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3728 Communications Control Matrix Switch Presentation Guide

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ABSTRACT

The 3728 Communications Control Matrix Switch was announced by IBM on August 20,1985. The material in this document has been used to provide technical education to customers and Systems Engineers about the 3728. This document discusses the characteristics, the components, and sample configurations of the 3728 Matrix Switch. This presentation is a general product overview of the 3728.

Foil 1:

Each 3728 Communications Control Matrix Switch is built of components. Each component will be described and its function in the switch will be discussed. Several possible 3728 configurations will be reviewed.

Operational considerations will be discussed.

Foil 2:

From a networking standpoint our environment looks very similar to this one. This could be a single or multi-site communications network complete with applications, some variety of access method (such as VTAM or TCAM) and a communications controller front-end (3705/3725). Running in the 3725s is some kind of control program (NCP, EP, or PEP). Associated with with the 25's are the 3727 Moss Consoles. These consoles provide the 3725 with hardware and microcode support facilities and can provide for 3725 reconfiguration via port swapping. The RS322 and V.35 lines are attached off the 3725 LICs. Modems and DSUs provide for the telco interface out into the network finally ending at the PU/LUs of the end user.

This is the environment into which customers have grown today. They have taken the networking products which IBM and others offer, and have built to the various stages of development todays networks with alternate routing, dynamic routing, path tables and switching that are basically controlled through the access method and 37x5 control programs.

Foil 3:

With the introduction of the 3728, IBM expands the opportunities and capabilities within the IBM product line. We now provide a communications control matrix switch that will sit in front of your 37X5's irregardless of what is behind them. It is not software sensitive. The RS232 or V.35 cables from the 3725 LIC ports connect into the 3728. The RS232 or V.35 signals are switched through the digital portion the switch. These signals are switched to a odem or to another DTE (a 3725 for example). In addition, the analog side the modem could be switched to variety of lines on the downstream side of the 3728. The 3728 switch can provide both digital and analog switching, one or the other or some combination of the two.

You will notice that the 3727 MOSS consoles are missing from the 3725s. 3725 MOSS consoles now can be emulated through a 3728 console. This function is available when the PC-XT and its 3728 program product are used to control the 3728. If you elect to not use the PC/XT, the 3161 will provide control of the 3728 switch itself. In that mode, the 3161 does not provide the Moss Console support.

You will often see the switch diagramed in some form of a "U" shape. A lot of documentation uses that only to indicate that within a single

switch, we have both a digital and analog function that can be performed by the switch. The actual configuration you end up with is based on the customer switching requirements and the number of lines to be switched.

Foil 4:

Again this is a matrix switch, a hardware component of the network. The software involved in the switch does not come from any host. Microcode for the 3728 is loaded from a mini-tape cassette on the switch into the microprocessor. The microprocessors themselves are redundant.

The 3728 is a time-division multiplexed switch. The time-division multiplexed architecture allows the switch to be loaded in any capacity without interference of throughput. In a TDM, all port cards are allocated a time slot and all ports connected to the card are allocated the same amount of time so loading the switch does not affect throughput.

This is a blocked matrix switch. There is a continual discussion going on as to whether blocked or non-blocked architecture within matrix switches is best. A later chart will show what we mean by our implementation of a blocked architecture and how it relates to the 3728 matrix switch.

The 3728 is designed to either replace a manual AB switch which exists today or to replace a patch panel. Again, the switch itself is transparent to any access method software or 3705/3725 software. The 3728 is, again, a data communications switch. The 3728 does not switch dial connections through the analog side of the switch. It is not a PBX. While some PBX's state they can handle switching data and voice, the 3728 does not switch voice.

Foil 5:

We can logically connect 3725/3705 cables through the switch to the modems and can switch links between modems and the analog lines. Switching can be done manually, ie. operator initiated, or automatically, ie. event driven. Manual switching is done through the 3728 console, either 3161 or PC/XT; automatic switching is set up and executed using the PC/XT as a console. More information will become available on both the rational and examples of automatic switching on the 3728.

The 3728 supports multiple predefined configurations. The 3728 will store three configurations in the switch in battery backed-up microprocessor cards. One of these configurations is the active configuration for the switch. The other two are backup or alternate configurations for the 3728. In the event of a power failure which effects the entire 3728, (eg. total building power failure), the active configuration is saved in the battery backed-up memory so that when the 3728 is powered up, the last active configuration comes up with it. You don't have to reactivate your last active configuration.

