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*Programming Protel Payphones*
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When the Bell System was broken up, one of the effects of that historic telephone event was the removal of the Telephone Company's monopoly on pay telephones. Suddenly, anybody or any company could become a pay phone operator. This new class of pay phone was called the Customer Owned Coin Operated Telephone, or COCOT for short. This new kind of pay phone business opportunity led many different companies to start manufacturing pay phone equipment that could be used on ordinary business phone lines. Private pay phone operators had to use ordinary phone lines because they didn't want to depend on the Phone Company's equipment to control their private phones. Many different manufacturers made equipment for the emerging COCOT market, but as time marched

on, Protel became the most popular and widely deployed brand of COCOT phone equipment in the USA and many other countries as well. Because COCOTs were designed to operate on ordinary phone lines, all phone rating and routing decisions must be made by the phone itself. These phones also must secure the unrestricted phone lines they operate on from unauthorized calls, since those calls don't make money for the COCOT operator. Since these phones must do so much, they are actually small specialized computers, running a software program written by the phone manufacturer, and equipped with modems so the phone's internal software can be reconfigured at will by the COCOT operator. To allow the COCOT operators to reprogram their phones at any time, the COCOT manufacturers provide the operators with computer software designed to manage all their phones. Protel calls their software ExpressNet. This article will thoroughly explain how to use ExpressNet to program a Protel pay phone, just like those big COCOT operators do.

The Protel ExpressNet software allows the COCOT operator a convenient way to manage all of their pay phones remotely, without having to go from phone to phone and enter complicated programming sequences on the keypad. This remote access capability does raise some security concerns with COCOT operators, such as, "How do the phones keep unauthorized people from reconfiguring them?" Since the software and pay phones themselves were developed in the 1980's, the cheapest option available at the time was "Security by Obscurity." Protel would only sell the software to COCOT owners, and the cost was a considerable expense for somebody who wasn't running a pay phone business. To further protect the phones, a 4 digit numeric security code could be programmed into the pay phone, discouraging rival COCOT operators from reprogramming phones that belonged to another company. During modem communications, if the pay phone receives the wrong 4 digit numeric security code it will hang up right away. Thus, a brute force attack requires at most 9,999 phone calls. This "Security by Obscurity" has been lessened over the years, as the pay phone manufacturer Protel has set up a web site where anyone can download an upgrade-only version of their ExpressNet software. This upgrade-only file can be modified to allow for a complete fresh installation of the ExpressNet software without it having to find a previous version. To allow the full installation of ExpressNet without an upgrade, the INSTALL.DAT file must be modified. This is not an article about software piracy however, so the exact procedure for getting the software to install from the upgrade-only file is left as an exercise for the reader. This article is about how to use ExpressNet after it has been installed on a computer.

When ExpressNet is first installed and started up, it prompts for a

username and password. The default name is PROTEL and the default password is PROTELX3. Once you get past this screen, you can go to the password management menu by pressing 6 then 3, and either add users, or change passwords. You should also press 6 then 2, and choose the option to turn off the password prompt at startup. Next, you'll want to press 5 then 4 from the Main Menu to go to the modem setup. You need to set up a modem in order to program pay phones. Protel pay phones have only 2 speeds, 300 baud and 1200 baud. This is a lot slower than most modern modems now operate at, but most modern modems maintain backward compatibility down to these low speeds. Protel 7000 series pay phones use a proprietary 1200 baud modem scheme which requires a Protel modem. That proprietary scheme is not compatible with any other modem.

Once the software is installed and set up to use a modem, it is now time to get ready to program a pay phone. Programming a pay phone requires 3 things in the ExpressNet software, a site record, a costing record, and an options/registers record. The costing record and options/registers record must be created before being assigned to a site record. There is 1 site record for every pay phone that is managed by ExpressNet. The options/registers record is simplest to create. This record is accessed by pressing 3 from the main menu. This record controls many details of the pay phone's behavior, and also sets security codes, the number of rings before the modem answers, the phone company's computer number, and coin line options. The security code options are important to consider. The first security code is only used by the ExpressNet software to log in to the pay phone. The coin box amount security codes allow the pay phone to tell somebody how much money is inside if a special code is dialed from the pay phone. The Credit Express code allows entry into Protel's special "Program Mode" from the keypad of the pay phone. Coin line options generally aren't used unless the phone being programmed is on an actual coin line. The ExpressNet software offers online help in programming each option when the user presses F1. Generally, a pay phone operator only makes one options/registers record for all their phones, but they can make more if some phones need to behave differently, like not allowing incoming calls, or coin line/normal line differences, or having different security codes in different phones to discourage unauthorized reprogramming.

