Technische Dokumentation

A Crane Co. Company

Electronic Coin Validation System of Series G-40.0000

General Description

06/05 JBe/vBi
Edition: 2.3
AB.40-GB

CRANE

National Rejectors, Inc. GmbH • Zum Fruchthof 6 • D-21614 Buxtehude
Telefon: +49 (0)4161-729-0 • Telefax: +49 (0)4161-729-115 • e-mail: info@nri.de • Internet: www.nri.de

Contents

1. General

The validator G-40 is a world-wide proven product within the standardized 5" size for the vending machine industry. Its modular design enables optimum solutions for all insertions- and interface configurations of the gambling, vending or service machine area.

For reacting to counterfeit money and for possible individual adjustments, NRI offer a special adjustment programme (WinEMP). To use this software you will need an IBM-compatible PC.

For critical coins there is the possibility to use several channels on the G-40.0000, for instance one is programmed for ‘normal’ the other one for ‘narrow’ bandwidth. You have simply to switch over a DIL switch to select the ‘narrow' bandwidth and thus reject even more counterfeit money.

Starting with number **/4** (marking within the model number)the G-40 offers the possibility to choose from two configurations (blocks) with 12 coin channels each. These blocks may be programmed in a different way and thus can obtain different coin combinations. This feature is particularly suitable for flexible siwtching over from one currency to the other.

All 12 channels of a block can be programmed with different coin types. Assigned to 6 lines these coin types or denominations are transferred to a machine (standard version). Alternatively it exists the S1 version with serial interface in order to communicate with the vending machine control.

Coin acceptance:	up to 12 different coin types programmed to 6 outputs
Coin diameter:	15 to 31 mm (thickness = 3.4 mm) or 15 to 32 mm (thickness = 2.4 mm)
Coin thickness:	1.5 to max. 2.4 or 3.4 mm

Coin sorting:	5 chutes programmable, independent of coin parameters
Coin blocking:	- one inhibit line for all coins - single inhibit lines for each coin denomination - a DIL-switch for blocking individual coins is provided for each channel
Power supply:	between 12 and 24 V
MCBF:	*Minimum coin between failures* which could not be cleared by reject operation. MCBF > 500,000 coins referring to maximum 5 years
MTBF:	*Minimum time between failures* for any non-coin related failure requiring a service call (bent or humid coins, acceptance or slug problems) MTBF depending on the number of accepted coins, max. 5 years

2. Measuring principle

Six inductive measuring sensors which are arranged one after another, collect the measuring values of each coin. The special arrangement of the sensors make it possible to measure the material, thickness, volume and embossing depth of coins. In addition, the diameter and mass are measured by optical sensors.
The obtained measurement values are compared with the acceptance bands stored within the 12 channels. If they correspond completely with a channel the validator values the inserted coin corresponding to the programmed output information, unless the channel is inhibited by the appropriate DIL switch or the appropriate input line.

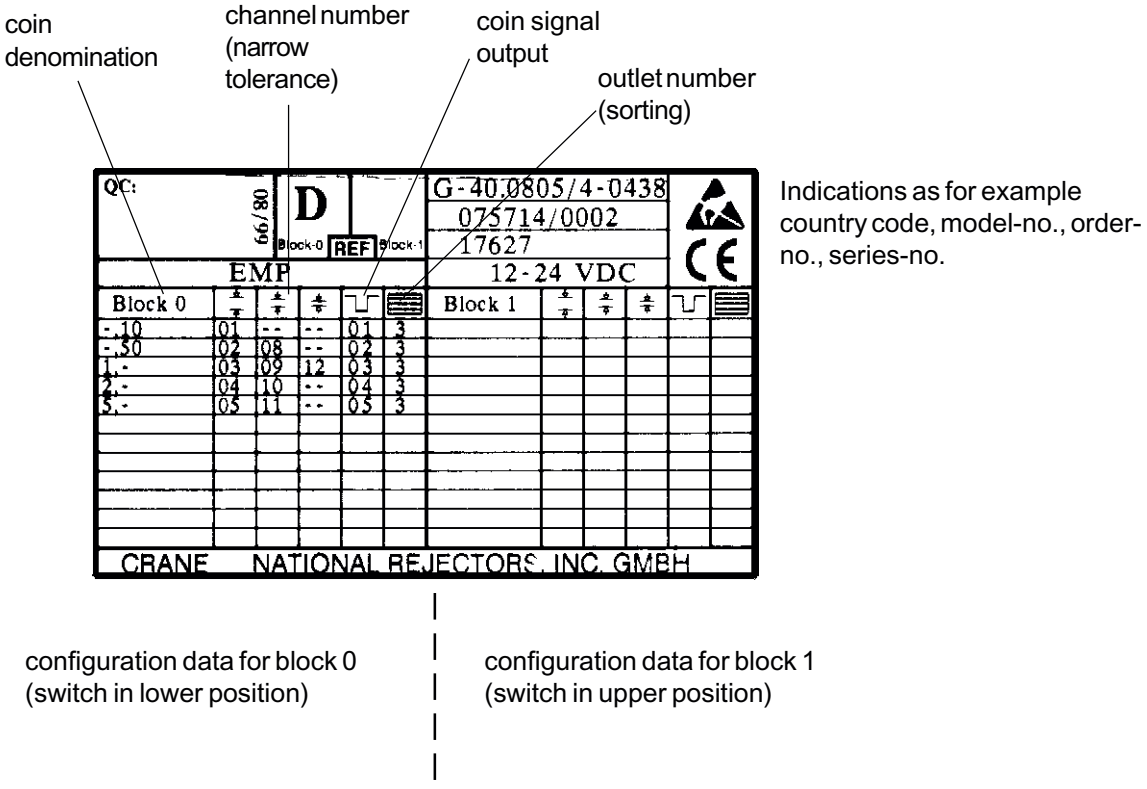
After successful measurement a light barrier in the area of the acceptance gate checks whether the inserted coins falls unhindered into the cash channel. Within validators containing a sorting the 'accepted coin sensor' is completed by a 'sorting control'. Only after passing this additional sensor is the appropriate coin signal given.
Thus the whole acceptance area inluding the falling direction is supervised, thus preventing manipulations.

3. Identification label

The identification label will show you which coin denomination has been assigned to each of the channels. A channel can be programmed either with normal, narrow or very narrow tolerances. By having a narrower tolerance the rejection of counterfeit money is more successful.

In addition, the identification label indicates which output will send a signal to the vending machine after a coin has been accepted.

Within validator series with integrated 5-way sorting unit each accepted coin is guided into one of the sorting chutes. The identification label shows the outlet number to which the coin or channel has been assigned.



4. Coin channels

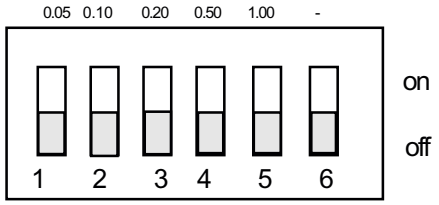
The 12 channels of the coin validator unit can be variably connected to the 6 coin signal outputs and the 6 individual blocking inputs. It is also possible to connect several channels to one output. Old and new coins with the same value, e. g. can give a pulse through the same coin signal output.

