

Evaluation board manual

-MB1500EB00-

-MB1500EB00A-

Serial data programming tool

For PLL Frequency synthesizer



THE POSSIBILITIES ARE INFINITE

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INTRODUCTION

This evaluation tool is designed to demonstrate the operation of the FUJITSU MB15xxx series PLL frequency synthesizers.

It will allow the user to investigate the operation capability of the PLL IC and modify the loop parameters for optimal performance.

CHAPTER1. HARDWARE DESCRIPTION

1 HARDWARE SETUP

This programming tool enables you to control the FUJITSU PLL frequency synthesizers via a personal computer. The personal computer is connected to the evaluation board via a parallel port. The installed programming software generates signals that are sent directly to the evaluation board or through the interface board. In case of using the cable, the amplitude of these signals is converted to a lower level on the evaluation board prior to reaching the PLL IC. In case of using via the interface board, it is unnecessary to convert the amplitude of the signal. The amplitude of the signal is lower through interface board, moreover the trigger delay can be arranged on the interface board.

Fig1.1 Hardware construction using the cable, MB1500EB00A. (Image)

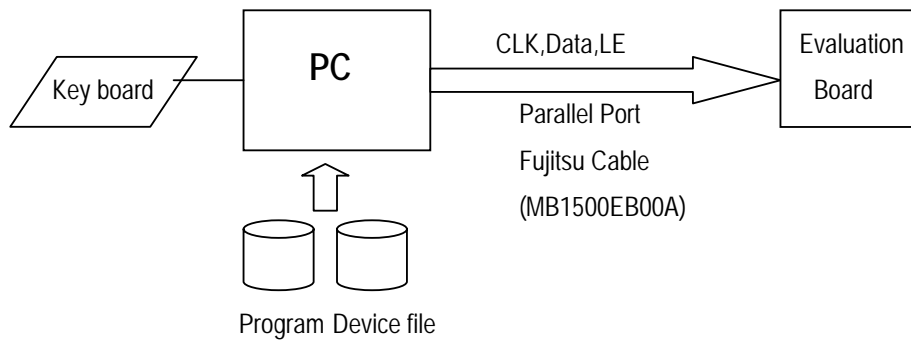
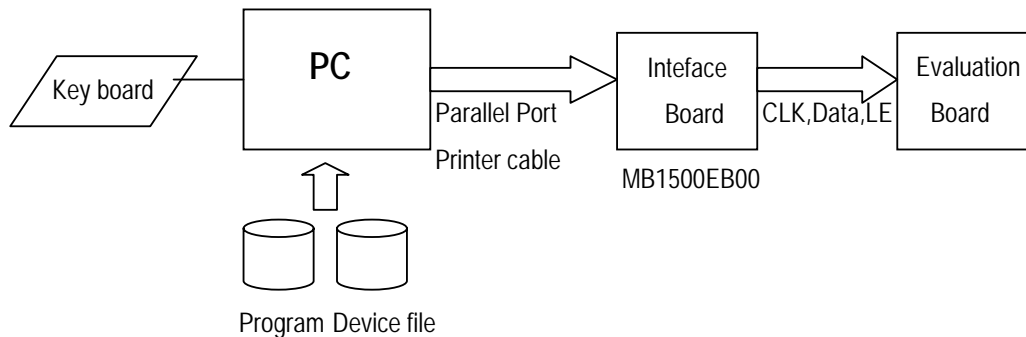


Fig1.2 Hardware construction using the interface board, MB1500EB00 (Image)

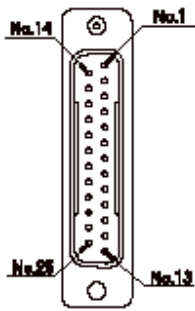


2 THE CABLE, MB1500EB00A CONFIGURATION

In case of using the cable, you can connect the parallel port to the evaluation board directly.

2.1 Information on the connector pins

The personal computer and the PLL evaluation board are connected with a cable. The connector should be a 25-pin (D-SUB) connector for the personal computer's printer port. Several of the connector pins correspond to the CLK, Data, LE, GND and the trigger of the measurement equipment. This correspondence is shown in the following table.



D-SUB 25-pin connector	Fujitsu original connector (MB1500EB00A)	
3	P2	1 Clock (White)
2		2 Data (Blue)
4		3 LE (Yellow)
20,21,22	P3	1 GND (Black)
5	P4	1 Trigger (BNC connector)
18,19		2 GND for equipment (BNC connector)

2.1.1.Data output pin

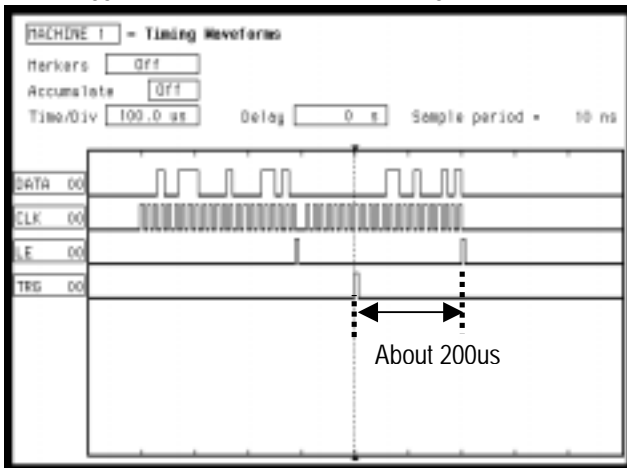
Connect the three wires (white, blue and yellow) connector to the data input pins on the evaluation board.

