

IBM 3814 Switching Management System

MANAGEMENT SUMMARY

UPDATE: While the 3814 Switching Management System has remained a relatively stable product since its introduction in 1980, IBM continues to introduce enhancements from time to time. Last year, IBM announced a software enhancement, the Multi-System Configuration Manager. This IBM licensed program provides central control of multiple 3814 systems through a host-attached terminal. Used in conjunction with the 1440 Switching Management Feature, the program can provide central control of up to sixty-four 3814 systems. Using the 1440 feature, matrix switches can communicate with a host through a 3274 communications control unit.

The IBM 3814 Switching Management System was designed for those users who have a need for channel-to-control unit switching under a single point control. The 3814 is a modular channel-to-I/O control unit switch that allows multiple IBM central processing units (CPUs) to share peripheral devices. The 3814 broadens the system I/O capability by pooling groups of control units among the channels; allowing rapid reconfiguration of I/O devices; minimizing the effect of cable restrictions on configuration capability and planning; and extending channel capability by permitting simultaneous on-line availability of more than eight control units. The 3814 also eliminates the need to duplicate hardware at installations where there are multiple CPUs and the I/O devices are shared resources. The 3814 system can be used with the IBM System/370, Models 135 and up, 303X Series, 4300 Series, 308X, and 3090 Series processors.

The 3814 Switching Management System consists of Models A1 to A4 control units, Models B1 to B4 remote units, and Models C1 to C4 expansion units. The 3178 Model C20 or 3278 Model 2 display units must be configured as a system console. The IBM 3604 Model 6 Keyboard/Dis- ➤

The 3814 Switching Management System provides for more efficient use of I/O devices by pooling groups of control units among the channels of one or more IBM processors. Switching can be performed at up to four physical locations that are up to 1,000 feet apart.

MODELS: Models A1 to A4 control units, Models B1 to B4 remote units, Models C1 to C4 expansion units.

CONFIGURATION: Matrix sizes range from 4 by 4 to 8 by 16 or 16 by 8 providing a maximum of 128 matrix crosspoints.

COMPETITION: Beall Models 3, 3D, 3Q, 5, 6, and 6E; Data Switch Model 1200 Intelligent Peripheral Switch and Model 1400 switch with channel extension; and T-bar 3232.

PRICE: Prices range from \$47,480 to \$60,070.

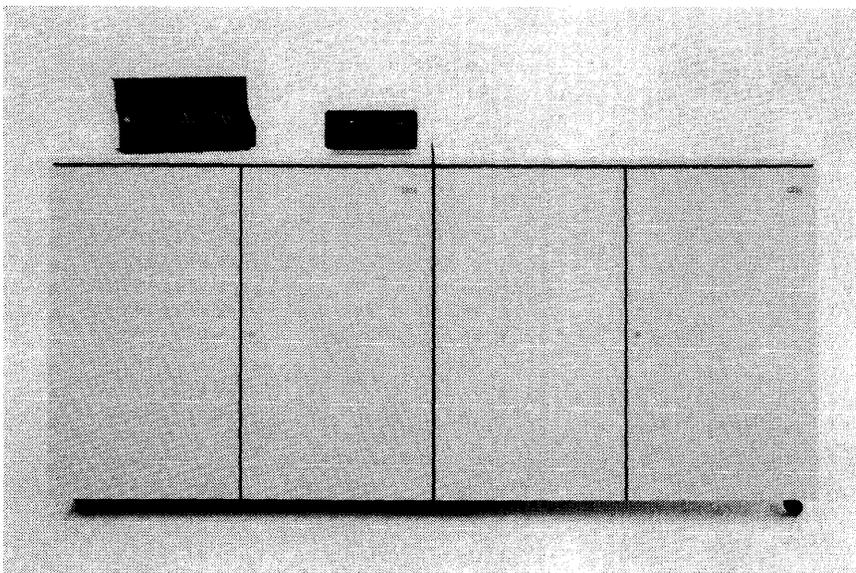
CHARACTERISTICS

MANUFACTURER: International Business Machines Corporation (IBM), Old Orchard Road, Armonk, NY 10504. Contact your local IBM representative.