On the back of the coin validator you will find 2 blocks of DIL-switches. To each DIL-switch one of the 12 channels has been assigned. Thus you can inhibit the acceptance of coins by actuating the DIL-switch of the corresponding channel to be blocked.

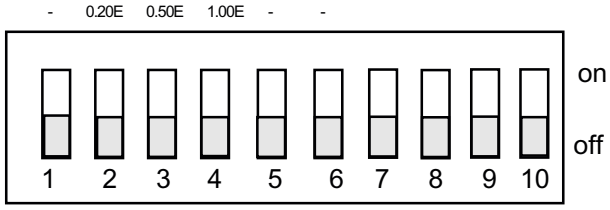
Example: 50 p is programmed in channel 4 'normal' and in channel 9 'narrow'

'normal' setting

Channels 1-6

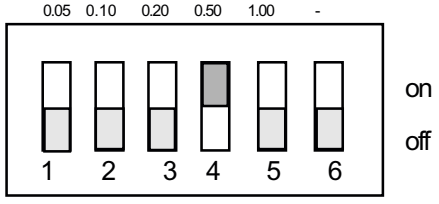


Channels 7-12

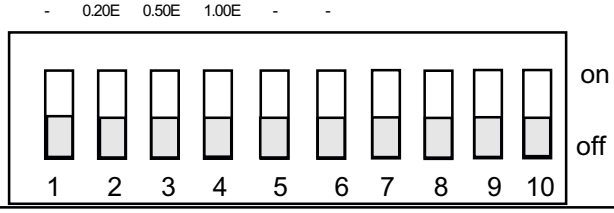


'narrow' setting

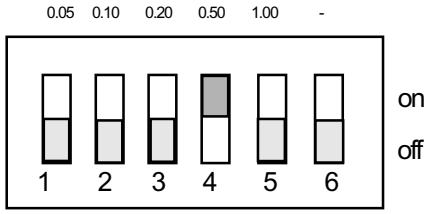
Channels 1 - 6



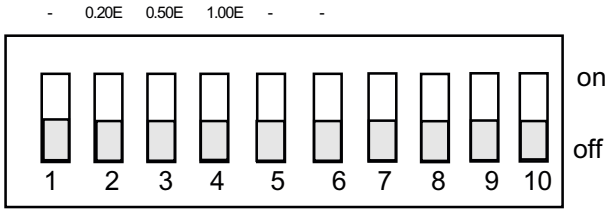
Channels 7 -12



Coin inhibit - example 50p
Channels 1 - 6



Channels 7 -12



The switches 7 and 9 of the 10-pole switch arrangement 2 are reserved for future applications. By using switch 8 you can carry out the block switch-over (see chapter 6). In on-position switch 10 offers a write-protection of the E²PROM area of the microcontroller.

5. Sorting

The sorting by means of flaps has been realised by the use of three magnets. The unit can be programmed so that the coins are guided to the 5 coin outlets independent of their parameters.

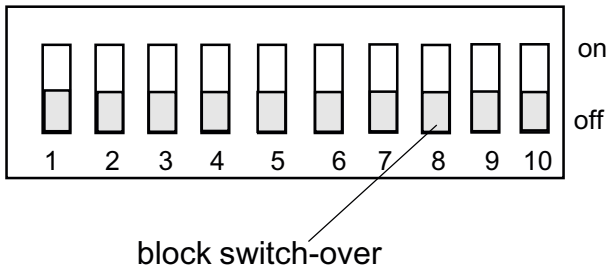
The numbering of the coin outlets starts on the back of the validator. The customers determine the assignment of the 12 channels to these outlets. The appropriate information is stored in a programming table in the memory of the validator.

6. Block switch-over

Starting with modell no. **G-40../4..** the validator offers the possibility to have two configurations, independent from each other. To each of these 'blocks' 12 individual coin channels are assigned with appropriate tables (denominations, sorting information etc). The programming is done either at NRI or at a service station. Although both blocks are programmed you can only work with one of them.
This type of validator can be recognized by the label with the extended indications (see chapter 3).

This function is ideal for storing additionally to the actual currency a second coin combination with individual interface information (table). For example in case of a currency conversion the actual settings are deactivated and the new ones are actived. A further application can be if independent from the currency an alternative vending machine interface is selected.

For all standard devices the switch-over is done by only **one** DIL switch:

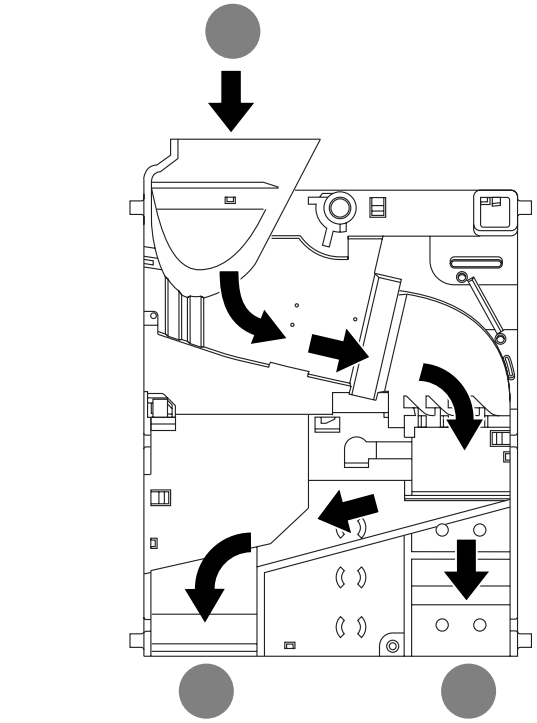


On the rear of the G-40 two switch arragement are positioned. For switching over from block 0 to block 1 please use swtich No. 8 of the lower switch. Please proceed as follows:

* Switch off power supply
* Switch on switch no. 8
  - lower position = only block 0 active (left side on label)
  - upper position = only block 1 active (right side on label)
* Switch on power supply
* Check coin acceptance (please refer to label)

7. Assemblies

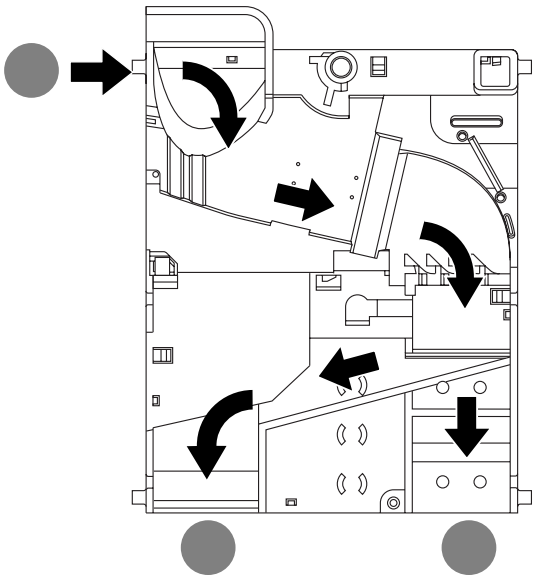
Top entry



Interface	Sorting	Model-No.
BDTA standard	x	G-40.06xx
BDTA standard	-	G-40.00xx
Serial S1 (MDB)	x	G-40.08xx
Serial S1 (MDB)	-	G-40.07xx
SWP/ BACTA standard	x	G-40.04xx
SWP/ BACTA standard	-	G-40.03xx

