

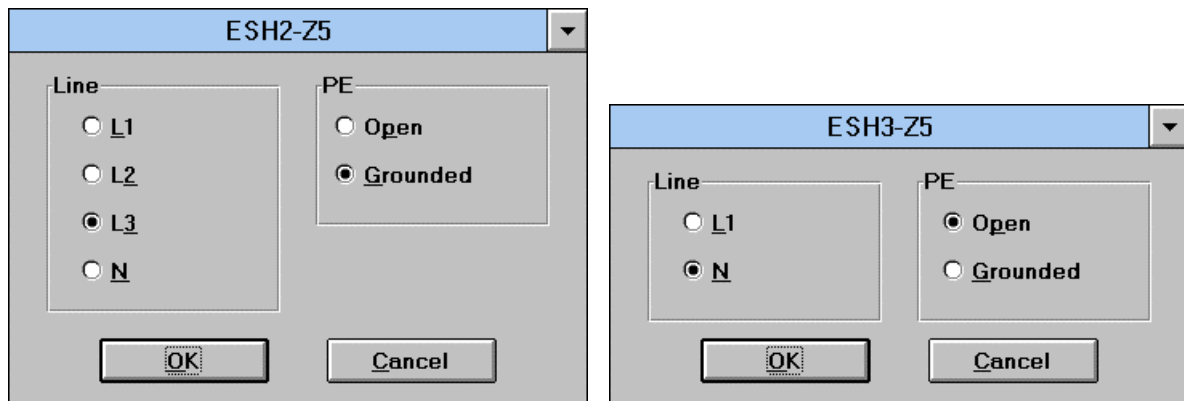
4 Standard Device Drivers

4.1 V Networks ESH2-Z5 / ENV 4200 and ES-H3-Z5 / ENV 216

The drivers provide all functions that are necessary for controlling the artificial mains networks ESH2-Z5 / ENV 4200 (four line V-network) and ESH3-Z5 / ENV 216 (two line V-network) from Rohde&Schwarz.

4.1.1 Interactive Mode

With the selection of **ESH2-Z5...** or **ES-H3-Z5...** in the menu **Test - Set device** the corresponding dialogue comes up:



One of the provided lines (live, neutral) can be chosen. In addition the protective earth can be set (no effect on ENV 4200; with ENV 216 this will set the optional high pass filter) to be either open (floating) or grounded.

4.1.2 Script Mode

In the script mode the settings of the artificial mains network are done by means of the commands `set_device(...)` and `get_device(...)`. A detailed description is given in chapter 5.2 of the "script development kit".

Setup of the line to be tested

Command: LISN_PHASE

Parameter: "N", "P1"
"P2", "P3" (ESH2-Z5 only)

Setup of the PE (floating / grounded)

