P275E
FM Monitor

Firmware version 2.2e

User Guide

Contents

1 Introduction

1.1 Using this guide

This guide covers the P275E FM Monitor device. It provides the information needed to install and using the equipment.
Please read this entire guide and familiarize yourself with the controls before attempting to use this device.

If you have any questions or comments regarding this document, please contact us via email. We welcome your feedback.

1.2 Description of the equipment

The P275E FM Monitor forms a quick and economic solution for remote FM broadcast monitoring and measurements. It is especially suitable for broadcasting locations where direct listening and monitoring of the signal is not possible due to the great distance.

The device extends the original P275's capabilities with direct Ethernet communication and adds some other useful features:

- Remote control and access to the values via TCP connection or integrated HTTP server
- Configurable 5V logic outputs can be activated in case of alarm condition or can remotely reset any device in the broadcast chain
- The aluminium case provides excellent shielding in strong RF signal environment
- Switchable attenuator extends the input power range up to 1W

The device fully supports the FM Scope and RDS Spy software for Windows.

1.3 Other documents

This document is not a complete reference manual. Please follow these resources for complete information:

- Specification of the Ethernet module Lantronix XPORT-05R (XP1001000-05R), http://www.lantronix.com
- P275 FM Broadcast Analyzer User Manual
- FM Scope User Guide
- Support section at http://www.pira.cz

1.4 Technical parameters

Outer dimensions	144 x 105 x 37 mm
Power supply voltage	5 V DC
Ripple allowed	max. 100 mV pp
Supply current	max. 350 mA
Power supply connector	2.1 mm
RF input	BNC 50 ohms
Max. input RF power	1 W (attenuator ON) / 10 mW (attenuator OFF)
Attenuator	20 dB (+/- 2 dB)
Unwanted inherent reception	< 35 dBµV
Remote listening audio format	ADPCM 82.5 kbps 1-ch
Measurement data formats	ASCII, JSON, HTTP

IMPORTANT!!! The device power supply voltage is 5 V. Exceeding that voltage will result in permanent damage to the device! Always check the power supply voltage or use the original power supply adapter.

2   Hardware description

2.1   Internal layout

2.1.1   Installation of the P275 board (applies to kit version only)

In the case the P275 receiver board has not been installed yet, follow these steps:

1. Loosen the four screws at the corners of the panel on the side of the BNC connector and eject the panel including the mainboard
2. Place the receiver board in the prepared position on the mainboard, making sure all connectors are properly connected
3. Fix the receiver board with four M2.5 screws on the spacers
4. Insert the assembly back into the aluminium box and screw the panel