MODELS: The 3814 Switching Management System comprises three model groups: the Model A1, A2, A3, and A4 Controllers; the Model B1, B2, B3, and B4 Remote Units; and the Model C1, C2, C3, and C4 Expansion Units.

CONTROLLERS: All 3814 configurations require a Model A controller.

COMPUTERS INTERFACED: The 3814 Switching Management System attaches to the byte or block multiplexer channels of any IBM System/370, Models 135 and up: ➤



The 3814 system shown here consists of a Model A controller with console and a power control panel, and, on the right, a Model C expansion unit. The Model C derives its power from the Model A controller.

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► play, a required component when the 3814 was first introduced, is no longer available from IBM. One Model A Controller and system console are required on each 3814 system. The Model B and C units can be added to the system to expand its switching capability. The four submodels in each model group provide different switch matrix sizes ranging from 16 to 128 nodes, or matrix crosspoints. The B models can be located up to 1,000 feet from the Model A Controller, and a second operator console can also be located up to 1,000 feet from the controller.

In addition to basic switching functions, the 3814 features security, diagnostic, and backup functions. The system automatically diagnoses itself when powered on and continues to monitor itself during operation to detect malfunctions. An alarm and visual indicators signal problems to operators. Users can attach up to six 3287 Model 1 or 2 printers for hard copy, time-stamped audit trails and configuration listings. Audit trails and configurations can also be viewed from a system display. To protect the system from unauthorized access, up to four levels of password security are available. To guard against possible system malfunctions, users may configure an alternate Model A controller in place of a B unit. Operators can manually switch the system to the alternate controller. In the event of a system malfunction or control power loss, the switchover will occur automatically.

COMPETITIVE POSITION

In the peripheral matrix switch world, vendors tend to measure competitive position by the maximum number of matrices that can be squeezed in a box. Using this criterion, IBM comes out near the back of the pack. The availability of larger matrix sizes from IBM competitors is good for installations with humongous switching needs, but for many an average installation with average requirements, all the matrix switch vendors will have something to offer. These days, the handful of vendors offering such specialized products load their products down with value-added features and options to make their switch a standout among switches.

The IBM 3814 Switching Management System competes with the Data Switch Model 1200 Intelligent Peripheral Switch, and its Model 1400 with channel extension capabilities. Other competing products include Beall Models 3, 3D, 3Q, 5, 6, and 6E, and T-bar 3232.

The largest single available 3814 matrix is 16 by 8 or 8 by 16, creating 128 possible matrix crosspoints. Data Switch offers a maximum matrix size of 16 by 48. Beall claims to lead the pack with the largest possible matrix size. Its Model 6E can be expanded to a 32-by-48 matrix. Inter-cabling four Model 6Es creates a maximum matrix size of 32 by 193.

To make it possible to handle larger 3814 matrix configurations, IBM introduced its Multi-System Configuration Manager licensed program. Used together with the System Attachment feature, it's now possible to control up to sixty-four 3814 configurations ranging from 4 by 4 to 16 by 64 ►

► 3031, 3032, 3033, 3081, 3083, 3084 systems, 3090 systems, and 4331, 3441, 4361, or 4381 processors.

CONFIGURATION: A basic 3814 system can contain up to four switching units. Individual units can be combined to create an 8-by-16 or 16-by-8 matrix containing up to 128 crosspoints or what IBM calls nodes.

The Model A units contain an integrated microcode-driven processor that controls the 3814 system. The Model B units can be remotely connected to a Model A or another Model B at distances of up to 1,000 feet. The Model C units can be attached to a Model A or Model B to extend the switching capacity of the system. The various models are connected via a customer-supplied loop cable that begins and ends at the Model A Controller.

