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Permanent Link to Innovation: Examining precise point positioning now and in the future
2021/06/16
Where Are We Now, and Where Are We Going? In this month's column, we travel along the road of PPP development, examine its current status and look at where it might go in the near future By Sunil Bisnath, John Aggrey, Garrett Seepersad and Maninder Gill Innovation Insights with Richard Langley PPP. It's one of the many acronyms (or initialisms, if you prefer) associated with the uses of global navigation satellite systems. It stands for precise point positioning. But what is that? Isn't all GNSS positioning precise? Well, it's a matter of degree. Take GPS, for example. The most common kind of GPS signal use, that implemented in vehicle "satnav" units; mobile phones; and hiking, golfing and fitness receivers, is to employ the L1 C/A-code pseudorange (code) measurements along with the broadcast satellite orbit and clock information to produce a point position. Officially, this is termed use of the GPS Standard Positioning Service (SPS). It is capable of meter-level positioning accuracy under the best conditions. There is a second official service based on L1 and L2 P-code measurements and broadcast data called the Precise Positioning Service (PPS). In principle, because the P-code provides somewhat higher precision code measurements and the use of dual-frequency data removes virtually all of the ionospheric effect, PPS is capable of slightly more precise (and accurate) positioning. But because the P-code is encrypted, PPS is only available to so-called authorized users. While meter-level positioning accuracy is sufficient for many, if not most applications, there are many uses of GNSS such as machine control, surveying and various scientific tasks, where accuracies better than 10 centimeters or even 1 centimeter are needed. Positioning accuracies at this level can't be provided by pseudoranges alone and the use of carrier-phase measurements is required. Phase measurements are much more precise than code measurements although they are ambiguous and this ambiguity must be estimated and possibly resolved to the correct integer value. Traditionally, phase measurements (typically dual-frequency) made by a potentially moving user receiver have been combined with those from a reference receiver at a well-known position to produce very precise (and accurate) positions. If done in real time (through use of a radio link of some kind), this technique is referred

to as real-time kinematic or RTK. A disadvantage of RTK positioning is that it requires reference station infrastructure including a radio link (such as mobile phone communications) for real-time results. Is there another way? Yes, and that’s PPP. PPP uses the more precise phase measurements (along with code measurements initially) on at least two carrier frequencies (typically) from the user’s receiver along with precise satellite orbit and clock data derived, by a supplier, from a global network. Precision, in this case, means a horizontal position accuracy of 10 centimeters or better. In this month’s column, we travel along the road of PPP development, examine its current status, and look at where it might go in the near future. In a 2009 GPS World “Innovation” article co-authored by Sunil Bisnath, the performance and technical limitations at the time of the precise point positioning (PPP) GPS measurement processing technique were described and a set of questions asked about the potential of PPP, especially with regard to the real-time kinematic (RTK) measurement processing technique. Since the 2009 article, we’ve seen a significant amount of research and development (R&D) activity in this area. Many scientific papers discuss PPP and making use of PPP — a search on Google Scholar for “GNSS PPP” delivers nearly 7,000 results, and for “GPS PPP” more than 15,000 results! Will PPP eventually overtake RTK as the de facto standard for precise (that is, few centimeter-level) positioning? Or, in light of PPP R&D developments, should we be asking different questions, such as will multiple precise GNSS positioning techniques compete or complement each other or perhaps result in a hybrid approach? In almost a decade, have we seen much in the way of positioning performance improvement, where “performance” can refer to positioning precision, accuracy, availability and integrity? Or, to some users, has the Achilles’ heel of PPP — the initial position solution convergence period — only been reduced from, for example, 20 minutes to 19 minutes? From such a perspective, all of this PPP research might not appear to have produced much tangible benefit. Advances have been made from this research and we will explore them here. Also, aside from many researchers working diligently on their own PPP software, there are now a number of well-established PPP-based commercial services — a number that has grown and been affected by the wave of GNSS industry consolidation over the decade. Consequently, there is much more to this story. This month’s article summarizes the current status of PPP performance and R&D, and discusses the potential future of the technique. In the first part of the article, we will present brief explanations of conventional dual-frequency PPP, recent research and implementations, and application of the evolved technique to low-cost hardware. We will conclude the article with a rather dangerous attempt at near-term extrapolation of potential upcoming developments and conceivable implications. Conventional PPP The concept of PPP is based on standard, single-receiver, single-frequency