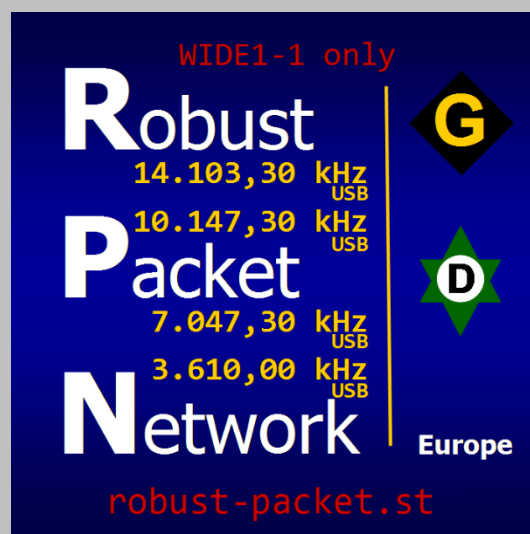


2024-01-15


Robust Packet Network

# Manual

RPR-HF-APRS



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## Introduction

The following are the results and preliminary status quos of an open exchange between the RPR users summarized in this manual.

**It is the goal of Robust-Packet-Network to make Robust Packet Radio more popular within the HF-APRS and Packet Radio community and to strengthen the network.**

Here the focus is set on frequencies and broadcast times in the network, as well as configurations of digipeaters, mobile and fixed stations.

**All given data and statements are matter of constant changes and will be varied towards the needs and requirements of all users.**

## Bulletin Board

- The **Teensy RPR hardware project** is meanwhile fully established within the RPR-Community. Modifications and enhancements are carried on constantly.

Discussions and developments can be followed via **Groups.io robustpacket**. A download with an additional can be found under following link:

<http://robust-packet.st/RPR-TNC.zip>

Robert, DM4RW and Hans-Peter, DL6MAA are the brains behind the **Teensy RPR Modem**.

- The Robust Packet Network has its own **Bandmeister DMR Talkgroup** named **TG24098 (Robust Packet)** as Data Voice Meeting Point. The dashboard link is:

<https://brandmeister.network/?page=lh&DestinationID=24098>

- The Robust Packet Network has a **SIGNAL Social Media platform** named **Robust Packet Network**. To join follow the group link:

[https://sinal.group/#CjQKICA7DviMAdd5PGo5\\_a36xXuGPAtWcMkejFDLc17A5BJtEhA6\\_mS8iMh2BcRC3bJO9XLu](https://sinal.group/#CjQKICA7DviMAdd5PGo5_a36xXuGPAtWcMkejFDLc17A5BJtEhA6_mS8iMh2BcRC3bJO9XLu)

or use this QR-code:



In order to varify participants better find here a list with 5-figures-abbreviated phone numbers:

<http://robust-packet.st/RPNSG.pdf>

- Latest SCS Tracker firmware & TRConfig is available here












<http://robust-packet.st/SCS-Tracker-Firmware.zip>

- If you like to operate reciprocal between FSK and RPR please note the following. This operational mode of the SCS Trackers is called **alternate mode** or **mixed mode** by some hams. SCS Tracker's manual uses the term **toggle mode**. **Toggle mode** provides a power cut between beacons with a deaf receiver. The latest **dual mode** operates continuously on a main selected modulation. The beacon transmission then comes twice with the second one being the other modulation before jumping back to the main selected one. So, you can listen and transmit continuously on RPR but (as safeguard) transmit a FSK beacon on top.

- [www.robust-packet.st](http://www.robust-packet.st) is 'on air'. To make RPN more popular please consider to implement <http://robust-packet.st> in your Comment [%AC] (SCS Tracker) / Beacon Comment (UI-View). Since it is quiet long for 300 baud operation a 2m transmission would help as well.

Daily developments and **corrections** can be found online here !  
<http://www.robust-packet.st/Robust-Packet-Network-Manual.pdf>

## RPR-Network Europe H24

RPN20 (Robust-Packet-Network on 20m)				
20 m	DB0UAL-10		Bavaria	Gate/Digi RF-INT-RF H24 operational
RPN30 (Robust-Packet-Network on 30m)				
30 m	DK2EZ-10		Hesse	Gate/Digi RF-INT-RF H24 operational
30 m	EI5HBB-10		Kilkenny	Gate/- RF-INT-RF H24 operational
30 m	HB9ZF-10		Canton Zurich	Gate/Digi RF-INT-RF H24 operational
30 m	LY2EZ-10		Šiauliai	Gate/Digi RF-INT-RF H24 operational
30 m	SK0BO-12		Greater Stockholm	Gate/Digi RF-INT-RF H24 operational
Winlink RMS (on 10147.3 kHz)				
30 m	DM4RW-10		Baden-Württemberg	00-23 UTC operational
30 m	SK0BO-10		Greater Stockholm	00-23 UTC operational
30 m	SM0YOS		Greater Stockholm	00-23 UTC operational
RPN80 (Robust-Packet-Network on 80m)				
80 m	DB0UAL-10		Bavaria	Gate/Digi RF-INT-RF H24 operational
80 m	HB9ZF-5		Canton Zurich	Gate/Digi RF-INT-RF H24 operational

• H24 = 24 hours operation • H12 = except night hours • HX = variable times / on request • HN = night times

## Comment

The interest in operating specific frequencies are as widely spread as the applications the users prefer.

Long-distance travellers focus 20 & 30 m band. Within Europe 80 m is regarded as a valuable band as well. First it means that HF-APRS activities are not over after sunset and second it lets participate lower class licensed hams. Long-distance mobile stations may claim antenna problems but in an area between 500-1000 km even short monoband antennas have shown excellent results.

Agreement among all hams is not to lose each other on too many different frequencies. Anyway, new activities raised up on 40 m. After changing IARU bandplan towards 7000-7200 kHz the digimode part in the IARU Region 1 went up as well. In order to stay clear of the CW area the frequencies 7047.30 kHz USB for RPR respectively 7047.60 kHz USB for FSK (HFP) have been developed. Efforts to find a worldwide 40 m frequency failed due to IARU bandplan differences.

In theory there are APRS frequencies existing as well in the 10 m, 15 m and 17 m areas but no gate or digipeater infrastructure is to be found there. So, in order to concentrate activities those frequencies are no longer mentioned in this document.

## RPR-Frequencies Europe

20 m	<b>14103.3 kHz</b>	USB	DB0UAL 14102.0 kHz USB
30 m	<b>10147.3 kHz</b>	USB	
40 m	<b>7047.3 kHz</b>	USB	
60 m	<b>5354.0 kHz</b>	USB	
80 m	<b>3610.0 kHz</b>	USB	

**Comment**

14103.3 kHz USB – This frequency has become the second strongest frequency in use behind 30m. In order to exchange longpaths and intercontinental in general 20m it of great use.

10147.3 kHz USB – The only really common frequency worldwide including sideband selection. FSK frequency is 10147.60 kHz USB and TOGGLE-MODE is possible as well.

7047.3 kHz USB – The specific Dial-QRG is a good reminder reflecting the 30 m one and fulfils the conditions according the IARU Region 1 bandplan. Little usage so far.

5354.0 kHz USB – The latest frequency is in operation since 2017. It is usable in day & night conditions. Experimental usage only so far.

3610.0 kHz USB – The traditional frequency from Bavaria. For years DB0UAL(-10) has done a reliable job single handily. Meanwhile a wider interest is aroused. Especially after sunset many stations join a 'fly-in'. Since no specific path setting for DB0UAL(-10) is required any longer other gates enjoy the interaction.

