

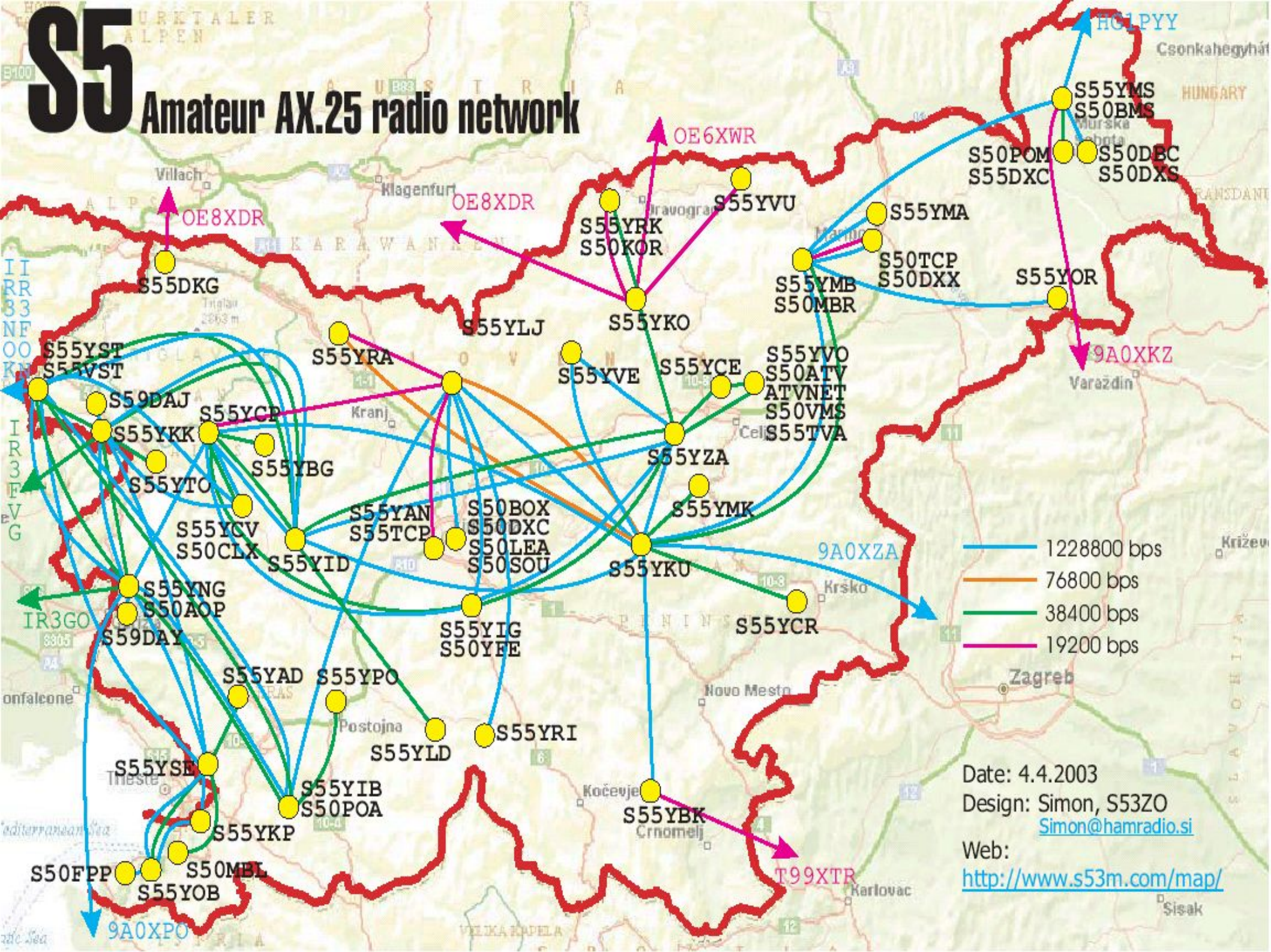
RIS 2011

# NADGRADNJA OMREŽJA ZA NE-BREZHIBNI PROTOKOL

Matjaž Vidmar, S53MV

FE, Ljubljana, 22.01.2011

# S5 Amateur AX.25 radio network



Date: 4.4.2003  
 Design: Simon, S53ZO  
[Simon@hamradio.si](mailto:Simon@hamradio.si)  
 Web: <http://www.s53m.com/map/>

## NanoBridge M5: World's First Cost-Effective 5GHz MIMO Bridging Solution

**InnerFeed**  
antenna technology

**airMAX**  
MIMO TDMA Protocol



SYSTEM INFORMATION							
Processor Specs	Atheros MIPS 24Kc, 400MHz						
Memory Information	32MB SDRAM, 8MB Flash						
Networking Interface	1 X 10/100 BASE-TX (Cat. 5, RJ-45) Ethernet Interface						
REGULATORY / COMPLIANCE INFORMATION							
Wireless Approvals	FCC Part 15.247, IC RS210, CE						
RoHS Compliance	YES						
OPERATING FREQUENCY 5470MHz-5825MHz							
5GHz TX POWER SPECIFICATIONS			5GHz RX SPECIFICATIONS				
	DataRate	Avg. TX	Tolerance		DataRate	Sensitivity	Tolerance
5GHz 11n	MCS0	23 dBm	+/-2dB	5GHz 11n	MCS0	-96 dBm	+/-2dB
	MCS1	23 dBm	+/-2dB		MCS1	-95 dBm	+/-2dB
	MCS2	23 dBm	+/-2dB		MCS2	-92 dBm	+/-2dB
	MCS3	23 dBm	+/-2dB		MCS3	-90 dBm	+/-2dB
	MCS4	22 dBm	+/-2dB		MCS4	-86 dBm	+/-2dB
	MCS5	20 dBm	+/-2dB		MCS5	-83 dBm	+/-2dB
	MCS6	19 dBm	+/-2dB		MCS6	-77 dBm	+/-2dB
	MCS7	18 dBm	+/-2dB		MCS7	-74 dBm	+/-2dB
	MCS8	23 dBm	+/-2dB		MCS8	-95 dBm	+/-2dB
	MCS9	23 dBm	+/-2dB		MCS9	-93 dBm	+/-2dB
	MCS10	23 dBm	+/-2dB		MCS10	-90 dBm	+/-2dB
	MCS11	23 dBm	+/-2dB		MCS11	-87 dBm	+/-2dB
	MCS12	22 dBm	+/-2dB		MCS12	-84 dBm	+/-2dB
	MCS13	20 dBm	+/-2dB		MCS13	-79 dBm	+/-2dB
	MCS14	19 dBm	+/-2dB		MCS14	-78 dBm	+/-2dB
MCS15	18 dBm	+/-2dB	MCS15	-75 dBm	+/-2dB		
PHYSICAL / ELECTRICAL / ENVIRONMENTAL							
Enclosure Size	241x326x326 mm						
Weight	135g (feed), 680g(bracket),610g(dish)						
Enclosure Characteristics	Outdoor UV Stabilized Plastic						
Mounting Kit	Pole Mounting Kit included						
Max Power Consumption	5.5 Watts						
Power Supply	24V Carrier POE Adapter Included (POE-24)						
Power Method	Passive Power over Ethernet (pairs 4,5+; 7,8 return)						
Operating Temperature	-30C to 75C						
Operating Humidity	5 to 95% Condensing						
Shock and Vibration	ETSI300-019-1.4						
Antenna Gain	22dBi						
ANTENNA INFORMATION							
Return Loss	H-Pol Elevation	H-Pol Azimuth	V-Pol Elevation	V-Pol Azimuth			



NIZKA MP CENA 70-80EUR  
CELOTNE POSTAJE Z  
ANTENO IN NAPAJANJEM

VISOKA HITROST PRENOSA  
DO 100Mbps

SPEKTRALNO UČINKOVITA  
MODULACIJA QAM-OFDM

MIMO 2X2 UPORABLJA OBE  
POLARIZACIJI

POPOLNA ZDRUŽLJIVOST  
S SVETOM RAČUNALNIKOV  
IN ŽIČNEGA INTERNETA

NI VF ANTENSKEGA KABLA

GALVANSKO LOČEN PoE  
(UDAR STRELE!)

UPORABEN DOMET OMEJEN  
(SMISELNO) NA 10km

OMEJEN NA ISM PASOVE  
2.4GHz in 5.6GHz:  
STROGO VIDEN DOMET  
(NE GRE SKOZI KROŠNJE)

ZATIKANJE/OBEŠANJE:

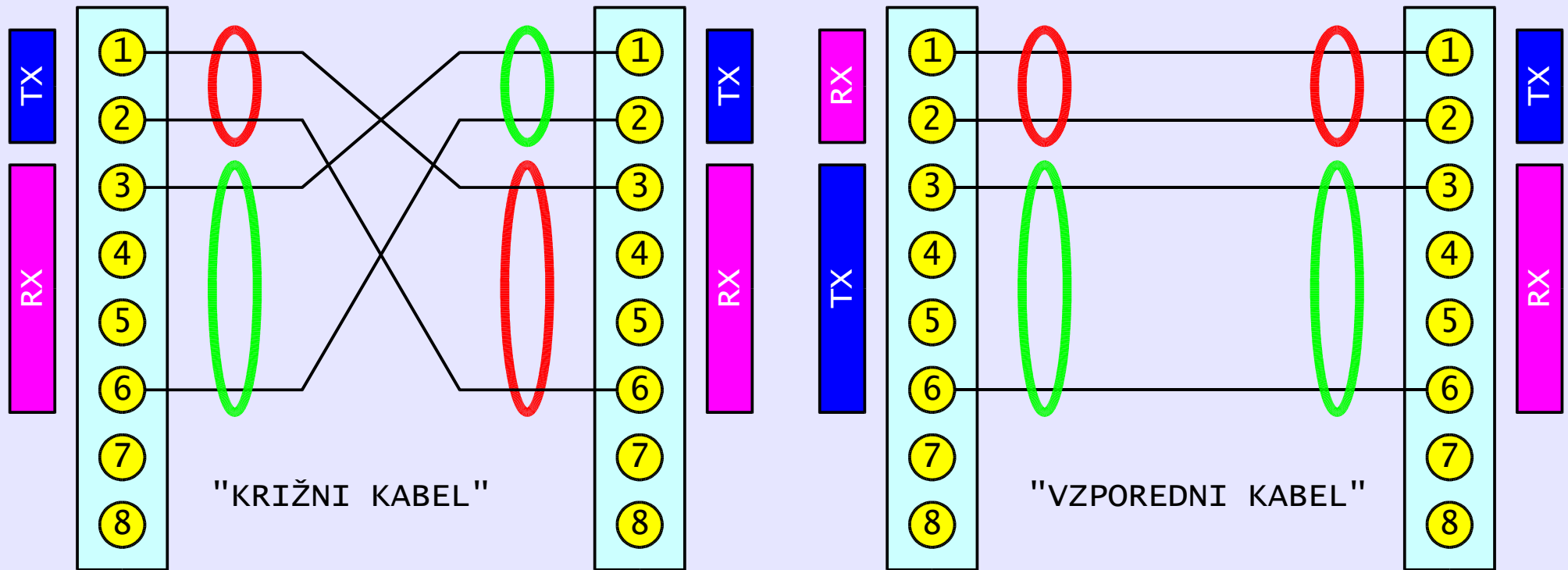
- RAVEN WLAN
- RAVEN ETHERNET
- RAVEN USMERJANJA
- OPERACIJSKI SISTEM

NE OMOGOČA TELEMETRIJE  
NITI TELEKOMANDE

NE OMOGOČA DRUGAČNIH  
PROTOKOLOV

NE DOPUŠČA SAMOGRADNJE

WLAN: DOBRE IN SLABE STRANI



AutoMDIX: samodejna menjava paric (1/2047)

Modem 10Mbps: Manchester (občutljiv na polariteto)

Modem 100Mbps: 4B5B+diferencialno+skrambler+triniv

UTP kabel + MAC stikala >>> omogočajo FULL-DUPLEX

AutoNegotiation: samodejna izbira hitrosti/duplex

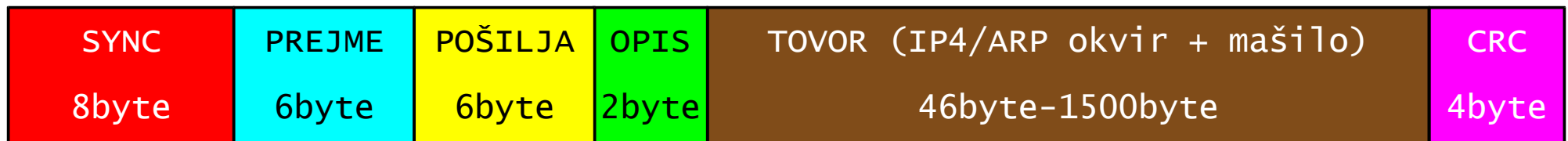
ETHERNET UTP KABEL (4 parice, vtikač RJ45)

STIKALNA  
URA ZA  
RESET

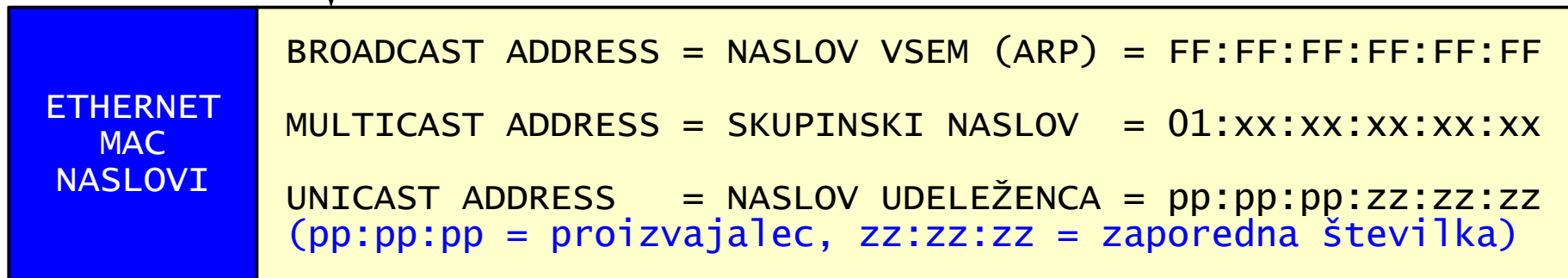


NAPAJALNIK PoE (Power over Ethernet)





0x0800 = podatkovni okvir IP4  
0x0806 = vprašanje/odgovor ARP



OMEJEVANJE VELIKOSTI USMERJEVALNE TABELE MAC/IP4:  
IP DOMENA, MASKA, PRIVZETI PREHOD (DEFAULT GATEWAY)

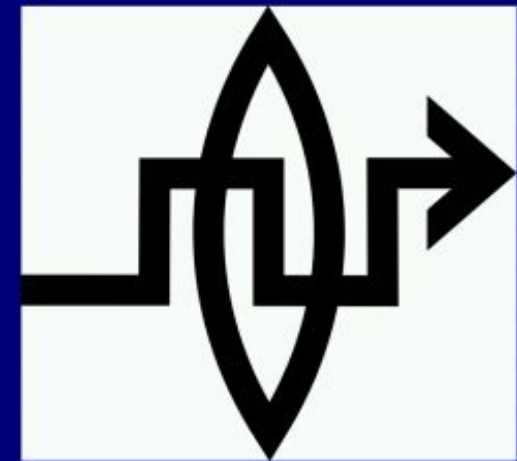
IP4 NASLOV ZNOTRAJ DOMENE: POŠLJI NA MAC ZA  
NASLOV IP4 IZ TABELE

IP4 NASLOV IZVEN DOMENE: POŠLJI NA MAC PRIVZETEGA  
PREHODA

ETHERNET OKVIRJI, NASLOVI IN ARP

## ***Technical data***

- 480,000 / 340,000 GHz – red, infrared
- 10Mbps full duplex
- BER  $10^{-9}$
- RTT < 1ms
- Range 1.4km