One Model A Controller is required on each 3814 system. Each A model contains one or two 4-by-4 switch matrices, its own power supply and the control power for one expansion model, a diskette drive, a control panel, an audible alarm, and four system power sequence interfaces. A second Model A Controller can be configured in place of a Model B for controller backup. The 1430 Alternate Controller feature is required to implement this configuration. Up to four 3278 Model 2 or 3178 Model C20 Display Stations can be configured as operator consoles. A 3278 Model 2 can be located 100 feet away from a Model A. A second 3278 can be located up to 1,000 feet away. A 3278 can emulate an IBM 3604 Model 6 display to provide compatibility. The 3604 is no longer available from IBM. Additionally, up to six 3287 Model 1 and 2 printers can be installed for hard copy output.

The Model B Remote Units are standalone models that contain their own power supply and the control power for one expansion model. The Model B units include one or two 4-by-4 switch matrices, a control panel, an audible alarm, and four system power sequence interfaces. The loop connection from the Model B to the Model A Controller can be made through another Model B or a Model C.

The Model C Expansion Units do not have their own power supply and must be attached to a Model A or B. The loop connection from the Model C to the Model A Controller can be made through a Model B or another Model C. The Model C units contain one or two 4-by-4 switch matrices and four system power sequence interfaces. A maximum of two Model Cs is permitted on each 3814 system.

PHYSICAL CHARACTERISTICS: A 3814 should be installed over a raised floor in a machine room environment. The system uses 208 VAC or 240 VAC, single phase, three wire, 60 Hz.

PERFORMANCE: Models A1, B1, and C1 each contain one 4-by-4 switch matrix. Models A2, B2, and C2 each include two 4-by-4 switch matrices that are internally configured as one 4-by-8 matrix, while Models A3, B3, and C3 include two 4-by-4 matrices internally configured as one 8-by-4 matrix. Models A4, B4, and C4 contain two 4-by-4 switch matrices that can be cabled as two 4-by-4 matrices, one 4-by-8 matrix, or one 8-by-4 matrix. In each case, the first digit represents the number of channels, and the second the number of switchable interfaces. The Model A1, B1, and C1 can be field upgraded to a Model A4, B4, or C4, respectively, by adding a second 4-by-4 switch matrix.

The various 3814 models can be combined to form larger or more complex configurations. The following matrix sizes can be built from the basic units: 4 by 4, 4 by 8, 4 by 12, 4 by 16, 8 by 4, 8 by 8, 8 by 12, 8 by 16, 12 by 4, 16 by 4, and 16 by 8. Other combinations not specified here are also possible. A 3814 system can support a maximum of 128 nodes (matrix crosspoints). Each system must have one Model A Controller. Only one Model A per system is permitted. ►

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► from a host-attached terminal. This approach increases the size of a matrix configuration beyond the maximum 16-by-8 matrix size, but involves the interfacing of multiple 3814 cabinets. Competitors contend the interconnection of multiple IBM switches creates a large footprint and could potentially degrade switching integrity as well. In comparison, Beall offers a maximum 32-by-48 matrix size contained in a single unit.

In addition to matrix size considerations, IBM, Beall, and Data Switch all offer other features on various models as either standard or optional. All three vendor systems, for instance, can store predefined configurations to facilitate the reconfiguration of peripheral devices. All three offer some built-in diagnostic features, and all support three-megabyte data throughput speeds.

Both Beall and Data Switch feature dual and redundant power supplies to ensure uninterrupted operation. IBM, however, lets users configure an alternate Model A controller in place of a B unit. In the event of a power failure or malfunction, the system will automatically switch to the alternate unit.

Both Beall and Data Switch offer products for controlling multiple switches. Beall sells the Expert Channel Switching System and Data Switch sells the Configuration Management System.

