DVI-100

User Guide

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Content

1 Introduction

1.1 Overview

This document contains information about installation, settings, and operation of the DVI-100 TETRA Radio Modem. Additional information is also available over the Internet, at the website www.TetraModem.com, in the FAQ pages. This includes practical guidance relating to antenna selection and installation, operating range, extension modules, software support, etc.

1.2 Safety Precautions

This equipment transmits radio waves in the frequency range 380 to 470 MHz or -800 MHz. Under certain circumstances, these radio waves could be harmful to any living being or electronic equipment near it. Care should be taken to ensure that the radio and antenna systems are installed and commissioned only by trained persons.

This radio equipment should not be used in life support systems or in safety systems without our prior written permission.

1.3 Disclaimer

We have carefully checked the contents of this document, and the hardware and software described in it, for compatibility. We cannot however exclude possibilities of deviations and cannot guarantee complete conformity of the document with the equipment it describes. If any corrections or improvements are to be made, they will be taken into consideration in the next edition of this document.

Important instructions are marked by the expressions "Important", "Note" or “Caution!”. These should be carefully observed. Explanations regarding these precautions can be found in the website www.TetraModem.com, in the Login Area pages.

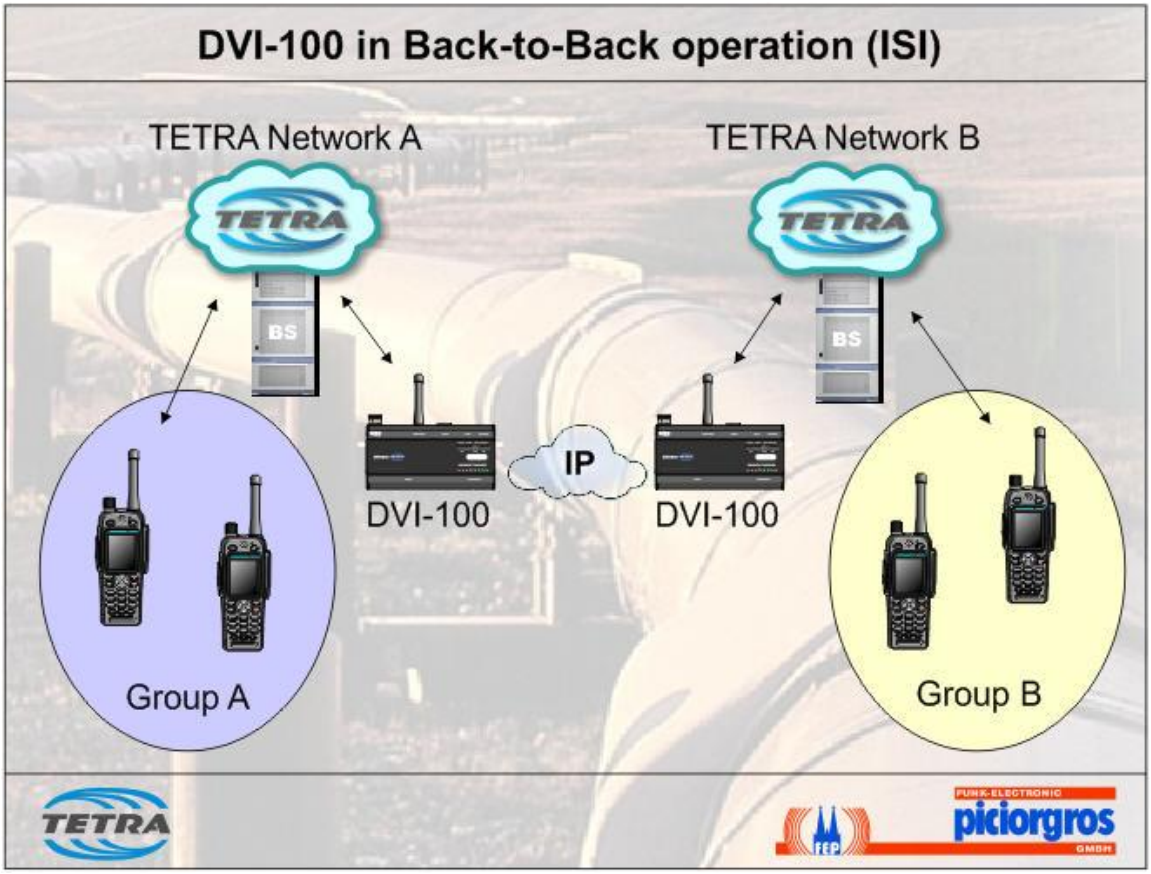
1.4 General description

The DVI-100 (Digital Voice Interface) will be attached to a TETRA Network in the same way as a normal TETRA hand portable, and it can be a Member of up to 25 talkgroups. When it receives a voice call, rather than decoding the digitally coded ACELP data stream into analogue audio and feeding it to the Loudspeaker, it is sent as a digital (UDP) data stream to its IP port. Connecting two DVI-100s back-to-back with each device connected to a different TETRA network (which could be different infrastructure manufacturer, different frequency bands or geographically separated), allows the networks to be "interconnected" based on group calls, status messages, and short data messages. As the voice data stream is not converted back into an analogue signal at any time, the voice quality has the same brilliant quality as received with a TETRA hand portable.
The DVI-100 can be used in each of the three following described scenarios.

1.5 Application scenarios

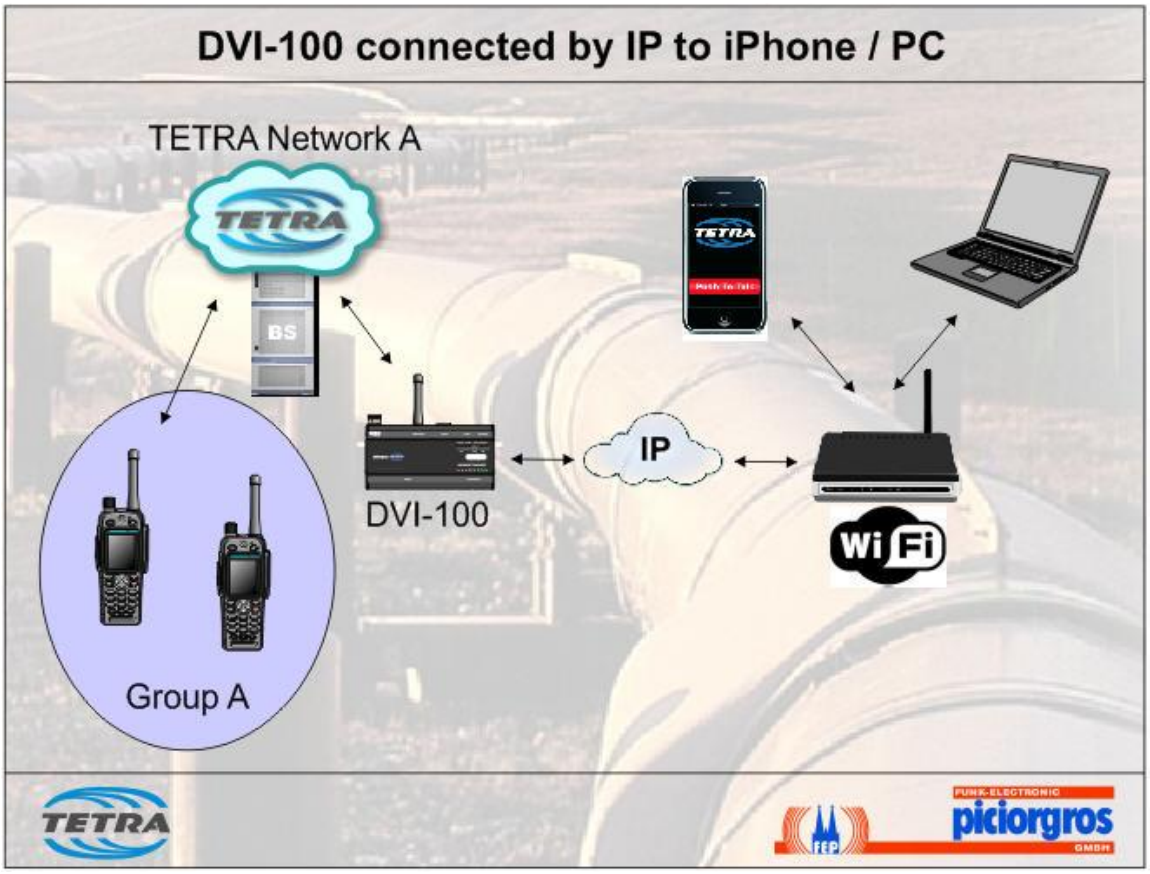
1.5.1 Back to Back Operation

With two DVI-100's logged into different TETRA networks and by connecting them via Back-to-Back IP, an easy ISI for voice and SDS transmission can be implemented.



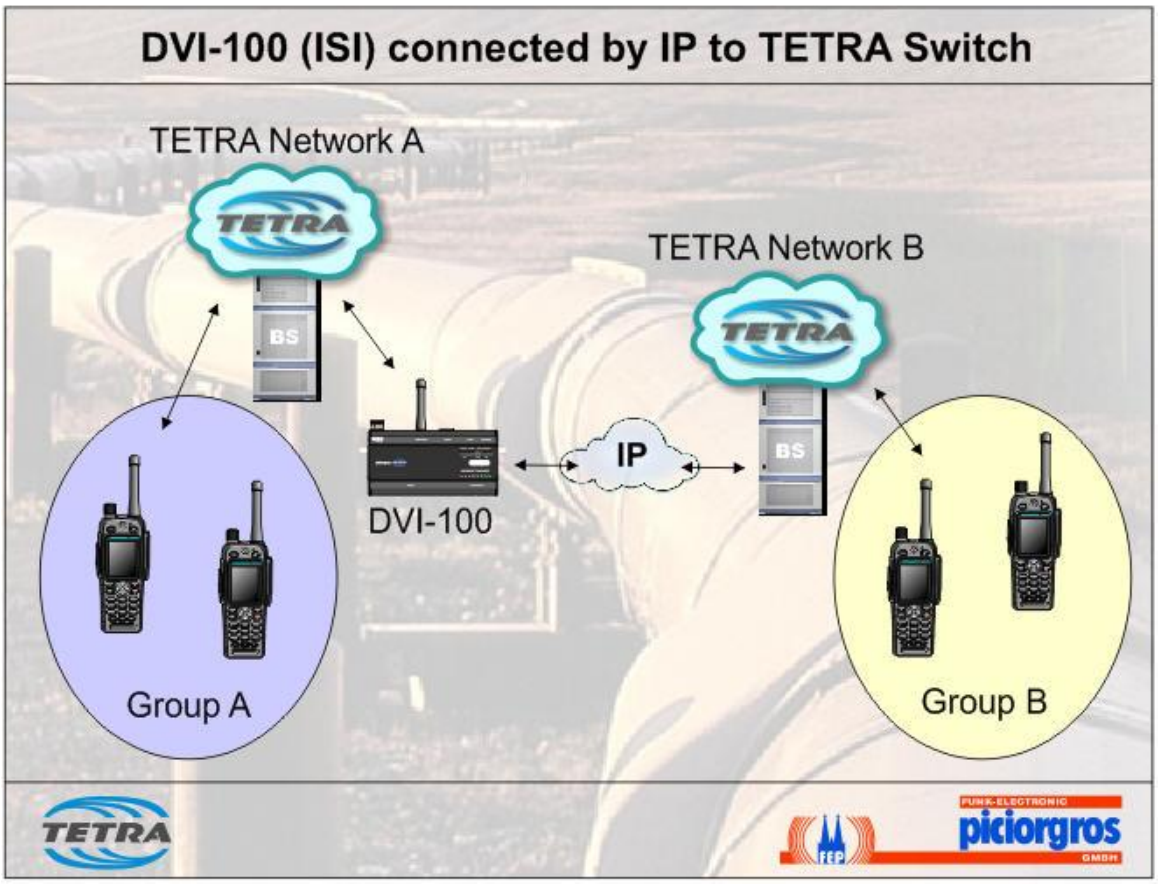
1.5.2 Connected to the iPhone or a Computer

Using the DVI with IP, the voice data can easily be sent to, or received by, a remote application, potentially running on any type of device. This allows the voice call to be bridged between the TETRA infrastructure and another device. An iPhone application is available, as well as Java based software for Mac or Windows Computers. This application can be useful, if a user needs to talk or just listen to a group within a TETRA network, even when they are out of coverage of the TETRA network.



1.5.3 Connected by IP directly to a TETRA switch

The PTX Protocol developed by the University of Dortmund and Piciorgros GmbH is license free and can be implemented to an interface device (PC) or directly into a TETRA switch. So an Inter System Interface (ISI) for voice and data based on groups can easy be implemented.

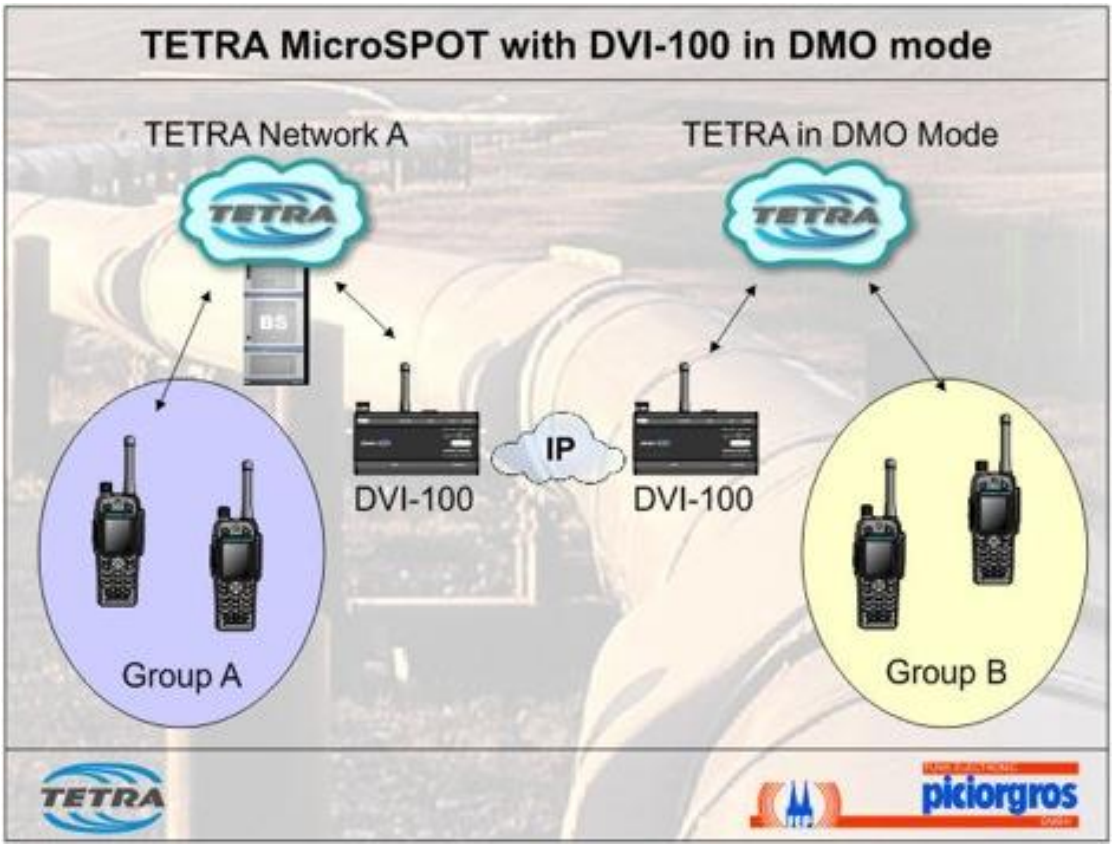


1.5.4 TETRA MircoSPOT with DVI-100 in DMO mode

This configuration can be used to create a local TETRA access point (MicoSPOT) which operates in DMO mode. The DVI-100 in DMO mode is connected by an IP connection to another DVI-100 in server mode, which is attached to a TETRA network.

All TETRA terminals in DMO mode and in range of the DVI-100 MicroSPOT can access the configured group(s) of the trunked TETRA network by using voice, SDS and status communication.

