



Tec**T**ronix **S**ystems inc.

Operating Instructions
GENIUS Control Unit
Optional: Serial Interface

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Date in Service d/m/y: _____

We would like to take this opportunity to thank you for purchasing your Metal Detector from TecTronix. The confidence you have placed in our product is sincerely appreciated and we will endeavor to provide the best service and support possible.

Please take the time to read the User Manual completely as this provides you with the expertise necessary to install and adjust the system according to your requirements. In addition to this, you will learn about the sophisticated options provided by the **Genius** electronics.

If you have any problems in the set up and operation of your system, the TecTronix team are available to assist you.

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1 General information

1.1 Fields of applications

- To operate a protocol printer
- Remote controlled operating from PC, PLC or control station
- TQM (Total Quality Management)
- Basic system to operate the TecTronix Data Management INSIGHT GENIUS

1.2 Symbols used



= Important notes



= Danger notes



= Safety notes

1.3 Legal basis

This document supplements the instruction manual „Control Unit GENIUS“ and „Belt Conveyor System CONSENSE- D“.

2 Technical data

2.1 Purpose of the interface

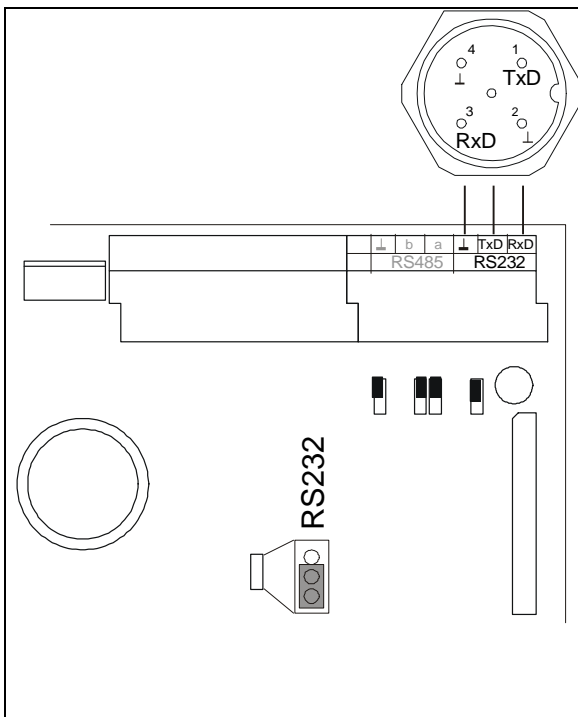
The serial interface is used for printouts of the logbook data base or for remote control.

2.2 Electrical specification / connection



Either RS232 or RS 484 serial interface can be used, not both at a time

2.2.1 RS232



The electrical specification complies with the RS232-C standard.

Following signals are available:

TxD	Transmittal data
RxD	Reception data
⊥	Signal ground

The RS 232 serial interface is activated if the jumper is used as shown. It is connected to the four pin socket at the bottom of control cabinet.

An extension cable is enclosed.

To connect an event printer:

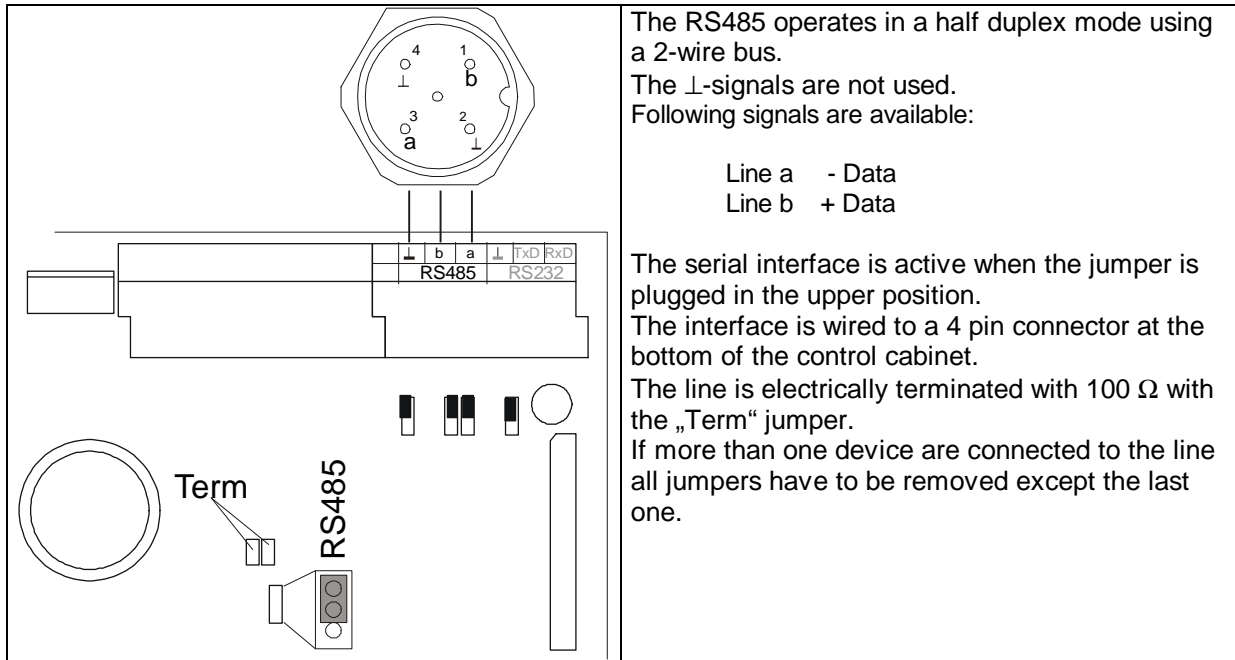
Pin2: RxD Pin3: TxD Pin5: ⊥

To connect a PC:

9 pole plug : Pin2: TxD Pin3: RxD Pin5: ⊥

The serial interface operates half duplex mode (no simultaneous receiver/transmitter signals).

2.2.2 RS485



2.3 Serial data format (RS232 and RS485)

9600 Baud
8 Data bits
1 Stop bit
no parity

Subject to change without notice.

3 Configuration

3.1 Selection of output device

See also Operational Manual „Control Unit GENIUS“: 6: Menu structure / operation

interface	
none	
printer online	
printer portable	
PC/SPS	
▼	▲
ESC	O.K.

Interface: Select „Serial interface “ in Setup page 2. Use ▼ and ▲ to select the operation mode.

„O.K.“ return to Setup page 2, „ESC“ ignores any changes and returns to Setup menu.

„None“: serial interface deactivated.

„Printer online“: immediate transfer of an event (see 4.1 and Operational Manual „Control Unit GENIUS“: Event recording by GENIUS Logbook)

„Printer portable“: the user can read back the events from the log book (see also 4.2 and 5).

„PC/SPS“: A PC or SPS can be used for remote control. The GENIUS controller is set to a slave mode and transmits data only upon request of the host (see 4.3).

The TecTronix visualisation program "CDM" also requires this mode. This mode will get to menu "Serial Setup".

Serial Setup	
--> Baud Rate: 19200	
(9600 / 19200)	
Device ID:	M
012...ABC...	
▼	▲
Rate	O.K.

Serial Setup: appears after selecting PC/PS in menu Serial Interface. Button "Rate/ID" selects between adjustment of Baud rate and "User identification".

▼ and ▲ will change the parameter.

„O.K.“ will get to Setup menu page 2.

„Baud Rate“: Adjustment of Baud rate, either 9600 or 19200 Baud.

„Device ID“: an identification character has to be set to identify the GENIUS via serial interface. This allows to operate several devices via one RS 485 serial interface (see 4.3.2).

3.2 Device name input

enter device name:	
▼	
DETECTOR 1	
▲	
▼▲	= 012...ABC...
▼	▲
→	O.K.

Device name: Select „Device / Line,, in Setup menu page 2.

