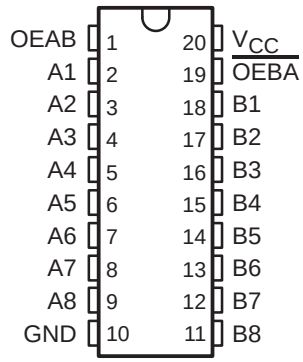
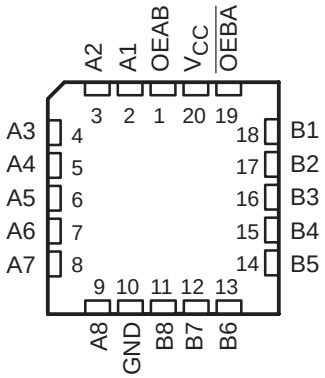
- **Lock Bus-Latch Capability**
- **True Logic**
- **High-Current 3-State Outputs Can Drive up to 15 LSTTL Loads**
- **Package Options Include Plastic Small-Outline (DW) and Ceramic Flat (W) Packages, Ceramic Chip Carriers (FK), and Standard Plastic (N) and Ceramic (J) 300-mil DIPs**

**SN54HC623 . . . J OR W PACKAGE**
**SN74HC623 . . . DW OR N PACKAGE**
**(TOP VIEW)**




**SN54HC623 . . . FK PACKAGE**
**(TOP VIEW)**




## description

These octal bus transceivers are designed for asynchronous two-way communication between data buses. The control-function implementation allows for maximum flexibility in timing.

The ’HC623 allow data transmission from the A bus to the B bus or from the B bus to the A bus, depending upon the logic levels at the output-enable (OEAB and $\overline{\text{OEBA}}$) inputs.

OEAB and $\overline{\text{OEBA}}$ disable the device so that the buses are effectively isolated. The dual-enable configuration gives the transceivers the capability to store data by simultaneously enabling OEAB and $\overline{\text{OEBA}}$. Each output reinforces its input in this transceiver configuration. When both OEAB and $\overline{\text{OEBA}}$ are enabled and all other data sources to the two sets of bus lines are in the high-impedance state, both sets of bus lines (16 total) remain at their last states. The 8-bit codes appearing on the two sets of buses are identical.

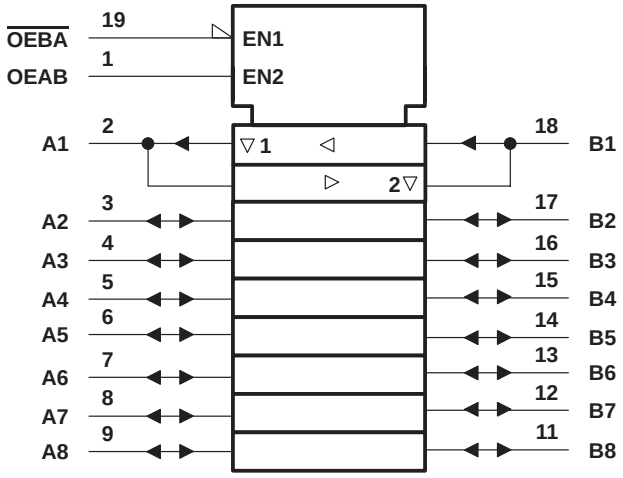
The SN54HC623 is characterized for operation over the full military temperature range of –55°C to 125°C. The SN74HC623 is characterized for operation from –40°C to 85°C.

**FUNCTION TABLE**

| INPUTS | | OPERATION |
|---|---|---|
| $\overline{\text{OEBA}}$ | OEAB | |
| L | L | B data to A bus |
| H | H | A data to B bus |
| H | L | Isolation |
| L | H | B data to A bus, A data to B bus |

