

Generator System

NSG 2050

OPERATING INSTRUCTIONS



601-166D

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WARNING:

Lethal danger from high voltages and the risk of radiating illegal electromagnetic interference.

The NSG 2050 may only be installed and used by authorised and trained EMC specialists (electrical engineers).

The NSG 2050 must only be used for EMC tests as set down in these operating instructions.

Manufacturer
SCHAFFNER ELEKTRONIK AG
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1 Safety advice

The generators and their accessories work at high voltages.

Improper or careless handling can be fatal!

These operating instructions form an integral part of the equipment and must be available to the operating personnel at all times. All the safety instructions and advice notes are to be observed.

Neither SCHAFFNER Elektronik AG, Luterbach, Switzerland nor any of the subsidiary sales organisations can accept any responsibility for personal, material or consequential injury, loss or damage that results from improper use of the equipment and accessories.

1.1 General

Use of the generator is restricted to authorised and trained specialists.

The generator is to be used only for the purposes set down by the manufacturer.

The construction of the unit renders it unsuitable for use in an explosive atmosphere.

Persons fitted with a heart pacemaker must not operate the instrument nor approach the test rig while it is in operation.

Only approved accessory items, connectors, adapters, etc. are to be used to ensure safe operation.

Safety measures are described in these instructions as follows:

WARNING: For potential dangers that could result in serious injury or death.

CAUTION: For potential dangers or where careless handling could cause light injuries or material damage.

1.2 Installation

The instrument conforms to protection class 1, but with an increased leakage current.

Local installation regulations must be respected to ensure the safe flow of leakage currents.

Operation without a protective earth connection is forbidden!

Two independent protective earth connections are necessary (instrument and EUT supply) connected back to the local permanent installation or to a fixed, permanent protective earth conductor.

Operate the equipment only in dry surroundings. Any condensation that occurs must be allowed to evaporate before putting the equipment into operation. Do not exceed the permissible ambient temperature, humidity or altitude.

Use only nationally approved connectors and accessory items.

Ensure that a reliable return path for the interference current is provided between the EUT and the generator. The reference ground plane and the earth connections to the instruments as described in the relevant test standard serve this purpose well.

The instruments must generally not be opened. This may only be undertaken by a qualified specialist if specifically instructed to do so in the operating manual. Depending on the Pulse Network (PNW) utilised, the equipment can work with two independent power supplies, one for the generator and one for the EUT. Besides the mains supply itself, certain instruments or parts thereof, also operate at high voltages which are not provided with any internal form of extra protection against being touched.

1.3 Test execution

The test area must be so organised that no unauthorised persons have access during execution of a test. If a safety contact (interlock) is used as a means of access control to the test zone (e.g. Faraday cage), then an additional contact in series is necessary to provide protection for parts of the EUT that are in danger of being touched.

EUTs, together with their accessories and cables, are to be considered as being live during a test. The test generator must be stopped and the EUT supply interrupted before any work is carried out on the EUT. This can be implemented by opening the interlock circuit, but depends on the type of generator in use.

The EUT is to be tested only in a protective cage or under a hood which provides protection against electric shock and all manner of other dangers pertaining to the particular EUT (see: Dangers concerning the EUT).

The safety instructions concerning all the instruments and associated equipment involved in the test rig are to be observed.

The configuration of the test rig is strictly to be in compliance with the methods described in the relevant standard to ensure that the test is executed in a standard-conform manner.

1.4 Dangers concerning the generator

- Local burning, arcing, ignition of explosive gases.
- Danger from the resultant EUT supply current caused by a flash-over or breakdown resulting from the superimposed high voltage effects.
- Dangers from a disrupted EUT.
- Disturbance of unrelated electronics, telecommunications, navigational systems and heart pacemakers through unnoticed radiation of high frequency energy.

1.5 Dangers concerning the EUT

EUTs are often simply functional samples that have not previously been subjected to any safety tests. It can therefore happen in some cases that the EUT is quickly damaged by internal overloads caused by the control electronics being disrupted or it may even start to burn.

- As soon as the EUT shows signs of being disrupted the test should be stopped and the power to the EUT switched off.
- Internal disruption of the electronics can result in the interference voltage or the EUT supply voltage being present on the EUT's housing.
- Electrical breakdown or arcing from plugged connections that are over-stressed voltage-wise during the test.
- Explosion of electronic components with fire or fragmentation as a result of the energy dissipated, e.g. from the resultant supply current or ignition of vaporised plastics materials.
- Faulty behaviour by the EUT, e.g. robot device strikes out, temperature controller fails, etc.

1.6 Applicable safety standards

Development and manufacture is in compliance with ISO 9001.

The equipment conforms to the safety requirements of IEC 1010-1 / EN 61010-1 (Safety requirements for electrical equipment for measurement, control and laboratory use). The switching power supply conforms to IEC 950.

All mains driven types of generators are equipped for high voltage working safety in accordance with VDE 0104. For details see the chapter "Standards".

The interference immunity has been tested in conformity with EN 50082-1.

It is the user's responsibility to ensure that the test set up does not emit excessive radiation that may affect other equipment. The generator itself does not produce any illegal radiation, however the EUT and/or the associated cables may start radiating EMI.

Since the purpose of this instrument is to produce interference signals for interference immunity tests, the requirements of EN 50081-1 to limit the radiated EMI can only be complied with by operating the system inside a Faraday cage.

2 Unpacking, storage and transport

2.1 General



Throw nothing away!

Packaging either:

- Keep for despatching the instrument to the calibration service
- Return to the relevant sales outlet
- Dispose of in an environmentally friendly manner,

thus:

Packaging materials:	Carton:	cardboard
	Padding:	CFC-free polystyrene foam
	Plastic bags:	polyethylene









Avoid the possibility of condensation occurring!

If a large temperature difference has been experienced, allow some hours to elapse to permit the temperature to stabilise before opening the package.

2.2 Storage and transport

- Do not stack, either packaged or out of the packing.
- Do not up-end, arrows on the packaging must always point upwards.
- Protect from dampness, heat, cold and rain.
- Do not throw.
- Do not sit or stand on the instrument and packaging.
- Despatch only in the original packaging or its equivalent.

2.3 Unpacking

- Is the packaging intact?
If **NO**  → **transportation company**
- Are all the packages present and correct?
If **NO**  → **transportation company**
- Open the packaging, remove the accessories.
- Lift the instrument out of the packaging by its side hand-grips.
- Are the instrument and the accessories intact?
If **NO**  → **transportation company**
- Are the contents of the package complete according to the packing list?
If **NO**  → **sales outlet**
- Keep the operating instructions with the instrument.
(Copies can be ordered from the sales outlet)
 → **sales outlet**
- Save the packaging.
(Inform the sales outlet in advance if you intend to return the instrument)
 → **sales outlet**

ATTENTION: An electrical function check is only permissible and possible by a trained specialist.

3 Description of the instrument

3.1 Introduction

This top class EMC test instrument for high energy pulse tests provides you with an efficient means to perform functional examinations on all types of electronic equipment to determine their susceptibility to electromagnetic disturbances.

The unit also enables tests to be run that exceed the requirements called for in the standards. All conceivable requirements have already been incorporated into the concept of the modular basic instrument.

