STANDARD MICROSYSTEMS CORPORATION

# COM 8046
# COM 8046T

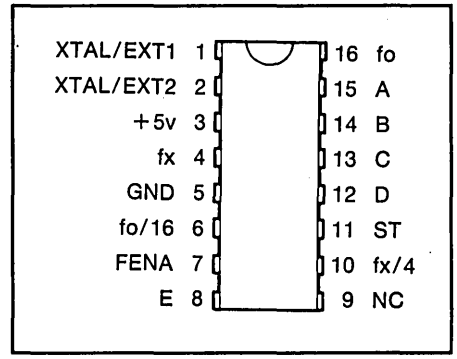
# Baud Rate Generator
## Programmable Divider



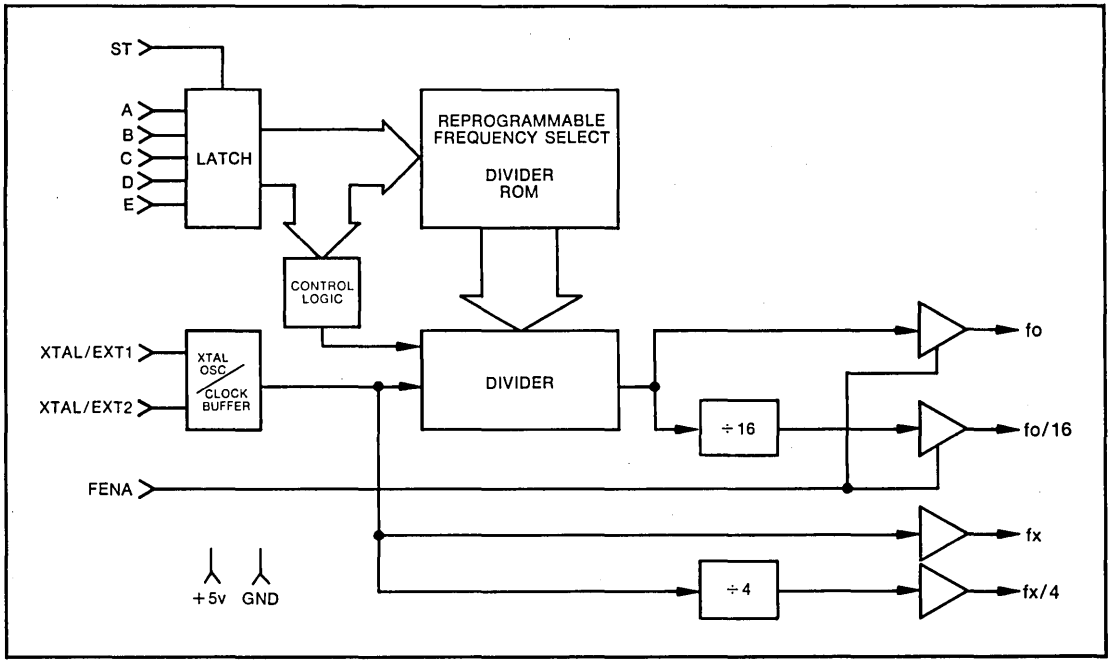
### FEATURES

- ☐ On chip crystal oscillator or external frequency input
- ☐ Single +5v power supply
- ☐ Choice of 32 output frequencies
- ☐ 32 asynchronous/synchronous baud rates
- ☐ Direct UART/USRT/ASTRO/USYNRT compatibility
- ☐ Re-programmable ROM via CLASP® technology allows generation of other frequencies
- ☐ TTL, MOS compatible
- ☐ 1X Clock via fo/16 output
- ☐ Crystal frequency output via fx and fx/4 outputs
- ☐ Output disable via FENA

### PIN CONFIGURATION




### BLOCK DIAGRAM



## General Description

The Standard Microsystems COM 8046 is an enhanced version of the COM 5046 Baud Rate Generator. It is fabricated using SMC's patented COPLAMOS® and CLASP® technologies and employs depletion mode loads, allowing operation from a single +5v supply.

The standard COM 8046 is specifically dedicated to generating the full spectrum of 16 asynchronous/synchronous data communication frequencies for 1X, 16X and 32X UART/USRT/ASTRO/USYNRT devices.

