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Usage Tips for the IBM 2074 Model 3 Console Support Controller

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Overview

This paper describes the new or significant features, functions, and attributes of the IBM 2074 Model 3 console support controller. The paper assumes you are familiar with the earlier models of the 2074, thus minimal introductory information is included. If you are not familiar with an earlier model, we suggest that you consult the following information sources for additional introduction:

- *Introducing the IBM 2074 Control Unit, SG24-5966. This IBM Redbook provides a reasonably complete introduction for the unit and includes setup and configuration examples (some of which are repeated in this paper). This redbook was published in September 2000, corresponding to the first model of the 2074. Later models have changed several details, but this redbook remains the primary introductory and usage publication.*
- *2074 Console Support Controller Configuration Guide, SC28-6806-02. This publication provides basic configuration information for the current model.*
- *2074 Console Support Controller Installation and Maintenance Information, G229-9028-03. This publication includes helpful diagnostic procedures.*
- *IBM 2074 Model 3 Console Support Controller at ibm.com/servers/eserver/zseries/networking/2074.html. This page contains overview information and links to associated detail information.*

Brief Introduction

The IBM 2074 Console Support Controller can be used with most operating systems that run on IBM systems and that support local, non-SNA, DFT 3270 devices. This paper generally describes its use with z/OS®, but the 2074 may also be used with other operating systems including z/OS.e, OS/390®, MVS™, z/VM®, VM/VSE®, VM, VSE/ESA™, and TPF. This paper references IBM ~ zSeries® processors for attachment, but the 2074 may also be used with earlier IBM S/390® processors or with mixtures of zSeries and S/390 processors.

The IBM 2074 addresses several problems:

- *Most zSeries installations use multiple LPARs. Each LPAR can require one or more local 3270¹ devices/sessions for operating system consoles and possibly a few TSO terminals. The local 3270 devices require a local IBM 3174 Control Unit for each LPAR. As the number of LPARs grows, the number of local 3174s also grows. Additional 3174s would also be required for additional LPARs used for test and development purposes.*

¹ A local 3270 means that it is directly attached to a control unit on a system channel, and is not connected through modems or LANs. It also implies that the control unit is not controlled by SNA

- *IBM is no longer marketing or manufacturing 3174 Control Units.*
- *Most existing local 3174 Control Units were built for parallel channels. Channel cabling and switching arrangements for these, in a situation where LPAR flexibility is important, can become difficult. Also, parallel channels are not available with the latest zSeries processors such as the IBM ~ zSeries 800 (z800) and the IBM ~ zSeries 990 (z990).*
- *Even where sufficient ESCON® 3174 control units are available, the switching arrangements (through ESCON directors) and the IOCDs definitions for many control units potentially used by many LPARs can become unreasonably complex.*

The IBM 2074 is a replacement for local, non-SNA 3174 Control Units. The 2074 is a shared control unit that can be used simultaneously by multiple LPARs, using channels with Multiple Image facility (MIF). For example, a single 2074 might provide z/OS consoles (and/or TSO sessions) for ten LPARs.² The LPARs might be in a single mainframe or spread across multiple zSeries and S/390 systems.

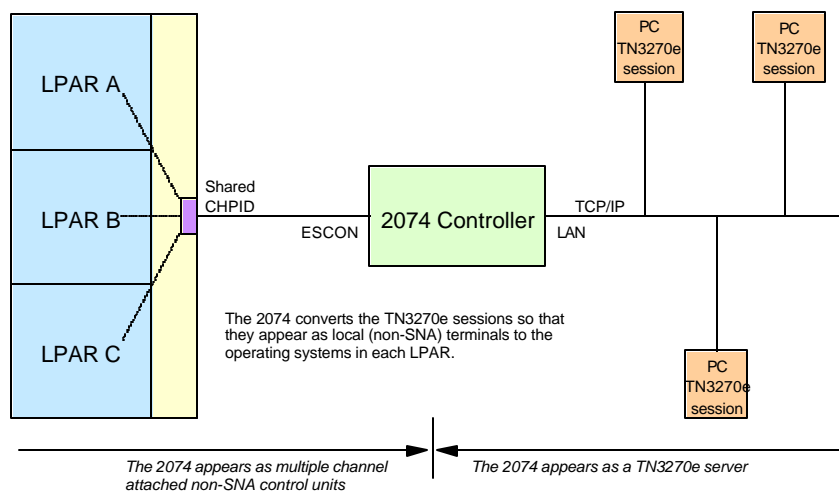
The 2074 does not use existing "real" 3270 devices or connections. That is, it does not use coax cables or any of the family of "real" 3270 terminals. Instead, it uses TCP/IP connections with TN3270e clients over LAN(s) to connect terminals (usually PCs) to the 2074. It uses ESCON channels to connect the 2074 to zSeries processor channels, either directly or through ESCON directors or FICON™ Bridge connections.

The following illustration provides a conceptual view of a 2074 installation. Practical details, with multiple channels, multiple systems, and ESCON directors, can make a more complex environment, but the basic concept remains the same. As illustrated, the 2074 can be regarded as a protocol converter. One side appears as a TN3270e server and the other side appears as multiple channel-attached 3174 control units with 3270 terminals attached to it.

² The 10 LPARs mentioned here is simply an illustration. There is not a limit of 10 LPARs. Limitations are ..

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It does not especially matter which TN3270e software package is used in the client PCs, provided the client TN3270e software supports all the structured fields and other features of current 3270 architecture³. A key point is that the TN3270e clients are seen by the operating systems (in the LPARs) as local, non-SNA 3270 terminals. The use of the LAN and TCP/IP connections is not visible to the software.

Only TN3270e (TN3270 extended) emulators, as opposed to TN3270 emulators, may be used. TN3270e functions include an LU field that is vital for normal 2074 usage.

The TCP/IP connection provided by the "terminal side" of the 2074 control unit is a full-function TCP/IP subsystem. Routing tables may be installed in the 2074. Full IP addresses are used. A name server could be used on the LAN, although this service is not provided by the 2074. The LAN might be connected to the Internet, although this would create security exposures that would require very careful thought⁴. For the purposes of this document, we assume that a private LAN is used. To maximize redundancy, up to four private LANs might be used.

The 2074 appears as multiple 3174 control units, since a single 3174 control unit cannot be shared by multiple channels or LPARs.

³ This statement represents the concept. In practice, IBM has tested only the IBM eNetwork Personal Communications TN3270 emulator (commonly known as PCOM) and this is the only supported emulator.

