

Installing SVXLink On Raspberry Pi OS Buster Lite

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When I first set up an EchoLink node on a Raspberry Pi using SVXLink software by SM0SVX (<https://www.svxlink.org/>), I found it a challenge. There were several sets of instructions on the internet and some tips and tricks to use along the way, but I didn't find one document that worked for me from end-to-end. For my own peace of mind and so I could recreate a working EchoLink node should the need ever arise, I built a new microSD card from scratch and made the following set of instruction. After the instructions are some of the useful tips and tricks that helped me with my initial build. Thanks to G4NAB/F5VMR whose instructions formed the basis for the steps of this document.

1. Download Raspberry Pi OS Buster (just "with desktop") and write it to the microSD card (I used an 8GB card). <https://www.raspberrypi.org/software/operating-systems/#raspberrypi-os-32-bit>
2. Before removing the card from your computer, create an empty file called ssh (no extension) and copy it to the boot directory of the microSD card. This step allows you to access the RPi from your computer using an SSH client. ssh pi@raspberrypi.local
Password: raspberry
3. Log in to your RPi and type sudo raspi-config. Set time zone, locale, define a new password, change the hostname to something appropriate, especially if you have multiple RPi's. Under Interfaces, enable VNC.
4. Type sudo adduser svxlink. Use svxlink as the password. This user is needed by SVXLink.
5. Type sudo apt-get update then sudo apt-get upgrade to bring Buster up to the current level. The upgrade may take a while.
6. Type sudo apt install git to make sure git is installed.
7. Type sudo git clone <http://github.com/sm0svx/svxlink.git> This will give you a download of the latest master of svxlink.git including svxreflector, svxserver and svxremote into a folder called svxlink in the current user.
8. Install the tools needed to build svxlink: type sudo apt install gcc g++ make cmake groff gzip doxygen tar git
9. Install the following third party libraries, one at a time:
sudo apt install libsigc++-2.0-dev
sudo apt install libpopt-dev
sudo apt install tcl8.6-dev
sudo apt install libgcrypt20-dev
sudo apt install libasound2-dev
sudo apt install libgsm1-dev
sudo apt install libspeex-dev
sudo apt install librtlsdr-dev
sudo apt install libqt4-dev

```
sudo apt install curl libcurl4-openssl-dev libjsoncpp-dev
```

```
sudo apt install libopus0 opus-tools libopus-dev
```

Note: if the system asks Y/n for any of the above commands, always go for Y.

```
sudo apt install alsa-utils
```

Note: alsa-utils may already be installed.

10. To begin the compilation process, change to the source directory: `cd svxlink/src`
11. Create the build directory: `sudo mkdir build` and change to it: `cd build`
12. Start compiling by typing the following command exactly, on one line:
`sudo cmake -DCMAKE_INSTALL_PREFIX=/usr -DSYSCONF_INSTALL_DIR=/etc \ -
DLOCAL_STATE_DIR=/var ..`
13. Type `sudo make` Note: this command will take 30-45 minutes to run, depending on the processor.
14. Type `sudo make doc` to prepare all the documentation and manual files.
15. Type `sudo make install` to compile all the software into the operating system.
16. Type `sudo ldconfig` to create the necessary links and cache. The software is installed at this point, but not yet ready for use.
17. Next process is to install the English sounds for SVXLink. Start by changing to the sounds directory: `cd /usr/share/svxlink/sounds/`
18. Download the sound files with `wget`:
`sudo wget https://github.com/sm0svx/svxlink-sounds-en_US-
heather/releases/download/14.08/svxlink-sounds-en_US-heather-16k-13.12.tar.bz2`
19. Uncompresss the sound files:
`sudo tar xvjf svxlink-sounds-en_US-heather-16k-13.12.tar.bz2`
20. Type: `sudo ln -s en_US-heather-16k en_US`
21. Setup GPIO pin 17 for PTT (and optionally pin 18 for Squelch): `sudo nano /etc/rc.local`
Add the following lines between `fi` and `exit 0`

```
#####
```

```
#GPIO SCRIPT #
```

```
#TO BE INSERTED#
```

```
#ON START-UP #
```

```
#####
```

```
# GPIO 17 as PTT to TX1
```

```
echo 17 > /sys/class/gpio/export
```

```
echo out > /sys/class/gpio/gpio17/direction
```

```
#sudo chmod 777 /sys/class/gpio/gpio17/value
```

```
# GPIO 18 as Squelch to RX1
```

```
echo 18 > /sys/class/gpio/export
```

```
echo in > /sys/class/gpio/gpio18/direction
```

```
#sudo chmod 777 /sys/class/gpio/gpio18/value
```