## HF-APRS Frequency Calculation

HF-APRS Dial Frequency Calculation RPR ⇔ FSK						
Tone Frequencies 1600/1800						
Region		RPR	USB=300 Hz lower than FSK	FSK	USB=300 Hz higher than RPR	side band
20 m	worldwide	14103.3 kHz		14103.6 kHz		USB
30 m	worldwide	10147.3 kHz		10147.6 kHz		USB
40 m	Europe	7047.3 kHz		7047.6 kHz		USB
60m	Europe	5354.0 kHz		5354.3 kHz		USB
80 m	Europe	3610.0 kHz		3610.3 kHz		USB
	= no usage					BOLD = active usage
<a href="http://www.robust-packet.st/tipsandtricks/HF-APRS-Frequency-Calculation.pdf">www.robust-packet.st/tipsandtricks/HF-APRS-Frequency-Calculation.pdf</a> for details						

## Own Station

HF-APRS Dial Frequency Calculation RPR ⇔ FSK						
Tone Frequencies ____ / ____						
Band		RPR	USB=300 Hz lower than FSK	FSK	USB=300 Hz higher than RPR	side band
20 m			141 __ . __ kHz		141 __ . __ kHz	USB
30 m			101 __ . __ kHz		101 __ . __ kHz	USB
40 m			70 __ . __ kHz		70 __ . __ kHz	USB
60 m			53 __ . __ kHz		53 __ . __ kHz	USB
80 m			36 __ . __ kHz		36 __ . __ kHz	USB

## HF-APRS Frequencies Worldwide

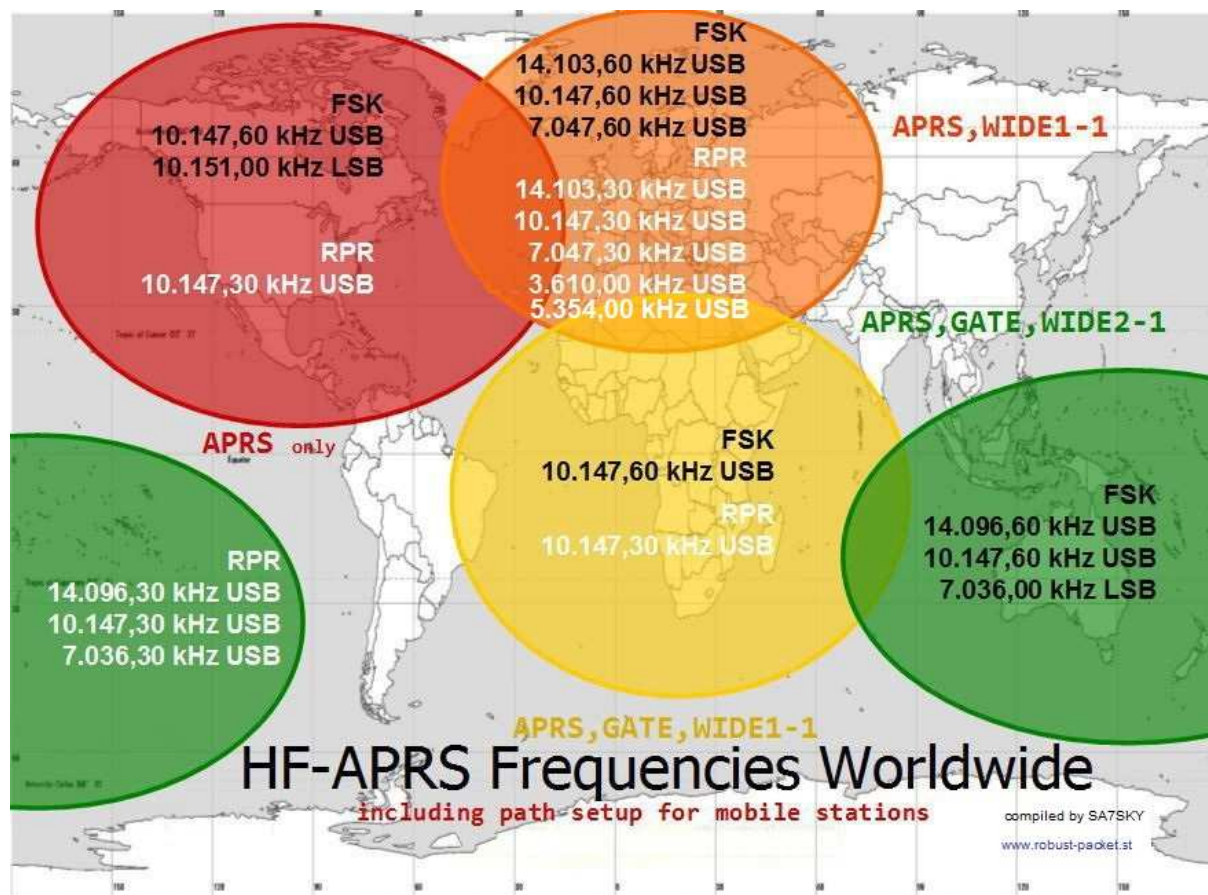


chart as download image under [www.robust-packet.st/hf-aprs-worldwide-chart.html](http://www.robust-packet.st/hf-aprs-worldwide-chart.html)

## Comment

North America (red) Main activities take place on the 30 m band. No further information could be found so far concerning the other bands. According to WA8LMF the density of gates in North America is such high that digipeating is undesirable. A point of view that can be found in Europe as well. Anyway, we have to keep on mind that i.e., mobile stations with a distance of 100-200 km to each other would never learn their proximity. With flat tires in the middle of nowhere digipeating then gets a different touch...

When RPR traffic starts now in North America a path APRS,WIDE1-1 is recommended. FSK (HFP) traffic does not encounter any influence by RPR !

Europe (orange) – see comment on previous page

Africa (yellow) Only activities observed are on the 30 m band. It is known that RPR gates are offered as well. Whether that is upon request and therefore temporary only is matter of survey.

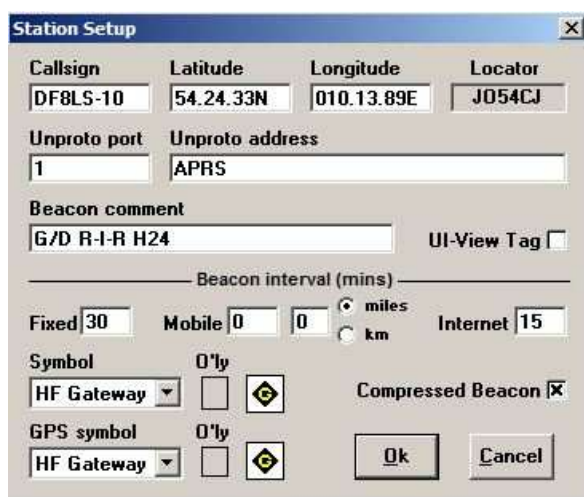
Oceania (green) – Driving force when it comes to HF-APRS are the Australian hams. Specifics here are the different frequencies on 20 m & 40 m compared to Europe and different side band selection as well. The historical development doing HF-APRS came by the usage of old commercial radios. Those provided only USB and so 20 m was kept USB ever since. Shown RPR frequencies are

theoretical entries only for the time being but hams down there are highly interested to enter the community of robust packet users.

General statement about path setting in South Africa and Australia – In those areas gating to the internet takes place via crossgating to the VHF-net. So, by using GATE and then WIDEN-n results in the necessary hops to the VHF IGATE.

## RPR-IGATE

### UI-View



**Station Setup**

Callsign	Latitude	Longitude	Locator
DF8LS-10	54.24.33N	010.13.89E	J054CJ

Unproto port: 1    Unproto address: APRS

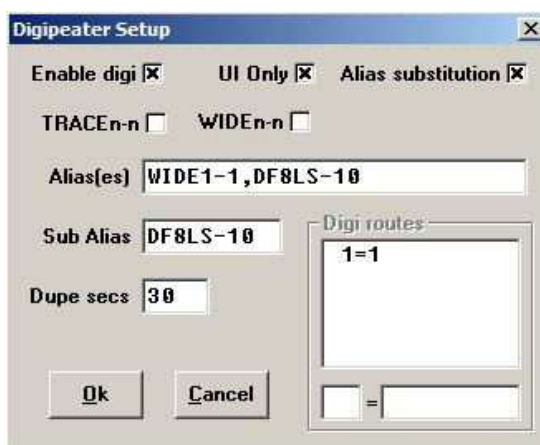
Beacon comment: G/D R-I-R H24    UI-View Tag ☐

Beacon interval (mins): Fixed 30    Mobile 0    0 miles    Internet 15

Symbol: HF Gateway    O'ly ☐    Compressed Beacon ☒

GPS symbol: HF Gateway    O'ly ☐

Ok    Cancel



**Digipeater Setup**

Enable digi ☒    UI Only ☒    Alias substitution ☒

TRACE-n ☐    WIDEN-n ☐

Alias(es): WIDE1-1,DF8LS-10

Sub Alias: DF8LS-10

Dupe secs: 30

Digi routes: 1=1

Ok    Cancel

[with unmodified original program]

#### Beacon Comment – Service Code

##### features

G/D Gate & Digi available

-/D Digi only

G/- Gate only

##### connectivity

R-I-R Radio ⇌ Internet ⇌ Radio connection

R-I Radio ⇌ Internet only

R Radio only / no internet i.e. Digi/p

##### time table

H24 24 hours operation

H12 except night hours

HX variable times / on request

HN night times



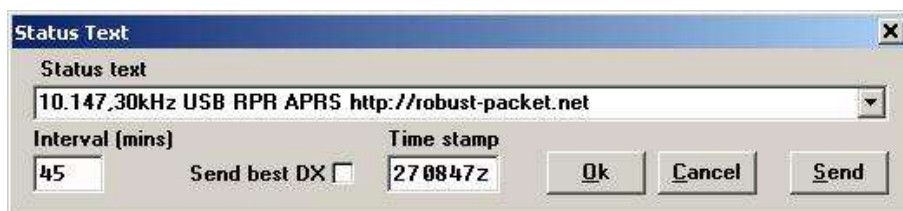
**APRS Compatibility**

Unproto address: APRS

Default message type APRS ☒

Enable UI-View(32) extensions ☒

Ok    Cancel



**Status Text**

Status text: 10.147.30kHz USB RPR APRS <http://robust-packet.net>

Interval (mins): 45    Send best DX ☐    Time stamp: 27 08 47z

Ok    Cancel    Send



# Robust Packet Network

[www.robust-packet.st](http://www.robust-packet.st)

