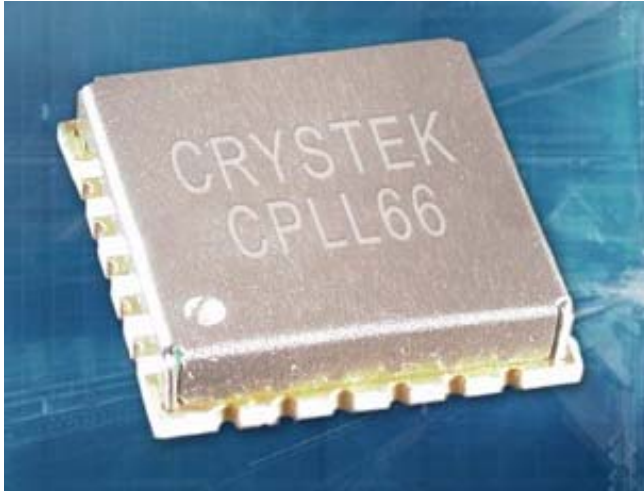


**CRYSTEK**  
**MICROWAVE**  
A DIVISION OF CRYSTEK CORPORATION

## RF PLL Synthesizer

**CPLL66-1600-2200**

0.60" SQ SMD



### Features

**1.600 GHz - 2.200 GHz**

**Standard 3 Wire Interface**

**Small layout 0.6" × 0.6"**



### Applications

**Digital Radio Equipment**  
**Fixed Wireless Access**  
**Satellite Communications Systems**  
**Base Stations**  
**Personal Communications Systems**  
**Portable Radios**  
**Test Instruments**  
**Wireless Infrastructure**



The CPLL66 is a complete PLL/Synthesizer needing only an external frequency reference and supply voltages for the internal PLL (phase lock loop) and VCO (voltage controlled oscillator). The Crystek CPLL66 is programmed using a standard three line interface (Data, Clock and Load Enable).

The CPLL66 family has been initially released to cover 1 GHz to 5 GHz in bands. It is housed in a compact 0.6-in. × 0.6-in. × 0.15-in. SMD package which saves board space. Typical phase noise at 4 GHz is -90 dBc/Hz at 10 kHz offset with 0 dBm minimum output power.

Rev J

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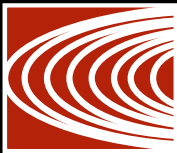
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# RF PLL Synthesizer

**CPLL66-1600-2200**

0.60" SQ SMD

| PERFORMANCE SPECIFICATION                                          | MIN   | TYP  | MAX   | UNITS  |
|--------------------------------------------------------------------|-------|------|-------|--------|
| <b>Frequency Range:</b>                                            | 1.600 |      | 2.200 | GHz    |
| <b>Step Size:</b>                                                  |       | 1000 |       | kHz    |
| <b>Settling Time</b> , to within $\pm 1$ kHz (Freq. step < 25MHz): |       | 5    |       | msec   |
| <b>Output Power:</b>                                               | +2.0  | +5.0 | +8.0  | dBm    |
| <b>Output Phase Noise:</b>                                         |       |      |       |        |
| @1kHz offset                                                       |       | -66  | -62   | dBc/Hz |
| @10kHz offset                                                      |       | -93  | -88   | dBc/Hz |
| @100kHz offset                                                     |       | -116 | -111  | dBc/Hz |
| @1MHz offset                                                       |       | -137 | -132  | dBc/Hz |
| <b>Power Supply:</b>                                               |       |      |       |        |
| V1=VCO Supply                                                      | 11.4  | 12.0 | 12.6  | Volts  |
| V2=PLL Supply                                                      | 2.7   | 3.0  | 3.3   | Volts  |
| <b>Supply Current:</b>                                             |       |      |       |        |
| I1=VCO Input Current                                               |       | 20   |       | mA     |
| I2=PLL Input Current                                               |       | 25   |       | mA     |
| Spurious Suppression                                               |       | -65  | -60   | dBc    |
| PFDSpur                                                            |       | -70  | -60   | dBc    |
| Reference Feedthru                                                 |       | -80  | -70   | dBc    |
| <b>Harmonic Suppression:</b>                                       |       |      |       |        |
| 2 <sup>nd</sup>                                                    |       | -15  | -10   | dBc    |
| 3 <sup>rd</sup>                                                    |       | -25  | -15   | dBc    |
| Reference Frequency                                                |       | 10   |       | MHz    |
| Input Reference Level                                              | 0.8   |      | V2    | Vp-p   |
| Input Impedance                                                    |       | 100K |       | Ohm    |
| RF Output Impedance                                                |       | 50   |       | Ohm    |
| <b>Operating Temperature Range:</b>                                | -40   |      | +85   | °C     |
| <b>Logic Inputs (Clock, Data, and LE):</b>                         |       |      |       |        |
| Input "High" Voltage                                               | 1.4   |      |       |        |
| Input "Low" Voltage                                                |       |      | 0.6   | Volts  |
| <b>Locked Detector (LD):</b>                                       |       |      |       |        |
| Locked                                                             | 1.4   |      |       | Volts  |
| Un-Locked                                                          |       |      | 0.4   | Volts  |