22. Define gpio17 in /etc/svmlink/gpio.conf

```
sudo nano /etc/svmlink/gpio.conf
```

```
GPIO_OUT_HIGH="gpio17"
```

Note: GPIO_USER="svmlink" should already be set

23. Begin the sound card setup process: sudo nano /etc/modprobe.d/raspi-blacklist.conf

Type the following into the file: blacklist snd_bcm2835

Save and exit the file.

24. Type sudo nano /lib/modprobe.d/aliases.conf

Insert a # before the line options snd-usb-audio index=-2

```
GNU nano 3.2 /lib/modprobe.d/aliases.conf

# These are the standard aliases and dependencies.
# This file does not need to be modified.

# prevent unusual drivers from appearing as the first sound device #####
options snd-pcsp index=-2
#options snd-usb-audio index=-2
options cx88_alsa index=-2
options snd-atiixp-modem index=-2
options snd-intel8x0m index=-2
options snd-via82xx-modem index=-2

# work around other kernel issues #####
# The EHCI driver should be loaded before the ones for low speed controllers
# or some devices may be confused when they are disconnected and reconnected.
softdep uhci-hcd pre: ehci-hcd
softdep ohci-hcd pre: ehci-hcd
```

Save and exit the file.

25. Reboot to enable the changes.

26. Type sudo alsamixer to open the volume controls for the sound card. RPiOS has PulseAudio installed, but our USB Audio Device should be listed as device 0. Press F6 to

bring up the list and select 0 USB Audio Device.

```
AlsaMixer v1.1.8
Card: PulseAudio
Chip: PulseAudio
View: F3:[Playback] F4: Capture F5: All
Item: Master
F1: Help
F2: System information
F6: Select sound card
Esc: Exit

Sound Card
- (default)
0 USB Audio Device
  enter device name...

00
38<>38
< Master >
```

27. Press F5 to show all the volume controls. For my setup, I set the Speaker and Capture Mic levels to 38 to get good sound to and from the radio.

```
AlsaMixer v1.1.8
Card: USB Audio Device
Chip: USB Mixer
View: F3: Playback F4: Capture F5:[All]
Item: Mic [dB gain: 7.00]
F1: Help
F2: System information
F6: Select sound card
Esc: Exit

Speaker 71
MM
L R
CAPTURE
38
00

38<>38 71 38
Speaker Mic < Mic > Auto Gain Control
```

28. Press Esc to exit the mixer. Save these settings (even after rebooting) by typing `sudo alsactl store`

29. The final steps are to set the parameters in `/etc/svxlink/svxlink.conf` and `/etc/svxlink/svxlink.d/ModuleEchoLink.conf` to enable your installation, paying attention to syntax and whether you are operating simplex or duplex. I have included my working settings for a simplex node at the end of this document.
30. To start SVXLink from the command line, type `sudo svxlink`
31. If all has gone well, you should see the following, with no errors:

```
pi@echolinkpi3:~ $ sudo svxlink
SvxLink v1.7.99.29 Copyright (C) 2003-2020 Tobias Blomberg / SM0SVX

SvxLink comes with ABSOLUTELY NO WARRANTY. This is free software, and you are
welcome to redistribute it in accordance with the terms and conditions in the
GNU GPL (General Public License) version 2 or later.

Using configuration file: /etc/svxlink/svxlink.conf
--- Using sample rate 48000Hz

Starting logic: SimplexLogic
Loading RX: Rx1
Loading TX: Tx1
Loading module "ModuleHelp" into logic "SimplexLogic"
  Found /usr/lib/arm-linux-gnueabi/hf/svxlink/ModuleHelp.so
  Module Help v1.0.0 starting...
Loading module "ModuleEchoLink" into logic "SimplexLogic"
  Found /usr/lib/arm-linux-gnueabi/hf/svxlink/ModuleEchoLink.so
  Module EchoLink v1.5.99.0 starting...
SimplexLogic: Event handler script successfully loaded.
EchoLink directory status changed to ON
--- EchoLink directory server message: ---
EchoLink Server v2.5.9997

ECH0EC2-1: Herndon, VA USA
```

Tips and Tricks

The following tips and trick proved helpful in testing various functions and in completing the setup of the node.

