DISTRIBUTED 6250 BPI TAPE

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INTRODUCTION

One of the most frequently heard buzz words of the computer industry today is that of distributed processing - making a high level of data processing available to each user, but allowing each user to attach to and access a large data base.

This paper deals with another aspect of distributed computer power - that of distributing 6250 BPI tape systems between a number of CPU's. Qualex Technology, Inc. has formally announced "SMASH" SHARED MASS ARCHIVE STORAGE HOST at this HPGSUG user meeting and this paper will describe system operation, system configurations, etc. In addition, features of 6250 BPI technology will be highlighted.

Qualex first introduced 6250 BPI tape technology and systems to HP end users in September of 1980. Prior to this date this field proven product (first installed in 1978) was only available to OEMs. Qualex's first tape systems provided users with a state-of-the-art technology solution to the frustrating backup, archive and interchange problems being experienced by the HP user. The Qualex Group 3000 tape systems provide the following features:
* Modern tape technology design
* 125 or 75 inches per second tape speed
* 60 sec rewind time for 2400 foot reel
* Triple density 800/1600/6250 BPI or Dual density 1600/6250 BPI
* Switch selectable density
* Automatic thread/load
* Use of Easy Load cartridges

* Extensive Diagnostic capability both within the drive and
  controller and via loadable software diagnostics
* Plug & program compatible with Series II & III
* Employs the most field proven 125 ips, small size 6250 drive
  in the industry

With the March 1, 1981 announcement by HP of the dedicated channel
7976A Tape Subsystem, for the Series 30, 33 and 44, and the HPIB
interface module (STARFISH) for the HP3000 Series III, the pio-
neering efforts by Qualex to bring this state-of-the-art in tape
technology to the Hewlett Packard community has been totally en-
dorsed. The HP product does not match the performance, economics,
configuration, serviceability and technology of the Qualex product,
but at least now, the user knows that the use of 6250 is now
acceptable in the HP world, will have two sources to choose from
and can evaluate these sources based on price/performance.

It is appropriate at this point to review the advantages of 6250
BPI tape technology to the user.
* Higher Recording Rate for Greater Data Throughput
* Reel Storage capacity increased more than threefold
* Improved Read/write reliability with multi track error
  correction
* Quicker access to data
* Smaller IBG (0.3 inch vs 0.6 inch @ 1600 BPI)
* Shorter rewind time

Besides the above benefits/features, the 6250 technology provides
additional advantages to HP users - when compared with hardware
they are currently using. These advantages are:
* Auto thread/auto load
* High speed rewind - 500 ips
* 125 ips tape speed
* Quick rewind time - less than 1 minute
* Triple density

* Switch selectable density
* Automatic Hub
* Vastly improved operator features

THE RIGORS OF 6250 TAPE DESIGN

To meet these stringent requirements required a new generation of tape equipment encompassing significant breakthroughs in tape transport and capstan design as well as development of sophisticated controllers to meet all the format encoding/decoding, error correction and status requirements of the GCR code. The controller, to do this, is basically a complex computer in itself.

6250 BPI uses a recording technique known as Group Coded Recording (GCR). The formatter/controller "codes" bytes of user data into five bytes of coded data to be recorded such that there will be no more than two zero's in succession. This provides for an efficient code for recording the data without experiencing the long strings of ones often displayed in the 800 BPI or NRZI mode of recording. This coding technique also provides for a self clocking recording system which, when coupled with the multiple ECC characters built into the code, allows two tracks in error to be corrected "on the fly" (without stopping and re-reading).

The 6250 code is extremely powerful. An ECC character is inserted after each seventh user byte. Two additional ECC characters are inserted after the data portion of the block is complete. Due to the "overhead" of group coding and ECC characters, the actual recording density is 9042 BPI - not 6250. The user data comes to the tape system at a 6250 rate, but this data is actually put on tape in coded format at 9042 BPI. This high density not only required new head and read/write circuit technology, but also new sophistication in transport design to preclude data errors under stringent tape motion dynamics.