A name consisting of 10 characters can be input. This name will be used for future printouts (see also 5).

Default name: DETECTOR 1

▼ and ▲ changes the marked character, key → selects the position of the character.

„O.K.“ confirms the input and skips to input of the line name.

3.3 Line name input

enter line name:	
▼	
LINE 1	
▲	
▼▲	= 012...ABC...
▼	▲
→	O.K.

Line name: appears after input and confirmation of the device name.

A name consisting of 10 characters can be input. This name will be used for future printouts (see also 5).

Default name: LINE 1

▼ and ▲ changes the marked character, key → selects the position of the character.

„O.K.“ completes and returns to Setup page 2.

4 Communication systems

4.1 Printer online

If an event (metal detection, fault, change of parameters...) occurs it is transmitted immediately by the serial interface.

This mode is useful for a continuous print out or any data logging system for statistical process control.

4.1.1 Transmission format

The data are sent in text format.

Each line consists of 42 characters and is ended by CR (ASCII 13).

Depending on the event 1 or 2 lines are transmitted. No handshake is performed (neither software nor hardware handshake).

After transmission of one line the controller waits 1,5 seconds before transmitting the next line.



If events occur faster than be printed out then some events are skipped which can be seen on the print-out below.

(A complete printout can be get selecting the modes „Printer portable“ or „PC/SPS“).

4.1.2 Event format

Each event starts with Day. Month, Hour:Minute:Second
followed by kind of message and additional information.

Event	Printout
Switch on GENIUS	6.10.,10:47:15 event: power on
Switch off GENIUS	6.10.,10:47:15 event: power off
Metal detection: number of detection since commissioning, signal intensity (amplitude)	6.10.,10:52:58 metal 00013 Ampl: 2000
Error messages: number of error messages since commissioning, Second line: kind of error.	1. 1.,05:36:12 Fault 00001 Line interruption Auto balance activated Receiver voltage too high Transmitter/receiver broken 24VDC output overloaded
Change product	5.10.,15:21:33 change product PRODUCT 1 -> PRODUCT 2
Change batch	6.10.,11:00:26 change batch
„Product teach-in“ selected without product change	6.10.,10:51:24 product data changed
„Product teach-in“ selected and product changed	6.10.,10:51:24 product data changed PRODUKT 1 -> PRODUCT 2
Performance validation requested	5.10.,14:50:00 request for test
Start of performance validation by user with access code number 1000	5.10.,14:50:14 test start, USER:1000
Result of performance validation test: test piece with ident no. 1 detected.	5.10.,14:50:24 test piece 1 yes
Result of performance validation test: test piece with ident no. 2 detected.	5.10.,14:50:26 test piece 2 no
End of performance validation test routine	5.10.,14:50:35 end of test

4.1.3 Example of online hardcopy

```
1. 1.,03:33:28 Event: power on
1. 1.,03:34:26 change product
   Standard -> PRODUCT 1
1. 1.,03:36:37 product data changed
1. 1.,03:40:19 metal 00005 Ampl: 768
1. 1.,04:34:28 metal 00006 Ampl: 1064
1. 1.,04:44:06 metal 00007 Ampl: 234
1. 1.,10:22:56 metal 00008 Ampl: 345
1. 1.,10:43:18 metal 00009 Ampl: 567
1. 1.,13:40:00 metal 00010 Ampl: 890
```

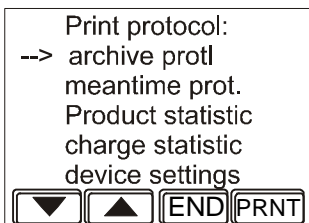
4.2 Printer portable

When selecting this mode the events listed in the data base of the controller unit can be polled. This mode is specially useful to print out events from time to time. Moreover the controller provides on request statistics, device protocols, device parameter settings and a listing of the product memory.

