

# Intelligent Waveform Synthesizer

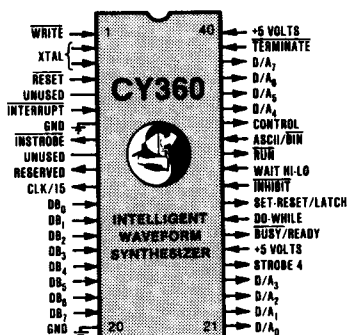
# CY360

The CY360 Intelligent Waveform Synthesizer is a standard 5 volt 40-pin LSI device designed to provide flexible generation of sine waves, triangle waveforms, square waves, computed waveforms, and user defined functions. The initiation and termination of these waves can be under external control or under the control of a program stored in the CY360 itself. The CY360 accepts ASCII or binary commands from a keyboard or computer through a parallel TTL interface that also enables simple RS232 and IEEE-488 interface designs. The CY360 drives standard 8-bit digital-to-analog (D/A) converters and includes a 16-bit operational mode.

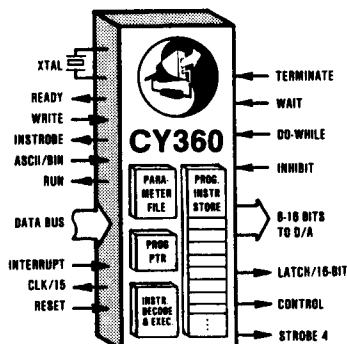
## Standard Features

- ASCII-decimal or binary input
- 24 Hi-level language commands
- External initiate/terminate
- Programmed initiate/terminate
- Multi-phase sine wave outputs
- 0.00001 to 50,000 pulses/second
- Sweep frequency operation
- Piece-wise approx to any function
- Pseudo-random signal output
- Single 5 volt supply
- Stored program capability
- Absolute amplitude stability
- 16-bit output mode
- Mixed waveform sequences
- Software selected timing
- Programmable amplitude modes
- User defined functions
- "Live" host interface

## Pin Configuration



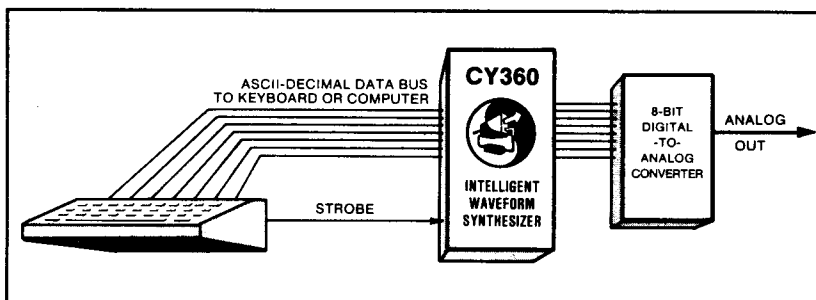
## Logic Diagram



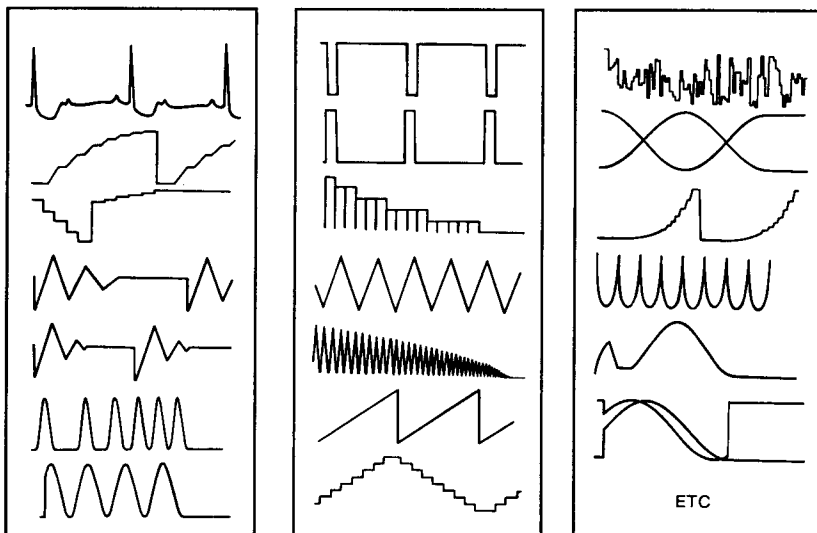
## CY360 Intelligent Waveform Synthesizer

The CY360 functions as an intelligent interface between microcomputers and D/A converters. The CY360 accepts ASCII or Binary commands and data and performs local functions concurrent with the master computer.

### Prototype Development System



### Example Waveforms

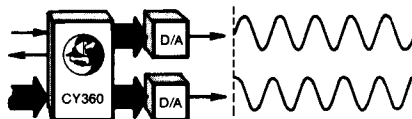


## Commands

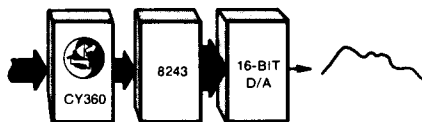


- A.** ARGUMENT  
declare argument
- B** BITSET  
output bit
- C** CLEAR  
output bit
- D.** DELAY 'd'  
milliseconds
- E** ENTER  
program code
- F.** FUNCTION  
select
- G** GENERATE  
signal
- I.** INITIAL  
argument
- J.** JUMP to address 'a'  
of program
- L<sub>n</sub>.** LOOP to address 'a',  
n times
- N<sub>n</sub>.** NUMBER of cycles  
or pulses
- O.** OUTPUT 8 bits  
or 16 bits
- P.** POINT-to-point  
timing
- Q** QUIT  
entering code
- R.** RANGE/  
mode-select
- S.** SET output pin 29  
to 0 or 1
- T** TIL pin 28 hi,  
repeat program
- U.** UNLOCK  
special mode(s)
- V** VALUE table  
user specified
- W.** WAIT until pin 31  
high or low
- X** EXECUTE  
program code
- +<sub>m,n</sub>** POSITIVE  
slope command
- <sub>p,q</sub>** NEGATIVE  
slope command
- Ø** COMMAND mode  
re-enter

