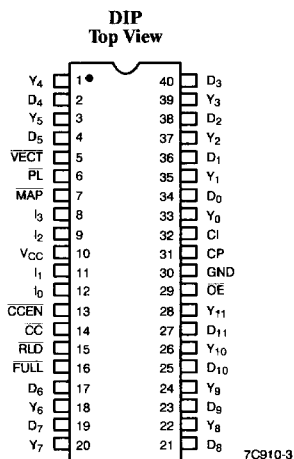
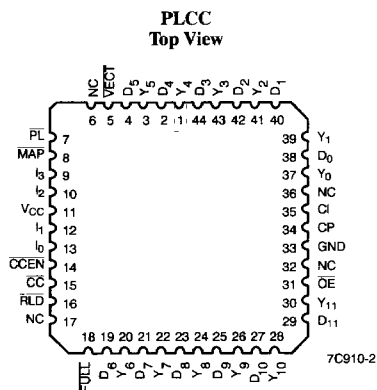


## Pin Configurations



## Selection Guide

| Minimum Clock Cycle (ns) | Stack Depth (words) | Operating Range | Part Number |
|--------------------------|---------------------|-----------------|-------------|
| 40                       | 17                  | Commercial      | CY7C910-40  |
| 46                       | 17                  | Military        | CY7C910-46  |
| 50                       | 17                  | Commercial      | CY7C910-50  |
| 51                       | 17                  | Military        | CY7C910-51  |
| 93                       | 17                  | Commercial      | CY7C910-93  |
| 99                       | 17                  | Military        | CY7C910-99  |

## Maximum Ratings

(Above which the useful life may be impaired. For user guidelines, not tested.)

|                                                                |                                          |
|----------------------------------------------------------------|------------------------------------------|
| Storage Temperature .....                                      | - 65°C to +150°C                         |
| Ambient Temperature with<br>Power Applied .....                | - 55°C to +125°C                         |
| Supply Voltage to Ground Potential<br>(Pin 10 to Pin 30) ..... | - 0.5V to +7.0V                          |
| DC Voltage Applied to Outputs<br>in High Z State .....         | - 0.5V to +7.0V                          |
| DC Input Voltage .....                                         | - 3.0V to +7.0V                          |
| Output Current into Outputs (LOW) .....                        | 30 mA                                    |
| Static Discharge Voltage .....                                 | > 2001V<br>(Per MIL-STD-883 Method 3015) |

## Operating Range

| Range                   | Ambient Temperature | V <sub>CC</sub> |
|-------------------------|---------------------|-----------------|
| Commercial              | 0°C to +70°C        | 5V ±10%         |
| Military <sup>[1]</sup> | - 55°C to +125°C    | 5V ±10%         |

Note:

1. T<sub>A</sub> is the "instant on" case temperature.

## Pin Definitions

| Signal Name       | I/O | Description                                                                                                                                     |
|-------------------|-----|-------------------------------------------------------------------------------------------------------------------------------------------------|
| $D_0 - D_{11}$    | I   | Direct inputs to the RC (Register/Counter) and multiplexer. $D_0$ is LSB and $D_{11}$ is MSB                                                    |
| $\overline{RLD}$  | I   | Register load. Control input to RC that, when LOW, loads data on the $D_0 - D_{11}$ pins into RC on the LOW-to-HIGH clock (CP) transition.      |
| $I_0 - I_3$       | I   | Instruction inputs that select one of sixteen instructions to be performed by the CY7C910.                                                      |
| $\overline{CC}$   | I   | Control input that, when LOW, signifies that a test has passed.                                                                                 |
| $\overline{CCEN}$ | I   | Enable for $\overline{CC}$ input. When HIGH $\overline{CC}$ is ignored and a pass is forced. When LOW the state of $\overline{CC}$ is examined. |
| CP                | I   | Clock input. All internal states are changed on the LOW-to-HIGH clock transitions.                                                              |

| Signal Name       | I/O | Description                                                                                                         |
|-------------------|-----|---------------------------------------------------------------------------------------------------------------------|
| CI                | I   | Carry input to the LSB of the incrementer for the MPC.                                                              |
| $\overline{OE}$   | I   | Control for $Y_0 - Y_{11}$ outputs. LOW to enable; HIGH to disable.                                                 |
| $Y_0 - Y_{11}$    | O   | Address output to microprogram memory. $Y_0$ is LSB and $Y_{11}$ is MSB.                                            |
| $\overline{FULL}$ | O   | When LOW indicates the stack is full.                                                                               |
| $\overline{PL}$   | O   | When LOW, this indicates the pipeline register has been selected as the direct input ( $D_0 - D_{11}$ ) source.     |
| $\overline{MAP}$  | O   | When LOW, this indicates the mapping PROM (or PLA) has been selected as the direct input ( $D_0 - D_{11}$ ) source. |
| $\overline{VECT}$ | O   | When LOW, this indicates the Interrupt Vector has been selected as the direct input ( $D_0 - D_{11}$ ) source.      |

