8040C/8040CLN

User's Guide

Rubidium Frequency Standard

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- Microchip products meet the specifications contained in their particular Microchip Data Sheet.

- Microchip believes that its family of products is secure when used in the intended manner, within operating specifications, and under normal conditions.

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8040C/8040CLN USER'S GUIDE

Preface

NOTICE TO CUSTOMERS

All documentation becomes dated, and this manual is no exception. Microchip tools and documentation are constantly evolving to meet customer needs, so some actual dialogs and/or tool descriptions may differ from those in this document. Please refer to our website (www.microchip.com) to obtain the latest documentation available.

Documents are identified with a "DS" number. This number is located on the bottom of each page, in front of the page number. The numbering convention for the DS number is "DSXXXXXXXXA", where "XXXXXXXX" is the document number and "A" is the revision level of the document.

For the most up-to-date information on development tools, see the MPLAB® IDE online help. Select the Help menu, and then Topics, to open a list of available online help files.

OVERVIEW

The internal rubidium reference oscillator on the 8040C/8040C LN product was changed from the SA22C to the SA55 in 2021. PCN0031 specifies model revisions affected by this change (included in **Appendix A. "PCN00031"**). **Appendix B. "Revised Information Due to Implementation of SA55"** details differences in functionality. The original functionality with the SA22C has been preserved in the manual for historical purposes. Users should always verify the revision of the unit located on the serial number label on the rear panel of the instrument to determine which internal reference and relevant instructions apply. A note has been included on any paragraph where an update applies.

PURPOSE OF THIS GUIDE

The 8040C/8040CLN User's Guide describes the procedures for unpacking, installing, using, maintaining the 8040C/8040CLN. Please review the most recent copy of the datasheet:
https://www.microsemi.com/document-portal/doc_download/133415-rubidium-8040c-datasheet

WHO SHOULD READ THIS GUIDE

This document is intended for engineers and telecommunications professionals who are designing, installing, operating, or maintaining time, frequency, and synchronization systems having a requirement for a low profile and highly precise frequency generator. To use this document effectively, you should have a good understanding of digital telecommunications technologies and analog frequency generation and synthesis techniques.

DOCUMENT LAYOUT

This guide contains the following sections:
- **Chapter 1. "Introduction"**: Provides an overview of the product, equipment purpose, and factory configurations.

- **Chapter 2. "Installation"**: Contains the information on mounting, power connection, fuse, voltage, and signal connections.
- **Chapter 3. "Operation"**: Provides an overview of powering up the product, understanding the indicator LEDs, adjusting the oscillator frequency, disciplining to external 1 PPS, and configuring outputs.
- **Chapter 4. "Options"**: Describes the two optional configurations for 8040C/8040CLN: twelve output and low phase noise.
- **Chapter 5. "Technical Support"**: Contains information about technical support for the product, including maintenance, helpful resources, points of contact, and shipping preparation information.
- **Appendix A. "PCN00031"**: Process change notification regarding the 8040C/8040CLN internal rubidium reference changing from the SA22C oscillator to the SA55 oscillator.
- **Appendix B. "Revised Information Due to Implementation of SA55"**: Explanation of changes to the 8040C/8040CLN start banner, 1 PPS disciplining, and frequency settings for the change to SA55.

CONVENTIONS USED IN THIS GUIDE

This manual uses the following documentation conventions:

DOCUMENTATION CONVENTIONS

Description	Represents	Examples
Arial font:		
Italic characters	Referenced books	*MPLAB® IDE User's Guide*
	Emphasized text	...is the *only* compiler...
Initial caps	A window	the Output window
	A dialog	the Settings dialog
	A menu selection	select Enable Programmer
Quotes	A field name in a window or dialog	"Save project before build"
Underlined, italic text with right angle bracket	A menu path	*File>Save*
Bold characters	A dialog button	Click **OK**
	A tab	Click the **Power** tab
N'Rnnnn	A number in verilog format, where N is the total number of digits, R is the radix and n is a digit.	4'b0010, 2'hF1
Text in angle brackets < >	A key on the keyboard	Press <Enter>, <F1>
Courier New font:		
Plain Courier New	Sample source code	`#define START`
	Filenames	`autoexec.bat`
	File paths	`c:\mcc18\h`
	Keywords	`_asm, _endasm, static`
	Command-line options	`-Opa+, -Opa-`
	Bit values	`0, 1`
	Constants	`0xFF, 'A'`
Italic Courier New	A variable argument	`file.o`, where `file` can be any valid filename
Square brackets [ ]	Optional arguments	`mcc18 [options] file [options]`

DOCUMENTATION CONVENTIONS

Curly brackets and pipe character: { | }	Choice of mutually exclusive arguments; an OR selection	`errorlevel {0|1}`
Ellipses...	Replaces repeated text	`var_name [,` `var_name...]`

	Represents code supplied by user	`void main (void)`
		`{ ...`
		`}`

WARNINGS, CAUTIONS, RECOMMENDATIONS, AND NOTES

Warnings, Cautions, Recommendations, and Notes attract attention to essential or critical information in this guide. The types of information included in each are displayed in a style consistent with the examples below.