The instrument simulates pulses such as those typically produced by a lightning strike. The modularity of the generator system enables the multiplicity of pulse shapes required to carry out various surge pulse tests to be achieved with just a single instrument.

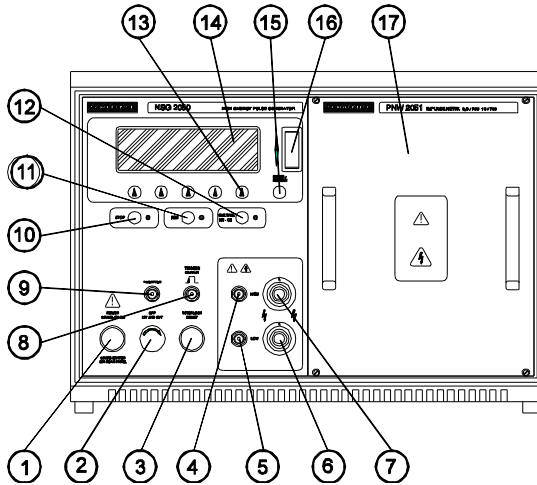
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Before you can inscribe your electronic products with the legally required CE symbol you must have performed an EMC test in conformity with **EN 50082-1** or the appropriate product standard.

The NSG 2050 is intended for executing interference immunity tests with surge pulses as called by IEC, CCITT, Bellcore and ANSI as well as electrical fast transients given in IEC 1000-4-4 and power quality test such as IEC 1000-4-11 and various derivatives.

3.2 Operating elements

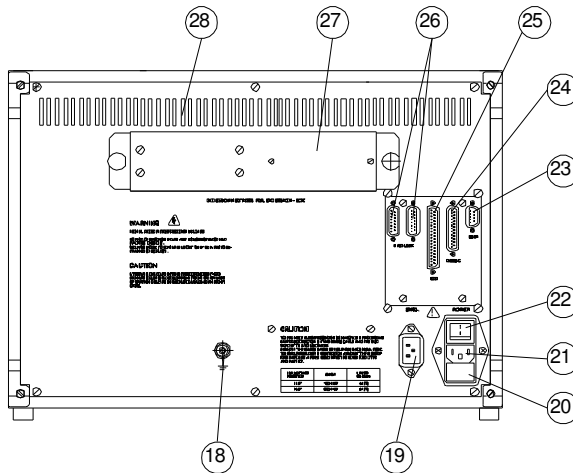
3.2.1 Front panel



- | | | |
|---|----------------------|--|
| 1 | “POWER” button | Toggle function “STAND-BY” < > “ON” with STAND-BY indicator. Press the button 10 s after the mains supply has been switched on. |
| 2 | “EMERGENCY OFF” | Emergency off function for use under computer and manual control. Switches the EUT supply off and puts the pulse generator into the “STOP” mode. Interlock will open up. |
| 3 | Interlock reset | Reset after the interlock has been triggered. |
| 4 | Monitor Output, High | 1:1000 voltage monitor, high impedance |
| 5 | Monitor Output, Low | 1:1000 voltage monitor, high impedance |

6	Output Low	Pulse Output, low
7	Output High	Pulse Output, high
8	Trigger Output	CRO trigger signal, 5V active high
9	I-monitor	Current monitor, 1V = 200A with ext. 50 Ω termination
10	"STOP" key	Stops the current test, switches the HV off and resets the test duration timer. The green LED indicates the 'Stop' state.
11	"RUN" key	Switches the high voltage on and, once the set voltage level has been attained, starts the test running for the duration defined by the "Test time" timer. The red "RUN" LED Indicates the 'Run' state.
12	"Ext. Trigger HV-ON" key	The external trigger signal must become active within a few seconds of pressing this button (see 4.6.2 User Port).
13	Function keys	Their active function is shown in the display.
14	LCD display	Shows set values and system messages.
15	"ENTER" key	Terminates each input and activates the selected function. Return to the basic menu.
16	Rotary knob	For changing the selected parameters
17	Module slot	To accommodate the PNW module

3.3 Rear panel



- 18 Earth connection point
- 19 Synchronisation input
- 20 Voltage selector with fuse for the generator supply
- 21 Mains input for generator power supply
- 22 Mains switch
- 23 "User" port
- 24 Remote control connector, 25-pin RS 232, DCE, without HW control lines 9600 baud, 8-bit, even parity, 2 stop bit
- 25 Connector for controlling an external coupling device (CDN)
- 26 Connector for interlock
- 27 Termination connector
- 28 Ventilation slots

4 Installation and power supply

4.1 Installation

Apart from the power connection and the synchronisation supply, no further installation is necessary for manual operation of the instrument.

The test rig itself must, however, be configured precisely in accordance with the relevant standard and test plan to enable standard-conform surge tests to be carried out correctly.

4.2 Location

A screened room (Faraday cage) is the only location that may be considered. Only trained, authorised personnel without a heart pacemaker should be granted access. The ambient conditions should be within the specifications of all the equipment involved.

An environment as per IEC 68-1 (1988) is recommended:

Ambient temperature:	15 °C	to	35 °C
Relative humidity:	25 %	to	75 %
Air pressure:	86 kPa	to	106 kPa

The ventilation slots on the instrument must not be blocked.

4.3 Power supply

The NSG 2050 has two independent power supply inputs:

- (1) Instrument supply via an IEC 320/IV equipment connector
- (2) Synchronisation feed via a mains cable fed from an internal or external CDN

WARNING: Use of the CDN 131 /133 or the PNW 2055 produces earth leakage currents of up to 3 A, because of the coupling capacitors and filter involved.

The NSG 2050 must hence by efficiently earthed.

One of the following additional protective measures is likely to be necessary, depending on local regulations:

- Permanently connected additional earth conductor.
- Both power feeds including the protective earth lines to be connected separately to the building's fixed installation.

CAUTION: RCD circuit breakers rated at ≤ 30 mA can be triggered by the EUT supply. This may first be noticed while the instrument is in operation with a CDN 131 / 133 or PNW 2055.

4.3.1 Instrument power supply

This can be obtained from a single-phase 100, 115, 220, 230 or 240 Volt, 50/60 Hz mains outlet. The voltage selector is to be set to suit the local conditions.

Line voltage	Range	IEC 127 5 x 20 mm	max. Power selection
110 - 120 V	90 - 120 V	4A (T)	230 VA
220 - 240 V	200 - 240 V	2A (T)	250 VA

It is imperative that a protective earth connection is also provided.

4.3.2 Synchronisation supply connection

This connection is required when the pulse is to be synchronised to the mains frequency. The connection is generally made via the external or internal CDN.

Voltage range:	10 V ... 230 Vac (+10%)
Frequency range:	15 ... 440 Hz

4.3.3 Connections:

Cable:	Protective earth PE:	yellow / green
	Neutral line	N: blue
	Phase (reference)	L: brown

4.4 Front panel connections

This is the high voltage output socket at which the pulse appears. These outputs are symmetrical and floating. The protective earth is connected to the screen of the cable.

4.4.1 Coupling via the High/Low Output

The appropriate connector should always be mounted directly and carefully on the cable. Adapters do not generally have a sufficiently high voltage rating. A suitable cable is e.g. RG 213 and for the connector LEMO type 415.

