

Indirect and Indexed Memory Addressing

COS10004 Lecture 9.2

LDR and STR memory addressing

- We have previously discussed and seen how LDR and STR support *indirect addressing*
 - allows memory to be addressed via registers holding the address
- For example:
 - `LDR R0, [R1]` will load into R0, the contents of the memory address that is currently held in R1.
 - `STR R3, [R4]` will store the value in R3 to the memory word with address currently held in R4

LDR Indirect example

```
MOV R1, #0x00040
```

```
LDR R0, [R1]
```

R1

R0

| Memory | | | | |
|--------|------------|------------|------------|------------|
| 000 | 0x0 | 0x4 | 0x8 | 0xc |
| 0x0000 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0001 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0002 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0003 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0004 | 0xffffffff | 0x00000000 | 0x00000000 | 0x00000000 |
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| 0x0007 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
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MOV R1, #0x00040
```

```
LDR R0, [R1]
```

R1

0x00040

R0

0xffffffff



| Memory | | | | |
|--------|------------|------------|------------|------------|
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STR Indirect example

```
MOV R0, #0xffffffff
```

```
MOV R1, #0x00040
```

```
STR R0, [R1]
```

R1

R0

| Memory | | | | |
|--------|------------|------------|------------|------------|
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MOV R0, #0xffffffff
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MOV R1, #0x00040
```

```
STR R0, [R1]
```

R1

R0

0xffffffff

Memory

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MOV R1, #0x00040
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STR R0, [R1]
```

R1

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STR R0, [R1]
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R1 0x00040

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Memory

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STR Indirect example

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```

R1

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R0

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Indexed Memory Addressing

- It is often desirable to address specific words/bytes of memory as an offset from some base address.
- For example:
 - Accessing dedicated memory locations that control/interact with external hardware/systems
 - Pixel display
 - Arrays (blocks of memory used to collect values of the same type)
 - Structs (blocks of memory used to collect values of different types)
- In such examples, there is typically a base address indicating the start of addresses dedicated to the specific use-case.
- We can therefore index specific memory locations within as an offset from this base address

Indexed Addressing Syntax

- In ARM assembly:
 - `LDR R0, [R1 + #4]`
 - `STR R2, [R1 + #16]`
 - `LDR R0, [R1 + R3]`
 - `STR R2, [R1 + R4]`

Indexed Addressing Syntax

- In ARM assembly:

- `LDR R0, [R1 + #4]`

Load the value at memory address $[R1] + 4$ bytes into R0

- `STR R2, [R1 + #16]`

- `LDR R0, [R1 + R3]`

- `STR R2, [R1 + R4]`

Indexed Addressing Syntax

- In ARM assembly:

- LDR R0, [R1 + #4]

- STR R2, [R1 + #16]

Store the value in R2 in memory at address [R1] + 16 bytes

- LDR R0, [R1 + R3]

- STR R2, [R1 + R4]

Indexed Addressing Syntax

- In ARM assembly:

- `LDR R0, [R1 + #4]`
- `STR R2, [R1 + #16]`
- `LDR R0, [R1 + R3]`
- `STR R2, [R1 + R4]`

Load the value at memory address $[R1] + R3$ (no. of bytes) into R0

Indexed Addressing Syntax

- In ARM assembly:

- `LDR R0, [R1 + #4]`
- `STR R2, [R1 + #16]`
- `LDR R0, [R1 + R3]`
- `STR R2, [R1 + R4]`

Store the value in R2 in memory at address $[R1] + R4$ (no. of bytes)

Indexed Addressing LDR Example

```
MOV R1, #0x00040  
LDR R0, [R1 + #4]
```

R1

R0

| Memory | | | | |
|--------|------------|------------|------------|------------|
| 000 | 0x0 | 0x4 | 0x8 | 0xc |
| 0x0000 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0001 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0002 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0003 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0004 | 0x00000000 | 0xffffffff | 0x00000000 | 0x00000000 |
| 0x0005 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0006 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0007 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0008 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0009 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x000a | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x000b | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x000c | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x000d | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x000e | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x000f | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0010 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0011 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0012 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0013 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0014 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0015 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0016 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0017 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0018 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0019 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x001a | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x001b | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x001c | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x001d | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x001e | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x001f | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |

Indexed Addressing LDR Example