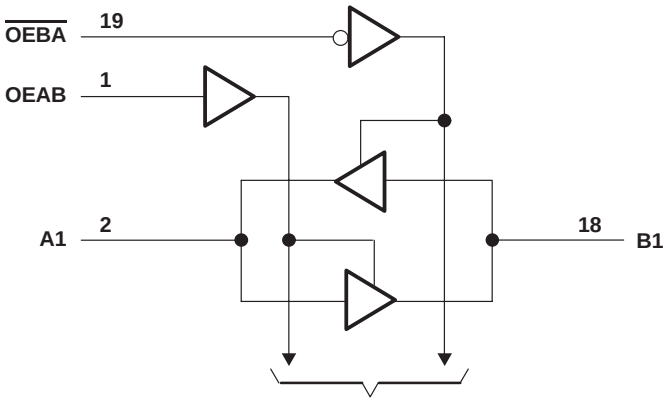
Please be aware that an important notice concerning availability, standard warranty, and use in critical applications of Texas Instruments semiconductor products and disclaimers thereto appears at the end of this data sheet.

## logic symbol†




† This symbol is in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.

## logic diagram (positive logic)




## absolute maximum ratings over operating free-air temperature range‡

Supply voltage range, $V_{CC}$ . . . . . –0.5 V to 7 V
Input clamp current, $I_{IK}$ ($V_I < 0$ or $V_I > V_{CC}$) (see Note 1) . . . . . ±20 mA
Output clamp current, $I_{OK}$ ($V_O < 0$ or $V_O > V_{CC}$) (see Note 1) . . . . . ±20 mA
Continuous output current, $I_O$ ($V_O = 0$ to $V_{CC}$) . . . . . ±35 mA
Continuous current through $V_{CC}$ or GND . . . . . ±70 mA
Package thermal impedance, $\theta_{JA}$ (see Note 2): DW package . . . . . 97°C/W
N package . . . . . 67°C/W
Storage temperature range, $T_{stg}$ . . . . . –65°C to 150°C

‡ Stresses beyond those listed under “absolute maximum ratings” may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under “recommended operating conditions” is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

NOTES: 1. The input and output voltage ratings may be exceeded if the input and output current ratings are observed.
2. The package thermal impedance is calculated in accordance with JESD 51, except for through-hole packages, which use a trace length of zero.

## recommended operating conditions

| | | | SN54HC623 | | | SN74HC623 | | | UNIT |
|---|---|---|---|---|---|---|---|---|---|
| | | | MIN | NOM | MAX | MIN | NOM | MAX | |
| $V_{CC}$ | Supply voltage | | 2 | 5 | 6 | 2 | 5 | 6 | V |
| $V_{IH}$ | High-level input voltage | $V_{CC}$ = 2 V | 1.5 | | | 1.5 | | | V |
| | | $V_{CC}$ = 4.5 V | 3.15 | | | 3.15 | | | |
| | | $V_{CC}$ = 6 V | 4.2 | | | 4.2 | | | |
| $V_{IL}$ | Low-level input voltage | $V_{CC}$ = 2 V | 0 | | 0.5 | 0 | | 0.5 | V |
| | | $V_{CC}$ = 4.5 V | 0 | | 1.35 | 0 | | 1.35 | |
| | | $V_{CC}$ = 6 V | 0 | | 1.8 | 0 | | 1.8 | |
| $V_I$ | Input voltage | | 0 | | $V_{CC}$ | 0 | | $V_{CC}$ | V |
| $V_O$ | Output voltage | | 0 | | $V_{CC}$ | 0 | | $V_{CC}$ | V |
| $t_t$ | Input transition (rise and fall) time | $V_{CC}$ = 2 V | 0 | | 1000 | 0 | | 1000 | ns |
| | | $V_{CC}$ = 4.5 V | 0 | | 500 | 0 | | 500 | |
| | | $V_{CC}$ = 6 V | 0 | | 400 | 0 | | 400 | |
| $T_A$ | Operating free-air temperature | | –55 | | 125 | –40 | | 85 | °C |