2.1.2.Trigger output pin (BNC Connector)

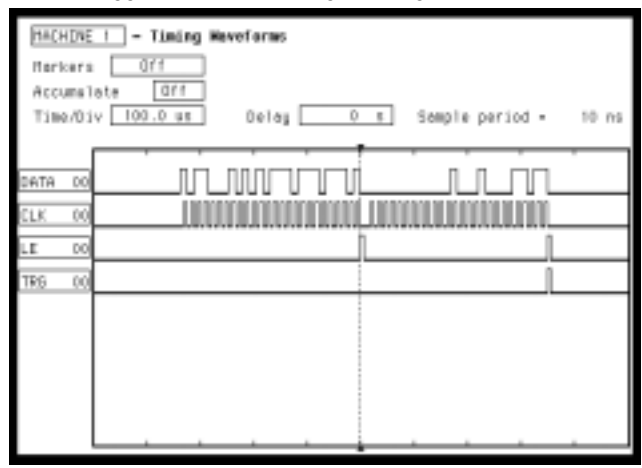
The connector should be connected to a measurement equipment such as a modulation domain analyzer. The trigger signal is outputted through this connector. The logical level of the trigger signal is a positive pulse. The timing is as follows:

The trigger is outputted about 200us before the LE rises or the same time as LE rises. You can select the timing of the trigger on the software program. In case of selected the delay about 200us, the exact time is depended on the PC being used.

The trigger rises about 200us before rising LE



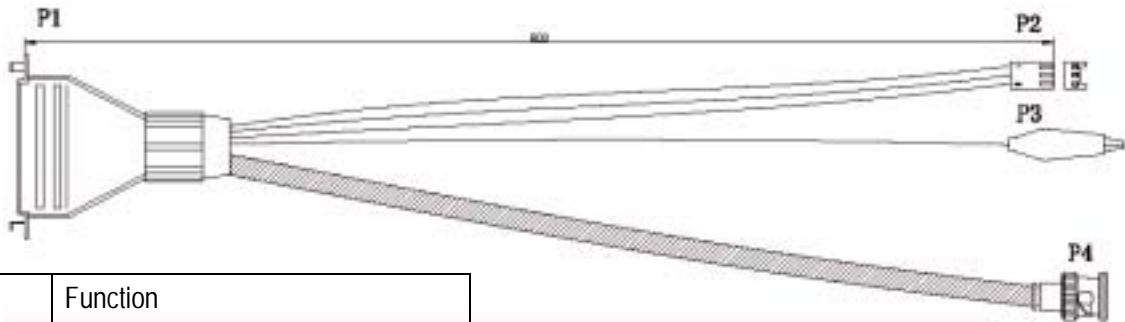
The trigger rises same timing as rising LE



2.1.3.GND pin

Connect to ground on the evaluation board.

2.2. Cable description

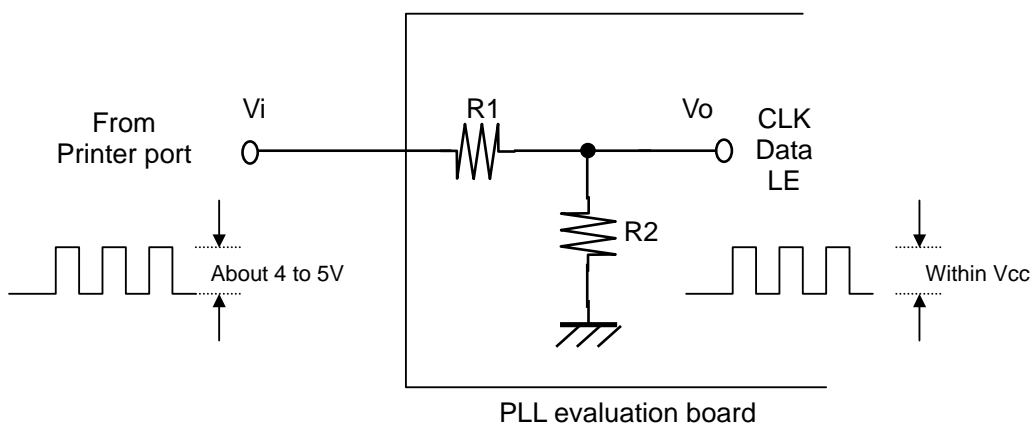


Symbol	Function
P1	D-SUB 25-pin Connector
P2	CLK,Data,LE Connector
P3	GND
P4	Trigger (BNC connector)

2.3. Dealing with the interface to the evaluation board

The Clock, Data and LE output level from PC is about 4V to 5V and it must be reduced to a lower level prior to reaching the PLL IC.