```
MOV R1, #0x00040  
LDR R0, [R1 + #4]
```

R1

0x00040

R0

Memory

| 000 | 0x0 | 0x4 | 0x8 | 0xc |
|--------|------------|------------|------------|------------|
| 0x0000 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0001 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0002 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0003 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0004 | 0x00000000 | 0xffffffff | 0x00000000 | 0x00000000 |
| 0x0005 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0006 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0007 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0008 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0009 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x000a | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x000b | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x000c | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x000d | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x000e | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x000f | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0010 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0011 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0012 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0013 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0014 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0015 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0016 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0017 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0018 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0019 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x001a | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x001b | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x001c | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x001d | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x001e | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x001f | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |

Indexed Addressing LDR Example

```
MOV R1, #0x00040  
LDR R0, [R1 + #4]
```

R1

0x00040

R0

Memory

| 000 | 0x0 | 0x4 | 0x8 | 0xc |
|--------|------------|------------|------------|------------|
| 0x0000 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0001 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0002 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0003 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0004 | 0x00000000 | 0xffffffff | 0x00000000 | 0x00000000 |
| 0x0005 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0006 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0007 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0008 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0009 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x000a | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x000b | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x000c | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x000d | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x000e | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x000f | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0010 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0011 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0012 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0013 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0014 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0015 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0016 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0017 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0018 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0019 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x001a | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x001b | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x001c | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x001d | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x001e | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x001f | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |

Indexed Addressing LDR Example

```
MOV R1, #0x00040
```

```
LDR R0, [R1 + #4]
```

R1 0x00040

R0

$0x00040 + 4 = 0x00044$

Memory

| 000 | 0x0 | 0x4 | 0x8 | 0xc |
|--------|------------|------------|------------|------------|
| 0x0000 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0001 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0002 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0003 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0004 | 0x00000000 | 0xffffffff | 0x00000000 | 0x00000000 |
| 0x0005 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0006 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0007 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0008 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0009 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x000a | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x000b | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x000c | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x000d | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x000e | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x000f | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0010 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0011 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0012 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0013 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0014 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0015 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0016 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0017 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0018 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0019 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x001a | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x001b | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x001c | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x001d | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x001e | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x001f | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |

Indexed Addressing LDR Example

```
MOV R1, #0x00040
```

```
LDR R0, [R1 + #4]
```

R1

0x00040

R0

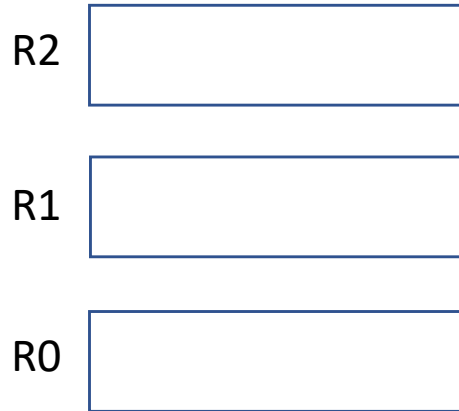
0xffffffff

Memory

| 000 | 0x0 | 0x4 | 0x8 | 0xc |
|--------|------------|------------|------------|------------|
| 0x0000 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0001 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0002 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0003 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0004 | 0x00000000 | 0xffffffff | 0x00000000 | 0x00000000 |
| 0x0005 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0006 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0007 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0008 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0009 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x000a | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x000b | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x000c | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x000d | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x000e | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x000f | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0010 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0011 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0012 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0013 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0014 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0015 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0016 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0017 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0018 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0019 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x001a | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x001b | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x001c | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x001d | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x001e | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x001f | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |

Indexed Addressing STR Example

```
MOV R0, #0xfffffffff
MOV R1, #0x00040
MOV R2, #16
STR R0, [R1 + R2]
```



| Memory | | | | |
|--------|------------|------------|------------|------------|
| 000 | 0x0 | 0x4 | 0x8 | 0xc |
| 0x0000 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0001 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0002 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0003 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0004 | 0x00000000 | 0xffffffff | 0x00000000 | 0x00000000 |
| 0x0005 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0006 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0007 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0008 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0009 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x000a | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x000b | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x000c | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x000d | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x000e | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x000f | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0010 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0011 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0012 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0013 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0014 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0015 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0016 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0017 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0018 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0019 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x001a | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x001b | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x001c | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x001d | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x001e | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x001f | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |

Indexed Addressing STR Example

