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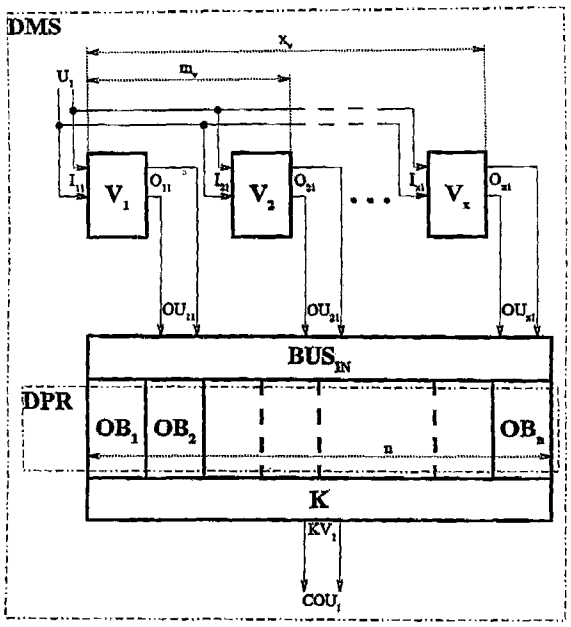
(54) **Title:** METHOD FOR A ONE-TIME CALIBRATION OF A MULTIPLE BRANCHES DIGITAL MEASUREMENT SYSTEM WORKING IN MINIMUM NUMBER OF BRANCHES MODE



(57) **Abstract:** The method of the one-time calibration of a digital measurement system according to the invention is performed so, that the first evaluated voltage (U_1) is supplied identically on the first input (I_{11}), (I_{21}), to the first input (I_{X1}) of the first branch (V_1), second branch (V_2) to the last possible branch (V_x). In the first step each branch stores, in parallel, the sequence of partial immediate information from each branch's respective first output (O_{11}), (O_{21}) to (O_{x1}) through the input bus (BUS_{IN}) to the determined partial raster (DPR), divided into the entered number pursuant to nth order number (n_n) of the parallel structured areas, starting with the first structured area (OB_1), second structured area (OB_2) to the last possible structured area (OB_n), i.e. the first possible partial information (OU_{11}), the second possible partial information (OU_{21}) to the last possible partial information (OU_{x1}), together with the first order number (n_1) of the first structured area (OB_1), with the second order number (n_2) of the second structured area (OB_2) to the nth order number (n_n) of the last possible structured area (OB_n) of the determined partial raster (DPR). In the second step the comparator (K), on the basis of a comparison of the respective pairs of partial immediate information of the individual branches, evaluates the result of the comparison so that when the immediate values of two units of partial information of two branches from the set of the first possible branch (V_1), second possible branch (V_2) to the last possible branch (V_x) are in the same identical area, i.e. in either the same first area (OB1), in the same second area (OB_2) up to in the same nth area (OB_n), or if their first order number (n_1), second order number (n_2) to nth order number (n_n), differ at most by a value of one, then the digital measuring system (DMS) declares, through the output (KV1) of the comparator (K), the correctness of the evaluated voltage (U_l) by its first logical correct output unit (COU_1).

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— *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments*

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METHOD FOR A ONE-TIME CALIBRATION OF A MULTIPLE BRANCHES DIGITAL MEASUREMENT SYSTEM WORKING?IN MINIMUM NUMBER OF BRANCHES MODE

Technical Field

The invention concerns the method for a one-time calibration of a digital measurement system working in the mode of the minimum number of branches from all possible branches, which is part of the railway signalling equipment.

Background of the Invention

So far an automatic method for a one-time calibration of a digital measurement system has not been resolved in railway signalling technology. Until now a solution, where it is necessary to manually carry out the regular periodic calibration of each branch of the measurement system by measuring and adjusting has been used. This is disadvantageous, because this method is relatively laborious and expensive since the influence of the human factor is asserted adversely during these stereotypical periodical activities.