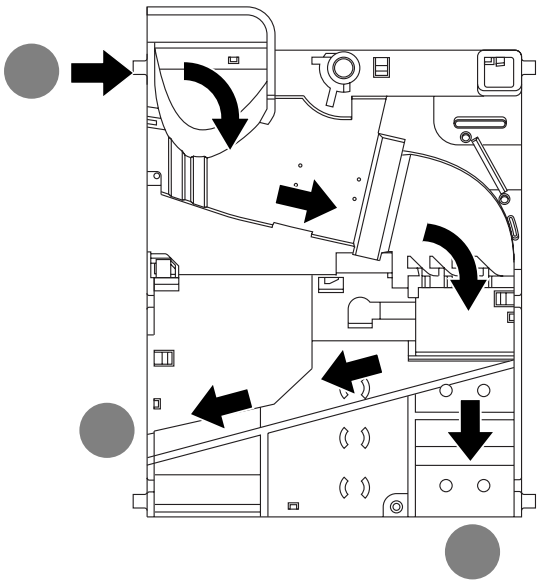
SWP = skill with prize

Front entry



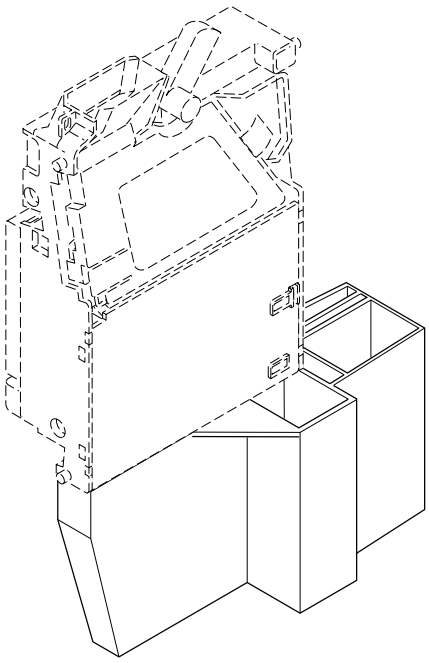
Interface	Sorting	Model-No.
BDTA standard	x	G-40.16xx
BDTA standard	-	G-40.10xx
Serial S1 0(MDB)	x	G-40.18xx
Serial S1 (MDB)	-	G-40.17xx
SWP/ BACTA standard	x	G-40.14xx
SWP/ BACTA standard	-	G-40.13xx

Front entry /Front return



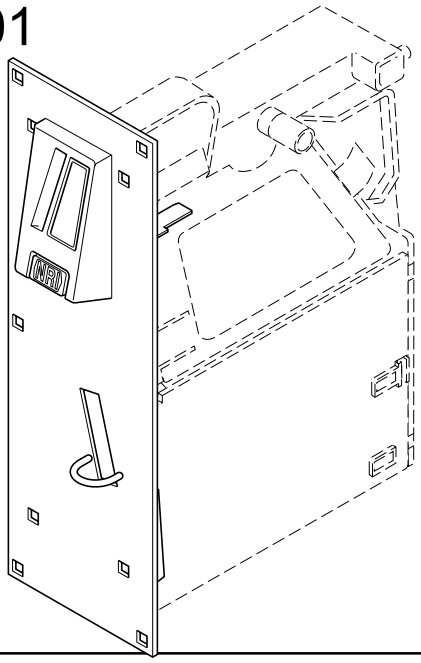
Interface	Sorting	Model-No.
BDTA standard	x	G-40.26xx
BDTA standard	-	G-40.20xx
Serial S1 (MDB)	x	G-40.28xx
Serial S1 (MDB)	-	G-40.27xx
SWP/ BACTA standard	x	G-40.24xx
SWP/ BACTA standard	-	G-40.23xx

Sorting adapter



for AWP/SWP devices
SAP-No.: 10402
No.: 82542

Frontplate G-42.4001



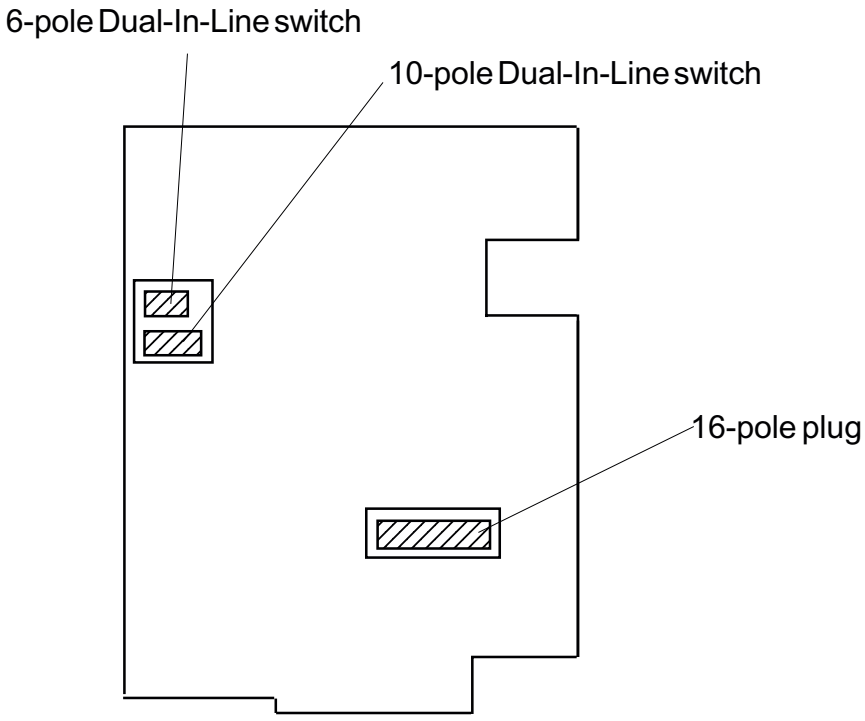
for AWP/SWP devices
SAP-No.: 10897
No.: G-42.4001

8. Interfaces

8.1. BDTA Standard

The Bundesverband der Deutschen Tabakwaren-Großhändler und Automaten-aufsteller determined the DTG standard 2 for the electrical interface to the machine. This standard include the specification of the supply voltage, the coin signal lines, blocking functions and the return signal. In addition to further standardisation requirements for validators the measurement quality of validators is also specified.