## Manual

SCS-Tracker	UI-View	aprs.fi - presentation
<b>Comment [%AC]</b> under APRS Settings	<b>Beacon Comment</b> under Station Setup	<b>Comment text</b> <i>1. line (green) in the bubble</i> <i>http:// and mailto: links are always blue</i> mobiles show this in moving list <a href="http://aprs.fi/moving/">http://aprs.fi/moving/</a>
<b>Report Text [%AR]</b> under APRS Settings	<b>Status Text</b> under Status Text	<b>Status message</b> <i>2. line (magenta) in the bubble</i> <i>http:// und mailto: links are always blue</i> not shown in the moving list

Result in the internet

 **DF8LS-12** · center · zoom · info  
 2011-11-09 07:19:02z - 2012-03-27 09:05:29z  
 G/D R-I-R H12 {UIV32}  
 10.147,30kHz USB RPR APRS <http://robust-packet.net>  
 [APU25N via TCP/IP\*,qAC,T2KA]

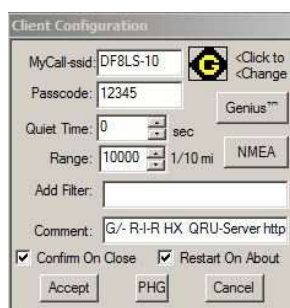
## APRSIS32

There are no specific entries to be done in the menus of the APRSIS32 program to operate RPR with the SCS Tracker. Even the 300 bauds are automatically selected as configured in the tracker itself when entering the KISS mode.

To reach the KISS mode you first create a new port with KISS as choice. The name 'SCS' is free selectable. Then you exchange directly in the XML file anything between <OpenCmd> ... and ...</CloseCmd> with the actual example below. This is done straight with the txt editor.

If you wish to digipeat this is done in the XML as well in the line **after the very last radio port !!!** you created. (see example)

## Menu Setting



Range maximum is 1000 mi / 1609 km  
 Under Add Filter you may enter callsigns that go beyond that range i.e. b/KJ4ERJ\*



Comment may be changed here as well

# Robust Packet Network

[www.robust-packet.st](http://www.robust-packet.st)

## Manual



Crucial to the function as GATE is the tick in **RF to IS**. Whoever is ticking **IS to RF** becomes a bidirectional IGATE, though APRS-IS is configured in the same manner.



Without the **RF to IS** setting here in APRS-IS gating would not work. Corresponding **IS to RF** when the bidirectional function is desired. Don't forget to enable, either here or in the menu of the program.

## SCS Tracker KISS Mode & Digipeating - XML file

```
<!--RFPort[0]-->                                check your values!
<RFPort Name="10.1473"> using this port name here i.e. for 30m results in DX reports incl. valid frequency
<Protocol>KISS</Protocol>
<Device>COM6:38400,N,8,1</Device>                check your values!
<RfBaud>300</RfBaud>
<OpenCmd>^027~!!0</OpenCmd>
<OpenCmd>^064^075!!0</OpenCmd>
<CloseCmd>^192^255^192~!!1</CloseCmd>
<CloseCmd>^027~!!0</CloseCmd>
<QuietTime>0</QuietTime>
<Enabled>1</Enabled>
<XmitEnabled>1</XmitEnabled>
<ProvidesNMEA>1</ProvidesNMEA>
<RfToIEnabled>1</RfToIEnabled>
<IStoRfEnabled>1</IStoRfEnabled>
<MyCallNot3rd>0</MyCallNot3rd>
<BeaconingEnabled>1</BeaconingEnabled>
<BeaconPath></BeaconPath>
<BulletinObjectEnabled>1</BulletinObjectEnabled>
<DXEnabled>0</DXEnabled>
<DXPath>RFOONLY</DXPath>
<MessagesEnabled>1</MessagesEnabled>
<MessagePath></MessagePath>
<TelemetryEnabled>0</TelemetryEnabled>
<TelemetryPath></TelemetryPath><!--DigiXform-->    do N O T change this line (under development)
</RFPort>
<!--RFPort[0]-->                                check your values!

<!--RFPort[1]-->                                check your values!
<RFPort Name="...
...
<!--DigiXform-->    do N O T change this line (under development)
</RFPort>
<!--RFPort[1]-->                                check your values!

<!--DigiXform--> exchange this line with

<DigiXform>WIDE1-1=CA5IGN-10*</DigiXform>
<DigiXform>CA5IGN-10=CA5IGN-10*</DigiXform>
if you wish to digipeat. Otherwise leave it untouched.
```

Using the settings mentioned above lets the SCS Tracker easily enters KISS mode and exits back to stand alone operation. Anyhow, when restarting APRSIS32 it is vital to switch the tracker powerless for a second (under investigation).

### SCS PTC-IIIusb / PTC-IIusb / TRXPTC KISS Mode - XML file

```

<!--RFPort[0]-->                                check your values!
<RFPort Name="10.1473">                          using this port name here i.e. for 30m results in DX reports incl. valid frequency
<Protocol>KISS</Protocol>
<Device>COM6:38400,N,8,1</Device>                check your values!
<RfBaud>300</RfBaud>
<OpenCmd>^027~!!1</OpenCmd>
<OpenCmd>^M~!!1</OpenCmd>
<OpenCmd>QUIT!cmd:</OpenCmd>
<OpenCmd>PSKA 250</OpenCmd>                      check your values!
<OpenCmd>TONES 2</OpenCmd>
<OpenCmd>TRX Frequency 10147.3</OpenCmd>
<OpenCmd>PAC!pac:</OpenCmd>
<OpenCmd>BAUD r300!pac:</OpenCmd>
<OpenCmd>^064^075!!0</OpenCmd>
<CloseCmd>^192^255^192~!!2</CloseCmd>
<CloseCmd>^M~!pac:!1</CloseCmd>
<CloseCmd>QUIT!cmd:</CloseCmd>
<QuietTime>0</QuietTime>
<Enabled>1</Enabled>
<XmitEnabled>1</XmitEnabled>
<ProvidesNMEA>1</ProvidesNMEA>
<RfToIEnabled>1</RfToIEnabled>
<IStoRfEnabled>1</IStoRfEnabled>
<MyCallNot3rd>0</MyCallNot3rd>
<BeaconingEnabled>1</BeaconingEnabled>
<BeaconPath></BeaconPath>
<BulletinObjectEnabled>1</BulletinObjectEnabled>
<DXEnabled>0</DXEnabled>
<DXPath>RFOONLY</DXPath>
<MessagesEnabled>1</MessagesEnabled>
<MessagePath></MessagePath>
<TelemetryEnabled>0</TelemetryEnabled>
<TelemetryPath></TelemetryPath>
<!--DigiXform-->
</RFPort>
<!--RFPort[0]-->                                check your values!

```

## SCS PTC-II &amp; PTC-IIpro (with DSP-II module at port 1) KISS Mode - XML file

```

<!--RFPort[0]-->                                check your values!
<RFPort Name="10.1473"> using this port name here i.e. for 30m results in DX reports incl. valid frequency
<Protocol>KISS</Protocol>
<Device>COM6:38400,N,8,1</Device>                check your values!
<RfBaud>300</RfBaud>
<OpenCmd>^O27~!!1</OpenCmd>
<OpenCmd>^M~!!1</OpenCmd>
<OpenCmd>Q!cmd:</OpenCmd>
<OpenCmd>RESET!cmd:</OpenCmd>
<OpenCmd>TONES 4!cmd:</OpenCmd>
<OpenCmd>BRIGHT 6!cmd:</OpenCmd>
<OpenCmd>PSKA 550!cmd:</OpenCmd>                check your values! Adjusts the RPR TXLevel
<OpenCmd>PAC!pac:!2</OpenCmd>
<OpenCmd>USER 0!pac:!1</OpenCmd>
<OpenCmd>PRBOX 0!pac:!1</OpenCmd>
<OpenCmd>BAUD R300!pac:!1</OpenCmd>
<OpenCmd>^064^075!!0</OpenCmd>
<CloseCmd>^192^255^192~!!2</CloseCmd>
<CloseCmd>^M~!pac:!1</CloseCmd>
<CloseCmd>Q!cmd:</CloseCmd>
<CloseCmd>BRIGHT 1!cmd:</CloseCmd>
<QuietTime>0</QuietTime>
<Enabled>1</Enabled>
<XmitEnabled>1</XmitEnabled>
<ProvidesNMEA>1</ProvidesNMEA>
<RfToIEnabled>1</RfToIEnabled>
<IStoRfEnabled>1</IStoRfEnabled>
<MyCallNot3rd>0</MyCallNot3rd>
<BeaconingEnabled>1</BeaconingEnabled>
<BeaconPath></BeaconPath>
<BulletinObjectEnabled>1</BulletinObjectEnabled>
<DXEnabled>0</DXEnabled>
<DXPath>RFOONLY</DXPath>
<MessagesEnabled>1</MessagesEnabled>
<MessagePath></MessagePath>
<TelemetryEnabled>0</TelemetryEnabled>
<TelemetryPath></TelemetryPath>
<!--DigiXform-->
</RFPort>
<!--RFPort[0]-->                                check your values!