⁴ There are no TCP/IP security issues unique to the 2074. However, given that z/OS consoles are often used with no security controls whatsoever, one can question whether a LAN containing these should be connected to

The above general description applies to all models of the 2074. The key points are:

- *The 2074 emulates multiple, channel-attached non-SNA 3174 control units. The multiple emulated 3174s may be used by multiple LPARs. If an ESCON Director is used, the use may be extended to multiple processors.*
- *The 2074 converts TN3270e sessions to appear as local, non-SNA DFT sessions on the emulated 3174 control units.*
- *A given TN3270e client session (terminal) may be associated with only one emulated 3174, and, therefore, with only one LPAR.*
- *One ESCON channel from the 2074 to a processor channel (or an ESCON director port) is standard. A second ESCON channel is optional.*
- *The 2074 comes equipped with two Ethernet and two Token-Ring LAN adapters*

What has changed?

The 2074-003 introduces a number of new elements:

- *A new base server is used, providing more basic processing power.*
- *Up to ninety-six (96) client (TN3270e) sessions may be used when configured with two ESCON channel adapters.*
- *A new mini-tower enclosure is used. Optionally, this may be rack-mounted.*
- *MTRJ connectors are used instead of the older ESCON duplex connectors.*
- *New Ethernet adapters (1000Base-T) are used and support 100 Mbps and 10 Mbps operation*
- *OMA/2 emulation is provided and documented.*
- *Several new operator functions are provided to provide better diagnosis of network problems.*
- *Additional connection parameters optimize recovery.*

What has not changed?

Key unchanged elements include:

- *Multiple paths to a given TN3270e session (that is, to a given "terminal") are not supported.*
- *Coax connections are not available.*
- *Parallel (bus and tag) interfaces are not available.*
- *Only two client sessions may be used on the 2074 itself, and these are intended for diagnostic purposes.*

- *You can use both "real" 3174 control units and 2074 units in the same configuration.*
- *Terminal emulation is for DFT 3270 only. CUT emulation is not provided.*
- *The general setup and configuration processes are unchanged from earlier models.*
- *The underlying PC operating system for the 2074 is OS/2®.*
- *You cannot connect more than one NIC to the same LAN.*

Selected Topics

This section of the paper contains brief discussions of various topics that may be of interest to anyone considering 2074-003. This material is not intended to replace the formal documentation which you should refer to for additional details.

One or two ESCON channels

A 2074-003 has one ESCON as standard with an optional second ESCON channel feature that connect to a host, directly or through an ESCON director or FICON Bridge. The general use of these channels is not intuitive (and has not changed from earlier models of the 2074, except for the number of sessions supported). It is important to understand how the channels are used.

Each channel can have up to forty-eight (48) client TN3270e sessions. The channels do not provide two paths or an alternate path to any single session. To a large extent, two ESCON channels in a 2074-003 operate as if there were two 2074 units, each with a single channel. The only common functions are the control desktop (on the OS/2 display of the 2074) and the LAN and IP interfaces used for client TCP/IP connections.

Each channel (known as CA0 or CA1 in the 2074 configuration screens) is associated with a set of client sessions. Each set of client sessions (if both ESCON channels are present) has its own Device Configuration map (commonly known as a DEVMAP). The two channel sets share the same IP addresses, but have two different TCP/IP port addresses. A client session selects which channel set it wants by selecting the appropriate TCP/IP port number. The default port numbers are 3270 (CA0) and 3271 (CA1).

Multiple sessions

You may have up to ninety-six (96) 3270 client sessions (including the two that are usually placed on the 2074 display unit). There is a maximum of forty-eight (48) 3270 sessions associated with each ESCON adapter. To have more than forty-eight 3270 sessions you must have the second ESCON adapter in the 2074-003.

In the z/OS environment, the sessions can be divided between z/OS console sessions ("operator consoles") and VTAM® sessions in any way that is convenient for you. The VTAM sessions

are typically used for TSO, but could be used for CICS®, IMS™, or any other subsystem or application that communicates through VTAM.

Traditional 2074 focus on its use for operating system operator console sessions. However, in the z/OS case, experienced systems programmers will recognize that its use for TSO terminals is equally important. Local non-SNA 3270 sessions (such as provided by the 2074) usually remain operational when configuration or definition problems prevent SNA or TCP/IP interfaces from starting. A local TSO terminal is often needed to repair the definitions involved so that SNA or TCP/IP 3270 interfaces are again available.

New Ethernet adapters

Two Ethernet adapters are standard with the 2074-003. One is on the planar board of the PC and the other is in an adapter slot. Both are 1000Base-T adapters. This means

- *They use copper wire connections*
- *The adapter is capable of operating at 1000, 100, or 10 Mbps. (These are commonly known as gigabit Ethernet, fast Ethernet, and standard Ethernet, respectively. Do not confuse this gigabit Ethernet with gigabit Ethernet that uses a fiber connection. The 2074 adapter uses only copper connections.)*

The speed used is determined by sensing the LAN and matching the speed detected there, provided it is either 10 or 100 Mbps. IBM defines support only for 100 and 10 Mbps speeds for the 2074-003 and it has been tested and only supported at these speeds.

Please note: If you decide (without IBM support) to experiment with 1000 Mbps operation, you should use the Ethernet adapter card in slot 4; this has a faster bus connection than the planar Ethernet adapter. For operation at 1000 Mbps, the speed should be set at the adapter and on whatever switch it uses for LAN connection. When operating at 1000 Mbps, full duplex is normal. You should also note that there is minimal need for 1000 Mbps operation in any typical 3270 environment since the data rates involved are much too low. However, other concerns (such as an existing LAN operating at 1000 Mbps) may prompt such experimentation with this unsupported environment.

Connection parameters

Three new connection parameters⁵ (specified in the Parameters field of the Device Configuration panels (often known as the F2 panels or screens) provide new management options. Both new options are related to recovery when a client TN3270e session is unexpectedly disconnected from the 2074. These options would appear (in the Device Configuration panel) as:

Index	Device	LPAR#	Port	CU	UA	Mgr	Parameters
01	3278	1	20	0	00	2	/CON /DHD

The /CON parameter

If the LAN connection from the 2074 to a TN3270e client is lost and then reconnected, and if that client is being used as a z/OS operator console, the current screen size (the number of lines on the screen) may be lost. That is, the reconnected session might attempt to operate in 24x80 mode instead of the intended mode with more lines. The /CON parameter prevents the session from resetting to 24x80 if it was originally defined as a larger screen size. The /CON option should be used only for z/OS operator consoles. It should not be used if the terminal session might be used for TSO or other VTAM application.

It is recommended using the /CON option for sessions that will be used only as operator consoles.

The /DHD option

The Deferred Host Disconnect (/DHD) option is also intended only for z/OS operator console sessions. If the 2074 is unexpectedly disconnected from the TN3270e client, a timer is started. Until this time expires, output sent from the host to the terminal is discarded (since the terminal is not connected) but the host is informed that the write was successful.