The 3728 is designed to simplify backup of 3725. Backup of 3725s can be defined in multiple steps, depending on what failed. The backup of a lost scanner differs from the backup of an entire 3725. Do you iml the scanner? Do you reload the entire 3725? Do you switch to a backup 3725? Those are decisions customers have to make. Somewhere between patch panel switching of lines; use of matrix switches that are available today; and alternate routing and dynamic reconfigurations via software; customers have come to some understanding today of how to perform network backup.

With the 3728 Matrix Switch, we are offering another option to allow configuring and implementing a backup network configuration. This configuration could be invoked from an operator console or automatically from a PC/XT. The consoles supporting the 3728 are the 3161 or a PC-XT running the 3728 program product.

Foil 6:

On the analog side, the 3728 allows for modem sharing. We also use the term, modem sparing. Should you decide to use a modem pool, the 3728 would provide the facility to switch modems in and out of line connections.

The 3728 console, PC/XT, can replace the 3725 console,(the 3727). You don't lose any of the function that you currently have in the 3727. The connection to the 3725 is through the second async adapter port on the PC-XT. The software control for this 3727 emulation function resides in the PC-XT. In a remote control type of operation involving 3725s, you can provide remote Moss support. This is not IBM's answer to the remote Moss requirements that have been levied against the 3725 product. But it is

an option, so that if you are doing switching with a 3728, you can use the same PC/XT console facility to have remote Moss support.

As a communication product, the 3728 is designed to address the network availability problem, giving you faster, if not automatic switching of lines as they fail. The design of the product from a hardware standpoint is as a fully redundant system component. There is no single point of failure within the switch. However, given this general statement, each unit of the 3728 gets its power from a single power cord which drives the two power supplies. The TDM bus itself is a physical wire implanted in the backplane. Those are the only two common areas of the switch that could take one unit of a switch down. Everything else that controls the switch itself is redundant. Should an individual port card fail, only the lines on that port card are down. The drivers from the port cards to the TDM bus are designed so that in a failure, the driver disconnects from the bus. One port card cannot short out the entire bus. You will lose only the slot that the port card exists in.

For the PC-XT or the 3161, we can provide centralized control of remote nodes, switches. There are 61 nodes in the addressing structure of 3728s. The PC-XT takes a node number, and is defined as a node. When you logon to the PC-XT you actually logon to that node. You can logon to a switch by its' node number. These are the only two devices that take a node number. A node is defined as an addressable unit. It is either a switch or a PC-XT. You can logon to a switch and control that switch either locally or as a remote switch. You can logon to a PC/XT and setup files.

The 3728 does give full support to LPDA functions of IBM modems. Some matrix switches don't pass either pin 18 or pin 25 of the RS232 interface. The 3728 switch does pass both pins and as such gives full LPDA support. The 3728 can enhance problem determination. The 3728 provides the capability to switch around suspected failing components. These components could be anything from an individual 3725 LIC card to the link going out to PU at the end of the line. Wrap blocks may be installed in the 3728. Internal wrapping may be also be performed within a 3728 port itself. These wrap capabilities in the 3728 may be used with the diagnostics of the 3725 or diagnostic capabilities from a datascope. You could wrap internal to the switch and setup a wrap that can go downline to a modem and come back to the switch itself.

Foil 7:

In referring to the connection between a 3725 and a PU, we identify the cable connection as DTE or DCE. The 3725 is a DTE and the modem is a DCE. When the 3728 is cabled between the 3725 and a modem, its' appearance is as though it were transparent to the network. Define the connections as though you were inside the 3728 looking out. Looking towards the 3725, you see the 3725 as a DTE, thus you (the 3728) must be a DCE. Likewise, looking towards the modem, you see a DCE, thus you (the 3728) must present a DTE interface. In the case where the 3725 is using the 3725 Direct

Attach Cables (eg. 3725 cable groups 88 or 1400), the 3728 sees a DCE coming in and thus requires a DTE interface for this cable.

Foil 8:

In this product overview we now shift to the components which are used to build the units of the 3728. In the base unit of a 3728 are redundant power supplies, microprocessors, and timing cards. In addition, you'll find up to six types of option cards and three types of port cards. The base unit also includes a mini-cassette tape unit which contains the microcode which is initially loaded into the microprocessors at power up time.

