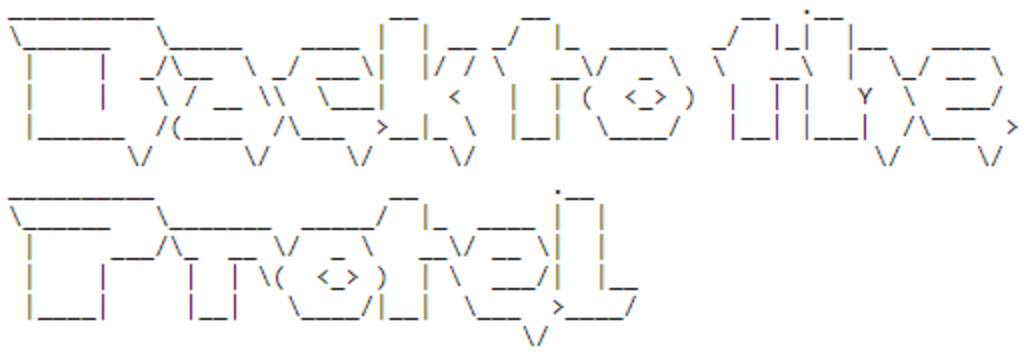


This story starts like most stories where a !so1337 person like me has acquired a payphone like no other. A Protel model 7000, in a HAF Western Electric housing, with extra special graffiti-etched chrome plating and a gummy handset. In their prime, these phones could serve as a means to call your grandma to come get you at the mall, make an anonymous call to an ex then hang up, or could be used to facilitate a simple crack deal. Nowadays, in the 21st century, the existence of these phones is few and far in between and the payphones that do exist are deemed to be ancient and abandoned due to the ever-evolving cellphone technology.

This is a tutorial of how to assess and transform your Protel 7000 into a working unit so that you can make and answer phone calls without the need of modern coinage or if you'd like to pay yourself that's fine too. So, we begin our journey of going Back to the Protel.

Step 1: External inspection – This thing is heavy…

Check that all the following components exist:

1. A handset - The thing you put up to your ear and listen to and talk through, hopefully with a cable still attached.
2. A "hookswitch/cradle" - Where the handset is picked up from to make a call and placed in when you complete your call.
3. A 12-button keypad - The thing you dial a phone number with and later to be discussed - used for programming at the phone.
4. "Vandal-proof" locks (you may or may not have keys or locks for that matter)
    1. For the housing locks, if present – There should be 2 which are commonly Medeco brand locks. There is one located on the upper left-hand side on the upper housing and the other is located on the lower right-hand side on the lower housing. If you did not receive any keys with your phone, then you will either need to pick or drill the locks. The former will require extra patience and the latter will require a drill and probably more than one drill bit. I was lucky enough to have locks and actually receive keys with my payphone. More info about the locks can be found here (and probably other places on the web) - https://products.northeastlock.com/item/medeco-locks/payphone-mechanical/item-1401
    2. In order to remove the upper housing and lower vault door you **WILL** need a "T-Key" or "T-wrench" which is used in conjunction with either the upper or lower lock and keys. You can fab one or just pick one up online from places such as eBay or Amazon for about $10.
5. A coin slot – Typically located on the front toward the top of the phone.
6. A coin release lever – Typically located to the left of the coin slot.
7. A coin bucket – Typically located on the front, lower right of the phone.
8. A volume button – If installed, this is typically located on the top left of front of the phone. Used to change the handset volume.

Step 2: Internal Inspection –

Separating the Upper & Lower Housing (*ref. payphone.com*)

1. Insert the upper housing key into the upper housing lock (located on the right side of the phone) & turn it 1/8 turn counterclockwise.
2. Insert the T-wrench key into the T- wrench insert (located approx. 6 inches above the upper housing lock) & turn it 1/8 turn clockwise, until you hear the phone 'snap' open.
3. Slide the upper housing away from the lower housing (make sure the upper housing cable is disconnected from the circuit board.)

Once inside the upper housing you should see many components inside such as:

9. The Protel circuit board chassis which can either be plastic or steel. This houses the magical Protel circuit board.
10. To the right, you should see the coin mechanism assembly which takes up a vertical 1/3 of the right side of the upper housing.
11. Another component is the 48V relay which is normally located at the base of the upper housing. This controls whether the coin hopper collects or refunds coins.
12. You may see a two-row 5-pair termination block at the base which is used to ground the Protel board and can be used to bridge various components.
13. There are a few items that are important to mention (these may or may not be present depending on what you received):
    1. The Upper Housing Interconnect ribbon cable for connection from the Protel board to the dial/hookswitch assembly – **Required**
    2. The Electronic Coin Validator interconnect ribbon cable - **Required**
    3. The 3-wire Escrow Relay plug (green, red, & white wires) - **Required**
    4. The modular RJ11 Telephone Line connector and possibly an RJ11 pigtail extension. – **Pigtail not required**, but the port is where you will eventually need to connect your phone line.
    5. The Grounding Terminal (commonly green) and possibly a wire leading down to the previously mentioned terminal block. **– Required**
    6. The Ni-Cad Battery pos/neg Connection and possibly a Ni-Cad battery still in the battery compartment (behind the (if present) plastic cover) – **Required ****Note - If a battery does exist it is probably dead but worth checking with a multimeter.
        - **Option 1** – If the battery is dead or not present you can purchase one online from eBay, payphone.com or various other places.
        - **Option 2** – You can purchase a charger online. Amazon sells USB chargers for relatively cheap (Blomiky), or you can opt for a more expensive charger. **Note:** Back in the day when phones were connected to the phone system the batteries were being charged while the phone was not in use. I haven't tested this yet, so I am unsure if the batteries are being charged when the phone is connected to a VoIP adapter.
        - **Option 3 (recommended)** – Purchase 4 AA rechargeable batteries (e.g., Eneloop, Energizer, etc.) and a battery holder with pos/neg leads and an optional switch if you so desire. The switch is not required but if you want to preserve the charge you can switch off the power without having to pull the batteries. To be honest, I have not had to recharge these batteries in the past year, even with all of the activity performed on the phone so this is a preference.

