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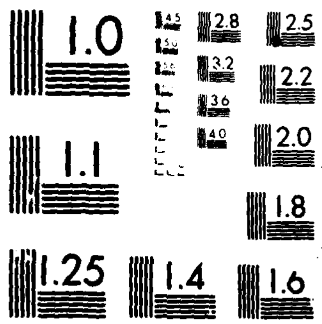

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MEASUREMENT AUTOMATIZATION OF PCM 30/32
TELETRANSMISSION SYSTEMS SIGNALLING UNIT

By

Marian Zientalski

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MEASUREMENT AUTOMATIZATION OF PCM 30/32 TELETRANSMISSION SYSTEMS SIGNALLING UNIT

Marian Zientalski

The national implementation of production of modern teletransmission systems having time division of channels and code pulse modulation required the elaboration of a series of test control devices, necessary for production needs and correct service of PCM systems. At the Telecommunications Institute of the Gdansk Polytechnic with the close collaboration of the TELKOM-TELETRA Great Poland Teleelectronic Plants in Poznan, the following test-control devices for the needs of the TCK-24 and PCM 30/32 systems were developed and implemented.

-- devices to measure the elemental foot of error of the type MESB-1, MESB-2, and MESB-3;

-- software measurement machines and testers for tests on PO11 conversational channel units, PO91 and S-501 signalling channel units and S-511 group signalling units.

The article presents the device developed which permits the automatization of production tests on S-511 group signalling units, which enter into the composition of terminal devices of the PCM 30/32 systems. The principles of the automatization of tests on the unit are discussed and the realized variant of the device is given.

Automatization Concept of Tests on the S-511 Unit

The manual testing of group signalling units used in the stage of setting in motion the production of the PCM 30/32 systems took much work and required combining a larger number of apparatus making it possible to simulate the work conditions of tested boards and that (apparatus) used for testing. Production costs would be greatly increased with the required high qualifications of workers.

Implementing serialized production of PCM 30/32 systems required developing a suitable device which would allow automatic checking of units in a short time, signalling failures, which ensures locating them quickly and simplifies correction. In the elaborated concept of automatizing tests on the S-511 unit checking the correctness of action of the tested unit takes place by a comparison of the logical states in sequential read-outs of the tested and standard unit.

The comparison takes place during activ ation of both boards by runs corresponding to runs lead to the unit under normal working conditions in the PCM 30/32 device. For this purpose there are signals created which correspond by the time position to the individual binary numbers of the channel slot, the 16th slot and the odd frame, and signals simulating information leading to the unit inputs in its transmitting and receiving parts. These signals can take the form of an impulse series or the constant logical level "0" or "1" depending on the conditions placed on these signals by the test program.

The fundamental test cycle, whose algorithm is presented in Figure 1, has the following run:

1) definition of number of tested position, corresponding to the number of the feed of the tested unit. This number is determined by the state of the position meter, which controls the commutation unit. The runs from the chosen feeds of the tested and standard unit are passed by the commutation unit to the input of the unit of comparison;

2) clearing the error store of the position;

3) synchronization of the work of the tested and model unit by using the properly formed input functions, identical for both units;

4) establishing the test conditions, determined by the measured program unit in support of the states of position counters and variants;

5) comparison of conformity of runs with the tested and model unit at discrete moments in time, synchronized with runs in unit inputs; the method used makes it possible to discover irregularity in the operation of the tested unit; in the case of uncovering a descrepancy--at least in one moment of comparison--the position error and unit error stores take the state "1";

6) signalling the test result; the state "0" or "1" of the position error store and the state "1" of the unit error store; if after exceeding the capacity of the position counter the error storage is in "0" state then the signal "unit good" appears. In the case of verifying the error in the tested unit, the position error and unit error stores take the "1" state and the signal "unit bad" appears.

The testing device developed can also be used for manual operation in testing states in an arbitrary read-out. In a manual position selection the compatibility of logical states for the feed number and the number of the variant selected manually by the keyboard is checked. There also exists the possibility of a measurement of an arbitrary self-contained system on a board with probes.

Discussion of Device Developed

A block diagram of the developed testing device is presented in Fig. 2. The device is composed of a series of functional units each of which contains one or several boards, which are:

* Impulse generation unit(P1). The unit includes a quartz generator and frequency dividers together with a logical gate unit. The task of the unit is the generation of impulse runs having frequencies of repetition, completion and phase couplers such as those which appear in TCK 30/32 terminal equipment and are lead to S-511 group signalling boards.

