventing ribbon from moving | 25B. | Adjust or replace solenoid wire and/or solenoid |
| 26. | No carriage movement | 26A. | Defective 7060/6761 | 26A. | Replace 7060/6761 |
| 27. | Carriage grinds on return | 27A. | Defective 6756 | 27A. | Replace 6756 |
| 28. | Print fading in and out | 28A. | Solenoid wire intermittenly catching ribbon | 28A. | Adjust or replace solenoid wire and/or solenoid. |
| 29 | Carriage forced to left or right | 29A. | Defective 6756 | 29A. | Replace 6756 |
| 30. | Connect scope ground to print ground and get a spark | 30A. | defective 6756, something shorting to ground | 30A. | Replace 6756 |

| | SYMPTOM | | CAUSE | | SOLUTION |
|---|---|---|---|---|---|
| 31 | Carriage intermittently hangs or hesitates at left margin | 31A. | Defective 6756 | 31A. | Replace 6756 |
| | | 31B. | Read switch 0 out of adjustment | 31B. | Adjust read switch 0 |
| 32. | Left margin wavy | 32A. | Timing gear pickups not getting good signal | 32A. | adjust and or align timing gear and pickups |
| | | 32B. | WS improperly adjusted | 32B. | Adjust WS |
| 33. | Part or all of print line breaking up | 33A. | Ribbon cable to carriage causing interference | 33A. | Replace ribbon cable or try taping two sides of cable together with tape every 4" along front |
| | | 33B. | Defective 6756 | 33B. | Replace 6756 |
| 34. | Won't print last character | 34A. | Last reed switch, SW2, out of adjustment, too far left | 34A. | Adjust reed switch 2 |
| 35. | Carriage intermittently hangs on right margin | 35A. | Last reed switch, SW2, too far right | 35A. | Adjust reed switch 2 |
| 36. | Intermittently loose servo | 36A. | Defective 6756 | 36A. | Replace 6756. |
| | | 36B. | Defective Drive Motor | 36B. | Replace Motor |

## 2231-1/-2 Underscore

To enable the underscore function on the 31W-1/-2 printer the following boards must be as stated below:

210-6761-Timing and Format Control Board for 10 and 12 Pitch
E-REV level must be at least 4 up to latest, E-REV 9

210-7060-10 Pitch Data Storage, I/O Control and Char Generator Board
E-REV level must be at least 3 up to latest, E-REV 7.
Solder wire from L17 pin 9 to L27 pin 10

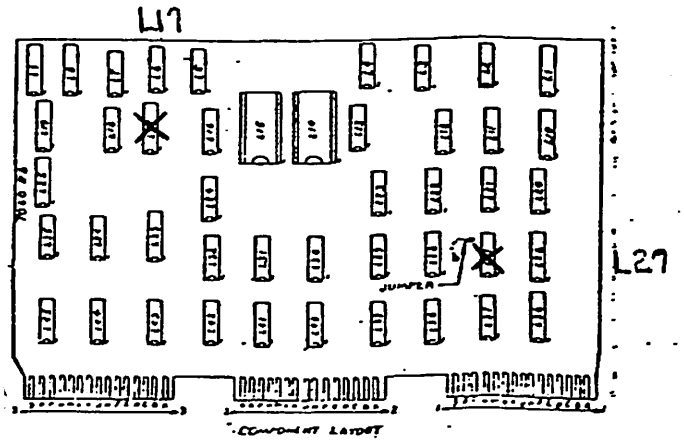
210-6760-12 Pitch Data Storage, I/O Control and Char Generator Board
E-REV level must be at least 2 up to latest, E-REV 7.
Solder wire from L17 pin 8 to L28 pin 10

Some new 31W printers are being sent out with 210-7160A boards for 10 pitch and 210-7160-1A for 12 pitch replacing the 7060 and 6760 respectively. If you have a problem with underscoring with these boards, try reverting back to the 7060 and 6760. The 7160A and the 7160-1A are universal boards for parallel printers for 2200 and VS and should be capable of underscoring. There are jumpers on the 7160A and 7160-1A which should be set as follows:

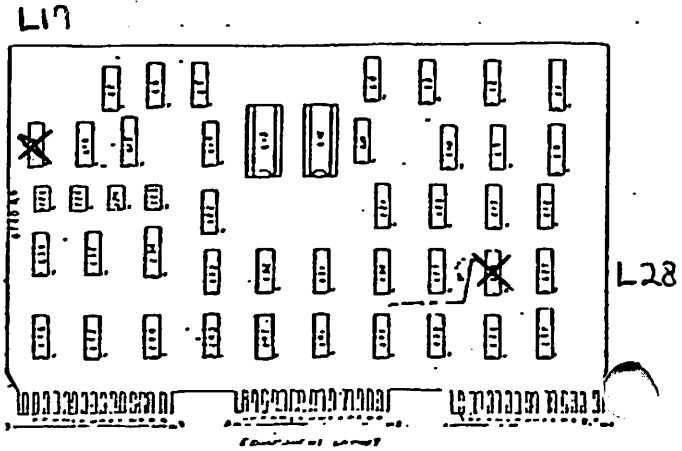
A to B, D to E, F to G, N to P, U to V, X to Y

```
10 PRINT HEX(C1C2C3C4),
20 GOTO 10
```

7060




6760



Intended For: Terry Boyles This Item is In Progress
Author: Mike Bahia
Subject: dial in ???

---

To: Mike Bahia From: Terry Boyles
Subject: dial in ??? Date Sent: 11/13/96

We decided that instead of trying to find 11 bit modems we would use one of their local PCs running PC2200 and PCanywhere as a gateway to the host. Though it ties up another PC it was by far the simplest and cheapest solution. Just thought you'd be interested, thanks again ,Terry.

---------- Reply ----------

To: Terry Boyles From: Mike Bahia
Subject: dial in ??? Date Sent: 10/24/96

Terry,

This sounds like a remote terminal w/ a dial up line. The dial up procedure would then be dependent on the modem. On the 2200 side the port being used is just like any other port & is always active. You should be able to attach a local terminal to it & if the baud rate matches, get the 'Ready Basic-2' prompt. With any Wang 2200 terminal, it should come up with the terminal type & baud rate in the top left corner w/ power on. If the port is good & the terminal shows the prompt, the only thing left is the connection between again assuming the baud rate & parity is correct. For a dial up line you would use 2 standard RS232 cables between MXE & modem & terminal & modem. On normal 2200 terminal cables pins 2 & 3 are crossed which you do not want w/ modems. PC would need to have emulation s/w & possibly an adaptor cable to go from 9 to 25 pin. It would probably be easier if you called me & we could discuss specifically what your application is. My number is 508-858-7095.

Regards,
Mike

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

To: Mike Bahia From: Terry Boyles
Subject: dial in ??? Date Sent: 10/24/96

what is the best way to dial into a 2200 cs with MXE terminal controllers using either a PC or a 2336 terminal?

---------- Reply ----------

Terry,

Thanks for the update. Glad you were able to help this customer. Will print this out & use it for future reference.

Thanks again, Mike

*To:*
*CS/2200 file*

*Date: 3 August 1989.*

*Re: CS/2200 remote interconnections.*

*Anderson Jacobsen @1200 baud -*

*Octocom Systems 255 Ballardvale St. Wilmington, MA 01887 Tel 508-658 6050.*
*2400 bps maximum dialup or lease. Do not handle flow control precisely.*

*Telenetics Model 921 9600 bps Works in 11 bit mode MNP level 5 or V.32.*
*Firmware resident protocol packet full-duplex mode between modems.*
*Dialup or leased line via Dave Bormes 2400 bps @ $239 9600 list @ $1495.*
*(modem works with VS, 2110, or 2200)*
*(this is best bet costwise on up to three terminals.)*

*MiCom works @9600 bps line speed 19.2K terminals*
*Order MiCom box with Wang features.*
*Dedicated line Statistical Multiplexor with line speed @9600 bps.*
*from Blackbox (NE distributor) or DataMark.*
*Not cheap about $3200 per end.*
*(Jim Simpson uses)*

*Racal Vadic 2400 pa-1 pa-2*
*used about $200 . can not used with wang modem.*

*Tel-Cor 2496MA 9600 baud modem $599 Olney Maryland 301-924-7400*

*Barry Patton.*

*Wang TeleModem 0-2400 bps.*

To:
CS/2200 file

Date: 3 August 1989.

Re: CS/2200 remote interconnections.

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Not cheap about $3200 per end.
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Racal Vadic 2400 pa-1 pa-2
used about $200 . can not used with wang modem.

Tel-Cor 2496MA 9600 baud modem $599 Olney Maryland 301-924-7400

Barry Patton.

Pam Patton

Wang TeleModem 0-2400 bps.

Dave Bormes
UDS - MOTOROLA
with call back w/ model #
2400 MNP 5

Chuck MacArthur
Leominster
System 18, inc.
534-3376
23 Water ST

Rebecca & Tom Peters
MNP/V.42
tel-cor - 2200 model - 9600 Baud - must match
Both connects
MXF Has no CTS
MXE Has no 10 BIT mode

CODEX Hunt or single line

Package Subject: Remote 2200 W/S

Item Title: Remote 2200 W/S

Leo,

# signs usually indicate noise or parity problems or something set improperly in the modem. You indicated 9600 Sync. The MXE is an Asynchronous Controller. Is the modem capable of converting Async to Synchronous and back again? Most likely the problem is the modem. If you would like to isolate the modem you could order a Racal Vadic WA3451, p/n 725-0110, from stock and run a test from my system in the Towers. You need to insure the customer has the standard 6 pin module phone jack available to tie into the phone line and a phone with the same type jack. You may also need to order a T-Adapter, p/n 726-8089, which allows the phone and modem to share the same line.

Additionally I could FAX you the switch/strap settings used in the Racal Vadic. You may be able to find some common option settings for there modem but if it is Synchronous it may need to be replaced. If they decide to replace it I could probably provide some companies or names that could help insure you get a modem that is being used at other 2200 sites without problems.

Regards, Mike

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

To: Mike Bahia From: Leo Olmos
Subject: Remote 2200 W/S Date Sent: 09/27/93

Mike, I got the remote terminal working, but I'm getting a lot of parity errors ( a lot of these #### !! ) The modem is configuered as follows:
9600 SYNC, CTS ON, RTS ON, CONSTANT CARRIER, DSR ON, RX TIMING,
Any ideas would be appreciated!!

Leo Olmos
Los Angeles
818 5572300

CC: Mike Bahia W0000600 6FLT3
From: Mike Bahia Security: Limited
Subject: 2200 Questions Date 11/09/93

---

Excellent. Glad you were able to resolve it.

Mike

---------- Reply ----------

To: Mike Bahia From: Leo Olmos
Subject: 2200 Questions Date Sent: 11/09/93

Mike,
The information I received from you resolved the problem, the remote terminal is up and working.

Thanks, Leo

---------- Reply ----------

To: Leo Olmos From: Mike Bahia
Subject: 2200 Questions Date Sent: 11/03/93

Leo,
Any progress on this problem?

Mike

---------- Reply ----------

CC: Mike Bahia From: Mike Bahia
Subject: 2200 Questions Date Sent: 10/05/93

Leo,
The standard setup calls for 1 start bit, 1 stop bit, 8 data bits, & odd parity. Dependent on the workstation type, you may be able to select 7 data bits or change the parity to even or none. This would then allow you a 10 bit character.

Regards, Mike

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

To: Mike Bahia From: Leo Olmos
Subject: 2200 Questions Date Sent: 10/05/93

Mike,

I am still working on the 2200 remote terminal in Los Angeles. The modem people are requesting information on how to set the following:

Stop Bits=
Data Bits=
Parity=

Any information you have would be greatly appreciated.

Thanks,

# RESET USED BY PC2200

HEX CODES & COMMUNICATION CREATED W/ CNTL_R (EQUIVALENT OF RESET).

PC SENDS FB12 (FB IS PRINTER XOFF, TURN OFF PRINTER IN CASE IN USE)
(12 IS RESET CODE)

MXE RESPONDS W/ EITHER

FBF6 (IF NO OPEN TO 204) OR FBF2 (IF #OPEN 204 IN AFFECT)
10 MIL SEC DELAY AFTER F6 — 50 MIL SEC DELAY AFTER F2

PC SENDS F8 (CRT XON)
10 MIL SEC DELAY AFTER F8

PC SENDS FA (CRT XOFF)
10 MIL SEC DELAYS AFTER FA

} THIS IS DONE TO ENABLE THE MXE WHICH COULD BE SLOW TO RESPOND TO SYNC UP W/ THE PC AGAIN.

PC SENDS FB (PRINTER XOFF)
50 MIL SEC DELAY AFTER FB

PC SENDS E4
50 MIL SEC DELAY AFTER E4

PC SENDS F8 (CRT XON)
50 MIL SEC DELAY AFTER F8

PC SENDS F9 (PRINTER XON)

} POWER ON SEQUENCE

To: Steve Budd

From: David Temlak

Date: December 9, 1988

Subject: Use of The Telemodem With 2200 Systems

---

Ed O'Toole has recently had several inquiries concerning the Wang 2400bps Telemodem in use with the 2200 system. The configurations have been for both leased as well as dial up phone lines. The following is a detailed explanation of how to connect the telemodems to any of the following standard CS/2200 terminals.

1. 2236 DE/DW
2. 2336 DE/DW
3. 2436 DE/DW
4. 2536 DE/DW

All standard CS/2200 terminals when interacting with the CS/2200, use 11 bit data format. That is 1 start bit, 8 data bits, 1 parity bit (odd), and 1 stop bit. The telemodem normally handles 10 bit data format. The telemodem user manual states that it will not accept commands when set for 11 bit format. This is not entirely true. The modem will accept the commands, but will only respond using a 10 bit data format. This causes "garbage" to be printed out on the screen. If the user realizes that this garbage is an expected response and not a modem error, the proper commands can be given to complete the modem connection.

The Telemodems should be strapped in intelligent mode with the battery back-up enabled i.e.

| Switch | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| | UP | UP | DN | UP | DN |

Note: For leased lines the telemodem is designed only to work in the intelligent mode. Connection can not take place while the telemodem is in either the dumb or manual mode.

There are many ways of properly configuring and connecting the two modems. Three methods are discussed here

1) When using two CS/2200 terminals to configure the modems follow the following steps...

STEP 1: Connect the modems to CS/2200 terminals using the telemodem's RS-232 cables.

STEP 2A: To connect the modems using a dial line, it is recommended to type the following commands at both the CS/2200 terminals. (AFTER EACH COMMAND THERE WILL BE A RESPONSE OF FOUR IDENTICAL CHARACTERS, NOT THE EXPECTED "OK" PROMPT NORMALLY SEEN. THESE CHARACTERS ARE SIMPLY THE MODEM RESPONSE CODE TRANSMITTED IN 10 BIT FORMAT.)

# MEMORANDUM

TO: Dawn Mertzer 6010
Ed O'Toole 60803

FROM: Steve Budd

DATE: December 9th, 1988

SUBJECT: 2200 System Leased Line Modem Application

---

Following a request from TSO, R&D have evaluated two methods for successfully implementing a two wire leased line connection between a 2200 terminal and a 2200 system.

The first configuration uses a Wang Telemodem configured as an intelligent modem. This is described in the application note 'Use of The Telemodem With 2200 Systems', written by David Temlak and dated December 9th, 1988. A copy is attached.

The second method uses a 'dumb' modem configuration consisting of a Racal Vadic 2422S. Attached is a second memo from David Temlak, 'Switch Settings for Racal Vadic 2422S', dated December 8th, 1988 describing how to configure the RV 2422S for a leased line application. The modem was verified to operate in an 11 bit two wire leased line environment between a 2200 terminal and a 2200 system. The same configuration was also verified to function between a PC280 running ProComm software and a WPC running PCTTY, version 3.0. The PC280 was connected to the Originating modem and the WPC connected to the Answering modem.

Although the RV 2422S was used for international V.22bis requirements on the AMMUS program, the modem is not generally available through Wang. If you need any further information please contact either myself or David Temlak.

CC: David Temlak

1. AT&F&W
2. ATS0=1 (FOR ANSWERING MODEM ONLY)
3. ATU23=1
4. ATDT PHONE NUMBER (FOR ORIGINATING MODEM ONLY)

STEP 2B: To connect the modems using a leased line (2 wire leased line only), it is recommended to type the following commands at both the CS/2200 terminals. (AFTER EACH COMMAND THERE WILL BE A RESPONSE OF FOUR IDENTICAL CHARACTERS, NOT THE EXPECTED "OK" PROMPT NORMALLY SEEN THESE CHARACTERS ARE SIMPLY THE MODEM RESPONSE CODE TRANSMITTED IN 10 BIT FORMAT.)

1. AT&F&W
2. AT&L1
3. ATU20=0
4. ATS22=13
5. ATU23=1
6. ATD (AT ORIGINATING MODEM ONLY)
7. ATA (AT ANSWERING MODEM ONLY)

STEP 3: After the modems are connected, transfer the RS-232 cable from the back of the CS/2200 terminal at the host site, and attach it to the appropriate TC controller (eg 2236 MXE) in the 2200 system. The connection should not drop! This is due to the modem ignoring the DTR signal from the terminal. The remote CS/2200 terminal should now be able to talk directly to the 2200 system as if he were attached directly. Make sure all concerned terminals and controllers are set for 2400bps operation.

2) If the user has on hand two terminals that perform 10 bit async data transmission (2110 or 2113A for example), he can follow the following steps...

STEP 1: Connect the modems to Async 10 bit terminals using the telemodem's RS-232 cables.

STEP 2: Same as STEP 2 in configuration 1

STEP 3: After the modems are connected, remove the 10 bit terminal at the remote end and replace it with the CS/2200 terminal.

STEP 4: Move the RS-232 cable from the back of the CS/2200 terminal at the host site, and attach it to the appropriate TC controller in the 2200 system. The connection should not drop! This is due to the modem ignoring the DTR signal from the terminal. The remote CS/2200 terminal should now be able to talk directly to the 2200 system as if he were attached directly. Make sure all concerned terminals and controllers are set for 2400bps operation.

note: With the 10 bit terminals you will clearly be able to see the "OK" prompt being returned from the modem after each command.

3) One last alternitive is to configure the host modem through a CS/2200 terminal that is already directly connected (via a Terminal/Mux cable) to the 2200 system. To accomplish this you must have an MXE or equivalent TC controller present. Follow the following steps...

STEP 1: Connect the remote modem to a CS/2200 terminal using the telemodem's RS-232 cable.

STEP 2: Connect the host modem to the MXE port using the RS-232 cable of the telemodem.

STEP 3: Using the TTY emulation package (version 7.00.03 or later), you establish a configuration with the defined port that is connected to the telemodem. Be sure the protocol is properly set for either 10 or 11 bits (remember if 10 bit is selected you can see the modem responses to your commands). For example

| | |
|---|---|
| Baud Rate: | 2400 |
| Parity: | Odd |
| Stop Bits: | 1 |
| Bits per Character: | 7 or 8 |
| Line Protocol: | TTY Terminal |
| Modem Operation: | Full Duplex |
| Host Echo Each Character: | No |

STEP 4: Same as STEP 2 in configuration 1

STEP 5: After the connection is established, release the TTY port on the MXE board of the 2200 for terminal emulation. The remote terminal should now be properly connected.

| | | |
|---|---|---|
| cc | Mike Giammusso | 014-890 |
| | Ed O'Toole | 001-180 |
| | Henry Turko | 014-890 |
| | Dawn Mertzer | 001-180 |
| | Tyler Olsen | 014-890 |
| | Dennis Dunaway | 014-890 |

To: Steve Budd

From: David Temlak

Date: December 8, 1988

Subject: Switch Settings for Racal Vadic 2422S

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While the Telemodem is applicable for use on any 2200 system, there has been a request for a second source 11 bit modem. The 2422S from Racal Vadic has been fully tested to meet the following needs. The 2200 system requires 11 bit operation for terminal emulation. In addition the application requested by Ed O'Toole states that the modem need not be intelligent and that it function in a leased line environment. The following list defines the front panel strapping required to initialize the modem for this particular application...

Originating Modem

| LEASED LINE OPTIONS | OPTION NUMBER | SETTING |
|---|---|---|
| | 00 | 02 |
| | 09 | 02 |

| FRONT PANEL SELECTIONS: | OPTION KEY | STATUS |
|---|---|---|
| | ORIG/ANS | ORIG |
| | LEASE/PSTN | LEASE |

Answering Modem

| LEASED LINE OPTIONS | OPTION NUMBER | SETTING |
|---|---|---|
| | 00 | 02 |
| | 09 | 02 |

| FRONT PANEL SELECTIONS: | OPTION KEY | STATUS |
|---|---|---|
| | ORIG/ANS | ANS |
| | LEASE/PSTN | LEASE |

Subject: Wang Telemodem — Ed O'Toole, Dave Perlo

There are multiple ways to configure the WTM, this document will outline configurations that could be used with the 2200.

The WTM is normally programmed in 10 bit data format. A 2200 terminal can program the WTM without changing from the standard 11 bit data format, however the return codes from the WTM will not be properly interpreted.
IF DON'T CHANGE TO 10 BIT THE COMMANDS WILL WORK, BUT THE RESPONSES ON THE 2200 SCREEN WILL NOT BE MEANINGFUL.

Required Commands: (All commands must be prefixed with the "AT" command; commands can be strung together. ie. AT &F U23=1 &S0 &W)

| | | |
|---|---|---|
| | AT | Attention, used to prefix all command lines |
| * | &F | Fetches Factory Defaults |
| * | U23=1 | 11 Bit Transmission (Required for 2200) |
| | S0=x | Auto Answer Ring Count (Answer after x Rings) |
| * | &W | Writes Configuration to Non Volatile Memory |
| | DTxx | Dial/Tone xx is phone number of remote modem |

MUST BE ENTERED FOR LEASED LINES ALSO

For 2 Wire Leased Line Operation Only: RESPONDS

| | | |
|---|---|---|
| AT | &L1 | Leased Line |
| AT | U20=0 | Disables Line Current Sensor |
| AT | S22=13 | Disables Blind Dialing |

(In later versions of WTM firmware, only the &L1 command is required for a leased line)

Data Communication Mode is set with dip switches (Back of WTM) U=UP, D=Down

SW 12345

| | |
|---|---|
| UUDUD | Intelligent Mode (Required to Program WTM) |
| UDDUD | Manual Mode |
| DUDUD | Dumb Mode |

Connections are established differently depending on the data mode. It is assumed that all dial up remote modems are set for auto answer. WTMs used for either Manual or Dumb modes must be programmed in Intelligent mode prior to use. (ie 11 bit transmission, auto answer, etc)

Intelligent Mode:

Dial Up — Originating end enters ATDT9,6176560500, modem will go off hook and dial number entered. (Comma in telephone number enters a delay for dialtone) MAY BE ABLE TO MANUALLY DIAL & WHEN HEAR TONE TYPE IN ATD.

Leased — 2 wire leased lines are only supported in Intelligent mode. The following commands must be entered at the same time(within seconds); Originating end enters "ATD", then at remote end enter "ATA" (Answer). Connection will be established and will remain up until modem is powered off or line fails.

Manual Mode: (Uses 6 softkeys, upper right side of modem)

Switches have different functions depending on the model

| Switch | WTM1200 | WTM2400 |
|---|---|---|
| 1 (top) | 300 baud | 300 baud |
| 2 | 1200 baud | 1200 baud |
| 3 | Originate | 2400 baud |
| 4 | Answer | Originate |
| 5 | Auto Answer | Answer |
| 6 | | Auto Answer |

Dial the telephone number normally, when answer tone is heard the call is converted to a data call using the softkeys, select the baud rate to be used, then originate.

Dumb Mode:

Dial the remote modem listen for the answer tone and hang up phone.

0419y

# WANG TELEMODEM

SW 1 & 2 — 3 MODES

| | |
|---|---|
| INTELLIGENT | 1 & 2 UP |
| DUMB | 1 DOWN 2 UP |
| MNL DATA | 1 UP 2 DOWN |

SW 4 (UP) IN LOCAL W/ INTELLIGENT OR DUMB MODE ALLOWS THE SOFT KEYS TO BE PROGRAMMED FOR SPEED DIALING

(UP) IN LOCAL W/ MNL DATA MODE SOFT KEYS DEFAULT TO MANUAL DATA SELECTIONS

(DOWN) IN REMOTE ALLOWS WTM TO SEND A 2 BYTE ASCII CODE TO THE DTE

INTELLIGENT - ALLOWS THE SOFT KEYS TO BE PROGRAMMED & ALLOWS COMMUNICATION BETWEEN THE DTE & MODEM TO MAKE USE OF THE MODEMS OPTIONS VIA THE ~~PROGRAM~~ TERMINAL & PROGRAMMING OF THE WTM FROM THE DTE.

DUMB - MOST COMMONLY USED TO TRANSFER FILES IN AUTO-ANSWER
WTM CAN NOT BE CONTROLLED BY DTE
MAY NOT CONFORM W/ RS232

MANUAL DATA - CONFORMS TO RS232
ACTS UPON PREVIOUSLY PROGRAMMED DATA SENT TO WTM
SOFT KEYS DEFAULT TO MANUAL DATA SELECTIONS

★★★ WTM IS NOT COMPATIBLE W/ THE RACAL VADIC 3451 ON 2200 DUE TO THE WAY THE 11 BIT PROTOCOL IS HANDLED.

To Program the WTM on 2200 both ends

1. Set sw's in back of WTM to 1, 2, 4 up to program WTM in INTELLIGENT Mode

2. Set 2200 terminal to 1200 baud, 7 data, EVEN parity (on a 2236DE/DW - 2, 3, 5 on) to communkate w/ WTM

3. Cable WTM PHONE to W/S

4. Key AT return = OK on screen (talking to Telemode

5. Key AT space S$\emptyset$ = 2 1 YES (Auto answer after 1 ring)

OR

6. Key AT space S$\emptyset$ = 2 1 space U23 = 1 & W (U23 sets 11 bit mode & W saves it)

IF KEY AT space U23 ? RET · SHOULD COME BACK W. 001 MEANING SET TO 11 BIT

7. Turn sw 2 on back of WTM OFF, 1 & 4 remain on (Manual Data mode)

8. Recycle Power to WTM

9. Return W/S to normal sw settings for 1200 baud, 8 data bits, ODD PARITY (sw's 1, 3, 5 on for 2236DE/DW)

Remote

Had to leave in INTELLIGENT MODE

AT space DT space TEL #

Wang TeleModem

Wang CS/2200 terminals require 11 bit odd parity.

Wang Telemodem -- 1200 or 2400 bps

ng WA3451 -- 1200
(11 bit mode incompatible with TeleModem 11 bit mode)

Wang Telemodem -- Setup instructions:
Normal power up mode depends on switch settings.

At the async terminal type:

| | | |
|---|---|---|
| Type | AT return | |
| responds | OK | |
| Type | AT U23=1 &W return | (originate only terminal) |
| or | | |
| Type | AT U23=1 S0=1 &W return | (autoanswer terminal) |
| where | AT | from manual 4-2 command start sequence |
| | U23=1 | from manual 6-5 set 11 bit mode. |
| | S0=1 | from manual 7-3 set autoanswer and ring count |
| | &W | from manual 6-10 force register restore on power up. |
| responds | OK | |
| do | flip switches to manual mode (1&2 down) | |
| do | Power cycle the modem | |
| | (unplug and replug moem to make new dip switches active) | |

Contact: Ed O'Toole 6-0803 Electronics Ave.

Unknow sequence below may be good or bad:

| | | |
|---|---|---|
| | AT U23=1 F1 B2400 S13=94 S23=26 &W return | |
| where | AT | from manual 4-2 command start sequence |
| | U23=1 | from manual 6-5 set 11 bit mode. |
| | F1 | from manual 6-3 set modem to full duplex |
| | B2400 | from manual 6-2 set modem to 2400 bps |
| | S13=94 | from manual 7-6 set UART defaults |
| | | (94) meaning ?? |
| | S23=26 | from manual 7-10 (set power up defaults) |
| | | (26) meaning ?? |
| | &W | from manual 6-10 force register restore on power up. |

Reference "The Wang TeleModem Installation and User's Guide
715-0653 9-86

CS/2200 T.C. Emulations

ASC

Teletype Emulator
IBM 2741 (Selectric)

BSC

Multileaving Hasp
IBM 2780
IBM 3780
IBM 3741
Wang 2200 to 2200
2200-WPS mode

Burroughs TC500

Burroughs Poll/Select

BSC 3275

IBM 3275 BSC emulation

BSC 3271

IBM 3271 BSC emulation
(9 device streams total of mix below)
8 3277 terminals, 4 3288 printers.

RCM

Remote Control Maintenance

S/2200 via 2258 LCO link

VS/2200 via BSC package and VS TC COPY.

PC/2200

via 2236DE terminal emulators.

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

Modem connections:

| | | |
|---|---|---|
| 2227N | Null modem | Async only. |
| 2228N | Null modem | Async or Bisync. |
| Wang Telemodem | | 0-2400 baud |
| WA3451 | | 0-1200 baud async only. |

NOTE: 2200 Terminals require 11 bit mode, when talking as program terminals.

NOTE: Wang TeleModem is not compatible with WA-3451 in 11 bit mode.

Table 6. Controllers for Communications

| Emulation | MXE | 2227B | 2228B | 2228C | 2228D D-4 | 2258 LCO |
|---|---|---|---|---|---|---|
| Asynchronous | | | | | | |
| RCM | Yes | Yes | Yes | Yes | - | - |
| ASC | Yes | Yes | Yes | Yes | - | - |
| ASC With Flow Control | Yes | - | - | - | - | - |
| Asynchronous/Synchronous | | | | | | |
| Burroughs Poll Select | | | Yes | Yes | - | - |
| Synchronous | | | | | | |
| 2780/3780/3741 | - | - | Yes | Yes | - | - |
| 2200-2200 | - | - | Yes | Yes | - | - |
| 2200/WP | - | - | Yes | Yes | - | - |
| 2200/VS TCCopy | - | - | Yes | Yes | - | - |
| IBM 3275 | - | - | - | Yes | - | - |
| IBM 3271 BSC | - | - | - | - | Yes | - |
| 2200/VS | - | - | - | - | - | Yes |

Table 7. Line Speeds of the Communication Controllers

| Device | Line Speed (bps) | Mode |
|---|---|---|
| MXE | 110-19,200 | Terminal Mode |
| | 110-9,600 | Asychronous TC |
| 2227B/28B/28C | 110-9600 | Asychronous mode |
| 2228B/28C | 0-4800 | Synchronous |
| 2228D-4 | 0-9600 | Synchronous |

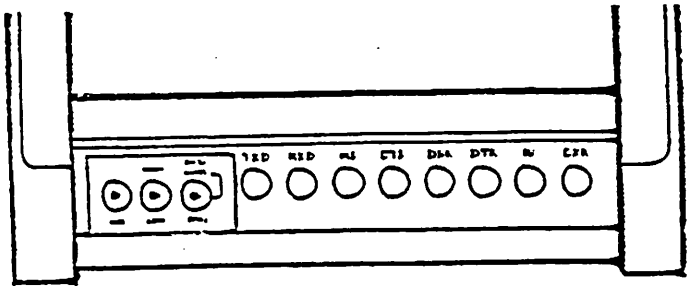
MVP/LVP

## Remote 2236DE with RACAL-VADIC Modem (WA3451)

* THIS IS A CORRECTION TO DISTRICT NEWSLETTER #17. PLEASE DISREGARD THAT WRITE-UP AND USE THIS INSTEAD.

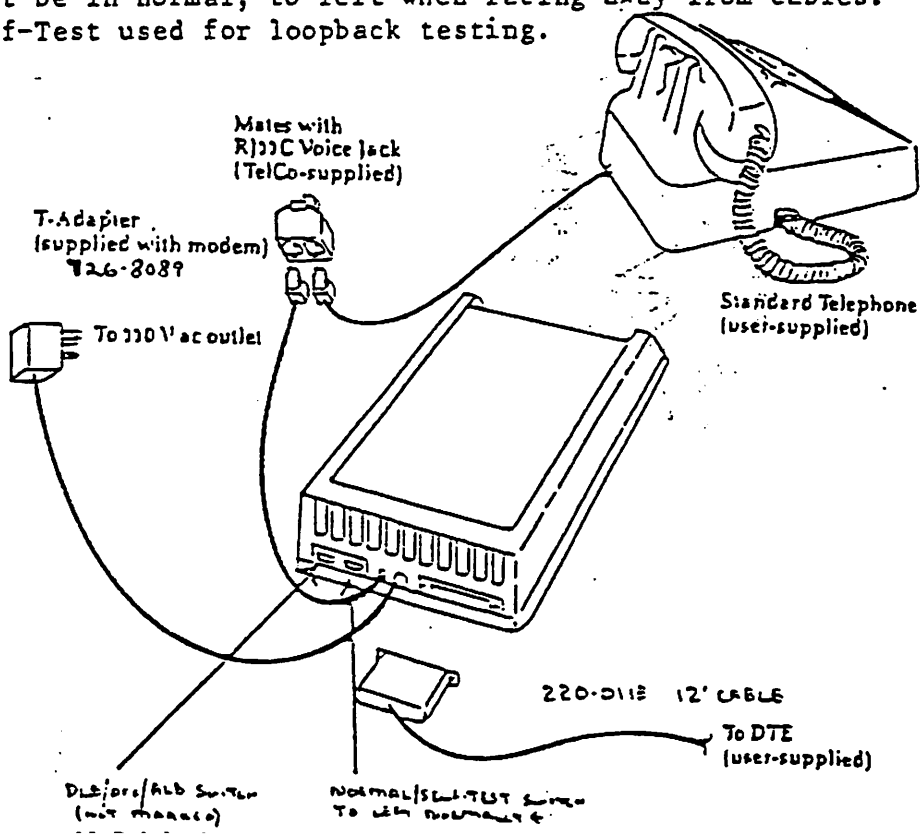
The following information should be helpful in bringing a remote DE terminal on line. If still having a problem give us a call at the District Office.

1. Terminal and Mux D port set at 1200 baud  7592 19.2K baud-sw. 1, 3 on
   1200 baud-sw. 1, 3, 5 on
2. Must use TC cable part # 220-0113 12' or 220-0334 50'
   Runs from 36DE to modem, and from Mux D port to modem.
3. Racal-Vadic (WA3451) Modem switch settings
   Internal (push sides of cover in and pull up)
   Switch Bank A (on right up front)-sw. 1, 2, 4, 6, 7 on or closed
   Switch Bank B (on right mid board)-sw. 1, 5 on or closed
   External
   High/Low - High (1200)
   DATA/AANS/OFFL



DATA-this position at remote site after connection made to put modem in data mode.
AANS (center position)-this position at host site if ready to go on line/at remote use this setting while dialing host system.
OFFL-this position at both ends when not in use to avoid running up telephone bill.

DLB/OFF/ALB (not marked, on left facing rear panel)
Must be in off position which is center.
ALB and DLB are for loopback testing.
Normal/Self-Test (not marked, on rear panel to the right of DLB/OFF/ALB when facing).
Must be in normal, to left when facing away from cables.
Self-Test used for loopback testing.



4. A T-Adapter should be supplied with the modem. The RJ11C voice jack used to plug the phone in is removed, the T-Adapter plugged in it's place. The RJ11C voice jack is then plugged into the T-Adapter on the side marked phone, the modem jack to the other side.

5. Going On Line
   A. Insure system partitioned for the TC port on the Mux D.
   B. With computer equipment plugged into modem and both powered on the DTR light should be lit on modem. The light indicates equipment is ready and connected to modem.
   C. At host site set DATA/AANS/OFFL from OFFL to AANS (center position).
   D. At remote site set DATA/AANS/OFFL from OFFL to AANS (center position) and dial phone number of system. Phone at other end should ring followed by a high pitched tone, and then a second tone. When you hear the second tone switch the remote modem to DATA and hang up the phone. At this time the HS (high speed), CTS (clear to send), DSR (data set ready), DTR (data terminal ready), and CXR (carrier detect) should all come on at both ends and the terminal should have READY (BASIC 2) PARTITION # on screen. If not key RESET on terminal. If still no READY, power off terminal, power back on and assure that 2236DE 1200 BPS comes up on screen and again key RESET. To recall system switch DATA/AANS/OFFL to OFFL then to AANS (center position), dial number, and proceed as before.
   E. To disconnect switch DATA/AANS/OFFL back to OFFL.

CHECKLIST
1. System partitioned to TC port.
2. Baud rate on terminal and Mux D match (1200 usually).
3. Terminal comes up with 2236DE logo when powered on.
4. TC cables used from Mux D to modem and from terminal to modem.
5. Modems connected to phone lines properly.
6. Modems on both ends match and switch settings on modems correct. Host modem DATA/AANS/OFFL switch set to center position.
7. With equipment and modems on and ready but switched to OFFL or (Aans center position), DTR is lit.
8. Correct dial up procedure: DATA/AANS/OFFL to Aans/Dial/Ring/Tone/ 2nd Tone/switch remote modem to DATA, hang up.
9. HS, CTS, DSR, DTR, and CXR all on after hanging up.

**<u>NOTE</u>:

The District 2200 MVP is now set up for telecommunications with any 36D type terminal using a Wang RACAL VADIC modem, WA3451 (part #725-0110), or a compatible replacement and we are also capable of going on-line to a customer's system with a 36DE terminal from our shop. Please call us if we can help you with a TC problem. If there are any questions about the customer's modem concerning compatibility or proper operation, bring a Wang modem with you to the site and you can then try going on-line with us.

# WA3451 RADCAL VADIC MODEM

## Switch/Strap Settings for Dial-up and Dedicated Lines

The Wang Modem, RACAL VADIC WA3451 (P/N 725-0110), can be configured to meet the needs of a particular installation by selecting the appropriate options. The options are selected by switch banks and solder straps within the unit. Normally these options need not be changed as they are preset to Wang specs for use with a dial up line. However, if using a dedicated (leased) line these options need to be checked as several are different.

