

# CAMBRIDGE

# ExpandaCore 11

Low-Cost Expansion Memory for the PDP-11 Family of Computers

ExpandaCore 11 is a plug-compatible add-on memory for all PDP-11 computer models



**cm** CAMBRIDGE MEMORIES, INC.

Cambridge Memories, one of the world's leading suppliers of add-on memory systems for small and large computers, was the originator of minicomputer expansion memories. The company currently has over 10,000 memory units installed worldwide.

ExpandaCore 11 is a high-performance expansion memory system for use with all models of the PDP-11 line of minicomputers.

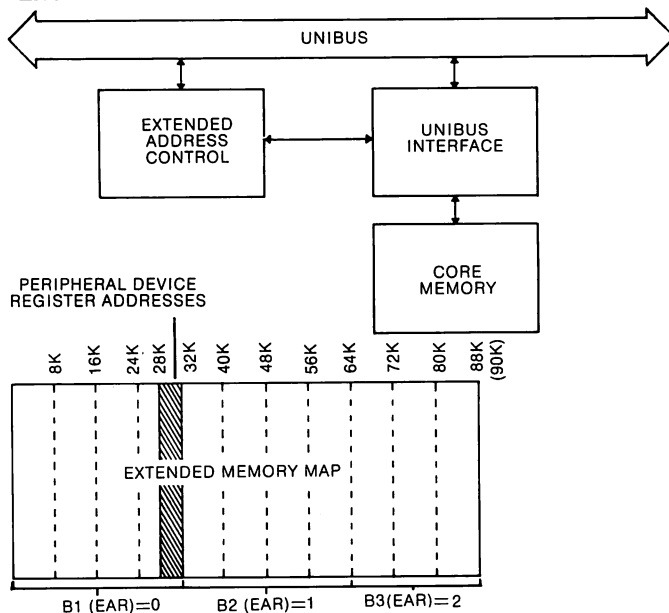
This memory system offers an extended address register (EAR) option, which can extend the memory capacity of PDP-11 computers to nearly triple, in some models, the memory capacity offered by Digital Equipment Corporation.

In addition, ExpandaCore 11 is directly plug-compatible to all PDP-11s, through a simple interconnection into the Unibus data channel.

And it comes in two unique packaging configurations – MiniCage for up to 24K of expansion, and VertiCage, for up to 124K of add-on capacity. Every ExpandaCore 11 has its own self-contained power supply, front panel access to cards, and field-expansion capabilities.

ExpandaCore 11 lets you run your PDP-11 up to 30 per cent faster than its rated maximum. This is possible because the memory system can be fully interleaved. This interleaving takes full advantage of the asynchronous design of PDP-11 processors, allowing for simultaneous reading and writing from different memory sectors at the higher speed of the ExpandaCore memory.

### EXTENDED ADDRESS REGISTER MAP



The extended address register (EAR), a feature found only on ExpandaCore 11 systems, adds two additional addressing bits per memory system. This unique capability allows PDP-11 users to triple the size of their PDP-11 memories with no processor modifications.

Because of the 18-bit word length of ExpandaCore 11 systems, parity bits can be generated as an optional feature *automatically*. Whether you use a PDP-11/03 or the powerful 11/45, you can take advantage of this fundamental error correction capability, which only ExpandaCore 11 provides as an option for every PDP-11 system.

ExpandaCore 11 is compatible with every PDP-11, through a single interconnection plug that attaches your expansion memory directly into the Unibus data channel.

As one of the largest suppliers of add-on memory systems for PDP-11 minicomputers, Cambridge Memories gives you more than just high-performance hardware at nominal prices.

We also give you rigorously tested products. Every ExpandaCore 11 is systems tested on a PDP-11 for over 48 continuous hours before shipment to a customer.