Sample applications for the MicoSPOT can be improving inhouse coverage or covering white spots inside a TETRA network. By using a reliable mobile IP link (3G or LTE) mobile forces can use the TETRA network even in uncovered areas.



2 Connections and Hardware Installation

2.1 Mechanical Details

The dimensions of the DVI-100 housing conform to DIN 43880, and therefore it can be mounted on a standard 35mm DIN rail [DIN EN 50022]. A serial interface ("COM") available as a standard 9-pin D-sub connector is available as a service interface and not used in operation.
On the lower side of the housing an RJ-45 connector for the Ethernet port allows the DVI-100 to be hard-wire networked with a LAN or in a minimal configuration with a second DVI-100 for back-to-back operation.

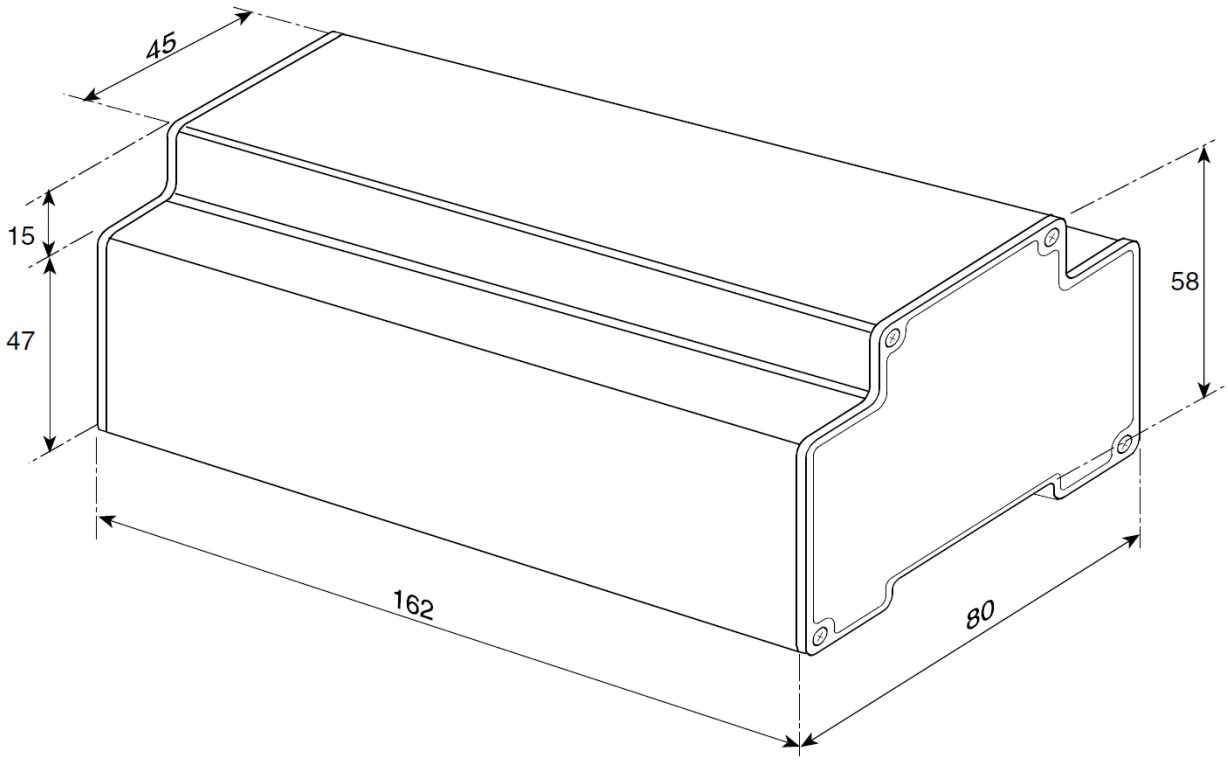
On the upper side of the unit is located the plug-in terminal connector for the power supply (12-24 VDC +/-20%) and a BNC socket for the antenna.

A 10-pole DIP-switch allows a reset to the default IP address or to factory configuration.

LED lamps on the front panel provide information about the operating condition of the unit: e.g., received TETRA RF signal strength, error conditions, etc.

2.1.1 Dimensions

The dimensions of the DVI-100 are as follows:
162mm (9T) wide x 80mm high x 62mm deep
All dimensions exclude connectors and antenna.

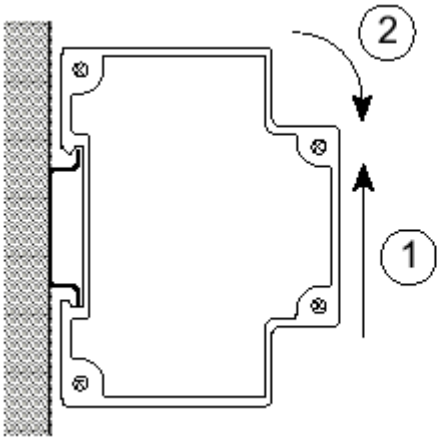


2.1.2 Mounting

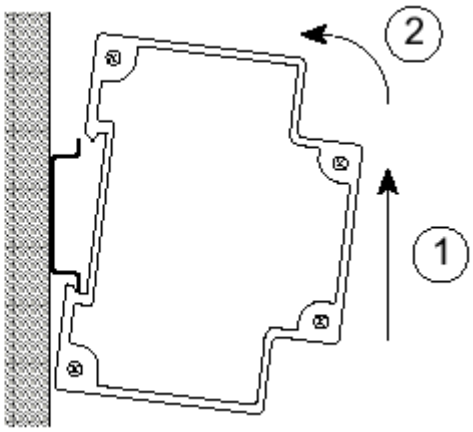
The DIN-rail mounting clip is at the bottom of the Module. First the lower lip (spring-loaded) of the clip is engaged with the lower flange of the DIN rail, with the Module tilted downward slightly. The Module is then pushed upward (1) and rotated backward (2) until the upper lip of the clip snaps onto the upper flange of the DIN rail.

2.1.3 Dismounting

To dismount the Module, force it upwards (1), and then rotate its upper end outward (2) until the upper lip of the Module's clip disengages from the upper flange of the rail. Then move the Module down slightly to disengage its lower lip from the rail flange.



Mounting



Dismounting

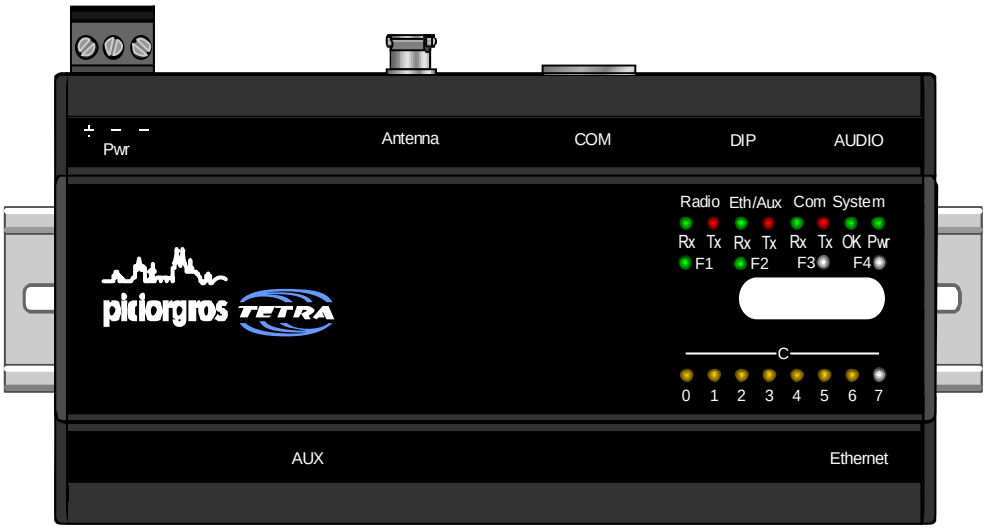
2.2 Electrical Connections

2.2.1 Power Supply Input

The required supply voltage (12-24 VDC +/-20%) is connected through 3-way screw terminal connector located on the upper side of the enclosure.

The terminals are assigned as follows (viewed from the front of the module, facing the front panel):

Outer (left): Enclosure Ground (electrical earth)
Middle: + 12 Volt to + 24 Volt (+/- 20%)
Inner (right): GND, 0 Volt from Power Supply



2.2.2 Serial Interface

The DVI-100 a serial interface which is only used for service purposes. Therefore no connection to this interface is needed.

Pin No.	Pin Assignment: Primary Interface, RS-232	
2	TxD	Send data DVI-100 → peripheral
3	RxD	Receive data TMO-110 ← peripheral
4	DTR	Shorted to Pin 6
5	GND	
6	DSR	Shorted to Pin 4
7	RTS	Handshake DVI-100 ← peripheral
8	CTS	Handshake DVI-100 → peripheral

For the connection of the COM interface to a PC or PLC, use a standard 1:1 connector-terminated cable (9-pin D-sub male to 9-pin D-sub female).

2.2.3 Ethernet Interface

The Ethernet interface is provided via an RJ-45 socket on the underside the unit. This is a standard 10/100 Mbit/s interface. Two LEDs indicate the operating condition of this interface:

- Green LED: Lights up when an Ethernet network is connected (LINK)
- Yellow LED: Blinks when data transfer is taking place (DATA)

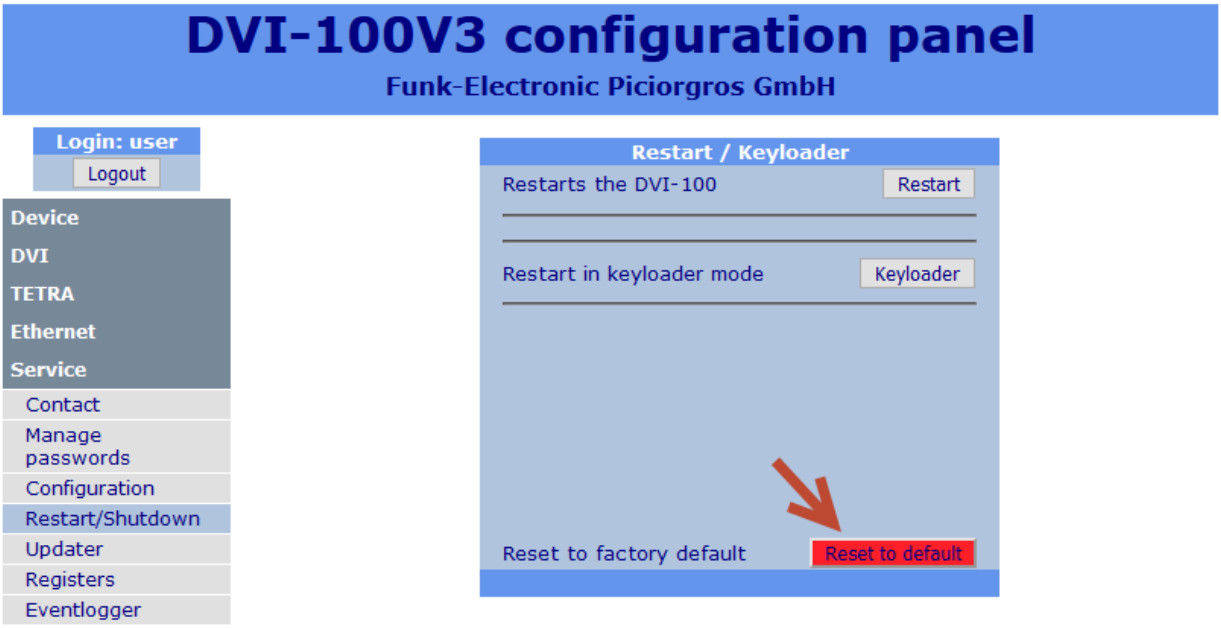
Network parameters such as IP address, net mask, and gateway address can be assigned by the webserver based configuration.

2.3 Reset to factory default

The DVI-100 can be reset to the factory default configuration. This can be done in two ways:

2.3.1 Reset via Web Server

A button on the page "Service" → "Restart/Keyloader" can perform a Reset-to-Factory-Default:



2.3.2 Reset via Configuration Button

New method (Firmware V3.42+):

- Power down the DVI-100
- Press the button behind the small hole in the back of the device with a paperclip or similar tool and keep it pressed
- Power up the device
- Keep the button pressed for at least 5 seconds until the middle 6 LED's of the RSSI bar start flashing
- The device has now started with the default configuration. The button can be released.

Old method (prior to Firmware V3.42):
If the configuration button behind the small hole at the back of the DVI-100 is pressed for at least 5 seconds (using a Paperclip or SIM-Extractor of a smartphone), the LED's of the RF display begin to flash alternating. The DVI-100 will then perform a reset to factory defaults.

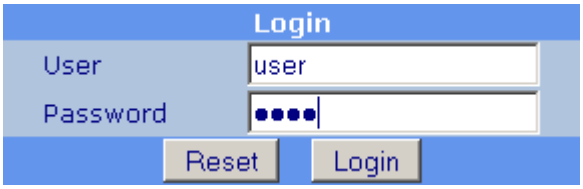
2.4 Temporary reset to default IP address

If the IP address of a DVI-100 is unknown, it can be temporarily reset to the default address:

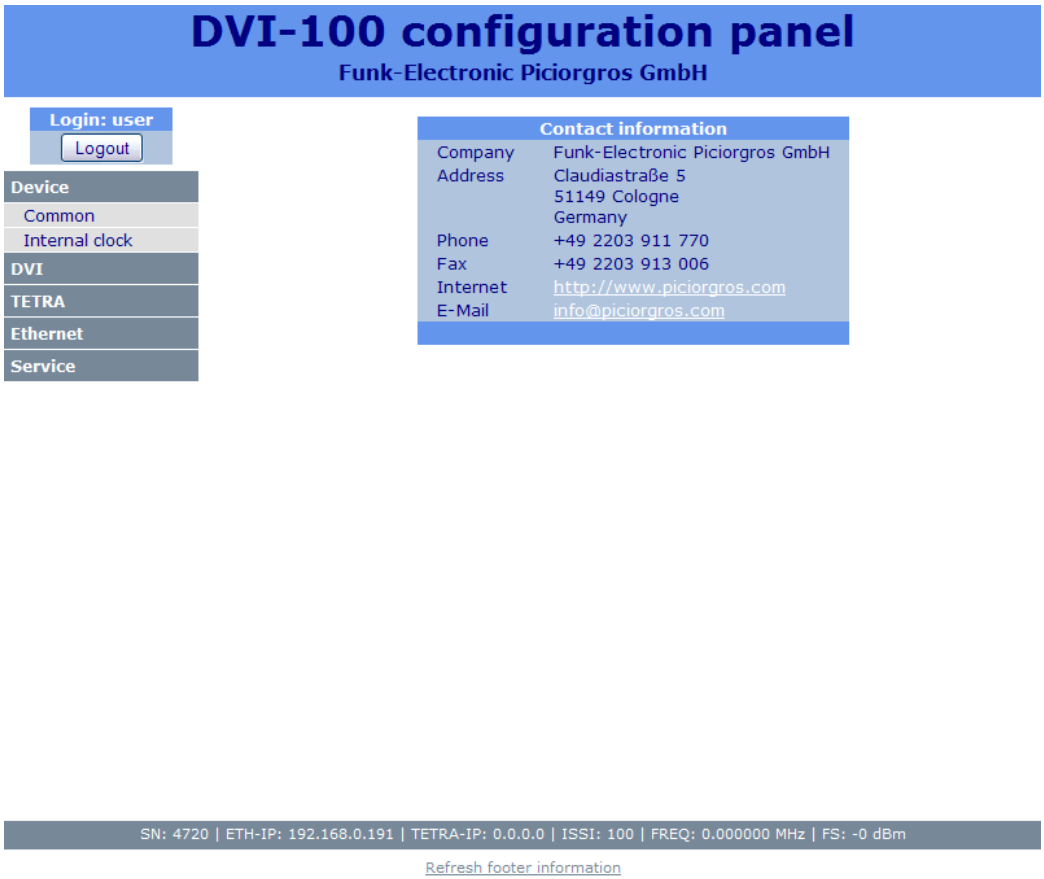
- Press for one second on the configuration switch behind the small hole at the back of the DVI-100, until the "OK"-LED starts to flash in a 1:1 cycle
- Release the configuration button (Take care: A 5-seconds-press resets the complete device to default!)
- The DVI-100 can be now accessed on its default IP address 192.168.0.199/20. The originally configured IP can be seen and changed in the webserver on "IP settings" → "Ethernet".
- To resume to normal mode, press again for 1 second on the configuration switch, until the OK-LED resumes to be permanently on. The DVI now reacts to the configured IP address

2.5 Access the embedded Web server

The whole configuration is done by accessing the internal web server of the DVI-100 and changing certain parameters using the user-friendly interface. The first to do is to integrate the device into the local network. The network is supposed to use addresses of the type 192.168.0.xxx.
The DVI-100 itself is available at the address 192.168.0.199. It must be sure that the network has the right range of addresses and there is no other device with this address connected to the network.
Accessing the interface the first time, a username and a password are required. The login is registered to the name 'user' and the password 'user'. The password can be changed as one of the following steps.



