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Design and Implementation of a Measuring Head with Modular Exchange Capability Using the 112-System

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Abstract

According to the measurement issues in the terminations of both small-capacitance telephones and burglar alarms, this study proposes a kind of device that can automatically monitor the operating state of the module exchange in 112-system. This instrument uses the three-terminal phase measurement technique, which may accurate measurements of electrical resistance and capacitance across the lines' sav earl layers. Therefore, it may finish the subscriber line measurement. In addition, it includes measures on the noise and the degree of balance, and it can evaluate a wide range of switches and lines. Errors are asse seed to meet user needs after the system has undergone extensive testing, achieving the goals of reducing manual labour and maximizing the effectiveness of measurement and feedback.

Introduction

The 112- System atom acted measuring system has been used by all telecommunications operators today. Only the host exchange and a small subset of module exchanges with exceptionally large capacitances employ fully automated testing equipment. Autonomous testing or do broad simulation. As IoT technology evolves, so do the requirements for a modern home phone system, which now must coordinate not just wired and cordless phones but also wireless connections, security alarms, smart home automation, and more. Customers have expressed dissatisfaction with the fact that the measuring devices used in certain module exchanges of telecommunication firms have poor intelligent control and low capacitance. As the information age progresses and communication technologies advance, users' terminal devices inevitably become more diverse. Meanwhile, the measuring of the terminals of small-capacitance telephones and burglar alarms presents an egregious new challenge for the circuitry maintenance departments of telecommunications companies. This system can perform measurements on non-standard terminals including small-capacitance telephones and burglar alarms thanks to its incorporation of the metal wire assisted test device. In addition to being able to measure conventional telephones, modems, fax machines, IC cards, magnetic cards, coin phones, and even the scrambler of an extension telephone set with a terminal, a trunk line, and a telephone burglar alarm may all be tested with this instrument. The product's measurements are precise and trustworthy, and it is simple to hook up to the 112 network and set up. What is more, it can calibrate its own precision and do periodic self-measurements.

Analysis on Current Systems

Since the turn of the century, 112 testing instruments have been in use. Early 2006 research found that 90% of devices had either irreparable damage to their test boards or were otherwise unusable. Furthermore, the measuring instruments are ebb added in every apparatus. freshly accessible network devices, such as AG and DSLAM, do not link to the measurement system; rooms without specific employees to undertake maintenance (maintenance cost is greater). In addition, the existing 112-system automatically operates the numbers by matching the first three digits; however, this method is unable to differentiate users in the cities and counties of certain places, necessitating the need for manual re-distribution. However, they not only hinder rigorous assessment and efficient management and control, but also increase the reaction time required to check for and fix mistakes. In addition, the 112-system's report system has too few report samples, which means it cannot meet the needs for individualized LAN management. Some of its limitations include a lack of support for on-site inspection and repair and the inability to do statistical analysis based on the cable code and fault kind. This system combines remote and local testing capabilities, an RS232 interface without a power-supply filter, and six sets of test buses (twelve pairs).

Principles and Applications of the Design

Diagram of the System Structure

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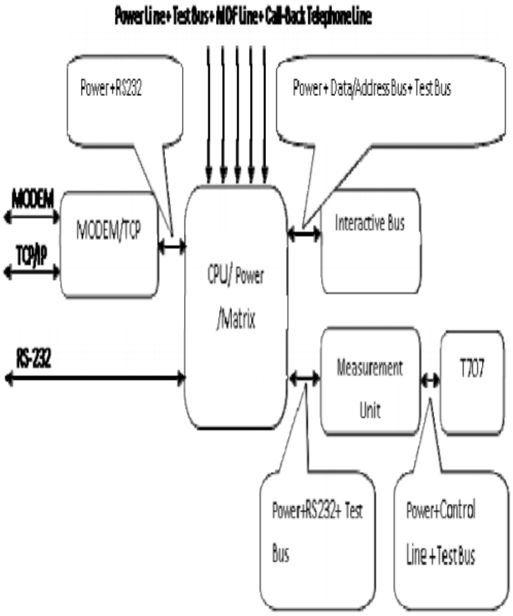
There are five circuit daughter cards that make up the main board of the system. You will need a central processing unit (CPU) card and a measuring card to get started. The measurement card is responsible for the actual measurements, while the CPU card manages the power supply, the six pairs of test bus matrix, and the control and communication units. included the standard unit of measurement. You may choose between a T707 card, an interactive test card, or a MODEM card. Diagram one depicts the overall system architecture.



