Orbitor 6000
Central Site Ethernet Bridge/Router Installation & Applications Guide

Issue 1

Part # 168-27905

Develcon®

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Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Warning: The user is cautioned that modifications to this equipment can void the authority granted by the FCC to operate the equipment

The following repairs may be made by the customer: none.

Canadian Emissions Standard ICES-003

This digital apparatus does not exceed the Class A limits for radio noise emissions from digital apparatus as set out in the interference-causing equipment standard entitled "Digital Apparatus", ICES-003 of the Department of Communications.

Cet appareil numérique respecte les limites de bruits radioélectriques applicables aux appareils numériques de Classe A prescrites dans la norme sur le matériel brouilleur: "Appareils Numériques", NMB-003 édictée par le ministre des Communications.

For products marked with the CE Telecommunications label, the following declaration applies:

"The manufacturer declares that as shipped from the factory this product is in compliance with the CE Telecommunications Terminal Equipment Directive 91/263/EEC with the marking CE 168 X applied in respect of this declaration, and in respect of the following telecommunications interfaces,

X.21(V.11) - NET 1
X.21bis(V.28) and X.21bis(V.35) - NET 2
PSTN ISDN Basic Rate Interface compatible with I.420 - NET 3

The manufacturer further declares that the product conforms with the requirements of the Low Voltage Directive 73/23/EEC and with the requirements of the EMC Directive 89/336/EEC (for radiated emissions at the Class A level). This product is not intended for residential applications."

ISDN Type Approval Labels

Labels for National ISDN Type Approvals can be found on the inside surface of the backpanel of the ISDN module.

Canadian ISDN Approval

The ISDN interface of this device is intended for direct connection to the S/T jack of an NT-1 unit and therefore does not require Communications Canada certification. The Orbitor 6000 should only be connected to Communications Canada approved NT-1 units.

Statements for ISDN U Module

NOTICE: The Canadian Department of Communications label identifies certified equipment. This certification means that the equipment meets certain telecommunications network protective, operational and safety requirements. The Department does not guarantee the equipment will operate to the user's satisfaction.

Before installing this equipment, users should ensure that it is permissible to be connected to the facilities of the local telecommunication company. The equipment must also be installed using an acceptable method of connection. The customer should be aware that compliance with the above conditions may not prevent degradation of service in some situations.

Repairs to certified equipment should be made by an authorized Canadian maintenance facility designated by the supplier. Any repairs or alteration made by the user to this equipment, or equipment malfunctions, may give the telecommunications company cause to request the user to disconnect the equipment.

Users should ensure for their own protection that the electrical ground connections of the power utility, telephone lines and internal metallic water pipe system, if present, are connected together. This precaution may be particularly important in rural areas.

CAUTION: Users should not attempt to make such connections themselves, but should contact the appropriate electric inspection authority, or electrician, as appropriate.

Using This Manual

This Installation and Applications Guide provides the basic information required to initially set up and configure the Orbitor 6000 Bridge/Router. This guide is organized into the following sections:

"***Installation***" provides instructions for installing the Orbitor 6000.

"***Typical Applications & How to Configure Them***" provides simple configuration examples for typical applications in which the Orbitor 6000 might be used. The applications described in this document are for example only and provide a method of quick configuration of the Orbitor 6000. The applications and corresponding configuration may be combined if the operation of the Orbitor 6000 requires more complexity. For more complete information on all of the configuration parameters available please refer to the appropriate Menu Reference Manual file for your operating software on the accompanying disks.

"***Introduction to Filtering***" provides an introduction to the pattern filtering options of the Orbitor 6000. Several examples of typical pattern filters are also provided.

"***Menu Trees***" provides a graphical tree type overview of the structure of the built-in menu system of the Orbitor 6000. All of the configuration is performed using the options provided in the menu system. The Menu Tree is like an index to the menu options.

"***Configuration Pages***" provides a place to note the current configuration of the Orbitor 6000 for future reference. If a replacement unit is required, the configuration may be quickly modified to be the same as the existing unit.

"***Octet Locations on Ethernet Frames***" provides a graphical representation of the various common Ethernet frames that the Orbitor 6000 will bridge or route. When defining a pattern filter, these frame displays indicate the offset values to use in order to define the pattern filter correctly.

"***Servicing Information***" provides information on changing Link interfaces.

"***Interface Pinouts***" provides information on Link interface connectors.

Using The Electronic Reference Manual

The Orbitor 6000 Reference Manuals are provided as Adobe Acrobat PDF files on the accompanying disks. The Menu Reference Files are provided individually for ease of configuration with each type of software load being described in a separate file; for example, ISDN commands are in one file called "ISDNMENU.PDF".

The Adobe Acrobat Reader program is available for most computer operating platforms from Adobe on the Internet at: www.adobe.com. Versions of the reader program are also available from Develcon at: www.develcon.com.

The Reference Manual provides the following information:

- Introduction to bridging, routing, and Orbitor 6000 features,
- Pin out references for the link modules,
- List of event and alarm logs, and
- Expanded description of programmable filtering.

The Menu Reference Manuals provide the following information:

- Complete description of the options for the built-in menu system.

NOTE: Develcon is evaluating the possibility of distributing all reference manuals as PDF files. Please forward your comments on this new method of documentation by email to info@develcon.com or send us a fax @ 306-931-1370.

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Installation

The Orbitor 6000 is a Central Site Ethernet Bridge/Router that may be configured to support leased lines or ISDN circuits.

Lease line units provide bridging and IP/IPX routing and support from 1 to 14 physical wide area network (WAN) links that may operate at speeds up to 2.048 Mbps.

ISDN units provide bridging and IP/IPX routing and support 7 ISDN BRI interfaces via integral ISDN-ST or ISDN-U link modules. Each ISDN BRI interface supports two 64 Kbps B-channels for a total of 14 B-channels.

The following instructions provide a quick set-up guide for installation of the Orbitor 6000 Ethernet Bridge/Router:

Unpack the Orbitor Ethernet Bridge/Router

Rough handling during shipment can damage electronic equipment. As you unpack the bridge/router, carefully check for signs of damage. If damage is suspected, contact the shipper. Save the box and all packing material to protect the bridge/router should it ever need to be moved or returned for service.

Check the packing slip that identifies the components and the LAN connector. All external connections to the Orbitor Ethernet Bridge/Router are provided by the connectors on the rear of the bridge/router.

Select a Site

Place the bridge/router in a well ventilated area. The site should maintain normal office temperature and humidity levels. Air vents located on the sides of the bridge/router must have an inch or so of clearance from any object.

Identify the Reset Switch

The hardware reset switch is located on the main board inside the front cover of the bridge/router. The switch is located between the 10BaseT connector and the Power LED.

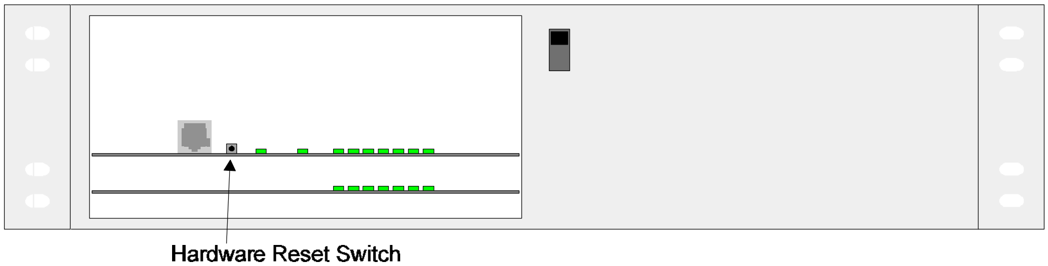


Figure 1-1 Front View of the Orbitor Ethernet Bridge/Router

Identify the Connectors

Each unit is configured with a standard 10BaseT LAN connector on the front of the unit, and either a 10Base5 and 10Base2 LAN module.

Refer to Appendix D: Servicing Information for information on replacing modules.

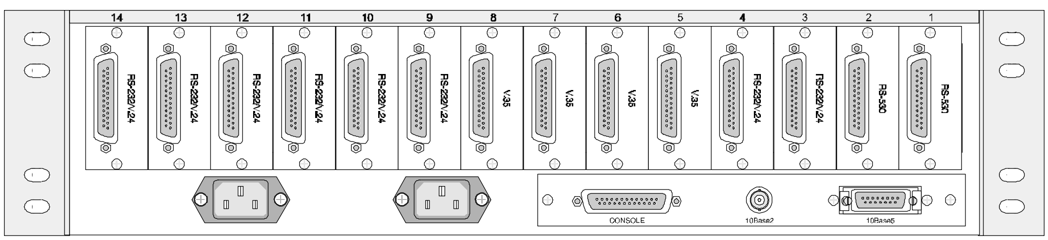


Figure 1-2 Rear View of the Orbitor Ethernet Bridge/Router

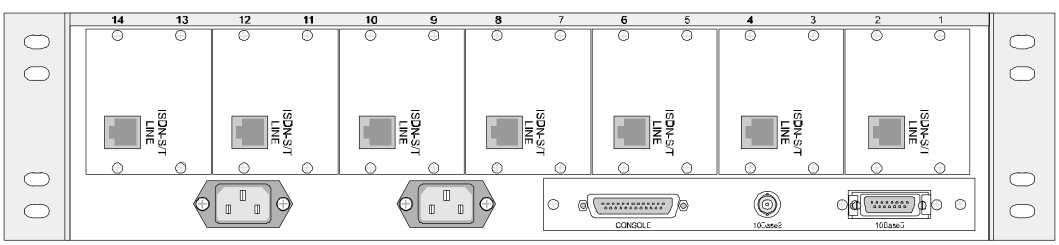


Figure 1—3 Rear View of the ISDN Orbitor Ethernet Bridge/Router

Connect to the Console

Connection to the bridge/router operator's console is made through the DB25 connector labeled CONSOLE on the back of the bridge/router.

Connect the console port of the Orbitor Ethernet Bridge/Router to a computer running an asynchronous communication package or a standard asynchronous terminal. The bridge/router supports autobaud rates at 1200, 2400, 9600 or 19,200 bps. Both the bridge/router and the bridged network through the use of "hotkey" Menus.

Make the LAN Connections

Connection to the LAN is made through the connectors on the LAN interface module on the back of the bridge/router. The 10BaseT LAN connector is on the front of the unit.

Each unit is configured with a 10Base5 and 10Base2 module.

Make the Link Connection(s)

By default each of the links are configured as permanent DTE interfaces. The clocking for each link will be provided by the DCE device connected to each link.

The V.35 link modules require interface converters that convert from a DB25 connector to a male 34-pin (V.35) connector used for the V.35 interface. Be sure to secure the cable connector(s) to the bridge/router and the communications equipment with the connector screws to prevent accidental disconnection.

The ISDN-ST interface module of the ISDN Orbitor Bridge/Router provides a RJ-45 connector to connect to the RJ-45 connector of the NT1 provided with your ISDN service.

The ISDN-U interface module of the ISDN Orbitor Bridge/Router provides an integrated NT1 with a RJ-45 connector to connect directly with your ISDN service.

Once the bridge/router has established communications with its partner across the WAN, the corresponding "Link" LED(s) will turn green.

Note: *Bridge/Router database changes and statistics viewing may be done remotely by establishing Telnet connections to a partner bridge/router across the WAN. This is accomplished by selecting the "Connect" option. The "Connect" option is found under the Remote Access Menu.*

Power Up the Bridge/Router

Once the LAN and Link connections are made and the console is connected to a terminal, you are ready to power-up the Orbitor Ethernet bridge/router. Connect the AC power cord to the back of the Orbitor Ethernet bridge/router and plug the cord into the AC wall outlet.

Observe the LEDs as the bridge/router powers up. The LEDs will go through a flashing pattern as the power-up diagnostics are performed.

Enter at least one <RETURN> (up to three if necessary) in order for the bridge/router to determine the baud rate of the terminal used for the console (i.e., autobaud). The following information will now be seen on the console connected to the bridge/router :

```
Terminals supported:
    ansi, avt, ibm3101, qvt109, qvt102, qvt119, tvi925,
    tvi950, vt52, vt100, wyse-50, wyse-vp, teletype
Enter terminal type:
```

Select the terminal type being used if listed and enter its name (in lower case) at the prompt, or choose the terminal type **teletype** if your terminal is not listed. This terminal type operates in scroll mode and may be used successfully until a custom terminal definition is created.

Login to Bridge/Router and Enter the Required Configuration

At the login screen type a 1 and the default password to enter the menu system of the Orbitor Ethernet Bridge/Router. The default password is “password” (case sensitive) and should be changed if security is desired.

With the options of the built-in menu system, the Orbitor may be configured to operate within your environment.

Refer to the appropriate Menu Reference Manual file for your operating software on the accompanying disks for a complete description of all the Menu Options.

Viewing of statistics is also possible within the built-in menu system of the Orbitor bridge/router.

Mandatory Configuration

The Orbitor 6000 requires a minimum amount of mandatory configuration in order to operate. The following table identifies the configuration parameters that must be defined for proper operation under the operational states shown in the table.

Mandatory Configuration		
Bridge	**IP Router**	**IPX Router**
none	**IP Address**	none
	IP Routing	
	IP Forwarding	
Lease Line	**ISDN**	
none	**ISDN Switch Type**	
	Directory Numbers	

The configuration options required for proper initial operation are described in Section 2: Typical Applications and How to Configure Them. Each type of operational software requires a different set of parameters to be configured.

Refer to Section 2 for details on configuring the Orbitor 6000 in different operational states. Also refer to the appropriate Menu Reference Manual file for your operating software on the accompanying disks for a complete description of all the Menu Options.

Other options may be changed depending upon specific installation configurations. Refer to the menu tree in Appendix A for a reference of the menu structure and options.

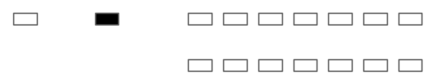
Identify the Status LEDs

Off	Bridge/Router is powered down
Green	Power supply output is good
Red	Power supply output is bad
Yellow	Output from one of the supplies is bad (redundant supplies)

POWER

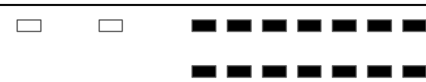
Off	Bridge/Router is powered down
Green	LAN is connected and forwarding
Red	Bridge/Router is NOT connected to the LAN or LAN Interface Type is configured incorrectly
Yellow	LAN NOT forwarding: i.e. Listening, Learning, or Blocking
Yellow (flashing)	Bridge/Router is in BOOT mode

LAN



Off	LINK module is not present or module is Disabled
Green	LINK is up
Red	LINK is down (failed)
Yellow	LINK is configured to be down: Disabled, Time-Of-Day

LINK 1 - 14



2 Typical Applications & How to Configure Them

The Orbitor 6000 is a central site Ethernet Bridge/Router that may be configured to support leased lines or ISDN circuits. This section will describe how to set up the Orbitor 6000 using each of its networking functions. Note that for a particular version of software some of the configuration examples may not apply; for example, the leased line configuration sections do not apply to configuring an ISDN Orbitor.

The Orbitor 6000 may be configured as a simple Ethernet bridge, an Ethernet IP router, an Ethernet IPX router, or a combination of the three. When operating the Orbitor 6000 as a combination bridge/router simply configure each of the components separately.

Note: *The configuration options described within this section are only for initial set up and configuration purposes. For more complete information on all of the configuration parameters available please refer to the appropriate Menu Reference Manual file for your operating software on the accompanying disks; for example, ISDN commands are in one file called "ISDNMENU.PDF".*

Applicable Configuration Sections

When setting up the Orbitor 6000 in a particular configuration, one or more of the configuration examples in this section may be applicable. The following list may be used as a general starting point to the relevant sections.

IP Routed Network	IP Router	IP Default Gateway	IP Static Route	IP Subnet Mask
IPX Routed Network	IPX Router			

Configuration specific to the type of WAN interface must be added to the basic configuration required for IP routing, IPX routing, and bridging.

Managing the Orbitor 6000 Using the Menus

This section describes the minimum configuration parameters required when setting up the Orbitor 6000. Each of the configuration scenarios require setting of operational parameters on the Orbitor 6000. The built-in menu system of the Orbitor 6000 is used to configure the unit.

When navigating around the menu system, a new menu or an option may be chosen by simply typing the number associated with the option you wish to choose. The menu system operates on a “hotkey” principle. Each menu option may be chosen by simply typing the number associated with that option. The Orbitor 6000 will accept the choice and act on it immediately.