- **Option 3a** – I have destroyed more OEM Ni-Cad battery connectors than I'd like to admit when trying to disconnect the battery from the board. If you're struggling with the fragile OEM battery connector you can snip the OEM connector off then use two female breadboard jumper connectors, strip and connect to the corresponding battery wires. Then, place them side to side and use some heat shrink tubing to marry the two connectors together.

Step 3: Removing the Protel circuit board chassis (*ref. payphone.com*)

1. Disconnect the 25-pin dial assembly connector from the point labeled "UPPER HOUSING" on the chassis assembly.
2. Disconnect the escrow relay from the point labeled "RELAY" on the chassis assembly.
3. Disconnect the electronic coin scanner (if installed) from the point labeled "ELECTRONIC COIN VALIDATOR" on the chassis assembly.
4. Disconnect the trigger switch (if mechanical coin mechanism is installed) from the point labeled "TRIGGER SWITCH" on the chassis assembly.
5. Disconnect the RJ11 connector from the point labeled "TELEPHONE LINE" on the chassis.
6. Disconnect the ground wire from the quick disconnect terminal on the chassis .
7. Disconnect the coin box alarm connector (if installed).
8. Loosen the captive nut at the bottom of the chassis assembly.
9. Remove the chassis assembly from the lower housing by lifting the board **upward** and then **pulling out** on the lower edge of the board.

Step 4: Removing the Protel circuit board from the chassis

1. There is a retention tab at the bottom of the chassis that you can push to open the chassis to reveal the Protel circuit board.
2. To remove the circuit board from the chassis there are a few more retention tabs, one on the bottom and one tucked away at the middle of the board. The latter will require a small tool like a mini screwdriver (gently push to release it).
3. Once the board is removed from the chassis, you will notice a few components that are important to highlight.
    a. **The Programming Button.** This is (typically) a red circular button that is used to program the phone. More on this later. **Optional:** I was tired of having to remove the upper housing every time I wanted to use the programming function (i.e., programming a free number on the fly) so I desoldered the button from the board and soldered 4 separate wires to each of the 4 pads where the button was attached to the Protel board. I stripped the opposing ends of each wire and attached the wires together to make two pairs. I then removed the volume wire connections from the hookswitch assembly and connected the two programming button wire pairs to the two volume button wires. This allowed me to invoke the programming functionality via the volume button with the upper housing secured. I am no electronics expert, but I suspect that when pressing the button, it is performing some sort of simple disrupt in which the board recognizes this as a signal to set the programming mode. I am sure someone besides the Protel engineers knows what is actually happening here. And others who know how to bypass this completely 😊
    b. Handset Transmitter Level Toggle Switch. This switch allows adjustment of transmit level for the attached handset. This has a High, Medium, or Low setting.

i. Up = Low transmit level
ii. Center = High Transmit level
iii. Down = Medium Transmit level

c. On the back of the Protel board, you may or may not see a small battery seated in a battery cradle. The model I have commonly seen on a dead phone is the **Saft LS-14250 1/2 AA 3.6V Lithium**. This battery is most likely dead but check it to be sure. If it is dead, Amazon actually sells these in pairs as batteries for Mac computers. I am not a Mac user but those of you that are, may recognize these and possibly have an extra. This battery **is required** in order to preserve the programming settings of the board.
d. Electronic Coin Scanner (ECS II) board. If present, this is installed at the top of the board and attached with two 15-pin headers. This can be removed and replaced if needed. Per the Protel documentation - This provides electronic coin identification and validation functions. The electronic coin scanner recognizes all U.S. and Canadian coins. – **Required if you want to use coins** but if you want to eliminate the usage of coins this is not required. **Note -** I haven't tested the functionality of programming the phone without this component so even if you decide not to use coins it may still be required.
e. 1200 Baud DPSK Modem – If present, this can be found at the middle of the board attached by two 10-pin headers that can also be removed and replaced. Per the Protel documentation - This is a built-in modem for remote computer polling and programming. Specs - 300 bps FSK half-duplex or 1200 bps FSK half-duplex when communicating with a Protel UPMS 1200 modem. – **Required for communication between the PC-connected modem and the payphone.**

Step 5: Putting it all back together.

Reinstall the Protel board into the chassis

1. Re/install any components that you previously removed (e.g., the PCB battery, the ECS II, Modem)
2. Starting from the top, seat the two holes of the board first then lay the board down to seat into the bottom retainer clip. If the center retainer did not seat when laying the board down, then gently push on the center of the board until you hear it engage.

Install the chassis assembly.