## electrical characteristics over recommended operating free-air temperature range (unless otherwise noted)

| PARAMETER | | TEST CONDITIONS | | $V_{CC}$ | $T_A$ = 25°C | | | SN54HC623 | | SN74HC623 | | UNIT |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | MIN | TYP | MAX | MIN | MAX | MIN | MAX | |
| $V_{OH}$ | | $V_I$ = $V_{IH}$ or $V_{IL}$ | $I_{OH}$ = –20 μA | 2 V | 1.9 | 1.998 | | 1.9 | | 1.9 | | V |
| | | | | 4.5 V | 4.4 | 4.499 | | 4.4 | | 4.4 | | |
| | | | | 6 V | 5.9 | 5.999 | | 5.9 | | 5.9 | | |
| | | | $I_{OH}$ = –6 mA | 4.5 V | 3.98 | 4.3 | | 3.7 | | 3.84 | | |
| | | | $I_{OH}$ = –7.8 mA | 6 V | 5.48 | 5.8 | | 5.2 | | 5.34 | | |
| $V_{OL}$ | | $V_I$ = $V_{IH}$ or $V_{IL}$ | $I_{OL}$ = 20 μA | 2 V | | 0.002 | 0.1 | | 0.1 | | 0.1 | V |
| | | | | 4.5 V | | 0.001 | 0.1 | | 0.1 | | 0.1 | |
| | | | | 6 V | | 0.001 | 0.1 | | 0.1 | | 0.1 | |
| | | | $I_{OL}$ = 6 mA | 4.5 V | | 0.17 | 0.26 | | 0.4 | | 0.33 | |
| | | | $I_{OL}$ = 7.8 mA | 6 V | | 0.15 | 0.26 | | 0.4 | | 0.33 | |
| $I_I$ | $\overline{OEAB}$ or $\overline{OEBA}$ | $V_I$ = $V_{CC}$ or 0 | | 6 V | | | ±0.1 | ±100 | | ±1000 | | ±1000 | nA |
| $I_{OZ}$ | A or B | $V_O$ = $V_{CC}$ or 0 | | 6 V | | | ±0.01 | ±0.5 | | ±10 | | ±5 | μA |
| $I_{CC}$ | | $V_I$ = $V_{CC}$ or 0, | $I_O$ = 0 | 6 V | | | 8 | | 160 | | 80 | μA |
| $C_i$ | $\overline{OEAB}$ or $\overline{OEBA}$ | | | 2 V to 6 V | | 3 | 10 | | 10 | | 10 | pF |

### switching characteristics over recommended operating free-air temperature range, $C_L$ = 50 pF (unless otherwise noted) (see Figure 1)

| PARAMETER | FROM (INPUT) | TO (OUTPUT) | $V_{CC}$ | $T_A$ = 25°C | | | SN54HC623 | | SN74HC623 | | UNIT |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | MIN | TYP | MAX | MIN | MAX | MIN | MAX | |
| $t_{pd}$ | A or B | B or A | 2 V | | 29 | 105 | | 160 | | 130 | ns |
| | | | 4.5 V | | 10 | 21 | | 32 | | 26 | |
| | | | 6 V | | 8 | 18 | | 27 | | 22 | |
| $t_{en}$ | $\overline{OEBA}$ | A | 2 V | | 112 | 210 | | 315 | | 265 | ns |
| | | | 4.5 V | | 27 | 42 | | 63 | | 53 | |
| | | | 6 V | | 20 | 36 | | 54 | | 45 | |
| $t_{dis}$ | $\overline{OEBA}$ | A | 2 V | | 40 | 150 | | 225 | | 190 | ns |
| | | | 4.5 V | | 18 | 30 | | 45 | | 38 | |
| | | | 6 V | | 16 | 26 | | 38 | | 32 | |
| $t_{en}$ | OEAB | B | 2 V | | 112 | 210 | | 315 | | 265 | ns |
| | | | 4.5 V | | 27 | 42 | | 63 | | 53 | |
| | | | 6 V | | 20 | 36 | | 54 | | 45 | |
| $t_{dis}$ | OEAB | B | 2 V | | 40 | 150 | | 225 | | 190 | ns |
| | | | 4.5 V | | 18 | 30 | | 45 | | 38 | |
| | | | 6 V | | 16 | 26 | | 38 | | 32 | |
| $t_t$ | | A or B | 2 V | | 20 | 60 | | 90 | | 75 | ns |
| | | | 4.5 V | | 8 | 12 | | 18 | | 15 | |
| | | | 6 V | | 6 | 10 | | 15 | | 13 | |



### switching characteristics over recommended operating free-air temperature range, $C_L$ = 150 pF (unless otherwise noted) (see Figure 1)

