

Technical Notes

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1. Introduction

This manual contains technical data that will aid in using the NET232 product but is not required in the user manual.

2. Binary to Hex Conversion

Many of the Device Server's configuration procedures require you to assemble a series of options (represented as bits) into a complete command (represented as a byte). The resulting binary value must be converted to a hexadecimal representation.

Hexadecimal digits have values ranging from 0 to F, which are represented as 0-9, A (for 10), B (for 11), etc. To convert a binary value (for example, 0010 0011) to a hexadecimal representation, the upper and lower four bits are treated separately, resulting in a two-digit hexadecimal number (in this case, 4C).

Use the following table to convert values from binary to hexadecimal.

Table 1 - Binary to Hexadecimal Conversion Table

Decimal	Binary	Hex
0	0000	0
1	0001	1
2	0010	2
3	0011	3
4	0100	4
5	0101	5
6	0110	6
7	0111	7
8	1000	8
9	1001	9
10	1010	A
11	1011	B
12	1100	C
13	1101	D
14	1110	E
15	1111	F

2.1 Connect Mode Options

Note: Character response codes are C=connect, D=disconnect, N=unreachable

In the NET232 User manual, the binary bit fields for options in connect mode, disconnect mode, flush mode, interface mode, and pack control mode are described in detail. The following pages are a summary of the possible hexadecimal entries for each of these options.

Table 2 - Connect Mode Options

Accept Incoming Connections	Serial Response Upon Connection	Active Connection Startup	Hostlist	Hex
Never	None (quiet)	No active startup		N/A
Never	None (quiet)	Any character		1
Never	None (quiet)	Active DTR		2
Never	None (quiet)	CR (0x0D)		3
Never	None (quiet)	Manual connection		4
Never	None (quiet)	Autostart		5
Never	None (quiet)	UDP		C
Never	Character	No active startup		10
Never	Character	Any character		11
Never	Character	Active DTR		12
Never	Character	CR (0x0D)		13
Never	Character	Manual connection		14
Never	Character	Autostart		15
Never	Character	UDP		1C
With DTR	None (quiet)	No active startup		40
With DTR	None (quiet)	Any character		41
With DTR	None (quiet)	Active DTR		42
With DTR	None (quiet)	CR (0x0D)		43
With DTR	None (quiet)	Manual connection		44
With DTR	None (quiet)	Autostart		45
With DTR	None (quiet)	UDP		4C
With DTR	Character	No active startup		50
With DTR	Character	Any character		51
With DTR	Character	Active DTR		52
With DTR	Character	CR (0x0D)		53
With DTR	Character	Manual connection		54
With DTR	Character	Autostart		55
With DTR	Character	UDP		N/A
Unconditionally	None (quiet)	No active startup		C0
Unconditionally	None (quiet)	Any character		C1
Unconditionally	None (quiet)	Active DTR		C2
Unconditionally	None (quiet)	CR (0x0D)		C3
Unconditionally	None (quiet)	Manual connection		C4
Unconditionally	None (quiet)	Autostart		C5
Unconditionally	None (quiet)	UDP		CC
Unconditionally	Character	No active startup		D0
Unconditionally	Character	Any character		D1
Unconditionally	Character	Active DTR		D2
Unconditionally	Character	CR (0x0D)		D3
Unconditionally	Character	Manual connection		D4
Unconditionally	Character	Autostart		D5
Unconditionally	Character	UDP		DC