```

## SCS PTC-IIlex KISS Mode - XML file

```

<!--RFPort[0]-->
<RFPort Name="10.1473">
  <Protocol>KISS</Protocol>
  <Device>COM6:38400,N,8,1</Device>
  <RfBaud>300</RfBaud>
  <OpenCmd>^027~!!1</OpenCmd>
  <OpenCmd>^M~!!1</OpenCmd>
  <OpenCmd>Q!cmd:</OpenCmd>
  <OpenCmd>TONES 4!cmd:</OpenCmd>
  <OpenCmd>BRIGHT 6!cmd:</OpenCmd>
  <OpenCmd>PSKA 250!cmd:</OpenCmd>
  <OpenCmd>PAC!pac1:</OpenCmd>
  <OpenCmd>USER 0!pac1:</OpenCmd>
  <OpenCmd>PRBOX 0!pac1:</OpenCmd>
  <OpenCmd>BAUD R300!pac1:</OpenCmd>
  <OpenCmd>^064^075!!0</OpenCmd>
  <CloseCmd>^192^255^192~!!2</CloseCmd>
  <CloseCmd>^M~!pac1:!1</CloseCmd>
  <CloseCmd>Q!cmd:</CloseCmd>
  <QuietTime>0</QuietTime>
  <Enabled>1</Enabled>
  <XmitEnabled>1</XmitEnabled>
  <ProvidesNMEA>1</ProvidesNMEA>
  <RfToISEnabled>1</RfToISEnabled>
  <IStoRFEEnabled>1</IStoRFEEnabled>
  <MyCallNot3rd>0</MyCallNot3rd>
  <BeaconingEnabled>1</BeaconingEnabled>
  <BeaconPath></BeaconPath>
  <BulletinObjectEnabled>1</BulletinObjectEnabled>
  <DXEnabled>0</DXEnabled>
  <DXPath>RFONLY</DXPath>
  <MessagesEnabled>1</MessagesEnabled>
  <MessagePath></MessagePath>
  <TelemetryEnabled>0</TelemetryEnabled>
  <TelemetryPath></TelemetryPath>
<!--DigiXform-->
</RFPort>
<!--RFPort[0]-->

```

*check your values!*

using this port name here i.e. for 30m results in DX reports incl. valid frequency

*check your values!*

*check your values! (only difference to PTC-II & Ilpro)*

*check your values!*

## SCS P4dragon KISS Mode - XML file

```

<!--RFPort[0]-->
<RFPort Name="10.1473">
  <Protocol>KISS</Protocol>
  <Device>COM2:38400,N,8,1</Device>
  <RfBaud>300</RfBaud>
  <OpenCmd>^027~!!1</OpenCmd>
  <OpenCmd>^M~!!1</OpenCmd>
  <OpenCmd>Q!cmd:</OpenCmd>
  <OpenCmd>TONES 4!cmd:</OpenCmd>
  <OpenCmd>BRIGHT 6!cmd:</OpenCmd>
  <OpenCmd>PAC!pac:</OpenCmd>
  <OpenCmd>PRBOX 0!pac:</OpenCmd>
  <OpenCmd>PRPort 1!pac:</OpenCmd>
  <OpenCmd>USER 0!pac:</OpenCmd>
  <OpenCmd>BAUD R300!pac:</OpenCmd>
  <OpenCmd>TXLevel R 170!pac:</OpenCmd>
  <OpenCmd>^064^075!!0</OpenCmd>
  <CloseCmd>^192^255^192~!!2</CloseCmd>
  <CloseCmd>^M~!pac:!1</CloseCmd>
  <CloseCmd>Q!cmd:</CloseCmd>
  <QuietTime>0</QuietTime>
  <Enabled>1</Enabled>
  <XmitEnabled>1</XmitEnabled>
  <ProvidesNMEA>0</ProvidesNMEA>
  <RfToISEnabled>0</RfToISEnabled>
  <IStoRFEEnabled>0</IStoRFEEnabled>
  <MyCallNot3rd>0</MyCallNot3rd>
  <NoGateME>0</NoGateME>
  <BeaconingEnabled>1</BeaconingEnabled>
  <BeaconPath>WIDE1-1</BeaconPath>
  <BulletinObjectEnabled>1</BulletinObjectEnabled>
  <DXEnabled>0</DXEnabled>
  <DXPath>WIDE1-1</DXPath>
  <MessagesEnabled>1</MessagesEnabled>
  <MessagePath>WIDE1-1</MessagePath>
  <TelemetryEnabled>0</TelemetryEnabled>
  <TelemetryPath>WIDE1-1</TelemetryPath>
<!--DigiXform-->
</RFPort>
<!--RFPort[0]-->

```

*check your values!*

using this port name here i.e. for 30m results in DX reports incl. valid frequency

*check your values!*

*check your values!*

*check your values!*

*check your values!*

**WinRPR Software – Config.txt (ICOM- IC-7300 Example)**

```
; TNC commands for WinRPR
;
; As usual you must type the Escape key before any command.
;
; %B (300, R300, R600, 1200, 9600) – Selects modem type and speed.
; %D (0,1) – Parallel FSK300 decoder when in Robust Packet mode – %D0 = off, %D1 = on.
; I (callsign) – Sets MYCALL for the current channel (See S).
; @K – Initiates KISS mode on serial and socket connections.
; S (0,1-10) – Selects TNC channel. 0 = UI(APRS), 1-10 = ten connected channels.
; %X(0-2500) – Sets output amplitude for all modes.
```

**[PROGRAM]**

```
; WATERFALL 0 = COLORED, 1 = BW "inverted", 2 = BW "normal"
```

```
WATERFALL:0
```

```
; FOOTPRINT OF WinRPR: 0=normal, 1=small
```

```
SMALLSIZE:1
```

```
[END]
```

**[AUDIO]**

```
; Audio Device Number, starting at 1
```

```
RX:1
```

```
TX:1
```

```
[END]
```

**[PTT]**

```
; PTT COM number
```

```
PTTPORT:9
```

```
; Set to 1 if DTR should be used instead of RTS
```

```
USEDTR:1
```

```
[END]
```

**[COMOUT]**

```
; Set it to a COM port generated by com0com tool
```

```
COMOUTPORT:0
```

```
[END]
```

**[TCP]**

```
; Traditionally...
```

```
; - 8000 for AGW (not supported),
```

```
; - 8001 for KISS,
```

```
; - 8002 for TNC prompt
```

```
TCPPOINT:8001
```

```
[END]
```

**[TNC]**

```
; # is used as ESC character
```

```
; turn off parallel FSK300 decoder, 1=ON, 0=OFF
```

```
##%d 0
```

```
; set current channel s
```

```
#s 0
```

```
; set mycall for the current channel set with s!!!
```

```
#i MOSUY
```

```
; set transmit level!!!
```

```
##%xr 800
```

```
; set modulation
```

```
##%b R300
```

```
; activate KISS, if required
```

```
#@K
```

```
[END]
```

**AGW Packet Engine with SCS Tracker, PTC-IIseries, PTC-IIIseries, TRXPTC****& P4dragon \* - XML file**

```

<!--RFPort[0]-->                                check your values!
<RFPort Name="10.1473"> using this port name here i.e. for 30m results in DX reports incl. valid frequency
<Protocol>AGW</Protocol>
<Device>@localhost:8000</Device>
<RfBaud>300</RfBaud>
<!--OpenCmd-->
<!--CloseCmd-->
<QuietTime>0</QuietTime>
<Enabled>1</Enabled>
<XmitEnabled>1</XmitEnabled>
<ProvidesNMEA>0</ProvidesNMEA>
<RfToIEnabled>0</RfToIEnabled>
<IStoRfEnabled>0</IStoRfEnabled>
<MyCallNot3rd>0</MyCallNot3rd>
<NoGateME>0</NoGateME>
<BeaconingEnabled>1</BeaconingEnabled>
<BeaconPath>WIDE1-1</BeaconPath>
<BulletinObjectEnabled>1</BulletinObjectEnabled>
<DXEnabled>0</DXEnabled>
<DXPath>RFONLY</DXPath>
<MessagesEnabled>1</MessagesEnabled>
<MessagePath></MessagePath>
<TelemetryEnabled>0</TelemetryEnabled>
<TelemetryPath></TelemetryPath>
<!--DigiXform-->
</RFPort>
<!--RFPort[0]-->                                check your values!

