AUTOMATIC MEASUREMENT APPLICATION FOR CAR USE TV TUNER PERFORMANCES

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ABSTRACT

This technical report contains information based on the summer international training that took place in ALPS Electric Company in Japan. The time period for the whole project was nearly two months, from the 7th of July till the 3rd of September 2004. The structure of the project contains two main areas of interest dealing with creating a *PLL controller* and an *Automatic Measurement Application.* The PLL controller is used to set a concrete model of digital car TV tuner to the desired state via I2C interface and the Automatic Measurement Application to measure tuner performances. The communication between this application and test equipments is based on GPIB interface protocol.

1 INTRODUCTION

Tuner as an entrance electronic circuit of the broadcast receivers and associated devices has a lot of performances that express its behavior. Among of all *The AGC Gain reduction versus AGC voltage*, *the tuner gain measurements* for each channel, *the 3rd Order inter modulation* and *the tuner isolation measurements* are very time consuming. This technical report describes a creation of the Auto Measurement Application that enables these measurements to be done automatically. Each of these measurements requires the tuner to be set and to be tuned on the specified frequency. Therefore the first task was to create an application and thus to enable the user to set a new type of the tuner to an exactly defined state using personal computer via parallel port and I2C interface board. Please note that the applications were created for the private company, therefore not all of the details are mentioned.

2 PLL CONTROLLER

The PLL controller solution is divided into the blocks as Figure 1. describes. The first block**,** graphical user interface (GUI)**,** is about to provide every possible combination of the tuner status and enables the user to choose comfortably. Immediately after the user makes any change, the data bytes are recalculated by the PLL data equation calculation part of the

application. For the reason that the tuner contains two ICs with their unique addresses, the program allows inputting all of their combinations. One of the most important things in this communication is to initialize the LPT port successfully. The initialization function was tested under Win 98, Win 2000 and XP operating systems with success. However, three states can occur and these are *SUCCESS*, *SPEED ERROR* and *WINIO ERROR*. After the initialization is successful, the LPT initialization button is disabled not to cause any troubles. Communication between the PC and the tuner starts with a *START* condition. At the end of the transfer data block a *STOP* condition is executed. An *ACKNOWLEDGE* check is obligatory at the end of each successful communication. The master generates the acknowledge-related clock pulse and waits for an answer. If the acknowledge answer does not occur, the transmission is canceled, the stop condition is executed and the data transfer should be called again.

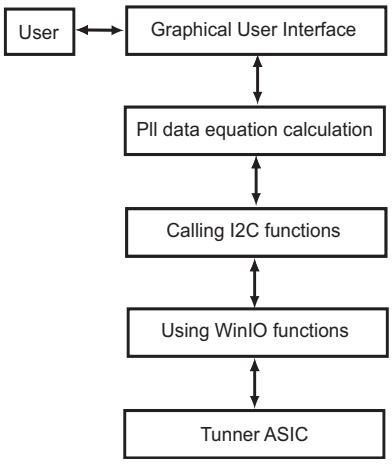

Fig. 1: *Pll control solution.*

3 AUTO MEASUREMENT APPLICATION.

3.1 OBJECTIVE OVERVIEW

The task for creating the auto measurement application was quite unique and is divided into the three major problems as can be found in a solution diagram on Figure 2. Firstly, it was necessary to create a Gpib.dll function library to control and set the instruments. Secondly, to build up the algorithms for each measurements and testing its reliability. And finally to create a graphical user interface that enables to choose the settings of the test instruments comfortably and implement the PLL controller, which was described above. There are two possible ways how to display and store the data from the application. The program generates a chart immediately after each measurement is finished. The second is to save the numerical data up to 10 measurements into *The Coma Separated Value* format. This data format enables further data operation using Excel program.

