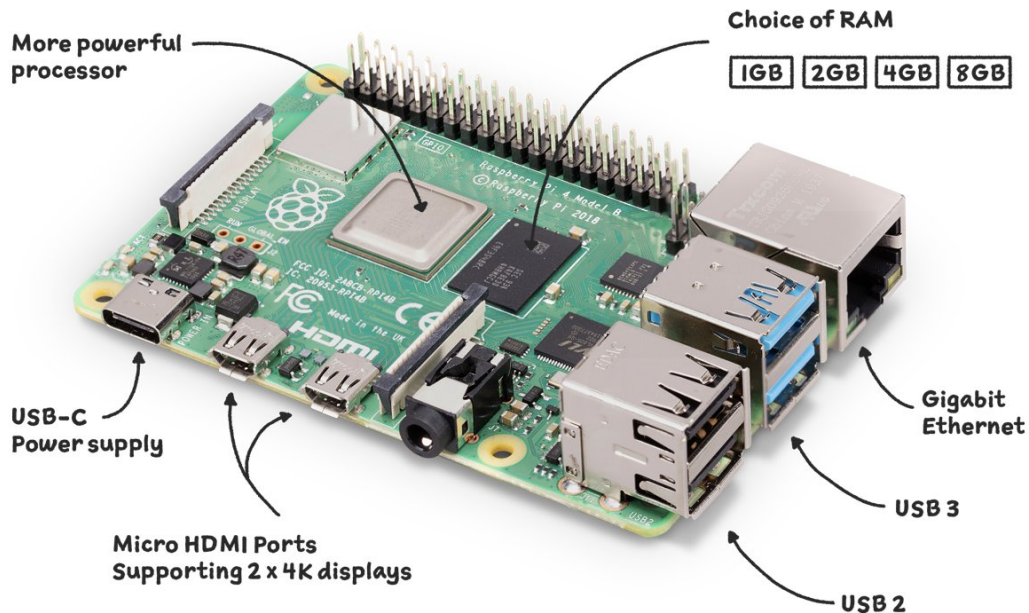


# A New Incredible PBX 2027 Image for the Raspberry Pi Edit

 [nerdvittles.com](http://nerdvittles.com)



Earlier this year we introduced a new Incredible PBX 2027 installer for the Raspberry Pi. But we heard from many of you that it was simply too time-consuming to go through both the installation of the Raspberry Pi OS and then the Incredible PBX 2027 setup. This is particularly important to those that use the Raspberry Pi as a teaching platform because of the lengthy install process. So today we are pleased to introduce a Raspberry Pi image for the Raspberry Pi 4 and 400 that installs almost instantaneously after burning the image to a microSD card.

## Assembling the Required Raspberry Pi Components

Before you can deploy Incredible PBX 2027, you'll first need the necessary Raspberry Pi hardware. To support the enhanced Incredible PBX 2027 platform, we strongly recommend either the Raspberry Pi 400 or the [Raspberry Pi 4B with at least 2GB RAM](#). You can choose a reseller below for quicker delivery. Assuming you already own an [HDMI-compatible monitor](#) and a [USB keyboard](#) (only required if you don't buy a RasPi 400)...

- [Raspberry Pi 4B](#) or [Raspberry Pi 400](#)
- [\\$10 USB-C RasPi 4 \(only\) Power Supply](#)
- [\\$9 32GB microSDHC Class 10 card \(strongly recommended!\)](#)
- [\\$5 Official RasPi 4B Case](#) or see above for our favorite

