ptf

Precise Time and Frequency, Inc

ptf 1229A Frequency Generator/ Micro Phase Stepper

Operation and Maintenance Manual

Document #:
Revision: B

Certificate of Conformance

This certificate confirms that the following equipment:

Unit type: ***ptf*** 1229A Frequency Generator

Serial Number: _____

has successfully passed a FINAL ACCEPTANCE TEST and conforms in all respects of form, fit, and function to current specifications, including regulatory requirements and certifications.

Inspected and verified by: Date:

_____ _____

For Precise Time and Frequency, Inc

Introduction

Congratulations on your purchase of the ***ptf*** 1229A Frequency Generator !

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 provide a unit that is highly advanced, and gives a very powerful feature set in an inexpensive and compact package,

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.

President
Precise Time and Frequency, Inc.

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This manual is applicable to ptf 1229A units fitted with software version 2– 2 and above.

1. ***ptf* 1229A Frequency Generator - Technical Overview**

The ptf 1229A Frequency Generator utilizes at it's heart the latest in Direct Digital Synthesizer (DDS) technology to provide output frequencies theoretically settable to a 48 bit resolution, but limited for this application to a resolution of 0.1 Hz. Each fitted channel operates independently and provides both sine and digital outputs under the control of a supervisory monitor and control processing unit. The outputs can also be adjusted in phase independently of each other.

The unit includes an NTP client, enabling time to be automatically acquired and used for time stamping of events and for the front panel display. Also the unit can optionally have an auto switched input fitted for redundancy applications.

