

# Nixdorf 8890 Series

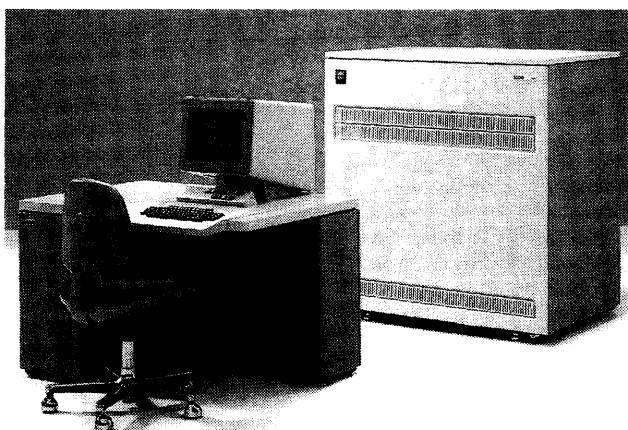
## MANAGEMENT SUMMARY

**UPDATE:** Nixdorf has retained the C72 model from the 8890 Series and added the D-models to the range. The entirely restructured range offers increased main memory, increased disk storage capacity, and a wide assortment of peripherals and software. Nixdorf has also filled in the gap that once existed for PCs to link with 8890 applications through the TEMPUS LINK.

Nixdorf Computer recorded a highly satisfactory business year with revenues for 1986 totaling DM 4.5 billion, a 15 percent increase over 1985. Of that figure, DM 2.35 billion came from Germany, and DM 2.15 came from sales in international markets. Approximately 92 percent of revenue originated in Nixdorf's major markets in Europe. At the beginning of 1987, orders on hand amounted to a healthy DM 4.4 billion, an increase of 13 percent over 1986's figure.

An imposing presence in Germany and throughout the world, Nixdorf has rallied from sluggish sales in 1985 to regain its leadership as one of the world's most dynamic computer manufacturers. Although the company suffered a severe personal loss with the death of its founder, Heinz Nixdorf, in 1986, it has made a smooth transition to a new management team committed to pursuing his ideals. Nixdorf attributes its revitalized performance in 1986 to several factors arising from an expansion of and emphasis on marketing. Drawing from its expertise as a seasoned systems supplier, Nixdorf zeroed in on users' needs in vertical markets and service. Strengthened by years of developing and refining network capabilities, the firm responded to the crucial needs of large organizations for departmental, branch, and subsidiary integration. Adding to the general health of their business year, Nixdorf PCs and microcomputers attracted new users in the professions and small businesses.

Nixdorf's ability to recognize market needs has also led the firm into intense development of applications software,



8890-D models can be upgraded in the field.

The Nixdorf 8890 Series consists of small-to medium-sized plug-compatible mainframes comparable to the IBM 4300. Capable of flexible configurations, the models in the 8890 Series can function as independent computers, components in a network, or as departmental machines.

**MODELS:** 8890 Models C72, D13, D18, D23, and D28.

**CONFIGURATION:** From 4MB to 16MB main memory; from 260MB to 730MB disk storage; and a maximum of 256 workstations. The 8705 Communications Controller supports from 2 to 32 lines.

**COMPETITION:** IBM 4300 Series.

**PRICE:** Prices range from DM 225.700 to DM 468.250, depending on model and configuration.

## CHARACTERISTICS

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## Nixdorf 8890 Series

**TABLE 1. SYSTEM CHARACTERISTICS**

	<b>8890 Model</b>				
Features	Model C72	Model D13	Model D18	Model D23	Model D28
Performance (MIPS)	0,65	1,5	1,8	2,3	2,8
Processor	CPU 200 ns +IPU +64 KB cache	CPU 60 ns +64 KB cache	CPU 60 ns +64 KB cache	CPU 50 ns +64 KB cache	CPU 43 ns +64 KB cache
Main Memory (MB)	4, 8, 12, 16	8, 16	8, 16	8,16	8,16
Operator Console	Console screen Console printer	Color screen, console printer			
Bytemultiplex Channels	—	1 with 80 KB/s	1 with 80 KB/s	1 with 100 KB/s	1 with 100 KB/s
Standard Option	2 with 35 KB/s	1 with 80 KB/s	1 with 80 KB/s	1 with 100 KB/s	1 with 100 KB/s
Blockmultiplexer Channels	—	4 with 3 MB/s	4 with 3 MB/s	4 with 3 MB/s	4 with 3 MB/s
Standard Option	5 with 2,3 MB/s	2 with 3MB/s	2 with 3 MB/s	6 with 3 MB/s	6 with 3 MB/s
Integrated Adapters	Display workstations Communication lines	User diskette	User diskette	User diskette	User diskette
System Throughput	User diskette 7 MB/s	13 MB/s	13 MB/s	16 MB/s	22 MB/s
Optional Features	—	Highspeed arithmetic unit for techno-scientific applications.			

➤ which has widened the firm's product line and satisfied acute demands in the marketplace. By paying attention to applications software, Nixdorf has acquired leverage into what is for them, new markets, such as engineering, factory automation, manufacturing, and telecommunications. In spite of the new activity in 1986, however, Nixdorf did not neglect its solid base of users in mainframes and the banking, retail, and insurance fields. The company grew substantially in retail and insurance and increased its share of the banking market, with which it is widely identified.

The revitalization of Nixdorf manifests itself quite notably in the 8890 Series of mainframes. The models within the 8890 Series include the 8890-C72 entry-level model, a bus-oriented system based on autonomous microprogrammable processors, and the 8890-D models D13, D18, D23, and D28, which can attain a maximum throughput of 2.8 MIPS. Recognizing the direction of the market, Nixdorf has tailored the series for use not only as standalone machines, but as components in a network or departmental systems.

Nixdorf has completely restructured the line by increasing its power and adding to it a vast array of compatible peripherals. Once more in tune with the marketplace, Nix-

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**DISTRIBUTORS:** Nixdorf is represented by agencies in the following countries: Argentina, Brazil, Chile, Colombia, Denmark, Ecuador, Egypt, France, Indonesia, Israel, Italy, Japan, Korea, Malaysia, Peru, Portugal, Sri Lanka, Thailand, Venezuela, Yugoslavia, and Zimbabwe.

**MODELS:** 8890 Models C72, D13, D18, D23, and D28.

**DATE ANNOUNCED:** C72—October 1985; D13, D18, D23, and D28—January 1986.

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TABLE 2. MASS STORAGE

DISK DRIVES	8370-1	8350-M1	8370-N
Capacity	260MB	280MB	730MB (2x365MB)
Type	Fixed	Fixed	Fixed
Recording Mode	FBA	CKD	FBA
Transfer/rate	1.0 MB/s	1.0 MB/s	2.3 MB/s
System attachment	Via integrated adapter to block multiplexer channel	Via integrated adapter to block multiplexer channel	Via integrated adapter to block multiplexer channel

➤ dorf has addressed the proliferation of microcomputers in the business sector by producing an expansion card that enables a PC to function as a standard terminal in a network and by introducing TEMPUS LINK, an intelligent PC/8890 link.

