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## 82C55A CHMOS PROGRAMMABLE PERIPHERAL INTERFACE

- Compatible with all Intel and Most Other Microprocessors
- High Speed, "Zero Wait State" Operation with 8 MHz 8086/88 and 80186/188
- 24 Programmable I/O Pins
- Low Power CHMOS
- Completely TTL Compatible
- Control Word Read-Back Capability
- Direct Bit Set/Reset Capability
- 2.5 mA DC Drive Capability on all I/O Port Outputs
- Available in 40-Pin DIP and 44-Pin PLCC
- Available in EXPRESS
  - Standard Temperature Range
  - Extended Temperature Range

The Intel 82C55A is a high-performance, CHMOS version of the industry standard 8255A general purpose programmable I/O device which is designed for use with all Intel and most other microprocessors. It provides 24 I/O pins which may be individually programmed in 2 groups of 12 and used in 3 major modes of operation. The 82C55A is pin compatible with the NMOS 8255A and 8255A-5.

In MODE 0, each group of 12 I/O pins may be programmed in sets of 4 and 8 to be inputs or outputs. In MODE 1, each group may be programmed to have 8 lines of input or output. 3 of the remaining 4 pins are used for handshaking and interrupt control signals. MODE 2 is a strobed bi-directional bus configuration.

The 82C55A is fabricated on Intel's advanced CHMOS III technology which provides low power consumption with performance equal to or greater than the equivalent NMOS product. The 82C55A is available in 40-pin DIP and 44-pin plastic leaded chip carrier (PLCC) packages.

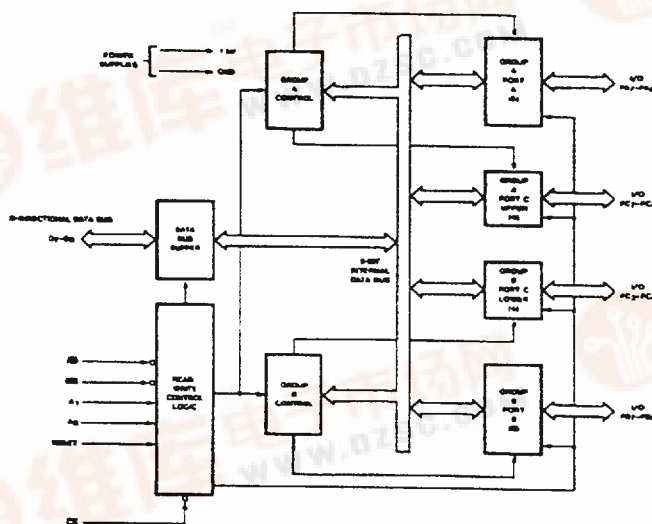


Figure 1. 82C55A Block Diagram

231256-1

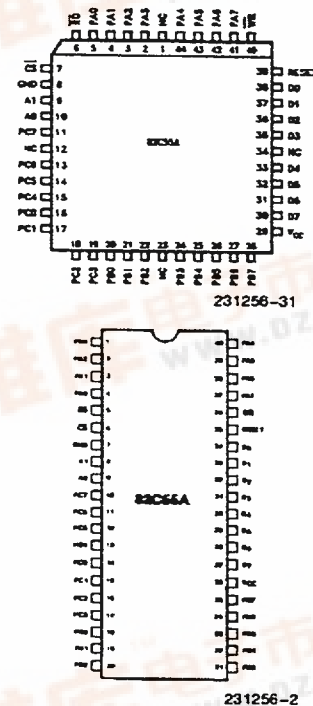


Figure 2. 82C55A Pinout

Diagrams are for pin reference only. Package sizes are not to scale.

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September 1987

Order Number: 231256-004

Table 1. Pin Description

Table 1: Pin Description

Symbol	Pin Number Dip	Pin Number PLCC	Type	Name and Function																																																																		
PA <sub>3-0</sub>	1-4	2-5	I/O	<b>PORT A, PINS 0-3:</b> Lower nibble of an 8-bit data output latch/buffer and an 8-bit data input latch.																																																																		
RD	5	6	I	<b>READ CONTROL:</b> This input is low during CPU read operations.																																																																		
CS	6	7	I	<b>CHIP SELECT:</b> A low on this input enables the 82C55A to respond to RD and WR signals. RD and WR are ignored otherwise.																																																																		
GND	7	8		<b>System Ground</b>																																																																		
A <sub>1-0</sub>	8-9	9-10	I	<p><b>ADDRESS:</b> These input signals, in conjunction RD and WR, control the selection of one of the three ports or the control word registers.</p> <table> <tr> <th>A<sub>1</sub></th><th>A<sub>0</sub></th><th>RD</th><th>WR</th><th>CS</th><th>Input Operation (Read)</th></tr> <tr> <td>0</td><td>0</td><td>0</td><td>1</td><td>0</td><td>Port A - Data Bus</td></tr> <tr> <td>0</td><td>1</td><td>0</td><td>1</td><td>0</td><td>Port B - Data Bus</td></tr> <tr> <td>1</td><td>0</td><td>0</td><td>1</td><td>0</td><td>Port C - Data Bus</td></tr> <tr> <td>1</td><td>1</td><td>0</td><td>1</td><td>0</td><td>Control Word - Data Bus</td></tr> </table> <p><b>Output Operation (Write)</b></p> <table> <tr> <td>0</td><td>0</td><td>1</td><td>0</td><td>0</td><td>Data Bus - Port A</td></tr> <tr> <td>0</td><td>1</td><td>1</td><td>0</td><td>0</td><td>Data Bus - Port B</td></tr> <tr> <td>1</td><td>0</td><td>1</td><td>0</td><td>0</td><td>Data Bus - Port C</td></tr> <tr> <td>1</td><td>1</td><td>1</td><td>0</td><td>0</td><td>Data Bus - Control</td></tr> </table> <p><b>Disable Function</b></p> <table> <tr> <td>X</td><td>X</td><td>X</td><td>X</td><td>1</td><td>Data Bus - 3 - State</td></tr> <tr> <td>X</td><td>X</td><td>1</td><td>1</td><td>0</td><td>Data Bus - 3 - State</td></tr> </table>	A <sub>1</sub>	A <sub>0</sub>	RD	WR	CS	Input Operation (Read)	0	0	0	1	0	Port A - Data Bus	0	1	0	1	0	Port B - Data Bus	1	0	0	1	0	Port C - Data Bus	1	1	0	1	0	Control Word - Data Bus	0	0	1	0	0	Data Bus - Port A	0	1	1	0	0	Data Bus - Port B	1	0	1	0	0	Data Bus - Port C	1	1	1	0	0	Data Bus - Control	X	X	X	X	1	Data Bus - 3 - State	X	X	1	1	0	Data Bus - 3 - State
A <sub>1</sub>	A <sub>0</sub>	RD	WR	CS	Input Operation (Read)																																																																	
0	0	0	1	0	Port A - Data Bus																																																																	
0	1	0	1	0	Port B - Data Bus																																																																	
1	0	0	1	0	Port C - Data Bus																																																																	
1	1	0	1	0	Control Word - Data Bus																																																																	
0	0	1	0	0	Data Bus - Port A																																																																	
0	1	1	0	0	Data Bus - Port B																																																																	
1	0	1	0	0	Data Bus - Port C																																																																	
1	1	1	0	0	Data Bus - Control																																																																	
X	X	X	X	1	Data Bus - 3 - State																																																																	
X	X	1	1	0	Data Bus - 3 - State																																																																	
PC <sub>7-4</sub>	10-13	11,13-15	I/O	<b>PORT C, PINS 4-7:</b> Upper nibble of an 8-bit data output latch/buffer and an 8-bit data input buffer (no latch for input). This port can be divided into two 4-bit ports under the mode control. Each 4-bit port contains a 4-bit latch and it can be used for the control signal outputs and status signal inputs in conjunction with ports A and B.																																																																		
PC <sub>0-3</sub>	14-17	16-19	I/O	<b>PORT C, PINS 0-3:</b> Lower nibble of Port C.																																																																		
PB <sub>0-7</sub>	18-25	20-22, 24-28	I/O	<b>PORT B, PINS 0-7:</b> An 8-bit data output latch/buffer and an 8-bit data input buffer.																																																																		
VCC	26	29		<b>SYSTEM POWER:</b> + 5V Power Supply.																																																																		
D <sub>7-0</sub>	27-34	30-33, 35-38	I/O	<b>DATA BUS:</b> Bi-directional, tri-state data bus lines, connected to system data bus.																																																																		
RESET	35	39	I	<b>RESET:</b> A high on this input clears the control register and all ports are set to the input mode.																																																																		
WR	36	40	I	<b>WRITE CONTROL:</b> This input is low during CPU write operations.																																																																		
PA <sub>7-4</sub>	37-40	41-44	I/O	<b>PORT A, PINS 4-7:</b> Upper nibble of an 8-bit data output latch/buffer and an 8-bit data input latch.																																																																		
NC		1, 12, 23, 34		No Connect																																																																		



## 82C55A FUNCTIONAL DESCRIPTION

### General

The 82C55A is a programmable peripheral interface device designed for use in Intel microcomputer systems. Its function is that of a general purpose I/O component to interface peripheral equipment to the microcomputer system bus. The functional configuration of the 82C55A is programmed by the system software so that normally no external logic is necessary to interface peripheral devices or structures.

### Data Bus Buffer

This 3-state bidirectional 8-bit buffer is used to interface the 82C55A to the system data bus. Data is transmitted or received by the buffer upon execution of input or output instructions by the CPU. Control words and status information are also transferred through the data bus buffer.