WARNING
To avoid serious personal injury or death, do not disregard warnings. All warnings use this style. Warnings are installation, operation, or maintenance procedures, practices, or statements, that if not strictly observed, may result in serious personal injury or even death.

CAUTION
To avoid personal injury, do not disregard cautions. All cautions use this style. Cautions are installation, operation, or maintenance procedures, practices, conditions, or statements, that if not strictly observed, may result in damage to, or destruction of, the equipment. Cautions are also used to indicate a long-term health hazard.

> **Note:** All notes use this style. Notes contain installation, operation, or maintenance procedures, practices, conditions, or statements that alert you to important information, which may make your task easier or increase your understanding.

WHERE TO FIND ANSWERS TO PRODUCT AND DOCUMENT QUESTIONS

For additional information about the products described in this guide, please contact your Microchip representative or your local sales office. You can also contact us on the web at www.microchip.com/.

When this manual is updated the latest version will be available for downloading from Microchip's web site. Manuals are provided in PDF format for ease of use. After downloading, you can view the manual on a computer or print it using Adobe Acrobat Reader.

Manual updates are available at: www.microchip.com/.

THE MICROCHIP WEBSITE

Microchip provides online support via our website at www.microchip.com. This website is used as a means to make files and information easily available to customers. Accessible by using your favorite Internet browser, the website contains the following information:

- **Product Support** – Data sheets and errata, application notes and sample programs, design resources, user's guides and hardware support documents, latest software releases and archived software
- **General Technical Support** – Frequently Asked Questions (FAQs), technical support requests, online discussion groups, Microchip consultant program member listing
- **Business of Microchip** – Product selector and ordering guides, latest Microchip press releases, listing of seminars and events, listings of Microchip sales offices, distributors and factory representatives

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Users of Microchip products can receive assistance through several channels:

- Distributor or Representative
- Local Sales Office
- Field Application Engineer (FAE)
- Technical Support

Customers should contact their distributor, representative or field application engineer (FAE) for support. Local sales offices are also available to help customers. A listing of sales offices and locations is included in the back of this document.

Technical support is available through the website at: www.microsemi.com/ftdsupport

DOCUMENT REVISION HISTORY

Revision A (October 2021)

- Initial release of this document as MIcrochip DS50003206A. This Microchip document replaces the Microsemi document 15254-201 revision D.

Table of Contents

Chapter 1. Introduction

1.1 OVERVIEW

This manual contains procedures and information for proper installation and operation of the Microchip 8040C/8040CLN Rubidium Frequency Standard.

1.2 PURPOSE OF EQUIPMENT

The 8040C/8040CLN is a highly accurate and stable Rubidium frequency reference standard that provides atomic clock performance in a user-configurable 1U rack-mount chassis. Each of the connectors can be individually programmed to generate any of the following frequency outputs:

- 1 MHz, 5 MHz, or 10 MHz sine wave
- 1 MHz, 5 MHz, or 10 MHz square wave
- 1 PPS

The 8040C uses Microchip's model SA22C Rubidium as its internal oscillator, and provides direct user control via an RS-232 to perform the following tasks:

- Adjust the SA22C Rubidium oscillator frequency.
- Tune the SA22C to an external 1 PPS input.

> **Note:** Please refer to **Appendix 9. "PCN00031"** and **Appendix 10. "Revised Information Due to Implementation of SA55"** for models incorporating the SA55.

1.3 FACTORY CONFIGURATIONS

TABLE 1-1: FACTORY CONFIGURATIONS

Part Number	Description
15230-101	Six Outputs, Standard Performance
15230-102	Twelve Outputs, Standard Performance
15230-104	Six Outputs, Low Phase Noise
15230-105	Twelve Outputs, Low Phase Noise
15230-106	Twelve Outputs (all 10 MHz sine), Standard Performance
15230-111	Twelve Outputs (all 10 MHz sine), Low Phase Noise, DC Power

NOTES:

Chapter 2. Installation

2.1   MOUNTING

The Microchip 8040C mounts in standard 19-inch equipment racks and takes up 1U of vertical space (1.75 inches). The chassis depth is 12 inches.

For best performance, the operating environment should have a stable temperature. In addition, ensure that there are no strong magnetic fields (>2 gauss) in the vicinity of the shelf, because the unit's Rubidium oscillator is sensitive to DC and AC magnetic fields.