Summary of Invention

The aforementioned disadvantages of the solution that is currently known is removed or substantially limited by this method for a one-time calibration of a digital measurement system, working in the mode of the minimum number of branches from all possible branches pursuant to this invention, the essence of which consists in that the first input evaluated voltage *is supplied identically* on the first input of the first possible branch, on the first input of the second possible branch to the first input of the last possible branch. In the first step each branch from the set of the first possible branch, second possible branch to the last possible branch *stores, in parallel*, the sequence of partial immediate information, having a high information capacity about the first evaluated voltage (*i.e. the first possible partial information*), from each branch's respective first output (*i.e. from the first output of the first possible branch, the first output of the second possible branch to the first output of the last possible branch*), through the input bus to the determined partial raster, divided into the entered number pursuant to the nth order number of the parallel structured areas, starting with

Detailed Description of the Invention's Preferred Embodiments

The method of the one-time calibrations of the digital measurement system **DMS**, working in the mode of the minimum possible branches $\mathbf{m_v}$ from all the possible branches $\mathbf{x_v}$ is apparent from the generalised schematic diagram of the version from which it is apparent, that the first evaluated voltage ***U_1 is supplied*** identically on the first input $\mathbf{I_{11}}$ of the first possible branch $\mathbf{V_1}$, on the first input $\mathbf{I_{21}}$ of the second possible branch $\mathbf{V_2}$ to the first input $\mathbf{I_{X1}}$ of the last possible branch $\mathbf{V_X}$ with the subsequent calibration being performed in two steps.

In the first step each branch from the set of the first possible branch $\mathbf{V_1}$, second possible branch $\mathbf{V_2}$ to the last possible branch $\mathbf{V_X}$ *stores*, in parallel, the sequence of partial immediate information, having a high information capacity about the first evaluated voltage $\mathbf{U_1}$ (*i.e. the first possible partial information* ***OU_{11}***), from each branch's respective first output (*i.e. from the first output* ***O_{11}*** *of the first possible branch* ***V_1***, *the first output* ***O_{21}*** *of the second possible branch* ***V_2*** *to the first output* ***O_{X1}*** *of the last possible branch* ***V_X***) through the input bus $\mathbf{BUS_{IN}}$ to the determined partial raster **DPR**, divided into the entered number pursuant to the nth order number $\mathbf{n_n}$ of the parallel structured areas, starting with the first structured area $\mathbf{OB_1}$, second structured area $\mathbf{OB_2}$ to the last possible structured area $\mathbf{OB_n}$; it further *stores* the second possible partial information $\mathbf{OU_{21}}$, until it *stores* the last possible partial information $\mathbf{OU_{X1}}$ together with the first order number $\mathbf{n_1}$ of the first structured area $\mathbf{OB_1}$, with the second order number $\mathbf{n_2}$ of the second structured area $\mathbf{OB_2}$ to the nth order number $\mathbf{n_n}$ of the last possible structured area $\mathbf{OB_n}$ of the determined partial raster **DPR**.

In the second step the comparator **K**, on the basis of a comparison of the respective pairs of partial immediate information of the individual branches, *evaluates* the result of the comparison so that, when the immediate values of two units of partial information of two branches from the set of the first possible branch $\mathbf{V_1}$, second possible branch $\mathbf{V_2}$ to the last possible branch $\mathbf{V_X}$ *are in the same identical area,* i.e. in either the same first area $\mathbf{OB_1}$, in the same second area $\mathbf{OB_2}$ up to in the same nth area $\mathbf{OB_n}$, or if their first order number $\mathbf{n_1}$, second order number $\mathbf{n_2}$ to nth order number $\mathbf{n_n}$ *differ at most by a value of one*, then the digital measuring system **DMS** *declares*, through the output $\mathbf{KV_1}$ of the comparator **K**, the *correctness* of the evaluated voltage $\mathbf{U_1}$ by its first logical correct output unit $\mathbf{COU_1}$.

the first structured area, second structured area to the last possible structured area; it further *stores* the second possible partial information, until it *stores* the last possible partial information together with the first order number of the first structured area, with the second order number of the second structured area to the nth order number of the last possible structured area of the determined partial raster. Whereas in the second step the comparator, on the basis of a comparison of the respective pairs of partial immediate information of the individual branches, evaluates the result of the comparison so that, when the immediate values of two units of partial information of two branches from the set of the first possible branch, second possible branch to the last possible branch are in the same identical area, i.e. in either the same first area, in the same second area up to in the same nth area, or if their first order number, second order number to nth order number *differ at most by a value of one* then the digital measuring system *declares*, through the output of the comparator, the correctness of the evaluated voltage by its first logical correct output unit.

The one-time calibration of the measurement system is only performed in the structures of the fixed programmable memory of each digital measurement system on all its possible branches when being manufactured or during the reconstruction of the relevant signalling equipment. The correct status of the once-performed calibration is controlled during the remainder of the technical life of the signalling equipment without the influence of a human factor in accordance with the entered algorithm by repeating automatic measurements according to this invention, where it is based on the assumption that a disruption of the measurement system's data, e.g. the entry sensitivity, will only occur in one of all the possible branches of the measurement system at one time.