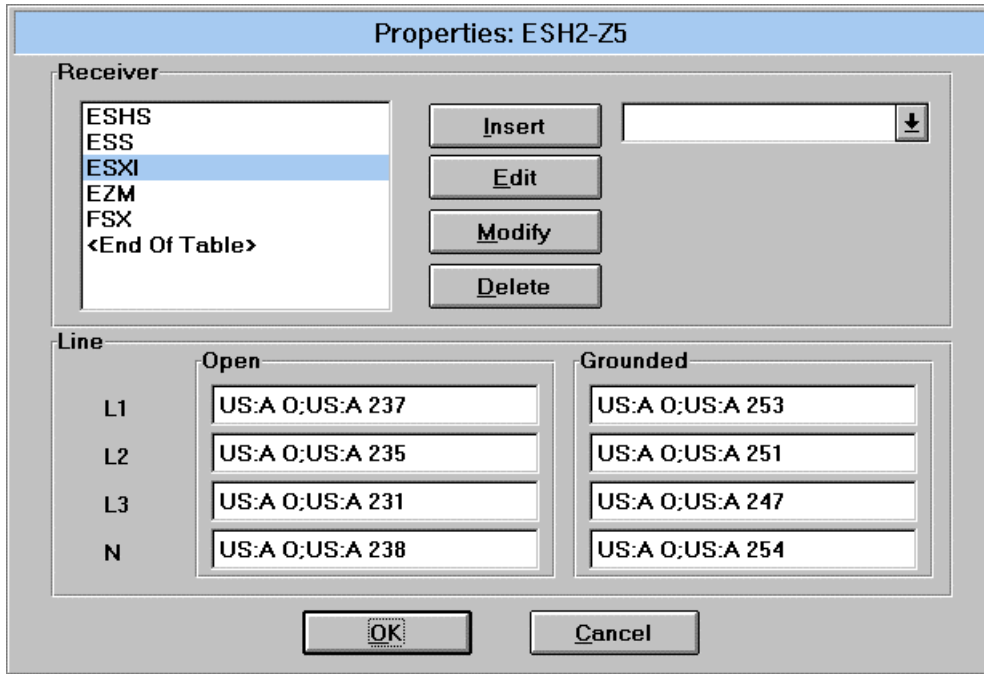
Command: LISN_PE

Parameter: "FLO", "GND"

4.1.3 IEEE Bus Commands

The IEEE bus commands for remote control are dependant on the instrument to which the artificial mains network is connected to. The control works via the user port of that instrument.

The settings have to be done in the dialogue Properties in the menu Device configuration with respect to the referring instrument.



With the installation of an option ES-K1x all necessary commands are already provided (files *S_NN2.INI* for ESH2-Z5 / ENV 4200, *S_NN3.INI* for ESH3-Z5).

Through double clicking of a certain receiver all IEEE bus commands that are suited to control the user port will be displayed in the corresponding fields. Receivers that are not used might be deleted from the list (the commands for those receivers will also be deleted!), and only "active" receivers can be inserted into the list.

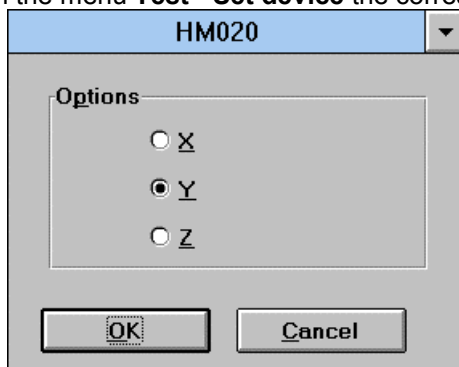
The commands can be arbitrarily edited (max. 50 characters) so that the driver could also be used for other purposes, e.g. for switching - via the user port - of a device under test.

4.2 Triple Loop Antenna HM020

The drivers provide all functions that are necessary for controlling the triple loop antenna HM020 from Rohde&Schwarz.

4.2.1 Interactive Mode

With the selection of **HM020...** in the menu **Test - Set device** the corresponding dialogue comes up:



One of the three loops can be selected.

4.2.2 Script Mode

In the script mode the settings of the triple loop antenna are done by means of the commands `set_device(...)` and `get_device(...)`. A detailed description is given in chapter 5.2 of the "script development kit".

Setup of the loop to be tested

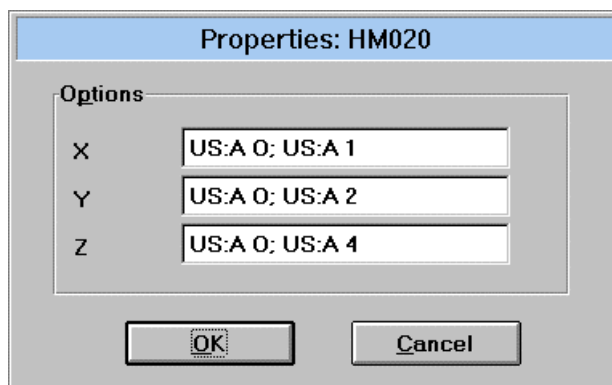
Command: LOOP

Parameter: "X", "Y", "Z"

4.2.3 IEEE Bus Commands

The IEEE bus commands for remote control are dependant on the instrument to which the artificial mains network is connected to. The control works via the user port of that instrument.