If the client reconnects to the 2074 within the timer limit, the 2074 will automatically simulate the 3270 CLEAR key. z/OS console support will then reformat the screen and continue sending operator messages. z/OS is not aware that the console was disconnected for a period, and no recovery action is needed for the temporarily disconnected console. The missing messages (intended for the console) are lost (at least at that console). The assumption is that messages that were sent during the disconnected period were also sent to other function consoles and appear in the SDSF log and so forth.

⁵ These parameters were available in previous 2074 versions but were not well documented and were considered somewhat experimental.

The /LGN and /NOLGN option

In order to indicate the 3270 client sessions are connected to the 2074, the 2074 is designed to display a “LOGON TEXT” to show the status of the session when the host system is down or the ESCON connection is disconnected or off-line. When the host system is up and running, only the host system logon screen is displayed.

An example of the “LOGON TEXT” follows:

```
** 2074 Index 01 Connected to LU14-CA0 via IP Address 10.10.1.1:3270 **
**           CA=0 Index=01 LPAR=1 Port=CB CU=0 UA=0 LName=LPAR1 **
** Type=009033 Model=001 Mfg=000 SN=0000010179 Tag=0C7 Status=Inactive **
```

The 2074 will always clear the 3270 client session before displaying the “LOGON TEXT”. Thus when the host system (z/OS or z/VM) is shutdown, the final “Disable Wait” or “Shutdown Completed” messages will be cleared by the 2074 in order to display the above “LOGON TEXT”.

Seeing the last “Disable Wait” or “Shutdown Completed” messages is very important to system programmers when the system is having a problem. Therefore, the 2074 provides an option on the “Advanced Telnet3270” panel (the panel where the LUName is entered) to selectively display or not display the “LOGON TEXT” on an individual 3270 client session. The default is to display the “LOGON TEXT”. The options are:

/LGN Enable the clearing of the 3270 client session and displaying the “LOGON TEXT” message when the host system is down or the ESCON connection is disconnected or off-line (This is the default).

/NOLGN Disables the clearing of the 3270 client session and disable the displaying of the “LOGON TEXT” message when the host system is down or the ESCON connection is disconnected or off-line.

Existing parameters

The parameters available on earlier 2074 models are still available. Briefly, these are:

- */R=xxx This parameter can specify an LU name or IP address. Only clients with a matching LU name or IP address can connect to this session. Multiple sessions may be defined with the same LU name. A client (with the same LU name) will be connected to the first unused session with the LU name.*
- */RSP This parameter can also be entered in the Device Manager Parameter panel (F2, F12); it will then apply to all 3270 sessions associated with the ESCON adapter. This*

causes the 2074 to wait for a response for each packet sent on the LAN before sending another packet.

- */RTO=x This parameter can also be entered in the Device Manager Parameter panel (F2, F12); it will then apply to all 3270 sessions associated with the ESCON adapter. This is a response time out value (in seconds). If a client session does not respond in this time, the connection is assumed to have failed and the host is informed that the emulated 3270 is not ready.*
- */S or /S= This has many options that are used for tracing. This parameter is used only at the direction of IBM support.*

These parameters are further documented in the LAN3274.DOC file present on the 2074 disk.

OMA/2 configuration and use

An OMA/2 device reads CDs (in a specified format) and appears to the host as a 3422 tape drive. It is a read-only device. z/VM and VSE/ESA operating systems, software products, and software maintenance have been available in this format. z/OS can use the device, but no products or maintenance is distributed in this format.

2074 device manager 3 provides OMA/2 emulation. The CD drive in the 2074 is the input device. The appropriate Device Configuration panel line is shown as index 2 in the following example:

Index	Device	LPAR#	Port	CU	UA	Mgr	Parameters
01	3278	1	20	0	00	2	
02	3422	1	20	1	00	3	H:*.TDF

In this case, the operating system in LPAR 1 on the host and CHPID connected to port 20 on the ESCON director that is connected to the ESCON adapter on the 2074 must have a 3422 tape drive defined (to the operating system and to the IOCDS) at CUADD 1, UNITADD 00.

The OMA/2 format includes a file on the CD named XXXX.TDF, where XXXX corresponds to the name of the emulated tape volume.

Setup and operation is explained in more detail in the AWSOMA.DOC file included on the 2074 disk.

The AWSMOUNT command, issued from an OS/2 command window, can be used to emulate a tape rewind or the mounting of another tape (really another CD) on the 3422 drive. Examples are included in the DOC file. The "address" used in the AWSMOUNT command is the index line number in the DEVMAP, preceded with a zero. In the example above the address used with an AWSMOUNT command would be 002.

Base 2074-003 enclosure

The base server used for 2074-003 is currently an IBM ~ xSeries® 235. Unlike earlier 2074 models, the Model 003 is not tied to a particular base xSeries. The display included with the 2074-003 is a 17-inch display. The larger 19-inch display used with earlier 2074 models was found to be unnecessary. The new display uses less space and is considerably more convenient to move around.

The most obvious change is the 2074-003 enclosure. It is a typical PC tower enclosure, with an option for rack mounting. Earlier 2074 models were intended only for rack mounting. However many users placed their 2074s on tables (and often placed the heavy displays on top of the 2074s, despite all recommendations to the contrary). This arrangement could use valuable table space, look messy, and sometimes led to component damage. The new tower enclosure offers an alternative to these situations.

The tower enclosure can also be rack mounted using the Racking Unit feature. Rack mounting is done by turning the 2074 sideways and using the mounting rails which make up the Racking Unit feature. An IBM CE will install the Racking Unit feature. When installed in a rack, the 2074-003 requires 5U space. No additional space above or below the unit is required for cooling.

As with the earlier 2074 models, the display and keyboard must be within a relatively short distance from the back of the 2074, whether it is rack mounted or floor standing.

Multipathing

Multiple paths to a given TN3270e session (that is, to a given "terminal") are not supported. This characteristic can cause confusion when planning an installation. It might appear that multiple ESCON channels and multiple LAN connections should, in some way, provide multiple paths to a 3270 session. This is not so. Different TN3270e sessions can be accessed by different paths (ESCON and/or LAN), but a given session has only one path. Redundancy for consoles can be provided by defining multiple consoles (multiple TN3270e sessions) using different ESCON channels to the 2074-003 and different LANs (from the 2074) to connect to the different sessions. Failure of one path would terminate the session(s) on that path, but the other session(s) could operate on the other paths.

Coax connections

Coax connections are not available. Existing "real" 3270 terminals cannot be used with the 2074. Coax connections to other devices that may emulate a "real" 3270 terminal are not available. This is unchanged from earlier 2074 models.

⁶ If everything is working correctly, these lines are displayed for such a brief time that they are not readable. The information they contain is most useful when everything is not working correctly.