In registered state the user can see a menu on the left hand side, a content window on the right and a footer containing selected information on the bottom.


DVI-100 configuration panel
Funk-Electronic Piciorgros GmbH
Login: user
Logout
Device
Common
Internal clock
DVI
TETRA
Ethernet
Service
Contact information
Company Funk-Electronic Piciorgros GmbH
Address Claudiastraße 5
51149 Cologne
Germany
Phone +49 2203 911 770
Fax +49 2203 913 006
Internet http://www.piciorgros.com
E-Mail info@piciorgros.com
SN: 4720 | ETH-IP: 192.168.0.191 | TETRA-IP: 0.0.0.0 | ISSI: 100 | FREQ: 0.000000 MHz | FS: -0 dBm
Refresh footer information

3 Register the DVI-100 to the TETRA Network

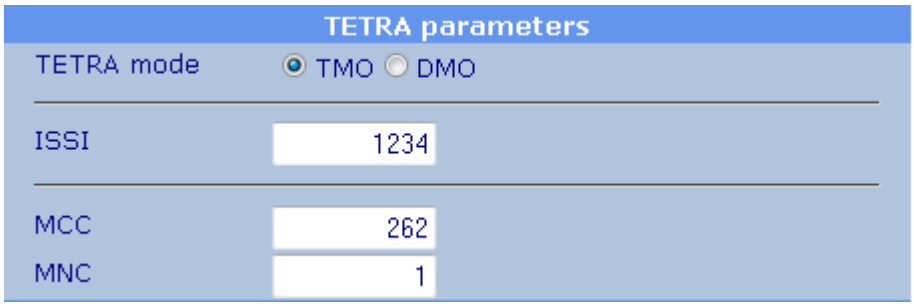
In factory default state there is no information available for the device to enter the TETRA network. This is why the TETRA parameters have to be configured before the device is able to register on the network.

3.1 Basic TETRA parameters

The TETRA parameters configuration can be accessed in "TETRA >> Parameters"

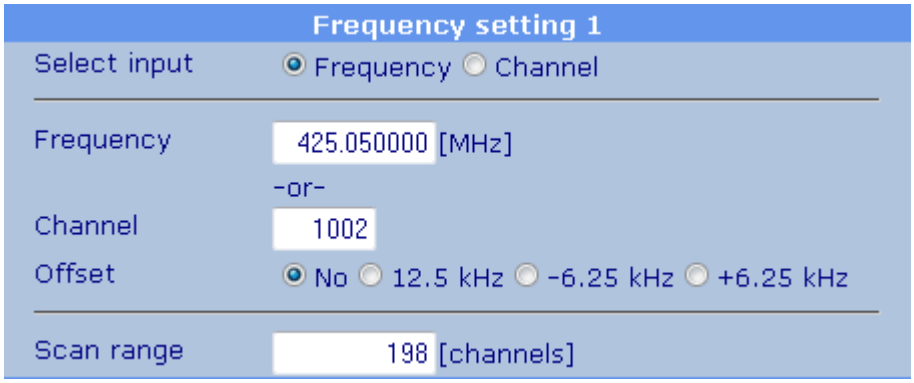
First, the operation mode must be selected between TMO mode and DMO mode. The TMO mode (trunked mode) is used when the DVI-100 should be attached to an existing TETRA infrastructure while the DMO mode (direct mode) should be used to create a local MicroSPOT in areas without TETRA coverage.

In both modes, the basic parameters are the ISSI, the MCC and the MNC. The MCC and MNC must match the corresponding values of the TETRA infrastructure (TMO mode) or the TETRA terminals which needs to communicate with the DVI-100 (DMO mode). The ISSI must be a unique subscriber number which must be configured in the TETRA infrastructure in TMO mode.



3.2 TMO mode parameters

If the TMO mode is configured, at least one scan range for the lookup of base stations of the TETRA network must be configured. Here, the value of the first (lowest) scan frequency must be inserted. Alternatively if no frequency information is available, a TETRA “Channel” can be selected at “Select input” and the number of the first channel can be inserted in combination with the networks offset value. The range of scanned channels can be varied up to a maximum value of 400.



To apply the changes the button “Apply” has to be pushed. Following a button appears underneath to restart the device. After the restart the device reprograms the internal TETRA modem with the new parameters. This can be seen when the numbered LEDs in the RF display are toggled from the right to the left.

Next the modem starts to log in the network. The RF display runs from the right to the left again. This means that it is essential to observe the LED movement at least twice before the device is registered in the network using the new parameters.

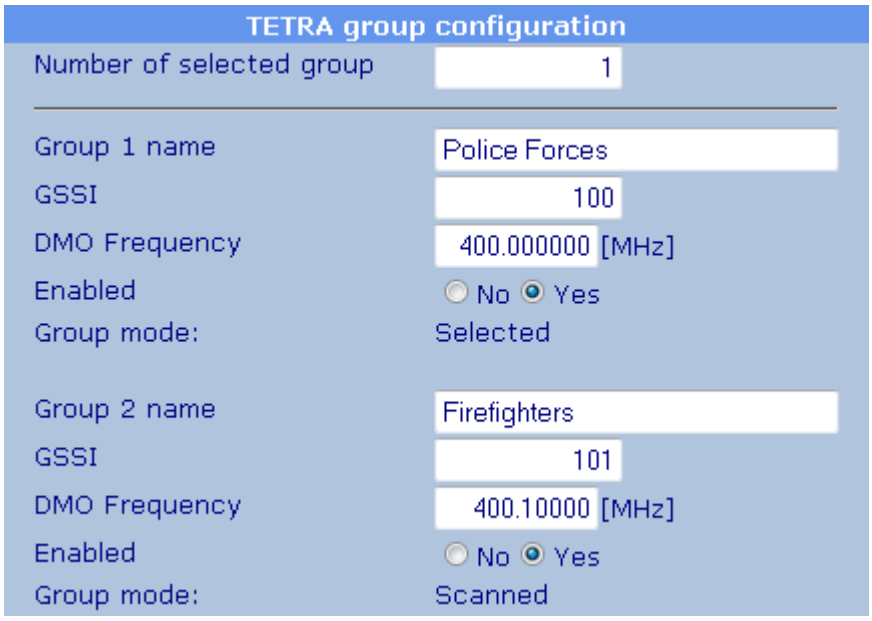
When registered the RF display shows the field strength of the device. Otherwise it starts consecutive tries to access the network.

3.3 Configure the available TETRA groups

The DVI-100 manages up to 25 TETRA groups. Each group must be configured in the infrastructure. The DVI-100 can register to these groups and they have to be programmed at “TETRA >> Group configuration”.

To configure the "selected" group, the corresponding number must be written to the upper input field. All other groups are "scanned".

In DMO mode, each group includes also a frequency input field. As there will be no scanned groups in DMO mode, only the selected group is active in this case, using the configured frequency. A change between DMO groups (and frequencies) can be achieved by changing the selected group of the DVI-100.



Group X name
This is the name of the group. It is an additional information which is transmitted to the clients to display group names. It has no effect to the TETRA network.

GSSI
The Group Short Subscriber Identity (GSSI) is the identifier of the TETRA group.

DMO Frequency (DMO mode only)
This field is only visible in DMO mode and defines the frequency on which the DVI-100 is operating for any given groups. In DMO mode, there are no scanned groups and the DVI-100 will only operate on the selected group. With changing the selected group, also the frequency will be changed according to the configuration of this page.

Enabled
Only enabled groups are registered towards the TETRA network. This feature can be used to temporarily prevent a group from being registered in the TETRA network without removing it completely from the DVI-100 configuration.

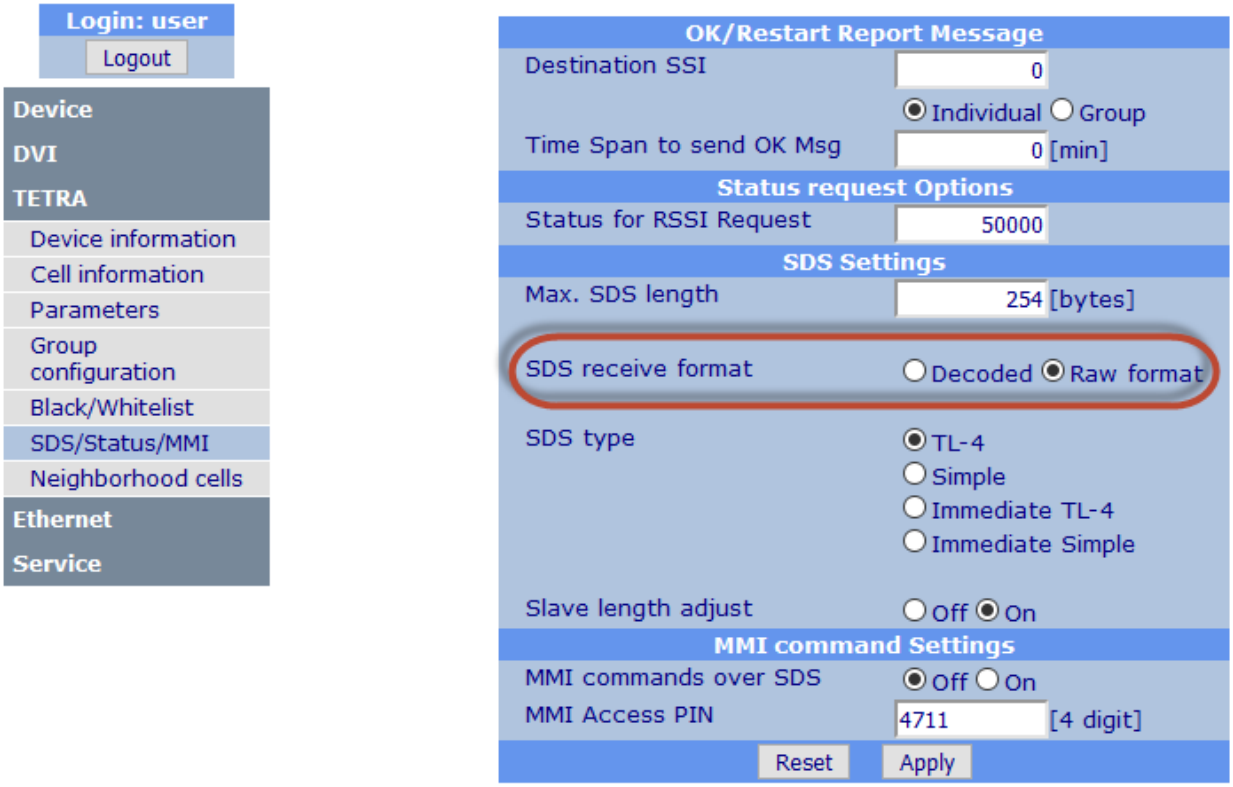
Group mode
Scanned groups are participants of the communication. The selected group is the main talkgroup for a TETRA subscriber.

If no defined call destination is given to the DVI-100 by a connected client, any outgoing calls are made to the selected group by default. In addition to the selected group, voice calls, SDS and status messages of all scanned groups will be received by the DVI-100 in TMO mode.

In DMO mode, there are no scanned groups – and only the selected group will be the one and only group calls and messages can be received from.

3.4 SDS mode (from firmware 3.50)

From firmware 3.50 the SDS mode can be selected between "Decoded" and "Raw format" in "TETRA" → "SDS/Status/MMI":



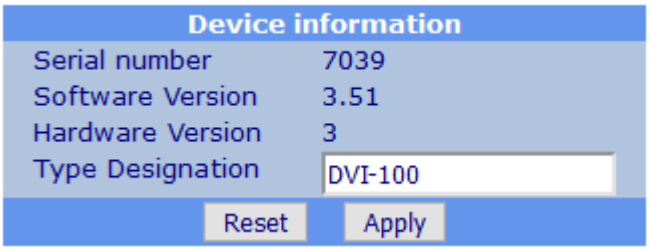
When "Decoded" is selected (default), an incoming SDS will be decoded and only the payload will be transferred to the connected devices. In case the other end is a DVI-100 in back-to-back-mode it will send out this SDS with the configured SDS type as a new message. Only incoming SDS of the types "TL-4" or "Simple" can be received and processed, and the outgoing SDS on the other side will be always in the format configured by "SDS type". This mode is needed as soon as a DVI-Server is connected or if any connected DVI-100 in back-to-back mode have a firmware version lower than 3.50.

In "Raw format" the received SDS is transferred including the full SDS header (including the PID code). With this mode also other SDS types with different PID codes can be bridged. This mode should be selected in DVI back-to-back configurations, but all connected DVI-100 must run at least firmware version 3.50!

4 General Setup

4.1 Read general DVI-100 information and change the designation

To get general information about the device on hand the menu item “Device >> Common” can be selected. The delivered data contains detailed information about the device and version numbers.

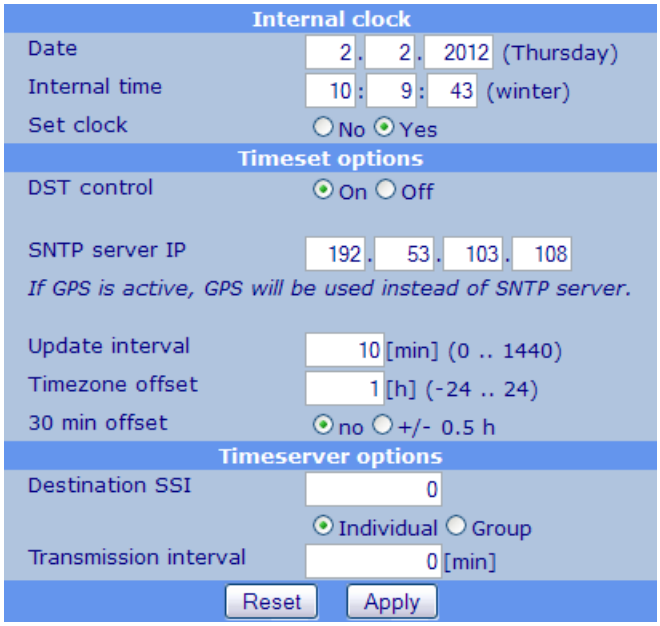


The field “Type designation” represents the designation of the DVI. This text can be used in messages to identify the device.

4.2 Adjust the internal clock

The internal clock can be adjusted manually at “Device >> Internal clock”. Here the date can be entered as “dd/mm/yyyy” and the time information as “hh/mm/ss”. To apply the inserted time, the user has to set the option “Set clock” to “Yes” and press the “Apply” button.

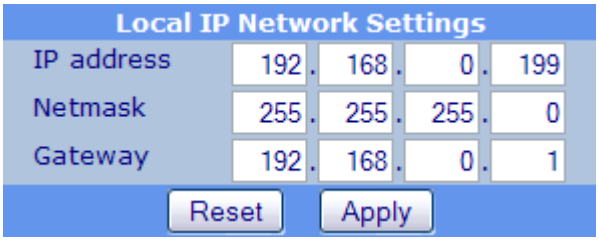
Optionally the DST control can be switched off is needed.
As soon as a valid IP address is inserted for the SNTP server, the DVI connects the server to fetch time information on its own. Furthermore the interval of connecting the SNTP server and the offset of the local time in relation to the delivered time can be adjusted.



