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This edition applies to Release 1 of the IBM 9370 Information System Token-Ring Subsystem, Advanced Communication Function/Virtual Telecommunications Access Method (ACF/VTAM) Version 3.1.2, Virtual Machine System Product (VM/SP) Release 5 and to all subsequent releases until otherwise indicated in new editions or Technical Newsletters, for use with the IBM Token-Ring Network.

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Abstract

This document is volume one of a series of two volumes on the 9370 LAN installation.

- Volume one (this book) presents our experiences installing 9370 Token-Ring Subsystem in the ITSC Raleigh, with emphasis on the practical information that readers will need to install and run their own 9370 Token-Ring environment. Though operations under SNA are emphasized, instructions for installation and operation of TSAF and SQL are also covered

  Volume two, **"IBM 9370 LAN, Volume 2 - 802.3 Support" (Form No GG24-3227)**, describes the installation and usage of the 802.3 Integrated 9370 Subsystem (Feature 6130/6035). The software that has been used to operate the IBM 9370 IEEE 802.3 Subsystem is TCP/IP V1.1. TSAF is not part of this documentation.

These books are designed for customers and system engineers who are responsible for planning or installing a 9370 system in a LAN environment.

WS CSYS (94 pages)

Preface

Document purpose and scope

The purpose of this document is to:

1. Give an overview of the 9370 Token-Ring Subsystem's capabilities in a LAN environment.
2. Describe how to use the IBM 9370 Token-Ring Support Programs to provide connectivity between 9370 applications and Token-Ring stations.
3. Describe how to install 9370 Token-Ring Adapter. Hardware as well as software installation tasks will be covered.
4. Document tests that were performed by the International Technical Support Center, Raleigh on the 9370 equipment attached to its Token-Ring LAN Network.

Organization

This document is organized as follows:

- **Chapter 1: IBM 9370 Concepts**

  Chapter 1 provides an overview of the 9370 Token-Ring Communications Subsystem and its relation to the error management activities on the ring.

- **Chapter 2: Token-Ring Hardware Installation**

  Chapter 2 describes the hardware requirements and the installation procedures to set up the system.

- **Chapter 3: 9370 Token-Ring Software Installation**

  Chapter 3 covers software requirements and describe the software parameter definitions necessary to logically set up the system in a SNA environment. Additionally, LAN-related software for the Token-Ring stations is mentioned.

- **Chapter 4: Test Environment**

  Chapter 4 provides an overall view of the Token-Ring network that was used during the project.

- **Chapter 5: Tests Performed**

  Chapter 5 describes the environment in which the documented tests were performed. Special mention is made of the interrelationship of parameters among the different systems involved on each scenario.

- **Chapter 6: Operational Considerations**

  Chapter 6 mentions some considerations that any user of the 9370 Token-Ring subsystem should be aware of.

- **Chapter 7: Problem Determination**

  Chapter 7 describes the 9370 Alert Generation on a LAN. The new NetView LAN displays are illustrated through the use of problem determination scenarios.

- **Chapter 8: TSAF Installation and Operation**

  Chapter 8 describes the software requirements and the way to install and operate TSAF under 9370 Token-Ring Subsystem.

- **Appendix A: Activation Flows**

  Appendix A provides the logical flow of different activation sequences when operating on the LAN.

- **Appendix B: Other VTAM System Definitions**

  Appendix B provides definitions for additional components involved in a Token-Ring LAN connection.

- **Appendix C: VM Directories**

  Appendix C provides the directories used for the SQL and TSAF Virtual Machines during the tests.

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1.0 9370 Concepts

1.1 9370 Connectivity Overview

The 9370 system supports a variety of input and output devices via different I/O controllers. An I/O controller is a 9370 set of cards which allows devices to be connected to the 9370 without a separate control unit. In the 9370 subsystem, an I/O subsystem is comprised of an I/O controller and the devices it controls.

The Communication Subsystem in the 9370 can be configured to support different line disciplines, depending on the selected I/O processor and the associated adapter. The communications support that the 9370 system can provide is included in the four telecommunication subsystems.

All four Communication Subsystems are based on the same Communication Processor plus one or more Communication Adapter cards and appropriate microcode. This combination of I/O processor, adapter card and microcode is called a Communication Subsystem controller.

More than one Communication Subsystem controller can co-exist on the same 9370 system.

Under the control of this communication system, the 9370 system can connect to other systems in a communications network and share data with them, under the following circumstances:

- As a host to remote terminals or other systems.
- While connected to a remote host system.
- While communicating with other systems on a peer-to-peer basis.

You can have a maximum of two Communication Subsystems controllers in the 9373, a maximum of four in the 9375, and a maximum of twelve in the 9377 Processor.

1.1.1 Communication Subsystem Controllers

1. Telecommunications Subsystem. This is controlled by the Telecommunication Subsystem Controller, which lets you attach communication lines from the 9370 Processor to public networks.
2. ASCII Subsystem. This is controlled by the ASCII Subsystem Controller, which lets you attach ASCII Devices to the 9370 Processor.
3. IEEE 802.3 Local Area Network (LAN) Subsystem. This is controlled by the IEEE 802.3 LAN Controller, which lets you attach the 9370 Processor to an IEEE 802.3 network.
4. IBM Token-Ring Subsystem. This is controlled by the IBM Token-Ring Subsystem Controller, which lets you attach the 9370 Processor to an IBM Token-Ring Network.

1.1.2 Telecommunications Subsystem Controller

The Telecommunications Subsystem Controller allows you to:

- Attach your 9370 System to **public networks**: nonswitched telegraph lines, public switched telephone networks, or nonswitched voice grade lines.

- Attach **TTC2 devices** to your 9370 Processor directly or through display controllers with ASCII support.

The Telecommunications Subsystem Controller consists of one Communication Processor plus up to three adapter cards.

The **Multi-Protocol Two-Line Adapter** (Feature 6031) attaches the 9370 Processor to public networks; it also attaches TTC2 devices to the 9370 Processor. The adapter supports standard synchronous and asynchronous line protocols:

- US Telegraph Terminal Control Type 2
- Binary Synchronous Communication (BSC)
- Synchronous Data Link Control (SDLC)
- High-Level Data Link Control (HDLC), also called X.25 - Level 2

1.1.3 ASCII Subsystem Controller

The ASCII Subsystem Controller lets you attach a variety of asynchronous devices, such as display stations, printers, plotters, development systems, graphic equipment, and personal computers to 9370 applications that support basic 3270 data streams.

The ASCII Subsystem Controller consists of one Communication Processor plus up to four adapter cards. The **Asynchronous Four-Line Adapter** (Feature 6032) attaches up to four asynchronous communication lines. You can attach to them any ASCII device that has a EIA RS-232C (CCITT V.24/V.28) or EIA RS-422(CCITT V.11) interface with ASCII encoding.

Modes of Operation:

- **ASCII/3270 conversation mode**. The ASCII terminal is treated as a normal 3270 device. Terminal definition tables allow attachment of most ASCII terminals, including OEM terminals.
- **Transparent mode**. Provides transmission of graphics data to devices with graphics capabilities.
- **ASCII support mode**. This provides the same functional capability as when you are working with UNIX. ASCII printers, plotters, and graphic devices are supported as full duplex ASCII terminals.

1.1.4 IEEE 802.3 Local Area Network Subsystem Controller

The IEEE 802.3 Local Area Network Subsystem Controller lets you attach your 9370 Processor to an IEEE 802.3 Local Area Network.

The IEEE 802.3 LAN Subsystem Controller consists of one communications processor plus one adapter card.

The **IEEE 802.3 LAN Adapter** (Feature 6035) provides a physical link and access control to the IEEE 802.3 standard. The programming support must be equivalent to the Open Systems Interconnection (OSI) Layer 3 and above. This lets you communicate with all other LAN-attached hosts.

1.1.5 IBM Token-Ring Local Area Network Subsystem Controller

The IBM Token-Ring Local Area Network Subsystem Controller lets you attach your 9370 Processor to an IBM Token-Ring Local Area Network.

The IBM Token-Ring LAN Subsystem Controller consists of one communications processor plus one adapter card.

1.2 9370 Token-Ring Subsystem Overview

This section introduces the IBM 9370 Token-Ring Subsystem and outlines the way in which support for Token-Ring attachment has been implemented in the 9370 and the hardware and software components involved.

1.2.1 Compliance with IEEE 802 Standards

The support for the attachment of the IBM 9370 Information System to the IBM Token-Ring LAN is implemented by hardware in the form of the 9370 Communications Processor Card (feature 6130) and the Token-Ring Adapter card (feature 6034) together with software in the form of the 9370 Token-Ring Subsystem Support Program.

The 9370 Token-Ring Subsystem complies with the IEEE 802.2 (Logical Link Control) and 802.5 (Medium Access Control) Standards for Local Area Networks.

1.2.2 Support of Token-Ring by Higher Layer Protocols and Products

The Token-Ring Network provides a communications link for different upper-layer protocols, such as SNA and TCP/IP. Also, the 9370 Token-Ring Adapter hardware and microcode supports three different address groups; this allows up to three different communications access methods to use the same adapter hardware concurrently.

One Token-Ring Adapter (feature 6034) is permitted on each Communications Processor (feature 6130). The following access methods and communications protocols are currently supported with the 9370 Token-Ring Adapter:

- Virtual Telecommunications Access Method (VTAM)
  for both 9370-9370 communications and 9370-workstation connections
  - VTAM to VTAM connections (PU5 to PU5) have a leased-line appearance.
  - 9370-Workstation connections (PU5 to PU2) have a switched-line appearance. A PU Type 2 can be a PC running 3270 emulation, a 3174, or a S/36.
    - VM/VTAM V3R1.2 (Available 2Q/88)
    - VM/VTAM V3R2 (Available 3Q/88)
    - VSE/VTAM V3R2 (Available 4Q/88)
- TSAF - Transparent Services Access Facility, a no-charge feature of VM/SP5, includes support for communication between 9370 members of a TSAF collection over the Token-Ring. There is no workstation support. Later releases of VTAM will have support for TSAF as a VTAM application for 9370-9370 communication.
- TCP/IP Program Offering will support TCP/IP protocols for 9370-9370 communications as well as 9370-workstation communications over the Token-Ring Network.

1.2.3 The 9370 Token-Ring Subsystem Functional Components Description

The IBM 9370 Token-Ring Subsystem Support programs, together with the I/O Communications Processor Card (feature 6130) and the Token-Ring Adapter Card, constitute a device which conforms to the architecture of S/370 input and output operations and provides Token-Ring attached devices with the capability of communicating with S/370 Access Methods and Application programs. Figure 1 on page 4 illustrates the functional components of the 9370 Token-Ring Subsystem Support Programs.

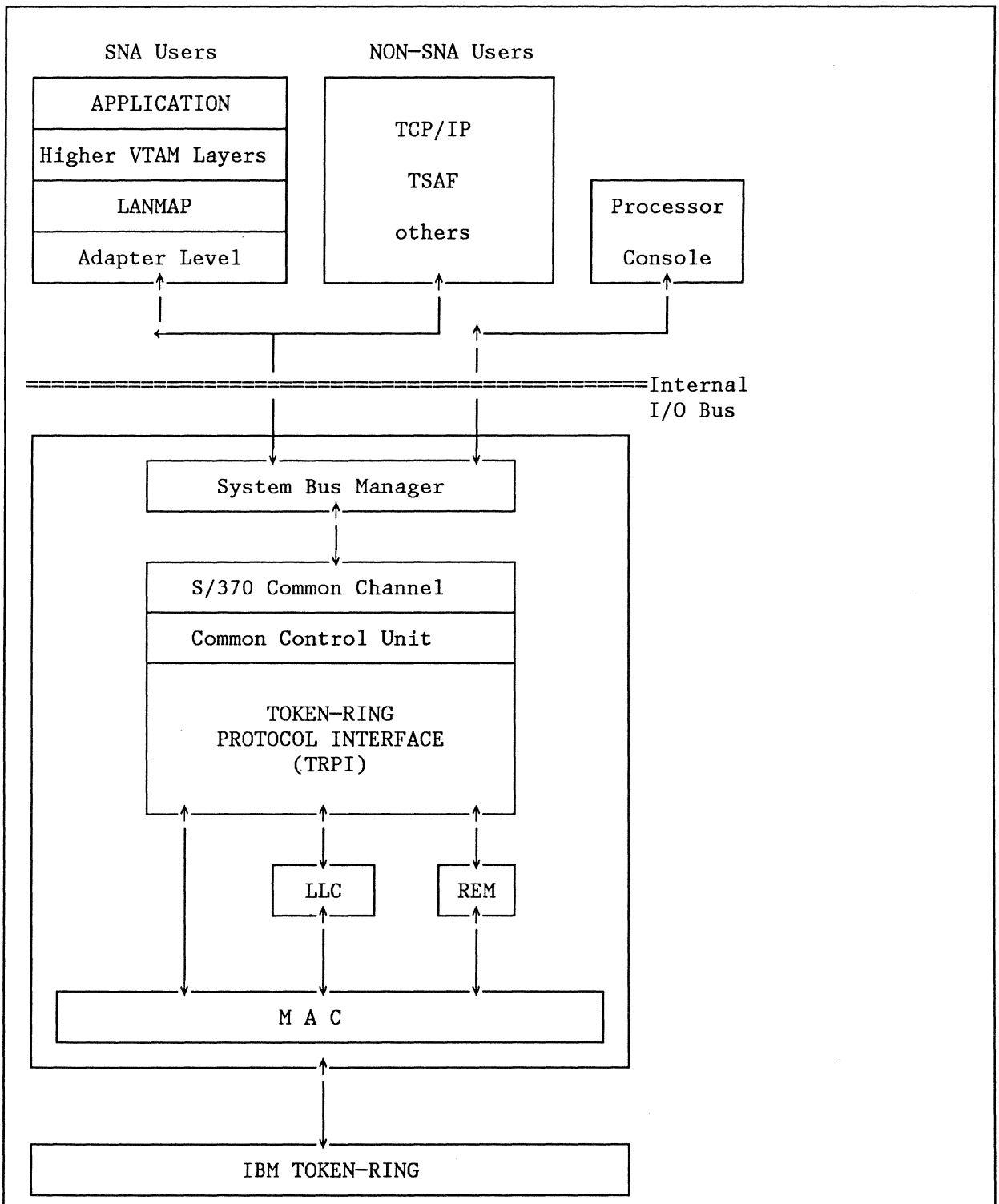

Figure 1. Overview of IBM 9370 Token-Ring Subsystem

The Token-Ring Subsystem appears to the S/370 Host Software as a byte multiplexor channel, so all standard S/370 Input/Output functions specified in the S/370 Architecture are supported.

The diagram shows that the interface between the S/370 channel code and the LLC and MAC layers of the Token-Ring Network Architecture is provided by the Token-Ring Protocol Interface (TRPI).

TRPI is interrupt-driven and receives data and commands from the attaching user (for example, VTAM) through the S/370 channel. The information is then converted into commands which can be subsequently executed by the LLC, MAC or REM (Ring Error Monitor) functional components.

Similarly, commands received from the LLC/MAC layers or REM component will be converted by the TRPI into S/370 Channel Control Words (CCWs) for subsequent execution by host users. Again, host users in this context can be one of the following:

- IEEE 802.2
- SNA User - such as VTAM
- Non-SNA user - such as TSAF and TCP/IP.

1.2.4 Services Provided by Token-Ring Protocol Interface (TRPI)

Several services are provided to the Token-Ring Subsystem by the TRPI:

- Provides interface to S/370 channel
- Enables or disables LLC, MAC and Ring Error Monitor
- Transfers data
  - For outbound data, TRPI moves data FROM buffers specified by Channel Control Words.
  - For inbound data, TRPI moves data TO buffers specified by Channel Command Words.
- Builds and Routes commands:
  - From S/370 channel to LLC, MAC or REM
  - From LLC, MAC or REM to the specific host user according to a CETI group ID (CETI stands for Continuously Executing Transfer Interface).

1.3 Continuously Executing Transfer Interface Protocol Overview

Apart from TRPI, the other important component which allows communication between the Token-Ring Subsystem and the host software is called CETI (Continuously Executing Transfer Interface).

CETI can be seen as the host-side implementation of the access protocol whose partner on the adapter side is implemented in the TRPI component (for CETI level 1 - the adapter level) and the LLC, MAC and REM components (for CETI Level 2 or LANMAP). The main objective of this access protocol is to provide maximum throughput between the host application and the Token-Ring Adapter/TRPI.

This is achieved by using continuous (looping) channel programs to transfer data between (for example) VTAM and the I/O devices. CETI minimizes the number of Start IO commands and Attention Interrupts required to exchange data (which, in turn, increases throughput).

CETI is structured in two layers:

- The Adapter Level (or CETI Level 1)
- LANMAP (or CETI Level 2).

The Adapter Level (or CETI Level 1)

Level 1 is concerned only with how messages are put into buffers by the continuously executing channel programs. The Adapter Level maintains a group of four ports (or subchannel addresses) for communication between the S/370 Application and the I/O device. These ports have separate functions but must have contiguous subchannel addresses, since they are closely associated. The four ports are:

- Control Port
- Interrupt Port
- Inbound Data Port
- Outbound Data Port

Each of these ports or subchannels has a continuously executing channel program running for it (except the Interrupt port which is driven by the Control Port). These programs are short and essentially function to issue read and write commands of control information and data every few milliseconds. Level 1 of CETI specifies an architecture (or set of protocols) whose job it is to ensure that these programs operate without error to transfer buffers of data quickly between the application and the channel control unit. It provides for some flow control, interrupts when necessary, initialization and error recovery.

Level 1 makes no reference to the contents of the messages being moved except for the length (as contained in a header).

LANMAP (or CETI Level 2)

Level 2, however, does look at device and network-specific information required to complete the connection. All Level 2 protocols are implemented by passing data imbedded in messages transferred by Level 1. Level 2 provides for device initialization, routing, device error recovery, device statistics reporting, data-type verification and message verification.

As the name implies, LANMAP provides a mapping function of SNA connection and data messages to the LLC primitives implemented in the Token-Ring Adapter hardware. It also senses error situations at the station/link or port level and notifies the user via NMVT alerts and operator messages. It will create SNA RUs to initiate error recovery or termination of the connection.

1.3.1 Overview of Data Flow and Control in the CETI Group

The CETI Group consists of the four ports mentioned previously; see "Continuously Executing Transfer Interface Protocol Overview" on page 5.

- Control Port - This is a S/370 device used to transfer information between the S/370 application and the Control Unit. It functions to control the flow of data between the application and the data ports. Normally the host software uses the Control Port to tell the Control Unit when there is data available to be sent on the Outbound Data Port or when there are Buffers available to receive data on the Inbound Data Port.
- Interrupt Port - There is one Interrupt Port for each Control Port. The Interrupt Port is used by the Control Unit to send Attention interrupts to the S/370 host software to indicate changing conditions on the Data Ports. That is to say, its purpose is to receive Attention interrupts from the Control Unit and present them to the Host application. Throughput is optimized by an algorithm which ensures that the application is not flooded with interrupts for every change on the Data Ports.
- Data Port - This is an S/370 device used for data transfer in one direction through a CETI-capable Control Unit. The Control Unit only executes a data-transfer operation when there is data to transfer, as indicated by Control Block In/Out, which is transmitted on the Control Port.

1.3.2 Performance Considerations.

This method of "polling" the application by the Control Unit (and thus preventing performance-degrading Start I/Os from being issued by the application and interrupting the Control Unit) uses the application's ability to update the Control Block Out when it has filled outbound (or emptied inbound) buffers via internal counters.

The Control Unit can also interrupt the application to alert it to changes in the Control Block In. For reasons of efficiency, the applications shouldn't be notified every time an internal counter is incremented. A simple algorithm could report (for instance) every tenth update.

1.4 Ring Error Monitor Functional Description

The Ring Error Monitor observes, collects, and analyzes hard-error and soft-error reports sent by ring stations on a single ring and assists in error detection and fault isolation.

The Ring Error Monitor functional address on the ring is the destination address for all soft-error reports generated by ring stations.

Hard-error reports are sent to all-station MAC addresses and examined by the Ring Error Monitor Hard Error Analysis Program.

Maintaining compliance to the IEEE 802.2 and 802.5 recommendations, the 9370 Token-Ring Communication Subsystem operates according to the architecture in its Ring Error Monitor function. If the Ring Error Monitor function has been included in its operation, 9370 Token-Ring Subsystem, handles all the REM-related frames generated by the different stations and passes them to the appropriate routines in the Token-Ring Protocol Interface (TRPI). When analyzing Ring Error Monitor data, these routines, will make available the information to the processor console operator either in Service, System Programmer or System Administrator Mode. At this time, there is no 9370 application to receive the REM information. When such an application becomes available, it will require the allocation of a CETI group to operate, which is not the case with the current REM support.

As previously mentioned, the Ring Error Monitor (REM) in the 9370 Token-Ring Subsystem contains microcode that (if configured) will reside in the I/O Processor card. It attaches to the Token-Ring through the I/O Adapter card.

1.4.1 Hard Error Processing Function

Hard errors are detected, isolated, and bypassed through the use of a Beacon MAC frame. This frame is generated by any ring station that detects a hard-error condition and is addressed to all the stations on the ring.

The contents of Beacon MAC frames on the ring are made available to the Ring Error Monitor hard-error processing function by the ring station.

The main information included is:

- The address of the Beacon MAC frame transmitter.
- The address of the nearest active upstream neighbor (NAUN) of the Beacon MAC frame transmitter.

1.4.1.1 Beacon Fault Domain

The Beacon MAC frame transmitting station and its NAUN are collectively known as the Beacon Fault Domain. In order to determining where the problem is, the NAUN station will disconnect from the ring, perform an internal test, and (if the test is successful) then re-attach to the ring; the other station will then follow the same error detection procedure. Usually the beaconing problem is solved when the failing station can't re-insert in the ring.

1.4.1.2 Hard-Error Isolation Function

A hard error is defined as a complete disruption of the electrical signal path somewhere in the ring. Hard errors can be produced either when the adapter is being initialized or during normal operation. Once a Hard error is detected, the stations start transmitting Beacon frames, so the ring is known to be in a beaconing condition.

Once the Ring Error Monitor detects a beaconing condition, it starts the permanent-error detection timer. If the beaconing condition does not cease before the timer expires, the Ring Error Monitor notifies LAN managers that an error which cannot be automatically recovered exists on the ring.

When the ring recovers before the timer expires, the ring error monitor may query each station identified in the fault domain indicated in the last received Beacon MAC frame.

If both stations respond to the queries, the Ring Error Monitor notifies LAN managers that a temporary beaconing condition existed on the ring. If one or both stations do not respond to the queries, the Ring Error Monitor notifies the LAN managers that there was a temporary beaconing condition on the ring and that one or both stations left the ring. The addresses of the stations which left the ring are included in the notification to the LAN managers.

1.4.2 Soft Error Processing Function

A soft error is defined as a temporary error. Generally it is an intermittent failure that causes signal degradation. Soft errors do not impede the operation of the ring, but excessive errors may severely impact the performance of the Token-Ring Network.

When the ring stations detect soft errors, they transmit Soft Error MAC frames.

The Ring Error Monitor performs error detection and isolation by analyzing Report Soft Error MAC Frames that are periodically sent by ring stations experiencing errors. These MAC frames are sent to the functional address assigned to the Ring Error Monitor. Ring Error Monitor analyzes the soft error reports in real time and determines when soft errors are occurring at a rate that significantly degrades the performance of the ring. When such a condition is detected, the Processor Console REM Support Function is notified that REM is detecting excessive errors on the ring. REM then provides the processor console with information described in the Fault Domain. REM, however, cannot attempt any error recovery on the ring.

1.4.2.1 Isolating and Non-Isolating Error Processing

The error counters included in a Report Soft Error MAC frame are divided into two types (isolating and non-isolating) which correspond to the type of error being reported. The source of isolating error can be isolated to a fault domain; the source of non-isolated errors cannot be isolated to a domain smaller then a ring.

Isolating Soft-Error Processing Function
When a Report Soft Error MAC Frame is received by REM, the information contained in the isolating error counts is used to accumulate **weight** against the reporting station and its NAUN. The weight accumulated for a particular station is an indication that the station is causing excessive soft errors on the ring.

The Ring Error Monitor maintains two weight thresholds: the impending soft-error threshold and the excessive soft-error threshold. The impending soft-error threshold is lower than the excessive soft-error threshold.

The 9370 has implemented three basic processes for isolating error analysis: weight accumulation, weight decrement to time, and threshold and decrement interval adjustment. All of these techniques compare the current weight value to the established threshold value; if the threshold is exceeded, an alert is generated. The first process establishes a static comparison between weight and the threshold value; the remaining two use adjustment techniques depending on the error rate.

1.4.2.2 Intensive Mode Reporting Function

Intensive mode reporting is a facility that enables a LAN manager to request a REM to forward selected Report Soft Error MAC frames it receives to the LAN manager.

There are two types of operation:

- Ring-intensive mode operation

  enables the REM to generate reports to the LAN manager for all Report Soft Error MAC frames that contain at least one of a specified type of soft error on a ring.

- Auto-intensive mode operation

  causes the REM to automatically forward the contents of Report Soft Error MAC frames received from adapters in fault domains that have exceeded one of the error thresholds.

1.4.2.3 Operating Environment Constraints

The Ring Error Monitor operating environment has the following constraints:

1. One or more Ring Error Monitors can reside on the same ring. If no Ring Error Monitors are on a particular ring, it is not possible to monitor errors on that ring.
2. One or more Ring Error Monitors can report to a LAN manager. The LAN manager also sets reporting function classes in the LAN reporting mechanism to selectively receive the Ring Error Monitor reports and notification.
3. A Ring Error Monitor's parameter can be set only by the controlling LAN manager. This control is enforced by the LAN reporting mechanism and the Ring Error Monitor together.

2.0 9370 Token-Ring Hardware Installation

This chapter provides information about the installation procedures for the Token-Ring hardware. Listed here are the 9370 hardware pre-requisites plus the things you must consider when customizing the system to support your environment.

2.1 Hardware Requirements

This section describes the hardware requirements and considerations for installing the hardware in the 9370 to enable it to attach to the Token-Ring.

2.1.1 Adapter Hardware Installation

The Token-Ring Network Adapter is supported by the Communications I/O Processor (feature 6130). This is the correct I/O Processor card (NOT feature 6030 which is used for some other subsystems, and referenced in several documents in HONE Data Bases as the Token-Ring IO Processor card for the 9370.)

When preparing for upgrading the 9370 you must ensure that the 6130 card along with the Token-Ring Network Adapter card (feature 6034) are available for installation.

To support the installation, you must also ensure that the 9370 has the correct level of microcode installed. At the time of testing this level was the GA3 level which includes support for the 6130 Communications I/O Processor. Your customer engineer will be able to advise you on this subject.

Once the cards are installed, you should check the I/O configuration of the 9370 using the processor console in System Programmer mode. (Make sure that the channel addresses match those that you will use in the DMKRIO definitions described in "9370 Token-Ring Software Installation" on page 19).

This is described in the next section, "Setting Up Procedures for Operation" and gives you the ability to review and alter the channel assignment for the Token-Ring Subsystem as well as some other parameters which will be important to your environment, such as the Locally Administered Address for the 9370 Token-Ring adapter and whether or not you wish to enable the Ring Error Monitor Function (REM).

2.1.2 Cabling requirements

The cables required for connecting the 9370 to the 8228 Multistation Access Unit (MSAU) are General Token-Ring Network Adapter cables. These are the same cables that you would use with your PC Token-Ring adapter card for connecting to the MSAU. (Part No. 6339098).

2.2 *Setting Up Procedures for Operation*

When initially installed (or upon any modification to the Token-Ring Subsystem), the 9370 system has to be customized to reflect such change. System customization is a menu-driven process that is summarized in the following paragraphs.

2.2.1 Processor Console

The personal computer that interfaces with the 9370 is called the Processor Console. Its functions are:

- **Configuration services**
  The Processor Console is used to alter the configuration parameters of the Token-Ring subsystem through a series of screens from which the user enters data specifying new configuration parameters. Data entered on a screen is stored in the processor console and downloaded to the Token-Ring Subsystem processor memory during next Initial Microcode Load (IML).