## Getting Started with Incredible PBX 2027

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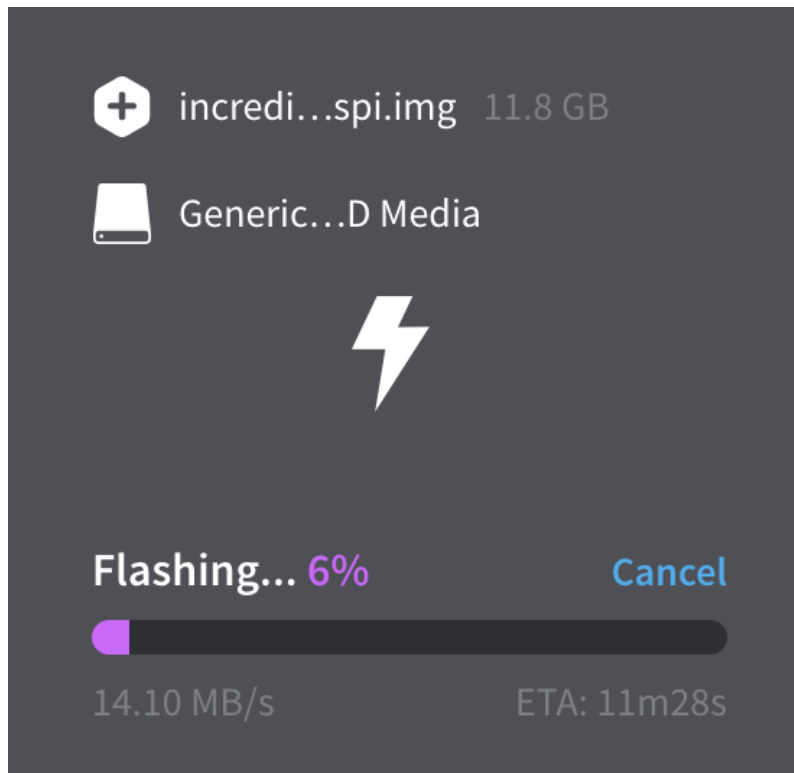
Unlike the previous setup process, you cannot use the [Raspberry Pi Imager](#) to create your microSD card. Instead, we recommend the free Balena Etcher application which is available for all desktops. So begin by installing the Balena Etcher software [here](#).

Next, download and unzip the [Incredible PBX 2027 image](#) from the Incredible PBX Repo.

If you don't already have one, we recommend you purchase the \$9.99 SD Card Reader using our [referral link](#). Then insert a 32GB microSD card into the reader and plug the reader into your desktop machine. Using our referral links helps fund our open source projects.



Now run the Balena Etcher app. Choose *Flash from File* and select the unzipped Incredible PBX 2027 image from your desktop: **incrediblepbx2027-raspi.img**. Next, choose *Select Target* and choose the microSD card you plugged into your PC. Finally, click *Flash* to transfer the Incredible PBX 2027 image to your microSD card. When the process completes, eject the microSD card and insert it into and boot your Raspberry Pi.



If flashing fails, try formatting the microSD card on a Linux machine first. Format: `mkfs.vfat /dev/sda`. Or Reformat: `mkfs.vfat /dev/sda1` Then repeat the Etcher flashing.

After your Raspberry Pi boots, do the following:

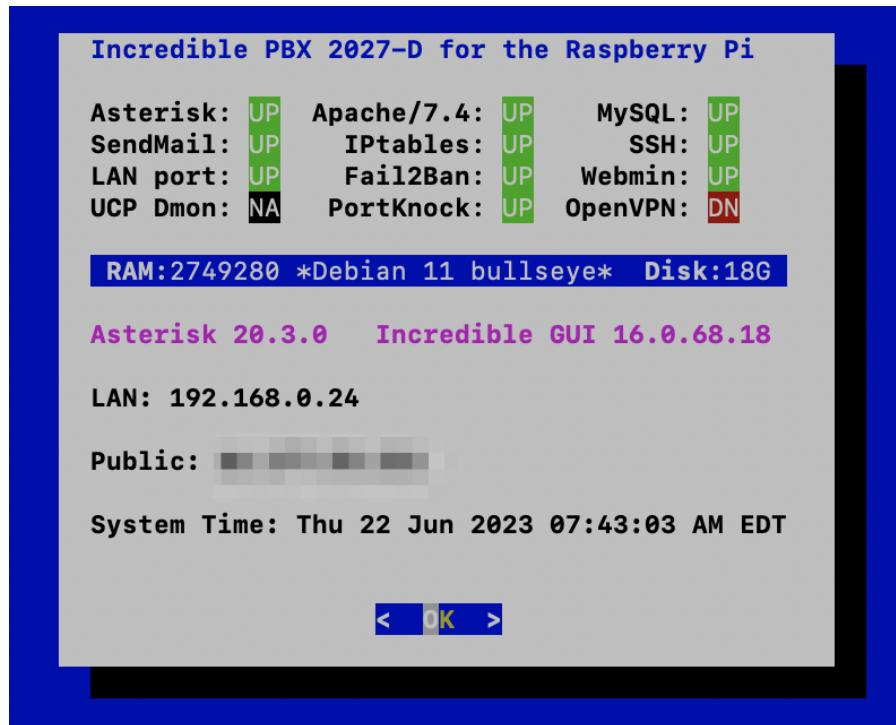
1. Press ENTER to display Login prompt. Login as root with password: `password`
2. Agree to license terms by pressing ENTER
3. When initial setup completes, press ENTER
4. When raspi-config begins:
5. What user should use these settings? Press ENTER
6. System Options -> Wireless LAN: Configure SSID and Password, if desired
7. Localization Settings: Set Locale, Timezone & WiFi Country
8. Advanced Options: Resize image to match SD card size
9. Finish -> Reboot Now: YES
10. If rc.local fails to start after rebooting, press Ctrl-Alt-Del to reboot again
11. Wait for Asterisk to finish starting up. Then switch to your Desktop PC
12. Make note of the Private IP address above RasPi login prompt before you go

