

Programmable RF Signal Generator

# **DPL-3.2GXF**

## **User's Manual**

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DPL-3.2GXF is a wide band synthesizer utilizing 48 bit DDS(Direct Digital Synthesizer) and PLL(Phase Locked Loop) technique. It provides pure sine wave signal output from 5MHz-3.2GHz in 0.001Hz steps. The stable output level has been achieved in the range of -40dBm-+14dBm with ALC function. DPL-3.2GXF is having internal 10MHz clock reference and might be used as not only a stand-alone synthesizer but also the clock source for embedded system. In case the accurate 10MHz clock is available externally, the frequency stability can be improved. Parameter settings such as frequency, output level and so on can be controlled by serial data which is connected to PC communication port and can be memorized into EEPROM. An optional board , FIX-3.2GX is available to control any settings without using a PC.

## ■ Specification

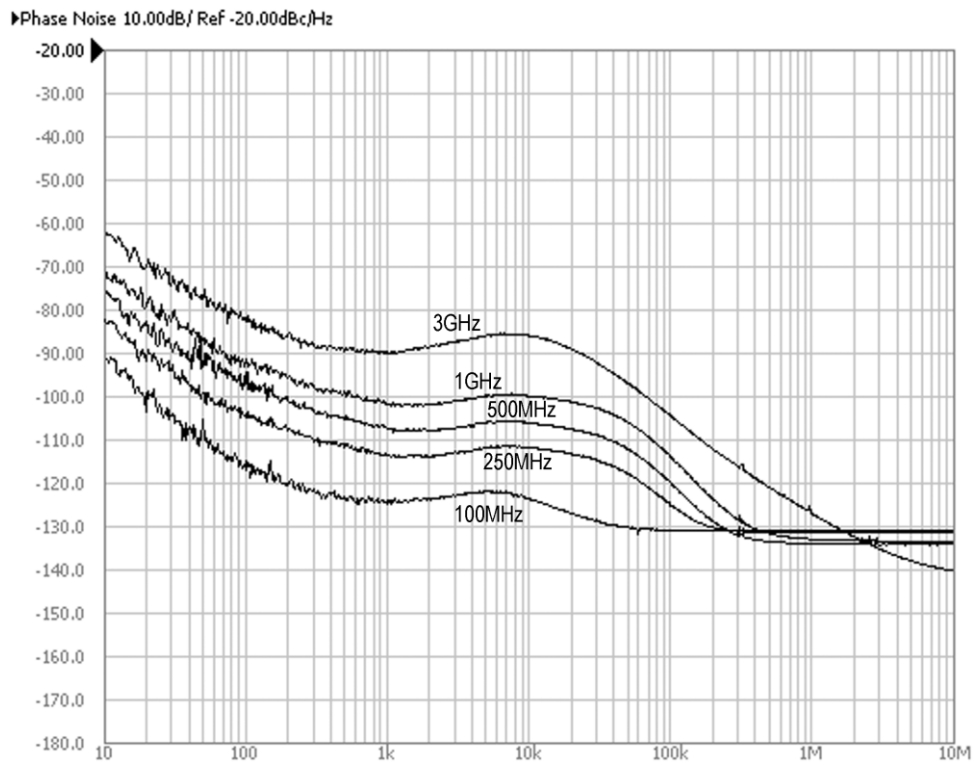
Power supply	+4.75V ~ +7V 1.5A
**Be careful with voltage drop of power supply line. If the supply voltage at power input terminal is lower than 5V, the maximum output level and spurious would be worse.	
Frequency range	5MHz ~ 3200MHz
Frequency resolution	0.001Hz
Output level	+14dBm ~ -40dBm
RF OFF output level	-60dBm or less
Output level accuracy	± 1dB or less(output level -30dBm or more) ± 2dB or less(output level from under -30dBm ~ -40dBm exclusive)
Output level resolution	0.1dB
Phase offset range	-360.0° ~ +360.0°
Phase offset resolution	0.1°
Output impedance	nominal 50 Ohm
Spurious	-60dBc or less