The menu system consists of different menu levels each containing new configuration options. Navigation back out of a nested menu is easily accomplished by pressing the tab key. The tab key takes you to the next higher menu level. If you wish to move from your current menu location directly to the main menu simply press the equals “=” key.

When choosing menu options that will toggle between values, simply pressing the number associated with that option will cause the options value to change. Each successive selection of the option will cause the options value to change.

Some menu options require input from the operator. When selecting an option that requires a value, the menu system will display the range of values acceptable and a prompt symbol “>”. Simply enter the new value at the prompt symbol and press enter. Should you make an error in entering the new value, the <BACKSPACE> key (for most terminals) deletes the most recently entered characters.

Conventions

Throughout this section, Orbitor 6000 menu options are shown that are required for the various configuration choices. The appropriate menu options are shown in each instance in the following format:

1. Configuration Option Name

Location: Main
↳ Sub-Menu Name
↳ Sub-Menu Name
↳ *Option Name*

The configuration option is shown as well as the options location within the menu system. The ↳ character indicates that a sub-menu level must be chosen. The option name is finally shown in italics.

The keyboard graphic in the left margin indicates that this is information that the user will have to enter for configuration.

The note icon is used to provide miscellaneous information on the configuration and set up of the Orbitor.

Configuration: Note *The Configuration Note is used to indicate that there may be a difference in configuration between the various operational modes of the Orbitor. This may mean for example that the IP subnet mask size is configured differently for an ISDN Orbitor than it is for a leased line Orbitor.*

The information icon is used to indicate that more information is available on this subject. The information is usually located within another document as specified.

The caution icon indicates that caution should be taken when performing this task.

Should You Bridge or Route?

When connecting two Local Area Networks together, the first question to ask is should I bridge or route? The decision to bridge or to route may be decided by how the existing networks have been already set up.

Bridging should be used when the network consists of non-routable protocols or routable protocols using the same network numbers. Some protocols can only be bridged; some of the more well known are NetBEUI (used by Microsoft Windows 3.11, Windows ’95 and Windows NT), and LAT (used by Digital Equipment Corp.).

If your IPX or IP network address is the same at both locations bridging is simpler and requires less configuration. If the locations are to be routed together, the network numbers will have to be different in both cases, this could require extensive reconfiguration.

IPX routing should be used if the two locations are already set up with different IPX network numbers. Routing IPX will minimize the number of SAP and RIP messages being sent across the WAN.

IP routing should be used if the two locations are already set up with different IP network numbers or if you wish to divide your one IP network number into two sub-networks.

In some cases both bridging and routing may be required. Routing may be required for IP information and bridging may be required for NetBEUI.

Configure as an Ethernet Bridge

An Ethernet bridge intelligently forwards LAN traffic to remotely connected LANs across the Wide Area Network (WAN).

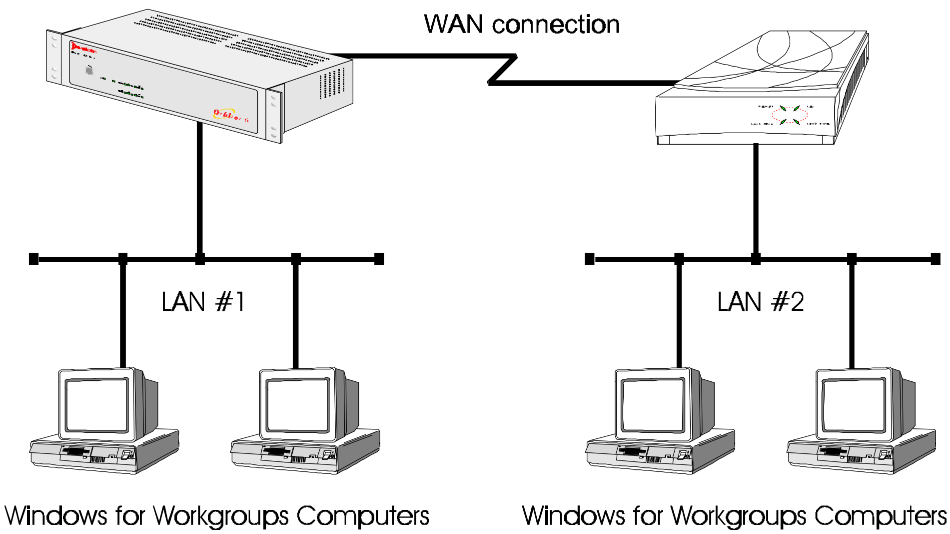


Figure 2-1 Bridged Local Area Networks

Ethernet bridges simply forward information based on Ethernet MAC addresses. If a LAN packet is destined for a device located on a remote LAN, the bridge will forward that packet to the remote LAN. If a LAN packet is destined for a device located on the local LAN, the bridge will ignore the packet.

Ethernet bridges also communicate to each other using what is called the Spanning Tree Protocol (STP). STP is used to prevent loops in a network which cause LAN traffic to be re-broadcast again and again causing network congestion.

The Orbitor 6000 is pre-configured to operate as an Ethernet bridge compatible with the IEEE 802.1d Spanning Tree Protocol definitions. This means that without configuration modifications, the Orbitor 6000 will bridge Ethernet traffic to its partner bridges when the Wide Area Network (WAN) connection has been established.

The Orbitor 6000 also is pre-configured as an IPX router. This means that if you wish to bridge IPX traffic instead of routing it, you must disable the IPX routing function of the Orbitor 6000. Once IPX routing has been disabled, all IPX traffic will be bridged between partner bridges on the WAN.

The two Local Area Networks may be bridged together with minimal configuration required. Simply connect the Orbitors to each of the LANs and connect the WAN interfaces to the supplied equipment from the service provider. The WAN set up must be configured appropriately in order for the links to operate. Once the WAN connection has been established to the remote partner Orbitor, the Orbitor will proceed to bridge the LAN traffic between the two locations.

If SNMP or Telnet management is required for the Orbitor, an IP address must be defined for each Orbitor. The IP address allows network management stations to use SNMP to configure and monitor the Orbitor remotely. The IP address also allows telnet stations to connect to the Orbitor and view the built-in menu system without having to physically connect to the device.

1. IP Address

Location: Main
↳ Configuration
↳ Internet Set up
↳ *IP Address*

The IP address consists of 4 octets and is represented by 4 fields separated by periods (“**.**”), where each field is specified by a decimal number (e.g. 199.169.1.10). Each decimal number must be less than or equal to 255, that is the maximum value of each 8-bit field.

The configuration options described here are only for initial set up and configuration purposes. For more complete information on all of the configuration parameters available please refer to the Menu Reference Manual file on the accompanying disks.

Configure as an Ethernet IP Router

An Ethernet IP router is used to intelligently route Internet Protocol (IP) LAN traffic to remotely connected LANs across the WAN.

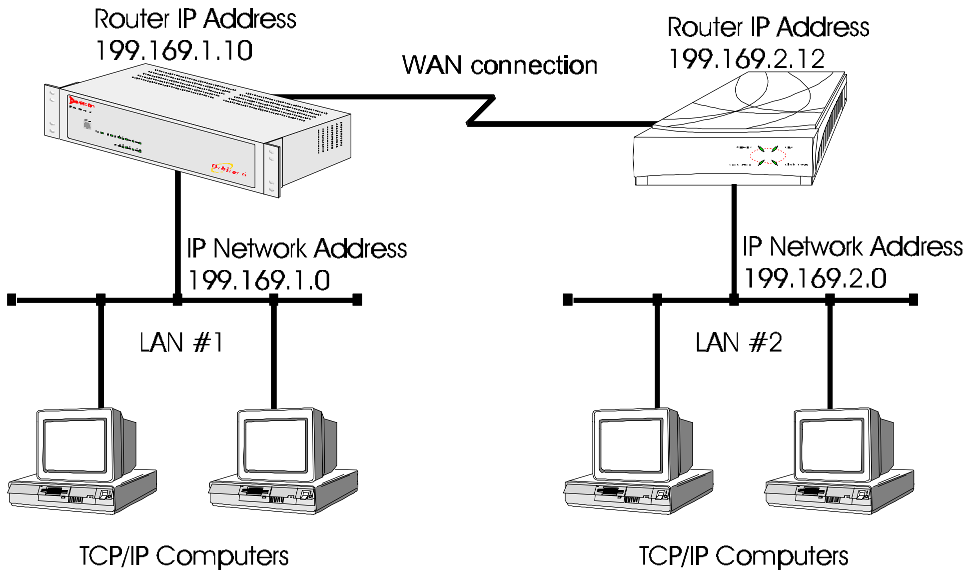


Figure 2-2 IP Routed Local Area Networks

IP routers forward IP frames based upon their IP destination address and an internal routing table. The router maintains the internal routing table with the remote network IP addresses and the remote partner IP routers associated with those networks. When an IP frame is received from the local LAN, the destination IP address is examined and looked up in the routing tables. Once the destination IP network is found in the routing tables, the IP router sends the IP frame to the remote partner Orbitor that is connected to the appropriate remote IP network. If no explicit route entry is found in the routing tables, the IP frame is sent to the Default Gateway.

To configure the Orbitor 6000 to be an IP router, the following parameters must be defined in the built-in menu system.

1. ***IP Address***

Location: Main
↳ Configuration
↳ Internet Set up
↳ *IP Address*

The IP address consists of 4 octets and is represented by 4 fields separated by periods (“**.**”), where each field is specified by a decimal number (e.g. 199.169.1.10). Each decimal number must be less than or equal to 255, that is the maximum value of each 8-bit field.

Configuration: Note *IP Routing must be disabled on the Orbitor before its IP Address may be changed.*

The subnet mask will default to the appropriate setting for the class of IP address that you have entered. If the subnet mask for the local LAN has been changed, the Subnet Size field will also need to be changed to the same value as the one defined for the local LAN.

2. IP Routing Enabled

Location: Main
↳ Configuration
↳ IP Routing Set up
↳ *IP Routing*

When a number of Orbitor IP routers are connected on the same WAN, some of the Orbitors may be defined to not be IP routers.

Configuration: Note *The Orbitors that are configured as IP routers will continue to route IP frames between themselves and the Orbitors that are configured as bridges will bridge the IP frames between themselves.*

3. IP Forwarding Enabled

Location: Main
↳ Configuration
↳ IP Routing Set up
↳ *IP Forwarding*

The IP Forwarding function enables or disables the forwarding of IP traffic when IP routing is enabled. When IP forwarding is disabled, all IP traffic across the WAN links will be blocked. While IP forwarding is disabled, the Orbitor will still operate as an IP RIP router and maintain its routing tables.

The *default gateway* parameter only needs to be defined when there is another IP router connected to the local LAN that is the default gateway for this IP network.

Once the WAN connections have been established to the remote partner Orbitors, the IP router portion of the Orbitors will begin to build their routing tables according to the IP frames they receive from the network. Manual entries may be made in the routing tables by adding *static IP routes*.

The configuration options described here are only for initial set up and configuration purposes. For more complete information on all of the configuration parameters available please refer to the Menu Reference Manual file on the accompanying disks.

Define an IP Default Gateway

An IP default gateway is an IP router that is resident on the local IP network that this Orbitor is connected to and is used to route IP frames for destination networks that do not exist in the routing tables. When an IP frame is received that is destined for a network that is not listed in the routing tables of the Orbitor, the Orbitor will send the IP frame to the default gateway. If the device originating the IP frame is on the same local LAN as the Orbitor, the Orbitor will then send an ICMP redirect message to the originating device. Any future IP frames for that destination network will then be sent to the default gateway instead of the Orbitor.

A default gateway may be configured if there are a large number of routes that will pass through another router to a larger network. An example of this would be a router that is used to connect to the Internet. All of the Orbitors on the local LAN would have the Internet access router as the default gateway. The Orbitors would route information within the internal network and any IP frames that are destined for the Internet would be routed to the default gateway.

1. ***Default Gateway***

Location: Main
↳ Configuration
↳ Internet Set up
↳ *Default Gateway*

The IP address of the default gateway consists of 4 octets and is represented by 4 fields separated by periods ("**.**"), where each field is specified by a decimal number (e.g. 199.169.1.10). Each decimal number must be less than or equal to 255, that is the maximum value of each 8-bit field.

A configured Default Gateway will override a default route learned from RIP.

Configuration: Note *On ISDN Orbitors, the Default Gateway may be located across the WAN connection.*

The configuration options described here are only for initial set up and configuration purposes. For more complete information on all of the configuration parameters available please refer to the Menu Reference Manual file on the accompanying disks.

Define an IP Static Route

Static IP routes may be defined when one specific router is to be used to reach a destination IP network. The static route will have precedence over all learned RIP routes even if the cost of the RIP learned routes is lower.

1. Edit Static Route

Location: Main
↳ Configuration
↳ IP Routing Set up
↳ IP Routes
↳ Edit Route
↳ *Route IP Address*
↳ *Route*
↳ *Cost*

Each static IP route is defined in the Edit Route menu. The destination network IP address is specified when you first enter the menu and then the IP address of the next hop route and the cost may be defined.

Once all of the static IP routes are defined they may be viewed with the *Show Static Routes* command from the IP Routes menu.

Configuration: Note *On ISDN Orbitors, when the IP routing protocol is set to none, the subnet mask size must also be defined when creating a static route entry. The subnet mask is required to allow for a static route to be created to a different IP network address.*

The configuration options described here are only for initial set up and configuration purposes. For more complete information on all of the configuration parameters available please refer to the Menu Reference Manual file on the accompanying disks.

Define an IP Subnet Mask

An IP network may be divided into smaller portions by a process called sub-netting. If for example, a small company wishes to connect to the Internet, they might be assigned a single class C IP network address (199.169.100.0). This network address allows the company to define up to 255 host addresses within their network. Their network will be attached to the Internet with an IP router.

Now if this company adds another physical location, they might want to have an internal router to route between the two or more IP networks. An IP router may be desirable between the two IP networks to minimize traffic on the router connection. The original IP network address may be sub-netted into two or more smaller IP networks consisting of a smaller number of host addresses in each location. This allows each of the sites to be a smaller IP network and to be routed together to allow inter-network communication.

The Orbitor 6000 allows standard subnet sizes from 2 to 22 bits of the host field. The subnet size determines how many bits of the host field of the original IP network address will be used for the creation of subnets. In this example, a subnet size of 2 will result in the creation of 4 sub-networks from the original IP network address. Since two of the resulting sub-network will have either all zeros or all ones as the subnet address, they are invalid. So setting a subnet size of 2 will generate two resulting sub-networks with up to 62 host addresses each. The new IP network addresses will be: 199.169.100.64 and 199.169.100.128. The subnet mask for the newly created networks will be 255.255.255.192. For information on defining variable length subnet masks refer to the next section.

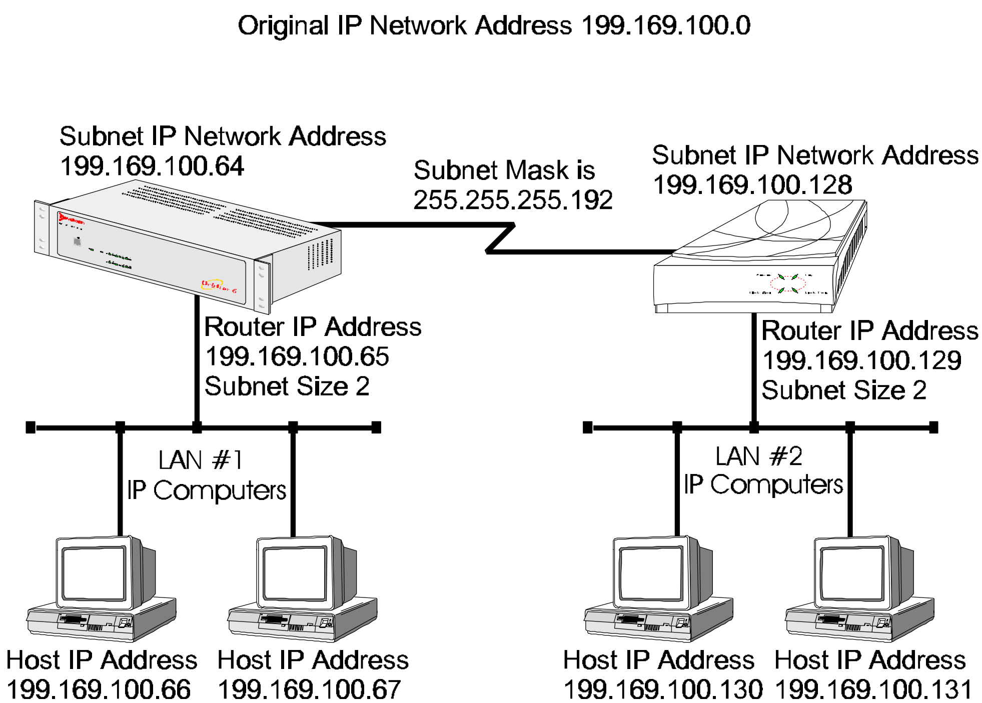


Figure 2-3 Defining an IP Subnet Mask

To configure the Orbitor 6000 routers to route between the newly created sub-networks, the following parameters must be defined in the built-in menu system.