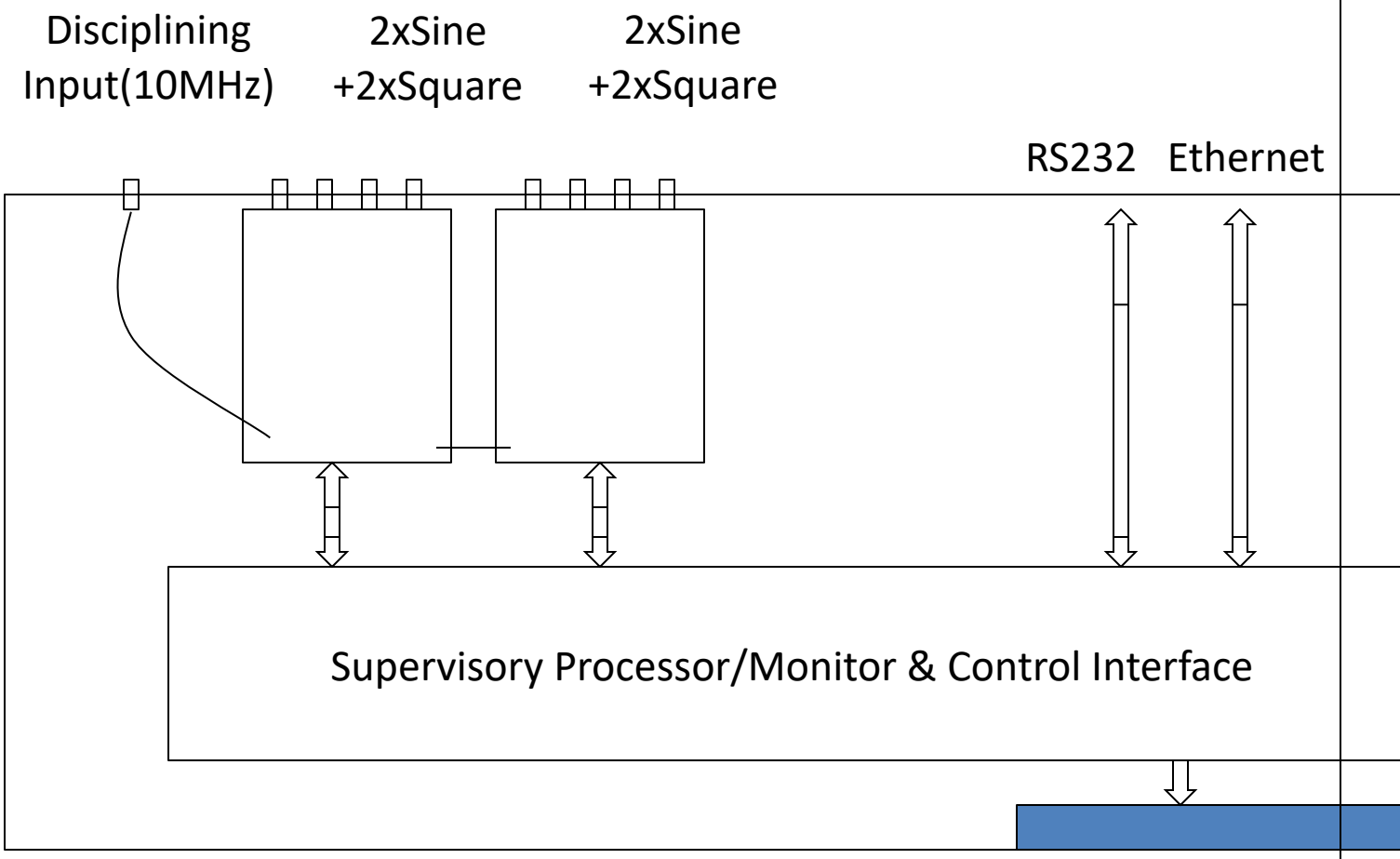


Figure 1. ***ptf*** 1229A Frequency Generator Schematic

1.1. Technical Description

The ***ptf*** 1229A Frequency Generator architecture is based upon a 35MHz embedded microprocessor module interfacing to up to two Dual Channel DDS modules, providing two sine and two digital outputs each.

Each DDS output has broadband filtering on the sine wave output to insure the generation of a clean, low noise sine wave.

Each module contains a 100MHz oscillator to drive the two on-board DDS's. If the external 10MHz disciplining input is used, the 100MHz oscillator is phase locked to the incoming 10 MHz, therefore insuring output accuracy locked to the accuracy of the disciplining source.

Optionally an internal OCXO or Rubidium source may be used as an alternative, or in conjunction with the external disciplining input.

Status of the input lock and DDS status and health is internally monitored and reported on front panel LED's (power, lock, and fault LED indicators) and on the front panel vacuum fluorescent display. Ethernet and RS232 monitor/control i/o ports also report fault and status, providing both local (front panel) and remote (Ethernet/RS232) indication, control and setup.

Due to the flexibility provided by the Microprocessor/FPGA/DDS architecture, ***ptf*** is able to implement many special features and i/o functions upon request. If ordered with this unit, details of any special features, if any, will be found in the appendix to this manual.

Standard unit set-up, monitoring and control is via either the front panel keypad/display, RS 232 (DB9 connector) or Ethernet (RJ 45 connector) interfaces, which allow access utilizing http, or telnet protocols. SNMP is optionally available.

Standard unit output functionality includes:

Front panel keypad/display

2 independently settable DDS channels each providing one sine and one digital output (total 2 channels/4 outputs)

Each sine output provides a 1V rms RF sine wave output into 50 ohms

Each digital output provides a TTL output (5V nominal) into 50 ohms

Independent output phase control of each channel*[note]

Note: Phase change is achieved by implementing calculated frequency change by an exact period of time. Phase changes provide phase continuity when implemented.

2. *ptf* 1229A Frequency Generator - Specifications

Electrical

Frequency Output Channels (4 max.)

Frequency Range	0.1Hz to 30MHz (0.1Hz resolution over range)
Phase Adjustment Range	0 to 999,999,999 nano seconds (1 ns resolution)

Output Level	
Sine	settable in amplitude up to 1V rms (nominal)
Square	5V TTL
Harmonic Distortion	<-40 dB
Non-Harmonic Signals	<-80 dB
Load Impedance	50 ohms
Isolation	>80 dB
Connectors	BNC

SSB Phase Noise @ 10MHz
(1 Hz Bandwidth) Offset from carrier

10 Hz	-95 dBc/Hz
100 Hz	-125 dB
1,000 Hz	-148 dB
10,000 Hz	-162 dB

RF Input

Frequency	10MHz
Level	1 V rms (nominal)
Alarm Output	Summary alarm indicates failure of any output signal
Non-alarm condition:	Relay energized (fail safe)
Connector:	9 pin D-male

Controls & Indicators

Power	Green LED, power is connected
Alarm	Red LED, Input reference present but DDS module not locked.
Lock	Input signal indicator, indicates internal oscillator locked. (Only applicable when an external frequency reference is applied)