Accept Incoming Connections	Serial Response Upon Connection	Active Connection Startup	Hostlist	Hex
Never	None (quiet)	No active startup	Hostlist	N/A
Never	None (quiet)	Any character	Hostlist	21
Never	None (quiet)	Active DTR	Hostlist	22
Never	None (quiet)	CR (0x0D)	Hostlist	23
Never	None (quiet)	Manual connection	Hostlist	N/A
Never	None (quiet)	Autostart	Hostlist	25
Never	None (quiet)	UDP	Hostlist	
Never	Character	No active startup	Hostlist	N/A
Never	Character	Any character	Hostlist	31
Never	Character	Active DTR	Hostlist	32
Never	Character	CR (0x0D)	Hostlist	33
Never	Character	Manual connection	Hostlist	N/A
Never	Character	Autostart	Hostlist	35
Never	Character	UDP	Hostlist	N/A
With DTR	None (quiet)	No active startup	Hostlist	N/A
With DTR	None (quiet)	Any character	Hostlist	61
With DTR	None (quiet)	Active DTR	Hostlist	62
With DTR	None (quiet)	CR (0x0D)	Hostlist	63
With DTR	None (quiet)	Manual connection	Hostlist	N/A
With DTR	None (quiet)	Autostart	Hostlist	65
With DTR	None (quiet)	UDP	Hostlist	N/A
With DTR	Character	No active startup	Hostlist	N/A
With DTR	Character	Any character	Hostlist	71
With DTR	Character	Active DTR	Hostlist	72
With DTR	Character	CR (0x0D)	Hostlist	73
With DTR	Character	Manual connection	Hostlist	N/A
With DTR	Character	Autostart	Hostlist	75
With DTR	Character	UDP	Hostlist	N/A
Unconditionally	None (quiet)	No active startup	Hostlist	N/A
Unconditionally	None (quiet)	Any character	Hostlist	E1
Unconditionally	None (quiet)	Active DTR	Hostlist	E2
Unconditionally	None (quiet)	CR (0x0D)	Hostlist	E3
Unconditionally	None (quiet)	Manual connection	Hostlist	N/A
Unconditionally	None (quiet)	Autostart	Hostlist	E5
Unconditionally	None (quiet)	UDP	Hostlist	N/A
Unconditionally	Character	No active startup	Hostlist	N/A
Unconditionally	Character	Any character	Hostlist	F1
Unconditionally	Character	Active DTR	Hostlist	F2
Unconditionally	Character	CR (0x0D)	Hostlist	F3
Unconditionally	Character	Manual connection	Hostlist	N/A
Unconditionally	Character	Autostart	Hostlist	F5
Unconditionally	Character	UDP	Hostlist	N/A

The following connect mode options are for when you use modem emulation:

Table 3 - Connect Mode Options for Modem Emulation

Accept Incoming Connections	Response	Hex
Never	Echo	16
Never	Without echo	6
Never	1-character response	7
With DTR	Echo	56
With DTR	Without echo	46
With DTR	1-character response	47
Unconditionally	Echo	D6
Unconditionally	Without echo	C6
Unconditionally	1-character response	C7

2.2 Disconnect Mode Options

Table 4 - Disconnect Mode Options

Disconnect with DTR Drop	Telnet Mode and Terminal Type Setup	Channel (port) Password	Hard Disconnect	State LED Off with Connection	Disconnect with EOT (^D)	Hex
			Enable			0
		Enable	Enable			10
			Enable		Enable	20
		Enable	Enable		Enable	30
	Enable		Enable			40
	Enable	Enable	Enable			50
	Enable		Enable		Enable	60
	Enable	Enable	Enable		Enable	70
Enable			Enable			80
Enable		Enable	Enable			90
Enable			Enable		Enable	A0
Enable		Enable	Enable		Enable	B0
Enable	Enable		Enable			C0
Enable	Enable	Enable	Enable			D0
Enable	Enable		Enable		Enable	E0
Enable	Enable	Enable	Enable		Enable	F0
			Enable	Enable		1
		Enable	Enable	Enable		11
			Enable	Enable	Enable	21
		Enable	Enable	Enable	Enable	31
	Enable		Enable	Enable		41
	Enable	Enable	Enable	Enable		51
	Enable		Enable	Enable	Enable	61
	Enable	Enable	Enable	Enable	Enable	71
Enable			Enable	Enable		81
Enable		Enable	Enable	Enable		91
Enable			Enable	Enable	Enable	A1
Enable		Enable	Enable	Enable	Enable	B1
Enable	Enable		Enable	Enable		C1
Enable	Enable	Enable	Enable	Enable		D1
Enable	Enable		Enable	Enable	Enable	E1
Enable	Enable	Enable	Enable	Enable	Enable	F1
			Disable			8
		Enable	Disable			18
			Disable		Enable	28
		Enable	Disable		Enable	38
	Enable		Disable			48
	Enable	Enable	Disable			58
	Enable		Disable		Enable	68
	Enable	Enable	Disable		Enable	78

Disconnect with DTR Drop	Telnet Mode and Terminal Type Setup	Channel (port) Password	Hard Disconnect	State LED Off with Connection	Disconnect with EOT (^D)	Hex
Enable			Disable			88
Enable		Enable	Disable			98
Enable			Disable		Enable	A8
Enable		Enable	Disable		Enable	B8
Enable	Enable		Disable			C8
Enable	Enable	Enable	Disable			D8
Enable	Enable		Disable		Enable	E8
Enable	Enable	Enable	Disable		Enable	F8
			Disable	Enable		9
		Enable	Disable	Enable		19
			Disable	Enable	Enable	29
		Enable	Disable	Enable	Enable	39
	Enable		Disable	Enable		49
	Enable	Enable	Disable	Enable		59
	Enable		Disable	Enable	Enable	69
	Enable	Enable	Disable	Enable	Enable	79
Enable			Disable	Enable		89
Enable		Enable	Disable	Enable	Enable	99
Enable			Disable	Enable	Enable	A9
Enable		Enable	Disable	Enable	Enable	B9
Enable	Enable		Disable	Enable		C9
Enable	Enable	Enable	Disable	Enable		D9
Enable	Enable		Disable	Enable	Enable	E9
Enable	Enable	Enable	Disable	Enable	Enable	F9

