IBM Flex System V7000 Storage Node delivers integrated, innovative storage for IBM PureSystems

**At a glance**

IBM® PureFlex™ System is a new category of systems that integrates multiple server architectures, networking, storage, and system management capability into a single system.

IBM Flex System™ V7000 Storage Node is a powerful block storage system designed to integrate into the IBM PureFlex System and IBM Flex System infrastructure for extremely rapid storage deployment and breakthrough management simplicity.

**Flex System V7000:**
- Is built on the industry-leading storage virtualization and efficiency capabilities of IBM Storwize® V7000
- Features sophisticated storage technologies including thin provisioning, automated tiering, external storage virtualization, real-time compression, clustering, replication, and a next-generation graphical user interface (GUI)
- Supports 8Gb Fibre Channel (FC) and 10Gb Ethernet Fibre Channel over Ethernet (FCoE) and iSCSI host connectivity
- Supports twenty-four 2.5-inch 6Gb SAS drives, nearline drives, and solid state drives per enclosure
- Scalable to 240 drives per system and 960 drives per clustered system with the attachment of Flex System V7000 and Storwize V7000 expansion enclosures

**Overview**

IBM Flex System V7000 Storage Node is an integrated storage system for IBM PureFlex System and IBM Flex System, designed to deliver high performance, advanced function, high availability, and modular and scalable storage capacity.

IBM PureFlex System and IBM Flex System are a new category of computing that integrates multiple server architectures, networking, storage, and system management capability into a single system that is easy to deploy and manage.

IBM PureFlex System and IBM Flex System have built-in virtualization support of servers, storage, and networking to speed provisioning and increase resiliency. In addition, it supports multiple open industry standards, operating systems, networking and storage fabrics, virtualization, and system management protocols, to easily fit within existing and future datacenter environments. IBM PureFlex System and Flex System are scalable and extendable with multigeneration upgrades to protect and maximize IT investments.
The new IBM Flex System V7000 Storage Node is a powerful block storage system designed to integrate into the IBM PureFlex System or IBM Flex System infrastructure for extremely rapid storage deployment and breakthrough management simplicity. By enabling virtualization, consolidation, and tiering in businesses of all sizes, it is designed to improve application availability and resource utilization. Flex System V7000 offers easy-to-use, efficient and cost-effective management capabilities for both new and existing storage resources in your IT infrastructure. This new class of storage system combines no compromise design along with virtualization, efficiency, and performance capabilities.

IBM Flex System V7000 Storage Node is built on the industry-leading storage virtualization and efficiency capabilities of IBM Storwize V7000 including

- IBM System Storage® Easy Tier® for automated SSD optimization
- IBM Real-Time Compression for data footprint reduction

While also being physically and logically integrated into IBM PureFlex System or IBM Flex System.

IBM Flex System V7000 helps simplify and speed IBM PureFlex System and IBM Flex System deployment, providing superior integration of server and storage management to automate and streamline provisioning for greater responsiveness to business needs and lower overall cost.

Speed Time to Value with:

- Integration by design: Automates deployment with integration into IBM PureFlex System or IBM Flex System infrastructure for deployment in minutes, not weeks.
- Simplified experience: Simplifies management significantly with an integrated, intuitive user interface for ease of use and faster system accessibility to increase administrative efficiency and simplicity.
- Built-in expertise:
  - Virtualized storage: Virtualizes third-party storage for investment protection and nondisruptive migration of the current storage infrastructure.
  - Helps to optimize performance and costs for mixed workloads: Up to 200% higher performance than with HDD alone by optimizing SSD usage with Easy Tier.

Key prerequisites

Flex System V7000 Storage Node requires:

- Flex System V7000 control enclosure with optional Flex System V7000 or Storwize V7000 expansion enclosures.
- Flex System V7000 software, version 6.4 or later, for operation. Use of the software is entitled through the acquisition of Flex System V7000 software licenses.
- Flex System Enterprise Chassis with all necessary components to support Flex System V7000 as a node and a switch module supporting the connectivity option configured with the Flex System V7000.