Configuring RPi to run svxlink at startup (Buster)

Step 1. Create a script:

```
sudo nano /etc/xdg/lxsession/LXDE-pi/svxlink_start.sh
```

```
#!/bin/bash
```

```
lxterminal -e svxlink
```

Ctrl-O to save the file then Ctrl-X to exit. This script will start SVXLink in a terminal window.

```
sudo chmod 777 /etc/xdg/lxsession/LXDE-pi/svxlink_start.sh
```

This command makes the script executable and modifiable by anyone. You can change it from the File Manager window, also.

Step 2. To run the script at startup, create a new file with the following lines:
sudo nano /etc/xdg/autostart/svxlink_start.desktop

```
[Desktop Entry]
Type=Application
Name=svxlink_start
Comment=start svxlink in terminal window
NoDisplay=true
Terminal=true
X-KeepTerminal=true
Exec=sh /etc/xdg/lxsession/LXDE-pi/svxlink_start.sh
```

Ctrl-O to save the file then Ctrl-X to exit.
When the RPi is started, SVXLink will start in a terminal window.

Sound Test

Test to see if sound works: `$ speaker-test -c 2`
Change `-c` to fit your speaker setup. Use `-c 8` for 7.1, for instance: `$ speaker-test -c 8`

Playing a Wave File

To download a test file: `sudo wget`
http://www.freespeceffects.co.uk/soundfx/sirens/police_s.wav

To play the file: `sudo aplay police_s.wav`

Testing PTT GPIO Pin

Below is a Python script for testing the PTT pin (GPIO17). Create a new text file "PTT.py".

```
nano PTT.py
```

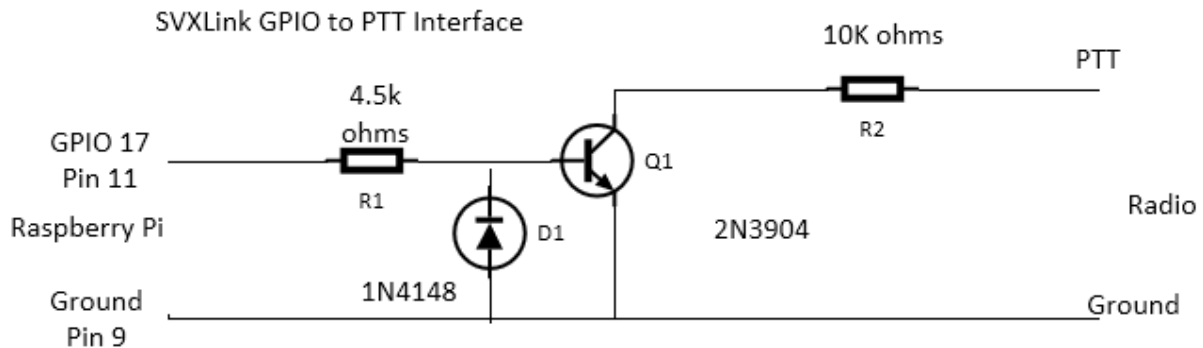
Type in the following code:

```
import RPi.GPIO as GPIO
import time
GPIO.setmode(GPIO.BCM)
GPIO.setwarnings(False)
GPIO.setup(17, GPIO.OUT)
print "PTT on"
GPIO.output(17, GPIO.HIGH)
time.sleep(2)
print "PTT off"
GPIO.output(17, GPIO.LOW)
GPIO.cleanup()
```

Once you have typed all the code and checked it, save and exit the text editor with “Ctrl + x” then “y” then “enter”. To run the code, type `sudo python PTT.py`.

Connecting GPIO Pin 17 to the Radio’s PTT Line

The interface circuit consists of a 2N3904 transistor, a 4.7k ohm resistor, a 10k ohm resistor, and a 1N4148 diode.



Watching the SVXLink Log (Real Time)

If you want to create a log file that can be saved and viewed, then start SVXLink with logging enabled:

```
sudo svxlink --logfile=/var/log/svxlink.log
```

Open up a second terminal window. From the command line issue the following command to view the log: `tail -f /var/log/svxlink.log`

This will add new lines real time and scroll as the log grows. To exit just type Ctrl+C

The log file records every connection and every incoming and outgoing signal, so if you are using an 8GB microSD card, you don’t want to have logging turned on all the time. I recommend using it only for troubleshooting and moving the file to a USB drive from time to time or deleting it after reviewing.