The main advantage of the method of the one-time calibration of the digital measurement system working in the mode of the minimum number of branches of all the possible branches consists in the fact that the objective automatic calibration is performed for secure measurement system applications without the negative influence of a human factor.

Brief Description of Drawings

The invention is described in detail in an exemplary fashion, clarified with the generalised schematic diagram on the attached drawing.

Industrial Applicability

The method of the one-time calibration of the digital measurement system according to this invention can be used both for the new construction of railway signalling equipment and for innovations to existing signalling equipment as long as electronic devices are introduced in these cases. The invention can also be used anywhere where the calibration of a digital measurement system is to be performed in the sense of ČSN EN (Czech/European Norm) 50 129.

List of Relational Symbols

DMS	Digital Measurement System
m_v	Minimum Number of Branches
x_v	All Possible Branches
I_{11}	First Input of the **First Possible Branch V_1**
I_{21}	First Input of the **Second Possible Branch V_2**
I_{X1}	First Input of the **Last Possible Branch V_X**
V_1	First Branch
V_2	Second Branch
V_X	Last Possible Branch
U_1	First Evaluated Voltage
O_{11}	First Output of the **First Possible Branch V_1**
O_{21}	First Output of the **Second Possible Branch V_2**
O_{X1}	First Output of the **Last Possible Branch V_X**
BUS_{IN}	Input Bus
DPR	Determined Partial Raster
n_n	nth Order Number of the **nth Parallel Structured Area OB_n**
n_1	First Order Number of the **First Area OB_1**
n_2	Second Order Number of the **Second Area OB_2**
OB_1	First Area
OB_2	Second Area
OB_n	nth Area
OU_{11}	First Possible Partial Information
OU_{21}	Second Possible Partial Information
OU_{X1}	Last Possible Partial Information
K	Comparator
KV_1	Output **of Comparator K**
COU_1	Logical Correct Output Unit **of Comparator K**

CLAIMS

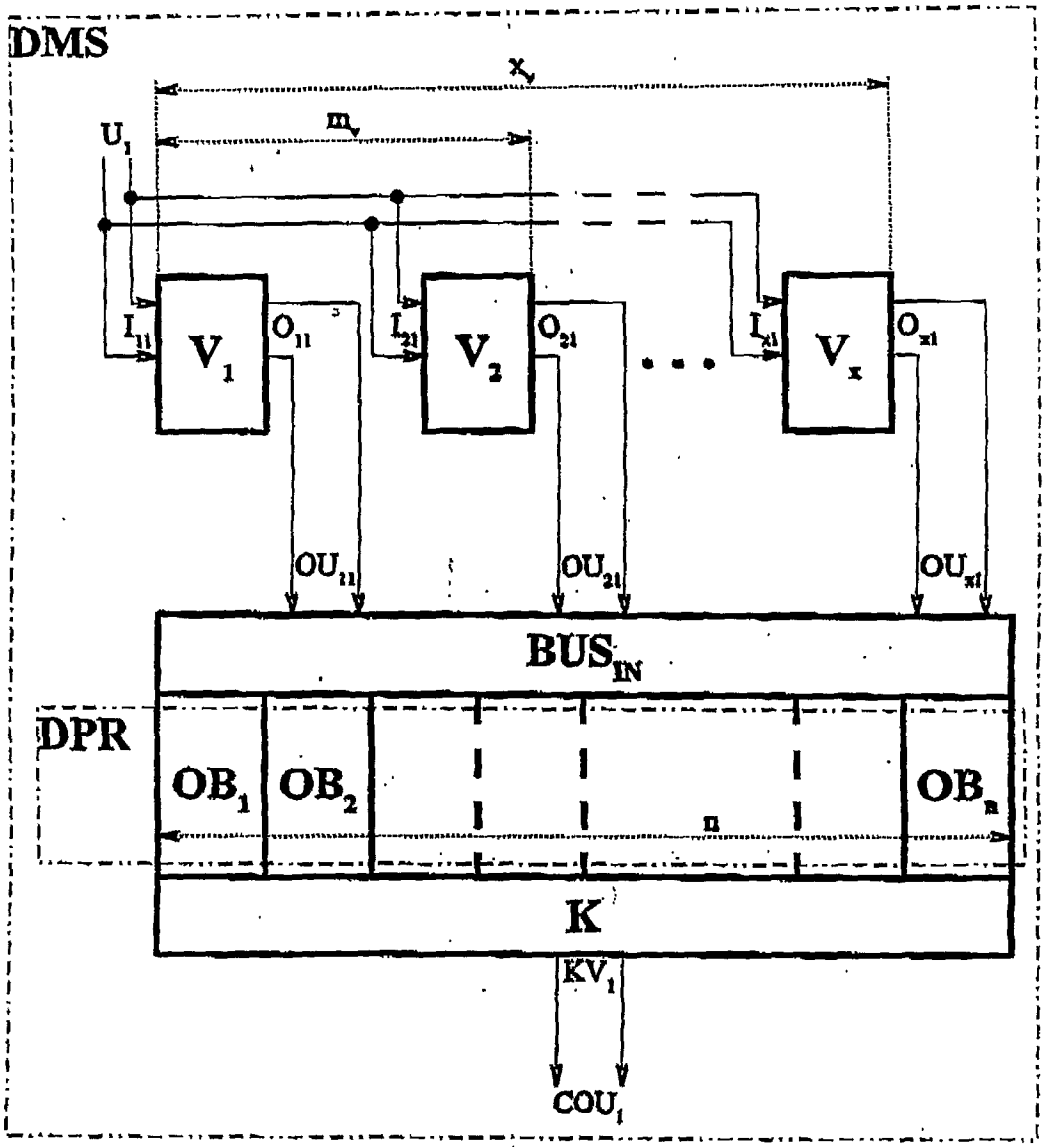
The method of the calibration of a digital measurement system (DMS) working in the mode of the minimum number of branches (m_v) from all possible branches (x_v)