The DVI can be used as timeserver for TETRA devices. Therefore the SSI of the target group or individual Piciorgros device has to be entered as “Destination SSI” at the timeserver section. The interval defines how often the time information is sent.

4.3 Change the DVI-100 network setting

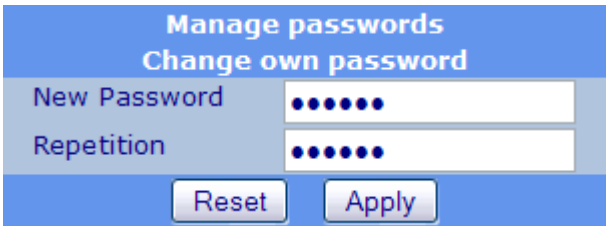
The menu item “Ethernet >> Network” links to the configuration page for the Ethernet interface.
Here the IP address of the DVI-100 as well as the netmask and the gateway information can be defined. It is recommended to change the Ethernet parameters according to the needs of the installation.



The configuration has to be saved by pressing the Apply button. Afterwards the device has to be restarted. This can be done remotely by using the appearing orange bar which contains the restart button. For the next login the target IP address in the browser must be adjusted.

4.4 Change the web servers passwords

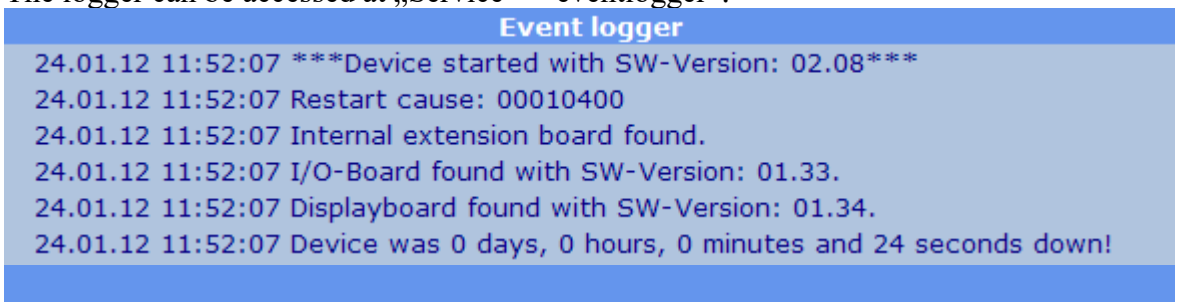
The own password can be changed at „Service >> Manage passwords“. To validate a new password, the code must be entered in both designated fields.



The password becomes valid immediately. To reset it to the default it can either be changed back manually or the Reset-to-Factory-Default operation resets the whole setting of the DVI including the passwords.

4.5 The Eventlogger

The eventlogger stores information about the behaviour of the DVI-100. Special events are able to trigger messages which allow the user to detect e.g. configuration problems. The logger can be accessed at „Service >> eventlogger“.

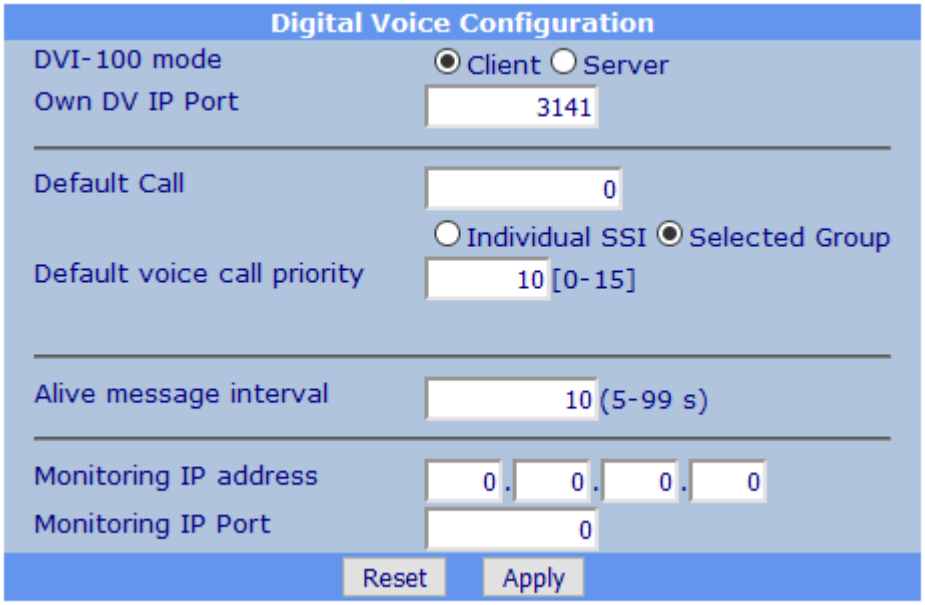


5 DVI-100: Client mode

5.1 Activation of the client mode

To define the DVI-100 device to work as client, the configuration site at “DVI >> General configuration” contains the relevant settings.

The option “DVI-100 mode” is the main selection and has to be set to “Client”.



Own DV IP Port
Sending and listening port at the Ethernet interface of the DVI-100 (Default is port 3141).

Default Call SSI
Messages received on the Ethernet interface which have no explicit target information are directed to this target in the TETRA network. This is, by default, the current selected group. The destination can be also any individual device. In a back-to-back configuration this is also the target where all calls and messages will go to.

Default voice call priority
This is the voice call priority which is used for outgoing calls where the priority is not given in the call setup from the other end (i.e. when the DVI-100 is connected to a DVI-Server and/or the call originates from a smart phone client). Priority 15 means "Emergency call". Default is 10.

In a back-to-back-scenario between two or more DVI-100 the call priority of outgoing calls is copied from the priority of the incoming call on the other end (firmware 3.50 or higher required).

Alive message interval
The client cyclically sends an alive-message to the server via the Ethernet interface. The time span of this interval can be defined in the range of 5 to 99 seconds. If the server does not respond, the client tries periodically to reconnect to the DVI server.

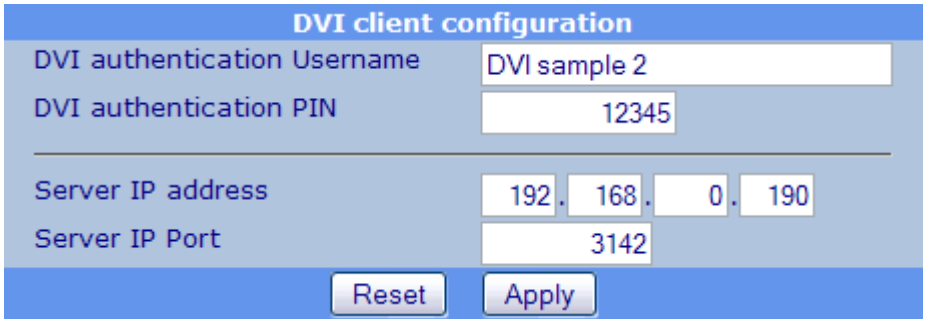
Monitoring
The monitoring functionality needs to have an IP address and port information. While operating the DVI spreads all incoming voice and message data also to the configured monitoring target in the Ethernet network.

5.2 Configure the connection parameters

Each client can be identified with the combination of username and password. At the site “DVI >> Client configuration” these information can be edited for the device in hand.

Regarding the following screenshot the users’ information (username and password) can be configured in the upper two fields.

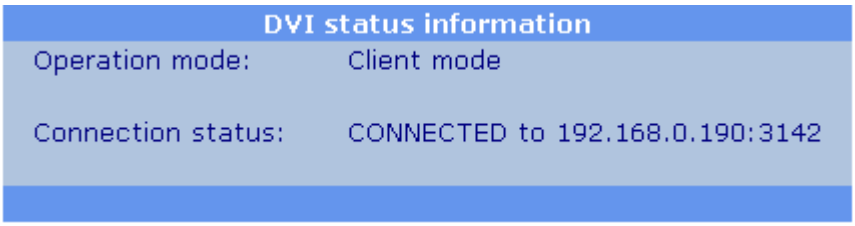
The username / PIN combination must be configured in the DVI-100 server to authenticate the clients. Without a matching username / PIN combination, the server will not accept any connection attempts from a client.



To make the client familiar with the responsible communication server, this data has to be inserted in the next fields. The “Server IP address” must be programmed as the IP address of the servers Ethernet port. Similarly the number of the port has to equal the listening port of the server.

5.3 View the connection status

To get the information about the current connection status to the server, the user can select the menu item “DVI >> Status information”.

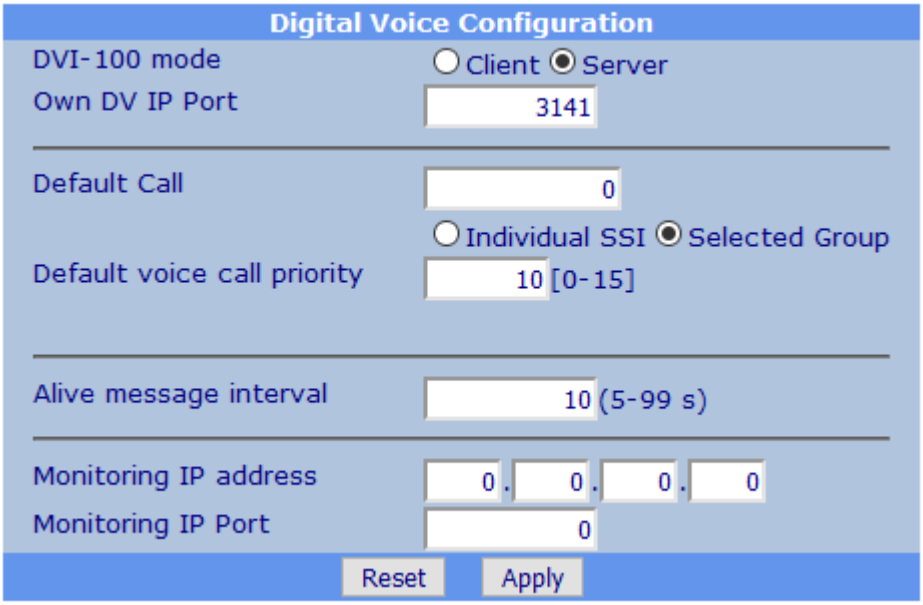


6 DVI-100: Server mode

6.1 Activation of the server mode

To define the DVI-100 device to work as server, the configuration site at “DVI >> General configuration” contains the relevant settings.

The option “DVI-100 mode” is the main selection and has to be set to “Server”.



Own DV IP Port
Sending and listening port at the Ethernet interface of the DVI-100 (Default is port 3141).

Default Call SSI
Messages received on the Ethernet interface which have no explicit target information are directed to this target in the TETRA network. This is, by default, the current selected group. The destination can be also any individual device. In a back-to-back configuration this is also the target where all calls and messages will go to.

Default voice call priority
This is the voice call priority which is used for outgoing calls where the priority is not given in the call setup from the other end (i.e. when the DVI-100 is connected to a DVI-Server and/or the call originates from a smart phone client). Priority 15 means "Emergency call". Default is 10.

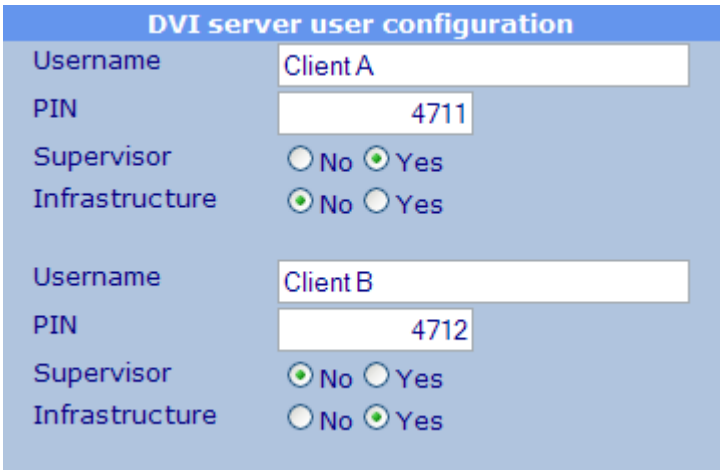
In a back-to-back-scenario between two or more DVI-100 the call priority of outgoing calls is copied from the priority of the incoming call on the other end (firmware 3.50 or higher required).

Alive message interval
The server cyclically sends an alive-message to each client via the Ethernet interface. The time span of this interval can be defined in the range of 5 to 99 seconds. If a client does not respond, the server will tag this client as "disconnected".

Monitoring
The monitoring functionality needs to have an IP address and port information. While operating the DVI spreads all incoming voice and message data also to the configured monitoring target in the Ethernet network.

6.2 Manage the client list

As soon as the DVI-100 is installed to work as server, the device has to be programmed with the account information of the potential clients. The site “DVI >> Server configuration” offers a list consisting of ten input collections for the client data.



Username
The username is the name of the client which is transmitted during the registration process.

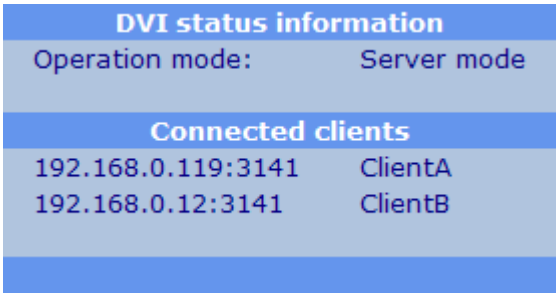
PIN
The PIN is the four digit long security number which is transmitted during the registration process.

Supervisor
A client who is configured as supervisor is able to change the "selected" TETRA group of the server DVI.

Infrastructure
A client who is confirmed as infrastructure will not be served with information messages from the server. These messages include client or group status information as this data is mainly used to display this information on the GUI of a client.

6.3 View the connection status

To get the information about the participants which are currently connected the user can select the menu item “DVI >> Status information”.
Here the operating mode is shown. In case that the current device is a server, the following picture declares the operating mode as “Server mode”.



The section “Connected clients” contains a list of all currently connected clients. Each client is represents one row. The information includes the clients IP address and their used port number as well as the clients’ designation.

7 Troubleshooting and Administration

7.1 Brief Instructions

The following brief instructions provide a brief overview of the start-up steps for putting the DVI-100 into operation:

7.1.1 Configuring the TETRA Network Parameters

The network parameters must be set into the DVI-100 (if this was not done at the factory before delivery, for project specific orders): MNC, MCC, ISSI, GSSI, frequency. These settings are done directly in the DVI-100.

Also the operation mode (server / client) must be configured along with the needed parameters (i.e. IP address of the server for client mode).

7.1.2 Antenna

Ensure that an antenna appropriate for the frequency band used by the TETRA network is connected to the modem. An outdoor antenna will generally result in better performance than a plug-in (modem mounted) corkscrew antenna. If the modem is installed inside a metal cabinet, the antenna should be completely outside the cabinet. If the modem is installed inside a steel-reinforced concrete or steel structured building, the antenna should be installed outside the building.

Avoid the use of a whip antenna directly on top of the DVI-100 in any case!

If several units are operating on the same site, ensure that the antenna has at least 2m distance to any other antenna of other DVI-100's or other radio equipment.

7.1.3 Power Supply and Power-Up Sequence

When a voltage of 12-24 VDC +/-20% is applied to the power supply input terminal-block of the DVI-100, it starts up immediately. The "Pwr" LED lights up first, and a short time later the "OK" LED lights up and stays continuously lit. If "OK" LED blinks, this indicates as error condition corresponding to the blink pattern.

While the TETRA engine of the DVI-100 is being initialized, the LED lamps of the RF signal strength indicator array flash in sequence, from right to left. When the initialization is complete, the modem attempts to tie into the TETRA network. If this is successful, then several consecutive LEDs of the RF signal strength indicator array light up (the number of LEDs lighting up is proportional the RF received signal strength). A minimum of 3 LEDs (from left to right) should be lit for reliable communication.

During the setup of the embedded TETRA engine, the LED display RF indicates the LED's stepping from right to left as a single dot.
Once the configuration is terminated and the device has successfully logged into the TETRA network, a bar of LED's (from left to right) indicates the RF field strength of the received TETRA signal. For a proper communication, at least 3 LED should be indicated.
It should be considered, that the displayed RF field strength is the received field strength from the base station and maybe the base station can still be received, while the base station does not receive the TMO any more.