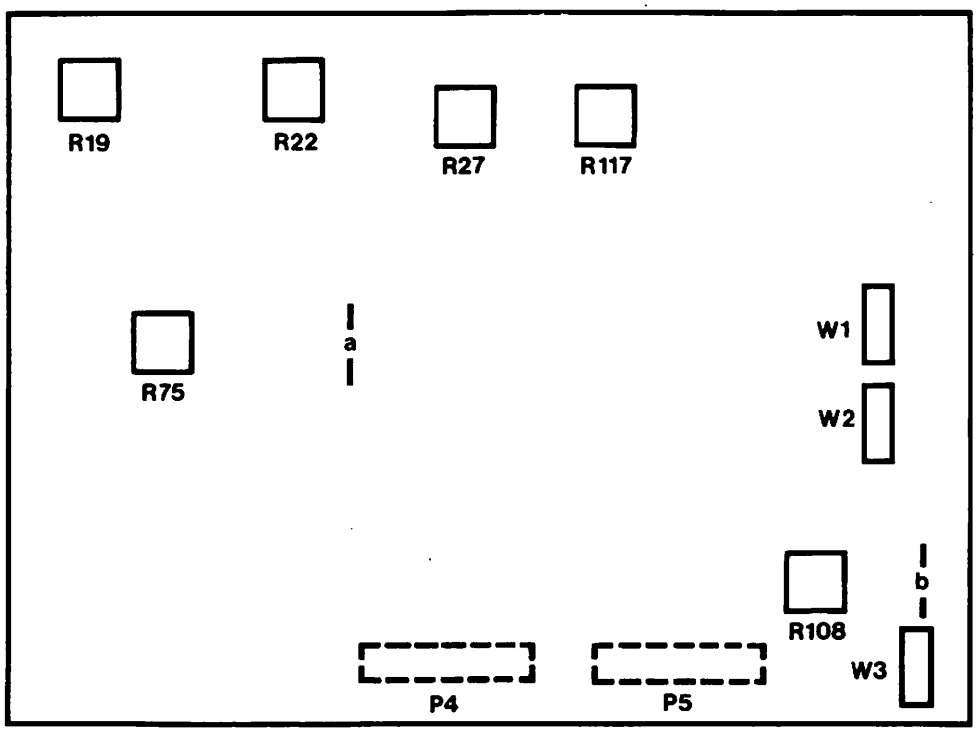
To gain access into the modem push the sides in along the middle one third at the gap and the cover should release so that it may be lifted off. See the back of this page for physical locations of options.

| | DIAL UP | DEDICATED |
|---|---|---|
| Sw. Bk. A | 1, 2, 4, 6, 7 on | 1, 2, 4, 6 on |
| Sw. Bk. B | 1, 5 on | 1 on |

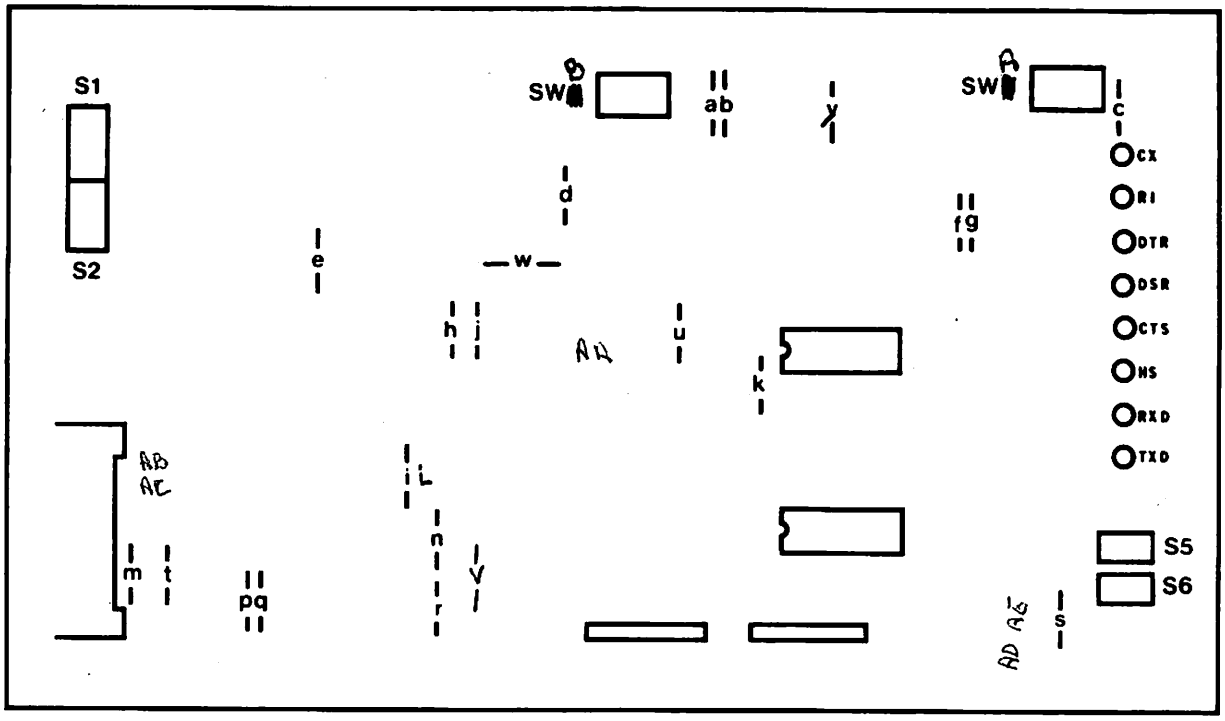
| STRAPS | DIAL UP | DEDICATED |
|---|---|---|
| A | OUT | IN |
| B | IN | IN |
| C | IN | IN |
| D | OUT | OUT |
| E/L | OUT/IN | IN/OUT (Miles Apart)<br>OUT/IN (Within bldg or office park) |
| F/G | IN/OUT | IN/OUT |
| H/W | OUT/IN | OUT/IN |
| J | OUT | OUT |
| K | IN | IN |
| M | OUT | OUT |
| N | IN | IN |
| P/Q | OUT/IN | IN/OUT (SWITCHED CTS/RTS FOR 2336) |
| R | OUT | OUT |
| S/U/AB/AC | IN/OUT/OUT/IN | IN/OUT/OUT/IN |
| T/V | IN/IN | IN/IN |
| X | IN | IN |
| Y | OUT | OUT |
| AA | OUT | OUT |
| AD/AE | OUT/IN | OUT/IN |
| W1 | OUT | OUT |
| W2 | OUT | OUT |
| W3 | OUT | OUT |
| W4 | OUT | OUT |
| W5 | OUT | OUT |

One other change internally needs to be made for use on a dedicated line. On the bottom board on the Modem is a black box. This needs to be removed by unscrewing the two screws holding it from underneath. Inside is a red wire which for a dial-up line should be attached to connector E2. For a dedicated line this red wire should be moved to connector E1 which is under the black cover along the edge of the board. Be careful not to pinch the wires when replacing the black cover.

Externally for a dedicated line both Modems on either end should have the DATA/AANS/OFFL switch set to DATA (DSR and DTR should be on) to make the connection which is done by pressing the momemtary ANS switch on the remote end. The line may be broken by switching the DATA/AANS/OFFL switch to AANS or OFFL.




top board (81165)




bottom board (81164)

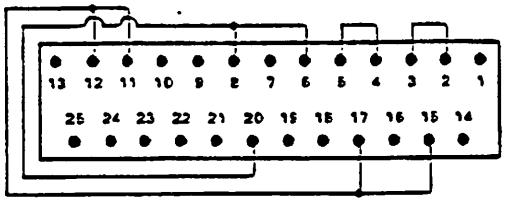
**Figure 5-1. Switch and Strap Locations**

TELECOMMUNICATIONS:

Troubleshooting the 2228D Board:

The following recommendations for troubleshooting communication problems on 2200 systems utilizing the 2228D controller are to be performed prior to board replacement.

1. CE should first try "power-up self test" diagnostic. By using a RS232 loop back connector (WLI #420-1040) and turning SW2-1 ON prior to power-up, the 2228D will run an additional self-test routine called "S10 Bisync External Test." (Switch 2 is located on the motherboard near RS232 connector.) The red LED will be on for approximately 10 seconds and then should go off. If LED stays on or blinks, it is an indication that the 2228D may be defective. (This is documented in the 2228D Maintenance Manual # 729-0858, pages 4-2 and 6-17.) Once this test has passed successfully, the following information should be used to run more extensive tests. DO NOT FORGET TO TURN SW2-1 OFF!!!




| Pins | Description | Jumper Pin Location | |
|---|---|---|---|
| | | From | To |
| 2 | Transmit Data | | |
| 3 | Receive Data | 2 | 3 |
| 4 | Request to Send | 4 | 5 |
| 5 | Clear to Send | 6 | 8 |
| 6 | Data Set Ready | 8 | 20 |
| 8 | Receive Line Sig Detector | 11 | 12 |
| 11 | Secondary Req to Send | 12 | 15 |
| 12 | Secondary Rec'd Line Sig Det | 15 | 17 |
| 15 | Receiver Sig Element Tim | | |
| 17 | Receiver Sig Element Tim | | |
| 20 | Data Terminal Ready | | |

RS-232 Loopback Connector (WLI #420-1040)

2. Use a Wang Operating System Software (Rel. 2.3), other than Customers, configured with a device address table which includes 2228D primary address (01C) and secondary address (09C). NOTE: Secondary address must be hex 80 higher than primary. Also, configure a partition for a minimum of 56K. (These prerequisites are a must in order to run the following diagnostics.)

3. Field Level Diagnostics
   A. All 2228D controllers in the field should be "Rev 2 or Higher" with the exception of a limited quantity of Rev 1's originally installed at Mutual Benefit Life.
   B. Single sided, single density (usually MVP and VP systems) Disk # 702-0097C 2228D TC Field Level Diagnostics Rev 2.
   C. Dual sided, double density (usually LVP and SVP systems) Disk # 732-0002B LVP/SVP System Exerciser (which includes TC) Run "Telecommunications" and "2228D Field Service Diagnostics Rev 2."
   D. Availability of explanatory documentation, which accompanies the above mentioned diagnostic disks, would be helpful even though the diagnostic disks are self-prompted.

4. Currently in the field, there are only two acceptable numbers for the PROM located on the memory board of the 2228D Communications Controller. They are # 4219 and # 4381.

The following information is specifically for Northwestern Mutual Life:

1. Perform all previous procedures listed.

2. Be sure system and switch box are configured properly. There are five different configurations for this account. They may all be found in the National Accounts Alert Notice #19-2 dated January 27, 1982.
   NOTE: If you are having problems bringing system up when loading TC software, you may bypass switch box by running cable directly from 2228D controller into modem.

3. Interpretation is not always available for all error codes. One of these is 4D1520. This code is peculiar to NML's operating system and appears quite often. History of the 4D1520 error code indicates that the 2228D microcode did not load properly. This may result from bad or disconnected modem, A/B switch box bad or switch in wrong position, bad or disconnected cable, and possibly a defective 2228D board. A variety of other error codes: 540220, P48, P34, etc., may indicate some equipment, usually a printer, is powered down and/or configured incorrectly. Do not overlook the possibility that Customers software may be at fault.

4. Modem considerations for NML's Async operation: Black and yellow wires should be <u>disconnected</u> from Telco line.

If you have any questions or would like copies of the diagnostics, please contact the District.

**WANG LABORATORIES, INC.**
ONE INDUSTRIAL AVENUE, LOWELL, MA 01851 • TEL: 617/459-5000, TWX 710-343-6769, TELEX 94-7421

WANG

# TECHNICAL SERVICE BULLETIN
## SECTION: HardWare Technical

NUMBER: HWT 5069 REPLACES: _____ DATE: 04/12/85 PAGE 1 OF 1

MATRIX ID. 7301 PRODUCT/RELEASE# 2200

TITLE: Jumpers J5, J6, J7 on 2228D1 PCB

PURPOSE:

To define jumpers J5, J6, and J7 on the 209-7658 PCB (2228D1 TC controller).

EXPLANATION:

1. The jumper J6 is for power on reset and must be installed on the board to operate.

2. The jumper J5 is for master clock and must be installed on the board to operate.

3. The jumper J7, when jumpered, connects Pin #19 "secondary request to send" and Pin #11 "clock" together on the RS232 connector. This jumper must not be installed to insure proper operation of the TC controller.

GROUP: Telecommunications Networking Support Group MAIL STOP: 0127

To: Michael Bahia MS014-A3A/LOWELL
From: John Elfrank Security: Limited
Subject: 2200 data to IBM sys 38 Date Received: 11/26/91

---

yes. 2200 BATCH will work.

JEE

---------- Reply ----------
To: John Elfrank From: Michael Bahia
Subject: 2200 data to IBM sys 38 Date Sent: 11/25/91

John,
Were you able to find out anything further on this situation?
Regards, Mike

---------- Reply ----------
TC: Michael Bahia From: Michael Bahia
Subject. 2200 data to IBM sys 38 Date Sent: 10/25/91

What's a system 38? What you need to know is what IBM protocol this system 38 supports if you are to use a TC board. PC2200 can be used to get data in a 512 byte sector format on a 5 1/4" disk. This can also be done w/ the 1.2 Meg floppy in the DS or a CS-D with the latest format utility from the System menu from the O/S. It allows you to choose either 256 or 512 byte sectors You still need to know if the System 38 has a 5 1/4" floppy. Assuming it does, you should be able to use 5 1/4" diskettes but someone needs to know how the data needs to be laid out. Someone familiar with the software will probably need to be involved. If a programmer is needed, I could probably give you some names.
Regards, Mike

---------- Original Memo ----------
To: Michael Bahia From: John Elfrank
Subject: 2200 data to IBM sys 38 Date Sent: 10/24/91

Mike,
I have a customer that copies a data file from their LVP on a DSDD disk and sends it to their home office who goes through painstaking efforts to get it on their system 38.

If they had a PC running PC2200, would this help by converting the file to DOS file or would it be better to try to link the systems with a TC controller.(If so, which TC controller supports a system 38 protocol)

JEE

M. Bahia

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# CARD READER

## GENERAL INFORMATION

To run diagnostic deck, type in one load/62B then run, execute. Deck will run thru automatically and stop if test fails or error occurs. Program deck will run on T, C, & VP. On the 2200's, one must use customer programs to check out the reader because it does not have the options necessary to run diagnostics.

On 2200MVP's, on must use a new style controller PN#210-7336. The diagnostic run is the same execpt for the Hollerith where you must edit out one line statement or remove the card from the test deck. 170 Data Load BT (N=82)/629, C$().

The only difference between a 44A (S-T-C-VP) and a 44B (MVP) is the controller card (210-7336) which may be used in any system. The old style piggy back controller cannot be used in the MVP (212-2244A).

Switch settings for both controller is 628. From top to bottom switches are 80, 40, 20, 10, & 8 so turn on 20 & 8. Ignore any numbers etched on board next to switch. (Sw 1-3)

There have been several occasions of the customer cards causing read problems. So don't get hung up doing adjustments when the problem may only be bad cards. Check to see if they are new cards, look for light timing marks, writing on cards, and overall card quality.

If a customer is picking up data where none was supposed to be, run a deck of blank cards thru using the load/62B statement. There should be no print-out on the CRT. If the gap between the light source and photrans is too great, follow procedures in "Read Error" section to adjust.

If the customer is getting intermittent pick checks and read errors the only problem may be dirt. Clean the picker sector with an alcohol pad and picker sector holes with a paper clip. To clean read station, first soak an IBM card in alcohol and very carefully manually feed the card into the read station. Move the card back and forth several times and carefully pull it out. Also, clean the pinch rollers.

## SWITCH SETTINGS

For IBM punch, set index marks to non-clock, data mode to punch, control mode to remote, and shutdown to auto.

For mark sense, set index marks to clock and data mode to mark sense. All others should be the same as in punch.

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ERRORS

Hopper Check-Indicates no cards are left in hopper. It will come on when machine is turned on or the card deck is thru running. The light is activated by a switch in the hopper. The switch may be formed in case the blower does not shut down when the hopper is empty or does not turn on with cards in hopper. Also, indicates when stacker is full.

Stack Check-Indicates when card has entered read station but has not come out.

Pick Check-Indicates that after six picks a card did not go thru picker or that machine did not recognize any cards that did go thru.

## 4.1 CARD FEEDING MECHANISM - GENERAL

The card feeding mechanism, Figure 4-1, is designed around an air flow system that uses air pressure to separate the cards, and an air vacuum to pick the cards. Pressurized air riffles the first half inch of cards in the input hopper so that they stand apart, individually "air cushioned" from the rest of the card deck and each other. This prevents the cards from sticking together in case of static electricity, hole locking, or torn webs, and eliminates frictional forces between the cards. The vacuum picker pulls the bottom card in and holds it against the picker's rubber surface. When a pick command is received from the 2200, the reader's electronics drives a rotary solenoid coupled to the picker sector causing it to rotate. As the solenoid moves the picker sector, the card is accelerated due to the friction forces caused by the vacuum between the picker's rubber surface and the card. The picker sector rotates, pulling the card toward and into the drive rollers. When the leading edge of the card reaches the drive rollers, the rollers pull the card into the card track. The picker is now returned to its rest position by spring tension. As the card in the track clears the picker's surface, the next card is sucked down ready for the next pick command.

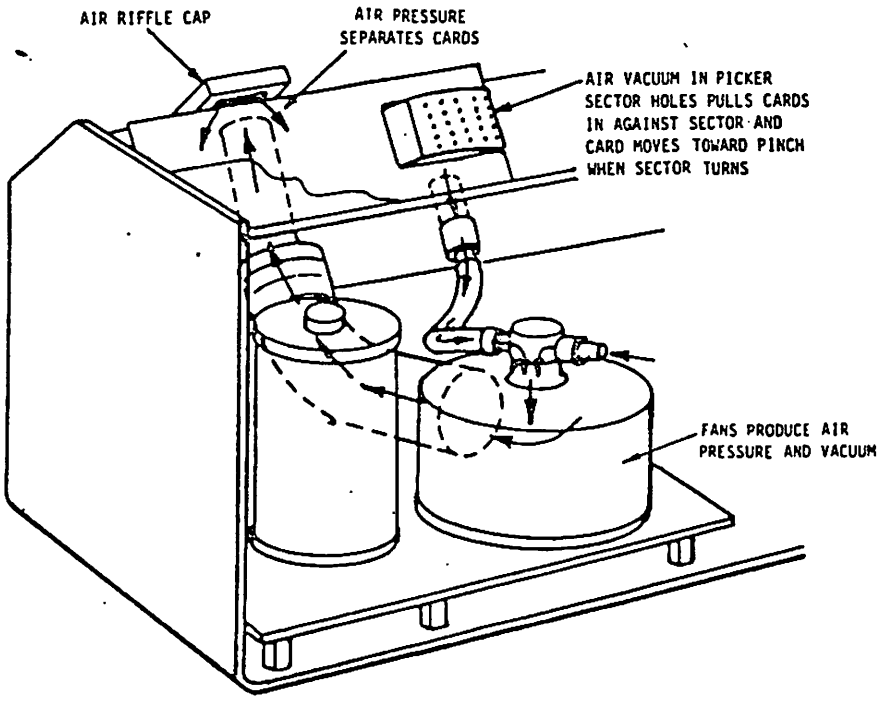



FIGURE 4-1

FIGURE 1-5

WANG 2234/2234A - CARD FILE; REAR VIEW; DOCUMATION M-200 PUNCH ONLY

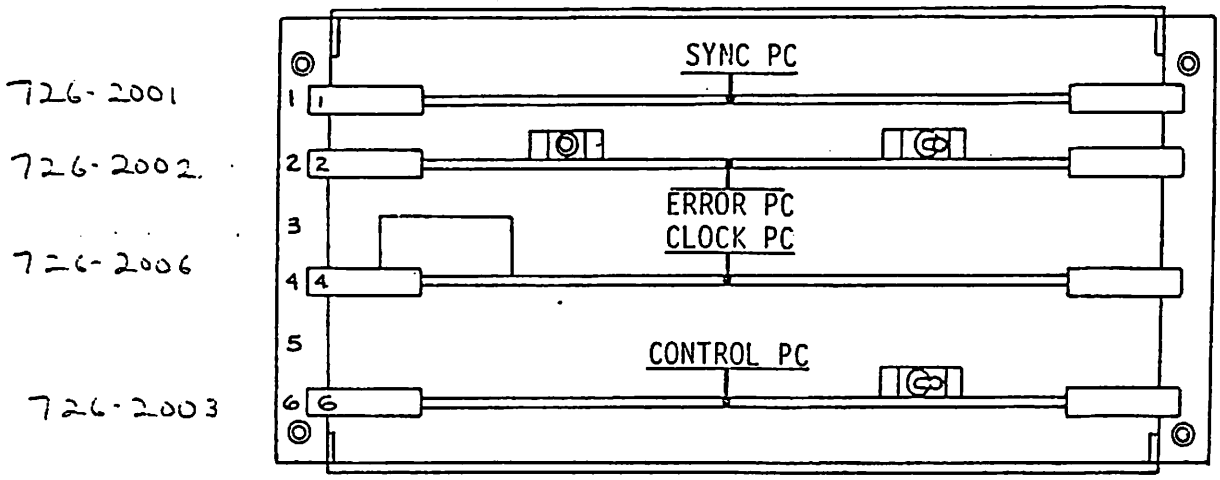
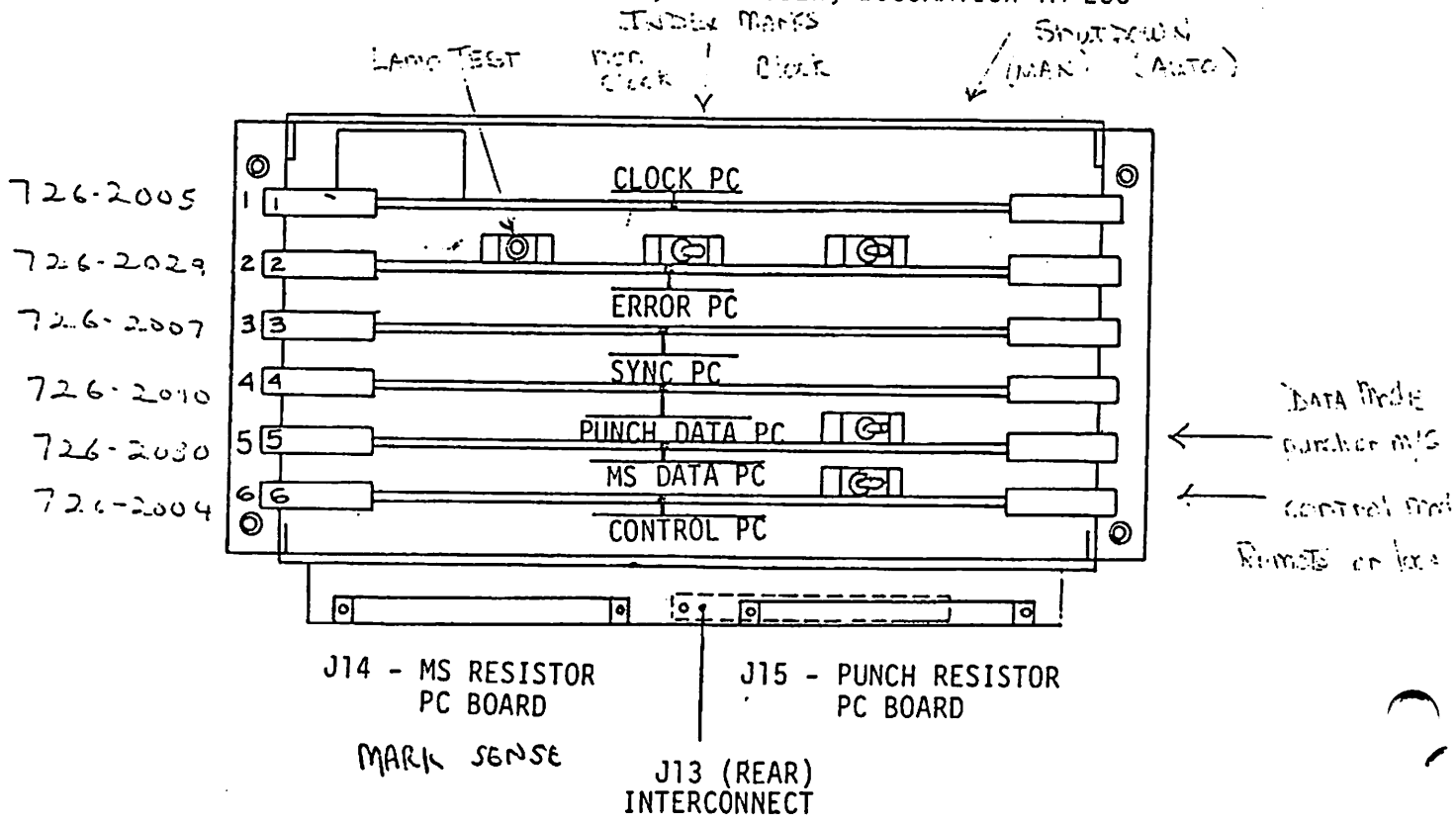



FIGURE 1-6 PUNCH & MARK SENSE

WANG 2244/2244A - CARD FILE; REAR VIEW; DOCUMATION TM-200



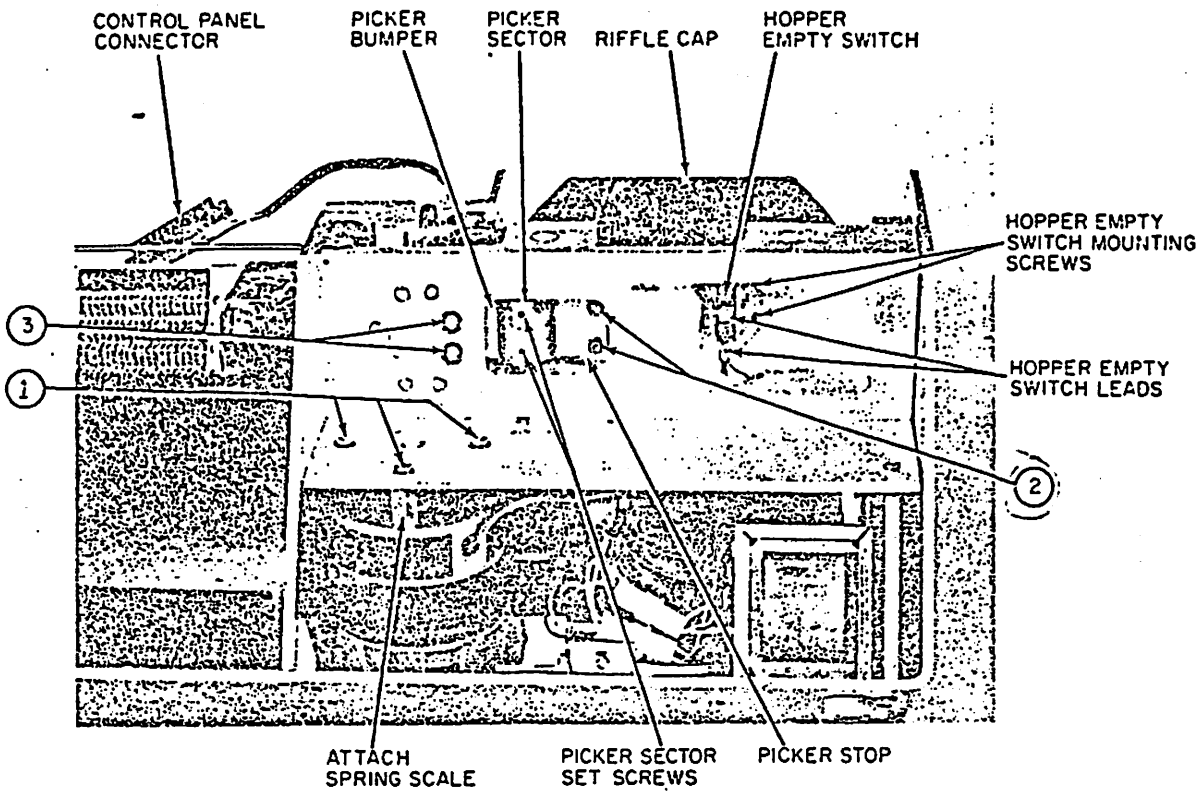



Figure 6-10. Picker Sector Adjustment, Front View

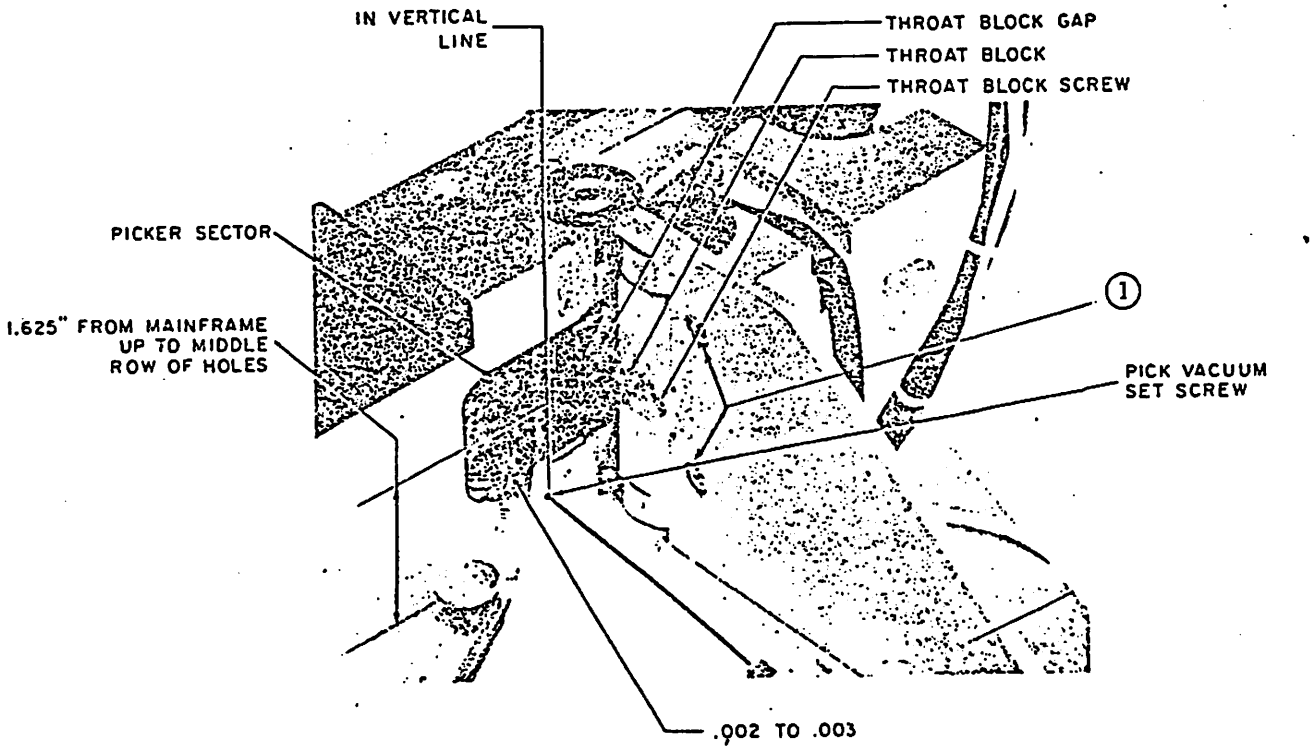



Figure 6-9. Picker Sector Adjustment, Rear View

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# PICK CHECK

The most common error on 44 card readers is a pick check. There are numerous causes of pick checks and will be covered in two sections:

a) Electrical
b) Mechanical

There is an easy way to determine if the problem is mechanical or electrical. If two or more cards go thru the picker, the problem is usually electrical. If only one or none are fed thru, the problem is probably mechanical.

## A) Electrical

The two most common electrical problems are either an improperly adjusted read station or a PCB. Changing the PCB is the quickest and easiest and should be tried first.

If you determine that a PCB is not the problem, a check of the read head voltages should be performed.

1) Remove both front and back covers.

2) Put resistor boards (located underneath card cage) on extender board. As you face rear of machine, the mark sense goes on the left and has thirteen resistors. The punch holes on the right and has twelve resistors.

3) First, check the punch board. This is done by turning on the machine with no cards in the hopper. Read voltages across each resistor. The range is 1.3 to 4 volts but should be in the 2.5 volt range.

4) Next, check mark sense board. This is done by first turning on, then hand feeding an upside down blank card halfway thru the read station. The voltages have the same range as the punch.

5) To increase voltage, increase resistance and vice-versa.

6) If after changing the boards and adjusting the resistors boards you still get pick checks, adjustment of read station may be necessary. This is covered in the "Read Error" section.

## B) Mechanical

The first thing to check are the six picker sector adjustments. These are to be done in the order given.

1) Picker Sector Height - Using a six inch steel ruler,

measure the distance from the main frame to the the middle row of holes on the picker sector. This should be exactly 1 5/8 inch. To adjust, loosen picker sector set screws underneath and move until proper distance is acquired.

2) Air gap between picker sector and vaccuum adapter plate - There should be a .002 inch gap between them. To adjust, loosen vaccuum plate set screw and vaccuum elbow tube screw (follow small tube from blower to front of machine). Adjust for proper gap then retighten screws.

3) Picker Sector Rest Position - The back edge of the last row of holes on the picker sector should line up with the middle of the vaccuum adapter plate set screw. If not, loosen the back stop set screws and adjust. (2)

4) Gap Between Throat Block and Picker Sector - This should be .008 inches or a thickness of one IBM card. To adjust, simply loosen the phillips screw on the throat block and move it up or down as needed.

5) Picker Sector Bumper - This bumper is used to limit picker sector over-travel to .020 inches beyond the point where the card is grabbed by the pinch roller. To check the adjustment, put two inches of cards into the hopper and turn the machine on. If the cards begin to feed, press stop. Then manually feed the cards by pushing the bottom of the picker sector to the right. From the point where the cards are grabbed by pinch rollers to where forward motion stops, there should be only .020 inches of movement. To adjust, loosen the bumper set screws (3) and move the front or back as needed.

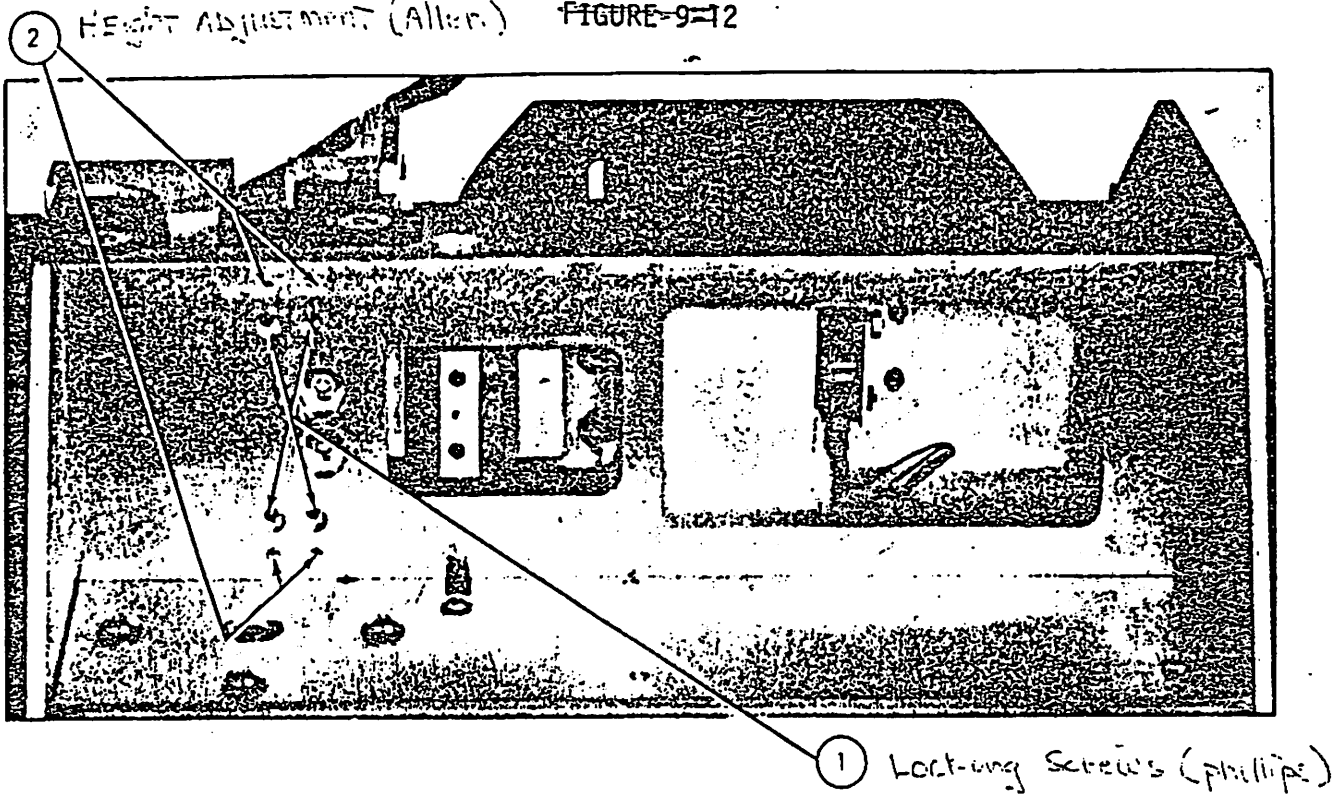
6) Solenoid Coupling - This is a difficult adjustment and rarely needs to be done so be sure it is out of adjustment before doing it. To check adjustment, there should be a gap of .015 inches when the top of the solenoid is depressed. See Figure B. To adjust, loosen two sets of screws on the top coupling, depress the top of the solenoid until there is .015 inches clearence between the wafers and then tighten.

## READ ERRORS

Usually these are caused by one of two things; a PCB or misalignment of the read head.

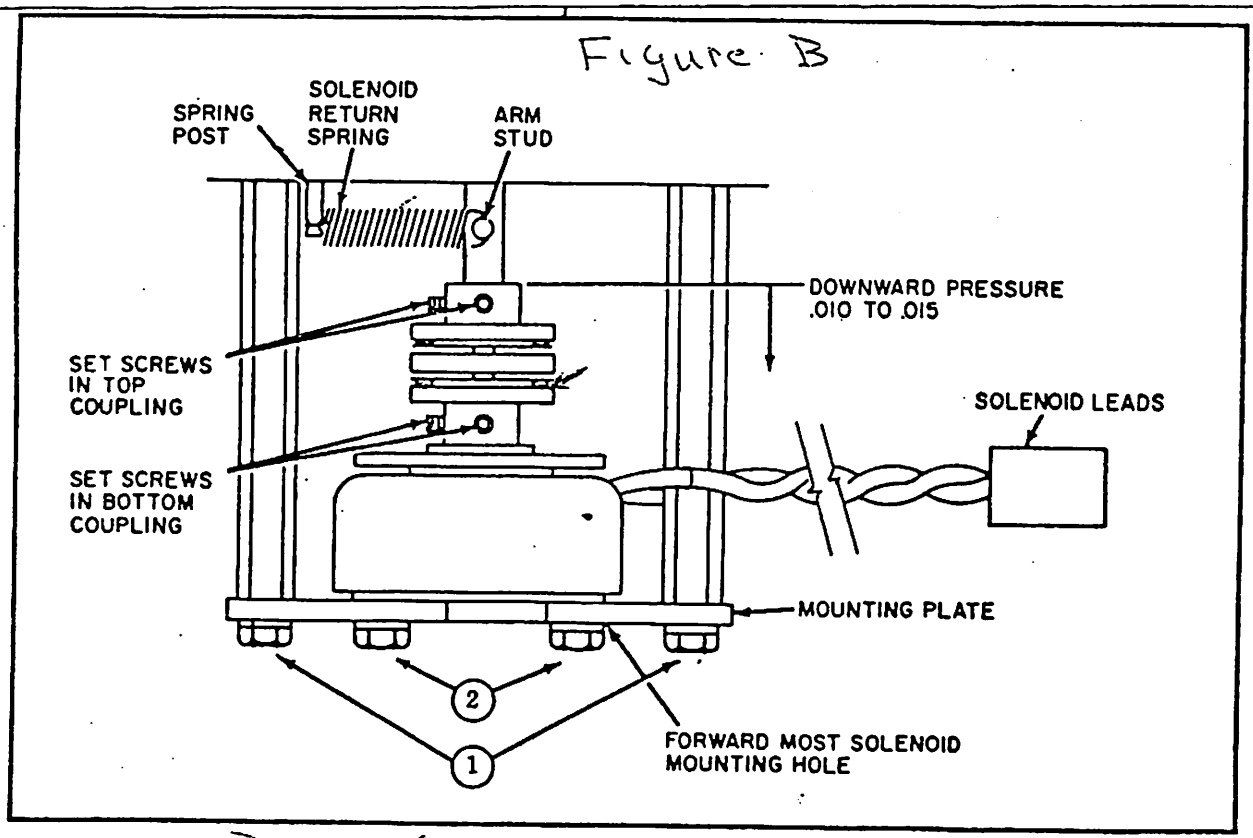
The easiest thing to try is the PCBs and controller card. If this doesn't cure the problem the alignment of the read head should be checked.

Figure A
~~FIGURE 9-12~~




READ AND LIGHT STATION MOUNTING AND ADJUSTMENT SCREWS

Figure B




Pick Solenoid

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First check for proper voltages on the resistor boards as per pick check section under electrical adjustments. If all the stations read O.K. but errors are still occurring, alignment of the read head may be needed. Also, if the resistor values are progressively higher when going from one side of the resistor board to the other it may indicate misaligned read head.