- **Activation services**
  These services download the Token-Ring Subsystem microcode and initialize and start all functions.

- **Problem Analysis services**
  Problem Analysis is a set of routines that identify the source of problems.

The Processor Console can have three types of sessions:

1. **Manual Operations**
   In this type of session, you can access and control basic processor functions such as initializing the system, carrying out an Initial Machine Load (IML), or an Initial Program Load (IPL). Manual operations are divided into the following modes:

   - General User
   - System Administrator
   - System Programmer
   - Service

   The first three modes listed are customer modes. The service mode should only be used by qualified service personnel.

2. **Work Station**
   In this type of session, the processor console can be used as an interactive terminal associated with a program; for example, VTAM or CMS sessions.

3. **Remote**
   In this type of session, you connect to another system that you want to operate, connect to IBM service, or transfer data to IBM.

2.2.2 Selecting the Operating Mode

Once the 9370-interfacing PC is initialized, it becomes the System Processor Console; the first panel that it displays is the 9370 User-Options Screen. At this point the user can select to use the Processor Console in different modes. The following operating modes can be selected:

- **System Administrator**

  The System Administrator mode allows the user only to review the current I/O configuration. It is impossible to make any changes under this mode.

- **System Programmer**

  The System Programmer mode allows the user to modify the I/O configuration. Displays of the current I/O as well as the next I/O configurations are also included functions under this mode.

- **Service**

  Service mode is a function which allows the user to display Measurement Data and Ring Error Data panels. All the functions contained under the System Programmer mode are also included.

Specifications related to Token-Ring functions accessible under the System Programmer mode will be covered in this bulletin. If the reader wants to obtain more information on this topic he should refer to the 9370 publications in **"Using the 9370 Token-Ring Subsystem" (SA09-1738).**

To access the general section of the System Programmer Menu, a sequence of panels has to be followed, as it is shown in the following figures. The panel sequence starts with the User Options screen, which is the first displayed screen after the console has been initialized. (Please note that it is user's responsibility to restrict the access to this function by the use of security passwords).

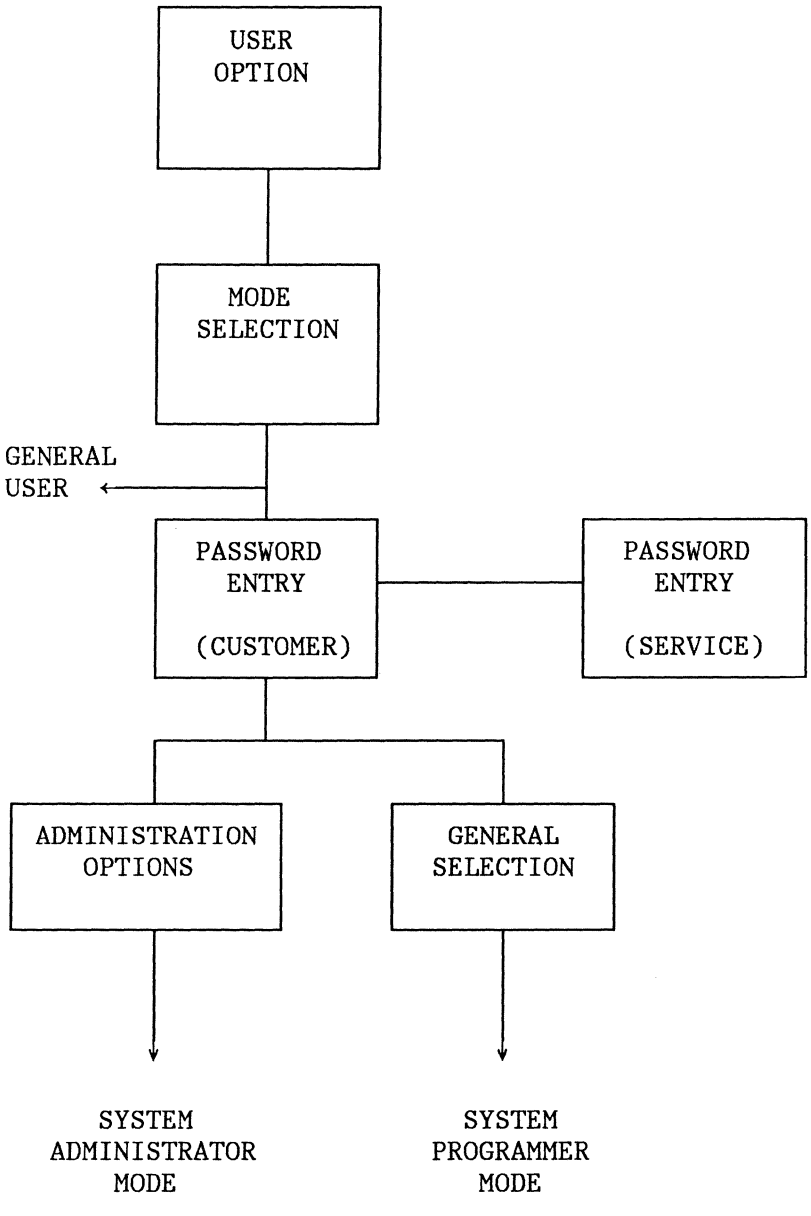

Figure 2. Overview of Mode Selection Process

Once the System Programmer mode has been selected, a General Selection menu panel will be displayed to the user. Under this Menu, different functions are allowed. System IPL as well as remote operations are included here, among many others.

The System Programmer's General Selection Menu is presented next.

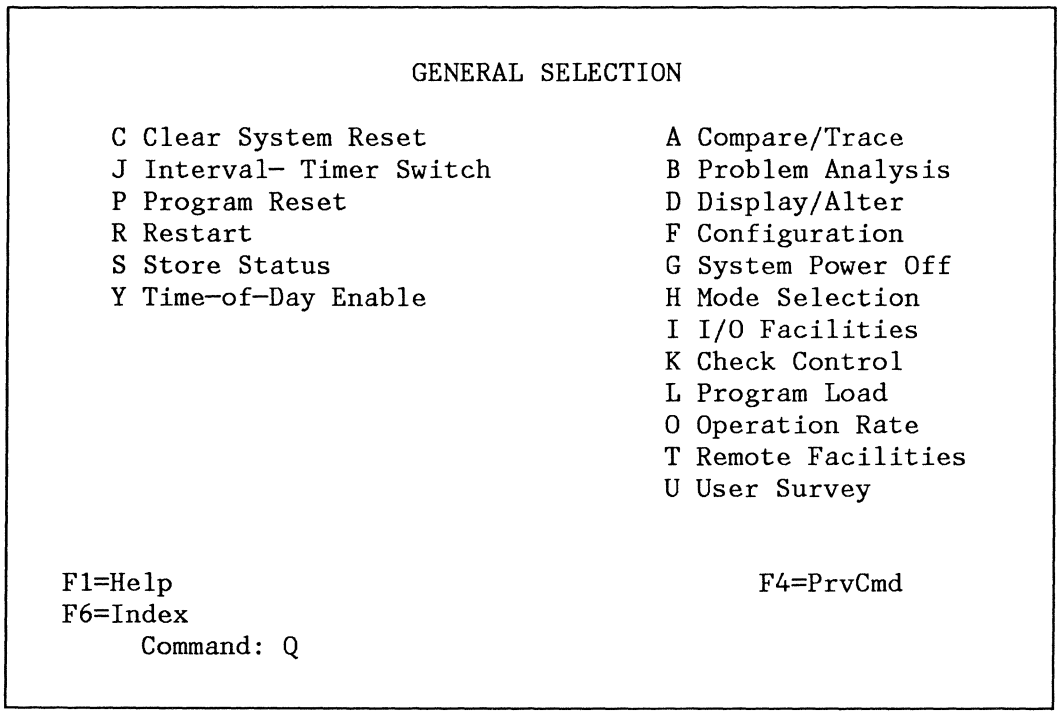

Figure 3. General Selection Screen (Q)

The Token-Ring related function on this panel is the configuration function (option F). During the initial configuration of the 9370 Token-Ring subsystem, the user should access the configuration function to set up some operational parameters. To do so, he should enter option FI beside the already displayed command Q. As a result of such action, the Configuration for the next I/O panel will be presented. Please note that option FI is a concatenation of two commands; a single F will take the user to the configuration menu where the user should select option I for the Next I/O function.

As the user can observe in the following figure, general information related to the 9370 installed I/O Hardware will be presented.

```
Configuration                    NEXT I/O                    page  1
                                                               of  1
Select an S/370 address to display/alter I/O configuration

   S/370                                  RACK
   CHANNEL        I/O                      - UNIT
   ADDRESS        FEATURE                     - CARD

   0              6020                    A - 17A - 03
   1              6130 - 0030             B - 01A - 07
   5              6003                    A - 17A - 09
   6              6003                    A - 17A - 10
   A              6030 - 0000             B - 01A - 03
   B              6030 - 0000             A - 17A - 05
   C              6010                    A - 17A - 02
   D              6010                    B - 01A - 02


                          Last change: 88/05/25 04:13:45


F1=Help  F2=MainMenu            F4=Prvcmd      F5=PrvMenu
F6=Index                                       F10=Alter
     Command: QFJ
```

Figure 4. Next I/O Screen

The Next I/O screen contains the following I/O configuration information:

- **S/370 CHANNEL ADDRESS** establishes a relationship between the physically installed hardware and the S/370 channel address that the 9370 system will associate with it.
- **I/O FEATURE** displays the feature number of the IOP and, for 6130, the microcode feature number as well.
- **RACK-UNIT-CARD** displays the physical location of the IOP card.

The displayed information resides in a data set in the Processor Console. All the information displayed is I/O Processor-related and is either non-modifiable (like the physical location of the adapter) or modifiable (like the assigned channel address). To initially set up this address, the user has to change the display screen mode to Alter Screen Mode. To do so, he has to press F10. By doing so, the same screen will be presented highlighting the modifiable fields (in this case, the S/370 channel address). The first position of the operating system specifications (DMKRIO in the VM case) for the different CETI groups that will operate under the 6130 I/O processor has to match the value entered here to be able to operate. Once the modifications have been typed and the enter key is pressed, a validation process will take effect and the mode of the screen will be changed to display mode. Also, if the user decides not to modify the values on the screen by pressing F10 or "enter," Display mode will be resumed.

To obtain the panel containing detailed information about the I/O device for a specific installed I/O feature, the user has to enter the number of the channel beside the already displayed QFJ command. A two-page display containing information related to the Token-Ring Network Adapter Card for the next I/O will be presented.

Particular I/O Processor information for the Token-Ring I/O processor (such as the address range used by the three CETI groups in the 9370 Token-Ring Adapter Card) will be displayed on the first page of the 6130-0030 display, as well as some information related to the physical location of the adapter card.

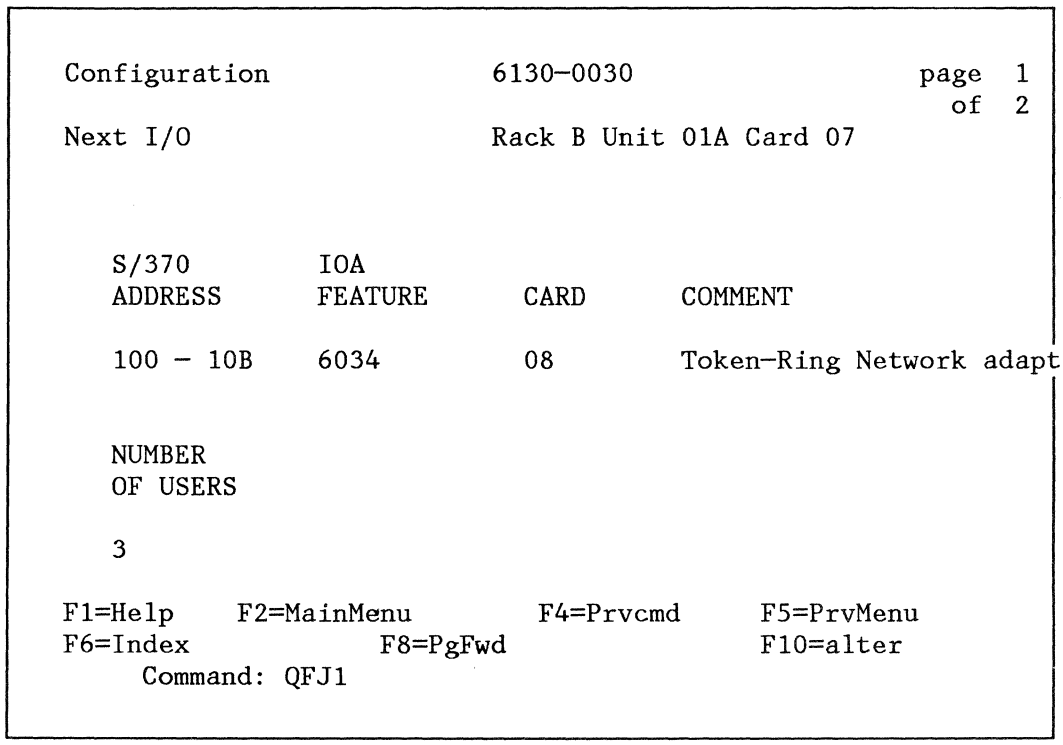

Figure 5. The Next 6130-0030 Configuration Screen, Page 1

Page 1 of the current and next 6130-0030 screens displays the following:

- The 'Rack, Unit, Card' values given under the 6130-0030 title show the physical location of the IOP.
- 'S/370 ADDRESS' shows the range of assigned consecutive addresses.
- 'IOA FEATURE' shows the feature number of the token-ring IOA card.
- 'CARD' shows the IOA card slot number.
- 'COMMENT' provides a 20-character line for relevant comments.
- 'NUMBER OF USERS' shows how many groups of four subchannel addresses are configured.

To initially set up this address range (or for later modifications) the user must press F10 on the previous panel. The modifiable fields will be highlighted and underscored. The user may enter the hexadecimal addresses of the different CETI groups and a comment on them. Remember that the four CETI-group addresses are consecutive and the maximum number of CETI groups per adapter is three.

The second panel of the two-page display can be accessed from page one either in Display or Alter mode by pressing F8. **Most of the information contained on this display should be the default specification for the Direct Memory Access (DMA) and the user should not attempt to modify it.** (DMA questions will be excluded from the display in future microcode levels.) Nevertheless, this display contains parameters that the user has to specify, such as the inclusion of the Ring Error Monitor Function (REM) on the adapter or the Locally Administered Address of the 9370 Token-Ring adapter, or the LAN inactivity timer.

The second page of the 6130-0030 display panel is shown in the following figure:

```
Configuration                6130-0030
Next I/O

   Node Address (hexadecimal).....................4000 0011 4014
   DMA SCB/SSB Mode (0=Cycle 1=Burst).............1
   DMA List Mode (0=Cycle 1=Burst)................1
   DMA List Status Mode (0=Cycle 1=Burst).........1
   DMA Receive Data Mode (0=Cycle 1=Burst)........1
   DMA Transmit Data Mode (0=Cycle 1=Burst).......1
   DMA Receive Burst Size (0=65534, even).........128
   DMA Transmit Burst Size (0=65534, even)........128
   DMA Bus Retry Threshold (1-255)................1
   DMA Parity Retry Threshold (1-255).............1
   Inactivity Timer (30-32767, 100 ms units)....30
   Enable Ring Error Monitor (0=No 1=Yes).........1

F1=Help      F2=MainMenu        F4=Prvcmd      F5=PrvMenu
F6=Index     F7=Pgbk
     Command: QFJ1
```

Figure 6. The Next 6130-0030 Configuration Screen, Page 2

Node Address is the 9370 Token-Ring Network Adapter address. If the user does not modify this field, leaving it with the original value of X'0's, the Universal or Burned-In Address will be in effect at Adapter Open time unless the associated software is able to specify the Locally Administered Address of the adapter (for example, in VTAM).

As in the previous cases, by pressing F10 the user may change the display to Alter mode on this screen. If the user came to this screen by pressing F8 and was already in Alter mode, the mode status is preserved. The modifiable fields on this page will be highlighted. The modifications will be saved after the user depresses the enter key; the screen also will be reset to Display mode.

Once the desired alterations have been made and the enter key is pressed, a validation process will take place and Display mode will be resumed. The user may wish to verify the change of the entered operands. This is done by accessing the Next I/O displays that have been described in the previous section (but without modifying the screen mode from Display to Alter).

3.0 9370 Token-Ring Software Installation

This chapter provides information about the installation procedures for the Token-Ring host software and related products. Listed here are the software prerequisites plus the things you must consider when customizing the software to support your environment. There are several places where work has to be planned and completed before you can expect to establish a 9370 running an operational Token-Ring network which will be easy to maintain and manage.

3.1 Software Requirements

This section provides information about the products required to allow a 9370 Information System to establish communications over the Token-Ring. There is a section at the end of this chapter about additional products which are relevant in this environment to support the operation of a Token-Ring, or which enhance the facilities available over it.

3.1.1 VTAM (SNA) Environment

To enable communications between a 9370 and workstations (or between 9370s) VM/VTAM Version 3 Release 2 is required. The Token-Ring support is a standard function of the VTAM's basic code for the 9370. This function is supported by VM/SP Systems with the following levels of service:

- VM/SP Release 4 with Program Update Tape 8701
- VM/SP Release 5 with Program Update Tape 8702

For VSE systems, this function will be available with VSE/VTAM V3R2, which will be available in the fourth quarter of 1988.

3.1.2 NON-SNA Environment Using TSAF

Transparent Services Access Facility has its own support for communications over the Token-Ring to another system running TSAF. There is no workstation support and the product is intended to provide Distributed Database Access for other programs, such as Structured Query Language (SQL/DS). TSAF is a no-charge feature of VM/SP R5. For additional details on installation of this product, see "TSAF Installation and Operation" on page 77 and also the Bulletin **"VM/SP Release 5 Installation Experiences"** (GG24-3183).

3.2 Operating System Customization for Token-Ring - VM DMKRIO

Before you can use the Token-Ring subsystem, you have to make the real adapter devices known to the 9370 Operating System. In this test environment, the 9370 operating system was VM, and the updates you have to make are in the DMKRIO definitions for the system's I/O configuration.

The System Programmer/Administrator can update DMKRIO by logging on to the MAINT machine.

This section describes the macro and control statement invocations necessary to generate real Input/Output from Token-Ring LAN subsystem links.

Each LAN subsystem must be defined to CP on a separate channel, as a group of 3088 devices, by specifying macro entries in DMKRIO.

The macros which need to be defined are the RDEVICE, RCTLUNIT and RCHANNEL macros, and their specifications should be:

- RDEVICE macro
  - Four, eight or twelve consecutive subchannel addresses depending on whether you have one, two or three CETI groups on the Token-Ring LAN subsystem.
  - Device type of 3088.

  For example: the following RDEVICE macro describes the starting address for twelve consecutive device addresses as 100, and specifies a device type of 3088. This provides enough addresses for the three CETI groups which the Token-Ring Subsystem is capable of supporting.

  ▲ RDEVICE ADDRESS=(100,12),DEVTYPE=3088

- RCTLUNIT macro
  - Address of the first port of the first CETI group
  - Control unit type of 3088
  - 32-DEVICE feature.

  For example: the following RCTLUNIT macro describes the address of 100, a control unit type of 3088, and a 32-DEVICE feature:

  ▲ RCTLUNIT ADDRESS=100,CUTYPE=3088,FEATURE=32-DEVICE

- RCHANNEL macro
  - Channel address
  - Channel type of block multiplexor

  For example: the following RCHANNEL macro describes the channel address of 1 and a channel type of block multiplexor:

  ▲ RCHANNEL ADDRESS=1,CHTYPE=BLKMPXR

When the definitions in the DMKRIO source file are complete and you are satisfied that they match the real I/O configuration as displayed by the system processor console, do the necessary assembly of the source file according to your installation's procedures. Follow this step by generating a new CP nucleus to bring the changes into effect.

3.3 *Token-Ring Support Under VTAM - SNA Environment*

Communications over the Token-Ring for workstations requiring access to 9370 applications or for 9370-to-9370 communications can take place using VTAM as the SNA Access Method.

Because the support for the Token-Ring LAN in VTAM uses extensions of definitions for existing environments such as channel attachments and switched support, there is no need to recode application programs in order to use the Token-Ring, and the new definition procedures are similar to those implemented for other types of Communication Adapter support.

The LAN/VTAM is a new type of Communications Adapter support, and will co-exist with other VTAM DLC's (Data Link Controls) so that all existing attachments will remain usable subject to the normal restrictions on support of links between Host subareas. These restrictions apply to the concurrent use of one link only between host subarea nodes (PU5 to PU5) which could be (for example) the Token-Ring, or one SDLC link or a channel-to-channel connection. Multiple parallel links are not currently supported via the communications adapters for Host-Host traffic.

3.3.1 VTAM Resource Definition

VTAM requires that the physical configuration of the network be defined in terms of the network nodes which can be addressed and therefore used by application programs, and also controlled by the VTAM operator (using VTAM commands).

This section describes some of the VTAM parameters which are new and apply only to this new type of connection. Many of the parameters are ones which have been used in VTAM before for other node types and will therefore be familiar, but some of these may have different default values (attention to this will be drawn wherever possible). Sample definition sets are provided for the Token-Ring configuration used in the testing of the various scenarios; see "9370 Token-Ring Test Scenarios" on page 41.

As previously mentioned, VTAM uses switched-line support to map to Token-Ring LAN connections for workstations (PU2) wishing to access the 9370, while connections between 9370s on the ring appear to VTAM as leased (Point-to-Point) SDLC lines.

Defining an attachment for a Token-Ring in VTAM therefore involves defining:

- Local Area Network Major Nodes
- Switched Major Nodes.

The LAN major node is a new type, previously unavailable. It contains some definitions for the LAN adapter itself as well as the definitions for any other 9370s on the ring (with leased-line appearance). It also contains "placeholder" definitions of the lines and Physical Units (PU Type 2) for the workstations which will have access to this VTAM with a switched-line appearance. These are then fully defined in the Switched Major Node.

All the usual rules for defining resources to VTAM must be followed. Network-unique names must be used for all definitions which will be active at the same time. A definition is active when VTAM reads the major node which contains it. This will happen if the major node appears in VTAM's initial configuration list or is activated by operator VARY ACT command.

3.3.1.1 Defining a Local Area Network Major Node

In the LAN major node you must file statements to describe the node type, the port(s) used by the LAN and the stations (including 9370s) attached to the LAN.

You must file a VBUILD statement and a PORT statement for the major node and GROUP, LINE and PU statements for the minor nodes. You must have a VBUILD statement for each LAN major node, but it may contain more than one link group, as defined by the GROUP statement. Each link group must contain a unique set of minor nodes (LINEs and PUs).

A definition and further discussion of each parameter is beyond the scope of this book. Just the relevant parameters in the different definitions will be defined and discussed.

The VBUILD Statement

Code one VBUILD for each connection between VTAM and a LAN. The VBUILD statement has a new operand which is required.

Name	Definition Statement	Operands
(name)	VBUILD	TYPE=LAN

The PORT Statement

The PORT statement identifies VTAM's CETI group to the LAN subsystem. It also provides an opportunity to specify a Locally Administered Address for the 9370 Token-Ring Adapter card. This address will be the one used when the 9370 inserts itself onto the ring and is the address which should be used as the destination address in all other ring-attached devices which will be owned by VTAM.

Code only one PORT statement for each VBUILD TYPE = LAN major node. The following figure shows the operands of the PORT statement with an explanation of some of them.

Name	Definition Statement	Operands
(name)	PORT	CUADDR=cua (,LANCON=ct1,cn2|5) (,MACADDR=macaddr) (,MAXDATA=n|2000) (,MAXSTN=n) (,SAPADDR=n|4)

CUADDR = cua

This defines the channel unit addresses used for the attached LAN. The address that is specified here is the first of four consecutive subchannel addresses which will be used by the CETI group assigned to this port. This is a three-digit hexadecimal address. The first digit is the channel number and is in the range 0 to F. The second and third digits are the subchannel address and are in the range 00 to FB. For example, if CUADDR = 038 is specified, VTAM will assign 038, 039, 03A and 03B subchannel addresses. The valid range for CUADDR is thus 000 to FFB.

MACADDR = macaddr

Specifies the 12-digit MAC address of this LAN adapter when it is opened onto the ring. If nothing is specified here, the address specified by the service processor wil be used (if MACADDR is omited and the Service Processor address is invalid or omitted then the Universal or Burned-In Address on the card will

be used). You may specify an 8-digit number which will be prefixed by VTAM with 4000 to form the 12-digit address. (Please remember that all the Locally Administered Addresses MUST begin with the prefix 4000.)

MAXDATA = n|**2000**

Specifies the maximum number of bytes in the information field of the LLC Protocol Data Unit (LPDU) that can be transmitted on the LAN. The valid range is 64 to 65535 but this should be specified to be within the allowable limits for the 9370 Token-Ring Subsystem. Currently this can be a maximum of 2012 bytes. If you exceed the limit for your subsystem, errors will occur when you attempt to open the adapter by activating this LAN Major Node.

MAXSTN = n

This specifies the number of ring stations (PUs) including other 9370s that can communicate via the LAN to this 9370 through this port. Allowable values for n range from 1 to 65535. At this time the maximum supported by the 9370 LAN adapter is 64 PUs per adapter. Because a PU may support multiple LUs, this should not prove to be a limitation on the number of users which can attach to this host.

NOTE: The value specified for MAXSTN cannot exceed the maximum value allowed by the Token-Ring Subsystem in the 9370. Consult the appropriate documentation for your subsystem to determine the maximum value to be coded.

SAPADDR = n|**4**

Specifies the Service Access Point (SAP) address for the connection of the LAN to VTAM that this major node is defining. A Service Access Point identifies the logical point for transfer of data between the Data Link Control layer of the LAN to the higher layers, such as a Path Control component, implemented in the node. A layer can have more than one SAP associated with it, so that the node can have more than one independent connection with SAPs concurrently. This is important when more than one application needs to use the ring concurrently via the same adapter.

The SAP Address is used here to route information coming from the LAN to the appropriate Channel Unit Address (CUA).

The default value for the SAP address here is 4, but can be a multiple of 4 in the range 4 to 252. The value 4 is the suggested value for normal use since this is the default individual SAP address used by SNA nodes to identify Path Control as the data link user.

When there are 3174 stations on the ring, it is very important to utilize the VTAM's default value for SAP, in the definition of the PU that will represent the 3174 (SAP value defaults to 04). In the 3174, this value is internally defined and cannot be modified at customization; nevertheless, this is not the case with the 3270 Emulation PC, where you can specify different values for a SAP to talk to.

Defining other 9370s on the Token-Ring

Other 9370s attached to the ring as peer processors must be defined in the LAN major node by a pair of LINE and PU statements in a non-switched SDLC line group with a GROUP statement.

Most of the operands on the GROUP statement apply to the LINE and PU statements below it, but can be coded here for simplicity. This is the "VTAM Sift-Down Effect".

Name	Definition Statement	Operands
name	GROUP	DIAL=NO (,ISTATUS=ACTIVE|INACTIVE) (,LANACK=(t|0,n|0)) (,LANCON=(ctl,cn2)) (,LANINACT=ti|4.8 (,LANRESP=(tl,n2)) (,LANSDWDW=(k|2,nw|1)) (,LNCTL=SDLC) (,PUTYPE=5) (,SPAN=spanname)

For a full description of the various operands, such as the LAN-specific timers and counters, see **VTAM Installation and Resource Definition** (SC23-0111). The important thing to notice from the GROUP statement is that the line is SDLC non-switched (DIAL = NO), (LNCTL = SDLC) and the 9370 is PU Type 5.

The LINE statement needs no operands if all the above operands are coded on the GROUP statement, since they are the same. You may wish to have different ISTATUS for operational reasons. It also needs a unique name.