Number of LED	Field Strength
1	below -103 dBm
2	-103 dBm
3	-95 dBm
4	-87 dBm
5	-79 dBm
6	-71 dBm
7	-63 dBm
8	-55 dBm or higher

7.1.4 Failure to Register on the TETRA Network

If the DVI-100 does not succeed in registering on the TETRA network and all LEDs of the RF Signal Strength Indicator are unlit, the antenna system modem settings of the TETRA network parameters should carefully checked and corrected as necessary.

A TETRA terminal can be used to quickly determine whether TETRA network coverage is available at a site. Take the TETRA terminal near the installed equipment antenna. If the terminal (when it is switched on) indicates that it has tied into the TETRA network, then the TETRA network coverage is available at the antenna location.

If the TETRA network settings have been correctly done on the DVI-100, then the antenna system should be examined to see whether it is correctly installed, and the antenna has been correctly selected for operating frequency range. In addition, the length and type of antenna cable are important considerations. If the antenna cable is longer than 5m, low-loss cable should be used (e.g., RG-213 or Aircell). As a general practice, it is recommended that the antenna cable is kept as short as possible (20m RG-213 reduces the transmit and receive signal strength by half). Antenna cable loss should be compensated by using an antenna of appropriate gain.

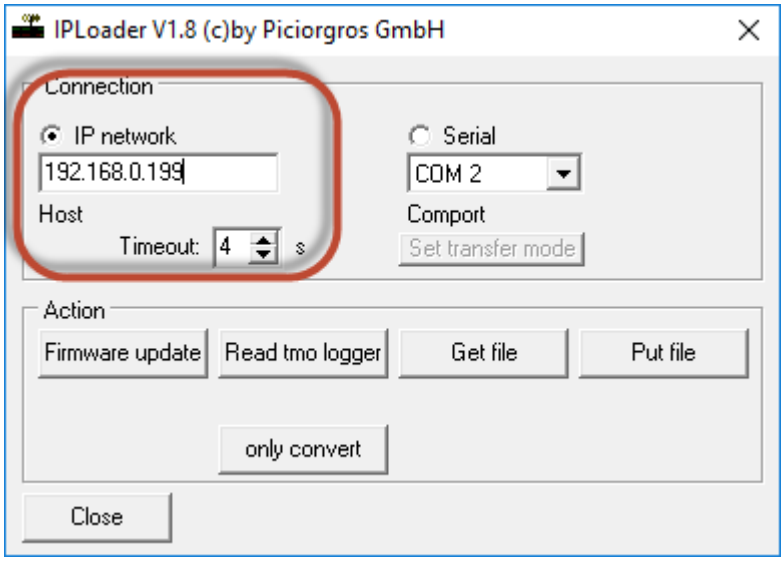
7.2 Save and restore the configuration

The configuration of the DVI-100 can be saved to the computer to have a configuration backup or to "clone" the configuration to other DVI-100.

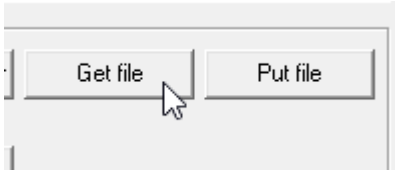
The "IPLoader" software is needed for this.

7.2.1 Configuration download from the DVI-100

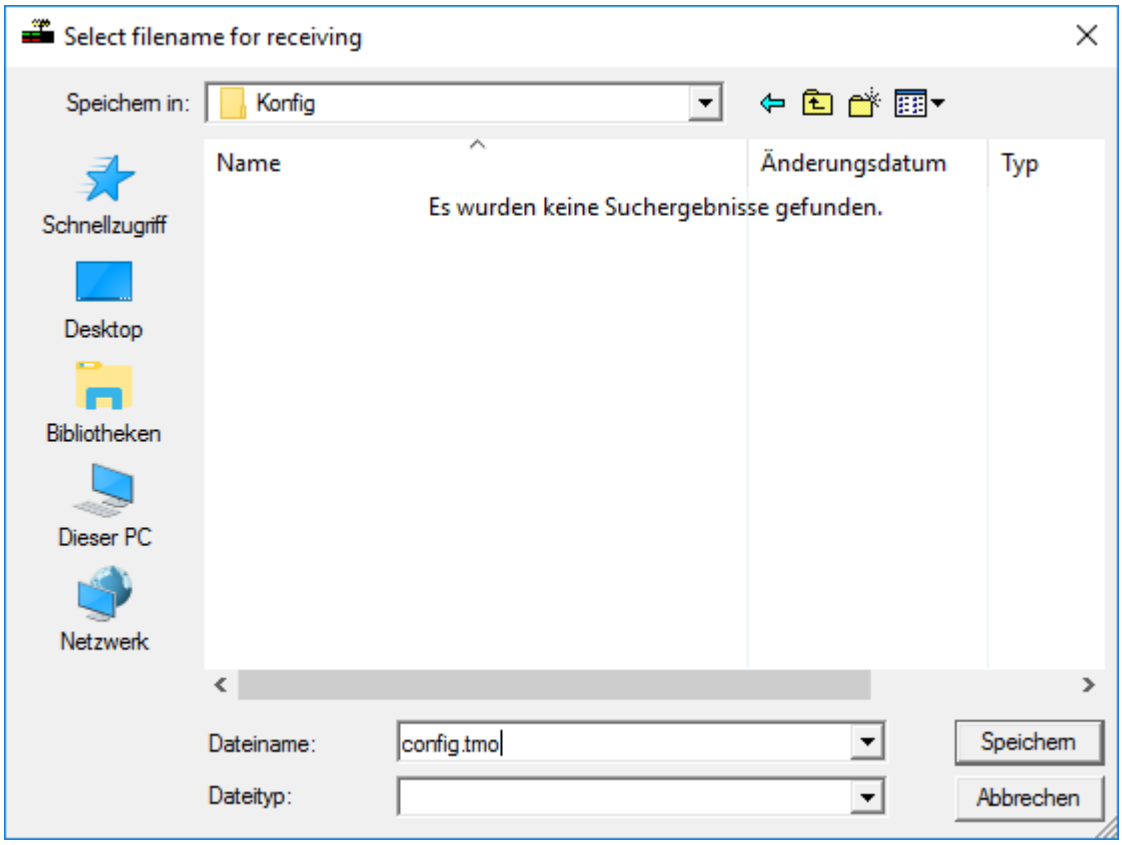
To read the configuration out of the DVI-100, start the IP Loader and ensure it is set to "IP network" with the IP address of the DVI-100 entered:



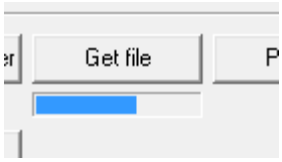
Click on "Get file"



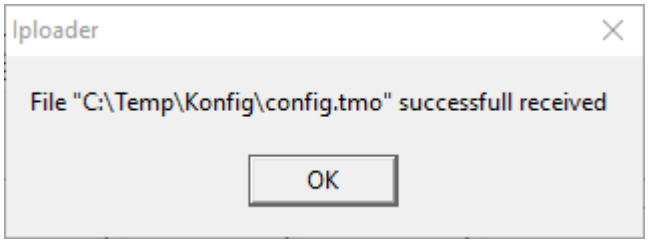
Specify a location on the computer where the file should be stored and give "config.tmo" as the file name:



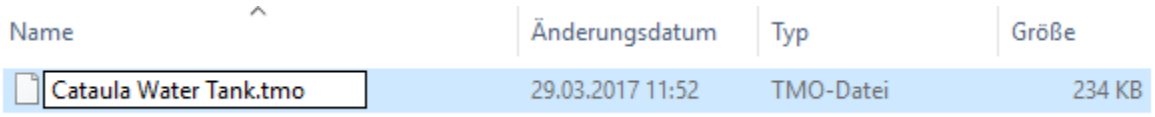
A progress bar will be shown below the button to indicate the transfer is ongoing:



Finally followed by a success message:



The file name can afterwards be edited to any convenient name to keep record from which device the configuration was read. It is important to keep the file extension ".tmo"!



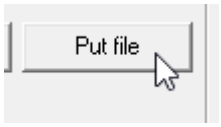
7.2.2 Restoring the configuration

A configuration file can be uploaded in any DVI-100 which has the same hardware version. This gives you the ability to restore the exact configuration if someone has broken it, or to upload the configuration into other DVI-100's to "clone" a certain configuration.

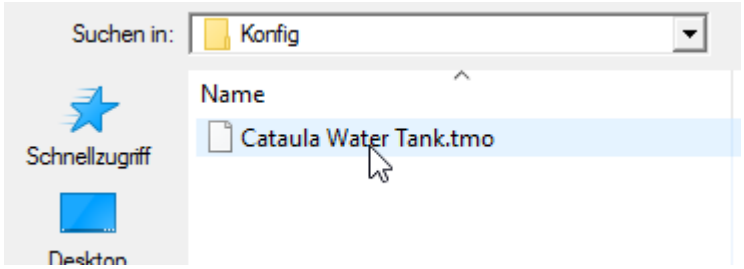
If the configuration should be "cloned" or being used as a template, make sure to alter unique TETRA parameters like the ISSI to avoid double ISSI's in the network which would cause trouble.

Any programmed authentication/encryption keys are not included in the configuration backup!

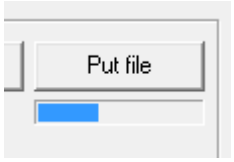
To restore the configuration, click on "Put file":



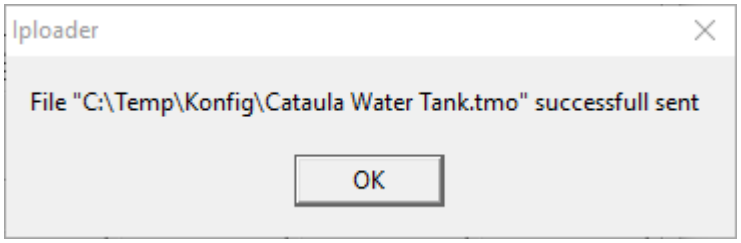
And specify the configuration file:



A progress bar below the button will indicate the transfer progress:



Followed by a success message:



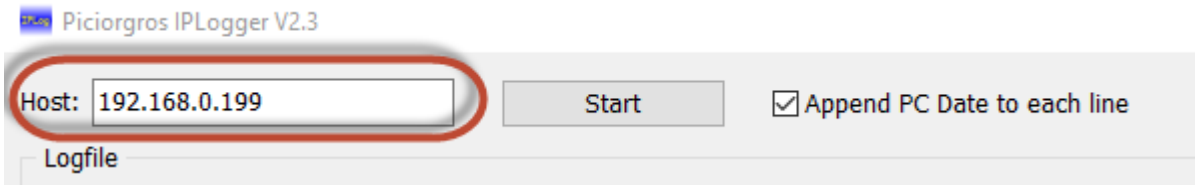
The DVI-100 will automatically restart to apply the new configuration.

7.3 Getting support logs

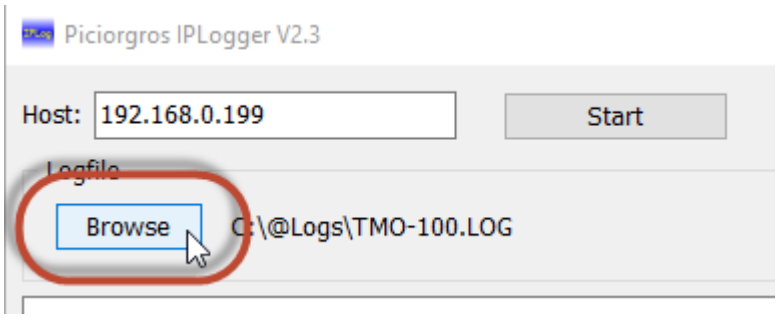
When problems are experienced the support might ask for a so called "IPLog". This log shows many internal processes and data flows of the DVI-100.

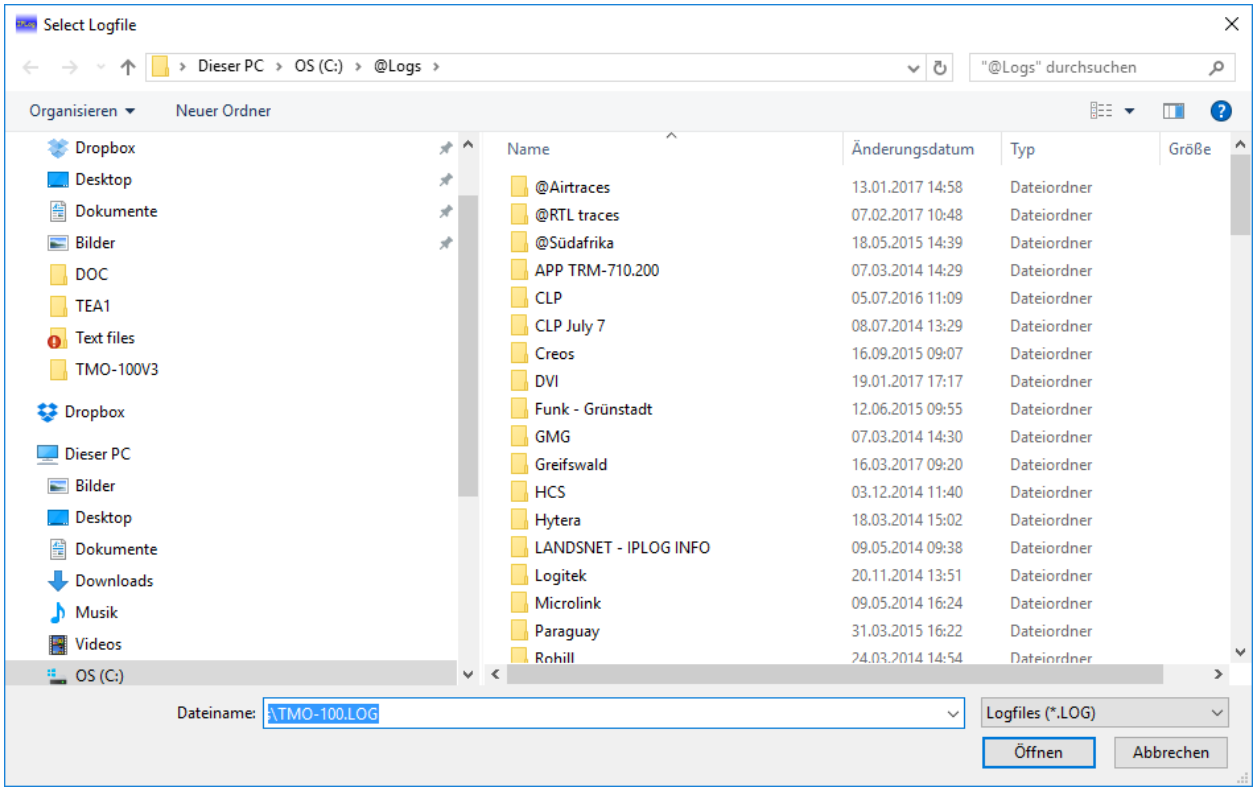
IPLogs can be taken with the software "IPlogger". This requires an Ethernet connection of the PC running the IPLogger to the DVI-100. **Due to the high amount of data don't use the IPLogger over a WAN or internet connection as this might overflow the TCP buffer of the DVI-100!**

When the IPLogger is started, ensure that the IP address is set to the IP address of the DVI-100:



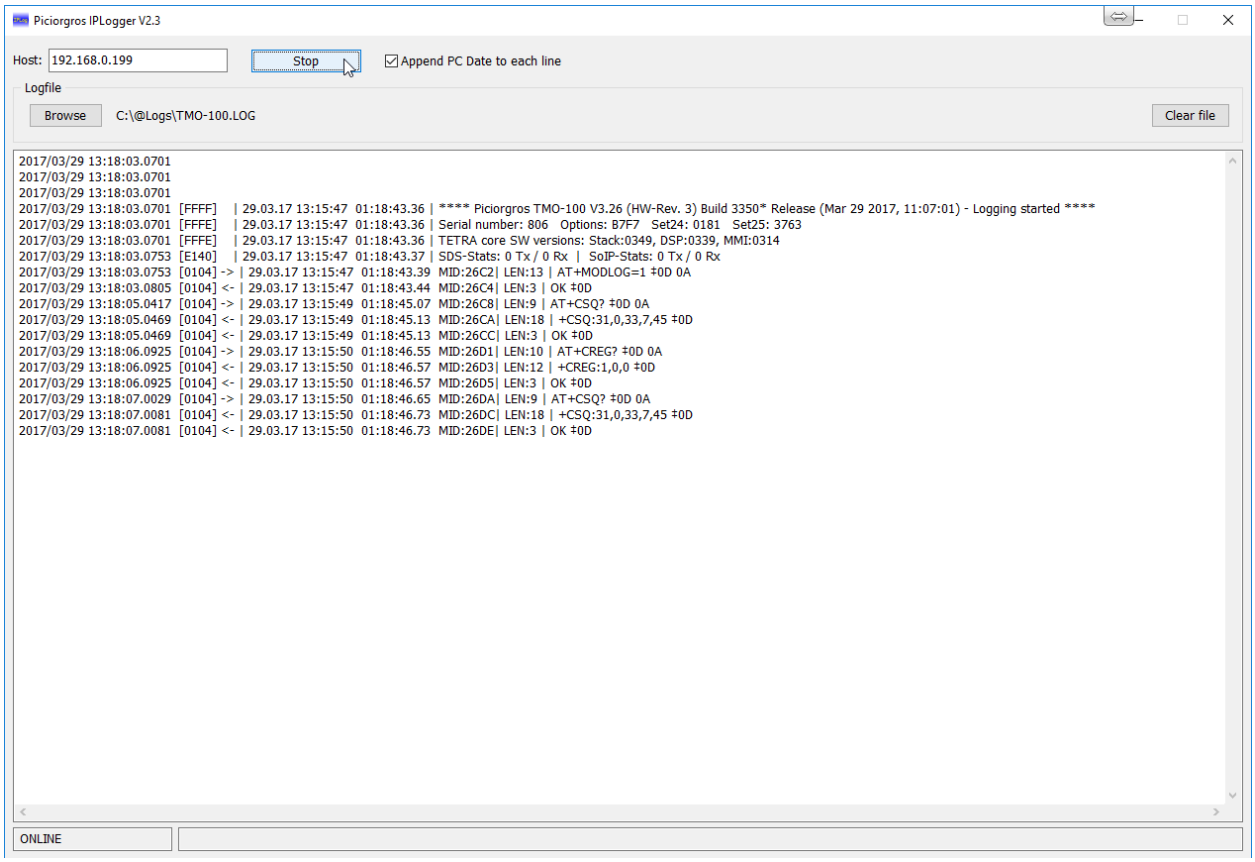
In the next step specify the folder and file name on the PC where the log should be written to:





The extension ".log" should be kept!

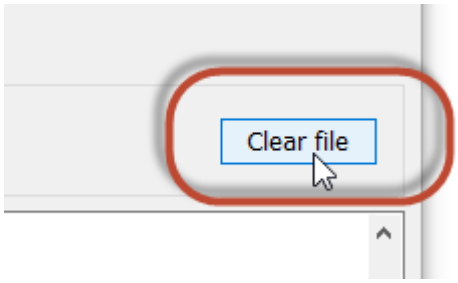
Finally the button "Start" can be pressed to start the logging:



The logged messages will appear in the window of the IPLogger to give a control that the logging is active and running.

The logging can be stopped and continued at any time. Even when the IPLogger is restarted, it will always append its data at the end of the specified log file.

If the log file should be cleared, press the button "Clear file".



This can be done during a running log "on the fly" without the need to stop the IPLogging.

Finally, when sending the log file to the support, it is highly recommended to put it into a ZIP archive as this will dramatically shrink the size of the file which needs to be sent.

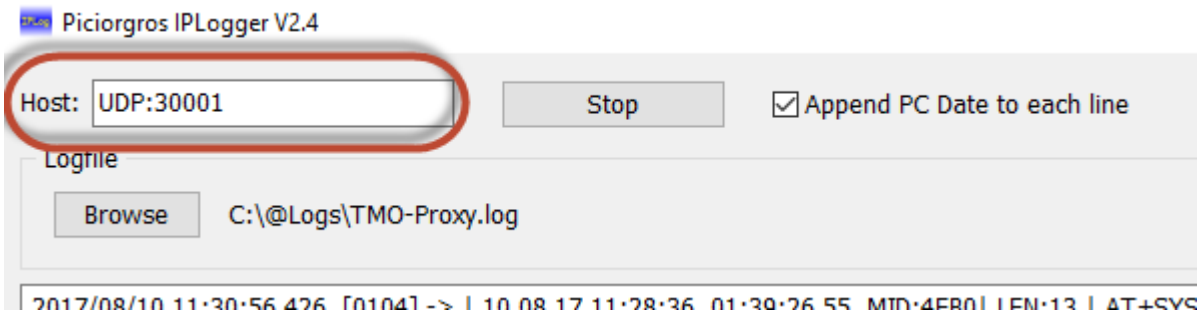
7.3.1 UDP logging (from V3.50)

The common logging method of getting logs is using TCP which puts a high load to the DVI's IP stack regarding to the high number of messages created in operation. In situations a high number of logging events are transferred (i.e. during voice calls), the TCP logging can break. It will be recovered from the IPLogger, but in the meantime logging messages could be lost.

As a resource saving alternative, UDP logging can be configured from firmware 3.50 on. There are some important points to mention:

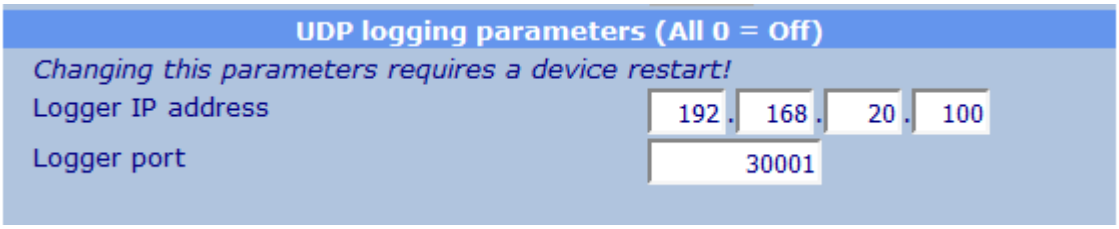
- The IPLogger with at least version 2.4 is needed for UDP logging
- The UDP logging must be configured in the DVI-100 as the DVI-100 is the active part sending the messages out in UDP logging mode.
- After finishing the logging session the UDP logging in the DVI-100 should be disabled, otherwise it will continue to send out UDP packets via its Ethernet port. Also even UDP logging creates an additional load to the DVI-100.
- As the DVI must not buffer several messages until getting the TCP-ACK, the UDP logging can also be used via WAN connections with higher latency.

To configure UDP logging in the IPLogger, the UDP method and the port number where the IPLogger listens to the messages must be specified like this:



In this example the IPLogger listens on UDP port 30001. As soon as the "Start" button is pressed, the logger will listen for incoming messages.

On the DVI side the IP address and port number where the log messages will be sent to must be configured. The IP address is the one where the IPLogger can be reached, the port number must match the one to which the IPLogger is listening. The UDP logger configuration can be found on "Service" → "Configuartion":



As long as an IP address and a port number is entered here, the DVI-100 sends out the logger messages to this IP address and port.

If either the IP address or the port number is "0", no log messages are sent via UDP.

Notes:

- If the logging session has finished and no more logging is needed, the UDP logging should be terminated by setting at least the "Logger port" to 0. Otherwise the DVI will continue sending out UDP packets on the Ethernet port, also the UDP logging also puts some additional load to the DVI-100.

- Any changes to the UDP logger settings need a restart of the DVI-100 to take effect.

- It is OK to use UDP logging over a WAN connection (VPN, Internet etc.), even with high latency. When using a 3G/4G connection please note that the logging produces a reasonable amount of data.
  If the packets need to pass a firewall and/or NAT router you need to take care that the packets will pass and that an appropriate forwarding rule is created in the router.

8 DVI-100 Firmware update procedure

There are 4 different firmware versions in the DVI-100:

- The DVI-100's main firmware
- The "Stack" firmware of the embedded TETRA radio
- The "MMI" firmware of the embedded TETRA radio (only for V3 radios)
- The "DSP" firmware of the embedded TETRA radio

All these versions can be updated via the Ethernet port of the DVI-100.

8.1 Preparation and setup

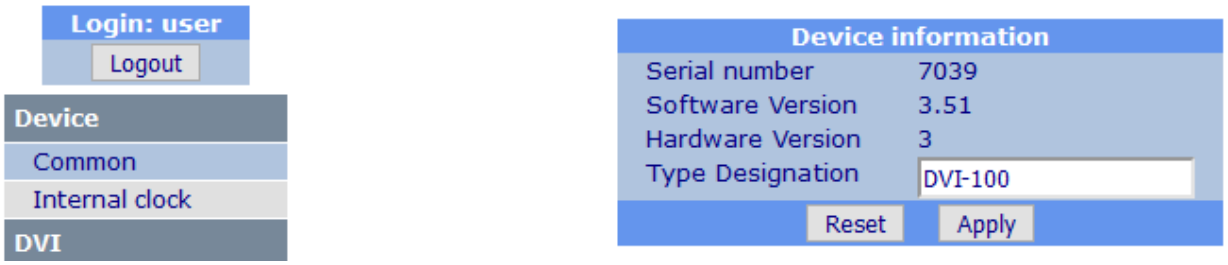
For updating the DVI-100 you will need the following equipment:

- PC with Ethernet connection
- IPLoader software
- Firmware files for the DVI-100 and its TETRA radio

8.2 Update procedure for the DVI-100 main firmware

The DVI-100 firmware is a single file with the extension ".pfo". To update the DVI-100, it must be connected to the PC via Ethernet.

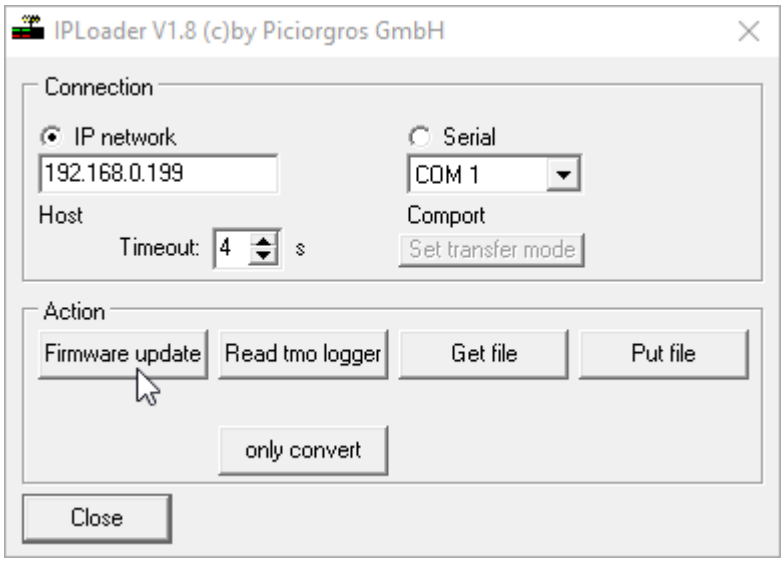
The software version in the DVI-100 can be checked in the webserver on the page "Device" → "Common". In this screenshot it's version 3.51:



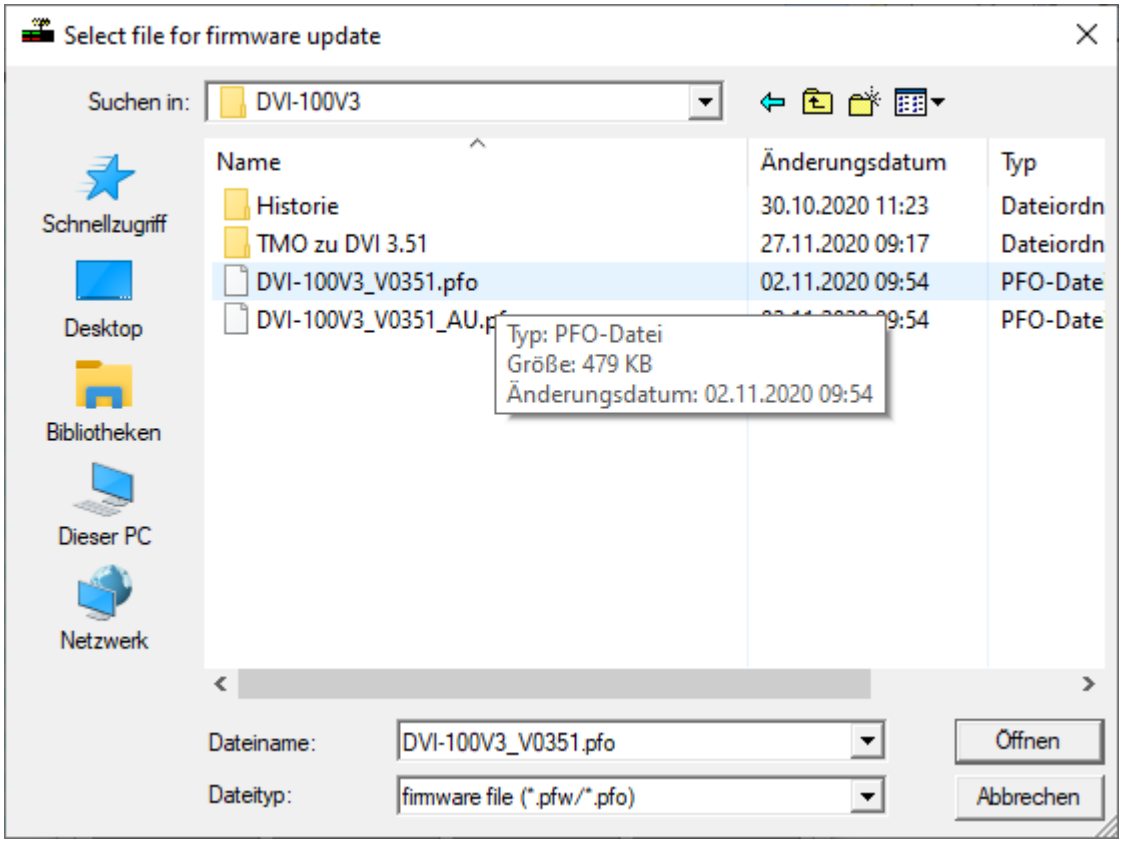
A firmware with the same version can be loaded into the DVI-100 but will not trigger the internal update process.

All configurations and feature activations are preserved and will not be lost after the update!

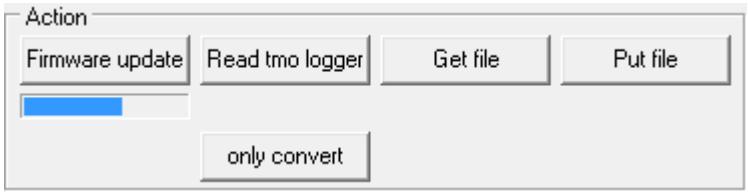
In the IPLoader the IP address of the DVI-100 must be entered in the "IP network" field. Then the button "Firmware update" must be clicked.



Select the DVI-100 firmware file and open it:



The IPLoader will immediately start the transfer to the DVI-100, indicating the transfer progress:



The internal update process will start immediately after the file has been transferred. The "Link"-LED on the Ethernet plug will go off for approximately around 30 seconds.

Important!
During the internal reprogramming, **DO NOT INTERRUPT THE POWER TO THE DVI-100.** Otherwise the DVI-100 will not start and must be restored by Piciorgros or a service partner.