READ HEAD ADJUSTMENT (FIGURE A)

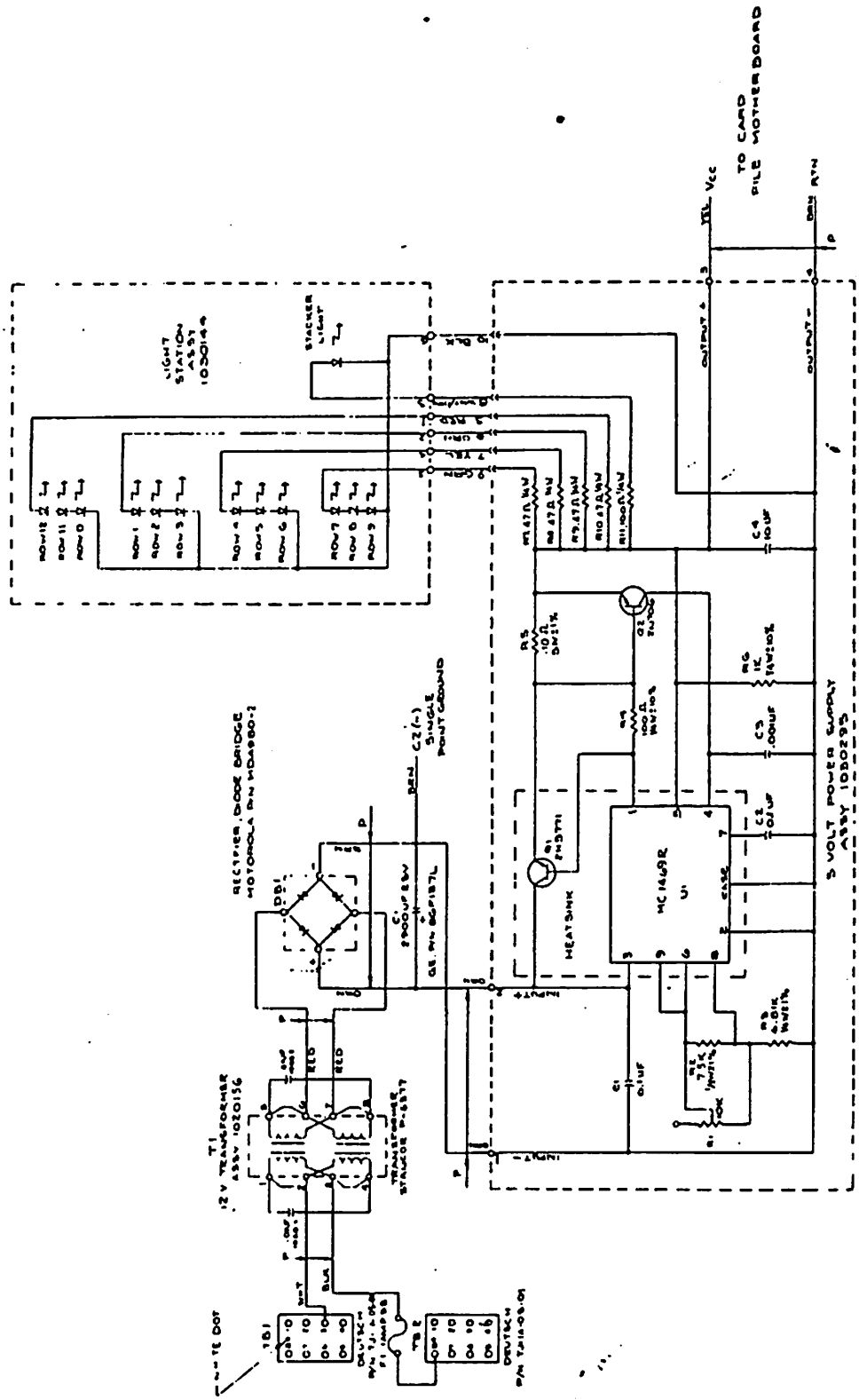
1) Remove both top and back covers and put the resistor board on extender.

2) Check the gap between the top and bottom of the read head. Two IBM cards should fit snugly between them. To adjust, loosen four phillips screws holding the light station and turn four allen screws in or out as needed.

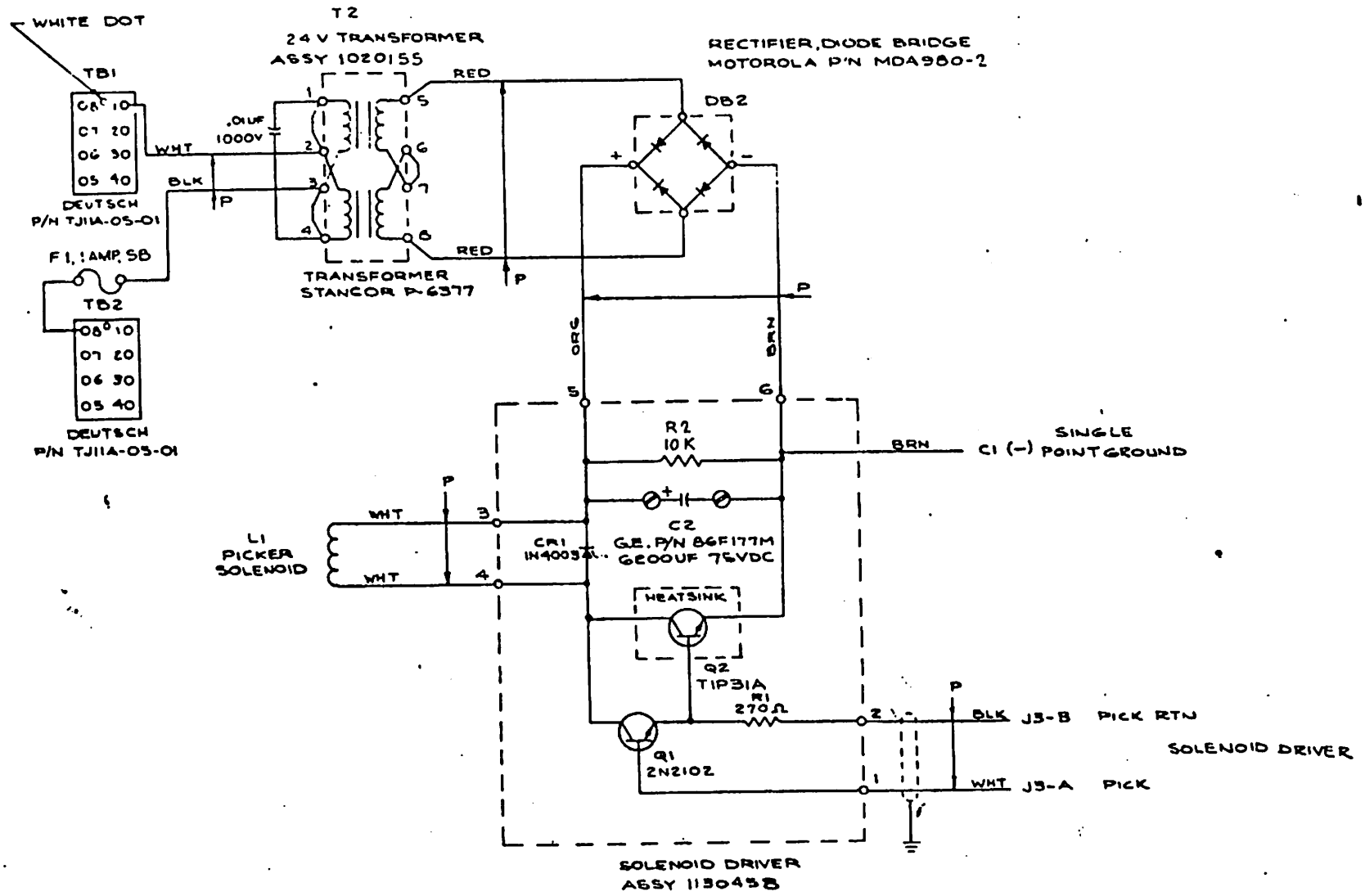
3) Using an old CP-1 punch card, punch out several rows of holes. Then, manually feed the card until one row of holes is over the light source. Loosen four phillip screws holding the light source. You must accomplish two things when doing this adjustment. The first, is to get the maximum voltage on the resistors on the resistor board. The second, is to align the light source to the read station. Obtain the maximum voltage by alternately checking the first and last resistor on the resistor board. When the maximum voltage is achieved, slowly feed the card further into the read station. The first and last voltages on the resistor board should drop at the same time. If they do not, move the light source slightly back and forth until the first and last resistors on the resistor board have a voltage drop or increase at approximately the same time.

Another cause for read or pick errors may be a bad read station. To check, feed a card thru to see if the resistors voltage on both the punch and mark sense resistor boards rise or fall.

Also, check the resistors to see if one has a larger value than the ones next to it. This may indicate a weak photran or a cracked read station.




Schematic Diagram, 5V Power Supply, 115 VAC, 60 Hz
(Dwg. No. 1140637)




Schematic Diagram, Solenoid Driver, 115 VAC, 60 Hz
(Dwg. No. 1140632)

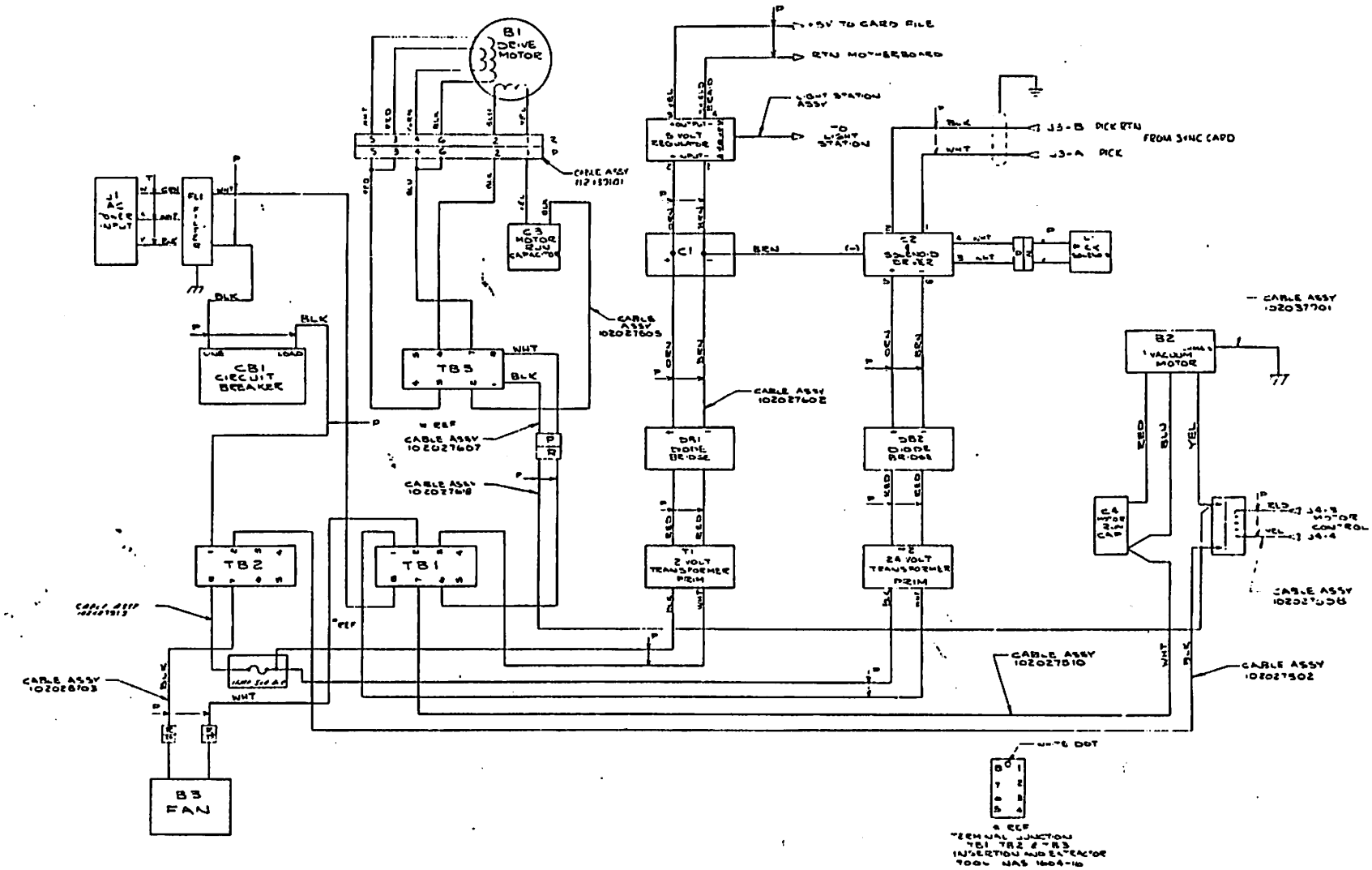



Figure 10-1. Wiring Diagram, AC Power Distribution, 115 VAC, 60 Hz (Dwg. No. 1040755)

## 8.1 GENERAL

If trouble persists after checking the adjustment procedures in Chapter 6, use the following fault isolation chart to analyze the problem. If it is determined that a part is defective and needs replacement, use the repair and replacement procedure in Section 9, and the illustrated parts breakdown in Chapter 10.

## 8.2 TROUBLESHOOTING CHART

NOTE:
When using test equipment for troubleshooting, connect test equipment ground to reader logic ground.

| SYMPTOM | PROBABLE CAUSE | REMEDY |
|---|---|---|
| POWER indicator fails to light. | 1. Power cord is not connected to reader or power source. | 1. Connect power cord to reader and power source. |
| | 2. Circuit breaker CB1 is not on | 2. Place circuit breaker CB1 to ON position. |
| | 3. Fuse F1 is defective. | 3. Replace F1. |
| | 4. Lamp is burned out. | 4. Replace lamp. |
| | 5. +5 volt power regulator defective. | 5. Replace +5 volt power regulator. |
| A given lamp fails to light when lamp test switch is activated (POWER indicator excluded). | 1. Lamp is burned out. | 1. Replace defective lamp. |
| | 2. Defective Error Card. | 2. Replace Error Card. |
| When LAMP TEST switch is activated, none of the lamps on the control panel will light. (POWER indicator excluded). | 1. Defective lamp test switch. | 1. Replace lamp test switch. |
| | 2. Defective Error Card | 2. Replace Error Card. |
| HOPPER CHECK indicator does not light when hopper goes empty or stacker goes full. No other error indications. | 1. Lamp is burned out. | 1. Replace lamp. |
| | 2. Defective Error Card. | 2. Replace Error Card. |

| SYMPTOM | PROBABLE CAUSE | REMEDY |
|---|---|---|
| HOPPER CHECK indicator does not light when hopper goes empty and PICK CHECK indicator is lit. | 1. Hopper empty switch not adjusted properly.<br>2. Defective hopper empty switch. | 1. Adjust hopper empty switch per paragraph 6.6.<br>2. Replace hopper empty switch. |
| HOPPER CHECK indicator does not light when stacker goes full. | 1. Stacker full switch is not adjusted properly.<br>2. Defective stacker full switch. | 1. Adjust stacker full switch per paragraph 6.7.<br>2. Replace stacker full switch. |
| PICK CHECK indicator fails to light when reader makes six attempts and fails to pick a card. | 1. Lamp is burned out.<br>2. Defective Error Card. | 1. Replace lamp.<br>2. Replace Error Card. |
| STACK CHECK indicator fails to light when there is a stack check condition. | 1. Lamp is burned out.<br>2. Defective Error Card. | 1. Replace lamp.<br>2. Replace Error Card. |
| PICK CHECK indicator lights regularly after making six pick attempts. | 1. Dirty picker sector.<br>2. Maladjustment of picker stops, vacuum plate, throat clearance, or solenoid coupling.<br>3. Defective Sync Card.<br>4. Defective Error Card.<br>5. Defective Clock Card. | 1. Clean picker sector with denatured alcohol.<br>2. Readjust picker sector per paragraph 6.8.<br>3. Replace Sync Card.<br>4. Replace Error Card.<br>5. Replace Clock Card. |
| READ CHECK indicator fails to light when a dark check or light check condition occurs. | 1. Lamp is burned out.<br>2. Column "0" output or Column "81" output is missing from the Clock Card.<br>3. One light or one dark output missing from the Control Card.<br>4. Defective Error Card. | 1. Replace lamp.<br>2. Replace Clock Card.<br>3. Replace Control Card.<br>4. Replace Error Card. |

| SYMPTOM | PROBABLE CAUSE | REMEDY |
|---|---|---|
| Reader picks three cards, and then stops with a PICK CHECK. | 1. Good pick reset output is missing from the Clock Card. | 1. Replace Clock Card. |
| | 2. Clear pick control is missing on the Sync Card. | 2. Replace Sync Card. |
| | 3. Pick attempt counter is not being cleared out properly. | 3. Replace Sync Card. |
| Reader picks two to six cards and then stops with a PICK CHECK. | Pick attempt counter is not being reset at good pick reset time. Defective Sync Card. | Replace Sync Card |
| Reader picks one card but the reader will not pick additional cards. Unable to stop the reader by pressing the STOP switch. | 1. Column "84CR" output is missing from the Clock Card. | 1. Replace Clock Card |
| | 2. Column strobe phase "B" or phase "D" is missing from Sync Card. | 2. Replace Sync Card. |
| | 3. Clock phase "C" or phase "D" is missing from Clock Card. | 3. Replace Clock Card. |
| | 4. Clock phase "B" is missing from Clock Card. | 4. Replace Clock Card. |
| Reader reads erroneous data. | 1. Defective Clock Card. | 1. Replace Clock Card. |
| | 2. Defective Sync Card. | 2. Replace Sync Card. |
| | 3. Defective Control Card. | 3. Replace Control Card. |
| Reader reads erroneous data. (2244/44A) PUNCH MODE MS MODE | 4. Defective Punch Data Card. | 4. Replace Punch Data Card. |
| | 5. Defective MS Data Card or Punch Data Card. | 5. Replace MS Data Card or Punch Data Card. |

| SYMPTOM | PROBABLE CAUSE | REMEDY |
|---|---|---|
| Sharp, metallic noise from picker sector while reading cards. | 1. Picker sector maladjusted. | 1. Adjust picker sector per procedure in paragraph 6.8. |
| | 2. Rubber roller worn. | 2. Replace roller. |
| | 3. Bearing bad. | 3. Replace bearing. |
| | 4. Belt too tight. | 4. Readjust belt. |

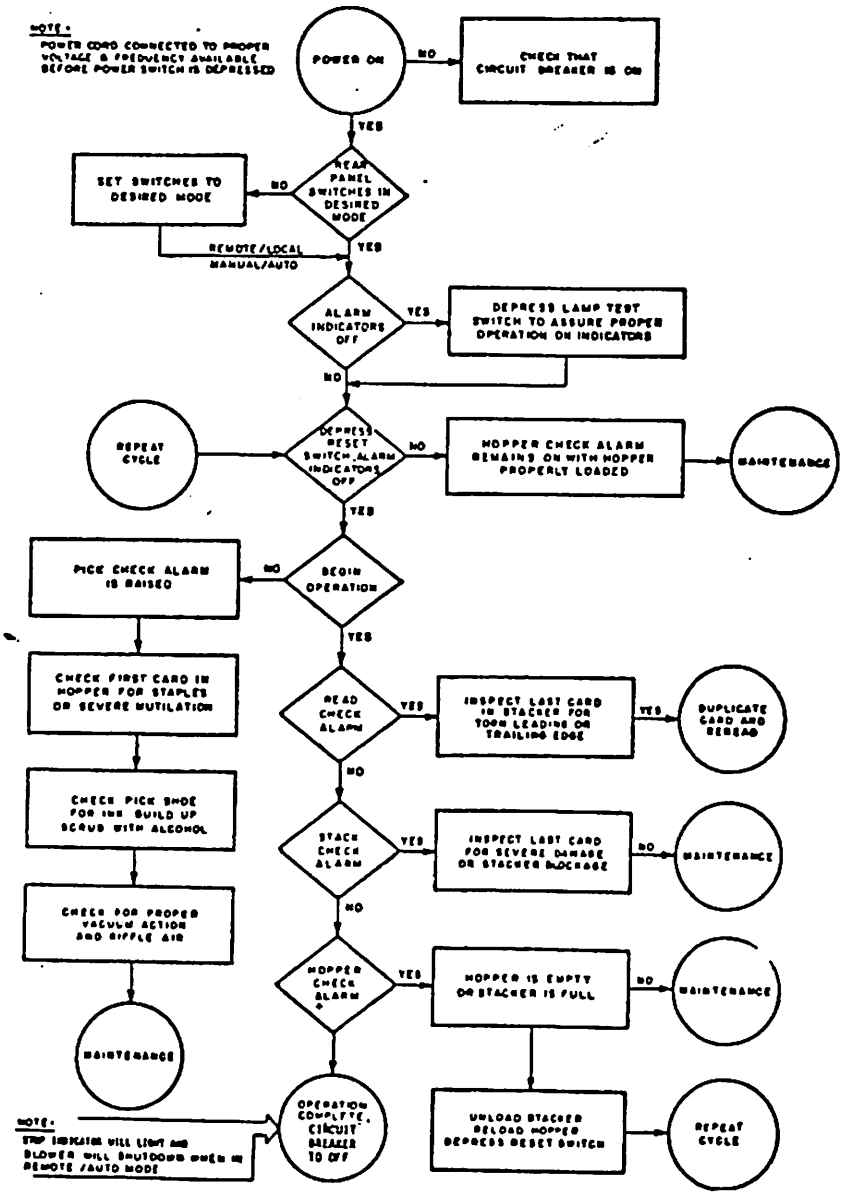



FIGURE 8-1

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# MORE TROUBLE SHOOTING

## Intermittent Pick Checks

1. Return spring on pick solenoid slipped
2. Loose set screw on solenoid coupling shaft.
3. Dirty picker sector.
4. Dirty read station.
5. Read station out of adjustment - Check for two or three volt reading on resistor board.
6. Bad photran on read station - Check if all photran turn off and on.
7. Board problem.
8. Picker sector mechanical adjustments out.

## Read Errors

1. Board problem.
2. Misaligned read head - Check voltages on resistor board. Should all be approximately 2.5 volts.
3. Customer has bad cards.
4. Check light source for loose wire or burnt out bulb.

## Other Problems

1. No solenoid pick or continuous pick - Bad diode bridge DB2.
2. No blower shutdown - Board or wires to hopper empty. Switch have been reversed. Check switch adjustment.
3. Blowing fuses - One of two diode bridges are bad. Disconnect one at a time to see which one. Transistor on the solenoid driven board is bad. Located on top of cap under picker solenoid and attached to bottom of reader. Disconnect from source and try it.
4. Too much rifling action, getting pick checks at end of program deck. Check hose coupling, it may be loose,

CUSTOMER ENGINEERING PRICE CATALOG EFFECTIVE 02/01/78

| PART NO | VC | VENDOR PART NO | DESCRIPTION | RETAIL($US) | EXCHANGE |
|---|---|---|---|---|---|
| 726-0800 | 50 | 00000282 | BELT TIMING DRIVE | 9.00 | |
| 726-0801 | 50 | 00000313 | REPL BY 325-2403-M | 2.00 | |
| 726-0802 | 50 | 00000519 | BELT TIMING BLO-60HZ | 10.00 | |
| 726-0803 | 50 | 00000123 | IC DM7416N | 1.00 | |
| 726-0804 | 50 | 00000318 | LAMP 6V .20A | 3.00 | |
| 726-0805 | 50 | ORDER 376-0167 | IC 74176N/DM8280A | 10.00 | |
| 726-0806 | 50 | 20010601 | SOLENOID PICK | 27.00 | |
| 726-0807 | 50 | | XSTOR PT: SD 1440-3L | 5.00 | |
| 726-0808 | 50 | | XSTOR PT: SD 1445-5L | 4.00 | |
| 726-0809 | 50 | | LED (STKR) SE1445-3L | 4.00 | |
| 726-0810 | 50 | 00000143 | RECT MDA980-2 | 7.00 | |
| 726-0811 | 50 | 00000115 | XSTOR MC1469R | 8.00 | |
| 726-0812 | 50 | 00000139 | XSTOR 2N2102S | 6.00 | |
| 726-0813 | 50 | 20214305 | BAD PART NUMBER | 4.00 | |
| 726-0814 | 50 | 00000447 | MAG PICK-UP | 23.00 | |
| 726-0815 | 50 | 20049801 | SOLENOID ASSY | 123.00 | |
| 726-0816 | 50 | 00003256 | HOSE(REP F/00000471) | 18.00 | |
| 726-0817 | 50 | 00000141 | XSTOR T1P41C | 3.00 | |
| 726-0818 | 50 | 10023501 | SWITCH HOPPER EMPTY | 16.00 | |
| 726-0819 | 50 | 20127002 | PULLEY 50HZ | 12.00 | |
| 726-0820 | 50 | 00000520 | BELT BLO-50HZ | 9.00 | |
| 726-0821 | 50 | 20076102 | PULLEY BLO DRIVE50HZ | 41.00 | |
| 726-0822 | 50 | 20076101 | PULLEY BLO DRIVE60HZ | 41.00 | |
| 726-0823 | 50 | 40076801 | BASE PLATE | 304.00 | |
| 726-0824 | 50 | 40040402 | PLATE PICKER MTG | 99.00 | |
| 726-0825 | 50 | 00000456 | CORD POWER | 11.00 | |
| 726-0826 | 50 | 10158907 | READ/LIGHT STA-MAT34 | 604.00 | 195.00 |
| 726-0827 | 50 | ORDER 376-0074 | IC 741C OP AMP | 4.00 | |
| 726-0828 | 50 | 00000053 | SEE 726-0805 | 10.00 | |
| 726-0829 | 50 | 00000051 | IC 75450 DUAL DRIVER | 3.00 | |
| 726-0830 | 50 | 00000232 | POT TRIM 10K | 4.00 | |
| 726-0831 | 50 | | LAMP READ STATION-44 | 13.00 | |
| 726-0832 | 50 | 40262601 | READ/LIGHT STA-MAT44 | 1074.00 | 312.00 |
| 726-0833 | 50 | 00000056 | IC LM311D | 13.00 | |
| 726-0834 | 50 | 20038201 | PHOTOCELL ASSY STACK | 29.00 | |
| 726-0835 | 50 | 00000539 | MOTOR VAC 115V/60HZ | 225.00 | |
| 726-0836 | 50 | 00000082 | SWITCH PCB | 7.00 | |
| 726-0837 | 50 | 00000541 | BLOWER 115V/60HZ | 172.00 | |
| 726-0838 | 50 | 00000083 | SWITCH PCB | 3.00 | |
| 726-0839 | 50 | 00000042 | IC H6F22009XX | 20.00 | |
| 726-2000 | 50 | 30029505 | PWR SUPPLY ASSY | 139.00 | 79.00 |
| 726-2001 | 50 | 40035303 | PCB SYNC -34 | 392.00 | 142.00 |
| 726-2002 | 50 | 40061003 | PCB ERROR CARD-34 | 338.00 | 129.00 |
| 726-2003 | 50 | 40061905 | PCB CONTROL -34 | 290.00 | 117.00 |
| 726-2004 | 50 | 40061916 | PCB CONTROL -44 | 290.00 | 117.00 |
| 726-2005 | 50 | 40076501 | PCB CLOCK -44 | 396.00 | 141.00 |
| 726-2006 | 50 | 40076505 | PCB CLOCK -34 | 386.00 | 141.00 |
| 726-2007 | 50 | 40094512 | PCB SYNC TM -44 | 360.00 | 134.00 |
| 726-2008 | 50 | 40224201 | REPL BY 726-2029 | 380.00 | |
| 726-2009 | 50 | 40224701 | REPL BY 726-2030 | 598.00 | 194.00 |

CUSTOMER ENGINEERING PRICE CATALOG EFFECTIVE 02/01/78

| PART NO | VC | VENDOR PART NO | DESCRIPTION | RETAIL($US) | EXCHANGE |
|---|---|---|---|---|---|
| 726-2010 | 50 | 40228204 | PCB PCH DATA TM-44 | 344.00 | 130.00 |
| 726-2011 | 50 | 20032803 | REPL BY 726-2000 | 139.00 | 79.00 |
| 726-2012 | 50 | 30101203 | PWR SUPPLY+-15V(44) | 273.00 | 112.00 |
| 726-2013 | 50 | 10010501 | COUPLING SOL | 37.00 | |
| 726-2014 | 50 | 20125801 | GEAR TIMING | 20.00 | |
| 726-2015 | 50 | 20002101 | ROLLER DRIVE | 14.00 | |
| 726-2016 | 50 | 20005901 | DRIVE ROLLER | 9.00 | |
| 726-2017 | 50 | 30003701 | SECTOR ASSY | 94.00 | |
| 726-2018 | 50 | 20004801 | TUBE PICK VACCUUM | 14.00 | |
| 726-2019 | 50 | 00000114 | SCREW BUTTON HD BLK | 2.00 | |
| 726-2020 | 50 | 00000109 | RELAY 10A 120/240VAC | 57.00 | |
| 726-2021 | 50 | 00000188 | CKT BRKR 8A 115/60 | 24.00 | |
| 726-2022 | 50 | 00002798 | CKT BRKR 8A 230/50 | 74.00 | |
| 726-2023 | 50 | 20015502 | XFMR ASSY 24V-115V | 45.00 | |
| 726-2024 | 50 | 20015602 | XFMR ASSY 12V-115V | 45.00 | |
| 726-2025 | 50 | 00000067 | XTAL 4.8 MHZ | 50.00 | |
| 726-2026 | 50 | 40033319 | NOT NORMALLY STOCKED | 668.00 | |
| 726-2027 | 50 | 20023901 | ADAPTER ASSY VACUUM | 21.00 | |
| 726-2028 | 50 | 00000407 | CLAMP | 2.00 | |
| 726-2029 | 50 | 40224209 | PCB ERROR -44 | 380.00 | 139.00 |
| 726-2030 | 50 | 40224711 | PCB MS DATA -44 | 598.00 | 194.00 |
| 726-2031 | 50 | 10394601 | MOTOR 230V 50HZ | 3.00 | |
| 726-2032 | 50 | 00002050 | CAP 4UF 50HZ | 12.00 | |

# CARD READER

## COMMON ADJUSTMENTS

1. Picker Sector Height
   The center of the middle row of holes in the picker sector should be exactly 1 5/8" from base of hopper.
   --Losen set screws in back of picker sector to adjust.

2. Picker Sector Rest Position
   The back edge of the last row of holes in the picker sector should line up with the center of vacuum adapter plate set screw hole.
   --Adjust rest stop.

3. Vacuum Adapter Plate Air Gap
   The gap between the picker sector and the vacuum adapter plate should be .002".
   --Loosen set screw under picker sector to adjust. Make sure adapter plate does not protrude into hopper. It may be necessary to loose vacuum hose underneath to lift adapter plate.

4. Throat Block Gap
   Throat block gap should be .008".
   --Losen screw to adjust. Make sure picker sector is not being pushed back when measuring or adjusting.

5. Picker Sector Travel
   Put card reader in Remote and Shutdown in manual. With cards in hopper manually move picker sector very slowly until card is just grabbed by feed rollers. You should be able to move picker sector approximately .020" after the card is grabbed.
   --Adjust forward stop.

6. Read Station Gap
   The read station gap should be two cards wide. Cut a card in half the long way and insert all the way into the read station. Loosen one of the bottom phillips screws holding the read station approximately a 1/2 turn. Turning in corresponding setscrew just slightly should be just enough to cause cards to bind in station. If OK check the other screw on the bottom in the same manner, then do the top. Back off setscrews after checking till they just stop binding, and tighten phillips.
   --If adjustment is needed, loosen both bottom phillips screws about a turn and tighten the bottom setscrews continually moving cards in and out checking for a bind. Continue loosening phillips screws a little at a time and tightening setscrews until cards start to bind. When adjusted properly loosening phillips slightly and tightening corresponding setscrew slightly should cause bind. Adjust top in same manner.

7. Read Station Alignment
   Connect a scope to: CH 1 to CH 1 of punch finger board, right board and far right resistor facing back, CH 2 to CH 12 of punch finger board, right board far left resistor.
   1.0V/Div chop mode 1 mil/div auto.
   Insert card into hopper, blank side facing front and notch away from read station, and manually feed into read station making sure card is flush along hopper base. Feed rollers should not be turning. There should be a voltage on both channels and as you slowly feed the card into the read station you should see both signals move toward ground at the same time. Check several times.
   --To adjust loosen four phillips screws holding read station and adjust signals to move toward ground at same time by physically moving top or bottom one way or the other depending on which end is seeing the card first. At the same time you should be trying to get as much voltage as possible out of both channels.

8. Punch Station Voltages
   Each channel should read from 2.4V to 3.0V across the resistor. Raising the resistance raises the voltage. The resistors should normally be between 100 OHM and 900 OHM.
   --Change resistor to a higher OHM reading for a low voltage reading and a lower OHM reading for a high reading.

9. Mark Sense Voltages
   With a blank card in read station, blank side to front, again you should read between 2.4V to 3.0V across each resistor. These resistors normally run from 1K OHM to 10K OHM, sometimes higher.
   --Adjust by increasing or decreasing resistance as above.

# CARD READER SOFTWARE

2234 - Punch Cards Only
2244 - Punch or Mark Sense

Switch Settings for Punch — Punch, Non Clock
For Mark Sense — Opt Mark, Clock

| Model | Device Addresses | Data Type | Statement |
|---|---|---|---|
| 2234/44 | 628 | Hollerith Data Values | DATALOAD |
| 2234/44 | 629 | Hollerith Data Images | DATALOAD BT |
| 2234/44 | 62A | Binary Data Images | DATALOAD BTA |
| 2234/44 | 62B | Hollerith Program Cards | LOAD/62B |
| 2244 | 62C | Special Mark Sense Program Cards | LOAD/62C |
| 2244 | 62D | Special Mark Sense Data Cards | DATALOAD |

Program for reading Hollerith Data combination Punch/Mark Sense Card

```
10 DIM A$(3)40
20 DATALOAD BT(N=82)/629,A$()
30 PRINT A$ (1);A$(2)
40 GOTO 20
```

2234 Boards

| | | | |
|---|---|---|---|
| 1. | 726-2001 | Sync PCB | 40035303 |
| 2. | 726-2002 | Error PCB | 40061003 |
| 3. | 726-2006 | Clock PCB | 40076505 |
| 4. | 726-2003 | Control PCB | 40061905 |

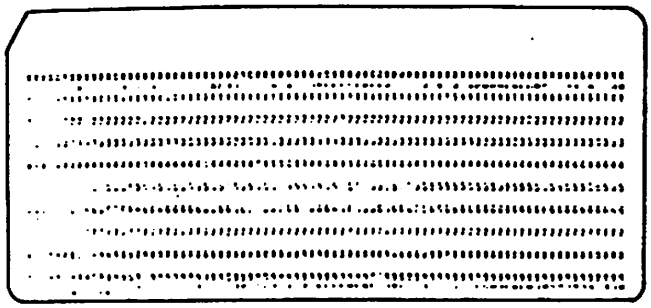
2244 Boards

| | | | |
|---|---|---|---|
| 1. | 726-2005 | Clock PCB | 40076501 |
| 2. | 726-2029 | Error PCB | 40224209 |
| 3. | 726-2007 | Sync PCB | 40094512 |
| 4. | 726-2010 | Punch Data PCB | 40228204 |
| 5. | 726-2030 | Mark Sense Data PCB | 40224711 |
| 6. | 726-2004 | Control PCB | 40061916 |

Controllers

| | |
|---|---|
| 212-2234A | Punch Only Controller |
| 212-2244A | Punch/Mark Sense Controller |
| 210-7336 | Controller for T, VP, and MVP |

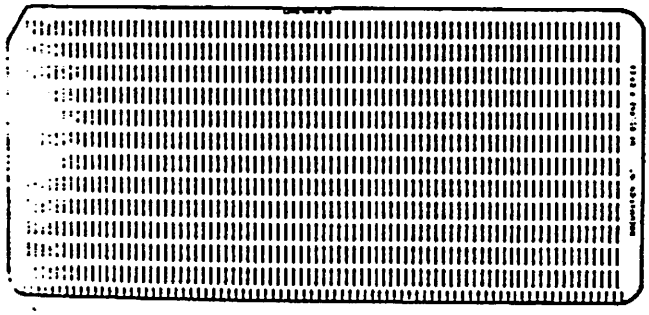
## 80-COLUMN PUNCH CARD



FOR: 2234
2234A
2244
2244A (PUNCH, NON-CLOCK)

FIGURE 3-1

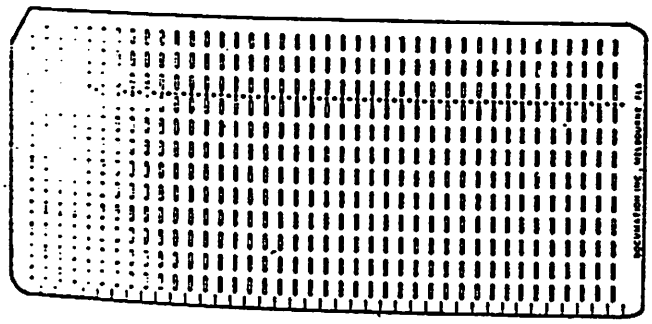
## 80-COLUMN PUNCH/MARK SENSE CARD



FOR: 2234
2234A
2244 (PUNCH, NON-CLOCK; IGNORES MARKS
2244A (OPTICAL, CLOCK or NON-CLOCK; READS PUNCH OR MARK IN CLOCK MODE; READS PUNCH IN NON-CLOCK MODE

FIGURE 3-2

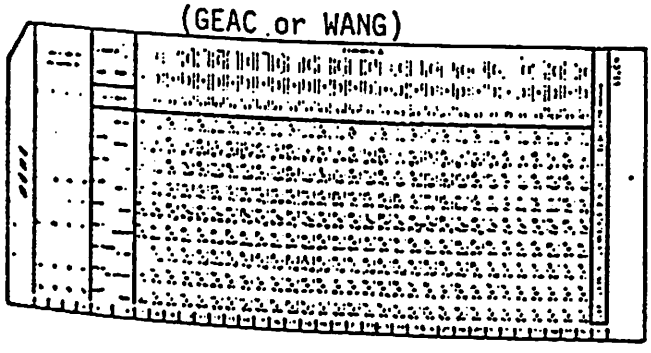
## 40-COLUMN MARK SENSE CARD



ONLY FOR: 2244 (OPTICAL, CLOCK)
2244A

FIGURE 3-3

## BASIC PROGRAM LOADING CARD (GEAC or WANG)



ONLY FOR: 2244A (OPTICAL, CLOCK)

FIGURE 3-4

**WANG LABORATORIES, INC.**
ONE INDUSTRIAL AVENUE, LOWELL, MA 01851 • TEL: 617/459-5000, TWX 710-343-6769, TELEX 172108

WANG

# TECHNICAL SERVICE BULLETIN
## SECTION: SoftWare Technical

NUMBER: SWT 8165 REPLACES: _____ DATE: 12/06/88 PAGE 1 OF 2

MATRIX ID. 8405 PRODUCT/RELEASE# WPC BASIC2/Release 3.01.05

TITLE: Release of WPC BASIC2, 3.01.05

PURPOSE:
To inform the field of the availability of the Wang Professional Computer BASIC2, release 3.01.05.

EXPLANATION:
The WPC BASIC2 is an implementation of the 2200 series BASIC2 interpreter for the Wang PC. WPC BASIC2 is highly compatible with 2200 BASIC2 and includes powerful extensions to the language.

Hardware Requirements

- Wang PC system with a minimum of 256K of memory.

Software Requirements

- Wang PC Operating System release 2.02 or greater

Media

The WPC BASIC2, release 3.01.05, software package consists of one 360KB diskette. The diskette part number is 734-0110-b.

Enhancements

- Support for the ANSI Minimal BASIC (X3.60-1978) has been added.
- Re-directed input without using ODOA.EXE is now allowed.
- The CALL statement has been added allowing user written programs to be dynamically linked and executed by WPC BASIC2.

GROUP: Desktop Systems/Peripherals Group MAIL STOP: 001-140

EXPLANATION (cont'):

Problems Corrected

- Printer linefeed is now turned off after INVOKE is issued. (PROBE F011594)
- The '$GIO' command to output a character to the bottom right hand corner of the screen without an unwanted line feed can now be used. (PROBE F500991)
- INPUT now allows re-entry of illegal numeric values.
- MAT INPUT now works correctly.
- The PRINT USING carriage returns now works correctly.
- HEX(0204xx0E) is now correctly ignored.
- HEX(010C) and HEX(030C) now do vertical wrap correctly.
- MAT PRINT now displays correctly.
- The cursor is now attached upon exiting.

Restrictions and Support Considerations

- WPC BASIC2 only runs on a Wang PC system or on a Wang APC system in Wang MS/DOS mode.