1. Connect the Ni-Cad battery connector to the point labeled "BATTERY" on the chassis. **(Or other, see previous Option 3)**
2. Install the chassis assembly into the lower housing by guiding the tab at the top rear of the chassis assembly into the slot located at the top left corner inside the phone's lower housing.
3. Then, slide the chassis assembly upward until the captive nut at the bottom left of the chassis assembly is aligned with the mounting stud. Tighten the captive nut.
4. Connect the ground wire attached to the middle terminal of the terminal block to the ground quick disconnect terminal on the chassis.
5. Connect the RJ11 plug from the terminal block to the point labeled "TELEPHONE LINE" on the chassis assembly.
6. Connect the electronic coin validator connector (if installed) to the point labeled "ELECTRONIC COIN VALIDATOR" on the chassis assembly.
7. Connect the trigger switch connector (if mechanical coin mechanism is installed) to the point labeled "TRIGGER SWITCH" on the chassis assembly.
8. Connect the coin relay connector to the point labeled "RELAY" on the chassis assembly. Ensure that the green wire is toward the left of the connector when plugging it into the board.
9. Connect the vault door alarm connector (if installed). **Not required if you do not wish to use the functionality.**
10. Rest the upper housing of the phone on the ledge of the lower housing and then connect the dial assembly connector to the 25-pin connector labeled "UPPER HOUSING" on the chassis assembly.
11. If you haven't implemented the volume button hack **do not** secure the upper and lower housings of the phone together - yet. You will still need access to the programming button to initialize the phone. Depending on the length of the cables from the upper housing to the inside of the phone you may be able to rest the upper housing to the side of the lower housing. If you're able to set the upper housing aside without putting the cables at risk, you are ready to follow the procedure below to initialize the phone.
    a. Enter the Program Mode
        i. Locate the program button access hole on the chassis assembly just under the terminal block connector **or relocated version via the volume button**.
        ii. With the phone on hook, press and hold down the programming button.
        iii. While still pressing the button, lift the handset off hook. Listen in the receiver for a single beep. When the "beep" is heard, release the button.
        iv. In the interim, input an arbitrary 10-digit telephone number of the paystation using the format 01 XXX XXX XXXX *(star). A beep will be heard in the receiver when the number is accepted. Again, this can be an arbitrary 10-digit phone

number but keep this number in mind since you will need this for programming the phone via ExpressNet. More on this later.

v. Input the phone number of the remote computer modem, which can be arbitrary as well. Similar to the Site number, this will also need to be entered in the Modem Setup of the ExpressNet software program.

Step 6: Making them talk

With ~~a little~~ a lot of trial and error I found that there are a few basics things that are required in order to program a payphone via a PC: **A PC, PC programming software, a modem, and a working phone line.**

1. A PC program to interact with the modem –
    a. There were two programs that were commonly referenced during my research: ExpressNet and Panorama. ExpressNet (a DOS-based program) developed by Protel appeared to be the most commonly used back in the day and also by present day hobbyists, so I decided to go with this option. I scoured the internet but could not find a copy until I came across a bootable version of ExpressNet (v1.55). Thanks internet.

2. A PC to run ExpressNet -
    a. While I had a bootable version of ExpressNet, none of my modern PCs had a serial port for the modem so while I could interact with the menu and get to know ExpressNet I still could not sync with a modem. I tried a USB-to-serial adapter, but this did not work. Probably PEBKAC.
    b. I was then able to extract the files from the bootable image and attempted to run ExpressNet on my WIN 10 PC (in Compatibility Mode) but WIN 10 laughed at me and asked if I belonged to AARP.
    c. I then attempted to run a Windows 98 VM in VirtualBox and was able to install ExpressNet. However, even after tweaking some of the serial port settings I still could not get my modem to sync with ExpressNet. I later found that this **may** have been due to "timing" issues within the hypervisor. Moving on.
    d. I then attempted to install ExpressNet within DOSBox on my WIN10 PC and was successful. I used my USB-to-serial adapter but again was unsuccessful with syncing the modem. I determined that it was easier to get a used Windows 95/98 PC with a real DB9 serial port and do it the old-fashioned way.
    e. I was able to get my hands on a used, cheap, Dell Inspiron laptop. I had an old stash of 3.5-inch floppy disks to install ExpressNet from. I then hooked up a DB25 (modem side) > DB9 (PC side) serial cable to the modem. Success! But this ended up being a short-term solution because when I unplugged the power supply while the PC was running it would shut down. Missed this in the eBay as-is mentions 😊
    f. I finally found a refurbished Wyse V90LE which was being sold as a retro gaming rig on eBay. This had a dual-boot option for either booting into WIN XP or WIN 98. It had preinstalled USB drivers, a real serial port, and a DVI-to-HDMI adapter port for an external monitor. It also had a pretty small form factor which allowed for easy transport. Oh, there was an ethernet port too, and, no I did not connect this to the internet but the ethernet port did come in handy when connecting to the Obi adapter's web interface. More on that later.

3. The modem –
    a. I planned on using an old Zoom V.90 I had sitting in a box somewhere, but I found a couple of references online stating that the Protel phones would not communicate with non-Protel modems. This did not make sense to me since I saw an option within ExpressNet to configure a "non-Protel modem". Plus,

other people were able to make non-Protel modems work successfully. Still, I spent the next few days trying to make it work but to no avail, so I finally broke down and procured a used Protel UPMS1200 modem from eBay, for the nostalgias of course.

4. A working phone line –

   I did not have any sort of dedicated phone service in my home, so I needed to find an alternative. Remember, I wanted to use the phone as real home phone at some point, so this was a requirement. After performing some research, I determined that my best bet would be to procure a used VoIP Analog Telephone Adapter (ATA). I found a number of ATA models that could work such as a Cisco SPA, a magicJack (yep, that is still a thing), or an Obi202. I am sure there are many other VoIP options, but these seemed to be the best options to choose from at the time for what I was trying to accomplish.