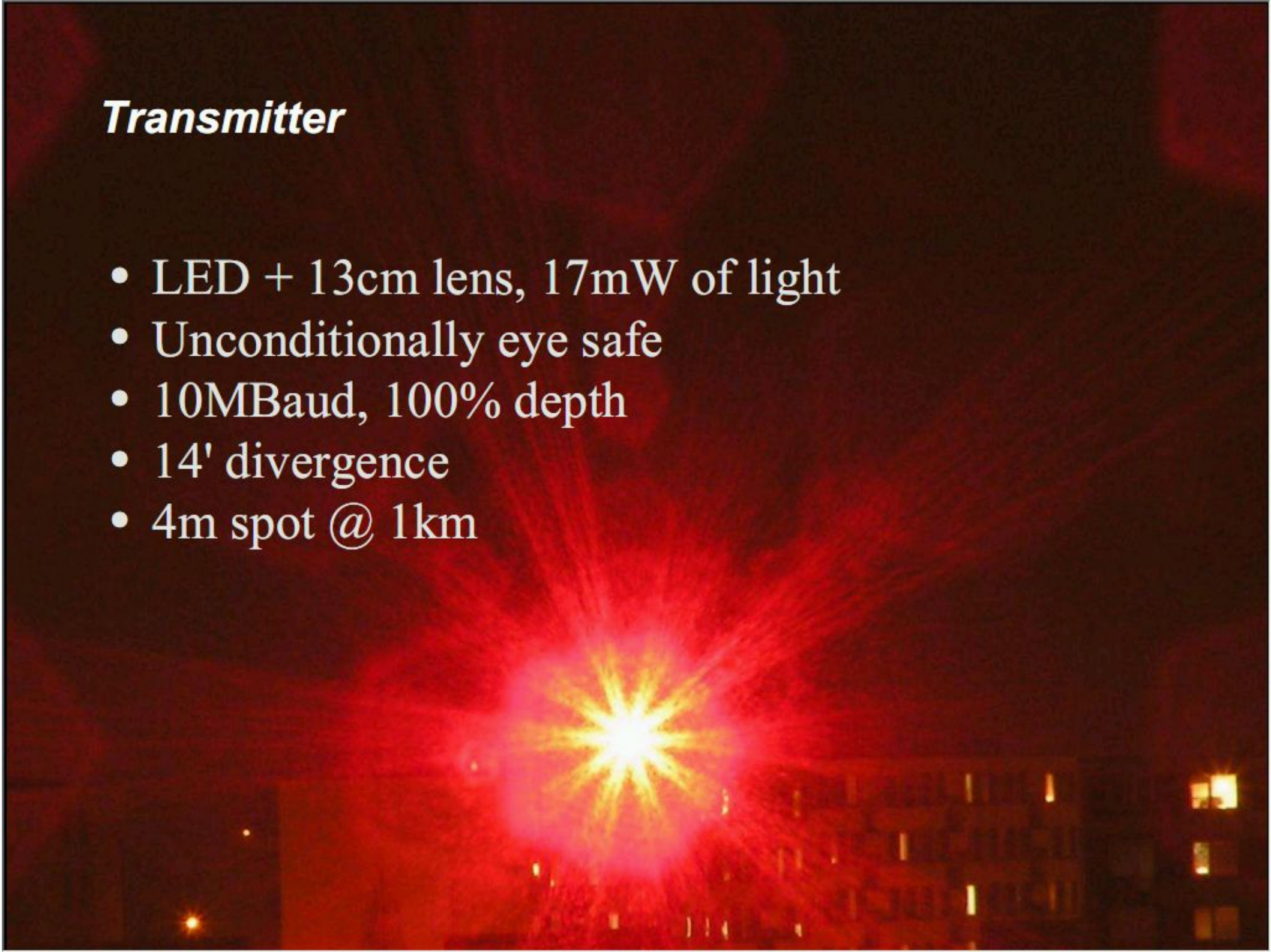


**RONJA  
PROJECT**



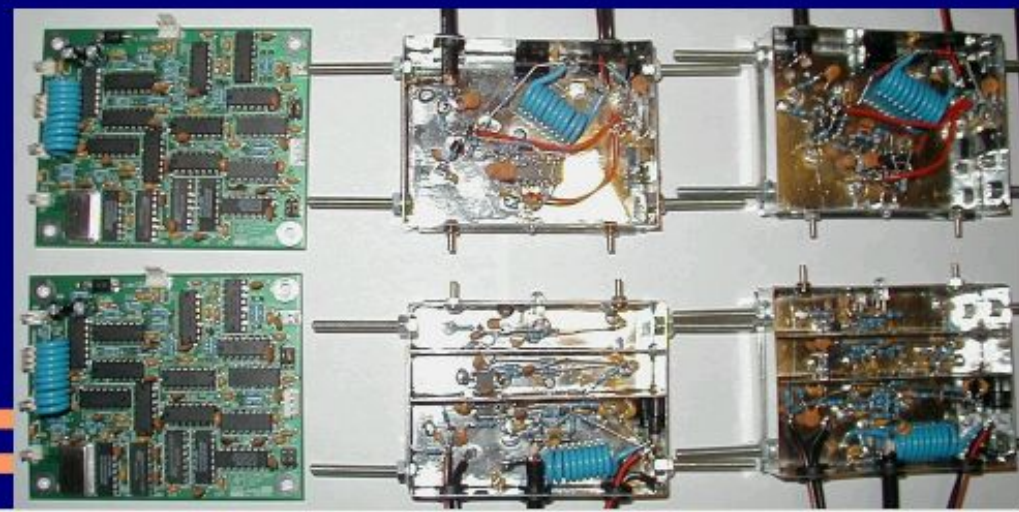
## *Transmitter*

- LED + 13cm lens, 17mW of light
- Unconditionally eye safe
- 10MBaud, 100% depth
- 14' divergence
- 4m spot @ 1km



## ***A link consists of...***

- 4 magnifying glasses
- 4 smoke pipes
- steel parts
- 426 electronic components
- ~\$300,- material
- ~70 hours building time



# ***Thank You For Attention***

- Twibright Labs Ronja
- <http://ronja.twibright.com>



S55YCP





S55YCP



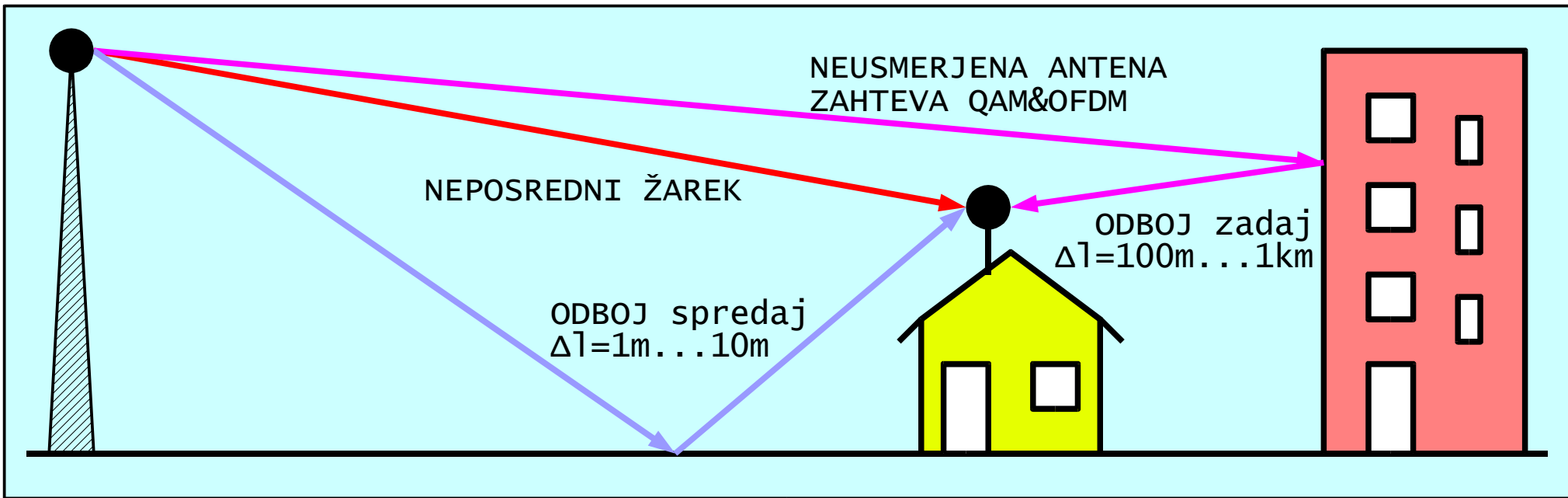
TOPLOTNI ŠUM 293K=20C	-174dBm/Hz				
ŠUM SPREJEMNIKA	+3dB				
BITNA HITROST	1200bps	38.4kbps	1.2288Mbps	10Mbps	50Mbps
PASOVNA ŠIRINA	+31dB.Hz	+46dB.Hz	+61dB.Hz	+70dB.Hz	+77dB.Hz
IZGUBA DEMODULATORJA	+2dB				

SIGNAL/ŠUM BPSK/QPSK	+10dB				
OBČUTLJIVOST PSK	-128dBm	-113dBm	-98dBm	-89dBm	-82dBm
IZKORISTEK PSK/FSK TX	40%...70%				

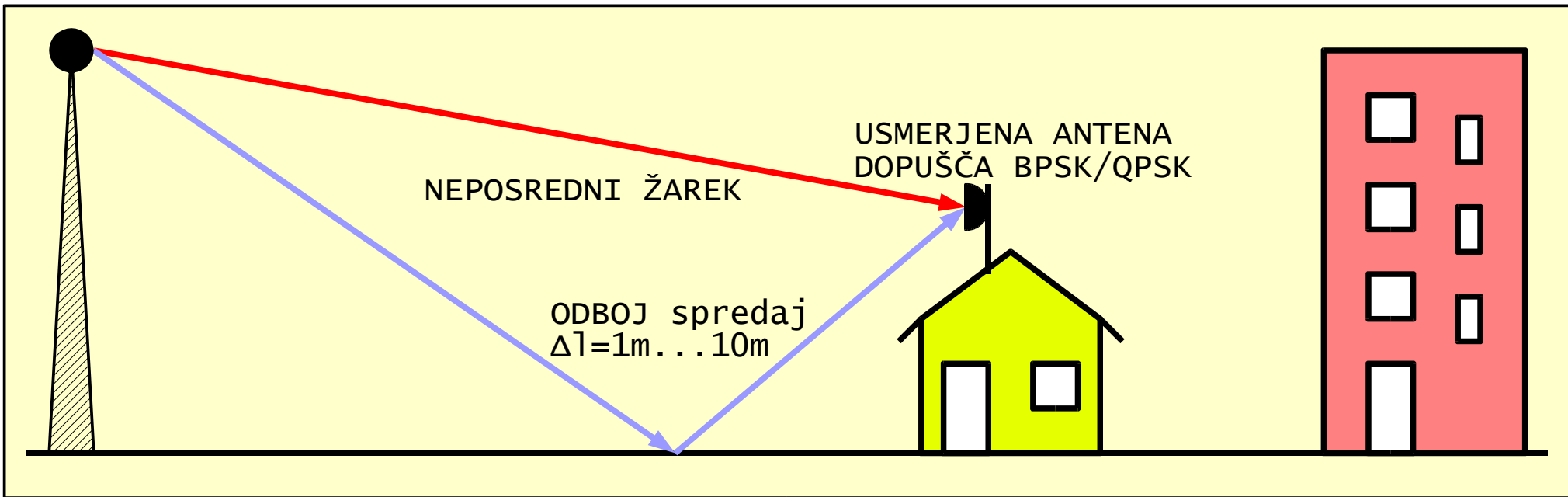
SIG/ŠUM QAM&OFDM (FSK)	+20dB (+15...+25dB)				
OBČUTLJIVOST QAM (FSK)	-118dBm	-103dBm	-88dBm	-79dBm	-72dBm
IZKORISTEK OFDM TX	3%...10%				

ZVEZA 100km ANTENI 30cm	1k2-NBFM Ptx=10mW	38k-WBFM Ptx=0.3W	1M2-BPSK Ptx=1W	10M-QPSK Ptx=8W	50M-OFDM Ptx=4kW
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MOČI ODDAJNIKOV ZA RAZLIČNE VRSTE ZVEZ



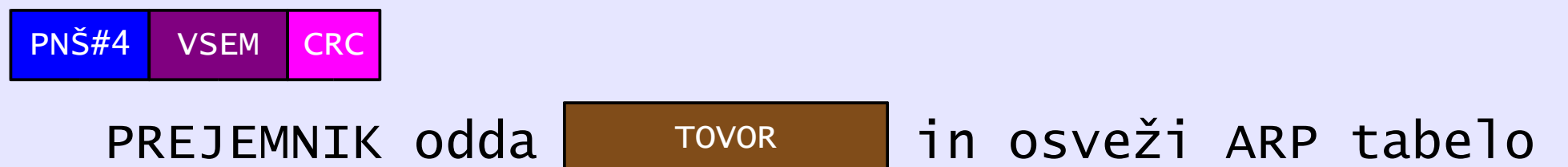
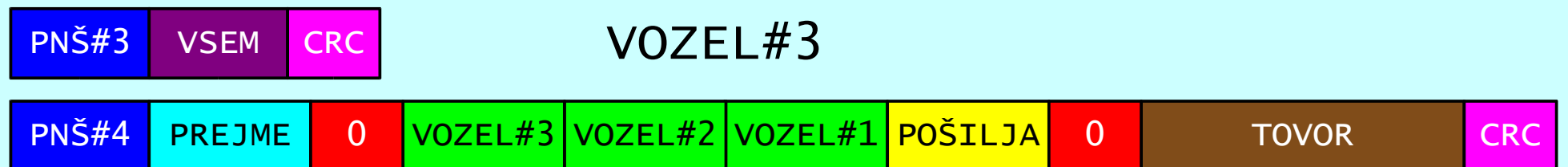
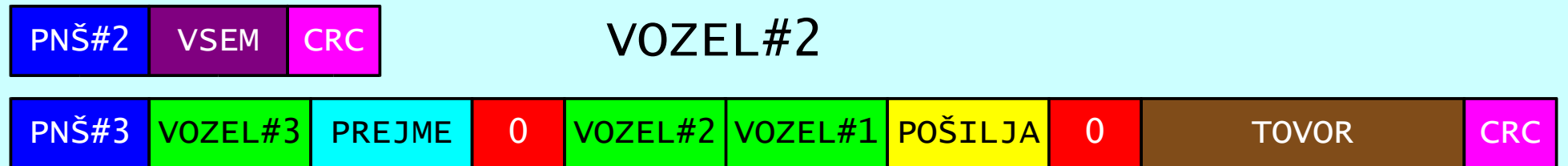
$C = 10\text{Mbps}$  (BPSK) >>>--->> DOLŽINA ENEGA BITA  $T = 30\text{m}$



# UČINEK ODBOJEV V RADIJSKI ZVEZI



POŠILJATEJ prejme **TOVOR** in uporabi ARP tabelo



NASLAVLJANJE V OKVIRJIH NE-BREZHIBNEGA PROTOKOLA

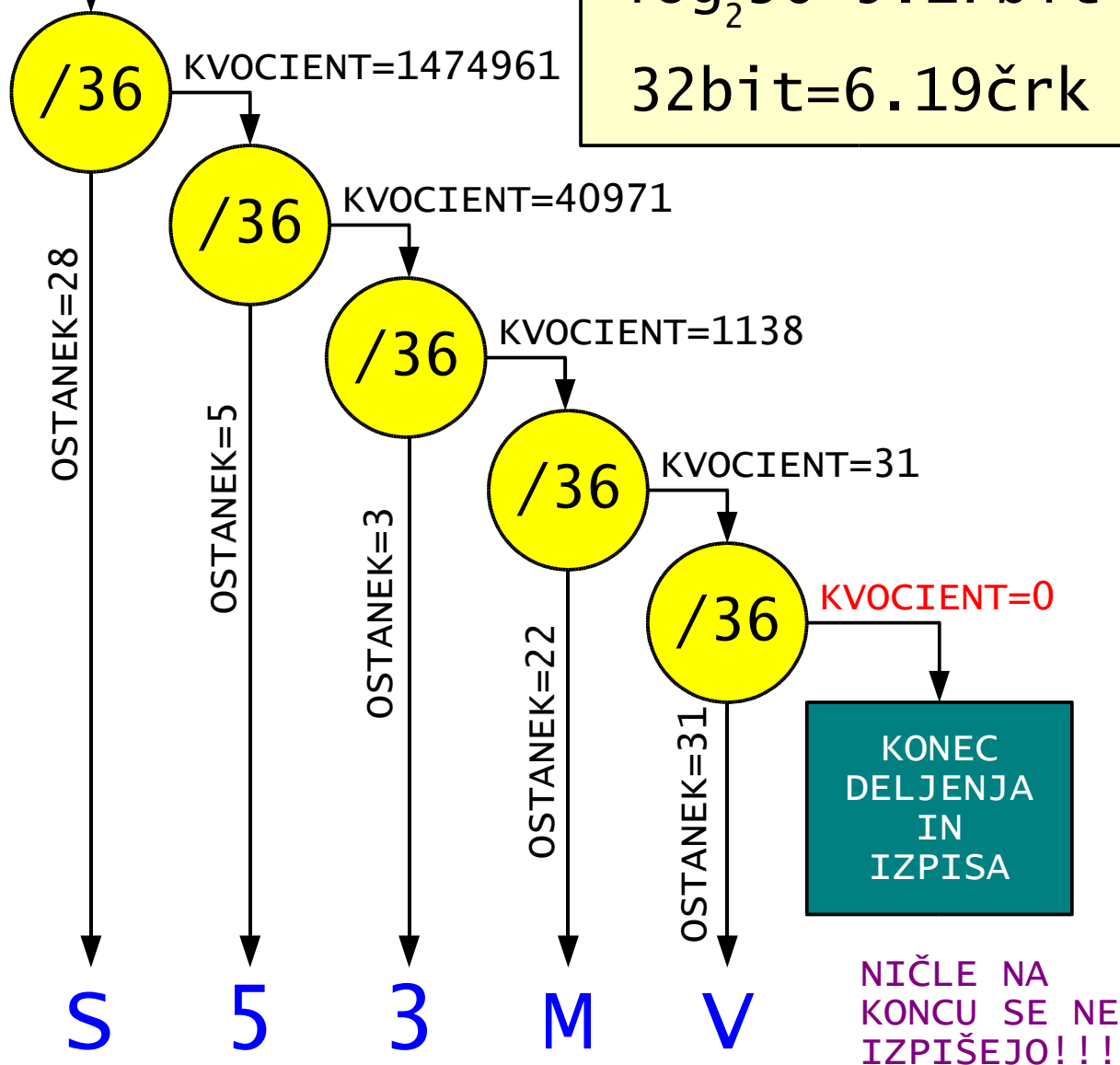
# KODIRNA TABELA MODULO (36)