The COM 8046 features an internal crystal oscillator which may be used to provide the master reference frequency. Alternatively, an external reference may be supplied by applying complementary TTL level signals to pins 1 and 2. Parts suitable for use only with an external TTL reference are marked COM 8046T. TTL outputs used to drive the COM 8046 or COM 8046T should not be used to drive other TTL inputs, as noise immunity may be compromised due to excessive loading.

The reference frequency (fx) is used to provide two high frequency outputs: one at fx and the other at fx/4. The fx/4 output will drive one standard 7400 load, while the fx output will drive two 74LS loads.

The output of the oscillator/buffer is applied to the divider for generation of the output frequency $f_O$. The divider is capable of dividing by any integer from 6 to $2^{19} + 1$, inclusive. If the divisor is even, the output will be square; otherwise the output will be high longer than it is low by one fx clock period. The output of the divider is also divided internally by 16 and made available at the $f_O/16$ output pin. The $f_O/16$ output will drive one and the $f_O$ output will drive two standard 7400 TTL loads. Both the $f_O$ and $f_O/16$ outputs can be disabled by supplying a low logic level to the FENA input pin. Note that the FENA input has an internal pull-up which will cause the pin to rise to approximately $V_{CC}$ if left unconnected.

The divisor ROM contains 32 divisors, each 19 bits wide, and is fabricated using SMC's unique CLASP® technology. This process permits reduction of turn-around-time for ROM patterns.

The five divisor select bits are held in an externally strobed data latch. The strobe input is level sensitive: while the strobe is high, data is passed directly through to the ROM. Initiation of a new frequency is effected within 3.5μs of a change in any of the five divisor select bits; strobe activity is not required. This feature may be disabled through a CLASP® programming option causing new frequency initiation to be delayed until the end of the current $f_O$ half-cycle All five data inputs have pull-ups identical to that of the FENA input, while the strobe input has no pull-up.

## Description of Pin Functions

| Pin No. | Symbol | Name | Function |
|---|---|---|---|
| 1 | XTAL/EXT1 | Crystal or External Input 1 | This input is either one pin of the crystal package or one polarity of the external input. |
| 2 | XTAL/EXT2 | Crystal or External Input 2 | This input is either the other pin of the crystal package or the other polarity of the external input. |
| 3 | $V_{CC}$ | Power Supply | +5 volt supply |
| 4 | $f_X$ | $f_X$ | Crystal/clock frequency reference output |
| 5 | GND | Ground | Ground |
| 6 | $f_O/16$ | $f_O/16$ | 1X clock output |
| 7 | FENA | Enable | A low level at this input causes the $f_O$ and $f_O/16$ outputs to be held high. An open or a high level at the FENA input enables the $f_O$ and $f_O/16$ outputs. |
| 8 | E | E | Most significant divisor select data bit. An open at this input is equivalent to a logic high. |
| 9 | NC | NC | No connection |
| 10 | $f_X/4$ | $f_X/4$ | ¼ crystal/clock frequency reference output. |
| 11 | ST | Strobe | Divisor select data strobe. Data is sampled when this input is high, preserved when this input is low. |
| 12-15 | D,C,B,A | D,C,B,A | Divisor select data bits. A = LSB. An open circuit at these inputs is equivalent to a logic high. |
| 16 | $f_O$ | $f_O$ | 16X clock output |

For electrical characteristics, see page 189.

# ELECTRICAL CHARACTERISTICS COM8046, COM8046T, COM8116, COM8116T, COM8126, COM8126T, COM8136, COM8136T, COM8146, COM8146T

**MAXIMUM GUARANTEED RATINGS***

| | |
|---|---|
| Operating Temperature Range | 0°C to + 70°C |
| Storage Temperature Range | −55°C to +150°C |
| Lead Temperature (soldering, 10 sec.) | +325°C |
| Positive Voltage on any Pin, with respect to ground | +8.0V |
| Negative Voltage on any Pin, with respect to ground | −0.3V |

