HP 98256A and HP 98257A
RAM Memory Cards

This Installation Note explains how to add HP 98256A and HP 98257A Random Access Memory (RAM) cards to an HP 9000 Series 200 or 300 computer. Each HP 98256A card adds 256K bytes of memory and each HP 98257A card adds 1M byte.

Series 200 computers can address a maximum of 7 1/2M bytes of RAM, although they may not have enough accessory slots to physically accomodate that much RAM. For this reason, a 16-slot bus expander is available, the HP 9888A. Thus, you can add up to seven HP 98257A cards. You can add up to 30 HP 98256A cards if your computer has no RAM on its processor board. If it has internal RAM, you may add up to 29 HP 98256A cards.

Add-on RAM cards are addressed the same regardless of whether an HP 9888A bus expander is used. If you are installing HP 98257A cards in a Model 216 computer with a HP 9888A bus expander, they must go in the expander.

Series 300 computers can also address a maximum of 7 1/2M bytes of RAM. However, the number of available slots must be considered as well as the amount of built-in RAM. An eight-slot bus expander, the HP 98568A, is available, but only one expander may be added to the system. Thus, you are limited to a maximum of 12 slots for add-on memory. Assuming you have enough empty slots, you can add 12 HP 98256A cards. You may add six HP 98257A cards if your computer has 1M byte of internal RAM. Otherwise, you may add seven HP 98257A cards.

Add-on RAM cards are addressed the same regardless of whether a bus expander is used.

Computer Museum

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Task Inventory

Due to the wide variety of installation possibilities, this Note presents four different installation procedures. To make them easier to find, each is printed on different colored paper. Find your installation in the following list:

Installing RAM cards in a Series 300 computer or a Series 200 computer other than a Model 216 (that is, a Model 217, 220, 226, 236 or 237):

- HP 98257A cards, go to the BLUE pages
- HP 98256A cards, go to the GREEN pages

Installing RAM cards in a Series 200 Model 216 computer:

- without a HP 9888 Bus Expander, go to the YELLOW pages
- with a HP 9888 Bus Expander, go to the PINK pages

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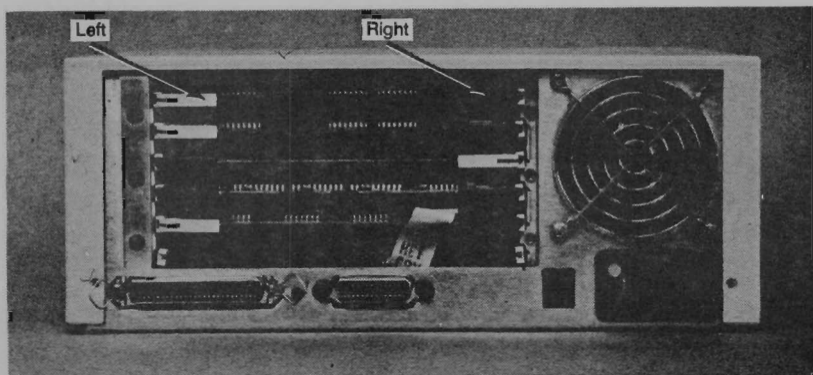**For research and education purposes only.**

Installing HP 98257A Cards

This procedure explains how to install HP 98257A 1M byte RAM cards in a Series 200 Model 217, 220, 226, 236 or 237 computer or a Series 300 computer.

1. Turn the computer off and remove any existing RAM cards from it. Do this by unscrewing the interfaces and removable covers from the accessory slots and examine them for cards with plastic extractors listed in the following table. Remove the cards by pulling out on the extractors.

RAM Card Identification Table

Product Number	Memory Size	Extractor Colors Left	Right	Configuration Switch Segments
98257A	1M byte	Violet	Green	4
98256A	256K byte	Yellow	Red	6
98254A	64K byte	Red	Red	8

RAM Memory Card Extractors

2. Now switch the computer on and write down the amount of available RAM memory:

```
9836C    (serial no.)
Copyright 1982,
All Rights Reserved.

BOOTROM 3.0
Keyboard
Color Graphics
2 flexible Discs
HP-IB
655200 Bytes ◄──────────

BOOTING SYSTEM
RESET TO Power-Up
```

These entries may differ depending on computer and options.

This entry is the amount of memory in the computer.

Typical Power-up Display

Your amount of built-in memory is: _____.

──────────────────────────────────────
Note

If you do not get this display, but hear a series of beeps instead, your built-in memory amount is zero.
──────────────────────────────────────

3. Here is an address map for the HP 98257A cards. If you have 1M byte of built-in memory, cross off the first address:

1st Card   5th Card

2nd Card   6th Card

3rd Card   7th Card

4th Card

Switch Location
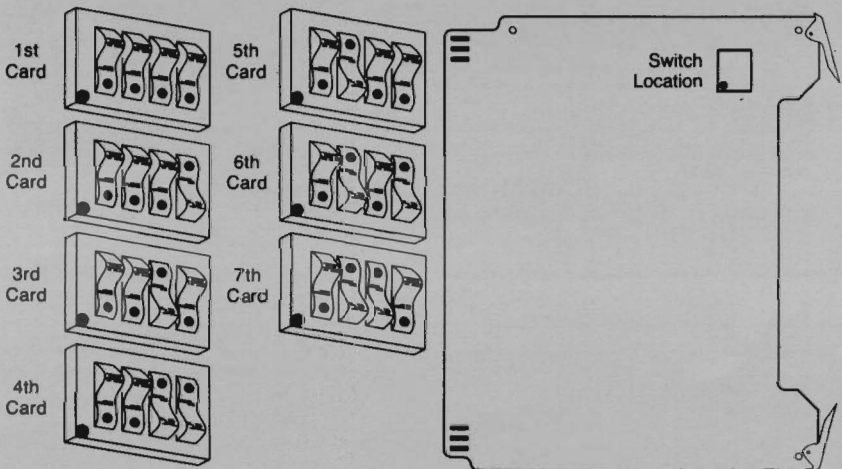
HP 98257A 1M Byte Card Switch Settings

4. Address the HP 98257A cards starting with the first **UNUSED** address. Cross of each address as you use it.

5. Turn the computer off and install the HP 98257A cards in it. They may go in any slot. Install them so that the side with the switches is up. Press the cards in until the extractors are flat against the card.