Planned availability date

December 10, 2012
**Description**

**Integrated, innovative storage for IBM PureSystems™**

IBM Flex System V7000 Storage Node is a powerful block storage system designed to enable rapid storage deployment and breakthrough management simplicity through integration with IBM compute, storage, networking, virtualization and management infrastructures. It helps simplify and speed PureFlex System and IBM Flex System infrastructure deployment with superior server and storage management integration to automate and streamline provisioning and to help organizations achieve greater responsiveness to business needs while reducing costs.

**Integrating IBM Storwize V7000 capabilities:** Integrated into PureFlex System or IBM Flex System solutions, Flex System V7000 can become part of a highly efficient, highly capable, next-generation information infrastructure.

Flex System V7000 is derived from the same base technology as the successful Storwize V7000. It supports unmatched performance and flexibility through internal virtualization and built-in SSD optimization technologies. Nondisruptive migration of data from existing storage translates to simplified implementation, which minimizes user disruption. Sophisticated storage technologies, including IBM Real-time Compression™, thin provisioning, automated tiering, external storage virtualization, clustering, replication and a next-generation graphical user interface (GUI) are designed to help you obtain efficiency from your PureFlex or IBM Flex System infrastructure.

**Simplified management with automated deployment:** The PureFlex System and IBM Flex System have been designed to solve such major IT challenges as storage and network deployment and integrated management, systems security management, virtual systems monitoring and management, and performance tracking.

Flex System V7000 automatically configures into the PureFlex System or IBM Flex System infrastructure. When placed into the Flex System Enterprise Chassis, Flex System V7000 is immediately recognized and added to IBM Flex System Manager™ and its Chassis Map, helping reduce the time required for setup and configuration management. IBM Flex System Manager provides physical and logical storage topology views and shows relationships between storage and server resources, enabling you to track key resources based on business use. Provisioning capabilities include image management for simple virtual machine creation, deployment and cloning. You can manage storage system pools for data lifecycle management and storage placement based on business policies.

**Virtualization:** Flex System V7000 virtualizes internal and third-party storage for rapid, flexible provisioning and investment protection. Combining storage and server virtualization can build a more powerful virtualized infrastructure than either virtualization solution deployed alone. By integrating and virtualizing all of your storage, you get a single user interface with a management console that is integrated into the comprehensive management system.

Flex System V7000 is a virtualized storage system that enables rapid third-party external storage virtualization to manage capacity in other disk systems. When Flex System V7000 virtualizes a disk system, capacity in the external system inherits the functional richness and ease of use of Flex System V7000, including advanced replication, thin provisioning, Real-time Compression, and Easy Tier.

**Performance optimization:** Storage tiering helps optimize storage use with data location to improve system performance, reduce costs and simplify management. Easy Tier technology built into Flex System V7000 automatically and dynamically moves only the appropriate data to SSDs in the system, so you get SSD performance without manually creating and managing storage tier policies.
A hybrid storage pool is created containing two tiers, SSD and hard disk drive (HDD). The busiest volume portions are identified and automatically relocated to high-performance SSDs, and the remaining data can take advantage of higher capacity HDDs for the best value.

**Compression for enterprise-class storage efficiency:** Real-time Compression can improve efficiency by compressing data as much as 80 percent, enabling you to store up to five times as much data in the same physical disk space. It is designed for use with active primary data such as production databases and email applications, dramatically expanding the range of data that can benefit from compression.

Real-time Compression, together with other efficiency technologies, can reduce acquisition costs, reduce rack space, and lower power and cooling costs. When combined with external storage virtualization, it can significantly enhance the usable capacity of your system.

**Flex System V7000 Storage Node components**

Flex System V7000 Storage Node is comprised of the following:

- Flex System V7000 hardware:
  - Flex System V7000 control enclosure
  - Flex System V7000 expansion enclosure
- Flex System V7000 software

All functional capabilities for the Flex System V7000 Storage Node are provided through the Flex System V7000 software. The Flex System V7000 software is preloaded by IBM on the Flex System V7000 control enclosure. Use of the software is entitled through the acquisition of Flex System V7000 software licenses.