```

remark by SV1UY

All PTC-IIseries (except PTC-IIe which does not support RPR or PTC-II without the DSP+ board/Extra RAM), PTC-IIIseries, TRXPTC and P4dragons should be setup as "NORD><LINK TNC2" Modems and use SMACK KISS Protocol in Packet Engine, Free or Pro. Then in Packet Engine's Setup, Radio Port Manager, Edit Radio Port, Property Page, TNC Control Commands: InitKiss1 field type "^PAC BAUD R300" without the quotes. In InitKiss2 field type "^PAC" again without the quotes and leave InitKiss3 as is.

SCS Trackers should also be setup as a "NORD><LINK TNC2" Modems using SMACK KISS Protocol in Packet Engine, Free or Pro but in Packet Engine's Setup, Radio Port Manager, Edit Radio Port, Property Page, TNC Control Commands: InitKiss1 and InitKiss2 should be left blank if you are using an SCS Tracker and again leave InitKiss3 as is.

See next page for setup examples

\*except PTC-II without DSP+ board/Extended RAM & PTC-IIe which do not support RPR



**Properties for Port1**

Property Page Tnc Commands

Select Port: COM5

Be carefull for Modems like Baycom etc need also the Baudrate.

SerialPort BaudRate: 38400

TNC Type: Select Your Tnc Model. NORD><LINK TNC2

TNC Sub Type: Select The special KISS Mode. Smack KISS

TNC Control Commands:

IniKiss1: ^PAC BAUD R.300

IniKiss2: ^PAC

IniKiss3: ^@K

☒ Exit Kiss On Exit

☒ Single Port

☐ Dual Port

☐ Quadraple Port

TNC RadioPorts

Port Description (Frequency,BaudRate etc)	Port Kiss ID
Port1: P4dragon	0
Port 2:	0
Port 3:	0
Port 4:	0

OK Cancel Apply

**Properties for Port2**

Property Page Tnc Commands

Select Port: COM4

Be carefull for Modems like Baycom etc need also the Baudrate.

SerialPort BaudRate: 38400

TNC Type: Select Your Tnc Model. NORD><LINK TNC2

TNC Sub Type: Select The special KISS Mode. Smack KISS

TNC Control Commands:

IniKiss1:

IniKiss2:

IniKiss3: ^@K

☒ Exit Kiss On Exit

☒ Single Port

☐ Dual Port

☐ Quadraple Port

TNC RadioPorts

Port Description (Frequency,BaudRate etc)	Port Kiss ID
Port1: Tracker	0
Port 2:	0
Port 3:	0
Port 4:	0

OK Cancel Apply

## SCS Tracker

SCS TRConfig - APRS Settings



APRS Settings

APRS Callsign [%AM]: SA7SKY-10

Path [%AP]: APRS

Position

☐ Beacon OFF

☐ GPS

☒ Fixed

Lat: N 55°56.98 N  
Lon: E 014°17.40 E

TX Interval [%AT]

☐ Auto TX Interval

x 1 (normal) [%AL]

☒ Manual TX interval: 900 seconds

APRS Symbol [%AY]

House (HF)

☒ alternate table

GPS Altitude [%AA]

☒ in the following APRS-Packets:  
compressed + uncompressed (2)

☒ compressed (BASE91) [%AS]

☒ Timestamp [%AI]

APRS Valid [%AV]: 1200 s

NMEA Out [%AN]

☒ output: APRS datagrams on GPS-Port

[%AK] RPR APRS SSID

APRS Digipeater Callsign [%X]:

Tracking Options

☐ APRS beacon only in tracking mode [%AX]

Comment [%AC]: Helge

Status Report

Report Text [%AR]: http://robust-packet.st

Send Status Report [%AE]: 

☐ Never

☒ On every 2 APRS Transmission

Tracking - HF mode Toggle [%AH]

☐

☐ only if in HF-PR-Mode [%B]

☐ always

Digipeating / Gateway Options

APRS-Digipeating [%AD]

☐ Digip. Alias:

Cross Mode Digipeating [%AG]

☐ Cross Mode: R300 Bd 

☒ NO Unproto Cross mode

☐ APRS Unproto only

☐ ALL Unproto

APRS frequency beacon [%AF]

☐ Interval: 0 seconds

☐ [%AQ] APRS Digipeater Substitution

GPS Settings

NMEA Baudrate [%N]: AUTO

Get GPS Pos

OK

Abbrechen

TRConfig Version 2.0.0.0

SCS TRConfig - General Settings



Callsign (I): SA7SKY-10

TX-Delay (T): 40 x 10 ms

TX-Tail (%N): 0 x 10 ms

Switch ch. (S): 0

300 Bd FSK Center Freq. (%F): 1500 Hz

TX amplitudes

AFSK (%XA): 300 mV

FSK (%XF): 600 mV

Robust PR (%XR): 600 mV

1200 Bd TX Emphasis [%E]: 0 x 3 dB

Connect Text (U)

☐

allow remote disconnect (//Q)

RPR Center Freq. (%L): 1500 Hz

Monitor (M)

☒ U

☒ I

☒ S

☒ C

PR-Mode (%B)

Standard PR

☐ 300 Bd

☐ 1200 Bd

☐ 9600 Bd

☐ 19200 Bd

Robust PR

☒ R 300 Bd

☐ R 600 Bd

OK

Abbrechen

TRConfig Version 2.0.0.0

18-28

SCS TRConfig - Misc Settings

☒ Add-Linefeed (A)

☒ Echo (E) 500 Frack (F) 150 Timer2

Digipeating (R) 10 Retry (N) 18000 Timer3

☐ Alias Digi (@R) SA7SKY-10

☐ PTT (X) 64 Persistence (P)

☐ Duplex (@D) 15 Slottime (W)

☐ Flags (@F) 10 # of channels (Y)

☐ UI-Poll (@U) 60 Ipoll (@I)

☐ Callsign Check (@V) 0100001416F585AD Modem ID String (%I)

☐ TX Freq. track. (%T)

☐ ext. Multi-Modem-DCD

Flow-Control off, XON/XOFF off Flow-Control (Z)

Time settings

Timestamp (K): OFF

☐ Auto GPS Time Sync. (%K)

☐ Sync. to PC-time

OK Abbrechen

TRConfig Version 2.0.0.0

## RPR-MOBILE

### UI-View

Station Setup

Callsign DF8LS Latitude Longitude Locator

Unproto port 1 Unproto address APRS,WIDE1-1

Beacon comment Helge UI-View Tag ☒

Beacon interval (mins)

Fixed 15 Mobile 1 1 miles km Internet

Symbol Jeep 0'y ☐ ☒ Compressed Beacon ☒

GPS symbol Jeep 0'y ☐ ☒

Ok Cancel

APRS Compatibility

Unproto address APRS

Default message type APRS ☒

Enable UI-View(32) extensions ☒

Ok Cancel

Status Text

Status text 10.147,30kHz USB RPR APRS <http://robust-packet.net>

Interval (mins) 45 Send best DX ☐ Time stamp 232050z

Ok Cancel Send

### Comment

After longer discussions about pros and cons of digipeating the European answer is a YES for mobile stations and a NOT-NECESSARELY for gates & digis. But unlike 2 m operation the path should be set to WIDE1-1 allowing a single hop (reminds old ECHO).

In case of difficult HF propagation conditions Status Text should be avoided or set to a high time interval.

### Crosspeater operation (according to DF8HL)

Some Hardware i.e. Yaesu VX-8 have unproto addresses not starting with AP... Meaning that not even the first two letters are AP (except under specific circumstances) but more or less random ones. When hiking through the remote wilderness or doing a trip by canoe some hams use their mobile station as crossdigipeater and mode changer from 2m-FSK to HF-RPR. In order to pass even those non-AP... addresses digipeaters and gates should independently of all formats digipeat and igate anything they receive if the path holds in first place a not yet digipeated ALIAS like WIDE1-1 or the digipeaters station callsign.