Name	Definition Statement	Operands
name	LINE	DIAL=NO (,ISTATUS=ACTIVE|INACTIVE) (,LANACK=(t|0,n|0)) (,LANCON=(ctl,cn2)) (,LANINACT=ti|4.8 (,LANRESP=(tl,n2)) (,LANSDWDW=(k|2,nw|1)) (,LNCTL=SDLC) (,PUTYPE=5) (,SPAN=spanname)

The PU also will use the values coded on the GROUP statement for the operands which affect it. There are, however, two additional operands which need to be considered here.

Name	Definition Statement	Operands
name	PU	MACADDR=macaddr (,ISTATUS=ACTIVE|INACTIVE) (,LANACK=(t|0,n|0)) (,LANCON=(ct1,cn2)) (,LANINACT=ti|4.8 (,LANRESP=(t1,n2)) (,LANSDWDW=(k|2,nw|1)) (,PUTYPE=5) (,SAPADDR=n|4) (,SPAN=spanname)

The MACADDR is the MAC address of the other 9370 LAN adapter, which is the MACADDR on the PORT statement of the other 9370's own LAN major node. If the other 9370 has no Locally Administered Address specified in its VTAM LAN major node, then you must use here the Universal or Burned-In Address of its adapter.

The SAPADDR is the SAP address of the VTAM in the other 9370 which is also coded on the PORT statement in its LAN major node definition. This will normally be the default value of 4.

For SNA PUs, you must define one pair of LINE and PU statements for each 9370 on the ring. There may be one GROUP for all 9370s or more than one.

Defining Stations on the Ring

After the GROUP, LINE and PU statements for the peer 9370s on the ring, you must code GROUP, LINE and PU statements for the PU2 stations which will require the services of this 9370 and its VTAM. Again, the LINE and PU statements must be coded in pairs under a GROUP statement.

For ease of coding, you may put operands which apply to the LINEs and PUs on the GROUP statement because they will "sift down".

Name	Definition Statement	Operands
name	GROUP	DIAL=YES (,ANSWER=ON|OFF) (,CALL=IN|OUT|INOUT) (,ISTATUS=ACTIVE|INACTIVE) (,LNCTL=SDLC) (,MAXLU=n|2) (,SPAN=spanname)

Name	Definition Statement	Operands
name	LINE	(,ANSWER=ON|OFF) (,CALL=IN|OUT|INOUT) (,ISTATUS=ACTIVE|INACTIVE) (,MAXLU=n|2) (,SPAN=spanname)

Name	Definition Statement	Operands
name	PU	(,ISTATUS=ACTIVE|INACTIVE) (,MAXLU=n|2) (,SPAN=spanname)

These are fairly simple statements which define the downstream PU2s as being on switched SDLC lines. The full definitions for these stations have to be coded in the Switched Major Node - another VTAM dataset.

The labelname of the GROUP macro is very important for dial-out operations. Its value has to match the GRPNAME value of the PATH statement in the Switched Major Node definition for the ring stations. By establishing this parameter relationship, VTAM can determine the LINE definitions to use for mapping the PU and associated LUs involved in the dial-out process.

3.3.1.2 Defining a Switched Major Node

A Switched Major Node is defined by coding a VBUILD statement for the major node followed by separate PU, PATH and LU statements for each minor node, in that order.

The Token-Ring related operands in the PU and LU macros define physical units and logical units that can dial in to, or be dialed out from, the 9370/LAN. These lines are defined in the switched line groups in the LAN major node. For dial-out operations, PATH statements define the possible paths to be used for connection between the 9370 and the PU.

The PU and LU statements are very similar to those used in the LAN major node described above. If you already have a Switched Major Node defined for your network, it will be possible to copy those definitions and modify them for use in the LAN environment. There are some new operands, and some of the normal switched operands may not be used in the LAN environment, in which case they are allowed but have no meaning.

Defining the Node Type - The VBUILD Statement

Code one VBUILD statement for each major node in this VTAM. Its format is as follows:

Name	Definition Statement	Operands
(name)	VBUILD	TYPE=SWNET (,MAXGRP=n) (,MAXNO=n)

TYPE = SWNET is a required operand and defines this as a Switched Major Node to VTAM.

The PU (Switched) Definition Statement

Code a PU statement for each 3270-type station which will access the 9370 via the Token-Ring. There are many possible operands which you can code on the PU statement, some of which will apply to the LUs coded under it. For a full description of the operands, see **"VTAM Installation and Resource Definition"** (SC23-0111).

The VTAM's definition for a switched PU, has new LAN parameters. Some new LAN parameters, are architectural related parameters (like Time outs, retry counts) which are not going to be covered in this book, but if the reader wants more information on these parameters, he can refer to **"VTAM Installation and Resource Definition"** (SC23-0111) or **'Token-Ring Network Architecture Reference"** (SC30-3374). Some other parameters which need extra attention will be covered in more detail.

Here is a list of the new operands that have been added to the Switched PU definition.

Name	Definition Statement	Operands
name	PU	IDBLK=identification block ,IDNUM=identification number (,ISTATUS=ACTIVE|INACTIVE) (,LANACK=(t|0,n|0:ehp2)) (,LANCON=(ct1,cn2)) (,LANINACT=ti|4.8 (,LANRESP=(t1,n2)) (,LANSDWDW=(k|2,nw|1)) (,LANSW=YES|NO) (,MACADDR=macaddr) (,PUTYPE=2) (,SAPADDR=n|4) (,SPAN=spanname)

IDBLK = Identification Block

This is a three-digit hexadecimal number which denotes the device type and is typically found in the Component Description Manual. For 3174s and PCs using 3270 emulation, the IDBLK should be coded as 017. IDBLK is a required operand - you must code it. The IDBLK is combined with IDNUM (see below) to form a unique station identifier which is used in the XID exchange during the dial procedure with VTAM.

IDNUM = Identification Number

This is a five-digit number which identifies the specific device. The value typically used is the serial number of the device being defined; this ensures that the XID formed by combining IDBLK and IDNUM will be unique. IDNUM is required - you must code it.

LANSW = YES|NO

Specifies whether the PU can be used as a station on a LAN attached directly to a 9370/LAN. If the operand is not coded then you must code one of the following operands for the device to be used as a station on the ring.

LANACK
LANCON
LANINACT
LANRESP
LANSDWDW
MACADDR
SAPADDR

The minimum coding for a dial-in PU is LANSW = YES.

MACADDR = macaddr

Specifies the MAC Address of the PU being defined. This is the operand which VTAM considers to be the PU Token-Ring address for Host-Initiated (Dial-Out) connection. This will be the address used, for example, when a PC opens its adapter on to the ring for a 3270 emulation session. This will be either the Universal (Burned-In) Address or the Locally Administered Address for that adapter. It consists of 12 digits but may be specified here with 8, in which case VTAM applies a prefix of 4000 to the value. This operand is the minimum and is required for a Dial-out PU.

PUTYPE = **2**

Specifies that this station will be a PU Type 2, which is obligatory for a switched LAN station.

SAPADDR = n|**4**

This specifies the Service Access Point in the destination ring station for the PU. The valid range is 4 to 252 in multiples of 4. This should correspond with the SDLC Station Address used in the 3270 emulation program line description of a PC, and, for SNA nodes you should use a value of 4.

The (Switched) LU Definition Statement

Code an LU statement for each Logical Unit associated with this Physical Unit in the switched major node. The LU statement must follow the PU statement with which it is associated.

Name	Definition Statement	Operands
name	LU	LOCADDR=n (,DLOGMOD=default logon mode table entry) (,ISTATUS=ACTIVE|INACTIVE) (,LOGAPPL=application program name) (,LOGTAB=interpret table name) (,MODETAB=logon mode table name) (,PACING=n|1:ehp2) (,SPAN=spanname) (,SSCPFM=FSS|USSSCS|USSNTO| USS3780,|USS3270|USS3275) (,USSTAB=USS definition table name) (,VPACING=n|2:ehp2)

There are many operands for the LU statement which may be more convenient to code on the PU statement where they will sift down to the LUs defined under it. For a full explanation of the various operands, see **"VTAM Installation and Resource Definition'** (SC23-0111).

name - a name is required for each logical unit. It should be unique.

LOCADDR = n

Specifies the local address of this logical unit at the physical unit. This must match the local addresses used in any ring-attached 3174-3Rs or in any ring-attached PCs running 3270 emulation and acting as a gateway for other PCs on the ring.

The Switched PATH Definition Statement

This is used to define paths for Dial-out operations by VTAM to stations on the ring. You can code multiple path statements for a PU in the switched major node, up to a maximum of 256. The PATH statement must follow the associated PU statement. For a full description of the PATH statement, see **"VTAM Installation and Resource Definition"** (SC23-0111).

Name	Definition Statement	Operands
(name)	PATH	DIALNO=telephone number (,GID=n) (,GRPNM=groupname) (,PID=n) (,REDIAL=n|3) (,USE=YES|NO)

Note that the DIALNO as well as the REDIAL operand has no meaning in the LAN environment, although they may be coded.

3.3.1.3 General Switched Major Node Considerations

Unlike other implementations of the Switched Major Node, such as for real Switched SDLC lines or for Token-Ring support using NTRI (NCP Token-Ring Interface), in a 37XX Communications Controller, the LAN Adapter support does not use the DIALNO operand of the path statement to initiate a DIAL-OUT connection with the ring-station.

For a DIAL-OUT operation, VTAM uses as the number to call, the value of the MACADDR operand coded on the PU statement of the Switched Major Node. The PATH statement tells VTAM the name of the GROUP Macro that contains lines to be used to MAP the PU definition for the activating station. Matching names are required between the value for the operand GRPNM of the PATH macro in the Switched Major Node and label name of the GROUP macro that defines the LAN stations in the LAN major node.

For a DIAL-IN operation, the minimum coding for the Ring-station in the Switched Major Node is to specify LANSW = YES. The ring-station has the MAC address of the 9370, which is effectively its "telephone number." Assuming then that the XID exchange is successful, a link will be established.

If PC 3270 emulation is being used at the workstation, the connection will normally be established by the device. In recovery/restart situations, it may also be desirable to establish the connection from VTAM, so unless there is a reason, devices should be specified as CALL = INOUT on the LINE statement in the LAN Major Node. See also "9370 Token-Ring Test Scenarios" on page 41 for further information.

VTAM XID Exchange

VTAM constructs a 48-bit unique identifier for the ring-station during the establishment of a connection. It must be unique for every station in the network - not just this Major Node, and provides an additional level of security checking/validation.

The XID is constructed using the IDNUM and IDBLK operands of the Switched PU statement. These must match definitions used at the workstation or 3174 Control Unit.

- IDBLK = Identification Block is a 12-bit string which identifies the type of device and is required. This is normally obtained from the component description manual for the device.
  - For a PC with 3270 Emulation, IDBLK = 017
  - For a 3174, IDBLK = 017
  - For a PC running APPC/PC, IDBLK = 050
- IDNUM = Identification Number is a 20-bit string assigned to the particular station being defined. For any class of device, this number should be unique. One way to ensure this is to use the serial number of the device to construct this field. The value in the Switched Major Node PU definition must match what is customized in the PC or 3174.
- The XID has the following structure:
  - Bits 0-3 Reserved
  - Bits 4-7 PUTYPE
  - Bits 8-15 '00'
  - Bits 16-27 IDBLK
  - Bits 28-47 IDNUM.

3.4 *PC Software - IBM PC 3270 Emulation Version 3*

This is the product installed on the Token-Ring attached workstations wishing to access the 9370 as a host. Other workstation products may use the facilities of PC3270 emulation for host communications. These include the following:

- Personal Services/PC
- PROFS/PC Support
- PC Requesters (the PC component of Enhanced Connectivity Facilities products).

3.4.1 Functions Offered by PC 3270 Emulation V3

There are a variety of facilities which this product offers the end user apart from the basic function of emulating a 3270-type terminal on an SDLC line, Token-Ring network or co-axially attached. Most of the extra functions are options which are chosen during the customizing process and if chosen they will usually increase the size of the program when it is loaded into PC memory.

The list of additional facilities includes the following:

- Definition of PC-attached printer as being Host-addressable (an LU)
- Direct Host print to printer or disk
- Direct screen print to disk
- Hot-key facility to Alternate-Tasks for DOS applications
- File transfer (SEND and RECEIVE) to CMS or TSO, for example
- Presentation-space API (application program interface) for user-written applications
- User-definable Keyboard re-mapping
- Line Trace facility
- Server-Requester Program Interface (for using Enhanced Connectivity Facilities).

Adapter Initialization
Before using a program in the PC which is to communicate over the Token-Ring LAN, it is necessary to first initialize and open the adapter. Where PC3270 Emulation is concerned, this consists of the following steps:

- Loading LAN Support program or the adapter handler code (TOKREUI). The LAN Support Program device drivers should be included in the CONFIG.SYS file. It can be specified a Locally Administered Address for that adapter.
- Loading the PC3270 Emulation Program.
- Executing the program.

The act of loading and executing the PC3270 Emulation Program causes the adapter to open onto the ring and open the Service Access Point and associated Link Station. It is possible to have multiple programs running in the same PC and communicating through the same Token-Ring Adapter. Only one will be responsible for opening the adapter and they will generally use different SAPs.

Comments:

- PC3270 Emulation Program cannot be used from a shared disk since the customization process updates one of the modules for the specific station.
- DOS 3.2 or later is required.

- PC 3270 V3 will coexist with PC LAN Program (PC LAN Program has to be loaded first and it will open the adapter).
- TOKREUI, if used, cannot be loaded from shared server-disks.

3.4.1.1 Standalone Versus Gateway/Network Station Configurations

PC 3270 Emulation can be configured in four ways to communicate over the Token-Ring. These are as follows:

- Standalone station - The PC communicates directly with the host. That is, the SNA Physical Unit and Logical Unit (PU and LU) are implemented together in the PC.
- Gateway Station - This acts as a gateway for other network stations to access the host, that is, the SNA PU only is implemented here and the PC is acting like a 3274 controller only.
- Network Station - Uses the Gateway Station to access the host, that is, the SNA LU is implemented here. Up to 32 Network Stations may use one Gateway Station as a controller.
- Gateway and Network Station - Acts as a Gateway for other Network Stations on the ring, but also has a screen session with the host itself.

In the Token-Ring environment there are some advantages to having your PCs configured as Standalone stations on the ring, and unless there is some other restricting consideration this should be the preferred option. The main advantages are:

- For maintaining performance of gateways, it is frequently desirable to have a dedicated PC performing this function. This is not required if Standalone stations are used.
- In the Gateway/Network Station setup, NETBIOS is required. NETBIOS requires more workstation memory (about 46K).
- The Standalone configuration uses the DLC interface provided by TOKREUI. This is more efficient than using the NETBIOS End User Interface (NETBEUI) as required by the Gateway/Network Station setup.

The following diagram illustrates the various interfaces available in the PC for Token-Ring communications and their relationship to each other.

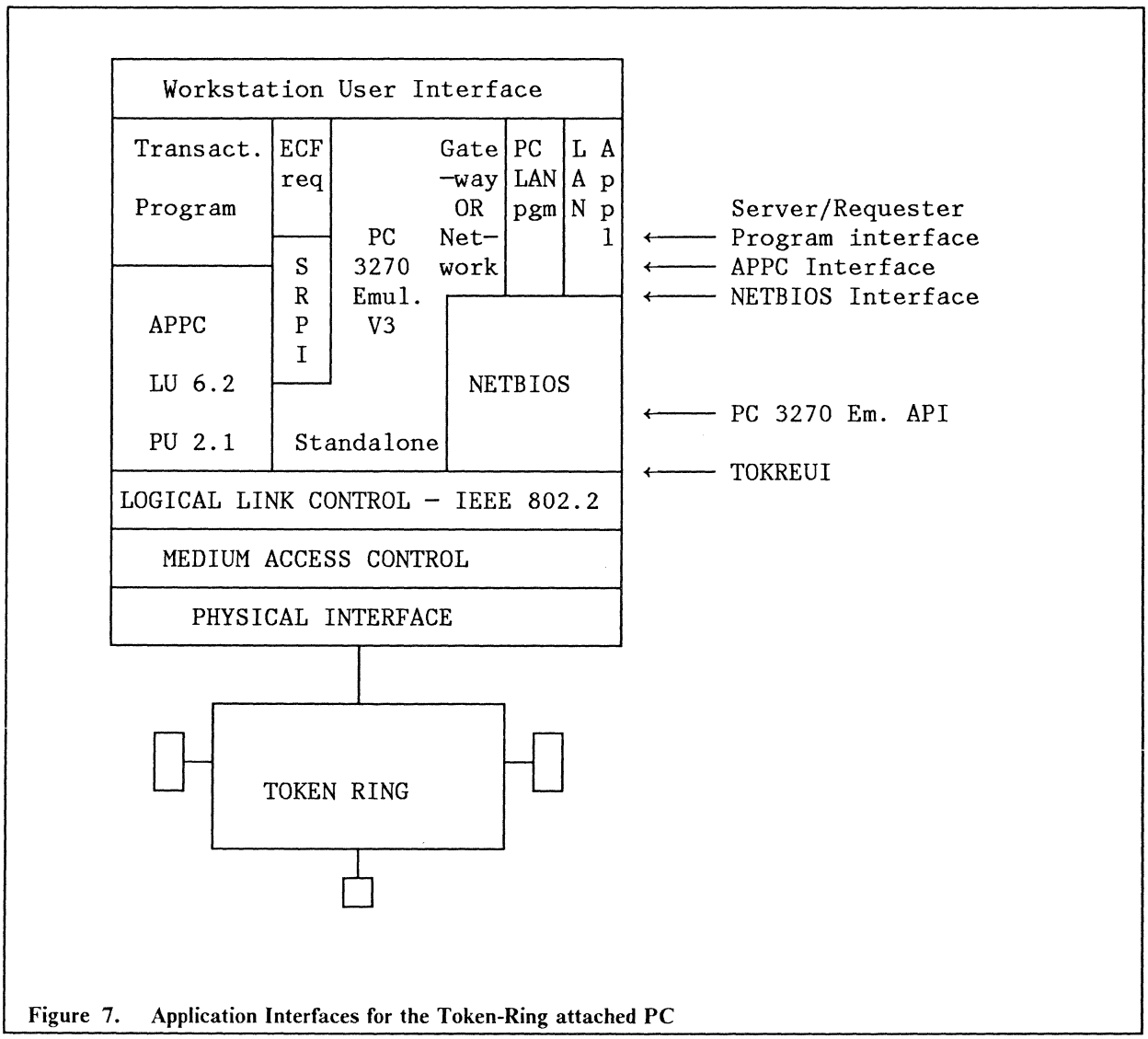

Figure 7. Application Interfaces for the Token-Ring attached PC

3.4.2 Locally Administered Versus Universal (Burned-In) Addresses

In most installations it is desirable to use some form of Locally Administered Address when opening an adapter onto the Token-Ring. The Burned-In Address is one which is administered by the IEEE world-wide to ensure uniqueness. A Locally Administered Address (LAA) is desirable for several important reasons:

- The address is used to establish a connection with VTAM and is coded in the VTAM definition library. This means that if a PC adapter fails or is replaced or moved for some reason, and you were using the Burned-In Address, you would have to change the VTAM definitions in order to continue with a different adapter.
- By using LAAs you can plan in advance for additional network stations. They can be administered more effectively.
- It is easy to adopt some kind of naming convention which can make the Adapter Address meaningful to the Network Administrator or someone involved in Network Operation and Management.

The main consideration in using LAAs is that they should be kept unique within the establishment.

3.5 Planning for Other Products to Support the Token-Ring Environment

Described here are some of the additional software products available to enhance the facilities for the end user, operator, administrator and technician over the Token-Ring Network. Some are host products which have features that integrate intelligent workstations on the LAN with increased application functions, and some are products which should be considered for any LAN installation to facilitate design, management and problem determination on the ring.

3.5.1 Planning Host Products for Token-Ring Installations

Because VTAM views the workstations attached to the ring as being on Switched SDLC links, there are no other special host products required. Products which should be considered for application function include:

- NetView - For Operations, Management and Problem Determination.
- CMS File Transfer Programs - for file upload/download to/from PCs.
- VM/CMS Servers - for Enhanced Connectivity Facilities with PCs.

3.5.1.1 NetView

NetView Release 2 can be used to support the operation of the Token-Ring and also can be used as a Problem Determination tool. NetView considerably simplifies the interface to VTAM for operators who will be changing the status of, or displaying the status of, resources in the network.

Since all the Ring-attached resources are treated by VTAM as being on either switched or leased-lines, many of the NETVIEW commands and messages will be familiar. However, the Token-Ring Adapter interface is capable of providing the Hardware-Monitor component of NetView with error information in the form of generic alerts if there have been errors in initializing the adapter. For samples of such alerts - see "Problem Determination" on page 69. These give the host operator information as to whether there are errors in the coding of the VTAM parameters which are being used to open the adapter onto the ring, for example.

3.5.1.2 CMS File Transfer Facility

- This supports file upload/download between the PC and CMS.
- A product is needed at the host as well as the workstation.
- It is a customization option in the PC 3270 Emulation Program.
- The Presentation Services (PSERVIC) 'Query bit' must be set on in VTAM's Logmode entry for workstation wishing to use this function.

3.5.1.3 Enhanced Connectivity Facilities (ECF)

These products were not implemented in the test environment, but an overview is included to complete the description of products which may be planned for in the Token-Ring environment.

Enhanced Connectivity Facilities provides the PC-user with a set of functions which extend his resources to include host-resources. The main elements of ECF are the Server and Requester Programs and the Server/Requester Programming Interface (SRPI).

Servers in the Host (e.g. VM/CMS Servers - 5664-327) are designed to respond to requests from the PC for data or resources. Requests from the PC are issued by the IBM PC Requesters. This combination of products provides the following functions:

- Virtual Disk - host disk space available to the PC and formatted as PC disk space. Users can share data and import/export data directly.
- Virtual Print - PC printer output can be redirected to host printers.
- Virtual File - provides the PC with access to host files as if they were PC files. Data and field transformations are provided.
- File Transfer - to and from the host or between virtual disk and a host file. Many different PC file formats are supported for use with different PC packages.
- Host Data Access - via a Query Facility which formats a request to extract data from host database products such as DB2 and SQL/DS. Queries may be stored for re-use.

The Server-Requester Programming Interface is implemented in VM/SP (in the CMSSERV command) and in the PC-3270 Emulation Program V3. This provides the application programmer with a consistent interface for issuing requests and receiving replies over a Host-to-PC connection. SRPI is a customization option of the 3270 Emulation Program V3.

3.5.2 Planning Workstation Products for Token-Ring Installations

This section consists of a description of some Token-Ring components and products as implemented in the test environment. At the workstation level these were:

- IBM Token-Ring Bridge Program Version 1.1
- IBM LAN Manager Program
- NetView/PC
- IBM Trace and Performance Program.

The physical components that can be used in the ring and with appropriate software communicate with the 9370 are the following:

- IBM PCs, PC/XT and PC/AT
- IBM 3174 Model 03R with 3270-type terminals attached

  Note: for information on LAN-related questions for 3174-03R customization, see "9370 Token-Ring Test Scenarios" on page 41.

For a view of the network as it was implemented, see Figure 8 on page 40. This shows that the network makes use of some additional products on the PCs.

3.5.2.1 IBM Token-Ring Network Bridge Program

- The PC/AT is required for the Bridge function.
- A PC/AT to be used as a bridge requires two Token-Ring Type II adapters.
- The bridge program provides:
  - Bridge management functions
  - Bridge configuration details
  - Path trace functions and ring test capability
  - Reports on error conditions and beaconing conditions.

3.5.2.2 *The IBM LAN Manager Program*

LAN Management is a term for a set of architected management facilities which can be implemented in Token-Ring Network stations. It is a set of functions which enable an operator to maintain and manage a Token-Ring LAN and consists of the following components:

- LAN Reporting Mechanism
- Ring Error Monitor
- Configuration Report Server
- Ring Parameter Server
- LAN Bridge Server.

Not all of these functions must be present on every LAN, and more than one function may be implemented in a single LAN station. These functions collect data from the network, analyze them, and then forward.

The IBM LAN Manager Program is a program product which provides LAN Manager functions for a ring. It monitors a single ring and provides the following types of functions to assist the user with maintenance and management of the network:

- Event logging for display or printing (ALERTS)
- Symbolic name assignment
- Request information about adapters on the ring (NAUN's for example)
- Remove adapters from the ring
- Perform ring tests
- Display adapters experiencing soft errors
- Test the data path between two adapters on the same ring or two different linked rings
- Display ring configuration (active adapters)
- Specify error logging options
- Establish and terminate reporting links to bridges.

Prerequisites for the LAN Manager program are:

- a PC/XT, AT or PS/2 Model 50, 60 or 80 with at least 640K memory and a fixed disk drive.
- PC DOS Version 3.3 or higher
- LAN Support Program or TOKREUI supplied with the adapter.

The LAN Manager program may be installed standalone or in a PC together with NETVIEW/PC - described below.

3.5.2.3 *NETVIEW/PC*

Netview/PC is an IBM network management program which extends existing network management capabilities beyond the traditional SNA environment, providing integrated management of SNA, non-SNA, voice and non-IBM parts of the information network. It provides a communication channel to NetView at the host site or Systems and Network Control Center (S/NCC) for flow of information from these other environments.

An application such as the IBM LAN Manager program can pass management information to Netview/PC (via an Application Program Interface - API) to be forwarded to NETVIEW. To do this the LAN Manager and Netview/PC are installed in the same PC. The LAN Manager program is one example of such an

application - others may be used which could potentially interface to a voice network (CBX) or multiplexing equipment, for example.

This kind of environment allows the forwarding of detailed information (such as Hardware Alerts) to the central site, where problem diagnosis can be undertaken.

To install and run Netview/PC you need at least:

- A PC/XT or AT with at least 640Kb of memory
- PC DOS Version 3.2 or later
- IBM LAN Manager Program.

For communication of alerts to a host computer running the NetView product, you will also need:

- An IBM Realtime Interface Co-Processor Card with 512Kb memory, and
- EIA RS-232C / CCITT V.24 interface board
- RS-232C Modem Attach cable, or
- RS422A Direct Attach cable.

3.5.2.4 IBM Token-Ring Network Trace and Performance Program

This program provides the following functions:

- A Trace Facility - this saves data from the ring and stores it in files on disk or diskette. You can specify a variety of parameters to select out only the information you are interested in - for example, particular source or destination adapters, or MAC frames only or combinations of such parameters.
- Trace Analysis Facility - you can analyze a trace from a variety of different perspectives in a summary format, and (if required) in byte-by-byte detail.
- Performance Facility - collects information on performance and writes it to disk. You can monitor a variety of frame types and/or ring addresses.
- Performance Analysis Facility - analyses the data captured above. You can find out distributions of frames according to lengths or frame type and express the ring traffic as a percentage of available capacity.

To run the Trace and Performance program, you need:

- A PC/XT 286 or PC/AT, or PS/2 Model 30, 50, 60 or 80
- At least 512Kb of PC memory
- PC DOS Version 3.2 or later
- The IBM Token-Ring Network Trace and Performance Adapter II for IBM PCs and PS/2 Model 30
- The IBM Token-Ring Network Trace and Performance Adapter /A for IBM PS/2 models 50, 60 and 80.

The special adapters have a security feature built in to them which tells the IBM LAN Manager program that an active tracing adapter is present on the ring. The LAN Manager can remove the trace adapter from the ring if desired for security reasons.

4.0 9370 Token-Ring Test Environment

4.1 The Test Environment

The International Technical Support Center in Raleigh, has installed a Multiple-Ring Token-Ring Network to support its Local Area Network testing. The 9370 processors were installed on the Backbone Ring 1 which contains all host attachments (not shown here - 3745, 372X, 3174-01L). This ring is linked to the devices ring (Ring 3) by a PC running the IBM Bridge Program V 1.1.

There is a PC running LAN Manager Program Version 1.0 which can support the multiple-ring environment, and this is in turn installed under NetView/PC so that alerts generated on the Token-Ring can be forwarded to NetView running on the 9370 Model 90. Here they can be displayed to the Focal Point Network Operator as a Generic Alert by the Hardware Monitor component of NetView Release 2.