2.3 Flush Mode (Buffer Flushing) Options

Table 5 - Flush Mode Options

Serial to Network Clear input buffer upon:	Network to Serial Clear output buffer upon:	Alternate Packing Algorithm	Hex
None			0
Active connection			10
Passive connection			20
Active connection Passive connection			30
Disconnect			40
Active connection Disconnect			50
Passive connection Disconnect			60
Active connection Passive connection Disconnect			70
		Enable	80
Active connection		Enable	90
Passive connection		Enable	A0
Active connection Passive connection		Enable	B0
Disconnect		Enable	C0
Active connection Disconnect		Enable	D0
Passive connection Disconnect		Enable	E0
Active connection Passive connection Disconnect		Enable	F0
	Active connection		1
Active connection	Active connection		11
Passive connection	Active connection		21
Active connection Passive connection	Active connection		31
Disconnect	Active connection		41
Active connection Disconnect	Active connection		51
Passive connection Disconnect	Active connection		61
Active connection Passive connection Disconnect	Active connection		71

Serial to Network Clear input buffer upon:	Network to Serial Clear output buffer upon:	Alternate Packing Algorithm	Hex
	Active connection	Enable	81
Active connection	Active connection	Enable	91
Passive connection	Active connection	Enable	A1
Active connection Passive connection	Active connection	Enable	B1
Disconnect	Active connection	Enable	C1
Active connection Disconnect	Active connection	Enable	D1
Passive connection Disconnect	Active connection	Enable	E1
Active connection Passive connection Disconnect	Active connection	Enable	F1
	Passive connection		2
Active connection	Passive connection		12
Passive connection	Passive connection		22
Active connection Passive connection	Passive connection		32
Disconnect	Passive connection		42
Active connection Disconnect	Passive connection		52
Passive connection Disconnect	Passive connection		62
Active connection Passive connection Disconnect	Passive connection		72
	Passive connection	Enable	82
Active connection	Passive connection	Enable	92
Passive connection	Passive connection	Enable	A2
Active connection Passive connection	Passive connection	Enable	B2
Disconnect	Passive connection	Enable	C2
Active connection Disconnect	Passive connection	Enable	D2
Passive connection Disconnect	Passive connection	Enable	E2
Active connection Passive connection Disconnect	Passive connection	Enable	F2
	Active connection Passive connection		3
Active connection	Active connection Passive connection		13
Passive connection	Active connection Passive connection		23
Active connection Passive connection	Active connection Passive connection		33
Disconnect	Active connection Passive connection		43
Active connection Disconnect	Active connection Passive connection		53
Passive connection Disconnect	Active connection Passive connection		63
Active connection Passive connection Disconnect	Active connection Passive connection		73

Serial to Network Clear input buffer upon:	Network to Serial Clear output buffer upon:	Alternate Packing Algorithm	Hex
	Active connection Passive connection	Enable	83
Active connection	Active connection Passive connection	Enable	93
Passive connection	Passive connection Active connection	Enable	A3
Active connection Passive connection	Active connection Passive connection	Enable	B3
Disconnect	Active connection Passive connection	Enable	C3
Active connection Disconnect	Active connection Passive connection	Enable	D3
Passive connection Disconnect	Active connection Passive connection	Enable	E3
Active connection Passive connection Disconnect	Active connection Passive connection	Enable	F3
	Disconnect		4
Active connection	Disconnect		14
Passive connection	Disconnect		24
Active connection Passive connection	Disconnect		34
Disconnect	Disconnect		44
Active connection Disconnect	Disconnect		54
Passive connection Disconnect	Disconnect		64
Active connection Passive connection Disconnect	Disconnect		74
	Disconnect	Enable	84
Active connection	Disconnect	Enable	94
Passive connection	Disconnect	Enable	A4
Active connection Passive connection	Disconnect	Enable	B4
Disconnect	Disconnect	Enable	C4
Active connection Disconnect	Disconnect	Enable	D4
Passive connection Disconnect	Disconnect	Enable	E4
Active connection Passive connection Disconnect	Disconnect	Enable	F4
	Active connection Disconnect		5
Active connection	Active connection Disconnect		15
Passive connection	Active connection Disconnect		25
Active connection Passive connection	Active connection Disconnect		35
Disconnect	Active connection Disconnect		45
Active connection Disconnect	Active connection Disconnect		55
Passive connection Disconnect	Active connection Disconnect		65