The other major component to programming a pay phone with ExpressNet is the costing record. Costing records set all the rates, local calling areas, and long distance routing information. Generally, one costing record is needed for every rate center that a pay phone operator has phones in, as the local calling areas are different in every one. Costing records are accessed by pressing 2 the main menu in ExpressNet. After choosing a record, a 2nd menu will come up. This menu is an indication that these records are somewhat complex to set up. Protel costing records have a total of 137 cost bands, which can each have different rates. Cost bands 80-137 are pre-defined for certain special calls like 411, 911, 1-800, incoming, 0 operator, international, and many others. Cost bands 0-79 are user defined, and can be assigned area code by area code, or prefix by prefix. The cost band configuration is accessed by pressing 2 from the costing record menu. You have to press PageUp/PageDown to move off the first screen, the arrow keys won't move off the screen for some reason. Each cost band has 11 configurable parameters. The most important ones are initial rate, overtime rate, initial period, overtime period, route and keypad control. For rates and time periods, these fields control how much the phone asks for up-front, and how long it lets the call go before asking for more money. For example, to have 25 cent unlimited local calls, set initial rate to 0.25, initial time to 255, overtime rate to 0.00,

and overtime period to 1. To have long distance calls be 1 dollar every five minutes, set both initial and overtime rate to 1.00, and set initial and overtime period to 5. The overtime period must be at least 1, or else the cost band won't be enabled, and any prefixes and area codes assigned to it will be prevented from making calls. The route field controls how the pay phone dials the call onto the phone line. Route 0 dials the call just like the pay phone user dialed it. Routes 1 to 15 can be configured to make the phone dial extra things like long distance access numbers, to allow the pay phone to use the phone service provider the owner wants. These routes will be covered later in the Routes section. The keypad control field tells the pay phone whether to allow the keypad in this cost band or not. This can be set to 1 for completely off, 8 for completely on, or some number in between for a digit limited state of "on." Another field to consider is the 3 digit field (SAC-CI-AD) to the right of the route field. This controls the answer detection method. 000 is for normal COCOT educated guess mode, 001 is for loop reversal mode, and 003 is for no answer detection. There are other fields, but they are for card calls made on phones equipped with a credit card slot. See the online help for more information.

The next important part of a costing record are the area code and prefix tables. These let you assign cost bands to individual area codes, prefixes, and even international country codes. This is accessed by option 3 from the costing record menu. There is then another menu for Multi-Band NPA, Single Band NPA, and Country Codes. The Multi-Band NPA menu allows you to assign individual prefixes to cost bands. A Multi-Band NPA should be created for every area code in the local calling area of the pay phone, so the local prefixes can be separated from the long distance prefixes. Another important option in the 7-digit NPA. This allows 7 digit calling to take place. If it's not already on the menu, choose to add an NPA, make up a number, save it, then press F6 to change it to be the 7-digit NPA. Selecting an NPA from the Multi-Band NPA menu brings up a large list of prefixes and their associated cost bands. Each prefix should be set to a cost band. If most of the prefixes should be in the same cost band, use the F10 key, which changes all the prefixes at once. Once all the Multi-Band NPAs are set up, go back to the previous menu, and go into the Single Band NPA menu. The large list on this screen is a list of AREA CODES. This screen lets you set cost bands on an area-code-by-area-code basis only. Again, the F10 key can be used to change all the area codes at once. After setting the Single Band NPAs, you could also go to the Country Code menu, and assign some country codes to the special international cost bands. There are a lot fewer of these than the domestic cost bands. Once all the prefixes, areacodes, and country codes are assigned to cost bands, you can move on to the routes menu.