1. IP Address

Location: Main
↳ Configuration
↳ Internet Set up
↳ *IP Address*

The IP address consists of 4 octets and is represented by 4 fields separated by periods ("**.**"), where each field is specified by a decimal number (e.g. 199.169.1.10). Each decimal number must be less than or equal to 255, that is the maximum value of each 8-bit field.

Configuration: Note *IP Routing must be disabled on the Orbitor before its IP Address may be changed.*

2. Subnet Size

Location: Main
↳ Configuration
↳ Internet Set up
↳ *Subnet Size*

The Subnet Size defines the subnet mask by using the specified number to reserve a series of contiguous bit locations immediately following the network portion of the IP address. These reserved bit locations are then used as part of the network portion of the IP address. The subnet size must be the same as the subnet size defined on the other Orbitor routers connected on the same WAN connection when the IP routing protocol is set to RIP.

The subnet mask created will vary depending upon which class of IP address is being sub-netted. A class A network with an 8-bit mask will have a mask of 255.255.0.0, while a class B network with an 8-bit mask will have a mask of 255.255.255.0.

The configuration of the sub-netted class C IP network is now completed. Remember that each of the 4 sub-networks created may only have 62 host IP addresses defined.

The configuration options described here are only for initial set up and configuration purposes. For more complete information on all of the configuration parameters available please refer to the Menu Reference Manual file on the accompanying disks.

Define a Variable Length IP Subnet Mask

The ISDN version of the Orbitor 6000 allows for the definition of subnet masks that consist of all zeroes or all ones. Normally subnet masks of these types are not allowed. The use of variable length subnets allows the creation of four distinct subnets with the use of a two bit subnet size. A two bit subnet size under the standard configuration would result in two useable subnets and two non-useable subnets. The non-useable subnets would not be valid due to the fact that the subnet portion of the address would contain all zeroes or all ones.

An IP network may be divided into smaller portions by a process called sub-netting. If for example, a small company wishes to connect to the Internet, they might be assigned a single class C IP network address (199.169.100.0). This network address allows the company to define up to 255 host addresses within their network. Their network will be attached to the Internet with an IP router.

Now if this company adds another physical location, they might want to have an internal router to route between the two or more IP networks. An IP router may be desirable between the two IP networks to minimize traffic on the router connection. The original IP network address may be sub-netted into two or more smaller IP networks consisting of a smaller number of host addresses in each location. This allows each of the sites to be a smaller IP network and to be routed together to allow inter-network communication.

The Orbitor 6000 allows variable length subnet sizes from 1 to 22 bits of the host field. The subnet size determines how many bits of the host field of the original IP network address will be used for the creation of subnets. In this example, a variable length subnet size of 1 will result in the creation of 2 sub-networks from the original IP network address. So setting a subnet size of 1 will generate two resulting sub-networks with up to 126 host addresses each. The new IP network addresses will be: 199.169.100.0 and 199.169.100.128. The subnet mask for the newly created networks will be 255.255.255.128.

1. Nonstandard Subnets

Location: Main
↳ Configuration
↳ Internet Set up
↳ *Nonstandard Subnets*

To define a subnet mask that contains all zeroes or all ones, the Nonstandard Subnets option must be set to enabled.

To configure the Orbitor routers to route between the newly created sub-networks, the following parameters must be defined in the built-in menu system.

1. IP Address

Location: Main
↳ Configuration
↳ Internet Set up
↳ *IP Address*

The IP address consists of 4 octets and is represented by 4 fields separated by periods ("**.**"), where each field is specified by a decimal number (e.g. 199.169.1.10). Each decimal number must be less than or equal to 255, that is the maximum value of each 8-bit field.

Configuration: Note *IP Routing must be disabled on the Orbitor before its IP Address may be changed.*

2. Subnet Size

Location: Main
↳ Configuration
↳ Internet Set up
↳ *Subnet Size*

The Subnet Size defines the subnet mask by using the specified number to reserve a series of contiguous bit locations immediately following the network portion of the IP address. These reserved bit locations are then used as part of the network portion of the IP address. The subnet size must be the same as the subnet size defined on the other Orbitor routers connected on the same WAN connection when the IP routing protocol is set to RIP.

The subnet mask created will vary depending upon which class of IP address is being sub-netted. A class A network with an 8-bit mask will have a mask of 255.255.0.0, while a class B network with an 8-bit mask will have a mask of 255.255.255.0.

The configuration of the sub-netted class C IP network is now completed. Remember that each of the 2 sub-networks created may only have 126 host IP addresses defined.

The configuration options described here are only for initial set up and configuration purposes. For more complete information on all of the configuration parameters available please refer to the Menu Reference Manual file on the accompanying disks.

Define a Variable Length IP Subnet Mask While Using Static IP Routes

In addition to the ability to define variable length subnet sizes, the ISDN version of the Orbitor 6000 also allows the IP routing protocol to be changed from RIP to none. Changing the IP routing protocol to none allows the Orbitor to be used in configurations where a routing protocol other than RIP is being used. The IP routing functions of the Orbitor are accomplished through the use of static IP routes when the routing protocol is set to none.

Another use of static routing only would be the uneven allocation of subnet sizes within the network. A class C network for example may be divided up into 4 sub-networks by using a two bit subnet mask. Two of the resulting sub-networks may be used for two remote office LAN locations while the remaining two sub-networks may be combined to form a larger local LAN at the central office. Static IP routes are then created between the networks to allow for data transfer.

If for example, a company wishes to connect to the Internet, they might be assigned a single class C IP network address (199.169.100.0). This network address allows the company to define up to 255 host addresses within their network. Their network will be attached to the Internet with an IP router.

Now if this company adds two other physical locations, they might want to have an internal router to route between the internal IP networks. The original IP network address will be sub-netted into three smaller IP networks consisting of a smaller number of host addresses in each location. This allows each of the sites to be a smaller IP network and to be routed together to allow inter-network communication.

The Orbitor 6000 allows variable length subnet sizes from 1 to 22 bits of the host field. The subnet size determines how many bits of the host field of the original IP network address will be used for the creation of subnets. In this example, a variable length subnet size of 1 at the central office and 2 at the two remote offices will result in the creation of 3 sub-networks from the original IP network address.

Setting a subnet size of 1 at the central office will allocate half of the available host addresses resulting in up to 126 host addresses available. The new central office IP network address will be: 199.169.100.0. The subnet mask for the newly created network will be 255.255.255.128.

Setting a subnet size of 2 at the two remote offices will allocate one quarter of the available host addresses resulting in up to 62 host addresses available at each of the two remote offices. The new remote offices IP network addresses will be: 199.169.100.128 and 199.169.100.192. The subnet mask for the newly created remote office networks will be 255.255.255.192.

The configuration options described here are only for initial set up and configuration purposes. For more complete information on all of the configuration parameters available please refer to the ISDN Menu Reference Manual file on the accompanying disks.

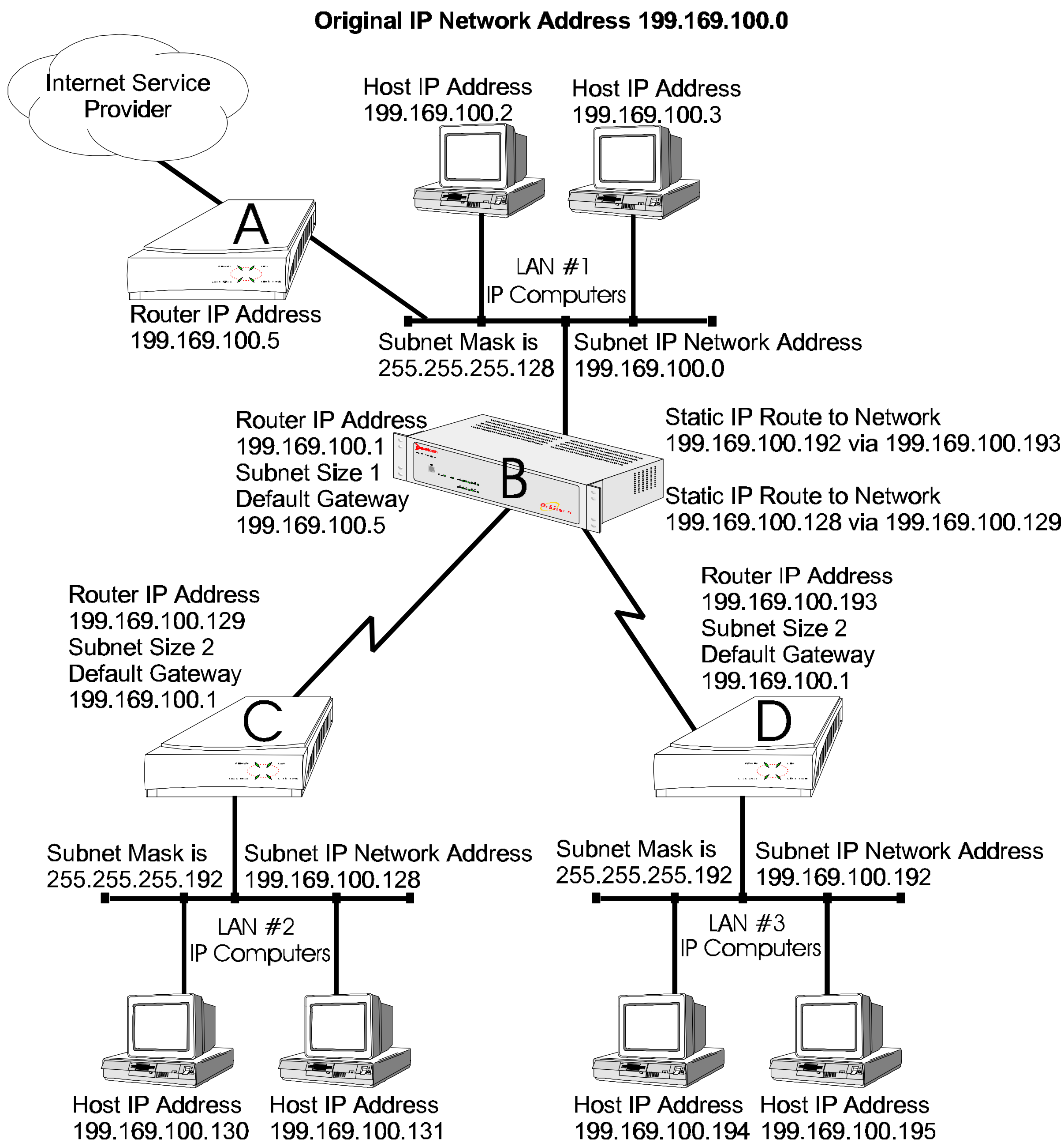


Figure 2-4 Defining a Variable Length IP Subnet Mask With IP Static Routing

Routers B, C, and D must have their **Routing Protocol** in the IP Routing Set up menu set to none. This will cause all routing between the three routers to be performed based on the static IP routes defined. Router B will have two static routes defined; one to the IP sub-network on LAN #2 through router C, and one to the IP sub-network on LAN #3 through router C. The static routes are defined in the IP Routes menu of the IP Routing Set up menu.

Both router C and D should have their **Default Gateways** defined as router B. This will cause all non local IP traffic to be sent to router B. Router B should have its Default Gateway defined as router A to allow for all IP traffic destined outside the organization to be handled by the Internet access router A.

Configure as an Ethernet IPX Router

The Orbitor 6000 is preconfigured to operate as an IPX router when installed in an IPX network. The Orbitor will learn the IPX network numbers from the local LAN and when the WAN connections are established, the Orbitor will route the IPX frames to the appropriate destination IPX network.

The IPX routing scenario may consist of one of the two following configurations. The first configuration consists of Novell servers located on each of the LAN segments to be connected. The second configuration consists of Novell servers located on only one of the LAN segments to be connected. The Orbitor IPX router will need to be configured differently in the second configuration with Novell servers located on only one of the LAN segments.

Novell Servers in Both Locations

An Ethernet IPX router is used to intelligently route Novell IPX LAN traffic to remotely connected LANs across the WAN.

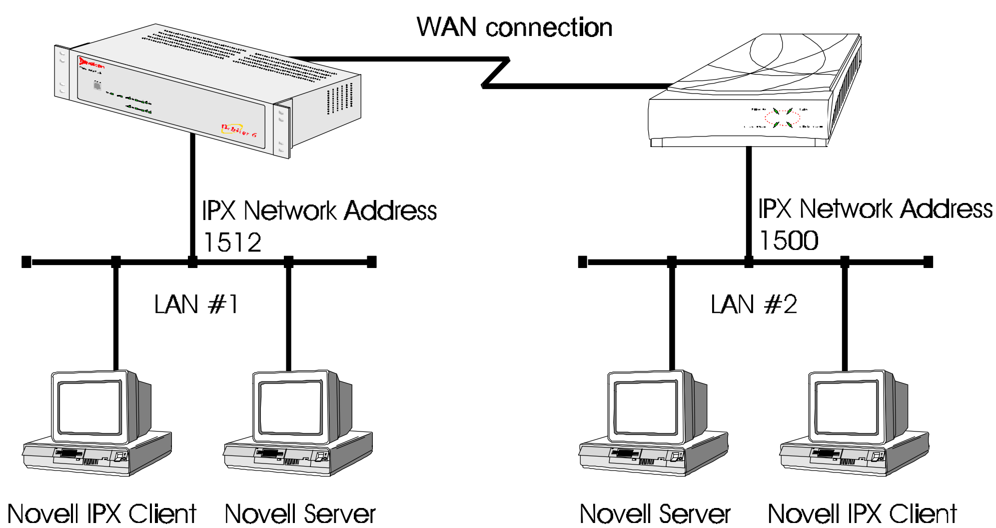


Figure 2-5 IPX Routed Local Area Networks (Servers on both sides)

IPX routers forward IPX frames based upon their IPX destination address and an internal routing table. The router maintains the internal routing table with the remote network IPX addresses and the remote partner IPX routers associated with those networks. When an IPX frame is received from the local LAN, the destination IPX address is examined and looked up in the routing tables. Once the destination IPX address is found in the routing tables, the IPX router sends the IPX frame to the remote partner Orbitor that is connected to the appropriate remote IPX network.

To configure the Orbitor 6000 to be an IPX router when both LAN segments contain Novell servers, the IPX network numbers are learned automatically from the routing information and service announcements sent by the servers. The Orbitor will automatically assign the IPX network numbers and proceed to route the IPX frames to the appropriate destination network.

When two IPX LAN segments with Novell servers on each segment are to be connected together with IPX routers, you must ensure that the IPX network numbers on each of the Novell servers is ***unique****. If the IPX network numbers are the same, the IPX routers will not operate.*

Once the WAN connections have been established to the remote partner Orbitors, the IPX router portion of the Orbitors will begin to build their routing tables according to the IPX frames they receive from the network.

The configuration options described here are only for initial set up and configuration purposes. For more complete information on all of the configuration parameters available please refer to the Menu Reference Manual file on the accompanying disks.

Novell Servers in One Location Only

Some Novell LAN installations require that a remote LAN that consists of only Novell IPX clients be connected to a central LAN that contains the Novell servers and some more clients. In this configuration, the Orbitor IPX router located at the remote site must be configured with the appropriate IPX network numbers. The IPX network number must be configured manually because there is no Novell server at the remote site. The Orbitor must act as a Novell server to supply the proper IPX network number to the clients on the remote site LAN.

In the following diagram, the Orbitor connected to LAN #2 must be configured with IPX network number 1500 using the appropriate frame type. The clients connected to LAN #2 must also be running with the same frame type as defined on the Orbitor. After the Orbitors have established the WAN connection, the IPX routing procedures will cause the names of the services located on LAN #1 to be stored in the services table on the Orbitor on LAN #2. When one of the clients on LAN #2 starts up, it will look for a server on the local LAN and the Orbitor will respond with the list of servers that are located on the central LAN.

