



# SUPPORTING SYSTEM INTEGRATORS

How to bring Decodio's  
powerful analysis capabilities  
into any project.

**INCREASING INNOVATION  
AND EXPANDING  
CAPABILITES TOGETHER**

**TDOA/AOA  
LOCALIZATION**

**PROCESSING  
PLUG-INS**

**SIGNAL ANALYSIS  
DECODING  
DECRYPTION**

**DRIVE  
TESTING**

**CUSTOM  
ALERTS**

**POST-CAPTURE  
ANALYSIS**

# INTRODUCTION



Developing a Spectrum Monitoring system, but lacking a digital radio monitoring and TDoA localization capability? Know that we routinely work with large and small system integrators in a myriad of markets. Because of Decodio's agile and scalable software packages, it was made for integration, bringing the potential of its high-performance channelizing capabilities and software-defined radio decoders into existing hardware solutions.

We offer a simple way to include channelization/DDCs and protocol decoders for non-cooperative analysis. This booklet serves as a guide on your journey to discover our offerings and services.



- ➔ 20+ protocols and up to 500 analysis channels on a standard Windows PC
- ➔ Backend/frontend integration possibilities
- ➔ Flexible licensing options
- ➔ Push results to third party software via TCP/IP JSON commands
- ➔ Development license and technical support available
- ➔ TDoA localization subsystem

## Protocol decoders

### DIGITAL PMR

TETRA  
TETRAPOL  
DMR, dPMR  
NXDN  
MPT 1327  
POCSAG  
P25 (Phase 1 & 2)

### ANALOG

AM  
FM  
SSB

### AMATEUR

C4FM/Fusion  
PACKET  
DSTAR

### AIR

ADSB  
ACARS  
VDLM2  
FLARM

### MARITIME

AIS  
ATIS  
DSC  
GMDSS HF



*Custom protocols  
can be added  
through plugin API.*

## Market sectors



SIGINT



PUBLIC SAFETY



INDUSTRY



CRITICAL INFRASTRUCTURE



REGULATION AUTHORITIES



EW



TRANSPORTATION



AIR AWARENESS



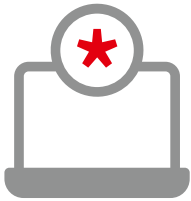
MARITIME AWARENESS



NETWORK OPERATORS

# DECODIO SOFTWARE LINEUP

- All of our products interact with each other for powerful analysis combinations.
- Tailoriable is present in each software, adjusting channel limits, protocols, and number of receivers or IQ files.



## Flagship products



### RED

Our flagship software, provides core signal processing and decoding features for over 20 protocols and 500 channels on a standard PC.  
NET and ReX versions of RED enable more tailorability.



### ORANGE

An offline visualization tool for decoded PMR protocol data, which conveniently interfaces display results via charts and data tables.



### LOCALIZER

An emitter-localization solution based on TDoA or AoA. Hybrid TDoA/AoA options are available. Able to integrate into larger system deployments.



## Add-on Products



### PINK

Alarming software that triggers actions.



### BLUE

Web-based visualization and monitoring based on Elasticsearch and Kibana

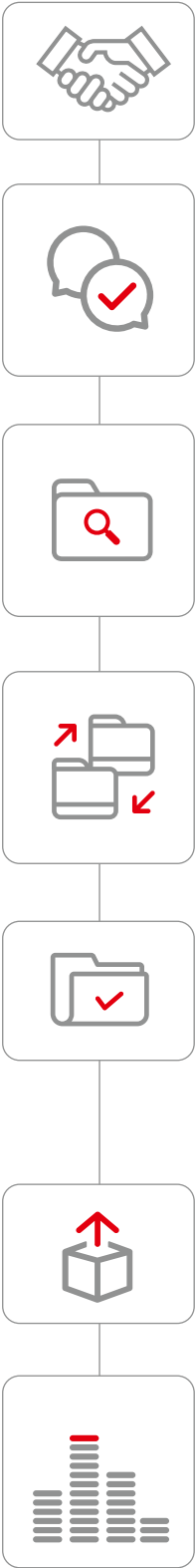


### GREEN

Plugin-based C/C++ application programming interface (API) to RED, perfect tool for custom signal processing and acquisition.

# PROJECT IMPLEMENTATION PROCESS

➔ Decodio follows a proven and efficient process to help our clients.