   I initially started with the magicJack Home because at the time the device was the cheapest out of the three, plus they were throwing in a free 1-year subscription with the purchase of a new device. When I received it, I plugged it in and configured it with a real phone number. I then connected an RJ11 telephone cable from the magicJack to the Protel RJ11 interface. I picked up the handset and NO DIAL TONE! I tested another analog phone I had lying around and confirmed that the magicJack worked fine. It was the Protel that was not functioning.

   I continued researching what the common issues were in this case and found that the phone had to first be baselined with “new” firmware. Also, if you recall, the batteries are typically dead, and the purpose of the NiCad battery is to power your phone. The 3.6V Lithium battery on the Protel circuit board is to preserve the firmware settings. After replacing both batteries, I was still unsure how I was going to get a good firmware file to the phone without the ability for ExpressNet to communicate with it.

   Solution – (Feb 2020) I found a post on a public forum from a guy who runs his own payphone company. He had an active ExpressNet server used to communicate with his phones in circulation. At first, I was a bit surprised that someone would have something like this in 2020 but payphones do still exist and rightfully so! He provided a fixed payphone number along with an ExpressNet reporting phone number so that anyone could baseline their phone. He stated that it probably wouldn’t work using VoIP, but it did. SUCCESS!

   (MAR 2021) - This number is still active today and can be used to baseline your phone. Out of respect, I will not provide the reporting number here, but I will say that this was posted on a public forum that still exists.

   Now that I had a working phone line, I decided to make/take a couple of phone calls from/to my Protel and it worked.

   Here is the general procedure I used to interact with the payphone server (which is also documented in the Protel manual):

i. Ensure that the handset is on-hook. Press the program button (on main board) and while holding the button down come off-hook wait for a beep in the handset. One beep. Release the program button.
ii. Enter the payphone's number at this point on the keypad. **Note:** Do not dial (1) before entering the number. Only the area code, exchange, and number. Dial 00 XXX XXX XXXX *(star) and you will hear single beep.
iii. Once you hear the beep, immediately dial 25 X XXX XXX XXX then * (star) on the keypad, you should get another single beep. **Note:** More than one beep is a failure therefore if you get more than one beep you will need to repeat this number.
iv. Now dial *#3 on the keypad. The phone should repeat its phone number back to you then it will call/connect to the reporting PC and ExpressNet will give you a download. If the connection is successful, you will hear a sharp beep and subsequent data bursts in the receiver.
v. Place the handset on-hook. **Note:** The download could take several minutes. If you go off-hook and still hear data just hang up again and wait.
vi. **Note 1:** You do not need to be in programming mode for this next step. Once you have a dial tone again, on the phone keypad, dial *#6 and it should give you the date and time of your download. If it does not, the download was not complete, or it failed. **Note 2:** Things that will cause a failure are dead batteries (agreed), batteries that are not connected, wrong firmware, wrong phone number, bad board, and/or bad keypad.

Moving on. Now I had working phone that I could make and take phone calls via the magicJack. But I still wanted to interact with the phone to program it myself, maybe change some settings, like turning off the annoying default electronic ringer. Yes, I am aware that I can program the phone from the keypad itself for things such as a free phone number or special rate bands but this a bit of a tedious process. In short, there are a number of things you can do from the keypad itself, but I wanted more options. Off I go.

I read that in order to program the phone I would need two phone lines. Maybe you were lucky enough to have two phone lines when you were a kid. I was not, so this was unfathomable to me at first. How could I get another phone line? Maybe I could purchase another magicJack? "Jeez, more money being thrown at this effing phone thing?", said wife. So, I opted to purchase an Obi202 ATA 😊. I found that the Obi202 is the last VoIP device that Google Voice will work with where you can get a free phone number. I picked one up online and configured it with the free Google number I provisioned. Making and taking phone calls were just as easy as with the magicJack.

However… Later on, after a lot of tinkering, my firmware settings ended up getting erased. At the time I had the Obi adapter connected as my outbound phone line and tried to use this to connect to the initialization service and it didn't work. I tried several times actually but to no avail. This may have been because the Google Voice service was free whereas the magicJack service was paid and assumed to therefore provide better quality. I connected my magicJack and everything worked as before. I haven't tried using the Google service with my Obi since but I'm not ruling it out.

In my experience, the Obi202 was and still is one of the most complex devices because there are so many different settings available to configure. More on this later.

At this point, I had a working PC with ExpressNet, a working OEM modem that I could sync with, a working payphone, and two working phone lines. I still needed to configure the modem settings in ExpressNet with the new Google Voice number I provisioned for the Obi202 as the Reporting Number. I also had to configure the payphone with an arbitrary phone number and reset the Reporting Number which was to be my Google Voice number. I used the previous procedure for programming the phone. **Note:** I initially set an arbitrary number in the Protel because the number to the magicJack was what my Obi device would talk to over the internet. There are a few other settings that had to be configured within ExpressNet in order to start the programming process. Other than configuring the modem with the new Reporting Number other configuration settings were to provision a new Site Record, Costing Record and Options/Registers Record.