Before the appearance of TEMPUS LINK, the 8890 Series experienced a void in PC connectivity to its applications because data transmission in both directions created difficulties. With TEMPUS LINK, the PC user can access data from an 8890 system and make data from PC applications accessible to the mainframe. In addition, TEMPUS LINK supports the exchange of data between several PCs.

TEMPUS LINK has download and upload functions with which the PC user can increase disk or diskette capacity without hardware extensions. The PC works with "virtual" disks that reflect the 8890 system, and several PC can access the same virtual disks. The system can process PC data via standard access methods such as VSAM with NIDOS/VSE EASY and CMS with VM/ESX. Designed with open architecture, TEMPUS LINK is not dependent on disk type or on the data transmission interface of the PC.

Enhancements to the NIDOS/VSE operating system have produced NIDOS/VSE EASY for the 8890. The user IOF (Interactive Operating Facility) interface developed for EASY links all its components together in a uniform system. IOF dispenses with the need for long command sequences and enables the user to start interactive or batch functions from displayed menus through single-key selection. The simplicity of the IOF function allows individuals without extensive system knowledge to use it.

Addressing the critical area of data security, Nixdorf has incorporated data protection mechanisms within IOF, some of which include an extended IOF logon function, user-defined passwords, frequent password changes, application authorization, central application monitoring, separate passwords for each function, and an automatic logoff function.

### COMPETITIVE POSITION

As a plug-compatible system, The Nixdorf 8890 Series competes directly against the IBM 4300 Series, a range that IBM has not neglected. Recently, IBM added four new high-end processors to the 4300 Series in an effort, many ➤

### ➤ DATA FORMATS

**BASIC UNITS:** 8-bit byte; 32-bit word.

**FIXED-POINT OPERANDS:** 16-, 32-, and 64-bit operands are used.

**BYTE-ORIENTED OPERANDS:** Byte-oriented operands support the storage of customer data regardless of the main memory concept of the machine and addresses.

**INSTRUCTIONS:** The 8890 employs extended precision techniques (187 instructions) in ECPS:VSE mode. It supports the System/370 mode instruction set (183) with the exception of the multiprocessor commands.

**INTERNAL CODE:** ASCII.

### MAIN STORAGE

**TYPE:** ECL.

**CYCLE TIME:** 43 ns (D28); VLSI provides 45 ns cycle time; LSI provides 35 ns cycle time.

**CAPACITY:** Model C72—4MB/8MB/12MB/16MB; Models D13, D18, D23, and D28—8MB/16MB.

**CHECKING:** Main memory is equipped with error detection and correction facilities.

**STORAGE PROTECTION:** Data transfer to and from main memory occurs on a 16-byte data path via the interleaving technique used in larger mainframe systems. Single-bit errors are corrected immediately, and multiple bit errors are detected and referred to the corresponding retry mechanism for further handling. The integrated service processor monitors the computer's activities and responds to errors by taking autonomous action to display faulty conditions. The system offers storage protection of programs and data against overwriting and unauthorized access in 2KB blocks. Additional protection of the low address area occurs in real memory through a process known as low address protect.

**MICROPROGRAM MEMORY:** The microprogram memory stores frequently used operating system functions and control routines, an arrangement that hastens the executions of these functions and frees the CPU from routine jobs. The integrity of control programs contained in this storage system stays constant through horizontal parity checks monitored by vertical check sum techniques.

**CACHE MEMORY:** For the optimization of cache memory, Nixdorf has introduced bipolar 4 Kbit LSI memory elements. ➤

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▷ industry analysts believe, to entice users to stay with IBM instead of going over to Digital Equipment's line. The four additional 4381 model groups extend the power range of the existing 4381 models and overlap the performance of the larger 3090 models.

All this attention focused on the 4300 by IBM can only make Nixdorf's job harder. Although Nixdorf increased the memory capacities of the 8890 Series to 16MB across the line, the memory capacities of IBM's top-end offerings of the 4300 Series, Model Groups 23 and 24, extend to 64MB.

Frequently, comparisons between systems from different vendors focus on MIPS (Million Instructions Per Second), but this approach will not work with the 8890 and 4300 because IBM has not released MIPS ratings for the series. With much justification, IBM has indicated that MIPS comparisons do not accurately reflect actual performances. IBM has argued that the proper test of relative power depends upon measuring performance in a specific environment according to controlled benchmarks.

Instead of concentrating on power in megabytes and MIPS as a marketing strategy, Nixdorf will most likely stress the features that gave birth to the plug-compatible industry: price/performance ratio. In addition, Nixdorf will also do well to emphasize the space-saving features of the 8890, such as its integrated controllers and tightly-packed memory chips that result in reductions, according to Nixdorf, of up to 40 percent in floor space. In this era of premium rentals for floor space, that is no small achievement.

With the 4300, IBM has primarily targeted the engineering/scientific markets. Nixdorf's 8890 can respond to that market by the addition of a high-speed arithmetic unit. To attract users in the scientific marketplace, Nixdorf can emphasize that the NIDOS/VSE EASY is a workstation-oriented operating system that can run software specifically designed for technical applications.

### ADVANTAGES AND RESTRICTIONS

With the 8890, Nixdorf has changed the image of the mainframe from that of an unchanging machine that occupies a large amount of space in exchange for processing large volumes of data, to that of a flexible unit capable of functioning as an independent computer, a component in a network, or as a departmental machine. The 8890 moves computing power out of the computer room and into the hands of the user.

No longer an esoteric creation that responds only to the commands of specialized personnel, the mainframe in the guise of the 8890 has shed its mystery and become user-friendly. The Interactive Operating Facility (IOF) within the NIDOS/VSE EASY operating system guides the user into the system through menus and help functions. NIDOS/VSE EASY also sets the application into the foreground and spares the user vast amounts of system work. ▷

### ▶ CENTRAL PROCESSOR

**MODEL 8890-C72:** The entry-level C72 is bus-oriented and based on a number of microprogrammable processors. The central bus connects the CPU and the Instruction Preprocessing Unit with main and cache memories and with the I/O processors.

**8890-D MODELS:** The 8890-D processors are based on Emitter Coupled Logic (ECL) gate arrays. The processors include two types of ECL gate arrays:

- VLSI, 1,500 gates per chip, 0.45 nanosecond cycle time
- LSI, 550 gates per chip, 0.35 cycle time

Gate arrays with up to 108 pins are placed on chip carriers which connect the individual ICs. The chip carriers measure 22 by 42 cm and consist of ten-layered epoxy cards reinforced by glass fiber.