SVXLink Configuration Settings

Since there was no internet connection at the site of the repeater, we set up a remote EchoLink node at my house, on the repeater’s TX and Rx frequencies. The node is registered with EchoLink under my call sign (VE6PLC) but is configured to announce the repeater’s call sign (VA6CAL). Below are the `svxlink.conf` settings in use for the VA6CAL/VE6PLC-R remote EchoLink node.

```
#####  
#                                     #  
#      Configuration file for the SvxLink server      #  
#                                     #  
#####
```

[GLOBAL]

#MODULE_PATH=/usr/lib/arm-linux-gnueabi/hf/svxlink

LOGICS=SimplexLogic

CFG_DIR=svxlink.d

TIMESTAMP_FORMAT="%c"

CARD_SAMPLE_RATE=48000

#CARD_CHANNELS=1

LOCATION_INFO=LocationInfo

#LINKS=LinkToR4

[SimplexLogic]

TYPE=Simplex

RX=Rx1

#RX=NONE

TX=Tx1

#MODULES=ModuleHelp,ModuleParrot,ModuleEchoLink

MODULES=ModuleHelp,ModuleEchoLink

CALLSIGN=ER-VA6CAL

#CALLSIGN=ER-VE6PLC

SHORT_IDENT_INTERVAL=0

LONG_IDENT_INTERVAL=60


```
#IDENT_ONLY_AFTER_TX=4

#EXEC_CMD_ON_SQL_CLOSE=500

EVENT_HANDLER=/usr/share/svxlink/events.tcl

DEFAULT_LANG=en_US

#RGR_SOUND_DELAY=0

RGR_SOUND_DELAY=-1

REPORT CTCSS=110.9

#TX CTCSS=ALWAYS

TX CTCSS=MODULE,LOGIC,ANNOUNCEMENT

MACROS=Macros

FX_GAIN_NORMAL=0

FX_GAIN_LOW=-12

#ACTIVATE_MODULE_ON_LONG_CMD=4:EchoLink

#QSO_RECORDER=8:QsoRecorder

ONLINE_CMD=998877

MUTE_RX_ON_TX=1

MUTE_TX_ON_RX=1

#STATE_PTY=/var/run/svxlink/state

[RepeaterLogic]

TYPE=Repeater

RX=Rx1

TX=Tx1

#MODULES=ModuleHelp,ModuleParrot,ModuleEchoLink,ModuleTclVoiceMail
```

MODULES=ModuleHelp,ModuleParrot,ModuleEchoLink

CALLSIGN=MYCALL

SHORT_IDENT_INTERVAL=10

LONG_IDENT_INTERVAL=60

#IDENT_ONLY_AFTER_TX=4

#EXEC_CMD_ON_SQL_CLOSE=500

EVENT_HANDLER=/usr/share/svxlink/events.tcl

DEFAULT_LANG=en_US

RGR_SOUND_DELAY=0

REPORT CTCSS=136.5

#TX CTCSS=SQL_OPEN

MACROS=Macros

#SEL5_MACRO_RANGE=03400,03499

FX_GAIN_NORMAL=0

FX_GAIN_LOW=-12

#QSO_RECORDER=8:QsoRecorder

#NO_REPEAT=1

IDLE_TIMEOUT=30

OPEN_ON_1750=1000

#OPEN_ON CTCSS=136:2000

#OPEN_ON_DTMF=*

#OPEN_ON_SQL=5000

#OPEN_ON_SEL5=01234

#OPEN_SQL_FLANK=OPEN

#OPEN_ON_SQL_AFTER_RPT_CLOSE=10

IDLE_SOUND_INTERVAL=3000

#SQL_FLAP_SUP_MIN_TIME=1000

#SQL_FLAP_SUP_MAX_COUNT=10

#ACTIVATE_MODULE_ON_LONG_CMD=4:EchoLink

#IDENT_NAG_TIMEOUT=15

#IDENT_NAG_MIN_TIME=2000

#ONLINE_CMD=998877

#STATE_PTY=/var/run/svxlink/state

[LinkToR4]

CONNECT_LOGICS=RepeaterLogic:94:SK3AB,SimplexLogic:92:SK3CD

#DEFAULT_ACTIVE=1

TIMEOUT=300

6#AUTOACTIVATE_ON_SQL=RepeaterLogic

[Macros]