## INITIAL CONTACT

## PROJECT REQUIREMENTS BRIEFED

- Protocols
- Timeline and Budget
- Number of Channels and Bandwidth required
- Review of existing Infrastructure (Receivers, Network, Data)

## PROJECT EVALUATION

- Capability Match
- Supported/not supported
- Export Control applicable
- Custom development

## OFFERING

- ROM
- Formal Quote

## AGREEMENT

## EXPORT CONTROL

## PAYMENT & SHIPMENT

## OPERATION & SUPPORT

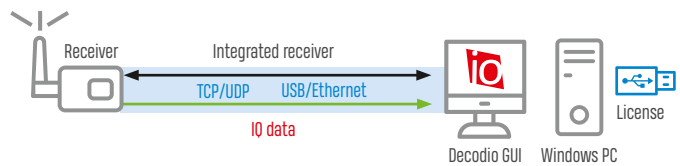
- Setup
- Initial Training
- Operation
- Updates

# SYSTEM DESIGN OPTIONS

- ➔ 4 general designs that showcase our ease of integration.
- ➔ We understand every project is unique and stand ready to discuss your specific needs.

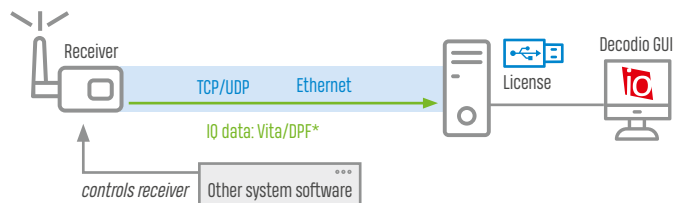
## 1 INTEGRATED RECEIVER WITH DECODIO GUI

- Pick from 20+ integrated receivers
- Control receiver inside the Decodio GUI
- Quick delivery, perfect for kit solutions
- Able to adapt to current customer kits



## 2 NON-INTEGRATED RECEIVER WITH DECODIO GUI

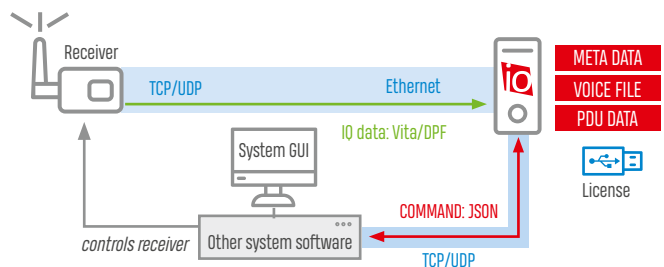
- Partner our GUI with your system
- Use your own receiver and software
- Great way to add Decodio to a system suite
- Stream IQ data via TCP/UDP into Decodio software



(\*DPF=Decodio proprietary format)

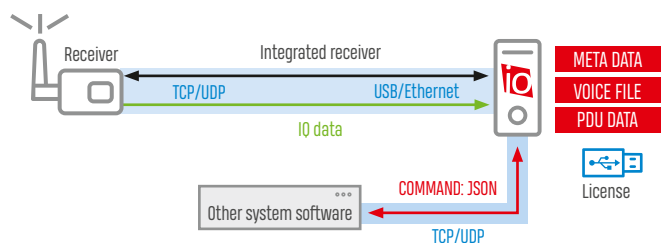
## 3 NON-INTEGRATED RECEIVER, DECODIO BACKEND

- Add Decodio to an established project
- Use your own receiver and software
- Control Decodio software via JSON commands
- Display Decodio results inside your GUI
- Requires VITA-49 IQ input to Decodio software
- RED can run without GUI as a Windows service



## 4 INTEGRATED RECEIVER, DECODIO BACKEND

- Add Decodio to an established project
- Use an integrated receiver
- Control Decodio software via JSON commands
- Display Decodio results inside your GUI
- RED can run without GUI as a Windows service