Connection Status

Connection status (host to 2074, and 2074 to client) is important information for system management and, often for end users. Useful information is available in several forms. When a TN3270e client connects to the 2074 (through a TCP/IP connection), the following three lines are sent to the client and should appear at the top of the 3270 display window:

```
**      2074 Index 03 Connected to XXXX via IP Address 10.10.0.3:3270      **
**              CA=0 Index=03 LPAR=3 Port=21 CU=0 UA=02 LName=TS01              **
** Type=007490 Model=001 Mfg=IBM SN=000000001234 Tag=0F0 Status=Active **
```

An alternate form of the third line is:

```
** Type=007490-001 Mfg=IBM SN=000000001234 Tag=00D0 Link=00
Status=Active**
```

Lines similar to this example will remain on the 3270 client session until a host sends data, such as a VTAM logo screen⁶. Most of the information is obvious. The index value is taken from the 2074 Device Configuration panel, as are the LPAR, Port, CU, UA, and LU (/R=) values. The CA value is either 0 or 1 depending on which ESCON channel is associated with this session.

The information in the third line is taken from the host system. If no channel connection exists from the 2074 to the host the third line will contain "No ESCON Connection Detected."

If the 2074 was connected to the host (via an ESCON channel) and then loses that connection, the third line will contain "Status=Inactive."

3270 indicators

Many 3270 emulators display a status indicator similar to that on "real" 3270s. This is in the lower left-hand side of the screen. Relevant information can include the following:

$M^{\underline{A}} \blacksquare$	a			Session connected properly
$M^{\underline{A}} \square$	a	\approx	659	(Blinking) LUname does not match any available entry in DEVMAP
$M^{\underline{A}} \square$	a	\approx	659	TN3270e client disconnected its communication
$M^{\underline{A}} \square$	a	\approx	659	Invalid IP port number, or 2074 not IMLed, or LAN3274 not running

In these displays the large M and underlined A are constant (and reflect an internal terminal protocol). The lower-case "a" is a screen session number, which may be relevant. The broken line symbol indicates that communication with the 2074 is broken.

Client link status

A very useful operator function has been added with the 2074-003 software. This involves opening an OS/2 command window (on the 2074 console) and issuing a command such as **LAN3274 CA0 ALL /Q**. This will display a table for all the sessions through ESCON channel 0, with C (client) and H (host) columns included among other condensed data. This indicates whether an operational path exists from the 2074 to the host and/or client. If either column contains an "N" for a session, that session is not fully operational. This provides a quick, convenient operational view of the 2074 operational status.

Failure scenarios

This can be a complex topic. For critical installations, where elimination of single points of failure is important, multiple 2074 units should be used. Key elements in planning may include the following:

- *z/OS consoles may be defined in groups that include sessions through multiple 2074 units and/or multiple ESCON channels on a given 2074. z/OS sends the same messages to all consoles in the group and the loss of a given console should be only a slight inconvenience.*
- *z/OS consoles may be defined on separate LAN, possibly running on separate LAN cables. These would connect to multiple PC client systems.*
- *A PC with client TN3270e sessions may have several sessions active, but these are normally all from the same LAN.*
- *The /DHD and /CON parameters should normally be used for z/OS console sessions. These help mask or recover from transient LAN problems.*

- *The system console (one per LPAR, available on a HMC or Support Element) is the ultimate fallback console for z/OS and can be used to restart other consoles.*
- *The integrated 3270 session on the HMC (available only with z990 processors) is not used by z/OS but can be used by z/VM LPAR.*

Alternate operation scenarios can become complex. For example, consider the situation where you are forced to immediately evacuate a building. If you have access to one of the 2074 LANs from outside the building, you might be able to operate your system (which we assume is still running in the evacuated building) remotely. In this case, you might need to force the disconnection of several of the client sessions in the evacuated building (to free the proper connection session in the 2074). One way to do this is to install power units (for the client systems) that can be powered down remotely. Obviously, this must be part of a larger plan. It does, however, illustrate the flexibility of the 2074 emulated consoles.

Configuration overview

There are four areas of configuration involved with a 2074:

- *Operating system configuration. z/OS, for example, might be configured (via HCD, an IODF, and a PARMLIB member) to expect a console at device number ("software address") 0700.*
- *zSeries I/O subsystem configuration, as specified in an IOCDS. The IOCDS is typically created via HCD, but could also be created from a source IOCP file.*
- *2074 configuration, using panels on the 2074 OS/2 desktop.*
- *Client TN3270e configuration, through whatever method is used for the particular client.*

The z/OS configuration steps are outside the scope of this informal paper. Suffice it to say that configuration proceeds as if multiple local 3174s were available.

IOCP listing extract

The IOCDS for a large zSeries processor can be quite complex. The key elements relevant to a 2074 are illustrated here:

```
RESOURCE PARTITION=( ( ZOS1 , 1 ) , ( ZOS2 , 2 ) )
CHPID PATH=( 04 ) , SHARED , PARTITION=( ( ZOS1 ) , ZOS2 ) ) , TYPE=CNC
CNTLUNIT CUNUMBR=0401 , PATH=04 , UNITADD=( ( , 16 ) ) , UNIT=3174
IODEVICE CUNUMBR=0401 , ADDRESS=( 0700 , 16 ) , UNITADD=00 , UNIT=3270
```

The partition numbers in the RESOURCE statement are used in 2074 session definitions. A CNTLUNIT statement defines a single 3174 control unit. In an extreme example, each 2074

⁷ An IOCDS can contain definitions for nonexistent devices and this is typically done for terminals.

⁸ No LINK addresses are shown in this trivial example, and this implies that an ESCON Director is not involved.

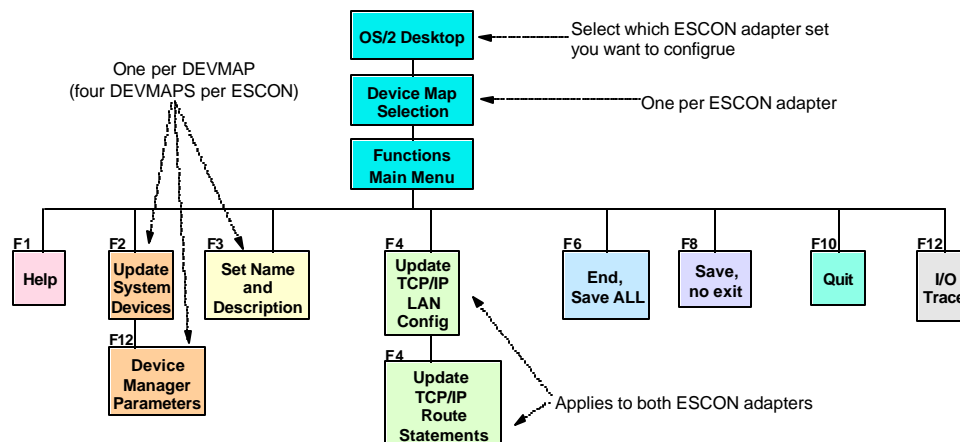
session could appear as a separate control unit, with each session requiring a CNTLUNIT and IODEVICE statement in the IOCDS. The example shown here can handle up to 16 sessions.⁷ In the 2074 Device Configuration, up to 16 sessions would have the same LPAR number, the same PORT address⁸, the same CU address, and UA addresses from 00 to 0F. The operating system would see these sessions as device numbers 0700 to 070F.