### Read/Write and Control Logic

The function of this block is to manage all of the internal and external transfers of both Data and Control or Status words. It accepts inputs from the CPU Address and Control busses and in turn, issues commands to both of the Control Groups.

### Group A and Group B Controls

The functional configuration of each port is programmed by the systems software. In essence, the CPU "outputs" a control word to the 82C55A. The control word contains information such as "mode", "bit set", "bit reset", etc., that initializes the functional configuration of the 82C55A.

Each of the Control blocks (Group A and Group B) accepts "commands" from the Read/Write Control Logic, receives "control words" from the internal data bus and issues the proper commands to its associated ports.

Control Group A - Port A and Port C upper (C7-C4)  
Control Group B - Port B and Port C lower (C3-C0)

The control word register can be both written and read as shown in the address decode table in the pin descriptions. Figure 6 shows the control word format for both Read and Write operations. When the control word is read, bit D7 will always be a logic "1", as this implies control word mode information.

### Ports A, B, and C

The 82C55A contains three 8-bit ports (A, B, and C). All can be configured in a wide variety of functional characteristics by the system software but each has its own special features or "personality" to further enhance the power and flexibility of the 82C55A.

**Port A.** One 8-bit data output latch/buffer and one 8-bit input latch buffer. Both "pull-up" and "pull-down" bus hold devices are present on Port A.

**Port B.** One 8-bit data input/output latch/buffer. Only "pull-up" bus hold devices are present on Port B.

**Port C.** One 8-bit data output latch/buffer and one 8-bit data input buffer (no latch for input). This port can be divided into two 4-bit ports under the mode control. Each 4-bit port contains a 4-bit latch and it can be used for the control signal outputs and status signal inputs in conjunction with ports A and B. Only "pull-up" bus hold devices are present on Port C.

See Figure 4 for the bus-hold circuit configuration for Port A, B, and C.

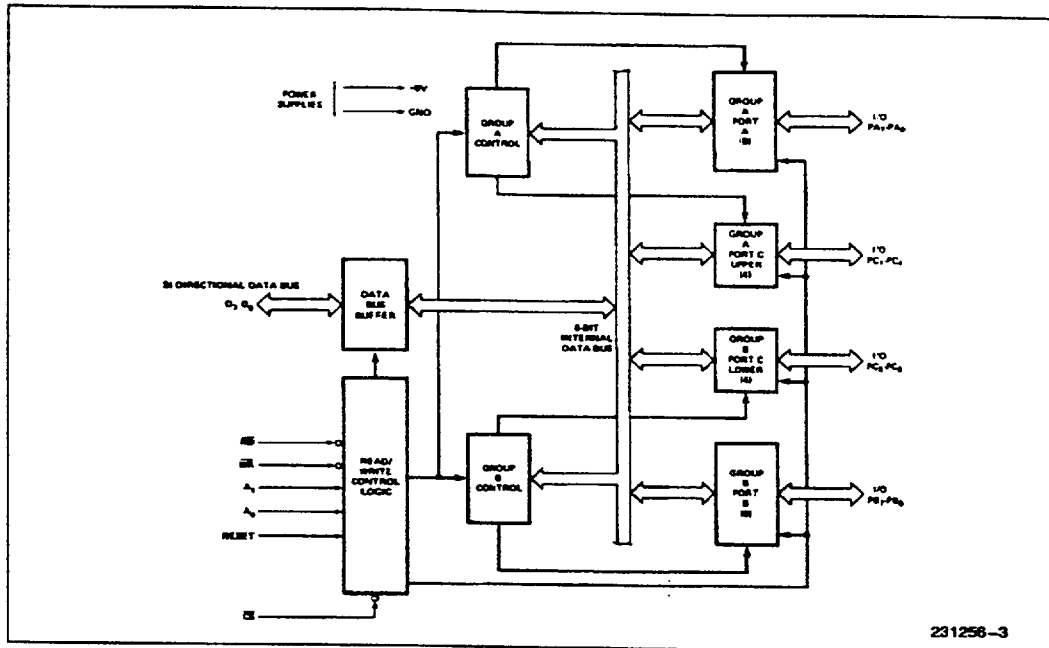


Figure 3. 82C55A Block Diagram Showing Data Bus Buffer and Read/Write Control Logic Functions

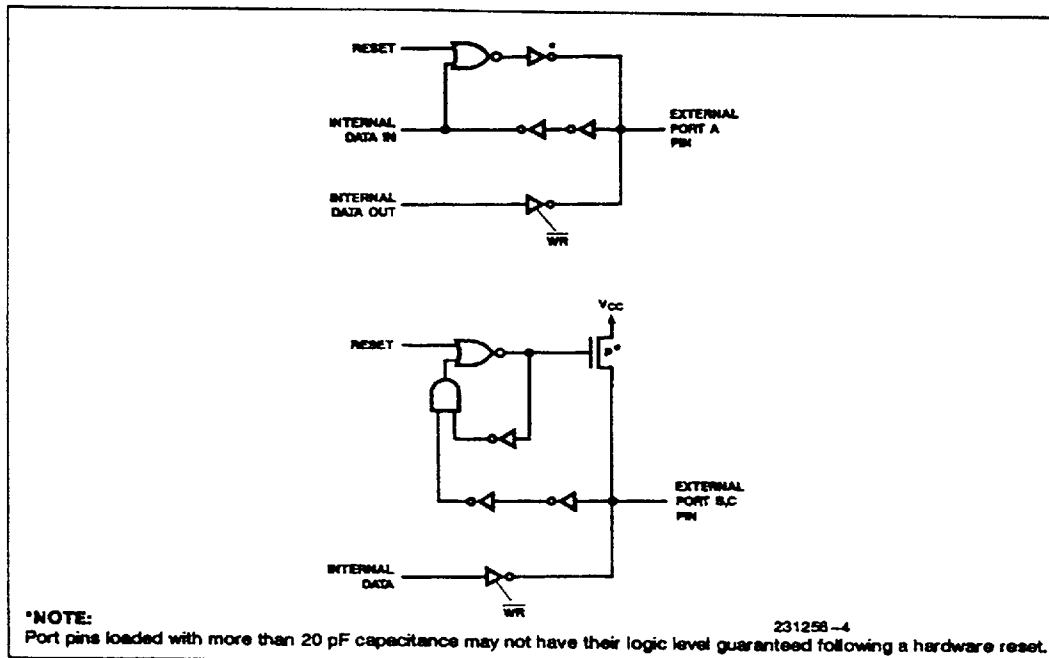


Figure 4. Port A, B, C, Bus-hold Configuration

# 82C55A OPERATIONAL DESCRIPTION

## Mode Selection

There are three basic modes of operation that can be selected by the system software:

- Mode 0 — Basic input/output
- Mode 1 — Strobed Input/output
- Mode 2 — Bi-directional Bus

When the reset input goes "high" all ports will be set to the input mode with all 24 port lines held at a logic "one" level by the internal bus hold devices (see Figure 4 Note). After the reset is removed the 82C55A can remain in the input mode with no additional initialization required. This eliminates the need for pullup or pulldown devices in "all CMOS" designs. During the execution of the system program, any of the other modes may be selected by using a single output instruction. This allows a single 82C55A to service a variety of peripheral devices with a simple software maintenance routine.

The modes for Port A and Port B can be separately defined, while Port C is divided into two portions as required by the Port A and Port B definitions. All of the output registers, including the status flip-flops, will be reset whenever the mode is changed. Modes may be combined so that their functional definition can be "tailored" to almost any I/O structure. For instance; Group B can be programmed in Mode 0 to monitor simple switch closings or display computational results, Group A could be programmed in Mode 1 to monitor a keyboard or tape reader on an interrupt-driven basis.

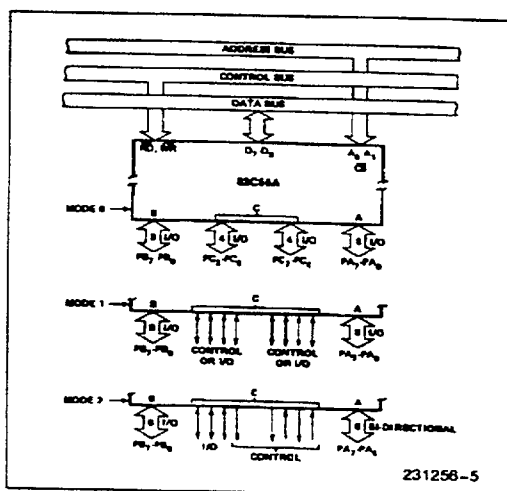


Figure 5. Basic Mode Definitions and Bus Interface

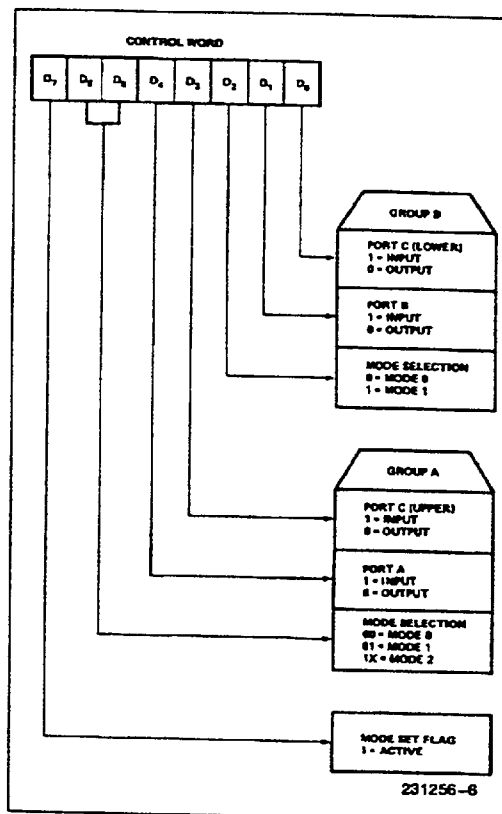


Figure 6. Mode Definition Format

The mode definitions and possible mode combinations may seem confusing at first but after a cursory review of the complete device operation a simple, logical I/O approach will surface. The design of the 82C55A has taken into account things such as efficient PC board layout, control signal definition vs PC layout and complete functional flexibility to support almost any peripheral device with no external logic. Such design represents the maximum use of the available pins.

