

**Vigintos Elektronika**

**FM EXCITER**

**EX-FM-35S**

Technical specification

TELECOMPOONENTS

## CONTENTS

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1. GENERAL INFORMATION.....	3
2. MAIN DRAWING .....	5
3. OPERATION .....	6
4. USER INTERFACE.....	8
5. PERFORMING SIGNAL LEVEL ADJUSTMENTS .....	10
6. CHANGING TRANSMISSION MODE.....	10
7. INSTALLATION.....	11
APPENDIX 1: LED indication states .....	12
APPENDIX 2: PLL synthesizer frequency settings .....	13
APPENDIX 3: Analogue remote control output.....	15
NOTES .....	16

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## 1. GENERAL INFORMATION

EX-FM-35S is a FM exciter with integrated stereo coder and 20W nominal output power.

### SERVICE CONDITIONS:

Temperature range:	+5...+45 °C
Humidity:	90%, non-condensing
Supply-line voltage:	~220V (+10-15%), 50 Hz±1

### MONITORING:

- Left and Right audio input levels
- SCA(RDS) input level
- Modulation
- Incident, forwarded and reflected RF wave power
- Mono/stereo mode
- Frequency lock-on mode

### SETTINGS:

- Left, Right, SCA(RDS) input levels adjustment
- Output power adjustment
- Carrier-frequency adjustment
- Switching between stereo or mono operation mode

### REMOTE CONTROL:

- RS485
- RS232 (OPTIONAL)
- ETHERNET(OPTIONAL)

## 1.1 Technical data

<b>RF PARAMETERS</b>	
<b>Frequency range</b>	87.5 -108 MHz   65.9 –74 MHz (adjustment with precision of 10 KHz)
<b>Modulation type</b>	Direct carrier frequency modulation
<b>Frequency stability</b>	±1.0 ppm
<b>Output power</b>	0-20W(ALC), adjustable
<b>Output connector</b>	N female, 50 Ω
<b>Probe</b>	-30 dB, directional coupler
<b>Probe connector</b>	BNC-female
<b>Spurious and harmonic suppression:</b>	≤ - 70 dBc with band-pass filter (optional)
<b>Residual AM:</b>	≤ 0.10%, synchronous, ≤ 0.15%, asynchronous,
<b>S/N ratio:</b>	
<b>MONO</b>	≤ -82 dB, ref to ± 75 KHz dev.
<b>STEREO</b>	≤ -77 dB, ref to ± 75 KHz dev.
<b>Amplitude response:</b>	
<b>Internal stereo L-R</b>	±0.2dB, 30Hz to 15 KHz
<b>MPX</b>	±0.1dB, 30Hz to 100 KHz
<b>T.H.D.</b>	≤ 0.05% up to 7 KHz
<b>Stereo separations</b>	≤ -56 dB, 30 Hz to 15 KHz ≤ -65dB @ 1 KHz
<b>Pilot tone</b>	19 KHz±0.5 Hz
<b>Audio inputs L-R:</b>	0±6 dB, 600 Ω ±10% 15 KHz filter
<b>Input connectors:</b>	XLR female, balanced
<b>SCA(RDS) input:</b>	0±12 dB, 10 k Ω+10% BNC
<b>19 KHz output:</b>	1 Vpp, load ≥ 2 k Ω, BNC

<b>GENERAL PARAMETERS</b>	
<b>Power consumption</b>	100 VA, ref 20W RF output
<b>Cooling</b>	Forced air
<b>Dimension</b>	2U 19" RACK
<b>Weight</b>	12 kg

## 2. MAIN DRAWING

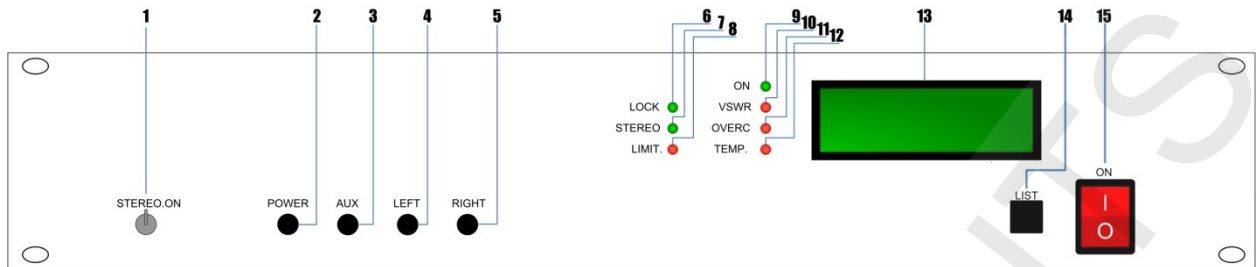


Figure 2.1 Front view:

1 – Operation in stereo mode on/off; 2 – Output power adjustment; 3 – Auxiliary/RDS channel level adjustment; 4 – Left audio channel level adjustment; 5 – Right audio channel level adjustment; 6 – “Frequency locked” indicator; 7 – “Operation in stereo mode” indicator; 8 – Overmodulation indicator; 9 – Power on/off indicator; 10 – Critical V.S.W.R. indicator; 11 – Overcurrent indicator; 12 – Temperature alarm indicator; 13 – LCD; 14 – Control button “LIST”; 15 – On/Off button.

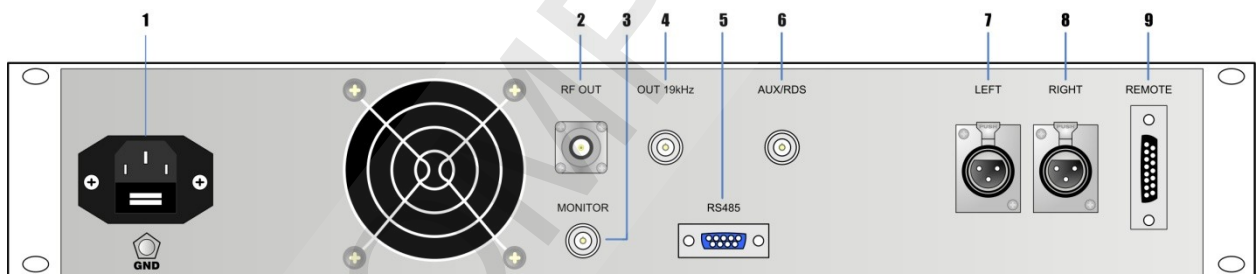


Figure 2.2 Back view:

1 – Power socket; 2 – RF output ; 3 – RF probe output; 4 – Pilot-tone output; 5 – RS485 input; 6 – RDS signal(or additional user information output) output; 7 – Left channel input; 8 – Right channel input; 9 –Analogue remote control output;

### 3. OPERATION

EX-FM-35S operation could be explained by following block diagram:

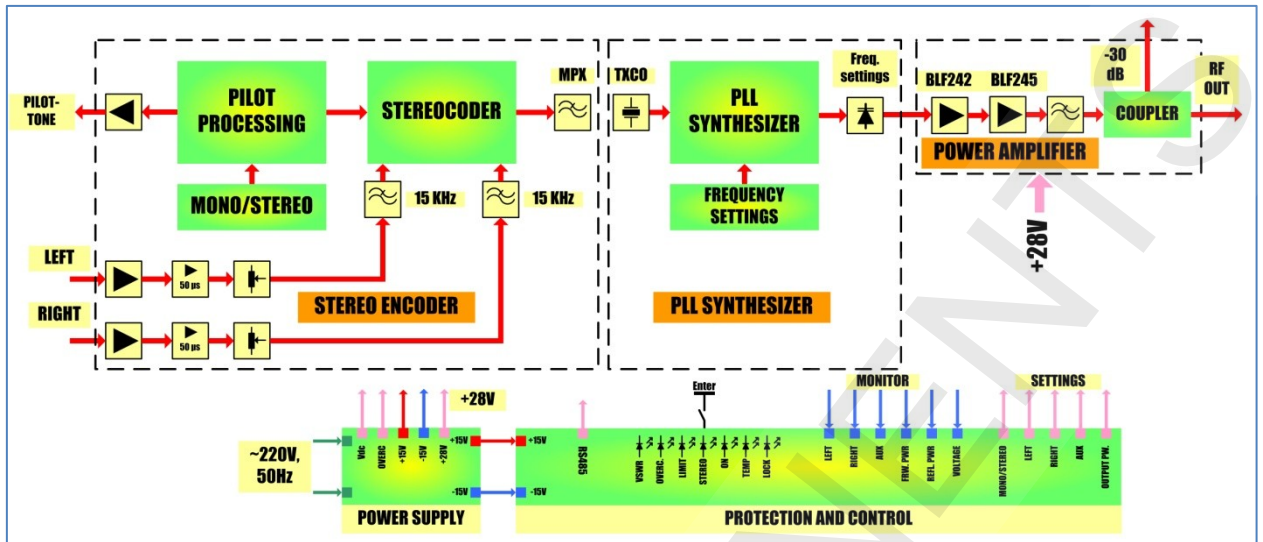


Figure 3.1 Block-diagram

Typically, exciter houses 5 active parts:

- 1. Stereo Encoder.** It combines *Left* and *Right* stereo signals into a single composite stereo signal.
  - 2. PLL synthesizer and VCO.** EX-FM-35S uses standard PLL architecture which is implemented with the *National Semiconductors LMX2306 IC* PLL frequency synthesizer. *LMX2306* offers superior carrier frequency stability and precise tuning.
  - 3. Power amplifier.** Power amplifier consists of two amplifier stages and output filter. First amplifier (pre-amplifier) stage is implemented with *Philips Semiconductors BLF242 MOSFET* transistor. Pre-amplifier stage is suited for initial signal amplification. Second amplifier (Power amplifier) stage is implemented with *Philips Semiconductors BLF245 MOSFET* transistor and operates in AB-mode. This stage is suited for final amplification and boosts output signal power up to 20W
  - 4. Protection and control block.** This block is implemented with *Atmel ATmega128* microcontroller and is suited for controlling EX-FM-35. All information about main EX-FM-35 parameters (such as Left&Right signal levels, power supply voltage and current, forwarded and reflected waves power) CPU visualize on LCD display(13 in **Figure 2.1**) . If one or more EX-FM-35 parameters value become critical, then in order to attract user's attention, CPU indicates this with LED indicators on the front panel (6,7,8,9,10,11,12 in **Figure 2.1**). More information about LED indications is given in [Appendix 1](#).
- EX-FM-35 parameters level adjustment is performed by tuning potentiometers (2,3,4,5 in **Figure 2.1**) with screwdriver. More information about tuning parameters is given in [section 5](#).

**5. Power supply.** Exciter's power supply consists of the one 150W transformer. Transformer has three windings which produce 21V, ~21V, ~33V voltage. Each winding is connected to the step-down converter for producing -15V, +15V, +28V direct voltages. -15V and +15V voltages are used for supplying stereo encoder, PLL synthesizer and CPU (protection and control block). +28V voltage is used for supplying power amplifier.

TELECOM COMPONENTS

#### 4. USER INTERFACE

**EX-FM-35S** exciter can be controlled directly or remotely. Direct control is executed by using control button “LIST”(14 in **Figure 1.**) Remote control requires “Measuring Control”<sup>1</sup> software installed, PC with COM-port, null-modem and COM1-cable.

When **EX-FM-35S** turn on, it instantly goes to the main operation mode. By default, LEDs with labels “ON”, “STEREO” (if transmission in [stereo mode](#) is enabled) and “LOCK” must light up.

**NOTE:** After turning on, LED indicator with label “LOCK” lights up not straightly, but after some period of time. Depending of synthesizer generated frequency this time period can vary. For lower frequencies (88 MHz) frequency “locks” quicker, for higher (108MHz) – slower.

In this mode user can monitor exciter’s parameters:

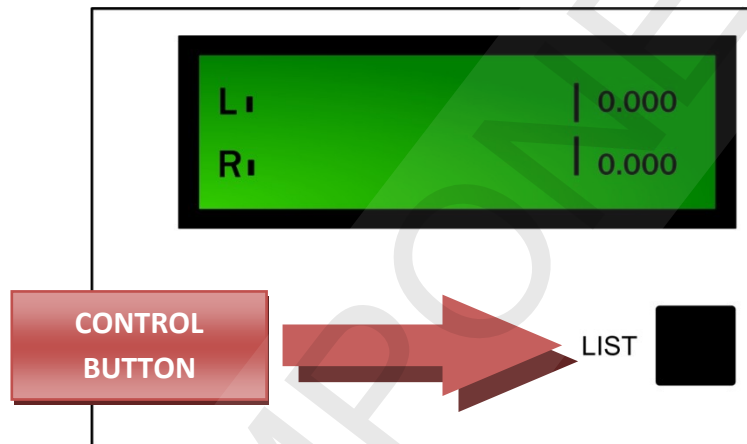


Figure 4.1 LCD indicator

Pressing shortly “LIST” button cycles menu windows. Menu’s hierarchical scheme is shown in **Figure 4.2**

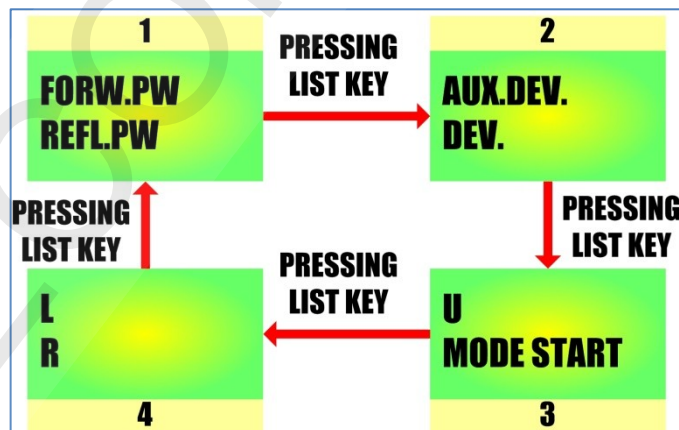


Figure 4.2 Menu

<sup>1</sup> Special software developed by Vigintos Elektronika to access and control remotely FM- and TV- transmitters



**1 screen:** In this window user can monitor forwarded and reflected waves power values. **FORW.PW** – represents forwarded wave power, **REFL.PW** – reflected wave power.

**2 screen:** In this window user can monitor auxiliary and FM signal deviation. **AUX.DEV** – auxiliary signal deviation. **DEV.** – FM signal deviation.

**3 screen:** In this window user can monitor power amplifier supply voltage (in Volts) and exciter’s operation mode

**4 screen:** In this window user can monitor such parameters as Left or Right signal level. **L** here means – left channel level, **R** – right channel level.

Holding “LIST” button more than 3 s opens *additional options menu* (Figure 4.3). In this menu user can change **EX-FM-35S** attributes such as *LAN address* or *Unit number*.

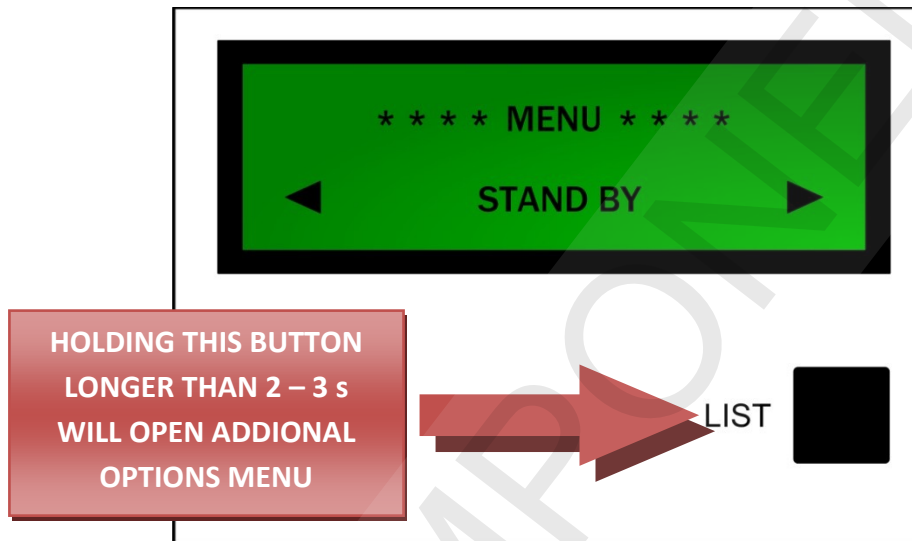


Figure 4.3 Opening additional options menu

**!!! WARNING:** Manufacturer highly recommends do not change any of *EX-FM-35S* exciter’s attributes in *additional options menu*.

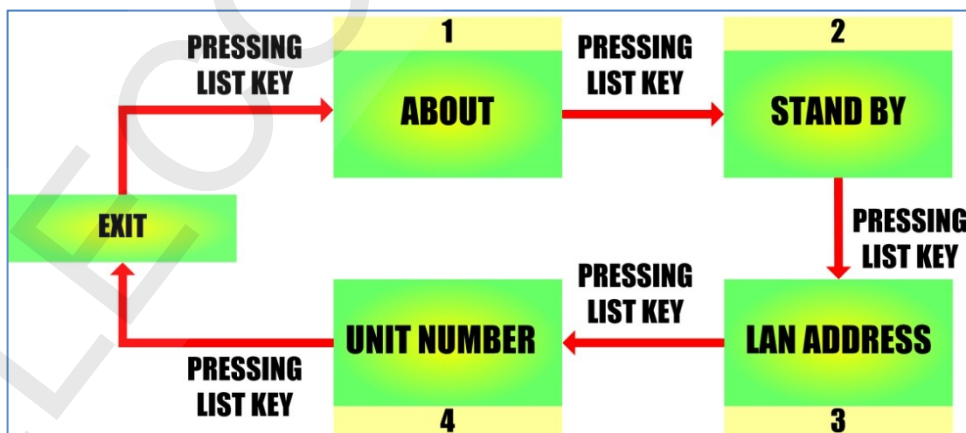


Figure 4.4 Additional options menu

1. **ABOUT** – entering this menu item will show main information about exciter (manufacturer, device's serial number, LAN address, Unit number and etc.)
2. **STAND BY** – activating this menu item will switch exciter to the "STAND BY" mode. In "STAND BY" mode exciter stops transmission and dramatically decreases power consumption.
3. **LAN address** – in this menu item user can change device's address in *Local Area Network*( network which consists of various devices such as amplifiers, drivers, modulators or etc., within the limits of one transmitter). In this menu pressing shortly "LIST" button will result incremental (with step +1) change of device's LAN number. Holding "LIST" button more than 2-3 s confirms applied changes.
4. **Unit number** – in this menu item user can change device's unit number(unique number which identifies device's type(modulator, amplifier or etc.) in the LAN) .
5. **EXIT** – exits to the main menu

## 5. PERFORMING SIGNAL LEVEL ADJUSTMENTS

Level adjustments are performed by tuning potentiometers with labels LEFT, RIGHT, AUX, POWER on the front panel (2,3,4,5 in **Figure 2.1** ). This can be done using dielectric screwdriver. Clockwise screwdriver's rotation increases level value, counter-clockwise-decreases.