### SCS Tracker

SCS TRConfig - APRS Settings

**APRS Settings**

APRS Callsign [%AM]: SA7SKY

Path [%AP]: APRS,WIDE1-1

**Position**

☐ Beacon OFF Lat: N 00°00.00 N

☒ GPS Lon: E 000°00.00 E

☐ Fixed

**TX Interval [%AT]**

☒ Auto TX Interval x 0.5 (slow) [%AL]

☐ Manual TX interval: 0 seconds

**APRS Symbol [%AY]**

alternate table

**GPS Altitude [%AA]**

☒ in the following APRS-Packets:  
compressed (3)

☒ compressed (BASE91) [%AS]

☒ Timestamp [%AI]

APRS Valid [%AV]: 1200 s

**NMEA Out [%AN]**

☒ output APRS datagrams on GPS-Port

**[%AK] RPR APRS SSID** 16

APRS Digipeater Callsign [%X]: RPN

**Tracking Options**

☐ APRS beacon only in tracking mode [%AX]

Comment [%AC]: Helge TG24098

**Status Report**

Report Text [%AR]: http://robust-packet.st

Send Status Report [%AE]: ☐ Never

☒ On every 10 APRS Transmission

**Tracking - HF mode Toggle [%AH]**

☐ ☒ only if in HF-PR-Mode [%B]

☐ always

**Digipeating / Gateway Options**

**APRS-Digipeating [%AD]**

☐ Digip. Alias:

**Cross Mode Digipeating [%AG]**

☐ Cross Mode: R300 Bd ☒ NO Unproto Cross mode

☐ APRS Unproto only

☐ ALL Unproto

**APRS frequency beacon [%AF]**

☐ Interval: 0 seconds

☐ [%AQ] APRS Digipeater Substitution

**GPS Settings**

NMEA Baudrate [%N]: AUTO

OK Abbrechen

TRConfig Version 2.0.0.0

# Robust Packet Network

[www.robust-packet.st](http://www.robust-packet.st)

## Manual

SCS TRConfig - General Settings

Callsign (I): SA7SKY

TX-Delay (T): 40 x 10 ms

TX-Tail (%N): 0 x 10 ms

Switch ch. (S): 0

300 Bd FSK Center Freq. (%F): 1500 Hz

RPR Center Freq. (%L): 1500 Hz

TX amplitudes

AFSK (%XA): 300 mV

FSK (%XF): 600 mV

Robust PR (%XR): 600 mV

1200 Bd TX Emphasis [%E]: 0 x 3 dB

Connect Text (U)

☐ allow remote disconnect (//Q)

Monitor (M)

☒ U

☒ I

☒ S

☒ C

PR-Mode (%B)

Standard PR

☐ 300 Bd

☐ 1200 Bd

☐ 9600 Bd

☐ 19200 Bd

Robust PR

☒ R 300 Bd

☐ R 600 Bd

OK Abbrechen

TRConfig Version 2.0.0.0

SCS TRConfig - Misc Settings

☒ Add-Linefeed (A)

☒ Echo (E) 500

Digipeating (R)

☐ SA7SKY Alias Digi (@R)

☒ PTT (X) 64

☐ Duplex (@D) 15

☐ Flags (@F) 10

☐ UI-Poll (@U) 60

☐ Callsign Check (@V) 0100001416F585AD

☐ TX Freq. track. (%T)

☐ ext. Multi-Modem-DCD

Frack (F) 150 Timer2

Retry (N) 18000 Timer3

MaxFrame (O) 2

Persistence (P) 15

Slotime (W) 10

# of channels (Y) 60

Ipoll (@I)

Flow-Control off, XON/XOFF off

Flow-Control (Z)

Time settings

Timestamp (K): OFF

☐ Auto GPS Time Sync. (%K)

☐ Sync. to PC-time

Modem ID String (%I)

OK Abbrechen

TRConfig Version 2.0.0.0

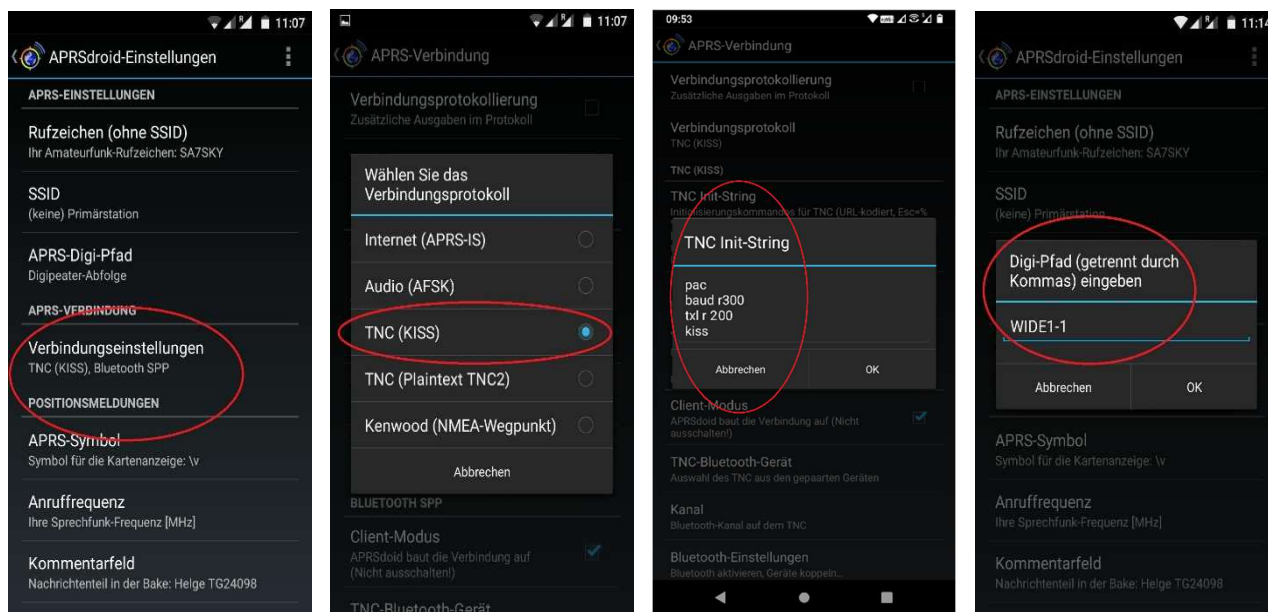


## SCS PTC-Illusb & APRSdroid via Bluetooth

### Init string for TNC KISS

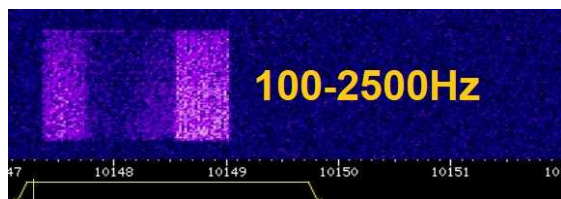
pac  
 baud r300  
 txl r 200  
 kiss

*check your values!*

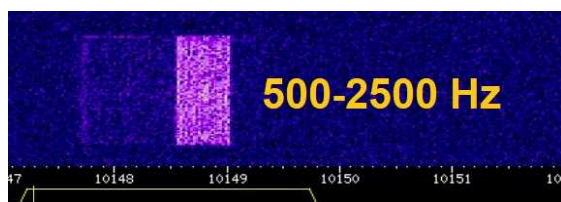


## Clean Signal Management

Sometimes on WebSDR waterfalls you may see unwanted signal side shadows. Please consider to use *transmit filters* if the radio offers that option. See as an example the result using P4dragon and IC-7300:



P4dragon pac: TXL R 200 (200mV)  
 ACC MOD Level 50% ⇒ ALC maximum  
 Transmit filter TBW 100-2500



P4dragon pac: TXL R 200 (200mV)  
 ACC MOD Level 50% ⇒ ALC maximum  
 Transmit filter TBW 500-2500

### Setting the transmit filter width

The transmit filter width for the SSB and SSB-D mode can be set. Only for the SSB mode, WIDE (wide), MID (middle) or NAR (narrow) can be selected.  
 ① The filter can be independently set on the speech compressor function is ON or OFF.

#### To change the filter width in the SSB mode:

1. Set the operating mode to USB or LSB mode.
2. Push **FUNCTION**.  
 • Opens the FUNCTION screen.
3. Touch [TBW].  
 ① Touching [TBW] sets the filter width to WIDE, MID or NAR.



FUNCTION screen (SSB mode)

The transmit filter widths are set to the following values by default.

- SSB (WIDE): 100 Hz to 2900 Hz
  - SSB (MID): 300 Hz to 2700 Hz
  - SSB (NAR): 500 Hz to 2500 Hz
  - SSB-D: 300 Hz to 2700 Hz
- SSB-D can be manually adjusted to the SSB (NAR) values 500 Hz to 2500 Hz

① You can change the filter width values in the following settings. (p. 12-3)

- MENU > SET > Tone Control/TBW > TX > SSB > TBW (WIDE)
- MENU > SET > Tone Control/TBW > TX > SSB > TBW (MID)
- MENU > SET > Tone Control/TBW > TX > SSB > TBW (NAR)
- MENU > SET > Tone Control/TBW > TX > SSB-D > TBW

## RPR – Theory

### Why RPR-APRS?

Till now APRS-operation on shortwave was done by ordinary HF-packets (FSK 300 bd). Now what makes the difference towards RPR?