To assure that your desktop computer is whitelisted in the Incredible PBX firewall, we recommend completing the rest of the install using SSH or Putty on your desktop machine. The `ip a` command above will tell you the local IP address of your RasPi. So login using this command and default password of `password: ssh root@ip-address`.

1. Set secure root password with command: `passwd`

2. Set secure FreePBX password: /root/admin-pw-change
3. Set secure Apache password: /root/apache-pw-change
4. /root/reset-extension-passwords (701 to 705)
5. /root/reset-conference-pins
6. /root/reset-reminders-pin
7. Make note of your PortKnocker codes: cat knock.FAQ
8. DONE!

When the install finishes, reboot your Raspberry Pi and log back in as root. Let the Automatic Update Utility bring your system up to current specs after which the *pbxstatus* display should show something like the following.



NOTE: To activate an OpenVPN client connection, create and copy a client configuration named *incrediblepbx2027.ovpn* from your OpenVPN server into the */etc* folder & reboot.

**What's Included?** Incredible PBX 2027 serves up a never before available VoIP powerhouse featuring Asterisk 20 and all FreePBX 16 GPL modules, an Apache web server, the latest MariaDB SQL server (formerly MySQL), SendMail mail server, Webmin, and most of the Incredible PBX feature set including SIP, PJSIP, SMS, voice recognition, AsteriDex, gTTS Text-to-Speech VoIP applications, Call-By-Name Dialing, News, Weather, Telephone Reminders, and hundreds of features that typically are found in commercial PBXs: Conferencing, IVRs and Email Delivery of transcribed voicemails, AutoAttendants, Voicemail Blasting, and more. We've also incorporated the Zero Trunk Configuration feature from the

LITE build which lets you sign up with one of our VoIP providers and start making and receiving calls instantly. Or you can use the new ClearlyIP trunking module included in the GUI for seamless integration of SMS messaging into FreePBX® and its User Control Panel.

**Choosing a SIP Provider.** As we mentioned, Incredible PBX 2027 comes preconfigured to support many of the major SIP providers including those that financially support Nerd Vittles and our open source projects: ClearlyIP, Skyetel, and VoIP.ms. As the old saying goes, they may not be the cheapest, but you get what you pay for. With all our providers, you only pay for minutes you use so signing up with more than one provider is a smart idea. For the full list of supported VoIP providers, visit the [Incredible PBX Wiki](#).