Host products which were also installed were:

- RSCS to support the transmission of files between the 9370s
- SQL/DS to provide a sample distributed database and transactions to test the use of TSAF (Transparent Services Access Facility) over the Token Ring Network.

The PCs attached to the Devices Ring 3 were all running PC 3270 Emulation Program Version 3.2 to access VTAM on the 9370s.

The PC running the Token Ring Trace and Performance Program only traces frames which are flowing on the ring to which it is directly attached.

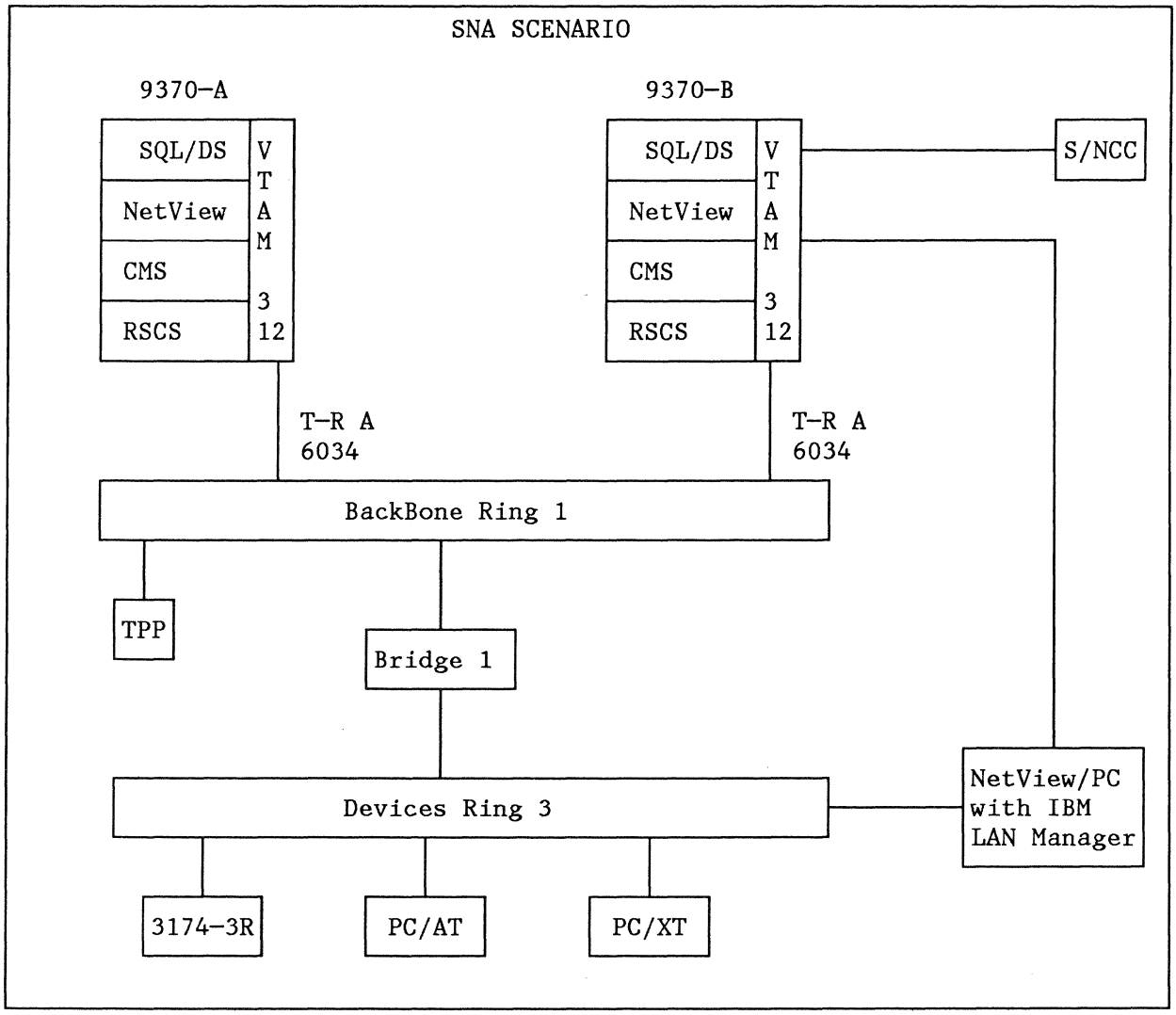

Figure 8. 9370 Token-Ring Installation residency. SNA Scenario

NOTE: TPP is the IBM Trace and Performance Program.

The environment was set up originally to use normal SNA connectivity between the 9370s. This meant that all the required Path Tables, Cross-Domain Resource definitions, Logmode tables and USS tables were already present because they were in use for the SDLC leased-line setup which was previously used for the cross-domain sessions and terminal support. Samples of some of these tables are given in "Appendix B. Sample VTAM Source Tables" on page 85.

The chapter on scenarios and operational considerations all assume that CDRM-CDRM sessions exist between the two hosts where these are relevant. A real trace of the CDRM-CDRM session setup flow is also given in "Token-Ring Frame Trace for CDRM-CDRM Session Establishment" on page 59.

5.0 9370 Token-Ring Test Scenarios

This chapter will provide the reader with guidance on how to define and customize the different components involved in the setting-up tasks for the 9370 Token-Ring subsystem in an SNA environment.

For a particular test, this chapter defines the test objective, provides a detailed configuration description of the test and a chart showing intersystem dependencies to consider. Operational considerations on each scenario are also provided.

5.1 Scenario 1. Workstation Session Establishment

The purpose of this scenario is to illustrate the way that 3270 stations (either 3174s or PCs running 3270 Emulation Program) on the ring can communicate to VTAM applications over a Token-Ring adapter on the 9370.

3270 Token-Ring stations are all handled as switched line terminals by VTAM in the 9370. Therefore, for session establishment between VTAM and the terminals, the switched line dial-in and dial-out functions are used. In this scenario, the dial function from the 3174 and PC 3270 Emulation to 9370 VTAM over a Token-Ring Network is described.

Dial-in requires that the appropriate Token-Ring Major Nodes are already active when the 3174-03R is IMLed or when the 3270 Emulator in the PC is initiated to connect to VTAM through the Token-Ring Adapter in the 9370.

Dial-out function will require that the downstream PU (either 3174 or PC with EM3270) be active.

5.1.1 Configuration

The detailed configuration of the Token-Ring Subsystem at the host and at the station is as follows:

- 9370 Model 90 with VTAM 3.1.2
- 3174-03R
- PC-AT running Emulation Program V3.

In "9370 Token-Ring Test Environment" on page 39, the test scenario involves more than one ring and a bridge, its presence is transparent to VTAM or station definitions.

The main points to consider in the configuration are the utilization of a single CETI group to communicate with the stations. The other CETI groups remain undefined to the operating system. Following is the detailed configuration:

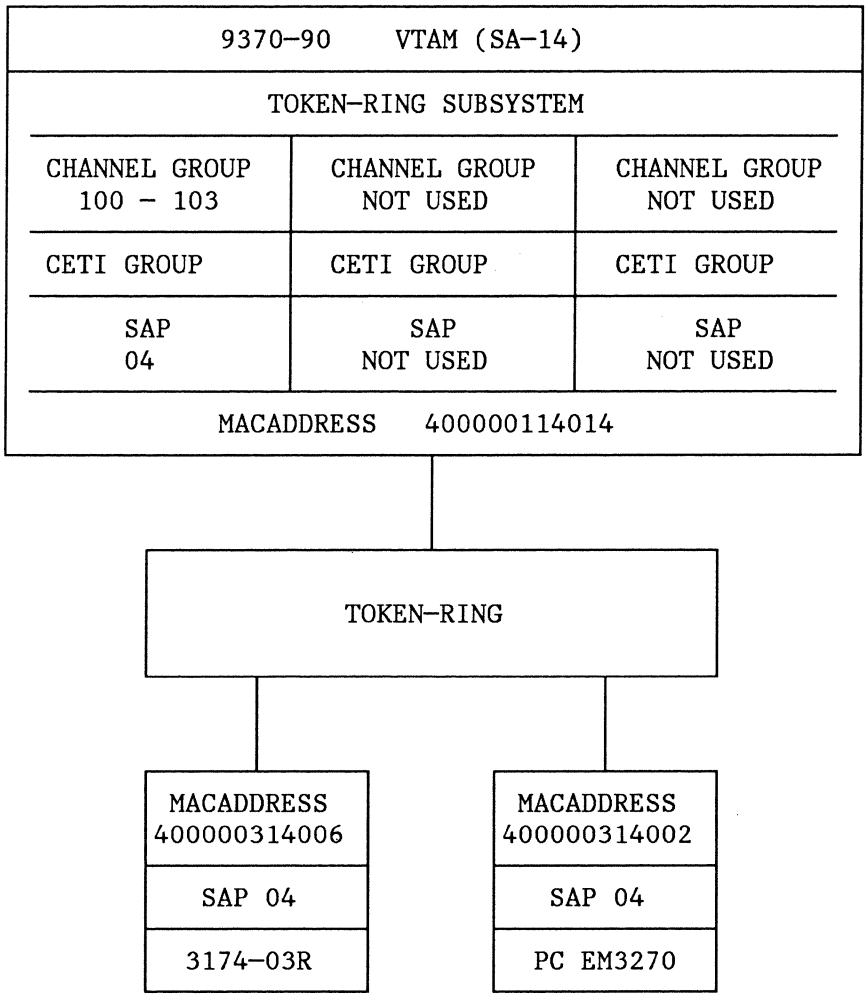

Figure 9. Scenario 1 Test Configuration

5.1.2 Definitions

VM will require the definition of the Token-Ring Communication subsystem. This definition will be included in the I/O devices definition of VM known as DMKRIO which (after an assembly and linkedit process) will constitute the I/O device operating module for VM. Following is the definition that was used during the performed test.

```
RDEVICE   ADDRESS=(100,4),DEVTYPE=3088

RCTLUNIT  ADDRESS=100,CUTYPE=3088,FEATURE=32-DEVICE

RCHANNEL  ADDRESS=1,CHTYPE=MULTIPLEXOR
```

VTAM will require the definition of two major nodes:

- *VBUILD TYPE=LAN* is used to define the Token-Ring Adapter on the 9370. For Scenario 1 the name of this Major Node is CD114LA1.
- *VBUILD TYPE=SWNET* is used to describe stations attached by the Token-Ring to VTAM (the Switched Major Node). For Scenario 1, the name of this Major Node is SD114SC1.

These two Major Nodes are coded as follows:

```
* ////////////////////////////////////////////////////////////////////
* /                                                                  /
* /                                                                  /
* /  ——   LAN MAJOR NODE FOR 9370-90 SUBAREA 14                      /
* /                                                                  /
* ////////////////////////////////////////////////////////////////////
*
*
         VBUILD TYPE=LAN
*
*
PORT1    PORT  CUADDR=100,                                          X
               LANCON=(5,2),          SAME AS IN SWNET PU'S       X
               MACADDR=400000114014,                              X
               MAXSTN=32,             LIMITED BY ADAPTER TO 64 MAX X
               SAPADDR=4              SNA SAP
*
*
GD114T10 GROUP DIAL=YES,              GROUP FOR SWITCHED PU'S     X
               ISTATUS=ACTIVE,                                    X
               LNCTL=SDLC
*
LN0001   LINE  CALL=INOUT
PU0001   PU    MAXLU=16
*
LN0002   LINE  CALL=INOUT
PU0002   PU    MAXLU=16
*
LN0003   LINE  CALL=INOUT
PU0003   PU    MAXLU=16
*
LN0004   LINE  CALL=INOUT
PU0004   PU    MAXLU=16
*
LN0005   LINE  CALL=INOUT
PU0005   PU    MAXLU=16
*
LN0006   LINE  CALL=INOUT
PU0006   PU    MAXLU=16
*
LN0007   LINE  CALL=INOUT
PU0007   PU    MAXLU=16
*
LN0008   LINE  CALL=INOUT
PU0008   PU    MAXLU=16
*
LN0009   LINE  CALL=INOUT
PU0009   PU    MAXLU=16
*
LN0010   LINE  CALL=INOUT
PU0010   PU    MAXLU=16
```

```
*************************************************************************
*         VTAM SWITCHED MAJOR NODE FOR TRLAN/9370                       *
*************************************************************************
E14SW    VBUILD TYPE=SWNET,             REQUIRED                        X
                MAXNO=12,               REQUIRED                        X
                MAXGRP=5
**
E14TRP2  PU     ADDR=13,                COULD BE ANYTHING (NOT USED)    X
                IDBLK=017,              PC 3274 EMULATOR                X
                IDNUM=E0002,            PC 3274 EMULATOR                X
                DISCNT=NO,                                              X
                IRETRY=NO,              NOT USED                        X
                ISTATUS=ACTIVE,                                         X
                LANACK=(0,0),                                           X
                LANCON=(5,2),                                           X
                LANINACT=4.8,                                           X
                LANRESP=(5,2),                                          X
                LANSDWDW=(7,1),                                         X
                LANSW=YES,                                              X
                MACADDR=00314002,                                       X
                MAXDATA=265,            MAMUMUM ALLOWED BY PC 3270 EMU  X
                MAXOUT=7,               NOT USED FOR 9370/LAN           X
                MAXPATH=4,                                              X
                PACING=0,                                               X
                PUTYPE=2,                                               X
                SAPADDR=4,              SNA SAP                         X
                SSCPFM=USSSCS,                                          X
                USSTAB=USSSNA,                                          X
                VPACING=0
**
E14D0201 PATH   DIALNO=0004400000314002,  NOT USED FOR 9370/LAN         X
                GRPNM=GD114T10,           GROUP MACRO LABELNAME         X
                GID=1,PID=1,                                            X
                USE=YES
**
E14P2L02 LU     LOCADDR=2                FOR THE PC EMULATOR
E14P2L03 LU     LOCADDR=3                FOR THE PC EMULATOR
E14P2L04 LU     LOCADDR=4                FOR THE PC EMULATOR
E14P2L05 LU     LOCADDR=5,               FOR THE PC EMULATOR            X
                LOGAPPL=ND114
**
E14TRP6  PU     ADDR=13,                COULD BE ANYTHING (NOT USED)    X
                IDBLK=017,              3174 03R                        X
                IDNUM=E0006,            3174 03R                        X
                DISCNT=NO,                                              X
                IRETRY=NO,              NOT USED                        X
                ISTATUS=ACTIVE,                                         X
                LANACK=(0,0),                                           X
                LANCON=(5,2),                                           X
                LANINACT=4.8,                                           X
                LANRESP=(5,2),                                          X
                LANSDWDW=(7,1),                                         X
                LANSW=YES,                                              X
                MACADDR=00314006,                                       X
                MAXDATA=2042,                                           X
                MAXOUT=7,               NOT USED FOR 9370/LAN           X
                MAXPATH=4,                                              X
                PACING=0,                                               X
                PUTYPE=2,                                               X
                SAPADDR=4,              SNA SAP                         X
                SSCPFM=USSSCS,                                          X
                USSTAB=USSSNA,                                          X
                VPACING=0
**
E14D0601 PATH   DIALNO=0004400000314006,  NOT USED FOR 9370/LAN         X
                GRPNM=GD114T10,                                         X
                GID=1,PID=1,                                            X
                USE=YES
**
E14P6L02 LU     LOCADDR=2                FOR THE 3174 SCREENS
E14P6L03 LU     LOCADDR=3                FOR THE 3174 SCREENS
E14P6L04 LU     LOCADDR=4,               FOR THE 3174 SCREENS           X
                LOGAPPL=ND114            FOR THE 3174 SCREENS
```

5.1.3 3174 Dependent Parameters

Some customization parameters in the 3174-03R must correlate to parameters in the VTAM definitions at host. Also VTAM definitions have to correlate to some VM DMKRIO definitions.

The following table shows what must be considered:

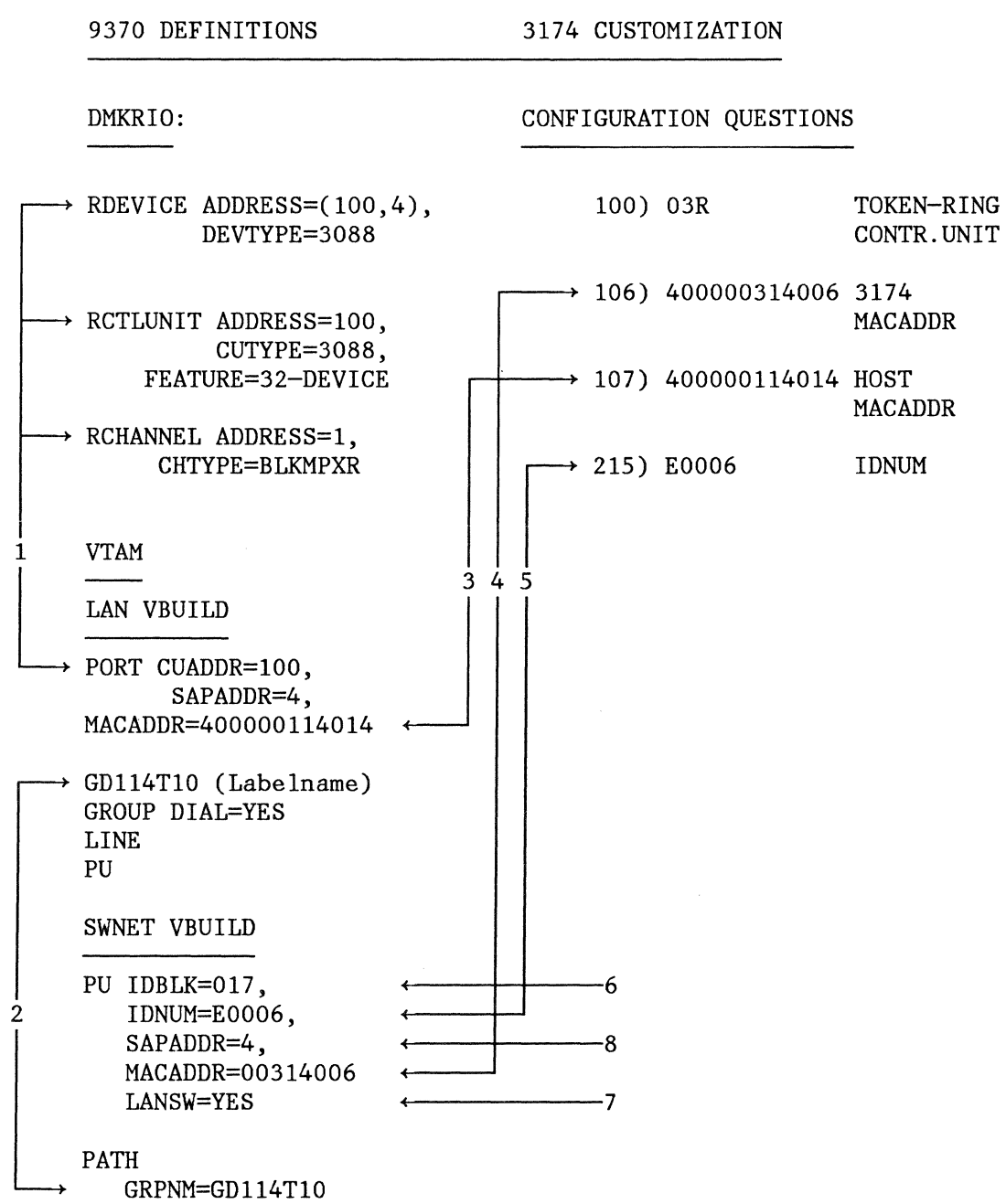

Figure 10. Scenario 1. 9370 with 3174 Dependent Parameters

The following descriptions refer to the numbered relationships in Figure 10 on page 45:

1. One CETI group of a Token-Ring adapter uses four consecutive Channel Addresses. These addresses are generated in DMKRIO of VM. The PORT CUADDR operand of the VBUILD TYPE = LAN Major Node refers to the first address of the RDEVICE macro of the DMKRIO.

2. The name in the GRPNM parameter of the PATH macro in the Switched Major Node refers to the label name of the GROUP macro with DIAL = YES in the LAN Major node. This is used to map the definitions of a Switched PU and associated LUs to the Line Group definitions in a particular LAN Major Node. This is used in Dial-out operations.

3. The Host MACADDR configured in Question 107 of the 3174 Customization must match the MACADDR on the PORT macro of the 9370 Token-Ring adapter. This is used during dial-in operations.

4. The 3174's own MACADDR must match with the MACADDR in the switched PU macro which describes the 3174-03R to VTAM. VTAM uses this address for dial-out procedures. VTAM definitions do not require the '4000' Prefix for the MACADDR. It will be added automatically by VTAM.

5. Question 215 in the 3174 Customization defines the IDNUM of the 3174. The IDNUM in the 3174 and the PU macro for the 3174 must be the same or the XID exchange fails.

6. IDBLK is hard-coded in the 3174-03R. It must be 017 in the PU macro of VTAM's Switched Major Node.

7. By specifying LANSW = YES or any LAN parameter in the TYPE = SWNET definition, VTAM creates a control block for this LAN PU, which is 16 bytes bigger than the normal switched LU control block.

8. 3174 always uses a SAP address of 4. It is hard-coded in the control unit.

5.1.4 3270 Emulation Program Dependent Parameters

When defining the system to communicate a 3270 Emulation Program to VTAM in a 9370 Host, several parameters have to correlate in both systems to be able to establish an SNA session. The following figure shows parameter dependencies for this environment.

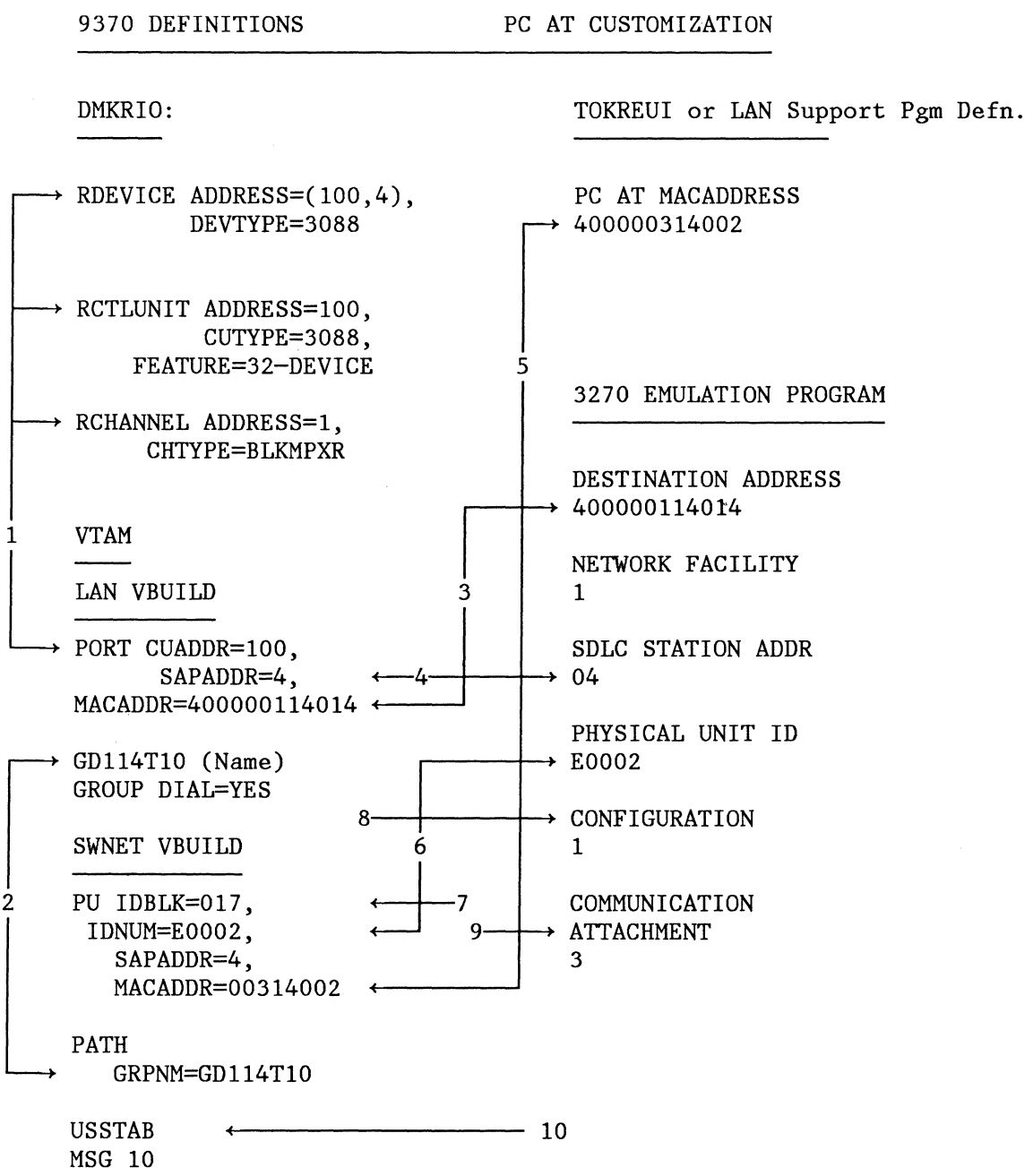

Figure 11. Scenario 1. 9370 with 3270 Emulation Program Dependent Parameters.

The following description refers to the numbered relationship in Figure 11 on page 47:

1. One CETI group of a Token-Ring adapter uses four consecutive Channel Addresses. These addresses are generated in DMKRIO of VM. The PORT CUADDR operand of the VBUILD TYPE = LAN Major Node refers to the first address of the RDEVICE macro of the DMKRIO.

2. The name in the GRPNM parameter of the PATH macro in the SWITCHED Major Node refers to the name of the GROUP macro with DIAL = YES in the LAN Major node. This is used to map the definitions of a Switched PU and associated LUs to the Line Group definitions in a particular LAN Major Node.

3. The DESTINATION ADDRESS in the 3270 Emulation Program must match with the MACADDR in the PORT macro of VTAM. The PORT macro describes the 9370 Token-Ring adapter address and this address should be known by the Token-Ring stations for Dial-in operations.

4. If a PC with a 3270 Emulation Program is trying to connect to the Token-Ring, then the SDLC STATION ADDR should actually be the SAPADDR in the Token-Ring adapter of the 9370. Here, you can in fact select which VTAM-allocated CETI group of the Token-Ring adapter in the 9370 should be used.

5. In the LAN Support program or with TOKREUI command, the PC's own locally administered MACADDR is defined. The MACADDR must match with the MACADDR of the PU macro, which describes the PC in the Switched Major Node to VTAM. This is required for dial-out operation. VTAM definitions do not require the '4000' Prefix. It will be added automatically by VTAM.

6. If a PC with an Emulation Program is connected to a Token-Ring then the PHYSICAL UNIT ID is actually the IDNUM and must match with the IDNUM in the PU macro of the Switched Major Node which describes the PC to VTAM. Otherwise the XID exchange will fail.

7. The IDBLK is hard-coded in the PC 3270 Emulation Program as 017. It must be the same value in the PU macro of VTAM's Switched Major Node.

8. Configuration Option 1 describes the station as a Standalone PU Station.

9. Communication Attachment Option 3 shows that the station will be connected to a Token-Ring network.

10. The USSTAB MSG10 as a VTAM Logo may not exceed 256 bytes; or, you will get an error.

5.1.5 Operation

To make this connection operative, the addresses assigned to the CETI group have to be activated. Once they are active, they have to be attached to the VTAM machine and the Major node definitions should be activated either by operator command or automatically by the execution of a NetView CLIST.

