Precise Time and Frequency, Inc

ptf 2210A

Operation and Maintenance Manual

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Revision	A

Introduction

Congratulations on your purchase of the ***ptf 2210A*** Quartz frequency standard !

This product meets the highest standards of quality and reliability, and Precise Time and Frequency, Inc wants to insure that you enjoy the maximum benefits and functionality that this unit can provide.

The technology within this unit uses the decades of experience in time and frequency applications of our engineering team, to give a product that is highly advanced, and provides an extremely stable and accurate reference for your timing and frequency application,

Operation of the unit is straightforward and the contents of this manual are designed to provide a basic understanding of the product, set-up and functionality, and procedures for maintenance and repair.

If you have any questions or concerns, please do not hesitate to contact our technical service department who will be pleased to provide assistance.

Please help us to live up to our stated objectives, our company motto is:

KNOW THE NEEDS AND EXPECTATIONS OF YOUR CUSTOMER...THEN DELIVER!

Once again, thank you for purchasing our product, and we look forward to you utilizing Precise Time and Frequency, Inc. for your future time and frequency instrumentation needs.

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1. Quartz Oscillator

The heart of the ***ptf 2210A*** is a precision ovenized quartz oscillator that provides an accurate and stable 10MHz reference.

The quartz oscillator uses a high quality internal quartz crystal oscillator encased in a specially designed ovenized environment to keep the crystal temperature constant and minimize any effects of temperature on the unit's performance.

In addition to providing the accurate 10MHz output the unit also supplies additional RF outputs if (optionally) ordered) including an output 1PPS signal. If desired a disciplining 1PPS input reference can be optionally ordered, and the ***ptf 2210A*** will lock the output to this input reference.

2. *ptf 2210A* Quartz Standard - Technical Overview

The ***ptf 2210A*** utilizes an internal quartz module, and (optionally) distributes and conditions the 10MHz signal to provide a range of outputs at 1MHz (optional), 5MHz (optional) and 10MHz. The unit also optionally provides a 1PPS disciplining input and a 1PPS output.

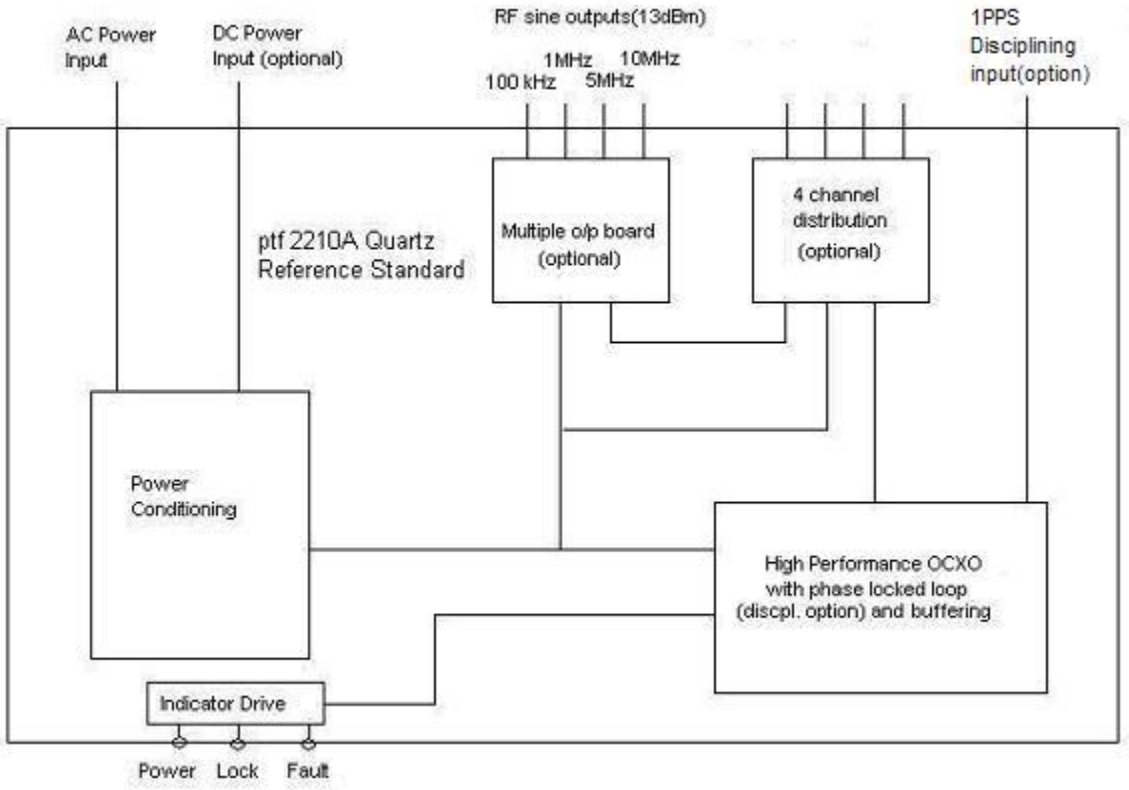

Figure 1. ptf 2210A Quartz Standard Schematic

2.1. Technical Description

The ***ptf 2210A*** Quartz Standard has an inherent stability due to the precision quartz reference, which is suitable as a stand alone reference for many applications.