## Linux options

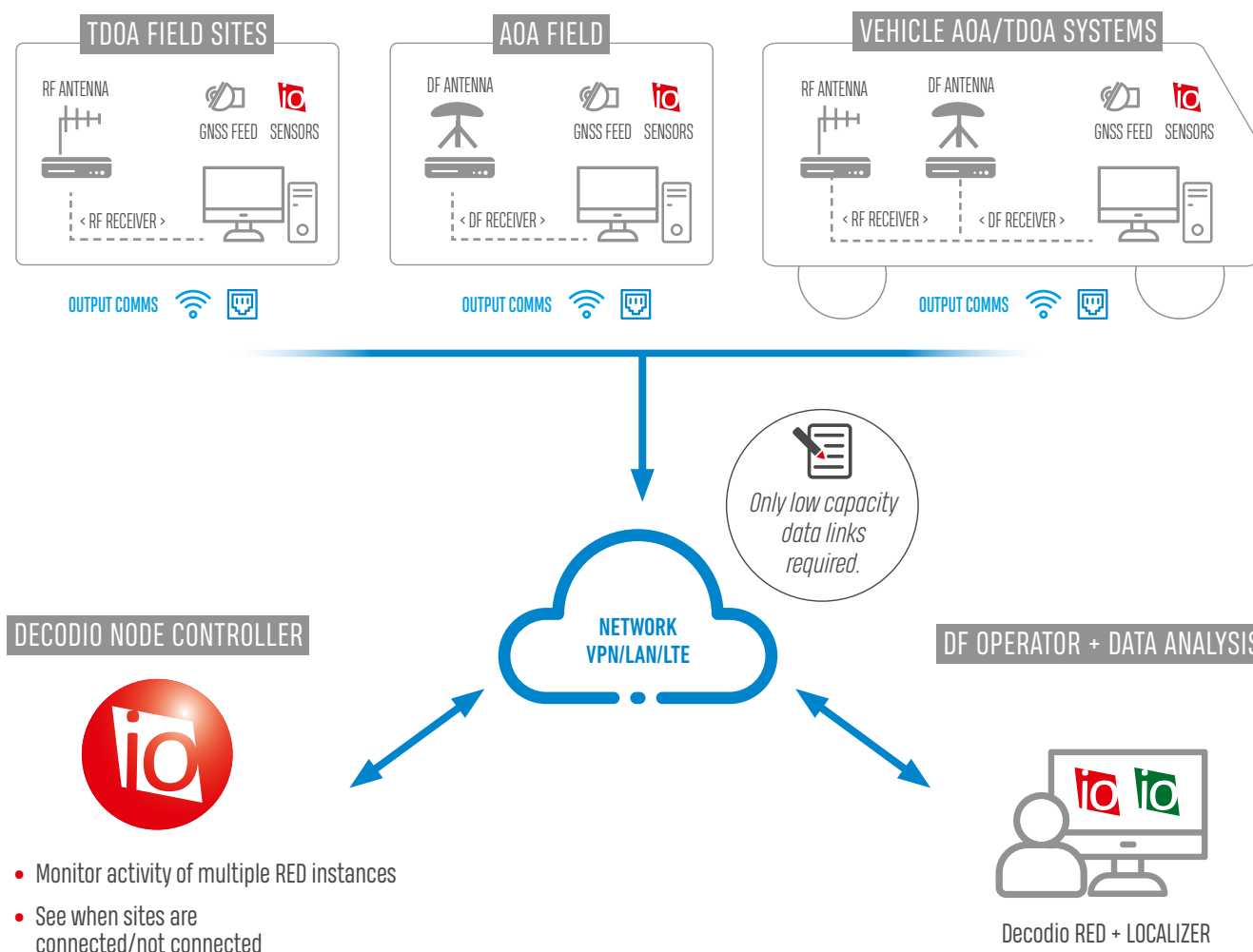


While Decodio requires a Windows PC, there are options to incorporate Linux systems. Please contact us to learn more.

# MULTI-SITE INTEGRATION

## Cross Fix with LOCALIZER

- ➔ LOCALIZER is an emitter-localization solution that is based on both “time difference of arrival” (TDoA) and “angle of arrival” (AoA).
- ➔ Decodio is also able to build hybrid solutions based on available DF systems in combination with TDoA.
- ➔ Thanks to the open JSON TCP/IP interface Decodio’s Localizer TDoA capability can complement a xG, drone detection- or satellite-monitoring system with fast and precise emitter localization functionality.
- ➔ Assign jobs to Decodio Localizer on signals of interest and pinpoint the position of a drone remote-controller, a satellite phone or a mobile handset. The TDoA technology is well proven for short bursted signals which also allows the localization of military hopper radios.
- ➔ The Decodio Localizer service provides the estimated position in lat/lon via the JSON TCP/IP interface to your monitoring system.