So, to activate the TYPE = LAN Major Node the following command should be issued.

v net,act,id = CD114LA1

A display shows the following:

```
  NCCF         N E T V I E W                ND114 WTCR11    02/23/88
   ND114    DISPLAY NET,ID=CD114LA1,SCOPE=ALL
   ND114    IST097I  DISPLAY  ACCEPTED
   ND114
IST075I  VTAM DISPLAY - NODE TYPE = LAN MAJ NODE
IST486I  NAME= CD114LA1, STATUS= ACTIV          , DESIRED STATE= ACTIV
IST956I  PORT SAP=  4 MAC=400000114014 MAXDATA= 2000 MAXSTN=   32
IST958I  INBND=  209 OUTBND=  190 PENDING=  1 ATTN=  203 CUA=100
IST654I  I/O TRACE = OFF, BUFFER TRACE = OFF
IST170I  LINES:
IST232I  LN0001  , ACTIV
IST232I  LN0002  , ACTIV
IST232I  LN0003  , ACTIV
IST232I  LN0004  , ACTIV
IST232I  LN0005  , ACTIV
IST232I  LN0006  , ACTIV
IST232I  LN0007  , ACTIV
IST232I  LN0008  , ACTIV
IST232I  LN0009  , ACTIV
IST232I  LN0010  , ACTIV
IST314I  END
```

Two new messages are shown in this display:

IST956I

This message is part of the output from a DISPLAY ID command for a LAN Major Node, LAN station, or SWNET station. It identifies a PORT or PU for which the values of **SAPADDR**, **MACADDR**, **n**, and **MAXSTN** will subsequently be listed.

SAPADDR is the Service Access Point address.

MACADDR is the twelve-digit hexadecimal Medium Access Control (MAC) address.

n is the maximum number of bytes of data per frame.

IST958I

This message is part of the output from a DISPLAY ID command for a LAN Major Node.

inbnd is the total number of inbound messages.

outbnd is the total number of outbound messages.

pending is the current number of pending output messages.

attn is the total number of attention interrupts counted.

cua is the channel unit address of the interrupt port.

To activate the switched line PUs and LUs, issue the following command:

v net act,id=sd114sc1

The display then shows the following:

```
  NCCF         N E T V I E W                ND114 WTCR11    02/23/88
   ND114    DISPLAY NET,ID=SD114SC1,SCOPE=ALL
   ND114    IST097I  DISPLAY  ACCEPTED
   ND114
IST075I  VTAM DISPLAY - NODE TYPE = SW SNA MAJ NODE
IST486I  NAME= SD114SC1, STATUS= ACTIV          , DESIRED STATE= ACTIV
IST084I  NETWORK NODES:
IST089I  E14TRP2  TYPE = PHYSICAL UNIT     , ACTIV
IST089I  E14P2L02 TYPE = LOGICAL UNIT      , ACTIV
IST089I  E14P2L03 TYPE = LOGICAL UNIT      , ACTIV
IST089I  E14P2L04 TYPE = LOGICAL UNIT      , CONCT
IST089I  E14P2L05 TYPE = LOGICAL UNIT      , CONCT
IST089I  E14TRP6  TYPE = PHYSICAL UNIT     , ACTIV
IST089I  E14P6L02 TYPE = LOGICAL UNIT      , ACTIV
IST089I  E14P6L03 TYPE = LOGICAL UNIT      , ACTIV
IST089I  E14P6L04 TYPE = LOGICAL UNIT      , ACTIV
IST089I  E14P6L05 TYPE = LOGICAL UNIT      , ACTIV
IST089I  E14P6L06 TYPE = LOGICAL UNIT      , ACTIV
IST089I  E14P6L07 TYPE = LOGICAL UNIT      , ACTIV
IST089I  E14P6L08 TYPE = LOGICAL UNIT      , ACTIV
IST089I  E14P6L09 TYPE = LOGICAL UNIT      , ACTIV
IST314I  END
```

Now the Token-Ring Adapter is activated, and VTAM is ready for an XID exchange with Token-Ring stations.

5.1.6 Connecting a Workstation to the Token-Ring

There are two ways to establish a connection between VTAM and a workstation on the Token-Ring.

1. VTAM and its appropriate Major Nodes (VBUILD TYPE=LAN and VBUILD TYPE=SWNET) are active and the workstation is not set up for connection. The connection will be established when the set up of the workstation for connection is completed. That can be either the completion of the 3174 IML or the activation of the EM3270 in the PC.

   At this point a **dial-in** procedure will be initiated automatically.

2. The workstation is ready to connect to VTAM but VTAM is not ready for a connection. This means that at least the VBUILD TYPE=SWNET is not active. The connection will be established when VTAM and its Major Nodes become active.

   At this point a **dial-out** procedure should be initiated.

To clarify the above information please review the following sections on dial-out and dial-in procedures.

5.1.6.1 Dial-in for the 3174-03R

Let's assume VTAM and the Major Nodes VBUILD TYPE=LAN and VBUILD TYPE=SWNET are active. After IML of the 3174, a sequence of frames and commands initiated by the 3174 will be interchanged between the host and the Token-Ring station; as a result of that, the Status Code **3174** will appear on the Status Display Panel. At this time the USS 10 Message will be shown on the terminals controlled by the 3174.

Logons to an application program can now be entered.

A Token-Ring frame trace obtained with a Token-Ring station running the Trace and Performance Program shows what has happened.

If you analyze the Token-Ring frame trace you have to consider that a frame always flows from the ORIGIN ADDRESS to the DESTINATION ADDRESS. (The trace includes the following information: Record number, Destination Address, Destination SAP Address, Source Address, Source SAP Address and a frame interpretation).

From the VTAM's definition for 9370 Token-Ring Adapter and the station's Switched Major Node, the reader can obtain the station's addresses. These are as follows:

Station address 00314006
9370 TR address 00114014

And the obtained trace during the session establishment is:

```
   DESTINATION    ORIGIN
   ADDRESS        ADDRESS

 0 400000114014 00 C00000314006 04  < TEST >
 1 400000314006 04 C00000114014 00  < TEST >
 2 400000114014 04 C00000314006 04  < XID >
 3 400000314006 04 C00000114014 04  < XID >
 4 400000114014 04 C00000314006 04  < XID >
 5 400000314006 04 C00000114014 04  < SABME >
 6 400000114014 04 C00000314006 04  < UA >
 7 400000314006 04 C00000114014 04  < RR >
 8 400000114014 04 C00000314006 04  < RR > 0
 9 400000314006 04 C00000114014 04  < I > 0 0 Req. SC  ACTPU
10 400000114014 04 C00000314006 04  < I > 0 1 Res. SC  ACTPU
11 400000314006 04 C00000114014 04  < RR > 1
12 400000314006 04 C00000114014 04  < I > 1 1 Req. SC  ACTLU
13 400000314006 04 C00000114014 04  < I > 2 1 Req. SC  ACTLU
14 400000314006 04 C00000114014 04  < I > 3 1 Req. SC  ACTLU
15 400000114014 04 C00000314006 04  < I > 1 4 Res. SC  ACTLU
16 400000114014 04 C00000314006 04  < I > 2 4 Req. FMD NOTIFY SSCP-  LU User data.
17 400000314006 04 C00000114014 04  < RR > 2
```

As you can see from the figure, after IML of the 3174-03R has been completed, the 3174-03R sends a TEST frame to its 9370 Host.

VTAM returns the TEST frame to the 3174-03R which will initiate an XID exchange. This means the 3174-03R sends a Null-XID to the 9370 which will respond with a Null-XID to request the Real-XID from the 3174-03R.

Then the 9370 sends a SABME (Set Asynchronous Balanced Mode Extended) frame to the 3174 to establish contact with the 3174 System which will be completed with a UA (Unnumbered Acknowledgment) frame.

Now VTAM starts to activate the PU and the LUs of the 9370 successfully.

5.1.6.2 Dial-out for the 3174-03R

When connected to the ring, the 3174 can display two particular status codes in the display located in the control unit: 505 and 583. 505 will be displayed if the control unit has been IMLed and it has not established contact with the host; 583 will be displayed if the control unit was in session to VTAM since its last IML when the connection was lost. Possibles causes of lost connection can be logical, like deactivation of the LAN VTAM Major Nodes, or physical, like communication failures.

A dial-out procedure is not really required if the controller unit is in 505 status. When 505 is displayed, the controller is active and keeps sending TEST commands over the ring permanently on a cyclic basis, so when eventually the VTAM definitions become active, the connection will be established by a dial-in procedure.

On the other hand, if the status of the display is 583, the activity of the controller trying to establish a connection on the ring has been stopped and a Dial-out procedure will be required.

This means that after activation of VTAM Major Nodes, VTAM must force a connection by initiating a dial-out procedure. This can be accomplished in two ways:

1. You have to code a LOGAPPL statement on a VTAM LU definition of the 3174-03R in the VBUILD TYPE = SWNET.

   For this purpose you can use a real LU or a 'dummy' one; the application defined in the LOGAPPL operand could be a real or a 'dummy' application.

   The advantage of coding a 'dummy' LU with a LOGAPPL statement is that you get an automatic restart of your 3174-03R when the Switched Major Node is inactivated and activated, and none of your real LUs is in session with an application. In our coding example, the LU with the name E14P6L04 has the LOGAPPL statement.

   Even if the 3174-03R has Status Code 505, you could get an immediate connection and don't have to wait for the 3174 to start another connection cycle that could represent an average connection delay of two minutes.

2. If for any reason a LOGAPPL statement is not coded and you want VTAM to initiate a dial-out procedure, you can use the following operator command:

   V NET,ACT,ID = E14P6L04,LOGON = ND114,LOGMODE = XXXXXXX

   By doing this, the 3174-03R session to VTAM will be completed. At this point, the LU identified by the ID in the previous command, will display application's Good-Morning message meanwhile the other terminals will display the VTAM logo (USSMSG10).

The Token-Ring Frame Trace is very similar to that of dial-in examples with the following exceptions:

- The first TEST frame is initiated by VTAM and sent to the 3274-03R, which responds.
- Only VTAM sends a Null-XID to request a Real-XID from the 3174-03R.

5.1.6.3 Dial-in for the PC/AT with 3270 Emulation Program

VTAM and the Major Nodes VBUILD TYPE = LAN and VBUILD TYPE = SWNET are active. The adapter has already been initialized either by LAN Support program or by the TOKREUI command and 3270 Emulation Program parameters have been defined as already described in this documentation.

Bring up the Emulation Program until you get the 3270 TASK SELECTION SCREEN.

Select Option **A** (Communicate) to initiate a connection to the Token-Ring.

If connection to the Token-Ring has been completed, the USSMSG10 message will be shown on the screen of the PC/AT. At this point, a logon to an application program can be entered.

The Token-Ring frame trace is quite similar to that of a 3174-03R dial-in.

5.1.6.4 Dial-out for the PC/AT with 3270 Emulation Program

The PC/AT is connected to the Token-Ring and ready to contact to VTAM, but VTAM is not ready for connection.

To confirm this status, you see the 3270 Emulation Program message "14 Communication Check 510" on the PC screen.

After activation of VTAM and the Major Nodes, VTAM must be forced to initiate a dial-out procedure. This can be accomplished in two ways:

1. You have to code a LOGAPPL statement on a real or 'dummy' LU in the LU definitions of the PC/AT in the VBUILD TYPE = SWNET Major Node. The application in the LOGAPPL statement need not be a real one. (You can also code LOGAPPL = XXX and it will work.)

   The advantage of coding a 'dummy' LU with a LOGAPPL statement is that you get an automatic restart of your PC/AT when the Switched Major Node is inactivated and activated. In our coding example, the LU with the name E14P2L05 has the LOGAPPL statement.

2. If for any reason a LOGAPPL statement is not coded and you want VTAM to initiate a dial-out procedure you can use the following operator command:

   V NET,ACT,ID = E14P2L05,LOGON = ND114,LOGMODE = XXXXXXX

   This connects the PC/AT to VTAM and the USSMSG10 message will appear on all the screens except on the one to which the logon command was issued. (An application's good morning message will be displayed on this screen.)

The Token-Ring frame trace is very similar to that of the dial-in example for the 3174-03R with the following exceptions:

The first TEST frame is initiated by VTAM and sent to the PC/AT, which responds. Only VTAM sends a Null-XID to request a Real-XID from the PC/AT.

5.2 *Scenario 2. 9370 Cross-Domain Session Establishment*

This scenario describes a Host-Host connection of two 9370 Systems over a Token-Ring.

The 9370 on the Token-Ring supports the full function of an intermediate network node (INN) with other 9370 in a Host-Host connection.

This means that CDRM-CDRM session will be established between two 9370 Systems using the Token-Ring Network.

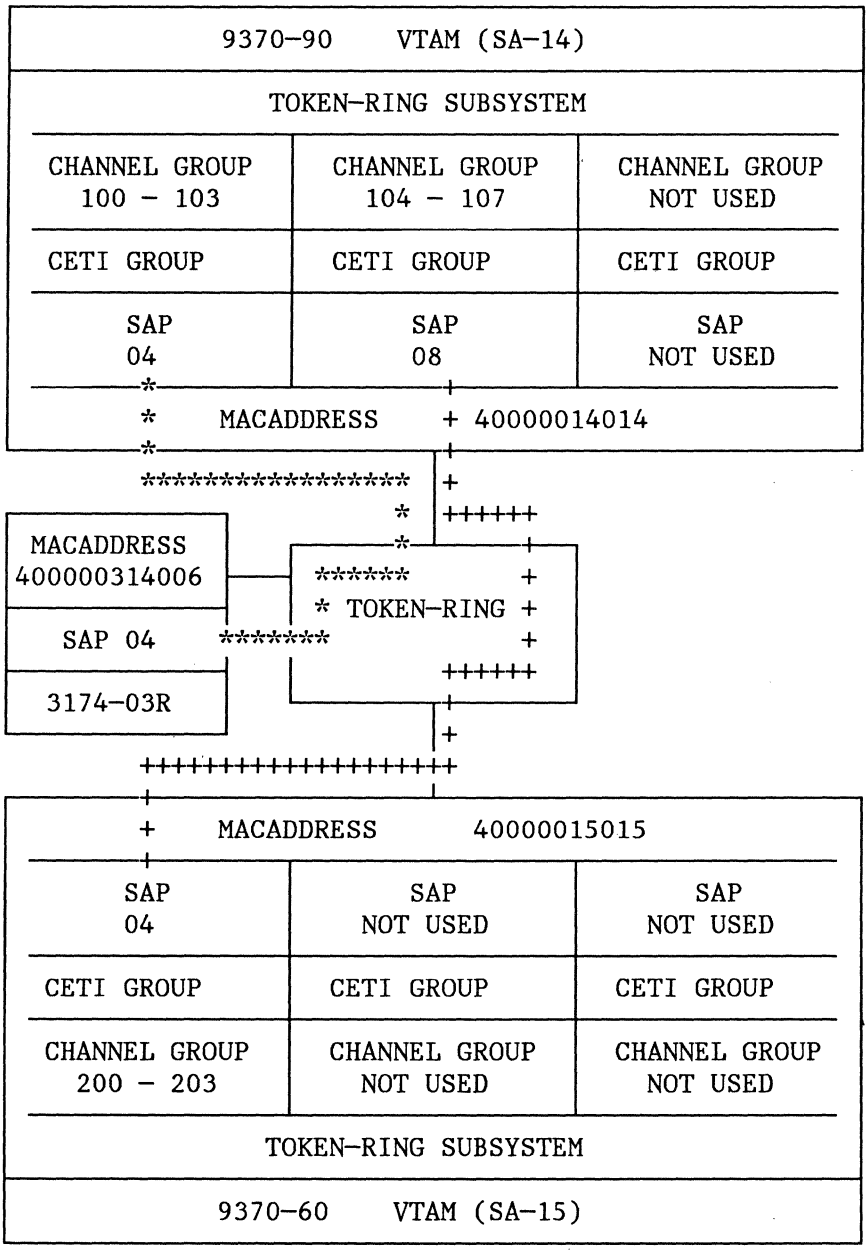

Figure 12. Scenario 2 Test Configuration

5.2.1 Configuration

The configuration is as follows:

- 9370 Model 90 with VTAM 3.1.2
- 9370 Model 60 with VTAM 3.1.2

The scenario configuration figure shows that on the 9370-90 (SA-14) a CETI group with SAP 04 and Channel Addresses 100-103 still supports the configuration from Scenario 1, where a 3174-03R and a PC/AT with Emulation Program were connected to the Token-Ring, but now there is another CETI group in communication with another 9370 over the same Token-Ring adapter. Due to a lack of diagram space, the PC/AT is no longer shown.

Use of a different SAP address for the Host to Host connection

As previously mentioned, a 9370 Token-Ring Adapter supports three CETI groups. These three CETI groups can either be used by VTAM with three VBUILD TYPE = LAN Major Nodes, by non-SNA applications like TSAF, TCPIP, or by a combination of these.

In our test scenario the 9370-90 (SA-14) uses a CETI group with SAP 08 and CUADDR of 104 to establish a Host-Host connection to the 9370-60 (SA-15)

The 9370-60 (SA-15) uses a CETI group with SAP 04 and CUADDR of 200 for this connection. In spite of VTAM's capability to use three CETI groups, there is no technical need to do so.

You can run all your VTAM connections to all stations which can be connected to the Token-Ring over one CETI group and make all the definitions in one VBUILD TYPE = LAN Major Node.

In our case, we had two reasons to use a different SAP address in the 9370-90:

1. To give an example of how to use a different SAP address and how to code it.
2. To prevent any interruption to the working configuration of Scenario 1. Because a different SAP address in the 9370 Token-Ring Adapter requires a different TYPE = LAN Major Node, this gives you the ability to activate and deactivate TYPE = LAN Major Nodes without interrupting the traffic running over SAP 04 because this TYPE = LAN Major Node remains active.

   This could be interesting if you want to expand your Token-Ring environment while protecting your already-running environment from any interruption during the operability tests of the new part of the network.

   If the new environment runs satisfactorily, then you can put these definitions in the VBUILD TYPE = LAN Major Node of your production system and release the CETI group.

5.2.2 Definitions

As previously mentioned, to communicate with another 9370 SNA Host in the ring, it must be defined in *VBUID TYPE = LAN* with a

- GROUP Macro that defines a line group for 9370/LANs attached to the Token-Ring
- LINE Macro for each peer 9370/LAN connected to the Token-Ring
- PU Macro for each 9370 with which VTAM will communicate over the Token-Ring.

To define the HOST-HOST connection, *VBUILD TYPE = LAN* must be coded on each Host.

For the 9370-90, it is CD114LA2 supporting user sessions and CDRM-CDRM sessions.

For the 9370-60, it is CD115LA1 supporting only user sessions.

These two Major Nodes are coded as follows.

```
* ////////////////////////////////////////////////////////////////////
* /  ——    LAN MAJOR NODE FOR 9370-90 SUBAREA 14                    /
* ////////////////////////////////////////////////////////////////////
*
         VBUILD TYPE=LAN
*
PORTA    PORT  CUADDR=104,                                          X
               LANCON=(5,2),          SAME AS IN SWNET PU'S       X
               MACADDR=400000114014,                              X
               MAXSTN=32,             LIMITED BY ADAPTER          X
               SAPADDR=8              TEST SAP
GD114T0A GROUP DIAL=NO,               GROUP FOR PU TYPE 5         X
               ISTATUS=ACTIVE,                                    X
               LANACK=(0,0),                                      X
               LANCON=(5,2),                                      X
               LANINACT=3,                                        X
               LANRESP=(5,2),                                     X
               LANSDWDW=(7,1),                                    X
               LNCTL=SDLC,                                        X
               PUTYPE=5
*
LD114T01 LINE  ISTATUS=ACTIVE,        LINE ON TOKEN RING          X
               PUTYPE=5
*              STATOPT='LAN  TO SA15 '
CD114H15 PU    MACADDR=400000115015,  RING NO.1 SA15 PU15 9370-60 X
               PUTYPE=5,                                          X
               SAPADDR=4,             SNA SAP                     X
               ISTATUS=ACTIVE
*              STATOPT='PU FOR SA15'
*
GD114T10 GROUP DIAL=YES,              GROUP FOR SWITCHED PU'S     X
               ISTATUS=ACTIVE,                                    X
               LNCTL=SDLC
*
LN0001   LINE  CALL=INOUT
PU0001   PU    MAXLU=16


* ////////////////////////////////////////////////////////////////////
* /  ——    LAN MAJOR NODE FOR 9370-60 SUBAREA 15                    /
* ////////////////////////////////////////////////////////////////////
*
         VBUILD TYPE=LAN
*
PORT1    PORT  CUADDR=200,                                          X
               LANCON=(5,2),          SAME AS IN SWNET PU'S       X
               MACADDR=400000115015,                              X
               MAXSTN=32,             LIMITED BY ADAPTER to 64    X
               MAXDATA=2000,          DEFAULT VALUE               X
               SAPADDR=4              SNA SAP
*
GD115T01 GROUP DIAL=NO,               GROUP FOR PU TYPE 5         X
               ISTATUS=ACTIVE,                                    X
               LANACK=(0,0),                                      X
               LANCON=(5,2),                                      X
               LANINACT=4.8,                                      X
               LANRESP=(5,2),                                     X
               LANSDWDW=(7,1),                                    X
               LNCTL=SDLC,                                        X
               PUTYPE=5
*
LD115T01 LINE  ISTATUS=ACTIVE,        LINE ON TOKEN RING          X
               PUTYPE=5
*              STATOPT='LAN  TO SA14 '
CD115H15 PU    MACADDR=400000114014,  RING NO.1 SA14 PU14 9370-90 X
               PUTYPE=5,                                          X
               SAPADDR=8,             TEST SAP                    X
               ISTATUS=ACTIVE
*              STATOPT='LAN PU SA14'
```

5.2.3 Dependent Parameters

Some parameters in the VBUILD TYPE = LAN Major Nodes of both 9370s must correlate to each other, and some parameters of the VBUILD TYPE = LAN Major Node must also correlate with the VM definitions in DMKRIO.

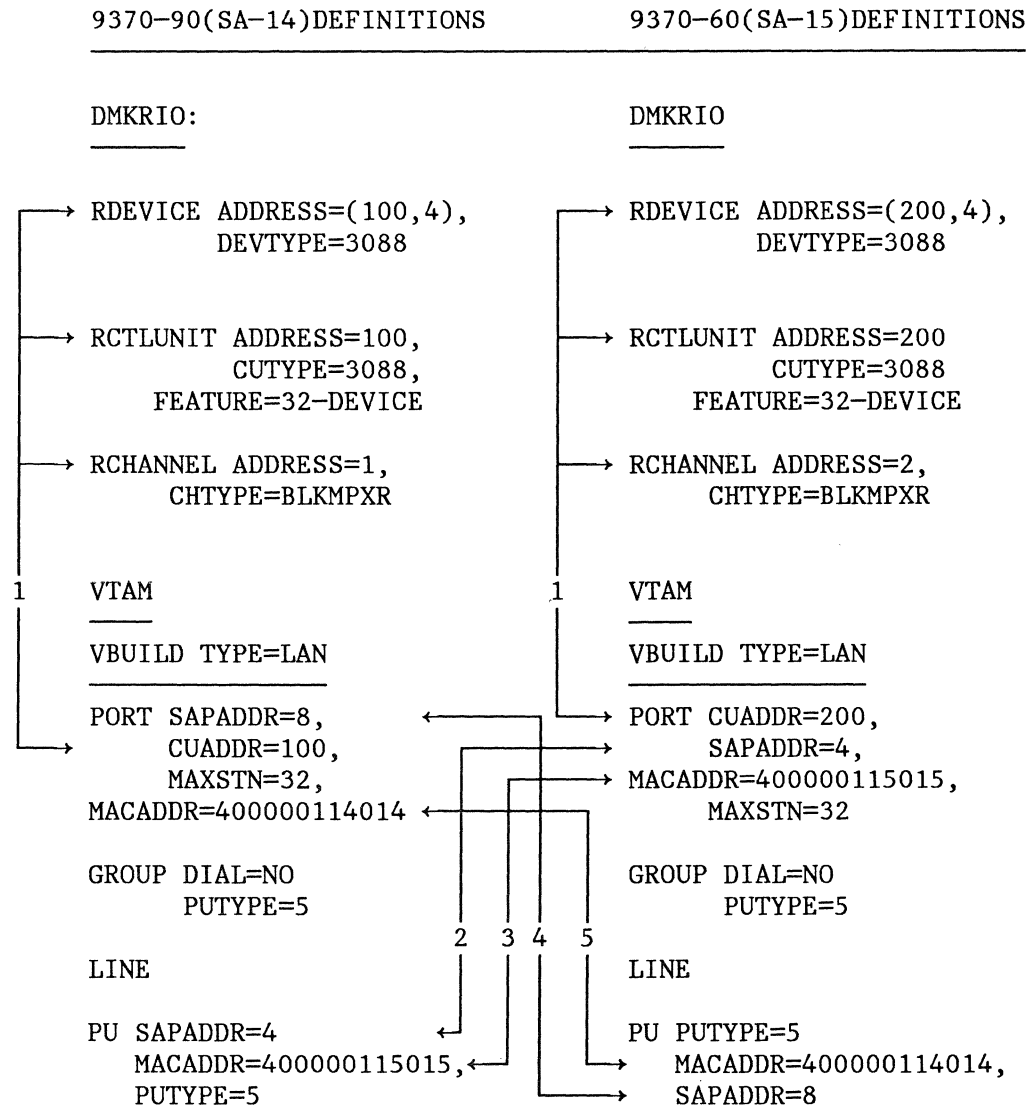

Figure 13. Scenario 2. 9370 Host-to-Host Connection

The following descriptions refer to the numbered relationships in Figure 13.

1. One CETI group of a Token-Ring adapter uses four consecutive Channel Addresses. These addresses are generated in DMKRIO of VM. The PORT CUADDR operand of the VBUILD TYPE = LAN Major Node refers to the first address of the RDEVICE macro of DMKRIO.

2. The SAPADDR operand of the PU macro in the 9370-90 must match with the SAPADDR operand of the PORT macro of the 9370-60. The SAPADDR of the PU macro describes which SAPADDR of the Host Partner has to be used.

3. The MACADDR operand of the PU macro in the 9370-90 points to the MACADDR in the PORT macro of the Host Partner and must correlate.

4. Because the two 9370 are equal partners in a Host-Host connection all these parameter dependencies also work in the opposite direction. This means the description for point 2 is also valid for point 4.

5. Same as point 3, but for the other 9370.

5.2.4 Operation

To make the Host-Host connection operative, the adapter addresses have to be activated and attached to VTAM, and the VTAM definitions have to become active. So, to activate the TYPE = LAN Major Node the following command should be issued.

v net,act,id = CD114A2

A display shows the following:

```
  NCCF         N E T V I E W                ND114 WTCR11    02/23/88

IST075I  VTAM DISPLAY - NODE TYPE = LAN MAJ NODE
IST486I  NAME= CD114LA2, STATUS= ACTIV          , DESIRED STATE= ACTIV
IST956I  PORT SAP=  8 MAC=400000114014 MAXDATA= 2000 MAXSTN=   32
IST958I  INBND=  601 OUTBND=  628 PENDING=  0 ATTN=  537 CUA=104
IST654I  I/O TRACE = OFF, BUFFER TRACE = OFF
IST170I  LINES:
IST232I  LD114T01, ACTIV----E
IST314I  END
```

Message IST232I shows that the INN link between the two 9370s, is activated.

A display of the Cross Domain Resource Manager shows that they are active.

```
  NCCF         N E T V I E W                ND114 WTCR11    02/23/88

   ND114    DISPLAY NET,CDRMS,SCOPE=ALL
   ND114    IST097I  DISPLAY  ACCEPTED
   ND114
IST350I  VTAM DISPLAY - DOMAIN TYPE = CDRMS
IST089I  MD114M01 TYPE = CDRM SEGMENT     , ACTIV
IST482I  MC314    ACTIV, SA         14, EL     1  NETID = NETD
IST482I  MC315    ACTIV, SA         15, EL     1  NETID = NETD
IST314I  END
```

5.2.4.1 Token-Ring Frame Trace for CDRM-CDRM Session Establishment

A Token-Ring frame trace obtained from a Token-Ring station running the Trace and Performance Program shows how a CDRM-CDRM session is established.

If you analyze the Token-Ring frame trace, you have to consider that a frame always flows from the ORIGIN ADDRESS to the DESTINATION ADDRESS. (The trace includes the following information: Record Number, Destination Address, Destination SAP Address, Source Address, Source SAP Address and an frame interpretation).