8.1.1 Switch positions



8.1.2 Pin assignment

Pin 1	ESP4	single inhibit channel 4	active high
Pin 2	ESP5	single inhibit channel 5	active high
Pin 3	ESP2	single inhibit channel 2	active high
Pin 4	ESP6	single inhibit channel 6	active high
Pin 5	Rü	coin return signal	active low
Pin 6	Sp	input total blocking	active low
Pin7	MS4	coin signal 4	active low
Pin 8	0V	supply voltage GND	
Pin 9	MS6	coin signal 6	active low
Pin 10	MS2	coin signal 2	active low
Pin 11	MS5	coin signal 5	active low
Pin 12	MS3	coin signal 3	active low
Pin 13	MS1	coin signal 1	active low
Pin 14	ESP3	single inhibit channel 3	active high
Pin 15	ESP1	single inhibit channel 1	active high
Pin 16		supply voltage +12 to 24 Volts	

Blocking coin acceptance - Sp/Lö - Pin 6
An external voltage controls the acceptance of coins.
Blocking: < 0.9 V
Accepting: > 3.7 V
Umax: 28 V

Blocking individual coins - ESP1-6/Lö - Pin 1,2,3,4,14,15
An external voltage controls the acceptance of individual coin types.
Blocking: > 3.7 V
Accepting: < 0.9 V
Umax: 28 V

Return signal - Rü - Pin 5
Output of device = open switch contact
Return active: < 0.8 V at 20mA. The signal is not debounced.
Umax: 28 V

Coin signal/price output - MS1-6 - Pin 7,9,10,11,12,13
Output of device = open collector - NPN - transistor.
Signal: active, low < 0.8 V
Pulse time: 100 ms +/- 10%
Umax: 28 V
Imax: 10 mA

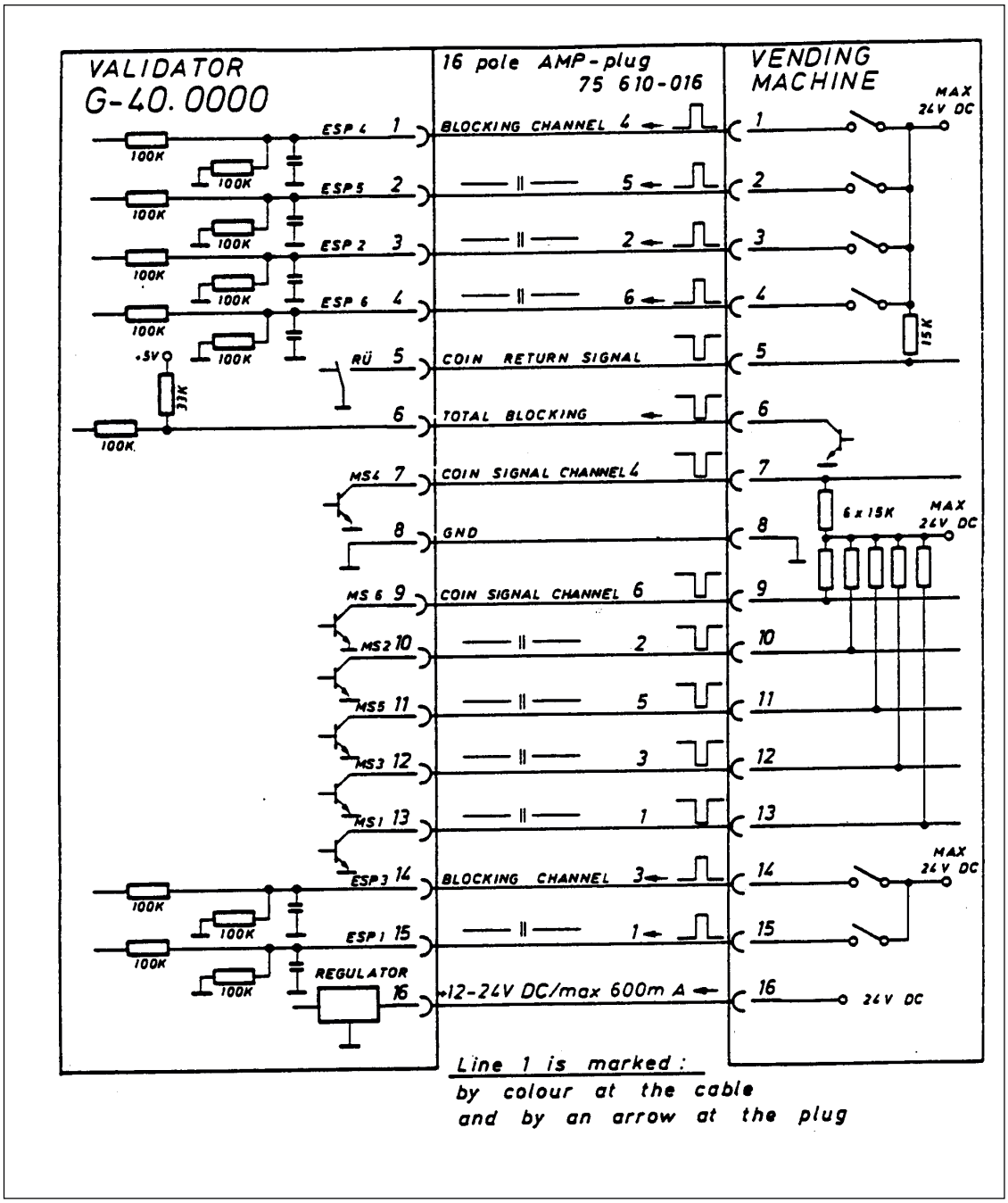
Power supply - Pin 8, 16

Voltage range:	10 to 28 V	
Current consumption	at 12 V	at 24 V
Standby current:	approx. 40 mA	approx. 40 mA
Coin in measuring section:	approx. 65 mA	approx. 65 mA (200ms)
Coin acceptance without sorting:	approx.350mA	approx. 310 mA (30ms)
	approx. 130mA	approx. 120 mA (90ms)
Coin acceptance with sorting:	approx. 600mA	approx.550 mA (max.)

Temperature range, climate
0 º to 60 º C
Climatic class F

Bounce-free signals:
All signals have to be debounced (starting on the input side) (> 10 ms).

8.1.3 Interface



8.2 AWP (amusement with prize) devices according to BACTA standard or SWP

For AWP and SWP machines in the gambling machine area a parallel interface is used mainly which is established in the BACTA standard. For coin signals a 15-pole exists, as well as a 17-pole connection. The behaviour of the validator with this interface differs in parallel and binary mode.

