Introduction
This HOWTO explains how to set up the Kenwood TS-590S for remote operation across the internet.
In general, the mechanics of remote transceiver operation are well understood and straightforward:

- TX audio is conveyed from a local PC across the internet to a remote PC, which is in turn connected to the radio.
- RX audio is conveyed in the opposite direction from the radio back to the local PC, and thence to headphones or loudspeaker.
- TX keying, such as VOX or PTT, is remotely controlled across the internet.

In this respect, there is little unusual in the basic techniques described in this HOWTO.
However, the TS-590S has an additional (possibly unique?) feature that greatly enhances remote operation. This is the capability to send monitored sidetone audio along the same path as the RX audio. This means that from the comfort of your local PC you can listen to the radio’s TX Monitor, letting you check and adjust the quality of the TX audio in (more or less) real time – no more guessing how your signal might sound thousands of miles away!

Software
There are many well-known software utilities that can handle remote operation (such as IPsound, Hamachi, LogMeIn etc.; or even Kenwood’s ARHP-590/ARUA-10), but in this HOWTO the chosen tools are:

- Skype [1] for the audio transfer between a local PC and the remote radio.
- TeamViewer [2] for remote control of the ARCP-590 program [3].

Familiarity with the TS-590S Instruction Manual [4] and ARCP-590 is assumed.
HOWTO Structure

This HOWTO consists of three parts and an appendix:

- **Part 1: Remote System Components**
  - Basic Remote Control Functionality
  - TX Monitor Feedback
  - The Big Picture, showing how everything fits together

- **Part 2: Initial Remote System Configuration**
  - Choice of PC Operating Systems
  - Software Installation: Skype, TeamViewer and ARCP-590
  - Skype Connections
  - Running Two Instances of Skype
  - Windows Sounds – how to prevent them reaching the transmitter
  - Choosing Skype Audio Device Drivers
  - Setting up the Skype Audio Drivers
  - Answering Incoming Skype Calls
  - Configuring ARCP-590 for Universal Serial Bus (USB) audio transmission
  - TX Menu Setup: TX audio input, VOX operation, Transmit time-out timer, RX audio output, TX Monitor output

- **Part 3: Using the Remote System**
  - Testing remote operation for the first time
  - Checking connectivity between the PCs
  - Adjusting the audio settings: RX audio, TX audio and TX Monitor audio
  - A summary of all the relevant controls

- **Appendix 1: Using the ARCP-590 Control Panel to Adjust Radio Settings**
  - TS-590S menu settings
  - Setting the TX Monitor level
  - Remote TX tuning
PART 1: REMOTE SYSTEM COMPONENTS

Basic Remote Control Functionality

Figure 1 shows the basic setup for remote control of the TS-590S.

TX audio (in red) originates in a microphone that is connected to a local client PC. The audio passes through the internet and then through a remote server PC that is connected by a USB cable to the TS-590S.

In the reverse direction, RX audio (in green) originating in the TS-590S passes through the internet back to the local client PC and thence to the headphones.

There is also a link (in purple) between the two PCs for controlling the server PC and the radio.
TX Monitor Feedback

The TS-590S has a feature that lets you route the output of the TX Monitor into the RX audio path. See Figure 2.

Thus when you are transmitting, the monitored audio is transferred back through the internet to the local client PC, where you can hear and/or record the audio.

The rest of this HOWTO explains in detail how to implement the scenario shown in Figure 2, with Windows running on both PCs.

The Big Picture

The chosen tool for audio transfer across the internet is Skype. It is in common use, easy to install, and the audio quality is very good.

At first sight it may seem that a standard Skype connection between the two PCs is all that is required for remote TS-590S operation, but there is a catch. When you speak into the microphone, the return channel from the remote PC is momentarily muted – this is exactly what you don’t want to happen when trying to listen to the TX Monitor as you are speaking!

The solution is to set up two independent Skype connections: one for the outgoing TX audio and the other for the incoming RX audio and TX Monitor audio. See Figure 3.