In addition, the unit optionally comes with an external disciplining input which can be used to lock the ***ptf 2210A*** to another external reference, for example a GPS receiver, which may have excellent long term stability but is unable to provide the short and medium term stability performance of the ***ptf 2210A***.

If fitted, the external disciplining input is fed directly to the quartz module and, if present, is used internally within the module to “lock” the quartz 10MHz output to the 1PPS disciplining input.

Any adjustments required (e.g. calibration) are applied directly to the quartz module.

3. *ptf 2210A* Quartz Standard - Specifications

3.1. Electrical

RF Outputs	
Frequency	10MHz (sine wave)
Optionally	100kHz, 1MHz, 5MHz
Amplitude	>7dbM , 0.5V rms (+13dBm with Distribution or MOPS options)
1PPS Output	5V TTL Level

Aging	
5MHz	
after 30 days of operation	<1E-10/day
per year	<1E-8
10MHz	
after 30 days of operation	<5E-10/day
per year	<3E-8

Phase Noise	
Offset from (10MHz) carrier	Phase Noise(dBc)
1Hz	-95
10Hz	-120
100Hz	-145
1000Hz	-150
10000Hz	-155

Input Power requirements	110 to 240 V (+/-10%) AC / 50-60 Hz

3.2. Mechanical/Environmental

Dimensions	1U(1.75”) high x 19”wide x 12” deep
Temperature	
Operating	0 to 50 degrees Celsius
Storage	-10 to +70 degrees Celsius
Humidity	0 to 95%, non-condensing
Weight	< 10 lbs

4. Unpacking/Inspection/Installation

4.1. Unpacking/Inspection

The ***ptf 2210A*** Quartz Standard together with accessories, is shipped in a custom designed package. Upon receipt the equipment should first be visually inspected for any signs of visible damage.

If visible damage is apparent immediate notification should be given to both Precise Time and Frequency, Inc., and the carrier responsible for shipment. Do not discard the shipping container that should be made available for inspection by the carrier.

For purposes of unit reference, the unit serial number located on the rear panel of the unit should be quoted in all communications.

4.2. Chassis Installation

The ptf 2210A Quartz Standard chassis is supplied with rack ears ready for simple installation into a standard 19-inch rack frame/cabinet.

For adequate support when mounted into the rack, a rear supporting bar or tray should be used as the rack ears are designed to secure the unit in the rack, NOT to support the full weight of the unit.

Attention should be given to the internal rack environment to insure the unit operates within it's specified operating temperature range of 0 to 50 deg. C also noting that the unit relies upon convection for cooling, so there should be sufficient air flow to accommodate this.

4.3. Connections

A diagram showing the connectors is provided in section 4.3.4 at the end of this section.

4.3.1. Power Connection

Power is supplied by connecting the supplied ac power cable to an ac source, at 120 or 230 V ac, +/-15%. The ac input is a universal input – no range switching is required.

4.3.2. Timing Input/Output Connections

BNC connectors are provided for the standard ***ptf 2210A*** Quartz Standard outputs.

4.3.3. Connections

NOTE: The connector output positions may vary slightly according to the options fitted. Always refer to the label on the side of the unit for the correct locations.

4.3.2.1 Multiple Output Module (Optional)

The ***ptf*** 2210A equipped with an optional **Multiple Output Module (MOPS)** provides 100kHz, 1MHz 5MHz *and* 1PPS output capabilities.