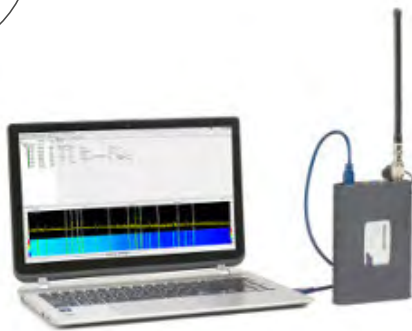


# INTEGRATED RECEIVERS

- ➔ Control these RF receivers directly from inside the Decodio GUI.
- ➔ Choose from an ever growing list with top names in the radio frequency industry.



Check our website for the latest updated receiver list.

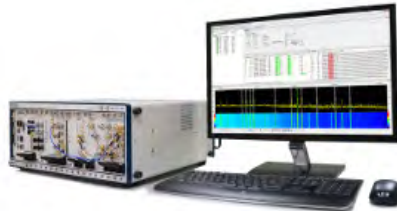


## COMPACT

- Tektronix RSA306
- Tektronix RSA5xx
- Signal Hound BB60C/D
- Signal Hound SM200B/C, SM435B/C
- NARDA SignalShark
- Rohde & Schwarz PR100
- Rohde & Schwarz PR200
- Twin RX (NI USRP 2945 & 2955)
- NI USRP/ ETTUS N200
- HackRF, SDRPlay, AirSpy, RTLSDR
- Keysight FieldFox

## ROBUST

- NI PXIe-5667
- NI PXIe-5668R
- IZT R3xxx/R4xxx/R5xxx series
- Rohde & Schwarz ESMD/ESME/ESMW
- Rohde & Schwarz EM100
- Rohde & Schwarz EM200
- Plath SIR 2115



## DIRECTION FINDERS

- Rohde & Schwarz DDF550/DF255
- Rohde & Schwarz DDF 1555/DDF007
- Rohde & Schwarz PR100/PR200
- Rohde & Schwarz EM100/200
- Rohde & Schwarz EB500/DDF205
- NARDA SignalShark ADFA 1/2

## RECEIVER INTEGRATION REQUEST

### Don't see your receiver listed above?

No worry, as it is possible to integrate your receiver after review by our engineering leadership. If we agree, then an actual receiver needs to arrive to our Zürich office for testing and integration development. This can take weeks to months, depending on each case.

### Want to keep control of your receiver?

Refer to our section on streaming IQ data directly to the software.