0="0"	18="I"
1="1"	19="J"
2="2"	20="K"
3="3"	21="L"
4="4"	22="M"
5="5"	23="N"
6="6"	24="O"
7="7"	25="P"
8="8"	26="Q"
9="9"	27="R"
10="A"	28="S"
11="B"	29="T"
12="C"	30="U"
13="D"	31="V"
14="E"	32="W"
15="F"	33="X"
16="G"	34="Y"
17="H"	35="Z"

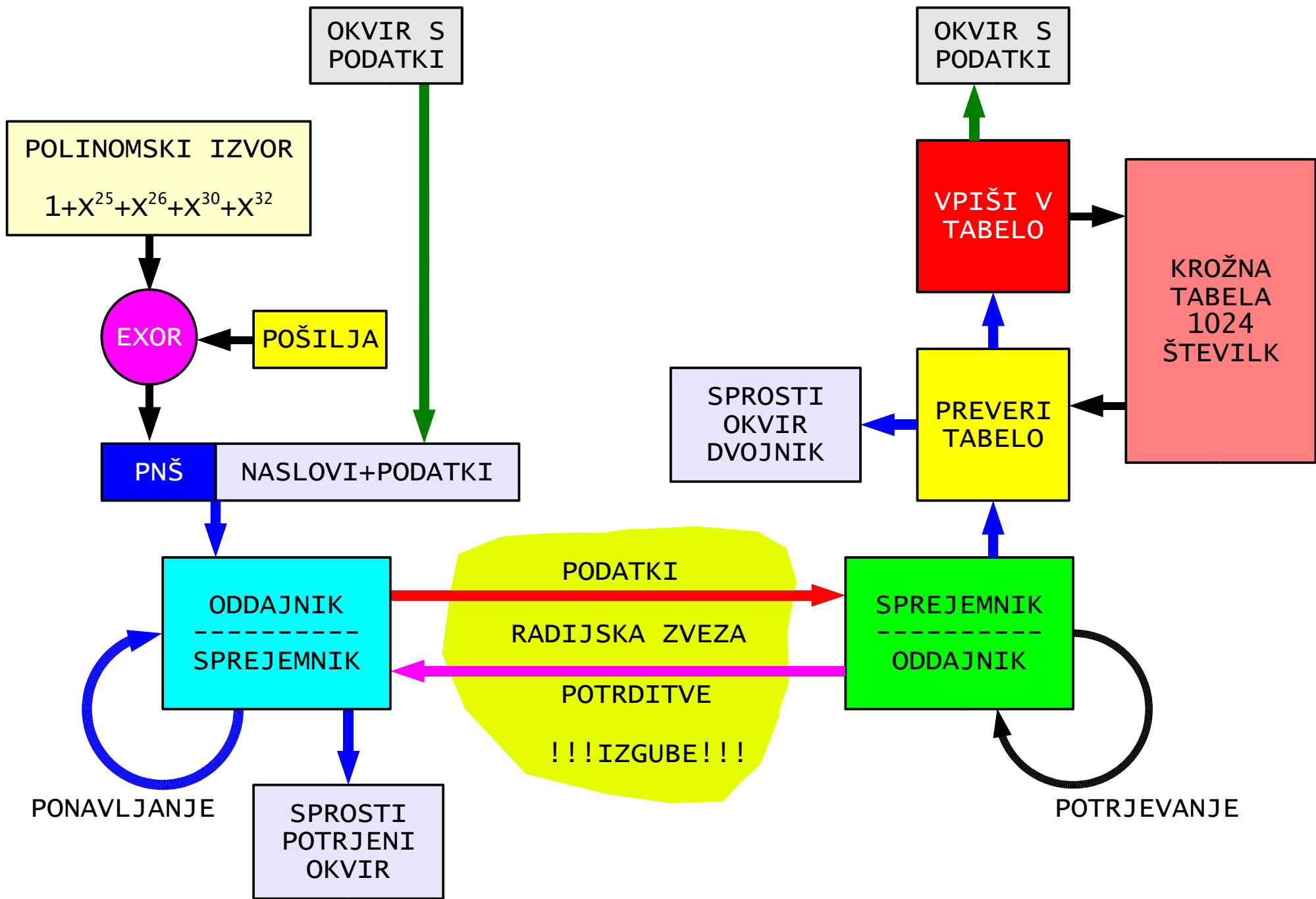
32-bitni  
NASLOV

0x032A3880=53098624

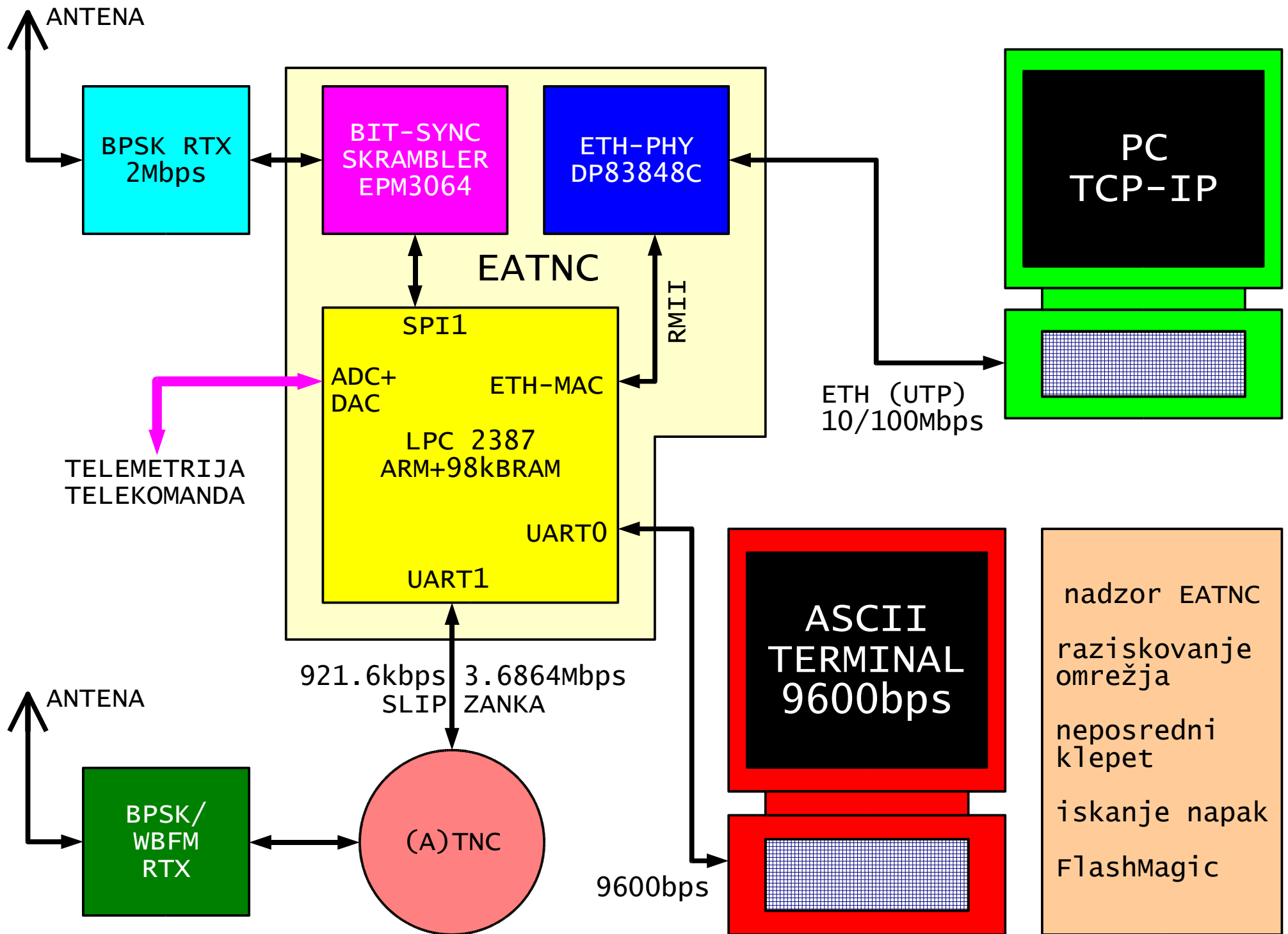
$\log_2 36 = 5.17 \text{ bit}$   
32 bit = 6.19 črk

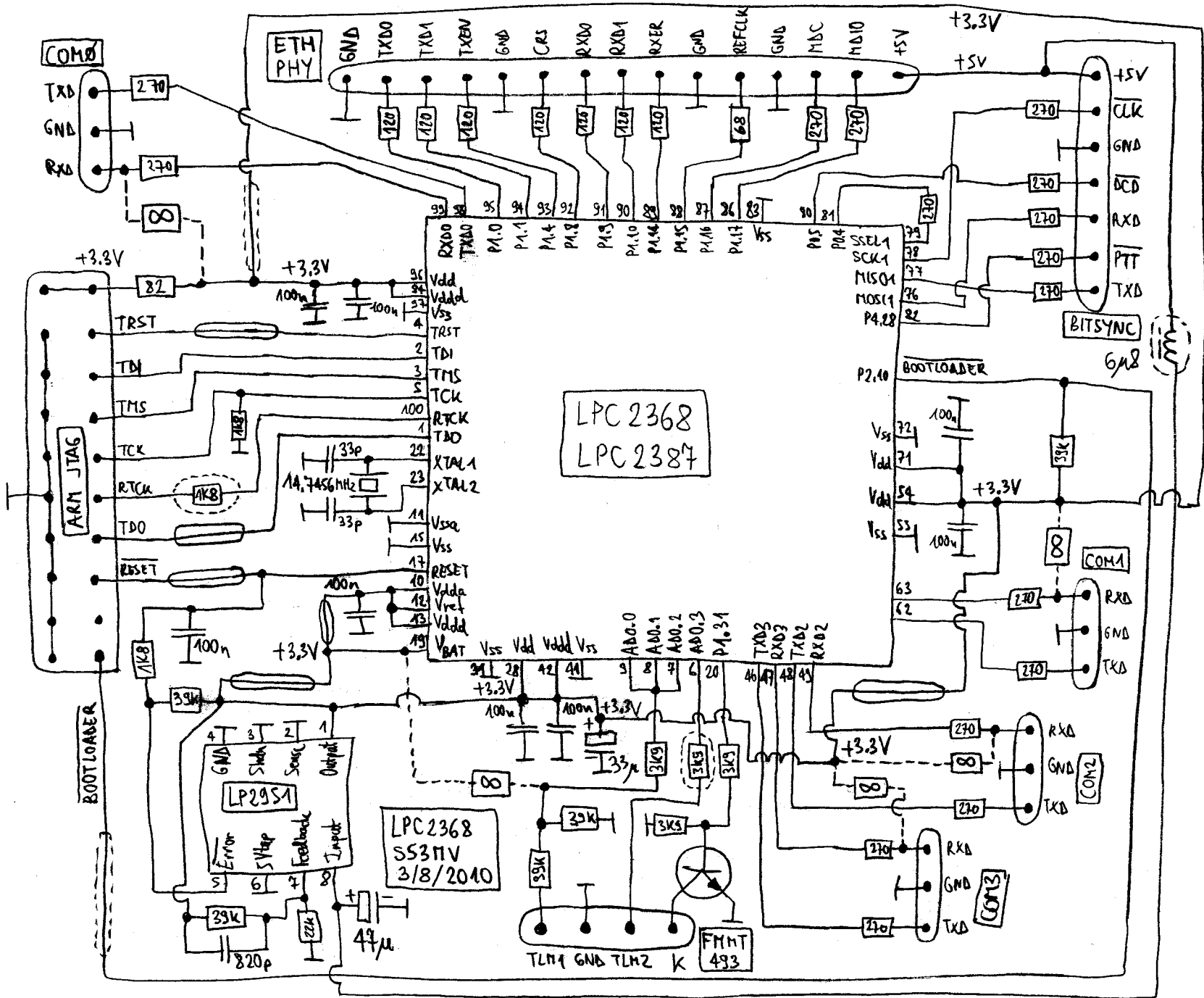


KODIRANJE 32-bitnih NASLOVOV NBP MODULO (36)