Serial to Network Clear input buffer upon:	Network to Serial Clear output buffer upon:	Alternate Packing Algorithm	Hex
Active connection Passive connection Disconnect	Active connection Disconnect		75
	Active connection Disconnect	Enable	85
Active connection	Active connection Disconnect	Enable	95
Passive connection	Active connection Disconnect	Enable	A5
Active connection Passive connection	Active connection Disconnect	Enable	B5
Disconnect	Active connection Disconnect	Enable	C5
Active connection Disconnect	Active connection Disconnect	Enable	D5
Passive connection Disconnect	Active connection Disconnect	Enable	E5
Active connection Passive connection Disconnect	Active connection Disconnect	Enable	F5
	Passive connection Disconnect		6
Active connection	Passive connection Disconnect		16
Passive connection	Passive connection Disconnect		26
Active connection Passive connection	Passive connection Disconnect		36
Disconnect	Passive connection Disconnect		46
Active connection Disconnect	Passive connection Disconnect		56
Passive connection Disconnect	Passive connection Disconnect		66
Active connection Passive connection Disconnect	Passive connection Disconnect		76
	Passive connection Disconnect	Enable	86
Active connection	Passive connection Disconnect	Enable	96
Passive connection	Passive connection Disconnect	Enable	A6
Active connection Passive connection	Passive connection Disconnect	Enable	B6
Disconnect	Passive connection Disconnect	Enable	C6
Active connection Disconnect	Passive connection Disconnect	Enable	D6
Passive connection Disconnect	Passive connection Disconnect	Enable	E6
Active connection Passive connection Disconnect	Passive connection Disconnect	Enable	F6
	Active connection Passive connection Disconnect		7

Serial to Network Clear input buffer upon:	Network to Serial Clear output buffer upon:	Alternate Packing Algorithm	Hex
Active connection	Active connection Passive connection Disconnect		17
Passive connection	Active connection Passive connection Disconnect		27
Active connection Passive connection	Active connection Passive connection Disconnect		37
Disconnect	Active connection Passive connection Disconnect		47
Active connection Disconnect	Active connection Passive connection Disconnect		57
Passive connection Disconnect	Active connection Passive connection Disconnect		67
Active connection Passive connection Disconnect	Active connection Passive connection Disconnect		77
	Active connection Passive connection Disconnect	Enable	87
Active connection	Active connection Passive connection Disconnect	Enable	97
Passive connection	Active connection Passive connection Disconnect	Enable	A7
Active connection Passive connection	Active connection Passive connection Disconnect	Enable	B7
Disconnect	Active connection Passive connection Disconnect	Enable	C7
Active connection Disconnect	Active connection Passive connection Disconnect	Enable	D7
Passive connection Disconnect	Active connection Passive connection Disconnect	Enable	E7
Active connection Passive connection Disconnect	Active connection Passive connection Disconnect	Enable	F7

2.4 Interface Mode Options

Table 6 - Interface Mode Options

Interface	Bits	Parity	Stop Bits	Hex
RS-232C	7	No	1	48
RS-232C	7	No	2	C8
RS-232C	7	Even	1	78
RS-232C	7	Even	2	F8
RS-232C	7	Odd	1	58
RS-232C	7	Odd	2	D8
RS-232C	8	No	1	4C
RS-232C	8	No	2	CC
RS-232C	8	Even	1	7C
RS-232C	8	Even	2	FC
RS-232C	8	Odd	1	5C
RS-232C	8	Odd	2	DC
RS-422/485 NOT SUPPORTED				

2.5 Pack Control Options

Table 7 - Pack Control Options

Sendcharacter Defined by a:	Trailing Character s	Idle Time Force Transmit:	Send Immediately after Sendcharacter	Hex
1-Byte Sequence	No	12ms		0
1-Byte Sequence	No	52ms		1
1-Byte Sequence	No	250ms		2
1-Byte Sequence	No	5sec		3
1-Byte Sequence	1	12ms		4
1-Byte Sequence	1	52ms		5
1-Byte Sequence	1	250ms		6
1-Byte Sequence	1	5sec		7
1-Byte Sequence	2	12ms		8
1-Byte Sequence	2	52ms		9
1-Byte Sequence	2	250ms		A
1-Byte Sequence	2	5sec		B
2-Byte Sequence	No	12ms		10
2-Byte Sequence	No	52ms		11
2-Byte Sequence	No	250ms		12
2-Byte Sequence	No	5sec		13
2-Byte Sequence	1	12ms		14
2-Byte Sequence	1	52ms		15
2-Byte Sequence	1	250ms		16
2-Byte Sequence	1	5sec		17
2-Byte Sequence	2	12ms		18
2-Byte Sequence	2	52ms		19
2-Byte Sequence	2	250ms		1A
2-Byte Sequence	2	5sec		1B