At 6250 BPI, the interrecord gap is cut in half from 0.6 inch, used

at 1600 or 800 BPI, to 0.3 inches. The actual start and stop
distances however were reduced by two thirds. At 1600 BPI, the
normal start or stop distances is 0.190 inches whereas at 6250 the
start distance is 0.075 inches. This provides quick access to data
for the user, but represented stiff requirements for the tape drive
designers.

The Qualex product meets all the requirements of the 6250 code.
Qualex chose the Series 3000 transport it uses (manufactured by
by Telex) because:
* the product is the only unit in it's size designed from the
  start for 6250 operation.
* the product had extensive field use with impressive
  reliability.
* the product was designed for serviceability and featured
  quality components and conservative design margins.

By way of contrast, the competitive product is actually a per-
formance strained 75 ips, 1600 BPI machine modified to operate at
6250 BPI, but unable to write the IBM/ANSI standard 0.3 inch inter-
record gaps on start/stop operation and also operates at excessively
high tape tension.

The main thrust of the first part of this paper is to point out that
meeting the challenge of 6250 BPI tape technology requires a more
complex design with a corresponding increase in cost. This increase
in cost translates into substantial benefits to the user in terms of
a significant improvement in reliability; dramatically higher
performance; along with the added benefits of ease of operation.
The performance match between current disk drives and tape memory
has now been satisfied and in the bargain the user has gained a more
error tolerant product and the solution(s) to the previous tedious
requirements, and resultant problems, associated with operator tape
handling.

DISTRIBUTED 6250

The higher cost of this technology is what prompted Qualex to study
methods of maximizing return on investment (ROI) to the the user.
Qualex's current product is already lower cost and higher per-
formance than the 7976A. However, to further enhance ROI, Qualex
has designed SMASH (Shared Mass Archive Storage Host) to allow
sharing of this state-of-the-art performance and technology over
multiple CPU's.

SMASH allows the operator to switch the Qualex Group 3000 tape
system between two, three or four CPU's. As the next slides will
show, this system can be shared with various models of the HP3000
computers.

The first slide shows a single tape system tied to a Series III CPU.
The next slide adds the Shared Mass Storage Feature option 002.
The following slide shows option 004 which allows coupling four
CPU's to the Group 3000 tape system. The CPU's can be a mix of
Series II or III's and Series 44's.

The hardware elements of SMASH are housed in the Series 3000 tape
controller/tape drive cabinet. No additional cabinet is required.

Selection of which CPU is connected to the tape system via SMASH is
done by an operator activated switch.

A review of cost savings for the user is covered in the following
charts.

As can be seen, this cost savings of the Qualex tape systems are
significant, running from $20,000 to $194,000 depending on the
configuration selected.

A significant dimension of the SMASH product for the single CPU
user, making an investment in 6250 tape today, is the opportunity
to enhance his return on investment when his site upgrades to a new

computer and/or adds additional CPU capability to his site.

In summary, 6250 BPI technology is now a reality for HP3000 computers. The user has options to choose from with the most current being the SMASH capability introduced by Qualex. 6250 BPI technology is state-of-the-art in tape design - brings many benefits to the user and with the announcement of SMASH, provides a cost effective solution to a multiple CPU site.

