

# Gooch & Housego

MODEL NUMBER:

## **(R) 64020-200-2ADMDFS-A** **SPECIFICATIONS**

Document Number: **56A18641E**

A Digital Frequency Synthesizer OEM Module with Analog and Digital Modulation input and a 2 Watt RF Output. When specified as R64020-200-2ADMDFS-A, the unit delivered will be manufactured to be compliant with EU Directive 2002/95/EC for **Reduction of Hazardous Substance**.

<b><u>PARAMETER</u></b>	<b><u>SPECIFICATION</u></b>
Bandwidth:	20 – 200 MHz typical
Clock Frequency:	1000 MHz
Step Size:	< 1 Hz with 30 Bits input
Frequency Settling Time:	250 ns Maximum
Power Out:	2 watts typical
Harmonic Distortion:    2 <sup>nd</sup> . 3 <sup>rd</sup> .	-20 dBc Maximum -15 dBc Maximum
Analog Modulation:	0 to +1 volt Analog into 50 $\Omega$ , +1 volt = Full RF power output.
Digital Modulation:	TTL levels TTL Active High = Full RF output power TTL Active Low = Minimum RF output power No Signal = Full RF output power (pulled high internally)
Rise and Fall Time:	20 ns
Extinction Ratio: Digital: Analog:	30 dB Minimum 40 dB Minimum
Reference Out:	A reference signal from the un-modulated output of the synthesizer. +0 dBm nominal
Applied Power:	+ 28 volts DC @ 1 amp Maximum + 3.3 volts DC @ 1 amp Maximum
<b>MAXIMUM RATINGS:</b>	
Ambient Temperature:	40 <sup>o</sup> C
RF Output:	No DC Feedback
Supply Voltage:	30 volts DC 3.5 volts DC
<b>INPUT / OUTPUT CONNECTIONS:</b>	
+28v, +3.3V, and Gnd	Filtered Feedthru
Mod In	SMC Male
Reference Out	SMC Male
RF Output	SMA Female
"FREQUENCY SELECT" Control	TTL 30 bit binary word, Digital Modulation Input, Reset, and a Latch control input through the 37 pin D sub connector. See page 2 for pinout.
Outline Drawing	53D3887

56A18641E

1 of 4

# 64020-200-2ADMDFS-A

"FREQUENCY SELECT" PIN OUT  
37-PIN MALE D-SUB CONNECTOR

<u>PIN</u>			<u>PIN</u>		
1	FS <sub>0</sub>	LSB	20	FS <sub>1</sub>	
2	FS <sub>2</sub>		21	FS <sub>3</sub>	
3	FS <sub>4</sub>		22	FS <sub>5</sub>	
4	FS <sub>6</sub>		23	FS <sub>7</sub>	
5	FS <sub>8</sub>		24	FS <sub>9</sub>	
6	FS <sub>10</sub>		25	FS <sub>11</sub>	
7	FS <sub>12</sub>		26	FS <sub>13</sub>	
8	FS <sub>14</sub>		27	FS <sub>15</sub>	
9	FS <sub>16</sub>		28	FS <sub>17</sub>	
10	FS <sub>18</sub>		29	FS <sub>19</sub>	
11	FS <sub>20</sub>		30	FS <sub>21</sub>	
12	FS <sub>22</sub>		31	FS <sub>23</sub>	
13	FS <sub>24</sub>		32	FS <sub>25</sub>	
14	FS <sub>26</sub>		33	FS <sub>27</sub>	
15	FS <sub>28</sub>		34	FS <sub>29</sub>	MSB
16	Latch		35	Digital Modulation Input (Active High)	
17	Master Reset (Active High)		36	N/C	
18	N/C		37	N/C	
19	Ground				

$$\text{Control Word } K_{10} = \frac{F_{\text{OUT (Hz)}}(2^{31})}{F_{\text{OSC (Hz)}} \text{ in Decimal notation}}$$

## CONTROL WORD CALCULATIONS

The output frequency and step size is a function of the clock rate and the "FREQUENCY SELECT" data. The output frequency can be calculated from the formula:

$$f_{out} = \frac{(f_c)(k_{10})}{2^n}$$

Where:  $f_c$  = clock frequency in Hz  
 $k_{10}$  = input word in decimal notation  
 $n = 31$  \*See note below.

The minimum output frequency and step size are given by:

$$f_{min} = \frac{f_c}{2^n}$$

An example of setting the frequency:

Clock frequency =  $1000 \times 10^6$  Hz

Desired output frequency =  $30.00 \times 10^6$  Hz

$$K_{10} = \frac{f_{OUT(Hz)}(2^{31})}{f_{OSC(Hz)}}$$

$$K_{10} = \frac{30 \times 10^6 (2^{31})}{(1000 \times 10^6)}$$

$K_{10} = 64424509.44$  Decimal

Convert  $K_{10}$  to HEX

∨- MSB    ∨ - LSB

$K_{HEX} = 3D70A3D$

→

03D70A3D

-Setting for front panel "HEX" switches

NOTE: The switches on the front panel of the driver are LSB to MSB - right to left.