4.2.1 Transmission format

The data are sent in text format of the chosen language. Each line consists of 42 characters and is ended by CR (ASCII 13). Depending on the event 1 or 2 lines are transmitted. No handshake is performed (neither software nor hardware handshake). After each line the controller waits 1.5 sec for next line transmission. Each printout starts and ends with ++++++
If this line is missing at the end, the hardcopy is not completed.

4.2.2 Type of print out



Print Protocol: If in GENIUS logbook menu (see Op. Man. „Control Unit GENIUS“: event recording by GENIUS Logbook) the key „PRNT“ was pressed then the type of printout have to be selected by moving the cursor with the ▼ and ▲ keys.
Printer is started with „PRNT“
When the print out is finished „GENIUS Logbook“ is displayed.
„END“ returns to the previous menu without any printout.

- | | |
|---------------------------|---|
| „Archive protocol“: | Complete printout of all events |
| „Record check print out“: | similar to Archive protocol. |
| „Product statistics“: | Number of metal detection and faults since last product change. |
| „Batch statistics“: | Number of metal detection and faults since last batch change. |
| „Device parameter“: | Print out of all settings, number of metal detection and faults since commissioning, list of stored products. |

4.2.3 Archive protocol

The archive protocol completely records and stores all events.

After the +++ line the title, date, time and a consecutive number is printed, followed by the device and line name


(see 3.2 and 3.3) for easier identification.

The printout of the archive protocol starts with the next following event of the last printout.

Example: Two successive archive protocols:

<pre> +++++ archive protocol 6.10.1998, 9:52 No. 10 device: DETECTOR 1 line: LINE 1 Date , Time Event No. ----- 5.10.,05:36:16 metal 00008 Ampl: 531 5.10.,05:50:33 metal 00009 Ampl: 174 5.10.,13:07:15 metal 00010 Ampl: 341 5.10.,13:07:47 metal 00011 Ampl: 180 5.10.,13:12:42 metal 00012 Ampl: 142 5.10.,13:16:16 event: power off 5.10., 8:16:16 event: power on 6.10., 8:31:04 product data changed PRODUCT 1 -> PRODUCT 2 6.10., 9:31:33 product data changed 6.10., 9:51:58 metal 00013 Ampl: 2000 +++++ </pre>	<pre> +++++ archive protocol 6.10.1998, 12:42 No. 11 device: DETECTOR 1 line: LINE 1 Date , Time Event No. ----- 6.10.,10:52:59 metal 00014 Ampl: 2000 6.10.,10:53:00 metal 00015 Ampl: 2000 6.10.,11:05:13 metal 00016 Ampl: 143 6.10.,11:05:58 metal 00017 Ampl: 203 6.10.,11:05:58 metal 00018 Ampl: 461 6.10.,11:08:35 metal 00019 Ampl: 119 6.10.,11:12:59 metal 00020 Ampl: 124 6.10.,12:15:57 change product PRODUCT 2 -> PRODUCT 1 +++++ </pre>
--	--

After printout of the archive protocol the operator is asked „delete memory?“. In case of any trouble, input „no“ in order to repeat the printout procedure, otherwise select „yes“.

 <p>The event data base can handle 1000 listings. In case of memory overflow the oldest listing is overwritten. To ensure that events, which have not been printed out (archived) yet, will not get lost, the display warns the operator before deleting.</p>	<div style="border: 1px solid black; padding: 5px;"> <p style="text-align: center; margin: 0;">Warning</p> <p style="margin: 0;">Print archive! Logb. list. vacant:: 100 events</p> <p style="text-align: right; margin: 0;"><input type="button" value="O.K."/></p> </div>
--	--

4.2.4 Record check printout

The **record check** allows to print out a listing of records at any time. The printout format is identical to the archive protocol (except the head line) but is not affecting the page numbers.