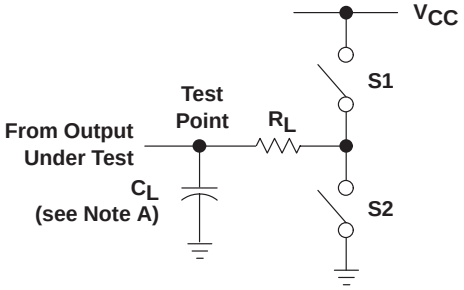
| PARAMETER | FROM (INPUT) | TO (OUTPUT) | $V_{CC}$ | $T_A$ = 25°C | | | SN54HC623 | | SN74HC623 | | UNIT |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | MIN | TYP | MAX | MIN | MAX | MIN | MAX | |
| $t_{pd}$ | A or B | B or A | 2 V | | 44 | 135 | | 200 | | 170 | ns |
| | | | 4.5 V | | 14 | 27 | | 40 | | 34 | |
| | | | 6 V | | 11 | 23 | | 34 | | 29 | |
| $t_{en}$ | $\overline{OEBA}$ | A | 2 V | | 130 | 270 | | 405 | | 335 | ns |
| | | | 4.5 V | | 31 | 54 | | 81 | | 67 | |
| | | | 6 V | | 23 | 46 | | 69 | | 56 | |
| | OEAB | B | 2 V | | 130 | 270 | | 405 | | 335 | ns |
| | | | 4.5 V | | 31 | 54 | | 81 | | 67 | |
| | | | 6 V | | 23 | 46 | | 69 | | 56 | |
| $t_t$ | | A or B | 2 V | | 45 | 210 | | 315 | | 265 | ns |
| | | | 4.5 V | | 17 | 42 | | 63 | | 53 | |
| | | | 6 V | | 13 | 36 | | 53 | | 45 | |



### operating characteristics, $T_A$ = 25°C

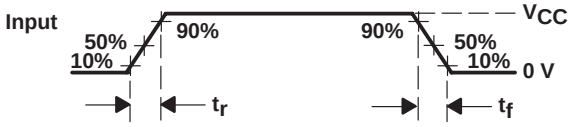
| PARAMETER | | TEST CONDITIONS | TYP | UNIT |
|---|---|---|---|---|
| $C_{pd}$ | Power dissipation capacitance per transceiver | No load | 40 | pF |

## PARAMETER MEASUREMENT INFORMATION

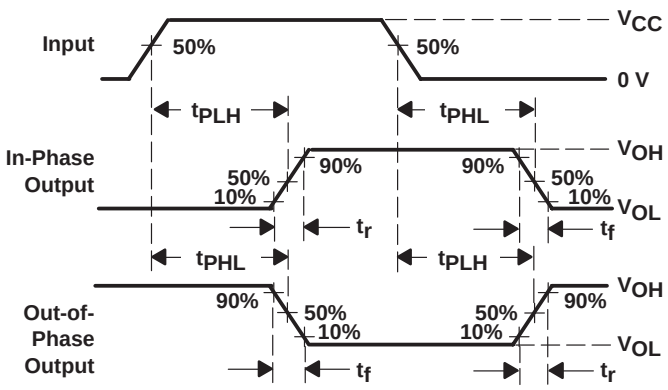



LOAD CIRCUIT

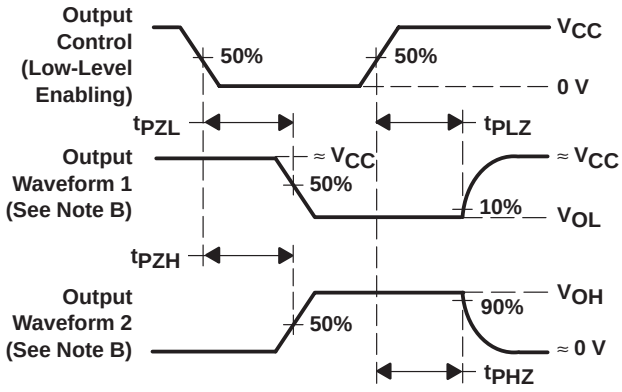
| PARAMETER | | $R_L$ | $C_L$ | S1 | S2 |
|---|---|---|---|---|---|
| $t_{en}$ | $t_{PZH}$ | 1 kΩ | 50 pF or 150 pF | Open | Closed |
| | $t_{PZL}$ | | | Closed | Open |
| $t_{dis}$ | $t_{PHZ}$ | 1 kΩ | 50 pF | Open | Closed |
| | $t_{PLZ}$ | | | Closed | Open |
| $t_{pd}$ or $t_t$ | | –– | 50 pF or 150 pF | Open | Open |




