

## SLEEP MODE

Function Generators FG4024 and FG4048 can be put in sleep mode by transmitting all zeros to the serial *DATA* input. This is done by pulling up the *LATCH* input to a logic "1" and holding it high. The *CLOCK* signal can be removed or left active during sleep mode as shown in Figure 1. The sleep mode will reduce power consumption by 500mW while the DC/DC converter still supplies power to an external circuit.

An alternate sleep mode can be implemented when the serial *DATA* and *LATCH* inputs are not present as shown in Figure 2. The pull-down resistor on the serial *DATA* input ensures all zeros and the *LATCH* input is slowly pulled up. In the sleep mode the sine and triangular waveform outputs will be around zero volts. The square wave output will depend on the output offset of the sine waveform, which will be either a high or a low value.

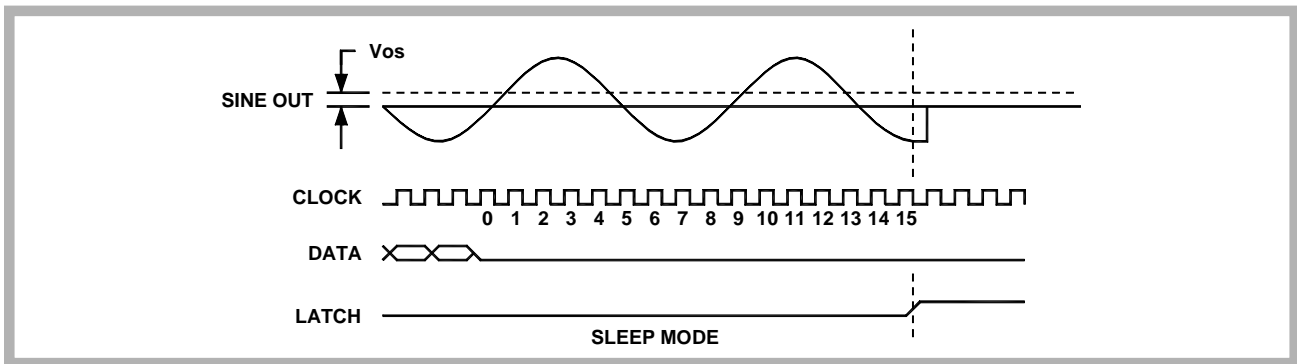


FIGURE 1. Sleep Mode

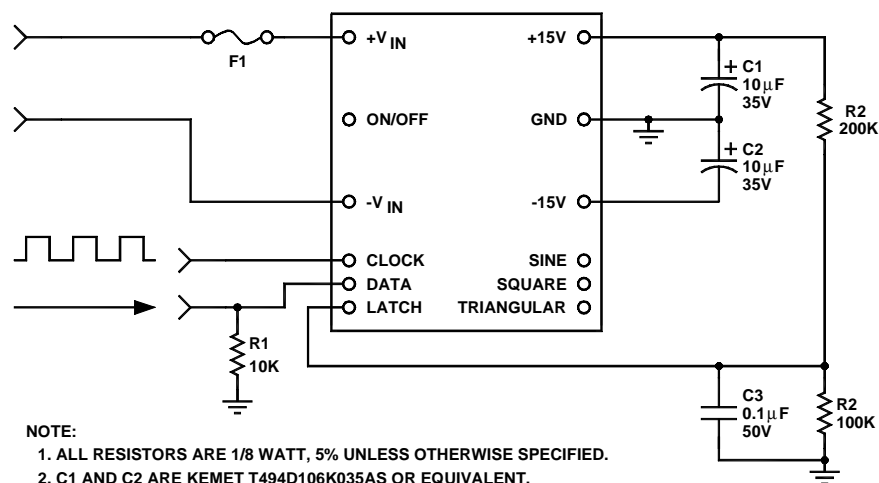
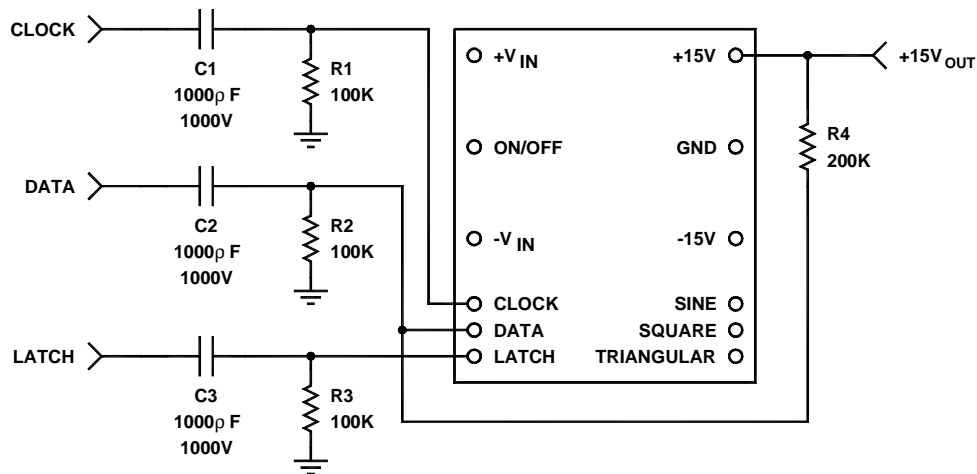