Sendcharacter Defined by a:	Trailing Characters	Idle Time Force Transmit:	Send Immediately after Sendcharacter	Hex
1-Byte Sequence	No	12ms	Yes	20
1-Byte Sequence	No	52ms	Yes	21
1-Byte Sequence	No	250ms	Yes	22
1-Byte Sequence	No	5sec	Yes	23
1-Byte Sequence	1	12ms	Yes	24
1-Byte Sequence	1	52ms	Yes	25
1-Byte Sequence	1	250ms	Yes	26
1-Byte Sequence	1	5sec	Yes	27
1-Byte Sequence	2	12ms	Yes	28
1-Byte Sequence	2	52ms	Yes	29
1-Byte Sequence	2	250ms	Yes	2A
1-Byte Sequence	2	5sec	Yes	2B
2-Byte Sequence	No	12ms	Yes	30
2-Byte Sequence	No	52ms	Yes	31
2-Byte Sequence	No	250ms	Yes	32
2-Byte Sequence	No	5sec	Yes	33
2-Byte Sequence	1	12ms	Yes	34
2-Byte Sequence	1	52ms	Yes	35
2-Byte Sequence	1	250ms	Yes	36
2-Byte Sequence	1	5sec	Yes	37
2-Byte Sequence	2	12ms	Yes	38
2-Byte Sequence	2	52ms	Yes	39
2-Byte Sequence	2	250ms	Yes	3A
2-Byte Sequence	2	5sec	Yes	3B

2.6 Interface Mode

Setup Mode requires a hex number for the Interface Mode. The following table shows the valid hex values for Interface Mode.

HEX	Stop Bit	Parity	Char Bit	RS Type
48	1	None	7	232
49	1	None	7	422/485
4B	1	None	7	485 2-wire
4C	1	None	8	232
4D	1	None	8	422/485
4F	1	None	8	485 2-wire
58	1	Odd	7	232
59	1	Odd	7	422/485
5B	1	Odd	7	485 2-wire
5C	1	Odd	8	232
5D	1	Odd	8	422/485
5F	1	Odd	8	485 2-wire
78	1	Even	7	232
79	1	Even	7	422/485
7B	1	Even	7	485 2-wire
7C	1	Even	8	232
7D	1	Even	8	422/485
7F	1	Even	8	485 2-wire
C8	2	None	7	232
C9	2	None	7	422/485
CB	2	None	7	485 2-wire
CC	2	None	8	232
CD	2	None	8	422/485
CF	2	None	8	485 2-wire
D8	2	Odd	7	232
D9	2	Odd	7	422/485
DB	2	Odd	7	485 2-wire
DC	2	Odd	8	232
DD	2	Odd	8	422/485
DF	2	Odd	8	485 2-wire
F8	2	Even	7	232
F9	2	Even	7	422/485
FB	2	Even	7	485 2-wire
FC	2	Even	8	232
FD	2	Even	8	422/485
FF	2	Even	8	485 2-wire

3. IP Addresses

Each TCP/IP node on a network host has a unique IP address. This address provides the information needed to forward packets on the local network and across multiple networks if necessary.

IP addresses are specified as **x.x.x.x**, where each x is a number from 1 to 254; for example, 192.0.1.99. The Device Server must be assigned a unique IP address to use TCP/IP network functionality.

IP addresses contain three pieces of information: the network, the subnet, and the host.

3.1 Network Portion

The network portion of the IP address is determined by the network type: Class A, B, or C.

Table 8 - Network Portion of IP Address

Network Class	Network Portion of Address
Class A	First byte (2nd, 3rd, and 4th bytes are the host)
Class B	First 2 bytes (3rd and 4th bytes are the host)
Class C	First 3 bytes (4th byte is the host)

In most network examples, the host portion of the address is set to zero.

Table 9 - Available IP Addresses

Class	Address Range	Comments
A	1.0.0.1 to 126.255.255.254	126 networks of 16,777,214 hosts
B	128.1.0.1 to 191.254.255.254	16,328 networks of 65,534 hosts
C	192.0.1.1 to 233.255.254.254	2,097,150 networks of 254 hosts
D	224.0.0.0 to 239.255.255.254	Reserved for multicast groups
E	240.0.0.0 to 254.255.255.254	Reserved for experimental and future use

Consider the IP address 36.1.3.4. This address is a Class A address; therefore, the network portion of the address is 36.0.0.0 and the host portion is 1.3.4.