To use all available functions the P275 receiver board must contain firmware version 2.2e or later.
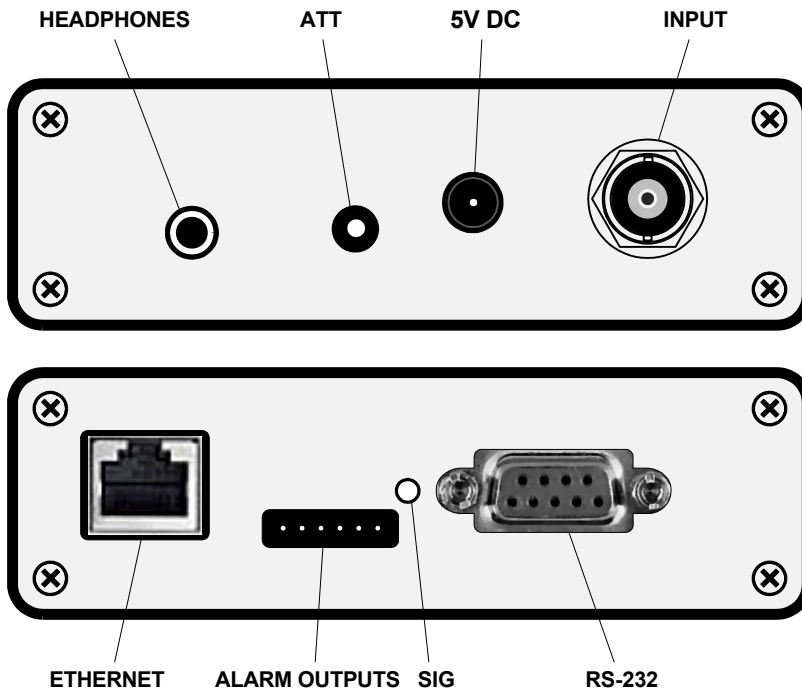
2.1.2   Mainboard description
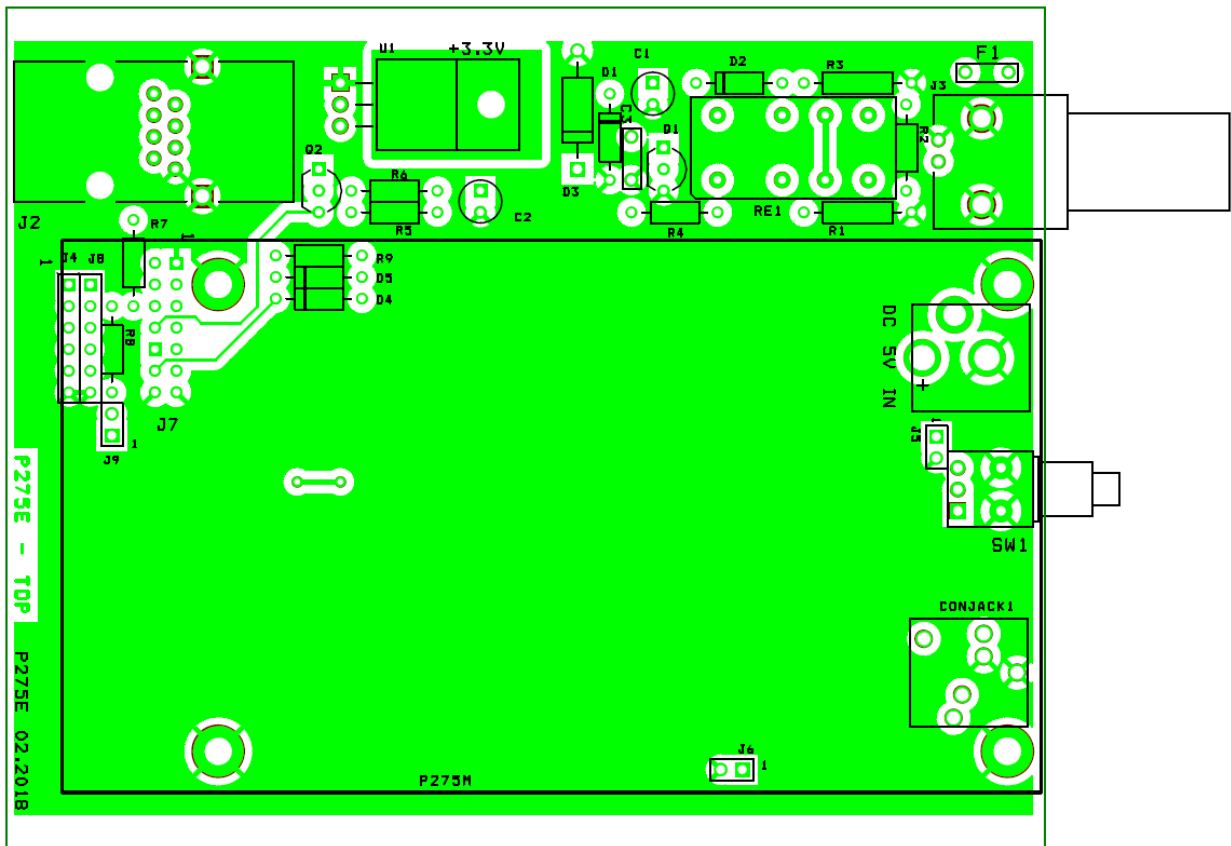
The connection diagram is attached to this document.