Following are the Token-Ring addresses of the 9370s on the ring. These values were specified in the MACADDR operand at PORT macro in the LAN Major Node.

```
9370-90 (SA = 14)  00114014
9370-60 (SA = 15)  00115015
```

The trace obtained during the session establishment is the following:

```
                DESTINATION      ORIGIN
                ADDRESS          ADDRESS

 0 400000114014 RS 400000114014 RS  < Duplicate Address Test >
 1 400000114014 RS 400000114014 RS  < Duplicate Address Test >
 2 400000115015 00 C00000114014 00  < TEST >
 3 400000114014 00 C00000115015 00  < TEST >
 4 400000115015 04 C00000114014 04  < XID >
 5 400000114014 04 C00000115015 04  < XID >
 6 400000115015 04 C00000114014 04  < XID >
 7 400000114014 04 C00000115015 04  < SABME >
 8 400000115015 04 C00000114014 04  < UA >
 9 400000115015 04 C00000114014 04  < I > 0 0  User Data
10 400000114014 04 C00000115015 04  < RR > 0
11 400000114014 04 C00000115015 04  < RR > 1
12 400000115015 04 C00000114014 04  < RR > 0
13 400000114014 04 C00000115015 04  < I > 0 1  User Data
14 400000115015 04 C00000114014 04  < RR > 1
15 400000115015 04 C00000114014 04  < I > 1 1  User Data
16 400000114014 04 C00000115015 04  < I > 1 1  User Data
17 400000114014 04 C00000115015 04  < RR > 2
18 400000115015 04 C00000114014 04  < RR > 2
19 400000114014 04 C00000115015 04  < I > 2 2  User Data
```

Before this trace was started, VTAM and its Major Nodes for a Host-Host connection were active on the 9370-60 (SA-15). Therefore station initialization procedures for VTAM Subarea 15 were not traced. A complete Host-Host initialization sequence for a stations can be find in "Appendix A. Activation Flow Sequences" on page 81.

As part of the ring insertion procedures, the station has to send a Duplicate Address Test command to verify that there is no other station on the ring with the same address. 9370 Token-Ring Subsystem's insertion on the ring will be the result of an activation on the TYPE = LAN VTAM Major Node definition; but only if the 9370 Token-Ring Adapter is not already opened.

If there is no duplicate address on the ring, the sequence will continue with a TEST frame from the 9370-90 to the 9370-60. The 9370-60 responds to the 9370-90 also with a TEST frame.

An XID exchange will happen between both subareas and, if successful, the 9370-60 will send a SABME frame to establish the contact with the 9370-90 which in turn will acknowledge it with a UA frame.

Now, a sequence of information frames flows between both Hosts containing the traditional SNA commands to establish a Cross-Domain Session Manager's session.

Explicit Route activation

Virtual Route activation

CDRM activation.

And as a result of that, the Cross-Domain Resource Managers on each processor are in session with each other and able to handle all the Cross-Domain requests.

6.0 Operational Considerations

This chapter describes some of the operational considerations which need to be made when planning and installing a Token-Ring network attached to 9370 processors. Some of these are particularly important where there is more than one 9370 in the planned environment, as in the test environment used for the scenarios in "9370 Token-Ring Test Scenarios" on page 41. Others may be important when, for example, you plan to share the use of the adapter between up to three applications, or use more than one CETI Group for an application.

6.1 Multiple CPU Environment

There are several points which need to be considered when more than one CPU is planned for direct attachment to the Token-Ring Network, these will mostly be concerned with:

1. The degree of back-up required for end-users in the event of a CPU failure or adapter failure.
2. The amount of Cross-Domain traffic expected - that is, traffic caused by users who need access to applications on more than one CPU.
3. Simplification of the administration of a multi-CPU environment.
4. Reduction of the impact of a CPU failure on the end-user population as a whole.

6.1.1 Cross-Domain Sessions between 9370 and LAN Stations

It is important to remember that the support for Cross-Domain sessions in the 9370 Token-Ring Environment is different from the situation where you have a 37XX Communications Controller with Token-Ring Interface Couplers (TICs) and NCP Token-Ring Interface (NTRI). In the 9370/LAN-attached environment, a ring-station wishing to establish a Cross-Domain session with an application in another 9370 in the Ring will always send the Token-Ring frames back to its owner host regardless the final destination of the SNA PIU. This is because the only way to address stations in the ring is via MAC ADDRESSES, and these can't be dynamically modified. The CDRM in the station's owner VTAM will forward the PIU as a new frame on the ring to the CDRM in the other 9370, and then to the application. The opposite data flow will be done for the response.

We can conclude from the previous paragraph that if VTAM is terminated on the 9370, which is not the final destination of the cross-domain session (it doesn't contain the application which is in session with the terminal), then the session is lost. (This can be avoided in the 37XX environment, where sessions can continue via the NCP when the owning VTAM has terminated.)

6.1.2 Back-up and Recovery

The Token-Ring Architecture is extremely rich with functions for recovery of error situations which occur on the Ring itself; many errors can be expected to be recovered automatically without intervention. The Ring topology, when implemented with a structured cabling system, enables rapid resolution of problems when user intervention is required, and also allows a very flexible approach to the design of high-availability environments using back-up rings and bridging techniques.

Where there are multiple CPUs attached to the network there are a number of different scenarios offering different degrees of resilience in the event of a failure, or a different impact level on the user population.

Consider the following simplified environment:

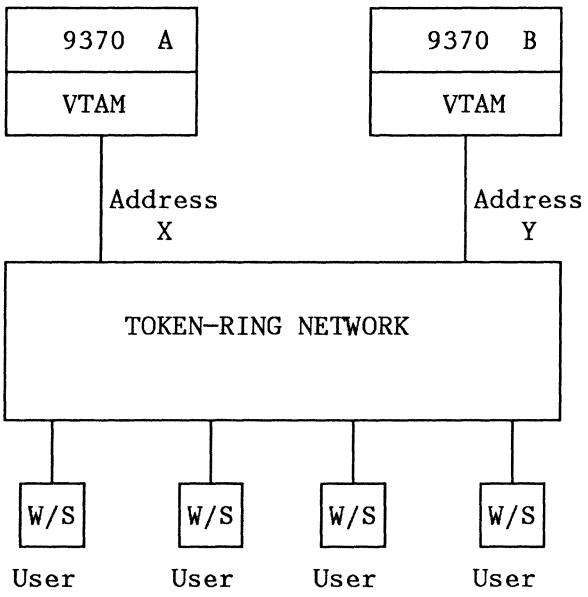

Figure 14. Multiple CPU Environment

Several possibilities for the users to access applications at host could be described, for example:

1. Each user only requires access to one machine, (say for an office system such as PROFS). Users would be able to transmit files and documents Cross-Domain to the other system.
2. Users may need to be able to log on to an application on either machine at any time.
3. One machine acts as a full back-up for the other. In the event of a failure on one CPU, a user should be able to continue to do work on the other machine.

6.1.3 Ownership Considerations

Ownership of network resources by a 9370/VTAM can be established in different ways according to the requirements of the end-user and the degree of back-up required between 9370s. Network Ownership here means that the VTAM which initially controls the network resource and is the destination address is the owner.

6.1.3.1 Ownership on both 9370's - No Cross-Domain Traffic

In the first situation mentioned above, it would be reasonable to treat the users as two separate groups, administered and controlled separately from each 9370. This means having a LAN Major Node and a Switched Major Node coded in each VTAM for the different logical parts of the network. If a 9370 is disrupted for some reason, only its users lose their sessions. The disadvantage of this approach is that control and management of the network is not centralized and there are different sets of definitions on each 9370.

The advantage of this approach is that if there is a disruption in the operation of one host, then only half of the user population is affected. The impact of a failure is reduced below that of the approach where all the network definitions are maintained on one 9370 in its VTAM major nodes.

6.1.3.2 Ownership on a single 9370

This means that one machine acts as the owner for all resources on the network (apart from other 9370s). Initial contact from ring-stations is made with this VTAM even if they require sessions with applications in another 9370. This considerably reduces the complexity of managing the network by concentrating the operator and directory functions on one machine but if that machine is disrupted, all sessions are lost with both 9370s. However, the incidence of failure might be so low as to be outweighed by the manageability benefits of the CMC (Communications Management Configuration) approach.

There are also some considerations which might further reduce the impact of a failure on the network when network ownership is on one 9370.

From the point of view of the network station, the main problem is how to establish a session with the other 9370 in the event that the owning 9370 fails in some way. This can be done in three different ways:

1. Reload the PCs with a duplicate copy of the 3270 Emulation Program, specifying the second 9370 as the destination address. For 3174s attached to the ring, this is less practical since it means re-customizing or an IML from a standby control diskette which may take some minutes. For PCs this step can be automated and made relatively transparent to the end-user. The remaining 9370 will need the necessary Switched Major Node definitions.

2. Deactivate the LAN major node in the second 9370. Since all sessions have already been lost due to failure of the network-owning 9370, this will not cause problems. The 9370 can then be brought back onto the ring by activating a second set of LAN Major Node definitions containing the address of the owning-9370 as the Locally Administered Address of the adapter. An identical Switched Major Node definition would also be required in the second 9370. No action is required at the network stations.

3. Activate a second adapter (if one exists) on the remaining 9370 (see Figure 15 on page 64) using a VTAM LAN Major Node which gives it the same Locally Administered Address as the failed 9370 had. The appropriate Switched Major Node Definition would also be required. There would be no action required on behalf of the end-user.

6.1.3.3 Ownership on both 9370s - Cross-Domain Traffic

The third case above is particularly relevant in the scenario where each 9370 normally owns part of the network of ring-stations and any ring-station may require to log-on cross-domain to the other 9370. Each 9370 can then act as back-up for the other in the event of one failing by having two adapters on each machine connected to the LAN.

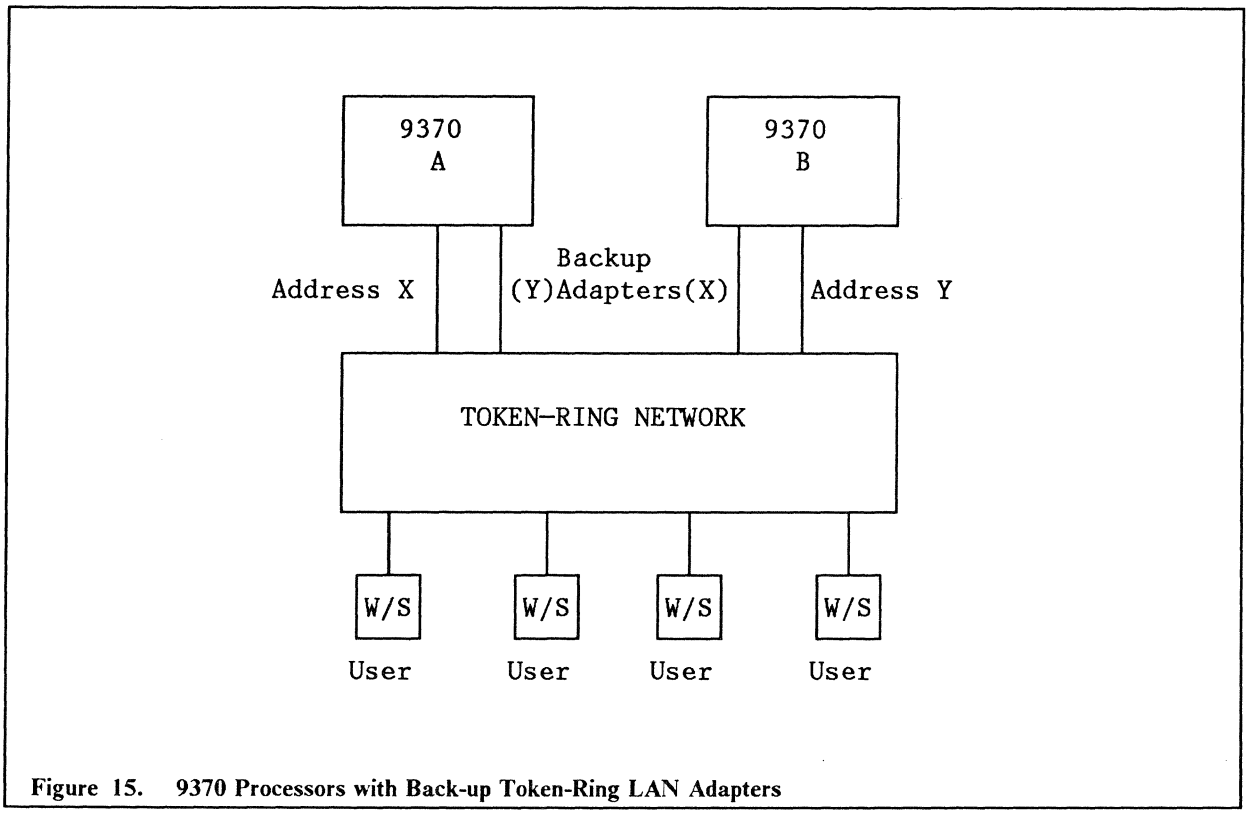

Figure 15. 9370 Processors with Back-up Token-Ring LAN Adapters

In the above situation, because you are not having to deactivate the LAN Major Node on the back-up machine to assume ownership with a new LAN Major Node (by re-initializing the adapter with a different address), any sessions already owned by the "back-up" 9370 remain undisturbed, and the users whose sessions to the failing 9370 were lost need take no action to access the back-up.

The 9370 Network operator may need to take some action to initiate a connection from the host to the workstations.

Clearly an important consideration is an orderly shutdown and reset when the failing host is returned to normal operation. You could not bring it back on to the ring with the back-up already using its MAC Address because at ring insertion procedure, it will fail with the Duplicate Address Test.

6.1.3.4 Re-Establishing Sessions for the Workstations

There are some important points to note about the way in which a workstation on the ring can re-establish its session with a 9370 after some form of failure and recovery at the host. Essentially there are two methods because of the VTAM switched support we are using here. These are:

- Host-initiated (or Dial-Out)
- Workstation-initiated (Dial-In)

There are some instances where it may be necessary for the host to initiate the connection to the workstation. One example of this is where the Switched Major Node is inactivated and later reactivated. Unless specific action is taken, either in coding the definitions for the Switched PUs and LUs, or by operator command, the ring-attached workstations will remain in a "connectable" state. For PCs you will see a "Communications Check 510" message on the screen with PC3270 Emulation, and for a 3174-03R you will see a Status Code of 583 on the display register.

If your workstation is a PC, you can reload the emulation software by pressing F2 (Exit 3270 Emulation) and then taking Option A (Communicate) off the main menu.

If you are attached to a 3174-03R, however, the equivalent action is to re-IML, which is not practical. You will then have to use one of the following methods to initiate the connection from the host.

Use of VARY NET,ACT with LOGON command

It is possible to cause the Host to call the ring-attached workstation and initiate the connection. The VTAM operator command, *VARY NET,ACT,ID=luname,LOGON=applid,LOGMODE=mode* will do this. Note that you can issue this command to a dummy LU coded on the appropriate PU statement.

In our scenario we had at least three LUs coded on each PU statement. For PCs this is sometimes a useful thing to do for planning purposes if the PC is to be capable of multiple host sessions at some time. For 3174s you can also have dummy LUs. The real LU for the screen session will then come into session with VTAM and receive the normal USSMSG10 (or "Good Morning") message. If you have many LUs to activate in this way and you have NetView installed, you might code a CLIST to automate this function. The screens attached to a 3174-03R will also get the VTAM USSMSG10 message unless you use the command to log a real terminal onto a specified application, when that terminal will get the application logo and all others will get USSMSG10.

Use of LOGAPPL Operand on (switched) LU Statement

The VARY ACT method is useful where specific operator intervention is required for a terminal. It would normally be preferable if the terminals on the LAN received the USSMSG10 message automatically when the Switched Major Node is reactivated. This is achieved by coding a LOGAPPL operand on an LU statement for a given PU. This will usually be a "dummy" LU and as a result of VTAM processing this operand, the other LUs on the PU will get USSMSG10 presented automatically.

6.2 Use of Multiple CETI Groups

In many installations the usual case will be to use only one CETI group which will be dedicated to VTAM's use of the adapter with a default SAP of X'04' being used. The PORT statement in the LAN Major Node will relate this to a CETI group of four channel addresses.

However, it can be seen from the chapter describing the tested scenarios ("9370 Token-Ring Test Scenarios" on page 41) that it is possible to implement some alternatives which may be desirable for operational reasons. These are:

1. Use of more than one CETI Group (SAP) by the same VTAM in a 9370
2. Use of more than one CETI Group (SAP) by different applications in the same 9370
3. Not tested here - the use of more than one adapter by the same VTAM either on the same ring or different ones.

The diagram following shows some of the combinations:

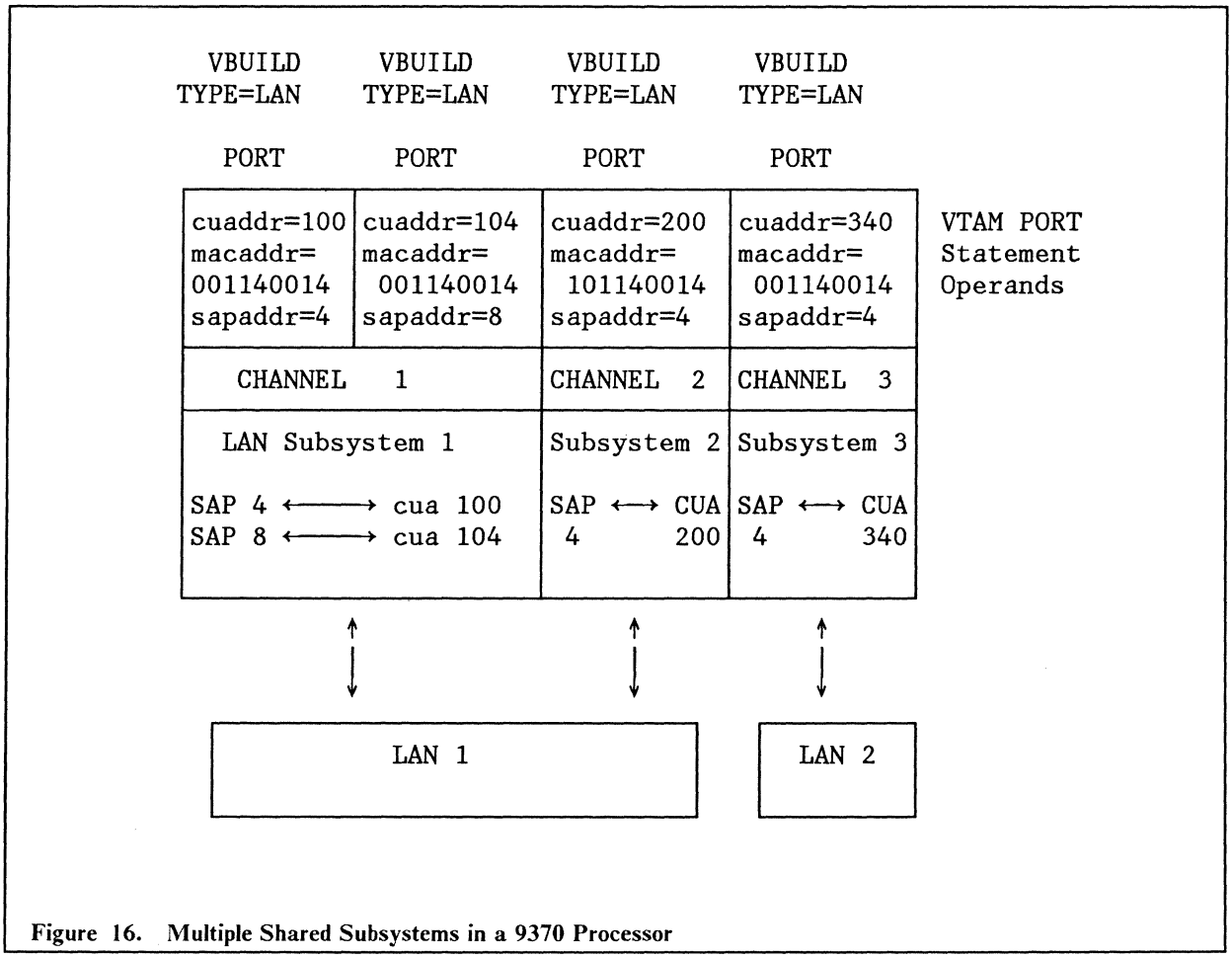

Figure 16. Multiple Shared Subsystems in a 9370 Processor

In the figure above, all of the subsystems are utilized by VTAM. Subsystem 1 has two connections between VTAM and LAN 1. They have the same MAC address but different SAP addresses.

It might be useful to implement a second connection to the LAN from the same VTAM if, for example, you needed to test a connection to a device on the ring such as another 9370. You could code the test definitions in another LAN Major Node using a different SAP Address and activate and deactivate this at will without impacting the production users.

6.2.1 Setting Network (Adapter) Parameters

It is important to remember that it is the FIRST connection between a host application (such as VTAM) and the LAN subsystem which sets the network parameters for the adapter when it is opened. Such parameters include MACADDR, MAXDATA and MAXSTN. This occurs when the first LAN Major Node is activated. Subsequent connections to the LAN, made by activating other LAN Major Nodes, should use these same values or errors will occur. Note also that in the figure above there are two different connections to the LAN using subsystem 1. These can be the same VTAM (using two LAN Major Nodes) or different VTAM's, but the SAP addresses must be different for shared use of the adapter. The different SAP addresses determine effectively which channel address (CETI Group) is used.

Subsystem 2 is connected to the same LAN as subsystem 1, which means that it needs a unique MAC address.

Subsystem 3 is on a different LAN so the MAC address can be the same as one which has been used before.

6.2.2 SAP Allocation by other Applications

The allocation of SAP addresses by VTAM has already been discussed. In the situation where there are other applications present and sharing the use of a single LAN Subsystem, it is important to ensure there is no conflict in the assignment of SAP Addresses. Several SAPs have been pre-defined by the IEEE for specific functions; a list of these can be found in the **"IBM Token Ring Architecture Reference"** (Form No. SC30-3374). These are some examples in the Token-Ring environment:

- SNA Path Control Default SAP X'04' (Individual)
- SNA Path Control Default SAP X'05' (Group)
- Department of Defense Internet Protocol SAP X'06'
- LAN Management SAP X'F4' (Individual)
- LAN management SAP X'F5' (Group)
- TSAF Assigned SAP X'80'.

The assignment of a SAP for TSAF is done internally by the software and is not under the control of the user as it is with VTAM. The TSAF user only has to specify which channel addresses are to be dedicated to TSAF (and hence which CETI Group). For frames interchanged between TSAF applications on different 9370s, SAP X'80' is used.

Also note that TSAF has no facility for specifying the MAC address to be used for communications over the ring. The following rules apply to this:

- If another application (such as VTAM) has initialized the adapter already, TSAF will use that Locally Administered Address (LAA).
- If TSAF is opening the adapter it uses the LAA specified in the I/O configuration panels on the Service Processor.
- If no LAA is specified in the I/O Configuration, TSAF uses the Burned-In Address of the adapter.

Therefore, in order to avoid any conflicts when sharing an adapter between VTAM and TSAF you should make sure that:

1. VTAM should normally be the application to initialize the adapter and set the network parameters.
2. The MAC address for the adapter is specified in the service processor I/O configuration to be the same as will be set by VTAM. If TSAF initializes the adapter it will use this address.

7.0 Problem Determination

During the installation and operation of the Token-Ring with workstations connecting to a 9370 processor there are likely to be problems which will occur either due to VTAM coding errors or due to some physical failure which may have occurred on the ring.

The purpose of this chapter is to show some typical scenarios and illustrate the various symptoms of the problem with the tools available. For the most part, the tools used are:

- NetView
- LAN Manager Program and NetView/PC
- Trace and Performance Program

Other tools which are available and will provide useful information for Problem Determination and Token-Ring Network Management in general are:

- Adapter Diagnostic Program - part of the PC Token-Ring Adapter package.
- Ring Diagnostic Program - especially where LAN Manager Program is not installed. This is also part of the PC Token-Ring Adapter package.

For more complex problems it may be necessary to use some of the tracing capabilities of VTAM. Diagnosis of the LAN support feature of VTAM involves using the VTAM Internal Trace (VIT) to record events in the functions of the feature.

The following documentation provides information which will be useful for the interpretation of trace material from the different sources:

- **SNA Architecture Reference Summary** (GA27-3236)
- **IBM Token-Ring Network Architecture Reference** (SC30-3374)
- **VTAM Diagnosis Guide** (SC23-0116)

7.1 Token-Ring Error Situations and Recovery

The Token-Ring Subsystem of the 9370 is capable of recovering many errors which occur with no intervention from other host components. This is because many recovery functions are part of the base Token-Ring Architecture and so the 9370 LAN Adapter will execute the same recovery procedures as any other ring-station in the event of an error situation. However, when errors do occur, the 9370 LAN Subsystem can use the alert function to provide an operator with notification of an actual or impending loss of availability of service over the Token-Ring (see the section on 9370 Alerts later in this chapter).

7.1.1 Ring Station Insertion and Removal

Once a station is physically connected to a 8228 Multi-Station Access Unit it is not a part of the operational Token-Ring network until it has initialized and opened its adapter. This is done by inducing a low voltage in the lobe cable which has the effect of closing a relay in the MSAU.

The ring is now part of the network. This act of insertion does not disrupt the operation of the ring and the topology of the ring is continually updated by a process known as Nearest Active Upstream Neighbor (NAUN) Notification, which relies on the unidirectional transmission property of the ring. The NAUN notification process is fundamental to the isolation of errors to a "Fault Domain." If a ring station detects that it is failing it will remove itself from the ring. Also, removing or breaking the lobe cable between the Ring-station and the MSAU will cause the relay to open.

7.1.2 Token-Ring Soft Errors

These are errors which are normally tolerated by error-recovery procedures. They are usually caused by events such as lost tokens, frame errors (cyclic redundancy checks), lost frames or code violations. It is useful to know about these events because if the occurrence of soft-errors is excessively high, ring performance may be significantly degraded. The Ring Error Monitor collects and analyses soft errors. Each station sends its count of such errors to the REM functional address together with the address of its NAUN for isolation purposes, so that a problem could be by-passed if necessary.

7.1.2.1 9370 Problem Analysis Function

The 9370, apart from being able to serve as the Ring Error Monitor (see "Ring Error Monitor Functional Description" on page 7 for details), also has a problem analysis function which, when executed from the Service Processor in System Programmer, System Administrator or Service mode, reports on the REM Notifications accumulated by the 9370.

Two conditions are reflected in the Problem Analysis screens:

1. Weight-Exceeded Notification
2. Error Rate Decaying Notification

The first notification is designed to show you when the soft-error threshold has been exceeded and that some remedial action may be advisable to isolate the error. A detailed screen is available to show the fault domain and error weight.

The second notification is designed to show you whether or not the remedial action has actually been successful. Again a detailed screen is available to show the fault domain and error weight.

For a complete description of this function, see the manual in the 'IBM 9370 Information System' series titled **"Using the Token-Ring Subsystem"** (SA09-1738).

7.1.3 Hard Errors

Hard errors are permanent faults (sometimes not recoverable without intervention). They are usually caused by equipment faults or cabling problems.

If a hard error occurs on the ring, the next downstream station will recognize the fault on the receiving side of its attachment and will start a process of recovery known as Beaconing. For a detailed description of the beaconing process, see the **IBM Token-Ring Network Architecture Reference** (SC30-3374). The important result of the process is that the stations in the fault domain will remove themselves from the ring and perform self-testing. (The NAUN of the beaconing station tests first.) If both self-tests are satisfactory and the two stations in the fault domain re-insert but the problem does not disappear, then manual intervention is required. Usually one or the other station will remain isolated from the ring.

A Beaconing state is immediately recorded and displayed by the following stations:

- Ring Diagnostic Program
- LAN Manager Program
- Bridge Program
- NetView, if the alert is forwarded by NetView/PC.