Example: Record check print out and archive protocol:

<pre> +++++ Record check protocol 6.10.1998, 11:07 device: DETECTOR 1 line: LINE 1 Date , Time Event No. ----- 6.10.,10:52:59 metal 00014 Ampl: 2000 6.10.,10:53:00 metal 00015 Ampl: 2000 6.10.,11:05:13 metal 00016 Ampl: 143 6.10.,11:05:58 metal 00017 Ampl: 203 6.10.,11:05:58 metal 00018 Ampl: 461 +++++ </pre>	<pre> +++++ archive protocol 6.10.1998, 12:42 No. 11 device: DETECTOR 1 line: LINE 1 Date , Time Event No. ----- 6.10.,10:52:59 metal 00014 Ampl: 2000 6.10.,10:53:00 metal 00015 Ampl: 2000 6.10.,11:05:13 metal 00016 Ampl: 143 6.10.,11:05:58 metal 00017 Ampl: 203 6.10.,11:05:58 metal 00018 Ampl: 461 6.10.,11:08:35 metal 00019 Ampl: 119 6.10.,11:12:59 metal 00020 Ampl: 124 6.10.,12:15:57 change product PRODUCT 2 -> PRODUCT 1 +++++ </pre>
---	---

4.2.5 Product statistics

Is a short summary of all metal and fault messages since the last product change until printout. The record shows beside the device and line name, the name of the running product and its adjustment parameters followed by: date / time of product change „---->“, date / time of print out.

```

+++++
Product statistics:

device:   DETECTOR 1
line:     LINE      1

  Product   Sens.  Threshold  Phase
-----
2 PRODUCT 1   16    210      -----

6.10, 12:15 ---> 6.10.1998, 12:43

No. of metal detection :    4
Number of malfunctions :    0
+++++
                
```

4.2.6 Batch statistics

Shortform summary of all metal and fault messages since last batch change until printout. Same format as product statistic.

```
+++++
Batch statistics:

device:   DETECTOR 1
line:     LINE      1

  Product      Sens. Threshold  Phase
-----
2 PRODUCT 2   16      210    -----

6.10, 10:15 --> 6.10.1998, 11:43

No. of metal detection :   5
No. of malfunctions   :   0
+++++
```

4.2.7 Device parameters

All settings and parameters including access code numbers are printed out. The counts of the „number of metal detection / faults“ counters are also printed out which relates back to the commissioning.

```
+++++
System settings  GENIUS  6.10.2000 11:43

Software:   STE V3.1b  AWE V1.10
Frequency:  289 kHz

Device:     DETECTOR 1
Line:       LINE      1

Code change prod.: deactivated
Code teach prod. : deactivated
Code setup   : 1234
No. of metal detection :   20
No. of malfunctions :     1
List of products:
  Product      Sens. Threshold  Phase
-----
1 PRODUCT 1   17      100    115.5°
2 PRODUCT 2   16      210    -----
+++++
```

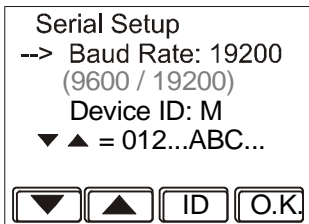
4.3 PC / SPS mode

In this mode the controller of the GENIUS is operating as a „slave“. The controller delivers data in case of data request via serial interface to the external PC or SPS. Instructions are sent according to the transmission protocols.

This mode allows also to poll the different protocols and statistics as well as changing products remote controlled.

4.3.1 Interface configuration

After selection of „PC/SPS“ in menu “Interface” the configuration menu “Serial Setup” appears.



The Baud rate 9600 or 19200 can be selected as well as the “Device Identifier (M is standard).
The RATE/ID button selects the input.
O.K. returns

The serial interface allows to poll the protocols and statistics and remote control the GENIUS controller unit (changing products etc).