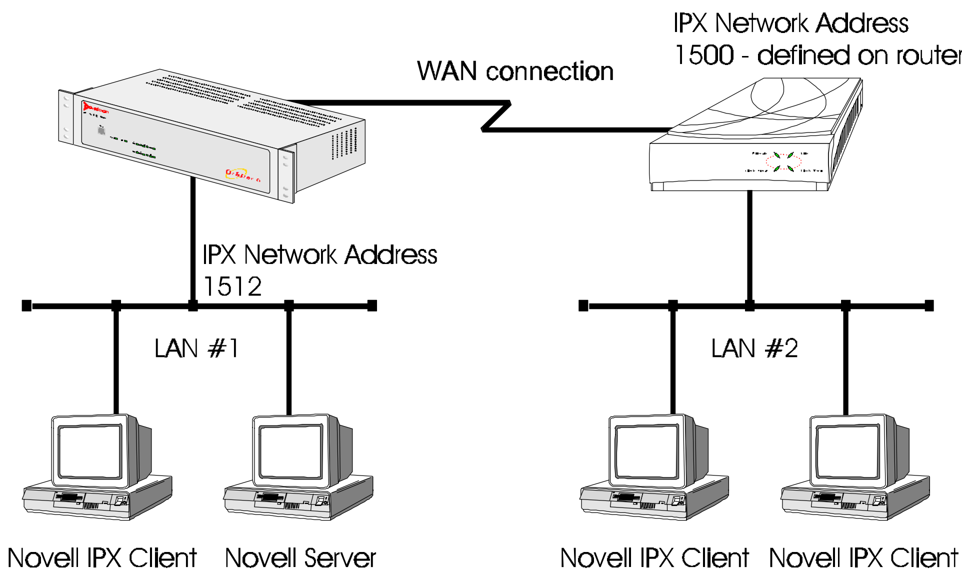


Figure 2-6 IPX Routed Local Area Networks (Servers on one side)

The following steps must be performed on the Orbitor connected to LAN #2.

1. IPX Routing Disabled

Location: Main
↳ Configuration
↳ IPX Routing Set up
↳ *IPX Routing*

Disabling IPX routing allows the IPX frame types to be modified.

2. IPX Frame Types

Location: Main
↳ Configuration
↳ IPX Routing Set up
↳ Network Numbers
↳ *Ethernet-II Frames*
↳ *RAW 802.3 Frames*
↳ *IEEE 802.2 Frames*
↳ *802.2 SNAP Frames*

Define the appropriate IPX network number for the appropriate frame type. Note that IPX network numbers must be unique. If more than one frame type is to be used, each frame type must have a unique IPX network number. There must be no duplicate IPX network numbers within your entire IPX routed network, they must all be unique. The IPX network numbers may be any value from 0 to FFFFFFFF HEX.

3. IPX Routing Enabled

Location: Main
↳ Configuration
↳ IPX Routing Set up
↳ *IPX Routing*

IPX routing must be re-enabled to allow the Orbitor to operate as an IPX router with the newly defined IPX network numbers.

All Orbitor IPX routers connected to the same WAN must have IPX routing enabled for IPX routing to take place between the LANs. When a number of Orbitor IPX routers are connected on the same WAN and one of the Orbitors has IPX routing disabled, all of the Orbitor IPX routers will become bridges only for IPX frames.

4. IPX Forwarding Enabled

Location: Main
↳ Configuration
↳ IPX Routing Set up
↳ *IPX Forwarding*

IPX forwarding must be re-enabled to allow the Orbitor to forward IPX frames onto the WAN to the partner Orbitor IPX routers.

The IPX Forwarding function enables or disables the forwarding of IPX traffic when IPX routing is enabled. When IPX forwarding is disabled, all IPX traffic across the WAN links will be blocked. While IPX forwarding is disabled, the Orbitor will still operate as an IPX router and maintain its routing and server tables.

Configure Basic ISDN Connections

The ISDN Orbitor 6000 establishes WAN connections to other ISDN Orbitor 6000, 3000, 2000, or 1000 units via ISDN (Integrated Services Digital Network) connections. From 1 to 14 ISDN B-channels (2 B-channels per ISDN BRI interface) may be used to connect to other ISDN Orbitors. One ISDN connection is required to establish a WAN connection between two Orbitors. The ISDN parameters must be defined on each of the Orbitors before the connection can be established.

Before the Orbitor 6000 can establish an ISDN connection to another ISDN Orbitor, the ISDN information must be defined. The phone numbers must be defined for the ISDN interface, and the ISDN switch type must be defined for the Orbitor. Refer to the following diagram that shows two Orbitor 3000 units connected to an Orbitor 6000 unit with two ISDN B-channels being configured on one of the Orbitor 3000s and one B-channel on the other.

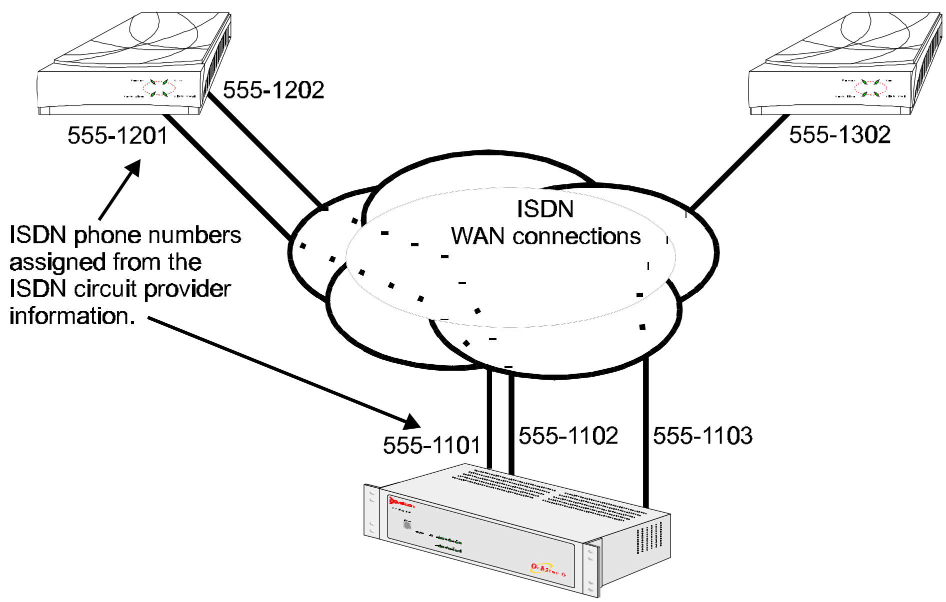


Figure 2-7 Basic ISDN Configuration

The following steps must be performed on the Orbitor 6000 in the network.

1. *Switch Type*

Location: Main
↳ Configuration
↳ Interface Set up
↳ WAN Set up
↳ ISDN Set up
↳ *Switch Type*

Ten ISDN switch types are available:net3, ni-1, ni-2, dms-100, 5ess-pp, 5ess-mp, tph1962, kdd, sweden, or ntt. Note that if your Orbitors are located within different ISDN jurisdictions, the ISDN switch type may be different on each of the Orbitor units.

2. Directory Number & SPID for each Link (ISDN B-channel)

Location: Main
↳ Configuration
↳ Interface Set up
↳ WAN Set up
↳ Link Set up
↳ *Directory Number*
↳ *SPID*

The directory number for each of the ISDN B-channels must be defined. The directory numbers **must** be set the same as the value provided by your ISDN service for this Orbitor.

The directory numbers will be the ISDN phone numbers used to establish a call between the Orbitors. The SPIDs are used to register the ISDN interface with the central switch.

For most European installations the switch type will be NET3 which only requires one directory number.

Most North American installations use the switch type NI-1 and require the use of two directory numbers as well as two SPID (Service Profile Identifiers) values.

Once the ISDN switch type and directory numbers have been configured, the Orbitor must be reset for the new values to take effect and for the ISDN BRI interface to register with the central switch.

1. Soft Reset

Location: Main
↳ Diagnostics
↳ *Soft Reset*

Once the Orbitor has restarted it is ready to establish ISDN connections.

With the ISDN numbers and switch type defined, an ISDN call may be placed from one Orbitor to another. The calls may be placed manually or automatically. The automatic call features available are Auto-Call and IP Address Connect. An Auto-Call connection is established each time the Orbitor starts up. An IP Address Connect call is established to a specifically configured remote Orbitor when certain IP traffic is received from the local LAN.

The configuration options described here are only for initial set up and configuration purposes. For more complete information on all of the configuration parameters available please refer to the “ISDNMENU.PDF” Menu Reference Manual file on the accompanying disks.

* * * *

3
Introduction to Filtering

The Orbitor 6000 provides programmable filtering which gives you the ability to control under what conditions Ethernet frames are forwarded to remote networks. There are many reasons why this might need to be accomplished, some of which are security, protocol discrimination, bandwidth conservation, and general restrictions.

Filtering may be accomplished by using two different methods. The first method is to filter or forward frames based solely on their source or destination MAC address. This method of filtering is useful when bridging between LANs and for providing remote access security in any type of network. The Ethernet MAC (Media Access Control) address is checked against the addresses in the filtering list and the frame is filtered or forwarded accordingly.

The second method of filtering is pattern filtering where each frame is checked against a filter pattern. The filter pattern may be defined to perform a check of any portion of the Ethernet frame. Separate filter patterns may be defined for bridged frames, IP routed frames, and IPX routed frames.

For more information on filtering please refer to the Programmable Filtering section of the Orbitor 6000 reference manual file. The PDF file is located on the accompanying diskette.

MAC Address Filtering

MAC address filtering is provided by three built-in functions.

The first function is “Filter if Source”; the second is “Filter if Destination.” The third function allows you to change the filter operation from “positive” to “negative.” The positive filter operation causes frames with the specified MAC addresses to be filtered. The negative filter operation causes frames with the specified MAC addresses to be forwarded.

You may easily prevent any station on one segment from accessing a specific resource on the other segment; for this, “positive” filtering and the use of “Filter if Destination” would be appropriate. If you want to disallow a specific station from accessing any service, “Filter if Source” could be used.

You may easily prevent stations on one segment from accessing all but a specific resource on the other segment; for this, “negative” filtering and the use of “Forward if Destination” would be appropriate. If you want to disallow all but one specific station from accessing any service on the other segment, the use of “Forward if Source” could be used.

Pattern Filtering

Pattern filtering is provided in three separate sections: Bridge Pattern Filters, IP Router Pattern Filters, and IPX Router Pattern Filters. When the Orbitor is operating as an IP/IPX Bridge/Router, each of the frames received from the local LAN is passed on to the appropriate internal section of the Orbitor. The IPX frames are passed on to the IPX router, the IP frames are passed on to the IP router, and all other frames are passed on to the bridge. Different pattern filters may be defined in each of these sections to provide very extensive pattern filtering on LAN traffic being sent to remote LANs.

Pattern filters are created by defining an offset value and a pattern match value. The offset value determines the starting position for the pattern checking. An offset of 0 indicates that the pattern checking starts at the beginning of the data frame. An offset of 12 indicates that the pattern checking starts at the 12th octet of the data frame. When a data frame is examined in its HEX format, an octet is a pair of HEX values with offset location 0 starting at the beginning of the frame. Please refer to *Appendix C - Octet Locations on Ethernet Frames* for more information on octet locations in data frames.

The pattern match value is defined as a HEX string that is used to match against the data frame. If the HEX data at the appropriate offset location in the data frame matches the HEX string of the filter pattern, there is a positive filter match. The data frame will be filtered according to the filter operators being used in the filter pattern.

The following operators are used in creating Pattern filters.

- offset — Used in pattern filters to determine the starting position to start the pattern checking.

  Example: 12-80 — This filter pattern will match if the packet information starting at the 12th octet equals the 80 of the filter pattern.

| OR — Used in combination filters when one **or** the other conditions must be met.

  Example: 10-20|12-80 — This filter pattern will match if the packet information starting at the 10th octet equals the 20 of the filter pattern or if the packet information starting at the 12th octet equals the 80 of the filter pattern.

& AND — Used in combination filters when one **and** the other conditions must be met.

  Example: 10-20&12-80 — This filter pattern will match if the packet information starting at the 10th octet equals the 20 of the filter pattern and the packet information starting at the 12th octet equals the 80 of the filter pattern.

~ NOT — Used in pattern filters to indicate that all packets **not** matching the defined pattern will be filtered.

Example: ~12-80 This filter pattern will match if the packet information starting at the 12th octet does not equal the 80 of the filter pattern.

( ) brackets Used in pattern filters to separate portions of filter patterns for specific operators.

Example: 12-80&(14-24|14-32) This filter pattern will be checked in two operations. First the section in brackets will be checked and then the results of the first check will be used in the second check using the first portion of the filter patter. If the packet information starting at the 14th octet equals 24 or 32, and the information at the 12th octet equals 80, the filter pattern will match.

Popular Filters

Shown here are some of the more commonly used pattern filters.

Bridge

Bridge pattern filters are applied to Ethernet frames that are bridged only. When the Orbitor is operating as a router, all routed frames will be unaffected by the bridge pattern filters.

IP & Related Traffic

IP & Related Traffic	
Forward only	**~(12-0800|12-0806)**
Filter	**(12-0800|12-0806)**

Novell IPX Frames

Novell IPX Frames	
EthernetII	**(12-8137)**
802.3 RAW	**(14-FFFF)**
802.2	**(14-E0E0)**
802.2 LLC	**(14-AAAA&20-8137)**

NetBIOS &NetBEUI (Windows For Workgroups)

NetBIOS & NetBEUI (Windows For Workgroups)	
Filter	**(14-F0F0)**
Forward only	**~(14-F0F0)**

Banyan

Banyan
(12-0BAD)
(12-80C4)
(12-80C5)

IP Router

IP router pattern filters are applied to IP Ethernet frames that are being routed. When the Orbitor is operating as an IP router, all IP routed frames will be checked against the defined IP router pattern filters. IP routed frames are unaffected by the bridge pattern filters and the IPX router pattern filters.

NetBIOS over TCP

NetBIOS over TCP	
NETBIOS Name Service	(22-0089)
NETBIOS Datagram Service	(22-008A)
NETBIOS Session Service	(22-008B)

Note: Uses the TCP Destination Port location

Other interesting TCP Ports

Other interesting TCP Ports		
Decimal	Hex	Usage
21	15	FTP
23	17	Telnet
25	19	SMTP
69	45	TFTP
109	6D	POP2
110	6E	POP3

A
Menu Trees

The menu trees on the next few facing pages are a graphical representation of the hierarchy of the built-in menu system of the Orbitor 6000. Each of the menus are shown with the options of the menus being displayed below the specific menu name.

Each of the menu options shown in each of the menu trees is explained in the accompanying Orbitor 6000 menu reference files. The PDF files are located on the accompanying diskettes.

Menu names are displayed in boxes. The numbers on the left side of the boxes indicate the menu option from the parent menu that this menu corresponds to. All menu options are listed with numbers indicating their actual position within the menu system.

Menu options contained within a grayed box are display options. Display options are used to provide information on various operational states and to also provide statistics.