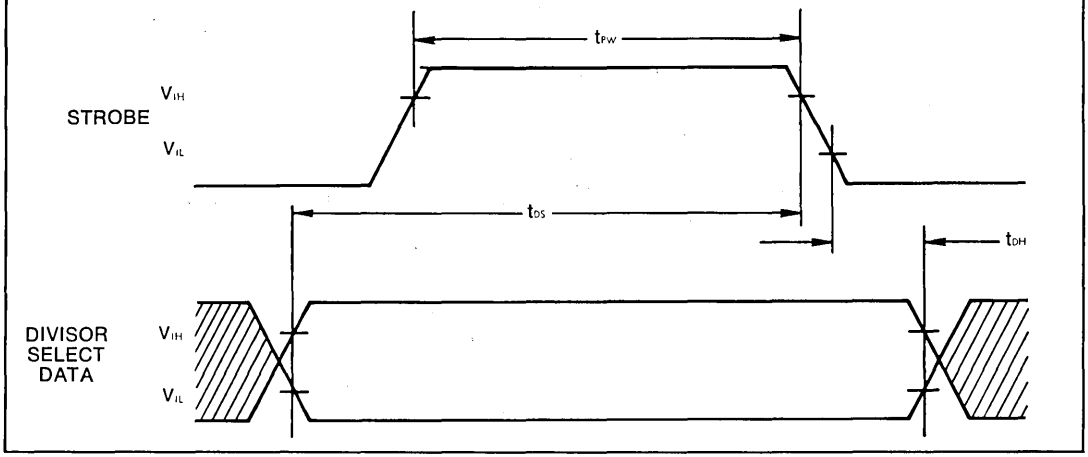
*Stresses above those listed may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or at any other condition above those indicated in the operational sections of this specification is not implied.

NOTE: When powering this device from laboratory or system power supplies, it is important that the Absolute Maximum Ratings not be exceeded or device failure can result. Some power supplies exhibit voltage spikes or "glitches" on their outputs when the AC power is switched on and off. In addition, voltage transients on the AC power line may appear on the DC output. If this possibility exists it is suggested that a clamp circuit be used.

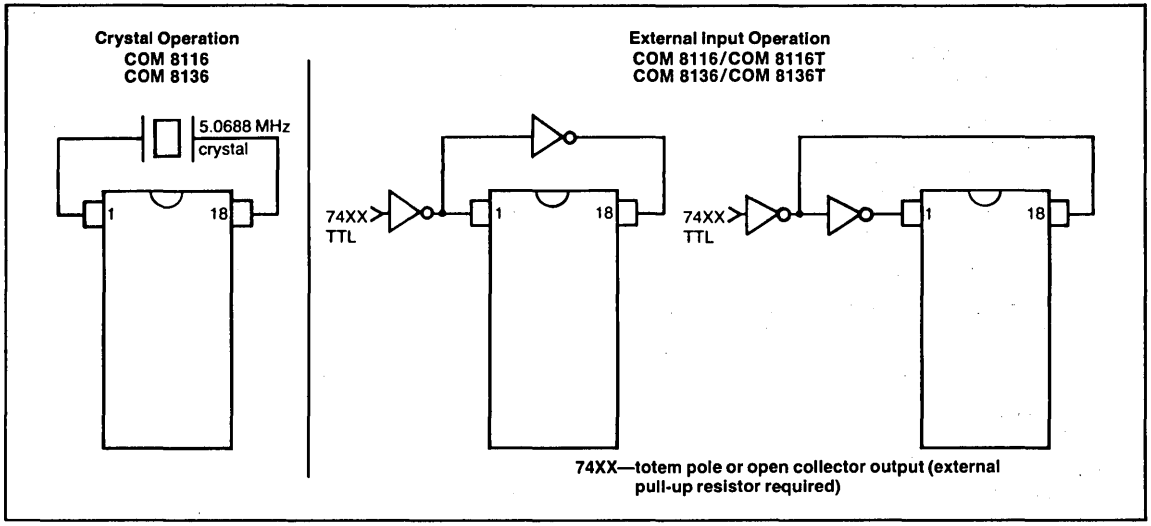
**ELECTRICAL CHARACTERISTICS** ($T_A$ = 0°C to 70°C, $V_{CC}$ = +5V ±5%, unless otherwise noted)