3.2 Subnet Portion

The subnet portion of the IP address represents which **sub-network** the address is from. Sub-networks are formed when an IP network is broken down into smaller networks using a **subnet mask**.

A router is required between all networks and all sub-networks. Generally, hosts can send packets directly only to hosts on their own sub-network. All packets destined for other subnets are sent to a router on the local network.

3.3 Host Portion

The host portion of the IP address is a unique number assigned to identify the host.

3.4 Network Address

A host address with all host bits set to 0 addresses the network as a whole (for example, in routing entries).
192.168.0.0

3.5 Broadcast Address

A host address with all host bits set to 1 is the broadcast address, meaning for “for every station.”
192.168.0.255

Network and broadcast addresses must not be used as a host address; for example, 192.168.0.0 identifies the entire network, and 192.168.0.255 identifies the broadcast address.

3.6 IP Subnet Mask

An IP subnet mask divides IP address differently than the standards defined by the classes A, B, and C. An IP subnet mask defines the number of bits to be taken from the IP address as the network or host sections. The Device Server prompts for the number of host bits to be entered and then calculates the netmask, which is displayed in standard decimal-dot notation (for example, 255.255.255.0) when saved parameters are displayed.

Table 10 - Standard IP Network Netmasks

Network Class	Network Bits	Host Bits	Netmask
A	8	24	255.0.0.0
B	16	16	255.255.0.0
C	24	8	255.255.255.0

Table 11 - Netmask Examples

Netmask	Host Bits
255.255.255.252	2
255.255.255.248	3
255.255.255.240	4
255.255.255.224	5
255.255.255.192	6
255.255.255.128	7
255.255.255.0	8
255.255.254.0	9
255.255.252.0	10
255.255.248.0	11
...	...
255.128.0.0	23
255.0.0.0	24

3.7 Private IP Networks and the Internet

If your network is not and will not be connected to the Internet, you may use any IP address. If your network is connected or will be connected to the Internet, or if you intend to operate the Device Server on an intranet, you should use one of the reserved sub-networks. Consult your network administrator with questions about IP address assignment.

3.8 Network RFCs

For more information about IP addresses, refer to the following documents, which can be located on the World Wide Web using one of the following directories or indices:

RFC 950	Internet Standard Subnetting Procedure
RFC 1700	Assigned Numbers
RFC 1117	Internet Numbers
RFC 1597	Address Allocation for Private Networks

3.9 ARP and Telnet

The unit's IP address must be configured before a network connection is available. If the unit has no IP address, you can use Address Resolution Protocol (ARP) method from UNIX and Windows-based systems to assign a temporary IP address. If you want to initially configure the unit through the network, follow these steps:

1. On a UNIX or Windows-based host, create an entry in the host's ARP table using the intended IP address and the hardware address of the unit, which is found on the product label on the bottom of the unit.

```
arp -s 191.12.3.77 00:20:4a:xx:xx:xx
```

Note: For the ARP command to work on Windows 95, the ARP table on the PC must have at least one IP address defined other than its own.

2. If you are using Windows 95, type ARP -A at the DOS command prompt to verify that there is at least one entry in the ARP table. If the local machine is the only entry, ping another IP address on your network to build a new entry in the ARP table; the IP address must be a host other than the machine on which you are working. Once there is at least one additional entry in the ARP table, use the following command to ARP an IP address to the unit:

```
arp -s 191.12.3.77 00-20-4a-xx-xx-xx
```

3. Open a Telnet connection to port 1. The connection will fail quickly, but the unit will temporarily change its IP address to the one designated in this step.

```
telnet 191.12.3.77 1
```

4. Finally, open a Telnet connection to port 9999, and press Enter within three seconds to go into Setup Mode. If you wait longer than three seconds, the unit will reboot.

```
telnet 191.12.3.77 9999
```

5. Set all required parameters

Note: The IP address you just set is temporary and will revert to the default value when the unit's power is reset unless you log into the unit and store the changes permanently.

3.10 Configuring the Subnet Mast

How do I calculate the host bits for configuring the subnet mask?

Netmask	Host Bits
255.255.255.254	Do Not Use
255.255.255.252	Not recommended
255.255.255.248	3
255.255.255.240	4
255.255.255.224	5
255.255.255.192	6
255.255.255.128	7
255.255.255.0	8
255.255.254.0	9
255.255.252.0	10
255.255.248.0	11
255.255.240.0	12
255.255.224.0	13
255.255.192.0	14
255.255.128.0	15
255.255.0.0	16
255.254.0.0	17
255.252.0.0	18
255.248.0.0	19
255.240.0.0	20
255.224.0.0	21
255.192.0.0	22
255.128.0.0	23
255.0.0.0	24

4. Glossary of Terms

Address space

A linear array of locations that a thread can access. Simple processors have only one, and these processors are referred to as 'linear' addressing.