Harmonic spurious	-30dBc or less (When the output level is from +10dBm to -30dBm, and supply voltage is from 5V to 7V)
Internal reference clock	
Frequency accuracy	+/-2.5ppm or less(0 ~ +50 degree C)
Long term frequency stability	+/-1ppm or less per year
External reference input	
Frequency	10MHz
Input level	+6dBm( $\pm 3$ dB)
Impedance	50 Ohm
Interface	
Type	Asynchronous serial data RS-232C Use a straight cable for PC serial port
Connector	D-Sub 9 pin
Setting time	frequency: max 76mS Amplitude: max 1mS
Environmental condition	
Operating temperature range	0 ~ +50 degree C
Dimension	W100xH35xD100(mm)
Weight	300g

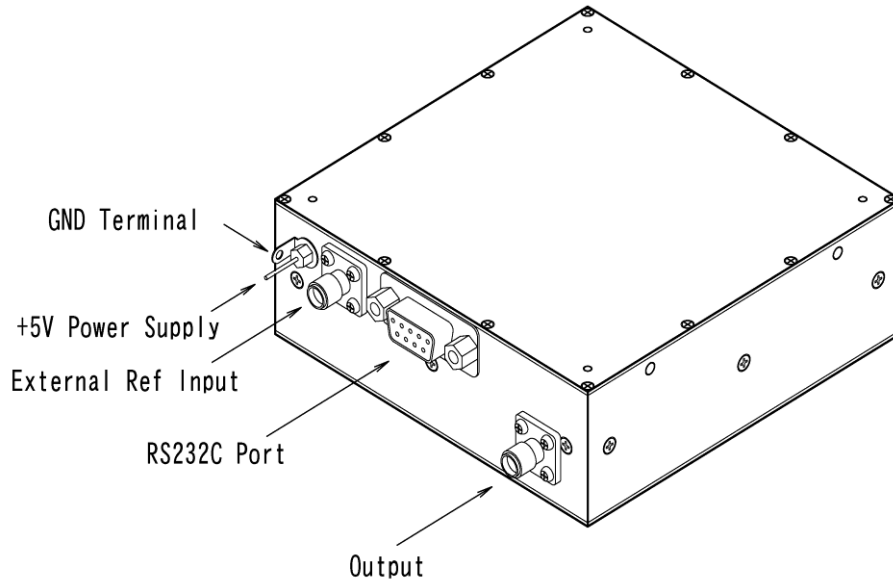
■ Phase Noise (Typical) under the internal reference clock mode

(Unit is in dBc)

Freq. [Hz]	Offset from Carrier [Hz]						
	10	100	1K	10K	100K	1M	10M
3G	-61.8	-82.7	-89.9	-86.0	-104.5	-127.3	-140.2
1G	-71.6	-93.3	-101.8	-99.8	-113.7	-133.0	-133.6
500M	-78.1	-98.8	-107.8	-106.0	-119.8	-134.0	-134.2
250M	-84.0	-105.3	-113.5	-111.8	-124.8	-131.5	-131.4
100M	-91.4	-115.6	-123.4	-123.2	-130.6	-131.0	-131.0