6. Now switch the computer back on and recheck the amount of available memory. You should have approximately

1 048 400 bytes for each HP 98257A card

plus the built-in RAM figure from step 2.

If you do not obtain the correct amount of available RAM, refer to the "In Case of Trouble" section on page 6.

7. If you obtain the correct figure, you have successfully installed the HP 98257A cards. If you have neither HP 98256A nor HP 98254A cards to install, your installation is complete. You may want to refer to the section on "Optimizing Performance", on page 5.

- If you have HP 98256A cards to install in your computer, go to the GREEN pages.

- If you have HP 98254A cards to re-install in your computer but no HP 98256A cards, continue here.


Note

HP 98254A cards are not useable in RAM configurations greater than 2M bytes. If the RAM figure obtained in step 5 plus the RAM contained on HP 98254A cards exceeds 2M bytes, you must leave one or more of them out of the computer.
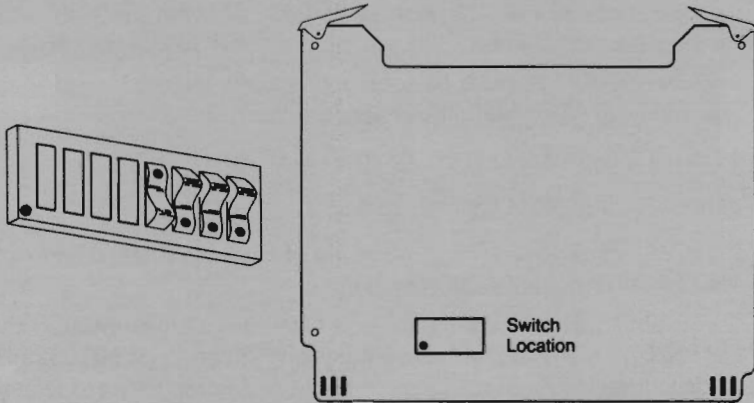
---

8. Take the next **UNUSED** address from the table in step 3 and reverse it. For instance, if you have installed one HP 98257A card, the next unused address is
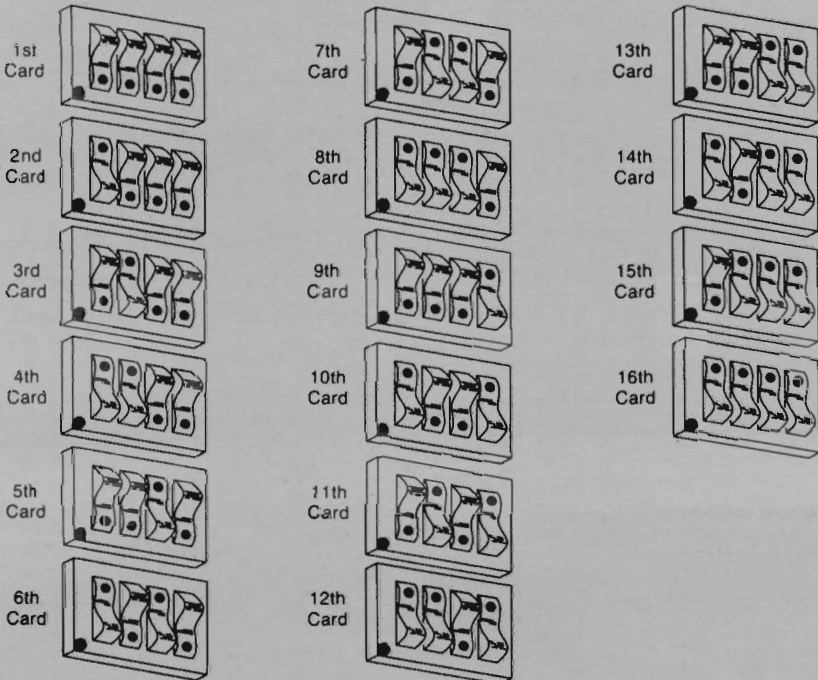

When reversed, it becomes

4
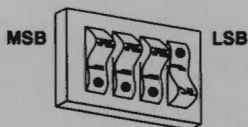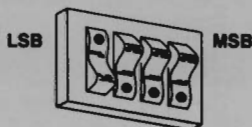
9. Place this address in the **right-hand** four segments of each HP 98254A address switch. For instance, the above example would look like this:

HP 98254A 64K Byte Card Switch Settings

10. Now take the addresses from this address map and place them in the **left-hand** four segments of the appropriate address switch:

11. Switch the computer off and install the cards in the computer. They may go in any slot. Install them so that the side containing the switches is up. Press the cards in until the extractors are flat against the card.

12. Now switch the computer on and check the power-up display for the amount of available RAM. You should have approximately

    65 000 bytes for each HP 98254A card

    plus the available RAM figure from step 6.

    If you obtain the correct figure, your installation is complete.

    If you do not obtain the correct amount of available RAM, refer to the "In Case of Trouble" section on page 6.

Optimizing Performance

Access time for built-in memory is less than for add-on memory. Therefore, you may wish to arrange your memory so that your program spends the maximum amount of time executing in built-in memory.

If you have 1M byte of built-in RAM (from step 2), one or more HP 98257A RAM cards and run one program repetitively, you may wish to optimize the performance of your system. This is done by relocating the built-in memory within the address matrix until the optimum location is found.