The input voltage must be within the supply voltage range of the PLL IC. The specification of the supply voltage for most of the Fujitsu PLL ICs is 3.6V or less. To reduce the input voltage, a simple voltage divider is used.



$$V_o = R_2 / (R_1 + R_2) \times V_i$$

Example :

$V_i = 4.0V$ (from PC), $V_o = 2.5V$ (To CLK, Data and LE)

In case of $R_2 = 2k\Omega$

$$R_1 = (V_i - V_o) R_2 / V_o$$

$$R_1 = (4 - 2.5) 2k / 2.5 = 1200 \approx 1.2k\Omega$$

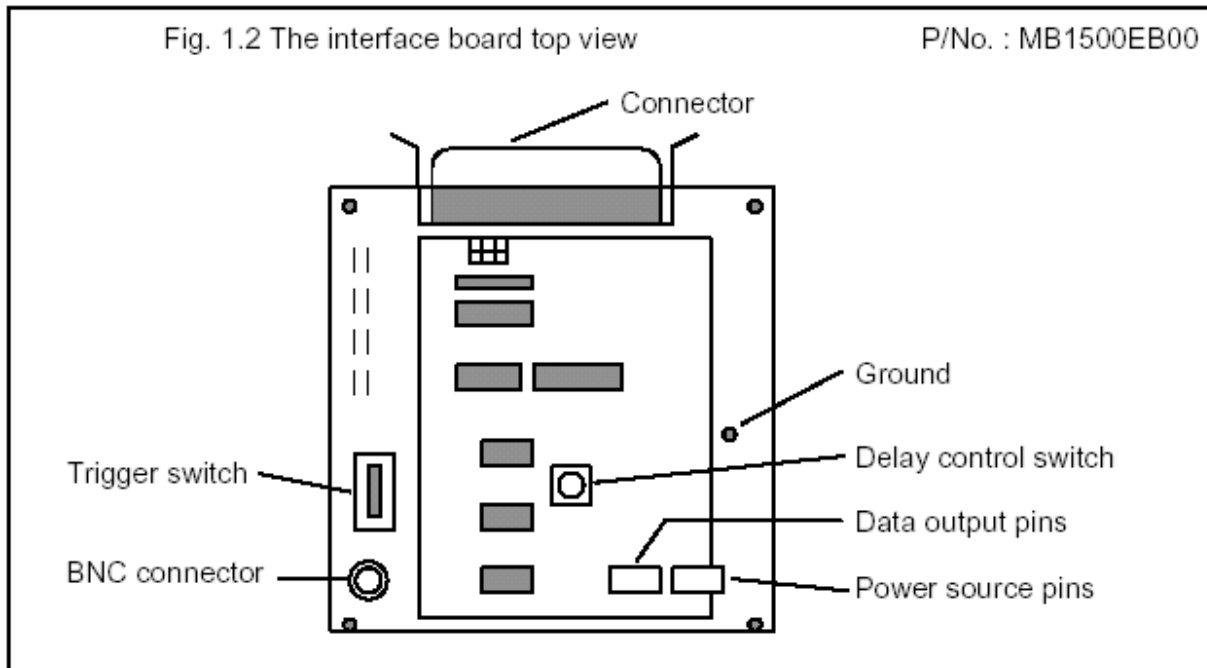
3. THE INTERFACE BOARD, MB1500EB00, CONFIGURATION

In case of using the interface board, you connect the parallel port to the evaluation board through the interface board.

The printer cable between PC and the interface board is needed. Fujitsu does not support it, so please prepare it.

You can arrange the delay time or the polarity of the trigger signal. And don't need the arrange of the amplitude of the signals,

3.1 Interface board description

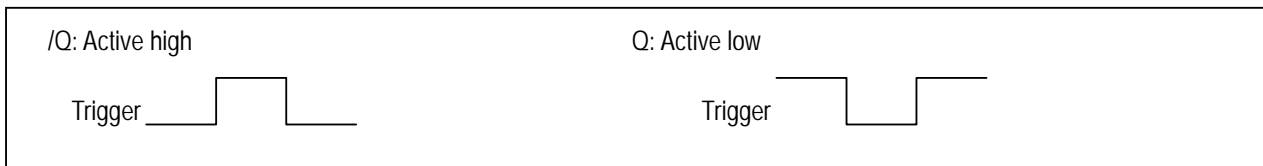


3.1.1.Connectors

The personal computer and the interface board are connected with a printer cable. The connector should be have 25pin DSUB connector for the personal computer's printer port and 36pin connector for the interface board. Fujitsu does not support it.

3.1.2.Trigger Switch

Logical level of the trigger signal can be switched by the trigger switch.



3.1.3.BNC Connector

The connector should be connected to a time interval analyzer. A trigger signal is output through this connector.

3.1.4.Data Output pin

Connect one side of the three wire(white, blue and yellow) connected to the data output pins on the interface board.

The other side is connected to the data input pins on the evaluation board.

3.1.5.Power source pin

Connect two wire(red and black) connector to the power source pins, and the other side to ground and Vcc respectively.

(Vcc=3V to 5V(needs to be as same as supply voltage for the IC))

