![ECLER logo]

MIMO88

DIGITAL MATRIXES

Installation Digital Matrix

USER MANUAL

INDEX

1 IMPORTANT REMARK

CAUTION
RISK OF ELECTRIC SHOCK
DO NOT OPEN

WARNING: SHOCK HAZARD - DO NOT OPEN
AVIS: RISQUE DE CHOC ÉLECTRIQUE - NE PAS OUVRIR

The lightning flash with arrowhead symbol, within an equilateral triangle, is intended to alert the user to the presence of uninsulated "dangerous voltage" within the product's enclosure that may be of sufficient magnitude to constitute a risk of electric shock to persons.

The exclamation point within an equilateral triangle is intended to alert the user to the presence of important operating and maintenance (servicing) instructions in the literature accompanying the appliance.

WARNING (If applicable): The terminals marked with symbol of " ⚡ " may be of sufficient magnitude to constitute a risk of electric shock. The external wiring connected to the terminals requires installation by an instructed person or the use of ready-made leads or cords.

WARNING: To prevent fire or shock hazard, do not expose this equipment to rain or moisture.

WARNING: An apparatus with Class I construction shall be connected to a mains socket-outlet with a protective earthing connection.

2 IMPORTANT SAFETY INSTRUCTIONS

1. Read these instructions.
2. Keep these instructions.
3. Heed all warnings.
4. Follow all instructions.
5. Do not use this apparatus near water.
6. Clean only with dry cloth.
7. Do not block any ventilation openings. Install in accordance with the manufacturer's instructions.

8. Do not install near any heat sources such as radiators, heat registers, stoves, or other apparatus (including amplifiers) that produce heat.

9. Do not defeat the safety purpose of the polarized or grounding type plug. A polarized plug has two blades with one wider than the other. A grounding type plug has two blades and a third grounding prong. The wide blade or the third prong are provided for your safety. If the provided plug does not fit into your outlet, consult an electrician for replacement of the obsolete outlet.

10. Protect the power cord from being walked on or pinched particularly at the plugs, convenience receptacles, and at the point where they exit from the apparatus.

11. Only use attachments/accessories specified by the manufacturer.

12. Unplug the apparatus during lightening sorts or when unused for long periods of time.

13. Refer all servicing to qualified personnel. Servicing is required when the apparatus has been damaged in any way, such as power supply cord or plug is damaged, liquid has been spilled or objects have fallen into the apparatus, the apparatus has been exposed to rain or moisture, does not operate normally, or has been dropped.

14. Disconnecting from mains: When switching off the POWER switch, all the functions and light indicators of the unit will be stopped, but fully disconnecting the device from mains is done by unplugging the power cable from the mains input socket. For this reason, it always shall remain easily accessible.

15. Equipment is connected to a socket-outlet with earthing connection by means of a power cord.

16. The marking information is located at the bottom of the unit.

17. The apparatus shall not be exposed to dripping or splashing and that no objects filled with liquids, such as vases, shall be placed on apparatus.

NOTE: *This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.*

WARNING: This product must not be discarded, under any circumstance, as unsorted urban waste. Take to the nearest electrical and electronic waste treatment centre.

NEEC AUDIO BARCELONA, S.L. accepts no liability for any damage that may be caused to people, animal or objects due to failure to comply with the warnings above.

3   IMPORTANT NOTE

Thank you for choosing our Ecler **MIMO88 Installation Digital Matrix**!

It is **VERY IMPORTANT** to carefully read this manual and to fully understand its contents before any connection in order to maximize your use and get the best performance from this equipment.

To ensure optimal operation of this device, we strongly recommend that its maintenance be carried out by our authorised Technical Services.

All ECLER products are covered by warranty, please refer to www.ecler.com or the warranty card included with this product for the period of validity and conditions.

4   INTRODUCTION

The MIMO88 is a fully programmable digital audio matrix, with the following features:

- 8 balanced MIC/LINE inputs (independent phantom power per input channel).
- 8 balanced LINE outputs.
- 2 MONITOR outputs that can be used as auxiliaries.
- Expandable to 16 inputs/16 outputs by linking a second MIMO88 unit (getting a real 16 inputs and 16 outputs matrix). Connect the two units using a CAT5 crossover cable (100 meters maximum distance).
- 8 GPI control ports (*General Purpose Input*).
- 8 GPO control ports (*General Purpose Output*).
- Programming and remote management via Ethernet using EclerNet Manager (or point to point, with a direct CAT5 cable, or from an Ethernet network).
- Remote control via Ethernet clients of EclerNet Manager: simultaneous clients with custom control panel.
- Remote control from third party external devices. (Crestron, AMX, Vity, Medialon, etc. Registered trademarks of their manufacturers). TP-NET protocol, via Ethernet or RS-232 ports.
- Remote control bus for WPNETTOUCH digital panels and MPAGE16 messaging consoles (*paging*).
- Configuration memory (*presets*) management.
- Scheduled events based on calendar.
- WPNET4KV and WPNET8K compatible control panels (using specific retro-compatible Firmware*****).
  * For more information see WPNET4KV and WPNET8K user's manual.
- Extensive DSP available:

- o Routing matrix/mixer, from any input to any output with adjustable level for crossover points (independent mixes of different inputs for each output).
- o Mono or stereo channel processing.
- o Level control, mute, vu-meters and phase adjustment for inputs and outputs.
- o Internal signal generator (sine wave, pink noise, white noise, polarity test).
- o Parametric EQ on inputs and outputs.
- o Delay on inputs and outputs.
- o Gate/compressor on input channels.
- o Compressor/limiter on outputs.
- o Input channel priority assignment (*ducking*).
- o Virtual and physical messaging consoles (*paging*).
- o Automatic mixer.

The MIMO88 programming is done with [EclerNet Manager](www.ecler.com) application. Please refer to the EclerNet Manager software manual at www.ecler.com for more information.

5 INSTALLATION

5.1 Location, assembly, ventilation

The MIMO88 has been especially designed to be installed in a standard 19" rack, taking up 1U.