2.2   Connectors, control elements and status indicators

All the elements can be found on the side panels.

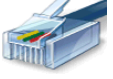| Connector or element	Description
Headphones	Stereo 3.5mm JACK connector for optional connection of headphones.
ATT (RF attenuator)	Controls switchable attenuator for the input signal. The attenuation value depends on specific hardware configuration, by default it is 20 dB (+/- 2 dB). The switch has 3 positions: ON – the attenuator is enabled OFF – the attenuator is disabled SW – the attenuator can be remotely controlled, see section 4.3.1. For the MPX input signal, the switch must be in OFF position.
5V DC	Power supply connector. Recommended power supply adapter: 5 V, min. 1 A, connector 2.1/5.5mm, + inside. **IMPORTANT! Exceeding the voltage will result in permanent damage to the device!**
Input	Input connector for RF or MPX signal. Nominal input impedance is 50 ohms. Max. RF power (with attenuator disabled) is 10 mW. Max. MPX signal swing is 8 Vpp.
RS-232	The serial port allows local connection and emergency setting of network parameters, see section 3.2.3. Since fw version 2.2e, the device supports concurrent communication on the RS-232 and Ethernet ports.
SIG	By default, the LED indicates reception of a station. This setting can be changed, see section 4.3.2.
Alarm Outputs	Optional outputs for operating status indications or for general use. See section 4.3.2.
Ethernet	Ethernet connector RJ-45. Use a standard cat 5e cable to connect to an Ethernet network.

3 Installation

3.1 Hardware installation

For basic steps, please follow the original P275 User Manual.

3.1.1 Communication ports

The device is equipped with two independent communication ports: Ethernet and RS-232. Each port can be used by different application. Each port supports the communication protocol as described in section 'USB and COM Port Communication' in the original P275 manual.

Physical plug	Port reference	Description and purpose
Ethernet	Port 1	All Ethernet activity is handled via this port. Supported network protocols include DHCP, DNS, TCP and HTTP. The port supports single client (connection), maximum data throughput is 115200 bps.
RS-232 / USB micro	Port 2	This port is dedicated for especially for local connection or for the Emergency mode of Ethernet setup. Where required, any commercially available USB-to-RS232 adapter can be connected as well. Supported baud rates for data acquisition are 19200 and 115200 bps. The device supports autobaud feature.

3.2 Ethernet setup

3.2.1 Determining the IP address and setting the network parameters

Connect the device to a local network and connect the power supply. If the IP address of the device is already known, type that IP address to address bar of the web browser and follow the instructions on the screen. When you're prompted for name and password, only confirm the blank dialogue box by clicking on the OK button.

If the device IP address is not known yet (usually on first use), the IP address can be determined and the Ethernet connection can be configured by the **Lantronix DeviceInstaller** application, which is available for free download at **http://www.lantronix.com** or at **https://pira.cz/fm_broadcast_analyzer/di.zip**.
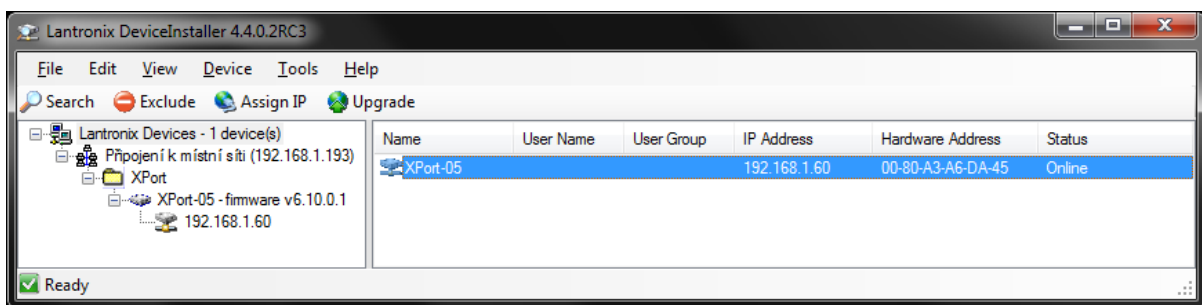
If the above method cannot be applied, follow the section 3.2.3.