Environmental and Physical

Temperature:	0° to 50° C
Relative Humidity:	0 to 95%, non-condensing
Power Requirements	
AC Input (±15%)	90 - 264 VAC, <10W
Dimensions (HxWxD):	1U x 19” x 12”
Weight	<10lbs

Configuration Options

Option #	Description
ADOP	Additional outputs(total outputs = 4 sine and 4 TTL)
DCPS	DC Power Supply

2.1.1. Control/Monitor i/o

Control/monitor functions are available on a rear panel mounted DB9 RS232 connector. Allowing full remote monitoring and control of the available unit functions.

Details and set up of the functions available on this interface can be found in section 5.3 of this manual.

2.1.2. 100/10 Base T Ethernet

Control/monitor functions are also available on a rear panel mounted RJ-45 Ethernet connector. Allowing full remote monitoring and control of the available unit functions.

Details and set up of the functions available on this interface can be found in section 5.4 of this manual.

3. Unpacking/Inspection/Installation

3.1. Unpacking/Inspection

The ***ptf*** 1229A Frequency Generator 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, which 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.

3.2. Chassis Installation

The ***ptf*** 1229A Frequency Generator 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.

3.3. Power Connection

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

3.4. Timing Input/Output Connections

BNC connectors are provided for the standard ***ptf*** 1229A Frequency Generator outputs.

3.5. Control/Monitor/Alarm Relay Connections

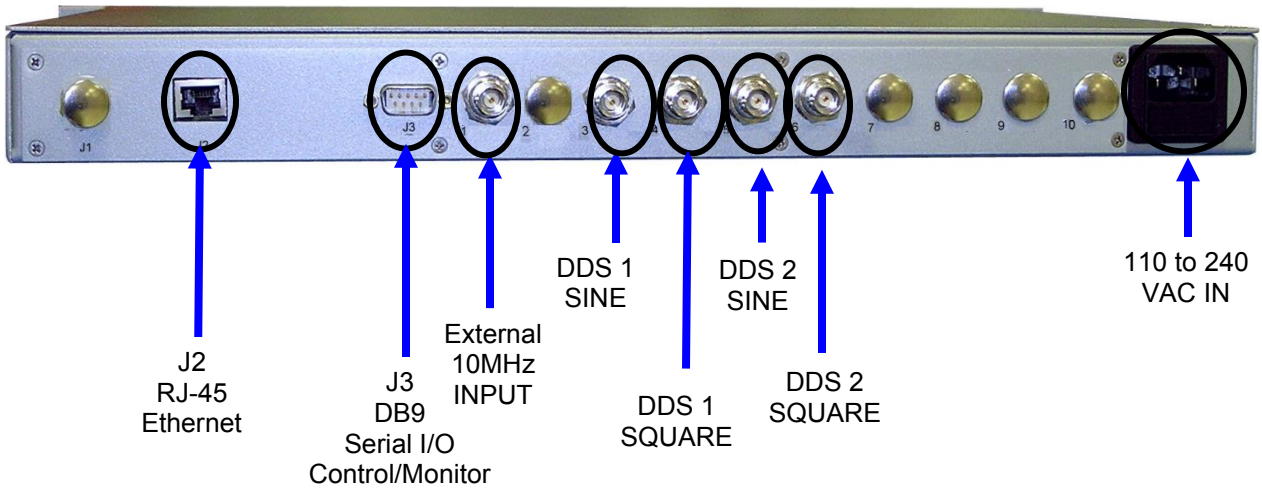
Control and monitoring is available through an RS232 port (female 9-contact D connector) and over an Ethernet port (RJ45 connector). The RS232 port is configured as DTE, receiving data on pin 3 and transmitting data on pin 2. Pin 5 is chassis ground, and the other lines are unused.

DB9 Connector

Pin #	Function	Comments
1	Alarm Relay NO	Closed when in alarm
2	TX Data (RS232)	
3	RX Data (RS 232)	
4		
5	Ground (RS232)	
6		
7	Alarm Relay NC	Open when in alarm
8	Alarm Relay Common	
9		

3.6. Connection Diagram

ptf 1229A standard output/input connections are as shown in the picture below:



Note:
If your unit(s) is configured with optional outputs please refer to APPENDIX in the back of this manual.

