Worldwide Response Center

HP 3000 APPLICATION NOTE # 92

SUBNET

3000

HEWLETT PACKARD

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RESPONSE CENTER APPLICATION NOTES

HP 3000 APPLICATION NOTES *are published by the Worldwide Response Center twice a month and are distributed with the Software Status Bulletin. These notes address topics where the volume of calls received at the Center indicates a need for addition to or consolidation of information available through HP support services.*

Following this publication you will find a list of previously published notes and a Reader Comment Sheet. You may use the Reader Comment Sheet to comment on the note, suggest improvements or future topics, or to order back issues. We encourage you to return this form; we'd like to hear from you.

HP 3000 Application Note #92

SUBNET 3000

Introduction

SUBNETTING is a very useful topic however can be very confusing to initially understand. It is assummed that the reader has a basic understanding of IP addresses and how they are used in a network.

There are three (3) tables that give all subnets for the three (3) address classes. These tables are only for those netmasks using contiguous bits. Examining the tables, should help the reader when it comes time to apply subnetting within their own network.

This Application Note provides an overview to understanding subnetting it does not explain the history of it. There is one (1) case study that is subnetted using the needs of a fictitious company. Reasoning processes are explained to a limited degree.

Throughout this article, IP addresses are presented in *dot notation*. This is a decimal representation of an IP address. The 3000 format for IP addresses is a more human readable format. Therefore, the addresses of C 205.222.123 017 (HP 3000) is the same as 205.222.123.17 (dot notation).

More information concerning subnets can be obtained from the following sources:

Leffler, McKusick, Karels, Quarterman "The Design and Implementation of the 4.3BSD UNIX Operating System"

Stevens "UNIX NETWORK PROGRAMMING"

Comer, Stevens "Internetworking with TCP/IP volume 1"

COMMUNICATOR 3000 G.03.09 and COMMUNICATOR 3000/XL 2.1

RFC950: "Internet Standard Subnetting Procedure"

RFC940: "Toward an Internet Standard Scheme for Subnetting"

RFC917: "INTERNET SUBNETS"

RFC1020: "INTERNET NUMBERS"

RFC1122: "Requirements for Internet Hosts—Communication Layers"

Subnet addressing allows multiple physical networks to share a single IP network address.

This is accomplished by partitioning the address into multiple address spaces. Subnetting uses bits in the host (node) address portion of the IP address as subnet identifiers.

IP adresses are currently divided into five (5) classes (RFC1020). These classes are A, B, C, D and E. Class D is reserved for MULTICAST addresses and class E is reserved for future use. This article will only consider classes A, B, and C.

The difference between classes is the number of available hosts in each class. There are 32 bits to all IP addresses, each divided into four (4) groups of 8 bits (octets). Each octet is within the range from 0 to 255.

Figure 1 provides a breakdown of the IP address for each class of address.

```
FIG 1:

 CLASS A ADDRESS:

    +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
    |  NETWORK    |    HOST          NUMBER            PORTION   |
    |  PORTION    |                                              |
    +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+

       NETWORK PORTION range is 1-126
       number of available hosts is 16,777,214
       8 NETWORK bits; 24 HOST bits
       *per RFC1020 All of NETWORK 0 and 127 are reserved.

 CLASS B ADDRESS:

    +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
    |  NETWORK          PORTION    |    HOST          PORTION    |
    |                              |                             |
    +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+

       NETWORK PORTION range is 128.1 - 191.254
       number of available hosts is 65,534
       16 NETWORK bits; 16 HOST bits


 CLASS C ADDRESS:

    +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
    |  NETWORK         NUMBER          PORTION    |    HOST     |
    |                                             |    PORTION  |
    +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+

       NETWORK PORTION range is 192.0.1 - 223.255.254
       number of available hosts is 254
       24 NETWORK bits; 8 HOST bits
```

Although it is perfectly legal per the standard (RFC 950), to use any bit within the HOST NUMBER PORTION for subnetting, it is highly recommended that all bits used for subnetting be contiguous. It is further suggested that the bits start at the beginning of an octet (on a byte boundary) adjacent to the NETWORK PORTION of the IP address. All classes of IP addreses can be subnetted. The NETWORK PORTION is always masked out (network mask) and this is represented by 255's (BINARY 1's; HEX:F's) for each octet that composes the network IP portion.