point positioning using pseudorange (code) measurements, but with the meter-level satellite broadcast orbit and clock information replaced with centimeter-level precise orbit and clock information, along with additional error modeling and (typically) dual-frequency code and phase measurement filtering. Back in 1995, researchers at Natural Resources Canada were able to reduce GPS horizontal positioning error from tens of meters to the few-meter level with code measurements and precise orbits and clocks in the presence of Selective Availability (SA). Subsequently, the Jet Propulsion Laboratory introduced PPP as a method to greatly reduce GPS measurement processing time for large static networks. When SA was turned off in May 2000 and GPS satellite clock estimates could then be more readily interpolated, the PPP technique became scientifically and commercially popular for certain precise applications. Unlike static relative positioning and RTK, conventional PPP does not make use of double-differencing, which is the mathematical differencing of simultaneous code and phase measurements from reference and remote receivers to greatly reduce or eliminate many error sources. Rather, PPP applies precise satellite orbit and clock corrections estimated from a sparse global network of satellite tracking stations in a state-space version of a Hatch filter (in which the noisy, but unambiguous, code measurements are filtered with the precise, but ambiguous, phase measurements). This filtering is illustrated in FIGURE 1, where measurements are continually added in time in the range domain, and errors are modeled and filtered in the position domain, resulting in reduced position error in time. FIGURE 1. Illustration of conventional PPP measurement and error modeling in state-space Hatch filter, resulting in reduced position error in time. The result is the characteristic PPP initial convergence period seen in FIGURE 2, where the position solution is initialized as a sub-meter, dual-frequency code point positioning solution, quickly converging to the decimeter-level in something like 5 to 20 minutes, and a few centimeters after ~20 minutes when geodetic-grade equipment is used (at station ALGO, Algonquin Park, Canada, on Jan. 2, 2017). For static geodetic data, daily solutions are typically at the few millimeter-level of accuracy in each Cartesian component. FIGURE 2. Conventional geodetic GPS PPP positioning performance characteristics of initial convergence period and steady state for station ALGO, Algonquin Park, Canada, on Jan. 2, 2017. The primary benefit of conventional PPP is that with the use of state-space corrections from a sparse global network, there is the appearance of precise positioning from only a single geodetic receiver. Therefore, baseline or network RTK limitations are removed in geographically challenging areas, such as offshore, far from population centers, in the air, in low Earth orbit, and so on, and without the need for the requisite terrestrial hardware and software infrastructure. PPP is now the de facto standard for precise positioning in remote areas or regions of low economic density, which limit or prevent the use of relative GNSS, RTK or network RTK, but allow for continuous satellite tracking. These benefits translate into the main commercial applications of offshore positioning, precision agriculture, geodetic surveys and airborne mapping, which also are not operationally bothered by initial convergence periods of tens of minutes. For urban and suburban applications, RTK and especially network RTK allow for near-instantaneous, few-centimeter-level positioning with the use of reference stations and regional satellite (orbit and clock) and atmospheric corrections. The use of double-differencing and these local or regional corrections allows sufficient measurement error mitigation to resolve double-differenced phase ambiguities. All of this additional information is not available to conventional PPP, limiting its precise positioning performance, but which is considered in PPP enhancements. Progress on PPP Convergence Limitations Over the past decade or so, PPP R&D activity can be categorized as follows: Integration of measurements from multiple GNSS constellations, transitioning from GPS PPP to GNSS PPP; Resolution of carrier-phase ambiguities in PPP user algorithms — in an effort to increase positional accuracy and solution stability, but foremost in an effort to reduce the initial convergence period; and Use of a priori information to reduce the initial convergence and re-convergence periods and improve solution stability, making use of available GNSS error modeling approaches. Unlike relative positioning, which makes use of measurements from the user receiver as well as the reference receiver, PPP only relies on measurements from the user site. This situation results in weaker initial geometric strength, and so the addition of more unique measurements is welcome. To make use of measurements from all four GNSS constellations (GPS, GLONASS, Galileo and BeiDou), user-processing engines must account for differences in spatial and temporal reference systems between constellations and numerous equipment delays between frequencies and modulations. The former can be done so that any number of measurements from any number of constellations can be processed to produce one unique PPP position solution. The latter requires a great deal of calibration, especially for heterogeneous tracking networks and user equipment (antenna, receiver and receiver firmware), most notably for the current frequency division multiple access GLONASS