Foil 9:

Every 3728 Communications Control Matrix Switch has a base unit. The base unit is more a logical definition than a physically different unit from the extension units of a 3728 switch or node. Within the base unit are two totally redundant power supplies; two redundant micro- processor cards ; and two redundant timing cards. These three elements power supplies, microprocessor cards and timing cards represent the only common logic elements within the unit. That is, a total loss of one of these elements could effect the entire unit. The redundancy of these elements allows for any one element to fail and the switch would not be affected. The backup element would take over the function without impact to the operations of the 3728 or to the data links using the switch. The next three ports are controlled by a microprocessor card and are located on the microprocessor back-panel. These are the Remote Test port, the Switch Control Console port and the Switch Logging Printer port. Each unit contains space for four option cards and fifteen Port cards. The Port card slots are the ones used for establishing the data transfer connections through the switch. These are the resources which determine the capacity and content of your switch. Cable connector panels are installed in the rear of the base unit and are accessible from the back of the 3728. All cabling is done through these panels. In general, there is one panel for each card installed in the 3728. The Minicassette Tape Drive loads microcode into the microprocessor card.

Foil 10:

If your switching needs exceed the capacity of a base unit, then extension units are added to the base unit. A 3728 switch can be expanded to include fifteen extension units. Each extension unit contains the exact redundancy found in the base unit. There are two power supplies, two microprocessor cards and two timing cards. All other features found on base unit are also available on each of the extension units. The base unit required the minicassette tape drive while the extension units have that as an option. Each unit has its own 110 Volt power cord.

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Foil 11:

The redundant power supplies share the power load on each unit. Should a voltage loss or deviation be sensed from one power supply, that power supply is failed and the other supply picks up the full load. A single power supply could indefinitely power the unit. The failed power supply can be powered off, unplugged, replaced, reconnected and powered on without affecting the rest of the switch. These power supplies require a single phase 110 volt power source. Each unit is connected to the power source by its own cable.

Foil 12:

The two microprocessor cards in each unit of a 3728 switch are Intel 8088 based, and provide the initial and the operational control of the 3728. The two microprocessor cards are mirror images of each other. Using background diagnostics, the microprocessors monitor each other. In the case where the primary microprocessor card fails, the secondary nondisruptively takes over in full support and knowledge of the configuration of the switch. The failed microprocessor card may be powered off, removed and replaced without impact to the switch. These, as all cards in the 3728, are hot-pluggable. Each pair of microprocessor cards provides control to its own unit.

Up to three configurations for the switch can be stored in battery backed-up memory on the microprocessor cards. The currently active configuration is also stored in battery backed-up CMOS memory.

The consoles are controlled by the microprocessor card. This means that any configuring or changing of configurations is done through the microprocessor card. When one configuration is made active, those specific port connections are loaded into the participating port cards. Once a configuration is active, the MP cards are only used for driving the consoles and printer. They could both be powered off and not impact the data being passed through the switch. That is entirely controlled through the port cards. However, you need the MP cards and the console to change a configuration and to receive messages reflecting events which occur on the switch.

On power up, the minicassette tape drive loads the microcode for the switch into the primary microprocessor card. The primary then loads the secondary.

Foil 13:

The master timing cards provide the clock for the Time Division Multiplexed bus in each unit. These are also totally redundant and can switch from primary to backup without impact on the switch. These cards are also hot pluggable. Within a multi-unit 3728 switch, the timing in the base unit synchronizes the master timing cards in the other units of the switch. The actual timing of each units' TDM remains under full control of that units' timing cards.

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Foil 14:

The Remote-test port is functionally a part of the Microprocessor card on each unit of a 3728. It uses an IBM 5541 modem or equivalent (Bell 103/212 compatible modem). The Remote Test port makes available a dial access port into the 3728 for operations of the switch. This port is designed to allow remote engineering access into your 3728 for diagnostic purposes should that ever be needed. However, this dial access port could be used by you for the occasional operation of the switch from a dial terminal.

Foil 15:

A port on the microprocessor back panel provides the interface for the switch control console. This is an asynchronous ASCII port capable of speeds from 75 to 9600bps. The speeds are selected via dip switches on the back panel. This port supports a 3161 or equivalent console in direct support of the 3728. This console is the operator interface to configuring and controlling the 3728 switch. If a console is connected to this port, a logging printer is required to record all events which may occur on the 3728 switch.

Foil 16:

The switch logging printer also connects to the 3728 via the microprocessor back-panel. It is an asynchronous ASCII port capable of speeds from 75 to 9600bps. The speed is also set via dip switches on the microprocessor back panel. This printer is required to provide a permanent log of the events which the switch senses. These events reflect configuration changes made by an operator and any alarms or messages generated through the switch. Without a printer, up to eight messages could be queued for the 3161, but the next would be written over the first message. Thus a printer, the 4201 Proprinter, is required if you have a 3161 Switch Control Console. A Switch Logging Printer will log messages of this switch and any other switch that is set up to send its messages to this node. The printer can be a central point of reference for activity on multiple switches. In this case, the remote node logs its own messages plus ships a copy back to the controlling node and its' printer.