2074 configuration panels

The 2074 provides a number of configuration panels. These are briefly illustrated starting at "2074 configuration panels" on page 18. If you are not familiar with these panels, you might want to review them before continuing with the following discussion.

The following navigation map illustrates the relationships of the various configuration panels. The key panels are accessed through F2, F3, and F4 and are often known by these function key names.

Much of the discussion about 2074 configuration involves the Device Configuration panels. These panels (one for each ESCON adapter set) are accessed by the Update System Devices



selection (F2) from the Main Menu. These panels are known as the Device Configuration panel, the Update System Devices panel, or the F2 panel and these names are used interchangeably.

Parameter relationships

The relationships between the various configuration panels can be confusing to new 2074 users. The following table may help. It says, for example, that the CU parameter (in the F2) panel must match the CUADD parameter on an CNTLUNIT statement in the IOCP source that was used to create the current IOCDS.

Panel or Data	Parameter		Panel or Data	Parameter
Device Configuration (F2)	Index=		(no correspondence to anything, but used by AWSMOUNT for OMA devices)	
Device Configuration (F2)	LPAR	=	IOCP RESOURCE	(number)
Device Configuration (F2)	Port	=	ESCON director port number that is connected to target CHPID on zSeries	
Device Configuration (F2)	CU	=	IOCP CNTLUNIT	CUADD
Device Configuration (F2)	UA	=	IOCP IODEVICE	UNITADD
Device Configuration (F2)	Parameters R=xxx	=	TN3270e client emulator	LUNAME

Panel or Data	Parameter		Panel or Data	Parameter
Update TCP/IP LAN (F4)	IP addr	=	TN3270E client	IP address
Start Device Mgr (F2+F12)	PORT	=	TN327e client	PORT
Device number (used by z/OS or applications)		=	IOCP IODEVICE	ADDRESS

Complex configurations

Considering more complex configurations may help explain the configuration process. These examples involve different parameters in the Channel Adapter Device Configuration panel (also known as the F2 panel). The examples use extracts from this panel.

One session per LPAR (on the same host system)

Index	Device	LPAR#	Port	CU	UA	Mgr	Parameters
01	3278	1	01	0	00	2	/R=LPAR1
02	3278	2	01	0	00	2	/R=LPAR2
03	3278	3	01	0	00	2	/R=LPAR3
etc							

This example assumes that one of the 2074 ESCON channels is directly connected to an ESCON CHPID on the host. (Port=01 implies this direct connection.) The single ESCON channel would be used by all LPARs through the EMIF facility. This definition assumes that each LPAR has defined (in the IOCDS) a dedicated 3174 control unit with CUADD=0 and that only UNITADD=0 (one device) will be used for the defined connection. The TN3270e clients are on one of the LANs connected to the 2074 (Mgr=2); it does not matter which LAN. A TN3270e client with LU=LPAR2, for example, would automatically connect to the terminal session defined with

/R=LPAR2. (The LU and /R names are arbitrary, but must match.) Only one client (at one time) could connect to an LPAR, since there is only one session defined for each LPAR in this example. Nothing in this data defines what device number will be used by z/OS to access the 3270 session; this would be specified by the ADDRESS parameter in IODEVICE statement in the IOCDS.

One session per host, same LPAR on each host

Index	Device	LPAR#	Port	CU	UA	Mgr	Parameters
01	3278	1	20	0	00	2	/R=HOST1
02	3278	1	21	0	00	2	/R=HOST2
03	3278	1	22	0	00	2	/R=HOST3
	etc						

In this example, each session is defined for a different port number. The port number is the number of the ESCON director port that is connected to the target host. The assumption here is that each port is connected to a different processor. LPAR 1 is the target in each host system. Each host is assumed to have a 3174 control unit defined (in its IOCDS) for use by LPAR 1, with CUADD=0 and UNITADD=0. A client TN3270e can select which host it wants by using an LU name that corresponds to the /R parameter for that host.

Many sessions, same LPAR same host

Index	Device	LPAR#	Port	CU	UA	Mgr	Parameters
01	3278	1	20	0	00	2	/R=TSO
02	3278	1	20	0	01	2	/R=TSO
03	3278	1	20	0	02	2	/R=TSO
	etc						

In this example, all sessions are with the same LPAR and the same host (which is implied by the same port number for all sessions). The host IOCP should have a 3174 defined for use by this LPAR, with CUADD=0 and a range of UNITADD addresses from 00 to 02 (or more). Note that the /R parameters are all the same in this example. A TN3270e client with LU=TSO would automatically connect to the first 2074 session (with /R=TSO) that is free. That is, the client could not directly control which 2074 session it would use. This is a convenient arrangement for VTAM/ TSO terminals.

Many sessions, many LPARs, many hosts

Index	Device	LPAR#	Port	CU	UA	Mgr	Parameters
01	3278	1	20	0	00	2	/R=CON1
02	3278	1	20	0	01	2	/R=TSO1
03	3278	1	20	0	02	2	/R=TSO1
04	3278	2	20	1	00	2	/R=CONX
05	3278	2	20	1	00	2	/R=TSOX
06	3278	1	22	0	00	2	/R=CON22
07	3278	1	22	0	01	2	/R=TSO22
08	3278	1	22	0	02	2	/R=TSO22
09	3278	5	25	0	00	2	/R=WESTCON
0A	3278	5	25	0	00	2	/R=WEST
0B	3278	5	25	0	00	2	/R=WEST
0C	3278	1	30	0	00	2	/R=TSOA
0D	3278	2	30	0	00	2	/R=TSOB
0E	3278	3	30	0	00	2	/R=TSOC
etc							

This example uses four hosts (four different port numbers, which we assume are connected to different hosts), six different LPARs (including three LPAR 1s on three different hosts). On the first host we used two different CU addresses. This was not required, but may have been convenient when the systems programmer defined the IODF and IOCDS for that host.

Planning for addressing

Assuming that only one processor is involved, we have many ways to arrange addressing between the operating system (device numbers) and 2074 sessions. These examples involve a 2074 with a single ESCON adapter. With two ESCON adapters, each can be configured in any of the ways described here.