1. Select a frequently-used program or routine as a benchmark.

2. Time execution of the benchmark enough times to determine that it consistently executes in the same length of time.

3. Turn the computer off and refer to the address map in step 3 on page 2.

4. Find the HP 98257A RAM card with its switches set to "2nd Card". Change its switches to "1st Card".

5. Run the benchmark and write down the execution time.

6. Now find the HP 98257A RAM card with its switches set to "3rd Card". Change its switches to "2nd Card".

7. Again run the benchmark and write down the execution time.

8. Continue moving your HP 98257A RAM cards up until they have all been moved.

9. Set the RAM card switches to the configuration which yielded the fastest execution time.

In Case of Trouble

If you do not obtain the correct amount of available memory, first turn the computer off and verify that the cards are plugged in correctly. Then turn it back on and see if the amount of memory is correct. If it still is not, turn the computer off and check the card addressing. If it is correct, set a card aside and continue the process with the remaining cards.

If you still have trouble, verify that you have assigned the addresses correctly. If you have, and no arrangement of cards will increase the amount of memory, put the computer into use with the maximum amount of memory you can obtain. Then replace all the unused cards in their anti-static bags and call your HP Sales and Service office for assistance.

Installing HP 98256A Cards

This procedure explains how to install new or re-install existing HP 98256A 256K byte RAM cards in a Series 200 Model 217, 220, 226, 236 or 237 computer or a Series 300 computer.

1. If you have not already done so, turn the computer off and remove any existing RAM cards from it, except for HP 98257A cards. Do this by unscrewing the interfaces and removable covers from the accessory slots and examine them for cards with plastic extractors listed in the following table. Remove the cards by pulling out on the extractors.

RAM Card Identification Table

Product Number	Memory Size	Extractor Colors Left	Right	Configuration Switch Segments
98257A	1M byte	Violet	Green	4
98256A	256K byte	Yellow	Red	6
98254A	64K byte	Red	Red	8

RAM Memory Card Extractors

2. Now switch the computer on and write down the amount of available RAM memory:

```
9836C      (serial no.)
Copyright 1982,
All Rights Reserved.
```

These entries may differ depending on computer and options.

```
BOOTROM 3.0
Keyboard
Color Graphics
2 flexible Discs
HP-IB
655200 Bytes ◄─────────
```

This entry is the amount of memory in the computer.
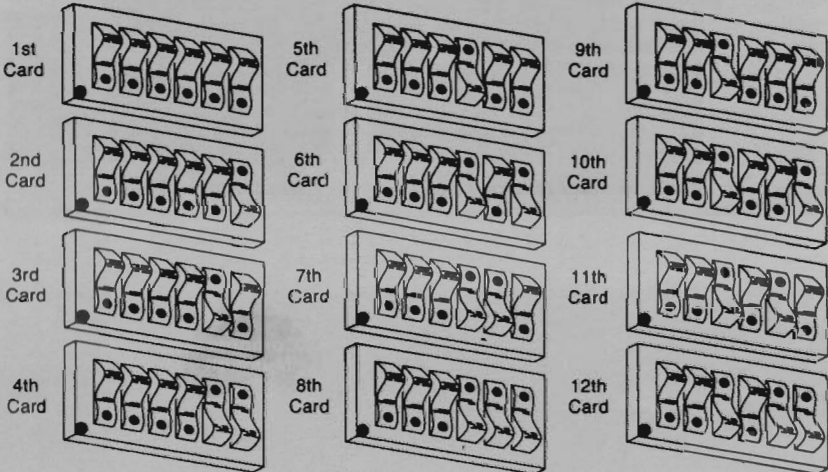
```
BOOTING SYSTEM
RESET TO Power-Up
```
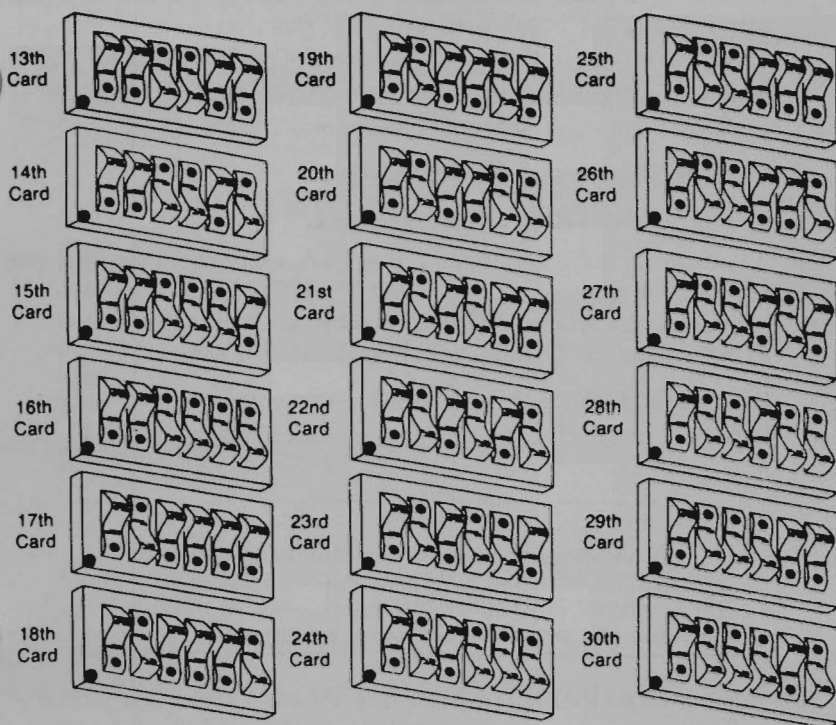
**Typical Power-up Display**

Your amount of memory is: _____

Note

If you do not get this display, but hear a series of beeps instead, your memory amount is zero.

---

3. Here is an address map for the HP 98256A cards. Starting at the top, cross off one address for each 262 000 bytes of RAM installed in the computer.