4.3.4. Diagram of connections

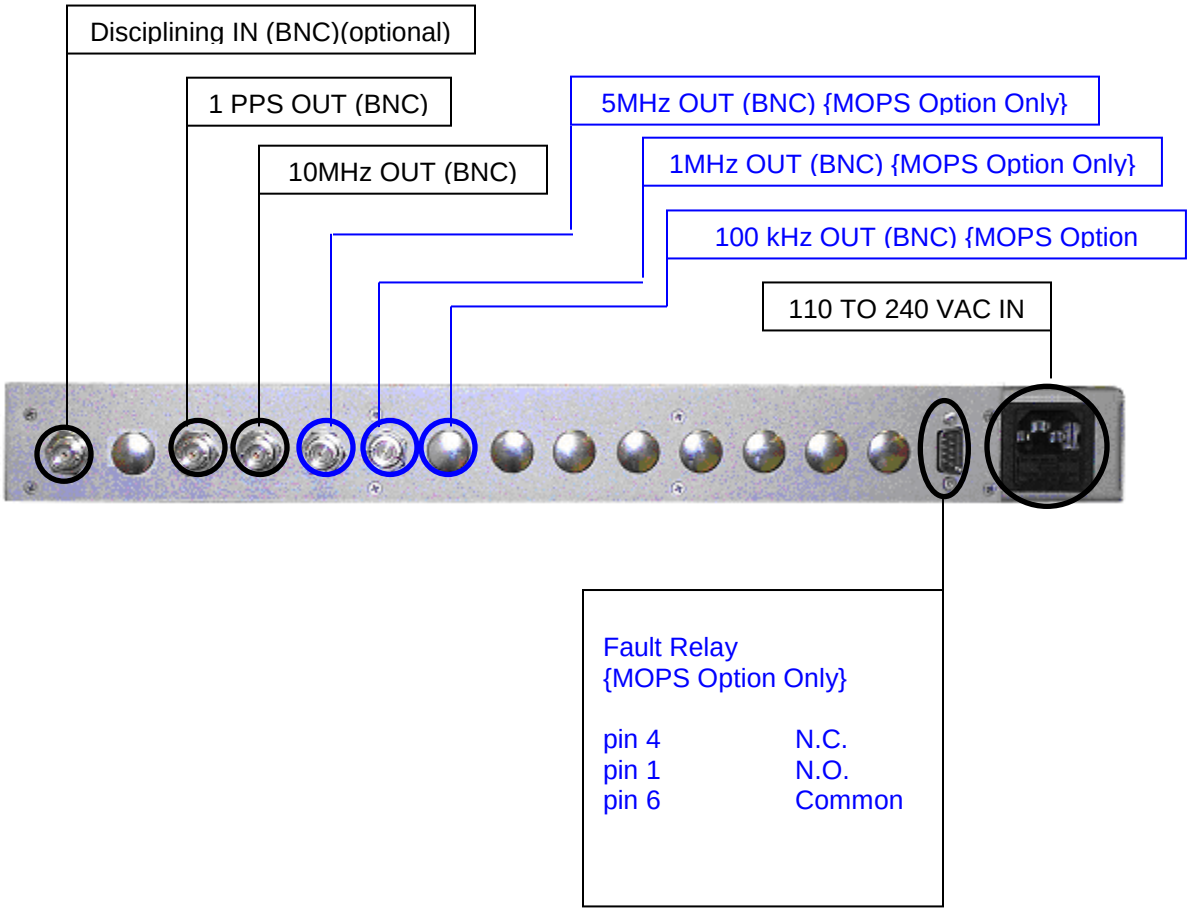

Figure 2. Unit Rear Panel Connectors

5. ***ptf 2210A*** Quartz Standard – Operation

5.1. Initialization

Warm up.

When first powered on the unit will take approximately 5 minutes to warm up to specification.

When power is applied the power LED on the front panel will illuminate. Additionally, if the disciplining input option is fitted the LOCK LED will illuminate to indicate the internal oscillator is locked to the external input. Note; although fitted, the LOCK LED will not illuminate if the external disciplining option has not been ordered.

If there is a fault on the unit the red Fault LED will illuminate.

5.2. Operation

5.2.1. Normal Use

Powering on is all that is required as the unit is very straightforward to use.

5.2.2. Timing Operation

In addition of being a Quartz Frequency Standard, the ***ptf 2210A*** optionally generates a one pulse per second signal (PPSOUT), as well.

With the input disciplining option the ***ptf 2210A*** has two basic modes of operation: “Track” and “Holdover”.

In the “Track” mode, the unit uses an external reference to correct the Quartz oscillator frequency.

In the holdover mode the unit maintains the last frequency acquired before the disciplining input was disconnected.

5.2.3. Calibration

Specialized equipment is required for calibration of the unit, and therefore it is recommended that the unit be returned to the factory for calibration.

6. Maintenance

6.1. Overview

The ***ptf 2210A*** Quartz Standard uses highly advanced technology components together with some specialty components such as the internal OCXO oscillator.

Advanced techniques with highly sophisticated equipment, are used for assembly and test of the unit.

Due to the above, very little periodic maintenance of the unit is required and the units can be expected to deliver many years of trouble free operation. The sections below describe the few items that may require periodic maintenance.

Any maintenance or service of the unit should be performed at a Precise Time and Frequency, Inc. authorized facility, to insure the appropriate equipment and expertise is available.

6.2. Local Oscillator

In normal operation, the unit uses an internal quartz oscillator to provide the RF and pulse outputs.