4.4.2 Trigger outputs

The BNC connector "TRIGGER OUTPUT" on the front panel provides a trigger connection for an oscilloscope. A 5V trigger pulse (high impedance) about 100 ms wide is produced approximately 30 ms before each pulse.

4.4.3 Monitor voltage output

These outputs serve only for supervisory purposes and must not be used for calibration or measurement tasks.

These outputs are attenuated by 1000:1 to enable the pulse to be observed on an oscilloscope. The CRO should be set to provide a high impedance input.

Since the generator is "floating", i.e. symmetrically configured, the monitor outputs must be measured differentially.

4.4.4 Current output, I-Monitor

This output must be connected to an oscilloscope with a 50 Ω termination so that 1V = 200A. An attenuator may have to be used depending on the type of CRO used and its input voltage divider.

4.5 EUT connection

Depending on the PNW employed, the NSG 2050 superimposes the pulses directly on the High and Low pulse outputs.

The method for connecting an EUT is described in the relevant PNW manual.

4.5.1 Using other coupling devices

When a user wishes to use his own coupling devices these must be equipped with the correct connectors and cables.

Particular care must be paid to the safety connections in order to ensure that the safety philosophy of the NSG 2050 is not compromised.

The type of connections used will depend on the requirements of the test.

4.6 Connections to rear panel

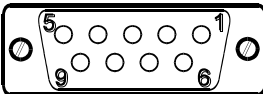
4.6.1 Synchronisation supply

The synchronisation supply can be obtained from other frequencies to suit the particular application. For example, the object under test might be intended for the US market (60 Hz) but can be tested with the instrument powered from a 50 Hz source. Synchronisation is automatically implemented when power is supplied to the input. The frequency is measured automatically before each pulse is triggered and the parameters that have been set are adjusted accordingly.

4.6.2 The "USER" port

The USER port is a multi-function connector. It can be used for the following tasks:

- Input to the EUT monitor
- Input for external triggering via synchronisation signal
- Output for external trigger ready
- Output for end of test signal (EOT)
- Input for EUT monitoring (Pin 1, active low)



Connector pin-out

Pin	Signal
1	EUT_FAIL Input
2	EXT_TRIG Input
3	E_TRIG_RDY Output
4	GND
5	GND
6	EOT
7	N.C.
8	N.C.
9	N.C.

The "EUT-Fail INPUT" serves to supervise the function of the EUT.

The generator is put into the STOP mode and the message "INFO 115" is displayed when this input is activated. It can be driven from TTL/CMOS logic at up to 15V or by a contact to earth; current approx. 1 mA.

The circuitry for recognising an EUT fail function depends on the type of test object. In general this will be different for every test. An EMC-compliant connection to the system is essential.

External trigger input via synchronisation signal (Pin 2, active low)

This facility enables the pulse to be synchronised to an external signal. The external signal triggers the generation of a pulse. The delay is about 30 ms. It can be driven from TTL/CMOS logic at up to 15V or by a contact to earth; current approx. 1 mA.

This form of triggering must occur within a few seconds of the EXT_TRIG_RDY signal otherwise Error 210 (ext. trigger missing) will be displayed.

Output for external trigger ready (Pin 3)

This signal is intended for external pulse triggering. When the Ext-Trigger / HV ON mode is active and the high voltage has attained the specified level, the signal EXT_TRIG_RDY switches from 0 to +5V for about 900 ms. The pulse can only be triggered via Pin 2 while this signal is active.

End Of Test output (Pin 6)

This signal can be used for an optical or acoustic indication that the test has ended.

The "End Of Test" output (EOT) switches from 0 to +5V when the test ends.

4.6.3 Remote control interface (RS 232)

Remote control is effected from an associated computer via an RS 232 link.

Since the primary function of the NSG 2050 is the generation of high energy pulses, any electrically connected interface must work with an optical link to prevent EMC problems or even destruction occurring. Such an opto-link also enables the computer to be operated outside the Faraday cage. Opto-link modules are available from SCHAFFNER as accessories. The interface port is configured as follows:

Baud rate:	9600	Pin 1	Protective ground
Parity:	even	Pin 2	Input (RxD)
Data-bits:	8	Pin 3	Output (TxD)
Stop-bits:	2	Pin 7	Signal ground
Mode:	DCE	Pin 18	+12V
		Pin 25	-12V

The protocol complies with the command-set of SCPI (Standard Commands for Programmable Instruments).

Remote control

A number of control software possibilities can be considered:

1 SCHAFFNER Program WIN 2050:

This is a complete, comprehensive, “ready-to-work” Windows™-based operating surface which offers a convenient means to store whole control sequences, ramping functions and result logging.

2 SCHAFFNER-INTEPRO POWERSTAR™:

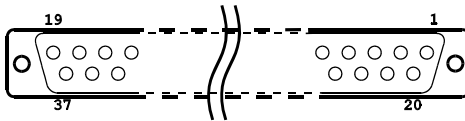
This is a very versatile software system that enables whole test rigs with instruments from various manufacturers to be controlled. All types of measurement and evaluation are supported so that a comprehensive assessment of the state of the EUT is possible.

3 Application with standard programming environments for measuring instruments:

Programming environments that may be considered are: VEE™ from *hp* as well as LabWindows™ from *National Instruments*.

4.6.4 External CDN control connection

Pin-out of the 37-pin D-sub miniature connector



Pin	Signal	Description
1	GND	Connected to ground via choke
2	K 0	Coupling K 0 Output
3	K 1	Coupling K 1 Output
4	K 2	Coupling K 2 Output
5	K 3	Coupling K 3 Output
6	K 4	Coupling K 4 Output
7	EUT POWER	EUT POWER Control Output
8	GND	Connected to ground via choke
9	NC	---
10	NC	---
11	GND	Connected to ground via choke
12	V 1	1 Voltage Limit Input*
13	V 2	2 Voltage Limit Input*
14	V 3	3 Voltage Limit Input*
15	CDN 0	CDN 0 Input
16	CDN 1	CDN 1 Input
17	CDN 2	CDN 2 Input
18	CDN ERROR	CDN Error Input:
19	N.C.	---
:	:	:
37	N.C.	---

* Voltage from 0 ... 9.5 kV depending on CDN

Output: High (+5V) = active; 0 V = inactive

Input: Low (GND, 0 V) = active; N.C.(+5 V max.) = inactive

4.6.5 Interlock

The NSG 2050 has an integral interlock system in keeping with the kind of safety standard expected of a high voltage test instrument.

This system has the following functions:

Inputs:

- Input for external monitoring, e.g. from special coupling networks and access control restrictions.
- Internal "Emergency off" button opens the interlock circuit.

Outputs:

- Operating mode: The NSG 2050 cannot be switched to RUN or "Ext. Trigger HV ON" if the interlock circuit is not closed. The STOP function is implemented if the interlock circuit is opened while the generator is in the RUN state.
- EUT-Power: The EUT power supply cannot be switched on if the interlock circuit is not closed. The EUT supply is switched off if the interlock circuit is opened while the supply is switched on.
- Warning lamps: The green lamp is switched off and the red one switched on when the interlock circuit is closed.
- Display: An open interlock circuit is shown on the display by an open switch symbol.
- Status messages to the remote control computer.
- Interlock output for other system equipment.

The interlock system for all the equipment in the ProfLine range has the same configuration and hence numerous items can be successfully connected together.