For additional information on the Flex System V7000 software, refer to Software Announcement, and ZG12-0304, dated November 13, 2012, IBM Flex System V7000 Storage Node Software 6.4 delivers integrated, innovative storage for IBM PureSystems.

**Flex System V7000 hardware models**

Flex System V7000 hardware models are designed for use in the Flex System Enterprise Chassis.

**The Flex System V7000 control enclosure features:**

- Dual node canisters with 16 GB of cache (8 GB per canister)
- 8Gb FC and 10Gb FCoE / iSCSI host connectivity options
- 24 2.5-inch 6Gb SAS drive bays
- 6Gb SAS ports for the attachment of expansion enclosures
- Management modules with integrated connectivity to the Flex System Chassis Management Module
- Support for the attachment of other storage devices using the FC or FCoE interface to enable use of the External Virtualization function

**The Flex System V7000 expansion enclosure features:**

- Dual expansion canisters
- 24 2.5-inch 6Gb SAS drive bays
- 6Gb SAS ports for attachment of to upstream and downstream enclosures
- Management modules with integrated connectivity to the Flex System Chassis Management Module
**Host connectivity:** Host connectivity to compute nodes is provided through optional Flex System V7000 control enclosure network cards that connect to the Flex System Enterprise Chassis midplane and its switch modules. Available options are:

- 10Gb Converged Network Adapter (CNA) 2 Port Daughter Card for FCoE and iSCSI fabric connections
- 8Gb Fibre Channel (FC) 4 Port Daughter Card for Fibre Channel fabric connections.

Both cards must be installed in pairs (one card per node canister) and the following configurations are supported:

- Two or four 10Gb CNA cards
- Two 8Gb FC cards
- Two 10Gb CNA cards and two 8Gb FC cards

**Drive options:** Both the Flex System V7000 control and expansion enclosures support high-capacity nearline disk drives, high-performance disk drives, and solid state drives. Drive types can be intermixed within an enclosure. The following 6Gb SAS drives are supported:

- 500 GB and 1 TB GB 7,200 rpm disk drives
- 300 GB, 600 GB, and 900 GB 10,000 rpm disk drives
- 146 GB and 300 GB 15,000 rpm disk drives
- 200 GB and 400 GB solid state drives

**Scalability:** The Flex System V7000 control enclosure supports the attachment of Flex System V7000 expansion enclosures (maximum of two) and Storwize V7000 expansion enclosures (maximum of nine). Flex System V7000 and Storwize V7000 expansion enclosures can even be intermixed behind a single Flex System V7000 control enclosure, although the total number of expansion enclosures cannot exceed nine.

**Accessibility by people with disabilities**

A US Section 508 Voluntary Product Accessibility Template (VPAT) containing details on accessibility compliance can be requested at


**Reference information**

For additional information on the Flex System V7000 software, refer to Software Announcement, and ZG12-0304, dated November 13, 2012, IBM Flex System V7000 Storage Node Software 6.4 delivers integrated, innovative storage for IBM PureSystems.

**Product number**

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* Starting point model. This model cannot be ordered stand-alone and can only be ordered as a component of a configured order.

** Pseudo part number. This item cannot be ordered stand-alone and can only be ordered as a component of a configured order.

*** Previously announced pseudo part number and shown here only for completeness of the product structure. This item cannot be ordered stand-alone and can only be ordered as a component of a configured order.