## Continuing Your Incredible PBX 2027 Journey

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If you entered WiFi credentials when running `raspi-config` above and your Raspberry Pi does not have a wired network connection, it should automatically enable the Wi-Fi connection on reboot. Issuing the command `ip a` will tell you the local IP addresses of `wlan0` and `eth0`. With the Raspberry Pi 3B, 4B and 400, WiFi is built into the hardware. But you still have to provide your SSID name and SSID password to make a connection to your WiFi network. If `pbxstatus` does not show a network connection, here's how to enable Wi-Fi:

If your WiFi network requires a password, insert the following into `/etc/wpa_supplicant/wpa_supplicant.conf`:

```
ctrl_interface=DIR=/var/run/wpa_supplicant GROUP=netdev
update_config=1
country=US

network={
    ssid="YourSSID"
    psk="YourSSIDpassword"
    key_mgmt=WPA-PSK
    scan_ssid=1
    priority=7
}
```

Now restart your server: *reboot*. When the reboot finishes, you now should have network connectivity.

You may also need to change the default PortKnocker setting to your wireless LAN connection:

```
sed -i 's|eth0|wlan0|' /etc/default/knockd
service knockd restart
```

Finally, if your PBX is sitting behind a NAT-based router, you'll need to redirect incoming UDP 5060-5061 and UDP 10000-20000 traffic to the private IP address of your RasPi. This is required for all of the SIP providers included in the Incredible PBX 2027 build. Otherwise, all

inbound calls will fail.

## Configuring Skyetel for Incredible PBX 2027

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If you've decided to go with Skyetel, here's the drill. Sign up for Skyetel service and take advantage of the [Nerd Vittles Free \\$10 credit and BOGO special](#). First, [complete the Prequalification Form here](#). You then will be provided a link to the Skyetel site to complete your registration. Once you have registered on the Skyetel site and your account has been activated, open a support ticket and request the \$10 credit for your account by referencing the [Nerd Vittles special offer](#). Once you are happy with the service, open another ticket after funding your account and request that Skyetel match your deposit of up to \$250. That gets you up to \$500 of half-price calling. Credit is limited to one per person/company/address/location. If you have numbers to port in, you can do it at no cost after funding your account.

Skyetel typically does not require SIP registrations to make connections to your PBX. Instead, Skyetel utilizes **Endpoint Groups** to identify which servers can communicate with the Skyetel service. An Endpoint Group consists of a Name, an IP address, a UDP or TCP port for the connection, and a numerical Priority for the group. For incoming calls destined to your PBX, DIDs are associated with an Endpoint Group to route the calls to your PBX. For outgoing calls from your PBX, a matching Endpoint Group is required to authorize outbound calls through the Skyetel network. Thus, the first step in configuring the Skyetel side for use with your PBX is to set up an Endpoint Group. Here's a typical setup for Incredible PBX 2027:

- **Name:** MyPBX
- **Priority:** 1
- **IP Address:** PBX-Public-IP-Address
- **Port:** 5061
- **Protocol:** UDP
- **Description:** 2027.incrediblepbx.com

To receive incoming PSTN calls, you'll need at least one DID. On the Skyetel site, you acquire DIDs under the **Phone Numbers** tab. You have the option of **Porting in Existing Numbers** (free for the first 60 days after you fund your account) or purchasing new ones under the **Buy Phone Numbers** menu option.

Once you have acquired one or more DIDs, navigate to the **Local Numbers** or **Toll Free Numbers** tab and specify the desired **SIP Format** and **Endpoint Group** for each DID. Add **SMS/MMS** and **E911** support, if desired. **Call Forwarding** and **Failover** are also supported. That completes the VoIP setup on the Skyetel side. System Status is always available [here](#).

## Configuring VoIP.ms for Incredible PBX 2027

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To sign up for VoIP.ms service, may we suggest you [use our signup link](#) so that Nerd Vittles gets a referral credit for your signup. Once your account is set up, you'll need to set up a SIP SubAccount and, for Authentication Type, choose Static IP Authentication and enter your Incredible PBX 2027 server's public IP address. For Transport, choose UDP. For Device Type, choose Asterisk, IP PBX, Gateway or VoIP Switch. Order a DID in their web panel, and then point the DID to the SubAccount you just created. Be sure to specify **atlanta1.voip.ms** as the POP from which to receive incoming calls. On the Incredible PBX side, simply Enable the VoIPms trunk and save your update.