Known Anomalies

- Print /005(255) does not work the same as on the 2200. Instead, Print /005(80) can be used with eighty characters and a semicolon (;) are sent to prevent the unwanted line feed. However, printing to clear the hold produces two line feeds instead of one. To circumvent this multiple line-feed problem, Print /005(255) can be used but the (255) is treated as if it were (80). (PROBE F009017)
- When the user is running the WPC BASIC2 interpreter with the printer powered off, the system prompts with either of the following two error messages.

  Error 101.1 or Error 95.2

  The system should prompt with the following error message.

  Error 101.1: printer error, printer out of paper or non-existent

- When the user is using the PRINT BOX statement, on-screen corruption of the box graphic occurs and incorrect scrolling appears to take place. An example of the PRINT BOX statement is as follows.

```
10  PRINT HEX (03)
20  INPUT "LINE", L:PRINT HEX (03): PRINT AT (L,0);
30  PRINT BOX (10,60):  GOTO 20
```

  This screen display problem occurs when the user enters the number 15 or a number greater than 15 for LINE. (PROBE F700370)

- The Screen Dump function supports only the U.S. 2200 character set. (PROBE F700209)

## AUTOMATIC FILE CATALOGING MODE

The Automatic File Cataloging mode keeps track of the size and location of each cataloged file. It greatly simplifies the process of storing and retrieving information on the disk. Catalog Mode permits the user to save and load program and open and process data files by name, without concern for where the files are actually stored on the disk. The complex 'housekeeping' chores associated with locating the file are automatically performed by the system.

The structure used to keep track of the name and location of each file is called the "catalog". The catalog consists of two parts, a catalog index and a catalog area. All catalog program and data files are stored in the catalog area; the major portion of the platter is occupied by the catalog area. The catalog index contains the name and location of each file stored in the catalog area.

Automatic File Cataloging Mode consists of 18 BASIC statements which invoke a set of built-in routines that perform specific file control functions. Each newly created file is automatically placed in an available location by the system and the file's name and location are recorded for future reference. In addition, a number of auxiliary file maintenance operations (such as skipping records within a file, creating backup copies of files and providing essential file parameters) are supported. Among the BASIC statements that are available in this mode are:

- **SCRATCH DISK** - used to create a catalog area and index on a specified disk platter.
- **MOVE END** - can alter the size of the catalog area after created.
- **MOVE** - moves active files from one to another logical unit
- **LIST DC** - lists all file names and locations.
- **SAVE DC** - names and saves program files on disk.
- **LOAD DC** - loads a program on disk into memory.
- **DATASAVE DC OPEN** - names and allocates space for new data files on disk.
- **DATA LOAD DC** - reads data from a currently open file on disk.
- **SCRATCH** - scratches a file that is no longer used.

## ABSOLUTE SECTOR ADDRESSING MODE

This mode allows the programmer to directly access any sector on the disk by specifying its sector address. In Absolute Sector Addressing, the locations of all files (and/or records) must be maintained by the user. There is no catalog in this mode; the user can, however, create a catalog or similar reference table. The user, in this mode, is able to design his own disk operating system or to write special routines which can be used in conjunction with cataloged files.

Eight BASIC statements are supported in the Absolute Sector Addressing mode. Many of these are similar to those supported in the catalog mode. Several of the Absolute Sector Addressing statements are listed below:

- SAVE DA - stores programs on the disk; the starting sector location at which the program is to be stored must be specified.
- LOAD DA - needs a program from disk (starting sector address must be specified) into user memory.
- DATASAVE DA - stores data files on the disk in a specified location.
- DATALOAD DA - moves data from a specified location on disk into memory.
- COPY - copies information in a specified range of sectors from one platter to corresponding sectors on another platter.

As you have probably determined by now, you can determine which mode is operating without having to memorize all of the BASIC statements each mode supports. Look at the following two statements:

```
LOAD   DC                SAVE   DA
```

The first is in catalog mode and the second is using absolute sector addressing. The DC or DA indicate which mode is presently in operation.

The two main features of the Absolute Sector Addressing mode in comparison to the catalog mode is 1) the user can create a data management system or specialized search and sort routines, and 2) sectors can be directly accessed. The user can also access individual sectors in the catalog mode. In the catalog mode, the system will quickly access the beginning sector of a cataloged file; and to get to a sector in the middle of the file, a separate DSKIP statement is needed. In the absolute

ERGO Systems, Inc.
11903 Enid Drive
Potomac, Maryland 20854 U.S.A.
Telephone (301) 983- 8245
FAX (301) 299-6206

# KFAM-7 modified for 32 users
## All Versions
## October 29, 1992

Because of the demand to increase the number of active users operating under KFAM-7, ERGO has modified the KFAM-7 to accommodate up to 32 active terminals.

In the "MUX" Version of KFAM, all record tracking is done in the "KDR" sector of the KFAM Key files. In the "GLOBAL" Version of KFAM, global subroutines track Record/File locking via global variables thereby increasing system performance by reduced Disk I/O's. These modifications have been made in both the WANG 2200 and Niakwa Compiled Basic2C operating systems.

Niakwa has created an unexpected problem in that they now save a date and time stamp in the first 30 bytes of the last data file sector. This is also where KFAM saves password and file access information for controlling KFAM File Access. We have modified KFAM to write the password and access code information past the 30 Byte Date/Time stamp, which was introduced with Niakwa Release III. All release 3.20 versions can over-ride the problem by setting byte 40 of $OPTIONS to HEX(01).

We have developed two simple programs which display all the activity in the KDR of a selected key file as the file and its records are being accessed. These will help you in confirming proper record protection when using our modified subroutines. They also allow testing of "Add - Find New" ('233), Modify - Find Old ('232), Delete ('236), Find Next ('237). You may want to load the appropriate program in several workstations and confirm record locking and file protection. The program names are "TESTKFAM" for testing the "MUX" version and "TEST0307" for testing the "GLOBAL" and "MULTIBANK" version. They are accessible from the KFAM main menu by selecting option 10 - Dynamic File Status Display. ISS will automatically determine and load the appropriate version.

Another new program will appear on the ISS-KFAM Utilities Menu IF the GLOBAL version is in use (i.e. a global partition is defined and contains KFAM subroutines). It is accessed via function 11 - Dynamic Global Table Display. It will continuously display the contents of the Global Access Tables thus allowing the user to determine which files are open by which terminals and which records in each file are being protected and which terminal is protecting them.

A program named "KDRCONVT" is included and must be executed prior to running any modified KFAM-32 Subroutines. This program re-writes the KDR to accommodate the 32 users and will adjust the PASSWORD and FILE ACCESS codes to an area that will not conflict with NIAKWA Date & Time stamping. Make sure all users are off the system before executing this program. KDRCONVT is accessible from the KFAM main menu by selecting option 9 - Convert to 32 Users. Note that all of the KFAM utilities and subroutines will crash with a hard error if a file has not been converted to 32 user version. This program should also be run for "MUX" files (leave Key File Disk Address Blank to adjust the "MUXED" file access codes to the new area).

Another program called "RE-SET" is also included which must be customized for your specific application. KFAM and MUX Files and their Disk Addresses and passwords are in data statements for automatically re-setting the KFAM Access Tables. The password required to run this program is "SYSTEM" but may changed by modifying line no. 3050.

File reorganizations may be accomplished via the standard Wang reorganize utilities. The reorganize in place utility on the KFAM main menu is completely functional. Also, the reorganize sub-system as documented in the KFAM manual is fully functional. A sample reorganize setup program called TESTREOG has been included. This program will reorganize TESTF010 and return to the KFAM main menu. It may be easily customized to reorganize any data file. See the KFAM manual for more information (e.g. how to reorganize alternate key files).

There are three programs included with KFAM which contain all of the KFAM subroutines as follows;

KFAM0107 Single Global bank Version 5.5

KFAM0207 MUX Version 5.5

KFAM0307 Multi-Bank Version 5.5

Additionally included with KFAM-32 is KFAM0517 which is a "MUX" version 5.1. The reason for two "MUX" versions is that WANG's version 5.5 of "MUX" subroutines require a global partition, while ver. 5.1 does not. For NIAKWA based applications, 5.1 Version should be used. KFAM0517 contains all of the variables necessary to run defined in COM statements at the top of the program. It also performs the necessary initializations of important variables. The COM statements and initializations may be stripped out of this program and placed in a startup program designed to perform all system startup logic and define all system common.

The appropriate version of KFAM may be dynamically loaded into the application software by executing a line of code similar to the following line in the very beginning of each program which requires KFAM:

```
10 SELECT @PART"KFAM":ERROR LOADT"KFAM0517" 10,10 BEG 21
```

Remember to ensure that KFAM variable S2 is set to the partition number of each workstation in your application programs.

The function keys displayed on the menus refer to Wang function keys. The keyboard should be mapped to correspond to the Wang keyboard layout. The standard keyboard layout supplied with Niakwa does a rather poor job of approximating Wang's keyboard. We recommend the following:

| PC KEY | WANG EQUIVALENT |
|---|---|
| ESC | SF '0 |
| F1-F10 | SF '01-'10 |
| SHFT F1-F10 | SF '11-'20 |
| CNTL F1-F10 | SF '21-'30 |
| ALT F1 | SF '31 |
| ALT ESC or CNTL H | HELP SCREEN |

NOTE: ALT ESC is not distinguishable from ESC on some older keyboards.

VS OFFICE Thursday 11/14/91 08:28 am Page: 1

To: Michael Bahia MS014-A3A/LOWELL
From: Kirit Baxi Security: Limited
Subject: Your WP problem fix Date Received: 11/14/91

---

ORIG "709PCHR1"

Mike
You need to change the following in Program '709PCHAR'

line 1915 is a as follows:
1915 SELECT PRINT <@H9$>:PRINT HEX(02 08 01 0F 02 08 02 0F 0D);:IF T5(5)=2 THEN PRINT HEX(0A):IF C4=2 THEN PRINT HEX(0A 0A):IF C4=3 THEN PRINT HEX(0A 0A 0A):SELECT PRINT <@H8$>:RETURN
NOW THE NEW LINE IS AS FOLLOWS:
1915 SELECT PRINT <@H9$>:PRINT HEX(02 08 01 0F 02 08 02 0F 0D);:IF T5(5)=2 THEN PRINT HEX(0A):IF C4=2 THEN PRINT HEX(0A):IF C4=3 THEN PRINT HEX(0A 0A):
SELECTPRINT <@H8$>:RETURN
This will fix you problem. I am not sending you the whole file as that will take a lot of time. you can make change yourself.
so far as the future is concerned you may issue a TSB and let users sort it out.
Regards
John Baxi

FIXES PROBLEM WHERE GET XTRA LF IF 1ST # IN FORMAT LINE IS OTHER THAN 1.

| CPM017V3 | CLASRJV1 |
|---|---|
| 004 | 015 |
| ON | OFF |

| | |
|---|---|
| 1 | 704 |
| 2 | 715 |
| 3 | 204 |
| 4 | 215 |

MUST USE FORM 1 WITH LASERS OR WILL GET BLANK PAGES BETWEEN PAGES OF DOCUMENT.

CC: Mike Bahia W0000600 6FLT3
From: Mike Bahia Security: Limited
Subject: converting 2200 wp Date 12/21/92

---

Torbjorn,
This has not come up before and in most cases would be handled by the customer's programmer so I am unaware of what other ways may exist. However, I plan to keep a copy of this as reference should someone ask. If I get any information on this I will let you know.
Regards, Mike

---------- Original Memo ----------
To: Mike Bahia From: Torbjorn Sagner
Subject: converting 2200 wp Date Sent: 12/21/92

Hi Mike,

I have got a request from a customer (previus customer) to convert their old WP (D.A.T.A 3500) document to Word for windows document. I have tried and found one way to do that, but wonder if you have some other suggestions.

This is my way to do it.

1 Convert from DATA 3500 to 2200 WP document
2 Archive the document in the 2200 on an OIS formated archive diskett
3 Retreiv the dokument on OIS system
Convert to Word for Windows with Aladin sw.

I don't know if this is the most effective way, but it works.

Best reg.
Torbjorn

Package Subject: Converting 2200 WP

Item Title: Converting 2200 WP

bjorn,

Thanks for the quick response. Will get back to you on this if necessary when return from vacation. Sorry to see you leaving. Will miss you. Best regards, Mike

---------- Reply ----------

To: Mike Bahia From: Torbjorn Sagner
Subject: Converting 2200 WP Date Sent: 07/13/95

Mike,

Yes thank you I'am fine, hope it's the same for you. Things are changeing over here. Fist i must tell you that I'am going to leave Wang first of September, I will join an other computer company OWELL-WM Data (a swedish dealer for Compaq and IBM) as service mgr. So I'am a litle sad, more then 10 years and the years have left their marks, you can't just forget everything.

Enough of that, over to your questions.

I remember how we did the conversion, Aladin is a conversion sw that converts f rom WP format (OIS or VS) to MS Word, Word Perfect or Ami Pro. I don't think the sw still is avalible. But if your VS people are familiar with Lightspeed (MacSoft terminal emulution for VS) it's no problem. In Lightspeed you can convert and transfer documents from VS to PC (LAN). That was the easy part.

s more tricky to get the documents from 2200 to OIS ore VS format.

The reason why i used 2200 WP was that in 2200 WP there is a funktion that you can save documents into OIS format at OIS formated disketts and in DATA 3500 there is a funktion to convert documents into 2200 WP.
For the Redshaw i don't know, i have never heard about it.

It must be a more easy way to do the conversion.
Have you herd about a PC program called RAZZIA, with that program you can pick up any ASCII text file and convert it to any format you want, with a very simple macro you can do it very qickly. I have used that program to convert 2200 data into Excel without any problem I simpy do like this.

1. Print the data file useing PC as a terminal with file transfer posibilities I use PC2200 emul. form Computer Consepts, to a txt file at the PC.
2. Pick up the TXT fil with RAZZIA.
3. Do the conversion and save into Excel format.

I might think you can use this way to convert your documents but i'm not sure. If you send me a document ( diskett or via office) i can try it out for you.

The last question you have was how long the process may take for 10Mb.

Package Subject: Converting 2200 WP

The time for the conversion is not depending in how meny meg there are it is more depending in how meny documents there are,a very ruff guess is that it will take 15-30 min/doc.

Ok! Hope this could clear the things for you,?!?!?!?! Don't hesitate if you want me to explain more.

I have a question for you.

A CS386 Turbo (CD-D model) have a 150mb tape drive installed but the sw does not like it. It thinks it is a 45MB streamer any answer to that ?? Backup is working ok but you can't restore any tapes.

Best regards Torbjorn

---------- ORIGINALTEXT ----------

Till Torbjorn Sagner Fran: Mike Bahia
Ärende: Converting 2200 WP Avsänt: 95-07-12

Torbjorn,

How are you? Hope things with you are well. Need to jog your memory. A few years back you sent me a memo on converting DATA 3500 WP documents to Word for Windows. You indicated 4 steps:

1. Convert DATA 3500 document to 2200 WP document.
2. Archive document in 2200 to an OIS formatted archive diskette.
3. Retrieve document on OIS.
4. Convert to Word for Window w/ Aladin S/W.

Have a few questions on this procedure and I am not familiar with the OIS.

1. Customer has Redshaw WP which is another large 2200 vendor. Not sure how it compares with DATA 3500 or 2200 WP. Have you converted any Redshaw WP?
2. If it needs to be converted to 2200 WP what is the process? Is there a conversion program included w/ the 2200 WP? Did not see any reference in 2200 WP Supervisory Manual. Have not had chance yet to look through WP menus & will be on vacation next week so hope you don't mind me asking.
3. Was the OIS formatted diskette 5 1/4" or 8" or if both available on OIS does it matter?
4. Where can you get this Aladin S/W? We do not have any OIS people in Home Office Support groups? I assume this s/w is for the OIS.
6. Last question. Can you give me any idea of how long the process may take? Cust has a 10 Meg disk filled with documents.

Hope you can remember. Thanks for your help.

Best regards, Mike

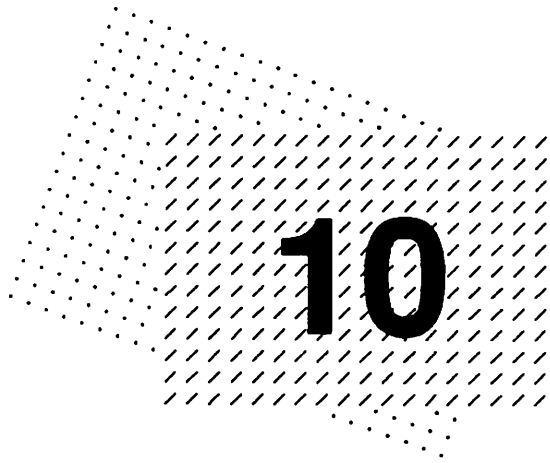
To: Michael Bahia MS014-A3A/LOWELL
From: Chris Seil Security: General
Subject: COPY2200 and 5 1/4" disk Date Received: 11/22/91

---

Mike -

Bill Dini over in VSOS says he didn't know whether copy2200 works on 5 1/4" diskettes. My test results in our lab here duplicate the customer problem. I can't get it to work with 5 1/4 inch diskettes either. I guess at this point I am going to have to go with the documentation and call it useful for 8" diskettes only.

Chris Seil
WSC VSOS Group




# DOS Utilities

## Overview

DOS utilities provide the CS/2200 user with the ability to use DOS diskettes and files without accessing a PC.

The main functions of the utilities are:

- List the contents of a DOS diskette
- Delete or rename a file
- Display or print a text file
- Format and create a DOS diskette
- Duplicate a DOS diskette
- Copy DOS files from one diskette to another DOS diskette
- Copy DOS files to CS files in block mode (or CS files in block mode to DOS files)

The main program which starts the DOS utilities is DOSSTART.

If the 2536DW, 2636DW or PC2200 are used as terminals a status line appears at line 25. The line clears when you execute the EXIT command. The system then returns to the START module.

Redirection of commands, for example, COPY (filename.ext) > PRN or DIR /W > LPT1 are not supported.

The DOS utilities are restricted to the root directory.

# The DOS Utilities Display

Select DOS Utilities from the System Utilities menu (see figure 10-1).

```
System Utilities - ( ) Copr. Wang Laboratories, Inc. 1990

                                                    Partition 1, 100 K
                                                           Terminal 1
Select item and press RUN/EXEC:

                    - Partition Generator
                    - Partition Status
                    - Format Disk Platter
                    - Move File
                    - Backup Platter
                    - Recover from Backup
                    - System Install
                    - Make a Reference List of File Names
                    - Initialize Date & Time
                    - DOS Utilities
                    - Game
```

**Figure 10-1. System Utilities Menu**

A display, similar to the example shown in Figure 10-2, appears on the screen.

```
CS DOS Emulation Version 1.0 © Wang Laboratories, Inc., 1990
CS DOS Emul\A>



A: = D10     B: = D20     C: = D11     LPT1: = 704     Terminal 1     Partition 1
```

**Figure 10-2. CS DOS Emulation Screen**

The defaults are configured as follows:

```
Drive A = CS/D10

Drive B = CS/D20

Drive C = CS/D11

LPT1    = CS/704 (terminal printer)

12/24 hr = 1 (12hr display) if set to (2) the 24hr
```

The C: drive is a CS/2200 Catalogued drive. It handles file transfers from DOS to a CS/2200 file (or a CS/2200 file to DOS). The file transfer is in a 512-byte block. Any other CS/2200 files may be transferred, however, incoherent characters may appear at the end of the file.

## Using the SETUP Command

You can reconfigure the default settings using the SETUP command. At the DOS command processor (shown in Figure 10-2), type in SETUP. The DOS SETUP program appears. (See figure 10-3.)

```
                    DOS SETUP Program

Address for Drive A for DOS emulation:  D10
Address for Drive B for DOS emulation:  D20
Address for Drive C for DOS emulation:  D11
Address for printer (LPT1)          :  704
Clock display 12/24 hr [1/2]        :    1



Update configuration y/n

A: = D10     B: = D20     C: = D11    LPT1 = 704    Terminal 1    Partition 1
```

**Figure 10-3. The DOS SETUP Screen**

If you want to use the default setting, choose n (no). If you want to change the default setting, choose y (yes). After making your selection, a display, similar to the example shown in Figure 10-4, appears on the screen.

```
                    DOS SETUP Program

Address for Drive A for DOS emulation:  D10
Address for Drive B for DOS emulation:  D20
Address for Drive C for DOS emulation:  D11
Address for printer (LPT1)          :  704
Clock display 12/24 hr [1/2]        :    1



Setup Complete - Press any Key to Continue

A: = D10     B: = D20     C: = D11    LPT1 = 704    Terminal 1    Partition 1
```

**Figure 10-4. DOS SETUP Complete**

If your setup is complete, press any key to continue.

## Commands

The DOS emulation package supports the following commands.

### CLS

CLS clears the screen.

### COPY [d:]filename.ext [d:]filename.ext

*Note: This command works only on the CS/386 operating system.*

The COPY command copies any file from a DOS diskette to another DOS diskette. You can copy files even if you have one drive on the CS system. You can also COPY files from 360K to 1.2 MB (as well as COPY files from 1.2 MB to 360K).

Wild cards are not supported and the CS filename is restricted to (8) characters.

*Format:*

```
copy a:readme.doc b:readme.txt

copy a:autoexec.bat

copy c:readme.d a:readme.doc will copy CS file to a DOS file.

copy a:readme.doc c:readme.d will copy DOS file to a CS file
       DOS/CS and CS/DOS copies are in block mode only.
```

**DEL [d:]filename.ext or *.***

The DELETE command deletes a file in the root directory. The wildcard *.* deletes all files in the root directory.

**DIR [d:] [/P] [/W]**

DIR uses switches /P and /W to display the contents of the root directory. 12hr or 24hr time display is supported. You can set up an automatic display using the SETUP command.

*Example:*

DIR C: lists the contents of the 2200 drive that you defined with an address using the SETUP command.

**DISKCOPY [d:] [d:]**

DISKCOPY makes copies of DOS diskettes. You cannot copy from 1.2 MB to 360K (or 360K to 1.2 MB). If you do not designate a drive, the default drive is assumed.

**EXIT**

EXIT returns you to the START module. Before leaving the DOS command processor, EXIT clears line 25 on the workstations that support the 25th line as the status line. (See Figure 10-5.)

```
CS DOS Emulation Version 1.0 © Wang Laboratories, Inc., 1990
CS DOS Emul\A> EXIT


A: = D10     B: = D20     C: = D11     LPT1: = 704     Terminal 1     Partition 1
```

**Figure 10-5. DOS Emulation EXIT Screen**

**FORMAT [d:] [/V]**

FORMAT initializes a DOS diskette with BOOT Track for DOS Version 3.3. The [/V] switch allows you to add the volume label to the disk.

> ***Note:*** *A 1.2 MB diskette can only be initialized on a 1.2 MB drive. A 360K diskette can only be initialized on a 360K drive.*

## HELP

HELP displays the commands currently supported in the DOS emulation package. (See Figure 10-6.)

```
CS DOS Emul\A> HELP
                        Wang CS DOS Emulation - HELP Screen

Command                                          Description

A:                                               Select drive A
B:                                               Select drive B
CLS                                              Clear screen
COPY      [d:] [name.ext] [d:] [new.ext]         Copy file
DELETE    [d:] [filename.ext]                    Delete file
          [d:] [*.*]                             Delete all files
DISKCOPY  [d:] [d:]                              Duplicate diskette A & B drives
DIR       [d:] [/p] [/w]                         Display directory
EXIT                                             Exit from emulation
FORMAT    [d:] [/v]                              Format a DOS diskette
HELP                                             Display HELP
RENAME    [d:] [filename.ext]                    Rename a file
SETUP                                            Alter CONFIG
TYPE      [d:] [filename.ext]                    Display text file
               [>LPT1]                           Print text file
VER                                              Display version number

Note:  [d:] refers to drive A:, drive B:, or drive C:

CS DOS Emul\A>
A: = D10  B: = D20  C: = D11  LPT1= 704  Terminal 1  Partition 1
```

**Figure 10-6. CS DOS Emulation HELP Screen**

## RENAME [d:]filename.ext newname.ext

RENAME [d:]filename.ext newname.ext renames a file on drive [d:]. If [d:] is omitted the command renames a file on the default drive. Wildcards are not supported.

## SETUP

SETUP enables you to change your system configuration. System administrators can access this utility at the system console.

> ***Note:*** *Individual users do not have access to SETUP. If you try to change defaults while another user is accessing the utility, problems result.*

## TYPE [d:]filename.ext [>LPT1]

> ***Note:*** *This command works on CS/386 operating systems only.*

TYPE displays a text file on a DOS diskette. The character set is translated to *Extended IBM Code Page #437.* Not all characters in the IBM codepage are available on the CS character set, therefore, some characters are substituted for the nearest character. For example, A with an angstrom is displayed as A.

Optional use of the pipe command >LPT1 produces the printed text file on a printer at the designated address for LPT1. The default address is set to 704; suitable drivers must be loaded.

**VER**

VER displays the current version of the software.

***Note:*** *[d:] is the drive designation, for example, A:, B:, or C:*

# CS/2200 DOS Utilities Rel 0.3

## Important Changes:

1 - Start programme is now 'DOSSTART'
2 - To display 24 hr clock on dir commands, change line 90 on 'DOSSTART' programme. Change I5$="2"
3 - DISKCOPY and COPY commands are currently implemented on DEFAULT drive only.
4 - 'DOS' programme should be loaded and then resaved as follows on CS 386 systems: Select new:resavet"DOS"

## Enhancements:

1 - Indirect drive addressing is now supported. i.e. dir b: type b:readme.doc etc.
2 - Command 'b:' will make default drive 'b' and vice versa for 'a:'
3 - 'config' file is now used to store configuration details. These can be changed by 'setup' command.
4 - On PC2200 and 2536DW workstations a status line on line 25 will be displayed displaying current defaults for drives and LPT1
5 - COPY oldname.ext newname.ext is now supported. Any type of files may be copied. The process is slow. Default drive is currently supported.
6 - Character set translation is now implemented to support international character set. Extended IBM character set is used as default. Main translation table is in T$(). Dir programs adjust the table for hex(60) to hex (7f) locally. The main table stays in all upper case from hex(40) to (7c).
7 - 12 hr or 24 hr clock display is now implemented.
8 - 'HELP' Command has been added. This command will display the current commands.

## Bugs Fixed:

1 - DIR command did not display maximum number of files.
2 - On 'DEL *.*' Command hidden system files were being counted for bytes used.
3 - File names with no extension e.g. alphabet failed with various commands.

Distribution:

Not Requested

CS/2200 DOS Emulation 0.3

---

Hi folks
Pls note the following changes to the DOS Emulation utilities on version 0.3.

1) A 'config' file has now been implemented.
2) Two drive support has been added. i.e you can now issue commands as dir a:/p, dir b:/w etc however drive 'A' remains the default drive.
3) Translation table has been added to allow international use. The table used is Extended IBM Codepage # 437. Some characters and graphics do not exist on 2200 character sets will not be displayed.
4) Minumus three characters of the command must be input. i.e
   del *.* or ren test.doc etc.
5) Help function will be added.
6) Copy file function is provided however the file length will be different from that of the original due to the fact that the cs386 OS can write files in minimum 512 byte blocks.

If you have any further ideas be fore this release goes ou for test pls let me know.
Regards
John Baxi

Item Subject: CS/2200 DOS Emul Rev 0.2

The following commands are now supported:

| | | |
|---|---|---|
| C | - | Clears the screen and returns prompt 'CS DOS Emul A>' |
| DELETE | - | Deletes 'filename.ext' or '*.*' |
| DISKCOPY | - | Makes a copy of a DOS Diskette |
| DIR | - | with swithches /p /w allows the disk directory be displayed. (Root directory only) |
| FORMATA: | - | Formats a 'DOS' Diskette'. With optional switch of /v will allow volume name to be added. |
| RENAME | - | Allows file name to be changed. only 'filename.ext' is supported. |
| SETUP | - | Allows user to configure the address of drive 'A' |
| TYPE | - | 'filename.doc' type files be displayed on the screen CS/2200 character set will be displayed. |
| TYPE | - | 'filename.doc' >lptl be output to a terminal printer |
| VER | - | Displays the current version on the screen. |

CUST: Coos Bay Distributors
Coos Bay, Oregon

System 2200 LVP w/ PM017
O.S. 3.3 WP 2.5B

AUTO "CGENPART"
KEY SHIFT HALT WHEN SCREEN BLANKS WHILE LOADING O/S
VERIFY CGENPART IN MEM
1ST LINE OF PROG
5 REM !CGENPART
ON LINE 100 CONTROLS AUTO EXECUTION
100 GOTO1150 : REM % DELTHIS GOTO FOR AUTO EXEC

PM017 WILL NOT UNDERSCORE IN 2200WP.

SW SETTINGS: SW BK 1 1,3,6,7 OFF 2,4,5,8 ON SW BK 2 ALL OFF CORRECT

LISTDT 015 CPM017V3 ON CORRECT

DP TEST
```
10 SELECT PRINT 215
20 PRINT HEX(0208030E)
30 PRINT "ABCD";
40 GOTO 20
```

BASIC 2 UTILITIES REF MANUAL ENABLES UNDERSCORE GPD ESCAPE SEQ

PRINTS CORRECTLY WITH UNDERSCORE

2200WP PERIPHERAL DEVICE SELECTIONS PRINTERS

ADDRESS FOR ALL PRINTERS USING DRIVERS MUST BE 7xx.
TYPE FOR ALL PRINTERS USING DRIVERS MUST BE CHARACTER.

| # | ADDRESS | TYPE | COMMENT |
|---|---|---|---|
| PRINTER 1 | 715 | CHARACTER | PM017 TESTED & WORKS INCL UNDERSCORE |
| | WAS USING 215 & TYPE AS LINE | | |

AS DOCUMENTED IN SRN FOR WP 2.5, ALL PRINTERS USING DRIVERS MUST USE ADDRESS 7xx & BE DESIGNATED AS CHARACTER PRINTERS.

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# TECHNICAL SERVICE BULLETIN

## SECTION: SoftWare General

NUMBER: SWG 9186 REPLACES: _____ DATE: 09/21/90 PAGE 1 OF 3

MATRIX ID. 4304 PRODUCT/RELEASE# 2200 (MVP/LVP/SVP/VP/CS/MicroVP/386)

TITLE: Purpose of Printer Drivers & use with 2200WP

PURPOSE:

To clarify the use of Printer Drivers and to properly setup Wang printers that require them in 2200WP, thus insuring proper operation of the printer and all it's supported features.

EXPLANATION:

OVERVIEW: Many of the printers currently used on the 2200 Product Line require a Print Driver for proper operation and full use of features under standard operating procedures for DP and 2200WP. These printers listed with the latest Print Drivers to be used with them include:

| | |
|---|---|
| DM-50/300.....@DM50/V0 | PM010.....@PM010V2 |
| PM016.....@PM016V3 | PM017.....@PM017V3 |
| PM018.....@PM018V3 | LCS15.....@LASRJV1 |
| LDP8.....@LASRJV1 | @pm060V0 |

These Drivers come with the Operating System. The purpose of the driver is to allow the use of the same 2200 Basic instruction with any supported printer for a supported function such as line feed, carriage return, top of form, etc.. As the current group of printers come from several vendors, often different codes are required with each for the same function. The driver converts the standard 2200 code into the proper code required by that specific printer to perform the function requested. This makes it easy to use any supported printer without altering programs.

The codes to activate the various features of a printer are often referred to as escape sequences. Escape sequences are normally hex codes and can be activated by placement within parenthesis of a PRINT HEX( ) command. The BASIC-2 Utilities Reference Manual, p/n 700-6855x, must be used for the correct escape sequences to be used with Wang print drivers. They are found in the chapter on Generalized Printer Drivers. The escape sequences found in the printer's Product Maintenance Manual or User's Guide will in most cases be the codes required by the printer. The Wang drivers convert the standard escape sequences as found in the Utilities Reference Manual to the specific sequences required by the printer. If not using a driver or the driver is off, the Wang standard escape sequences may not be rocognized. Wang 2200WP uses the standard escape sequences.

GROUP: 2200 Product Support MAIL STOP: 014-A3A

WANG

# TECHNICAL SERVICE BULLETIN
## SECTION: SoftWare General

NUMBER: SWG 9186 REPLACES: _____ DATE: 09/21/90 PAGE 2 OF 3

MATRIX ID. 4304 PRODUCT/RELEASE# 2200 (MVP/LVP/SVP/VP/CS/MicroVP/386)

TITLE: Purpose of Printer Drivers & use with 2200WP

EXPLANATION (cont'):

The following is a brief sample of a few standard escape sequences shown within a 2200 BASIC command:

```
PRINT HEX(02070E).............selects printer
PRINT HEX(02070F).............deselects printer
PRINT HEX(0208030E)............enable underscore
PRINT HEX(0208030F)............disable underscore
PRINT HEX(020C010200dd0F)......sets form length to # of lines set by dd
```

As stated, the above commands would require the correct printer driver to be installed and ON, and the feature to be supported by the printer.

INSTALLING DRIVERS: Printer Drivers are installed in @GENPART and activated as the system is booted to Ready. PF'7 is used from the GENPART screen. The Driver name, printer address, and terminal # if a terminal printer must be supplied. The print driver is a data file and must be on the Operating System disk booted from. The Driver name must match exactly with the data file name on disk. If a print driver is installed by running @GENPART while the system is up, the system must be re-booted to activate. When booting from an O/S on floppy, it should be noted that the Print Drivers are usually on disk 2 of 2 and therefore the driver cannot be easily installed. LIST the operating system disk to check to see if the Print Driver needed is on that disk.

DETERMINING IF THE DRIVER IS ON: If a driver is installed properly in @GENPART and is on the O/S disk booted from, the Driver defaults to ON. To verify if the Print Driver is ON for a specific terminal, list the Device Table from that terminal.

```
LIST DT   execute
```

The line near the bottom beginning with PDT (Printer Driver Table) will lists all drivers available to the terminal being used. If there is a driver listed it will also clearly indicate either ON or OFF. The driver is turned ON and OFF by the following commands:

```
SELECT DRIVER xxx        turns driver on for address xxx (204,215,etc)
SELECT DRIVER xxx OFF    turns driver off for address xxx
```

GROUP: 2200 Product Support MAIL STOP: 014-A3A

# TECHNICAL SERVICE BULLETIN
## SECTION: SoftWare General

NUMBER: SWG 9186 REPLACES: _____ DATE: 09/21/90 PAGE 3 OF 3

MATRIX ID. 4304 PRODUCT/RELEASE# 2200 (MVP/LVP/SVP/VP/CS/MicroVP/386)

TITLE: Purpose of Printer Drivers & use with 2200WP

EXPLANATION (cont'):

2200WP 2.5: Wang's 2200WP was written to be usable with all Wang supported printers. To use all supported features of both the printer & WP, the correct print driver must be on and the printer must be configured properly. Up to 4 printers total can be configured in 2200 WP. To configure a printer for use in 2200WP follow these steps:

1. From the WP Main Menu space to the 'Utilities' pick & Execute.
2. Space to 'Supervisory Functions' & Execute.
3. Space to 'Manage System Configuration' & Execute.
4. Space to 'Peripheral Device Selects' & Execute.
5. There are 4 possible entries here requiring address and type printer to be entered with an optional comment. Printers using drivers must use 7 as the 1st number of the address (704, 715, 716) as noted on the bottom of the screen, otherwise the actual address (204, 215, 216) is used. The type printer is either character or line. All printers using drivers must be listed as character type. This is as noted in the SRN for 2200WP 2.5. The comment field is commonly used for the actual printer model number. Failure to use a 7xx address or to use CHARACTER for type with printers needing drivers will cause a loss of some functionality in WP, often affecting underscoring.
6. If a terminal printer, there is an additional step. Repeat steps 1 to 3, space to 'Terminal Default Assignments', and key Execute. For each Terminal Printer in step 5, make a corresponding entry here for the proper terminal. Again, all printers using drivers must be listed as CHARACTER printers.

SUMMARY:

For proper operation in 2200 WP with printers using drivers:

1. Verify the driver is there & ON from the W/S to be used: LIST DT
2a. Check the printer configuration in WP. From the 'Peripheral Device Selects' menu verify: address starts with 7, type = CHARACTER.
2b. For terminal printers, from 'Terminal Default Assignments', insure the printer is listed as a CHARACTER printer with the correct terminal.

A new release of 2200WP, 2.6 will be out this fall. Questions concerning this TSB can be referred to Mike Bahia, 2200 Product Support, tel (508)-656-0256.

GROUP: 2200 Product Support MAIL STOP: 014-A3A

T.: Coos Bay Distributors
Coos Bay, Oregon

System 2200 LVP w/ PM017
O.S. 3.3 WP 2.5B

PM017 will not underscore in 2200WP.

Sw Settings: SW BK 1 1,3,6,7 off 2,4,5,8 on SW BK 2 all off correct

LISTDT 015 CPM017V3 ON correct

DP TEST
```
10 SELECT PRINT 215
20 PRINT HEX(0208030E)
30 PRINT "ABCD";
40 GOTO 20
```

BASIC 2 UTILITIES REF MANUAL ENABLES UNDERSCORE GPD ESCAPE SEQ

Prints correctly with UNDERSCORE

2200WP Peripheral Device Selections Printers

Address for all printers using Drivers must be 7xx.

Type for all printers using Drivers must be CHARACTER.

| # | Address | Type | Comment |
|---|---|---|---|
| Printer 1 | 715 | CHARACTER | PM017 TESTED & WORKS incl UNDERSCORE |
| | was using 215 & type as | LINE | |

Documented in SRN for WP 2.5, all printers using drivers must use address 7xx & be designated as CHARACTER printers.

MAIN MENU

UTILITIES

SUPERVISORY FUNCTIONS

MANAGE SYSTEM CONFIGURATION

PERIPHERAL DEVICE SELECTS

PRINTERS SCREEN ALLOWS 4 ENTRIES

| PRTR # | ADDR | TYPE | COMMENT |
|---|---|---|---|
| 1 | 704 | CHAR/LINE | |
| 2 | 715 | | |
| 3 | | | |
| 4 | | | |

DEV TYPE 7 xy IS REQ BY ALL PRINTERS USING DRIVE

TERMINAL DEFAULT ASSIGNMENTS

TERMINAL DEFAULTS SCREEN

| TERM # | DEFAULT LIB | DEFAULT ARCHIVE | ATTACHED PRINTER | COMMENT |
|---|---|---|---|---|
| 1 | A | | CHARACTER | |
| 2 | | | N/A | |
| 3 | | | | |
| 4 | | | | |
| 5 | | | | |
| 6 | | | | |
| 7 | | | | |

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# TECHNICAL SERVICE BULLETIN

## SECTION: SoftWare Technical

NUMBER: SWT 9225 REPLACES: _____ DATE: 12/06/89 PAGE 1 OF 3

MATRIX ID. 4301 PRODUCT/RELEASE# CS/386 Release 1.0 Operating System

TITLE: Software Idiosyncrasies with the CS/386

PURPOSE:

To inform the field of problems and differences using the CS/386 O/S.

EXPLANATION:

Although most software running on a VP, MVP, LVP, or CS type CPU can be run as is on the 386 board, there are cases where changes may need to be made. There are also some bugs that have been identified. The following is a current list of problems and concerns. See TSB HWT 9373, Matrix 4103 published 12/12/89 for a current list of hardware concerns.

Partitioning the System:

1. The amount of memory space per partition on the CS/386 should be doubled when compared with the VLSI as a general rule of thumb. Variables for example, require more space for coding with the 386 board which will result in most programs requiring a larger partition size. If additional memory is not partitioned, it is possible A01 and A02 errors may occur.

2. Any partition can be any size up to the maximum available memory (8MB). There are possibilities where increasing the partition size could create a problem. Certain sort modules and possibly other programs may expect a 56KB partition and changing that parameter could cause a failure. The software vendor would need to correct this.

3. Any partition of any size can be global to any other partition. You do not have the concept of bank partitions.

4. Within "@GENPART" the device table should have only 1 entry per disk controller address & the number of terminals should not exceed the number of terminal ports available. There are only 3 disk controller addresses: 310, 320, 330. For example, for controller 310, make a single entry /310, not an entry for each specific platter address or for tape like D11, D12, D1F, D51, or D5F. Additional entries could cause I92 errors if RESET is keyed while accessing disk. Entering more terminals than physically possible, especially if using a Triple Controller has caused problems.