A few terms are needed to better understand this subnet concept and how to use it properly. These are:

```
NETWORK MASK: The bits which are used to mask out the network number
              portion of the IP address. This mask is class specific.

                ex: CLASS C NETWORK MASK is 255.255.255.0

    SUBNET FIELD: Indicates the bits in the IP address used to identify
                  the subnet number.

                ex: CLASS C NETWORK using 4 subnet bits is 0.0.0.240

    NETMASK:      The complete mask. This is the NETWORK MASK + SUBNET MASK.

                ex: USING our 2 above examples is: 255.255.255.240

    SUBNET:       Logically visible sub-sections of a single IP network
                  address resulting from masking the assigned network IP
                  address and the NETMASK.
```

The term NETMASK is the same as the term SUBNET MASK when used in actual practice.

A few rules should be applied:

```
1: All SUBNETS within the same network should use the same NETMASK.

2: The SUBNET MASK should start adjacent to the NETWORK IP address.

3: The SUBNET MASK bits should all be contiguous.
```

Subnetting is applied by actually combining the IP address with the NETMASK (SUBNET MASK) by performing a logical AND. A LOGICAL AND is performed according to the rules where 1+1=1, 1+0=0, 0+0=0.

LOGICAL AND

```
 1 0
 +-+-+
1|1|0|
 +-+-+
0|0|0|
 +-+-+
```

This gives us a new network (SUBNET) address for the node. Thus to know which nodes (hosts) are on the same network, the IP address for that node plus the NETMASK for the node (same as that for all nodes in the network) needs to be known.

The following example applies the idea of LOGICAL AND to find out the SUBNET on which the node is on.

```
EXAMPLE:
                   CLASS C ADDRESS: 192.200.201.122
                   NETMASK OF:      255.255.255.224

         +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
IP addr  |1 1 0 0 0 0 0 0|1 1 0 0 1 0 0 0|1 1 0 0 1 0 0 1|0 1 1 1 1 0 1 0|
Mask     |1 1 1 1 1 1 1 1|1 1 1 1 1 1 1 1|1 1 1 1 1 1 1 1|1 1 1 0 0 0 0 0|
         +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
LOG AND  |1 1 0 0 0 0 0 0|1 1 0 0 1 0 0 0|1 1 0 0 1 0 0 1|0 1 1 0 0 0 0 0|
         +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```

The SUBNET is the result of the LOGICAL AND, therefore in decimal format, the subnet address is 192.200.201.96 (11000000.11001000.11001001.01100000).

From above, it can be observed that a LOGICAL AND of a value (x) with 255 results in the value (x). This is because 1+1=1 and any thing else is 0.

Now, to determine which host addresses are on the same SUBNET as this host, the HOST bits need to be turned all on (1's) and all off (0's).

```
               192             200             201             96
         +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
SUBNET   |1 1 0 0 0 0 0 0|1 1 0 0 1 0 0 0|1 1 0 0 1 0 0 1|0 1 1 0 0 0 0 0|
         +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
                                                            - - - - -
                                                            | | | | |
                                             HOST BITS ALL OFF----+-+-+


               192             200             201             127
         +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
SUBNET   |1 1 0 0 0 0 0 0|1 1 0 0 1 0 0 0|1 1 0 0 1 0 0 1|0 1 1 1 1 1 1 1|
         +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
                                                            - - - - -
                                                            | | | | |
                                             HOST BITS ALL ON +-+-+-+-+
```

This indicates that the SUBNET RANGE is 192.200.201.96 - 192.200.201.127. Host address of all 0's and all 1's are reserved so the valid HOSTS on this SUBNET are within the range of 192.200.201.97 - 192.200.201.126. Thus there are 30 HOSTS on this subnet. There are 30 hosts on all subnets of the netmask 255.255.255.224.

The subnets for a netmask are determined working with the subnet field bits (those that extend into the host address part for that IP class). In our example of 255.255.255.224, there is a network mask of 255.255.255.0 since this is a class C address, and a subnet field of 0.0.0.224. To determine the subnets, the 224 portion (SUBNET FIELD) is represented in its binary form and the bits are turned off(0) and on(1) to give all combinations.

For example:

```
    1 1 1 0 0 0 0 0 = 224  there are 3 SUBNET FIELD BITS and 5 HOST BITS.
    - - - * * * * *
   SUBNET| HOST BITS
   FIELD |                There are 2^3-2 (6) subnets and 2^5-2 (30) hosts.
```

The subnets and their ranges for the the NETMASK of 255.255.255.224 are:

SUBNET FIELD	SUBNET RANGE
0 0 0 0 0 0 0 0 (0)	NOT VALID RANGE: NO HOSTS ALLOWED (RFC 1122)
0 0 1 0 0 0 0 0 (32)	0 0 1 0 0 0 0 0 (32) - 0 0 1 1 1 1 1 1 (63)
0 1 0 0 0 0 0 0 (64)	0 1 0 0 0 0 0 0 (64) - 0 1 0 1 1 1 1 1 (95)
	* * * * * 5 HOST BITS(*)
0 1 1 0 0 0 0 0 (96)	0 1 1 0 0 0 0 0 (96) - 0 1 1 1 1 1 1 1 (127)
1 0 0 0 0 0 0 0 (128)	1 0 0 0 0 0 0 0 (128)- 1 0 0 1 1 1 1 1 (159)
1 0 1 0 0 0 0 0 (160)	1 0 1 0 0 0 0 0 (160)- 1 0 1 1 1 1 1 1 (191)
1 1 0 0 0 0 0 0 (192)	1 1 0 0 0 0 0 0 (192)- 1 1 0 1 1 1 1 1 (223)
1 1 1 0 0 0 0 0 (224)	NOT VALID RANGE: NO HOSTS ALLOWED (RFC 1122)

From RFC 1122 (Requirements for Internet Hosts) Sec 3.2.1.3, Page 31:
IP addresses are not permitted to have the value 0 or -1 for any of the <Host-number>, <Network-number>, or <Subnet-number> fields (except in the special cases listed above).

-1 as used in RFC 1122 is shorthand for all 1's. The special cases refer to types of broadcasts. This indicates that the 0 subnet and 224 subnet in the above example are not legal and can not have hosts assigned in their ranges (as shown above).

To give an example of how subnetting can be applied to a network, a fictitious case study will be considered.

CASE STUDY:

There are 5 sites in this company. Each site has a lan network with a maximum of 8 hosts on it and a X.25 network to connect them together. In addition all sites have PT-to-PT links which are used for backup purposes in case 1 site get isolated from the X.25 network.

- Each LAN network is considered a unique network; 5 network IP's needed.
- The X.25 network is considered 1 network; 1 network IP needed.
- The PT-to-PT network is considered 1 network although it could be considered as 5 unique networks; 1 network IP is needed.

MAP SCHEMATIC:

```
    PT to PT----|SITE A |----{X.25        X.25}----|SITE C |----PT to PT
                |                                  |
           ---LAN------                       ---LAN------

    PT to PT----|SITE B |----{X.25        X.25}----|SITE D |----PT to PT
                |                                  |
           ---LAN------                       ---LAN------

                    PT to PT----|SITE E |----{X.25
                                |
                           ---LAN------
```

This company has been assigned a CLASS C address of 205.222.123.0 . We need to have 7 SUBNETS with at least 8 HOSTS in each subnet. It is desired to have room for expansion so that we will not have to change our NETMASK in the near future.

The number of SUBNET FIELD BITS can be found by solving the equation: 2^n - 2 > 7. Brute force methods yield that n must be 4 or greater. Our HOST requirement is at least 8. Solving a similar equation : 2^n - 2 > 8 and applying Brute force techniques again, it is discovered that 4 or greater host bits are needed. Thus the solution to our search for a NETMASK must have 4 subnet field bits and 4 host bits which fits into our 8 bit octet.

Knowing that our NETMASK is obtained by adding the NETWORK MASK to the SUBNET FIELD:

<NETWORK MASK>+<SUBNET FIELD>=NETMASK

we can start building the NETMASK. The NETWORK MASK for all CLASS C addresses must be 255.255.255.0 and the SUBNET FIELD (for this case) is composed of 4 bits. This is represented as:

```
1 1 1 1 0 0 0 0    | 4 SUBNET FIELD BITS; 4 HOST BITS

In decimal form, this is 240. Thus our NETMASK is 255.255.255.240 .
In binary form this is presented as:

         +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
NETMASK  |1 1 1 1 1 1 1 1|1 1 1 1 1 1 1 1|1 1 1 1 1 1 1 1|1 1 1 1 0 0 0 0|
         +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
                255             255             255             240

This NETMASK will allow us to have 14 (2^4-2) SUBNETS with 14 (2^4-2) HOSTS
per SUBNET. We will find the 7 subnets (that we need) and their associated
ranges.