Leased Line Menu Tree

MAIN

Menus & sub-Menus

Information Displays

(1) **Configuration**

- 1] **Access Set-Up**
  1. Terminal Set-Up menu
  2. Device Set-Up menu
  3. Remote Access menu
  4. Load FLASH Set-Up menu
  5. **TFTP Restore**
  6. **Hardware Status**
  7. **Dump**
  8. **Restore**
  - 1] **Terminal Set-Up**
    1. **Terminal**
    2. **Show**
    3. **Add**
    4. **Remove**
  - 2] **Device Set-Up**
    1. **Password**
    2. **Remote Password**
    3. **Device Name**
    4. **LAN Name**
    5. **Show Time**
    6. **Set Time**
  - 3] **Remote Access**
    1. **Telnet**
    2. **Connect**
    3. **Show Names**
    4. **Add Name**
    5. **Remove Name**
  - 4] **Load FLASH Set-Up**
    1. **Console (ZMODEM)**
    2. **Network (TFTP)**
- 2] **Interface Set-Up**
  1. WAN Set-Up menu
  2. **LAN Interface Type**
  - 1] **WAN Set-Up**
    1. Operating Parameters menu
    2. Activation Conditions menu
    3. **Conditional Operation**
    4. **Link Operation**
    5. **Module Operation**
    6. **Copy**
    7. **Link Status**
    8. **Reset Link**
    - 1] **Link Operating Parameters**
      1. **Speed**
      2. **Retry Timer**
      3. **Retry Count**
      4. **CD Wait Time**
      5. **Extended Buffering**
      6. **Compression**
    - 2] **Link Activation Conditions**
      1. Activation Schedule menu
      2. **Auto Answer**
      - 1] **Link Activation Schedule**
        1. **Activation Time Schedule**
        2. **Display Activation Time Schedule**
        3. **Display Time**
- 3] **Bridging Set-Up**
  1. Spanning Tree menu
  2. **Bridge Forwarding**
  3. **Bridge Aging Timer**
  4. **Show Bridging Table**
  5. **Show Permanent Table**
  6. **Clear Bridging Table**
  - 1] **Spanning Tree**
    1. LAN Port menu
    2. **STP State**
    3. **Device Priority**
    4. **Bridge Priority**
    5. **Forwarding Delay**
    6. **Message Age Timer**
    7. **Hello Time**
    8. **Show Bridge**
    9. **Topology Status**
    - 1] **LAN Port**
      1. **State**
      2. **Path Cost**
      3. **Priority**
      4. **Show Port**
- 4] **Internet Set-Up**
  1. ARP Set-Up menu
  2. **IP Address**
  3. **Nonstandard Subnets**
  4. **Subnet Size**
  5. **Network Mask**
  6. **Default Gateway**
  7. **BSD Type Broadcast**
  8. **Time To Live**
  9. **Help**
  - 1] **ARP Set-Up**
    1. **ARP Aging Timer**
    2. **ARP Retry Timer**
    3. **Show ARP Table**
- 5] **IP Routing Set-Up**
  1. IP Routes menu
  2. **IP Routing**
  3. **IP Forwarding**
  4. **ARP Proxy**
  5. **Source Quench Generation**
  6. **Show Interconnect**
  7. **Help**
  - 1] **IP Routes**
    1. Edit Route
    2. **Show All Routes**
    3. **Show Static Routes**
    4. **Clear Static Routes**
    - 1] **Edit Route**
      1. **Status**
      2. **Route**
      3. **Cost**
      4. **Type**
      5. **Remove**
- 6] **IPX Routing Set-Up**
  1. Network Numbers menu
  2. **IPX Routing**
  3. **IPX Forwarding**
  4. **Show Interconnect**
  5. **Show Routes**
  6. **Show Services**
  7. **Help**
  - 1] **Network Numbers**
    1. **Ethernet-II Frames**
    2. **RAW 802.3 Frames**
    3. **IEEE 802.2 Frames**
    4. **802.2 SNAP Frames**
    5. **Help**

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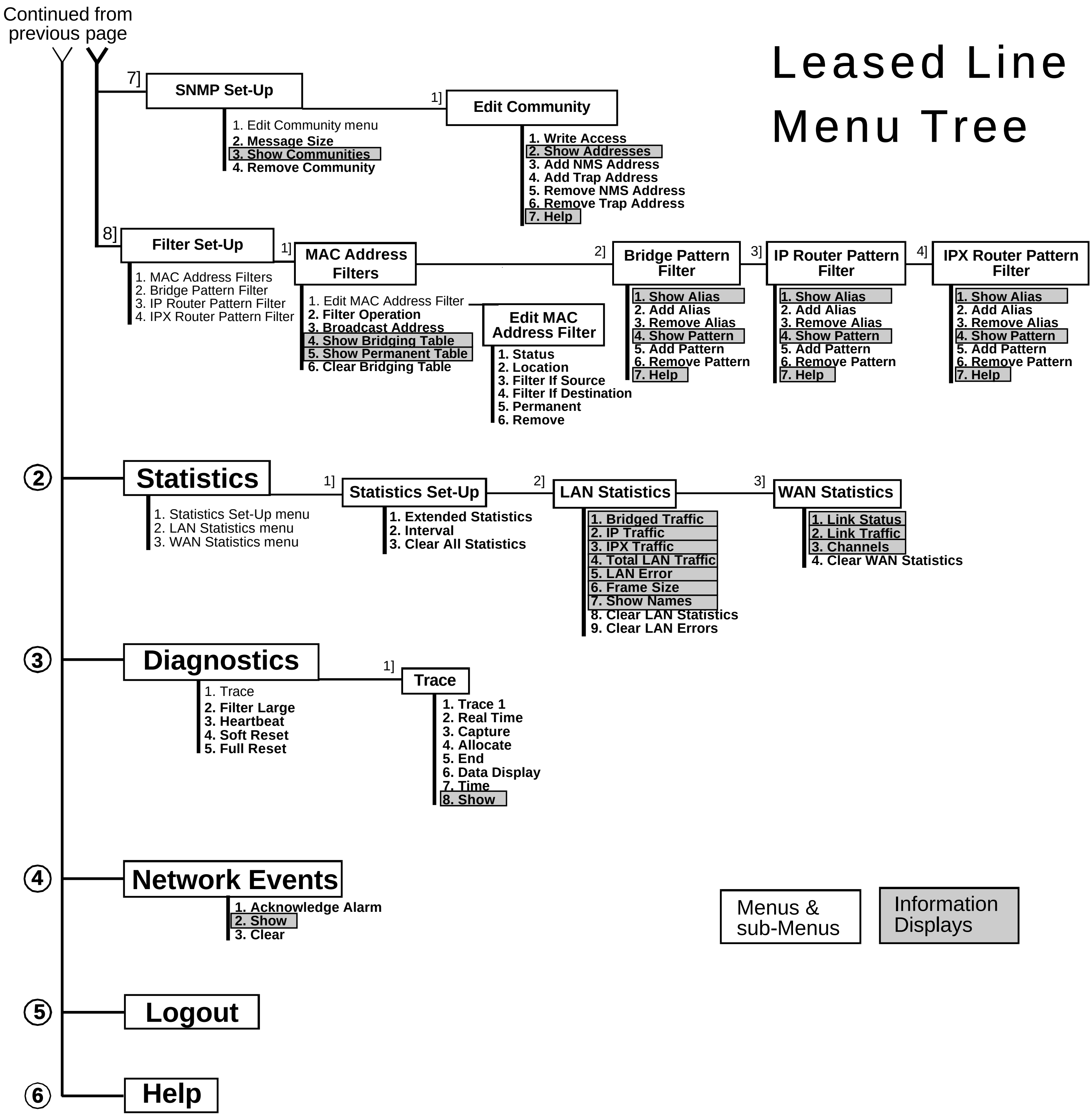
Leased Line Menu Tree



ISDN Menu Tree

MAIN

Menus & sub-Menus | Information Displays

- ① **Configuration**
  - 1] **Access Set-Up**
    1. Terminal Set-Up menu
    2. Device Set-Up menu
    3. Remote Access menu
    4. Load FLASH Set-Up menu
    5. **TFTP Restore**
    6. **Hardware Status**
    7. **Dump**
    8. **Restore**
    - 1] **Terminal Set-Up**
      1. **Terminal**
      2. **Show**
      3. **Add**
      4. **Remove**
    - 2] **Device Set-Up**
      1. **Password**
      2. **Remote Password**
      3. **Device Name**
      4. **LAN Name**
      5. **Show Time**
      6. **Set Time**
    - 3] **Remote Access**
      1. **Telnet**
      2. **Connect**
      3. **Show Names**
      4. **Add Name**
      5. **Remove Name**
    - 4] **Load FLASH Set-Up**
      1. **Console (ZMODEM)**
      2. **Network (TFTP)**
  - 2] **Interface Set-Up**
    1. WAN Set-Up menu
    2. **LAN Interface Type**
    - 1] **WAN Set-Up**
      1. ISDN Set-Up menu
      2. Link Set-Up menu
      3. Group Set-Up menu
      4. Connection Management menu
      5. Remote Site Set-Up menu
      6. IP Address Connect menu
      7. **Extended Routing**
      8. **Extended Buffering**
      - 1] **ISDN Set-Up**
        1. Security Set-Up menu
        2. **Switch Type**
        - 1] **Security Set-Up**
          1. **Password Security**
          2. **ISDN Password**
          3. **Add Security Entry**
          4. **Show Security Database**
          5. **Remove Security Entry**
      - 2] **Link Set-Up**
        1. HDLC Operating Parameters menu
        2. **Link Operation**
        3. **Module Operation**
        4. **Phantom Power Detect**
        5. **Dial Prefix**
        6. **Directory Number**
        7. **SPID**
        - 1] **HDLC Operating Parameters**
          1. **Retry Timer**
          2. **Retry Count**
      - 3] **Group Set-Up**
        1. **Multilink Operation**
        2. **Force 56k**
        3. **Hunt Group #**
        4. **Show Group**
        5. **Add Link**
      - 4] **Connection Management**
        1. **Connection Management**
        2. **Ignore Bridge Traffic**
        3. **Ignore IPX Type 20**
        4. **Idle Timer**
        5. **TCP Keepalive**
        6. **IPX Watchdog Interval**
      - 5] **Remote Site Set-Up**
        1. Edit Remote Site menu
        2. **Manual Call**
        3. **Force Disconnect**
        4. **Show Remote Sites**
        5. **Remove Remote Site**
        - 1] **Edit Remote Site**
          1. ISDN Call Set-Up menu
          2. Primary Call Set-Up menu
          3. Secondary Call Set-Up menu
          4. **Auto-Call**
          5. **Remote Site Device Name**
          6. **Group**
          - 1] **ISDN Call Set-Up**
            1. **ISDN Number**
            2. **Call You**
            3. **Call Me**
            4. **Redial Timer**
            5. **Redial Count**
          - 2] **Primary Call Set-Up**
            1. **Conditional Operation**
            2. **Activation Schedule**
            3. **Display Schedule**
          - 3] **Secondary Call Set-Up**
            1. **Conditional Operation**
            2. **Activation Schedule**
            3. **Display Schedule**
            4. **Traffic Level**
            5. **Up Threshold**
            6. **Up Stability Timer**
            7. **Down Threshold**
            8. **Down Stability Timer**
      - 6] **IP Address Connect Set-Up**
        1. Edit IP Address Entry menu
        2. **IP Address Connect**
        3. **Show IP Address Entries**
        4. **Remove IP Address Entry**
        - 1] **Edit IP Address Entry**
          1. **IP Address**
          2. **IP Address Mask**
          3. **Remote Site**

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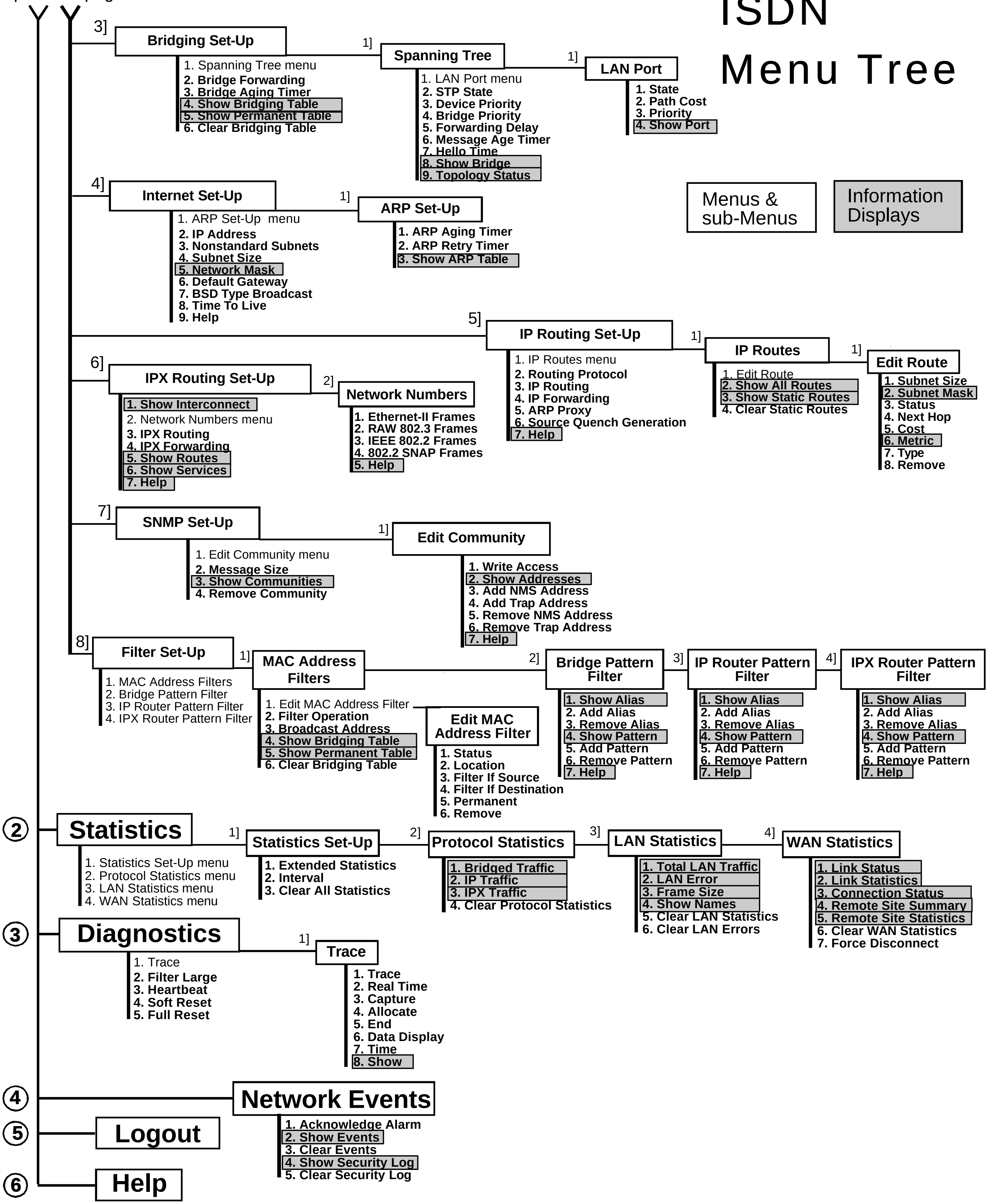
ISDN Menu Tree



* * * *

B
Configuration Pages

These configuration pages are provided to keep a log of the configuration settings for this Orbitor 6000. If a replacement unit is installed the configuration may be easily set to match the existing unit by following the settings on these pages.

Remember that the configuration Dump and Load commands may also be used to store the configuration of an Orbitor. This way if a replacement unit is required, the saved configuration may be simply Loaded into the replacement unit and the configuration will be the same as the existing unit.

There are two sets of configuration pages included in this section. Each set consists of two facing pages and corresponds to a version of operating software.

The default values, where applicable, are shown in brackets.