The settings have to be done in the dialogue Properties in the menu Device configuration with respect to the referring instrument.



With the installation of an option ES-K1x all necessary commands are already provided (file `SH_HM020.INI`) but depending on the cable to be used, other settings might be required (check with volt meter).

The commands can be arbitrarily edited (max. 50 characters) so that the driver could also be used for other purposes, e.g. for switching - via the user port - of a device under test.

4.3 Relay Matrix RSU/PSU

The drivers provide all functions that are necessary for controlling the relay matrix devices RSU and PSU from Rohde&Schwarz. The RSU is identical to the PSU except the electrical specifications of the RF relays.

4.3.1 Concept

The software can control up to four RSU units. These units can be used separately as well as combined. For a combined usage there's an extra driver SUPER-RSU that is not associated to any interface but can address any of the installed RSU drivers. Therefore the SUPER-RSU driver is a means to handle a set of RSU drivers, e.g.:

```

SUPER-RSU => {RSU1}
or
SUPER-RSU => {RSU1 + RSU2 + RSU3 + RSU4}

```

Automatic switching of one or more RSUs during sweeps/scans (change of antennas or receivers) is possible only through making use of the SUPER-RSU driver; here additional system transducers should be defined to take respect of the signal loss through the relay cabling. For all other purposes it is sufficient to use of the RSU driver(s) only.

4.3.2 Setup of the RSU Drivers

To get the drivers into the device list, one has to go into the device configuration, press the **Load** button and then go into the selection box 'Device'.

Select the RSU, edit the name (e.g. RSU1 if you want to use more than one RSU) and the GPIB address, then add the device to the list.

Repeat this for all (max. 4) RSUs you want to install.

If needed, also select the SUPER-RSU and add it to the device list now.

Now the relay switch definitions have to be made:

For each RSU driver go to the **Properties...** and define switching paths ('Signal Path') and the corresponding commands, e.g.:

for *RSU1* (path name / command):

'Path X'	'S1 R2'	(set relay 1; reset relay 2)
'Path Y'	'R1 R2'	(reset relay 1; reset relay 2)
'Path Z'	'R1 S2'	(reset relay 1; set relay 2)

for *RSU2* (path name / command):

'Path Left'	'S3 S4'	(set relay 3; set relay 4)
'Path Right'	'R3 R4'	(reset relay 3; reset relay 4)

Now leave the dialogs and test all path definitions through the interactive dialog(s) for the relay matrix:

```
'Test' => 'Set device...' => 'RSU1'
```

Select a path and press **Switch**. Check the relay settings through the RSU's front panel LEDs.

4.3.3 Setup of the SUPER-RSU Driver

Before you define any settings for the SUPER-RSU you should first define system transducers for the cables you're using, e.g. '*Cable low range*' and '*Cable hi range*'.

Now look at the following example:

You want to use relay 3 of RSU2 to switch automatically between Antenna1 and Antenna2 during scans/sweeps.

```

Antenna1      'Cable low range'
>>>-----|
              |
              |#####
              |# RSU2 #-----('Cable standard')-----> Receiver
              |#####
              |
>>>-----|
Antenna2      'Cable hi range'

```

You have to go into the **Properties...** dialog (Device Configuration). Define a global 'Signal Path Name' and associate the referring RSUx paths (select and add), along with the corresponding system transducer (cable loss), e.g.:

```

Antenna1
  RSU2: 'Path Left'
  (RSUx: '...')
  System Transducer: 'Cable low range'
Antenna2
  RSU2: 'Path Left'
  (RSUx: '...')
  System Transducer: 'Cable hi range'

```

Now when you create or edit any scan/sweep range table, select the required 'Signal Path' for each range, e.g.:

```

0 - 300 MHz
  Antenna1 (text 'Cable low range' will appear)
300 - 1000 MHz
  Antenna2 (text 'Cable hi range' will appear)
Any cables that belong to both signal paths can be added as "Additional Transducers".