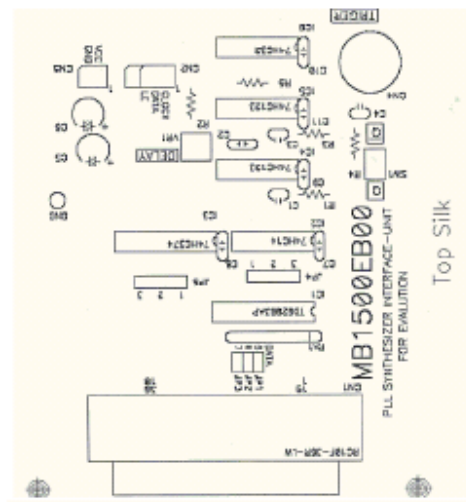
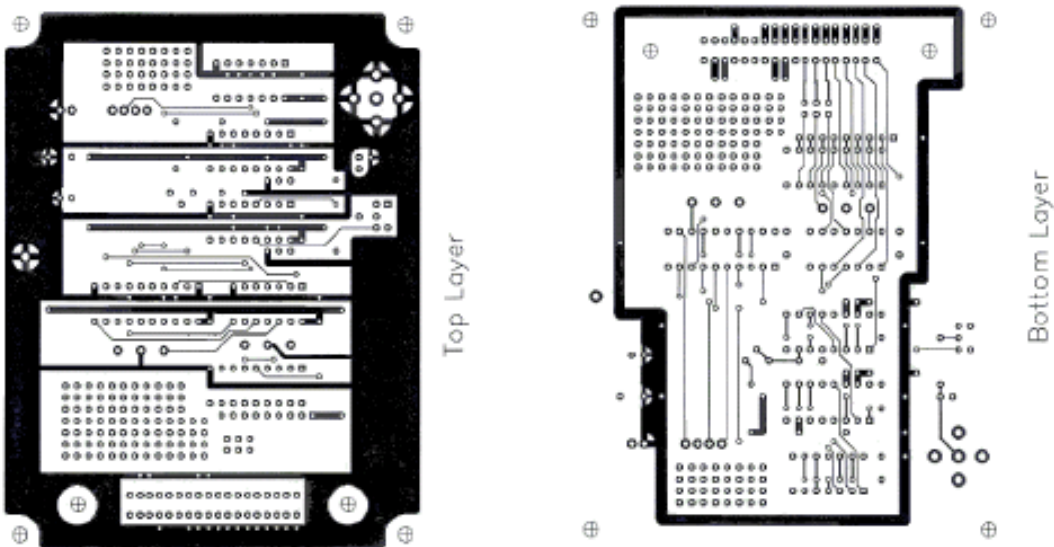
3.1.6.Ground pin

Connect to ground. Need to share ground of the evaluation board with the interface board.

3.1.7.Delay control trimming

Trim the delay time of the trigger signal. The time depends on the personal computer.

3.2. Interface board layout



CHAPTER2.SOFTWARE DESCRIPTION Ver411

1 OVERVIEW

This evaluation tool is designed to demonstrate the operation of the FUJITSU MB15xxx series PLL frequency synthesizers. It will allow the user to investigate the operation capability of the IC and modify the loop parameters.

2 USER ENVIRONMENT

OS: Windows 95, 98, Me

Windows NT4.0, 2000, XP (The user should have manager's permission prior to executing the software.)

3 CONTENTS

Program contents

FJ PLL.exe : Execution file to evaluate PLL series
FjPLL.vxd : Virtual device driver
Fjpll.sys : Kernel driver

Device files

The individual PLL device files are in the sub-directory "LIB". It is located under the same directory as the FjPLL.exe file. Do not change the name of the "LIB" sub-directory.

Applied device

Single PLL	MB15A01, MB15A02 MB15C02, MB15C03 MB15E03/L/SL, MB15E05/L/SL, MB15E06, MB15E07/L/SL
Dual PLL	MB15F02/L/SL, MB15F72SP/UL, MB15F03/L/SL, MB15F73SP/UL, MB15F04, MB15F05/L, MB15F07SL, MB15F08SL, MB15F78SP/UL, MB15F74UL, MB15F76UL, MB15F83UL, MB15F86UL MB15F88UL, MB15U30SP

4. SETUP

This programming tool consists of the Fujitsu cable connector or the interface board, a PLL evaluation board and the programming software. The Fujitsu cable connector or the interface board is not absolutely necessary for the evaluation set up. If you can make the cable such as FJ original cable, it is available for the software.

1. Connect a parallel cable or the connector of the interface board with a printer cable to a printer port of a personal computer.
2. Connect the data pin, CLK(3pin), Data(2pin), LE(4pin) and GND pin(20,21,22pin) from the connector to the CLK, Data, LE pins and GND on the evaluation board.
3. Insert the floppy disk into the floppy disk drive on the personal computer, or down load it from web site into the personal computer.

The discrimination of the connection between the cable(MB1500EB00A) and the interface board(MB1500EB00) is automatically.

5. HOW TO USE THE PROGRAM

5.1 Starting the program

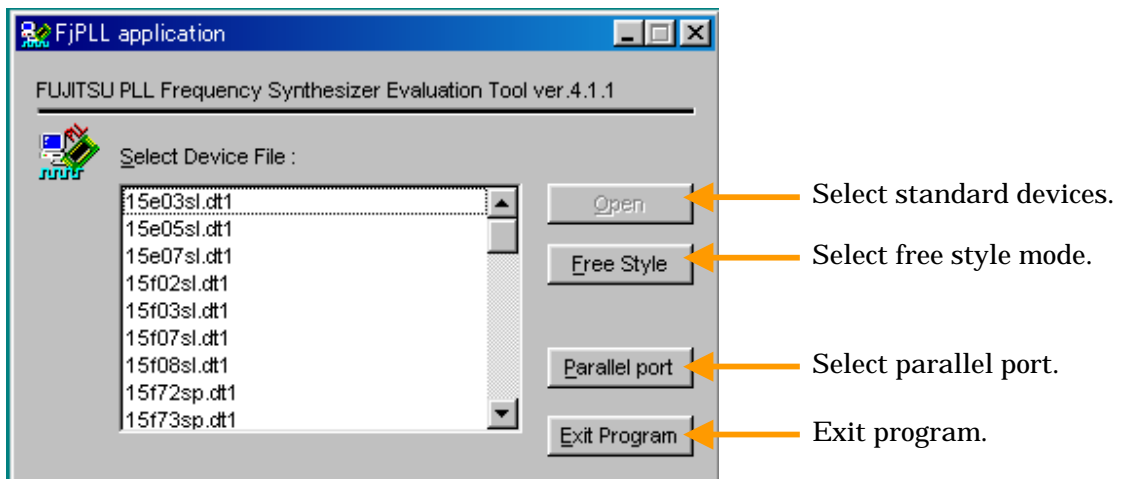
Double click "FJPLL.exe" to run the program. If there is no printer port on the personal computer, the following message will appear and the program will not run.