It is very important not to enclose the MIMO88 or expose it to extreme temperatures as it generates heat. It's also necessary to promote the passage of fresh air through the ventilation holes of the chassis, leaving at least one rack unit off between each device and installed above and below it in the rack frame.

If the setup has several amplifiers in the same rack or in a closed cabinet with doors, it is highly recommended to supply them forced ventilation, installing fans at the upper and lower ends. This upward air flow will help to dissipate the heat generated inside.

5.2 Connection to an AC outlet and switching on

The MIMO88 operates under voltages between 90 and 264 V at 47 to 63 Hz. This device features an over dimensioned power supply that adapts to the mains voltage in any country of the world with no need to make any adjustments.

On the rear panel, there is a power switch for the unit (20) next to the IEC power connector. On the front panel, a LED (7) lights up when the unit is switched on.

The mains cables must not be near the shielded cables carrying the audio signal, as this could cause humming.

5.3   Signal input connections

The rear panel of the MIMO88 offers 8 balanced analogue signal inputs, "IN" (9), accepting both line and microphone level signals. Input signal type selection and management are carried out from EclerNet Manager application. Please refer to the EclerNet Manager software manual at www.ecler.com for more information.

Signal input connectors are 3 position screw terminal block. The wiring is:

Hot or direct signal   >   Terminal +

Cold or inverted signal   >   Terminal -

Ground   >   Terminal ⊥

For unbalanced connection short-circuit pin ⊥ to pin -.

5.4   Audio Output Connections

The rear panel of the MIMO88 offers 8 analogue signal outputs, "OUT" (8), and two additional "MONITOR" (10) outputs, all balanced and accepting line level signals.

Signal output connectors are 3 position screw terminal blocks. The wiring is:

Hot or direct signal   >   Terminal +

Cold or inverted signal   >   Terminal -

Ground   >   Terminal ⊥
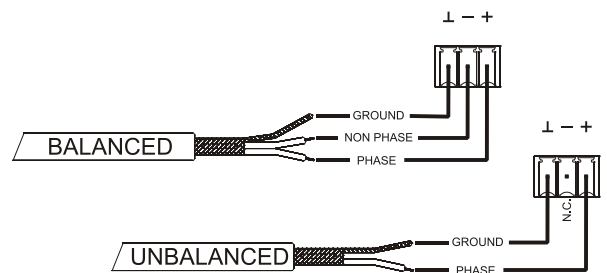
For UNBALANCED connections, leave the – terminal unconnected.

5.5 ETHERNET port for programming and control

A RJ45 type connector (11) allows connecting the equipment to an Ethernet network:

- Management from EclerNet Manager application. Please refer to the EclerNet Manager software manual at www.ecler.com for more information.
- Possibility of direct connection (point to point) between a computer and a MIMO88 unit.
- Connection to third party other devices. (Crestron, AMX, Vity, Medialon, etc. Registered trademarks of their manufacturers). Protocol used: Ecler TP-NET. See the TP-NET protocol manual for more information.

5.5.1 Factory Preset Network settings

The factory default network settings for EclerNet Manager compatible devices are as follows:

- IP: 192.168.0.100
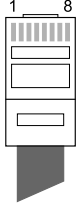- Mask: 255.255.255.0
- Gate: 192.168.0.1
- UDP Port: 2210

5.6 LINK BUS digital audio port

A RJ45 type connector (12) allows connecting the equipment to a second MIMO88 unit for a two-way exchange of digital audio and control data between the two units, the whole behaving as a real matrix with 16 inputs and 16 outputs. The maximum permissible distance between the two units using a standard CAT5 cable is 100 meters.

To work in 16x16 mode, one of the two coupled MIMO88 units (linked by BUS LINK) assumes the role of MASTER and the other one the role of SLAVE. MASTER or SLAVE mode is set by the selector (13) located on the rear panel of each unit. In single MIMO88 setups, selector position is irrelevant.

In 16x16 mode, the two units behave as a single device with 16 inputs and 16 outputs. All Ethernet programming and remote control of the MASTER-SLAVE pair is done with EclerNet Manager application and communication uses the Ethernet port of the MASTER unit only, it's not necessary to use the Ethernet port of the SLAVE unit. (Except for updating the firmware).

Caution: two MIMO88 units coupled by BUS LINK **should be linked with a crossover cable**, i.e. with a CAT5 cable dedicated to the BUS LINK ports of both units, up to 100 meters long, and **without intermediate Ethernet hardware or other**. Please refer to the EclerNet Manager software manual at www.ecler.com for more information.

RJ-45 CONNECTOR WIRING "CROSSOVER"			
RJ-45 (1)	**COLOR**	**RJ-45 (2)**	
PIN 1	WHITE/ORANGE	PIN 3	
PIN 2	ORANGE	PIN 6	
PIN 3	WHITE/GREEN	PIN 1	
PIN 4	BLUE	PIN 7	
PIN 5	WHITE/BLUE	PIN 8	
PIN 6	GREEN	PIN 2	
PIN 7	WHITE/BROWN	PIN 4	
PIN 8	BROWN	PIN 5	

5.7   REMOTE ports 1 and 2 for digital remote controls

The REMOTE 1 and REMOTE 2 ports (14) are two connection points for the digital bus of remote control devices such as WPNETTOUCH wall panel or MPAGE16 messaging console (*paging*). Each of them can be connected to a digital bus branch, at which the various remote devices will be daisy-chained, the last one being loaded with a 120 Ω termination resistance between CAN HIGH and CAN LOW.
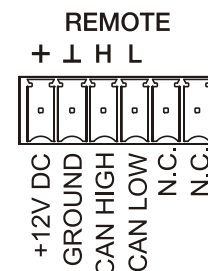
Refer to the remote device documentation (WPNETTOUCH, MPAGE16, etc) for more information about your connection and controls.