```
MOV R0, #0xffffffff
```

```
MOV R1, #0x00040
```

```
MOV R2, #16
```

```
STR R0, [R1 + R2]
```

R2

R1

R0

| Memory | | | | |
|--------|------------|------------|------------|------------|
| 000 | 0x0 | 0x4 | 0x8 | 0xc |
| 0x0000 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0001 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0002 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0003 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0004 | 0x00000000 | 0xffffffff | 0x00000000 | 0x00000000 |
| 0x0005 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0006 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0007 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0008 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0009 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x000a | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x000b | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x000c | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x000d | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x000e | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x000f | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0010 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0011 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0012 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0013 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0014 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0015 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0016 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0017 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0018 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0019 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x001a | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x001b | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x001c | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x001d | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x001e | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x001f | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |

Indexed Addressing STR Example

```
MOV R0, #0xffffffff
```

```
MOV R1, #0x00040
```

```
MOV R2, #16
```

```
STR R0, [R1 + R2]
```

R2

R1

0x00040

R0

0xffffffff

| Memory | | | | |
|--------|------------|------------|------------|------------|
| 000 | 0x0 | 0x4 | 0x8 | 0xc |
| 0x0000 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0001 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0002 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0003 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0004 | 0x00000000 | 0xffffffff | 0x00000000 | 0x00000000 |
| 0x0005 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0006 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0007 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0008 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0009 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x000a | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x000b | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x000c | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x000d | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x000e | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x000f | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0010 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0011 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0012 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0013 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0014 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0015 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0016 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0017 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0018 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0019 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x001a | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x001b | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x001c | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x001d | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x001e | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x001f | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |

Indexed Addressing STR Example

```
MOV R0, #0xffffffff
```

```
MOV R1, #0x00040
```

```
MOV R2, #16
```

```
STR R0, [R1 + R2]
```

R2

| |
|----|
| 16 |
|----|

R1

| |
|---------|
| 0x00040 |
|---------|

R0

| |
|------------|
| 0xffffffff |
|------------|

| Memory | | | | |
|--------|------------|------------|------------|------------|
| 000 | 0x0 | 0x4 | 0x8 | 0xc |
| 0x0000 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0001 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0002 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0003 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0004 | 0x00000000 | 0xffffffff | 0x00000000 | 0x00000000 |
| 0x0005 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0006 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0007 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0008 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0009 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x000a | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x000b | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x000c | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x000d | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x000e | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x000f | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0010 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0011 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0012 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0013 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0014 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0015 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0016 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0017 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0018 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0019 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x001a | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x001b | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x001c | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x001d | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x001e | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x001f | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |

Indexed Addressing STR Example

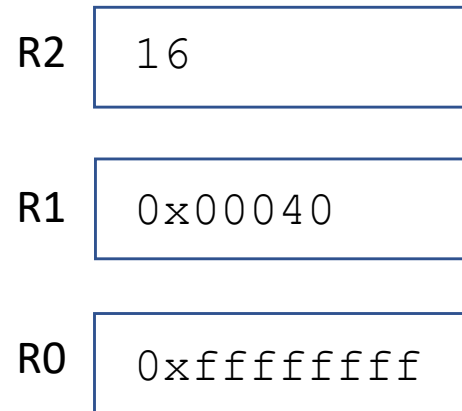
```
MOV R0, #0xfffffffff
MOV R1, #0x00040
MOV R2, #16
STR R0, [R1 + R2]
```

| | |
|----|-------------|
| R2 | 16 |
| R1 | 0x00040 |
| R0 | 0xfffffffff |

| Memory | | | | |
|--------|------------|------------|------------|------------|
| 000 | 0x0 | 0x4 | 0x8 | 0xc |
| 0x0000 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0001 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0002 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0003 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0004 | 0x00000000 | 0xffffffff | 0x00000000 | 0x00000000 |
| 0x0005 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0006 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0007 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0008 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0009 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x000a | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x000b | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x000c | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x000d | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x000e | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x000f | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0010 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0011 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0012 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0013 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0014 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0015 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0016 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0017 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0018 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0019 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x001a | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x001b | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x001c | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x001d | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x001e | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x001f | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |

Indexed Addressing STR Example