## Adding a Bootable SSD to Raspberry Pi

Shown below are the two components that make up the 256GB storage solution for the Raspberry Pi. These include the M.2 SSD SATA drive and the M.2 enclosure which provides a USB connector that's compatible with your RasPi. Assembly of the components takes less than a minute as shown in the steps below:



You can order the [M.2 SSD SATA drive](#) and the [UGREEN M.2 enclosure](#) using our Amazon referral links which help support Nerd Vittles and the Incredible PBX open source project. Once you have assembled your SSD in the sleeve, log back in as root using SSH or Putty. For best performance, insert the SSD drive into one of the blue USB 3.0 ports and verify that `/dev/sda` device is shown when you issue the command: `fdisk -l`

Now proceed with the following steps to copy the image from your microSD card to the new SSD SATA drive:

```
rpi-clone -l -e sda -f sda
# answer prompts with yes and incred2027
# once the image is copied, dismount the drive when prompted
mount /dev/sda2 /mnt/clone
cd /mnt/clone/boot
cp -p -r /boot/* .
sed -i 's|sda2|mmcblk0p2|' /boot/cmdline.txt
cd /
umount /mnt/clone
halt
```

Now you're ready to restart your Raspberry Pi from the SSD SATA drive. Remove the microSD card and reboot your server.





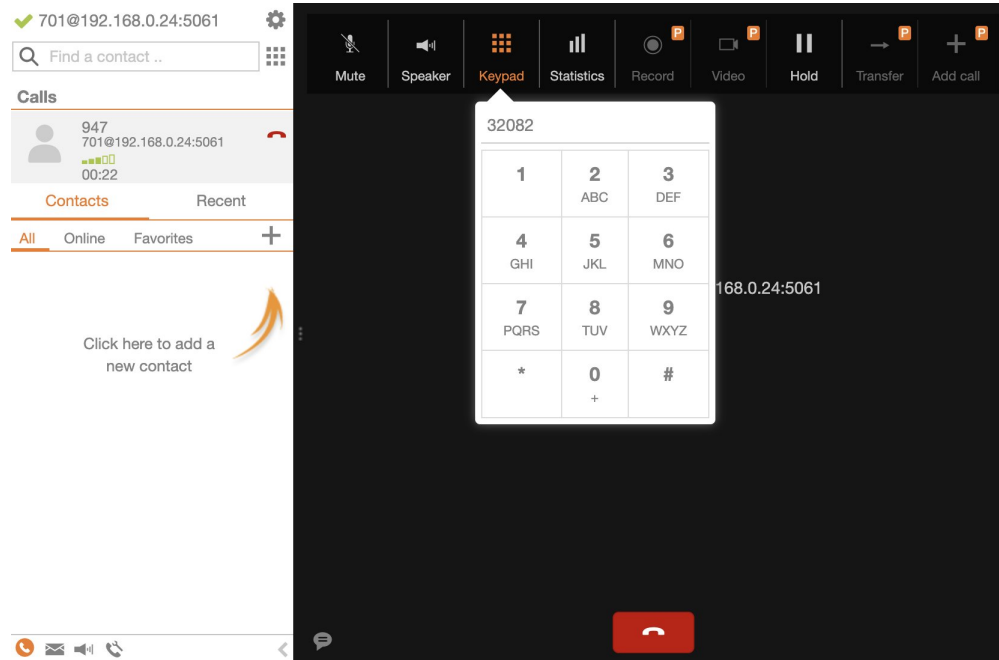
## Configuring a Softphone for Incredible PBX 2027

The screenshot shows the Zoiper configuration interface, divided into three main sections:

- Section 1 (Left):** Contains the Zoiper logo and instructions: "Fill in your hostname and select your provider from the list". It features two input fields: one for the SIP address (pre-filled with "701@192.168.0.24:5061") and one for the password (masked with dots). A "Login" button is at the bottom.
- Section 2 (Middle):** Contains instructions: "This could also be called 'Domain', 'SIP server', 'Registrar' or 'SIP Proxy'. For example 'sip.example.com' or '123.21.123.32:5060'". It has an input field for the SIP address (pre-filled with "192.168.0.24:5061") and a "Next" button at the bottom.
- Section 3 (Right):** Contains instructions: "Optional Authentication and Outbound proxy" and "Please wait, we are testing possible configurations". It has input fields for "Authentication username" and "Outbound proxy". Below these are radio button options for SIP TLS (PRO), SIP TCP (Not found), SIP UDP (Found), and IAX UDP. A "Skip" button is at the bottom.