** Additional information**

Flex System V7000 base system models consist of the following items:

- Flex System V7000 control enclosure (Model X49, SEO / part number 4939H49):
  - Double-high, full-wide node for use in an IBM Flex System Enterprise Chassis
  - Two node canisters with 16 GB cache (8 GB per canister)
  - 8Gb FC, 10Gb iSCSI and 10Gb FCoE host connectivity options
  - Two management modules (one per canister) with integrated connectivity to the Flex System Chassis Management Module
  - Two 6Gb SAS ports (one per canister) for attachment of a Flex System V7000 or Storwize V7000 expansion enclosures
  - Twenty four slots for 2.5-inch SAS drives

- Flex System V7000 expansion enclosure (Model X29, SEO / part number 4939H29):
  - Double-high, full-wide node for use in a Flex System Enterprise Chassis
  - Two expansion canisters
  - Two management modules (one per canister) with integrated connectivity to the Flex System Chassis Management Module
  - Four 6Gb SAS ports (two per canister) for attachment to upstream and downstream enclosures
  - Twenty four slots for 2.5-inch SAS drives
The following items are optionally available. Refer to the Product number section for feature numbers and SEO/part numbers:

- 10Gb Converged Network Adapter (CNA) 2 Port Daughter Card
- 8Gb Fibre Channel (FC) 4 Port Daughter Card
- 2.5-inch 6Gb SAS disk drives:
  - 500 GB and 1 TB 7,200 rpm disk drives
  - 300 GB, 600 GB, and 900 GB 10,000 rpm disk drives
  - 146 GB and 300 GB 15,000 rpm disk drives
- 2.5-inch 6Gb SAS solid state drives (SSD):
  - 200 GB and 400 GB solid state drives
- Expansion enclosure attachment cables
- RFID tag

### Publications

The following Flex System V7000 publications are available:

- IBM Flex System V7000 Storage Node Installation Guide
- IBM Flex System V7000 Storage Node Troubleshooting, Recovery, and Maintenance Guide
- Safety Notice

The most up-to-date product documentation, including the Flex System V7000 information center, is available and downloadable at

http://www.ibm.com/support

### IBM Publications Center Portal

http://www.ibm.com/shop/publications/order

The Publications Center is a worldwide central repository for IBM product publications and marketing material with a catalog of 70,000 items. Extensive search facilities are provided, as well as payment options via credit card. A large number of publications are available online in various file formats, which can currently be downloaded free of charge.

When available, translated product documentation is downloadable from the following IBM support site

http://www.ibm.com/support

### Services

#### Global Technology Services

IBM services include business consulting, outsourcing, hosting services, applications, and other technology management.

These services help you learn about, plan, install, manage, or optimize your IT infrastructure to be an On Demand Business. They can help you integrate your high-speed networks, storage systems, application servers, wireless protocols, and an array of platforms, middleware, and communications software for IBM and many non-IBM offerings. IBM is your one-stop shop for IT support needs.

IBM Implementation Services for Flex System - enablement and configuration

IBM services can assist you with the planning, implementation, configuration and testing of Flex System compute nodes, storage node, software and management.
Additionally, we provide basic skills instruction on the IBM Flex System to your key in-house personnel. Some of the tasks that we perform as part of the implementation service are:

- System hardware review
- Hardware connectivity check
- Network switch configuration
- Flexible Systems Manager (FSM) set up (if applicable)
- Compute node management and update management
- Flex System V7000 storage implementation and configuration

For details on available services, contact your IBM representative or visit http://www.ibm.com/services/

For details on available IBM Business Continuity and Recovery Services, contact your IBM representative or visit http://www.ibm.com/services/continuity

For details on education offerings related to specific products, visit http://www.ibm.com/services/learning/index.html

Select your country, and then select the product as the category.

**Technical information**

**Specified operating environment**

**Physical specifications**

- Height: 110 mm (4.4 in)
- Width: 432 mm (17.0 in)
- Depth: 505 mm (19.9 in)

- **Approximate weight:**
  - Control enclosure:
    - Empty: 21.0 kg (46.3 lb)
    - Fully configured: 27.7 kg (61.0 lb)
  - Expansion enclosure:
    - Empty: 18.4 kg (40.5 lb)
    - Fully configured: 25.1 kg (55.4 lb)

**Operating environment**

Air temperature:

- Operating: 5° to 40° C (41° to 104° F) up to 3,048 m above sea level (10,000 ft above)
- Non-operating: 1° to 60° C (33.8° to 140° F)