8.2.1 Parallel Mode

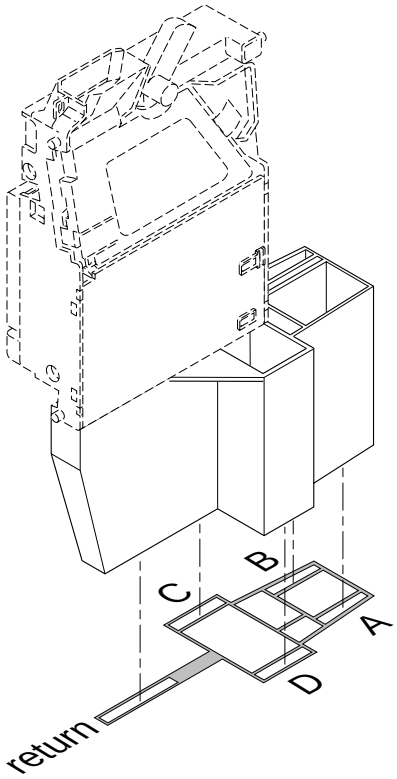
As soon as the select line is 'high' or is not used the machine receives the appropriate interface signals at the 15- or 17-pole connection. Via internal tables the output lines and single inhibit lines, as well as the assigment of the routing plug are assigend to a coin channel. At the routing plug a coin can be guided by a bridge to another chute (B,C,D) of the sorting adapter.

8.2.2 Binary Mode

The validator switches to the binary mode if the select line is 'low' and confirms this on the output line 6 (IDENT). In this mode the output line 4 is used as STROBE. The remaining 4 signal lines are programmed in the 'fault tolerant' mode.
This special coding of the coin outlet information prevents the possibility to obtain a higher credit by manipulation and contact problems.

8.2.3 Sorting Control

By three magnets and a flap control coins are guided to 4 coin chutes of the validator independent of their coin parameter. The outlets of the sorting adapter are marked with A,B,C and D (see next page). Each coin outlet can be defined as the cashbox chute. The assignment is programmed at NRI according to customers' requirements.



8.2.4 Routing Plug

At the 18-pole connector the coin channels can be guided by appropriate bridges to the sorting chutes B,C and D of the sorting adapter. All 12 coin channels can be assigned to the lines 1 to 6 of the routing plug to enable wide and narrow coin channels, as well as token validation.
Contrary to the BACTA standard chute A can be also used for diversion of coins.

8.2.5 Sorter Override

By the override plug a tube full recognition is given to the validator. If the appropriate pin of the plug is switched to 'low' the coin for this sorting chute is diverted as programmed in the sorting table. In addition the coin can also be guided into the cashbox chute. The required operation can be programmed by an internal function bit. Thus a 'Default Sorting' is also feasible without a routing plug.

8.2.6 Dual Coin Rundown

Via this plug the coin or token route via a dual coin rundown is recognized automatically. If a token is inserted the channels 5, 10 and 11 are enabled, whilst if a coin is inserted the remaining channels are enabled. Thus it is possible to adjust the acceptance bands wider and an overlapping with coins is excluded.

8.2.7 Switchable Sorting

By using the switches 7 and 8 of the blocking switch S1 four different sorting combinations of the coins can be set. The selection of the alternative sorting ways S1 to S3 is done by binary method, whereby the values of the two switches can be seen below.

The sorting combination S0 is determined in a table within the EEPROM. This table can be reprogrammed at any time.
The coin outlets for the sorting ways S1 to S3 are fixed combinations stored in the ROM.

Blocking switch S1

inhibit C1	inhibit C2	inhibit C3	inhibit C4	inhibit C5	inhibit C6	sorting single	sorting dual
S1.1	S1.2	S1.3	S1.4	S1.5	S1.6	S1.7	S1.8
off	off	off	off	off	off	off	off

Blocking switch S2 (from software version 29 00 296-006 on)

inhibit C7	inhibit C8	inhibit C9	inhibit C10	inhibit C11	inhibt C12	sort. prio. A–D	reserved	binary mode	VPP-save
S2.1	S2.2	S2.3	S2.4	S2.5	S2.6	S2.7	S2.8	S2.9	S2.10
off	off	off	off	off	off	off	off		

8.2.7.1 Sorting priority

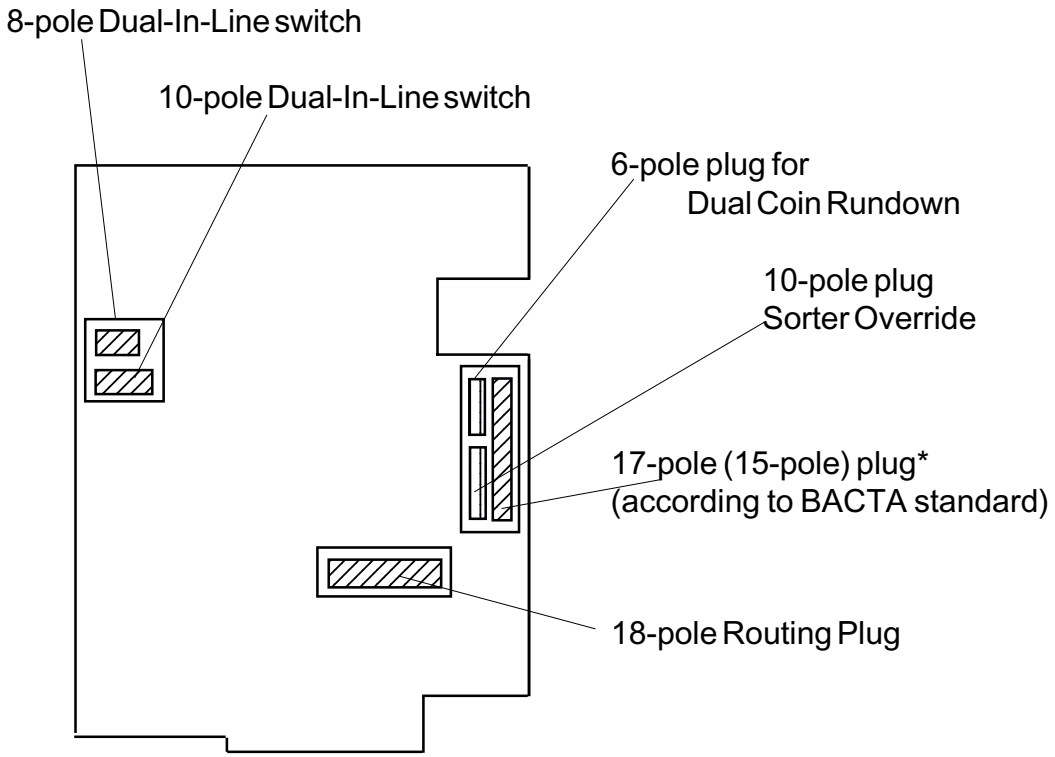
If the routing plug is used to divert coins in case of a full tube, the coins are first sorted in way D, then in way C, etc. This standard setting can be modified by means of switch 7 of switch block S2.

Switchable sorting ways S0 - S3 (from software version 29 00 296-006 on)

Channel	Coin	S0	S1	S2	S3
1	1 £	x	B	C	D
2	50	x	B	C	D
3	20	x	B	C	D
4	10	x	B	C	D
5	TOK1	x	B	C	D
6	2 £	x	B	C	D
7	5	x	B	C	D
8	50a	x	B	C	D
9	1 £e	x	B	C	D
10	TOK2	x	B	C	D
11	TOK3	x	B	C	D
12	–	x	B	C	D

x = programmable within EEPROM, standard programming way A

8.2.8 Switch positions - BACTA version



* To connect the AWP devices G-40.x3xx and G-40.x4xx with the 17-pole interface to the NRI testers
- G-19.0594 (power supply of 220/230 V, ordering code 11801) or
- G-19.0651 (power supply of 110/115 V, ordering code 21410)

you will require the adapter G-55.0342 with a 17-pole ribbon cable, which must additionally ordered (ordering code 15556).