## Architecture of the CY7C910

### Introduction

The CY7C910 is a high-performance CMOS microprogram controller that produces a sequence of 12-bit addresses that control the execution of a microprogram. The addresses are selected from one of four sources, depending upon the (internal) instruction being executed ( $I_0 - I_3$ ), and other external inputs. The sources are (1) the external ( $D_0 - D_{11}$ ) inputs, (2) the RC, (3) the stack, and (4) the MPC. Twelve bit lines from each of these four sources are the inputs to a multiplexer as shown in the Logic Block Diagram. The outputs of the multiplexer are applied to the inputs of the three-state output drivers ( $Y_0 - Y_{11}$ ).

### External Inputs: $D_0 - D_{11}$

The external inputs are used as the source for destination addresses for the jump or branch type of instructions. These are shown as Ds in the two columns in the Table of Instructions. A second use of these inputs is to load the RC.

### Register Counter: RC

The RC is implemented as twelve D-type, edge-triggered flip-flops that are synchronously clocked on the LOW-to-HIGH transition of the clock, CP. The data on the D inputs is synchronously loaded into the RC when the load control input,  $\overline{RLD}$ , is LOW. The output of the RC is available to the multiplexer as its R input and is output on the Y outputs during certain instructions, indicated with an R in the Table of Instructions.

The RC is operated as a 12-bit down counter. Its contents are decremented and tested to see if they are zero during instructions 8, 9, and 15. This enables micro-instructions to be repeated up to 4096 times. The RC is arranged such that if it is loaded with a number, n, the sequence will be executed exactly n + 1 times.

### The Stack and Stack Pointer: SP

The 17-word by 12-bit stack is used to provide return addresses from micro-subroutines or from loops. The SP, which points to the last word written, is integral to the operation of the stack. This per-

mits reference to the data on the top of the stack without having to perform a Pop operation.

The SP operates as an up/down counter that is incremented when a Push operation (instructions 1, 4, or 5) is performed or decremented when a Pop operation (instructions 8, 10, 11, 13, or 15) is performed. The Push operation writes the return address on the stack and the Pop operation effectively removes it. The actual operation occurs on the LOW-to-HIGH clock transition following the instruction.

The stack is initialized by executing instruction zero (JUMP TO LOCATION 0 or RESET). Every time a "jump to subroutine" instruction (1, 5) or a loop instruction (4) is executed, the return address is Pushed onto the stack; and every time a "return from subroutine (or loop)" instruction is executed, the return address is Popped off the stack.

When one subroutine calls another or a loop occurs within a loop (or a combination), which is called nesting, the logical depth of the stack increases. The physical stack depth is 17 words. When this depth occurs, the  $\overline{FULL}$  signal goes LOW on the next LOW-to-HIGH clock transition. Any further Push operations on a full stack will cause the data at that location to be overwritten, but will not increment the SP. Similarly, performing a Pop operation on an empty stack will not decrement the SP and may result in non-meaningful data being available at the Y outputs.

### The Microprocessor Counter: MPC

The MPC consists of a 12-bit incrementer followed by a 12-bit register. The register usually holds the address of the instruction being fetched. When sequential instructions are fetched, the carry input (CI) to the incrementer is HIGH and one is added to the Y outputs of the multiplexer, which is loaded into the MPC on the next LOW-to-HIGH clock transition. When the CI input is LOW, the Y outputs of the multiplexer are loaded directly into the MPC so that the same instruction is fetched and executed.

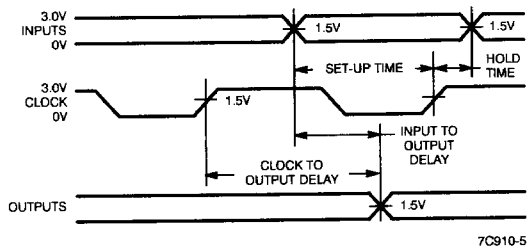
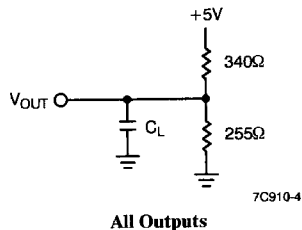
**Electrical Characteristics** Over Commercial and Military Operating Range,  $V_{CC}$  Min. = 4.5V,  $V_{CC}$  Max. = 5.5V<sup>[2]</sup>