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1 Details of this feature are documented in detail in the TS-590S TechNote on SSB Audio Handling [5].
Figure 3: The big picture. There are two separate Skype connections for the outgoing and incoming audio, to overcome the effects of RX channel muting when transmitting.
PART 2: INITIAL REMOTE SYSTEM CONFIGURATION

This part of the HOWTO explains the installation and setup of the software and hardware necessary for remote TS-590S operation. Although the procedures described here run to several pages, in practice it should not take very long to set everything up, and you only have to do it once.

PC Operating Systems

Local client PC: You can use *any* operating system on the local client PC, provided that Skype and TeamViewer will run under it. In practice this means the PC could be any Windows, Mac or Linux-based machine. (See also the Afterthought section on the last page of this HOWTO).

Remote server PC: Because ARCP-590 is a Windows program, you are constrained to running Windows on the remote server PC.

The procedures described in this HOWTO are based on Windows XP running on both PCs.

Software Installation

1. On each PC:
   a. Download and install Skype.
   b. Create two Skype accounts – see the table below.

2. On each PC:
   a. Download and install TeamViewer.
   b. Create a TeamViewer account. On the remote server PC select the remote login option.

3. On the remote server PC:
   a. Install ARCP-590.

Skype Connections

There are two separate Skype connections, marked #1 and #2 in Figure 3. Only half of each connection is used.

A total of four Skype accounts are required. It is recommended that you choose meaningful names for these accounts, such as `k590-local1`, `k590-local2`, `k590-remote1` and `k590-remote2` in Figure 3.

Make a note of all the login names and passwords. Without a table like this you will quickly forget which names and passwords belong to which accounts!

<table>
<thead>
<tr>
<th>PC</th>
<th>Software</th>
<th>Login Name</th>
<th>Password</th>
</tr>
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<tr>
<td>Local Client PC</td>
<td>Skype</td>
<td>k590-local1</td>
<td>pwk590-local1</td>
</tr>
<tr>
<td></td>
<td>Skype</td>
<td>k590-local2</td>
<td>pwk590-local2</td>
</tr>
<tr>
<td></td>
<td>TeamViewer</td>
<td>123 456 789</td>
<td>pwabc123</td>
</tr>
<tr>
<td>Remote Server PC</td>
<td>Skype</td>
<td>k590-remote1</td>
<td>pwk590-remote1</td>
</tr>
<tr>
<td></td>
<td>Skype</td>
<td>k590-remote2</td>
<td>pwk590-remote2</td>
</tr>
<tr>
<td></td>
<td>TeamViewer</td>
<td>987 654 321</td>
<td>pwxzy456</td>
</tr>
</tbody>
</table>
Running two Instances of Skype

On each PC you need to set up Skype to handle two separate connections:

Connection #1: By default the Skype installation process creates a desktop Skype icon. Right-click on the icon and then click on Rename. Rename the icon to k590-local1 or k590-remote1 as appropriate. When you double-click on the icon, one instance of Skype will run.

Connection #2: Clicking on the Skype icon again will not start a second instance of Skype. Instead, you need to configure Skype to start with the /secondary option. To do this:

1. Find the Skype executable file (Skype.exe) in: C:\Program Files\Skype\Phone\.
2. Right-click on it and select Send to > Desktop (create shortcut).
3. Locate the new shortcut on the desktop, then right-click on it and select Properties.
4. In the Target field, add: /secondary. The Target field should now read "C:\Program Files\Skype\Phone\Skype.exe" /secondary
5. Click OK.
6. Right-click on the new shortcut again, and then click on Rename. Rename the icon to k590-local2 or k590-remote2 as appropriate.
7. You can now start a new instance of Skype every time you double-click the new shortcut.

Figure 4 shows an example of how the desktop looks on the remote server PC when both Skype icons are configured, alongside the TeamViewer and ARCP-590 icons. When hovering the mouse over the TeamViewer icon in the Taskbar, the remote login ID is displayed. (The icons are similar on the local client PC, except that ARCP-590 is not required).
Windows Sound Effects

Windows has an interesting habit of producing a collection of sound effects for all occasions. Usually this is not an issue, as long as the sounds are confined to the PC. But if the sounds find their way into the audio signal path to your radio, your transmitted audio will be accompanied by a sundry collection of dings, clicks, squawks, alarms and other unwanted noises.