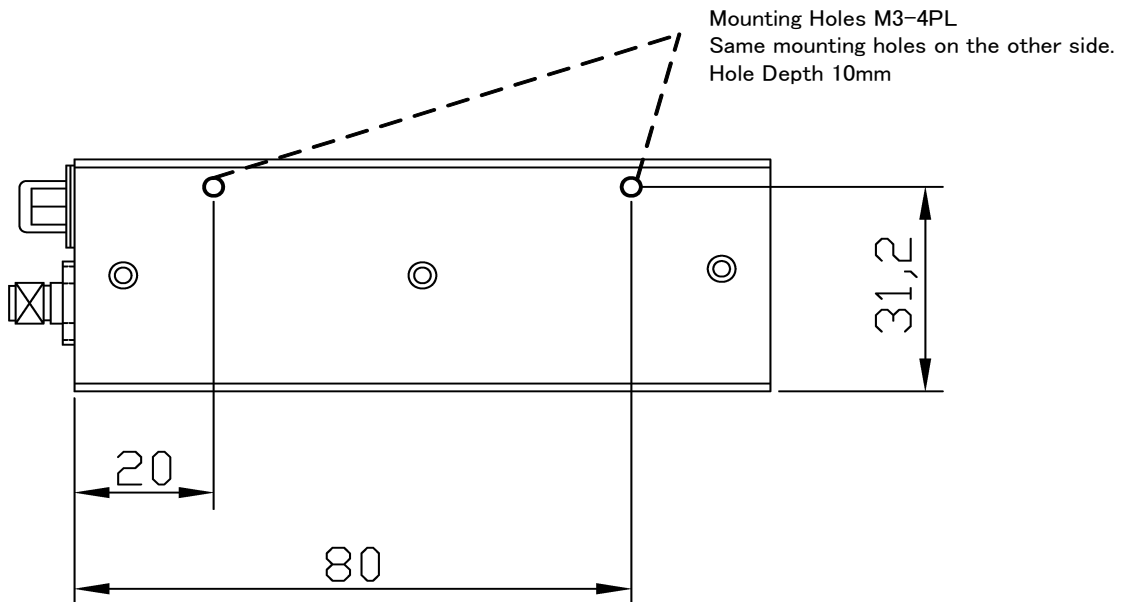
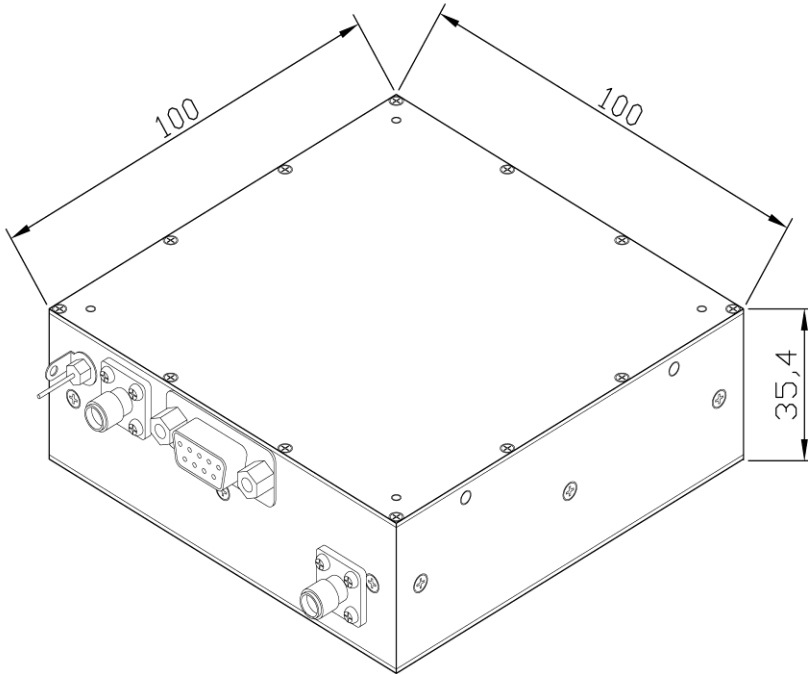


## ■ Terminal



1. 5V Power supply terminal  
Connect +5V  $\pm 5\%$  the power supply having more than 1.5A current capacity .
2. Ground terminal  
Connect the ground of the power supply  
(Caution: Do not touch + side of the power supply to the ground. To use a heat shrinking tube is recommended for its protection)
3. External reference clock input terminal  
Apply 10MHz reference clock to this connector (SMA) which has 50 Ohm input impedance. The external clock mode must be selected.
4. RS-232C port  
This is a connector for serial communication for setting frequency and output level and so on. Interface is RS-232C. Use a D-sub9 pin(male)connector and a straight cable for PC serial port.
5. Output port  
This is a connector of output signal. Use SMA (male)connector.

■ Outline Dimension



■ RS-232C port communication condition

Type of communication	Asynchronous serial data
Interface Level	RS-232C
Communication speed	9600BPS
Data length	8 bit
Stop bit	1 bit
Parity	none
Flow control	none

9 pin D-Sub pin assignment

Pin#	Signal name	Signal direction	Remarks
1	CD	DPL → terminal	Not used
6	DSR	→	Connected to DTR internally
2	RD	→	
7	RTS	←	Connected to CTS internally
3	TD	←	
8	CTS	→	Connected to RTS internally
4	DTR	←	Connected to DSR internally
9	RI	→	PLL unlocked signal
5	GND	←→	

Pin#9 is an open drain output and used as a PLL unlocked signal.

When PLL is locked : Low(Short to GND)

When PLL is unlocked : High(Open)

Please refer to the above table to set serial communication parameters of your terminal software. Any communication software such as Hyperterminal can be used.