FIGURE 2

## GROUND LOOPS AND ISOLATION

To eliminate ground loops or when the load is at high potential, a two-way isolation input-to-output, output-to-output can be implemented as is shown in Figure 3. High voltage ceramic disc capacitors are recommended with a rating of 1000V or greater, such as Murata part number GRM43-2X7R102K102AL.

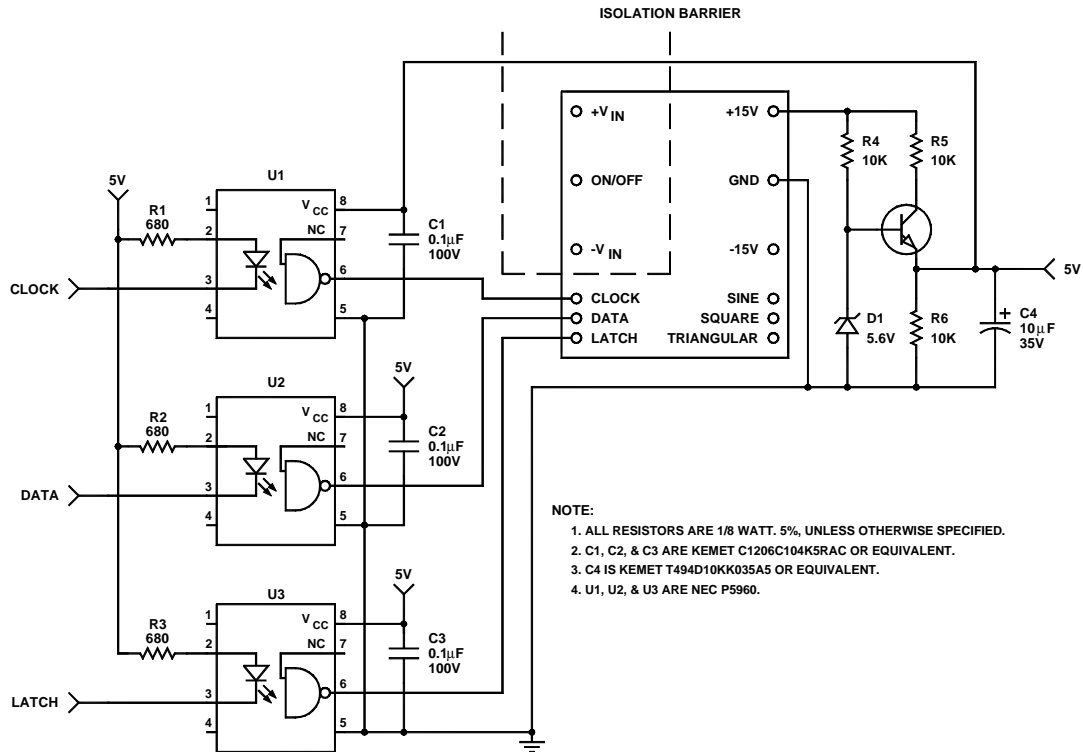
Another method of isolation is available when the load of the DC/DC converter is at high potential as indicated in Figure 4. The circuit employs NEC PS96001 high-speed optoisolators. Note that the a separate +5V for the output section of the optoisolator output section originates from the +15V auxiliary output.



