```
                          ┌──────────┐
                          │  Start   │
                          └────┬─────┘
                               │
                    ┌──────────▼──────────┐
                    │ Store reference to  │
                    │ UPC in register 1   │
                    └──────────┬──────────┘
                               │
                    ┌──────────▼──────────┐
                    │ Add for loop        │
                    │ counter to register │
                    │ 2                   │
                    └──────────┬──────────┘
                               │
                    ┌──────────▼──────────┐        ┌─────────────────────┐        ┌─────────────────────┐
                    │ Subtract 1 from for │        │ Add check number    │        │ Move 9 into         │
                    │ loop counter        │        │ to register 9       │        │ register 6          │
                    └──────────┬──────────┘        └──────────┬──────────┘        └──────────┬──────────┘
                               │                              │                              │
                    ┌──────────▼──────────┐        ┌──────────▼──────────┐        ┌──────────▼──────────┐
                    │ Load number from    │        │ Multiple register 4 │        │ Subtract register   │
                    │ UPC to register 3   │        │ by 3                │        │ 4(remainder) from   │
                    └──────────┬──────────┘        └──────────┬──────────┘        │ register 6 and      │
                               │                              │                   │ place result in     │
                    ┌──────────▼──────────┐        ┌──────────▼──────────┐        │ register 7          │
                    │ Subtract 48 from    │        │ Add register 5, to  │        └──────────┬──────────┘
                    │ number              │        │ register 4          │                   │
                    └──────────┬──────────┘        └──────────┬──────────┘        ┌──────────▼──────────┐
                               │                              │                   │ Add one to          │
                    ┌──────────▼──────────┐        ┌──────────▼──────────┐        │ register 0          │
                    │ Add number to       │        │ Subtract 1 from     │        └──────────┬──────────┘
                    │ first sum in        │        │ register 4          │                   │
                    │ register 4          │        └──────────┬──────────┘        ┌──────────▼──────────┐
                    └──────────┬──────────┘                   │                   │ Are registers 9     │── No ──┐
                               │                   ┌──────────▼──────────┐        │ and 7 the same?     │        │
                    ┌──────────▼──────────┐        │ Subtract 10 from    │        └──────────┬──────────┘        │
                    │ Load number from    │        │ register 4          │                   │                   │
                    │ UPC to register 3   │        └──────────┬──────────┘                  Yes      ┌───────────▼─────────┐
                    └──────────┬──────────┘                   │                               │       │ Add one to          │
                               │                   ┌──────────▼──────────┐                    │       │ register 0          │
                    ┌──────────▼──────────┐        │  Is register 4 > 10 │── Yes              │       └───────────┬─────────┘
                    │ Subtract 48 from    │        └──────────┬──────────┘                    │                   │
                    │ number              │              No   │                    ┌──────────▼──────────┐        │
                    └──────────┬──────────┘                   │                    │       END           │◄───────┘
                               │                              │                    └─────────────────────┘
                    ┌──────────▼──────────┐
                    │  Loop counter >0?   │── No ──► (to Add check number to register 9)
                    └──────────┬──────────┘
                          No   │
                    ┌──────────▼──────────┐
                    │ Add number to       │
                    │ second sum in       │
                    │ register 5          │
                    └─────────────────────┘
```

```
                              ┌──────────┐
                              │  Start   │
                              └──────────┘
                                   │
                                   ▼
                          ┌──────────────────┐
                          │ Store reference to│
                          │    STRING in      │
                          │    register 1     │
                          └──────────────────┘
                                   │
                                   ▼
                          ┌──────────────────┐                    ┌──────────────────┐        ⎫ This decreases the memory
                          │ Store reference to│                    │   Subtract 1 from │        ⎬ by 1, essentialy reading the
                          │   Eos in register 2│                   │    register 2     │        ⎭ string backwards.
                          └──────────────────┘                    └──────────────────┘
                                   │                                        │
                                   ▼                                        ▼
                          ┌──────────────────┐                    ┌──────────────────┐
                          │   Load next       │                   │ Load character    │
                          │ character of string│◄─────            │ referenced to by  │
                          │  into register 3  │                   │ register 2, into  │
                          └──────────────────┘                    │   register 4      │
                                   │                              └──────────────────┘
                                   ▼                                        │
This checks to see if the character is              ⎫            ▼
potentially a lowercase letter as they              ⎬     ◇ Is value of ◇        ◇ Is value of ◇
range from 97-122. Performing this at               ⎭   character smaller or   character smaller or
the begining improves effeceincy as                     equal to 90?            equal to 90?     No
we don't need to check for character
between 91-96 and 123-127.                                   │ No                     │ No
                                                             ▼                         ▼
                                              ┌──────────────────┐        ┌──────────────────┐
                                              │  Subtract 32 from │        │  Subtract 32 from │
                                              │      value        │        │      value        │
                                              └──────────────────┘        └──────────────────┘
Now that all characters are, at most, value  ⎫              │                         │
90, we only need to check if the character   ⎬              ▼                         ▼
is larger then 65 (the value of 'A'), if not we ⎭    ◇ Is value of ◇          ◇ Is value of ◇
know the character can be ignored.             character greater or        character greater or
                                               equal to 65?                equal to 65?

                                                                                   Yes
                                                                                    │
                                                                                    ▼
                                                                          ◇ Is Eos            ⎫ Has entire string
                                                                     reference greater        ⎬ been checked?
                                                                     or equal to STRING       ⎭
                                                                         reference? ◇
                                                       No
                                    ◇ Are                      │                   │ Yes
                              registers 3 and 4               ▼                     ▼
                                the same? ◇          This checks if both character
                                                     nth distence from center are
                                       No            the same (Is the string
                                        │            potentially a palindrome?)
                                        ▼                                          ▼
                              ┌──────────────────┐                    ┌──────────────────┐
                              │ Add 1 to reguster 0│───────────────►  │ Add 1 to register 0│
                              └──────────────────┘                    └──────────────────┘
                                                                                │
                                                                                ▼
                                                                          ┌──────────┐
                                                                          │   End    │
                                                                          └──────────┘
```

Text labels in flowchart:

- Start
- Store reference to STRING in register 1
- Store reference to Eos in register 2
- Load next character of string into register 3
- Subtract 1 from register 2
- Load character referenced to by register 2, into register 4
- This decreases the memory by 1, essentialy reading the string backwards.
- Is value of character smaller or equal to 90?
- This checks to see if the character is potentially a lowercase letter as they range from 97-122. Performing this at the begining improves effeceincy as we don't need to check for character between 91-96 and 123-127.
- Subtract 32 from value
- Now that all characters are, at most, value 90, we only need to check if the character is larger then 65 (the value of 'A'), if not we know the character can be ignored.
- Is value of character greater or equal to 65?
- Is Eos reference greater or equal to STRING reference?
- Has entire string been checked?
- Are registers 3 and 4 the same?
- This checks if both character nth distence from center are the same (Is the string potentially a palindrome?)
- Add 1 to reguster 0
- Add 1 to register 0
- End