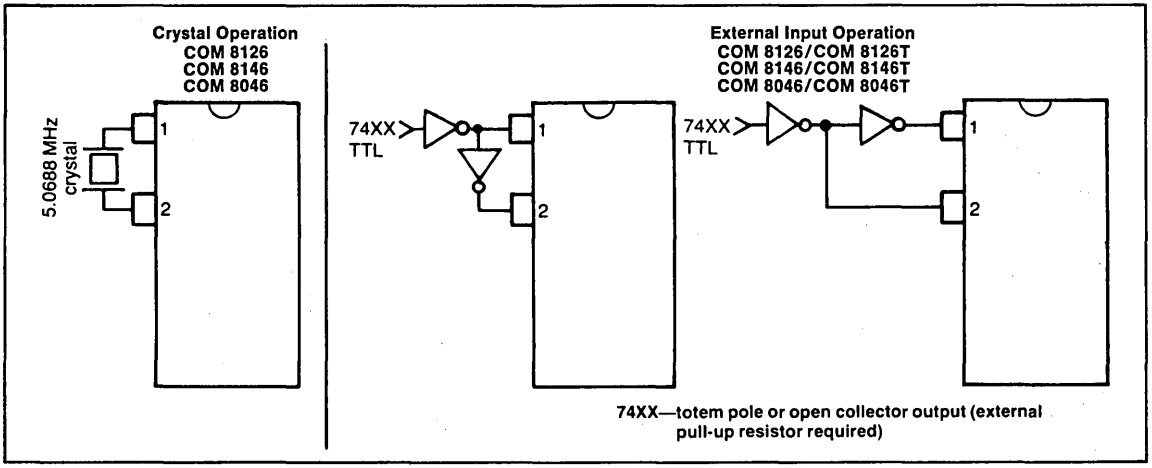
| Parameter | Min. | Typ. | Max. | Unit | Comments |
|---|---|---|---|---|---|
| **D.C. CHARACTERISTICS** | | | | | |
| INPUT VOLTAGE LEVELS | | | | | |
| Low-level, $V_{IL}$ | | | 0.8 | V | |
| High-level, $V_{IH}$ | 2.0 | | | V | excluding XTAL inputs |
| OUTPUT VOLTAGE LEVELS | | | | | |
| Low-level, $V_{OL}$ | | | 0.4 | V | $I_{OL}$ = 1.6mA, for $f_X/4$, $f_O/16$ |
| | | | 0.4 | V | $I_{OL}$ = 3.2mA, for $f_O$, $f_R$, $f_T$ |
| | | | 0.4 | V | $I_{OL}$ = 0.8mA, for $f_X$ |
| High-level, $V_{OH}$ | 3.5 | | | V | $I_{OH}$ = −100μA; for $f_X$, $I_{OH}$ = −50μA |
| INPUT CURRENT | | | | | |
| Low-level, $I_{IL}$ | | | -0.1 | mA | $V_{IN}$ = GND, excluding XTAL inputs |
| INPUT CAPACITANCE | | | | | |
| All inputs, $C_{IN}$ | | 5 | 10 | pF | $V_{IN}$ = GND, excluding XTAL inputs |
| EXT INPUT LOAD | | 8 | 10 | | Series 7400 equivalent loads |
| POWER SUPPLY CURRENT | | | | | |
| $I_{CC}$ | | | 50 | mA | |
| **A.C. CHARACTERISTICS** | | | | | $T_A$ = +25°C |
| CLOCK FREQUENCY, $f_{IN}$ | 0.01 | | 7.0 | MHz | XTAL/EXT, 50% Duty Cycle ±5% COM 8046, COM 8126, COM 8146 |
| | 0.01 | | 5.1 | MHz | XTAL/EXT, 50% Duty Cycle ±5% COM 8116, COM 8136 |
| STROBE PULSE WIDTH, $t_{PW}$ | 150 | | DC | ns | |
| INPUT SET-UP TIME | | | | | |
| $t_{DS}$ | 200 | | | ns | |
| INPUT HOLD TIME | | | | | |
| $t_{DH}$ | 50 | | | ns | |
| STROBE TO NEW FREQUENCY DELAY | | | 3.5 | μs | @ $f_X$ = 5.0 MHz |

**TIMING DIAGRAM**




SECTION IV




For ROM re-programming SMC has a computer program available whereby the customer need only supply the input frequency and the desired output frequencies. The ROM programming is automatically generated.