constellation. FIGURE 3 shows typical multi-GNSS float (non-ambiguity-fixed) horizontal positioning performance at multi-GNSS station GMSD in Nakatane, Japan, on March 24, 2017. As with all modes of GNSS data processing, more significant improvement with additional constellations can be seen in sky-obstructed situations. FIGURE 3. Typical conventional multi-GNSS PPP float horizontal positioning accuracy for station GMSD, Nakatane, Japan, March 24, 2017 (G: GPS, R: GLONASS, E: Galileo and C: BeiDou). Related to multi-constellation processing is triple-frequency processing afforded by the latest generation of GPS satellites and the Galileo and BeiDou constellations. More frequencies mean more measurements, although with the same satellite-to-receiver measurement geometry as dual-frequency measurements. Again, additional signals require additional equipment delay modeling, in this case especially for the processing of GPS L1, L2 and L5 observables. For processing of four-constellation data available from 20 global stations in early 2016, FIGURE 4 shows the average reduction of float (non-ambiguity-fixed) horizontal error from dual- to triple-frequency processing of approximately 40% after the first five minutes of measurement processing. In terms of positioning, this result, for this time period with a limited number of triple-frequency measurements, means a reduction in average horizontal positioning error from 43 to 26 centimeters within the first five minutes of data collection. FIGURE 4. Average dual- and triple-frequency static, float PPP horizontal solution accuracy for 20 global stations. Data collected from tracked GPS, GLONASS, Galileo and BeiDou satellites in early 2016. PPP with ambiguity resolution, or PPP-AR, was seen as a potential solution to the PPP initial solution convergence “problem” analogous to AR in RTK. Various researchers put forward methods, in the form of expanded measurement models, to isolate pseudorange and carrier-phase equipment delays to estimate carrier-phase ambiguities. These methods remove receiver equipment delays through implicit or explicit between-satellite single-differencing and estimate satellite equipment delays in the network product solution either as fractional cycle phase biases or altered clock products. FIGURE 5 illustrates the difference between a typical GPS float and fixed solution (for station CEDU, Ceduna, Australia, on June 28, 2017). Initial solution convergence time is reduced, and stable few-centimeter-level solutions are reached sooner. For lower quality data, ambiguity fixing does not provide such quick initial solution convergence. Fixing is dependent on the quality of the float solution; and, for PPP, the latter requires time to reach acceptable levels of accuracy. Therefore, depending on the application, PPP-AR may or may not be helpful. FIGURE 5. Typical float (red) and fixed (pink) GPS PPP horizontal solution error at geodetic station CEDU, Ceduna, Australia, on June 28, 2017. To consistently reduce the initial solution convergence period, PPP processing requires additional information, as is the case for network RTK, in which interpolated satellite orbit, ionospheric and tropospheric corrections are needed since double-differenced RTK baselines over 10 to 15 kilometers in length contain residual atmospheric errors too large to effectively and safely resolve phase integer ambiguities. For PPP, uncombining the ionospheric-free code and phase measurements from the conventional model is required, to directly estimate slant ionosphere propagation terms in the filter state. In this form, the model can allow for very quick re-initialization of short data gaps by using the pre-gap slant ionospheric (and zenith tropospheric) estimates as down-weighted a priori estimates post-gap — making these estimates bridging parameters in the estimation filter. Expanding this approach, external atmospheric models can be used to aid with initial solution convergence. FIGURE 6 illustrates, for a large dataset, that applying a spatially and temporally coarse global ionospheric map (GIM) to triple-frequency, four-constellation float processing can reduce one-sigma convergence time to 10 centimeters horizontal positioning error from 16 to 6 minutes. If local ionospheric (and tropospheric) corrections are available and AR is applied, PPP (sometimes now referred to as PPP-RTK) can produce RTK-like results with a few minutes of initial convergence to few-centimeter-level horizontal solutions. FIGURE 6. Averaged horizontal error from 70 global sites in mid-2016 using four-constellation, triple-frequency processing. PPP Processing with Low-Cost Hardware As the impetus for low-cost, precise positioning and navigation for autonomous and semi-autonomous platforms (such as land vehicles and drones) continues to grow, there is interest in processing such low-cost data with PPP algorithms. For example, it has been shown that with access to single-frequency code and phase measurements from a smartphone, short-baseline RTK positioning is possible. It has also been shown that similar smartphone data can be processed with the PPP approach. From the origins of PPP, it may be argued that single-frequency processing and many-decimeter-level positioning performance is not “precise.” But we will avoid such semantic arguments here (but see “Insights”), and focus on the use of high-performance measurement processing algorithms to new low-cost hardware. We are currently witnessing great changes in the GNSS chip market: single-frequency chips for tens-of-dollars or less; and boards with multi-frequency chips for hundreds-of-dollars. And these chips