## Single Bit Set/Reset Feature

Any of the eight bits of Port C can be Set or Reset using a single OUTput instruction. This feature reduces software requirements in Control-based applications.

When Port C is being used as status/control for Port A or B, these bits can be set or reset by using the Bit Set/Reset operation just as if they were data output ports.

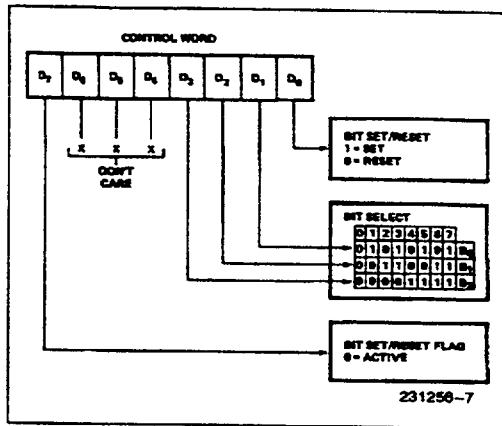


Figure 7. Bit Set/Reset Format

### Interrupt Control Functions

When the 82C55A is programmed to operate in mode 1 or mode 2, control signals are provided that can be used as interrupt request inputs to the CPU. The interrupt request signals, generated from port C, can be inhibited or enabled by setting or resetting the associated INTE flip-flop, using the bit set/reset function of port C.

This function allows the Programmer to disallow or allow a specific I/O device to interrupt the CPU without affecting any other device in the interrupt structure.

INTE flip-flop definition:

(BIT-SET)—INTE is SET—Interrupt enable  
(BIT-RESET)—INTE is RESET—Interrupt disable

#### Note:

All Mask flip-flops are automatically reset during mode selection and device Reset.

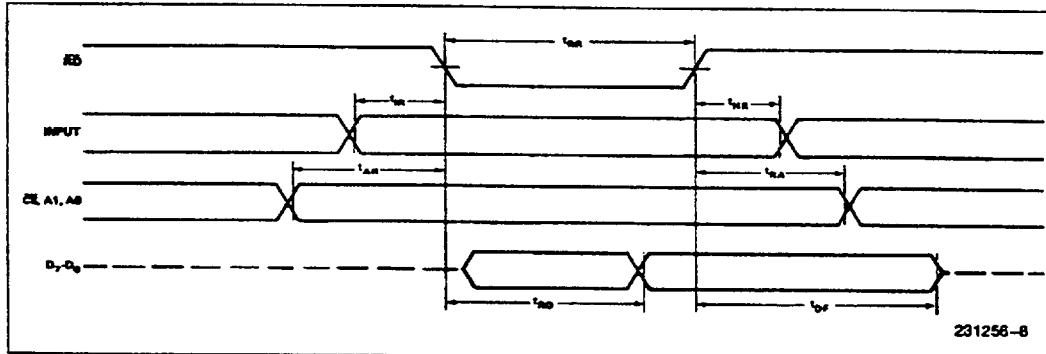
# Operating Modes

**Mode 0 (Basic Input/Output).** This functional configuration provides simple input and output operations for each of the three ports. No "handshaking" is required, data is simply written to or read from a specified port.

## Mode 0 Basic Functional Definitions:

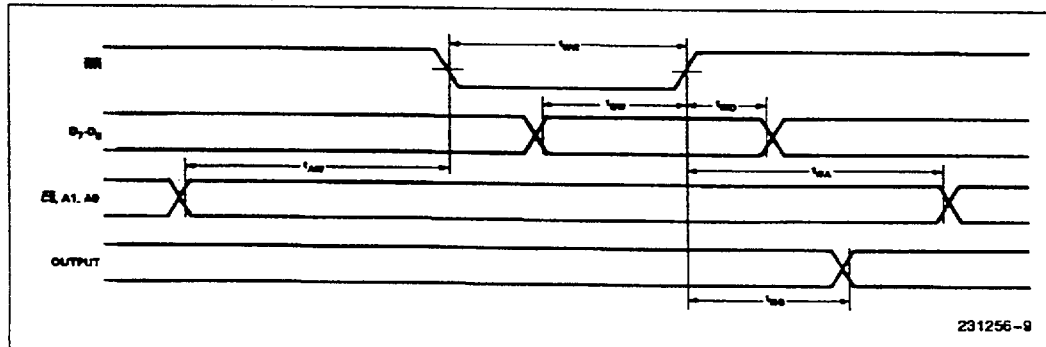
- Two 8-bit ports and two 4-bit ports.
- Any port can be input or output.
- Outputs are latched.
- Inputs are not latched.
- 16 different Input/Output configurations are possible in this Mode.

## MODE 0 (BASIC INPUT)



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## MODE 0 (BASIC OUTPUT)