The 8890-D central processing units include all features offered by the IBM System/370, as well as hardware and microprograms that support the specific address structure of the virtual memory concept inherent in the IBM 4300 architecture.

The Models D13, D18, D23, and D28 offer a maximum throughput of 2.8 MIPS. With the implementation of a high-speed arithmetic unit, throughput increases considerably. Upgrades of these models can be performed in the field. The use of 256KB memory chips supports an upgrade to 16MB through the addition of a single memory board. The use of integrated 256 Kbit memory elements produces a compact design along with low power consumption and heat dissipation.

The Instruction Processor handles the execution of instructions, including I/O commands, controls and monitors channel procedures and memory access, and works with the Service Processor for console communication and in case of a hardware failure. The cache memory buffer supplies data to the Instruction Processor instead of drawing from the slower main memory.

Functions performed by the Service Processor include the following:

- Permanent monitoring of the power supply, air cooling, and humidity
- Communication between the console and the computer
- Error analysis and storage of important additional information
- Monitoring and execution of the communication with maintenance personnel during remote maintenance conducted by telephone

The systems contain several timing units, including an interval timer, programmable in 3.33 ms — 15.5 h steps, and a CPU timer, programmable in 1  $\mu$ s intervals — 143 years. The battery-powered TOD clock has a timer that needs to be set only once and subsequently runs with quartz precision in 1  $\mu$ s steps even when the machine is turned off.

**PHYSICAL SPECIFICATIONS:** The basic cabinet for Models D13, D18, D23, and D28 are 120 cm wide by 80 cm deep by 130 cm high. The Models D13 and D18 weigh 531 kg, and the Models D23 and D28 weigh 771 kg. ▶

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TABLE 3. INPUT/OUTPUT UNITS

<b>TAPE DRIVES</b> Speed Transfer Rate Recording density System attachment	8420-44 75 ips 120/470 KB/s 1600/6250 bpi Via integrated adapter to block multiplexer channel	8420-6 125 ips 200/780 KB/s 1600/6250 bpi Via integrated adapter to block multiplexer channel	8420-8 200 ips 320/1250 KB/s 1600/6250 bpi Via integrated adapter to block multiplexer channel
<b>SYSTEM PRINTERS</b> Print Speed 48 characters 64 characters Print positions System attachment	8203-ZD11 750 lpm 600 lpm 132/136 Via integrated adapter to byte or block multiplexer channel	8203-ZD12 1500 lpm 1250 lpm 132 Via integrated adapter to byte or block multiplexer channel	8203-ZD10 2000 lpm 1640 lpm 132 Via integrated adapter to byte or block multiplexer channel

➤ Nixdorf has tapped the resources of microprogramming technology to increase the efficiency of the 8890. The microprogram memory, incorporated into the system, stores often-used functions of the operating system, as well as control routines. This arrangement hastens the execution of these tasks and relieves the CPU from performing routine jobs, thereby optimizing the use of the CPU for running applications. Microprogramming also supports extended instruction sets, more operating system functions, and the addition of new peripherals.

In addition to the conservation of space afforded by the compact chip technology, the 8890 extends space-saving capabilities by offering peripherals with integrated controllers. Since the controllers do not reside in the mainframe, itself, a change in the CPU does not mandate a corresponding change in the controllers and peripherals, an arrangement that saves the user money.

The 8270 Display Workstations can also generate solid savings. Since the 8890 regards both local and remote display systems as *local devices*, the remote display user does not have to purchase a communication controller or associated software. Nixdorf also keeps cabling costs to a minimum by allowing the displays to be linked via existing coaxial cable or through four-wire cables that are economical and easy to install. Since the workstations operate on one line in a multipoint connection mode, users can increase the number of workstations whenever necessary without installing additional cabling.

By making provisions for the use of the VM/ESX operating system, Nixdorf has protected the software investments of 8870 users who migrate to the 8890-D Series. VM/ESX enables 8890-D models to run COMET/BASIC and the wide variety of vertical software supported by the 8870.

Nixdorf offers users a host of communications possibilities in the 8890 through comprehensive communications software. VM/ESN (Extended System Network) supports a ➤

### ➤ CONFIGURATION RULES

Model C72 can be configured with a 200 ns CPU, IPU, 64KB cache, main memory from 4 to 16MB (in 4MB increments), operator console, console printer, disks, and magnetic tapes.

Model D13 can be configured with a 60 ns CPU plus 64KB cache, 8MB or 16MB main memory, operator console with color screen, console printer, one byte multiplexer channel, four block multiplexer channels, disks, and magnetic tapes.

Model D18 can be configured with a 60 ns CPU plus 64KB cache, 8MB or 16MB main memory, color screen console, console printer, one byte multiplexer channel, four block multiplexer channels, disks, and magnetic tapes.

Model D23 can be configured with a 50 ns CPU plus 64KB cache, 8MB or 16MB, color console, console printer, one byte multiplexer channel, four block multiplexer channels, disks, and magnetic tapes.

Model D28 can be configured with a 43 ns CPU plus 64KB cache, 8MB to 16MB main memory, color console, console printer, one byte multiplexer channel, four block multiplexer channels, disks, and magnetic tapes.

### MASS STORAGE

The 9-inch disks used with the 8890 Series have high storage capacities. The thin-film technology incorporated into the disks enhances the flight properties of the read/write heads. The disks reside in a compact cabinet that requires only 0.43 sqm for the storage of 1.46GB (2 x 730MB). They feature a transfer rate of 2.3MB per second and a positioning time of 15 ms.

For backup purposes, Nixdorf offers magnetic tape units with high-recording densities.

For detailed information on mass storage, see Table 2.

### INPUT/OUTPUT CONTROL

The central bus in the 8890 Series connects the internal processor (CPU, IPU) with the main and cache memories and with the I/O processors. Peripherals connect via com- ➤

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➤ wide range of protocols. A multitasking system, VM/ESN can handle dialogue and batch processing. The MHF (Multihost Facility) accommodates online connections to IBM-compatible systems and XEP (Extended Emulation Program) supports SDLC, HDLC, and X.21 dial lines. □

▶ compatible interfaces and controllers that are mostly integrated into the peripherals. Standalone controllers or integrated adapters connect display workstations and communications lines. Depending on the model, up to ten block multiplexer channels can be attached. Since the peripherals link to the system via standard channel interfaces, the replacement of a CPU does not necessitate modifications in the peripherals.

To ensure high data throughput, the D models have high-speed channels that transfer 3MB per second. The attachment of each peripheral subsystem to its own separate channel greatly accelerates the I/O process.

For detailed information on input/output units, see Table 3.

### WORKSTATIONS

For use with the 8890 Series, Nixdorf offers the 8270 Compatible Display System which includes Models 8178-A2, 8179-C4, 8180-A1, and 8180-P1. The 8270 is compatible with the IBM 3270 display system or any other comparable system. A single Nixdorf 8274 control unit can replace up to eight IBM 3274 control units.