Convert  $K_{HEX}$  to Binary

∨ LSB - pin1

$K_B = \underline{000011110101110000101000111101}$   
 ^

-Setting for binary word input to back panel "FREQUENCY SELECT" 37 pin

These 4 bits are added to complete the 30 bit word

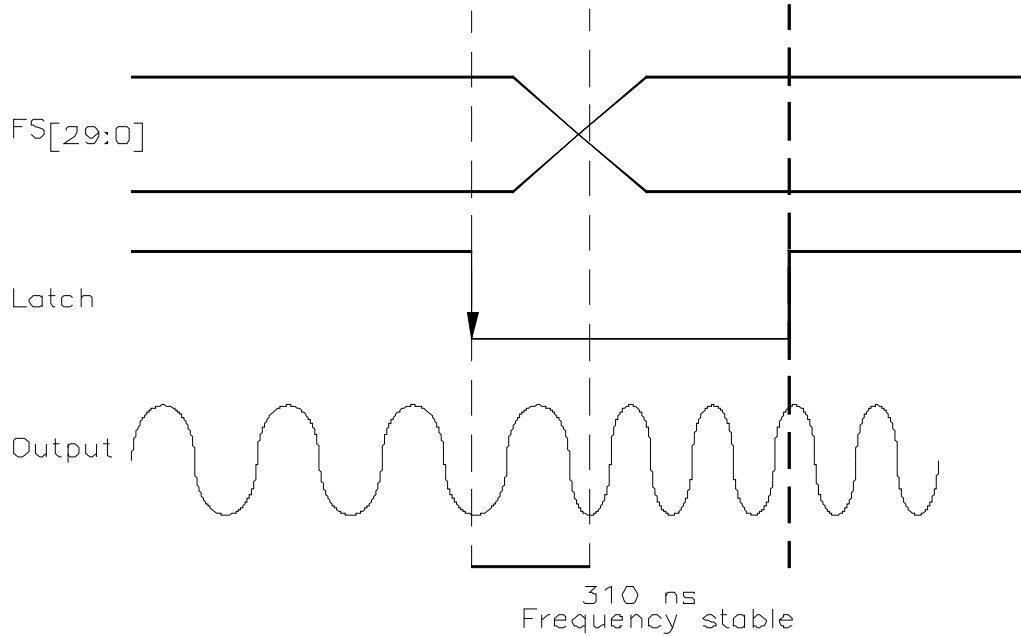
D-sub connector

\*Note: This system only uses 30 bits to set the frequency output from the driver. The accumulator inside the chip is 31 bit, so use  $2^{31}$  in your calculations for precision.

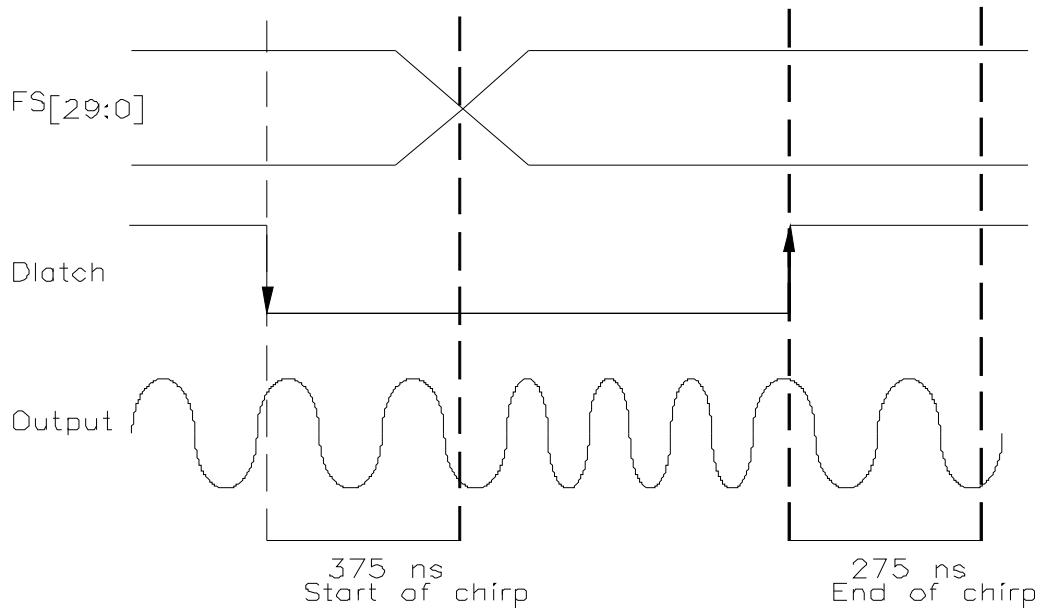
The LATCH function (pin 16) is a TTL compatible input which is used to load new frequency information into the driver. Frequency data is loaded into the driver when the signal on the LATCH pin goes from HIGH to LOW (falling edge).

Master RESET is a TTL active HIGH and resets the accumulator to zero, ie, no frequency output, when a TTL HIGH is applied to pin 17. This is pulled LOW via a 1 KΩ resistor.

To generate a single frequency, apply the binary frequency word to the FS input, A falling edge on the LATCH input will then load the data and change the frequency.



To generate a frequency chirp, set the starting frequency as above and then apply the delta word to the FS input. A falling edge on DLATCH will then load the delta frequency word and initiate the chirp. The chirp will stop and output will return to starting value on a rising edge.



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