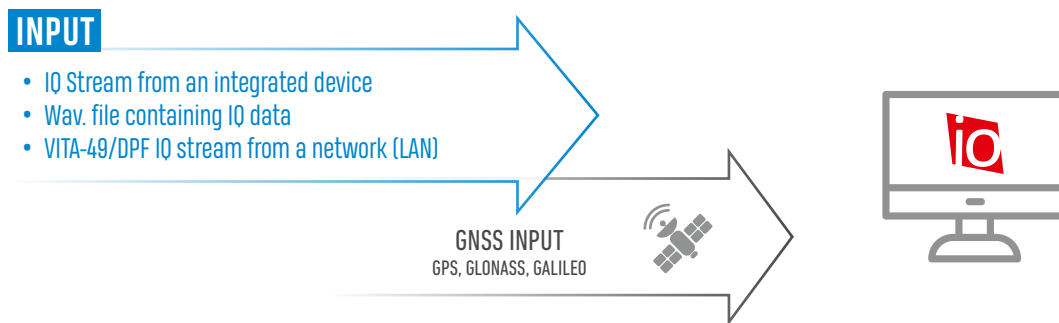


# IQ INPUTS/OUTPUTS

## Feeding Decodio software

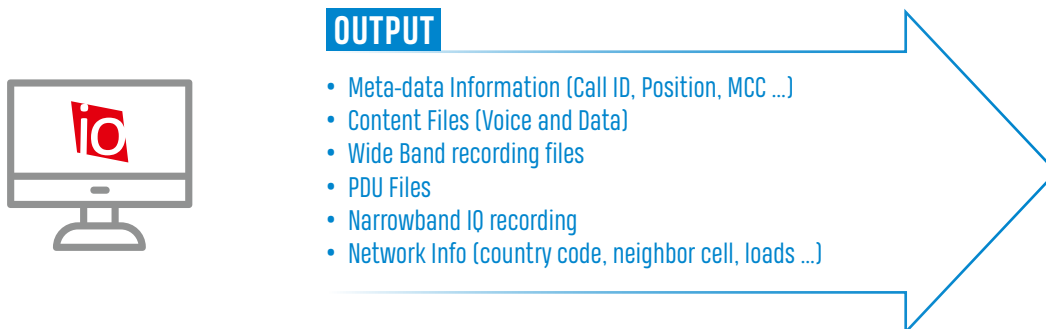
Decodio RED/ReX/NET requires IQ data input to conduct analysis and can receive it in three ways.

- 1 IQ Stream from an integrated device
- 2 IQ .wav File
- 3 VITA-49 IQ/DPF IQ data stream



## Post analysis information

Decodio RED/ReX/NET exports a myriad of data for further analysis.



## Command formats

➔ Use Decodio as a backend via JSON TCP/UDP Commands.

```
{
  "TimeStamp":"2020-11-10T14:46:03.885",
  "Version":"0.55",
  "command":"status",
  "msg":"New connection from ::ffff:127.0.0.1"
}
{
  "ModesGuiInitParameters":{},
  "SoftwareVersion":"1.9.8.0",
  "TimeStamp":"2020-11-10T14:46:03.885",
  "Version":"0.55",
  "command":"connected",
  "licensedDevices":[0,1,2,3,4,5,6,7,8],
  "licensedPDUOuts":[1,4,5],
  "licensedProtocols":[0,1,2,3,4,5,12,27,2000,2001,2002],
  "licensedTools":[0],
  "serverStart":"2020-11-10T14:45:41.868",
  "serverStatus":"License: Local"
}
```

### JSON 1 Example

The message is the first message sent by the application when a new connection to the control port is opened (it contains license information).

### JSON 2 Example

The following message creates a TETRA stream centered on 390.500 MHz and assigns it to device 1:

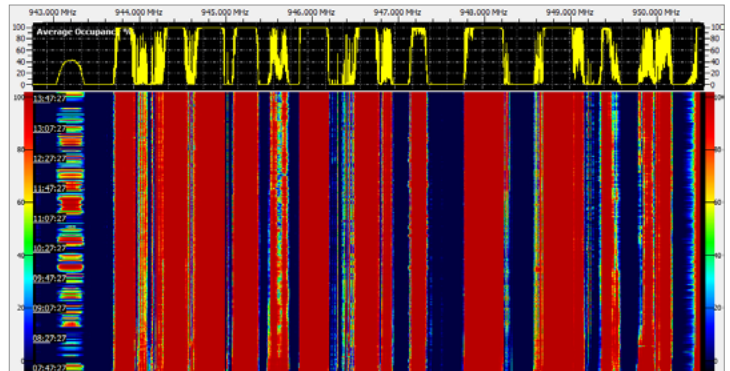
```
{
  "DeviceId": 1,
  "Frequency": 390500000,
  "Label": "TETRA",
  "ModelId": 1,
  "command": "modifyStream"
}
```

# MODULES/TOOLS

## Additional modules

➔ Additional modules and tools that can be applied to RED

- Crypto Interface
- Band Occupancy
- Channel Occupancy
- ITU Measurements
- Tasking
- Frequency Switching
- Band Monitoring
- Channel Scan
- Classifier
- Spectrum Marking
- Emissions Detection
- Alerting/Alarming
- Panorama View
- Mask Triggering



## General system requirements



- Windows 10 64 Bit
- Quad-Core Processor min. 3 GHz (e.g. Intel i7-4770)
- Gb Ethernet card supporting jumbo frames
- 16 GB RAM
- Optimum screen resolution: 1920 x 1200
- Sound card (optional)
- SSD (recommended, depending on recording requirements)

# DECODING STREAM OPTIONS

- Streams mark IQ spectrum channels to allow further spectral data analysis inside Decodio RED/NET/ReX. Each stream is subject to a specific device and protocol, as indicated by the hierarchy in the project configuration.
- A recording stream in Decodio ReX can record or demodulate a narrowband channel. Alternatively, a Decodio RED supported protocol stream represents a carrier and is used to decode the data.
- The stream number is important for license configurations and can be purchased in two ways (locked or superstreams).