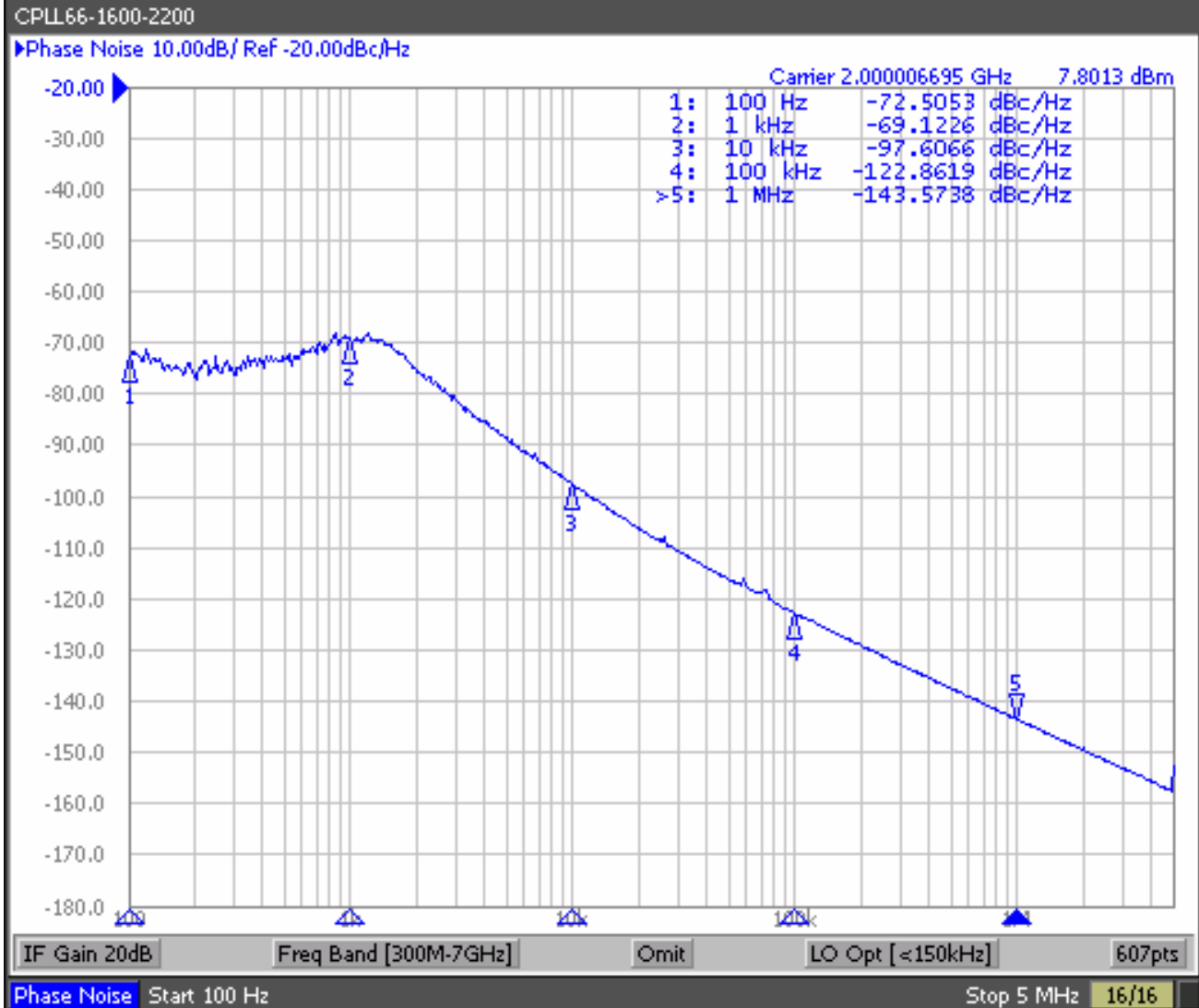


## RF PLL Synthesizer

**CPLL66-1600-2200**

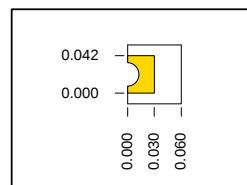
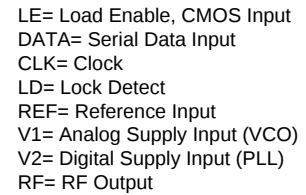
0.60" SQ SMD

### Agilent E5052A Signal Source Analyzer





0.60" SQ SMD



### Pad Detail

TEMPERATURE

260°C

217°C

200°C

150°C

Ramp-Up  
3°C/Sec Max.