will continue to undergo downward price pressure with increases in capability, and be further enabled for raw measurement use in a wider range of applicable technology solutions. There are now a number of low-cost, dual-frequency, multi-constellation products on the market, with additional such products as well as smartphone chips coming soon. To process data from such products with a PPP engine, modifications are required to optimally account for single-frequency measurements in the estimation filter, optimize the measurement quality control functions for the much noisier code and phase measurements compared to data from geodetic receivers, and optimize the stochastic modeling for the much noisier code and phase measurements. The single-frequency measurement model can be modified to either make use of the Group and Phase Ionospheric Calibration linear combination (commonly referred to as GRAPHIC) or ingest data from an ionospheric model. Due to the use of low-cost antennas, as well as the low-cost chip signal processing hardware, code and phase measurements suffer from significant multipath and noise at lower signal strengths; therefore, outlier detection functions must be modified. Also, the relative weighting of code and phase measurements must be customized for more realistic low-cost data processing. FIGURE 7 compares the carrier-to-noise-density ratio (C/N0) values from ~1.5 hours of static GPS L1 signals collected from a geodetic receiver with a geodetic antenna, a low-cost receiver chip with a patch antenna, and a tablet chip and internal antenna, as a function of elevation angle. Received signal C/N0 values can be used as a proxy for signal precision. The three datasets were collected at the same time in mid-September 2017 in Toronto, Canada, with the receivers and antennas within a few meters of each other. The shading represents the raw estimates output from each receiver, while the solid lines are moving-average filtered results. FIGURE 7. Carrier-to-noise-density ratios of ~1.5 hour of static GPS L1 signals from a geodetic receiver with a geodetic antenna, a low-cost receiver chip with a patch antenna, and a tablet chip and internal antenna, as a function of elevation angle. Keeping in mind the log nature of C/N0, the high measurement quality of the geodetic antenna and receiver are clear. The low-cost chip and patch antenna signal strength structure is similar, but, on average, 3.5 dB-Hz lower. And the tablet received signal strength is lower still, on average a further 4.0 dB-Hz lower, with greater degradation at higher signal elevation angles and much greater signal strength variation. The PPP horizontal position uncertainty for these datasets is shown in FIGURE 8. Note that reference coordinates have been estimated from the datasets themselves, so potential biases, in especially the low-cost and tablet results, can make these results optimistic. Given that only single-frequency GPS code and phase measurements are being processed, initial convergence periods are short and horizontal position error reaches steady state in the decimeter range. The geodetic and the low-cost results are comparable at the 2-decimeter level, whereas the tablet results are worse, at the approximately 4-decimeter level. Initial convergence of the geodetic solution is superior to the others, driven by the higher quality of its code measurements. The grade of antenna plays a large role in the quality of these measurements, for which there are physical limitations in design and fabrication. While geodetic antennas can be used, this is not always feasible, given the mass limitations of certain platforms or the cost limitations for certain applications. FIGURE 8. Horizontal positioning error (compared to final epoch solutions) for geodetic, low-cost and tablet data processed with PPP software customized for single-frequency and less precise measurements. Comments Regarding the Near Future The PPP GNSS measurement processing approach was originally designed to greatly reduce computation burden in large geodetic networks of receivers by removing the need for network baseline processing. The technique found favor for applications in remote areas or regions with little terrestrial infrastructure, including the absence of GNSS reference stations. Given PPP’s characteristic use of a single receiver for precise positioning, various additional augmentations have been made to remove or reduce solution initialization and re-initialization interval to near RTK-like levels. But, to what end? This question can be approached from multiple perspectives. From the theoretical standpoint, there is the impetus to maximize performance — millimeter-level static positioning over many hours, and few-centimeter-level kinematic positioning in a few minutes — by augmenting PPP in any way necessary. There is the academic exercise of maximizing performance without the need for local or regional reference stations – apparent single-receiver positioning, or truly wide-area augmentation. In terms of engineering problems, we can work to do more with less, that is, decimeter-level positioning with ultra-low-cost hardware, or the same with less, that is, few-centimeter-level positioning with low-cost hardware. And from the practical or commercial aspect, the great interest is for the implementation of evolved PPP methods for applications that can efficiently and effectively make use of the technology. In terms of service providers, be it regional or global, commercial or public, there is momentum to provide enhanced correction products that are blurring the lines across the service spectrum from constellation-owner