```

4.3.4 Script Mode

In the script mode the settings of the RSU devices are done by means of the commands `set_device(...)` and `get_device(...)`. A detailed description is given in chapter 5.2 of the "script development kit".

4.4 Driver LPT I/O

4.4.1 Overview

The driver LPT I/O provides all functions that are necessary for controlling a parallel port of the PC. The driver can be used for simple monitoring and controlling purposes.

4.4.2 Hardware

The parallel port can be used as a controlling/monitoring interface, i.e., the lines of the interface can separately be set as output lines or be read as input lines. Setting and reading of the lines will occur only when the driver is being told to do so, not permanently in the background.

The driver LPT I/O makes use of the following signals (pin no. in brackets):

Reading: /ERROR (Pin # 15), SLCT (# 13), PE (# 12), /ACK (#10), /BUSY (# 11)

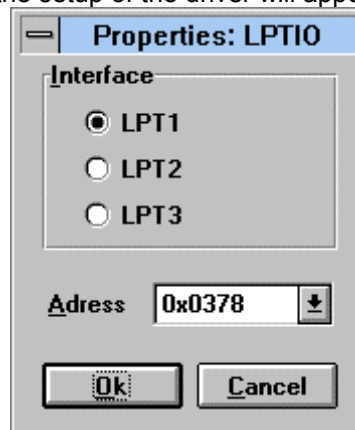
Writing: D0 - D7 (# 2-9), /STROBE (# 1), AUTO FEED (# 14), /INIT (# 16), SLCT IN (# 17)

The hardware control registers will be directly accessed.

A more detailed description of the PC's parallel port can be found in various publications.

4.4.3 Properties

Through selecting of the LPT I/O driver in the **device configuration** and clicking onto the button **Properties**, the following dialog for the setup of the driver will appear:



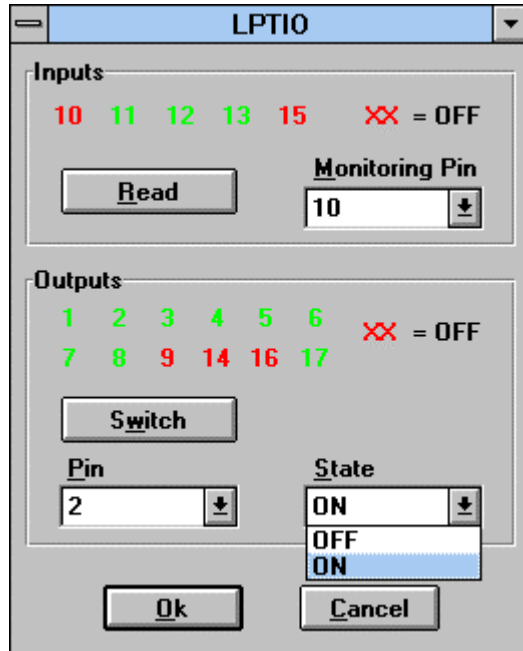
In the upper area of the dialog, one of the parallel ports can be selected as an **interface** (normally there's no problem if the hardlock is attached to the same interface port). With the field **Address** the base I/O address of the port can be selected. If the address is not known then e.g. start the diagnostics program *MSD.EXE* and look for the LPT ports.

Parameter: **Interface**
Function: selection of the parallel port
Value range: LPT1, LPT2, LPT3.

Parameter: **Address**
Function: selection of the base I/O address
Value range: 03BChex, 0378hex, 0278hex

4.4.4 Dialog mode

When selecting the LPT I/O driver in the **Test -> Set device...** then the referring dialog comes up:



The dialog consists of two areas, one for reading the input lines and one for setting the output lines. The numbers refer to the hardware pins of the parallel port.