To confine the sound effects to the PC, the basic rule is simple: Windows always outputs the sound effects to the default sound playback device. Provided you do not select a default device that communicates with the radio, your on-air signals will not be corrupted with Windows sound effects.

Selecting the Default Sound Playback Device for each PC

Selecting the default sound playback device is straightforward.

Click on Control Panel > Sounds and Audio Devices, then click on the Audio tab. See Figure 5.

Select the default device from the dropdown list, then click on the Apply button at the bottom of the window.

You need to do this on both PCs.

In Figure 5 the selected default device (SigmaTelAudio) is the built-in soundcard in the remote server PC.

Choosing the Skype Audio Device Drivers

It is a good idea to draw up a table of the audio drivers for the Skype “Microphones” and “Speakers” settings in each PC.

In this example:

- The “Generic USB Audio Device” is a plug-in USB audio card in the local client PC, for the microphone and headphones.
- The “USB Audio Codec” is the driver used in the remote server PC to communicate with the TS-590S via the USB cable.
- The PC’s built-in drivers (“SoundMAX Digital Audio” and “SigmaTel Audio”) are not used.

<table>
<thead>
<tr>
<th>PC</th>
<th>Skype ID</th>
<th>Microphone Driver</th>
<th>Speakers Driver</th>
</tr>
</thead>
<tbody>
<tr>
<td>Local Client PC</td>
<td>k590-local1</td>
<td>Generic USB Audio Device</td>
<td>SoundMAX Digital Audio</td>
</tr>
<tr>
<td></td>
<td>k590-local2</td>
<td>SoundMAX Digital Audio</td>
<td>Generic USB Audio Device</td>
</tr>
<tr>
<td>Remote Server PC</td>
<td>k590-remote1</td>
<td>SigmaTel Audio</td>
<td>USB Audio Codec</td>
</tr>
<tr>
<td></td>
<td>k590-remote2</td>
<td>USB Audio Codec</td>
<td>SigmaTel Audio</td>
</tr>
</tbody>
</table>

Further information on dealing with Windows sound effects is included in Appendix 1 of "How To set up the Kenwood TS-590S for Digital Data and Digital Voice Operation" [6].
Setting up the Skype Audio Drivers: Local Client PC

After creating the table of Skype audio drivers as above, you are now ready to set up these drivers in Skype. In the local client PC, start the Skype session for **k590-local1**, then click on **Tools > Options… > Audio settings**. Then select the “Microphones” and “Speakers” drivers. See the top half of Figure 6.

![Image of audio devices](image)

**Figure 6: Selecting the audio device drivers on the local client PC. The drivers marked with an X are not used**

Next:

- Check the box to “Automatically adjust microphone settings”.
- Uncheck the box to “Automatically select speakers settings”.
- Set the “Speakers” Volume slider to minimum.
- Click on the **Save** button to save these settings.

Finally, start the Skype session for **k590-local2** and enter the audio driver settings in a similar manner, per the lower half of Figure 6.
Setting up the Skype Audio Drivers: Remote Server PC

The steps for selecting the audio drivers on the remote server PC follow the same procedure as for the local client PC. See Figure 7.

**Figure 7: Selecting the audio device drivers on the remote host PC**

**Answer Incoming Calls on the Remote Server PC**

To avoid having to manually accept incoming Skype calls on the remote server PC, it is advisable to select auto-answer. You need to do this for both sessions (k590-remote1 and k590-remote2).

To set this option, click on **Tools > Options… > Call settings > Show advanced options**, then check the “Answer incoming calls automatically” box. See Figure 8.

**Figure 8: Selecting the auto-answer option on the remote host PC. This must be done for both Skype session #1 and #2**
Configuring ARCP-590

When operating remotely, there are two ways to key the transmitter:

- By clicking on the ARCP-590 **Send** button.
- By using USB VOX.

By default the ARCP-590 **Send** button (ringed in Figure 9) is configured to transmit any audio that is input to the radio’s *microphone* socket.