Foil 17:

The EIA/8 Port Cards provide either the DTE or DCE electrical interface between a device and the 3728 port. Each of these port cards will support up to 8 ports of RS232 at speeds of up to 19.2kbps. All eight ports may be run at 19.2kbps without restrictions. The same card supports the DTE or the DCE interface. The difference is in the cabling and back-panel connectors. The ports of an EIA/8 card may be internally clocked by the 3728. Sixteen of the twenty-three leads of the RS232 interface are passed through the switch. Pins 18 and 25 are passed. These provide the support of the LPDA function utilized by IBM modems.

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Foil 18:

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The EIA/8D card supports the same port functions of the EIA/8 card. However, it takes 2 of the 15 timing slots on the TDM to support each of these cards. The need for this card is defined in an appendix of the 3728 Installation Planning Guide. Basically, any device put serially into a communication link can induce some amount of phase jitter to signals passing through it. When type A Scanners on a 3725 are fully populated with 8 LIC cards, and are running at 9.6kbps or greater, the phase jitter introduced by the 3728 caused the 3725 scanner to occasionally lose a data bit. The resultant error shows up as 11B1 errors on the 3725 and/or retransmissions which result in high error-to-data ratios on some lines. Using two time slots in the 3728 reduces the phase jitter to an acceptable level at the 3725. This problem could just as well be resolved by 'depopulating' the 3725 scanner to only seven LICs. Review the configuration for more details on this.

Foil 19:

The VF/16 Port Card is the analog port card. It provides the electrical interface for the four-wire leased line analog input from telecommunications lines to modems. Each card supports 16 such lines. We do not support switching of voice or the digital input to a DSU.

Foil 20:

The V.35 Port Card supports the DCE or DTE V.35 electrical interface between the 3728 port and the device. Each of these Port Cards can be strapped to support either four or two lines. In the four port mode, each of the ports on the V.35 card can support lines up to 76.8kbps. In the two port mode, each port can support lines up to 153.6kbps. The V.35 card passes twelve leads.

Foil 21:

The 3728 does not monitor data itself. It does provide for external test equipment to passively or actively monitor ports in the switch. The RTM option card provides four ports for external monitor equipment to passively monitor RS232 ports. The RTM can optionally provide monitoring of an analog VF port using an analog adapter. Each RTM card takes one of the 15 port slots in the 3728 unit. You can install multiple RTM cards in a 3728 switch as required. The RTM card itself has a set of LEDs on the front of the card and can monitor the EIA leads for any of the ports in the switch. Switches on the front of the RTM card allow selecting the desired port.

Foil 22:

The Active/Passive Test Switch allows connection of monitoring equipment which can actively test a line. The A/PTS option card does not take a port slot, but does require an RTM port card. The combination of both these cards will allow you to both passively monitor and actively test RS232 ports(or lines). In passive monitoring, receivers monitor for specific

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port addresses. In active testing, the test equipment drives signals through the 3728 ports. The 3728 provides the monitoring and port connections, not the test equipment.

Foil 23:

The passive monitoring and active testing of the V.35 ports is providing by the Real Time Test Card, the RTT card. The RTT card uses one of the 15 port card slots and provides two connections for test equipment. Multiple RTT cards may be installed in a 3728 unit. The test equipment must be provided by the customer.

Foil 24:

The Network Control Interface option card (NCIC) provides the interface for attaching PC/XT consoles and the communications links between 3728 switches. This card provides support for 4 connections per NCI card. Up to two NCI cards may be installed in a 3728, but only in the base unit. The NCI card supports an asynchronous ASCII protocol at speeds of 75 to 9600bps. The cumulative speed of all the NCI links cannot exceed 9600bps. From one NCI card, you can, for example, connect one PC/XT console and three remote 3728 switches. This card uses one of the four option slots, not a port card slot.

Foil 25:

Automatically included in each unit of a multi-unit 3728 switch are Extension Unit Control cards. One EUC card is included in an option slot for each unit. These cards control inter-unit communication and provide a bi-directional control link in a 3728 switch.