## PURCHASED PROTOCOLS

TETRA DECODER  
P25 DECODER



20 Streams ready to be used.  
16

● Decoders not active

TETRA DECODER 10  
P25 DECODER 7



10 Leftover streams  
9

● Decoders activated, take streams from respective banks.

TETRA DECODER 10  
P25 DECODER



10 Leftover streams  
16 Streams ready to be used.

● TETRA still using assigned streams.  
● P25 streams returned to bank.

10 Leftover streams  
16 Streams ready to be used.

## LOCKED STREAMS

The maximum number of streams are locked to their protocols or to ReX analog analysis.

**Ideal for:**

Single Protocol Operators with set number of channels

**Example:**

Public Safety TETRA operator with 16 channels

## SUPERSTREAMS

Unassigned streams can be used across multiple protocols or recording windows.

Allows protocol decoders to "rent" streams from unassigned group up to the maximum amount ordered.

**Ideal for:**

Federal Regulators or SIGINT/EW users.

**Example:**

Regulator has 50 superstreams, starts TETRA decoding and uses 20 streams, then turns on P25 decoding and uses 25 streams. This leaves 5 streams for another protocol. If the user removes the TETRA decoding, then other protocols can use/add 25 streams.

## PURCHASED PROTOCOLS

TETRA DECODER  
P25 DECODER  
NXDN DECODER  
DMR DECODER

● Decoders not active

TETRA DECODER 10  
P25 DECODER 20  
NXDN DECODER 5  
DMR DECODER 25



40 Leftover streams

● Decoders active, pull needed streams from bank.

TETRA DECODER 10  
P25 DECODER 20  
NXDN DECODER  
DMR DECODER



70 Leftover streams

● TETRA & P25 decoders active  
● NXDN & DMR return active streams to bank

TETRA DECODER 20  
P25 DECODER 30  
NXDN DECODER  
DMR DECODER



50 Leftover streams

● TETRA & P25 decoders find more channels and pull streams from increased bank

## PURCHASED SUPERSTREAMS

100 Superstream bank is full.

# INSTANCE MODES AND LICENSE OPTIONS

## Instance modes

### LOCAL

For use on a **single PC** only (stand alone). Local software cannot interact with other Decodio software instances.

### SERVER

Allows a user to **control instance remotely** by either:  
a) an instance in remote mode or  
b) 3rd party application.

### REMOTE

This mode allows a user to **access a server mode instance** via a network connection. Enables access to signal processing from another location.

## License options

### SINGLE LICENSE, SINGLE USER



Great for **single applications**, license is inserted into the user's PC.

### SINGLE LICENSE (SERVER), SINGLE USERS



Use a **license server** to enable non-simultaneous access from multiple users. Here, a single license is checked out by a **single user**, and when the user is finished, it can be returned and then check out from another user. Similar to a library book. Great for teams that need to access the license, but not at the same time.

### MULTIPLE LICENSE (SERVER), MULTIPLE USERS



**Multiple users** access multiple licenses hosted on a **central server**. Perfect for multiple analysts working on the same protocol, or if analysts need to tap into the license across different time zones. Number of licenses is part of the floating license configuration.

## Dongle types



To view codemeter dongle types, please visit their webpage.

The Decodio software is protected by a WIBU-Systems AG CodeMeter license dongle. To run the software it is necessary to connect the dongle to the computer. If the dongle is removed, the software will terminate automatically. The dongle is included in all software purchases.

### The license controls the following features and functionalities:

- license expiration date
- supported signal acquisition devices incl. quantity
- supported protocols incl. max. number of streams/channels
- allowed software versions
- TCP/IP remote interface
- custom outputs (e.g. PDU output)
- single/multiple floating licenses possible based on licenses server configuration

# EXPORT CONTROL INFORMATION

**Decodio products are 100% designed, developed, and shipped from our Zürich, Switzerland office.**

A few of our products are subject to Swiss export control regulations, requiring Decodio to submit end user statements for controlled products to SECO (State Secretariat for Economic Affairs) and gain approval prior to shipment. Additionally, some end users could be prohibited from receiving our products. Please reach out to our team for more information. Because SECO policies can change often, we will advise you of current impacts during our project evaluation process.