Basic mode

For basic mode (without LPARs), the LPAR number (in the F2 panel) must be 0. In this case, we could define a single CU (probably number 0) and a range of UAs. This would be reflected directly in the IOCDS definitions. For example:

```
CHPID PATH=(02),TYPE=CNC
CNTLUNIT CUNUMBR=C400,PATH=02,CUADD=0,UNIT=3174,UNITADD=((00,4))
IODEVICE CUNUMBR=C400,ADDRESS=(900,4),UNIT=3270,UNITADD=00
```

The following 2074 F2 definitions could be used with this IOCDs:

Index	Device	LPAR#	Port	CU	UA	Mgr	Parameters
01	3278	0	01	0	00	2	
02	3278	0	01	0	01	2	
03	3278	0	01	0	02	2	
04	3278	0	01	0	03	2	

The 2074 is directly connected to the CHPID (PORT=1 means a direct connection). Four sessions are defined and these will have device numbers 900-903 for the operating system. The 2074 TCP/IP definitions (F4 panel) might include

```
LAN0 (Ether) IPAddress>10.10.0.1 Mask>255.255.255.0
Enabled?(y/n)>Y Parms>metric 1 mtu 1500
IEEE 802.3 enabled?(y/n)>N
```

A TN3270e client could connect to one of these sessions by connecting to IP address 10.10.0.1, port 3270 (the default TCP/IP port address for the first channel adapter in the 2074). Since no /R parameter is specified, the client sessions should not have LU parameters. A client will be connected to the first unused session. If all four sessions are used, the client will be unable to connect.

When LPARs are involved, there are many more addressing options available.

One CU, one range of UAs, unique device numbers

Consider these definition, involving two LPARs:

```
RESOURCE PARTITION=( (MVS1,1) , (MVS2,2) )
CHPID PATH=(04) , SHARED , PARTITION=( (MVS1,MVS2) ) , TYPE=CNC
CNTLUNIT CUNUMBR=700 , PATH=04 , UNITADD=( (00,32) ) , UNIT=3174
IODEVICE CUNUMBR=700 , ADDRESS=(700,32) , UNIT=3270
```

The 2074 Device Configuration might be:

Index	Device	LPAR#	Port	CU	UA	Mgr	Parameters
01	3278	1	01	0	00	1	/R=MVS1OP
02	3278	2	01	0	01	1	/R=MVS2OP
03	3278	1	01	0	02	2	/R=MVS1
04	3278	1	01	0	03	2	/R=MVS1
..	
10	3278	1	01	0	0F	2	/R=MVS1
11	3278	2	01	0	10	2	/R=MVS2
12	3278	2	01	0	11	2	/R=MVS2
..	
20	3278	2	01	0	1F	2	/R=MVS2

We have a CHPID shared by both LPARs. A single CU is defined for the 2074. (This could not be done with a "real" 3174). The 3270 sessions have Unit Addresses ranging from 00 to 1F. Some sessions are defined for LPAR 1 and some for LPAR 2. The device numbers (seen by both LPARs) range from 700 to 71F.

However LPAR 1 will find that device number 701 is not available. 701 corresponds to UA 01 and this is assigned to LPAR 2 in the 2074 configuration. An LPAR cannot "see" devices assigned to other LPARs.

The first two sessions in this example (one belonging to each LPAR) will appear on the 2074 display. This is due to the Mgr=1 parameter. The two PCOM sessions on the 2074 display should have their LU values set to MVS1OP and MVS2OP. (We remind you that the two 2074 sessions are not intended for routine use; they are intended for diagnostic use or initial setup.)

One CU, overlapping UAs and device numbers

It is often necessary to have the same device number for consoles in multiple LPARs. For example, you might run multiple copies of z/OS with each expecting an operator console at device number 700. There are several ways to do this.

One method is:

```
RESOURCE PARTITION=( (MVS1,1), (MVS2,2) )
CHPID PATH=(04), SHARED, PARTITION=( (MVS1,MVS2) ), TYPE=CNC
CNTLUNIT CUNUMBR=700, PATH=04, UNITADD=( (00,32) ), UNIT=3174
IODEVICE CUNUMBR=700, ADDRESS=(700,16), UNIT=3270,
UNITADD=0
```

This provides a string of 16 3270 devices, starting with address 700, that is known to all LPARs. This would be invalid with a real 3174 control unit, but works here because the 2074 can separate LPAR usage.

Index	Device	LPAR#	Port	CU	UA	Mgr	Parameters
01	3278	1	01	0	00	2	/R=MVS1OP
02	3278	1	01	0	01	2	/R=MVS1
03	3278	1	01	0	02	2	/R=MVS1
04	3278	1	01	0	03	2	/R=MVS1
..	
10	3278	1	01	0	0F	2	/R=MVS1
11	3278	2	01	0	00	2	/R=MVS2OP
12	3278	2	01	0	01	2	/R=MVS2
..	
20	3278	2	01	0	0F	2	/R=MVS2

With these definitions, each LPAR has the same range of device numbers. For example, the session defined in Index 1 will be device number 700 for LPAR 1 and the session defined in index 11 will be device number 700 for LPAR 2. The IOCDS appears to define a single 3174 with 16 sessions. However, each LPAR will see its own 3174 with 16 sessions. This appears to defy HCD/IOCP/IOCDS logic and works only because the 2074 emulates a different 3174 for each LPAR.

Another way to accomplish exactly the same thing, and that might appear more sane to HCD/IOCP/IOCDS is the following:

```
RESOURCE PARTITION=( (MVS1,1), (MVS2,2) )
CHPID PATH=(04), SHARED, PARTITION=( (MVS1,MVS2) ), TYPE=CNC
CNTLUNIT CUNUMBR=700, PATH=04, UNITADD=( (00,32) ), UNIT=3174
IODEVICE CUNUMBR=700, ADDRESS=(700,16), UNIT=3270,
UNITADD=0, PARTITION=(MVS1)
IODEVICE CUNUMBR=700, ADDRESS=(700,16), UNIT=3270,
UNITADD=10, PARTITION=(MVS2)
```

We now have two IODEVICE definitions, each creating device numbers in the 700-71F range. Note that each IODEVICE starts at different UNITADD addresses.

The matching 2074 Device Configuration might be:

Index	Device	LPAR#	Port	CU	UA	Mgr	Parameters
01	3278	1	01	0	00	2	/R=MVS1OP
02	3278	1	01	0	01	2	/R=MVS1
03	3278	1	01	0	02	2	/R=MVS1
04	3278	1	01	0	03	2	/R=MVS1
..	
10	3278	1	01	0	0F	2	/R=MVS1
11	3278	2	01	0	10	2	/R=MVS2OP
12	3278	2	01	0	11	2	/R=MVS2
..	
20	3278	2	01	0	1F	2	/R=MVS2

Again the session at Index 11 becomes device number 700 for LPAR 2.