5.2 Setting the test conditions

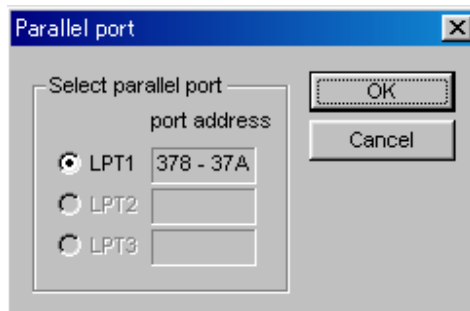
The following window is opened after executing the FjPLL.exe file.

5.2.1. Click the "Exit Program" button if you wish to quit the program.



5.2.2. Click the "Parallel port" button and select a usable port .

Most of the time only one port will be available, as shown below. However, you can select any valid parallel port displayed.

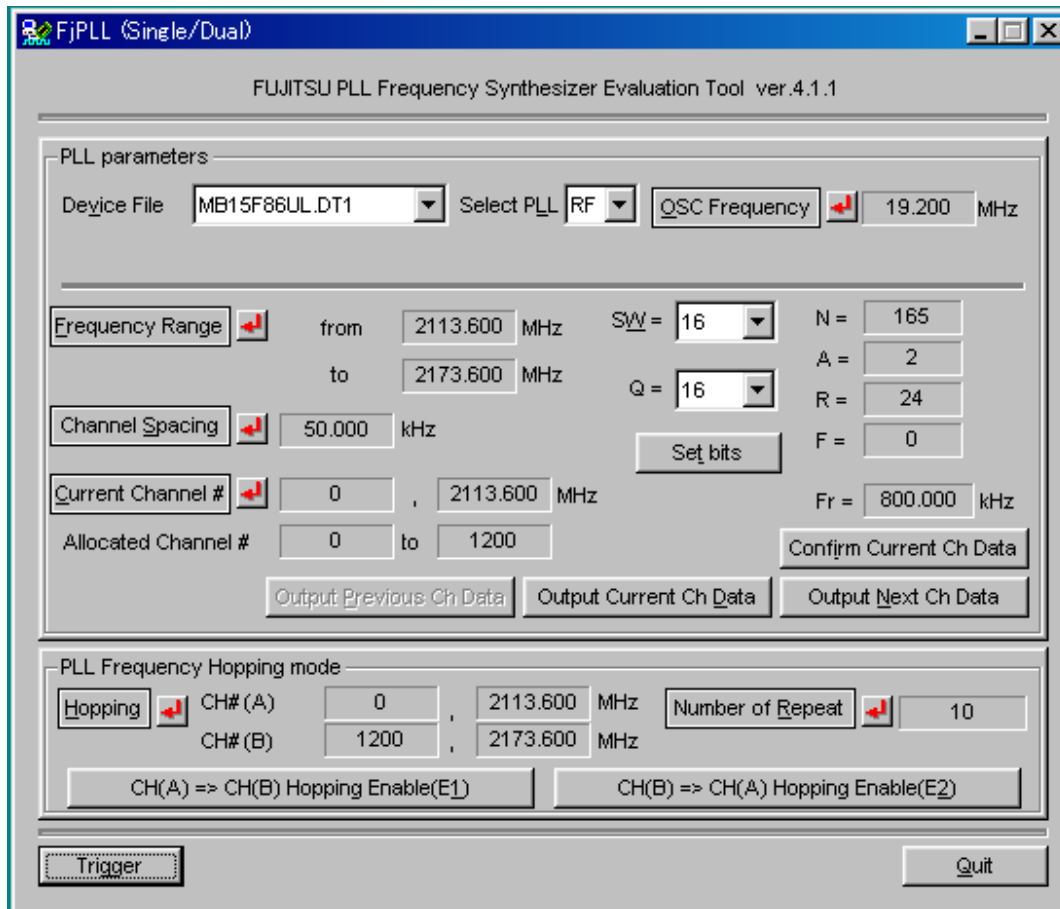


5.3. Standard device

5.3.1. Select the PLL device file you wish to use and then click the "Open" button.

The parameter setting dialog window shown below will appear. This window may look a bit different than the one shown below depending on the PLL device chosen.

Click on the arrows shown on the window next to each parameter and input the desired data.



5.3.1. Each function and Short cut key

All parameters next to the arrows must be set before going to the next step. Hot Keys are also available for setting the parameters.

Parameter	Key board	Descriptions
Device file	ALT + V	Select device
Select PLL	ALT + L	Select PLL section
OSC Frequency	ALT + O	Set OSC frequency.
Frequency range	ALT + F	Set VCO range
Channel Spacing	ALT + S	Set ch frequency
Current Channel	ALT + C	Set ch.number
M	ALT + M	Set prescaler ratio
Set bit	ALT + T	Set the function
Output Current Ch Data	ALT + D	Output data
Output Previous Ch Data	ALT + P	Output data
Output Next Ch Data	ALT + N	

Parameter	Key board	Descriptions
Confirm Current Ch Data	ALT + I	Confirm data bit
Hopping	ALT + H	Set hopping range
Number of Repeat	ALT + R	Set number
Hopping of Repeat	ALT + E	Output data
Trigger	ALT + G	Set trigger timing
Quit	ALT + Q	Exit

Note: In case that the displayed data is different from the real data, please re-confirm the value.

