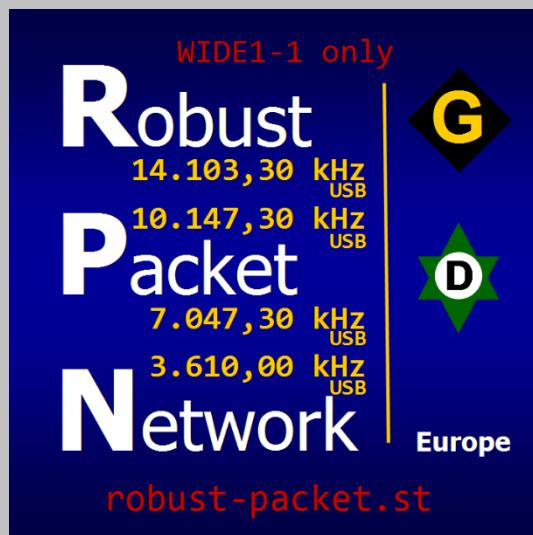


2024-01-15

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/RRP-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

or use this QR-code:



In order to verify 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](#) 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>

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RPR-Network Europe H24

RPN20 (Robust-Packet-Network on 20m)				
20 m	DBOUAL-10		Bavaria non-standard 14102.00 kHz USB	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	DBOUAL-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	14103.3 kHz	USB	DB0UAL 14102.0 kHz USB
30 m	10147.3 kHz	USB	
40 m	7047.3 kHz	USB	
60 m	5354.0 kHz	USB	
80 m	3610.0 kHz	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 TOOGLE-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.

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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		
20 m	worldwide	14103.3 kHz		14103.6 kHz			
30 m	worldwide	10147.3 kHz		10147.6 kHz			
40 m	Europe	7047.3 kHz		7047.6 kHz			
60m	Europe	5354.0 kHz		5354.3 kHz			
80 m	Europe	3610.0 kHz		3610.3 kHz			
= no usage		BOLD = active usage					
www.robust-packet.st/tipsandtricks/HF-APRS-Frequency-Calculation.pdf 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
20 m		141 ____ . ____ kHz		141 ____ . ____ kHz	
30 m		101 ____ . ____ kHz		101 ____ . ____ kHz	
40 m		70 ____ . ____ kHz		70 ____ . ____ kHz	
60 m		53 ____ . ____ kHz		53 ____ . ____ kHz	
80 m		36 ____ . ____ kHz		36 ____ . ____ kHz	