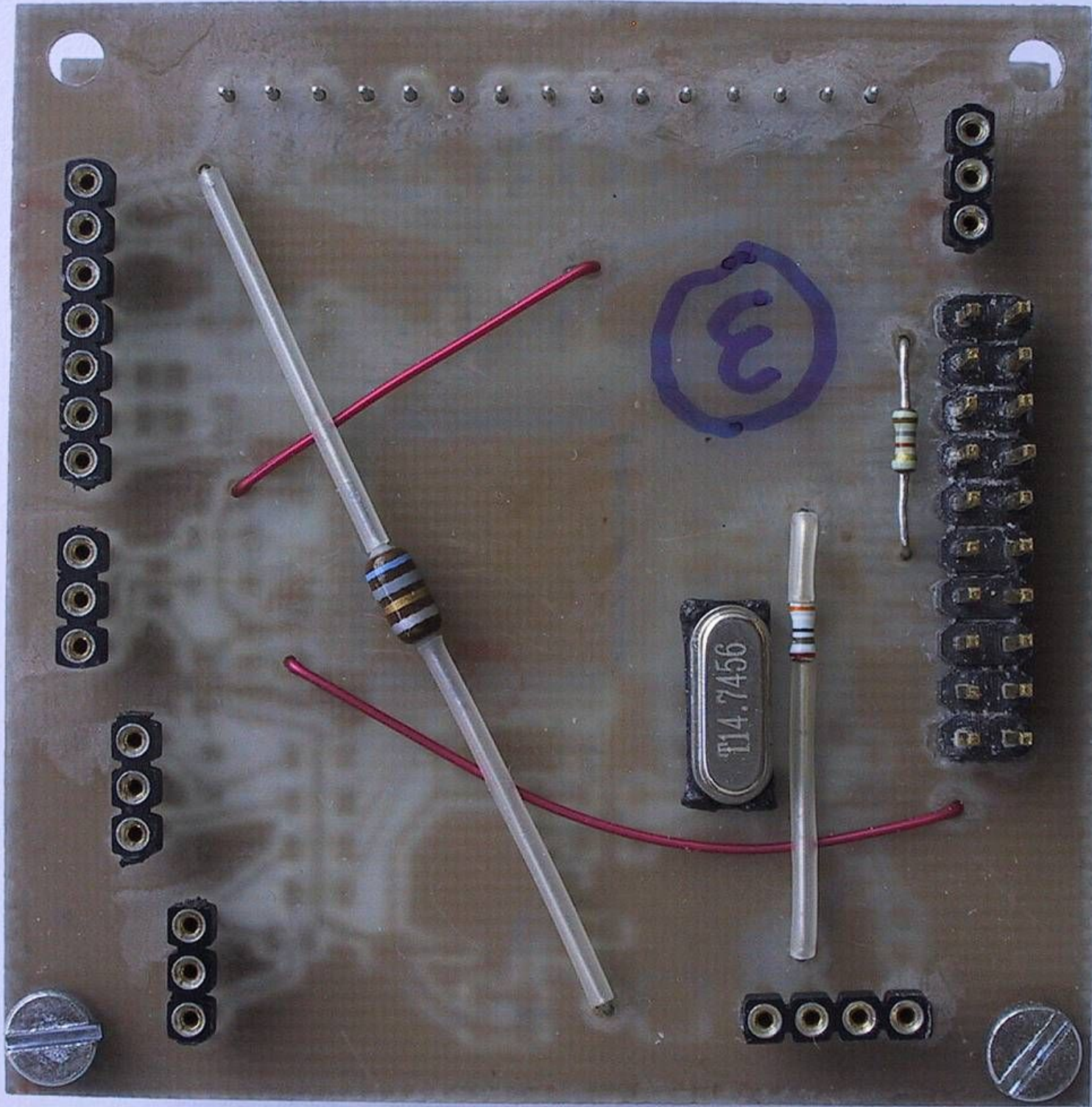


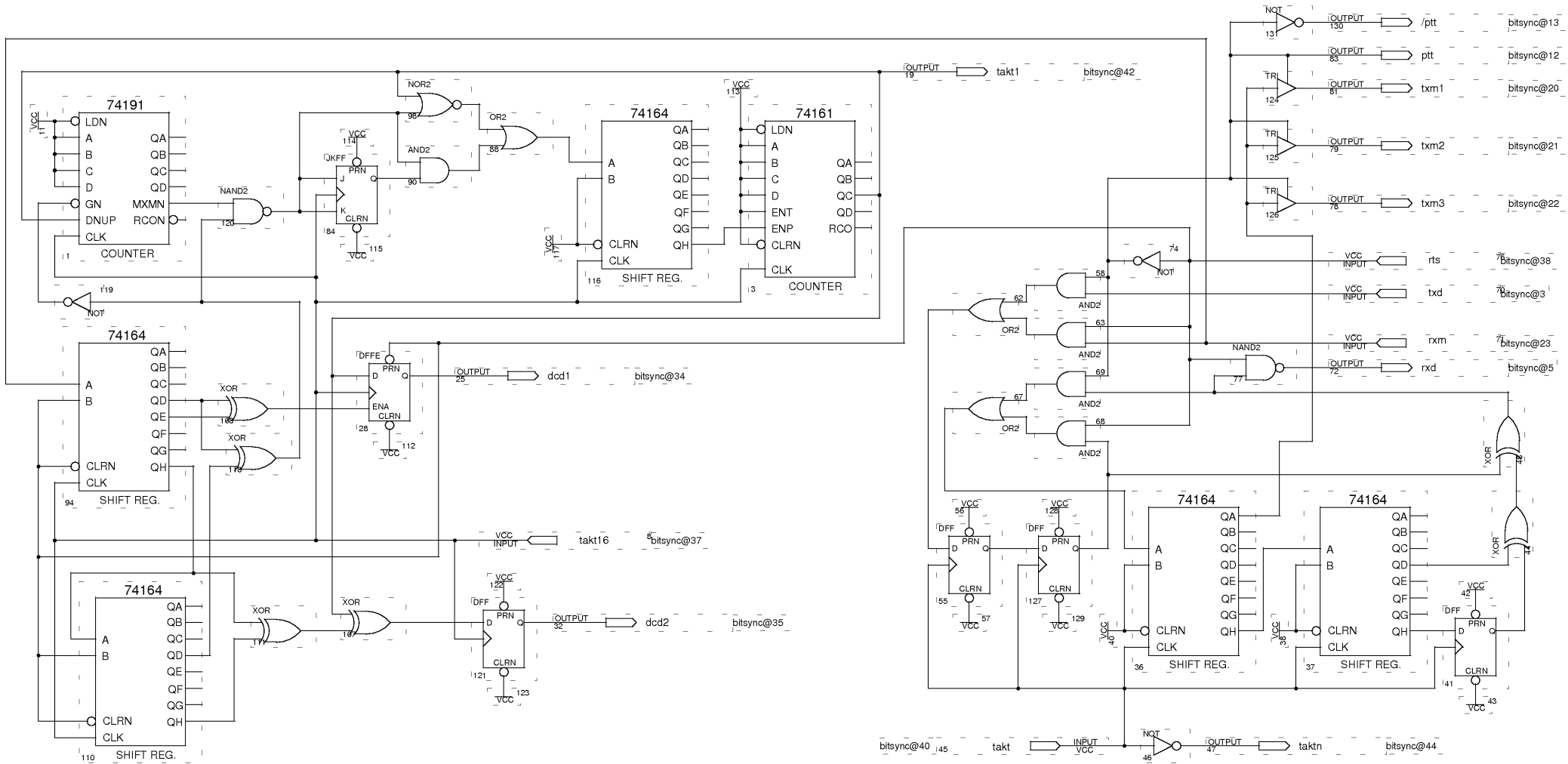
# ZAŠČITA OKVIRJEV NE-BREZHIBNEGA PROTOKOLA















**Compiler**

Compiler Netlist Extractor Database Builder Logic Synthesizer Fitter Timing SNF Extractor Assembler

0 50 100

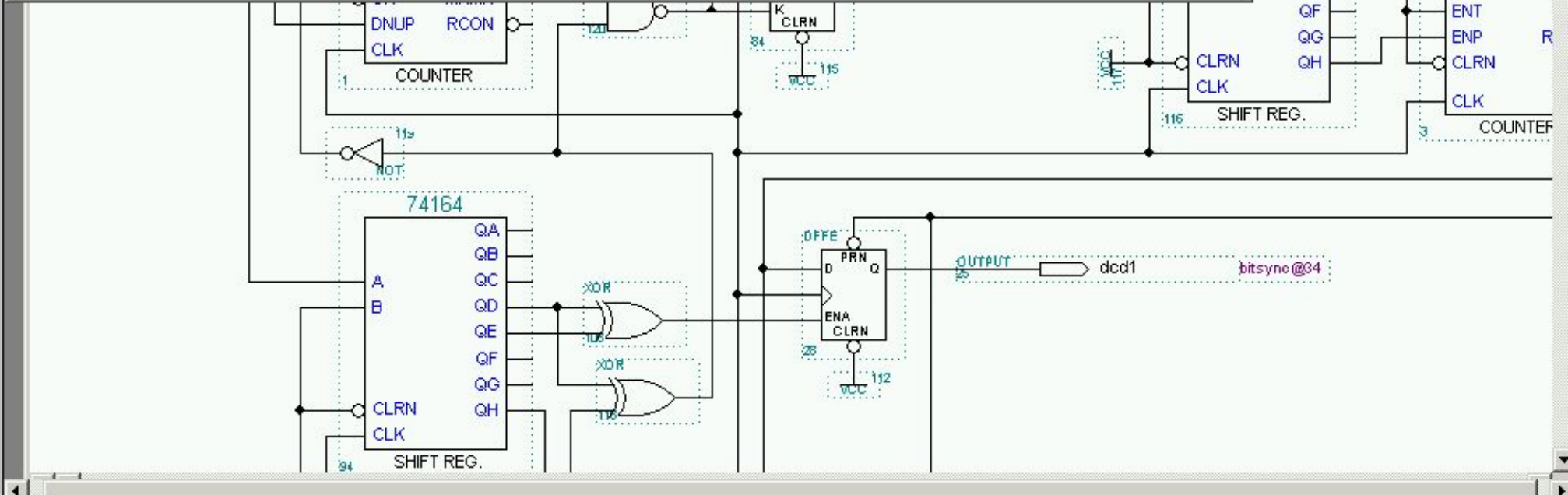
Start Stop

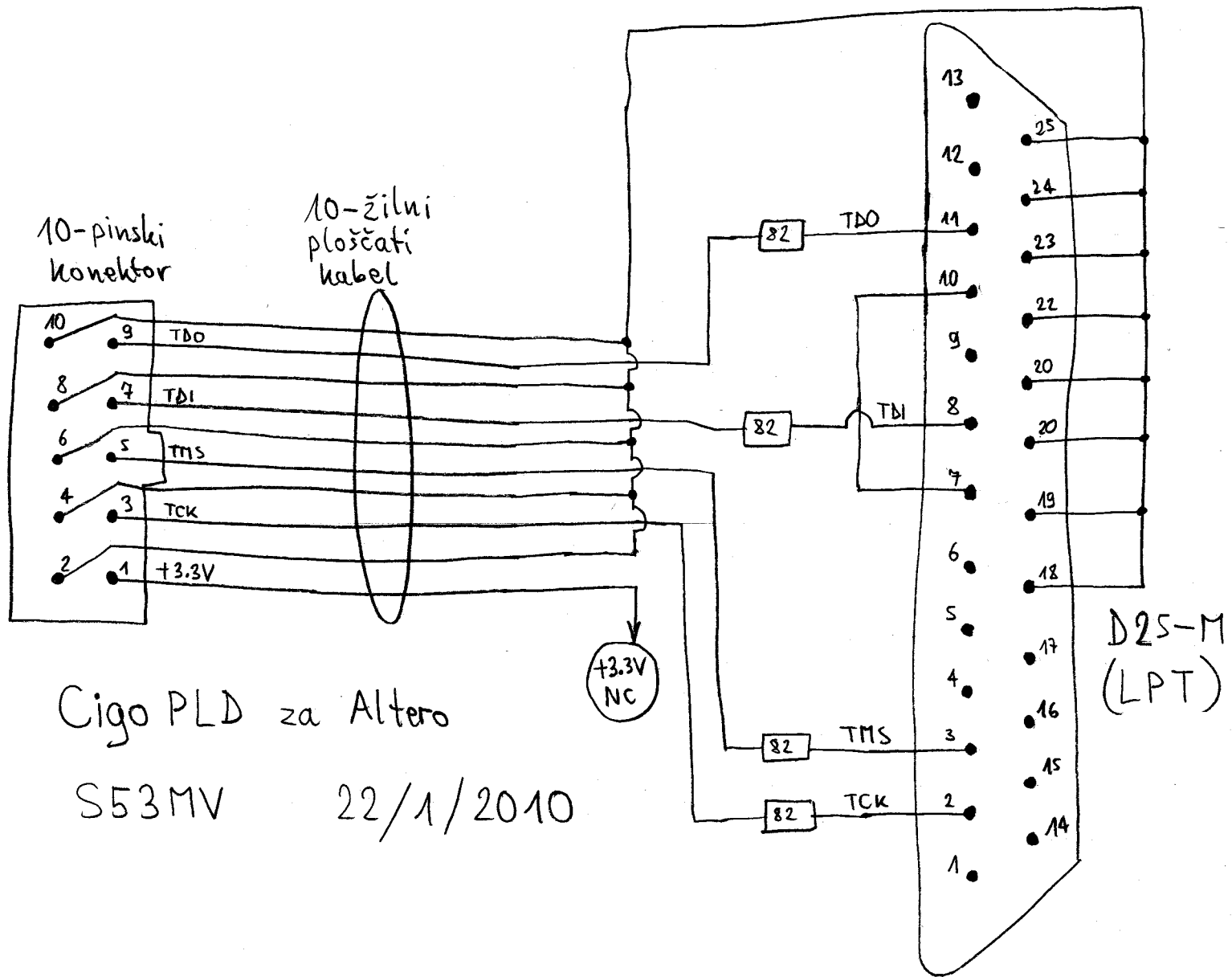
**Messages - Compiler**

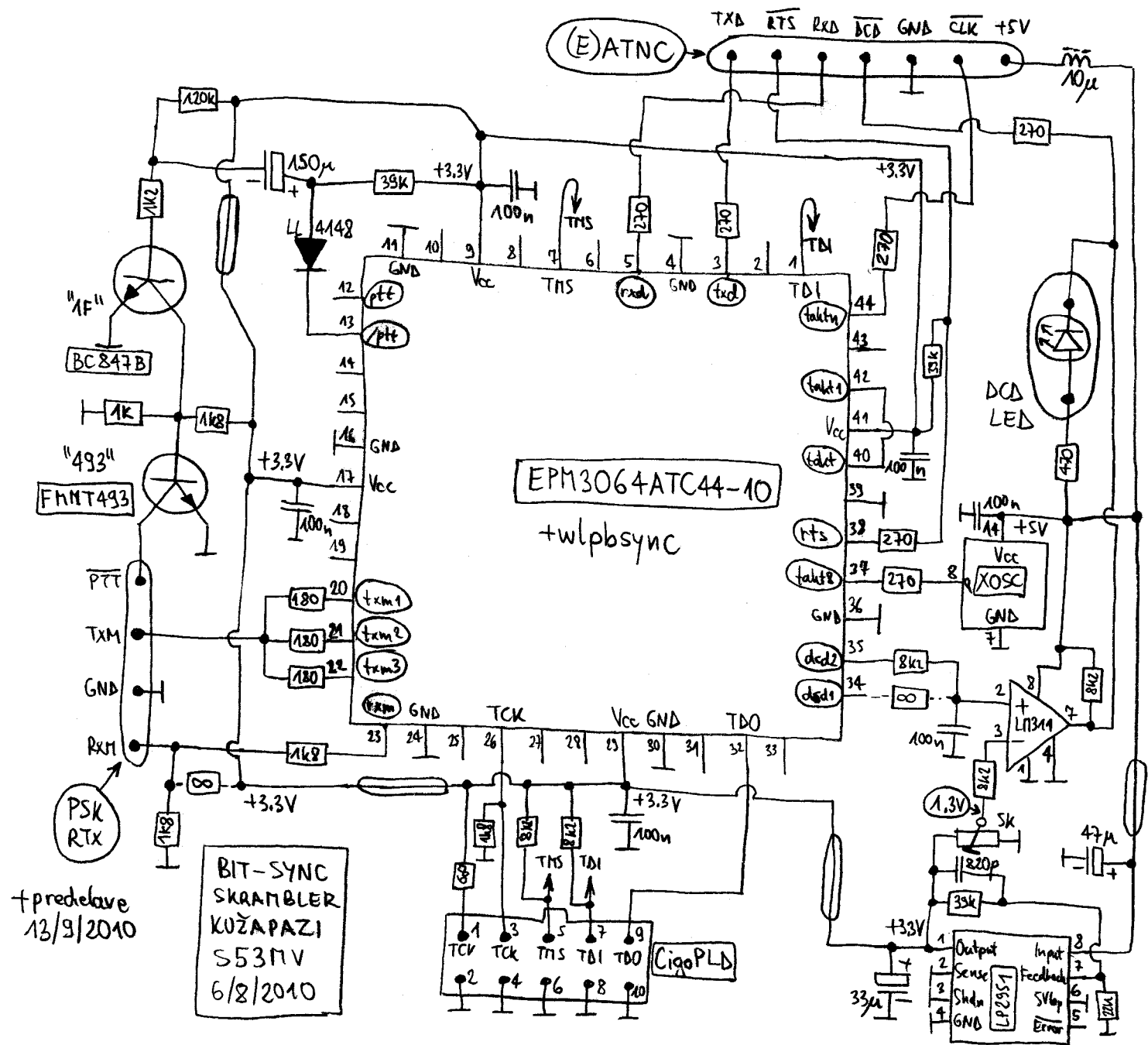
Info: Design Doctor has given the project a clean bill of health based on the EPLD Rules set  
Info: Chip 'bitsync' in device 'EPM3064ATC44-4' has less than 10% of logic cells available for future logic changes - if your project is likely to change, Altera recommends using a larger device

◀ Message ▶ 0 of 2  Locate in Floorplan Editor Help on Message

◀ Locate ▶ 0 of 0 Locate All







+predejava  
13/9/2010

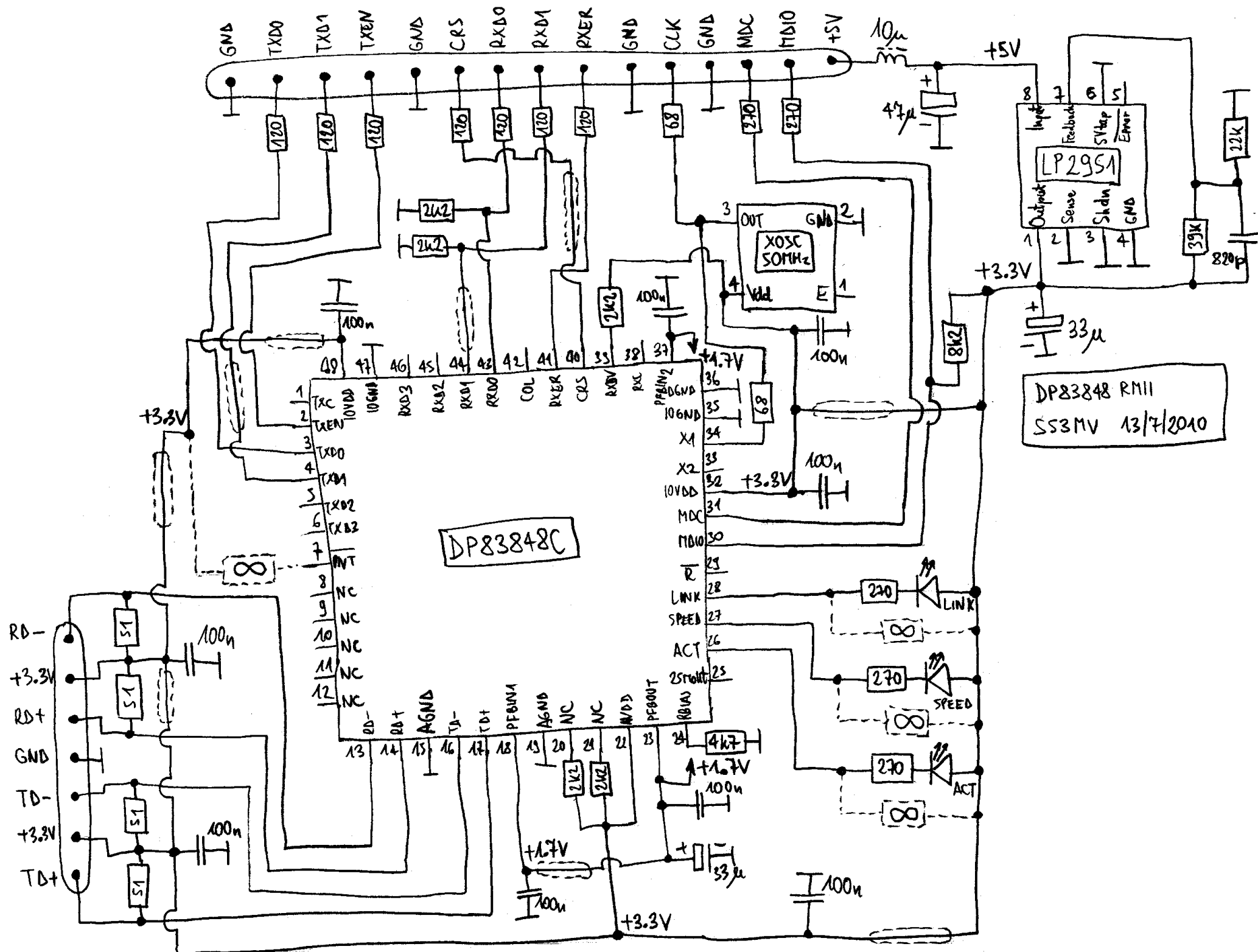
BIT-SYNC  
SKRAMBLER  
KUŽAPAZI  
S531V  
6/8/2010