1=EchoLink:9999#

7=EchoLink:51068#

8=EchoLink:496228#

9=EchoLink:455453#

03400=EchoLink:9999#

[QsoRecorder]

```
#REC_DIR=/var/spool/svxlk/qso_recorder
#MIN_TIME=1000
#MAX_TIME=3600
#SOFT_TIME=300
#MAX_DIRSIZE=1024
#DEFAULT_ACTIVE=1
#TIMEOUT=300
#QSO_TIMEOUT=300
#ENCODER_CMD=/usr/bin/oggenc -Q \"%f\" && rm \"%f\"
```

[Voter]

```
TYPE=Voter
RECEIVERS=Rx1,Rx2,Rx3
VOTING_DELAY=200
BUFFER_LENGTH=0
#REVOTE_INTERVAL=1000
#HYSTERESIS=50
#SQL_CLOSE_REVOTE_DELAY=500
#RX_SWITCH_DELAY=500
```

[MultiTx]

```
#TYPE=Multi
#TRANSMITTERS=Tx1,Tx2,Tx3
```

[NetRx]

TYPE=Net

HOST=remote.rx.host

TCP_PORT=5210

#LOG_DISCONNECTS_ONCE=0

AUTH_KEY="Change this key now!"

CODEC=S16

#SPEEX_ENC_FRAMES_PER_PACKET=4

#SPEEX_ENC_QUALITY=4

#SPEEX_ENC_BITRATE=15000

#SPEEX_ENC_COMPLEXITY=2

#SPEEX_ENC_VBR=0

#SPEEX_ENC_VBR_QUALITY=4

#SPEEX_ENC_ABR=15000

#SPEEX_DEC_ENHANCER=1

#OPUS_ENC_FRAME_SIZE=20

#OPUS_ENC_COMPLEXITY=10

#OPUS_ENC_BITRATE=20000

#OPUS_ENC_VBR=1

[NetTx]

TYPE=Net

HOST=remote.tx.host

TCP_PORT=5210

```
#LOG_DISCONNECTS_ONCE=0
AUTH_KEY="Change this key now!"
CODEC=S16
#SPEEX_ENC_FRAMES_PER_PACKET=4
#SPEEX_ENC_QUALITY=4
#SPEEX_ENC_BITRATE=15000
#SPEEX_ENC_COMPLEXITY=2
#SPEEX_ENC_VBR=0
#SPEEX_ENC_VBR_QUALITY=4
#SPEEX_ENC_ABR=15000
#SPEEX_DEC_ENHANCER=1
#OPUS_ENC_FRAME_SIZE=20
#OPUS_ENC_COMPLEXITY=10
#OPUS_ENC_BITRATE=20000
#OPUS_ENC_VBR=1
```

```
[Rx1]
```

```
TYPE=Local
AUDIO_DEV=alsa:plughw:0
AUDIO_CHANNEL=0
SQL_DET=VOX
#SQL_DET=CTCSS
#SQL_START_DELAY=0
SQL_START_DELAY=10
```

SQL_DELAY=0
SQL_HANGTIME=2000
#SQL_EXTENDED_HANGTIME=1000
#SQL_EXTENDED_HANGTIME_THRESH=15
SQL_TIMEOUT=600
VOX_FILTER_DEPTH=20
VOX_THRESH=500
CTCSS_MODE=2
CTCSS_FQ=110.9
CTCSS_SNR_OFFSET=0
CTCSS_OPEN_THRESH=15
CTCSS_CLOSE_THRESH=9
CTCSS_BPF_LOW=60
CTCSS_BPF_HIGH=270
#SERIAL_PORT=/dev/ttyS0
#SERIAL_PIN=CTS
#SERIAL_SET_PINS=DTR!RTS
#EVDEV_DEVNAME=/dev/input/by-id/usb-SYNIC_SYNIC_Wireless_Audio-event-if03
#EVDEV_OPEN=1,163,1
#EVDEV_CLOSE=1,163,0
#GPIO_SQL_PIN=gpio30
#PTY_PATH=/tmp/rx1_sql
#HID_DEVICE=/dev/hidraw3
#HID_SQL_PIN=VOL_UP