HF-APRS Frequencies Worldwide

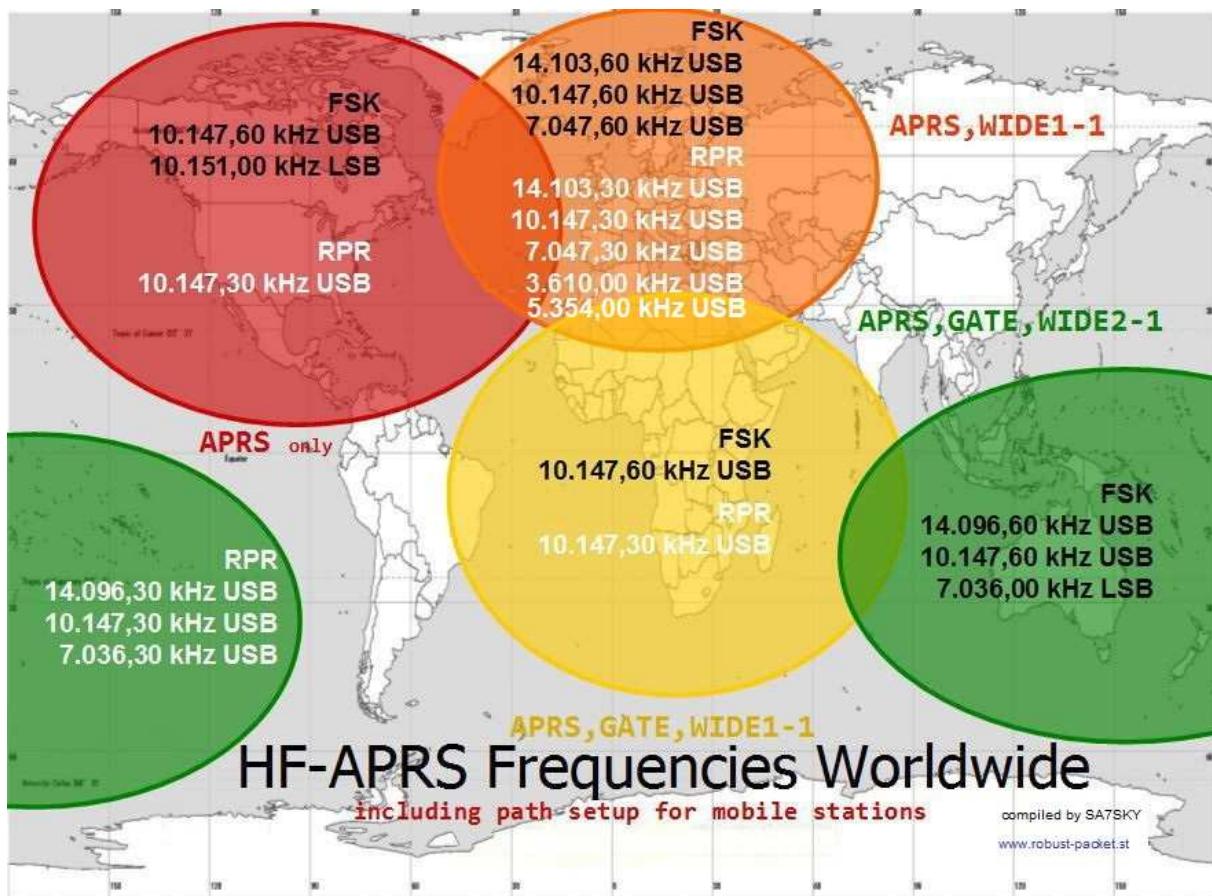


chart as download image under www.robust-packet.st/hf-aprs-worldwide-chart.html

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

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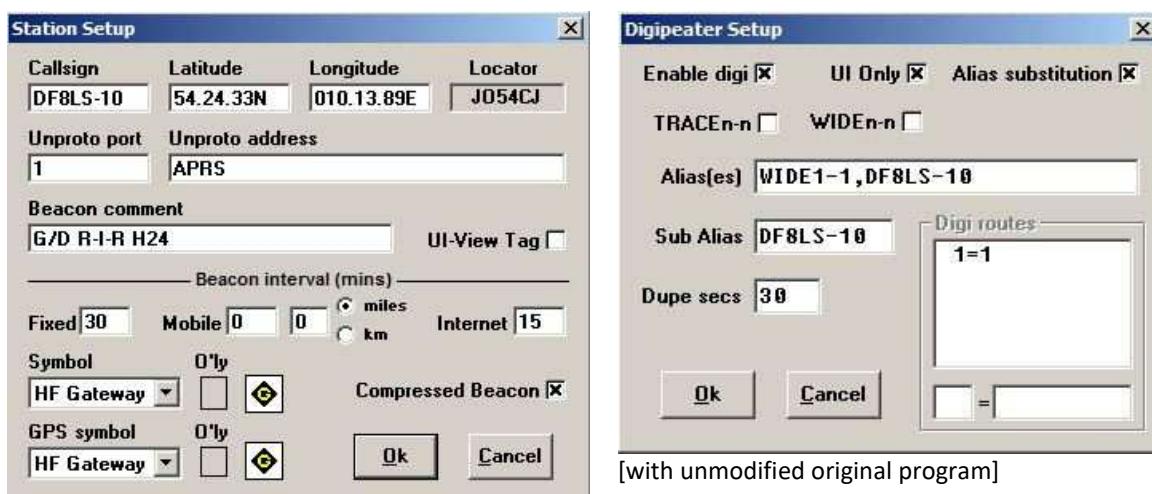
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theoretical entries only for the time being but hams down there are highly interested to enter the community of robust packet users.

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



[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

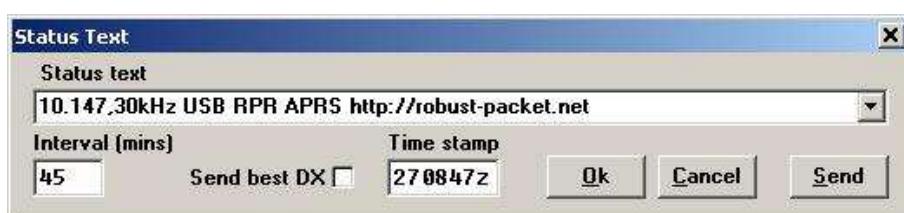
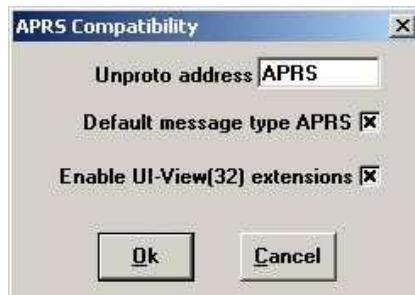
R Radio only / no internet i.e. Digi/p
time table

H24 24 hours operation

H12 except night hours

HX variable times / on request

HN night times



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SCS-Tracker	UI-View	aprs.fi - presentation
Comment [%AC] under APRS Settings	Beacon Comment under Station Setup	Comment text <i>1. line (green) in the bubble</i> <i>http:// and mailto: links are always blue</i> mobiles show this in moving list http://aprs.fi/moving/
Report Text [%AR] under APRS Settings	Status Text under Status Text	Status message <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

G 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 TCPIP*,qAC,T2KA]

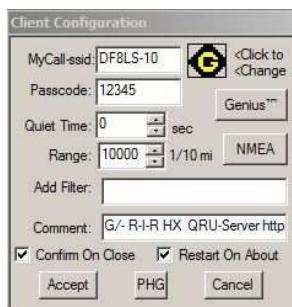
APRSIS32

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.