The last important part of making a costing record is the Routes menu. This is option 4 from the Costing Record menu. There are really only 15 available routes available for configuration. The 80xx routes are used for coin and non-coin calls. The 81xx routes are only used by pay phones equipped with credit card slots, and only for calls where a credit card is inserted in the slot. Setting up the routes is only necessary if the pay phone must dial calls differently than what a normal phone user would dial. This is necessary if long distance calls need a carrier access code, or some other special treatment. Otherwise, the routes can be left alone, and the pay phone will just dial directly whatever the pay phone user is dialing. To program a route to make calls via AT&T, choose a route between 8001 and 8015, then enter 07101028800 in the access number field, then move down to the "switch format" field and enter **3*0000. This configuration adds 1010288 to the beginning of

every call assigned to this route as the call is dialed out by the pay phone. Once a route is defined, it must be assigned to a cost band to actually be used. That assignment is not done in the route menu, but in the cost band menu. Routes are a powerful tool that can be used to do a lot of crazy telephone trickery. It's really too large of a topic for this already large article, so it will be covered in more detail in a future article. Once the routes are set up, you are finally done with a costing record. The good thing about costing records is that they can be copied, so if you are programming phones in different local calling areas, all you need to do is copy the record, give it a new name, and then edit the area codes and prefixes to match the new calling area. There is no need to build up cost bands and routes again.

The next step in programming a pay phone is to make a Site Record for the phone you want to program. This record is fairly quick to create. The most important part of the site record is the phone number of the pay phone, and you enter that number to create the record. The next most important parts are the assignment of the Costing Record and the Options/Registers Record. Everything else in the site record is just descriptive information about the phone, which can be filled in with any pertinent information. The Group Number can be used to group many pay phones together by entering the same string here in many site records. Then you can have the software call all your pay phones just by using the Group Number.

After all these records are created in the ExpressNet database, the fun can finally begin. That is, calling up a Protel pay phone, and reprogramming it. The ExpressNet software calls this "polling" a phone. Polling a phone doesn't mean you have to reprogram it every time, as many polling options are available. To poll a pay phone, choose options 5, then 3, "Manual Polling," from the main menu. This screen presents a list of polling actions, and gives you a place to enter phone numbers and group numbers. You can enter up to 10 of each. The "Download Parameters" option is the only one that will reprogram a pay payphone, all the other options just read data out of the pay phone. Even if "Download Parameters" is not chosen, the ExpressNet software will still try to program a pay phone on the first call after the creation of its site record. The last option to check after entering the phone numbers or phone groups to call is the modem port. Choose whichever one corresponds to your modem. The last step is to press F8 to call all the phone numbers on the phone number list, or press F9 to call all the phones in all the groups in the group list. Then sit back and watch the software reach out and reprogram pay phones. If you feel like keeping track of the pay phones you reprogram, you could go back to the main menu and choose options 5, then 2, "Automatic Polling," and set up scheduled polling, so that the ExpressNet software will call pay phones at regular intervals.

If, for some reason, the polling calls don't work, you may need to check to see if the modem is set up correctly. The default setup is for the proprietary Protel modem, and that should work with most other modems. To make changes to the modem setup, choose options 5, then 4 from the main menu for "Modem Setup." To change modem settings, or define new modem types, move the cursor down to "SPACE" and press the space bar. After that, press F7 to edit the modem profile and change the init string for your modem to something that will make your calls to pay phones work. Consult a modem manual to help compose your init string.

Once the ExpressNet software makes a successful polling call to a pay phone, it will download data out of the phone which can be viewed in the site record. To view that data, go back to the site record of a phone that has been polled, and you should see a summary of the amount in the phone, and any status flags the phone may have reported. Status flags are the pay phone's

way of reporting problems. Other interesting utilities can be found by pressing F7 from the site record. You can see the CDR viewer, the call accounting viewer, and other things here. The CDR viewer shows a list of dialed calls made from the pay phone. The call accounting viewer shows all the types of calls made and how much money was paid for each type of call.

Protel's ExpressNet remote administration software for pay phones is a very powerful software package which can make pay phones do all sorts of crazy things, almost anything a pay phone operator could dream up. Since this article really only covered the minimum necessary to make a pay phone operational, there will be future articles covering advanced programming topics. For more information about ExpressNet, including many technical bulletins about undocumented features of Protel pay phones and ExpressNet, visit Protel's technical support section at http://www.protelinc.com/main/tech_support.asp.

There are also some links here to download the ExpressNet software as an upgrade-only package. Remember to use remote pay phone administration software responsibly.