The Nixdorf screen is compatible with the IBM 3278 terminal display. Normal 4-wire cables or existing coaxial cable can implement cabling between the control unit and the display. See Table 4 for detailed characteristics of these units.

**8274 CONTROL UNIT:** The 8274 Control Unit controls both local and remote display workstations and eliminates those distinctions for the central computer, so that local and remote terminals appear to be local to the system and to application software. Users can configure local and remote display terminal workstations in point-to-point or multipoint connections. Remote workstations can attach to the 8274 via ordinary networks. The control unit can handle various Nixdorf networks, leased lines, switched lines, Datex-L, and Datex-P. Nixdorf has equipped two models of the control unit with a dual channel switch that allows two computers to use a single control unit, or one control unit can connect to two separate channels of one computer.

**8890 IHK78 PC EXTENSION CARD:** The IHK78 extension card allows personal computers to be supported by the 8890 Series as standard terminal workstations. The standard format of the IHK78 enables it to be used not only with Nixdorf 8810 PCs, but also with IBM and IBM-compatible PCs. The card has its own processor and memory for the line protocol, thereby enabling terminal emulation and protocol handling to function independently of the current PC application. The IHK78 connects to 8890 systems via the C and D models of the 8274 controller or by direct interface BSA-DA in C models via IHSS lines, V.24 modem links, Datex-L, and Datex-P (with 8274 Datex-P controller also for PCs).

To use the IHK78 PC, the PC must have a least one diskette drive, a minimum of 256KB of main memory, a monochrome or color screen, and PC keyboard. Software prerequisites for use of the card include MS-DOS from Version 2.11 and upward. The IHK78 is compatible with common PC extension cards, such as V.24 interface card, memory extension cards, and fixed disk controllers.

**WORKSTATION PRINTERS:** The range of workstation printers offered by Nixdorf includes matrix and letter quality printers, line and character printers, high-performance, and low-cost printers, which are available as standalone or desktop models. Users can choose national character sets independently of the character set configured in the display workstation. All printers attach directly to the display terminal. Users can define and initiate printer assignments from any authorized display workstation.

Every workstation printer can operate in the following three modes:

- Local mode in which hard copies of screen contents can be printed, where several display terminals share one printer
- System mode in which the printer works under the control of the CPU and is locked against local print
- Shared mode in which both local and system modes can be used on the same printer

Nixdorf offers the following workstation printers:

- Multifunction 8287-ND24/25—inexpensive needle printer in the medium performance range. Features include near letter quality mode, bar code print, variable character size, OCR print, and optional cut sheet processing.
- Matrix line printer 8289-ZD09—a high-performance needle line printer, characterized by multifunctional capabilities. Additional features, such as near letter quality mode and OCR characters, and a high print speed enables this printer to handle applications that previously could be covered only in combination with another printer.
- Mini needle printer 8287-ND26—an inexpensive printer in the low-performance range. It can be used when relatively small volumes of printing needed to required and when no multifunctionality is required.
- Needle printer 8287-ND11—for use with high-volume printing. It falls into the upper range of performance.
- Daisywheel printer 8287-TD06—a fast, modularly designed unit that can be optionally equipped with a single tractor or cut-sheet feeder. Users can select perfect letter quality in different print styles from an entire range of national daisywheels.
- Ink jet printer 8287-MD02—for use where high print speed and low noise is required.

### COMMUNICATIONS CONTROL

Communications lines can be established by standalone controllers in large configurations or via integrated adapters. The VM/ESN (Extended System Network) software package supports a host of protocols. A multitasking system, VM/ESN supports dialogue and batch processing on interconnected systems. The Multihost Facility (MHF) handles online connections to IBM-compatible systems and the interconnection of 8890 systems. The Job Transfer Program (JTP) and File Transfer Program (FTP) handle batch communications, especially the sharing of load, resources, and data.

For communication with other computers and systems, as well as for network control, Nixdorf offers communications controllers with varying performance ranges. The 8890-C72 ▶

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TABLE 4: DISPLAY WORKSTATIONS

CHARACTERISTICS	8178-A2	8180-A1	8179-C4	8180-P1
Screen size	12-inch	12-inch	14-inch	12-inch
Display screen color	Brown	Brown	Black	Switchable
Character color	Amber	Amber	4 colors	Switchable
Refresh rate	50Hz	50 Hz	60 Hz	75 Hz
Character matrix	7 x 9	7 x 9 5 x 7	10 x 9	7 x 9 5 x 7
Character set	128	128	128	128
Screen formats (standard)	24 x 80	24 x 80	24 x 80	24 x 80
Transfer rate	19.2Kbps	To 64Kbps	To 64Kbps	To 64Kbps
Power requirement	100 VA	150 VA	160 VA	150 VA
Heat output	70 VA	100 VA	110 VA	100 VA
Operating noise	0 dB (A)	37 dB (A)	37 dB(A)	37 dB (A)

► supplies integrated adapters for the attachment of a communications controller. The D models use a separate controller containing the same adapters. This arrangement accommodates the attachment of a greater number of display workstations and the implementation of additional functions. Since the 8890 system treats local and remote display stations as local displays, remote display workstations require no communications controller or related software.

Existing coaxial cables and four-wire cables can be used. Since one communications line can operate several display workstations in a multipoint connection, any subsequent attachments of additional workstations to the existing lines do not require further cabling. Remote display workstations can operate via leased, X.21, and X.25 lines.

**8705 COMMUNICATIONS CONTROLLER:** The 8705 can run under the following operating modes:

- Extended Emulation Program (XEP), a control program that enables 8890-D models to communicate with a SNA host over a SDLC line.
- Emulation Program (EP) mode
- Network Control Program (NCP) mode
- Partitioned Emulation Program (PEP) mode

Field upgradable, the 8705 has 1MB of main memory and can be upgraded to support up to 32 lines. The 8705 comes in two models: 8705-4 which supports up to 16 SNA/SDLC, BSC, and start/stop lines; and 8705-6 which supports up to 32 SNA/SDLC, BSC, and start/stop lines. The 8705-6 also has a high-speed processor that almost doubles the throughput of the standard model. Users can achieve multiple computer configurations by using a two-channel switch or a second channel adapter.

The 8705 includes frames provided by the diagnostic processor that assist with installation, configuration, maintenance, and operation. The operator can maintain and operate the 8705 remotely or locally. Modular hardware architecture facilitates expansion.

For detailed information on the 8705, see Figure 5.

XEP (Extended Emulation Program) is a front-end control program especially developed for the 8705 communication controller. In addition to supporting all function of the EP

emulation program, such as BSC and start/stop lines, XEP also supports SDLC, HDLC, and X.21 dial lines.