8.2.9 Pin Assignment 15 (17) pole plug

17 pole	15 pole	Signal	Signal parallel	Coin par.	Signal binary	Coin binary
Pin 1	——	MS6	coin signal 6	5p	Ident	
Pin 2	Pin 1	MS5	coin signal 5	Token	Accept 5	coin line
Pin 3	Pin 2	VCOM	VCOM		VCOM	
Pin 4	Pin 3	MS1	coin signal 1	1 £ /2 £	Accept 1	coin line
Pin 5	Pin 4	Coding				
Pin 6	Pin 5	MS2	coin signal 2	50 p	Accept 2	coin line
Pin 7	Pin 6	MS3	coin signal 3	20 p	Accept 3	coin line
Pin 8	Pin 7		nc.		select par./bin.	
Pin 9	Pin 8	MS4	coin signal 4	10 p	Accept 4	strobe
Pin 10	Pin 9	ESP4	single inhibit C.4	10 p	reserved	——
Pin 11	Pin 10	UB	+10 to 24 Volts		+UB	
Pin 12	Pin 11	GND	GND		GND	
Pin 13	Pin 12	ESP3	single inhibit C.3	20 p	Inhibit 3	20 p
Pin 14	Pin 13	ESP2	single inhibit C. 2	50 p	Inhibit 2	5/10/50/50a
Pin 15	Pin 14	ESP1	single inhibit C. 1	1 £	Inhibit 1	1 £
Pin 16	Pin 15	ESP5	single inhibit C. 5	Token	Inhibit 5	Token
Pin 17	——	ESP6	single inhibit C. 6	5 p	Inhibit 6	2 £

Pin assignment plug Dual Coin Rundown

1 R +
2 token active high
3 coin active high
4 nc
5 key
6 GND

Pin assignment plug Sorter Override

1 GND
2 key
3 nc
4 nc
5 nc
6 (A)
7 B
8 C
9 D
10 +UB

Pin assignment Routing Plug

nc	nc	nc	CH1	CH2	CH3	GND	CH4	CH5
2	4	6	8	10	12	14	16	18
1	3	5	7	9	11	13	15	17
(A)	NC	GND	D	nc	GND	C	B	CH6

8.3 Serial Interface S1 (MDB)

The validator series G-40.0800 comprises validator G-40. including sorting and a serial interface. This interface follows the Multi Drop Bus (MDB) specification.

Advantages of a serial interface:

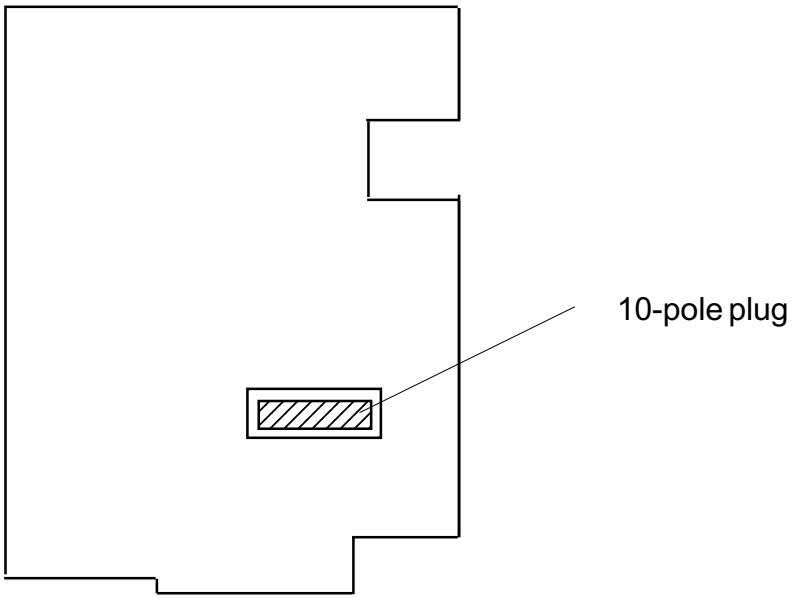
- o less faults and repairs due to less lines and less electronic components
- o more flexible and more comprehensive communication
- o easy extension of the system with additional peripherial units
- o cost reduction
- o transfer and control of functions.

Technical features:

- supply voltage 12 volts DC
- closed-circuit current 40 mA, maximum 600mA at coin acceptance with sorting
- the validator works in slave mode.

Please refer also to the 'Specification of G-40. serial S1'.

8.3.1 Switch position - Version S1 (MDB)



9. Option String Recognition

By optical sensors in the acceptance area of the validator a manipulation at the acceptance flap or a coin on a string can be recognized. These optics identify tight strings as well as slack ones.

If the validators recognizes such a manipulation, the coin line is switched active for 30 seconds and the coin pulse is suppressed automatically. The fault signal can be programmed to coin line 1 or 6, or can be ignored completely.

If the manipulation is not elimated, the fault signal is triggered again. During this time the coin acceptance is inhibited.

10. Option Teach Mode

By using the teach mode you can programme coins or token in channel 10 and 11 without any additional tools.

How to proceed:

o The validator remains connected to the machine.

* On the back of the validator are two switch arrangements (see next page). Turn switch No. 12 ON.

* Depending on the channel which should be taught (channel 10 or 11) switch ON the appropriate DIL-switch.

* Insert coins or token you would like to programme.

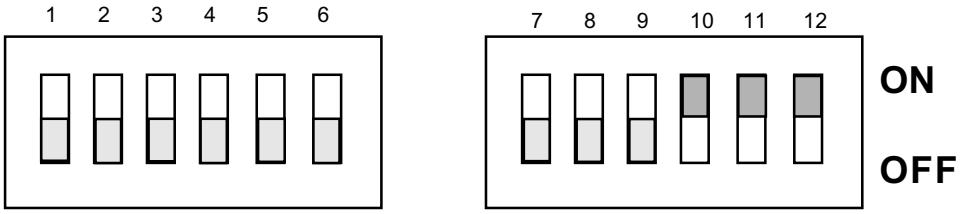
o After insertion of the 10th coins or token respectively the validator gives an acoustical signal (the acceptance gate clicks).

The measurement values are registered.

* Switch off the switch no. 12.

* Switch off appropriate switch of channel 10 or 11.

o The acceptance gate clicks once again, i.e the programming has been completed successfully.



In case the acceptance rate of a coin or token programmed with the teach mode is not acceptable, you can programme the coin or token with wider acceptance bandwidths. Therefore please proceed as follows:

* DIL-switch 12 to ON position. Teach mode is active.
* Switch on the desired channel 10 or 11.
* Insert new coins or token at least 10 times.
o The acceptance gate clicks once. The measurement values are registered.
* Set switches for channel 10 and 11 to ON position.
o **Wider acceptance bandwidths are calculated.**
* DIL-switch 12 to OFF position.
* Switches for channel 10 and 11 to OFF position.
o Coin or token is programmed. The teach mode is finished and the channel 10 or 11 are ready to accept coins or token.