Please refer to the EclerNet Manager software manual at www.ecler.com for more information about MIMO88 programming to manage remote devices connected to REMOTE1 or REMOTE2.
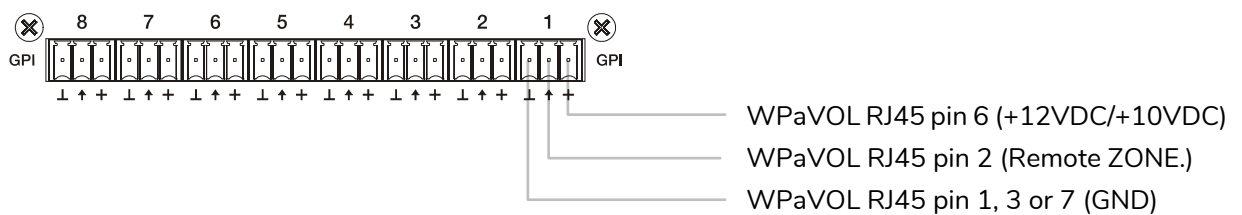
The rear panel of the MIMO88 offers 8 GPI inputs (16) for 0-10 VDC continuous control voltage. Each of these inputs can be connected to an external physical device (potentiometer, contact closure, continuously variable voltage 0-10V DC, etc.) and assigned to a MIMO88 function, as for example:

- Input, output channel or matrix crosspoint volume remote control by means of a WPaVOL physical knob or an Ecler WP Series WPaVOL-IR remote control
- MUTE or SOLO activation/deactivation by means of a switch or contact closure
- Recalling a *preset* with a push button or contact closure

GPI connectors are screw terminal blocks with three-contacts. The wiring is as follows:

Positive, + 12 VDC	>	Pin +
Variable voltage, 0-12 VDC	>	Pin ↑
Ground	>	Pin ⊥

WPaVOL RJ45 pin 6 (+12VDC/+10VDC)
WPaVOL RJ45 pin 2 (Remote ZONE.)
WPaVOL RJ45 pin 1, 3 or 7 (GND)

Jumpers position: ALOG / LIN → **LIN position**
+12 / +10 → **+12 position**

WPaVOL connection to MIMO serial GPI ports

WPaVOL-SR RJ45 pin 6 (+12VDC/+10VDC)
WPaVOL-SR RJ45 pin 2 (Remote VOL.)
WPaVOL-SR RJ45 pin 1, 3 or 7 (GND)

WPaVOL-SR RJ45 pin 8 (Remote VOL.)
WPaVOL-SR RJ45 pin 1, 3 or 7 (GND)
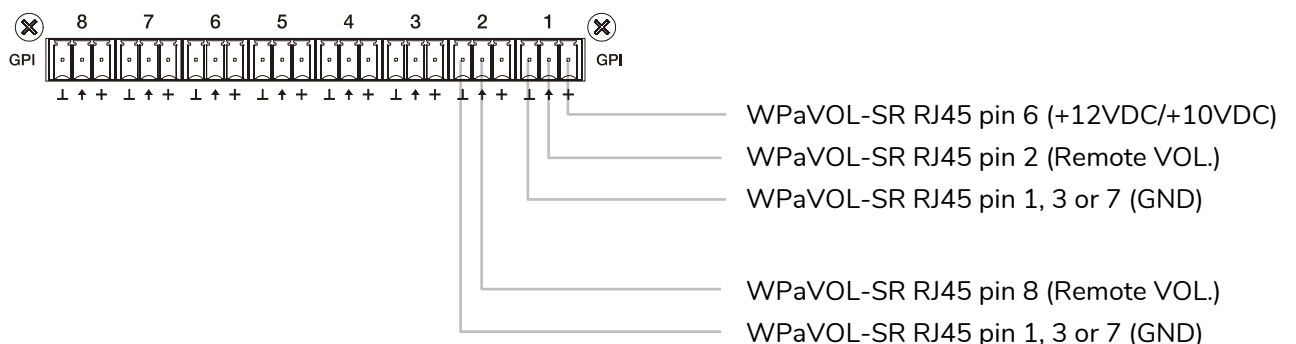
Jumpers position: ALOG / LIN → **LIN position**
+12 / +10 → **+12 position**

WPaVOL-SR connection to MIMO serial GPI ports

Connecting cables can be up to 500 meters with a minimum section of 0.5 mm^2.

Consult your ECLER dealer or www.ecler.com about the WP series remote control wall panels and other accessories available for connection to the REMOTE/VCA port.

5.9 GPO Remote Control Ports

The rear panel of the MIMO88 offers 8 NO/NC (normally open/ normally closed) relay outputs (17). Each of these outputs may be assigned to a MIMO88 function, such as a button of EclerNet Manager (MUTE key, SOLO key, etc.). This makes it possible to interact with external devices such as projection screen motors or movable partitions, lights, sirens, other equipment GPI entries, etc.3.10. Remote control RS-232 Port

5.10 Remote control RS-232 Port

The built-in RS-232 port in the rear panel allows an external device to communicate with an MIMO88 unit via a serial connection. Said connection uses the TP-NET protocol syntax so to enable the external device to obtain the value of any of the parameters of the MIM088 unit (by "GET" commands) and/or modify said values ("SET" commands). See the TP-NET protocol manual for more information.

The serial connection should comply with the following specifications:

Baud rate: 57600 (fixed, no auto negotiation)

Data bits: 8

Parity: None

Stop bits: 1

Flow control: None

WIRING RS232 – DB9	
RS232	**DB9**
Tx	Pin 2 (RxD)
Rx	Pin 3 (TxD)
Gnd	Pin 5 (Signal Gnd)

The following elements are available on the MIMO88 front panel:

- **MONITOR output** (marked with a headphones symbol): it produces the same monitoring signal already available via the rear panel screw terminal block, but here on a ¼" TRS jack and with a rotary volume control (2) for listening through headphones. It is especially useful for listening to input or output signals without disturbing the normal operation. In 16x16 mode both MIMO units receive the same signal. The monitored signal is selected with EclerNet Manager control software. Please refer to the EclerNet Manager software manual at www.ecler.com for more information.