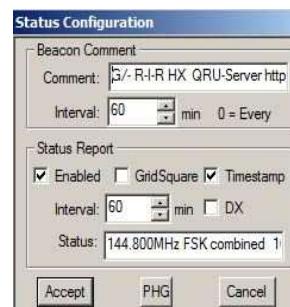
If you wish to digipeat this is done in the XML as well in the line **after the very last radio port !!!** you created. (see example)

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*

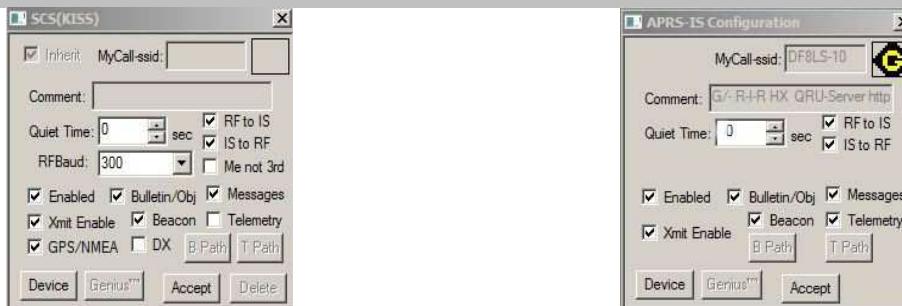


Comment may be changed here as well

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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>
<RFtoISEnabled>1</RFtoISEnabled>
<IStoRFEnabled>1</IStoRFEnabled>
<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]-->

<!--RFPort[1]-->                               check your values!
<RFPort Name="...">
...
<!--DigiXform-->                           do NOT change this line (under development)
</RFPort>
<!--RFPort[1]-->

<!--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.

```

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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]-->
<RFPort Name="10.1473">          check your values!
<Protocol>KISS</Protocol>      using this port name here i.e. for 30m results in DX reports incl. valid frequency
<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>
<RFtoISEnabled>1</RFtoISEnabled>
<IStoRFEnabled>1</IStoRFEnabled>
<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!
```

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SCS PTC-II & 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>^027~!!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>
<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!
```

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SCS PTC-IIex 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>Q!cmd:</OpenCmd>
<OpenCmd>TONES 4!cmd:</OpenCmd>
<OpenCmd>BRIGHT 6!cmd:</OpenCmd>
<OpenCmd>PSKA 250!cmd:</OpenCmd>                check your values! (only diffence to PTC-II & IIpro)
<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>
<IStoRFEnabled>1</IStoRFEnabled>
<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!
```

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SCS P4dragon 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>COM2:38400,N,8,1</Device>                check your values!
<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>          check your values!
<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>
<IStoRFEnabled>0</IStoRFEnabled>
<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!
```

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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
```

```
TCPPORT: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]
```

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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>
<RFtoISEnabled>0</RFtoISEnabled>
<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 filed 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

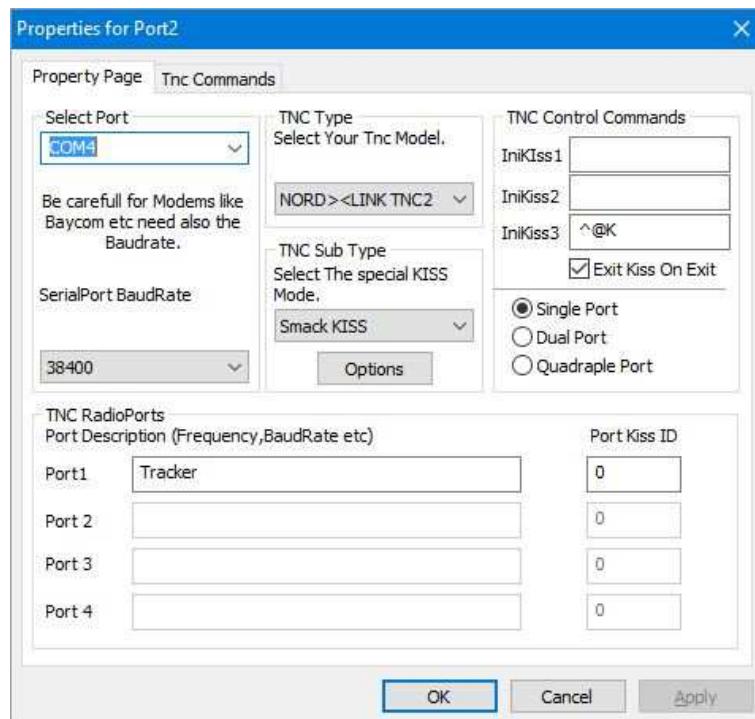
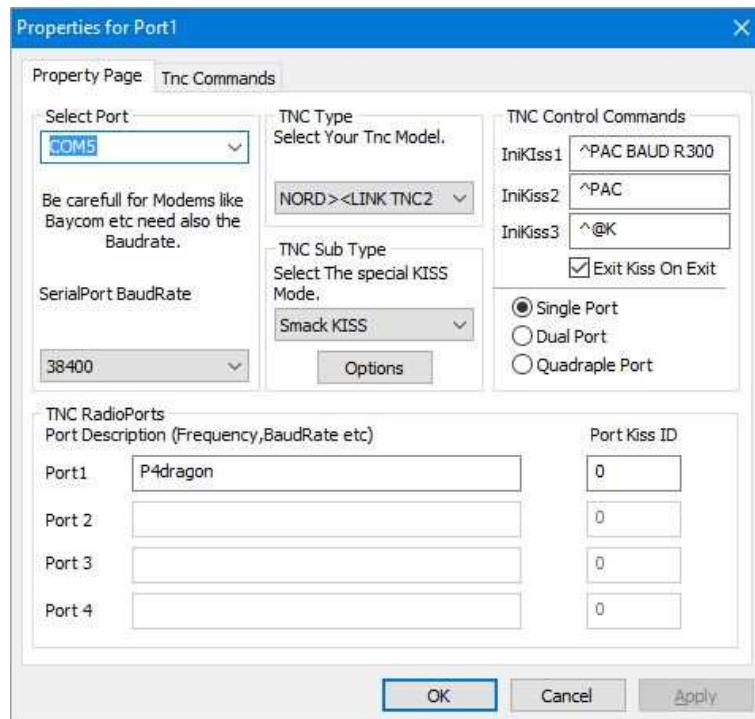
*except PTC-II without DSP+ board/Extended RAM & PTC-IIe which do not support RPR