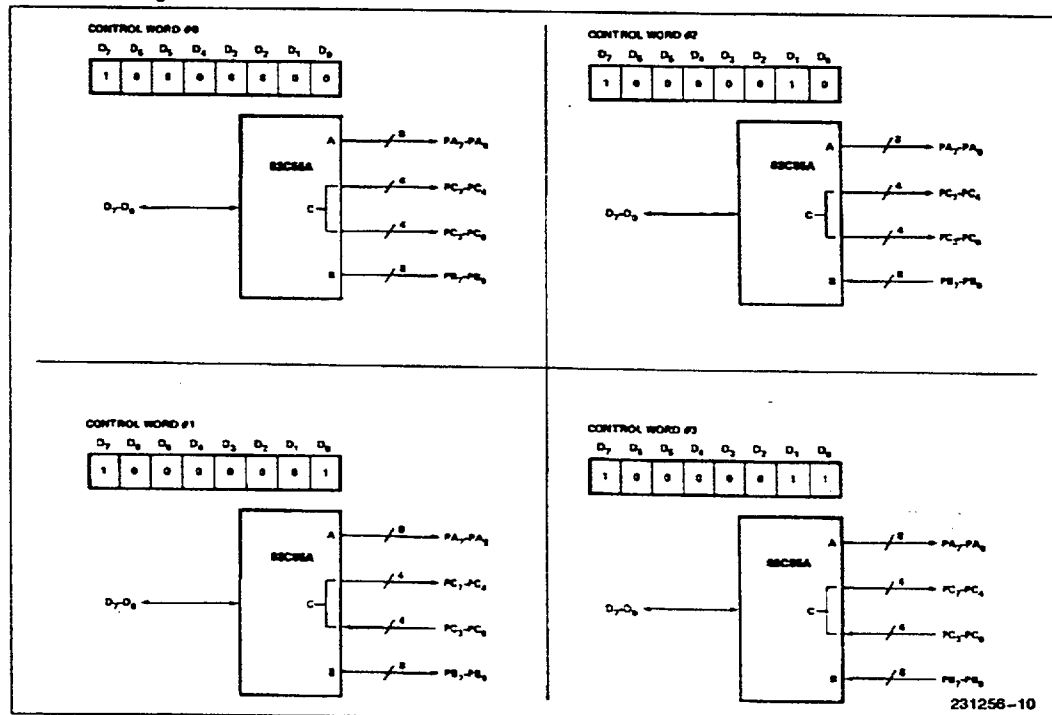


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## MODE 0 Port Definition

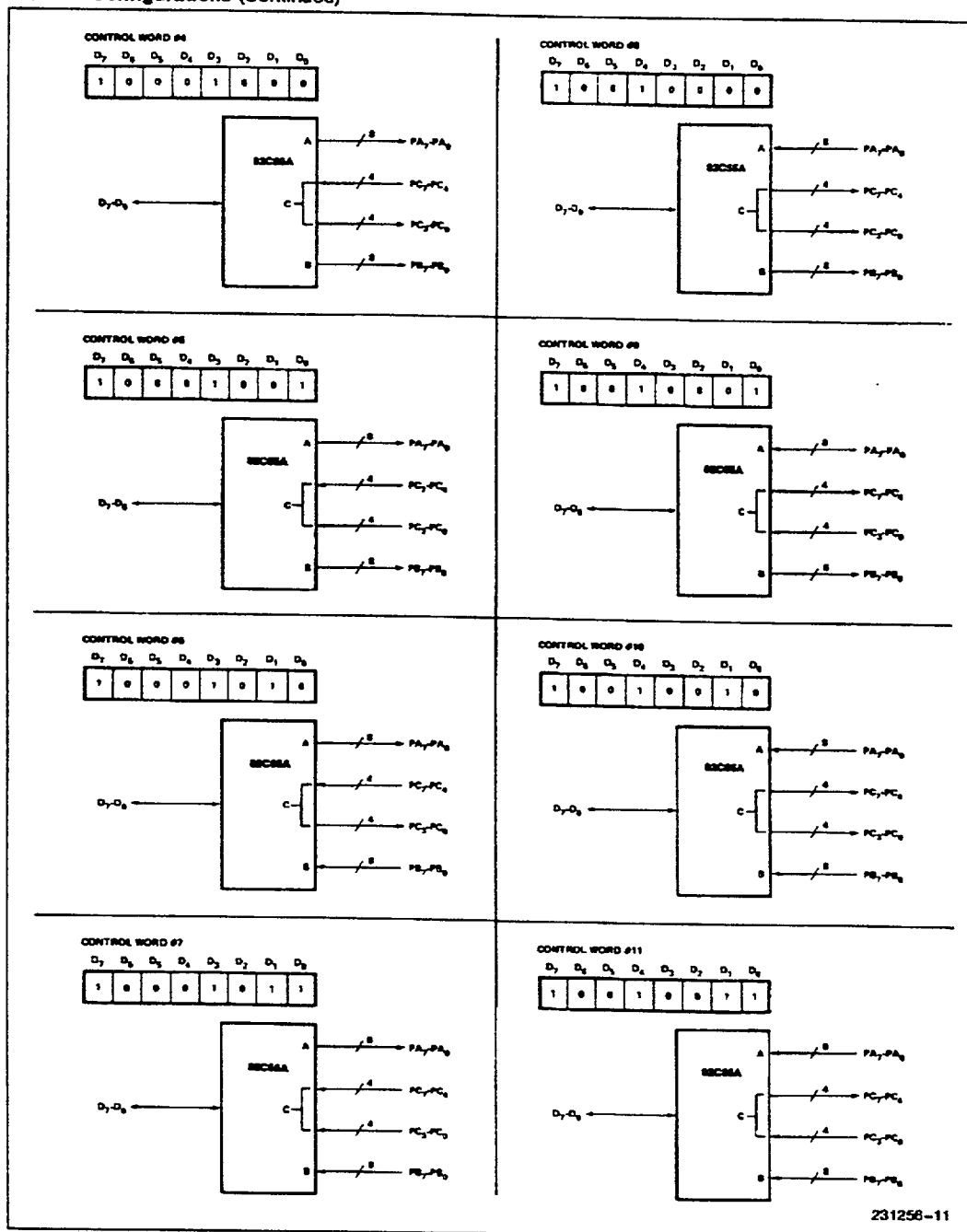
A		B		GROUP A			GROUP B	
D <sub>4</sub>	D <sub>3</sub>	D <sub>1</sub>	D <sub>0</sub>	PORT A	PORT C (UPPER)	#	PORT B	PORT C (LOWER)
0	0	0	0	OUTPUT	OUTPUT	0	OUTPUT	OUTPUT
0	0	0	1	OUTPUT	OUTPUT	1	OUTPUT	INPUT
0	0	1	0	OUTPUT	OUTPUT	2	INPUT	OUTPUT
0	0	1	1	OUTPUT	OUTPUT	3	INPUT	INPUT
0	1	0	0	OUTPUT	INPUT	4	OUTPUT	OUTPUT
0	1	0	1	OUTPUT	INPUT	5	OUTPUT	INPUT
0	1	1	0	OUTPUT	INPUT	6	INPUT	OUTPUT
0	1	1	1	OUTPUT	INPUT	7	INPUT	INPUT
1	0	0	0	INPUT	OUTPUT	8	OUTPUT	OUTPUT
1	0	0	1	INPUT	OUTPUT	9	OUTPUT	INPUT
1	0	1	0	INPUT	OUTPUT	10	INPUT	OUTPUT
1	0	1	1	INPUT	OUTPUT	11	INPUT	INPUT
1	1	0	0	INPUT	INPUT	12	OUTPUT	OUTPUT
1	1	0	1	INPUT	INPUT	13	OUTPUT	INPUT
1	1	1	0	INPUT	INPUT	14	INPUT	OUTPUT
1	1	1	1	INPUT	INPUT	15	INPUT	INPUT

## MODE 0 Configurations



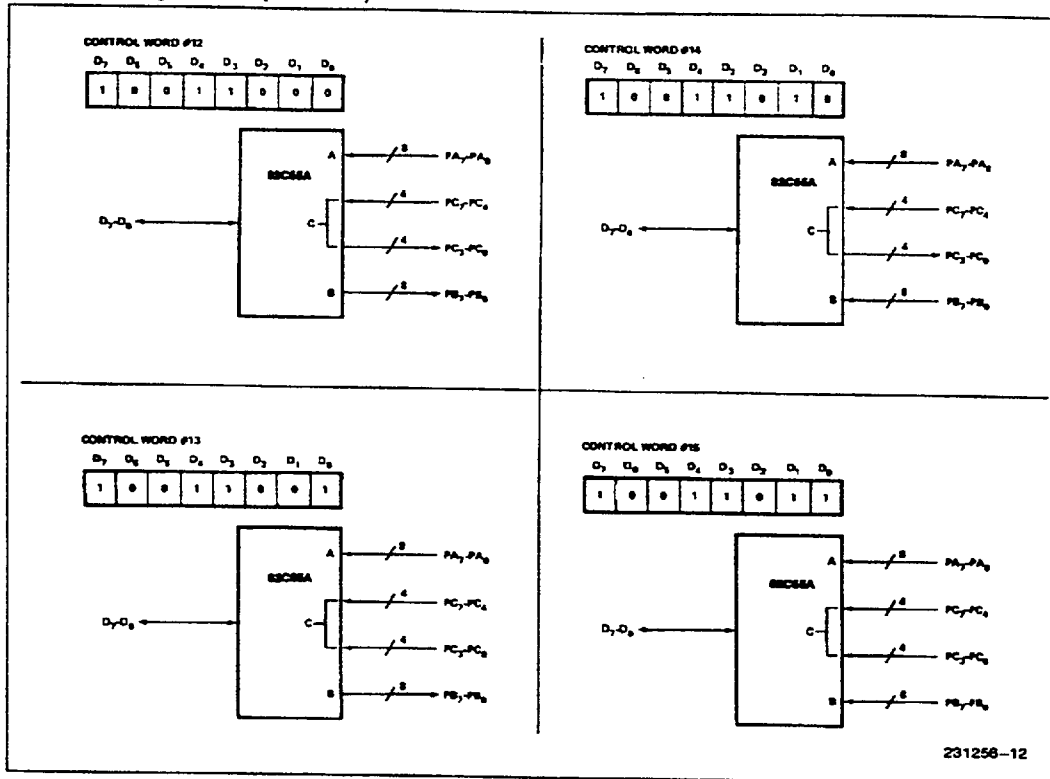


MODE 0 Configurations (Continued)



231256-11

## MODE 0 Configurations (Continued)



## Operating Modes

**MODE 1 (Strobed Input/Output).** This functional configuration provides a means for transferring I/O data to or from a specified port in conjunction with strobes or "handshaking" signals. In mode 1, Port A and Port B use the lines on Port C to generate or accept these "handshaking" signals.

## Mode 1 Basic functional Definitions:

- Two Groups (Group A and Group B).
- Each group contains one 8-bit data port and one 4-bit control/data port.
- The 8-bit data port can be either input or output. Both inputs and outputs are latched.
- The 4-bit port is used for control and status of the 8-bit data port.

# Input Control Signal Definition

**STB (Strobe Input).** A "low" on this input loads data into the input latch.

## IBF (Input Buffer Full F/F)

A "high" on this output indicates that the data has been loaded into the input latch; in essence, an acknowledgement. IBF is set by STB input being low and is reset by the rising edge of the RD input.

## INTR (Interrupt Request)

A "high" on this output can be used to interrupt the CPU when an input device is requesting service. INTR is set by the STB is a "one", IBF is a "one" and INTE is a "one". It is reset by the falling edge of RD. This procedure allows an input device to request service from the CPU by simply strobing its data into the port.

### INTE A

Controlled by bit set/reset of PC<sub>4</sub>.

### INTE B

Controlled by bit set/reset of PC<sub>2</sub>.

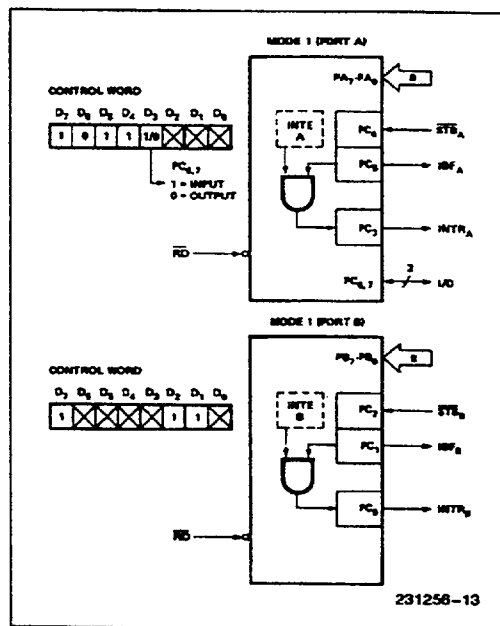


Figure 8. MODE 1 Input

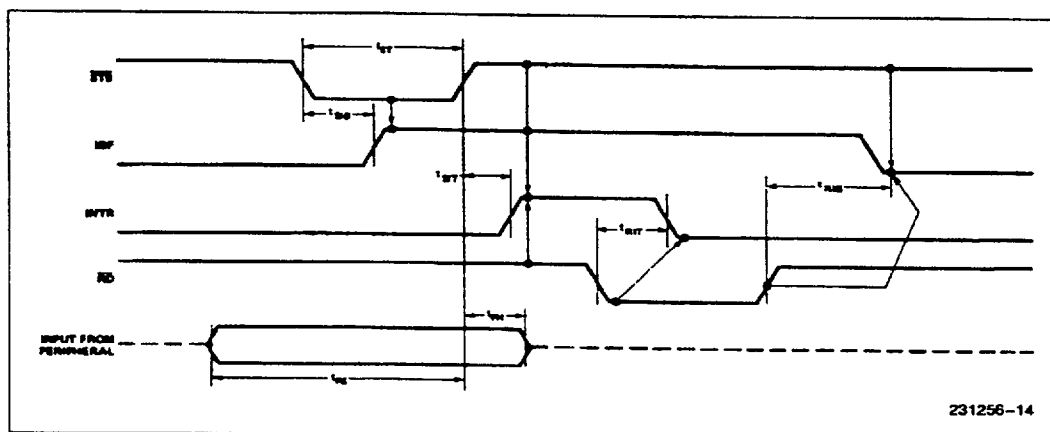


Figure 9. MODE 1 (Strobed Input)

## Output Control Signal Definition

**ÖBF (Output Buffer Full F/F).** The ÖBF output will go "low" to indicate that the CPU has written data out to the specified port. The ÖBF F/F will be set by the rising edge of the WR input and reset by ACK input being low.