**POWER** – tuning potentiometer with this label will adjust output power in interval 0-20W

**LEFT** – tuning this potentiometer will result change in level of left audio signal.

**RIGHT** – tuning this potentiometer will result change in level of right audio signal.

**AUX** – tuning this potentiometer will change level of RDS(auxiliary) signal.

## 6. CHANGING TRANSMISSION MODE

**EX-FM-35S** can operate in two transmission modes: stereo or mono. Switching between transmission modes can be done by toggling up/down "STEREO ON" switch(1 on **Figure 1.**) Transmission in stereo mode is indicated by green color LED indicator with label "STEREO"(7 in **Figure 1**). In order to operate in stereo transmission mode switch must be set to upper position. To operate in mono transmission mode switch must be set to lower position.

## 7. INSTALLATION

### **Attention!!!**

**Only qualified technical personnel should service the present equipment.**

**Before making any action towards the equipment, please read carefully user's manual**

1. **Attention!!! Before installing EX-FM-35S exciter please check that all devices which will be connected to EX-FM-35-35S are properly grounded and have their power turned off**
2. Connectors with labels "LEFT" and "RIGHT" (7 and 8 in **Figure 2.2**) connect to left and right stereo signal sources respectively
3. Connector with label "AUX/RDS" (6 in **Figure 2.2**) connect to RDS coder's auxiliary output
4. Connector with label "OUT 19KHz" (5 in **Figure 2.2**) connect to RDS coder's synchronization input
5. Connector with label "RF output" (3 in **Figure 2.2**) connect to output feeder (power amplifier)
6. Depending on which type of remote control you will use, connect it to connectors with labels RS232 or RS485 respectively.
7. Connect power supply cable to the power supply cord (1 in **Figure 2.2**)
8. Connect power supply cable to the power supply-line.
9. Turn on power of EX-FM-35S and connected to it devices

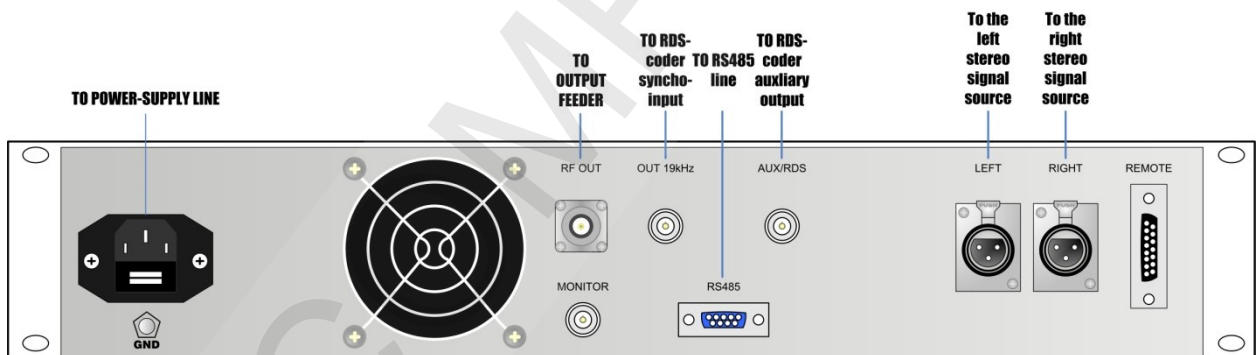


Figure 7.1 Installation

**APPENDIX 1: LED indication states**

LED color Indication color	LOCK	STEREO	LIMIT.	TEMP	OVERC	VSWR	ON
<b>GREEN</b>	Frequency locked	Transmission in stereo mode	-	-	-	-	Power is on
<b>RED</b>	-	-	-	Overheating	Power supply overcurrent	Critical V.S.W.R	-
<b>YELLOW</b>	-	-	Overmodulation, output signal distorted	-	-	-	-
<b>NO INDICATION</b>	Frequency unlocked, reference generator destabilized	Transmission in mono mode	FM modulator operating normally	Temperature is ok	Power supply operating normally	V.S.W.R. is in permissible range	Power is off

**APPENDIX 2: PLL synthesizer frequency settings**

PLL synthesizer generated frequency value can be adjusted using DIP-4 switches in “synthesized oscillator” (refer to the **EX-FM-35S** schematics). First upper switch represents tens of MHz, second – ones of MHz, third – tenths of MHz, fourth – one hundredths of MHz. Switch’s buttons positions represent multiply factor. Final frequency can be calculated using expression:

$$F_{carrier} = A \cdot 10 + B \cdot 1 + C \cdot 0.1 + D \cdot 0.01 \text{ [MHz]} \quad (1)$$

Where *A, B, C, D* multiply factors (depends on switch’s buttons positions) that are given in **Figure 9**:

MULTIPLY FACTOR	SWITCH POSITION
0	
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	

	<b>X 10 MHz</b>	
	<b>X 1 MHz</b>	
	<b>X 0.1 MHz</b>	
	<b>X 0.01 MHz</b>	

$F_{carrier} = 10\text{MHz} \cdot 9 + 1\text{MHz} \cdot 3 + 0.1\text{MHz} \cdot 0 + 0.01\text{MHz} \cdot 0 = 93\text{MHz}$

Figure 8.1

1. Find multiply factor A for first upper switch (in this example such first upper switch's buttons configuration corresponds multiply factor **9**)
2. Find multiply factor B for second switch ( corresponds multiply factor **3** )
3. Find multiply factor C for third switch ( corresponds multiply factor **0** )
4. Find multiply factor D for fourth switch ( corresponds multiply factor **0** )
5. Use formula 1

$$F_{carrier} = 10MHz \cdot 9 + 1MHz \cdot 3 + 0.1MHz \cdot 0 + 0.01MHz \cdot 0 = 93MHz$$

### APPENDIX 3: Analogue remote control output

In critical cases, when remote control options are unavailable (missing one or more of remote control required key-elements) analogue control output (9 in **Figure 2.2**) allows monitoring or controlling exciter manually. Each connector's pin represents output voltage value, which is proportional to the corresponding exciter's parameter value. Pins descriptions are given in figure below:

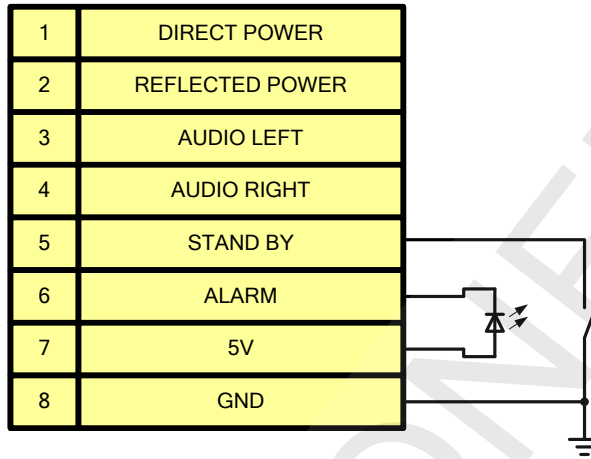


Figure 8.2

PIN NUMBER	DESCRIPTION
1 pin	Represents direct wave power value. Nominal output value <b>4V</b> corresponds <b>20W</b> power
2 pin	Represents reflected wave power value. Nominal output value <b>4V</b> corresponds <b>3W</b> power
3 pin	Represents left audio signal level. <b>775mV</b> represents <b>0 dB</b> level
4 pin	Represents right audio signal level. <b>775mV</b> represents <b>0 dB</b> level
5,8 pins	By connecting this pins together, exciter can be switched to the STAND BY mode
6,7 pins	These pins represents "LOCK" indicator

NOTES

TELECOM COMPONENTS



**Vigintos Elektronika**

**FM POWER AMPLIFIER**

**RFM-PA-1001M**

Technical specification

## CONTENTS

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1. GENERAL INFORMATION .....	3
2. MAIN DRAWING .....	4
3. OPERATION .....	5
4. USER INTERFACE .....	6
5. INSTALLATION .....	8
APPENDIX 1: LED indication states .....	9

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## 1. GENERAL INFORMATION

The 1 kW RFM-series solid state broad-band RF power amplifier is designed as output stage amplifier for FM broadcasting transmitters in the frequency range from 87.5 to 108 MHz

This product meets to the requirements of main European Standards.

### SERVICE CONDITIONS:

<b>Temperature range:</b>	+5...+45 °C
<b>Humidity:</b>	90%, non-condensing
<b>Supply-line voltage:</b>	~220V (+10-15%), 50 Hz±1

### MONITORING:

- Forwarded and reflected power
- Unbalanced power
- DC power supply and current

### 1.1 Technical data

#### TECHNICAL DATA

<b>Frequency range</b>	87.5 -108 MHz
<b>Nominal output power</b>	1000W ± 0.5 dB (ALC)
<b>Output/input impedance</b>	50 Ω
<b>RF input connector</b>	N female
<b>RF output connector</b>	7/16 female
<b>Probe</b>	- 40 dB directional coupler
<b>Probe connector</b>	BNC
<b>Harmonic attenuation</b>	≤ -80 dB
<b>Power consumption</b>	1800 VA ref. 1000 W RF output

#### GENERAL PARAMETERS

<b>Power consumption</b>	1800 VA, ref 1000 W RF output
<b>Cooling</b>	Forced air
<b>Dimension</b>	5U 19" RACK
<b>Weight</b>	50 kg

## 2. MAIN DRAWING

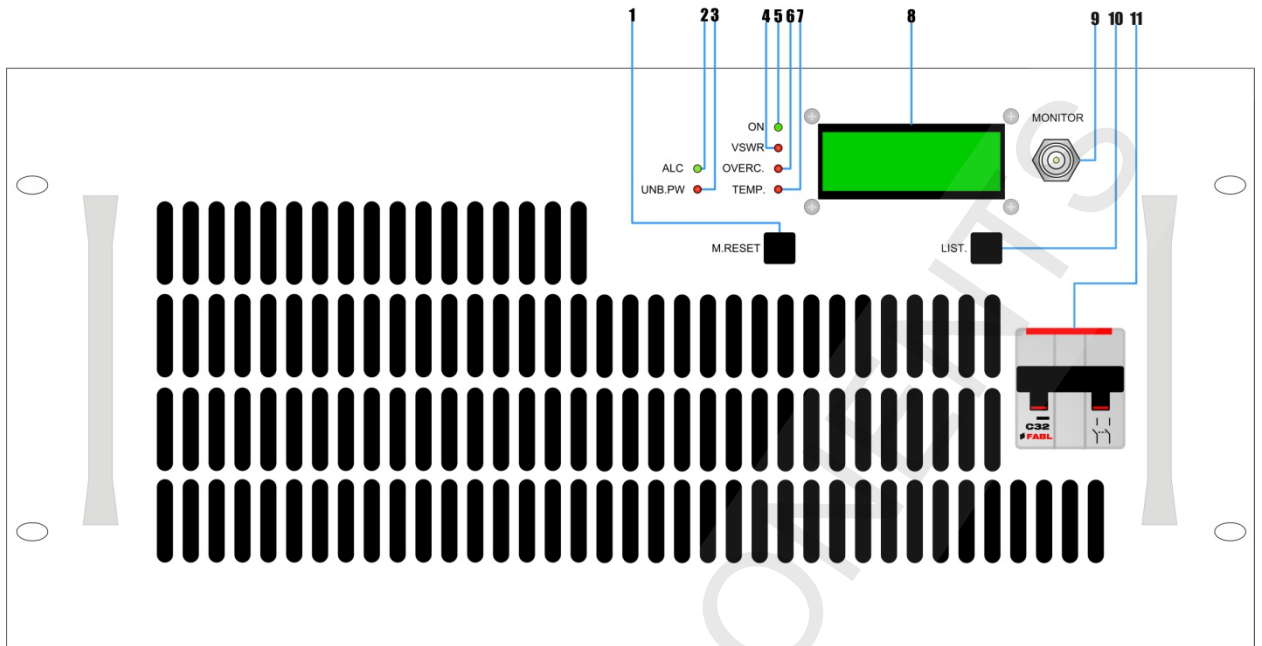


Figure 2.1 Front panel:

1 – “M.RESET” control button; 2 – “ALC” indicator; 3 – “UNBALANCE” indicator; 4 – “V.S.W.R.” indicator; 5 – “ON” indicator; 6 – “OVERCURRENT” indicator; 7 – “TEMPERATURE” indicator; 8 – LCD; 9 – RF probe; 10 – “LIST” button; 11 – “On/Off” switch;

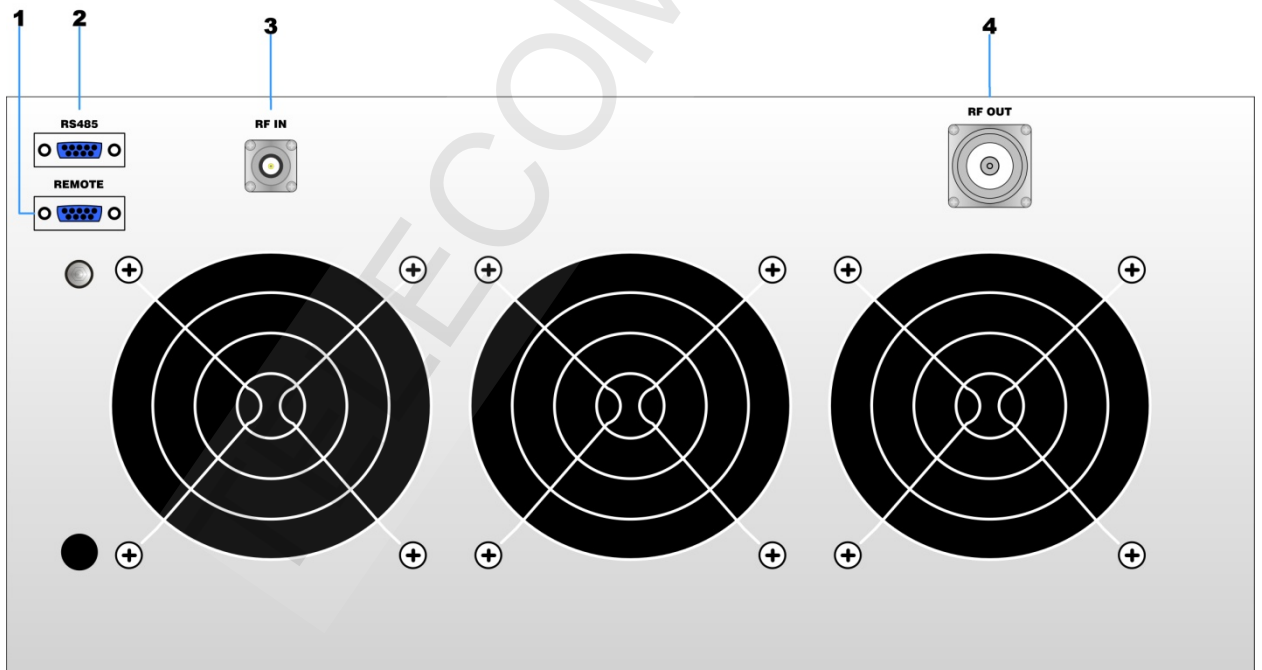


Figure 2.2 Back panel

1 – Analogue control input; 2 – “RS485” input; 3 – RF input; 4 – RF output;

### 3. OPERATION

**RFM-PA-1001** operation can be explained by the following block diagram:

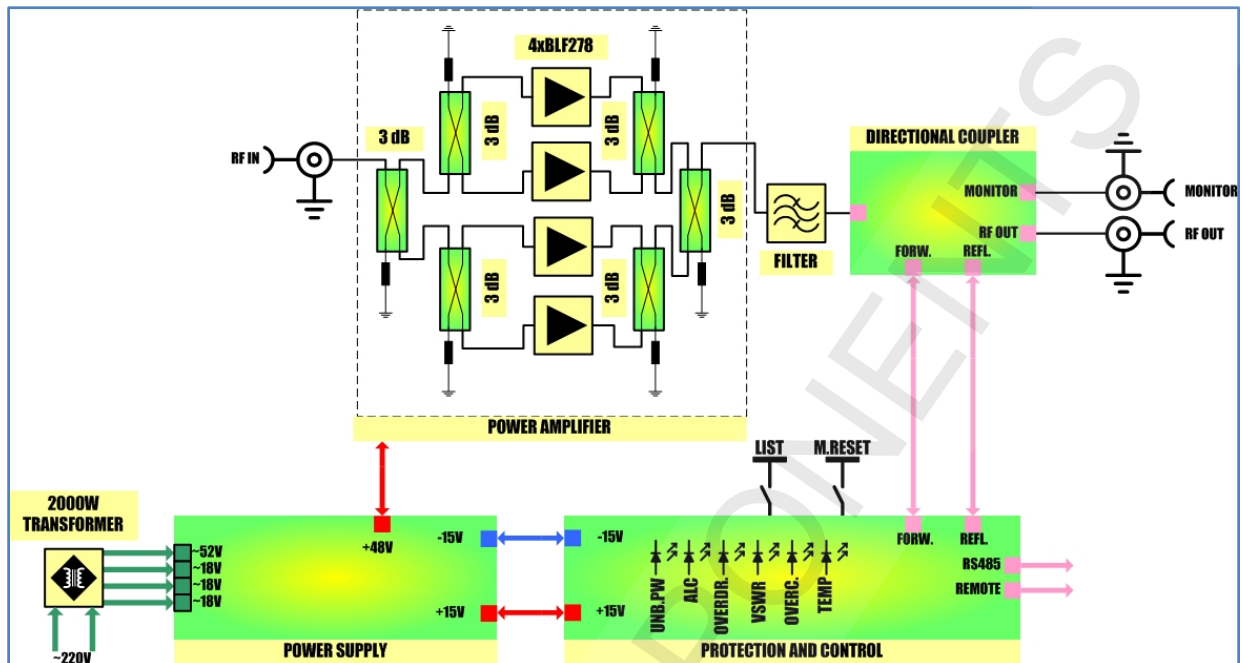


Figure 3.1 Block-diagram

As is shown in block-scheme, **RFM-PA-1001** consists of four parallel amplifier stages which are implemented with MOSFET transistors BLF278. RF signal from exciter is directed to **RFM-PA-1001** input. After that, with 3dB directional couplers RF signal is splitted and redirected to the amplifier stages. Each stage amplifies RF signal and directs it to 3dB combiners. Output filter forms requested output RF signal's spectrum, removes spurious and illegitimate radiations. During amplification process, **RFM-PA-1001** power amplifier's CPU constantly monitors and measures parameters such as temperature, power supplies' current and voltage, ALC's state, forwarded and reflected wave power value. All parameters are visualized on LCD screen. User can monitor **RFM-PA-1001** parameters directly on LCD, or remotely with PC.