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(continue) remark by SV1UY



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SCS Tracker

SCS TRConfig - APRS Settings

APRS Settings

APRS Callsign [%AM]: SA7SKY-10

Path [%AP]: APRS

Position

Beacon OFF Lat: N 55°56.98 N
 GPS Lon: E 014°17.40 E
 Fixed

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

[%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

OK **Abbrechen**

TRConfig Version 2.0.0.0

SCS TRConfig - General Settings

Connect Text (U)

allow remote disconnect (/Q)

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 **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

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

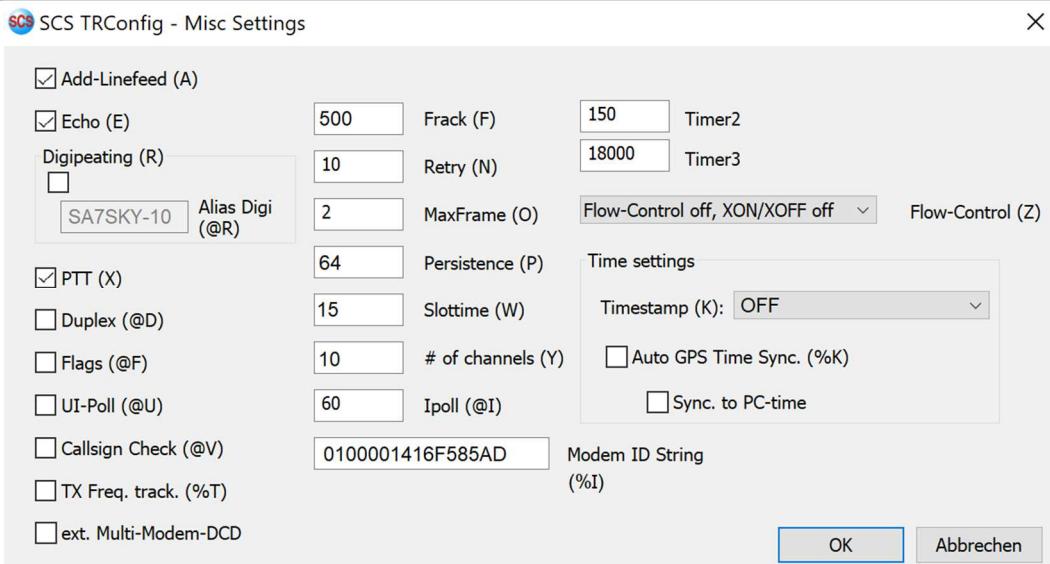
OK **Abbrechen**

TRConfig Version 2.0.0.0

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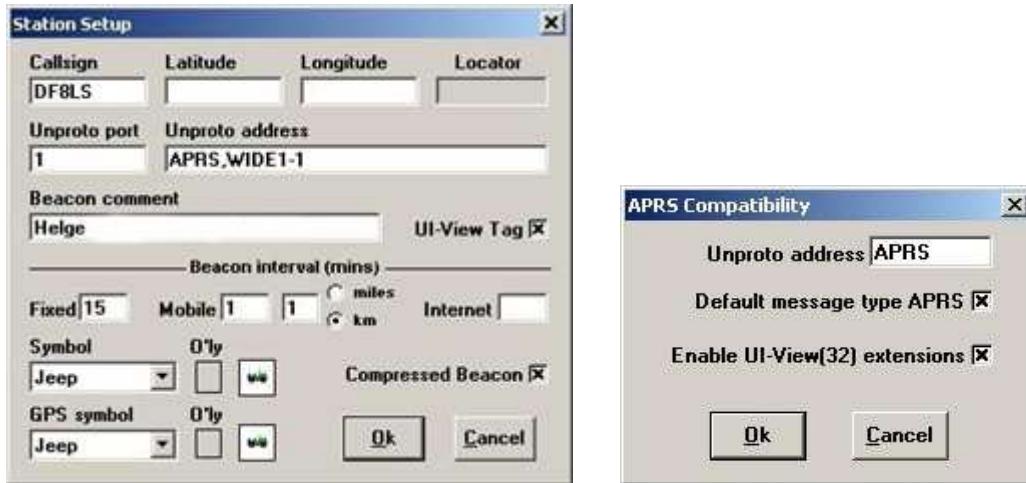
Manual