1st Card   5th Card   9th Card

2nd Card   6th Card   10th Card

3rd Card   7th Card   11th Card

4th Card   8th Card   12th Card

4. Address the HP 98256A cards using the first **UNUSED** address. Cross off each address as you use it.
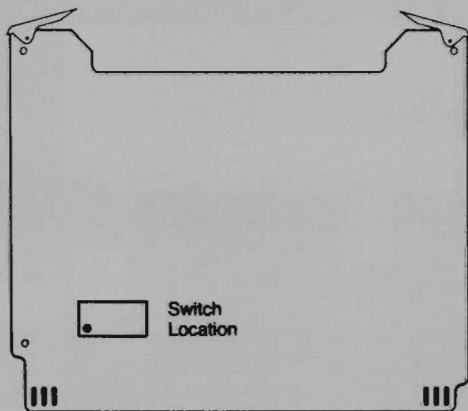
**HP 98256A 256K Byte Card Switch Settings**

5. Turn the computer off and install the HP 98256A cards in it. They can go in any slot. Install them so that the side with the switches is up. Press the cards in until the extractors are flat against the card.

6. Now switch the computer back on and write down the amount of available memory. You should have approximately

   262 000 bytes for each HP 98256A card

   plus the available RAM figure from step 2.

7. If you obtain the correct figure, you have successfully installed the HP 98256A cards. If you have no HP 98254A cards to re-install in your computer, your installation is complete. You may wish to refer to the section on "Optimizing Performance", on page 5.

   If you have HP 98254A cards to re-install in your computer, continue here.

Note

HP 98254A cards are not useable in RAM configurations greater than 2M bytes. If the RAM figure obtained in step 5 plus the RAM contained on HP 98254A cards exceeds 2M bytes, you must leave one or more of them out of the computer.

---

8. Take the next **UNUSED** address from the table in step 3 and reverse it. For instance, if you have installed one HP 98257A card and two HP 98256A cards, the next unused address is

MSB   LSB

When reversed, it becomes

LSB   MSB
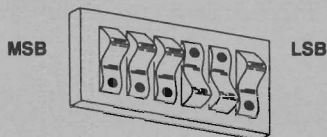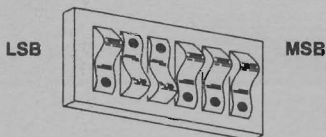
9. Place this address in the **right-hand** six segments of the address switch of the first four HP 98254A cards (if you have more than four HP 98254A cards, use one HP 98256A address for each four HP 98254A cards). For instance, the above example would look like this:
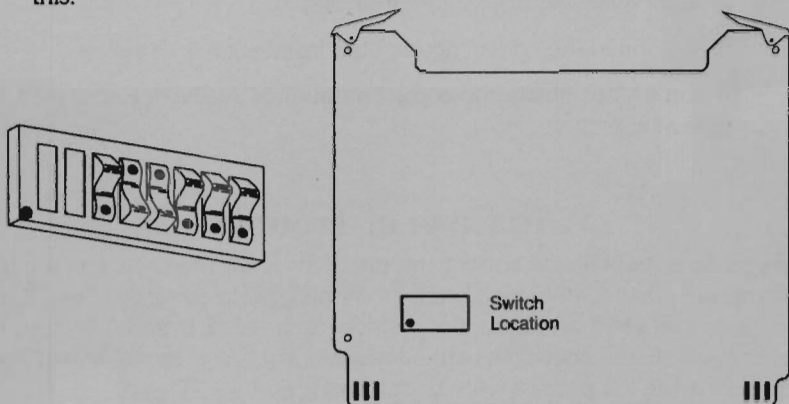
Switch
Location

HP 98254A 64K Byte Card Switch Settings

10. Now take the addresses from this table and place them in the **left-hand** two segments of the appropriate address switch:

LSB

1st, 5th, 9th and 13th Card

2nd, 6th, 10th and 14th Card

3rd, 7th, 11th and 15th Card

4th, 8th, 12th and 16th Card

11. Switch the computer off and install the cards in the computer. They may go in any slot. Install them so that the side containing the switches is up. Press the cards in until the extractors are flat against the card.

12. Now switch the computer on and check the power-up display for the amount of available RAM. You should have approximately

65 000 bytes for each HP 98254A card

plus the available RAM figure from step 6.

If you obtain the correct figure, your installation is complete.

If you do not obtain the correct amount of available RAM, read the following section.

In Case of Trouble

If you do not obtain the correct amount of available memory, first turn the computer off and verify that the cards are plugged in correctly. Then turn it back on and see if the amount of memory is correct. If it still is not, turn the computer off and check the card addressing. If it is correct, set a card aside and continue the process with the remaining cards.

If you still have trouble, verify that you have assigned the addresses correctly. If you have, and no arrangement of cards will increase the amount of memory, put the computer into use with the maximum amount of memory you can obtain. Then replace all the unused cards in their anti-static bags and call your HP Sales and Service office for assistance.
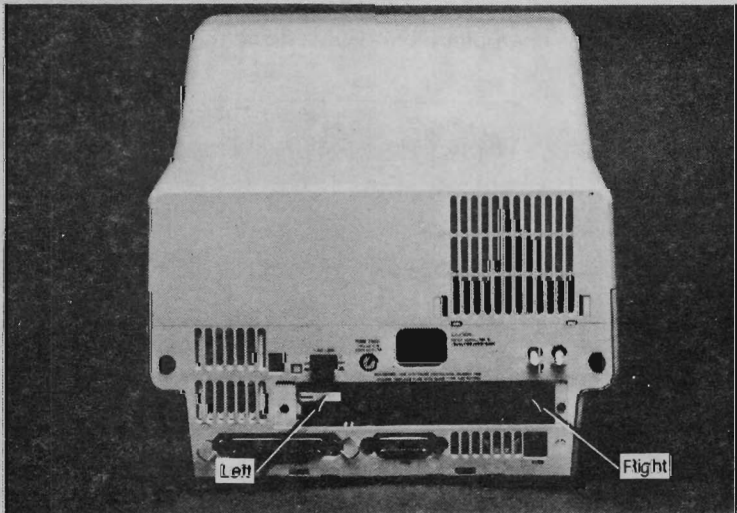
Installing RAM Cards in a Model 216 Without a HP 9888 Bus Expander

This procedure explains how to install HP 98256A and 98257A RAM cards in a Model 216 computer. If you are using a HP 9888 bus expander, go to the section titled "Installing RAM Cards in a Model 216 with a HP 9888 Bus Expander" (PINK pages).