#SIGLEV_DET=TONE
#SIGLEV_SLOPE=1
#SIGLEV_OFFSET=0
#SIGLEV_BOGUS_THRESH=120
#TONE_SIGLEV_MAP=100,84,60,50,37,32,28,23,19,8
#SIGLEV_OPEN_THRESH=30
#SIGLEV_CLOSE_THRESH=10
DEEMPHASIS=0
#SQL_TAIL_ELIM=300
#PREAMP=6
PEAK_METER=1
DTMF_DEC_TYPE=INTERNAL
DTMF_MUTING=1
DTMF_HANGTIME=40
DTMF_SERIAL=/dev/ttyS0
#DTMF_PTY=/tmp/rx1_dtmf
#DTMF_MAX_FWD_TWIST=8
#DTMF_MAX_REV_TWIST=4
#1750_MUTING=1
#SEL5_DEC_TYPE=INTERNAL
#SEL5_TYPE=ZVEI1
#FQ=433475000
#MODULATION=FM
#WBRX=WbRx1

[WbRx1]

#TYPE=RtlUsb

#DEV_MATCH=0

#HOST=localhost

#PORT=1234

#CENTER_FQ=435075000

#FQ_CORR=0

#GAIN=0

#PEAK_METER=1

#SAMPLE_RATE=960000

[Tx1]

TYPE=Local

AUDIO_DEV=alsa:plughw:0

AUDIO_CHANNEL=0

PTT_TYPE=GPIO

#PTT_TYPE=NONE

#PTT_PORT=/dev/ttyS0

GPIO+PATH=/sys/class/gpio

PTT_PIN=gpio17

#PTT_PIN=DTRRTS

#HID_DEVICE=/dev/hidraw3

#HID_PTT_PIN=GPIO3

#SERIAL_SET_PINS=DTR!RTS

#PTT_HANGTIME=1000

PTT_HANGTIME=500

TIMEOUT=300

TX_DELAY=500

CTCSS_FQ=110.9

CTCSS_LEVEL=9

PREEMPHASIS=0

DTMF_TONE_LENGTH=100

DTMF_TONE_SPACING=50

DTMF_DIGIT_PWR=-15

#MASTER_GAIN=1.0

MASTER_GAIN=0.0

[LocationInfo]

#APRS_SERVER_LIST=euro.aprs2.net:14580

#STATUS_SERVER_LIST=aprs.echolink.org:5199

LON_POSITION=114.08.00W

LAT_POSITION=51.08.00N

#CALLSIGN=ER-VE6PLC

CALLSIGN=ER-VA6CAL

FREQUENCY=147.135

TX_POWER=10

#ANTENNA_GAIN=6

#ANTENNA_HEIGHT=20m

#ANTENNA_DIR=-1

PATH=WIDE1-1

BEACON_INTERVAL=10

TONE=110

[ModuleEchoLink.conf](#)

sudo nano /etc/svxlink/svxlink.d/ModuleEchoLink.conf

[ModuleEchoLink]

NAME=EchoLink

ID=2

TIMEOUT=60

#ALLOW_IP=192.168.1.0/24

#DROP_INCOMING=^()\$

#REJECT_INCOMING=^()\$

#ACCEPT_INCOMING=^(.*)\$

#REJECT_OUTGOING=^()\$

#ACCEPT_OUTGOING=^(.*)\$

#REJECT_CONF=0

#CHECK_NR_CONNECTS=2,300,120

SERVERS=servers.echolink.org

CALLSIGN=VE6PLC-R

PASSWORD=eP1gOwkeXR85

SYSOPNAME=Cliff Linton

LOCATION=[Svx] Calgary, Alberta

#PROXY_SERVER=the.proxy.server

#PROXY_PORT=8100

```
#PROXY_PASSWORD=PUBLIC
#BIND_ADDR=10.20.30.40
MAX_QSOS=10
MAX_CONNECTIONS=11
LINK_IDLE_TIMEOUT=300
#AUTOCON_ECHOLINK_ID=9999
#AUTOCON_TIME=1200
#USE_GSM_ONLY=1
#DEFAULT_LANG=en_US
DESCRIPTION="You have connected to a SvxLink node,\n"
    "a voice services system for Linux with EchoLink\n"
    "support.\n"
    "Check out http://svxlink.sf.net/ for more info\n"
    "\n"
    "QTH:  Calgary, Alberta\n"
    "QRG:  Repeater link on 147.135+ MHz\n"
    "CTCSS: CTCSS 110.9 Hz\n"
#    "Trx:  My_transceiver_type\n"
#    "Antenna: My_antenna_brand/type/model\n"
```