

## IP Addressing Guide

Class A first octet range 1 – 127*	(Network 127 is reserved for loopback and internal testing)	Leading bit pattern	0
Class B first octet range 128 – 191		Leading bit pattern	10
Class C first octet range 192 – 223		Leading bit pattern	110
Class D first octet range 224 – 239	(Reserved for multicast)	Leading bit pattern	1110
Class E first octet range 240 – 255	(Reserved for experimental, used for research)	Leading bit pattern	11110

### Maximum number of unique addresses in each class

Class A  $2^7 - 2 = 126$                       Class B  $2^{14} - 2 = 16,382$                       Class C  $2^{21} - 2 = 2,097,150$

### Formulas to determine the number of subnets or hosts created by borrowing from the host portion of the address

**M** = the number of bits borrowed (Masked)                      **U** = the number of bits remaining or not borrowed (Unmasked)

$2^M$  = Total # of subnets created                       $2^U$  = Total # of host on each subnets

$2^M - 2$  = Useable # of subnet created                       $2^U - 2$  = Useable # of host on each subnet

Class A License						Class B License					
N.H.H.H						N.N.H.H					
# of Bits Borrowed	Subnet Mask	Total # Subnets	Useable # Subnets	Total # Hosts	Useable # Hosts	# of Bits Borrowed	Subnet Mask	Total # Subnets	Useable # Subnets	Total # Hosts	Useable # Hosts
2	255.192.0.0	4	2	4,194,304	4,194,302	2	255.255.192.0	4	2	16,384	16,382
3	255.224.0.0	8	6	2,097,152	2,097,150	3	255.255.224.0	8	6	8,192	8,190
4	255.240.0.0	16	14	1,048,576	1,048,574	4	255.255.240.0	16	14	4,096	4,094
5	255.248.0.0	32	30	524,288	524,286	5	255.255.248.0	32	30	2,048	2,046
6	255.252.0.0	64	62	262,144	262,142	6	255.255.252.0	64	62	1,024	1,022
7	255.254.0.0	128	126	131,072	131,070	7	255.255.254.0	128	126	512	510
8	255.255.0.0	256	254	65,536	65,534	8	255.255.255.0	256	254	256	254
9	255.255.128.0	512	510	32,768	32,766	9	255.255.255.128	512	510	128	126
10	255.255.192.0	1,024	1,022	16,384	16,382	10	255.255.255.192	1,024	1,022	64	62
11	255.255.224.0	2,048	2,046	8,192	8,190	11	255.255.255.224	2,048	2,046	32	30
12	255.255.240.0	4,096	4,094	4,096	4,094	12	255.255.255.240	4,096	4,094	16	14
13	255.255.248.0	8,192	8,190	2,048	2,046	13	255.255.255.248	8,192	8,190	8	6
14	255.255.252.0	16,384	16,382	1,024	1,022	14	255.255.255.252	16,384	16,382	4	2
15	255.255.254.0	32,768	32,766	512	510						
16	255.255.255.0	65,536	65,534	256	254						
Class C License						N.N.N.H					
# of Bits Borrowed	Subnet Mask	Total # Subnets	Useable # Subnets	Total # Hosts	Useable # Hosts	# of Bits Borrowed	Subnet Mask	Total # Subnets	Useable # Subnets	Total # Hosts	Useable # Hosts
2	255.255.255.192	4	2	64	62	2	255.255.255.192	4	2	64	62
3	255.255.255.224	8	6	32	30	3	255.255.255.224	8	6	32	30
4	255.255.255.240	16	14	16	14	4	255.255.255.240	16	14	16	14
5	255.255.255.248	32	30	8	6	5	255.255.255.248	32	30	8	6
6	255.255.255.252	64	62	4	2	6	255.255.255.252	64	62	4	2

**NOTE:** You must borrow at least 2 bits and you must leave at least 2 bits.