M-O-R-E

GROUP: VS Systems Hardware MAIL STOP: 001-330

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# TECHNICAL SERVICE BULLETIN

## SECTION: SoftWare Technical

NUMBER: SWT 9225 .1 REPLACES: _____ DATE: 12/06/89 PAGE 2 OF 3

MATRIX ID. 4301 PRODUCT/RELEASE# CS/386 Release 1.0 Operating System

TITLE: Software Idiosyncrasies with the CS/386

Operational Problems and Concerns:

5. The floating point mathematics on the CS/386 assures accuracy to 10 digits compared to 13 digits with previous 2200 CPU's. This could cause the 9th thru 13th numbers to the right of the decimal point to be slightly different after a calculation from the answer on an older type 2200 CPU, especially if multiple math operations are done.

6. There has been a problem identified using advanced math functions that may create an incorrect result. A fix will be in the next release of the O/S and is available now in maintenance release 1.04 on an as needed basis.

7. For any software package that looks for CPU type, the partition status line byte 9 is coded "W" on a CS/386, "V" on a VP, and "M" for a LVP/MVP/CS. On certain versions of TOM software currently running on LVP's, MVP's, or CS's for example, the system won't come up on a 386 CPU board as it sees the CS/386 as a wrong CPU. Contact TOM or the appropriate vendor for a fix. Wang's ISS Utility has to be corrected for this. The problem is found on line 420 of program "ISS.000M":

```
420 A$=$PSTAT(#PART):IF STR(A$,9,1)="M" THEN S3=4:.....etc
```

8. If the current 2200/VLSI software makes decisions on the partition status line bytes 10 and 11, the software may require an update to run on the CS/386. Under the MVP O/S, byte 10 denotes memory bank, byte 11 denotes the amount of partition memory. On the CS/386, partition status bytes 10 and 11 signify the amount of partition memory (there are no banks).

Disk Related:

9. The second digit of the first byte of a header record for a program file sector must be 0. On older 2200 systems it did not matter if the second digit was non-zero. This could cause an error A01 with the 386. Legal program header records must begin with hex 40, 50, 60, or 70.

M-O-R-E

GROUP: VS Systems Hardware MAIL STOP: 001-330

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# TECHNICAL SERVICE BULLETIN

## SECTION: SoftWare Technical

NUMBER: SWT yxxx REPLACES: _____ DATE: 12/06/89 PAGE 3 OF 3

MATRIX ID. 4301 PRODUCT/RELEASE# CS/386 Release 1.0 Operating System

TITLE: Software Idiosyncrasies with the CS/386

Printer Related

10. The 2273 Band printer may add &/or drop characters intermittently with Rel 1 of the CS/386 O/S. The fix is in maintenance rel 1.03 available now on an as needed basis until the next release of the O/S is available.

11. Printer drivers - Rev 1 of the 386 operating system has a bug when executing printer drivers. If experiencing these problems you need the next level of O/S (when available). A maintenance release is available.

Workstation Related

12. If EDIT/RECALL is used to recall a long line of program text an error A05 could occur. In re-coding the O/S for the 386 Processor some instructions as well as variables required more space. Split the line between 2 line numbers as a workaround if necessary. R&D is working this.

13. PC2200 (195-7560-X) is the recommended Terminal Emulator if using a PC (XT or AT compatible) as a workstation. PC2200 emulates a 2536DW workstation. There may be a problem coming in and out of emulation with the PC while the CS/386 CPU is operational. When a terminal is powered off or logically disconnected (PC world), the 386 totally ignores it to save time. If the PC is reloaded with the 2200 emulator, avoid hitting any keys, especially the RESET function until the screen is updated by the 386 and either 'READY (BASIC-2) PARTITION #' or the current 2200 program is on the screen. If the 386 receives a signal such as RESET before it has found out the terminal is reconnected, the O/S could be blown. This problem has not been verified with the PC but R&D is working on a related problem with the 2536DW. See TSB HWT 9373, Matrix 4103, item 17.

Tape Related:

14. The DS Tape Utility has a problem going beyond 99mb. In program "@DSTAPEB" at line 1010 the number of #'s in parenthesis must be increased from 5 to 6 as shown: 1010 : : : CONVERT VAL(C$,3) TO C5$,(######) causes X71

GROUP: VS Systems Hardware MAIL STOP: 001-330

2,5,9,10 Revised Mike Bahia 5/6/88

# Extending the Life and Performance of Your 2200

by

Tim VeArd

Tens of thousands of organizations are wondering what to do about that old Wang 2200 that's been sitting in the corner for years. Why is this old dinosaur still being used? Because it's reliable and still works! In fact, many of its users have never experienced a major problem with it.

The 2200 is the second most successful minicomputer ever built - only the IBM System 34 had more users. But, unlike IBM 34 users, 2200 users have choices available when it comes time to replace their computers. Data and software from a 2200 can be transfered as is to many machines. In addition to Wang's own replacement for the 2200, the CS/DS, BASIC-2 programs and data can be moved to at least 120 other computers by using either Niakwa Management Systems' BASIC-2C, Spectrix's BASIC-3 or CCI's BASIC-K.

Perhaps another reason for the 2200 still being used by so many people is that maybe now there are too many choices to analyze. While many have successfully replaced their 2200, others have discovered that moving data and software to another manufacturer may not have been the best choice for them. In some cases, the newer hardware wasn't faster, was less reliable, had limited growth paths and it wasn't as easy to use as the 2200.

What do you do? While I have my own list of favorite replacements for the 2200, there are just too many choices for one to be "right" for everyone. Making the correct choice is not just a simple matter of picking another computer. You should consider the availability and cost of maintenance; will the system be as easy to use; will it be as fast; will it "hold up" as well for many years; can you use any of your existing perpherials; will you need special power or air conditioning; can you get software support; is the manufacturer financially stable and do they have a history of "upward migration". Very few companies are as committed as Wang is at providing a growth path for existing users to newer products. Some users have their 12 year old multi-user 2200MVPs (upgraded from single user 2200VPs) working with new Wang DS cabinets. I'm using a 14 year old disk drive with a CS.

There are new options being announced every month and rumors of spectacular developments coming soon. For some, the best course of action today could be to wait until tommorrow. As long as your 2200 still performs or can be made to perform better, waiting might be a good choice. There are several things you can do to improve the performance and extend the life of your current hardware. Your options range from investing a few weekend hours to spending a couple thousand dollars. These strategies involve rearranging data on your disks, reconfiguring your hardware, adding a few new or used components, completely replacing some hardware or modifing programs.

## Reconfiguring Data Disks

Many 2200 owners use Phoenix or Winchester disk drives with multiple platters. Drives with multiple platters have separate heads to read or write data on each platter, but these heads are "ganged" (all heads move together). To visualize this, picture a head glued to the tip of each finger on your right hand. Now imagine that the fingers of your left hand are disk platters. Put the fingers of one hand in between the fingers of the other and move your right hand back and forth. Like the finger tips of your moving hand, the heads for all platters always move together.

Pretend that on platter #1 (the top finger of your left hand) there is a data file positioned at the beginning of the platter (near your finger tip) and another file located at the end of the platter (near the joint of the two fingers). When two people use these files at the same time, the heads are constantly flying from one end of the platter to the other to retrieve data. If these two files were closer together, the heads won't have to move as far to service both users - thus operations become faster.

Complicate this picture (are your fingers tired yet?) with another file on platter #4 (your baby finger). Let's put this file near the middle of the platter (by your knuckle). When a third person asks for data from that file, the heads really begin to fly. Remember, the heads for all platters move together. So, now you have the top head moving from end to end and taking the bottom head (who wants to stay in the middle) with it. It's no wonder that your drive often sounds like an out-of-balance washing machine.

You can reduce some of the movement of the heads by rearranging the data files on your disk. LIST all of your disks to find out what area of each platter, by sector address, your files occupy. Analyze which files are used most often by the most number of people. Backup and reformat all platters. Using your analysis, copy files back one at a time. Your goal is to position the most active files on separate platters and in the same relative areas on each platter (preferably, near the center of each). Start by moving some of your least used files. Then, as a platter becomes full enough, move one of your most active files so that it now occupies the center, then finish by moving the remaining files back.

You can use BASIC-2 commands (COPY or MOVE) or utilities (like @MOVEFIL). But, some software systems (like AIMS) require that you use their utilities to successfully move a file and its companion work files. Be patient, because this procedure takes time. Don't take too much time trying to get it absolutely perfect, because at best, it only improves performance by about 15% on Phoenix drives and up to 30% on Winchesters. The real payoff comes from making the drive operate smoother, thus extending its life. Anyway, who wants to listen to an out-of-balance washing machine all day?

## Reconfiguring Hardware

Spreadout Users and Data - A few years ago, this option was too expensive to even consider. Now, with so much used hardware available, you can achieve tremendous gains in performance for just a few hundred dollars. It's possible to buy a used 2200 or Phoenix disk drive for under $1,000 (I've seen them for as low as $500 each). It's possible for well under $2,000 to double your system "through put" (the amount of work that can be done in any given period of time) by simply adding another CPU and disk drive. First, make sure that your software is able to handle "logical" terminals before trying to use multiple CPUs.

Rearranging your most active files on separate disk drives, instead of just separate platters, yields a dramatic boost in performance. Also, as many have discovered, adding a ninth user "brings a 2200 to its knees". There are a few reasons for not putting more than eight terminals on a 2200, but mainly it's because only one terminal at a time can do anything. The 2200 shares its time among all users, in 30 millisecond periods called "time slices". The more users a 2200 has to poll, the less number of time slices each user gets. Thus, each user gets more time slices by having less users on each 2200. You can share up to four disk drives with up to four 2200's. With a little effort, it's possible to have up to 32 terminals sharing data and performing just as well as an 8 terminal system.

UP TO 12 WINC DRIVES OR
OR 6 [redacted] PX DRIVES
w/ up to 16 CPU's.



You can share up to 3 disk drives w/ 24 users + still get good

Organize Users by Function - When you do have multiple CPUs, you will also have a few other options. You can analyze what types of jobs are being performed and then arrange users on those CPUs to make your criticial tasks faster. For example, most word processing software packages available for the 2200 slow down all other users. When a terminal runs word processing software, it completely uses each time slice. Other types of software can use INPUT/LINPUT or versions of KEYIN statements that put a terminal "to sleep" in between keystrokes. When a terminal is not truly busy, it gives up its time slice. Therefore, at any given time, most terminals (except for word processors) are "asleep" and the 2200 is free to dedicate most of its time to servicing the currently active users. However, all software systems have some peak use periods when they will also consume all of their available time slices (for example, an accounting system closing a month).

You can experiment by confining all word processors to one CPU and leaving another CPU to just service accounting operators. Or you can balance your system by evenly distributing word processors and accounting across all available CPUs. You can even manage (swap terminal plugs) your resources on a daily basis to get the best "through put" for the scheduled work load.

## Adding New Components

There are several "add on" devices that can improve the performance of your system, such as additional core memory and RAM disks. A word of warning, some of these devices cannot be used with another manufacturer's hardware should you later decide to replace your CPU. You should also take the time to be sure that the benefits are cost justified.

Additional Memory - Depending upon the software and the CPU you are using, additional memory can yield two benefits. First, some software can take advantage of having additional memory available. Years ago, an "unwritten" standard was adopted by many software authors to not use more than 28K bytes of memory per terminal. Now that memory is cheaper, some authors rewrote their packages to give better performance (my own system is now 65% faster if there is more memory). Contact your supplier and ask if there is a new release of your software that improves performance if you have 56K of memory per terminal available. If you write your own software, later in this article you will find a few suggestions (some requiring more memory) that may help you make your own code faster. Second, the Wang CS (and a 2200 using extended memory supplied by Southern Data Systems in Raleigh, NC), can configure additional memory not used by terminals as RAM disk.

RAM Disk - RAM (Random Access Memory) disks are a form of additional electronic memory that can be used just like a regular disk drive. There are two types of RAM disk, internal (extended main memory) and external (attached to the CPU's I/O bus like another disk drive). Unlike regular disk drives, there are no mechanical parts like spinning platters and moving heads, therefore these electronic disks are very fast. Compare the access rate of a Winchester drive of 27ms to a RAM disk's 1.5ms (internal) or 3.4ms (external) - a RAM disk is obviously many times faster.

Unlike regular disk drives, when the power is turned off, internal RAM disks send what is written on them to the "bit bucket" (data heaven). One safe configuration is to put only programs on a RAM disk. My research shows that an average program loads about 0.25 seconds faster from a RAM disk. If your software constantly loads other programs or overlays pieces of programs, you'll see screens "pop up" faster. My system used to load 5 programs in a row in over 6 seconds. With RAM disk, it now does it under 5 seconds or about 22% faster. But, if your system only loads one program and then uses that same program for hours, you will see no benefit at all.

You can also put work or reference files that are not written to on the RAM disk. This way, if power does fail, then nothing can be lost. But, it generally requires changes in your software to configure and use a file in this fashion. If you try to copy an entire disk to an internal RAM disk, you may run into other problems in addition to losing data. Many software systems test a disk to make sure that it is really there and ready to use. That test uses a $GIO statement because a $IF ON is not always reliable. You will usually get an I92 error (time out) when using $GIO on internal RAM disks. Another problem is that internal RAM disks use a unique, fixed address that some software packages written many years ago won't recognize.

External RAM disks are better when you have multiple CPUs, since terminals on one CPU cannot share programs or data on another CPU's internal RAM disk. Also, some external RAM disks (like Northeast Digital Corporation of Southhampton, PA) let you pick the address to use, support the $GIO test and automatically backups everything written on the RAM disk to a built-in Winchester disk drive during a power failure or normal shut down.

My tests indicate that RAM disks really begin to "pay off" when you have many users sharing the same sets of programs and work files. With just a few users or shared files, there are only small gains (about 15-25%) in performance. Where as, you may see higher gains (around 40-50%) when 8 terminals are using a properly configured RAM disk. Unless you have many programs that are frequently loaded and heavily used or shared work files, you may not experience enough benefits to cost justify a RAM disk. Also, more is not always better. You don't need a large internal RAM disk if you are just putting programs and work files on it. I used Wang's 2 meg (about 7,500 sectors) RAM disk and got great results, but increasing its size to 4 meg or 8 meg did not really increase performance much more, until investing weeks rewritting my software to perform sorts on the bigger RAM disk.

## Replacing Some Existing Hardware

Carefully selecting new or replacement disk drives, terminals and CPUs can really help you improve the performance and extend the life of the rest of your hardware. In some cases, you can actually build a "bridge" to another computer system, while still using your existing hardware.

Terminals - You can implement several strategies when replacing or adding new terminals. If you are heavily using word processing on your Wang CS or 2200, consider using Wang's new 2436WP terminal. The 2436WP does the word processing and gives up its time slices on the 2200 while doing it. There are 6 "windows" that let you start, monitor or switch jobs on the 2200 while doing word processing. We measured an increase in system performance of about 12% by switching just one word processing user to a 2246WP.

If you are planning to replace your CPU later, there are some terminals (Spectrix Microsystems of Markham, Canada) that can be used on your 2200 and later be used by other CPUs. Of course, there are a few replacement CPUs that can also use your existing 2200 terminals, so you can still buy Wang terminals and have options later. You can also use IBM PC clones as terminals on your 2200 by using software (Southern Data System's 2536PC or MacSoft of Bakersfield, CA) that makes the PC emulate a 2200 terminal.

Disk Drives - If you must replace an existing disk drive, it's a golden opportunity to truly enhance the performance of your system. Don't just buy a new drive without planning for growth. Investigate the many features that you can also get for very little extra when buying a new drive. Even if you plan to migrate to another CPU, there are choices that let you use the drive now on your 2200 and then later on another CPU.

To illustrate what you should now expect from any new disk drive, look at Wang's DS. In addition to getting a disk drive, you also get cache memory (which can also be configured as a RAM disk). It's almost like buying a hamburger, because you can "have it your way". Buy an empty cabinet and add on more drives as your budget permits. Drives range from slower 10 and 20 megs, all the way up to faster 64 and 140 meg drives. You can have several drives in the same cabinet or connect several cabinets together. Best of all, anyone can pick up the entire DS cabinet an carry it anywhere. CAUTION SHOULD BE TAKEN MOVING A CABINET. THE CABINET IS NOT DESIGNED TO BE MOVED W/ DRIVES INSTALLED. Another important feature to look for in any new disk drive is how do you backup? Like Wang's DS, some manufacturers (like Magna Computer Corp. of Manchester, NH) now offer you choices between built-in tape drives or small removeable disk cartridges. Some manufacturers can offer things like built-in cache memory, RAM disk and backup systems - others cannot. Most of the disk drive systems now available will work as well as your existing drives. But, some of the replacement drives will not be faster because they do not have those extras. ~~Even though~~ Wang's DS is designed to ~~work with their new Wang CS, you will also see~~ improved "through put" on a 2200 ~~because~~ of its cache memory and external RAM disk.

CANNOT CONNECT CABINETS TOGETHER. 3 CABINETS /CPU MAX.

PROVIDE WITH PROPER USE

Southern Data Systems makes a disk drive that has a built-in RAM disk, cache memory and removeable backup, but can also be used with other CPUs. For example, your Wang 2200, Wang CS, Wang PC and dozens of other IBM PC clones can all share the same disk drive. In fact, SDS even lets your 2200 emulate certain MS/DOS commands and read MS/DOS files. This drive lets you "network" a 2200 with many non-Wang CPUs and directly exchange data.

CPUs - You can keep most of your existing hardware and just replace your CPU. Most of a computer system's cost is in its perpherials (terminals, disks and printers), not the CPU. With a 2200, there are several options that may let you have the best of both worlds. Most users like their 2200 and really don't want to completely replace it. Some people are required to have some MS/DOS or UNIX capability and are planning to replace their 2200 to meet those corporate goals. By integrating an MS/DOS or UNIX based CPU with your 2200, you not only achieve the ability to communicate with those other computers, you also make your existing 2200 perform better by spreading out some of its current work load. If you purchase components wisely, both CPUs can share the same resources (like terminals, printers and even disk drives) in case of emergencies or hardware failures.

(WITHOUT EXCEPTION IF USING A MVP L/P SVP MICROVP)

The cleanest and simplest way to replace your 2200 is with Wang's new CS. You do not have to buy a DS or any new perpherials to use a CS. The CS uses ~~every~~ almost device that a 2200 uses, ~~without exception~~ - even non-Wang items like SDS's Extended BASIC-2 language, terminals, printers and disks. The CS has low maintenance costs (low enough to almost pay for it by just what is saved on your 2200's maintenance). The CS is smaller, quieter and generates less heat. However, replacing a 2200 with a CS will not increase your overall system performance yet (don't forget Wang's commitment of "upward migration" and rumors now being heard), unless you also buy extra memory for RAM disk or a DS. A CS and DS together are about 20% faster than a 2200 for most users, mainly because of the cache memory in the DS.

You can also buy another CPU and integrate it with your existing CS/2200. Using one of the BASIC compilers, you can exchange data with the 2200 and the new CPU. Data can be exchanged between many different CPUs (including the 2200) using Niakwa's BASIC-2C compiler and a floppy diskette. You can directly share data between a large variety of CPUs using both Southern Data System's disk drive and Niakwa's BASIC-2C. With Spectrix's BASIC-3 or CCI's BASIC-K you can connect a wire between CPUs and transfer entire disk platters back and forth, without conversion (but taking some time).

? BETWEEN WHAT & WHAT

## Modifing Software to Increase Performance

If you purchased software, contact your supplier to see if there are new releases offering performance enhancements. Wang's BASIC-2, SDS's Extended BASIC-2, Niakwa's BASIC-2C, Spectrix's BASIC-3 and CCI's BASIC-K have all included several new verbs in their recent releases that can improve the performance of software. As a result, many software authors are making major improvements to their packages now to take advantage of those verbs.

If you write your own software, you can use those new verbs and also learn to generate more efficient code. It would be impossible to cover in this article all of the "tricks" that I've accidently stumbled over during the years to make code faster. But, without giving away too many trade secrets, I can share some ideas that show you how to start developing your own techniques. I catagorize most improvements as belonging to one of three basic groups: (1) structure, (2) save-a-byte and (3) save-a-second.

Structure: This refers to how a program is organized. The 2200 is stack oriented. All variables and internal values are put into "push down, linked electronic lists". A "push down" stack means that the last used (or referenced) value is put on top of a list. "Linked" means that there are several entry points into a stack. For example, there are 26 entry points into the variable stack - one for each letter of the alphabet.

```
10 DIM A$64,B$12,N$24,C$32,C1$20,C2$10,C(10),C$(2)5
```

In the statement above, C$ is referenced first, so it's on the bottom of the list of C's. When your program needs the value held in C$, the 2200 jumps to the "C stack" and asks the first variable "are you C$?", to which the stack says "No, I'm C$()". The 2200 moves down the list until it finds C$ at the bottom before it retrieves the value stored in it. If C$ is used a lot by your program, you will improve over all "through put" if C$ is DIMensioned after all the other variables that start with the letter C. Spreadout variables to take advantage of the 26 entry points, because if they all start with the same letters, your program will be slower.

Generally putting your most frequently used subroutine at the top of your program makes it faster. To prevent the 2200 from scanning every line starting from the top of a program with each GOSUB or GOTO, line numbers are divided into 16 groups. In the statement "GOSUB 9000", the 2200 jumps to a starting line number stored in memory for that group of lines and then scans the lines from that entry point to find out where line #9000 is in memory, before it can execute the routine you put there. If you add more code to your program, a subroutine may move from the top of one entry point to the bottom of another. If your subroutine is used thousands of times, put it at the top of the program and it will probably run faster. If all DEFFN X(v)'s (defined functions) are put together in the same area (like the top) of a program, instead of sprinkled through out, they will also execute faster. Since the 2200 only maintains 16 line number references for user defined subroutines, other GOSUB'XXs will be slower.

Since most versions of BASIC automatically print spaces between verbs and syntax when LISTing code, many programmers develop a bad habit of inserting spaces as they write code. The 2200 takes extra time to analyze the blanks (and extra disk space and memory is wasted). 2200 programs are resolved before running. Variables are assigned to stacks, verbs are turned into machine code (atomized) and other housekeeping chores are done. Programs resolve faster if there are no imbedded blanks found in your statements. Imbedded spaces also impede the overall program execution. You can automatically eliminate imbedded blanks by using the "⟨S⟩" parameter the next time you SCRATCH and SAVE your program: SAVE ⟨S⟩ T$()"program".

Save-a-byte: These techniques can be used to do the same things with less code, and often as a result, less time. To illustrate some "tricks" not found in manuals, I'll list some statements and their shorter equivalents:

| Normal Statement | Short Version doing the same thing |
|---|---|
| STR(A$,1,20)=STR(B$,1,20) | STR(A$,,20)=B$<br>- '1' is assumed as the default and string for B$ isn't needed |
| STR(A$(1),20,6)=STR(B$(1),40,6) | STR(A$(),20,6)=STR(B$(),40)<br>- again, 1 is assumed and length for B$ isn't needed |
| IF K$="N" OR K$="Y" THEN 200 | IF POS("YN"=K$) > 0 THEN 200<br>- POS is shorter and faster |
| A=POS(A$=HEX(0D)) | A=POS(A$=0D)<br>- HEX is assumed |
| IF POS(HEX(0102)=STR(A$,1,1)) THEN. A=VAL(STR(A$,1,1) | IF POS(HEX(0102)=A$) THEN ..<br>A=VAL(STR(A$,1)) -or- A=VAL(A$)<br>- Only 1st referenced byte of A$ is actually checked or used |
| A$=" " .. or .. A$=HEX(20) | A$=Z$<br>- DIM Z$1. If used alot, saves core and time(imbedded blanks) |

There are literally dozens of similiar gimicks that save memory. My love affair with looking for "save-a-byte" gimicks started by accident fifteen years ago when I was desperately looking for ways to avoid A01 (memory overflow) errors. I was puzzled when I didn't get an error message when entering the first statement shown above and by mistake omitted a '1'. BASIC verbs require rigid syntax (rules and structured format). Therefore, the 2200 expects to find certain values assigned. With many verbs, if the value is not supplied, the 2200 assigns a default value.

Some gimicks, like combining short program lines together, saves both space in memory and time. The smaller a program is, the faster it loads and resolves. Every line number that is eliminated, saves 4 bytes of memory (and may result in less lines for GOSUBs to fall through).

Also use LIST V and look for variables that are not used very often. If these identified variables are just temporary work variables, meaning that their values are not needed later, they can be combined. Reuse one variable over and over again as a temporary work variable. For every numeric variable that you eliminate, you will save 12 bytes of core memory.

Save-a-second: Another set of techniques involves replacing code with verbs that do the same thing, but faster. Every BASIC verb takes a unique amount of time to execute. Years ago, I formed the habit of starting each work day by spending a few minutes looking for ways to do things faster and with less code. It resulted in creating a list of ratios used to compare how long a verb takes to execute. You can develop your own list by writing a simple one line program that executes a verb at least one million times using a FOR/NEXT loop and then time how long each verb takes. I'll share part of my list with you. The verbs are listed in time order, with the fastest on top and the slowest at the bottom of the list. The list compares each verb to the REM verb.

| BASIC-2 Verb or Statement | Number of Times Slower |
|---|---|
| REM | 1.0 |
| GOTO | 2.1 times longer |
| A=1 | 3.3 times longer |
| ADD (+) or SUBTRACT (-) | 5.3 times longer |
| ON A GOTO | 5.4 times longer |
| MULTIPLY (*) | 5.6 times longer |
| IF A$=HEX(20) (alpha to HEX) | 5.9 times longer |
| IF A$=B$ THEN (alpha to alpha) | 6.9 times longer |
| IF A=1 THEN (numeric) | 7.2 times longer |
| CONVERT STR(A$,1,1) TO A | 7.7 times longer |
| DIVIDE (/) | 14.6 times longer |
| STR(A$,1,16)=STR(B$,1,16) | 14.6 times longer |

As you can see, every statement in a program takes time to execute, even a REM statement that does nothing. In repetitive routines, when a group of lines are used thousands of times, eliminate statements that are not really needed. When sorting 50,000 records, a REM can cost minutes. A common mistake is to imbed a statement like "A=1" in the middle of heavily used routines. As the table shows, setting "A=1" takes 3.3 times longer than a REM. If the "A=1" can be moved outside of that frequently used routine, your program will be faster. Now using the table, let's substitute verbs that do the same thing, but execute faster. Consider these examples:

| Normal Statement | Faster Version doing the same thing |
|---|---|
| IF A=1 THEN 200 | ON A GOTO 200<br>- ON is 25% faster than an IF and ON is also shorter |
| IF A=3 THEN 20: IF A=4 THEN 30 | ON A-2 GOTO 20, 30<br>- Replace 2 IF's with 1 ON is 38% faster and much shorter |
| A=A*2 | A=A+A<br>- ADD is faster than MULTIPLY |

As you can see, these investigations can result in vastly more efficient code. Let me share a few other general observations with you:

- Alphanumeric comparisons are always faster than numeric comparisons
- Comparing a HEX code is faster than comparing an alphanumeric
- Eliminating extra variables from your program not only saves memory, it also saves time because it makes scaning the stacks a little faster for all verbs that use variables.

Finally, there are a few new verbs in all versions of the BASIC-2 language that can also make your programs somewhat faster. Most notably is:

DATA LOAD/SAVE BM T(A) A$()

This verb can replace the BA (block address) LOAD/SAVE statements in your programs. With it, you can build large data buffers to load a track (24 sectors) of data at a time. It can dramatically reduce the number of "disk hits" your program uses to retrieve or save data, thus eliminating "traffic jams" for those overworked disk heads. By simply using this verb, I was able to reduce the "disk hits" from 839 down to merely 52 when sorting 836 records. Reducing the total number of disk hits made the sort about 10% faster when only 1 terminal was in use. But, when 4 terminals were in use, the sort was 36% faster. Just like a RAM disk, the more users involved, the better your response time will be as you adjust how a disk is used.

## Miscellaneous Tips

While these tips probably won't give your computer a sudden burst of speed, they might help you avoid costly "down times" and also help extend its life. Any computer system works better and lasts longer if it is properly maintained and used with a little care.

Environment - Most computers will function properly even at the higher temperatures now found in many of today's offices. But rapid changes in temperature and humidity will CAN ~~shorten your hardware's life~~ AFFECT PERFORMANCE. The temperature range recommended by most manufacturers is 65 to 80 degrees Fahrenheit (18 to 27 degrees Celsius). Humidity should be from 40% to 60%. Some computers will tolerate different ranges, but most experience some problems when the temperature changes by more than 2 degrees per hour. The humidity should also not vary by more that 2% per hour.

Perhaps the most neglected element is humidity. Too much humidity and moisture leaves residue ~~or causes electrical shorts.~~ WHICH CAN SHORTEN YOUR HARDWARES LIFE High humidity causes paper to expand, which can jam some printers. Too little humidity and you get static electricity which causes dust build-up, reduced disk or tape life, excessive wear ~~of printer heads and~~ random data ~~problems~~ ERRORS ~~on~~ WITH disk ~~write/read heads.~~ If possible, CPUs and disk drives should not be placed on carpets, unless they are anti-dust and anti-static computer carpets.

& PAPER CLING POSSIBLY CAUSE JAMS OR IMPROPER PRINT

Maintenance - Several years ago, many users abandoned their maintenance contracts. They felt it would be cheaper to pay "by the call" or use a third party maintenance organization. Some users said they could save enough money on maintenance costs to buy another system when their existing system no longer worked. In practice, some people did save some money for awhile - during the years when Wang maintenance was high. Today, Wang maintenance prices are realistic, especially on the CS and DS.

There are several disadvantages to not being on a maintenance contract. Obviously, when an emergency does occur and you do need service, you have a lower priority than those other companies who are on maintenance. This is true regardless of who you use for maintenance, either Wang or one of the third party companies. Second, like the self service gas stations of today, relatively little preventative maintenance is being done by many users. For example, filters are not being cleaned or replaced on Phoenix disk drives (which CAN cause) as much down time as electronic failures).

Some third party maintenance companies "repair to the part" or use boards that have been repaired before. They simply cannot afford to carry a large stock of parts, nor do they even have the latest engineering changes (ECNs) that may be applicable to your hardware. Quite often, manufacturers swap defective boards or complete systems. ~~with updated new components.~~ It's not unusual for a customer on maintenance to have their complete CPU replaced when several problems occur at once. While how quickly a problem is fixed is an important measurement of how well maintenance is being done, having old components being replaced with new ones can have a hidden benefit of extending the overall life of your system. One study that examined the effect of swapping boards versus replacing the exact part, suggests that you might get several more years of use from hardware where swaps are made.

MOST CASES REPLACEMENT PARTS ARE NEW. MANY TIMES REPLACE MULTIPLE PART CAN INTRODUCE MORE PROBLEMS THAN REPLACING THE 1 PROBLEM PART

With today's more realistic maintenance prices, you may be better off with a service contract. But, actively monitor preventative maintenance. Place a tag on the front of each piece of your equipment. Record the dates that each was last serviced, particularily noting when the filters were last replaced or cleaned. Make a habit of routinely checking the tags and when your customer engineer visits, be sure the filters are cleaned if needed.

Daily Operations - Obviously, you should avoid raising dust or smoking near the CPU, disk drives and disk platter storage areas. The clearance between some disk platters and the heads flying over them is 100 micro inches. A partical of cigarette smoke is 250 micro inches. One human hair is 4,000 micro inches. Since they won't fit in between the platters and heads, you might get a "head crash" and lose everything on the drive. Vacuum cleaners or other machinery with large electric motors should not be operated near the CPU or disk drive - and certainly, never while they are running.

Many users come to work early in the morning to do backups. The hardware is powered on, and almost immediately they start coping disks or performing other disk intensive operations. This is the worst time of the day to do a backup. Not only is the hardware still warming-up, so is the air around it. Most offices are not fully heated or cooled at night, thus in the morning the temperatures are usually changing by more than two degrees per hour. If possible, let the hardware warm-up for at least several minutes (I wait at least 15 minutes) before doing backups. Just like an expensive sports car, let it warm-up before racing it. Also, monitor the temperature changes during this period. If the air temperature varies a lot during this warm-up period, see if you can either adjust when the building starts heating or cooling, or else do backups during a period when temperatures and humidity are not changing (the end of the work day is usually best).
IT IS IMPORTANT TO NOTE THAT DATA SHOULD NOT BE WRITTEN TO A DISK AT A TEMPERATURE SIGNIFICANTLY DIFFERENT THAN THE TEMPERATURE AT WHICH IT WILL BE READ, 15° F IS USUALLY A SAFE RANGE OVER 20° F CHANGE DEFINITELY AVOIDED. DISK PLATTERS EXPAND & CONTRACT W. TEMP & CHANGE IN TEMP BETWEEN WRITING & READING OF > 20° F MAY LIKELY CAUSE PROBLEMS READING

Disaster Planning - Most users backup their data and programs. But, most do not keep a "grandfather" backup that is different than today's backup, just in case the current backup was made when s/w errors (HARDWARE ERRORS CAN NOT BE CORRECTED) existed that you were not aware of. You should keep a daily backup and a backup that is at least a week old (many keep a backup for last month and last year). You should also keep one backup "off site" in case of a disaster like a flood, fire or other natural disaster. One disaster that occurs more often than a natural catastrophe is damage caused by disgruntled employees. If they destroy things you can see, it's easier to recover from than having someone insert or delete subtle changes to your data that you may not see for weeks or months. Keeping several sets of backups off site can help if this occurs.

Disaster planning should not be limited to just off site backups. Ask yourself, if your computer was completely destroyed by fire, how long would it take you to get back into business? How long did it take to get your current system after you ordered it? It could take months before you can get new hardware to even load that "off site" backup on a drive. You can join forces with other local users and simply agree to share each other's hardware (after hours, for example) until the other receives new hardware. Some groups have created a joint pool of hardware that members can use during a disaster, or borrow whenever one piece of equipment is out of service while waiting for repair parts. Some companies offer Disaster Contracts that guarentee that you can be processing again within 24 hours.

## Summary

You do have several inexpensive options that will help extend the life of your hardware. But, sooner or later, you will need to replace most of your system. ~~All~~ most electronic and mechanical devices eventually wear out. After all, how long do you expect your car or TV to last? A life cycle model I did suggests that mechanical devices like printers and disks are usually replaced within 4 to 6 years, while CPUs can last from 8 to 10 years. This article was not intended to convince you that you can indefinitely extend the life of your hardware. You should view it as extending the time in which you have to form a long-ranged plan for future growth. With a little planning, you may never have to stop using one system and then start using another, but rather, just gradually replace components as they wear out.

THE KEY TO THE LIFE CYCLE OF DEVICES IS NOT LONG REPLACEMENT PARTS WILL BE AVAILABLE.

## CS / 2200 Resource sharing

### Disk Multiplexing

- Each CPU can have a maximum of 3 disk controllers.
- 2275-MUX.
  allows a DS or 2280 drive to be shared with up to 3 other CPUs.
- 2275-MUXE
  Extends the 2275-MUX range to 3 more CPUs.
- A single DS cabinet can thus be shared by 1-16 CPUs.

### User Partitions.

- Each CPU can support 1-16 terminals.
- Each CPU can support 1-16 partitions.
- Each partition has a maximum size of 56K. (61K in memory bank 1).
- Any partition may run in foreground or background.
  Foreground partitions have access to a terminal.

  Background partitions do not require terminal access.

  Background partitions may be started in the foreground and then sent into the background.

  Simple programming inclusions can be made to allow partitions to run in the foreground if a terminal is available or in the background if it is not.

This example was incorporated in the BSC communications package.

Module "BSC*010M" lines 5620-5780.

```
5720 F8=-F8 : ON F8+2 GOTO , , 5760
5725 Set items for foreground

5760 Set items for background and $RELEASE TERMINAL
```

| Variable F8 | PRINT to | $IF ON test #9 | Terminal Mode |
|---|---|---|---|
| -1 | /005 | /001 | Foreground, background possible. |
| 0 | /005 | /001 | Foreground ONLY. |
| +1 | /000 | /005 | Background, foreground possible. |

/000 as an output device is a bit bucket.
/001 is the input keyboard.
/005 is the CRT, in the background it can be tested for availability.

# 2200VP ERROR CODES

2200VP CODE

## NONRECOVERABLE ERRORS

Mics. Errors:

| | |
|---|---|
| A01 | memory exceeded (01,02) [text <--> symbol tbl] |
| A02 | memory exceeded (02) [text <--> value stack] |
| A03 | not enough memory (84) [LISTDC, MOVE, COPY] |
| A04 | stack overflow (02) [operator stack] |
| A05 | line too long (45) |
| A06 | program protected (44) |
| A07 | illegal immediate mode statement (24) |
| A08 | statement not legal here |
| A09 | program not resolved |

← equivalent 2200 CODE

Syntax Errors:

| | |
|---|---|
| S10 | missing left parenthesis (04) |
| S11 | missing right parenthesis (05) |
| S12 | missing equal sign (06) |
| S13 | missing comma (35) |
| S14 | missing asterisk (94) |
| S15 | missing > (76) |
| S16 | missing letter (21) |
| S17 | missing hex digit (33) |
| S18 | missing relation operator (14) |
| S19 | missing required word (12) |
| S20 | expected end of statement (10) |
| S21 | missing line number (11) |
| S22 | illegal PLOT argument (54) |
| S23 | missing literal string (39) |
| S24 | illegal expression or missing variable (15) |
| S25 | missing numeric scalar variable (16) |
| S26 | missing array variable (17) |
| S27 | missing numeric array (=1) |
| S28 | missing alpha array (63) |
| S29 | missing alpha variable (40) |

Program Errors:

| | |
|---|---|
| P32 | start > end (77) |
| P33 | line number conflict (45) |
| P34 | illegal value (18,13) |
| P35 | no program (23) |
| P36 | undefined line number or CONTINUE illegal (11) |
| P37 | undefined special function subroutine (48) |
| P38 | undefined FN (08) |
| P39 | FN nested too deep (09) |
| P40 | NEXT without FOR (26) |
| P41 | RETURN without GOSUB (25) |
| P42 | illegal image (37) |
| P43 | illegal matrix operand (91) |
| P44 | matrix not square (89) |
| P45 | operand dimensions not compatible (90) |
| P46 | illegal microcommand (95) |
| P47 | missing buffer variable (96) |
| P48 | illegal device specification (47) |

P49 interrupt table full
P50 illegal dimensions or variable length (=3,22)
P51 variable or value too short (37)
P52 variable or value too long (=2,42)
P53 noncommon variables already defined (30)
P54 common variable required (87)
P55 undefined array (22)
P56 illegal subscripts (22)
P57 illegal STR() arguments (41)
P58 illegal field/delimiter specification (35)
P59 illegal redimension (92,22)

## RECOVERABLE ERRORS

### omputation Errors:

C60 underflow (03)
C61 overflow (03)
C62 division by zero (03)
C63 zero divided by zero, or zero ↑ zero (03)
C64 zero raised to negative power (03)
C65 negative number raised to noninteger power (03
C66 SQR of negative power (03)
C67 LOG of zero (03)
C68 LOG of negative power (03)
C69 argument too large (03)

### xecution errors:

X70 insufficient data (27,28)
X71 value exceeds format (56)
X72 singular matrix (93)
X73 illegal INPUT data (29)
X74 wrong variable type (43)
X75 illegal number (20)

### Disk Errors:

D80 file not open (86)
D81 file full (62)
D82 file not in catalog (80)
D83 file already catalogued (79)
D84 file not scratched (78,73)
D85 index full (88)
D86 catalog end error (74)
D87 no end of file (82)
D88 wrong record type (52,58)
D89 sector address beyond EOF (82)

### I/O Errors:

I90 disk hardware error (61) IX'C0' not rec'd
I91 disk hardware error (65,83)
I92 disk hardware error (61--timeout)
I93 disk format error (67)
I94 format key engaged (67)
I95 seek error (71)
I96 CRC error (72)
I97 LRC error (68)
I98 illegal sector address (64)
I99 read-after-write error (85)

Cause: The format of a number is illegal

Recovery: Correct the number.