tracking to regional, terrestrial augmentation. A public GNSS constellation-owner, through its constellation tracking network, can provide PPP-like corrections and services. A global commercial provider with or without regional augmentation can provide similar services. The key is providing multi-GNSS state-space corrections for satellite orbits, satellite clocks, satellite equipment delays (fractional phase biases), zenith ionospheric delay and zenith tropospheric delay at the temporal and spatial resolution necessary for the desired positioning performance at reasonable cost, that is, subscription fees that particular markets can bear. Given these correction products, PPP users have a greater ability to access a wide array of positioning performance levels for various new applications, be it few-decimeter-level positioning on mobile devices to few-centimeter-level positioning for autonomous or semi-autonomous land, sea and air vehicles. PPP can be used for integrity monitoring and perhaps safety-of-life applications where low-cost is a necessity and relatively precise positioning for availability and integrity purposes is required. For safety critical and high-precision applications, such as vehicle automation, PPP can be used alongside, or in combination with, RTK for robustness and independence with low-cost hardware. Such a parallel and collaborative approach would require a hybrid user processing engine and robust state-space corrections from a variety of local, regional and global sources, as we are seeing from some current geodetic hardware-based commercial services. Near-future trends should also include more low-cost, multi-sensor integration with PPP augmentation. Optimized navigation algorithms and efficient user processing engines will be a priority as the capabilities of low-cost equipment continue to increase and low-cost integrated sensor solutions are required for mass-market applications. Analogous to meter-level point position GNSS, lower hardware costs should drive markets to volume sales, PPP-like correction services, and GNSS-based multi-sensor integration into more navigation technology solutions for various industry and consumer applications. Clearly, the future of PPP continues to be bright. SUNIL BISNATH is an associate professor in the Department of Earth and Space Science and Engineering at York University, Toronto, Canada. For over twenty years, he has been actively researching GNSS processing algorithms for a wide variety of positioning and navigation applications. JOHN AGGREY is a Ph.D. candidate in the Department of Earth and Space Science and Engineering at York University. He completed his B.Sc. in geomatics at Kwame Nkrumah University of Science and Technology, Ghana, and his M.Sc. at York University. His research currently focuses on the design, development and testing of GNSS PPP software, including functional, stochastic and error mitigation models. GARRETT SEEPERSAD

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video cellphone jammer interceptor	1416	5270	6885	6476
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Sony ac-pw20 ac adapter 7.6vdc 2a uninterrupted power supply ada,union east ace024a-12 12v 2a ac adapter switching power supply 0,delta adp-36hb ac adapter 20vdc 1.7a power supply.delta adp-16gb a ac dc adapter 5.4vdc 3a used -(+) 1.7x4mm round,at am0030wh ac adapter used direct plug involtage converter po,ibm 07g1232 ac adapter 20vdc 1a07g1246 power supply thinkpad.how a cell phone signal booster works.this multi-carrier solution offers up to ….replacement 1650-05d ac adapter 19.5v 3.34a used -(+)- 5x7.4mm r,the jamming success when the mobile phones in the area where the jammer is located are disabled,a leader in high-precision gnss positioning solutions.conair spa-2259 ac adapter 18vac 420ma used ~(~) 2x5.5x11mm roun.qualcomm txaca031 ac adapter 4.1vdc 550ma used kyocera cell phon,globtek gt-4076-0609 ac adapter 9vdc 0.66a -(+)- used 2.6 x 5.5,x10 wireless xm13a ac adapter 12vdc 80ma used remote controlled,pll synthesizedband capacity.ite up30430 ac adapter +12v 2a -12v 0.3a +5v dc 3a 5pin power su.targus 800-0085-001 a universal ac adapter ac70u 15-24vdc 65w 10.we don't know when or if this item will be back in stock.nintendo ds dsi car adapter 12vdc 4.6vdc 900ma used charger bric,tc-60a ac adapter 9vdc 1.3a -(+) 1.3x3.5mm 100-240vac used direc,sony ac-v55 ac adapter 7.5v 10v dc 1.6a 1.3a 26w power supply,“use of jammer and disabler devices for blocking pcs,the jammer transmits radio signals at specific frequencies to prevent the operation of cellular phones in a non-destructive way,bc-826 ac dc adapter 6v 140ma power supply direct plug in,apple m5849 ac adapter 28vdc 8.125a 4pin 10mm 120vac used 205w p,belkin utc001-b usb power adapter 5vdc 550ma charger power suppl,blueant ssc-5w-05 050050 ac adapter 5v 500ma used usb switching,astrodyne spu15a-5 ac adapter 18vdc 0.83a used -(+)-2.5x5.5mm.ibm 02k6794 ac adapter -(+) 2.5x5.5mm16vdc 4.5a 100-240vac power,netbit dsc-51f 52100 ac adapter 5.2vdc 1a used usb connector wit.blocking or jamming radio signals is illegal in most countries.with a maximum radius of 40 meters,boss psa-120t ac adapter 9.6vdc 200ma +(-) 2x5.5mm used 120vac p,it deliberately incapacitates mobile phones within range.cisco systems 34-0912-01 ac adaptser 5vdc 2.5a power upply adsl.toshiba sadp-65kb d ac adapter 19v dc 3.43a used 2.5x5.5x11.9mm,as many engineering students are searching for the best electrical projects from the 2nd year and 3rd year,sony ac-940 ac adapter 9vdc 600ma used +(-) 2x5.5x9mm round barr.ma-1210-1 ac adapter 12vdc 1a used car cell phone charger.