It must be generated on the 8890 to reflect the configuration of the 8705 and the data communication network. Subsequently, the XEP load program is transferred across the byte multiplexer channel connection to the 8705. Afterwards, the 8890 and the 8705 will appear as a PU type 2 in the SNA network. The XEP, therefore, furnishes the 8890-D models with the same SNA facilities as the 8890-C model via integrated communication adapters.

**ETHERNET CONTROLLER:** Nixdorf supports the international LAN standard Ethernet by combining the Ethernet Local Area Network Controller (ELC) and the KNET software. This arrangement supports high-speed connections between IBM systems with a /370 architecture, as well as with Unix systems, such as Nixdorf's Targon, other Nixdorf systems, Digital Equipment Corporation's VAX systems, and compatible PCs, such as Nixdorf's 8810.

## SOFTWARE

**OPERATING SYSTEM:** *NIDOS/VSE (Nixdorf Disk Operating System/Virtual Storage Extended) EASY*, an extension of Nixdorf's NIDOS/VSE, has uniform user interface functions. It includes an integrated PWS II Editor, capabilities for linking a PC or PC network to the operating system, the option of uploading or downloading between the PC and host, and improvements in the performance of TCP interactive mode. EASY, a modular system, can function in main computer centers and can also be integrated into existing SNA or BSC networks for controlling decentralized computers.

NIDOS/VSE EASY includes an Interactive Operating Facility (IOF) that furnishes menu-driven user interfaces. IOF does not require job-control knowledge on the part of the user. It provides a high degree of system transparency while safeguarding the system with a variety of data protection mechanisms. Interactive System Facility (ISF), a pregenerated, ready-to-run system, can be adapted to suit user requirements via menu-driven parameter input.

NIDOS/VSE EASY also supports the linking of a PC or PC network to the operating system. The TEMPUS-LINK optional component supplies DOWNLOAD and UPLOAD capabilities that can increase disk or diskette capacity without necessitating the upgrading of PC hardware, thereby allowing the PC to access host data and the host to access PC data. ►

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TABLE 5: 8705 COMMUNICATIONS CONTROLLER

8705 CONTROLLER	MODEL 4	MODEL 6
Memory	1MB	1MB
Cycle time	160 ns	160 ns
Instruction executing time	6-17 cycles	3-14 cycles
Lines (maximum)	16	32
Interfaces	V.24/V.21/V.35	V.24/V.21/V.35
Line speed (maximum)	5600 bps	5600 bps
Protocols	BSC, S/S, SNA/SDLC	BSC, S/S, SNA/SDLC
Channel adapter (max.)	2	2
Two-channel switch	1	1
Line adapters (max.)	4	8
Weight/Height/Depth	60 x 91.3 x 72.2 cm	60 x 91.3 x 72.2 cm
Footprint	0.433 sqm	0.433 sqm
Weight	150 kg	150 kg
Power consumption	1 KVA	1 KVA

► The operating system supports integrated procedure processing through a function called EPROC that allows job control instructions to be called up selectively under the control of parameters or events. EPROC allows procedures to be nested as often as fifteen times. Via EPROC, users can query system information, such as date, time, partition, ID, device type, or cancel code, and depending upon the response, to branch off or device independently jobs or steps to be started or aborted.

The EPROC facility allows procedures to perform tasks such as preparing messages for the user, starting other procedures, or changing job sequences within procedures. Procedures are stored in the Partition Data Set (PDS) library. The PDS libraries can accommodate the source statement library, relocatable library, and procedures.

ECON (Extended Console Support) allows one or more user terminals to be simultaneously defined as console displays. All messages to and from the system are logged in a console file, which can be printed or stored on tape. ECON allows designated terminals to perform only limited functions, e.g., display of certain partitions), even those protected by password. ECON terminals can exchange messages among themselves. Users can also specify in advance that without further input a terminal automatically switches over from console to user status after a set period of time.

VM/ESX, the carrier for virtual operating systems and 8870/BASIC applications, supports a variety of applications and is compatible with 8870/BASIC. An 8870 user can protect software investments by migrating to the Nixdorf 8890-D series. The 8890 models can run COMET/BASIC and other industry-specific software offered on the 8870.

VM/ESX, comparable to VM/SP, has as its core the control program (CP) that manages resources such as main memory, disks, printers, etc. and makes them available for other control programs or guest operating systems. The Conversational Monitoring System (CMS) runs under VM/ESX as a single-user operating system. CMS supplies the basis for creating a system environment for 8870/BASIC applications called Basic runtime system. This runtime system assumes the typical functions of an operating system such as file management and access synchronization, menu-driven user support, and device support.

LANGUAGES: Nixdorf's Cobol compiler offers compatibility with the ANS Cobol x.3.23-3974 standard. NCobol supports SAM, DAM, ISAM, and VSAM access methods. VSAM support includes file types such as KSDS, ESDS,

and RRDS. An extension of NCobol, ICM (Interactive Checkout Manager) allows programs to be checked dynamically during testing on the terminal by setting break points, changing memory contents, and running the program at a prescribed point. The Assembler converts Assembler source code into machine code via the System/370 and ECPS instruction set.

COMMUNICATIONS SOFTWARE: KNET software enables any computers that can implement the TCP/IP protocols, such as the Nixdorf 8890, Nixdorf Targon, IBM 30XX, 4300, and 9370, Siemens 7.800, Digital Equipment Corporation VAXs, PCs, and Sun workstations, to be linked via an Ethernet LAN. KNET conforms to the ISO/OSI reference model for layered network architectures and implements industry-standard protocols.

KNET controls the communication between an 8890 system, or any /370-compatible host, and the other systems connected to the Ethernet LAN. The 8890 functions as a peer on the network instead of as master in the usual master/slave relationship. KNET also supports connections over BSC lines and channel-to-channel adapters. Its architecture supports concurrent multiple communications protocols. For example, TCP/IP protocols can coexist with XNS or OSI protocols. According to Nixdorf, KNET is the only product that allows concurrent sessions to be built using different protocols over the same Ethernet.

Through the use of KNET, a host can provide remote logon services to a workstation, and remote logon can occur from a workstation to a host. Users with a 3270 terminal can logon to any workstations on the LAN as if they were at a directly attached ASCII terminal. The user at an ASCII workstation can also logon to the mainframe as a 3270 device. The 3270 full screen emulator supports bidirectional emulation for any ASCII terminal on the network.

KNET offers direct file transfer between 8890 systems or IBM System/370 mainframes and other systems through the implementation of TCP/IP File Transfer Protocol (FTP). KNET also implements the UDP/IP Trivial File Transfer Protocol (TFTP) for transferring files between the mainframe and IBM compatible PCs. FTP also provides remote directory services and translates workstation files and data into recognizable structures for the IBM System/370 mainframe.

MULTI-HOST FACILITY (MHF) allows NIDOS/VSE DDP users to access remote computers and allows them to share the applications of the computers. MHF emulates a



## Nixdorf 8890 Series

► remote control unit and can operate as a BSC or SNA control unit. It is also possible to emulate several control units. Each virtual control unit supports up to 32 devices.