![Figure 9: The ARCP-590 control panel display. Before using the Send button to transmit, the program must be configured to use the USB audio input. Also, the VOX button should not be clicked, as this enables VOX on the microphone input (Instead, VOX control is set up through menu options in the TS-590S)](image)

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3 For details of different methods of keying the radio, see “TS-590S TechNote: SSB Audio Handling” [5]
Clearly you do not want to select the TS-590S microphone input when operating remotely. Instead, you need to configure ARCP-590 to cause the radio to transmit audio that is on the USB input. To do this, in ARCP-590 click on Tool > Setup TX Control... The window in Figure 10 appears.

![Setup TX Control](image)

**Figure 10: Configuring ARCP-590 to transmit USB audio**

Select the ACC2/USB button and the USB button, then click on OK. From now on, each time you use the Send button to key the transmitter, the incoming audio from the local client PC will be transmitted.

If you prefer to use VOX rather than using the Send button, then do not click on the VOX button on the ARCP-590 display. This button enables VOX on the microphone input, which again is not what you want when operating remotely. Instead, you will need to configure certain menus in the TS-590S for USB VOX operation – see later.
TS-590S Menu Settings for Remote Operation: TX Audio

There are two TS-590S menus that control the TX audio level and audio input selection in the radio:

- **Menu 64**: USB Audio Input Level – controls the TX audio level, *if the speech processor PROC is switched OFF*. If PROC is switched ON, Menu 64 is not operational – in that case you will need to adjust the audio input level externally from the radio (for example, by using Windows audio mixer controls in either or both of the PCs).

- **Menu 63**: Line Select – this control must be set to USB.

See Figure 11.

![Diagram of TS-590S menus for TX audio](image)

Figure 11: TS-590S menus for TX audio. Note that if the speech processor is switched OFF, Menu 64 controls the USB audio input level (on the left of the diagram). On the other hand, if the processor is switched ON, adjustments to Menu 64 have no effect (on the right of the diagram).
TS-590S Menu Settings for Remote Operation: VOX

As mentioned earlier, if you want to use VOX on a remote TS-590S you cannot use the VOX button on the ARCP-590 control panel display.

Instead, you will need to set the VOX controls in the radio. There are three menus:

- **Menu 71**: USB VOX Gain.
- **Menu 69**: Data VOX\(^4\) ON/OFF – this menu should be set to ON for VOX operation.
- **Menu 70**: Data VOX\(^4\) Delay Time.

![Figure 12: VOX Menus](image)

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TS-590S Menu Settings for Remote Operation: Transmit Time-Out Timer

It is probably a good idea to set the Transmit Time-Out Timer to a non-zero value when operating the radio remotely. Menu 49 allows various time-out limits to be set, up to 30 minutes.

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\(^4\) Do not be confused by the word “Data”. This control is used for any type of TX audio (including voice) that uses the USB (or ACC2) input to the radio.
**TS-590S Menu Settings for Remote Operation: RX Audio and TX Monitor**

There are three TS-590S menu settings that control the audio output from the radio to the remote server PC (and from there back to the local client PC):

- **Menu 65**: USB Audio Output Level – controls the level of the combined RX audio and TX Monitor audio.
- **Menu 68**: Mix Beep Tones – an ON/OFF control that routes the radio’s beep tones and TX Monitor output to the USB audio output. For remote operation this control should be set to ON. The output level of the TX Monitor is controlled from the TX MONI button on the front panel of the radio.
- **Menu 03**: Beep Output Level – controls the level of the beep tones.

See Figure 13.

**Figure 13: TS-590S menus for controlling audio from the receiver**
PART 3: USING THE REMOTE SYSTEM

This final part of the HOWTO describes how to drive the TS-590S remotely, once you have set everything up as in Part 2.

Testing for the First Time

If at all possible, it is highly recommended that when you test the system for the first time, you locate both the local client PC and the remote server PC + radio in the same room. This will make the job very much easier!

Checking Connectivity between the PCs

The first step is to verify that the TeamViewer session and the two Skype connections between the two PCs are operational.

1. From the TeamViewer window on the local client PC, log in to TeamViewer on the remote server PC.
2. Start the two Skype sessions on the remote server PC, by double-clicking on the two Skype desktop icons. (Note: Double-check that the audio settings are still as you set them up earlier. It has been found that sometimes these settings do not “stick”).
3. On the local client PC, start the two Skype sessions.
4. After a minute or so, all four Skype “users” should appear as being on-line in the Contacts lists.
5. On the local client PC, connect k590-local1 to k590-remote1 and connect k590-local2 to k590-remote2.