Due to aging characteristics of the local oscillator, over a period of time the control voltage may need adjustment to maintain the accuracy of the unit. This would normally be after several years, dependent upon the specific application requirements.

If calibration is required, the unit should be returned to a ptf facility.

7. Software Supplement – Disciplining Option

When the disciplining input option is fitted, the unit may be disciplined by means of a 1PPS (One Pulse Per Second) signal applied to the 1PPS input (e.g. from a Cesium Standard or GPS receiver).

Internally the unit is wired to remain in the “track” mode when a 1PPS signal is applied.

When the input is removed, the unit will hold h last value of frequency attained, with an aging rate equivalent to approximately 1E-9 per day.

There is also an RS232 serial port for controlling some of the conditions of the disciplining. Serial prot settings are;

9600 Baud, no arity, 1 start bit, 8 data bits, 1 stop bit

The available commands are as follows;

The 2 basic commands are ; M<ENTER> and Cxxxx<ENTER>

For M<ENTER> the returned answer looks like;
HH GG FF EE DD CC BB AA<CR><LF>
Where;
HH Read back of the frequency adjustment voltage
GG reserved
FF reserved
EE reserved
DD control voltage
CC Oven 1 heating voltage
BB Oven 2 heating voltage
AA reserved

Cxxxx<ENTER> returns the output frequency correction through a DAC by steps of approximately 6E-12, where xxxx is a signed 16 bit word in hex coded ASCII.

In track mode (the default mode of the unit) this command is not active.

The following table gives a summary of other available commands;

Command Name	Syntax Command	Data Field (if any)	Response Syntax	Response Data (if any)
Set Tracking Window	**TW**ddd<CR><LF>	ddd = Half Tracking Window by 100ns step. From 1 to 255 ddd = 999 : interrogation	ddd<CR><LF>	ddd : Half Tracking Window by 100ns step.
Set no Alarm Window	**AW**ddd<CR><LF>	ddd = Half no Alarm Window by 100ns step. From 1 to 255 ddd = 999 : interrogation	ddd<CR><LF>	ddd : Half no Alarm Window by 100ns step.
Set tracking phase loop time constant	**TC**dddddd<CR><LF>	dddddd = Time constant in seconds (001000 to 999999) TC000000 : change to auto. (<)TC001000 : no change	Dddddd<CR><LF>	dddddd : time constant in seconds
Set module customization	**MC**sxx [cc…c] <CR><LF>	s = L : Load parameter s = S : Store parameter ccc..c s = B : Load start behavior s = A : Activate msg at start s = C : Cancel msg at start s = H : Load Help s = T : Load Data Type xx = 00..FF: msg number, ccc…c : new welcome message, up to 24 characters	cc..c<CR><LF> or d<CR><LF> or xy<CR><LF>	ccc..c : response to MCLxx or to MCHxx. d : 0, 1 response to MCBdd or xy : Data Type, response to MCTxx, x=0 RAM, x=1 eeprom, x=2 Flash, y=0 Byte, y=1 sByte, y=2 Word, y=3 sWoord, … y=8 string ASCII, y=9 strng binary
Set phase comparator Offset	COsddd	s :+/- signe ddd : limited with range + 127 / - 128 CO+999 : interrogation	sddd	s :+/- signe ddd : offset in approx 1 ns steps
View PPSRef Sigma	**VS**<CR><LF>		ddd.d<CR><LF>	ddd.d : Sigma of PPSRef in ns. In tracking, Status 2, 3.
View Time constant	**VT**<CR><LF>		dddddd<CR><LF>	dddddd : Loop time constant now in use, in ns.
Raw phase adjust	**RA**sddd<CR><LF>	s :+/- signe ddd : limited with range + 127 / - 128	sddd <CR><LF>	s :+/- signe ddd : raw phase just asked in 100 ns steps
Reset micro controller	**RESET**<CR><LF>			(Identification & welcome message, GPS binary)

8. Contact Information – Technical Assistance

   The Precise Time and Frequency, Inc service department normal hours of operation are from Monday to Friday, between the hours of 8.00 a.m. and 5.00 p.m. US Eastern Standard Time.

   24 hour, 7-day technical assistance is available under special contract.

   Before returning any equipment for service or repair please contact our service department for an RMA number.

   Tel: (+1) 978 535 4848
   Fax: (+1) 978 535 3549
   E-mail: service@ ptfinc.com

   Shipping address is:

   Precise Time and Frequency, Inc.
   200 Corporate Place
   Peabody, MA 01960
   USA

   Attn: Service Manager

   Billing address is:

   Precise Time and Frequency, Inc.
   200 Corporate Place
   Peabody, MA 01960
   USA

   Attn: Accounts