The procedure for configuring the Protel modem with the new Reporting Number goes something like this:

1. Within the Main Menu of ExpressNet, select option 5 - Modems Menu.
2. Choose option 4 – Modem Setup
3. You will be prompted with an option to choose the modem port which is most likely option 1 – COM 1, this should already be highlighted so press Enter
4. Within the first field – "Phone Nr." you would type in the phone number that is associated with the modem. Again, in my case, I used the Google Voice number I provisioned.
5. Once this is done, press F2 to save.
6. Press ESC twice to go back to the Main Menu.

*The procedures for setting up the Costing, Site and Options/Registers records can be found in the following online reference.

Once all was said and done, I was ready to start the remote programming process. I connected the Protel to my magicJack and my Protel modem to the Obi202 Phone 1 port. I decided to start from the phone to see if I could communicate with my PC. There were two options I could chose to execute: (ref. Protel documentation)

1. (Not in programming mode) *#2 - General Reporting Status: (Sets Status Check Flag (ST)) This reporting command is entered by taking the handset off hook and then pressing the following keys on the keypad: *#2. This causes the phone to call in to the remote computer and report the details of the calls that have been made on the phone since the last time the phone reported this information to the computer. Information such as destination numbers dialed, call charges, etc., will be sent to the computer for record keeping purposes. The phone will also verify with the computer that call rates and operating parameters (rates/options) of the phone are correct and up to date. If there is a discrepancy between the rates/options information in the computer and the rates/options information stored in the phone, the computer will automatically send updated rates/options information to the phone.
2. (While in programming mode) *#3 - Program Update: (Generally Called Phone Repair (PR)) (This command should only be used when performing a new installation, when replacing the firmware on the chassis assembly or when replacing the chassis assembly.) This command will only be accepted if it is entered while the phone is in the program mode. This command (*#3)

causes the phone to sound (in the handset) the ANI number of the phone, and then cause the phone to call in to the remote computer and request a complete download of rates/options information. If necessary, the phone will send general call status information to the computer before accepting a rates/options download.

Both options caused my modem to answer and start firing stuff off to the payphone, but I received a "Time-out on carrier detect" error in the Communications Errors menu (option 5 in the Modems Menu). Looking up the specific error it is caused by a time-out when the modem does not receive any data in a pre-determined timeframe. But where was this pre-determined timer setting and how can I change it to give it more time? Within the Modem Setup menu, in the space where the settings of the modem are recorded there is a value for "Init" which I'm pretty sure is short for Initialization. This is where the AT commands are set in order to change the parameters for how the modem will operate. Here is the breakdown for each of the blocks of AT commands in the initialization string:

Protel Default Init String (ExpressNet v1.44) – (ref. found here)

AT-M1 | L0 | E0 | Q0| V1 | X3| S10=255 | S0=0 | S9=2 | S7=100 | &D2

- AT - Modem Attention, there are some specific commands that follow, see below
- M1 - Speaker Control 1 = Speaker is on during call establishment, but off when receiving carrier.
- L0 - Sets internal speaker = 0 = Low volume
- E0 - Command echo = 0 = Disables command echo.
- Q0 - Quiet Results Codes Control 0=Enables result codes to the DTE.
- V1 - Displays result codes long form (test). 1=send word responses.
- X3 - EXtended Result Codes 3 = Enables monitoring of busy tones.
- S10=255 - Carrier Loss Disconnect Time = 255 = the modem functions as if a carrier is always present.
- S0=0 - Rings to Auto answer - 0 = Disables auto-answer mode.
- S9=2 - Carrier Detect Response Time = 2 = 2/10ths of a sec
- S7=100 - Wait Time For Carrier After Dial, modem will wait for carrier before hanging up = 100 seconds
- &D2 - Controls DTR - 2 = Hang up, turn off auto answer, and return to command mode after losing DTR

ExpressNet has an option where you can watch modem activity such as a phone attempting to communicate with the modem as well as when the modem attempts to connect with the phone. To get here you use the following procedure:

1. Within the Main Menu of ExpressNet, select option 5 - Modems Menu.
2. Choose option 1 – View Modem Status, press enter
3. This interface yields high level information such as:
    a. Site Nr. - The telephone number of the phone site that the computer is communicating with.
    b. Column 1 - Type -
        i. M = Manual poll in progress.
        ii. 0 = Automatic outgoing poll in progress.
        iii. I = Incoming call in-progress.
    c. Column 2 –
        i. 1 = First outgoing poll attempt.
        ii. 2 = Second outgoing poll attempt.

d. Setup - Flashing square indicates that the modem is in the process of being set up for communication with a phone (resetting modem, etc.).
    i. TXD - Flashing square indicates that the modem is transmitting information to the phone.
    ii. RXD - Flashing square indicates that the modem is receiving information from the phone.

4. Displaying detailed information on modem port activity
    a. From the "Modem Status" screen use the arrow keys to highlight the modem port that you want to monitor and then press [ENTER.]
        i. Group ..... This is the group number assigned to the site account.
        ii. Site Nr ..... This is the site account ANI number.
        iii. Curr. Vers ..... This is the version number of the program that was operating in the phone the last time that the computer communicated with the phone.
            1. An "E'' at the end of the version number indicates that the phone is operating from a program stored in E2ROM.
            2. An "R" at the end of the version number indicates that the phone is operating from a program stored in ROM.
        iv. Firm Vers ..... This is the version of the program stored in EPROM in the phone.
        v. Old PhChksum ..... This is the checksum number of the program that was operating in the phone the last time that the phone and the computer communicated.
        vi. EEROM File ..... This is the name of the E2ROM file specified in the site record.
        vii. Phone Nr ..... Payphone' s telephone number as reported from the phone to the computer.
        viii. Software Ver ..... Version number of the software operating in the phone, as reported from the phone to the computer.
        ix. Phone Checksum .... This is the checksum of the program that is operating in the phone, as reported from the phone to the computer.
        x. Cash box vol…… This field reflects the volume full of the cash box, as reported from the phone.
        xi. Date ..... Date that the computer and the phone communicated with each other.
        xii. Time ..... Time that the computer and the phone began communication.
        xiii. Flags ..... This field displays any flags that were reported from the phone to the computer.