Each instrument is equipped with two 15-pin connectors which serve as the interlock input and output respectively. The interlock circuit must always be terminated at both ends with the relevant connections being looped through the various safety contacts in the system. This is achieved automatically when using original SCHAFFNER accessories by making the connections to the interlock connectors with 15-way standard cables wired on a 1:1 basis. An arbitrary number of instruments and/or accessory devices can be incorporated in the safety concept.

The high voltage and the EUT supply are only enabled if the safety conditions are fulfilled at every unit that is connected (emergency stop button unlocked, safety contact closed, etc.)

The interlock function must be implemented for the control of warning lamps to comply with VDE 0104. Once the interlock circuit is closed, the instruments are able to be switched on and the red lamp lights up.

If an instrument is to be used without an external interlock contact then the two terminating connectors supplied must be inserted.

Signal levels:	Voltage	48 Vdc max.
	Current	20 mA min. / 1 A max.

Connector:	15-pin sub-min D-socket
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Max. permissible cable length:	3 m each, screened (safe operation is guaranteed up to 10 m)
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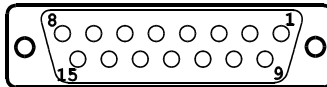
Actuation is via potential-free switch contacts.

All signals are active LOW, i.e. switched to GND.

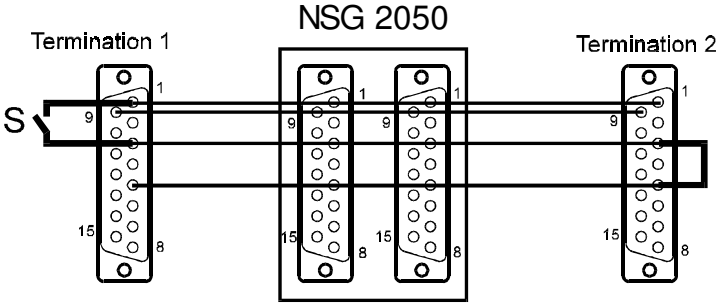
The pin-out at the interlock input and output connectors is identical. All the pins are individually interlinked whereby the internal connection between the two pins 3 can be interrupted by the emergency stop button or the internal interlock facility when either is activated.

15-pin Interlock connector

Pin	Function
1	GND, 0 V
2	NC, linked to the other interlock connector
3	Interlock input/output (internal switch)
4	NC, linked to the other interlock connector
5	Interlock status (triggers the interlock function in the instrument and switches the relay at +12 to +48 V for this purpose)
6	NC, linked to the other interlock connector
7	NC, linked to the other interlock connector
8	NC, linked to the other interlock connector
9	Switch warning lamps and peripherals on (active as soon as the NSG 2025 is switched from Standby to ON)
10	NC, linked to the other interlock connector
11	NC, linked to the other interlock connector
12	NC, linked to the other interlock connector
13	NC, linked to the other interlock connector
14	NC, linked to the other interlock connector
15	NC, linked to the other interlock connector
Housing	Screen



15-pin D-connector

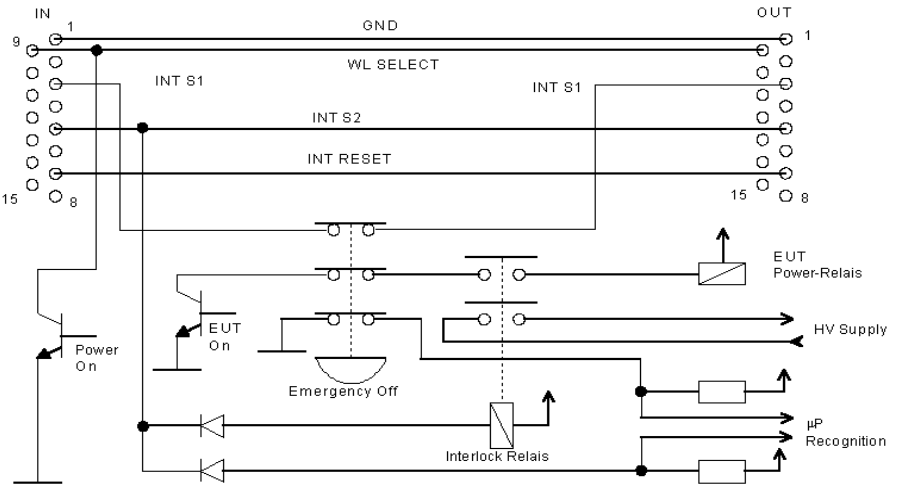


Circuit diagram of the interlock system

S: external safety switch (e.g. test hood, door-switch, safety button, etc.)

A number of such interlock connectors can be linked in series to achieve a safe test set-up.

The safety contacts must be connected in series when several access safety barriers are necessary. An open contact or an input raised to more than 1.5 V is enough to inhibit the instrument.

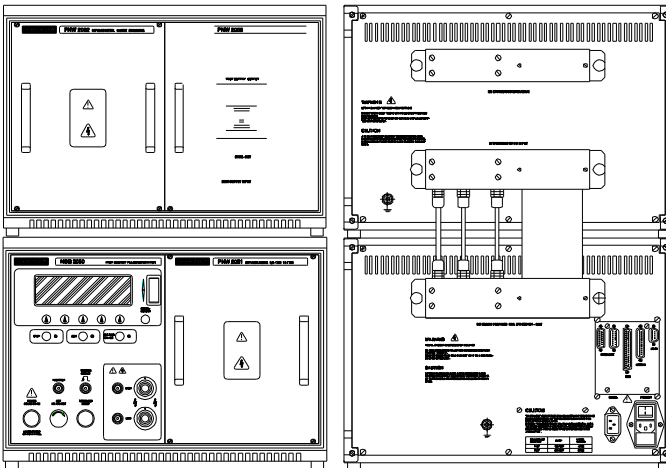


Internal circuit diagram of the instrument

4.7 Connection of the INA 2050 expansion chassis

When two or more PNWs are to be used and it is inconvenient to keep exchanging them or it is required to run complete test sequences in conjunction with the WIN software, the NSG 2050 offers the handy facility of being able to add up to two expansion chassis.

The expansion chassis, INA 2050, consists of an empty housing but which is equipped with all the necessary connections to ensure that the safety of the test rig is not jeopardised.



Links between the basic unit and an expansion chassis

To install the expansion chassis, first remove the termination connector from the basic unit by pulling out the black knob. This terminator must then be carefully inserted in the expansion chassis (upper connector unit) and be secured by pushing the black knobs in again.

A moulded inter-connection unit is supplied with the INA 2050 to link it to the main or basic unit.

Note that this inter-connection unit must be connected or disconnected carefully to ensure that no damage is done to the moulded-in connector strip (data-bus).

5 Description of functions

The NSG 2050 belongs to the new family of SCHAFFNER ProfLine system units. These instruments have high performance microprocessor control and generously dimensioned high voltage and power components.

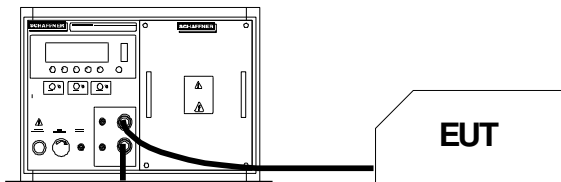
Following is a description of the functions from the outside to inside.