Critical Temperature Zone

Ramp-Down  
6°C/Sec.

Preheat  
180 Secs. Max.

8 Minutes Max.

260°C for  
10 Secs. Max.

90 Secs. Max.

## ENVIRONMENTAL COMPLIANCE

| Parameter              | Conditions               |
|------------------------|--------------------------|
| Mechanical Shock       | MIL-STD-883, Method 2002 |
| Mechanical Vibration   | MIL-STD-883, Method 2007 |
| Solderability          | MIL-STD-883, Method 1014 |
| Resistance to Solvents | MIL-STD-883, Method 2016 |

## Programming Guide for CPLL66-XXXX

### Introduction

The CPLL66 uses a simple 3 wire interface to program four internal registers. See Figure 1.

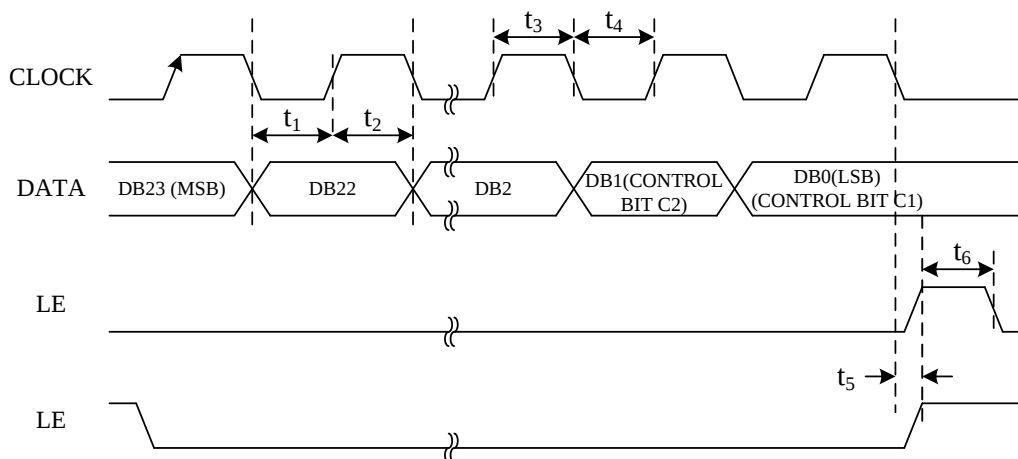


Figure 1. Timing Diagram

There are four 24 bit registers that need to be programmed. Which register is written into is simply controlled by Control Bits C1 and C2. Table I summarizes the Truth Table for Control Bits C1 and C2.

Table I. C2, C1 Truth Table

| Control Bits |    | Data Latch                           |
|--------------|----|--------------------------------------|
| C2           | C1 |                                      |
| 0            | 0  | R Counter                            |
| 0            | 1  | N Counter (A and B)                  |
| 1            | 0  | Function Latch (Including Prescaler) |
| 1            | 1  | Initialization Latch                 |

Table II shows the details of the four 24 bit registers.

| REFERENCE COUNTER LATCH |      |      |                          |                   |      |      |                            |                          |      |      |      |      |      |     |     |     |     |     |     |     |     |                 |       |
|-------------------------|------|------|--------------------------|-------------------|------|------|----------------------------|--------------------------|------|------|------|------|------|-----|-----|-----|-----|-----|-----|-----|-----|-----------------|-------|
| RESERVED                |      |      | LOCK DETECT<br>PRECISION | TEST MODE<br>BITS |      |      | ANTI-<br>BACKLASH<br>WIDTH | 14-BIT REFERENCE COUNTER |      |      |      |      |      |     |     |     |     |     |     |     |     | CONTROL<br>BITS |       |
| DB23                    | DB22 | DB21 | DB20                     | DB19              | DB18 | DB17 | DB16                       | DB15                     | DB14 | DB13 | DB12 | DB11 | DB10 | DB9 | DB8 | DB7 | DB6 | DB5 | DB4 | DB3 | DB2 | DB1             | DB0   |
| X                       | 0    | 0    | LDP                      | T2                | T1   | ABP2 | ABP1                       | R14                      | R13  | R12  | R11  | R10  | R9   | R8  | R7  | R6  | R5  | R4  | R3  | R2  | R1  | C2(0)           | C1(0) |