Foil 26:

The final option card offered is the Multiunit-Switch/8 card. This card provides the port connections to pass data between units of a 3728. The card's primary function is to allow the testing of any port in a switch from test equipment installed off the base unit. Up to four MS/8 cards may be installed in the switch, but each takes one of the fifteen port slots in each unit of the switch. The MS/8 card will also allow for an occasional inter-unit port connection to be made. There are eight channels for data transfer per card. One RS232 port connection between units takes two of these eight channels. You can see that this mode of making port connections could become very expensive.

Foil 27:

Each unit of a multi-unit 3728 switch is in effect, a self sufficient unit with redundant power, microprocessors and timing. The interconnections of these units are for the purpose of providing a common console and co-ordinated control of all the units. In addition, port testing data can be passed back to centralized test equipment via the MS/8 cards. Should any unit fail completely, we will have lost that unit and its port connections. Control of the remaining units will continue by the reverse cabling. Timing control between units is used to maintain synchronization of the timing cards. This control is assumed by the timing card in the highest active unit.

Foil 28:

The whole purpose of switching is to provide stability and flexibility to a network. The switch must be able to allow recovery of failed elements, through switching, without introducing more instability into the network. The 3728 is a blocked switch. Blocked architecture limits the any to any port connections within the switch. Any to any connections may be established but only within that unit of the 3728 switch. With all the redundancy that we have of the common elements, the remote chance of a unit failure would only create an outage to the ports on that unit, not to the entire switch, as could happen with this same scenario on a nonblocked matrix switch. The 3728, as a blocked switch, can be grown by adding only the additional units required to handle new ports. A blocked switch must be carefully planned and configured. There is an IBM configuration aid available to SEs, which will assist in this configuration process. In planning for a blocked switch, you must be able to identify which ports are to be connected in a normal and a backup environment. Future growth must also be considered in configuring. All ports which may be connected need to be assigned to one unit. For example, in a symmetrical 3725 to 3725 backup, scanner one in the first 3725 is backed up by scanner 1 in the second 3725. In this case one 3728 unit would be defined as containing all the scanner ports from both scanner one's and the ports from the modems representing these lines

Foil 29:

All controls of the 3728 are handled through the console. At the Switch Control Console the 3728 is defined. The ports are identified and configurations are built. The operator selects and loads the configuration which runs the switch. Changes to configurations are made from the console. Triggers and alarms are set via the console. Monitoring and report generating are also done from the console. This console is a 3161 or 3161 compatible Asynch/ASCII terminal. The 3728 must have at least one console, but the 3161 console can be cabled into any unit of the 3728 switch. This allows multiple 3161 consoles on a switch; One per unit. The console presents full screen, menu driven panels to the operator. While there is only one active configuration on a 3728, there can be stored three predefined configurations for the switch. The operator can select and update any of these three. Note that if the active configuration is selected, any changes done are immediately reflected in the switch port connections. This console can also be used to control other, remote 3728s through the NCI link. Also required if the console is the 3161, is a Switch Logging Printer. This satisfies the requirement that a history of events be maintained for reference.

Foil 30:

While the 3161 is the basic console offered with the 3728, a PC/XT may be used as an operations console. In this mode the PC/XT is referred to as the Support Processor. All functions available with the 3161 are available with the PC/XT. In addition, using the 3728 licensed program product, command lists may be generated and stored on the PC for use in an automatic operations environment. These command lists can be invoked by pre-defined events on the 3728, or by time. In addition, a Message log is maintained on the PC/XT hard disk. The Message Log will store 32 32K files. Also on the hard disk is space for about 600 additional files. These files can be additional configurations, and command lists. The software allows full editing capability of the stored files. One further function available only with the PC/XT and its software is the support for 3725s. Ths PC/XT can emulate the 3727 MOSS console for local or remote 3725s, attached to a 3728. While the 3161 attached to a port off the Microprocessor Card, the PC/XT attaches to one of the four ports of an NCI Card. The speed of this link connection is a maximum of 4800bps. Logically, the PC/XT is addressed an another node. So for the 61 node addresses available, 3728 nodes and PC/XT consoles use these addresses.

Foil 31:

The PC/XT as a support processor console for the 3728 requires these components. The standard keyboard; 640K of RAM; a 10 Meg Hard disk with 320KB floppy diskette; math co-processor and two RS232 communications adapters. The two adapters are used by connecting to the NCI port with one, and to a 3725 MOSS cable on the other. In addition, a color adapter and monitor are required. The printer adapter and color printer are optional when the PC/XT is the 3728 console. The historical log is maintained on the PC/XT hard disk, but a printer is handy when performing and recording configurations. The licensed program product is required. This is not a DOS based product. This means you cannot multitask this PC to perform both DOS based functions and operate as a 3728 console.