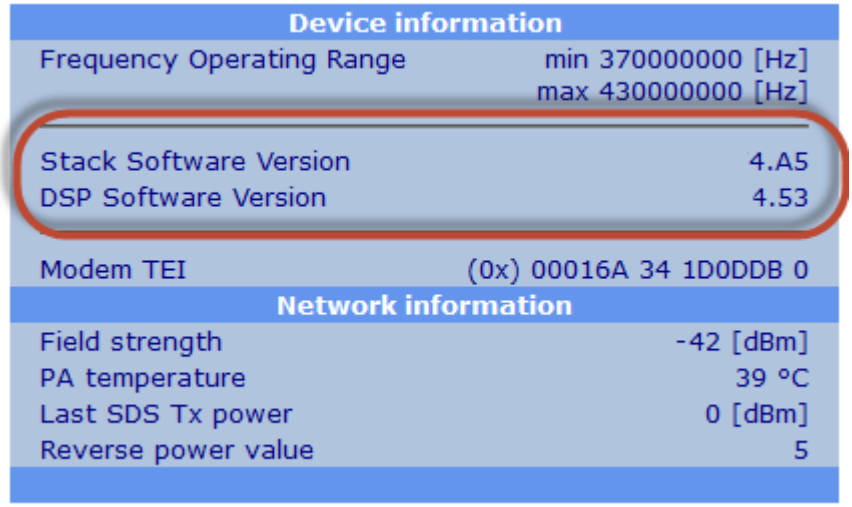
After the update process has ended, the device will start immediately with the new firmware. The Link-LED on the Ethernet plug will light up again, along with the OK-LED. The firmware has been updated.

8.3 Update of the TETRA radio firmware

The integrated TETRA radio core does have three different software parts:

- Stack
- MMI (only for V3 radios, from V4 on there is no MMI)
- DSP

The current software versions of the DVI-100 can be checked on the webserver page "TETRA" → "Device information":



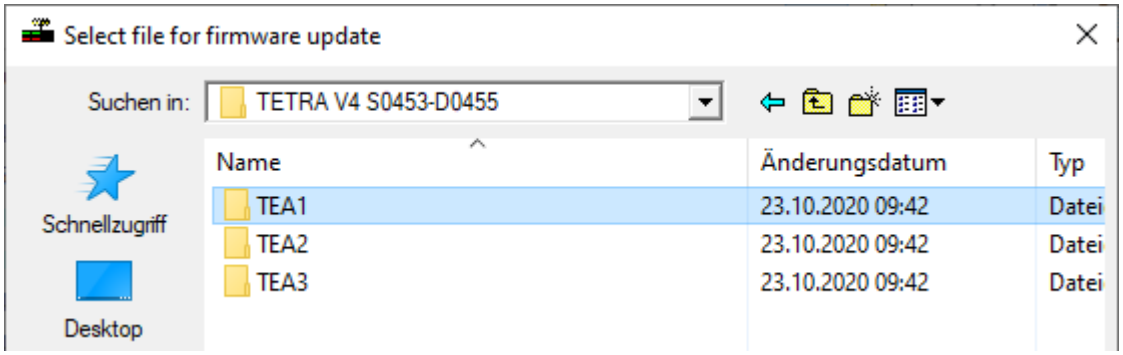
The firmware version of a radio software package can be seen in the file name of the archive:

This package contains:
Stack version 4.53
DSP version 4.55

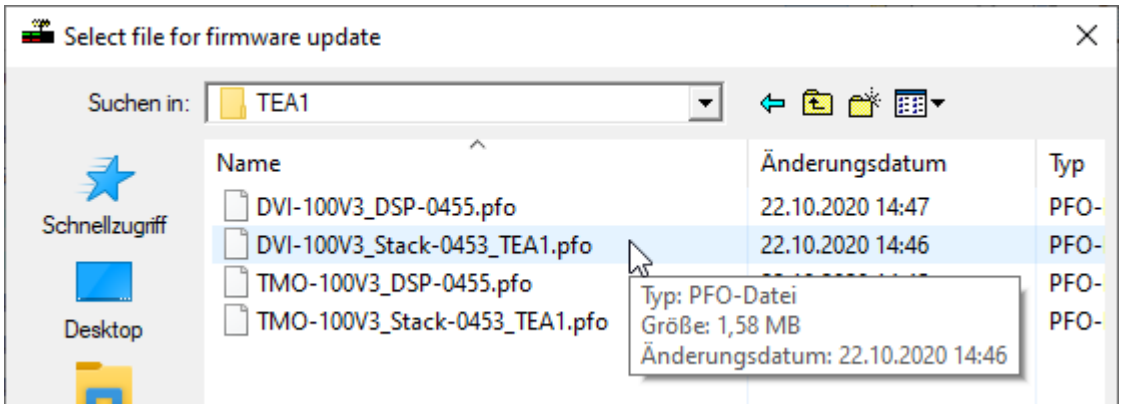
Only files with different versions must be transferred to the DVI-100.

To update the TETRA core firmware, the same procedure as for the DVI-100 firmware update is used. The firmware file for the device must be transferred via the IPLoader software, using the button "Firmware update".

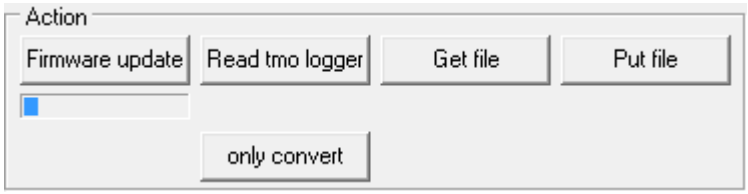
It is important to use the firmware version which is matching to the TEA version of the DVI-100. Standard is TEA1 if not ordered differently. If a DVI-100 has got a different TEA version, this is written on the back of the DVI-100, either "TEA2" or "TEA3".



Inside the folder select the firmware and device type which needs to be updated. In this case we want to update the stack of a DVI-100:



After selecting the file, it will be transferred to the DVI-100.

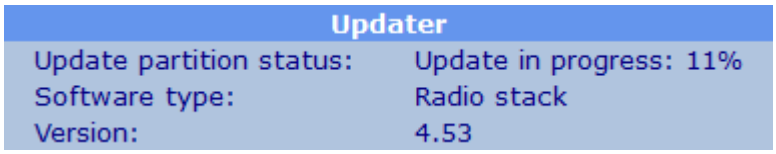


Once the file is transferred to the DVI-100, it will start the update file check and the internal update process. For radio updates, the DVI-100 will not restart and power loss is not critical (the update can be reapplied in case something went wrong).

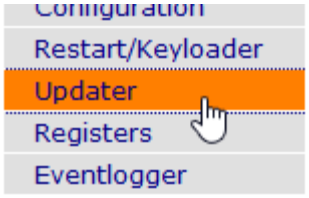
When the update process has started, the "Radio Tx" and "Radio Rx" LED will blink alternating, also the RSSI LED bar will flash. The RSSI LED will show the progress bar, growing from the left to the right.

The update process can take up to 5 minutes for Stack and MMI!

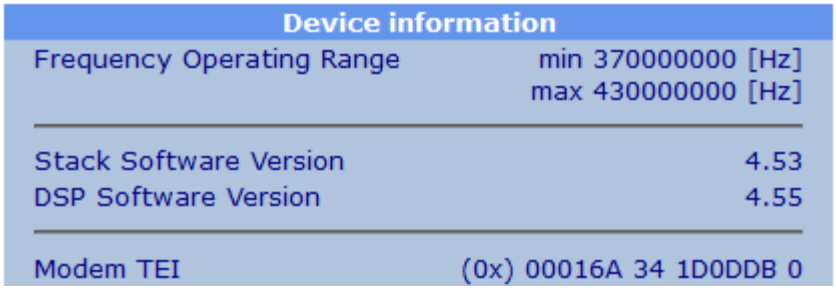
A detailed view of the update process is available in the webserver on the page "Service" → "Updater":



This page can be refreshed by just clicking again on the menu item "Updater"



Once the updater has finished and the TETRA core has been restarted, the new versions can be seen in "TETRA" → "Device information":



To update the DSP or the MMI (V3 radios only) the same procedure must be repeated, but choosing the firmware files for DSP or MMI instead.

9 Programming authentication and AIE keys

To use the TETRA authentication and Air Interface Encryption feature it is necessary that K-Keys and/or SCK keys can be programmed into the DVI-100 and K-Ref files are generated for the TETRA infrastructure.

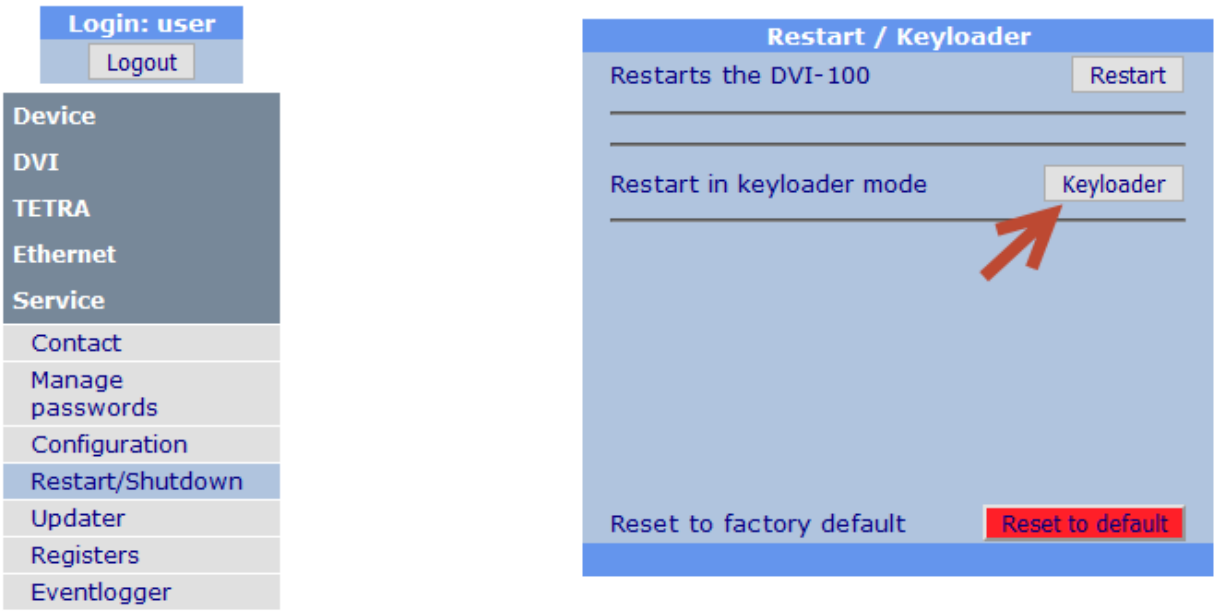
This is a short overview how to use the Keyloader software to generate and load a K-Key into the DVI-100. For a detailed description of the Key Loader software please refer to the Keyloader software manual.

9.1.1 Preparing the DVI-100 for the key programming

The key programming is using a serial connection to the DVI-100. The AUX serial interface of the DVI-100 is used for this once the DVI-100 is set into key loader mode.

Therefore the PC which is running the Keyloader software must be connected to the serial AUX port of the DVI-100. The connection can be done via a native serial port of the PC or a USB-to-serial cable.

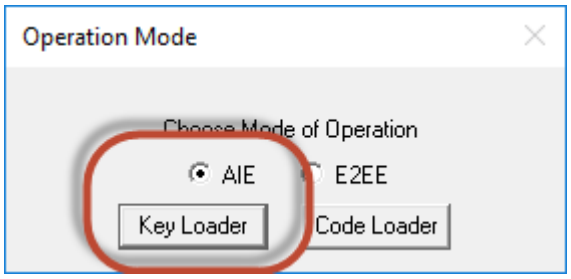
In the web server of the DVI-100, the button "Keyloader" on the page "Service"→"Restart/Keyloader" must be pressed:



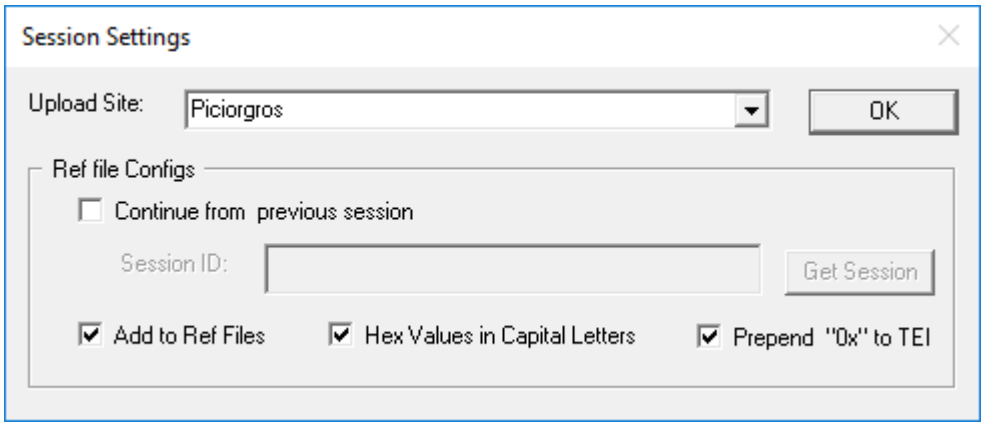
The DVI-100 now restarts and afterwards the RSSI-LED 6 (second LED from the right) flashes yellow. The DVI-100 is now ready for the key programming.

9.1.2 Connecting the Keyloader software

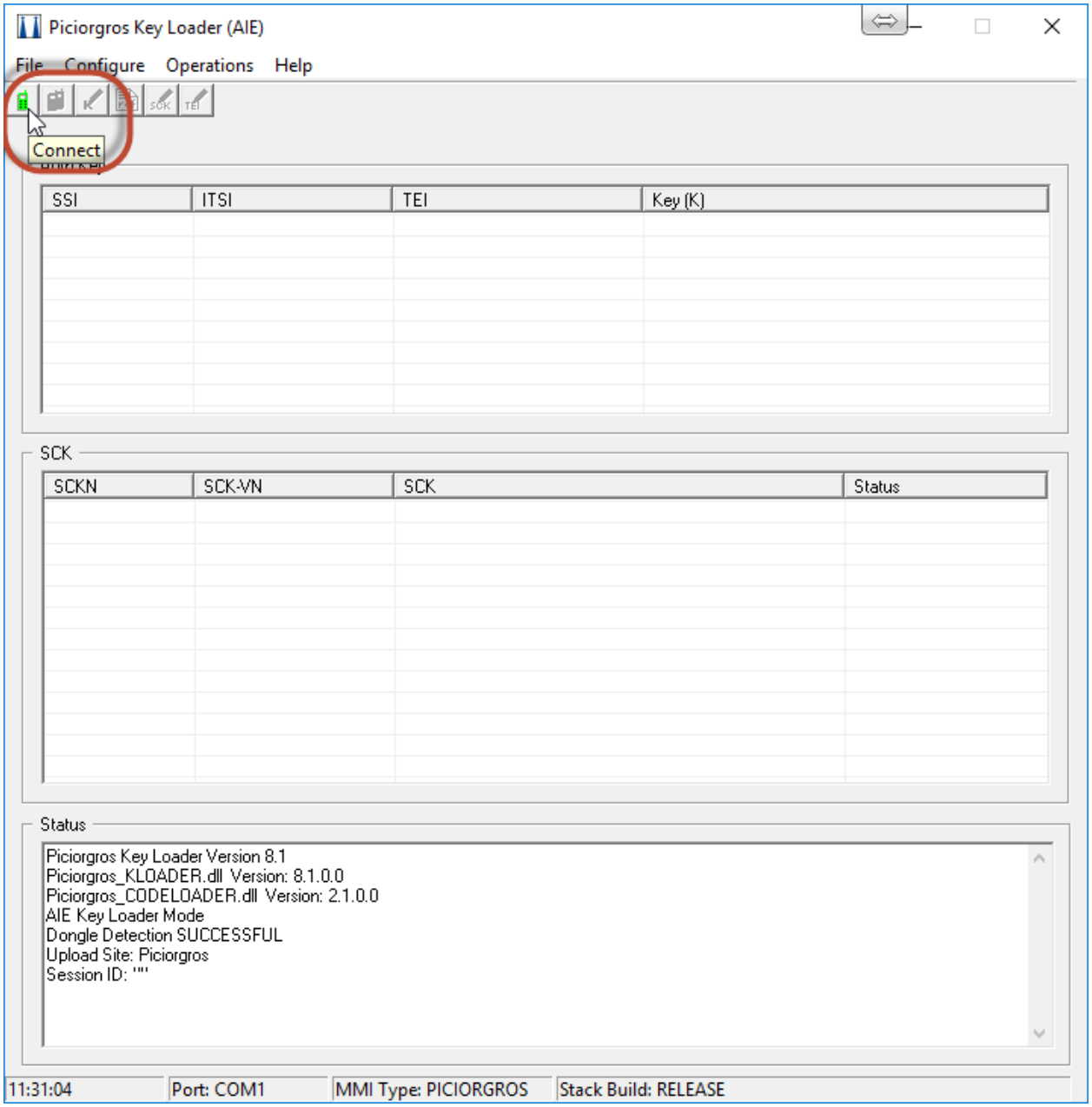
The Keyloader software must be started, the option "AIE" must be chosen and the "Key Loader" mode must be selected.