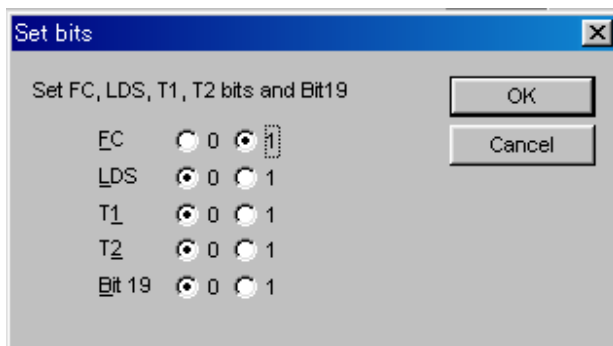
If Integer values are not calculated by the below calculation, the error values are set automatically.

$$fvco = [(M * N) + A] * fr(\text{channel spacing}).$$

5.3.2 .Set bits

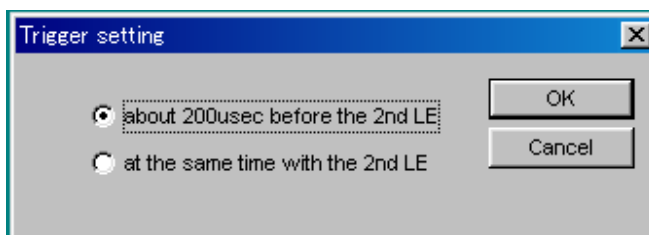
“Set bits” button sets various functions such as FC, CS bit etc. The functions are different according to each PLL device.

The “Set bits” window appears as shown below.



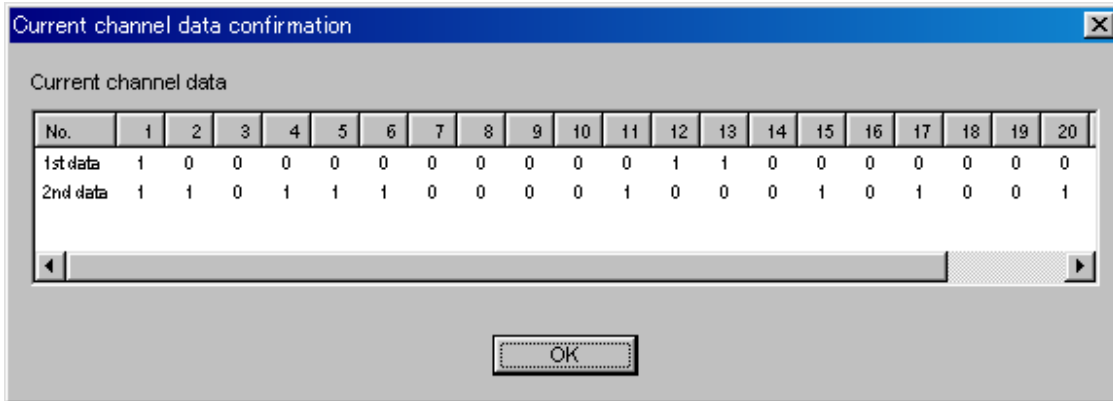
5.3.3. Trigger

Click the button “Trigger”, it enable to select the trigger timing.



5.3.4. Confirm current Ch data

Click the button "Confirm current Ch data"; the results of the serial data by binary code is shown in the window



5.3.5. Measurement

Click the button "Output current Ch Data"; the value of the present channel is automatically calculated and outputted through the port.

Click the button "Output Next Ch Data"; the value of the next channel is automatically calculated and outputted through the port.

Click the button "Output Previous Ch Data"; the value of the previous channel is automatically calculated and outputted through the port.

HOPPING

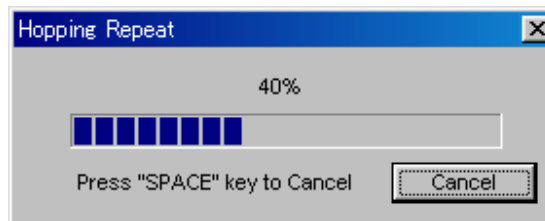
After test conditions are entered, measurements can be performed by sending the serial data to the PLL sample under test.

Hopping enable progress—ALT+ E

Hopping is repeated for a desired time by setting the

"Number of repeat" field to the desired value.

It can be cancelled using a space key.