4. *ptf* 1229A Frequency Generator – Operation

4.1. Initialization

Upon power up the unit will display the software version / unit type on the display screen while initializing.

Once initialization is complete, an information screen appears showing the channel output frequencies that have been set..

The following steps are part of the initialization process:

Verification of compatible s/w version and CPLD firmware
Restoration/initialization of stored “flash” memory parameters
Initialization of Ethernet functionality
Initialization of front panel keypad (if fitted)
Initialization of DDS modules
Initialization of internal Oscillator phase locked loop

4.2. Entering Frequency Information

Each independent channel (2 fitted as standard, optionally up to 4) can be set in frequency through either front panel, serial, telnet or http commands. The frequency set for a channel will apply to both the sine and square wave outputs.

4.3. DB9 RS 232 Control/Monitor Port

4.3.1. Configuration

The RS232 port factory default setting is 57600-8N1, but may be changed through the RS232 menu.

4.3.2. DELIBERATELY LEFT BLANK

4.3.3. Command Set

Commands available on the RS232 serial port are of the form:

Letter number space argument1 space argument2 space ... argument n <CR>

The number immediately following the letter is a two-digit number.

e.g. E01 200<CR>
E02 0<CR>
E17 ret<CR>

To return the current value of a parameter type <CR> immediately after the identifier.

e.g. E01<CR>

A comprehensive HELP system is available that can be accessed through the RS232 port.Type;

help <CR>

and the complete set of available commands will be returned. For more comprehensive information on a particular command type;

[command letter][command number][space]?<CR>

e.g. E01 ?<CR>

returns;

Serial Use Name	Command	Keypad?	Current Value
CH1 FREQ	A01	Yes	10000000

Set Ch 1 Frequency O/P(Hz)
Entry type is number
Minimum Value : 0
Maximum Value :99999999.9

The following table details the standard command set available within the ***ptf*** 1229A Frequency Generator. Where special functions have been included for particular applications outside of the standard configuration these are listed in a separate appendix.

Function	Description	Data	Cmnd
Frequency	Set channel 1 output frequency	0 to 30000000	E01
Frequency*[Note1]	Set channel 1 duty cycle	-2000 to +2000	E02
Frequency	Set channel 2 output frequency	0 to 30000000	E03
Frequency*[Note1]	Set channel 2 duty cycle	-2000 to +2000	E04
Frequency	Set channel 3 output frequency	0 to 30000000	E05
Frequency*[Note1]	Set channel 3 duty cycle	-2000 to +2000	E06
Frequency	Set channel 4 output frequency	0 to 30000000	E07
Frequency*[Note1]	Set channel 4 duty cycle	-2000 to +2000	E08
Amplitude	Set channel 1 output amplitude	0 to 9	E09
Amplitude	Set channel 2 output amplitude	0 to 9	E10
Amplitude	Set channel 3 output amplitude	0 to 9	E11
Amplitude	Set channel 4 output amplitude	0 to 9	E12
Phase	Adjust channel 1 output phase	-999999999 to 999999999	E13
Phase	Adjust channel 2 output phase	-999999999 to 999999999	E14
Phase	Adjust channel 3 output phase	-999999999 to 999999999	E15
Phase	Adjust channel 4 output phase	-999999999 to 999999999	E16
Time	Set Date	MM/DD/YYYY	E21
Time	Set Time	HH:MM:SS	E22
Time	Time Mode	UTC	E23
Time	Local Time Offset	0 to 50	E24
Time	Daylight savings type	US, UK	E25
Time	Daylight savings on/off	On or off	E26
Display	Display brightnes	1 ton 8	E27
Display	Display blanking time (seconds)	0 to 32000	E28
I/O	IP address of this 1229A xxx.xxx.xxx.xxx	000.000.000.000 to 255.255.255.255	E29
I/O	Netmask, xxx.xxx.xxx.xxx	000.000.000.000 to 255.255.255.255	E30
I/O	Gateway, xxx.xxx.xxx.xxx	000.000.000.000 to 255.255.255.255	E31
I/O	DHCP Off or On	off or on	E32
Admin	Administrator Password	Xxxxxx	
I/O	Baud Rate	9600 or 19200 or 57600	E37
Time	NTP Server I/P Address	000.000.000.000 to 255.255.255.255	E40
Time	NTP update interval(seconds)	0 to 100000	E41
I/O	Telnet timeout (seconds)	0 to 100000	E44
RESET	System reset		

NOTE 1: Duty cycle adjustments apply to the TTL output only.