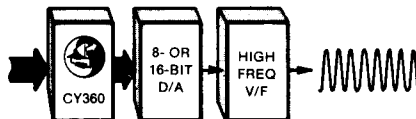
THE CY360 OPERATES IN SEVERAL SPECIAL MODES TO PROVIDE EXTENDED RESOLUTION, EXTENDED FREQUENCY OPERATION, TWO-PHASE SINE WAVE, AND OTHER SPECIAL OUTPUTS.



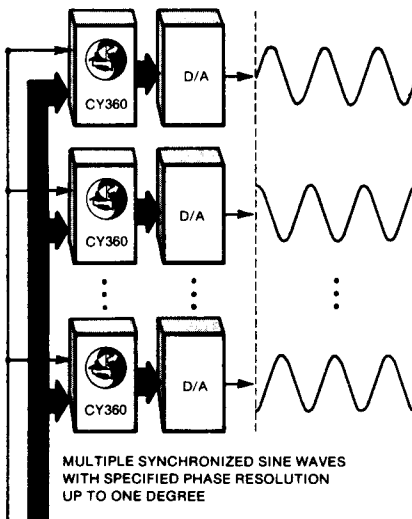
TWO-PHASE SINUSOIDAL OUTPUTS



16-BIT RESOLUTION LINEAR APPROXIMATION



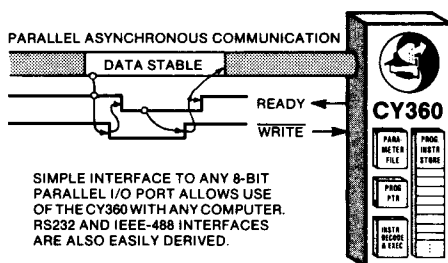
HI-FREQUENCY OUTPUT USING V/F CONVERTER



MULTIPLE SYNCHRONIZED SINE WAVES  
WITH SPECIFIED PHASE RESOLUTION  
UP TO ONE DEGREE

**The CY360 Intelligent Waveform Synthesizer** is designed to provide an easy to use source of low audio frequency waveforms, for analog simulation, test signal generation, music generation, bio-medical applications, stimulus generation, control applications, systems calibration, and other applications calling for powerful, flexible function generation. Low frequency sine waves can be generated with up to one degree angular resolution, and high frequency sine waves up to 50 MHz can be controlled by the CY360 via external V/F converters. *The CY360 is NOT designed to replace high accuracy, high frequency sources costing thousands of dollars, but is instead designed to provide function capabilities not previously available at any price.*

## CY360 Timing & Control Signals



## CY360 Electrical Specifications

### ABSOLUTE MAXIMUM RATINGS:

Ambient Temperature under bias	0°C to 70°C
Storage Temperature	-65°C to +150°C
Voltage on any pin with respect to GND	-0.5V to +7V
Power Dissipation	1.5 Watts

### DC & OPERATING CHARACTERISTICS:

T<sub>A</sub>=0°C to 70°C, V<sub>CC</sub>=+5V ±10%

PARAMETER	MIN	MAX	REMARKS
Pwr Supply Current		70 mA	
Input High Level	2.0V	V <sub>CC</sub>	(3.8V for XTAL <sub>1,2</sub> , Reset)
Input Low Level	~0.5V	0.6V	(0.6V for XTAL <sub>1,2</sub> , Reset)
Data Bus Leakage		10 μA	High Impedance State
Output Hi Voltage	2.4V		I <sub>OH</sub> = -40 μA
Output Low Voltage		0.45V	I <sub>OL</sub> = 1.6mA
Crystal Frequency	2MHz	11MHz	

## CY360 Program Storage

The CY360 will execute commands immediately or will store a sequence of commands for later execution. There are several sync inputs and outputs for synchronizing an executing program to the external world. A stored program facility allows the CY360 to function as a co-processor and provides the ultimate in intelligent operation.

## CY360 Function List

The CY360 provides both standard and user defined functions as described:

SINE WAVE 3.6 Hz to 3.6 KHz, up to 50 MHz with external V/F

2-PHASE SINE WAVE 0° - 180° phase difference with 1° resolution, 3.8 Hz to 2 KHz

PULSES, SQUARE WAVES variable amplitude, number, duty factor, 0.00001 to 50,000 pps

TRIANGLE WAVES variable amplitude and frequency, continuous or single sweep

SAWTOOTH, STAIRCASE variable timing and amplitude resolution

PSEUDO-RANDOM SIGNAL variable timing, select repeatable or new sequences as desired

PIECEWISE LINEAR APPROXIMATIONS to any waveform via commands which specify slope and length of line segments

USER DEFINED FUNCTIONS allow any waveform (EKG, etc.) to be specified via tables sent to the CY360 by command. One-shot or repeating (60 8-bit entries)

COMBINATION OF WAVEFORMS many of the above waveforms can be combined in a stored program and concatenated, with synchronization possible. See program storage.