While Beall has emphasized size and the availability of many matrix combinations, Data Switch has been diversifying its product line and moving into related communications areas to compete in the IBM world. Both Data Switch and IBM, for instance, have introduced channel extension products for increasing the distance between mainframes and low- to medium-speed peripherals. Data Switch Model 8000 and 8044 channel extenders using fiber optics are configured with the Model 1400 peripheral switch, while IBM implements fiber-optic technology through the 3044 Fiber Optic Channel Extender Link. Please refer to the Data Switch report in this section for more information about the company's channel extension products.

ADVANTAGES AND RESTRICTIONS

IBM offers the 3814 Switching Management System to speed up reconfigurations, reduce errors, and improve availability. Should key peripherals fail, the product makes it easier to reconfigure and bypass problems. The product could also reduce the number of I/O devices required in shops operating at peak demand. Additionally, the 3814 makes it possible to determine the status and availability of I/O devices, and comes with three to four levels of password security to minimize or prevent unauthorized access.

The 3814 features built-in self-diagnostic features, plus audible alarms and indicators to communicate problems to operators. Hard copy printers and system displays help personnel better track system activity and pinpoint problems. Immediate channel switching makes it possible for operators to take a device down at once to isolate a problem. ►

► The Multi-System Configuration Manager, an IBM license program, together with the 1440 System Attachment Feature make it possible to centrally control up to sixty-four 3814 systems. Using this package, 3814 configurations ranging from 4 by 4 to 16 by 64 are possible. The maximum configuration can include up to 256 individual 3814 switch units. The 1440 feature lets users attach a 3814 system directly to a host processor through the IBM 3274 Control Unit. The feature also lets users control one or more 3814 configurations from a host-attached terminal. Users can attach an IBM 3178 Model C20 Display Station or the IBM 3278 to use as the 3814 console. The consoles require the 1420 display attachment feature and the 1410 expanded storage feature.

To simplify system operation, the 3814 provides storage for up to 80 predefined configurations, including the current and prior configurations.

The 3814 also supports IBM's datastreaming feature, which provides a channel data rate of up to three megabytes per second. The 3814 can switch nondatastreaming devices as well.

The 3814 is cabled to the channel as a standard control unit. Each 4-by-4 matrix channel attachment is equivalent to one half of a dedicated control unit. The 3814 supports channels with the Two-Byte Interface, but the interface must be attached on two consecutive channels and on two consecutive control unit interfaces in the same 4-by-4 switch matrix.

SPECIAL FEATURES: The 3814 Models A and B feature a power control panel that is mounted on the top of the cabinet. The power for the Model C is controlled from the control panel of the attached Model A or B. The control panel includes a Local/Remote switch that specifies where power control should reside. When the switch is set on Local, power can be turned on or off only from the 3814. When the switch is set on Remote, power sequencing control can be provided by up to four host processors per 3814 model or, optionally, by up to eight processors per model. The 3814 units can be interconnected for power sequencing. This means the system power control on any 3814 unit controls the power on all 3814s. The 3814 control panel also includes a Power On button, a Unit Emergency Power Off switch, a reset switch for the audible alarm, and Power On, Power On Pending, Power Fault, Power Off if in Local, I/O Power Sequence Complete, Loop Ready, and Alarm Condition indicators.

Three or four levels of password authorization control access to the 3814 system: one level each for the operations supervisor, the operator, and the customer engineer. With the attachment of the 1420 feature, 32 additional passwords across four authority levels are provided. The feature also lets users attach up to two 3178 C20 or two 3278 Model 2 Display Stations, and three 3287 Model 1 or 2 printers to display configurations and provide time-stamped audit trails of switching activity. Additionally, the 1420 feature makes it possible to assign installation defined names for configurations, and provides for more stored crosspoints and two-channel switch configurations. The 1410 expanded storage unit feature is a prerequisite.