■ How to control

The following message is returned when DPL-3.2GXF is powered on.

```
DPL-3.2GXF  V1.0  Firm V1.0

MAIN MENU
F_xx _____ Frequency SET
A_xx _____ Output Level SET
P_xx _____ Phase Offset SET
ON _____ Output ON
OFF _____ Output OFF
SAVE _____ Frq&Level SAVE
SUB _____ SUB MENU ENTRY
STS _____ STATUS
HELP _____ MAIN MENU CONTENTS
```

```
SYSTEM STATUS
Frequency = 1 234 567 890.123 [Hz]
Output Level = 0.0 [dBm]
Phase Offset = +0.0 [Deg]
Output = ON
PLL LOCKED
10MHz Base Clock Source = Internal
External Clock Synchronize = OFF
*
```

This is just an example.  
The status depends on how the unit is set

After the prompt “\*” (2Ahex) is returned, commands can be entered. There are two modes in command menu, main menu mode and sub menu mode. Frequency and output level setting can be done in main menu mode. System setting command such as setting 10MHz clock source can be done in sub menu mode. Enter space code (20hex) after each command to set a value, then enter return key (0Dhex) as a delimiter.

When ECHO BACK is set ON, entered codes are returned with return code (0Dhex) and line feed code (0Ahex)

When ECHOBACK is set OFF, only “\*” (2Ahex) is returned.



■ Main menu mode

<b>MAIN MENU</b>	
F_xx _____	Frequency SET
A_xx _____	Output Level SET
P_xx _____	Phase Offset SET
ON _____	Output ON
OFF _____	Output OFF
SAVE _____	Frq & Level SAVE
SUB _____	SUB MENU ENTRY
STS _____	STATUS
HELP _____	MAIN MENU CONTENTS

1. F command      Frequency setting

The frequency setting has four formats, GHz unit input, MHz unit input, KHz unit input and Hz unit input. Add “G”, “M”, “K” after the setting value for distinguishing the unit. A GHz unit can be set maximum 12 digits following decimal point, and also, a MHz unit maximum 9 digits, a KHz unit maximum 6 digits, Hz unit maximum 3 digits. When DPL-3.2GF received the data correctly, it returns “\*” (2Ahex) as a prompt which means the frequency setting is completed. When the data received incorrectly or some errors occurred during the transfer, “ERROR-“, the type of error and “\*” (2Ahex) code is returned. After that “\*” (2Ahex) code is returned, then you can enter new command . This is the case ECHO BACK is set ON. When ECHO BACK is set OFF, “?” (3Fhex) is returned instead of “\*” code. The message “ERROR-“ and the type of error are not returned. Each time the frequency data is set continuously, be sure “\*” (2Ahex) is returned after each command.

\*\* Please note that even if the frequency of beyond the 3.2GHz was set, it would be accepted but the quality of the signal would not be guaranteed.

Here are some examples how to set frequencies.

How to set on GHz unit

\*\* Please note that under score”\_” means SPACE (20hex) and (CR) means return code (0Dhex).

3.2GHz	<b>F_3.2G(CR)</b>
1.234567890123GHz	<b>F_1.234567890123G(CR)</b>

How to set on MHz unit

100MHz	<b>F_100M(CR)</b>
123.456789123MHz	<b>F_123.456789123M(CR)</b>

How to set on KHz unit

20,000KHz	<b>F_20000K(CR)</b>
123,456.789KHz	<b>F_123456.789K(CR)</b>

How to set on Hz unit

1,000,000,000.000Hz	<b>F_1000000000(CR)</b>
1,234,567,890.123Hz	<b>F_1234567890.123(CR)</b>

How to confirm the setting value

**F(CR)** or **F\_?(CR)**

2. A command ----- Output level setting

Enter a desired output level, following A and space. The setting value can be set in dBm unit with decimal point. 0.1dB digit can be allowed but if omitted, it is assumed as 0.

“+” (2Bhex) expression can be omitted but “-“(2Dhex) must be entered.

When the received data is correct and the output level setting is completed, it returns “\*” (2Ahex) code as a prompt. When the data received incorrectly or some errors occurred during the transfer, it is returned “ERROR-“, the type of error and “\*” code (in case ECHO BACK is set ON). When ECHO BACK is set OFF, only “?” is returned. Each time the output data is set continuously, make sure whether “\*” (2Ahex) code is returned, and then set the new data.