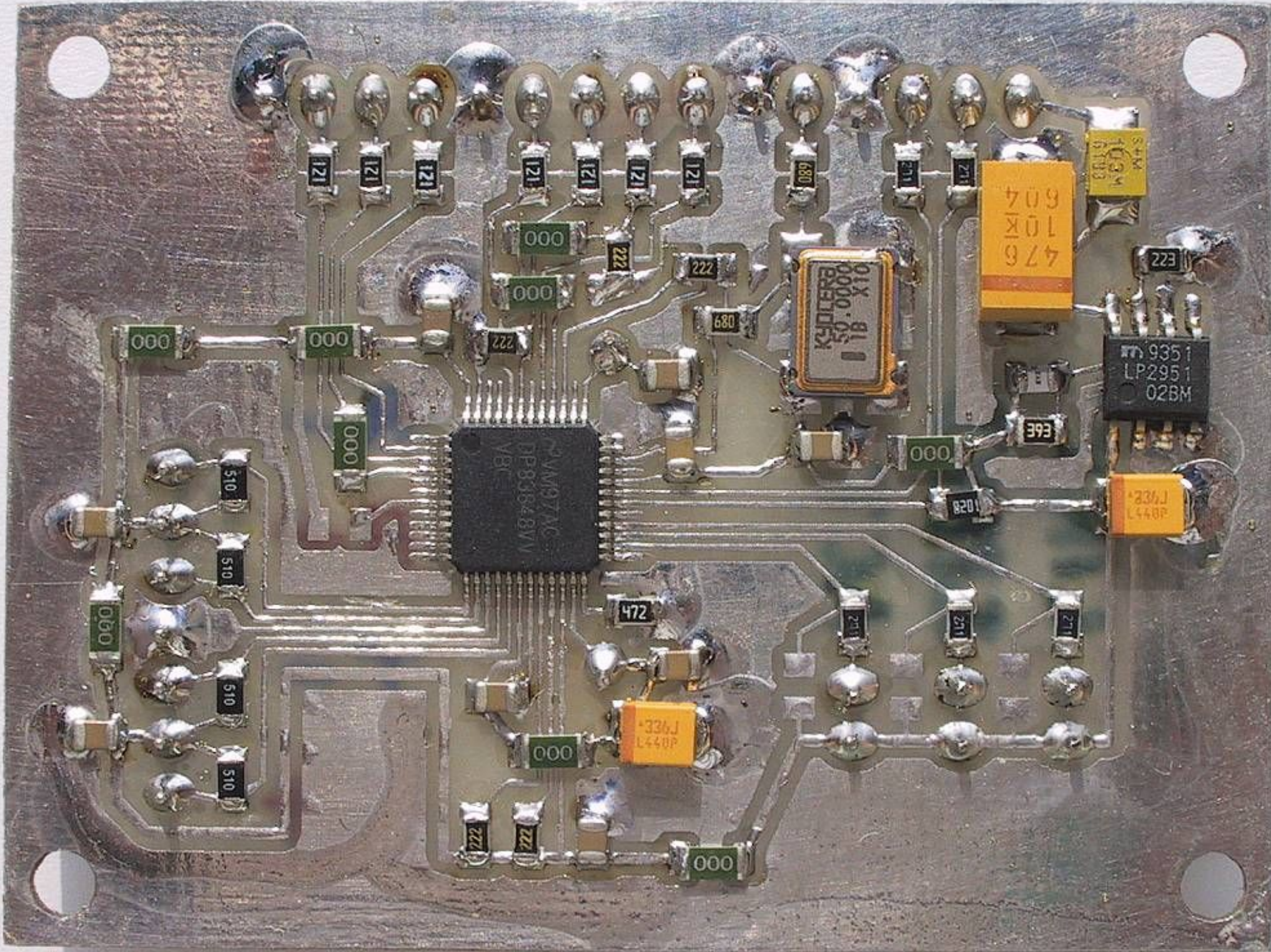
EPM3064ATC44-10  
+wlpbsync

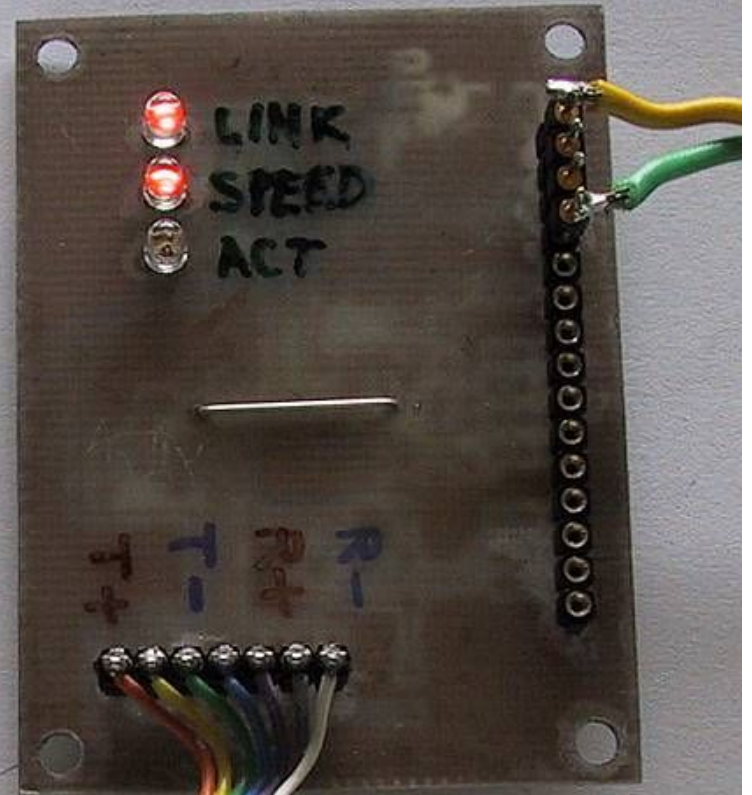
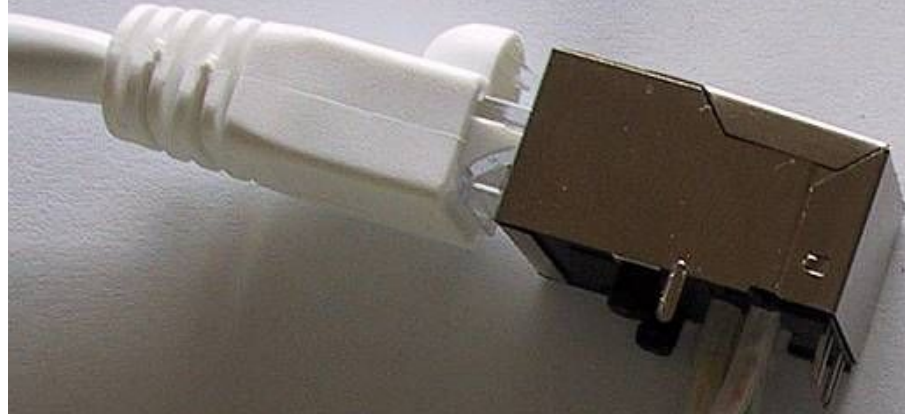
CigoPLD