Block

A block is a variable-size piece of memory that a task can acquire. Blocks are allocated from heaps. [Related: Buffer, heap]

Auto-Negotiate:

Clause 28 of the IEEE 802.3u standard specifies a MAC sublayer for the identification of the speed and duplex mode of connection being supported by a device. Support of this feature is optional for individual vendors.

Auto-sense:

Ability of a 10/100 Ethernet device to interpret the speed or duplex mode of the attached device and to adjust to that rate. Official term is Auto-Negotiation in Clause 28 of the IEEE 802.3u standard.

Baseband LAN:

A LAN that uses a single carrier frequency over a single channel. Ethernet, Token Ring and Arcnet LANs use baseband transmission.

Baud:

Unit of signal frequency in signals per second. Not synonymous with bits per second since signals can represent more than one bit. Baud equals bits per second only when the signal represents a single bit.

Binaries:

Binary, machine readable forms of programs that have been compiled or assembled. As opposed to Source language forms of programs.

BOOTP:

A TCP/IP network protocol that lets network nodes request configuration information from a BOOTP "server" node.

bps:

Bits per second, units of transmission speed.

Bridge:

A networking device that connects two LANs and forwards or filters data packets between them, based on their destination addresses. Bridges operate at the data link level (or MAC-layer) of the OSI reference model, and are transparent to protocols and to higher level devices like routers.

Bus:

A LAN topology in which all the nodes are connected to a single cable. All nodes are considered equal and receive all transmissions on the medium.

Byte:

A data unit of eight bits.

Channel:

The data path between two nodes.

Domain Name:

A domain name is a text name appended to a host name to form a unique host name across internets.

Download:

The transfer of a file or information from one network node to another. Generally refers to transferring a file from a "big" node, such as a computer, to a "small" node, such as a terminal server or printer.

End Node:

A node such as a PC that can only send and receive information for its own use. It cannot route and forward information to another node.

Ethernet:

The most popular LAN technology in use today. The IEEE standard 802.3 defines the rules for configuring an Ethernet network. It is a 10 Mbps, CSMA/CD baseband network that runs over thin coax, thick coax, twisted pair or fiber optic cable.

Firmware:

Alterable programs in semipermanent storage, e.g., some type of read-only or flash reprogrammable memory.

Flash ROM:

See ROM.

Framing:

Dividing data for transmission into groups of bits, and adding a header and a check sequence to form a frame.

FTP:

File Transfer Protocol, a TCP/IP protocol for file transfer.

Full-Duplex:

Independent, simultaneous two-way transmission in both directions, as opposed to half-duplex transmission.

Gateway:

A device for interconnecting two or more dissimilar networks. It can translate all protocol levels from the Physical layer up through the Applications layer of the OSI model, and can therefore interconnect entities that differ in all details.

Hardware Address:

See Network Address.

Host:

Generally a node on a network that can be used interactively, i.e., logged into, like a computer.

Host Table:

A list of TCP/IP hosts on the network along with their IP addresses.

IEEE 802.3:

The IEEE (Institute of Electrical and Electronic Engineers) standard that defines the CSMA/CD media-access method and the physical and data link layer specifications of a local area network. Among others, it includes 10BASE2, 10BASE5, 10BASE-FL and 10BASE-T Ethernet implementations.

Internet:

A series of interconnected local, regional, national and international networks, linked using TCP/IP. Internet links many government, university and research sites. It provides E-mail, remote login and file transfer services.

Internetworking:

General term used to describe the industry composed of products and technologies used to link networks together.

IP Address:

See Network Address.

ISO Layered Model:

The International Standards Organization (ISO) sets standards for computers and communications. Its Open Systems Interconnection (OSI) reference model specifies how dissimilar computing devices such as Network Interface Cards (NICs), bridges and routers exchange data over a network. The model consists of seven layers. From lowest to highest, they are: Physical, Data Link, Network, Transport, Session, Presentation and Application. Each layer performs services for the layer above it.

KB

Kilobyte. KBps is Kilobytes per second.

Kbps:

Kilobits per second.

LAN:

Local Area Network, a data communications system consisting of a group of interconnected computers, sharing applications, data and peripherals. The geographical area is usually a building or group of buildings.

Latency:

The delay incurred by a switching or bridging device between receiving the frame and forwarding the frame.

Layer:

In networks, layers refer to software protocol levels comprising the architecture, with each layer performing functions for the layers above it.

Line Speed:

Expressed in bps, the maximum rate at which data can reliably be transmitted over a line using given hardware.

Logical Link:

A temporary connection between source and destination nodes, or between two processes on the same node.