NOTE 2: Phase adjustment is not available below frequencies of 1Hz.

4.3.4. Status Command

In addition to the standard commands listed above, the ptf 1229A includes a command for providing summary data on the unit.

4.3.4.1. Status Command

Format of the entry for this command is <STATUS><ENTER>

4.4. RJ-45 Ethernet Control/Monitor Port

4.4.1. Configuration

The default IP address for the ***ptf*** 1229A Frequency Generator is 192.168.0.17. This address may be changed via the RS232 port or the front panel. The unit may also be set to acquire an IP address automatically by enabling its DHCP server.

Note: Before changing the IP address, the Netmask, or the Gateway, the Ethernet cable should be plugged in and connected to your network, otherwise the unit will appear to stop as the processor will be searching for network information that it cannot find.

If the Ethernet cable is plugged in after the unit powers up and dhcp was off and a zero IP, you must enter a valid IP and cycle power for the servers to start.

If the Ethernet cable is plugged in after the unit starts and there was a valid IP previously stored, then the servers will start without cycling power.

4.4.2. Command Set and Timeout Using Telnet Client

The TELNET interface is accessed through a TCP/IP connection to port 23. The command set is the same as for the RS232 interface.

There is also a timeout on the Telnet client set by command E44. The timeout value is entered in seconds, up to a maximum of 100,000. A value of 0 = no timeout.

4.4.3. Use with http client

When using an HTTP client such as Internet Explorer, the ***ptf*** 1229A Frequency Generator serves up an intuitive web page with the control and monitor functionality provided at the front panel and over the RS232 port.

When connected to a standard web browser (Microsoft Explorer) via the Ethernet interface the unit first does an authentication procedure. It will ask for a user name and password for access. The user name will always be admin, the password is whatever the unit password is at that time. After authentication the unit serves up the following web page.

PTF 1229A Web Interface

Enter the Command Number (Example E01)

If you leave the value empty, its current setting will be returned.

If you enter a value, you are setting that value for that command.

Refer to your manual for valid command numbers and their valid settings.

Or click this link Valid Commands

Command Number

Command Value

Submit

Clicking on the “Valid Commands” link will display a list of commands that are valid for use via the web browser. The commands available are shown on the next page.
:

Valid Web Browser Commands;

ptf Precise Time and Frequency, Inc.

Frequency Synthesizer Commands available via Http

Return to Command Page

Cmd	Read R Write W	Description	Min, Max or String Values
E01	R/W	Channel 1 Frequency	0 to 30,000,000
E02	R/W	Channel 1 Duty Cycle	-2000 to +2000
E03	R/W	Channel 2 Frequency	0 to 30,000,000
E04	R/W	Channel 2 Duty Cycle	-2000 to +2000
E05	R/W	Channel 3 Frequency	0 to 30,000,000
E06	R/W	Channel 3 Duty Cycle	-2000 to +2000
E07	R/W	Channel 4 Frequency	0 to 30,000,000
E08	R/W	Channel 4 Duty Cycle	-2000 to +2000
E09	R/W	Channel 1 Amplitude	0 to 9
E10	R/W	Channel 2 Amplitude	0 to 9
E11	R/W	Channel 3 Amplitude	0 to 9
E12	R/W	Channel 4 Amplitude	0 to 9
E13	R/W	Channel 1 Phase Change (nano seconds)	-999,999,999 to 999,999,999
E14	R/W	Channel 2 Phase Change (nano seconds)	-999,999,999 to 999,999,999
E15	R/W	Channel 1 Phase Change (nano seconds)	-999,999,999 to 999,999,999
E16	R/W	Channel 1 Phase Change (nano seconds)	-999,999,999 to 999,999,999
E17	R/W	Phase Direction	Adv or Ret (Advance/Retard)
E18	R/W	Auto Switch 1 Input (if fitted)	Primary or Backup
E19	R/W	Auto Switch 1 Mode (if fitted)	Auto or Manual
E21	R	Date(UTC)	
E22	R	Time(UTC)	
E29	R/W	Ip Address xxx.xxx.xxx.xxx	000.000.000.000 to 255.255.255.255
E30	R/W	Netmask xxx.xxx.xxx.xxx	000.000.000.000 to 255.255.255.255
E31	R/W	Gateway xxx.xxx.xxx.xxx	000.000.000.000 to 255.255.255.255
E32	R/W	DHCP Off or On	On or Off
E33	R/W	Password	Numbers only
E37	R/W	Serial Port Baud Rate	9,600, 19200, or 57600
E41	R/W	NTP update interval	0=No update, minimum 2 max 100000(seconds)
E44	R/W	Telnet Session Timeout Period	0=No Timeout to 100000 (seconds)
STATUS	R	Unit Version Capabilities and Status	
LOGOUT	R	Logout Telnet Session	
RESET	R	System Reset	