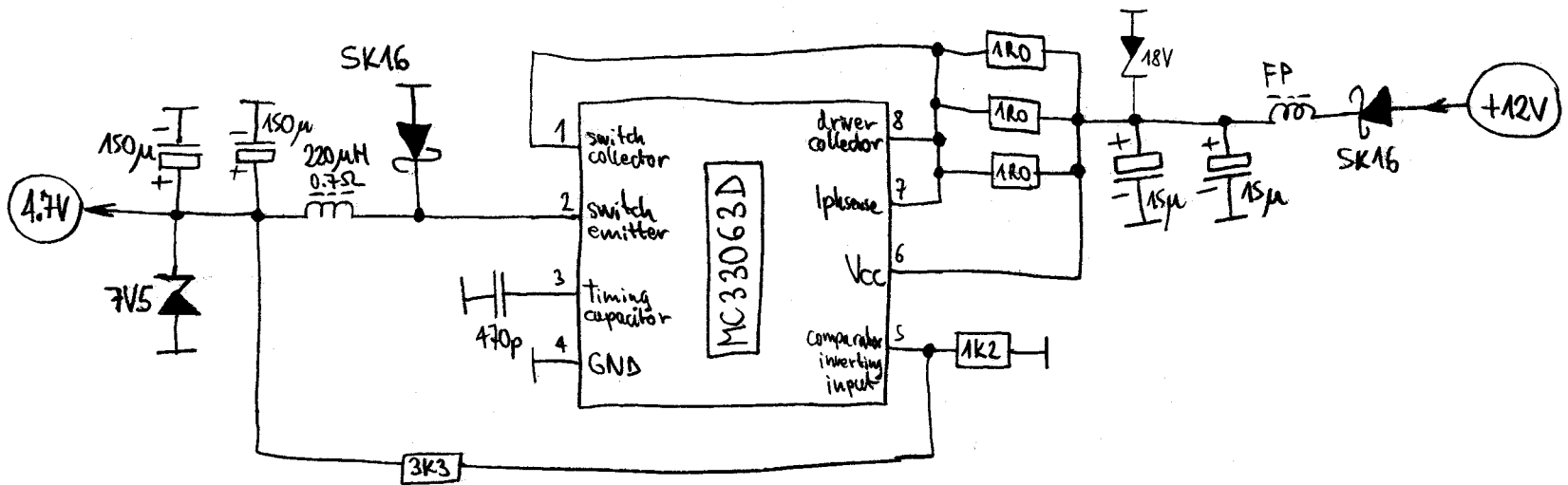




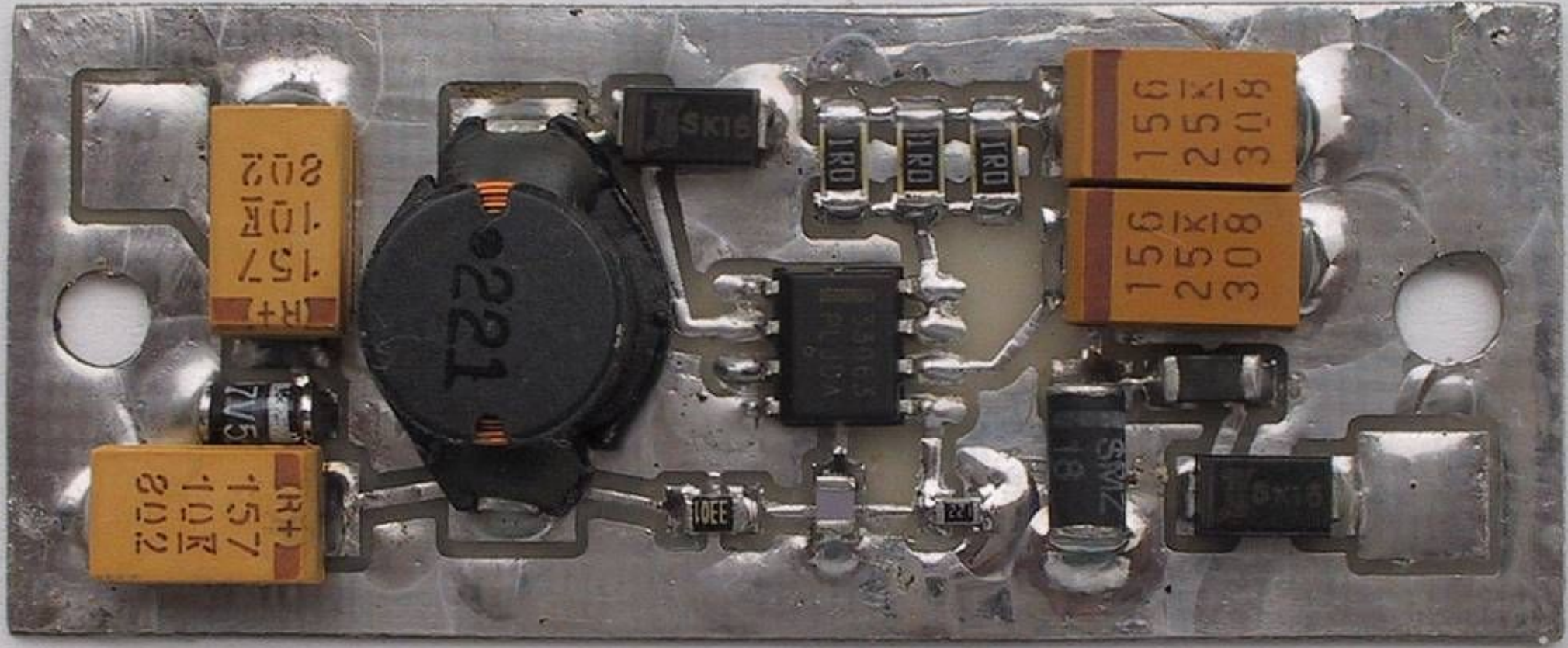


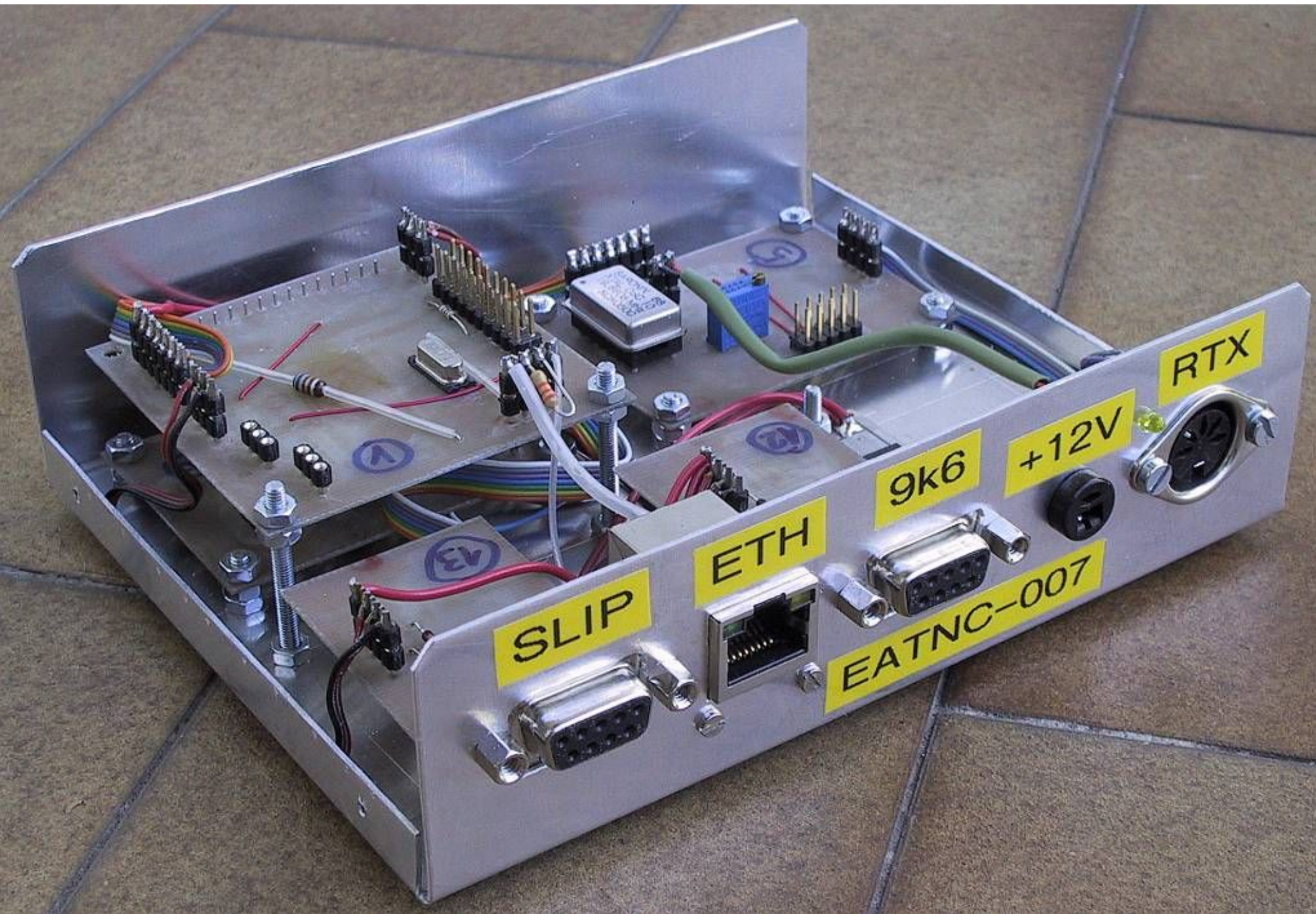






SWITCHING NAPAJALNIK ZA (E)ATNC  
 S53MV 28/08/2010





SLIP

ETH

9k6

+12V

RTX

EATNC-007

megabitna PSK radijska postaja

HDLC-NBP

NBP lokalna zanka ASV  
ali  
SLIP TCP/IP

NBP-SLIP

100Mbps  
Ethernet  
TCP/IP

Ethernet

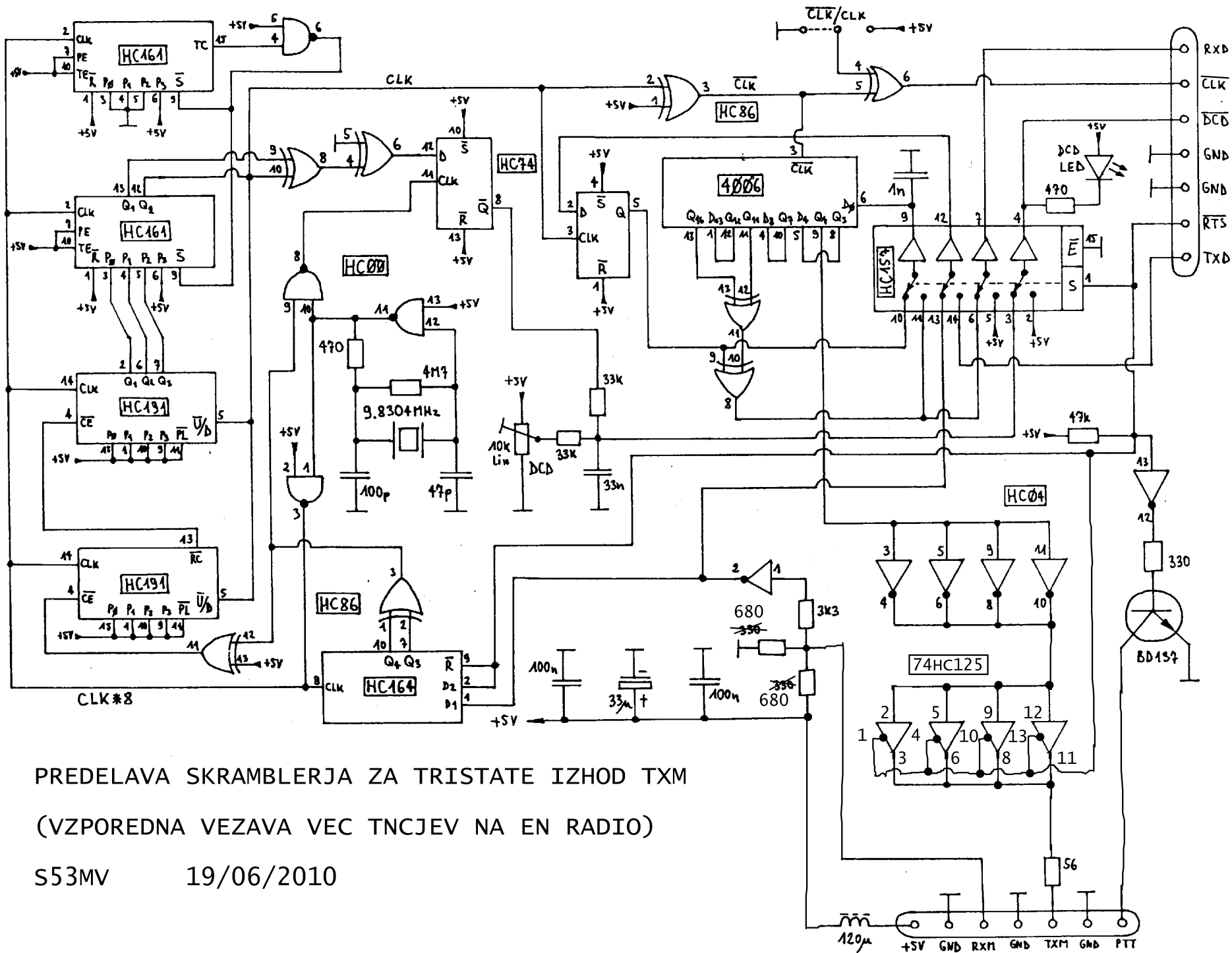
EATNC

A/D & D/A

telemetrija &  
telekomanda  
ali  
analogna radijska postaja

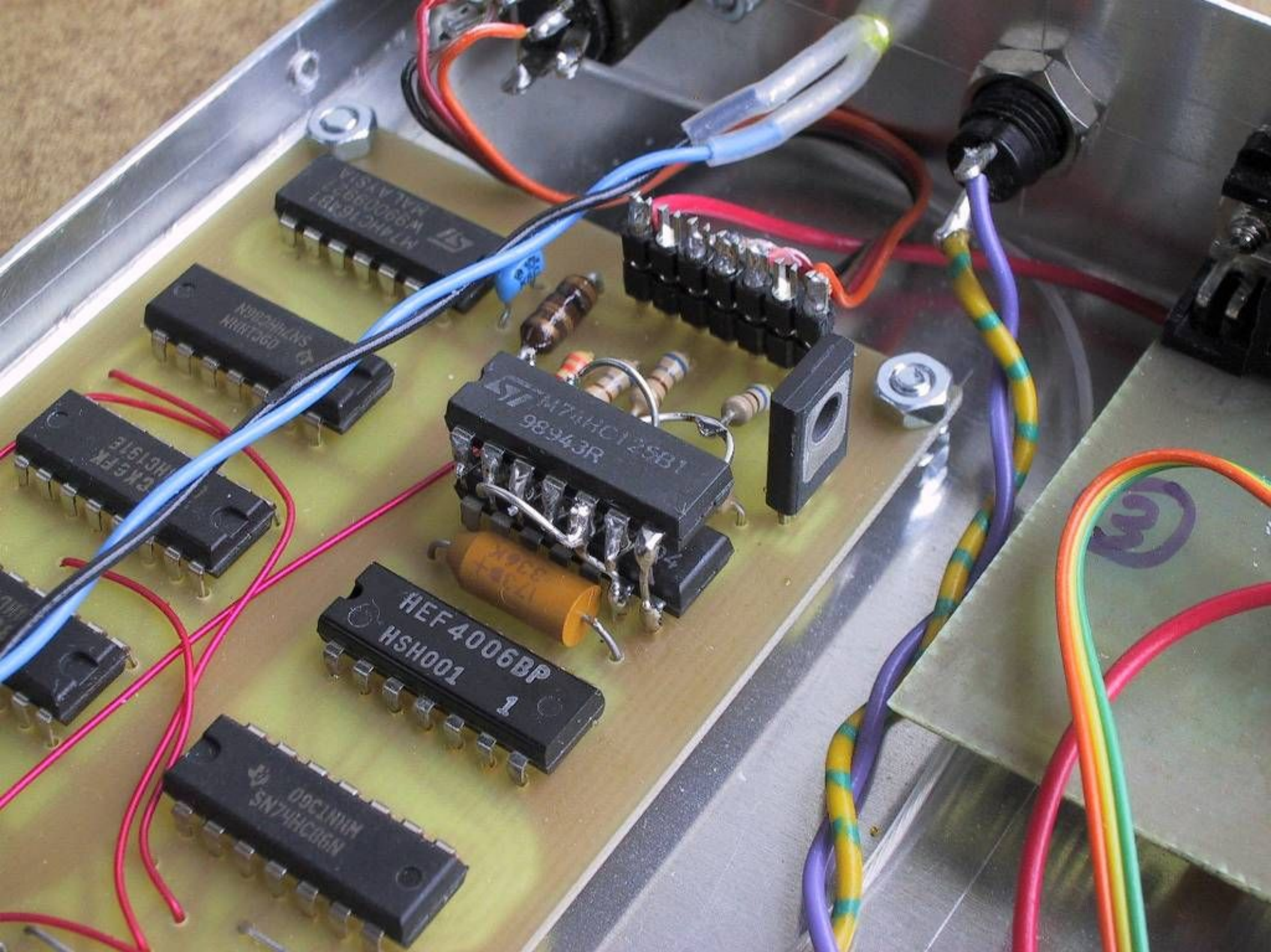
RS-232

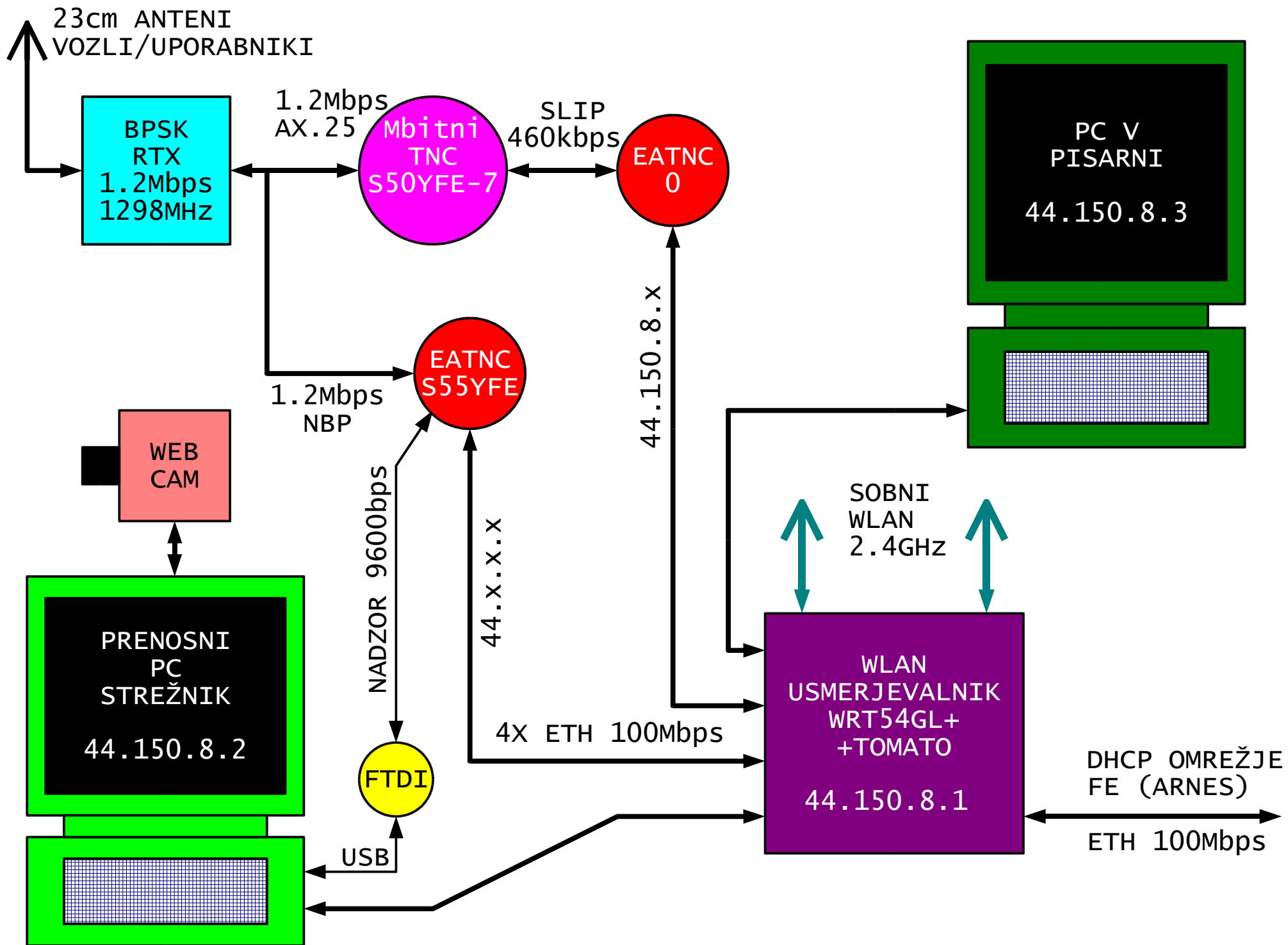
nastavljanje parametrov  
raziskovanje omrežja  
preprosta TTY zveza  
(9600bps, 8bit, no-parity)



PREDELAVA SKRAMBLERJA ZA TRISTATE IZHOD TXM  
 (VZPOREDNA VEZAVA VEC TNCJEV NA EN RADIO)

S53MV 19/06/2010



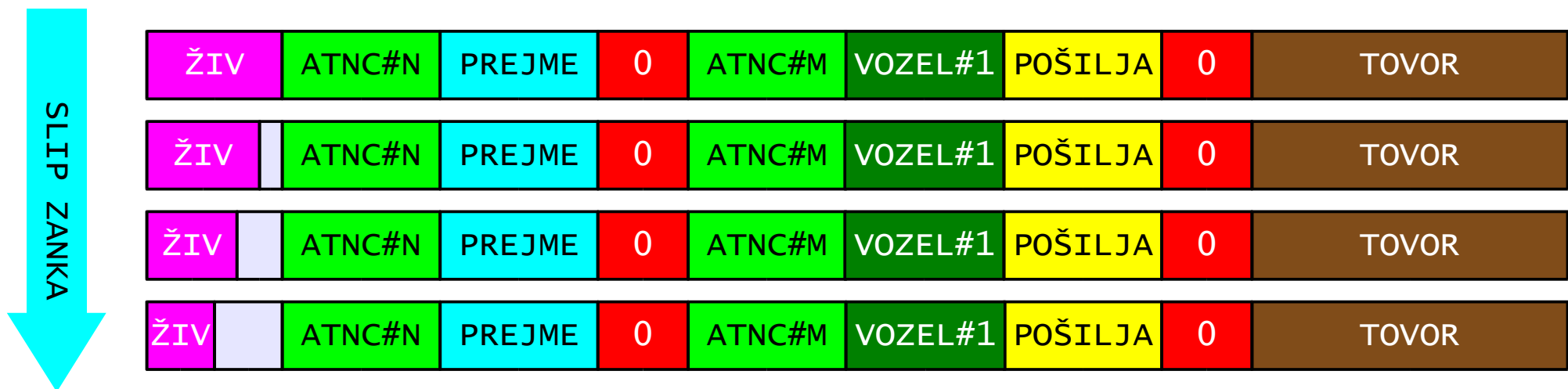
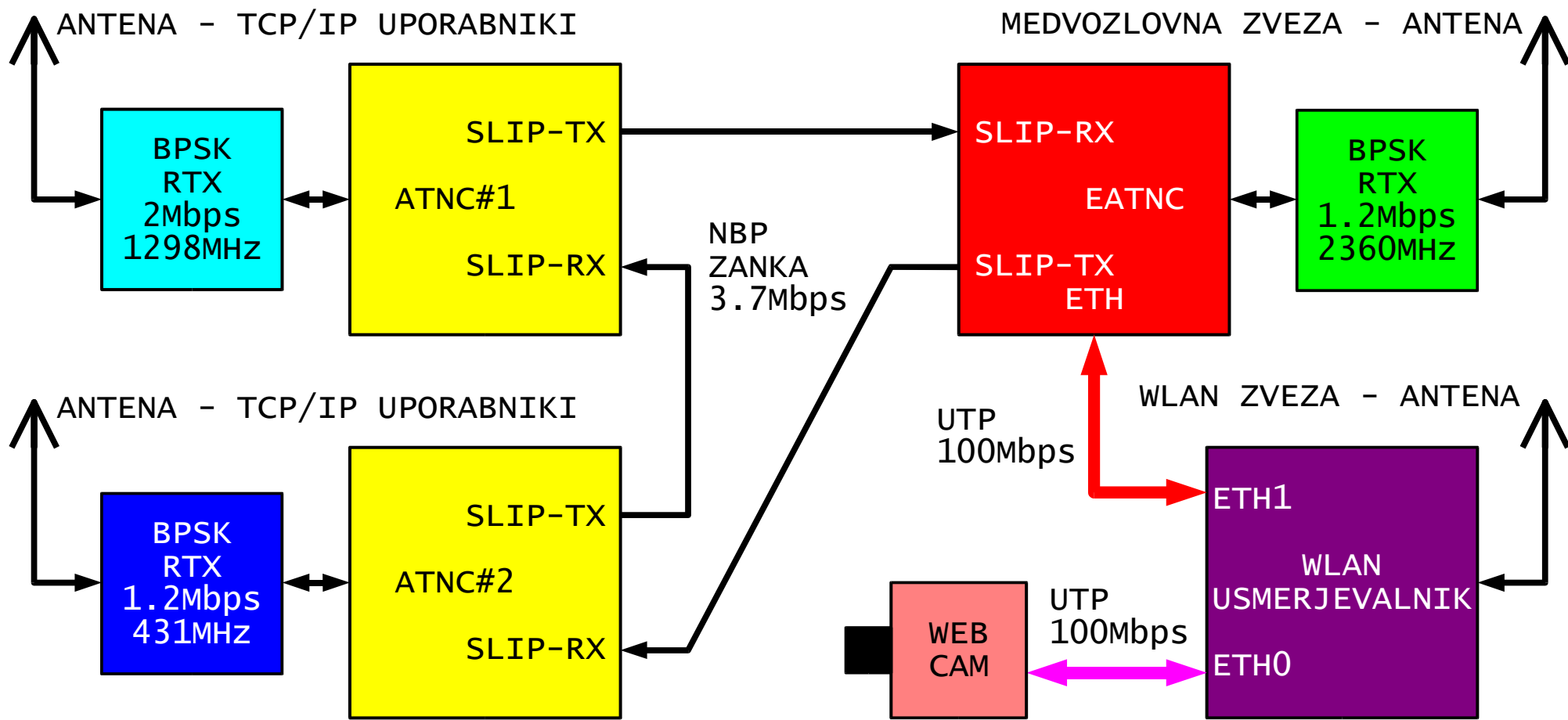