You are now ready to check out the receive audio from the TS-590S.

Adjusting the Audio Settings: Receive Audio

1. From the local client PC, use TeamViewer to start ARCP-590 on the remote server PC.
2. Check that the radio is in the receive state (front panel green LED lit).
3. With the headphones plugged into the Speakers output jack on the local client PC, listen to the audio from the radio. You should hear any signal(s) that the radio is receiving.
4. From the ARCP-590 control panel, adjust the USB Audio Output Level (Menu 65) in the radio to a comfortable listening level – see Appendix 1. If you cannot set the level properly because the RX audio level is too high or too low, then adjust the k590-remote2 USB Audio Codec Microphone level in the Windows audio mixer on the remote server PC. If that still does not give you a suitable audio level, you may then need to adjust the k590-local2 Speakers audio level on the local client PC as well.

You are now ready to set up the TX audio level.
Adjusting the Audio Settings: TX Audio

For initial testing, connect the radio to a dummy load, and set the power to 5 watts. Then do the following:

1. From the local client PC, click on the ARCP-590 Send button. The red TX LED on the radio’s front panel should light.

2. Plug the headphones into the radio’s PHONES jack, then speak into the microphone that is connected to the local client PC. You should hear the transmitted audio in the headphones, and the power output meter should kick up on speech peaks.

3. On the radio, turn PROC off. Then from the ARCP-590 control panel adjust the USB Audio Input Level (Menu 63) to obtain clean transmitted audio in the headphones. If you cannot set the level properly because the TX audio level is too high or too low, then adjust the k590-remote1 USB Audio Codec Speaker level in the Windows audio mixer on the remote server PC. If that still does not give you a suitable audio level, you may then need to adjust the k590-local1 microphone audio level on the local client PC as well. (If you prefer to transmit with PROC switched on, Menu 63 is not operational. In that case you will need to make the audio level adjustment in the remote server PC).

You are now ready to checkout the TX Monitor.

Adjusting the Audio Settings: TX Monitor Audio

With the radio still in the transmit state (front panel red LED lit), do the following:

1. Plug the headphones back into the Speakers output jack on the local client PC.

2. Speak into the microphone. You should hear your voice in the headphones. (Because of internet propagation delays in both directions, your returning voice may be delayed by perhaps several tens of milliseconds, but you will soon get used to it. Use Menu 68 to turn TX Monitor off if desired).

3. From the ARCP-590 control panel, adjust the TX Monitor output to a comfortable level – see Appendix 1.

That’s it. You are finally ready to use the system on the air!

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By default you will also hear the TS-590S beep tones. If you do not want to hear these tones, reduce the Beep Output Level control (Menu 03) to zero.
Summarizing the TS-590S Controls

Here is a handy table with all the relevant TS-590S controls collected together.

<table>
<thead>
<tr>
<th>Menu #</th>
<th>Function</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>03</td>
<td>Beep Output Level</td>
<td>Set to zero if you do not want to hear the beep tones.</td>
</tr>
<tr>
<td>49</td>
<td>Transmit Time-Out Timer</td>
<td>Set to a non-zero value to limit runaway transmissions.</td>
</tr>
<tr>
<td>64</td>
<td>USB Audio Input Level</td>
<td>Use to adjust the TX audio level <strong>IF</strong> PROC IS SWITCHED OFF.</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>If</strong> PROC is switched ON, this control does not work. Instead, adjust the level with the Windows Audio Mixer control in the remote server PC.</td>
</tr>
<tr>
<td>65</td>
<td>USB Audio Output Level</td>
<td>Use to adjust the RX Audio Level.</td>
</tr>
<tr>
<td>68</td>
<td>Mix Beep Tones</td>
<td>Switch on to hear the TX Monitor (and the beep tones).</td>
</tr>
<tr>
<td>69</td>
<td>Data VOX On/Off</td>
<td>Use for remote VOX.</td>
</tr>
<tr>
<td></td>
<td></td>
<td><em>(Do not use the ARCP-590 control panel VOX button).</em></td>
</tr>
<tr>
<td>70</td>
<td>Data VOX Timing</td>
<td>Use for remote VOX.</td>
</tr>
<tr>
<td></td>
<td></td>
<td><em>(Do not use the ARCP-590 control panel VOX timing setting).</em></td>
</tr>
<tr>
<td>71</td>
<td>USB VOX Gain</td>
<td>Use for remote VOX.</td>
</tr>
<tr>
<td></td>
<td></td>
<td><em>(Do not use the ARCP-590 control panel VOX gain setting).</em></td>
</tr>
</tbody>
</table>
APPENDIX 1: USING THE ARCP-590 CONTROL PANEL TO ADJUST RADIO SETTINGS