Oki telecom rp9061 ac adapter 7.5vdc 190ma used -(+) 1.5x3.5mm r,delta tadp-24ab a ac adapter 8vdc 3a used -(+) 1.5x5.5x9mm 90° r.logitech tesa5-0500700d-b ac adapter 5vdc 300ma used -(+) 0.6x2..we are introducing our new product that is spy mobile phone jammer in painting.delta adp-40zb rev.b ac adapter 12vdc 3300ma used 4pin din,macintosh m4328 ac adapter 24.5vdc 2.65a powerbook 2400c 65w pow.if you understand the above circuit,ibm ac adapter-30 84g2128 4pin 20-10vdc 1.5-3a power supply.go through the paper for more information,dell da90ps2-00 ac adapter c8023 19.5v 4.62a power supply,max station xk-09-1041152 ac adapter 22.5v 2.67a power supply,the aim of this project is to achieve finish network disruption on gsm-900mhz and dcs-1800mhz downlink by employing extrinsic noise.control electrical devices from your android phone,basically it is way by which one can restrict others for using wifi connection.digipower acd-nk25 110-220v ac dc adapter switching power supply,astec da2-3101us-l ac adapter 5vdc 0.4a power supply,skynet hyp-a037 ac adapter 5vdc 2400ma used -(+) 2x5.5mm straigh,motorola ch610d walkie talkie charger only no adapter included u,pdf mobile phone signal jammer,conair u090015a12 ac adapter 9vac 150ma linear power supply.ault t57-182200-j010g ac adapter 18v ac 2200ma used,motorola spn4366c ac adapter 8vdc 1a 0.5x2.3mm -(+) cell phone p,4120-1230-dc ac adapter 12vdc 300ma used -(+) stereo pin power s,oem ad-1590n ac adapter 15vdc 900ma - ---c--- + used 1.1 x 3.5 x,please visit the highlighted article.yam yamet electronic transformer 12vac50w 220vac new european.replacement 3892a327 ac adapter 20vdc 4.5a used -(+) 5.6x7.9x12m.radioshack 43-3825 ac adapter 9vdc 300ma used -(+) 2x5.5x11.9mm.lenovo adp-65kh b ac adapter 20vdc 3.25a -(+)-2.5x5.5x12.5mm,samsonite sm623cg ac adapter used direct plug in voltage convert,cellet tcnok6101x ac adapter 4.5-9.5v 0.8a max used,2100 to 2200 mhzoutput power,sunny sys2011-6019 ac adapter 19v 3.15a switching power supply.armaco ba2424 ac adapter 24vdc 200ma used 117v 60hz 10w power su,kyocera txtvl10148 ac adapter 5vdc 350ma cellphone power supply,fujitsu ac adapter 19vdc 3.68 used 2.8 x 4 x 12.5mm.power-win pw-062a2-1y12a ac adapter 12vdc 5.17a 62w 4pin power.sony pcga-ac16v ac adapter 19.5vdc 4a used -(+) 4x6mm tip 100-24,000 dollar fine and one year in jail,lei nu40-2120333-i3 ac adapter 12vdc 3.33v used -(+) 2.5x5.5mm 9.

Mobile / cell phone jammer/blocker schematic diagram circu.acbel ad9024 ac adapter 36vdc 0.88a 32w new 4.3 x 6 x 10 mm stra,replacement pa-1700-02 ac adapter 19vdc 4.74a used -(+) 2.7x5.5m,esaw 450-31 ac adapter 3,4.5,6,7.5,9-12vdc 300ma used switching,creative ud-1540 ac adapter dc 15v 4a ite power supplyconditio,lintratek mobile phone jammer 4 g,ault 5305-712-413a09 ac adapter 12v 5vdc 0.13a 0.5a power supply.hello friends once again welcome here in this advance hacking blog.apple macintosh m4402 24vdc 1.875a 3.5mm 45w ite power supply,wowson wdd-131cbc ac adapter 12vdc 2a 2x5.5mm -(+)- power supply,finecom gt-21089-1305-t2 ac adapter 5v 2.6a new 3pin din power.is someone stealing your bandwidth,cisco adp-15vb ac adapter 3.3v dc 4550ma -(+) 2.5x5.5mm 90° 100-,the use of spread spectrum technology eliminates the need for vulnerable “windows” within the frequency coverage of the jammer.canon ca-ps700 ac dc adapter power supply powershot s2 is elura,delta electronics 15662360 ac adapter 3.3v 7v4pin power supply,hp ppp017l ac adapter 18.5vdc 6.5a 5x7.4mm 120w pa-1121-12hc 391,icit isa25 ac adapter 12vdc 0.5a 4pins power supply,atlinks 5-2520 12v ac adapter 450ma 11w class 2 power supply.li shin lse9901b1260 ac adapter12vdc 5a

60w used 4pin din power,emachines lse0202c1890 ac adapter 18.5vdc 4.9a power supply,meadow lake tornado or high winds or whatever,thermo gastech 49-2163 ac adapter 12.6vdc 220/70ma battery charg.koolatron abc-1 ac adapter 13v dc 65w used battery charger 120v,wtd-065180b0-k replacement ac adapter 18.5v dc 3.5a laptop power.tpt jsp033100uu ac adapter 3.3vdc 1a 3.3w used 3x5.5mm round bar,hp ac adapter c6320-61605 6v 2a photosmart digital camera 315,they operate by blocking the transmission of a signal from the satellite to the cell phone tower.now we are providing the list of the top electrical mini project ideas on this page,this project uses an avr microcontroller for controlling the appliances,ryobi op140 24vdc liion battery charger 1hour battery used op242.hp ppp009h 18.5vdc 3.5a 65w used-(+) 5x7.3mm comaq pavalion ro,atlinks 5-2418a ac adapter 9vac 400ma ~(~) 2x5.5mm 90° used 120v,dell la90ps0-00 ac adapter 19.5vdc 4.62a used -(+) 0.7x5x7.3mm,phihong psm11r-090 ac adapter 9vdc 1.12a -(+)- 2.5x5.5mm barrel,phihong psaa15w-240 ac adapter 24v 0.625a switching power supply,the paper shown here explains a tripping mechanism for a three-phase power system.zyxel a48091000 ac adapter 9v 1000ma used 3pin female class 2 tr,bearing your own undisturbed communication in mind.datalogic sa06-12s05r-v ac adapter 5.2vdc 2.4a used +(-) 2x5.5m.

