

# Rubidium Frequency Standard

## 8040C



Today's precision test equipment requires a stable reference to make accurate frequency measurements. The equipment used varies depending on stability, accuracy and output signal format. All of these parameters can lead to a multitude of configurations, platforms and products that can be expensive to implement and maintain.

The Microchip 8040C solves this problem by providing a stable and accurate frequency reference with multiple output signal formats in an easy to install 1U rack mountable chassis. Unlike other units, the 8040C offers configurable RF outputs, external GPS disciplining and a RS-232 interface for command and control.

The 8040C has six outputs, each of which can be user configured to provide a 1 MHz, 5 MHz or 10 MHz sine, square wave, or 1PPS output. The standard configuration of the 8040C has three 10 MHz, one 5 MHz, one 1 MHz and 1PPS output.

A 1PPS input allows the 8040C to be disciplined by an external GPS receiver for improved frequency accuracy and long-term stability. The 8040C auto adaptive algorithm allows plug-and-play connectivity for easy GPS disciplining.

The 8040C is field-configurable, allowing the instrument to support changing functionality in evolving systems. If more outputs are required, the 8040C can be purchased with an option card that adds six additional outputs, bringing the total output configuration to twelve. The option card, like the standard unit, can be configured for any combination of available frequency or format.

Also available is a low phase noise version that provides a greater than 30 dB improvement in close in-phase noise.

The 8040C is designed around Microchip's SA.55 Miniature Atomic Clock, which is deployed worldwide as the reference oscillator in wireless base stations.

### Performance Parameters

|  |  |
|--|--|
| Accuracy at shipment   | $< \pm 5 \times 10^{-11}$  |
| Retrace on-off-on  | $< \pm 5 \times 10^{-11}$<br>24 hours, 24 hours,<br>24 hours at 25°C |
| Control range  | $\pm 1 \times 10^{-6}$ with<br>$1 \times 10^{-12}$ resolution        |
| Aging Monthly, <sup>1</sup> Yearly<br>1. After 30 days of<br>continuous operation. | $< 5 \times 10^{-11}$ , $< 5 \times 10^{-10}$                        |

### KEY FEATURES

- 6 configurable outputs
- RF and pulse outputs
- AC input
- Remote monitoring and control
- GPS disciplining

### OPTIONAL FEATURES

- 12 configurable outputs
- Low phase noise
- DC input

### Stability

| Avg. Time (s) | ADEV Standard           | ADEV Low Noise          |
|---------------|-------------------------|-------------------------|
| 1             | $< 3.0 \times 10^{-11}$ | $< 1.5 \times 10^{-11}$ |
| 10            | $< 1.0 \times 10^{-11}$ | $< 8 \times 10^{-12}$   |
| 100           | $< 3.0 \times 10^{-12}$ | $< 2.5 \times 10^{-12}$ |

### SSB Phase Noise

| Offset (Hz) | 8040C Standard,<br>10 MHz | 8040C Low Noise,<br>10 MHz |
|-------------|---------------------------|----------------------------|
| 1           | -72 dBc                   | -100 dBc                   |
| 10          | -95 dBc                   | -130 dBc                   |
| 100         | -130 dBc                  | -144 dBc                   |
| 1K          | -140 dBc                  | -150 dBc                   |
| 10K         | -148 dBc                  | -150 dBc                   |

## Specifications

### Electrical Specification (standard and low noise)

| Frequency Outputs |   |
|-------------------|---|
| Frequency         | 1 MHz, 5 MHz and 10 MHz                     |
| Format            | Sinewave                                    |
| Amplitude         | 1 Vrms                                      |
| Harmonic          | <-40 dBc                                    |
| Non-harmonic      | <-60 dBc (standard)<br><-80 dBc (low noise) |
| Connector         | BNC   |
| Load impedance    | 50Ω   |
| Location          | Rear panel                                  |
| Frequency         | 1 MHz, 5 MHz and 10 MHz                     |
| Format            | TTL   |
| Amplitude         | >3V peak                                    |
| Pulse width       | 50% duty cycle                              |
| Connector         | BNC   |
| Load impedance    | 50Ω   |
| Location          | Rear panel                                  |
| Timing Outputs    |   |
| Format            | 1 PPS                                       |
| Amplitude         | >3V   |
| Pulse width       | 400 ns                                      |
| Rise time         | <20 nS                                      |
| Jitter            | <10 pSD RMS                                 |
| Connector         | BNC   |
| Load impedance    | 50Ω   |
| Location          | Rear panel                                  |
| Timing Inputs     |   |
| Sync input        | 1 PPS                                       |
| Amplitude         | 5V max                                      |
| Connector         | BNC   |
| Load impedance    | >100 kΩ                                     |
| Location          | Rear panel                                  |

## Performance Parameters

| Warm-up Time                        |   |
|-------------------------------------|---|
| Time to lock                        | <5 minutes  |
| Time to <1E-9                       | <8 minutes  |
| GPS Disciplining                    |   |
| Time for valid output               | <20 minutes   |
| Frequency accuracy                  | <1 × 10 <sup>-12</sup>                                |
| Remote system interface and control |   |
| Connector                           | 9-Pin female rectangular D-Sub                        |
| Location                            | Rear panel  |
| Protocol                            | RS-232-C (DTE), 57600<br>BAUD, 8 Data Bit, 1 Stop Bit |

## Environmental and Physical Specifications

| General Environment (operating)  |  |
|----------------------------------|--|
| Temperature                      | 0°C to 50°C  |
| Temperature coefficient          | <3E-10   |
| Storage temperature              | -40°C to 71°C  |
| Humidity                         | 95% 0 to 50°C  |
| Magnetic field                   | DC (±2 gauss)  |
| Magnetic sensitivity             | <4E <sup>-11</sup> /gauss  |
| Altitude (operating)             | 0 to 50,000 feet   |
| AC power requirements            | 90 to 240 VAC<br>47 to 63 Hz<br>25W (operating)<br>45W (warm-up)   |
| DC power requirements (optional) | 18 to 36 VDC (24VDC nominal)<br>25 W (operating)<br>45 W (warm-up) |
| Dimensions/weight                | 19" W × 1.75" H × 12" D<br><6 lbs.                                 |

MTBF= 232,500 hours IAW Telcordia (Bellcore) SR332, Issue 1

## Compliance

|           |                                |
|-----------|--------------------------------|
| EMI/EMC   | FCC Part 15 Subpart B, Class B |
|           | ICES-003 Issue 7               |
| UL Safety | IEC 61010-1:2001 (2nd Edition) |

## Ordering Information

| Part Number | Description                    |
|-------------|--------------------------------|
| 15230-101   | 6 output standard performance  |
| 15230-102   | 12 output standard performance |
| 15230-104   | 6 output low phase noise       |
| 15230-105   | 12 output low phase noise      |

## 8040C Connections (shown with 12 output option)