2.2   POWER CONNECTION/FUSE/VOLTAGE

The Microchip 8040C is powered from an AC source or optionally from a 24V DC source. The AC fuse is located inside the AC connector/filter on the rear panel.

To change the fuse, open the cover on the rear panel AC connector by using a screw-driver on the connector's cover slot. Once the cover is open, the fuse holder may be removed for inspection or replacement.

The Microchip 8040C/8040CLN may be powered from 90V AC or 240V AC. The 8040C automatically detects the input voltage therefore no manual configuration is required.

Microchip does not provide a power cable for the 24V DC version of the product. An 18 AWG cable is suggested with Molex connector 0003121026 and crimp terminal Molex 0018121222.

DANGER
ELECTRICAL SHOCK HAZARD - Use a locally approved power cord or power cord adapter for connection to the power source.

2.3   SIGNAL CONNECTIONS

Output signal cables may be connected in any order to the rear panel BNC connectors.
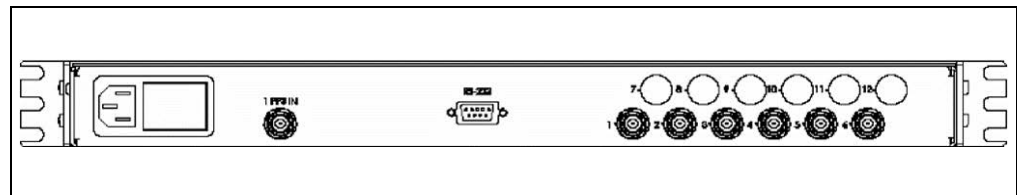
FIGURE 2-1:   *8040C/8040CLN Standard Configuration – Rear Panel AC version.*

8040C/8040CLN User's Guide
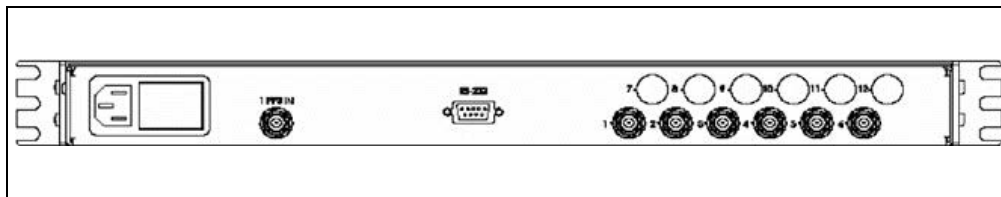
FIGURE 2-2: *8040C/8040CLN Standard Configuration – Rear Panel DC version.*

2.3.1 Output Signals

The standard Microchip 8040C/8040CLN has six BNC output connectors. The outputs are factory-programmed as described in Table 5-1.

TABLE 2-1: **FACTORY SETTINGS FOR STANDARD OUTPUTS**

BNC #	Signal
1	10 MHz sine wave
2	10 MHz sine wave
3	10 MHz sine wave
4	5 MHz sine wave
5	1 MHz sine wave
6	1 PPS
7-12	Optional (not included in the base configuration)

2.3.2 Input Signals

The 1 PPS IN connector takes a 1 PPS input from an external source, such as a GPS receiver or Cesium frequency standard, which is then used to discipline the 8040C's Rubidium oscillator. See **Section 6.4 "Disciplining to External 1 PPS"**.

2.3.3 Console

The RS-232 connector on the 8040C/8040CLN's back panel provides a command line interface to perform the following tasks:

- Adjust the Rubidium oscillator's frequency
- Synchronize to an external 1 PPS input

TABLE 2-2: **RS-232 CONNECTOR PIN-OUT**

DB9-F	Function
3	TX (Transmit Data)
2	RX (Receive Data)
5	GND (Signal Ground)

Note: Requires a null modem cable (DTE).

Chapter 3. Operation

3.1   POWERING UP

Connecting the power cord from the 8040C/8040CLN to the AC or DC source provides power to the unit. For the DC version, on the power cord apply:

• 24V DC on the red wire
• Ground or return on the black wire

The POWER LED illuminates immediately thereafter. The LOCK LED illuminates within five minutes, indicating that the 8040C's frequency accuracy is within ±5E-8 of absolute frequency. Removing the power cord from the IEC receptacle on the rear panel turns the power off.

3.2   INDICATOR LEDS

CAUTION
Do not use the Microchip 8040C as a reference source until the LOCK indicator is turned on.

The three LED indicators on the front panel provide a cursory view of the 8040C/8040CLN operating status.

POWER is lit when AC or DC power is applied to the unit.

LOCK is lit when the unit's Rubidium oscillator reaches operating temperature and its frequency output is within specifications.