5.1 System configurations

5.1.1 Autonomous control

Autonomous manual control of the instrument to execute tests with one type of interference.

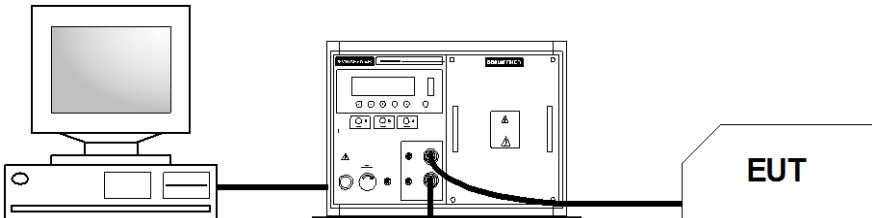
- Economical
- Simple
- Fast



5.1.2 Computer control of the instrument

Automatic running of test sequences incl. coupler switching under software control.

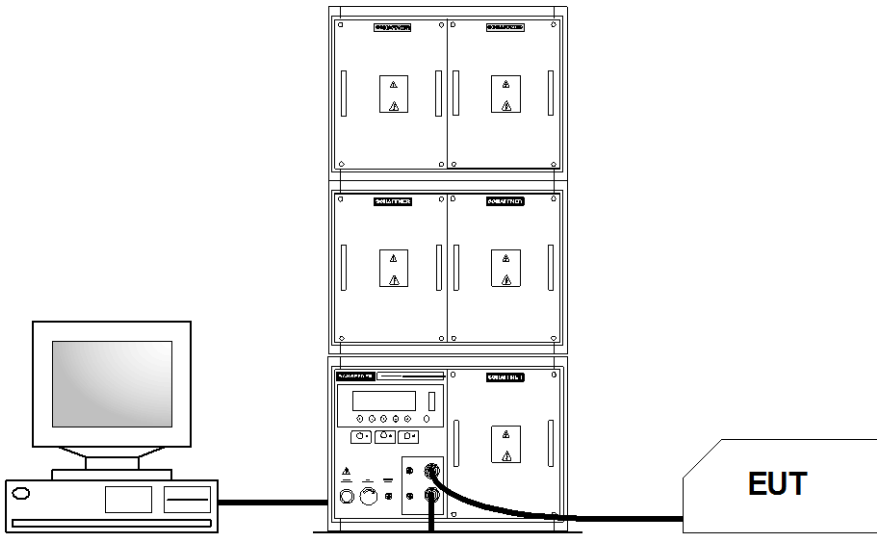
- “Ramping” of the set parameters
- Printout of the test results
- Remote control
- Large, clearer display screen
- Cost-effective system



5.1.3 Test system with multiple network modules

Autonomous manual control or use of the Windows™ user-interface for all types of module.

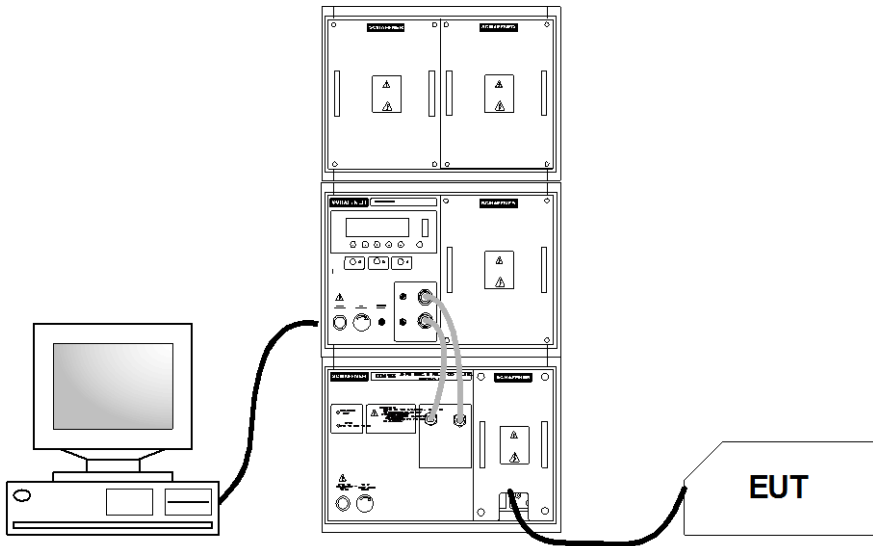
- Up to two expansion chassis can be connected each of which can accommodate two modules
- Test sequences are programmable



5.1.4 Test system with multiple modules and coupling networks

Common Windows™ user-interface for all the modules and coupling networks.

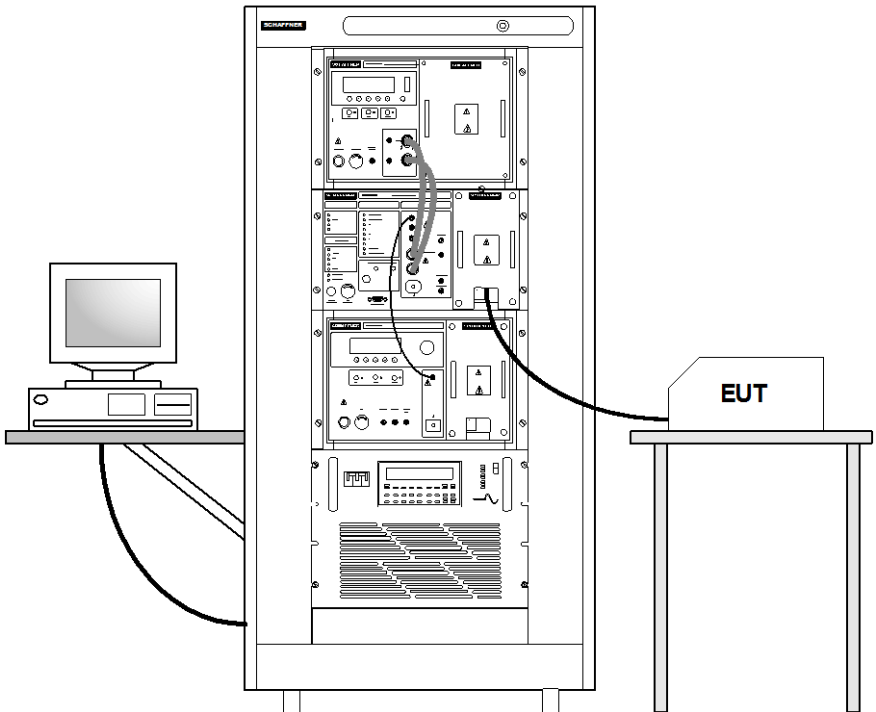
- Test sequences are programmable
- The EUT is connected directly to the coupling unit