By default (option 1 on the next picture) the IP address is assigned automatically from DHCP server or AutoIP feature.

If fixed IP address is desirable, select option 2 and fill the values according to the network configuration:

Confirm current changes by pressing **OK**, select **Apply Settings** after completing the set-up.

3.2.2   Setting-up the communication parameters

The serial communication parameters of the embedded Ethernet module can be verified on the Serial Settings tab.

The P275 receiver communicates at 115200 bps, no parity, 8 data bits. It is especially important to keep these parameters:

On the 'Connection Settings' tab, set the parameters of the embedded TCP server, especially the local port on which the device will accept the client application connection. Note the selected port value for later use.
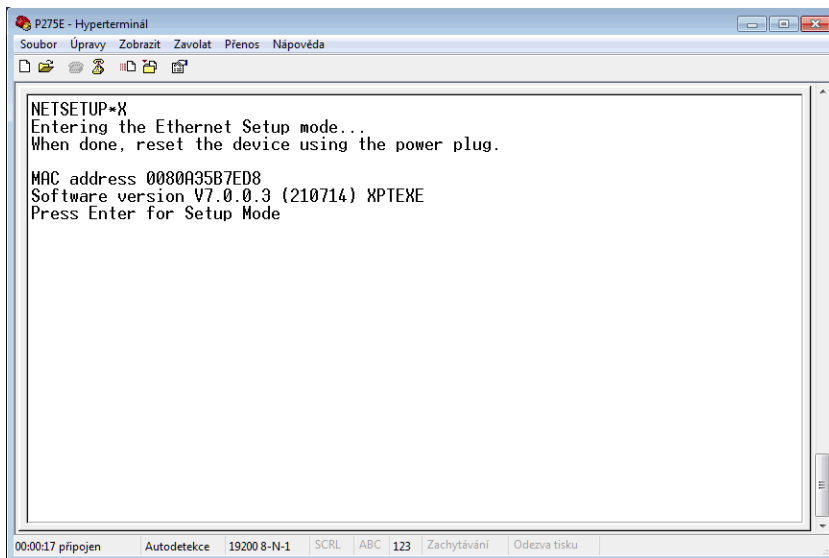
3.2.3   Emergency mode

The emergency mode allows direct local serial communication with the embedded Ethernet module, including its setting to factory defaults.
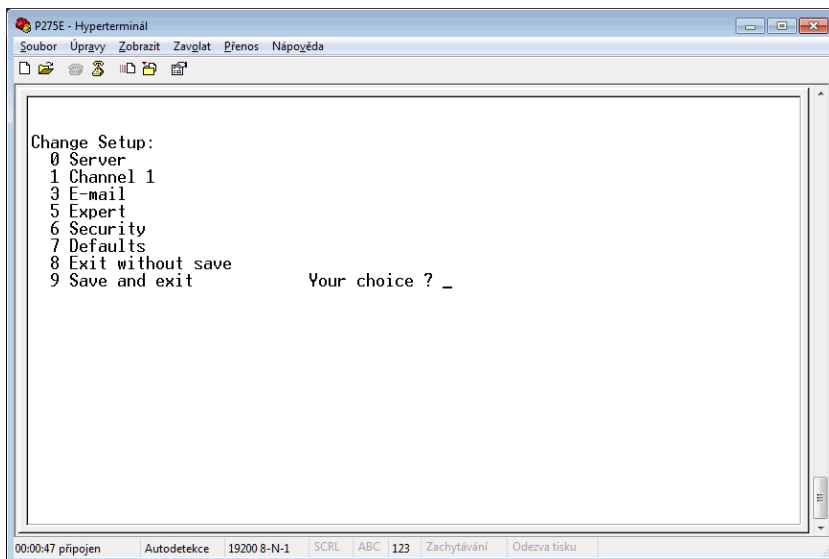
This option will be probably used rarely, in the cases when it is not possible to establish a network communication with the device, for example after setting of incorrect network parameters or losing the access password.

