



**Frequency Synthesizer Communication Protocol  
(Model Number: PFS-1G20G)**

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## Introduction

**Model PFS-1G20G / PFS-18G40G / PFS-20G40G** is a low phase noise frequency synthesizer module designed and manufactured for standard test instrumentation, communication, and Radar systems as a local oscillator. The module covers a frequency range of 1 to 20 GHz or 20 to 40GHz with an exceptional low harmonics and spurious emissions as well as superior low phase noise performance. The model is externally referenced with internal reference backup. The frequency resolution of the module is up to 0.1 Hz below 15GHz. The phase noise of the oscillator is dependent on the quality of the reference source. The oscillator has a maximum spurious of -65 dBc. The oscillator has a built-in voltage regulator to further improve the signal quality and provide over voltage protection. The normal operating state of the oscillator is external referenced. This module can be directly controlled with digital signals through Micro-D connector (RS-232 protocol) for system development and integration.

This document intends to give the instructions for PFS-1G20G / PFS-18G40G / PFS-20G40G operations by using communication protocol.

# Serial Communication Protocol

## 1. Asynchronous Serial Port Configuration

Baud Rate	Start Bit	Data Frame	Parity Bit	Stop Bit
115200bps	1 bit	8 bits	NA	1 bit

## 2. Command Format

Format	Number of Bytes	Description
Header	1	Command begins with 0xAA
Module Number	1	0x55, broadcasting
Command Index	1	Refer to command summary
Data Length	1	Number of data bytes
Data	Variable Length	MSB first
Parity	1	XOR output of all other bytes

## 3. Command Summary

Command Index	Data Length	Data	Note	Data Transmission
0x00	1 byte	1. 0x01 Product Version; 2. 0x02 Frequency and Power; 3. 0x04 Temperature; 4. 0x05 Reference Clock; 5. 0x06 Lock and Output Status;	Check Status	PC->SYN
0x05	8 bytes	6 bytes (Frequency, unit 0.1Hz) 2 bytes ( power level, reserved, need any 2 bytes here)	Frequency and Attenuation	PC->SYN
0x10	8 bytes	2 bytes (Production Date) 2 bytes (Project Number) 2 bytes (Product ID) 2 bytes (Software Version)	Check Product Version	SYN->PC

0x11	9 bytes	1 byte (0x05) 6 bytes (Frequency, unit 0.1 Hz) 2 bytes (Power, unavailable in LFS32)	Check Frequency and Power	SYN->PC
0x13	2 bytes	Signed integer, 0.0625°C/unit	Check Temp	SYN->PC
0x14	1 byte	1. 0x01 Using Internal Reference Clock 2. 0x00 Using External Reference Clock	Check Reference Clock	SYN->PC
0x15	1 byte	0x00(Internal OCXO unlocked and output unlocked) 0x01(Internal OCXO unlocked but output locked) 0x02(Internal OCXO locked but output unlocked) 0x03(Internal OCXO locked and output locked)	Check Lock and Output Status	SYN->PC
others	RESERVED	RESERVED	RESERVED	RESERVED