#### 4. USER INTERFACE

**RFM-PA-1001** power amplifier can be controlled directly or remotely. Direct control is executed by using control button “LIST” (11 in **Figure 1**.) After turning power on, amplifier enters to the main operation mode. By default, “ON” and “ALC” must light up. In this mode user can monitor amplifier parameters. Pressing “LIST” button shortly cycles menu windows:

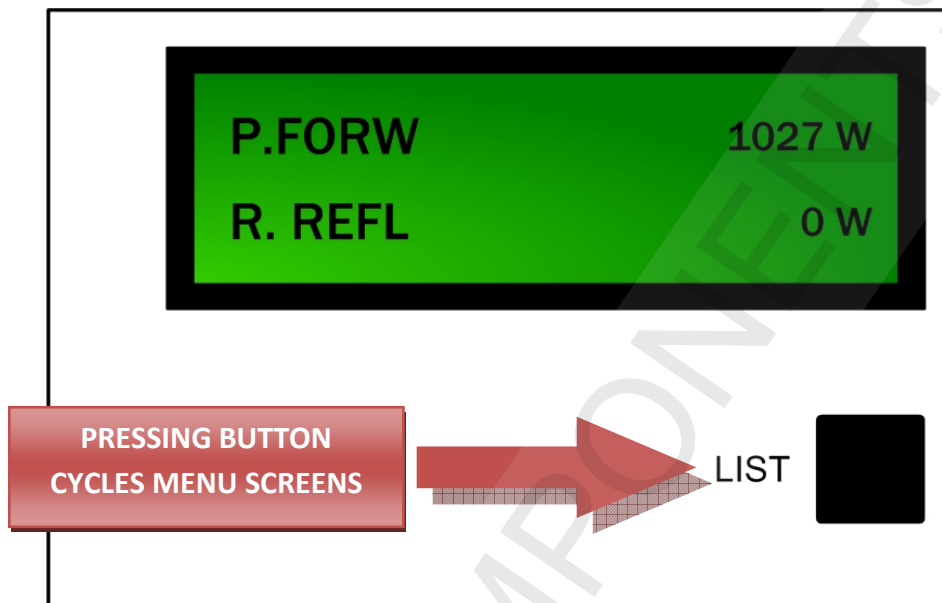


Figure 4.1 User interface

Main operation mode can be described by the following diagram:

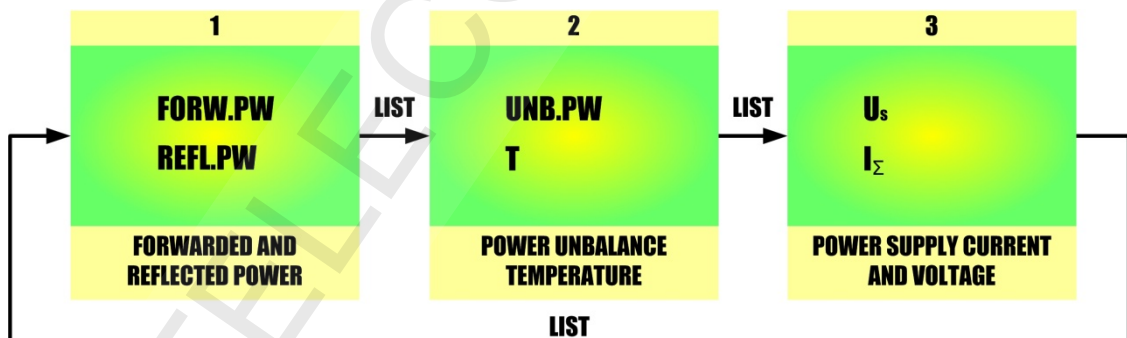


Figure 4.2 Menu

- 1 screen** In this screen user can monitor forwarded and reflected power values. **P Forw** – visualize forwarded wave power, **P Refl** – visualize reflected wave power.
- 2 screen** In this screen user can monitor power unbalance on combiner-bridge and amplifier’s temperature. **UNB.PW** – represents unbalanced power value, **T** – temperature.
- 3 screen** In this screen user can monitor power-supply voltage and current.

If any of monitored parameters will go out of desired range, then to attract operator's attention, CPU will indicate that with LED indicators. LED indicators states and their descriptions are given in [Appendix 1](#).

Pressing and holding "LIST" button longer than 3 s, will show following information about amplifier:

1. Manufacturer
2. Serial number
3. LAN and UNIT numbers. (**LAN address** – unique device address in network which consists of consists of various devices such as amplifiers, drivers, modulators or etc., within the limits of one transmitter. **UNIT number** – number which identifies device type.)

TELECOM COMPONENTS

## 5. INSTALLATION

### **Attention!!!**

**Only qualified technical personnel should service the present equipment.**

**Before making any action towards the equipment, please read carefully user's manual**

1. **Attention!!! Before installation please check that all devices which will be interconnected are properly grounded and have their power turned off**
2. Exciter's **EX-FM-35S** connectors with labels "LEFT" and "RIGHT" connect to left and right stereo signal sources respectively
3. Exciter's **EX-FM-35S** connector with label "AUX/RDS" connect to RDS coder's auxiliary output
4. Exciter's **EX-FM-35S** connector with label "OUT 19KHz" connect to RDS coder's synchronization input
5. Connect power-supply cable to exciter's **EX-FM-35S** power socket
6. Exciter's **EX-FM-35S** connector with label "RF OUT" connect to **RFM-PA-1001** power amplifier's connector with label "RF IN"
7. Using RS485 cable connect between connectors with labels "RS485" (if you are using RS485 remote control options). If you are using another type of remote control connect it to the RS232 or ETHERNET connectors respectively
8. Connect power-supply cables of **EX-FM-35S** and **RFM-PA-1001** to power-line
9. Turn on **EX-FM-35S** and **RFM-PA-1001** power

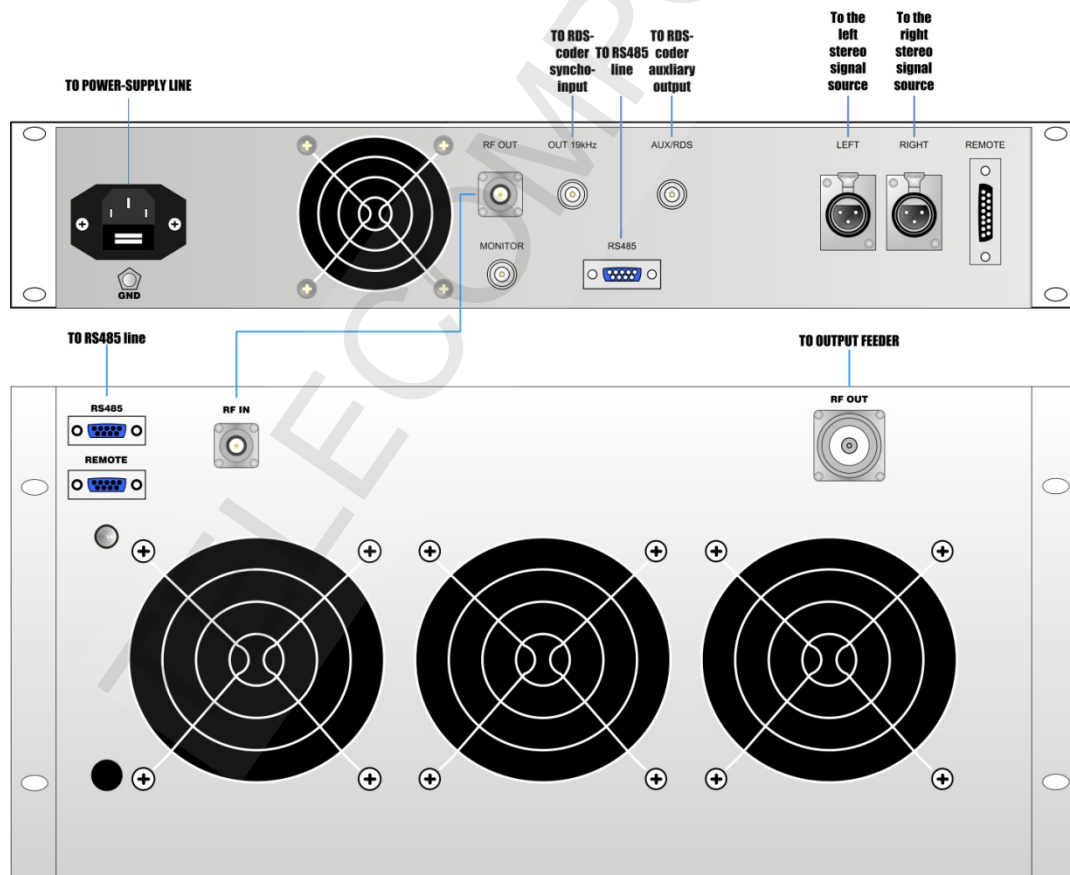
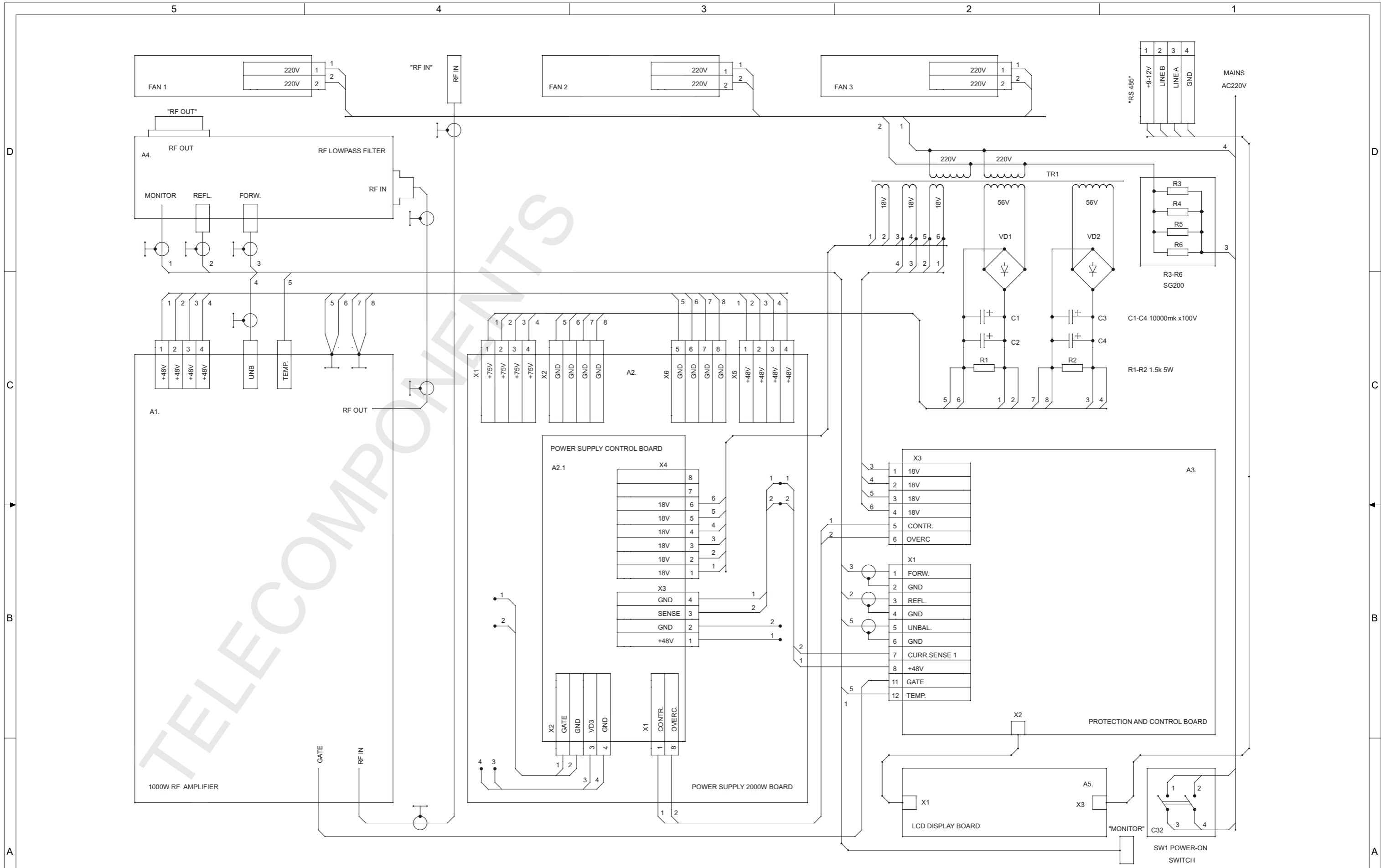