Following steps may be applied:

1. Connect the device to a PC using a serial cable or USB to serial adapter.
2. On the PC run a terminal application (e.g. HyperTerminal or PuTTy) and set following parameters:
   Speed 19200, parity none, data bits 8.
3. In the terminal, click on Connect, then write this keyword: NETSETUP*X
   The device is case sensitive and does not return echo.
4. Immediately after the prompt press the Enter key.
5. Continue according to the instructions on the screen. Finally, select exit and save configuration.
6. Reset the device by disconnecting and connecting the power supply.

4 Using the device

4.1 FM Scope application

For basic steps, please refer to the FM Scope User Guide.

4.1.1 First communication with the FM Scope

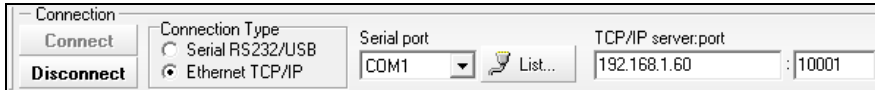The FM Scope application is free for download at **https://www.pira.cz**. The application version must be 1.5 rev. 18 or later.

In the Connection field, select 'Ethernet TCP/IP' connection type, fill the IP address of the device and the network port from the previous step. Click on Connect.

The application status bar at the bottom indicates the connection status. Verify the function by selecting a local station and clicking on Tune.

4.1.2 Headphones audio output setup

The analogue audio output may be useful in some specific applications. The audio output options are available in the menu: Options – Device Setup. Here you can adjust volume, pre-emphasis and some more parameters.
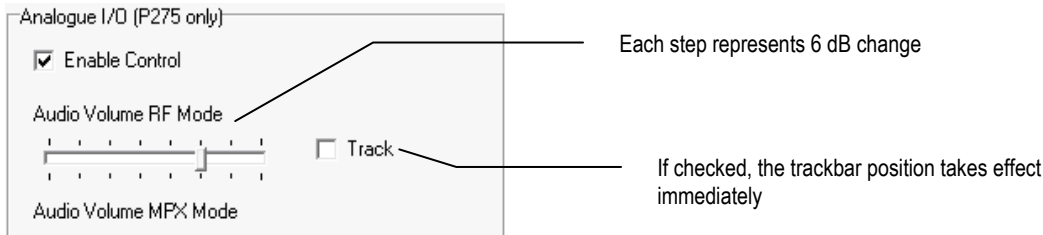
Note: Requires firmware version 2.2b r6 or later and FM Scope version 1.6.1 or later. The headphones audio output is not suitable for audio applications like rebroadcasting. Higher volume results in better S/N.

4.1.3 Ethernet options

The Ethernet options are available in the menu: Options – Device Setup.

Web PIN	Restricts the access to the device's embedded web server unless the predefined PIN is entered. The PIN consists of four digits. Allowed range is '0000' to '9999'. See also section 4.2. Default value is '0000' which means 'no PIN entry is required'.
HTTP response header options	Specifies HTTP response header options for selected attribute. The 'keep-alive' option cannot be selected unless 'Inactivity Timeout' is enabled in the Disconnect Mode setup window. See also sections 3.2.2 and 4.2. Default and recommended value is 'Connection: close' which requires no extra care.
Ethernet RESET Inactivity Timeout	Forms an additional simple Ethernet watchdog. If no meaningful command is received during the period specified, a RESET operation is performed on the embedded Ethernet module. Default value is 0 (disabled).

4.1.4   Saving current configuration

Once all settings are done, save the configuration to the device's non-volatile (permanent) memory:

In toolbar, click on the button

The device is now ready for stand-alone operation.

4.1.5   Remote audio listening

The device supports remote audio listening of currently tuned station, incl. RDS functions PS, RT and TA.