*VM/ESN (Virtual Machine/Extended Systems Networking)* is a network software subsystem that allows a VM/ESX or VM/SP operating system to communicate with other systems. It supports Systems Network Architecture (SNA) using SDLC transmission facilities. In SNA networks, VM/ESN connects an 8890 system to a SNA host as a Boundary Node (2780/3780 and 3770 emulation, as well as 3270 emulation). It supports point-to-point protocols including 2770/2780/3770/3780 and HASP multileaving.

VM/ESN complies with the ISO Reference Model for Open Systems Interconnection. It supports the following Remote Spooling Communication Subsystem standards from IBM:

- NPT—Non-Programmable Terminals for 2780 BSC batch procedures
- SML—Spool Multi-Leaving for BSC links between the host and RJE nodes

UTILITIES: *ESF/VSE* can spool to disk printing, reading, and punching for up to twelve partitions. *ESF/VSE* also supports tape spooling. Spooling data sets can be processed according to priority, and multiple outputs generated. An automatic warm-start at system start ensures the integrity of the spooled data sets.

*PWS II* is a full screen editor for online processing of PDS libraries. It has an interface to *ESF* to check on the execution and control of jobs. *PWS II* can copy, delete, insert, rename, and scroll in PDS files. It also supports access to system or private libraries for source and relocatable libraries.

*TCP with TPS (TP monitor with Terminal Printer Spooling)* has a nucleus of approximately 35K, ensuring high throughput. *TCP* controls any amount of terminals, lines, and transactions. Through its balanced store management feature, *TCP* ensures that fixed and variable buffer areas exist for terminals, tasks, lines, and files. *TCP* can handle local and remote terminals. Its file management feature controls input/output operations and keeps data consistent in concurrent updates. *TCP* programs can be written in NCobol, Assembler, CPG, and PL/1.

For all read/write operations, *TCP* records the state of the transaction both before and after updating. In an abort, the data belonging to a transaction is automatically returned to its original state (dynamic transaction backout). If an error occurs, *TCP* automatically restarts and, using log data, reproduces destroyed data to the state prior to the previous successfully concluded transaction.

*TPS* runs as an application of *TPC* as an online spooling system for the support of terminals and system printers. It can route printer data from *ESF* to any printer. Similarly, a terminal printer can route printer data to another terminal or system printer. *TPS* has interfaces that enable users to transmit data from their own programs to *TPS*.

A set of routines enables users to write network applications that can communicate with one another. These routines serve as the interface between an application and the TCP/IP network layers. A network application running in the mainframe can send data to, and obtain data, from a program running on another computer or workstation.

*NIFTY* is a utility program that supports programmers and operators in handling disk, diskette, and tape files. With the assistance of *NIFTY*, users can display, alter, or copy file contents.

**DATABASE MANAGEMENT:** Nixdorf's system, *REFLEX*, automatically combines distributed data into one database from which the user can view the information within that database in the form of tables. Descriptive query languages enable the user to inform the database about the information needed. The system offers physical and logical data independence that remains unaffected after the replacement of disks, physical storage structures, and access methods. To further ensure data independence, users can access only named tables, thereby allowing applications to remain independent of the sequence or number of columns. Users can add new tables and columns to the database without modifying existing application programs or restructuring the database.

Users can select or extract lines or columns from existing tables to create new, virtual tables. This feature allows users to design new logical views of data without changing the organization of the database. The addition of new data automatically expands the size of the database and does not require specifically allocated disk space.

Nixdorf refers to multiple independent changes to the database as "transactions," and *REFLEX* sustains data consistency even in cases of distributed transactions. It also ensures that the changes in the database will be reflected only after the execution of a successful transaction.

The assignment of user-specific privileges protects data from unauthorized access and modification. Users can define privileges all the way down to the column level.

A buffer pool in the system, which holds the most frequently used information, optimizes access time to information held in the database. *REFLEX* is integrated into the operating system and subdivided into concurrent processes serving individual users.

**PERFORMANCE ANALYSIS/MONITORING:** For performance analysis and monitoring, Nixdorf offers *MAX*, a software tool that measures, analyzes, monitors, and displays important information on CPU usage, channel and device usage, memory usage, and paging operations. *MAX* requires no additional storage capacity since it can function as a link to the existing monitor (*TCP*) or as a subtask in the spooler partition.

*MAX* includes the following features:

- User dialogue requiring no specialized knowledge
- Help functions for syntax
- Easy implementations onsite with a *SYSIN* tape
- Integration of software tool into the operating system

**APPLICATIONS SOFTWARE:** Nixdorf offers *COMET TOP*, a suite of modular software for planning, control, and monitoring activities in a company. The modules of *COMET TOP* can be used on their own or integrated with modules for other application areas. *COMET TOP* includes the following modules:

- Financial Accounting (*FINAC*)

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- ▶ • Cost and Management Accounting (COSTING)
- Order Processing/Invoicing (OP/INV)
- Stock Control (STOCON)
- Purchase Order Processing (POP)
- Production Control (FEROS)
- Payroll
- Word Processing (DETAS 8890)
- Report Generator (LIGA)
- Spreadsheet Analysis (CALC)

COMET TOP can be adapted to the requirements of various lines of business and to the size and structure of a company. Nixdorf has provided for international installation of the software by addressing country-specific concerns, such as text appearing in local languages. Nixdorf also provides worldwide maintenance and ongoing development.

**TOOLS:** COMET TOP tools include a checklist system that tailors the applications to individual needs. COMET TOP CHICO converts the responses to the questions in the checklist into parameters accessed during the execution of individual programs. COMET TOP ISUS uses the answers to the CHICO questions to compute exact file sizes and to automatically allocate data areas on disk. COMET TOP CAPA assists users in determining the amount of disk capacities required. Additional program tools assist users in

designing reports and forms, as well as in data entry requirements and inquiry screen layouts.

**FORS** is a package designed for the automotive field. It interfaces with COMET FEROS and has a teleprocessing interface to connect with automobile manufacturers.

**AVA** is a software package for architects, construction planners, builders, and public and corporate construction departments. It contains software modules that can be used for calls for tender, order placement, and account reconciliation, as well as for object control with the network planning techniques. AVA can interface with COMET FINAC.

**F+T** is a computer-aided order processing control system for the window, door, and shutter manufacturing industries. It contains modules for handling single-part and serial production, such as time management, calculation, material requirements planning, cutting optimization, online control of manufacturing equipment, and order-related statistics. The program masks come in English, French, and German.

**TOP EDGE CONTROL** is a financial planning and reporting system that allows the user to automatically call monthly statement data from COMET files and user addresses. It can also format reports. TOP EDGE CONTROL interfaces with COMET TOP modules.