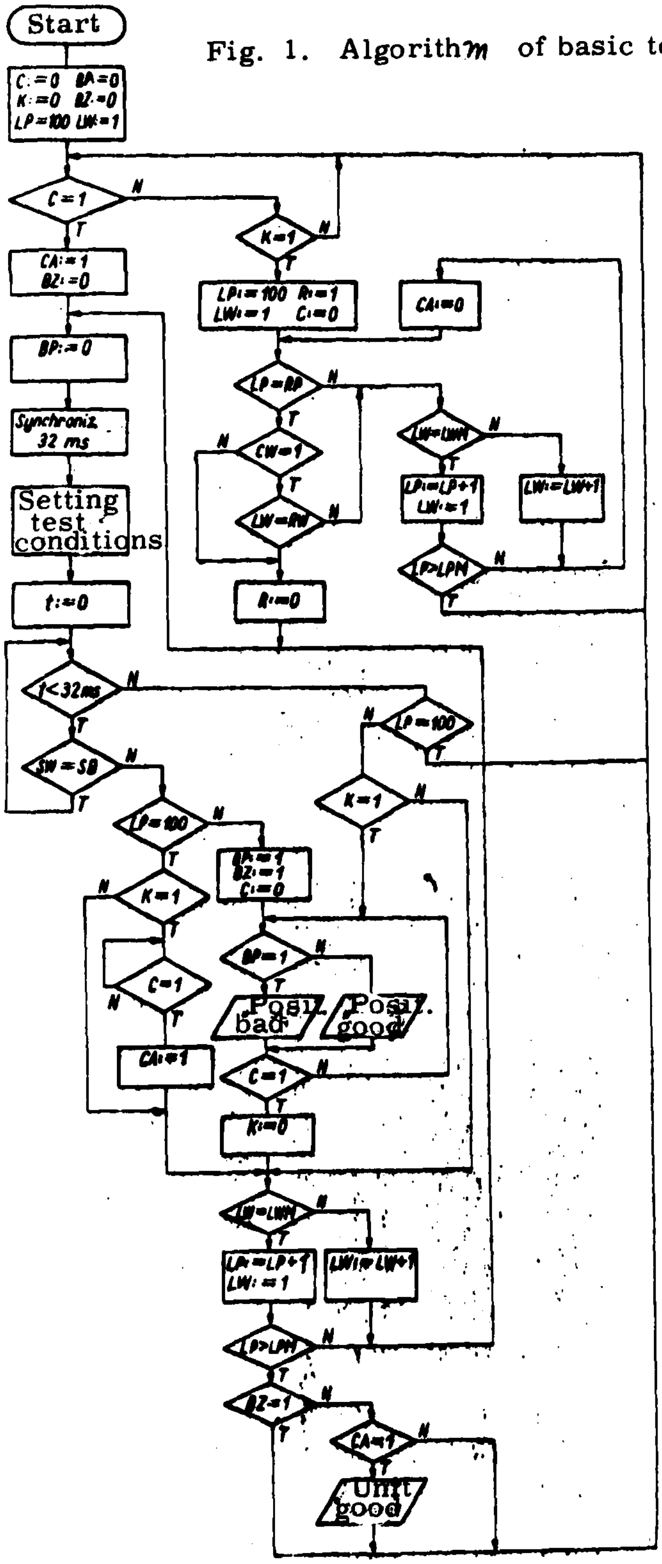

Fig. 1. Algorithm of basic test cycle.

* Input activity unit (P4). The unit includes frequency dividers together with a series of gates which serve to achieve required impulse form, pseudorandom sequence generator together with a logical system creating impulses designated for checking multigate synchronization system, and an amplifier series with an open collector, serving to control the model and tested units.

* Control amplifier unit (P2, P3). The unit includes an amplifier series, by means of which the runs created by the impulse generation unit and imput activity unit are supplied to the inputs of the tested and model units.

* Commutation unit (P5-P11). This unit realizes the addition, in compatibility with the state of the counter, of terminal blocks of the tested and model board to the comparison system.

* Counter unit (P12). The unit includes counters whose state is defined by the number of the tested position of the group signalling unit and the number of the measurement variant for a given position. The unit is composed of a position counter which defines in BCD code the number of the tested output of the unit, decoding gates, separators and a variant counter, defining the variant number of for a given measurement position.

* Measurement program unit (P13). The unit includes electronic systems which serve to subject the operation of other units of tested equipment to the states of the counters and which determine the testing program for a given position.