PREHOD NBP(AX.25)/ARNES S55YFE

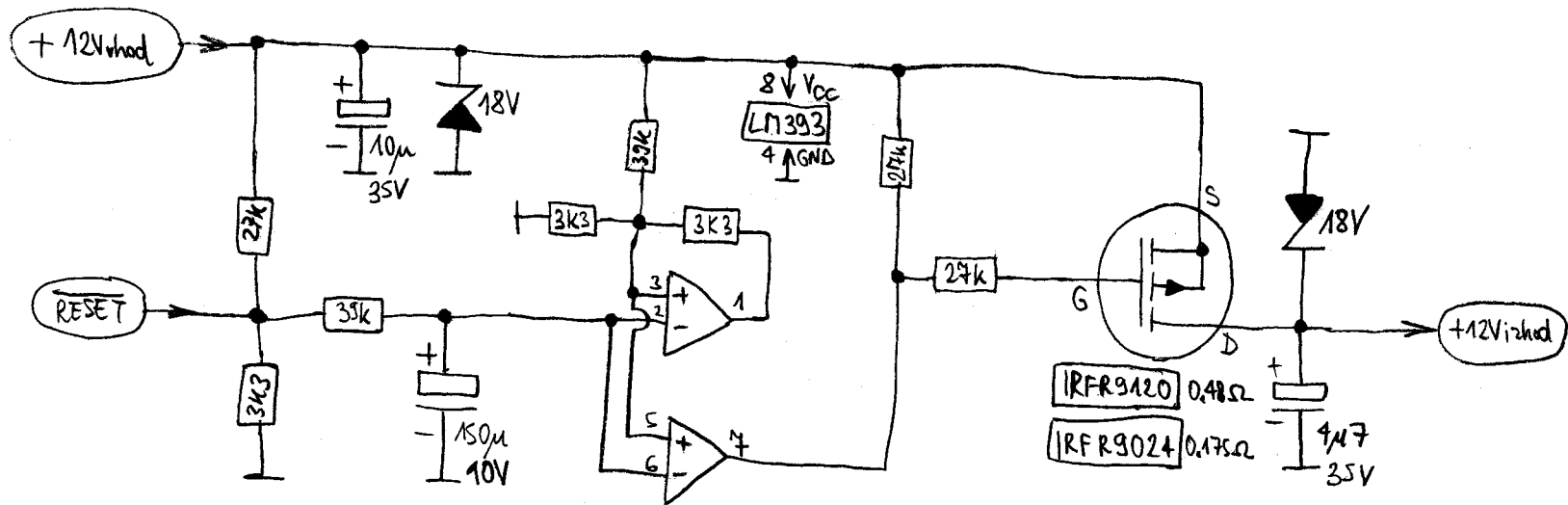
S55YFE



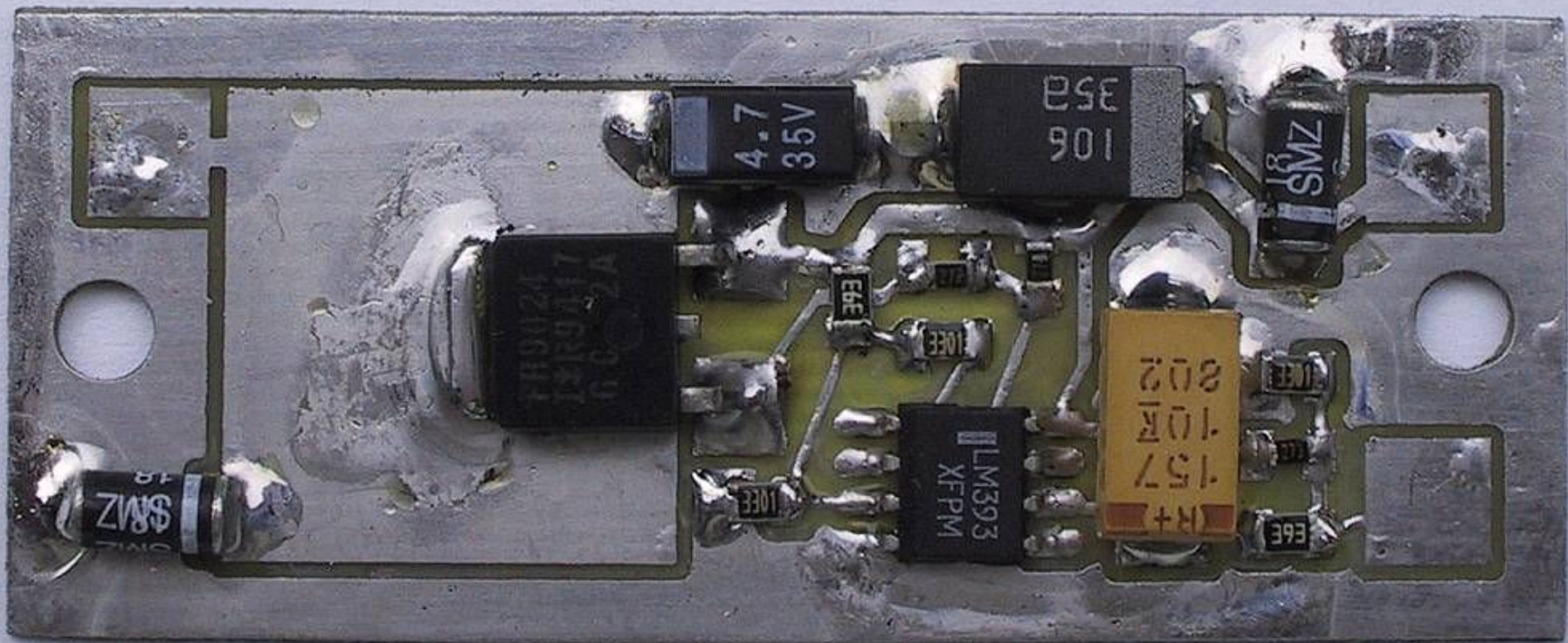
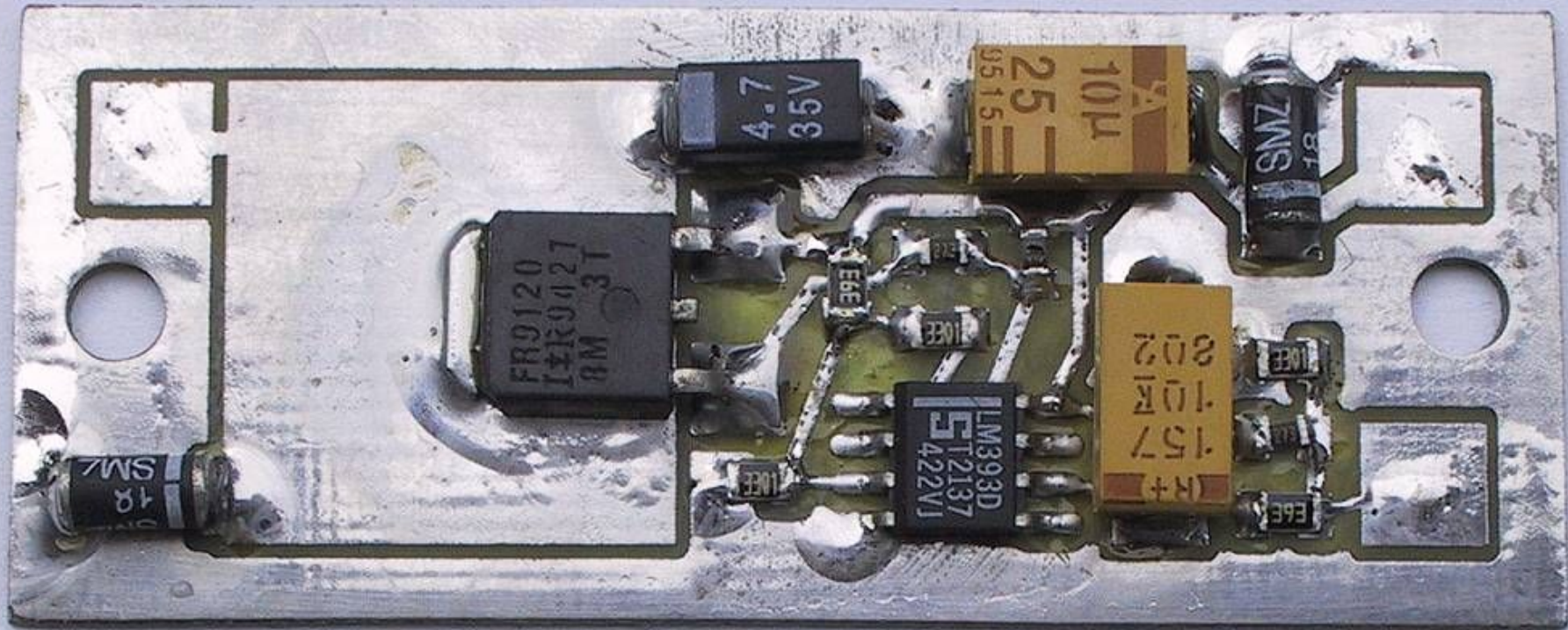


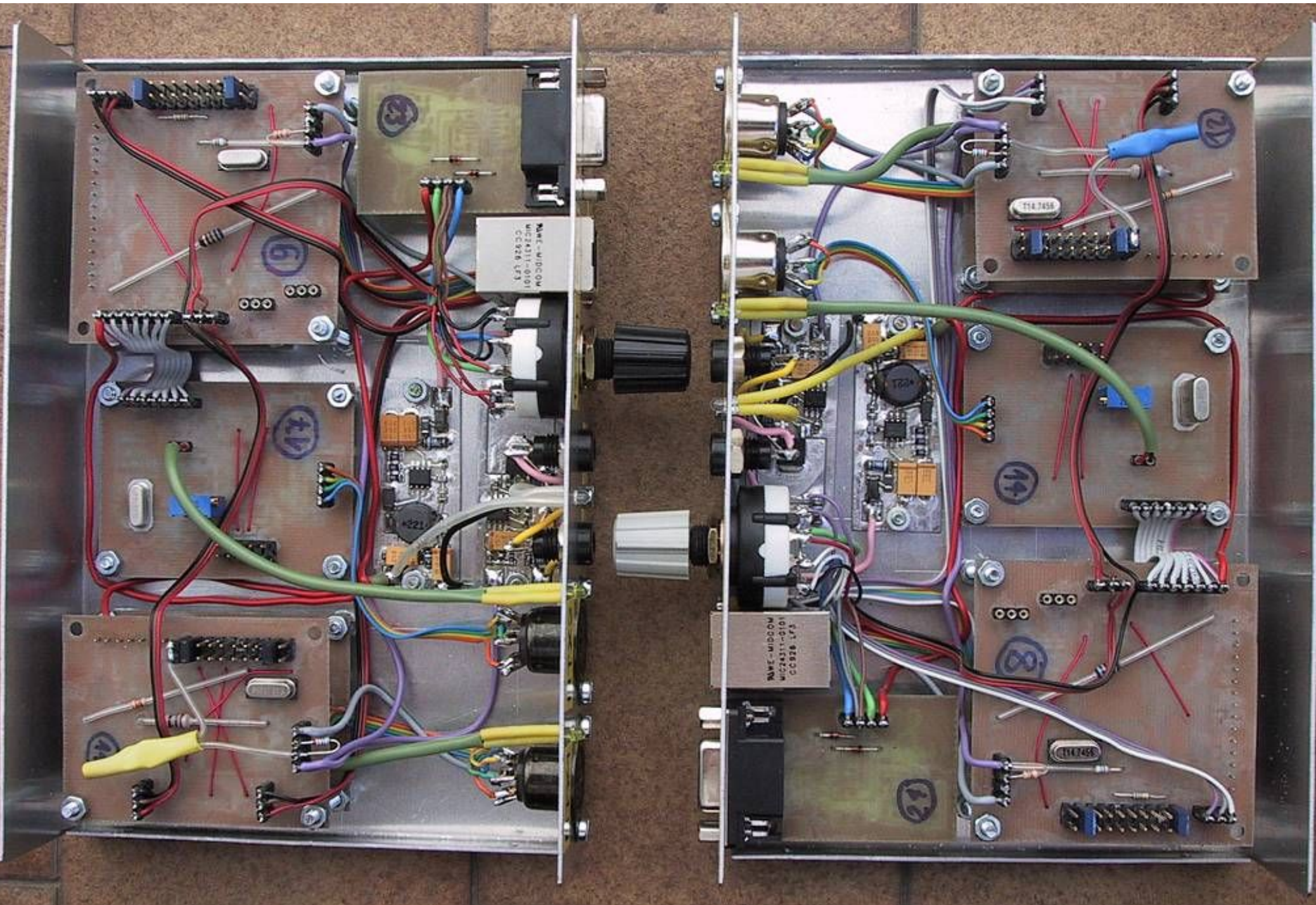


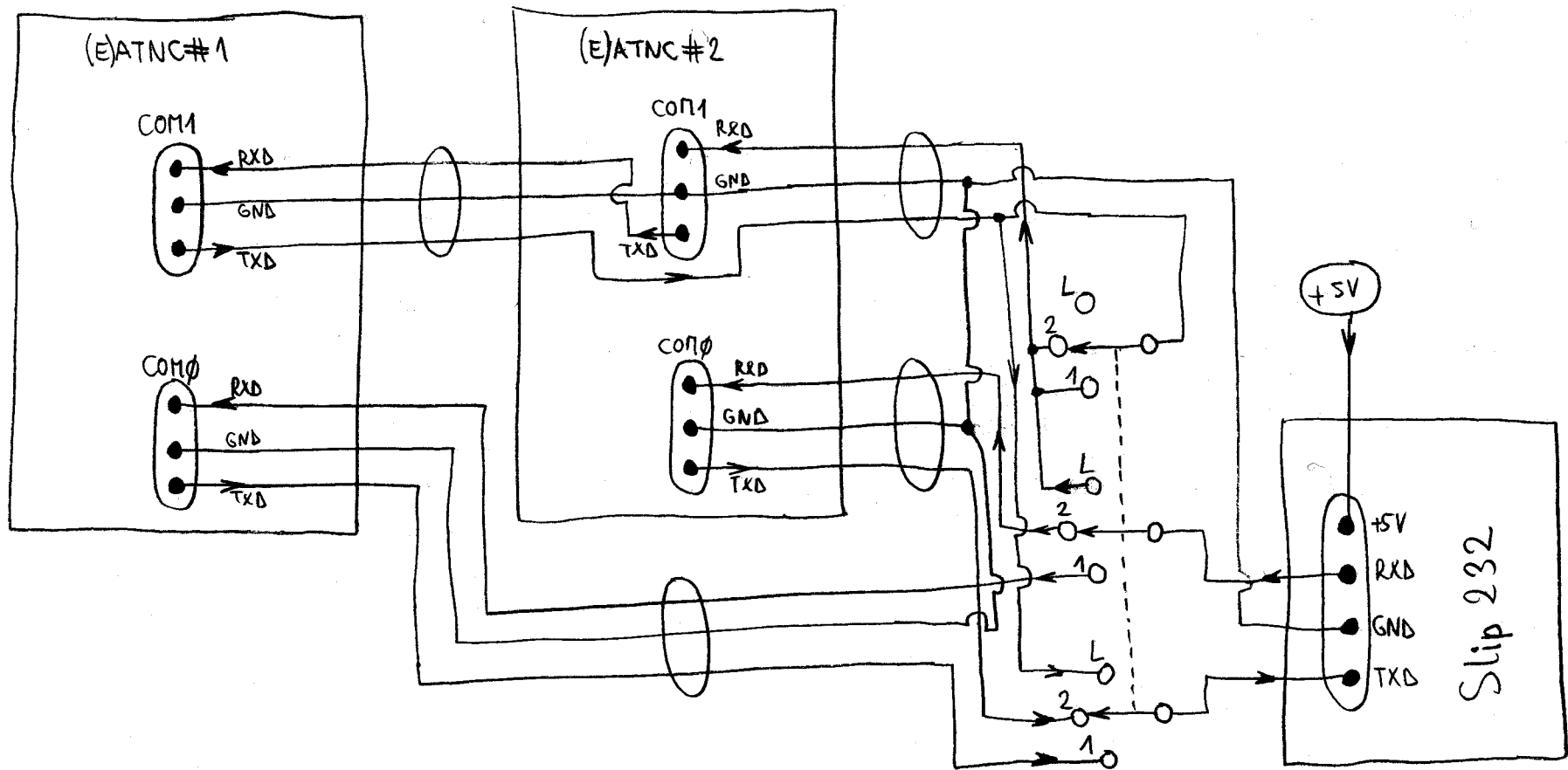
VEZAVA ATNCjev, EATNCjev IN WLAN V VOZLIŠČE ASV