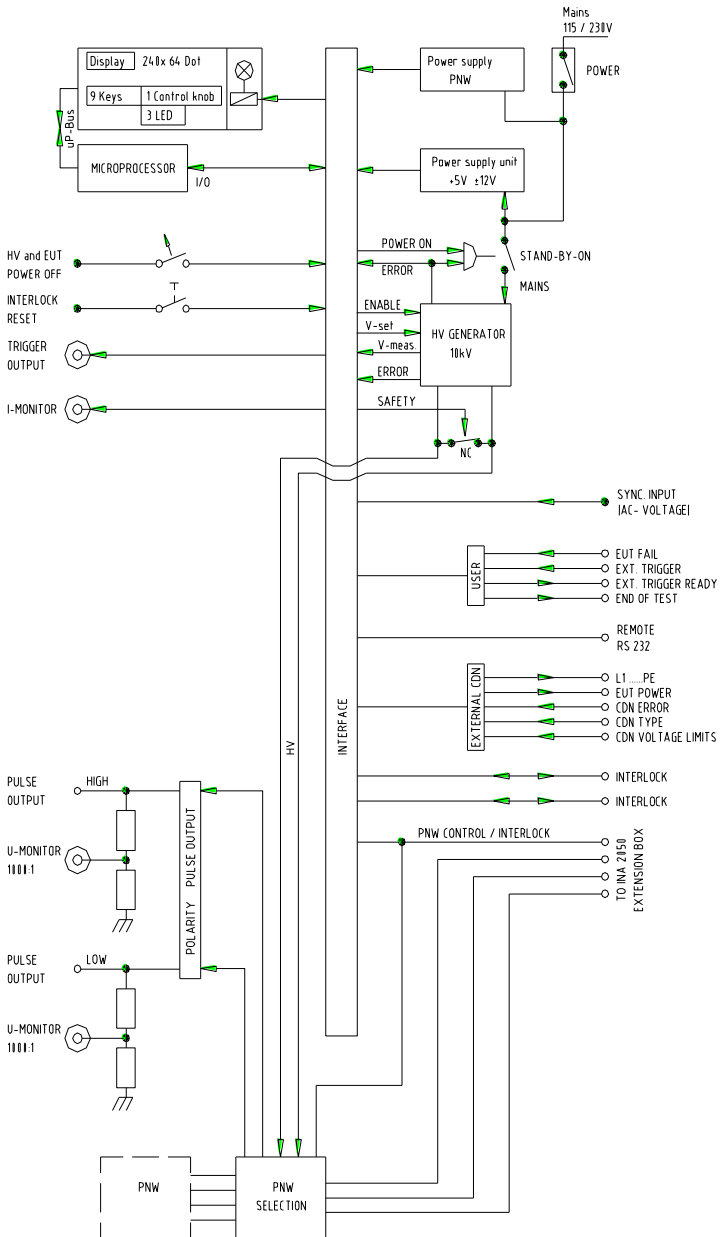
5.1.5 Test system “ProfLine” with multiple types of interference

Test system with automatic switching of the interference type by means of a combination coupler

- Complete interference immunity tests with all mains-superimposed types of interference can be executed automatically
- Complete test report on an EUT
- Common Windows™ user-interface for all the instruments
- Test sequences are programmable
- The EUT is connected to one output



5.2 Block diagram



5.3 System messages

All the messages from the system are either indicated on the display panel by means of a code number, or, in case of remote control, sent via the serial port. These fall into the following groups:

Status messages:	INFO
<ul style="list-style-type: none">• NO ERROR There are no errors present	No. 000
<ul style="list-style-type: none">• INTERLOCK OPEN The interlock facility is open circuit. Try pressing the "Interlock Reset" button. Interlock terminator and "Extension Chassis" terminator plugs as well as the PNWs must be connected.	No. 006
<ul style="list-style-type: none">• FAULT IN THE 12VP SUPPLY A fault in the +12 V supply has been detected.	No. 103
<ul style="list-style-type: none">• FAULT IN THE 12VN SUPPLY A fault in the -12 V supply has been detected.	No. 104
<ul style="list-style-type: none">• FAULT IN THE 5V SUPPLY A fault in the +5 V supply has been detected.	No. 105
<ul style="list-style-type: none">• SYNCH. SIGNAL MISSING The synchronisation signal necessary for synchronous pulse triggering is not present. Connect the EUT supply to the synch. input.	No. 106
<ul style="list-style-type: none">• FAULT IN THE 5VE SUPPLY A fault in the +5 V supply to the extension bus has been detected.	No. 107
<ul style="list-style-type: none">• FAULT IN THE 48V SUPPLY A fault in the +48 V supply has been detected.	No. 108

- EUT FAULT No. 115
The EUT has signalled a fault.
- REPETITION TOO SMALL No. 122
The minimum repetition time has not been attained.
- TIMEOUT IN THE HV SUPPLY No. 125
The HV could not be generated in the given time.
- HW FAULT No. 127
A hardware fault has been detected.
- FAULT IN THE 24V SUPPLY No. 128
A fault in the +24V supply has been detected.
- A FIELD IS SELECTED No. 129
The "RUN" or the "HV-ON" key has been pressed while an operating field is selected.
- EUT SEC OPEN No. 200
The "HV and EUT OFF" switch has been activated.
- PNW TABLE TOO SMALL No. 201
The table for defining the PNW modules is too small.
(Message for the programmer only)
- * PNW DEFINITION
MISSING No. 202
The definition of an installed PNW is not present in the NSG-2050 main frame unit.
- TOO MANY INT. COUPLINGS No. 203
PNW definition contains more than 32 internal couplings.
(Message for the programmer only)
- CDN DEFINITION MISSING No. 204
The definition of an installed CDN is not present in the NSG-2050 main frame unit.

- **PNW FAULT** No. 205
The selected PNW has signalled a fault.
- **PNW HAS BEEN CHANGED** No. 206
The PNW configuration has been changed (PNW module removed or enhanced).
- **CDN FAULT** No. 207
The connected CDN has signalled a fault.
- **CDN HAS BEEN CHANGED** No. 208
A different CDN has been connected to the NSG-2050.
- **NO PNW PRESENT** No. 209
No PNW is present in the NSG-2050 (no module has been inserted).
- **EXT. TRIGGER MISSING** No. 210
Waiting for the "EXT-Trigger" in "HV-ON" mode. This signal has not been activated or was too late.
- **FAULT DETECTED** No. 211
Erroneous behaviour has been detected by the software while generating a pulse.

6 Function check

6.1 Function check

Very many functions are checked automatically by the control module upon power-up or during actual operation so that a simple function check for verification purposes is adequate.


6.2 Time Out

The function selected by means of the function keys is highlighted in inverse video. A time-out reaction is always accompanied by a beep signal after 2 min. This is to protect internal circuits from continuous loading and hence saves internal components from aging.

6.2.1 Control

- 1 Study the section entitled "Advice on safe operation" in the manual.
- 2 Set the instrument to "STAND-BY" with the mains switch on the rear panel.
 - ⇒ "POWER" button lights up. Wait 10 sec. for processor self-test.
- 3 Switch from "STAND-BY" to ON with the "Power" button on the front panel.
 - ⇒ Display is activated and shows default settings.
 - ⇒ Operating state is in the "STOP" mode
 - ⇒ There are no system messages in the display field (e.g. INFO 103)

4 Check the interlock circuit

Circuit open: ⇒ Display shows 
Instrument cannot be switched to
"RUN" (INFO 006)

Circuit closed: ⇒ Display shows 

- #### 5 Press the "RUN" button with the safety interlock circuit closed.
- ⇒ With the emergency off button released, the HV indication changes from "OFF" to "ON".
 - ⇒ A beep is sounded if the emergency off button is still latched, the message "INFO 006" (Interlock open) is displayed.