Figure 5.1 Installation

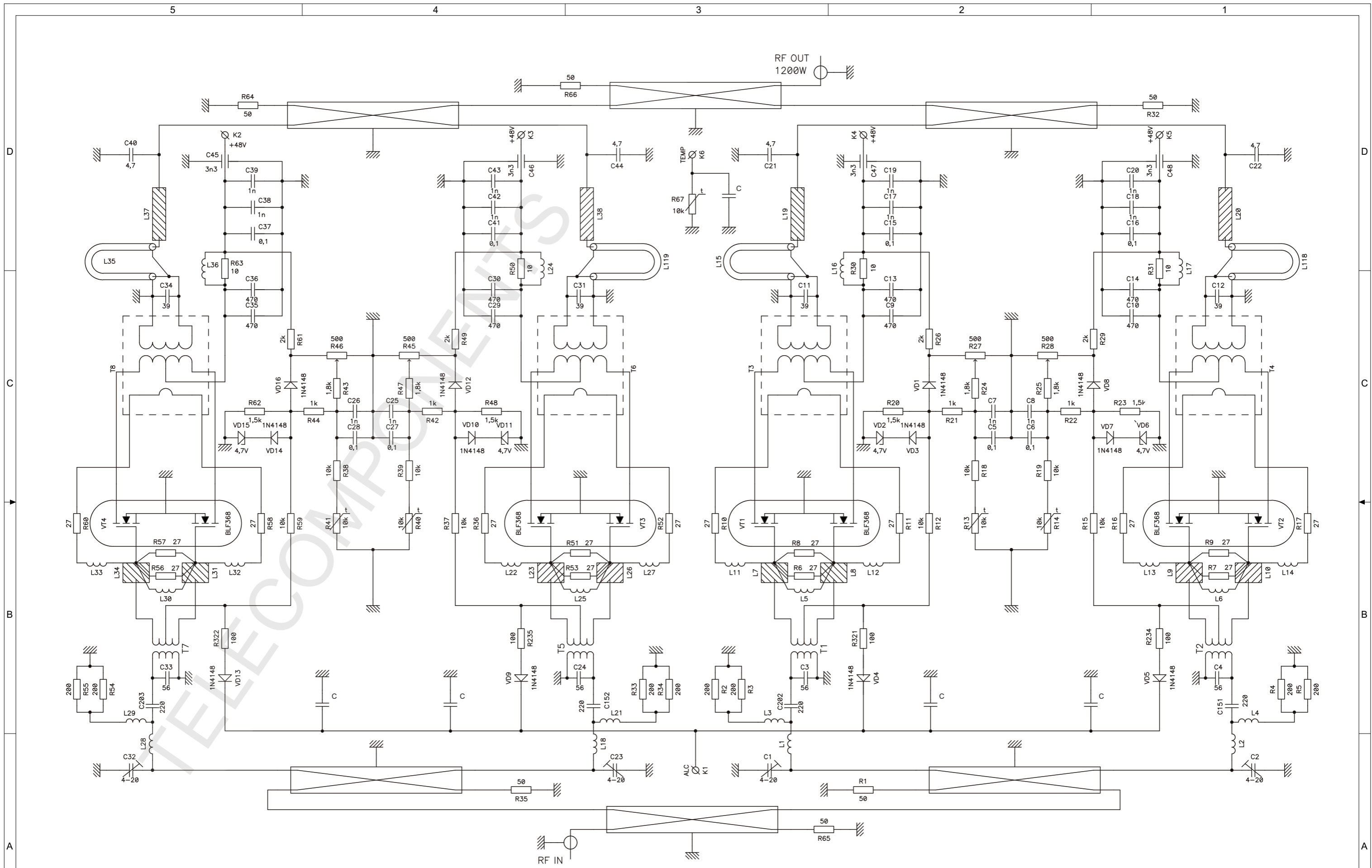



**APPENDIX 1:** LED indication states

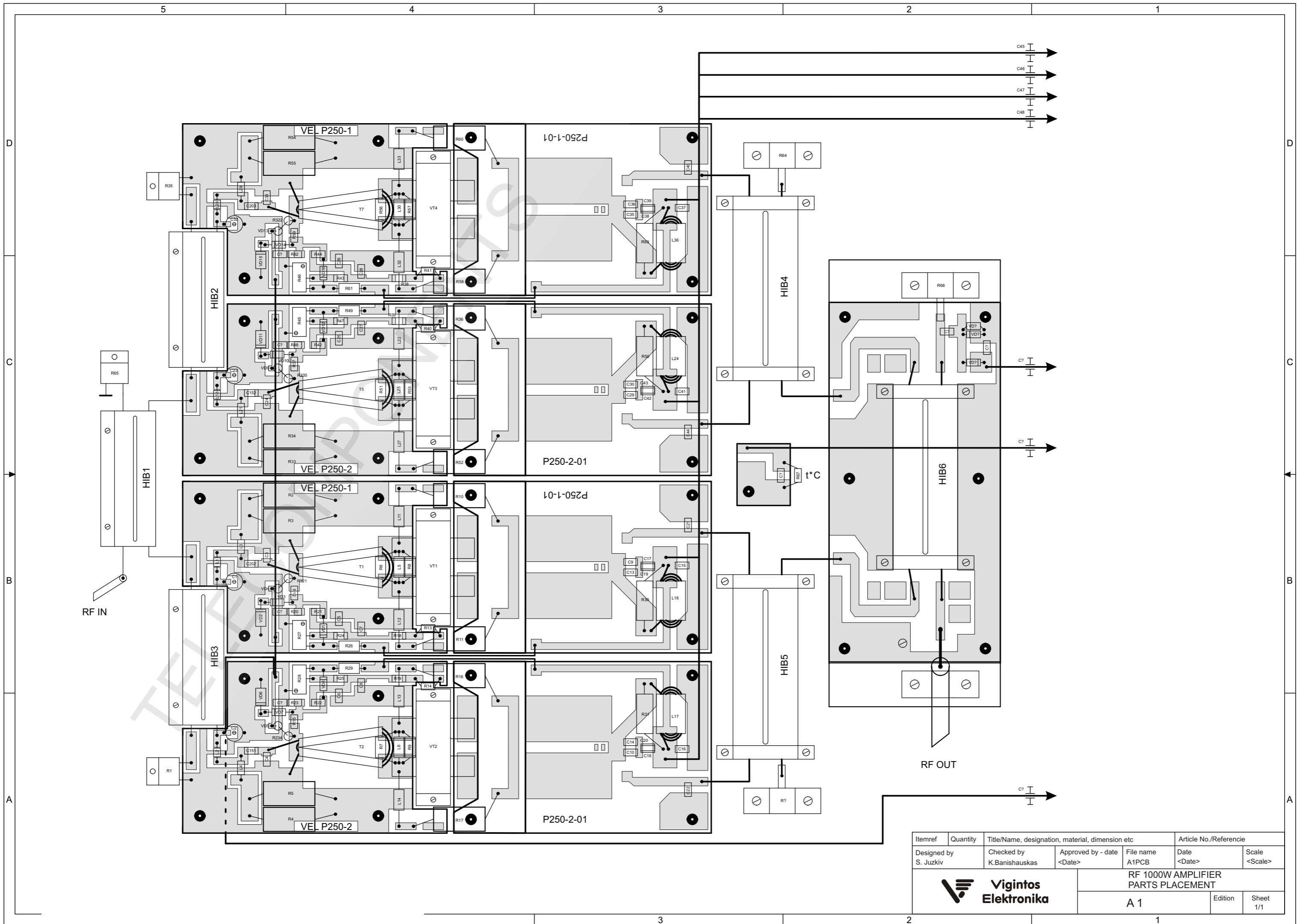
LED NAME Indication color	ALC	TEMP	OVERC	UNB.PW	VSWR	ON
<b>GREEN</b>	ALC ok	-	-	-	-	Power is on
<b>RED</b>	-	Overheating	Power supply overcurrent	Unbalance power is critical	V.S.W.R. value is critical	-
<b>YELLOW</b>	-	-	-	-	-	-
<b>NO INDICATION</b>	ALC malfunction, power is off	Temperature is ok	Power supply operating normally	Unbalance power value is in permissible range	V.S.W.R. is in permissible range	Power is off




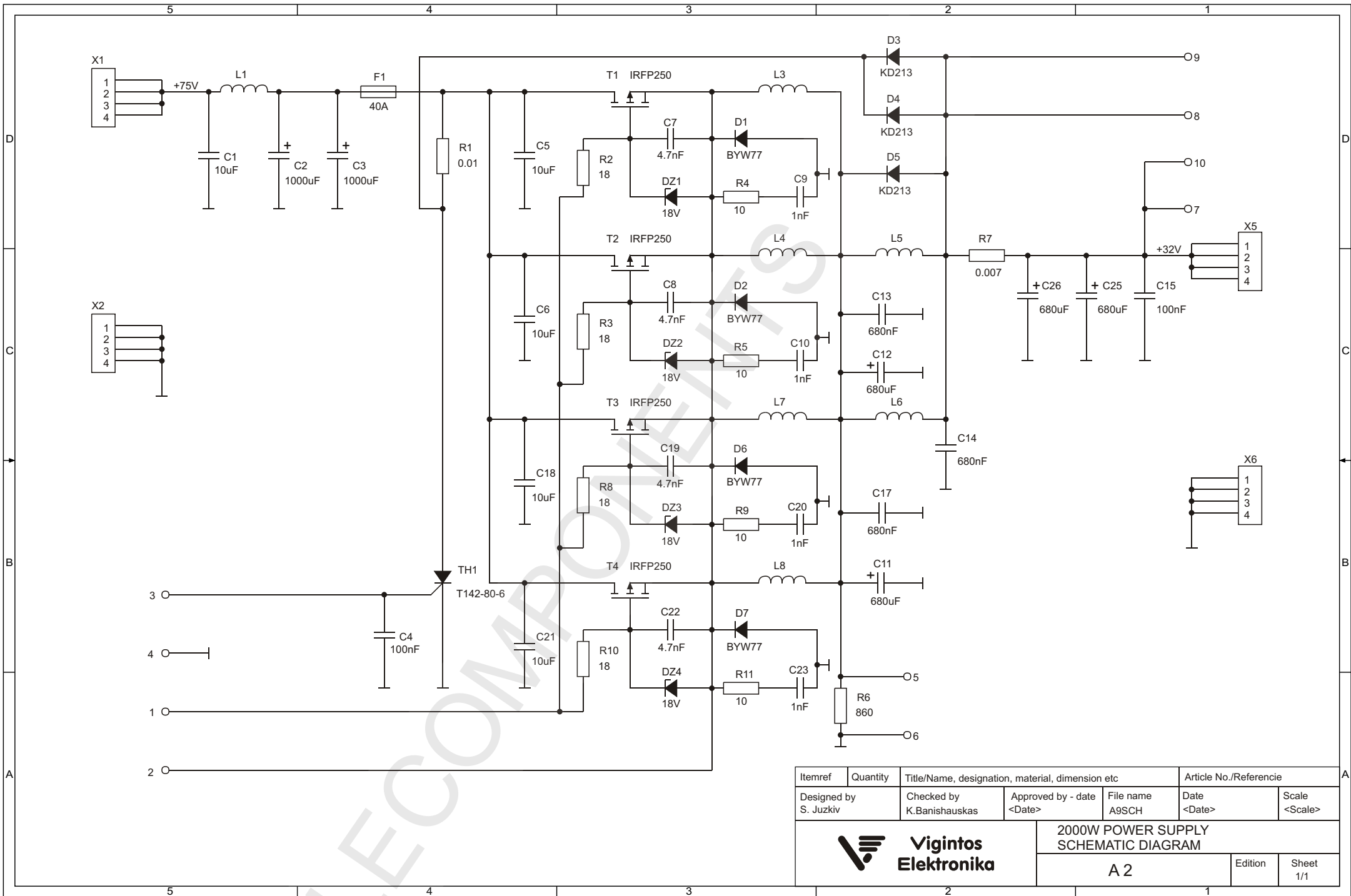
Itemref	Quantity	Title/Name, designation, material, dimension etc	Article No./Reference		
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 <b>Vigintos Elektronika</b>			RFM-PA-1001M GENERAL ELECTRICAL SCHEMATIC		
			A		Edition




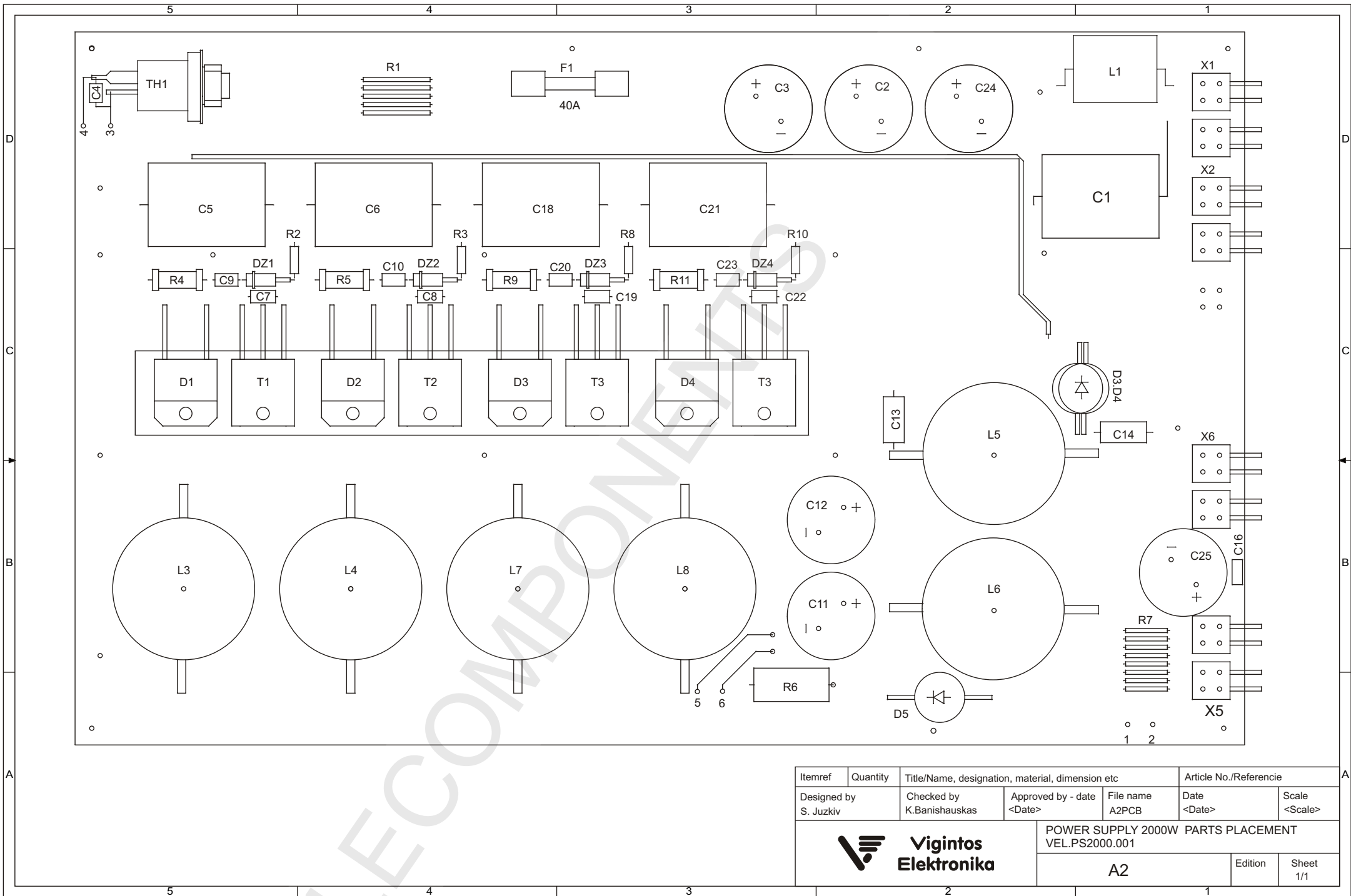
Itemref	Quantity	Title/Name, designation, material, dimension etc	Article No./Referenc		
Designed by S. Juzkiv	Checked by K.Banishauskas	Approved by - date <Date>	File name A1SCH	Date <Date>	Scale <Scale>
			RF 1000W AMPLIFIER SCHEMATIC DIAGRAM		
			A 1	Edition	Sheet 1/1




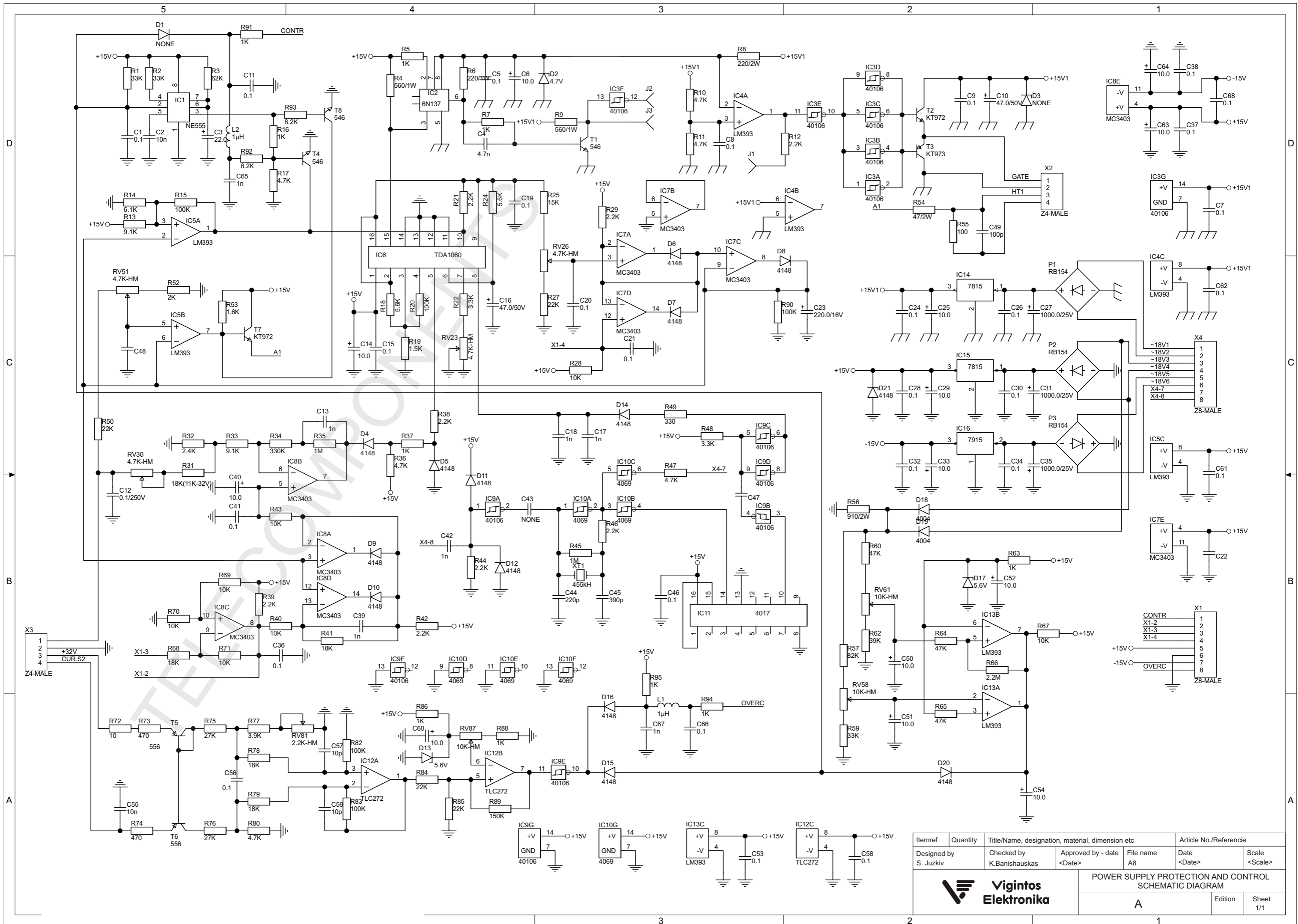
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 <b>Vigintos Elektronika</b>			RF 1000W AMPLIFIER PARTS PLACEMENT		
			A 1	Edition	Sheet 1/1



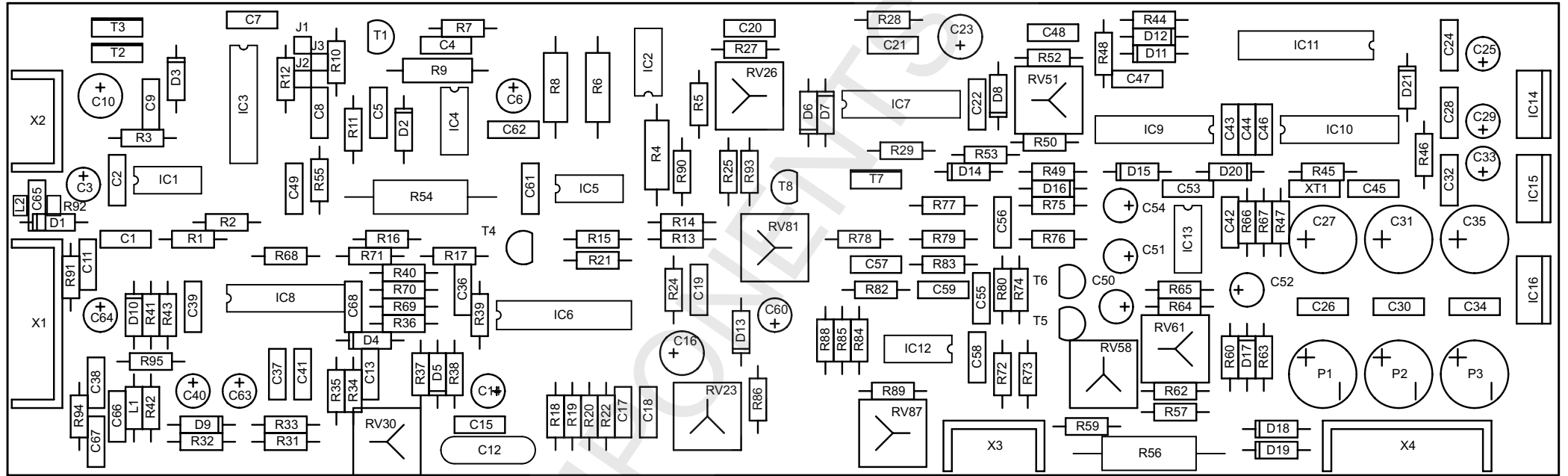
Itemref	Quantity	Title/Name, designation, material, dimension etc			Article No./Referencie	
Designed by S. Juzkiv	Checked by K.Banishauskas	Approved by - date <Date>	File name A9SCH	Date <Date>	Scale <Scale>	
 <b>Vigintos Elektronika</b>				<b>2000W POWER SUPPLY SCHEMATIC DIAGRAM</b>		