TRConfig Version 2.0.0.0

RPR-MOBILE

UI-View



Comment

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

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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 gate 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 SCS TRConfig - APRS Settings

The screenshot shows the 'APRS Settings' tab of the SCS TRConfig software. It includes sections for APRS Settings, Tracking Options, Digipeating / Gateway Options, and GPS Settings. Key settings include:

- APRS Settings:** APRS Callsign: SA7SKY, Path: APRS,WIDE1-1. Position: GPS (Lat: 00°00.00 N, Lon: 00°00.00 E). TX Interval: Auto TX Interval (x 0.5 (slow)). APRS Symbol: Van.
- Tracking Options:** APRS beacon only in tracking mode (unchecked), Comment: Helge TG24098. Status Report: Report Text: http://robust-packet.st, Send Status Report: On every 10 APRS Transmission.
- Digipeating / Gateway Options:** APRS-Digipeating: Digip. Alias: (dropdown menu). Cross Mode Digipeating: Cross Mode: R300 Bd, NO Unproto Cross mode selected. APRS frequency beacon: Interval: 0 seconds, APRS Digipeater Substitution checked.
- GPS Settings:** NMEA Baudrate: AUTO, Get GPS Pos button.

At the bottom right are OK and Abbrechen buttons, and the text 'TRConfig Version 2.0.0.0'.

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SCS SCS TRConfig - General Settings

Callsign (I):	SA7SKY	Connect Text (U)	<input type="checkbox"/>
TX-Delay (T):	40	x 10 ms	<input type="checkbox"/> allow remote disconnect (/Q)
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		Monitor (M)	PR-Mode (%B)
AFSK (%XA):	300	mV	Standard PR
FSK (%XF):	600	mV	<input type="radio"/> 300 Bd
Robust PR (%XR):	600	mV	<input type="radio"/> 1200 Bd
1200 Bd TX Emphasis [%E]:	0	x 3 dB	<input type="radio"/> 9600 Bd
			<input type="radio"/> 19200 Bd
			Robust PR
			<input checked="" type="radio"/> R 300 Bd
			<input type="radio"/> R 600 Bd

OK Abbrechen

TRConfig Version 2.0.0.0

SCS SCS TRConfig - Misc Settings

<input checked="" type="checkbox"/> Add-Linefeed (A)			
<input checked="" type="checkbox"/> Echo (E)	500	Frack (F)	150 Timer2
Digipeating (R)	10	Retry (N)	18000 Timer3
<input type="checkbox"/> SA7SKY Alias Digi (@R)	2	MaxFrame (O)	Flow-Control off, XON/XOFF off Flow-Control (Z)
<input checked="" type="checkbox"/> PTT (X)	64	Persistence (P)	Time settings
<input type="checkbox"/> Duplex (@D)	15	Slottime (W)	Timestamp (K): OFF
<input type="checkbox"/> Flags (@F)	10	# of channels (Y)	<input type="checkbox"/> Auto GPS Time Sync. (%K)
<input type="checkbox"/> UI-Poll (@U)	60	Ipoll (@I)	<input type="checkbox"/> Sync. to PC-time
<input type="checkbox"/> Callsign Check (@V)	0100001416F585AD	Modem ID String (%I)	
<input type="checkbox"/> TX Freq. track. (%T)			
<input type="checkbox"/> ext. Multi-Modem-DDC			