- **Input LED indicators**: indicate the presence of audio signal at the unit's input, and its intensity level (green, amber and red indicate in this order the increased intensity level)

- **Output LED indicators**: indicate the presence of audio signal at the unit's output, and its intensity level (green, amber and red indicate in this order the increased intensity level)

- **Status LED indicators (STATUS)**:
  - **DATA:**
    - Off: there is no connection to EclerNet Manager even if connected to Ethernet.
    - On: connected to EclerNet Manager or to other third party application via TP-NET protocol. Flashing: data traffic with EclerNet Manager or another application.
  - **LINK:**
    - 1. If the device is configured as 8x8 MASTER, the LED is permanently off.
    - 2. If the device is configured as 16x16 MASTER:
      - If everything is correct (SLAVE is connected and there is no communication error), the LED quickly and continuously toggles between green (50ms) and unlit (50ms)
      - If there is a communication error with the SLAVE, the LED quickly toggles between green (50ms) and red (200ms)
      - If no SLAVE is connected (or if connected equipment is another MASTER), the LED slowly toggles between green (800ms) and red (200ms)
    - 3. If the device is configured as SLAVE:
      - If everything is correct (MASTER is connected and there is no communication error), the LED quickly and continuously toggles between orange (50ms) and unlit (50ms)

- If there is a communication error with the MASTER, the LED quickly toggles between orange (50ms) and red (200ms)
- If no MASTER is connected (or if connected equipment is another SLAVE), the LED slowly toggles between orange (800ms) and red (200ms)

o **POWER:** illuminates when the unit is in operation. It flashes if there is an error in the unit or if firmware is not correct. It also flashes when you update firmware
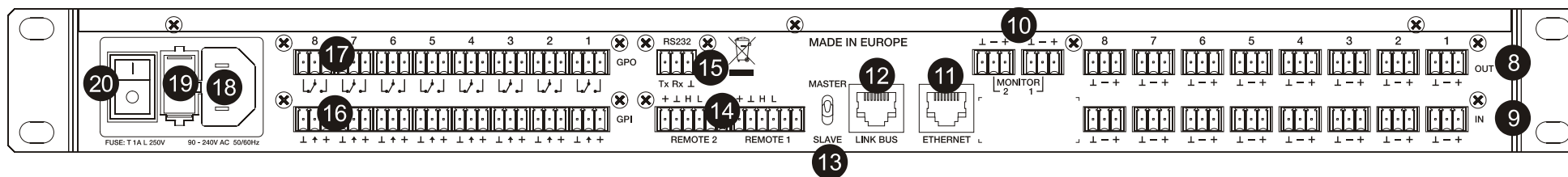
6   CLEANING

The front panel should not be cleaned with dissolvent or abrasive substances because silk-printing could be damaged. To clean it, use a soft cloth slightly wet with water and neutral liquid soap; dry it with a clean cloth. Be careful that water never gets into the unit through the holes of the front panel.

7   FUNCTION LIST

1. Headphones connection stereo jack
2. Volume control for the headphones output, VOL
3. Input signal indicators, INPUTS
4. Output signal indicators, OUTPUTS
5. Data traffic indicator, DATA
6. Link (with another unit) indicator, LINK
7. Power on indicator, POWER
8. Signal output screw terminal, OUT
9. Signal input screw terminal, IN
10. Signal output screw terminal, MONITOR
11. RJ-45 connector, ETHERNET
12. RJ-45 connector, LINK BUS
13. MASTER – SLAVE selector, MASTER SLAVE
14. Screw terminals for digital remote control, REMOTE
15. Screw-assembled remote-control terminals via the TP-NET, RS-232 protocol
16. Screw terminals for continuous voltage control, GPI
17. Screw terminal for relay output, GPO
18. Mains socket
19. Fuse holder
20. Power switch

8 FUNCTION DIAGRAM
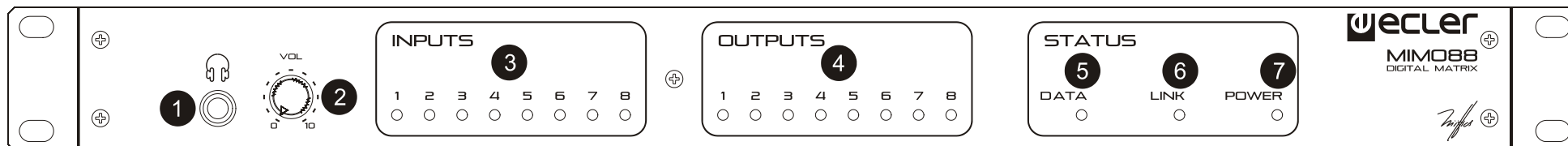
9 TECHNICAL CHARACTERISTICS

MIMO88

| DSP	
DSP	2 x 32/64bit
Sampling Rate	48kHz
Latency IN to OUT	<2.9ms (+1ms for 16x16)

Converters	
Resolution	24bit AKM
Dynamic Range	AD:110dB, DA: 115dB

Analogue	
8+8 Input/Output	Terminal block (Symmetrical)
2 monitor output	Terminal block (Symmetrical)
Headphones related	Jack ¼
Analogue Input headroom	+27dBV = +30dBu
Max. output level	+18dBV = +21dBu
Input sensitivity @ 0dBV out	From -50dBV to +10dBV in 0.5dB step
Input Impedance	Balanced, >4kΩ
Phantom power	+42VDC, 5mA max. software switched
Headphones	>200mW/200Ω
Frequency response (-3dB)	5Hz to 24kHz
Flatness	better than ±0.1dB
THD+Noise @ 1kHz, 0dBV input (line)	<0.004%
THD+Noise @ 1kHz, -40dBV input (mic.)	<0.008%
Output Noise floor FFT (20Hz - 20kHz)	better than 115dB
Interchannel crosstalk (20Hz - 20kHz)	better than 90dB (100dB typ.)
Channel Leakage (20Hz - 20kHz)	better than 100dB (115dB typ.)
CMRR 20Hz- 20kHz	65dB typ.