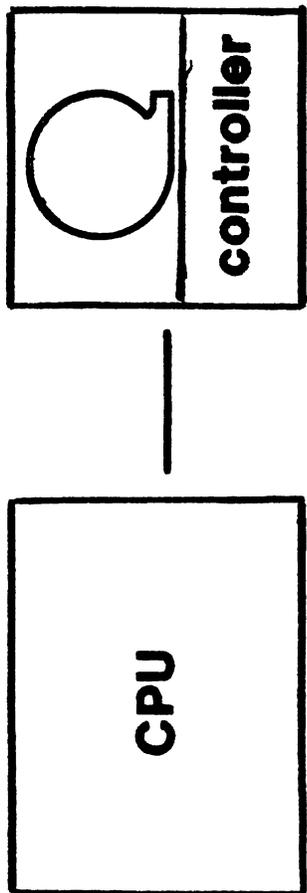# DISTRIBUTED 6250 BPI TAPE

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USER ADVANTAGES OF 6250

6250 TAPE PROVIDES UNIQUE ADVANTAGES TO HP USERS

QUALEX

- Auto Thread/Autoload

- Triple Density

- High Speed Rewind

- 125 ips Tape Speed

- Switch Selectable Density
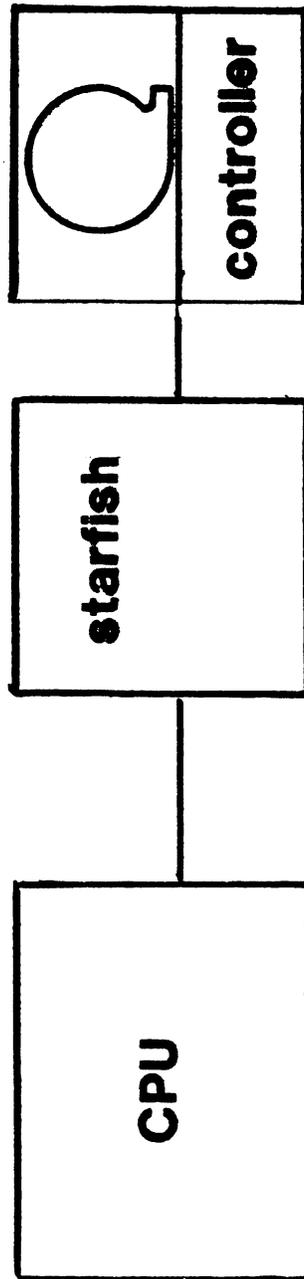
- Automatic Hub

- Improved Operator Features

QUALEX

SINGLE TAPE SYSTEM

Qualex

CPU — controller

HP7976A

CPU — starfish — controller

QUALEX

SMASH - ANNOUCEMENT

QUALEX INTRODUCES

"SMASH"

SHARED MASS ARCHIVE STORAGE HOST

SMASH (2 CPU'S)

SMASH - Shared Mass Archive Storage Host

QUALEX

```
+-----------+                              +-----------+
|           |                              |           |
|   CPU     |                              |   CPU     |
|           |                              |           |
|   #2      |                              |   #1      |
|           |                              |           |
+-----------+                              +-----------+
      ^                                          ^
      |                                          |
      |                                          |
      |        +------------------+              |
      +------->|   Tape           |<-------------+
               |   Drive          |
               |------------------|
               |   Controller     |
               |------------------|
               |   SMASH          |
               +------------------+
```

SMASH (4 CPU'S)