1 PPS SYNC is lit when a valid external 1 PPS signal is applied to 1 PPS IN.
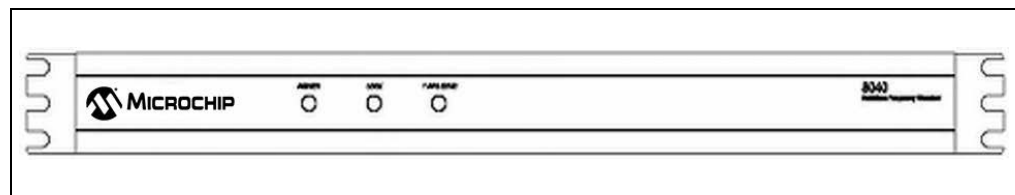
FIGURE 3-1:   *Microchip 8040C/8040CLN Front Panel.*

3.3   ADJUSTING OSCILLATOR FREQUENCY

There are two reasons to adjust the unit's frequency output:

• To adjust for the effects of aging on the Rubidium oscillator's frequency
• To tune the Rubidium oscillator's frequency to that of a more accurate primary frequency source.

The Microchip 8040C/8040CLN is a secondary frequency standard (i.e., much more accurate than a quartz frequency standard, but not as accurate as a Cesium primary frequency standard). By comparing the Microchip 8040C/8040CLN to an external Cesium standard or GPS receiver, it can be readjusted periodically to match the primary standard's greater accuracy.

The 8040C/8040CLN output frequency is adjusted by using the RS-232 interface.

The `f` command allows the user to adjust the output frequency in parts <1E-11.

> **Note:** A typical external counter does not have a resolution or accuracy high enough to set this device, so do not reset the frequency unless established metrology methods are used for frequency measurement resolution of <1E-11.

Example:

1. At the `r>` prompt, enter `f`
   - For a 5E-11 change, enter `f5<CR>`
   - For a –5E-11 change, enter `f-5<CR>`
2. Press **ENTER**
3. At the `r>` prompt, enter `t`
4. Under the `t`, enter `5987717` (this is the pass code save command)
5. Press **ENTER** (unless changes are saved they will not be recorded)
6. Response: "Tuning Data Save"

> **Note:** Please refer to **Appendix 10. "Revised Information Due to Implementation of SA55"** for revisions that incorporated the SA55.

3.4 DISCIPLINING TO EXTERNAL 1 PPS

3.4.1 1 PPS Disciplining

The advent of low-cost GPS technology has brought about its widespread use throughout the telecommunications industry. The GPS system provides 1 PPS with extremely good long-term stability (e.g., <1E-12 averaged over 24 hours). However, the short-term stability of this signal is not suitable due to inherent noise perturbations in GPS related to background noise, atmospheric conditions, cross talk, multipath, and instabilities in the oscillators of GPS satellites and GPS receivers.

In order to provide the required stability for telecommunications, system designers must combine the benefits of short-term stability (such as from a Rubidium or low noise OCXO) with long-term stability (such as from GPS, Loran-C, GLONASS, or Cesium). In the past, external disciplining circuitry was required to combine short-term and long-term stability. The traditional approach involved adding an external circuit to the oscillator that had a phase lock loop detector to handle disciplining algorithms.

Microchip is a leader in time and frequency design and has pioneered the use of Rubidium oscillators in telecommunications. The model SA22C Rubidium oscillator in the Microchip 8040C/8040CLN provides an important new feature: built-in disciplining to a 1 PPS input from an external reference. This new feature eliminates the need for additional external disciplining circuitry. The 8040C/8040CLN is inherently capable of disciplining to an external primary reference to remove frequency offsets due to long-term aging.

3.4.2 Operation

Connect the 1 PPS source to the 1 PPS IN on the rear panel of the 8040C/8040CLN. The 8040C/8040CLN's Microchip Synchronization Adaptive Algorithm (SSAA) qualifies the 1 PPS input reference by detecting 256 valid 1 PPS input pulses and determin-

ing the number of outliers based on the time constant. An outlier is detected when the absolute time difference between the input 1 PPS and its expected time is greater than 1 microsecond.

Once the SSAA detects two outliers (two bad 1 PPS pulses) or no input 1 PPS, the algorithm places the 8040C/8040CLN into flywheel (holdover) mode. The flywheel mode provides for Rubidium short-term and long-term stability without the benefit of an external reference. The 8040C/8040CLN remains in flywheel mode until 256 "good" 1 PPS input pulses are detected.

Once the number of outliers is less than 2, the unit disciplines to the external reference. This implementation was designed to support applications where the reference input is a GPS receiver without serial communications between the receiver and the 8040C/8040CLN.

There are two modes of operation for the 1 PPS input: manual and automatic.

> **Note:** Please refer to **Appendix 10. "Revised Information Due to Implementation of SA55"** for revisions that incorporated the SA55.