Processing	
Input Level (x8)	Range: from Off to 0 dB
	Mute: Yes
	Signal Polarity reverse: Yes
	Metering: VU+clip pre & post fader
Output Level (x8)	Range: from Off to 0 dB
	Mute: Yes
	Solo: Yes
	Signal Polarity reverse: Yes
	Metering: VU+clip pre & post fader
Output Gain	Range: from 0 to +6 dB
Input Delay (x8)	from 0 to 1000 ms
	Units: sec/ms/m/cm.
Output Delay (x8)	from 0 to 1000 ms
	Units: sec/ms/m/cm.
Parametric Eq. Types	Bypass / On-Off all channels
(4 max per input)	Param Eq. Freq: 20Hz-20kHz
(8 max per output in 8x8 mode)	Gain: -60/+12 dB
(4 max per output in 16x16 mode)	Q: 0.3 to 200
	Low & High Shelf 6/12 dB/oct

	Low & High Pass 6/12 dB/oct
	All Pass 1/2 order
High & Low pass output Crossover filters (x8)	Bypass On-Off
	Butterworth in 6/12/18/24 dB/oct
	Bessel in 12/18/24 dB/oct
	Linkwitz-Riley in 12/24 dB/oct
Input Noise Gate (x8)	Bypass On-Off
	Threshold: from −80 dBV to +18 dBV
	Depth: 0 dB to 80 dB
	Attack time: from 0,1 ms. to 500 ms.
	Hold time: from 10 ms. to 3000 ms.
	Release time: from 10 ms. to 1000 ms.
Input Compressor / Limiter (x8)	Bypass On-Off
	Threshold: from −36 dBV to +18 dBV
	Ratio: 1:1 to inf:1 (limiter)
	Knee: hard / soft
	Attack time: from 0,1 ms. to 500 ms.
	Release time: from 10 ms. to 1000 ms.
	Make up gain: from 0 to +10 dB
Input Frequency Shifter	Available on all inputs. ON / OFF function
Output Limiter (x8)	Bypass On-Off
	Threshold: from −36 dBV to +18 dBV
	Attack time: from 0,1 ms. to 500 ms.
	Release time: from 10 ms. to 1000 ms.
Built in Signal Generator	Sine: from 20 Hz to 20 kHz
	Polarity: from 20 Hz to 20 kHz
	White noise
	Pink noise
Stereo Linking	Adjacent input / output channels
	Linked processing
	Matrix routing linked
Mix Matrix	Size: 8x8 (1-MIMO88)
	Size: 16x16 (2-MIMO88 with expan. link bus)
	Vol: Input, Output, Crosspoint
	Mute: Set/Clear individual, row, column, all
	Input /output Mono/stereo selector
	Meter: Input /output VU and clip
Pager	Input: IN1 to IN8 (or to IN16 in 16x16)
	Priorities: 4(1max) 4 (min)
	Depth: 0 dB to 80 dB
	Attack time: from 5 ms. to 2000 ms.
	Release time: from 50 ms. to 3000 ms.
	Chime Source: None, Melody 1, Melody 2
	Chime Volume: from −12 dB to 0 dB

Mechanical

Dimensions (WxHxD)	482.6x44x266.5mm
Weight	3.5kg

Supply	
Mains	90-264VCA 47-63Hz
Power consumption	45VA

Miscellaneous	
Management Connectivity	Ethernet Base-Tx 10/100Mb Auto X-Over CAT5 up to 100m.
Expansion LINK BUS (16x16 ch.)	Proprietary over CAT5, Xover cable up to 100m.
Remote Bus	2, over twisted pairs; up to 1km (see specific specs.)
GPI	8, from 0 to 10VDC or TTL level
GPO	8, 3 poles isolated relay; 1A, 48VDC max.
Aux. Power Supply for Remotes & GPI	+12VDC, 1.2A. max. (short circuit protected)
Time and date retention (battery)	1 month aprox. (ambient temperature dependant)
RTC accuracy	±1 minute /year

SOFTWARE	
EclerNet Software	Realtime full GUI of all functions and controls thru Ethernet with interactive graphical display
	Grouping mode channels or devices
	Grouping of other groups
	Automated report generation
	Up to 256 devices on same net
	Autodiscovery devices feature
	Routing capability through NAT gateways
	Real time metering at input/output (DSP)
	Device "Finder" feature
	Save & Recall setup and preset functions
	Firmware update capability thru Ethernet
	Password protection (device & project with two user levels)
	Default Network configuration:
	IP: 192.168.0.100
	Mask: 255.255.255.0
	Gate: 192.168.0.1
	UDP Port: 2210
Operating System	Windows® 10; W8.1; W8; W7; Vista (SP1); XP Prof. (SP3); W2000 Prof. (SP4)
Minimum EclerNet System Requirements	Pentium IV ® 1GHz
	512MB RAM
	40MB HDD free space
	800x600 pixels & 16bits color display
	10/100/1G Ethernet Network card