SMASH - 4 CPU Version

| CPU #1 | CPU #2 | CPU #3 | CPU #4 |

Tape Drive
Controller
SMASH
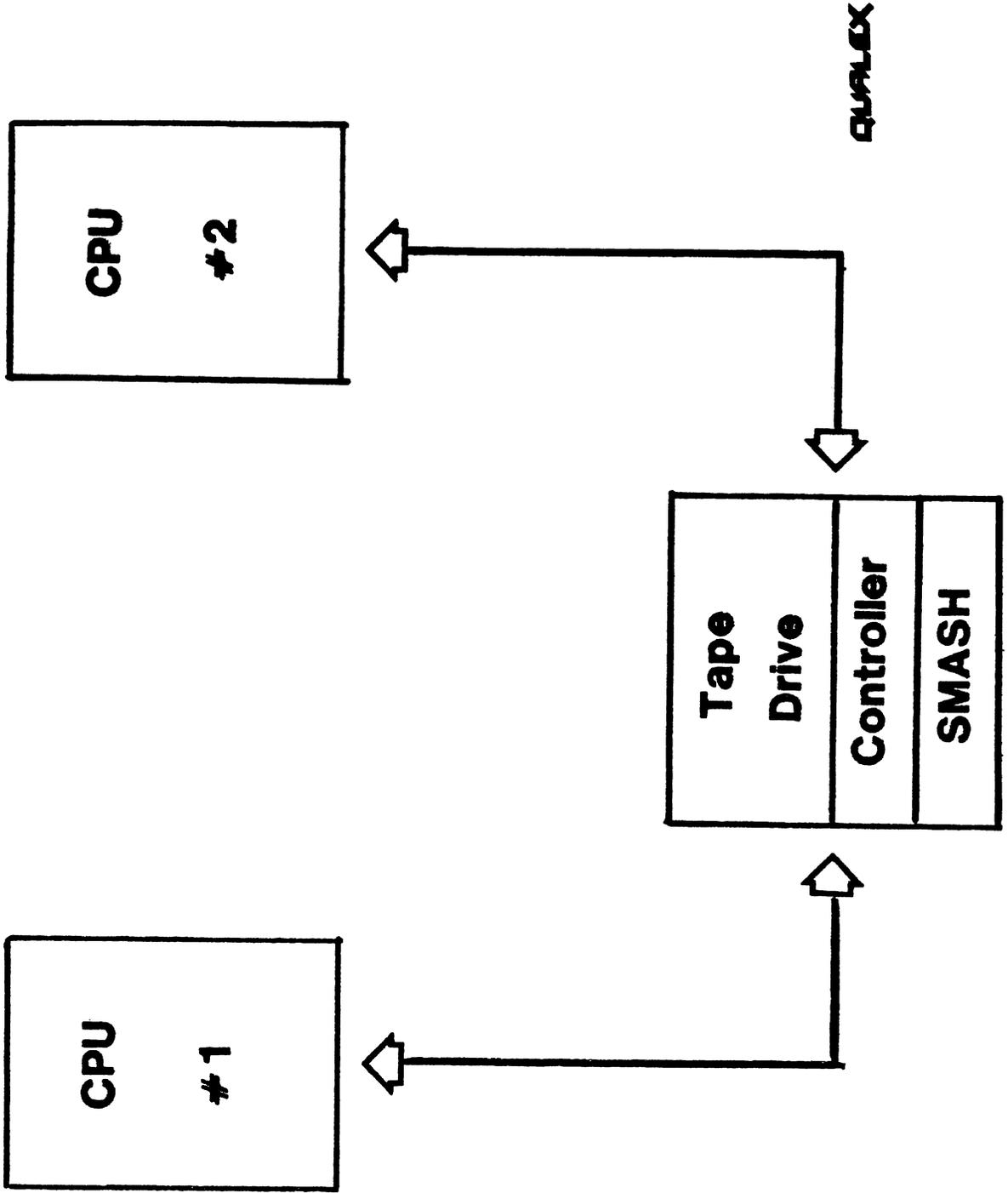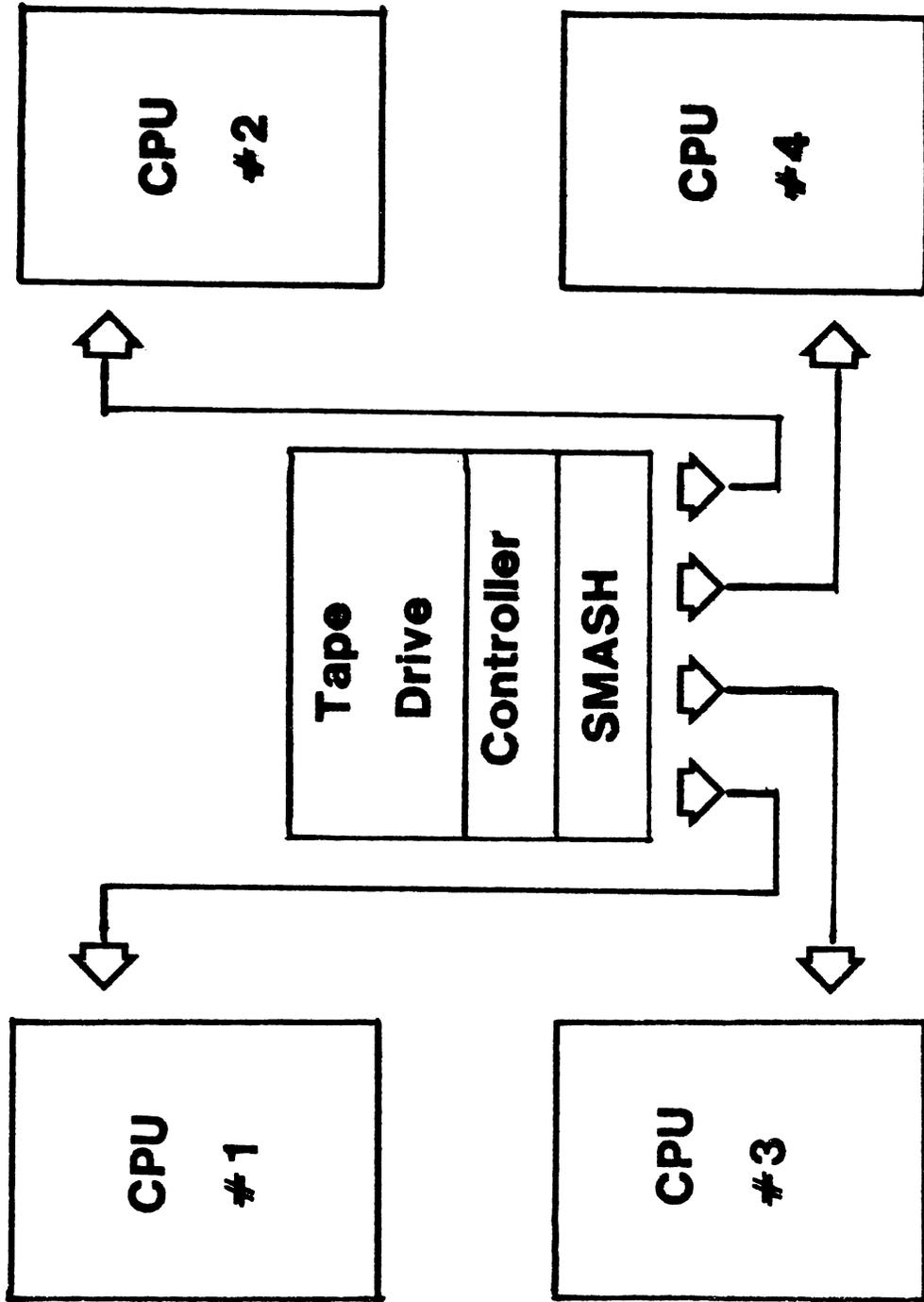
QUALEX