| N COUNTER LATCH |      |      |         |                |      |      |      |      |      |      |      |      |      |     |     |               |     |     |     |     |     |                 |       |
|-----------------|------|------|---------|----------------|------|------|------|------|------|------|------|------|------|-----|-----|---------------|-----|-----|-----|-----|-----|-----------------|-------|
| RESERVED        |      |      | CP GAIN | 13-BIT COUNTER |      |      |      |      |      |      |      |      |      |     |     | 6-BIT COUNTER |     |     |     |     |     | CONTROL<br>BITS |       |
| DB23            | DB22 | DB21 | DB20    | DB19           | DB18 | DB17 | DB16 | DB15 | DB14 | DB13 | DB12 | DB11 | DB10 | DB9 | DB8 | DB7           | DB6 | DB5 | DB4 | DB3 | DB2 | DB1             | DB0   |
|                 |      | G1   | B13     | B12            | B11  | B10  | B9   | B8   | B7   | B6   | B5   | B4   | B3   | B2  | B1  | A6            | A5  | A4  | A3  | A2  | A1  | C2(0)           | C1(1) |

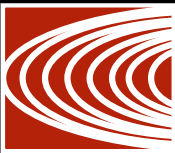
| FUNCTION LATCH     |      |                 |                  |      |      |      |                   |      |      |                       |      |      |      |                  |                    |                    |             |                |     |     |                 |                  |                 |  |
|--------------------|------|-----------------|------------------|------|------|------|-------------------|------|------|-----------------------|------|------|------|------------------|--------------------|--------------------|-------------|----------------|-----|-----|-----------------|------------------|-----------------|--|
| PRESCALER<br>VALUE |      | POWER-DOWN<br>2 | CURRENT SETTING2 |      |      |      | CURRENT SETTING 1 |      |      | TIMER COUNTER CONTROL |      |      |      | FASTLOCK<br>MODE | FASTLOCK<br>ENABLE | CP THREE-<br>STATE | PD POLARITY | MUXOUT CONTROL |     |     | POWER-DOWN<br>1 | COUNTER<br>RESET | CONTROL<br>BITS |  |
| DB23               | DB22 | DB21            | DB20             | DB19 | DB18 | DB17 | DB16              | DB15 | DB14 | DB13                  | DB12 | DB11 | DB10 | DB9              | DB8                | DB7                | DB6         | DB5            | DB4 | DB3 | DB2             | DB1              | DB0             |  |
| P2                 | P1   | PD2             | CP16             | CP15 | CP14 | CP13 | CP12              | CP11 | TC4  | TC3                   | TC2  | TC1  | F5   | F4               | F3                 | F2                 | M3          | M2             | M1  | PD1 | F1              | C2(1)            | C1(0)           |  |
|                    |      |                 |                  |      |      |      |                   |      |      |                       |      |      |      |                  |                    |                    |             |                |     |     |                 |                  |                 |  |

| INITIALIZATION LATCH |      |                 |                  |      |      |                   |      |      |                       |      |      |      |                  |                    |                    |             |                |     |     |                 |                  |                 |       |
|----------------------|------|-----------------|------------------|------|------|-------------------|------|------|-----------------------|------|------|------|------------------|--------------------|--------------------|-------------|----------------|-----|-----|-----------------|------------------|-----------------|-------|
| PRESCALER<br>VALUE   |      | POWER-DOWN<br>2 | CURRENT SETTING2 |      |      | CURRENT SETTING 1 |      |      | TIMER COUNTER CONTROL |      |      |      | FASTLOCK<br>MODE | FASTLOCK<br>ENABLE | CP THREE-<br>STATE | PD POLARITY | MUXOUT CONTROL |     |     | POWER-DOWN<br>1 | COUNTER<br>RESET | CONTROL<br>BITS |       |
| DB23                 | DB22 | DB21            | DB20             | DB19 | DB18 | DB17              | DB16 | DB15 | DB14                  | DB13 | DB12 | DB11 | DB10             | DB9                | DB8                | DB7         | DB6            | DB5 | DB4 | DB3             | DB2              | DB1             | DB0   |
| P2                   | P1   | PD2             | CP16             | CP15 | CP14 | CP13              | CP12 | CP11 | TC4                   | TC3  | TC2  | TC1  | F5               | F4                 | F3                 | F2          | M3             | M2  | M1  | PD1             | F1               | C2(1)           | C1(1) |

Table II. Latch Summary

When using the CPLL66 family in a synthesizer application, all four 24 bit registers need to be written into after power-up. After writing all four latches the first time, subsequent frequency step changes can be accomplished by changing the N Counter Latch only.

Specifications subject to change without notice.



## RF PLL Synthesizer

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**CPLL66-1600-2200**

0.60" SQ SMD

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### ***Programming Crystek p/n: CPLL66-1600-2200***

The following is specific programming for CPLL66-1600-2200 (1.6 GHz~2.2 GHz with 1 MHz Step Size and 10 MHz input reference frequency).

Program all four registers with the following:

R Counter Latch: 28H

N Counter Latch: 3201H

Function Latch: 9F8093H

The above values will set the CPLL66-1600-2200 to 1.6 GHz

