mesytec **MRC-1** and **MRCC** are the central controlling module for all remote controllable mesytec devices. The 1/12 NIM MRC-1 module provides a serial (RS-232 / USB) data input and two event bus branches for up to 16 remote controlled devices each, resulting in max. 32 devices per controller. MRCC has the same capabilities, but is a handy standalone module.

Features:

- Easy connection to any computer type via RS-232 or USB

- Script memory for standalone operation

- Up to 32 devices on two event bus branches

- Up to 35 m of bus length

- Optional: I/O for MRC-1 at the rear side with:

  - 2 digital outputs (TTL), 2 digital inputs (TTL),

  - 2 12 bit ADC inputs, 2 12 bit DAC outputs

Connection to PC

MRC-1 can be connected to the control PC by a standard RS-232 interface or USB.
MRCC is a bus powered USB device.

Default communication parameters are:
- Baudrate: 9.600 bd,
- Data format: 8N1.
  (8 data bits, no parity, 1 stop bit).
Baud rates can be set to 19.2, 38.4, 57.6 and 115.2 kBd by command.

At the USB port, MRC-1 / MRCC behave like a virtual serial device. Current virtual com port drivers for various operating systems can be found at the USB chip manufactureres site:
http://www.ftdichip.com/Drivers/VCP.htm

Also direct access drivers for own software developments are available there.

For easiest communication, a standard terminal program is used (like hyperterm that comes with Windows OS or any other terminal program on Linux/UNIX OS).

As soon as the connection is established, a simple <return> in the terminal program should produce a <MRC-1>" prompt.

After connecting the eventbus, the connected peripherals can be controlled.

Baudrate settings

Default baudrate is 9.6 kBd.
Baudrates can be changed using the "BD" command:

|	
BD9	sets Baudrate to 9.6 kBd
BD19	sets Baudrate to 19.2 kBd
BD38	sets Baudrate to 38.4 kBd
BD57	sets Baudrate to 57.6 kBd
BD115	sets Baudrate to 115.2 kBd

Changed baudrate can be saved using the "BS" command. If saved, MRC-1 / MRCC will also at power up start again with this baudrate as new default.

Connection to the Eventbus

Physical connection

The eventbus is a linear coaxial line which connects the devices with the MRC-1 / MRCC.

While the maximum total bus length is about 35 m, only short branches should be used to connect the modules. The coaxial bus **must be terminated** at the distant end with a 50 Ω terminator. The type of coaxial cable is not critical, thin lines with LEMO connectors and "T"-pieces (to connect modules) work as well as standard RG58 BNC cable.
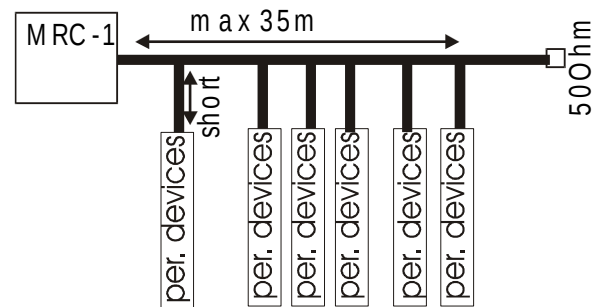
Address setup

Each peripheral device has an address selector switch that allows to select one out of 16 addresses. Addresses on the bus have to be unique to avoid collisions.

During transmission, the TX and RX LEDs show bus activity. In case of bad bus termination or if two devices on the bus have the same address, the collision LED lights up during bus transmission.

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2/4

Controlling peripheral devices

Direct memory

MRC-1 / MRCC regard peripheral devices as flat memory pages (with up to 256 memory cells) that can be written or read remotely.

The command list below explains general commands, each device manual showas a detailed memory map as well as some examples for rc.

Each memory cell represents one parameter of the peripheral device. Writeable parameters can be read back to check presets. Some devices also provide measured parameters to be read back (e.g. the HV supply MHV-4, where the voltage preset can be written to and read back from one address and the measured voltage at the output is provded at an other (read only) address.

Mirror memory

For some modules it may be a good advice to have parameters preset and checked before setting them into effect (for example the HV-supply, where a typo can lead to an erroneous high voltage and possibly causes damage).

For this purpose, an additional mirror memory is provided in these devices. Mirror memory provides all the writeable parameters at the same addresses like direct memory, but changes only take effect when mirror memory is copied to direct memory. This allows checking values before copying them to direct memory.

Command execution

A command to a device is transmitted within 400 us (after completed RS-232 transmission). When a SE (set) command is transmitted, the contents of the written address is read back automatically and the value is displayed for confirmation. So the command answer can be used for a prompt transmission check. Additionally, a read command (RE) is available for explicit readout of a parameter value.

Script memory

For easy use of the MRC-1 / MRCC, a script feature is implemented. When script recording is activated, the commands are recorded in a non volatile memory.

With hardware reset or on power up the MRC-1 / MRCC transmits the recorded script commands to the buses. This feature enables standalone operation of the MRC-1 (no PC needed), MRCC (only USB power needed) once a setup for the peripherals is defined and recorded.

I/O option (MRC-1 only)

As an additional option, the MRC-1 can be equipped with an I/O module.
It provides two 12 bit DAC outputs, two 12 bit ADC inputs, two TTL outputs and two TTL inputs for universal use. Analog signals can be created by DAC to set up external parameters which can be controlled by voltage. With digital outputs, trigger sources or other experiment parameters can be set at experiment start. The ADCs could be used for measurement of ambient parameters like temperature, airpressure, vacuum, voltages, …

Command Set MRC-1 / MRCC

General

cmd	=	command mnemonic
bus	=	bus number [0…1]
dev	=	device number [0…15]
par	=	parameter number [0…255]
val	=	16 bit value [0…65535]

(all commands closed by <ret>)

Command and values must each be separated by a <space>.

Scan command

SC *bus*
scan bus for connected devices, returns for each address on bus the ID code of a connected device and the rc status on / off.

Device commands

ON *bus dev*
Switch rc on for given device.
All rc parameters will take effect.

OFF *bus dev*
Switch rc off for given device.
Parameters will return to panel settings.

RST *bus dev*
Reset connected device – set all rc parameters to zero.

CP *bus dev*
Copy mirror memory of device @ bus to active memory. Mirror parameters will take effect immediately.

Examples

Bus scan

SC 0 <ret>
performs a bus scan on bus 0. Detected devices will be presented with their addresses.

Parameter set

SE 0 1 4 128 <ret>
Sets parameter 4 of device 1 on bus 0 to the value 128.

Parameter commands

Direct memory

SE bus dev par val
Set parameter par in device @ bus to given value

RE bus dev par
Read parameter par from device @ bus

Mirror memory

SM bus dev par val
set mirror parameter to given value

RM bus dev par
read given mirror cell from device

Extended command

(for some special devices → see individual data sheets)

CMD cmd bus dev par val
Send complete cmd set to device @ bus

Script commands

R1
switch script recording on

R0
switch script recording off

CL
clear script file

PS
Perform script: send stored script to bus

LI
list script file

Scripting

R1 <ret>	switches script recording on
SE 1 4 3 25 <ret>	set parameter
...	further cmds
R0 <ret>	switches script recording off
LI <ret>	List recorded script
PS <ret>	Perform recorded script (will also be performed on reset or power up)

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4/4