## Crystal Specifications

User must specify termination (pin, wire, other)

Prefer: HC-18/U or HC-25/U

Frequency — 5.0688 MHz, AT cut

Temperature range 0°C to 70°C

Series resistance <50 Ω

Series Resonant

Overall tolerance ± .01%

or as required

## Crystal manufacturers (Partial List)

**Northern Engineering Laboratories**
357 Beloit Street
Burlington, Wisconsin 53105
(414) 763-3591

**Bulova Frequency Control Products**
61-20 Woodside Avenue
Woodside, New York 11377
(212) 335-6000

**CTS Knights Inc.**
101 East Church Street
Sandwich, Illinois 60548
(815) 786-8411

**Crystek Crystals Corporation**
1000 Crystal Drive
Fort Myers, Florida 33901
(813) 936-2109

# COM 8046
# COM 8046T



**Table 2**

REFERENCE FREQUENCY = 5.068800MHz

| Divisor Select EDCBA | Desired Baud Rate | Clock Factor | Desired Frequency (KHz) | Divisor | Actual Baud Rate | Actual Frequency (KHz) | Deviation |
|---|---|---|---|---|---|---|---|
| 00000 | 50.00 | 32X | 1.60000 | 3168 | 50.00 | 1.600000 | 0.0000% |
| 00001 | 75.00 | 32X | 2.40000 | 2112 | 75.00 | 2.400000 | 0.0000% |
| 00010 | 110.00 | 32X | 3.52000 | 1440 | 110.00 | 3.520000 | 0.0000% |
| 00011 | 134.50 | 32X | 4.30400 | 1177 | 134.58 | 4.306542 | 0.0591% |
| 00100 | 150.00 | 32X | 4.80000 | 1056 | 150.00 | 4.800000 | 0.0000% |
| 00101 | 200.00 | 32X | 6.40000 | 792 | 200.00 | 6.400000 | 0.0000% |
| 00110 | 300.00 | 32X | 9.60000 | 528 | 300.00 | 9.600000 | 0.0000% |
| 00111 | 600.00 | 32X | 19.20000 | 264 | 600.00 | 19.200000 | 0.0000% |
| 01000 | 1200.00 | 32X | 38.40000 | 132 | 1200.00 | 38.400000 | 0.0000% |
| 01001 | 1800.00 | 32X | 57.60000 | 88 | 1800.00 | 57.600000 | 0.0000% |
| 01010 | 2400.00 | 32X | 76.80000 | 66 | 2400.00 | 76.800000 | 0.0000% |
| 01011 | 3600.00 | 32X | 115.20000 | 44 | 3600.00 | 115.200000 | 0.0000% |
| 01100 | 4800.00 | 32X | 153.60000 | 33 | 4800.00 | 153.600000 | 0.0000% |
| 01101 | 7200.00 | 32X | 230.40000 | 22 | 7200.00 | 230.400000 | 0.0000% |
| 01110 | 9600.00 | 32X | 307.20000 | 16 | 9900.00 | 316.800000 | 3.1250% |
| 01111 | 19200.00 | 32X | 614.40000 | 8 | 19800.00 | 633.600000 | 3.1250% |
| 10000 | 50.00 | 16X | 0.80000 | 6336 | 50.00 | 0.800000 | 0.0000% |
| 10001 | 75.00 | 16X | 1.20000 | 4224 | 75.00 | 1.200000 | 0.0000% |
| 10010 | 110.00 | 16X | 1.76000 | 2880 | 110.00 | 1.760000 | 0.0000% |
| 10011 | 134.50 | 16X | 2.15200 | 2355 | 134.52 | 2.152357 | 0.0166% |
| 10100 | 150.00 | 16X | 2.40000 | 2112 | 150.00 | 2.400000 | 0.0000% |
| 10101 | 300.00 | 16X | 4.80000 | 1056 | 300.00 | 4.800000 | 0.0000% |
| 10110 | 600.00 | 16X | 9.60000 | 528 | 600.00 | 9.600000 | 0.0000% |
| 10111 | 1200.00 | 16X | 19.20000 | 264 | 1200.00 | 19.200000 | 0.0000% |
| 11000 | 1800.00 | 16X | 28.80000 | 176 | 1800.00 | 28.800000 | 0.0000% |
| 11001 | 2000.00 | 16X | 32.00000 | 158 | 2005.06 | 32.081013 | 0.2532% |
| 11010 | 2400.00 | 16X | 38.40000 | 132 | 2400.00 | 38.400000 | 0.0000% |
| 11011 | 3600.00 | 16X | 57.60000 | 88 | 3600.00 | 57.600000 | 0.0000% |
| 11100 | 4800.00 | 16X | 76.80000 | 66 | 4800.00 | 76.800000 | 0.0000% |
| 11101 | 7200.00 | 16X | 115.20000 | 44 | 7200.00 | 115.200000 | 0.0000% |
| 11110 | 9600.00 | 16X | 153.60000 | 33 | 9600.00 | 153.600000 | 0.0000% |
| 11111 | 19200.00 | 16X | 307.20000 | 16 | 19800.00 | 316.800000 | 3.1250% |