TS-590S Menu Settings

To examine and adjust the TS-590S menu settings from the ARCP-590 control panel:

1. Click on the Menu... button. A three-panel window appears.
2. In the left panel, click on 00 All. A list of all the menu items appears in the center panel.
3. In the center panel, click on the menu number of interest. A list of possible setting values appears in the right panel.
4. Click on the chosen setting value.
5. Click on Close.

See Figure A1-1.

Figure A1-1: Viewing and setting menus
Setting the TX Monitor Level

To set the Monitor TX level, click on the Multi... button, then set the level as required. See Figure A1-2.

![Figure A1-2: Setting the TX Monitor level. (Do not use this window to set the VOX Gain or VOX Delay Time – use menus 70 and 71 instead)](image)

Remote TX Tuning

You can use ARCP-590 to remotely tune the TX. See Figure 14.

![Figure 14: Remote radio tuning](image)

On the ARCP-590 control panel, click on Radio, then click on TX Tune(H). A large banner then appears, confirming that the radio is transmitting a CW tuning signal. To turn the signal off, click on Radio and TX Tune(H) a second time.
Afterthought
With the increasing use of portable phone and tablet-based devices such as iPad, iPod, Android etc., there is a likelihood that they could be used as the local client “PC” for remote operation. This is provided they can support a TeamViewer session and two Skype sessions concurrently. I would be very interested to hear from anyone who has successfully done this.

References

<table>
<thead>
<tr>
<th>Resource</th>
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</thead>
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<tr>
<td>[3] ARCP-590 Control Program</td>
<td>Go to the TS-590S Resources Page: [homepage.ntlworld.com/wadei/ts-590s.htm]&lt;br&gt;Scroll down to the KENWOOD SOFTWARE section, and click on the “TS-590S Software” link. Then follow the Kenwood link to the ARCP-590 program</td>
</tr>
<tr>
<td>[5] TS-590S TechNote on SSB Audio Handling</td>
<td>Go to the TS-590S Resources Page: [homepage.ntlworld.com/wadei/ts-590s.htm]&lt;br&gt;Scroll down to the TECHNOTEs section, and click on the link “TS-590S TechNote: SSB Audio Handling”</td>
</tr>
<tr>
<td>[6] TS-590S HOWTO on digital operation</td>
<td>Go to the TS-590S Resources Page: [homepage.ntlworld.com/wadei/ts-590s.htm]&lt;br&gt;Scroll down to the HOWTOs section, and click on the link “HOWTO set up the Kenwood TS-590S for Digital Data and Digital Voice Operation”</td>
</tr>
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Acknowledgements
The impetus to write this HOWTO came originally from two people: Steve London (N2IC) and Tom Mandell (W3FRG). First, Steve recently made me aware that it was possible to use Menu 68 in the TS-590S to feed back TX Monitor audio via the USB (and ACC2) port. Second, Tom and I happened to be discussing remote operation, when at one point he said: “I wonder what the audio sounds like at the other end”. That was the “lightbulb” moment, when I realized he could use the TS-590’s TX Monitor feedback capability to monitor his audio and remotely experiment with equalizer settings.

Many thanks, then, to Steve and Tom for the initial stimulus and discussion, and also to Frank Riley (KK0K) for feedback on an early draft of this HOWTO.

Document Version History

<table>
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<th>Date</th>
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<tbody>
<tr>
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<td>7 May 2012</td>
<td>First public release</td>
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