VOLTAGE WAVEFORM
INPUT RISE AND FALL TIMES




VOLTAGE WAVEFORMS
PROPAGATION DELAY AND OUTPUT TRANSITION TIMES




VOLTAGE WAVEFORMS
ENABLE AND DISABLE TIMES FOR 3-STATE OUTPUTS

NOTES: A. $C_L$ includes probe and test-fixture capacitance.
B. Waveform 1 is for an output with internal conditions such that the output is low except when disabled by the output control. Waveform 2 is for an output with internal conditions such that the output is high except when disabled by the output control.
C. Phase relationships between waveforms were chosen arbitrarily. All input pulses are supplied by generators having the following characteristics: PRR ≤ 1 MHz, $Z_O$ = 50 Ω, $t_r$ = 6 ns, $t_f$ = 6 ns.
D. The outputs are measured one at a time with one input transition per measurement.
E. $t_{PLZ}$ and $t_{PHZ}$ are the same as $t_{dis}$.
F. $t_{PZL}$ and $t_{PZH}$ are the same as $t_{en}$.
G. $t_{PLH}$ and $t_{PHL}$ are the same as $t_{pd}$.

**Figure 1. Load Circuit and Voltage Waveforms**

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# SN74HC623, Octal Bus Transceivers With 3-State Outputs

DEVICE STATUS: **ACTIVE**

| PARAMETER NAME | SN74HC623 |
|---|---|
| Voltage Nodes (V) | 6, 5, 2 |
| Vcc range (V) | 2.0 to 6.0 |
| Input Level | CMOS |
| Output Level | CMOS |
| Output Drive (mA) | -6/6 |
| No. of Outputs | 8 |
| Logic | True |
| Static Current | 0.08 |
| tpd max (ns) | 22 |

## FEATURES

▲Back to Top

- Lock Bus-Latch Capability
- True Logic
- High-Current 3-State Outputs Can Drive up to 15 LSTTL Loads
- Package Options Include Plastic Small-Outline (DW) and Ceramic Flat (W) Packages, Ceramic Chip Carriers (FK), and Standard Plastic (N) and Ceramic (J) 300-mil DIPs

## DESCRIPTION

▲Back to Top

These octal bus transceivers are designed for asynchronous two-way communication between data buses. The control-function implementation allows for maximum flexibility in timing.

The 'HC623 allow data transmission from the A bus to the B bus or from the B bus to the A bus, depending upon the logic levels at the output-enable (OEAB and OEBA\) inputs.

OEAB and OEBA\ disable the device so that the buses are effectively isolated. The dual-enable configuration gives the transceivers the capability to store data by simultaneously enabling OEAB and OEBA\. Each output reinforces its input in this transceiver configuration. When both OEAB and OEBA\ are enabled and all other data sources to the two sets of bus lines are in the high-impedance state, both sets of bus lines (16 total) remain at their last states. The 8-bit codes appearing on the two sets of buses are identical.

The SN54HC623 is characterized for operation over the full military temperature range of -55°C to 125°C. The SN74HC623 is characterized for operation from -40°C to 85°C.

## TECHNICAL DOCUMENTS

▲Back to Top

To view the following documents, Acrobat Reader 4.0 is required.
To download a document to your hard drive, right-click on the link and choose 'Save'.