# COM 8116
# COM 8116T
# COM 8126
# COM 8126T
# COM 8136
# COM 8136T
# COM 8146
# COM 8146T

**Table 1**

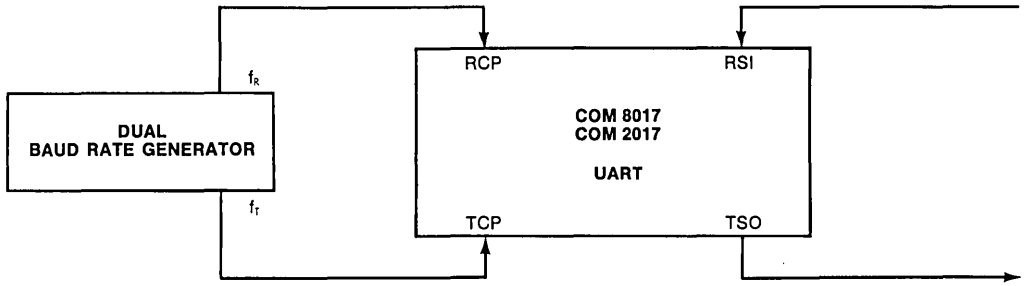
REFERENCE FREQUENCY = 5.068800MHZ
(STANDARD PART)

| Divisior Select DCBA | Desired Baud Rate | Clock Factor | Desired Frequency (KHz) | Divisor | Actual Baud Rate | Actual Frequency (KHz) | Deviation |
|---|---|---|---|---|---|---|---|
| 0000 | 50.00 | 16X | 0.80000 | 6336 | 50.00 | 0.800000 | 0.0000% |
| 0001 | 75.00 | 16X | 1.20000 | 4224 | 75.00 | 1.200000 | 0.0000% |
| 0010 | 110.00 | 16X | 1.76000 | 2880 | 110.00 | 1.760000 | 0.0000% |
| 0011 | 134.50 | 16X | 2.15200 | 2355 | 134.52 | 2.152357 | 0.0166% |
| 0100 | 150.00 | 16X | 2.40000 | 2112 | 150.00 | 2.400000 | 0.0000% |
| 0101 | 300.00 | 16X | 4.80000 | 1056 | 300.00 | 4.800000 | 0.0000% |
| 0110 | 600.00 | 16X | 9.60000 | 528 | 600.00 | 9.600000 | 0.0000% |
| 0111 | 1200.00 | 16X | 19.20000 | 264 | 1200.00 | 19.200000 | 0.0000% |
| 1000 | 1800.00 | 16X | 28.80000 | 176 | 1800.00 | 28.800000 | 0.0000% |
| 1001 | 2000.00 | 16X | 32.00000 | 158 | 2005.06 | 32.081013 | 0.2532% |
| 1010 | 2400.00 | 16X | 38.40000 | 132 | 2400.00 | 38.400000 | 0.0000% |
| 1011 | 3600.00 | 16X | 57.60000 | 88 | 3600.00 | 57.600000 | 0.0000% |
| 1100 | 4800.00 | 16X | 76.80000 | 66 | 4800.00 | 76.800000 | 0.0000% |
| 1101 | 7200.00 | 16X | 115.20000 | 44 | 7200.00 | 115.200000 | 0.0000% |
| 1110 | 9600.00 | 16X | 153.60000 | 33 | 9600.00 | 153.600000 | 0.0000% |
| 1111 | 19200.00 | 16X | 307.20000 | 16 | 19800.00 | 316.800000 | 3.1250% |

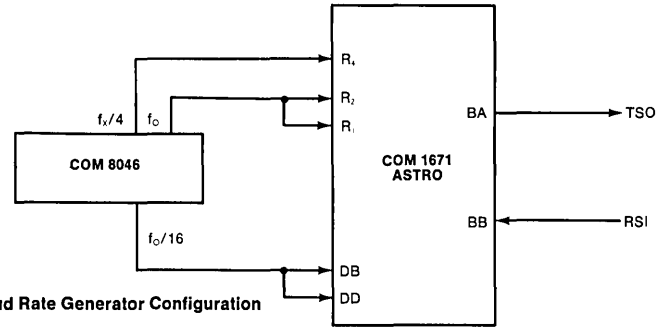
**Table 2**

REFERENCE FREQUENCY = 4.915200MHz
(COM81__ __-5)