OK Abbrechen

TRConfig Version 2.0.0.0

Robust Packet Network

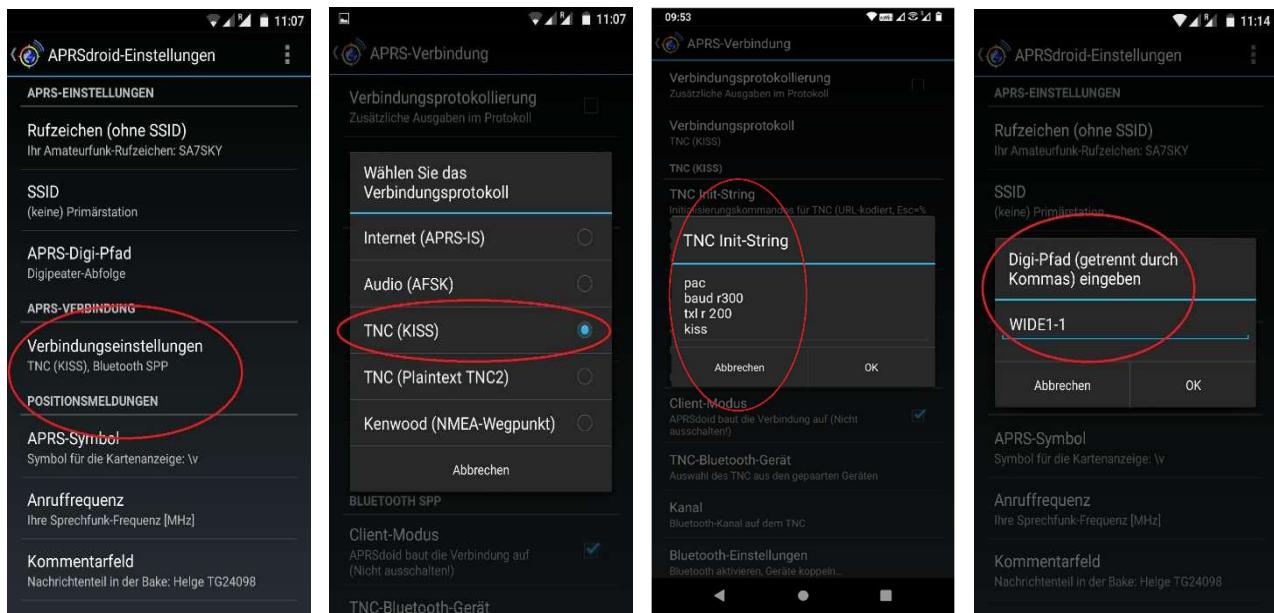
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SCS PTC-IIIusb & APRSdroid via Bluetooth

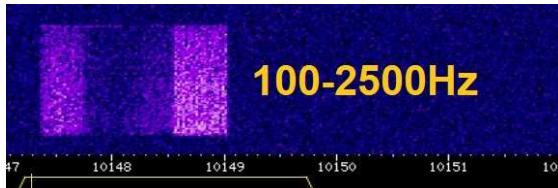
Init string for TNC KISS

```
pac  
baud r300  
txl r 200      check your values!  
kiss
```

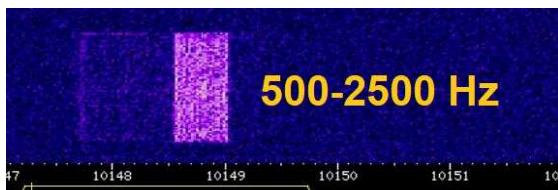


Clean Signal Management

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].
 - ② Touching [TBW] sets the filter width to WIDE, MID or NAR.



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

③ 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?

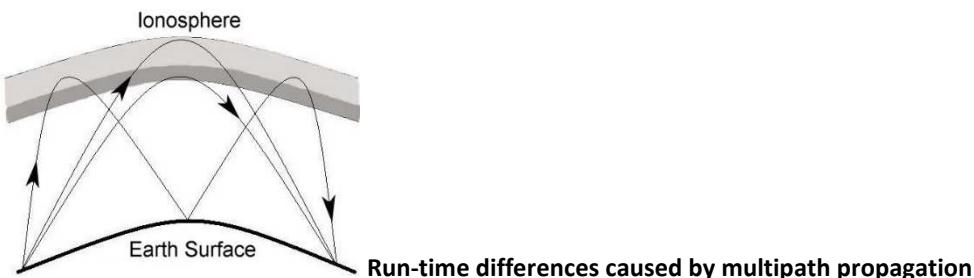
To answer that question, we initially focus the properties of HF-channels and the specialties when transmitting digital signals via shortwave.

Properties of an HF-Channel

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

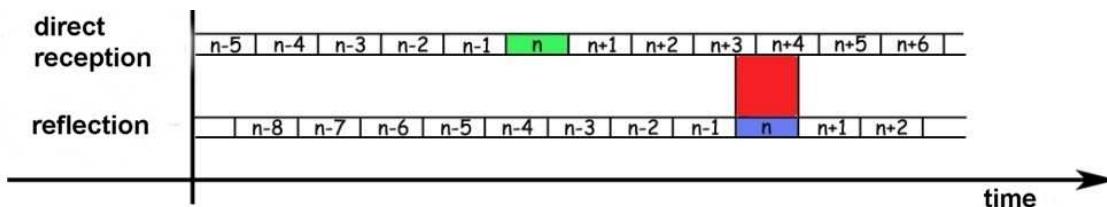
HF-transmission of digital signals

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.

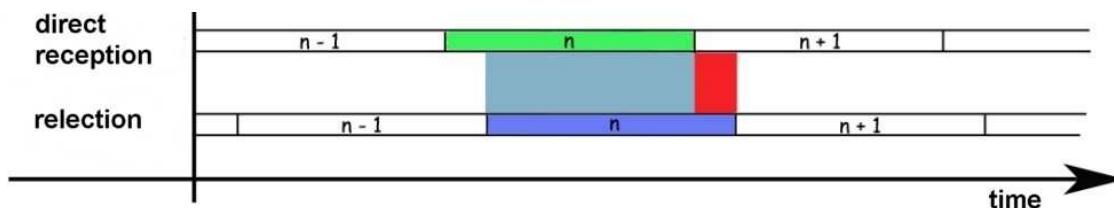
Superposition following symbols by echoed preceded symbols are called Intersymbol-Interference (ISI). Under typical shortwave conditions a symbol will influence samples that follow.