1. Turn the computer off and remove any existing RAM cards from it. Do this by unscrewing the interface or removable cover from the accessory slots and examine them for cards with plastic extractors listed in the following table. Remove the cards by pulling out on the extractors.

RAM Card Identification Table

Product Number	Memory Size	Extractor Colors Left	Right	Configuration Switch Segments
98257A	1M byte	Violet	Green	4
98256A	256K byte	Yellow	Red	6
98254A	64K byte	Red	Red	8

RAM Memory Card Extractors

2. Locate the built-in RAM address switch on the processor board and set it according to this diagram (you may need to pull the top cover off the computer):
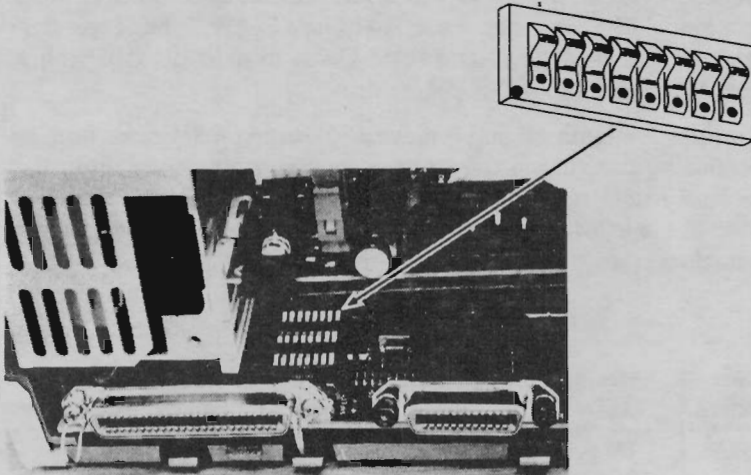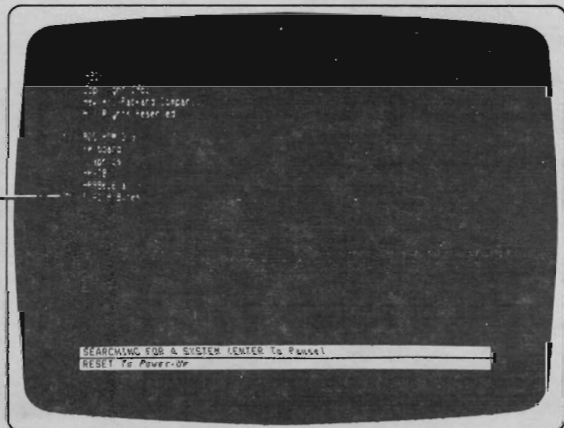

Built-in RAM Address Switches

3. Now switch the computer on and write down the amount of available RAM memory:

These entries may differ depending on computer and options.

This entry is the amount of memory in the computer.

Typical Power-up Display

4. Turn the computer off and set the built-in RAM address switch to match your memory configuration:

One
98257A

Two
98257As

One
98256A

Two
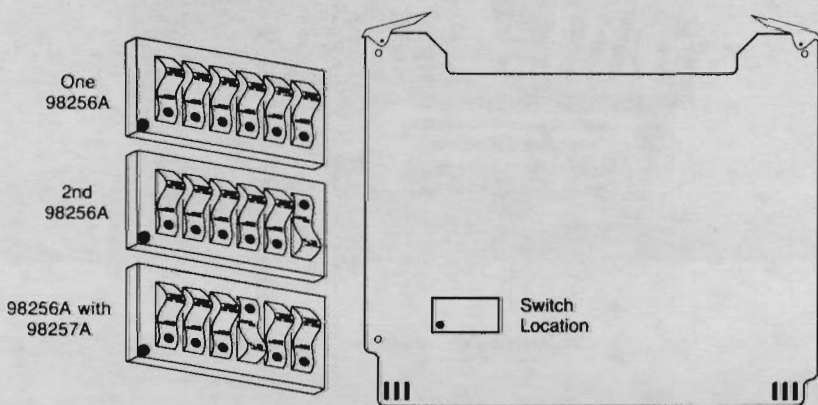98256As

One 98256A and
One 98257A
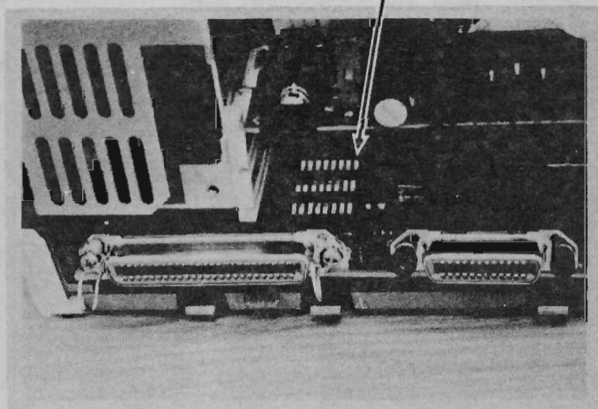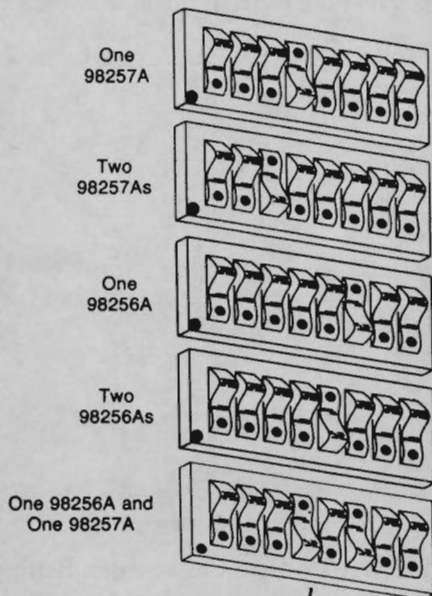
Built-in RAM Address Switches

5. Address and install the HP 98257A cards according to this chart. They may go in either slot. Install them so that the side containing the switches is up. Press the cards in until the extractors are flat against the card.