Pressing F8 within this menu will take you to a real-time communication monitor where if successful you will see blocks of (I'll call them unrecognizable) character sets steadily streaming down the monitor interface. I used this option pretty regularly to watch inbound and outbound activity. Think of it as a packet capture program but without a manual explaining what the characters mean. I'm sure there is some reference out there explaining why these characters are displayed this way, but I couldn't find it. I even watched every Matrix movie, and still don't know. I determined that if there was a steady stream of characters for a long period of time then the communication was going to be successful. That, and the ExpressNet program would eventually provide the status of the communication - success or failure.

I then decided to attempt to communicate with the phone from the PC. The modem was able to dial my phone because it rang but I could not hear anything once I picked up the phone handset. I later found that trying to program a payphone with a VoIP adapter over the internet was wishful thinking. There were some forum posts alluding to the need for changing the baud rate, from 1200 to 300 in both the modem as well as on the phone. Within ExpressNet, this can be done in the Modem Setup menu by simply changing the number from 1200 to 300. On the phone, this requires a simple procedure where you go into programming mode and dial 1860 *, wait for the beep to successfully verify completion. 1861 * is to change back to 1200 for future reference. Performing this entire procedure did not work so I was stuck. That is until I started looking through the ObiTalk forums where I learned what all those configuration settings were and how they could be applied in my case.

The Obi202.

The Obi202 device has two physical line ports for the ability to connect two separate phones or in my case a phone and a modem. I believed it was possible to remove the internet factor and do everything locally. The Obi device has a local web management interface option that does not require the internet to configure the device. By default, web access to the Internet (WAN) IP address of the OBi202 is disabled. To enable this feature, you must use another analog phone and follow the below procedure.

- Dial ***0 from the phone connected to the OBi202
- Enter 30#
- Press 1 to Enter a New Value
- Press 1# to Enable
- Press 1 to Save

I was in. Using the local web interface vs. the internet was a much quicker process, mainly because my changes are not going to outer space and back.

I then found that while PHONE 1 and PHONE 2 ports can function independently of each other, the OBi202 also offers some collaborative features to let the two phone ports talk to each other like a mini phone system. This might be interesting…

With the factory default digit map and call routing rules, you can dial a single “#” digit to call from one phone port to ring the other phone port. Depending on the current state of the called phone, one of the following things can happen:

1. If the called phone is idle (on-hook), it will ring normally with a special Caller-ID that indicates the call is from the other PHONE Port.

2. If the called phone is already on a call, the calling phone will barge in to join the call.

3. If the called phone is on-hook with a call on-hold, the calling phone will pick up and resume that call.

4. If the called phone is ringing, the calling phone will pick up and answer that call.

5. For all other scenarios, the calling phone will hear busy tone.

Enter the Obi DigitMaps. WTF did I get myself into…

Per the Obi RTFM, "DigitMaps are structured as a series of rules that are read from left to right. The OBi will apply the first rule that matches the format of the dialed number, so it is important you get your rule order correct. Each digit map is composed of one or more rules surrounded by round brackets ( ) these brackets MUST NOT be omitted."

Here is what a default DigitMap looks like for the Phone physical interfaces –

([1-9]x?*(Mpli)|[1-9]S9|[1-9][0-9]S9|911|**0|***|#|##|**70(Mli)|**8(Mbt)|**81(Mbt)|**82(Mbt2)|**1(Msp1)|**2(Msp2)|**3(Msp3)|**4(Msp4)|**9(Mpp)|(Mpli))

And for the OutboundRoute Digitmap -
{([1-9]x?*(Mpli)):pp},{(<##:>):li},{(<#:>):ph2},{(<**70:>(Mli)):li},{(<**82:>(Mbt2)):bt2},{(<**81:>(Mbt)):bt},{(<**8:>(Mbt)):bt},{**0:aa},{***:aa2},{(<**1:>(Msp1)):sp1},{(<**2:>(Msp2)):sp2},{(<**3:>(Msp3)):sp3},{(<**4:>(Msp4)):sp4},{(<**9:>(Mpp)):pp},{(Mpli):pli}

As you can see these are quite complex and assumed that if you remove or change a value then the call wouldn't go through.

Let's recap on what we're trying to accomplish –

1. I want to be able to call the modem to tell the phone to either check in or actually download new firmware.
2. I want to then be able to execute a manual poll from ExpressNet so that I can upload a new file or make any changes to my Protel.