```
MOV R0, #0xfffffffff
MOV R1, #0x00040
MOV R2, #16
STR R0, [R1 + R2]
```



$0x00040 + 16 (0xF) = 0x00050$

| Memory | | | | |
|--------|------------|------------|------------|------------|
| 000 | 0x0 | 0x4 | 0x8 | 0xc |
| 0x0000 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0001 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0002 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0003 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0004 | 0x00000000 | 0xffffffff | 0x00000000 | 0x00000000 |
| 0x0005 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0006 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0007 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0008 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0009 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x000a | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x000b | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x000c | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x000d | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x000e | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x000f | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0010 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0011 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0012 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0013 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0014 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0015 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0016 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0017 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0018 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0019 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x001a | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x001b | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x001c | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x001d | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x001e | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x001f | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |

Indexed Addressing STR Example

```
MOV R0, #0xffffffff
MOV R1, #0x00040
MOV R2, #16
STR R0, [R1 + R2]
```

R2 16

R1 0x00040

R0 0xffffffff

$0x00040 + 16 (0xF) = 0x00050$

| Memory | | | | |
|--------|------------|------------|------------|------------|
| 000 | 0x0 | 0x4 | 0x8 | 0xc |
| 0x0000 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0001 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0002 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0003 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0004 | 0x00000000 | 0xffffffff | 0x00000000 | 0x00000000 |
| 0x0005 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0006 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0007 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0008 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0009 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x000a | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x000b | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x000c | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x000d | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x000e | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x000f | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0010 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0011 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0012 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0013 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0014 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0015 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0016 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0017 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0018 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0019 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x001a | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x001b | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x001c | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x001d | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x001e | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x001f | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |

Indexed Addressing STR Example

```
MOV R0, #0xffffffff
MOV R1, #0x00040
MOV R2, #16
STR R0, [R1 + R2]
```

R2 16

R1 0x00040

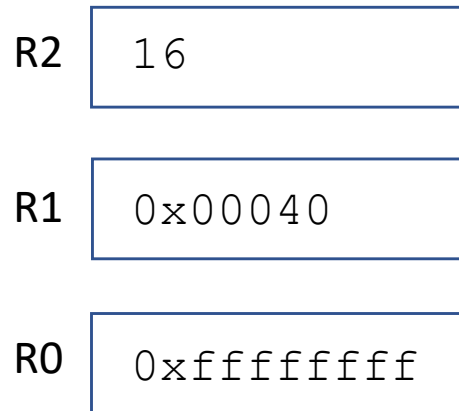
R0 0xffffffff

$0x00040 + 16 (0xF) = 0x00050$

| Memory | | | | |
|--------|------------|------------|------------|------------|
| 000 | 0x0 | 0x4 | 0x8 | 0xc |
| 0x0000 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0001 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0002 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0003 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0004 | 0x00000000 | 0xffffffff | 0x00000000 | 0x00000000 |
| 0x0005 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0006 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0007 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0008 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0009 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x000a | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x000b | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x000c | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x000d | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x000e | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x000f | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0010 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0011 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0012 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0013 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0014 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0015 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0016 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0017 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0018 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0019 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x001a | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x001b | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x001c | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x001d | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x001e | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x001f | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |

Indexed Addressing STR Example

```
MOV R0, #0xfffffffff
MOV R1, #0x00040
MOV R2, #16
STR R0, [R1 + R2]
```



| Memory | | | | |
|--------|------------|------------|------------|------------|
| 000 | 0x0 | 0x4 | 0x8 | 0xc |
| 0x0000 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0001 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0002 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0003 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0004 | 0x00000000 | 0xffffffff | 0x00000000 | 0x00000000 |
| 0x0005 | 0xffffffff | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0006 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0007 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0008 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0009 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x000a | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x000b | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x000c | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x000d | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x000e | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x000f | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0010 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0011 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0012 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0013 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0014 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0015 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0016 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0017 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0018 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0019 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x001a | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x001b | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x001c | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x001d | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x001e | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x001f | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |

Indexed Addressing LDRB Example

```
MOV R1, #0x00040  
LDRB R0, [R1 + #2]
```

R1

R0

| Memory | | | | |
|--------|------------|------------|------------|------------|
| 000 | 0x0 | 0x4 | 0x8 | 0xc |
| 0x0000 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0001 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0002 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0003 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0004 | 0xaabbccdd | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0005 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0006 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |

Indexed Addressing LDRB Example