3.4.3   Manual Control

The manual mode is beneficial to applications where the quality of 1 PPS is worse than 50 nanoseconds, or to applications where the noise profile is well known and a deterministic solution yielding more control to the system designer is desired. The manual mode requires the user to input two parameters, which are tau (or time constant) and dampening factor.

Tau is expressed in seconds and determines the PLL time constant for following a step in phase for the reference. The range of tau is 5 seconds to 100,000 seconds. Tau values outside of this range put the unit in automatic disciplining mode.

The dampening factor determines the relative response time and ringing in response to each step. There are no limitations for the dampening factor value; however, values between 0.5 and 2 are strongly recommended.

> **Note:** Please refer to **Appendix 10. "Revised Information Due to Implementation of SA55"** for revisions that incorporated the SA55.

3.4.4   Automatic Control

The automatic mode requires no user inputs to the SA22C Rubidium oscillator.

Automatic mode is adaptive and changes the SSAA time constant as changes in the 1 PPS reference are detected. The automatic mode is optimized for a 1 PPS input with up to 50 nanoseconds RMS of noise such as from a GPS timing receiver.

Because the short-term jitter of 50 nanoseconds is typically present on 1 PPS from a GPS reference, the automatic mode is generally suitable for most applications.

> **Note:** Please refer to **Appendix 10. "Revised Information Due to Implementation of SA55"** for revisions that incorporated the SA55.

3.5   CONFIGURING OUTPUTS

The 8040C/8040CLN has the unique capability of providing flexible output configurations. To change the output configuration of your 8040C/8040CLN:

1.   Unplug the 8040C/8040CLN from the AC or DC power source and remove the

top cover by removing the Phillips head screws around the perimeter of the unit.

2. Locate the main PCB inside the 8040C/8040CLN as indicated in the top half of Figure 6-2 and identify the dipswitches shown in the bottom half of Figure 6-2. *Each dipswitch configures the output format on its corresponding BNC* (e.g., SW**1** configures the output format on BNC**1**).
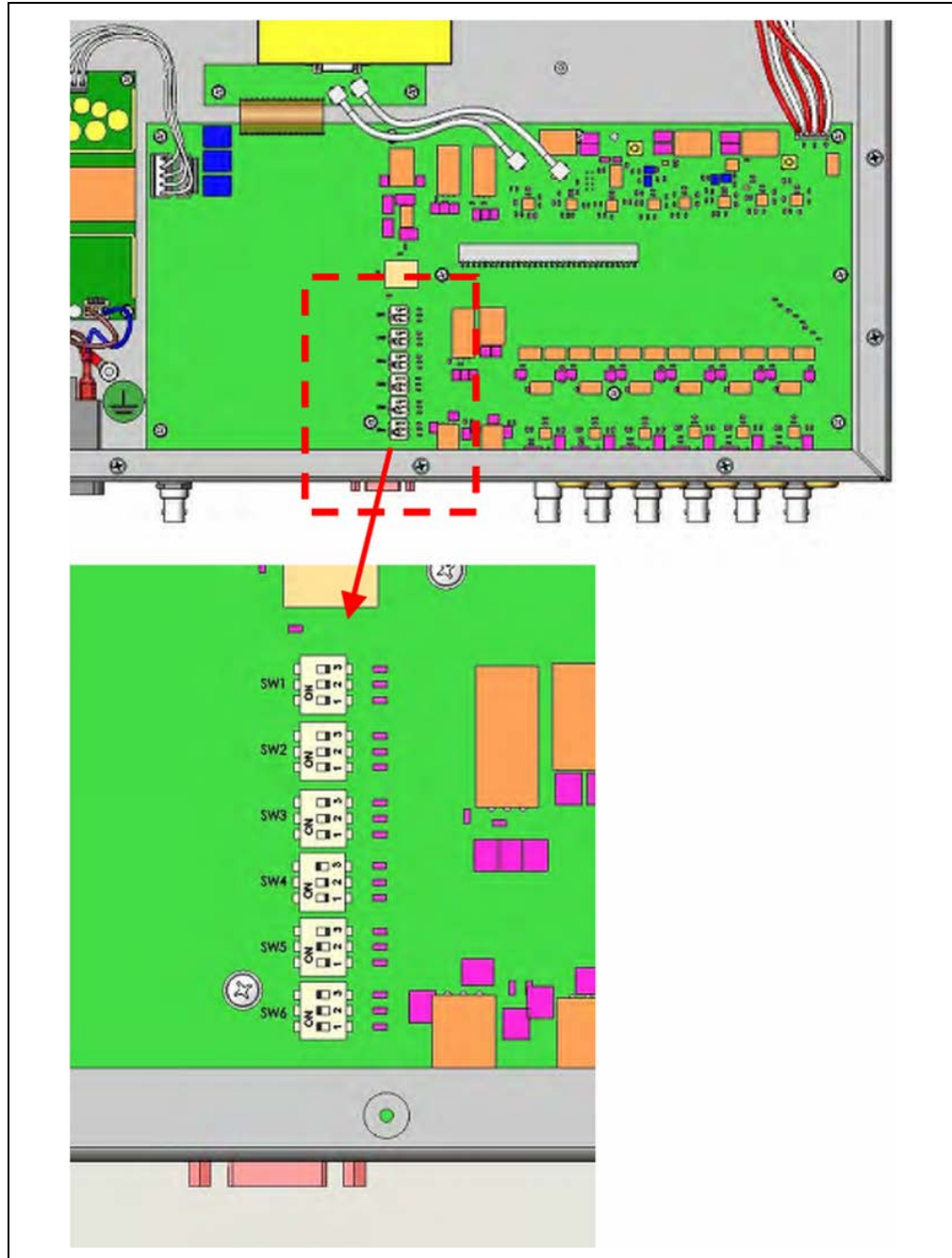
FIGURE 3-2:   *Dipswitch Locations for Configuring Outputs.*