ERR X76 ER 97 on T

Error: BUFFER EXCEEDED

Cause: The buffer variable is too small or too large for the specified operation.

Recovery: Change size of buffer variable.

DISK ERRORS (RECOVERABLE)

ERR D80 ERR 86 on T

Error: FILE NOT OPEN

Cause: The file was not opened.

Recovery: Open the file before attempting to read from it or write to it.

CODE D81 ER 67 on T

Error: FILE FULL

Cause: The file is full; no more information may be written into the file.

Recovery: Correct the program, or use MOVE to move the file to another platter and reserve additional space for it.

ERR D82 ER 80 on T

Error: FILE NOT IN CATALOG

Cause: A non-existent file name was specified, or an attempt was made to load a data file as a program file or a program file as a data file.

Recovery: Make sure the correct file name is being used; make sure the proper disk is mounted.

ERR D83 ER 79 on T

Error: FILE ALREADY CATALOGED

Cause: An attempt was made to catalog a file with a name that already exists in the Catalog Index.

Recovery: Use a different name, or catalog the file on a different platter.

ERR D84 ER 78 on T

Error: FILE NOT SCRATCHED

Cause: An attempt was made to rename, or write over a file that has not been scratched.

Recovery: Scratch the file before renaming it.

ERR D85 ER 86 on T

Error: CATALOG INDEX FULL

Cause: There is no more room in the Catalog Index for a new name.

Recovery: Scratch any unwanted files and compress the catalog using a MOVE statement, or mount a new disk platter and create a new catalog.

ERR D86 ER 74 on T

Error: CATALOG END ERROR

Cause: The end of the Catalog Area is defined to fall within the Catalog Idex, or an attempt has been made to move the end of the Catalog Area to fall within the area already occupied by cataloged files (with MOVE END), or there is no room left in the Catalog Area to store more information.

Recovery: Correct the SCRATCH DISK or MOVE END statement; or increase the size of the Catalog Area with MOVE END; or scratch unwanted files and compress the catalog with MOVE; or open a new catalog on a separate platter.

ERR D87 ER 82 on T

Error: NO END-OF-FILE

Cause: No end-of-file record was recorded in the file (with DATASAVE DC END or DATASAVE DA END), and therefore none could be found by the DSKIP END statement.

REcovery: Correct the file by writing an end-of-file trailer after the last data record.

ERR D88 ER 58 on T

Error: WRONG RECORD TYPE

Cause: A program record was encountered when a data record was expected, or vice-versa.

Recovery: Correct program. Be sure the proper platter is mounted and be sure the proper drive is being accessed.

ERR D89 ER 64 on T

Error: SECTOR ADDRESS BEYOND END-OF-FILE

Cause: The sector address being accessed by the DATALOAD DC or DATASAVE DC operation is beyond the end-of-file. This error can be caused by a bad disk platter.

Recovery: Run the program again. If error persists use a different platter or re-format the platter. If error still exists, contact Wang service personnel.

I/O ERRORS (RECOVERABLE)

ERR I90 ER 61 on T or ER 65 on T

Error: DISK HARDWARE ERROR

Cause: The disk did not recognize or properly resond to the System at the beginning of a read or write operation (the read or write has not been performed.)

Recovery: Run program again. If error persists, reformat disk platter. If error still occurs, contact Wang service personnel.

ERR I91 ER 61 or 65 on T

ERR I92 ER 83 on T

Error: DISK HARDWARE ERROR

Cause: The disk did not respond to the system at the beginning of a read or write operation in the proper amount of time (time-out). The read or write has not been performed.

Recovery: Run program again. If error persists, reformat disk platter. If error still occurs, contact Wang service personnel.

ERR I93 ER 67 on T

Error: DISK FORMAT ERROR

Cause: A disk format error was detected during a disk read or write. The disk is not properly formatted. The error can be either in the disk platter or in the disk hardware

Recovery: Format the disk again; if error persists, call

Rang Service personnel.

ERR I94 ER 66 on T

Error: FORMAT KEY ENGAGED

Cause: The disk format key is engaged. (The key should be engaged only when formatting a disk.)

Recovery: Turn off the format key.

ERR I95 ER 71 on T

Error: DISK SEEK ERROR, OR PLATTER PROTECTED

Cause: A disk seek error occurred, indicating that the specified sector could not be found on the disk platter. This error may indicate a bad format, or it may result from an attempt to read a protected diskette.

Recovery: Make sure the diskette is not protected, and run program again. If error persists, re-initialize (reformat) the disk. If error still occurs call Rang Service personnel.

ERR I96 ER 72 on T

Error: CYCLIC READ ERROR

Cause: A cyclic redundancy check error occurred during a disk read operation; the sector being addressed has never been written to or was incorrectly written. This usually means the disk was never initially formatted.

Recovery: Format the disk. If the disk was formatted, rewrite the bad sector, or reformat the disk. If error persists call Rang Service personnel.

ER I97 ER 66 on T

ERR I98

ER 64 on T

Error: ILLEGAL SECTOR ADDRESS OR PLATTER NOT MOUNTED

Cause: The disk sector being addressed is not on the disk, or the disk platter not mounted. (Maximum legal sector address depends upon the model of disk used.)

Recovery: Correct the program statement in error, or mount a platter in the specified drive.

ERR I99 or ER 65 on T

Error: READ-AFTER-WRITE ERROR

# Powering Up and Loading MVP

## Power Up

1. Turn on Terminals
   A. 2236DE will come up with the following message:
      2236DE R01 BAUD RATE BPS 8+0 (USA)
   B. 2236D will come on with just a cursor
2. Turn on CPU
   Terminal #1 should have the following message showing:
      MOUNT SYSTEM PLATTER
      PRESS RESET
   If not, try powering CPU off and on again
3. Turn on Disk drives and Printers
   Allow disk drives to come to ready and warm up.

## Loading System

| Prompt on Screen | Operator Function |
|---|---|
| 1. Mount System Platter<br>Press Reset | key RESET |
| 2. Key SF' ?_ | key SF 0 (Loader at address fixed 310)<br>key SF 1 (Loader at removable 310)<br>key SF 2 (Loader at fixed 320)<br>key SF 3 (Loader at removable 320) |
| 3. Menu | key SF 0 (Clear Partitions) |
| A. Number of Terminals | * key # |
| B. Number of Partitions | * key # (normally same as # of terminals) |
| C. | * key SF 2 (divides memory evenly) |
| | key SF 15 (execute) |
| C. OK to Execute | Y return |
| D. Password | return |
| Ready (Basic 2) Partition # | |

If you have more than 64K you will have to answer Number of Terminals, Partitions, and divide memory evenly for each bank.

COMPUTERS
WANG LABORATORIES, INC.
WORD PROCESSORS

# BASIC INSTRUCTIONS FOR SIMPLE DIAGNOSTICS

## TWO TYPES OF INSTRUCTIONS

1. Commands-immediate mode instructions which do not need to be in a program to execute.
   EXAMPLES: PRINT, LIST, CLEAR, LOAD, COPY, MOVE, ETC.

2. Statements-Instructions which can be used in a program.

Some instructions fall into both groups.

## PRINT INSTRUCTIONS

PRINT element-will print the designated element on selected device in program mode. If element is within quotation marks, it will be printed out as is.

```
EXAMPLE: PRINT "ABCD"
         ABCD
```

If element is a variable, a numeric function, or a hex code, its value will be printed.

```
EXAMPLE: PRINT 10*10
                100
```

Can be a command or statement.

HEXPRINT alphavariable-will print in hex codes the given alphavariable

Hex Codes-every character used by the CPU and by each peripheral has a hex code. Many hex codes would be the same between peripherals. There are also special hex codes used to position the cursor, sound a bell, move paper, etc., depending on the peripheral. Hex code charts should be found in the associated manual for that piece of gear.

EXAMPLES FOR CRT: HEX(01) CURSOR HOME,(03) CLEAR SCREEN, (07) BELL, ETC.

## NUMERIC OPERATIONS

The 2200 can equate mathmatical equations easily in the immediate mode or the programmable mode with or without variables. Any undefined numeric variable is equal to zero. Numeric variables are easily assigned values.

```
EXAMPLES: 10 X=25
          20 Y=50*9
          30 PRINT Y/X+10-Z
```

If this program were run, 28 would be printed out on screen.

NUMERIC FUNCTIONS

INT-integer function is used in conjunction with numeric operations and will round off a mixed number by equating it to the highest whole number less than the value.

```
EXAMPLE: INT (3.8)=3
         INT (6.1)=6
         INT (-2.1)=-3
         INT (10)=10
```

RND-random function produces random numbers between 0 and 1, and when used in conjunction with INT and multiplied by a number can be conveniently used as a random number generator.

```
EXAMPLE: X=INT (19583xRND(1))
```

Each time this instruction is executed a number between 0 and 19583 will be generated.

DATA MANIPULATION

DIM element-used to reserve space in memory for data, and must procede any reference to the element in the program. If used to receive data from disk, 1 sector, 256 BYTES, the element would be an alpha array; A$, B$, or C$, etc., which is 16 BYTES, and by adding 16 elements, A$(16) or B$(16) or C$(16), etc, we get 256 BYTES. More than one element may be in a STMT by separating with commas.

```
EXAMPLES:DIM A$(16)
         DIM B$(16),C$(16)
```

DATALOADBA F or R or T/_ _ _,(sector,L) alpha array-will load data from disk, address specified, sector specified, into memory allocated by alpha array. After execution of the statement, the address of the next consecutive sector is returned in numeric variable L.

```
EXAMPLE: DATALOADBAF/310, (1023,L) A$()
```

Will load data from fixed disk, address 310, sector 1023 into A$() in memory. L will be equal to 1024 after execution.

DATASAVEBA F or R or T $/_ _ _ , (Sector, L) alpha array-will take data in alpha array in memory and store it in designated sector of disk addressed. The "$" is optional and will cause a read after write. Again, L will receive next consecutive sector after execution.

DATALOADBT/10A or B, A$() & DATASAVEBT/10A or B, A$()-used to load or save data from or to cassette tape.

## BRANCHING INSTRUCTIONS

GOTO line number-causes program to go directly to line number designated. Also can be used in immediate mode to enable operator to begin program execution at line number specified. However, an immediate execution will not begin until halt/step or continue/execute keys have been hit.

FOR numeric variable=expression 1 TO expression 2 STEP expression
NEXT numeric variable-the FOR TO statement is used with its companion, the NEXT statement to form a counting loop. The STEP expression is optional and is used to count in increments greater or less than 1, which is the increment without the step. Next increments X and jumps back to the FOR TO statement.

```
EXAMPLE: 20 FOR X = 0 TO 19583 STEP 24
         30 DATALOADBAF (X,L)A$()
         40 NEXT X
```

Will load sector 0 into A$() first time thru, then sector 24, then sector 48, etc.

IF variable < , or<=, or = ,or>=,or > ,or<> expression THEN line number-will branch to designated line number if condition is met. The expression must be in quotes if it is an alphavariable value. See example in Determining Head Program for Alphavariable.

```
EXAMPLE: 20 FOR X=0 TO 1023
         30 IF X=500 THEN 60
         40 DATALOADBAF (X,L)A$()
         50 NEXT X
         55 END
         60 X= X+100
         70 GOTO 40
```

Will load every sector from 0 to 499 then load every sector from 600 to 1023 into A$() in memory. When finished A$() will contain only the data from sector 1023

## OPERATOR INTERVENTION

INPUT "optional message" variable, variable-allows operator to supply data to program during execution of program. An optional message can be used as a prompt to operator by using quotation marks after word INPUT. One or more variables may be used depending on how many different pieces of data to enter. Each piece of data when inputted will be separated by commas. Upon execution of the input statement the program will stop with a question mark on the screen, preceded by the optional message if used.

```
EXAMPLE: 10 INPUT "STARTING SECTOR, ENDING SECTOR" X,Y
         20 VERIFYF (X,Y)
         30 STOP
```

When this program is executed, this prompt will come up on screen.

```
      STARTING SECTOR, ENDING SECTOR?
```

Operator will type in 2 numbers separated by commas

```
      0,1023 execute
```

Sectors 0 to 1023 will be verified.

```
            EXAMPLE:    10 INPUT "NAME, TEST SCORE IS;"A$,B
                        20 PRINT A$: Print "YOUR SCORE IS"; B
```

When the program is executed the screen will look like this:

```
                  NAME, TEST SCORE?
```

Operator types in for Example:

```
                  YOUR NAME, 100, execute
```

Screen will then come back with:

```
                  YOUR NAME                YOUR SCORE IS 100
```

DEFFN'0-31 "optional message"- this statement is used to allow entry into a subroutine via the special function keys.

```
            EXAMPLE:    10  PRINT "SF1 TO VERIFY FIXED 310"
                        20  PRINT "SF2 TO VERIFY REMOVABLE 310"
                        30  PRINT "SF3 TO VERIFY FIXED 320"
                        40  PRINT "SF4 TO VERIFY REMOVABLE 320"
                        50  STOP
                        60  DEFFN'01
                        70  VERIFY F/310;: GOTO 10
                        80  DEFFN'02
                        90  VERIFY R/310;:GOTO 10
                        100 DEFFN'03
                        110 VERIFYF/320;: GOTO 10
                        120 DEFFN'04
                        130 VERIFYR/320;: GOTO 10
```

When this program is run the message within quotes will be printed on the screen one above the other. By keying the specified special function key, the specified disk will be verified and afterwards, the first four lines again will be printed on the screen.

STOPPING INSTRUCTIONS

Stop "optional message"- when this instruction is executed, program execution halts, STOP with optional message if used is printed on the screen. If there are further statements after the stop, keying CONTINUE execute will restart with the next instruction.

END - when executed, program execution halts, and the amount of free space in memory is displayed. Can be used in programmable or immediate mode. In program mode, clears operator and value stacks. A good way to check memory size is by clearing memory and using END in immediate mode. Remember with MVP, no partition can have more than 64K.

NOTE: Programs need not finish with STOP or END statements because a program will automatically stop with the last instruction.

## PROGRAMMING AND DEBUGGING AIDS

ON ERROR E$,N$,GOTO line number-this instruction is placed near the end of the program and if any error is encountered during the execution of that program, execution will jump to this instruction. E$ will received the error code and N$ the line number. Execution continues on at the line number specified with the GOTO. This instruction can only be used once in a program.

RENUMBER STEP#- immediate mode instruction used to renumber a program in memory normally to allow more space between instructions for additional instructions. STEP# is an option to use an increment other than 10. All references to line numbers within the program will also be changed accordingly.

EXAMPLE:

```
1 PRINT "ABC"              10 PRINT "ABC"            5 PRINT "ABC"
2 X=X +1                   20X=X+1                   10X=X+1
3 IF X=10 THEN 5           30 IF X=10 then 50        15 IF X=10 then 25
4 GOTO 1                   40 GOTO 10                20 GOTO 5
5 STOP                     50 STOP                   25 STOP
RENUMBER exec.             RENUMBER STEP 5 exec.
```

REM note-has no other function other than to allow the programmer a way to put comments or explanatory remarks within the program. Any character may be used in the note except for a colon, because it denotes the end of an instruction.

EXAMPLE: 10 REM This is an example of a REM statement.

HALT/STEP key-Pressing this key during program execution causes execution to stop at completion of the currently executing instruction. Each successive time the HALT/STEP is keyed after the first, the next statement is listed, executed, and execution halts.

SELECT P 1-6- causes a delay of 1/6 of a second for each number from 1 to 6 every time a carriage return is sent to the CRT.

```
EXAMPLE: SELECT P1  Selects a 1/6 second delay
         SELECT P6  Selects a 6/6 or 1 second delay.
```

SELECT P removes the pause.

## COPYING FLOPPY TO HARD DISK

```
10 DIMA$ (16): PRINT HEX (03)
20 FOR X=0 to 1023: PRINT "SECTOR=";X
30 DATALOADBA R or F/3_0,(X,L)A$()
40 DATASAVEBA R or F $/3_0, (X,L)A$()
50 HEXPRINT A$()
60 PRINT HEX (01)
70 NEXT X:END
```

## READING AND WRITING RANDOM SECTORS

```
10 DIMA$(16)
20 X=INT (19583 x RND (1) )
30 PRINT "SECTOR=";X
40 DATALOADBA R or F/3_0,(X,L)A$()
50 DATASAVEBA F or R/3_0,(X,L)A$()
60 GOTO 20
```

## READING DISK WITH ERRORS

```
10 DIMA$(16)
20 INPUT "STARTING SECTOR =" X
30 DATALOADBAF or R/3_0,(X,L)A$()
40 DATASAVEBAF or R/3_0,(X,X)A$()
50 PRINT X-1
60 IF X < 19584 THEN 30
70 END
80 ON ERROR E$,N$ GOTO 90
90 Z=Z+1:IF Z=100 THEN 110
100 GOTO 30
110 Z=0: STOP"100 RETRIES HAVE OCCURRED, RESTART AT LAST SECTOR"
```

## DETERMINING UPPER OR LOWER HEAD ON 44B

```
5 DIMA$
10 INPUT "SECTOR ADDRESS IS " X
20 A=INT (X/24)
30 PRINT A
40 INPUT "IS NUMBER ODD, Y OR N" A$
50 IF A$ ="Y" THEN 70
60 PRINT "LOWER HEAD" : GOTO 80
70 PRINT "UPPER HEAD" : GOTO 80
```

# CHAPTER 9
# UNDERSTANDING PROGRAMMING

When a programmer decides to write a program, he (or she) does not sit down and immediately enter it. Rather, a knowledgeable programmer begins by thoroughly analyzing the problem. If careful analysis is done in the beginning, fewer problems will crop up later. Part of this analysis process often includes a flow-chart.

## SECTION 9–1
## FLOW-CHARTING

A problem should be carefully analyzed and defined before writing a program to solve the problem. In defining the problem, the programmer should –

- First, determine the output needed – the answers wanted.
- Next, determine the data needed, and how to enter it into the program.
- Finally, determine the computations needed to arrive at the answers, including alternative courses of action.

The amount of work required by this last step of analysis depends upon the complexity of the problem. In many cases, a flow-chart of all the processing which is to take place can help simplify the analysis process. A flow-chart helps to crystalize the programmer's thoughts, by allowing one to illustrate on paper the exact order in which processing is to take place.

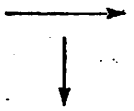
Fig. 9–1 gives some of the standard forms used in flow-charting.

Fig. 9–1a is an example of a flow-chart.

## FLOW-CHARTING

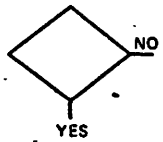
### FLOW-CHARTING SYMBOLS

– An oval indicates a starting or stopping operation



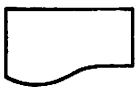
– Arrows indicate the direction of flow through the diagram. Every connecting line should have an arrow on it.

– A rectangular box indicates an operation (i.e., addition, squaring, etc.).




– A diamond indicates a decision (i.e., if YES; if NO), question or comparison.

– A large circle indicates where the program continues at some point. These points are identified by the same letter.



– A printout or display of any type (usually an answer).

– The Predefined Process Symbol, generally used to represent a Subroutine.

Fig. 9–1

## EXAMPLE OF A FLOW CHART

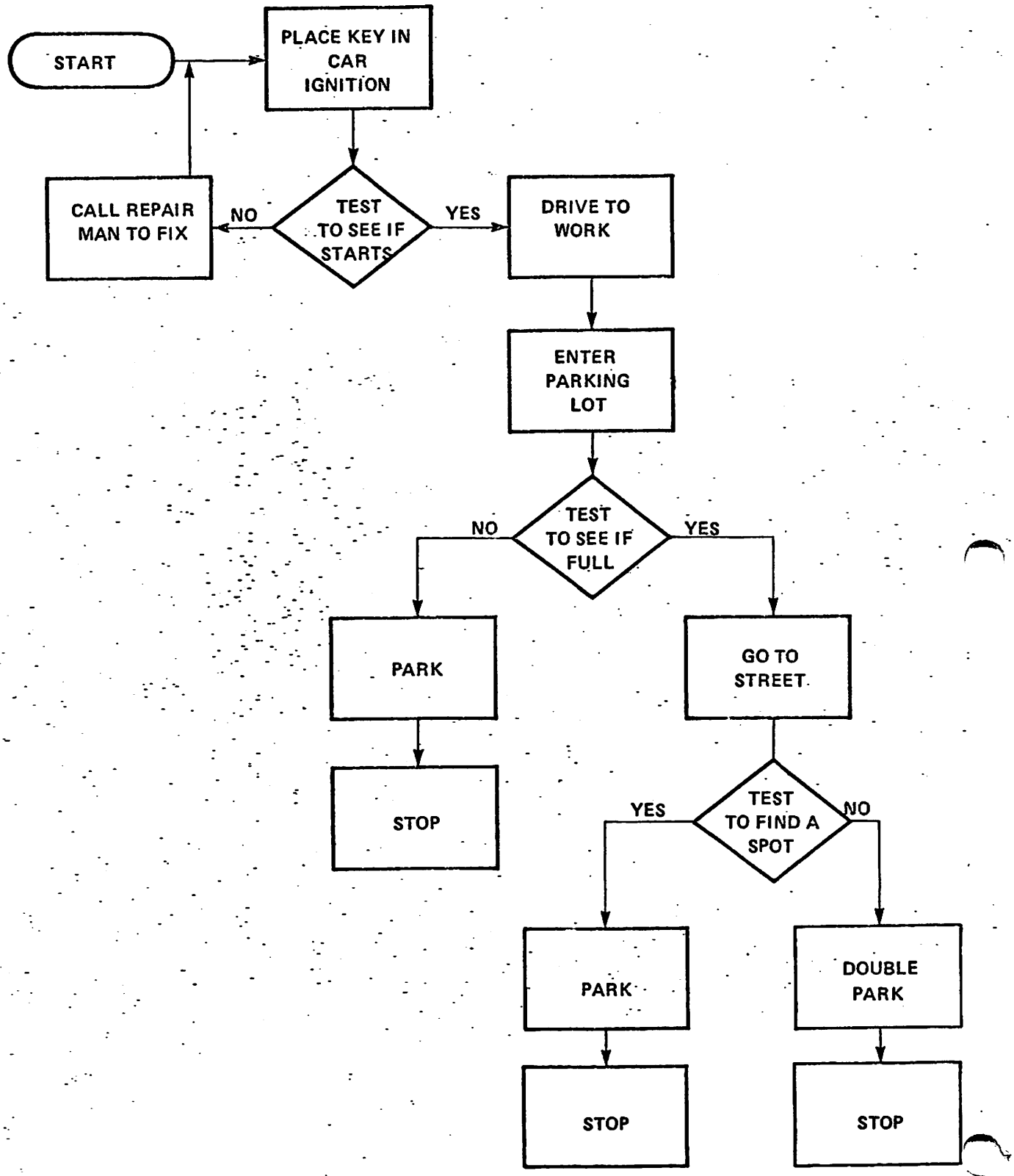


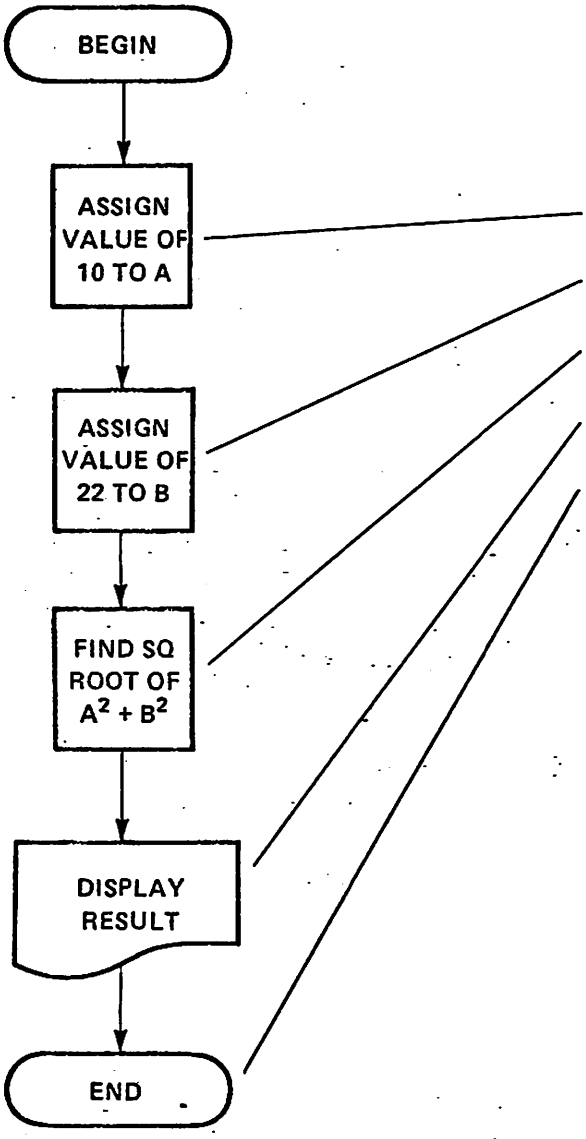

Fig. 9–1a

# CHAPTER 9
# UNDERSTANDING PROGRAMMING

The following is an example flow chart for solving the problem $C = \sqrt{A^2 + B^2}$, where A is assigned a value of 10, and B a value of 22.

Notice the relationship between the Flow Diagram and the Statements in the Program.

## FLOW DIAGRAM




```
10A = 10
20B = 22
30C = SQR (A↑2+B↑2)
40  PRINT A, B, C
50  END
```

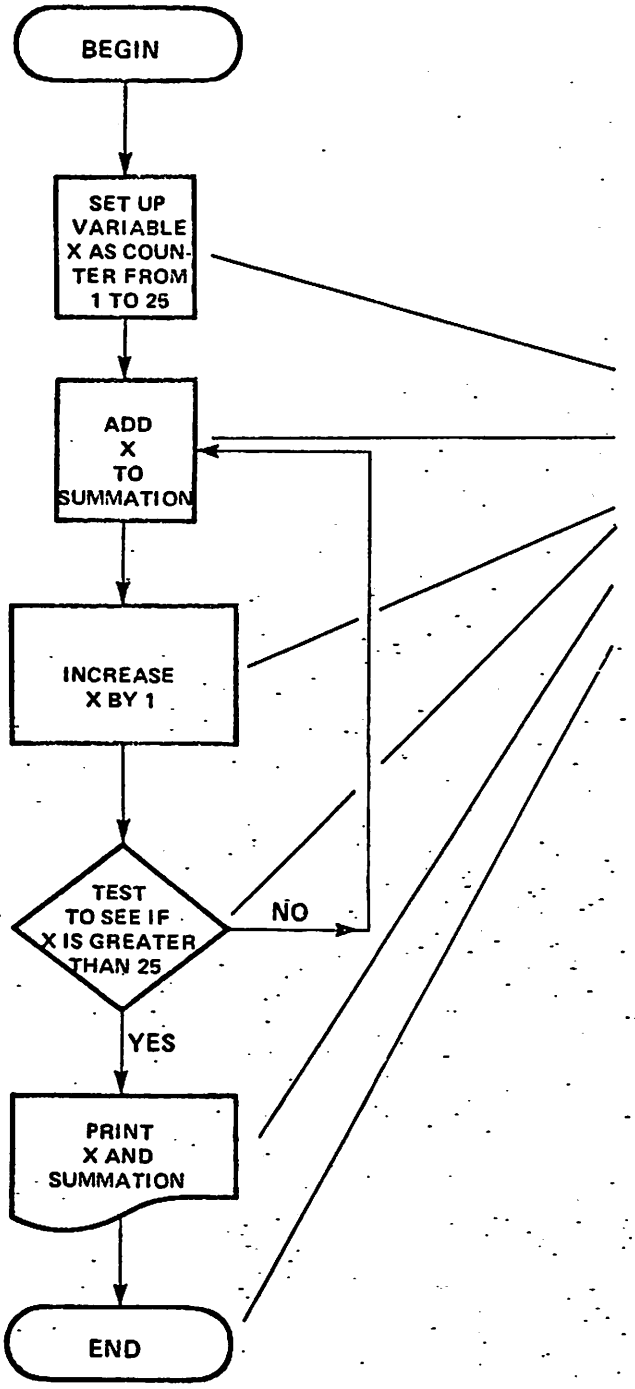
```
READY
:10 A=10
:20 B=22
:30 C=SQR (A↑2 + B↑2)
:40 PRINT A,B,C
:50 END
:RUN

 10          22          24.166091947

END PROGRAM
FREE SPACE = 3305
```

Fig. 9—1b

How would a FOR/NEXT loop be represented? Consider the following example, a summation of the first 25 integers.




```
10 FOR X = 1 TO 25
20 Y = Y + X
30 NEXT X
40 PRINT X, Y
50 END
```

```
READY
:10 FOR X = 1 TO 25
:20 Y = Y + X
:30 NEXT X
:40 PRINT X, Y
:50 END
:RUN

 25            325

END PROGRAM
FREE SPACE =  3324
```

Fig. 9–1c

Notice that the FOR/NEXT loop has an automatic test built into it. As long as the variable X is less than, or equal to 25, the program flows from step 20 to step 30, and back to step 20 again. A FOR/NEXT loop is an example of a "conditional branch"* because the loop depends (is conditional) upon the value of the variable (here, X) at a given time.

*A conditional branch as well as its definition is discussed in Chapter 12.

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WANG

# TECHNICAL SERVICE BULLETIN
## SECTION: SoftWare Technical

NUMBER: SWT 8028 REPLACES: _____ DATE: 04/12/88 PAGE 1 OF 1

MATRIX ID. 4306 PRODUCT/RELEASE# 2200

TITLE: Transmission of WP Documents on the 2200

PURPOSE:

To inform the field of the proper way to transmit WP documents on a 2200.

EXPLANATION:

We do not support transmission of WP documents on the 2200 with Asychronous Communications Emulation. In order to successfully transmit WP documents you must run Binary Synchronous Communication 1 (BSC 1). After the BSC 1 main menu screen appears, press SF'1 to activate CREATE A NEW CONFIGURATION. The screen clears and the Emulation Selection menu appears. Select '6 for 2200-WPS Mode.

GROUP: Telecommunications VS/PC/OIS/2200 Software MAIL STOP: 001-15A

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WANG

# TECHNICAL SERVICE BULLETIN
## SECTION: SoftWare Technical

NUMBER: SWT 8111 REPLACES: _____ DATE: 09/20/88 PAGE 1 OF 1

MATRIX ID. 4327 PRODUCT/RELEASE# CS/2200 WP 2.05.00

TITLE: CS/2200 WP FIX - F403000

PURPOSE:

To inform the field of a patch to CS/2200 WP 2.05.00 which corrects F403000.

EXPLANATION:

The problem reported in Probe F403000 occurs when two or more users simultaneously attempt to print a document in CS/2200 WP. This problem results in a printout of merged documents.

CORRECTIVE ACTION:

The CS/2200 WP Patch 2.05.0A is being shipped to all RTOMs and RSCs. The media content of this patch is "609POPTO" which must be installed to the media contents of WP 2.05.00 using the "@MOVEFIL" Utility of the CS/2200 Multi-User BASIC-2 OS 3.01.00. The patch will be rolled into all future releases of CS/2200 WP after 2.05.00. This patch is not available through SDC.

GROUP: Value Added Applications MAIL STOP: 001-32A

MICHAEL E BAHIA
PROJ# I478 ( 1 COPIES)
M/S: 001-330

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# TECHNICAL SERVICE BULLETIN
## SECTION: HardWare Technical

NUMBER: HWT 9328 REPLACES: _____ DATE: 10/06/89 PAGE 1 OF 1

MATRIX ID. 4103 PRODUCT/RELEASE# VP/MVP/LVP/SVP

TITLE: Problem Changing End of Month Date with Redshaw Software

PURPOSE:

To determine if a problem still exists trying to change the End of Month date using Redshaw software and to explain the necessary actions to be taken if it does.

EXPLANATION:

A few months back several calls were received from Redshaw sites reporting a problem trying to change the End of Month date. This is a common monthly procedure but in the cases reported, the date could not be changed and would continually default to 29. In each case reported, Redshaw's 8.5 Operating System was being used. Although there were no other problems and diagnostics ran error free, the problem could be corrected by replacing the 7588-1 Control Memory Board. Sometimes more than 1 board would need to be tried to find one which would work. At some sites the software had run for a few months before this problem occurred.

We need to know if this is still a concern in the field. A problem could not be found with boards sent in and tested by R&D that exhibited the symptom. There may have been a fault with Redshaw's software which was corrected. We were unable to get an answer from Redshaw on whether or not they found a cause. If this problem is still occurring, a resolution is important to insure CE's are not unnessarily spending time replacing boards when a software fix or an ECO is needed.

Should you have a customer who has reported this symptom within the last 2 months please contact via phone or Wang Office:

Mike Bahia
VS/2200 Product Support
(508)656-0256

GROUP: VS Systems Hardware MAIL STOP: 001-330

When doing a restore on
release 8.5. After restore
& software is loaded the
date won't change.

Shift halt return
TCH. then load DCR "U. EDITD"
return

run.set
print.set
continue.set
disc address is 310

GILMORE INS 11/03
S24 ERROR AFTER
ENTERING DATE IF
ADMINISTRP.
JUST KEEPS ASKING
TO RE-ENTER DATE
IN NORMAL MODE.
MUST ENTER YES IN
CAPITALS.

WANTED USER ID - GAVE EXAMPLE "JAJAJAJA" AT TRI COUNTY INSURANCE

MIKE,

HOPE THIS HELPS YOU WITH THE REDSHOW PROBLEM!!

FROM JOE SCHMIDT
FT. WAYNE, IND

*ISS utilities:*

## *Problem 1). CS/386 is recognized as VP.*

*In "ISS.000M" line 420*

```
 420 A$=$PSTAT(#PART)
    : IF STR (A$,9,1)="M" THE S3=4
    : ELSE S3=3
    : IF S3=4 AND STR(A$,10,1) > HEX(17) THEN 1440
    : IF S3=3 AND STR(A$,10,1) > HEX(19) THEN 1460
    $GIO /005(7601,A$)
    : A$=A$ AND HEX(10)
    ...
    SELECT PRINT 005(S0)
```

## *Problem 2). CS/386 error in SORT.4 illegal array setting.*

*On the CS/VLSI the maximum partition size was 61K bytes.*
*In the CS/386 the maximum array size is 64K bytes therefor it may be necessary to make some software changes to reflect.*

*In "SORT402A" line 4590*
*Current code is:*

```
4590 M1=INT(M*1024)-698 : .... : ...
```

*Change code to:*

```
4590 M1=INT(MIN(M,64)*1024)-698 : .... : ...
```

## CS/2200/386 Programming tip:

## Problem ... Verify value for all legal disk addresses.

*The following routine was incorporated into "@MOVE1" on the CS Systems Utilities to disk to verify all legal disk addresses. This logic, or a variation on it, may be required in other software packages.*

```
From "@MOVE1" DEFFN'100 to verify disk address prompt.
5025 DEFFN '100(S$)
    : IF S$="340" THEN 5035
    : $TRAN(S$,"AaBbCcDdEfFf")R
    : IF POS("DB3"=S$)>0 AND POS("123567"=STR(S$,2))>0
        AND VER(STR(S$,3),"H")>0 THEN 5030
    : Q$="I"
    : RETURN
5030 IF POS("3B"=S$)=0 OR POS("123"=STR(S$,2))=0 OR STR(S$,3)<>"0" THEN 5035
    : IF STR(S$,,1)="3" THEN STR(S$,3)="1"
    : STR(S$,,1)="D"
5035 Q$=" "
    : RETURN


In "ISS.205S" Replace logic DEFFN'205 logic, coded on lines 8875-8915 with .
8875 DEFFN '205(R,W3$,R1)
    : Q$=" "
    : IF R1<>0 AND R1<>1 OR R<0 OR R>15 THEN Q$="X"
    : IF W3$="340" THEN 8895
    : $TRAN(W3$,"AaBbCcDdEfFf")R
    : IF POS("DB3"=W3$)>0 AND POS("123567"=STR(W3$,2))>0
        AND VER(STR(W3$,3),"H")>0 THEN 8885
    : Q$="I"
    : GOTO 8905

8885 IF POS("3B"=W3$)=0 OR POS("123"=STR(W3$,2))=0 OR STR(W3$,3)<>"0" THEN 8895
    : IF STR(W3$,,1)="3" THEN STR(W3$,3)="1"
    : STR(W3$,,1)="D"
8895 Q$=" "
8905 IF R1=0 OR Q$ <> " " THEN RETURN
    : SELECT #R <W3$>
    : RETURN
```

## CS/2200/386 Programming tip:

## To allow DS interaction with 150MB tape drive.

## Problem ...Changes to DS Utilities Release 2.0. .

in "@DSTAPEB" B
Fix A: allow display of more than 99mb line 1010.
Fix B: allow display of up to 60 surfaces lines 70, 75, 520, 1015, 490.
Fix C: use DATA SAVE BM T to eliminate disk access lines 1180, 1190.

```
0010 REM ! @DSTAPEB - 10/18/88 - Backup Disk Platters to Cassette Utility.
0010 REM ! @DSTAPEB - 11/01/89 - Backup Disk Platters to Cassette Utility.

0020 REM ! - Release 2.
0020 REM ! - Release 2.1

0070 DIM S$(32)64 :REM
0070 DIM S$(60)64 : K9=60 :REM

0490 IF < 32 THEN 500
0490 IF < K9 THEN 500

0520 REM UPDATE DISPLAY : R=R+1 : IF R <= 19 THEN 550
0520 REM UPDATE DISPLAY : R=R+1 : IF K=0 OR K/12 <> INT(K/12) THEN 550

1010 : : : CONVERT VAL(C$,3) TO C5$,(#####)
1010 : : : CONVERT VAL(C$,3) TO C5$,(######)

1180 : : DATA LOAD BA T #2,(J)STR(B$(),,256):ERROR GOTO 1690
1180 : : DATA LOAD BM T #2,(J) B$():ERROR GOTO 1690
 and delete
1190 DATA LOAD BA T #2,(J+1) STR(B$(),257,256):ERROR GOTO 1690
```

< <= <> => >

*Software package mods required for CS/386 use.*
*Differences between CS/386 and CS/2200 operating systems.*

:

*Difference 1: The partition status line reflects two items.*

- *Byte 9 "V" if VP, "M" if MVP, "W" if CS/386.*
- *Byte 10 Current OS release number, on latest MVP '33', on CS/386 '10'.*
- *Byte 11 On MVP, memory bank as decimal value.*
- *Byte 11 On 386, partition size, hundreds digit.*
- *Bytes 12,13 partition size as packed decimal value.*
  *12 is integer portion.*
  *13 is fractional portion.*

*refer to CS Multiuser Language reference manual p. 16-52.*
** *refer to attached Problem 1) for an example of a required code change.*

*Difference 2:*
*On the CS/2200 MVP or VLSI operating systems the maximum partition size was 61K bytes. By definition the maximum array size was then less than 64K bytes.*

*In the CS/386 operating systems program memory is limited by CPU size; however ~~the maximum~~ array size is 64K bytes. Where array sizes are dynamically allocated it may be necessary to make some software changes to set an upper limit to the size of an array..*

Scalar ie string variable

** *refer to attached Problem 2) for an example of a required code change.*

*Difference 3:*
*The MVP operating system allowed programmed partitions in a maximum of 16 memory banks; a single universal global partition was restricted to 5K of bank 1. Multiuser operation in the CS/2200 MVP systems is described in detail in chapter 16 of the .."CS Multiuser Language reference manual" .*

*In the CS/386 there are no memory bank restrictions; any partition may be global to any other partition(s).*

*Difference 4:*
*The CS/386 provides the option of storage of programs in a new and faster format, (programs that can only be loaded on a CS/386 ~~processor~~ the CS/386).. The programs can be saved in this format by keying a SELECT NEW command then doing a standard program SAVE. This new format will require more memory space. In addition.*

*Software package mods required for CS/386 use.*

*ISS utilities:*

## Problem 1). CS/386 is recognized as VP.

*In "ISS.000M" line 420*

```
 420 A$=$PSTAT(#PART)
    : IF STR (A$,9,1)="M" THE S3=4
    : ELSE S3=3
    : IF S3=4 AND STR(A$,10,1) lt HEX(17) THEN 1440
    : IF S3=3 AND STR(A$,10,1) lt HEX(19) THEN 1460
    $GIO /005(7601,A$)
    : A$=A$ AND HEX(10)
    ...
    SELECT PRINT 005(SO)
```

SAME

## Problem 2). Allow new disk addresses.

Diff

*In "ISS.205S" Replace logic*

```
0875 DEFFN '205(R,W3$,R1)
    Q$=" "
    MAT SEARCH = STR (W3$,,3) TO W2$ STEP3
    IF R17etc Q$="X"
    IF W2$ = HEX()))))THEN Q$="I"
```

*DS Utilities.*

SAME STRATEGY

*@DSTAPEB*

*Fix A: allow display of more than 99mb  line 1010.*
*Fix B: allow display of up to 60 surfaces lines 70, 75, 520, 1015, 490.*
*Fix C: use DATA SAVE BM T to eliminate disk access  lines 1180, 1190.*

```
0010 REM ! @DSTAPEB - 10/18/88 - Backup Disk Platters to Cassette Utility.
0010 REM ! @DSTAPEB - 11/01/89 - Backup Disk Platters to Cassette Utility.

0020 REM ! - Release 2.
0020 REM ! - Release 2.1

0070 DIM S$(32)64 :REM
0070 DIM S$(60)64 : K9=60 :REM

0490 IF LT 32 THEN 500
0490 IF LT K9 THEN 500

0520 REM UPDATE DISPLAY : R=R+1 : IF R LT= 19 THEN 550
0520 REM UPDATE DISPLAY : R=R+1 : IF K=0 OR K/12 (NE) INT(K/12) THEN 550

1010 : : :  CONVERT VAL(C$,3) TO C5$,(#####)
1010 : : :  CONVERT VAL(C$,3) TO C5$,(######)

1180 : : DATA LOAD BA T #2,(J)STR(B$(),,256):ERROR GOTO 1690
1180 : : DATA LOAD BM T #2,(J) B$():ERROR GOTO 1690
 and delete
1190 DATA LOAD BA T #2,(j+1) str(b$(),257,256):ERROR GOTO 1690
```

VS OFFICE Electronic Mail Tuesday 07/30/91 08:29 am

Mike
Here is the software for 62 stations. The following rules must be followed.
1 - KFAM107X must be used as Global partition program.
2 - The use program must have the following variables modified.
V7$16 to V7$124
T8$1 to T8$2
3 - The enclosed programs will allow the defaults be set for upto 62 stations and initialize files, reset access tables etc. Let me have the feedback from SAS. I.E. Victor or his programmer Tim. I am on vacation from friday
Regards
John BAX\

Intended For: This Item is In Progress
Author: Mike Bahia
Subject: P46

---

To: Mike Bahia From: Anders Backner
Subject: P46 Date Sent: 01/15/96

The customer changed the MXE0 file and have not experienced any problem after that. So we can close this case.