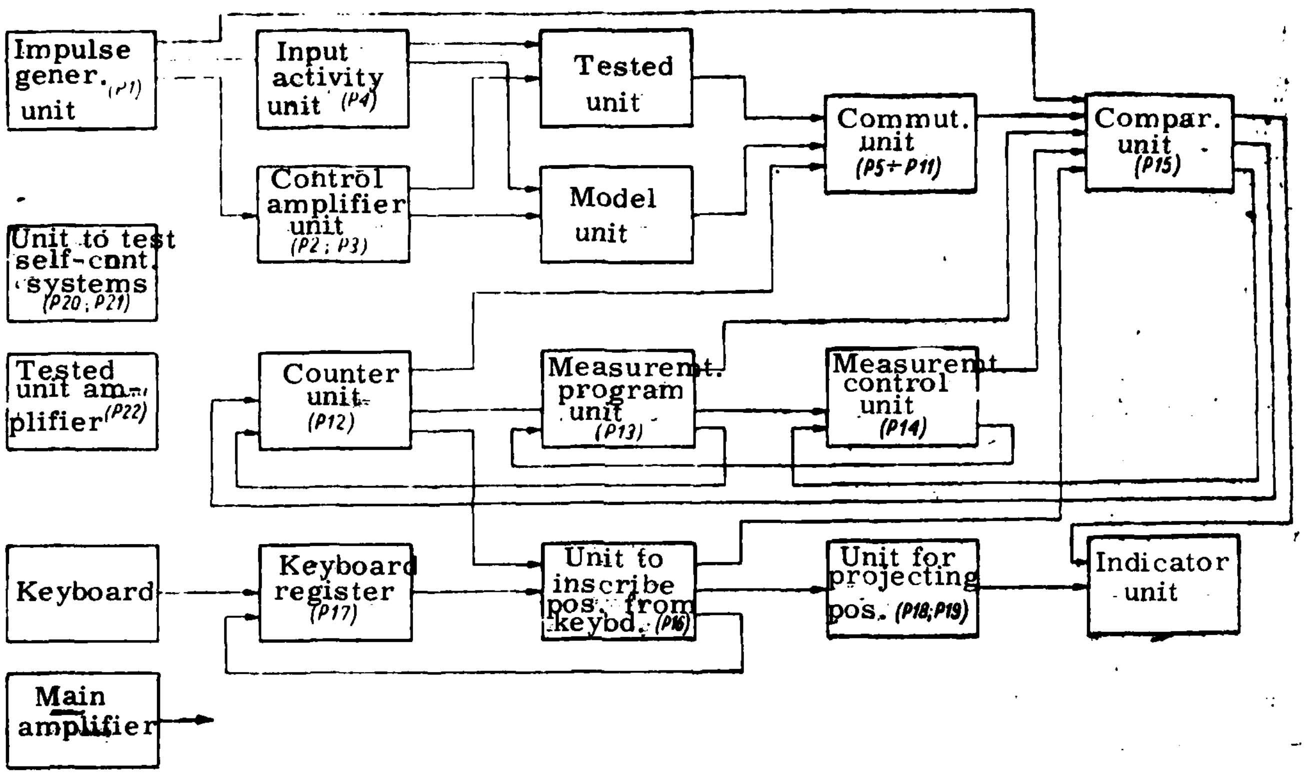

Fig. 2. Block diagram of developed test equipment

* Measurement control unit (P14). The unit contains systems which designate the measurement period and create ordered signals by a specified fragment of the testing cycle and auxiliary systems of clearing and synchronization.

* The comparison unit(P15) includes systems serving to check the conformity of the run obtained from the model and tested unit, to signal the result and creates pulses subject to comparative results, used by other equipment units.

* The unit inscribing the position from the keyboard (P16). The unit is comprised of systems comparing the states of counters with states of the keyboard register and serving to attain conformity of these states.

* The keyboard register (P17) includes triggers serving to recall the last 3 or 4 digits input from the keyboard programming the test cycle.

* Position projection unit (P18 and P19). The systems comprising the unit permit the projection of the state of counters or the keyboard register by digital indicators.

* The unit testing self-contained systems (P20 and P21) includes systems of digital comparators, storage and sampling systems, serving to test systems self-contained in tested boards.

* The main and auxiliary feeds serve to produce stabilized feed voltage; measurement equipment units, model unit of group signalling and tested unit.

The testing equipment developed was implemented in the production of PCM systems. It permits shortening the test time by several scores of times over, eliminates the subjective influence of the conducted testing and does not require using highly qualified workers during the process of starting and control of S-511 units.

The author wishes to thank sincerely the Great Poland TELKOM-TELETRA Tele electronic Plant in Poznan for its exemplary cooperation in realizing the subject discussed.

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