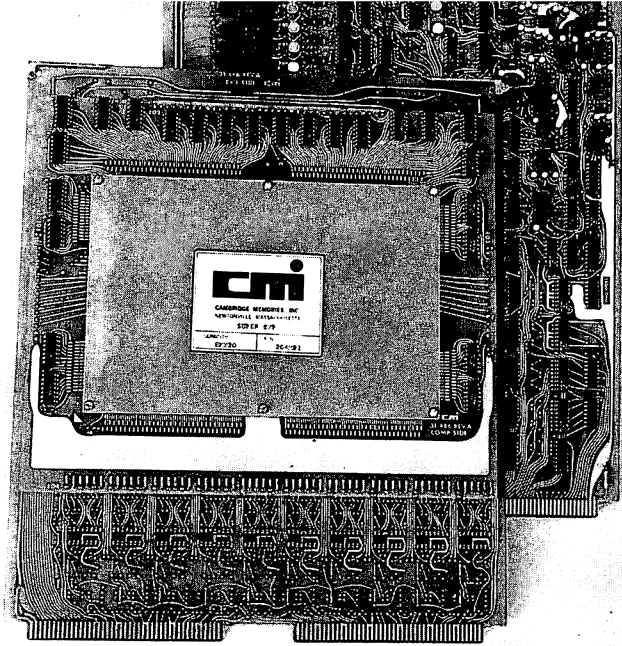
In addition, when our products are delivered, they come with a complete set of documentation and diagnostics.

ExpandaCore 11: it gives you all the room you need.

### MAJOR FEATURES

ExpandaCore 11 possesses comprehensive features that you would expect from one of the world's most experienced suppliers of add-on memory systems.

- Total Compatibility**  
ExpandaCore 11 is totally hardware and software compatible with all PDP-11 minicomputers. A single connector cable plugs into the Unibus channel in a matter of minutes to put the expansion memory into service at your site.
- Dual Packaging Configurations**  
To optimize space, power and cooling requirements, two packaging techniques are available:
  - MiniCage – a 5¼-inch high unit that can store up to 24K 16-bit words.
  - VertiCage – a 14-inch high unit that can store up to 124K 16-bit words.
- Higher Speed**  
The cycle time of ExpandaCore 11 core memory is 750 nanoseconds compared to 1.2 microseconds for models like the 11/05 and 11/20, and 850 nanoseconds for the 11/40 and 11/45. And the faster speed is utilizable because of the PDP-11's asynchronous design.
- Field Expandability**  
Any ExpandaCore 11 can be expanded at the user's site by simply plugging in additional 8K modules.
- Maximum Growth Potential**  
ExpandaCore 11 covers the full capacity range of every PDP-11 model, as follows:
  - For small and medium models, up to 28K expansion, in 8K modules, is offered (assuming a 4K resident memory).
  - For larger models, up to 124K expansion in 8K modules is possible (assuming an 8K resident memory).
- Memory Save**  
Every ExpandaCore has its own power supply – plus a monitor that observes central processor and other memory power units. In the event of power fluctuation or failure in any part of the system, ExpandaCore units immediately compensate to prevent data loss in the system, a feature unique to all Cambridge Memories add-on memories.
- Extended Memory**  
The unique Extended Address Register (EAR) option allows for memory capacities up to triple those offered by DEC. Two additional addressing bits enable users to address up to 90K words – with no processor modification.
- Parity Option**  
Automatic error correction is possible in every model of the ExpandaCore 11 because of the availability of an extra two parity bits.
- Full Interleaving**  
Effective cycle time can be improved by as much as 30 per cent using ExpandaCore 11's memory interleaving feature, an optional feature that enables users to read and write simultaneously using different memory sectors.



## OUR MEMORY BUILDING BLOCK

Every ExpandaCore 11 makes use of the same building block – the workhorse 8192-word Super ExpandaCore memory module that is in use in thousands of memory systems. A single control card drives up to nine memory storage boards, making field expansion an easy matter. And it has an 18-bit word length, 16 data bits and two optional parity bits – ideal for use in all models of the PDP-11.