We're in the home stretch now. You can connect virtually any kind of telephone to your new PBX. Plain Old Phones require an analog telephone adapter (ATA) which can be a separate board in your computer from a company such as Digium. This really is not an option with a Raspberry Pi. SIP phones can be connected directly so long as they have an IP address. These could be hardware devices or software devices such as the Zoiper5 softphone. We'll start with a free one today so you can begin making calls. You can find dozens of recommendations for hardware-based SIP phones both on Nerd Vittles and the VoIP-Info.org Forum when you're ready to get serious about VoIP telephony.

We recommend the Zoiper5 softphone which has a free option. [Download it from here](#) for your desktop of choice. Once installed, run it and ignore the nag screen for the commercial version. There are four screens (shown above) to navigate through to connect your softphone to your PBX. You'll need the credentials for the 701 extension on Incredible PBX. You can find them by running `/root/show-passwords` or you can decipher the password in the FreePBX GUI by navigating to *Applications -> Extensions -> 701* once you log in with your admin password which you set up above. You'll also need the IP address of your server which you can decipher by running `pbxstatus`. In the first screen shown above, fill in your 701 SIP address making sure to add the 5061 port since this is a PJSip extension. Enter your *Password* and click the **Login** button. On the second and third screens, leave the defaults and click **Next** then **Skip**. On the final screen, Zoiper5 will check for connections SIP TLS, SIP TCP, SIP UDP, and IAX UDP. You should see a green *Found* indicator for SIP UDP which means your connection was successfully established. Press **Next** and you'll have a working softphone.



Now test things out by dialing 947 for a weather report using the Zoiper5 dialpad. You'll be prompted to enter a 5-digit zip code. Note that this must be entered using the dialpad in the right window, NOT the original dialpad. You can try a few more calls to test things out:

- DEMO - Apps Demo
- 123 - Reminders
- 947 - Weather by ZIP Code
- 951 - Yahoo News
- TODAY - Today in History
- LENNY - The Telemarketer's Worst Nightmare

If you are a Mac user, another great no-frills softphone is [Telephone](#). Just download and install it from the [Mac App Store](#).

## Audio Issues with Incredible PBX 2027

If you experience one-way or no audio on some calls, add your external IP address and LAN subnet in the GUI by navigating to *Settings -> Asterisk SIP Settings*. In the *NAT Settings* section, click *Detect Network Settings*. Click *Submit* and *Apply Settings* to save your changes. Equally important, check your Router settings and verify that SIP ALG is Disabled.

## Configuring Gmail as Smart Relay Host

Most Raspberry Pi implementations will be on networks managed by companies like Comcast, Spectrum, and AT&T that block downstream mail servers (that's you) from sending email. The solution is to use Gmail or your local ISP as a smart relay host to send mail from

your server. You'll need this to deliver voicemails via email. Here's how to set it up using a Gmail account. IMPORTANT: You MUST use a Gmail App Password instead of your Gmail account password.

```
/root/enable-gmail-smarthost-for-sendmail
```

Now send yourself a test email message to make sure things are working properly:

```
echo "test" | mail -s testmessage yourname@yourmailprovider.com
```

## Almost-Free SMS Messaging Returns

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As you probably know, new Application To Person, 10 Digit Long Code (A2P 10DLC) SMS rules have gone into effect to lessen the chances of SPAM inundating the cellphone providers. As a result, SMS pricing from many VoIP providers has become prohibitively expensive. One provider that has not changed their pricing structure is VoIP.ms where SMS messages remain \$0.0075 per message. While VoIP.ms provides a web interface to send and receive SMS messages, Incredible PBX also includes a command-line interface to their service. The recommended setup is to use the VoIP.ms side to forward incoming SMS messages to either your email account and/or cellphone. Then you can send SMS messages from both the VoIP.ms web portal AND the command line interface of Incredible PBX. To get started...