Itemref	Quantity	Title/Name, designation, material, dimension etc			Article No./Referencie	
Designed by S. Juzkiv	Checked by K.Banishauskas	Approved by - date <Date>	File name A2PCB	Date <Date>	Scale <Scale>	
 <b>Vigintos Elektronika</b>				POWER SUPPLY 2000W PARTS PLACEMENT VEL.PS2000.001		
				A2		Edition



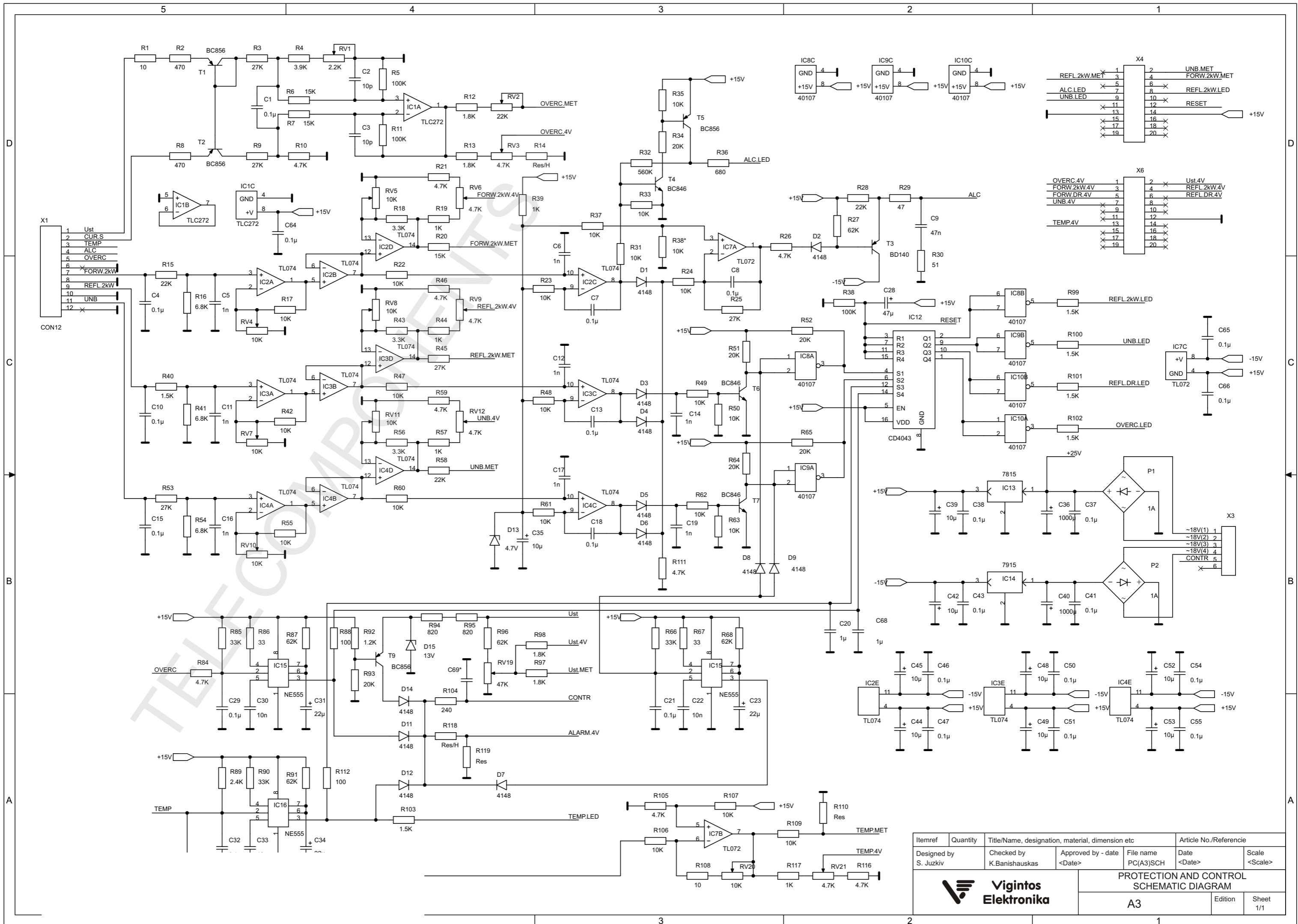
Itemref	Quantity	Title/Name, designation, material, dimension etc	Article No./Reference		
Designed by S. Juzkiv	Checked by K.Banishauskas	Approved by - date <Date>	File name A8	Date <Date>	Scale <Scale>
			POWER SUPPLY PROTECTION AND CONTROL SCHEMATIC DIAGRAM		
			A		Edition



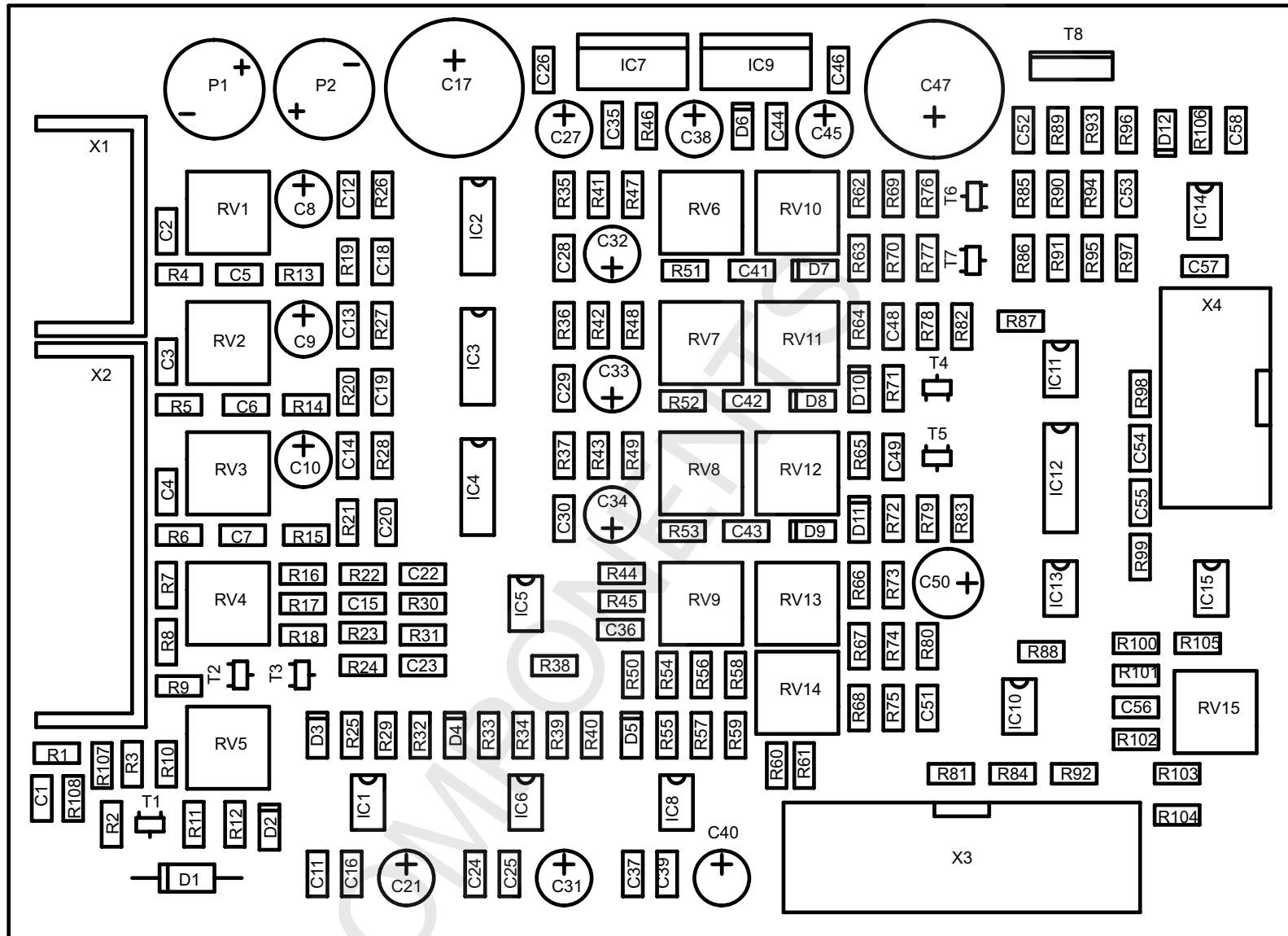
ELECTRICAL SPECIFICATIONS ARE SUBJECT TO CHANGE DUE TO CONTINUING PRODUCT IMPROVEMENT


Itemref	Quantity	Title/Name, designation, material, dimension etc			Article No./Referencie	
Designed by S. Juzkiv	Checked by K.Banishauskas	Approved by - date <Date>	File name A21PCB	Date <Date>	Scale <Scale>	
 <b>Vigintos Elektronika</b>				POWER SUPPLY PROTECTION AND CONTROL PARTS PLACEMENT		
				A	Edition	Sheet 1/1

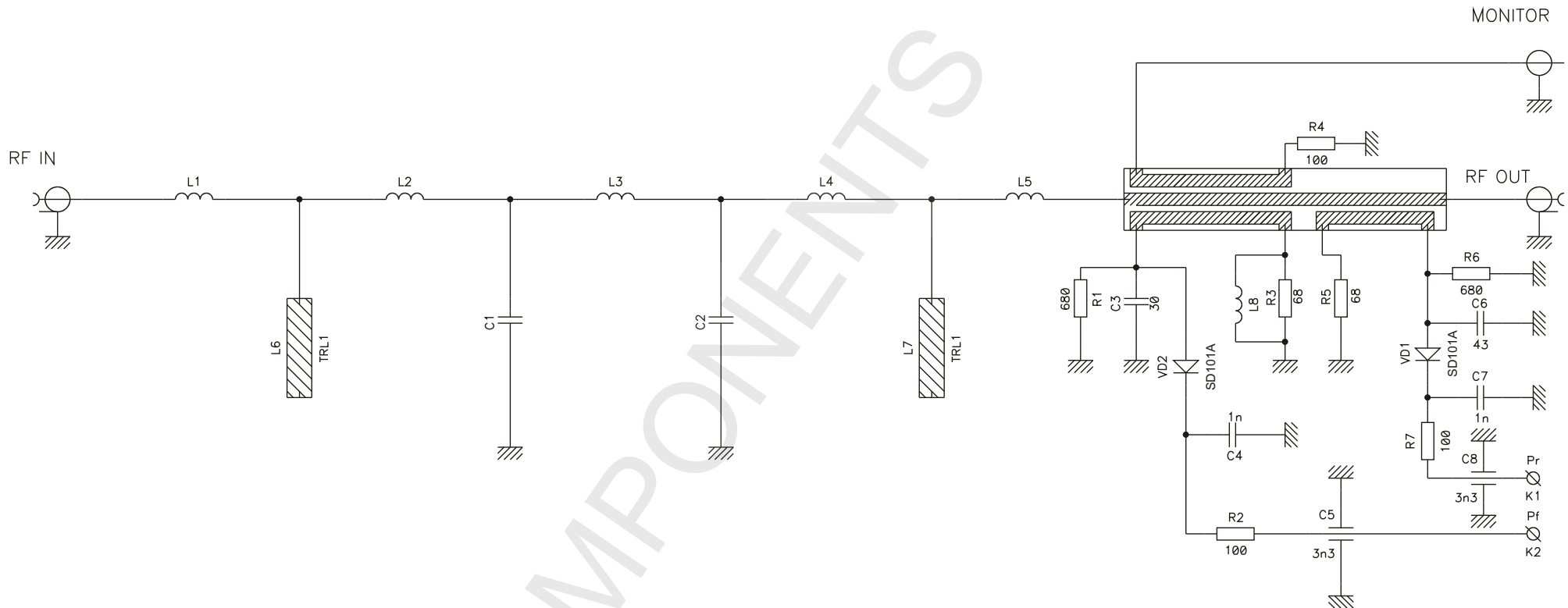





Itemref	Quantity	Title/Name, designation, material, dimension etc	Article No./Reference		
Designed by	Checked by	Approved by - date	File name	Date	Scale
S. Juzkiv	K.Banishauskas	<Date>	PC(A3)SCH	<Date>	<Scale>
			PROTECTION AND CONTROL SCHEMATIC DIAGRAM		
			A3	Edition	Sheet 1/1

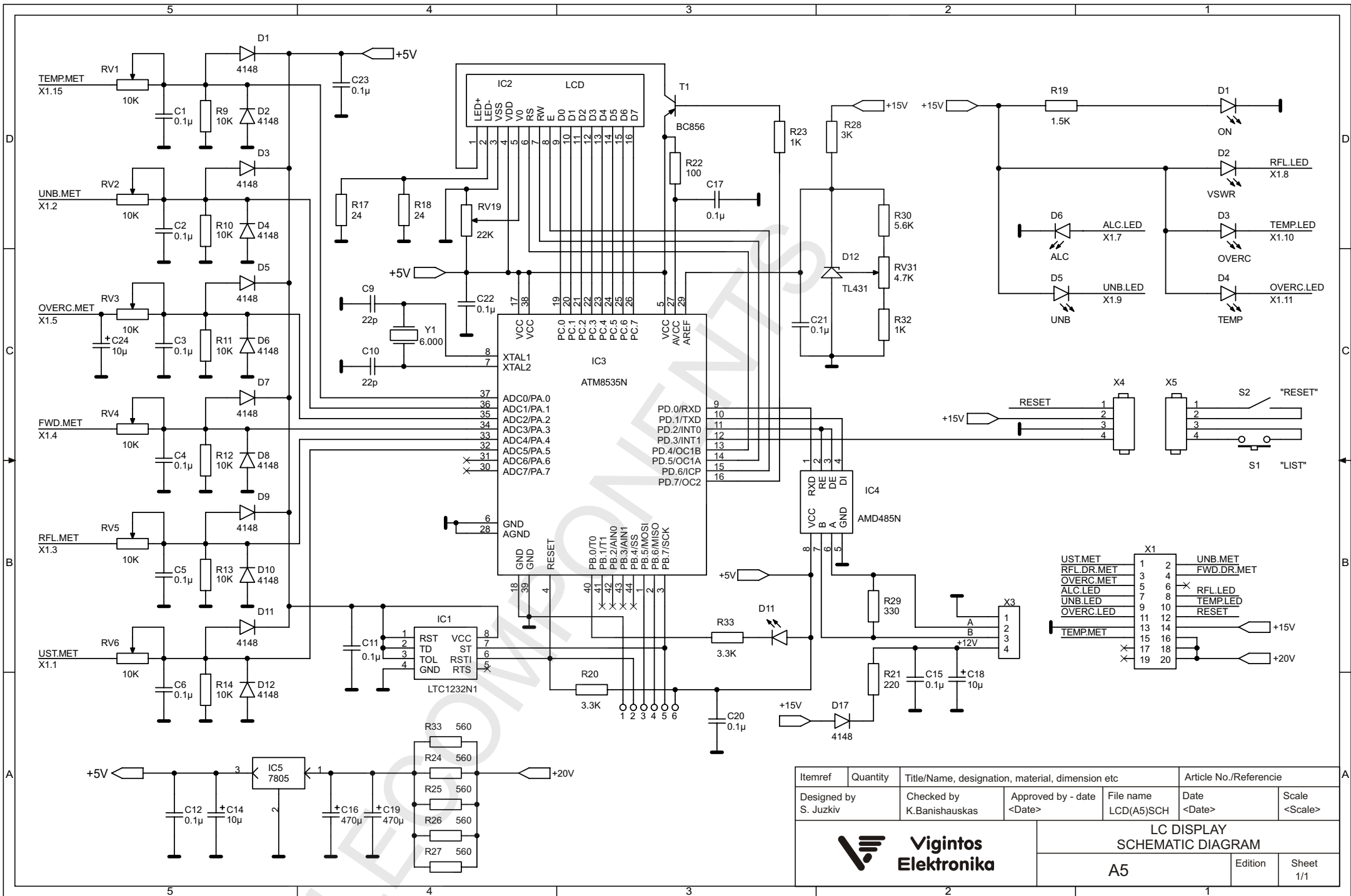



Itemref	Quantity	Title/Name, designation, material, dimension etc			Article No./Referencie	
Designed by S. Juzkiv	Checked by K. Banishauskas	Approved by - date <Date>	File name PC(A3)PCB	Date <Date>	Scale <Scale>	
 <b>Vigintos Elektronika</b>			PROTECTION AND CONTROL PARTS PLACEMENT			
			A3	Edition	Sheet 1/1	