## Products requiring end-user statement (SECO ECCN 5D001)



**RED**  
(protocol decoding only)



**NET**  
(protocol decoding only)

*Please note that if a non-controlled product is combined with a controlled product, the package is considered controlled. Example: NET + Localizer requires SECO approval to export.*

## Products that do not require end-user statement




**ReX**  
(analog demodulation)



**PINK**  
(alerting)



**LOCALIZER**



**ORANGE**  
(data display)



**BLUE**  
(web visualization)



**GREEN**  
(custom API)

## Integrator home country policies

The export/import controls of the integrator’s home country are the concern of the integrator (e.g. ITAR).

# WARRANTY, TECH SUPPORT & TRAINING



## Warranty



### Standard warranty

All Decodio software products come with a 1 year warranty that begins upon the date of delivery. This covers major and minor bug fixes and normally includes a new release update within the 1 year period. Hardware warranties are subject to the individual vendor warranty conditions.

### Extended warranty

Customers can purchase additional years to cover project periods after the one year standard warranty.

## Technical Support



Decodio stands ready to provide unparalleled technical support to our customers. For crashes or major issues, users can send us an email or call during normal working hours.

Additionally, systems integrators can purchase dedicated technical support at an hourly rate during the implementation phase of larger projects.

## Training



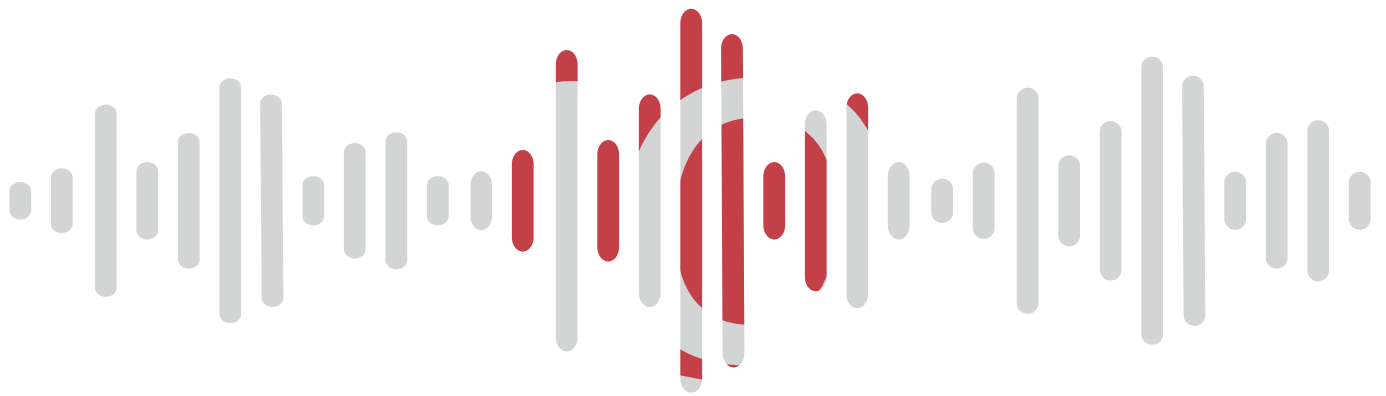
### System Introduction Training

Customers can purchase a standard one day system introduction training option. This training is normally accomplished remotely, however options for on-site training are possible.

### Operator Training

For more complex systems, we offer a three day training option. This will be tailored based on customer needs and configurations. It can be done in-person or remotely.