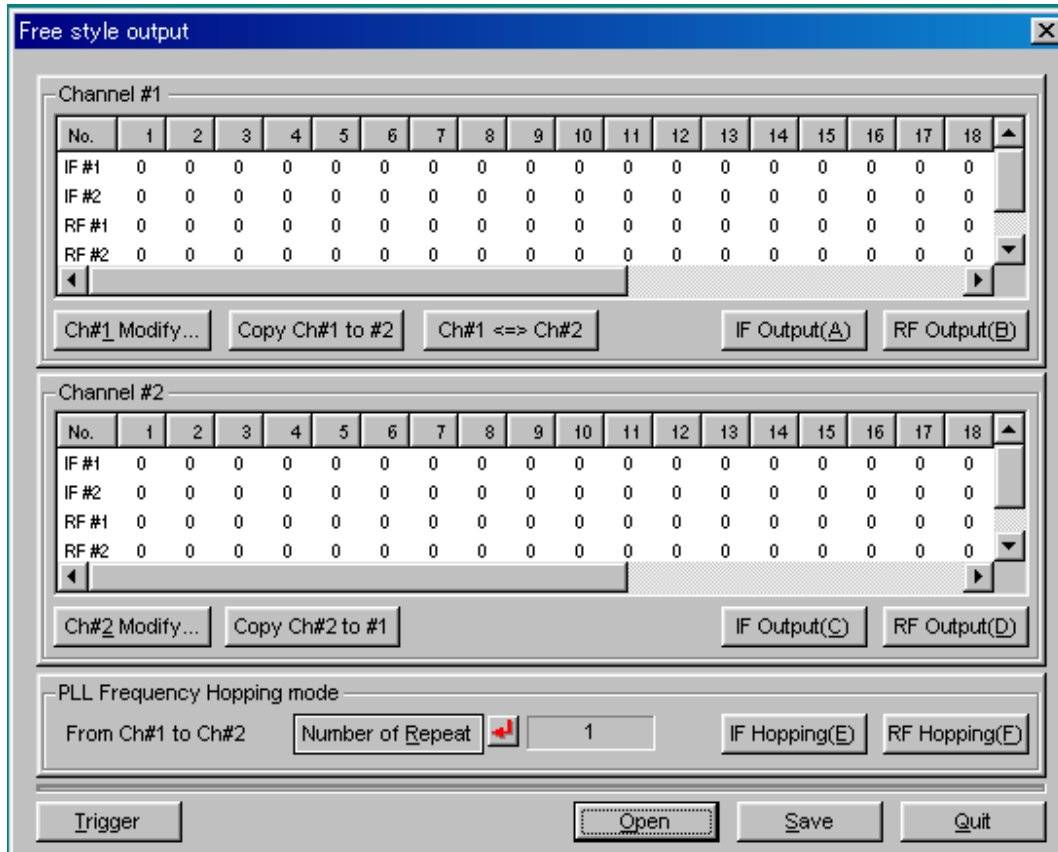


5.4.Free style mode

In the mode, you can set the serial data format at free. The data format consists of 5 lines per one channel and maximum 30bits per one line. When the hopping time is measured, two channels are prepared.

5.4.1. Click the button " Free Style", it can set a free binary code.

The window is shown below:



5.4.2. Function and Short cu key

The functions of the remaining buttons are described in the following table :

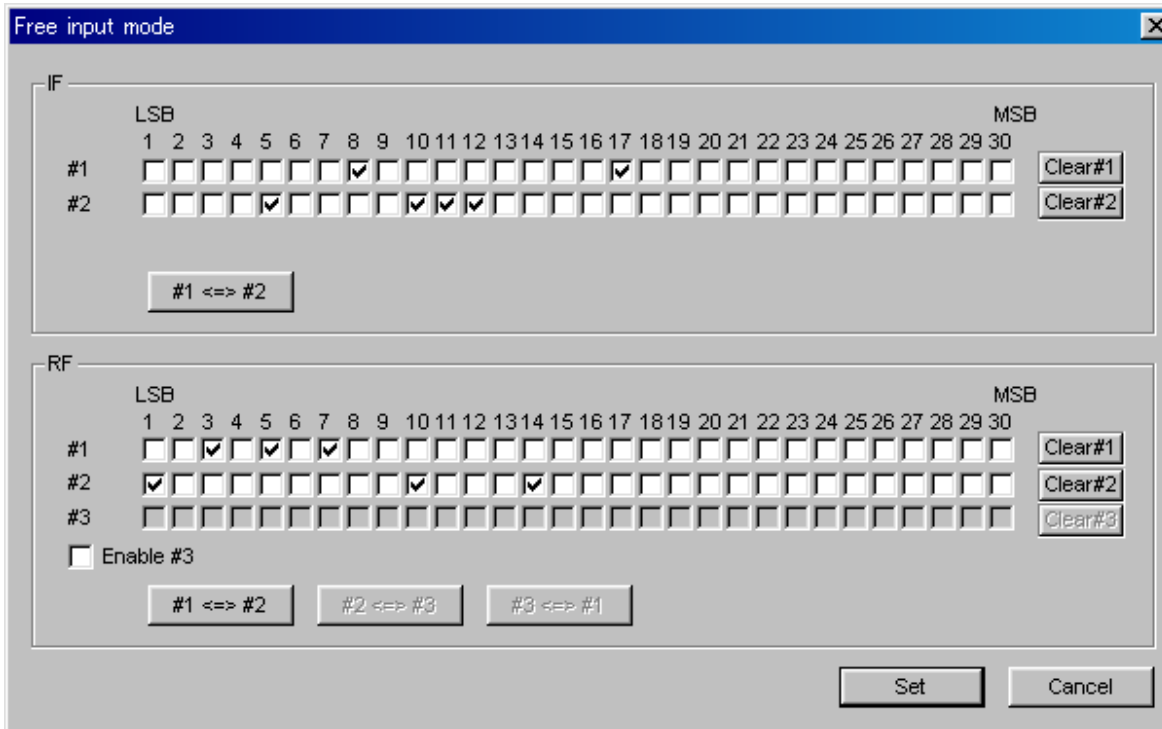
Parameter	Key board	Description
Ch#1Modify or Ch2#Modify	ALT + 1 or ALT + 2	Set a free style binary data of Ch1 or Ch2
Copy Ch#1 to #2	-	Copy Ch1 binary data to Ch2
Copy Ch#2 to #1	-	Copy Ch2 binary data to Ch1
Ch#1 <==> Ch#2	-	C1 binary data and Ch2 binary data change places.
IF Output (A) or (C)	ALT + A or ALT + C	Output data for IF Ch1 or IF Ch2.
RF Output (B) (D)	ALT + B or ALT + D	Output data for RF Ch1 or RF Ch2.
Number of Repeat	ALT + R	Set number of hopping
IF Hopping(E) or RF Hopping(F)	ALT + E or ALT + F	Output data for hopping for RF or IF.
Trigger	ALT + T	Set the trigger timing
Open	ALT + O	Open the saved format.
Save	ALT + S	Save the format
Quit	ALT + Q	Exit