```
MOV R1, #0x00040
```

```
LDRB R0, [R1 + #2]
```

R1

0x00040

R0

| Memory | | | | |
|--------|------------|------------|------------|------------|
| 000 | 0x0 | 0x4 | 0x8 | 0xc |
| 0x0000 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0001 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0002 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0003 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0004 | 0xaabbccdd | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0005 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0006 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |

Indexed Addressing LDRB Example

```
MOV R1, #0x00040  
LDRB R0, [R1 + #2]
```

R1

0x00040

R0

| Memory | | | | |
|--------|------------|------------|------------|------------|
| 000 | 0x0 | 0x4 | 0x8 | 0xc |
| 0x0000 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0001 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0002 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0003 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0004 | 0xaabbccdd | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0005 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0006 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |

Indexed Addressing LDRB Example

```
MOV R1, #0x00040
```

```
LDRB R0, [R1 + #2]
```

R1

0x00040

R0

| Memory | | | | |
|--------|---------------------|------------|------------|------------|
| 000 | 0x0 | 0x4 | 0x8 | 0xc |
| 0x0000 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0001 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0002 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0003 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0004 | 0xaa bb ccdd | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0005 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0006 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |

Indexed Addressing LDRB Example

```
MOV R1, #0x00040
```

```
LDRB R0, [R1 + #2]
```

R1

0x00040

R0

0x000000bb

| Memory | | | | |
|--------|---------------------|------------|------------|------------|
| 000 | 0x0 | 0x4 | 0x8 | 0xc |
| 0x0000 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0001 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0002 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0003 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0004 | 0xaa bb ccdd | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0005 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0006 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |

Indexed Addressing STRB Example

```
MOV R0, #0x000000ff
MOV R1, #0x00040
MOV R2, #3
STRB R0, [R1 + R2]
```

R2

R1

R0

| Memory | | | | |
|--------|------------|------------|------------|------------|
| 000 | 0x0 | 0x4 | 0x8 | 0xc |
| 0x0000 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0001 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0002 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0003 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0004 | 0xaabbccdd | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0005 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0006 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |

Indexed Addressing STRB Example

```
MOV R0, #0x000000ff
```

```
MOV R1, #0x00040
```

```
MOV R2, #3
```

```
STRB R0, [R1 + R2]
```

R2

| |
|---|
| 3 |
|---|

R1

| |
|---------|
| 0x00040 |
|---------|

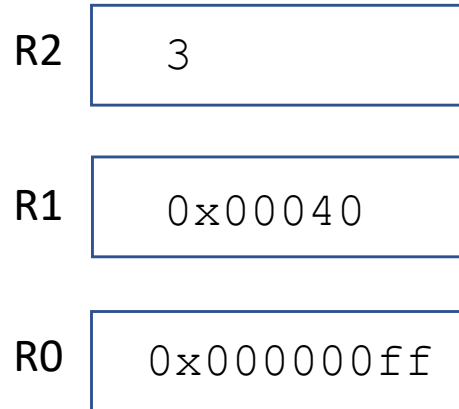
R0

| |
|------------|
| 0x000000ff |
|------------|

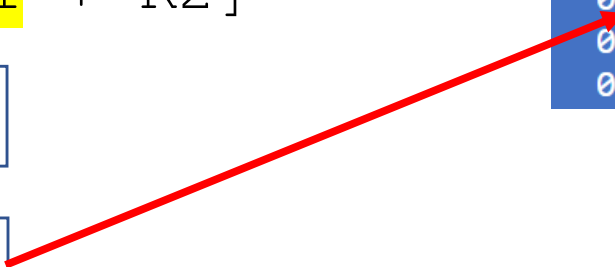
| Memory | | | | |
|--------|------------|------------|------------|------------|
| 000 | 0x0 | 0x4 | 0x8 | 0xc |
| 0x0000 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0001 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0002 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0003 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0004 | 0xaabbccdd | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0005 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0006 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |

Indexed Addressing STRB Example