Vežje za RESET ASV  
 553MV 08/03/2010







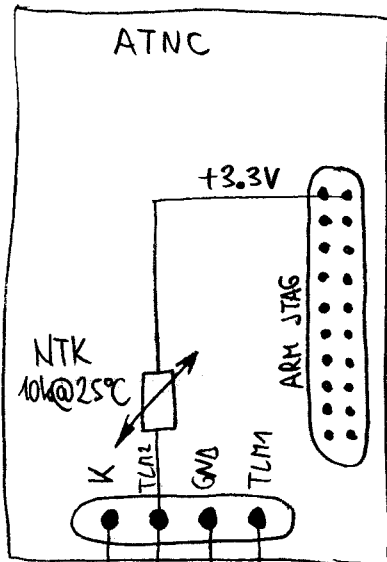
RS-232 preklopnik 3x3 v ASVju

S53MV 14/11/2010

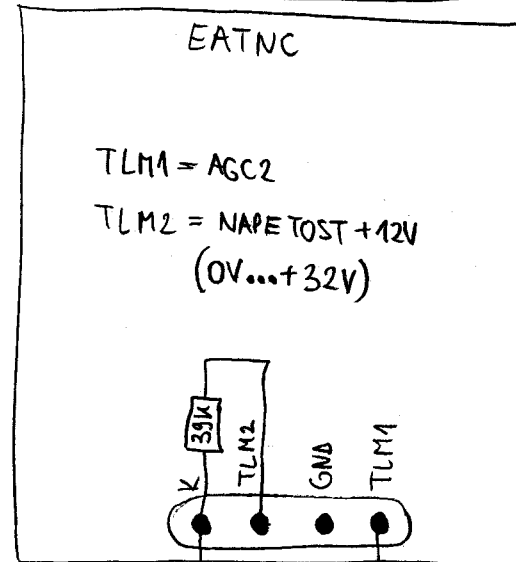
Y 3DC Ø 25 3DC FFFFFFFØ6 43

Y 3DC Ø 25 14Ø Ø 56

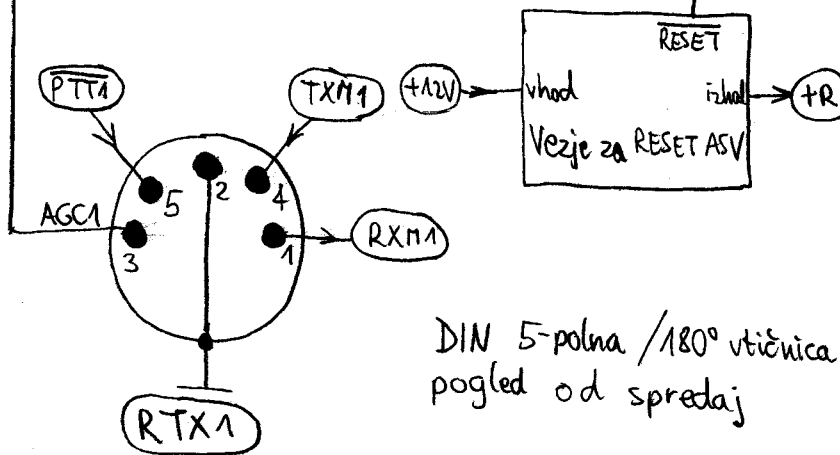
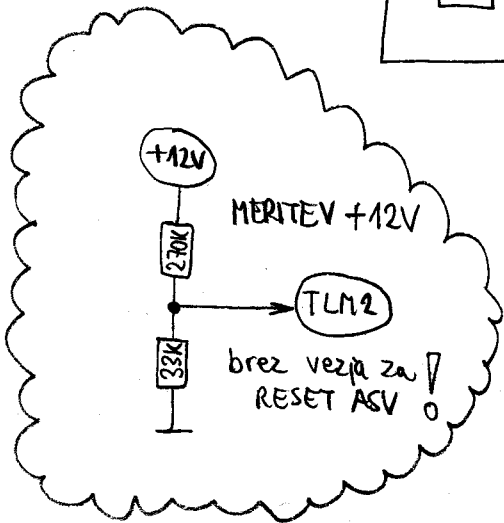
TLM1 = AGC1  
 TLM2 =  
 = TEMPERATURA  
 (-25°C...+75°C)



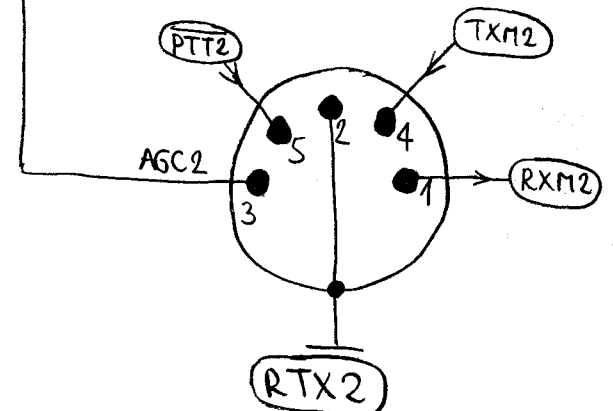
TLM1 = AGC2  
 TLM2 = NAPETOST +12V  
 (0V...+32V)



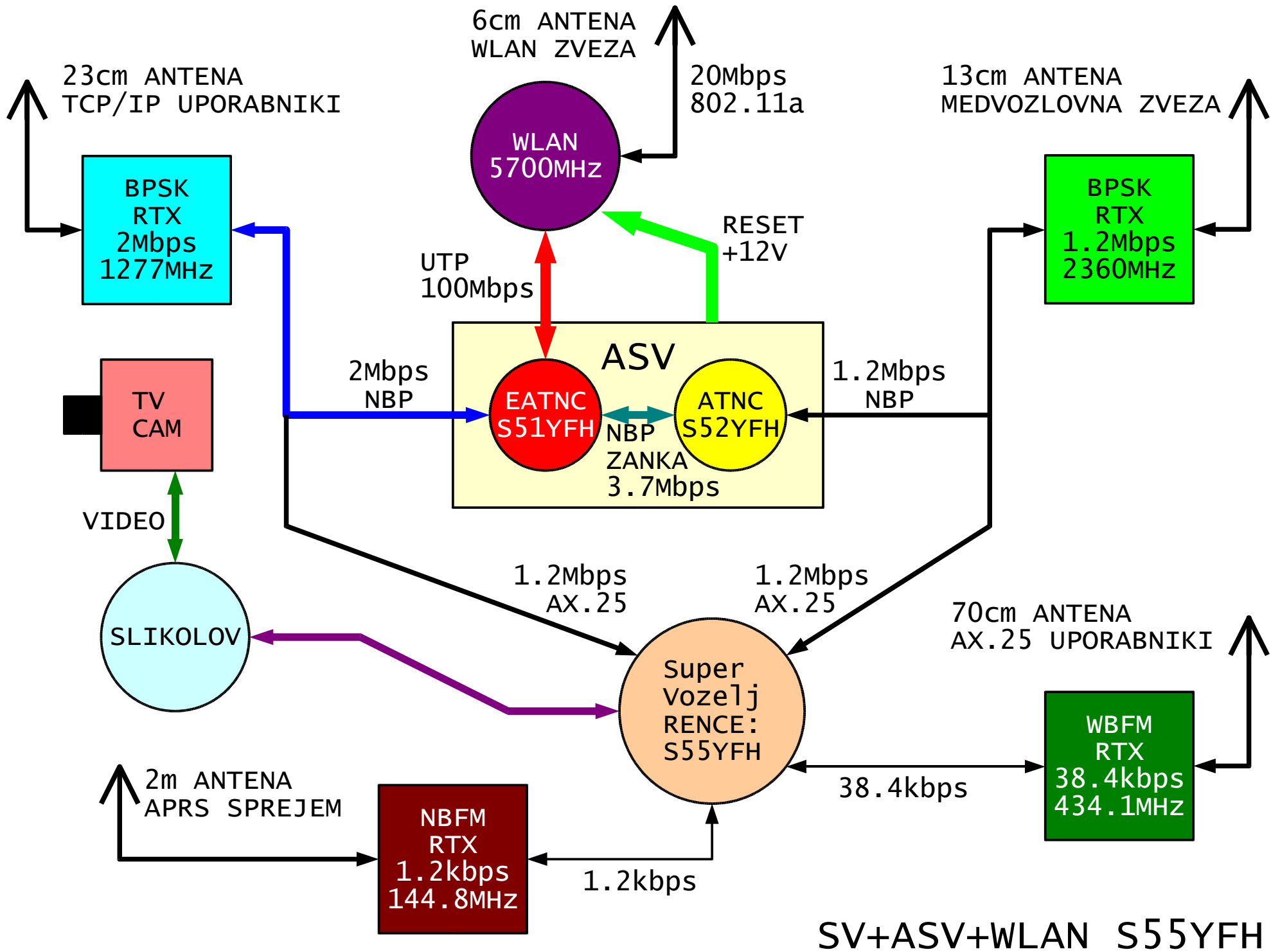
Telemetrija in  
 telekomanda ASV  
 S53MV 14/11/2010



DIN 5-polna / 180° vtičnica  
 pogled od spredaj







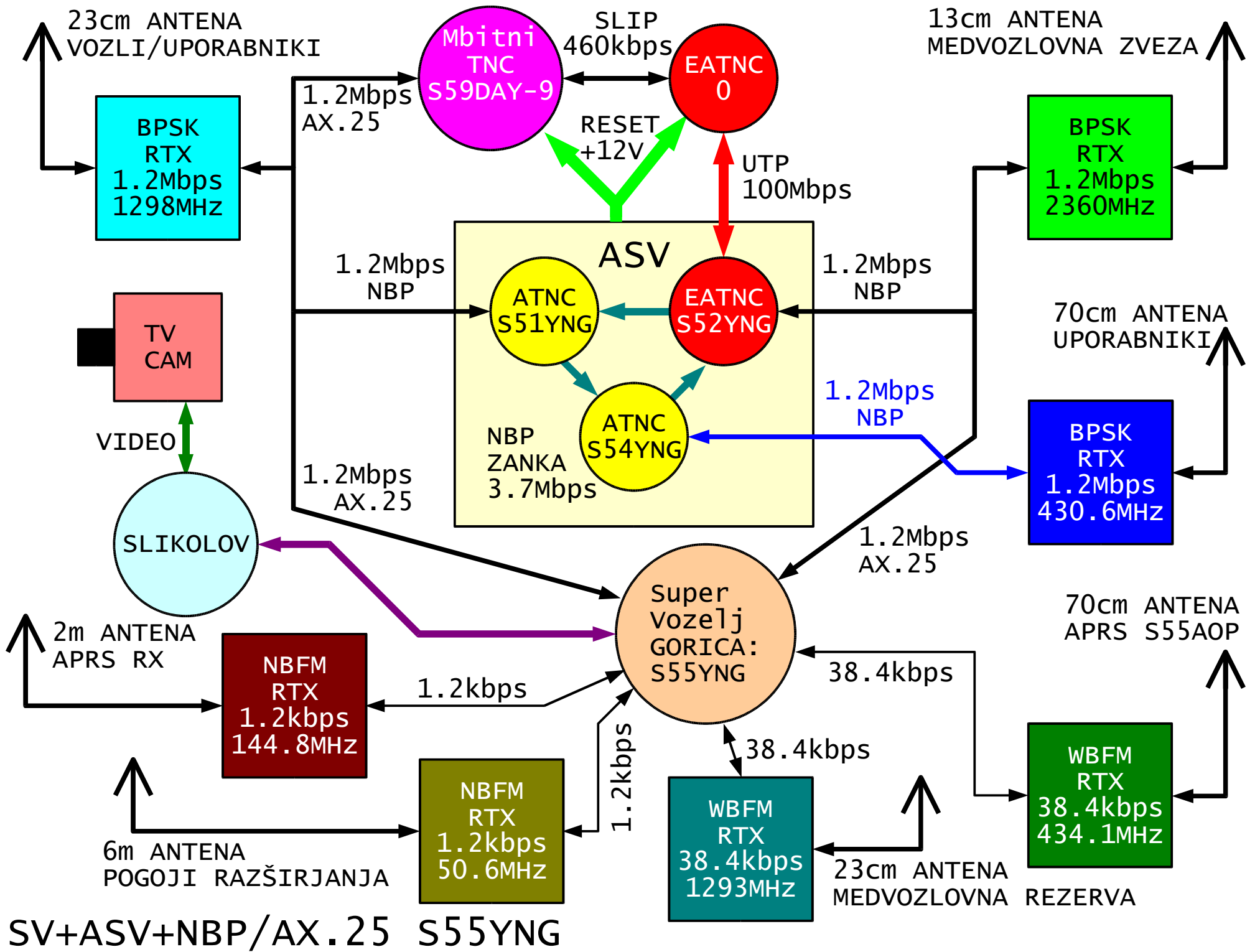


S55YFH

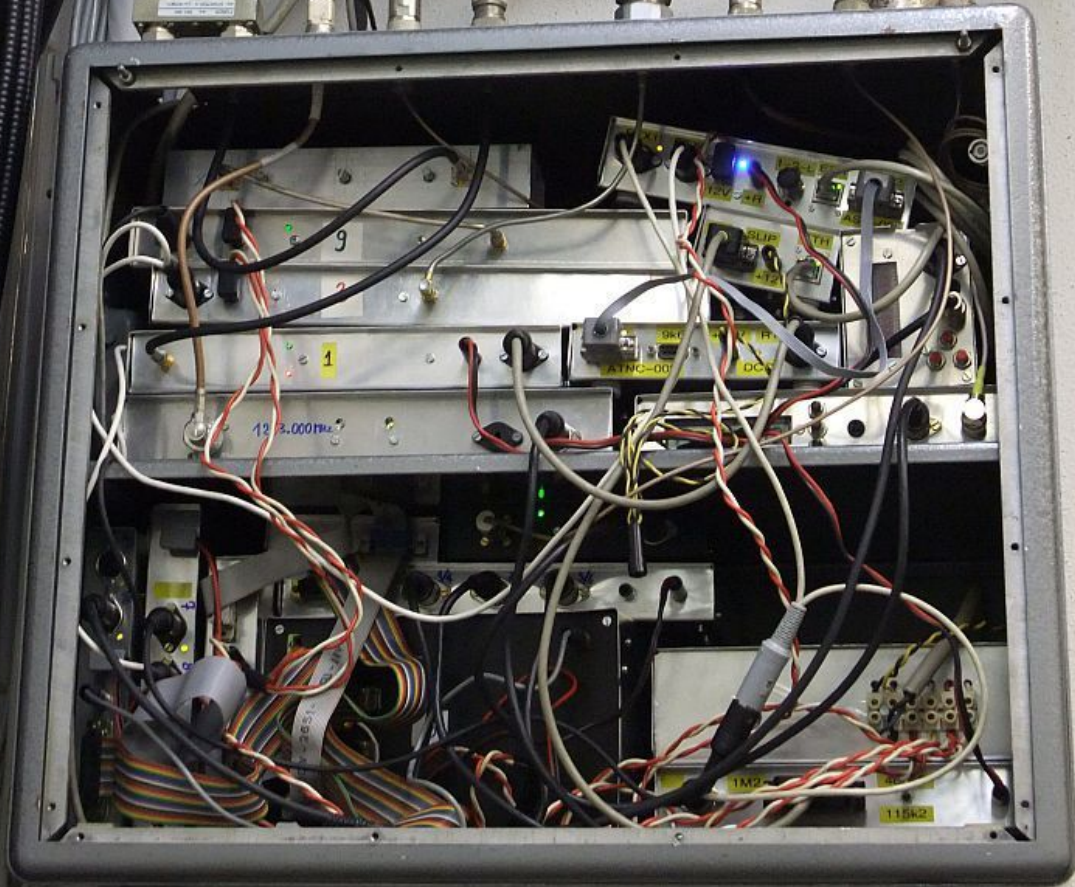


S55YFH





S55YNG



A photograph of a radio tower or antenna array. The tower is a complex structure of metal poles and cross-arms. It features several large, white, parabolic satellite dishes of various sizes. Some are mounted on the tower's main structure, while others are on separate supports. The background is a clear blue sky. The lighting suggests it might be late afternoon or early morning, as the shadows are long and the colors are slightly warm. The text '70cmPSK' is overlaid in yellow in the center, and 'S55YNG' is overlaid in yellow in the bottom right corner.

70cmPSK

S55YNG

S55YNG