2.5.4.2.Channel modify

Click the button “Ch#1 modify” or “Ch#2 modify” to set the binary data forCh#1 or Ch#2 for both IF and RF.

When a blank space is clicked, a binary “1” is set. A binary “0” is set when the space is left blank. This mode will output 30 bit binary data.

If the data length of the device under test is 23 bits, do not use 7MSB bits (24th to 30th bit).

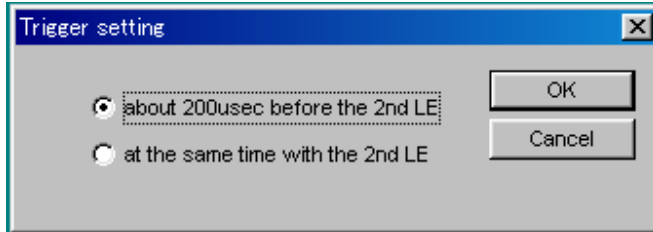


Click the button "#1<=>#2"; #1 binary data and #2 are reversed.

Click the button "Enable#3"; the third line is available for the RF section.

5.4.3. Trigger

Click the button "Trigger", it enable to select the trigger timing.



5.4.5. Save and Open

Click the button "Save", the setting data format can be saved in a personal computer.

Click the button "Save", the setting data format you saved can be read from a personal computer button.

5.4.6. Measurement

Click the button "IF OUTPUT(A)", "RF OUTPUT(B)", "RF OUTPUT(C)" and "RF OUTPUT(D)"; each binary data is outputted.

HOPPING

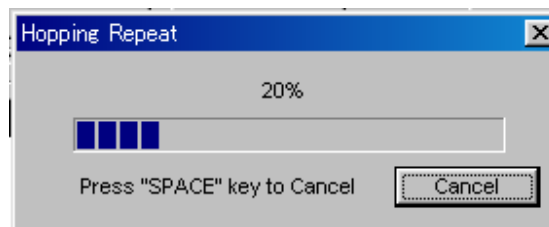
After binary codes are entered, the measurement can be performed by sending the serial data to the device under test.

Hopping enable progress—ALT+ E or F

Hopping is repeated for a desired time by setting

"Number of repeat" to the appropriate value.

It can be cancelled using a space key.



CHAPTER 3 EVALUATION BOARD DESCRIPTION

1. OVERVIEW

The PLL Evaluation board can measure loop characteristics.

Some synthesizers are pin compatible or have similar pin assignment, so that a general evaluation board is used by several PLLs.

2. EVALUATION BOARD SERIES

The following table shows the PLL part numbers and their corresponding evaluation board numbers.

Table1. P/No. of synthesizers and corresponding Evaluation board.

Part No	PKG type	Eval. Board No.	Part No	PKG type	Eval. Board No.
MB15Axx series			MB15F7xSP series		
MB15A01/A02	SSOP-16	MB1500EB01	MB15F72/73/78SP	TSSOP-20	MB1500EB16
MB15Exx series				BCC-20	MB1500EB16E
MBE03/L/SL	SSOP-16	MB1500EB01	MB15F7xUL series		
	BCC-16	MB1500EB01B	MB15F72/73/74 76/78UL	TSSOP-20	MB1500EB16
MB15E05/L/SL	SSOP-16	MB1500EB01		BCC-20	MB1500EB16E
	BCC-16	MB1500EB01B	MB15Uxx series		
MB15E06	SSOP-16	MB1500EB01	MB15U30SP	BCC-20	MB1500EB14
MB15E07/L/SL	SSOP-16	MB1500EB01		TSSOP-20	MB1500EB14B
	BCC-16	MB1500EB01B	MB15Cxx series		
MB15F0xx series			MB15C02/03	SSOP-16	MB1500EBC03
MB15F02/L/SL	SSOP-16	MB1500EB13	MB15C1xx series		
	BCC-16	MB1500EB13B	MB15C101/103	SSOP-8	MB1500EB02
MB15F03/L/SL	SSOP-16	MB1500EB13		BCC-20	MB1500EB02B
	BCC-16	MB1500EB13B	MB15C7xx series		
MB15F05/L	SSOP-16	MB1500EB13	MB15C703	BCC-20	MB1500EB05B
	BCC-16	MB1500EB13B			
MB15F07SL	SSOP-16	MB1500EB13			
	BCC-16	MB1500EB13B			
MB15F08SL	SSOP-16	MB1500EB13			
	BCC-16	MB1500EB13B			

Note: Some components come already assembled on the board. These are common for all synthesizers and they do not influence to loop filter characteristics (except for low pass filter components). Other components such as the VCO, the reference oscillator and the optimized loop filter, should be properly placed on the board by the user.

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