```
MOV R0, #0x000000ff
MOV R1, #0x00040
MOV R2, #3
STRB R0, [R1 + R2]
```

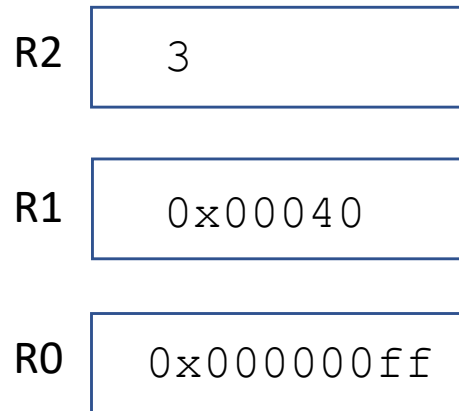


| Memory | | | | |
|--------|------------|------------|------------|------------|
| 000 | 0x0 | 0x4 | 0x8 | 0xc |
| 0x0000 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0001 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0002 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0003 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0004 | 0xaabbccdd | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0005 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0006 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |

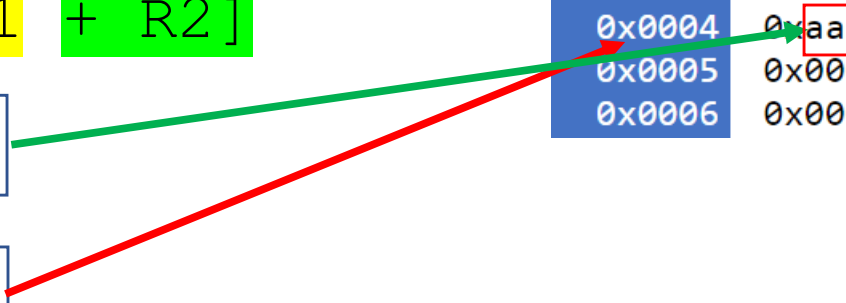


Indexed Addressing STRB Example

```
MOV R0, #0x000000ff
MOV R1, #0x00040
MOV R2, #3
STRB R0, [R1 + R2]
```



| Memory | | | | |
|--------|------------|------------|------------|------------|
| 000 | 0x0 | 0x4 | 0x8 | 0xc |
| 0x0000 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0001 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0002 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0003 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0004 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0005 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0006 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |



Indexed Addressing STRB Example

```
MOV R0, #0x000000ff
MOV R1, #0x00040
MOV R2, #3
STRB R0, [R1 + R2]
```

R2

| |
|---|
| 3 |
|---|

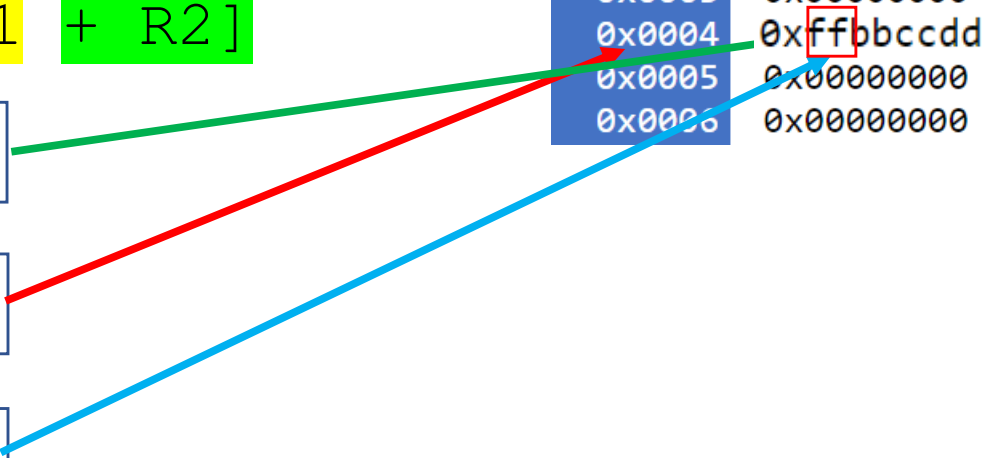
R1

| |
|---------|
| 0x00040 |
|---------|

R0

| |
|------------|
| 0x000000ff |
|------------|

| Memory | | | | |
|--------|------------|------------|------------|------------|
| 000 | 0x0 | 0x4 | 0x8 | 0xc |
| 0x0000 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0001 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0002 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0003 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0004 | 0xffbbccdd | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0005 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |
| 0x0006 | 0x00000000 | 0x00000000 | 0x00000000 | 0x00000000 |



Some Observations and Notes

- For word index addressing (ie STR, LDR):
 - the offset number of bytes must be a multiple of 4 (ie., 4 bytes per word)
- For byte index addressing (ie STRB and LDRB):
 - individual bytes can be addressed so no need for offset to be multiple of 4
 - Remember ARMLite uses little endian byte addressing
 - If a byte offset is larger than 4 then it will be addressing bytes in adjacent words