10 BLOCK DIAGRAM
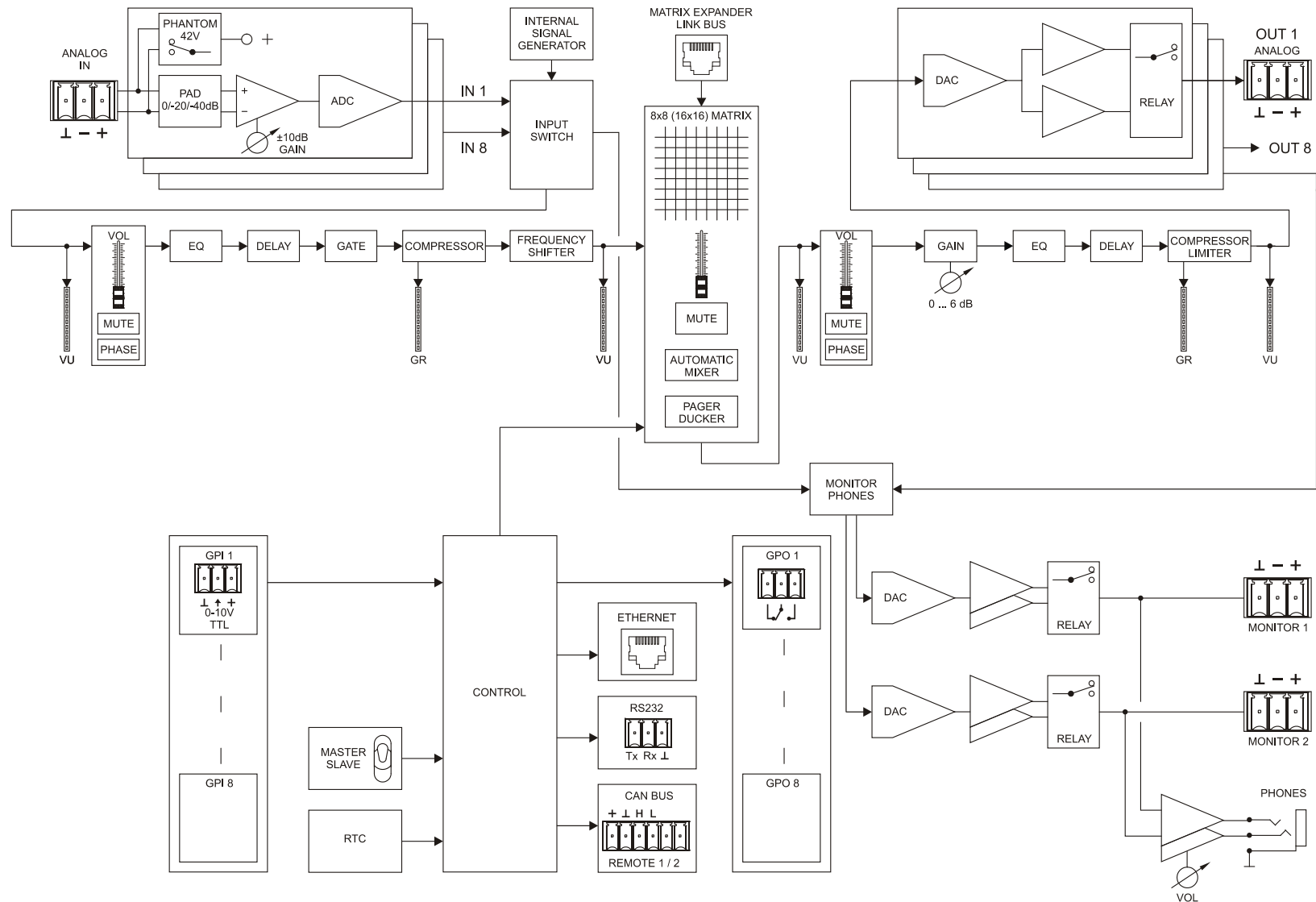
TP-NET PROTOCOL

SOFTWARE

Third-Party NET

USER MANUAL

11 TP-NET PROTOCOL INTRODUCTION

The TP-NET protocol lets a client device (control device) get and/or set the values of several parameters of the **EclerNet compatible** devices (**MIMO** and MIMO SG series **digital matrices**, DUO-NET PLAYER, NXA digital audio manager series, NZA amplifier series, NPA amplifier series, etc.), like volumes, mutes, alarms, etc. It's as well available for eMIMO1616 digital matrix, HUB series digital zoner, MIMO7272DN and MIMO4040CDN digital matrix.

The communication with these digital audio devices can be established using Ethernet and the UDP/IP transport protocol, always by means of the **5800** UDP port.

A second option for this communication is using the RS-232 interface that some of these compatible devices do also have (MIMO series, DUO-NET PLAYER, NXA series, etc.). In this case, the serial connection must fulfil the following specifications:

- Baud rate: **57600** (fixed, no autonegotiation) for all the devices, except for DUO-NET PLAYER, eMIMO1616, HUB series and MIMO4040CDN, which use **115200** baud rate)
- Data bits: 8
- Parity: None
- Stop bits: 1
- Flow control: None

In case the Ecler device has an Euroblock connector for the RS-232 interface, the serial cable wiring, from the device's connector to a standard DB9 serial interface connector, must be the following:

WIRING RS232 – DB9	
RS232	**DB9**
Tx	Pin 2 (RxD)
Rx	Pin 3 (TxD)
Gnd	Pin 5 (Signal Gnd)

The protocol is simple and direct, making it easy to read, write and modify the generated code. It is based on messages with no begin and end delimiter: each message is self-delimited by the UDP packet size, which is defined with a maximum of **80 characters**. All the messages must be written in capital letters.

To let some control systems (like CRESTRON®, EXTRON®, AMX®, RTI®, VITY®, MEDIALON®, etc.) process the messages more easily, the EclerNet device adds the character **LF (0x0A)** to the end of each message. This way the client can buffer the messages to process them, if it's required. The EclerNet device can also handle several messages received in a single message packet by using the **LF** delimiter.

The available messages are built with one or more fields separated with blank spaces (= blank space):

<TYPE> [PARAM1] [PARAM2] [PARAM3] [PARAM4][LF]

The first field (**TYPE**) defines the **message type** and then, the required parameters for it (each kind of message requires a given number of parameters). The field **TYPE** can have these values:

- **SYSTEM**
- **GET**
- **SET**
- **INC**
- **DEC**
- **SUBSCRIBE**
- **UNSUBSCRIBE**
- **DATA**
- **ERROR**

At the end of this document you'll find all the available messages and their parameters for each model of the EclerNet compatible devices.

The **SYSTEM, GET, SET, INC, DEC, SUBSCRIBE** & **UNSUBSCRIBE** messages can be sent from the client to the EclerNet device. The **DATA** & **ERROR** messages can be sent from the device to the client. The only exception is the **SYSTEM PING** message, that is a **SYSTEM** type message that is sent from the EclerNet device when the initial message from the client to the device was **SYSTEM CONNECT PINGPONG.**

The communication (using UDP or RS-232) starts when a client sends the message **SYSTEM CONNECT** to the EclerNet device. As far as the UDP communication requires no connection (unlike the TCP), the EclerNet device stores this client's IP address, and then uses it as the destination IP address for the messages that it generates (**DATA** & **ERROR**). After receiving the **SYSTEM CONNECT** message, the device dumps its entire configuration using several consecutive **DATA** messages.