NOTE:

1. ALL RESISTORS ARE 1/8 WATT, 5% UNLESS OTHERWISE SPECIFIED.

FIGURE 3



NOTE:

1. ALL RESISTORS ARE 1/8 WATT, 5%, UNLESS OTHERWISE SPECIFIED.
2. C1, C2, & C3 ARE KEMET C1206C104K5RAC OR EQUIVALENT.
3. C4 IS KEMET T494D10KK035A5 OR EQUIVALENT.
4. U1, U2, & U3 ARE NEC P5960.

FIGURE 4

### REDUCING AUXILIARY POWER OUTPUT RIPPLE

To further reduce the output ripple of the auxiliary output voltages to less than 10mV pk-pk required in noise sensitive circuits, refer to the circuit in Figure 5. The 10 $\mu$ F tantalum capacitors can be Sprague series T494D or

Kemet series T494. The 10 $\mu$ H inductors are Dale series IMC-1812 or equivalent. This circuit should be located as close as possible to the auxiliary power outputs of the function generator.

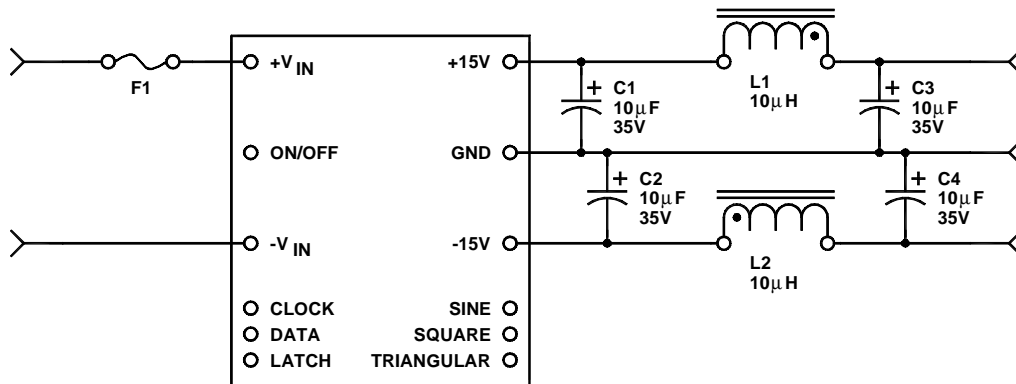


FIGURE 5

### CRYSTAL CONTROLLED STABILITY

A crystal oscillator can be utilized for a clock signal of the programmable frequency generator as shown in Figure