In the FM Scope menu, select Utilities – **P275E Audio Stream Player**:
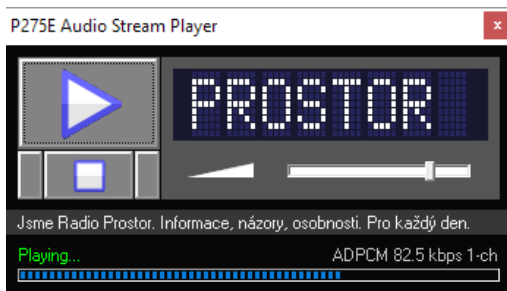
The audio streaming uses lossy audio compression. It is thus not intended for audio quality evaluating.

Minimum version required: FM Scope 1.7, P275E firmware 2.2d.
During the remote audio listening, the FM Scope does not provide MPX and RF spectrum functions.

4.2 Embedded HTTP server

The HTTP server is only available in TCP server mode (Connect Mode – Passive Connection – Accept Incoming: Yes). The HTTP server is only accessible if the TCP server is not serving any existing connection. The HTTP server's access URL is composed of the device IP address and the Connection TCP port (Endpoint Local Port).

Note: The HTTP client must comply with the RFC requirements related to the Connection parameter in the HTTP response header. Default Connection mode is 'close'. If another mode is required or if the connection needs to be closed by the P275E itself, configure the Disconnect Mode – Inactivity Timeout in the Ethernet setup.

4.2.1 Display the values in a web browser

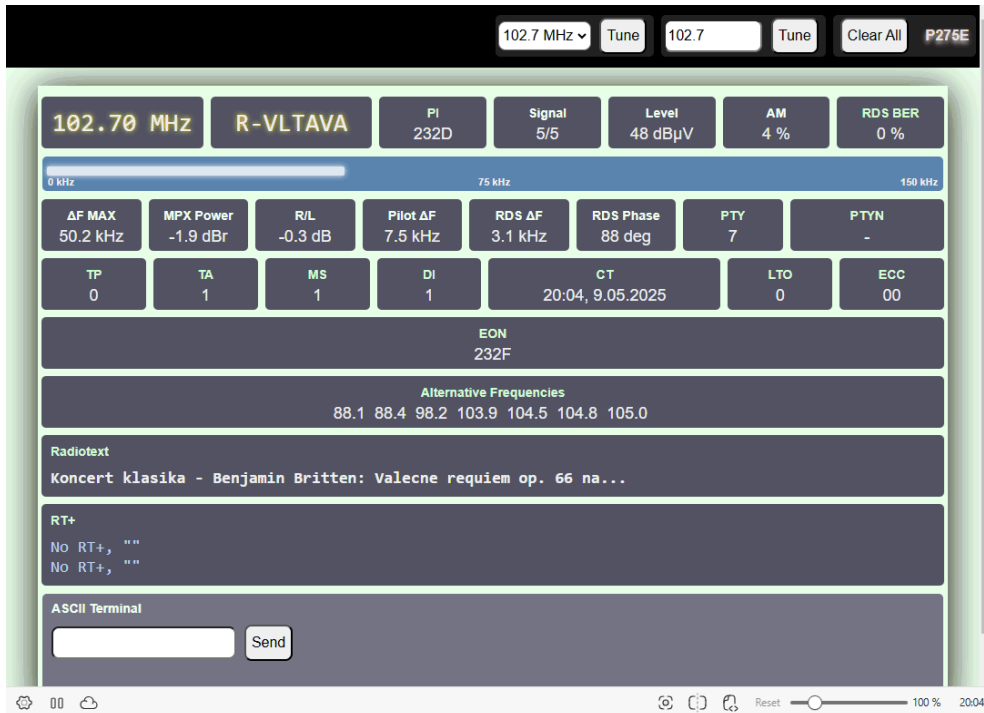Type the web server URL to the PC web browser or to your mobile device, for example `http://192.168.1.60:10001/`

Only one client can download the data at the same time. Multiple clients are supported via the web server integrated in the FM Scope.