Note: *Not all of the Orbitor 6000 configuration parameters are listed here.*

Leased Line

Access Set-Up Menu

TFTP Restore __ disabled __ enabled

Terminal Set-Up Menu

Terminal _______ terminal type

Device Set-Up Menu

Password ______________

Remote Password __ disabled __ enabled

Device Name ______________

LAN Name ______________

Remote Access Menu

Telnet __ disabled __ enabled

WAN Set-Up Menu

LAN Interface Type ______________

Link	Link Operation	Module Operation	Speed	Compression	Extended Buffering	Auto Answer
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						

Bridging Set-Up Menu

Bridge Forwarding __ disabled __ enabled

Bridge Aging Timer _______ (300) seconds

Spanning Tree Menu

STP State __ disabled __ enabled

Device Priority _______ (1)

Bridge Priority _______ (32768)

Forwarding Delay _______ (15) seconds

Message Age Timer _______ (20) seconds

Hello Time _______ (2) seconds

LAN Port Menu

State __ disabled __ enabled

Path Cost _______ (100)

Priority _______ (128) decimal

Internet Set-Up Menu

IP Address ____ . ____ . ____ . ____

Subnet Size _______ (none) value

Default Gateway ____ . ____ . ____ . ____

ARP Aging Timer _______ (2) minutes

ARP Retry Timer _______ (2) seconds

Address Mask Response __ disabled __ enabled

BSD Type Broadcast __ disabled __ enabled

Time To Live _______ (32)

IP Routing Set-Up Menu

IP Routing __ disabled __ enabled

IP Forwarding __ disabled __ enabled

ARP Proxy __ disabled __ enabled

Source Quench Generation __ disabled __ enabled

IP Routes Menu

Static Routes

Destination IP Address	Next Hop IP Address	Cost

IPX Routing Set-Up Menu

IPX Routing __ disabled __ enabled

IPX Forwarding __ disabled __ enabled

Network Numbers Menu

Ethernet-II Frames ________ (0) hex

RAW 802.3 Frames ________ (0) hex

IEEE 802.2 Frames ________ (0) hex

802.2 SNAP Frames ________ (0) hex

MAC Address Filters Menu

Filter Operation __ negative __ positive

Broadcast Address __ filter __ forward

MAC Address Filter Table

MAC Address	Source	Destination

Bridge Pattern Filter Menu

Aliases

____
____
____
____

Patterns

____
____
____
____

IP Router Pattern Filter Menu

Aliases

____
____
____
____

Patterns

____
____
____
____

IPX Router Pattern Filter Menu

Aliases

____
____
____
____

Patterns

____
____
____
____

Statistics Set-Up Menu

Extended Statistics __ disabled __ enabled

Interval ________ (60) seconds

Diagnostics Menu

Filter large __ disabled __ enabled

Heartbeat __ disabled __ enabled

ISDN

Access Set-Up Menu

TFTP Restore __ disabled __ enabled

Terminal Set-Up Menu

Terminal _______ terminal type

Device Set-Up Menu

Password _______________

Remote Password __ disabled __ enabled

Device Name _______________

LAN Name _______________

Remote Access Menu

Telnet __ disabled __ enabled

ISDN Set-Up Menu

Switch Type _______________

ISDN Password _______________

Link Set-up Menu

Link	Operation	Directory Number 1	SPID	Dial Prefix	Phantom Power Detect
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					

Group Set-up Menu

Group	Multilink	Force 56K	Hunt Group Number
1			
2			
3			
4			
5			

Remote Site Table

Index	Device Name	ISDN Number	Call You Prefix	Auto-Call	Group
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					

IP Address Connect Table

IP Address Connect __ disabled __ enabled

Index	IP Address	Address Mask	Remote Site Table Entry
1			
2			
3			
4			
5			
6			
7			
8			

Connection Management Menu

Connection Management __ disabled __ enabled

Ignore Bridge Traffic __ disabled __ enabled

Ignore IPX Type 20 __ disabled __ enabled

Idle Timer _______ (60) seconds

TCP Keepalive _______ (120) minutes

IPX Watchdog Interval _______ (59) seconds

Bridging Set-Up Menu

Bridge Forwarding __ disabled __ enabled

Spanning Tree Menu

STP State __ disabled __ enabled

Internet Set-Up Menu

IP Address ____ . ____ . ____ . ____

Nonstandard Subnets __ disabled __ enabled

Subnet Size _______ (none) value

Default Gateway ____ . ____ . ____ . ____

BSD Type Broadcast __ disabled __ enabled

Time To Live _______ (32)

IP Routing Set-Up Menu

IP Routing __ disabled __ enabled

Routing Protocol __ RIP __ none

IP Forwarding __ disabled __ enabled

ARP Proxy __ disabled __ enabled

Source Quench Generation __ disabled __ enabled

IP Routes Menu

Static Routes

Destination IP Address	Subnet Size	Next Hop IP Address	Cost

IPX Routing Set-Up Menu

IPX Routing __ disabled __ enabled

IPX Forwarding __ disabled __ enabled

MAC Address Filters Menu

Filter Operation __ negative __ positive

Broadcast Address __ filter __ forward

MAC Address Filter Table

MAC Address	Source	Destination

Bridge Pattern Filter Menu

Aliases

____

____

Patterns

____

____

IP Router Pattern Filter Menu

Aliases

____

____

Patterns

____

____

IPX Router Pattern Filter Menu

Aliases

____

____

Patterns

____

____

Statistics Set-Up Menu

Extended Statistics __ disabled __ enabled

Interval _______ (60) seconds

Diagnostics Menu

Filter large __ disabled __ enabled

Heartbeat __ disabled __ enabled

* * * *

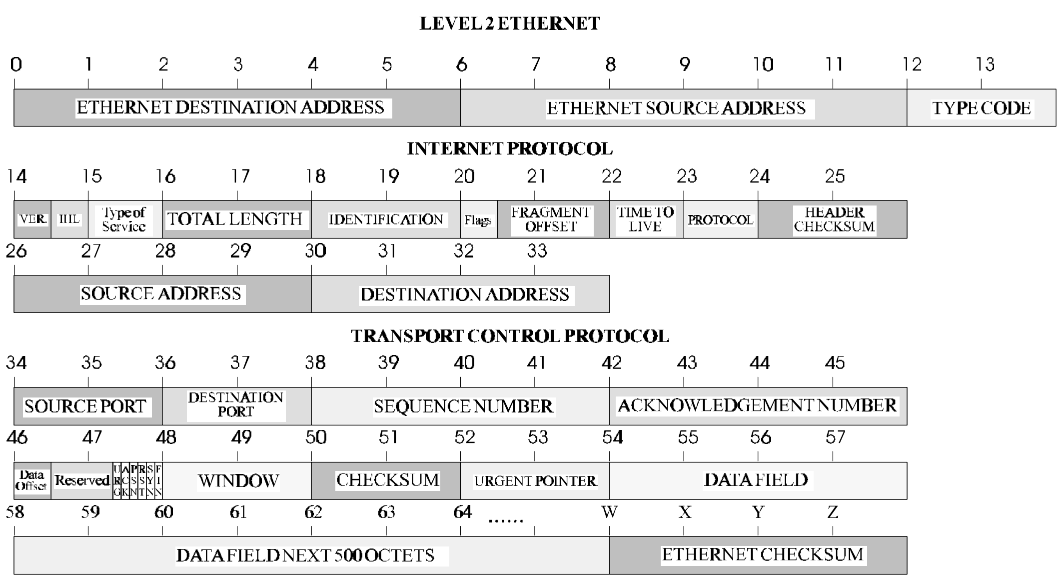
C
Octet Locations on Ethernet Frames

This appendix provides octet locations for the various portions of three of the common Ethernet frames. When creating pattern filters these diagrams will assist in the correct definition of the patterns. The offset numbers are indicated by the numbers above the frame representations.

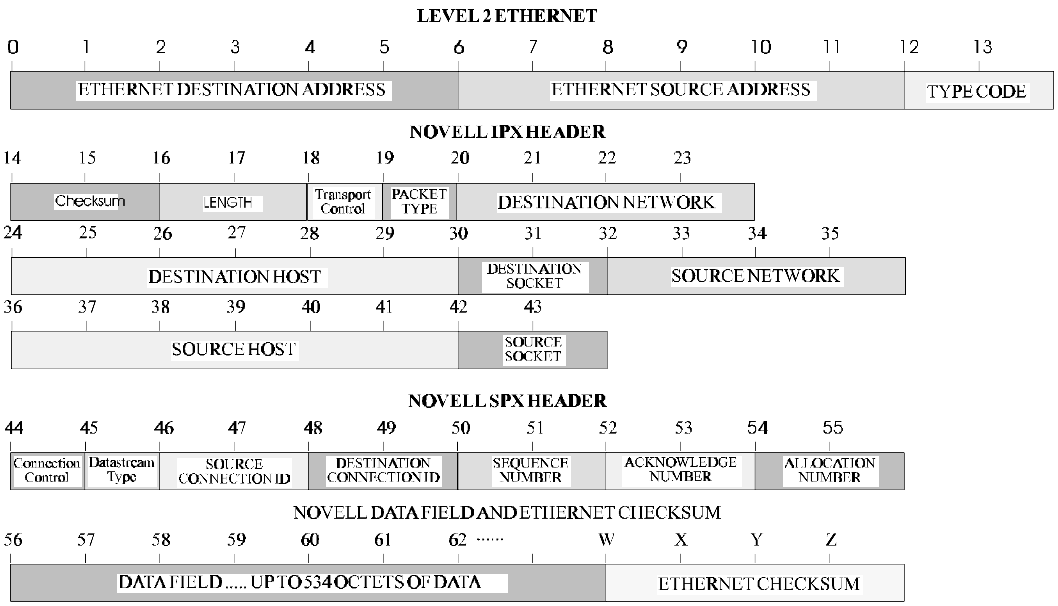
Note the differences in the TCP/IP and Novell frames when bridging and when routing. When routing, the TCP/IP and Novell frames are examined after the Level 2 Ethernet portion of the frame has been stripped from the whole data frame. This means that the offset numbers now start from 0 at the beginning of the routed frame and not the bridged frame.

Some of the common Ethernet type codes are also shown here. The Ethernet type codes are located at offset 12 of the bridged Ethernet frame.

Octet Locations on a Bridged TCP/IP Frame



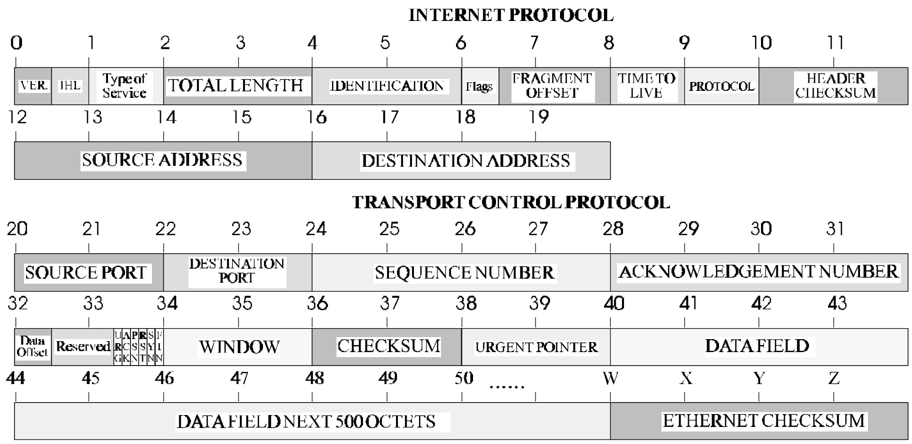
Octet Locations on a Bridged Novell Netware Frame



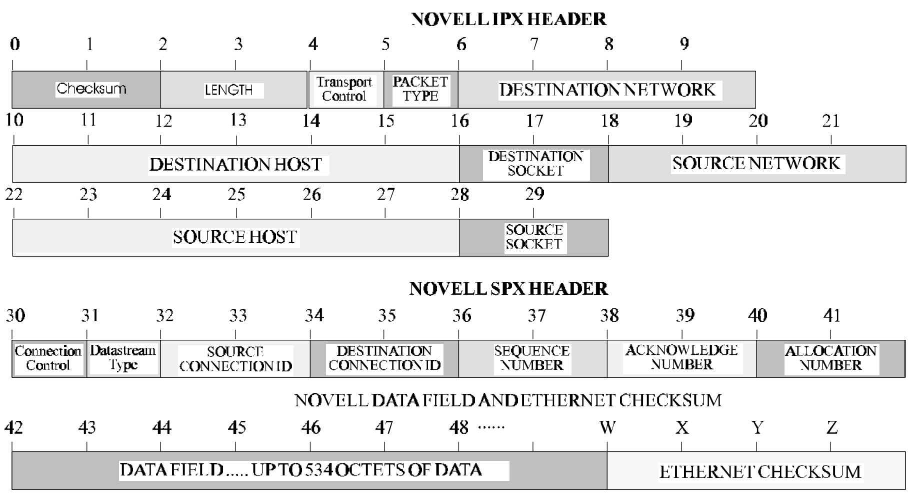
ETHERNET Type Codes

Type Code	Description
0800	DOD IP
0801	X.75 Internet
0804	Chaosnet
0805	X.25 Level 3
0806	ARP
0807	XNS Compatibility
6001	DEC MOP Dump/Load
6002	DEC MOP Remote Console
6003	DEC DECNET Phase IV Route
6004	DEC LAT
6005	DEC Diagnostic Protocol
6006	DEC Customer Protocol
6007	DEC LAVC, SCA
8035	Reverse ARP
803D	DEC Ethernet Encryption
803F	DEC LAN Traffic Monitor
809B	Appletalk
80D5	IBM SNA Service on Ether
80F3	AppleTalk AARP (Kinetics)
8137-8138	Novell, Inc.
814C	SNMP

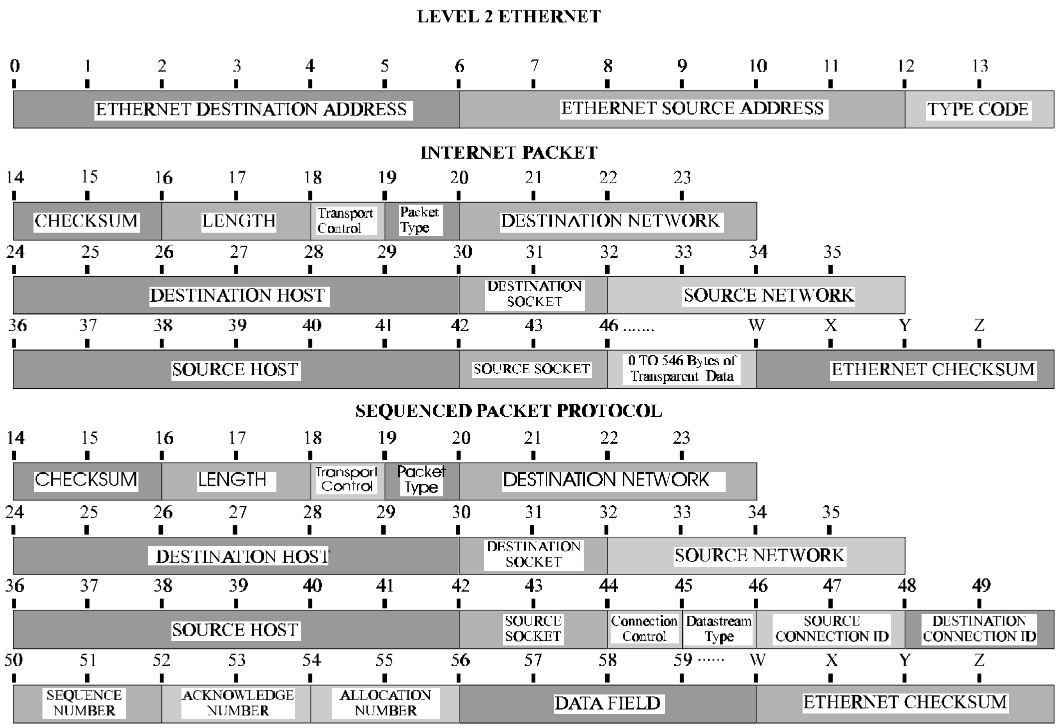
Octet Locations on an IP Routed TCP/IP Frame



Octet Locations on an IPX Routed Novell Netware Frame



Octet Locations on a Bridged XNS Frame



Opening of the case and removal of modules is only to be performed by qualified service personnel.

D
Servicing Information

Identifying the Internal Components

The major components of concern are shown in the following illustration.

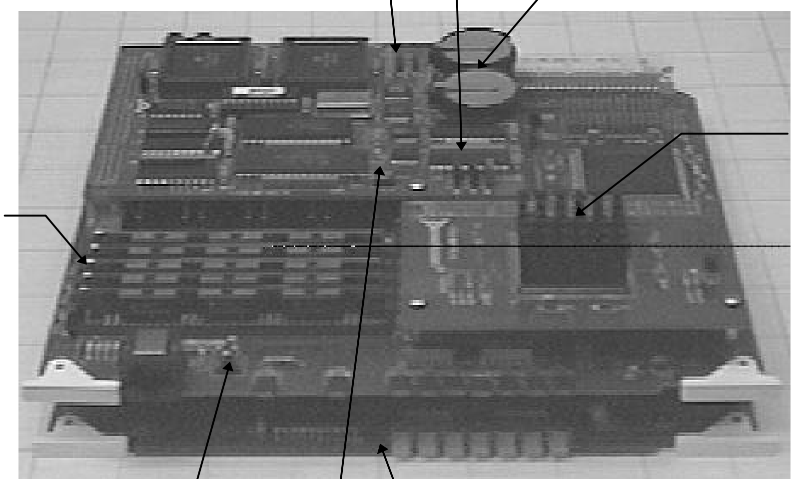


Figure D—1 View of the Orbitor 6 Bridge/Router Main and Expansion Boards

Main Board Strap Settings

Strap	1 - 2 Position	2 - 3 Position
W1	Factory purposes only	Factory purposes only
W2	Factory purposes only	Factory purposes only
W3	Override password setting	Allow password setting (default)
W4	Remain in Console load mode	Operational mode (default)
W5	Battery backup enabled (default)	Battery Backup Disabled
W6	WAN expansion board installed	WAN expansion board not installed
W7	Factory purposes only	Factory purposes only
W8	16 MB DRAM	4 MB DRAM (default)

Changing the Batteries

The battery has an approximate lifetime of 5 years. Schedule replacement at some time less than this to ensure consistent performance. Both batteries should be replaced when one of the batteries is reported as low.