**ACK (Acknowledge Input).** A "low" on this input informs the 82C55A that the data from Port A or Port B has been accepted. In essence, a response from the peripheral device indicating that it has received the data output by the CPU.

**INTR (Interrupt Request).** A "high" on this output can be used to interrupt the CPU when an output device has accepted data transmitted by the CPU. INTR is set when ACK is a "one", ÖBF is a "one" and INTE is a "one". It is reset by the falling edge of WR.

**INTE A**

Controlled by bit set/reset of PC<sub>6</sub>.

**INTE B**

Controlled by bit set/reset of PC<sub>2</sub>.

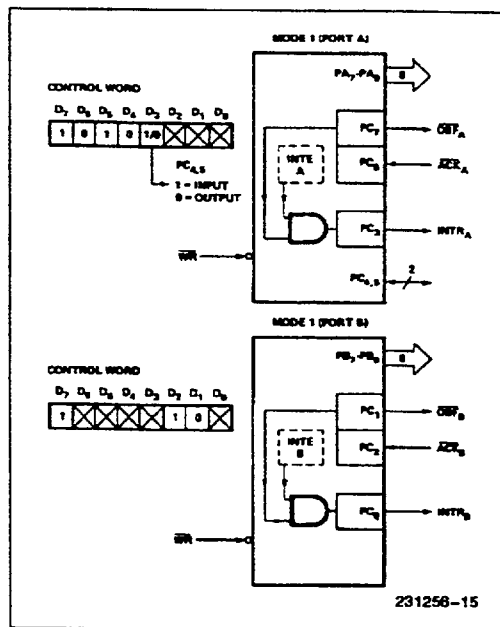


Figure 10. MODE 1 Output

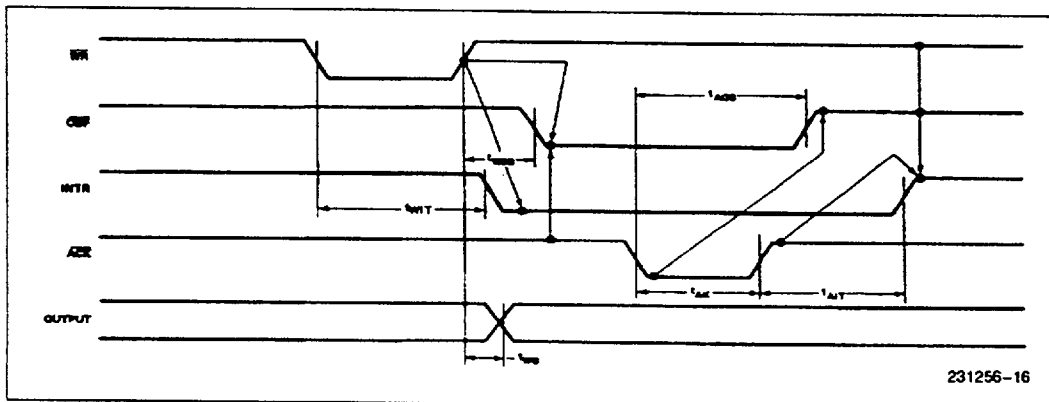


Figure 11. MODE 1 (Strobed Output)

### Combinations of MODE 1

Port A and Port B can be individually defined as input or output in Mode 1 to support a wide variety of strobed I/O applications.

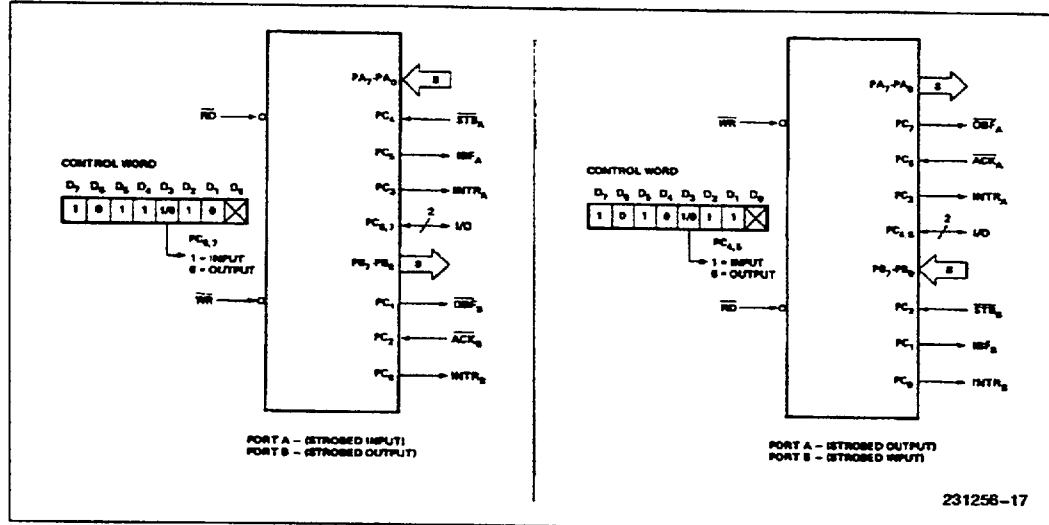


Figure 12. Combinations of MODE 1

### Operating Modes

**MODE 2 (Strobed Bidirectional Bus I/O).** This functional configuration provides a means for communicating with a peripheral device or structure on a single 8-bit bus for both transmitting and receiving data (bidirectional bus I/O). "Handshaking" signals are provided to maintain proper bus flow discipline in a similar manner to MODE 1. Interrupt generation and enable/disable functions are also available.

#### MODE 2 Basic Functional Definitions:

- Used in Group A only.
- One 8-bit, bi-directional bus port (Port A) and a 5-bit control port (Port C).
- Both inputs and outputs are latched.
- The 5-bit control port (Port C) is used for control and status for the 8-bit, bi-directional bus port (Port A).

#### Bidirectional Bus I/O Control Signal Definition

**INTR (Interrupt Request).** A high on this output can be used to interrupt the CPU for input or output operations.

### Output Operations

**ÖBF (Output Buffer Full).** The ÖBF output will go "low" to indicate that the CPU has written data out to port A.

**ACK (Acknowledge).** A "low" on this input enables the tri-state output buffer of Port A to send out the data. Otherwise, the output buffer will be in the high impedance state.