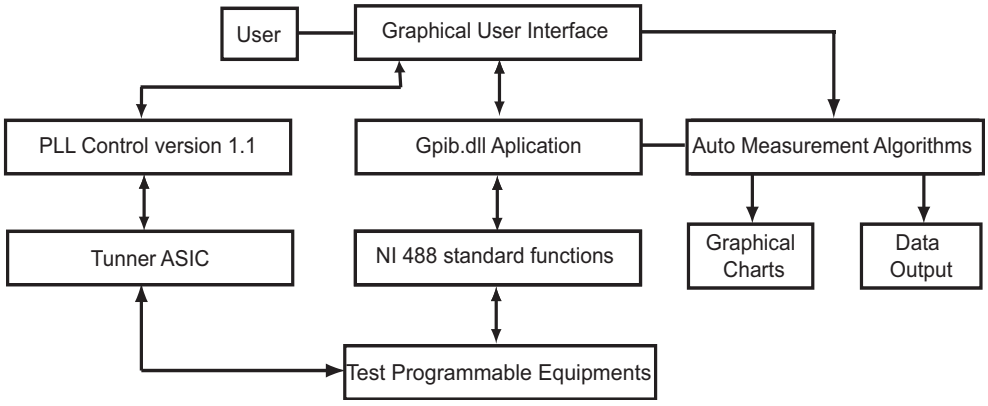

Fig. 2: *Auto Measurement solution diagram*

3.2 GPIB FUNCTION LIBRARY

GPIB - General Purpose Interface Bus (IEEE-488) is used to connect and control programmable instruments and to provide a standard interface for communication between instruments from different sources. The standard allows up to 15 devices to be connected on the same bus and consists of the 16 signal lines and the 8 ground lines. The signal lines are divided into the three groups, 8 data lines, 3 handshake lines and 5 interface management lines. The created GPIB library contains functions to set or to get the parameters that are necessary for the auto measurement application only. It represents an independent program block, which can be updated with the new functions and could be used in the different applications.

3.3 MEASUREMENT ALGORITHM EXAMPLE

The Automatic Gain Control circuit (AGC) is used for an automatic control input level, because the electric field intensity of the high-frequency signal that is sent from a broadcasting station is not always constant and depends on receiving environment and would cause an instability of a screen or different contrast of the screen per channel. The amplification degree of the video intermediate frequency amplifier circuit (IF AGC) is adjusted in combination with the radio frequency amplifier circuit (RF AGC) in the tuner. The *RF AGC Gain reduction* measurement is about to find a response of the RF gain reduction versus RF AGC voltage for the selected channel. To measure this characteristic it is necessary to turn off the automatic adjustment first and to set IF AGC voltage to 3 V. Figure 3 shows a measured characteristic generated by the application immediately after the measurement was done.

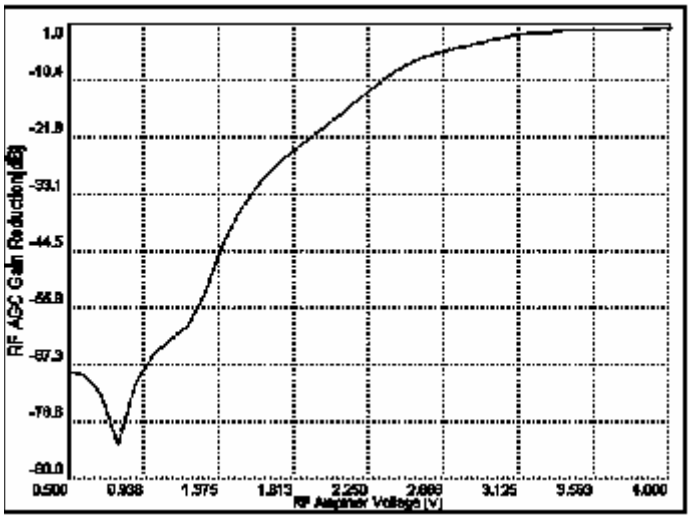

Fig. 3: *Measured characteristic of RF AGC gain reduction*

4 CONCLUSION

This report is the brief view of the project that creates a small drop in Japanese development ocean. The application that was described is intended to be a useful tool for the measuring tuner performances in an RF application development center and it should help to reduce time to market.

REFERENCES

[1] I2C Compatible ICs, Philips Components Datasheets, 2002