| Parameters | Description                                 | Test Conditions                                         | Min. | Max.     | Units         |
|------------|---------------------------------------------|---------------------------------------------------------|------|----------|---------------|
| $V_{OH}$   | Output HIGH Voltage                         | $V_{CC} = \text{Min.}, I_{OH} = -1.6 \text{ mA}$        | 2.4  |          | V             |
| $V_{OL}$   | Output LOW Voltage                          | $V_{CC} = \text{Min.}, I_{OL} = 12 \text{ mA}$          |      | 0.4      | V             |
| $V_{IH}$   | Input HIGH Voltage                          |                                                         | 2.0  | $V_{CC}$ | V             |
| $V_{IL}$   | Input LOW Voltage                           |                                                         | -3.0 | 0.8      | V             |
| $I_{IH}$   | Input HIGH Current                          | $V_{CC} = \text{Max.}, V_{IN} = V_{CC}$                 |      | 10       | $\mu\text{A}$ |
| $I_{IL}$   | Input LOW Current                           | $V_{CC} = \text{Max.}, V_{IN} = V_{SS}$                 |      | -10      | $\mu\text{A}$ |
| $I_{OH}$   | Output HIGH Current                         | $V_{CC} = \text{Min.}, V_{IH} = 2.4 \text{ V}$          | -1.6 |          | mA            |
| $I_{OL}$   | Output LOW Current                          | $V_{CC} = \text{Min.}, V_{OL} = 0.4 \text{ V}$          | 12   |          | mA            |
| $I_{OZ}$   | Output Leakage Current                      | $V_{CC} = \text{Max.}, V_{OUT} = V_{SS}/V_{CC}$         | -40  | +40      | $\mu\text{A}$ |
| $I_{SC}$   | Output Short Circuit Current <sup>[3]</sup> | $V_{CC} = \text{Max.}, V_{OUT} = 0 \text{ V}$           |      | -85      | mA            |
| $I_{CC}$   | Supply Current                              | $V_{CC} = \text{Max.}$                                  |      | 70       | mA            |
|            |                                             | Commercial                                              |      | 70       |               |
|            |                                             | Military                                                |      | 90       |               |
| $I_{CCI}$  | Supply Current                              | $V_{IH} \geq 3.85 \text{ V}, V_{IL} \leq 0.4 \text{ V}$ |      | 35       | mA            |
|            |                                             | Commercial                                              |      | 35       |               |
|            |                                             | Military                                                |      | 50       |               |

**Capacitance<sup>[4]</sup>**

| Parameters | Description        | Test Conditions                                                     | Max. | Units |
|------------|--------------------|---------------------------------------------------------------------|------|-------|
| $C_{IN}$   | Input Capacitance  | $T_A = 25^\circ\text{C}, f = 1 \text{ MHz}, V_{CC} = 5.0 \text{ V}$ | 8    | pF    |
| $C_{OUT}$  | Output Capacitance |                                                                     | 10   | pF    |

**Output Loads for AC Performance Characteristics<sup>[5,6]</sup> Switching Waveforms**



**Notes:**

- See the last page of this specification for Group A subgroup testing information.
- Not more than one output should be shorted at a time. Duration of the short circuit should not be more than one second.
- Tested initially and after any design or process changes that may affect these parameters.
- $C_L = 50 \text{ pF}$  includes scope probe, wiring, and stray capacitance.
- $C_L = 5 \text{ pF}$  for output disable tests.

### Guaranteed AC Performance Characteristics

The tables below specify the guaranteed AC performance of the CY7C910 over the commercial (0°C to +70°C) and the military (–55°C to +125°C) temperature ranges with V<sub>CC</sub> varying from 4.5V to 5.5V. All times are in nanoseconds and are measured between the 1.5V signal levels.

The inputs switch between 0V and 3V with signal transition rates of 1 volt per nanosecond. All outputs have maximum DC current loads.