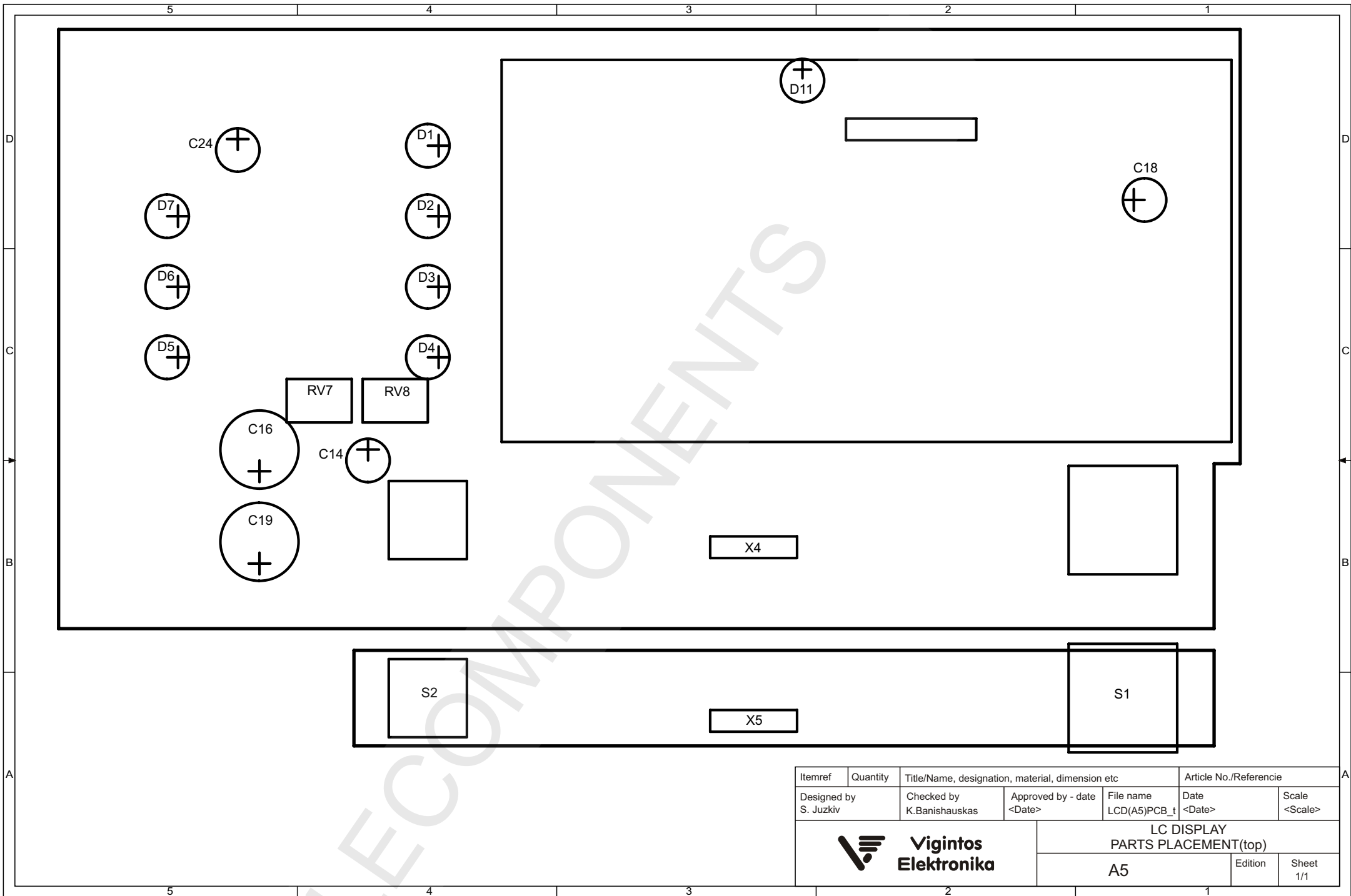



ELECTRICAL SPECIFICATIONS ARE SUBJECT TO CHANGE DUE TO CONTINUING PRODUCT IMPROVEMENT

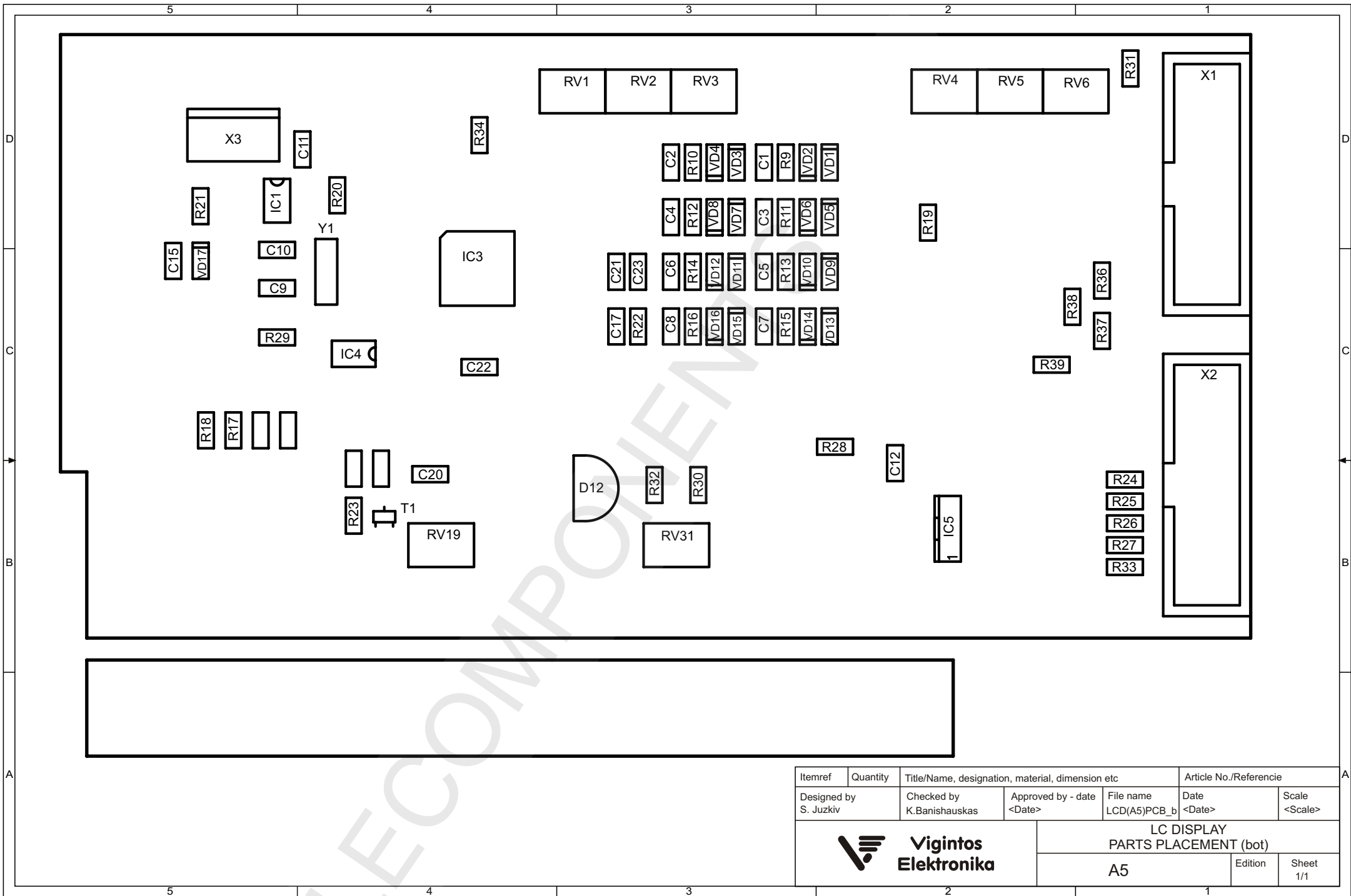
Itemref	Quantity	Title/Name, designation, material, dimension etc			Article No./Referencie	
Designed by S. Juzkiv	Checked by K.Banishauskas	Approved by - date <Date>	File name A4SCH	Date <Date>	Scale <Scale>	
 <b>Vigintos Elektronika</b>				RF lowpass filter schematic diagram		
				A4	Edition	Sheet 1/1




Itemref	Quantity	Title/Name, designation, material, dimension etc	Article No./Referencie		
Designed by	Checked by	Approved by - date	File name	Date	Scale
S. Juzkiv	K.Banishauskas	<Date>	LCD(A5)SCH	<Date>	<Scale>
 <b>Vigintos Elektronika</b>			<b>LC DISPLAY SCHEMATIC DIAGRAM</b>		
			A5	Edition	Sheet 1/1



Itemref	Quantity	Title/Name, designation, material, dimension etc			Article No./Referencie	
Designed by S. Juzkiv	Checked by K.Banishauskas	Approved by - date <Date>	File name LCD(A5)PCB_t	Date <Date>	Scale <Scale>	
			LC DISPLAY PARTS PLACEMENT(top)			
			A5	Edition	Sheet 1/1	



Itemref	Quantity	Title/Name, designation, material, dimension etc			Article No./Referencie	
Designed by S. Juzkiv	Checked by K.Banishauskas	Approved by - date <Date>	File name LCD(A5)PCB_b	Date <Date>	Scale <Scale>	
 <b>Vigintos Elektronika</b>			LC DISPLAY PARTS PLACEMENT (bot)			
			A5	Edition	Sheet 1/1	

# Remote Control

## System Description

The Remote control system (RCS) consists of the host and scanned devices. Devices are combined in a common RS485 network. The host polls the devices and sends data from the host to user's computers and sends commands from user to the devices.

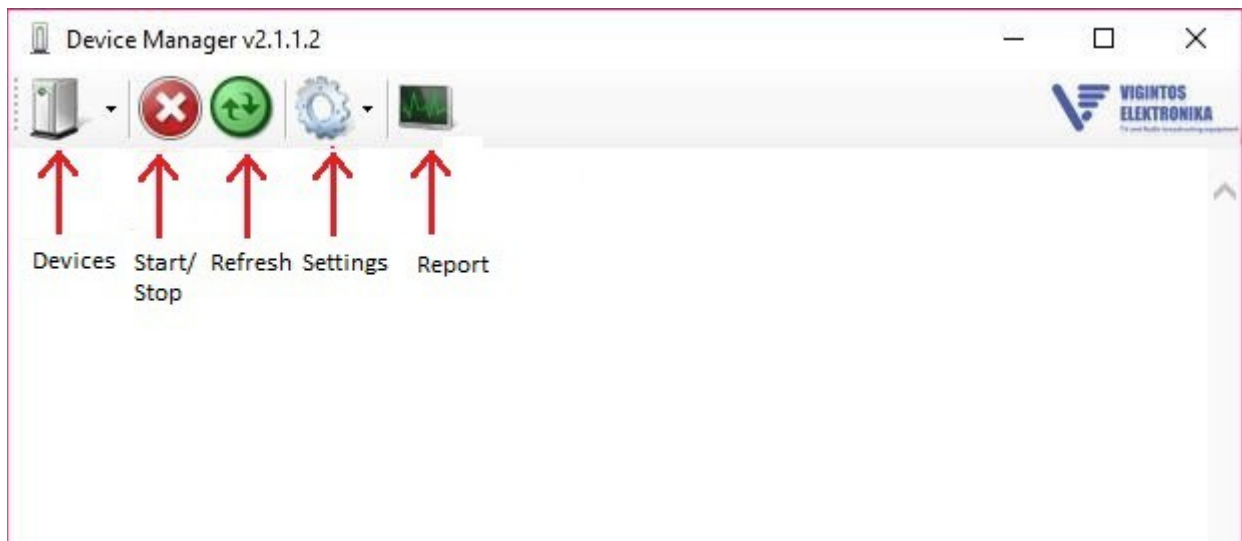
Up to 14 units may be connected to one host (except a host). Each device must have a unique address. The addresses may be from 2 to 15. The null address is broadcasting and not available for devices. The first address always belongs the host and cannot be changed. The host can be implemented as a separate module, or integrated into the device, as TV modulator or FM exciter. When system has backup and as consequence two hosts, one of them has be disabled. In this case we recommend to use an external host and turn off internal both. If the power is breaking the access to an internal host is denied.

External access to the host is provided by Ethernet. The Device Manager application is used to upload or configure the host. This program may be downloaded from the "[www.vigintos.com](http://www.vigintos.com)" site. The host communicates with the "Device Manager" application by UDP protocol with a broadcasting and set IP address and uses fixed 65534 port. So, the communication, when unknown IP address is available in a local network only.

For distant monitoring the SNMP agent is realized in the host. The SNMP agent supports the SNMP v1 protocol (annex A). It is the web server in the host.

### «Device Manager» application

The main application window is at the Pict.1



Pict.1

The context menu *Devices* contains three options (Pict 2.):

1. *Broadcast Address* (Broadcasting address)– this option scans all the devices available in the network. This option works in a local network only and is used for local devices scanning.
2. *IP Address* – use this option if the exact IP address of the host is known.
3. *RS485* – use this option when there is no host and a computer is used as host. The devices are connected to the computer by RS485 protocol. Mainly used for debugging devices.



Pict.2

The *Start/Stop* button is used to start or stop the devices polling.

The *Refresh* button is used for rescanning of the devices.

The *Settings* button is used to configure the program settings ( Pict. 3), namely, the interface language and the sorting of found devices.



Pict.3

When press the *Report* button the report window will appear. You can save report in the user specified place.

When you right-click on the company logo in the upper right-hand corner, you can see: program version, company address and phone numbers, link to the website and email address. All the possible boot loaders and programs for the host and the connected devices are shown also.

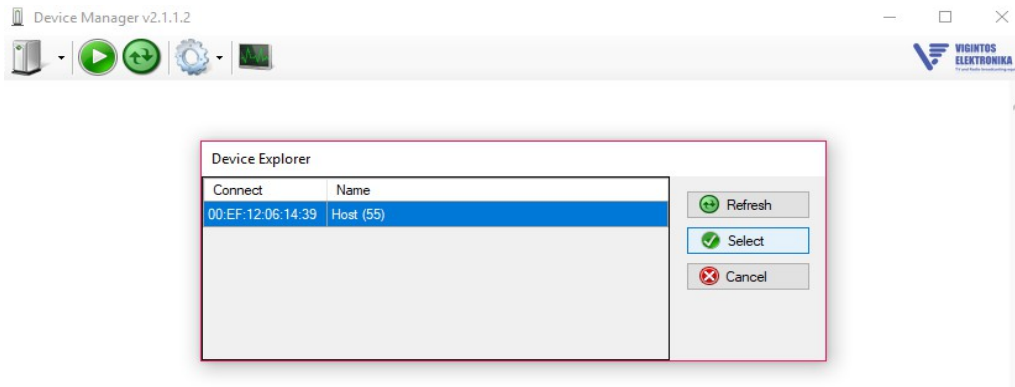
### How connect host

Connect a host module to a computer via an Ethernet cable. Run the *Device Manager* program.

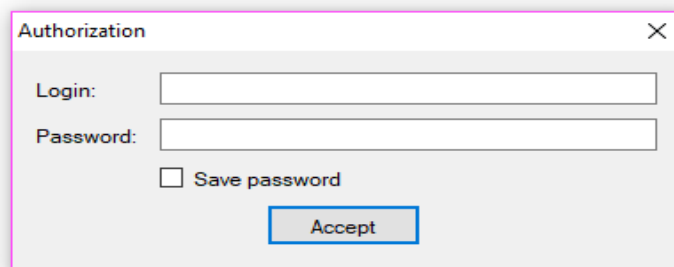
If an IP address is unknown select *Broadcast Address* option ( Pict. 2).

After scanning the *Device Explorer* windows will appear ( Pict. 4). Select Host and press the *Select* button. The authorization window will appear ( Pict.5).

The *Login* and *Password* fields are empty by default, then press the *Accept* button to go to the Host page (Pict. 6).

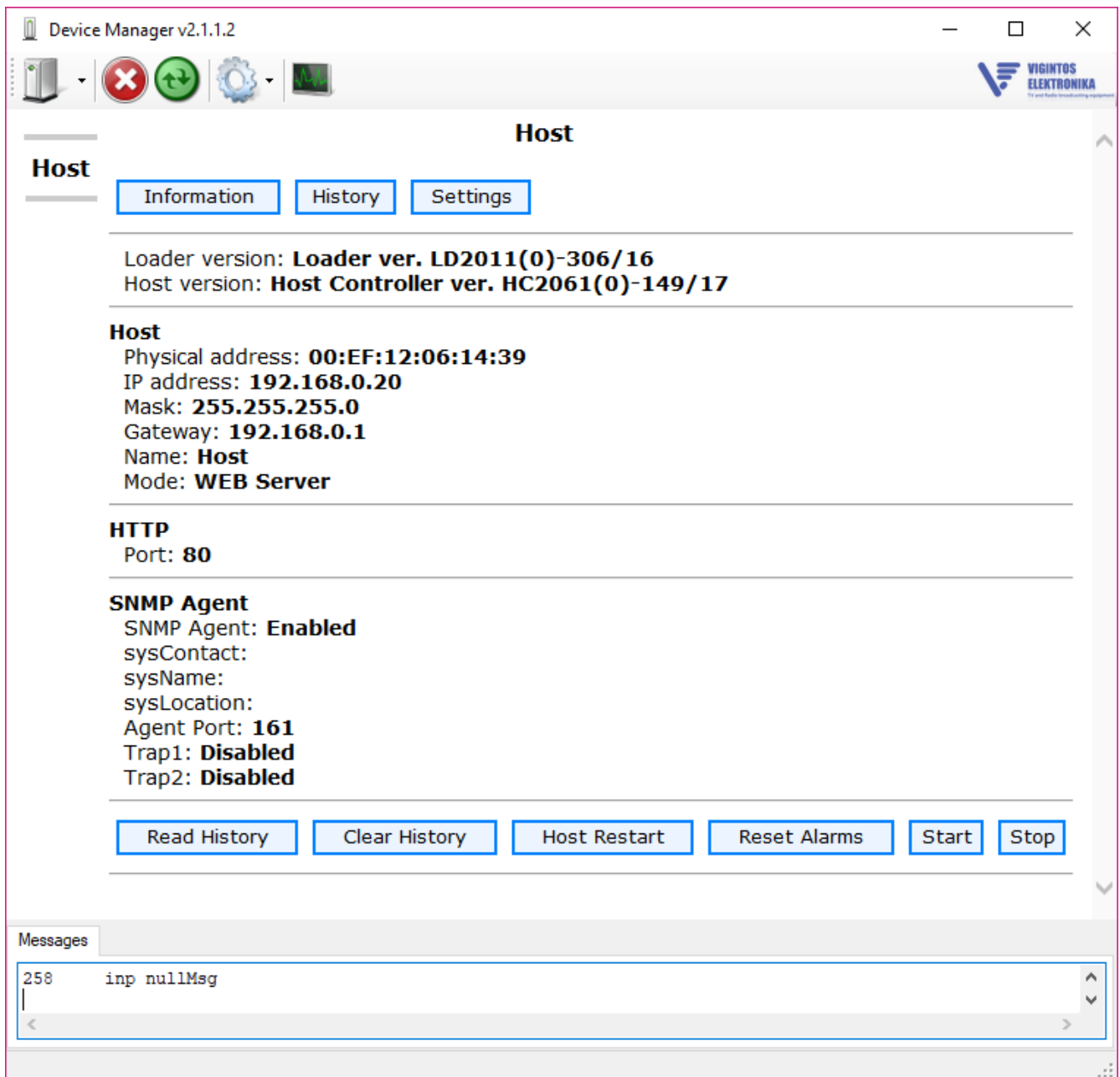


Pict.4



Pict.5





Pict.6

**Information option** consists:

The Loader and Host program version.

The MAC and IP addresses of the host, mask and gateway, host name and host mode.

HTTP port.

SNMP agent settings.

In the *Messages* window the messages between the host and *Device Manager* are displayed.