CAUTION !

Danger of explosion if battery is incorrectly replaced.

Replace only with the same or equivalent type recommended by the manufacturer.

Dispose of used batteries according to the manufacturer's instructions.

VORSICHT !

Explosionsgefahr bei unsachgemäßem Austausch der Batterie.

Ersatz nur durch denselben oder einen vom Hersteller empfohlenen gleichwertigen Typ.

Entsorgung gebrauchter Batterien nach Angaben des Herstellers.

Removing the batteries will destroy the current configuration. It is recommended that you perform a DUMP of the configuration using the Options found in the Access Set-Up Menu before removing the batteries.

DO NOT OPERATE the bridge/router without both batteries, as even in the discharged state they complete an important circuit. Leave the discharged batteries in place until new batteries are obtained.

1) Acquire two new 2430 Lithium batteries. The new batteries should be Sanyo or Renata CR2430, or equivalent

2) Dump the configuration, so it can be saved to disc and loaded back once battery replacement is completed.

3) Remove power from the bridge/router and open the front. Remove the main board.

4) Before touching the PCB, touch something metal to reduce the chance of static discharge harming the electronic circuits.

5) Carefully lift the center tab securing each battery enough so that the battery can be removed. Note the position of the old battery.

6) Install the new batteries, taking care to install them in the same position as the old batteries.

7) Install the main board, close the front, and power up the bridge/router.

8) Use the Load command found in the Access Set-Up Menu to load the configuration that was saved to disc with the Dump command.

Changing Link Interfaces

1) Disable the module from the menu system or remove power from the bridge/router. The module may be disabled from the WAN Set-Up menu.

   After an initial start, the Orbitor 6 will disable module operation for each WAN slot that does not have a WAN module. When a module is added to an empty slot, the module operation must be enabled before the Orbitor 6 will recognize the WAN module.

   Important:

   Failure to disable module operation before changing WAN modules may cause damage to the Orbitor 6 and the WAN module.

2) Remove the two screws securing the Link module to the rear of the bridge/router.

3) Remove the Link module from the bridge/router. Be sure to grip the module only by the flange at the bottom of the metal panel.

4) Install the new Link module and secure with the two screws.

5) If you removed power from the bridge/router in step 1, power up the bridge/router.

6) Enable the module from the WAN Set-Up menu.

To Clear a “Lost” Password

1) Remove power from the bridge/router.

2) Open the front of the bridge/router and remove the main board.

3) Move strap W3 to the 1-2 position.

4) Install the main board and reattach the power to the bridge/router and wait for the power-up diagnostics to finish.

5) Remove power from the bridge/router.

6) Remove the main board.

7) Move strap W3 to the 2-3 position.

8) Install the main board and close the front.

9) Power up the bridge/router.

10) Log into the bridge/router using the default password “password” and change the password as desired.

Installing A Wan Port Expansion Board

To upgrade a 7 port Orbitor 6 bridge/router to a 14 port unit, simply install the WAN port expansion board and the new link modules. Follow these steps to install the WAN port expansion board. After the expansion board is installed, install the additional link modules as indicated previously.

1) Remove power from the Orbitor 6 bridge/router.

2) Open the front panel and remove the main board.

3) Attach the WAN port expansion board to the bottom of the main board. The connector on the top of the expansion board mates with the connector on the bottom of the main board.

Main board connector which mates to the WAN expansion board.

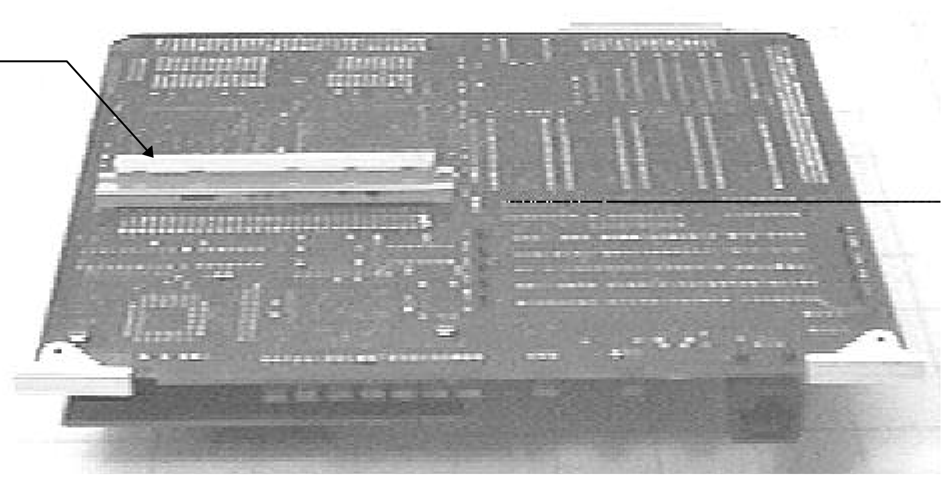
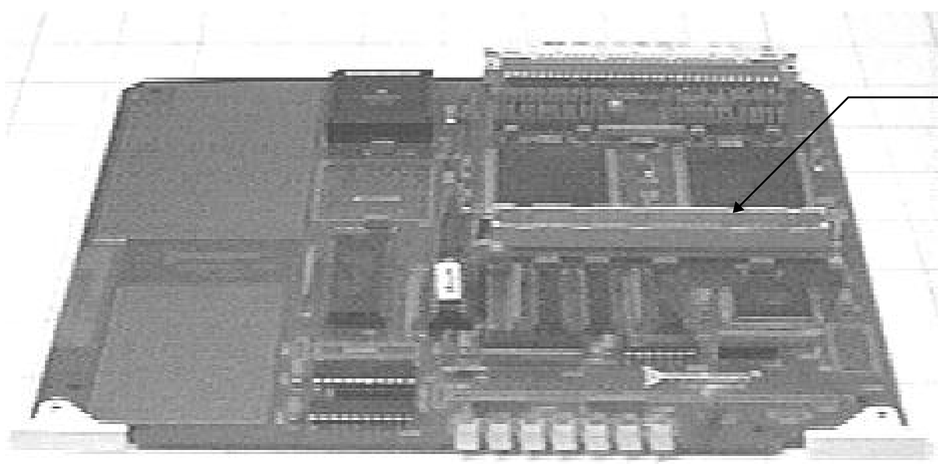


Figure D—2 Bottom View of Main Board



Expansion board connector which mates to the main board.

Figure D—3 Top View of WAN Port Expansion Board

4) Move the strap W6 to the 1-2 position.

5) Install the two connected board using the bottom two guide rails of the Orbitor 6 bridge/router.

Figure D—4 Main and Expansion Boards Installed in the Orbitor 6

6) Close the front panel and power up the Orbitor 6 bridge/router.

Changing the Link Integrity on the 10BaseT LAN Interface

To disable the link integrity option for the 10BaseT LAN interface, move the strap W1 to the main board under the battery board to the position shown below. To re-enable link integrity, move the strap back to the original position.

1) Remove power from the bridge/router.

2) Open the front and remove the main board.

3) Remove the battery board from the main board by removing the screw securing the battery board.

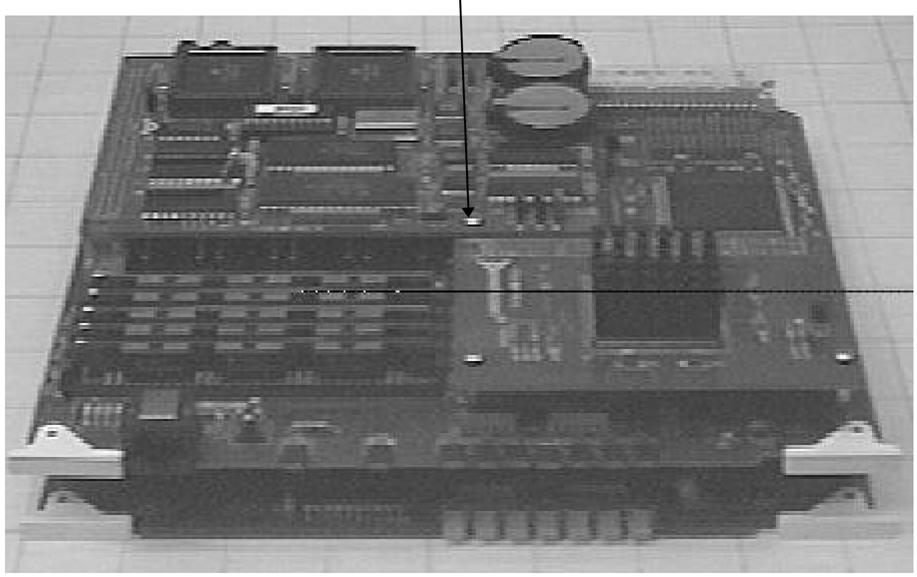


Figure D—5 Battery Board Removal

4) Change strap W1 to disable or enable link integrity.

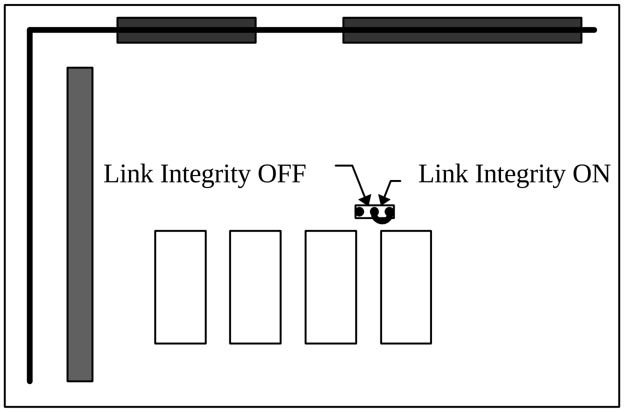


Figure D—6 Link Integrity Strap for 10BaseT Connector

5) Re-install the battery board on the main board by installing the screw removed previously.

6) Install the main board back in the bridge/router and close the front.

7) Power up the bridge/router.

E
Interface
Pinouts

Pinout Information

Each link interface available is described with detailed information on pin designation. Standard interface cables will provide correct connections to modems, datasets, or DSU/CSUs.

V.35 links are provided as DB25 connectors on the back of the bridge/router, so an interface converter is needed to convert to the standard V.35 connectors.

When connecting two bridge/routers back-to-back without modems, a null-modem cable is required to crossover the pins on the links. Crossing over the pins allows two bridge/routers both configured as DTE interfaces to be connected together. With this configuration, both bridge/routers will provide clocking for the links, and each bridge/router must have a link speed defined.

Link Clocking Information

All of the link interfaces on the Orbitor act as DTE devices, this means that they may be directly connected to DCE devices (modems, etc.) with the DCE devices providing the clocking for the link. The link speed is controlled by the DCE device. Setting the link speed on the Orbitor will not result in a speed change on the link.

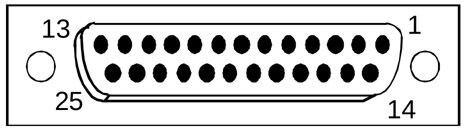
Some DCE devices allow the DTE devices connected to them to supply a clock signal which is then routed back to the transmit clock pins on the DCE interface. This clock is then received by the Orbitor link interface. By using this method, the Orbitor may be in control of the link speed. The link speed may also be controlled by the Orbitor when a null-modem cable is used to connect two Orbitors in a back-to-back configuration.

Changing the link speed within the menu system of the Orbitor changes the clock output speed that is generated on the DTE Terminal Timing pins on the link interfaces.

Console Pinouts

The connector shown here and pinouts described here correspond to the connector labeled "Console" on the back of the Orbitor 6000.

DB25 Female DCE



Contact Number	CCITT Circuit Number	Circuit	Circuit Name	Direction To DCE	Direction From DCE
1	101	AA	Protective Ground	NA	
2	103	BA	Transmitted Data	X	
3	104	BB	Received Data		X
5	106	CB	Clear to Send		X
6	107	CC	Data Set Ready		X
7	102	AB	Signal Ground	NA	
8	109	CF	Received Line Signal Detector (CD)		X
20	108.2	CD	Data Terminal Ready	X	
22	125	CE	Ring Indicator		X

Figure E—1 Console Pinouts

The connecting cable must be a shielded cable.

When connecting the Orbitor console directly to a modem, a null modem cable must be used because both the Orbitor console and the modem are DCE devices. A null modem cable with pinouts according to the following figure must be used.

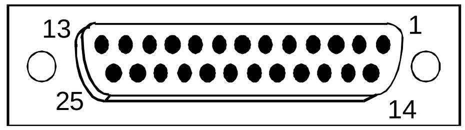
Orbitor Contact Number	Modem Contact Number
8	20
3	2
2	3
20	8
7	7
4	5
5	4
22	22

Figure E—2 Console Null Modem Cable Pinouts

V.24 & RS232C Link Pinouts

The connector shown here and pinouts described here correspond to the connector labeled "RS232 / V.24" on the back of the Orbitor 6000.

DB25 Female DTE



Contact Number	CCITT Circuit Number	Circuit	Circuit Name	Direction To DCE	Direction From DCE
1	101	AA	Protective Ground	NA	
2	103	BA	Transmitted Data	X	
3	104	BB	Received Data		X
4	105	CA	Request to Send	X	
5			----------		
6	107	CC	Data Set Ready		X
7	102	AB	Signal Ground	NA	
8	109	CF	Received Line Signal Detector (CD)		X
9			----------		
10			----------		
11			----------		
12			----------		
13			----------		
14			----------		
15	114	DB	Transmit Signal Element Timing (DCE Source)		X
16			----------		
17	115	DD	Receive Signal Element Timing (DCE Source)		X
18	141		Local Loopback	X	
19			----------		
20	108.2	CD	Data Terminal Ready	X	
21			----------		
22	125	CE	Ring Indicator		X
23			----------		
24	113	DA	Transmit Signal Element Timing (DTE Source)	X	
25			----------		

Figure E—3 RS232 Link Pinouts

The connecting cable must be a shielded cable.

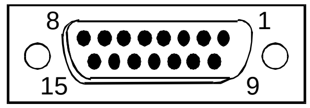
NOTE For U.K. Approval:

The connecting cable should be manufactured from Belden Cable, or a cable with equivalent specifications. Each end must be terminated in a male 25 pin X.21 bis connector as defined in ISO-2110 1989. The cable may be any length between 0 and 5M.

V.11 & X.21 Link Pinouts

The connector shown here and pinouts described here correspond to the connector labeled "V.11/X.21" on the back of the Orbitor 6000.

DB15 Female DTE



Contact Number	X.21 Circuits Reference	Circuit Name	Direction To DCE	Direction From DCE
1		Protective Ground	NA	
2	T (A)	Transmitted Data (A)	X	
3	C (A)	Control (A)	X	
4	R (A)	Received Data (A)		X
5	I (A)	Indication (A)		X
6	S (A)	Signal Element Timing (A)		X
7		----------		
8	Ground	Signal Ground	NA	
9	T (B)	Transmitted Data (B)	X	
10	C (B)	Control (B)	X	
11	R (B)	Received Data (B)		X
12	I (B)	Indication (B)		X
13	S (B)	Signal Element Timing (B)		X
14		----------		
15		----------		

Figure E—4 V.11 Link Pinouts

The connecting cable must be a shielded cable.

Circuits which are paired (contain an (A) and (B) reference) should be connected to twisted pairs within the connecting cable.

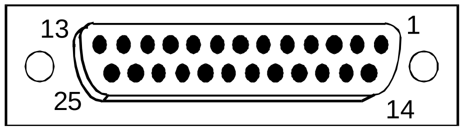
NOTE For U.K. Approval:

The connecting cable should be manufactured from Belden Cable, or a cable with equivalent specifications. Each end must be terminated in a male 15 pin X.21 connector as defined in ISO-4903 1989, but one end of the cable must have UNC-4-40 screws and the other end must have M3 screws. The cable may be any length between 0 and 5M.

RS442 & RS530 Link Pinouts

The connector shown here and pinouts described here correspond to the connector labeled “RS530” on the back of the Orbitor 6000.