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



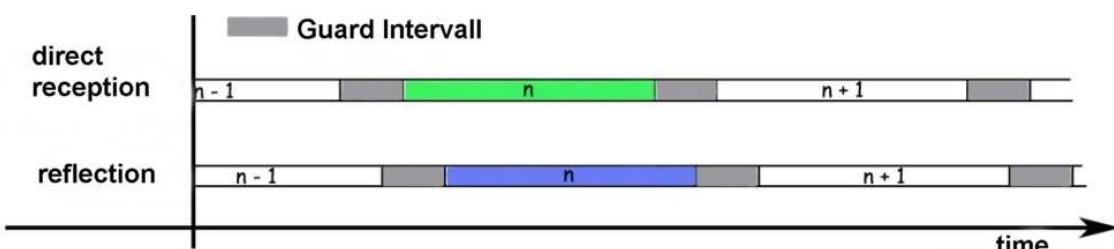
Improvement by extension of symbol length

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 50th 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 Intervall.

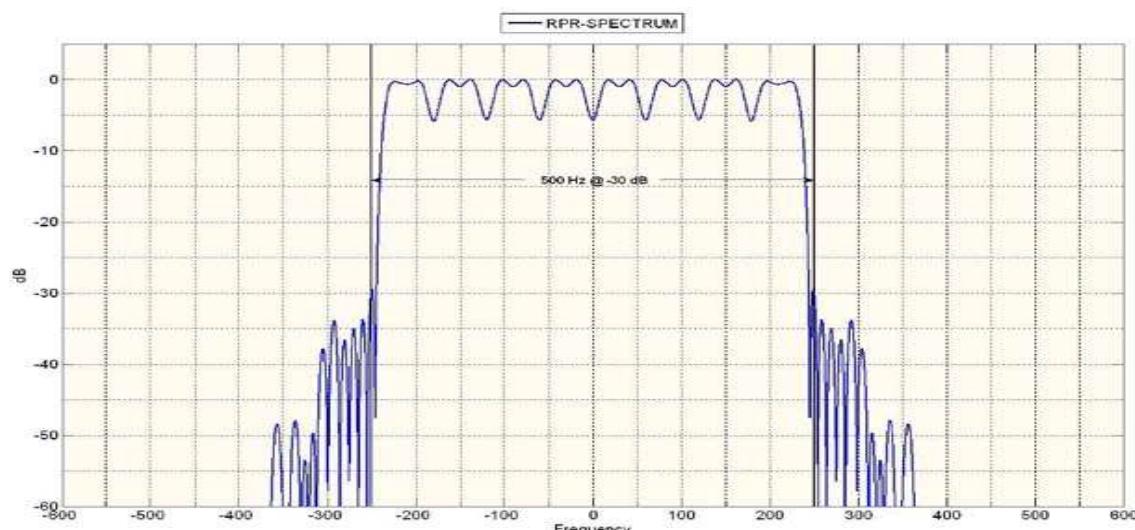


Elimination of Intersymbol-Interference by usage of Guard Interval

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.

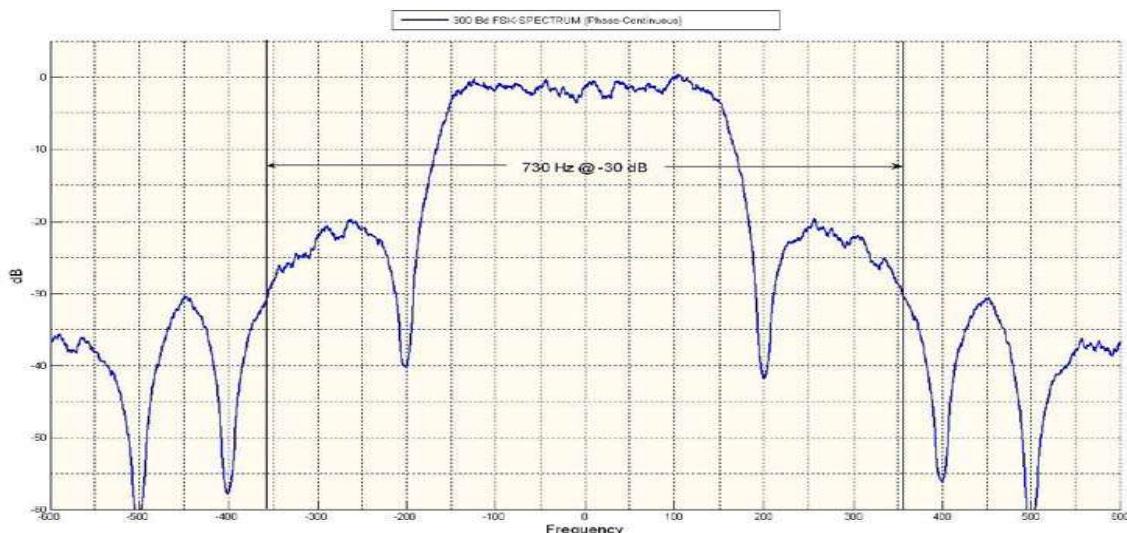
That is why RPR uses a method called Orthogonal Frequency Division Multiplex (OFDM). Supported by digital signal processing steep edge filters are no longer required. RPR works with 8 subcarriers with a 60 Hz tone gap. Average symbol length jumps to 20 ms in comparison to FSK with 3,3 ms. Without a doubt 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-Chechsum 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 unprotocollled (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 scabbled 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.