### 3. Serial Communication Process

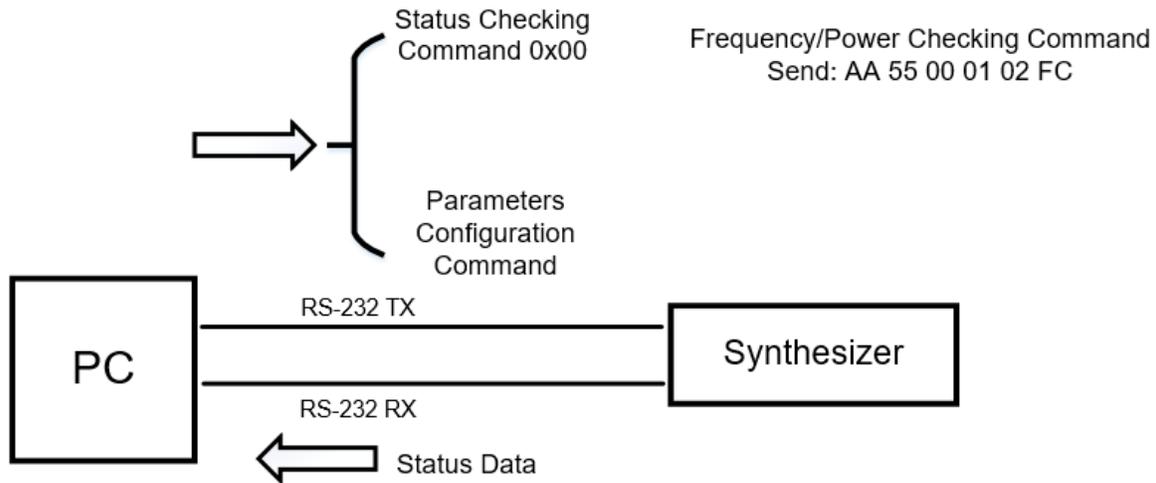


Fig. 1 Communication between PC and synthesizer

When PC sends parameter setup command through RS-232 TX pin to the synthesizer, the synthesizer will calculate the parameters and generate waveforms as required. When PC sends status check command to the synthesizer, the synthesizer will read the requested status data and send a command back to the PC through RS-232 RX pin. The communication between PC and synthesizer is illustrated in Fig. 1. Note that all the commands sent by both PC and synthesizer follow the same command format.

To operate the synthesizer, there are three steps,

1. Power on the synthesizer. The default operating frequency is 10 GHz, power level is 10 dBm, and output is on.
2. Configure the operating frequency and power level. For example, if the synthesizer is configured to generate CW waveform with frequency of 1 GHz, PC sends command below to the synthesizer,

**AA 55 05 08 00 02 54 0B E4 00 05 DC 92**

where AA (Header) 55(Module Number) 05(Command Index) 08(Command Length) 00 02 54 0B E4 00(Freq Data) 05 DC(Power Data, any 2 bytes, no use but need) 92(Parity).

If the operating frequency is 8 GHz, the command is

**AA 55 05 08 00 12 A0 5F 20 00 06 40 79**

3. Check the status of synthesizer.
  - 3.1 Current frequency check, PC sends command below to the synthesizer:

**AA 55 00 01 02 FC**

where AA (Header) 55(Module Number) 00(Command Index) 01(Command Length) 02(Check Frequency and Power Data) FC(Parity)

will get the response from synthesizer like below:

**AA 55 11 09 05 00 2E 90 ED D0 00 05 DC BF**

where AA (Header) 55(Module Number) 11(Command Index, response to frequency and power check ) 09(Command Length) 05(Data, coincident with the set frequency and power command) 00 2E 90 ED D0 00 (Frequency Data, unit in 0.1Hz, 0x002E90EDD000 translate in decimal is 200000000000, so the current frequency is 200000000000\*0.1 = 20000000000Hz = 20GHz) 05 DC (Power Data, nonsense in LFS32)BF(Parity)

3.2 Current temperature check, PC sends command below to the synthesizer:

**AA 55 00 01 04 FA**

will get the response from synthesizer like below:

**AA 55 13 02 01 E0 0F**

where AA (Header) 55(Module Number) 13(Command Index, response to temperature check ) 02(Command Length) 01 E0 (Temperature Data, unit in 0.0625°C, 0x01E0 translate in decimal is 480, so the current temperature is 480\*0.0625 = 30°C) 0F(Parity)

3.3 Current REF clock check, PC sends command below to the synthesizer:

**AA 55 00 01 05 FB**

will get the response from synthesizer like below:

**AA 55 14 01 01 EB**

where AA (Header) 55(Module Number) 14(Command Index, response to REF clock check ) 01(Command Length) 01 (REF clock, 01 means internal REF)EB(Parity)

3.4 Current lock status check, PC sends command below to the synthesizer:

**AA 55 00 01 06 F8**

will get the response from synthesizer like below:

**AA 55 15 01 01 EA**

where AA (Header) 55(Module Number) 15(Command Index, response to lock status check ) 01(Command Length) 01 (lock status, 01 means internal REF is unlocked to the external REF but the output is locked to the internal REF)EA(Parity)