Note: NetView also supports the generation of alerts directly by the 9370 Token-Ring Subsystem for certain types of problems - as discussed in the following section.

7.2 VTAM LAN Support - Generation of Alerts

The LAN Support in VTAM uses the ALERT function to notify the operator of problems occurring in the 9370 Token-Ring Subsystem. This means that if an adapter is experiencing problems with, for example, an Initialization Failure or Duplicate Address Test, then an ALERT may be constructed. VTAM builds a Network Management Vector Transport for the alert and this can be seen by:

1. Tracing the NMVT with the PIU option of the VTAM Internal Trace and decoding the resultant trace.
2. Using the Hardware Monitor component of NetView (NPDA) to browse the alerts which are occurring.

The alert information that is contained in the NMVT message is classified by vectors. In particular the LAN Support in VTAM will generate a type which contains the Alert Management Major Vector - X'0000'. The alert major vector and its subvectors are described in the **SNA Formats** (GA27-3136).

The Hardware Monitor component of NetView has new screens to support the new subvectors to simplify the process of problem determination. This means that NetView presents a panel which describes the cause of the problem by using the description code of the Basic Alert Subvector. Any detail subvectors generated will be used to present other meaningful information, such as the channel unit address and the command which caused the error and the error return code. The panels will also have some recommended actions to follow in order to correct the problem. If a service engineer is involved, the full hexadecimal data fields are available to him/her these panels.

7.2.1 Sample ALERT scenario - Adapter Initialization Error

The following screens were taken during a real error situation which occurred on the ring during testing. The error was caused in the initial installation stages by coding the parameter MAXDATA on the PORT statement of the LAN Major Node too large. The default is 2000, and a value of 2048 caused this error.

- Indication at NetView Operator screen - Command Facility
  - The only indication in the NCCF component that there has been a problem opening the LAN Major node is that all the links in the node (switched and leased) fail the ACTLINK procedure with a sense code of X'8002' which means the links have failed. A display of the major node shows the lines to have a status of NEVAC (never active) although the parameters for the LAN Major Node itself seem to have been set and the node is indicated by VTAM to be active.
- Indication at Status Monitor Panel
  - This screen shows an indicator that an important message has been received. That is, an ALERT Indicator is flashing. Next look at the Hardware Monitor (NPDA) component.
- Indication at Hardware Monitor screen - Alerts Dynamic
  - The following is an extract of the alerts which were present on the Alerts Dynamic screen:

```
 N E T V I E W                                    WTCR12    03/08/88 17:31:35
NPDA-31A                      * ALERTS-HISTORY *              PAGE   3 OF   3
                                                              DOMAIN: ND114

SEL# RESNAME  TYPE  DATE/TIME  ALERT DESCRIPTION:PROBABLE CAUSE
( 1) CD114LAN LAN  03/08 16:21 CONFIG/CUSTOMIZATION ERROR:LOCAL SYSTEM OPERATOR
( 2) CD114B82 NODE 03/08 16:35 RECOVERY IN PROGRESS:NETWORK ERROR
( 3) LD114B82 NODE 03/08 16:34 RECOVERY IN PROGRESS:NETWORK ERROR
( 4) CD114LA3 LAN  03/08 16:15 COMM SUBSYSTEM:COMM SUBSYSTEM CTRL INTERFACE
( 5) E14TRP32 NODE 03/08 15:54 RECOVERY SUCCESSFUL:VTAM RESOURCE
( 6) E14TRP32 NODE 03/08 15:54 RECOVERY IN PROGRESS:NETWORK ERROR
( 7) E14TRP32 CTRL 03/08 15:54 LINK ERROR:LAN LLC COMMUNICATIONS/REMOTE NODE
( 8) AUTO16VM OPID 03/08 15:53 FORWARD ALERT:PROP FAILURE




 ENTER SEL# (ACTION),OR SEL# PLUS M (MOST RECENT), P (PROBLEM), DEL (DELETE)

 ???
CMD==>
```

Figure 17. Alerts History Screen

The alert that we are interested in is Number 1 on the list above. This is the Alerts History, obtained by entering option A in the Alert Static screen. Selecting (1) will give the Recommended Action screen which is presented below:

```
 N E T V I E W                                    WTCR12    03/08/88 17:32:25
NPDA-BNIFEEC3      * RECOMMENDED ACTION FOR SELECTED EVENT *       PAGE 1 OF 1
 ND114        ISTPUS       CD114LAN
             +--------+      ----
 DOMAIN      |  COMC  |---( LAN  )
             +--------+      ----
USER    CAUSED - NONE

INSTALL CAUSED - MAXIMUM DATA TOO LARGE OR INVALID
       ACTIONS - D274 - CORRECT INSTALLATION PROBLEM

FAILURE CAUSED - COMMUNICATIONS INTERFACE
       ACTIONS - D011 - REVIEW EVENT DETAIL DISPLAY:
                 QUALIFIER 1 (CHANNEL UNIT ADDRESS),
                 QUALIFIER 2 (COMMAND), QUALIFIER 3 (ERROR CODE)
                D126 - CONTACT TOKEN-RING ADMINISTRATOR




 ENTER ST (MOST RECENT STATISTICS), DM (DETAIL MENU), OR D (EVENT DETAIL)

 ???
CMD==>
```

Figure 18. Recommended Action Screen

This shows more detail about the event and describes the detail qualifier items to be found on the event detail display below.

```
 N E T V I E W                                    WTCR12    03/08/88 17:32:38
NPDA-43T                        * EVENT DETAIL *                    PAGE 1 OF 1

 ND114        ISTPUS       CD114LAN
             +--------+      ----
 DOMAIN      |  COMC  |---( LAN  )
             +--------+      ----

DATE/TIME: 03/08 16:15

ERROR DESCRIPTION - THE LOCAL SYSTEM OPERATOR HAS MADE AN ERROR IN THE VTAM
DEFINITION.  THE MAXIMUM DATA SIZE IS TOO LARGE OR INVALID.

PROBABLE CAUSE - LOCAL SYSTEM OPERATOR

QUALIFIERS: 1) 0100              2) 810000            3) 33001A4D


ENTER  A  (ACTION) OR  DM  (DETAIL MENU)

 ???
CMD==>
```

Figure 19. Event Detail Screen

The Detail Qualifier subvectors show that the channel address was 100, and the command being executed had a code of 810000 (this is the Set Network Parameters command). Item 3) is the return code from the command execution and provides further diagnostic information to service personnel.

7.2.2 Sample Alert Scenario - Adapter already initialized

This alert was created because the network operator attempted to activate a second LAN Major Node to share the Token-Ring subsystem with one which was already active. The problem occurred because the second LAN major node was attempting to set network parameters which conflicted with those already set for the adapter. In this case, it was the MACADDR which was different.

Again, displaying the status of the second major node will indicate that the node is active and the VTAM messages will even display the MACADDR which is in error without indicating an error situation. The Status Monitor and the Network log will show that an alert indicator has been turned on, and when the alert is viewed the following Recommended Actions and Detail panels are displayed:

```
 N E T V I E W                                    WTCR12    03/08/88 17:33:02
NPDA-BNIFEEC0      * RECOMMENDED ACTION FOR SELECTED EVENT *       PAGE 1 OF 1
 ND114        ISTPUS       CD114LA3
             +--------+     ----
 DOMAIN      |  COMC  |---( LAN  )
             +--------+     ----
USER    CAUSED - NONE

INSTALL CAUSED - NONE

FAILURE CAUSED - LOADABLE COMMUNICATIONS SUBSYSTEM CONTROLLER MICROCODE
                 COMMUNICATIONS ACCESS METHOD
       ACTIONS - D011 - REVIEW EVENT DETAIL DISPLAY:
                  QUALIFIER 1 (CHANNEL UNIT ADDRESS),
                  QUALIFIER 2 (COMMAND), QUALIFIER 3 (ERROR CODE)
                 D276 - CONTACT COMMUNICATIONS SYSTEM PROGRAMMER



ENTER ST (MOST RECENT STATISTICS), DM (DETAIL MENU), OR D (EVENT DETAIL)

 ???
CMD==>
```

Figure 20. Recommended Action Screen

```
 N E T V I E W                                    WTCR12    03/08/88 17:33:32
NPDA-43T                        * EVENT DETAIL *                 PAGE 1 OF 1

 ND114        ISTPUS       CD114LA3
             +--------+     ----
 DOMAIN      |  COMC  |---( LAN  )
             +--------+     ----

DATE/TIME: 03/08 16:21

ERROR DESCRIPTION - A COMMAND TO THE ADAPTER HAS REPORTED AN UNSUCCESSFUL
COMPLETION OR AN ASYNCHRONOUS INDICATION HAS BEEN RECEIVED FROM THE ADAPTER.

PROBABLE CAUSE - COMMUNICATIONS SUBSYSTEM CONTROLLER INTERFACE

QUALIFIERS: 1) 0108              2) 810000            3) 1300EA01



ENTER  A  (ACTION) OR  DM  (DETAIL MENU)

 ???
CMD==>
 top
```

Figure 21. Event Detail Screen

The Event Detail screen again shows the detail qualifiers indicating that the channel unit address was 108 this time, and that the command being executed had a code of 810000 (Set_Network_Parameters). The third qualifier and description indicate that the command did not complete properly and that an error code of 1300EA01 resulted. This is issued as the completion code to the second or third Set_Network_Parameter enable command to enable another CETI group in the Token-Ring adapter. VTAM will always receive this completion code which will either indicate a successfull operation or a failed operation due to conflicting parameters with the already operating CETI group. You should refer to the **"Token-Ring Network Architecture Reference"** SC30-3374 for details.

7.3 SNA Errors

The other main type of problem that will be encountered when setting up the Token-Ring for operation will be those which occur in the SNA layers of communication. That is, frames will be capable of being transmitted across the ring between source and destination MAC addresses, but session setup with VTAM or an application may be impossible.

For this type of problem, normal SNA problem determination procedures should be followed since the support for the LAN environment is the same as SNA Switched Line Support (for PU 2s) or Leased Line Support (for PU 5s). VTAM traces will provide much information required in this environment and the installation of NetView will provide extra support, particularly if the problems are session-related. The Session Monitor component (NLDM) will provide information about such errors as bind failures, for example.

For further information on how to resolve common SNA-related problems, refer to **"ACF/SNA System Problem Determination Guide"** (GG24-1514).

8.0 TSAF Installation and Operation

Because TSAF does not use VTAM's communication support (it uses its own support instead) it was decided to cover the TSAF installation and operation independently. In the following sections you will find the required information to install and operate a TSAF collection over the ring in a 9370 system.

8.1 Overview

TSAF (Transparent Services Access Facility) is a new component of VM/SP Rel 5. It allows you to build a net (called a collection) where all the users can share the same application program. Up to eight TSAF systems can exist within a TSAF collection.

TSAF provides an APPC/VM program interface which handles communications between programs in two virtual machines. TSAF does not support SNA links and consequently can't be used across an SNA network. The way the application programs (like SQL/DS) communicate to CP is via the IUCV (Inter User Communications Vehicle) function of VM.

To get TSAF to communicate with another TSAF in 9370 systems, a valid communication path must exist. The following communication facilities are supported with VM/SP5:

- Channel-to-Channel Adapter
- Binary Synchronous Communication (BSC)
- IEEE 802.3 Local Area Network Subsystem on the 9370 Processor
- IBM Token-Ring Local Area Network Subsystem on the 9370 Processor.

A communication path does not mean that a direct link between each 9370 must exist. Each 9370 with TSAF installed has the capability to act as a Node (like in RSCS) and route queries to the next 9370 with TSAF.

8.2 TSAF Service Level

Currently TSAF has been updated to support the new LAN attachment in the 9370 system. The support is being given by two appars: VM29422 and VM29450. The purpose of these appars is to add a new subsystem driver to TSAF.

Now TSAF with the inclusion of the two appars, can support any of the LAN communication subsystems of the 9370 system:

- IEEE 802.3 LAN Ethernet (Registered Trade mark of Xerox Corp).
- IBM Token-Ring Communication subsystem.

8.3 TSAF Test Configuration

Based on our test configuration of "9370 Token-Ring Test Scenarios" on page 41 with two VTAM Major Nodes TYPE = LAN on the 9370-90 (SA-14) and one VTAM Major Node on the 9370-60 (SA-15) on the Token-Ring Adapter, we brought up TSAF (Transparent Service Access Facility) as a non-SNA application sharing the adapters as shown bellow:

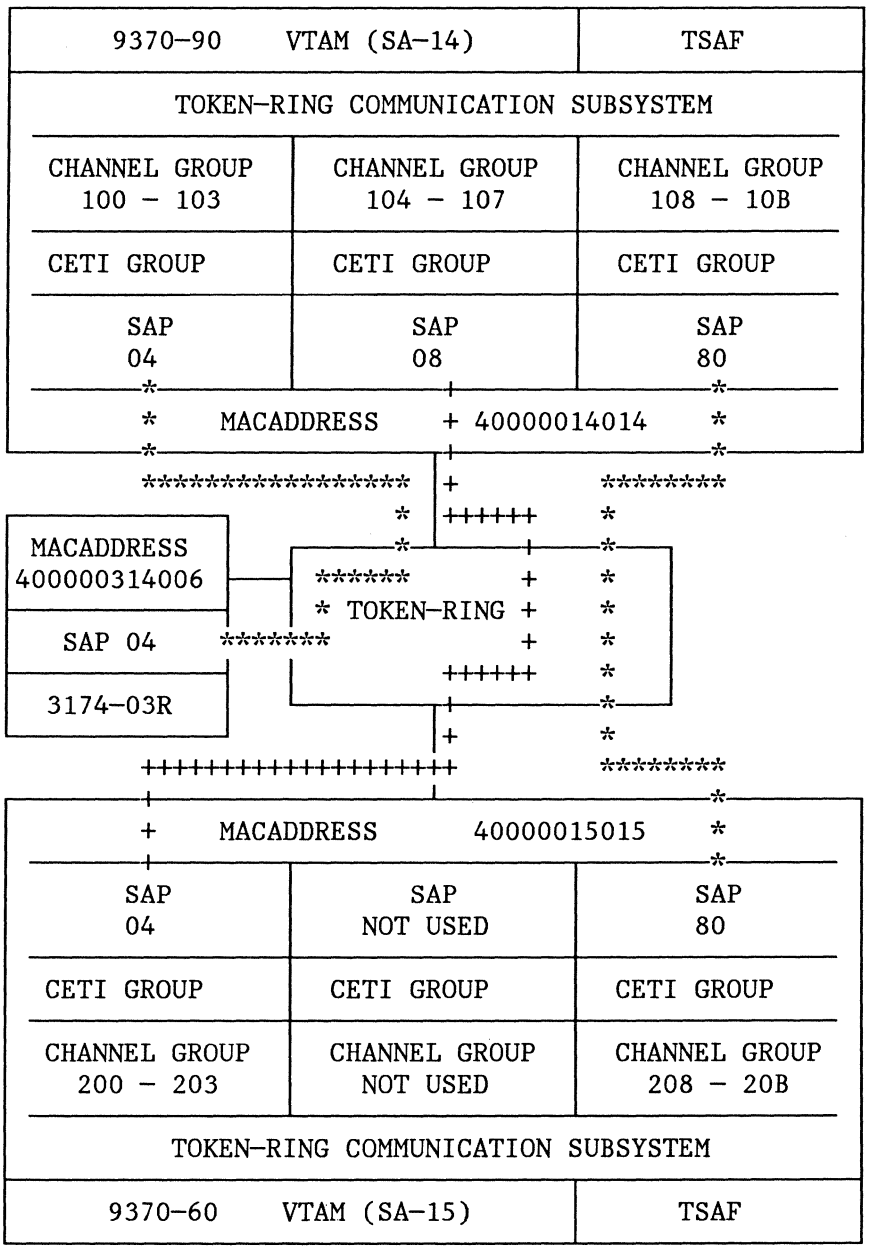

Figure 22. TSAF and VTAM using Token-Ring Subsystem

8.4 How To Connect TSAF To Token-Ring LAN

This section describes the macro and control statement invocations necessary to generate real input/output from Token-Ring LAN subsystem links. (The example assumes that TSAF will use a CETI group with an address range from 108 to 10B.)

VM DMKRIO Customization.

The VM DMKRIO definitions used to support this environment are the following:

- RDEVICE ADDRESS=(100,12),DEVTYPE=3088
- RCTLUNIT ADDRESS=100,CUTYPE=3088,FEATURE=32-DEVICE
- RCHANNEL ADDRESS=1,CHTYPE=MULTIPLEXOR

They include the support required for VTAM to share the adapter.

The communication facility which is going to be used to communicate TSAF in one machine to a remote TSAF must be dedicated. This is done by including the DEDICATE option in the directory entry of TSAF as follows:

```
DEDICATE 108
DEDICATE 109
DEDICATE 10A
DEDICATE 10B
```

In the TSAF CP Directory, do also the following: Specify option DIAG98 on the OPTION statement, for example:

```
USER TSAFVM password 4M 8M G

OPTIONS . . . DIAG98 . . .
```

DIAGNOSE Code X'98' lets the TSAF virtual machine perform the I/O on the CETI group without disrupting CP and other virtual machines.

For each CETI group used by TSAF, you must attach or dedicate all four addresses of the CETI group. The first address of the CETI group used by TSAF has also to be specified in the virtual addresses table of the devices that TSAF accesses. To acomplish this, the address value must be included in the file "ATSLINKS FILE A1" in the TSAF minidisk.

The resource manager (in this case SQL) will require special definitions on its profile to become known by the TSAF collection. A GLOBAL attribute to SQL should be given to the application that will serve the requests of all the machines in the collection. This specification is given in the VM statement IUCV. SQL applications in all the systems that will not serve the TSAF collection are identified with the LOCAL attribute.

Other VM operands for TSAF have to be coded in the TSAF directory (like IUCV and OPTION) but because they have no direct impact on the Token-Ring communication, they will not be discussed in this document. If the reader wants to get more information on how to code this operands he should refer to the **VM/SP TSAF Reference manual**.

In appendix C there are the VM directories for the TSAF and SQL virtual machines.

8.4.1 Routing

If links are available, the route from one 9370 to another 9370 on a LAN is always direct. There is no need for the route to span intermediate systems. The TSAF virtual machine uses the following logic for determining the faster route:

- A LAN is faster than a BSC link

- A LAN is slower than a CTC link.

As each TSAF virtual machine initiates a connection to the LAN (through the ADD LINK or RUNTSAF commands) it collects routing information. To collect routing information on the LAN, TSAF uses the Token-Ring broadcast capability. All other TSAF systems intercept the broadcast message and respond appropriately.

Each TSAF virtual machine on the LAN uses these messages to establish logically direct connections (logical links).

8.5 Operation

The TSAF machine is a service machine which is either autologged-on after IPL or is started manually with LOGON.

In our example we issue a 'Logon TSAFVM' and the following is to be seen on the Operator Console.

```
ATSCTL013I Trace area size is 40K
ATSCAC006I TSAF link statistics and session accounting records will be generated
ATSMRZ518I RESET: collection now has size 1
ATSCST001I Initialization is complete. The service level is 0100.
ATSMRX520I Synchronization is now NORMAL
```

Now TSAF has connected to the Token-Ring Subsystem.

A connection could happen in two different ways:

1. If the adapter was not already opened by an active VTAM Major Node TYPE=LAN or by a non-SNA application like TCP/IP, then TSAF opens the adapter.
   For this purpose TSAF uses the MAC address specification for the adapter during initial subsystem configuration - Page 2 of the current I/O configuration 6130-0030 screen.
   The Node Address is used as MACADDR for the Token-Ring Adapter.
   As SAP Address TSAF uses always **X'80'**, which is hard-coded in TSAF.

2. If the Token-Ring Adapter is already opened by an active VTAM Major Node TYPE=LAN or a non-SNA application, then TSAF uses the MACADDR and other parameters which have been used to open the Adapter.
   Even in this case, SAP Address **X'80'** is used because it is the only one TSAF can use.

8.5.1 Modified Commands

The following TSAF Commands are available:

ADD LINK vdev — Adds a link to the ATSLINKS file

DELETE LINK vdev — Deletes a link from the ATSLINKS file

QUERY LINK ALL — If the physical link is a LAN Subsystem, TSAF displays the active logical links on the LAN by specifying the LAN address.
The example shows this command on our installation.

```
query link all
Link: 108  Type: TLAN  Status:     up
Link: 108  Type: TLAN  Status:     up  LAN Address: 40000011 5015
```

QUERY ROUTE — If the physical link is a LAN subsystem, TSAF displays the first address of the CETI group, along with logical link information.

Appendix A. Activation Flow Sequences

The following charts illustrate the sequences of activity that would be expected in VTAM and over the LAN when the following types of connection are attempted.

- DIAL-OUT (Host-Initiated) from the 9370 to a PU Type 2 on the Token-Ring.
- DIAL-IN (Workstation-Initiated) from a PU Type 2 to a 9370 on the Token-Ring.
- Host-to-Host connection (PU5 to PU5) across the Token-Ring.