Foil 32:

A switch configuration using Support Processors in a multinode environment might look something like this. The PC at Site one can control switches at all three sites. In addition, this same console can become the MOSS support console for 3725s in Site one or can become the console at site two and become the MOSS console for Site two's 3725s. Messages from all sites are logged at their own site and are sent on to Site one for logging on that PC/XT. If the console is in emulation mode when a message is sent in from one of the 3728 switches, a notification message is placed on line 24 of the PC in emulation mode. The operator can leave emulation mode and retrieve the message or, if a printer is attached, just look at the printer.

Foil 33:

Four manuals are published on the 3728. The Introduction Manual and Installation Planning and Configuration Manuals will describe the 3728 switch and its functions. The Configurator on Hone assumes that you have the Installation Planning and Configuration Manual and have filled in the configuration charts in the appendix before you attempt to do a configuration. The Operations Guide defines the basic function and operations which the 3161 supports. The Support Processor Operations Guide defines the PC/XT additional functions and operations. So if you are using a PC/XT for a console, you must reference the Operations Guide and the Support Processor Operations Guide. In addition to these, the Raleigh World Trade Systems Center has a very good manual on the 3728. It is the IBM 3728 Installation Guide and is form number GG24-1738.

Foil 33:

Two configuration examples of the 3728 follow.

IBM 3728

COMMUNICATIONS

CONTROL

MATRIX

SWITCH

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AGENDA

• CHARACTERISTICS

• PRODUCT OVERVIEW

• **OPERATIONS**

• DOCUMENTATION

• EXAMPLE

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Environment BEFORE IBM 3728



Environment AFTER IBM 3728



- Communications Control Matrix Switch
- Telecommunications Hardware Component of the Data Communications Network
- Redundant Microprocessor Based System
- Utilizes TDM Internal Processing Architecture
- Utilizes 'Blocked' Architecture to Achieve Highest System Availability
- Replaces Manual A/B Switches
- Transparent to 37X5 Software

- Connects the IBM 3705/3725 Cables to Modems, and Modems to the Telecommunications Lines
- Provides for Manual or Automatic Switching and Patching of Modems and Telco Lines between 37X5's or between Ports on the same 37X5
- Supports multiple pre-defined switch configurations
- Simplifies 3705/3725 Backup
- Operations via PC-XT or 3161 Async ASCII Display

- Allows for Modem Sharing
- Replaces the 3727, the 3725 Console (PC-XT only)
- Enhances Network Availability
 - Faster/Automatic Telco Line Switching/Patching
 - High Availability
 Design via Redundant System Components
 - Centralized Control of Remote Nodes and 3725's -Maximum of 61 Interconnected Nodes
- Enhances Network Problem Determination via Messages and Alarms

3728 Attachment





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3728 Attachment



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Components

Base Unit Schematic



Components

- Base Unit
 - One per Node
 - Redundant Power Supply
 - Redundant Microprocessor
 - Redundant Timing
 - Remote Test Port
 - Switch Control Console Port
 - Switch Logging Printer Port
 - Four Option Card Slots
 - Fifteen Port Card Slots
 - Connector Panel
 - Minicassette Tape Drive

Components

- Extension Unit
 - Zero to Fifteen per Node
 - Redundant Power Supply
 - Redundant Microprocessor
 - Redundant Timing
 - Remote Test Port
 - Switch Control Console Port
 - Switch Logging Printer Port
 - Four Option Card Slots
 - Fifteen Port Card Slots
 - Connector Panel
 - Minicassette Tape Drive (Optional)

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Components

• Power Supply

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- Two per Unit
- In normal operations, both share the power load
- If one power supply fails, the other non-disruptively picks up the entire load
- Power supply is 'hot pluggable'
- One single phase power outlet per unit
- Power boundaries are per unit

Components

• Microprocessor (MP)

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- Two per Unit Intel 8088
- In normal operations, primary microprocessor controls the unit
- If primary fails, secondary non-disruptively continues processing for the unit
- Microprocessor is 'hot pluggable'
- Processing boundaries are per unit

Components

- Master Timing (MTC)
 - Two per Unit
 - In normal operations, primary timing card controls the unit and node
 - If primary fails, secondary non-disruptively continues timing for the unit and node
 - Timing card is 'hot pluggable'
 - Base unit MTC is master of node. It controls the clocking for all extension units.