**INTE 1 (The INTE Flip-Flop Associated with ÖBF).** Controlled by bit set/reset of PC<sub>6</sub>.

### Input Operations

**STB (Strobe Input).** A "low" on this input loads data into the input latch.

**IBF (Input Buffer Full F/F).** A "high" on this output indicates that data has been loaded into the input latch.

**INTE 2 (The INTE Flip-Flop Associated with IBF).** Controlled by bit set/reset of PC<sub>4</sub>.

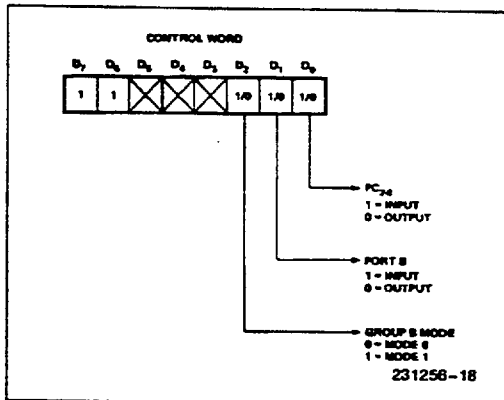


Figure 13. MODE Control Word

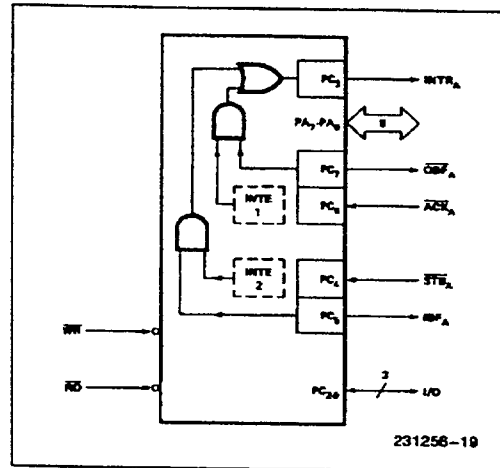


Figure 14. MODE 2

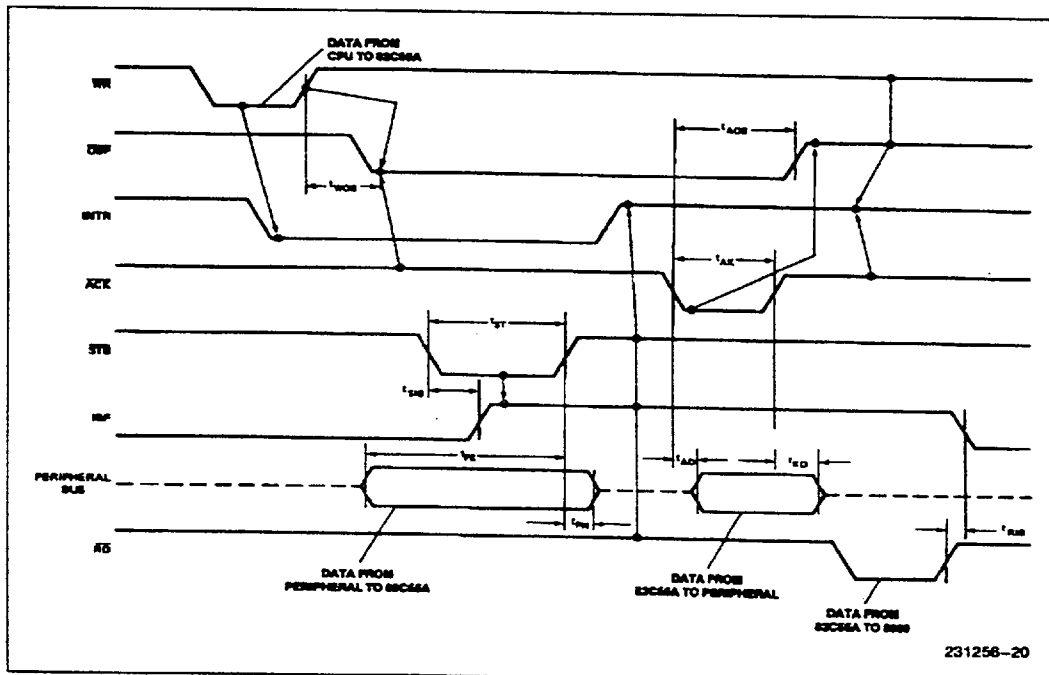


Figure 15. MODE 2 (Bidirectional)

**NOTE:**

Any sequence where WR occurs before ACK and STB occurs before RD is permissible.  
 $(INTR = IBF \cdot MASK \cdot STB \cdot RD + OBF \cdot MASK \cdot ACK \cdot WR)$

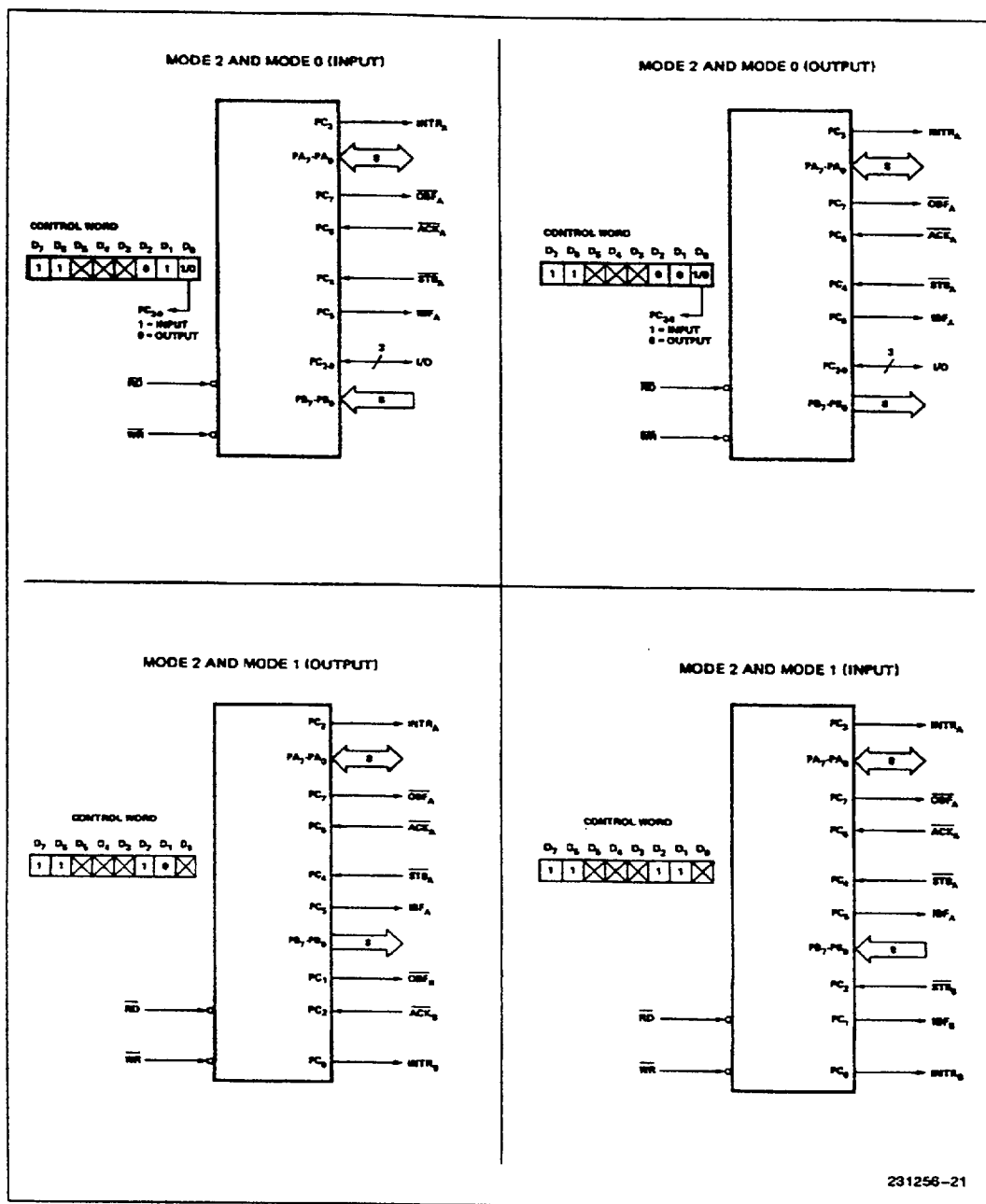


Figure 16. MODE 1/4 Combinations

## Mode Definition Summary

	MODE 0		MODE 1		MODE 2	
	IN	OUT	IN	OUT	GROUP A ONLY	
PA <sub>0</sub>	IN	OUT	IN	OUT	↔	
PA <sub>1</sub>	IN	OUT	IN	OUT	↔	
PA <sub>2</sub>	IN	OUT	IN	OUT	↔	
PA <sub>3</sub>	IN	OUT	IN	OUT	↔	
PA <sub>4</sub>	IN	OUT	IN	OUT	↔	
PA <sub>5</sub>	IN	OUT	IN	OUT	↔	
PA <sub>6</sub>	IN	OUT	IN	OUT	↔	
PA <sub>7</sub>	IN	OUT	IN	OUT	↔	
PB <sub>0</sub>	IN	OUT	IN	OUT	—	
PB <sub>1</sub>	IN	OUT	IN	OUT	—	
PB <sub>2</sub>	IN	OUT	IN	OUT	—	
PB <sub>3</sub>	IN	OUT	IN	OUT	—	
PB <sub>4</sub>	IN	OUT	IN	OUT	—	
PB <sub>5</sub>	IN	OUT	IN	OUT	—	
PB <sub>6</sub>	IN	OUT	IN	OUT	—	
PB <sub>7</sub>	IN	OUT	IN	OUT	—	
PC <sub>0</sub>	IN	OUT	INTR <sub>B</sub>	INTR <sub>B</sub>	I/O	
PC <sub>1</sub>	IN	OUT	IBF <sub>B</sub>	OBF <sub>B</sub>	I/O	
PC <sub>2</sub>	IN	OUT	STB <sub>B</sub>	ACK <sub>B</sub>	I/O	
PC <sub>3</sub>	IN	OUT	INTR <sub>A</sub>	INTR <sub>A</sub>	INTR <sub>A</sub>	
PC <sub>4</sub>	IN	OUT	STB <sub>A</sub>	I/O	STB <sub>A</sub>	
PC <sub>5</sub>	IN	OUT	IBF <sub>A</sub>	I/O	IBF <sub>A</sub>	
PC <sub>6</sub>	IN	OUT	I/O	ACK <sub>A</sub>	ACK <sub>A</sub>	
PC <sub>7</sub>	IN	OUT	I/O	OBF <sub>A</sub>	OBF <sub>A</sub>	

MODE 0  
OR MODE 1  
ONLY

## Special Mode Combination Considerations

There are several combinations of modes possible. For any combination, some or all of the Port C lines are used for control or status. The remaining bits are either inputs or outputs as defined by a "Set Mode" command.

During a read of Port C, the state of all the Port C lines, except the ACK and STB lines, will be placed on the data bus. In place of the ACK and STB line states, flag status will appear on the data bus in the PC2, PC4, and PC6 bit positions as illustrated by Figure 18.

Through a "Write Port C" command, only the Port C pins programmed as outputs in a Mode 0 group can be written. No other pins can be affected by a "Write Port C" command, nor can the interrupt enable flags be accessed. To write to any Port C output programmed as an output in a Mode 1 group or to

change an interrupt enable flag, the "Set/Reset Port C Bit" command must be used.

With a "Set/Reset Port C Bit" command, any Port C line programmed as an output (including INTR, IBF and OBF) can be written, or an interrupt enable flag can be either set or reset. Port C lines programmed as inputs, including ACK and STB lines, associated with Port C are not affected by a "Set/Reset Port C Bit" command. Writing to the corresponding Port C bit positions of the ACK and STB lines with the "Set/Reset Port C Bit" command will affect the Group A and Group B interrupt enable flags, as illustrated in Figure 18.