6.2.2 Remote control

The command set is available on request.

6.3 Faults

Triggering of a 10 or 30 mA RCD switch is not a fault but is caused by the leakage current from the mains coupling and usually occurs in conjunction with a CDN.

Remedy: use a 30 mA type; possibly use an isolating transformer for the EUT supply.

It is to be assumed that safe operation is no longer possible if:

- 1 the instrument exhibits electrical flash over
- 2 the instrument exudes a smell of burning
- 3 the instrument has been dropped or subjected to severe shock
- 4 the instrument shows visible signs of damage

- 5 the instrument exhibits faulty or missing functions
- 6 the instrument makes unusual noises
- 7 the instrument has been stored for a long time under unfavourable conditions.
- 8 the instrument shows INFO 127 on the display

Measures for 1 - 4: Send the instrument to a service centre to be checked.

5 - 8: Switch the instrument off for a few minutes and then cautiously try switching it on again and carry out a function check. Depending on the result either continue working or send the instrument to a service centre to be checked.

The instrument must be switched off and be sent to your local service centre if any of the following system messages appear on the display panel or operating computer:

Nos. 103, 104, 105, 107, 108, 125, 127, 128, 201, 202, 203, 204, 205, 207 or 211

These messages concern supply or function faults in the instrument.

6.4 Trouble shooting

Problem	Possible cause	Remedy
Instrument cannot be set to the "RUN" state	Display shows INFO 200 Display shows INFO 128 Display shows INFO 006	Release emergency off button & Close interlock circuit
"Power" button lamp does not light up; instrument can be switched on normally	Bulb in the button defective	Insert new bulb
"Power" button lamp does not light up; instrument cannot be switched on	No supply at generator's mains input or mains switch on rear panel is switched OFF	Check power input, switch on. Check fuse at mains input.
System message No. 006	Interlock circuit open	Close interlock circuit
System message No. 103	+ 12 V supply out of tolerance	Send instrument for service
System message No. 104	- 12 V supply out of tolerance	Send instrument for service
System message No. 105	+ 5 V supply out of tolerance	Send instrument for service
System message No. 106	No synchronisation signal	Set "asynchron", connect EUT ac supply to synch. input
System message No. 107	+5V extension bus supply is out of tolerance	Send instrument for service
System message No. 108	+48V supply out of tolerance	Send instrument for service
System message No. 115	EUT fault	EUT-Fail input activated
System message No. 122	Repetition value too low	Take care of minimum rep. Time between Stop and Start
System message No. 125	High voltage out of tolerance or EXT TRIGGER timing wrong	Check function with other PNW; Send instrument for service
System message No. 127	Hardware fault	Send instrument for service
System message No. 128	+ 24 V supply out of tolerance	Send instrument for service
System message No. 129	RUN or HV-ON key pressed while operating field is selected	Press ENTER first then RUN or HV-ON
System message No. 200	Emergency button still latched	If permissible, release the button
System message No. 201	PNW table too small	Request the latest firmware
System message No. 202	PNW definition is missing	Request the latest firmware
System message No. 203	Too many int. couplings	Request the latest firmware
System message No. 204	CDN definition is missing	Request the latest firmware
System message No. 205	PNW fault	Re-check function (possibly with another PNW)
System message No. 206	PNW has been changed	Press Enter & Interlock reset
System message No. 207	CDN fault	See CDN manual
System message No. 208	CDN has been changed	Press Enter & Interlock reset
System message No. 209	No CDN present	Insert PNW
System message No. 210	EXT. TRIGGER missing	Ext. Trigger not activated or too late in HV-ON operating mode
System message No. 211	SW fault detected when pulse is triggered	Re-check function, if necessary send instrument for service

6.5 Error message language selection

The error messages can be displayed in any of the following four languages:

English; French; German; Italian

Changing from one language to another can only be achieved via a PC (in terminal mode) working through the RS 232 interface. Proceed as follows to make a change:

- Switch on the NSG 2050 at the rear panel (Power switch).
- Press the Stand-by button, POWER ON.
- Connect the PC via an RS 232 cable to the 25-pin RS 232 remote control connector.
- Put the PC into the terminal-mode and make the settings as given in the operating instructions. See section 4.6.3 Remote control interface (RS 232)

The following commands should be entered:

SYST:COMM:REMO[]ON	([] stands for a "space"; NSG 2050 goes into Remote mode)
SYST:LANG[]ENGL	Error messages in English
SYST:LANG[]FREN	Error messages in French
SYST:LANG[]ITAL	Error messages in Italian
SYST:LANG[]GERM	Error messages in German

- Remove the cable connection between the PC and NSG 2050.
- Switch off the NSG 2050 at the rear panel.

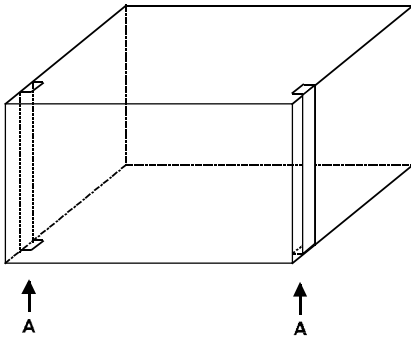
The new language setting is now permanently stored even when the generator is disconnected from the mains supply.

7 Rack installation

The instrument is designed for both bench-top use as well as for installation in a 19" rack. The instrument has to be fitted with the mounting brackets available as an option (INA 161) before installation in a rack.

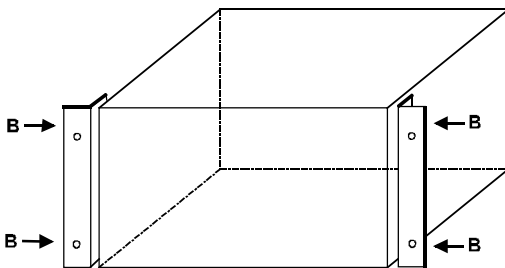
Assembly instructions

1 Remove the side masking strips:



Remove the masking strips by releasing the screws 'A'.

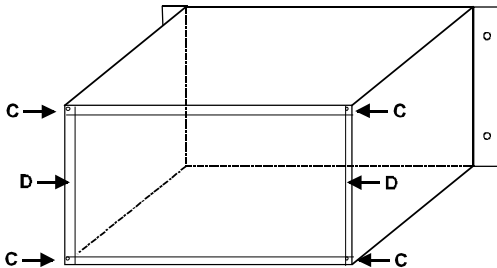
2 Mount option INA 161:



Attach the brackets INA 161 with the screws provided (B).

3 Remove the instrument's feet

The instrument is relatively deep and heavy. It must therefore be built into a rack on guide rails. The feet must be removed to achieve this.



- Lay the unit on its side
- Remove screws 'C'
- Remove plastic strips 'D'
- Pull the bottom cover off backwards
- Unscrew the feet
- Re-assemble the unit in reverse order

4 Mounting in a cabinet or rack

Equip the rack with guide rails.

Insert the instrument and screw firmly into place. The rack mounting screws are not supplied with the brackets as they need to be matched to the local needs regarding length, thread and appearance. It is advantageous if the screws can be obtained from the rack/cabinet supplier.