Design of the CPU Control Unit

Communication and control tasks area managed by the central processing unit (CPU), which is responsible for things like the three UART interfaces, the I/O expansion and relay control, the receipt and dispatch of DTMF dual tone multiple frequency, the processing of CALL PROCESS tone, address decoding and control, and the like. EEPROM with an SPI interface, and so forth. The architecture is shown in full in Diagram 2.

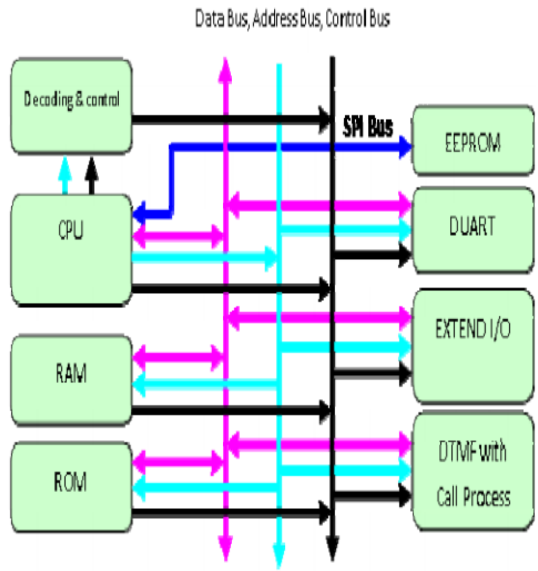
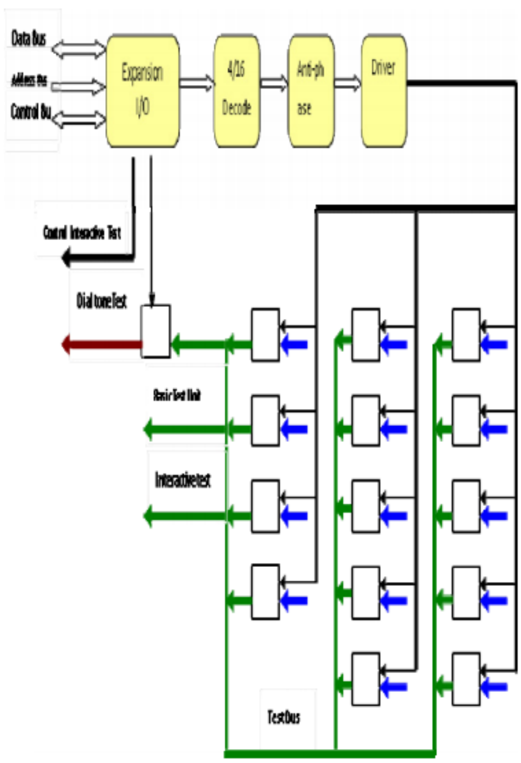


Diagram 2: Circuit Design of the CPU Control Unit

Design of the Test Bus Matrix Unit

One group (two pars) of MDF test bus and relay driver, etc. are all incorporated into the test bus matrix unit. Diagram three depicts the design in detail.



Measuring Head Environment, the measuring head's environment model shown in Diagram 4. The position and orientation measurements made as part of the communication control measuring technique have real-world applications. T-800's substitutional relations inside the system are considers limo defied. The switch, grab wire matrix, and test h eat, all of which are under coordinated control, are essential to the testing procedure. The large host exchange switch is li nuked through the switch's communication interface. The module exchange switch, however, also has an internal test unit in addition to the line-exchanging functionality. Typically, the module exchange is onto natured, and the host exchange switch through a fibre-optic connection. When it comes to swapping out smaller modules, the test head's own twelve test bus pairs really shine.