Mbps:

Megabits per second.

MIB:

Management Information Base, a database of network parameters used by SNMP and CMIP (Common Management Information Protocol) to monitor and change network device settings. It provides a logical naming of all information resources on the network that are pertinent to the network's management.

Multicast:

A multicast is a message that is sent out to multiple devices on the network by a host.

Name Server:

Software that runs on network hosts charged with translating (or resolving) text-style names into numeric IP addresses.

Network:

An interconnected system of computers that can communicate with each other and share files, data and resources.

Network Address:

Every node on a network has one or more addresses associated with it, including at least one fixed hardware address such as "ae-34-2c-1d-69-f1" assigned by the device's manufacturer. Most nodes also have protocol specific addresses assigned by a network manager.

Network Management:

Administrative services for managing a network, including configuring and tuning, maintaining network operation, monitoring network performance, and diagnosing network problems.

Node:

Any intelligent device connected to the network. This includes terminal servers, host computers, and any other devices (such as printers and terminals) that are directly connected to the network. A node can be thought of as any device that has a "hardware address."

Open System Interconnect (OSI):

See "ISO."

Packet:

A series of bits containing data and control information, including source and destination node addresses, formatted for transmission from one node to another.

Physical Address:

An address identifying a single node.

Physical Layer:

Layer 1, the bottom layer of the OSI model, is implemented by the physical channel. The Physical layer insulates Layer 2, the Data Link layer, from medium-dependent physical characteristics such as baseband, broadband or fiber-optic transmission. Layer 1 defines the protocols that govern transmission media and signals.

Port:

The physical connector on a device enabling the connection to be made.

Protocol:

Any standard method of communicating over a network.

Remote Access:

Access to network resources not located on the same physical Ethernet. (Physical Ethernet here refers to an entire site network topology.)

Router:

Device capable of filtering/forwarding packets based upon data link layer information. Whereas a bridge or switch may only read MAC layer addresses to filter, routers are able to read data such as IP addresses and route accordingly.

RS232 Signals

RXD	Receive Data
TXD	Transmit Data
RTS	Ready to Send
CTS	Clear to Send
DTR	Data Terminal Ready
CD	Carrier Detect
DSR	Data Set Ready
RI	Ring Indicator

Server:

A computer that provides resources to be shared on the network, such as files (file server) or terminals (terminal server).

Session:

A connection to a network service.

SNMP:

Simple Network Management Protocol, allows a TCP/IP host running an SNMP application to query other nodes for network-related statistics and error conditions. The other hosts, which provide SNMP agents, respond to these queries and allow a single host to gather network statistics from many other network nodes.

Source Code:

Programs in an uncompiled or unassembled form.

Switch:

Multiport Ethernet device designed to increase network performance by allowing only essential traffic on the attached individual Ethernet segments. Packets are filtered or forwarded based upon their source and destination addresses.

TCP/IP:

Transmission Control Protocol (TCP) and Internet Protocol (IP) are the standard network protocols in UNIX environments. They are almost always implemented and used together and called TCP/IP.

Telnet:

Telnet is an application that provides a terminal interface between hosts using the TCP/IP network protocol. It has been standardized so that "telnetting" to any host should give one an interactive terminal session, regardless of the remote host type or operating system. Note that this is very different from the LAT software, which allows only local network access to LAT hosts only.

10BASE-T:

Ethernet running on unshielded twisted pair (UTP) cable. Note that 10BASE-T is a point-to-point network media, with one end of the cable typically going to a repeater/hub and the other to the network device.

100BASE-TX

Specifies 100-Mbps operation using the CSMA/CD protocol over two pairs of category 5 UTP cable.

Terminal Server:

A concentrator that facilitates communication between hosts and terminals.

TFTP:

Trivial File Transfer Protocol. On computers that run the TCP/IP networking software, TFTP is used to quickly send files across the network with fewer security features than FTP.

Throughput:

The amount of data transmitted between two points in a given amount of time, e.g., 10 Mbps.

Topology:

The arrangement of the nodes and connecting hardware that comprises the network. Types include ring, bus, star and tree.

Twisted-Pair Cable:

Inexpensive, multiple-conductor cable comprised of one or more pairs of 18 to 24 gauge copper strands. The strands are twisted to improve protection against electromagnetic and radio frequency interference. The cable, which may be either shielded or unshielded, is used in low-speed communications, as telephone cable. It is used only in baseband networks because of its narrow bandwidth.

UTP:

Unshielded twisted pair, one or more cable pairs surrounded by insulation. UTP is commonly used as telephone wire.

Wide Area Network (WAN):

A network using common carrier transmission services for transmission of data over a large geographical area.