4.2.2 Getting the values in JSON format

The device can be fully controlled by HTTP GET method and any value can be acquired this way. Returned data format is JSON. The query format is according to the 'USB and COM Port Communication' section in the original P275 manual. The query is a part of the URL.

Example (get current frequency, signal level and deviation MAX):

    http://192.168.1.60:10001/output.json?y=%3FF%3FU%3FM

```
{
  "Frequency": " 96.70 MHz",
  "Level": "   36 dBuV",
  "MAX": " 53.3 kHz"
}
```

URL encoding table:

?	%3F
*	%2A
:	%3A
,	%2C

Example (tune to 106.2 MHz):

    http://192.168.1.60:10001/output.json?y=106200%2AF

If the device PIN is different from '0000', the PIN needs to be included in the URL as the first attribute.

Example (tune to 106.2 MHz, device PIN included):

    http://192.168.1.60:10001/output.json?pin=1234&y=106200%2AF

4.3 Further features

4.3.1 Remote control of the attenuator

If the attenuator switch is in the 'SW' position, the attenuator can be controlled remotely. This can be done from the FM Scope software (Options – Alarm Outputs) or using special commands:

ASCII command	Operation
ARJ:GD*X	Attenuator disabled
ARJ:GH*X	Attenuator enabled

When sending the commands from the FM Scope script, insert them as a parameter of the Send command:

Send(ARJ:GD*X)

resp.

Send(ARJ:GH*X)

4.3.2 ALARM outputs

Six pins are available: four independent digital outputs, optional +5V output and ground.

The function of the ALARM outputs is described in the P275 FM Broadcast Analyzer User Manual.

For setting up the alarm outputs, select Options – Alarm Outputs in the FM Scope software. For each output the user can assign a function and additional parameters, if apply. For manual control, the response is immediate upon clicking on the ON/OFF buttons. Other settings take effect when confirmed by the Send button. To make the configuration permanent, follow section 4.1.4.

The outputs can be also controlled from a script (for example for driving a relay switching between two antennas):

| ASCII command	Meaning
ARI:GD*X	Pin 2 logical 0, SIG LED on
ARI:GH*X	Pin 2 logical 1, SIG LED off
ARJ:GD*X	Pin 3 logical 0, attenuator disabled (optional)
ARJ:GH*X	Pin 3 logical 1, attenuator enabled (optional)
ARK:GD*X	Pin 4 logical 0
ARK:GH*X	Pin 4 logical 1
ARL:GD*X	Pin 5 logical 0
ARL:GH*X	Pin 5 logical 1

Optional +5V output is available on pin 1, the ground is on pin 6.

An indication LED, marked as 'SIG', is connected between pins 1 and 2. By default it indicates when a station is tuned:

ASCII command	Meaning
ARI:03*X	After power-up or tuning to a new station the LED is on. It turns off within 30 seconds if no signal is being received or the signal is weak. After a correct signal is fed into the unit, the LED turns on again. This is a default setting.