DB25 Female DTE



Contact Number	Circuit	Circuit Name	Direction To DCE	Direction From DCE
1	Shield	Protective Ground	NA	
2	BA (A)	Transmitted Data	X	
3	BB (A)	Received Data		X
4	CA (A)	Request to Send	X	
5	CB (A)	Clear to Send		X
6	CC (A)	Data Set Ready		X
7	AB	Signal Ground	NA	
8	CF (A)	Received Line Signal Detector		X
9	DD (B)	Receive Signal Element Timing (DCE Source)		X
10	CF (B)	Received Line Signal Detector		X
11	DA (B)	Transmit Signal Element Timing (DTE Source)	X	
12	DB (B)	Transmit Signal Element Timing (DCE Source)		X
13	CB (B)	Clear to Send		X
14	BA (B)	Transmitted Data	X	
15	DB (A)	Transmit Signal Element Timing (DCE Source)		X
16	BB (B)	Received Data		X
17	DD (A)	Receive Signal Element Timing (DCE Source)		X
18	LL	Local Loopback	X	
19	CA (B)	Request to Send	X	
20	CD (A)	Data Terminal Ready	X	
21	RL	Remote Loopback	X	
22	CC (B)	Data Set Ready		X
23	CD (B)	Data Terminal Ready	X	
24	DA (A)	Transmit Signal Element Timing (DTE Source)	X	
25		----------		

Figure E—5 RS530 Link Pinouts

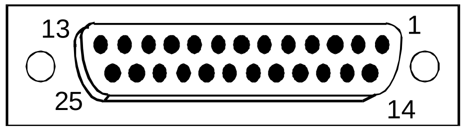
The connecting cable must be a shielded cable.

Circuits which are paired (contain an (A) and (B) reference) should be connected to twisted pairs within the connecting cable.

V.35 Link Pinouts

The connector shown here and pinouts described here correspond to the connector labeled "V.35" on the back of the Orbitor 6000.

DB25 Female DTE



DB25 Contact Number	M.34 Contact Number	CCITT Circuit Number	Circuit Name	Direction To DCE	Direction From DCE
1	A		Protective Ground	NA	
2			----------		
3			----------		
4	C	105	Request to Send	X	
5			----------		
6	E	107	Data Set Ready		X
7	B	102	Signal Ground	NA	
8	F	109	Data Channel Received Line Signal Detector		X
9	P	103	Transmitted Data (A)	X	
10	S	103	Transmitted Data (B)	X	
11	R	104	Received Data (A)		X
12	T	104	Received Data (B)		X
13			----------		
14	V	115	Receiver Signal Element Timing (A)		X
15			----------		
16	X	115	Receiver Signal Element Timing (B)		X
17			----------		
18	U	113	Transmitter Signal Element Timing (A) DTE	X	
19	W	113	Transmitter Signal Element Timing (B) DTE	X	
20	H	108.2	Data Terminal Ready	X	
21		141	Local Loopback	X	
22	J	125	Calling Indicator		X
23	Y	114	Transmitter Signal Element Timing (A)		X
24			----------		
25	AA	114	Transmitter Signal Element Timing (B)		X

Figure E—6 V.35 Link Pin Outs

The connecting cable must be a shielded cable.

Circuits which are paired (contain an (A) and (B) reference) should be connected to twisted pairs within the connecting cable.

NOTE For U.K. Approval:

The connecting cable should be manufactured from Belden Cable, or a cable with equivalent specifications. One end must be terminated in a male 34 pin X.21 bis connector as defined in ISO-2593 1984. The other end must be terminated in a male 25 pin X.21 bis connector as defined in ISO-2110 1989. The cable may be any length between 0 and 5M.

RS232 Null-Modem Cable Configuration

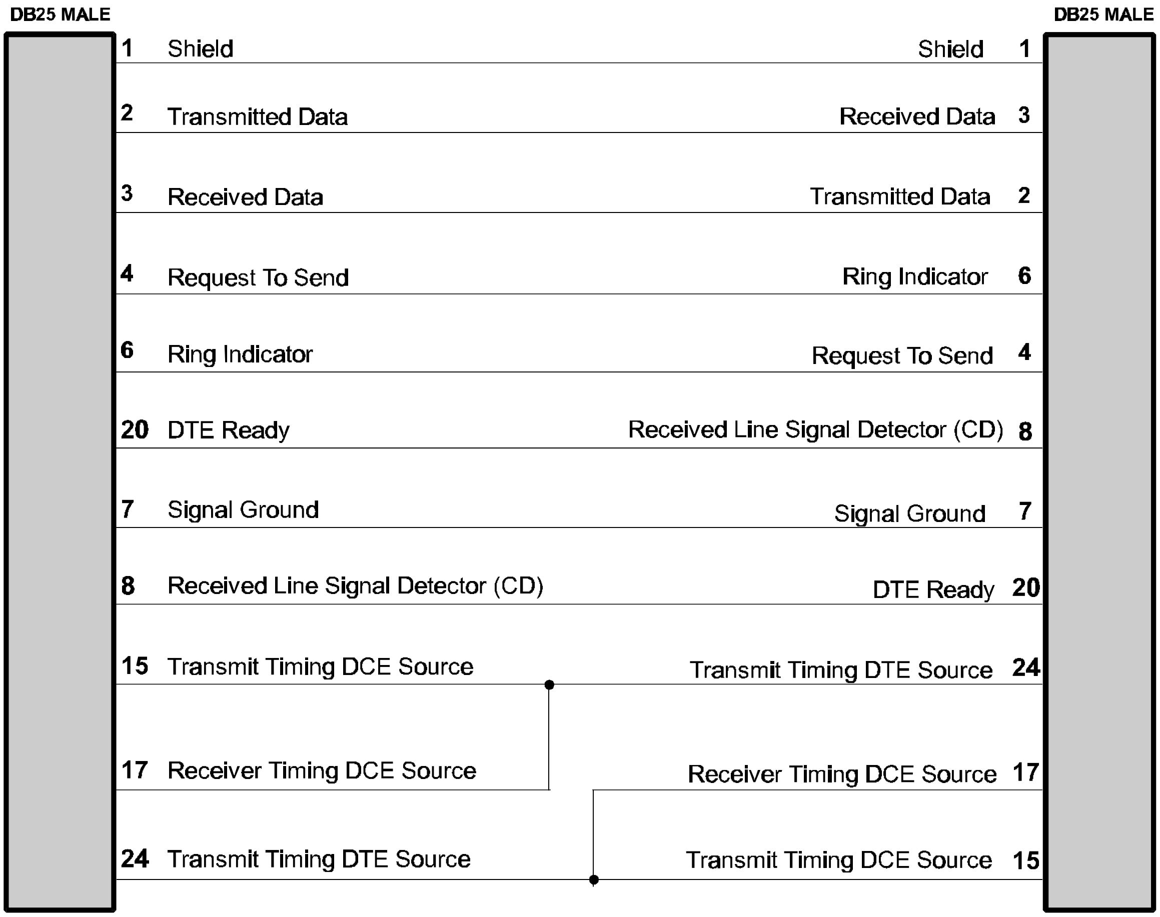


Figure E—7 RS232 Null-Modem Cable

The connecting cable must be a shielded cable.

This cable is needed when it is necessary to connect two units back-to-back and a set of modems is not available. Note that this cable specifies DB25 connectors on each end to allow direct connection to the link interface connector on each unit. The link speed must be defined for each of the two units.

V.35 Null-Modem Cable Configuration

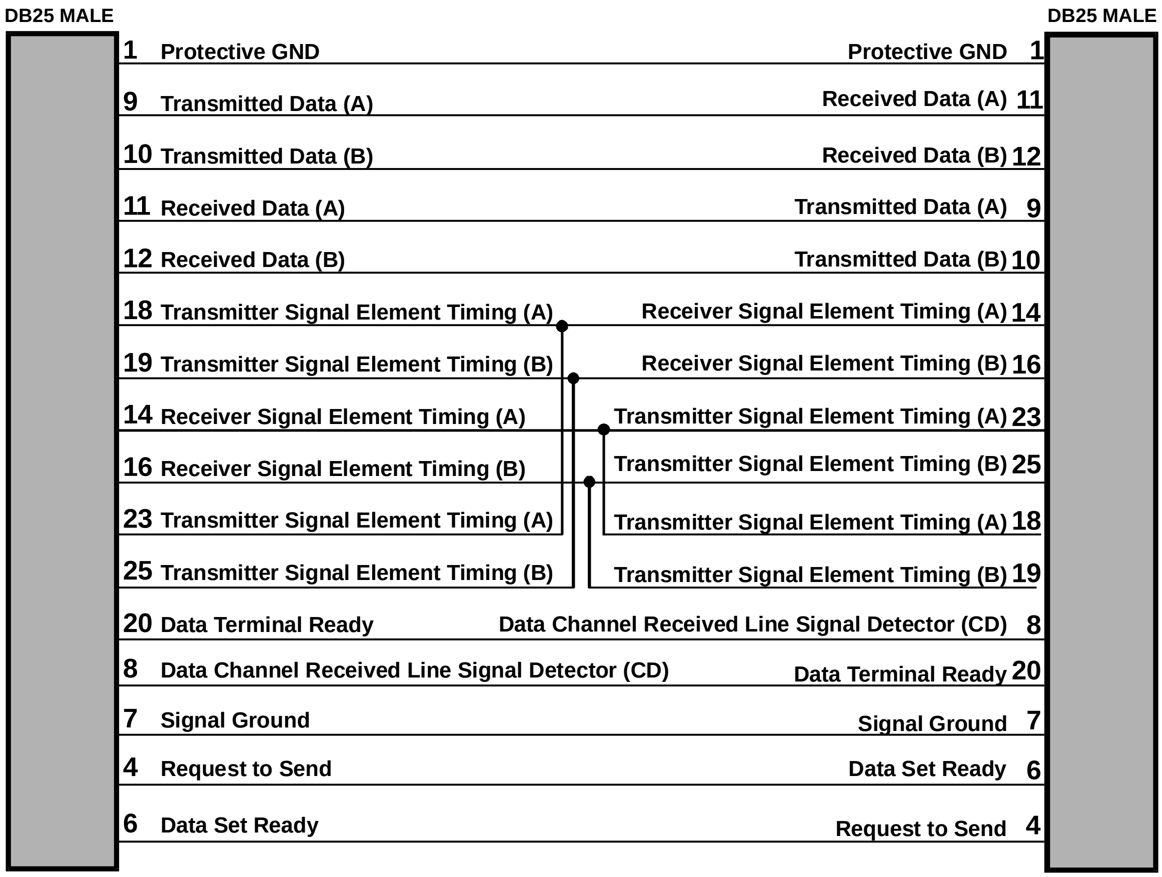


Figure E—8 V.35 Null-Modem Cable

The connecting cable must be a shielded cable.

Circuits which are paired (contain an (A) and (B) reference) should be connected to twisted pairs within the connecting cable.

This cable is needed when it is necessary to connect two units back-to-back and a set of modems is not available. Note that this cable specifies DB25 connectors on each end to allow direct connection to the link interface connector on each unit. The link speed must be defined for each of the two units.

RS530 Null-Modem Cable Configuration

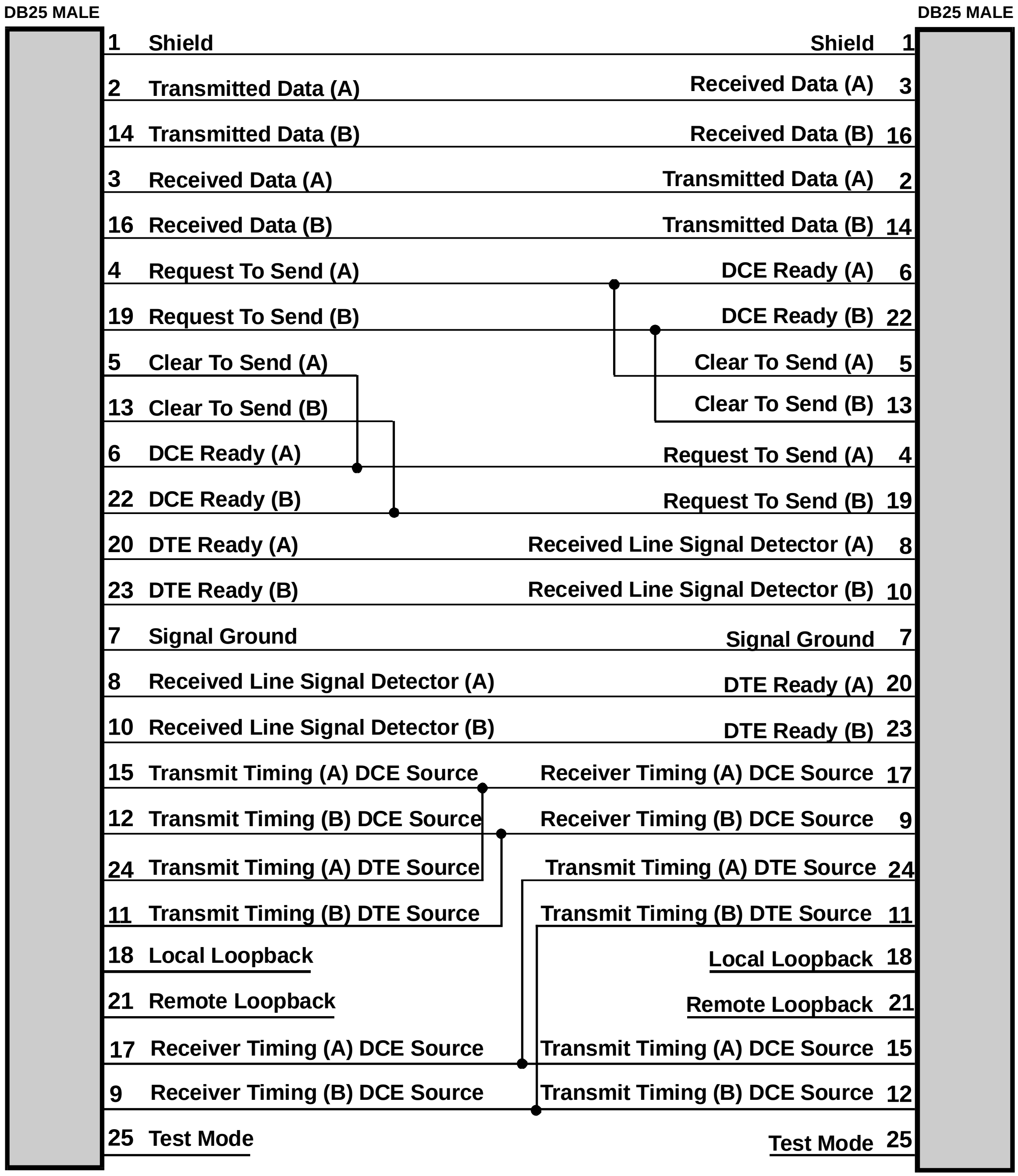


Figure E—9 RS530 Null-Modem Cable

The connecting cable must be a shielded cable.

Circuits which are paired (contain an (A) and (B) reference) should be connected to twisted pairs within the connecting cable.

This cable is needed when it is necessary to connect two units back-to-back and a set of modems is not available. Note that this cable specifies DB25 connectors on each end to allow direct connection to the link interface connector on each unit. The link speed must be defined for each of the two units.

RS530 To RS449 Conversion Cable

DB25 MALE		DB37 MALE/FEMALE
2	Transmitted Data (A)	4
14	Transmitted Data (B)	22
3	Received Data (A)	6
16	Received Data (B)	24
8	Received Line Signal Detector (A)	13
10	Received Line Signal Detector (B)	31
6	Data Set Ready (A)	11
22	Data Set Ready (B)	29
4	Request to Send (A)	7
19	Request to Send (B)	25
5	Clear to Send (A)	9
13	Clear to Send (B)	27
20	Data Terminal Ready (A)	12
23	Data Terminal Ready (B)	30
17	Receiver Signal Element Timing (DCE Source) (A)	8
9	Receiver Signal Element Timing (DCE Source) (B)	26
15	Transmit Signal Element Timing (DCE Source) (A)	5
12	Transmit Signal Element Timing (DCE Source) (B)	23
24	Transmit Signal Element Timing (DTE Source) (A)	17
11	Transmit Signal Element Timing (DTE Source) (B)	35
7	Signal Ground	19
1	Shield	1

Figure E—10 RS530 to RS449 Conversion Cable

The connecting cable must be a shielded cable.

Circuits which are paired (contain an (A) and (B) reference) should be connected to twisted pairs within the connecting cable.

This cable is used to connect an RS530 link to an RS449 device. The cable converts from a DB25 connector to a DB37 connector.