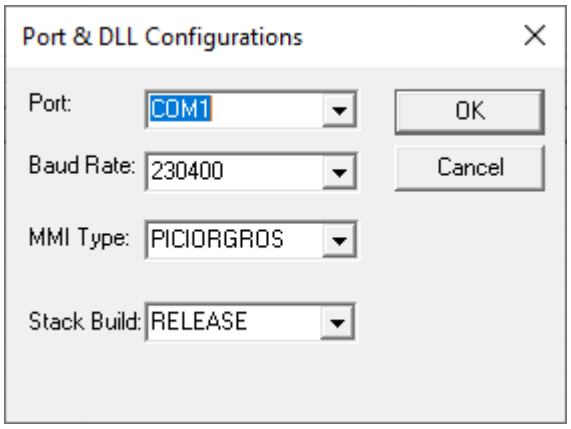
Select the following settings as shown in the picture below:



The Keyloader software is now ready to connect the the DVI-100:

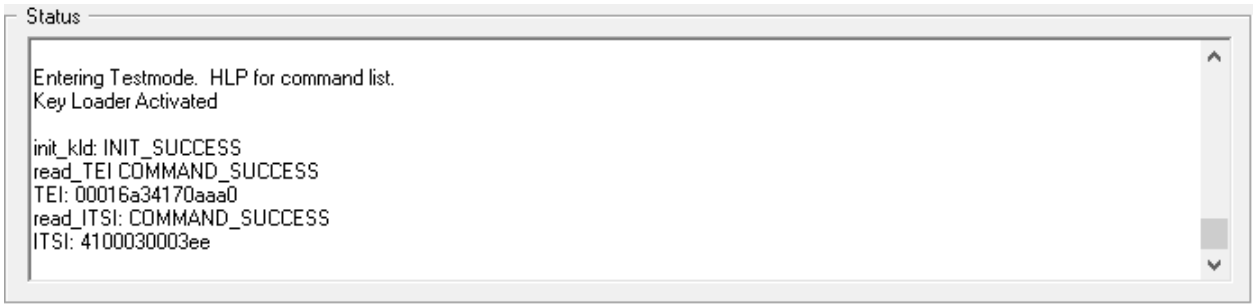


The COM port of the PC which is connected to the AUX port of the DVI-100 must be chosen:



For V4 radios (Stack version 4.x) you need to set the Baud Rate to 230400! For V3 radios (Stack version 3.x) the Baud Rate needs to be 115200!

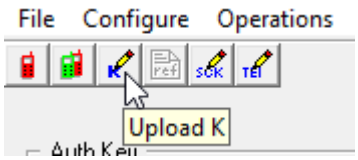
Once the connection is established, this message appear in the status window:



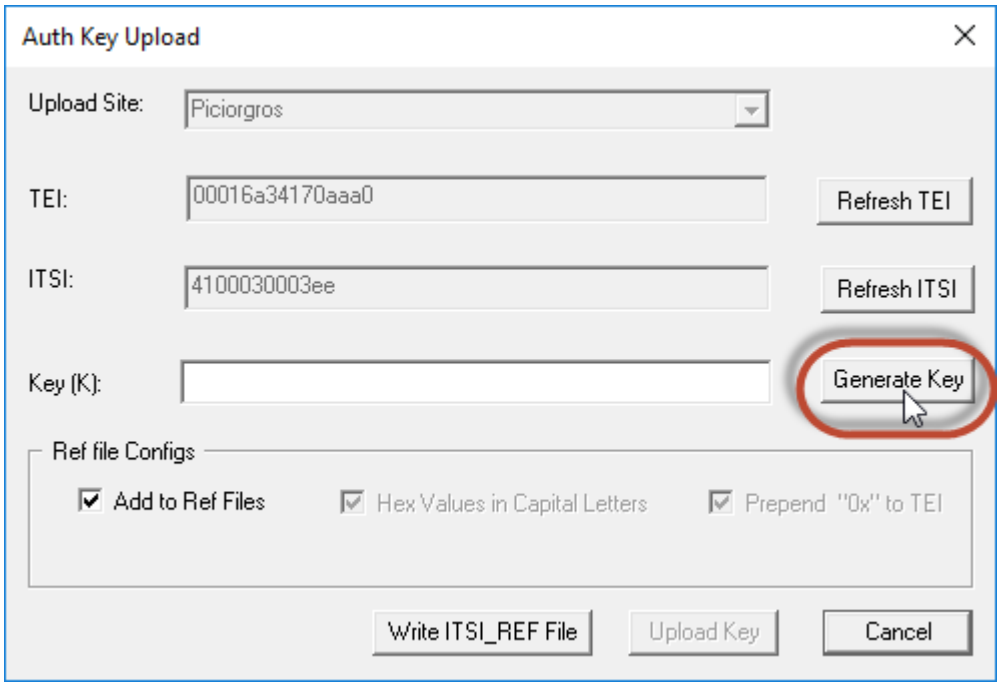
The generation and programming buttons will also become active:

9.1.3 Generating and programming a K-Key

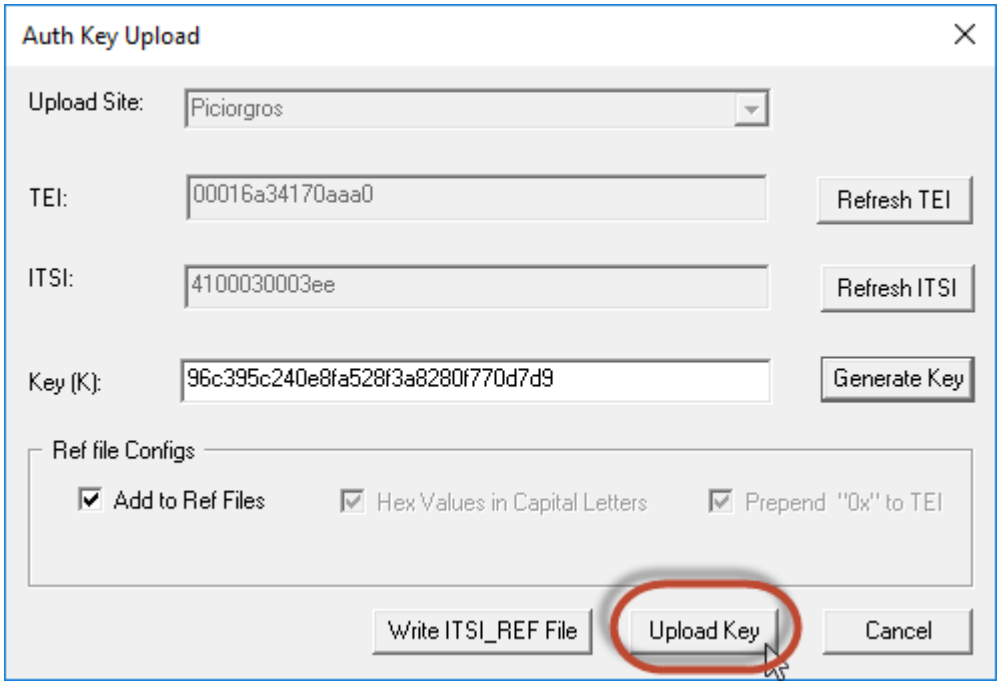
In connected state the "Upload K" button must be pressed:

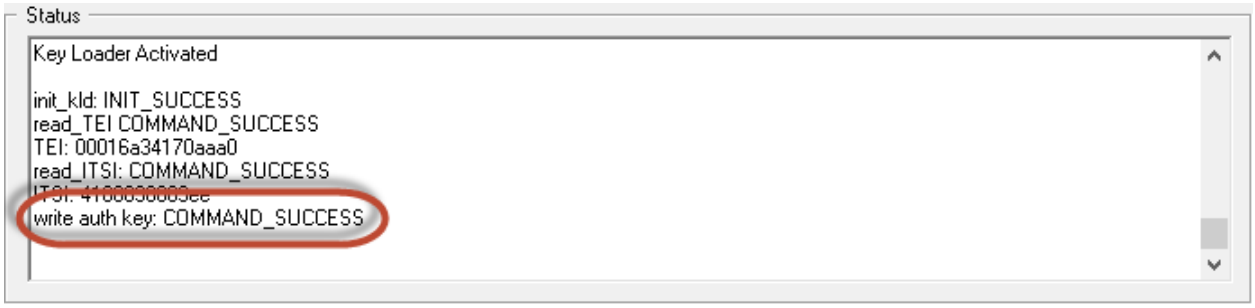


A new K-Key must be generated:

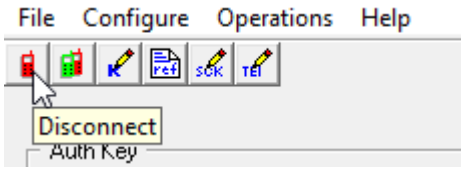

Auth Key Upload
Upload Site:
Piciorgros
TEI:
00016a34170aaa0
Refresh TEI
ITSI:
4100030003ee
Refresh ITSI
Key (K):
Generate Key
Ref file Configs
Add to Ref Files
Hex Values in Capital Letters
Prepend "0x" to TEI
Write ITSI_REF File
Upload Key
Cancel

The generated key must be uploaded into the DVI-100:





The Keyloader can now be disconnected from the DVI-100:

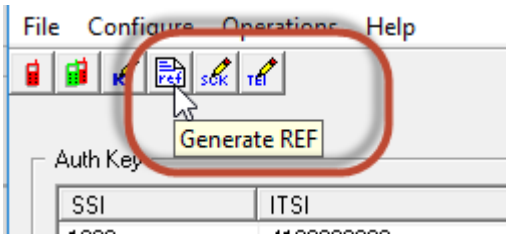


The DVI-100 must now be restarted to return to normal operation.

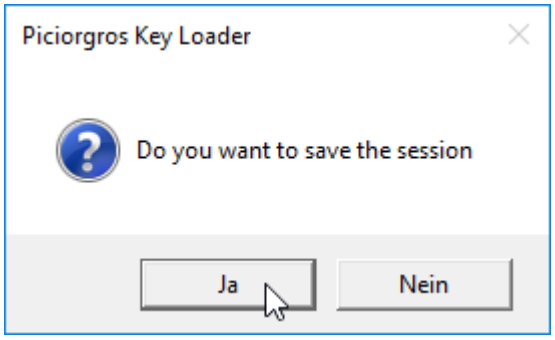
If more than one DVI-100 should be key programmed, other devices can be programmed without closing the Keyloader software. The next DVI-100 can be set into Keyloader mode and the Keyloader can be connected to it by the "Connect" icon, followed by generating and programming the K-Key. With this method only a single K-REF file is generated for a number of DVI-100.

9.1.4 Generating K-REF files

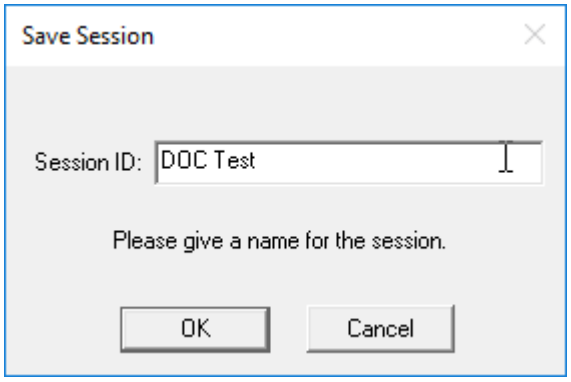
If all DVI-100 are programmed with K-Keys, the K-Ref file can be generated by the software:



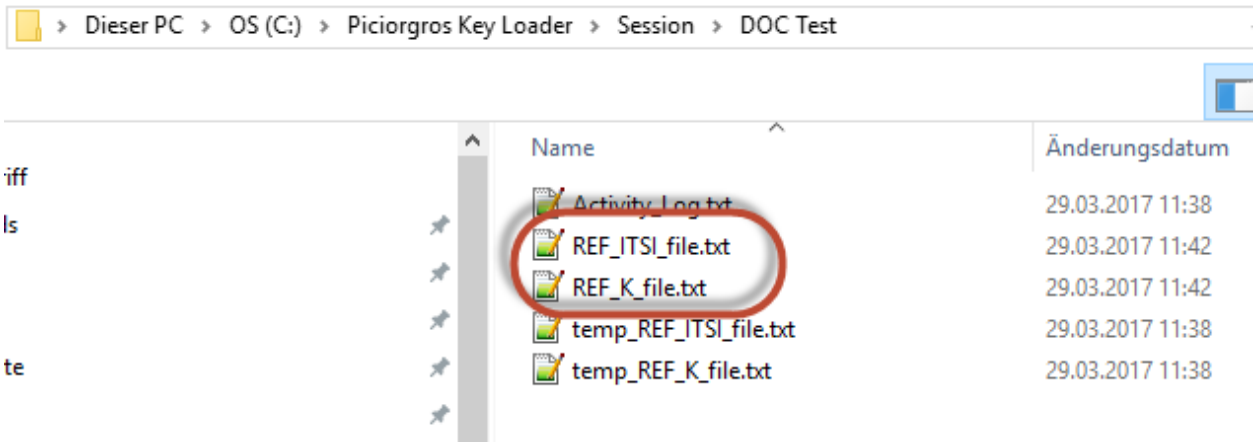
Answer the next question with "Yes":



And give a name to the session:



The REF-Files are generated and can be found on the Hard Disk of the computer in C:\Piciorgros Key Loader\Session\Name



Note:
If the infrastructure also needs an ITSI-REF-file to be provided, the TETRA ISSI, MCC and MNC must be configured in the DVI-100 before the keys are programmed and the REF-files are generated!

If no ITSI-REF file is needed, the keys can be generated and programmed without the need of any TETRA configuration of the device.

10 Specifications

Functions:	Digital Voice and Message Interface for TETRA
RF output power:	Class 3 (for 350 – 470 MHz) Class 3L and 4 (for 806 - 868 MHz)
RF power adjustment:	4 steps, each 5 dB
Frequency range:	Band 0: 350 MHz - 370 MHz Band 1: 370 MHz - 400 MHz Band 2: 400 MHz - 430 MHz Band 3: 450 MHz - 470 MHz Band 10: 806 MHz - 869 MHz
Receiver Sensitivity:	Static: min -112 dBm (Typ -115 dBm) Dynamic: min -103 dBm (Typ -107 dBm)
Interfaces:	
COM:	• Not used
AUX:	• RS-232, Sub-D (F) for TETRA radio logging
Ethernet:	• 10/100 Mbit/s
Operating modes:	• Bridging voice PTT calls for a single TETRA talk group to another DVI-100 or the DVI server application and vice versa • Bridging SDS and Status messages for a single TETRA talk group to another DVI-100 or the DVI server application and vice versa • Server mode (for up to 10 clients) or client mode
RF field strength indication:	Front panel LED bar graph display (for received radio signal)
Encryption (Option):	
Air Interface	TEA1, TEA2, TEA3, Class 2 and 3
Authentication	Normal and Mutual
RF Conformance	EN 300 394-1
EMC Conformance	EN 301 489-1 und -18
ESD Conformance	61000-4-2 von 1998
IOP certified	yes

Power supply voltage:	12-24 VDC +/- 20%
Power consumption (av.) Receive:	Registered to the TETRA network ~160mA @24V, ~300mA @12V
Transmit:	Peak current during transmit bursts can shortly use up to 1.5 Amps @12V power supply!
Enclosure:	Extruded aluminum body; plastic end caps
Operating Temperature:	-20°C to +65°C
Mounting:	35 mm DIN rail, symmetrical
Dimensions:	80mm x 162mm x 62 mm (excluding antenna and power connectors)