3. Use the dipswitch positions shown in Table 6-1 to generate a specific output format on a specific BNC. For example, to generate 10 MHz TTL on BNC3, set SW3 position 1 to **ON**, position 2 to **OFF**, and position 3 to **OFF**.

TABLE 3-1:   OUTPUT CONFIGURATION

Output Format	Position 1	Position 2	Position 3
10 MHz sine	OFF	OFF	OFF
10 MHz TTL	ON	OFF	OFF
5 MHz sine	OFF	OFF	ON
5 MHz TTL	ON	OFF	ON
1 MHz sine	OFF	ON	OFF
1 MHz TTL	ON	ON	OFF
1 PPS	ON	ON	ON

4.   After setting the outputs, replace the top cover and apply power.

3.6   CONSOLE

The Microchip Serial Interface Protocol (SIP) provides user communication with the 8040C/8040CLN through the serial port when the unit is connected to a host PC or terminal. All "developer-mode" commands are single-letter format.

3.6.1   Host Terminal Emulator Setup

Set up the comm port of the PC with the following configuration:

• Data rate (Baud/BPS - see note below)
• No parity
• 8 data bits
• 1 stop bit
• No local echo (unit echoes)
• No hardware or software flow control

All SSIP commands are a single ASCII letter. The baud rate of the 8040C/8040CLN is 57.6K.

Note: Requires a null modem cable (DTE).

NOTES:

Chapter 4. Options

There are two optional configurations for the 8040C/8040CLN, the Twelve Output option and the Low Phase Noise option. The additional outputs require an additional circuit card that provides six configurable outputs that are set up the same as in the standard unit. The Low Phase Noise option can be purchased with either the standard six outputs or with the optional twelve outputs.

4.1   TWELVE OUTPUT OPTION

With the Twelve Output option, the six additional outputs on channels 7 through 12 come pre-configured the same as channels 1 through 6 in the standard configuration. They can be reprogrammed as described in **Section 6.5 "Configuring Outputs"**.
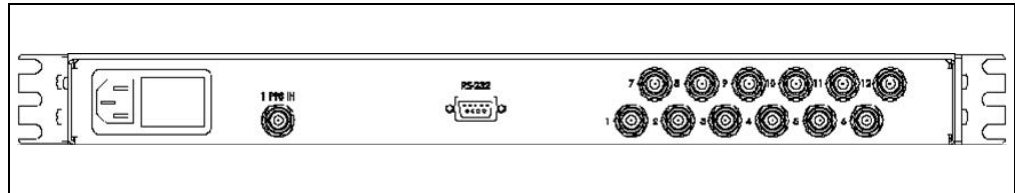
FIGURE 4-1:   *Back Panel of 8040C/8040CLN with the Twelve Output Option.*

TABLE 4-1:   OUTPUT CONNECTIONS

BNC	Signal
7	10 MHz sine wave
8	10 MHz sine wave
9	10 MHz sine wave
10	5 MHz sine wave
11	1 MHz sine wave
12	1 PPS
1-6	Standard configuration

4.2   LOW PHASE NOISE OPTION

The Low Phase Noise option does not require different operator instructions. This option provides improved phase noise specifications as described in specifications section of this manual.

NOTES:

Chapter 5. Technical Support

5.1 MAINTENANCE

This unit is designed to be maintenance-free. However, the following guidelines should be observed:

• Keep the unit clean, using a slightly water-moistened cloth.
• Keep it free from excessive dirt and moisture.
• Avoid cycling the power off and on more than is necessary.

If the unit requires servicing or repair, please contact Microchip Customer Assistance to obtain a Return Materials Authorization (RMA) using one of the numbers provided below.