Maintenance and reliability are optimized. Each memory board is fully interchangeable with any other, and each plugs easily into one of the storage slots available in the maximum configuration. The planar design, which Cambridge pioneered in 1968, reduces leads and connectors which are the major cause of memory failure. Tiny 18-mil, 3-wire, 3D cores used in the SuperExpandaCore system are the most advanced and reliable in core memory technology.

## PRODUCT TESTING

Cambridge Memories provides add-on and expansion memories for over 20 different computers, ranging from the IBM Model 370 to the Varian 620. As a result, the company maintains an extensive product testing facility in which every assembled expansion memory undergoes rigorous diagnostic testing while under control of a computer *identical to the host processor which the memory will support*. Every PDP-11 expansion memory unit passes through this process of reliability, quality control and software acceptance testing. The result is a proven unit that will plug-in quickly and go on-line fast at your installation.

## SOFTWARE/DOCUMENTATION/SERVICE

When we deliver you ExpandaCore 11, we deliver a company, not just a product. Supporting your low-cost expansion memory is an extensive support organization that provides:

- Software

A complete line of diagnostic routines and maintenance software – operational on PDP-11s for thousands of hours – is provided free of charge with every ExpandaCore 11 system – from the smallest 8K unit to a high-capacity 124K processor.

- Documentation

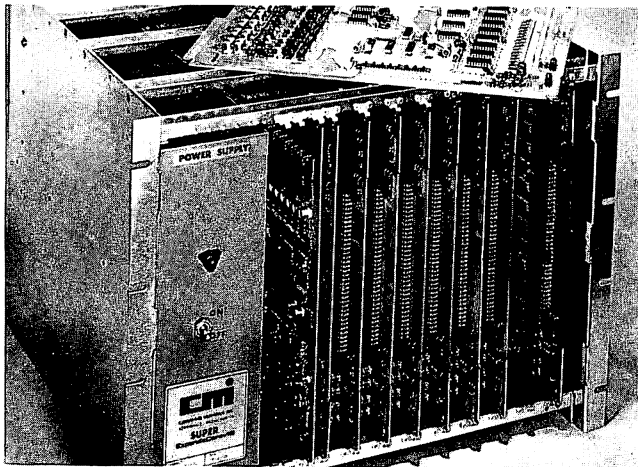
A complete and detailed set of operator manuals covering almost every type of operating circumstance is included in the purchase price of every ExpandaCore 11 system.

- Field Service

On-call maintenance for all Cambridge memory systems is available in major cities in the U.S. and Europe. Comprehensive field engineering training is provided for all service personnel; this factor, combined with the simple plug-in expansion and replacement of ExpandaCore 11 control and storage boards, insures fast diagnosis and repair. Complete spares inventories are maintained at every regional service site to support our prompt-service policy.

ExpandaCore 11 systems are built around compact 8K storage boards (photo, upper left) which can be packaged to provide up to 120K of expansion memory in units such as the 14-inch high VertiCage configuration (second photo). Every system comes equipped with full documentation and diagnostics software (third photo).