### Clock Requirements<sup>[2]</sup>

|                                   | Commercial |    |     | Military |    |     |
|-----------------------------------|------------|----|-----|----------|----|-----|
| Speed (ns)                        | 40         | 50 | 93  | 46       | 51 | 99  |
| Minimum Clock LOW                 | 20         | 20 | 50  | 23       | 25 | 58  |
| Minimum Clock HIGH                | 20         | 20 | 35  | 23       | 25 | 42  |
| Minimum Clock Period I = 14       | 40         | 50 | 93  | 46       | 51 | 100 |
| Minimum Clock Period I = 8, 9, 15 | 40         | 50 | 113 | 46       | 51 | 114 |

### Combinatorial Propagation Delays (C<sub>L</sub> = 50 pF)<sup>[2, 7]</sup>

| From Input                       | Commercial |    |    |               |    |    |      |    |    | Military |    |    |               |    |    |      |    |    |
|----------------------------------|------------|----|----|---------------|----|----|------|----|----|----------|----|----|---------------|----|----|------|----|----|
|                                  | Y          |    |    | PL, VECT, MAP |    |    | FULL |    |    | Y        |    |    | PL, VECT, MAP |    |    | FULL |    |    |
| Speed (ns)                       | 40         | 50 | 93 | 40            | 50 | 93 | 40   | 50 | 93 | 46       | 51 | 99 | 46            | 51 | 99 | 46   | 51 | 99 |
| D <sub>0</sub> – D <sub>11</sub> | 17         | 20 | 20 | —             | —  | —  | —    | —  | —  | 21       | 25 | 25 | —             | —  | —  | —    | —  | —  |
| I <sub>0</sub> – I <sub>3</sub>  | 25         | 35 | 50 | 20            | 30 | 51 | —    | —  | —  | 30       | 40 | 54 | 25            | 35 | 58 | —    | —  | —  |
| CC                               | 22         | 30 | 30 | —             | —  | —  | —    | —  | —  | 27       | 36 | 35 | —             | —  | —  | —    | —  | —  |
| CCEN                             | 22         | 30 | 30 | —             | —  | —  | —    | —  | —  | 27       | 36 | 37 | —             | —  | —  | —    | —  | —  |
| CP I = 8, 9, 15 <sup>[8]</sup>   | 30         | 40 | 75 | —             | —  | —  | 25   | 31 | 60 | 35       | 46 | 77 | —             | —  | —  | 30   | 35 | 67 |
| CP All Other I                   | 30         | 40 | 55 | —             | —  | —  | 25   | 31 | 60 | 35       | 46 | 61 | —             | —  | —  | 30   | 35 | 67 |
| OE <sup>[8]</sup>                | 21         | 25 | 35 | —             | —  | —  | —    | —  | —  | 22       | 25 | 40 | —             | —  | —  | —    | —  | —  |
|                                  | 21         | 27 | 30 |               |    |    |      |    |    | 22       | 30 | 30 |               |    |    |      |    |    |

### Minimum Set-Up and Hold Times Relative to clock LOW-to-HIGH Transition (C<sub>L</sub> = 50 pF)<sup>[2]</sup>

|                                 | Commercial |    |    |      |    |    | Military |    |    |      |    |    |
|---------------------------------|------------|----|----|------|----|----|----------|----|----|------|----|----|
|                                 | Set-Up     |    |    | Hold |    |    | Set-Up   |    |    | Hold |    |    |
| Speed (ns)                      | 40         | 50 | 93 | 40   | 50 | 93 | 46       | 51 | 99 | 46   | 51 | 99 |
| DI ↗ RC                         | 13         | 16 | 24 | 0    | 0  | 0  | 13       | 16 | 28 | 0    | 0  | 0  |
| DI ↗ MPC                        | 20         | 30 | 58 | 0    | 0  | 0  | 20       | 30 | 62 | 0    | 0  | 0  |
| I <sub>0</sub> – I <sub>3</sub> | 25         | 35 | 75 | 0    | 0  | 0  | 27       | 38 | 81 | 0    | 0  | 0  |
| CC                              | 20         | 24 | 63 | 0    | 0  | 0  | 25       | 35 | 65 | 0    | 0  | 0  |
| CCEN                            | 20         | 24 | 63 | 0    | 0  | 0  | 25       | 35 | 63 | 0    | 0  | 0  |
| CI                              | 15         | 18 | 46 | 0    | 0  | 0  | 15       | 18 | 58 | 0    | 0  | 0  |
| RLD                             | 15         | 19 | 36 | 0    | 0  | 0  | 15       | 20 | 42 | 0    | 0  | 0  |

#### Notes:

- A dash indicates that a propagation delay path or set-up time does not exist.
- The enable/disable times are measured to a 0.5 Volt change on the output voltage level with C<sub>L</sub> = 5 pF.