Here is another way to accomplish exactly the same thing. This involves more IOCDs work, but may appear clearer to traditional systems programmers. This method defines different control units (CU addresses) for the two LPARs.

```
RESOURCE PARTITION=( (MVS1,1), (MVS2,2) )
CHPID PATH=(04), SHARED, PARTITION=( (MVS1, MVS2) ), TYPE=CNC
CNTLUNIT CUNUMBR=700, PATH=04, UNITADD=( (00,16) ), UNIT=3174, CUADD=0
CNTLUNIT CUNUMBR=710, PATH=04, UNITADD=( (00,16) ), UNIT=3174, CUADD=1
IODEVICE CUNUMBR=700, ADDRESS=(700,16), UNIT=3270,
UNITADD=0, PARTITION=(MVS1)
IODEVICE CUNUMBR=710, ADDRESS=(700,16), UNIT=3270,
UNITADD=0, PARTITION=(MVS2)
```

The matching 2074 Device Configuration might be:

Index	Device	LPAR#	Port	CU	UA	Mgr	Parameters
01	3278	1	01	0	00	2	/R=MVS1OP
02	3278	1	01	0	01	2	/R=MVS1
03	3278	1	01	0	02	2	/R=MVS1
04	3278	1	01	0	03	2	/R=MVS1
..	
10	3278	1	01	0	0F	2	/R=MVS1
11	3278	2	01	1	00	2	/R=MVS2OP
12	3278	2	01	1	01	2	/R=MVS2

```
..      ....      .      ..      .      ..      .  
20      3278      2      01      1      0F      2      /R=MVS2
```

Again, the session at Index 11 will be device number 700 for LPAR 2.

These methods all accomplish the same thing. In some cases the "rules" for 3174 configurations are violated because the 2074 can use techniques unavailable for a 3174. In some cases, the IOCDS (or IOCP or HCD) definitions appear to have additional aspects that are not "normal" and not apparent from the HCD/IOCP/IOCDS definitions. The last method shown, while the longest, is the most compatible with traditional 3174 definitions and HCD/IOCP/IOCDS usage.

2074 configuration panels

The following material provides a quick overview of the 2074 configuration panels. For more details and extensive examples, see the documents referenced in the first section of this paper.

OS/2 desktop

The following sketch generally illustrates the OS/2 desk top display of the 2074. The two PCOM sessions on the desktop are intended for diagnostic work although they are often used as operator consoles for smaller systems.

The key elements display are the two (if you have two ESCON adapters in the 2074) smaller windows that have icons to (a) start⁹ one channel's operational environment for clients, (b) end the operational environment of the channel's clients, (c) configure the operational environment of the channel, and (d) configure trace functions.

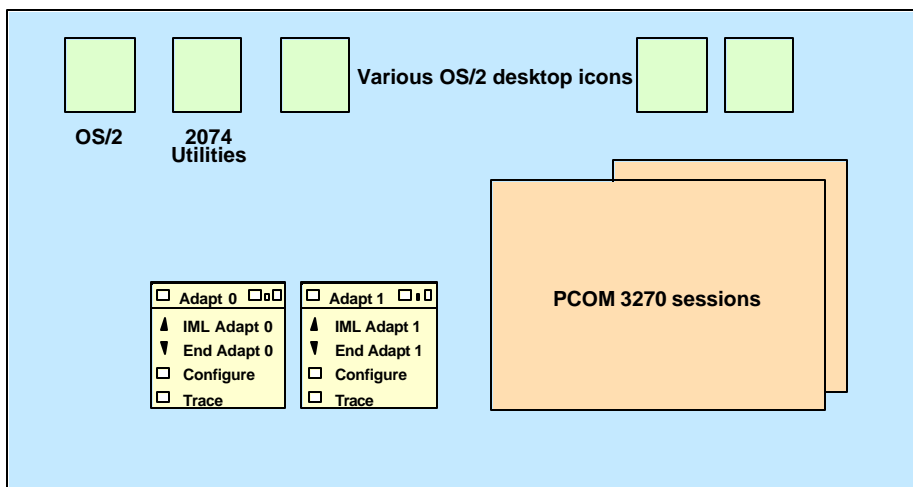
The Configure icon leads to the DEVMAP (Device Map) for the sessions associated with that channel. That is, there are two separate sets of DEVMAPs for a 2074 with two ESCON adapters. You must configure both.

¹⁰ Actually, a copy of one is active at any time. The original (not the copy) may be edited while the copy is

⁹ The icon says IML, meaning Initial Microcode Load. This terminology was meaningful with earlier

¹¹ hardware. It represents a bit of nostalgia here.

carried



Channel adapter x configuration

Selecting Configure in one of the adapter windows on the OS/2 desktop will display the window shown below. In this example, it is the window for ESCON channel adapter 0. A similar window could be displayed for channel adapter 1.

Each ESCON channel has a set of four DEVMAPs. Only one is active at any time.¹⁰ Having four DEVMAPs allows you to predefine alternate configurations.¹¹ You can perform two functions from this panel. You can select one of the DEVMAPs to configure ("edit"), and you can select the DEVMAP that will be loaded when you next IML this ESCON channel adapter environment.

```
IBM 2074 Channel Adapter 0 Configuration

Device Map Selection
Currently Active Device Map:
  E:\DEVMEP\DEVMAPAC/CA0 ADCD14

Active on Next IPL Device Map: ADCD15 (To set,see text below. To clear ALT+F11)

Editable Device Maps:
  Device Map 0 >E:\DEVMAP\DEVMAP0.CA0 ADCD14
  Device Map 1 >E:\DEVMAP\DEVMAP1.CA0 ADCD15
  Device Map 2 >E:\DEVMAP\DEVMAP2.CA0 Sample Configuration
  Device Map 3 >E:\DEVMAP\DEVMAP3.CA0 Sample Configuration

TAB the cursor to an 'editable' DEVMAP name and press ENTER to edit.
The Currently Active device map CANNOT be edited, only viewed.

To change the Active on Next IML DEVMAP, TAB the cursor
to an Editable DEVMAP name and press F11

Note: The ACTIVE DEVICE MAP was copied from E:\DEVMAP\DEVMAP0.CA0

F1 - Help          ENTER = Select Devmap          F10 - End Configurator
```

Function main menu

When a DEVMAP is selected to edit, the following panel is displayed. The two significant options are F2 (to configure sessions, also known as the "DEVMAP") and F4 (to configure TCP/IP options that apply to both ESCON channel environments).