# ABOUT DECODIO



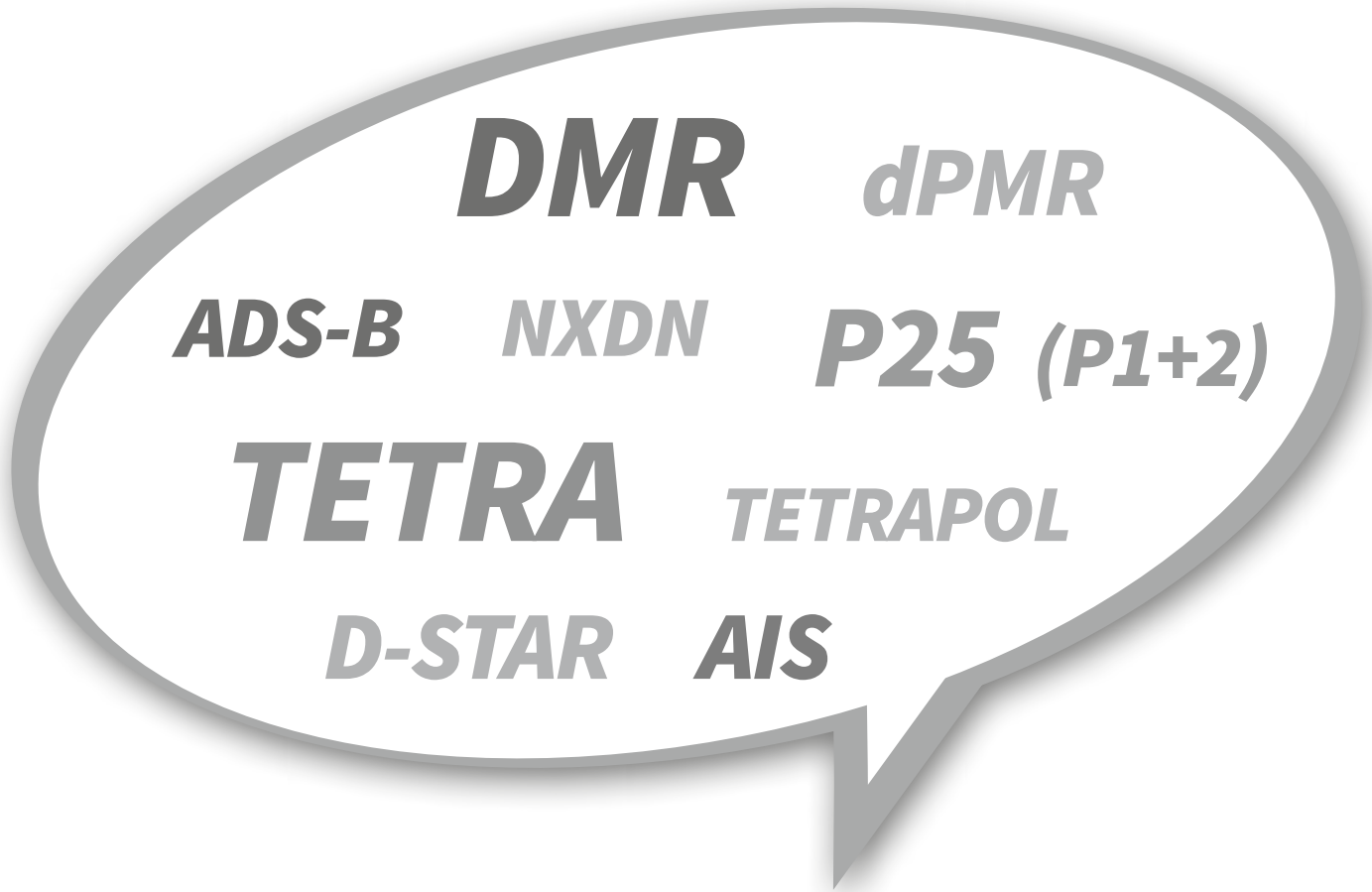
Based in Zürich, Switzerland, Decodio AG is a company specialized in digital signal processing, signal intelligence and radio monitoring. We develop innovative software solutions for a wide range of applications, including spectrum monitoring, quality assurance for wireless communication systems and SIGINT/COMINT for both end-users and system integrators.

Decodio was founded in 2012 and is committed to the development of leading software-defined radio technologies.



- November 2014, Decodio was awarded the CTI label from the Commission for Technology and Innovation of the Swiss Confederation. This label certifies that the company has fulfilled various developmental criteria required for sustainable growth.
- March 2018, Decodio's quality management system was certified to the standard ISO 9001:2015.
- Early 2019, Decodio GmbH was founded in Germany as a 100% subsidiary of the Swiss Decodio AG.
- End of 2022, Decodio SAS in Rennes/France was founded as a second subsidiary.





**DMR**

**dPMR**

**ADS-B**

**NXDN**

**P25 (P1+2)**

**TETRA**

**TETRAPOL**

**D-STAR**

**AIS**

## Contact us

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