At the

At the bottom of the tab are the button:

*Read History*– a log-file reading

*Clear History* – clear a log-file .

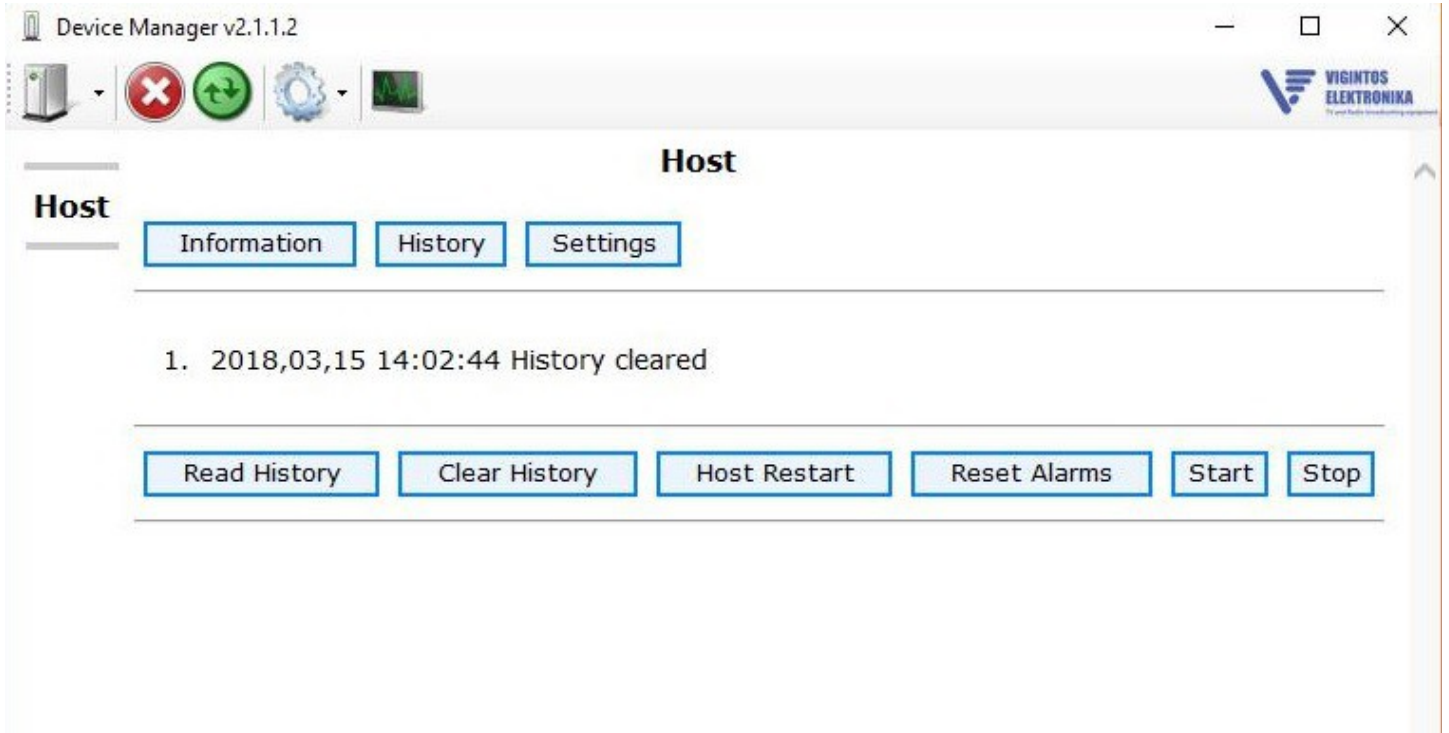
*Host Restart* – to restart the host (not a program «Device Manager»)

*Reset Alarms* — clear all alarms.

*Start/Stop* (Crapr.Cron)– start or stop the devices polling.

**History option** – display the log-file information (Pict.7).

**Settings option** used for configure a host. (Pict.8).



Pict.7

In this option you can set:

1. *Date-Time* . Displays the host time and computer system times. For synchronization press the *Synchronize* button.
2. *Host* . Contains the host network settings. In the *Mode case* can select the work mode: *WEB Server* – in this mode a host operates as a web-server and allows a remote control via internet. *Host disabled*– in this mode device operates as an exciter only, so it is relevant for hosts with exciters. This mode is used to disable the host function in transmitters with redundancy.
3. *Authorization*. This option is used to set a login and password for access to a transmitter. By default all the fields are empty ( Pict. 8 ).

*User* – at this level user can see and read device data and a log-file.

*Admin* — at this level, in addition to the above, user can change the settings of the host.

*Max access* –at this level user has access to the total settings.

4. *HTTP* – set port number for web-server(see. Pict. 9).
5. *SNMP Agent*. It allows to enable or disable SNMP agent function and save the setting to the MIB file ( Pict. 10). For more information see Annex A.
6. *Devices*. This option is used for searching and displaying the connected devices. Press the *Search devices* button for automatic scan ( Pict. 11). After scanning the list of the currently found devices will appear (Pict.12). The RS485 addresses are at the left column and the devices types at the right. For device will be controlled by host it have be present at the list *Devices*. Otherwise, a device will not be controlled by host, even it is physically connected to the host. To add a device press the "+" icon. Then select the type and address of the device. To change the order of the device use the "↓" icon. To refresh the list of the devices press the "Search" button. The program scans the device and finds all the devices are turned on and connected to RS485 with unique address.

There are some

There are some rules for setting addresses. A device does not have zero address. There should not be devices with the same addresses. The host always has the first address. The addresses in devices will change only after they are written to the memory by the button *Write to device*.

The *Write to device* button is used to save settings to the host memory. Then it will be the host reset and found devices appear in the *Information* window.

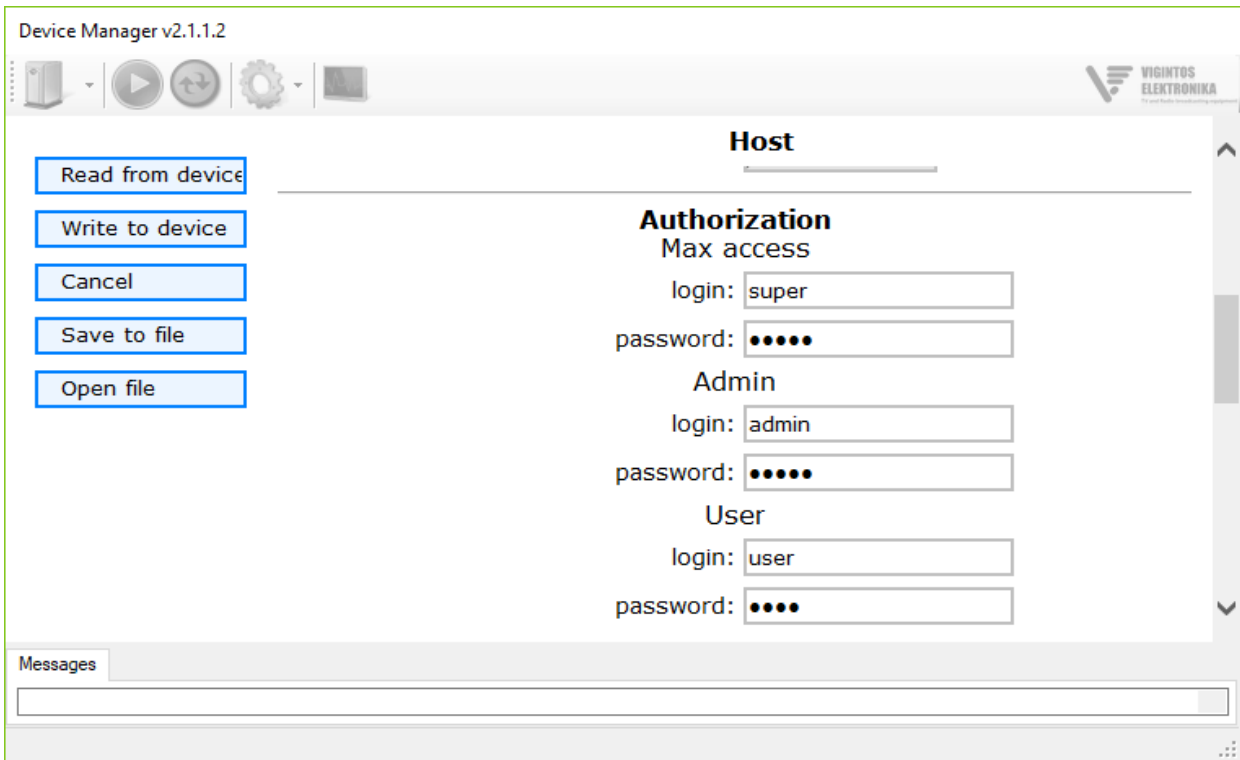
The *Read from device* button is used to set settings from the host memory.

The *Cancel* button is used to return to the *Information* tab without saving settings.

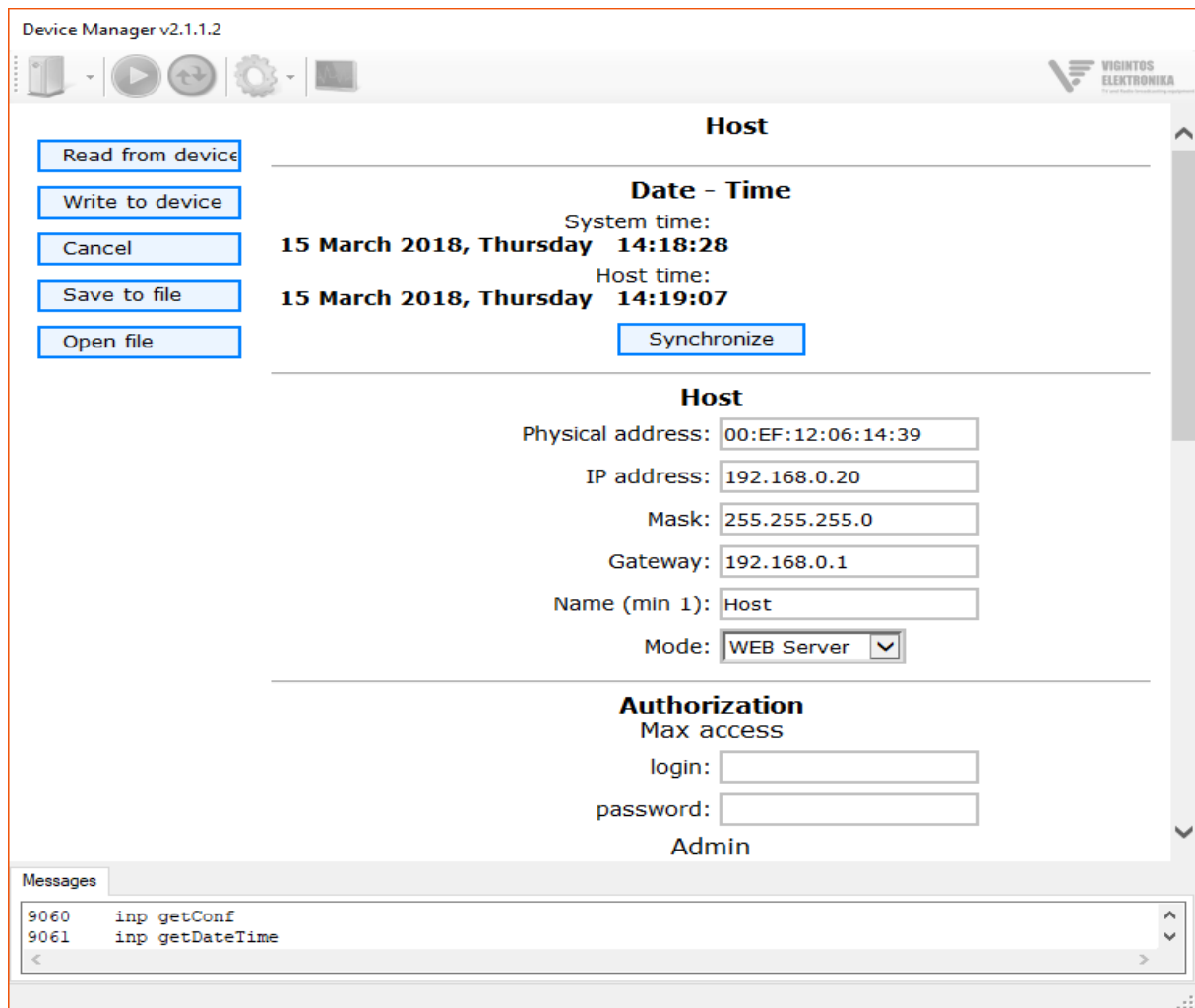
The *Save to file* button is used to save settings to the json-file at the user's computer.

The *Open file* button is used to set settings from the file.

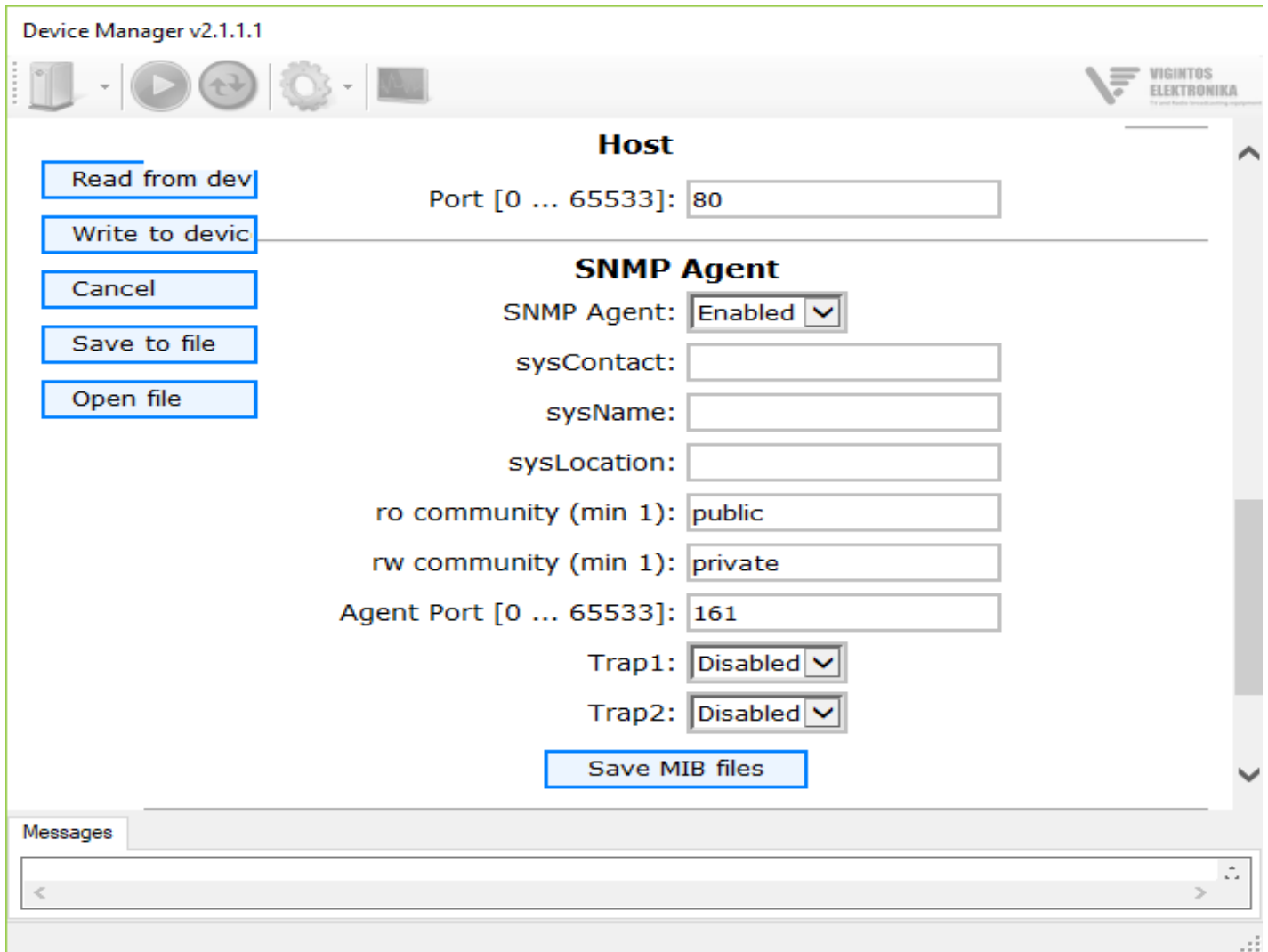
The *Write to device* button is used to save settings at the host memory.



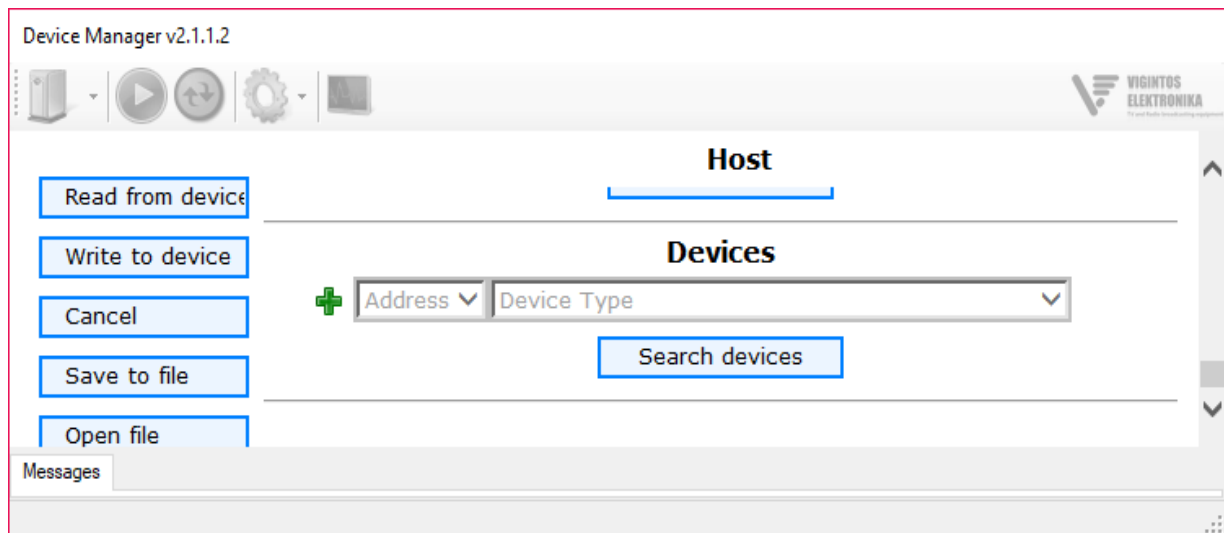
Pict 8.