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Teensy RPR TNC

This last Chapter is dedicated to the **Teeny 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 **ANTenna** 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 **CONnected** mode are possible. The **cable configuration is the same** like with the former SCS Tracker.

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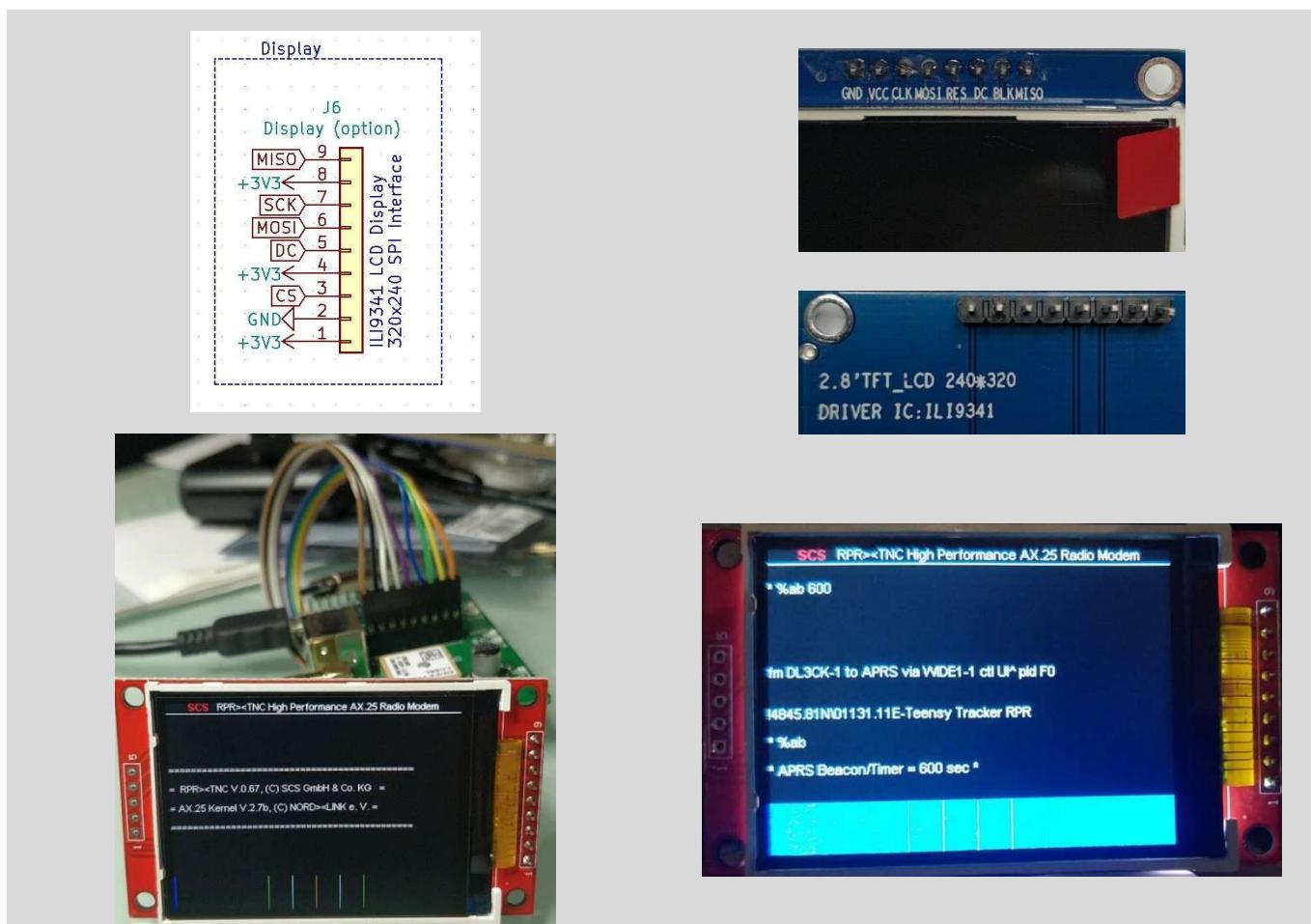
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The latest firmware 0.74 can be found here: <http://robust-packet.st/RPR-TNC.zip>

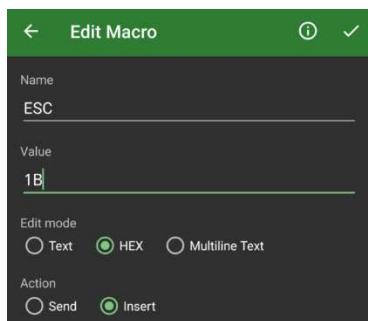
The hardware design is done by Robert, DM4RW and the software is as well in the hands of the RPR inventor Hans-Peter, DL6MAA.

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>