Analysis on the Result of Experiment

Principle of the Measurement

This apparatus makes use of the three-terminal phase measurement technique. The basic concept of measurement shown in Diagram 5. Since the introduction of a "measurement site," it is possible to measure not only a basic perfect electric circuit but also the distance between any two lines in the circuit. Actual electrical system. Here is how the measurement is done: Measurement commands are issued by users via terminals; either LTSC issues the command to the test head, which then returns the results, or the T707 issues the command to the test bus and related item testers, which then returns the results. When a measuring device reports back its results, LTSC will analyse them.

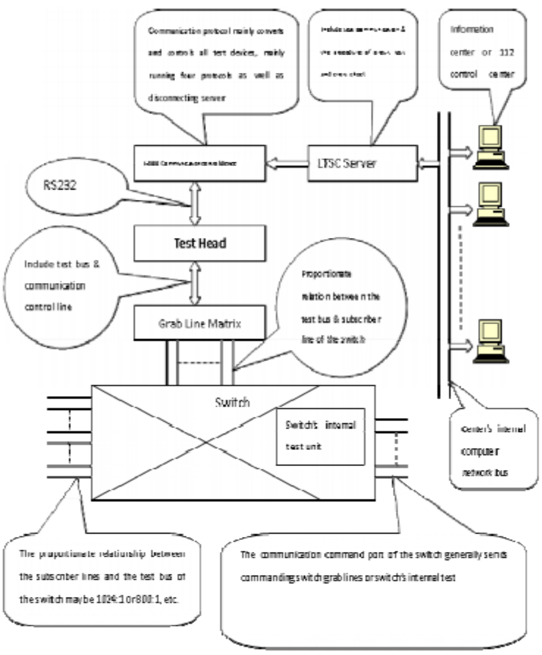


Diagram 4Model of the application environment of the measuring head

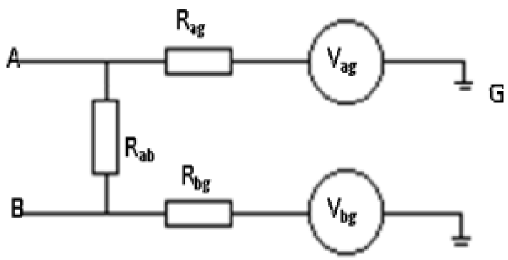


Diagram 5: Model of application environment of measuring head

The measurement procedure includes two aspects:

In the first part of the Terminal Exchange Test, a TCP/IP connection is stable shed between the 112-measuring centre and the measurement control device (T-800). The T-800 then connects the test bus for the users being g evaluated to the measuring head through the switch's communication connection in response to the grab line instruction.

After the subscriber lines have been mean sired by the matrix device, the T800 will transmit a line instruction to the communication interface of the switch and release the lines. Second, the Module Swap Exam: T-800 is used for evaluating the module swap and for communicating with the switch. Put it another way, the 112-measuring centre will connect to the T-800 via TCP/IP network; the T-800 will then issue a grab line command to the switches' communication interface; finally, the 112-measuring centre will issue a measuring command to the module exchange's measuring device. Finally, this measuring head finishes the task of measuring the subscriber lines in the module-exchange.

Analysis on the Line Model

The line model is a common example of layering in practice. The true subscriber line ash owns in Diagram 6. Users' phones connect to the subscriber line, which is can tired on the switch, after many connections are made between the switch and the subscriber lines. However, the subscriber line may be disconnected from the switch at any point. It results in two sets of wires: an internal line running from the point of disconnection to the switch's line, and an exterior line running from the point of disconnection to the users' telephone terminal.