Note: CPU'S may be Series II, III or 44.

COST COMPARISON - SINGLE CPU SERIES III

QUALEX

COST COMPARISON

SINGLE SYSTEM on SERIES III

Qualex: $47,500

HP: $67,480

Savings: $19,980

COST COMPARISON - SINGLE CPU
SERIES 44

QUALEX

SINGLE SYSTEM on SERIES 44

QUALEX

Qualex: $44,500

HP: $52,250

Savings: $7,750

COST COMPARISON - TWO CPU'S SERIES III

QUALEX

COST COMPARISON – TWO CPU'S SERIES III

Series III – without SMASH

Qualex: $95,000

HP7976A: $134,960

Savings: $39,960

Series III – with SMASH

Qualex: $61,614

HP7976A: $134,960

Savings: $73,346

QUALEX

COST COMPARISON - TWO CPU'S
SERIES 44

QUALEX

COST COMPARISON – TWO CPU'S SERIES 44

Qualex – with SMASH: $61,614

HP7976A: $104,500

Savings: $42,886

QUALEX

COST COMPARISON - FOUR CPU'S
2 SERIES III
2 SERIES 44

QUALEX

COST COMPARISON – 4 CPU'S   (2–III, 2–44)

Qualex – with SMASH: $75,826

HP7976A: $239,460

Savings: $163,634

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