**On the VoIP.ms portal**, do the following:

1. [Sign up for a VoIP.ms account](#) using our referral link<sup>1</sup>
2. Purchase a DID
3. In the Message Service DID section, enable SMS/MMS and...
4. Also provide email and/or cellphone forwarding numbers
5. In Main Menu/SOAP/RestAPI, enable API and...
6. Also create a very secure API password and...
7. Provide IP address whitelist for receiving API messages

**On your Incredible PBX platform**, login using SSH root and do the following:

1. `apt install php-soap -y`
2. `cd /root/sms-voip.ms`
3. `nano -w class.voipms.php`
4. Insert VoIP.ms username (email address) and API password
5. Save file: Ctrl-X, Y, then ENTER
6. `nano -w voipms-sms.php`
7. Insert 10-digit DID in \$SMSsender
8. Save file: Ctrl-X, Y, then ENTER

Now you're ready to try things out. Simply enter the recipient's 10-digit phone number and the desired message using the syntax below. The script should confirm transmission of the message.

```
/root/sms-voip.ms/voipms-sms.php smsnumber "sms message"
```

## Incredible PBX 2027 Administration

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We've eased the pain of administering your new PBX with a collection of scripts which you will find in the /root folder after logging in with SSH or Putty. Here's a quick summary of what each of the scripts does.

**admin-pw-change** lets you update the admin password for web browser access to the Incredible PBX GUI.

**apache-pw-change** lets you update the admin password for Apache applications such as AsteriDex and Reminders.

**add-fqdn** is used to whitelist a fully-qualified domain name in the firewall. Because Incredible PBX 2027 blocks all traffic from IP addresses that are not whitelisted, this is what you use to authorize an external user for your PBX. The advantage of an FQDN is that you can use a dynamic DNS service to automatically update the IP address associated with an FQDN so that you never lose connectivity.

**add-ip** is used to whitelist a public IP address in the firewall. See the add-fqdn explanation as to why this matters.

**del-acct** is used to remove an IP address or FQDN from the firewall's whitelist.

**iptables-restart** is the ONLY command you should ever use to restart the IPtables firewall and Fail2Ban.

**knock.FAQ** contains your PortKnocker credentials for emergency access to your server if the firewall locks you out. [Tutorial here.](#)

**reset-conference-pins** is a script that automatically and randomly resets the user and admin pins for access to the preconfigured conferencing application. Dial C-O-N-F from any registered SIP phone to connect to the conference.

**reset-extension-passwords** is a script that automatically and randomly resets ALL of the SIP passwords for extensions 701-705. Be careful using this one, or you may disable existing registered phones and cause Fail2Ban to blacklist the IP addresses of those users. *HINT:* You can place a call to the Ring Group associated with all five extensions by dialing 777.

**reset-reminders-pin** is a script that automatically and randomly resets the pin required to access the Telephone Reminders application by dialing 123. It's important to protect this application because a nefarious user could set up a reminder to call a number anywhere in the world assuming your SIP provider's account was configured to allow such calls.



**rpi-clone** is a utility that makes it easy to make a bootable image of the microSD card used to start your Raspberry Pi. You'll need a USB-to-microSD adapter to begin. Insert a backup microSD card large enough to hold all of the data on the primary microSD card (`df -h`). Insert the USB stick with the card. Identify the backup microSD card, usually `sda` (`fdisk -l`). Format the backup microSD card: `mkfs.vfat /dev/sda`. Or reformat: `mkfs.vfat /dev/sda1`. Then issue the following command to clone the main microSD card: **rpi-clone -f sda**. [Tutorial here](#).

**show-feature-codes** is a cheat sheet for all of the feature codes which can be dialed from any registered SIP phone. It documents how powerful a platform Incredible PBX 2027 actually is. A similar listing is available in the GUI at *Admin -> Feature Codes*.

**show-passwords** is a script that displays ALL of the passwords associated with Incredible PBX 2027. This includes SIP extension passwords, voicemail pins, conference pins, telephone reminders pin, and your Anveo Direct outbound calling pin (if configured). Note that voicemail pins are configured by the user of a SIP extension the first time the user accesses the voicemail system by dialing \*97.