The 3814 enters a diagnostic checkout procedure as part of the power-on sequence. Operating elements are continuously monitored during system operation to detect malfunctioning hardware. An audible alarm and visual indicators alert the operator to potential problems. All error conditions are recorded on the diskette in the Model A Controller for later diagnosis. Malfunctions can be isolated to individual system modules, making it possible for a customer engineer to power-down or power-up individual portions of a system to make repairs. While repairs are made to failing elements, users may continue to operate other unaffected elements. ►

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▶ As is often the case with IBM, required components and added features are priced separately. The system console and attachment features, for instance, must be obtained at an additional charge. □

▶ Optional features for the 3814 include Channel Expansion Internal, Channel Expansion External, Control Unit Power Sequencing, and Remote Two-Channel Switch Control.

The Channel Expansion Internal feature is available for 3814 Model C units only and comes in two versions. One version (feature 1520) provides four control unit interfaces, and the other (feature 1521) provides eight control unit interfaces. These features are required when a Model C is combined with a Model A or B to expand the number of channel interfaces. The 1520 feature for four control unit interfaces is required when combining a 4-by-4 (Model C1) or 8-by-4 (Models C3 or C4) switch with an 8-by-4 (Models A3, A4, B3, or B4) to create a 12-by-4 or 16-by-4 switch. The A4 or B4 model must be cabled as an 8-by-4 switch. The 1521 feature for eight control unit interfaces is required to combine a 4-by-8 (Model C2 or C4) switch with a 4-by-8 (Models A2, A4, B2, or B4) to create an 8-by-8 switch. Under the eight control unit version, the A4 or B4 model must be cabled as a 4-by-8 switch, and under the four control unit version, these models must be cabled as an 8 by 4. In the four control unit version, a maximum of one 1520 feature is permitted per Model C1, C3, or C4 unit. In the eight control unit version, a maximum of one 1521 feature is permitted per Model C2 or C4 unit. The four-control unit and eight-control unit versions are mutually exclusive.

The Channel Expansion External features 1531 and 1532 provide external cable connections for the control unit input of a 4-by-4 matrix to expand the number of channel interfaces on A, B, and C units. The 1531 feature is for the first 4-by-4 matrix and the 1532 is for the second 4-by-4 matrix. Feature 1531 is specifically used on Models A1, B1, C1, A2, B2, C2, A4, B4, or C4. Feature 1532 is required for the second 4-by-4 matrix in Models A2, B2, C2, A2, B3, C3, A4, B4, or C4. Feature 1531 is required to create an 8-by-4 switch within Models A4, B4, or C4. Models A, B, and C require both features 1531 and 1532 when expanding the channels on an eight-channel switch. Feature 1531 cannot

be installed on Models A3, B3, or C3, and feature 1532 cannot be installed on Models A1, B1, or C1. A maximum of one feature 1531 can be used for Models A1, B1, C1, A2, B2, C2, A4, B4, or C4. One feature 1532 can be used on a Model A2, B2, C2, A3, B3, C3, A4, B4, or C4.

The Control Unit Power Sequencing feature provides power sequencing control for up to four control units connected to any 3814 model. Features 1811, 1812, 1813, and 1814 provide power sequencing. Feature 1811 is for the first group of control units, 1812 for the second group, 1813 for the third group, and 1814 for the fourth group. These features must be installed in sequence. A maximum of one each is permitted per Model A, B, or C.

System Power Sequencing—Additional (feature 6350) provides power sequencing control from the fifth through the eighth system. A maximum of one 6350 feature is permitted per Models A, B, or C.

The Remote Two-Channel Switch Control—Basic (feature 6010) provides for the control of the remote enable/disable function on control units that have two-channel switches. The control units must have the Remote Switch Attachment feature. Feature 6010 provides support for up to eight interface selections.