SUBNET FIELD:  1 1 1 1 0 0 0 0

SUBNET 1:
  0 0 0 1 0 0 0 0  (16) range thru  0 0 0 1 1 1 1 1  (31)
  HOST IP ADDRESSES ON THIS SUBNET: 205.222.123.17 thru 205.222.123.30
```

```
SUBNET 2:
  0 0 1 0 0 0 0 0  (32) range thru  0 0 1 0 1 1 1 1  (47)
  HOST IP ADDRESSES ON THIS SUBNET: 205.222.123.33 thru 205.222.123.46

SUBNET 3:
  0 0 1 1 0 0 0 0  (48) range thru  0 0 1 1 1 1 1 1  (63)
  HOST IP ADDRESSES ON THIS SUBNET: 205.222.123.49 thru 205.222.123.62

SUBNET 4:
  0 1 0 0 0 0 0 0  (64) range thru  0 1 0 0 1 1 1 1  (79)
  HOST IP ADDRESSES ON THIS SUBNET: 205.222.123.65 thru 205.222.123.78

SUBNET 5:
  0 1 0 1 0 0 0 0  (80) range thru  0 1 0 1 1 1 1 1  (95)
  HOST IP ADDRESSES ON THIS SUBNET: 205.222.123.81 thru 205.222.123.94

SUBNET 6:
  0 1 1 0 0 0 0 0  (96) range thru  0 1 1 0 1 1 1 1 (111)
  HOST IP ADDRESSES ON THIS SUBNET: 205.222.123.97 thru 205.222.123.110

SUBNET 7:
  0 1 1 1 0 0 0 0 (112) range thru  0 1 1 1 1 1 1 1 (127)
  HOST IP ADDRESSES ON THIS SUBNET: 205.222.123.113 thru 205.222.123.126

Now we can assign these IP ranges for the LAN's at the different sites.

  SITE A: use 205.222.123.17 thru 205.222.123.30
  SITE B: use 205.222.123.33 thru 205.222.123.46
  SITE C: use 205.222.123.49 thru 205.222.123.62
  SITE D: use 205.222.123.65 thru 205.222.123.79
  SITE E: use 205.222.123.81 thru 205.222.123.94


   For X.25 NETWORK use 205.222.123.96 thru 205.222.123.111

   For PT to PT use 205.222.123.113 thru 205.222.123.126
```

On the HP 3000's, each system needs to have the NETMASK entered on the NETXPORT.NI.niname.PROTOCOL.IP screen (this will be used for all hosts on its NI). To reach hosts that are on a different NI, subnet gateways will need to be configured. These are hosts on different subnets. The screen NETXPORT.NI.niname.INTERNET.gatename is used to configure this information.

The configuration for NODEA on SITEA is done as an example.

The LAN IP address is 205.222.123 017. The X25 IP address is 205.222.123 096 and the PT/PT IP address is 205.222.123 113.

Reachable networks are configured in the INTERNET CONFIGURATION.

Attached is the CRITICAL SUMMARY of NODEA.

For the HP 3000 example we will consider site A. There will be 2 configuration templates: 1 for the GATEWAY NODE and 1 for the LEAFNODES.

MAP with IP addresses assigned:

```
GATEWAY NODES:
               SITEA: lan:    205.222.123.17
                      X.25:   205.222.123.96
                      PT/PT:  205.222.123.113

               SITEB: lan:    205.222.123.33
                      X.25:   205.222.123.97
                      PT/PT:  205.222.123.114

               SITEC: lan:    205.222.123.49
                      X.25:   205.222.123.98
                      PT/PT:  205.222.123.115

               SITED: lan:    205.222.123.65
                      X.25:   205.222.123.99
                      PT/PT:  205.222.123.116

               SITEE: lan:    205.222.123.81
                      X.25:   205.222.123.100
                      PT/PT:  205.222.123.117

LEAF NODE AT SITE A:

                      lan:    205.222.123.18
                      there is no X.25 or PT/PT on leaf nodes

SITE A : GATEWAY CONFIGURATION

  * You need to define reachable lan networks through the X.25 interface.