Display: current states of the **inputs**
Function: Display of the input line states. The state of each line is represented by its colour.

Button: **Read**
Function: Reads and displays the states of all input lines

Parameter: **Monitoring Pin**
Function: Selects the input line to be read (redundant functionality).

Display: current states of the **outputs**
Function: Display of the output line states. The state of each line is represented by its colour.

Parameter: **Pin**
Function: Selects the output line to be switched.

Parameter: **State**
Function: Selects the state of the line selected with **Pin**.
Value range: ON, OFF

Button: **Switch**
Function: Switches the selected line to the selected state and updates the display of the output lines.

4.4.5 Script Commands

Syntax of the script commands:

```
INTEGER get_device (STRING device, INTEGER cmnd, VOID param,
                   VAR INTEGER device_err_no, VAR STRING device_err_txt)
INTEGER set_device (STRING device, INTEGER cmnd, VOID param,
                   VAR INTEGER device_err_no, VAR STRING device_err_txt)
```

Parameter: description of the operation

Data type: description of the data type of the referring data

Transfer: Internal means, the data will be transferred to or from the software driver only.
External means, the command directly affects the device.

The information about the state of a pin ("high" or "low") is done by a character "S" (Set) or "R" (Reset) in the data string of the script function call.

ICS_OUT

Usage: `get_device`, `set_device`
 Parameter: `set_device`: state of a single output line to be switched
 `get_device`: state of a single output line (selected by ICS_INDEX)
 Data type: STRING
 Transfer: external
 Note: `set_device`: "S16" means pin 16 will be set (to "high")
 `get_device`: gives the state of a single output line (selected by ICS_INDEX)
 syntax: e.g. "S12", "R1".

ICS_IN

Usage: `get_device`
 Parameter: state of a single input line (selected by ICS_INDEX)
 Data type: STRING
 Transfer: external
 Note: syntax z.B. "S10", "R15".

ICS_INDEX

Usage: `get_device`, `set_device`
 Parameter: pin index
 Data type: INTEGER
 Transfer: internal
 Note: value range 1, ..., 17.

4.5 Relay Matrix TS-RSP

The TS-RSP device driver provides the functionality required for controlling the relays in the RF Relay Switch Matrix TS-RSP produced by Rohde & Schwarz. The device is controlled via the IEEE bus interface.

All functions can be performed in two different modes:

- **Physical Mode:**

All settings are transferred to the relay switch matrix.

- **Virtual Mode:**

The operation of the device is software simulated. The switch matrix is not addressed.

The device driver provides the following dialog boxes:

- **Device Operation Dialog,**
- **Properties Dialog.**

The TS-RSP device driver may also be controlled by a script.

4.5.1 Device

The TS-RSP is controlled via IEEE bus interface. It consists out of a main frame which contains an IEEE bus controlled I/O interface. Using this interface allows the control of RF relays which are located on a plug-in board. For making the RF relay switch matrix ready for flexible use in different systems, several relay boards with different types of relays are available:

RSP-EMI	(EMI Test System, 6 koaxial relays with 1 input and 2 outputs)
RSP-EMS	(EMS Test System, 11 Koaxial Relays with 1 input and 2 outputs, RF power meter)
RSP-BRF	(RF Test System, 4 Koaxial Relays with 1 input and 6 outputs)

The following combinations the relay plug-in boards are possible:

RSP-EMI + RSP-BRF
RSP-EMS + RSP-BRF

4.5.2 Properties

Multiple use of the device driver under a variety of logical names is possible in the **Device Configuration** dialog box.

After selecting the TS-RSP device in the **Device Configuration** Dialog and clicking the **Properties...** button the Properties Dialog Box will appear.

The dialog window is separated into two areas. In the upper area all already defined paths with their names, the used relay board and the corresponding relay settings are displayed in the field **Paths**. These settings can be modified in the lower area of the dialog using the fields **Relay Board** and **Relay Settings**.