6. The crystal should be placed as close as possible to the clock input and the input ground of the function generator.

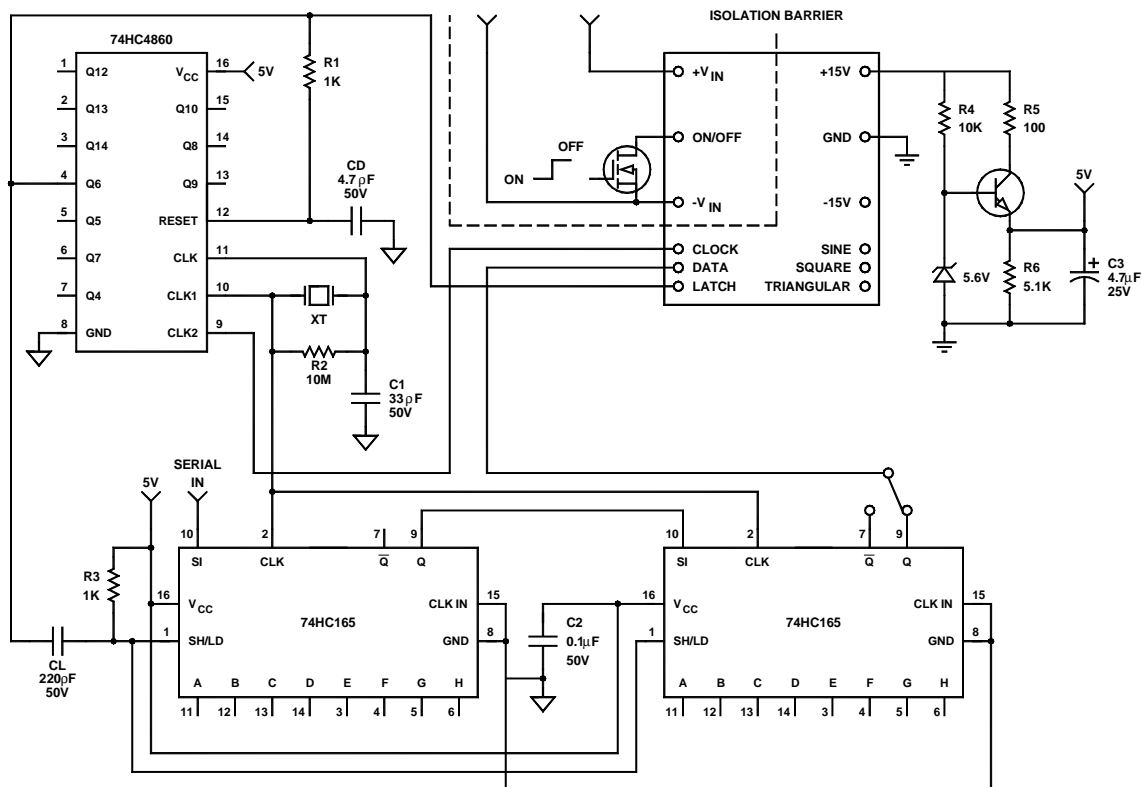


FIGURE 6

When a CPU is not available to generate information and different fixed high accuracy frequencies will be needed, the design in Figure 6 can be implemented for use at remote sites. With the addition of three IC's, a crystal oscillator and without any additional power supply requirements,  $2^{16}$  discrete frequencies can be generated.

A 14-bit binary counter, 74HC4060, driven by a crystal oscillator generates a 16-bit clock sequence for the function generator and 16-bit shift register (74HC165X2). The counter resets after the 16th clock pulse by feeding back Q6 to the reset input (pin 12), which generates a narrow pulse. The width of the pulse can be adjusted by changing the value of  $C_D$ . The output of Q6 is used to

load the data into the function generator and the 16-bit shift register. This circuit can be used as a parallel-to-serial interface when a 16-bit parallel port is used. The data can be loaded to the shift registers asynchronously by momentarily pulling down the shift load pins and removing  $C_L$ .

Note that the +5V power supply to the IC's is generated from the +15V of the function generator, which can power additional analog or digital circuits without the need of an additional DC/DC converter. Depending on the required output frequency of the function generator and the frequency of the crystal oscillator, the 16-bit data word to the shift register input can be calculated from the formula below.

$$\frac{F_0 * 2^{23}}{f_{CRYSTAL}} = (D_{15} - D_0)_{DEC}$$

**EXAMPLE:**

$f_{CRYSTAL} = 4.194304\text{MHz}$   
 $f_0 = 60\text{Hz}$  (Required output frequency)  
 $2^{23} = 8388608$

$$(D_{15} - D_0) = \frac{60 * 8388608}{4.194304 \times 10^6} = 120$$

MSB 0000 0000 - 0 1 1 1 1 0 0 0 LSB  
 $0 \times 128 + 1 \times 64 + 1 \times 32 + 1 \times 16 + 1 \times 8 + 0 \times 4 + 0 \times 2 + 0 \times 1 = 120$

Do not forget that the LSB is shifted in first, MSB last.  
 0000 0000 0111 1000

Suggested Crystal Manufacturers:  
 - Nymph/Saronix  
 - Pletronics