One
98257A

2nd
98257A
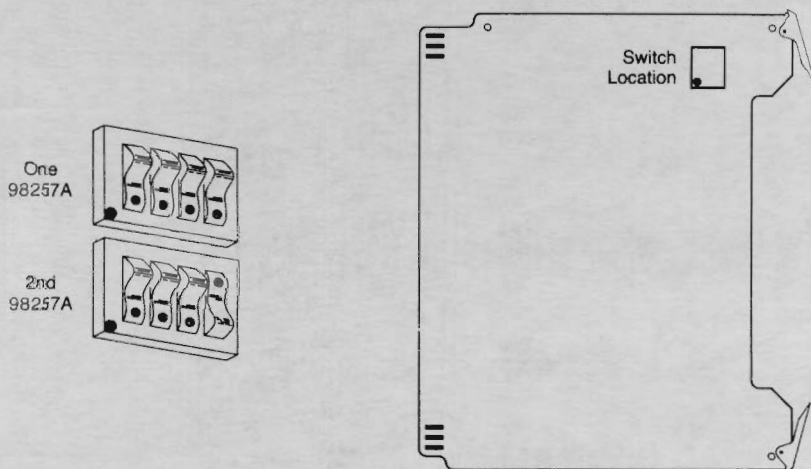
Switch
Location

HP 98257A 1M Byte Card Switch Settings

6. Address and install the HP 98256A cards according to this chart. They may go in either slot. Install them so that the side containing the switches is up. Press the cards in until the extractors are flat against the card.

One
98256A

2nd
98256A

98256A with
98257A

Switch
Location

HP 98256A 256K Byte Card Switch Settings

7. If you are re-installing a HP 98254A 64K byte card in your Model 216, set it according to the appropriate diagram. It may go in either slot. Install it so that the side containing the switches is up. Press the cards in until the extractors are flat against the card.
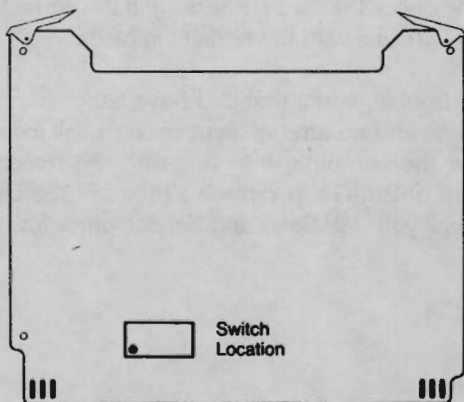
98257A and approximately
262K bytes built-in
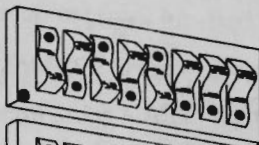
98257A and approximately
131K bytes built-in

98256A and approximately
262K bytes built-in

98256A and approximately
131K bytes built-in

Switch
Location

HP 98254A 64K Byte Card Switch Settings

8. Now switch on the computer and check the power-up display for the amount of available RAM. You should have approximately

1 048 400 bytes for each HP 98257A card

262 000 bytes for each HP 98256A card

65 000 bytes for a HP 98254A card

plus the built-in RAM figure from step 3.

If you obtain the correct amount of available RAM, you have successfully installed the RAM cards and your task is finished.

If you do not obtain the correct amount of available RAM, read the following section.

In Case of Trouble

If you do not obtain the correct amount of available memory, first turn the computer off and verify that the cards are plugged in correctly. Then turn it back on and see if the amount of memory is correct. If it still is not, turn the computer off and check the card addressing. If it is correct, set a card aside and continue the process with the remaining cards.

If you still have trouble, verify that you have assigned the addresses correctly. If you have, and no arrangement of cards will increase the amount of memory, put the computer into use with the maximum amount of memory you can obtain. Then replace all the unused cards in their antistatic bags and call your HP Sales and Service office for assistance.

Installing RAM Cards in a Model 216 With a HP 9888 Bus Expander

This procedure explains how to install HP 98256A and 98257A RAM cards in a Model 216 computer equipped with a HP 9888 bùs expander.

Note

HP 98254A 64K byte RAM cards are not generally compatible when using the HP 9888 bus expander with a Model 216. Consult your HP Customer Engineer for further information.
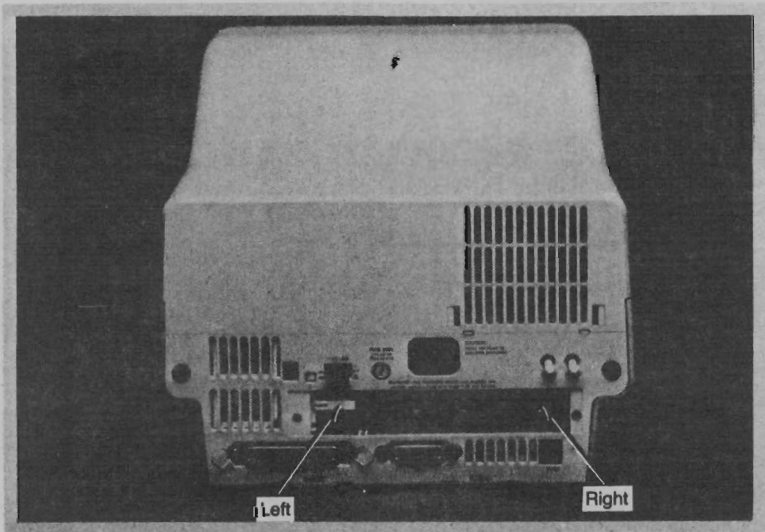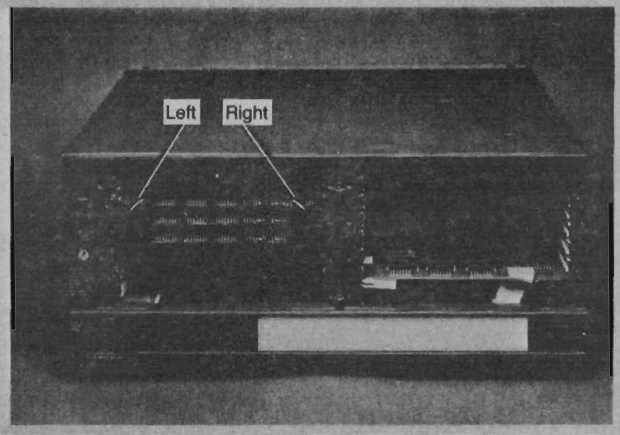