A.1 DIAL-OUT (Host-Initiated) from the 9370 to a PU Type 2 on the Token-Ring

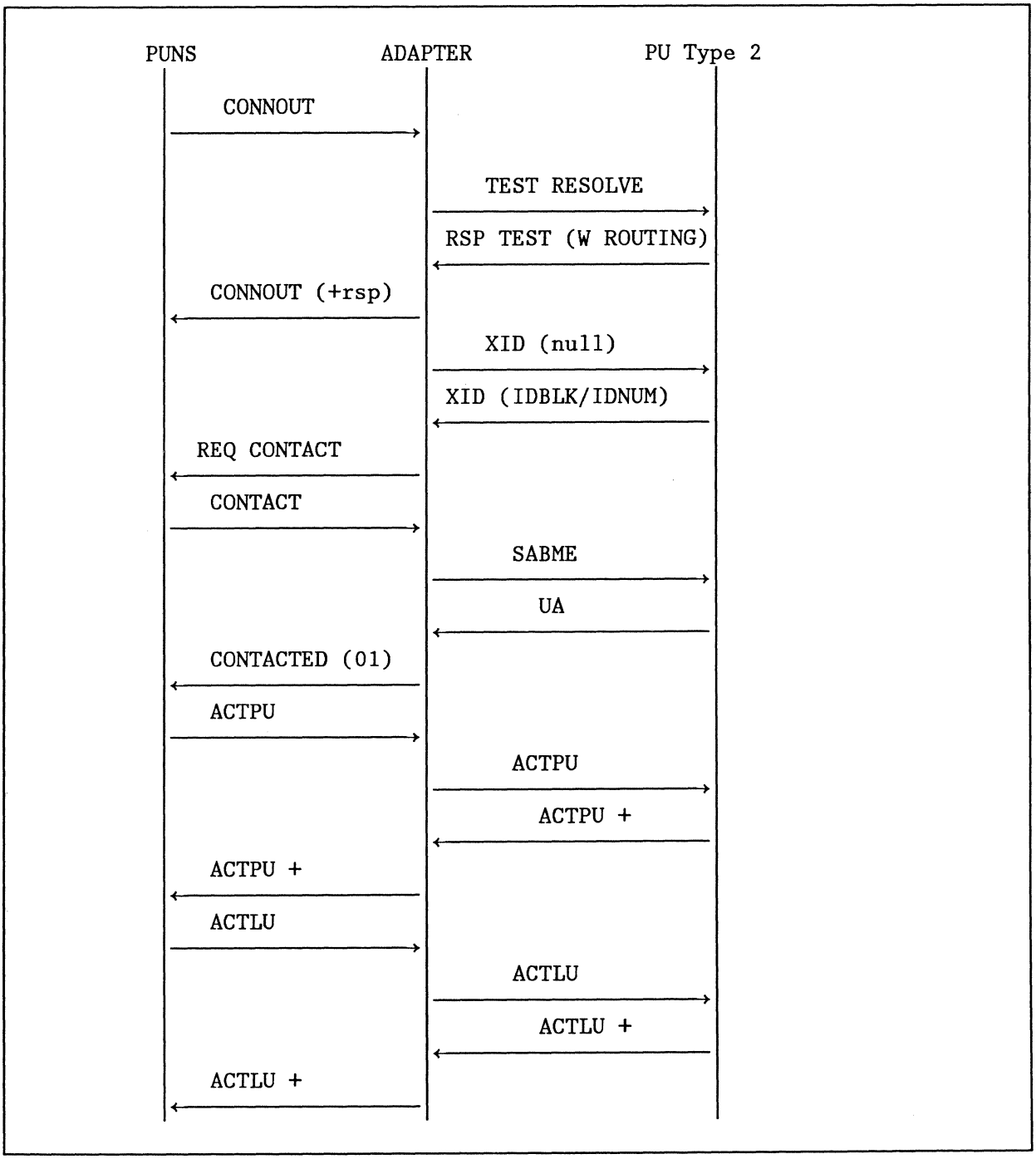

Figure 23. Host - PU Type 2 Dial-Out Activation Sequence

A.2 DIAL-IN (Workstation-Initiated) from a PU Type 2 to a 9370 on the Token-Ring

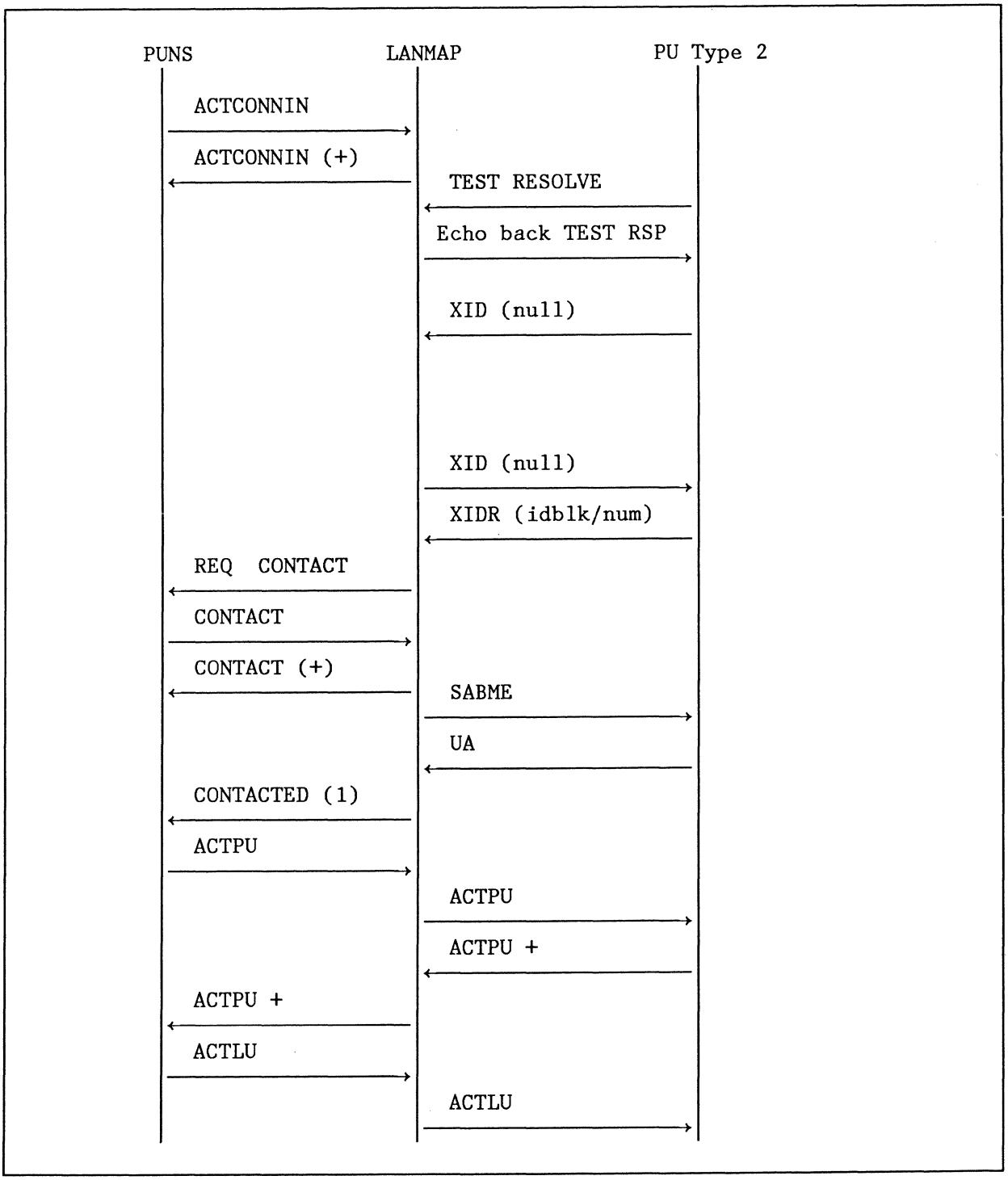

Figure 24. PU Type 2 Dial-In to a SNA Host Activation Sequence

A.3 Host-to-Host connection (PU5 to PU5) across the Token-Ring

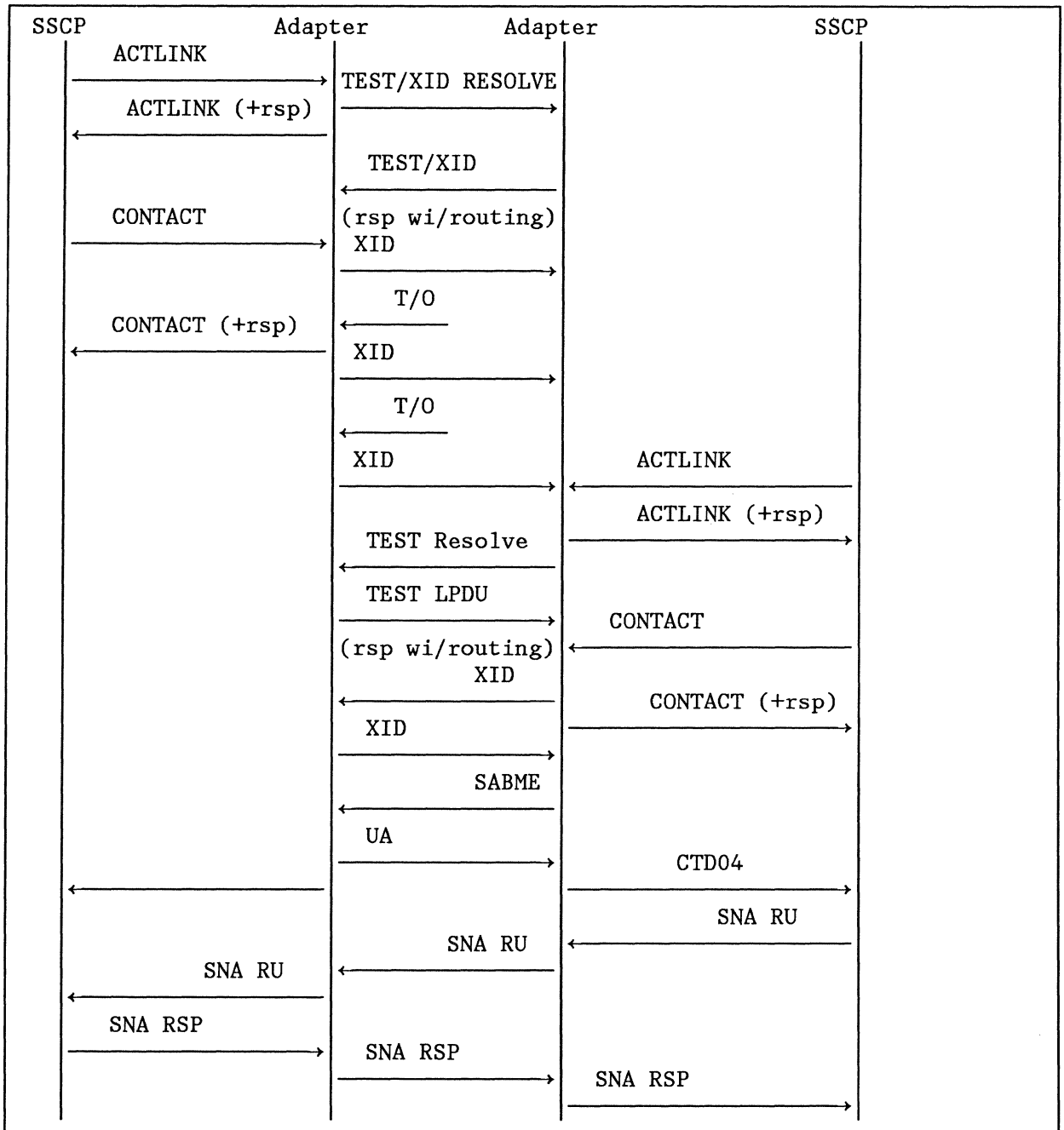

Figure 25. PU Type 5 to PU Type 5 XID Exchange

The ACTLINK from the second VTAM occurs at some arbitrary time after the first. This may cause enough Time-Outs (T/O) to flow for the retry limit to be reached. Low Subarea number activates first.

Appendix B. Sample VTAM Source Tables

B.1 Sample Mode Table

```
ISTINCLM MODETAB
         TITLE 'D4A32782'
*********************************************************************
*                                                                   *
*              3274 MODEL 1A (LOCAL SNA)                       @R490200*
*                WITH 3278 MODEL 2 SCREEN                           *
*              PRIMARY SCREEN 24 X 80 (1920)                        *
*              NO ALTERNATE SCREEN DEFINED                          *
*                                                                   *
*********************************************************************
D4A32782 MODEENT LOGMODE=D4A32782,FMPROF=X'03',TSPROF=X'03',            *
               PRIPROT=X'B1',SECPROT=X'90',COMPROT=X'3080',             *
               RUSIZES=X'87C7',PSERVIC=X'020000000000185000007E00'
         TITLE 'D4A32783'
*********************************************************************
*                                                                   *
*              3274 MODEL 1A (LOCAL SNA)                       @R490200*
*                WITH 3278 MODEL 3 SCREEN                           *
*              PRIMARY SCREEN 24 X 80 (1920)                        *
*              ALTERNATE SCREEN 32 X 80 (2560)                      *
*                                                                   *
*********************************************************************
D4A32783 MODEENT LOGMODE=D4A32783,FMPROF=X'03',TSPROF=X'03',            *
               PRIPROT=X'B1',SECPROT=X'90',COMPROT=X'3080',             *
               RUSIZES=X'87C7',PSERVIC=X'020000000000185020507F00'
         TITLE 'D4A32792'
*********************************************************************
*                                                                   *
*              3274 MODEL 1A (LOCAL SNA)                       @R490200*
*                WITH 3279 MODEL 2 SCREEN                           *
*              PRIMARY SCREEN 24 X 80 (1920)                        *
*              NO ALTERNATE SCREEN DEFINED                          *
*                                                                   *
*********************************************************************
D4A32792 MODEENT LOGMODE=D4A32792,FMPROF=X'03',TSPROF=X'03',            *
               PRIPROT=X'B1',SECPROT=X'90',COMPROT=X'3080',             *
               RUSIZES=X'87C7',PSERVIC=X'028000000000185000007E00'
         TITLE 'D4A32793'
*********************************************************************
*                                                                   *
*              3274 MODEL 1A (LOCAL SNA)                       @R490200*
*                WITH 3279 MODEL 3 SCREEN                           *
*              PRIMARY SCREEN 24 X 80 (1920)                        *
*              ALTERNATE SCREEN 32 X 80 (2560)                      *
*                                                                   *
*********************************************************************
D4A32793 MODEENT LOGMODE=D4A32793,FMPROF=X'03',TSPROF=X'03',            *
               PRIPROT=X'B1',SECPROT=X'90',COMPROT=X'3080',             *
               RUSIZES=X'87C7',PSERVIC=X'028000000000185020507F00'
         TITLE 'D4C32782'
```

```
*********************************************************************
*                                                                   *
*              3274 MODEL 1C (REMOTE SNA)                  @R490200*
*                WITH 3278 MODEL 2 SCREEN                           *
*              PRIMARY SCREEN 24 X 80 (1920)                        *
*              NO ALTERNATE SCREEN DEFINED                          *
*                                                                   *
*********************************************************************
D4C32782 MODEENT LOGMODE=D4C32782,FMPROF=X'03',TSPROF=X'03',        *
              PRIPROT=X'B1',SECPROT=X'90',COMPROT=X'3080',          *
              RUSIZES=X'87F8',PSERVIC=X'020000000000185000007E00'
         TITLE 'D4C32783'
*********************************************************************
*                                                                   *
*              3274 MODEL 1C (REMOTE SNA)                  @R490200*
*                WITH 3278 MODEL 3 SCREEN                           *
*              PRIMARY SCREEN 24 X 80 (1920)                        *
*              ALTERNATE SCREEN 32 X 80 (2560)                      *
*                                                                   *
*********************************************************************
D4C32783 MODEENT LOGMODE=D4C32783,FMPROF=X'03',TSPROF=X'03',        *
              PRIPROT=X'B1',SECPROT=X'90',COMPROT=X'3080',          *
              RUSIZES=X'87F8',PSERVIC=X'020000000000185020507F00'
         TITLE 'D4C32792'
*********************************************************************
*                                                                   *
*              3274 MODEL 1C (REMOTE SNA)                  @R490200*
*                WITH 3279 MODEL 2 SCREEN                           *
*              PRIMARY SCREEN 24 X 80 (1920)                        *
*              NO ALTERNATE SCREEN DEFINED                          *
*                                                                   *
*********************************************************************
D4C32792 MODEENT LOGMODE=D4C32792,FMPROF=X'03',TSPROF=X'03',        *
              PRIPROT=X'B1',SECPROT=X'90',COMPROT=X'3080',          *
              RUSIZES=X'87F8',PSERVIC=X'028000000000185000007E00'
         TITLE 'D4C32793'
*********************************************************************
*                                                                   *
*              3274 MODEL 1C (REMOTE SNA)                  @R490200*
*                WITH 3279 MODEL 3 SCREEN                           *
*              PRIMARY SCREEN 24 X 80 (1920)                        *
*              ALTERNATE SCREEN 32 X 80 (2560)                      *
*                                                                   *
*********************************************************************
D4C32793 MODEENT LOGMODE=D4C32793,FMPROF=X'03',TSPROF=X'03',        *
              PRIPROT=X'B1',SECPROT=X'90',COMPROT=X'3080',          *
              RUSIZES=X'87F8',PSERVIC=X'028000000000185020507F00'
         TITLE 'D4B32781'
*********************************************************************
*                                                                   *
*              3274 MODEL 1B/1D (LOCAL NON-SNA) OR         @R490200*
*              3274 MODEL 1C (REMOTE BSC) OR 3276 (BSC)             *
*                WITH 3278 MODEL 1 SCREEN                           *
*              PRIMARY SCREEN 12 X 40 (480)                         *
*              ALTERNATE SCREEN 12 X 80 (960)                       *
*                                                                   *
*********************************************************************
D4B32781 MODEENT LOGMODE=D4B32781,FMPROF=X'02',TSPROF=X'02',        *
              PRIPROT=X'71',SECPROT=X'40',COMPROT=X'2000',          *
              RUSIZES=X'0000',PSERVIC=X'004000000000C280C507F00'
```

```
         TITLE 'D4B32782'
*********************************************************************
*                                                                   *
*              3274 MODEL 1B/1D (LOCAL NON-SNA) OR          @R490200*
*              3274 MODEL 1C (REMOTE BSC) OR 3276 (BSC)             *
*                WITH 3278 MODEL 2 SCREEN                           *
*              PRIMARY SCREEN 24 X 80 (1920)                        *
*              NO ALTERNATE SCREEN DEFINED                          *
*                                                                   *
*********************************************************************
D4B32782 MODEENT LOGMODE=D4B32782,FMPROF=X'02',TSPROF=X'02',          *
               PRIPROT=X'71',SECPROT=X'40',COMPROT=X'2000',          *
               RUSIZES=X'0000',PSERVIC=X'00400000000000185000007E00'
         TITLE 'D4B32783'
*********************************************************************
*                                                                   *
*              3274 MODEL 1B/1D (LOCAL NON-SNA) OR          @R490200*
*              3274 MODEL 1C (REMOTE BSC) OR 3276 (BSC)             *
*                WITH 3278 MODEL 3 SCREEN                           *
*              PRIMARY SCREEN 24 X 80 (1920)                        *
*              ALTERNATE SCREEN 32 X 80 (2560)                      *
*                                                                   *
*********************************************************************
D4B32783 MODEENT LOGMODE=D4B32783,FMPROF=X'02',TSPROF=X'02',          *
               PRIPROT=X'71',SECPROT=X'40',COMPROT=X'2000',          *
               RUSIZES=X'0000',PSERVIC=X'00400000000000185020507F00'
         TITLE 'D4B32792'
*********************************************************************
*                                                                   *
*              3274 MODEL 1B/1D (LOCAL NON-SNA) OR          @R490200*
*              3274 MODEL 1C (REMOTE BSC) OR 3276 (BSC)             *
*                WITH 3279 MODEL 2 SCREEN                           *
*              PRIMARY SCREEN 24 X 80 (1920)                        *
*              NO ALTERNATE SCREEN DEFINED                          *
*                                                                   *
*********************************************************************
D4B32792 MODEENT LOGMODE=D4B32792,FMPROF=X'02',TSPROF=X'02',          *
               PRIPROT=X'71',SECPROT=X'40',COMPROT=X'2000',          *
               RUSIZES=X'0000',PSERVIC=X'00C00000000000185000007E00'
         TITLE 'D4B32793'
*********************************************************************
*                                                                   *
*              3274 MODEL 1B/1D (LOCAL NON-SNA) OR          @R490200*
*              3274 MODEL 1C (REMOTE BSC) OR 3276 (BSC)             *
*                WITH 3279 MODEL 3 SCREEN                           *
*              PRIMARY SCREEN 24 X 80 (1920)                        *
*              ALTERNATE SCREEN 32 X 80 (2560)                      *
*                                                                   *
*********************************************************************
D4B32793 MODEENT LOGMODE=D4B32793,FMPROF=X'02',TSPROF=X'02',          *
               PRIPROT=X'71',SECPROT=X'40',COMPROT=X'2000',          *
               RUSIZES=X'0000',PSERVIC=X'00C00000000000185020507F00'
         MODEEND
         END                          , END OF ISTINCLM
```

B.2 Sample USS Table

```
         PRINT NOGEN
*
* ////////////////////////////////////////////////////////////////////
* /                                                                  /
* /                                                                  /
* /                  USSTABLE for SNA Terminals                      /
* /                                                                  /
* /                                                                  /
* ////////////////////////////////////////////////////////////////////
*
*
        SPACE 4
USSSNA   USSTAB TABLE=STDTRANS
*
*
ND114        USSCMD CMD=ND114,REP=LOGON,FORMAT=BAL
             USSPARM PARM=APPLID,REP=APPLID,DEFAULT=ND114
             USSPARM PARM=P1,REP=DATA
             USSPARM PARM=P2,REP=LOGMODE,DEFAULT=D4C32793
ND1142       USSCMD CMD=ND1142,REP=LOGON,FORMAT=BAL
             USSPARM PARM=APPLID,REP=APPLID,DEFAULT=ND114
             USSPARM PARM=P1,REP=DATA
             USSPARM PARM=P2,REP=LOGMODE,DEFAULT=D4C32782
*
ND115        USSCMD CMD=ND115,REP=LOGON,FORMAT=BAL
             USSPARM PARM=APPLID,REP=APPLID,DEFAULT=ND115
             USSPARM PARM=P1,REP=DATA
             USSPARM PARM=P2,REP=LOGMODE,DEFAULT=D4C32793
*
ND1152       USSCMD CMD=ND1152,REP=LOGON,FORMAT=BAL
             USSPARM PARM=APPLID,REP=APPLID,DEFAULT=ND115
             USSPARM PARM=P1,REP=DATA
             USSPARM PARM=P2,REP=LOGMODE,DEFAULT=D4C32782
*
ND116        USSCMD CMD=ND116,REP=LOGON,FORMAT=BAL
             USSPARM PARM=APPLID,REP=APPLID,DEFAULT=ND116
             USSPARM PARM=P1,REP=DATA
             USSPARM PARM=P2,REP=LOGMODE,DEFAULT=D4C32793
*
ND1162       USSCMD CMD=ND1162,REP=LOGON,FORMAT=BAL
             USSPARM PARM=APPLID,REP=APPLID,DEFAULT=ND116
             USSPARM PARM=P1,REP=DATA
             USSPARM PARM=P2,REP=LOGMODE,DEFAULT=D4C32782
*
VM90         USSCMD CMD=VM90,REP=LOGON,FORMAT=BAL
             USSPARM PARM=APPLID,REP=APPLID,DEFAULT=AD114V01
             USSPARM PARM=P1,REP=DATA
             USSPARM PARM=P2,REP=LOGMODE,DEFAULT=D4C32793
*
VM902        USSCMD CMD=VM902,REP=LOGON,FORMAT=BAL
             USSPARM PARM=APPLID,REP=APPLID,DEFAULT=AD114V01
             USSPARM PARM=P1,REP=DATA
             USSPARM PARM=P2,REP=LOGMODE,DEFAULT=D4C32782
*
VM60         USSCMD CMD=VM60,REP=LOGON,FORMAT=BAL
             USSPARM PARM=APPLID,REP=APPLID,DEFAULT=AD115V01
             USSPARM PARM=P1,REP=DATA
             USSPARM PARM=P2,REP=LOGMODE,DEFAULT=D4C32793
*
VM602        USSCMD CMD=VM602,REP=LOGON,FORMAT=BAL
             USSPARM PARM=APPLID,REP=APPLID,DEFAULT=AD115V01
             USSPARM PARM=P1,REP=DATA
             USSPARM PARM=P2,REP=LOGMODE,DEFAULT=D4C32782
*
```

```
VM20        USSCMD CMD=VM60,REP=LOGON,FORMAT=BAL
            USSPARM PARM=APPLID,REP=APPLID,DEFAULT=AD116V01
            USSPARM PARM=P1,REP=DATA
            USSPARM PARM=P2,REP=LOGMODE,DEFAULT=D4C32793
*
VM202       USSCMD CMD=VM602,REP=LOGON,FORMAT=BAL
            USSPARM PARM=APPLID,REP=APPLID,DEFAULT=AD116V01
            USSPARM PARM=P1,REP=DATA
            USSPARM PARM=P2,REP=LOGMODE,DEFAULT=D4C32782
*
LOGON       USSCMD CMD=LOGON,FORMAT=PL1
            USSPARM PARM=APPLID
            USSPARM PARM=LOGMODE
            USSPARM PARM=DATA
*
LOGOFF      USSCMD CMD=LOGOFF,FORMAT=PL1
            USSPARM PARM=APPLID
            USSPARM PARM=TYPE,DEFAULT=UNCOND
            USSPARM PARM=HOLD,DEFAULT=YES
*
UNDIAL      USSCMD CMD=UNDIAL,FORMAT=PL1
*
IBMTEST     USSCMD CMD=IBMTEST,FORMAT=BAL
            USSPARM PARM=P1,DEFAULT=5
            USSPARM PARM=P2,DEFAULT=' ACF/VTAM works like MAGIC! '
*
*
*
* ---------------------------------------------------------------------
*
MESSAGES  USSMSG MSG=0,BUFFER=M0
*
          USSMSG MSG=1,TEXT='USSMSG1:  Invalid "%" Command Syntax!'
*
          USSMSG MSG=2,TEXT='USSMSG2:  "%" Command Unrecognized!'
*
          USSMSG MSG=3,TEXT='USSMSG3:  "%" Parameter Unrecognized!'
*
          USSMSG MSG=4,TEXT='USSMSG4:  "%" Parameter Invalid! The NAME *
               may be undefined or the NODE may be inactive.'
*
          USSMSG MSG=5,TEXT='USSMSG5: Unsupported Function. Reenter the*
               COMMAND!'
*
          USSMSG MSG=6,TEXT='USSMSG6: Sequence Error! Terminal already *
               in Session (LOGON Command) or not in Session (LOGOFF Com*
               mand) with an Application Program.'
*
          USSMSG MSG=7,TEXT='USSMSG7: Session not Bound (LOGON REQUEST *
               rejected by Application, BIND rejected by Terminal, CDRM*
               /CDRSC not active, No ROUTE available, wrong COS definit*
               ions, etc.) '
*
          USSMSG MSG=8,TEXT='USSMSG8: "%" Command Failed due to LACK OF*
                STORAGE! '
*
          USSMSG MSG=9,TEXT='USSMSG9:  Magnetic Card Data Error!'
*
          USSMSG MSG=10,BUFFER=MA
*
          USSMSG MSG=11,TEXT='USSMSG11: The requested Session(s) "%" ha*
               ve terminated successfully!'
*
          USSMSG MSG=12,TEXT='USSMSG12  Requested Parameter Omitted!'
*
          USSMSG MSG=13,TEXT='USSMSG13: IBMECHO : "%" '
*
```

```
* ------------------------------------------------------------------
*
*
        EJECT
M0      DC Y(M0FIN-M0DEB)
M0DEB   EQU *
*
M0AXXX DC  X'15'
M0BXXX DC  C'--------  Session Establishment in Progress  --------'
        DC  X'15'
M0CXXX DC  C' '
M0DXXX DC  X'15'
*
M0FIN   EQU *
* ------------------------------------------------------------------
        EJECT
MA      DC Y(MAFIN-MADEB)
MADEB   EQU *
*
MAAXXX DC  X'15'
MABXXX DC  C'--------  9377-90   SA14  --------'
        DC  X'15'
MACXXX DC  C'--------                                        --------'
        DC  X'15'
MADXXX DC  C'--------     Please select your Application!    -------- '
MAEXXX DC  X'15'
        DC  X'15'
        DC  C'ENTER COMMAND TO LOGON:                              '
        DC  X'15'
*
MAFIN   EQU *
        EJECT
* ------------------------------------------------------------------
          EJECT
STDTRANS  DC   X'000102030440060708090A0B0C0D0E0F'
          DC   X'101112131415161718191A1B1C1D1E1F'
          DC   X'202122232425262728292A2B2C2D2E2F'
          DC   X'303132333435363738393A3B3C3D3E3F'
          DC   X'404142434445464748494A4B4C4D4E4F'
          DC   X'505152535455565758595A5B5C5D5E5F'
          DC   X'606162636465666768696A6B6C6D6E6F'
          DC   X'707172737475767778797A7B7C7D7E7F'
          DC   X'80C1C2C3C4C5C6C7C8C98A8B8C8D8E8F'
          DC   X'90D1D2D3D4D5D6D7D8D99A9B9C9D9E9F'
          DC   X'A0A1E2E3E4E5E6E7E8E9AAABACADAEAF'
          DC   X'B0B1B2B3B4B5B6B7B8B9BABBBCBDBEBF'
          DC   X'C0C1C2C3C4C5C6C7C8C9CACBCCCDCECF'
          DC   X'D0D1D2D3D4D5D6D7D8D9DADBDCDDDEDF'
          DC   X'E0E1E2E3E4E5E6E7E8E9EAEBECEDEEEF'
          DC   X'F0F1F2F3F4F5F6F7F8F9FAFBFCFDFEFF'
*
          SPACE 4
END       USSEND
          END
```

B.3 Sample Cross Domain Resource Manager Definitions

```
         VBUILD TYPE=CDRM
* ////////////////////////////////////////////////////////////////////
* /                                                                  /
* /                                                                  /
* /  ---   CDRM DEFINITIONS FOR HOST 14 (SA=014)                    /
* /                                                                  /
* /                                                                  /
* ////////////////////////////////////////////////////////////////////
*
         NETWORK NETID=NETD
MC314    CDRM  SUBAREA=14,CDRDYN=YES,CDRSC=OPT,ISTATUS=ACTIVE
*              STATOPT='SA14 CDRM'
MC315    CDRM  SUBAREA=15,CDRDYN=YES,CDRSC=OPT,ISTATUS=ACTIVE
*              STATOPT='SA15 CDRM'
MC316    CDRM  SUBAREA=16,CDRDYN=YES,CDRSC=OPT,ISTATUS=ACTIVE
*              STATOPT='SA16 CDRM'
         NETWORK NETID=NETC
M11      CDRM  CDRDYN=YES,CDRSC=OPT,ISTATUS=ACTIVE
         GWPATH ADJNET=NETC,SUBAREA=27,ELEMENT=1
*              STATOPT='MVS CDRM'
```

B.4 Sample PATH Table definitions

```
*PATH DEFINITIONS FOR 9370-90 SUBAREA 14
*SA15 IS 9370-60 VIA LAN
*SA16 IS 9370-20 VIA SDLC
*
DD114M02 PATH  DESTSA=15,                                    *
               ERO=(15,1),                                   *
               VRO=0
DD114M03 PATH  DESTSA=16,                                    *
               ERO=(16,1),                                   *
               VRO=0
DD114M05 PATH  DESTSA=27,                                    *
               ERO=(27,1),                                   *
               VRO=0
DD114M06 PATH  DESTSA=12,                                    *
               ERO=(12,1),                                   *
               VRO=0
```

Appendix C. VM Directories

C.1 VM Directory For TSAF Machine

```
USER TSAFVM PASSWORD 4M 8M G
 ACCOUNT 1 XXXXXX
 OPTION MAXCONN 256 BMX ECMODE COMSRV ACCT CONCEAL REALTIMER DIAG98
 IUCV ALLOW
 IUCV *CRM
 IPL CMS PARM AUTOCR
 CONSOLE 009 3215 A OPERATOR
 SPOOL 00C 2540 READER *
 SPOOL 00D 2540 PUNCH A
 SPOOL 00E 1403 A
 LINK MAINT 190 190 RR
 LINK MAINT 19D 19D RR
 LINK MAINT 19E 19E RR
 LINK MAINT 492 192 RR
 LINK MAINT 494 494 RR
 MDISK 191 FB-512 275836 001000 VMWORK MR RTSAF WTSAF MTSAF
 DEDICATE 4A0 B82
```

Figure 26. Vm Directory for a TSAF Virtual Machine

C.2 VM Directory For SQLDBA Machine

```
USER SQLDBA PASSWORD 6M 6M G
 ACCOUNT SQL SQLDBA
 OPTION MAXCONN 25
 IUCV ALLOW
 IUCV *IDENT STARTDB GLOBAL
 IPL CMS
 CONSOLE 009 3215 T OPERATOR
 SPOOL 00C 2540 READER *
 SPOOL 00D 2540 PUNCH  A
 SPOOL 00E 1403 A                                              SQL00110
 LINK MAINT 190 190 RR                                         SQL00120
 LINK MAINT 19D 19D RR                                         SQL00130
 MDISK 191 FB-512 256016 8100 VM9303 W                         SQL00140
 MDISK 193 FB-512 264116 028350 VM9303 R RSQL WSQL             SQL00150
 MDISK 195 FB-512 292466 010530 VM9303 RR RSQL WSQL MSQL       SQL00160
 MDISK 200 FB-512 302996 023490 VM9303 R RSQL WSQL             SQL00170
 MDISK 201 FB-512 326486 009600 VM9303 R RSQL WSQL             SQL00180
 MDISK 202 FB-512 600000 092160 VM9303 R RSQL WSQL             SQL00190
```

Figure 27. VM Directory for the SQL Data Base Virtual Machine

C.3 VM Directory For An SQL User Machine

```
USER SQLUSER PASSWORD 6M 6M G
 ACCOUNT SQL SQLUSER
 OPTION MAXCONN 25
 IUCV STARTDB
 IPL CMS
 CONSOLE 009 3215 T OPERATOR
 SPOOL 00C 2540 READER *
 SPOOL 00D 2540 PUNCH  A
 SPOOL 00E 1403 A
 LINK MAINT 190 190 RR
 LINK MAINT 19D 19D RR
 LINK SQLDBA 195 195 RR
 MDISK 191 FB-512 336086 1620 VM9303 W
```

Figure 28. VM Directory for an SQL User Virtual Machine

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