## DATASHEET

▲Back to Top

Full datasheet in Acrobat PDF: sn74hc623.pdf (111 KB,Rev.B) (Updated: 05/01/1997)

## APPLICATION NOTES

▲Back to Top

View Application Notes for Digital Logic

- CMOS Power Consumption and CPD Calculation (Rev. B) (SCAA035B - Updated: 06/01/1997)
- Designing With Logic (Rev. C) (SDYA009C - Updated: 06/01/1997)
- Evaluation of Nickel/Palladium/Gold-Finished Surface-Mount Integrated Circuits (SZZA026 - Updated: 06/20/2001)
- Implications of Slow or Floating CMOS Inputs (Rev. C) (SCBA004C - Updated: 02/01/1998)
- Input and Output Characteristics of Digital Integrated Circuits (SDYA010 - Updated: 10/01/1996)
- LVT-to-LVTH Conversion (SCEA010 - Updated: 12/08/1998)
- Live Insertion (SDYA012 - Updated: 10/01/1996)
- Logic Solutions For IEEE Std 1284 (SCEA013 - Updated: 06/01/1999)
- SN54/74HCT CMOS Logic Family Applications and Restrictions (SCLA011 - Updated: 05/01/1996)
- Selecting the Right Texas Instruments Signal Switch (SZZA030 - Updated: 09/07/2001)
- Using High Speed CMOS and Advanced CMOS in Systems With Multiple Vcc (SCLA008 - Updated: 04/01/1996)

## RELATED DOCUMENTS

Back to Top

View Related Documentation for Digital Logic

- Logic Reference Guide (SCYB004, 1032 KB - Updated: 10/23/2001)
- Logic Selection Guide Second Half 2002 (Rev. R) (SDYU001R, 4274 KB - Updated: 07/19/2002)
- Military Semiconductors Selection Guide 2002 (Rev. B) (SGYC003B, 1648 KB - Updated: 04/22/2002)

## SAMPLES

Back to Top

| ORDERABLE DEVICE | PACKAGE INDUSTRY (TI) | PINS | TEMP (°C) | STATUS | PRODUCT CONTENT | SAMPLES |
|---|---|---|---|---|---|---|
| SN74HC623DW | SOP (DW) | 20 | -40 TO 85 | ACTIVE | View Product Content | Request Samples |
| SN74HC623N | PDIP (N) | 20 | -40 TO 85 | ACTIVE | View Product Content | Request Samples |

## PRICING/AVAILABILITY/PKG

Back to Top

| DEVICE INFORMATION | | | | | | | TI INVENTORY STATUS AS OF 3:00 PM GMT, 26 Sep 2002 | | | REPORTED DISTRIBUTOR INVENTORY AS OF 3:00 PM GMT, 26 Sep 2002 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ORDERABLE DEVICE | STATUS | PACKAGE TYPE\|PINS | TEMP (°C) | PRODUCT CONTENT | BUDGETARY PRICING QTY \| $US | STD PACK QTY | IN STOCK | IN PROGRESS QTY\|DATE | LEAD TIME | DISTRIBUTOR COMPANY\|REGION | IN STOCK | PURCHASE |
| SN74HC623DW | ACTIVE | SOP (DW) \| 20 | -40 TO 85 | View Contents | 1KU \| 3.64 | 25 | N/A* | 100 \| 03 Oct | 2 WKS | | | |
| | | | | | | | | 4984 \| 07 Oct | | | | |
| | | | | | | | | >10k \| 14 Oct | | | | |
| SN74HC623DWR | ACTIVE | SOP (DW) \| 20 | -40 TO 85 | View Contents | 1KU \| 3.67 | 2000 | 8000 | 4984 \| 04 Oct | 2 WKS | | | |
| | | | | | | | | >10k \| 11 Oct | | | | |
| SN74HC623N | ACTIVE | PDIP (N) \| 20 | -40 TO 85 | View Contents | 1KU \| 3.64 | 20 | 2000 | 640 \| 19 Sep | 2 WKS | | | |
| | | | | | | | | 2 \| 25 Sep | | | | |
| | | | | | | | | 4969 \| 07 Oct | | | | |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | >10k \| 14 Oct | | | | | | |
| | | | | | | | | 5287 \| 21 Oct | | | | | | |
| SN74HC623NSR | ACTIVE | SOP (NS) \| 20 | | View Contents | 1KU \| 3.64 | 2000 | N/A* | 4967 \| 07 Oct | 3 WKS | | | | | |
| | | | | | | | | >10k \| 14 Oct | | | | | | |

**Table Data Updated on: 9/26/2002**