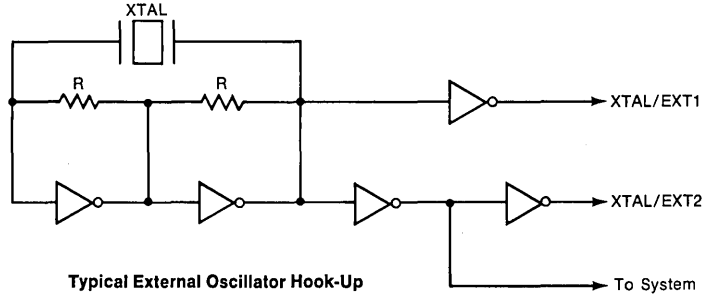
| Divisor Select DCBA | Desired Baud Rate | Clock Factor | Desired Frequency (KHz) | Divisor | Actual Baud Rate | Actual Frequency (KHz) | Deviation |
|---|---|---|---|---|---|---|---|
| 0000 | 50.00 | 16X | 0.80000 | 6144 | 50.00 | 0.800000 | 0.0000% |
| 0001 | 75.00 | 16X | 1.20000 | 4096 | 75.00 | 1.200000 | 0.0000% |
| 0010 | 110.00 | 16X | 1.76000 | 2793 | 109.93 | 1.758983 | 0.0100% |
| 0011 | 134.50 | 16X | 2.15200 | 2284 | 134.50 | 2.152000 | 0.0000% |
| 0100 | 150.00 | 16X | 2.40000 | 2048 | 150.00 | 2.400000 | 0.0000% |
| 0101 | 300.00 | 16X | 4.80000 | 1024 | 300.00 | 4.800000 | 0.0000% |
| 0110 | 600.00 | 16X | 9.60000 | 512 | 600.00 | 9.600000 | 0.0000% |
| 0111 | 1200.00 | 16X | 19.20000 | 256 | 1200.00 | 19.200000 | 0.0000% |
| 1000 | 1800.00 | 16X | 28.80000 | 171 | 1796.49 | 28.743859 | 0.1949% |
| 1001 | 2000.00 | 16X | 32.00000 | 154 | 1994.81 | 31.916883 | 0.2597% |
| 1010 | 2400.00 | 16X | 38.40000 | 128 | 2400.00 | 32.000000 | 0.0000% |
| 1011 | 3600.00 | 16X | 57.60000 | 85 | 3614.11 | 57.825882 | 0.3921% |
| 1100 | 4800.00 | 16X | 76.80000 | 64 | 4800.00 | 76.800000 | 0.0000% |
| 1101 | 7200.00 | 16X | 115.20000 | 43 | 7144.19 | 114.306976 | 0.7751% |
| 1110 | 9600.00 | 16X | 153.60000 | 32 | 9600.00 | 153.600000 | 0.0000% |
| 1111 | 19200.00 | 16X | 307.20000 | 16 | 19200.00 | 307.200000 | 0.0000% |



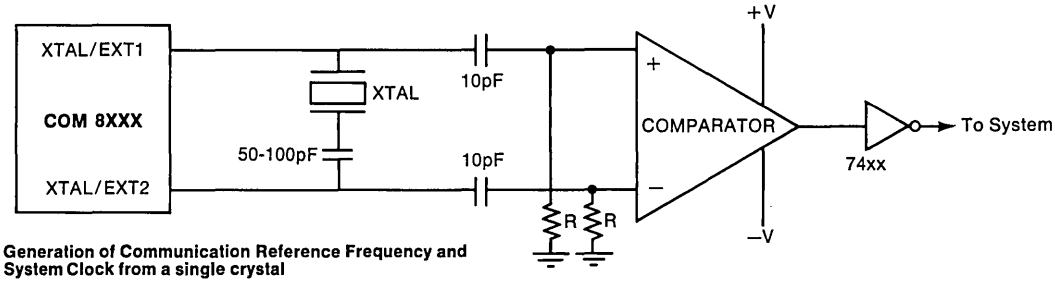

**Typical UART—Dual Baud Rate Generator Configuration**
**Full Duplex—Split Speed**




**Typical ASTRO—Baud Rate Generator Configuration**




**Typical External Oscillator Hook-Up**




**Generation of Communication Reference Frequency and System Clock from a single crystal**