Thanks for your help and concern in solving this problem.

Can not beat you in snowdepth since it is raining here.
But i have seen on TV that you on the Eastcoast have got enough snow.

Reagards Anders

---------- S V A R ----------

Till Anders Backner Fran: Mike Bahia
Ärende: P46 and DS hangs Avsänt: 96-01-11

Anders,

We have now set a record for most snow for the entire month of January with 39 inches & we still have 3 weeks left. Just wondering if you have heard thing on the PC2200 File Transfer problem with the P46 error.

Regards, Mike

---------- Reply ----------

CC: Mike Bahia From: Mike Bahia
Subject: P46 and DS hangs Date Sent: 12/13/95

Thanks for the update. Incidently, we are up on you in snow depth w/ 2" on the ground & more snow due tomorrow. It has also been very cold for this time of year.

Mike

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

To: Mike Bahia From: Anders Backner
Subject: P46 and DS hangs Date Sent: 12/13/95

Mike,

I have been in contact with the customer PROFA about the P46 error and he will try to copy EMXE0 file from 2.7. But the customer was not sure if he had any time before X-MAS to test this, so we have to wait a couples of weeks before we have a updte on this problem. I found out today that there have been an some missunderstanding about the OS version they are running at the

correct version should be 3.3. I am sorry that you have tested with another version, but we will follow the corrections you have suggested anway.

Now to something completly different the TEAC drives.
The serial number of the drives I have received are 713298 and 713397.
The U3 chip is revison "D" on both drives.
I have sent a wang office to Jean-Marie Coppens Wang European Logistics and asked him to check other drives they have in stock.
I will keep you updated as soon as I hear any thing from Jean-Marie Coppens.

Regards, Anders

---------- Reply ----------

Item Title: P46 error

Anders,

Not aware of this P46 error. According to my documentation, P46 is an illegal or unknown microcommand in a GIO, or an illegal escape sequence sent to a Printer Driver. What version of PC2200 do you have? I believe 2.0 is the latest.

On the O/S for the Turbo, it can be ordered through SDC, Software Distribution Control. Send an office memo to "SDC Customer Services". Include your RDB & address. They can get it out to you within a couple of days. I've attached the CSRN for Turbo Rel 1.30.01.

Friday, I received an office memo from Bjorn Franlund for a Turbo Upgrade for Wang Sweden so we have got a go-ahead on that.

Best regards,
Mike

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

To: Mike Bahia From: Anders Backner
Subject: P46 error Date Sent: 10/23/95

Hello Mike!

We have a customer in Sweden that are running WANG 2200 terminal-emulation from Computer Concepts Corp..
They have upgraded their operatingsystem from 2.7 to 3.5.
Since the upgrade they some times get P46 error when transfering files from 2200 to PC.
They have tested to run on 2.7 again and did not experience any problems.
The program stops on the same programline which are a GIO command.
So my question is if you have heard of any similar problem on version 3.5.
SEEMS TO WORK OK W/ FILES OF 50 SECTORS OR LESS IN SIZE.
Could you also please send me the Turbo software release 1.30.01.

Thanks in advance.

Anders Backner

Package Subject: PC2200 File Xfer

Item Title: PC2200 File Xfer

Mike

I will look in to this and inform the customer.
I will update you during next week of the progress.

Thanks!

Anders

---------- ORIGINALTEXT ----------

Till Anders Backner Fran: Mike Bahia
Ärende: PC2200 File Xfer Avsänt: 95-12-05

Anders,

Sorry for the delay. Tested the PC2200 File Transfer this morning transferring the EMXE0 file, about 80 sectors, from 2200 to PC. Did not fail. Used procedure starting on page 42 of the PC2200 Wang 2200 Terminal Emulation guide, Version 2, titled 'Starting the File Transfer Utility'. Used an MXD Controller w/ O/S 3.5.

Couple of things that may help you. If using an MXE Controller, you

1. If using an MXE Controller, you are probably using a different MXE microcode. There have been several versions between 2.6.2 & 3.5. Could try renaming EMXE0 on 3.5 and copying over this same file from the 2.6.2.

2. Note on page 41 og Guide, 1st paragraph under 'Special Considerations', indicates a problem existed on O/S 2.6.2 if using an MXE port a port # higher than 4. If this is the case something may have been changed to get it to work which could be causing a problem now. Reload the PC2200 File Transfer program from the PC2200 floppy. Instructions are on page 40. Save old files, PC2200FT & PC2200F1.

3. We have occasionally had problems related to special characters in foreign languages. Can you test in US language.

4. Not likely to be a hardware problem but you may want to try a different board. If using an MXE, try an MXD.

Try moving the EMXE0 code as I did. If we can duplicate each other's steps we should be able to isolate the problem. See if you can consistently move the EMXE0 code.

Regards, Mike

JUN 16 '92 10:53 WANG LABORATORIES TEXAS DISTF 10

HEAVY SORT TEST

```
0001 REM XXX DISKTEST XXX
0005 PRINT HEX(06 03)
0010 ON ERROR E$,N$GOTO 100
0015 PRINT "SCRATCH DISK T/D22 FIRST - SC
0020 SELECT #1/D22,#0/D21
0030 DIM Q$(4)64
0035 REM SCRATCHDISKT/D22,LS=1,END=65023
0040 X=50 : CONVERT X TO Q$,(####)
   : Q$="TESTFILE"
0045 Q=Q+1
   : PRINT "PASS";Q;TAB(60)
   : PRINT Q$,X;HEX(0D);
0050 DATA LOAD BA T#0,(1739)Q$()
0060 LIMITS T#1,Q$,X1,X2,X3,X4
   : IF X3=2THEN 80
0070 DATA SAVE DC OPEN T#1,65013,Q$
   : LIMITS T#1,Q$,X1,X2,X3
0080 FOR X0=X1TO X1+X-1
   : DATA SAVE BA T#1,(X0)Q$()
   : NEXT X0
0090 X=X+50 : CONVERT X TO Q$,(###
   : PRINT Q$,X;HEX(0D);
   : IF X>65000THEN 40
   : GOTO 80 70

0100 IF E$="DB6"THEN 40
0110 PRINT E$,N$,X0
   : PRINT "=SECTORTHATFAILED"
0120 STOP
1 REM XXX DISKTEST XXX
5 PRINT HEX(06 03)
10 ON ERROR E$,N$GOTO 100
15 PRINT "SCRATCH DISK T/D22 FIRST - SCRATCH DISK T/D22,LS=1,END=65023"
20 SELECT #1/D22,#0/D21
30 DIM Q$(4)64
35 REM SCRATCHDISKT/D22,LS=1,END=65023
40 X=50: Q$="TESTFILE"
45 Q=Q+1: PRINT "PASS";Q;TAB(60); PRINT Q$,X;HEX(0D);
50 DATA LOAD BA T#0,(1739)Q$()
60 LIMITS T#1,Q$,X1,X2,X3,X4: IF X3=2THEN 80
70 DATA SAVE DC OPEN T#1,65013,Q$: LIMITS T#1,Q$,X1,X2,X3
80 FOR X0=X1TO X1+X-1: DATA SAVE BA T#1,(X0)Q$(): NEXT X0
90 X=X+50: PRINT Q$,X;HEX(0D);: IF X>65000THEN 40: GOTO 80
100 IF E$="DB6"THEN 40
110 PRINT E$,N$,X0: PRINT "=SECTORTHATFAILED"
120 STOP
```

ON ERROR E#, N# GOTO 100

20 SELECT #1/D22, #0/D21
(WRITE ADDRESS, READ DATA ADDRESS)

30 DIM Q$(4)64

40 X = 50: CONVERT X TO Q$, (#####)

45 Q = Q+1 : PRINT "PASS"; Q

50 DATALOADBAT #0, (5000) Q$( )
(1000 K THIS IS SECTOR 88, NL READ. MUST BE A DATA SECTOR.)

60 SCRATCH DISKT#1, LS = 10, END = 65023

70 DATA SAVE DC OPENT#1, X, Q$

80 LIMITS T#1, Q$, X1, X2, X3: FOR X0 = X1 TO X2: DATASAVEBAT#1, (X0)Q$()
: NEXT X0

90 X = X + 50: CONVERT X TO Q$, (#####):
PRINT Q$; GOTO 70

100 IF E$ = "DB6" THEN 40

110 PRINT E$, N$, X0 (= SECTOR THAT FAILED)

120 STOP

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| | |
|---|---|
| To Mike Bahia | From Dennis Baldwine |
| Co. Wang | Co. Wang |
| Dept. | Phone # 851-7812 |
| Fax # 508-967-7020 | Fax # 851-7730 |

PRINTED IN U.S.A.

# Wang Laboratories
# Diagnostic Software Problem Report

Jim D'Amore T2 2ND FLR

Date: 12 / 14 / 90 Product Line: 2200 Priority:[1] P2

## Originator Information

*Reported By:** Mike Bahia Title: 2200 Product Support
*Wang Division:* _____ RDB: 8760 Mail Stop: D14-A3A
Address: Tower 2
Country: _____ State: _____ City: Lowell Zip: _____
Telephone: (____) ____ - _____ Extension: _____

## System Information

### Hardware

*System Model No:* CS/386
Unit Under Test Model No: _____
Part No: _____ E-REV Level: _____
Board P/N: _____

FTU REV 8734

### Software

*Title:* Magnetic Media P/N: 732-0049P
*Software Rel:* 69C1 Doc Rel: _____
*Monitor Release:*[2] _____
*Operating System Release:* _____

## Error Information

*Failure Occurs:* ☐ intermittently ☒ consistantly
☐ other: _____
*Error Indicator Codes:*[3] Led Indicators:[4] oooooooo or Hex Code: _____
Error Message From Program: CPU SOFTWARE MUST BE UPGRADED TO MVP 1.8 OR HIGHER OR VP 2.0 OR HIGHER

## Additional Problem Information

Description: _____

How to Duplicate: LOAD RUN
SELECT 'DISK UTILITIES'
SELECT 'FTU'

Materials Required: _____

* Do not omit any information in sections with italics titles.

CORRECTION ON BACK

IN PROGRAM FTU'S ADD THE FOLLOWING STATEMENT IN RED IN LINE 120 AS SHOWN:

120 B$=$PSTAT(1):IF STR(B$,9,1)="M" AND STR(B$,10,1)>=HEX(18) THEN 125:
IF STR(B$,9,1)="V" AND STR(B$,10,1)>=HEX(21) THEN 125:IF STR(B$,9,1)="W" THEN
125:PRINT HEX(0E);AT(12,15);"CPU SOFTWARE MUST BE UPGRADED TO 'MVP 1.8' OR
HIGHER, OR 'VP 2.0' OR HIGHER":GOTO 120

TO: Aissa Betancourt

FROM: Michael Riley

DATE: Dec. 01, 1989

SUBJ: 2200 diagnostic to detect bed SIMMs

PURPOSE:

CSO wants to remove all 1 Meg SIMMs from their spares. This requires that the built-in-diagnostic on boards that have 1 Meg SIMMs be able to detect the location of bad SIMMs, and will give CSO the ability to determine if the problem is the PCB or the SIMM.

SOLUTION:

I have tested the VLSI CPU (210-8937) and the CS386 CPU (212-7129) ability to determine bad SIMM locations on the board. The VLSI CPU does not have the capability of determining bad SIMM locations without major changes to its Boot/Diagnostic PROMs. The CS386 CPU can determine bad SIMM locations for non-catastrophic failures. There is a change needed to the Boot/Diagnostic PROM to be able to load the disk base diagnostic even if the SIMM memory had a catastrophic failure. This diagnostic is needed to give the bad SIMM location and R&D is working on this change. R&D will also give a memory map, to cross-reference memory location to SIMM chip.

Mike Balia

Jim Cunningham
Gene Schulz
M. L. Lee

0153m

REQUEST FORM
TO
DIAGNOSTIC ENGINEERING
CSO SUPPORT GROUP

[ ] Request for new Diagnostic package.

[ X ] Enhancement to a current Diagnostic Package.

[ ] Correction to a current Diagnostic Package.

[ ] Other

---

Pkg No. 195-2656-0 Rev. No. 18A4

Pkg Name 2200 DIAGNOSTIC PACKAGE

---

Request Description:

1) The 2200 CPU Instruction Test needs to be updated to include all new instructions added since the last update to the test. Without this upgrade we will not have a fully functional online CPU Diagnostic.

---

ORIGINATOR: Date: 11/14/89

Name: Mike Bahia Extension: 60256 M/S: 001-330

TSO Group: VS/2200/OA product support Recommended Priority: [ 2 ]

---

Accepted Priority: [ ]

P L M P L D DATE

---

# Diagnostic Program Documentation

Software Releases:

| Category | Disk Type | Part Number | Revision |
|---|---|---|---|
| All | 8" DSDD | 732-0002J | 2.00 |
| Printers/Plotters/Terminals | 8" SSSD | 702-0295B | 6591 |
| | 5-1/4" DSDD | 732-0052B | 6591 |
| Magnetic Media | 8" SSSD | 702-0292C | 2.00 |
| | 5-1/4" DSDD | 732-8520A | 2.00 |
| Telecommunications | 8" SSSD | 702-0294 | 6436 |
| | 5-1/4" DSDD | 732-0051 | 6436 |
| CPU/Memory test | 8" SSSD | 702-0293B | 18A4 |
| | 5-1/4" DSDD | 732-8521 | 18A4 |

NOTE DSDD means Double-Sided Double-Density
SSSD means Single-Sided Single-Density

PRE/RELEASE

Documentation Part Number: 760-0029E

Package Part Number 195-2956-0 295-2956-0D
ECO Number: xxxxx

## Program Name: 2200 Diagnostic Package

## Date: December 18, 1989

## Table of Contents



Diagnostic Engineering Department
WANG Laboratories, INC.
One Industrial Ave.
Lowell, Massachusetts 01851

## 1.0 REFERENCE DOCUMENTATION

Wang BASIC 2 Language Reference Manual.

## 2.0 CONFIGURATION REQUIREMENTS

### 2.1 Hardware

Minimum required configuration

2200 system
Check the configuration requirements for the program that is going to be run.

NOTE: Ensure that the partition size is large enough and the Device Table is properly configured.

### 2.2 Software

MVP CPU software must be rev. 1.8 or higher

VP CPU software must be rev. 2.1 or higher

Check the configuration requirements for the program that is going to be run.

## 3.0 PROGRAM DESCRIPTION

These are menu driven disks containing a combination of the diagnostics, utilities and exercisers for the 2200 MVP/LVP/SVP/VP systems. These programs are divided into four categories:

1. Printers/Plotters/Terminals
2. Magnetic Media
3. Telecommunications
4. CPU/Memory Test

The entire Diagnostic Package is contained on either one 8" Double-Sided Double-Density (DDDS) disk, four 8" Single-Sided Single-Density (SSSD) disks or four 5-1/4" Double-Sided Double-Density (DSDD) disks. The four disk set has the package divided into the four categories previously listed (one category per disk).

## 4.0 LOAD PROCEDURES

1. Select the device address with a 'SELECT DISK ###' statement (### equals the device address where program resides).

2. Input command 'LOAD RUN' to load if there is a "START" file. Input command 'LOAD RUN T"@MENU"', if there is no start file.

## 5.0 OPERATING INSTRUCTIONS

The menus in this package run the same as the system menus except the screening is revised. The Terminal number, Partition number and the size of the partition will be displayed in the lower right corner of the screen. Also the menus can be stepped backwards with 'PREV SCRN', CLEAR, or SF'31 keys.

Selection is made with the 'BACK SPACE', 'SPACE' bar, and the cursor arrows. When the desired selection is made (large dot before the name and the line is highlighted), press 'RUN' or 'RETURN' to initiate the selection. If the selection is another menu, then it will be displayed. If the selection is a program, then it will be loaded and run.

In order to support all of the 2200 LVP/SVP/MVP systems the diagnostic package needs to be available on 8" DSDD, 8" SSSD and 5-1/4" DSDD. The package is divided into four categories. Each category is small enough that it will fit on a SSSD 8" (or DSDD 5-1/4") disk. The entire package is on one 8" DSDD disk, four 8" SSSD or four 5-1/4 DSDD disks. The instructions for these disks are as follows:

| Disk Type | Category | refer to Section |
|---|---|---|
| 8" DSDD | All | 7.1 |
| 8" SSSD & 5-1/4" DSDD | Printers/Plotters/Terminals | 7.2 |
| 8" SSSD & 5-1/4" DSDD | Magnetic Media | 7.3 |
| 8" SSSD & 5-1/4" DSDD | Telecommunications | 7.4 |
| 8" SSSD & 5-1/4" DSDD | CPU/Memory test | 7.5 |

## 5.1 2200 LVP/SVP Diagnostic Package

After the menu is loaded the following four selections will be displayed on the screen;

| | |
|---|---|
| . Printers/Plotters/Terminals | Proceed to Appendix A |
| . Magnetic Media | Proceed to Appendix B |
| . Telecommunications | Proceed to Appendix C |
| . CPU/Memory test | Proceed to Appendix D |

Select one of the above, using the normal menu selection procedure, and proceed with the corresponding instructions below.

## 5.2 Printers/Plotters/Terminals

When this menu is loaded the following options are available by the normal menu selection procedure:

- Printers and Plotters
- Terminals/Keyboards

The options for these selections are described in Appendix A.

## 5.3 Magnetic Media

When this menu is loaded, the following options are available by the normal menu selection procedure:

- PLL/VCO Adjustments
- Alignment Routines
- Disk Utilities
- Disk Exercisers
- Mag Tape

The options for these selections are described in Appendix B.

## 5.4 Telecommunications

When this menu is loaded, the following options are available by the normal menu selection procedure:

- 2228 D/E/F Power-Up Diagnostic Error Code Interpreter
- 2228 D/E/F 7 Board Burn In
- 2228 E/F Field Service Diagnostic
- 2228 D Field Service Diagnostic Rev. 2
- 2228 D Field Service Diagnostic Rev. 1
- 2227B/2228B T/C Diagnostic

For these procedures, numbers and names see Appendix C.

## 5.5 CPU/Memory Test

When this menu is loaded, the following options are available by the normal menu selection procedure:

- CPU Instruction Exerciser
- CPU/Memory Diagnostic Procedure
- Memory Error Chip Identifier

For these procedures, numbers and names see Appendix D.

# 6.0 MISCELLANEOUS

SSSD means Single-Sided Single-Density
DSDD means Double-Sided Double-Density

Revision numbers are explained in Appendix E.

## 7.0 PROGRAM REVISION HISTORY

2.00.00 This Revision corrects the Problem running Multi Disk Diagnostics with the 386 Board.
The software has been patched to permanently circumvent the Error message "CPU SOFTWARE MUST BE UPGRADED TO RUN THIS PROGRAM"

18A4 Changed the 'IF THEN ELSE' test in the CPU Instructions Exerciser to not error on old releases of BASIC. Replaced a damaged 'FTU' file on the 5-1/4 DSDD Magnetic Media disk (5-1/4 revision is 68A0).

179E Added test to the CPU Instructions to verify the VLSI CPU chip executes conditional branches correctly. Test was written after a bad shipment of chips was received. Rewrote the Data Memory Diagnostic for the VLSI-2 CPU. Added and enhanced many tests. Field Service menu labels changed.

6734 Added support for 2200DS and RAM Disk to MULTIDSK and FTU. Also fixed time out errors on long cabled mux.
Added old style hashing routine to SUPERZAP.

6591 Internal change ECO update needed.

6534 Added 2220DW printer test to package.

64A7 Multidsk has been modified to check for intermittent writing.
STARTPLL was renamed to PLL and address selection was added.
General Disk was converted to an FTU and named FTU.
Phoenix Alignment was renamed to 2280ALGN and now has address selection.

6436 The package has been broken into four sections for use on Single-Sided Single-Density disks and the 5-1/4" disks.
The programs have been updated to the latest revisions.
MECI and FILZAP have been added.

6396 This package has been expanded to exercise the 2209A Tape Drive Unit.

# APPENDIX A

# OPTIONS FOR PRINTERS/PLOTTERS/TERMINALS

Select the desired test and refer to the appropriate documentation for the procedures.

| Menu selection | Program Name | Part Number | Soft | Doc. |
|---|---|---|---|---|
| . PRINTERS/PLOTTERS | | | | |
| . 2201L | 2201L | 760-1259 | 1.0 | 9434 |
| . 2220DW | 2220DW | 760-1327 | 6534 | 9534 |
| . 2221W | 2221W | (see note 1) | | |
| . 2231W-1 | 2231W-1 | (see note 1) | | |
| . 2231W-2 | 2231W-2 | (see note 1) | | |
| . 2231W-3 | 2231W-3 | (see note 1) | | |
| . 2231W-6 | 2231W-6 | (see note 1) | | |
| . 2232 | 2232 | 760-1258 | 61B0 | 9434 |
| . 2235 | 2235 | (see note 1) | | |
| . 2245 | 2245 | (see note 1) | | |
| . 2251 | 2251 | (see note 1) | | |
| . 2261W | 2261W | (see note 1) | | |
| . 2263-1 | 2263-1 | (see note 1) | | |
| . 2263-2 | 2263-2 | (see note 1) | | |
| . 2263-3 | 2263-3 | (see note 1) | | |
| . 2273-1 | 2273-1 | (see note 1) | | |
| . 2273-2 | 2273-2 | (see note 1) | | |
| . 2281W | 2281W | (see note 1) | | |
| . 2282 | 2282 | 760-1276 | 414A | 9434 |
| . TERMINALS/KEYBOARDS | | | | |
| . 2200 Universal Keyboard Test | uTextTst | 760-1265 | 1294 | 9434 |
| . Burn-In Test | 36debin | (see note 2) | | |
| . Local Printer Test | 36ptrloc | (see note 2) | | |
| . Character/Attributes Test | 36chratb | (see note 2) | | |
| . CRT Alignment Test | 36caling | (see note 2) | | |
| . Partition Monitor | 36parton | (see note 2) | | |

Notes

| | | | |
|---|---|---|---|
| 1 - Part of General Printer Exerciser | 760-1257 | 6441 | 9434 |
| 2 - Part of 2236DE/DW Field Service Diag. | 760-1270 | 11B1 | 9434 |

Revision numbers are explained in Appendix E.

# APPENDIX B

# OPTIONS FOR MAGNETIC MEDIA

Select the desired test and refer to the appropriate documentation for the procedures.

| Menu selection | Documentation Program Name | Part Number | Revision Soft | Doc. |
|---|---|---|---|---|
| . PLL/VCO Adjustments | | | | |
| . PLL Adj. (DSDD/Winchester) | PLL | 760-1250B | 84A5 | 94A5 |
| . VCO Adj. (DSDD/Win. w/o scope) | 2200 VCO | 760-1263 | 81B4 | 9434 |
| . Alignment Routines | | | | |
| . DSDD Drive (850/851) | 850ALIGN | 760-1223B | 8448 | 9545 |
| . Phoenix | 2280ALGN | 760-1264A | 84A4 | 94A4 |
| . Disk Utilities | | | | |
| . Field Test Unit | FTU | 760-1261D | 68A0 | 98A0 |
| . Volume Zap | SUPERZAP | 760-1260A | 8734 | 9734 |
| . Alternate Sector Test | PLL | 760-1250B | 84A5 | 94A5 |
| . Disk Exerciser | | | | |
| . Multiple Disk Exerciser | MULTIDSK | 760-1209D | 69C1 | 99C1 |
| . LVP DPU Burn In | DPU BI | 760-1262 | 41B4 | 9434 |
| . Mag Tape | | | | |
| . 2209A Tape Drive | 109A010A | 760-1269 | 2.0 | 9434 |
| . Kennedy Archiving Tape Drive | TAP 29M | 760-1103A | 7320 | 9434 |

Revision numbers are explained in Appendix E.

# APPENDIX C

# OPTIONS FOR TELECOMMUNICATIONS

Select the desired test and refer to the appropriate documentation for the procedures.

| Menu selection | Program Name | Documentation Part Number | Revision Soft | Revision Doc. |
|---|---|---|---|---|
| . 2228 D/E/F Power-Up Diag. Error Code Interpreter | 28DEFEI | 760-1121A | 3370 | 9434 |
| . 2228 D/E/F 7 Board Burn In | 7BDEFBI | 760-1124B | 4370 | 9434 |
| . 2228 E/F F.S. Diag. | 28EFSR2 | 760-1122A | 1370 | 9434 |
| . 2228 D F.S. Diag. Rev. 2 | 28DFSR2 | 760-1267 | 1158 | 9434 |
| . 2228 D F.S. Diag. Rev. 1 | 28DFSR1 | 760-1268 | 1121 | 9434 |
| . 2227B/2228B T/C Diagnostic | STARTTC | 760-1275 | 13B1 | 9434 |

Revision numbers are explained in Appendix E.

# APPENDIX D

# OPTIONS FOR CPU/MEMORY TEST

Select the desired test and refer to the appropriate documentation for the procedures.

| Menu selection | Program Name | Documentation Part Number | Revision Soft | Revision Doc. |
|---|---|---|---|---|
| . CPU Instruction Exerciser | SYS1(note 2) | 760-1266 | 1.0 | 9434 |
| . CPU/Memory Diagnostic Procedure | @@ (note 1) | 760-1271A | 179E | 979E |
| . Memory Error Chip Identifier | MECI | 760-1272 | 8434 | 9434 |

Notes:

1. The CPU/Memory Diagnostic Procedure explains how to load (boot) the CPU/Memory diagnostic. The documentation number and revision numbers are for the CPU/Memory diagnostic.

2. This test contains many files on the media. The file names are listed in the documention for the program.

Revision numbers are explained in Appendix E.

# APPENDIX E

# EXPLANATION OF REVISION NUMBERS

Rev. ___ ___ ___ ___

1st Position = Kind of Diagnostic

| | |
|---|---|
| Not Supported | 0 |
| Diagnostic Program | 1 |
| Monitor Package | 2 |
| Monitor Program | 3 |
| Burn In | 4 |
| Power Up | 5 |
| Exerciser | 6 |
| Board Repair | 7 |
| Utility | 8 |
| Document only | 9 |
| Reserved | A-F |

2nd Position = Last Digit of Year

| | |
|---|---|
| Self-explanatory | 0-9 |

3rd Position = Month of Revision

| | |
|---|---|
| January | 1 |
| February | 2 |
| March | 3 |
| April | 4 |
| May | 5 |
| June | 6 |
| July | 7 |
| August | 8 |
| September | 9 |
| October | A |
| November | B |
| December | C |

4th Position = Type of Change

| | |
|---|---|
| Brand New | 0 |
| Software Fix | 1 |
| Test Added | 2 |
| Enhancement | 4 |
| Hardware Change | 8 |

These numbers can be added together (in hex) to include more than one type of change.

# New Revision Number Standards

A First Release will be at Revision '01.00.00' unless there are multiple versions or there are other package components with dictate a field be a specific value for consistency.

A Bug Fix, a correction due to software code which fails to perform to the intent or expectations for which it was specified and designed, then the software would be corrected and reelased with the last node of the revision number incremented.

New software functions or tests added to the program which were not documented in prior releases of the DFS or DPD should be cause for the second node of the revision being incremented.

An Enhancement change, a minor change in software which causes no apparent functional change (e.g. a new test pattern), should be cause for the last node of the revision being incremented.

A Hardware change, whether a modification of an existing piece or an addition of another piece requiring a new release of the software, would be reflected in hte second or last node depending on the functional impact of the hardware change.

A diagnostic released to fix a bug.
Revision 01.00.01

A test was added, hardware changed, and a bug fixed.
Revision 01.01.00

# Diagnostic Program Documentation

Documentation Release: 99C1 Software Release: 69C1
Documentation Part Number: 760-1209D

Program Name: 2200 Multiple Disk Exerciser

Date: December 18, 1984



## Table of Contents



Diagnostic Engineering Department
WANG Laboratories, INC.
One Industrial Ave.
Lowell, Massachusetts 01851

## 1.0 REFERENCE DOCUMENTS

2200 Multiple Disk Exerciser

## 2.0 CONFIGURATION REQUIREMENTS

### 2.1 Hardware

Minimum required configuration

2200 with the minimum required configuration

Soft-sectored diskettes are not supported on 2270A controllers

2236DE/DW or equivalent terminal

If a printer is used, it must have a column width of at least 66 characters

### 2.2 Software

MVP CPU software must be rev. 1.8 or higher

VP CPU software must be rev. 2.1 or higher

Media containing the 2200 Multiple Disk Exerciser which is labeled: MULTIDSK

## 3.0 PROGRAM DESCRIPTION

The 2200 Multi-Disk Exerciser is a disk burn-in/exerciser with error logging capabilities. The exerciser tests eight sequential sectors for each random selection of; function, disk address and sector address.

## 4.0 LOAD PROCEDURES

### 4.1 Load directly from disk

1) Select the device address with a 'SELECT DISK ###' statement (see note 1)
2) Input command 'LOAD RUN "MULTIDSK"'

## 4.2 Load from 2200 Diagnostic Package

1) Select the device address with a 'SELECT DISK ###' statement (see note 1)
2) Input command 'LOAD RUN'
3) If 'MAGNETIC MEDIA' disk proceed with step 4
   Under '2200 DIAGNOSTIC PACKAGE' menu, select 'Magnetic Media'
4) Under 'MAGNETIC MEDIA' menu, select 'Disk Exercisers'
5) Under 'DISK EXERCISERS' menu, select 'Multiple Disk Exerciser'

Note 1: (### equals the device address where program resides)

# 5.0 OPERATING INSTRUCTIONS

## 5.1 Description of Operation

The first two screens of the exerciser require operator input to select the processes, the function, and amount of testing. The third screen displays the functions running, device being tested, number of errors, and the number of accesses that have been completed. When inputs are needed, it is indicated and all the options are listed at the bottom of the screen.

## 7.2 Screen Descriptions

On each screen, lines:

a) 20 and 21 will describe any status or error information.
b) 22 and 23, (in box), describe all input/command options for the current screen.

## 7.3 Procedures

1) For the exercisers set up procedure and screens see Appendix A.
2) For a description of the run time screen see Appendix B.
3) For a description of standard input and command options see Appendix C.

# 6.0 MISCELLANEOUS

## 6.1 Definitions

Hard error — A disk operation that failed during normal testing and would not successfully execute during ten retries.

Soft error — A disk operation that failed during normal testing and was successfully executed in less than eleven retries. Also a data compare error is considered a soft error.

## 7.0 PROGRAM REVISION HISTORY

Rev 69C1:

This Revision corrects the problem running multi disk diagnostics with the 386 Board.
The software has been patched to permenantly circumvent the error message "CPU SOFTWARE MUST BE UPGRADED TO RUN THIS PROGRAM".

Rev. 6735:

Added support for 2200DS and RAM Disk. Also fixed time out errors on long cabled mux.

Rev. 64A4:

Added a routine to zero the sector to R/A/W test so intermittent write problems would show up.

Removed the zero retries function.

Added the 30 MEG to the 2275.

Rev. 6441:

Corrected counter problem during init read and write.

Rev. 639C:

The 2275 option (Winchester and 5 1/4" floppy disk) have been added to the list of recognizable devices.

The screening has been made more user friendly. This will speed up the time it takes to initiate the test and also made it easier to understand.

Rev. 61B4:

The Quantum drives have been added to the list of recognizable devices. Since the Quantum Q2040 responds to two addresses it is treated as two separate devices.

Rev. 61A4:

Firmware retries on error are now suppressed on Disk Processing Unit's that have the ability.

Rev. 1.1:

Sector write backfill is now randomly selecting worst case data patterns.

## APPENDIX A

IMPORTANT: THIS EXERCISOR WILL RENDER ALL RESIDENT DATA IN THE RANGE OF THE SELECTED SECTORS INVALID AND TOTALLY USELESS.

### A.1 INITIAL INPUT and SCREEN

1 The operator is instructed to mount platters in all the drives that are to be tested. For a device to be testable it must:

a) have a scratch platter mounted.
b) not be write protected.
c) be operable enough for the address to be recognized as available.

2 Press 'RUN' or 'RETURN' and the program will scan all the possible disk addresses. The routine tries to ascertain what types of devices are at what addresses and reports this information on the Test and Parameter Select screen.

NOTE: If desired the default parmeters can be altered by pressing SF'2 and then editing to the desired parmeters (as described by appendix A.2). These parmeters will then be inserted as the test parmeters. If a sector selected is out of range of a device then the parmeter used will be as close to the the altered default as possible.

### A.2 TEST and PARAMETER SELECTION

1 A display of all devices available for testing is given with the following information:

a) test options
b) device address (see note 2)
c) model number
d) address of the first sector to be tested
e) address of the last sector to be tested

Note 2: (If the address was recognized, but an error occurred, the error is printed to the left of the device address).

2 The user prompts are as follows:

A) "Are all the above parameters correct?"

'N' (no), enters the edit mode, and 'CONT'/'CTNUE' will exit the edit mode. The option select menu may be edited using the following options:

| | | |
|---|---|---|
| a) Test | 'yes' or 'no' | If no, then no functions will be run on that device. |
| b) Frmt | 'yes' or 'no' | Format device? |

A) (continued)

| | | | |
|---|---|---|---|
| c) | Init | 'yes' or 'no' | Initialize the device. Write a test pattern on every sector selected for test. |
| d) | Ver | 'yes' or 'no' | Verify the device. Read the test pattern from every sector selected for test. |
| e) | Address | 'xxx' | xxx=address of the device to be tested. |
| f) | Model | 'xxxxxxxx' | Model number. (not used in exerciser operation) |
| g) | Sec. Range | 'xxxxx/yyyyy' | Sectors to be tested, from xxxxx to yyyyy. (must be greater than 8) |
| h) | Accesses | 'xxxxxxxx' | Number of sectors to be read. Type infinite for infinite. |

'Y' (yes) or 'CONT'/'CTNUE', then the system proceeds to the next prompt.

B) "To proceed type ENABLE WRITING "

The operator MUST enter 'ENABLE WRITING' to proceed further. If the phrase has already been entered correctly, and the exerciser has not been returned to the first screen (A1), then the phrase will not be requested again and the exerciser will by-pass this prompt.

C) "'WARNING: All resident data will be DESTROYED by this exercise'"

This is the final step and warning before any WRITING is done.

Ensure that all devices to be tested have scratch media installed.

Depressing CONT/CTNUE will start the exerciser.

## A.3 Miscellaneous

1 No further operator commands are needed UNLESS:

a) An error occurs during format, at which time the exerciser will have to be restarted.

b) A format is requested on a device that can't be software formatted.

2 If an error occurs during Init, then the device is eliminated from the test and the exerciser continues.

3 The model descriptions of the drives are as follows;

```
850 DSDD    - Double Sided Double Density floppy
1000        - internal winchester
1002        - internal winchester
1004        - internal winchester
Q2040       - internal winchester
Q2020       - internal winchester
2200DS RAMD- 2200 Data Storage Cabinit ram disk
2200DS FLPk- 2200 Data Storage Cabinit 320/360k floppy
2200DS FLPm- 2200 Data Storage Cabinit 1.2 meg floppy
2200DS WINr- 2200 Data Storage Cabinit removable carterage winchester
2200DS WIN - 2200 Data Storage Cabinit winchester
2230-1      - external disk drive
2260-1/2    - external disk drive
2260-1/4    - external disk drive
2266        - external disk drive
2275   WIN - 2275 winchester
2275   FLPm- 2275 1.2 meg floppy
2275   FLPk- 2275 320/360k floppy
2270        - external floppy drives
2270a       - external floppy drives
2280        - external disk drive
SYSTEM RAMD- System ram disk
```

## APPENDIX B

The following screen/test descriptions are in the order in which they occur.

B.1 If no devices have been selected to test, then the following message will be displayed on line 20 and the exerciser will wait for a command.

"RECHECK PARAMETERS, NO DEVICES ARE SELECTED"

Pressing 'RETURN' or 'RUN' will cause the routine to return to the Test and Parameter Select Menu.

B.2 Format

1 If a device is selected for Test and Format, and:

a) It can be software formatted, then the following message will appear on line 22 and the format will begin.

" CHECK: to ensure that the device is formatting and the system isn't hung"

b) It can not be software formatted, then the exerciser will stop, print the following message on line 20, and will wait for a command.

"Press the format button for XXX" (where xxx is the device address to be formatted)

2 When all of the devices requesting a format are formatted, then the initialize and/or test routines will commence.

## B.3 Run Screen

The run screen will be displayed with the following information of all the devices that are to being tested.

a) the disk address
b) the function (see note 3)
c) the number of accesses
d) the sector range being tested
e) the number of hard errors (see note 4)
f) the number of soft errors (see note 4)

Note 3: The current function (if in process) or the last function (if not in process) processed. During init "w" or "r" is printed next to "init" to indicate whether reading or writing.

Note 4: During init this column will stay blank. Init terminates testing of the device if an error is encountered.

The line containing the parameters of the device currently being processed is highlighted and the function updated, when applicable.

## B.4 Initialization

1 Init — A lower case 'w' appears to the right of the function name (Init) while the media is being written.

All disks sectors to be tested must be written, in the data field, with the current sector and disk addresses and then back-filled with a worst case data pattern.

2 Ver — A lower case 'r' appears to the right of the function name (Init) while the media is being verified. Seek location is also checked whenever a read is performed.

A) If media verification was selected, all sectors to be tested are read. The sector and disk addresses written in the data field are compared with the current sector and disk addresses for equality (i.e., to see if the heads seek to the correct location).

B) If media verification was not selected, the first, middle and last sectors to be tested on the disks are verified.

## B.5 Test

This is the exerciser portion of the "EXERCISER". The device, sector address, and function are reselected after eight sequential accesses.