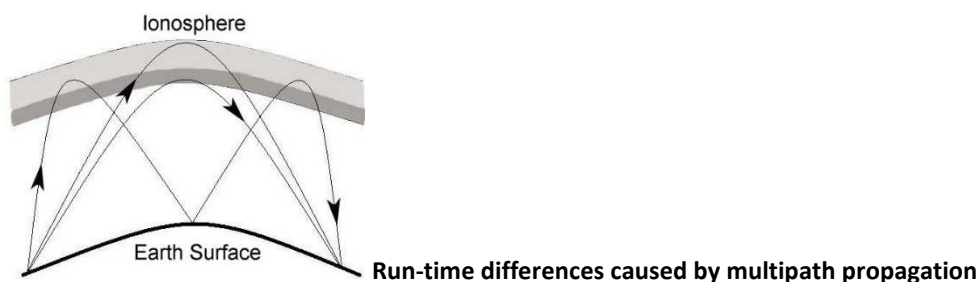
To answer that question, we initially focus the properties of HF-channels and the specialties when transmitting digital signals via shortwave.

#### Properties of an HF-Channel

small bandwidth (< 3kHz) - multipath propagation - phase shift – band noise and other disturbances  
- fading – constant fluctuating conditions

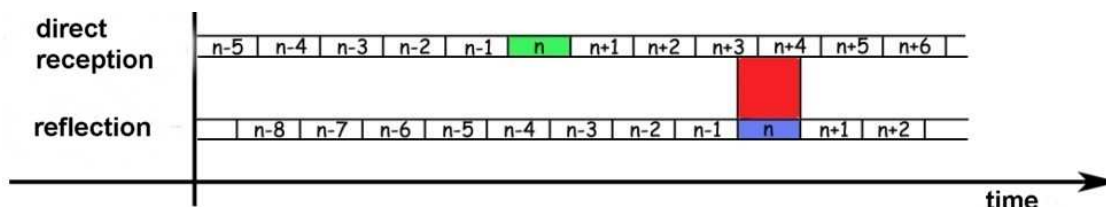
### HF-transmission of digital signals

When transmitting digital signal via radio by using single carriers you nearly always encounter problems on shortwave by multipath propagation.



A signal reaches the receiver via different ways. The different paths a signal has taken results in different delays of that signal. So, a mixture of direct signals meets time-shifted and reflected echoed signals.

The effect of this mixture is shown in following figure.

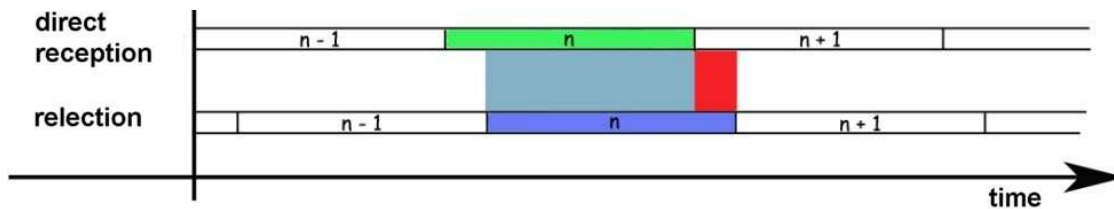


### Intersymbol-Interference by run-time distortion

This is a symbolic representation of the contents received. It is demonstrated that reflected signal are received such late that they put heavy influence on the direct signals.

Superposition following symbols by echoed preceded symbols are called Intersymbol-Interference (ISI). Under typical shortwave conditions a symbol will influence samples that follow.

To gentle the effect of ISI with the old FSK packets the length of symbols was prolonged (reduction to 300 bd). This led to an improvement of the relation between duration of a symbol and its echo. You simply allow the echo more time to fade.



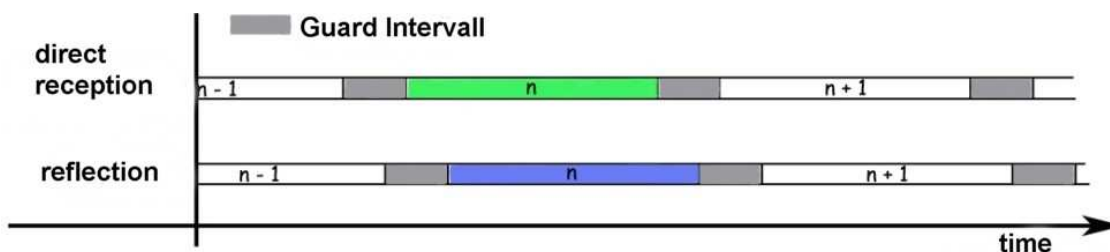
## Improvement by extension of symbol length

But it is obvious that symbols which follow are still broken by reflection of the preceding ones. Even when reducing to 300 bd time is still too short to cover the effects of multi pathing on shortwave.

## How can RPR do better?

The solution for the ISI problem is known since the 50<sup>th</sup> and has been used by military services for shortwave operation. It is the Multicarrier System. You take benefit of the Time-Bandwidth Product (TBP): data stream is distributed to several subcarriers. Instead of transmitting symbols successively in sequence now multiple and longer symbols are on air. The more subcarriers are used the longer the symbol can be. This method is called Frequency Division Multiplex (FDM).

Despite this improvement of symbol duration-to-echo relation still ISI may interfere. To encounter that a pause is inserted behind each symbol. This protective break is called Guard Interval.



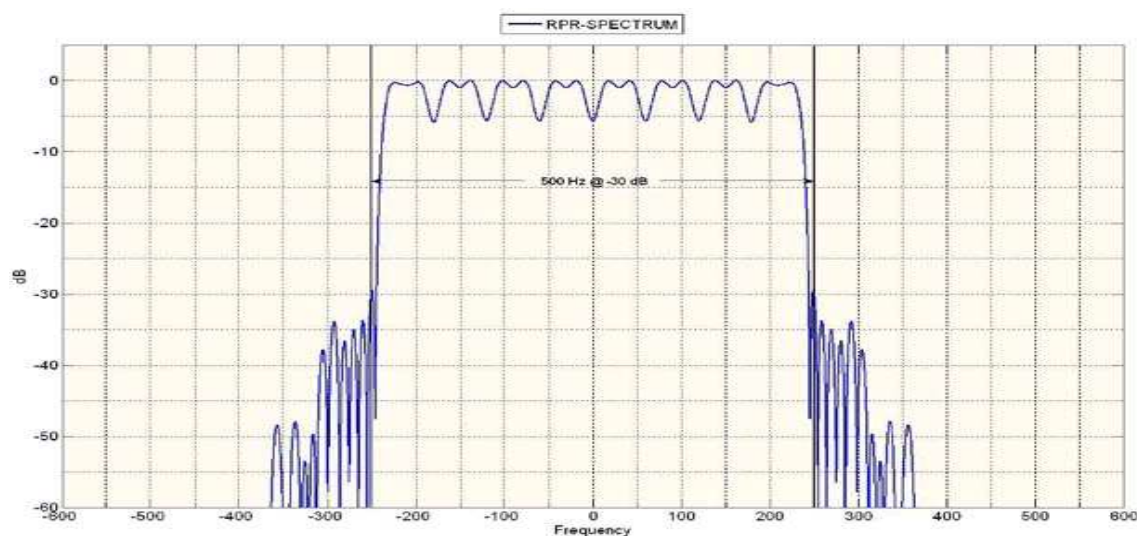


## Elimination of Intersymbol-Interference by usage of Guard Interval

The echo is now allowed to fade during the Guard Interval without breaking symbols that follow. Data stream ratio is nearly not affected but robustness against ISI substantially improved.

Anyway it is easy to imagine that realization of this method takes technical extravagance. To separate the single subcarriers steep edge filters are needed.