If the acceptance gate clicks twice the following reasons could be possible:

- the coin could not be programmed. There exists an overlapping of the acceptance bandwidths with already programmed coins/token.
- during the measurement a fault occured.
- the programming has been interrupted early.
- the acceptance limits could not be assigned to a channel as first DIL switch 10 or 11 has been set to ON instead of DIL switch 12.

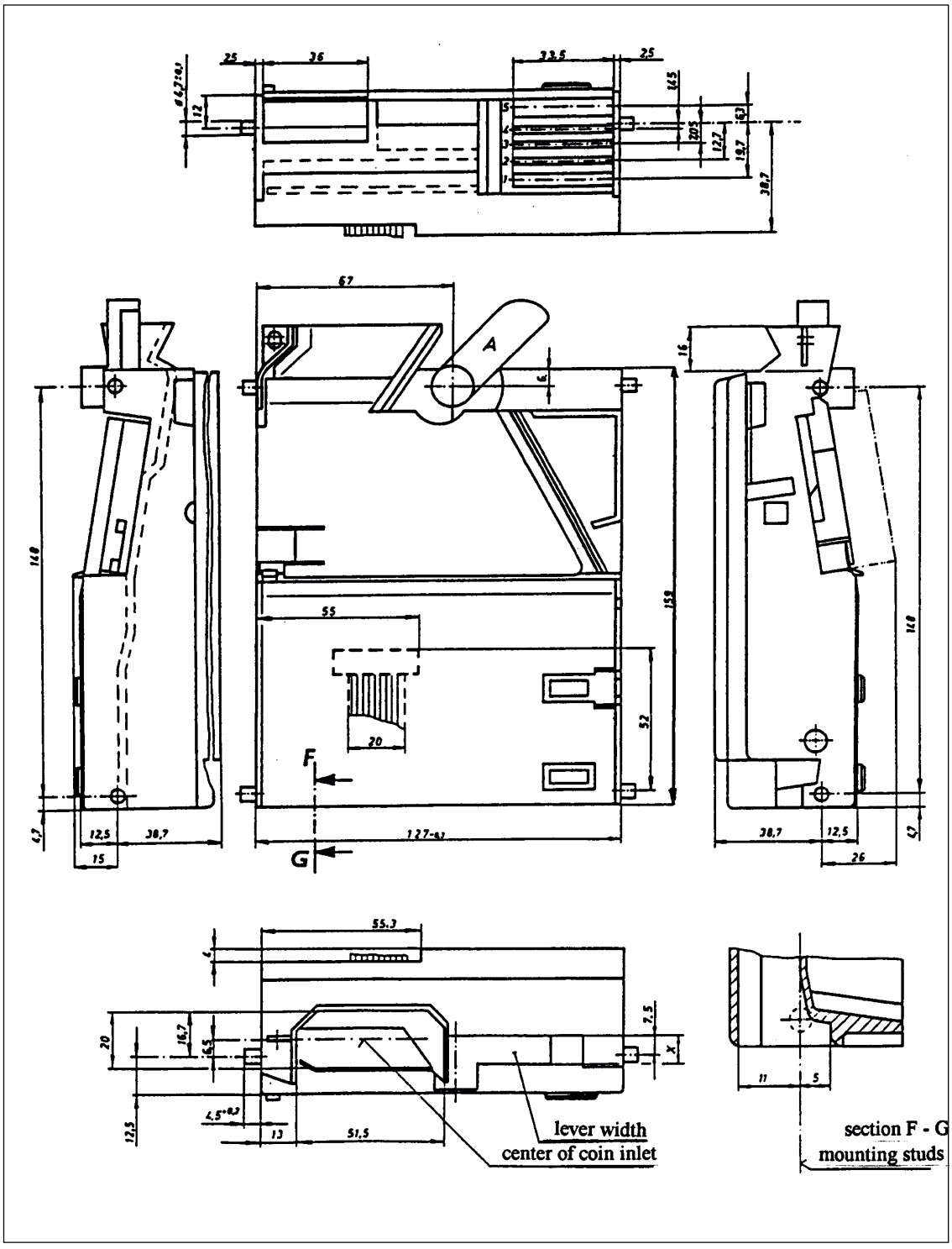
If a coin or token cannot be programmed the existing values remain stored in any case.

11. Option Multi Pulse

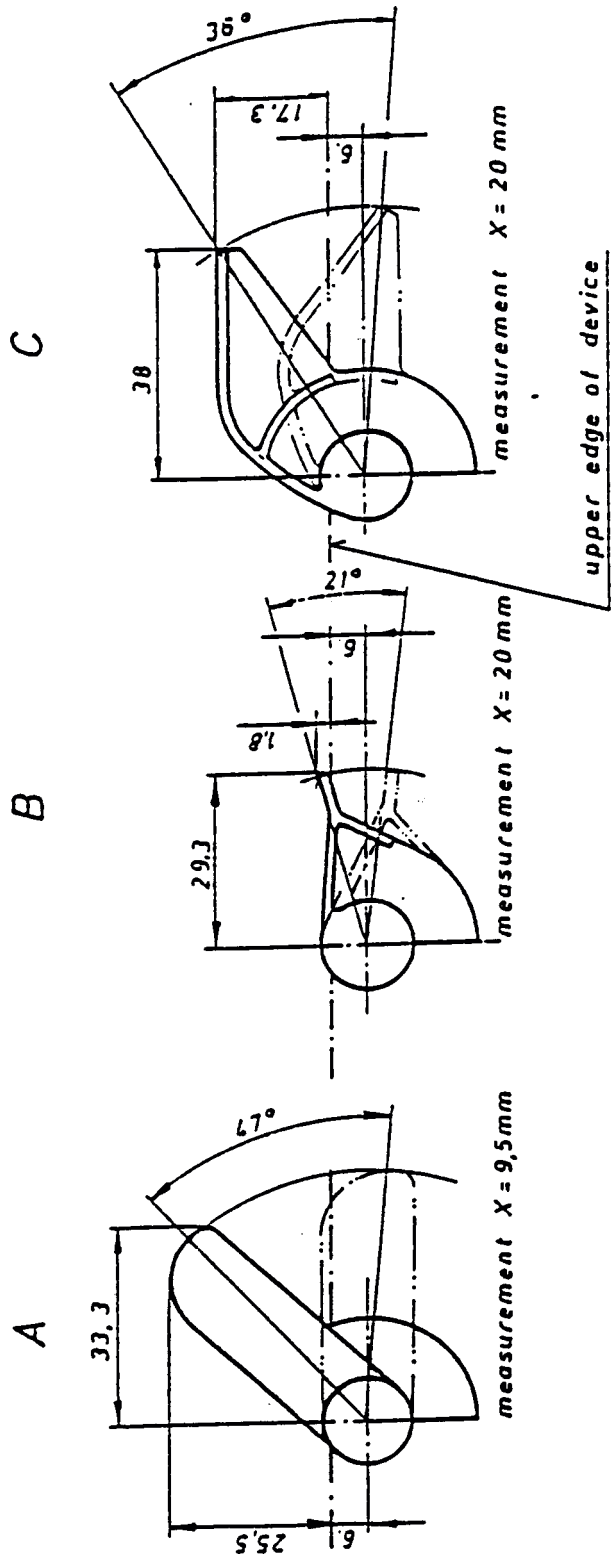
For each of the 12 channel multi pulses on a single coin output line are possible. Thus, for instance higher value coins can be also validated even if the machine does not have sufficient output lines.