Relative humidity:

- Operating: 8% to 85%
- Non-operating: 5% to 80%

Electrical power:

- **Voltage:** 12 V dc
• Power :
  – Control enclosure: 376 watts
  – Expansion enclosure: 188 watts

Heat dissipation (BTU per hour):
• Control enclosure: 1,283
• Expansion enclosure: 641

**Hardware requirements**
The Flex System V7000 requires a Flex System Enterprise Chassis (machine types 7893 and 8721). The chassis must contain the necessary components to support the Flex System V7000 as a node and the appropriate switch module supporting the connectivity option configured with the Flex System V7000.

Refer to Flex System V7000 product documentation and the IBM Systems Support site for information on additional requirements


**Software requirements**
The Flex System V7000 Storage Node requires the Flex System V7000 software, version 6.4 or later, for operation.

The Flex System V7000 software is preloaded by IBM on the Flex System V7000 control enclosure. Use of the software is entitled through the acquisition of a Flex System V7000 Base Software license. This license is required for the Flex System V7000 control enclosure and for each Flex System V7000 expansion enclosure.

A Storwize V7000 Base Software license is required for each Storwize V7000 expansion enclosure directly connected to a Flex System V7000 control enclosure.

Use of optional licensed products offered with the Flex System V7000 software is entitled through the acquisition of their respective licenses.

For additional information on the Flex System V7000 software, refer to Software Announcement ZG12-0304, dated November 13, 2012, IBM Flex System V7000 Software V6.4 delivers integrated, innovative storage for IBM PureSystems.

**Compatibility**
Refer to the IBM System Storage Interoperability Center (SSIC) for a comprehensive list of supported environments, devices, and configurations


**Limitations**
The Flex System V7000 Storage Node is only supported in the Flex System Enterprise Chassis (machine types 7893 and 8721).

**Planning information**

**Customer responsibilities**
Physical configuration and installation planning, along with machine installation and configuration, are customer responsibilities.

You are responsible for downloading or obtaining from IBM, and installing designated Machine Code (microcode, basic input/output system code (called BIOS), utility programs, device drivers, and diagnostics delivered with an IBM machine) and other software updates in a timely manner from an IBM Internet website or from other electronic media, and following the instructions that IBM provides. You may
request IBM to install Machine Code changes; however, you may be charged for that service.

**Cable orders**

Cables are required to attach an expansion enclosure into a Flex System V7000 system. The following expansion enclosure cables are offered with the Flex System V7000:

- **Internal Expansion Cable (feature number ADA1, SEO/PN 00Y4600):** A 0.328 meter SAS cable used for the attachment of Flex System V7000 expansion enclosures.
- **External Expansion Cable (feature number ADA6, SEO/PN 90Y7682):** A 6 meter SAS cable used for the attachment of Storwize V7000 expansion enclosures.

**Security, auditability, and control**

This product uses the security and auditability features of host hardware.

The customer is responsible for evaluation, selection, and implementation of security features, administrative procedures, and appropriate controls in application systems and communications facilities.

**Global Technology Services**

Contact your IBM representative for the list of selected services available in your country, either as standard or customized offerings, for the efficient installation, implementation, and integration of this product.

**IBM Electronic Services**

IBM has transformed its delivery of hardware and software support services to help you achieve higher system availability. Electronic Services is a Web-enabled solution that offers an exclusive, no-additional-charge enhancement to the service and support available for IBM servers. These services are designed to provide the opportunity for greater system availability with faster problem resolution and preemptive monitoring. Electronic Services comprises two separate, but complementary, elements: Electronic Services news page and Electronic Services Agent.

The Electronic Services news page is a single Internet entry point that replaces the multiple entry points traditionally used to access IBM Internet services and support. The news page enables you to gain easier access to IBM resources for assistance in resolving technical problems.