5.2 WHERE TO FIND ANSWERS TO PRODUCT AND DOCUMENT QUESTIONS

For additional information about the products described in this guide, please contact your Microchip representative or your local sales office. You can also contact us on the web at www.microsemi.com/ftdsupport.

When this manual is updated the latest version will be available for downloading from Microchip's web site. Manuals are provided in PDF format for ease of use. After downloading, you can view the manual on a computer or print it using Adobe Acrobat Reader.

Manual updates are available at: www.microsemi.com/ftdsupport

5.3 RELATED DOCUMENTS AND INFORMATION

See your Microchip representative or sales office for a complete list of available documentation. To order any accessory, contact the Microchip Sales Department. See www.microsemi.com/sales-contacts/0 for sales support contact information. If you encounter any difficulties installing or using the product, contact Microchip Frequency and Time Systems (FTS) Services and Support:

U.S.A. Call Center: including Americas, Asia and Pacific Rim

Microchip Frequency and Time Systems

3870 N 1st St.

San Jose, CA 95134

Toll-free in North America: 1-888-367-7966

Telephone: 408-428-7907

Fax: 408-428-7998

email: ftd.support@microchip.com

Internet: www.microchip.com/csac

Europe, Middle East, and Africa (EMEA)

Microchip FTS Services and Support EMEA

Altlaufstrasse 42

85635 Hoehenkirchen-Siegertsbrunn

Germany

Telephone: +49 700 3288 6435

Fax: +49 8102 8961 533

email: ftd.emeasupport@microsemi.com, ftd.emea_sales@microsemi.com

5.4   CUSTOMER SUPPORT

Users of Microchip products can receive assistance through several channels:

• Distributor or Representative
• Local Sales Office
• Field Application Engineer (FAE)
• Technical Support

Customers should contact their distributor, representative or field application engineer (FAE) for support. Local sales offices are also available to help customers. A listing of sales offices and locations is included in the back of this document.

Technical support is available through the website at:
http://www.microchip.com/support

5.5   PREPARATION FOR SHIPMENT

Turn off the Microchip 8040C/8040CLN prior to shipment by removing the AC or DC power cord from the rear panel. Package the instrument in its original packing, if possible. If the original packing materials are not available, pack the unit in a reinforced cardboard carton using foam to take up any space inside the carton. Do not use foam popcorn or crushed paper for packing.

Contact the Customer Assistance department before returning the unit to Microchip.

Appendix A. PCN00031

Microchip Corporation

June 30th, 2021

Product/Process Change Notification No: PCN-00031

Change Classification: Minor

Subject: Internal Reference Rubidium Oscillator change for 8040C products

Description of Change:

Change of Oscillator from SA22C to SA55

Reason for Change:

Original oscillator SA22C has been discontinued.

Application Impact:

No change to form, fit or specification. Minor changes to communications and 1pps disciplining process per 8040C user manual addendum 1.

Method of Identifying Changed Product:

The revision of the product listed on the serial number label on the rear panel. Please see new revisions below. Also, the initialization message at power up will state "SA55 by Microchip."

Products Affected by this Change:

The following lists the part numbers and the revision that will incorporate the change. The revision letter is visible on the serial number label on the back panel of the product.

15230-101 rev J, 15230-102 rev H, 15230-104 rev J, 15320-105 rev J, 15230-106 rev D, 15230-108 rev D,15230-109 rev D, 15230-111 rev D

Production Shipment Schedule:

Product 8040C with new oscillator is planned to ship no sooner than December 1st 2021. Existing backlog will be unaffected unless scheduled for shipment after December 1st 2021. Exact date of cut over may vary dependent upon material availability and qualification completion. Orders placed after July 15th 2021 will be shipped with integrated SA55.

Qualification Data:

A qualification report will be available upon request after November 15th, 2021.

Contact Information:

For tech support, please contact Microchip Frequency and Time Division (FTD) Services and Support:

U.S.A. Call Center (Including Americas, Asia and Pacific Rim)

3870 N 1st St., San Jose, CA 95134

Toll-free in North America: 1-888-367-7966

Telephone: 408-428-7907

Fax: 408-428-7998

Email: sjo-ftd.support@microchip.com

Internet: www.microsemi.com/ftdsupport

Europe, Middle East, and Africa (EMEA)

Altlaufstrasse 42, 85635 Hoehenkirchen-Siegertsbrunn, Germany

Telephone: +49 700 32886425

Fax: +49 8102 8961 533

Email: sjo-ftd.support@microchip.com, cisemeasales@microchip.com

Regards,

Microchip

Any projected dates in this PCN are based on the most current product information at the time this PCN is being issued, but they may change due to unforeseen circumstances. For the latest schedule and any other information, please contact your local Microchip Sales Office, the factory contact shown above, or your local distributor.