<INTERNET CONFIGURATION:>

  NEIGHBOR GATEWAY NAME: NODEBGATE   IPADDRESS: 205.222.123.97
  REACHABLE IP NETWORK: 205.222.123.32
  NETWORK MASK: 255.255.255.240
  HOPS: 1

  NEIGHBOR GATEWAY NAME: NODECGATE   IPADDRESS: 205.222.123.98
  REACHABLE IP NETWORK: 205.222.123.48
  NETWORK MASK: 255.255.255.240
  HOPS: 1

  NEIGHBOR GATEWAY NAME: NODEDGATE   IPADDRESS: 205.222.123.99
  REACHABLE IP NETWORK: 205.222.123.64
  NETWORK MASK: 255.255.255.240
  HOPS: 1

  NEIGHBOR GATEWAY NAME: NODEEGATE   IPADDRESS: 205.222.123.100
  REACHABLE IP NETWORK: 205.222.123.80
```

```
NETWORK MASK: 255.255.255.240
HOPS: 1
```

Note The REACHABLE IP ADDRESSES are the SUBNET upon which the lan we desire to connect to resides on. So the entry here is the SUBNET which we are trying to reach.

```
SITE A LEAFNODE CONFIGURATION:

 <INTERNET CONFIGURATION>

   NEIGHBOR GATEWAY NAME: NODEAGATE  IPADDRESS: 205.222.123.17
   REACHABLE IP NETWORK          NETMASK               HOPS
    205.222.123.32                255.255.255.240        2
    205.222.123.48                255.255.255.240        2
    205.222.123.64                255.255.255.240        2
    205.222.123.80                255.255.255.240        2
```

A similar process can be gone through for the pt/pt network, but our intention of having the PT/PT option is for emergency uses only (when X.25 connectivity is lost). In this network the PT/PT connection is to be used to connect the gateway host to the rest of the network and is thus not convenient (by choice).

TABLES:

CLASS A ADDRESS: 8 NETWORK BITS 24 HOST BITS

# BITS (contiguous)	NETMASK	# SUBNETS	# HOSTS PER SUBNET
2	255.192.0.0	2	4,194,302
3	255.224.0.0	6	2,097,150
4	255.240.0.0	14	1,048,574
5	255.248.0.0	30	524,286
6	255.252.0.0	62	262,142
7	255.254.0.0	126	130,070
8	255.255.0.0	254	65,534
9	255.255.128.0	510	32,766
10	255.255.192.0	1,022	16,382
11	255.255.224.0	2,046	8,190
12	255.255.240.0	4,094	4,094
13	255.255.248.0	8,190	2,046
14	255.255.252.0	16,382	1,022
15	255.255.254.0	32,766	510
16	255.255.255.0	65,534	254
17	255.255.255.128	131,070	126
18	255.255.255.192	262,142	62
19	255.255.255.224	524,286	30
20	255.255.255.240	1,048,574	14
21	255.255.255.248	2,097,150	6
22	255.255.255.252	4,194,302	2

CLASS B ADDRESS: 16 NETWORK BITS 16 HOST BITS

# BITS (contiguous)	NETMASK	# SUBNETS	# HOSTS PER SUBNET
2	255.255.192.0	2	16,382
3	255.255.224.0	6	8,190
4	255.255.240.0	14	4,090
5	255.255.248.0	30	2,046
6	255.255.252.0	62	1,022
7	255.255.254.0	126	510
8	255.255.255.0	254	254
9	255.255.255.128	510	126
10	255.255.255.192	1,022	62
11	255.255.255.224	2,046	30
12	255.255.255.240	4,094	14
13	255.255.255.248	8,190	6
14	255.255.255.252	16,382	2

CLASS C ADDRESS: 24 NETWORK BITS 8 HOST BITS

# BITS (contiguous)	NETMASK	# SUBNETS	# HOSTS PER SUBNET
2	255.255.255.192	2	62
3	255.255.255.224	6	30
4	255.255.255.240	14	14
5	255.255.255.248	30	6
6	255.255.255.252	62	2

Published Application Notes

HP 3000

Following is a list of the Application Notes published to date. If you would like to order single copies of back issues please use the *Request Form* attached and indicate the number(s) of the note(s) you need, and the part number(s).

Note #	Part Number	Topic
1	5958-5824	Printer Configuration Guide - Version 1
2	5960-2841	Terminal types for HP 3000 HPIB Computers - Version 1
3	5960-2842	Plotter Configuration Guide
4	5960-2843	Printer Configuration Guide - Version 2
5	5960-2844	MPE System Logfile Record Formats
6	5960-2845	Stack Operation
7	5960-2846	COBOL II/3000 Programs: Tracing Illegal Data
8	5960-2847	KSAM Topics: COBOL's Index I/O: File Data Integrity
9	5960-2848	Port Failures, Terminal Hangs, TERMDSM
10	5960-2849	Serial Printers - Configuration, Cabling, Muxes
11	5960-2850	System Configuration or System Table Related Errors