\*\* Please note that even if the output level of beyond the +14dBm was set , it would be accepted but the output level accuracy would not be guaranteed.

+10dBm	<b>A_10(CR)</b>
-0.5dBm	<b>A_-0.5(CR)</b>

How to confirm the setting value of output level data

**A(CR)** or **A\_?(CR)**

3. P command ----- Phase Offset setting

Enter a desired phase offset value, following P and space. The setting value can be set in degree(°) unit with decimal point. 0.1degree digit can be allowed but if omitted, it is assumed as 0. “+” (2Bhex) expression can be omitted but “-“(2Dhex) must be entered.

The received data is correct the phase offset setting is completed, it returns “\*” (2Ahex) code as a prompt. When the data received incorrectly or some errors occurred during the transfer, it is returned “ERROR-“, the type of error and “\*” code (in case ECHO BACK is set ON). When ECHO BACK is set OFF, only “?” is returned. Each time the phase offset data is set continuously, make sure whether “\*” (2Ahex) code is returned, and then set the new data.

[Example]

+90° P\_90(CR)  
-0.5° P\_-0.5(CR)

How to confirm the setting value of phase offset data

P(CR) or P\_?(CR)

[Example]

+45° +45.0[Deg]

4. ON command ----- output ON

Your setting frequency or output level will be output.

5. OFF command----- output OFF

Output is shut off.

6.SAVE command-----to memorize the setting value

The current frequency and output level can be memorized.

IF this command is completed, “Done” and “\*” were returned.

When the power is on next time, the stored data can be output.

7. SUB command ----- to select to the sub menu mode

Enter “EXIT(CR)” to back to main menu mode.

8. STS command-----To get the current status

The current frequency, output level, phase offset, output status, power supply voltage,

PLL status, 10MHz reference signal source will be returned.

For example,

**SYSTEM STATUS**

Frequency = 1 234 567 890.123 [Hz]  
Output Level = 0.0 [dBm]  
Phase Offset = +0.0[Deg]  
Output = ON  
System Power Voltage = 4.96 [V]  
PLL LOCK  
10MHz Standard Clock Source = Internal  
External Clock Synchronize = OFF

9. HELP command -----To get the menu help message.

The menu for all commands is displayed.

■ Sub menu mode for system setting

```

SUB MENU
CSEL ----- 10MHzClock Source Select
CLK ----- 10MHzClock Adjust
ONOFF ----- Power on Output ON/OFF Set
CS ----- External Clock Synchronize ON/OFF set
ECHO ----- ECHO ON/OFF Set
EXIT ----- SUB MODE EXIT
HELP ----- SUB MENU CONTENTS

```

SUB\*

Note: In this mode, “SUB\*” is returned instead of “\*”.

1. CSEL command ----- Internal or external clock mode can be switched with this command.

**10MHz\_Standard\_Clock\_Source\_Select**

```

In case, Internal Clock Source — put 'I' Key
In case, External Clock Source — put 'E' Key
In case, Exit ————— put 'X' Key

```

Note: The data input here will be memorized automatically.

2. CLK command -----To adjust the internal reference clock.
  1. First, confirm whether the current clock mode is internal mode with using STS command. If not, change to internal clock mode with CSEL command
  2. Connect the unit to a high resolution frequency counter and set a frequency.
  3. Enter “CLK” command, and the message is displayed as below.

**Internal\_10MHz\_Standard\_Clock\_Adjust**

```

'U' 'u' / 'D' 'd' key — Clock Adjust
'S' Key — Save
'X' Key — Exit
1840 (This number is just an example with no meanings)

```

Adjust the frequency by entering the following character till the frequency is given the right one on Frequency Counter.

```

“u” : To step the frequency up finely
“d” : To step the frequency down finely
“U” : To step the frequency up coarsely
“D” : To step the frequency down coarsely

```

4. Enter “S” for saving the setting value.
5. Enter “X” for exiting this CLK command.

3. ONOFF command-----To set output ON or OFF in case of setting the power on.

**Power on Output State**

In case, **Power on - Output ON** —— press '1' Key  
In case, **Power on - Output OFF** —— press '0' Key  
In case, **Exit** ————— press 'X' Key

Note: This setting is memorized automatically.