Table of Instructions

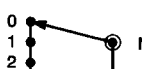
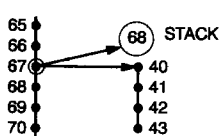
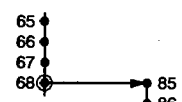
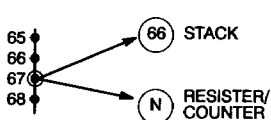
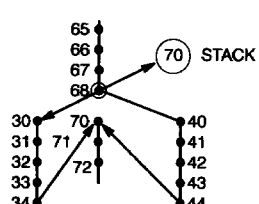
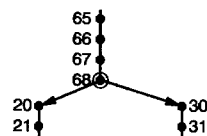
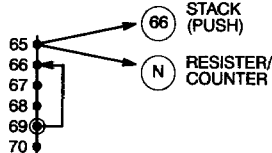
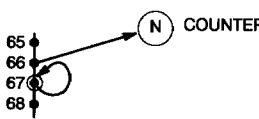
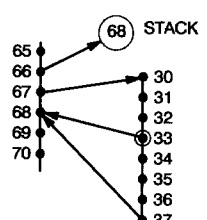
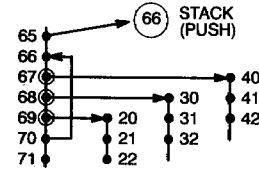
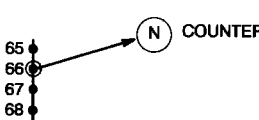
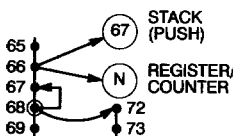
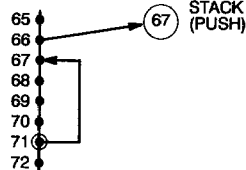
| I <sub>3</sub> – I <sub>0</sub> | Mnemonic | Name                     | Reg/Cntr Contents | Result                      |       |                            |       |          |        |
|---------------------------------|----------|--------------------------|-------------------|-----------------------------|-------|----------------------------|-------|----------|--------|
|                                 |          |                          |                   | Fail<br>CCEN = L and CC = H |       | Pass<br>CCEN = H or CC = L |       | Reg/Cntr | Enable |
|                                 |          |                          |                   | Y                           | Stack | Y                          | Stack |          |        |
| 0                               | JZ       | Jump Zero                | X                 | 0                           | Clear | 0                          | Clear | Hold     | PL     |
| 1                               | CJS      | Cond JSB PL              | X                 | PC                          | Hold  | D                          | Push  | Hold     | PL     |
| 2                               | JMAP     | Jump Map                 | X                 | D                           | Hold  | D                          | Hold  | Hold     | Map    |
| 3                               | CJP      | Cond Jump PL             | X                 | PC                          | Hold  | D                          | Hold  | Hold     | PL     |
| 4                               | Push     | Push/Cond LD CNTR        | X                 | PC                          | Push  | PC                         | Push  | (Note 9) | PL     |
| 5                               | JSPR     | Cond JSB R/PL            | X                 | R                           | Push  | D                          | Push  | Hold     | PL     |
| 6                               | CJV      | Cond Jump Vector         | X                 | PC                          | Hold  | D                          | Hold  | Hold     | Vect   |
| 7                               | JRP      | Cond Jump R/PL           | X                 | R                           | Hold  | D                          | Hold  | Hold     | PL     |
| 8                               | RFCT     | Repeat Loop,<br>CNTR ≠ 0 | ≠0                | F                           | Hold  | F                          | Hold  | Dec      | PL     |
|                                 |          |                          | =0                | PC                          | Pop   | PC                         | Pop   | Hold     | PL     |
| 9                               | RPCT     | Repeat PL,<br>CNTR ≠ 0   | ≠0                | D                           | Hold  | D                          | Hold  | Dec      | PL     |
|                                 |          |                          | =0                | PC                          | Hold  | PC                         | Hold  | Hold     | PL     |
| 10                              | CRTN     | Cond RTN                 | X                 | PC                          | Hold  | F                          | Pop   | Hold     | PL     |
| 11                              | CJPP     | Cond Jump PL & Pop       | X                 | PC                          | Hold  | D                          | Pop   | Hold     | PL     |
| 12                              | LDCT     | LD Cntr & Continue       | X                 | PC                          | Hold  | PC                         | Hold  | Load     | PL     |
| 13                              | LOOP     | Test End Loop            | X                 | F                           | Hold  | PC                         | Pop   | Hold     | PL     |
| 14                              | CONT     | Continue                 | X                 | PC                          | Hold  | PC                         | Hold  | Hold     | PL     |
| 15                              | TWB      | Three-Way Branch         | ≠0                | F                           | Hold  | PC                         | Pop   | Dec      | PL     |
|                                 |          |                          | =0                | D                           | Pop   | PC                         | Pop   | Hold     | PL     |