The Electronic Service Agent™ is no-additional-charge software that resides on your server. It monitors events and transmits system inventory information to IBM on a periodic, client-defined timetable. The Electronic Service Agent automatically reports hardware problems to IBM. Early knowledge about potential problems enables IBM to deliver proactive service that may result in higher system availability and performance. In addition, information collected through the Service Agent is made available to IBM service support representatives when they help answer your questions or diagnose problems. Installation and use of IBM Electronic Service Agent for problem reporting enables IBM to provide better support and service for your IBM server.

To learn how Electronic Services can work for you, visit

http://www.ibm.com/support/electronic
To obtain copies of the IBM Statement of Limited Warranty, contact your reseller or IBM.

**Warranty period**

- System (including the battery): Three years
- Optional features: Three years, unless specified otherwise

An IBM part or feature installed during the initial installation of an IBM machine is subject to a full warranty effective on the date of installation of the machine. An IBM part or feature which replaces a previously installed part or feature assumes the remainder of the warranty period for the replaced part or feature. An IBM part or feature added to a machine without replacing a previously installed part or feature is subject to a full warranty effective on its date of installation. Unless specified otherwise, the warranty period, type of warranty service, and service level of a part or feature is the same as the machine it is installed.

The following have been designated as consumables or supply items and are, therefore, not covered by this warranty:

- None

**Warranty service**

If required, IBM provides repair or exchange service, depending on the type of warranty service specified below for the machine. IBM will attempt to resolve your problem over the telephone or electronically by access to an IBM Web site. Certain machines contain remote support capabilities for direct problem reporting, remote problem determination, and resolution with IBM. You must follow the problem determination and resolution procedures that IBM specifies. Following problem determination, if IBM determines On-site Service is required, scheduling of service will depend upon the time of your call, machine technology and redundancy, and availability of parts. Service levels are response-time objectives and are not guaranteed. The specified level of warranty service may not be available in all worldwide locations. Additional charges may apply outside IBM's normal service area. Contact your local IBM representative or your reseller for country and location-specific information.

The type of service is Customer Replaceable Unit (for example, keyboard, mouse, speaker, memory, or hard disk drive) Service and On-site Service.

Customer Replaceable Unit (CRU) Service: IBM provides a replacement CRU to you for you to install. CRU information and replacement instructions are shipped with your machine and are available from IBM at any time on your request. A CRU is designated as being either a Tier 1 (mandatory) or a Tier 2 (optional) CRU. Installation of Tier 1 CRUs, as specified in this announcement, is your responsibility. If IBM installs a Tier 1 CRU at your request, you will be charged for the installation. You may install a Tier 2 CRU yourself or request IBM to install it, at no additional charge, under the type of warranty service designated for your Machine.

Based upon availability, a CRU will be shipped for next business day (NBD) delivery. IBM specifies in the materials shipped with a replacement CRU whether a defective CRU must be returned to IBM. When return is required, return instructions and a container are shipped with the replacement CRU, and you may be charged for the replacement CRU if IBM does not receive the defective CRU within 15 days of your receipt of the replacement.

The following parts or features have been designated as Tier 1 CRUs:

- Battery
• Bezel
• Canister
• Drive
• Filler panel
• I/O adapter
• I/O cable
• Tag

On-Site Service: At IBM's discretion you will receive CRU service or IBM will repair the failing machine at your location and verify its operation. If required, On-site Repair is provided, 9 hours per day, Monday through Friday excluding holidays, NBD response. You must provide a suitable working area to allow disassembly and reassembly of the IBM machine. The area must be clean, well lit, and suitable for the purpose. On-site Service is not available in all countries, and some countries have kilometer or mileage limitations from an IBM service center. In those locations where On-site Service is not available, the normal in-country service delivery is used.

Licensing: Programs included with this product are licensed under the terms and conditions of the License Agreements that are shipped with the system.

Maintenance services

ServicePac®, ServiceSuite®, ServiceElect, and ServiceElite: ServicePac®, ServiceSuite®, ServiceElect, and ServiceElite provide hardware warranty service upgrades, maintenance, and selected support services in one agreement.