This Product/Process Change Notification is confidential and proprietary information of Microchip and is intended only for distribution by Microchip to its customers, for customers' use only. It must not be copied or provided to any third party without Microchip's prior written consent.

Appendix B. Revised Information Due to Implementation of SA55

The 8040C/8040CLN internal rubidium reference changed from the SA22C to the SA55 per PCN00031. No specification parameters were changed to the 8040C; however, some of the functionality related to the SA22C Microsemi Serial Interface Protocol specified in the Microsemi SA22C User Guide could not be directly emulated (https://www.microsemi.com/document-portal/doc_down-load/136649-sa22c-user-guide-2017). This appendix captures the changes.

B.1 START BANNER

Some changes have been made to the start banner. The standard start banner will now appear as:


```
8040C by Microchip Technology, Inc., Copyright 2021
   SA5X V1.0.23.0.5DAA2CC2,V1.16; Adapter Version V1.0.3
   Mode CN03  Flag 0000  [C91F]ok

Unit serial code is 1904MX00001, current tuning state is 6
Crystal: 60000000hz, ACMOS: 10000000.0hz, Sine: 10000000.0hz
Ctl Reg: 0006, Res temp off: -1.538, Lamp temp off: -2.0589
FC: disabled, Srvc: high


Enter Run Mode
   FC mode is disabled
   1pps mode is enabled
r>
```

FIGURE B-1:   *Standard Start Banner.*

The following commands are now the only applicable commands usable with the 8040C:

TABLE B-1:   APPLICABLE COMMANDS WITH 8040C

Command	Action	Note
f	Adjust DDS Frequency (delta e-11).	See the detailed information below the frequency tuning paragraph.
g	Enable/Disable 1 PPS.	—
h	Display Help.	Returns the help menu per above.
i	Info (Show Program Info).	Some changes have been made to the return of the i command. The return will now appear as shown in Figure 10-2.
j	Display 1 PPS Delta Reg.	Unaltered from SA22C user's guide.

TABLE B-1:   APPLICABLE COMMANDS WITH 8040C

Command	Action	Note
p	Display Control Reg.	Reads control registers. Unchanged from SA22C user's guide.
q	Set Control Reg.	This command no longer has any functionality, as all registers are read-only, but the command will be accepted when received.
t	Save Tuning Data.	Unchanged from SA22C user's guide.
w	Display Health Data.	This command will not return information when in customer mode.
y	Set 1 PPS Coefficients.	Set 1 PPS time constant coefficient.
z	Save 1 PPS Coefficients.	Save 1 PPS coefficient.


```
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   SA5X V1.0.23.0.5DAA2CC2,V1.16; Adapter Version V1.0.3
   Mode CN03   Flag 0000   [C91F]ok

Unit serial code is 1904MX00001, current tuning state is 6
Crystal: 60000000hz, ACMOS: 10000000.0hz, Sine: 10000000.0hz
Ctl Reg: 0006, Res temp off: -1.538, Lamp temp off: -2.0589
FC: disabled, Srvc: high


Enter Run Mode
  FC mode is disabled
  1pps mode is enabled
r>
```

FIGURE B-2:   *Return for the `i` Command.*

B.2   REVISION TO 1 PPS DISCIPLINING SECTION BASED ON SA55 FUNCTIONALITY

For further reduction of phase and frequency errors, disciplining can be enabled/ disabled with the Disciplining parameter. The algorithm implements a high-resolution phase meter within the 8040C to automatically correct the phase and frequency relative to a reference 1 PPS input once per second with a resolution of 450 ps. The algorithm will simultaneously steer the phase and frequency to that of the external reference (1 PPS input), ultimately achieving accuracies of <1 ns and 1E-13, respectively, depending on the stability of the 1 PPS input.

The j command will report the most recent phase meter measurement to indicate the time-difference between input and output 1 PPS signals. The speed and effectiveness of the disciplining algorithm can be adjusted by the time constant tau (τ), which is user settable through the command y. Set Arg1 to 2, and Set Arg2 to a value between 10 and 45000 and save this setting command z. If command z is not sent, a default value will be used after the next start up. For more detailed information, please refer to Section 3.4 of DS50002938 "MAC-SA5x User's Guide".

http://ww1.microchip.com/downloads/en/DeviceDoc/Minia-
ture-Atomic-Clock-MAC-SA5X-Users-Guide-DS50002938B.pdf

B.3   REVISION TO FREQUENCY SETTINGS SECTION BASED ON SA55 FUNCTIONALITY

The frequency setting commands match SA22C, with the exception of the last frequency offset sent through command f will always be stored during power off. The command t is no longer required to store the value.

NOTES:

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