### PRICING AND SUPPORT

Nixdorf offers a comprehensive network for service for hardware and software. The company maintains more than 60 outlets in the Federal Republic of Germany. In addition, Nixdorf has subsidiaries in 44 countries. In all subsidiaries, hardware and software specialists, each responsible for a specific market segment, offer customer assistance.

The following prices are listed in Deutschemarks.

## EQUIPMENT PRICES

		Purchase Price (DM)	Annual Monthly Service Charge (DM)	Monthly Lease Including Service (1 year) (DM)	Monthly Lease Including Service (3 years) (DM)	Monthly Lease Including Service (5 years) (DM)
8890-C72	CPU, 4MB main memory, I/O bus, 1 byte multiplexer I/O processor, 2 block multiplexer I/O processor, system diskette, local CRT console, console keyboard, block multiplexer channel, 2nd I/O bus, peripherals cabinet with controller, peripheral cabinet without controller, 3 disks (280MB), external block multiplexer channel, 1 tape drive (120/470 KB/S), directly connected system printer, 8203-ZD07 printer	225.700	1.811	8.244	7.454	7.002
SP11 4 1	Memory expansion module for VM/BASIC applications with more than 15 workstations	22.000	30	657	580	536
8890-D13	8 MB main memory, color console, 1 byte multiplexer channel, 4 block multiplexer channels, system diskette, 1 peripherals cabinet with controller for channel attachment, 1 peripherals cabinet without controller, 3 disks (280MB) 1 tape drive (120/470 KB/S, channel interface box for 8203-ZD07 system printer, 8203-ZD07 system printer	438.500	2.054	14.551	13.017	12.140
8890-D23	8 MB main memory, color console, 1 byte multiplexer channel, 4 block multiplexer channels, system diskette	408.250	1.190	12.826	11.397	10.580
8890-D28	8 MB main memory, color console, 1 byte multiplexer channel, 4 block multiplexer channels, system diskette	468.250	1.360	14.706	13.067	12.130
8370-1	260MB hard disk, FBA mode	26.500	70	826	733	680
8350-M1	280MB hard disk, CKD mode	26.500	70	826	733	680
BG32 6 1111	Peripheral cabinet with controller	14.280	30	438	388	359
8370-M2	Hard disk (730MB) for single port, FBA mode	51.860	150	1.627	1.445	1.342
8370-N4	Hard disk (730MB) for dual port, FBA mode	55.750	171	1.760	1.565	1.453
BG36 9 2111	Peripheral cabinet with controller	14.280	30	438	388	359

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BG36 9 4111	Peripheral cabinet with dual controller	23.030	48	704	624	578
BG36 9 3111	Peripheral cabinet without controller	4.500	12	141	125	116
8370-A02	Hard disk, 14-inch, 730MB, FBA mode	73.500	621	2.716	2.459	2.312
0 001	Dual-port attachment for 8370-A02	5.020	14	158	140	130
8370-B02	Hard disk, 14-inch, 730MB	51.860	468	1.947	1.765	1.661
0 002	Dual-port attachment for 8370-B02	5.020	14	158	140	130
8370-C02	Hard disk, 14-inch, 730MB	78.570	635	2.875	2.600	2.443
AN50 1 8	Direct attachment for C Model for disk 8370-2, without input/output proc.	19.800	49	614	544	505
MP54 1	Magnetic disk control unit 8880-40 for C and D models for 8370-2	48.000	350	1.718	1.550	1.454
0 1	Expansion for double control unit (required for dual port)	19.800	49	614	544	505
TK03	Onetime TKD charge for retrofitting expansion required for double control unit.	2.500	—	—	—	—
8350-A02	Hard disk (2 x 635MB), CKD mode	128.000	841	4.479	4.188	3.897
8350-B11	Hard disk, 635MB	54.100	410	1.948	1.825	1.702
8350-B21	Hard disk, 635MB	27.100	410	1.179	1.117	1.056
MP04 0 0002	Dual-port feature for MP04 1 1	8.900	28	260	242	224
8880-4	Controller for 8350-2	25.000	298	950	900	855
MP51 2	Two-channel attachment for 8880-4 controller	15.000	32	446	418	389
8420-A03	Tape drive, 60/120 KB/s, 800/1600 bpi	27.500	322	—	—	—
8420-B03	Tape drive, 60/120 KB/s, 800/1600 bpi	23.500	275	—	—	—
8420-A04	Tape drive, 120/470 KB/s, 1600/6250 bpi	36.500	415	—	—	—
8420-B04	Tape drive, 120/470 KB/s, 1600/6250 bpi	29.500	387	—	—	—
AN55 1 3	Direct attachment for 8420-A03 (60/120 KB/s)	2.500	12	84	75	70
MB55 1	Direct attachment for 8420-A04	9.350	69	335	303	284
8420-A44	Tape drive, 120/470 KB/s, 1600/6250 bpi, incl. controller	41.500	415	1.598	1.453	1.370
8420-B44	Tape drive, with attachment to 8420-A44	32.500	320	1.247	1.133	1.068
8420-A06	Tape drive, 200/780 KB/s, 1600/6250 bpi incl. controller	63.000	632	2.248	2.207	2.081
8420-B08	Tape drive, with attachment to 8420-A08	36.500	380	1.421	1.293	1.220
MB51 1	Two channel attachment for 8420-A06 and 8420-A08	9.500	20	291	256	239
ZD07 1 111	8203 system printer, 300 lpm, 132 columns, 64 characters, upper case	27.500	318	1.006	951	896
ZD07 1 112	8203 system printer, 220 lpm, 132 columns, 96 characters, upper/lower case	27.500	318	1.006	951	896
ZD07 2 111	8203 system printer, 600 lpm, 132 columns, 64 characters, upper case	37.500	442	1.380	1.305	1.230
ZD07 2 112	8203 system printer, 440 lpm, 132 columns, 96 characters, upper/lower case	37.500	442	1.380	1.305	1.230
AN51 2	Direct attachment for 8203-ZD07 system printer	1.850	12	58	54	50
ZD52 1	Channel interface box for 8203-ZD07 with attachment to a D model	15.000	95	522	470	440
ZD11 1 13	8203 steel band printer for connection to C/D models, 750 lpm at 48 char., 600 lpm at 64 char., 420 lpm at 96 char., 330 lpm at 128 char.	27.500	355	1.139	1.043	988
ZD12 1 12	8203 steel band printer for connection to C/D models, 1,500 lpm at 48 char., 1,250 lpm at 64 char., 925 lpm at 96 char., 730 lpm at 128 char.	59.500	800	2.496	2.288	2.167
ZD10 1 111	8203 high-speed printer for connection to C/D models; 2,000 lpm at 48 char., 1,640 lpm at 64 chars., 1,200 lpm at 96 chars., 950 lpm at 128 chars.	79.540	1,440	3.707	3.429	3.750
AN52 1	Direct connection for DFV (PA4), integrated communication adapter	4.800	23	133	125	116
AN52 3	Direct connection for DFV (PA7), integrated communication adapter	12.000	69	332	312	290
AN56 1	Direct connection for 4 AWD, integrated communication adapter	5.200	27	147	139	128
AN56 1	Direct connection for 4 AWD, integrated communication adapter	5.200	27	147	139	128
DU16 1	8705 Model 4 communication controller	41.600	162	1.348	1.202	1.119
DU16 2	8705 Model 6 communication controller	70.700	345	2.360	2.113	1.971
DU16 0 0002	8705 DFV control unit	22.000	—	627	550	506
DU16 0 0003	8705 DFV control unit	29.100	183	1.012	911	852
DU22 1	Ethernet controller with built-in installation in C model	15.000	107	534	482	452
DU22 1 1	Ethernet controller, standalone for block multiplexer connection	25.000	220	932	845	795
DU22 2	Ethernet controller with built-in unit in BG32 6 1111 or MB10 1 1	15.000	107	534	482	452
BA61 5	Two-channel attachment for 8274-A12, A22, B12, B22, X.25 control unit (DATEX-P, channel controller (CIP for two-channel attachment)	2.100	6	67	62	58
BA69	DATEX-P control unit 8274-X.25	11.315	65	380	355	329
BA69 0 0001	Expansion for IMSS standard	3.100	19	133	125	117
BA69 0 0002	Expansion for V.24 standard	4.500	32	148	139	129