4.3.2 General message structure

A message consists of at least 8 protocol bytes. Up to 99 bytes of information data can be added:

device identifier	message identifier	data length	data length	Information data	checksum	checksum	finish with	finish with
'M'	'A'..'Z'	'0'..'9'	'0'..'9'		'0'..'F'	'0'..'F'	CR	LF

Device Identifier	The identification of GENIUS controller is 'M', but can be changed in menu „Serial setup“. Messages not starting with the programmed device identification are ignored. The following description uses the letter „M“. Special case: If a blank character is input the Genius will react to device identifications.
Message Identifier	The GENIUS controller identifies the instruction and processes the data if necessary.
Data length	The length of the information data is a ASCII-coded 2 digit number: 00 .. 99
Data	0 to 99 bytes ASCII code
Checksum	Low-order 8 bits of the sum of all characters from 'identif. system' to inform. Data'. The checksum is transmitted as 2 byte - hexadecimal value in 2 ASCII-code. If two following blank characters (ASCII 32) are sent to Genius the check sum is not generated. This eases the test of the serial interface with terminal programs as messages can be transmitted without a check sum.
Close	Each message is closed by 'CR' and 'LF'.

4.3.3 Instruction overview

Change product (see 4.3.4)	M B <xx> <product number> CR LF
Archive protocol (see 4.2.3)	M L 0 2 A A 7 D CR LF
Record check (see 4.2.4)	M L 0 2 Z A 9 6 CR LF
Product statistics (see 4.2.5)	M P 0 0 F D CR LF
Batch statistics (see 4.2.6)	M C 0 0 F 0 CR LF
Device parameter (see 4.2.7)	M G 0 0 F 4 CR LF
Last Audit Report (see 5.3)	M L 0 2 T A 9 0 CR LF

If for example 'M L 0 2 A A 7 D CR LF' is sent to the GENIUS controller then it will answer with the Archive protocol as described in 4.2.3. However no inquiry for deleting the memory is performed.



The GENIUS controller processes instructions only in operating mode. If „Adjustments“ or „Access code activation“ have been selected the controller automatically skips to operating mode to avoid access problems with the remote controller.

4.3.4 Changing a product

The serial interface allows to change products which are already stored by a remote controller, i.e. PC.

4.3.4.1 Data exchange between D2 and PC

1. Sending a requested product number:

PC -> GENIUS: 'M' 'B' '0' '1..3' <product no.>'0..F' '0..F' CR LF

2. The GENIUS compares the requested number with the memory.

3. If the number is found the following message is retransmitted after about 1 sec.:

GENIUS -> PC: 'M' 'O' '0' '1..3' <product no.> '0..F' '0..F' CR LF

At the same time the GENIUS changes the preset product parameters.

„Identification Message“ shows 'O' for OK in the data section of the display.

4. If the number is not found the following message is resent after about 1 sec.:

GENIUS -> PC: 'M' 'F' '0' '1..3' <product no> '0..F' '0..F' CR LF

„Identification Message“ is 'F' for fault. The GENIUS does not change the product.

4.3.4.2 Handling of product number memory

The Genius provides two preadjusted standard product memories: Product A and B, which cannot be changed, followed by a maximum 200 dynamic product memory. The number increases automatically with the number of product being programmed. If for example 4 products have been taught in, only 6 product numbers exist: (2 standard + 4 custom): -1, 0, 1, 2, 3, 4.

To select product A the product no. „-01“ , for product B „000“ and for product 1 „001“ have to be sent.

4.3.4.3 Generating a message

Generating a message by the host which make the GENIUS controller to change to product 16:

- | | | |
|----------------------|----------|-------------------------------------|
| 1. Identif. system: | 'M' | General instruction |
| 2. Identif. message: | 'B' | Instruction code for product change |
| 3. Data | '1', '6' | required product number 16 |
| 4. Data length | '0', '3' | Length of information data: 3 Bytes |

5. Evaluate checksum:

'M'	: 4D hex	
'W'	: 57 hex	
'0'	: 30 hex	
'3'	: 33 hex	
'0'	: 30 hex	
'1'	: 31 hex	
+	'6'	: 36 hex
=	19E hex ==> '9', 'E'	

6. Entire message: 'M' 'W' '0' '2' '0' '1' '6' '9' 'E' CR LF

5 The use of the GENIUS metal detector for quality insurance

In order to meet the requirements of TQM and HACCP the GENIUS controller is equipped beside the log book data base and protocol functions as described in chapter 4 with a **performance validation** processor, which allows to program the timing procedure for performance tests.