5 ANNEXES

5.1 Connection diagram
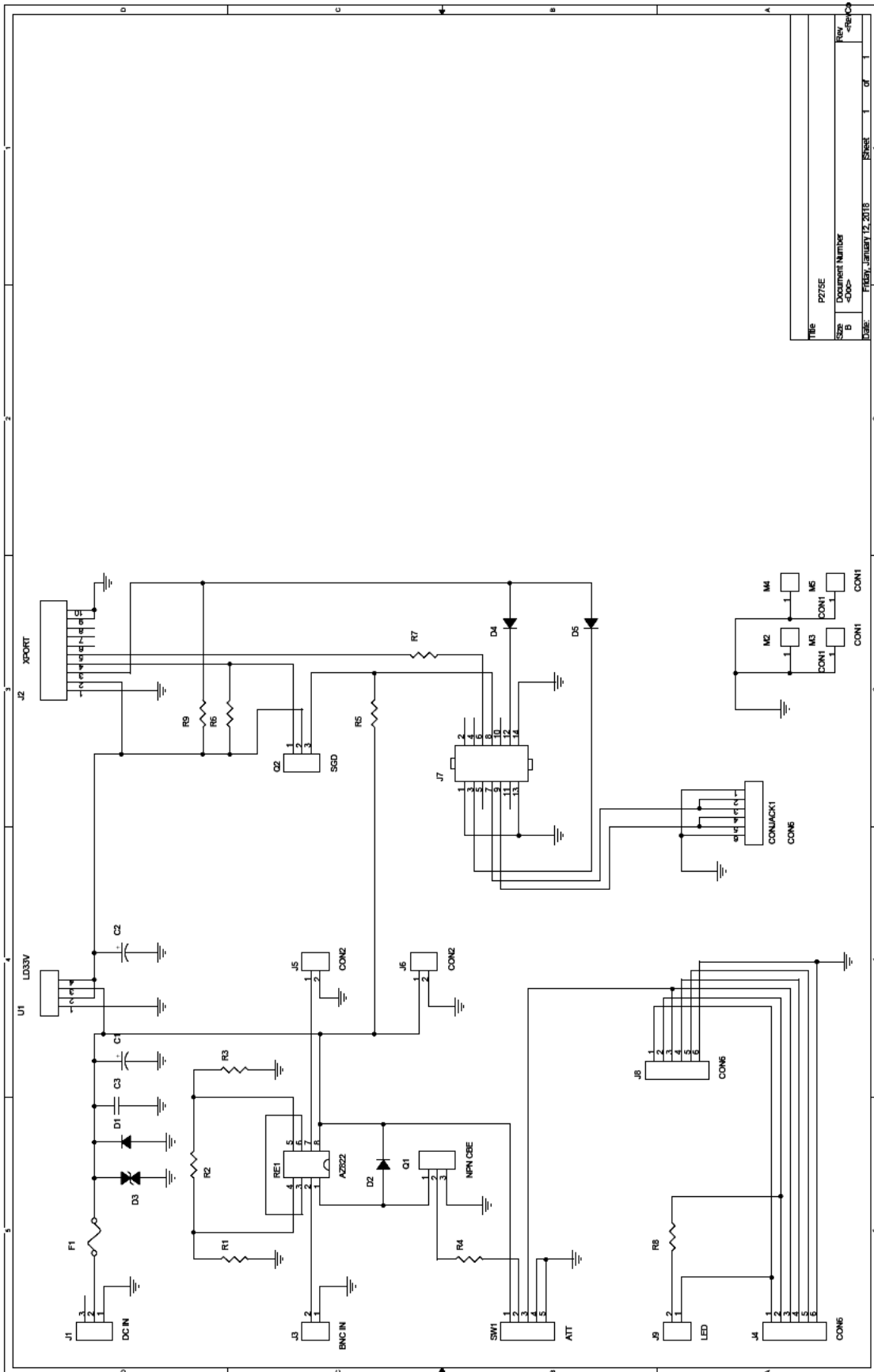
5.2   Part list

Marking	Description	Ordering code
J1	Coaxial DC power supply connector 2.1 mm	
J3	BNC connector 50 ohms, 90 deg.	BNC-125
SW1	Switch ON-OFF-ON, SP3T	TSSM1032C3
F1	Polymer fuse 0,7 A	
D1, D2, D5	Schottky diode 1A	
D3	Transil 6 V	1.5KE6V8CA
D4	*Not placed*	
Q1	Transistor BC547B	
Q2	Transistor ZVNL120A	
U1	Voltage regulator 3,3V TO220	LD1117V33C
RE1	Signal relay 5V, DPDT	RS-5-L
R1, R3	Resistor 62 ohms 1 W	
R2	Resistor 255 ohms	
R4, R7	Resistor 470 ohms	
R5, R6, R8, R9	Resistor 2k	
C1	Capacitor 22 to 100 uF	
C2	Capacitor 10 to 22 uF	
C3	Capacitor 100 nF	
J2	Lantronix XPORT-05R	XP1001000-05R
J7	Female header 2x7	ZL262-14DG
J8	Female header 1x6	ZL262-6SG