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BA61 4	Channel Controller (CIP)	2.100	6	67	62	58
BA61 9 1	BSA connection standard 1 (TIP)	2.300	6	72	64	59
BA61 9 2	BSA connection standard 2 (TIP)	2.500	8	79	71	66
BA61 9 5	BSA connection standard 2A (TIP)	2.500	8	79	71	66
BA61 9 6	BSA connection standard 2B (TIP)	2.500	8	79	71	66
BA61 9 3	BSA connection standard 3 (TIP)	2.500	8	79	71	66
BA61 9 4	BSA connection standard 4 (TIP)	1.900	6	60	54	50
BA61 9 7	BSA connection standard 5 (TIP)	2.500	8	79	71	66
BA61 9 8	BSA connection standard 6 (TIP)	3.300	10	103	99	94
BA61 9 9	BSA connection standard 7 (TIP)	2.500	8	79	71	66
BA61 7 1	BSA connection standard 1A (TIP)	2.300	6	72	64	59
DU05	MPE, maximum 9600 bps	1.950	16	69	65	61
DU13	Coax multiplexer 8299	2.370	20	84	78	73
EL04 1	OCR-A reader	2.950	19	110	99	93
EL04 2	OCR-B reader	2.950	19	110	99	93
PC51 9 07	DAP emulation, including IHK78 card for 8810/35 or 8810/55 (SW73 6 071)	2.800	15	95	85	79
ND03 1 1	Needle compact printer, 80 columns	6.378	82	264	242	229
ND04 1 1	Needle compact printer, 132 columns	6.678	84	275	251	238
ND11 2 2	Needle compact printer, 132 columns	6.900	115	284	263	251
ND13 1 1	Mini compact printer, 80 columns	3.100	63	152	141	135
ND24 2 2	Multifunction printer	2.550	42	115	106	101
ND25 2 2	Multifunction printer	2.700	46	123	114	109
MD02 1 122	Ink jet printer	9.722	128	384	361	342
TD03 2	Daisywheel printer	9.500	88	359	326	307
TD06 2	Daisywheel printer	5.800	59	225	204	193
ZD09 1 1111	Dot matrix	17.800	225	733	670	635
TA04 2	PIN PAD keyboard for workstation printers	390	3	14	13	12

### SOFTWARE PRICES

		30-Day Trial	Onetime License Fee Plus Service (DM)	Monthly License Including Service (DM)	Monthly Service (DM)
NIDOS/VSE EASY	NIDOS/VSE Rel. 2 including EPROC, PDS, DOC, ECON, ESF/VSE, NIFTY, PWSII, TCP, TPS, NCOBOL, IOF, ISF	No	—	—	—
SW71 8 471	NIDOS/VSE DDP—NIDOS/VSE EASY, MHF, JTP, FTP	—	55.000	—	—
SW71 8 472	NIDOS/VSE DDP—NIDOS/VSE EASY, MHF, JTP, FTP	—	—	2.950	—
SW71 8 473	NIDOS/VSE DDP—NIDOS/VSE EASY, MHF, JTP, FTP	—	—	—	980
SW71 8 391	VM/ESX	No	21.060	—	—
SW71 8 392	VM/ESX	No	—	900	—
SW71 8 393	VM/ESX	No	—	—	315
SW71 8 401	VM/BASIC software—VM/ESX, VM/ESN Rel. 2.2, Basic compiler, run-time system	No	36.000	—	—
SW71 8 401	VM/BASIC software—VM/ESX, VM/ESN Rel. 2.2, Basic compiler, run-time system	No	—	1.470	—
SW71 8 403	VM/BASIC software—VM/ESX, VM/ESN Rel. 2.2, Basic compiler, run-time system	No	—	—	400
SW71 8 501	VM/ESN Rel. 2.2	Yes	15.000	—	—
SW71 8 502	VM/ESN Rel. 2.2	Yes	—	835	—
SW71 8 503	VM/ESN Rel. 2.2	Yes	—	—	235
SW71 8 511	KNET for 8890	Yes	25.000	1.380	390
XEP Rel. 1	EP + 3270/3770 SDLC	Yes	6.500	320	100
XEP Rel. 2	Rel. 1 + HDLC	Yes	8.500	410	130
XEP Rel. 3	Rel. 2 + X.21 option	Yes	10.500	500	150
MBTX	Incl. XTAM for 8890	No	65.000	3.023	698
ERJE	Remote job entry	—	5.600	263	63
DSM/VSE	Disk Space Management, Virtual Storage Extended	Yes	7.000	290	40
TMS/VSE	Tape Management System, Virtual Storage Extended	Yes	7.000	290	40
DEG	Report generator	Yes	6.160	250	30
PWS/VSE	Integrated editor	Yes	4.760	205	35
NCOBOL	For NIDOS/VSE	Yes	12.960	410	50
PL/1	Interface for TCP	Yes	960	38	8
PL/1	Interface for TCP	Yes	960	38	8
Basic compiler	(VM/ESX)	Yes	14.940	500	85
VM/Cobol	Compiler (VM/ESX)	Yes	12.960	410	50
NDB	Mixdorf database system	Yes	24.320	950	190
NDB/DO	Data dictionary	Yes	16.000	650	150
NDB/DQ	Data query	Yes	16.000	650	150
DOCS	Distributed Office Communication System	Yes	20.000	815	190