Via an input in the table of the EEPOM 1 to 4 coin pulses can be programmed. Please pay attention that in the parallel mode of the BACTA interface of the G-40 a maximum of 2 pulses are settable for each of the 12 channels.

12. Dimensions



Lever options

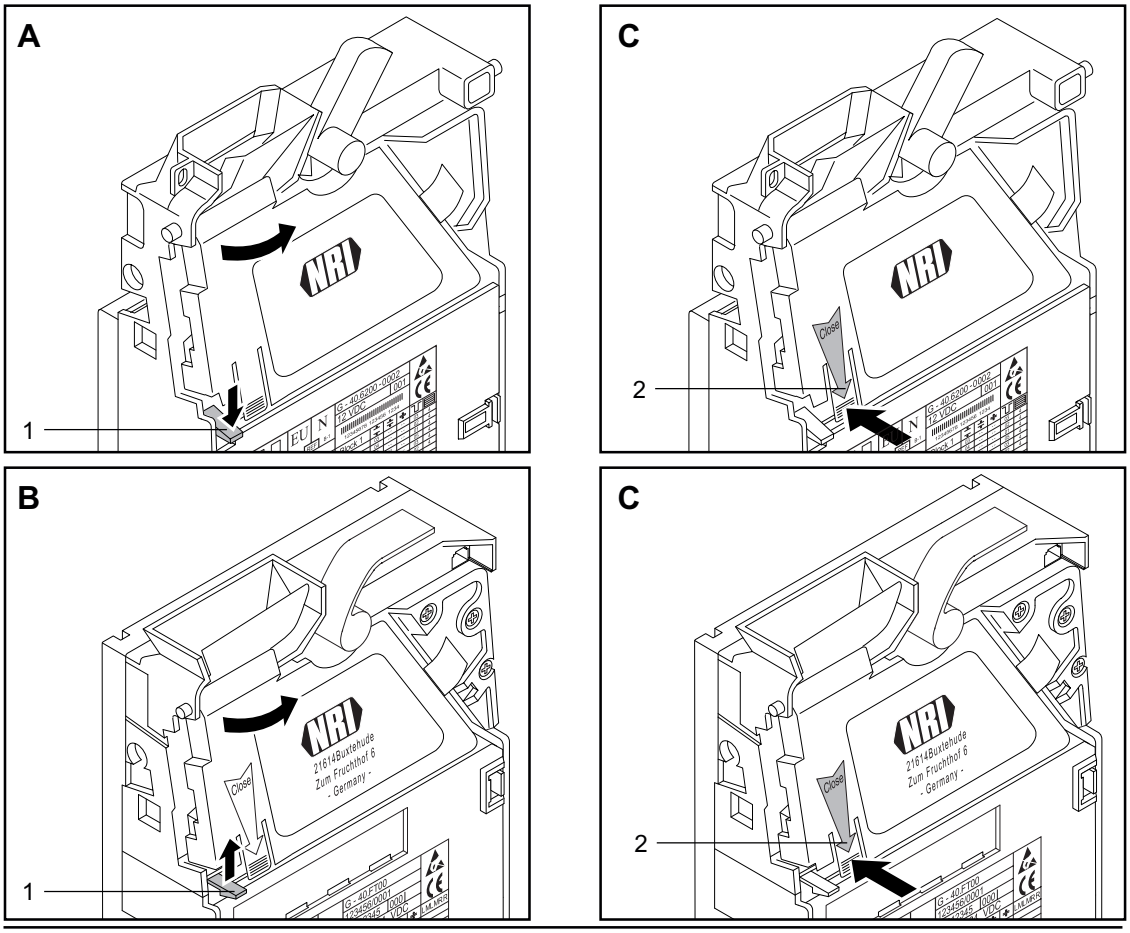


13. Cleaning

Only the coin validator's flight deck must be wiped clean from time to time with damp cloth (luke warm water with some washing up liquid). Over and above there is no further maintenance work to do.

Under no circumstances may the cloth be so wet that fluid runs into the device. Other the PCB will be damaged.
Do not use any solvents or scouring agents which attack the plastic of the device.

1. Pull the vending machine's mains plug.
2. Open the coin validator with lever **1**:
   – on the G-40.4500 press lever upwards (**B**).
   – on all other G-40 press lever downwards (**A**).
3. Wipe the coin runway inside the coin validator clean.
4. Press "Close" arrow **2**, so that the metal spring engages behind lever **1**, in order to close the coin validator (**C**).
5. Reconnect the vending machine to the mains supply.



14. What can be done, if ...?

Malfunctions can occur in all electronic devices. These do not always have to be faults in the device. In many cases the reason is improper connections or incorrect settings. Therefore: please first of all check, whether the malfunction can simply be remedied using the following table.

Troubleshooting

Problem	Possible causes	Remedy, tips
Coin validator does not accept coin	No power supply	• Connect ribbon cable to coin validator and vending machine correctly • Supply vending machine with voltage
	Return lever pressed	Make sure, that return lever is not inadvertently pressed
	Coin runway dirty	Open flight deck and clean coin runway (see Chap. 13 "Cleaning")
	Flight deck is not locked	Make sure, that spring is engaged behind lever (see Chap. 13 "Cleaning")
	Coin inhibited	• Make sure, that total blocking line (pin 6) is not activated by vending machine (see Chap. 8.1.2 "Pin assignment") • Make sure, that the single inhibit line assigned to the coin is not activated by the vending machine or the correct single inhibit line is assigned (if necessary, correct with WinEMP/PalmEMP) (see Chap. 8.1.2 "Pin assignment") • Make sure, that the coin is not inhibited using the DIL switches on the rear of the device or not only the narrow coin channel is enabled and the normal one is inhibited (see Chap. 4 "Coin channels")

Problem	Possible causes	Remedy, tips
Coin validator accepts coin but no credit is given	Coin does not exit the device	Make sure, that the coin outlet is not jammed by foreign objects or devices connected to the bottom of the coin validator

If the malfunction cannot be remedied, you can use the NRI testers
– G-19.0594 (for power supply of 220/230 V, ordering code 11801)/
– G-19.0651 (for power supply of 110/115 V, ordering code 21410)
to test the signal lines of the connecting cable.

To remedy other faults please contact our service technicians.