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Components

- Microprocessor Connections
 - Remote Test Port
 - One port per unit
 - Asynchronous ASCII dial in 300/1200 BPS port
 - IBM 5541 or Bell 103/212 compatible external modem required
 - Purpose is to allow a remote specialist to dial in to observe and control the node

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Components

- Microprocessor Connections
 - Switch Control Console Port
 - One port per unit
 - Asynchronous ASCII 75-9600 BPS Port
 - Directly connects Switch Control Console (SCC)
 - Purpose is to allow an operator console for controlling of the node
 - Supports 3161 or 3161-Compatible Terminal

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Components

- Microprocessor Connections
 - Switch Logging Printer Port
 - One port per unit
 - Asynchronous ASCII 75-9600 BPS Port
 - Directly connects Switch Logging Printer (SLP)
 - Purpose is to log all commands entered and all messages generated by the node or the interconnected nodes
 - Printer 4201 Proprinter with a Serial Adapter

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Components

• Port Cards

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- EIA/8
 - Provides the electrical connection between the device and the port
 - Supports EIA RS232C (V.24) interface at speeds up to 19.2 KBPS
 - Supports 8 Interface Ports
 - Two types DTE or DCE
 - Optionally, can clock connection
 - Sixteen leads passed

Components

• Port Cards

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- EIA/8D
 - Same as EIA/8 Except:
 - Low jitter options
 - Supports fully configured 37X5 scanner configurations
 - Uses two port slots

Components

• Port Cards

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- VF/16

 Provides the connection for the analog interface to the telecommunications line

- Supports four wire telecommunications lines

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- Supports 16 ports

Components

• Port Cards

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– V.35

- Provides the electrical connection between the device and the port
- Four types DTE or DCE
 V.35/4-Speeds up to 76.8 KBPS per Port
 V.35/2-Speeds up to 153.0 KBPS per Port
- Optionally, can clock connection
- Twelve leads passed

Components

• Option Cards

- Real Time Monitor (RTM)
 - Passively monitors up to four EIA or VF ports simultaneously
 - External hardware monitor required VF requires analog adapter and may require analog/digital conversion
 - One or more per unit
 - Uses a port slot

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Components

• Option Cards

- Active/Passive Test Switch (APTS)
 - Connects External hardware monitor to an RTM port for passive monitoring or to a data port for active testing of RS232C or VF ports
 - Acts as a logical A/B Switch
 - Uses an Option Slot

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Components

- Option Cards
 - V.35 Real Time Test (RTT)
 - Active testing or passive monitoring for two V.35 ports
 - External hardware monitor required can use EIA or V.35 monitor hardware
 - One or more per unit
 - Uses a port slot

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Components

- Option Cards
 - Network Control Interface Card (NCIC)
 - Provides communications interface for PC-XT and connection to remote nodes
 - Asynchronous ASCII protocol at speeds from 75 to 9600 BPS
 - Base unit only
 - Maximum of two per node
 - Supports four lines total speed cannot exceed 9600 BPS
 - Uses an option slot

 $\sum_{i=1}^{n}$

Components

- Option Cards
 - Extension Unit Control Card (EUCC)
 - Connects base and extension units for control and reporting
 - Provides Redundant connections between units
 - One per unit required in multi-unit switch
 - Uses an option slot

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Components

- Option Cards
 - Multi- unit Switch/8 (MS/8)
 - Provides inter-unit data path
 - Allows a port in one unit to connect to a port in another unit
 - Allows monitor data to be passed from a port in one unit to an RTM in another unit
 - Eight channels per card
 - Four per unit
 - Uses a port slot

COMPONENTS

BASE UNIT SCHEMATIC



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COMPONENTS

MULTI-UNIT SCHEMATIC



Extension Unit Control Channels Master Timing Channels Multiunit Switch/8 Channels -----

CONCEPT

- Blocked Architecture

- Minimal Provision for Cross Unit Port Connections (Does not provide true 'any to any' port connections)
- Better Availability
 - Single Unit Failure (E.G. Bus Failure) Only affects that unit
- Allows for incremental growth Expandable by unit
- Slightly more difficult to configure

CONCEPT

— Blocked Architecture



SWITCH CONTROL CONSOLE (SCC)

• NODE OPERATIONS

- DEFINE NODE PARAMETERS
- SELECT NODE CONFIGURATION
- RESET/RELOAD NODE
- ESTABLISH CONNECTIONS AND PATCHES
- DEFINE ALARMS
- GENERATE REPORTS
- OBTAIN STATUS INFORMATION
- DISPLAY NODE MESSAGES
- DEFINE CONFIGURATIONS
- ONE PER UNIT OR NODE