Preparation

1. Turn the computer off and remove any existing RAM cards from it. Do this by unscrewing the interfaces and removable covers from the accessory slots on both the computer and the expander. Look for cards with plastic extractors listed in the following table. Remove the cards by pulling out on the extractors.
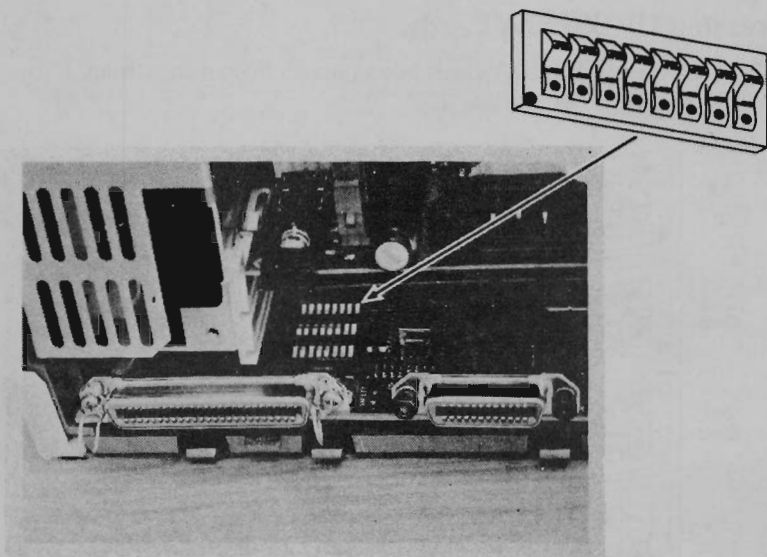
RAM Card Identification Table

Product Number	Memory Size	Extractor Colors Left	Right	Configuration Switch Segments
98257A	1M byte	Violet	Green	4
98256A	256K byte	Yellow	Red	6
98254A	64K byte	Red	Red	8

RAM Memory Card Extractors

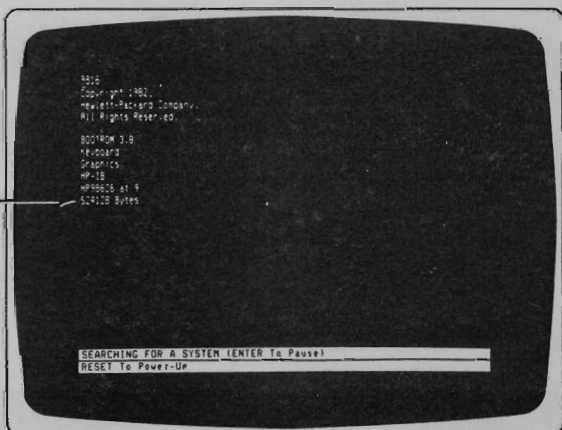2. Locate the built-in RAM address switch on the processor board and set it according to this diagram:

Built-in RAM Address Switches

3. Now switch the computer on and write down the amount of available RAM memory:

These entries may differ depending on computer and options.

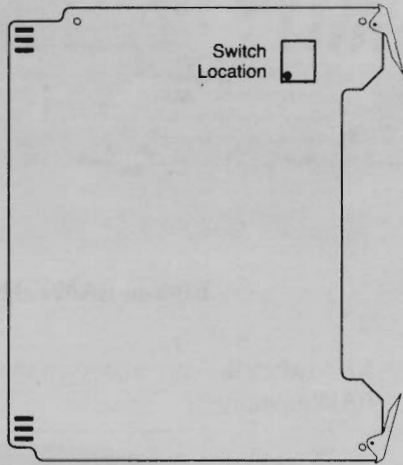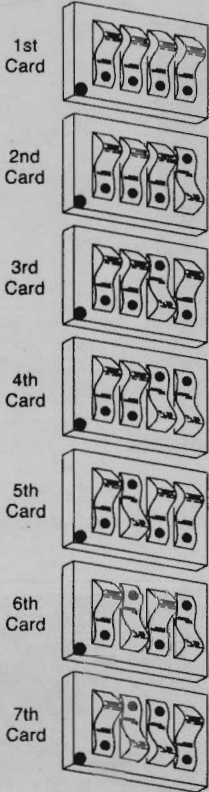This entry is the amount of memory in the computer.

Typical Power-up Display

4. If you have any HP 98257A cards to install, continue with step 5. If you have only HP 98256A cards to install, skip to step 11.

Addressing HP 98257A Cards

5. Address the HP 98257A cards according to this address map. Cross off each address as you use it.

HP 98257A 1M Byte Card Switch Settings

6. Turn the computer off and install the HP 98257A cards in it. They may go in any slot in the expander. Install them so that the side containing the switches is up. Press the cards in until the extractors are flat against the card.

7. Now take the next **UNUSED** address from the HP 98257A map and place it in the **left-most** four segments of the built-in RAM address switch.