Remote Two-Channel Control—Additional (features 6011, 6012, and 6013) expands the two-channel switch control capability for controlling eight additional pairs of interface selections. Feature 6011 is for the first additional pairs, feature 6012 is for the second additional, and feature 6013 is for the third additional. These features must be installed in sequence. A maximum of three groups of eight are permitted per Models A, B, and C.

PRICING: The 3814 Switching Management System is available under the terms of IBM's Rental or Lease Agreement (LRA) or for purchase. LRA includes maintenance; a separate maintenance contract is available for purchased units. LRA provides for month-to-month rental or for a two-year lease. The termination charge for the lease arrangement is the lower of 5 months' charges or 25 percent of the remaining value of the lease. Purchase credits can be accrued up to a maximum of 60 percent of the monthly payments.

EQUIPMENT PRICES

IBM 3814 Switching Management System, Models:

		Purchase Price (\$)	Monthly Maint. (\$)	Monthly Rental (\$)	Monthly Lease* (\$)
A1	Controller Unit (4 x 4)	47,480	145	2,630	2,105
A2	Controller Unit (4 x 8)	60,420	189	3,350	2,680
A3	Controller Unit (8 x 4)	64,740	185	3,595	2,875
A4	Controller Unit (two 4 x 4s)	69,570	203	3,875	3,095
B1	Remote Unit (4 x 4)	39,710	98	2,205	1,765
B2	Remote Unit (4 x 8)	52,660	143	2,920	2,335
B3	Remote Unit (8 x 4)	56,970	138	3,165	2,530
B4	Remote Unit (two 4 x 4s)	61,800	156	3,435	2,745
C1	Expansion Unit (4 x 4)	37,980	95	2,105	1,680
C2	Expansion Unit (4 x 8)	50,930	139	2,820	2,255
C3	Expansion Unit (8 x 4)	55,240	134	3,065	2,450
C4	Expansion Unit (two 4 x 4s)	60,070	153	3,340	2,670

Additional Hardware and Options

Upgrades	Model A1 to A4, Model B1 to B4, or Model C1 to C4	22,090	—	—	—
3178-C20	Display Station	1,720	—	—	—
3278-2	Display Station	1,965	10.00	109	93
3287-1	Hard Copy Printer	4,830	40.00	317	270
3287-2	Hard Copy Printer	5,150	50.00	388	330

*48-month lease.

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		<u>Purchase Price (\$)</u>	<u>Monthly Maint. (\$)</u>	<u>Monthly Rental (\$)</u>	<u>Monthly Lease* (\$)</u>
► Additional Hardware and Options					
1520	Internal Channel Expansion; four controller unit interfaces	1,550	1.00	86	69
1521	Internal Channel Expansion; eight controller unit interfaces	3,100	1.00	168	135
1531	External Channel Expansion; first 4 x 4 interface	5,350	1.00	294	235
1532	External Channel Expansion; second 4 x 4 interface	5,350	1.00	294	235
1811	Control Unit Power Sequencing; provides sequencing for first group of control units	518	1.00	27	21
1812	Control Unit Power Sequencing; provides sequencing for second group of control units	518	1.00	27	21
1813	Control Unit Power Sequencing; provides sequencing for third group of control units	518	1.00	27	21
1814	Control Unit Power Sequencing; provides sequencing for fourth group of control units	518	1.00	27	21
6350	Additional System Power Sequencing	207	—	8	6
6010	Remote Two-Channel Switch Control—Basic	5,180	19.50	284	226
6011	Additional Remote Two-Channel Switch Control	2,415	14.50	133	106
6012	Second Additional Remote Two-Channel Switch Control	2,415	14.50	133	106
6013	Third Additional Remote Two-Channel Switch Control	2,415	14.50	133	106
1410	Expanded Storage Unit	4,800	21.50	246	196
1420	Printer and Display Station Attachment	1,990	3.00	103	83
1430	Alternate Controller	1,990	3.00	103	83
1440	System Attachment Feature	5,700	15.00	307	248

*48-month lease. ■