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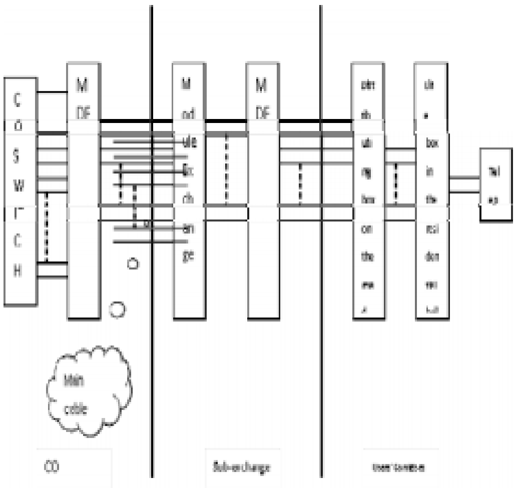
Typical Line Diagram of the Test Head

The actual testing and evaluation of networking technologies uses a configuration like that depicted in Diagram 7 for the connection of the head to the host exchange switch and the module exchange switch. A grab wire connects the test bus from the switch's internal test device to the switch's external test device and grab lines. matrix of 1024:1 or 800:1, finishing the test while the switch and testing equipment are under the direction of a single, coordinated operator. There are both series and parallel versions of test buses that the switch acts as a hub for since its internal test device and external test device utilize the same test bus. Meanwhile, the external test device is in the vanguard of both the 2-line and 4-line switch test models. The test bus is open in the parallel model and normally closed in the series model with four pairs of lines. ADSL tests only simulate a normally closed condition, which necessitates a switch between internal and external lines, rather than a normally opened one.



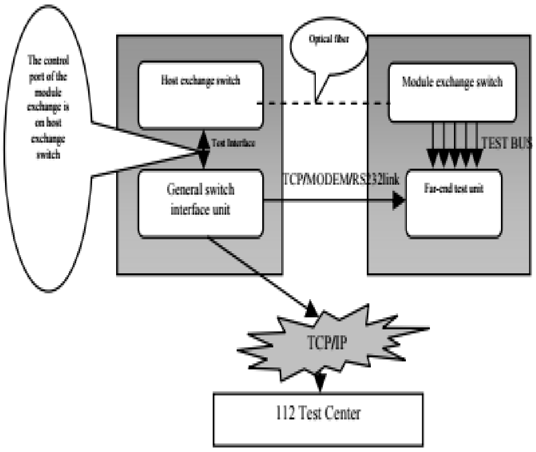


Diagram 7: Typical line connection of the test head

Diagram 6: Model of Subscriber Line

Analysis on the Result of the Test

Once the system's design finished, the big three switches (S1240, AXE10, and C&C08) erupt through their paces. Ideal line resistance, actual line resistance, ideal line capacitance, and real line capacitance are what are put through their paces in this experiment. Information on the area's tested

communication networks:

tabled in the first table. POTS, ISDN, and ADSL connections are all put through their paces. The noise and equilibrium tests are an extremely welcome addition to the test head. Because of the system's use of three-terminal test technology, it is providing precise assessments of extensive mistakes and intricate lines. The system has the limitation that high-frequency components in the subscriber line test signals will cause more test deviation after the ADSL test device has been out in the subscriber lines.

Table 1 The Tested Data of the Communication Network at Certain Area

Tested Items	Standard Value	Test Point	Actual Measurement Average Value average value
Ideal line resistance	200Ω	A-B	797Ω
	10KΩ	A-B	10.8 KΩ
	500KΩ	A-B	503.3 KΩ
Real Line Resistance	200Ω	A-B	798Ω
		A-G	35.6Ω
		B-G	34.8Ω
	10KΩ	A-B	10.2 KΩ
		A-G	39.6 KΩ
		B-G	35.8 KΩ
	500KΩ	A-B	124.5 KΩ
		A-G	88.4 KΩ
		B-G	47.6 KΩ
Ideal Line Capacitance	0.1uf	A-B	135nf
	0.5uf	A-B	539nf
	1.0uf	A-B	1.03uf
Real Line Capacitance	0.1uf	A-B	224 nf
		A-G	1.08 uf
		B-G	219 nf
	0.5uf	A-B	621 nf
		A-G	1.11 uf
		B-G	457 nf
	1.0uf	A-B	1.10 uf
		A-G	1.12 uf
		B-G	621 nf

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