First in the field **Relay Board** is selected, which relay board in the TS-RSP shall be addressed. After this the used relays are activated and configured. Using this principle two independent paths (each using different relays) can be switched without influencing each other. The path names are used via the device dialog, via a script or via the super driver **SUPER-RSU**.

Description of the Elements:

List: Paths

List of paths which can be set at the TS-RSP. The path name, the used relay board and the corresponding relay setting is displayed.

Parameter: Relay Board

Function: Selection of the desired relay board in the TS-RSP main frame.

Range: RSP-EMS, RSP-EMI, RSP-BRF.

Parameter: Relay Setting

Function: In this field all available relays for the selected relay board are displayed (for RSP-EMS and RSP-EMI this are two paths switches, for RSP-BRF this are four 6 path switches). For each relay the user can select whether it should be switched for the current path and if yes, to which position it should be set (NC = relay closed, NO = relay opened).

Range: dependent from the current selected relay board.

Parameter: Path

Function: Input field for the path name.

Range: Maximum 20 characters.

Button: Insert

The settings in the edit fields are added to the **Paths** list in the upper dialog area. But before this move, a check is made that the path does not exist already.

Button: Edit

The marked path settings are moved to the edit fields **path**, **relay board** and **relay setting**. A double click on the desired settings has the same effect.

Button: Modify

The modified settings are moved to the **Paths** list in the upper area of the dialog window. But first, a check is made, that the path is not available double:

Button: Delete

A marked path in the **Paths** list is deleted.

Button: Clear

All relays in the field **relay setting** are set to the not selected state. Additionally the edit field **Path** is cleared.

Button: OK

The dialog box is closed after the settings have been saved.

Button: Cancel

The dialog box is closed without the settings being saved.

4.5.3 Operating Dialog

When selecting the RSU device driver from the menu **Test >> Set Device** the Device Operation Dialog Box will appear.

The paths of the TS-RSP are to be switched here. When a path is switched a corresponding IEEE bus command is sent to the TS-RSP device. Several commands can be sent at the same time if they don't collide.

The settings are made in script mode with the commands `set_device(...)` and `get_device(...)`. A detailed description of the commands will be found in 4.5.4 Overview of the Script Commands.

Description of the General Elements:

Button: OK

Saves the settings and closes the dialog box.

Button: Cancel

Closes the dialog box without saving the settings.

Display: Paths

List of all paths possible to switch at the TS-RSP device, defined in the Properties.

List: Selected Paths

Path to be switched. One of the paths the Paths list contains which is selected via the Select button.

Button: Select

The marked path is copied to the Selected Paths list. If the new path collides with any path available already in this list, the old path is deleted from the list.

Button: Switch

Function: Switches the paths in the Selected Paths list.
Range: All path names defined in the properties dialog box.
Script command: RSU_SETPATH
 Type: STRING
 Direct transfer to device.

Display: Relay State

In this field the current state of all relays available in the relay board are displayed.

4.5.4 Overview of the Script Commands

Script Command Syntax:

INTEGER `get_device` (STRING Device, INTEGER Command, VOID Data,
 VAR INTEGER Device Error Code, VAR STRING Device Error Message)
 INTEGER `set_device` (STRING Device, INTEGER Command, VOID Data,
 VAR INTEGER Device Error Code, VAR STRING Device Error Message)

Parameter: Description of the data to be transferred.
Data Type: Identifies the type of data to be transferred.
Transfer: Internal Data is transferred to or from the device driver.
 External Command is sent directly to the device.

IDENT

Used in: get_device
Parameter: Device identification
Data type: STRING
Transfer: Internal

PHYNAME

Used in: get_device
Parameter: Physical name of the device.
Data type: STRING
Transfer: Internal

RSU_SETPATH

Can be used in: set_device
Parameter: Path to be switched at the TS-RSP.
Data type: STRING

RSU_SETCOMMAND

Can be used in: set_device
Parameter: Sends an IEEE bus command string to the TS-RSP.
Datentyp: STRING