FUNCTIONS

Current 2074 Program Level is: ??? xx/xx/03

Device Map is E:\DEVMAP\DEVMAP.CA0

Major Functions	Description of Major Functions
F1 Help F2 Update System Devices F3 Set 2074 Name and Description F4 Update LAN Configuration F6 End - Save All, then Exit F8 Save - Save ALL; do not Exit F10 Quit - Do not save anything F12 Edit Trace Entries	F2 Configure device addresses, LPARs, director ports, and TN3270e parms F3 Define the system LANID and a description of this DEVMAP F4 Change TCP/IP configuration parameters. Enable/disable LAN adapters

Device or session configuration

These are the primary panels for most 2074 configuration actions and you will spend most of your 2074 setup time with these panels. Remember that the panel shown here represents one DEVMAP on one ESCON channel. There are eight of these panels (if you have both ESCON channels) that can potentially be used.

Channel Adapter 0 Device Configuration

Active Devices: 4 _____ Max allowable device index is 40

Index	Device	LPAR#	Port	CU	UA	Mgr	Parameters
01	3278	1	11	0	00	2	/R=CON1
02	3278	1	11	0	01	2	/R=TSO1
03	3278	2	11	0	00	2	/R=CON2
04	3278	2	11	0	01	2	/R=TSO2

Mgr Codes: 1=AWS3274 2=LAN3274 3=AWSOMA
 F1 Help ALT+F1=Key Definitions F10=Main Menu Esc=Cancel Input

Each line in the body of the panel represents one potential TN3270e client connection. Remember that each terminal session can appear as a local, non-SNA 3174 control unit with one (or several) 3270 terminals. Briefly:

- *The Index is an arbitrary number that has no external meaning, other than being used with the AWSMOUNT command for OMA emulation.*
- *The Device may be 3278, 3287 (a printer), or 3422.*
- *The LPAR number is used to route this emulated 3174 to a particular LPAR. This is used only for EMIF or MIF channels. If a dedicated channel is used (or if the host is in basic mode with no LPARs) this LPAR number must be 0.*
- *The Port is an ESCON Director port that is connected to the host ESCON channel. It is not the director port connected to the 2074.*
- *The CU and UA columns are the Control Unit address and device Unit Address of the 3174 + 3270 being emulated. These must match appropriate numbers in the IOCDS.*
- *The Mgr field will contain 1, 2, or 3. A 1 means that this session is connected through the loopback address of the 2074 TCP/IP stack. Only two of these sessions (usually one for each ESCON adapter) are permitted. A 2 means a normal LAN TCP/IP connection is used for this session. (The session could be on any of the four LANs supplied with a 2074; the LAN identity is not relevant at this point.) A 3 is for OMA/2 tape drive emulation.*
- *The Parameter field can contain a number of options, as explained elsewhere.*

Start device manager parameters

This is a subpanel for the F2 (Device Configuration) panel. This panel can be used to set options that apply to all the sessions in the associated F2 panel.

Start Device Manager Parameter Input/Display

```
1  AWS3274
2  LAN3274 > /PORT=3270  /RSP  /RTO=60
```

F1=Help F7=Up F8=Down F10=Accept/Return ENTER=Accept Data Esc=Cancel

LAN configuration

The LAN configuration is common to both ESCON sets and all DEVMAPs. The panel (often known as the F4 panel) can be accessed when working with either ESCON set and any DEVMAP. While not apparent in the following example, the fields that may be changed are displayed in red. You can type over these fields when using the panel.

Four LAN interfaces are supplied with the 2074-003. Two are Token-Ring and two are Ethernet. A typical installation will use one LAN type or the other; however any combination is supported. Two LAN interfaces of each type are supplied so that you can have two similar LAN types for redundancy. If you use two interfaces, they must connect to different LANs. Smaller installations typically use only one of the four LAN interfaces.

Name panel

```
Update LAN Configuration for CA0 and CA1

LAN0 (Ether) IPaddress>10.10.1.1 Mask>255.255.255.0
Enabled?(y/n)>y Parms>metric 1 mtu 1492
IEEE 8.2.3 enabled?(y/n)>N
LAN1 (Ether) IPaddress>10.10.2.1 Mask>255.255.255.0
Enabled?(y/n)>N Parms>metric 1 mtu 1492
IEEE 8.2.3 enabled?(y/n)>N
LAN2 (token) IPaddress>10.10.3.1 Mask>255.255.255.0
Enabled?(y/n)>N Parms>metric 1
IEEE 8.2.3 enabled?(y/n)>N
LAN3 (token) IPaddress>10.10.4.1 Mask>255.255.255.0
Enabled?(y/n)>N Parms>metric 1
IEEE 8.2.3 enabled?(y/n)>N

Input file is C:\MPTN\BIN\SETUP.CMD          Press F4 for ROUTE statements
Output file is C:\MPTN\BIN\SETUP.CMD

F1=Help      F10=Save/Return    ENTER=Check Syntax    Esc=No Change
```

This panel allows you to set a 2074 name (and this name appears in other panels), and set a name for each DEVMAP. (Remember that there are eight DEVMAPs in a system with two ESCON adapters.)

Set 2074 Name and Description

```
Set for Device Map 0 -> E:\DEVMAP\DEVMAP0.CA0  
Configuration Description >  
2074 Unit Name >
```

F1=Help ENTER=Accept data; return to main menu ESC=No changes

IP route statements

This panel is important if you have anything except a single, simple, dedicated LAN subchannel. It contains the IP route statements that apply to both ESCON adapter sets. Changing this panel updates the OS/2 TCP/IP SETUP.CMD file.

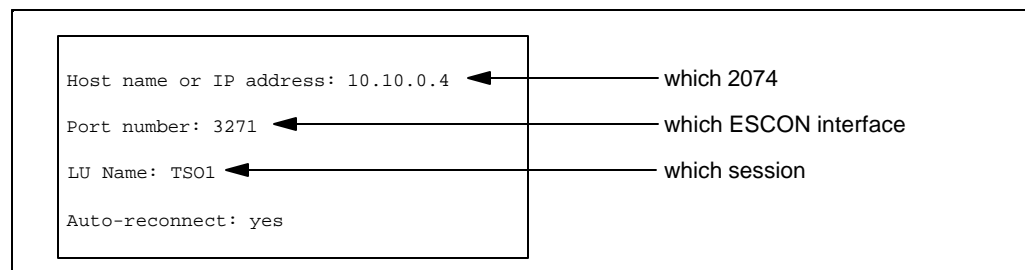
Update Route Statements

```
route -fh  
route add default 10.10.0.100  
rem route add -net 9 10.10.0.100 -netmask 255.255.255.0
```

F1=Help ENTER=Accept and return ESC=Return with no changes

Client TN3270e parameters

While not part of the 2074, every TN3270e client must have certain parameters set. The method for doing this (and the parameter field names) will differ among clients but the basic information that must be supplied in the same in all cases. PCOM uses the following field names; other emulators will probably have similar names.





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