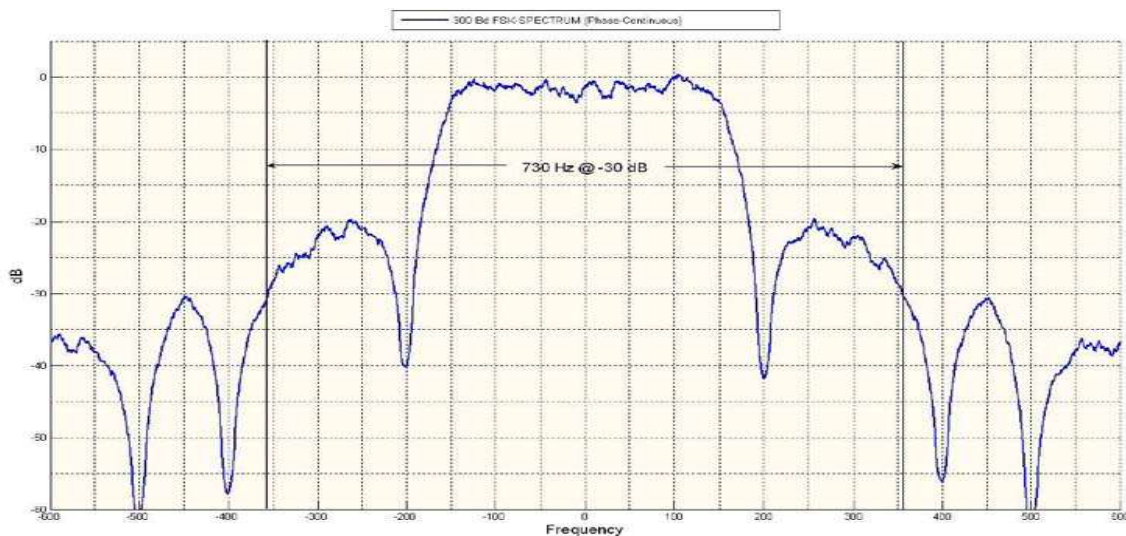
That is why RPR uses a method called Orthogonal Frequency Division Multiplex (OFDM). Supported by digital signal processing steep edge filters are no longer required. RPR works with 8 subcarriers with a 60 Hz tone gap. Average symbol length jumps to 20 ms in comparison to FSK with 3,3 ms. Without a doubt RPR can be called a multipath capable procedure appropriate for shortwave operation.



Spectrum of RPR (graphic OE3MZC)

Regardless the 8 subcarriers spectrum of RPR is not wider than those ones of FSK300. The opposite is true: bandwidth is just 500 Hz.

In comparison find the FSK300 (old HF-packet) spectrum below. Bandwidth is significantly greater with a value of 730 Hz.



Spectrum of FSK300 (graphic OE3MZC)

### The Problem of Channel Coding

Beside the discussed ISI multipath problem other uncertainties appear with APRS AX.25 and FSK operation: the missing channel coding.

In normal FSK-packet-radio-operation (same on VHF/UHF) a receiver rejects an error packet and requests a new transmission. Regarding the CRC-Checksum which is attached, an error packet is detected. This method is called ARQ (Automatic Repeat reQuest). It works fine with Packet Radio but when operating APRS this AX.25 automated request mechanism is override since we are transmitting unprotocoll (unproto) packets.

Just a tiny crack in the data packet makes it unusable. Receivers would detect it as an error packet and dump it. A lost transmission.

But even here RPR offers the solution with a suitable channel coding. This channel coding allows receiver not only to detect an error but – up to a certain degree – to correct those themselves. This is possible by targeted reconstruction data included in the package (Forward Error Correction). This method is good to correct single bit errors like caused by lightning and tiny band noise cracks.

But what happens when hole burst errors appear and complete blocks of related bits are lost? Not only 1 bit but i.e. a 10 bits group goes down the drain!? That cannot be corrected any more.

The trick then is the such called Interleaving: originally subsequent bits are scrabbled before transmission in such manner that they do not appear in their chronological order in the data block any longer.

Interleaving now produces out of 1 burst error a greater amount of single bit errors which then can be put together again by the Forward Error Correction.

In this way APRS-packets are protected effectively against transmission failures respectively in many cases can even be “repaired” by the receiving device.

## Teensy RPR TNC

This last Chapter is dedicated to the **Teensy RPR TNC**. It follows the former SCS Tracker after that had its end of production in 2020.

The **Teensy RPR TNC** is not a commercial product but a hamradio project not aiming for any profit. The following pictures will give a first impression.



The board contains a **GPS** receiver but need an external **ANT**enna as the main chip is not shielded.

A **mini DIN** connector goes to the radio and a **micro USB** via the top mounted Teensy will supply with power and connection to a PC. ICOM transceiver supply is possible as well. **Bluetooth** is part of version 3.

**KISS** mode as well as **CON**nected mode are possible. The **cable configuration is the same** like with the former SCS Tracker.



# Robust Packet Network

[www.robust-packet.st](http://www.robust-packet.st)

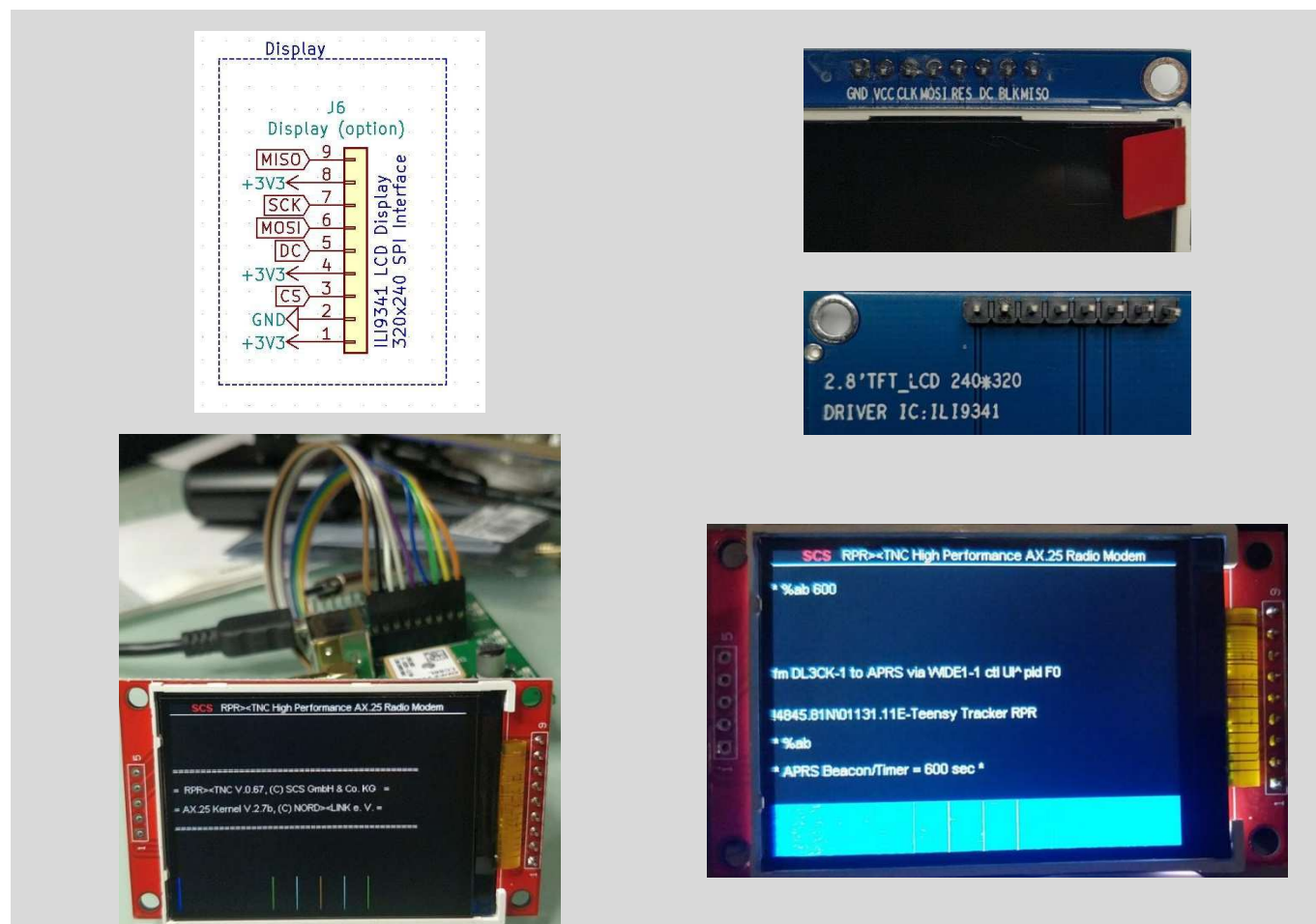
## Manual

The latest firmware 0.74 can be found here: <http://robust-packet.st/RPR-TNC.zip>

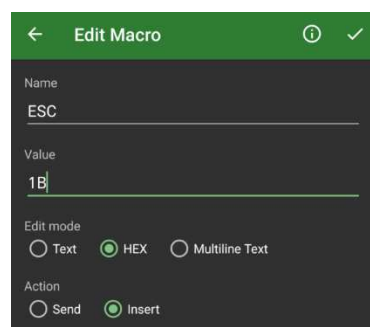
The hardware design is done by Robert, DM4RW and the software is as well in the hands of the RPR inventor Hans-Peter, DL6MAA.

It is possible to connect a display i.e. the 2.2" or 2.8" SPI TFT Display Module ILI9341 (240x320) to the Teensy board.

Please find next the connection schematic and the display in action which includes even a waterfall.



The Tracker can be connected as well with an Android based system. Greatest problem to steer the commands with an Android system is the missing of an ESC button. The solution is the definition of the HEX value 1B as a MARCO as INSERT function before adding the wished command.



A Manual is under development. <http://robust-packet.st/Teensy-RPR-TNC-Manual.pdf>