12	5960-2851	Pascal 3000 - Using Dynamic Variables
13	5960-2852	Terminal Types for HP 3000 HPIB Computers - Version 2
14	5960-2853	Laser Printers - A Software and Hardware Overview
15	5960-2854	FORTRAN Language Considerations - A Guide to Common Problems
16	5960-2855	IMAGE: Updating to TurboIMAGE & Improving Database Loads
17	5960-2856	Optimizing VPLUS Utilization
18	5960-2857	The Case of the Suspect Track for 792X Disc Drives
19	5960-2858	Stack Overflows: Causes & Cures for COBOL II Programs
20	5960-2859	Output Spooling
21	5960-2860	COBOLII and MPE Intrinsics
22	5960-2861	Asynchronous Modems

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Note #	Part Number	Topic
23	5960-2862	VFC Files
24	5960-2863	Private Volumes
25	5960-2864	TurboIMAGE: Transaction Logging
26	5960-2865	HP 2680A, 2688A Error Trailers
27	5960-2866	HP Trend: An Installation and Problem Solving Guide
28	5960-2867	The Startup State Configurator
29	5960-2868	A Programmer's Guide to VPLUS 3000
30	5960-2869	Disc Cache
31	5960-2870	Calling the CREATEPROCESS Intrinsic
32	5960-2871	Configuring Terminal Buffers
33	5960-2872	Printer Configuration Guide - Version 3
34A	5960-2873	RIN Management (Using COBOLII Examples) (A)
34B	5960-2874	Process Handling (Using COBOLII Examples) (B)
35	5960-2875	HPDESK IV (Script files, FSC, and Installation Considerations)
34C	5960-2876	Extra Data Segments (Using COBOLII Examples) (C)
36	5960-2877	Tips for the DESK IV Administrators
37	5960-2878	AUTOINST: Trouble-free Updates
38	5960-2879	Store/Restore Errors
39	5960-2880	MRJE Emulates a HASP Workstation
40	5960-2881	HP 250 / 260 to HP 3000 Communications Guidelines
41	5960-2882	MPE File Label Revealed
42	5960-2883	System Interrupts
43	5960-2884	Run Time Aborts
44	5960-2885	HPPA Patching Conventions for HP3000 900 Series Processors - Version 1
45	5960-2886	Vplus & Multiplexers
46	5960-2887	Setting Up an HPDesk HPTelex for the First Time
47	5960-2900	Customizing Database Data Items & Changing Passwords in JCL Files
48	5959-9215	Printer Configuration - Version 4
49	5959-9227	Configuring DATACOMM Products Into MPE
50	5959-9228	VFC's for Serial Printers

Note #	Part Number	Topic
51	5959-9237	Terminal Types for the HP 3000 HPIB Computers
52	5959-9242	Configuring MRJE
53	5959-9245	Using Special Characters on the 700/9x Series Terminals
54	5959-9251	Improving Database Performance
55	5959-9258	Customized Message Catalogs and Help Facilities
56	5959-9266	BRW Tips for Beginners
57	5959-9270	Configuring the HP 2334A Plus & HP 2335A As a Statistical Multiplexer
58	5959-9274	HPPA Pathing Conventions for HP3000 900 Series Processors - Version 2
59	5959-9289	HP 2334A and HP 2334A Configuration Recipes
60	5959-9301	TurboIMAGE's I-FILES and J-FILES
61	5959-7385	HPDeskManager - Looking Behind the Scenes
62	5959-7803	Setting Up a System Dictionary
63	5959-7834	Configuring Telesupport Modems for MPE V/E Systems
64	5960-1816	Finding Solutions in HP SupportLine
65	5960-1817	Using the Electronic Call Feature of HP SupportLine
66	5960-1818	Using the Feedback Feature of HP SupportLine
67	5960-1819	Printing Documents from HP SupportLine
68	5960-1820	HP SupportLine Commands
69	5960-2901	Nonsystem Volume Sets and the Migration of Private Volumes to an S9000 HP 3000
70	5960-2907	Modem Links for Remote Console and Standard DTC Connection s on Commercial XL HPPA Systems
71	5960-2918	Asynchronous Cabling
72	5960-2919	BRW Tips and Tricks
73	5960-2998	SNA NRJE Configuration
74	5960-2999	SNA IMF Configuration
75	5060-3000	XL NRJE Configuration

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Note #	Part Number	Topic
76	5960-4301	XL IMF Configuration
77	5960-4302	Calling the BRW Intrinsics
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