**timezone-setup** lets you reconfigure the correct time zone for your server.

**purge-cdr-cel-records** cleans out all existing entries in both the CDR and CEL tables of the Asterisk CDR database.

**sig-fix** disables module signature checking in FreePBX. It is automatically disabled upon installation.

**update-IncrediblePBX** is the Automatic Update Utility which checks for server updates from incrediblepbx.com every time you log into your server as root using SSH or Putty. Do NOT disable it as it is used to load important fixes and security updates when necessary. We recommend logging into your server at least once a week.

**upgrade-asterisk20** is self-explanatory and can be used to upgrade to the latest release of Asterisk 20.

**pbxstatus** (shown above) displays status of all major components of Incredible PBX 2027.

**Forwarding Calls to Your Cellphone.** Keep in mind that inbound calls to your DIDs automatically ring all five SIP extensions, 701-705. The easiest way to also ring your cellphone is to set one of these five extensions to forward incoming calls to your cellphone. You must have a working trunk for calls to your cellphone to complete successfully. After logging into your PBX as root, issue the following command to forward calls from extension 705 to your cellphone: `asterisk -rx "database put CF 705 6781234567"` where 6781234567 is your cellphone number.

To remove call forwarding: `asterisk -rx "database del CF 705"`

## Keeping FreePBX 16 Modules Current

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We strongly recommend that you periodically update all of your FreePBX modules to eliminate bugs and to reduce security vulnerabilities. Make a backup image with **rpi-clone** first! From the Linux CLI, log into your server as root and issue the following commands:

```
rm -f /tmp/*
fwconsole ma upgradeall
fwconsole reload
/root/sig-fix
systemctl restart apache2
/root/sig-fix
```

## Resolving an Expired Certificate Alert

---

1. Navigate to Admin -> Certificate Management in the FreePBX GUI
2. Click the Trashcan to delete the Self-Signed Certificate
3. Click New Certificate -> Generate Self-Signed Certificate
4. In the Description field, type: Default
5. Click Generate Certificate button



## Introducing Adminer: The Ultimate MySQL Editor

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If you're as sick of phpMyAdmin as we are, you'll be happy to know there's a new kid on the block, Adminer. Better yet, the install procedure is a painless, one-minute exercise. The setup procedure for Incredible PBX 2027 is documented [here](#). Once installed, you can connect to Adminer at `http://server-ip-address/adminer`. You should be prompted for your Apache admin credentials which were configured when you first installed Incredible PBX. Next, enter your MySQL root credentials and Adminer will display in all its glory. DO NOT OPEN PORT 80 FOR PUBLIC ACCESS, OR YOUR ENTIRE PBX WILL BE AT A HACKER'S MERCY!

### Select database

[Create database](#)   [Privileges](#)   [Process list](#)   [Variables](#)   [Status](#)

MySQL version: **5.5.5-10.6.12-MariaDB-0ubuntu0.22.04.1** through PHP extension **MySQLi**

Logged as: **root@localhost**

<input type="checkbox"/>	Database - Refresh	Collation	Tables	Size - Compute
<input type="checkbox"/>	<b>asteridex</b>	latin1_swedish_ci	?	?
<input type="checkbox"/>	<b>asterisk</b>	utf8mb4_unicode_ci	?	?
<input type="checkbox"/>	<b>asteriskcdrdb</b>	utf8mb4_unicode_ci	?	?
<input type="checkbox"/>	<b>avantfax</b>	latin1_swedish_ci	?	?
<input type="checkbox"/>	<b>information_schema</b>	utf8mb3_general_ci	?	?
<input type="checkbox"/>	<b>mysql</b>	utf8mb4_general_ci	?	?
<input type="checkbox"/>	<b>performance_schema</b>	utf8mb3_general_ci	?	?
<input type="checkbox"/>	<b>sys</b>	utf8mb3_general_ci	?	?
<input type="checkbox"/>	<b>timeclock</b>	utf8mb4_general_ci	?	?
<input type="checkbox"/>	<b>TravMan4</b>	latin1_swedish_ci	?	?

## What About Fax Support?

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Incredible PBX 2027 no longer includes fax support out of the box. To add it, [follow this tutorial](#).

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