H = HIGH  
L = LOW  
X = Don't Care

**Notes:**

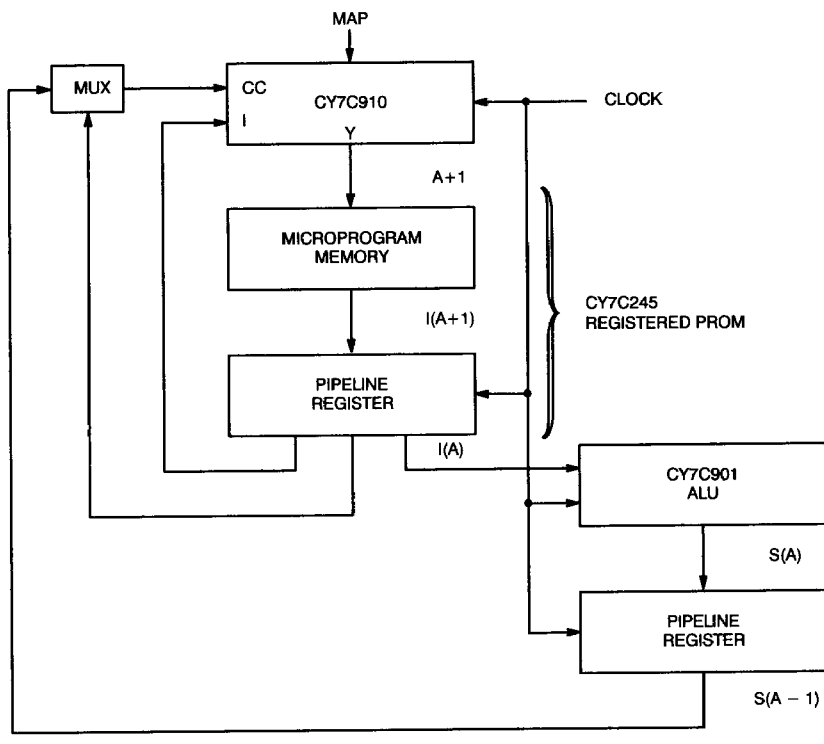
9. If CCEN = L and CC = H, then hold; else load.

CY7C910 Flow Diagrams

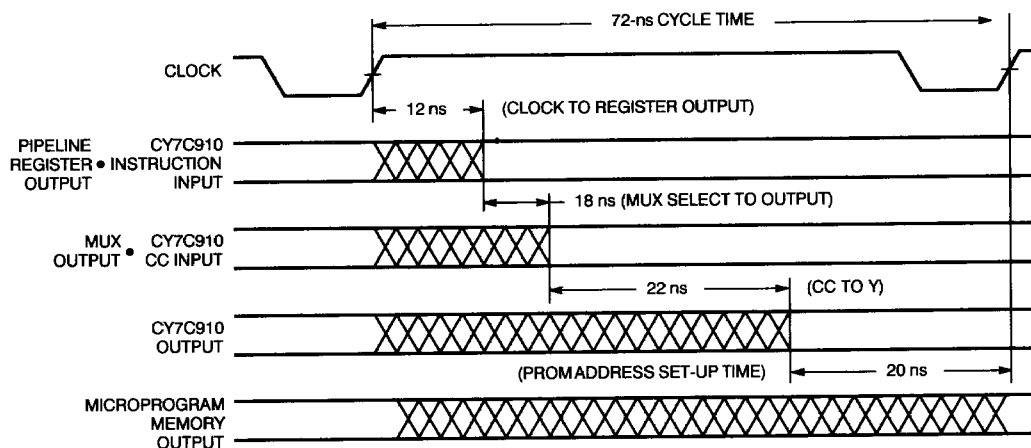
|                                                                                                                             |                                                                                                                             |                                                                                                                     |
|-----------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------|
| <p>0 Jump Zero (JZ)</p>                    | <p>1 Cond JSB PL (CJS)</p>                 | <p>2 Jump Map (JMAP)</p>          |
| <p>3 Cond Jump PL (CJP)</p>                | <p>4 Push/Cond LD CNTR (PUSH)</p>          | <p>5 Cond JSB R/PL (JSRP)</p>     |
| <p>6 Cond Jump Vector (CJV)</p>            | <p>7 Cond Jump R/PL (JRP)</p>              |                                                                                                                     |
| <p>8 Repeat Loop, CNTR ≠ 0 (RFCT)</p>     | <p>9 Repeat PL, CNTR ≠ 0 (RPCT)</p>       | <p>10 Cond Return (CRTN)</p>     |
| <p>11 Cond Jump PL &amp; POP (CJPP)</p>  | <p>12 LD CNTR &amp; Continue (LDCT)</p>  |                                                                                                                     |
| <p>14 Continue (CONT)</p>                | <p>15 Three-Way Branch (TWB)</p>         | <p>13 Test End Loop (LOOP)</p>  |