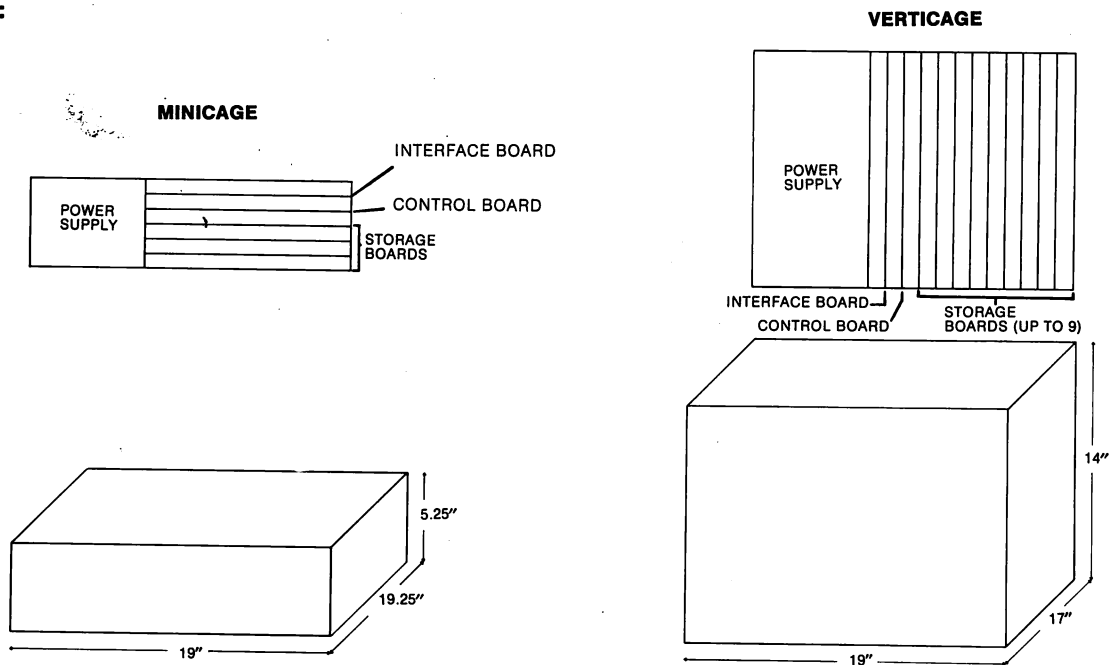
ExpandaCore 11 systems have numerous features that make them especially useful as add-on memories for the powerful PDP-11/45 computer, to which ExpandaCore 11 connects with just a single cable (bottom photo).



## EXPANDACORE 11 SPECIFICATIONS

Memory Class	<ul style="list-style-type: none"> <li>Coincident current core</li> <li>3-wire, 3D</li> <li>18-mil lithium-ferrite</li> </ul>
Organization	<ul style="list-style-type: none"> <li>Planar design</li> <li>One control board per system</li> <li>8192 18-bit words per storage board</li> </ul>
Memory Speed	<ul style="list-style-type: none"> <li>750 nanosecond cycle time</li> <li>800 nanosecond split cycle time</li> <li>300 nanosecond access time</li> <li>Operates at full speed on all PDP-11 processors because of asynchronous computer organization</li> </ul>
Capacity Range	<ul style="list-style-type: none"> <li>The ExpandaCore-11 series can augment any configuration of PDP-11 memory from 0K to the computer's full capacity.</li> <li>Utilizing the ExpandaCore-11's unique Extended Address Register (EAR) features, the PDP-11 computer can be extended beyond its advertised core memory capacities.</li> </ul>
Power	<ul style="list-style-type: none"> <li>105-125 VAC (or 210-250 VAC)</li> <li>47-420HZ</li> </ul>
Environmental Factors	<ul style="list-style-type: none"> <li>Temperature: 0° to +50°C (Operating) —20° to +70°C (Non-operating)</li> <li>Humidity: 0 to 90% (all conditions) No condensation</li> <li>Shock/Vibration: Meets commercial standards</li> </ul>
Packaging	<ul style="list-style-type: none"> <li>Available in two configurations – MiniCage for up to 24K – VertiCage for up to 124K</li> </ul>

### Dimensions:



### HOW TO ORDER EXPANDACORE 11:

Ordering your ExpandaCore 11 system is easy. Just use the following order designators:

Order No.	Description
S11-8K MC	First 8K with MiniCage. Initial complete 8K-word system with 8K x 16 core memory, MiniCage enclosure pre-wired for 24K, Unibus Cable, and self-contained power.
S11-8K VC	First 8K with VertiCage. Initial complete 8K-word system with 8K x 16 core memory, VertiCage enclosure pre-wired for 72K, Unibus cable, and self-contained power.
SM11 8K	Each additional 8K memory card.



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A good place to put your information.