The ventilation slots below the front panel and in the rear panel must be kept unobstructed. Air circulation must not be restricted in any way. If the cabinet has fan-assisted ventilation then the cooling air must be able to enter at the front of the NSG 2050.

In the case of certain cabinets it might be necessary to remove the hand-grips from the sides of the NSG 2050 or to modify the cabinet to accommodate the unit.

8 Standards

8.1 Safety measures as per VDE 0104

The safety measures contained in VDE 0104 are recommended for the operation of high voltage test rigs. This instrument provides all the necessary facilities.

The corresponding operating states of the NSG 2050 are:

Out of operation: The instrument is switched off at the mains switch on the rear panel.

The EUT supply is also isolated from the EUT connector by means of the internal circuit breaker.

No indicator lamps are alight.

Ready: The instrument is switched on but the interlock circuit is still open – the instrument is forced into the STOP-mode.

The external green warning lamp is alight.

Ready to switch: The interlock circuit is closed.
The EUT supply can be switched on and off.
The instrument is in the STOP-mode.
The external red warning lamp is alight.

In operation: The interlock circuit is closed.
The EUT supply can be switched on and off.
The instrument is in the RUN or EXT TRIGGER / HV-ON mode. The external red warning lamp is alight.

EMC

CAUTION: A test rig equipped with this instrument can radiate strong electromagnetic interference.
Operation is only permissible in a closed Faraday cage.

The test enclosure must be so configured and connected to the protective earth such that no pulse current can leave the enclosure by any cable whatsoever.

Sensitive electronic instruments as well as telecom-equipment must not be in the vicinity of, let alone actually inside, the same Faraday cage.

Take the possibility of disruption to flight safety installations into account.

8.2 Typical applications and standards

The NSG 2050 is intended mainly for tests in accordance with IEC 1000-4-5.

The following documents must be available for correct execution of standard-conform tests:

- Applicable standard
- Manuals for all the equipment incorporated in the test rig
- Test plan for the relevant EUT
- Test protocol

Every test rig is to be carefully planned in order to ensure that the requirements concerning safety, radiation limitation and reproducibility of results are met.

- The safety instructions given in this manual are to be strictly observed.
- The configuration of the test rig must be strictly in compliance with that specified in the standards in order to ensure standard-conform test execution. Even apparently small deviations can cause considerable differences in the test results.
- Reliable prevention of disruption to unrelated instruments and items of equipment by interference radiation from cables and the EUT can only be assured by working in a Faraday cage.

- In order that the test results can be faithfully reproduced, the test rig, cabling, test parameters, environmental conditions, peripheral equipment as well as the EUT's behaviour must all be precisely recorded. Ideally the whole arrangement should be carefully photographed.

8.3 Summary of standards concerning the PNWs

The NSG 2050 is intended to be used for various EMC tests. The PNWs are explained in the specific chapter in this manual together with references to the relevant standards. It should be remarked that today's pulse standards are complied with implicitly and their probable revisions have been taken into account as far as known. Additional, special coupling networks, for example, may be necessary for certain applications.

9 Maintenance

9.1 Service

WARNING: Do not open the instrument.

Contains high voltage capacitors which, in the event of a fault, can still store a dangerous charge even after the instrument has been switched off.

Mains connectors, high voltage connectors together with voltage-carrying electronic components are not additionally protected against being touched inside the instrument.

The instrument does not contain any user-serviceable parts. Work inside the unit may only be carried out by **specialists trained on this instrument**.

No modifications are to be carried out by the user on the NSG 2050. Only original Schaffner parts are to be used for repair purposes. The manufacturer accepts no responsibility whatsoever for damage, injury or other danger that arises through the use of non-original parts or due to modifications. Fuses may only be replaced by those of the same type and current rating.

Servicing is restricted to periodic cleaning of the external surfaces, a function check and verification or calibration of the pulse data.

9.2 External care

Clean the instrument housing with a damp cloth using a little mild, non-abrasive household cleanser if necessary.

No chemicals may be used for cleaning purposes. It is imperative to disconnect the instrument from the mains *before* it is cleaned.

Housing colours:	Panels: light grey	RAL 7035
	Frame: stone grey	RAL 7030

10 Replacement parts, Disposal and Warranty

10.1 Replacement parts

The NSG 2050 contains no parts that wear which should be kept in stock by the user. Should a repair become necessary, the replacement part may be any arbitrary component or module or a part of the housing. A suitable stock of parts is therefore only possible at a qualified service station.

10.2 Disposal

The NSG 2050 contains mercury relays and must therefore be disposed of in an environmentally friendly manner.

The instrument is so built that it can be dismantled right down to the component or circuit board level.

10.3 Warranty

SCHAFFNER grants a guarantee of 1 year on this device, effective from the date of purchase.

During this period, any defective component part will be repaired or replaced free of charge or, if necessary, the unit will be replaced by another of equivalent value. The decision regarding the method of reinstating the functional capability is at the sole discretion of SCHAFFNER.

Excluded from the guarantee are damage or consequential damage caused through negligent operation or use as well as the replacement of parts subject to degradation.

The guarantee is rendered invalid by any intervention on the part of the customer or a third party.

The goods are to be returned in the original packing or other equivalent packing suitable for the purpose of the foreseen means of transport. SCHAFFNER can accept no responsibility for damage in transit.

11 Technical specifications

11.1 Electrical specifications

Generator

Generated voltage: 9.5kV max.

Repetition rate: Depends of the PNW

Phase positioning: Synchronous from 0 - 359° or asynchronous

Polarity: Positive, negative or alternating

Internal impedance: Depends of the PNW

Pulse rise time: Depends of the PNW

Pulse width: Depends of the PNW

Remote control input: RS 232 port on the rear panel

Powering and Power supply

Instrument supply: Switchable nominal ranges:

Line voltage selection	Range	IEC 127 5 x 20 mm	max. Power
110 - 120 V	90 - 120 V	4A (T)	230 VA
220 - 240 V	200 - 240 V	2A (T)	250 VA

Connection via mains filter with IEC plug, voltage selector and switch

Frequency range: 50 / 60 Hz ± 5 %

Mains switches: Primary: in rear-mounted filter → OFF – Standby
Button: on front panel → Standby – ON
The instrument can be switched on or off under remote control while in the “Standby” state.

EUT sync. input 10 ... 230 Vac (+10%)

Frequency: 15 ... 440 Hz

Protection class: 1 (one), with increased leakage current of up to 30 mA due to coupling capacitors and EUT supply filter.

Conformity: Certificate of conformity with EU regulations (CE-Mark)

11.2 Dimensions

Housing type: 19", 7HU with hand-grips at the sides
Rack-mounting brackets can be added subsequently.

Dimensions: Width: 449 mm, Height: 310 mm, Depth: 500 mm

Weight: 20 kg approx. (without PNW)

11.3 Environmental conditions

Intended for use only inside a building.

Ambient
temperature:

Operation range: +5° ... +40° C

Storage and transport: -20° ... +70° C

Relative humidity:

Operation range: 20 % ... 80 %

> 31° C linear reduction to 50 % at 40° C

Condensation:

Not permissible during use.

Altitude:

Operation range: < 2000 m a.s.l.

Operation range: > 2000 m a.s.l. on request

Storage and transport: < 12000 m a.s.l.

13 Addresses

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