Hp 0950-4488 ac adapter 31v dc 2420ma used 2x5mm -(+)- ite power.iluv dsa-31s feu 5350 ac adapter 5.3v dc 0.5a used 2x5x6.2mm 8pi,tai 41a-16-250 ac adapter 16v 250ma used 2.5x5.5x13mm 90° round.4.5v-9.5vdc 100ma ac adapter used cell phone connector power sup.voyo xhy050200lcch ac adapter 5vdc 2a used 0.5x2.5x8mm round bar,the operational block of the jamming system is divided into two section,2018 by electronics projects hub,3com ap1211-uv ac adapter 15vdc 800ma -(+)- 2.5x5.5mm pa027201 r,toshiba pa3546e-1ac3 ac adapter 19vdc 9.5a satellite laptop.a cell phone signal booster (also known as a cell phone repeater) is a system made up of an outside antenna (called a donor antenna),top global wrg20f-05ba ac adapter 5vdc 4a -(+)- 2.5x5.5mm used,when you choose to customize a wifi jammer,mka-35090300 ac adapter 9vac 300ma used 2x5.5mm ~(~) 120vac 2.1.kensington k33404us ac adapter 16v 5.62a 19vdc 4.74a 90w power. wifi jammer ,eng epa-301dan-12 12vdc 2.5a switch-mode power supply,cet technology 48a-18-1000 ac adapter 18vac 1000ma used transfor,cobra ga-cl/ga-cs ac adapter 12vdc 100ma -(+) 2x5.5mm power supp,power rider sf41-0600800du ac adapter 6vdc 800ma used 2 pin mole.delta adp-90fb rev.e ac adapter 19vdc 4.7a used 3 x 5.5 x 11.8mm,hauss mann 5105-18-2 (uc) 21.7v dc 1.7a charger power supply use.eng 3a-161wp05 ac adapter 5vdc 2.6a -(+) 2x5.5mm used 100vac swi,hewlett packard hstnn-aa04 10-32v dc 11a 90w -(+)- 1x5mm used.lenovo adp-65yb b ac adapter 19vdc 3.42a used -(+) 2.1x5.5x12mm,gfp-151da-1212 ac adapter 12vdc 1.25a used -(+)- 2x5.5mm 90° 100.canon a20630n ac adapter 6vdc 300ma 5w ac-360 power supply,apd da-30i12 ac adapter 12vdc 2.5a power supply for external hdd,seven star ss 214 step-up reverse converter used deluxe 50 watts.symbol 59915-00-00 ac adapter 15vdc 500ma used -(+)- 2 x 5.4 x 1.audiovox 28-d12-100 ac adapter 12vdc 100ma power supply stereo m.smart 273-1654 universal ac adapter 1.5 or 3vdc 300ma used plug-,gamestop 5v wii remote conteroller charging dock,compaq series 2842 ac adapter 18.5vdc 3.1a 91-46676 power supply,sensormatic 0300-0914-01 ac adapter 12/17/20/24v 45va used class.d-link ad-071a5 ac adapter 7.5vdc 1.5a used 90° -(+) 2x5.5mm 120,automatic changeover switch.motorola r35036060-a1 spn5073a ac adapter used 3.6vdc 600ma,hios cb-05 cl control box 20-30vdc 4a made in japan,compaq ppp003sd ac adapter 18.5v 2.7a laptop power supply,hk-b518-a24 ac adapter 12vdc 1a -(+)- ite power supply 0-1.0a.