7C910-6

**One-Level Pipeline-Based Architecture (recommended)**

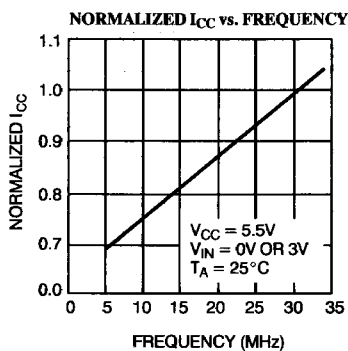
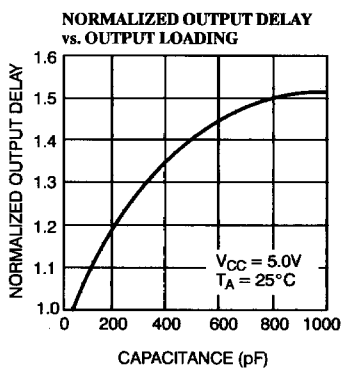
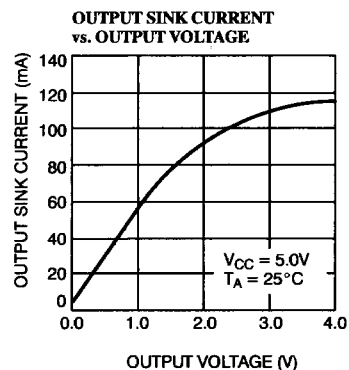
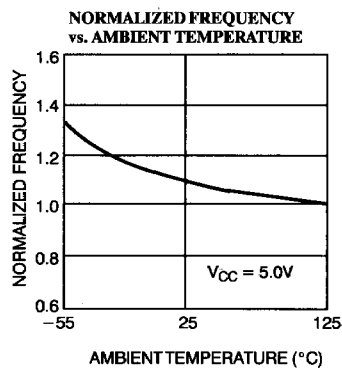
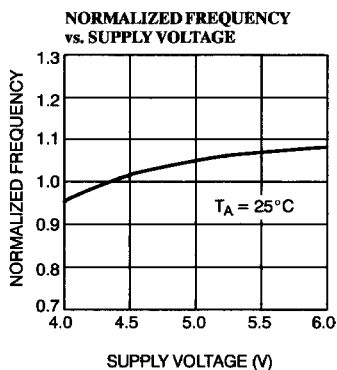
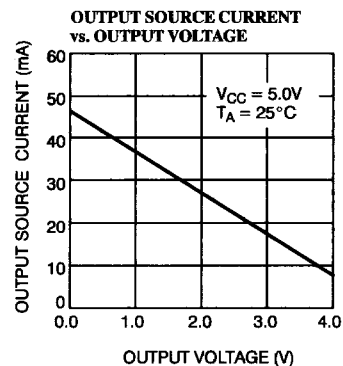
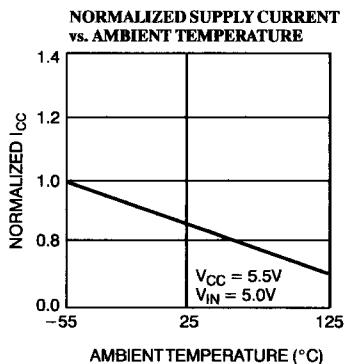
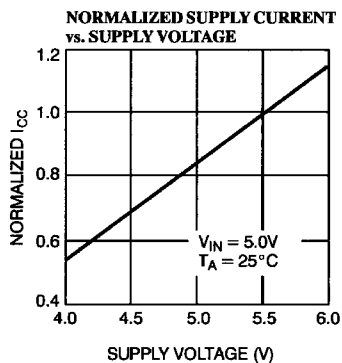