5.1 Instruction for setting the performance test intervals

1. Teach-in product
2. Convey product with a metallic test piece, which have to be detected. Mark the metallic test piece with a number between 1 and 99.
3. If necessary repeat this procedure one or two times, and mark them with numbers. If only one metallic test piece is used input the number 0 for the second and third.
4. In menu "Control interval (see operational manual „Control Unit GENIUS“: Activation of device check request) select „Alarm mode“. The interval is selectable between hourly, daily and weekly performance check. If daily or weekly check interval has been selected, then the hour have to be programmed, too. If the hourly check has been selected the performance validation check is requested every full hour.
5. Finally set for the product to be inspected the test piece numbers (see operational manual „Control Unit GENIUS“: Activation of device check request)
6. If several GENIUS metal detectors are interfaced with a host controller enter in Setup menu a markable **device name** and **line name** to ease the identification on the audit report (see 3.2 and 3.3).
7. Use also user identification numbers for the operators to be identified later on the performance check report.

5.2 Carrying out a performance validation

Audit Check demand!				
Enter User-ID: ####				
<table border="1"> <tr> <td>▼</td> <td>▲</td> <td>→</td> <td>O.K.</td> </tr> </table>	▼	▲	→	O.K.
▼	▲	→	O.K.	

If the system clock is equal to the set time then the green LED („operation“) is blinking and the operator is requested to input his user identification number.
At the same time „test request“ is recorded in the log book data base.
The test is started with „O.K.“.

audit-check	No.#
convey testpiece #	
F1 : detected	
F2 : not detected	

The operator is requested to convey the numbered test piece and to watch whether it is detected or not.
The detection is shown on the display for 1 sec „** DETECT **“
Confirm by F1 or F2 (it is also possible to convey the test piece several times at different areas of the aperture).
Note: The operator is responsible to use the requested and set test piece.
The metal detector is not verifying the kind of metal piece used for this procedure.
Three different test pieces (i.e. three different kind of metals) can be used according to the set test procedure.
All events during the entire test procedure are stored in the event data base
The test is finished after selection of F1 or F2 and skips to the operating mask (except mode „Printer portable“ was selected, see below)
The test results can be displayed when selecting the logbook (see operational manual „Control Unit GENIUS“: Activation of device check request).

5.3 Print out of Audit Reports

audit-check
print report?
F1 : yes F2 : no

If the serial interface is set to mode „Printer portabel“ the controller requires to input „yes“ (F1) for printing an Audit Report.
The report is generated as follows (see 4.1.1 transmission protocol):

```
+++++  
Audit-Report 6.10.1998, 11:56  
  
device:   DETECTOR 1  
line:     LINE      1  
  
Product   Sens. Threshold Phase  
-----  
2 PRODUCT 2   16   210   .-----  
  
Date , Time   Event No.  
-----  
6.10.,11:53:00 test request  
6.10.,11:54:02 test start, user:1234  
6.10.,11:56:36 metal 00030 Ampl: 331  
6.10.,11:56:39 test piece 11 yes  
6.10.,11:56:41 test piece 12 no  
6.10.,11:56:48 metal 00031 Ampl: 327  
6.10.,11:56:51 test piece 13 yes  
6.10.,11:56:51 end of test  
+++++
```

The Audit Report includes the following information:

- Device and line name
- Actual running product including settings
- time of test request
- time of reaction of the operator
- User (operator) identification number
- Numbers and intensity of metal detection (test piece verification)
- time quitting the performance check procedure



If „Printer online“ was set, the print out is carried out the same way as it is done for the Audit Report except printing the head line.

If „PC/SPS“ was set, the latest Audit Report can be polled via serial interface by the instruction

M L 0 2 T A 9 0 CR LF (see 4.3.3).

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