I didn't want to "really" dive down the DigitMap rabbit hole, so I decided to just use the Collaboration Function mentioned above and configure what Obi identifies as a Hotline. My goal was to do this in both directions, to at least get the Obi to facilitate comms between the Protel and modem. Here is what I did:

1. Connect the Protel to the Obi "PHONE 2" RJ11 port and the modem to the "PHONE 1" RJ11 port.
2. In the Obi Web Interface > Physical Interfaces field for both the "PHONE 1" and "PHONE 2" line ports. In Physical Interfaces, "PHONE 1" and "PHONE 2" line ports, I removed the default DigitMap values and replaced with exactly **(<#>)**.
3. Saved the settings.
4. Picked up the Protel handset and it automatically called my modem. But how was I going to trigger an off-hook action in ExpressNet for the modem to call the Protel, let alone trigger the software to talk to the Protel?
5. Interim Solution to at least test comms – Within ExpressNet, the Modem Setup menu has an option to Change/Test Modem. You tab to the field then press the spacebar and go into test mode. You have two options here to change a modem **OR** test it. Pressing F7 will bring up the interface with a field called Test Command. I was able to enter in "ATDT#" then press F9 to invoke the test. "ATDT#" =
    a. AT-Get the modem's ATtention
    b. D-Dial
    c. T-Touch-Tone
    d. #-Call this number

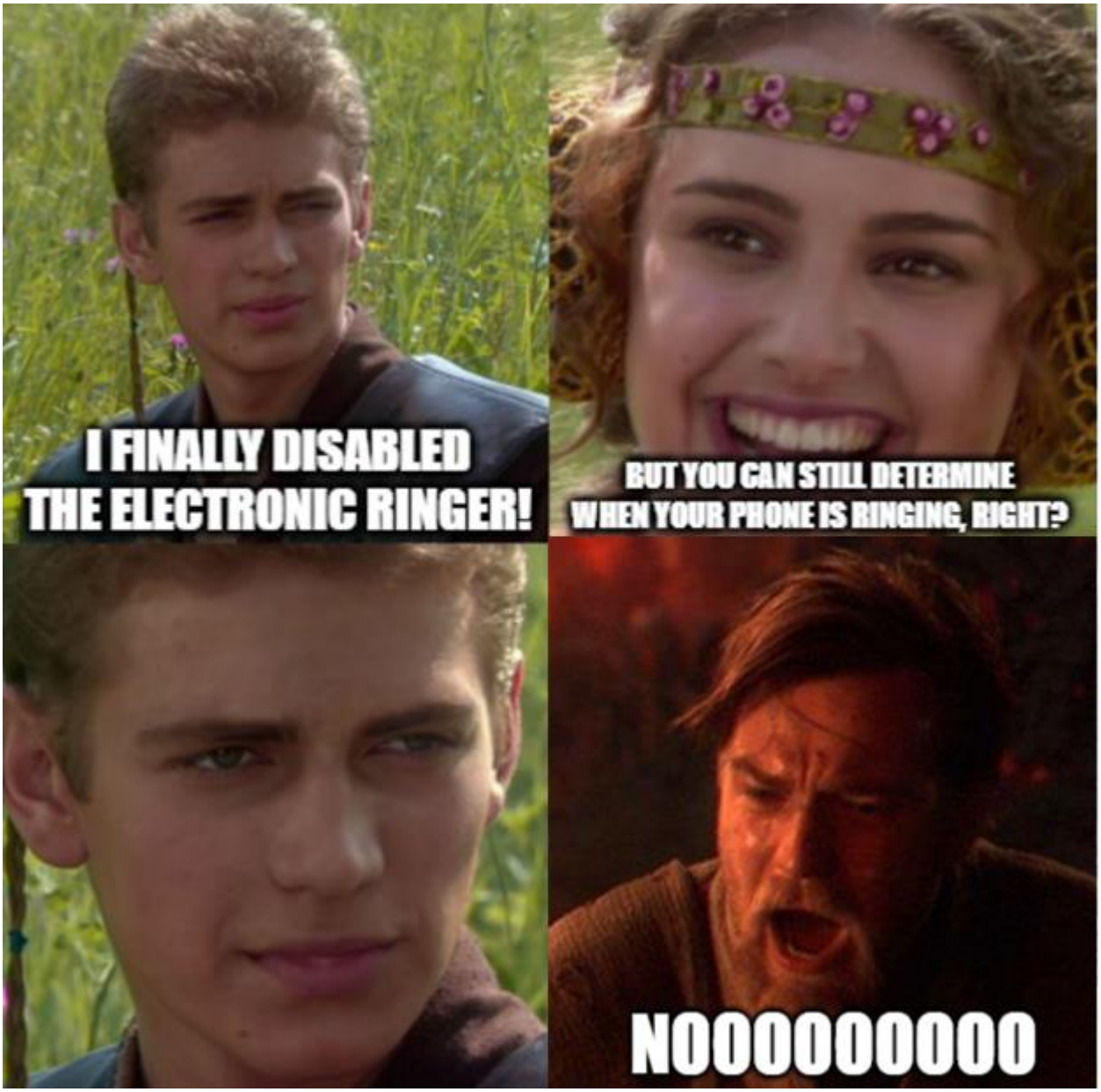
With the Protel, I knew I had the ability to communicate directly to the modem and I knew I needed to slow down the connection, so I implemented what Obi identifies as a Digit Timer (aka sleep function).

Per the Obi documentation, “The digit timer should only be used either as the first element of a rule (for a hot or warm line implementation) or as the last element of a rule as a means of overriding the default inter-digit timer. The digit timer – S – is CASE SENSITIVE. The notation S0, S1, S2, S9 gives digit timer values of 0, 1, 2 and 9 seconds respectively; S is equivalent to S1; S0 is the same as “blank”. You can concatenate multiple S elements together if you need more than 9s timeout, such as S9S5 for a 14s timeout. To create a hotline to the number 1-234-567-8910 we would write: <S0:12345678910>.”