## Current Drive Capability

Any output on Port A, B or C can sink or source 2.5 mA. This feature allows the 82C55A to directly drive Darlington type drivers and high-voltage displays that require such sink or source current.



### Reading Port C Status

In Mode 0, Port C transfers data to or from the peripheral device. When the 82C55A is programmed to function in Modes 1 or 2, Port C generates or accepts "hand-shaking" signals with the peripheral device. Reading the contents of Port C allows the programmer to test or verify the "status" of each peripheral device and change the program flow accordingly.

There is no special instruction to read the status information from Port C. A normal read operation of Port C is executed to perform this function.

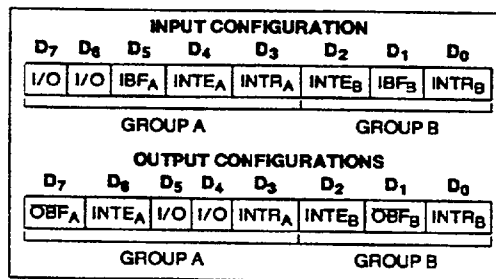


Figure 17a. MODE 1 Status Word Format

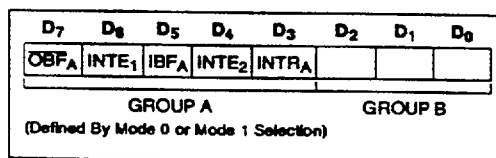


Figure 17b. MODE 2 Status Word Format

Interrupt Enable Flag	Position	Alternate Port C Pin Signal (Mode)
INTE B	PC2	ACK <sub>B</sub> (Output Mode 1) or STB <sub>B</sub> (Input Mode 1)
INTE A2	PC4	STB <sub>A</sub> (Input Mode 1 or Mode 2)
INTE A1	PC6	ACK <sub>A</sub> (Output Mode 1 or Mode 2)

Figure 18. Interrupt Enable Flags in Modes 1 and 2

**ABSOLUTE MAXIMUM RATINGS\***

Ambient Temperature Under Bias . . . 0°C to + 70°C  
 Storage Temperature . . . . . - 65°C to + 150°C  
 Supply Voltage . . . . . - 0.5 to + 8.0V  
 Operating Voltage . . . . . + 4V to + 7V  
 Voltage on any Input . . . . . GND - 2V to + 6.5V  
 Voltage on any Output . . . GND - 0.5V to  $V_{CC} + 0.5V$   
 Power Dissipation . . . . . 1 Watt

NOTICE: This is a production data sheet. The specifications are subject to change without notice.

\*WARNING: Stressing the device beyond the "Absolute Maximum Ratings" may cause permanent damage. These are stress ratings only. Operation beyond the "Operating Conditions" is not recommended and extended exposure beyond the "Operating Conditions" may affect device reliability.

**D.C. CHARACTERISTICS**

$T_A = 0^\circ\text{C}$  to  $70^\circ\text{C}$ ,  $V_{CC} = +5V \pm 10\%$ , GND = 0V ( $T_A = -40^\circ\text{C}$  to  $+85^\circ\text{C}$  for Extended Temperature)

Symbol	Parameter	Min	Max	Units	Test Conditions
$V_{IL}$	Input Low Voltage	-0.5	0.8	V	
$V_{IH}$	Input High Voltage	2.0	$V_{CC}$	V	
$V_{OL}$	Output Low Voltage		0.4	V	$I_{OL} = 2.5 \text{ mA}$
$V_{OH}$	Output High Voltage	3.0 $V_{CC} - 0.4$		V V	$I_{OH} = -2.5 \text{ mA}$ $I_{OH} = -100 \mu\text{A}$
$I_{IL}$	Input Leakage Current		$\pm 1$	$\mu\text{A}$	$V_{IN} = V_{CC}$ to 0V (Note 1)
$I_{OFL}$	Output Float Leakage Current		$\pm 10$	$\mu\text{A}$	$V_{IN} = V_{CC}$ to 0V (Note 2)
$I_{DAR}$	Darlington Drive Current	$\pm 2.5$	(Note 4)	mA	Ports A, B, C $R_{ext} = 500\Omega$ $V_{ext} = 1.7V$
$I_{PHL}$	Port Hold Low Leakage Current	+ 50	+ 300	$\mu\text{A}$	$V_{OUT} = 1.0V$ Port A only
$I_{PHH}$	Port Hold High Leakage Current	- 50	- 300	$\mu\text{A}$	$V_{OUT} = 3.0V$ Ports A, B, C
$I_{PHLO}$	Port Hold Low Overdrive Current	- 350		$\mu\text{A}$	$V_{OUT} = 0.8V$
$I_{PHHO}$	Port Hold High Overdrive Current	+ 350		$\mu\text{A}$	$V_{OUT} = 3.0V$
$I_{CC}$	$V_{CC}$ Supply Current		10	mA	(Note 3)
$I_{CCSB}$	$V_{CC}$ Supply Current-Standby		10	$\mu\text{A}$	$V_{CC} = 5.5V$ $V_{IN} = V_{CC}$ or GND Port Conditions If I/P = Open/High O/P = Open Only With Data Bus = High/Low CS = High Reset = Low Pure Inputs = Low/High

**NOTES:**

1. Pins  $A_1$ ,  $A_0$ , CS, WR, RD, Reset.
2. Data Bus; Ports B, C.
3. Outputs open.
4. Limit output current to 4.0 mA.

# CAPACITANCE

$T_A = 25^\circ\text{C}$ ,  $V_{CC} = \text{GND} = 0\text{V}$

Symbol	Parameter	Min	Max	Units	Test Conditions
$C_{IN}$	Input Capacitance		10	pF	Unmeasured pins returned to GND $f_c = 1\text{ MHz}^{(5)}$
$C_{I/O}$	I/O Capacitance		20	pF	

## NOTE:

5. Sampled not 100% tested.

# A.C. CHARACTERISTICS

$T_A = 0^\circ$  to  $70^\circ\text{C}$ ,  $V_{CC} = +5\text{V} \pm 10\%$ ,  $\text{GND} = 0\text{V}$

$T_A = -40^\circ\text{C}$  to  $+85^\circ\text{C}$  for Extended Temperature

## BUS PARAMETERS

### READ CYCLE

Symbol	Parameter	82C55A-2		Units	Test Conditions
		Min	Max		
$t_{AR}$	Address Stable Before $\overline{\text{RD}} \downarrow$	0		ns	
$t_{RA}$	Address Hold Time After $\overline{\text{RD}} \uparrow$	0		ns	
$t_{RR}$	$\overline{\text{RD}}$ Pulse Width	150		ns	
$t_{RD}$	Data Delay from $\overline{\text{RD}} \downarrow$		120	ns	
$t_{DF}$	$\overline{\text{RD}} \uparrow$ to Data Floating	10	75	ns	
$t_{RV}$	Recovery Time between $\overline{\text{RD}}/\overline{\text{WR}}$	200		ns	

### WRITE CYCLE

Symbol	Parameter	82C55A-2		Units	Test Conditions
		Min	Max		
$t_{AW}$	Address Stable Before $\overline{\text{WR}} \downarrow$	0		ns	
$t_{WA}$	Address Hold Time After $\overline{\text{WR}} \uparrow$	20		ns	Ports A & B
		20		ns	Port C
$t_{WW}$	$\overline{\text{WR}}$ Pulse Width	100		ns	
$t_{DW}$	Data Setup Time Before $\overline{\text{WR}} \uparrow$	100		ns	
$t_{WD}$	Data Hold Time After $\overline{\text{WR}} \uparrow$	30		ns	Ports A & B
		30		ns	Port C

## OTHER TIMINGS

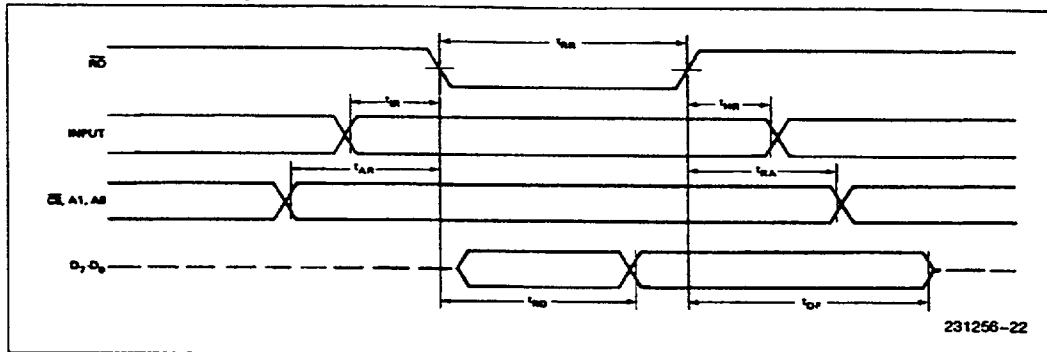
Symbol	Parameter	82C55A-2		Units Conditions	Test
		Min	Max		
$t_{WB}$	$WR = 1$ to Output		350	ns	
$t_{R}$	Peripheral Data Before $\overline{RD}$	0		ns	
$t_{HR}$	Peripheral Data After $\overline{RD}$	0		ns	
$t_{AK}$	ACK Pulse Width	200		ns	
$t_{ST}$	STB Pulse Width	100		ns	
$t_{PS}$	Per. Data Before $\overline{STB}$ High	20		ns	
$t_{PH}$	Per. Data After $\overline{STB}$ High	50		ns	
$t_{AD}$	ACK = 0 to Output		175	ns	
$t_{KD}$	ACK = 1 to Output Float	20	250	ns	
$t_{WOB}$	$WR = 1$ to $\overline{OBF} = 0$		150	ns	
$t_{AOB}$	ACK = 0 to $\overline{OBF} = 1$		150	ns	
$t_{SIB}$	$\overline{STB} = 0$ to $\overline{IBF} = 1$		150	ns	
$t_{RIB}$	$\overline{RD} = 1$ to $\overline{IBF} = 0$		150	ns	
$t_{RIT}$	$\overline{RD} = 0$ to $\overline{INTR} = 0$		200	ns	
$t_{SIT}$	$\overline{STB} = 1$ to $\overline{INTR} = 1$		150	ns	
$t_{AIT}$	ACK = 1 to $\overline{INTR} = 1$		150	ns	
$t_{WIT}$	$WR = 0$ to $\overline{INTR} = 0$		200	ns	see note 1
$t_{RES}$	Reset Pulse Width	500		ns	see note 2