is characterised by the fact that:

- the first evaluated voltage (U_1) *is supplied* identically on the first input (I_{11}) of the first possible branch (V_1), on the first input (I_{21}) of the second possible branch (V_2) to the first input (I_{X1}) of the last possible branch (V_X) so that
- **in the first step** each branch from the set of the first possible branch (V_1), second possible branch (V_2) to the last possible branch (V_X) **stores, in parallel** the **sequence of partial immediate information**, having a high information capacity about the first evaluated voltage (U_1),i.e. the first possible partial information (OU_{11}), from each branch's respective first output, i.e. from the first output (O_{11},of the first possible branch (V_1), the first output (O_{21}) of the second possible branch (V_2) to the first output (O_{X1}) of the last possible branch (V_X)) through the input bus (BUS_{IN}) to the determined partial raster (DPR), divided into the entered number pursuant to the nth order number (n_n) of the parallel structured areas, starting with the first structured area (OB_1), second structured area (OB_2) to the last possible structured area (OB_n); it further *stores* the second possible partial information (OU_{21}), until it *stores* the last possible partial information (OU_{X1}) together with the first order number (n_1) of the first structured area (OB_1), with the second order number (n_2) of the second structured area (OB_2) to the nth order number (n_n) of the last possible structured area (OB_n) of the determined partial raster (DPR) and
- **whereas in the second step** the comparator (K), on the basis of a comparison of the respective pairs of partial immediate information of the individual branches, **evaluates the result of the comparison** so that, when the immediate values of two units of partial information of two branches from the set of the first possible branch (V_1), second possible branch (V_2) to the last possible branch (V_X) are in the same identical area, i.e. in either the same first area (OB_1), in the same second area (OB_2) up to in the same nth

area (OB_n), or if their first order number (n_1), second order number (n_2) to nth order number (n_n) **differs at most by a value of one**,

- then the digital measuring system (DMS) **declares, through the output** (KV_1) of the comparator (K), the correctness of the evaluated voltage (U1) by its first logical correct output unit (COU_1).


DMS
x_v
m_v
U_1
I_11
V_1
O_11
I_21
V_2
O_21
I_x1
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OU_11
OU_21
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DPR
OB_1
OB_2
OB_n
n
K
KV_1
COU_1

INTERNATIONAL SEARCH REPORT

International application No
PCT/CZ2006/000095

A. CLASSIFICATION OF SUBJECT MATTER
INV. G01R31/3193 H04L1/06 B61L7/06 B61L21/06

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
G01R H04L B61L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal, WPI Data, INSPEC

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5 577 199 A (TANABE TAKASHI [JP] ET AL) 19 November 1996 (1996-11-19) abstract; claims 1-16; figures 1-34 column 4, line 31 - column 7, line 19 column 8, line 30 - column 10, line 52 column 12, line 61 - column 14, line 2	1
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A	US 4 284 256 A (NORTON DAVID J) 18 August 1981 (1981-08-18) abstract; claims 1-10; figures 1-4 column 2, line 50 - column 3, line 19	1

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[X] Further documents are listed in the continuation of Box C.

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Date of the actual completion of the international search	Date of mailing of the international search report
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INTERNATIONAL SEARCH REPORT

International application No
PCT/CZ2006/000095

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

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