But in my case, I wanted still wanted to use # instead of a phone number. This is mainly because I knew the # worked.

1. In the Obi Web Interface > Physical Interfaces field for both the “PHONE 1” and “PHONE 2” line ports. I replaced the (<#>) value with the value (<S9:#>) which delayed my hotline connection to the Protel by 9 seconds. Surely enough time to enter either keypad command.
2. Saved the settings.
3. I picked up the handset on the Protel and entered in the *#2 command on the keypad and voila I was able to start the communication and get the subsequent check in completed with ExpressNet.
4. Once in programming mode, I then tried the *#3 command and it also worked to subsequently download the latest firmware file as well as make any changes that I made in the Options/Registers record, like disable that blasted electronic ringer.

Note to self: Refrain from disabling the electronic ringer until you have figured out how to get bidirectional communications because then you have no audible indication that your phone is ringing.



Yes, I could have just enabled it by changing the Options/Registers Record and running the programming function again then hope for the best. But, come on, this isn't a real phone until it rings like a real analog phone.

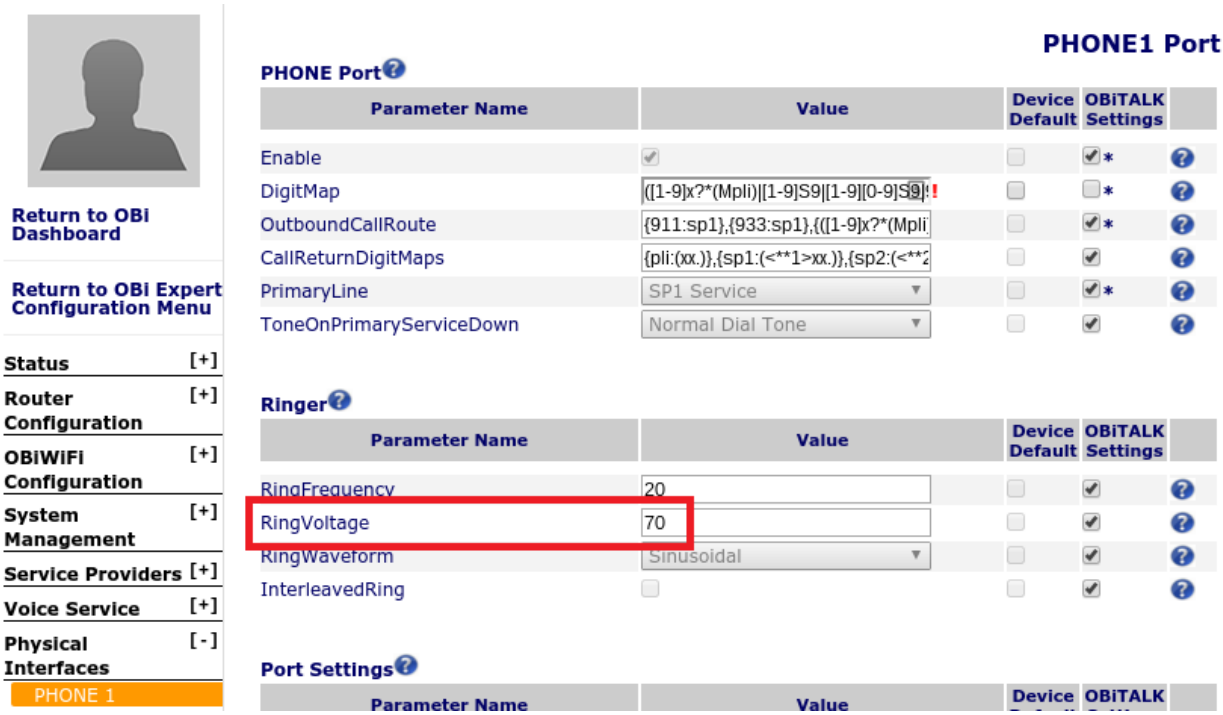
Enter the Protel Double Gong Ringer **(Optional unless you disabled the electronic ringer)**.

I was able to find one on eBay and hooked it up per the manual. It mounts on the upper/center portion of the board chassis. The two wires can be connected to the terminal block in line with the RJ11 two-wire pigtail. When the phone is called the double-gong ringer is engaged, quite loudly, from what I can remember from the 90s. Except, mine let out a slow clicking sound that was barely audible because remember, I didn't have an analog line and read that a mechanical ringer requires the amount of voltage that an analog line would produce. The ringer equivalence number (REN) is a telecommunications measure that represents the electrical loading effect of a telephone ringer on a telephone line.

Solution 1 – On the ringer itself you can adjust the position of the "clapper" to where it is closer to the

bells. I believe this is the equivalent to using that little lever on the side of one of those old house phones. This yielded a little more ring but nothing like the traditional light up your life ringing sound of the 1980s-90s.

Solution 2 – After researching some more I found that I could increase the voltage in the Obi's configuration settings from 70VAC to 82VAC. I really did not think this would make a difference and it was coming up on 2am, so I decided to test it out as my last procedure of the night. Ran my ADTD# command and I woke up the entire house. I was in a detached garage. The next day, my 90-year-old neighbor asked if I thought about upgrading my telephones to digital.



Moving on. To recap, I was able to get at least one directional communication working. Now for the modem to Protel communication.

This proved to be a bit trickier because I will need to insert myself once again into the communication from the modem to the Protel.