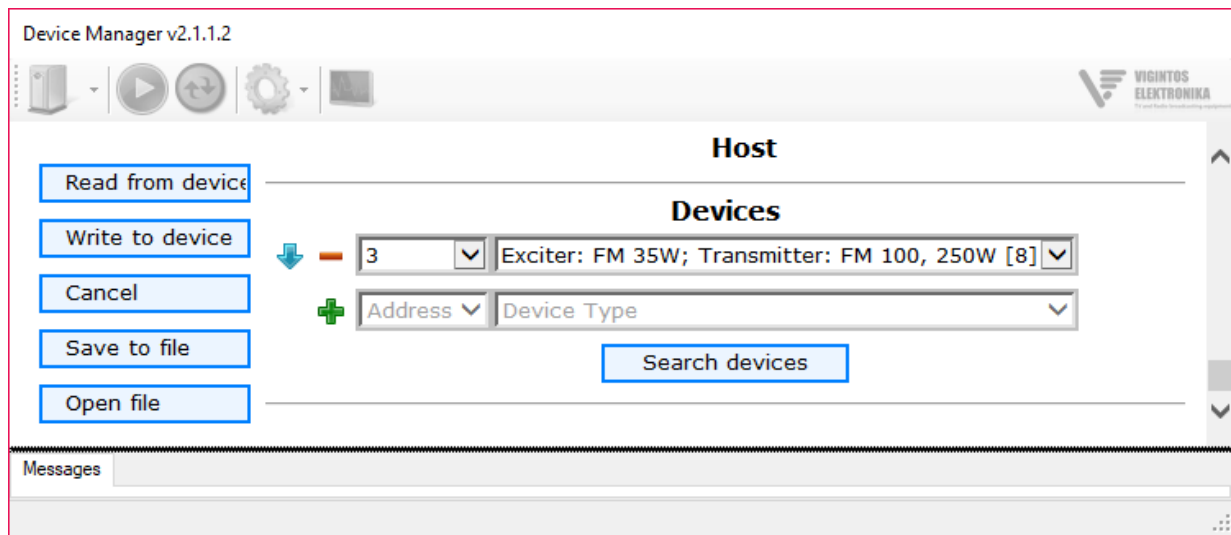
Pict 9.



Pict. 10.



Pict. 11.



Pict.12.

After the device list is determined click on the *Write to device* button to save the list to the host memory. The program will suggest a restart. After that, connect to the host again and log in. In addition to the host, all found devices with basic parameters will appear at the *Information* tab. The font color suits to the device state.

1. Grey. Device is not connected to RS485 network, but presents at the device list at the host memory. Device is passive and does not give data.
2. White. Events and device states do not affect the state of the system and are purely informative.
3. Green. Normal state.
4. Yellow. There are warnings at events and states.
5. Red. There is an alarm state. The power lock occurs.
6. Bordeaux. The device is locked. This state is like the alarm, but it cannot automatically return to a working state after the emergency state has disappeared. A device lock occurs if more than 10 alarms have been received by one of the parameters or states (events) in a short time.

The host with FM 35W exciter is shown at the Pict 13.

When select a device the program go to the device tab ( Pict.14).

An each device tab has the info section and settings section.

In the Info section there are the options:

*Events* : display activity and operation modes.

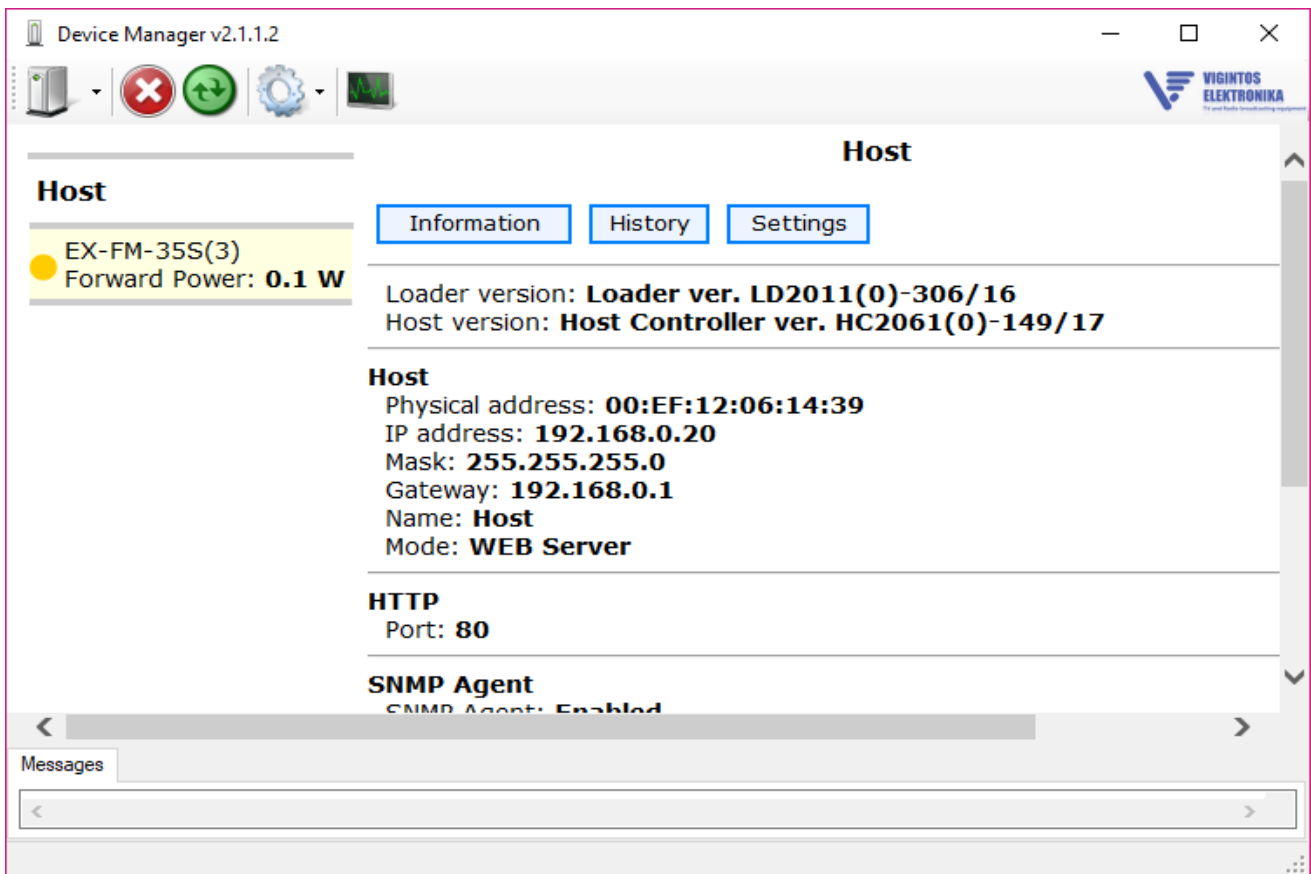
*Parameters*: display the current parameter values corresponding to the device, max and min value of this parameter and measuring scale for this parameter.

*Quantity*: show the parameters that are not measured and set when the device is configured.

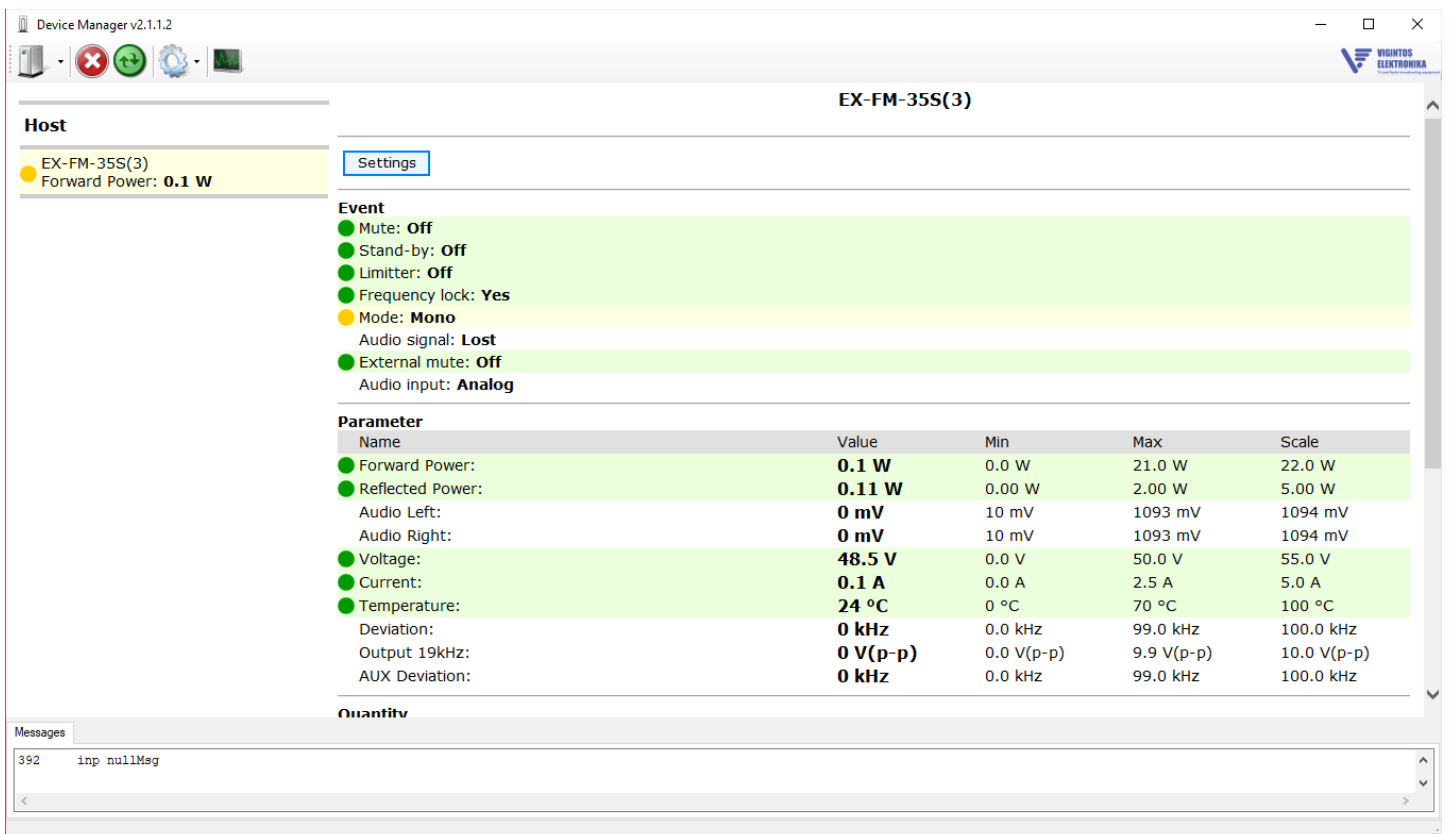
*Information*: contains the firmware version, device name and type, serial number and address on the RS485 network.

At the bottom there are the command buttons corresponding to a specific device.

To go to the settings section click the *Settings* button (Pict. 15).



Pict.13



Pict.14

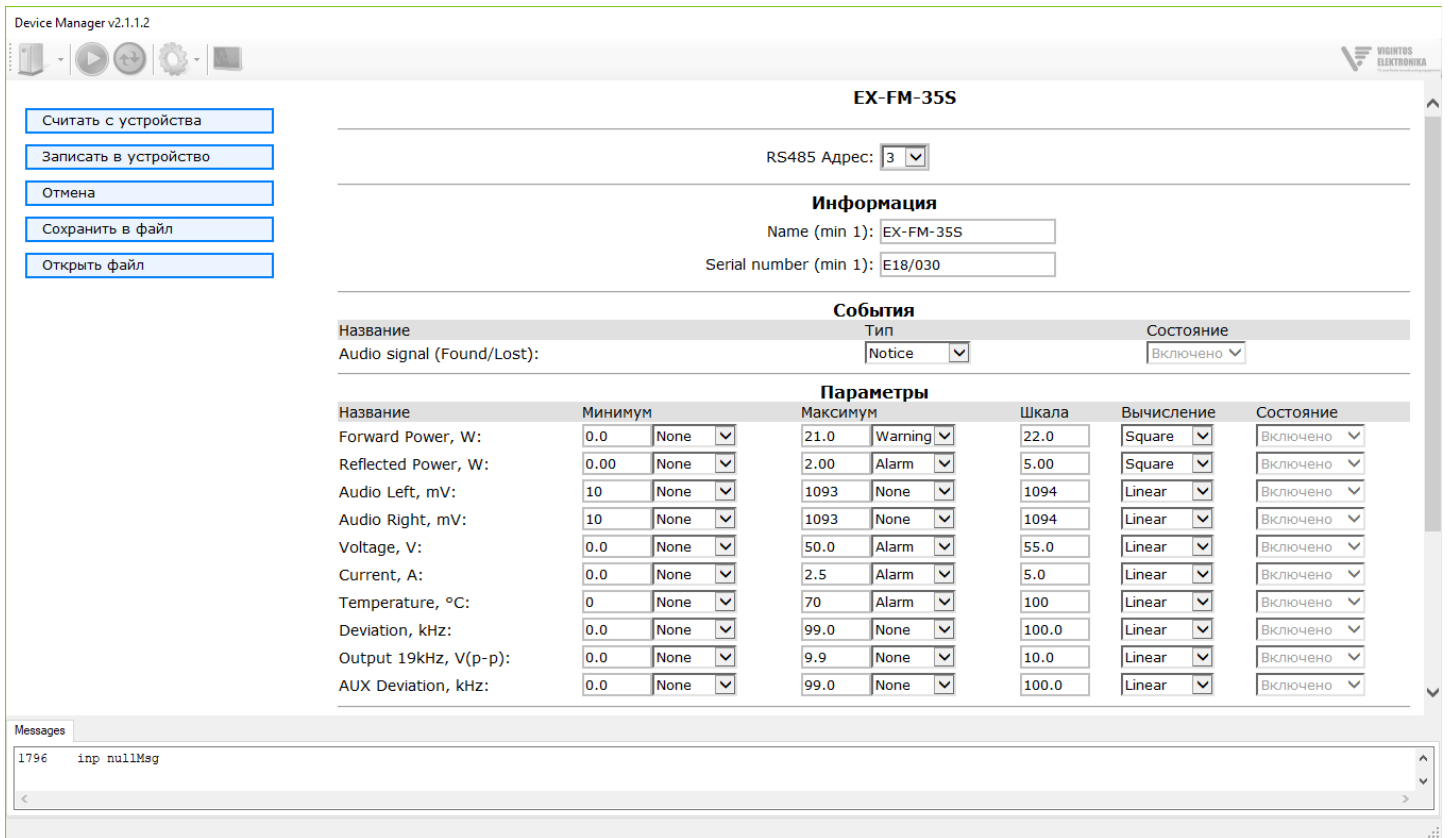


Рис. 15

## Device settings

This section is used for configure the connected device. Here you can make the following settings.

1. Change the RS485 address.
2. Change the name and serial number of the device.
3. Change the event type. Device can response to event as following :

- *Notice*. Sends a notice to the log-file.

- *Warning*. Send a notice and change color to yellow.

- *Alarm*. Send a notice, change color to red and lock output power.

4. The number of parameters and their name are not changeable by program. For the each parameter the limits corresponding events can be set. You can set the scale and calculation type also.

5. Change constant value within the specified range.

*Read from device* button is used for set settings from the device memory.

*Write to device* button is used for save settings to the device memory.

*Cancel* button is used to exit settings without save it in memory.

*Save to file* button is used to save settings in a json-file at the user's computer.

*Open file* button is used to set settings from file.

## Web server

To go the host's website, you need to enter the host's IP address in the address bar of the browser. At first, the user authorization window will appear (a higher access level are not allowed at this mode). After authorization, the host web-page will open. The page will display the host tab and the tabs for each device from the device list (Pict. 17 and Pict. 18). Appearance and data of the web-pages are identical to the program Device manager. By the website you can monitor the parameters of the transmitter and send the appropriate commands to the host and devices. The settings of the host and the connected devices are possible only from the Device Manager program.




Host x

Guest - □ ×

← → ↻ 192.168.0.20

## Host



**Host**

- EX-FM-35S(3)  
Forward Power: **0.1 W**

### Information

Loader version:	<b>Loader ver. LD2011(0)-306/16</b>
Host version:	<b>Host Controller ver. HC2061(0)-149/17</b>

### Command


-- ▾

[Save History](#) [Apply](#) [Cancel](#)

Рис. 17

Host 192.168.0.20

## EX-FM-35S(3)



**Host**

- EX-FM-35S(3)
- Forward Power: **0.1 W**

Event		
● Mute:	Off	
● Stand-by:	Off	
● Limiter:	Off	
● Frequency lock:	Yes	
● Mode:	<b>Mono</b>	
Audio signal:	Lost	
● External mute:	Off	
Audio input:	Analog	

Parameter		
● Forward Power:	<b>0.1 W</b>	Ok
● Reflected Power:	<b>0.11 W</b>	Ok
Audio Left:	<b>0 mV</b>	Ok
Audio Right:	<b>0 mV</b>	Ok
● Voltage:	<b>48.5 V</b>	Ok
● Current:	<b>0.1 A</b>	Ok
● Temperature:	<b>26 °C</b>	Ok
Deviation:	<b>0.0 kHz</b>	Ok
Output 19kHz:	<b>0.0 V(p-p)</b>	Ok
AUX Deviation:	<b>0.0 kHz</b>	Ok

Quantity		
Left level:	<b>127</b>	0 ... 255
Right level:	<b>127</b>	0 ... 255
AUX level:	<b>8</b>	0 ... 255
Frequency, MHz:	<b>87.50</b>	87.50 ... 108.00
Power level:	<b>0.1</b>	0.0 ... 22.0

Рис. 18