## NOTE:

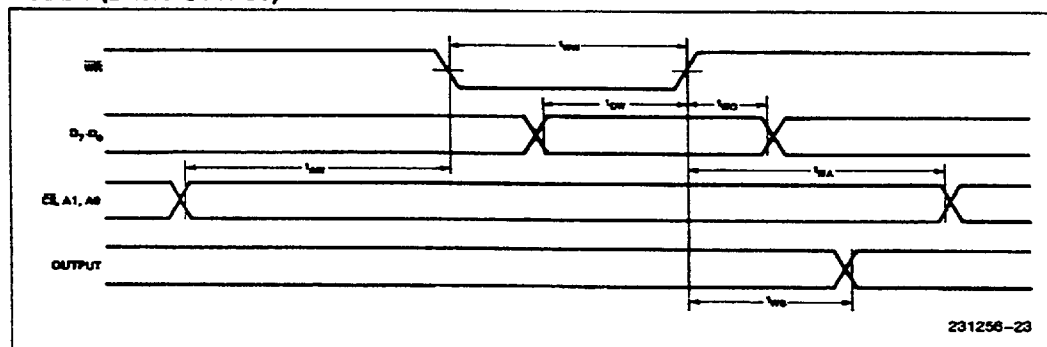
1.  $\overline{INTR} \uparrow$  may occur as early as  $WR \downarrow$ .2. Pulse width of initial Reset pulse after power on must be at least 50  $\mu$ Sec. Subsequent Reset pulses may be 500 ns minimum.

WAVEFORMS

MODE 0 (BASIC INPUT)

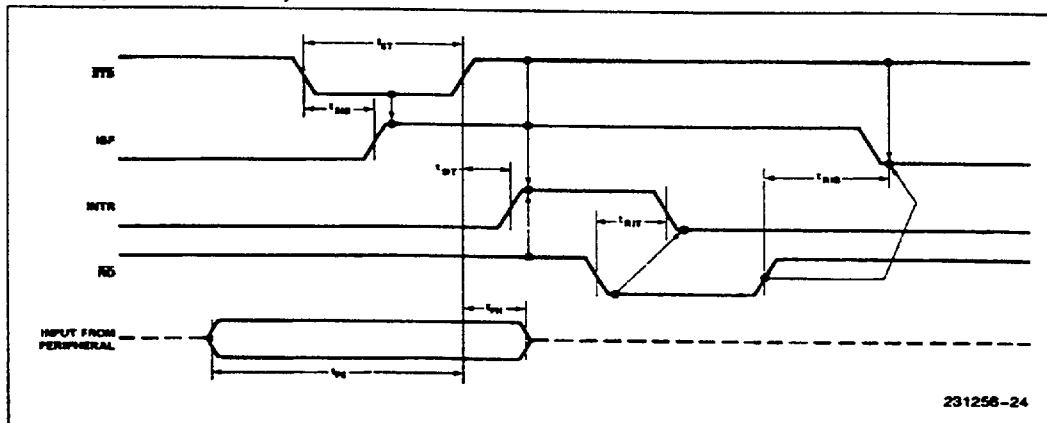


MODE 0 (BASIC OUTPUT)

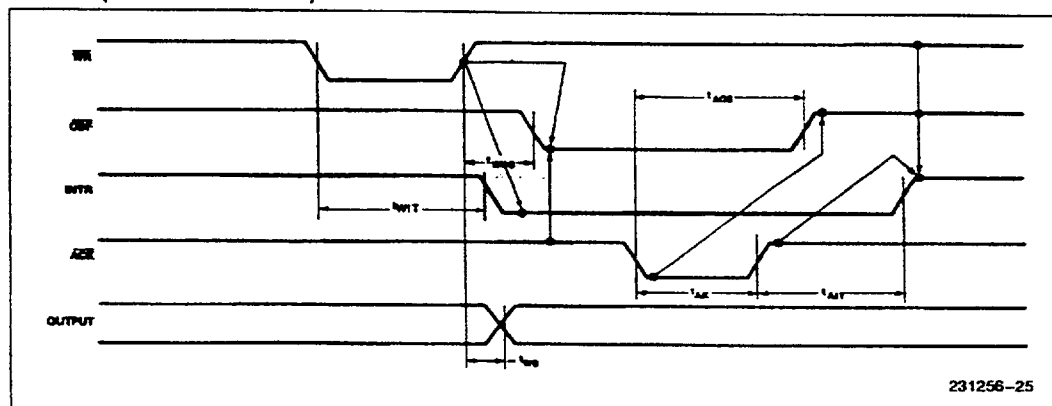


## WAVEFORMS (Continued)

## MODE 1 (STROBED INPUT)

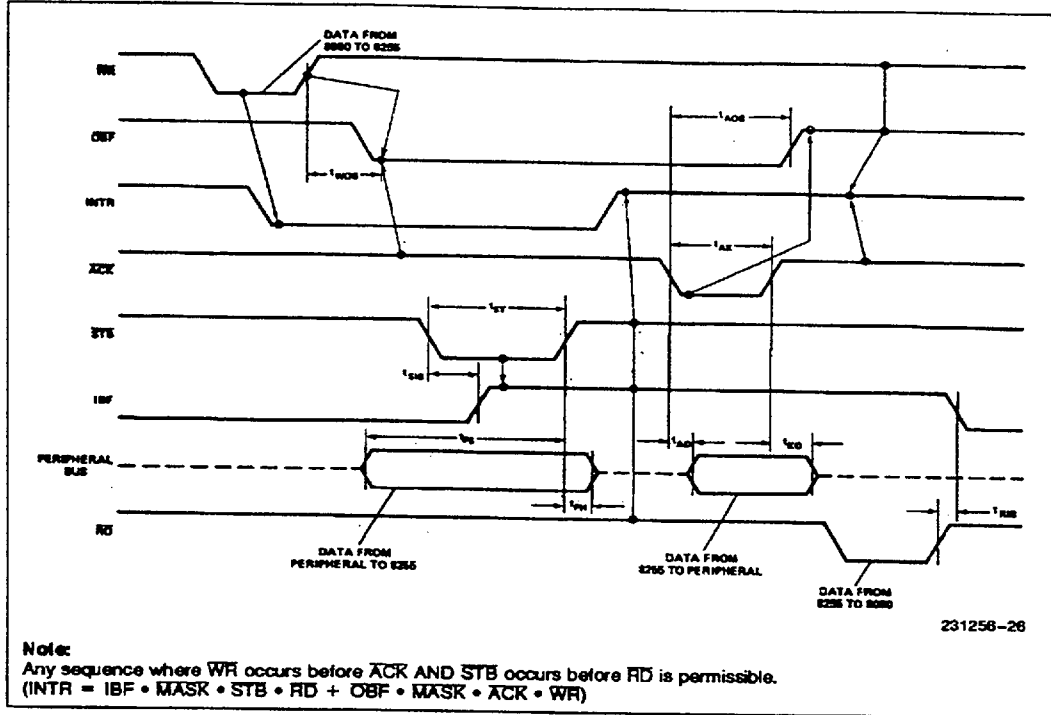


## MODE 1 (STROBED OUTPUT)

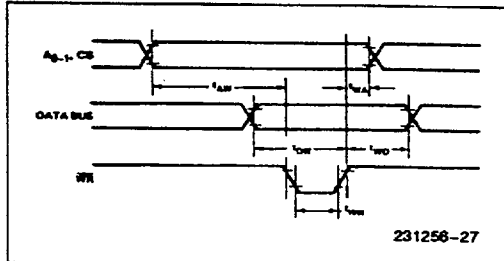


WAVEFORMS (Continued)

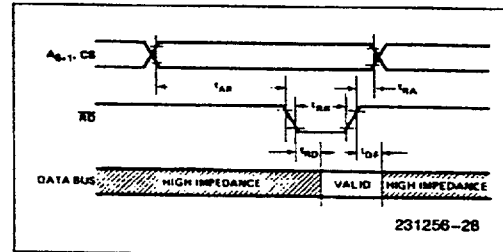
MODE 2 (BIDIRECTIONAL)



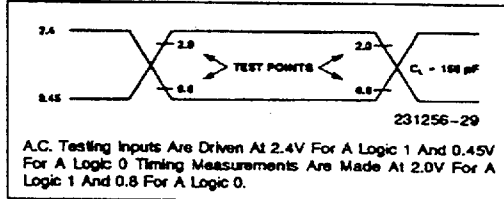
WRITE TIMING



READ TIMING



A.C. TESTING INPUT, OUTPUT WAVEFORM



A.C. TESTING LOAD CIRCUIT