4. CS command-----To set an external clock phase synchronous

**External clock synchronize ON/OFF set**

In case, **synchronize ON** -----press '1' key  
In case **synchronize OFF** -----press '0' key  
In case **Exit** -----press 'X' key

Note: This setting is memorized automatically.

5. ECHO command -----To set ECHO BACK

**Echo Back ON/OFF set**

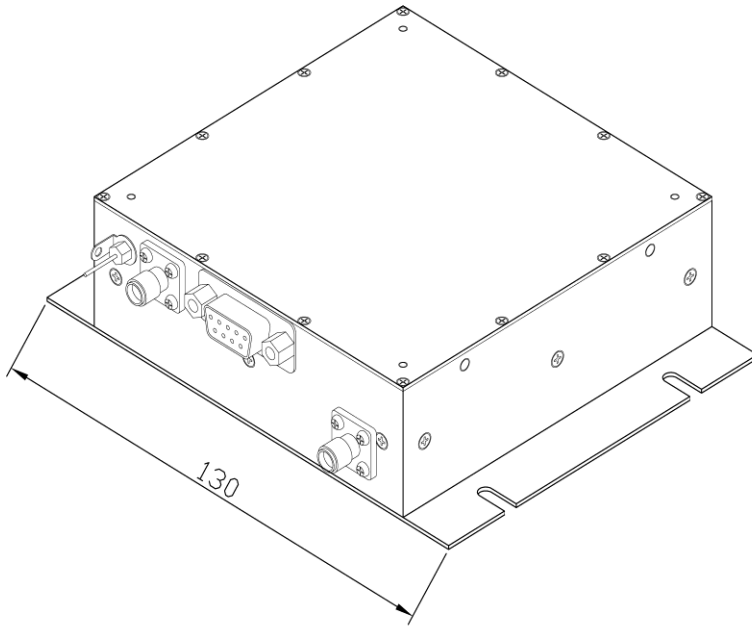
**ECHO ON** —— press '1' Key  
**ECHO OFF** —— press '0' Key  
**Exit** —————press 'X' Key

Note: This setting is memorized automatically.

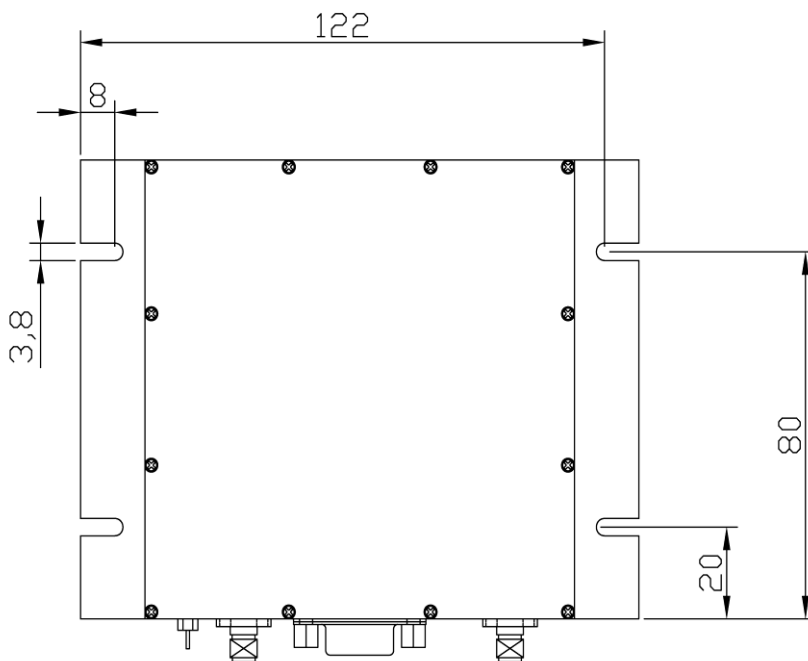
6. EXIT command -----To end sub menu mode and return to Main mode.  
7. HELP command ----- To get the sub mode menu help message.

■ Option -----Flange Type Case

Outline Dimension



Dimension of mounting holes



■ Cautions

1. Use the low noise power supply. When the switching power supply is used, use a noise filter to reduce switching noise from the power supply.
2. In external clock mode, use the external 10MHz clock having the frequency accuracy of less than +/-3ppm.
3. Pay attention airflow and thermal resistance when embedded to prevent not to raise temperature of the unit.

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