7C910-7



7C910-8

## Typical DC and AC Characteristics



7C910-9

**Ordering Information**

| Clock Cycle (ns) | Ordering Code | Package Type | Operating Range |
|------------------|---------------|--------------|-----------------|
| 40               | CY7C910-40DC  | D18          | Commercial      |
|                  | CY7C910-40JC  | J67          |                 |
|                  | CY7C910-40LC  | L67          |                 |
|                  | CY7C910-40PC  | P17          |                 |
| 46               | CY7C910-46DMB | D18          | Military        |
|                  | CY7C910-46LMB | L67          |                 |
| 50               | CY7C910-50DC  | D18          | Commercial      |
|                  | CY7C910-50JC  | J67          |                 |
|                  | CY7C910-50LC  | L67          |                 |
|                  | CY7C910-50PC  | P17          |                 |
| 51               | CY7C910-51DMB | D18          | Military        |
|                  | CY7C910-51LMB | L67          |                 |
| 93               | CY7C910-93DC  | D18          | Commercial      |
|                  | CY7C910-93JC  | J67          |                 |
|                  | CY7C910-93LC  | L67          |                 |
|                  | CY7C910-93PC  | P17          |                 |
| 99               | CY7C910-99DMB | D18          | Military        |
|                  | CY7C910-99LMB | L67          |                 |

**MILITARY SPECIFICATIONS**  
**Group A Subgroup Testing**
**DC Characteristics**

| Parameters           | Subgroups |
|----------------------|-----------|
| V <sub>OH</sub>      | 1, 2, 3   |
| V <sub>OL</sub>      | 1, 2, 3   |
| V <sub>IH</sub>      | 1, 2, 3   |
| V <sub>IL</sub> Max. | 1, 2, 3   |
| I <sub>IH</sub>      | 1, 2, 3   |
| I <sub>IL</sub>      | 1, 2, 3   |
| I <sub>OH</sub>      | 1, 2, 3   |
| I <sub>OL</sub>      | 1, 2, 3   |
| I <sub>OZ</sub>      | 1, 2, 3   |
| I <sub>SC</sub>      | 1, 2, 3   |
| I <sub>CC</sub>      | 1, 2, 3   |
| I <sub>CCI</sub>     | 1, 2, 3   |

**Clock Requirements**

| Parameters        | Subgroups       |
|-------------------|-----------------|
| Minimum Clock LOW | 7, 8, 9, 10, 11 |

**Combinational Propagation Delays**

| Parameters                                                                                      | Subgroups       |
|-------------------------------------------------------------------------------------------------|-----------------|
| From D <sub>0</sub> – D <sub>11</sub> to Y                                                      | 7, 8, 9, 10, 11 |
| From I <sub>0</sub> – I <sub>3</sub> to Y                                                       | 7, 8, 9, 10, 11 |
| From I <sub>0</sub> – I <sub>3</sub> to $\overline{\text{PL}}$ , $\overline{\text{VECT}}$ , MAP | 7, 8, 9, 10, 11 |
| From $\overline{\text{CC}}$ to Y                                                                | 7, 8, 9, 10, 11 |
| From $\overline{\text{CCEN}}$ to Y                                                              | 7, 8, 9, 10, 11 |
| From CP (I = 8, 9, 15) to $\overline{\text{FULL}}$                                              | 7, 8, 9, 10, 11 |
| From CP (All Other I) to Y                                                                      | 7, 8, 9, 10, 11 |
| From CP (All Other I) to $\overline{\text{FULL}}$                                               | 7, 8, 9, 10, 11 |

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**Minimum Set-Up and Hold Times**

| Parameters                                  | Subgroups       |
|---------------------------------------------|-----------------|
| DI $\nabla$ RC Set-Up Time                  | 7, 8, 9, 10, 11 |
| DI $\nabla$ RC Hold Time                    | 7, 8, 9, 10, 11 |
| DI $\nabla$ MPC Set-Up Time                 | 7, 8, 9, 10, 11 |
| DI $\nabla$ MPC Hold Time                   | 7, 8, 9, 10, 11 |
| I <sub>0</sub> – I <sub>3</sub> Set-Up Time | 7, 8, 9, 10, 11 |
| I <sub>0</sub> – I <sub>3</sub> Hold Time   | 7, 8, 9, 10, 11 |
| $\overline{\text{CC}}$ Set-Up Time          | 7, 8, 9, 10, 11 |
| $\overline{\text{CC}}$ Hold Time            | 7, 8, 9, 10, 11 |
| $\overline{\text{CCEN}}$ Set-Up Time        | 7, 8, 9, 10, 11 |
| $\overline{\text{CCEN}}$ Hold Time          | 7, 8, 9, 10, 11 |
| CI Set-Up Time                              | 7, 8, 9, 10, 11 |
| CI Hold Time                                | 7, 8, 9, 10, 11 |
| $\overline{\text{RLD}}$ Set-Up Time         | 7, 8, 9, 10, 11 |
| $\overline{\text{RLD}}$ Hold Time           | 7, 8, 9, 10, 11 |