1 All the devices selected for Test are assembled in a device list and the device to be tested is randomly selected.

2 The function is randomly selected from one of the following four:

a) VERIFY — Verifies the sectors selected and reports controller detected errors.
b) READ — Reads the selected sectors and checks that the correct data was read.
c) WRITE — Writes the selected sectors with same information that Init does and will report controller detected errors.
d) R/A/W — Writes the 8 sectors selected then immediately reads them and reports any errors.

3 The sector address is randomly selected from within the range allowed by the test parameters. That address PLUS 7 are the eight sectors tested (the range of sectors allowed for test can vary up to eight greater than the maximum address selected in the test parameters but not more than the system allows).

4 These parameters are combined, the test is run, and the above selection process is redone. Each device will be accessed (access = 1 sector R/A/W, READ, WRITE or VERIFY) as many times as was specified.

## B.6 Error Recovery

1 Four types of errors can occur:

A) The first error is a hardware error. When a hardware error occurs the statement "CHECKING ERROR" appears at the top center of the screen. This statement remains while the program does up to ten retries of the current function on the failing sector and then reports the error.

B) The second type of error is a seek error (the disk and sector address read from the media, as written by Init, did not compare with the addresses requested). If this error is detected, the error is reported, counted as a soft error and the test continues.

C) The third type of error is a data compare error (the data read from the disk didn't compare with the data that was expected from the disk, as written by Init). If this error is detected, the error is reported, counted as a soft error and the test continues.

D) The fourth error is a format error. If an error occurred during a Format operation, then the exerciser will stop, report the error, and wait for another command.

2 Errors are reported with the device address, sector address, function that was being performed, and the type of error that occurred.

A) The last error that occurred is displayed on line 21 of the RUN SCREEN. If the screen has been changed (define an error or to change the page) then the error is not redisplayed, but new ones will be displayed when they occur.

B) Errors can be printed on either printer 204 or printer 215. If the printer is selected, 500 errors will be printed and then printing will cease, unless SF'14 (printer select key) is toggled or the exerciser screen is changed (to a different page or screen), but the screen error display will constantly update.

## APPENDIX C

This is a description of the commonly used commands/inputs. All commands or inputs can be used when defined at the bottom of the screen (in the box).

| | |
|---|---|
| SF'15/31 | change the page. If there are more than 17 devices to be listed, then at the top right corner of the screen "More" will be printed. This applies to the Parameter Select, Test and Run screens, if more than 17 devices are available for testing. |
| SF'0 | "Define error I-xx" will be displayed. There is an explanation of errors I-90 through I-99 in the "Exerciser". xx is the last error encountered or selected by the operator, if neither has occurred then default is 90. xx can be left or changed to select 90-99. When the explanation is displayed the exerciser continues operation. |
| RETURN | displays the explanation of the error selected. |
| SF'0 | returns to the normal screen. |
| SF'14 | printer select. The currently selected printer option is displayed in the upper left corner of each screen. To change selection press SF'14, the selected printer option will toggle between 204, 215, and off (no printer selected), until the desired option is selected. |
| CLEAR/PREV SCRN | Returns to the last functional screen or menu. |
| CONT/CTNUE<br>RETURN or Y | These are general usage keys which cause a continuation to the next step. |

# Z200 DIAGNOSTIC

## INSTRUCTION EXERCISER BUG

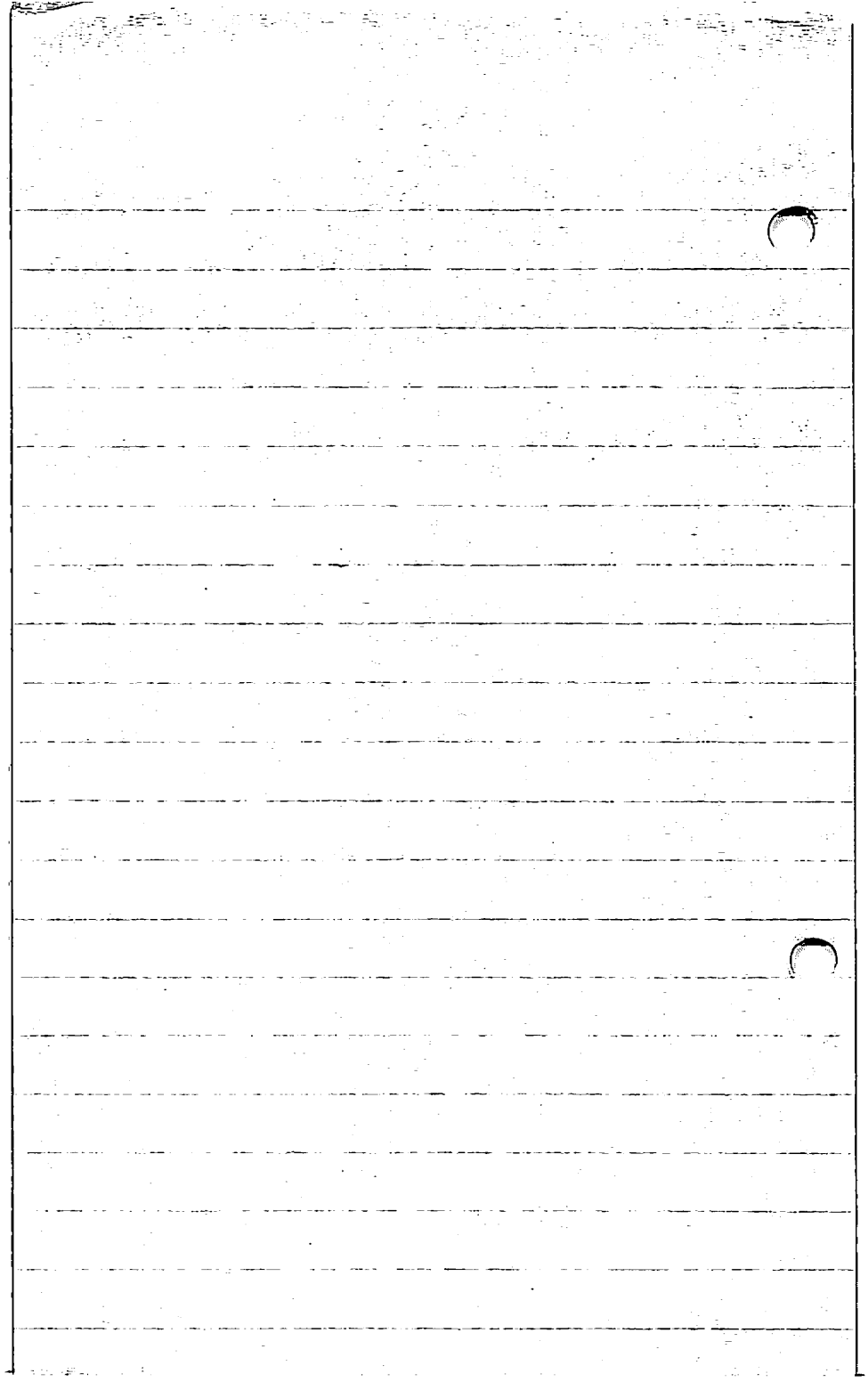
STAYS ON 1ST SCREEN W/ IF/THEN ERROR

PROGRAM BDIAG6

LINE 730

CHANGE FROM IF X<>0 THEN 8990

TO IF X<>Z THEN 8990



**WANG LABORATORIES, INC.**
ONE INDUSTRIAL AVENUE, LOWELL, MA 01851 • TEL. 617/459-5000, TWX 710-343-6769, TELEX 94-7421

F/E J.

WANG

# RELEASE MEMORANDUM

## Diagnostic Engineering Department

To: Distribution Date: March 1, 1988
From: Gail Stanwyck Doc: 3064c/VS6
Subject: 2200 Diagnostic Package, Rev. 179E, Release

---

The 2200 Diagnostic Package, Rev. 179E has been released.

The part numbers for this diagnostic package are as follows:

Package Part Number: 195-2956-0/295-2956-0B

Documentation Part Numbers:

| | | |
|---|---|---|
| 2200 Diagnostic Package | 979E | 760-0029C |
| 2200 Multiple Disk Exerciser | 9735 | 760-1209C |
| Volume Zap Utility | 9734 | 760-1260A |
| 2200 FTU | 9734 | 760-1261C |
| 2200 CPU and Memory | 979E | 760-1271A |

Software Part Numbers:

| | | |
|---|---|---|
| 8" DSDD All | 179E | 732-0002H |
| 8" SSSD Magnetic Media | 6734 | 702-0292B |
| 5 1/4" DSDD Magnetic Media | 6734 | 732-0049B |
| 8" SSSD CPU/Memory test | 179E | 702-0293A |
| 5 1/4" DSDD CPU/Memory test | 179E | 732-0050A |

ECO Number: 47012

Since the last release of this package the following changes have been made:

Added test to the CPU Instructions to verify the VLSI CPU chip executes conditional branches correctly. Test was written after a bad shipment of chips was received. Rewrote the Data Memory Diagnostic for the VLSI-2 CPU. Added and enhanced many tests. Field Service menu labels changed.

Added support for 2200DS and RAM Disk to MULTIDSK and FTU. Also fixed time out errors on long cabled mux.
Added old style hashing routine to SUPERZAP.

Distribution will be as follows:

Software & Documentation: (195-2956-0/295-2956-0B)

CE Home Office Distribution
CE Domestic Field Distribution
CE International Field Distribution
CE Domestic Repair Center Distribution
CE International Repair Center Distribution

If you would like to receive a copy of this diagnostic package, please send a speedy memo addressed to the Software Distribution and Control Customer Services Group, M/S 026-G7F, 836 North Street, Tewksbury, MA 01876. Please include your RDB number, complete Ship-to-address(include Mail Stop if located in Merrimack Valley, USA), Contact Name, Phone number, Diagnostic Package Number(s), and quantity required.

**WANG LABORATORIES, INC.**
ONE INDUSTRIAL AVENUE, LOWELL, MA 01851 • TEL: 617/459-5000, TWX 710-343-6769, TELEX 172108

WANG

# TECHNICAL SERVICE BULLETIN
## SECTION: SoftWare Technical

NUMBER: SWT 8040 REPLACES: _____ DATE: 03/29/88 PAGE 1 OF 1

MATRIX ID. 4332 PRODUCT/RELEASE# 2200 Diagnostic's

TITLE: 2200 Diagnostic Package

PURPOSE:

This TSB is to inform the field of a new release of the 2200 CPU and Memory Diagnostic for testing up to 8 meg of memory.
This release also corrects a bug running the CPU exerciser with MVP basic 3.0 or 3.1 .

EXPLANATION:

This new release of Diagnostics incorporates both the Diagnostics found on the loader to test memory (up to 8 meg) and the CPU Registers, as well as the On Line Basic instruction Exerciser necessary for proper testing of the CPU. This disk does not include an operating system.

The CPU Instructions Exerciser was enhanced to correct a problem when running operating system 3.0 or above. The CPU Instruction Exerciser, while testing the IF/THEN,ELSE statement, would come up with an error and cause the program to loop on the first screen of tests.

ENHANCEMENTS:

A test was written and added to the CPU Instructions Diagnostic to test that the VLSI chip executes conditional branches correctly. The Data Memory Diagnostic for the VLSI-2 was rewritten for testing up to 8 meg. Several other tests were enhanced.

The part number for this diagnostic package is 195-2956-0 (rev 179E).

This package should be available from SDC in mid April 88.

GROUP: VS New Products Core/Diagnostics MAIL STOP: 001-230

MICHAEL E BAHIA
PROJ# H756 ( 1 COPIES)
M/S: 001-260

DIAG VER 179E- FIXES THE IF/THEN PROB RUNNING ON 3.0 OR 3.1
VER 18A4- FIXES IF/THEN PROB RUNNING NEW DIAGS 179E W/ O/S 2.7 OR LOWER

# TECHNICAL SERVICE BULLETIN
# SECTION: SoftWare Technical

NUMBER: SWT 8040 REPLACES: _____ DATE: 03/18/88 PAGE 1 OF 1

MATRIX ID. 4332 PRODUCT/RELEASE# 2200 Diagnostic's

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This package should be available from SDC in mid April 88

GROUP: VS New Products Core/Diagnostics MAIL STOP: 001-230

COMPANY CONFIDENTIAL

WANG Laboratories, Inc.

-Jim D'Amore, 2228 DIAG 3/30/88

I found a small bug in "STARTCPU" Line 295. The symptom is if running in a partition 10 or greater the display scrolls. The fix

295 PRINT AT (23, W5-20); "a Partition" ...
PRINT AT (22, W5-12); "Terminal" ...

make

295 PRINT AT (23, W5-20); "Partition" ...
PRINT AT (22, W5-20); "Terminal" ...

TOlsen CS/2200 Support
xt 70339

P.S. I DID NOT CHANGE YOUR DISKETTE.
THANK YOU!

During the diagnostic the CRT display will show:

```
DS Tape Diagnostic -- Erase, writes canned stream, & read/verifies
                      45 Mb type cassette
     Address of tape cassette drive (D5F, D6F, or D7F): D5F

              Phase =  description of current phase

 x Initial Rewind and Erase
 x Write canned pattern to tape
   Rewind
   Read/verify
   Complete
   Phases
                                                        Data
                      Stream  Sector       DErr.#  Compare  #.Read  #.Write
                Mb     I / O  Equivalency  Errors  Errors   Errors  Errors
Write phase     mm       ww      sssss       ww                       ww
READ/verify     mm       ww      sssss       rr      cc       rr

Description of command prior to status read              At hh:mm:ss
.0 .1 .2 .3 .4 .5  .0 .1 .2 .3 .4 .5    .0 .1 .2 .3 .4 .5    .0 .1 .2 .3 .4 .5
00 00 00 00 00 01  02 00 01 00 09 13 C9=20 20 20 20 20 20 CC=20 20 20 20 20 20
S0 S1 DErr# UErr#  ID FS Mo Taddress CB=20 20 20 20 20 20 CD=20 20 20 20 20 20
```

Current operation being performed.

- - - - - - - - - - - - - - - - - - - -

Program description by phase:

Phase = Initial Rewind and Erase

Lines 17 -24 tape drive status and current command.

Erasing tape

- - - - - - - - - - - - - - - -

Phase = Rewind

Note: -- cassette is rewound to BOM.

- - - - - - - - - - - - - - - -

Phase = Writing canned pattern to tape

Note: -- logic fills buffer 512 bytes at a time and writes to DPU board.
Sector equivilency count is incremented on each write to the DPU..
Stream I/O counter is incremented after each write to tape, i.e. 16/mb..
Mb counter is incremented after each write to tape.
Pass is over when Mb specified is written to tape, approx. sec/mb.

Display:
Line 6: Phase = Move pattern in 512 byte blocks to 012 Mb tape

```
Line   :              Mb    Block Sector
Line 19: Write phase  aa     bbb  cccc            d                  e
```

- - - - - - - - - - - - - - - - -

Display:
Line 6: Phase = READ verify pass -- 012 Mb

```
Line   :              Mb    Block Sector
Line 20: READ/verify  aa     bbb  cccc            d                  e
```

Display after keying Reset '15

```
 00 00 00 00 00 00   17 00 00 00 00 00
 S0 S1 DErr# UErr#   ID FS Mo Taddress
```

| S0 Status byte 0 | S1 Status byte 1 |
|---|---|
| '40' CNI Cassette not in place | '40' ILL Illegal command |
| '20' USL Unselected device | '20' NDT No data detected |
| '10' WRP Write protected | '10' MMD Marginal block detected |
| '08' EOM End of Media | '08' BOM Beginning of Media |
| '04' UDA Unrecoverable data error | '04' BPE Bus parity error |
| '02' BNL Bad block not located | '02' Always zero |
| '01' FIL File mark detected | '01' POW Power On (RESET) occured |
| DErr# is a retry counter | UErr# is underrun error |

FS is Fault Status

'40' ROM Fault after reset
'20' RAM fault after selection
'10' BUFfer fault after reset
'08' STL STALL tape did not mover after motion command
'04' BOT Drive failed to detect EOT, BOT, or clear leader.
'02' DRV Drive fault

ID is drive & cassette information shown on menu after selection

Mo is Mode 0=Industry 1=Wang

Taddress is tape track number.

To: CS/2200 file 9/22/89
From: TBO

Re: D.S. Tape diagnostic utilities:
Pkg. Name 3.5" Teac streaming cassette drive - 725-4893
Pkg. No. 195-xxx Rev. No 1.0.

Abstract: This CS/2200 package incorporates a DS/CSD Teac streaming cassette drive diagnostic" as well as the "DS Utilities" release 2.0 package. The DS utilities are described in the "DS Utilities Manual" 715.0740 or the CS-D Users Guide" manual 715-2364. .

This CS/2200 tape diagnostic will function in either a DS cabinet or CS/D supporting either a 45 mB or 150 mB tape cassette. The program offers four alternatives.

1. Erase, write a worst case pattern, rewind and read/verify.
2. Erase, write a worst case pattern.
3. Rewind and read/verify a worst case pattern.
4. Rewind and read an unknown tape.

The program operates in sequential phases:

1. Rewind the tape, take status of the cabinet, the drive, and cassette.
2. Prompt the operator for number of MB to test.
3. Rewind and Erase the tape.
4. Write a pattern for the Mb requested.
5. Rewind the tape.
6. Read/verify the data and compare versus the pattern expected.
7. Rewind and stop.

## Operating instructions:

Mount diskette in drive
Key: SELECT DISK D10 RETURN
LOAD RUN RETURN

Screen 1:

CS/2200/386 Packaged Diagnostics

Select an item and press RUN/EXEC Partition d, 56 K
or press CANCEL/EDIT for previous menu Terminal 4

DS/CSD Teac streaming cassette drive diagnostic
DS Utilities

press RUN see loading DSTS.010.

Screen 2:

Pkg. Name 3.5" Teac streaming cassette drive - 725-4893
Pkg. No. 195-xxx Rev.No. 1.0.

Reset '15 - status codes
RETURN - Proceed
FN/TAB - Exit

Screen 3:

Pkg. Name 3.5" Teac streaming cassette drive - 725-4893
Pkg. No. 195-xxx Rev.No. 1.0.

Address of tape cassette drive (D5F, D6F, or D7F): D5F

Reset '15 - status codes
RETURN - Proceed
FN/TAB - Exit



Prompt 1:
Address of tape cassette drive (D5F, D6F, or D7F): D5F
Respond: RETURN or D6F and RETURN or D7F and RETURN.

Display:
line 23 - Rewinding tape
lines 17-22 Tape drive status information.
line 2 45 Mb type cassette
or 150 Mb type cassette

NOTE: If there is a media error the display will show --
Tape drive selected will not write to this tape Mb ne Mb

Screen 4:

DS Tape Diagnostic -- Erase, writes canned stream, & read/verifies
Drive address = D6F 45 Mb type cassette

Options :
1 not an option
2 not an option
3 READ worst case pattern
4 Read customer tape

RETURN - Proceed
FN/TAB - Exit

OPERATOR - see prompt above

Prompt for Option desired:
Respond: 1 or 2 or 3 or 4

Prompt 2: (29FC is the worst case pattern).
Pattern in hex 29FC29FC29FC29FC
Respond: RETURN

Prompt 3:
Number of mb to write, max. = 45
? __
Respond: positive integer value greater than 0 and less than max.and RETURN

# 2200 DIAGNOSTICS

| DIAG PART # | DOC PART # | TITLE | GEN SOFT | REL DOC | DATE |
|---|---|---|---|---|---|
| | | The Following 2200 Diagnostics are Not Supported by Diagnostic Engineering | | | |
| 702-0049 | 700-6225 | 2236DE Basic Q. A. | 1.0 | 1.0 | 10/12/79 |
| 702-0050 | 700-6225 | 2236DE Basic Q. C. | 1.0 | 1.0 | 10/12/79 |
| 702-0051 | 700-6225 | 2236DE Basic Pretest | 1.0 | 1.0 | 10/12/79 |
| 702-0062<br>378-2498<br>378-2499<br>702-0105 | | 2236 MXD Repair Aids | 1.0 | 1.0 | 1/8/80 |
| 702-0066<br>378-4167R2<br>378-2448R2<br>702-0104 | 700-6145 | 2228B/2227B TC Controller Monitor<br>2228B/2227B TC Controller | 3.0<br>3.0 | 3.0<br>3.0 | 7/23/80<br>7/23/80 |
| 702-0078 | | Mass Storage | 1.0 | | 10/21/80 |
| 702-0079 | | Peripheral | 1.0 | | 10/21/80 |
| 702-0080 | | Basic | 1.0 | | 10/21/80 |
| 702-0085<br>378-4226<br>378-4227 | 700-6225 | 2236DE Prom Based Repair Aids<br>2236 D/E Repair Aids Prog. Spec. | 1.0<br>1.0 | 1.0 | 8/1/80<br>8/1/80 |
| 702-0086<br>378-4143R1<br>378-4144R1<br>378-2519 | 700-6225 | 2236DE Prom Based Burn-in | 2.0 | 2.0 | 7/21/79 |
| 702-0094B<br>378-4379R1<br>378-4380R1<br>378-4381R1 | | 2228D TC Controller Power-Up | 2.01 | 2.02 | 12/22/81 |
| 702-0100<br>378-4252 | | LVP SVP Alignment | 1.0 | 1.0 | 12/15/80 |
| 702-0110<br>732-0004 | | Shugart 850-851 Alignment | 8120 | 9120 | 2/13/81 |
| 702-0112<br>378-4261<br>378-4262<br>378-3063 | | 2236DW Burn-In | 4161 | 9155 | 8/11/81 |

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# 2200 DIAGNOSTICS CONT.

| DIAG PART # | DOC PART # | TITLE | GEN SOFT | REL DOC | DATE |
|---|---|---|---|---|---|
| | | Unsupported 2200 Diagnostics Cont. | | | |
| 702-0125 | | 2200 System Master Monitor 15 Burn | 6134 | | 5/4/81 |
| 702-0126 | | 2200 System Diagnostic 15 Burn-In | 3140 | | 2/4/81 |
| 378-3103 | | 2200 Prom 15 Burn-In | | | |
| 702-0129 | | 2236DW QC Burn-In (FSC's only) | 4150 | | 5/18/81 |
| 702-0152 | | 22015 Printer Diagnostic | 1.0 | | 1/30/77 |
| 702-0162 | | 2260C MVP Disk | 1.0 | | 12/1/78 |
| 702-0165 | | 2270 & 2270A Production Diag. | 1.0 | | 1/1/77 |
| 702-0166 | | 2280 SMD Commands | 1.0 | | 4/2/79 |
| 702-0167 | | 2281P Printer Diagnostic | 1.0 | | 1/26/78 |
| 732-0001 | | DSDD Basic 2 | | | 12/15/80 |
| 732-0002C | | LVP/SVP SYSTEM EXERCISER | 6282 | 9282 | 11/02/82 |

End of List
Unsupported Diagnostics

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# 2200 DIAGNOSTICS CONT.

| DIAG PART # | DOC PART # | TITLE | GEN SOFT | REL DOC | DATE |
|---|---|---|---|---|---|
| 378-6005R1<br>378-6006R1 | 700-6883 | 2236DI Prom Burn-in 7892 BIT | 5190 | 9190 | 03/23/82 |
| 378-6002R1<br>378-4260R1 | | SVP Power-up | 5120 | 9120 | 3/20/81 |
| 378-4223R6<br>378-4230R6 | | LVP/SVP DPU POWER-UP | 51A8 | 91A8 | 9/7/81 |
| Package No:<br>195-2468-3 | | SVP Multiport Terminal/Printer Controller Power Up Self Test | 5250 | 9250 | 02/08/83 |
| Software:<br>702-0224<br>378-9017<br>378-9018 | | | 5250 | | |
| | 760-1075 | | | 9250 | |
| Package No:<br>195-2513-3 | | 2200 Kennedy Tape Power Up | 7320 | 9320 | 03/18/83 |
| Software:<br>702-0245<br>378-9037 | | | 7320 | | |
| | 760-1102 | | | 9320 | |
| Package No:<br>195-2552-0 | | 2200 Kennedy Tape F.S. & Bd Rpr. (with listing) | 6436 | 9434 | 06/27/84 |
| Software:<br>732-0002D<br>702-0292<br>732-0049 | | | 6436<br>6436<br>6436 | | |
| | 760-1119A | | | 9434 | |
| ECO No:<br>33254 | | | | | |
| Package No:<br>195-2608-3 | | 2228F Board Repair | 7320 | 9320 | 06/01/83 |
| Software:<br>702-0252<br>378-5146<br>702-0239 | | | 7320<br><br>7320 | | |
| | 760-1125 | | | 9320 | |
| ECO No:<br>28115 | | | | | |

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| DIAG PART # | DOC PART # | TITLE | GEN SOFT | REL DOC | DATE |
|---|---|---|---|---|---|
| Package No: 195-2609-3 | | 2228F Power Up Self Test | 5370 | 9370 | 09/06/83 |
| Software: 702-0242A 378-5145R1 | | | 5370 | | |
| | 760-1123A | | | 9370 | |
| Prom ECO No: 29330 Pkg ECO No: 29331 | | | | | |
| Package No: 195-2611-3 | | 2236 MXE Board Repair Aid | 1260 | 9260 | 04/26/83 |
| Software: 702-0181A 378-9002 378-9003 | | | 1260 | | |
| | 760-1126 | | | 9260 | |
| Package No: 195-2612-3 | | Low Cost Image Processor PUP | 5260 | 9260 | 04/26/83 |
| Software: 702-0253 378-7006 | | | 5260 | | |
| | 760-1127 | | | 9260 | |
| Prom ECO No: 23508 Pkg ECO No: 27610 | | | | | |
| Package No: 195-2614-3 | | Data Switch Station Bd Rpr. & Data Switch Station Signature Analyzer Board Repair | 8342 | 9342 | 04/26/83 |
| Software: 702-0209A 378-6046R1 | | | 8342 | | |
| | 760-1116 | | | 9342 | |
| | 760-1128 | | | 9280 | |
| ECO No: 27640 | | | | | |

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| DIAG PART # | DOC PART # | TITLE | GEN SOFT | REL DOC | DATE |
|---|---|---|---|---|---|
| Package No: 195-2631-3 | | Data Switch Station Test Attachment Board Repair | 7340 | 9340 | 06/10/83 |
| Software: 702-0255 | | | 7340 | | |
| 378-8044 | 760-1129 | | | 9340 | |
| ECO No: 28240 | | | | | |
| Package No: 195-2637-3 | | DataSwitch Master Controller Built In Test | 53C1 | 93C1 | 02/28/84 |
| Software: 702-0201B | | | 53C1 | | |
| 378-8009R4 | 760-1112A | | | 93C1 | |
| Prom ECO No: 31705 | | | | | |
| Pkg ECO No: 31706 | | | | | |
| Package No: 195-2682-3 | | 2228E TC Contr. Bd. Rpr. Diag. | 3378 | 9378 | 8/31/83 |
| Software: 702-0185A | | | 3378 | | |
| 702-0266 | | | 7220 | | |
| 378-4391 | 760-1166 | | | 9378 | |
| ECO No: 29233 | | | | | |
| Package No: 195-2683-3 | | Data Switch Master Controller Board Repair | 72C0 | 92C0 | 07/25/83 |
| Software: 702-0212 | | | 72C0 | | |
| 378-8010 | 760-1142 | | | 92C0 | |
| ECO No: 28285 | | | | | |

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| DIAG PART # | DOC PART # | TITLE | GEN SOFT | REL DOC | DATE |
|---|---|---|---|---|---|
| Package No: | | | | | |
| 195-2693-3 | | 2228 E TC Controller PUP S/T | 5368 | 9428 | 02/21/84 |
| Software: | | | | | |
| 702-0186A | | | 5368 | | |
| 378-4390R1 | | | | | |
| | 760-1169 | | | 9428 | |
| Prom ECO No: | | | | | |
| 31592 | | | | | |
| Pkg ECO No: | | | | | |
| 31593 | | | | | |
| Package No: | | | | | |
| 195-2877-3 | | MVP DPU Board Repair Monitor Prog & 2275 Floppy Winchester Disk Controller Program | 3410/ 7410 | 9410 | 03/28/84 |
| Software: | | | | | |
| 702-0282 | | Prom Diskette | 7410 | | |
| 379-2001 | | | | | |
| 702-0283 | | Monitor Diskette | 3410 | | |
| | 760-1242 | | | 9410 | |
| ECO No: | | | | | |
| 32089 | | | | | |
| Package No: | | | | | |
| 195-4262-D | | 2200 MVP 5 1/4" Winchester/Floppy Controller Built In Test | 5451 | 9451 | 10/16/84 |
| Software: | | | | | |
| No ref no. | | | | | |
| 379-2000R2 | | | | | |
| | 760-1213 | | | 9451 | |
| Prom ECO No: | | | | | |
| 33512 | | | | | |
| Pkg ECO No: | | | | | |
| 34387 | | | | | |

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# 2200 DIAGNOSTICS CONT.

| DIAG PART # | DOC PART # | TITLE | GEN SOFT | REL DOC | DATE |
|---|---|---|---|---|---|
| Package No: | | | | | |
| 195-2956-0 | | 2200 Diagnostic Package | 6547 | 9547 | 06/21/85 |
| Software: | | | | | |
| 732-0002E | | A11 8" DSDD | | 6547 | |
| 702-0292A | | Magnetic Media 8" SSSD | | 6547 | |
| 732-0049A | | Magnetic Media 5-1/4" DSDD | | 6547 | |
| 702-0293 | | CPU/Memory Test 8" SSSD | | 6436 | |
| 732-0050 | | CPU/Memory Test 5-1/4" DSDD | | 6436 | |
| 702-0294 | | Telecommunications 8" SSSD | | 6436 | |
| 732-0051 | | Telecommunications 5-1/4" DSDD | | 6436 | |
| 702-0295A | | Printers/Plotters/Terminals 8" DSDD | | 6534 | |
| 732-0052A | | Printers/Plotters/Terminals 5-1/4" DSDD | | 6534 | |
| | 760-0029A | 2200 Diagnostic Package | | 9547 | |
| | 760-1103A | 2200 Kennedy Tape FS & Bd Rpr | | 9434 | |
| | 760-1121A | 2228 D/E/F TC Controller PUP | | 9434 | |
| | 760-1122A | 2228 E/F TC Controller FS | | 9434 | |
| | 760-1124B | 2228 D/E/F TC Cntrlr Multi-Bd BI | | 9434 | |
| | 760-1209B | 2200 Multiple Disk Exerciser | | 94A5 | |
| | 760-1223B | Shugart 850/851 DSDD Disk Align | | 9545 | |
| | 760-1250B | 2200 DPU PLL Adjustment Utility | | 94A5 | |
| | 760-1257 | 2200 General Printer Exerciser | | 9434 | |
| | 760-1258 | 2232 Printer Exerciser | | 9434 | |
| | 760-1259 | 2201L Printer Exerciser | | 9434 | |
| | 760-1260 | Volume Zap Utility | | 9434 | |
| | 760-1261B | 2200 FTU | | 954E | |
| | 760-1262 | LVP/SVP Disk Processing Unit BI | | 9434 | |
| | 760-1263 | 850/Winchester VCO Adjustment | | 9434 | |
| | 760-1264A | Phoenix Head Alighment Utility | | 94A4 | |
| | 760-1265 | 2200 Terminal Universal Kybd | | 9434 | |
| | 760-1266 | 2200 CPU Instruction | | 9434 | |
| | 760-1267 | 2228D TC FS Diags. Rev. 2 | | 9434 | |
| | 760-1268 | 2228D TC FS Diags. Rev. 1 | | 9434 | |
| | 760-1269 | 2209A Tape Drive Diagnostic | | 9434 | |
| | 760-1270 | 2236DE/DW FS Diagnostic | | 9434 | |
| | 760-1271 | 2200 CPU/Memory Diagnostics | | 9434 | |
| | 760-1272 | Memory Error Chip Identifier | | 9434 | |
| | 760-1275 | 2227B/2228B Diagnostic | | 9434 | |
| | 760-1276 | 2282 Graphic CRT Exerciser | | 9434 | |

ECO No:
33124

| DIAG PART # | DOC PART # | TITLE | GEN SOFT | REL DOC | DATE |
|---|---|---|---|---|---|
| Package No: | | | | | |
| 195-4591-0 | | 2200 Diagnostic Board Repair Diagnostic Package | 7530 | | 04/10/85 |
| 195-4591-D | | Documentation Only | 7530 | | |
| Software: | | | | | |
| 702-0063A | | 22C32 Repair Aid Diagnostic Monitor | 70CE | | |
| 702-0089A | | 2228D Bd. Rpr. Diag. for Variable Memory Size | 1158 | | |
| 702-0091 | | 22C80 Multiplexor Bd. Level Rpr. | 1.0 | | |
| 702-0095B | | 2228D Board Repair | 7158 | | |
| 702-0103A | | 22C32 Repair Aid | 70CE | | |
| 702-0115A | | Basic Monitor for LVP DPU Bd. Rpr. | 11CF | | |
| 702-0116A | | LVP DPU Board Repair | 11CF | | |
| 702-0131 | | 2600 Control Memory Repair Aid | 714E | | |
| 702-0139 | | 7789 Repair Aid Diagnostic | 70CE | | |
| 702-0140 | | 22C32 Repair Aid Diagnostic | 70CE | | |
| 702-0141 | | 2200 SVP 7890 Bd. RA Basic Mon. | 3181 | | |
| 702-0142 | | 2200 SVP 7890 Board Repair Aids | 7181 | | |
| 702-0190 | | 7892 Repair Aid Diagnostic | 7230 | | |
| 702-0191 | | SVP Multiport/Prtr. Contrlr. RA | 1260 | | |
| 702-0196 | | 7916 CPU/CRT Repair Aid | 7240 | | |
| 732-0011 | | 7789 Repair Aid Diag. Basic Mon. & System | 70CE | | |
| 732-0017 | | SVP Multiport/Prtr. Contrlr. RA | 1260 | | |
| | 760-1340 | 22C80 Multiplexor Board Level Rpr. | 9530 | | |
| | 760-1342 | 2200 LVP Disk Proc. Unit Bd. RA | 9530 | | |
| | 760-1343 | 2600 Control Memory Board Repair | 9530 | | |
| | 760-1344 | 2200 SVP 7890 DPU Board Repair | 9530 | | |
| | 760-1345 | 2200 SVP/DPU Board Repair Monitor | 9530 | | |
| | 760-1346 | 22C32 PCB Repair Aid Diag. Mon. | 9530 | | |
| | 760-1347 | 7916 Repair Aids | 9530 | | |
| | 760-1348 | 7892 Repair Aid | 9530 | | |
| | 760-1349 | SVP Multiport/Printer Controller RA | 9530 | | |
| | 760-1350 | 7789 PCB Repair Aid Diagnostic Mon. | 9530 | | |
| | 760-1354 | 2228D Rev. 2 TC Board Repair | 9530 | | |
| ECO No: 36027 | | | | | |
| Package No: | | | | | |
| 195-5179-D | | 2200/VS Local Communcations | 5670 | 9670 | 08/26/86 |
| Prom Part No: | | Option Board Built In Test | | | |
| 379-2101 | | | 5670 | | |
| | 760-1509 | | | 9670 | |
| ECO No: 41253 | | | | | |

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| DIAG PART # | DOC PART # | TITLE | GEN SOFT | REL DOC | DATE |
|---|---|---|---|---|---|
| Package No: | | | | | |
| 195-5695-D | | 2200 DS Disk Processing Unit BIT | 5750 | 9750 | 07/30/87 |
| 295-5695-D | | | | | |
| Prom Part No: | | | | | |
| 379-8500 | | | 5750 | | |
| | 760-1574 | | | 9750 | |
| ECO No: | | | | | |
| 45253 | | | | | |

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MEMORANDUM

To: Distribution
From: Doreen White
Date: October 20, 1989
Subject: 210-6367A Keyboard Controller

Attached is a released test procedure for the 210-6367A Keyboard Controller. The Tewksbury Repair Center is responsible for performing the tests as described in this procedure. Any proposed changes to this document need to be submitted to me for evaluation by the Engineering Support Group.

Thank you for your cooperation in this matter.

cc: Jim Reilly
Jim Riley
Bill Rourke
Al Souma
Kim Thompson

| REPAIR OPERATIONS TEST PROCEDURE NO 77 | PART NUMBERS: 210-6367A<br>PAGE 2 OF 4<br>DATE 10/16/89 |
|---|---|

TITLE

210-6367A KEYBOARD CONTROLLER PCB

1. PURPOSE

1.1 To allow a technician to test the 210-6367A Keyboard Controller PCB.

2. RESPONSIBILITIES

2.1 Tewksbury Repair Center shall be responsible for performing the tests as described in this procedure.

3. EQUIPMENT AND SOFTWARE REQUIREMENTS

3.1 Keyboard Model 2222E WPN: 177-2222E
3.2 Monitor WPN: 270-0373 + 220-0103 CORX CRT CABLE
3.3 2200T CPU Chassis WPN: 177-2200-74
3.4 212-2216 CRT CONTROLLER (SW'S 1+3 ON ONLY)

4. TEST PROCEDURE

4.1 Set the SW1 switch bank on the 210-6367-A PCB to the following configuration:

1 ON 2-8 OFF

4.2 Insert the 210-6367-A PCB into any of the CPU I/O slots.

4.3 Plug the keyboard cable into the keyboard connector on top of 210-6367-A Controller PCB.

4.4 Power On the CRT.

4.5 Press the CPU On/Off switch to the On position and observe that the system displays the READY prompt (INDICATES CPU OPERATIONAL).

4.6 Set the Upper/Lower case switch located on the left side of the keyboard to the Down position.

4.7 Press each key on the keyboard twice to verify that each key is functioning correctly. Observe the following ~~special~~ functions WITH keys shown in Table 1 during the testing of the keyboard:

Table 1: Special Function Keys

| Keystrokes | Function |
|---|---|
| RETURN | Moves the cursor to the beginning of the next line. An ERR 15 is displayed if text is already printed on the previous line. |
| LOCK | Turns On the LED above the LOCK key. Press the SHIFT key to turn OFF the LED. |
| SHIFT | Lights LED when depressed. |
| E (Numeric Keypad) | Moves the cursor to the beginning of the next line. An ERR 15 is displayed if text is already printed on the previous line. |
| BACKSPACE | Moves the cursor to the left one position in the same row and erases the character that was in that position. |
| LINE ERASE | Sets the cursor position and all locations on the same line to blank spaces. |
| PRINT (Numeric Keypad) | Displays PRINT on the CRT. |
| RUN | Displays RUN on the CRT. |
| LOAD | Displays LOAD on the CRT. |
| CLEAR | Displays CLEAR on the CRT. |
| HALT/STEP | Moves the cursor to the beginning of the next line and prints an ERR 11 on the CRT. |
| RESET | Clears the entire screen and produces the READY prompt. |
| SF Keys | Prints an ERR 48 on the CRT. |
| EDIT | Displays an asterisk next to the cursor. |

DO NOT HAVE SYSTEM TO VERIFY ERROR CODES. ERRORS MAY VARY DEPENDENT ON WHAT IS TYPED ON LAST LINE.

4.8 Set the Upper/Lower case switch to the Up position. You can now enter all the alphabet characters on the keyboard in the uppercase. All gray double function keys on the numeric keypad are displayed in the lowercase. Press each key on the keyboard twice to verify that each key is functioning correctly. When you press the "E" key on the numeric keypad, the cursor moves to the beginning of the next line. An ERR 06 is displayed if text is printed on the previous line.

4.9 Press the LOCK key and the LED above the LOCK key will light. All double function keys are displayed in the uppercase.

4.10 Press the SHIFT key to release the LOCK key.

4.11 Press the SHIFT key and ensure the SHIFT LED is ON. While holding down the SHIFT key, press each key on the keyboard twice to verify that each key is functioning correctly. Observe the CRT when you press the following ~~special function~~ keys:

- o The LOCK key produces no effect on the CRT.
- o The "-" key displays PRINTUSING.
- o All SF keys display ERR 48.

4.12 After all testing is complete, turn Off the CPU and the CRT. Remove the keyboard cable from the Keyboard Controller PCB. Remove the PCB from the CPU and ship the good board to stock.