Note: if the configuration data dump process (usually a huge list of parameters & values) wants to be avoided after a **SYSTEM CONNECT** message, a **SYSTEM CONNECT ONCE** message can be used instead.

The communication can be terminated by two methods:

- **Manually:** when the client sends the **SYSTEM DISCONNECT** message**,** cancelling all the subscriptions and stopping the **DATA** & **ERROR** messages

- **Automatically:** in case the initial message was **SYSTEM CONNECT PINGPONG** and the client didn't get any **SYSTEM PONG** message in a period longer than 10 seconds (presuming a communication breakdown)

The **SET** messages don't have an automatic acknowledgement with a **DATA** message sent from the EclerNet device after it has processed the **SET** command. The client must update the values itself and must send the needed **GET** message if it requires confirmation from the device.

NOTES:

- The numerical values are always integer numbers without **+**, **–**, comma or dot symbols.
- **[PINGPONG]** is an optional parameter used to configure the device-client communication with a periodical check, to see whether the client or the device have terminated it. When configured this way, the device sends a **SYSTEM PING** once per second, and the client must answer with a **SYSTEM PONG** message. If anyone doesn't get these messages along a 10 seconds period, the communication will be considered terminated.
- **[ONCE]** is an optional parameter used to start the device-client communication without a full data dump process (usually a huge list of parameters & values).
- **<Input Channel>** & **<Output Channel>** are numerical values that identify an input or output channel of the EclerNet device.
  It can be within a [1..8] range for MIMO88 single units (8x8 matrix masters), and [1..16] for MIMO88 couples configured as 16x16 matrix masters.
- **<Preset Number>** is a numerical value that identifies one available Preset stored in the EclerNet device's memory.
  For the MIMO series it can be within the [1..99] range.
- **<Level>**, **<Pre Vumeter Level>** y **<Post Vumeter Level>** are numerical values in the [0..100] range that define values in a scale equivalent to [-inf..0] dB
- **<GPI>** & **<GPO>** are numerical values within the [1..8] range for the MIMO88 configured as 8x8 matrix masters (single units), and [1..16] for MIMO88 couples configured as 16x16 matrix masters.
- **<GPI Value>** is a numerical value within the [0..100] range that indicates the value of an analogue GPI input. For a digital input only 0 or 100 are the possible values.
- **<GPO Value>** is a numerical value within the [0..1] range: it can only be 0 or 1 (opened or closed GPO).
- **<Rate>** is a numerical value within the [1..10] range that sets the VU-meter refresh rate, or the number of times the vumeters' values are sent per second (by default = 3).

- **"<Device Name>"** is the device name inside double quotation marks, to allow for names with blank spaces.
- **<Error ID>** is a numerical value for an error code.
- **"<Error Description>"** is a text chain inside double quotation marks, containing an error description.
- **<Virtual Control>** is a numerical value that identifies a Virtual Control.
  It can be within a [1..64] range for MIMO88.

12 MIMO88 DIGITAL MATRIX

IMPORTANT NOTE: The communication must be started with the client sending **the first message** **SYSTEM CONNECT** or **SYSTEM CONNECT ONCE** to the EclerNet device. Otherwise, the commands from the client to the EclerNet device will be ignored. See TP-NET PROTOCOL INTRODUCTION chapter for additional information.

TYPE	PARAM1	PARAM2	PARAM3	PARAM4	DESCRIPTION
SYSTEM	CONNECT	[MASTER]	[PINGPONG]	[ONCE]	• MASTER: this parameter, applied in SYSTEM CONNECT, is used to disconnect all clients currently connected to the device, releasing all open and not correctly closed connections, opening a new connection. In this way we guarantee that the client that has set the MASTER option is the only one connected by TP-NET to the device. • PINGPONG: this parameter can be used with the MASTER parameter, the difference is that this parameter performs a periodic check to see if the communication is still open (PING PONG) or if after 10 seconds with no response, the communication has ended (PING). • ONCE: this parameter is used to prevent the device status dump.
	DISCONNECT				Cancel subscriptions and terminates communication
	SUBSCRIPTION_RATE	<Rate>			Alive message from device
	PING				Alive message from device
	PONG				Alive ACK message from client

GET					
	ALL				Dumps current device status (with DATA messages)
	PRESET				Gets the current PRESET
	ILEVEL	<Input Channel>			Gets the current LEVEL of an Input Channel
	OLEVEL	<Output Channel>			Gets the current LEVEL of an Output Channel
	XLEVEL	<Input Channel>	<Output Channel>		Gets the current LEVEL of a Matrix point
	IMUTE	<Input Channel>			Gets the current MUTE status of an Input Channel
	OMUTE	<Output Channel>			Gets the current MUTE status of an Output Channel
	XMUTE	<Input Channel>	<Output Channel>		Gets the current MUTE status of a Matrix Point
	IVU	<Input Channel>			Gets the VU-meter value of an Input Channel
	OVU	<Output Channel>			Gets the VU-meter value of an Output Channel
	GPI	<Input>			Gets the current value of a General Purpose Input
	GPO	<Output>			Gets the current value of a General Purpose Output **(not valid for MIMO88SG / MIMO1212SG)**
	INFO_NAME				Gets the Device Name
	INFO_MODEL				Gets the Device Model
	INFO_VERSION				Gets the Firmware Version
	INFO_MAC				Gets the Device MAC address
	VIRTUAL_CONTROL	<Virtual Control>			Gets the Virtual Control value