   For instance, if you installed two HP 98257A cards, the next entry in the address map is:
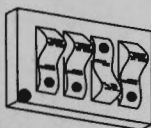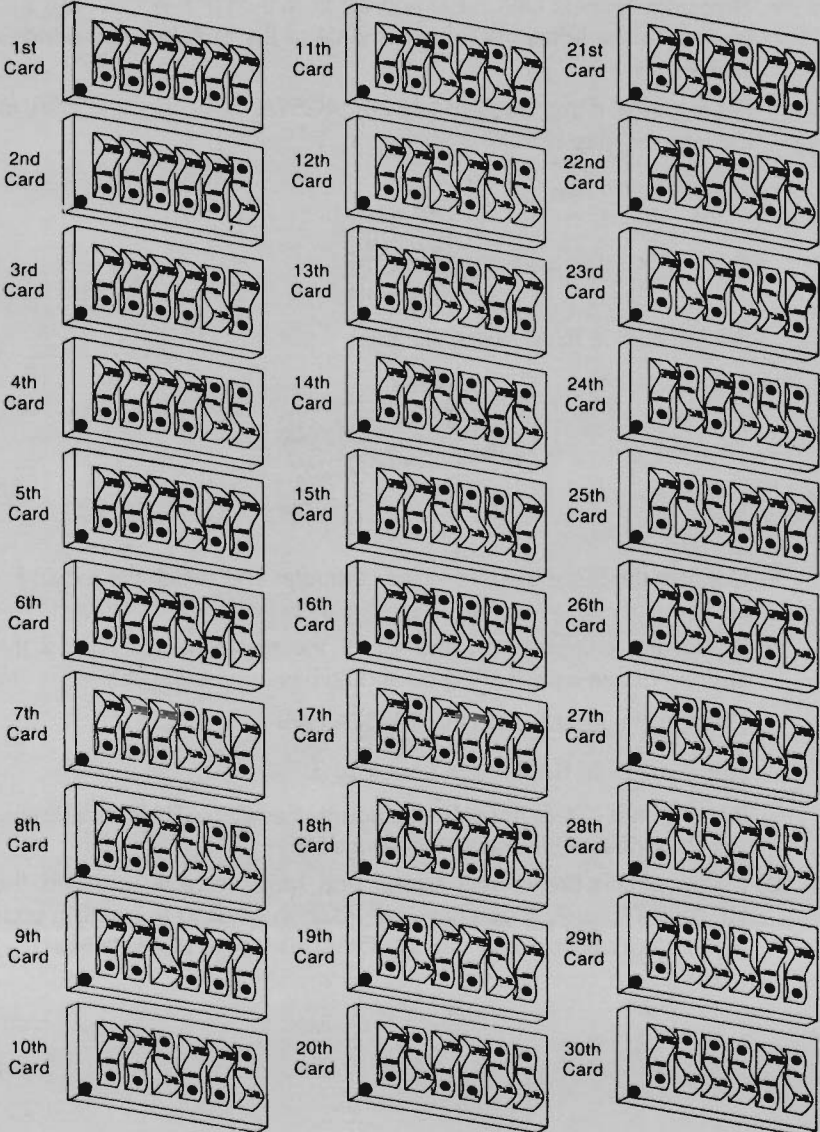
   Set the built-in RAM switch like this:
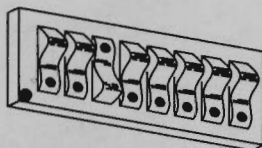
8. Connect the bus expander to the computer and switch the expander on.

9. Switch the computer on and check the power-up display for the amount of available RAM. You should have approximately

   1 048 400 bytes for each HP 98257A card

   plus the built-in RAM figure from step 3.

   If you do not obtain the correct amount of available RAM, refer to the "In Case of Trouble" section on page 26.

10. If you obtain the correct figure, you have correctly installed the HP 98257A cards. If you have HP 98256A cards to re-install in your computer, continue with step 11. Otherwise, your task is finished.

Addressing HP 98256A Cards

11. Here is an address map for the HP 98256A cards. Starting at the top, cross off four addresses for each HP 98257A card installed in the computer.

|		
1st Card	11th Card	21st Card
2nd Card	12th Card	22nd Card
3rd Card	13th Card	23rd Card
4th Card	14th Card	24th Card
5th Card	15th Card	25th Card
6th Card	16th Card	26th Card
7th Card	17th Card	27th Card
8th Card	18th Card	28th Card
9th Card	19th Card	29th Card
10th Card	20th Card	30th Card

12. Address the HP 98256A cards using the next **UNUSED** number. Cross off each address as you use it.
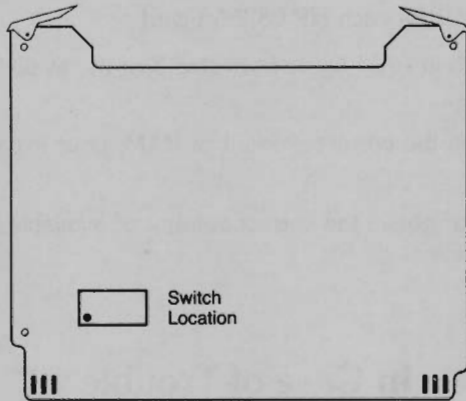
HP 98256A 256K Byte Card Switch Settings

13. Turn the computer and expander off and install the HP 98256A cards in the expander. They can go in any expander slot. Install them so that the side containing the switches is up. Press the cards in until the extractors are flat against the card.

14. Now take the next **UNUSED** address from the HP 98256A map and place it in the **left-most** six segments of the built-in RAM address switch.

    For instance, if you installed two HP 98257A cards and three HP 98256A cards, the next entry in the HP 98256A column is:
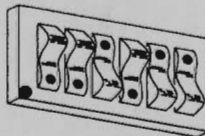
    Set the built-in RAM switch like this:

15. Connect the bus expander to the computer and switch the expander on.

16. Switch the computer on and check the power-up display for the amount of available RAM. You should have approximately

    262 000 bytes for each HP 98256A card

    plus the built-in RAM figure from step 3 or the available RAM figure from step 9.

    If you obtain the correct amount of RAM, your installation is complete.

    If you do not obtain the correct amount of available RAM, read the following section.

In Case of Trouble

If you do not obtain the correct amount of available memory, first turn the computer off and verify that the cards are plugged in correctly. Then turn it back on and see if the amount of memory is correct. If it still is not, turn the computer off and check the card addressing. If it is correct, set a card aside and continue the process with the remaining cards.

If you still have trouble, verify that you have assigned the addresses correctly. If you have, and no arrangement of cards will increase the amount of memory, put the computer into use with the maximum amount of memory you can obtain. Then replace all the unused cards in their anti-static bags and call your HP Sales and Service office for assistance.

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