SWITCH CONTROL CONSOLE (SCC)

- ASYNC/ASCII TERMINAL, 3161 OR 3161-COMPATIBLE
- FULL SCREEN DRIVEN PANELS
- PROVIDES FOR 3 PRE-DEFINED CONFIGURATIONS PER NODE
 - ALL CONFIGURATIONS HAVE THE SAME PORT AND GROUP NAMES
 - EACH CONFIGURATION CAN HAVE DIFFERENT PORT OR GROUP CON-NECTIONS

• ONLY 1 ACTIVE CONFIGURATION

- CAN BE USED TO CONTROL MUL-TIPLE NODES
- SWITCH LOGGING PRINTER MUST BE USED FOR HARDCOPY LOG

SUPPORT PROCESSOR (SP)

- ALL SCC FUNCTIONS PLUS

• AUTOMATIC COMMAND EXECUTION FOR UNATTENDED OPERATIONS

- PRE-DEFINED EVENTS
- TIMER INITIATED
- 32 MESSAGE LOG FILES
- UP TO 600 FILES STORED ON THE HARD DISK
- FULL EDITING OF THE STORED FILES
- PROVIDES 3725 OPERATOR SUPPORT -FULLY EMULATES 3727 OPERATIONS

SUPPORT PROCESSOR (SP)

- DIRECTLY ATTACHES VIA NCI CHANNEL

- UTILIZES A NODE NUMBER

SYSTEM SOFTWARE REQUIRED FOR THE PC-XT - AVAILABLE AS LICENSED PROGRAM 5668-787

SUPPORT PROCESSOR (SP)

- PC-XT COMPONENTS:

- STANDARD KEYBOARD
- 640K RAM
- 10 MB HARD DISK
- 320 KB FLOPPY DISKETTE
- MATH CO PROCESSOR MODULE
- 2RS323C COMMUNICATIONS ADAPTERS
- COLOR GRAPHICS ADAPTER
- RGB COLOR MONITOR (5153 MODEL 1)
- PRINTER ADAPTER (OPTIONAL)
- COLOR PRINTER (5182 MODEL 1)

SUPPORT PROCESSOR (SP)



DOCUMENTATION

INTRODUCTION MANUAL - GA27-3640

INSTALLATION PLANNING AND CONFIGURATION GUIDE - GA27-3641

OPERATIONS GUIDE - GA27-3643

SUPPORT PROCESSOR OPERATIONS GUIDE - GA27-3644

3728 INSTALLATION GUIDE - GG24-1738 - Ral International Sys Ctr.

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ENVIRONMENT

- 2 PRODUCTION 3725's
- 1 BACKUP 3725, CAN BACKUP EITHER PRODUCTION 3725
- 100 LINES SUPPORTED, 50 ON EACH PRODUCTION 3725
- ALL LINES ARE RS232C (EIA/8)
- PASSIVE MONITOR SUPPORT FOR ALL LINES
- OPERATIONS VIA SUPPORT PROCESSOR
- NO VF ATTACHMENT
- NO CROSS UNIT CONNECTIONS FOR NORMAL DATA TRAFFIC
- MINIMAL CONFIGURATION

CONFIGURATION



ENVIRONMENT

- 2 PRODUCTION 3725's

- 1 BACKUP 3725, CAN BACKUP EITHER PRODUCTION 3725
- 100 LINES SUPPORTED, 50 ON EACH PRODUCTION 3725
- ALL LINES ARE RS232C (EIA/8)
- PASSIVE MONITOR SUPPORT FOR ALL LINES
- OPERATIONS VIA SUPPORT PROCESSOR
- VF ATTACHMENT FOR ALL TELCO LINES (VF/16)
- NO CROSS UNIT CONNECTIONS FOR NORMAL DATA TRAFFIC
- NO MODEM SHARING
- MINIMAL CONFIGURATION

CONFIGURATION

	BASE	EU 1	EU 2	EU 3
OPTION	EUC NCIC	EUC	EUC	EUC
PORT	MS/8 1-VF 16 Telco 5-DTE 40 Modem 8-DCE 20 Prod1 20 Prod2 20 Backup 1 MOSS 3 3725	MS/8 6-DTE 42 Modem 6 Unused 8-DCE 21 Prod1 21 Prod2 21 Backup 1 Unused	MS/8 7–VF 112 Telco 3–DTE 18 Modem 6 Unused 4–DCE 9 Prod1 9 Prod2 9 Backup 5 Unused	MS/8 8 FREE RTM 5-VF 72 Telco 8 Unused

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