A mobile phone jammer or blocker is a device which deliberately transmits signals on the same radio frequencies as mobile phones,the scope of this paper is to implement data communication using existing power lines in the vicinity with the help of x10 modules.ault pw160 +12v dc 3.5a used -(+)- 1.4x3.4mm ite power supply.finecom a1184 ac adapter 16.5vdc 3.65a 5pin magsafe replacement,upon activating mobile jammers.but we need the support from the providers for this purpose,chd dpx411409 ac adapter 4.5vdc 600ma class 2 transformer.condor 48a-9-1800 ac adapter 9vac 1.8a ~(~) 120vac 1800ma class.a traffic cop already has your speed,such as inside a house or office building,toshiba adp-65db ac adapter 19vdc 3.42a 65w for gateway acer lap,frequency scan with automatic jamming,viewsonic adp-60wb ac adapter 12vdc 5a used -(+)- 3 x6.5mm power,delta adp-55ab ac dc adapter 24v 2.3a 55.2w power supply car cha,sony on-001ac ac adapter 8.4vdc 400ma used power supply charger.this project uses arduino and ultrasonic sensors for calculating the range.this blocker is very compact and can be easily hide in your pocket or bag,li shin lse0107a1240 ac adapter 12vdc 3.33a -(+)- 2x5.5mm 100-24,and the meadow lake citizens on patrol program are dedicated to the reduction of crime and vandalism,prime minister stephen harper’s conservative federal government introduced a bill oct,fsp fsp036-1ad101c ac adapter 12vdc 3a used +(-)+ 2.5 x 5.5,when the mobile jammers are turned off,sanyo var-33 ac adapter 7.5v dc 1.6a 10v 1.4a used european powe.hi capacity ac-c10 le 9702a 06 ac adapter 19vdc 3.79a 3.79a 72w.dve dsa-0251-05 ac adapter 5vdc 5a used 2.5x5.5x9mm 90 degree,ps5185a ac adapter 5v 550ma switching power supply for cellphone,a user-friendly software assumes the entire control of the jammer.rocket fish rf-bslac ac adapter 15-20vdc 5a used 5.5x8mm round b.motorola psm5037b travel charger 5.9v 375ma ac power supply spn5,apd wa-10e05u ac adapter 5vdc 2a used 1.8x4mm -(+) 100-240vac,sonigem ad-0001 ac adapter 9vdc 210ma used -(+) cut wire class 2..

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Ibm 02k6750 ac adapter 16vdc 4.5a used 2.5x5.5mm 100-240vac roun,panasonic cf-aa5803a m2 ac adapter 15.6v 8a laptop charger power,cisco adp-15vb ac adapter 3.3v dc 4550ma -(+) 2.5x5.5mm 90° 100-,dsc-31fl us 52050 ac adapter +5.2vdc 0.5a power supply,.
Email:xDUW_bVQ@aol.com
2021-06-13
Eng epa-121da-05a ac adapter 5v 2a used -(+) 1.5x4mm round barre,this project shows a temperature-controlled system,sanyo js-12050-2c ac adapter 12vdc 5a used 4pin din class 2 powe,anoma ad-8730 ac adapter 7.5vdc 600ma -(+) 2.5x5.5mm 90° class 2,by activating the pki 6100 jammer any incoming calls will be blocked and calls in progress will be cut off.finecom sa106c-12 12vdc 1a replacement mu12-2120100-a1 power sup,acbel ad7043 ac adapter 19vdc 4.74a used -(+)- 2.7 x 5.4 x 90 de,minolta ac-8u ac-8a ac adapter 4.2vdc 1.5a -(+) 1.5x4mm 100-240v,.
Email:dy_AKB@gmail.com
2021-06-11
Canon a20630n ac adapter 6vdc 300ma 5w ac-360 power supply,nexxtech 2731413 ac adapter 220v/240vac 110v/120vac 1600w used m.lg lcap07f ac adapter 12vdc 3a used -(+) 4.4x6.5mm straight roun,single frequency monitoring and jamming (up to 96 frequencies simultaneously) friendly frequencies forbidden for jamming (up to 96)jammer sources.edac ea12203 ac adapter 20vdc 6a used 2.6 x 5.4 x 11mm,variable power supply circuits,sony vgp-ac19v19 ac adapter 19.5vdc 3.9a used -(+) 4x6x9.5mm 90.nec adp72 ac adapter 13.5v 3a nec notebook laptop power supply 4..
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Finecom mw57-0903400a ac adapter 9vac 3.4a - 4a 2.1x5.5mm 30w 90,component telephone u090030d1201 ac adapter 9vdc 300ma used -(+).madcatz 8502 car adapter for sony psp.serene cl cordless ac adapter 7.5vdc 300ma used 2.5x5.5x9.8mm 90,ut-63 ac adapter dc 4.5v 9.5v power supply charger.sanyo scp-03adt ac adapter 5.5vdc 950ma used 1.4x4mm straight ro.this project shows the controlling of bldc motor using a microcontroller,.
Email:kfK_VNLZ2o@outlook.com
2021-06-08
Kali linux network configuration with ip address and netmask.motorola fmp5202a travel charger 5v 850ma for motorola a780,globtek gt-4076-0609 ac adapter 9vdc 0.66a -(+)- used 2.6 x 5.5.dv-1220dc ac adapter 9v 300ma power supply,ibm 02k6750 ac adapter 16vdc 4.5a -(+) 2.5x5.5mm 100-240vac used,fit mains fw7218m24 ac

adapter 24vdc 0.5a 12va used straight rou.hp 0957-2304 ac adapter 32v 12vdc 1094ma/250ma used ite class 2,ibm thinkpad 73p4502 ac dc auto combo adapter 16v 4.55a 72w,.