Warranty service upgrade: During the warranty period, a warranty service upgrade provides an enhanced level of On-site Service for an additional charge. A warranty service upgrade must be purchased during the warranty period and is for a fixed term (duration). It is not refundable or transferable and may not be prorated. If required, IBM will provide the warranty service upgrade enhanced level of On-site Service acquired by the customer. Service levels are response-time objectives and are not guaranteed.

IBM will attempt to resolve your problem over the telephone or electronically by access to an IBM Web site. Certain machines contain remote support capabilities for direct problem reporting, remote problem determination, and resolution with IBM. You must follow the problem determination and resolution procedures that IBM specifies. Following problem determination, if IBM determines On-site Service is required, scheduling of service will depend upon the time of your call, machine technology and redundancy, and availability of parts.

CRUs will be provided as part of the machine's standard warranty CRU Service except that you may install a Tier 1 CRU yourself or request IBM installation, at no additional charge, under one of the On-site Service levels specified below.

IBM will repair the failing machine at your location and verify its operation. You must provide a suitable working area to allow disassembly and reassembly of the IBM machine. The area must be clean, well lit, and suitable for the purpose.

Maintenance service: If required, IBM provides repair or exchange service, depending on the type of maintenance service specified below for the machine. IBM will attempt to resolve your problem over the telephone or electronically by access to an IBM Web site. Certain machines contain remote support capabilities for direct problem reporting, remote problem determination, and resolution with IBM. You must follow the problem determination and resolution procedures that IBM specifies. Following problem determination, if IBM determines On-site Service is required, scheduling of service will depend upon the time of your call, machine technology and redundancy, and availability of parts. Service levels are response-time objectives and are not guaranteed.

CRU Service: If your problem can be resolved with a CRU (for example, keyboard, mouse, speaker, memory, or hard disk drive), IBM will ship the CRU to you for you
to install. CRU information and replacement instructions are shipped with your machine and are available from IBM at any time on your request.

IBM specifies in the materials shipped with a replacement CRU whether a defective CRU must be returned to IBM. When return is required, return instructions and a container are shipped with the replacement CRU, and you may be charged for the replacement CRU if IBM does not receive the defective CRU within 15 days of your receipt of the replacement.

**On-site Service:** IBM will repair the failing machine at your location and verify its operation. You must provide a suitable working area to allow disassembly and reassembly of the IBM machine. The area must be clean, well lit, and suitable for the purpose.

**Maintenance service (ICA)**

Maintenance services are available for ICA legacy contracts.

**Non-IBM parts support**

**Warranty service:** IBM is now shipping machines with selected non-IBM parts that contain an IBM field replaceable unit (FRU) part number label. These parts are to be serviced during the IBM machine warranty period. IBM is covering the service on these selected non-IBM parts as an accommodation to its customers, and normal warranty service procedures for the IBM machine apply.

**Warranty service upgrades and maintenance services:** Under certain conditions, IBM Integrated Technology Services repairs selected non-IBM parts at no additional charge for machines that are covered under warranty service upgrades or maintenance services.

IBM Service provides hardware problem determination on non-IBM parts (for example, adapter cards, PCMCIA cards, disk drives, or memory) installed within IBM machines covered under warranty service upgrades or maintenance services and provides the labor to replace the failing parts at no additional charge.

If IBM has a Technical Service Agreement with the manufacturer of the failing part, or if the failing part is an accommodations part (a part with an IBM FRU label), IBM may also source and replace the failing part at no additional charge. For all other non-IBM parts, customers are responsible for sourcing the parts. Installation labor is provided at no additional charge, if the machine is covered under a warranty service upgrade or a maintenance service.

**Warranty service upgrades**

**IBM hourly service rate classification**

Two

**Field-installable features**

Yes

**Model conversions**

No

**Machine installation**

Customer setup. Customers are responsible for installation according to the instructions IBM provides with the machine.

**Licensed internal code and licensed machine code**

These products do not contain Licensed Internal Code or Licensed Machine Code.
Pricing

For all local charges, contact your IBM representative.

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