TYPE	PARAM1	PARAM2	PARAM3	PARAM4	DESCRIPTION
SET	PRESET	<Preset Number>			Sets the current PRESET
	ILEVEL	<Input Channel>	<Level>		Sets the current LEVEL of an Input Channel
	OLEVEL	<Output Channel>	<Level>		Sets the current LEVEL of an Output Channel
	XLEVEL	<Input Channel>	<Output Channel>	<Level>	Sets the current LEVEL for a Matrix point
	IMUTE	<Input Channel>	YES/NO		Sets the current MUTE status of an Input Channel
	OMUTE	<Output Channel>	YES/NO		Sets the current MUTE status of an Output Channel
	XMUTE	<Input Channel>	<Output Channel>	YES/NO	Sets the current MUTE status for a Matrix Point
	GPO	<Output>	<GPO Value>		Sets the current value for a General Purpose Output **(not valid for MIMO88SG)**
	VIRTUAL_CONTROL	<Virtual Control>	<Value>		Sets the Virtual Control value (Value can range from 1 to 100)
INC	ILEVEL	<Input Channel >	<Value>		Increases the current LEVEL of an Input Channel by Value (Value can range from ±1 to ±100)
	OLEVEL	<Output Channel>	<Value>		Increases the current LEVEL of an Output Channel by Value (Value can range from ±1 to ±100)
	XLEVEL	<Input Channel>	<Output Channel>	<Value>	Increases the current LEVEL of a Matrix point by Value (Value can range from ±1 to ±100)
DEC	ILEVEL	<Input Channel >	<Value>		Decreases the current LEVEL of an Input Channel by Value (Value can range from ±1 to ±100)
	OLEVEL	<Output Channel>	<Value>		Decreases the current LEVEL of an Output Channel by Value (Value can range from ±1 to ±100)

	XLEVEL	<Input Channel>	<Output Channel>	<Value>	Decreases the current LEVEL of a Matrix point by Value (Value can range from ±1 to ±100)
SUBSCRIBE	ALL				Subscribes to all VU-meters
	IVU	<Input Channel>			Subscribes to an Input Channel VU-meter
	OVU	<Output Channel>			Subscribes to an Output Channel VU-meter
UNSUBSCRIBE	ALL				Unsubscribe to all VU-meters
	IVU	<Input Channel>			Unsubscribe to an Input Channel VU-meter
	OVU	<Output Channel>			Unsubscribe to an Output Channel VU-meter

Note: INC and DEC commands are replied with a DATA command from the device with the resulting LEVEL value, after it has been increased or decreased. When the INC or DEC command tries to adjust a LEVEL value beyond its minimum or maximum limits, no reply (DATA command) will be produced.

TYPE	PARAM1	PARAM2	PARAM3	PARAM4	DESCRIPTION
DATA	PRESET	<Preset Number>			Shows the current PRESET
	ILEVEL	<Input Channel>	<Level>		Shows the current LEVEL of an Input Channel
	OLEVEL	<Output Channel>	<Level>		Shows the current LEVEL of an Output Channel
	XLEVEL	<Input Channel>	<Output Channel>	<Level>	Shows the current LEVEL for a Matrix point
	IMUTE	<Input Channel>	YES/NO		Shows the current MUTE status of an Input Channel
	OMUTE	<Output Channel>	YES/NO		Shows the current MUTE status of an Output Channel
	XMUTE	<Input Channel>	<Output Channel>	YES/NO	Shows the current MUTE status for a Matrix Point
	VIRTUAL_CONTROL	<Virtual Control>	<Value>		Shows the Virtual Control value (Value can range from 1 to 100)
	IVU	<Input Channel>	<Pre Vumeter Level>	<Post Vumeter Level>	Shows the VU-meter value of an Input Channel
	OVU	<Output Channel>	<Pre Vumeter Level>	<Post Vumeter Level>	Shows the VU-meter value of an Output Channel
	GPI	<Input>	<GPI Value>		Shows the current value of a General Purpose Input
	GPO	<Output>	<GPO Value)		Shows the current value of a General Purpose Output. **(not valid for MIMO88SG)**
	INFO_NAME	"<Device Name>"			Shows the Device Name
	INFO_MODEL	<Device Model>			Shows the Device Model
	INFO_VERSION	<Firmware Version>			Shows the Firmware Version
	INFO_MAC	<Device MAC address>			Shows the Device MAC address
ERROR	<Error ID>	"<Error Description>"			Informs about an error

13 ERROR CODES FOR ECLERNET DEVICES

13.1 COMMON ERROR CODES (to all EclerNet - TP-NET compatible devices)

ERROR ID	DESCRIPTION
0	TPNET_ERROR_NONE = 0,
1	TPNET_ERROR_INVALID_FIELD_TYPE,
2	TPNET_ERROR_INVALID_FIELD_PARAM1,
3	TPNET_ERROR_INVALID_FIELD_PARAM2,
4	TPNET_ERROR_INVALID_FIELD_PARAM3,
5	TPNET_ERROR_INVALID_FIELD_PARAM4,

13.2 MIMO88 SPECIFIC ERROR CODES

ERROR ID	DESCRIPTION
6	UDP_ERROR_TIMEOUT_PONG,
7	UDP_ERROR_CONNECT_WHILE_CONNECTED,
8	UDP_ERROR_DISCONNECT_WHILE_UNCONNECTED,
9	UDP_ERROR_INVALID_CLIENT_IP,
10	UDP_ERROR_MESSAGE_TOO_LONG,
11	UDP_ERROR_UNSUPPORTED_MESSAGE,
12	UDP_ERROR_UNSUPPORTED_PRESET_NUMBER,
13	UDP_ERROR_UNSUPPORTED_INPUT_CHANNEL_NUMBER,
14	UDP_ERROR_UNSUPPORTED_OUTPUT_CHANNEL_NUMBER,
15	UDP_ERROR_UNSUPPORTED_GPI_NUMBER,
16	UDP_ERROR_UNSUPPORTED_GPO_NUMBER,
17	UDP_ERROR_INVALID_LEVEL_VALUE,
18	UDP_ERROR_INVALID_RATE_VALUE,
19	UDP_ERROR_GPO_VALUE,