4.4.4. Network Time Protocol

The ***ptf*** 1229A includes an NTP client for automatic clock synchronization source to an NTP server on your network (e.g. ptf 3203A, ptf 3223A)..

4.5. Display Screens

4.5.1. Initialization: at initial turn-on, the unit displays an initialization screen with software version etc.

4.5.2. Post Initialization

After initialization the unit displays a basic frequency screen showing what the output frequencies of each channel are set to.

4.5.3. Status Screens

There are a number of status screens that are selected by pressing F1 and F2 from the frequency or menu screens. The user can move between status screens by using the front panel up/down keys
.

4.5.4. SETUP Menus

The parameters are setup by scrolling through the menus.

Conventions used in this manual are as follows:

< key description >	represents a key press
[xxxxxxxxxx]	represents data entry
(abcdefg)	description of display

<▲>	Up arrow
<▼>	Down arrow
<▶>	Forward arrow
<◀>	Back arrow

The <Down Arrow> scrolls to the next menu and the <Up Arrow> scrolls to the previous menu. Pressing the <menu> key at any time while in the main menu screens returns the user to menu 1.

While in any of the main menu screens, pressing <enter> allows the set-up parameters for that menu to be entered. The menus come in two basic forms, either numerical entry or selection of a mode from a list.

For numerical entry, once <enter> has been pressed from the main menu the parameter can be entered by using the keypad numerical keys. Once the correct number has been entered, pressing <forward arrow> will confirm the number entry and take the user to the next parameter. Pressing <enter> will accept the number and take the user back to the menu screen. Number selections can be cleared by pressing <back arrow>.

The following paragraphs describe the key functions while the user is within the different types of sub menus for data entry/parameter selection.

Edit Number sub menus

Use number keys 0 to 9 to enter number
Press <enter> to accept number
Press <back arrow> to backspace (clears last number entered)
Press F1 to enter negative numbers
Press F2 for decimal point
Press <up arrow> to return to previous menu
Press <menu> to cancel entry

NOTE: For negative numbers, enter the number first and then press F1 for the negative sign.

Note: for date, time, and IP entries the unit automatically “skips” over the slashes (for date), colons (for time), and decimal points (for IP data), once sufficient numbers have been entered.

Select from a list of options sub menus

Press <enter> to accept selected option/item
Press <forward arrow> to move to the next selection/item
Press <back arrow> to move to the last selection/item
Press <menu> to cancel
Press <menu> at any time to return to menu 1

5. Maintenance

5.1. Overview

The ***ptf*** 1229A Frequency Generator uses state-of-the art solid state and semi-conductor components.

All of the components are selected for their inherent high reliability, and as 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.

5.2. Keypad (optional)

When operating the front panel keypad, care should be taken not to use sharp objects for selecting the various functions as damage to the keypad can be caused.

The keypad is a replaceable item complete with the front panel overlay. If it becomes necessary to replace the keypad, the complete assembly must be replaced.

5.3. Vacuum Fluorescent Display

The vacuum fluorescent display has an MTBF of 20,000 hrs (approximately 2.25 years). For this reason the unit employs a special “blanking” function on the display. This function disables the display when not in use, to preserve display lifetime. If it becomes necessary to replace the display it is a straightforward operation as the display assembly is a plug in assembly, designed to be removed by undoing the four securing screws.

6. 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.

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

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Attn: Service Manager

Billing address is:

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Attn: Accounts